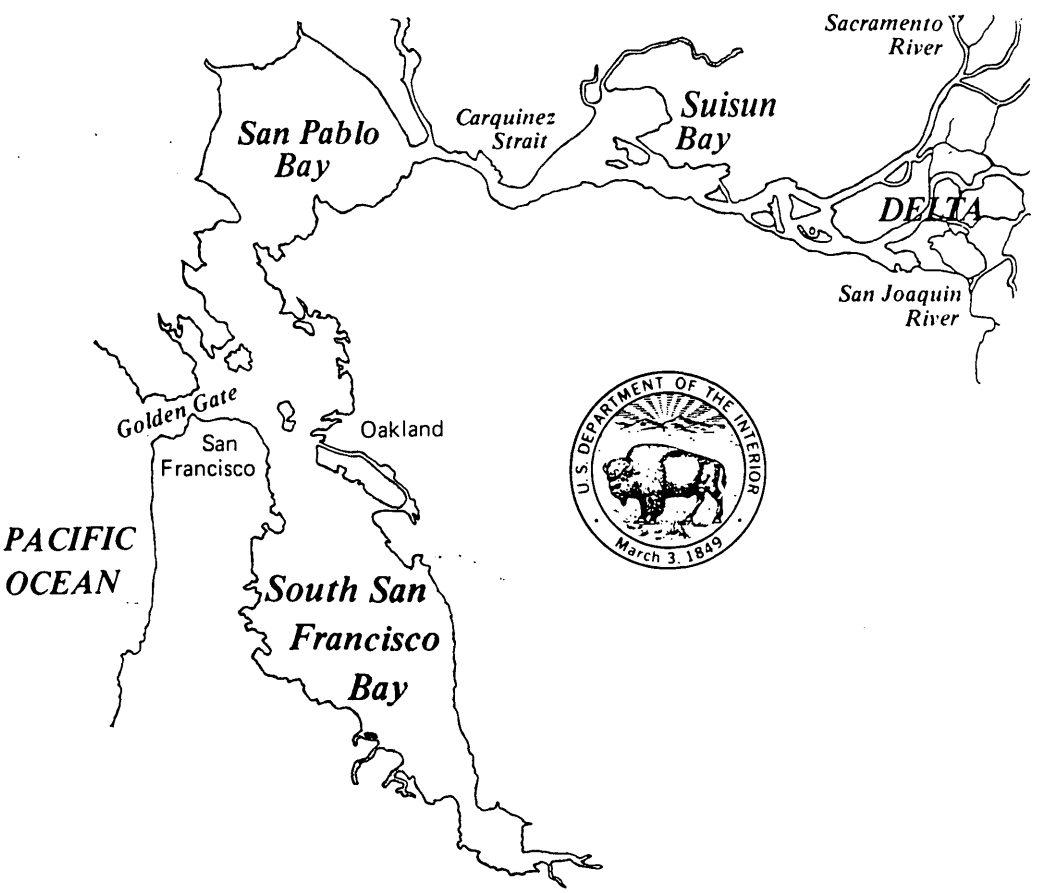
TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART I. DESCRIPTION OF DATA

U. S. GEOLOGICAL SURVEY
WATER RESOURCES INVESTIGATIONS REPORT 84-4339



February 1984

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY, CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART I. DESCRIPTION OF DATA

By Ralph T. Cheng and Jeffrey W. Gartner

U. S. Geological Survey

Water Resources Investigations Report 84-4339

February 1984

UNITED STATES DEPARTMENT OF THE INTERIOR
William P. Clark, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

WATER RESOURCES INVESTIGATIONS REPORT

For additional information
write to:

Regional Hydrologist
Water Resources Division
U.S. Geological Survey
345 Middlefield Road, MS 466
Menlo Park, CA 94025

Copies of this report
can be purchased from:

Open-File Services Section
Western Distribution Branch
U.S. Geological Survey
Box 25425, Federal Center
Lakewood, CO 80225

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY, CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

by Ralph T. Cheng and Jeffrey W. Gartner

CONTENTS

PART I. DESCRIPTION OF DATA

TABLES

ILLUSTRATIONS

CONTENTS

TABLES

ILLUSTRATIONS

APPENDICES

CONTENTS

TABLES

ILLUSTRATIONS

APPENDICES

CONTENTS

TABLES

ILLUSTRATIONS

APPENDICES

CONTENTS

TABLES

ILLUSTRATIONS

APPENDICES

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY, CALIFORNIA - RESULTS OF MEASUREMENTS, 1979-1980

ABSTRACT

Current-meter data collected at ninety-seven stations in San Francisco Bay, California between February 1979 and December 1980 are compiled in this report. The measurements include current speed and direction, and water temperature and salinity (computed from conductivity and temperature). Data processing procedures are discussed and documented. Tide-generating forces are explained, and the method of harmonic analysis is briefly reviewed. The time-series data for water speed and direction have been harmonically analyzed. For each deployment, the data are presented in two forms: (1) results from harmonic analysis; and (2) plots of tidal current speed and direction versus time, and salinity and temperature versus time. In addition, Eulerian residual currents have been computed using a vector-averaging technique.

Water-level observations from thirty-four stations in San Francisco Bay including the data from a long-term reference station at Presidio (Golden Gate) are presented. Time-series of water level data have been harmonically analyzed, and the results are given in tabular form. Results of measurements for the Suisun Bay region are compiled and discussed in Part II of this report. Similarly, results for San Pablo Bay, Central Bay, and South Bay are compiled and discussed in Parts III, IV, and V of this report, respectively.

Spatial distribution of the properties of tides and tidal currents are given in graphic form; bathymetry of the basin is shown to be an important factor affecting variations of tides and tidal currents.

INTRODUCTION

The need to systematically measure tides and tidal circulation, and to determine residual circulation has long been recognized as important to the understanding of the interactive physical, chemical, and biological processes which affect the San Francisco Bay estuarine system (fig. I.1).

Manmade changes which influence the ecological state of the Bay have occurred with increasing frequency and scope. These changes have been the subject of numerous studies, and much of the recent research effort has focused on the biological, chemical, and ecological aspects of the estuarine processes. Although hydrodynamic processes are generally recognized as inseparable from ecological concerns, until a few years ago studies of the physical processes of the Bay system had been mostly descriptive (Conomos, 1979). A hydraulic model of San Francisco Bay was constructed in 1960 by the U.S. Army Corps of Engineers as a tool to evaluate alternative plans for water-resource strategies, and an interdisciplinary study of the Bay that included some quantitative measurements was carried out in the early 1960's by the Sanitary Engineering Research Laboratory (SERL), University of California, Berkeley (Pearson and others, 1970).

Beginning in the late 1960's, the U. S. Geological Survey (USGS) initiated a continuing interdisciplinary research program which uses the San Francisco Bay estuarine system as an outdoor laboratory to study the complex interactive estuarine processes (Conomos and others, 1978; Cheng and Conomos, 1980). Physical and chemical properties of water along the main channels of the Bay system have been recorded for more than ten years (Smith and others, 1979). Also in the late 1970's, a collaborative project between the California State Lands Commission and National Ocean Survey/

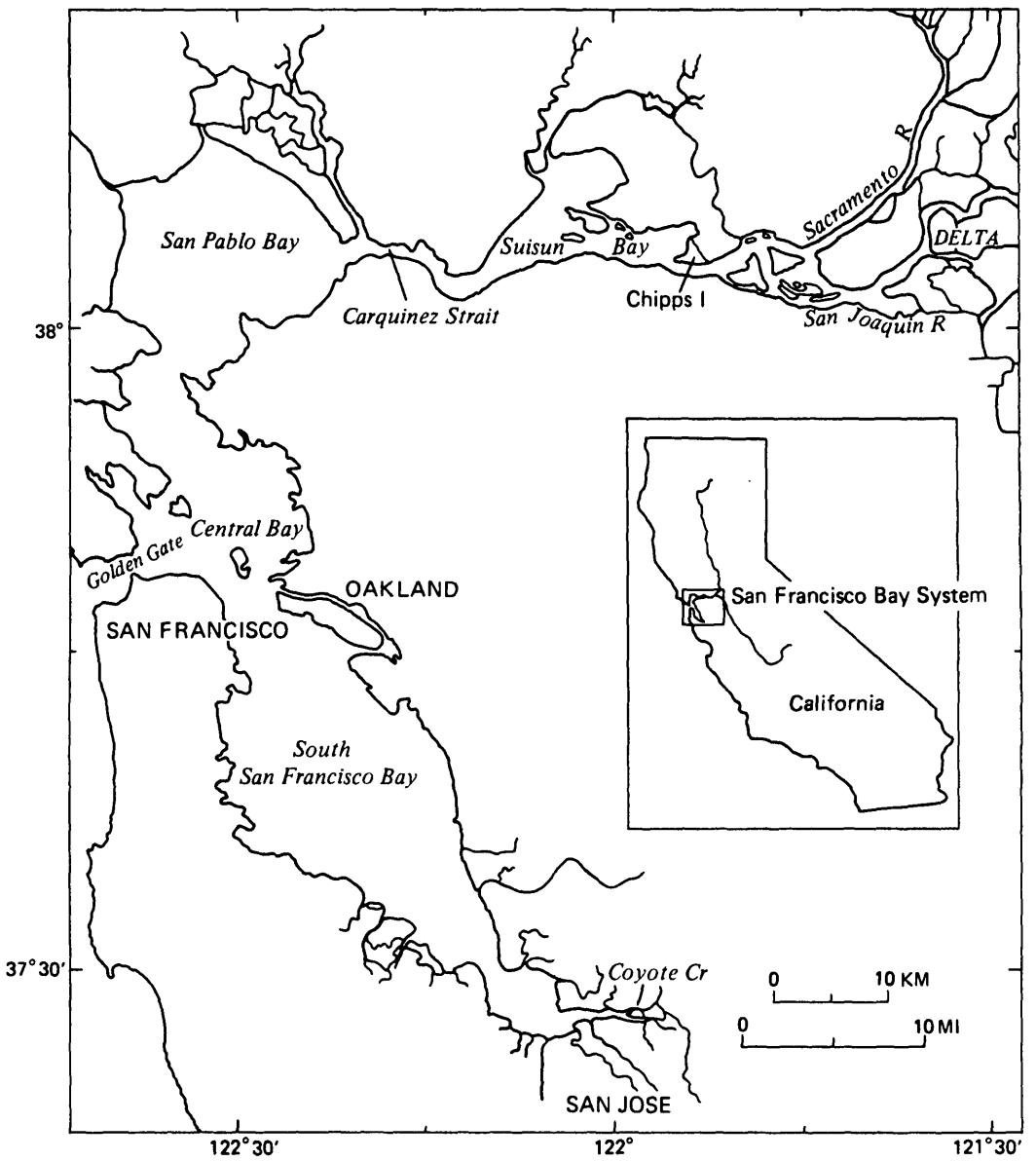


Figure I.1. Map of general study region, San Francisco Bay, California.

National Oceanographic and Atmospheric Administration (NOS/NOAA) began. The project required installation of numerous tide stations throughout the Bay for various lengths of time in an effort to define long-term changes in the marine boundary. A NOAA tide gauge has been maintained and tidal heights recorded for well over 100 years at Presidio near the Golden Gate Bridge (Smith, 1980).

The development and verification of various conceptual and numerical models which represent the interactive physical, chemical, and biological processes can be made more realistic with the quantification of tidal circulation, river inflows, winds, and tides (Cheng and Conomos, 1980). To meet these needs, a current-metering program was undertaken by the USGS as part of the interdisciplinary study of the San Francisco Bay estuarine system. Appropriate instruments were tested and selected (Cheng, 1978) and data processing procedures were developed (Cheng and Gartner, 1979, 1980).

During 1979 and 1980, a comprehensive tidal current survey of San Francisco Bay was conducted jointly by NOS/NOAA and the USGS (Patchen and Cheng, 1979). A network of current meters was deployed in the Bay system from which an extensive set of current observations was collected. Concurrently, water level observations (tides or stages) were made at numerous stations along the shoreline boundary of the Bay system. The current-meter arrays were designed and their locations and deployment periods selected to support multiple needs of several research groups. Analysis of tides and tidal-current data and the determination of Eulerian residual circulation are the main focus of this report. The results of present analysis can be used in various aspects of interdisciplinary research to further understanding of water circulation and mixing in the Bay, to update tides and tidal-current predictions, and to support

calibration and verification of mathematical and physical models. The complete data set (tides and tidal currents) resulting from the joint USGS/ NOS survey are documented in this report. The results of the measurements are compiled and grouped regionally in Part II to Part V to cover (a) the Suisun Bay region, (b) the San Pablo Bay region, (c) the Central Bay region, and (d) the South Bay region.

This report is organized by first providing a brief description of the physical setting of the San Francisco Bay estuarine system and a review of origins and the generating forces of tides and tidal currents. The field program and the techniques for measuring tidal current are then described, and some difficulties that were encountered during the field operation are discussed. Next, the data processing procedures and the methods of analysis are described in detail.

Current-meter data are presented in the form of time-series plots of current speed and direction, and water temperature and salinity. A summary of the results of harmonic analyses is given for each deployment. The time series of stage data have also been analyzed harmonically, and the resulting harmonic constants of tides are given in tabular form. The results of the analyses are discussed in the order of tides, tidal currents, and Eulerian residual currents. This report presents original data and documents primary data reduction procedures.

Acknowledgements

The authors wish to acknowledge the opportunity and the pleasure to collaborate with the Circulatory Surveys Branch of the National Ocean Service, National Oceanic and Atmospheric Administration on this project. The Tidal Analysis Branch of the National Ocean Service supplied data of

water level observations. The Department of Water Resources, State of California furnished data of Delta outflows used in this report. We thank the captain and crew of the R/V Polaris (USGS) for their assistance during our field work. We acknowledge the assistance of Mary Regan Flint from the California District Office, Water Resources Division, U.S. Geological Survey, who did some of the data processing.

SAN FRANCISCO BAY ESTUARINE SYSTEM

San Francisco Bay and Delta is one of the world's largest and most complex estuarine systems comprising numerous interconnected embayments, sloughs, marshes, channels, and rivers (fig. I.1). From Central Bay, its connection with the Pacific Ocean at Golden Gate, the system extends to the southeast into South San Francisco Bay. To the north and northeast it extends to San Pablo Bay, through Carquinez Strait to Suisun Bay and the Delta region. The total surface area of the San Francisco Bay system is about 1220 sq km and the mean depth is about 5 m referenced to mean lower low water (MLLW). Each embayment is dominated by wide expansive shoal areas surrounding deep and narrow ship channels. Narrow constrictions or straits which are usually areas of higher currents are the natural transitions from one embayment to the next. Although there are some similarities among the embayments, each embayment as indicated in figure I.1 has its own unique characteristics and will be described separately.

The southern reach, South San Francisco Bay (South Bay), has a wetted surface area of approximately 554 sq km and a mean depth of 3.4 m referenced to MLLW. As with all the embayments, South Bay is characterized by a deep channel with adjoining shoals. In South Bay the water is typically well mixed, and the water properties which vary seasonally are in part controlled by water exchange with the northern reach. South Bay receives more than 75 percent ($1.3\ km^3\ yr^{-1}$) of the total waste water discharged into the system, and during summer months sewage discharge into the Bay exceeds natural stream inflows (Conomos, 1979). Freshwater entering South Bay from local tributaries is about $0.1\ km^3\ year^{-1}$ compared to $20.9\ km^3\ year^{-1}$ entering the entire Bay system from all river sources.

Central Bay has a total area of 266 sq km, a mean depth of 10.7 m

(referenced to MLLW) and is a junction between the opening to the Pacific Ocean, South Bay, and the northern reach. It is the deepest embayment on average and has the smallest percentage of shoal area (20 percent). The tidal current patterns are generally complex and intense. There is a main ship channel (depth >9 m) which originates at the entrance to the Bay and extends through the Bay system. The deepest area of the system is at the Golden Gate (110 m), where depth is maintained by strong tidal currents.

The northern reach of San Francisco Bay, which consists of San Pablo and Suisun Bays and Carquinez Strait can be characterized as a partially mixed estuary; a significant vertical density gradient is present throughout the year. Nearly all the freshwater (90 percent) enters the San Francisco Bay system from the Sacramento and San Joaquin Rivers at the eastern end of the northern reach. The landward flowing saltwater is mixed upward, and the less dense freshwater is mixed downward resulting in surface salinity increasing down the estuary and a similar longitudinal salinity gradient in the more saline bottom water.

San Pablo Bay, like South Bay, has a deep main channel and extremely wide shoals (especially northeast of the ship channel). For San Pablo Bay, 57 percent of the total area of 271 sq km is shallower than 2 m, and the characteristic depth of the channel is 9 m compared to a mean depth of the basin of 2.7 m (referenced to MLLW). Because of the basin bathymetry, there were some difficulties deploying current meters in the vast shallow region. Carquinez Strait has an area of 31 sq km and is the transition region from San Pablo Bay to Suisun Bay. The mean depth and width of the Strait are 8.8 m and 2.5 km, respectively. The tidal currents are generally intensive and in the direction of the channel.

Suisun Bay is significantly more complex than the other embayments. It

consists of several deep channels surrounding numerous shoals and islands, and includes two sub-embayments, Grizzly and Honker Bays (mean dpeth <2 m). Suisun Bay has an area of 94 km^2 and a mean depth of 4.3 m (referenced to MLLW). The main channel, which ranges in depth from 9 to 14 m referenced to MLLW, connects Carquinez Strait and the Delta.

The Delta is a rich agricultural and recreational region comprising more than 1000 km of interconnected waterways, which receive freshwater primarily from the drainage basins of the Sacramento and San Joaquin Rivers covering about 40 percent of the land area of California. After diversion, storage, and consumption, the remaining water enters the Bay system at the eastern end of Suisun Bay. The volume of the Delta outflow ranges seasonally from extremely low values of about 50 - 150 m^3s^{-1} in summer to peak values of about 8000 - 12000 m^3s^{-1} in winter (wet winters) depending on rainfall and snowmelt runoffs, consumption, and diversions. Figure I.2 shows the Delta outflow at Chipps Island (Dayflow Summary, 1982) for 1979-1980 when the extensive USGS/NOS current survey was conducted.

There are four major factors which affect the circulation in the Bay system. They are the tides entering the Bay at Golden Gate from the Pacific Ocean, the meteorological forcing, the basin bathymetry, and the salinity field in the Bay system. Complex flow patterns in various embayments and the influence of Delta outflow affect the salinity field throughout the Bay system. The Delta outflows (San Joaquin and Sacramento Rivers) have a greater influence on the estuary's salinity than does the Pacific Ocean because of the greater seasonal variation. In Central Bay near-surface salinity varies inversely with river outflow. At the Golden Gate, salinity is controlled more by the ocean than by the rivers, but that is only a localized effect (Conomos, 1979). In the northern reach the salinity

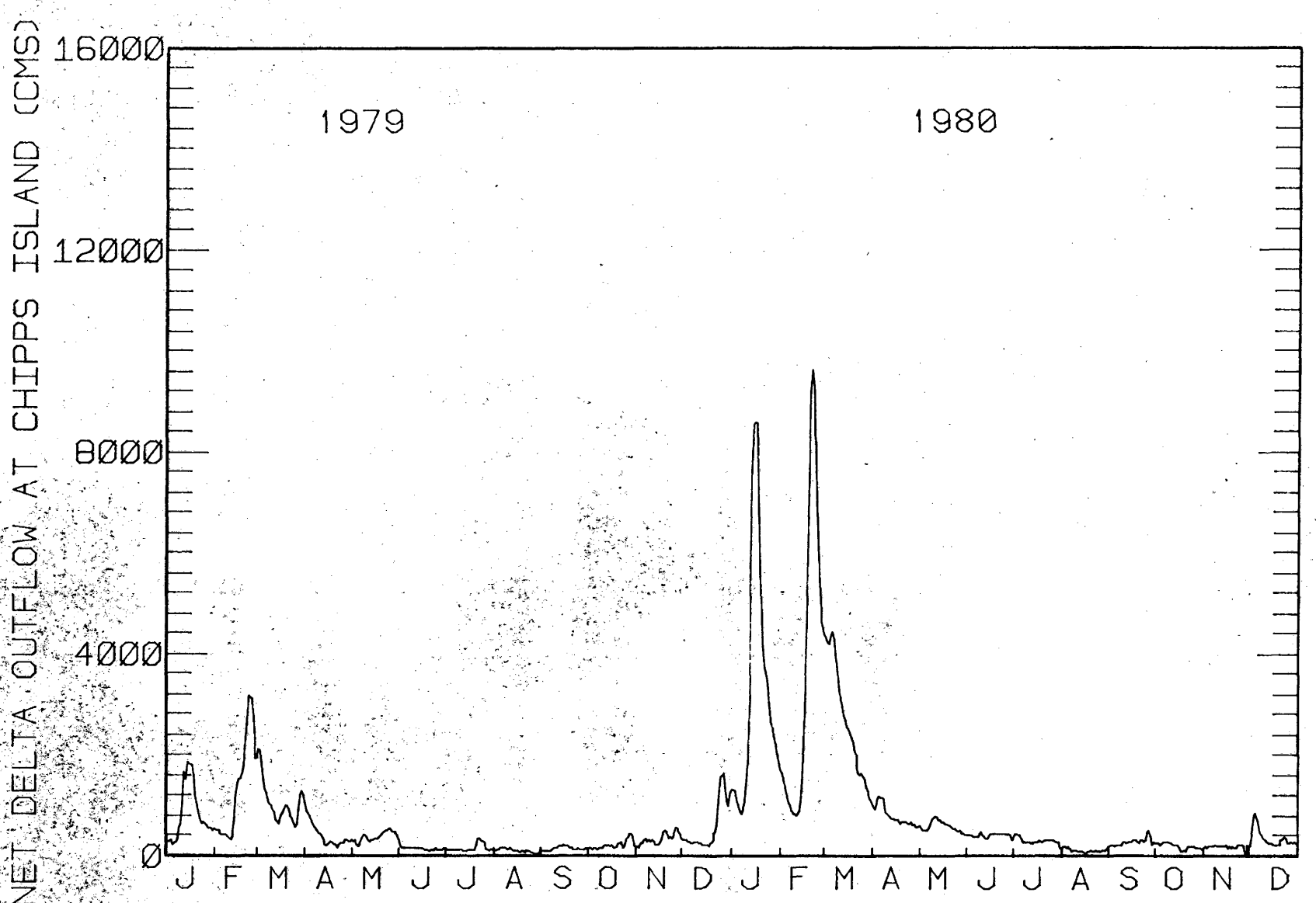


Figure I.2. Net Delta outflow at Chipps Island, 1979-1980.

values for Suisun Bay range from about 0-1 o/oo at the junction of the Delta to 10-15 o/oo at the eastern end of Carquinez Strait. Stratification is always present in the northern reach with a typical surface to bottom salinity difference of about 5 o/oo in winter and 3 o/oo in summer; a 10 o/oo difference during wet winter periods is possible. Saline water may intrude into the confluence of the Sacramento and San Joaquin Rivers in dry summers, whereas the saline water front may be kept in San Pablo Bay by freshwater during winter peak outflow periods. Carquinez Strait, which connects Suisun and San Pablo Bays, has a typical salinity value of 15 o/oo in summer and about 10 o/oo in winter. Salinity in San Pablo Bay varies in the range of 20 to 28 o/oo. All salinity values have large daily and temporal variations; all values given are spatial and temporal averages for the stated embayment.

The South Bay has near oceanic salinity values much of the year (Conomos, 1979) and is controlled by both oceanic conditions and the Delta outflows. During summer months South Bay is well mixed because of tidal-current-induced and wind-forced mixing effects. During wet winters when the Delta derived fresh water flows dominate, salinities in South Bay can be lowered to 10-15 o/oo near the southern end, and vertical stratification may be present.

Bay area climate is temperate and is characterized by dry summers and wet (rain) winters with mild climate influence from the ocean. Wind patterns vary seasonally. The prevailing wind is westerly or northwesterly and strongest during summer. Summer winds are reinforced by solar heating of interior air masses which generates diurnal sea-land breezes. Winter winds are more variable with periodic storms generating precipitation and south and southeasterly winds. Local variations in wind patterns and weather are common due to variations of local terrain surrounding the Bay.

ORIGINS OF TIDES AND TIDAL CURRENTS

Water circulation in San Francisco Bay is driven primarily by the tides which propagate into the Bay system from the Pacific Ocean through the narrow opening at Golden Gate. Secondary driving forces of tidal currents include the prevailing winds, the outflows of fresh water from the Delta, and local run-offs and municipal and industrial discharges. The water movements are strongly affected by the basin bathymetry and are further subject to the effects of the earth's rotation and frictional resistance at the bottom of the basin. Water density stratification plays a minor role in tidal circulation; stratification becomes important when the gravitational residual circulation is considered.

To explain the tide-generating forces, we must go back to Newton's law of mechanics which states that the force of attraction between two bodies is proportional to the product of their masses and inversely proportional to the square of their distance apart. Whereas the earth is also attracted to other celestial bodies, only the moon and sun exert appreciable forces on the earth. Thus, it is adequate to consider only the tide-generating forces of sun and moon on water bodies of the earth. Orbital motions of the moon around the earth, and similarly the earth around the sun generate centrifugal forces which balance out the respective attractions exactly, and thus the system is in a dynamic balance. Because the tide-generating forces in the moon-earth and earth-sun systems act in the same manner, it is sufficient to examine only the earth-moon system.

The earth-moon system is in a dynamic equilibrium; it implies that the "total" attractive force cancels exactly the "total" centrifugal force between them. Figure I.3 illustrates the attractive force and centrifugal force distributions on the surface of earth. As indicated, the sum of all

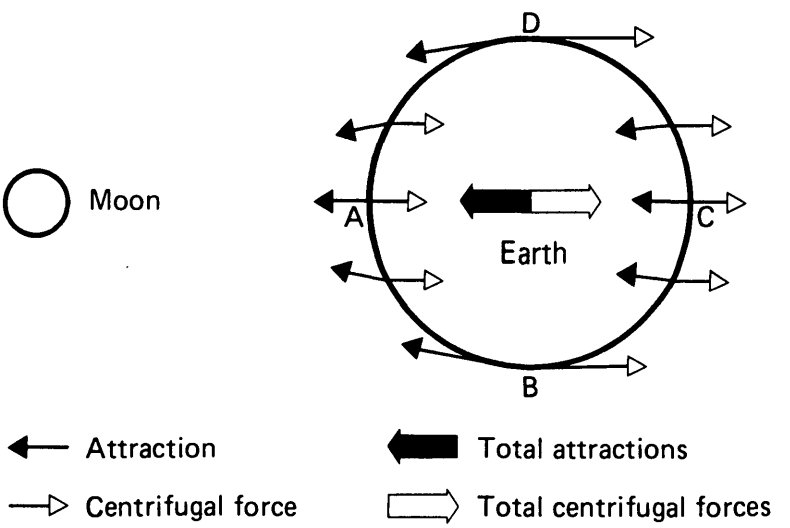


Figure I.3. The tide generating force as the difference between attractive and centrifugal forces at given points on earth.

attractive forces cancels exactly the centrifugal force at the center of mass, but it is important to note that individual mass parcels are not in equilibrium. The imbalance between the attractive and centrifugal forces at any given point on the surface of the earth is the tide-generating force whose distribution along a meridian is shown in figure I.4. At point A which is nearest to the moon, the attraction exceeds the centrifugal force and the net tide-generating force points vertically away from the earth's surface. At point C which is farthest from the moon, the net tide-generating force also points vertically away from the earth's surface, except in this case the centrifugal force exceeds the attraction. At points B and D, the nature of force balance gives net tide-generating forces pointing vertically downward. Other than at these points, there is a tide-generating force component tangential to the earth's surface. Newton's equilibrium theory of tides which is based solely on the static balance of forces explains the effects of tide-generating force on the water mass. The theory assumes that if the earth is covered completely with water of equal depth, tide-generating forces would have deformed the water surface and made a continuous water envelope enclosing the earth as shown in figure I.4. It is clear that the tide-generating force is a function of the relative position of the moon with respect to a particular point on the earth's surface.

If we now consider that the earth rotates about its own axis once a day, an observer at a fixed point on earth will experience two complete cycles in the change of tide-generating force each day. This cyclic process of the earth's rotation generates semidiurnal (twice daily) tides. Because the earth is not covered completely by water, the tide-generating forces also act on the land mass and the atmosphere at the earth's surface.

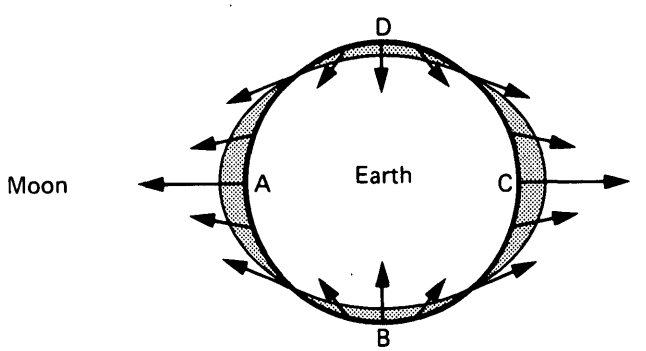


Figure I.4. Distribution of tide-generating force along a meridian. The shaded area is a schematic diagram of the displacement of a uniform layer of water by the tide-generating forces.

The end results are the phenomena of the earth tides, the atmospheric tides and, of course, the tides in the oceans. Because the tide-generating force per unit volume is proportional to the density of the media, the tide-generating force is largest on solid earth and smallest on the atmosphere. However, the solids are far more rigid than water, and water is much denser than the air; consequently, the tide-generating forces have the greatest effects on oceanic tides. Certainly both the earth tides and the atmospheric tides are important phenomena, but they are not the subject of the present discussion.

The earth-sun system behaves in exactly the same manner as the earth-moon system. The effects of sun and moon on tides are additive; the net result is the sum of all tide-generating forces at a given point on earth. A brief remark on the measurement of time is in order here. Because we have based our standard time on the earth-sun system (solar time), the period of the earth's rotation is exactly twenty four hours. Thus, the semidiurnal tide in the earth-sun system has a period of exactly twelve hours. As the moon revolves around the earth at roughly 30 days per revolution, when measured in solar time, the moon passes the same meridian on earth approximately every 24 hours 50 minutes. Thus the principal semidiurnal lunar tide has the period of 12.42 hours.

The orbital motions of the moon and earth in the solar system are much more complex than described above. The moon's plane of rotation (declination) varies at roughly a 27.5-day period. Similar astronomical precession of earth in the solar system produces longer term variations in the tide-generating forces, thus also longer term variations of tides. Fortunately, all the tide-generating forces can be calculated with high accuracy because the astronomical motions of the moon and earth relative to

the sun can be predicted with high precision.

As alluded to in the previous paragraph, the observed rise and fall of the water level is the sum of several tidal constituents. Each tidal constituent is known as a partial tide which is driven by a respective tide-generating force. Traditionally each partial tide is given a letter symbol which abbreviates its main characteristics, and a subscript number showing approximate cycles per day. Thus, the principal semidiurnal lunar and solar tides are denoted as M_2 and S_2, respectively. Because the axis of earth's rotation relative to the sun and to the plane of the moon's rotation do not coincide, the net effects produce the diurnal tides K_1, O_1, and P_1. Table I.1 gives the most important astronomical partial tides. As pointed out above, the frequencies of these tide-generating forces can be determined very accurately. Consequently, the frequencies of the partial tides are given with great precision.

Realistically, the earth is not covered with a uniform layer of water. On the contrary, the water depth in the oceans and the shorelines of any ocean are irregular and variable. Furthermore, due to the effects of the earth's rotation and the effects of fluid friction, an accurate prediction of the phase and the amplitude of tides cannot be obtained satisfactorily from solving a system of conservation equations. From the description given above, the tides at a given location can be expressed as a series of simple harmonic functions whose frequencies are the frequencies of the partial tides. When long-term observations of tides are available, the field data are fitted to the harmonic expression by means of regression methods to deduce the respective amplitude and phase for each partial tide. Once the amplitude and phase (the harmonic constants) of each partial tide are known, the same harmonic series can be used to predict tidal variations

at any time. This analysis procedure is known as tidal-harmonic analysis; its operational principles will be explained later in this report.

In a coastal embayment or estuary such as the San Francisco Bay system, the total extent of the embayment is small, and the tide-generating forces can be considered to be small everywhere within the basin. If we imagine the Bay as an enclosed basin like a lake, i.e., there is no connection between the Bay and the ocean, the tide-generating forces would produce independent oscillations known as seiches which would interact with and be modified by the basin bathymetry. Estuaries differ from lakes by definition in that estuaries are connected to an open ocean. At the junction, the oceanic tides force the water in estuaries to oscillate in sympathy with the oceanic tides. These sympathetic tides or forced oscillations act like waves which propagate from ocean into estuarine basin. The amplitude and phase angle of each tidal constituent are modified by the basin bathymetry, friction, river discharge, and by the rotational effect of the earth as the tides propagate up the estuary. Normally the independent tides in estuaries are negligibly small when compared to the forced oscillations if the basin is not in resonance with the independent tides. The tidal oscillations in estuaries can be seen as the propagation of shallow water, long period gravity waves from the oceanic junction up toward the head of the estuary. The effects of tidal waves extend from ocean to hundreds of kilometers upstream along the estuary. The tidal waves propagate at a speed of approximately $\sqrt{gh}$ where g is the gravitational acceleration and h is the water depth. For a mean basin depth of 20 m, the averaged wave speed is 14 m/sec. The wave length for a semidiurnal tide is on the order of 600 km, and the wave length for a diurnal tide is nearly doubled. In the San Francisco Bay system, the

length scale of the system is much smaller than the wave lengths of the tides. As the tidal wave propagates up the estuary, it sets up a hydraulic gradient along the axis of the estuary. This hydraulic gradient (water surface slope) which has the same frequencies as the forcing tides is the primary driving force of tidal currents. Therefore, the tides and tidal currents are but the two aspects of tidal dynamics, and they share the same frequencies as the incident oceanic tides. The amplitudes and phases along the estuary are modified by the local basin bathymetry as the tides propagate up the estuary.

To improve our understanding of the circulation in San Francisco Bay, the properties of both the tides and the tidal currents in the Bay system must be considered concurrently. Once the spatial distributions of the harmonic constants (the amplitude and phase) of tides and tidal currents have been compiled, they can be used to predict tides and tidal currents in the Bay. The long-term water level observations and current-meter data collected in 1979 and 1980 by the USGS/NOS form the basis for deriving these harmonic constants for San Francisco Bay. Indeed, the compilation of the harmonic constants for both the tides and tidal currents is one of the objectives of this report.

FIELD PROGRAM

Measurement of tidal currents

Tides and tidal currents in San Francisco Bay consist of several important semidiurnal and diurnal partial tides. Because the frequencies of the partial tides (tide-generation forces) are different, the resulting tides vary constantly in phase (reinforcing each other) and out of phase (canceling each other) in a fortnightly cycle. The net effects of the phase changes give rise to the spring and neap variations of tides and tidal currents. Longer time variations in orbital motions of the moon and earth give semi-annual and annual variations and finally an 18.6-year cycle tidal variation, the last occurring when the sun, earth, and moon return to the exact same relative positions. One of the principal objectives of the present field program is to measure the tides and tidal currents and to define the partial tides from these data. Clearly, the longer the time-series of field data, the more accurately each partial tide can be computed. Therefore, in the present joint USGS/NOS current survey only self-recording current meters which are capable of recording tidal-current speed and direction for a minimum of 15 days were used. Normally the deployment periods lasted between 15 and 35 days. Several current-meter stations were redeployed at the same geographic location to provide even longer data records. Unfortunately, usable data records sometimes were shorter than the deployment periods because of malfunctions of instruments, damaged moorings, or adverse field conditions.

Only long-term measurements of tides and tidal currents are considered useful and have been dealt with in this report. For example, a 25-hour continuous measurement of tides or tidal currents does not satisfy our

needs, and such data cannot be used to describe adequately the tidal circulation pattern in the Bay system. Similarly, the concept of a "representative" 25-hour tidal cycle (Fischer and Lawrence, 1983) cannot characterize the important spring-neap variation of tides and tidal currents. The spring-neap variation in tidal currents is known to play a significant role in mixing and is important in understanding processes controlling the water quality and the ecological balance of estuarine systems (Uncles and Radford, 1980; Budgell, 1982)

Current meters

Two types of recording current meters were used in this project; they were Endeco-174[1] and Aanderaa RCM-4 digital-recording current meters. The Endeco-174 is an axial-flow, ducted-impeller current meter which records data on a magnetic tape cartridge. Data can be recorded for as much as 40 days when the data-recording interval is selected to be two minutes. Accuracy specifications for Endeco-174 current meters as provided by the manufacturer (Environmental Devices Corporation, Marion, Mass.) are as follows: speed, $\pm$3.0 percent of full scale (257 cm/s) (above the threshold of 2.6 cm/s); direction, $\pm 7.2^{\circ}$; temperature, $\pm 0.2^{\circ}$C; and conductivity, $\pm$0.55 mmho/cm. These current meters were serviced by USGS personnel throughout the project. A detailed discussion of the characteristics of the Endeco-174 current meter was given by Cheng and Gartner (1980).

The Aanderaa RCM-4 utilizes a Savonius rotor as the speed sensor and a reel-to-reel magnetic tape for data storage. The maximum tape capacity is about 10,000 samples. Accuracy specifications for the Aanderaa RCM-4 as

[1]Use of brand or trade name in this report is for indentification purposes only and does not constitute an endorsement by the U.S. Geological Survey.

supplied by the manufacturer (Aanderaa Instruments, Bergen, Norway) are: speed, ±1 cm/s or 2 percent of full scale (250 cm/s); direction, ±5.0°; temperature, ±0.15°C; and conductivity, ±0.1 percent of range (0-70 mmho/cm). The sampling interval for the Endeco-174 was selected to be two minutes while that for the Aanderaa RCM-4 was set at ten minutes. The maintainance of Aanderaa current meters was provided by NOS/NOAA personnel during the project. Both types of current meters were used by the USGS and by NOS/NOAA.

Current-meter moorings

Three different types of current-meter moorings were designed and used in this study. A taut-wire mooring (fig. I.5a) was normally used at NOS stations where Savonius rotor type current meters (Aanderaa RCM-4) were employed. At shallow water stations (depth <20 m), a USGS mooring (fig. I.5b) was used in conjunction with Endeco-174 current meters in an effort to minimize erroneous speed values due to mooring line motion (Cheng, 1978). The third mooring type consisted of a bottom platform which rigidly supported an Aanderaa current meter at 0.9 or 1.7 m above bed (fig. I.5c). Because of the rigid mounting, the Savonius rotor type of current meter could be deployed in the shallow water wave zone and still provide useful data. Mooring types two and three were commonly combined to form a two-meter mooring with an Endeco-174 meter suspended in the mid-water column and an Aanderaa RCM-4 on the bottom platform.

Position of moorings

The positions of current-meter stations were determined by horizontal sextant fixes determined to the nearest second of arc (±31 m).

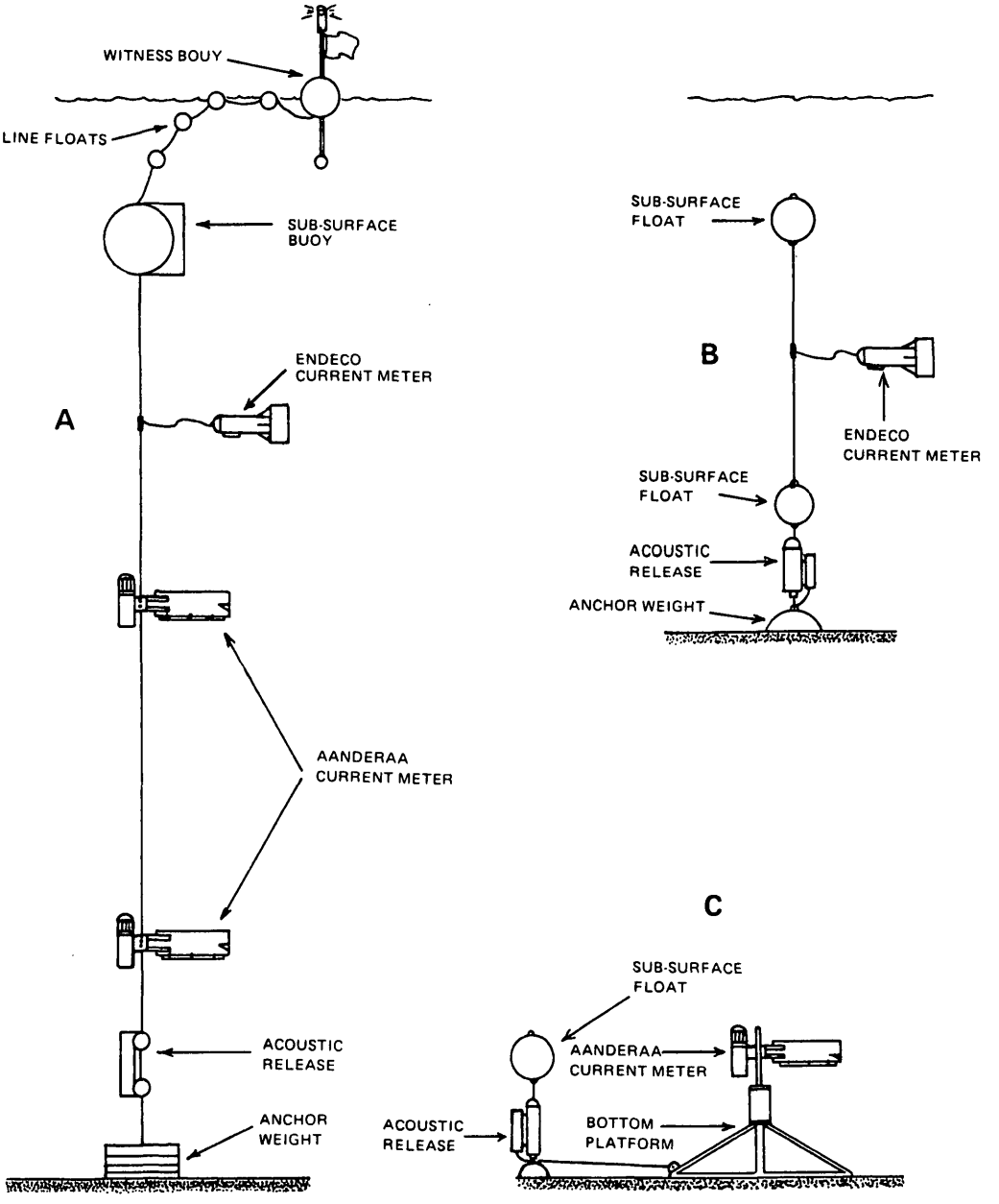


Figure I.5. Current-meter mooring designs used in the San Francisco Bay study.

Additionally, the sextant fix readings were routinely backed up with radar and visual references. The latitude and longitude of each station location were determined from published navigation charts. These data were originally recorded on deployment log sheets and have been entered into the header part of each data file.

Measurement of tides

The U.S. Geological Survey was not involved with the measurement of tides in this field program. However, tide data from stations along the perimeter of the Bay have been analyzed and included in this report. The source of the tide data is given and described in the next section.

FIELD DATA

Data arrangement

This report contains all data collected in the San Francisco Bay estuarine system during 1979 and 1980. Part I of this report gives a general description of when and where the current-meter data and water-level (tide) data were collected. Because of the large volume of data and for user's convenience, the data and the results of analyses are grouped regionally in Part II to Part V of this report.

Current-meter data

Ninety-seven (97) current meter stations were deployed in San Francisco Bay by the USGS and NOS during the combined current survey in 1979 and 1980. Multiple current meters were deployed at several current-meter stations in the main channel. The minimum length of current-meter deployment was normally fifteen days, and the maximum deployment was not to exceed thirty-five days. Figure I.6a, I.6b, I.6c, and I.6d depict the approximate geographic locations of the current-meter stations in Suisun Bay, San Pablo Bay, Central Bay, and South Bay regions. The latitude and longitude, and the water depth for each current-meter station at MLLW are tabulated in Part II to Part V of this report for the respective regions. Also included in these tables are the current-meter depth and the deployment and recovery dates. Figure I.7a, I.7b, I.7c, and I.7d are chronological bargraphs, which indicate the availability of the current-meter data with reference to time for the respective sub-embayments. Figure 6 and figure 7 define the distribution in space and time of current-meter data included in this report.

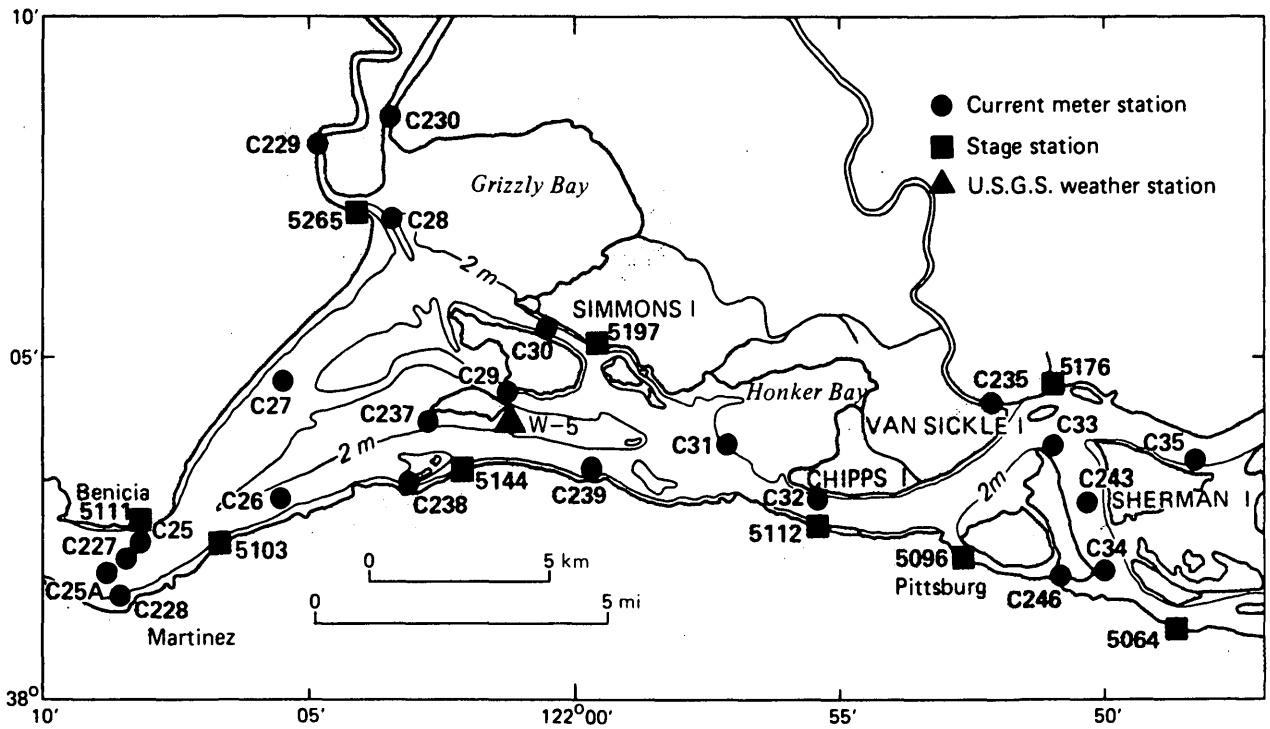


Figure I.6a. Map of Suisun Bay region and the location of current-meter moorings, tide stations, and USGS weather station.

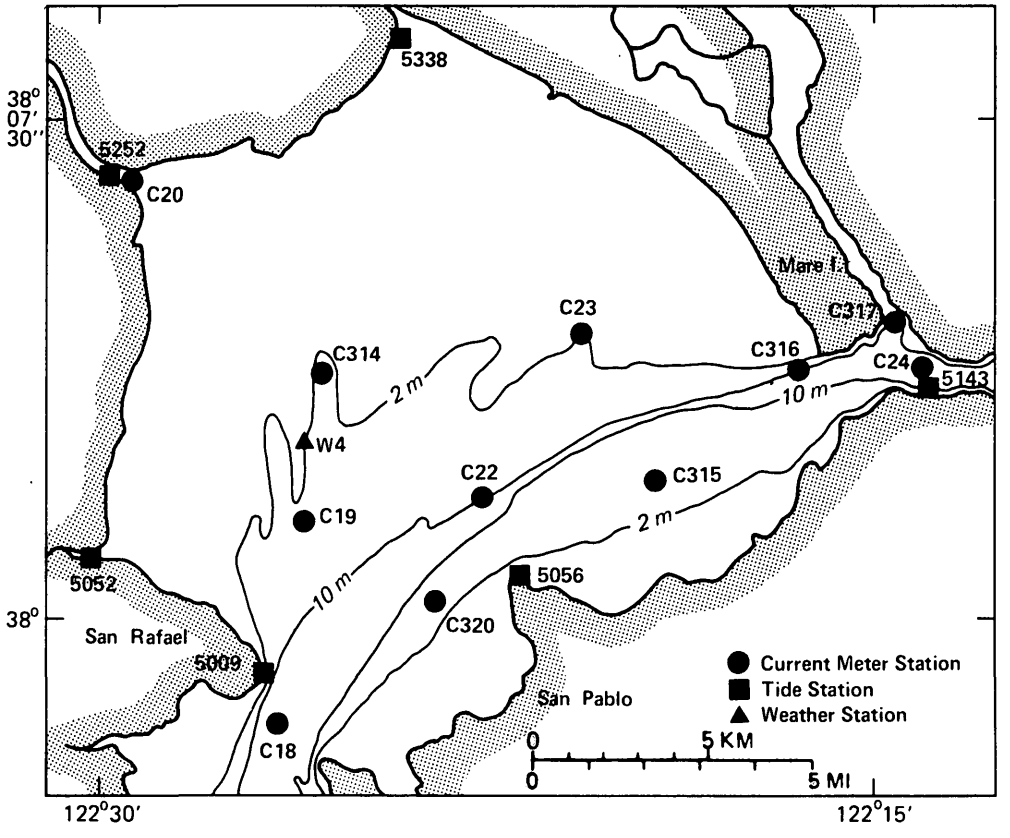


Figure I.6b. Map of San Pablo Bay region and the location of current-meter moorings, tide stations, and USGS weather station.

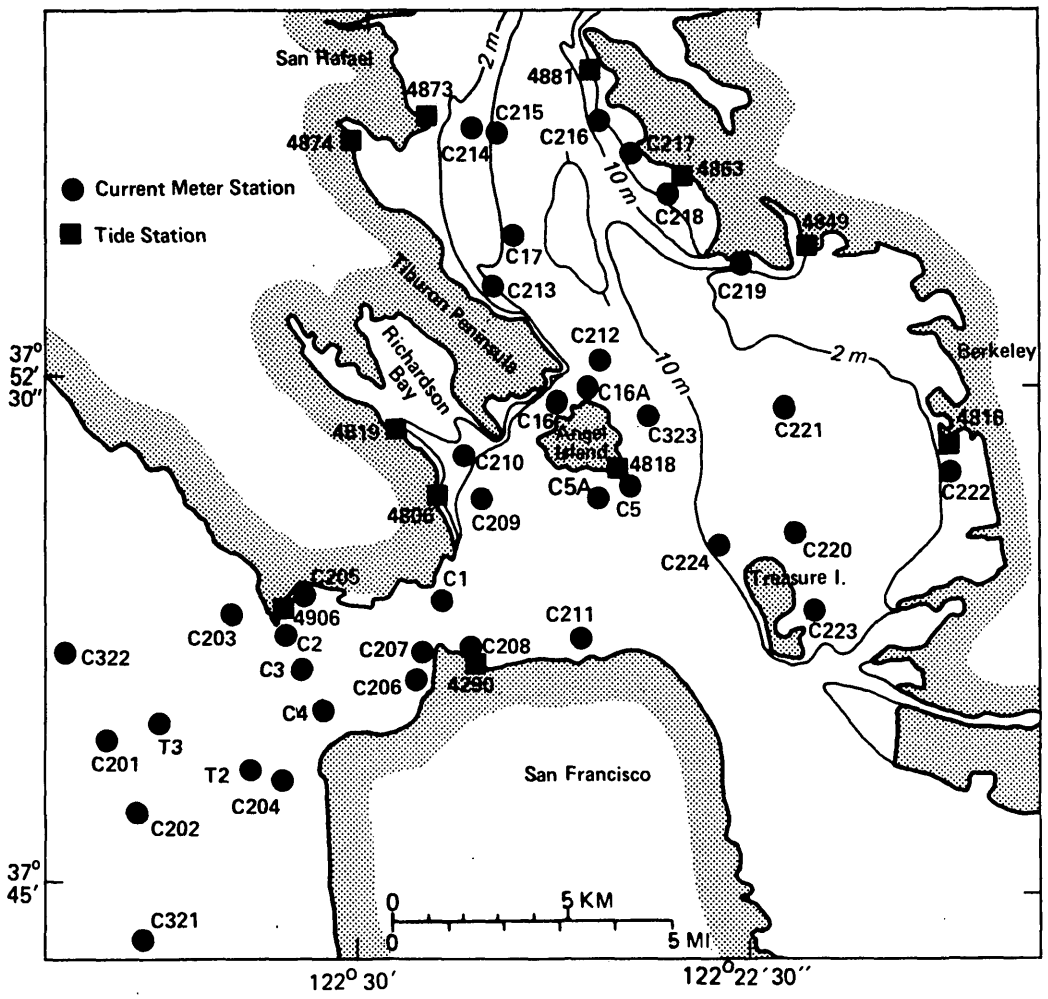


Figure i.6c. Map of Central Bay region and the location of current-meter moorings and tide stations.

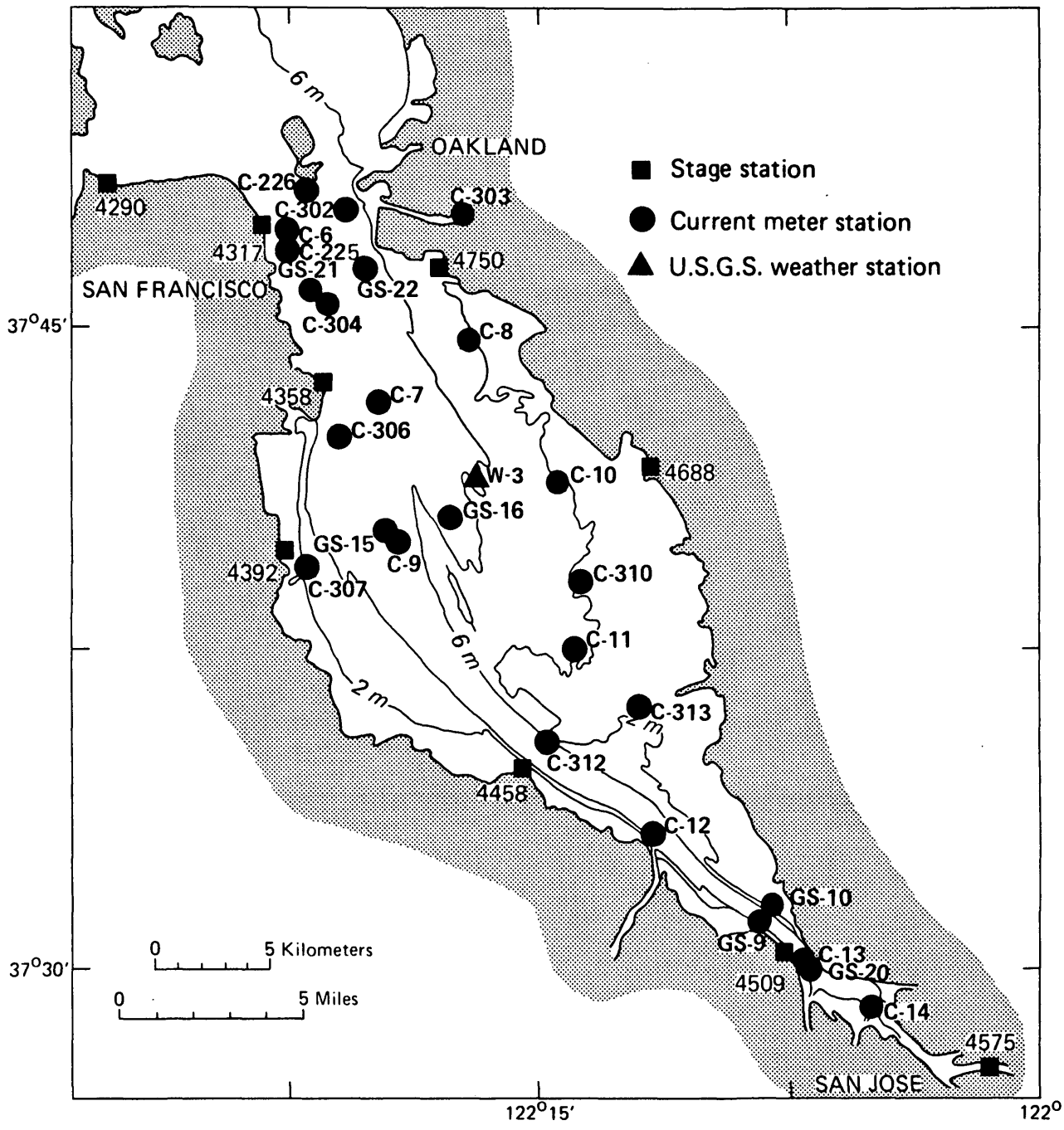
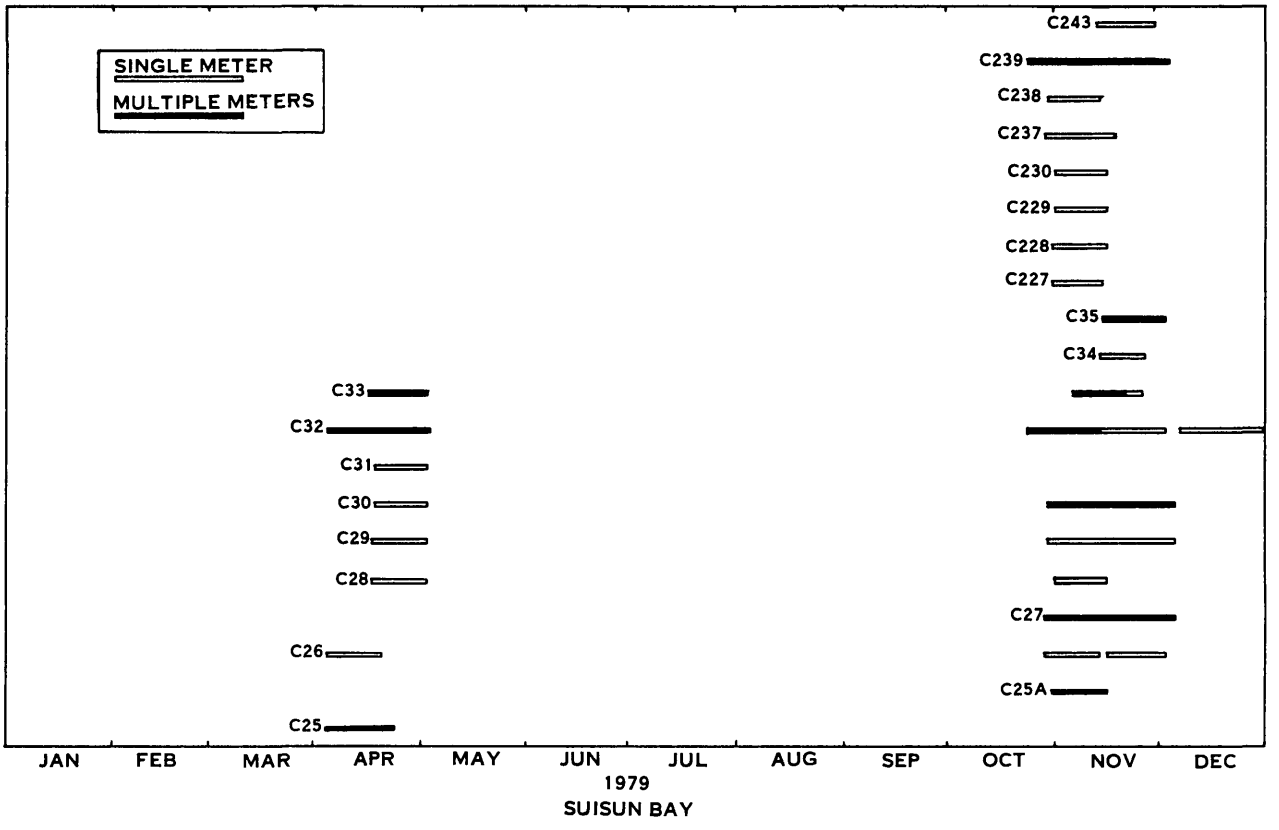


Figure I.6d. Map of South Bay region and the location of current-meter moorings, tide stations, and USGS weather station.



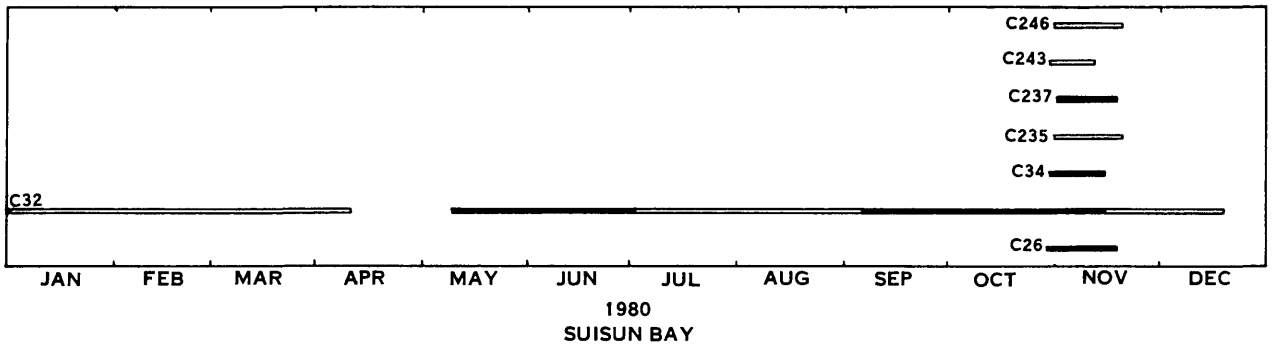


Figure I.7a. Bargraph of periods when current-meter arrays were deployed in the Suisun Bay region. Solid bars indicate multiple meters were used.

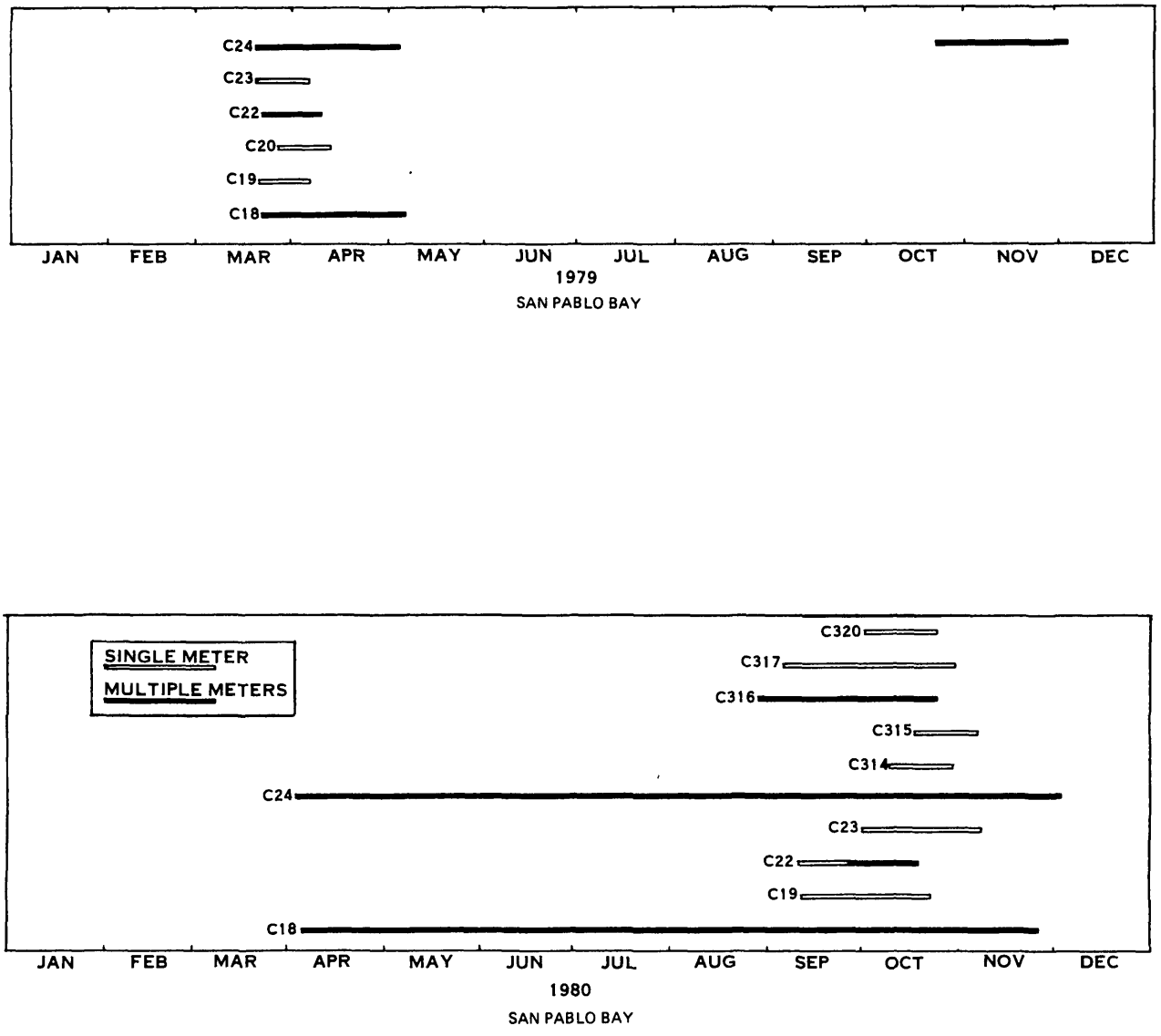
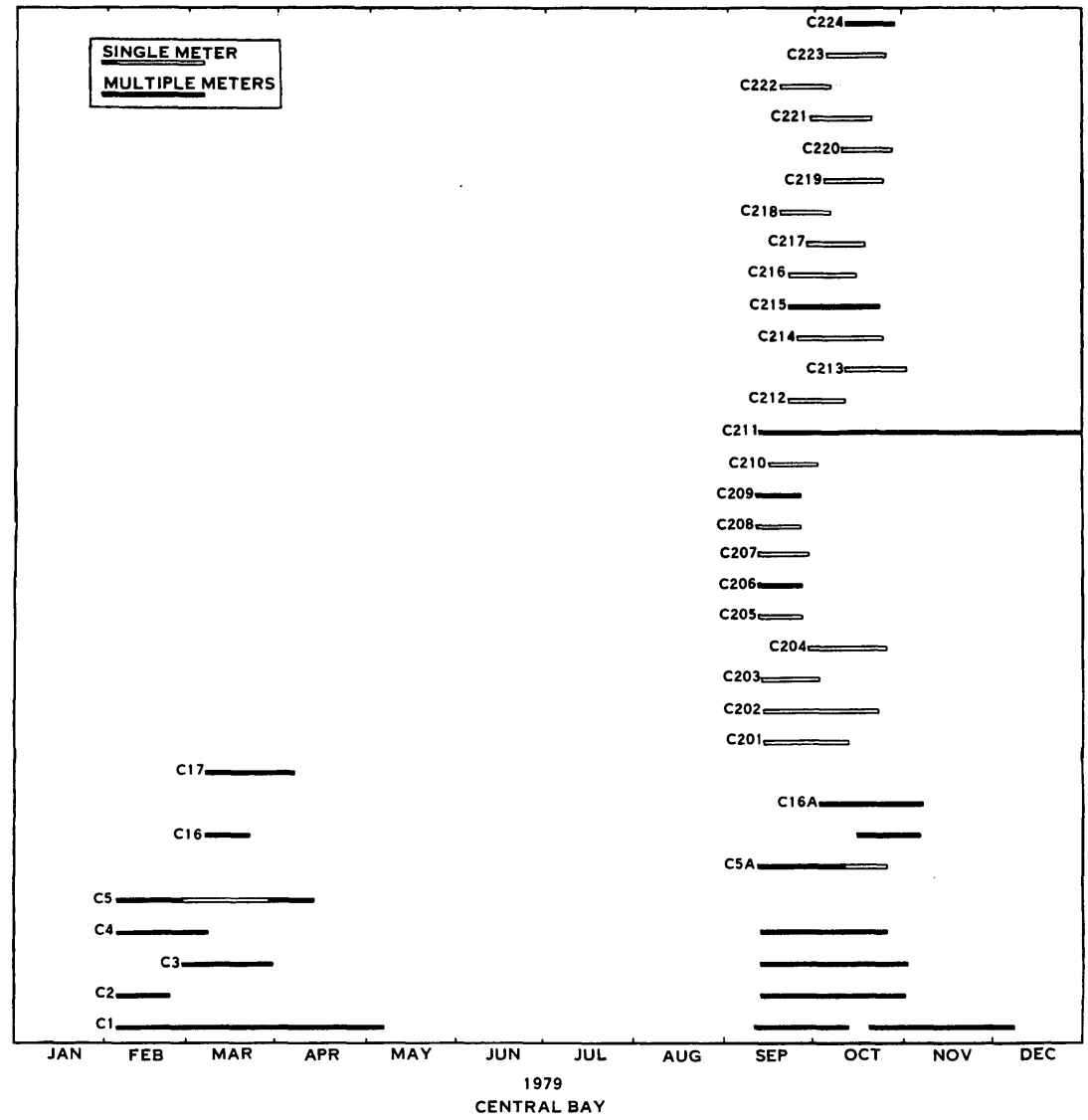


Figure I.7b. Bargraph of periods when current-meter arrays were deployed in the San Pablo Bay region. Solid bars indicate multiple meters were used.



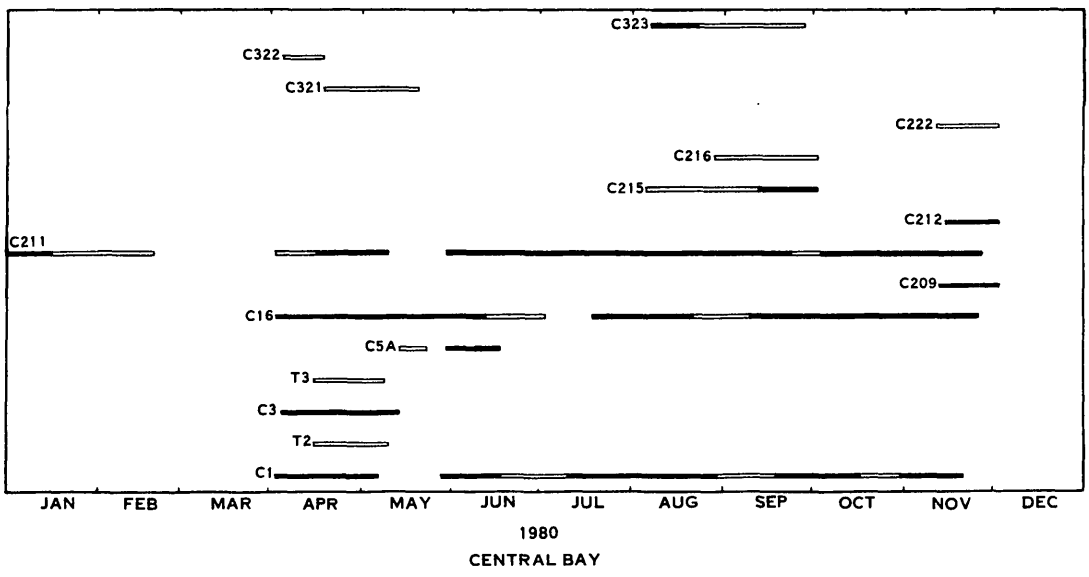
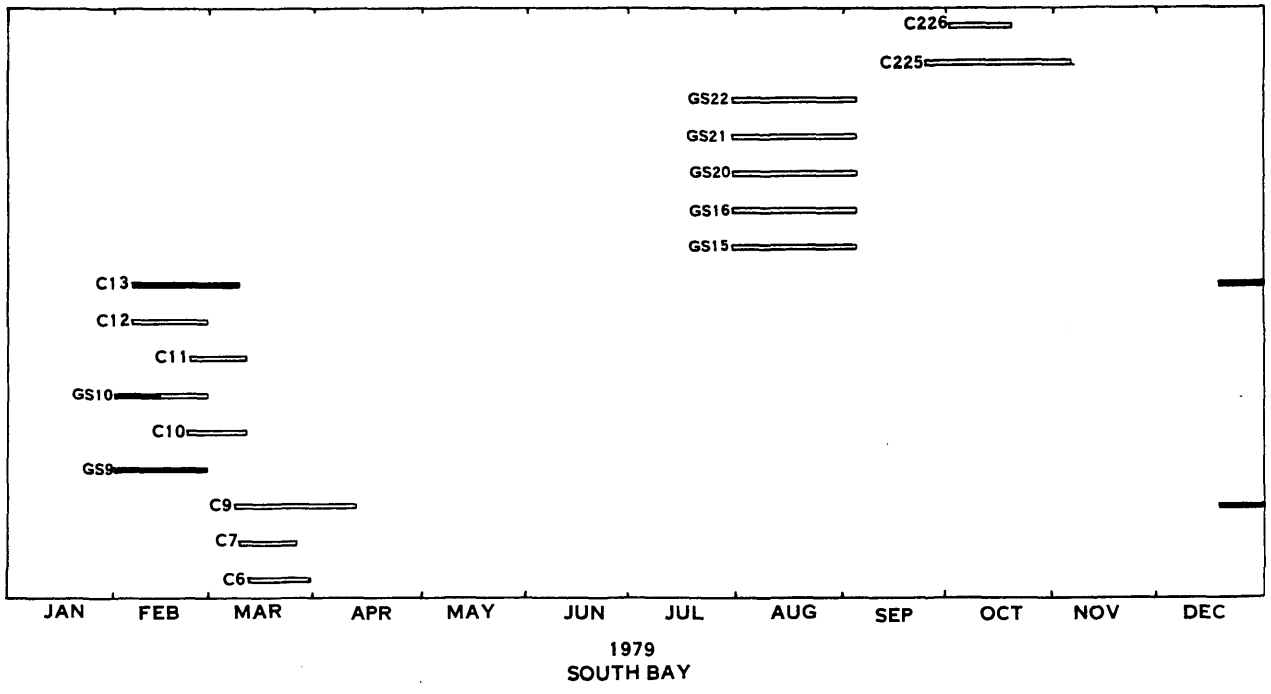


Figure I.7c. Bargraph of periods when current-meter arrays were deployed in the Central Bay region. Solid bars indicate multiple meters were used.



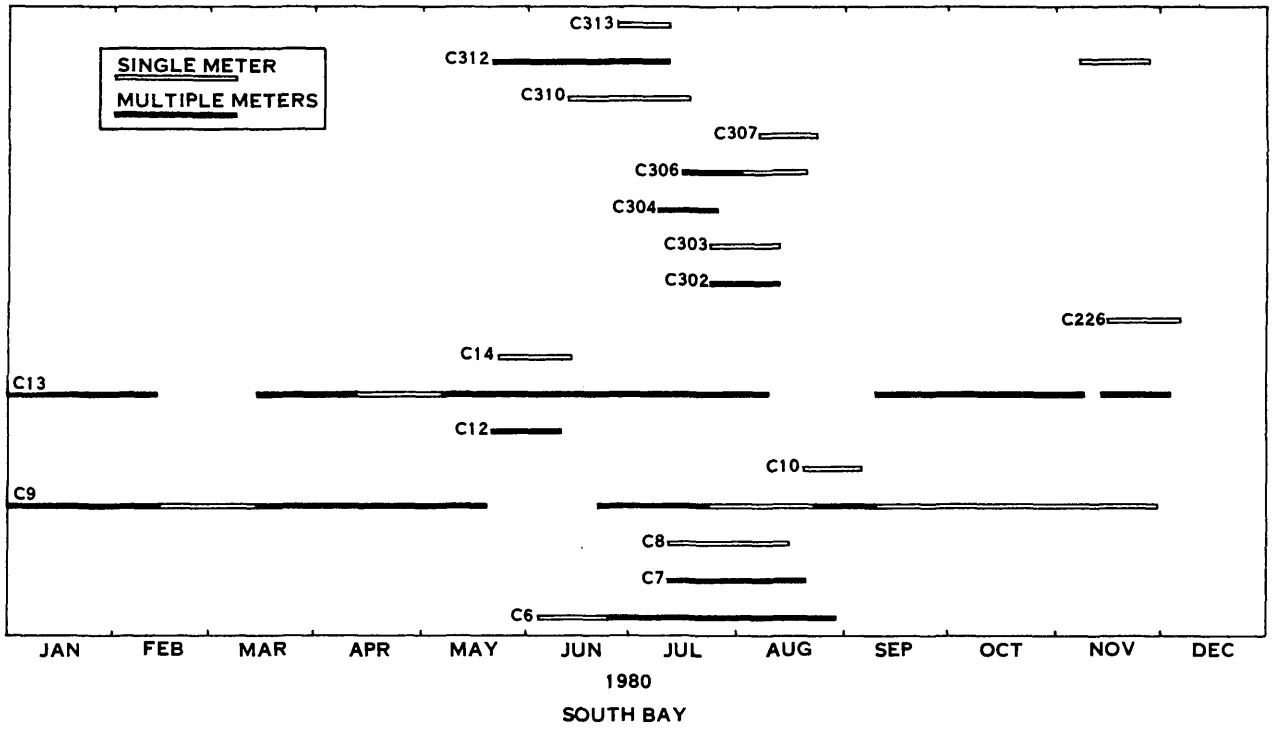


Figure I.7d. Bargraph of periods when current-meter arrays were deployed in the South Bay region. Solid bars indicate multiple meters were used.

Water-level (tide) data

Water-level data from thirty-four (34) stage stations located around the perimeter of San Francisco Bay (figs. I.6a, I.6b, I.6c, and I.6d) have been analyzed and are presented in Part II to Part V of this report. In addition, tide data from the station at Presidio (Golden Gate, fig. I.6c) have been analyzed for three consecutive years (1978, 1979, 1980). As the tides in the Bay system are the result of the forced oscillation by the tides generated in the ocean which propagate into the Bay system through Golden Gate, the properties of tides at Golden Gate are used as the reference values for tides at other locations of the Bay. The water-level data were received from NOS/NOAA on a standard 9-track computer tape in the form of hourly water levels at various stage stations. These data covered different time periods and might contain record gaps. In general, the results derived from the least-squares harmonic analyses are not affected by the presence of a record gap if the record gap represents only a small fraction of the total record analyzed.

DATA PROCESSING PROCEDURES

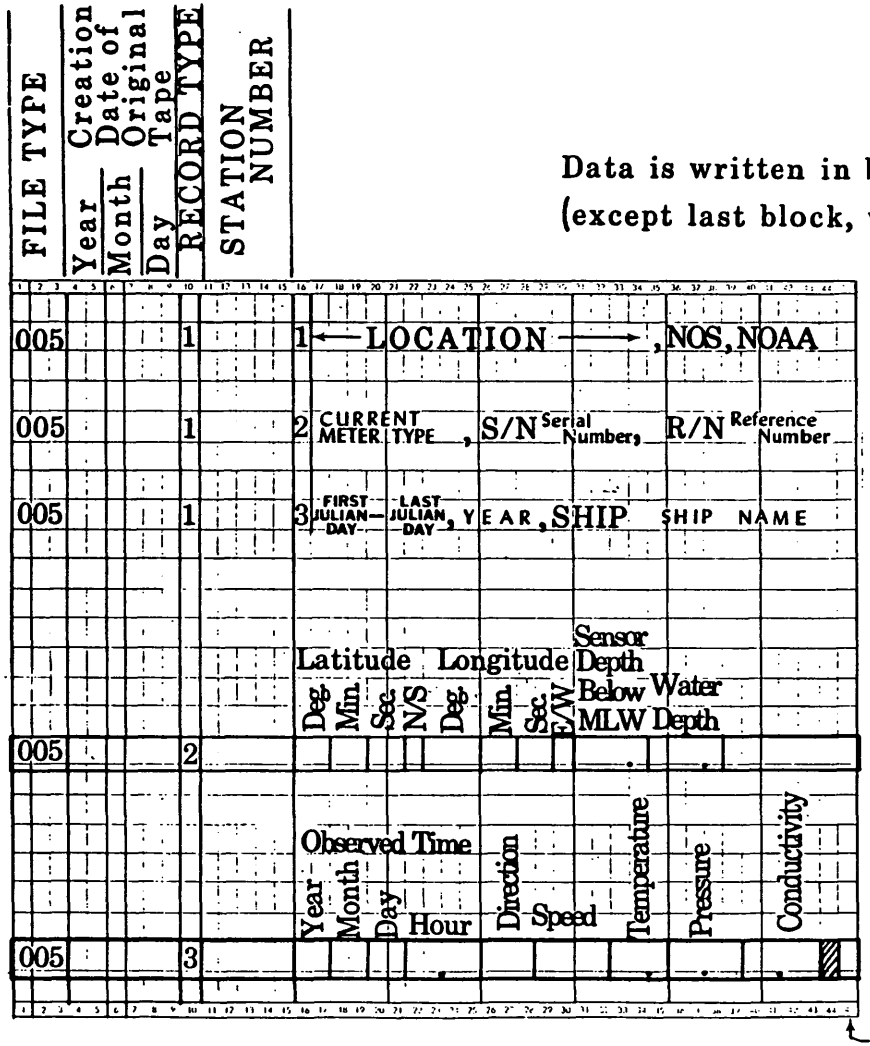
The raw data tapes from Endeco-174 current meters were read and translated into computer readable codes by the USGS utilizing a special tape reader (Cheng and Gartner, 1979). The data were examined for possible record gaps, and individual sensor calibration constants incorporated when the data set was converted to engineering units. Salinity was not directly measured; it was computed from temperature and conductivity values. All the computer programs used in the data processing have been documented in Cheng and Gartner (1980).

The initial processing of the data tapes from Aanderaa current meters, including those from current meters deployed and recovered by the USGS, was performed by the NOS/NOAA. Each data set was then converted to engineering units for filing. Complete Endeco and Aanderaa current-meter data sets in engineering units and in National Oceanographic Data Center (NODC) data format (fig. I.8) were then exchanged between the USGS and NOS/NOAA.

For both types of current-meter records, the water speeds and directions were vector-averaged to produce a new time series of 30-minute averages. Similar time series of 30-minute averages for temperature and salinity data were also computed and stored on standard 9-track computer tapes. The time-series of 30-minute average data were used as input for subsequent harmonic analyses and time-series plots.

There are two reference times used in the data sets. The tide data were given in Pacific Standard Time (PST) and the current-meter data supplied by NOS/NOAA were given in Greenwich Mean Time (GMT). GMT leads PST by eight hours. All USGS current-meter data were in PST. Because the most frequent data users are from the Bay region, all reference times have

NODC FORMAT FOR CURRENT DATA



Data is written in blocks of 4500 characters (except last block, which is ≤4500 characters).

Depth in meters.
Direction in degrees true.
Speed in cm/sec.
Temperature in degrees Celsius.
Pressure in kg/cm^2.
Conductivity in mmho/cm.

1 Indicates that data point was edited

Figure I.8. National Oceanographic Data Center data format.

been converted to PST in this report. As indicated on all time series plots, time is referenced to PST and Julian days. The times for all NOS/NOAA current-meter data were first converted to PST before being used for harmonic analysis. This practice does not affect the results from the harmonic analysis, and it is more convenient for local users to reference all times to PST.

Time-series plot

A time-series plot of data is one of the most useful ways for displaying data graphically. The tidal-current velocity is plotted in the form of speed and direction (relative to true north) versus time. Included in the plot legends are station position, meter height (above bed), and data tape or station number. If either speed or direction data were unusable at some point in a record, arithmetic averages of the "good" data (speed or direction) have been plotted (see for example record GSC7B1 in Part V). This situation prevailed if a compass or speed encoder failed to perform correctly. Note that in cases where speed or direction data are unusable or a record is too short, results of harmonic analysis are not presented.

A time-series plot of water temperature and salinity versus time is also given for each data file. If temperature data were in error due to an electronic problem in an instrument, conductivity rather than salinity was plotted because salinity could not be computed without temperature data. The minimum conductivity which can be measured by the Endeco-174 current meter is approximately 5 mmho/cm (approximately 3 o/oo salinity at 20^{o}C). During several deployments in Suisun Bay the minimum conductivities and salinities were below the threshold of the sensor. When this condition

occurred, a note is given on the time-series plot of salinity (see for example, data from station C32 in Part II).

Accuracy of conductivity data may be affected by two conditions. These are the amounts of marine growth on the external sensor and the battery voltage which is a function of the deployment duration and water temperature. As a check on data validity, Endeco conductivity (salinity) records were compared with data from nearby water-sampling stations collected during research cruises (Alpine and others, 1981; Dedini and others, 1981) as well as other current-meter records from the same area. If data appeared incorrect for an entire tape, no record was plotted. However, if data were correct for part of a deployment, the plot was terminated at the time when the data were in agreement with the last cruise sample or at the point of obvious electronic failure (see figure I.9). When no suitable data existed for making this determination, yet the data appeared to be erroneous, the time-series plot was terminated at the point of apparent error. This situation might exist if the conductivity value at the end of one deployment differed from that at the beginning of a subsequent deployment at the same station. Additionally, spurious temperature and conductivity readings in the USGS records were corrected when identified. Excluding the cases where data were obviously erroneous, no attempt was made to edit the speed or direction data in the USGS records.

The NOS records were plotted as received; all data editing was performed by that agency. However, in some cases the temperature or conductivity (salinity) data were obviously erroneous; these data were not included in the time-series plots. The plotted data provide users with a visual record to examine for possible "glitches." It is left for users to

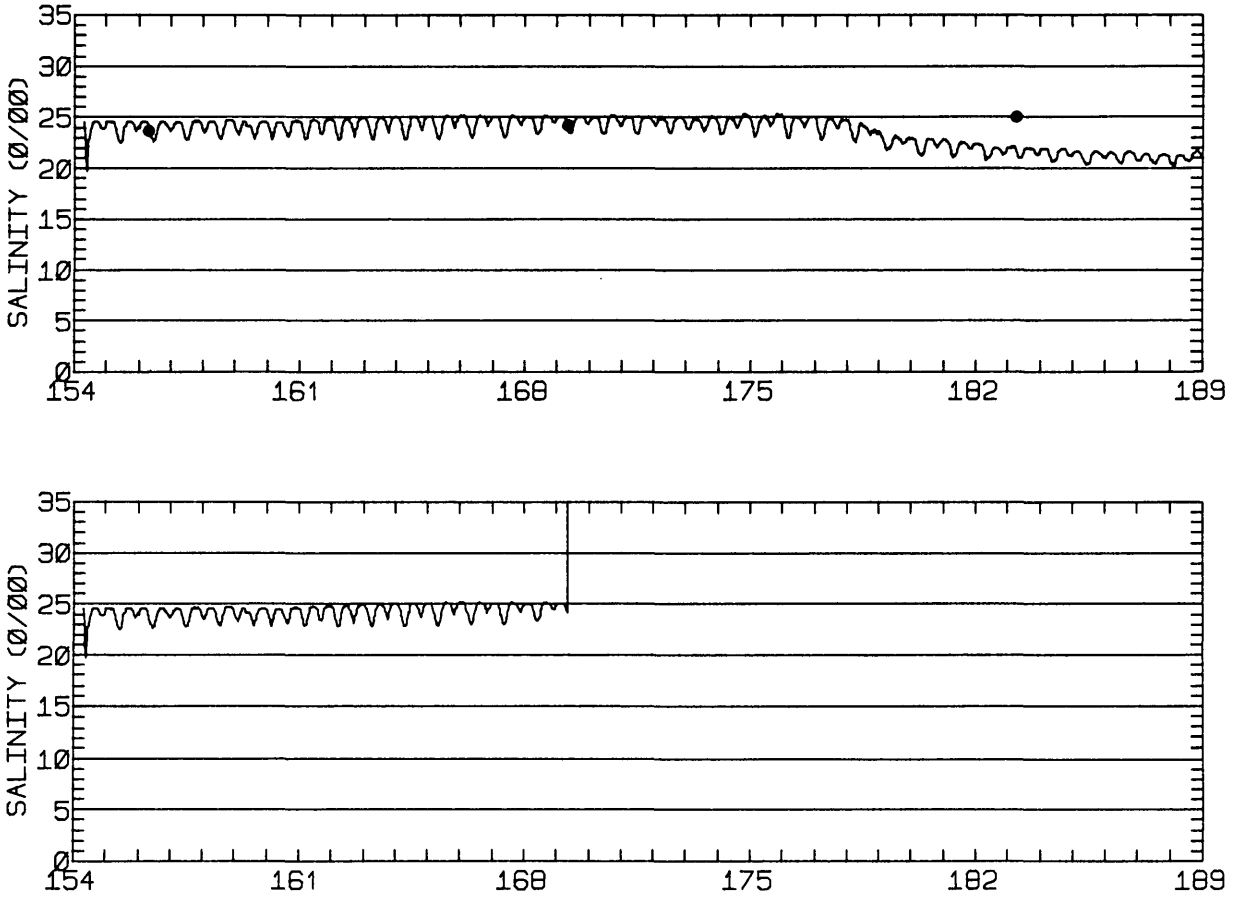


Figure I.9. Time series salinity plots from a deployment with degraded conductivity.

edit the data set if necessary before further analysis. For future reference and for special applications, all data in 2-minute files (USGS), 10-minute files (NOS), and 30-minute files (NOS and USGS) are currently stored on computer retrievable media.

Progressive-vector diagram

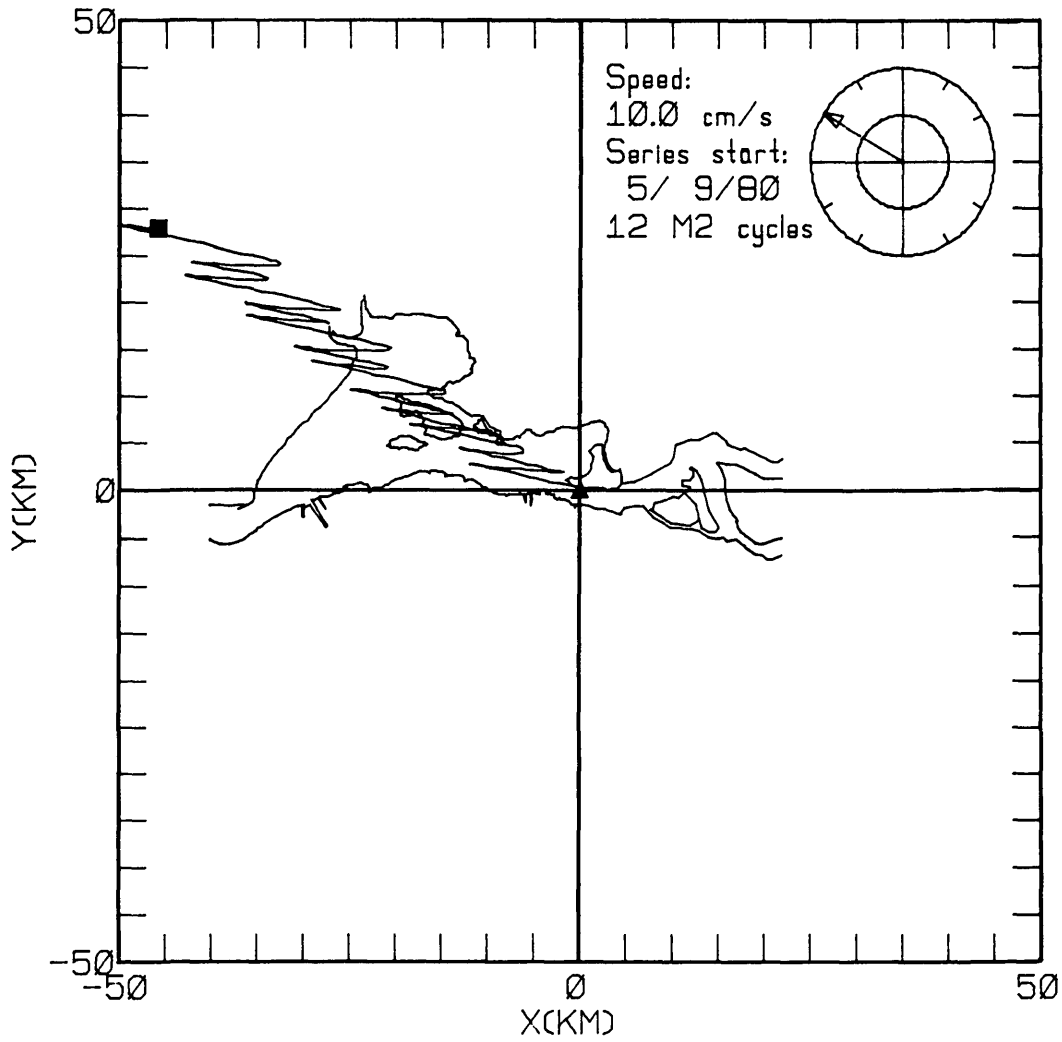
The progressive-vector diagram is another way to display current-meter data. This method of presentation is based on the concept of Lagrangian mechanics in which the water circulation is described by following the movements of the same water mass. As true Lagrangian data (tracking the water movements by drogues) are not available, the water parcel movements are estimated from the current-meter data. This technique is often used in oceanography to analyze data where the spatial variation of tidal current within the tidal excursion is negligible.

The progressive-vector diagram is a plot consisting of a series of displacement vectors with their tails joining the heads of the displacement vector from the previous time step. The displacement vector is computed from tidal-current velocity multiplied by a time increment. Current-meter data obtained at a fixed mooring give the water speed and direction at that fixed location; they are not necessarily the velocity representative of the same water parcel. In other words, the current-meter data are Eulerian variables (referenced to a fixed location), not Lagrangian variables. Thus, the progressive-vector diagram is an approximation which uses the Eulerian data to make a Lagrangian prediction of the actual water movements. In estuaries, such as San Francisco Bay, large spatial variations of tidal current exist in some areas, and substantial errors in the estimate of net water movements may result (Cheng, 1983). Therefore an

estimate based on a progressive-vector diagram is only a first order approximation for the net water movements.

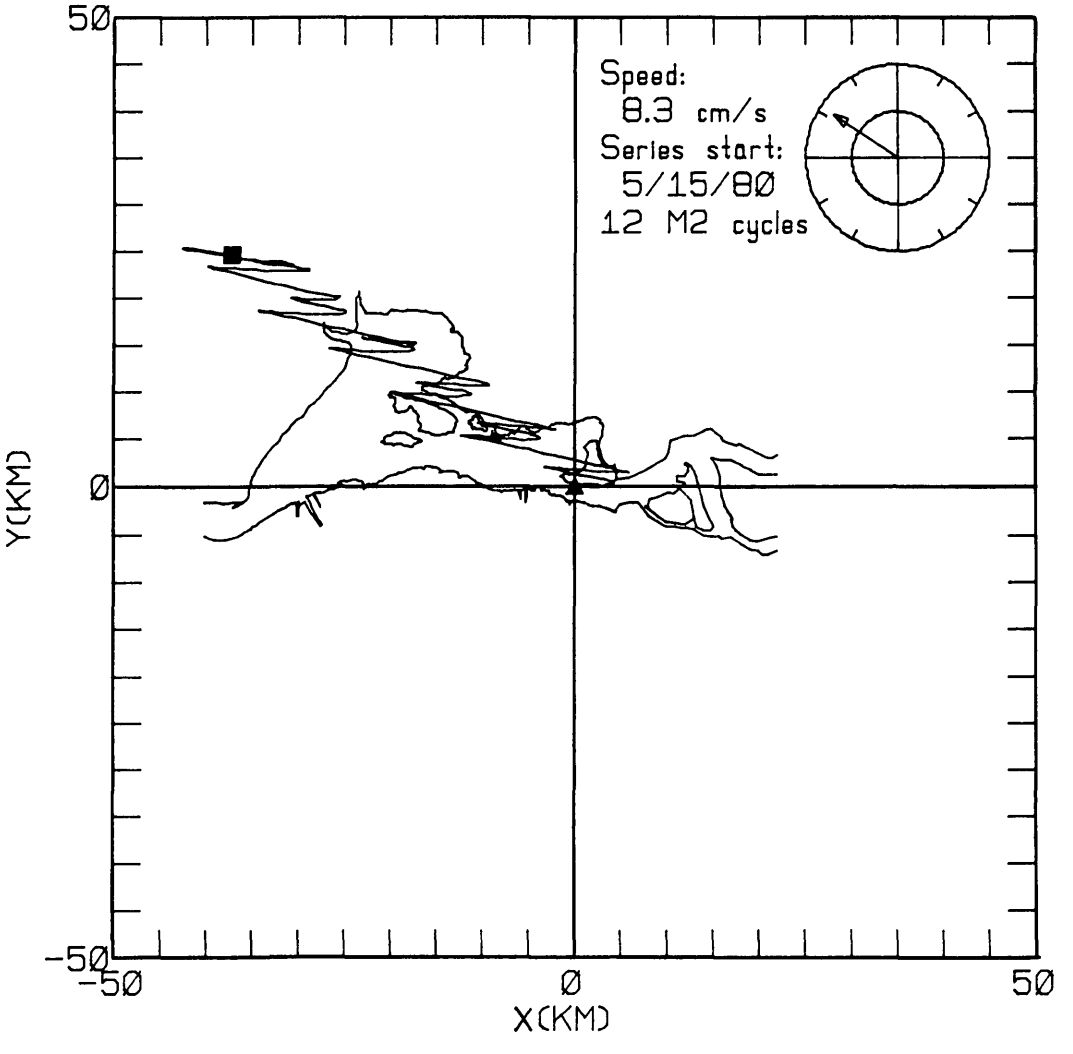
A computer program has been developed to plot a progressive-vector diagram which is superimposed on a map of the embayment in which the current observations were made. Each diagram covers an even number of M_2 cycles (normally 12 cycles). An example of such a progressive-vector diagram for Suisun Bay is given in figure I.10. The origin of the progressive-vector diagram (solid triangle) is the location of the current-meter station, the diagram indicates the estimated water movements, and the terminus of the plot (solid square) is the estimate of final position of a water parcel over the indicated time interval. Displayed on each diagram are: (1) the Eulerian estimate of water parcel trajectory; (2) Eulerian residual velocity components (net Eulerian displacement divided by the span of time); (3) vectorial display of the Eulerian residual velocity in a bull's eye plot; and (4) the interval covered by the diagram.

Other than providing a visual display of the water-parcel trajectories (approximate), all pertinent technical information is contained elsewhere in this report. Thus, the set of progressive-vector diagrams is not included herein. Nevertheless, the progressive-vector diagrams for all files have been plotted and are kept on file at USGS.



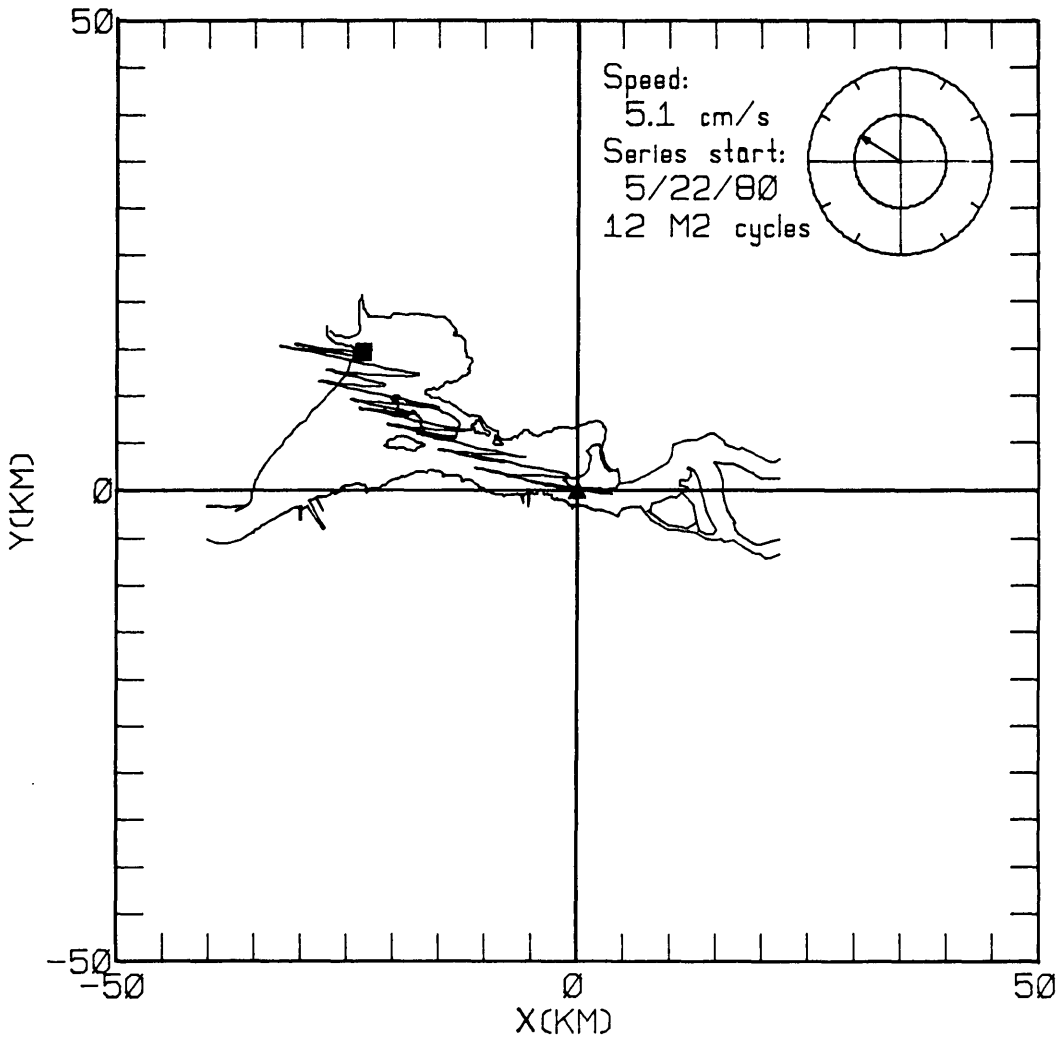
PROGRESSIVE VECTOR DIAGRAM: INTERVAL NO. 1
RESIDUAL U= -8.6, V= 5.2 (CM/S)
CHIPPS ISLAND 38- 2-58N 121-55-29W
METER 1.5 METERS ABOVE BED. STATION NUMBER 32

Figure I.10. An example of a series of progressive vector diagrams for current-meter data at Station C32 in Suisun Bay, California.



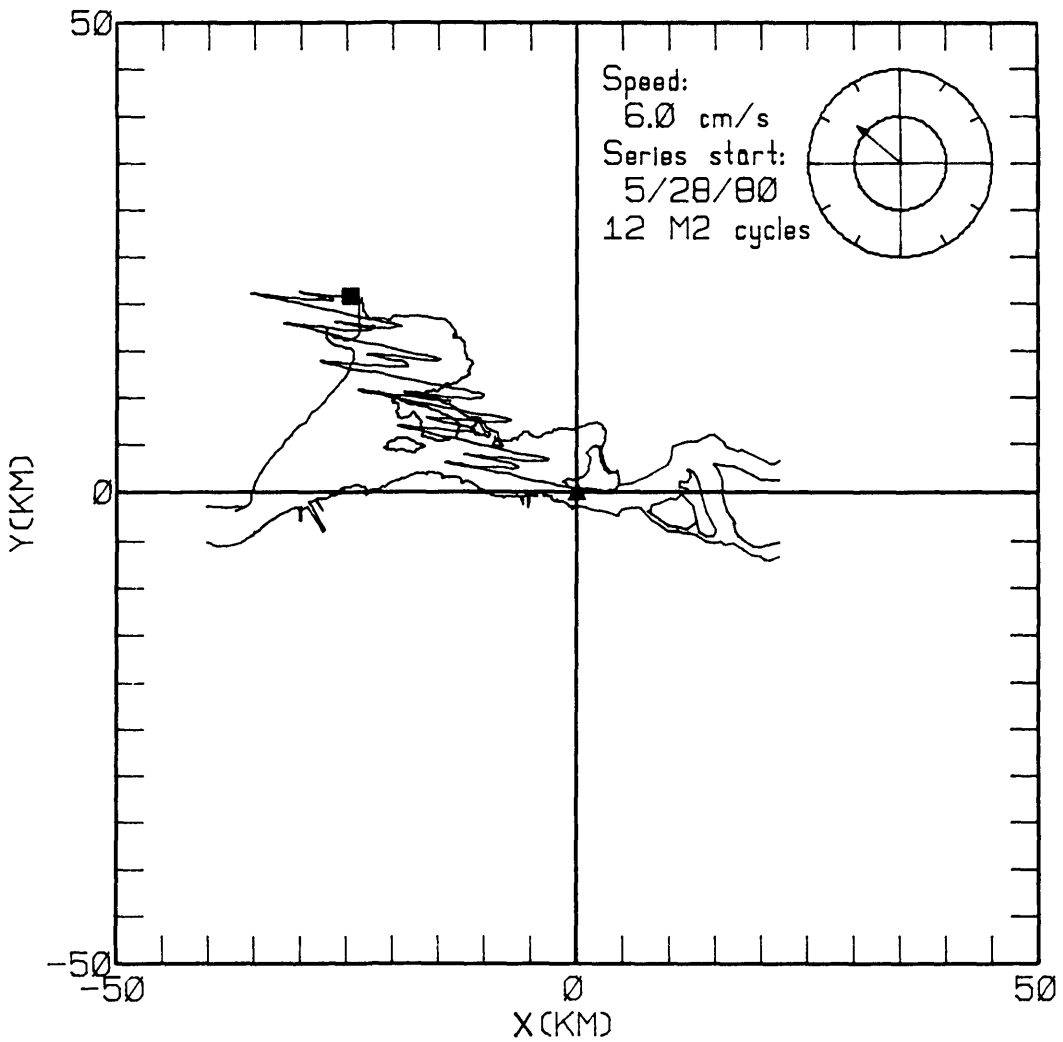
PROGRESSIVE VECTOR DIAGRAM: INTERVAL NO. 2
RESIDUAL U= -6.9, V= 4.6 (CM/S)
CHIPPS ISLAND 38- 2-58N 121-55-29W
METER 1.5 METERS ABOVE BED. STATION NUMBER 32

Figure I.10. (cont.)



PROGRESSIVE VECTOR DIAGRAM: INTERVAL NO. 3
RESIDUAL U= -4.3, V= 2.7 (CM/S)
CHIPPS ISLAND 38- 2-58N 121-55-29W
METER 1.5 METERS ABOVE BED. STATION NUMBER 32

Figure I.10. (cont.)



PROGRESSIVE VECTOR DIAGRAM: INTERVAL NO. 4
RESIDUAL U= -4.6, V= 3.9 (CM/S)
CHIPPS ISLAND 38- 2-58N 121-55-29W
METER 1.5 METERS ABOVE BED. STATION NUMBER 32

Figure I.10. (cont.)

METHOD OF ANALYSES

The method of tidal-harmonic analysis for tide and tidal current data was well documented in Schureman (1940, 1949). In this report the major harmonic constituents were computed by a least-squares method (Dronkers, 1964), and minor constituents were computed by inference method based on Newton's equilibrium theory of tides.

Harmonic analysis of stage data

As discussed in the section dealing with the origins of tides, the water level observations (H) can be expressed as the sum of N harmonic functions with each harmonic function representing a partial tide, i.e.,

$$H = H_o + \sum_{i=1}^{N} f_i H_i \cos[\omega_i t - (\kappa_i - E_i)] \qquad (1)$$

where H_o = mean water level

H_i = mean amplitude

f_i = nodal factor reciprocal

ω_i = angular frequency

κ_i = local epoch (phase)

t = time reconciled to a known reference

E_i = equilibrium argument at the reference time

and the subscript i indicates the i-th constituent. The frequencies of the tidal constituents are known astronomical constants; E_i depends on the reference time chosen for the data set, and f_i is a slowly varying function of time. The f_i's and E_i's can be computed straightforwardly by following the formulae given in Schureman (1940). Therefore equation (1) can be

rewritten as

$$H = H_o + \sum_{i=1}^{N} A_i \cos(\omega_i t - \phi_i) \qquad (2)$$

where A_i = apparent amplitude, and

ϕ_i = phase lag from the reference time.

When major harmonic constituents are sought by the least-squares method Eq. (2) can be further written as

$$H = a_o + \sum_{i=1}^{N} \{a_i \cos\omega_i t + b_i \sin\omega_i t\} \qquad (3)$$

where $a_o = H_o$, $a_i = A_i \cos\phi_i$, and $b_i = A_i \sin\phi_i$. In this form the a_i's and b_i's form a linear system in Equation (3), and can be determined numerically subject to the conditions of least-squares best fit to the data set of M observations $\{h_j\}$, j = 1, 2, ...M where h_j denotes the observed tidal height at $t = t_j$. The condition for $\sum_{i=1}^{N} [H_j - h_j]^2$ to be a minimum gives rise to a linear matrix equation, rank 2N + 1, whose solution gives values of a_i, i = 0, 1,..N, and b_i, i = 1, 2,...N. The mean tidal amplitude h_i and local epoch κ_i are thus determined from a_i's and b_i's. Because the method of harmonic analysis is based on a least-squares technique, a small data gap in the time series should not affect the overall analysis. Once the major harmonics have been obtained, the secondary tidal constituents can be computed by means of inference based on Newton's equilibrium theory (Schureman, 1940). Typically, tidal constituents O_1, K_1, N_2, M_2, S_2, MK_3, M_4, were solved by the least-squares method and the Q_1, P_1, J_1, ν_2, L_2, K_2, M_1, μ_2, and T_2 were obtained through inference. The angular frequencies of the constituents included in

the analysis are given in table I.1 (see Schureman, 1940 for other constants).

When the available tidal record is longer than the synodic period between K_1 and P_1 (183 days), the sixteen tidal constituents mentioned above have been solved directly by the least-squares method. For short records (less than about four months) tidal constituents O_1, K_1, N_2, M_2, S_2, M_4, MK_3 were solved by the least-squares method, and the Q_1, P_1, J_1, ν_2, L_2, K_2, M_1, μ_2, and T_2 were obtained through inference (Shureman, 1940).

If a yearlong record were available at a nearby station, a correction procedure can be applied to a shorter record to improve the results of the harmonic analysis (Parker, 1977). The quality of the least-squares fit is judged based on the standard deviation between the observed tidal heights and the tidal heights predicted for the same time period using the harmonic constants. The results of the harmonic analyses of tides (i.e., the harmonic constants) for each stage station in San Francisco Bay are given by region in Part II to Part V of this report.

In some applications the long term variations of tides such as the solar annual and semi-annual partial tides (Sa, and Ssa), and the lunar fortnightly constituent (Mf) are of interest. These tidal constituents are usually small, and Sa and Ssa are normally derived from 19-year monthly mean sea-level records. Long-term data at most stations, except at Golden Gate, are not available, therefore Sa, Ssa, and Mf were not solved. However, Sa, Ssa, and Mf were solved for tides at Golden Gate for 1978, 1979, and 1980 using the same least-squares harmonic analysis (not using the monthly sea levels). These results are included in table I.2 where the results of the harmonic analyses at Golden Gate for 1978, 1979, and 1980 are compared. As can be seen, these long-term constituents are not

TABLE I.1. Principal astronomical partial tidal constituents.

SYMBOL	PERIOD (SOLAR HOURS)	ANGULAR FREQUENCY (DEGREES/HOUR)	SPECIES
K_1	23.93	15.0411	Luni-solar diurnal
O_1	25.82	13.9430	Principal lunar diurnal
P_1	24.07	14.9589	Principal solar diurnal
Q_1	26.87	13.3987	Larger lunar elliptic diurnal
J_1	23.10	15.5854	Small lunar elliptic diurnal
M_1	24.83	14.4967	Smaller lunar elliptic diurnal
M_2	12.42	28.9841	Principal lunar semidiurnal
S_2	12.00	30.0000	Principal solar semidiurnal
N_2	12.66	28.4397	Larger lunar elliptic semidiurnal
K_2	11.97	30.0821	Luni-solar semidiurnal
ν_2	12.63	28.5126	Larger lunar evectional semidiurnal
L_2	12.19	29.6285	Smaller lunar elliptic semidiurnal
T_2	12.02	29.9589	Larger solar elliptic semidiurnal
μ_2	12.87	27.9682	Variational semidiurnal
MK_3	8.18	44.0252	Higher order harmonic of M_2-K_1 interaction
M_4	6.21	57.9682	Lunar quarter diurnal
Mf	327.86	1.0980	Lunar fortnightly
Ssa	4382.91	0.0822	Solar semiannual
Sa	8765.82	0.0411	Solar annual

TABLE I.2. Harmonic constants of tides at Golden Gate (Presidio $37^{o}48.4'$N, $122^{o}27.9'$W) 1978, 1979, 1980.

	Cycles/Day	Amplitude h_i (cm)			Modified Epoch κ'			Epoch** Difference
	ω_i	1978*	1979	1980*	1978*	1979	1980*	$\kappa'-\kappa$
Q_1	0.8932	-0.27	4.10	+0.63	+1.8	95.6	-3.6	15.3
O_1	0.9295	+0.59	22.73	-0.14	-0.7	97.5	+1.8	10.9
P_1	0.9973	+0.53	11.34	+0.67	-1.6	104.3	-1.1	2.8
K_1	1.0027	+0.29	36.77	+0.51	-0.8	106.8	-1.0	2.1
J_1	1.0390	+0.14	2.18	+0.12	-8.8	130.8	-24.9	-2.2
N_2	1.8960	+0.27	12.14	+0.03	-2.3	319.1	-3.5	17.4
ν_2	1.9008	-0.31	2.48	+0.36	+15.5	311.7	+15.6	16.8
M_2	1.9323	+0.08	57.41	-0.51	-1.1	338.9	-1.4	13.1
L_2	1.9686	-0.74	2.34	+0.05	+2.2	356.8	-0.4	8.7
S_2	2.0000	-0.29	13.57	-0.14	-2.6	338.2	-3.2	4.9
K_2	2.0055	+0.20	3.60	+0.51	-3.2	338.7	-12.6	4.3
MK_3	2.9350	+0.22	1.95	-0.03	-10.4	141.5	-0.7	15.2
M_4	3.8646	+0.20	2.32	+0.23	-2.6	47.3	-7.8	26.1
Mf	0.0732	+1.38	0.63	+0.53	68.9	155.2	-40.8	-8.8
Ssa	0.0055	+2.89	2.71	+4.95	+38.5	286.8	-0.6	-0.7
Sa	0.0027	-2.50	5.36	-1.27	+42.7	252.7	+20.7	-0.3

*Values are the difference between parameter values of the present year and year 1979, i.e., $X^*_{yr} = X_{yr} - X_{1979}$.

** κ is the local epoch.

stationary based on analysis of one year's record because Sa and Ssa are affected by the annual variation of the meteorological conditions and the annual variation of the river discharges. Sa, Ssa, and Mf are usually not used in prediction; they are included in table I.2 for reference only.

Harmonic analysis of current-meter data

Because the current meters were deployed in a biologically highly productive estuary, it was not uncommon to find the instrument sensors damaged by drifting debris, or adversely affected by floating marine plants or marine growth. Therefore the actual usable data series was often shorter than the deployment period. Although the deployments were planned to cover as much as 35 days, the current-meter records used in the analyses normally range between 15 and 29 days. Some shorter records were analyzed, but results from such short records are generally suspect. For the sake of uniformity and regardless of the record length at each station, the least-squares harmonic analysis was applied to solve for only six harmonic constants, i.e., O_1, K_1, N_2, M_2, S_2, M_4 for east-west and north-south tidal velocity components without further inference for minor constituents. Minor constituents were not calculated using the inference method for two reasons. The equilibrium theory of tides is less reliable in the case of tidal currents, and the accuracy of current measurements in estuaries is lower than that of tidal heights because of marine fouling on sensors, contamination of true signals by wave actions, and the slow response of sensors to changing external conditions (particularly true for the direction sensor). Thus the inability to resolve other harmonics probably does not increase the uncertainty in the analysis.

The velocity vector was first decomposed into east-west (u) and

north-south (v) components and the least-squares harmonic analysis was applied to both time series of velocity components. Only the maximum length of usable data, a maximum even number of M_2-tidal cycles from each file, was used in the analysis; thus, the start and stop times and record-lengths may not agree with the times shown in the corresponding time-series plots. The estimated tidal velocity components as expressed by the sum of N tidal-harmonic constituents can be written as

$$u = u_o + \sum_{i=1}^{N} f_i u_i \cos\{\omega_i t - [(\kappa_u)_i - E_i]\} \qquad (4)$$

and

$$v = v_o + \sum_{i=1}^{N} f_i v_i \cos\{\omega_i t - [(\kappa_v)_i - E_i]\} \qquad (5)$$

where u_o and v_o are the Eulerian residual velocity components (see discussion below), and $(\kappa_u)_i$ and $(\kappa_v)_i$ are epochs for the u and v series and the other symbols have been defined in Eq. (1). Once the harmonic constants (amplitudes and phases) have been determined, they can be used to estimate (predict) tidal-current values for any given period of time by using equations (4) and (5). A formal error analysis for the results of the harmonic analyses was not done. Because the tidal-current data records used in the analysis are much shorter than the stage data records, and due to the overall lower accuracy of the current-meter data, the harmonic constants for tidal currents are less accurate than the harmonic constants for tides. Users of these results should be aware of the inherent limitations when using the harmonic constants for predicting tidal currents. Some variations of the harmonic constants have been found for

tidal currents at the same station. This is particularly true for M_4 and other smaller constituents in Central Bay region. These variations could be the seasonal variations in the tidal current, which can not be resolved from analyzing a short record. The harmonic constants derived from the two velocity-component series were then combined to define the respective tidal current ellipses for each constituent. A further discussion of the properties of a tidal-current ellipse is given in the results section of this report.

Eulerian residual current

Tides and tidal currents are pseudo-periodic variables with periods on the order of 12 (semidiurnal) and 24 (diurnal) hours and will be referred to as tidal variables. When tidal fluctuations are removed from tidal variables by means of filtering or time averaging, the resultants are referred to as residual variables. Quite often residual variables are defined slightly differently because of the different filtering or averaging techniques used (Alfrink and Vreugdenhil, 1981). In general, residual variables characterize the net change of a given property over a time span much longer than several tidal periods, and they often have important effects on long term transport phenomena (Cheng and Casulli, 1982).

In this report, an Eulerian residual current is defined as the time averaged tidal current observations from in-situ current meters made over several M_2 tidal cycles. The M_2 period is used because it is by far the most dominant tidal constituent in the Bay system. Under this definition, the Eulerian residual current is equivalent to the net displacement calculated from a progressive-vector diagram divided by the lapsed time.

However, the Eulerian residual current should not be used to compute a net water parcel displacement, as the definition of the progressive-vector diagrams suggest. The net water parcel displacement is a Lagrangian concept whereas the Eulerian residual current is an Eulerian concept. Because the averaging period is a minimum of six days, it does not reveal the low frequency variations of residual current over one to three days (Elliott, 1976; Wang, 1976; Walters, 1982).

The values of residual currents are an order of magnitude smaller than those of tidal currents; thus the accuracy of residual currents is severely limited by and directly related to the accuracy of the current-meter data. The Eulerian residual currents have been computed using two independent methods. Before a least-squares harmonic analysis is applied, the record length of the current-meter data is reduced to a maximum even multiple of the M_2 period. The solutions of the zeroth order terms [see Eq. (4) and (5)] from the harmonic analysis, u_o and v_o, are the Eulerian residual-current components for that period.

The second method of computing the Eulerian residual current is to simply vector average the current-meter record over an even number of M_2 periods. The residual currents computed by these two methods are in close agreement, particularly when the input record is long and free from contamination due to minor fouling of the instrument. Although uncertainties exist in tidal-current measurements, agreement between the residual currents computed by these two independent methods suggests that the computed values of Eulerian residual circulation are satisfactory.

RESULTS

Tides in San Francisco Bay

Least-squares harmonic analysis was applied to three year-long series of water level (tide) data at Presidio (Golden Gate), the entrance to the Bay system from the Pacific Ocean. The computed harmonic constants for 1978, 1979, and 1980 are tabulated in table I.2. It is evident from these results that the invariance of the harmonic constants (particularly for the major constituents) at this station has been demonstrated.

Tidal energy distribution can be measured by the amplitudes squared of partial tides. At Presidio the sum of O_1, K_1, N_2, M_2, and S_2 accounts for more than 96.1 percent of the total tidal energy and P_1, which is the largest partial tide among the rest of the minor constituents, contributes 2.2 percent. A form number, F, for tides has been defined as the ratio of the sum of the amplitudes of the diurnal tidal species over the sum of the amplitudes of the semidiurnal species. Specifically, according to Defant (1958, 1961) a simplified definition for F, $F = (O_1 + K_1)/(M_2 + S_2)$, can be used to characterize tidal types. If F is less than 0.25, the tide is considered to be semidiurnal; and if F is greater than 3.0, the tide is diurnal. The form number at Golden Gate is 0.84; the tides entering the Bay are typically mixed diurnal and semidiurnal without a clear inclination toward either type. The amplitude ratio of the sum of five diurnal partial tides over the sum of six semidiurnal partial tides does not differ significantly from F = 0.84. Because the actual tides are the sum of the semidiurnal and diurnal partial tides, the resultant tides have two high waters and two low waters each day with the lower low water (LL) normally following the higher high water (HH). Tidal currents driven by these tides

have stronger ebbing currents than flooding currents. Following the lower low water are the lower high water (LH), and then the higher low water (HL). Although the tides are mixed, the M_2 tide is by far the largest partial tide. The M_2 period is approximately 12.42 hours; consequently, the higher high water arrives at the same location roughly 50 minutes later each day, because two M_2 periods is about 24 hours and 50 minutes.

The frequencies of the partial tides are all different; therefore in the course of time the various partial tides move in and out of phase with each other similar to beating in waves (Defant, 1961; Stoker, 1965). When the principal semidiurnal and diurnal tides are in phase, the partial tides reinforce each other and the tidal ranges are at their maximum. The tides in this period are known as the spring tides. Similarly, when the partial tides are out of phase, their effects tend to cancel each other and the tidal ranges become relatively small. Tides in this period are known as neap tides. The beating frequency of the principal semidiurnal and diurnal partial tides gives rise to the spring-neap tidal cycle variations in a fortnightly period. As previously discussed, longer term variations also exist because of the orbital motions of moon and earth, which give rise to semi-annual and annual variations, and finally an 18.6-year variation of tides.

The variations of tides are predictable from the results of harmonic analyses using Eq. (1). Each term in Eq. (1) represents the contribution of a partial tide. One month of water-level data at Golden Gate is plotted in figure I.11a along with the results from the harmonic analysis and the relative importance of each partial tide. The predicted tides (fig. I.11b) are given by the sum of the contributions from these partial tides M_2, K_1, ..., etc. For comparison, the difference between the field data and the

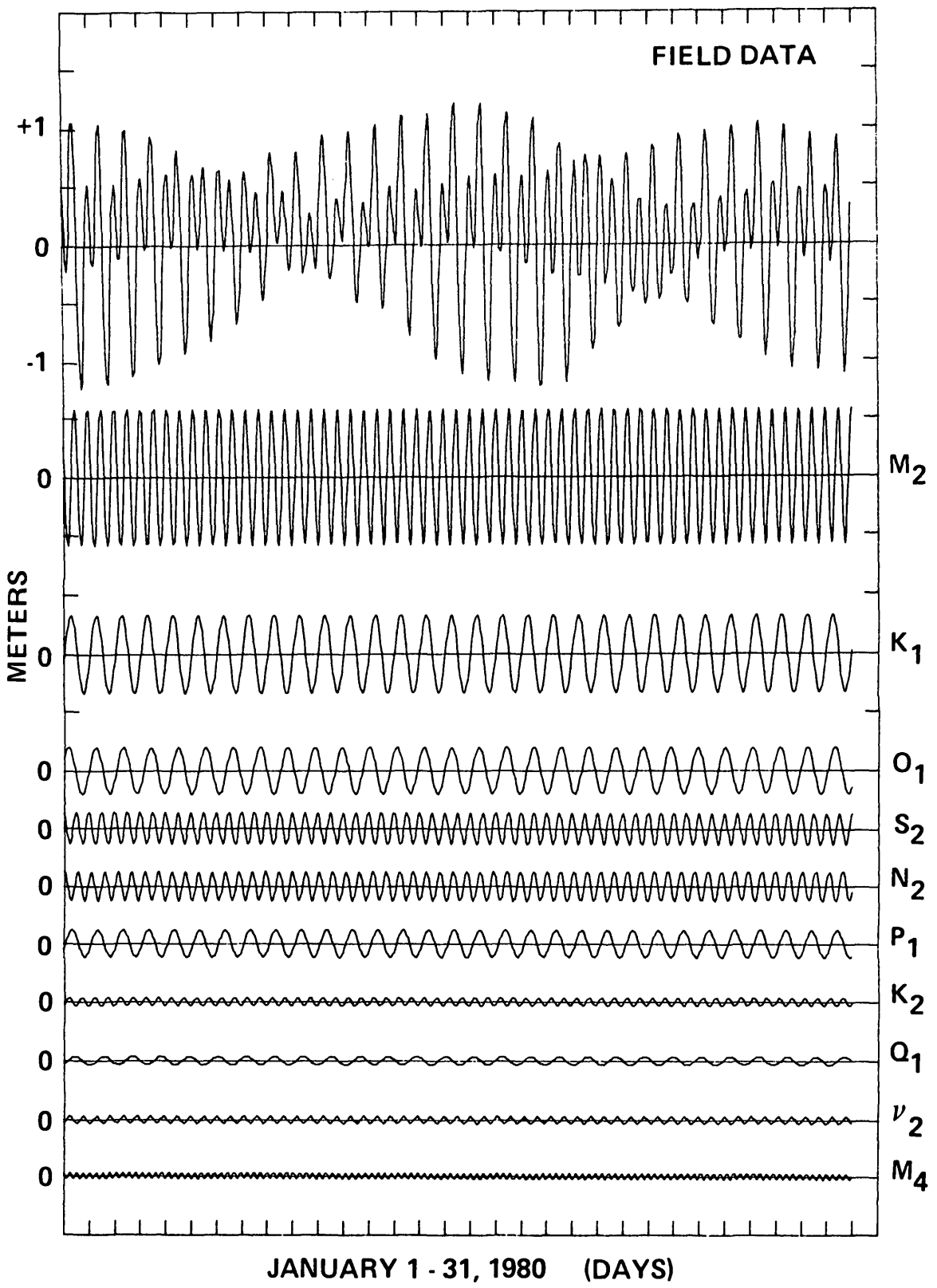


Figure I.11a. One month of field observations of tides at Golden Gate decomposed into tidal harmonics.

predicted tides are also shown in figure I.11b. The discrepancy between the data and the prediction is possibly due to variations of barometric pressure, winds, and river discharges, which are not accounted for by the equilibrium theory of tides. This discrepancy is generally small when compared with the actual field data. Shown in figure I.12 are the predicted water levels at Golden Gate for the entire year of 1980. It is instructive to observe the sequence of the daily HH, LL, LH, and HL waters as well as the clear presence of the fortnightly spring-neap variations. It is also noteworthy, that there are two periods near the spring and fall equinoxes when the tidal amplitude inequality throughout the spring and neap periods is relatively small and invariant. The short term and long term variations of the tides described above are of great importance in the understanding of the related transport phenomena in the Bay system.

Harmonic analyses were performed on all the available tide data in San Francisco Bay (1979 - 1980) (tables II.2, III.2, IV.2, and V.2). The results of the analyses are compiled in Appendices II.A, III.A, IV.A, and V.A. in terms of the harmonic constants for each tide station in the Suisun Bay region, San Pablo Bay region, Central Bay region, and South Bay region, respectively. As demonstrated above, the harmonic constants can be used for prediction of tides at these stations using Eq. (1). A description of the properties of tides in each embayment will be given in the part of the report where the data are presented.

Tidal currents in San Francisco Bay

For each current-meter data file analyzed, the results of the harmonic analyses are compiled in a summary sheet; the summaries are given in Appendices II.B, III.B, IV.B, and V.B. The summary lists the pertinent

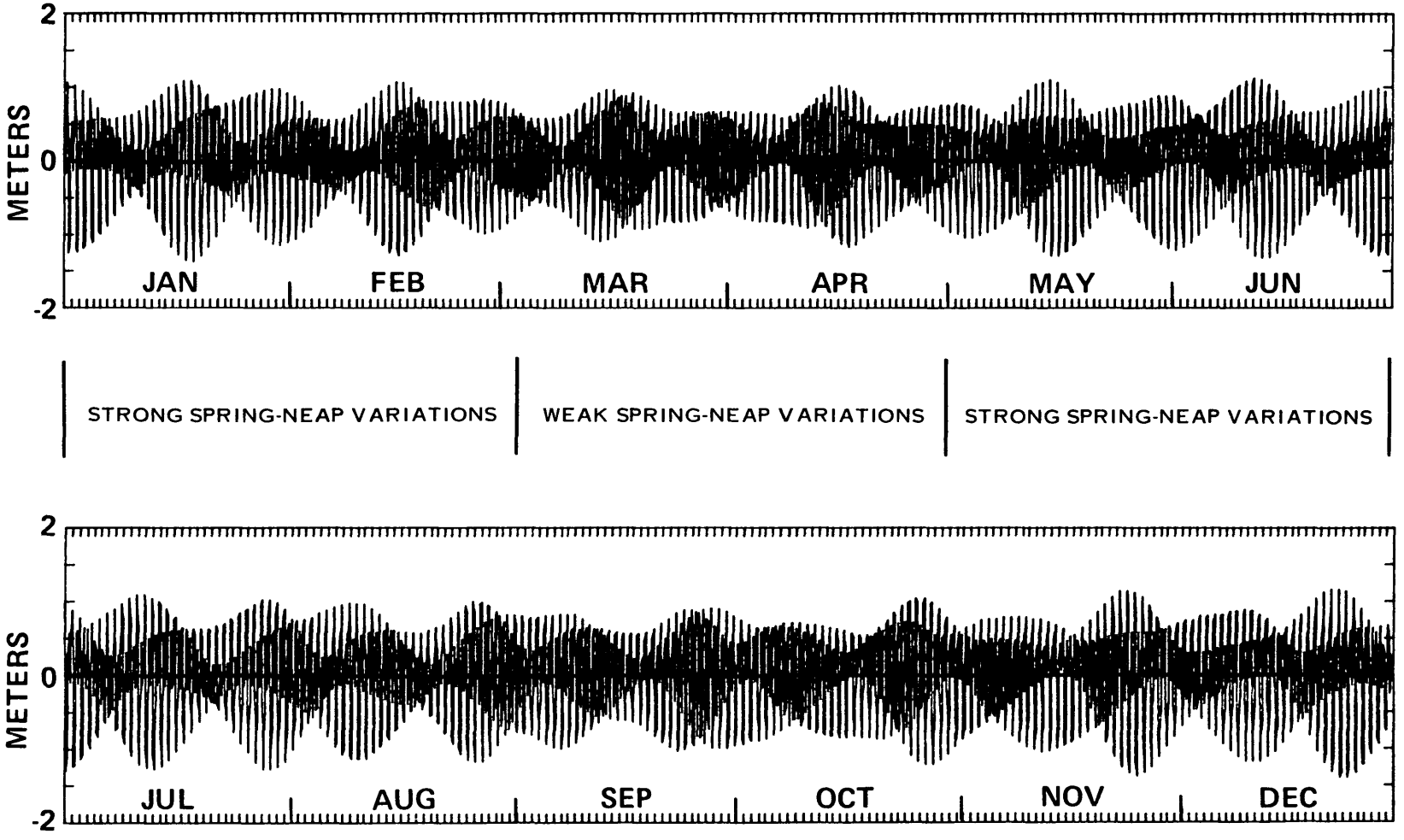


Figure I.12 Predicted tides at Golden Gate for 1980. The tides at Golden Gate are typical mixed semidiurnal and diurnal; variations of spring and neap tides are clearly depicted.

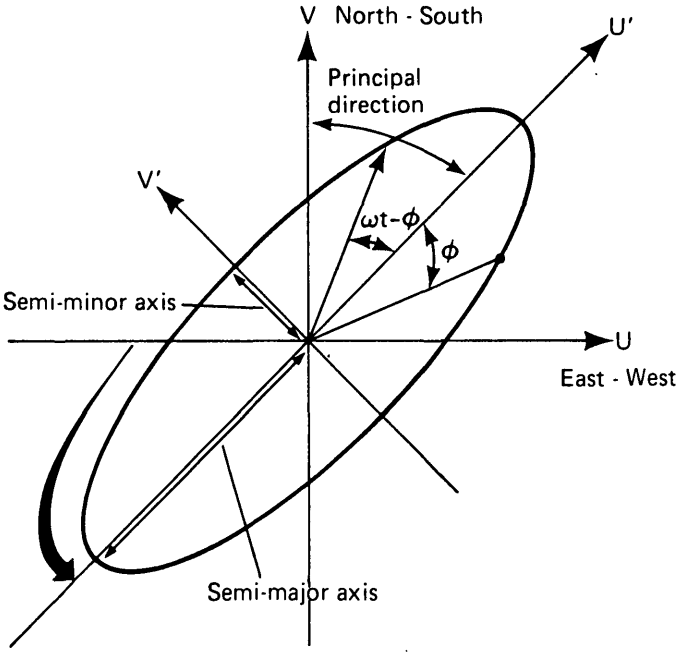
notes concerning the current-meter record and includes the station location, water depth, meter depth, start date of the time series, and the approximate record length. The harmonic constants defined in Eqs. (4) and (5) for both the u (east-west) and v (north-south) series were computed for O_1, K_1, N_2, M_2, S_2, and M_4. Additional general properties of tidal currents including the root-mean-squares (RMS) current speed, spring and neap tidal current maxima, principal tidal current direction, and tidal current form number are also given in the summary.

The harmonic constants defined in Eqs. (4) and (5) do not give the significant characteristics of the tidal currents. However, when the harmonic constants derived from the two velocity component series are combined, they define a tidal current ellipse for each partial tide on a hodograph plane. A hodograph is a plot of a time series of velocity vectors on a plane where the u and v are used as coordinates. Instead of Eqs. (4) and (5), the tidal-velocity components along the principal direction (u') and the normal to the principal direction (v') can be given as

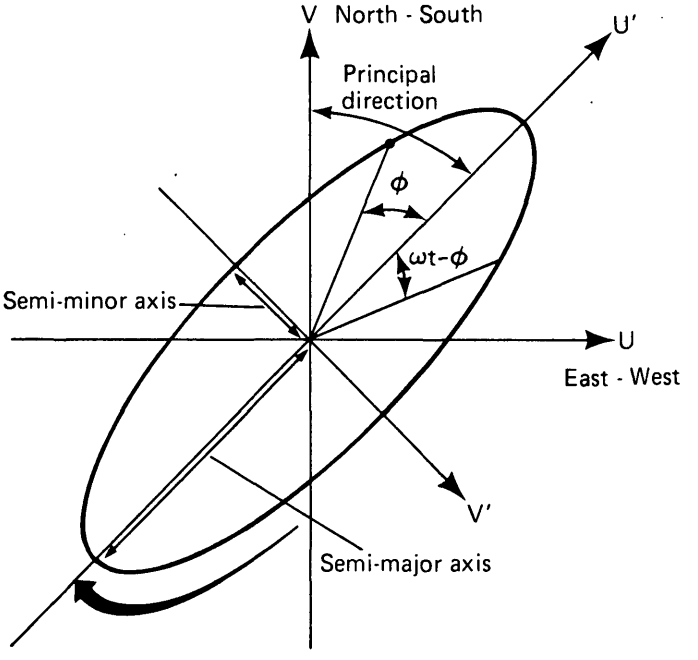
$$u' = u'_o + \sum_{i=1}^{N} f_i U_i \cos[\omega_i t - \phi_i] \tag{6}$$

$$v' = v'_o + \sum_{i=1}^{N} f_i V_i \sin[\omega_i t - \phi_i] \tag{7}$$

where U_i and V_i are the magnitude of the semimajor and semiminor axes of the i-th partial tidal current ellipse, the phase lag $\phi_i = \kappa_i - E_i$, and f_i, E_i, and ω_i have been defined in Eq. (1). It is more meaningful to cast Eqs. (4) and (5) in the form of Eq. (6) and (7) in which the local epoch κ_i can be compared with the local epoch of tides. Figure I.13 illustrates the



A COUNTERCLOCKWISE ROTATING TIDAL CURRENT ELLIPSE



A CLOCKWISE ROTATING TIDAL CURRENT ELLIPSE

Figure I.13. Illustration of tidal-current ellipses

physical significance of the various parameters which define a tidal current ellipse, and their inter-relations; and, of course, each partial tidal current describes an ellipse on the hodographic plane. The properties of tidal current ellipse for O_1, K_1, N_2, M_2, S_2, and M_4 are given in the summary sheet.

Each tidal current ellipse of a partial tidal current has the following properties: (1) The primary direction for flooding and ebbing is given by the slope of the major axis of the tidal current ellipse; (2) The maximum tidal current speed due to that partial tide is given by the magnitude of the semi-major axis; (3) The ratio of minor to major axes is a measure of the eccentricity of the tidal ellipse, i.e., it is a measure of the variation of the tidal-current directions; (4) The phase angle is equivalent to the modified epoch expressed in vectorial form, and finally; (5) The sense of rotation indicates the change of the tidal current direction with time. Similar to tides, the tidal currents can be estimated by using Eqs. (6) and (7) once the harmonic constants have been determined. The estimated tidal currents become the vectorial sum of contributions from tidal ellipses of partial tidal currents.

A tidal current form number F' is defined as the ratio of the sum of the semimajor axes of diurnal tidal species to the sum of the semimajor axes of semidiurnal species. $F' = (O_1 + K_1)/(M_2 + S_2)$ is used to estimate the tidal current type. Small values of F' indicate that the tidal currents are semidiurnal while large values are indicative of diurnal tidal currents. Values of F' between 0.25 and 3.0 are considered to be indicative of mixed semidiurnal and diurnal types. The computed form numbers F' for each file are given in the summary sheets. The principal current direction is calculated by a weighted average of the directions of

the major axes of the four partial tidal current ellipses, O_1, K_1, M_2, and S_2. The limits for the spring and neap tidal current speeds have been estimated by assuming that the four major tidal constituents are either in phase or out of phase. In other words, the maximum tidal current speed at spring tide is estimated by $(M_2 + S_2) + (O_1 + K_1)$, and the maximum speed at neap tide is estimated to be not less than $(M_2 - S_2) + (O_1 - K_1)$.

The most important properties of tidal currents can be characterized by five parameters: (1) the amplitude (magnitude of semimajor axis) of the M_2 constituent, (2) the RMS speed, (3) and (4) the spring and neap tidal current maxima, and (5) the principal direction. The spatial distributions of these variables for each embayment (figs. II.4, III.4, IV.4, and V.4) are plotted in which the M_2, RMS, spring, and neap current speeds are plotted along the principal direction. Furthermore, the spatial distribution of the tidal current is strongly dependent on the basin bathymetry. The RMS tidal current speed is found to be correlated with the mean-water depth. The dependence of tidal current speed and direction on basin bathymetry is highly significant; it can be used to estimate tidal current speed and direction elsewhere in the basin (Cheng and Gartner, 1982).

Following the summary sheet, the current-meter data are presented graphically in the form of time-series plots in Appendices II.B, III.B, IV.B, and V.B. For each data file, the time variations of the tidal current speed and direction are plotted versus time. Water temperature and salinity versus time are plotted on a separate page. The detailed considerations in producing these time-series plots have been discussed in the previous sections. As mentioned before, progressive-vector diagrams have also been developed for each data file, but are not included in this

report.

At all stations, the tidal currents show a strong bi-directional tendency. The principal current direction depends strongly on the local basin bathymetry. There is a spring and neap variation of the tidal current speed up to a factor of about two. Examination of the time-series plots reveals that the tidal currents are mixed semidiurnal and diurnal types; for most of the cases the tidal current type is closer to semidurnal than diurnal. The tidal-current properties can be concisely defined from the results of the harmonic analyses as given in the summary sheet preceeding each set of time-series plots.

Eulerian residual circulation in San Francisco Bay

As discussed previously, the Eulerian residual current in this report is defined as the vectorial average of the current-meter data made over several M_2 tidal cycles. The computed Eulerian residual currents are given in the summary for each current-meter data file. Depending upon the usable length of the record, the time averages are computed for every 12 M_2 tidal cycles, and an even number less than 12 M_2 cycles for the remaining available data in the record. The time average for the entire record length (maximum even M_2 cycles) is also given. As the Delta outflow is one of the variables which affect the Eulerian residual current in San Francisco Bay, especially the northern reach, the averaged values of the Delta outflow for that period of time have been estimated from Dayflow Summary (1982) and are given in the summary sheets.

The factors which affect the Eulerian residual circulation in the Bay are rather complex. Basin bathymetry, Delta outflow, spatial distribution of tidal currents (tidal current shear), temporal variations of tidal

currents (spring and neap variations), spatial and temporal distribution of salinity, and external wind forcings are all important factors which may have effects on the magnitude and spatial distribution of the Eulerian residual circulation. Although some general patterns of the Eulerian residual exist, it is difficult to draw a single simple conclusion from these data as to what the dominant driving force is for the residual currents. In other words, the computed Eulerian residual currents include all of the above mentioned driving forces; it is not possible to delineate the individual effects solely based upon examination of these data. The use of mathematical models is a possible way to resolve this question.

SUMMARY AND DISCUSSION

This report documents observations from current-meter deployments and water-level stations in San Francisco Bay, California during 1979 and 1980. The main purposes of this report are: (1) to document the data set collected during the intensive current survey which was conducted jointly by the USGS and NOS/NOAA; (2) to present the basic data in a form useful to users; and (3) to document results from harmonic analyses of these data. In Part II to Part V of this report are the tabulations of the harmonic constants of tides and tidal current and the time-series plots of current-meter data in Suisun Bay, San Pablo Bay, Central Bay, and South Bay regions. The tabulated harmonic constants given in this report can be used for predicting tides and tidal currents. The results from harmonic analyses have led to the conclusion that tides in the Bay are mixed progressive and standing waves with the South Bay approaching a standing wave, whereas in the northern reach the tide is more like a progressive wave. Analyses have also shown that the tidal currents are strongly dependent on the basin bathymetry. Because the Eulerian residual current is affected by basin bathymetry, Delta outflow, tidal currents, and external wind forcings, a simple conclusion with regard to the distribution and the generation mechanism of Eulerian-residual current cannot be reached from these analyses. The generation mechanism of the Eulerian residual currents is probably a combination of all of the above mentioned factors.

In retrospect of the field program, there are some areas which deserve attention in future current-meter studies. Because the current meters are deployed in a biologically rich environment, drifting debris and marine fouling remain potential problems. Even with the substantial efforts

devoted to this project, there are data gaps both in space and in time. Few measurements are available in shallow regions where circulation potentially has the largest impact on biological and chemical processes. In future studies special attention should be given to current measurements in shallow regions to aid further understanding of circulation over shoals. Because both suspended and dissolved material are transported by a local velocity (Lagrangian velocity) associated with the water mass, it would be most instructive to conduct concurrent Eulerian and Lagrangian measurements of water movements to define better the relation between the Eulerian and Lagrangian data.

REFERENCES

Alfrink, B.J., and Vreugdenhil, C.B., 1981, Residual currents, Rep. R1469-11, Delft Hydraul. Lab., Delft, the Netherlands.

Alpine, A.E., Cloern, J.E., and Cole, B.E., 1981, Plankton studies in San Francisco Bay. I. Chlorophyll distributions and hydrographic properties of the San Francisco Bay Estuary, July 1977 - December 1979; U. S. Geological Survey Open-File Report 81-213, 150 p.

Budgell, W.P., 1982, Spring-neap variation in the vertical stratification of Chesterfield Inlet, Hudson Bay, Naturaliste Can., v. 109, p. 709-718.

Cheng, R.T., 1978, Comparison of a few recording current meters in San Francisco Bay, California, in Woodward, W., Mooers, C.N.K., and Jensen, K., eds. Proceedings of a working conference on current measurements, Technical Report DEL-SG-3-78,, University of Delaware, Newark, Delaware, Jaanuary 11-13, p. 293-301.

Cheng, R.T., 1983, Euler-Lagrangian computations for estuarine hydrodynamics, in Taylor, C., Johnson, J.A., and Smith, R., eds. Proceedings, Third Inter. Conf. on Laminar and Turbulent Flows, Seattle, Wash. August 8-11, 1983, Pinderidge Press, p. 341-252.

Cheng, R.T. and Casulli, Vincenzo, 1982, On Lagrangian residual currents with applications in South San Francisco Bay, California, Water Res. Res., v. 18, no. 6, p. 1652-1662.

Cheng, R.T. and Conomos, T.J., 1980, Studies of San Francisco Bay by the U. S. Geological Survey, Institute of Environmental Sciences, Philadelphia, Penn., May 12-14, 1980, Proceedings, p. 299-303.

Cheng, R.T. and Gartner, J.W., 1979, A microcomputer based system for current meter data acquisition, IEEE, Ocean '79, San Diego, Calif., p. 288-291.

Cheng, R.T. and Gartner, J.W., 1980 Working notes on current meter deployment, recovery, maintenance, and data processing for San Francisco Bay: U. S. Geological Survey Open-File Report 80-1297. 68 p.

Cheng, R.T. and Gartner, J.W., 1982, Tides, tidal, and residual circulation in South San Francisco Bay, California, (abst), EOS, v. 63, no. 45, p. 946.

Conomos, T.J., 1979, Properties and circulation of San Francisco Bay Waters: in Conomos, T.J., ed., San Francisco Bay: the urbanized estuary: AAAS, Pacific Division, San Francisco, Calif. p. 47-84.

Conomos, T.J., Nichols, F.H., Cheng, R.T., and Peterson, D.H., 1978, Field and modeling studies of San Francisco Bay, Coastal Zone '78, the Proceedings of the Symposium on Technical, Environmental, Socioeconomic and Regulatory Aspects of Coastal Zone Management, ASCE, San Francisco, California, March 14-16, 1978.

Dayflow Summary, Water Year 1955-1980, 1982, State of California, Department of Water Resources.

Dedini, L.A., Schemel, L.E., Tembreull, M.A., 1981, Salinity and temperature measurements in San Francisco Bay waters, 1980, U.S. Geological Survey Open-File Report 82-125, 130 p.

Defant, Albert, 1958, Ebb and flow, Ann Arbor Science Paperbacks, Ann Arbor, Michigan, 121 p.

Defant, Albert, 1961, Physical oceanography, Pergamon Press, New York, 729 p.

Dronkers, J.J., 1964, Tidal computations in rivers and coastal waters. North-Holland Pub. Co., 518 p.

Elliott, A.J., 1976, A study of the effect of meteorological forcing on the circulation in the Potomac Estuary, Chesapeake Bay Institute, Spec. Rept. 56, Ref. 76-9, 66 p.

Fischer, H.B., and Lawrence, G.A., 1983, Currents in South San Francisco Bay, Report Number UCB/HEL-83/01, Hydraulic Engineering Laboratory, University of California, Berkeley, California.

Gartner, J.W., and Cheng, R.T., 1983, Observations from remote weather stations in San Francisco Bay, California, 1979-1981: U. S. Geological Survey Open-File Report 83-269, 120 p.

Parker, B.B., 1977, Tidal hydrodynamics in the Strait of Juan de Fuca - Strait of Georgia, NOAA Technical Report No. 69, 56 p.

Patchen, R.C., and Cheng, R.T., 1979, Current survey of San Francisco Bay by NOS/USGS, AGU, EOS, v. 60, no. 46, p. 843.

Pearson, E.A., Storrs, P.N. and Selleck, R.E., 1970, A comprehensive study of San Francisco Bay, v. VIII, summary, conclusions, and recommendation: UCB-SFRL, no. 67-5, 85 p.

Schureman, Paul, 1940, Manual of harmonic analysis and prediction of tides: (reprinted with correction, 1976) U.S. Coast and Geodetic Survey, Special Publication no. 98, 317 p.

Schureman, Paul, 1949, Tide and current glossary: (reprinted with correction, 1963), U.S. Coastal and Geodetic Survey, Special Publication No. 228, 40 p.

Smith, R.A., 1980, Golden Gate tidal measurements: 1854-1978: ASCE Port, Coast, Ocean Division, Journal of Water Way, v. 106, WW3, p. 401-410.

Smith, R.E., Herndon, R.E., and Harmon, D.D., 1979, Physical and chemical properties of San Francisco Bay waters: U. S. Geological Survey Open-File Report 79-511, 607 p.

Stoker, J.J., 1965, Water Waves: Interscience Publishers, New York, 567 p.

Uncles, R.J., and Radford, P.J., 1980, Seasonal and spring-neap tidal dependence of axis dispersion coefficients in the Severn - a wide, vertically mixed estuary: J. Fluid Mech., v. 98, part 4, p. 703-726.

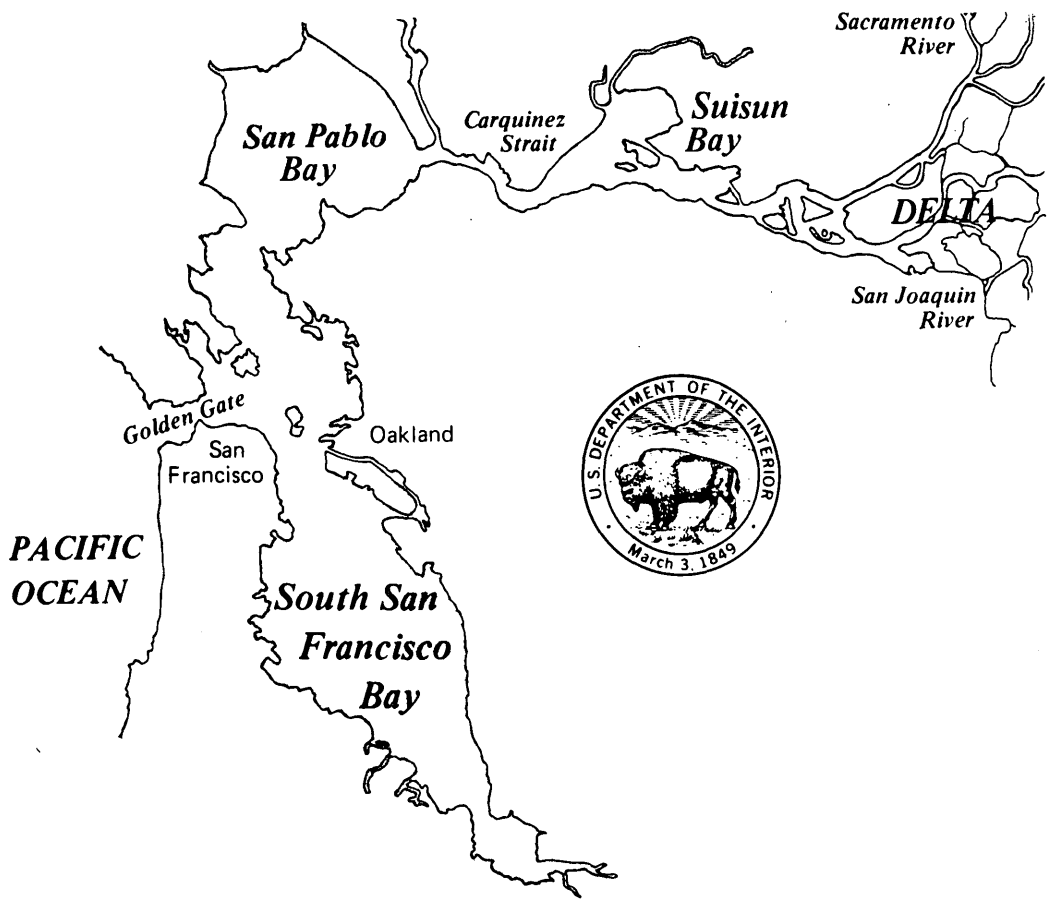
Walters, R.A., 1982, Low frequency variations in sea level and currents in South San Francisco Bay: Journal of Physical Oceanography, v. 12, no. 7, p. 658-668.

Wang, D.P., 1979, Subtidal sea level variations in the Chesapeake Bay and relations to atmospheric forcing, Journal of Physical Oceanography, v. 9, no. 2, p. 413-421.

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART II. RESULTS OF MEASUREMENTS IN SUISUN BAY REGION

U. S. GEOLOGICAL SURVEY
WATER RESOURCES INVESTIGATIONS REPORT 84-4339



February 1984

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY, CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART II. RESULTS OF MEASUREMENTS IN SUISUN BAY REGION

by Ralph T. Cheng and Jeffrey W. Gartner

U. S. Geological Survey

Water Resources Investigations Report 84-4339

February 1984

UNITED STATES DEPARTMENT OF THE INTERIOR
William P. Clark, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

WATER RESOURCES INVESTIGATIONS REPORT

For additional information
write to:

Regional Hydrologist
Water Resources Division
U.S. Geological Survey
345 Middlefield Road, MS 466
Menlo Park, CA 94025

Copies of this report
can be purchased from:

Open-File Services Section
Western Distribution Branch
U.S. Geological Survey
Box 25425, Federal Center
Lakewood, CO 80225

CONTENTS

PART II. RESULTS OF MEASUREMENTS IN SUISUN BAY REGION

TABLES

ILLUSTRATIONS

Page

APPENDICES

FIELD DATA

In Part II of this report, we include data collected in the Suisun Bay region, which is the northeastern embayment of the San Francisco Bay estuarine system (fig. II.1). The area of coverage extends from the region west of Benecia-Martinez to the area between Sherman Island and the confluence of the Sacramento and San Joaquin Rivers on the east. The Suisun Bay region includes two shallow sub-embayments, namely Grizzly Bay at its northern end and Honker Bay at its eastern end (fig. II.2). The mean depth in Grizzly and Honker Bays is less than 2 m (referenced to MLLW). Because accurate long term current measurements are not yet practical in such shallow depths, few current-meter data are available from these sub-embayments.

The central region of Suisun Bay consists of a system of deep channels surrounding numerous shoals and islands. As pointed out previously, there is a longitudinal salinity gradient along the main channel in Suisun Bay throughout the year. At certain combinations of Delta outflows and wind conditions, the vertical salinity stratification can be quite strong. Other than the winter months, the prevailing wind over the Suisun Bay region is westerly and steady (Gartner and Cheng, 1983)*. Thus, there are four important factors which influence circulation and affect the current-meter data in Suisun Bay; they are the basin bathymetry, tides, winds, and horizontal and vertical salinity gradients.

---

*References are given in Part I of this report.

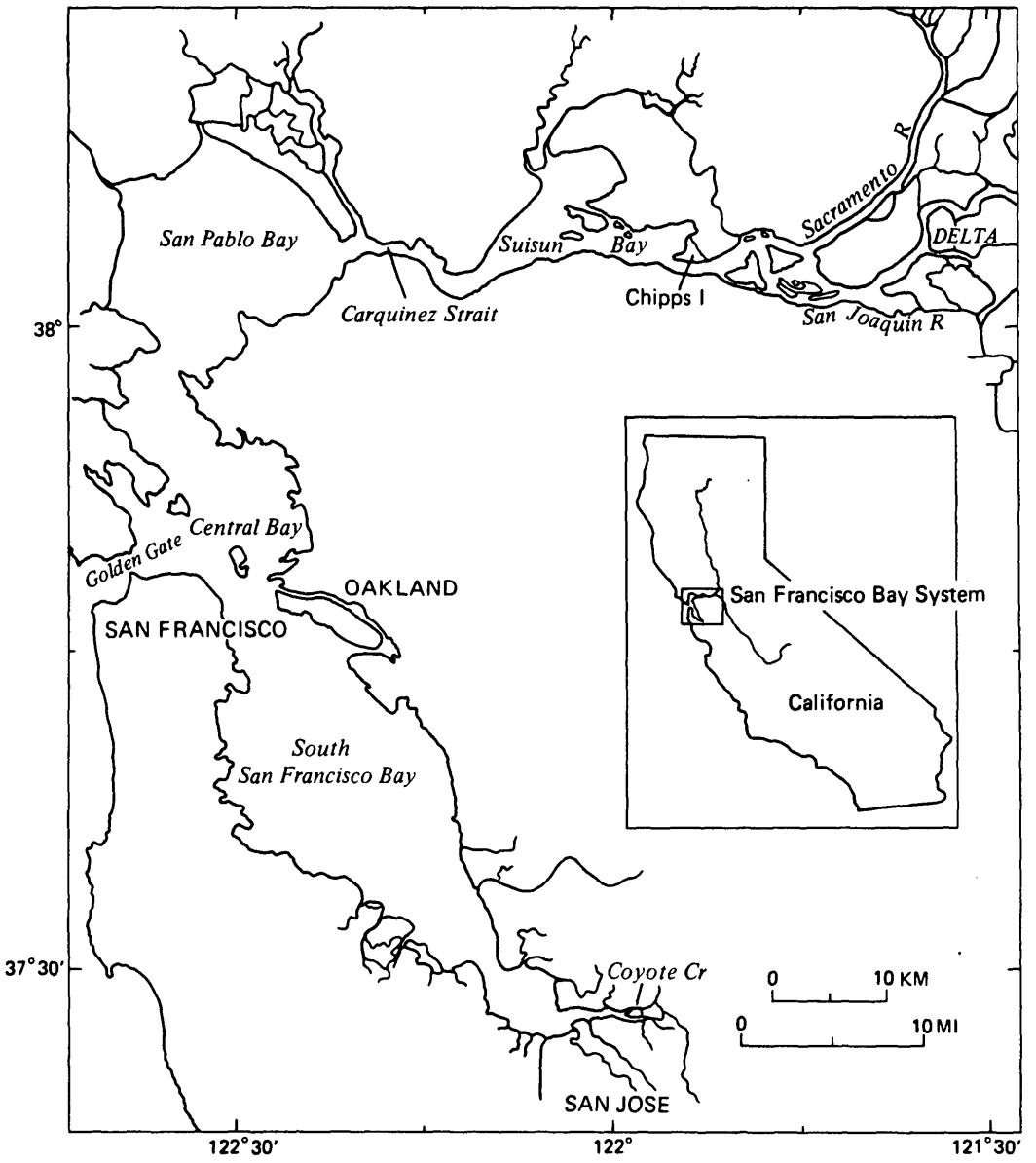


Figure II.1. Map of San Francisco Bay estuarine system.

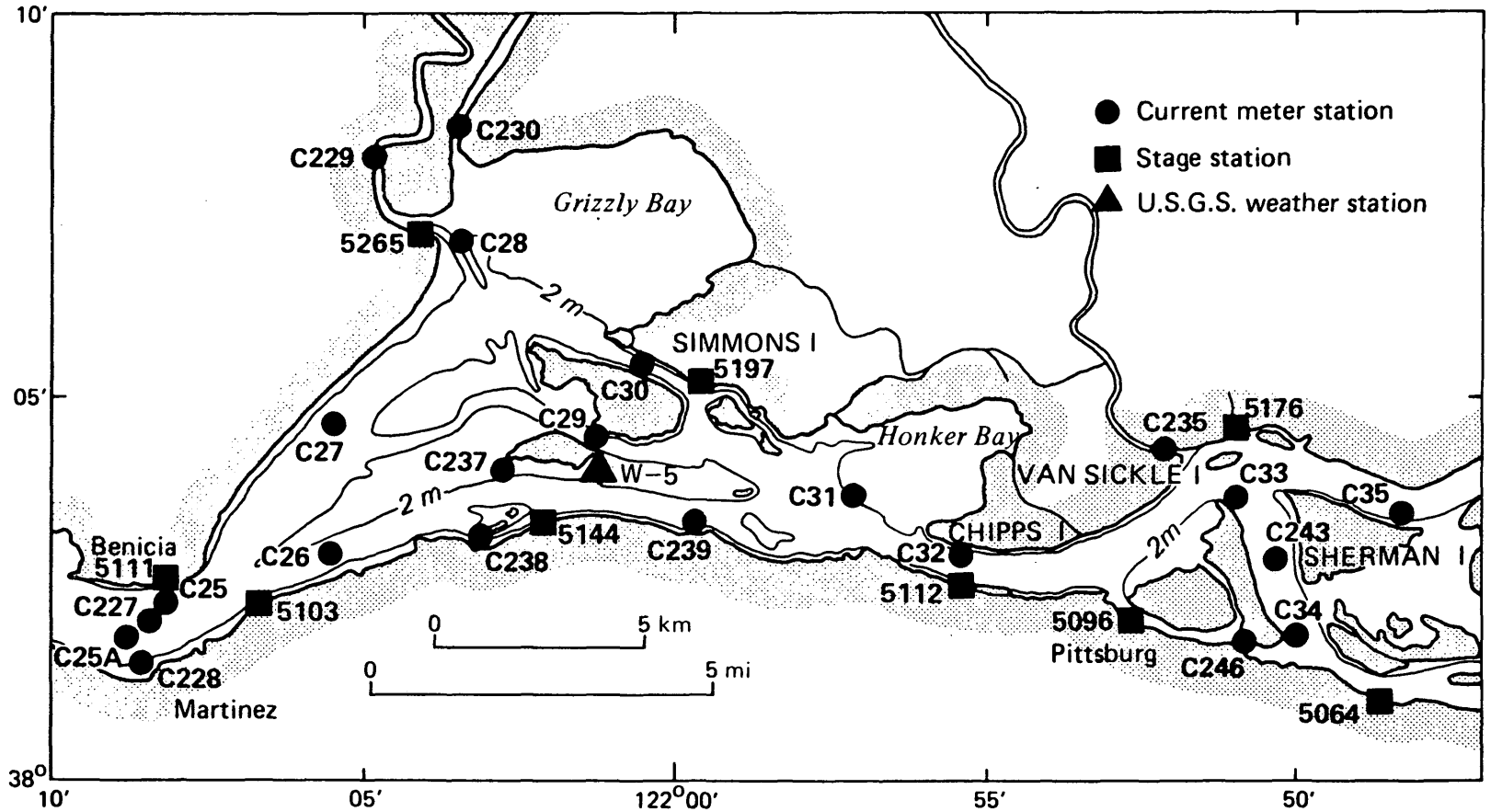


Figure II.2. Map of Suisun Bay region and the location of current-meter moorings, tide stations, and a USGS weather station.

Current-meter data

Twenty-two (22) current meter stations were deployed in the Suisun Bay region by the USGS and NOS/NOAA during the combined current survey in 1979 and 1980. Multiple current meters were deployed at several current-meter stations in the main channel. The minimum length of current-meter deployment was fifteen days, and the maximum deployment was not to exceed thirty-five days. Figure II.2 depicts the approximate geographic location of the current-meter stations in this region. The precise latitude and longitude, and the water depth for each current-meter station at MLLW are compiled in table II.1. Also included in table II.1 are the depths at which the current meters were deployed, and the deployment and recovery dates for all data included in this part of the report. Figure II.3 is a chronological bargraph which indicates the availability of the current-meter data in 1979 and 1980. The solid bars in the bargraph indicate current-meter stations where multiple current-meters were used for the indicated period of time. Table II.1, figure II.2, and figure II.3 describe the complete spatial and temporal distribution of the current-meter data. In addition, table II.1, figure II.2, and figure II.3 define other pertinent information for each current-meter record.

Water-level (tide) data

Water-level data from nine (9) stage stations located around the perimeter of Suisun Bay, California have been analyzed and are presented in this part of the report. The locations of these tide stations are shown in figure II.2, and the precise latitude and longitude of each station are given in table II.2. Because tides in the Bay system are the result of forced oscillations generated by tides in the Pacific Ocean which propagate

TABLE II.1. Endeco current meter deployments between 1 January 1979 and 31 December 1980 in Suisun Bay.

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
GSC27	38°	4.7'	122°	5.0'	302 79	340 79	GSC027A1	7.6	4.0
GSC29	38°	4.5'	122°	1.5'	303 79	340 79	GSC029A1	7.9	2.8
GSC30	38°	5.3'	122°	0.4'	303 79	340 79	GSC030A1	8.5	4.3
GSC32	38°	2.9'	121°	55.1'	341 79	10 80	GSC032A1	12.1	4.5
GSC32	38°	2.9'	121°	55.1'	10 80	38 80	GSC032B1	12.1	4.5
GSC32	38°	2.9'	121°	55.0'	38 80	66 80	GSC032C1	10.0	4.6
GSC32	38°	2.9'	121°	55.3'	67 80	101 80	GSC032D1	10.0	3.6
GSC32	38°	3.0'	121°	55.5'	130 80	158 80	GSC032F1	8.5	3.7
GSC32	38°	3.0'	121°	55.4'	158 80	183 80	GSC032G1	8.5	3.7
GSC32	38°	3.0'	121°	55.4'	183 80	217 80	GSC032H1	7.9	3.7
GSC32	38°	3.0'	121°	55.6'	218 80	249 80	GSC032I1	7.9	3.7
GSC32	38°	3.0'	121°	55.7'	249 80	276 80	GSC032J1	7.6	3.7
GSC32	38°	3.0'	121°	55.7'	249 80	276 80	GSC032J2	7.6	1.9
GSC32	38°	3.0'	121°	55.7'	276 80	291 80	GSC032K1	7.6	3.7
GSC32	38°	3.0'	121°	55.7'	276 80	291 80	GSC032K2	7.6	1.9
GSC32	38°	3.0'	121°	55.7'	291 80	319 80	GSC032L1	8.5	3.7
GSC32	38°	3.0'	121°	55.7'	291 80	319 80	GSC032L2	8.5	1.8
GSC32	38°	3.0'	121°	55.6'	319 80	353 80	GSC032M1	8.8	3.7
GSC235	38°	4.4'	121°	52.5'	304 80	324 80	GSC235A1	6.0	3.0
GSC237	38°	3.9'	122°	2.5'	302 79	346 79	GSC237A1	7.6	4.0
GSC237	38°	3.9'	122°	2.5'	305 80	322 80	GSC237B1	7.9	4.9
GSC239	38°	3.5'	121°	59.6'	297 79	318 79	GSC239A1	12.1	9.1
GSC239	38°	3.5'	121°	59.6'	318 79	338 79	GSC239B1	12.1	9.1

*Water depth in meters referenced to MLLW

†Meter depth in meters above bed

TABLE II.1 (cont.). Aanderaa current meter deployments between 1 January 1979 and 31 December 1980 in Suisun Bay.

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C025	38°	2.2'	122°	8.0'	94 79	114 79	1743	14.3	7.9
C025	38°	2.3'	122°	8.0'	94 79	114 79	1744	14.3	1.8
C025A	38°	2.0'	122°	9.0'	304 79	320 79	1909	12.2	6.1
C025A	38°	2.0'	122°	9.0'	304 79	320 79	1910	12.2	1.8
C026	38°	3.1'	122°	5.4'	94 79	110 79	1745	10.1	1.6
C026	38°	3.1'	122°	5.4'	302 79	318 79	1907	10.7	1.6
C026	38°	3.2'	122°	5.6'	320 79	337 79	1938	7.6	3.0
C026	38°	3.1'	122°	5.4'	302 80	322 80	2316	10.4	4.6
C026	38°	3.1'	122°	5.4'	302 80	322 80	2317	10.4	1.6
C027	38°	4.7'	122°	5.0'	302 79	340 79	1905	8.8	1.5
C028	38°	7.1'	122°	3.2'	107 79	123 79	1759	2.1	0.9
C028	38°	7.1'	122°	3.4'	305 79	320 79	1913	2.1	0.9
C029	38°	4.4'	122°	1.3'	107 79	123 79	1760	6.1	1.5
C030	38°	5.4'	122°	0.4'	108 79	123 79	1761	10.4	1.6
C030	38°	5.3'	122°	2.1'	303 79	340 79	1903	8.8	1.5
C031	38°	3.9'	121°	57.3'	108 79	123 79	1762	2.1	0.9
C032	38°	2.9'	121°	55.3'	94 79	124 79	1747	12.2	6.1
C032	38°	2.9'	121°	55.3'	94 79	124 79	1748	12.2	1.8
C032	38°	2.9'	121°	55.3'	297 79	318 79	1898	12.2	6.1
C032	38°	2.9'	121°	55.3'	297 79	319 79	1899	12.2	1.8
C032	38°	2.9'	121°	55.5'	318 79	337 79	1932	12.2	6.1
C032	38°	2.9'	121°	55.5'	130 80	155 80	2079	8.5	1.5
C032	38°	2.9'	121°	55.5'	158 80	183 80	2104	8.5	1.5
C033	38°	3.7'	121°	51.0'	106 79	123 79	1755	11.6	6.1
C033	38°	3.7'	121°	51.0'	107 79	123 79	1756	11.6	1.5
C033	38°	3.7'	121°	51.0'	310 79	325 79	1920	12.2	9.1
C033	38°	3.7'	121°	51.0'	310 79	330 79	1922	12.2	3.1
C034	38°	2.0'	121°	50.1'	318 79	331 79	1931	8.5	1.8
C034	38°	2.0'	121°	50.1'	303 80	319 80	2318	8.2	3.9
C034	38°	2.0'	121°	50.1'	303 80	319 80	2319	8.2	1.5
C035	38°	3.6'	121°	48.3'	319 79	337 79	1936	8.8	4.8
C035	38°	3.6'	121°	48.3'	319 79	337 79	1937	8.8	1.5
C227	38°	2.2'	122°	8.7'	304 79	319 79	1911	9.8	3.1
C228	38°	1.7'	122°	8.9'	304 79	320 79	1912	12.8	3.7
C229	38°	8.0'	122°	4.9'	305 79	320 79	1914	9.8	5.2
C230	38°	8.8'	122°	3.4'	305 79	320 79	1916	6.7	0.9
C237	38°	3.9'	122°	2.5'	305 80	322 80	2326	7.9	1.5
C238	38°	3.2'	122°	3.0'	303 79	318 79	1904	8.8	1.5
C239	38°	3.5'	121°	59.6'	297 79	318 79	1900	13.1	7.0
C239	38°	3.5'	121°	59.6'	297 79	318 79	1901	13.1	1.5
C239	38°	3.5'	121°	59.6'	318 79	338 79	1934	12.2	6.4
C243	38°	2.5'	121°	50.3'	317 79	334 79	1930	2.7	1.6
C243	38°	2.8'	121°	50.3'	303 80	316 80	2323	3.0	1.5
C246	38°	1.8'	121°	50.8'	304 80	324 80	2324	7.6	3.0

*Water depth in meters referenced to MLLW

†Meter depth in meters above bed

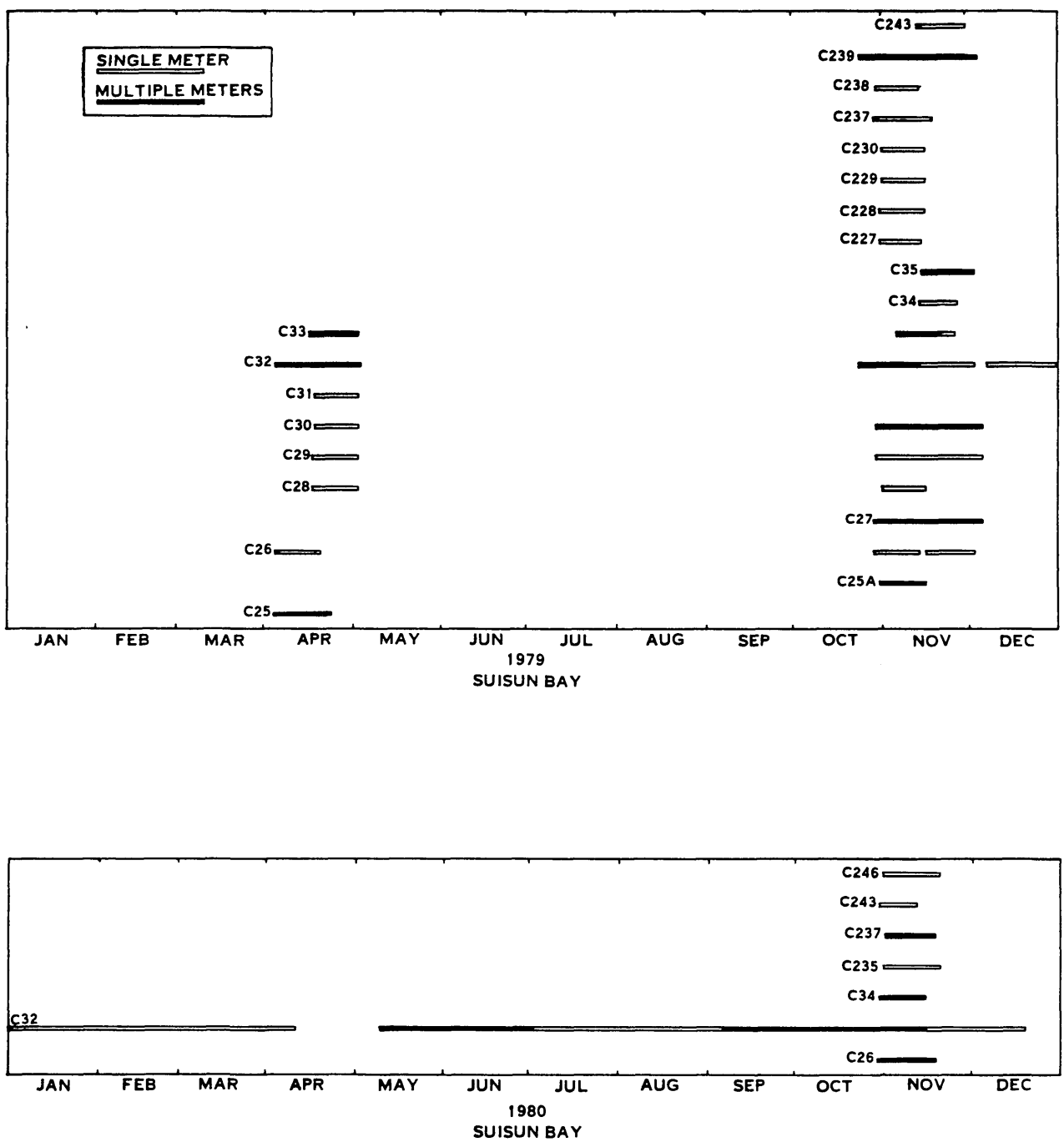


Figure II.3 Bargraph of periods when current-meter arrays were deployed in the Suisun Bay region. Solid bars indicate multiple meters were used.

TABLE II.2. Suisun Bay stage stations, 1978-1980

STATION NUMBER	STATION NAME	LATITUDE	LONGITUDE	START DATE	RECORD LENGTH (DAYS)
5111	Benecia	38°02.6′	122°07.8′	1/1/80	366
5103	Martinez	38°02.2′	122°07.0′	7/20/79	118
5144	Port Chicago	38°03.4′	122°02.3′	1/1/79	336
5265	Suisun Slough	38°07.3′	122°04.4′	9/1/78	248
5197	Simmons Is	38°05.1′	121°59.8′	10/25/79	33
5112	Mallard Ferry	38°02.6′	121°55.1′	6/15/80	172
5096	Pittsburg	38°02.1′	121°52.7′	3/31/79	154
5176	Collinsville	38°04.4′	121°50.9′	4/3/79	29
5064	Antioch	38°01.1′	121°48.9′	9/1/78	248

into the Bay system through Golden Gate, the tide data from the station at Golden Gate, (Presidio fig. II.1) are also included in this part of the report. The properties of the tides at Golden Gate are used as the reference values for tides at other locations in the Bay. As mentioned in Part I, the water-level data were received from NOS/NOAA on a standard 9-track computer tape in the form of hourly water levels at various stage stations. These data covered different periods of time in 1979 and 1980, and might contain record gaps. Because the records are usually quite long and generally quite accurate, the results derived from the least-squares harmonic analyses are not affected by the presence of a record gap if it is only a small fraction of the total record analyzed. Figure II.2 and table II.2 define the spatial and temporal distributions of the stage data included in Part II of the report. The exact period of time and the length of the record analyzed for each stage station are given in the harmonic analysis summary sheet for each stage station.

RESULTS

Tides in Suisun Bay

Least-squares harmonic analysis was applied to each of three yearlong (or nearly yearlong) water level records at Presidio (Golden Gate), the entrance to the Bay system from the Pacific Ocean. The computed results have been given in Part I, table I.2 of this report. We have included only the summary sheet for tides at Presidio for 1979 for comparison with results of the harmonic analyses at other stations. The tides entering the Bay have a form number of 0.84, which indicates that the tides are typically mixed diurnal and semidiurnal without a clear inclination toward either type. It is interesting to note that the lower low water usually follows the occurrence of the higher high water; the tidal currents usually have a stronger ebbing current than flooding current.

Harmonic analyses were made of all the tide data as indicated in table II.2. The results of the analyses are compiled in Appendix II.A in terms of the harmonic constants for each tide station. As discussed previously (see Part I of this report), the harmonic constants can be used for prediction of tides at these stations. The properties of the tides in Suisun Bay can be summarized by showing the spatial distributions of the phase and amplitude of the two most important partial tides (M_2 and K_1) over a map of the Suisun Bay region (fig. II.4). The results for tides at Presidio (Golden Gate) are also included for reference. Shown in figure II.4 are the form number, the modified epoch, κ', and the amplitudes of M_2 and K_1 partial tides. The tidal phase shift, $\Delta\kappa'$, (the modified epoch at station minus the modified epoch at Golden Gate) and the amplitude amplification factor, amf, (the ratio of the amplitude at station to the

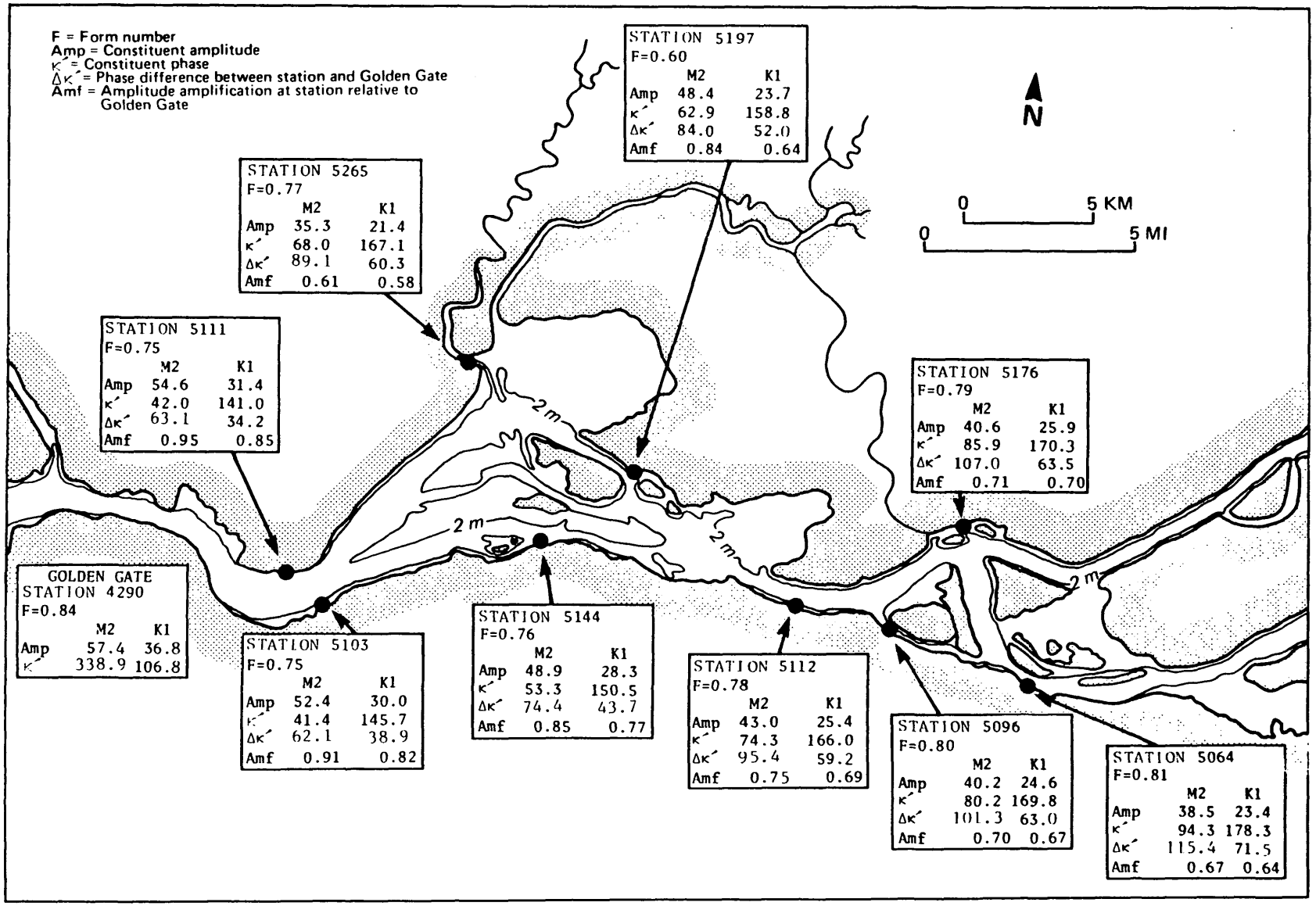


Figure II.4. Spatial distribution of properties of M_2 and K_1 tides in Suisun Bay, California.

amplitude at Golden Gate) are depicted in figure II.4. Due to the lack of data in the middle of the basin, co-tidal and co-range charts for Suisun Bay have not been constructed. Nevertheless, the present results give a general description of the properties of tides in Suisun Bay, California.

The form numbers for tides in Suisun Bay range between 0.60 and 0.81 indicating that the tides retain the properties of mixed semidiurnal and diurnal tides which are the basic characteristics of the tides at the Golden Gate. As the tides propagate through Carquinez Strait and along the main channel, the tides are expected to behave like progressive waves. However, there are numerous reflections of the tidal waves which develop due to the complicated basin bathymetry. The resulting tides are neither pure standing waves nor pure progressive waves. As the tides propagate over the shoals, significant frictional effects further modify the characteristics of the tides. The amplitude for the M_2 tide entering the western end of Suisun Bay (Station 5103) is about 90 percent of the amplitude of M_2 at Golden Gate. Further damping of the amplitude takes place in Suisun Bay. As the M_2 tide leaves the Bay at its eastern end (Station 5112), the amplitude of M_2 is reduced to about 75 percent of the amplitude at Golden Gate. The net phase shift between these two stations for M_2 is about 33 degrees. Values for amplitude amplification and phase shift for K_1 are also given in figure II.4; the properties for other partial tides are similar. Specific values of amplitude amplification and phase shift for other partial tides can be deduced from the results of the harmonic analyses given in the summary sheets (Appendix II.A).

Tidal current in Suisun Bay

The results of tidal-current measurements are presented in two forms. For each current-meter data file analyzed (tab. II.1), the results of the harmonic analyses are compiled in the summary sheets and are given in Appendix II.B. The summary lists the pertinent notes concerning the current-meter deployment and recovery. It includes the station location, water depth, meter depth, deployment and recovery dates, and the approximate record length. The harmonic constants for O_1, K_1, N_2, M_2, S_2, and M_4 are given for the tidal current components in the directions where the major and minor axes of the tidal current ellipses are defined (see Part I). As explained in Part I of this report, with the values for the major and minor axes, modified epoch (phase), and the sense of rotation for each partial tidal current ellipse, Eqs. (6) and (7) in Part I can be used for predicting the tidal current at the station. Additional general properties of tidal current including root-mean-squares (RMS) current speed, spring and neap tidal current limits, principal tidal current direction, and tidal current form number are also given in the summary sheet.

At almost all stations, the tidal currents show a strong bi-directional tendency. The principal current direction depends strongly on the local basin bathymetry. There is a spring and neap variation of the tidal current speed up to a factor of about two. As the form numbers indicate, the tidal currents in Suisun Bay are mixed semidiurnal and diurnal types; however, for most of the cases the tidal current type is closer to semidiurnal than diurnal.

Following the summary of the results of harmonic analyses, the current-meter data are presented graphically in the form of time-series

plots (Appendix II.B). For each data file, the time variations of the tidal-current speed and direction are plotted versus time. Water temperature and salinity are plotted versus time on a separate page. As mentioned before, the time-series plots are used to provide users with a visual display of the temporal variations of tidal currents and their associated properties. No effort was given to edit the data in the file. Portions of the data may be invalid due to marine fouling, malfunction of a sensor, or some other unknown reasons. It was our intention to leave the data close to their original form; users need to judge the validity of the data based on general principles of estuarine-physical oceanography. Only valid data (our own best judgement) were used in the harmonic analyses. Data users may need to edit out any invalid portions of the data given in the time-series plots before using the data for their intended applications.

The most important properties of tidal currents in Suisun Bay can be characterized by five variables: (1) the amplitude of M_2 tidal current ellipse (magnitude of semi-major axis of the M_2 tidal current ellipse), (2) the RMS tidal current speed, (3) and (4) the spring and neap tidal current speed limits, and (5) the principal tidal current direction. The spatial distribution of these quantities is plotted on a map of the Suisun Bay region (fig. II.5) in which the M_2, RMS, and the estimated spring and neap tidal current vectors are plotted in the principal tidal current direction at each station. The spatial distribution of the tidal current suggests that the tidal current is strongly dependent on the basin bathymetry. The correlation of the depth averaged tidal current and the water depth is examined by a linear regression of the RMS current speed versus the local mean water depth at MLLW. Only those current meter data when the current

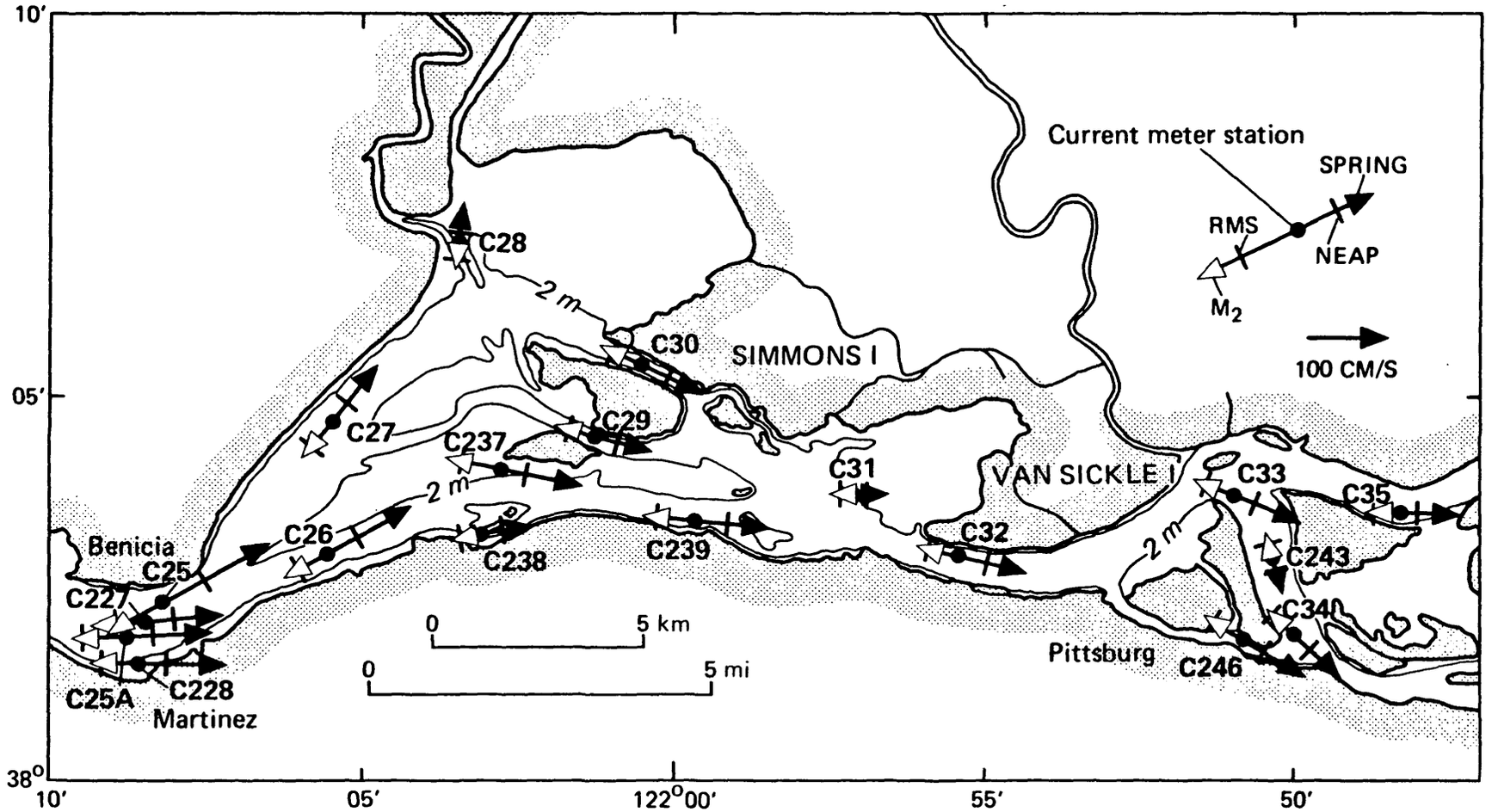


Figure II.5. Spatial distribution of tidal-current properties in Suisun Bay, California. The legend and scale of the velocity vectors are defined on the upper right hand corner of the figure.

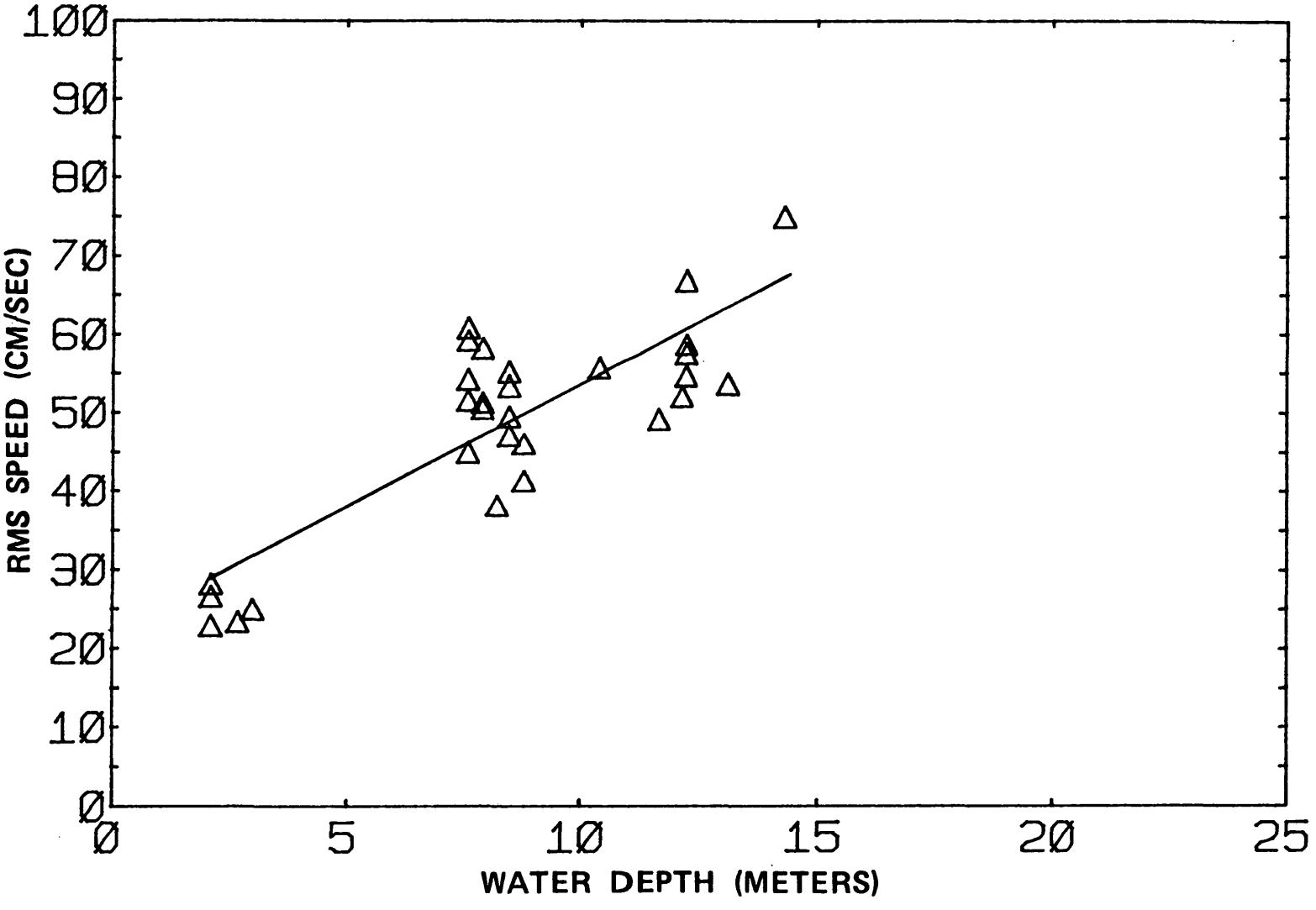


Figure II.6. Relation between RMS current speed and mean-water depth (MLLW) at deployment sites in Suisun Bay, California.

meters were placed between 35 percent and 65 percent of the local water depth were used as approximations to the depth averaged tidal currents. Simple linear regression of RMS current speed over the water depth gives a slope of 3.13 (cm/sec)/m, and the measure of the goodness of fit for the regression r^2 = 0.69 (fig. II.6). The present data set has confirmed the dependency of the tidal-current speed and direction on basin bathymetry in Suisun Bay, California. This is an important conclusion because this property can be used to estimate tidal current speed and direction elsewhere in the basin where field data are not available (Cheng and Gartner, 1982).

Eulerian residual current in Suisun Bay

As discussed in Part I of this report, the Eulerian residual current is defined as the vectorial average of the current-meter data made over several even M_2 tidal cycles. The computed Eulerian residual currents are given in the summary for each current-meter record. As the Delta outflow is one of the variables which affect the salinity distribution and the Eulerian residual current in Suisun Bay, the averaged values of the Delta outflow at the corresponding periods of time have been computed from Dayflow (1982) and are given in the summary sheets.

The factors which affect the Eulerian residual currents in Suisun Bay are rather complex. Basin bathymetry, Delta outflow, spatial distributions of salinity and tidal currents (tidal current shear), long-term temporal variations of tidal currents, salinity distribution, (spring and neap variations), and wind forcing at the water surface are all important factors which may have effects on the magnitude and spatial distribution of the Eulerian residual currents. Although a general pattern of the Eulerian

residual currents exists, it is difficult to draw a simple conclusion from these data as to what are the dominant factors which govern the generation mechanism of the Eulerian residual currents in Suisun Bay. In other words, the computed Eulerian residual currents include all of the above mentioned factors; it is not possible to delineate the individual effects solely based upon examination of these data. The use of mathematical models is a possible way to resolve this question. Indeed, one of the purposes of this data collection program is to support mathematical modeling research.

SUMMARY

In Part II, the observations from moored current meters and water-level stations in Suisun Bay are given. The main purposes of this part of the report are: (1) to document the data set collected in Suisun Bay, California during the intensive current survey which was conducted jointly by the USGS and NOS/NOAA; (2) to present the basic data in a form useful to users; and (3) to document results from harmonic analyses of these data. The tabulated harmonic constants given in Part II can be used to predict tides and tidal currents in Suisun Bay. The results from the harmonic analyses have led to the conclusion that tides in Suisun Bay are mixed progressive and standing waves in the main channel, and that the tidal currents are strongly dependent on the basin bathymetry. Whereas the Eulerian residual current is affected by basin bathymetry, Delta outflow, salinity stratification, tidal currents, and wind forcings, a simple conclusion concerning the dominance of these factors cannot be reached from these analyses. The generation of the Eulerian residual currents is probably a combination of all the above mentioned mechanisms.

APPENDIX II.A

RESULTS OF HARMONIC ANALYSES OF TIDES (STAGE) IN SUISUN BAY, CALIFORNIA

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414290
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 365 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 27 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 9.26 CM
TIME SERIES MEAN: 272.92 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.15	82.14	97.42
O1	0.92954	22.87	86.32	97.24
M1	0.96645	1.35	111.31	117.80
P1	0.99726	11.46	101.64	104.43
K1	1.00274	36.73	104.26	106.40
J1	1.03903	1.99	130.29	128.07
MU2	1.86455	0.80	231.49	252.68
N2	1.89598	12.44	299.88	317.29
NU2	1.90084	2.27	306.50	323.33
M2	1.93227	57.79	324.77	337.82
L2	1.96857	2.40	349.83	358.53
T2	1.99726	1.12	324.04	329.30
S2	2.00000	13.48	331.70	336.63
K2	2.00548	3.85	327.31	331.58
M4	3.86455	2.37	19.03	45.14
MK3	2.93501	2.09	126.13	141.33

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415111
START TIME OF SERIES (PST):
YEAR=1980
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 366 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 7 MIN 48 SEC
STANDARD DEVIATION OF THE TIME SERIES: 14.20 CM
TIME SERIES MEAN: 960.06 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	2.84	128.39	143.33
O1	0.92954	18.23	121.10	131.68
M1	0.96645	1.28	174.97	181.12
P1	0.99726	9.10	142.26	144.72
K1	1.00274	31.37	139.17	140.97
J1	1.03903	0.74	196.39	193.84
MU2	1.86455	1.40	212.29	232.80
N2	1.89598	10.63	5.14	21.88
NU2	1.90084	2.49	8.61	24.77
M2	1.93227	54.63	29.63	42.01
L2	1.96857	3.91	45.15	53.19
T2	1.99726	1.28	348.47	353.06
S2	2.00000	11.73	41.09	45.35
K2	2.00548	4.50	31.30	34.91
M4	3.86455	0.68	240.94	265.71
MK3	2.93501	1.50	116.02	130.21

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415103
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 7
DAY=20
HOUR= 0
APPROXIMATE RECORD LENGTH: 118 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 7 MIN 0 SEC
STANDARD DEVIATION OF THE TIME SERIES: 6.43 CM
TIME SERIES MEAN: 99.47 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.23	126.87	141.80
O1	0.92954	17.71	123.59	134.16
M1	0.96645	1.15	159.03	165.17
P1	0.99726	8.98	139.03	141.47
K1	1.00274	30.03	143.86	145.65
J1	1.03903	0.87	169.19	166.63
MU2	1.86455	1.42	211.73	232.21
N2	1.89598	9.63	3.05	19.77
NU2	1.90084	2.50	24.63	40.76
M2	1.93227	52.36	28.99	41.35
L2	1.96857	4.36	57.12	65.12
T2	1.99726	0.92	355.13	359.69
S2	2.00000	10.96	39.59	43.82
K2	2.00548	4.11	40.78	44.35
M4	3.86455	0.56	288.84	313.56
MK3	2.93501	2.00	131.20	145.35

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415144
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 336 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 2 MIN 18 SEC
STANDARD DEVIATION OF THE TIME SERIES: 11.44 CM
TIME SERIES MEAN: 194.24 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	2.35	139.14	153.99
O1	0.92954	16.32	134.49	144.99
M1	0.96645	0.42	141.36	147.43
P1	0.99726	8.47	154.69	157.05
K1	1.00274	28.25	148.78	150.49
J1	1.03903	0.74	194.95	192.31
MU2	1.86455	2.07	219.40	239.73
N2	1.89598	8.80	15.40	31.95
NU2	1.90084	2.53	29.53	45.51
M2	1.93227	48.90	41.11	53.31
L2	1.96857	3.64	68.98	76.83
T2	1.99726	1.37	17.19	21.59
S2	2.00000	10.13	54.85	58.93
K2	2.00548	4.14	56.02	59.44
M4	3.86455	0.79	355.30	19.71
MK3	2.93501	2.84	139.90	153.82

```
*********************************
* SUMMARY OF HARMONIC ANALYSIS *
*     WATER LEVEL STATIONS     *
*********************************
```

STAGE STATION: 9415265
START TIME OF SERIES (PST):
YEAR=1978
MONTH= 9
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 248 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 4 MIN 24 SEC
STANDARD DEVIATION OF THE TIME SERIES: 22.16 CM
TIME SERIES MEAN: 478.99 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	1.84	183.27	198.15
O1	0.92954	13.17	141.04	151.57
M1	0.96645	0.72	355.07	1.17
P1	0.99726	4.27	109.46	111.87
K1	1.00274	21.40	165.39	167.14
J1	1.03903	1.05	322.38	319.77
MU2	1.86455	1.25	248.16	268.56
N2	1.89598	6.38	37.34	53.97
NU2	1.90084	4.45	72.88	88.93
M2	1.93227	35.28	55.74	68.02
L2	1.96857	3.29	82.39	90.31
T2	1.99726	3.85	302.48	306.96
S2	2.00000	9.53	86.30	90.45
K2	2.00548	5.48	10.70	14.19
M4	3.86455	1.29	23.68	48.23
MK3	2.93501	2.28	149.51	163.53

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415197
START TIME OF SERIES (PST):
YEAR=1979
MONTH=10
DAY=25
HOUR= 0
APPROXIMATE RECORD LENGTH: 33 DAYS*
TIME MERIDIAN: 120 W
STATION LONGITUDE: 121 DEGREES 59 MIN 48 SEC
STANDARD DEVIATION OF THE TIME SERIES: 11.45 CM
TIME SERIES MEAN: 318.94 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	2.47	139.52	154.33
O1	0.92954	12.74	145.37	155.83
M1	0.96645	0.90	151.27	157.30
P1	0.99726	7.83	156.29	158.62
K1	1.00274	23.66	157.18	158.84
J1	1.03903	1.01	163.03	160.34
MU2	1.86455	1.16	64.80	85.04
N2	1.89598	10.07	335.10	351.58
NU2	1.90084	1.95	345.24	1.13
M2	1.93227	48.39	50.75	62.87
L2	1.96857	1.35	126.39	134.16
T2	1.99726	0.75	37.26	41.58
S2	2.00000	12.73	36.70	40.69
K2	2.00548	3.46	35.56	38.90
M4	3.86455	1.76	339.41	3.65
MK3	2.93501	3.57	110.13	123.92

*Inference method

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415112
START TIME OF SERIES (PST):
YEAR=1980
MONTH= 6
DAY=15
HOUR= 0
APPROXIMATE RECORD LENGTH: 172 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 121 DEGREES 55 MIN 6 SEC
STANDARD DEVIATION OF THE TIME SERIES: 10.00 CM
TIME SERIES MEAN: 390.12 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	2.63	167.22	181.95
O1	0.92954	14.71	146.95	157.33
M1	0.96645	1.22	216.47	222.42
P1	0.99726	7.83	158.50	160.75
K1	1.00274	25.43	164.45	166.04
J1	1.03903	0.27	303.72	300.96
MU2	1.86455	2.34	240.84	260.93
N2	1.89598	7.63	38.21	54.52
NU2	1.90084	1.91	42.14	57.87
M2	1.93227	43.01	62.38	74.34
L2	1.96857	3.65	74.03	81.63
T2	1.99726	0.62	13.94	18.11
S2	2.00000	8.39	71.90	75.74
K2	2.00548	3.67	68.97	72.15
M4	3.86455	1.48	19.55	43.48
MK3	2.93501	2.75	161.36	174.92

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415096
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 3
DAY=31
HOUR= 0
APPROXIMATE RECORD LENGTH: 157 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 121 DEGREES 52 MIN 42 SEC
STANDARD DEVIATION OF THE TIME SERIES: 9.18 CM
TIME SERIES MEAN: 556.99 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	2.02	171.70	186.39
O1	0.92954	13.47	152.45	162.78
M1	0.96645	0.24	226.31	232.21
P1	0.99726	8.17	176.77	178.98
K1	1.00274	24.64	168.29	169.84
J1	1.03903	0.50	276.96	274.15
MU2	1.86455	2.12	236.64	256.65
N2	1.89598	7.11	44.83	61.07
NU2	1.90084	1.84	67.34	83.00
M2	1.93227	40.17	68.26	80.15
L2	1.96857	2.85	95.40	102.93
T2	1.99726	0.46	47.74	51.83
S2	2.00000	7.49	80.42	84.18
K2	2.00548	3.74	78.95	82.05
M4	3.86455	1.47	28.48	52.24
MK3	2.93501	3.30	160.38	173.82

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415176
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 4
DAY= 3
HOUR= 0 *
APPROXIMATE RECORD LENGTH: 29 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 121 DEGREES 50 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 7.74 CM
TIME SERIES MEAN: 268.99 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	2.50	132.32	146.98
O1	0.92954	12.87	144.41	154.71
M1	0.96645	0.91	156.59	162.46
P1	0.99726	8.57	166.95	169.12
K1	1.00274	25.88	168.77	170.29
J1	1.03903	1.02	180.86	178.03
MU2	1.86455	0.97	60.39	80.35
N2	1.89598	8.92	60.51	76.69
NU2	1.90084	1.73	62.32	77.92
M2	1.93227	40.57	74.07	85.89
L2	1.96857	1.14	87.63	95.10
T2	1.99726	0.50	87.20	91.22
S2	2.00000	8.39	87.74	91.44
K2	2.00548	2.28	88.85	91.89
M4	3.86455	1.94	45.83	69.47
MK3	2.93501	2.60	137.40	150.74

* Inference method

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415064
START TIME OF SERIES (PST):
YEAR=1978
MONTH= 9
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 248 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 121 DEGREES 48 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 11.78 CM
TIME SERIES MEAN: 319.46 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	2.04	180.31	194.94
O1	0.92954	13.47	156.94	167.21
M1	0.96645	0.20	15.47	21.31
P1	0.99726	6.87	176.50	178.65
K1	1.00274	23.40	176.81	178.29
J1	1.03903	0.96	279.98	277.11
MU2	1.86455	2.05	250.42	270.30
N2	1.89598	6.82	59.64	75.76
NU2	1.90084	1.69	84.27	99.80
M2	1.93227	38.46	82.53	94.29
L2	1.96857	2.80	109.02	116.42
T2	1.99726	0.71	75.09	79.04
S2	2.00000	6.80	94.85	98.48
K2	2.00548	3.74	90.32	93.30
M4	3.86455	1.78	52.41	75.92
MK3	2.93501	2.39	175.54	188.78

APPENDIX II.B

The current-meter data are presented chronologically and station-by-station in Appendix II.B. For each file, the measured data and the results of analyses are presented in two forms: (1) results from the harmonic analyses; and (2) time series plots of tidal-current velocity (speed and direction) versus time, and salinity and temperature versus time. These results are given in the order of station numbers as listed in table II.1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C027
POSITION: 38 4'42"N 122 4'59"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 10/29/79 1833 PST JULIAN DAY=302
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

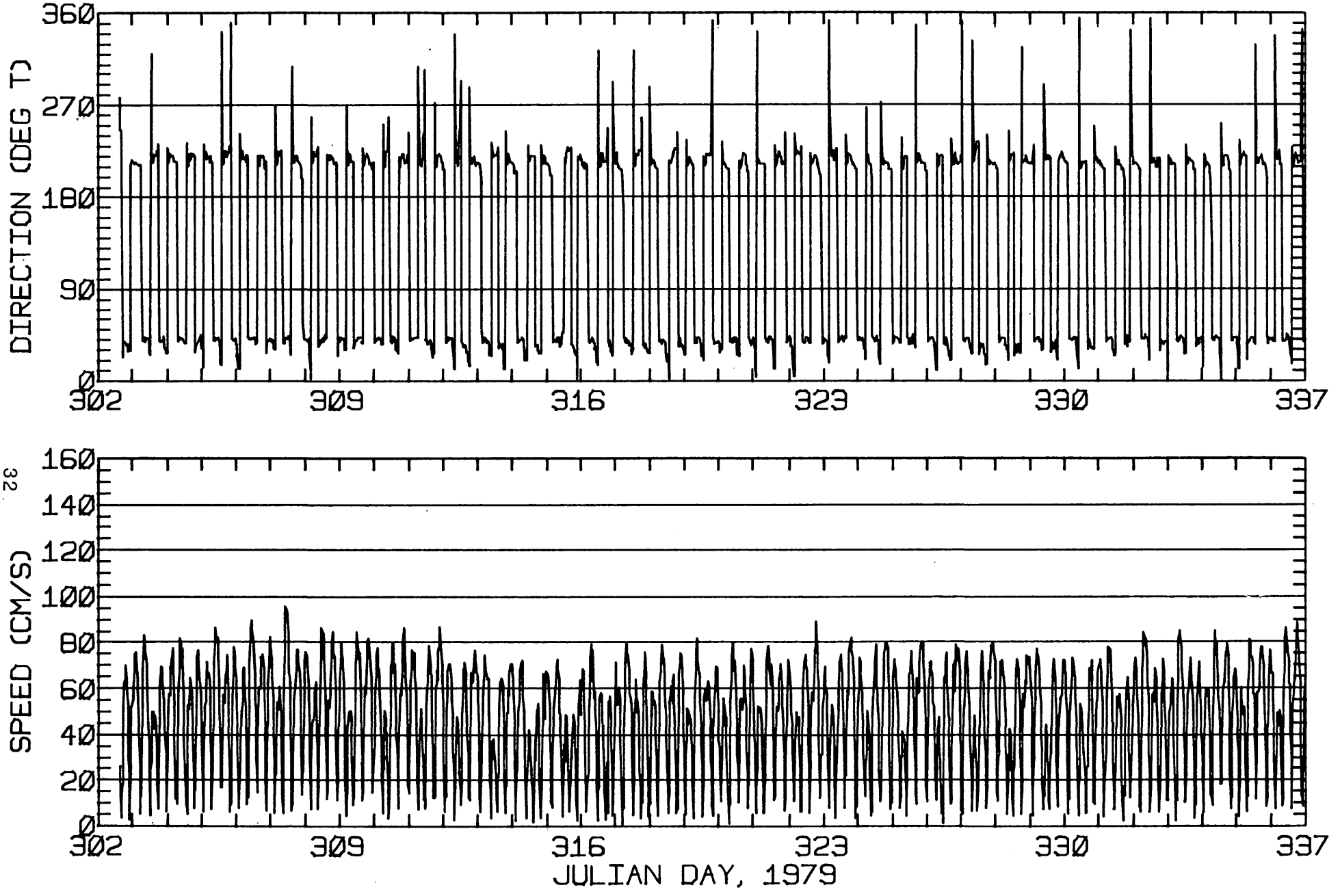
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.94	1.66	27.8	91.9	ANTI-CLOCKWISE
K1	25.66	1.41	37.7	89.3	ANTI-CLOCKWISE
N2	9.55	0.25	40.2	344.9	CLOCKWISE
M2	60.44	1.52	38.3	27.7	ANTI-CLOCKWISE
S2	11.51	0.22	42.0	356.8	ANTI-CLOCKWISE
M4	3.30	1.42	41.7	2.8	CLOCKWISE

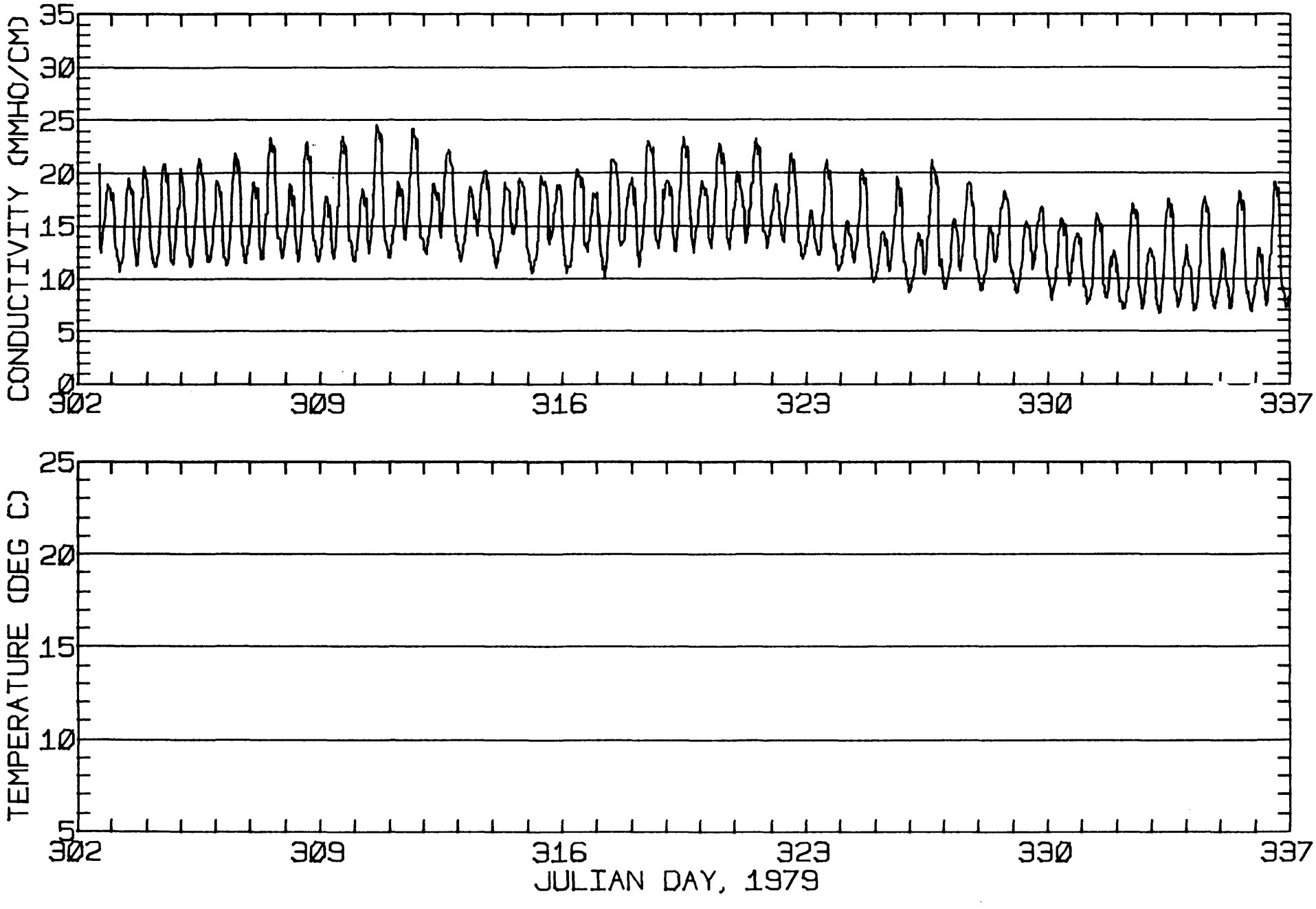
RMS SPEED: 51.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 110.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 37.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.54
STANDARD DEVIATION U-SERIES: 8.83 CM/SEC
STANDARD DEVIATION V SERIES: 12.82 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	2.3	227.
2	12	1.9	2.4	303.
3	12	3.2	4.6	257.
4	12	2.0	2.4	409.
5	8	0.5	-0.1	411.
ALL	56	2.0	2.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RESERVE FLEET 38- 4-42N 122- 4-59W
METER 4.0 METERS ABOVE BED TAPE NUMBER GSC027A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RESERVE FLEET 38- 4-42N 122- 4-59W
METER 4.0 METERS ABOVE BED TAPE NUMBER GSC027A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C029
POSITION: 38 4'30"N 122 1'27"W
METER TYPE: ENDECO
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 5.1 M (BELOW MLLW)
START TIME OF SERIES: 10/30/79 1117 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

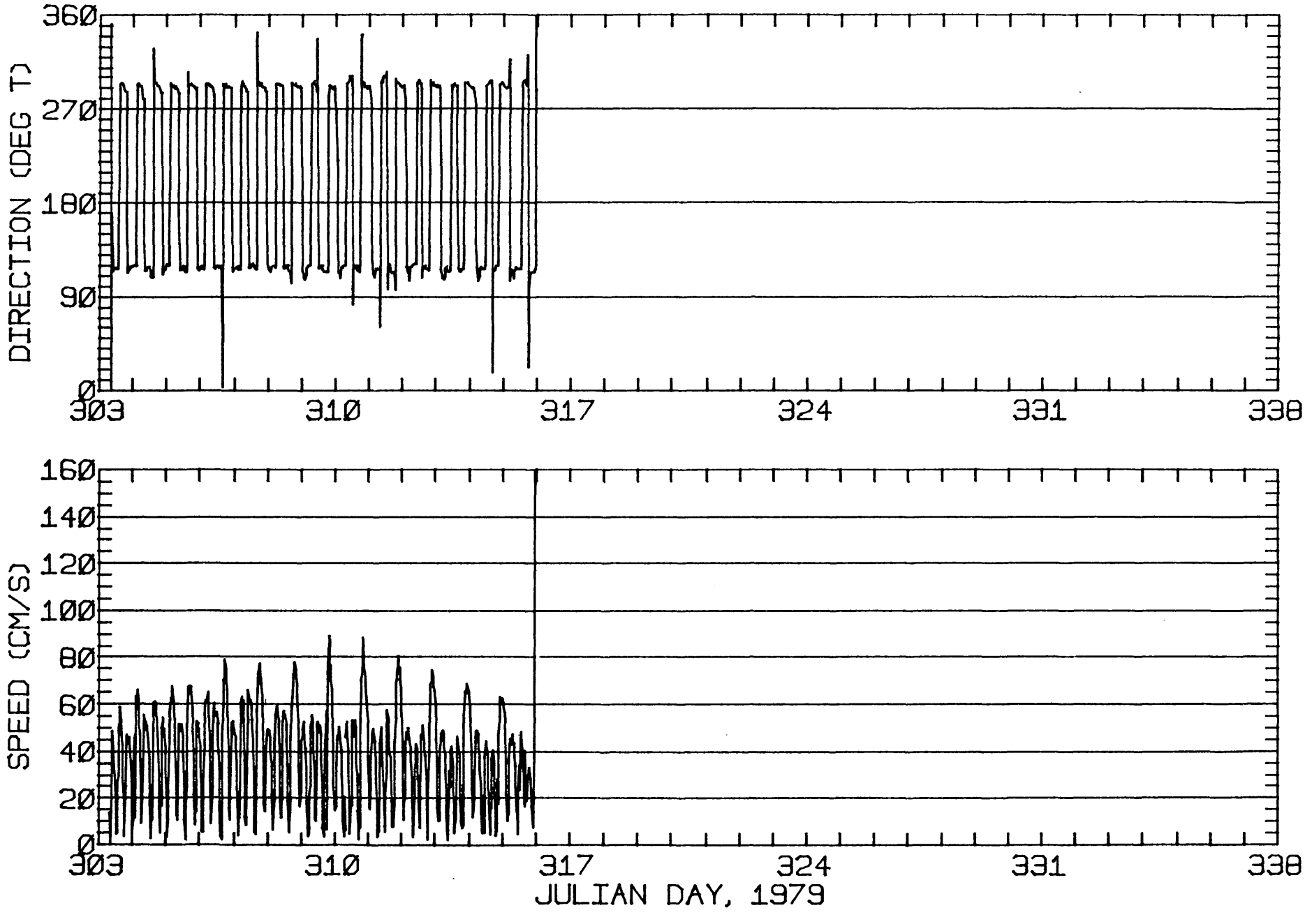
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.59	0.26	109.8	109.3	ANTI-CLOCKWISE
K1	18.83	0.69	112.2	99.1	ANTI-CLOCKWISE
N2	5.49	0.08	127.8	346.6	ANTI-CLOCKWISE
M2	47.54	0.88	113.1	50.8	ANTI-CLOCKWISE
S2	8.80	0.20	120.1	12.8	ANTI-CLOCKWISE
M4	3.88	0.06	117.9	336.4	ANTI-CLOCKWISE

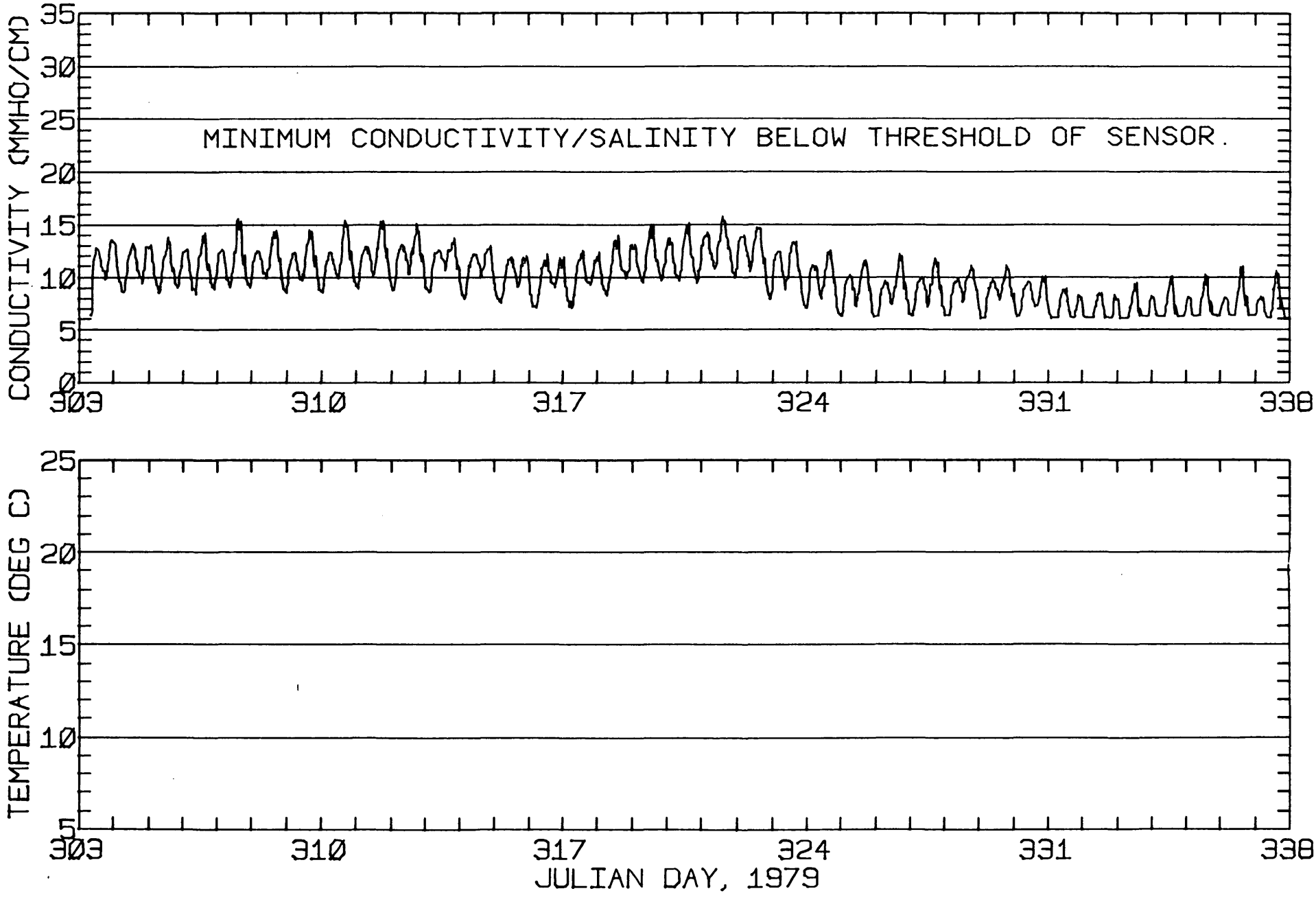
RMS SPEED:	43.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	86.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	31.5 CM/SEC
PRINCIPAL CURRENT DIRECTION:	113.2 DEGREES TRUE
TIDAL FORM NUMBER:	0.54
STANDARD DEVIATION U-SERIES:	13.43 CM/SEC
STANDARD DEVIATION V SERIES:	6.82 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.1	-0.5	227.
2	12	-4.8	1.2	303.
ALL	24	-4.5	0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RYER ISLAND 38- 4-30N 122- 1-27W
METER 2.7 METERS ABOVE BED TAPE NUMBER GSC029A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RYER ISLAND 38- 4-30N 122- 1-27W
METER 2.7 METERS ABOVE BED TAPE NUMBER GSC029A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C030
POSITION: 38 5'18"N 122 0'23"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 4.2 M (BELOW MLLW)
START TIME OF SERIES: 10/30/79 1208 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

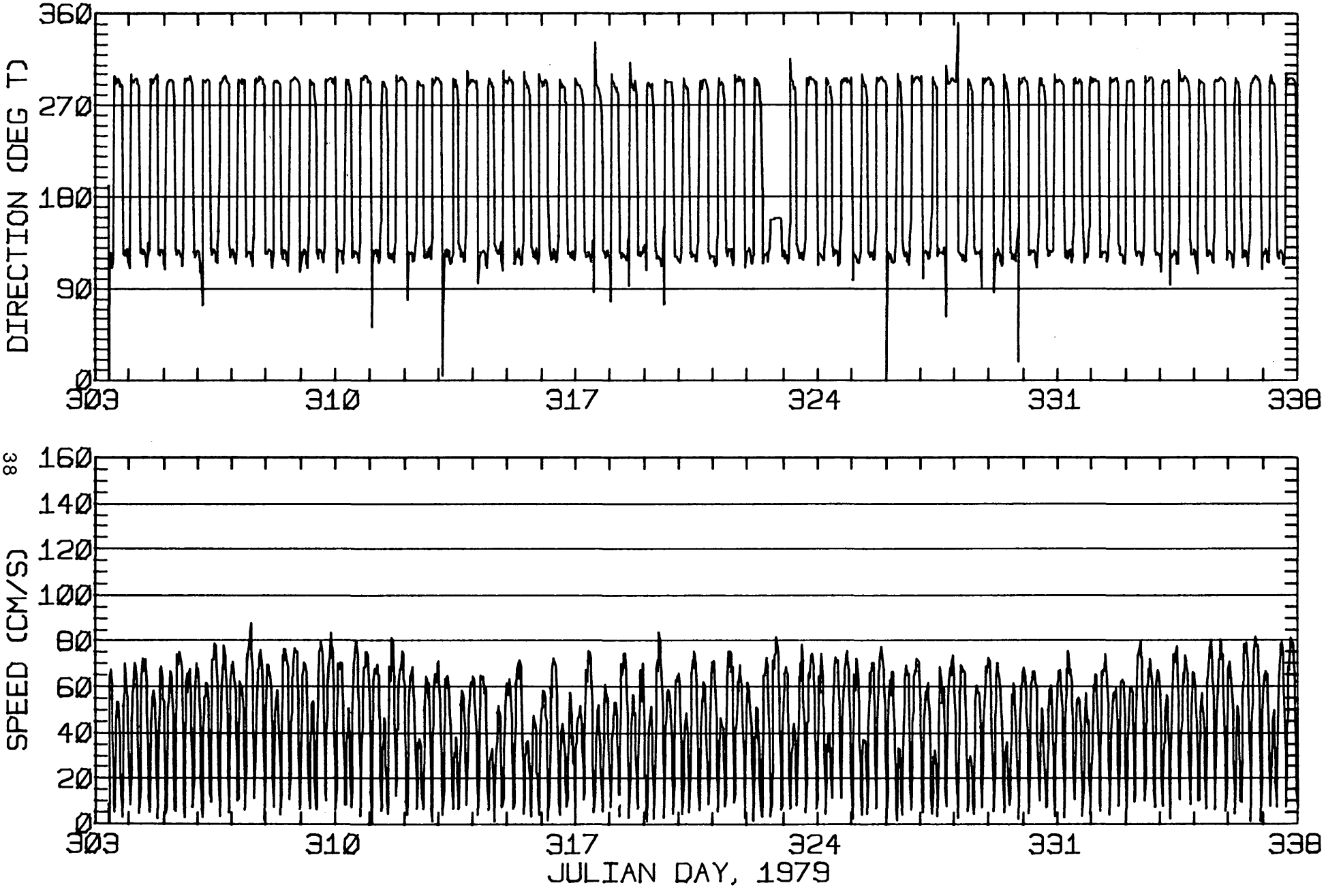
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.62	0.12	115.4	97.9	ANTI-CLOCKWISE
K1	22.92	0.50	117.7	106.2	CLOCKWISE
N2	9.76	0.13	124.5	7.5	CLOCKWISE
M2	58.33	0.85	118.2	50.5	ANTI-CLOCKWISE
S2	9.81	0.11	115.2	27.3	ANTI-CLOCKWISE
M4	1.81	0.94	165.1	67.4	CLOCKWISE

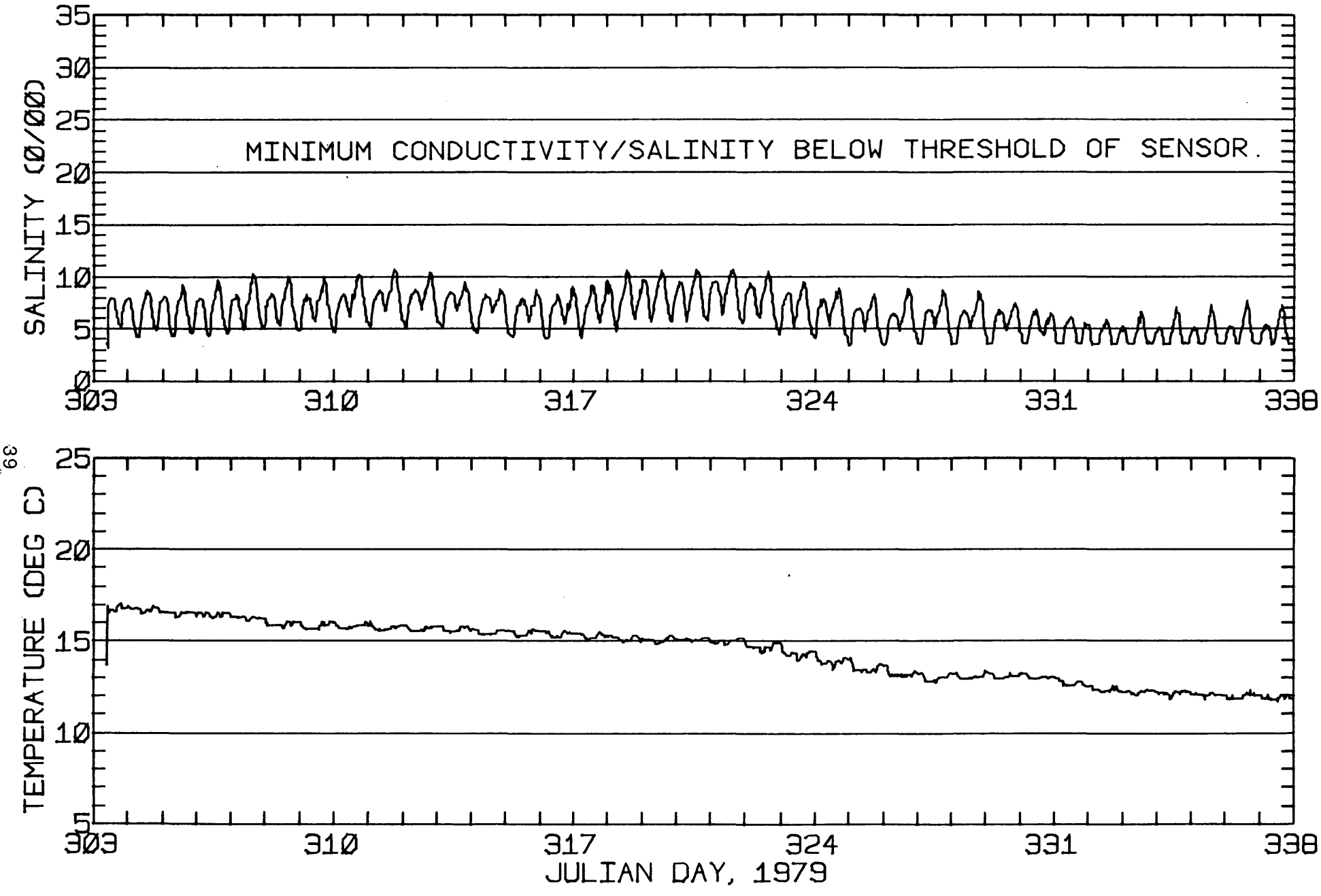
RMS SPEED: 49.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 117.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 11.45 CM/SEC
STANDARD DEVIATION V SERIES: 9.31 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.0	-5.7	227.
2	12	1.5	-4.9	311.
3	12	4.4	-7.3	255.
4	12	4.7	-8.2	423.
5	8	1.5	-5.2	465.
ALL	56	2.9	-6.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RYER ISLAND 38- 5-18N 122- 0-23W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC030A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RYER ISLAND 38- 5-18N 122- 0-23W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC030A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 2'58"N 121 55' 7"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 12/ 7/79 1013 PST JULIAN DAY=341
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

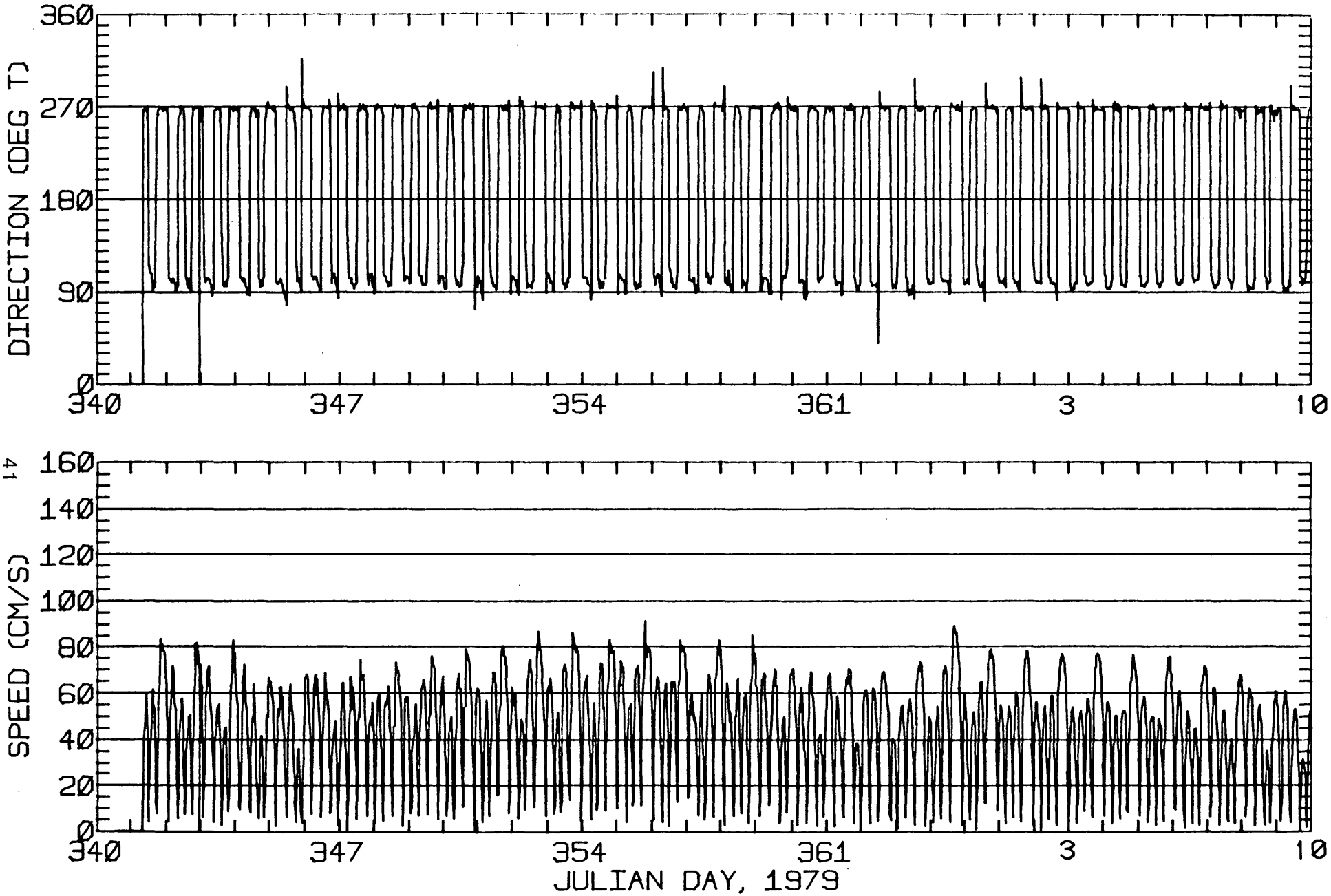
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.73	0.13	90.9	104.7	ANTI-CLOCKWISE
K1	27.28	0.52	91.9	110.0	ANTI-CLOCKWISE
N2	6.91	0.45	90.5	17.2	CLOCKWISE
M2	61.97	0.93	93.5	39.1	ANTI-CLOCKWISE
S2	8.91	0.10	93.2	45.3	CLOCKWISE
M4	2.73	0.60	124.4	55.1	CLOCKWISE

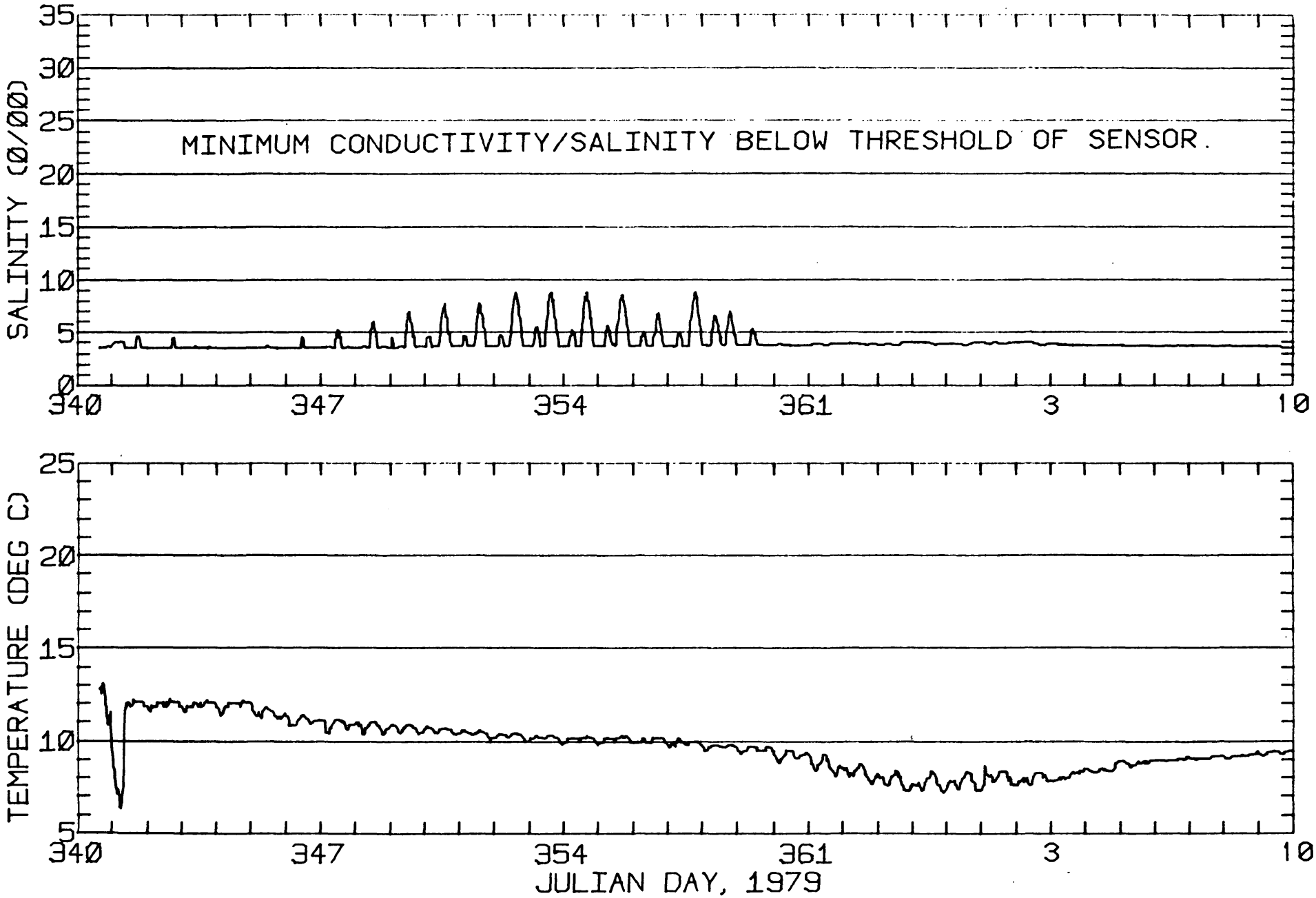
RMS SPEED: 52.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 108.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 92.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.54
STANDARD DEVIATION U-SERIES: 13.54 CM/SEC
STANDARD DEVIATION V SERIES: 3.14 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.0	-3.8	277.
2	12	-2.9	-4.2	224.
3	12	-5.5	-4.3	550.
4	12	-10.3	-2.8	1380.
5	8	-11.1	-3.3	1283.
ALL	56	-6.9	-3.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-58N 121-55- 7W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC032A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-58N 121-55- 7W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC032A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 2'56"N 121 55' 6"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 1/10/80 1249 PST JULIAN DAY= 10
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

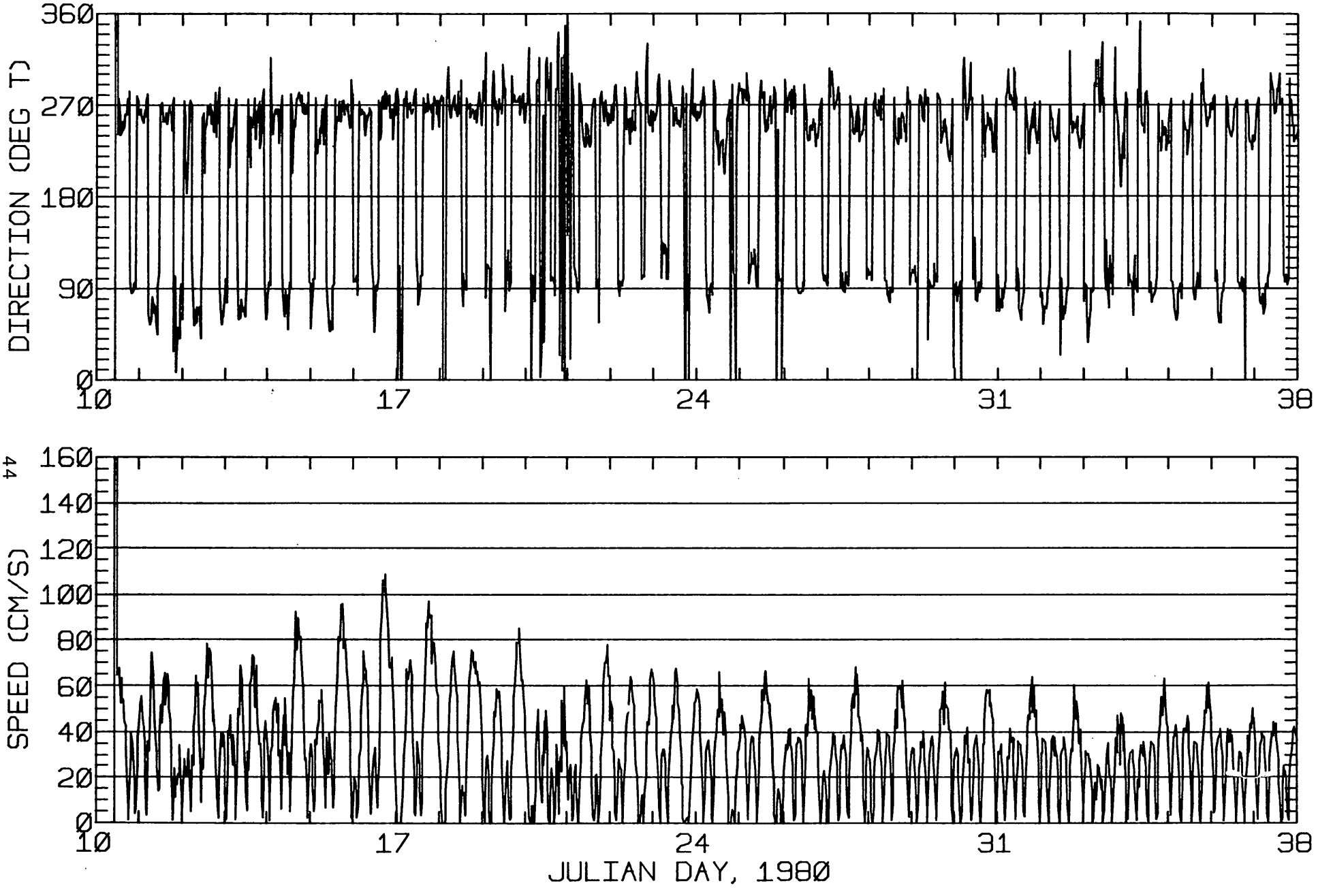
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.21	1.11	67.4	147.4	ANTI-CLOCKWISE
K1	16.29	0.50	76.3	123.0	CLOCKWISE
N2	4.62	1.24	99.7	70.0	ANTI-CLOCKWISE
M2	36.51	0.41	80.8	45.1	ANTI-CLOCKWISE
S2	5.04	0.61	95.6	13.4	CLOCKWISE
M4	3.12	0.04	98.3	89.1	ANTI-CLOCKWISE

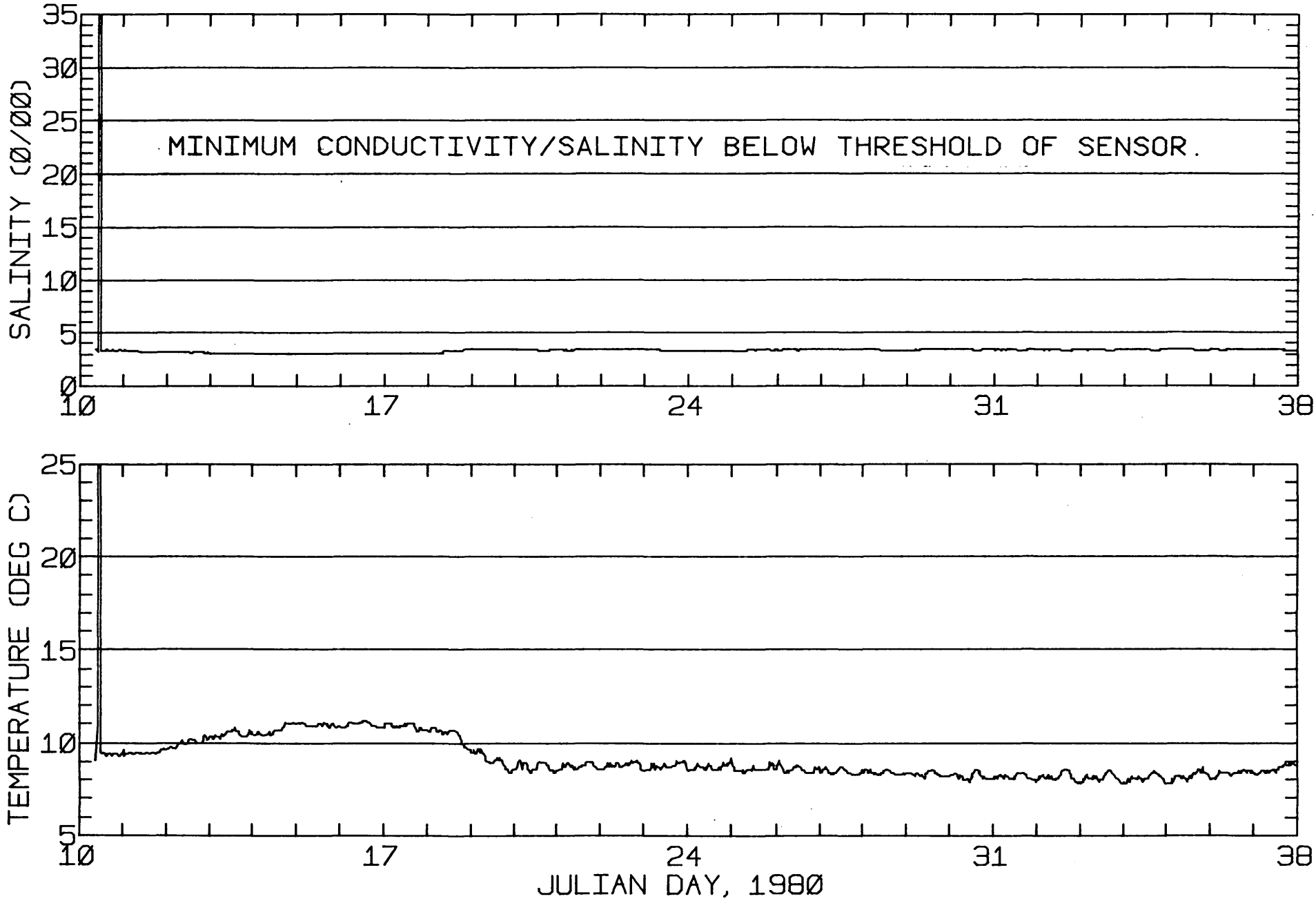
RMS SPEED:	39.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	66.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	23.4 CM/SEC
PRINCIPAL CURRENT DIRECTION:	79.1 DEGREES TRUE
TIDAL FORM NUMBER:	0.59
STANDARD DEVIATION U-SERIES:	16.23 CM/SEC
STANDARD DEVIATION V SERIES:	11.02 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-17.2	-1.7	3504.
2	12	-27.9	-0.1	7183.
3	12	-15.3	-5.0	3163.
4	12	-7.7	-4.0	1958.
5	4	-7.2	-3.2	1459.
ALL	52	-16.3	-2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-56N 121-55- 6W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC032B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-56N 121-55- 6W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC032B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 2'51"N 121 55' 0"W
METER TYPE: ENDECO
WATER DEPTH: 10.0 M (MLLW)
METER DEPTH: 5.4 M (BELOW MLLW)
START TIME OF SERIES: 2/ 7/80 1415 PST JULIAN DAY= 38
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

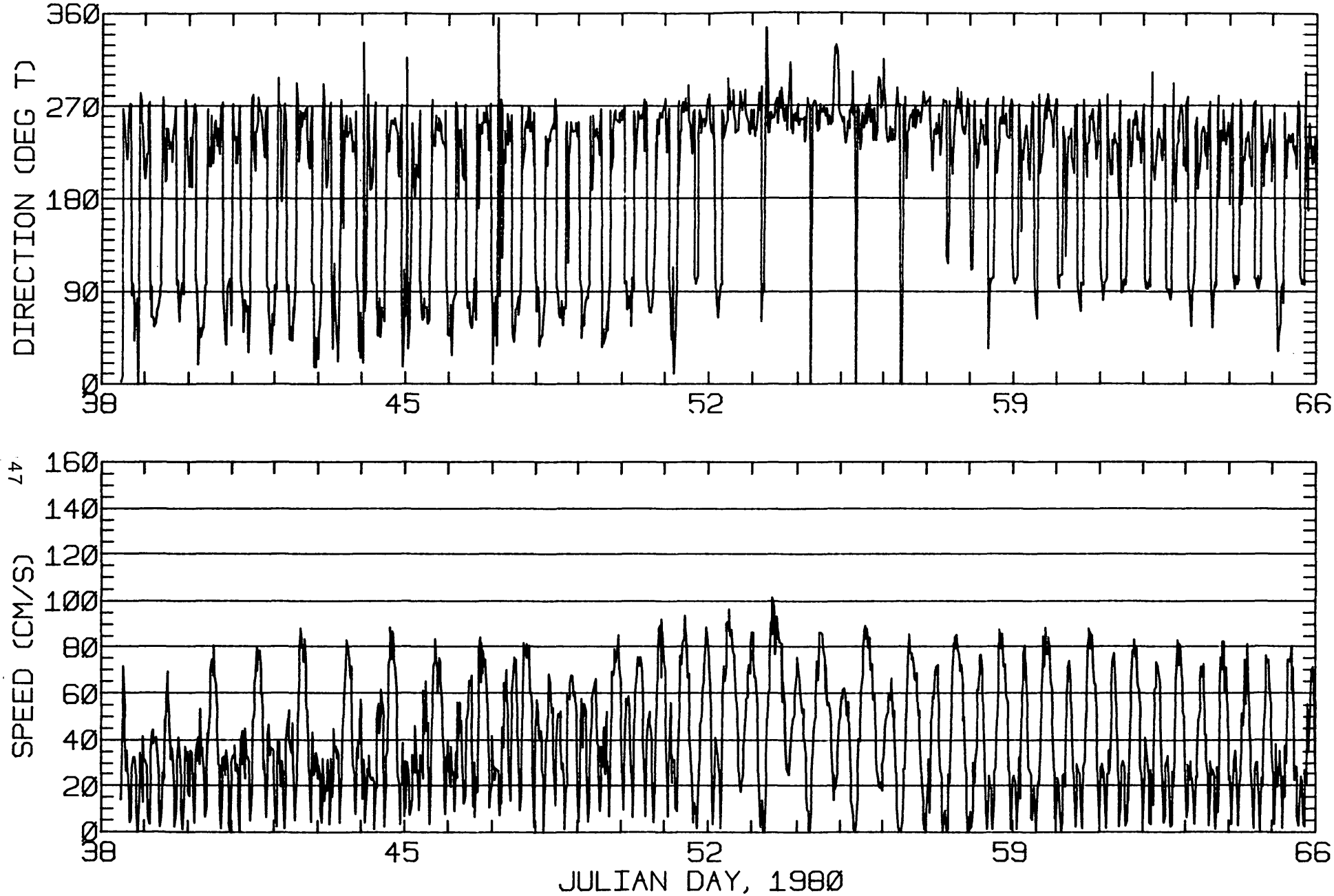
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.44	0.51	84.0	119.7	CLOCKWISE
K1	15.79	1.31	82.8	133.6	CLOCKWISE
N2	10.61	2.33	81.3	34.7	ANTI-CLOCKWISE
M2	42.29	1.87	69.6	41.7	CLOCKWISE
S2	10.71	1.93	66.8	68.6	CLOCKWISE
M4	2.80	1.53	176.3	284.4	ANTI-CLOCKWISE

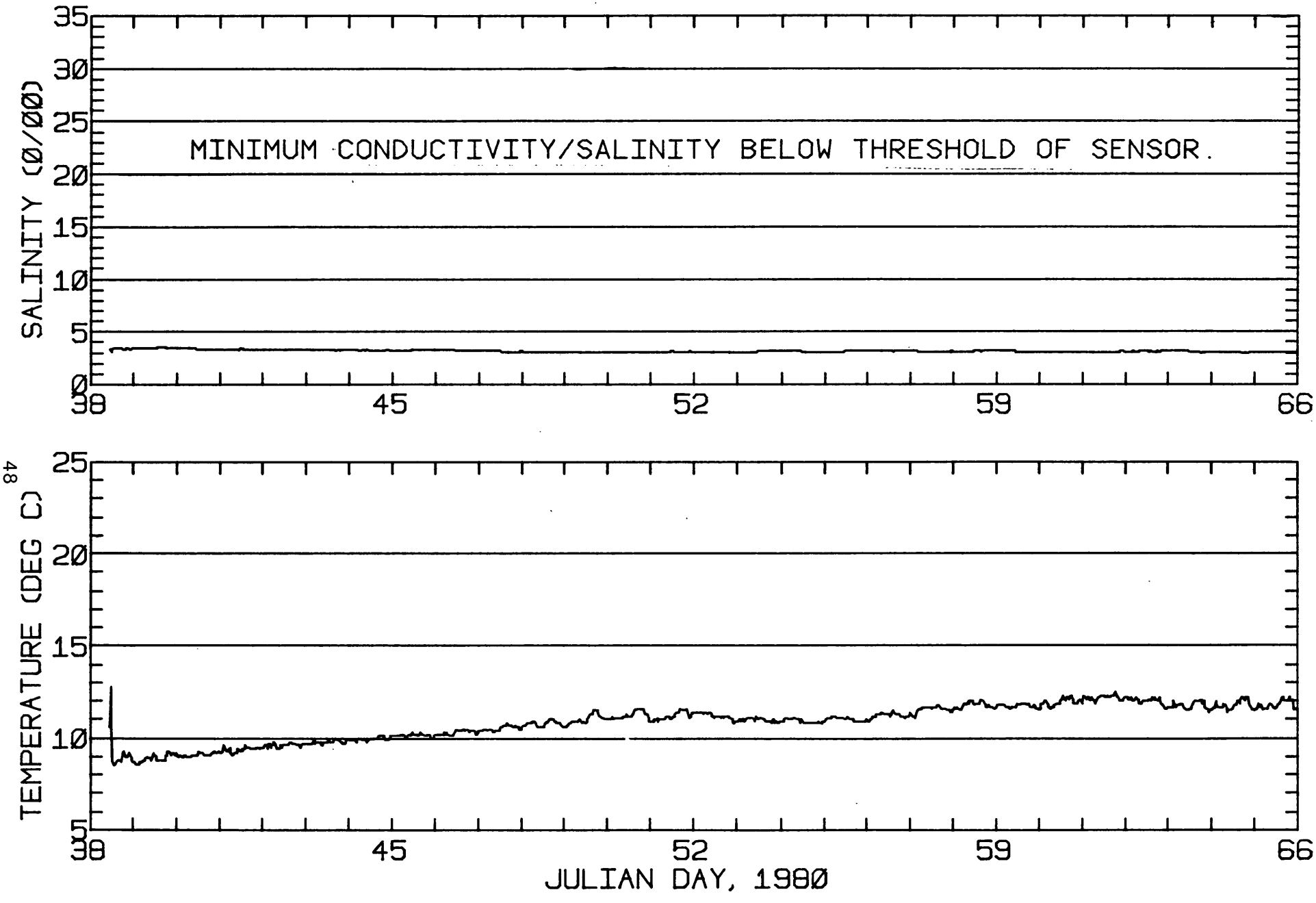
RMS SPEED:	48.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	80.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	27.2 CM/SEC
PRINCIPAL CURRENT DIRECTION:	73.9 DEGREES TRUE
TIDAL FORM NUMBER:	0.51
STANDARD DEVIATION U-SERIES:	19.30 CM/SEC
STANDARD DEVIATION V SERIES:	12.96 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.9	-4.3	962.
2	12	-11.0	-5.1	2073.
3	12	-42.0	-7.2	5391.
4	12	-25.8	-14.2	5011.
5	4	-17.8	-16.4	4278.
ALL	52	-21.1	-8.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-51N 121-55- 0W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC032C1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-51N 121-55- 0W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC032C1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 2'55"N 121 55'16"W
METER TYPE: ENDECO
WATER DEPTH: 10.0 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 3/ 7/80 1519 PST JULIAN DAY= 67
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

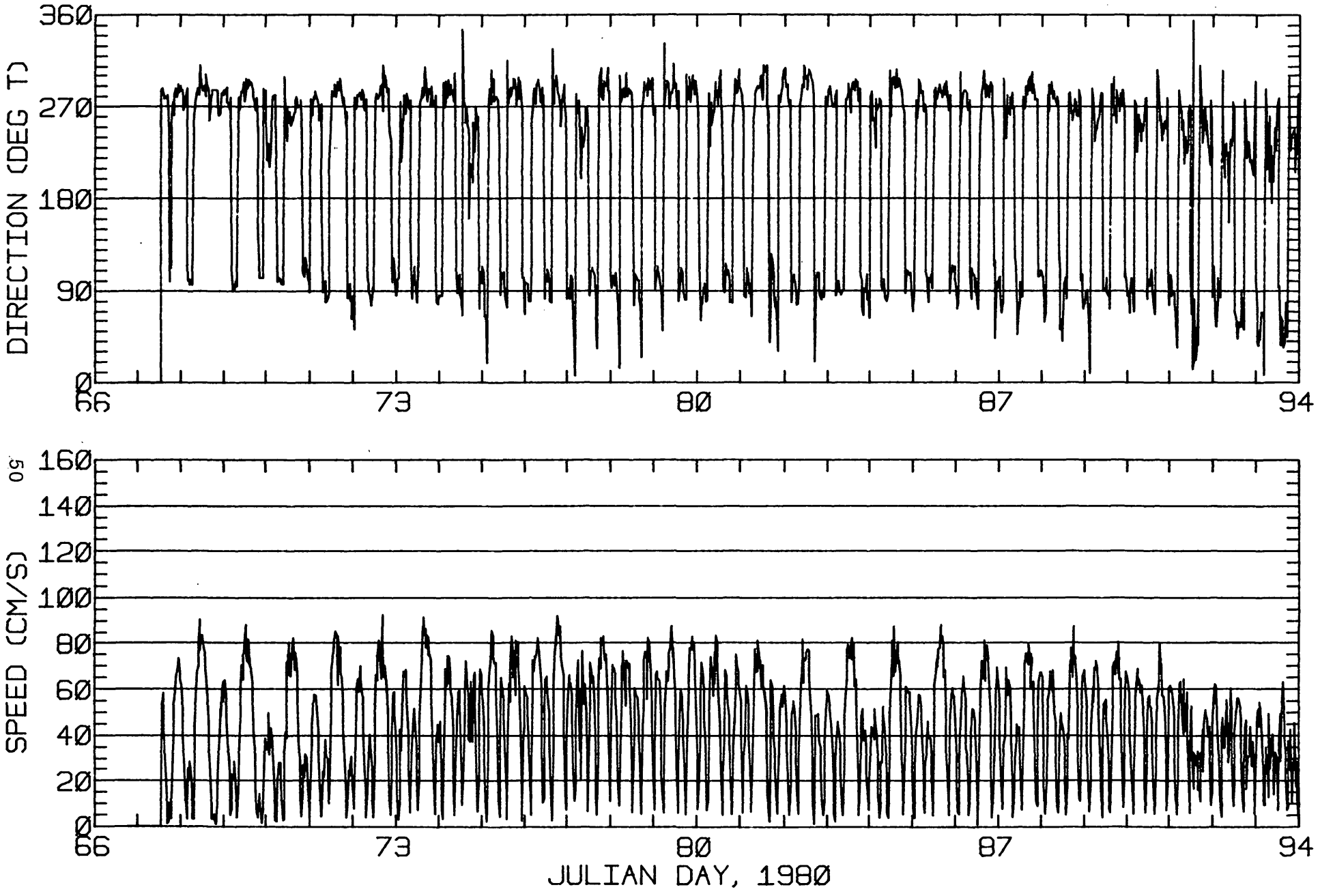
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.33	1.07	106.0	92.1	ANTI-CLOCKWISE
K1	11.83	1.52	106.2	120.1	CLOCKWISE
N2	17.30	0.25	118.2	359.2	ANTI-CLOCKWISE
M2	49.31	1.04	93.9	43.4	CLOCKWISE
S2	13.06	4.88	78.8	22.1	ANTI-CLOCKWISE
M4	8.60	0.20	93.8	75.2	ANTI-CLOCKWISE

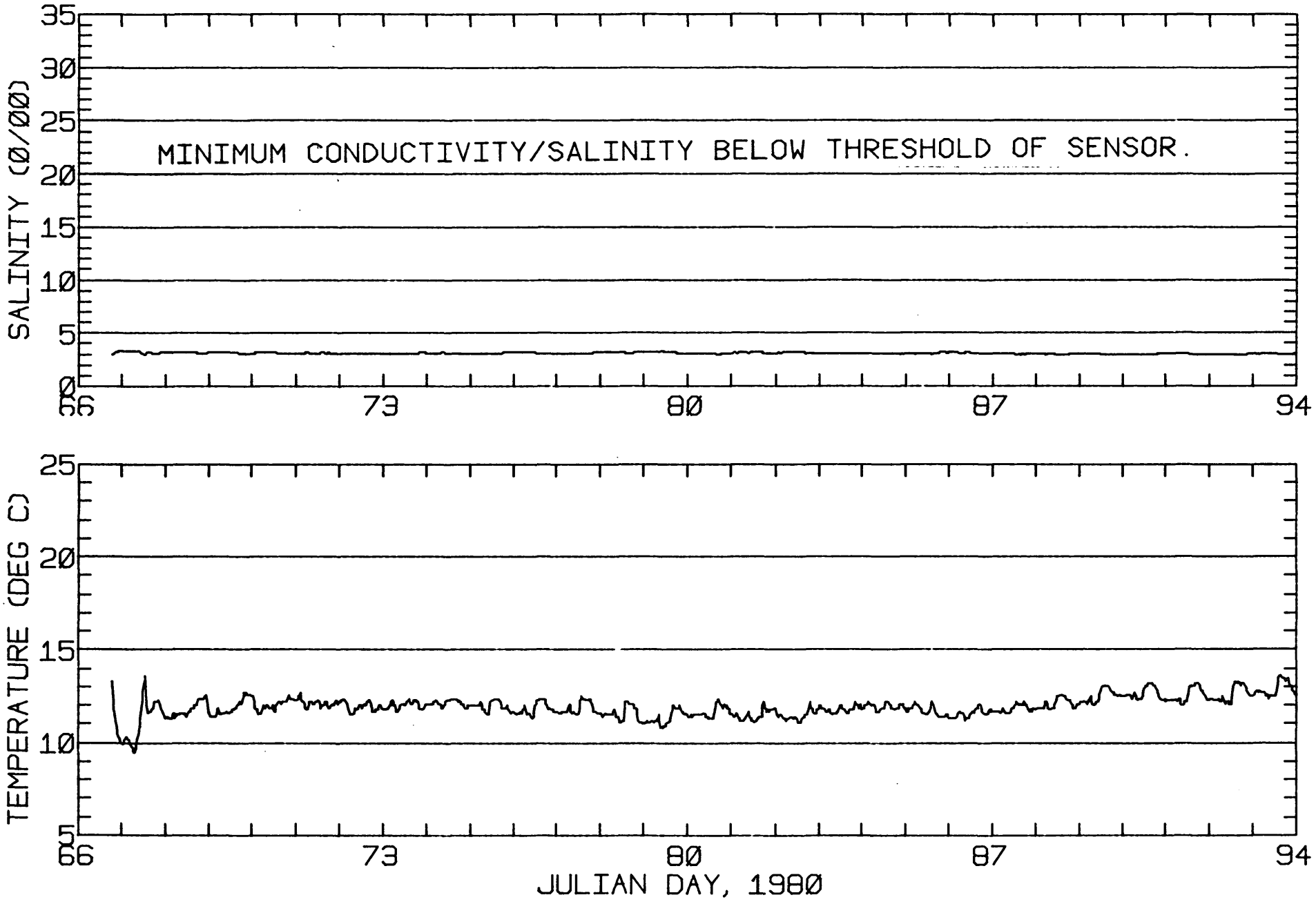
RMS SPEED:	49.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	82.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	32.8 CM/SEC
PRINCIPAL CURRENT DIRECTION:	94.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.32
STANDARD DEVIATION U-SERIES:	17.44 CM/SEC
STANDARD DEVIATION V SERIES:	14.92 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-27.9	4.9	3819.
2	12	-16.7	4.4	2548.
3	12	-14.1	6.6	1891.
4	12	-11.3	-0.5	1415.
5	8	0.8	-2.7	996.
ALL	56	-14.9	2.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-55N 121-55-16W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032D1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-55N 121-55-16W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032D1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 2'58"N 121 55'29"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 4.8 M (BELOW MLLW)
START TIME OF SERIES: 5/ 9/80 1106 PST JULIAN DAY=130
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

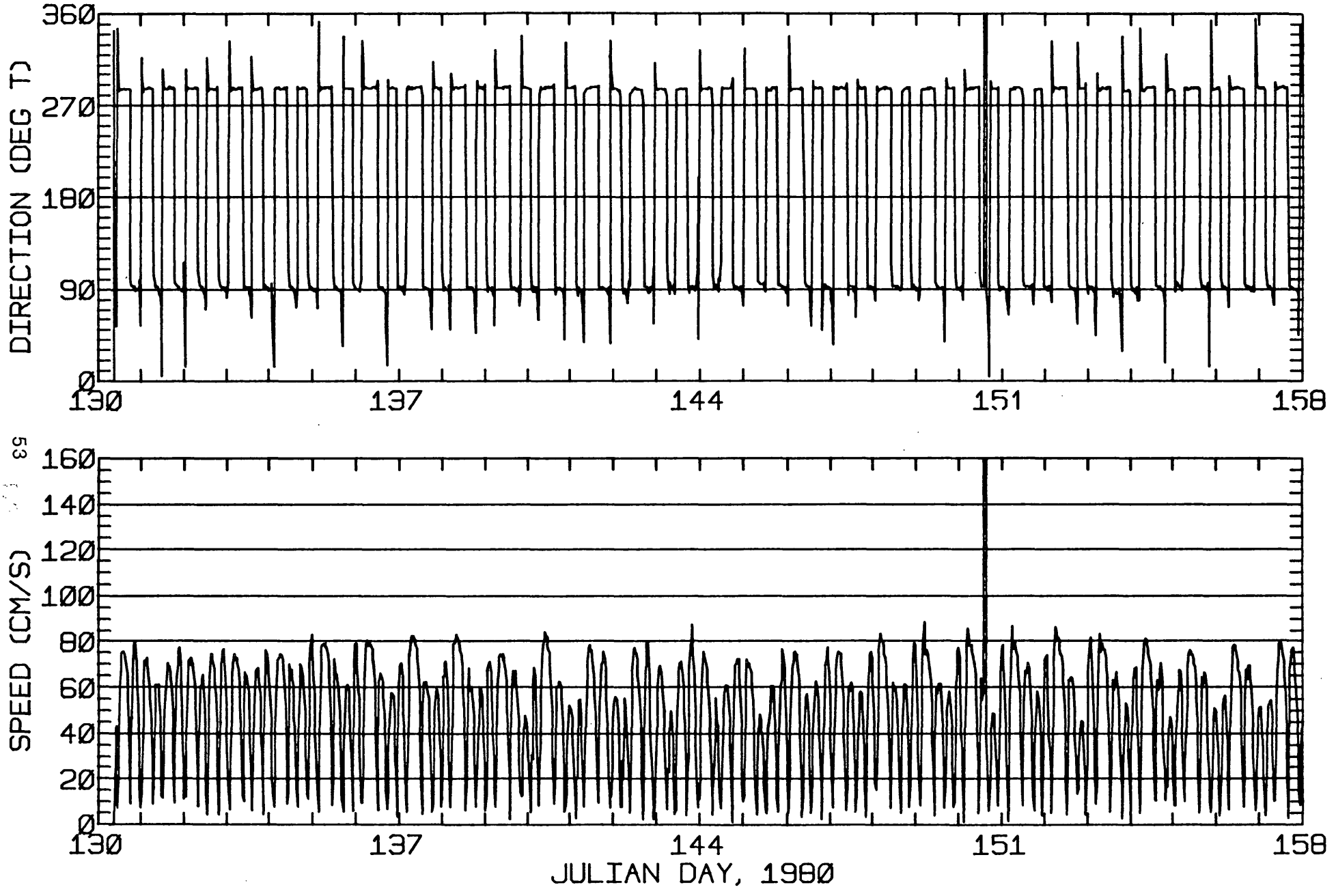
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.69	0.54	106.7	103.7	CLOCKWISE
K1	25.04	0.05	100.1	88.3	CLOCKWISE
N2	9.17	0.22	100.4	345.8	ANTI-CLOCKWISE
M2	63.38	0.73	99.4	33.7	ANTI-CLOCKWISE
S2	8.95	0.22	100.4	7.0	ANTI-CLOCKWISE
M4	5.99	1.36	84.8	41.2	ANTI-CLOCKWISE

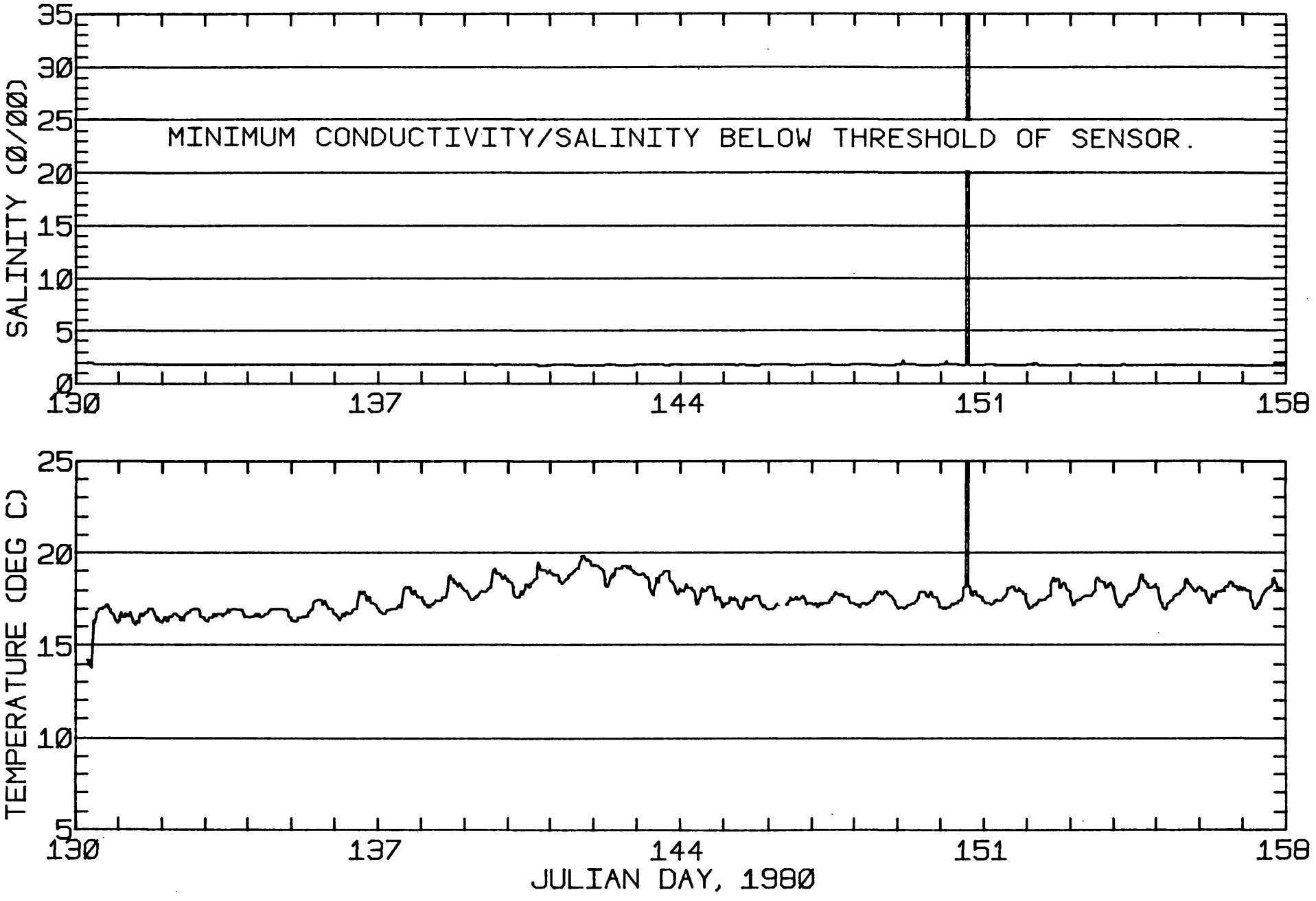
RMS SPEED:	53.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	108.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	40.1 CM/SEC
PRINCIPAL CURRENT DIRECTION:	100.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.49
STANDARD DEVIATION U-SERIES:	13.15 CM/SEC
STANDARD DEVIATION V SERIES:	3.28 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.8	8.8	717.
2	12	-6.9	8.4	653.
3	12	-5.1	6.9	542.
4	12	-4.9	8.0	443.
5	4	-4.8	7.2	412.
ALL	52	-6.1	8.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-58N 121-55-29W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032F1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-58N 121-55-29W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032F1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 2'59"N 121 55'26"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 4.8 M (BELOW MLLW)
START TIME OF SERIES: 6/ 6/80 1040 PST JULIAN DAY=158
APPROXIMATE RECORD LENGTH IS 48 M2-CYCLES

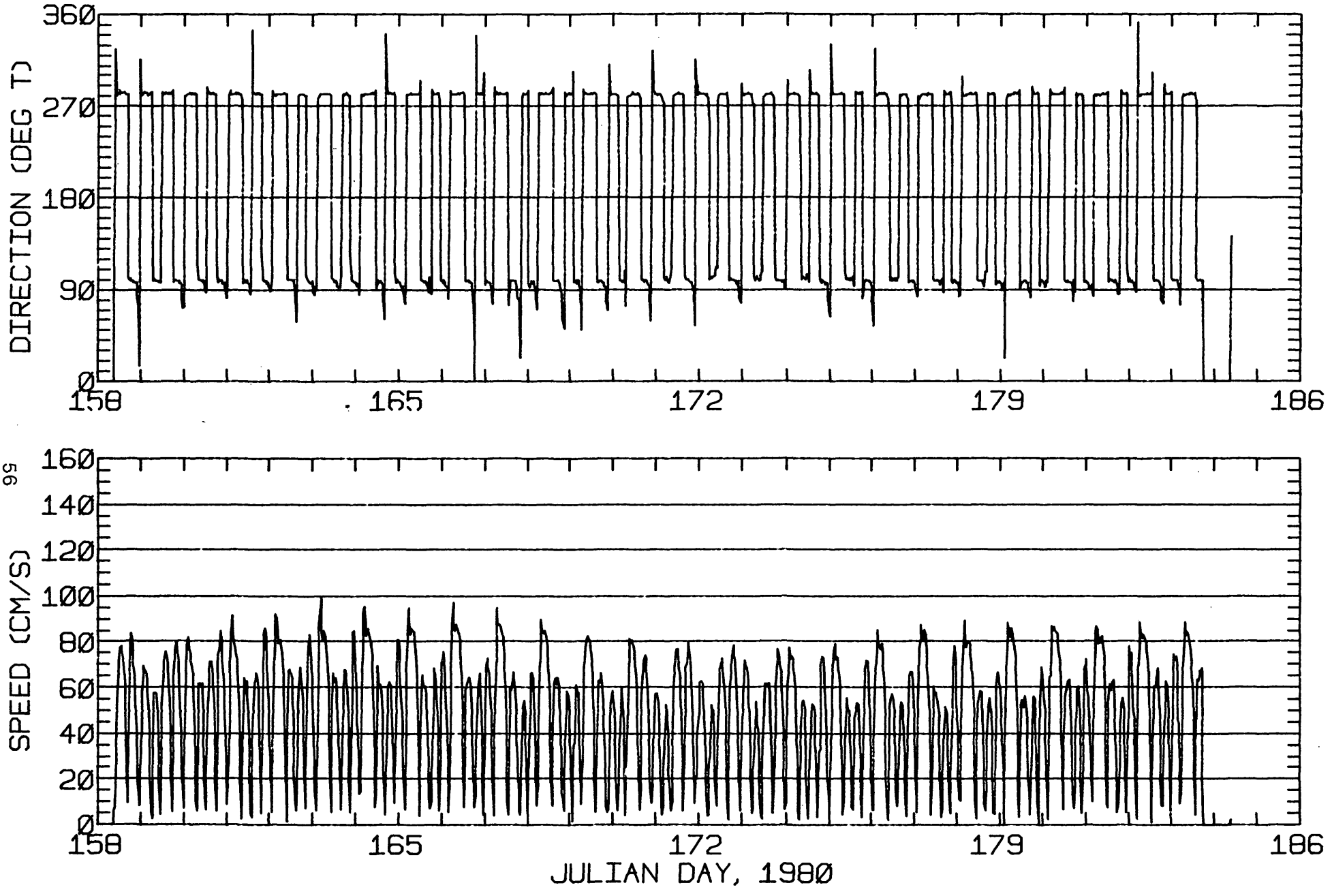
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.77	0.16	103.1	116.0	CLOCKWISE
K1	29.21	0.50	99.1	101.4	ANTI-CLOCKWISE
N2	7.49	0.32	98.2	349.8	ANTI-CLOCKWISE
M2	65.63	0.69	99.9	36.2	ANTI-CLOCKWISE
S2	4.32	0.04	98.5	8.3	ANTI-CLOCKWISE
M4	4.06	0.52	98.4	45.2	ANTI-CLOCKWISE

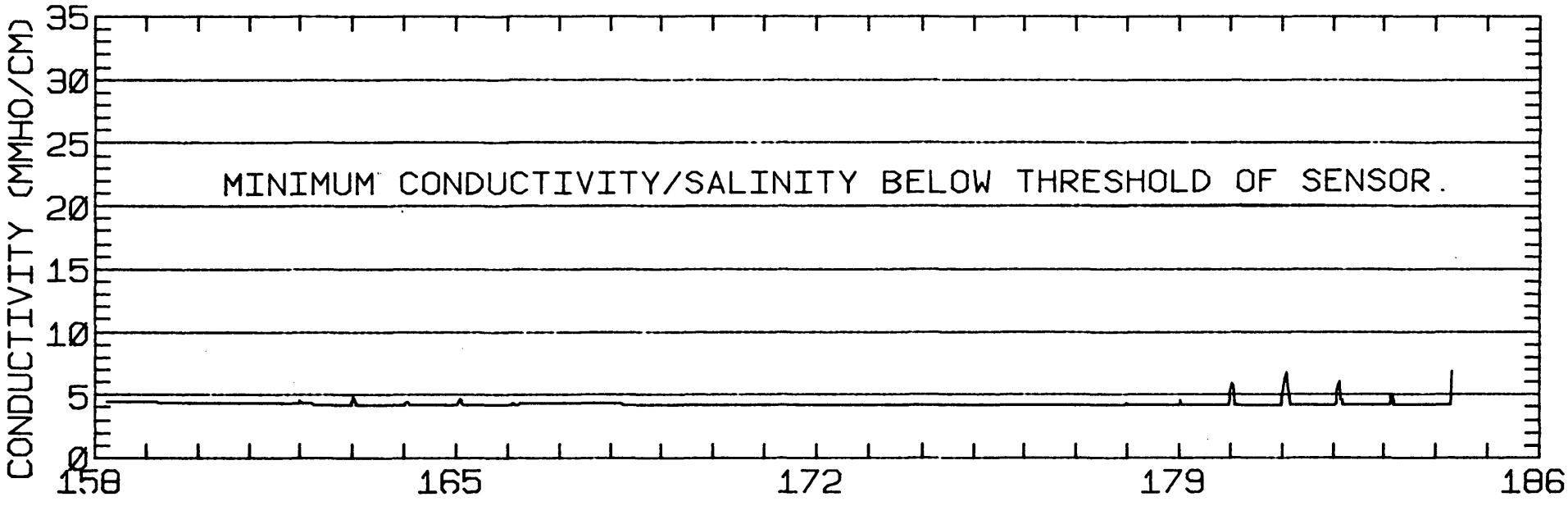
RMS SPEED:	55.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	111.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	44.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	100.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.60
STANDARD DEVIATION U-SERIES:	13.82 CM/SEC
STANDARD DEVIATION V SERIES:	2.93 CM/SEC

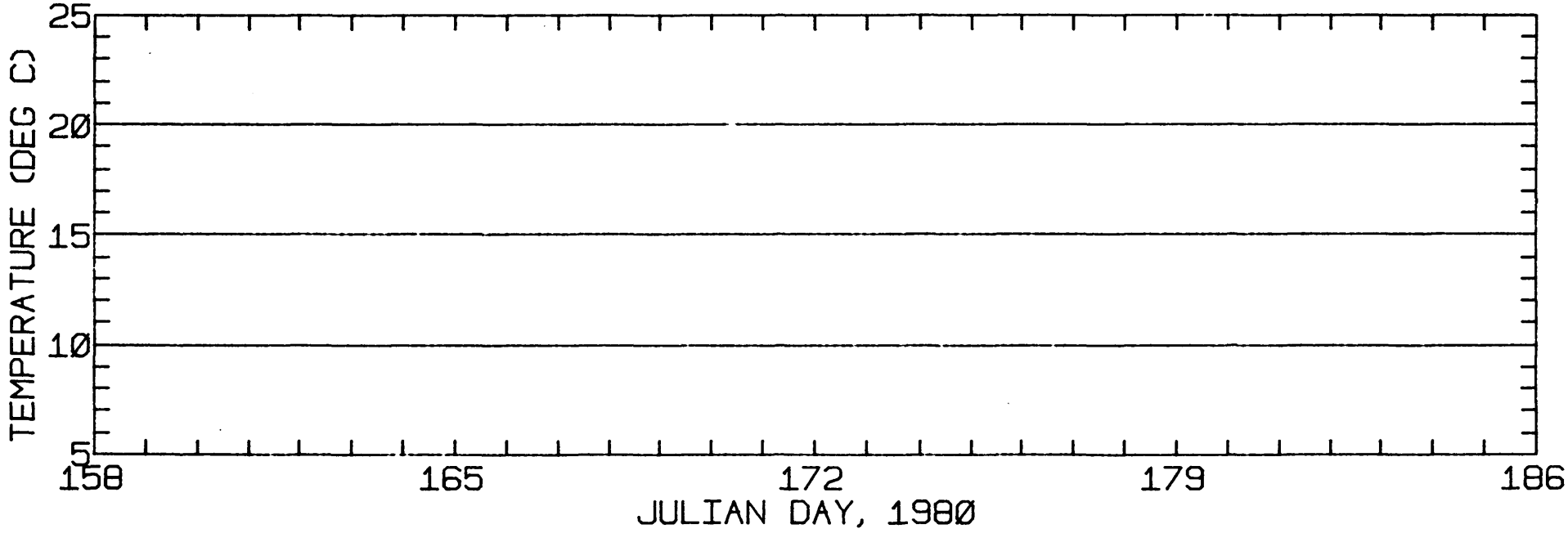
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.3	3.7	409.
2	12	-7.5	4.0	397.
3	12	-4.5	2.2	446.
4	12	-7.9	3.5	439.
ALL	48	-7.1	3.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-59N 121-55-26W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032G1.





CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 2-59N 121-55-26W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032G1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 0"N 121 55'26"W
METER TYPE: ENDECO
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 4.2 M (BELOW MLLW)
START TIME OF SERIES: 7/ 1/80 2130 PST JULIAN DAY=183
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

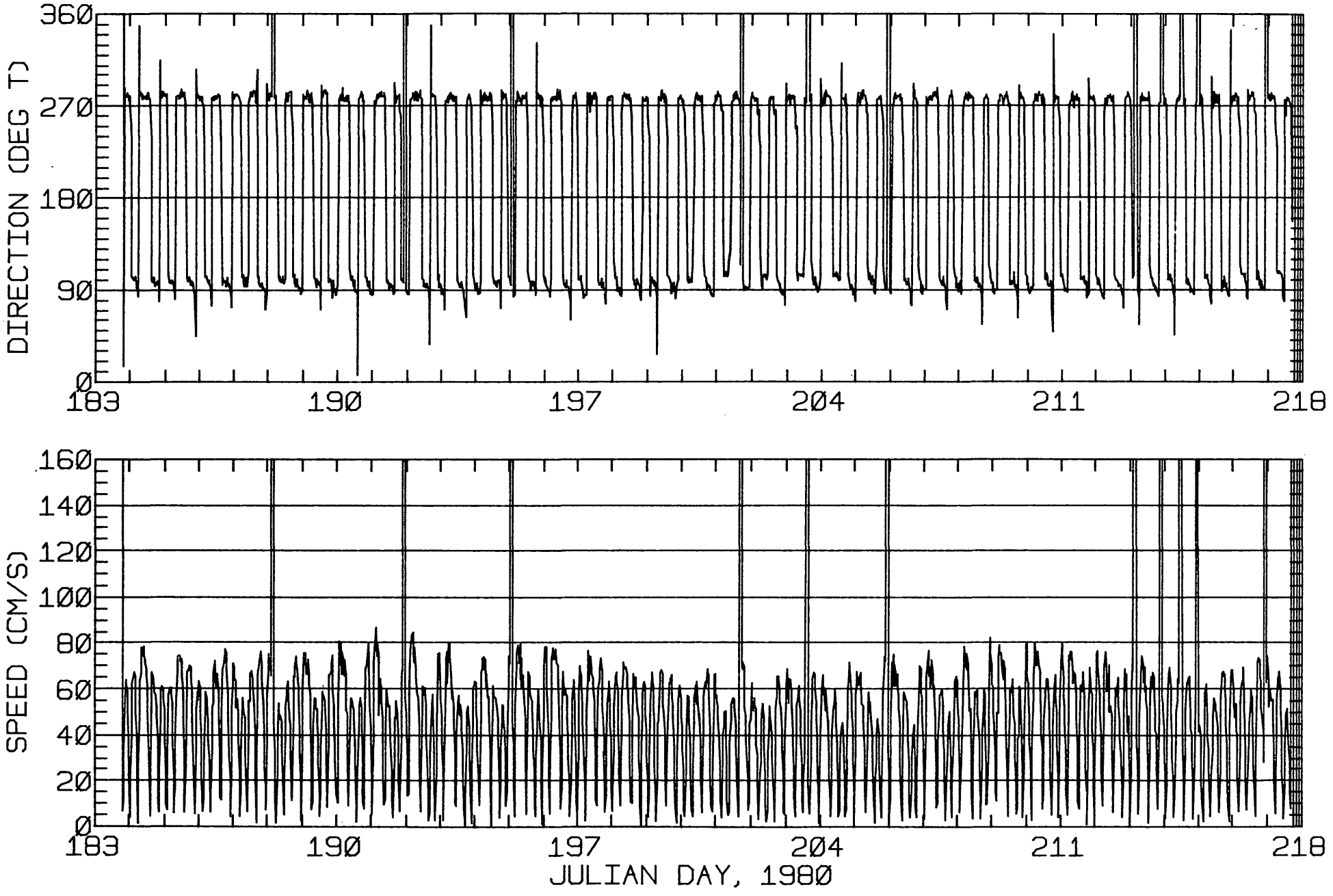
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.45	0.67	102.2	112.9	ANTI-CLOCKWISE
K1	25.02	0.70	96.2	115.1	ANTI-CLOCKWISE
N2	6.78	0.04	98.0	9.4	CLOCKWISE
M2	61.10	1.40	97.5	33.1	ANTI-CLOCKWISE
S2	5.86	0.00	97.3	67.1	CLOCKWISE
M4	2.75	1.02	72.9	56.8	ANTI-CLOCKWISE

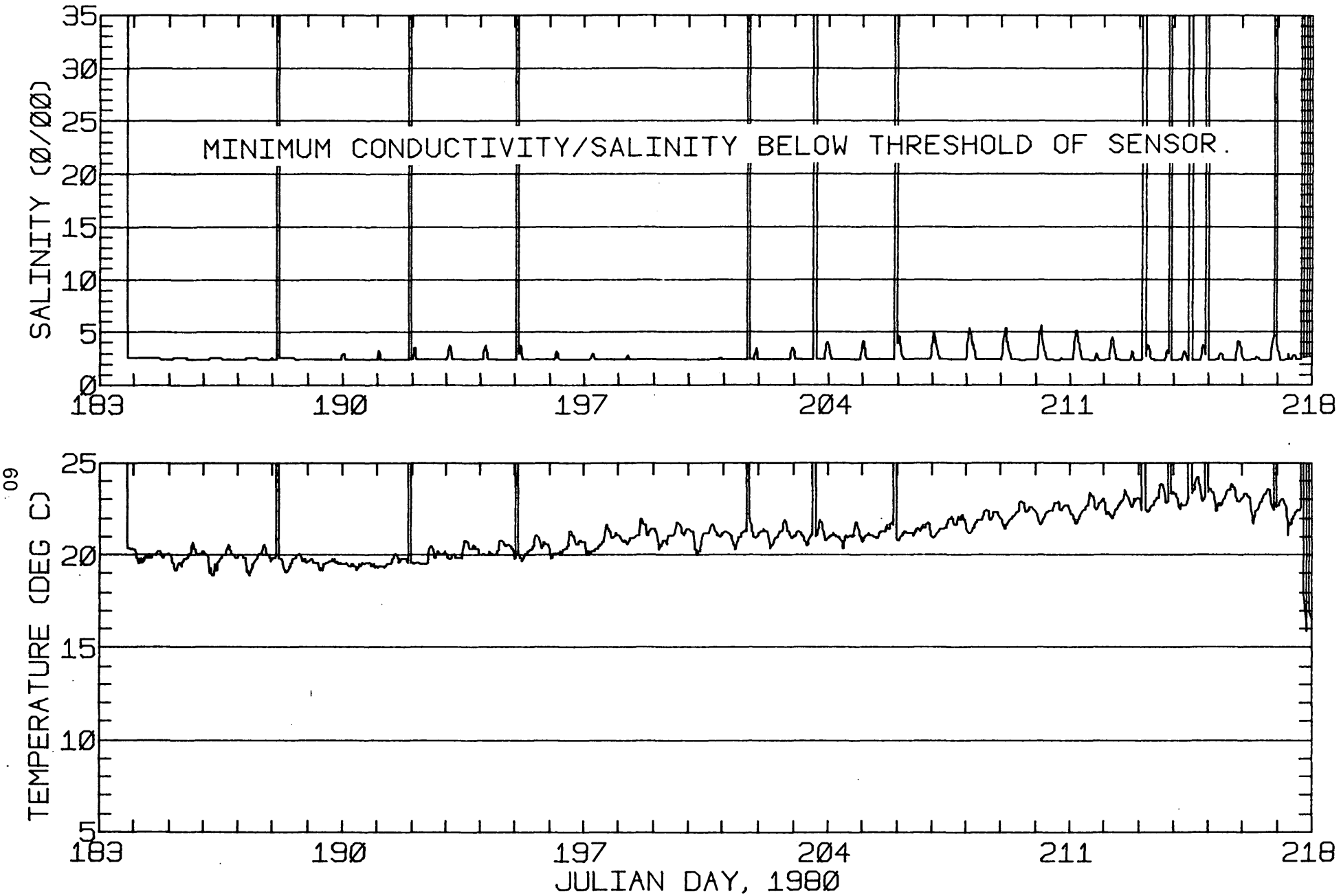
RMS SPEED:	50.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	104.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	42.7 CM/SEC
PRINCIPAL CURRENT DIRECTION:	97.7 DEGREES TRUE
TIDAL FORM NUMBER:	0.56
STANDARD DEVIATION U-SERIES:	13.77 CM/SEC
STANDARD DEVIATION V SERIES:	4.21 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.7	1.5	408.
2	12	-6.4	2.2	286.
3	12	-2.4	0.6	286.
4	12	-0.6	0.6	301.
5	8	-3.9	1.1	308.
ALL	56	-3.4	1.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 0N 121-55-26W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032H1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- ØN 121-55-26W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSCØ32H1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 0"N 121 55'35"W
METER TYPE: ENDECO
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 4.2 M (BELOW MLLW)
START TIME OF SERIES: 8/ 5/80 1057 PST JULIAN DAY=218
APPROXIMATE RECORD LENGTH IS 54 M2-CYCLES

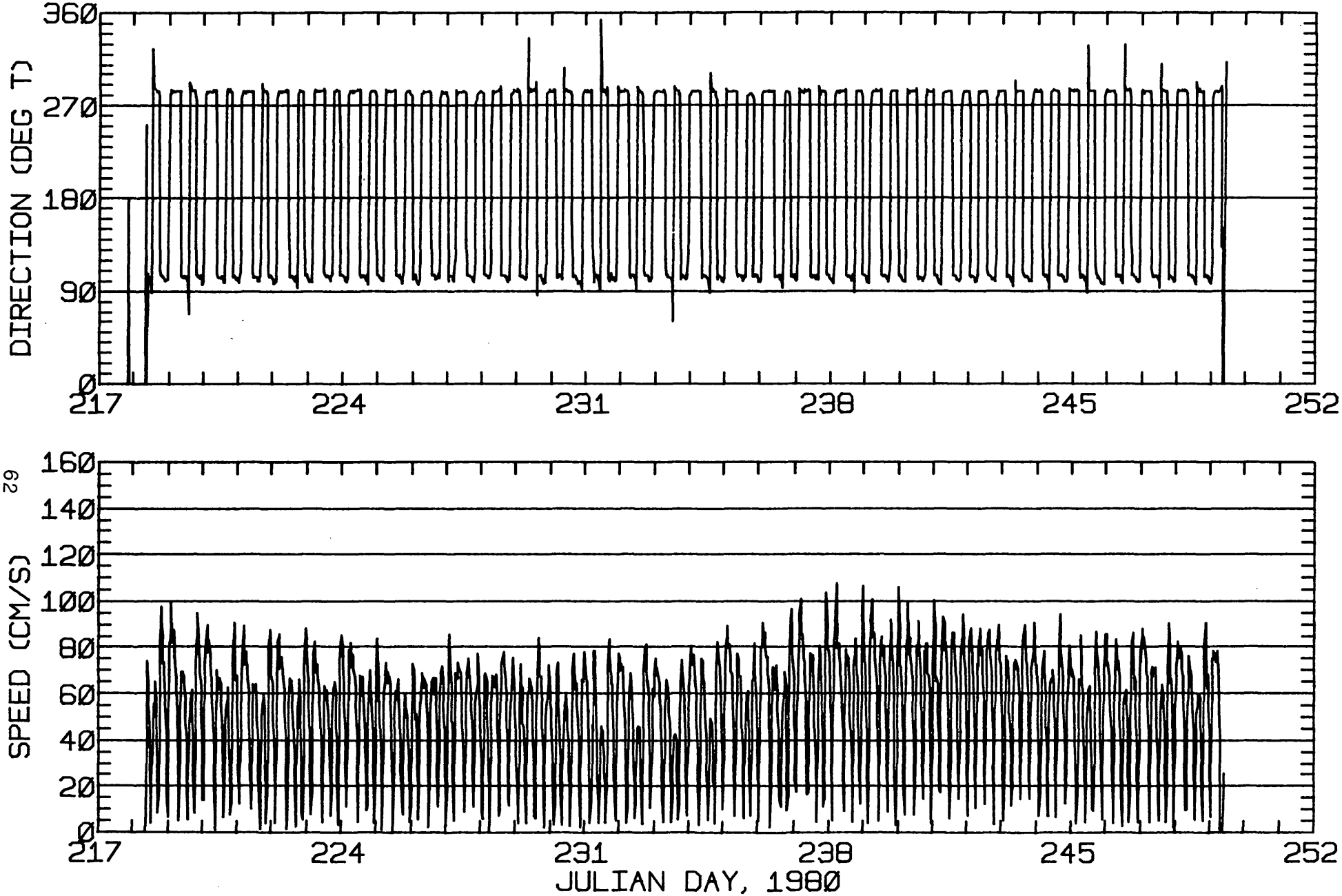
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.70	0.25	104.2	107.2	ANTI-CLOCKWISE
K1	21.94	0.02	103.6	122.7	CLOCKWISE
N2	11.36	0.18	103.4	38.9	ANTI-CLOCKWISE
M2	71.08	0.71	103.6	32.9	ANTI-CLOCKWISE
S2	11.54	0.03	103.2	57.5	CLOCKWISE
M4	3.59	0.76	101.4	51.4	ANTI-CLOCKWISE

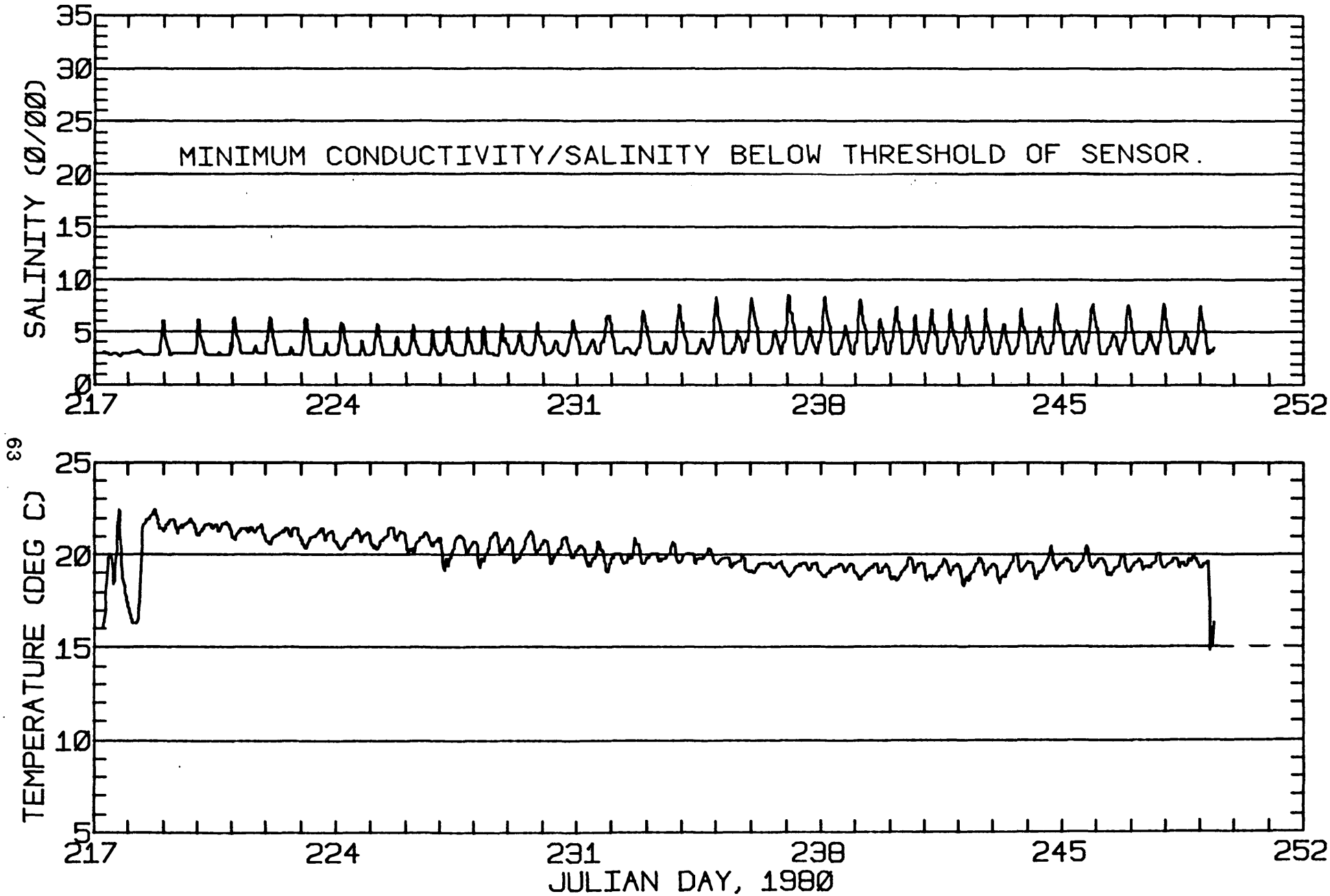
RMS SPEED: 58.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 118.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 51.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 103.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 14.55 CM/SEC
STANDARD DEVIATION V SERIES: 3.99 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.3	0.8	145.
2	12	-1.4	0.2	101.
3	12	-1.5	0.2	97.
4	12	-4.6	1.2	110.
5	6	-2.4	0.9	143.
ALL	54	-2.4	0.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 0N 121-55-35W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032I1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- ØN 121-55-35W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSCØ32I1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 1"N 121 55'40"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 3.9 M (BELOW MLLW)
START TIME OF SERIES: 9/ 5/80 929 PST JULIAN DAY=249
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

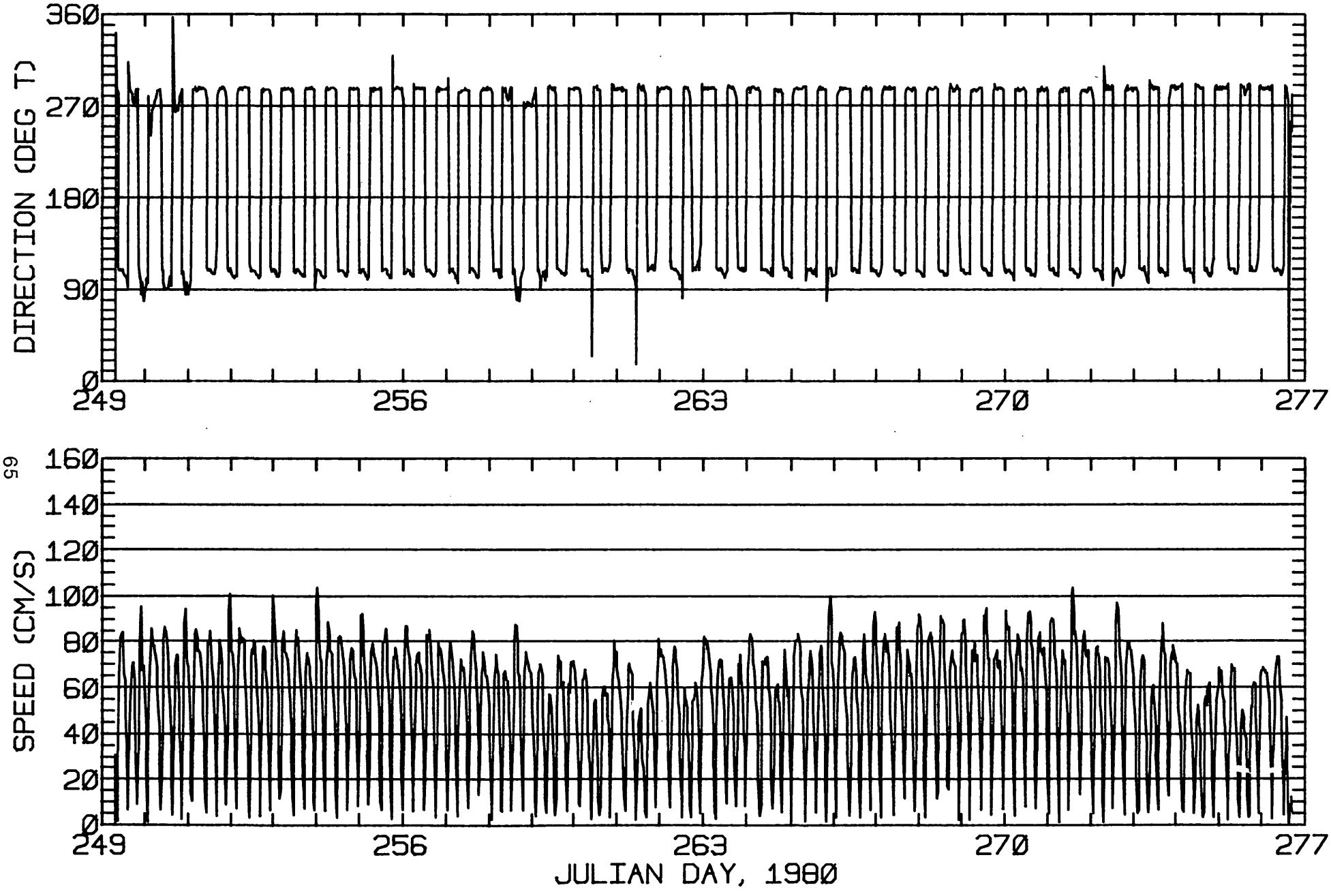
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.04	0.44	106.5	89.3	ANTI-CLOCKWISE
K1	15.17	0.03	106.0	109.6	ANTI-CLOCKWISE
N2	11.30	0.72	107.2	29.5	CLOCKWISE
M2	72.70	0.92	106.2	33.6	ANTI-CLOCKWISE
S2	16.60	0.40	105.3	43.2	CLOCKWISE
M4	4.79	0.94	109.4	65.6	ANTI-CLOCKWISE

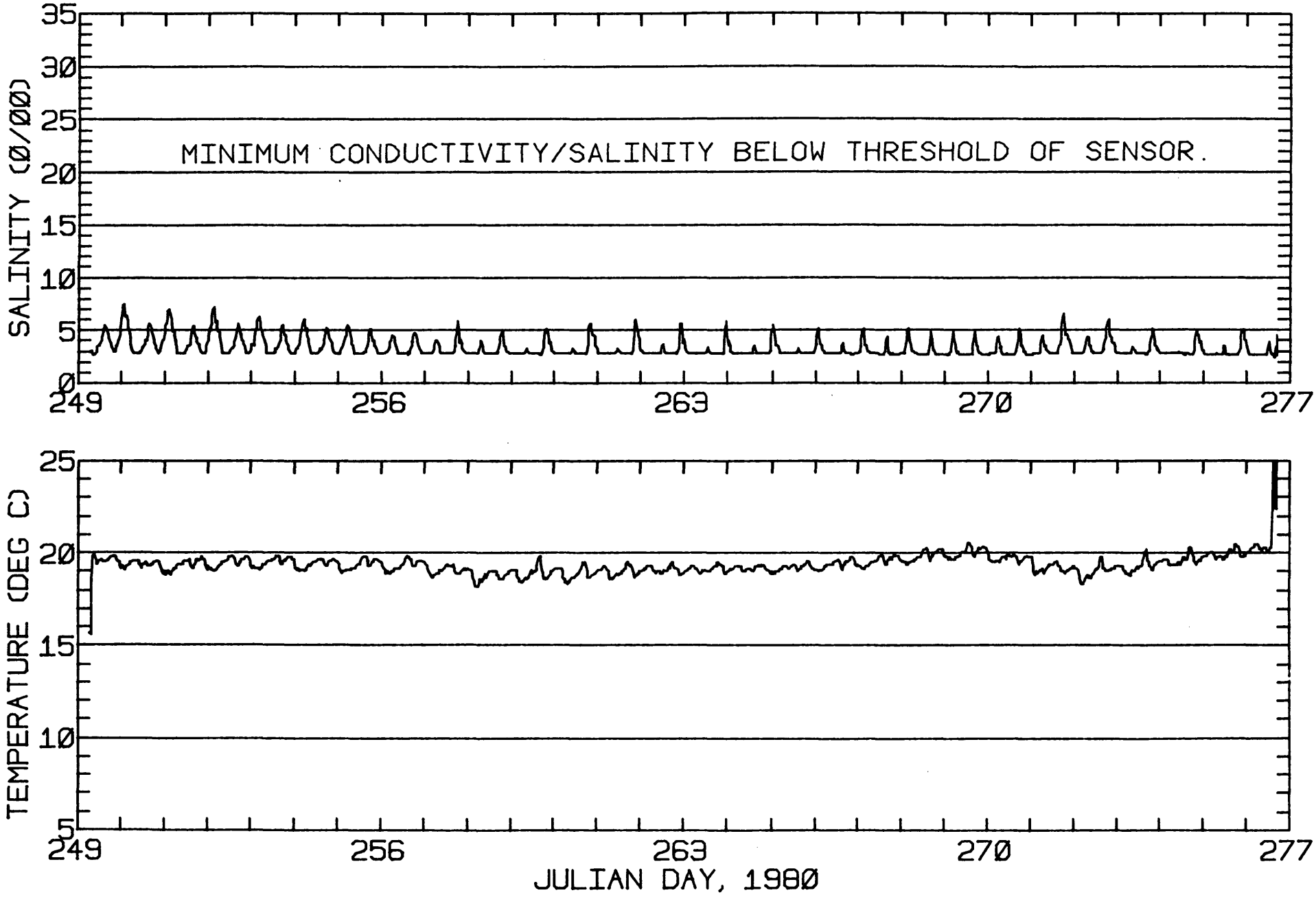
RMS SPEED: 59.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 117.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 54.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 106.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 14.73 CM/SEC
STANDARD DEVIATION V SERIES: 6.52 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.1	0.1	215.
2	12	-0.2	-0.4	285.
3	12	-4.1	0.5	302.
4	12	-1.0	0.2	379.
5	4	-2.0	0.3	244.
ALL	52	-1.4	0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032J1.



99

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032J1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 1"N 121 55' 7"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 5.7 M (BELOW MLLW)
START TIME OF SERIES: 9/ 5/80 929 PST JULIAN DAY=249
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

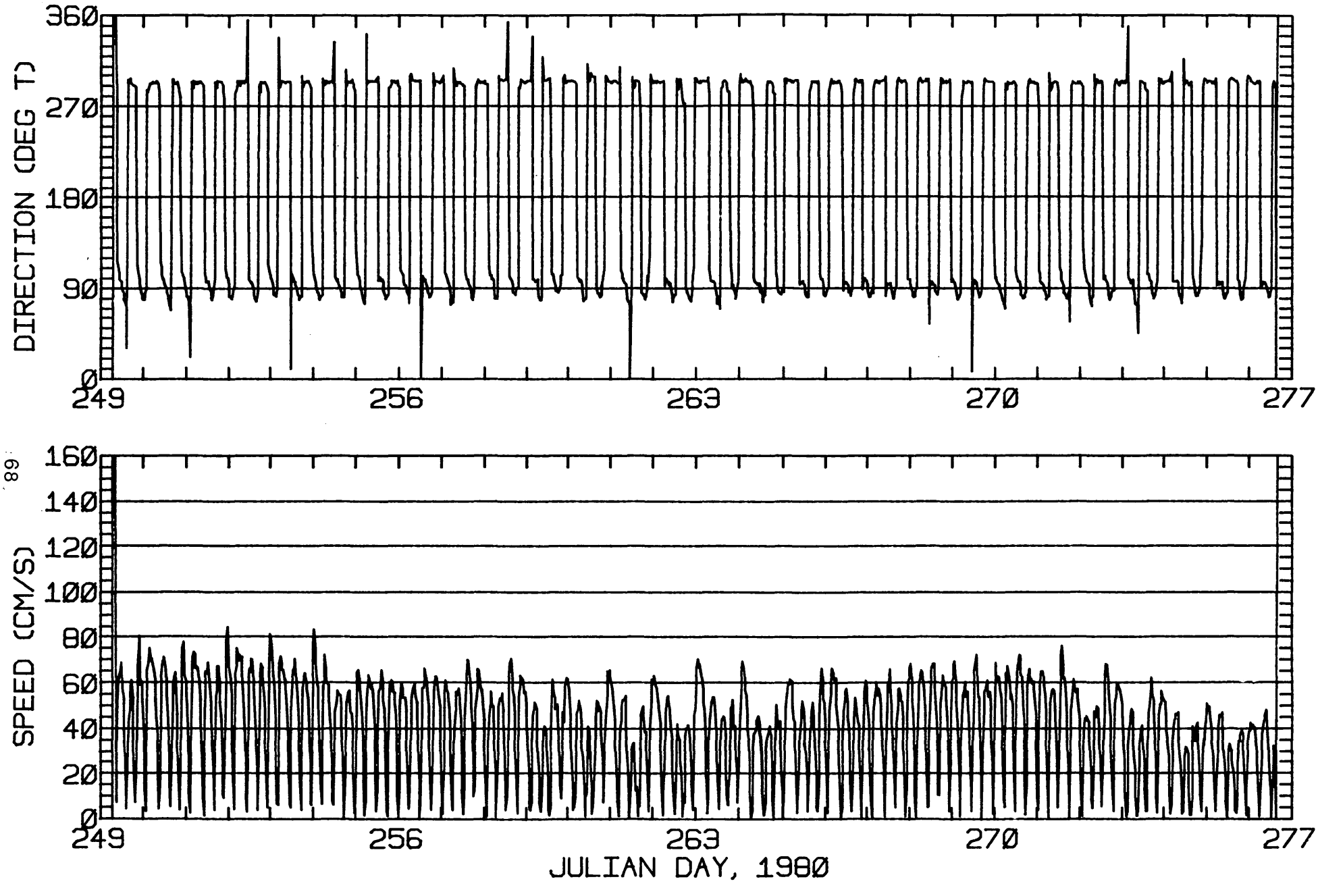
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.98	0.62	111.2	91.4	ANTI-CLOCKWISE
K1	12.73	0.53	104.8	110.9	ANTI-CLOCKWISE
N2	6.70	0.03	97.5	21.6	ANTI-CLOCKWISE
M2	53.85	2.44	103.7	34.2	ANTI-CLOCKWISE
S2	13.74	0.59	102.7	42.0	ANTI-CLOCKWISE
M4	4.23	1.19	55.6	80.6	ANTI-CLOCKWISE

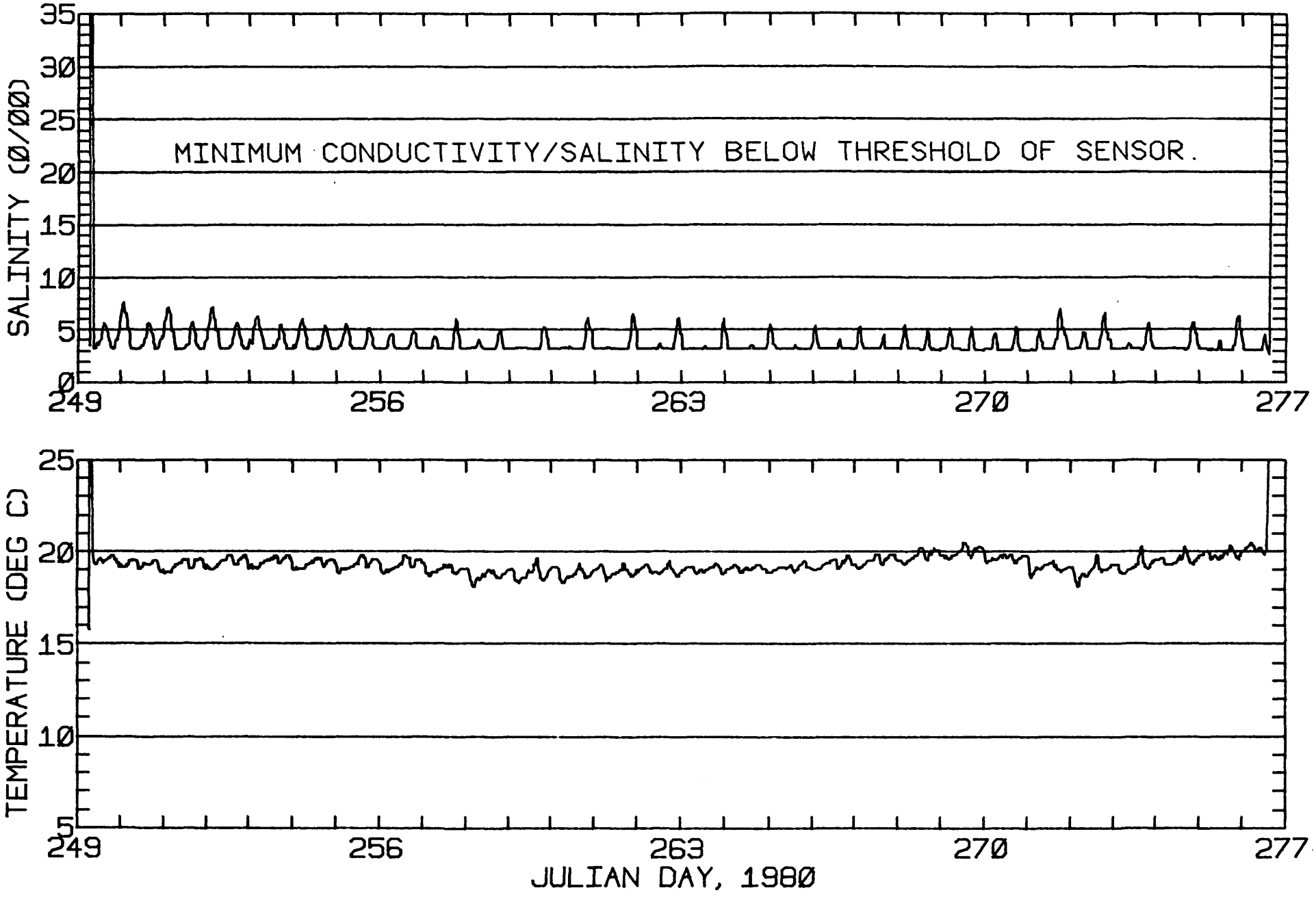
RMS SPEED: 45.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 91.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 38.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 104.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 11.77 CM/SEC
STANDARD DEVIATION V SERIES: 5.14 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.3	8.1	215.
2	12	0.9	7.1	285.
3	12	-2.8	8.1	302.
4	12	0.1	8.2	379.
5	4	0.5	6.0	244.
ALL	52	-0.1	7.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55- 7W
METER 1.8 METERS ABOVE BED TAPE NUMBER GSC032J2.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55- 7W
METER 1.8 METERS ABOVE BED TAPE NUMBER GSC032J2.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 1"N 121 55'40"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 3.9 M (BELOW MLLW)
START TIME OF SERIES: 10/ 2/80 1621 PST JULIAN DAY=276
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

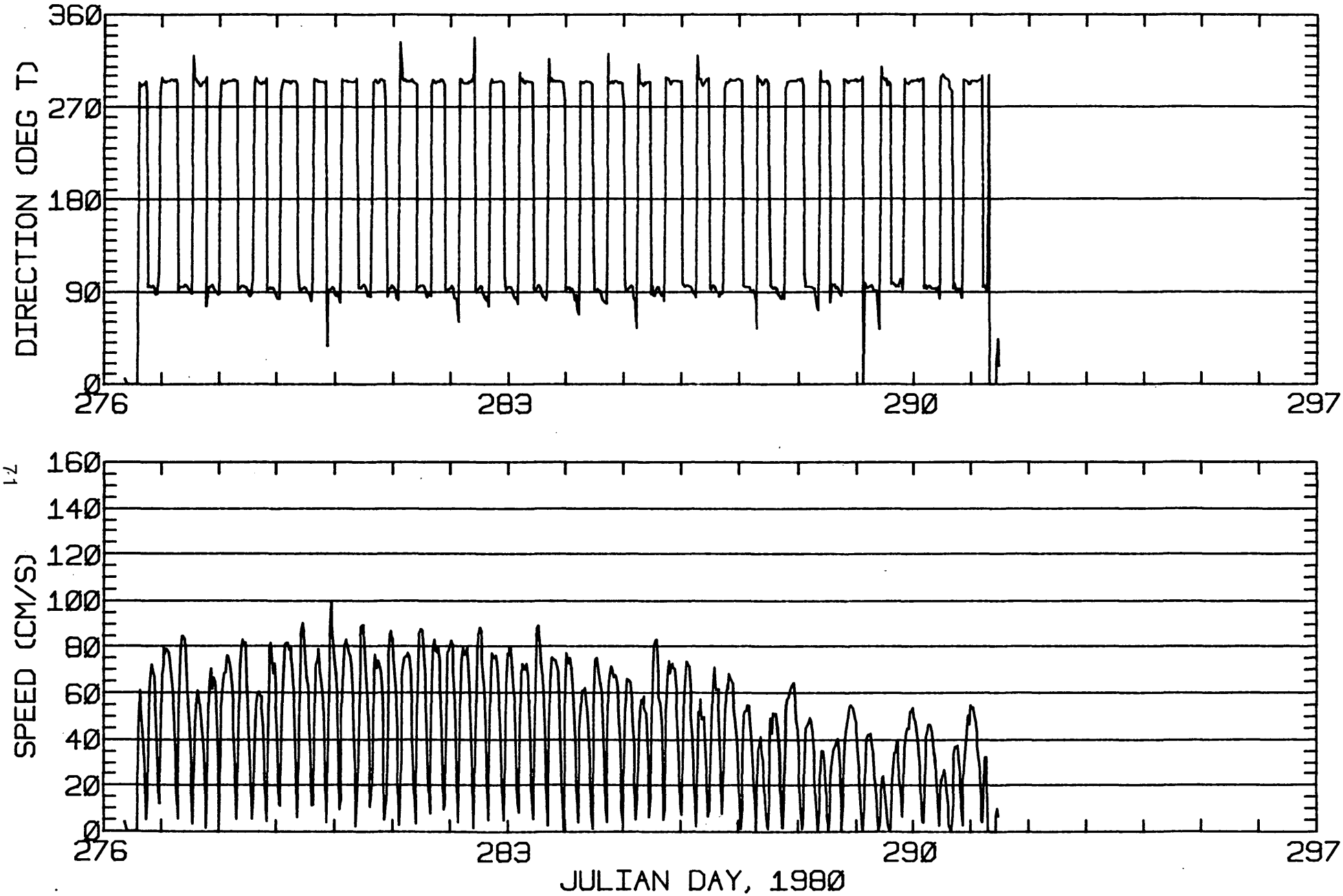
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.85	0.25	111.4	94.3	CLOCKWISE
K1	12.71	0.02	107.6	91.5	ANTI-CLOCKWISE
N2	14.92	0.26	106.2	9.1	CLOCKWISE
M2	69.05	1.31	104.2	37.4	ANTI-CLOCKWISE
S2	25.93	0.79	102.9	21.1	ANTI-CLOCKWISE
M4	4.75	0.38	70.7	86.6	ANTI-CLOCKWISE

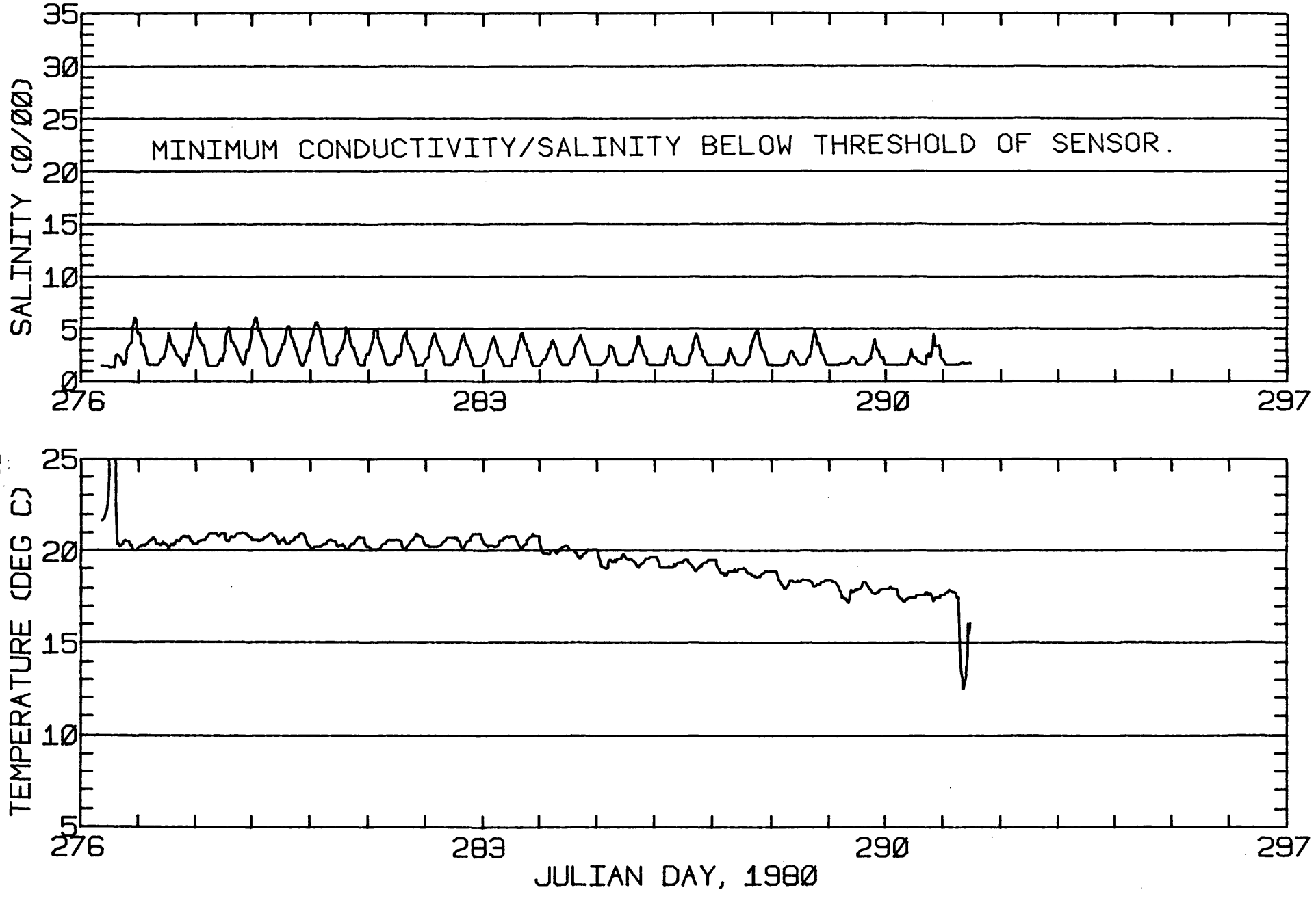
RMS SPEED:	54.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	119.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	42.3 CM/SEC
PRINCIPAL CURRENT DIRECTION:	105.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.26
STANDARD DEVIATION U-SERIES:	9.09 CM/SEC
STANDARD DEVIATION V SERIES:	4.45 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	11.2	260.
2	12	1.1	8.9	254.
3	2	-0.6	5.3	210.
ALL	26	0.6	9.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032K1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032K1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 1"N 121 55'40"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 5.7 M (BELOW MLLW)
START TIME OF SERIES: 10/ 2/80 1621 PST JULIAN DAY=276
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

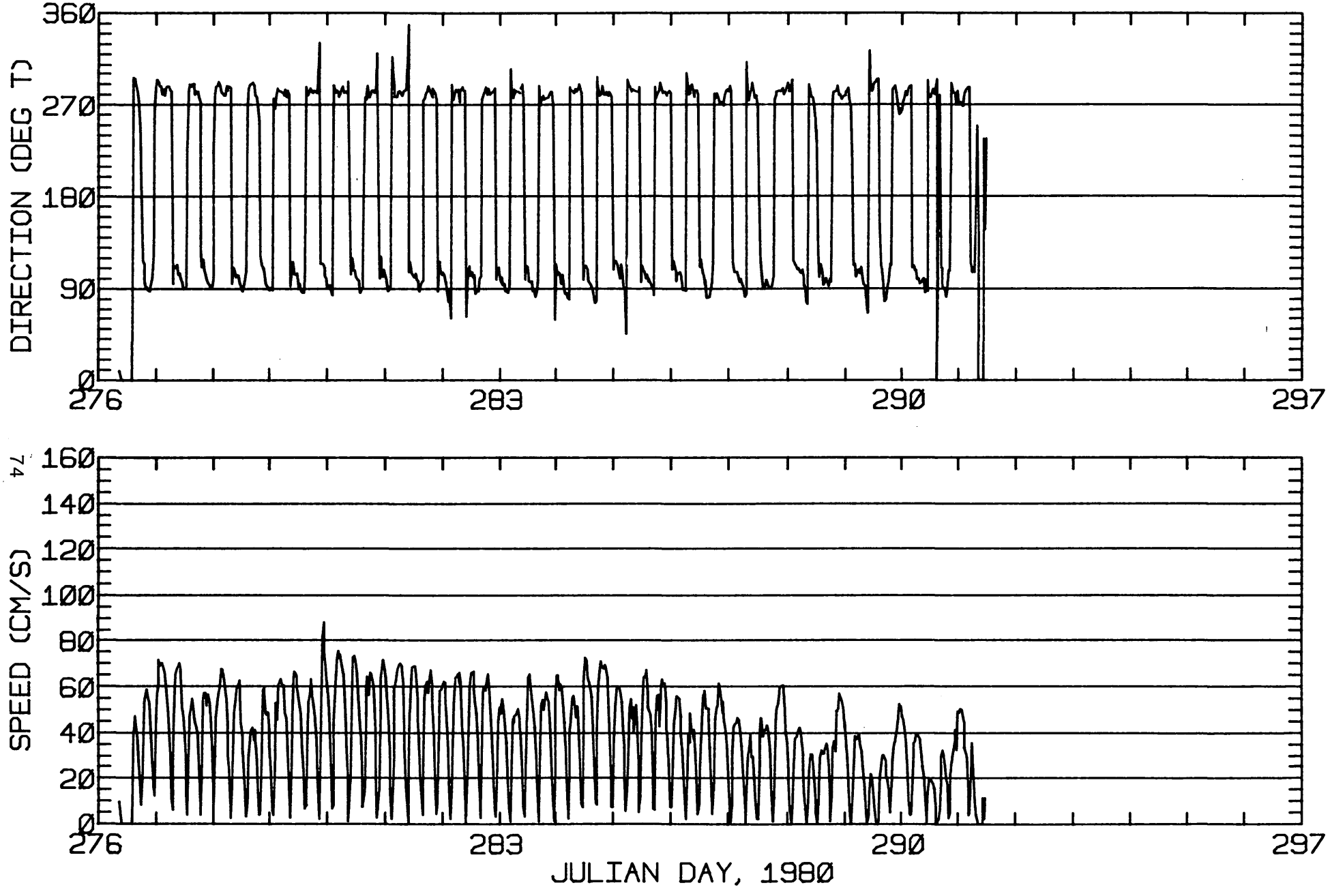
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.95	0.96	101.9	96.2	ANTI-CLOCKWISE
K1	11.30	0.42	99.2	93.5	ANTI-CLOCKWISE
N2	12.85	0.98	101.3	14.6	ANTI-CLOCKWISE
M2	58.42	2.40	101.5	36.7	ANTI-CLOCKWISE
S2	20.35	1.50	101.2	22.8	ANTI-CLOCKWISE
M4	2.55	2.06	147.0	32.2	ANTI-CLOCKWISE

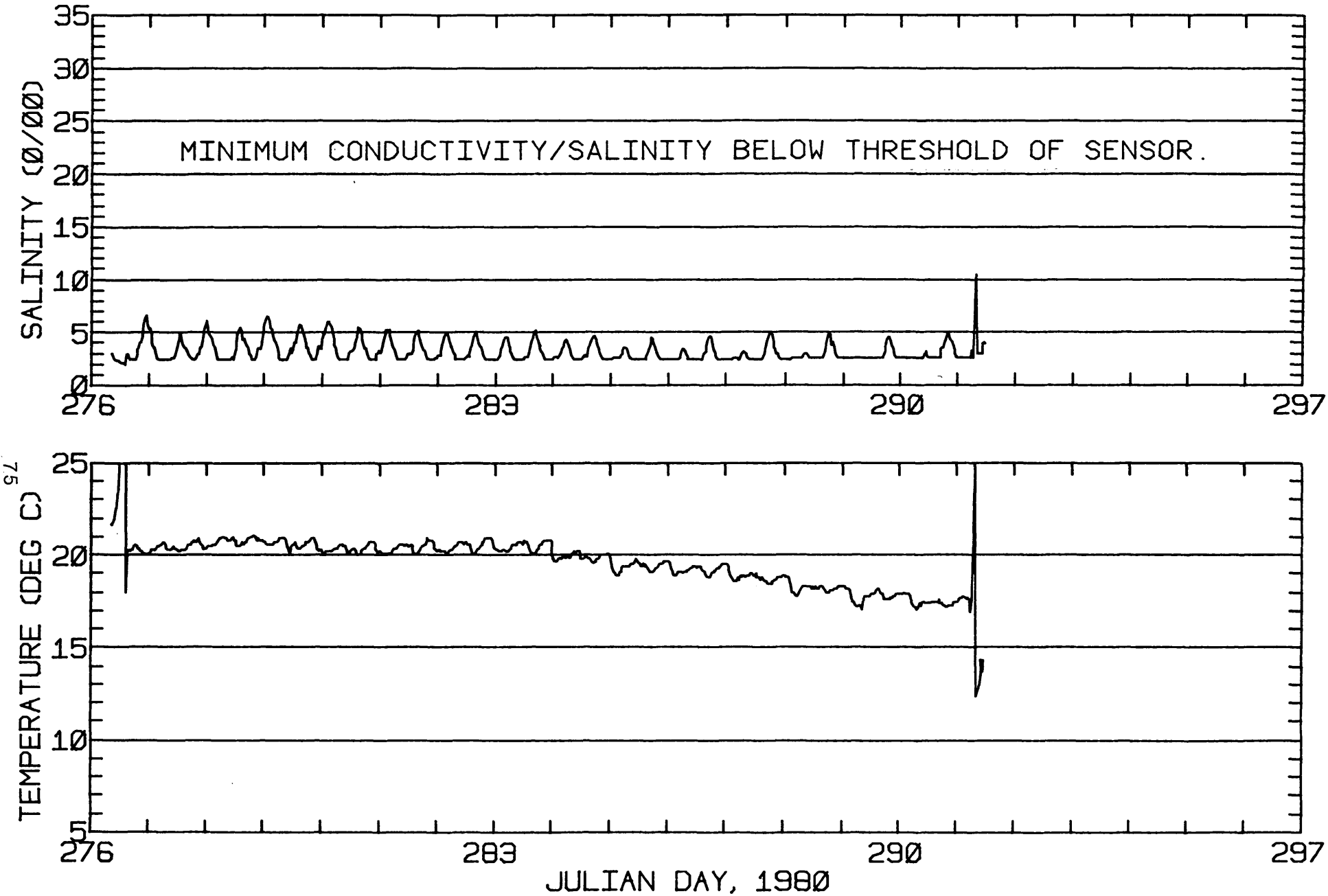
RMS SPEED: 44.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 101.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 101.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.28
STANDARD DEVIATION U-SERIES: 7.80 CM/SEC
STANDARD DEVIATION V SERIES: 5.28 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.3	1.6	260.
2	12	-1.2	0.9	254.
3	2	-1.9	-0.7	210.
ALL	26	-1.8	1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 1.8 METERS ABOVE BED TAPE NUMBER GSC032K2.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 1.8 METERS ABOVE BED TAPE NUMBER GSC032K2.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 1"N 121 55'40"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 4.8 M (BELOW MLLW)
START TIME OF SERIES: 10/17/80 925 PST JULIAN DAY=291
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

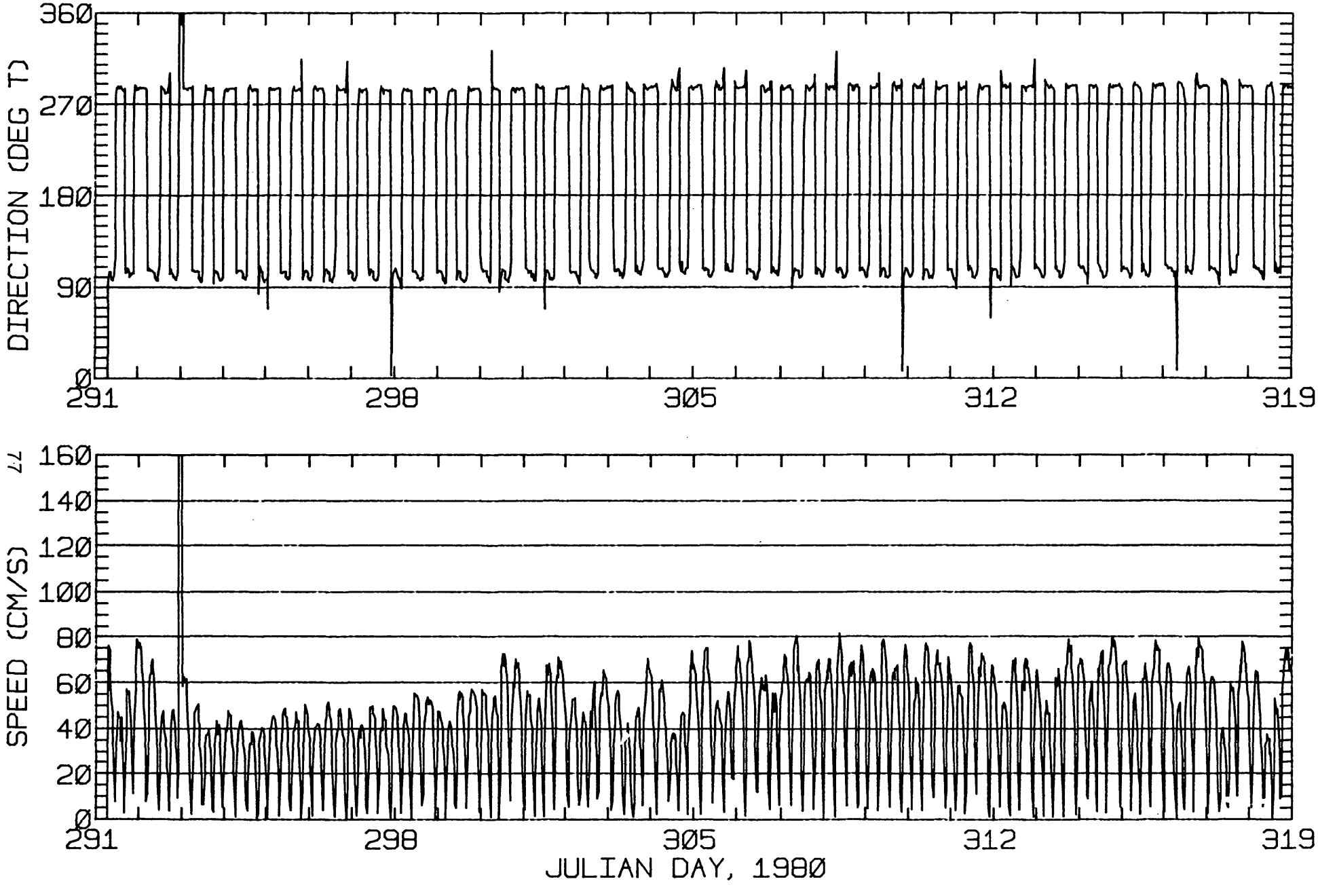
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.34	0.03	108.1	86.3	ANTI-CLOCKWISE
K1	17.98	0.42	105.1	89.3	ANTI-CLOCKWISE
N2	7.41	0.23	101.5	342.4	ANTI-CLOCKWISE
M2	56.13	0.98	105.3	38.7	ANTI-CLOCKWISE
S2	11.03	0.02	103.9	9.9	CLOCKWISE
M4	2.91	0.81	110.7	58.3	ANTI-CLOCKWISE

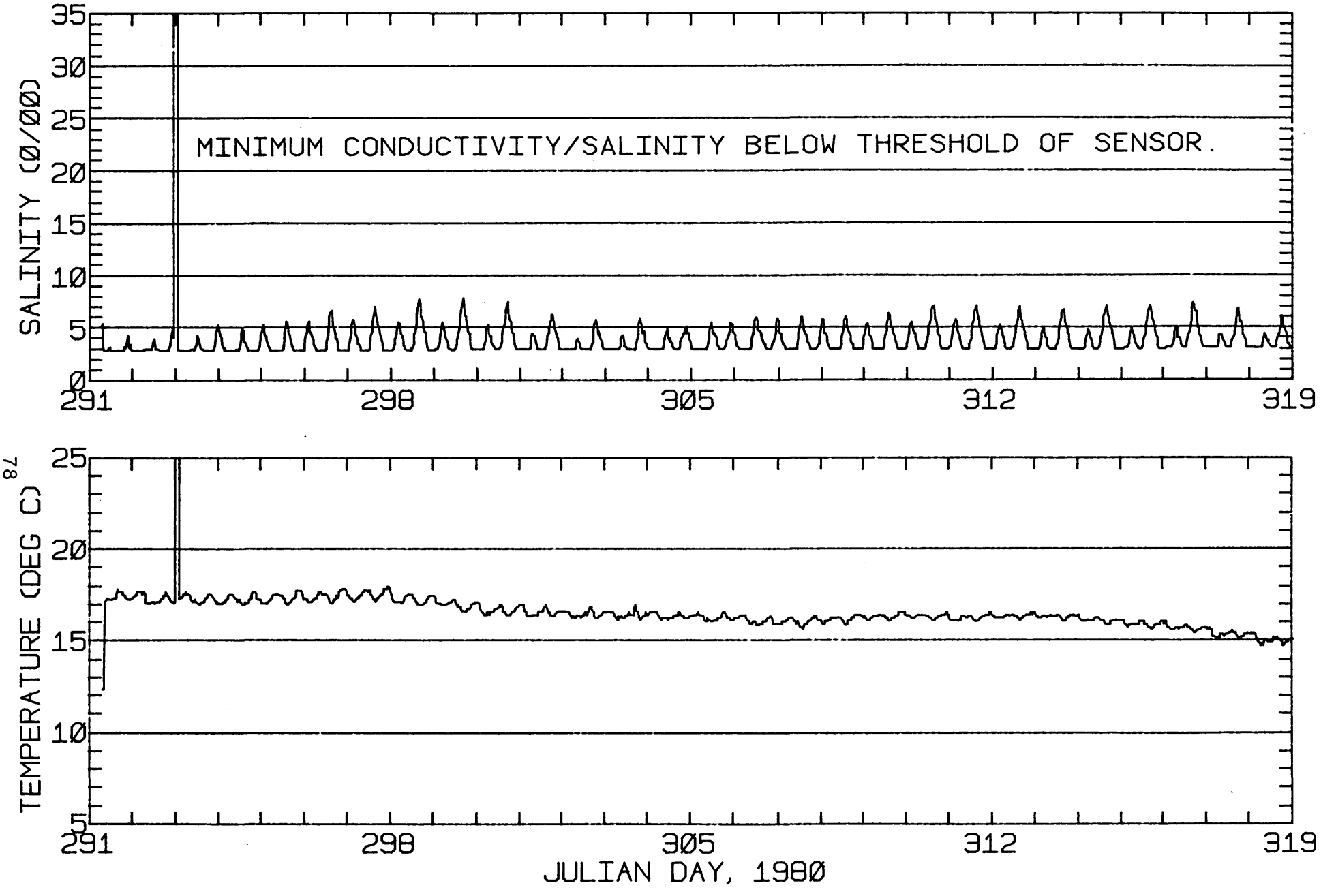
RMS SPEED:	47.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	95.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	37.5 CM/SEC
PRINCIPAL CURRENT DIRECTION:	105.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.42
STANDARD DEVIATION U-SERIES:	14.07 CM/SEC
STANDARD DEVIATION V SERIES:	5.21 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.5	1.0	138.
2	12	-0.8	1.2	187.
3	12	-1.7	1.5	160.
4	12	-1.2	1.6	192.
5	4	-3.1	1.9	195.
ALL	52	-1.2	1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032L1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032L1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 1"N 121 55'40"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 10/17/80 925 PST JULIAN DAY=291
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

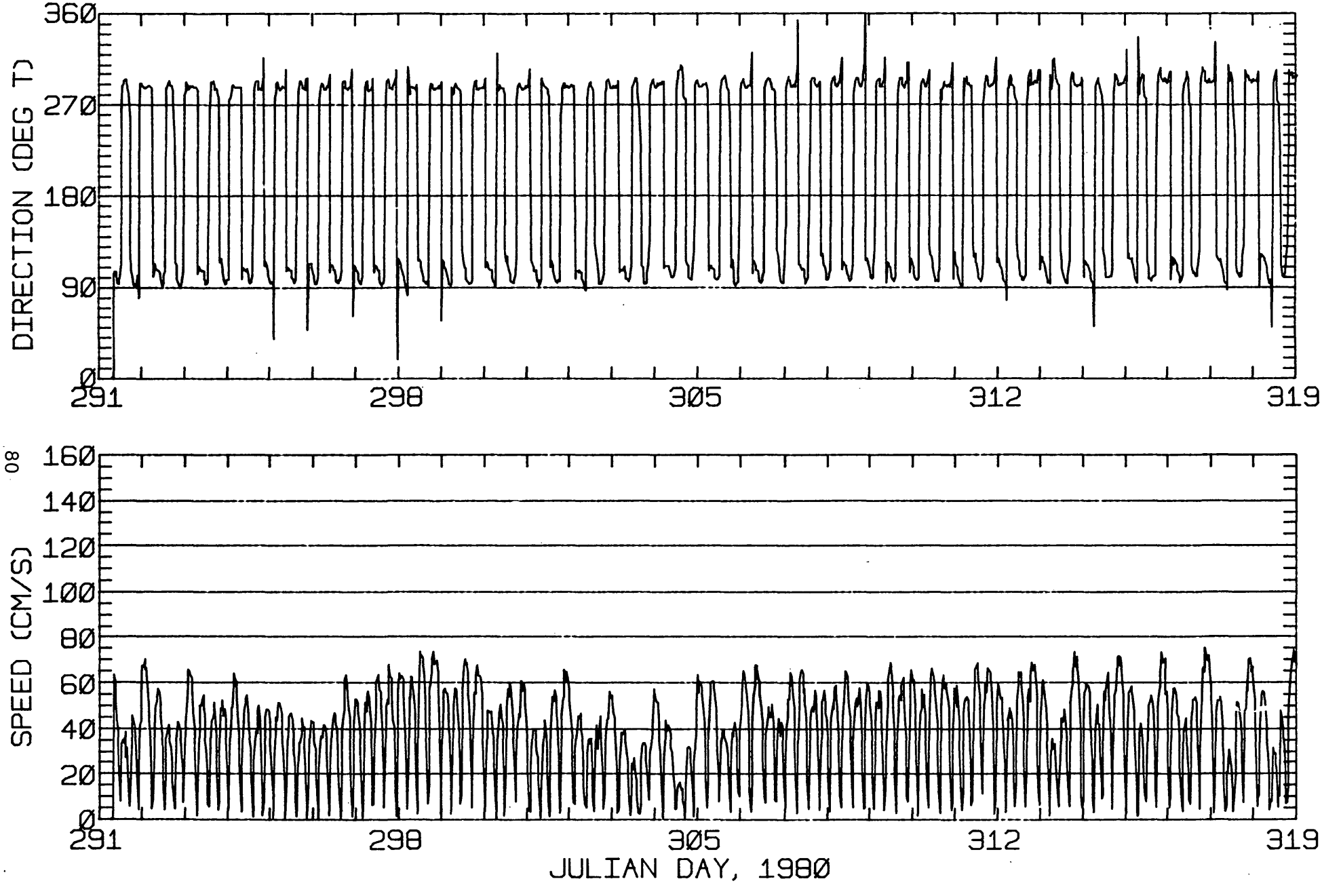
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.59	0.28	111.3	92.7	ANTI-CLOCKWISE
K1	17.29	1.13	107.3	91.2	ANTI-CLOCKWISE
N2	8.20	0.30	98.3	358.1	ANTI-CLOCKWISE
M2	50.80	2.16	106.8	37.8	ANTI-CLOCKWISE
S2	12.23	0.29	106.4	11.9	ANTI-CLOCKWISE
M4	2.11	1.34	134.4	20.6	ANTI-CLOCKWISE

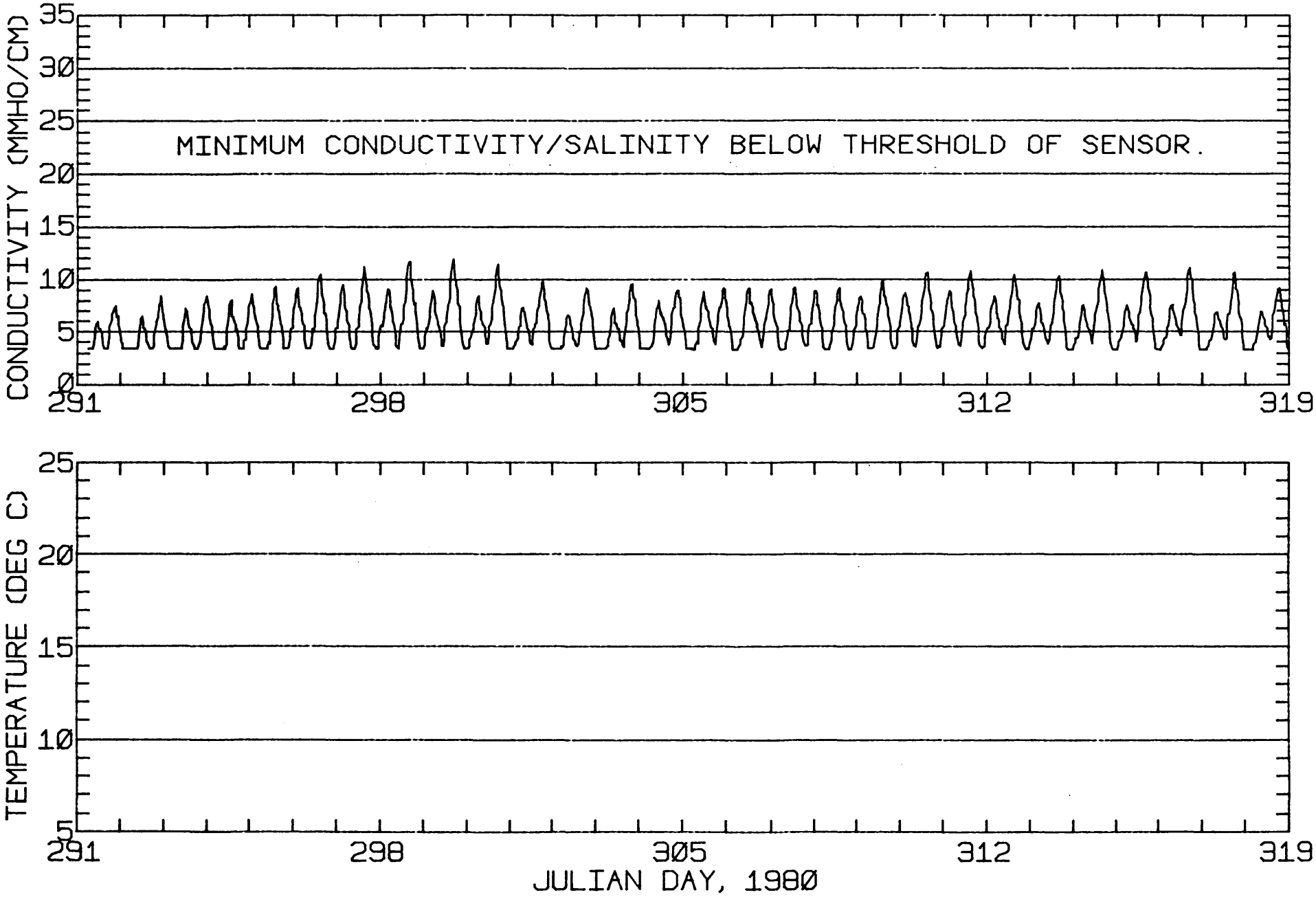
RMS SPEED:	43.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	90.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	31.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	107.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.44
STANDARD DEVIATION U-SERIES:	10.41 CM/SEC
STANDARD DEVIATION V SERIES:	5.75 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.1	1.9	138.
2	12	-1.6	1.9	187.
3	12	-1.2	2.1	160.
4	12	-1.1	2.2	192.
5	4	-2.8	2.7	195.
ALL	52	-1.4	2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 1.8 METERS ABOVE BED TAPE NUMBER GSC032L2.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 1N 121-55-40W
METER 1.8 METERS ABOVE BED TAPE NUMBER GSC032L2.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C032
POSITION: 38 3' 0"N 121 55'37"W
METER TYPE: ENDECO
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 5.1 M (BELOW MLLW)
START TIME OF SERIES: 11/14/80 1134 PST JULIAN DAY=319
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

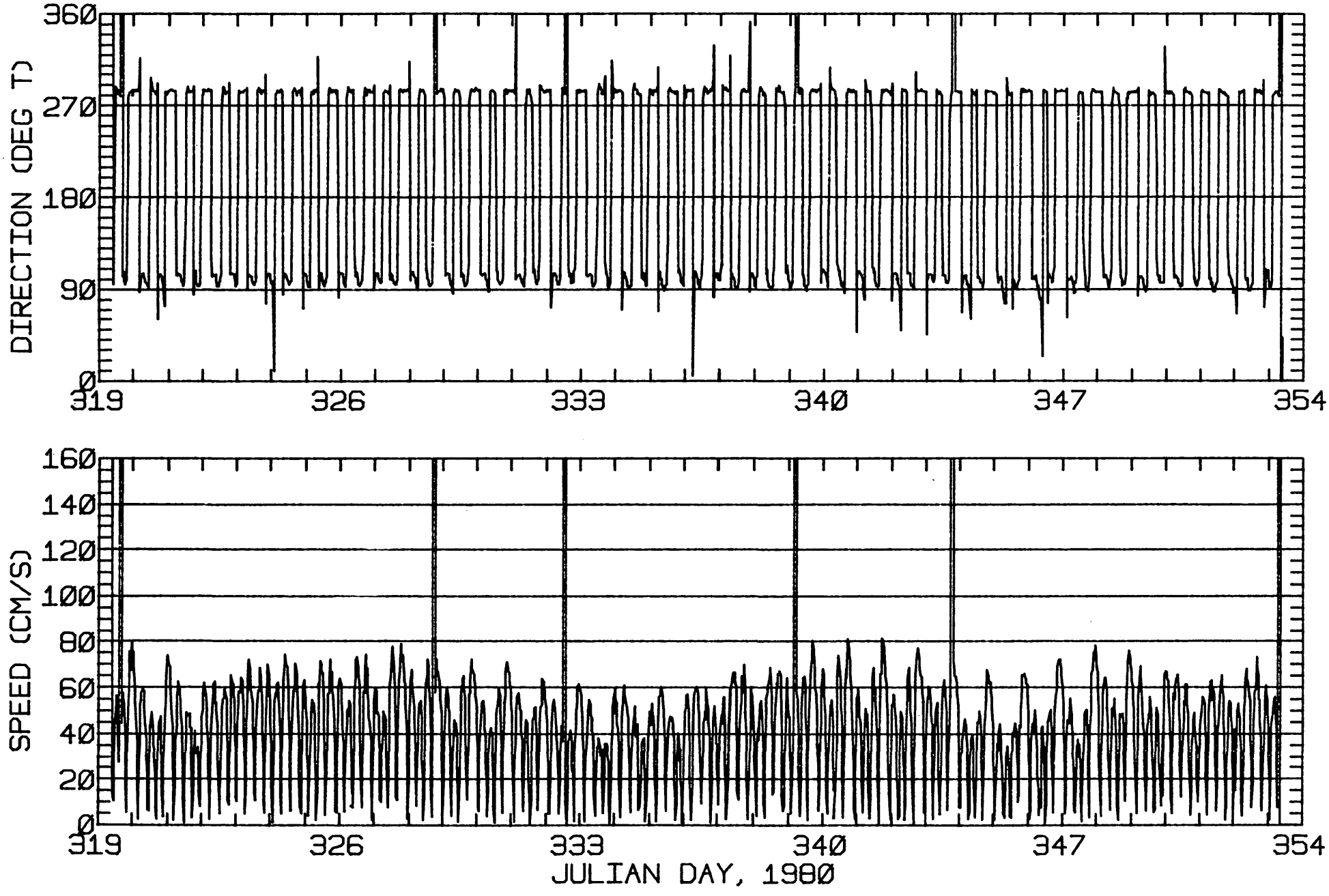
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.42	0.14	108.7	97.7	CLOCKWISE
K1	22.47	0.76	101.8	99.7	ANTI-CLOCKWISE
N2	9.93	0.02	102.9	7.2	ANTI-CLOCKWISE
M2	55.50	1.12	102.4	41.7	ANTI-CLOCKWISE
S2	8.77	0.10	102.0	6.8	ANTI-CLOCKWISE
M4	2.10	0.81	97.8	57.5	ANTI-CLOCKWISE

RMS SPEED: 46.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 95.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 102.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 11.42 CM/SEC
STANDARD DEVIATION V SERIES: 3.86 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.8	2.1	192.
2	12	-1.5	1.8	181.
3	12	-1.6	2.1	212.
4	12	-3.0	2.1	630.
5	8	-5.3	2.9	387.
ALL	56	-2.7	2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CHIPPS ISLAND 38- 3- 0N 121-55-37W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC032M1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C235
POSITION: 38 4'21"N 121 52'33"W
METER TYPE: ENDECO
WATER DEPTH: 6.0 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 10/30/80 1458 PST JULIAN DAY=304
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

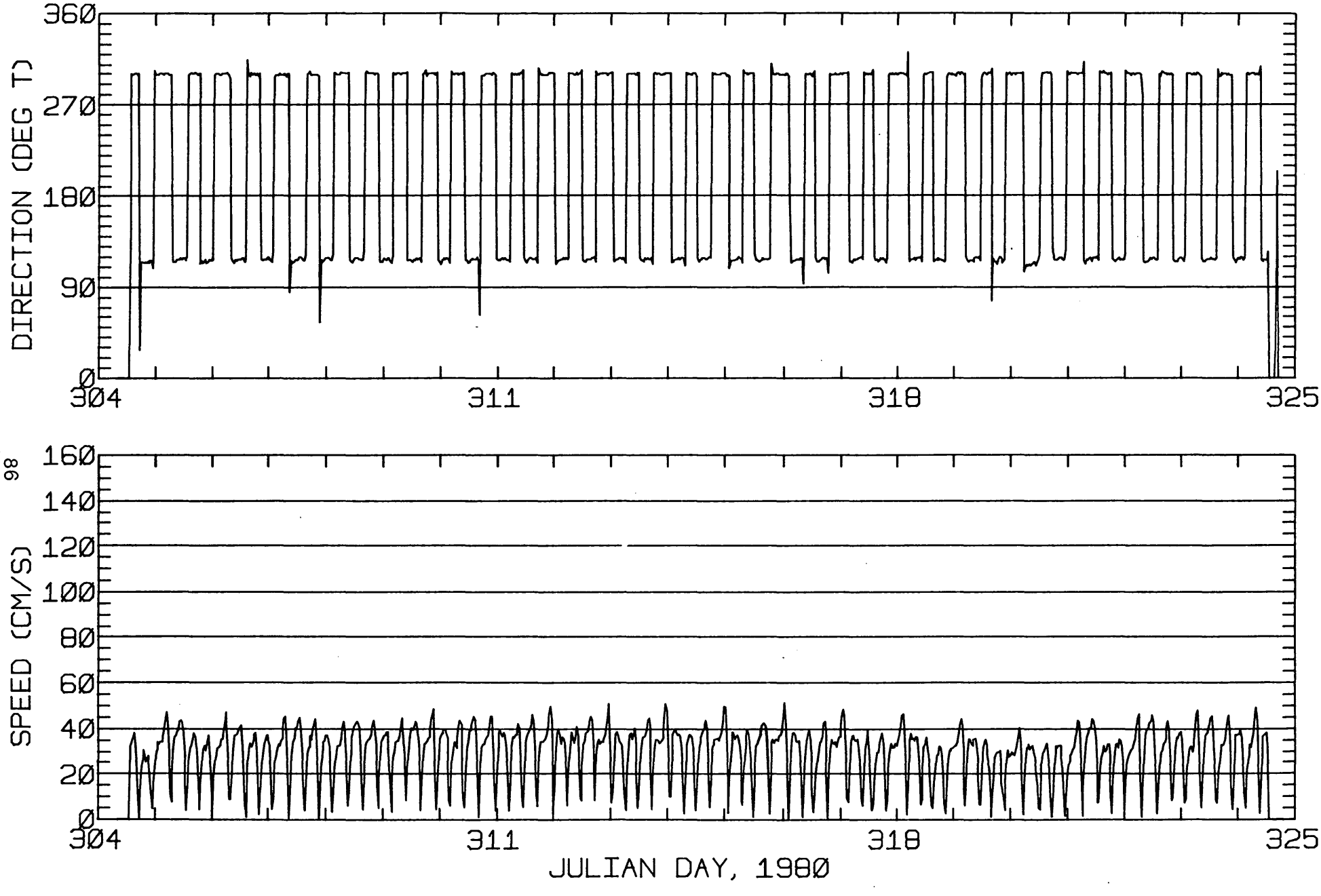
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.03	0.07	119.8	122.3	CLOCKWISE
K1	10.75	0.05	118.8	125.6	CLOCKWISE
N2	11.87	0.03	118.5	54.9	CLOCKWISE
M2	43.15	0.26	118.7	87.8	CLOCKWISE
S2	11.90	0.03	119.0	83.6	CLOCKWISE
M4	2.84	0.05	114.9	135.6	CLOCKWISE

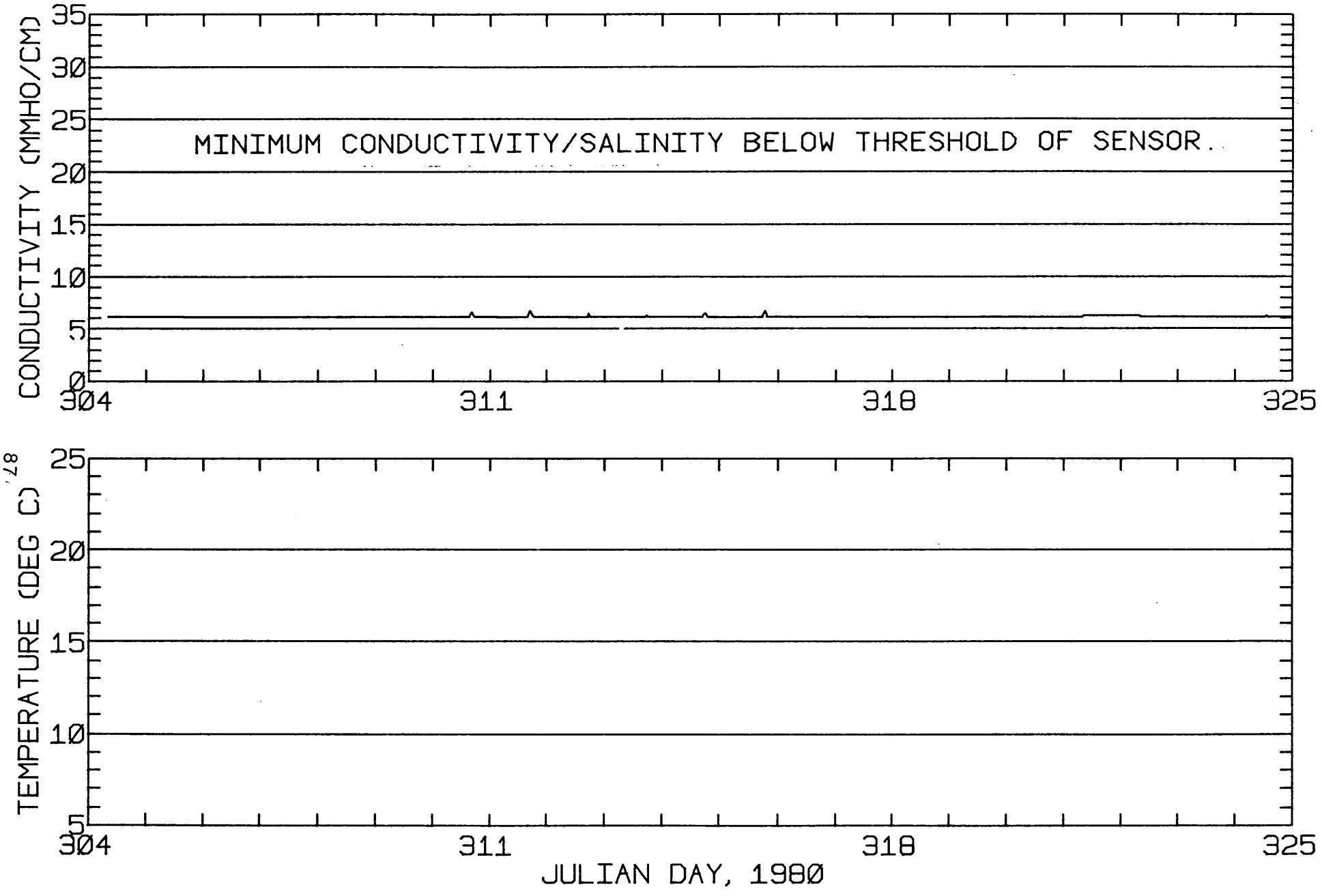
RMS SPEED: 31.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 70.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 118.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.29
STANDARD DEVIATION U-SERIES: 8.03 CM/SEC
STANDARD DEVIATION V SERIES: 4.47 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	1.3	150.
2	12	-1.7	1.8	194.
3	12	-0.8	1.4	197.
4	2	-0.1	1.0	174.
ALL	38	-1.0	1.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
MONTEZUMA SLOUGH 38- 4-21N 121-52-33W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC235A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
MONTEZUMA SLOUGH 38- 4-21N 121-52-33W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC235A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C237
POSITION: 38 3'52"N 122 2'31"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 10/29/79 1858 PST JULIAN DAY=302
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

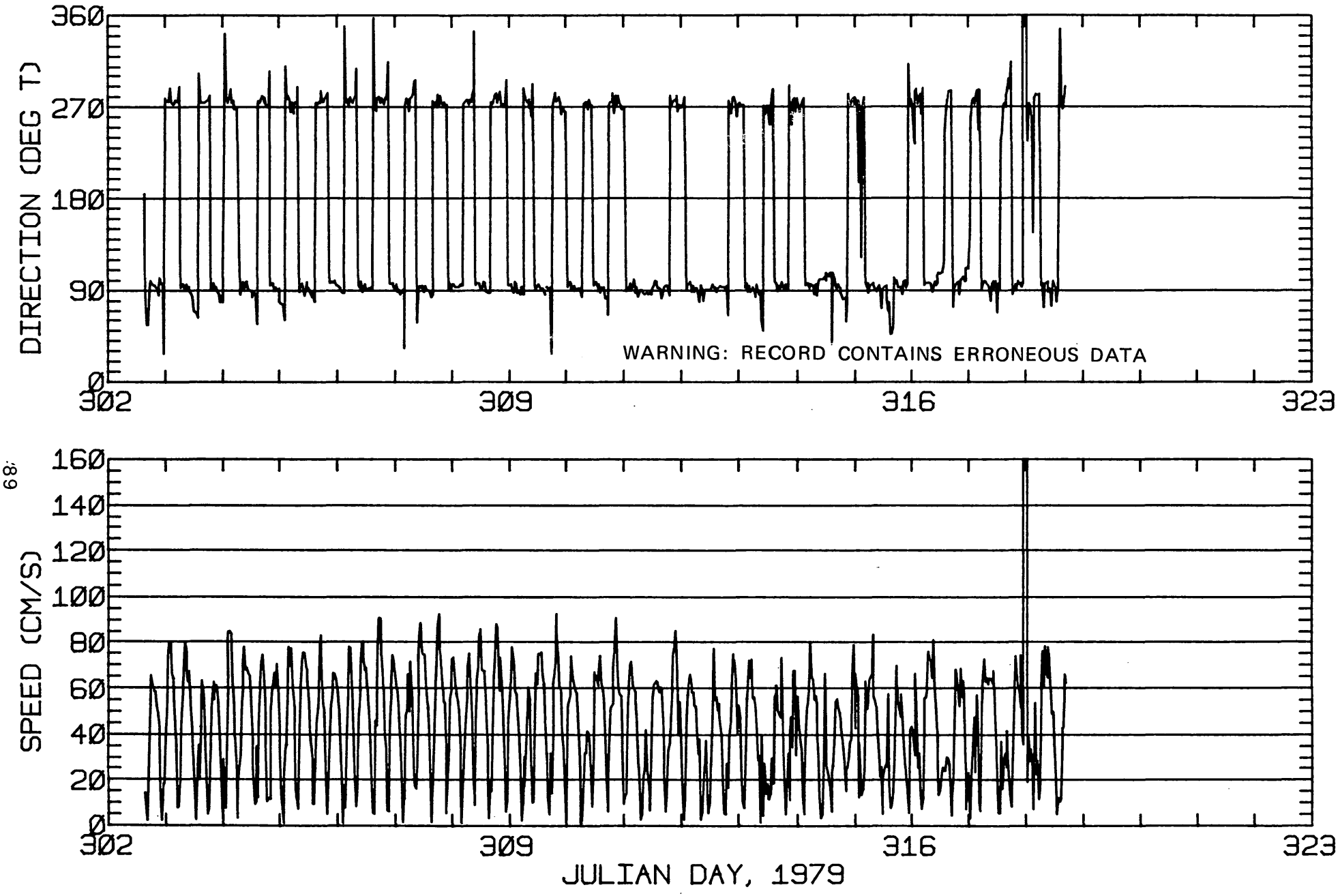
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.71	0.35	94.9	103.4	ANTI-CLOCKWISE
K1	21.58	0.27	93.4	101.3	ANTI-CLOCKWISE
N2	14.22	2.66	101.6	11.6	CLOCKWISE
M2	46.58	4.65	93.8	35.7	ANTI-CLOCKWISE
S2	11.77	1.45	95.0	354.6	CLOCKWISE
M4	8.40	0.17	94.1	305.3	ANTI-CLOCKWISE

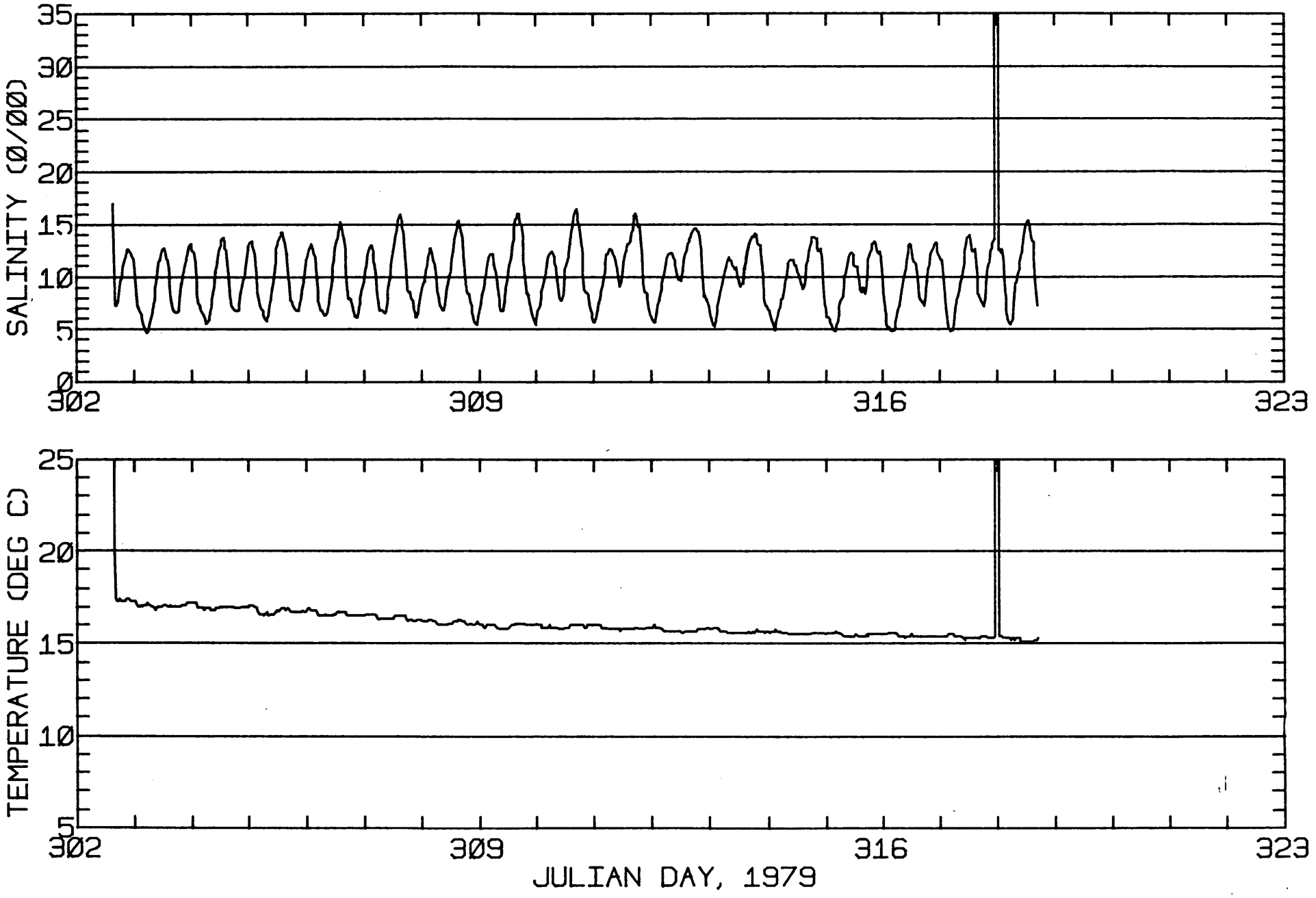
RMS SPEED:	53.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	93.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	27.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	94.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.60
STANDARD DEVIATION U-SERIES:	13.53 CM/SEC
STANDARD DEVIATION V SERIES:	4.28 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.2	1.8	227.
2	2	8.6	0.7	257.
ALL	14	4.8	1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
ROE ISLAND 38- 3-52N 122- 2-31W
METER 4.0 METERS ABOVE BED TAPE NUMBER GSC237A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
ROE ISLAND 38- 3-52N 122- 2-31W
METER 4.0 METERS ABOVE BED TAPE NUMBER GSC237A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C237
POSITION: 38 3'53"N 122 2'29"W
METER TYPE: ENDECO
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 10/31/80 1441 PST JULIAN DAY=305
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

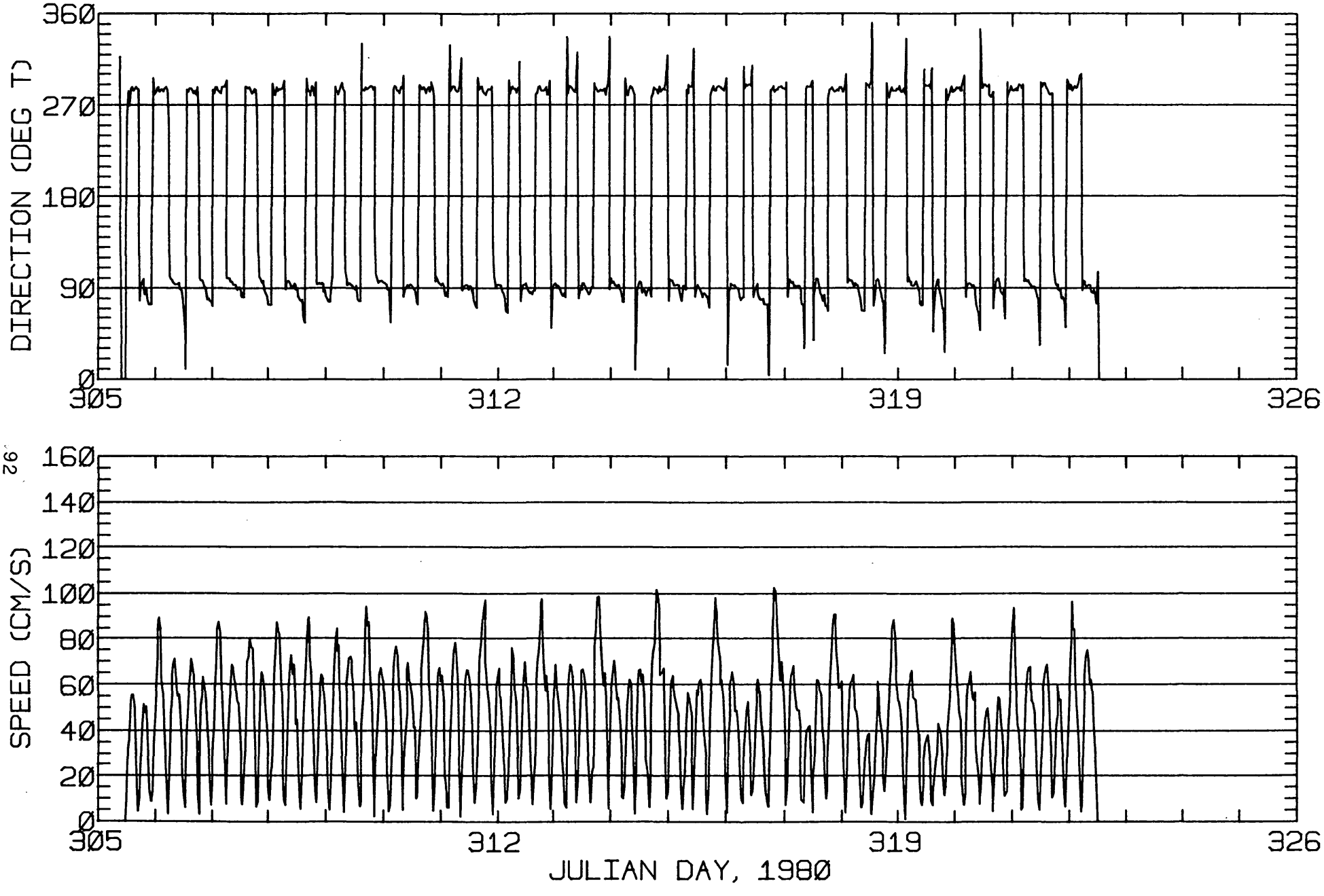
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.77	0.28	102.0	82.0	ANTI-CLOCKWISE
K1	22.32	1.03	99.8	77.3	ANTI-CLOCKWISE
N2	19.16	1.24	99.4	356.7	ANTI-CLOCKWISE
M2	70.16	1.73	99.8	25.4	ANTI-CLOCKWISE
S2	17.73	0.04	97.3	13.0	ANTI-CLOCKWISE
M4	4.68	1.48	109.1	305.3	ANTI-CLOCKWISE

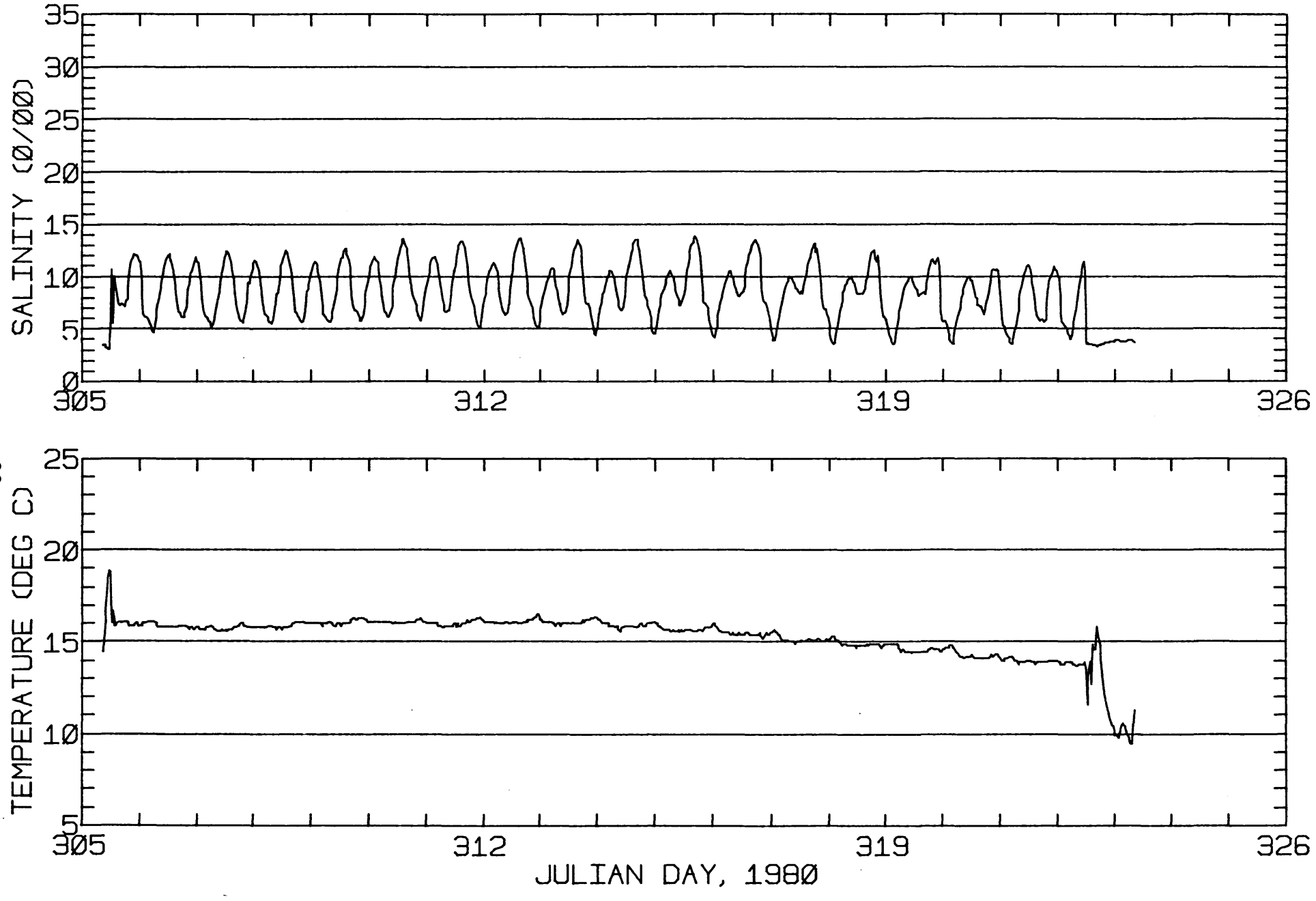
RMS SPEED:	51.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	123.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	42.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	99.7 DEGREES TRUE
TIDAL FORM NUMBER:	0.40
STANDARD DEVIATION U-SERIES:	11.69 CM/SEC
STANDARD DEVIATION V SERIES:	3.85 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.1	6.5	165.
2	12	-3.6	7.6	192.
3	8	-2.0	6.3	193.
ALL	32	-2.6	6.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
PORT CHICAGO 38- 3-53N 122- 2-29W
METER 4.9 METERS ABOVE BED TAPE NUMBER GSC237B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
PORT CHICAGO 38- 3-53N 122- 2-29W
METER 4.9 METERS ABOVE BED TAPE NUMBER GSC237B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C239
POSITION: 38 3'28"N 121 59'35"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 10/24/79 1640 PST JULIAN DAY=297
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

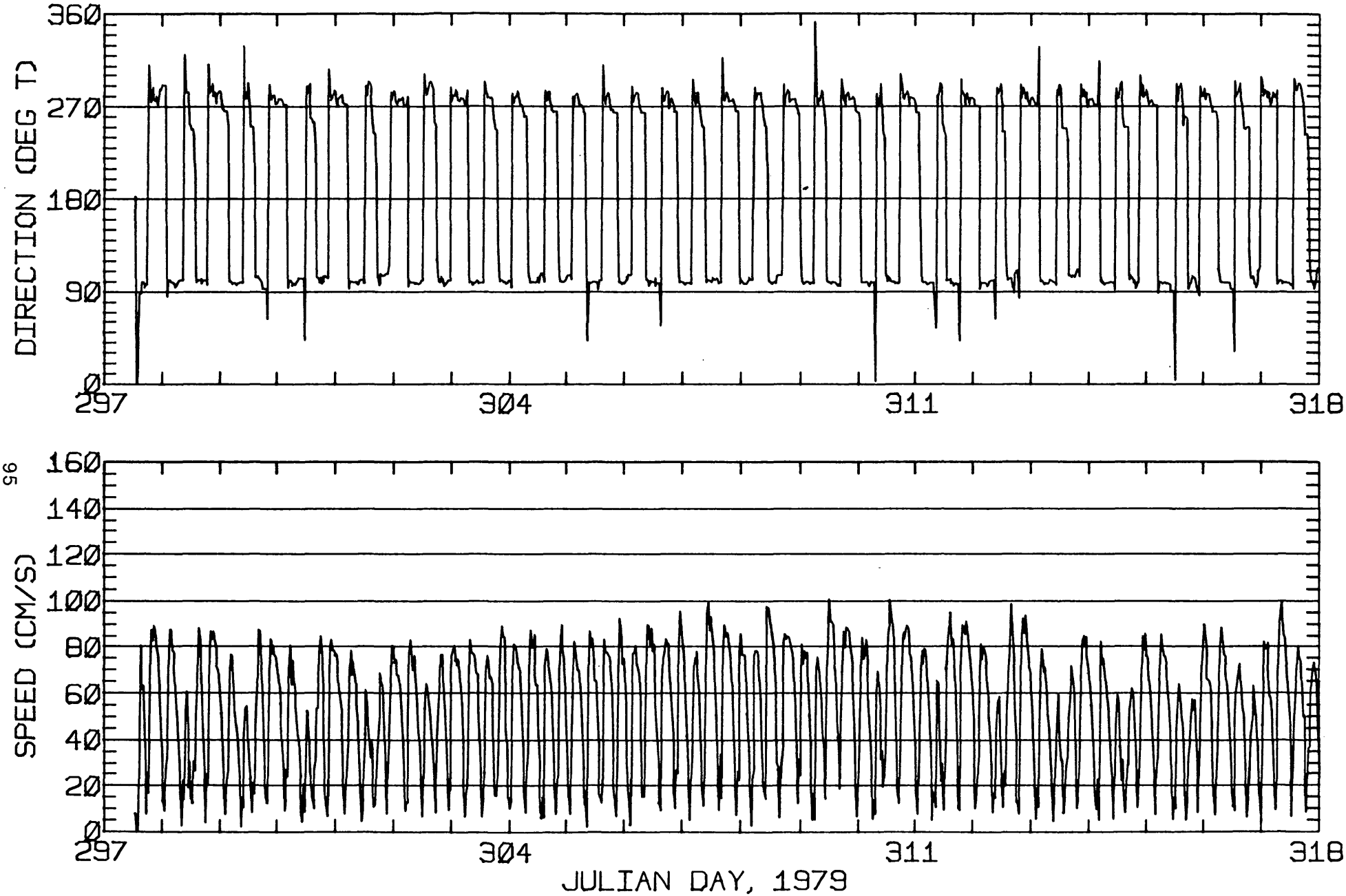
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.93	1.23	102.9	99.8	CLOCKWISE
K1	24.34	0.19	98.6	95.7	CLOCKWISE
N2	12.35	0.52	95.4	2.9	ANTI-CLOCKWISE
M2	65.65	3.26	99.6	43.1	ANTI-CLOCKWISE
S2	9.14	0.09	97.1	19.9	ANTI-CLOCKWISE
M4	4.21	0.47	78.1	75.1	CLOCKWISE

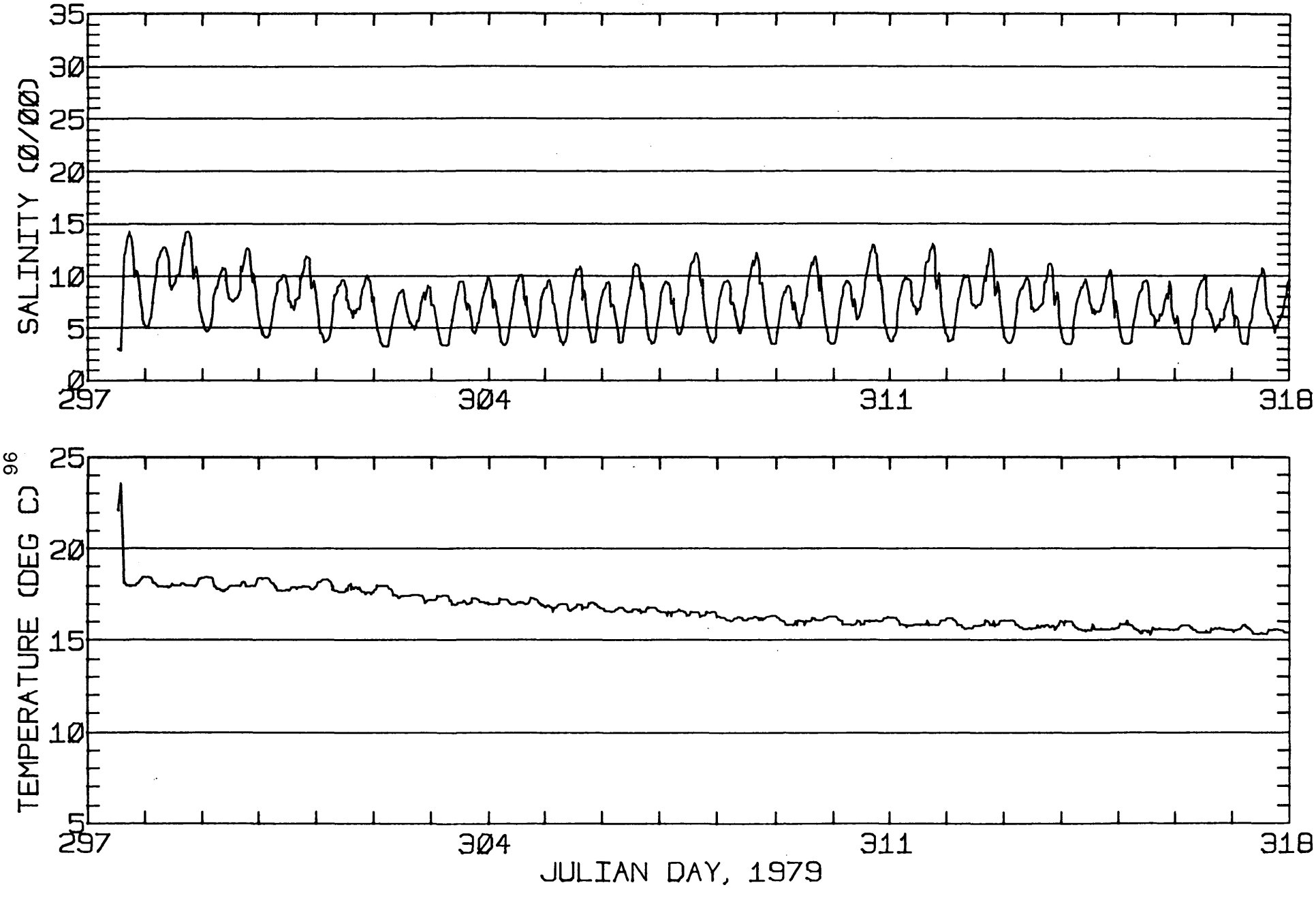
RMS SPEED:	57.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	111.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	44.1 CM/SEC
PRINCIPAL CURRENT DIRECTION:	99.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.48
STANDARD DEVIATION U-SERIES:	18.58 CM/SEC
STANDARD DEVIATION V SERIES:	5.80 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	-0.3	365.
2	12	-0.2	-1.5	206.
3	12	0.2	-0.5	311.
4	2	-2.3	0.3	308.
ALL	38	-0.3	-0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CONCORD WEAPONS STATION 38- 3-28N 121-59-35W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC239A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CONCORD WEAPONS STATION 38- 3-28N 121-59-35W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC239A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C239
POSITION: 38 3'27"N 121 59'34"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 11/14/79 1810 PST JULIAN DAY=318
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

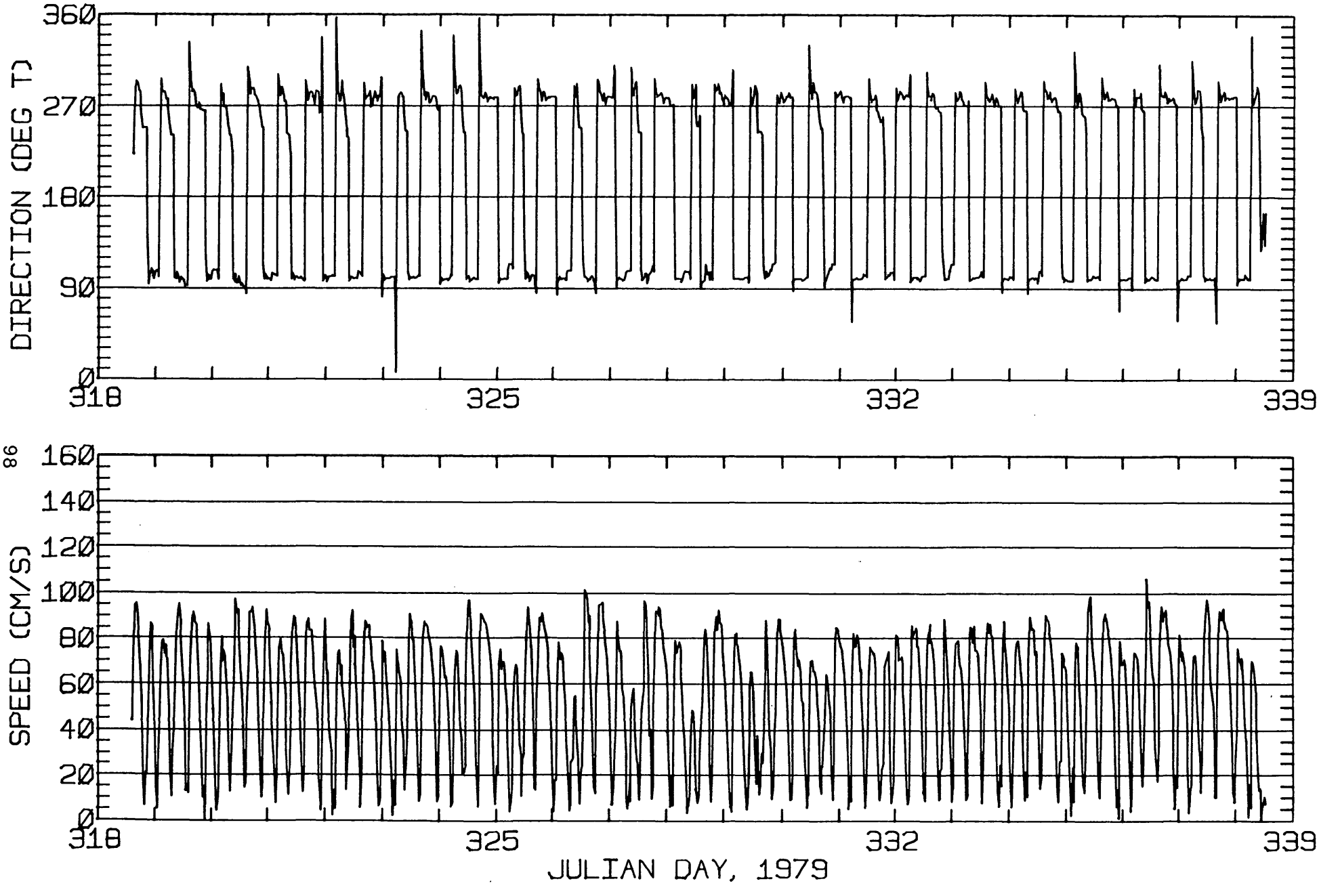
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.88	1.41	108.2	99.5	CLOCKWISE
K1	27.43	0.33	99.3	95.8	CLOCKWISE
N2	8.51	0.93	98.8	7.7	CLOCKWISE
M2	69.28	3.08	99.3	41.6	ANTI-CLOCKWISE
S2	15.08	0.64	96.9	22.7	ANTI-CLOCKWISE
M4	2.78	1.58	67.7	56.3	CLOCKWISE

RMS SPEED:	59.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	122.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	37.6 CM/SEC
PRINCIPAL CURRENT DIRECTION:	99.8 DEGREES TRUE
TIDAL FORM NUMBER:	0.45
STANDARD DEVIATION U-SERIES:	17.65 CM/SEC
STANDARD DEVIATION V SERIES:	6.27 CM/SEC

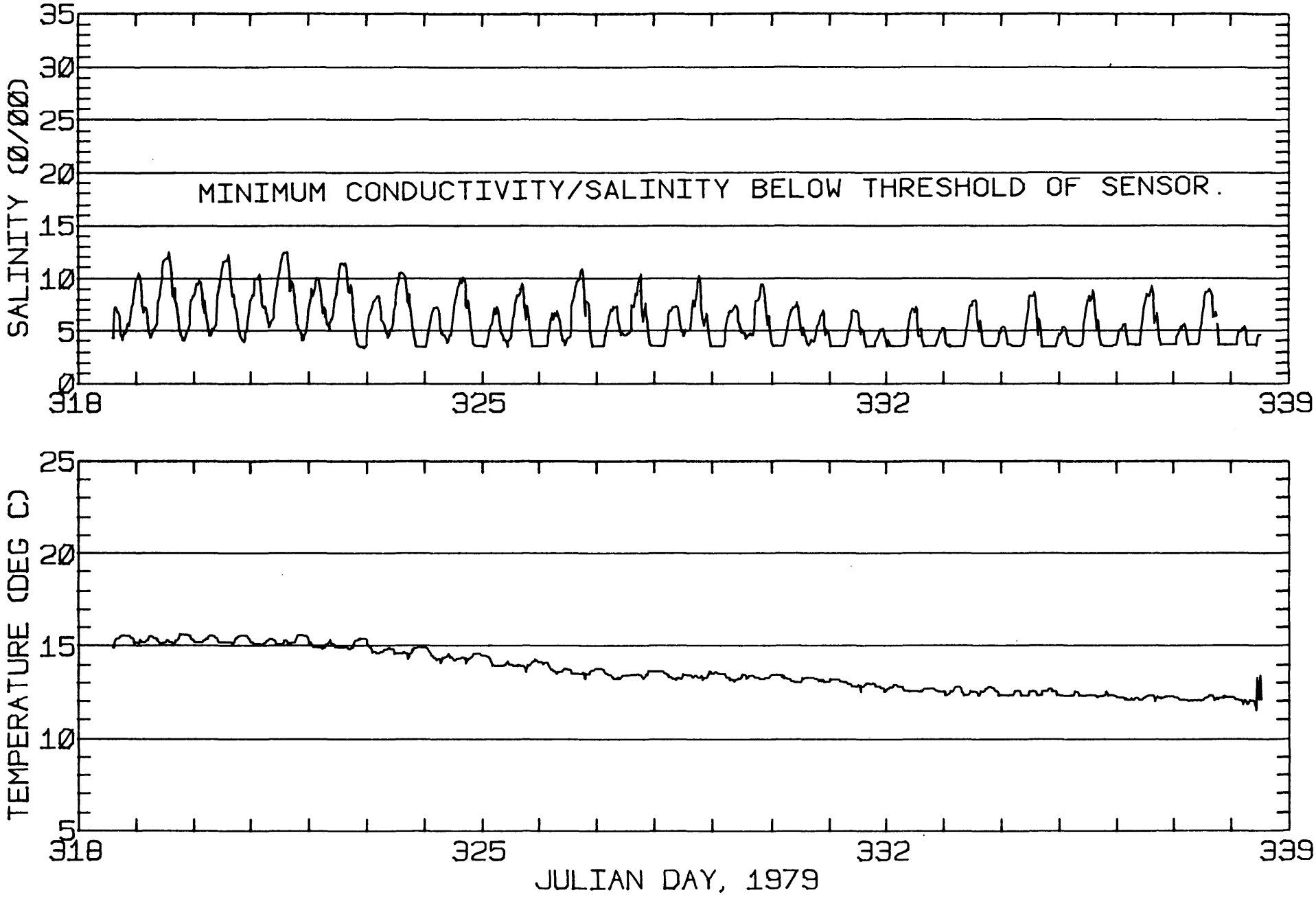
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.3	-0.7	342.
2	12	-1.4	-0.5	411.
3	12	-1.9	-0.5	464.
ALL	36	-2.5	-0.6	



86

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CONCORD WEAPONS STATION 38- 3-27N 121-59-34W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC239B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
CONCORD WEAPONS STATION 38- 3-27N 121-59-34W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC239B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 25
POSITION: 38 2'20"N 122 8' 1"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 4/ 4/79 1650 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

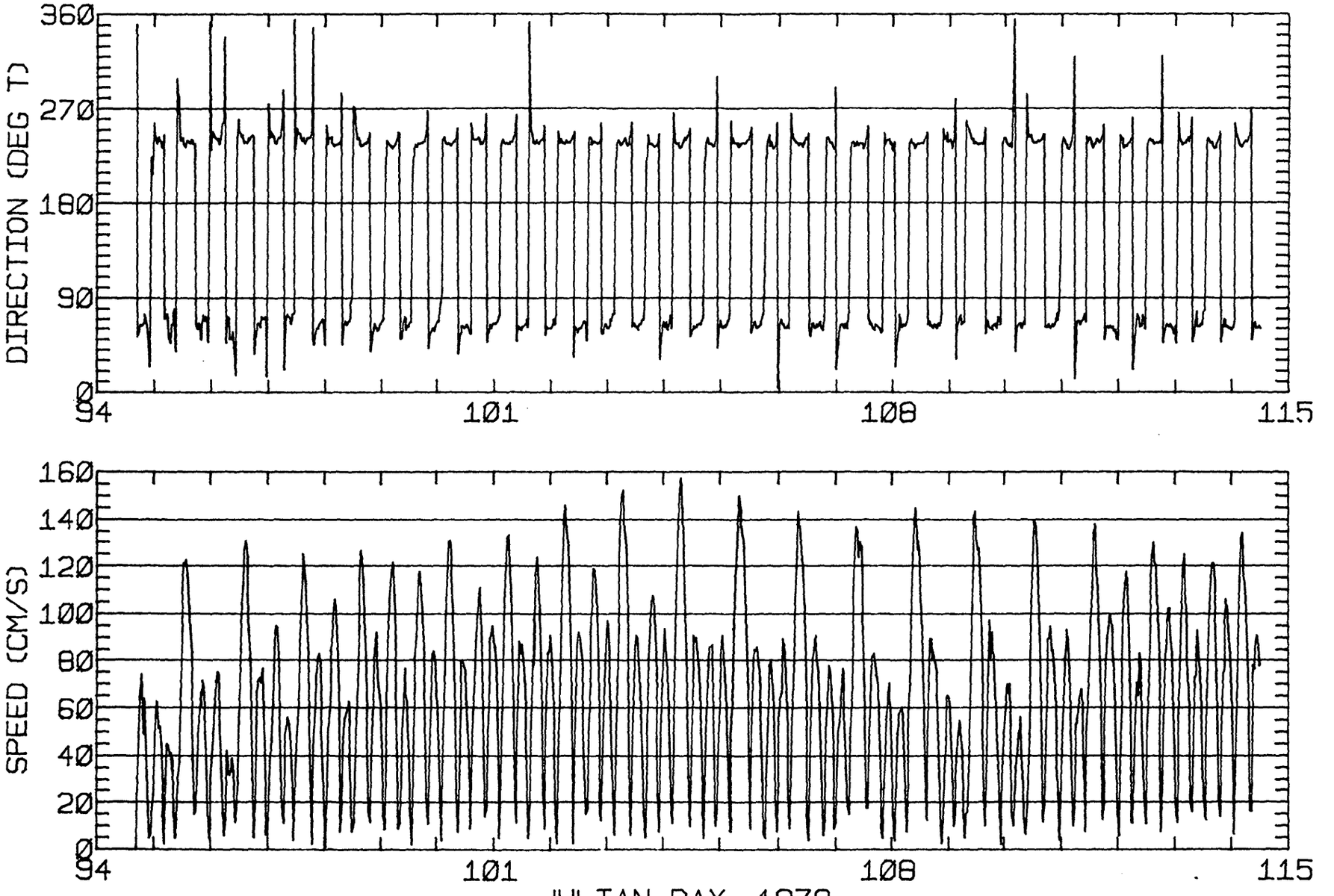
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	21.38	0.51	59.7	74.6	ANTI-CLOCKWISE
K1	27.78	0.14	60.0	65.0	CLOCKWISE
N2	17.12	0.59	60.4	325.6	ANTI-CLOCKWISE
M2	95.90	1.38	60.8	6.5	CLOCKWISE
S2	27.38	0.29	60.0	6.8	CLOCKWISE
M4	4.46	2.24	37.3	258.0	CLOCKWISE

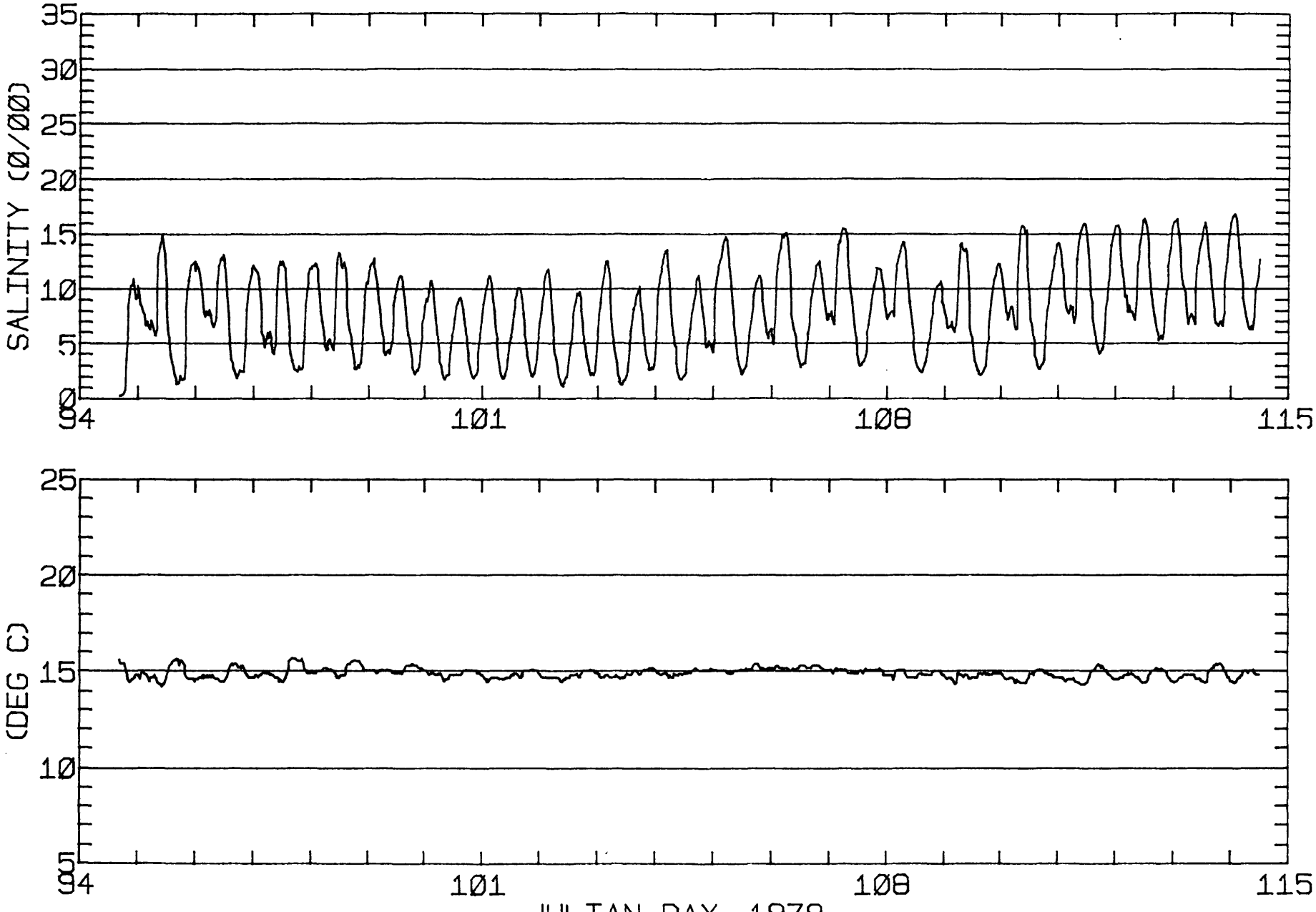
RMS SPEED: 75.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 172.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 62.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 8.33 CM/SEC
STANDARD DEVIATION V SERIES: 6.44 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-14.7	-9.7	568.
2	12	-11.2	-9.5	281.
3	12	-12.3	-9.6	232.
4	2	-11.6	-10.4	221.
ALL	38	-12.7	-9.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 25 38- 2-20N 122- 8- 1W
METER 007.9 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 25 38- 2-20N 122- 8- 1W
METER ØØ7.9 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 25
POSITION: 38 2'20"N 122 8' 1"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 4/ 4/79 1652 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

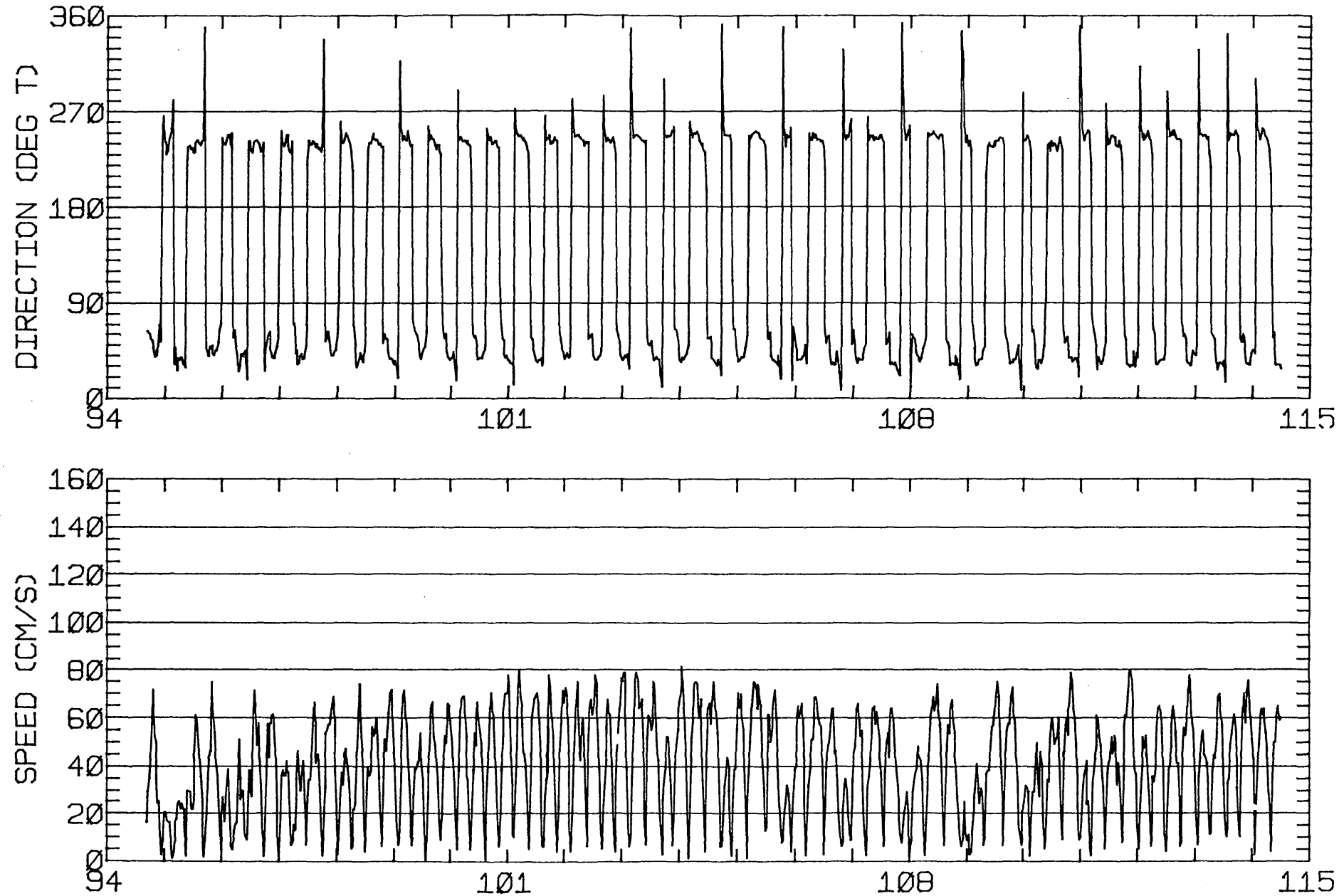
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.67	1.17	56.7	75.3	CLOCKWISE
K1	18.09	0.55	54.6	65.4	ANTI-CLOCKWISE
N2	7.69	0.84	51.3	314.5	ANTI-CLOCKWISE
M2	57.08	3.87	52.2	1.4	ANTI-CLOCKWISE
S2	17.57	1.30	54.4	4.3	ANTI-CLOCKWISE
M4	5.02	0.72	134.3	204.6	ANTI-CLOCKWISE

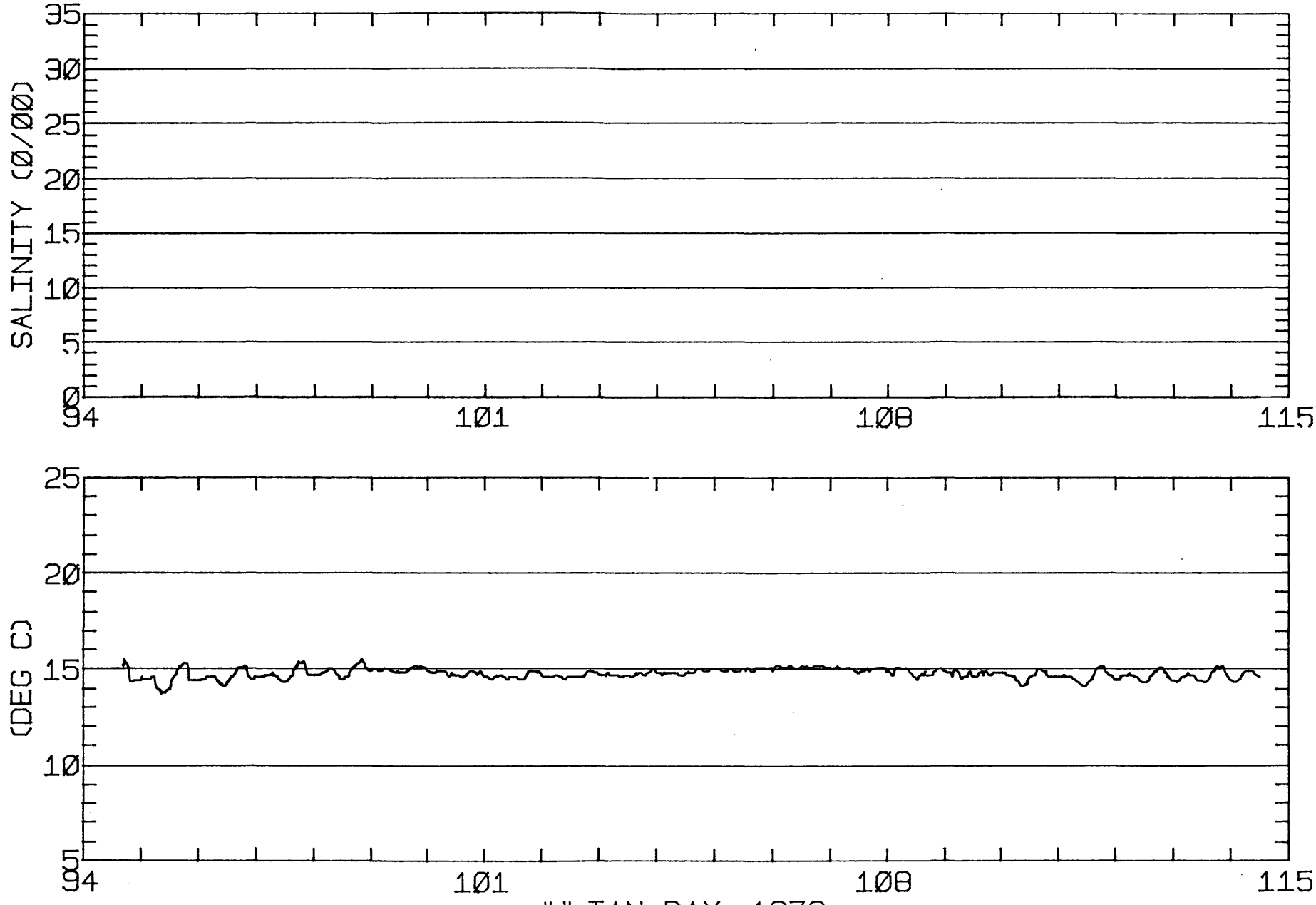
RMS SPEED: 45.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 106.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 53.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 7.76 CM/SEC
STANDARD DEVIATION V SERIES: 7.40 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.2	4.6	568.
2	12	-0.9	10.6	281.
3	12	-2.3	8.8	232.
4	2	-3.9	11.3	221.
ALL	38	-1.9	8.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 25 38- 2-20N 122- 8- 1W
METER 001.8 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 25 38- 2-20N 122- 8- 1W
METER ØØ1.8 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 25A
POSITION: 38 1'59"N 122 8'59"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 10/31/79 1700 PST JULIAN DAY=304
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

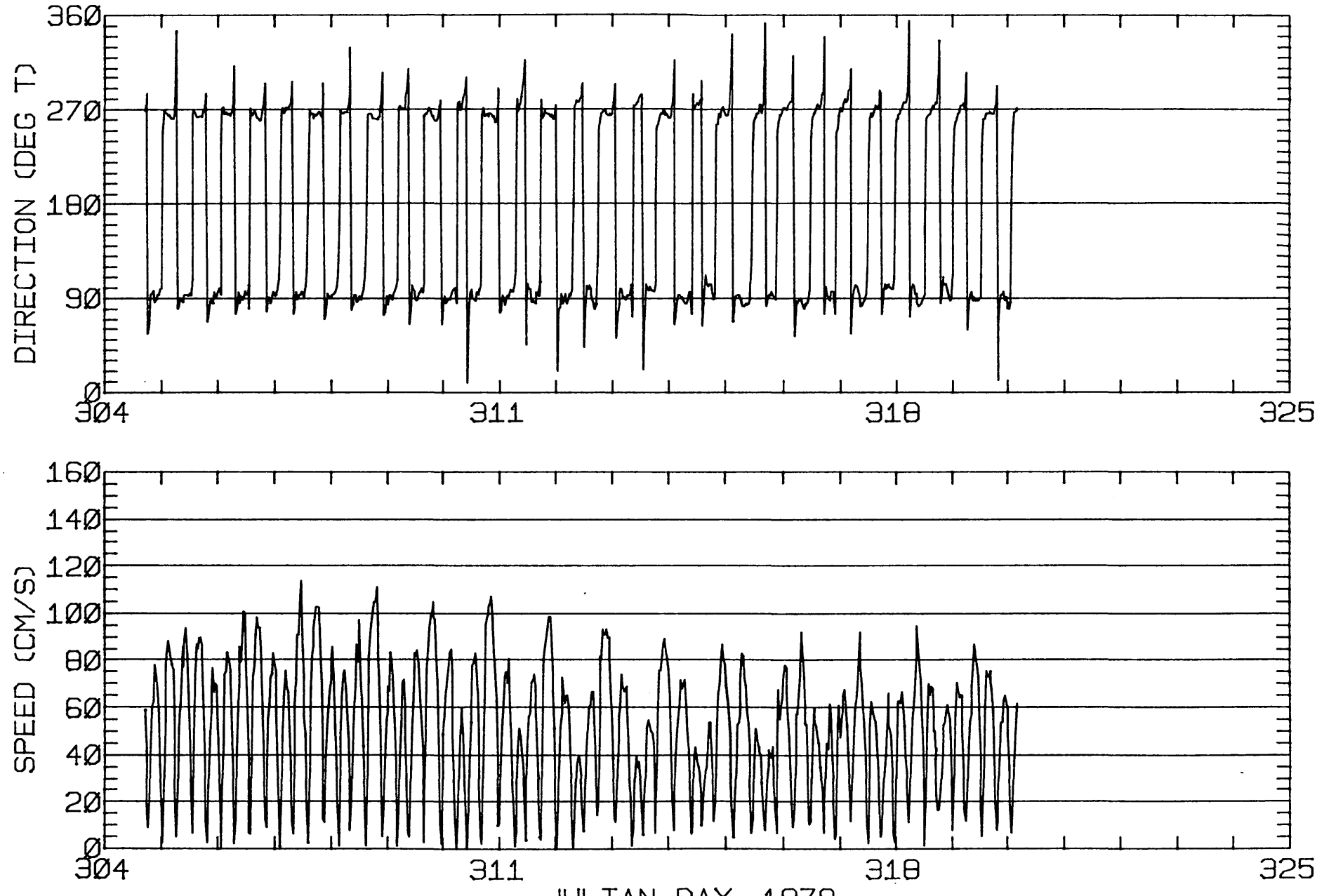
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.47	0.04	84.6	84.6	CLOCKWISE
K1	29.60	0.80	83.7	78.2	CLOCKWISE
N2	7.14	1.58	84.2	316.4	ANTI-CLOCKWISE
M2	69.68	3.34	89.8	15.2	CLOCKWISE
S2	12.57	0.42	90.7	339.1	CLOCKWISE
M4	2.16	0.47	37.4	184.6	ANTI-CLOCKWISE

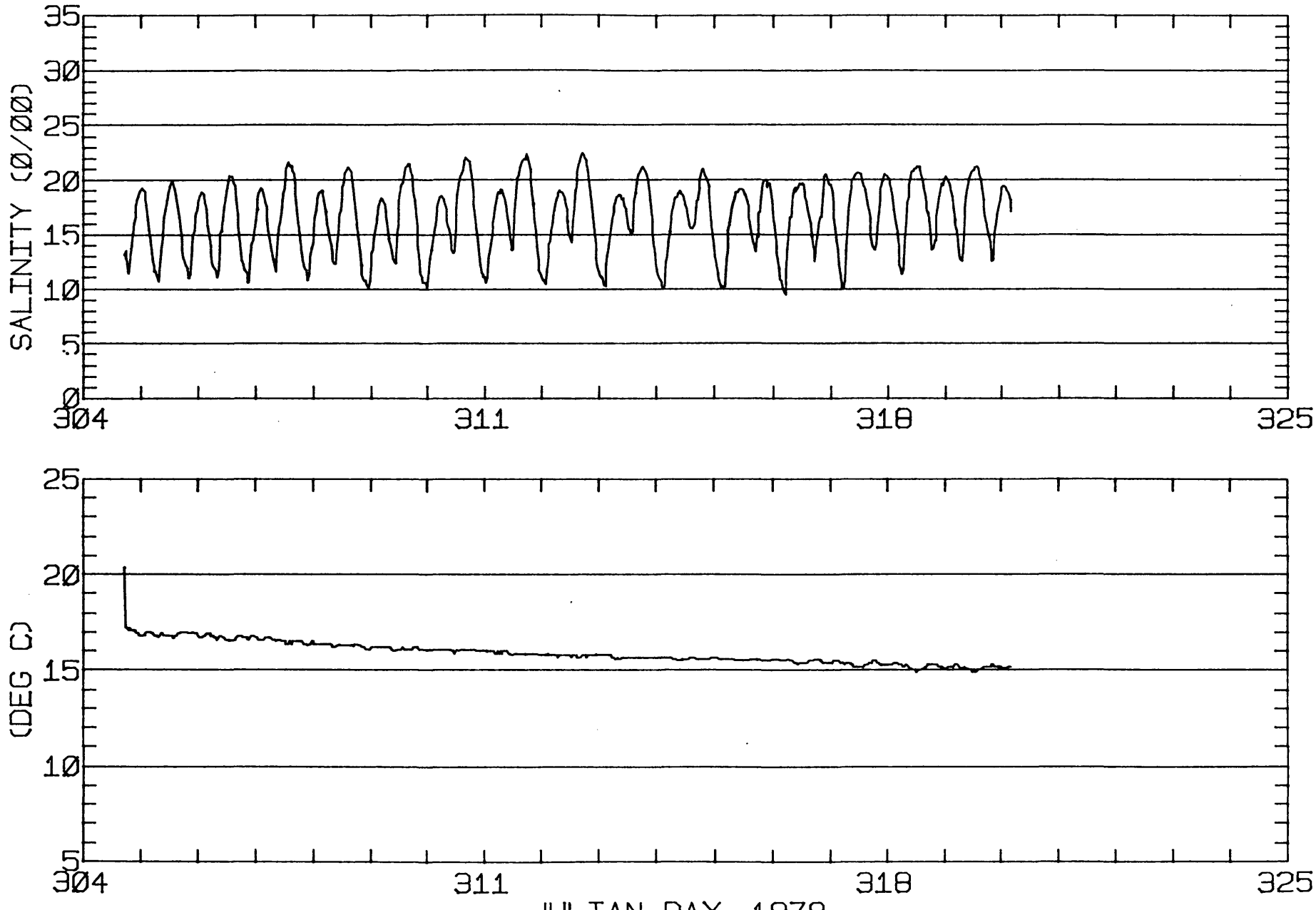
RMS SPEED: 58.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 126.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 42.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 87.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.54
STANDARD DEVIATION U-SERIES: 8.92 CM/SEC
STANDARD DEVIATION V SERIES: 5.39 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.4	-2.5	218.
2	12	-0.2	-0.8	317.
3	4	3.7	-1.3	255.
ALL	28	-0.1	-1.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 25A 38- 1-59N 122- 8-59W
METER 006.1 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 25A 38- 1-59N 122- 8-59W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 25A
POSITION: 38 1'59"N 122 8'59"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 10.4 M (BELOW MLLW)
START TIME OF SERIES: 10/31/79 1702 PST JULIAN DAY=304
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

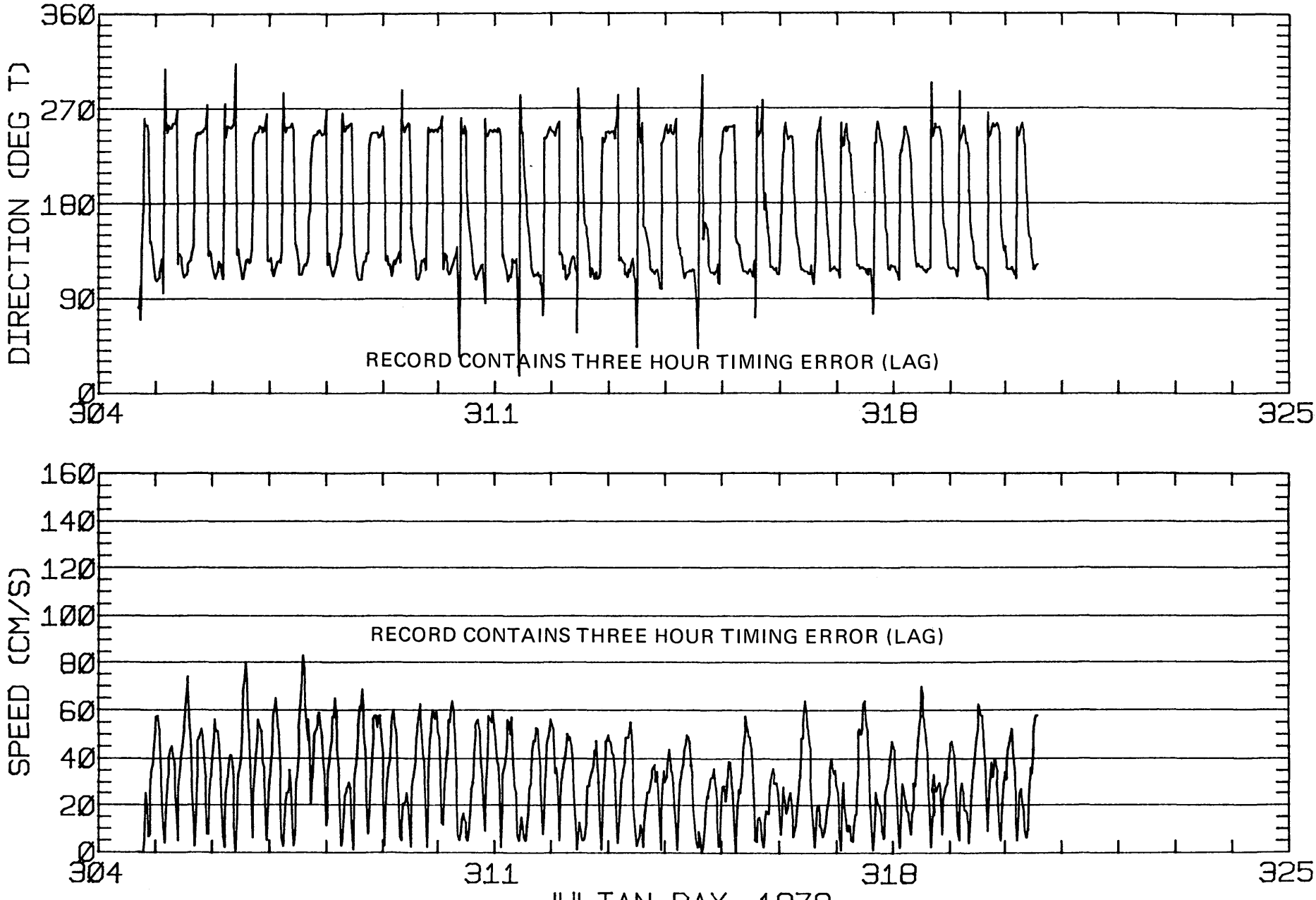
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

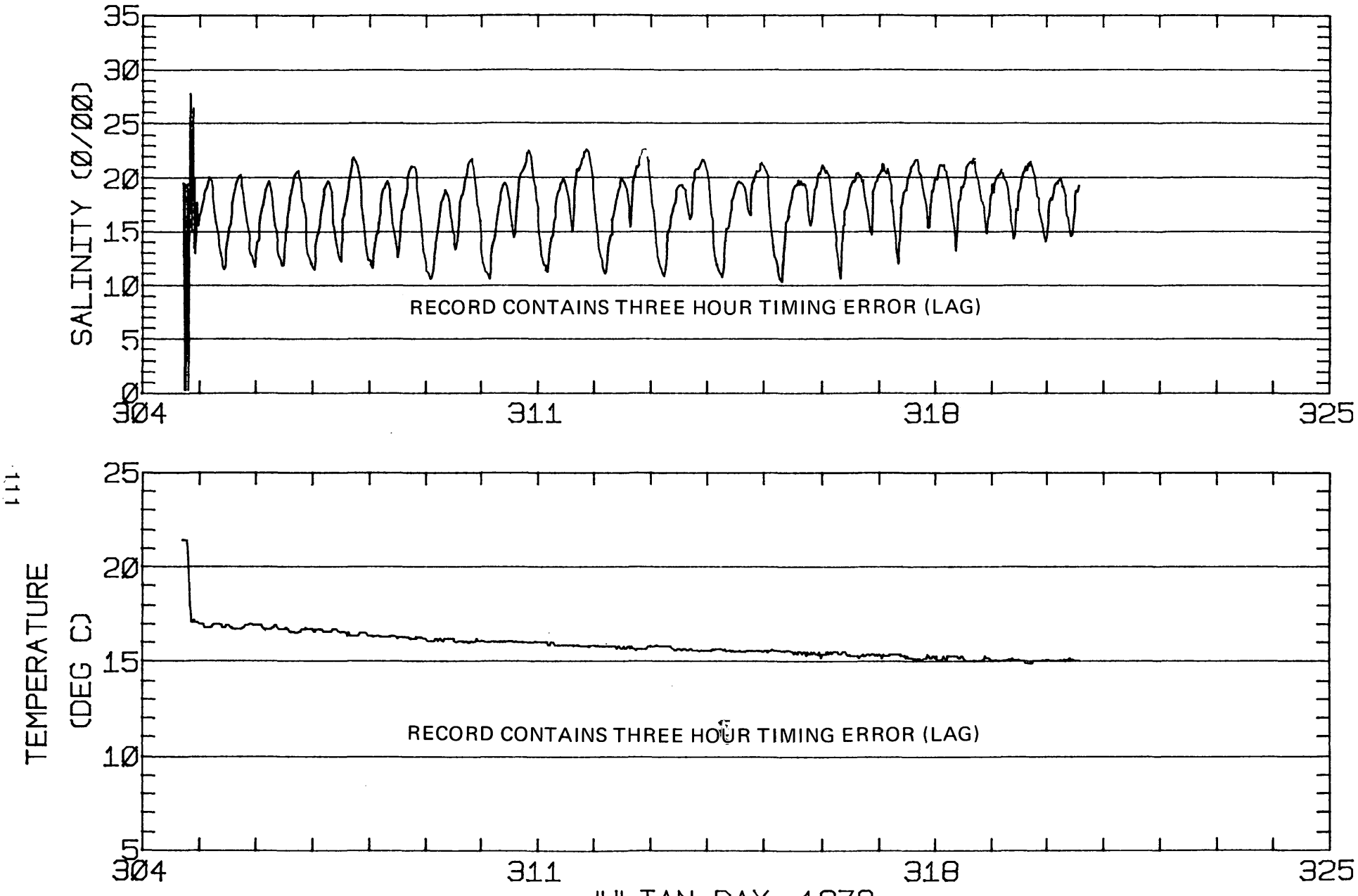
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	12			
4	12			
5	8			
ALL	56			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 25A 38- 1-59N 122- 8-59W
METER 001.8 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 25A 38- 1-59N 122- 8-59W
METER ØØ1.8 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 26
POSITION: 38 3'10"N 122 5'26"W
METER TYPE: AANDERAA
WATER DEPTH: 10.1 M (MLLW)
METER DEPTH: 8.5 M (BELOW MLLW)
START TIME OF SERIES: 4/ 4/79 1530 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

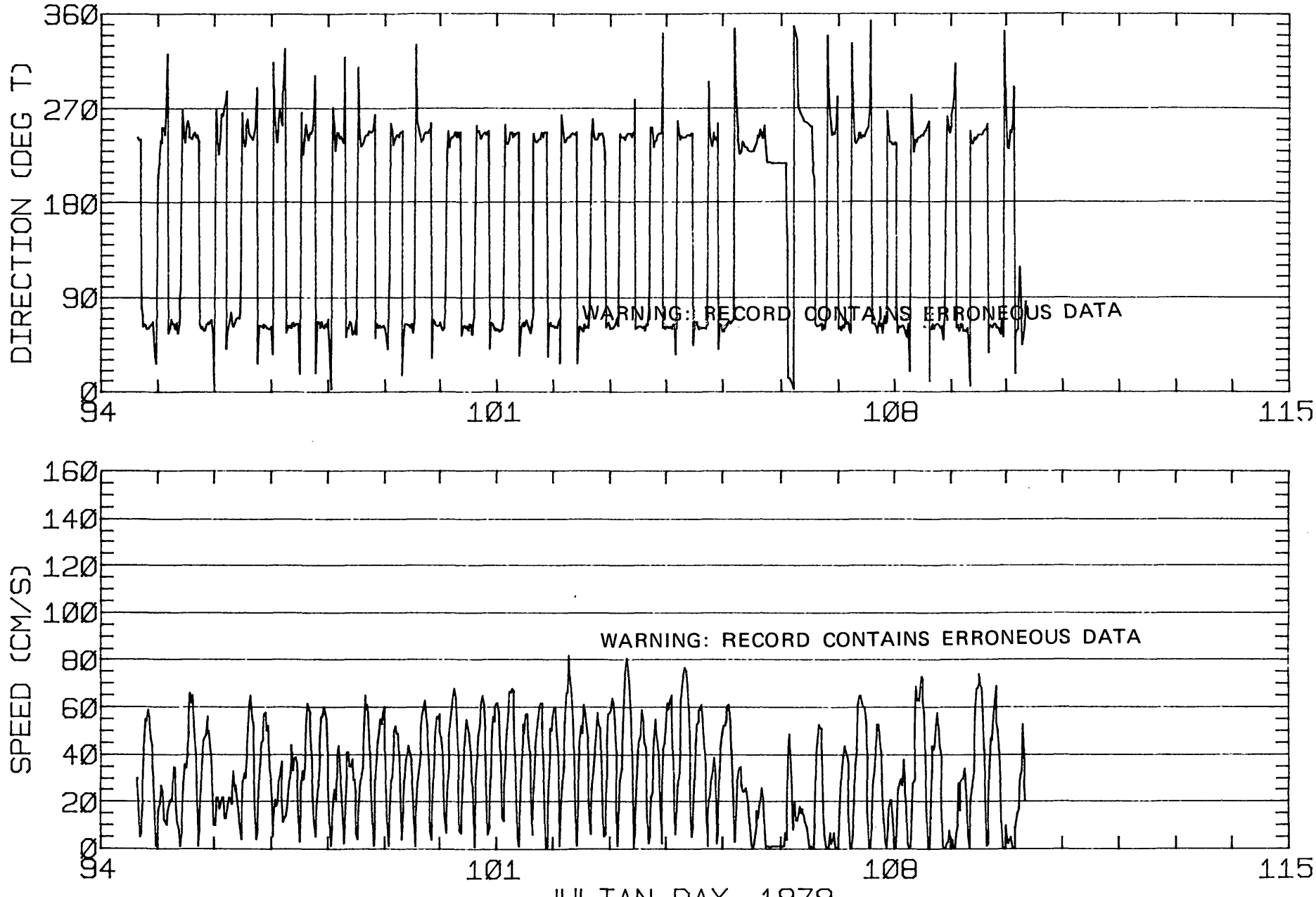
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.16	0.07	62.6	91.4	CLOCKWISE
K1	16.70	0.25	62.8	82.9	ANTI-CLOCKWISE
N2	9.58	0.88	65.2	346.8	ANTI-CLOCKWISE
M2	54.73	0.25	64.0	17.1	CLOCKWISE
S2	15.40	0.31	63.2	11.4	ANTI-CLOCKWISE
M4	1.32	0.36	88.0	290.0	CLOCKWISE

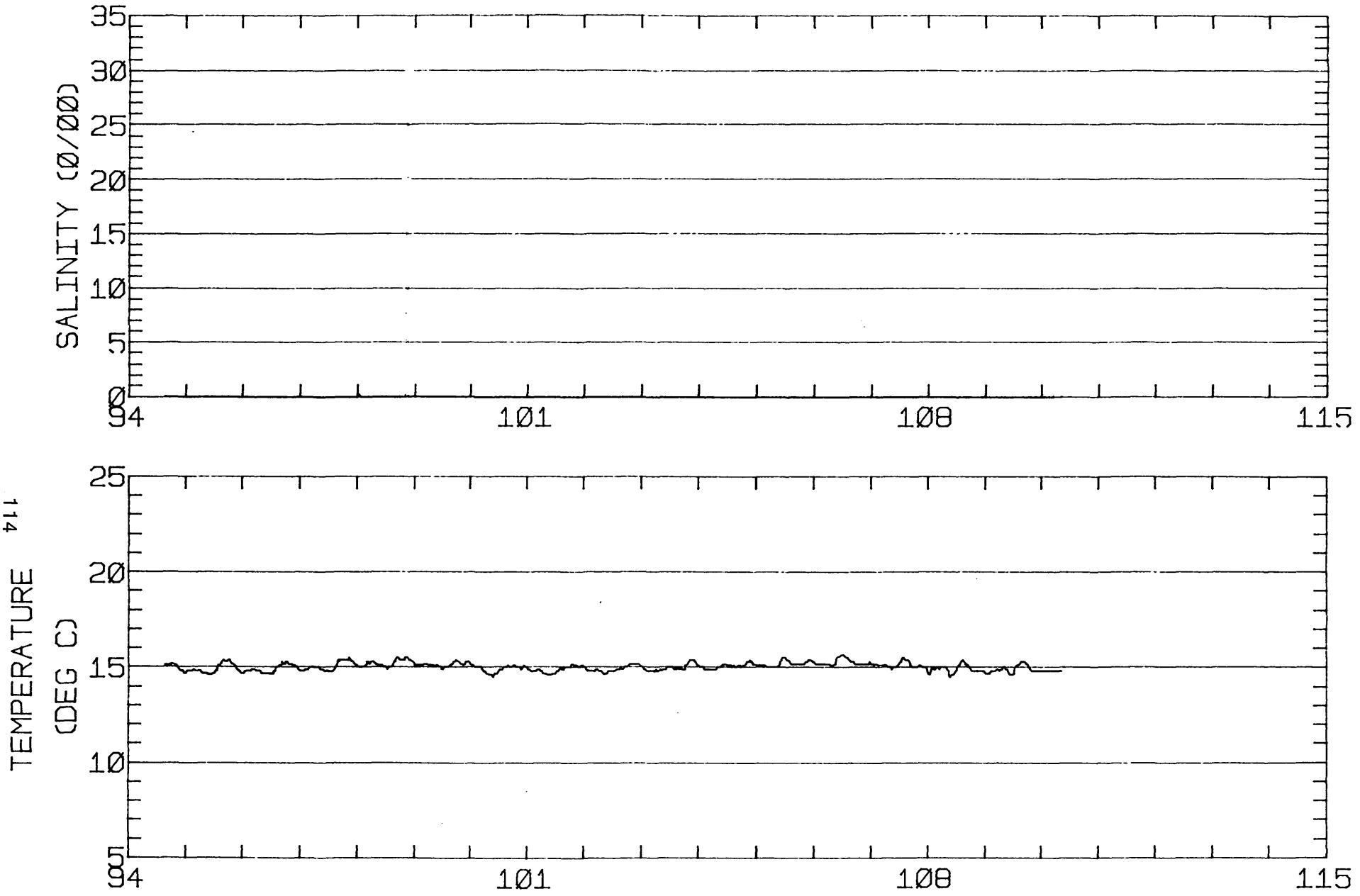
RMS SPEED: 41.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 100.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 63.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 5.42 CM/SEC
STANDARD DEVIATION V SERIES: 3.87 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.8	1.0	623.
2	8	-0.9	0.4	312.
ALL	20	-0.8	0.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3-10N 122- 5-26W
METER 001.6 METERS ABOVE BED. WATER DEPTH 010.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3-10N 122- 5-26W
METER ØØ1.6 METERS ABOVE BED. WATER DEPTH Ø10.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 26
POSITION: 38 3' 6"N 122 5'25"W
METER TYPE: AANDERAA
WATER DEPTH: 10.7 M (MLLW)
METER DEPTH: 9.1 M (BELOW MLLW)
START TIME OF SERIES:10/29/79 1442 PST JULIAN DAY=302
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

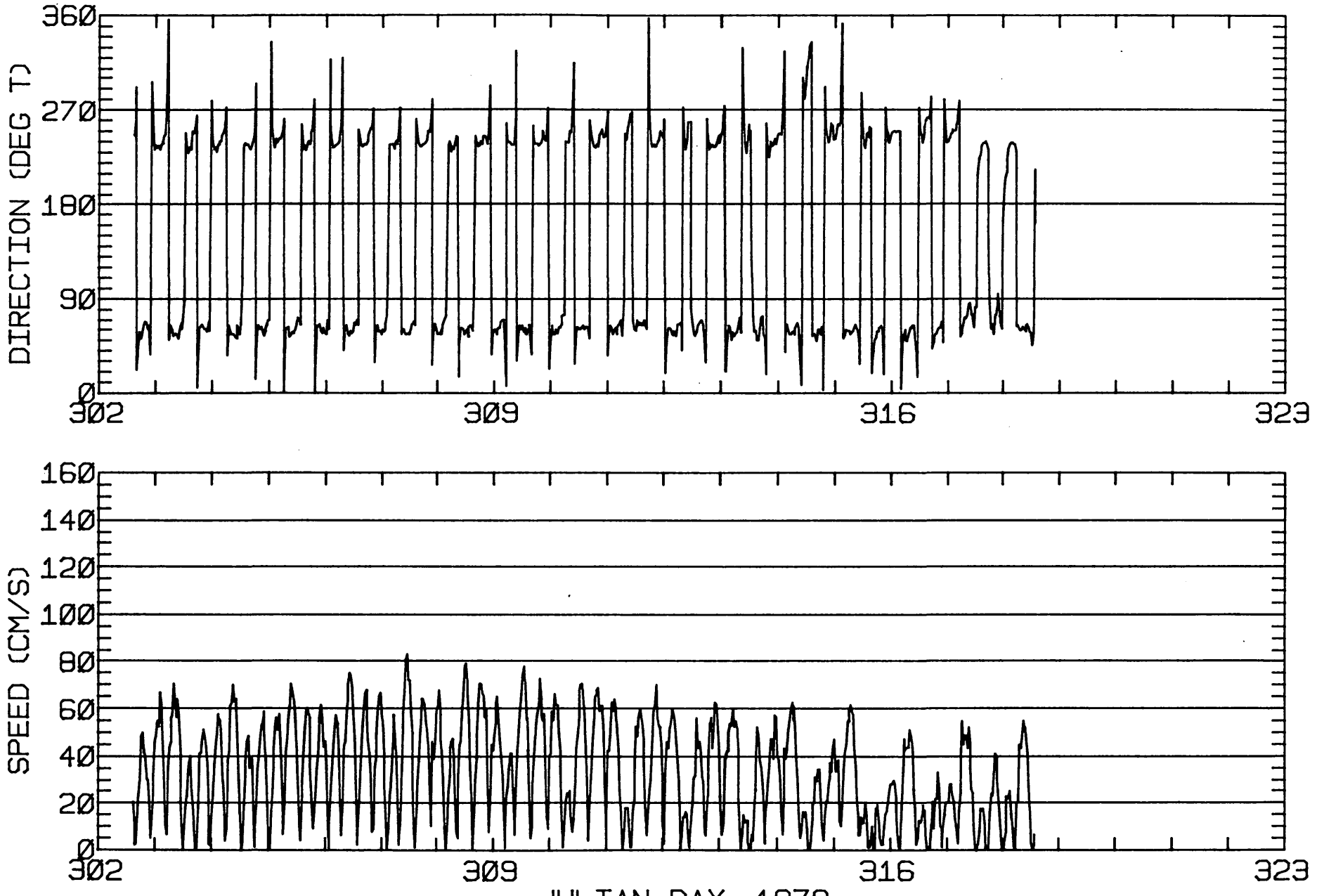
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.13	0.85	64.0	99.5	CLOCKWISE
K1	21.99	0.95	60.5	94.6	CLOCKWISE
N2	8.84	0.21	56.8	3.4	CLOCKWISE
M2	46.06	1.92	60.6	12.2	CLOCKWISE
S2	9.51	1.06	58.6	5.2	CLOCKWISE
M4	2.40	0.75	87.2	314.1	CLOCKWISE

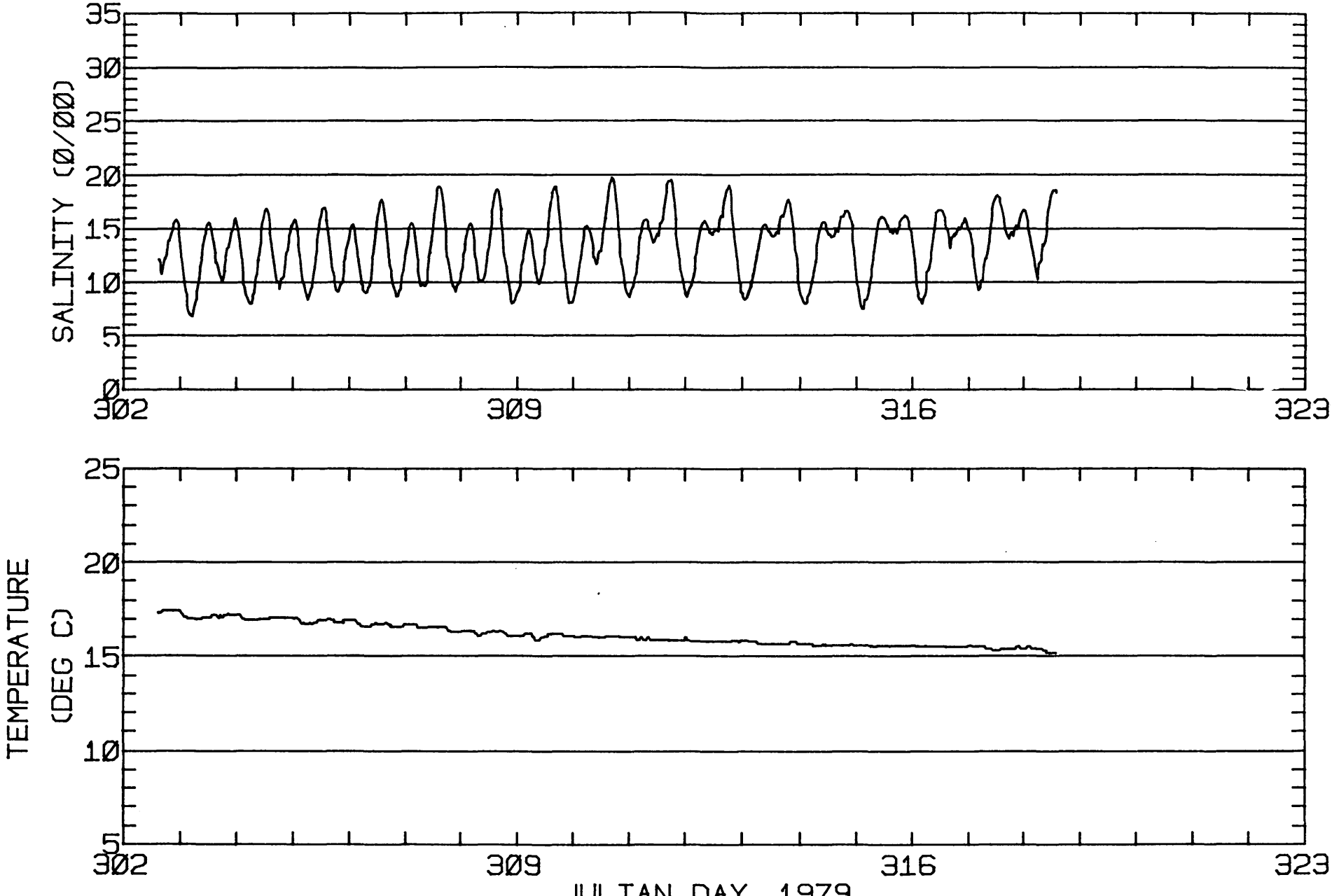
RMS SPEED: 45.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 90.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.63
STANDARD DEVIATION U-SERIES: 5.25 CM/SEC
STANDARD DEVIATION V SERIES: 3.93 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.7	3.0	257.
2	4	5.5	3.9	262.
ALL	16	4.9	3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3- 6N 122- 5-25W
METER 001.6 METERS ABOVE BED. WATER DEPTH 010.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3- 6N 122- 5-25W
METER ØØ1.6 METERS ABOVE BED. WATER DEPTH Ø1Ø.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 26
POSITION: 38 3'10"N 122 5'34"W
METER TYPE: AANDERAA
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 4.6 M (BELOW MLLW)
START TIME OF SERIES:11/16/79 1032 PST JULIAN DAY=320
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

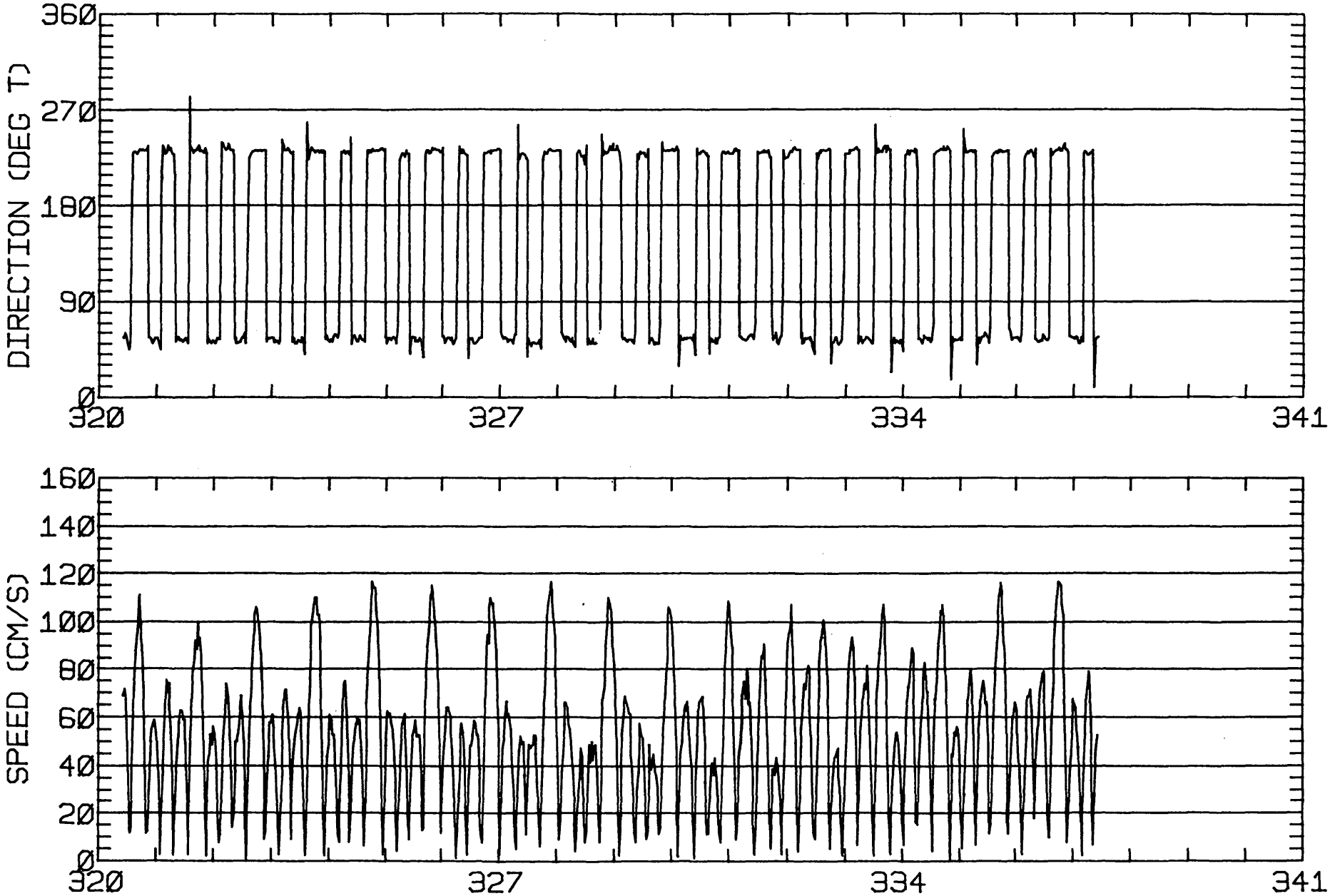
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.32	0.11	52.8	79.9	ANTI-CLOCKWISE
K1	32.85	0.08	54.0	86.8	CLOCKWISE
N2	11.71	0.08	52.5	353.5	CLOCKWISE
M2	68.66	0.36	53.2	16.7	CLOCKWISE
S2	13.49	0.28	54.4	5.8	ANTI-CLOCKWISE
M4	3.21	0.43	51.4	254.8	CLOCKWISE

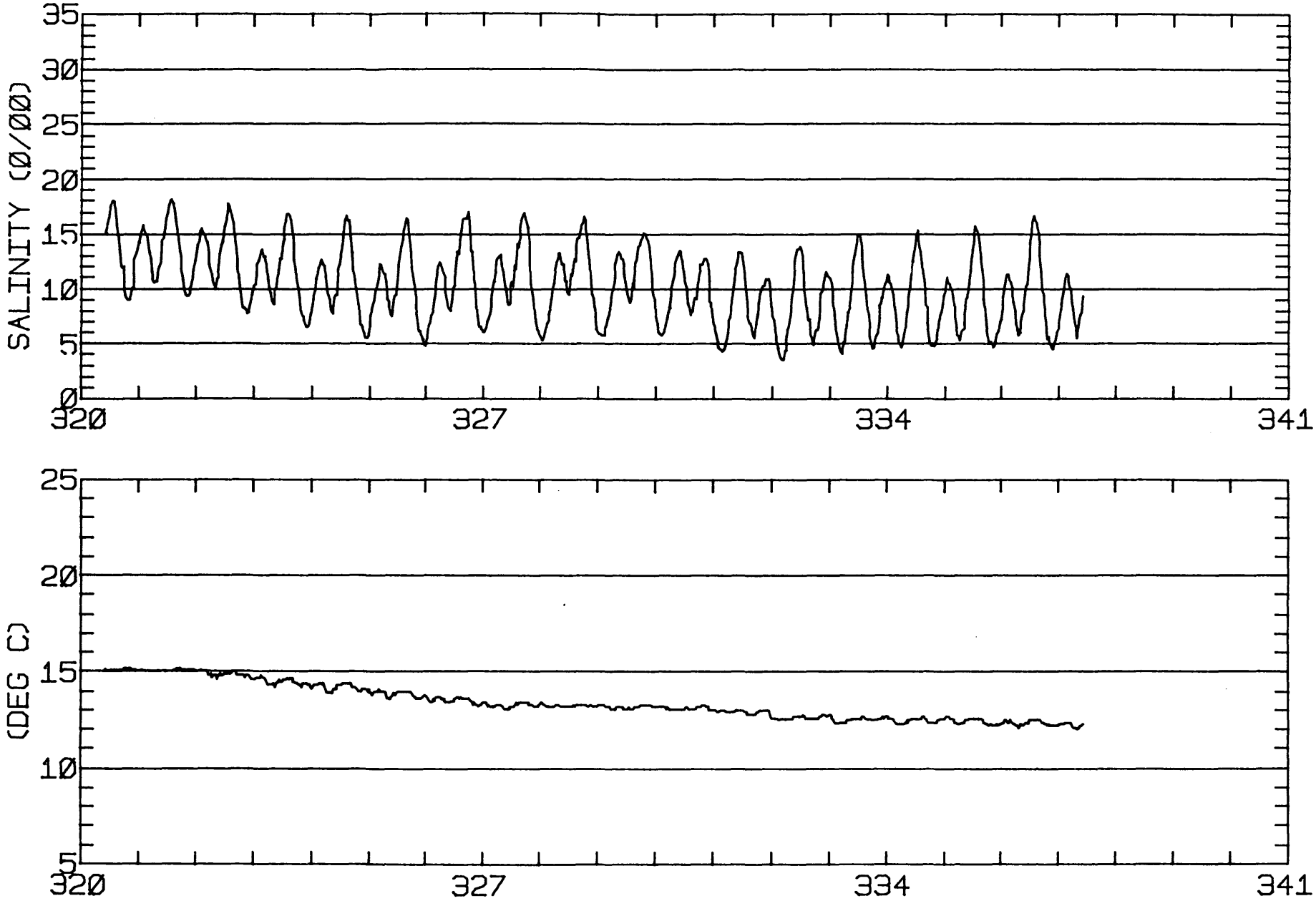
RMS SPEED: 60.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 129.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 53.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.57
STANDARD DEVIATION U-SERIES: 7.66 CM/SEC
STANDARD DEVIATION V SERIES: 6.18 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.1	-7.1	386.
2	12	-8.9	-8.3	429.
3	8	-9.8	-8.9	410.
ALL	32	-8.8	-8.0	



JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3-10N 122- 5-34W
METER 003.0 METERS ABOVE BED. WATER DEPTH 007.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3-10N 122- 5-34W
METER ØØ3.Ø METERS ABOVE BED. WATER DEPTH ØØ7.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 26
POSITION: 38 3' 6"N 122 5'25"W
METER TYPE: AANDERAA
WATER DEPTH: 10.4 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES:10/28/80 1520 PST JULIAN DAY=302
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

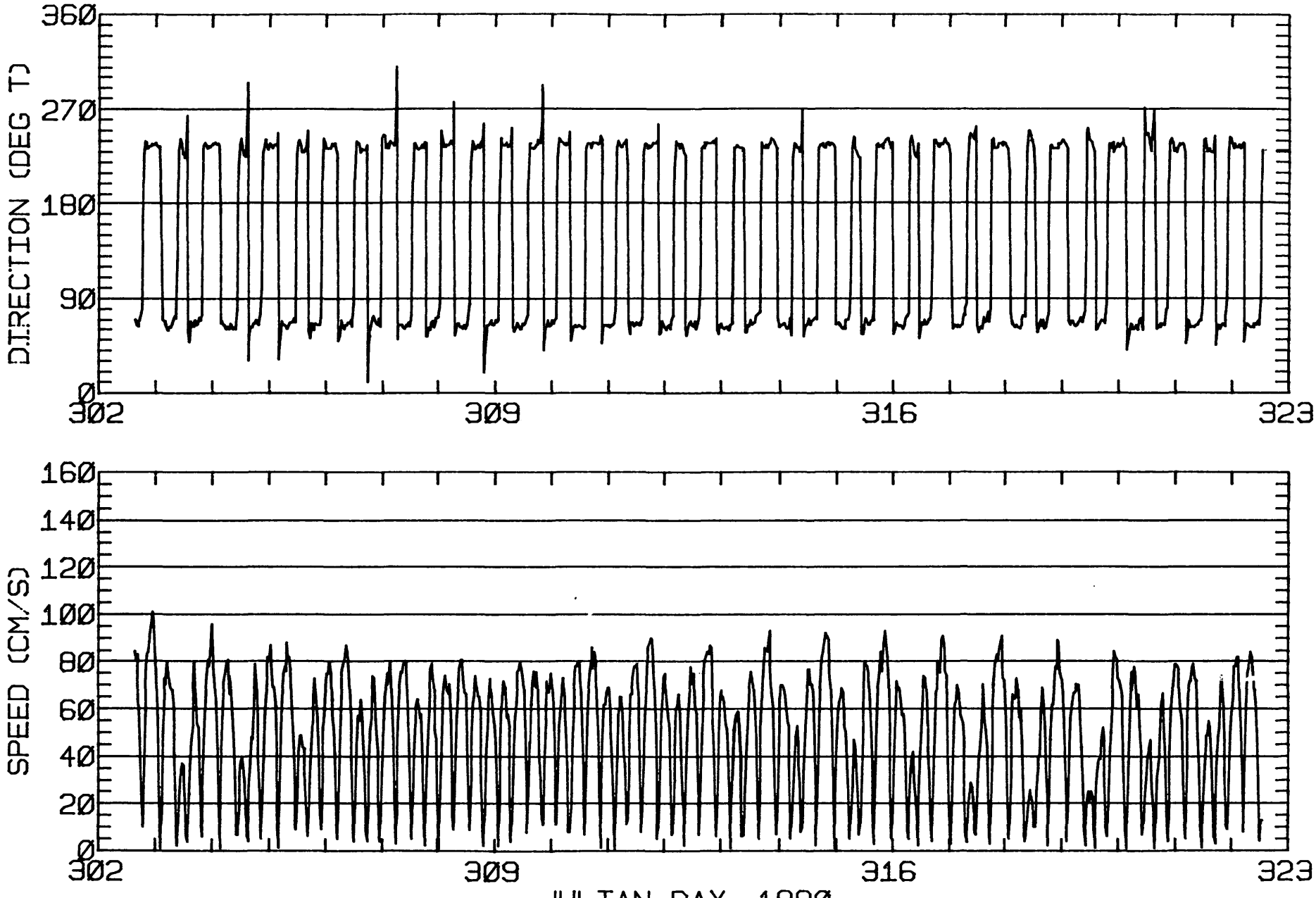
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.80	0.43	57.2	85.7	CLOCKWISE
K1	27.29	0.46	60.5	82.1	CLOCKWISE
N2	20.33	0.70	60.8	350.5	CLOCKWISE
M2	75.60	1.36	61.1	17.0	CLOCKWISE
S2	19.22	0.62	61.2	357.6	CLOCKWISE
M4	1.54	0.88	27.9	277.2	CLOCKWISE

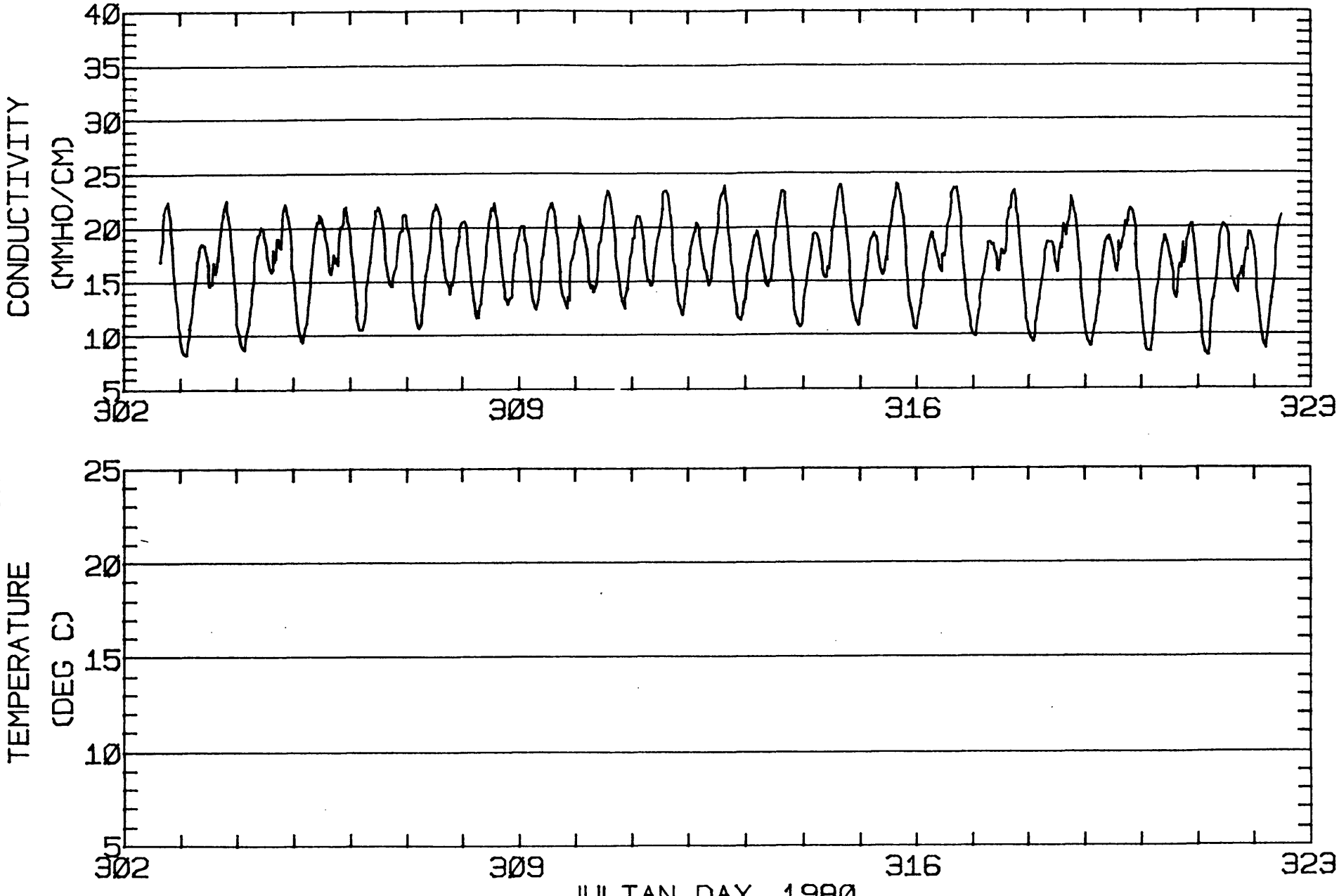
RMS SPEED: 55.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 137.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.45
STANDARD DEVIATION U-SERIES: 8.32 CM/SEC
STANDARD DEVIATION V SERIES: 4.64 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.8	-2.7	157.
2	12	2.3	-3.1	184.
3	12	2.4	-3.0	198.
4	2	3.0	-2.8	181.
ALL	38	2.9	-2.9	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3- 6N 122- 5-25W
METER 004.6 METERS ABOVE BED. WATER DEPTH 010.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3- 6N 122- 5-25W
METER 004.6 METERS ABOVE BED. WATER DEPTH 010.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 26
POSITION: 38 3' 6"N 122 5'25"W
METER TYPE: AANDERAA
WATER DEPTH: 10.4 M (MLLW)
METER DEPTH: 8.8 M (BELOW MLLW)
START TIME OF SERIES:10/28/80 1452 PST JULIAN DAY=302
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

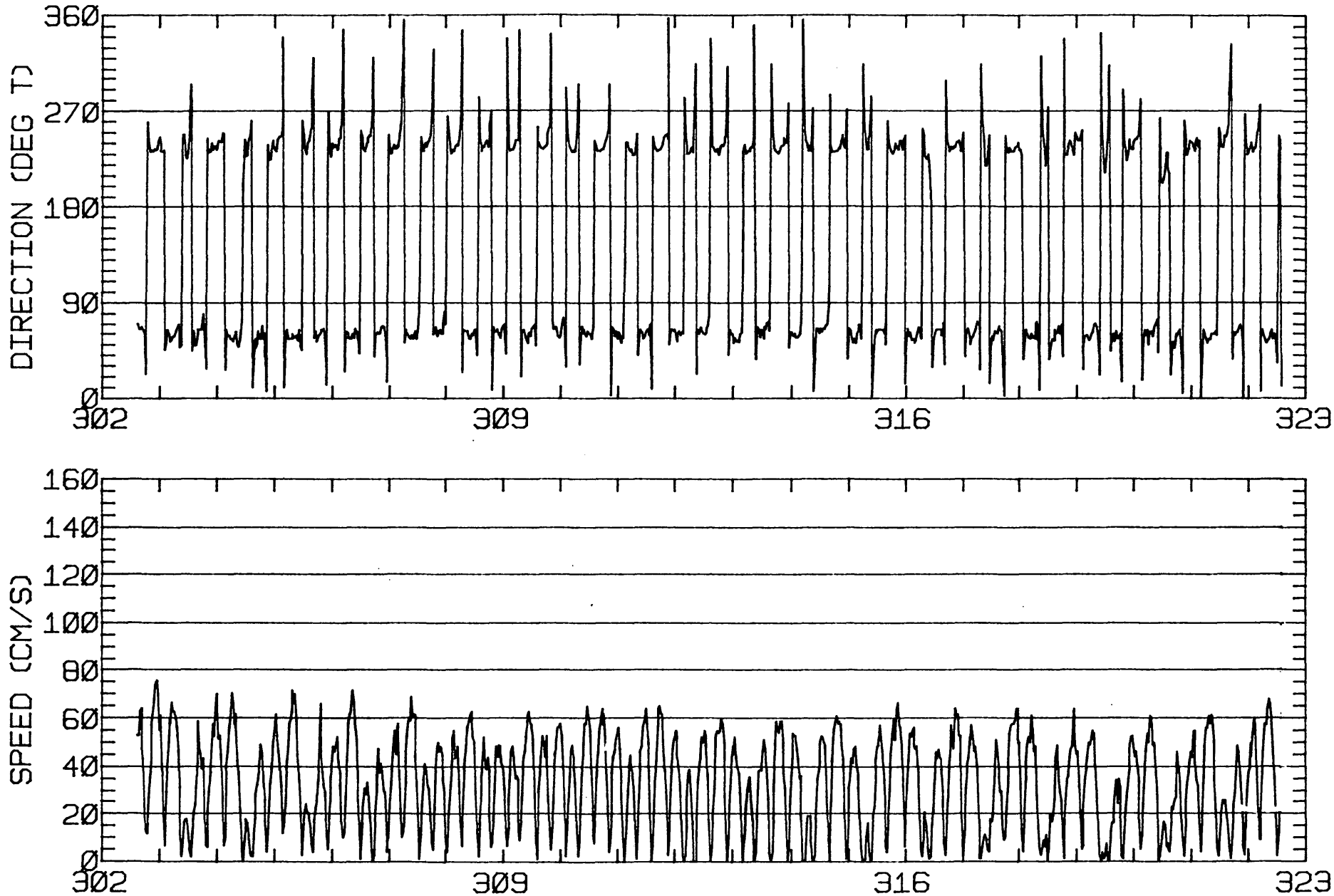
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.10	0.58	56.2	80.7	CLOCKWISE
K1	20.62	0.87	58.8	80.4	CLOCKWISE
N2	14.18	0.33	59.7	344.2	CLOCKWISE
M2	50.85	1.40	59.3	16.0	CLOCKWISE
S2	12.65	0.10	60.4	356.6	ANTI-CLOCKWISE
M4	1.07	0.65	124.9	355.1	CLOCKWISE

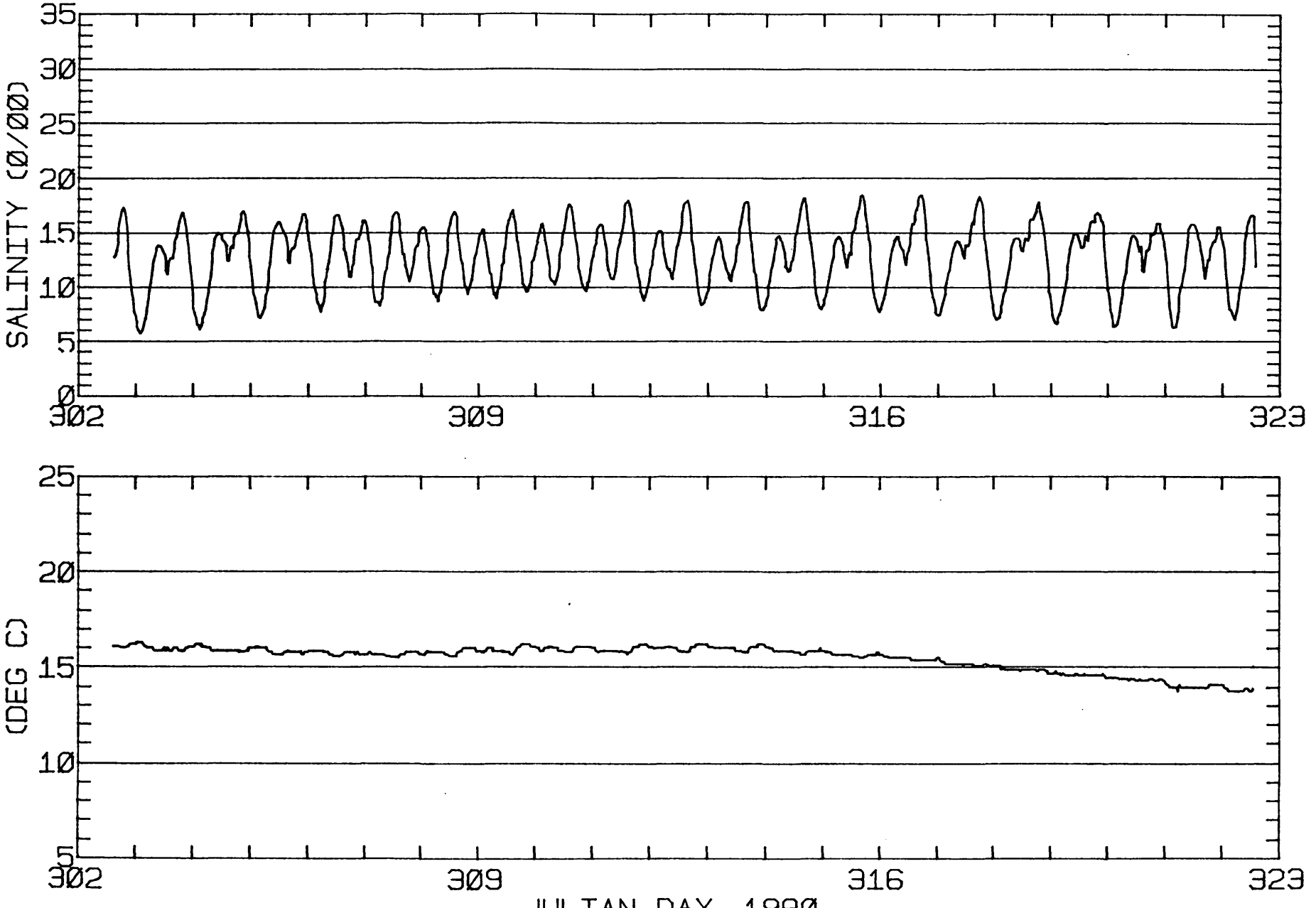
RMS SPEED: 38.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 96.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 59.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 5.58 CM/SEC
STANDARD DEVIATION V SERIES: 4.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.9	3.0	157.
2	12	3.9	0.8	184.
3	12	4.0	1.7	198.
4	2	4.0	3.1	181.
ALL	38	4.2	1.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3- 6N 122- 5-25W
METER 001.6 METERS ABOVE BED. WATER DEPTH 010.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 26 38- 3- 6N 122- 5-25W
METER 001.6 METERS ABOVE BED. WATER DEPTH 010.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 27
POSITION: 38 4'43"N 122 5' 2"W
METER TYPE: AANDERAA
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 7.3 M (BELOW MLLW)
START TIME OF SERIES:10/29/79 1644 PST JULIAN DAY=302
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

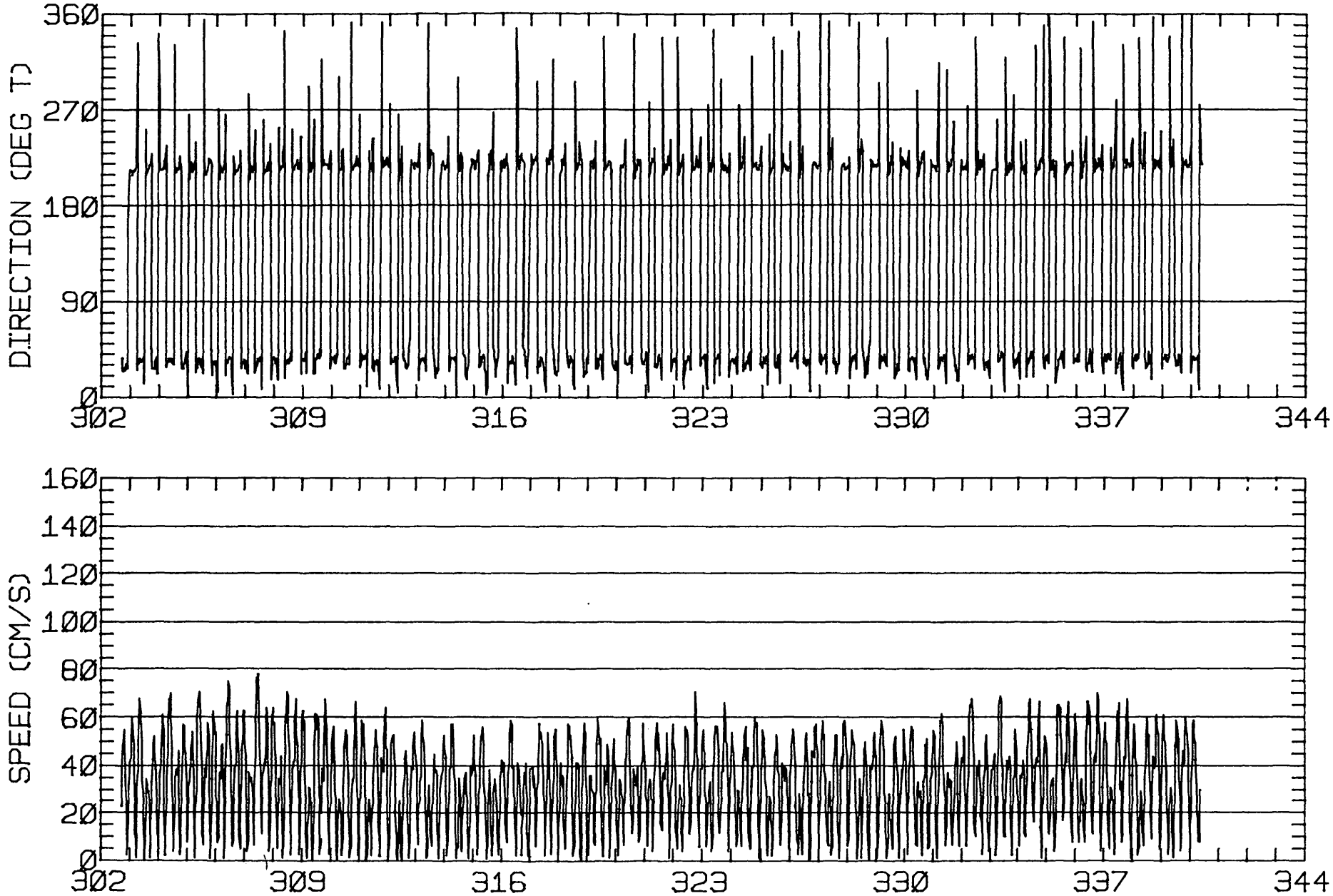
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.81	0.45	32.4	85.9	ANTI-CLOCKWISE
K1	18.31	0.65	37.3	87.0	ANTI-CLOCKWISE
N2	7.03	0.09	34.5	341.4	ANTI-CLOCKWISE
M2	44.59	0.31	36.2	18.8	CLOCKWISE
S2	7.78	0.44	35.7	344.4	CLOCKWISE
M4	2.30	0.34	44.5	328.4	CLOCKWISE

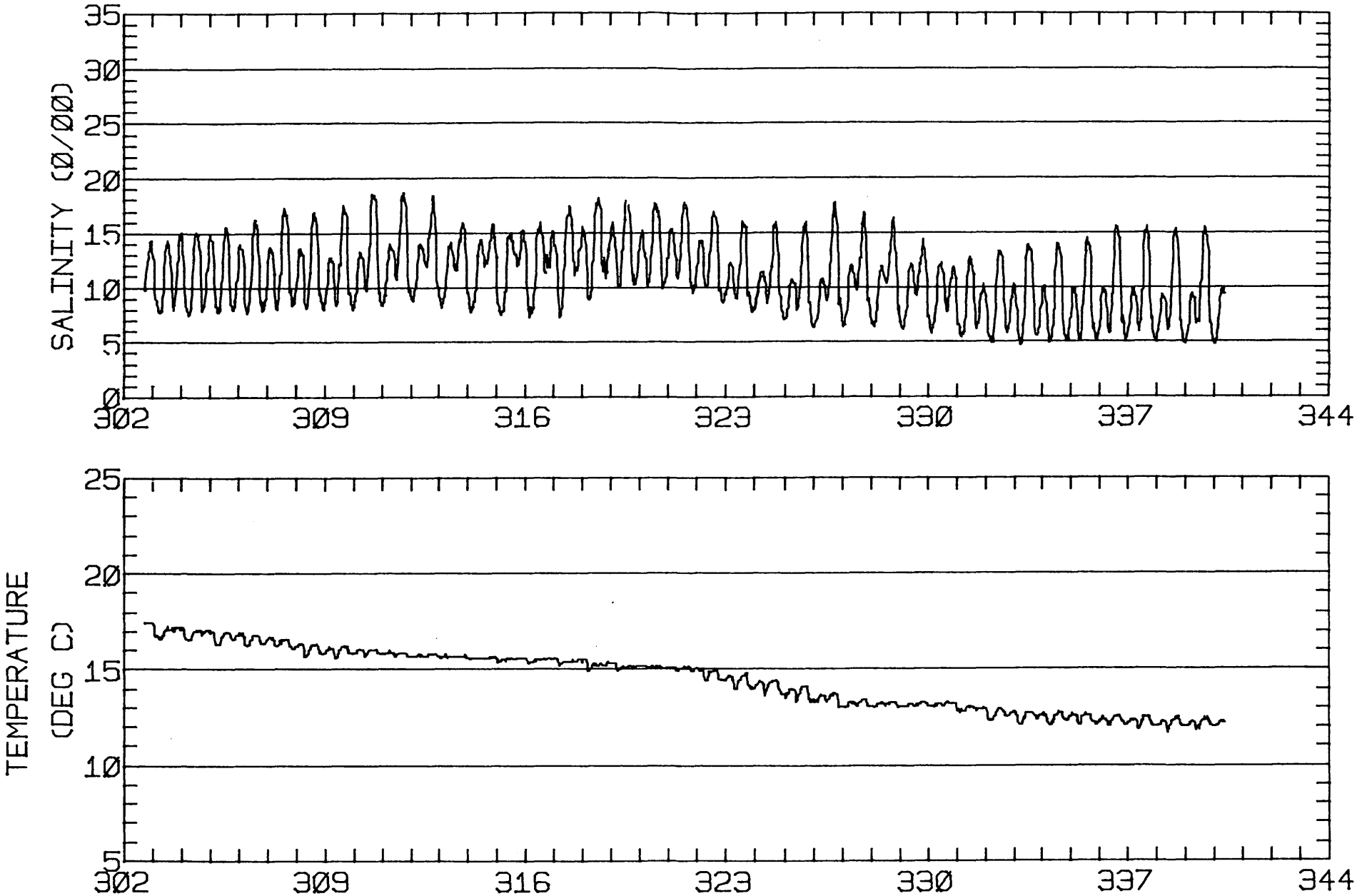
RMS SPEED: 37.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 79.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 36.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 5.07 CM/SEC
STANDARD DEVIATION V SERIES: 6.40 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	5.6	226.
2	12	1.4	4.9	303.
3	12	1.4	6.4	257.
4	12	1.7	5.3	409.
5	10	0.5	4.5	444.
ALL	58	1.4	5.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 27 38- 4-43N 122- 5- 2W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 27 38- 4-43N 122- 5- 2W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 28
POSITION: 38 7' 8"N 122 3'12"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 4/17/79 1420 PST JULIAN DAY=107
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

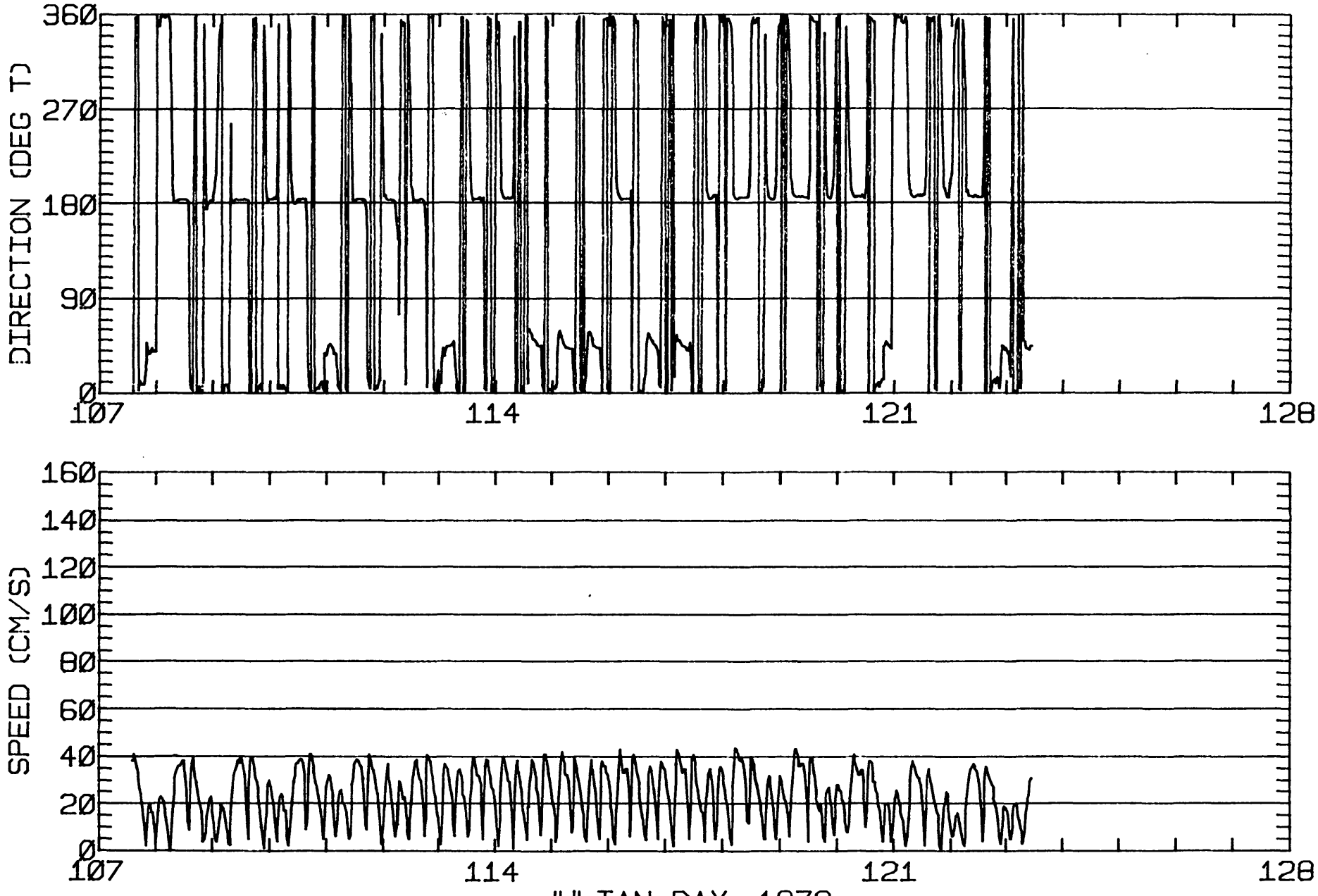
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.69	0.08	12.8	56.6	ANTI-CLOCKWISE
K1	12.12	0.65	6.6	75.3	CLOCKWISE
N2	2.65	1.41	325.5	355.3	CLOCKWISE
M2	24.17	0.46	356.6	349.2	ANTI-CLOCKWISE
S2	3.24	2.52	55.5	131.0	CLOCKWISE
M4	3.97	0.94	8.2	312.0	CLOCKWISE

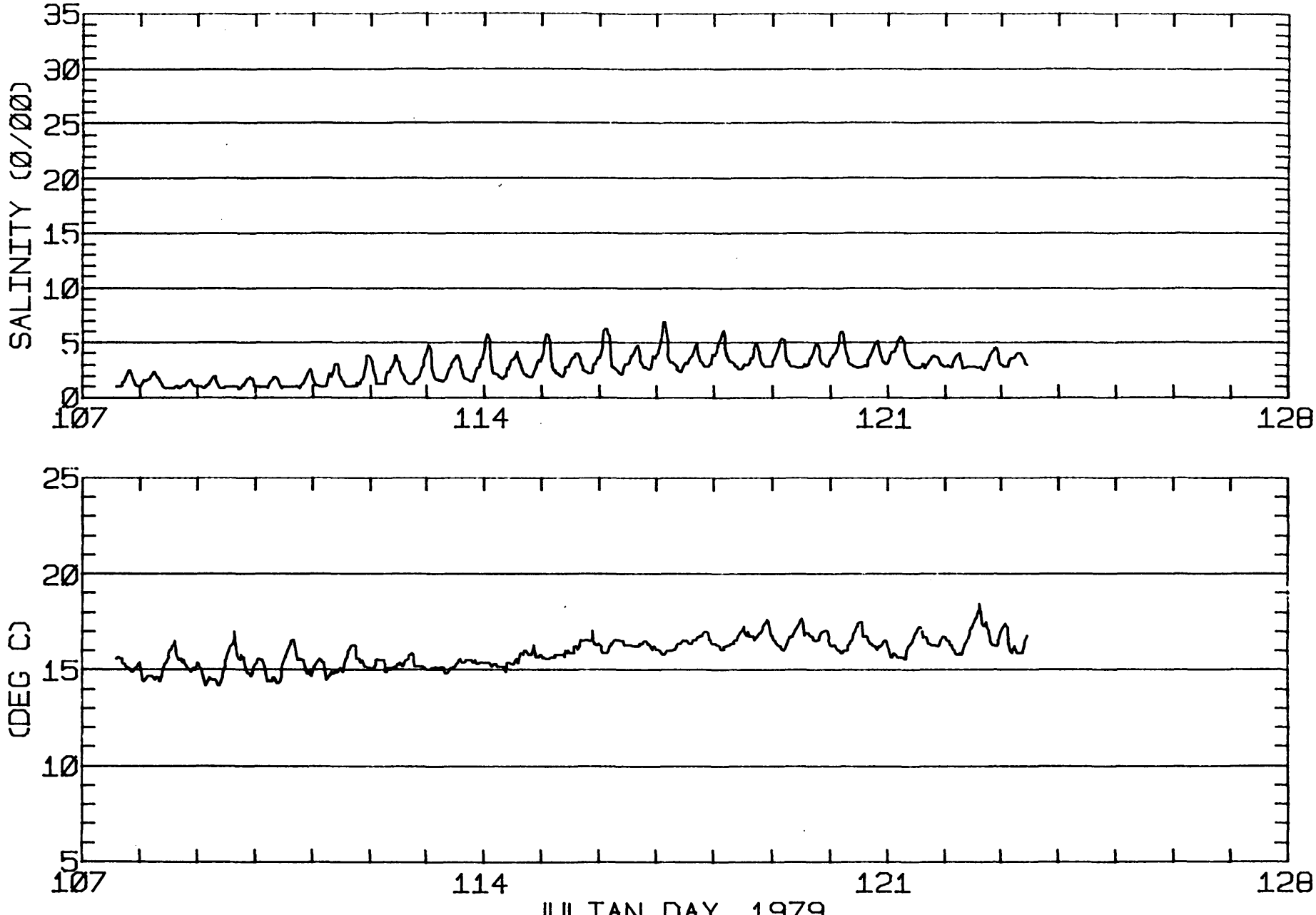
RMS SPEED: 26.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 49.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 6.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.80
STANDARD DEVIATION U-SERIES: 6.80 CM/SEC
STANDARD DEVIATION V SERIES: 14.41 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.0	1.9	232.
2	12	2.7	8.8	286.
3	6	-0.7	1.4	303.
ALL	30	1.3	4.5	



JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 28 38- 7- 8N 122- 3-12W
METER 000.9 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 28 38- 7- 8N 122- 3-12W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 28
POSITION: 38 7' 7"N 122 3'22"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 1/79 1130 PST JULIAN DAY=305
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

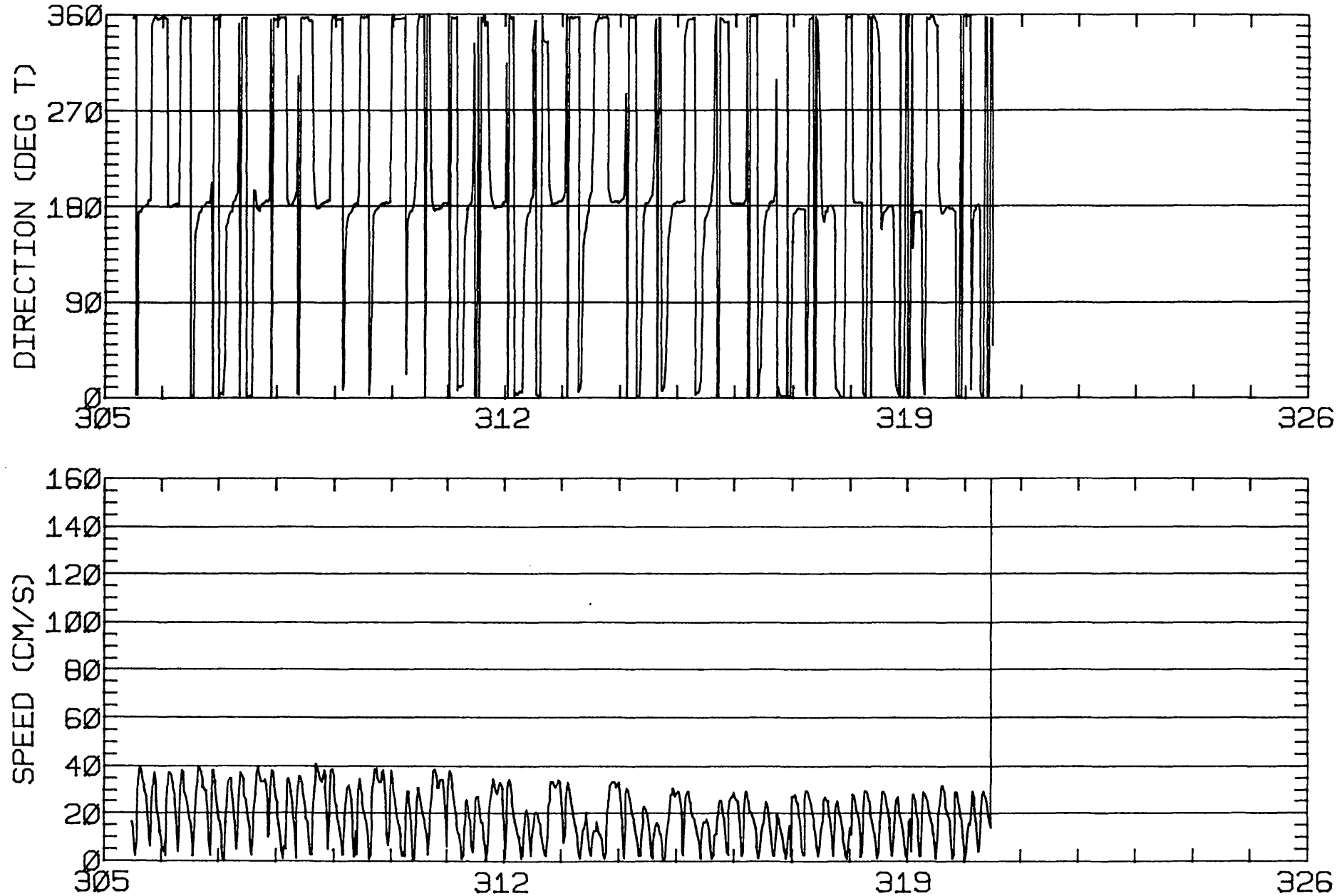
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.61	0.17	7.2	96.6	ANTI-CLOCKWISE
K1	9.37	0.35	3.4	65.6	CLOCKWISE
N2	2.63	0.54	356.8	318.6	CLOCKWISE
M2	26.79	0.57	359.8	4.0	CLOCKWISE
S2	4.53	0.12	355.9	336.5	ANTI-CLOCKWISE
M4	4.13	0.27	10.1	280.2	CLOCKWISE

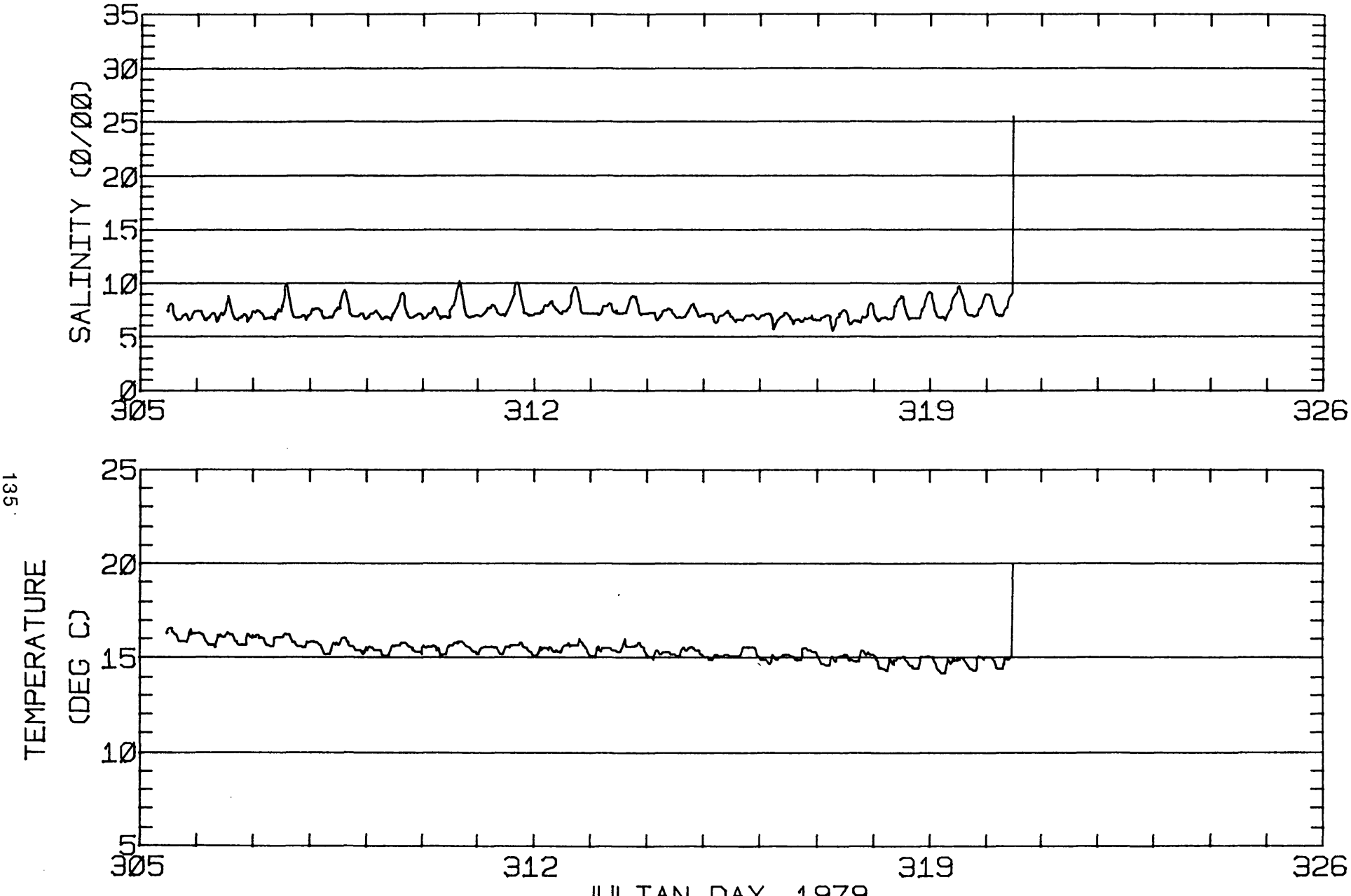
RMS SPEED: 22.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 46.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 1.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 1.60 CM/SEC
STANDARD DEVIATION V SERIES: 6.66 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.4	-1.7	218.
2	12	-0.3	-1.6	307.
3	4	0.4	0.8	225.
ALL	28	-0.2	-1.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 28 38- 7- 7N 122- 3-22W
METER 000.9 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 28 38- 7- 7N 122- 3-22W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 29
POSITION: 38 4'25"N 122 1'18"W
METER TYPE: AANDERAA
WATER DEPTH: 6.1 M (MLLW)
METER DEPTH: 4.6 M (BELOW MLLW)
START TIME OF SERIES: 4/17/79 1710 PST JULIAN DAY=107
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

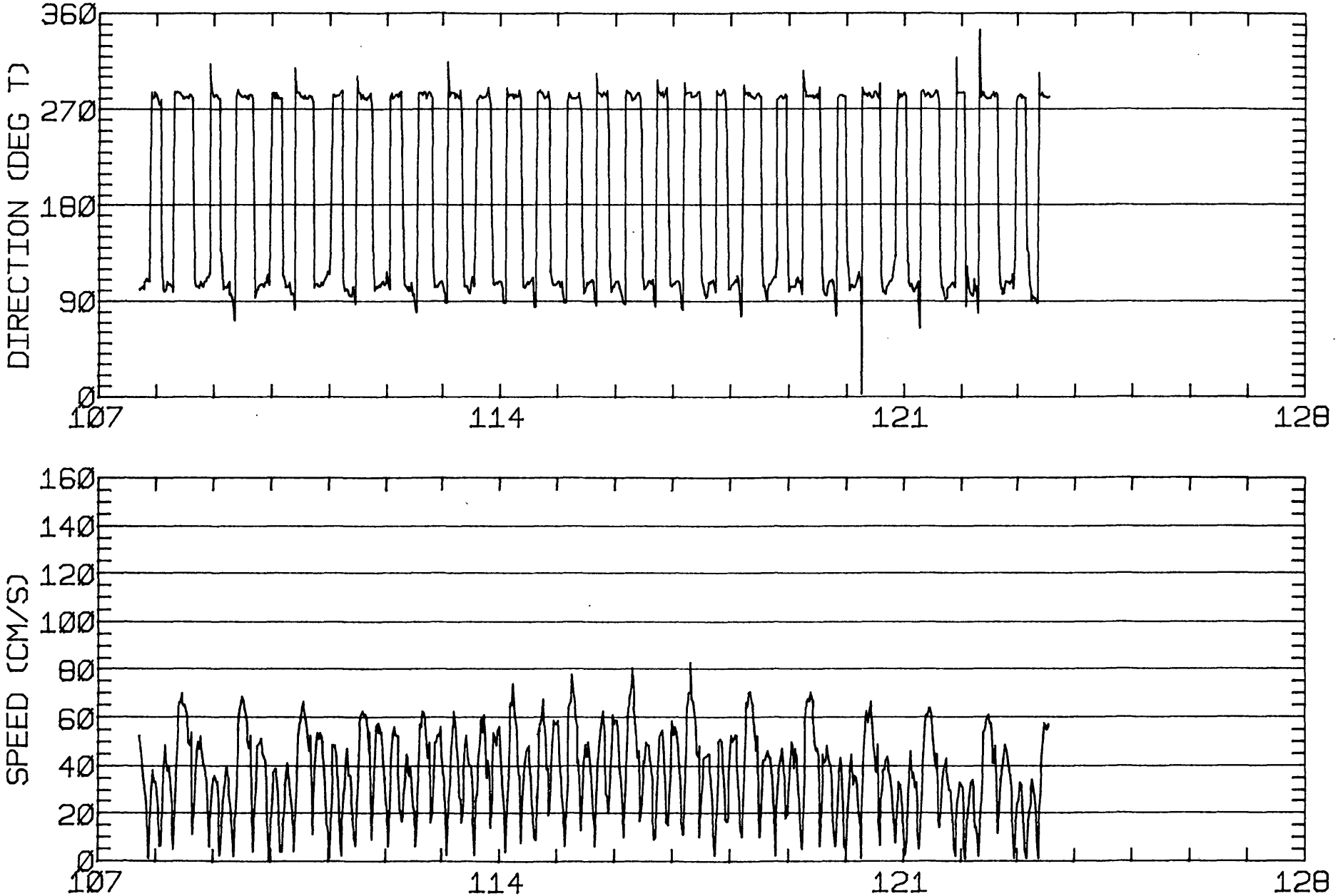
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.31	0.11	103.5	100.9	ANTI-CLOCKWISE
K1	20.15	0.23	105.9	93.9	ANTI-CLOCKWISE
N2	9.16	0.74	104.0	26.5	ANTI-CLOCKWISE
M2	47.90	0.64	103.7	34.9	ANTI-CLOCKWISE
S2	8.73	0.88	103.5	44.9	ANTI-CLOCKWISE
M4	2.60	0.39	101.7	325.4	ANTI-CLOCKWISE

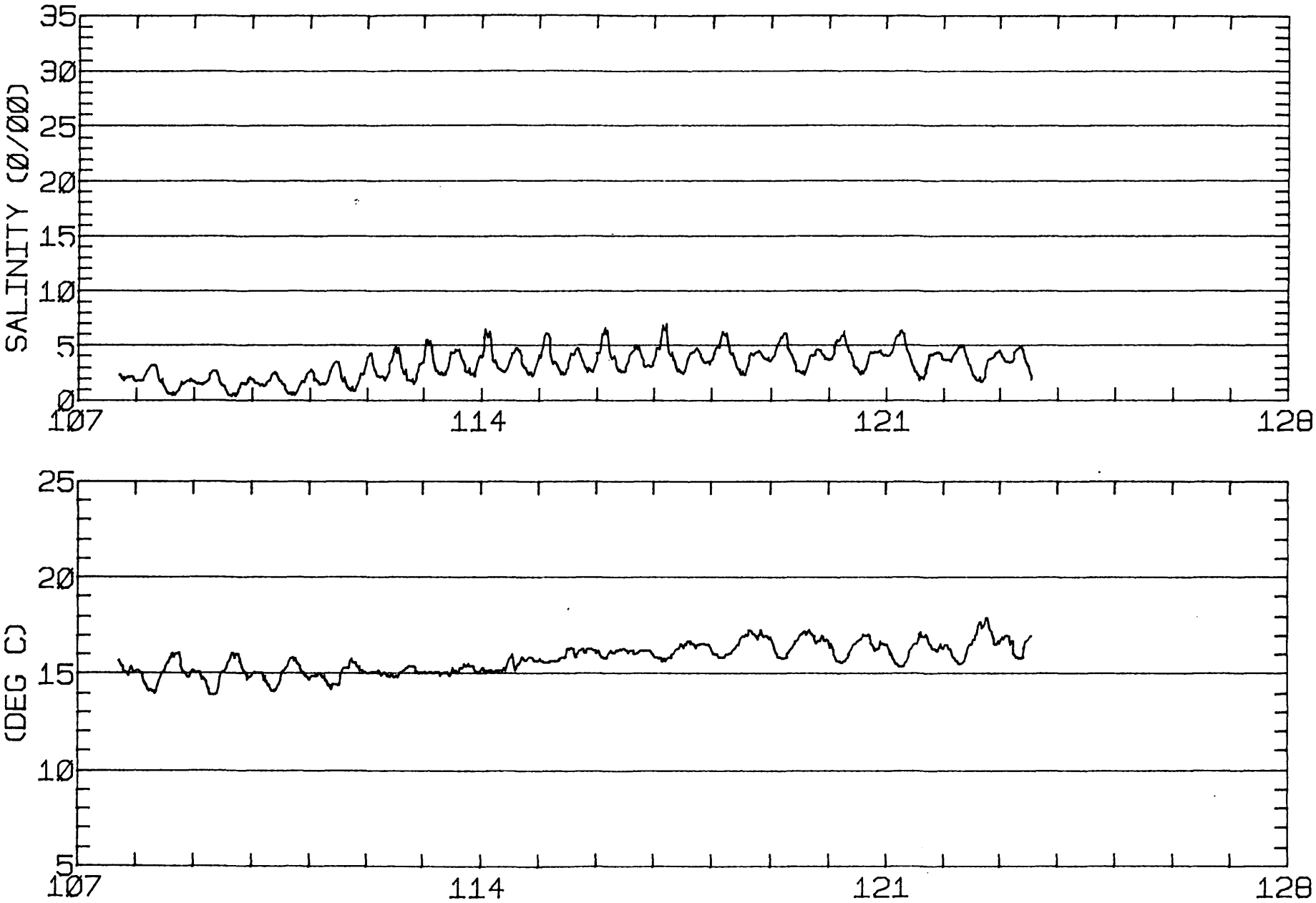
RMS SPEED: 41.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 87.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 104.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.54
STANDARD DEVIATION U-SERIES: 8.13 CM/SEC
STANDARD DEVIATION V SERIES: 3.72 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.9	0.2	227.
2	12	-3.5	-0.1	286.
3	6	-5.0	0.9	303.
ALL	30	-4.0	0.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 29 38- 4-25N 122- 1-18W
METER 001.5 METERS ABOVE BED. WATER DEPTH 006.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 29 38- 4-25N 122- 1-18W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ6.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 30
POSITION: 38 5'23"N 122 0'27"W
METER TYPE: AANDERAA
WATER DEPTH: 10.4 M (MLLW)
METER DEPTH: 8.8 M (BELOW MLLW)
START TIME OF SERIES: 4/18/79 1220 PST JULIAN DAY=108
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

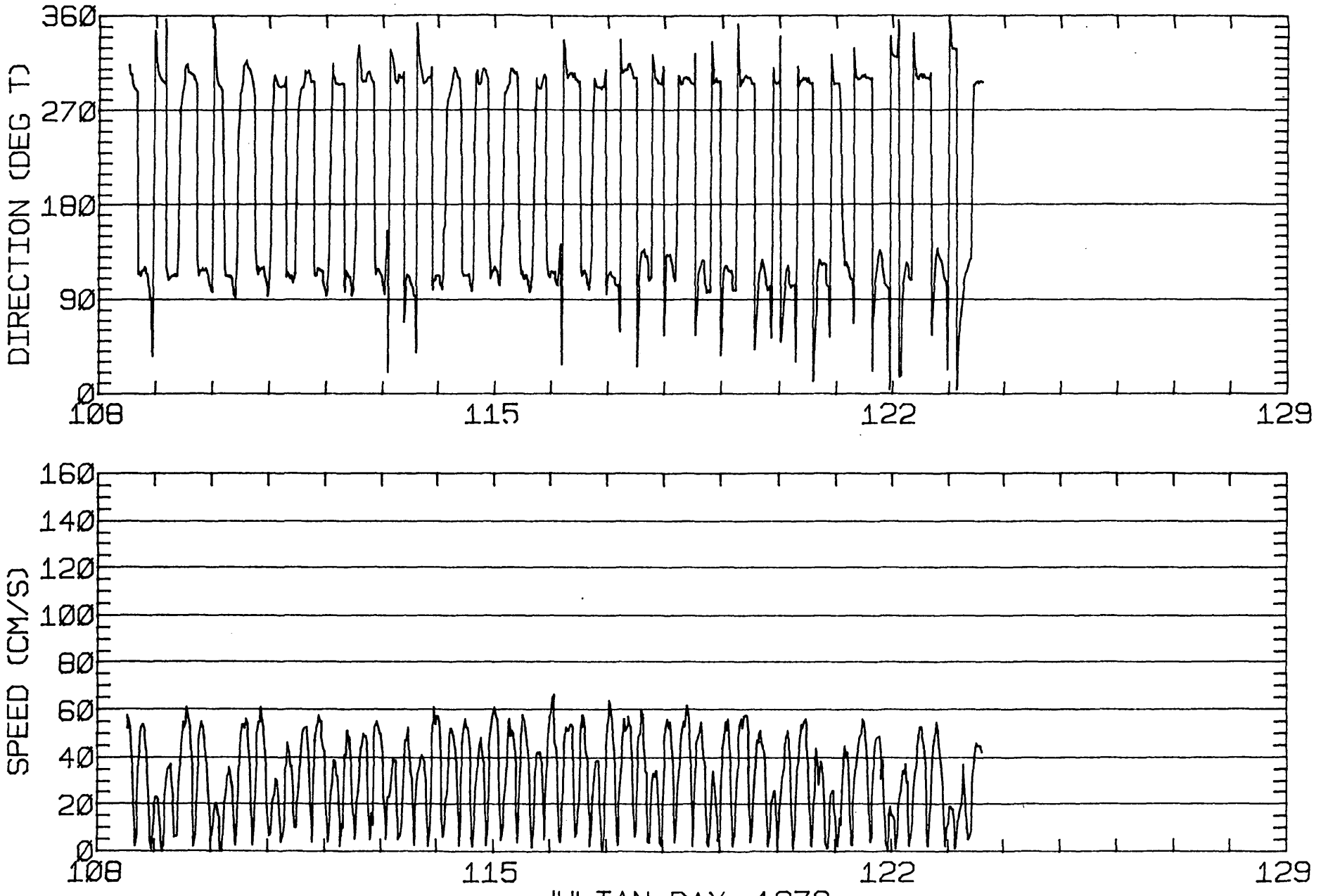
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.41	0.17	121.1	105.4	CLOCKWISE
K1	17.91	0.39	121.5	100.5	ANTI-CLOCKWISE
N2	6.63	0.58	115.8	36.1	ANTI-CLOCKWISE
M2	42.01	0.51	119.0	51.1	CLOCKWISE
S2	7.32	0.42	109.6	55.1	CLOCKWISE
M4	3.35	0.25	115.3	74.8	CLOCKWISE

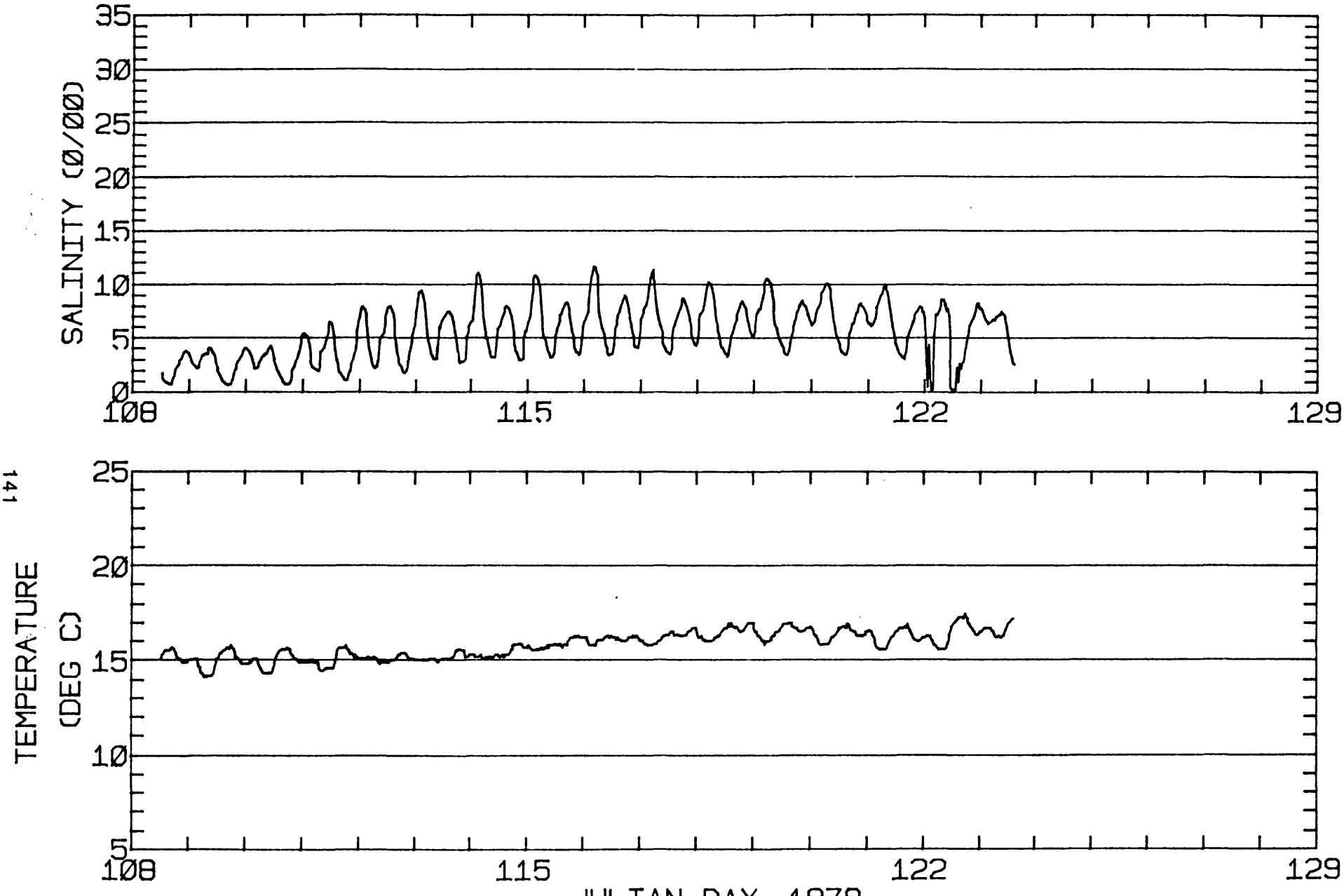
RMS SPEED: 37.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 76.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 118.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.55
STANDARD DEVIATION U-SERIES: 6.60 CM/SEC
STANDARD DEVIATION V SERIES: 6.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.9	1.5	227.
2	12	2.6	1.3	293.
3	4	1.2	1.4	305.
ALL	28	2.5	1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 30 38- 5-23N 122- 0-27W
METER 001.6 METERS ABOVE BED. WATER DEPTH 010.4 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 3Ø 38- 5-23N 122- Ø-27W
METER ØØ1.6 METERS ABOVE BED. WATER DEPTH Ø1Ø.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 30
POSITION: 38 5'20"N 122 0'26"W
METER TYPE: AANDERAA
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 7.3 M (BELOW MLLW)
START TIME OF SERIES:10/30/79 1020 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

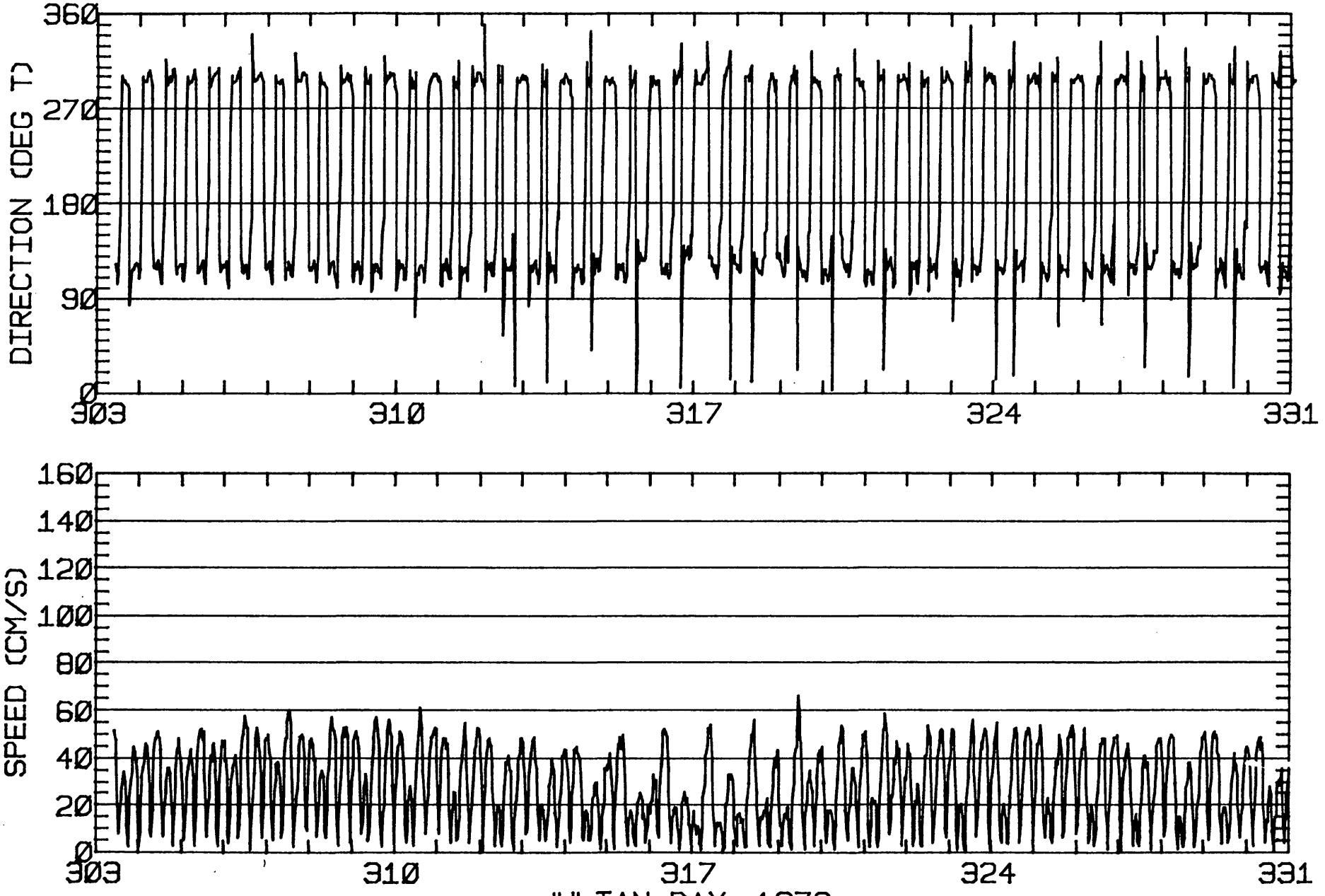
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.68	0.57	116.1	105.4	CLOCKWISE
K1	16.63	0.52	119.6	103.8	CLOCKWISE
N2	5.40	0.00	126.6	26.3	CLOCKWISE
M2	37.33	0.48	119.6	48.9	CLOCKWISE
S2	8.40	0.46	115.1	36.0	ANTI-CLOCKWISE
M4	0.49	0.38	16.9	184.8	ANTI-CLOCKWISE

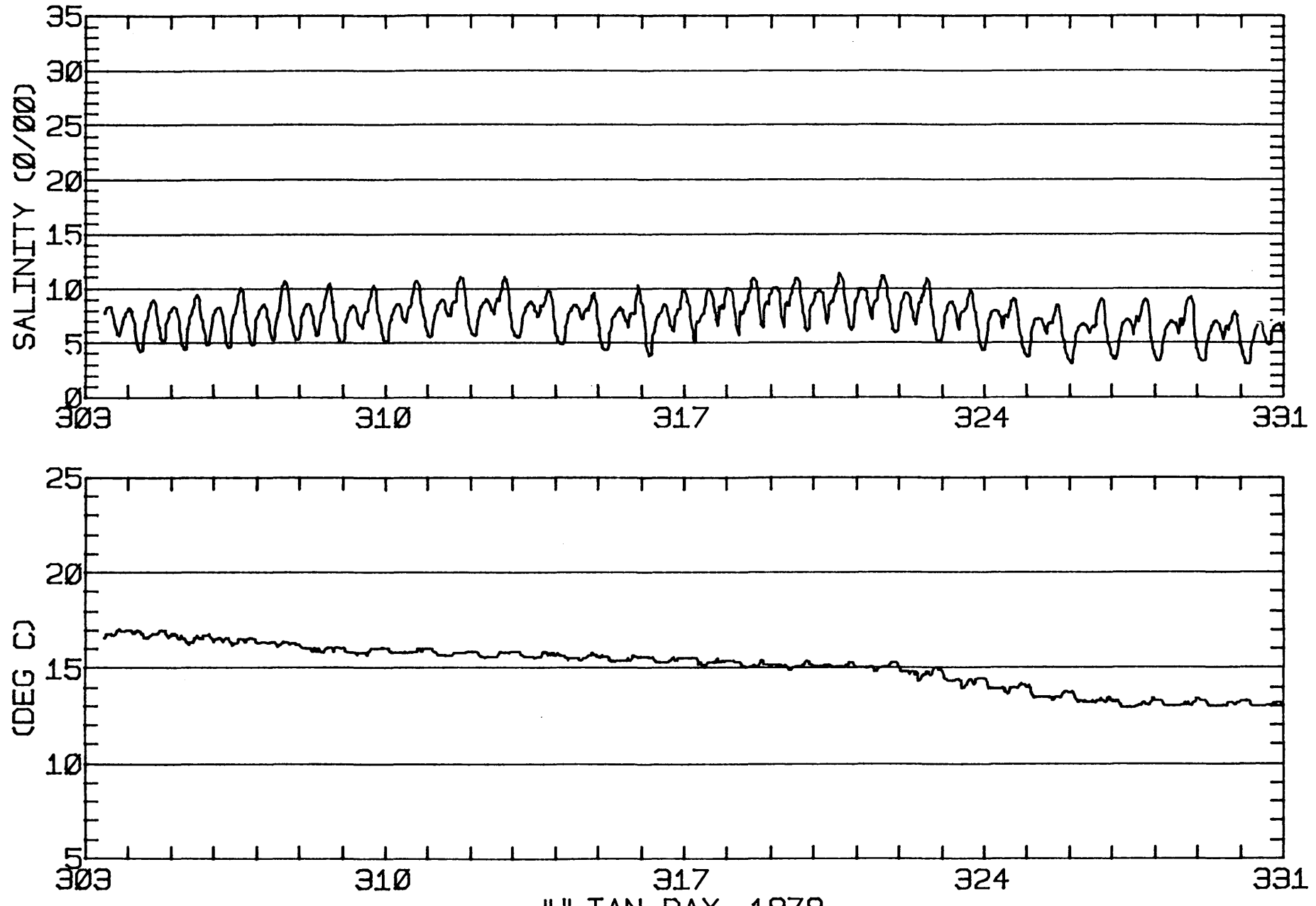
RMS SPEED: 32.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 72.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 118.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.58
STANDARD DEVIATION U-SERIES: 9.57 CM/SEC
STANDARD DEVIATION V SERIES: 4.55 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.1	-2.6	226.
2	12	3.6	-2.2	303.
3	12	7.5	-4.9	255.
4	12	3.8	-2.2	423.
5	10	-1.9	-1.9	395.
ALL	58	3.6	-2.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 30 38- 5-20N 122- 0-26W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 30 38- 5-20N 122- Ø-26W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 31
POSITION: 38 3'53"N 121 57'20"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 4/18/79 1030 PST JULIAN DAY=108
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

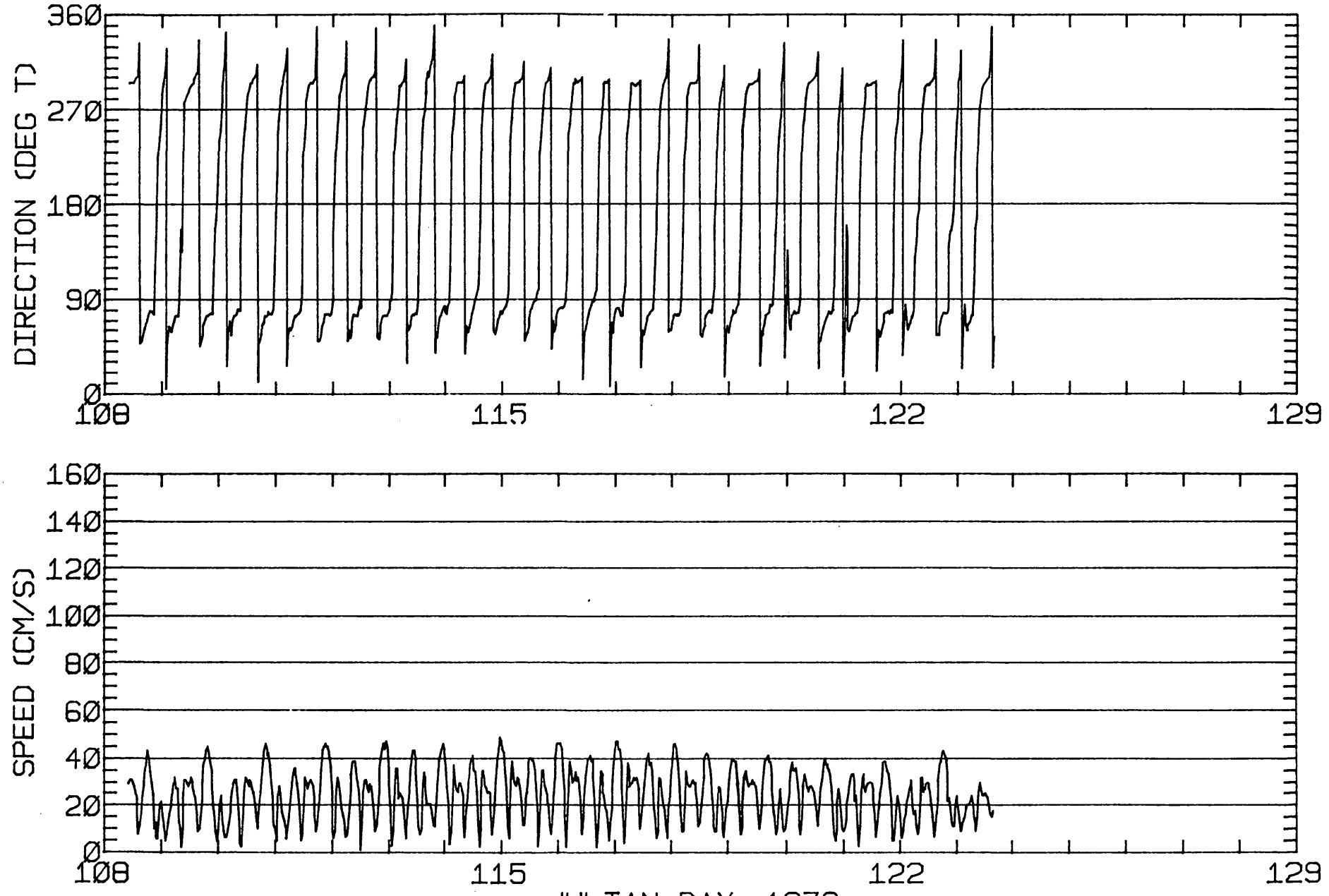
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.43	1.90	118.8	92.3	CLOCKWISE
K1	11.00	1.60	96.6	83.1	CLOCKWISE
N2	5.43	0.12	91.5	10.2	CLOCKWISE
M2	29.71	5.78	87.7	20.7	CLOCKWISE
S2	5.82	0.62	94.2	35.8	CLOCKWISE
M4	4.37	1.67	33.0	77.4	CLOCKWISE

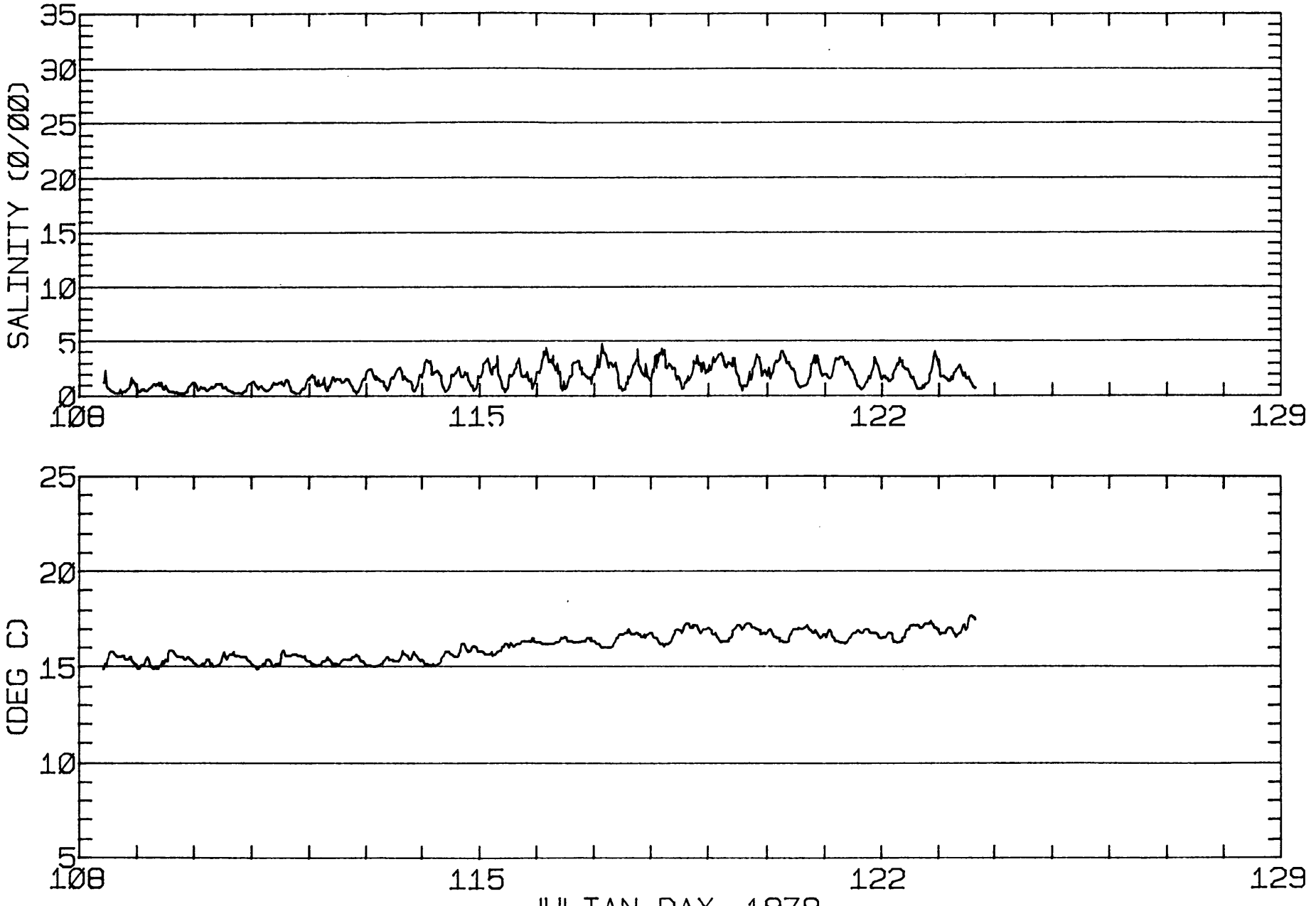
RMS SPEED: 28.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 52.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 93.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 5.78 CM/SEC
STANDARD DEVIATION V SERIES: 4.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.4	6.7	227.
2	12	5.1	6.6	286.
3	4	3.8	4.8	305.
ALL	28	5.0	6.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 31 38- 3-53N 121-57-20W
METER 000.9 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 31 38- 3-53N 121-57-20W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 32
POSITION: 38 2'52"N 121 55'18"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 4/ 4/79 1400 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

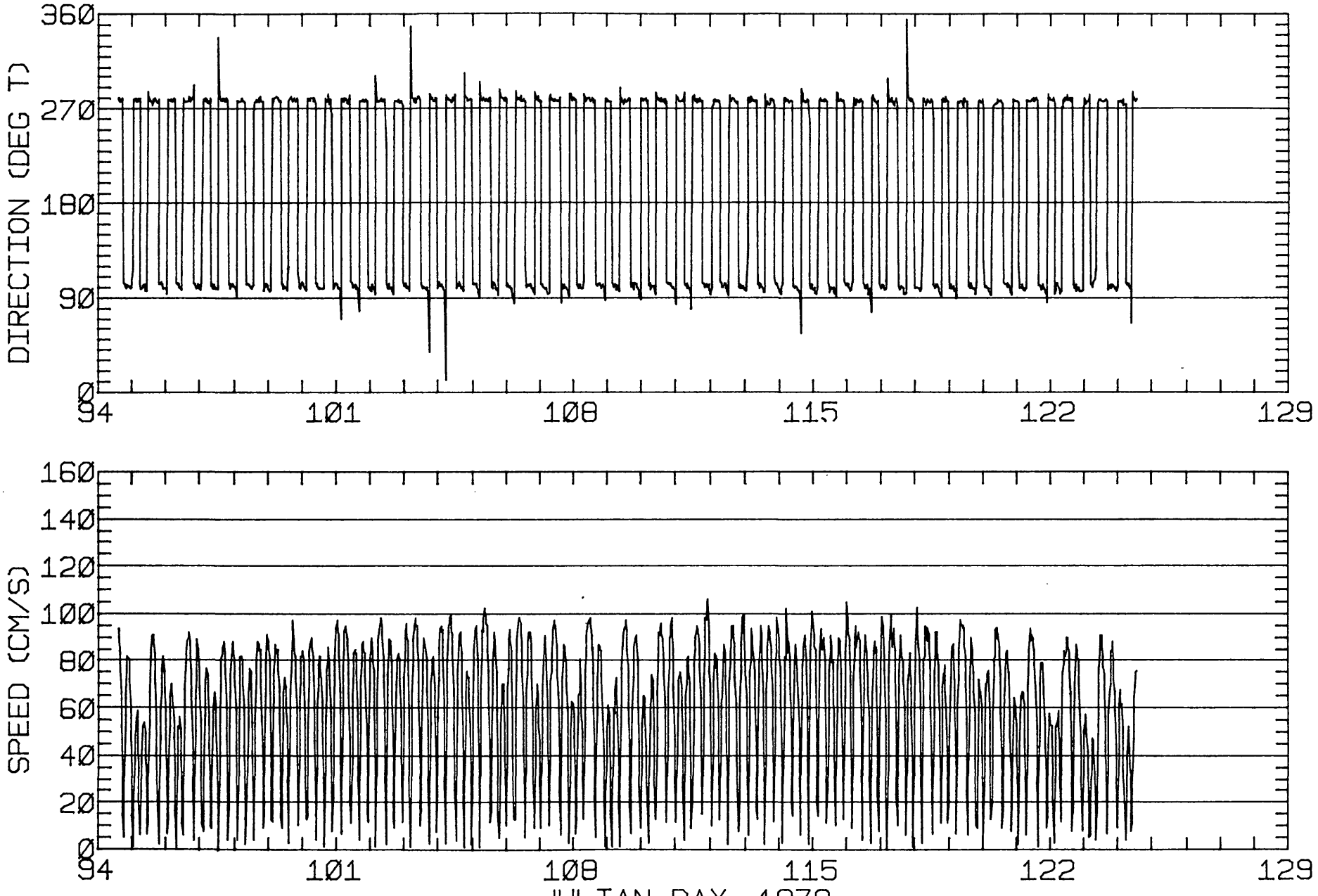
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.60	0.39	97.7	91.9	ANTI-CLOCKWISE
K1	25.45	0.15	99.0	88.9	ANTI-CLOCKWISE
N2	13.47	0.17	99.2	11.9	ANTI-CLOCKWISE
M2	82.20	0.91	99.5	42.8	ANTI-CLOCKWISE
S2	18.75	0.43	99.2	38.7	ANTI-CLOCKWISE
M4	3.33	0.29	114.3	66.9	ANTI-CLOCKWISE

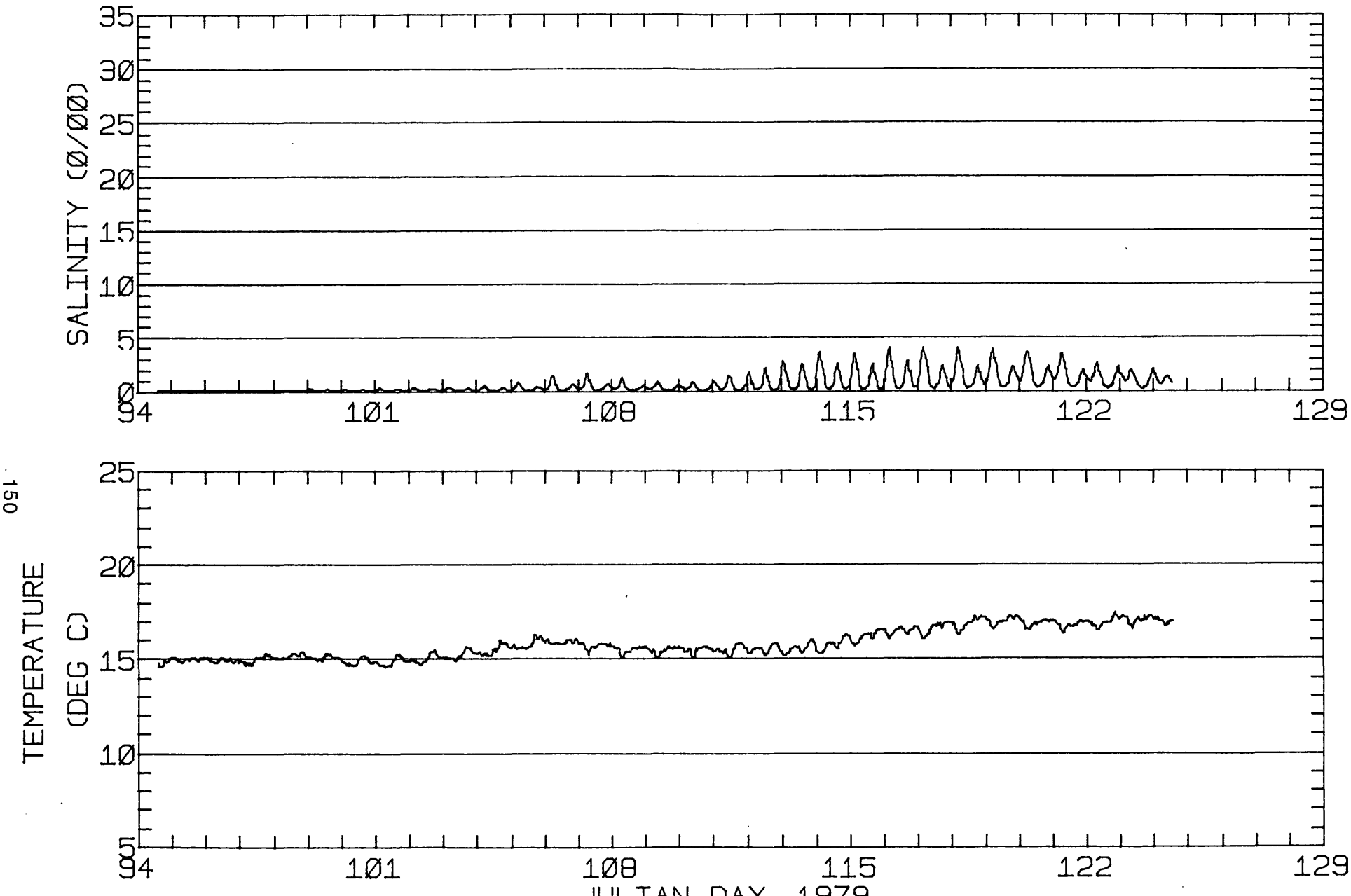
RMS SPEED: 66.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 142.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 53.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 99.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 13.43 CM/SEC
STANDARD DEVIATION V SERIES: 3.39 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.1	0.2	623.
2	12	-3.3	-0.6	281.
3	12	-2.2	-0.7	232.
4	12	-2.8	-0.6	273.
5	8	-6.5	-0.2	301.
ALL	56	-4.3	-0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-52N 121-55-18W
METER 006.1 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-52N 121-55-18W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 32
POSITION: 38 2'52"N 121 55'18"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 10.4 M (BELOW MLLW)
START TIME OF SERIES: 4/ 4/79 1402 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

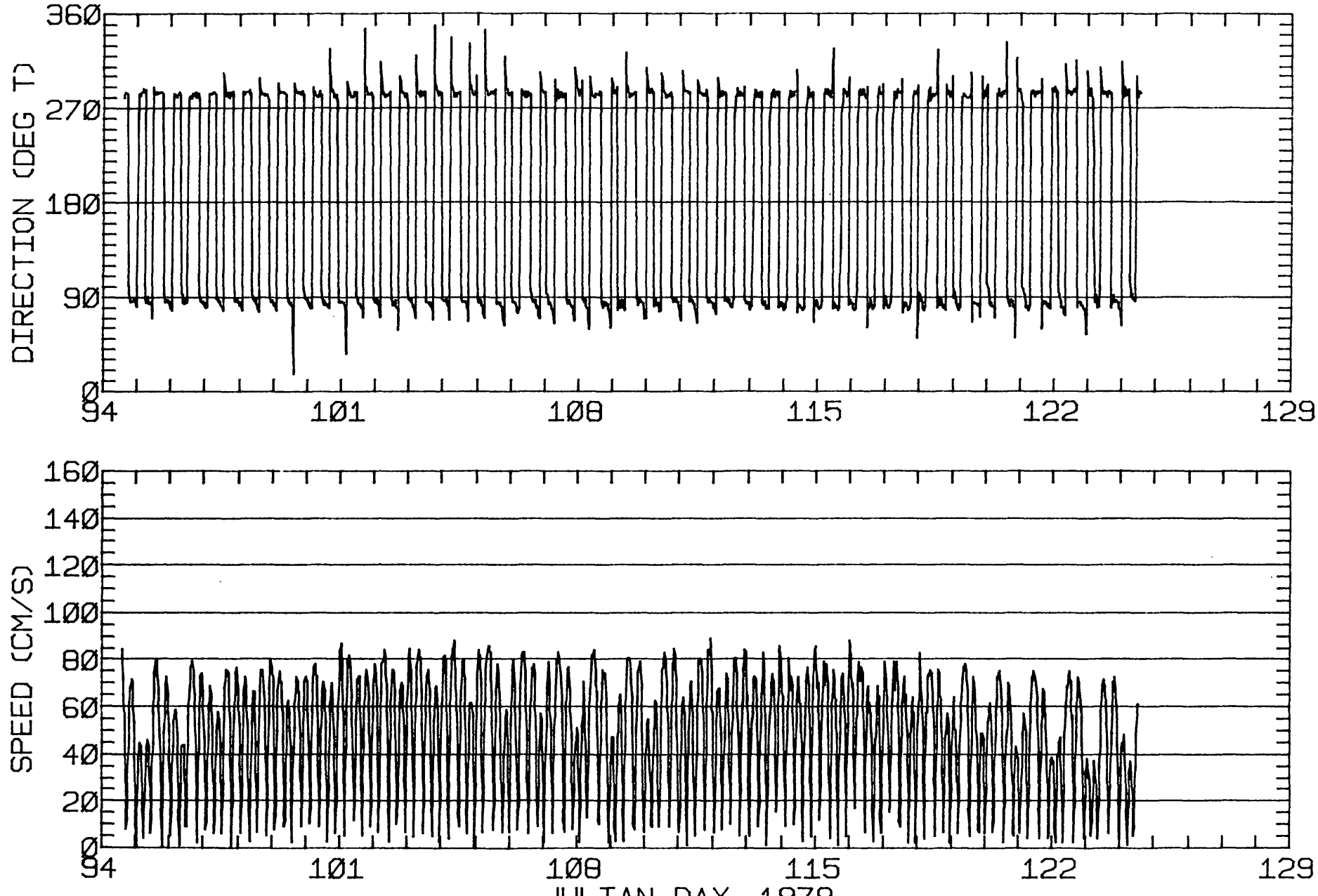
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.14	1.10	98.5	94.4	CLOCKWISE
K1	21.38	0.48	96.1	89.4	CLOCKWISE
N2	10.35	0.01	93.5	17.3	CLOCKWISE
M2	66.60	1.28	94.5	43.0	ANTI-CLOCKWISE
S2	14.93	0.21	94.2	34.3	ANTI-CLOCKWISE
M4	3.80	1.71	42.4	84.9	ANTI-CLOCKWISE

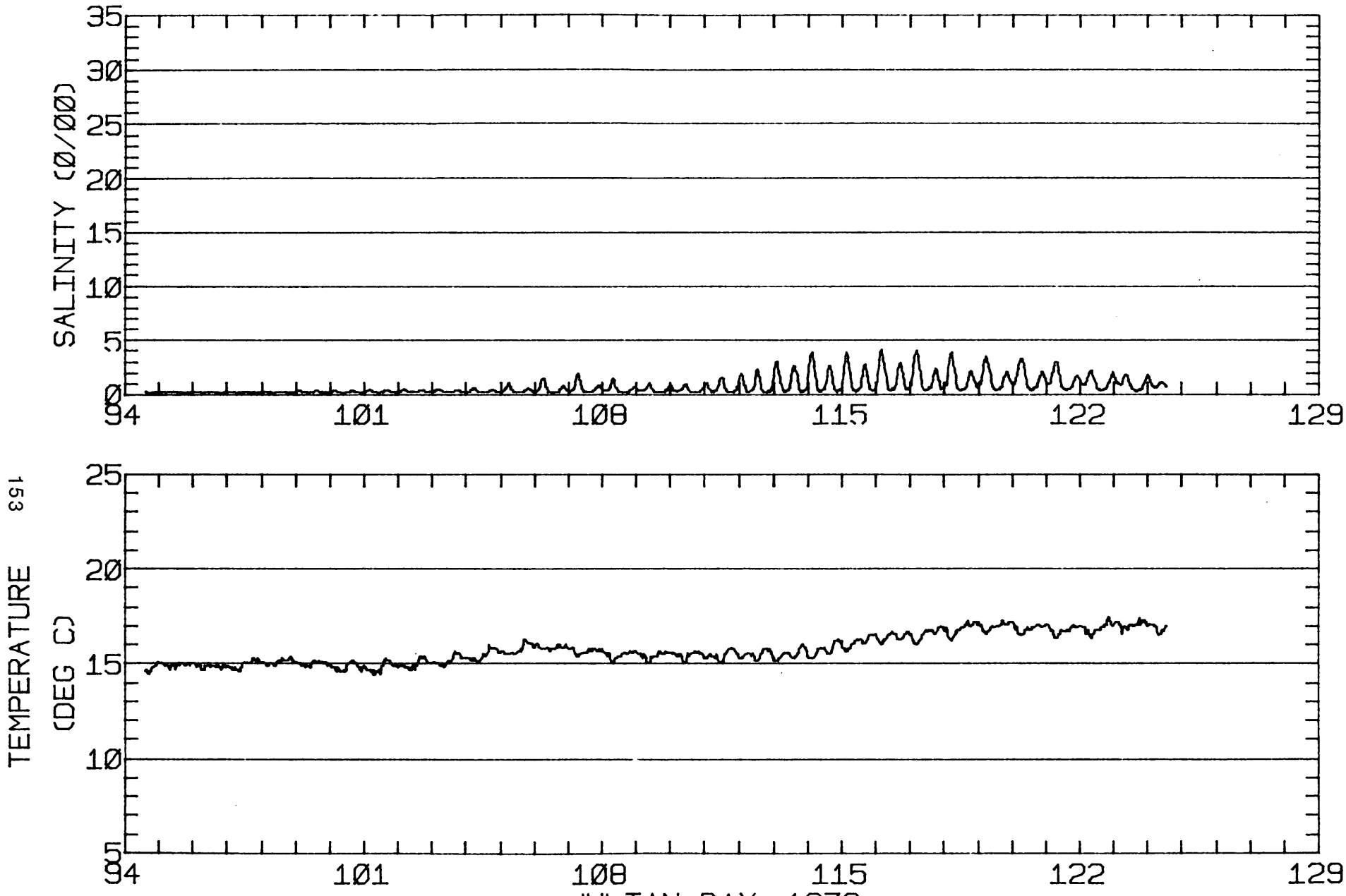
RMS SPEED: 55.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 116.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 43.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 95.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 10.99 CM/SEC
STANDARD DEVIATION V SERIES: 3.78 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.8	8.3	623.
2	12	-1.3	9.9	281.
3	12	-0.1	9.3	232.
4	12	-1.6	9.6	273.
5	8	-2.6	8.0	301.
ALL	56	-2.1	9.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-52N 121-55-18W
METER 001.8 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-52N 121-55-18W
METER ØØ1.8 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 32
POSITION: 38 2'51"N 121 55'17"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:10/24/79 1330 PST JULIAN DAY=297
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

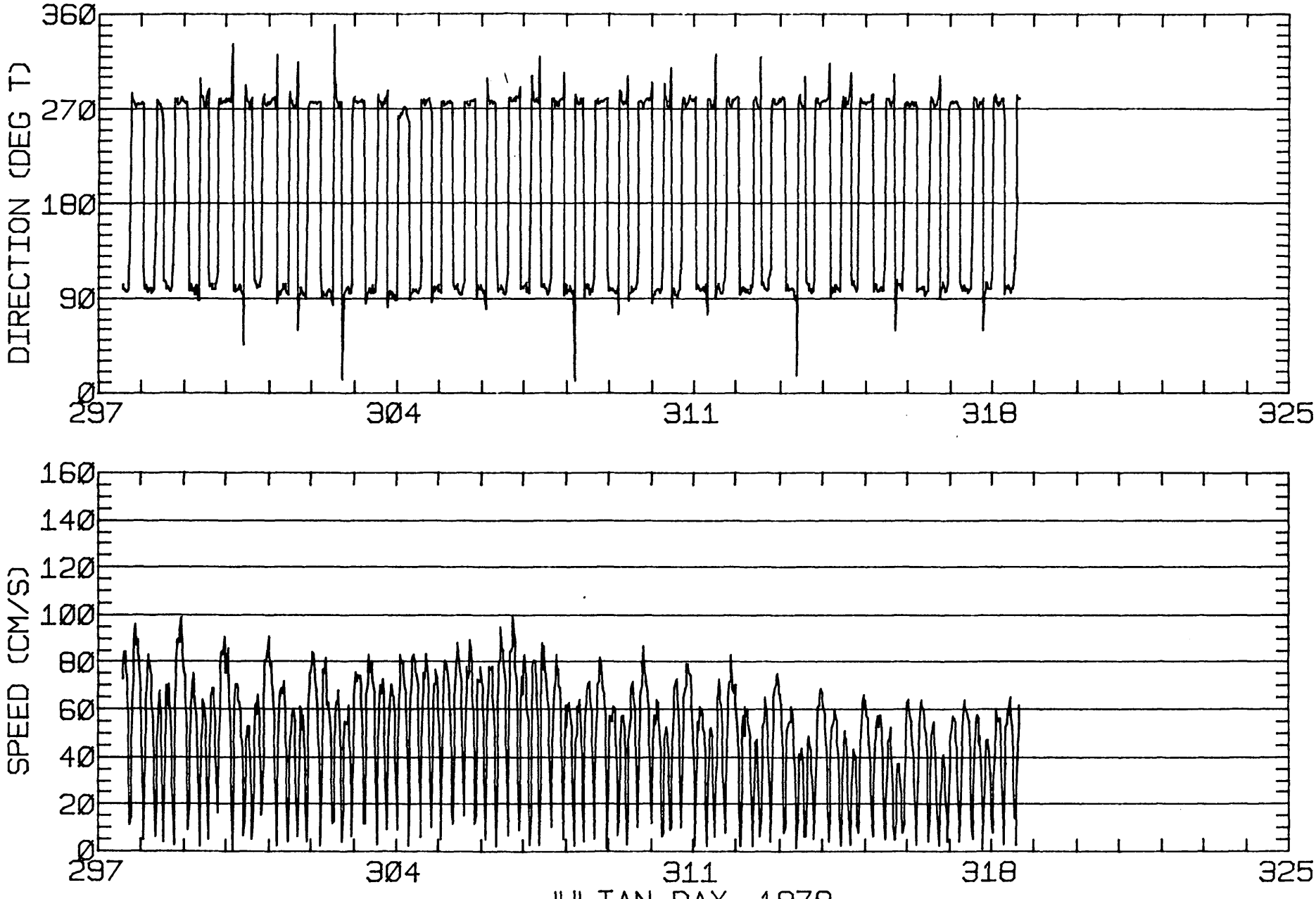
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.32	0.88	95.7	94.6	CLOCKWISE
K1	24.90	0.25	97.7	93.2	CLOCKWISE
N2	15.16	0.34	98.0	31.8	ANTI-CLOCKWISE
M2	64.46	0.16	97.7	39.0	CLOCKWISE
S2	9.72	0.34	97.0	19.4	CLOCKWISE
M4	2.30	0.55	100.9	14.9	CLOCKWISE

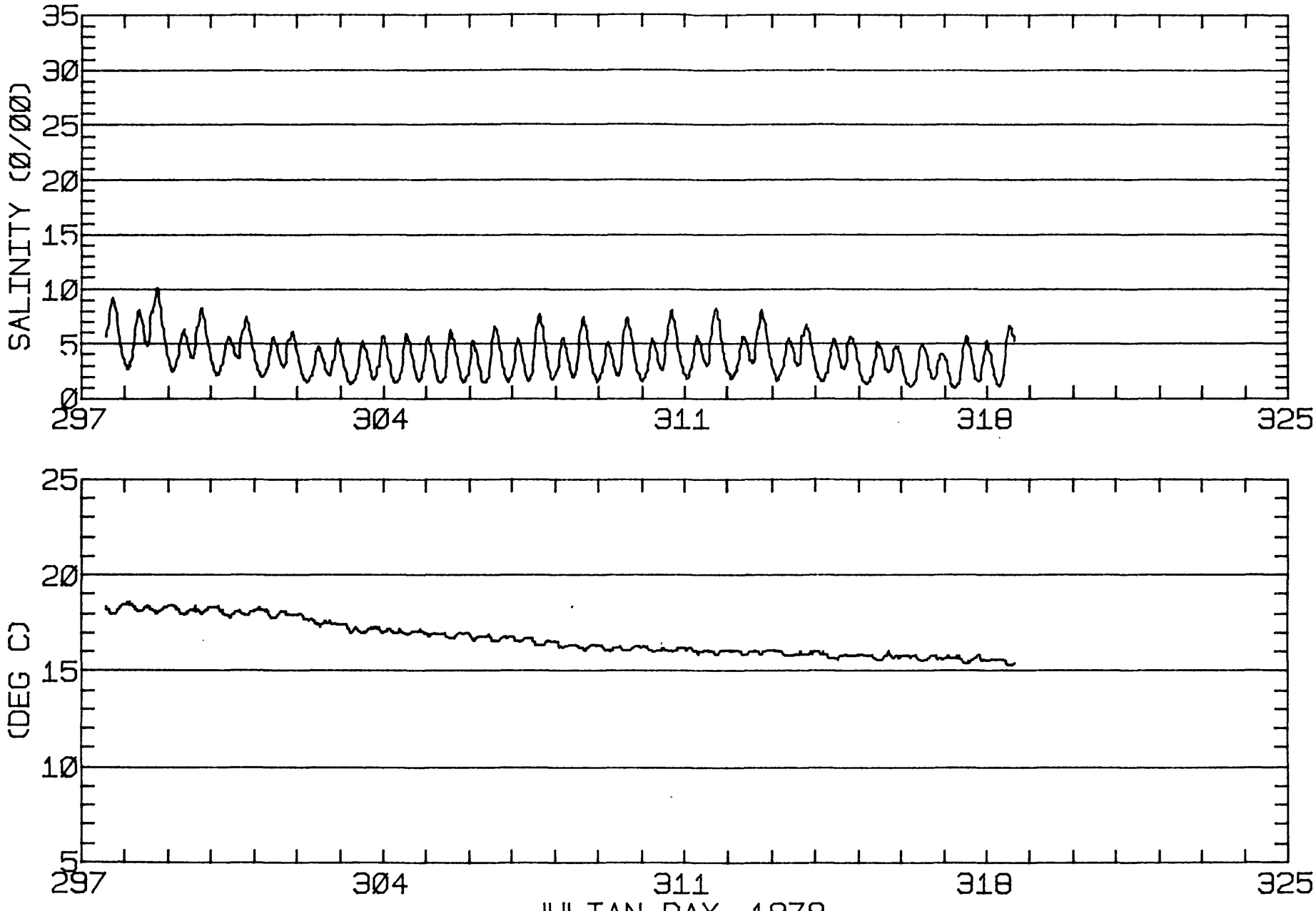
RMS SPEED: 54.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 110.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 97.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 12.52 CM/SEC
STANDARD DEVIATION V SERIES: 3.96 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.8	-0.2	330.
2	12	-1.9	-0.6	206.
3	12	-2.3	-0.4	311.
4	4	-1.5	-0.9	291.
ALL	40	-2.8	-0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-51N 121-55-17W
METER 006.1 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-51N 121-55-17W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 32
POSITION: 38 2'51"N 121 55'17"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 10.4 M (BELOW MLLW)
START TIME OF SERIES:10/24/79 1322 PST JULIAN DAY=297
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

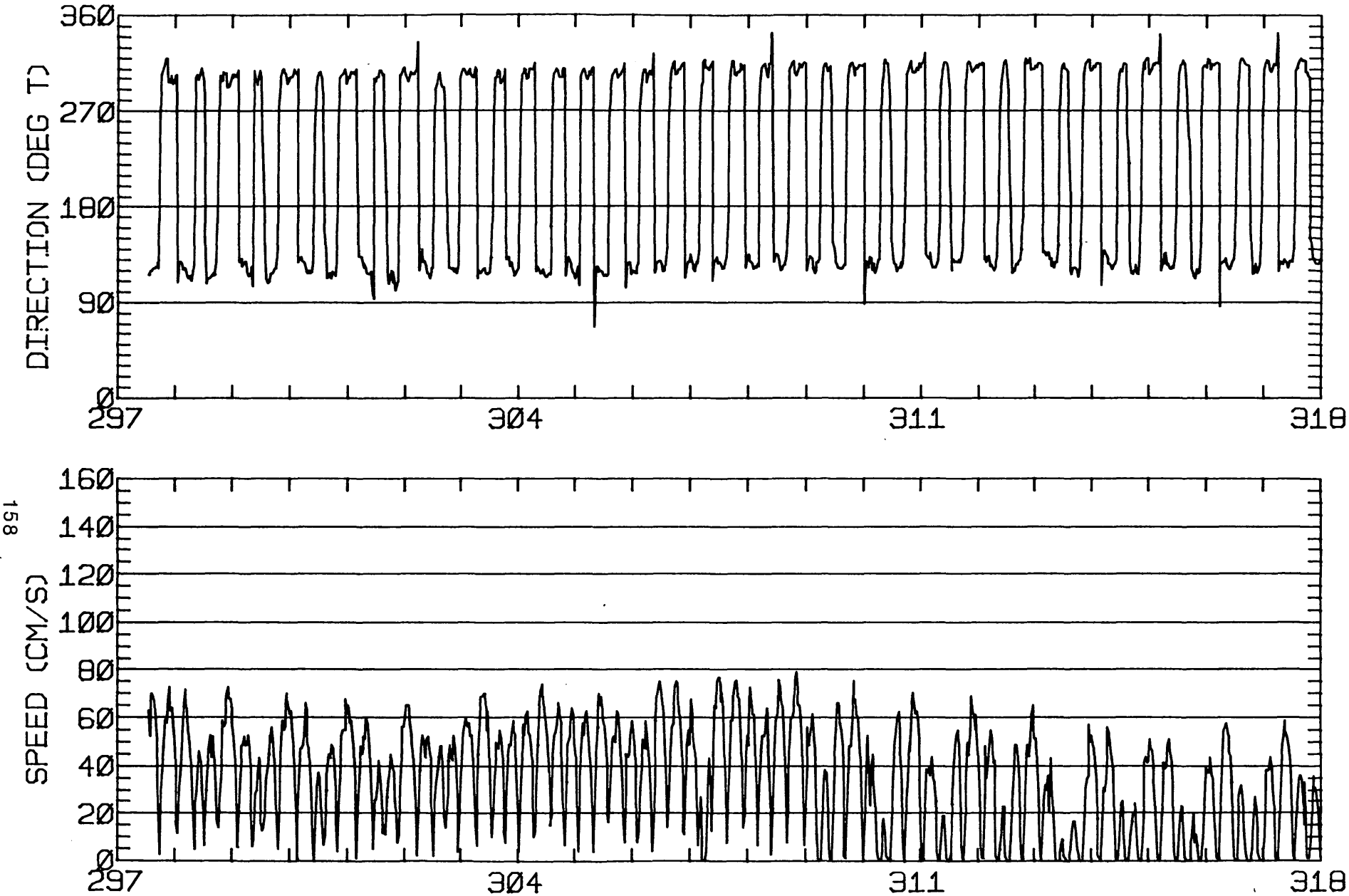
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.96	1.49	126.9	86.5	ANTI-CLOCKWISE
K1	19.52	0.13	119.4	90.3	CLOCKWISE
N2	12.16	1.16	126.3	38.4	ANTI-CLOCKWISE
M2	51.28	0.57	122.2	36.6	CLOCKWISE
S2	12.81	0.53	121.7	31.0	CLOCKWISE
M4	1.90	0.07	152.9	2.8	CLOCKWISE

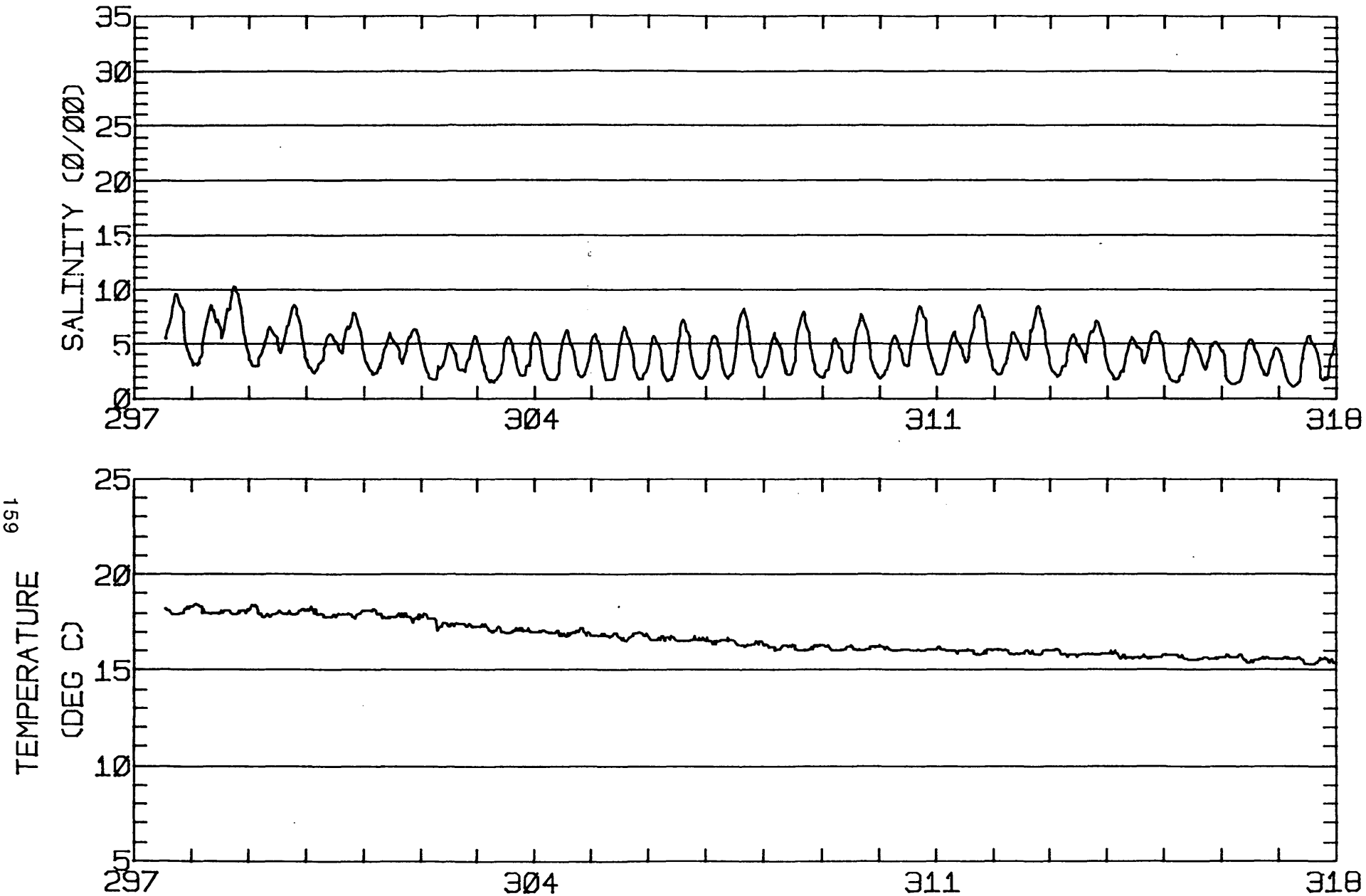
RMS SPEED: 45.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 97.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 122.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 8.54 CM/SEC
STANDARD DEVIATION V SERIES: 5.78 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.2	0.6	330.
2	4	1.0	0.9	193.
ALL	16	0.1	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-51N 121-55-17W
METER 001.8 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-51N 121-55-17W
METER ØØ1.8 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 32
POSITION: 38 2'54"N 121 55'25"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:11/14/79 1730 PST JULIAN DAY=318
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

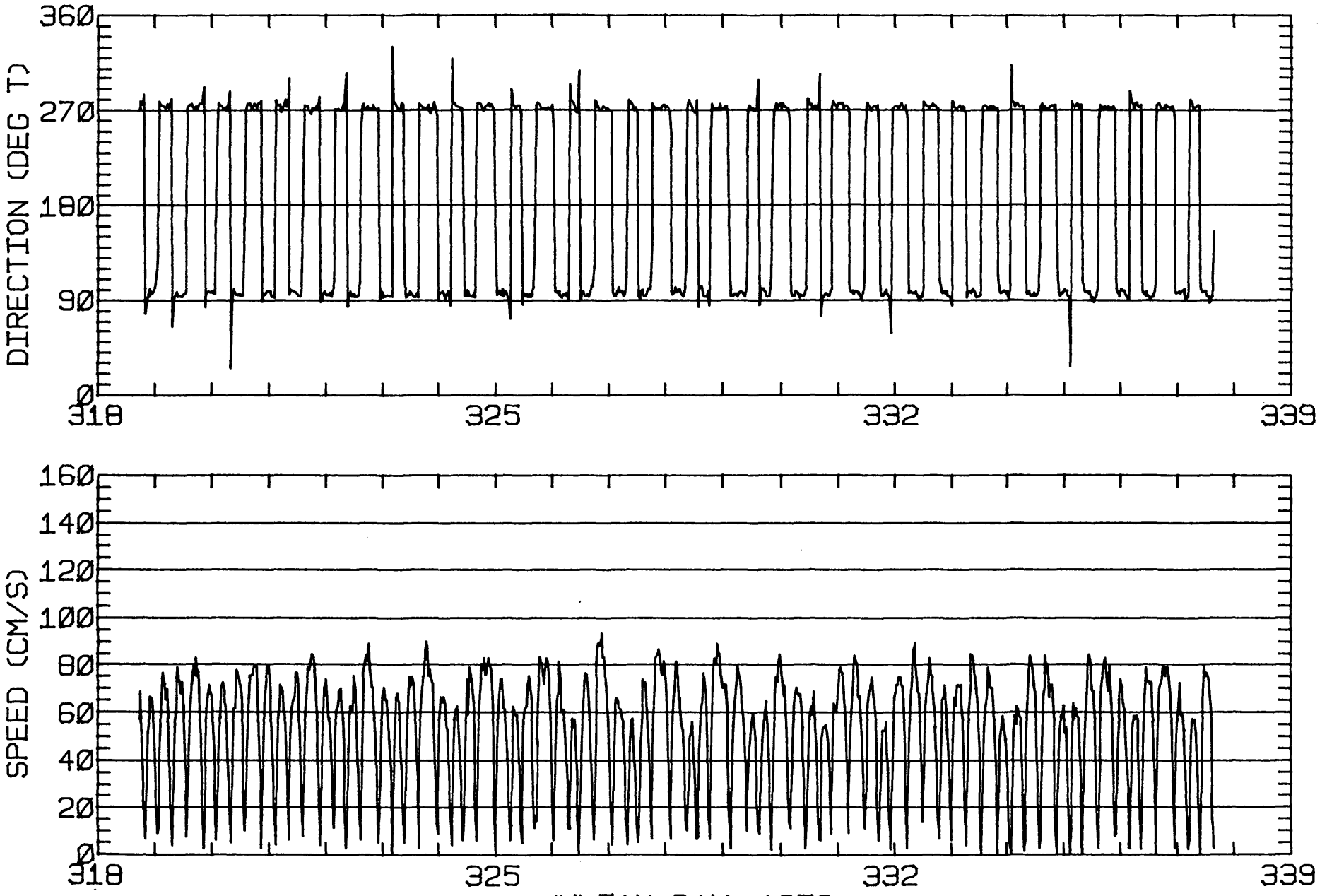
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.75	0.37	92.4	89.6	ANTI-CLOCKWISE
K1	27.82	0.20	93.9	97.7	ANTI-CLOCKWISE
N2	8.34	0.59	97.3	18.8	ANTI-CLOCKWISE
M2	68.38	0.21	95.2	39.9	CLOCKWISE
S2	13.21	0.06	94.7	30.2	ANTI-CLOCKWISE
M4	2.57	0.30	106.7	53.8	CLOCKWISE

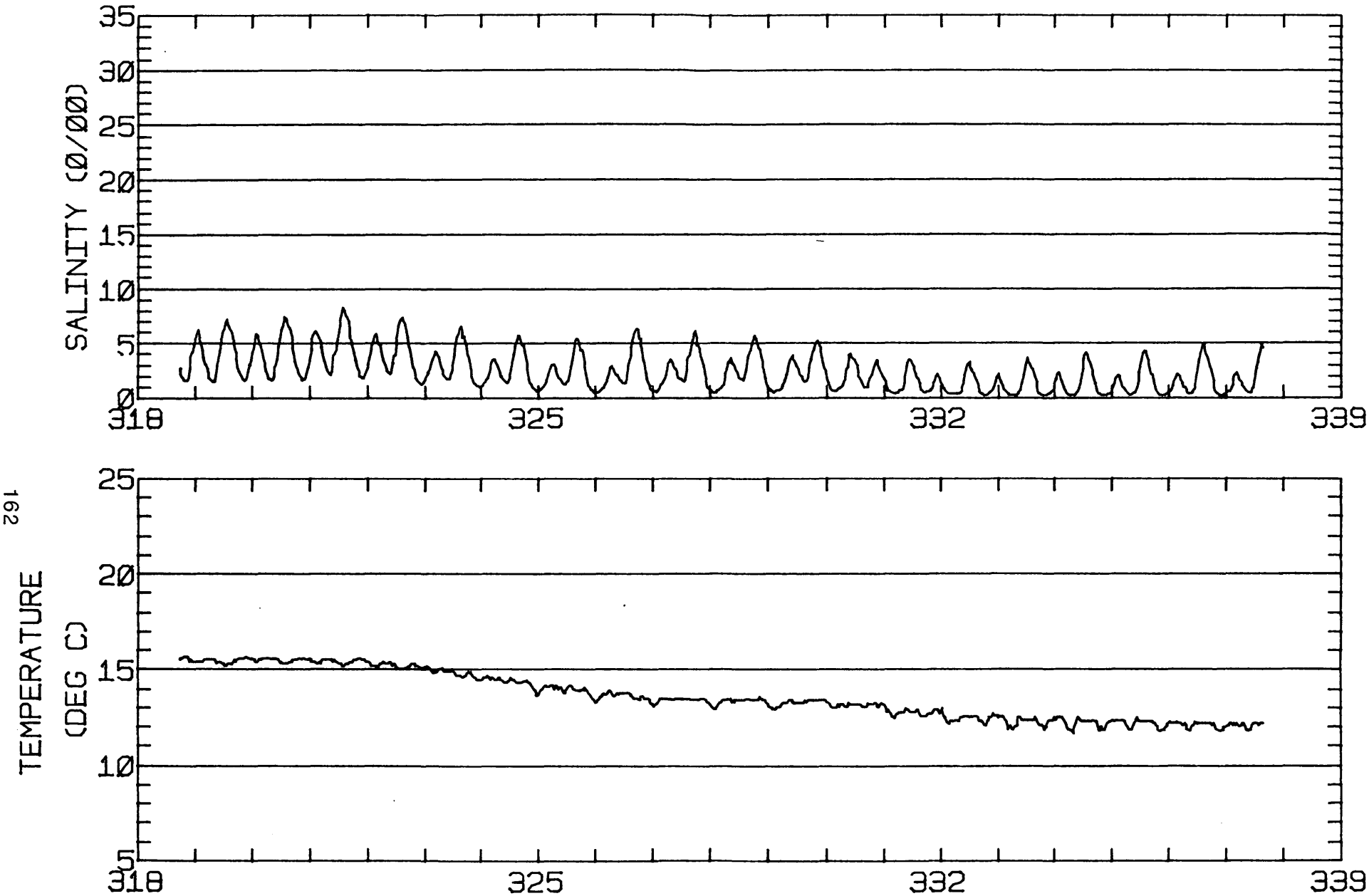
RMS SPEED: 57.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 121.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 94.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 13.69 CM/SEC
STANDARD DEVIATION V SERIES: 2.97 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.3	-0.8	342.
2	12	-3.3	-1.3	410.
3	12	-2.3	-1.0	464.
ALL	36	-3.6	-1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-54N 121-55-25W
METER 006.1 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 32 38- 2-54N 121-55-25W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 32
POSITION: 38 2'58"N 121 55'29"W
METER TYPE: AANDERAA
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 5/ 9/80 1005 PST JULIAN DAY=130
APPROXIMATE RECORD LENGTH IS 48 M2-CYCLES

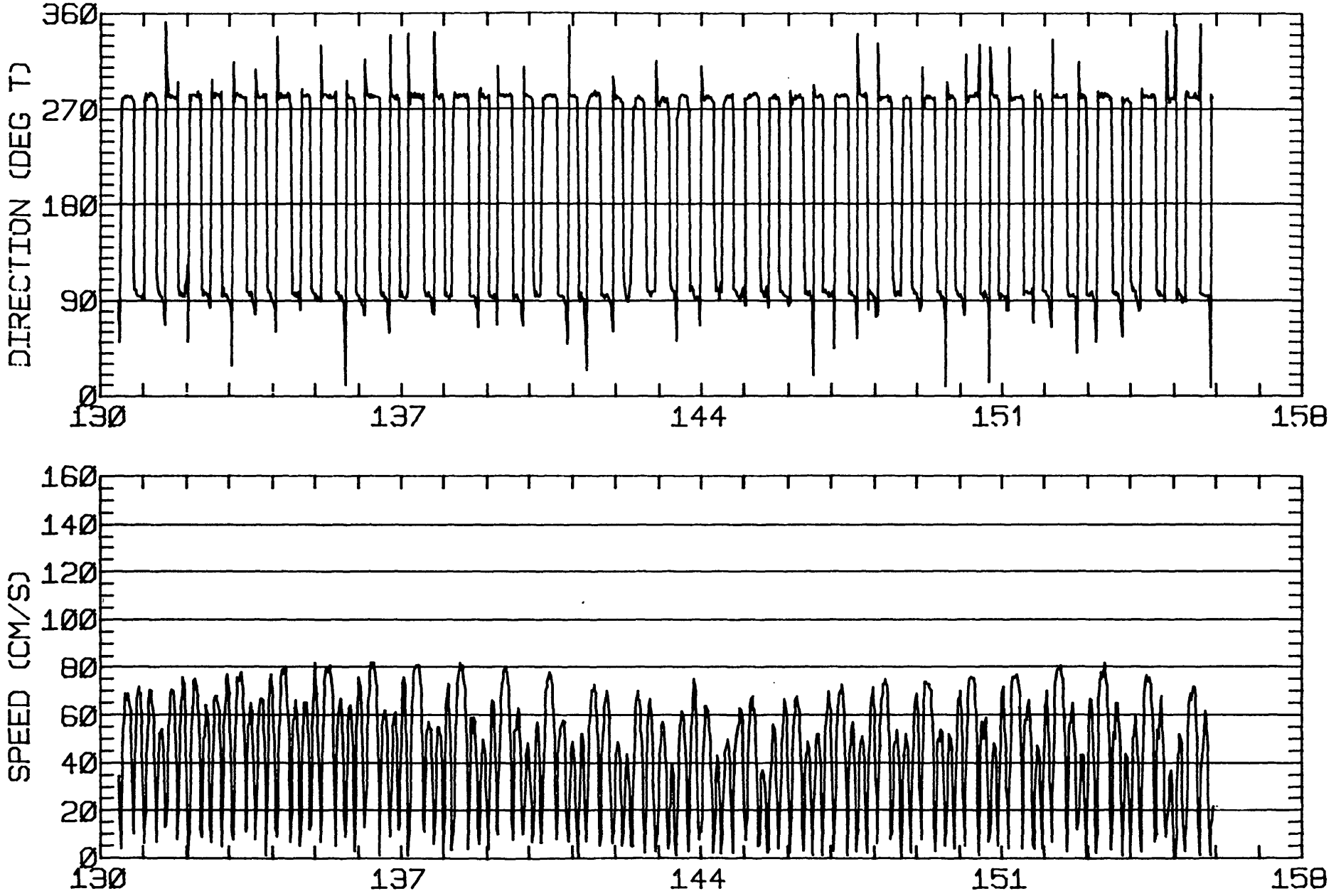
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.19	0.29	103.0	111.2	CLOCKWISE
K1	24.88	0.07	98.7	91.3	ANTI-CLOCKWISE
N2	8.59	0.34	99.4	354.5	ANTI-CLOCKWISE
M2	59.52	1.11	98.9	38.1	ANTI-CLOCKWISE
S2	8.98	0.44	100.3	12.7	ANTI-CLOCKWISE
M4	4.67	1.31	94.3	43.7	ANTI-CLOCKWISE

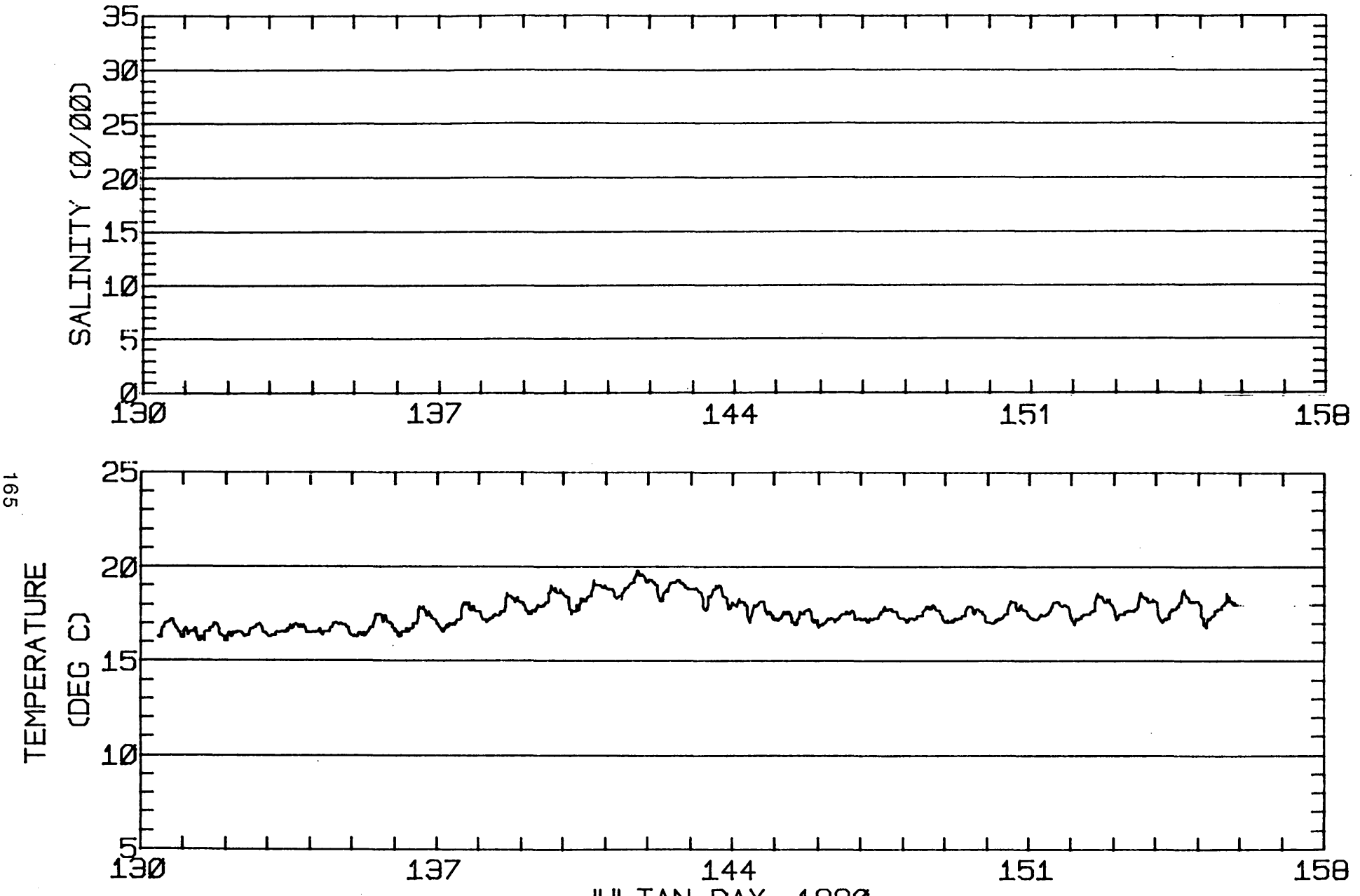
RMS SPEED: 50.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 103.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 99.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 10.08 CM/SEC
STANDARD DEVIATION V SERIES: 3.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.6	5.4	717.
2	12	-7.0	4.7	671.
3	12	-4.4	2.8	542.
4	12	-4.6	4.0	443.
ALL	48	-6.1	4.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-58N 121-55-29W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-58N 121-55-29W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 32
POSITION: 38 2'59"N 121 55'26"W
METER TYPE: AANDERAA
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 6/ 6/80 915 PST JULIAN DAY=158
APPROXIMATE RECORD LENGTH IS 8 M2-CYCLES

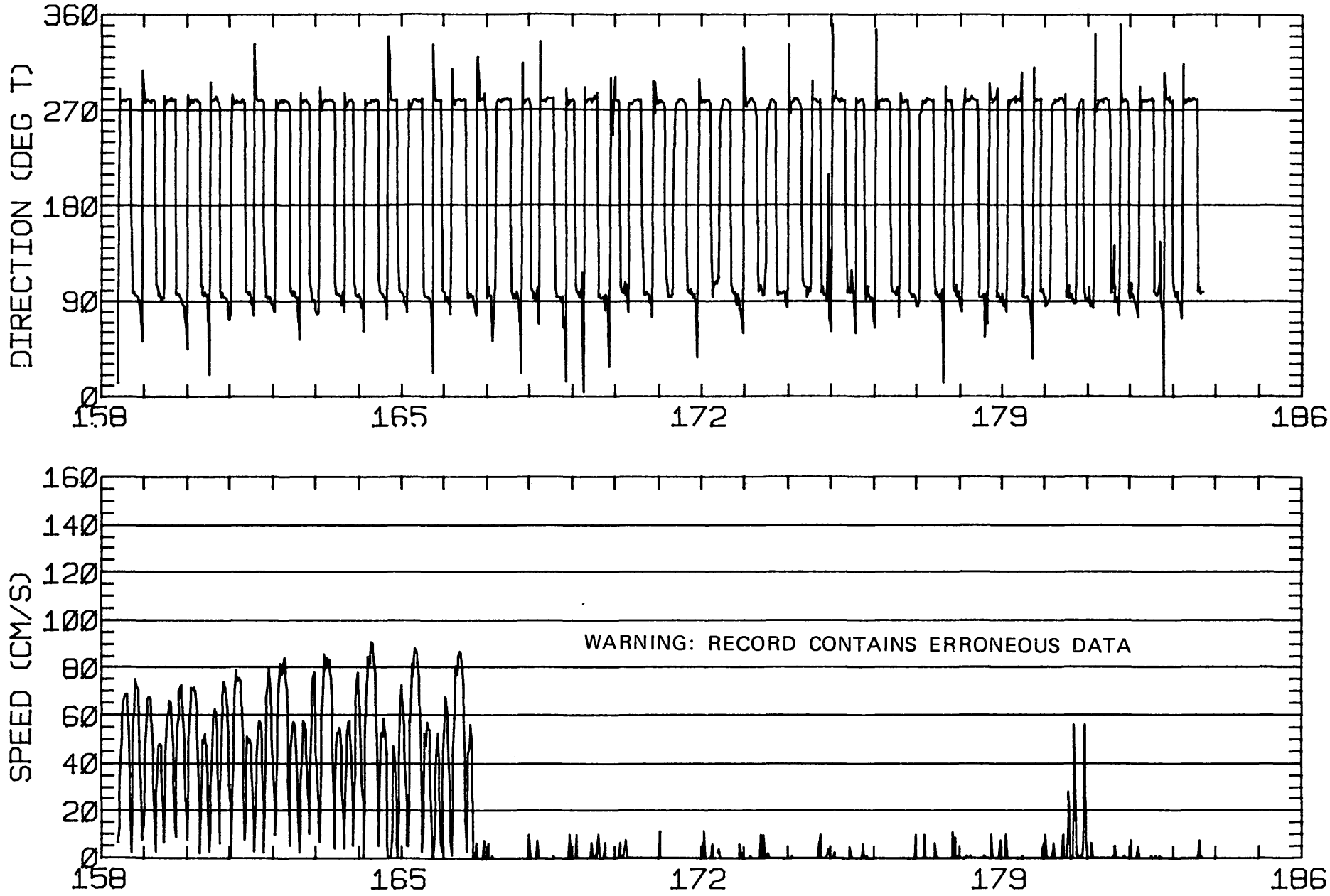
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.41	0.03	99.6	112.8	ANTI-CLOCKWISE
K1	31.04	0.69	94.6	101.3	ANTI-CLOCKWISE
N2	36.63	1.25	97.2	43.8	ANTI-CLOCKWISE
M2	31.83	0.82	96.6	2.0	CLOCKWISE
S2	10.91	0.17	88.1	336.6	ANTI-CLOCKWISE
M4	4.74	1.94	104.3	36.3	ANTI-CLOCKWISE

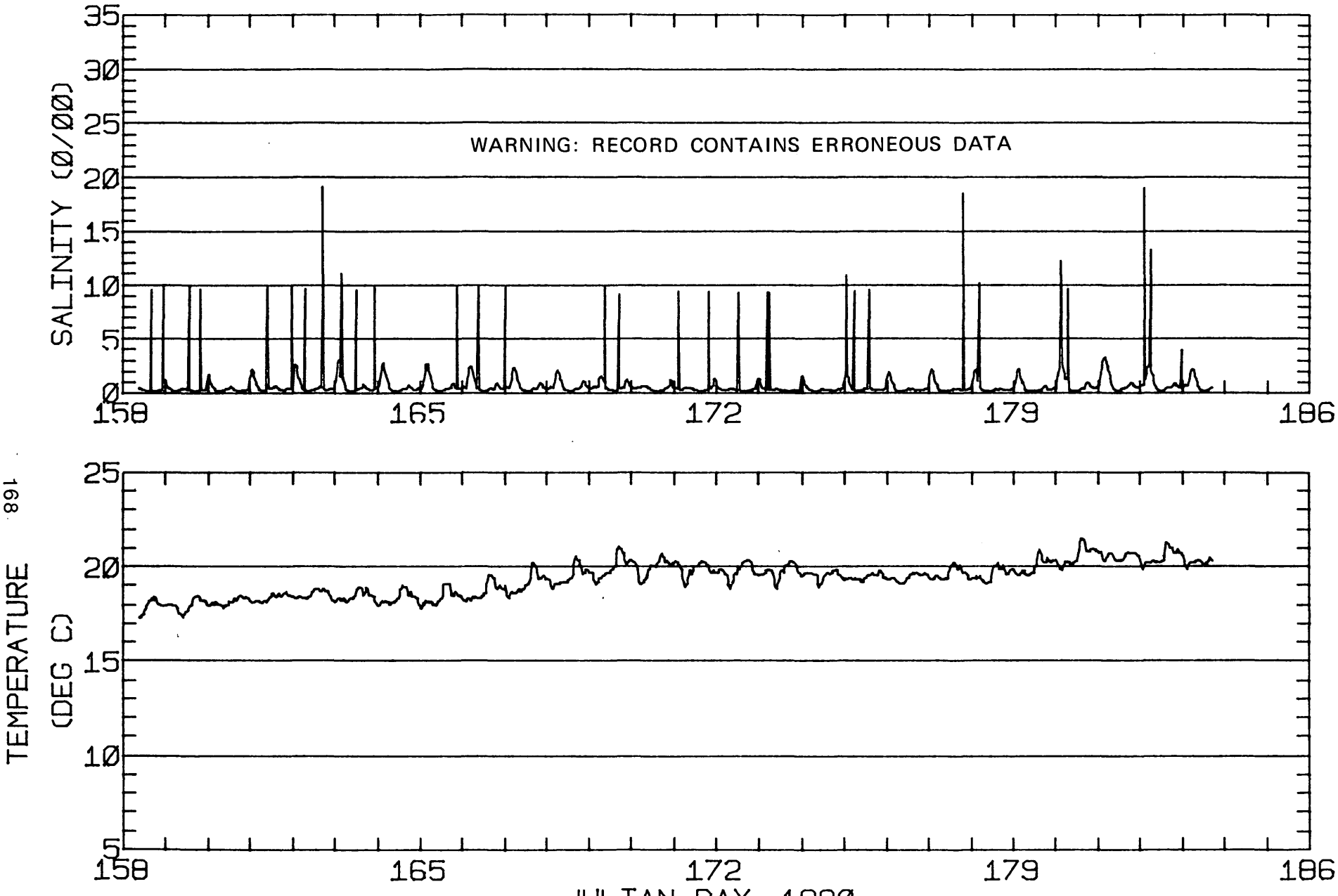
RMS SPEED: 52.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 87.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 3.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 95.3 DEGREES TRUE
TIDAL FORM NUMBER: 1.04
STANDARD DEVIATION U-SERIES: 7.83 CM/SEC
STANDARD DEVIATION V SERIES: 2.74 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	8	-8.3	3.2	391.
ALL	8	-8.3	3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-59N 121-55-26W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.5 METERS.



168

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 32 38- 2-59N 121-55-26W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 33
POSITION: 38 3'42"N 121 51' 0"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 5.5 M (BELOW MLLW)
START TIME OF SERIES: 4/16/79 1530 PST JULIAN DAY=106
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

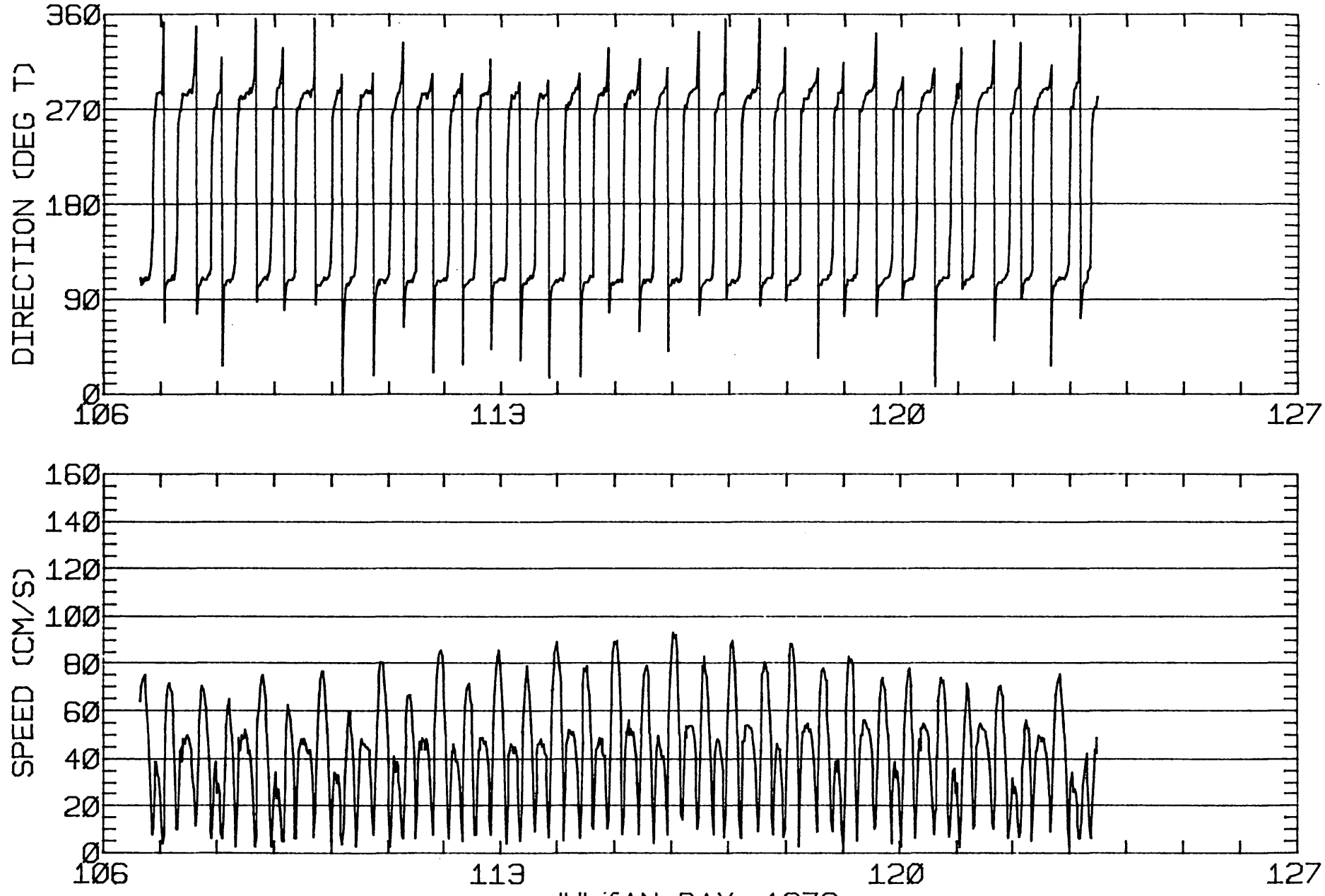
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.66	0.93	107.5	93.9	CLOCKWISE
K1	19.86	1.02	107.9	95.8	CLOCKWISE
N2	10.50	0.63	105.0	22.5	CLOCKWISE
M2	55.32	4.60	106.4	50.8	CLOCKWISE
S2	10.78	0.94	102.8	56.6	CLOCKWISE
M4	5.75	0.56	115.6	99.2	ANTI-CLOCKWISE

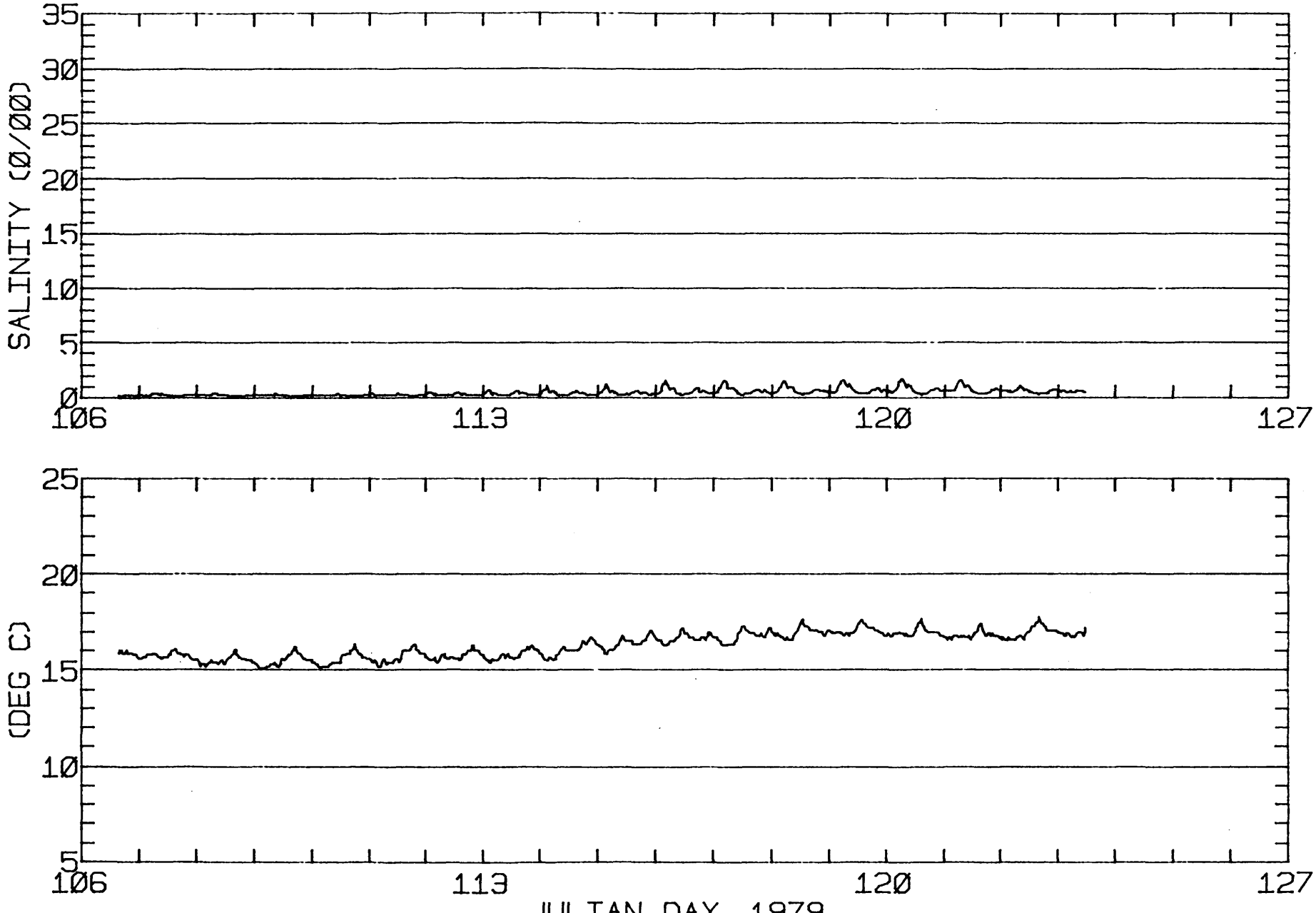
RMS SPEED: 49.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 94.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 33.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 106.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 10.15 CM/SEC
STANDARD DEVIATION V SERIES: 3.58 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.3	-3.6	241.
2	12	9.7	-4.3	273.
3	8	6.7	-3.9	301.
ALL	32	8.1	-3.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 33 38- 3-42N 121-51- 0W
METER 006.1 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 33 38- 3-42N 121-51- ØW
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 33
POSITION: 38 3'42"N 121 51' 0"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 10.1 M (BELOW MLLW)
START TIME OF SERIES: 4/17/79 1442 PST JULIAN DAY=107
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

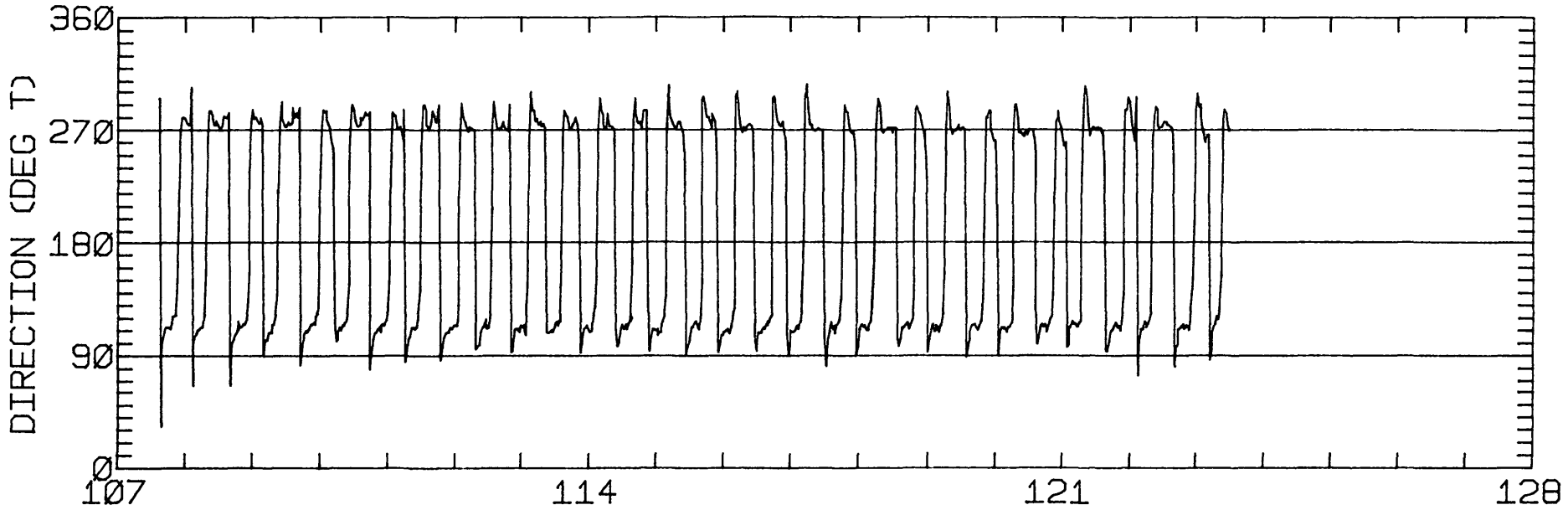
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

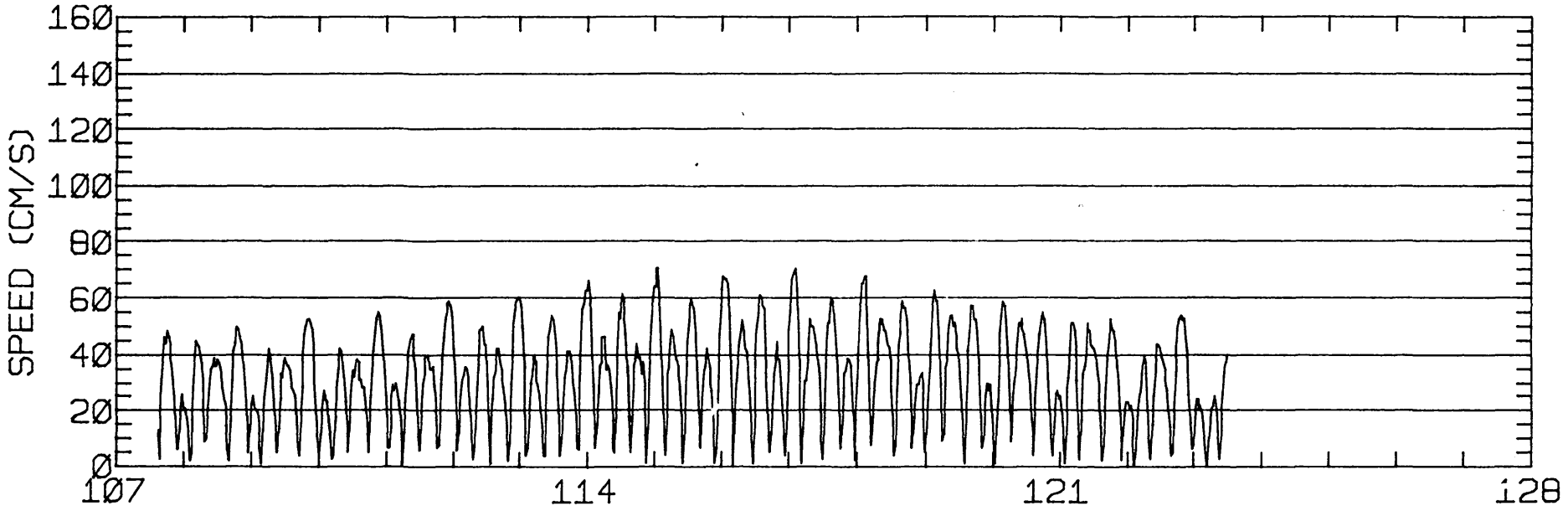
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.83	0.86	101.9	98.9	ANTI-CLOCKWISE
K1	15.06	0.09	102.2	93.8	CLOCKWISE
N2	7.12	0.47	98.2	8.8	CLOCKWISE
M2	41.27	1.09	105.9	51.3	CLOCKWISE
S2	8.40	0.64	102.8	58.5	ANTI-CLOCKWISE
M4	4.39	1.29	143.4	124.9	CLOCKWISE

RMS SPEED: 36.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 71.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 24.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 104.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 6.36 CM/SEC
STANDARD DEVIATION V SERIES: 4.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.7	-4.7	232.
2	12	4.2	-6.1	286.
3	6	2.0	-5.4	303.
ALL	30	3.6	-5.4	



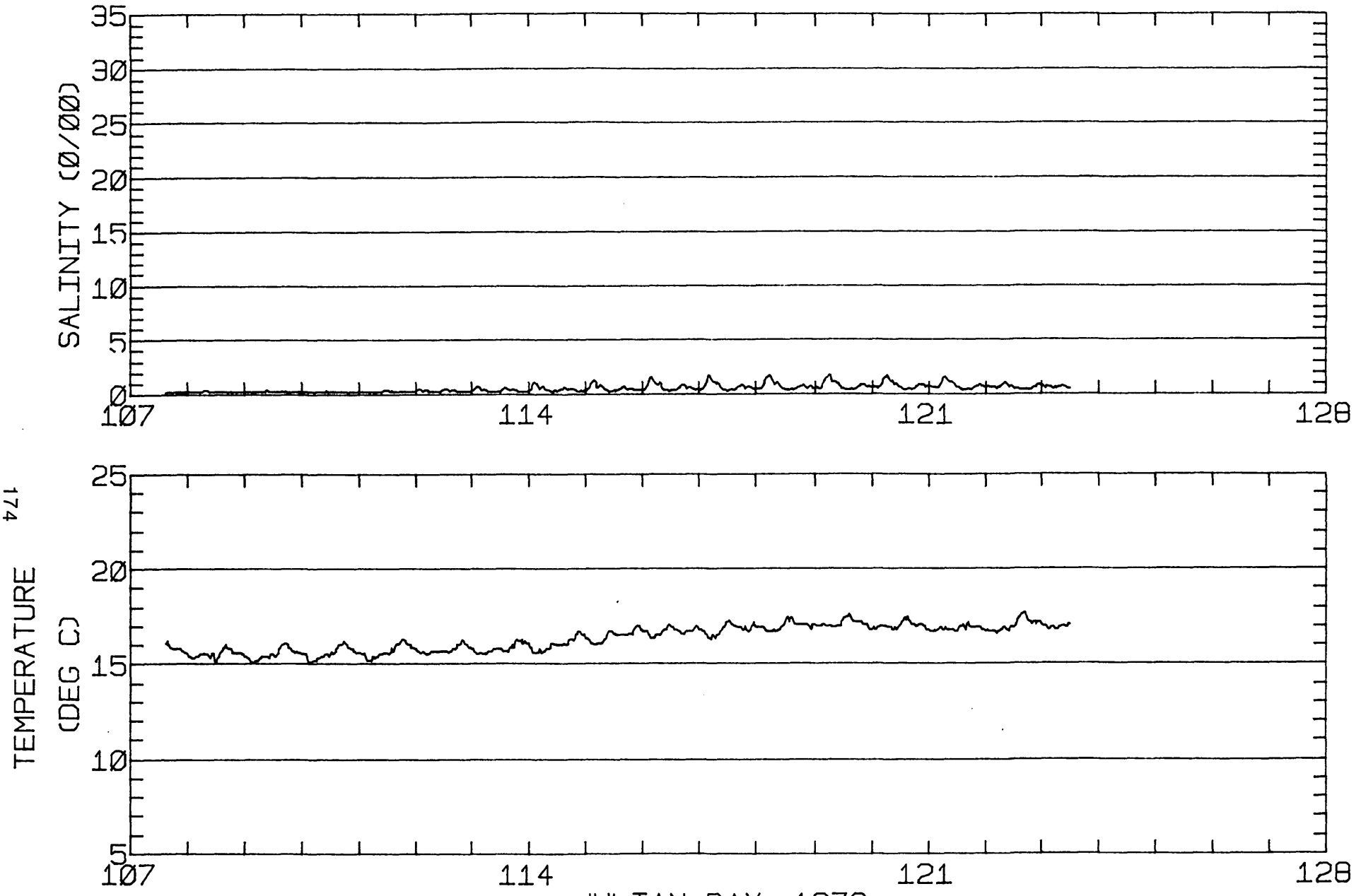


JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 33 38- 3-42N 121-51- 0W

METER 001.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 33 38- 3-42N 121-51- ØW
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 33
POSITION: 38 3'42"N 121 51' 2"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 3.1 M (BELOW MLLW)
START TIME OF SERIES:11/ 6/79 1400 PST JULIAN DAY=310
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

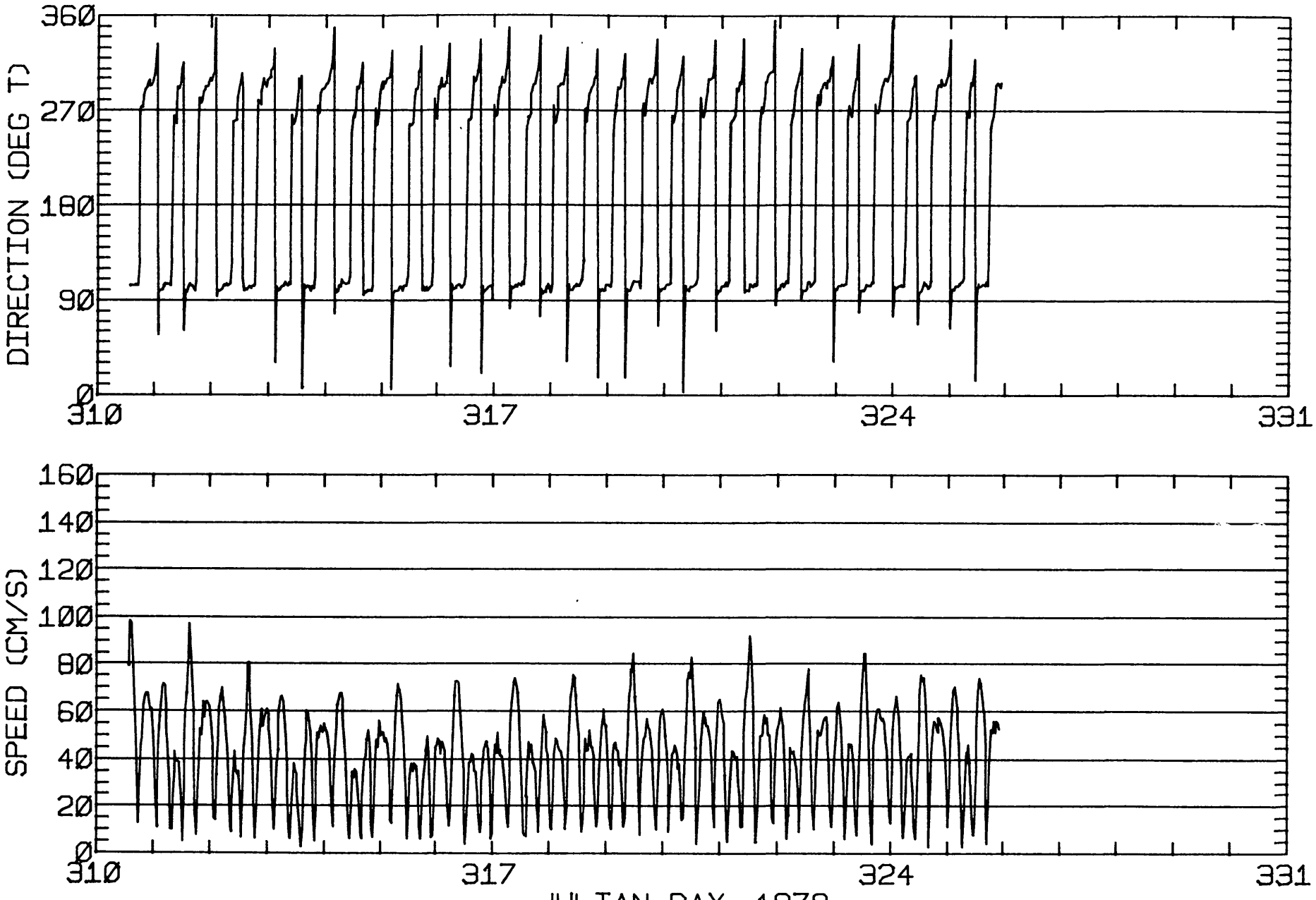
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.99	1.22	125.4	116.7	CLOCKWISE
K1	21.31	1.52	113.2	103.6	CLOCKWISE
N2	9.83	0.70	106.4	358.0	CLOCKWISE
M2	59.32	6.90	106.4	53.6	CLOCKWISE
S2	12.05	1.63	108.6	15.1	CLOCKWISE
M4	4.99	3.02	107.3	107.7	ANTI-CLOCKWISE

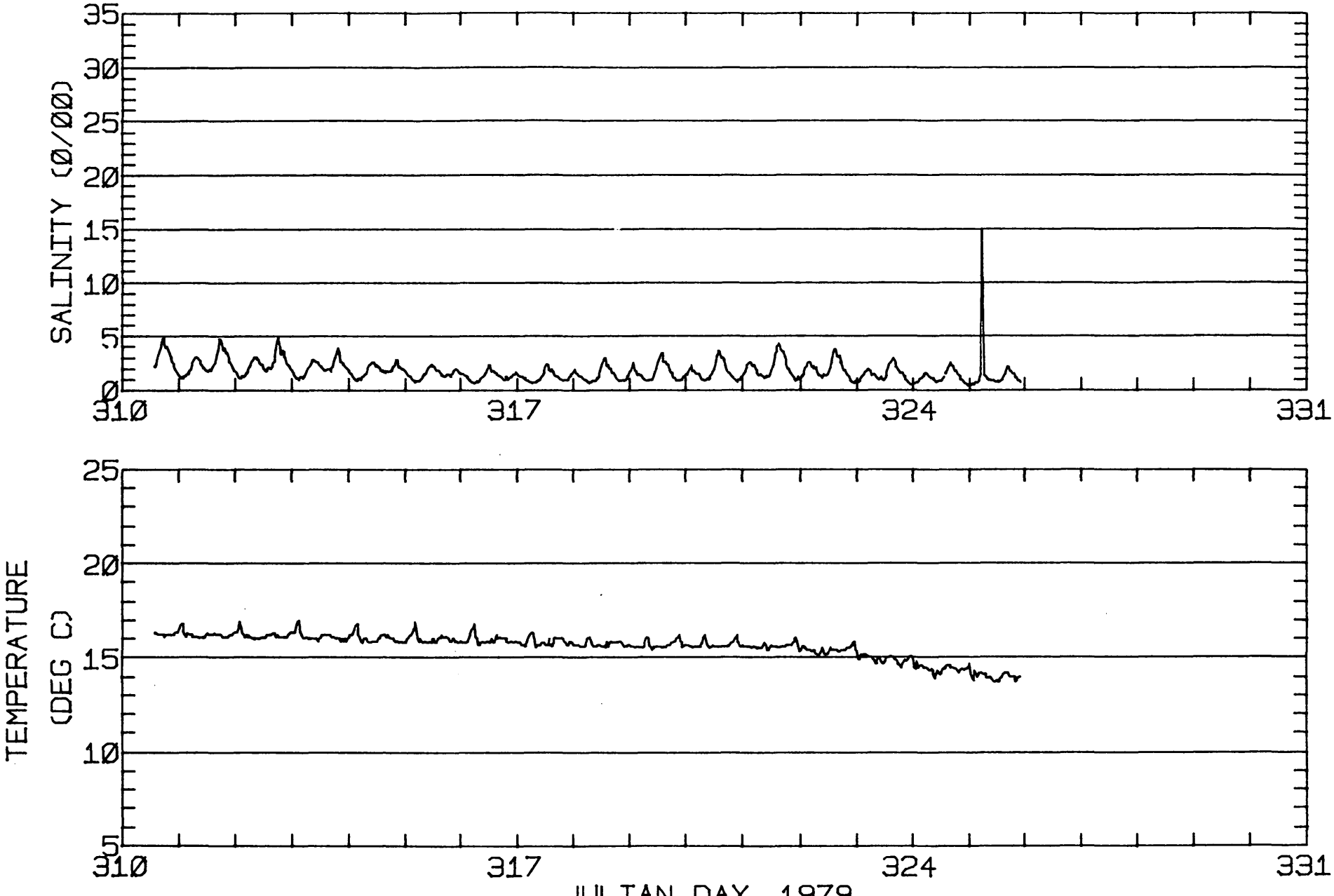
RMS SPEED: 46.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 99.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 33.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 109.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 8.92 CM/SEC
STANDARD DEVIATION V SERIES: 4.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.5	2.0	311.
2	12	5.6	1.5	261.
3	4	4.0	1.7	499.
ALL	28	4.9	1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 33 38- 3-42N 121-51- 2W
METER 009.1 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 33 38- 3-42N 121-51- 2W
METER ØØ9.1 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 33
POSITION: 38 3'42"N 121 51' 2"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 9.1 M (BELOW MLLW)
START TIME OF SERIES:11/ 6/79 1344 PST JULIAN DAY=310
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

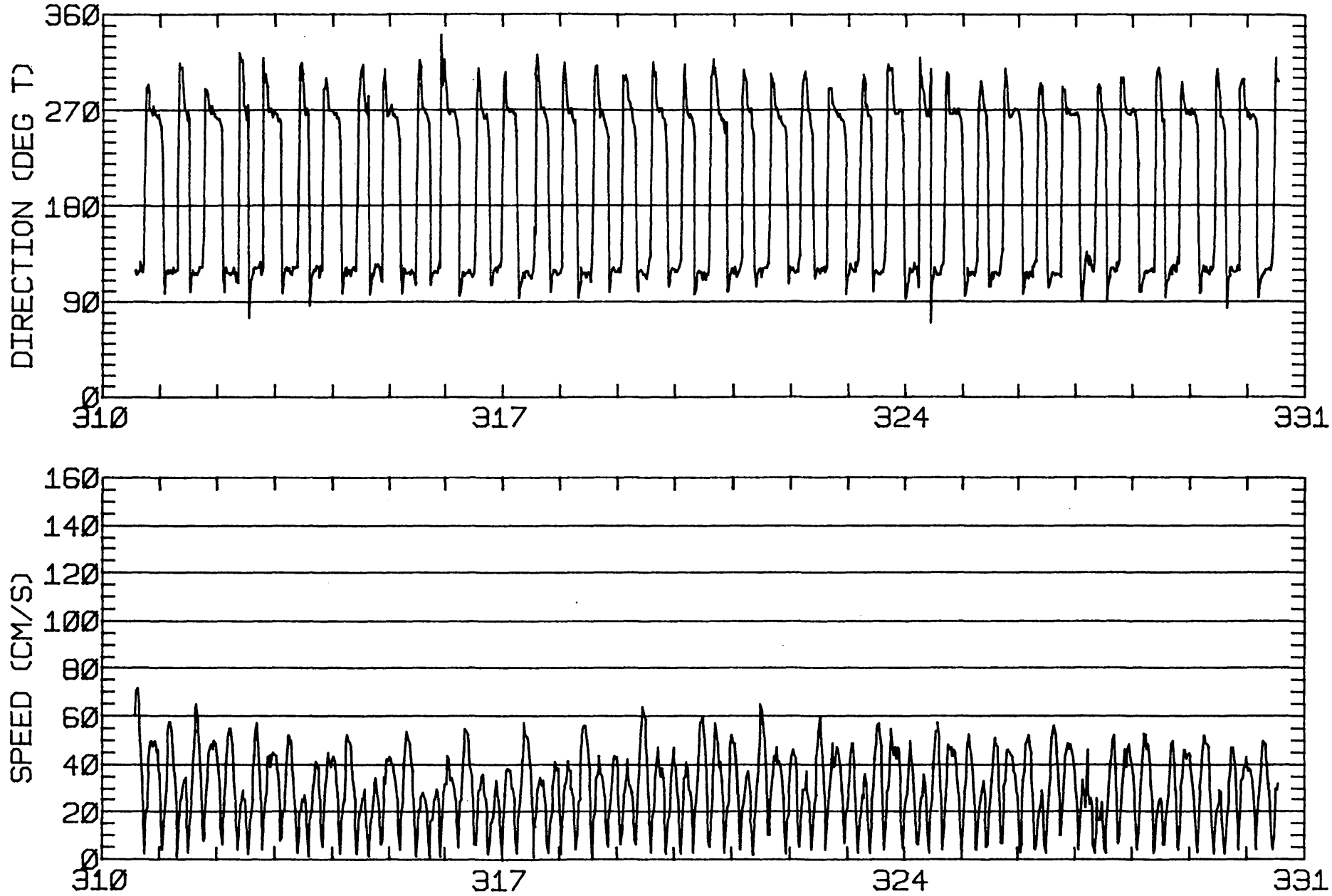
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.71	0.82	85.3	107.4	ANTI-CLOCKWISE
K1	15.97	0.71	100.5	104.8	ANTI-CLOCKWISE
N2	8.36	0.43	104.1	358.8	ANTI-CLOCKWISE
M2	43.03	2.25	107.7	51.9	ANTI-CLOCKWISE
S2	8.95	1.10	105.9	19.3	ANTI-CLOCKWISE
M4	4.29	1.35	168.7	142.1	CLOCKWISE

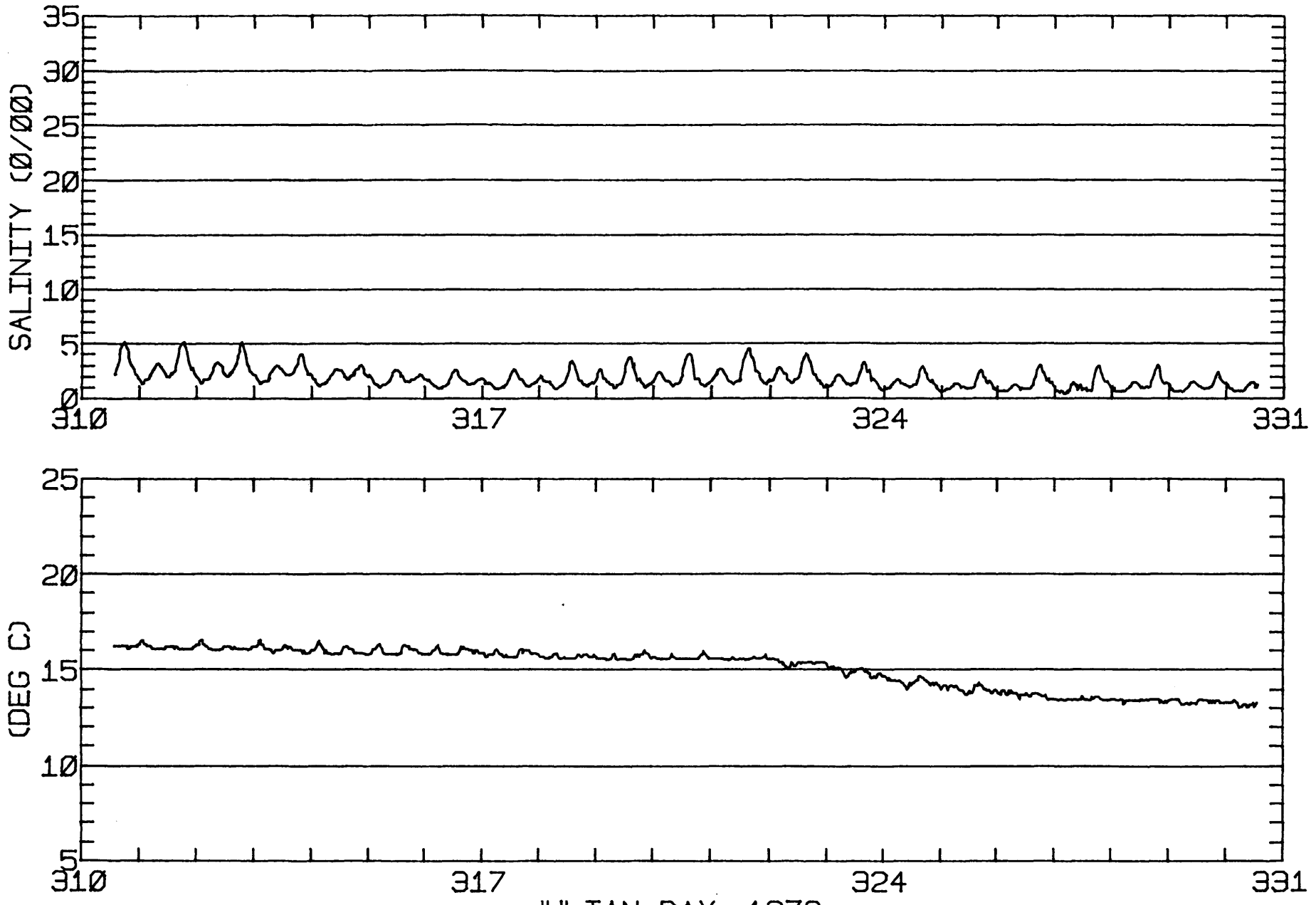
RMS SPEED: 33.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 73.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 104.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 6.00 CM/SEC
STANDARD DEVIATION V SERIES: 6.46 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	-6.5	311.
2	12	0.7	-6.1	261.
3	12	0.5	-6.0	425.
4	2	1.3	-6.5	395.
ALL	38	0.6	-6.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 33 38- 3-42N 121-51- 2W
METER 003.1 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 33 38- 3-42N 121-51- 2W
METER ØØ3.1 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 34
POSITION: 38 1'58"N 121 50' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES:11/14/79 1744 PST JULIAN DAY=318
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

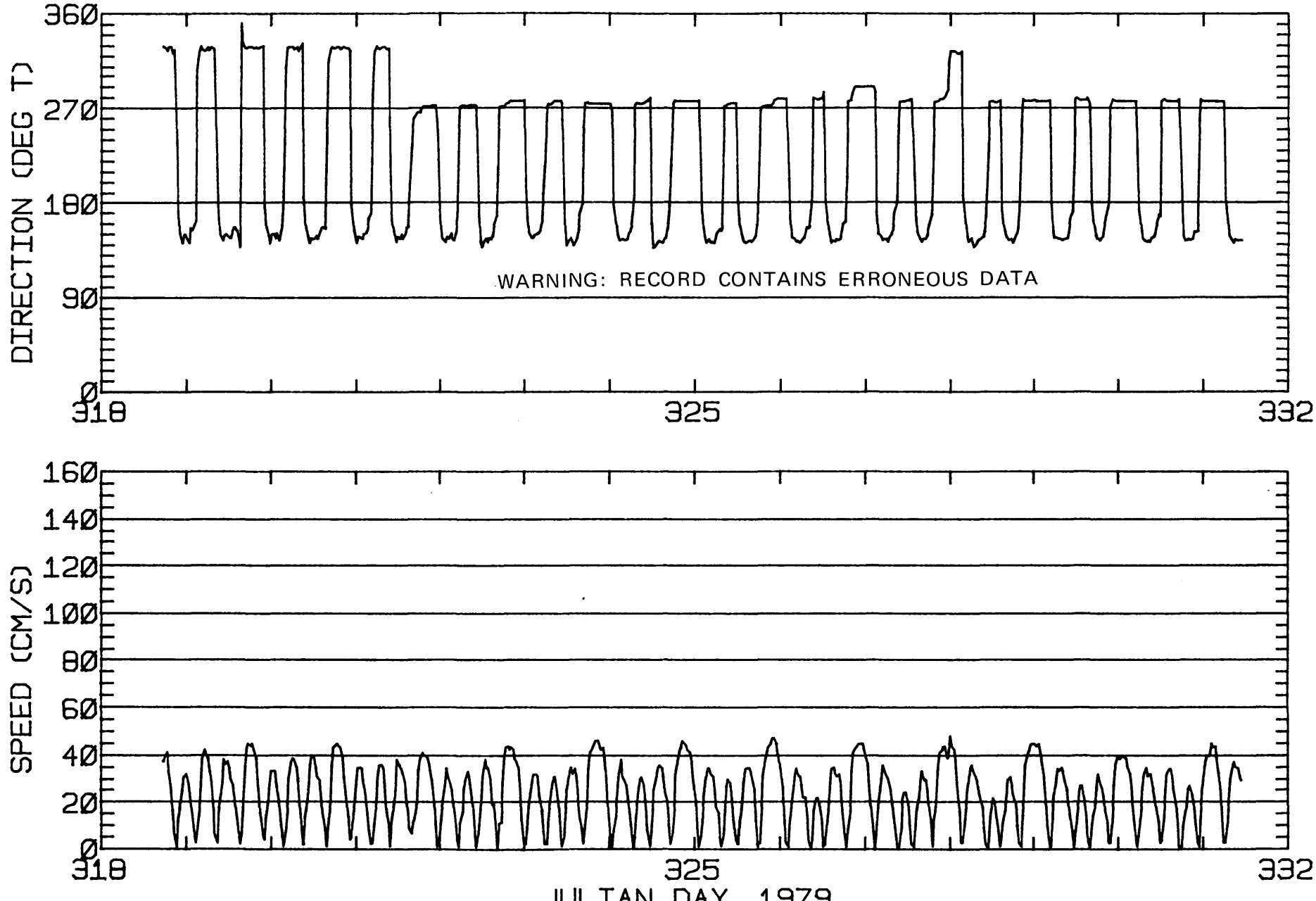
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.82	0.31	103.5	112.8	ANTI-CLOCKWISE
K1	13.27	0.40	119.3	118.9	CLOCKWISE
N2	8.78	4.55	152.2	355.7	ANTI-CLOCKWISE
M2	34.47	0.25	134.1	79.9	CLOCKWISE
S2	5.90	3.84	136.1	35.6	ANTI-CLOCKWISE
M4	2.47	1.06	197.1	114.3	CLOCKWISE

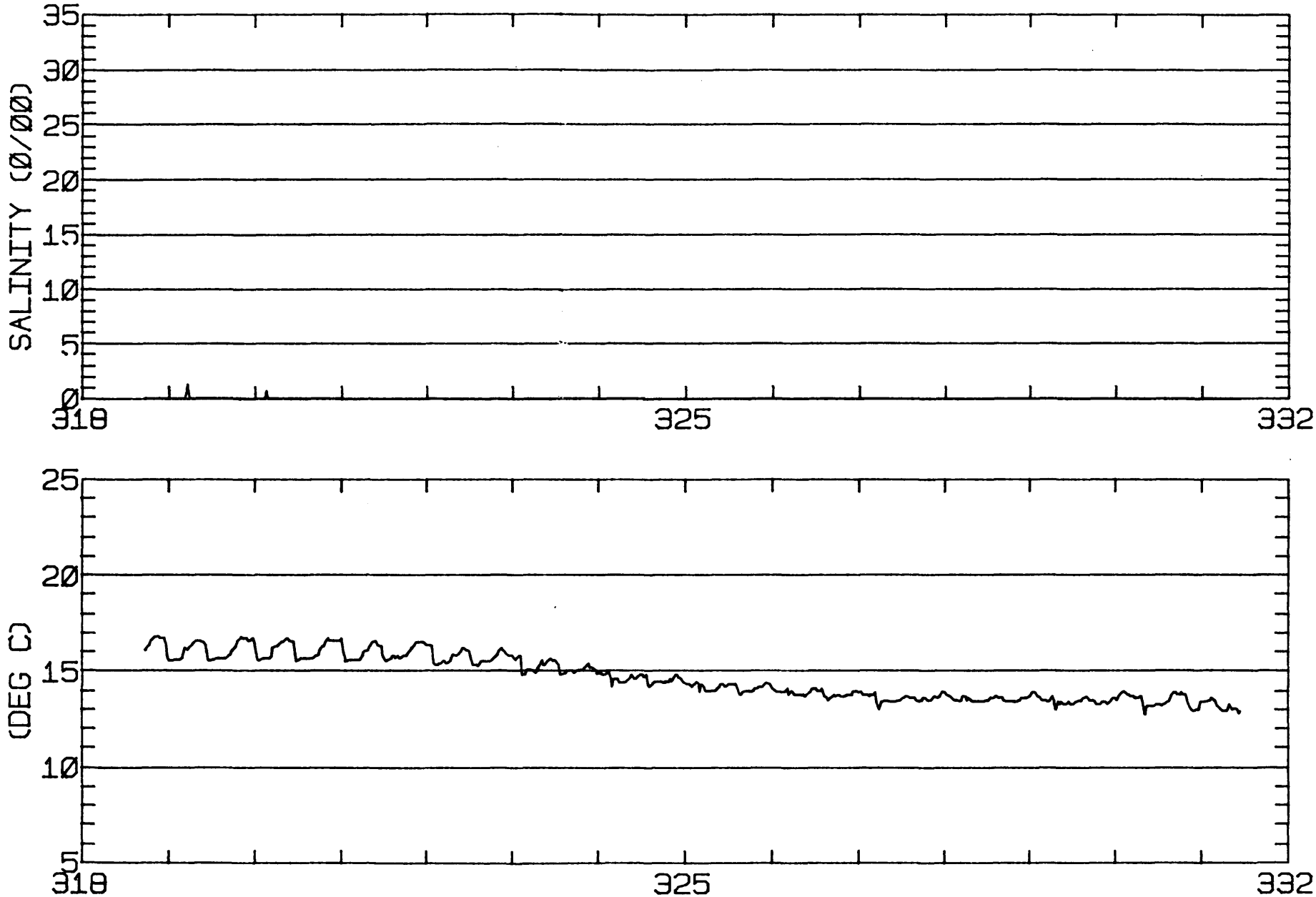
RMS SPEED: 27.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 61.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 127.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 4.85 CM/SEC
STANDARD DEVIATION V SERIES: 7.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.6	-3.5	342.
2	12	-7.0	-6.3	410.
ALL	24	-6.3	-4.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 34 38- 1-58N 121-50- 7W
METER 001.8 METERS ABOVE BED. WATER DEPTH 008.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 34 38- 1-58N 121-50- 7W
METER ØØ1.8 METERS ABOVE BED. WATER DEPTH ØØ8.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 34
POSITION: 38 1'57"N 121 50' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 8.2 M (MLLW)
METER DEPTH: 4.3 M (BELOW MLLW)
START TIME OF SERIES:10/29/80 1210 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

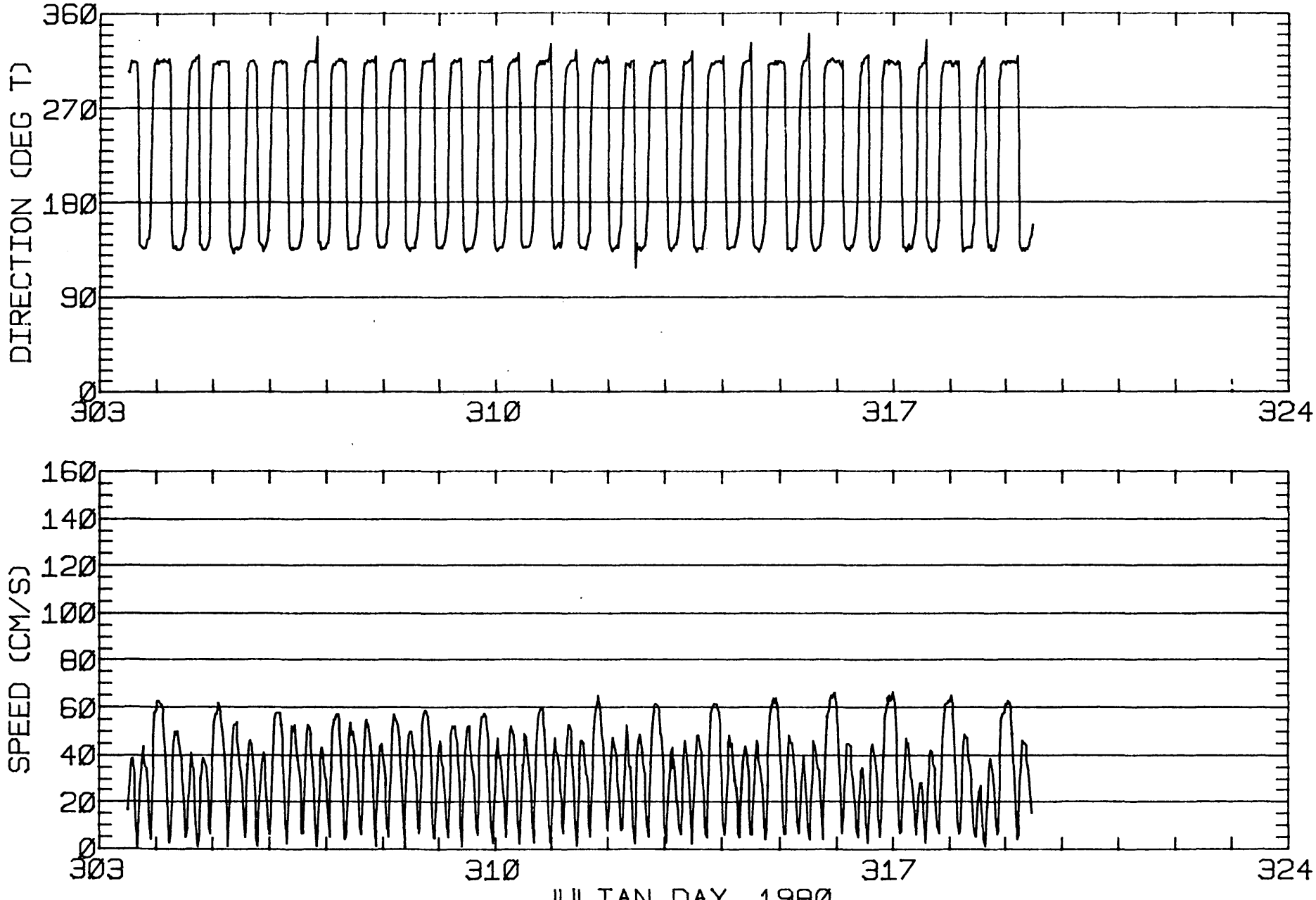
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.55	0.20	135.8	119.6	ANTI-CLOCKWISE
K1	17.84	0.10	135.3	111.1	CLOCKWISE
N2	14.24	0.17	136.1	55.5	CLOCKWISE
M2	51.65	1.92	135.8	82.3	CLOCKWISE
S2	12.06	0.47	136.4	63.6	CLOCKWISE
M4	0.86	0.52	168.5	33.2	ANTI-CLOCKWISE

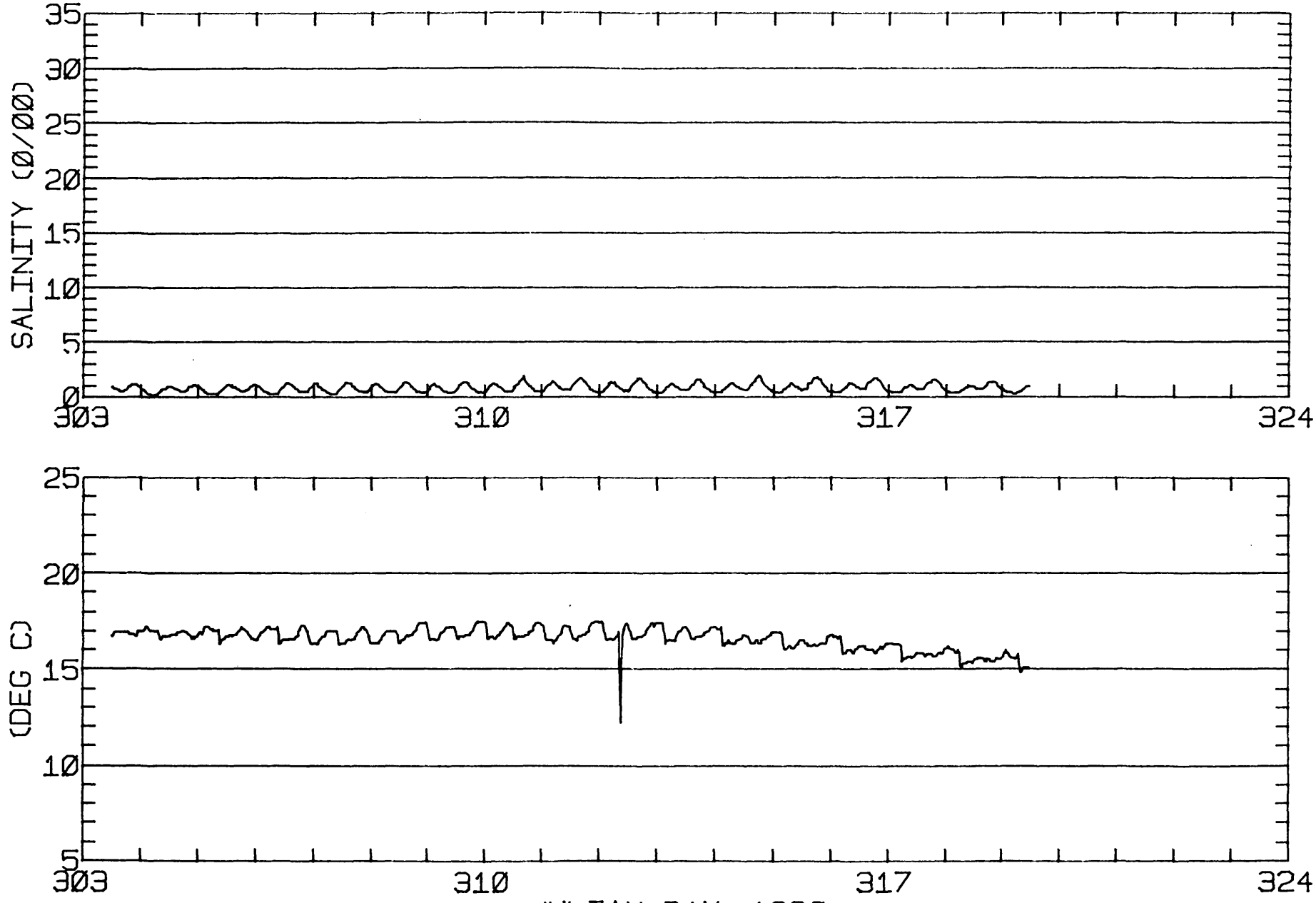
RMS SPEED: 38.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 93.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 33.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 135.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 4.49 CM/SEC
STANDARD DEVIATION V SERIES: 4.78 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.1	1.5	160.
2	12	-5.8	2.7	192.
3	6	-5.7	2.7	196.
ALL	30	-5.1	2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 34 38- 1-57N 121-50- 8W
METER 003.9 METERS ABOVE BED. WATER DEPTH 008.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 34 38- 1-57N 121-50- 8W
METER ØØ3.9 METERS ABOVE BED. WATER DEPTH ØØ8.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 34
POSITION: 38 1'57"N 121 50' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 8.2 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES:10/29/80 1222 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

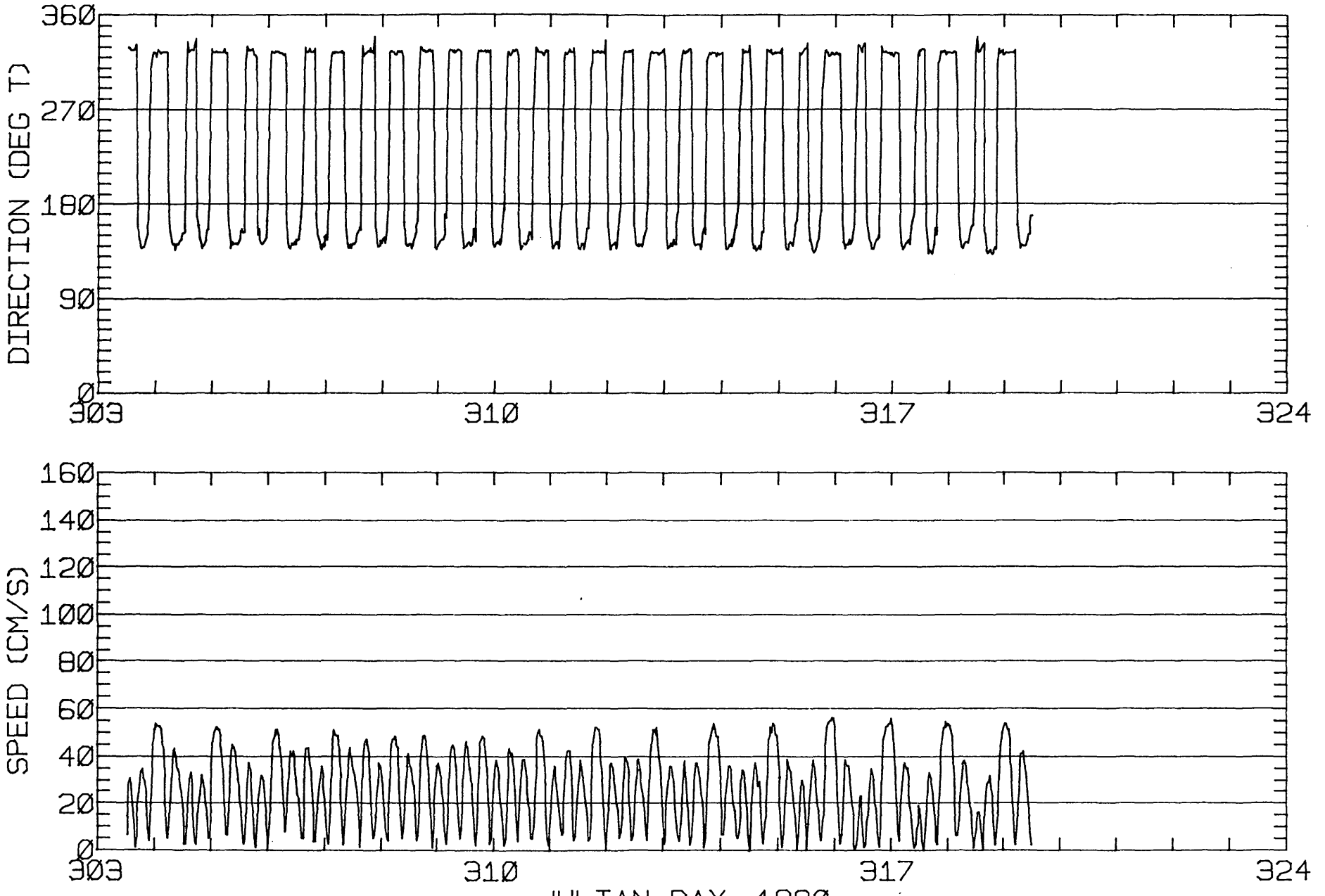
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.30	0.14	144.6	119.9	ANTI-CLOCKWISE
K1	15.06	0.33	143.9	114.0	ANTI-CLOCKWISE
N2	11.79	0.22	144.4	55.6	ANTI-CLOCKWISE
M2	41.75	0.98	144.1	83.5	CLOCKWISE
S2	9.84	0.22	144.2	62.6	CLOCKWISE
M4	1.72	0.98	146.3	57.9	ANTI-CLOCKWISE

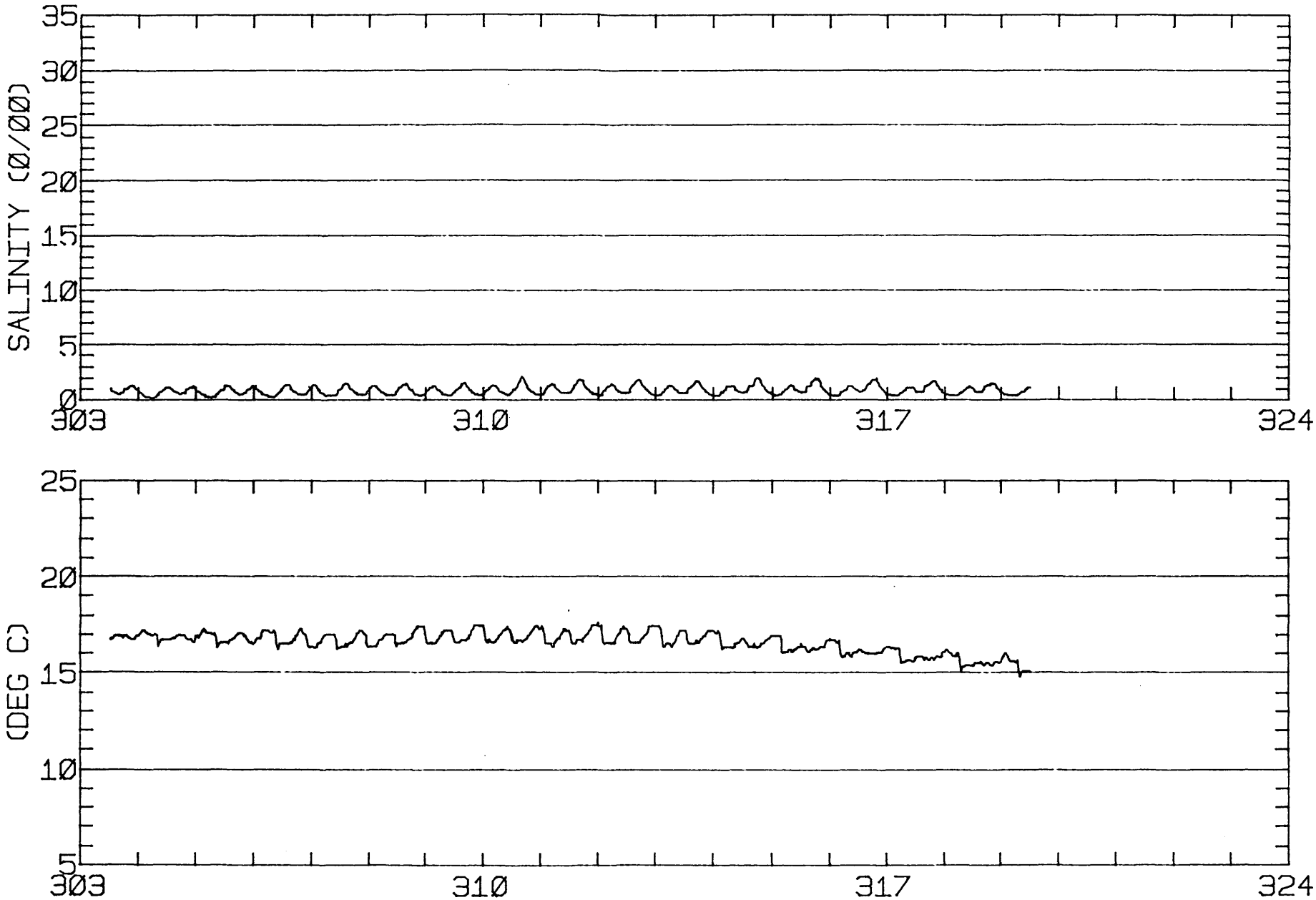
RMS SPEED: 31.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 77.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 144.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 3.00 CM/SEC
STANDARD DEVIATION V SERIES: 4.14 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.6	2.0	160.
2	12	-2.9	3.6	192.
3	6	-2.3	3.3	196.
ALL	30	-2.3	2.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 34 38- 1-57N 121-50- 8W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.2 METERS.



JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 34 38- 1-57N 121-50- 8W

METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 35
POSITION: 38 3'31"N 121 48'15"W
METER TYPE: AANDERAA
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 4.0 M (BELOW MLLW)
START TIME OF SERIES:11/15/79 1030 PST JULIAN DAY=319
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

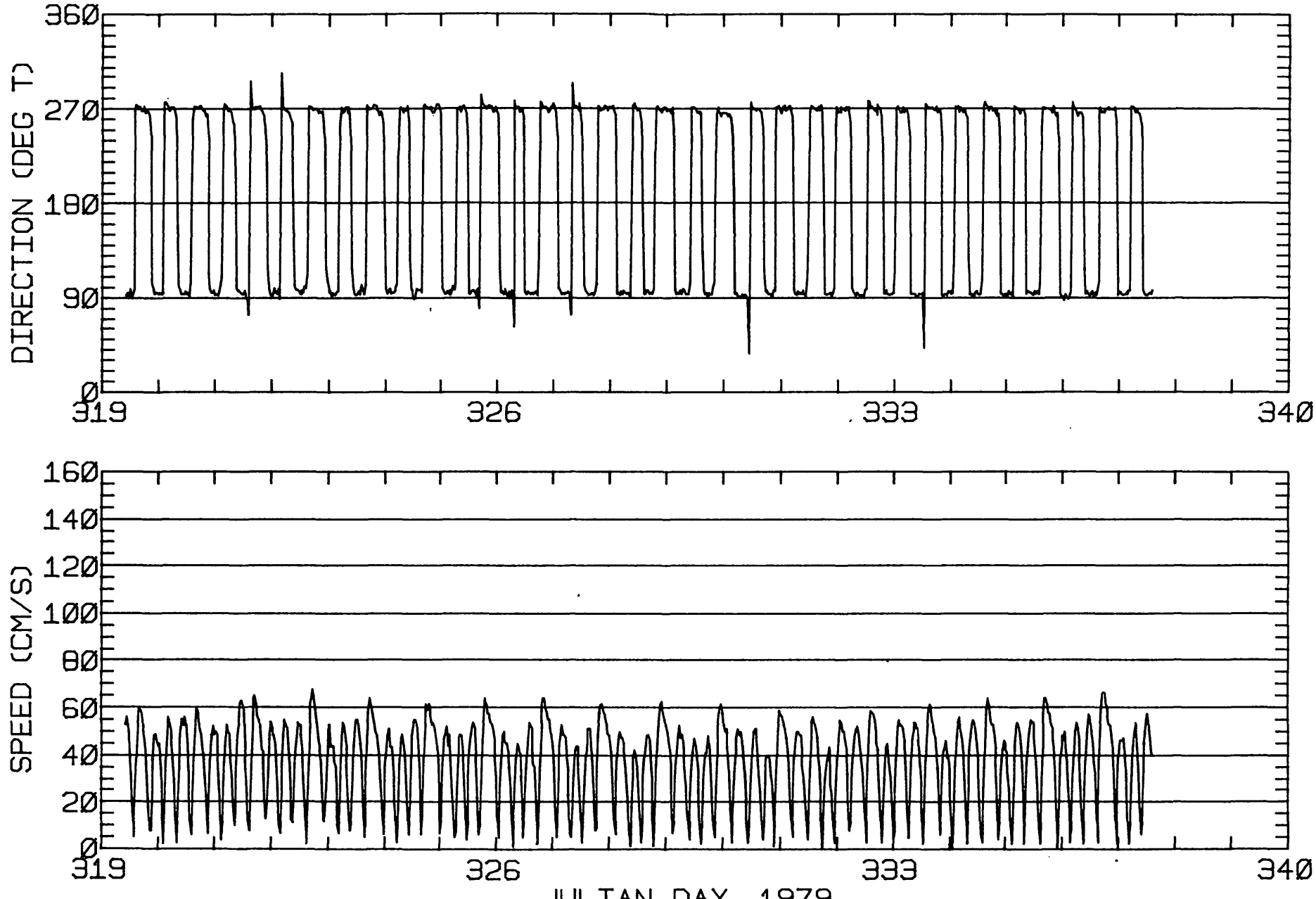
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.57	0.26	91.6	98.4	CLOCKWISE
K1	17.66	0.28	92.0	99.1	ANTI-CLOCKWISE
N2	6.22	0.59	88.4	21.2	CLOCKWISE
M2	48.98	1.13	92.0	42.7	ANTI-CLOCKWISE
S2	9.83	0.21	91.9	34.7	ANTI-CLOCKWISE
M4	1.24	0.10	98.0	85.8	CLOCKWISE

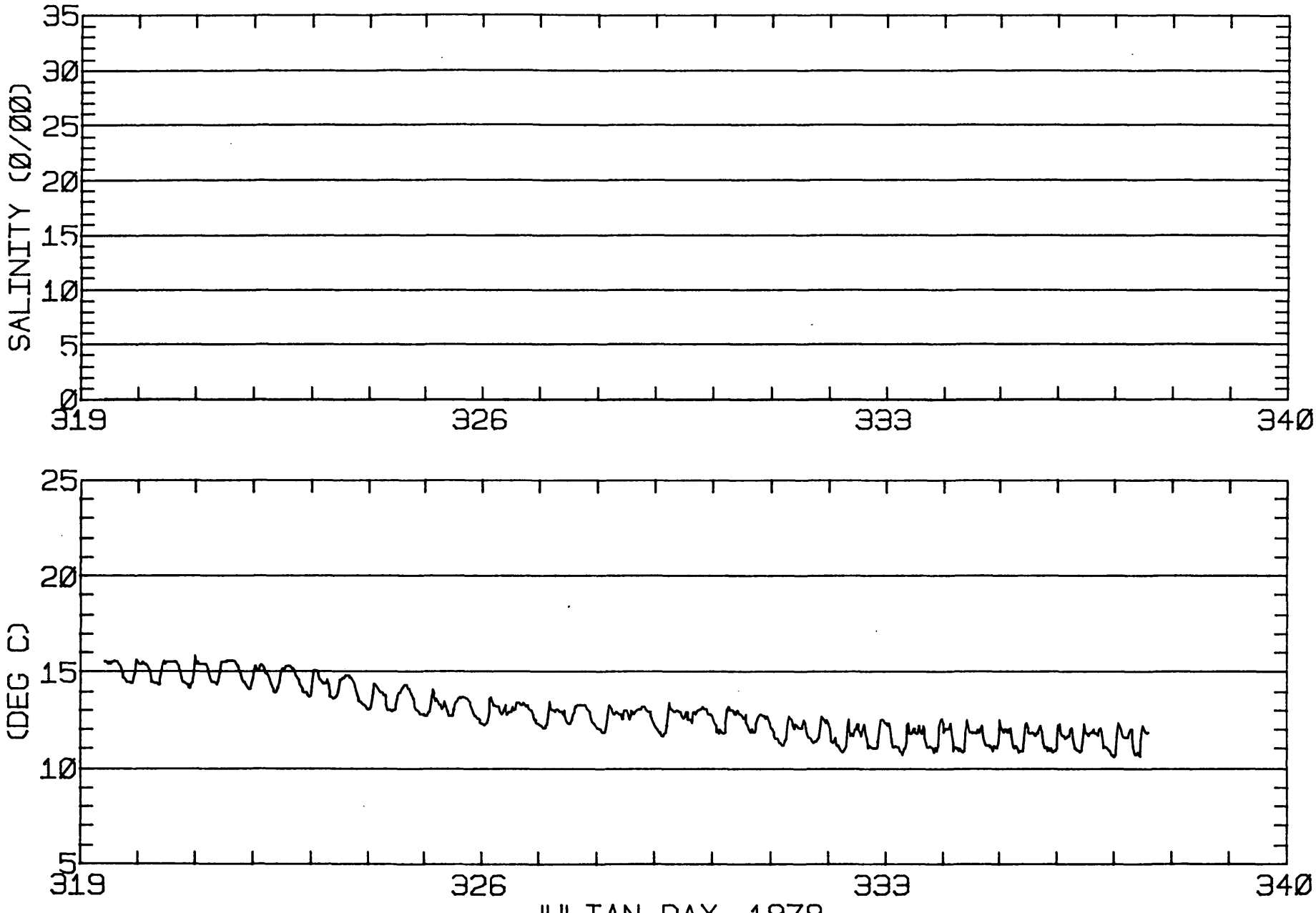
RMS SPEED: 41.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 84.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 91.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 9.41 CM/SEC
STANDARD DEVIATION V SERIES: 1.84 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.1	-2.2	342.
2	12	-5.0	-1.5	410.
3	10	-6.1	-1.3	439.
ALL	34	-4.3	-1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 35 38- 3-31N 121-48-15W
METER 004.8 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 35 38- 3-31N 121-48-15W
METER ØØ4.8 METERS ABOVE BED. WATER DEPTH ØØ8.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 35
POSITION: 38 3'31"N 121 48'15"W
METER TYPE: AANDERAA
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 7.3 M (BELOW MLLW)
START TIME OF SERIES:11/15/79 1032 PST JULIAN DAY=319
APPROXIMATE RECORD LENGTH IS 22 M2-CYCLES

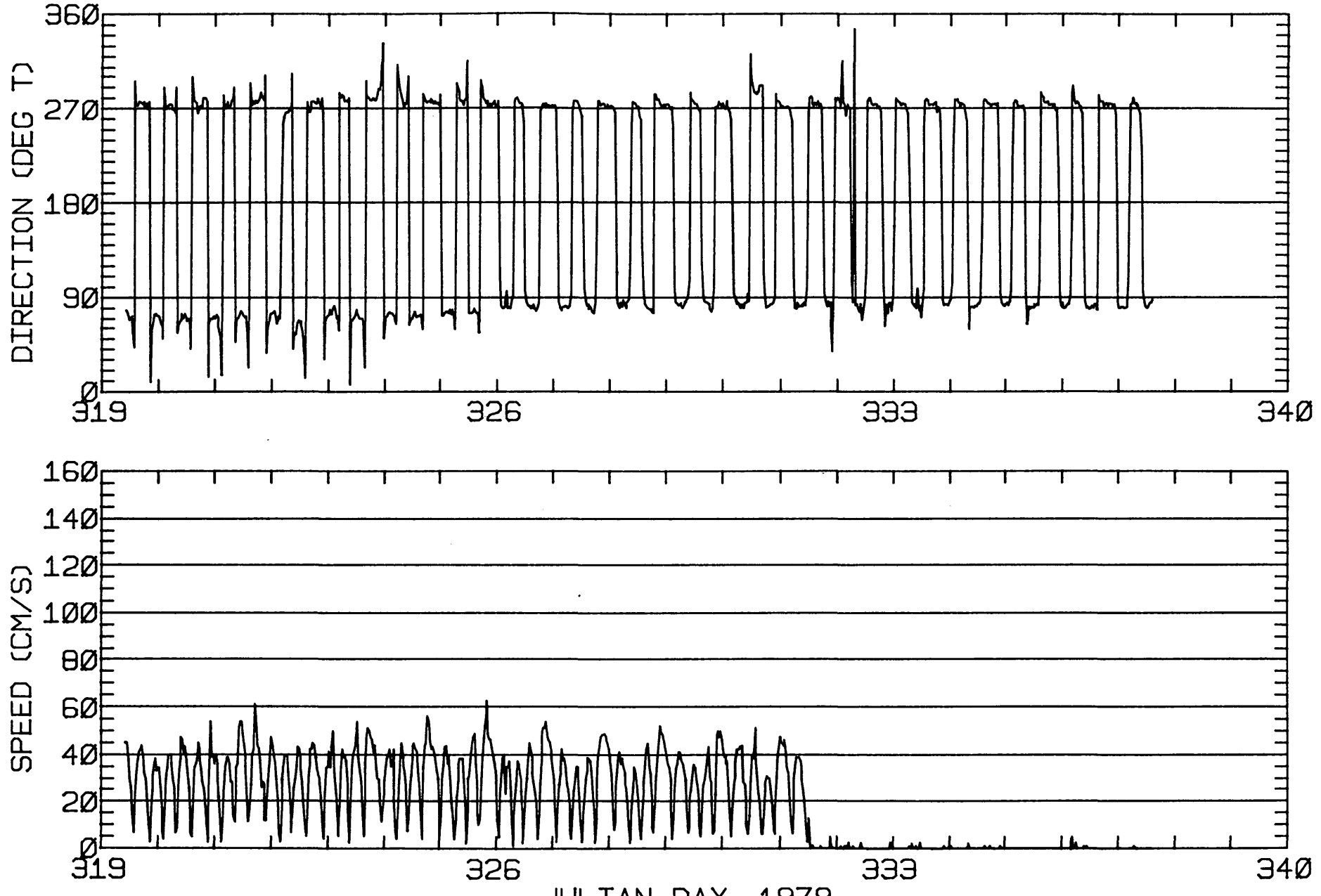
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.63	0.01	92.0	87.8	CLOCKWISE
K1	12.98	1.02	89.5	98.4	ANTI-CLOCKWISE
N2	8.37	0.76	98.3	350.4	CLOCKWISE
M2	44.09	0.42	86.5	41.3	CLOCKWISE
S2	7.18	0.65	79.2	7.8	CLOCKWISE
M4	1.70	0.48	35.1	43.9	ANTI-CLOCKWISE

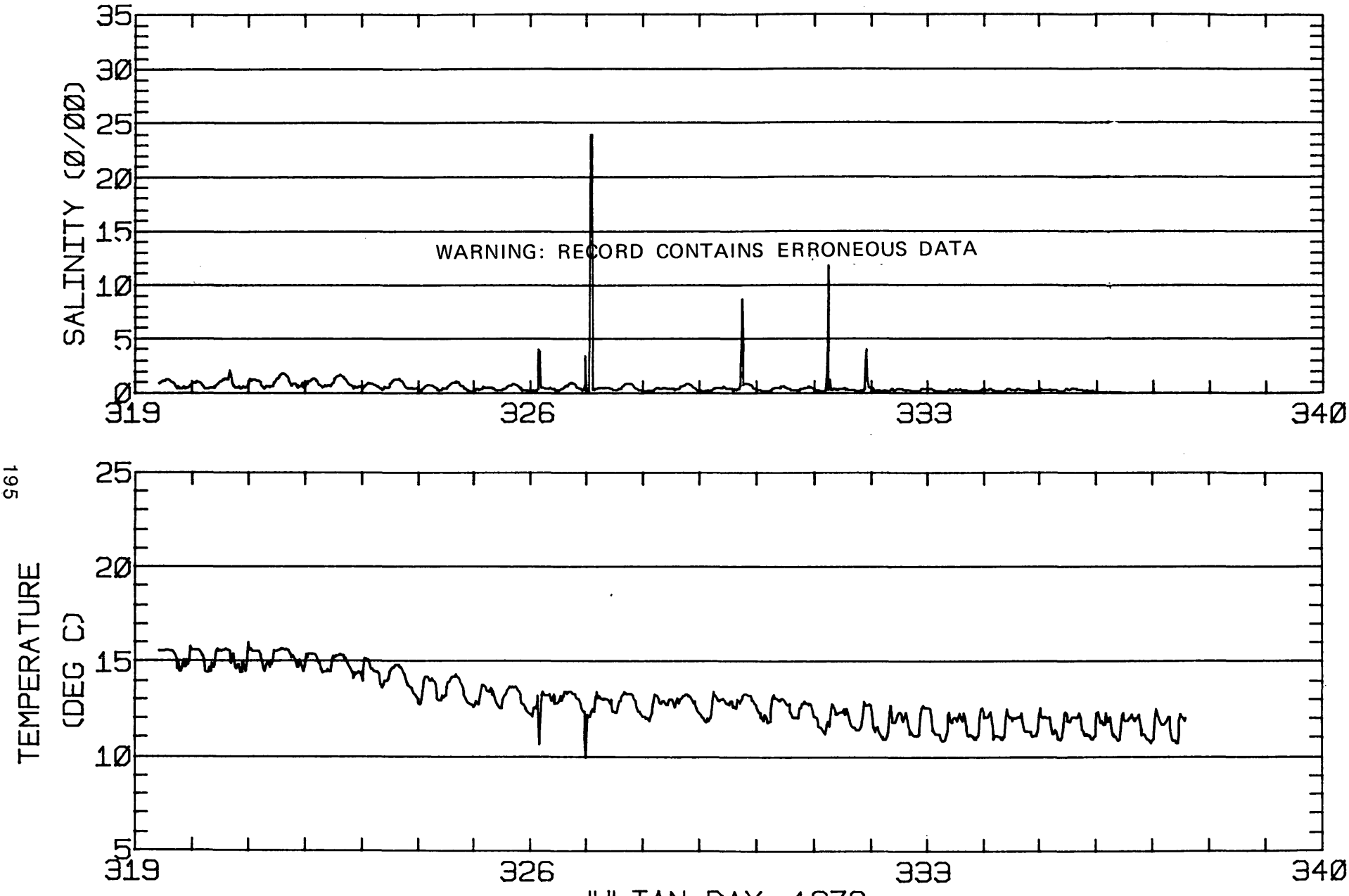
RMS SPEED: 33.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 72.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 87.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 7.91 CM/SEC
STANDARD DEVIATION V SERIES: 3.54 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	7.0	342.
2	10	-3.7	2.9	390.
ALL	22	-2.1	5.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 35 38- 3-31N 121-48-15W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 35 38- 3-31N 121-48-15W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 227
POSITION: 38 2'11"N 122 8'41"W
METER TYPE: AANDERAA
WATER DEPTH: 9.8 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 10/31/79 1624 PST JULIAN DAY=304
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

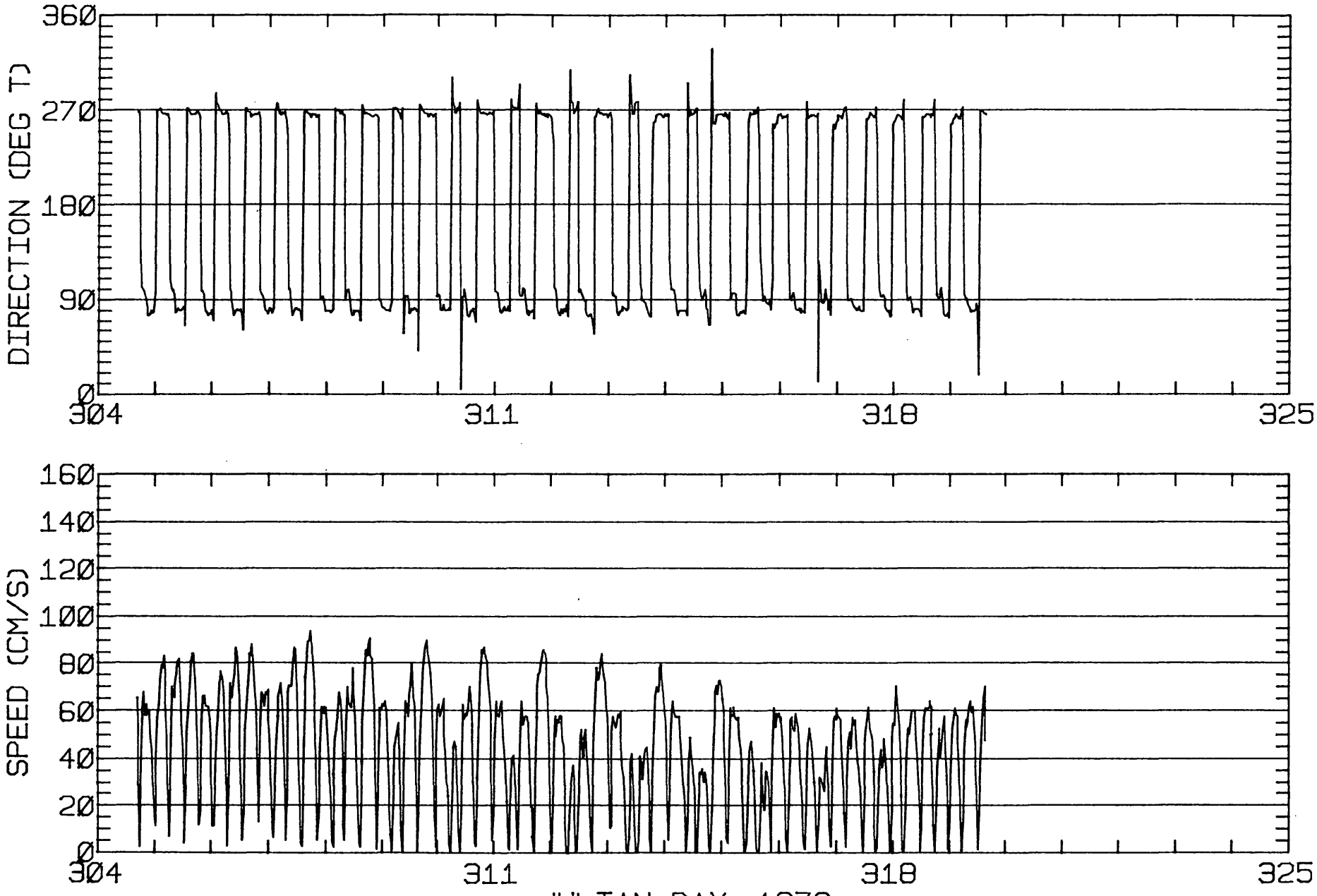
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.87	0.46	85.6	93.6	CLOCKWISE
K1	25.69	0.47	83.8	74.7	ANTI-CLOCKWISE
N2	6.05	0.90	82.1	1.9	ANTI-CLOCKWISE
M2	64.34	2.66	84.8	1.9	ANTI-CLOCKWISE
S2	10.22	0.41	85.2	325.7	ANTI-CLOCKWISE
M4	4.55	0.44	120.6	233.4	CLOCKWISE

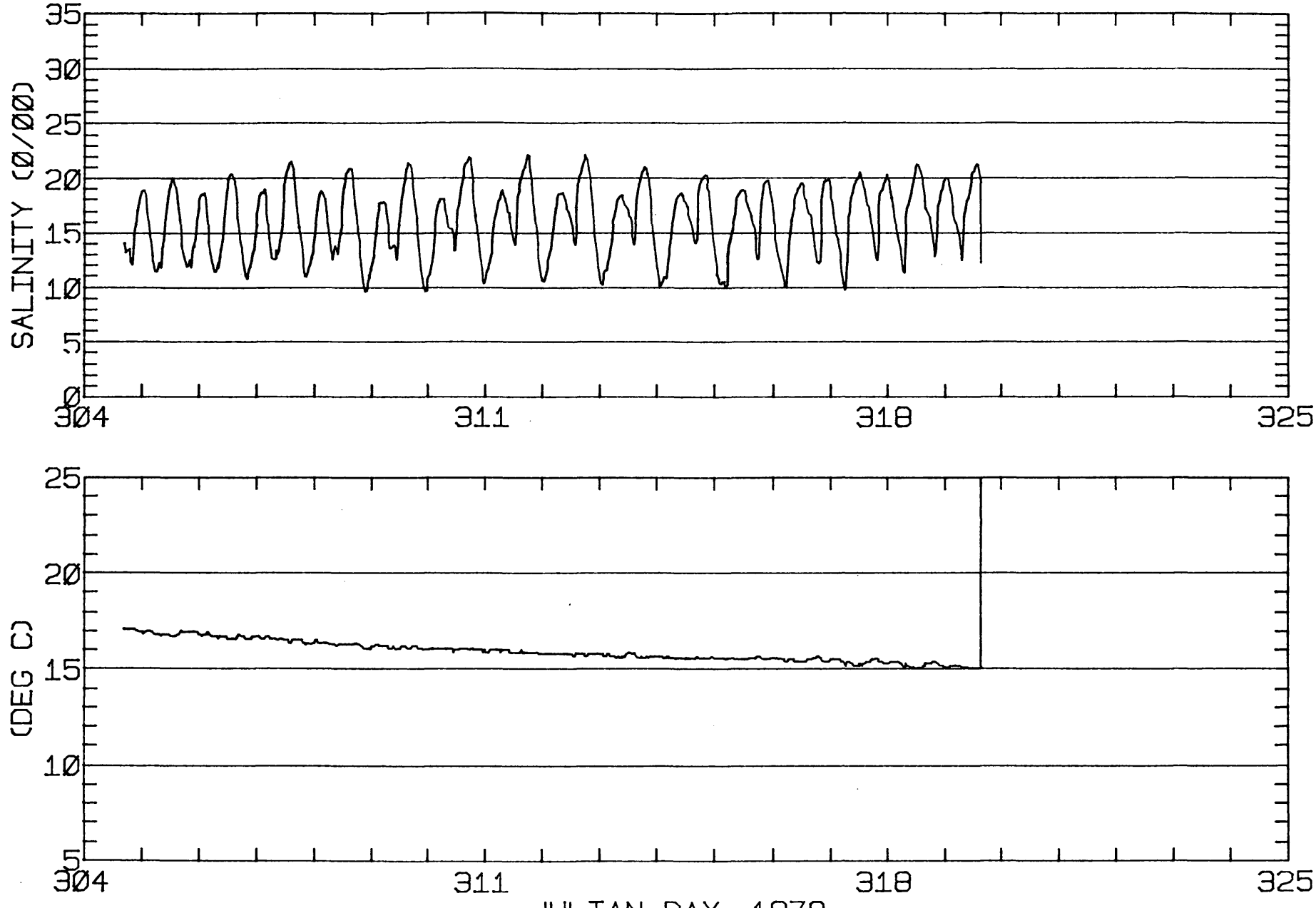
RMS SPEED: 51.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 113.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 84.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 9.61 CM/SEC
STANDARD DEVIATION V SERIES: 3.81 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	1.4	218.
2	12	-1.3	0.1	317.
3	4	0.6	-0.2	255.
ALL	28	-0.8	0.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 227 38- 2-11N 122- 8-41W
METER 003.1 METERS ABOVE BED. WATER DEPTH 009.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 227 38- 2-11N 122- 8-41W
METER ØØ3.1 METERS ABOVE BED. WATER DEPTH ØØ9.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 228
POSITION: 38 1'43"N 122 8'55"W
METER TYPE: AANDERAA
WATER DEPTH: 12.8 M (MLLW)
METER DEPTH: 9.1 M (BELOW MLLW)
START TIME OF SERIES: 10/31/79 1730 PST JULIAN DAY=304
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

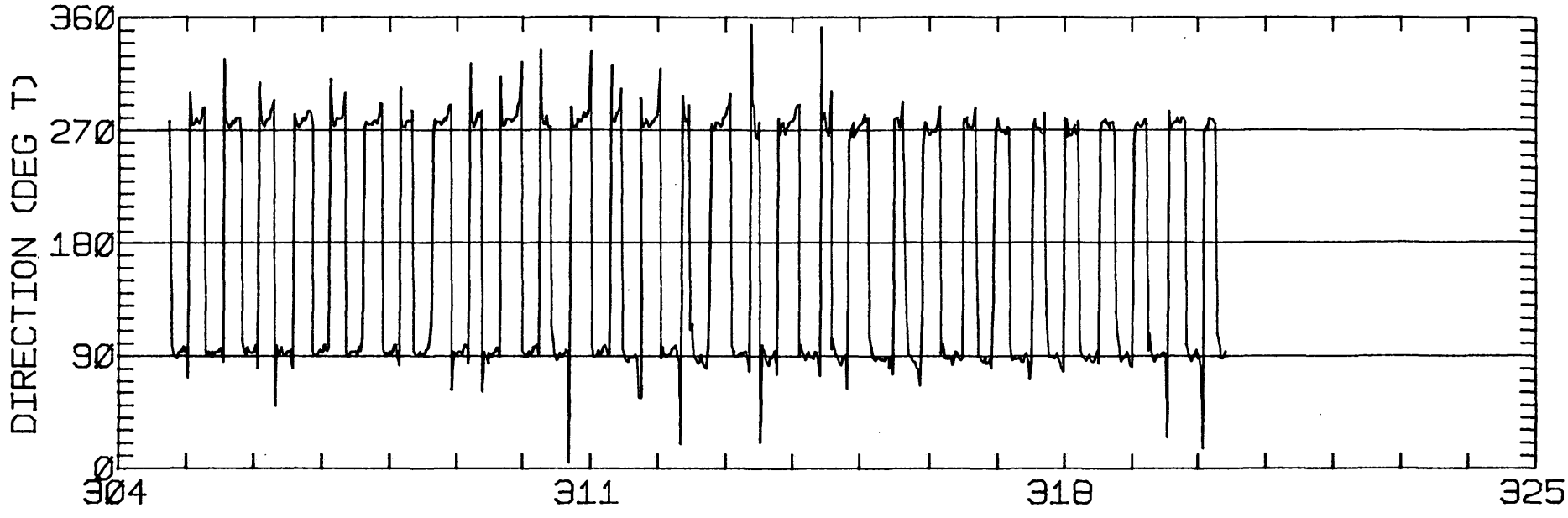
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

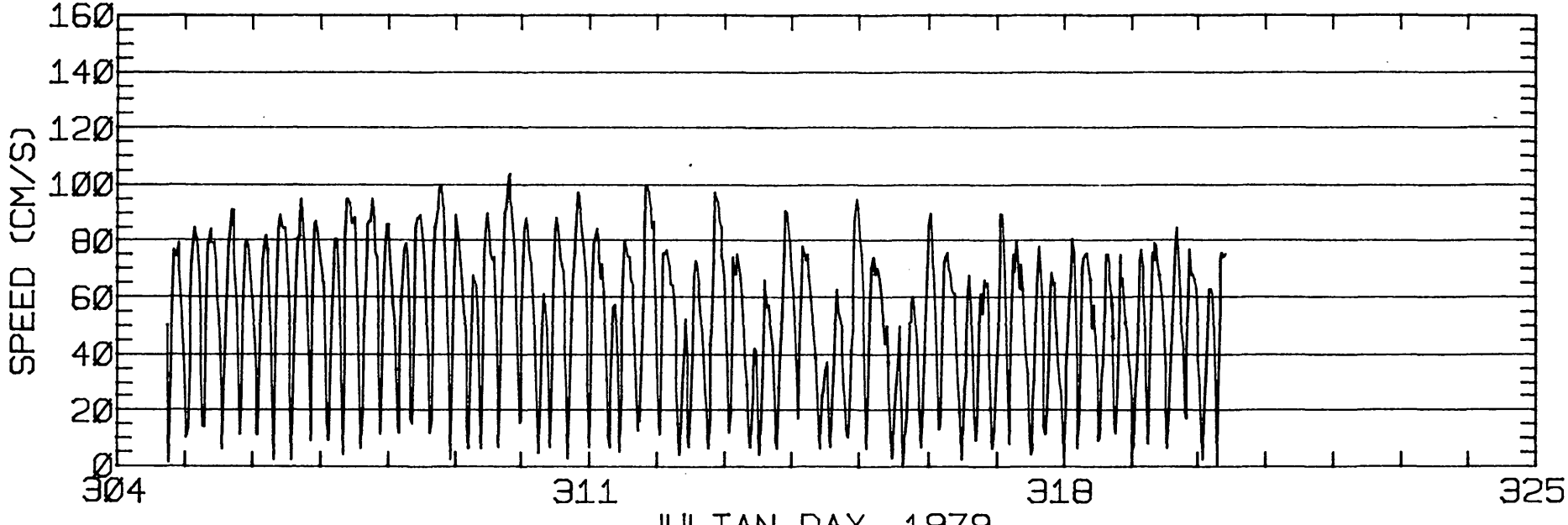
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.54	0.83	96.2	96.0	CLOCKWISE
K1	27.81	0.24	94.1	82.9	ANTI-CLOCKWISE
N2	5.22	2.57	120.9	344.5	CLOCKWISE
M2	72.03	0.54	94.5	18.3	ANTI-CLOCKWISE
S2	12.16	1.08	94.9	348.0	CLOCKWISE
M4	7.83	0.69	98.1	279.0	ANTI-CLOCKWISE

RMS SPEED: 59.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 128.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 94.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.53
STANDARD DEVIATION U-SERIES: 10.45 CM/SEC
STANDARD DEVIATION V SERIES: 4.04 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.1	3.0	218.
2	12	5.5	2.3	317.
3	6	6.5	2.0	242.
ALL	30	4.8	2.5	



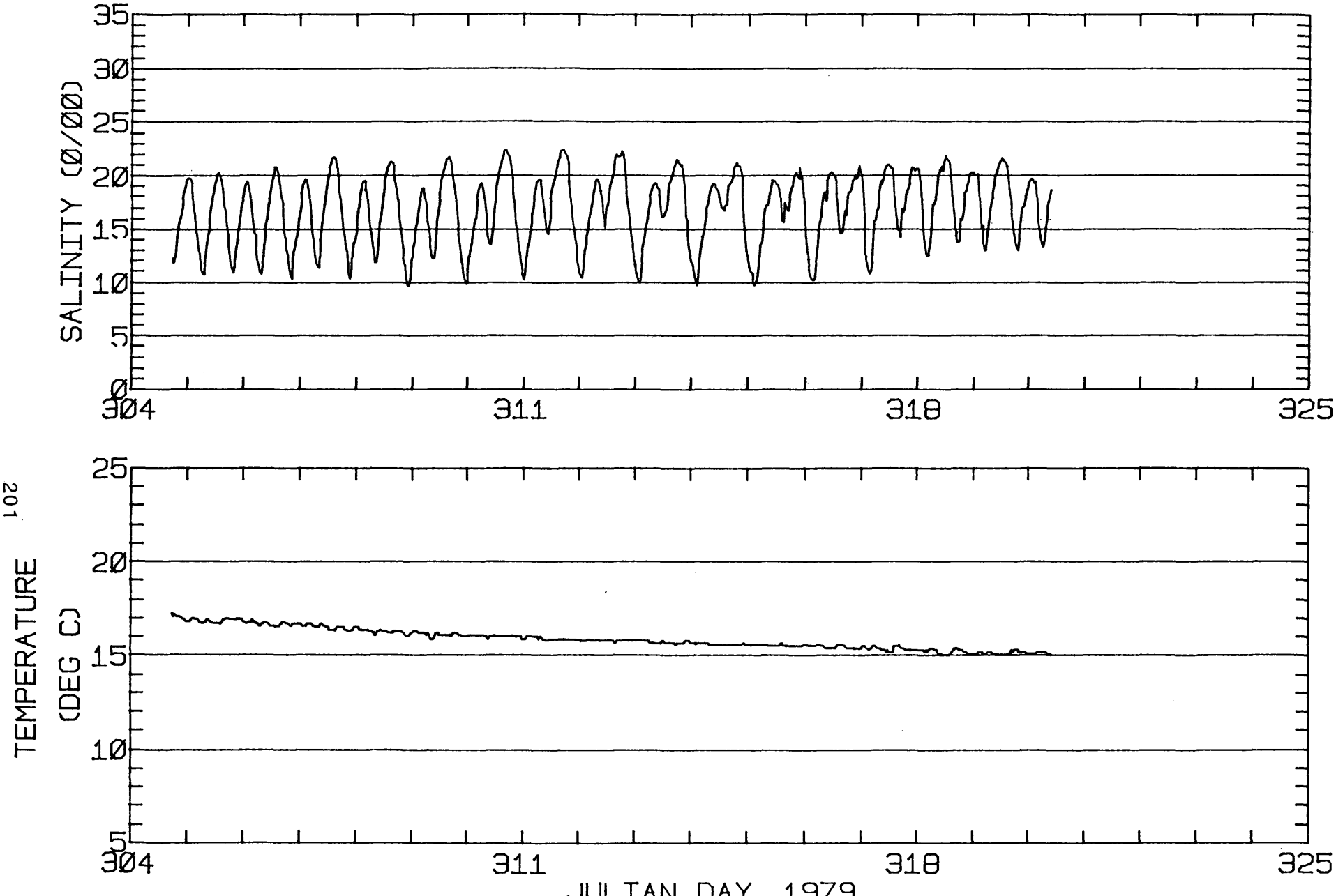


JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 228 38- 1-43N 122- 8-55W

METER 003.7 METERS ABOVE BED. WATER DEPTH 012.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 228 38- 1-43N 122- 8-55W
METER ØØ3.7 METERS ABOVE BED. WATER DEPTH Ø12.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 229
POSITION: 38 8'16"N 122 4'53"W
METER TYPE: AANDERAA
WATER DEPTH: 9.8 M (MLLW)
METER DEPTH: 4.6 M (BELOW MLLW)
START TIME OF SERIES:11/ 1/79 1302 PST JULIAN DAY=305
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

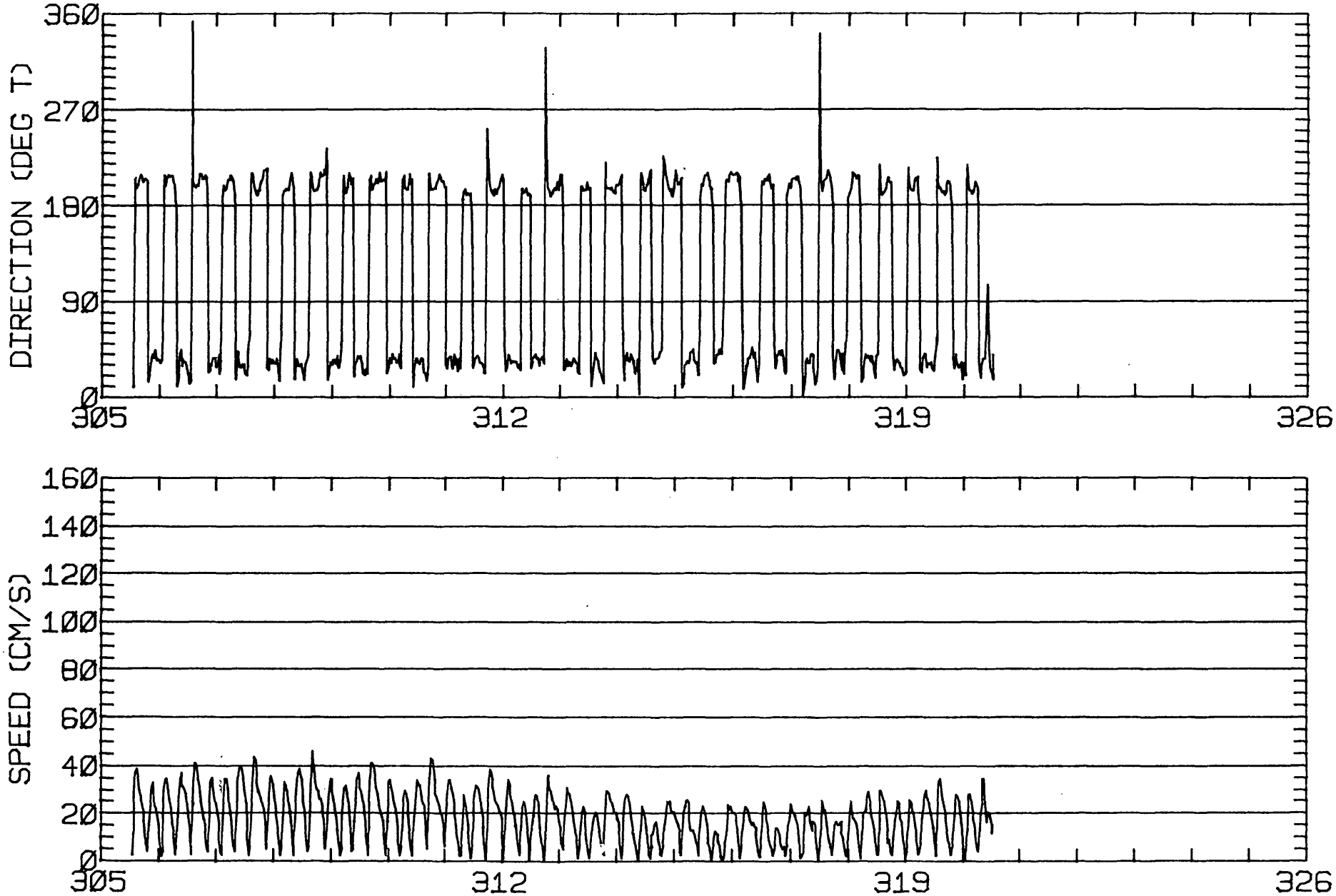
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.39	0.12	24.4	86.1	ANTI-CLOCKWISE
K1	8.51	0.08	25.9	69.6	CLOCKWISE
N2	3.38	0.40	26.0	323.6	CLOCKWISE
M2	25.87	0.31	27.3	1.8	CLOCKWISE
S2	5.37	0.36	24.4	346.7	ANTI-CLOCKWISE
M4	1.76	0.16	100.8	341.1	ANTI-CLOCKWISE

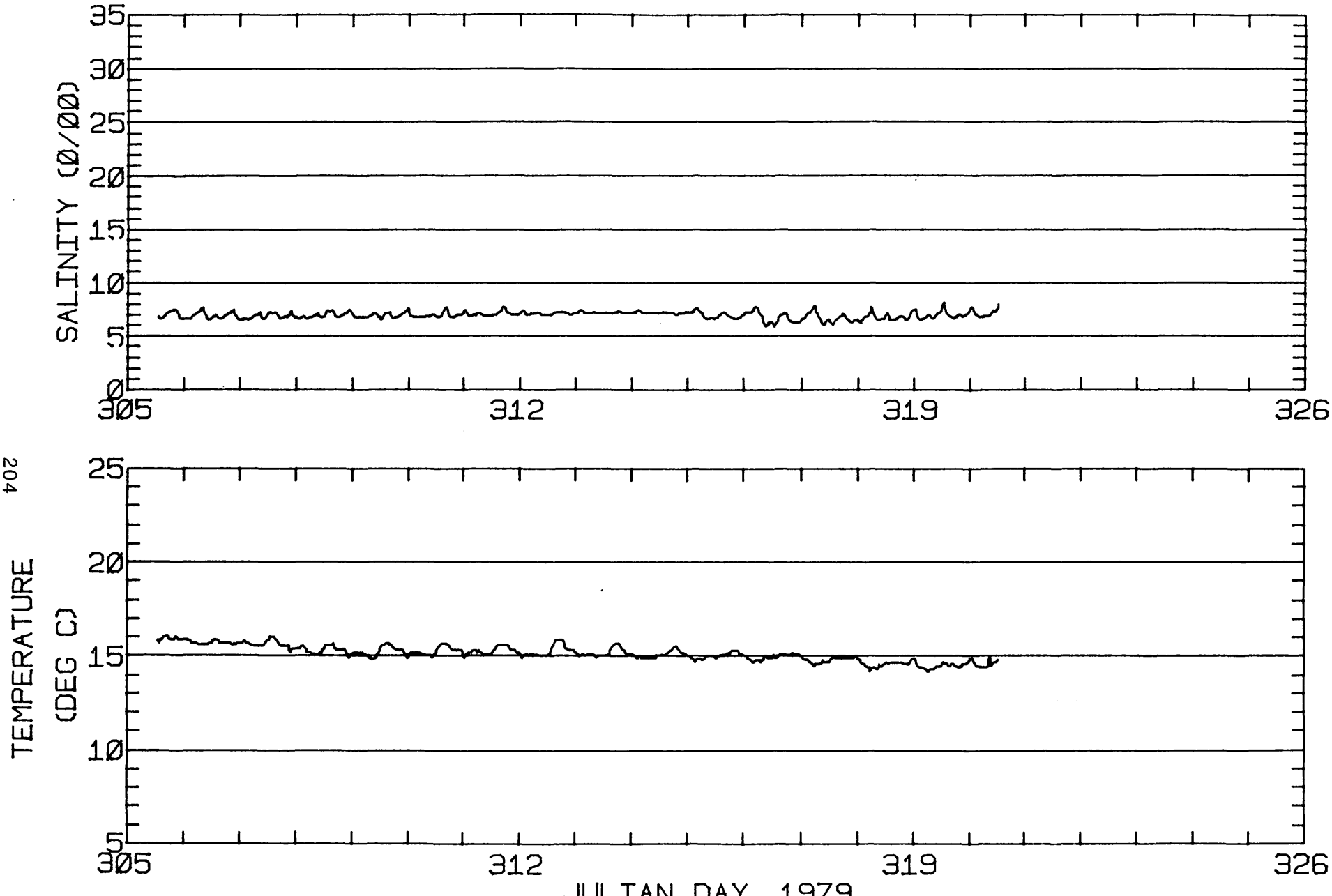
RMS SPEED: 21.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 43.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 15.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 26.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 2.84 CM/SEC
STANDARD DEVIATION V SERIES: 4.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

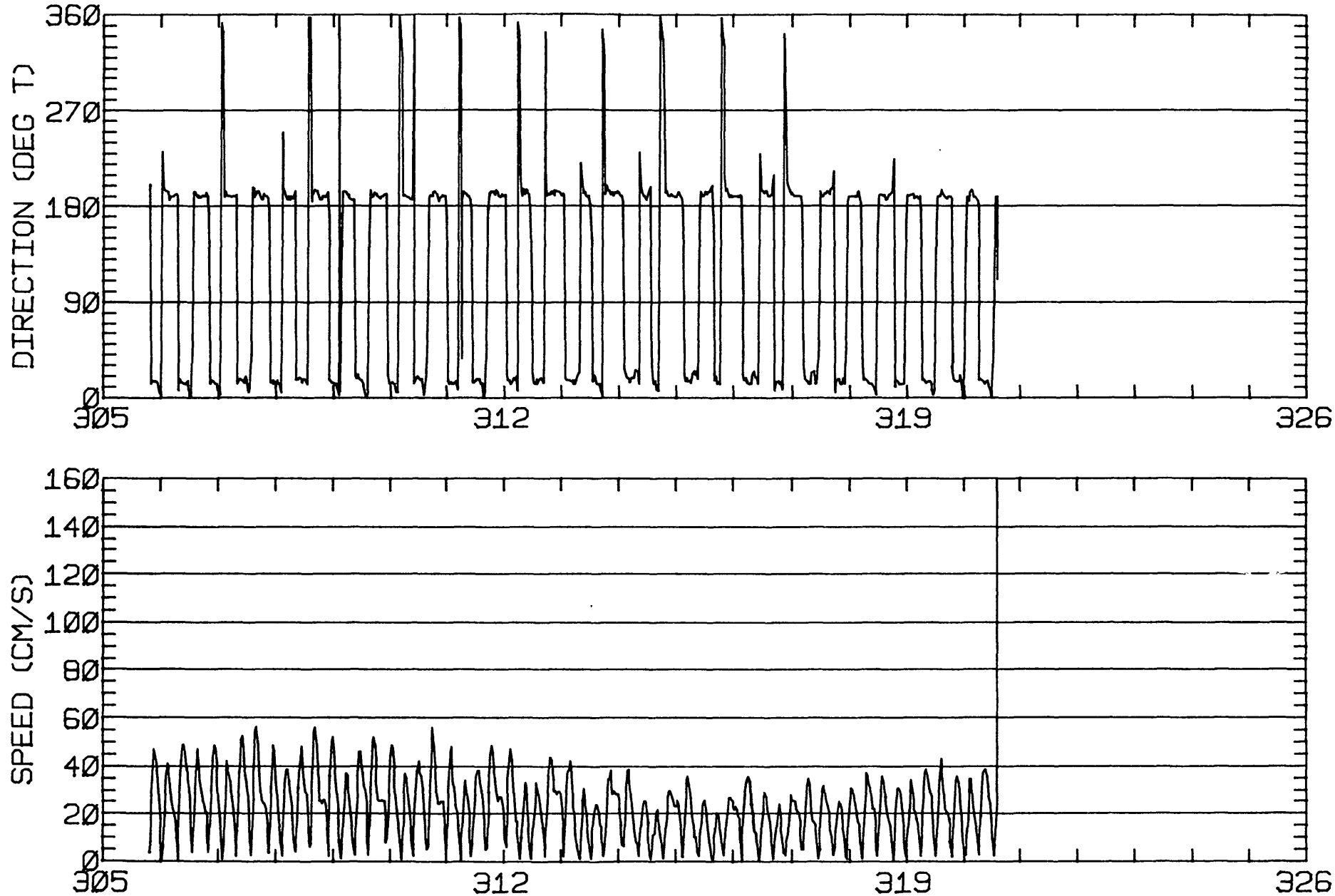
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.6	-1.3	218.
2	12	1.1	-2.0	307.
3	4	2.3	0.0	225.
ALL	28	1.5	-1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 229 38- 8-16N 122- 4-53W
METER 005.2 METERS ABOVE BED. WATER DEPTH 009.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 229 38- 8-16N 122- 4-53W
METER ØØ5.2 METERS ABOVE BED. WATER DEPTH ØØ9.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 230 38- 8-50N 122- 3-23W
METER 000.9 METERS ABOVE BED. WATER DEPTH 006.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 230
POSITION: 38 8'50"N 122 3'23"W
METER TYPE: AANDERAA
WATER DEPTH: 6.7 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES:11/ 1/79 1916 PST JULIAN DAY=305
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

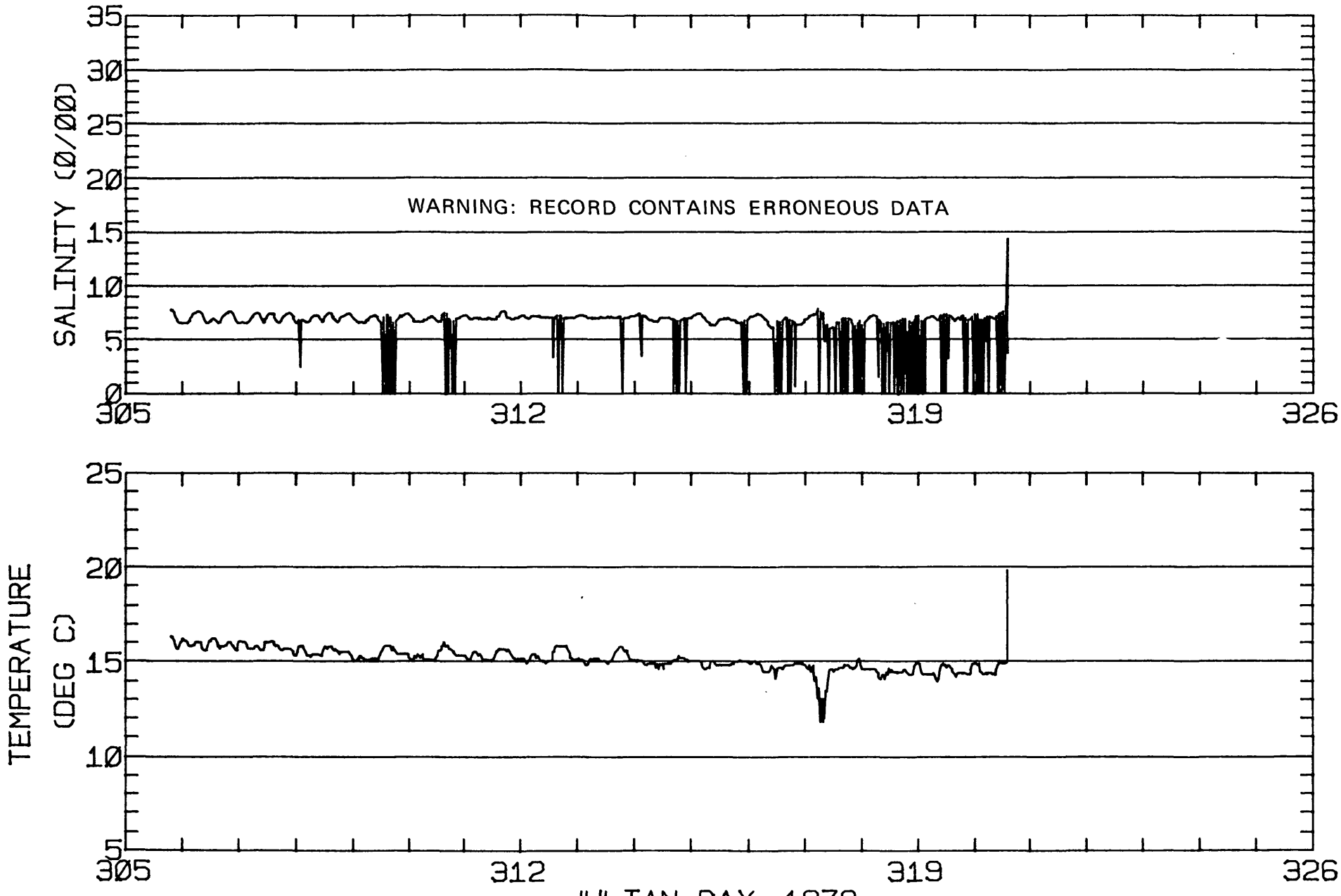
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.29	0.22	8.7	85.5	ANTI-CLOCKWISE
K1	10.16	0.13	15.5	67.9	ANTI-CLOCKWISE
N2	3.10	0.49	10.8	326.5	ANTI-CLOCKWISE
M2	32.78	0.60	12.7	357.2	ANTI-CLOCKWISE
S2	6.57	0.12	14.0	336.2	ANTI-CLOCKWISE
M4	3.37	0.44	19.3	17.1	ANTI-CLOCKWISE

RMS SPEED: 26.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 53.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 20.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 13.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 2.19 CM/SEC
STANDARD DEVIATION V SERIES: 6.32 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.6	-0.9	243.
2	12	0.1	-2.0	307.
3	4	0.8	-0.2	225.
ALL	28	0.4	-1.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 230 38- 8-50N 122- 3-23W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ6.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 237
POSITION: 38 3'53"N 122 2'29"W
METER TYPE: AANDERAA
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES:10/31/80 1210 PST JULIAN DAY=305
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

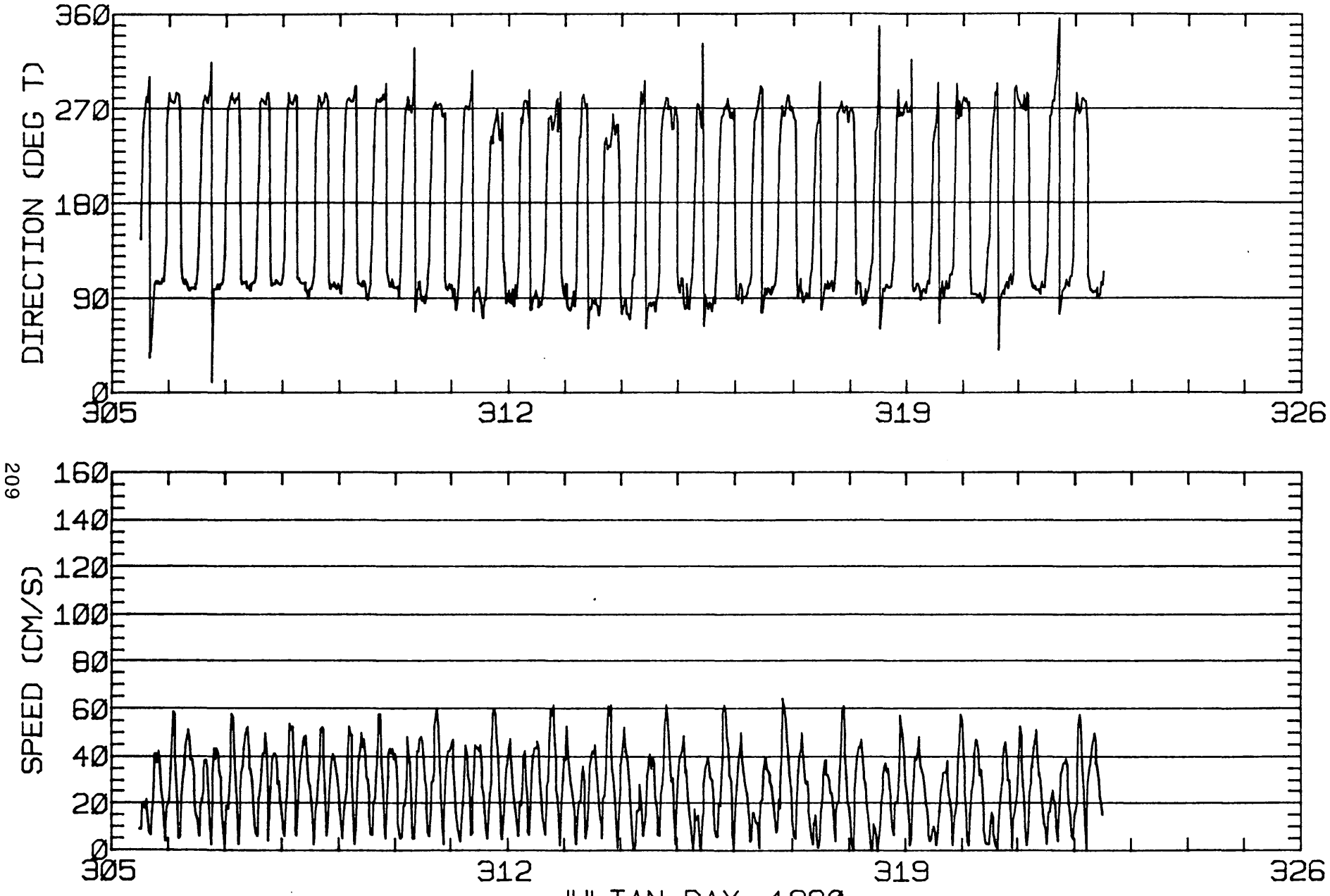
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.64	1.49	89.2	85.7	ANTI-CLOCKWISE
K1	13.80	0.64	87.5	80.5	CLOCKWISE
N2	12.47	0.27	106.2	347.5	ANTI-CLOCKWISE
M2	42.73	1.62	95.3	23.0	CLOCKWISE
S2	11.10	1.69	85.2	9.9	ANTI-CLOCKWISE
M4	3.53	0.48	118.6	308.6	CLOCKWISE

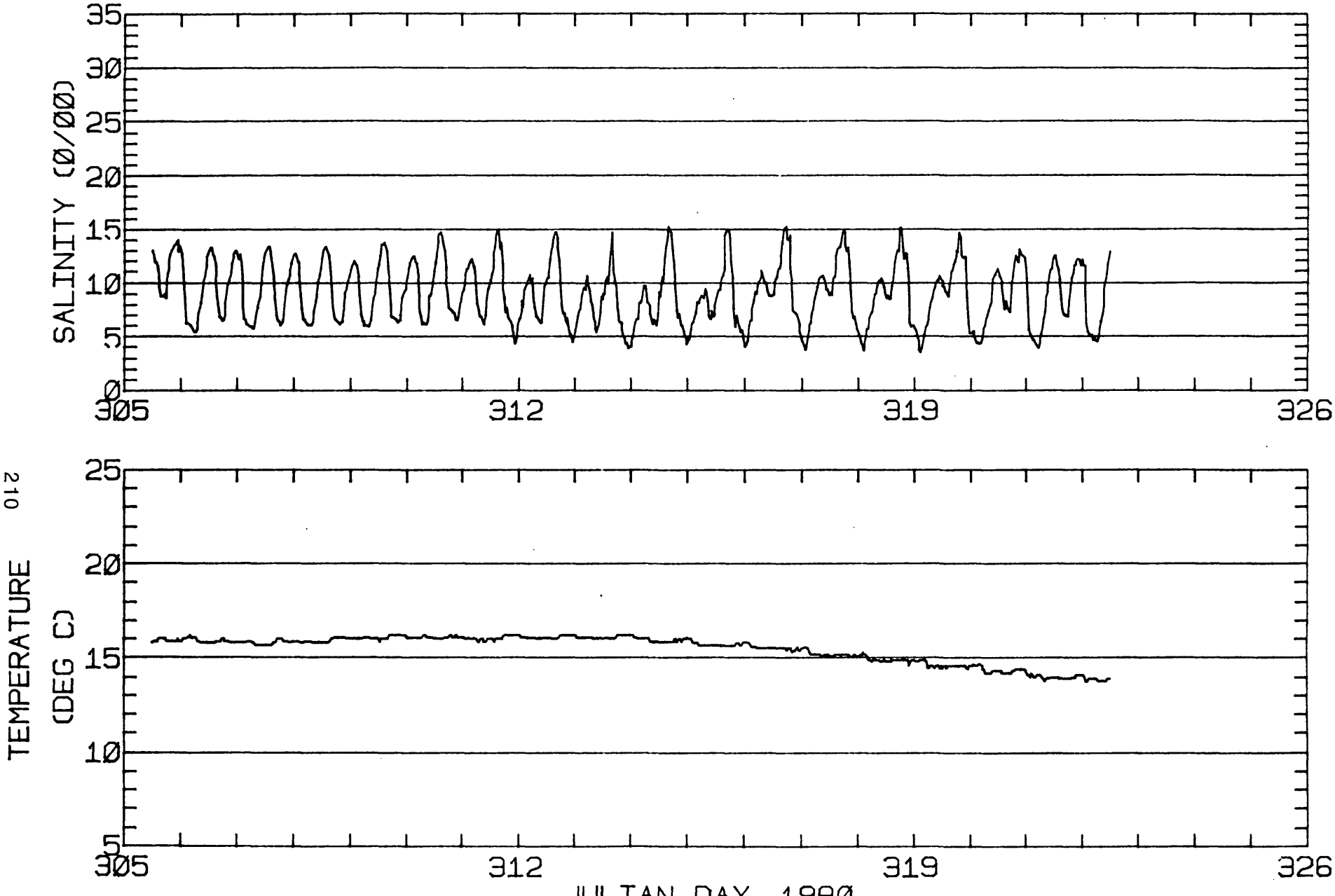
RMS SPEED: 31.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 77.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 91.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 6.03 CM/SEC
STANDARD DEVIATION V SERIES: 4.64 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.6	-1.9	165.
2	12	2.7	-1.7	192.
3	8	7.0	-2.2	193.
ALL	32	4.1	-1.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 237 38- 3-53N 122- 2-29W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 237 38- 3-53N 122- 2-29W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ7.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 238
POSITION: 38 3'12"N 122 2'58"W
METER TYPE: AANDERAA
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 7.3 M (BELOW MLLW)
START TIME OF SERIES:10/30/79 1122 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

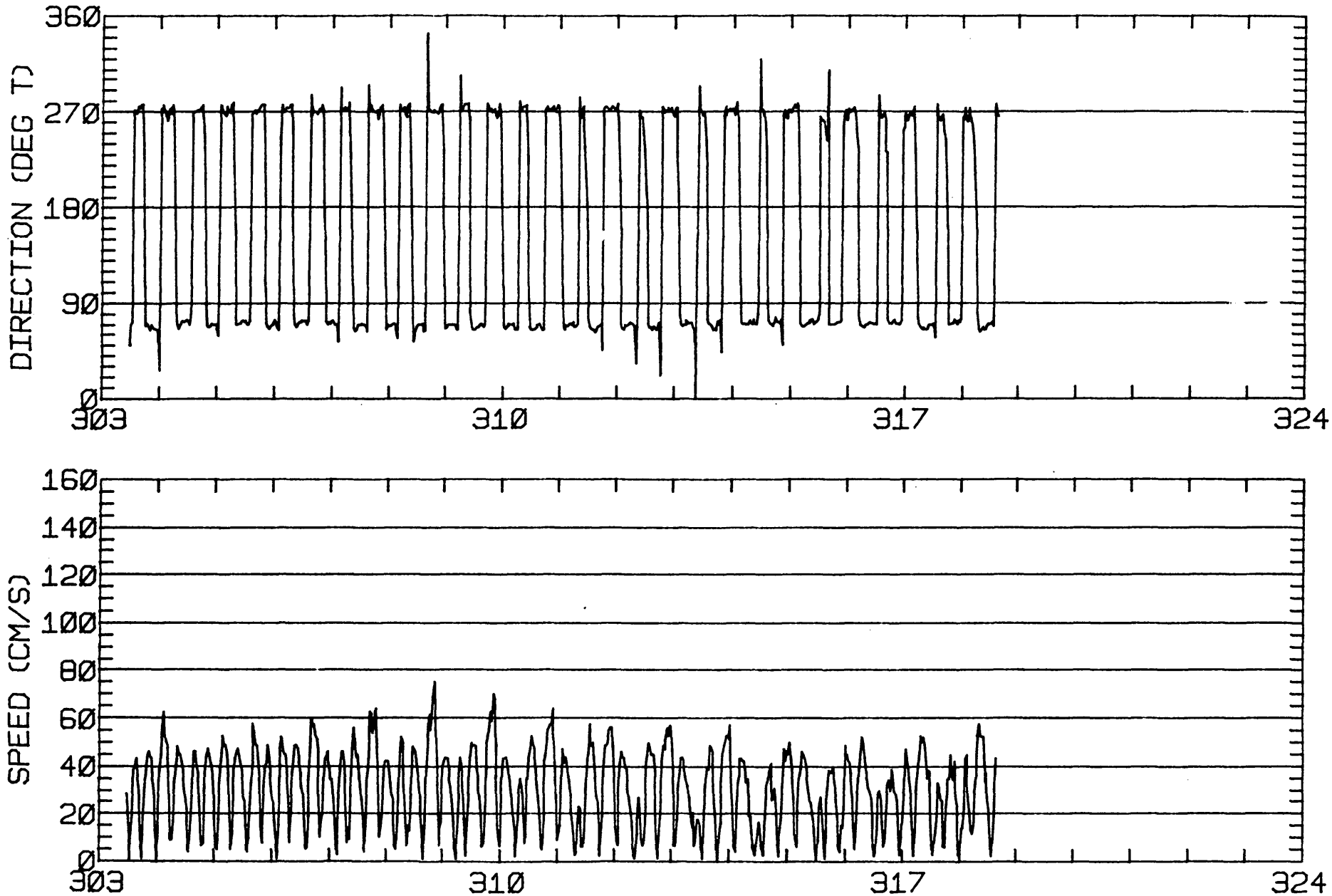
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.97	0.28	89.8	105.0	ANTI-CLOCKWISE
K1	16.47	0.11	82.7	99.0	ANTI-CLOCKWISE
N2	2.80	0.70	96.2	355.4	CLOCKWISE
M2	41.52	1.17	80.0	30.2	ANTI-CLOCKWISE
S2	5.65	0.14	83.6	0.5	CLOCKWISE
M4	4.99	3.00	102.1	286.7	ANTI-CLOCKWISE

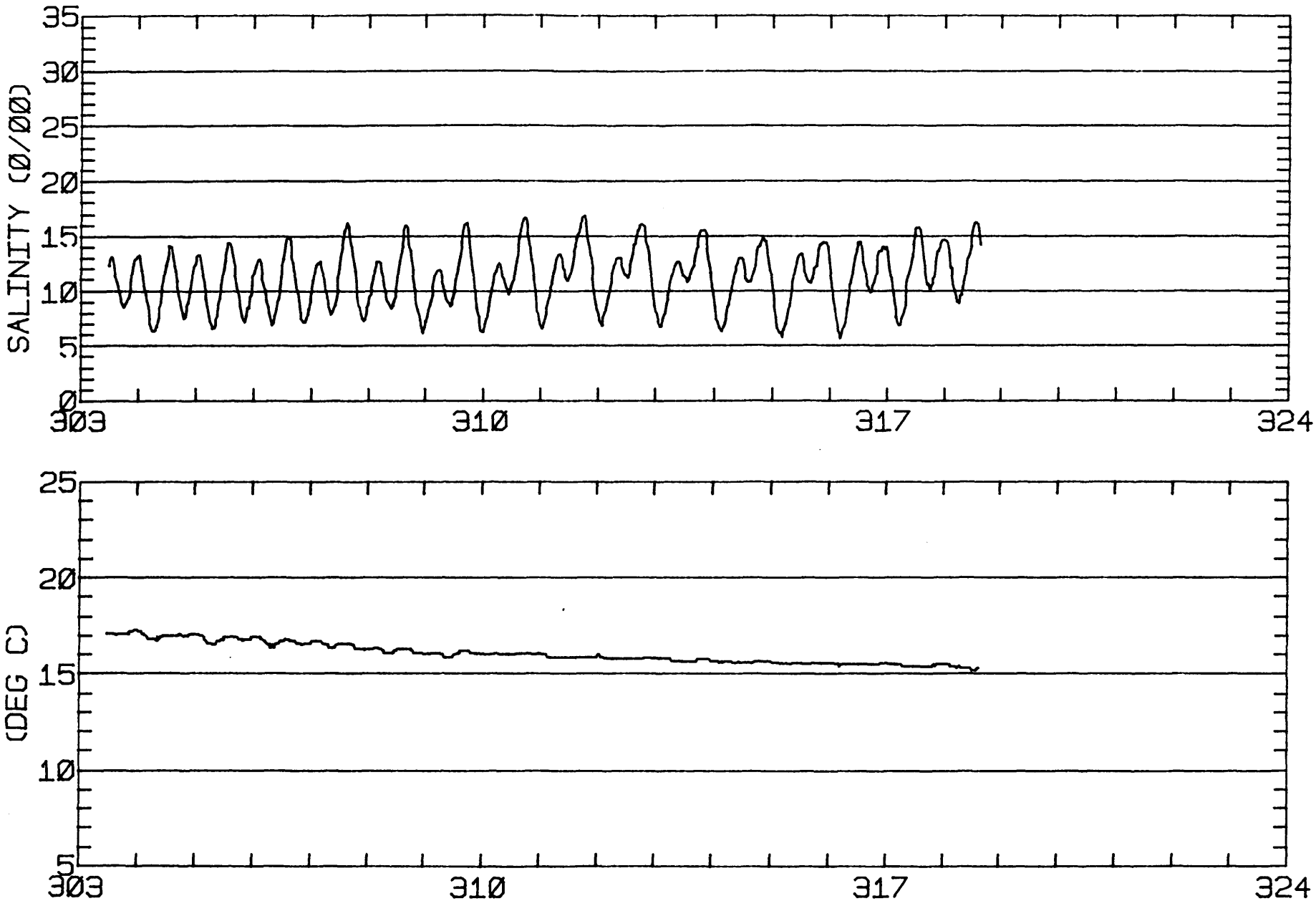
RMS SPEED: 35.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 74.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 82.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.58
STANDARD DEVIATION U-SERIES: 6.07 CM/SEC
STANDARD DEVIATION V SERIES: 4.58 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.1	5.7	226.
2	12	2.8	5.8	311.
3	4	6.6	5.0	291.
ALL	28	2.2	5.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 238 38- 3-12N 122- 2-58W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 238 38- 3-12N 122- 2-58W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 239
POSITION: 38 3'27"N 121 59'34"W
METER TYPE: AANDERAA
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:10/24/79 1530 PST JULIAN DAY=297
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

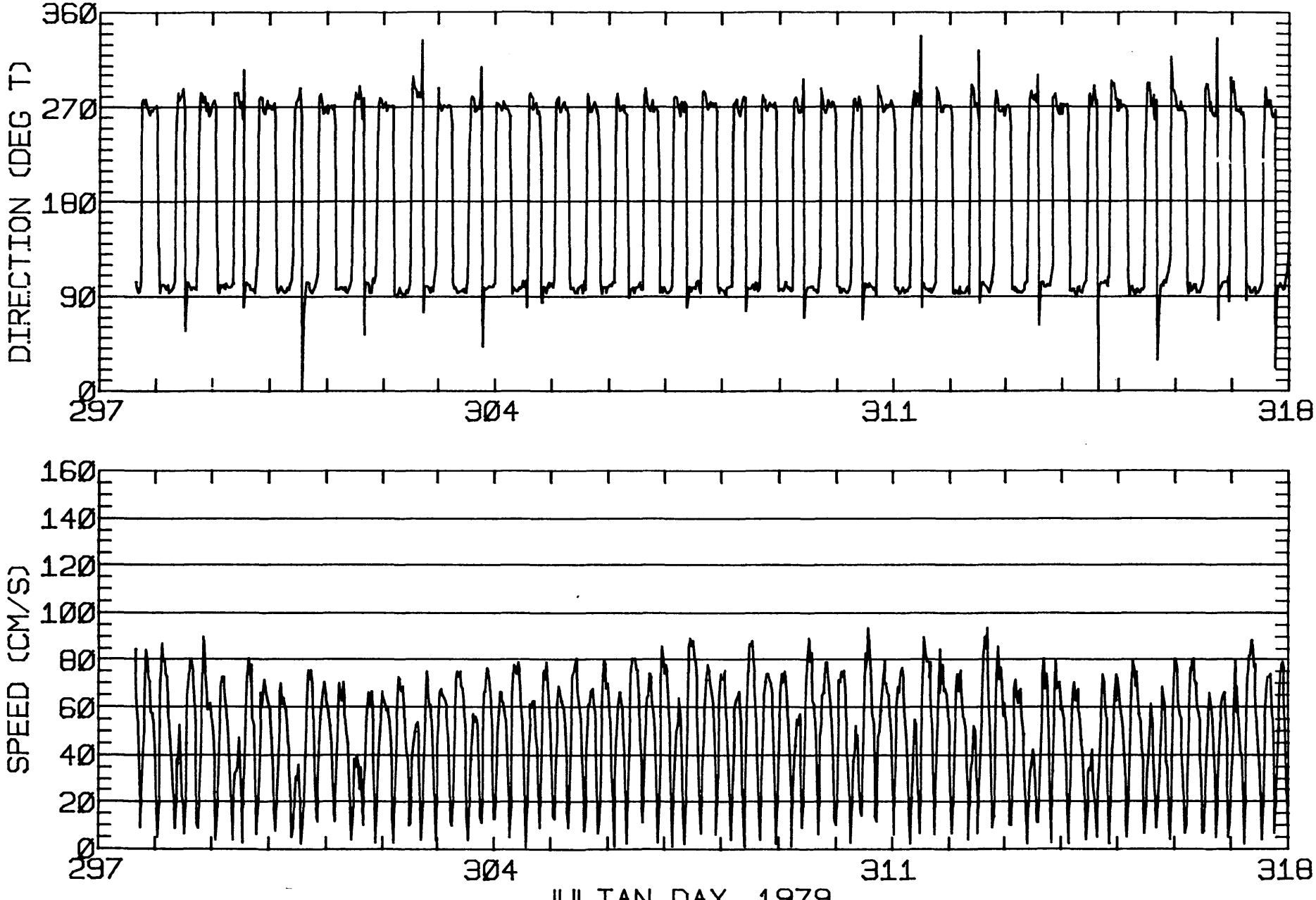
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.40	0.54	89.6	100.6	CLOCKWISE
K1	22.38	0.38	92.0	93.0	ANTI-CLOCKWISE
N2	10.88	0.03	92.9	347.3	ANTI-CLOCKWISE
M2	64.08	0.64	95.7	35.0	ANTI-CLOCKWISE
S2	8.83	0.01	93.5	22.4	CLOCKWISE
M4	3.39	1.08	96.4	7.8	CLOCKWISE

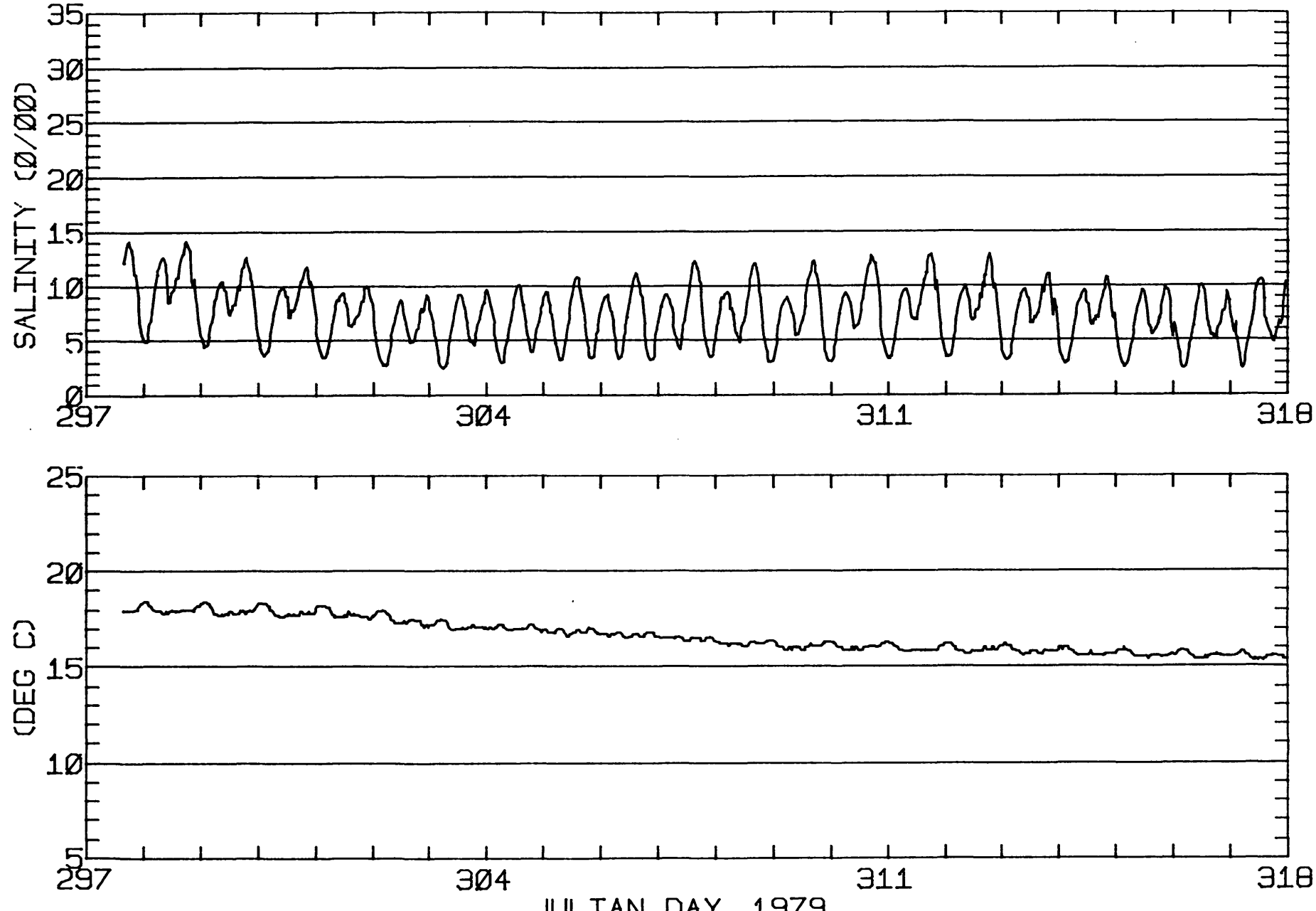
RMS SPEED: 53.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 106.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 94.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 12.46 CM/SEC
STANDARD DEVIATION V SERIES: 5.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.5	-2.5	330.
2	12	5.2	-3.4	206.
3	12	6.1	-2.3	311.
4	4	6.3	-3.2	291.
ALL	40	5.3	-2.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 239 38- 3-27N 121-59-34W
METER 007.0 METERS ABOVE BED. WATER DEPTH 013.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 239 38- 3-27N 121-59-34W
METER ØØ7.Ø METERS ABOVE BED. WATER DEPTH Ø13.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 239
POSITION: 38 3'27"N 121 59'34"W
METER TYPE: AANDERAA
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 11.6 M (BELOW MLLW)
START TIME OF SERIES:10/24/79 1522 PST JULIAN DAY=297
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

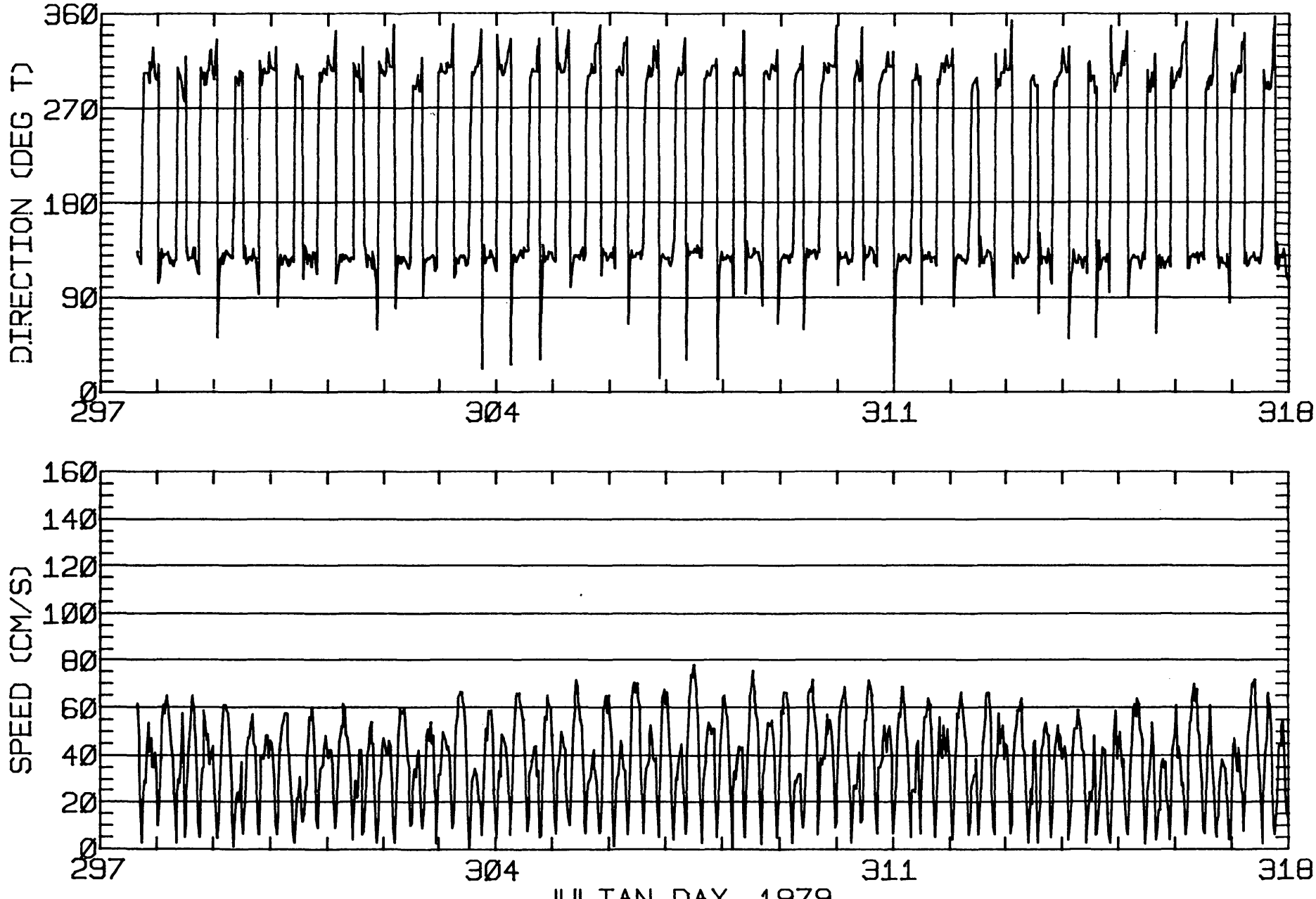
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.74	0.50	127.4	83.3	CLOCKWISE
K1	17.69	2.01	130.6	89.5	CLOCKWISE
N2	8.56	0.75	132.8	351.6	CLOCKWISE
M2	48.38	1.37	127.8	34.1	CLOCKWISE
S2	6.59	0.07	140.4	23.8	ANTI-CLOCKWISE
M4	2.86	0.22	167.4	20.6	CLOCKWISE

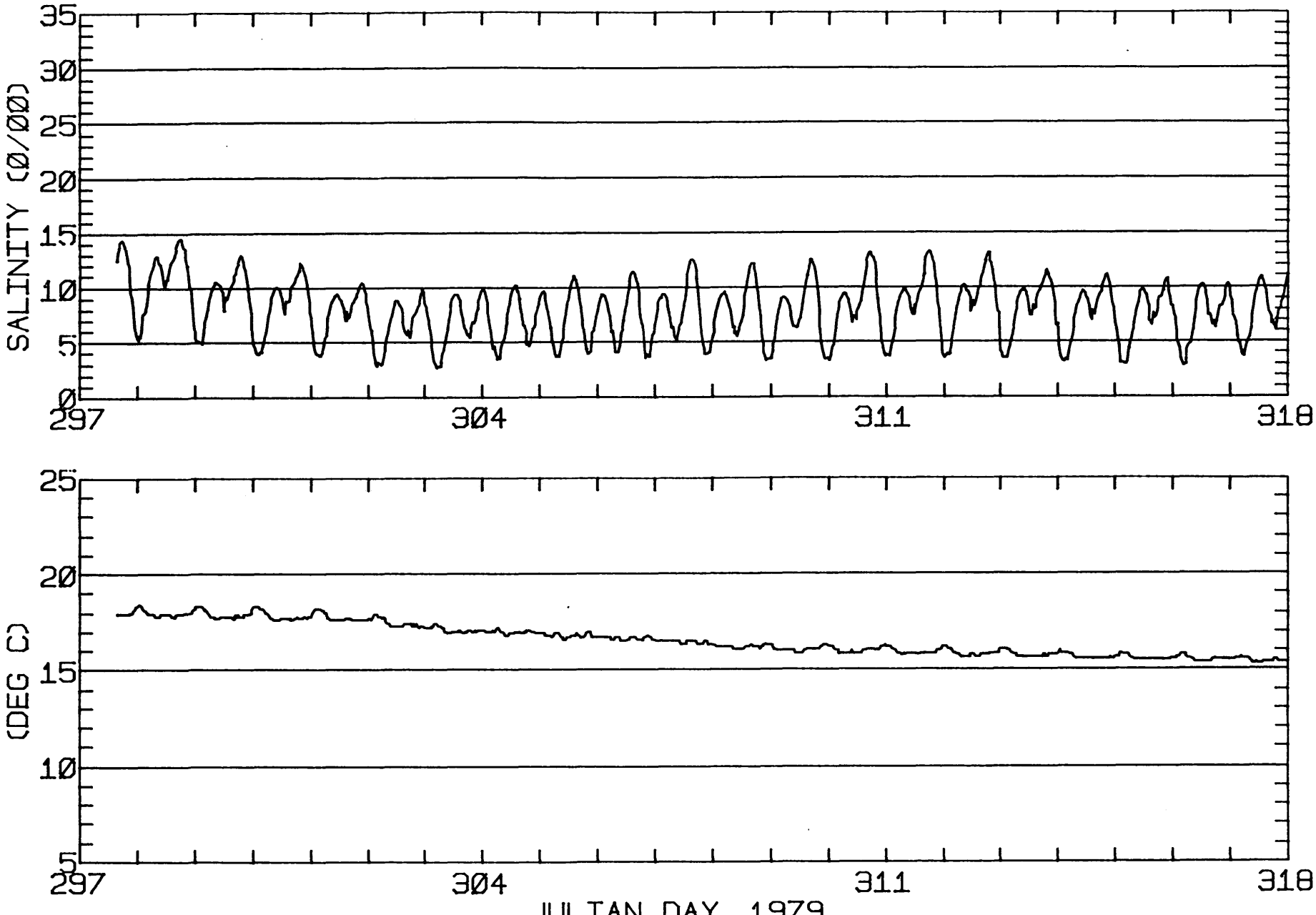
RMS SPEED: 41.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 80.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 129.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 9.35 CM/SEC
STANDARD DEVIATION V SERIES: 5.94 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.9	-4.2	330.
2	12	6.7	-5.7	206.
3	12	5.0	-4.6	311.
4	4	5.5	-4.8	291.
ALL	40	5.5	-4.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 239 38- 3-27N 121-59-34W
METER 001.5 METERS ABOVE BED. WATER DEPTH 013.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 239 38- 3-27N 121-59-34W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø13.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 239
POSITION: 38 3'28"N 121 59'35"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES:11/14/79 1524 PST JULIAN DAY=318
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

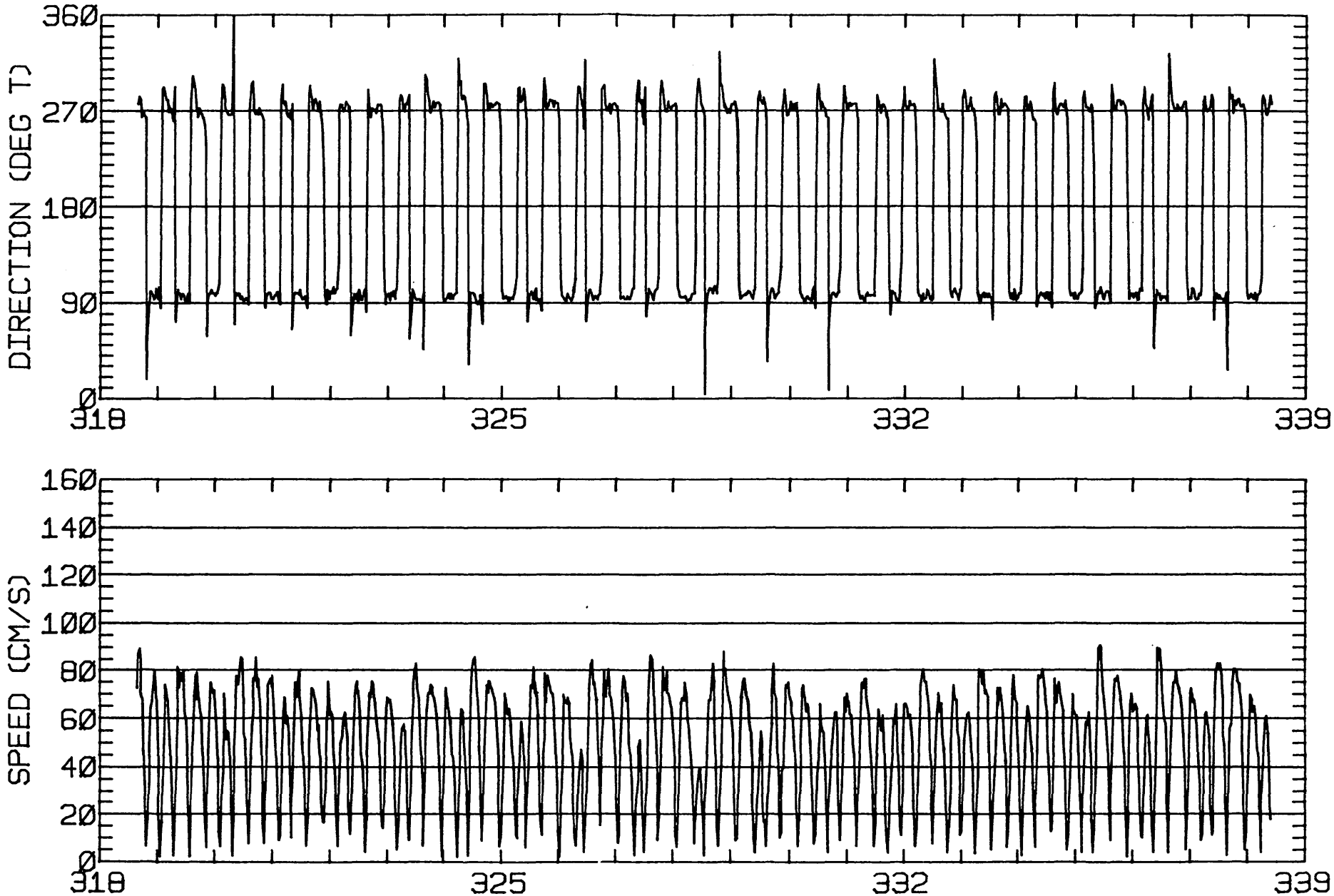
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.84	0.21	99.6	103.2	CLOCKWISE
K1	24.81	0.47	94.1	97.6	ANTI-CLOCKWISE
N2	8.20	0.52	97.1	9.6	CLOCKWISE
M2	64.26	1.50	96.4	36.0	ANTI-CLOCKWISE
S2	12.58	0.25	94.2	21.7	ANTI-CLOCKWISE
M4	1.96	0.28	72.5	339.3	CLOCKWISE

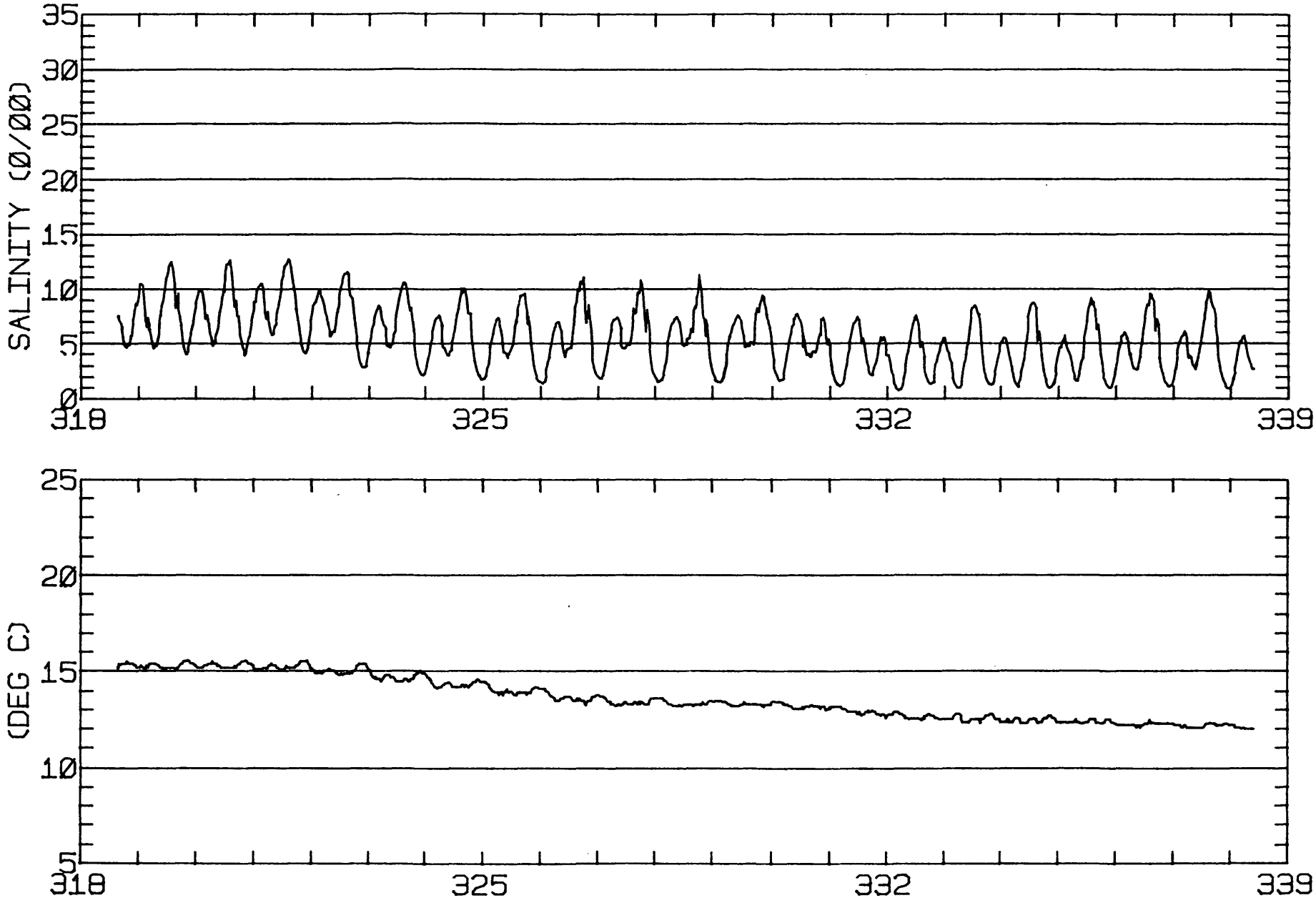
RMS SPEED: 54.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 112.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 95.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 12.74 CM/SEC
STANDARD DEVIATION V SERIES: 5.61 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.6	-0.5	293.
2	12	3.7	-0.6	410.
3	12	4.0	-1.1	464.
4	2	2.6	0.4	327.
ALL	38	3.1	-0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 239 38- 3-28N 121-59-35W
METER 006.4 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 239 38- 3-28N 121-59-35W
METER ØØ6.4 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 243
POSITION: 38 2'32"N 121 50'17"W
METER TYPE: AANDERAA
WATER DEPTH: 2.7 M (MLLW)
METER DEPTH: 1.1 M (BELOW MLLW)
START TIME OF SERIES:11/13/79 1052 PST JULIAN DAY=317
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

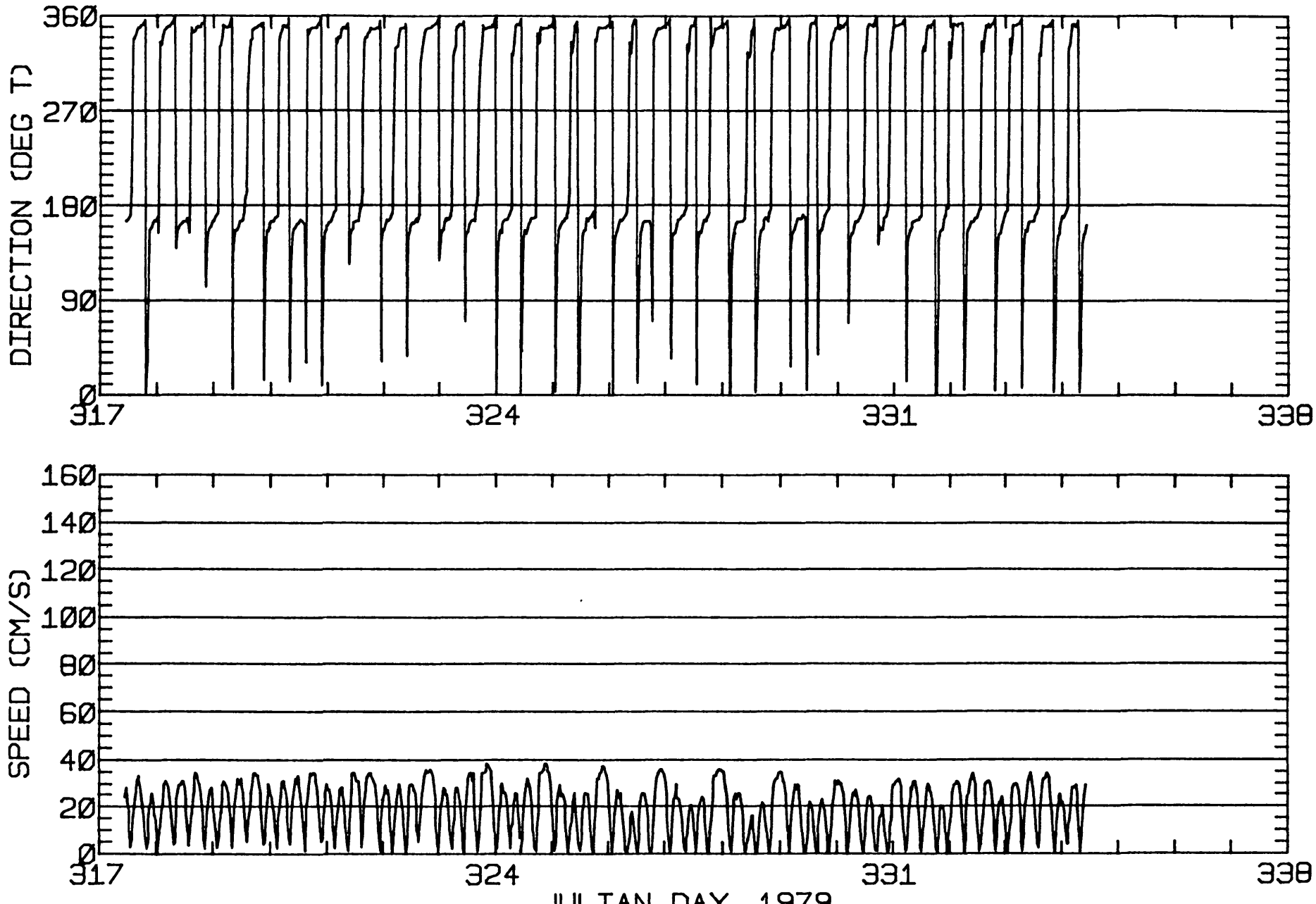
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.78	0.17	167.3	120.6	CLOCKWISE
K1	10.78	0.41	167.9	106.1	CLOCKWISE
N2	4.73	0.29	170.8	16.7	CLOCKWISE
M2	30.14	2.01	167.6	69.9	CLOCKWISE
S2	6.13	0.54	163.5	18.3	CLOCKWISE
M4	0.92	0.06	132.1	118.7	CLOCKWISE

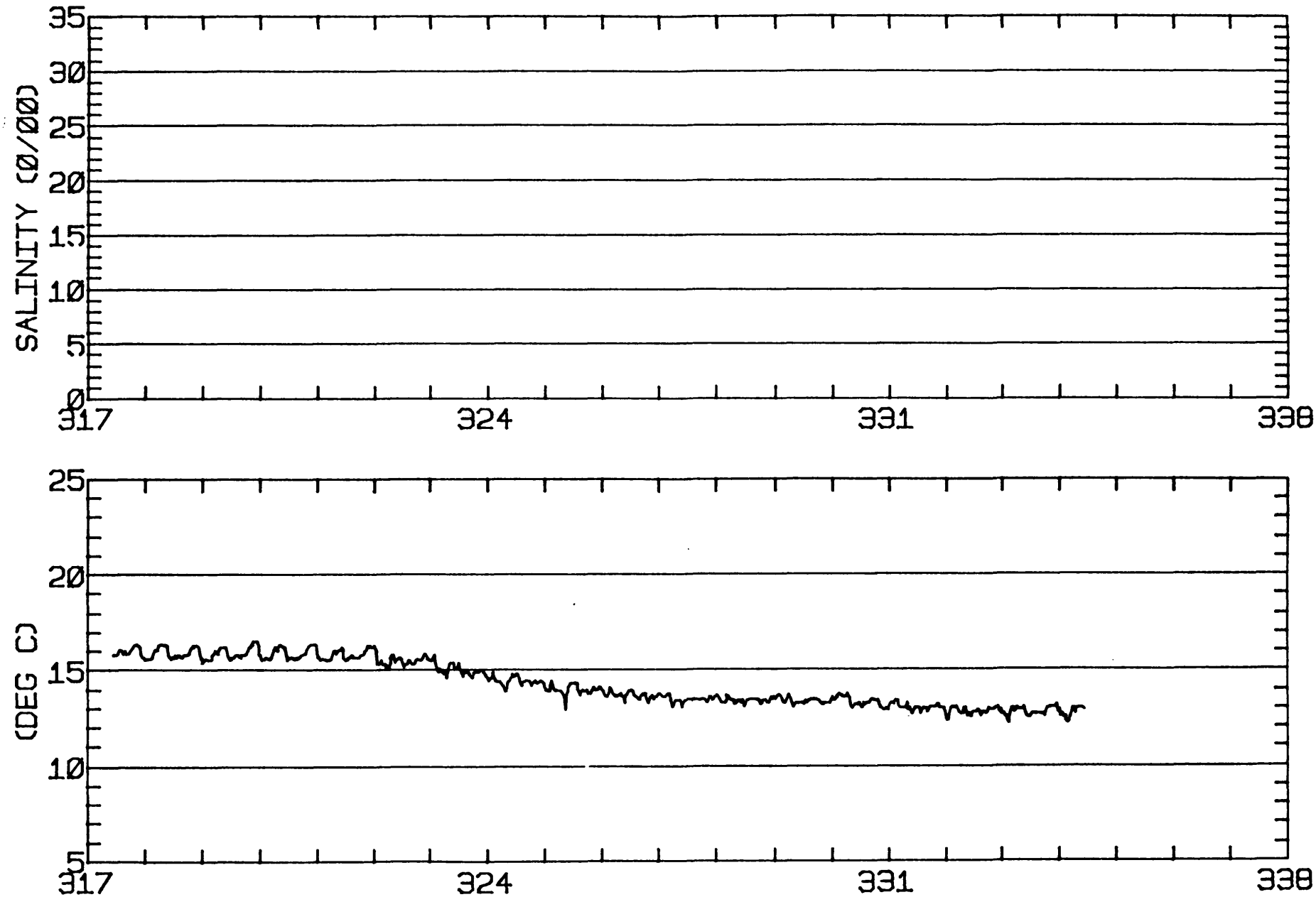
RMS SPEED: 23.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 51.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 167.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 1.65 CM/SEC
STANDARD DEVIATION V SERIES: 3.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.2	1.9	261.
2	4	0.2	3.0	499.
ALL	16	0.2	2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 243 38- 2-32N 121-50-17W
METER 001.6 METERS ABOVE BED. WATER DEPTH 002.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 243 38- 2-32N 121-50-17W
METER 001.6 METERS ABOVE BED. WATER DEPTH 002.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 243
POSITION: 38 2'45"N 121 50'20"W
METER TYPE: AANDERAA
WATER DEPTH: 3.0 M (MLLW)
METER DEPTH: 1.5 M (BELOW MLLW)
START TIME OF SERIES:10/29/80 1350 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

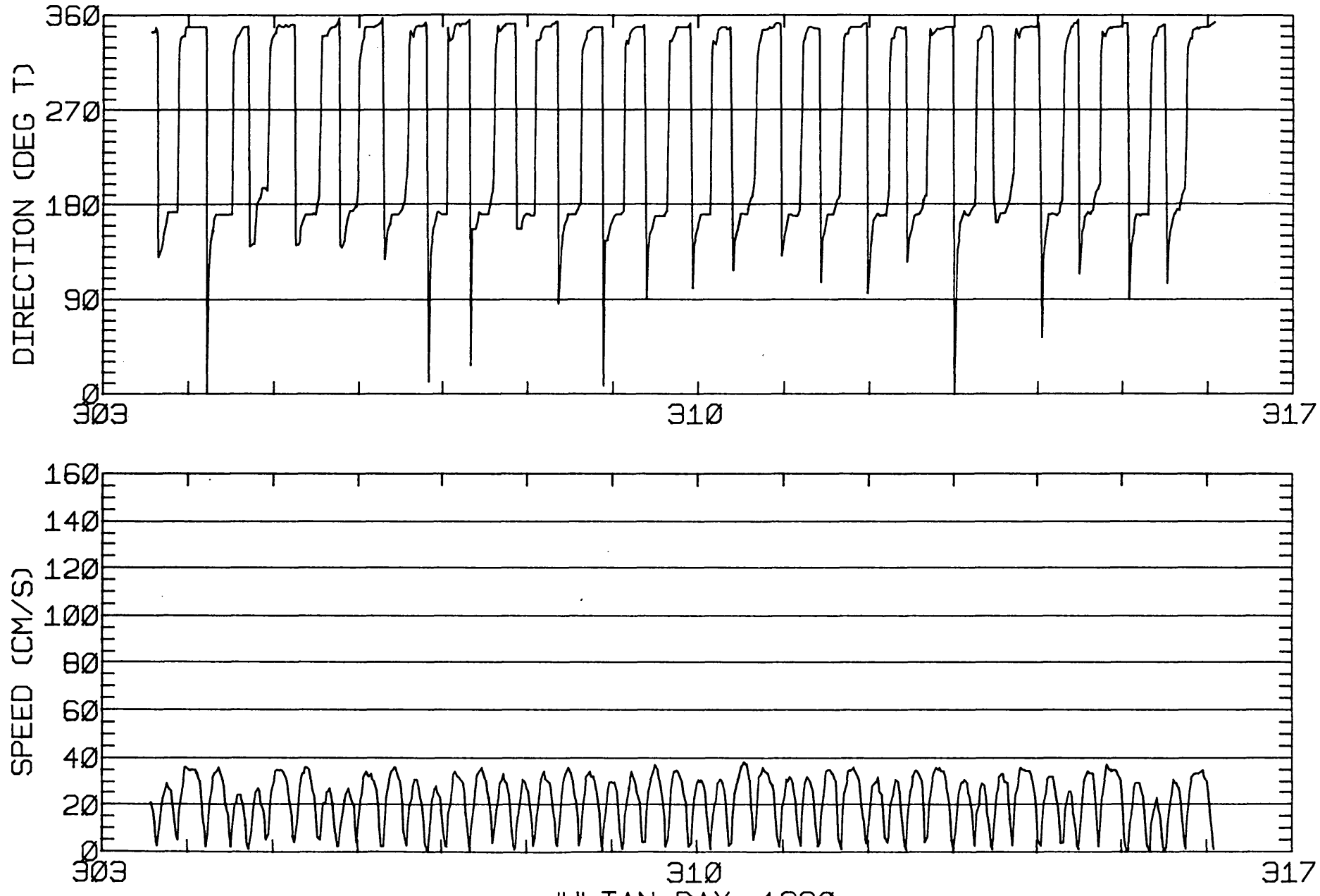
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.76	0.49	165.6	116.2	CLOCKWISE
K1	10.55	1.05	169.5	105.3	CLOCKWISE
N2	7.98	1.09	169.5	38.8	CLOCKWISE
M2	32.53	2.69	169.0	70.2	CLOCKWISE
S2	8.46	0.89	166.9	45.6	CLOCKWISE
M4	1.04	0.53	203.4	191.4	CLOCKWISE

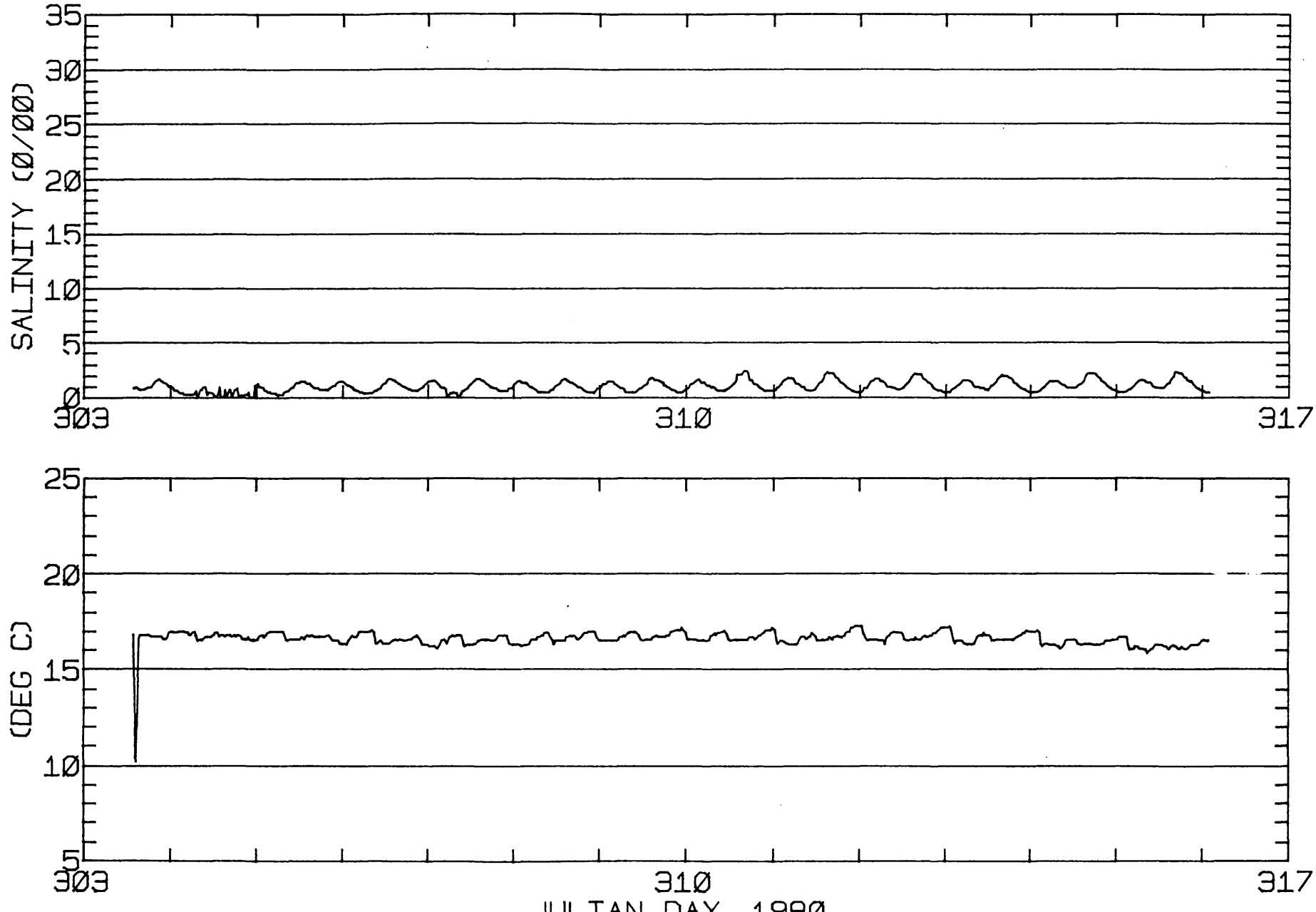
RMS SPEED: 24.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 57.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 19.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 168.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 2.31 CM/SEC
STANDARD DEVIATION V SERIES: 4.17 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.4	0.9	160.
2	12	-1.0	1.3	192.
ALL	24	-0.7	1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 243 38- 2-45N 121-50-20W
METER 001.5 METERS ABOVE BED. WATER DEPTH 003.0 METERS.



228

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 243 38- 2-45N 121-50-20W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ3.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 246
POSITION: 38 1'46"N 121 50'46"W
METER TYPE: AANDERAA
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 4.6 M (BELOW MLLW)
START TIME OF SERIES:10/30/80 1210 PST JULIAN DAY=304
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

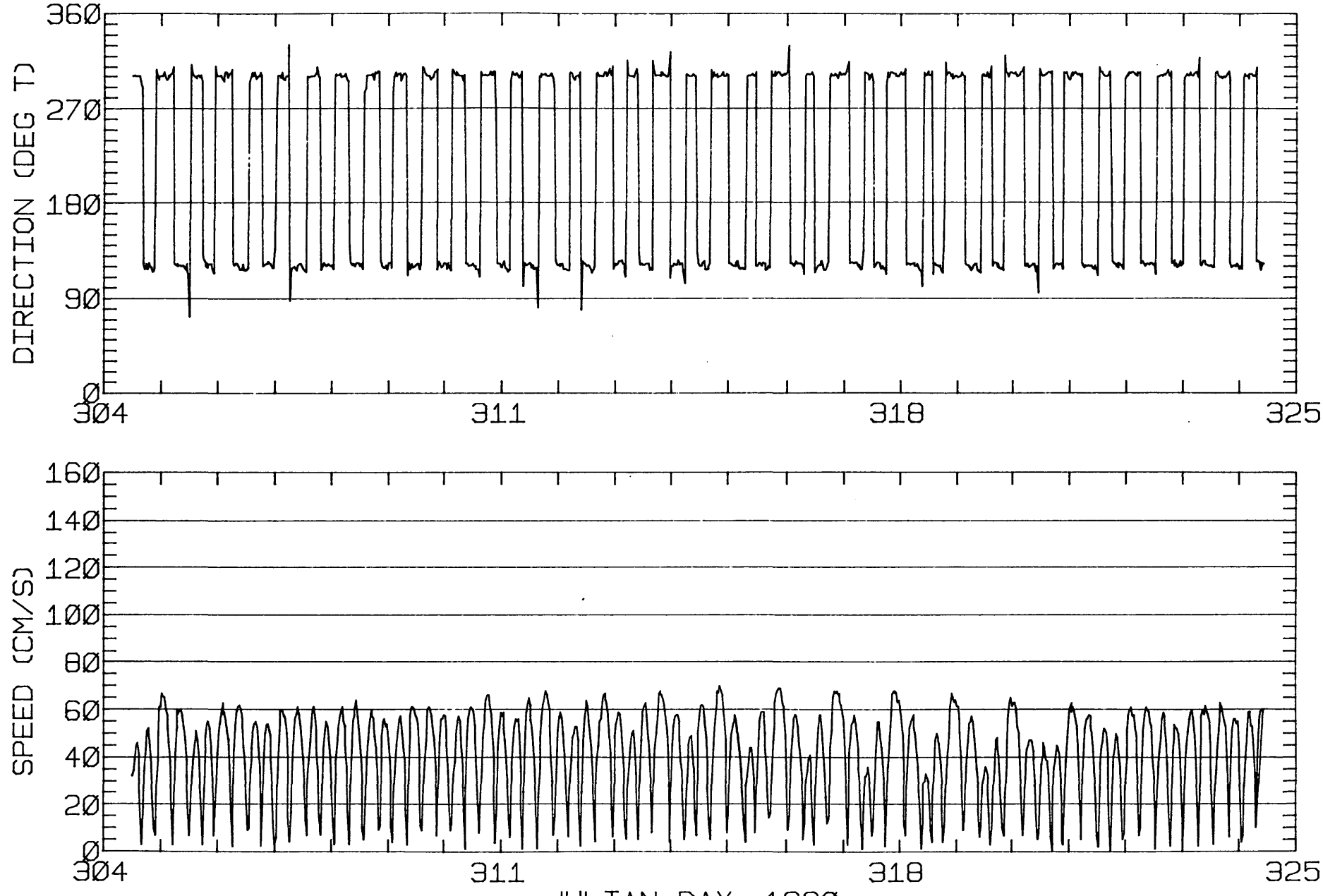
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.12	0.16	122.8	93.0	CLOCKWISE
K1	19.55	0.11	122.1	91.8	ANTI-CLOCKWISE
N2	16.16	0.17	121.7	8.0	CLOCKWISE
M2	61.54	0.27	121.8	38.3	ANTI-CLOCKWISE
S2	15.52	0.07	122.0	27.4	CLOCKWISE
M4	3.02	0.17	125.1	9.5	CLOCKWISE

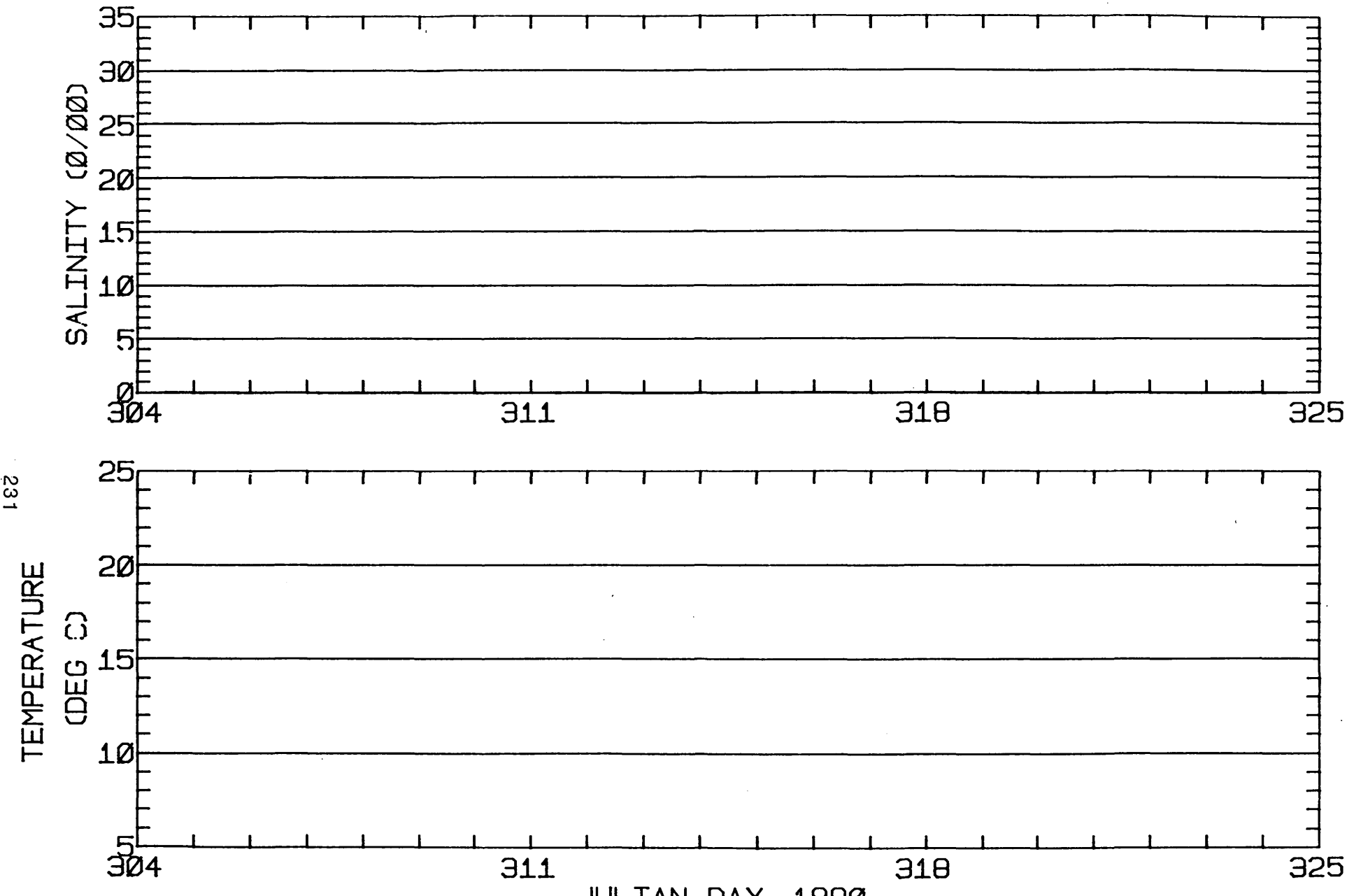
RMS SPEED: 45.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 107.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 122.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 7.52 CM/SEC
STANDARD DEVIATION V SERIES: 5.02 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	0.7	160.
2	12	-2.1	1.7	194.
3	12	-2.1	1.9	197.
4	2	-0.4	0.6	174.
ALL	38	-1.6	1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 246 38- 1-46N 121-50-46W
METER 003.0 METERS ABOVE BED. WATER DEPTH 007.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 246 38- 1-46N 121-50-46W
METER Ø03.Ø METERS ABOVE BED. WATER DEPTH Ø07.6 METERS.

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY, CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART III. RESULTS OF MEASUREMENTS IN SAN PABLO BAY REGION

by Ralph T. Cheng and Jeffrey W. Gartner

U. S. Geological Survey

Water Resources Investigations Report 84-4339

February 1984

UNITED STATES DEPARTMENT OF THE INTERIOR
William P. Clark, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

WATER RESOURCES INVESTIGATIONS REPORT

For additional information
write to:

Regional Hydrologist
Water Resources Division
U.S. Geological Survey
345 Middlefield Road, MS 466
Menlo Park, CA 94025

Copies of this report
can be purchased from:

Open-File Services Section
Western Distribution Branch
U.S. Geological Survey
Box 25425, Federal Center
Lakewood, CO 80225

CONTENTS

PART III. RESULTS OF MEASUREMENTS IN SAN PABLO BAY REGION

TABLES

ILLUSTRATIONS

APPENDICES

FIELD DATA

In Part III of this report, we include data collected in the San Pablo Bay region, which is the northwest section of the San Francisco Bay estuarine system (fig. III.1). For the purpose of this report, the San Pablo Bay region includes the deep Carquinez Strait and San Pablo Bay proper. The area of coverage extends from the region west of Benecia-Martinez, through Carquinez Strait and San Pablo Bay to Point San Pablo, which is on the boundary between San Pablo Bay and Central Bay. The Carquinez Strait is a deep channel which is oriented nearly east and west connecting Suisun and San Pablo Bays. There is only a small part of Carquinez Strait which is shallower than 6 m. It has a mean depth of 8.8 m and an average width of 2.5 km. The bathymetry in San Pablo Bay varies more drastically. Essentially, there is a deep channel in the southeast side of the basin, the northwest corner is a large shoal (fig. III.2). The total surface area of San Pablo Bay at MLLW is 271 sq km, 57 percent of which is shallower than 2 m. Because accurate long term current measurements are not yet practical in such shallow depths, few current data are available from the shoals of San Pablo Bay.

There is a longitudinal salinity gradient along the main channel in San Pablo Bay and Carquinez Strait throughout the year. At certain combinations of the Delta outflows and wind conditions, the vertical salinity stratification can be quite strong (Smith and others 1979)*. A lateral salinity gradient over the shoal is usually present, and the salinity in the vertical is well mixed because of the shallow depth.

---

*All references are listed in Part I of this report.

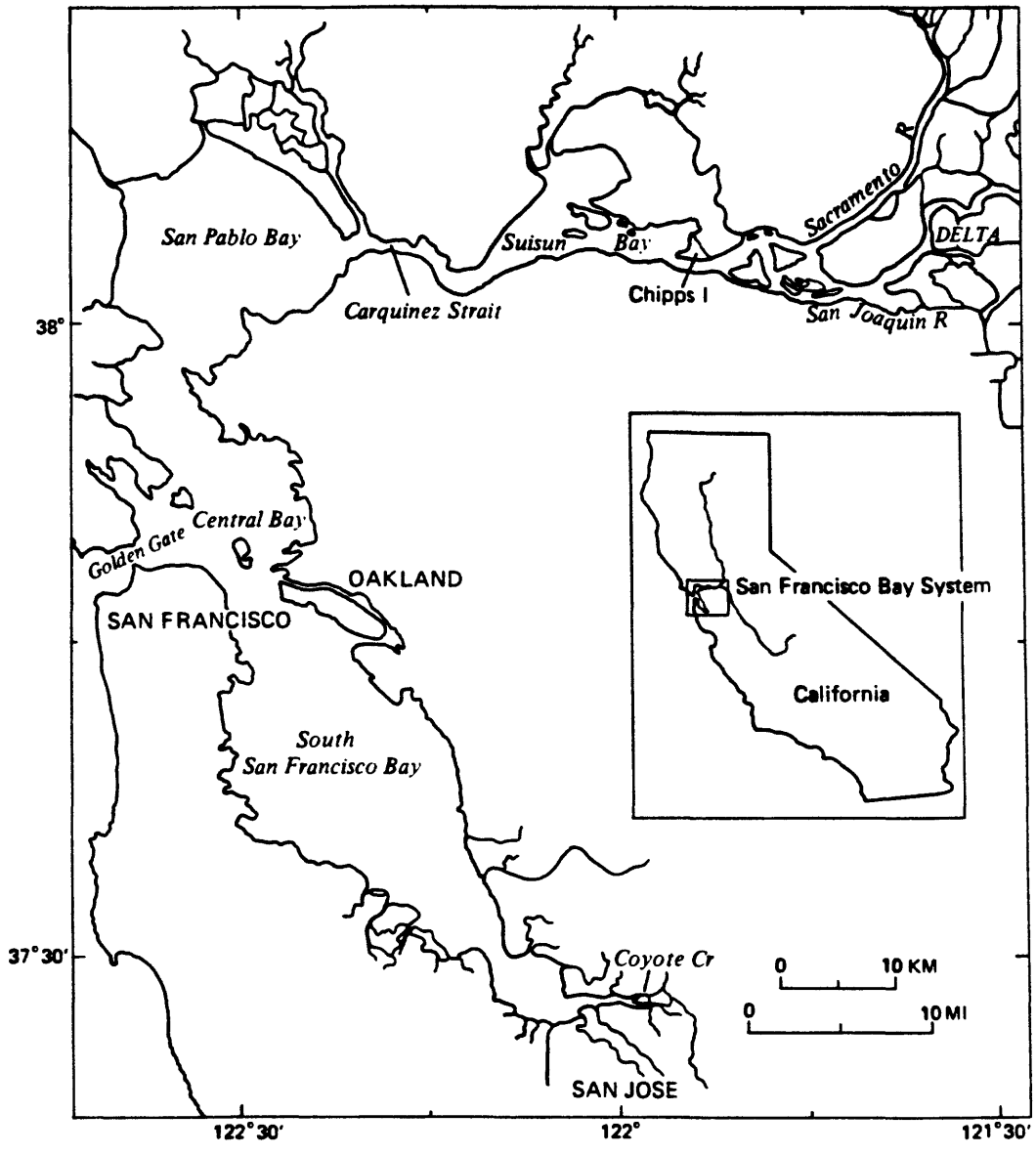


Figure III.1 Map of San Francisco Bay estuarine system.

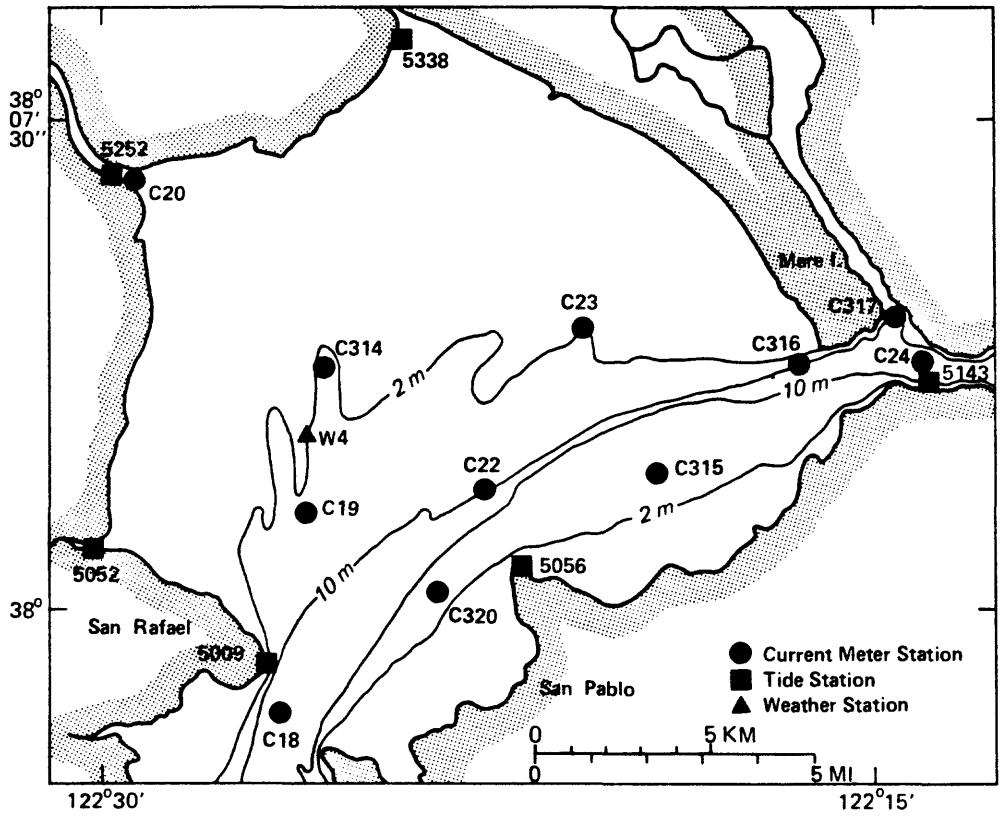


Figure III.2. Map of San Pablo Bay region and the location of current-meter moorings, tide stations, and a USGS weather station.

Other than during the winter months, the prevailing wind over the San Pablo Bay region is steady with some diurnal fluctuation due to solar heating in the central valley. The wind direction is generally from west or from southwest (Gartner and Cheng, 1983). Thus, there are four important factors which influence circulation and affect the current-meter data in San Pablo Bay; they are the basin bathymetry, tides, winds, and salinity stratification.

Current-meter data

Eleven (11) current-meter stations were deployed in the San Pablo Bay region by the USGS and NOS/NOAA during the combined current survey in 1979 and 1980. Multiple current meters were deployed at several current-meter stations in the main channel. The minimum length of current-meter deployment was fifteen days, and the maximum deployment was not to exceed thirty-five days. Figure III.2 depicts the approximate geographic location of the current-meter stations in this region. The precise latitude and longitude, and the water depth for each current-meter station at MLLW are compiled in table III.1. Also included in table III.1 are the depths at which the current meters were deployed, and the deployment and recovery dates for all data included in this part of the report. Figure III.3 is a chronological bargraph which indicates the availability of the current-meter data in 1979 and 1980. The solid bars on the bargraph indicate current-meter stations where multiple current meters were used for the indicated period of time. Table III.1, figure III.2, and figure III.3 define the complete spatial and temporal distributions of the current-meter data. In addition, table III.1, figure III.2, and figure III.3 define other pertinent information for each current-meter record.

TABLE III.1. Endeco current meter deployments between 1 January 1979 and 31 December 1980 in San Pablo Bay.

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
GSC18	37°	58.5'	122°	26.5'	81 79	96 79	GSC018A1	21.3	11.9
GSC18	37°	58.5'	122°	26.5'	81 79	96 79	GSC018A2	21.3	6.7
GSC18	37°	58.4'	122°	26.5'	96 79	127 79	GSC018B1	21.3	11.9
GSC22	38°	1.9'	122°	22.8'	81 79	100 79	GSC022A1	10.6	1.8
GSC22	38°	1.8'	122°	22.8'	269 80	291 80	GSC022C1	10.6	7.6
GSC316	38°	4.8'	122°	16.5'	240 80	261 80	GSC316A1	12.1	9.1

*Water depth in meters referenced to MLLW

†Meter depth in meters above bed

TABLE III.1 (cont). Aanderaa current meter deployments between 1 January 1979 and 31 December 1980 in San Pablo Bay.

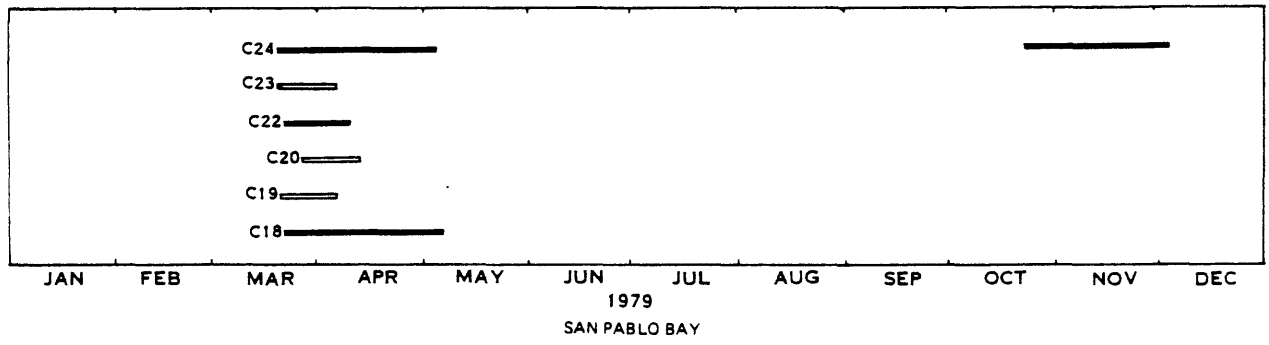
STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER+ DEPTH
C018	37°	58.5'	122°	26.5'	81 79	96 79	1730	21.3	15.2
C018	37°	58.4'	122°	26.5'	96 79	127 79	1749	21.3	15.2
C018	37°	58.4'	122°	26.5'	96 79	127 79	1750	21.3	9.1
C018	37°	58.7'	122°	26.3'	95 80	103 80	1970	21.0	9.1
C018	37°	58.7'	122°	26.3'	95 80	103 80	1971	21.0	2.1
C018	37°	58.7'	122°	26.3'	102 80	123 80	1978	21.3	15.2
C018	37°	58.7'	122°	26.3'	102 80	123 80	1980	21.3	2.1
C018	37°	58.8'	122°	26.3'	123 80	142 80	2006	20.4	15.2
C018	37°	58.8'	122°	26.3'	123 80	142 80	2007	20.4	9.1
C018	37°	58.8'	122°	26.3'	123 80	142 80	2008	20.4	2.1
C018	37°	58.7'	122°	26.3'	142 80	162 80	2045	21.0	15.2
C018	37°	58.7'	122°	26.3'	142 80	162 80	2046	21.0	9.1
C018	37°	58.7'	122°	26.3'	162 80	183 80	2072	21.7	15.3
C018	37°	58.7'	122°	26.3'	162 80	183 80	2073	21.7	9.2
C018	37°	58.7'	122°	26.3'	162 80	183 80	2074	21.7	2.2
C018	37°	58.8'	122°	26.3'	183 80	199 80	2106	21.3	15.1
C018	37°	58.8'	122°	26.3'	183 80	199 80	2108	21.3	2.1
C018	37°	58.8'	122°	26.3'	199 80	217 80	2144	21.3	15.2
C018	37°	58.8'	122°	26.3'	199 80	217 80	2145	21.3	9.1
C018	37°	58.8'	122°	26.3'	199 80	217 80	2146	21.3	2.1
C018	37°	58.8'	122°	26.2'	217 80	233 80	2176	21.7	15.3
C018	37°	58.8'	122°	26.2'	217 80	233 80	2177	21.7	9.2
C018	37°	58.8'	122°	26.2'	217 80	233 80	2178	21.7	2.2
C018	37°	58.8'	122°	26.2'	233 80	252 80	2200	21.3	15.2
C018	37°	58.8'	122°	26.2'	233 80	252 80	2202	21.3	2.1
C018	37°	58.8'	122°	26.2'	249 80	269 80	2229	21.3	15.1
C018	37°	58.8'	122°	26.2'	249 80	269 80	2230	21.3	9.1
C018	37°	58.8'	122°	26.2'	249 80	269 80	2231	21.3	2.1
C018	37°	58.8'	122°	26.2'	268 80	290 80	2265	21.3	15.2
C018	37°	58.8'	122°	26.2'	268 80	290 80	2266	21.3	9.1
C018	37°	58.8'	122°	26.2'	268 80	290 80	2267	21.3	2.1
C018	37°	58.8'	122°	26.2'	289 80	310 80	2298	21.3	9.1
C018	37°	58.8'	122°	26.2'	289 80	310 80	2299	21.3	2.1
C018	37°	58.8'	122°	26.2'	310 80	329 80	2336	21.3	15.2
C018	37°	58.8'	122°	26.2'	310 80	329 80	2337	21.3	9.1
C019	38°	1.6'	122°	25.5'	80 79	96 79	1728	3.4	1.0
C019	38°	1.2'	122°	26.2'	254 80	276 80	2241	3.4	1.6
C019	38°	1.4'	122°	26.2'	274 80	295 80	2275	3.4	1.6
C020	38°	6.6'	122°	29.6'	86 79	103 79	1733	3.0	0.9
C022	38°	1.9'	122°	22.6'	81 79	100 79	1732	11.6	1.5
C022	38°	2.1'	122°	22.4'	253 80	269 80	2235	8.8	3.0
C022	38°	2.0'	122°	22.8'	269 80	291 80	2268	8.8	2.7
C023	38°	4.5'	122°	20.5'	80 79	96 79	1729	2.1	0.9
C023	38°	4.5'	122°	20.7'	273 80	291 80	2273	1.8	0.9
C023	38°	4.5'	122°	20.7'	289 80	311 80	2300	1.8	0.9
C024	38°	3.7'	122°	13.1'	79 79	108 79	1725	22.6	16.8

STATION NUMBER	LATITUDE DEG	MIN	LONGITUDE DEG	MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C024	38°	3.7'	122°	13.1'	79 79	113 79	1727	22.6	2.2
C024	38°	3.6'	122°	12.9'	108 79	125 79	1752	17.7	12.5
C024	38°	3.6'	122°	12.9'	108 79	125 79	1753	17.7	6.4
C024	38°	3.7'	122°	13.3'	296 79	314 79	1895	21.7	15.6
C024	38°	3.7'	122°	13.3'	296 79	314 79	1896	21.7	9.5
C024	38°	3.6'	122°	13.0'	306 79	338 79	1917	17.1	11.0
C024	38°	3.6'	122°	13.0'	306 79	338 79	1918	17.1	4.9
C024	38°	3.6'	122°	13.0'	306 79	338 79	1919	17.1	1.9
C024	38°	3.7'	122°	13.1'	93 80	102 80	1961	18.3	11.9
C024	38°	3.7'	122°	13.1'	93 80	102 80	1962	18.3	5.7
C024	38°	3.7'	122°	13.1'	93 80	102 80	1963	18.3	2.1
C024	38°	3.7'	122°	13.1'	102 80	123 80	1974	16.8	11.8
C024	38°	3.7'	122°	13.1'	102 80	123 80	1975	16.8	5.8
C024	38°	3.7'	122°	13.1'	102 80	123 80	1976	16.8	2.2
C024	38°	3.7'	122°	13.1'	123 80	142 80	2003	17.7	11.9
C024	38°	3.7'	122°	13.1'	123 80	142 80	2004	17.7	5.8
C024	38°	3.7'	122°	13.1'	123 80	142 80	2005	17.7	2.1
C024	38°	3.7'	122°	13.1'	141 80	150 80	2042	17.7	1.9
C024	38°	3.7'	122°	13.1'	141 80	150 80	2043	17.7	5.8
C024	38°	3.7'	122°	13.1'	141 80	150 80	2044	17.7	2.1
C024	38°	3.7'	122°	13.1'	150 80	169 80	2057	18.0	11.9
C024	38°	3.7'	122°	13.1'	150 80	169 80	2058	18.0	5.8
C024	38°	3.7'	122°	13.1'	150 80	169 80	2059	18.0	2.1
C024	38°	3.6'	122°	13.1'	168 80	190 80	2088	18.0	11.9
C024	38°	3.6'	122°	13.1'	168 80	190 80	2089	18.0	5.8
C024	38°	3.7'	122°	13.1'	190 80	211 80	2118	17.7	11.9
C024	38°	3.7'	122°	13.1'	190 80	211 80	2120	17.7	2.1
C024	38°	3.7'	122°	13.1'	211 80	227 80	2159	18.0	11.9
C024	38°	3.7'	122°	13.1'	210 80	220 80	2160	18.0	5.8
C024	38°	3.7'	122°	13.1'	210 80	227 80	2161	17.7	2.1
C024	38°	3.6'	122°	13.1'	227 80	246 80	2192	18.0	11.9
C024	38°	3.6'	122°	13.1'	227 80	246 80	2193	18.0	5.8
C024	38°	3.6'	122°	13.1'	227 80	246 80	2194	18.0	2.1
C024	38°	3.7'	122°	13.1'	246 80	261 80	2222	18.0	11.9
C024	38°	3.7'	122°	13.1'	246 80	261 80	2223	18.0	5.8
C024	38°	3.7'	122°	13.1'	246 80	261 80	2224	18.0	2.1
C024	38°	3.7'	122°	13.1'	261 80	280 80	2250	18.0	11.9
C024	38°	3.7'	122°	13.1'	261 80	280 80	2251	18.0	5.8
C024	38°	3.7'	122°	13.1'	261 80	280 80	2253	18.0	2.1
C024	38°	3.7'	122°	13.1'	280 80	296 80	2285	17.7	11.9
C024	38°	3.7'	122°	13.1'	280 80	296 80	2286	17.7	5.8
C024	38°	3.7'	122°	13.1'	280 80	296 80	2287	17.7	2.1
C024	38°	3.6'	122°	13.1'	296 80	317 80	2309	17.7	11.9
C024	38°	3.6'	122°	13.1'	296 80	317 80	2310	17.7	5.8
C024	38°	3.6'	122°	13.1'	296 80	317 80	2311	17.7	2.1
C024	38°	3.6'	122°	13.1'	317 80	336 80	2351R	18.0	11.9
C024	38°	3.6'	122°	13.1'	317 80	336 80	2352R	18.0	5.8
C024	38°	3.6'	122°	13.1'	317 80	336 80	2353R	18.0	2.1
C314	38°	3.7'	122°	25.5'	282 80	302 80	2289	2.4	0.9
C315	38°	2.3'	122°	19.0'	290 80	310 80	2301	4.6	1.6
C316	38°	3.7'	122°	16.6'	240 80	261 80	2212	11.6	5.5
C316	38°	3.7'	122°	16.6'	240 80	261 80	2213	11.6	1.5
C316	38°	3.7'	122°	16.7'	261 80	280 80	2252	11.6	8.6
C316	38°	3.7'	122°	16.7'	260 80	280 80	2245	11.6	5.5
C316	38°	3.7'	122°	16.7'	260 80	280 80	2246	11.6	1.5

STATION NUMBER	LATITUDE DEG	MIN	LONGITUDE DEG	MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C316	38°	3.7'	122°	16.6'	280 80	297 80	2282	11.6	8.6
C316	38°	3.7'	122°	16.6'	280 80	297 80	2283	11.6	5.5
C317	38°	4.5'	122°	14.6'	248 80	268 80	2228	7.9	1.5
C317	38°	4.4'	122°	14.5'	267 80	288 80	2259	7.9	1.5
C317	38°	4.4'	122°	14.5'	282 80	303 80	2291	7.9	1.5
C320	38°	0.5'	122°	23.4'	274 80	297 80	2276	7.3	1.5

*Water depth in meters referenced to MLLW

†Meter depth in meters above bed



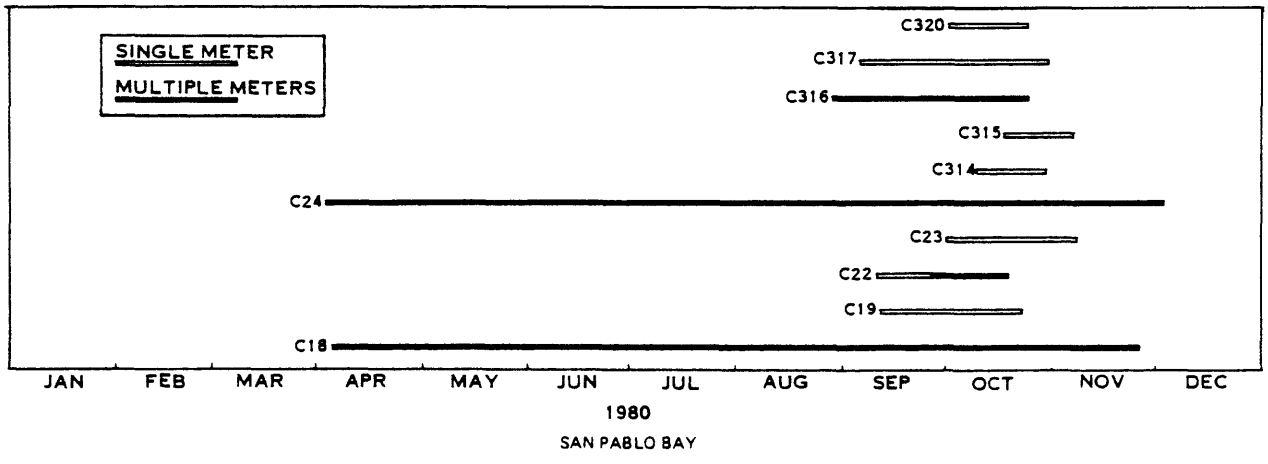


Figure III.3. Bargraph of periods when current-meter arrays were deployed in the San Pablo Bay region. Solid bars indicate multiple meters were used.

Water-level (tide) data

Water-level data from six (6) stage stations located around the perimeter of San Pablo Bay have been analyzed and are presented in this part of the report. The locations of these tide stations are shown in figure III.2, and the precise latitude and longitude of each station are given in table III.2. Because tides in the Bay system are the result of forced oscillations generated by tides in the Pacific Ocean which propagate into the Bay system through Golden Gate, the tide data from the station at Golden Gate, (Presidio fig. III.1) are also included in Part III of this report. The properties of the tides at Golden Gate are used as the reference values for tides at other locations in the Bay. As mentioned previously, the water-level data were received from NOS/NOAA on a standard 9-track computer tape in the form of hourly water levels at various stage stations. These data covered different periods of time in 1979 and 1980, and might contain record gaps. Because the records are usually quite long and generally quite accurate, the results derived from the least-squares harmonic analyses are not affected by the presence of a record gap if the record gap is only a small fraction of the total record analyzed. Figure III.2 and table III.2 define the spatial and temporal distributions of the stage data included in Part III of this report. The exact period of time and the length of the record analyzed for each stage station are given in the harmonic analysis summary sheet for each stage station.

TABLE III.2. San Pablo Bay stage stations, 1978-1980

STATION NUMBER	STATION NAME	LATITUDE	LONGITUDE	START DATE	RECORD LENGTH (DAYS)
5052	Gallinas Creek	38°01.0′	122°30.2′	7/7/79	137
5009	Point San Pedro	37°59.4′	122°26.8′	4/11/80	236
5252	Petaluma River	38°06.7′	122°30.0′	9/1/78	252
5143	Crockett	38°03.5′	122°13.4′	3/23/80	256
5338	Sonoma Creek	38°09.4′	122°24.4′	7/14/79	117
5056	Pinole Point	38°00.9′	122°21.6′	3/16/79	32

RESULTS

Tides in San Pablo Bay

Least-squares harmonic analyses were applied to each of three yearlong (or nearly yearlong) water-level records at Presidio (Golden Gate), the entrance to the Bay system from the Pacific Ocean. The computed results have been given in Part I, table I.2 of this report. We have included only the summary sheet for tides at Presidio for 1979 for comparison with results of the harmonic analyses at other stations. The tides entering the Bay have a form number of 0.84, which indicates that the tides are typically mixed diurnal and semidiurnal without a clear inclination toward either type. It is interesting to note that the lower low water usually follows the occurrence of the higher high water; the tidal currents usually have a stronger ebbing current than flooding current.

Harmonic analyses were made of all the tide data as indicated in table III.2. The results of the analyses are compiled in Appendix III.A in terms of the harmonic constants for each tide station. As discussed previously, the harmonic constants can be used for prediction of tides at these stations (see Part I of this report). The properties of the tides in San Pablo Bay can be summarized by showing the spatial distributions of the phase and amplitude of the two most important partial tides (M_2 and K_1) over a map of the San Pablo Bay region (fig. III.4). The results for tides at Presidio (Golden Gate) are also included for reference. Shown in figure III.4 are the form number, the modified epoch, κ', and the amplitudes of M_2 and K_1 partial tides. The tidal phase shift, $\Delta\kappa'$ (the modified epoch at station minus the modified epoch at Golden Gate), and the amplitude amplification factor, amf, (the ratio of the amplitude at station to the

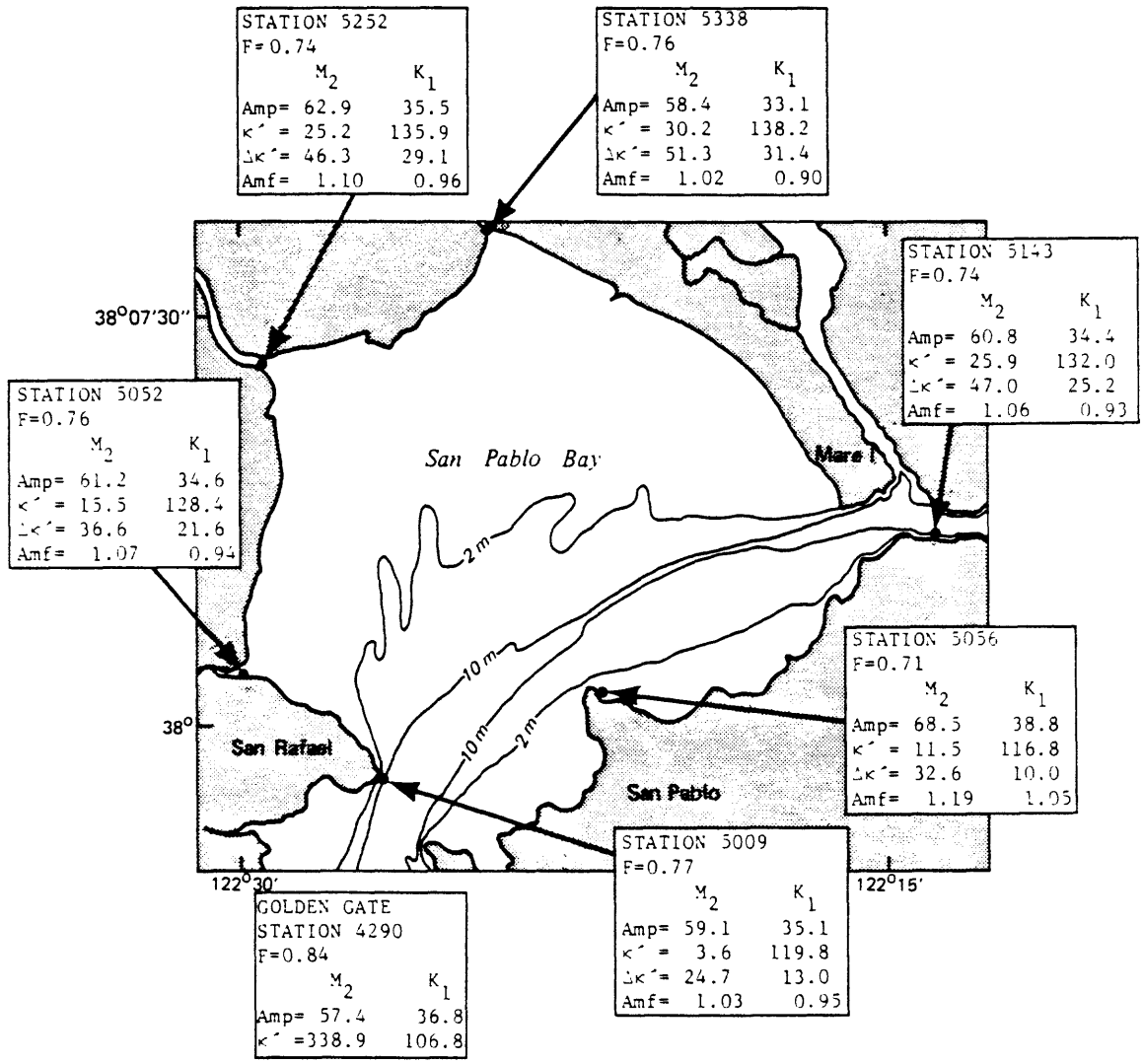


Figure III.4. Spatial distribution of properties of M_2 and K_1 tides in San Pablo Bay, California.

amplitude at Golden Gate) are depicted in figure III.4. Due to the lack of data in the middle of the basin, co-tidal and co-range charts for San Pablo Bay have not been constructed. Nevertheless, the present results give a general description of the properties of tides in San Pablo Bay, California.

The form numbers for tides in San Pablo Bay range between 0.71 and 0.77 indicating that the tides retain the same mixed semidiurnal and diurnal characteristics as the tides at Golden Gate. As the tides propagate through San Pablo Bay and Carquinez Strait along the main channel, the tides behave like progressive waves. The amplitudes of the tides in San Pablo Bay remain nearly constant showing a slight amplification of the tides due to reflection at shores. Most amplification of the tides is, perhaps, cancelled by the damping due to friction. As the tides propagate along the deep channel in Carquinez Strait, there is very little reflection of the tides, the frictional effects reduce the amplitudes for both M_2 and K_1 by about 10 percent. The net phase shift in this region for M_2 (between station 5009 and Station 5103) is about 37.8 degrees. Values for amplitude amplification and phase shift for K_1 are also given in figure III.4; the properties for other partial tides are similar. Specific values of amplitude amplification and phase shift for other partial tides can be deduced from results of the harmonic analyses given in the summary sheets (Appendix III.A).

Tidal current in San Pablo Bay

The results of tidal-current measurements are presented in two forms. For each current-meter data file analyzed (tab. III.1), the results of the

harmonic analyses are compiled in a summary sheet and are given in Appendix III.B. The summary lists the pertinent notes concerning the current-meter deployment and recovery. It includes the station location, water depth, meter depth, deployment and recovery dates, and the approximate record length. The harmonic constants for O_1, K_1, N_2, M_2, S_2, and M_4 are given for the tidal current components in the directions where the major and minor axes of the tidal current ellipses are defined (see Part I). As explained in Part I of this report, with the values for the major and minor axes, modified epoch (phase), and the sense of rotation for each partial tidal current ellipse, Eqs. (6) and (7) in Part I can be used for predicting the tidal current at the station. Additional general properties of tidal current including root-mean-squares (RMS) current speed, spring and neap tidal current limits, principal tidal current direction, and tidal current form number are also given in the summary sheet.

At almost all stations, the tidal currents show a strong bi-directional tendency. The principal current direction depends strongly on the local basin bathymetry. There is a spring and neap variation of the tidal current speed up to a factor of about two. As the form numbers indicate, the tidal currents in San Pablo Bay are mixed semidiurnal and diurnal types; however, for most of the cases the tidal current type is closer to semidiurnal than diurnal.

Following the summary of the results of harmonic analyses, the current-meter data are presented graphically in the form of time-series plots (Appendix III.B). For each data file, the time variations of the tidal-current speed and direction are plotted versus time. Water temperature and salinity are plotted versus time on a separate page. As mentioned before, the time-series plots are used to provide users with a

visual display of the temporal variations of tidal currents and their associated properties. No effort was given to edit the data in the file. Portions of the data may be invalid due to marine fouling, malfunction of a sensor, or some other unknown reasons. It was our intention to leave the data close to their original form; users need to judge the validity of the data based on general principles of estuarine-physical oceanography. Only valid data (our own best judgement) were used in the harmonic analyses. Data users may need to edit out any invalid portion of the data given in the time-series plots before using the data for their intended applications.

The most important properties of tidal currents in San Pablo Bay can be characterized by five variables: (1) the amplitude of M_2 tidal current ellipse (magnitude of semi-major axis of the M_2 tidal current ellipse), (2) the RMS tidal current speed, (3) and (4) the spring and neap tidal current speed limits, and (5) the principal tidal current direction. The spatial distribution of these quantities is plotted on a map of the San Pablo Bay region (fig. III.5) in which the M_2, RMS, and the estimated spring and neap tidal current vectors are plotted in the principal tidal current direction at each station. The spatial distribution of the tidal current suggests that the tidal current is strongly dependent on the basin bathymetry. The correlation of the depth-averaged tidal current and the water depth is examined by a linear regression of the RMS current speed versus the local mean water depth at MLLW. Only those current-meter data when the current meters were placed between 35 percent and 65 percent of the local water depth were used as approximations to the depth-averaged tidal currents. Simple linear regression of RMS current speed over the water depth gives a slope of 2.71 (cm/sec)/m, and the measure of the goodness of fit for the

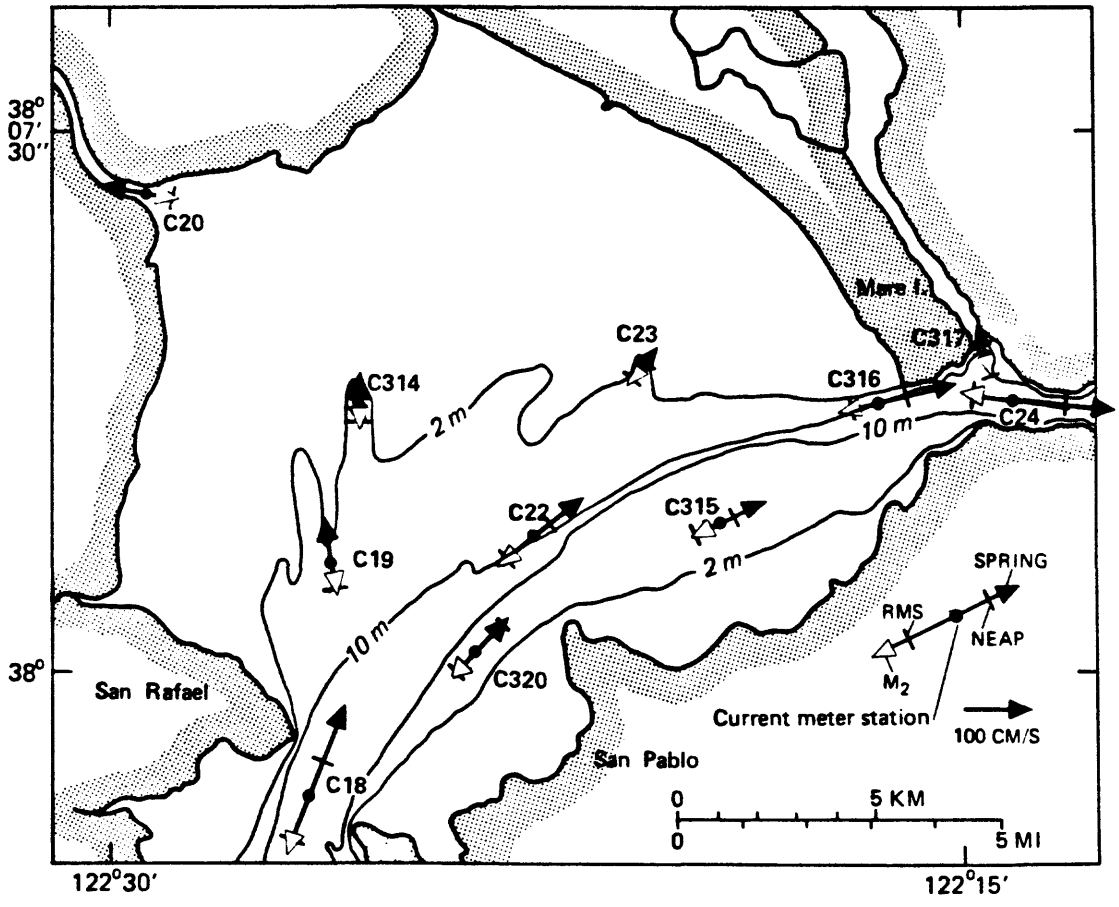


Figure III.5. Spatial distribution of tidal-current properties in San Pablo Bay, California. The legend and scale of the velocity vectors are defined in the lower right hand corner of the figure.

regression, r^2 = 0.91 (fig. III.6). The present data set has confirmed the dependency of the tidal-current speed and direction on basin bathymetry in San Pablo Bay, California. This is an important conclusion because this property can be used to estimate tidal current speed and direction elsewhere in the basin where field data are not available (Cheng and Gartner, 1982).

Eulerian residual current in San Pablo Bay

As discussed in Part I of this report, the Eulerian residual current is defined as the vectorial average of the current-meter data made over several even M_2 tidal cycles. The computed Eulerian residual currents are given in the summary for each current-meter data file. As the Delta outflow is one of the variables which affect the Eulerian residual current in San Pablo Bay, the averaged values of the Delta outflow at the corresponding periods of time have been computed from Dayflow (1982) and are given in the summary sheets.

The factors which affect the Eulerian residual currents in San Pablo Bay are rather complex. Basin bathymetry, Delta outflow, salinity stratification, horizontal salinity gradient, spatial distribution of tidal currents (tidal current shear), long term temporal variations of tidal currents (spring and neap variations), and wind forcing at the water surface are all important factors which may have effects on the magnitude and spatial distribution of the Eulerian residual currents. Although a general pattern of the Eulerian residual current exists, it is difficult to draw a simple conclusion from these data as to what are the dominant factors which govern the generation mechanism of the Eulerian residual current in San Pablo Bay. In other words, the computed Eulerian residual

currents include all of the above mentioned factors; it is not possible to delineate the individual effects solely based upon examination of these data. The use of mathematical models is a possible way to resolve this question. Indeed, one of the purposes of this data collection program is to support mathematical modeling research.

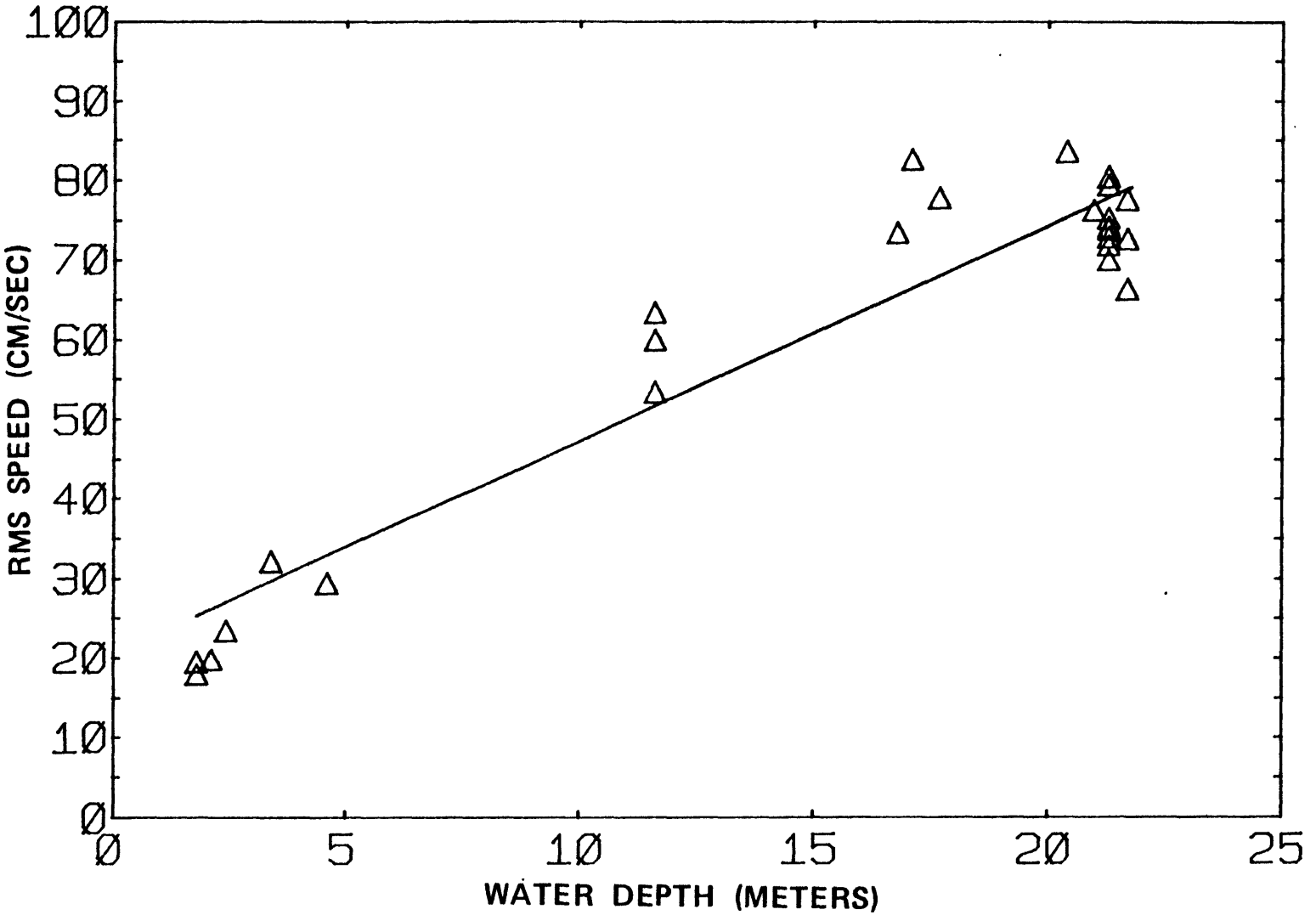


Figure III.6. Relation between RMS current speed and mean-water depth (MLLW) at deployment sites in San Pablo Bay, California.

visual display of the temporal variations of tidal currents and their associated properties. No effort was given to edit the data in the file. Portions of the data may be invalid due to marine fouling, malfunction of a sensor, or some other unknown reasons. It was our intention to leave the data close to their original form; users need to judge the validity of the data based on general principles of estuarine-physical oceanography. Only valid data (our own best judgement) were used in the harmonic analyses. Data users may need to edit out any invalid portion of the data given in the time-series plots before using the data for their intended applications.

The most important properties of tidal currents in San Pablo Bay can be characterized by five variables: (1) the amplitude of M_2 tidal current ellipse (magnitude of semi-major axis of the M_2 tidal current ellipse), (2) the RMS tidal current speed, (3) and (4) the spring and neap tidal current speed limits, and (5) the principal tidal current direction. The spatial distribution of these quantities is plotted on a map of the San Pablo Bay region (fig. III.5) in which the M_2, RMS, and the estimated spring and neap tidal current vectors are plotted in the principal tidal current direction at each station. The spatial distribution of the tidal current suggests that the tidal current is strongly dependent on the basin bathymetry. The correlation of the depth-averaged tidal current and the water depth is examined by a linear regression of the RMS current speed versus the local mean water depth at MLLW. Only those current-meter data when the current meters were placed between 35 percent and 65 percent of the local water depth were used as approximations to the depth-averaged tidal currents. Simple linear regression of RMS current speed over the water depth gives a slope of 2.71 (cm/sec)/m, and the measure of the goodness of fit for the

SUMMARY

In Part III, the observations from moored current meters and water-level stations in San Pablo Bay region are given. The main purposes of this part of the report are: (1) to document the data set collected in San Pablo Bay, California during the intensive current survey which was conducted jointly by the USGS and NOS/NOAA; (2) to present the basic data in a form useful to users; and (3) to document results from harmonic analyses of these data. The tabulated harmonic constants given in Part III can be used to predict tides and tidal currents in San Pablo Bay. The results from the harmonic analyses have led to the conclusion that tides in San Pablo Bay are mixed progressive and standing waves in the main channel but closer to a progressive wave, and the tidal currents are strongly dependent on the basin bathymetry. Whereas the Eulerian residual current is affected by basin bathymetry, Delta outflow, stratification, tidal currents, and wind forcings, a simple conclusion concerning the dominance of any one of these factors cannot be reached from these analyses. The generation of the Eulerian residual currents is probably a combination of all the above mentioned mechanisms.

APPENDIX III.A

RESULTS OF HARMONIC ANALYSES OF TIDES (STAGE) IN SAN PABLO BAY, CALIFORNIA

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414290
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 365 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 27 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 9.26 CM
TIME SERIES MEAN: 272.92 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.15	82.14	97.42
O1	0.92954	22.87	86.32	97.24
M1	0.96645	1.35	111.31	117.80
P1	0.99726	11.46	101.64	104.43
K1	1.00274	36.73	104.26	106.40
J1	1.03903	1.99	130.29	128.07
MU2	1.86455	0.80	231.49	252.68
N2	1.89598	12.44	299.88	317.29
NU2	1.90084	2.27	306.50	323.33
M2	1.93227	57.79	324.77	337.82
L2	1.96857	2.40	349.83	358.53
T2	1.99726	1.12	324.04	329.30
S2	2.00000	13.48	331.70	336.63
K2	2.00548	3.85	327.31	331.58
M4	3.86455	2.37	19.03	45.14
MK3	2.93501	2.09	126.13	141.33

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415052
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 7
DAY= 7
HOUR= 0
APPROXIMATE RECORD LENGTH: 137 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 30 MIN 10 SEC
STANDARD DEVIATION OF THE TIME SERIES: 6.76 CM
TIME SERIES MEAN: 173.69 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.00	105.59	120.91
O1	0.92954	21.37	108.73	119.69
M1	0.96645	1.26	132.04	138.57
P1	0.99726	10.64	124.54	127.37
K1	1.00274	34.58	126.26	128.44
J1	1.03903	1.76	156.48	154.30
MU2	1.86455	0.79	168.65	189.91
N2	1.89598	12.02	337.30	354.78
NU2	1.90084	3.02	351.60	8.50
M2	1.93227	61.18	2.33	15.47
L2	1.96857	4.01	23.35	32.13
T2	1.99726	1.52	29.38	34.71
S2	2.00000	12.87	17.98	22.98
K2	2.00548	4.91	1.89	6.24
M4	3.86455	0.90	243.60	269.87
MK3	2.93501	2.14	87.86	103.17

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415009
START TIME OF SERIES (PST):
YEAR=1980
MONTH= 4
DAY=11
HOUR= 0
APPROXIMATE RECORD LENGTH: 236 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 26 MIN 48 SEC
STANDARD DEVIATION OF THE TIME SERIES: 8.88 CM
TIME SERIES MEAN: 199.72 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.85	98.56	113.82
O1	0.92954	21.08	98.28	109.18
M1	0.96645	1.62	144.64	151.11
P1	0.99726	10.86	110.25	113.03
K1	1.00274	35.08	117.69	119.80
J1	1.03903	1.40	148.47	146.23
MU2	1.86455	1.25	169.05	190.19
N2	1.89598	12.18	325.76	343.14
NU2	1.90084	2.42	334.89	351.68
M2	1.93227	59.09	350.58	3.60
L2	1.96857	3.56	6.83	15.50
T2	1.99726	0.97	314.86	320.08
S2	2.00000	13.47	356.99	1.88
K2	2.00548	4.91	354.08	358.31
M4	3.86455	1.56	49.60	75.64
MK3	2.93501	2.29	116.36	131.50

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415252
START TIME OF SERIES (PST):
YEAR=1978
MONTH= 9
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 252 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 30 MIN 0 SEC
STANDARD DEVIATION OF THE TIME SERIES: 12.46 CM
TIME SERIES MEAN: 193.74 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.48	120.07	135.38
O1	0.92954	21.38	112.60	123.55
M1	0.96645	0.49	156.41	162.94
P1	0.99726	9.96	132.21	135.04
K1	1.00274	35.46	133.69	135.86
J1	1.03903	1.35	181.28	179.10
MU2	1.86455	2.16	153.69	174.95
N2	1.89598	12.08	349.31	6.80
NU2	1.90084	3.10	3.72	20.62
M2	1.93227	62.92	12.11	25.23
L2	1.96857	3.56	23.02	31.79
T2	1.99726	0.65	318.33	323.66
S2	2.00000	13.94	28.87	33.87
K2	2.00548	5.99	13.62	17.97
M4	3.86455	2.81	301.01	327.26
MK3	2.93501	4.43	69.36	84.66

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415143
START TIME OF SERIES (PST):
YEAR=1980
MONTH= 3
DAY=23
HOUR= 0
APPROXIMATE RECORD LENGTH: 256 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 13 MIN 24 SEC
STANDARD DEVIATION OF THE TIME SERIES: 8.64 CM
TIME SERIES MEAN: 311.33 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.28	113.13	128.16
O1	0.92954	20.39	110.83	121.51
M1	0.96645	1.61	164.54	170.79
P1	0.99726	10.22	129.74	132.29
K1	1.00274	34.44	130.06	131.96
J1	1.03903	0.88	168.46	166.00
MU2	1.86455	1.46	186.42	207.12
N2	1.89598	11.77	348.90	5.83
NU2	1.90084	2.98	358.88	15.22
M2	1.93227	60.76	13.28	25.85
L2	1.96857	4.51	30.70	38.92
T2	1.99726	1.26	332.03	336.80
S2	2.00000	12.92	23.81	28.26
K2	2.00548	4.66	18.95	22.74
M4	3.86455	1.63	205.66	230.80
MK3	2.93501	1.17	99.89	114.35

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415338
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 7
DAY=14
HOUR= 0
APPROXIMATE RECORD LENGTH: 117 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 24 MIN 24 SEC
STANDARD DEVIATION OF THE TIME SERIES: 9.72 CM
TIME SERIES MEAN: 196.66 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.13	124.45	139.66
O1	0.92954	19.56	121.30	132.17
M1	0.96645	1.46	141.86	148.30
P1	0.99726	8.83	125.48	128.21
K1	1.00274	33.06	136.07	138.15
J1	1.03903	0.69	170.65	168.38
MU2	1.86455	1.88	169.20	190.27
N2	1.89598	10.90	356.01	13.31
NU2	1.90084	2.73	2.79	19.50
M2	1.93227	58.39	17.28	30.22
L2	1.96857	5.35	32.37	40.96
T2	1.99726	0.22	149.68	154.82
S2	2.00000	11.10	32.06	36.88
K2	2.00548	6.64	23.33	27.49
M4	3.86455	4.28	319.76	345.64
MK3	2.93501	4.92	94.69	109.71

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9415056
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 3
DAY=16
HOUR= 0
APPROXIMATE RECORD LENGTH: 32 DAYS*
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 21 MIN 48 SEC
STANDARD DEVIATION OF THE TIME SERIES: 11.74 CM
TIME SERIES MEAN: 335.72 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.13	79.25	94.43
O1	0.92954	21.27	91.01	101.83
M1	0.96645	1.51	102.87	109.26
P1	0.99726	12.84	112.94	115.64
K1	1.00274	38.81	114.72	116.76
J1	1.03903	1.68	126.48	124.16
MU2	1.86455	1.64	11.50	32.48
N2	1.89598	19.59	299.67	316.88
NU2	1.90084	3.80	307.57	324.20
M2	1.93227	68.47	358.62	11.47
L2	1.96857	1.92	57.56	66.06
T2	1.99726	0.92	346.25	351.31
S2	2.00000	15.60	345.74	350.46
K2	2.00548	4.24	344.69	348.76
M4	3.86455	0.90	72.26	97.96
MK3	2.93501	0.61	83.48	98.37

*Inference method

APPENDIX III.B

The current-meter data are presented chronologically and station-by-station in Appendix III.B. For each file, the measured data and the results of analyses are presented in two forms: (1) results from the harmonic analyses; and (2) time series plots of tidal-current velocity (speed and direction) versus time, and salinity and temperature versus time. These results are given in the order of station numbers as listed in table III.1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C018
POSITION: 37 58'30"N 122 26'33"W
METER TYPE: ENDECO
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 9.4 M (BELOW MLLW)
START TIME OF SERIES: 3/22/79 1207 PST JULIAN DAY= 81
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

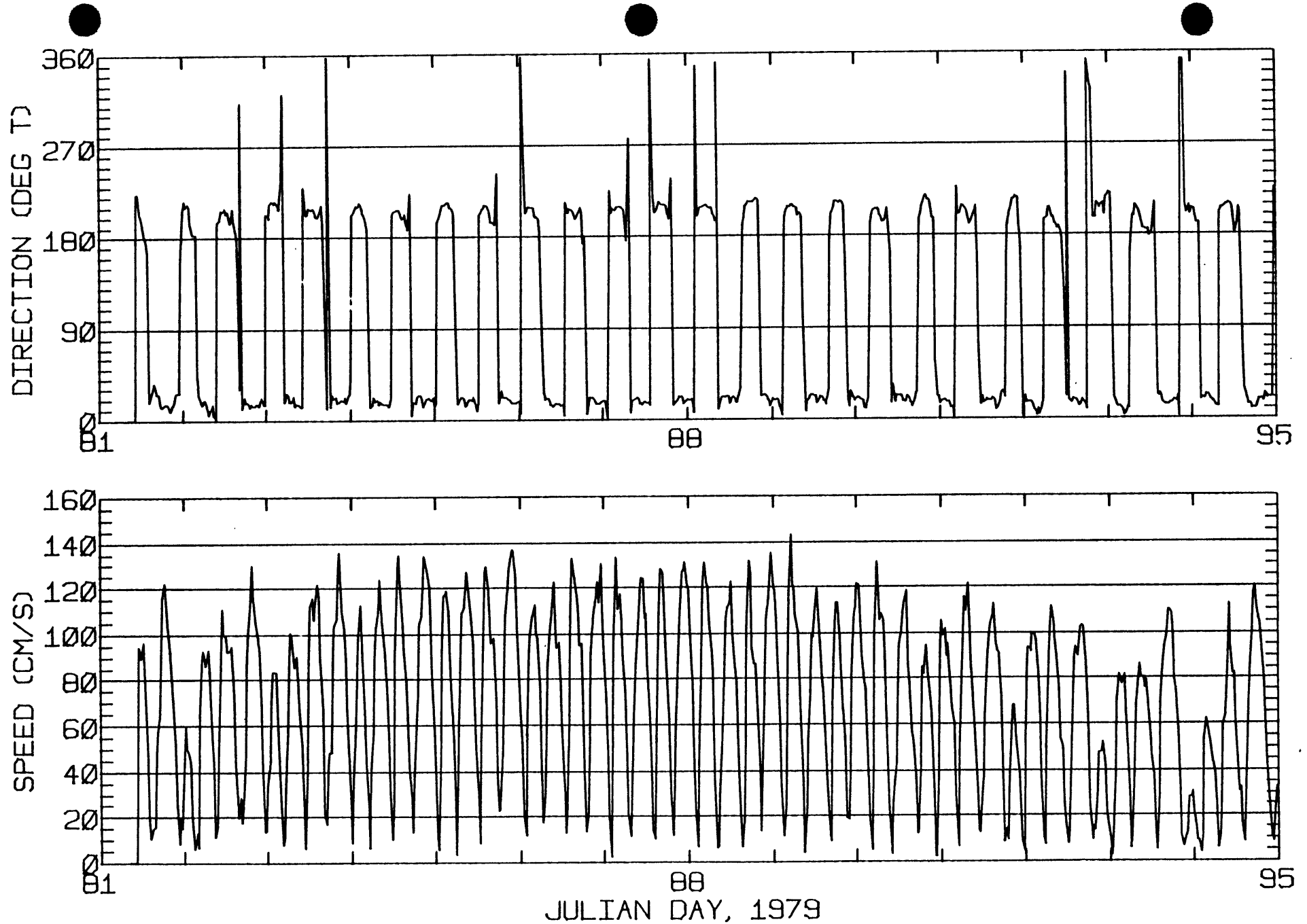
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.52	2.59	18.3	35.4	ANTI-CLOCKWISE
K1	21.74	2.11	16.1	45.6	ANTI-CLOCKWISE
N2	17.52	2.40	33.1	257.3	CLOCKWISE
M2	86.93	4.00	19.0	320.5	ANTI-CLOCKWISE
S2	21.76	2.20	30.6	304.7	CLOCKWISE
M4	5.82	1.61	54.6	74.9	CLOCKWISE

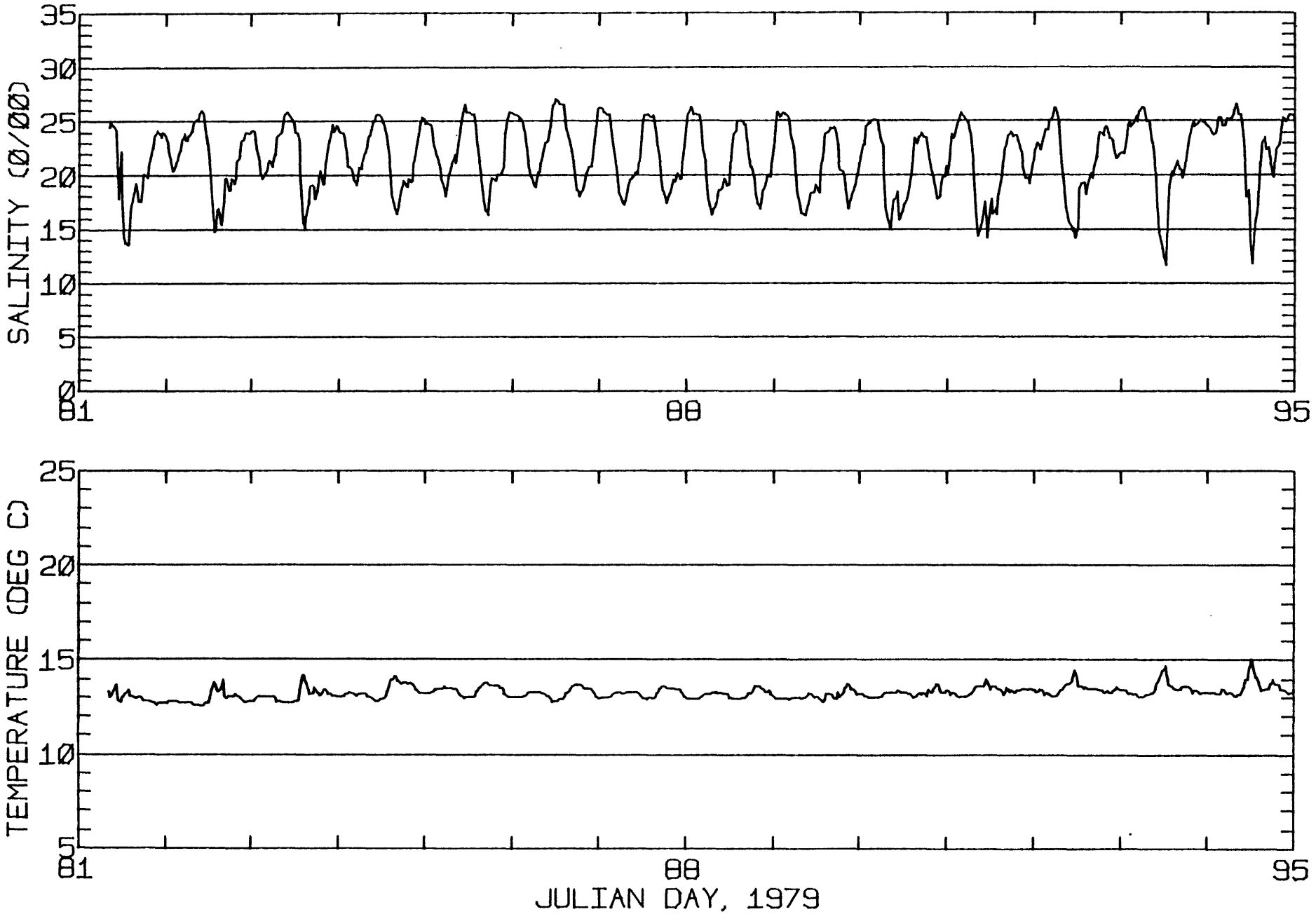
RMS SPEED: 80.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 148.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 61.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 20.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 9.47 CM/SEC
STANDARD DEVIATION V SERIES: 12.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.2	11.9	706.
2	12	0.1	11.7	1099.
ALL	24	-0.1	11.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 37-58-30N 122-26-33W
METER 11.9 METERS ABOVE BED TAPE NUMBER GSC018A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 37-58-30N 122-26-33W
METER 11.9 METERS ABOVE BED TAPE NUMBER GSC018A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C018
POSITION: 37 58'30"N 122 26'33"W
METER TYPE: ENDECO
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 14.6 M (BELOW MLLW)
START TIME OF SERIES: 3/22/79 1155 PST JULIAN DAY= 81
APPROXIMATE RECORD LENGTH IS 6 M2-CYCLES

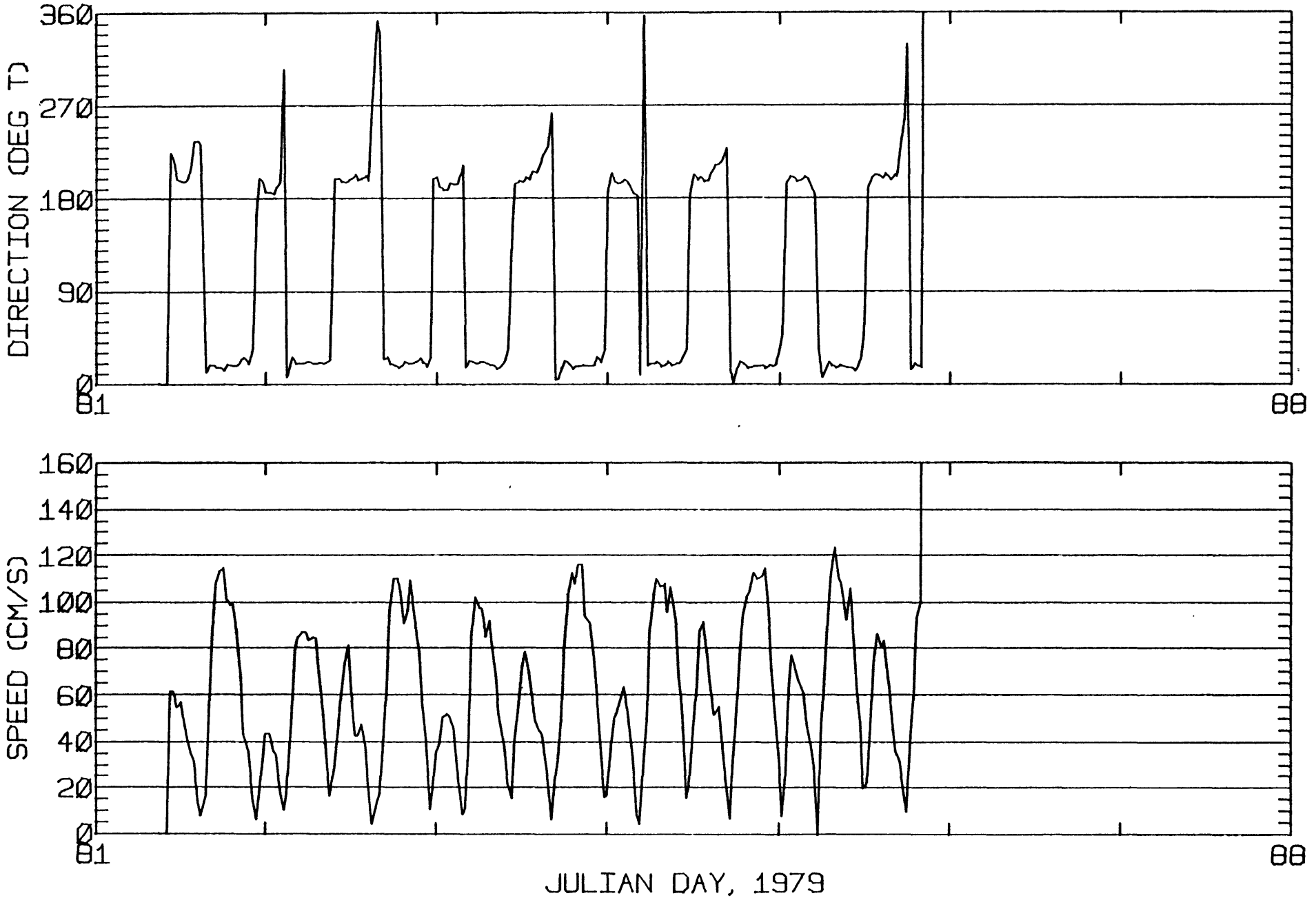
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.66	0.47	26.2	24.7	CLOCKWISE
K1	13.37	2.11	16.1	44.9	CLOCKWISE
N2	72.15	17.78	21.6	183.8	CLOCKWISE
M2	166.84	26.51	16.8	329.8	CLOCKWISE
S2	29.49	7.53	11.8	39.1	CLOCKWISE
M4	1.18	0.77	332.2	348.2	ANTI-CLOCKWISE

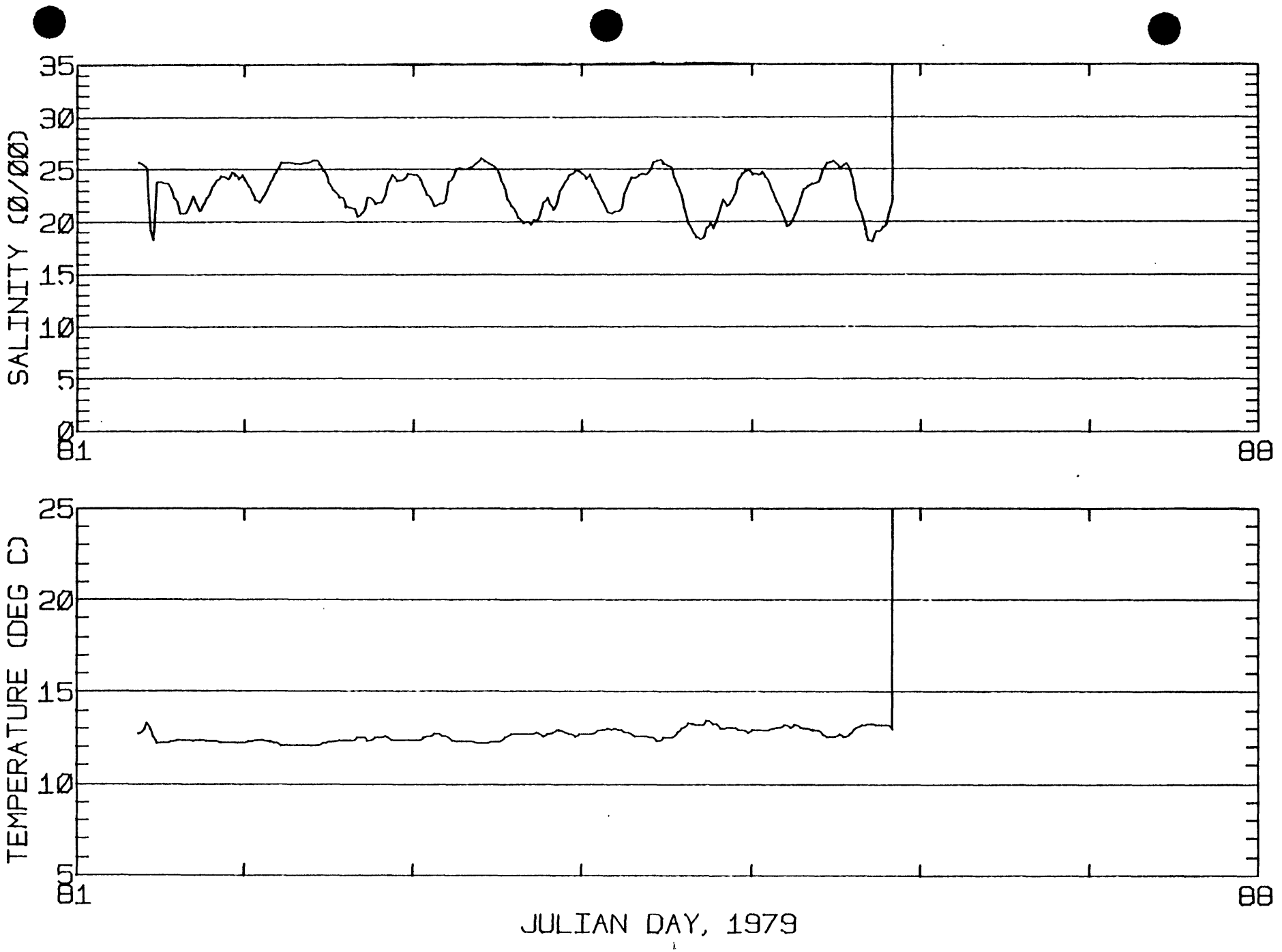
RMS SPEED: 66.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 223.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 137.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 16.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.14
STANDARD DEVIATION U-SERIES: 5.49 CM/SEC
STANDARD DEVIATION V SERIES: 11.75 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	6	7.9	21.5	788.
ALL	6	7.9	21.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 37-58-30N 122-26-33W
METER 6.7 METERS ABOVE BED TAPE NUMBER GSC018A2.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 37-58-30N 122-26-33W
METER 6.7 METERS ABOVE BED TAPE NUMBER GSC018A2.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C018
POSITION: 37 58'24"N 122 26'31"W
METER TYPE: ENDECO
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 9.4 M (BELOW MLLW)
START TIME OF SERIES: 4/ 6/79 1455 PST JULIAN DAY= 96
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

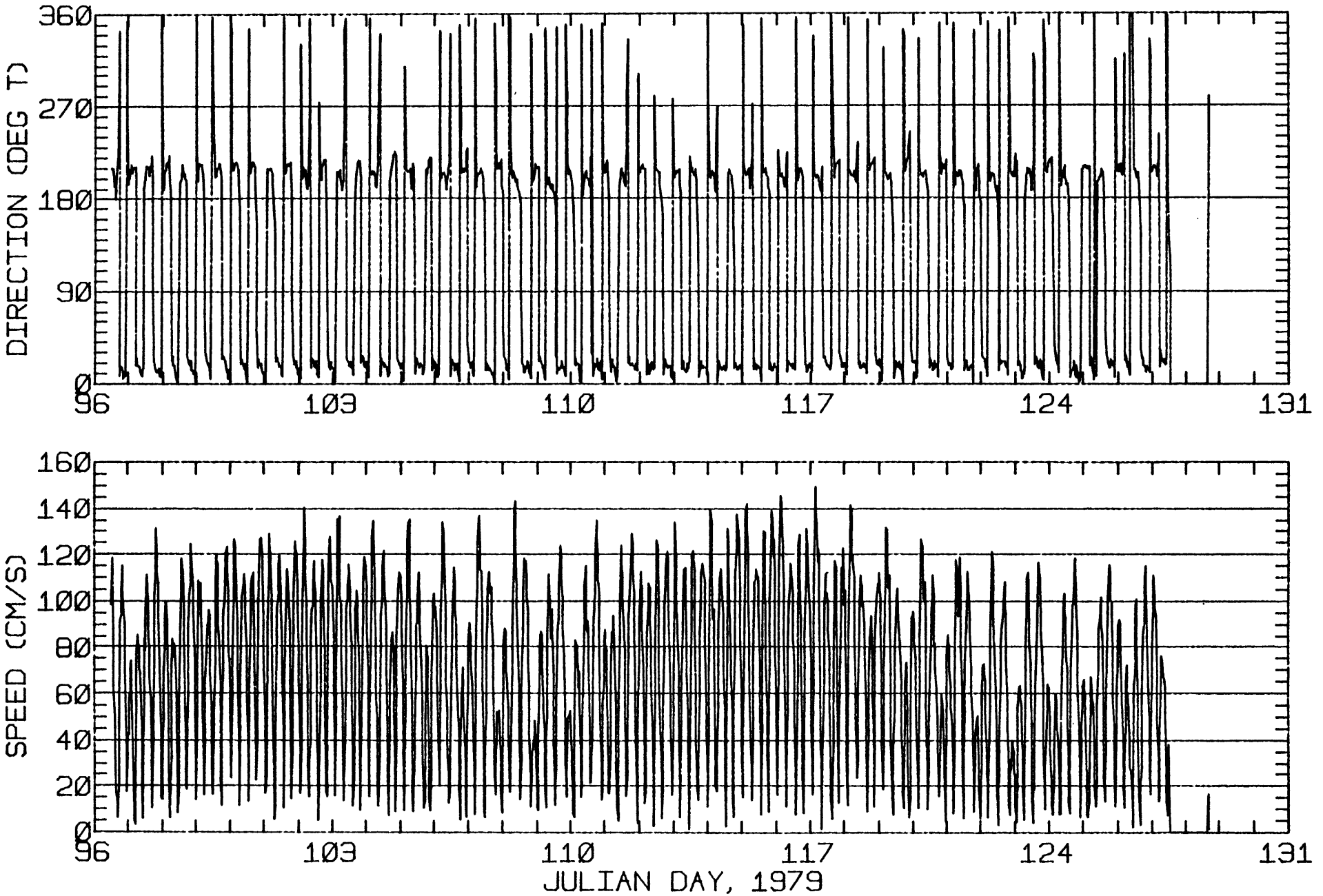
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.64	0.74	17.3	37.4	ANTI-CLOCKWISE
K1	30.03	1.14	15.7	37.1	ANTI-CLOCKWISE
N2	14.56	0.04	17.8	279.7	ANTI-CLOCKWISE
M2	97.18	3.46	21.1	318.8	ANTI-CLOCKWISE
S2	24.48	0.31	22.8	308.4	ANTI-CLOCKWISE
M4	4.22	1.55	46.5	92.1	CLOCKWISE

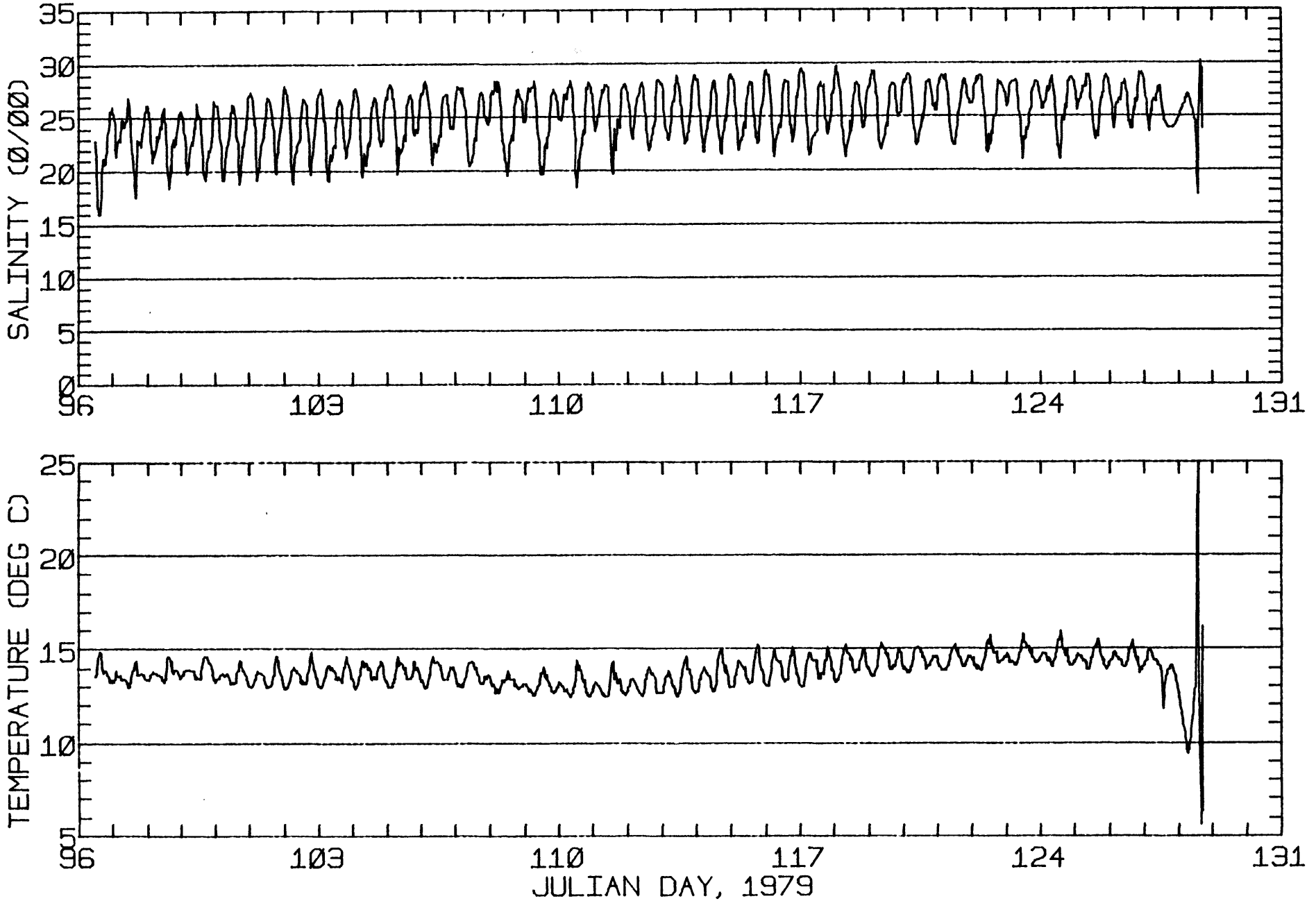
RMS SPEED: 79.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 170.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 61.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 20.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 10.17 CM/SEC
STANDARD DEVIATION V SERIES: 14.08 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.6	7.4	516.
2	12	-1.7	9.4	255.
3	12	-1.7	7.4	227.
4	12	-2.7	6.2	293.
5	8	-0.8	7.0	276.
ALL	56	-2.6	7.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 37-58-24N 122-26-31W
METER 11.9 METERS ABOVE BED TAPE NUMBER GSC018B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 37-58-24N 122-26-31W
METER 11.9 METERS ABOVE BED TAPE NUMBER GSC018B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C022
POSITION: 38 1'58"N 122 22'49"W
METER TYPE: ENDECO
WATER DEPTH: 10.6 M (MLLW)
METER DEPTH: 8.8 M (BELOW MLLW)
START TIME OF SERIES: 3/23/79 849 PST JULIAN DAY= 82
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

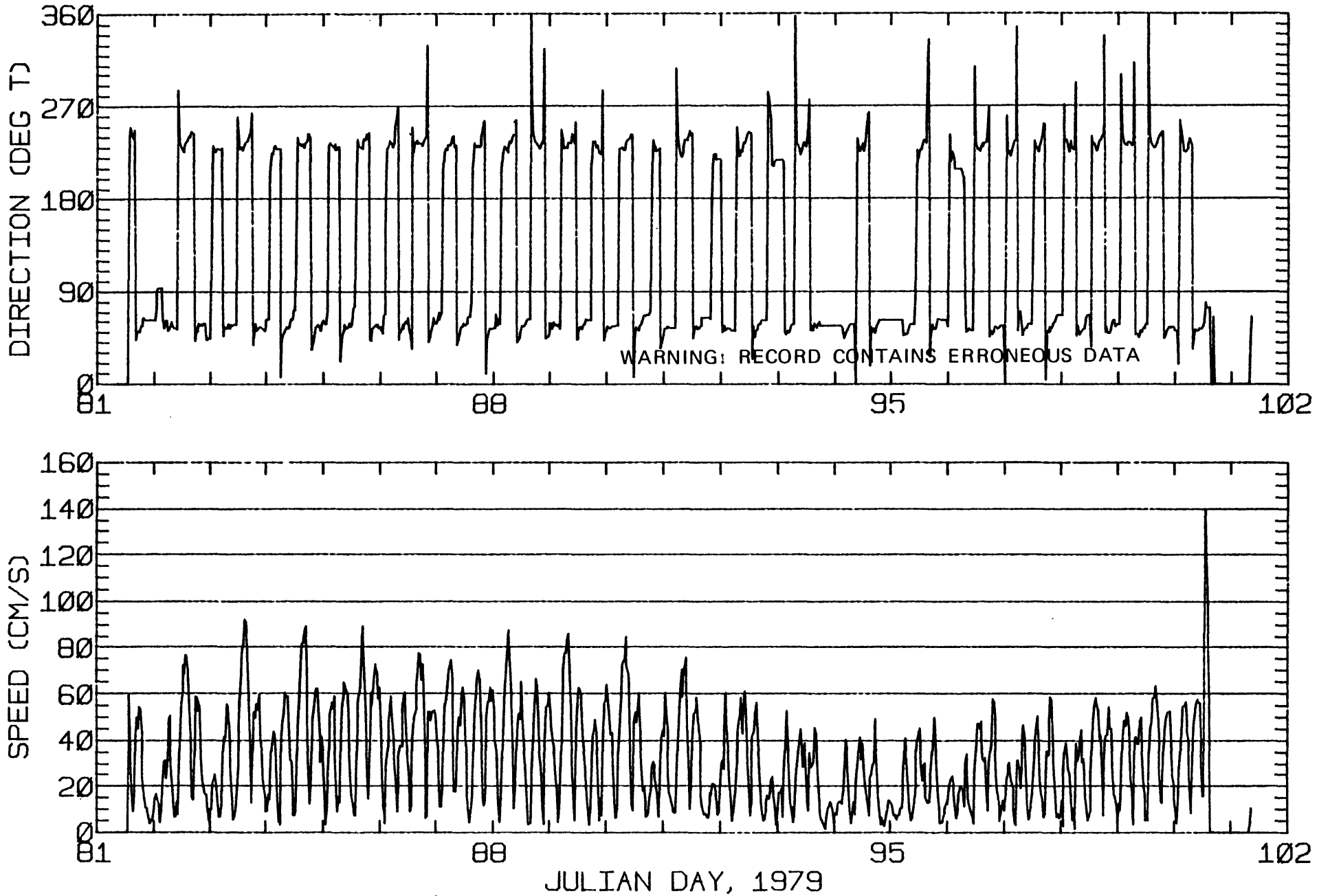
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.72	0.30	57.5	71.6	CLOCKWISE
K1	17.20	0.94	56.3	79.9	CLOCKWISE
N2	11.26	1.03	61.3	321.0	CLOCKWISE
M2	43.71	1.18	52.1	331.8	CLOCKWISE
S2	12.12	0.81	56.9	350.0	CLOCKWISE
M4	10.07	2.11	50.5	208.0	CLOCKWISE

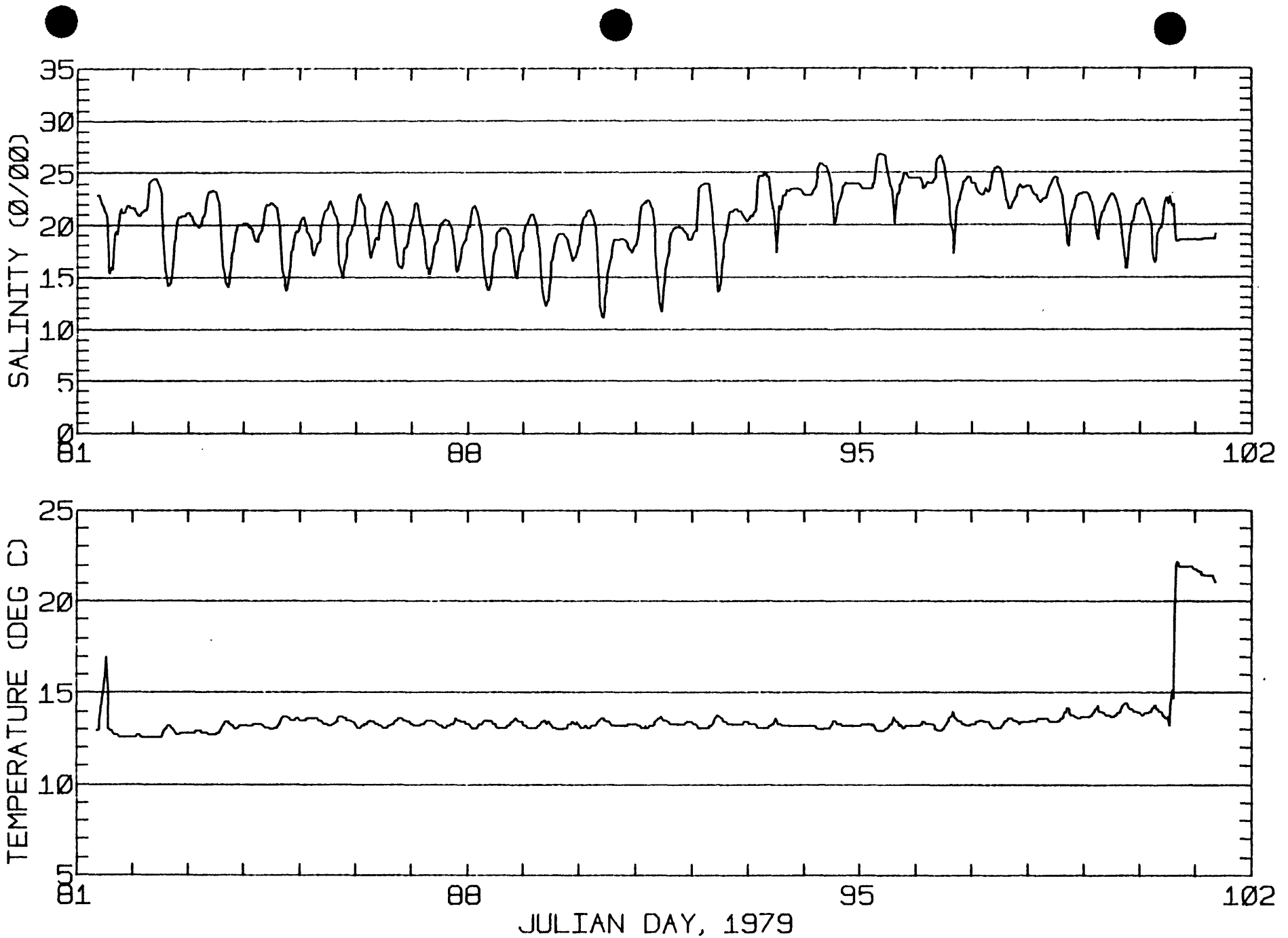
RMS SPEED: 44.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 88.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 54.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.59
STANDARD DEVIATION U-SERIES: 8.23 CM/SEC
STANDARD DEVIATION V SERIES: 6.46 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.4	-1.0	724.
2	8	0.3	-0.2	1192.
ALL	20	-0.7	-0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 38- 1-58N 122-22-49W
METER 1.8 METERS ABOVE BED TAPE NUMBER GSC022A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 38- 1-58N 122-22-49W
METER 1.8 METERS ABOVE BED TAPE NUMBER GSC022A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C022
POSITION: 38 1'51"N 122 22'49"W
METER TYPE: ENDECO
WATER DEPTH: 10.6 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 9/25/80 1542 PST JULIAN DAY=269
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

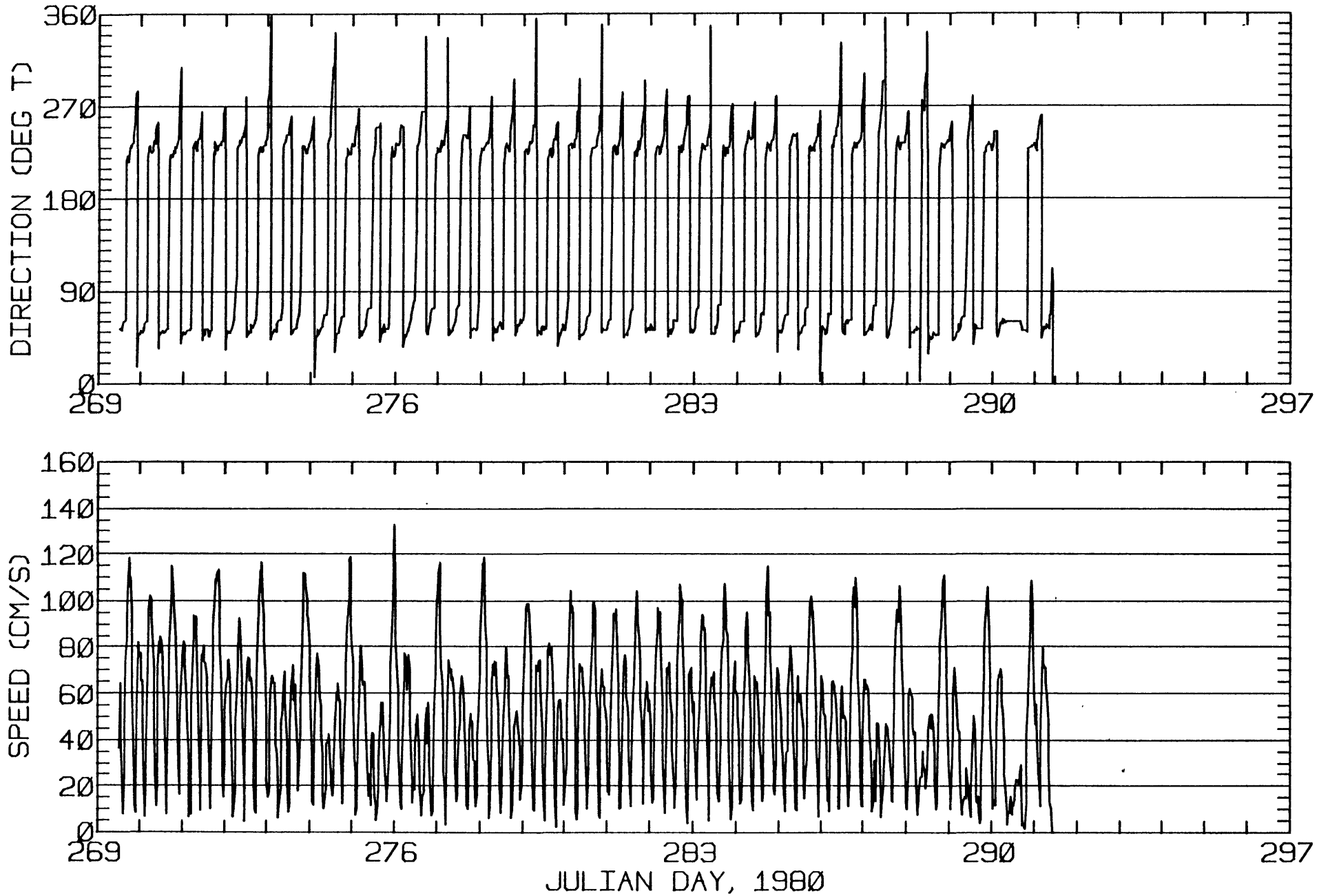
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.63	0.59	47.4	67.7	ANTI-CLOCKWISE
K1	19.80	0.82	49.6	61.5	CLOCKWISE
N2	15.90	2.14	49.8	327.6	CLOCKWISE
M2	72.30	6.96	52.4	346.0	CLOCKWISE
S2	23.30	1.95	51.3	336.7	CLOCKWISE
M4	3.27	1.19	53.5	201.4	CLOCKWISE

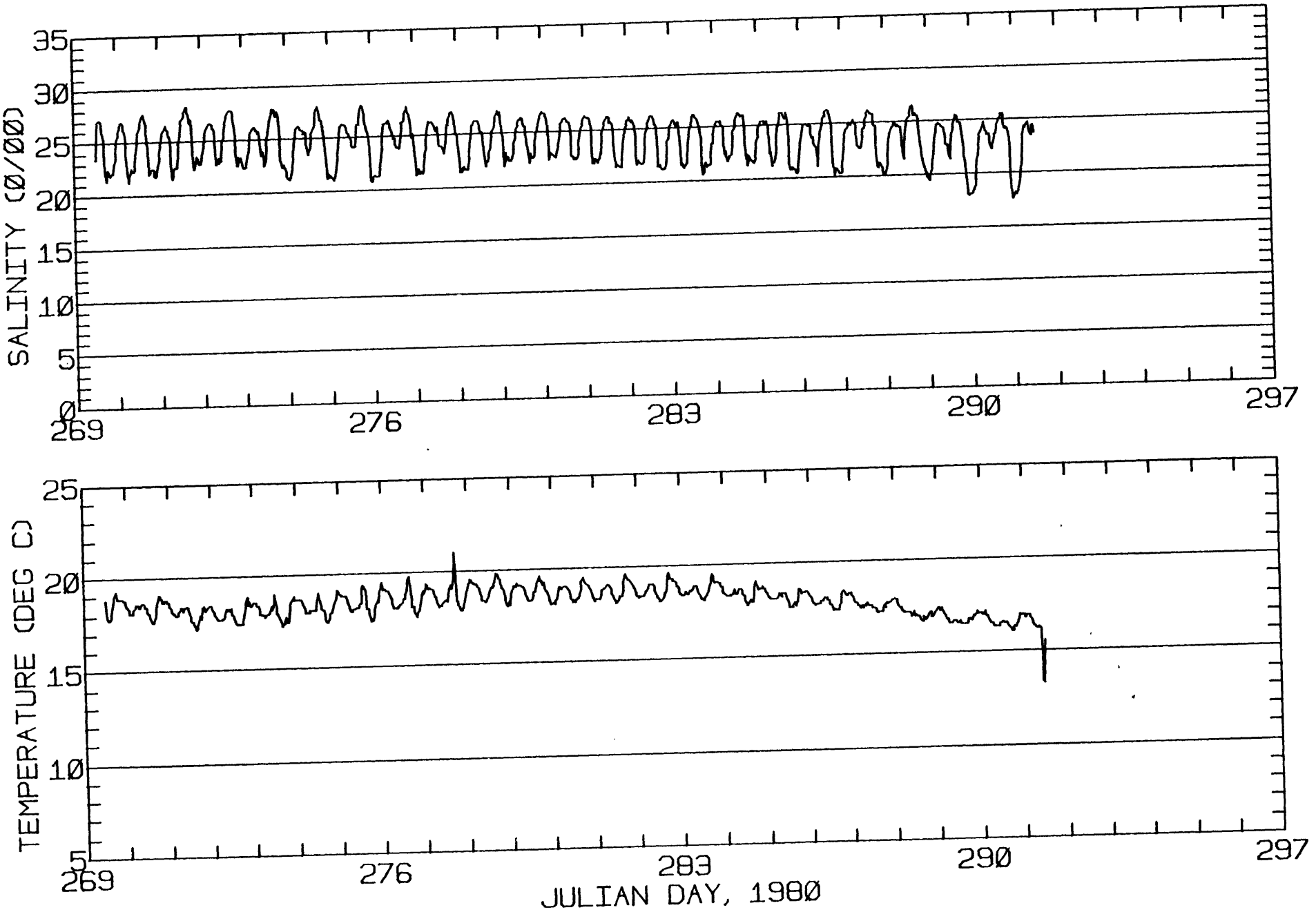
RMS SPEED:	60.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	133.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	46.8 CM/SEC
PRINCIPAL CURRENT DIRECTION:	51.1 DEGREES TRUE
TIDAL FORM NUMBER:	0.39
STANDARD DEVIATION U-SERIES:	11.43 CM/SEC
STANDARD DEVIATION V SERIES:	8.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.3	-3.8	364.
2	12	-7.4	-5.9	251.
3	12	-8.5	-5.3	275.
4	2	-5.3	2.2	227.
ALL	38	-7.3	-4.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 38- 1-51N 122-22-49W
METER 7.6 METERS ABOVE BED TAPE NUMBER GSC022C1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN PABLO STRAIT 38- 1-51N 122-22-49W
METER 7.6 METERS ABOVE BED TAPE NUMBER GSC022C1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C316
POSITION: 38 3'45"N 122 16'35"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 8/27/80 1431 PST JULIAN DAY=240
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

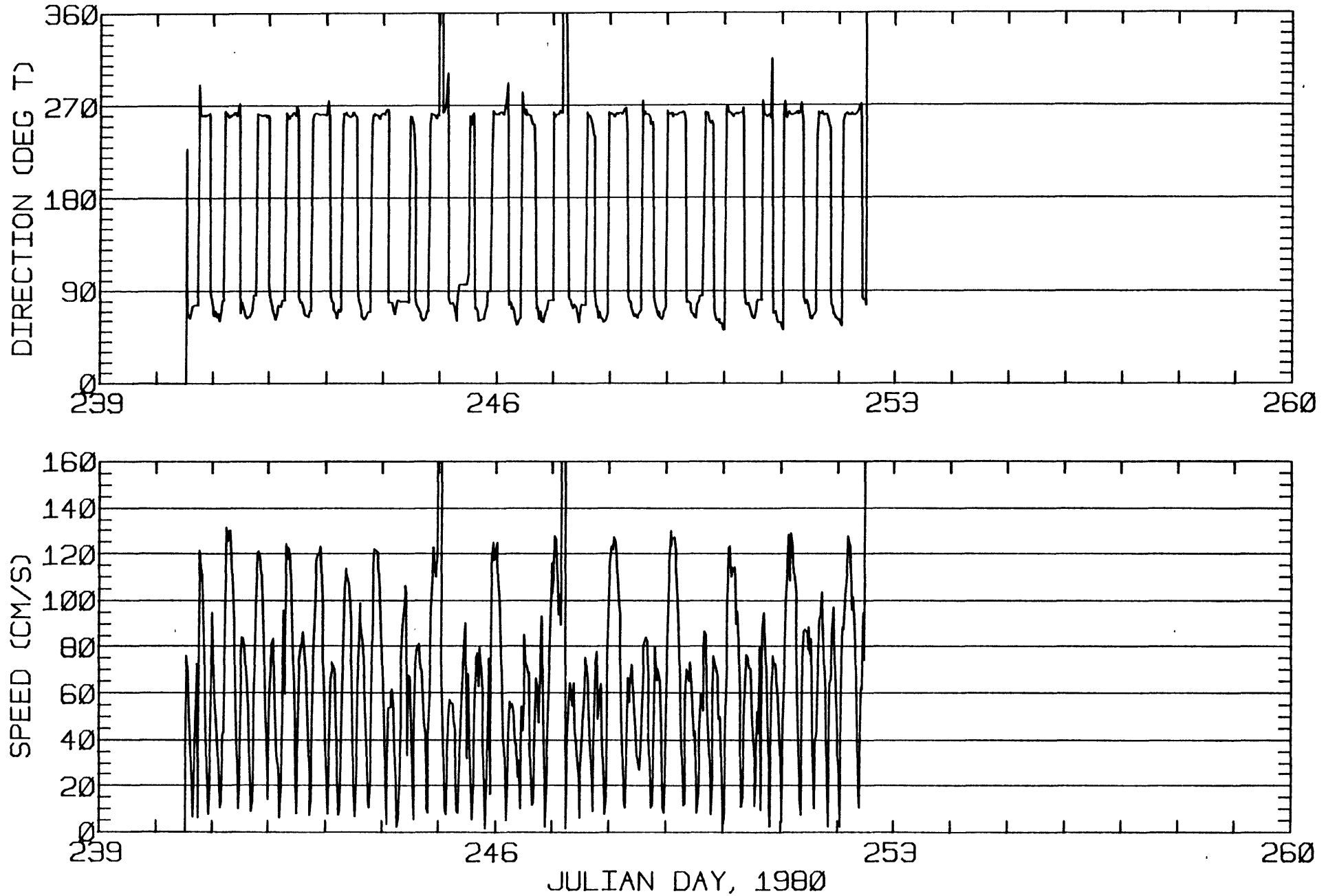
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	22.40	1.16	82.4	99.4	ANTI-CLOCKWISE
K1	30.29	1.35	79.6	101.1	ANTI-CLOCKWISE
N2	19.35	2.42	78.0	10.2	CLOCKWISE
M2	68.34	1.99	77.1	12.6	ANTI-CLOCKWISE
S2	21.52	1.29	78.0	357.5	ANTI-CLOCKWISE
M4	11.32	2.71	85.2	283.3	ANTI-CLOCKWISE

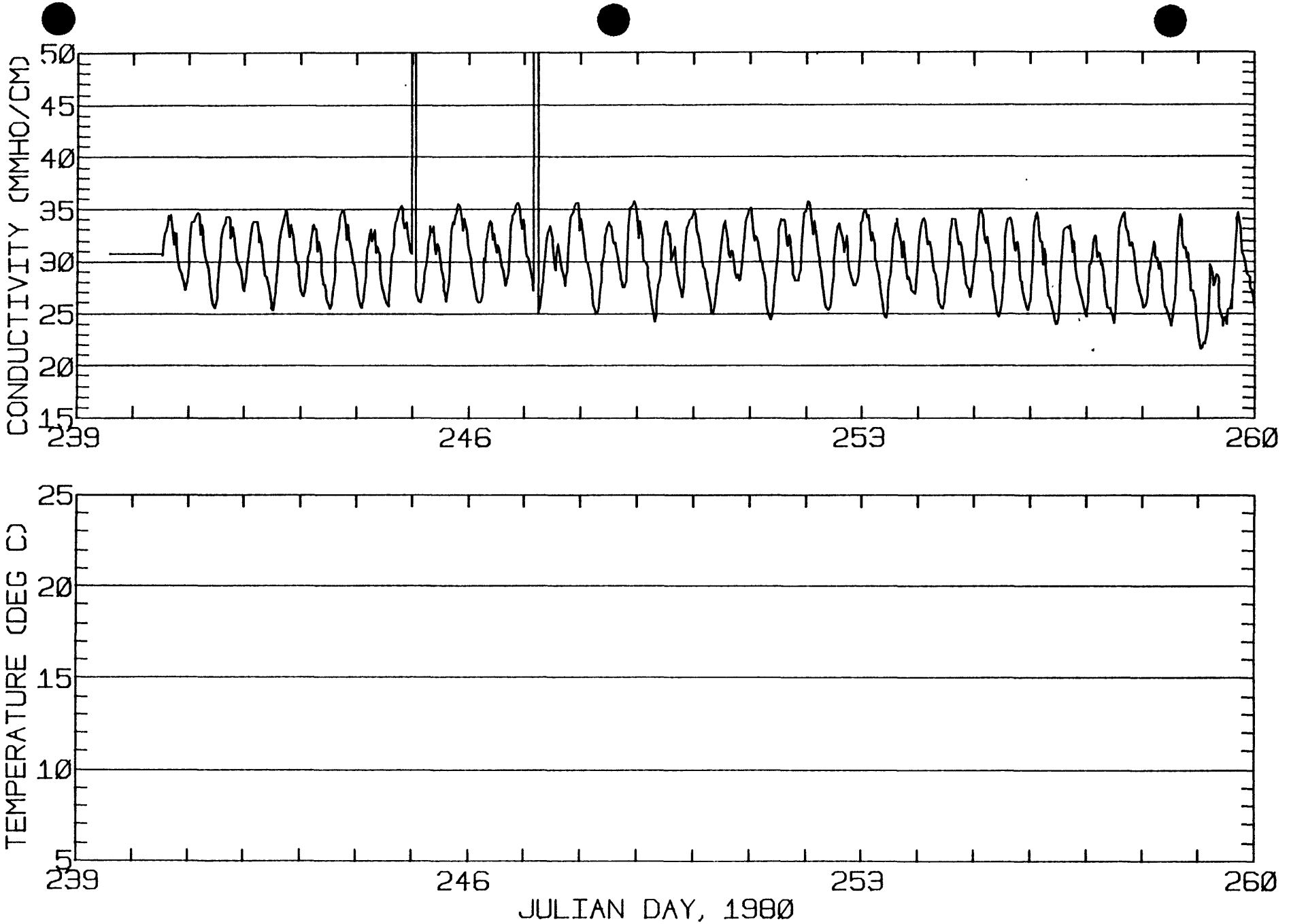
RMS SPEED: 70.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 142.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 38.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 78.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.59
STANDARD DEVIATION U-SERIES: 32.61 CM/SEC
STANDARD DEVIATION V SERIES: 7.12 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.1	2.9	129.
2	8	-10.0	3.1	216.
ALL	20	-8.2	3.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
MARE ISLAND 38- 3-45N 122-16-35W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC316A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
MARE ISLAND 38- 3-45N 122-16-35W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC316A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'30"N 122 26'33"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 3/22/79 1120 PST JULIAN DAY= 81
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

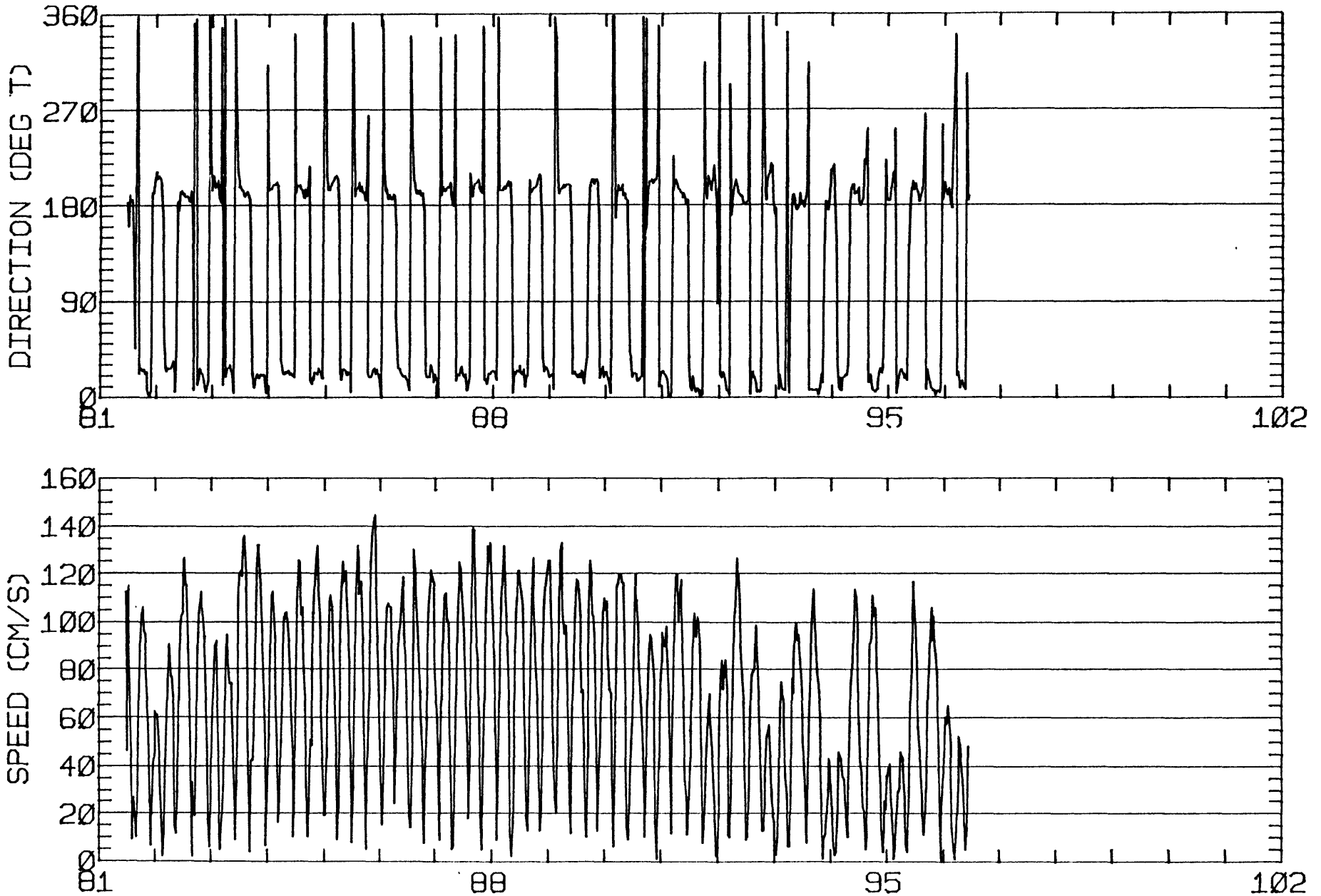
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.47	0.78	8.3	40.0	ANTI-CLOCKWISE
K1	23.95	0.37	7.8	47.0	ANTI-CLOCKWISE
N2	21.80	2.28	22.2	263.0	CLOCKWISE
M2	82.29	5.14	17.0	321.7	ANTI-CLOCKWISE
S2	23.55	0.16	26.8	307.2	ANTI-CLOCKWISE
M4	6.34	1.01	350.7	51.8	ANTI-CLOCKWISE

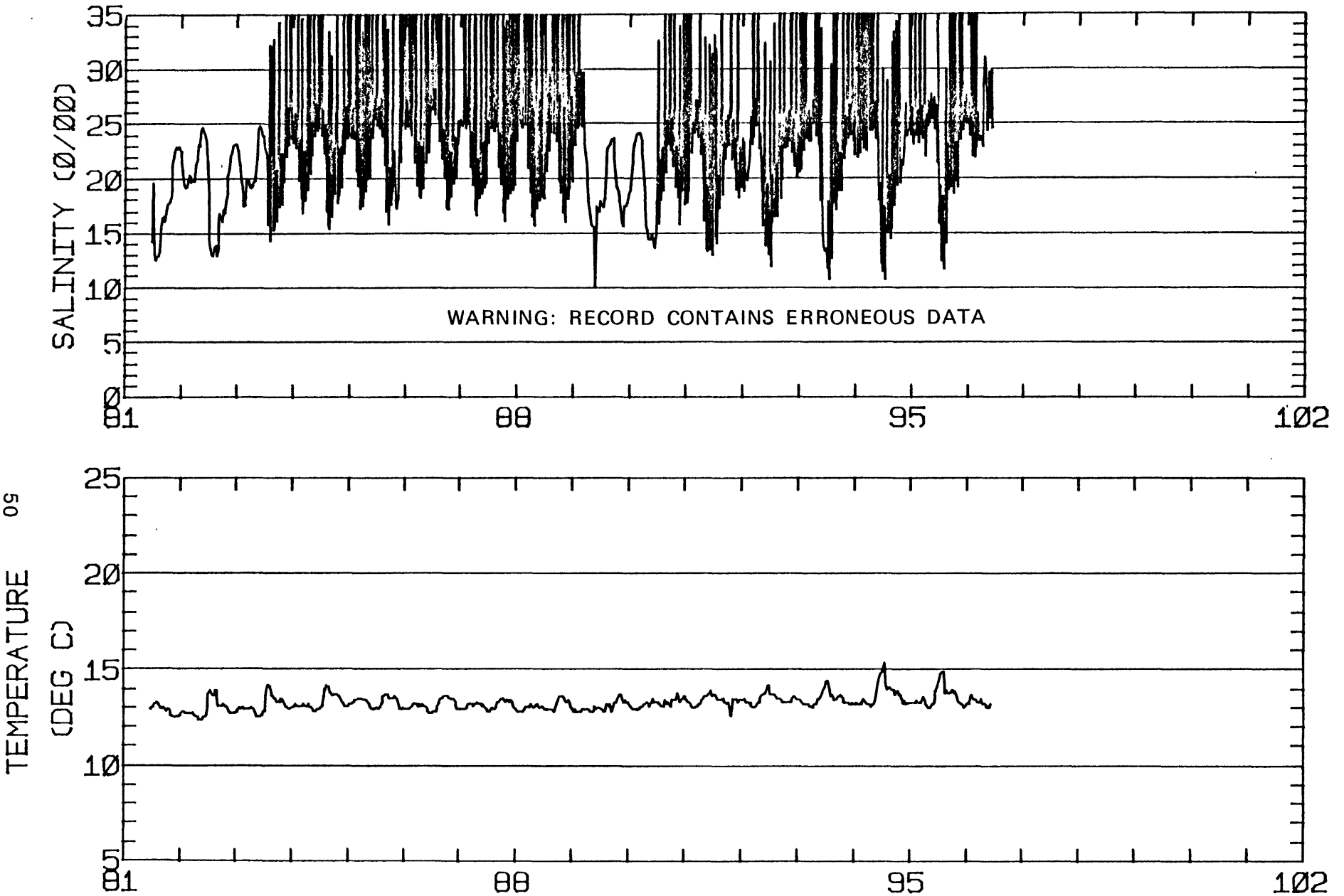
RMS SPEED: 77.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 150.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 55.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 15.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 9.71 CM/SEC
STANDARD DEVIATION V SERIES: 12.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.1	4.3	706.
2	12	1.1	3.0	1099.
3	4	-0.6	2.6	808.
ALL	28	2.6	3.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-30N 122-26-33W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-30N 122-26-33W
METER Ø15.1 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'24"N 122 26'31"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 4/ 6/79 1210 PST JULIAN DAY= 96
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

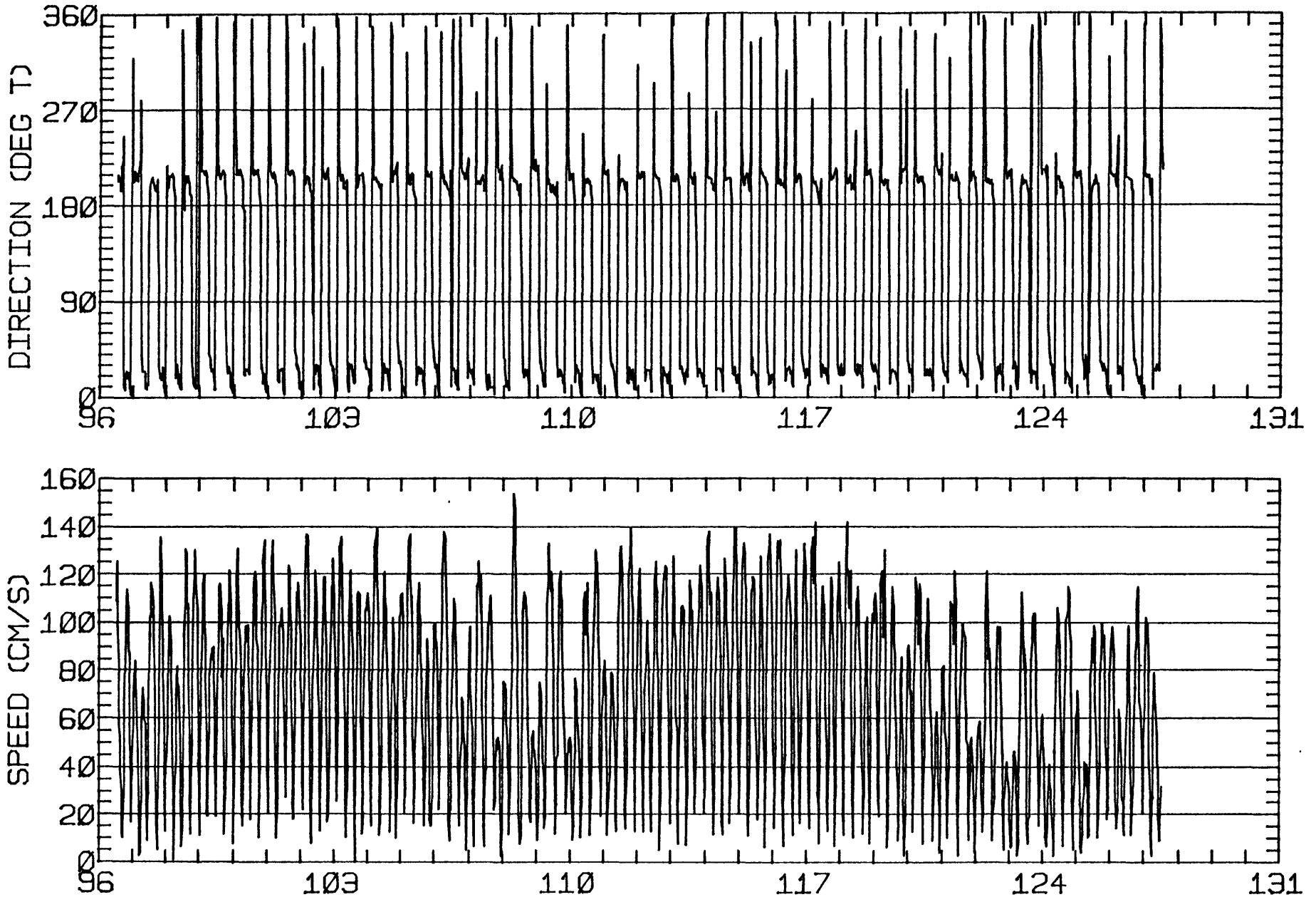
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.93	0.28	18.0	35.1	CLOCKWISE
K1	31.15	2.34	16.2	38.8	ANTI-CLOCKWISE
N2	14.86	0.45	25.6	283.0	ANTI-CLOCKWISE
M2	97.52	6.33	23.6	319.7	ANTI-CLOCKWISE
S2	25.48	1.03	24.5	306.9	ANTI-CLOCKWISE
M4	3.51	1.37	355.4	53.0	CLOCKWISE

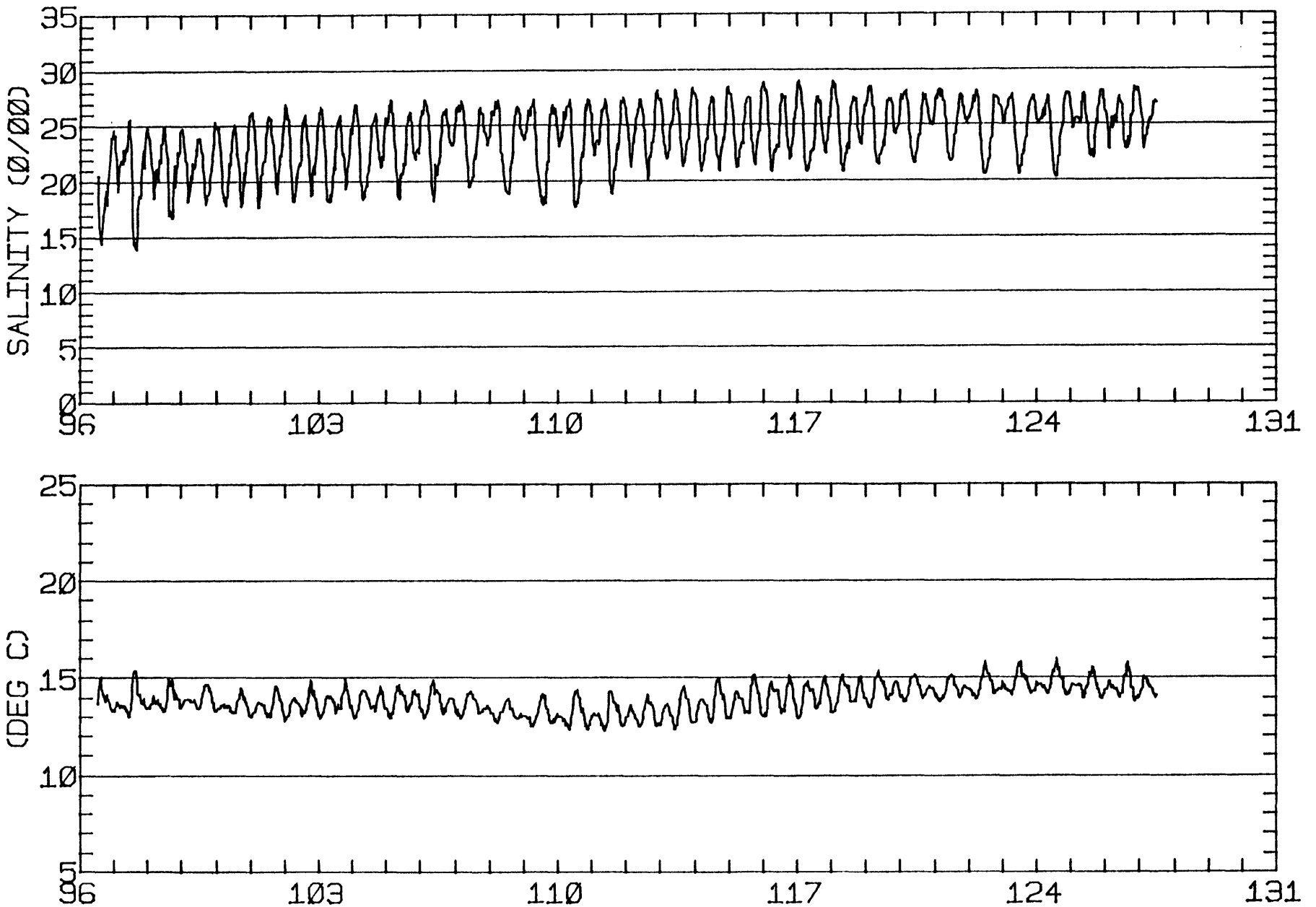
RMS SPEED: 79.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 173.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 59.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 21.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 9.54 CM/SEC
STANDARD DEVIATION V SERIES: 13.05 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.1	-0.8	516.
2	12	-2.9	2.1	255.
3	12	-1.6	3.1	227.
4	12	-0.8	2.8	293.
5	10	-2.0	0.1	276.
ALL	58	-2.9	1.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-24N 122-26-31W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-24N 122-26-31W
METER Ø15.1 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'24"N 122 26'31"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 4/ 6/79 1202 PST JULIAN DAY= 96
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

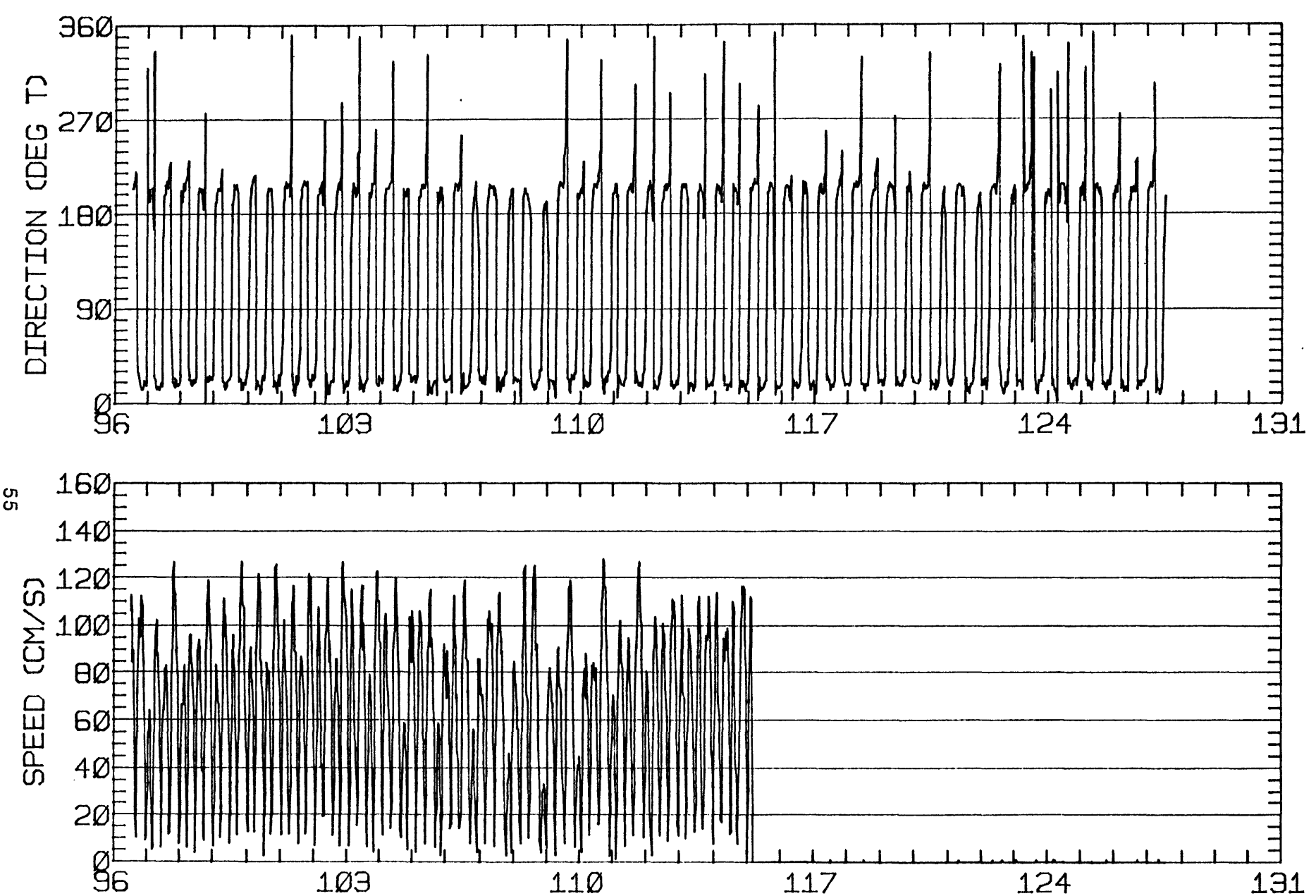
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.94	2.08	22.4	31.9	CLOCKWISE
K1	22.89	2.47	28.2	33.5	CLOCKWISE
N2	16.96	0.36	21.3	261.1	ANTI-CLOCKWISE
M2	92.03	2.25	21.8	312.4	CLOCKWISE
S2	26.04	0.71	22.5	306.1	CLOCKWISE
M4	3.61	0.13	77.3	90.1	CLOCKWISE

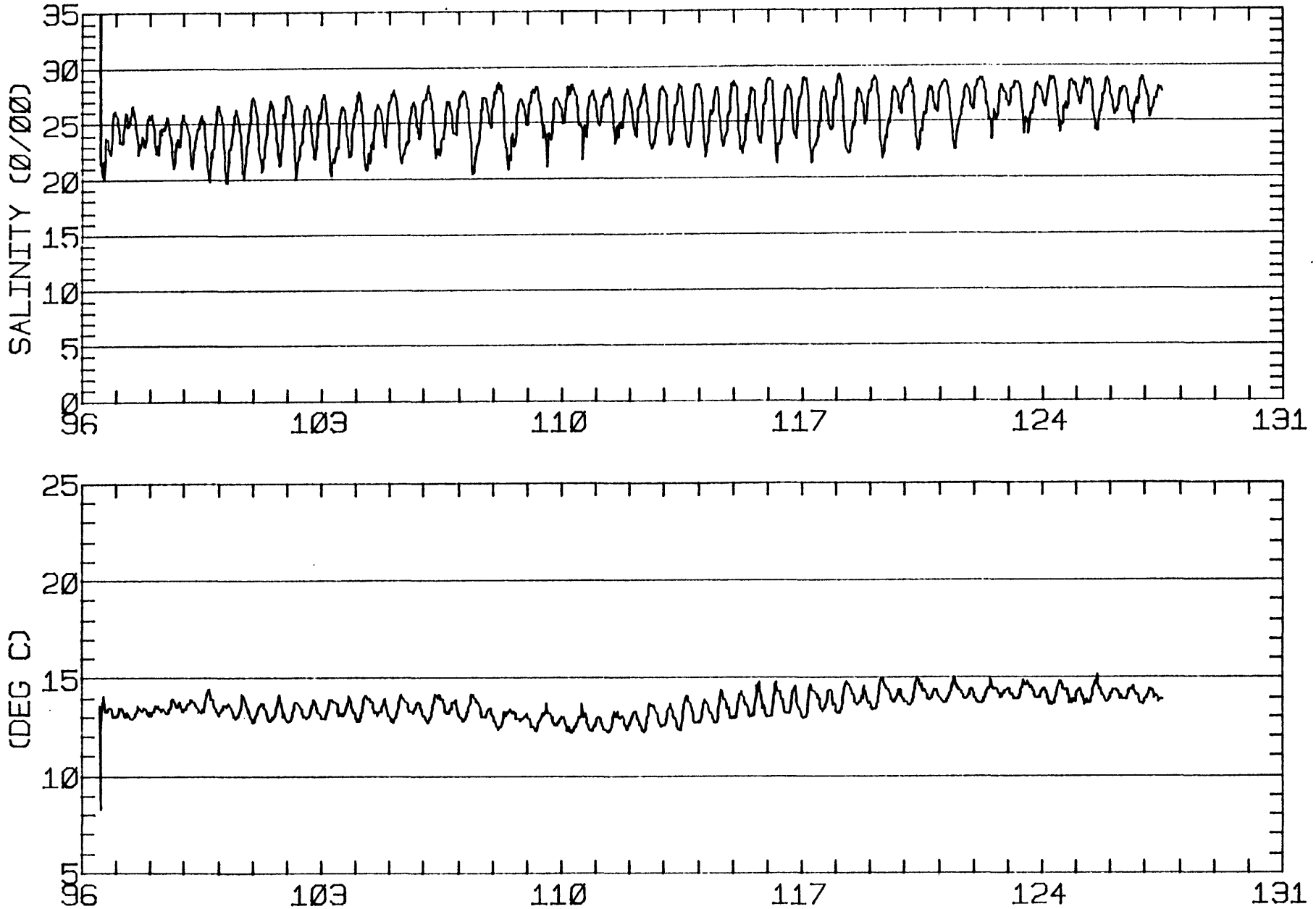
RMS SPEED: 72.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 159.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 62.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 22.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 8.46 CM/SEC
STANDARD DEVIATION V SERIES: 11.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.0	15.6	516.
2	12	3.9	15.5	255.
3	10	3.1	14.9	228.
ALL	34	3.4	15.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-24N 122-26-31W
METER 009.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-24N 122-26-31W
METER 009.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'41"N 122 26'17"W
METER TYPE: AANDERAA
WATER DEPTH: 21.0 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 4/ 4/80 1222 PST JULIAN DAY= 95
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

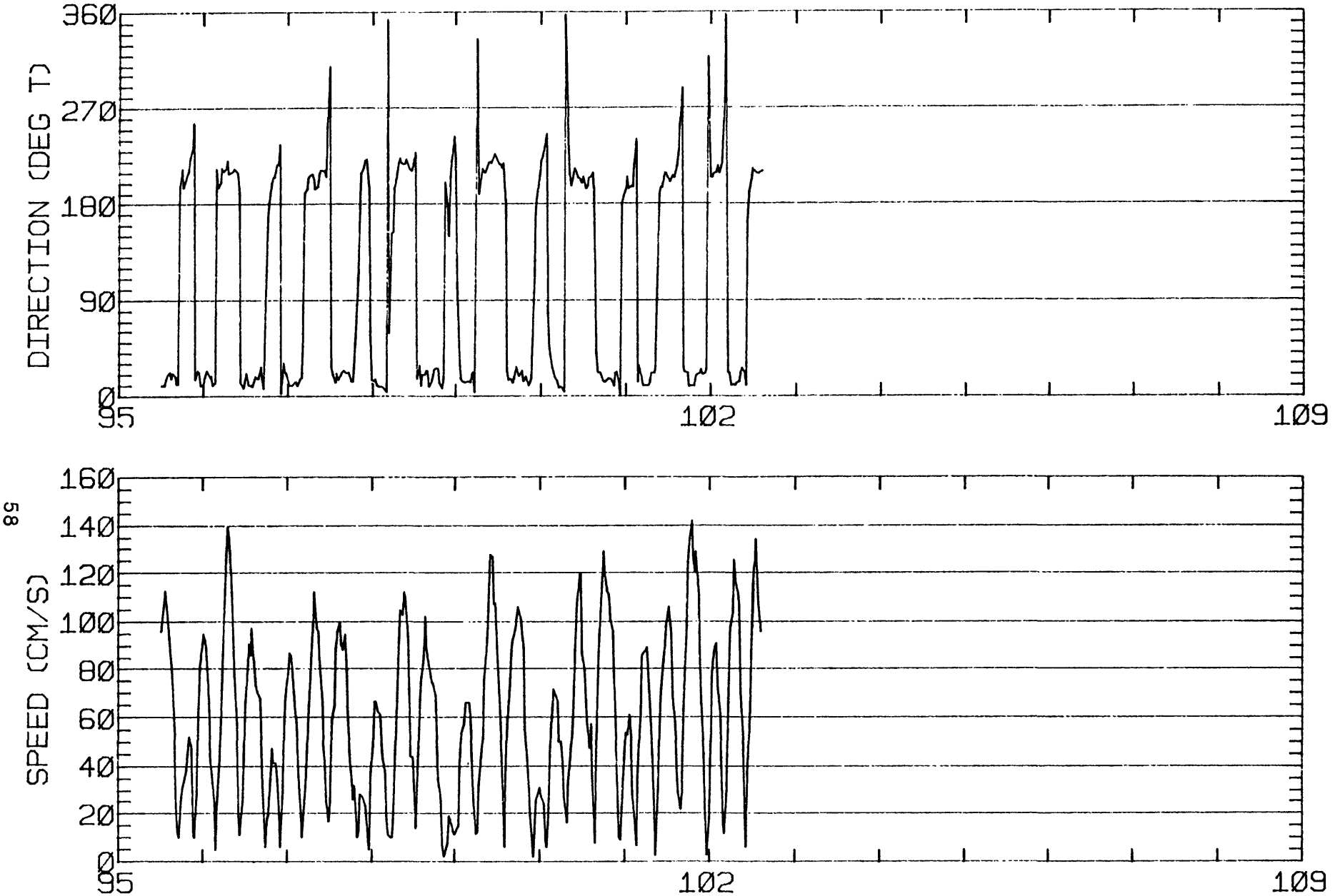
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	24.46	1.68	29.8	22.7	CLOCKWISE
K1	31.20	0.63	26.8	44.7	CLOCKWISE
N2	25.31	8.25	7.1	250.9	CLOCKWISE
M2	111.01	4.77	15.1	310.6	CLOCKWISE
S2	34.51	4.71	10.1	316.9	CLOCKWISE
M4	4.17	2.72	53.0	92.8	ANTI-CLOCKWISE

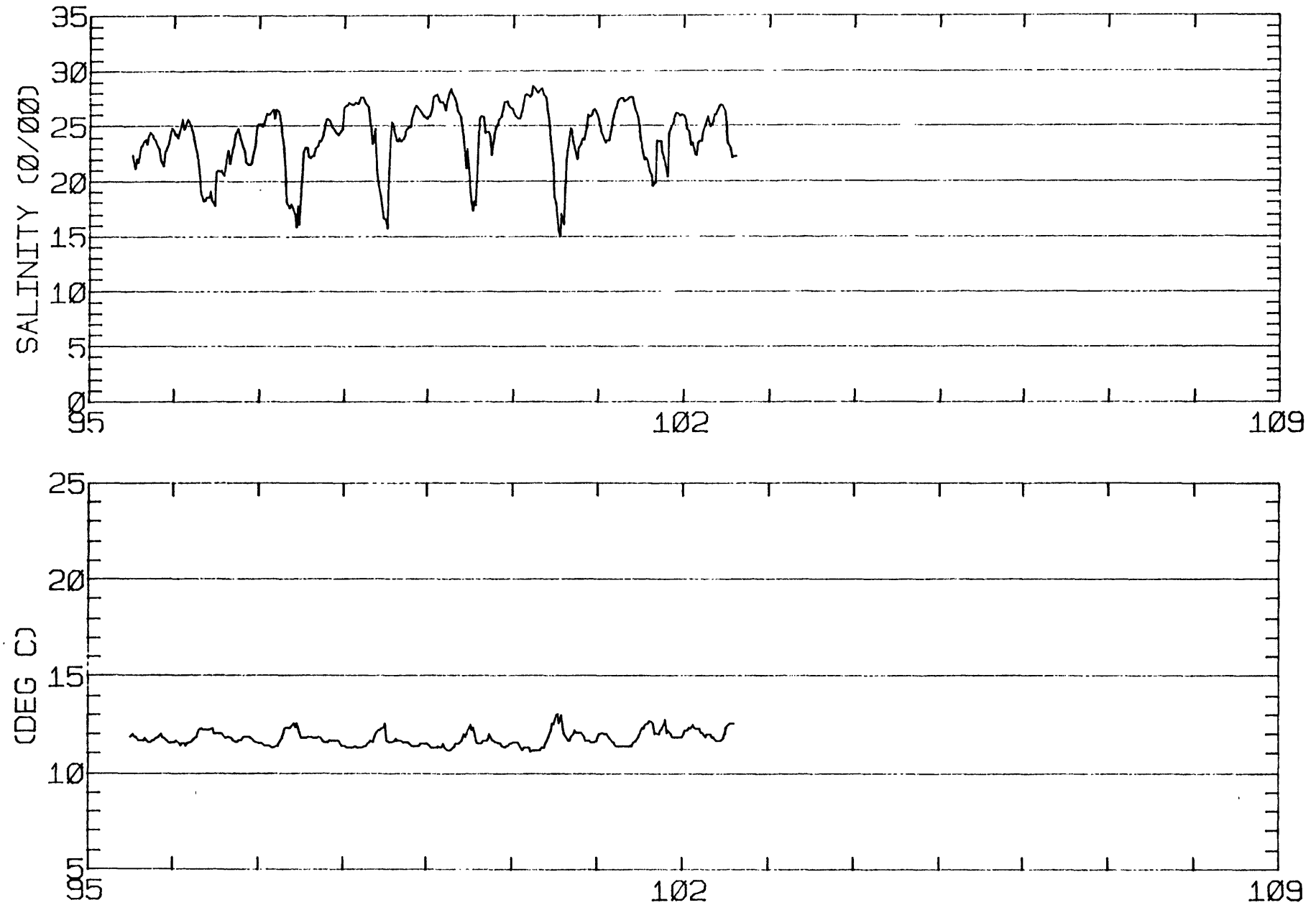
RMS SPEED: 66.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 201.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 69.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 17.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 9.48 CM/SEC
STANDARD DEVIATION V SERIES: 9.91 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.0	9.8	1105.
ALL	12	-3.0	9.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-41N 122-26-17W
METER 009.1 METERS ABOVE BED. WATER DEPTH 021.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-41N 122-26-17W
METER ØØ9.1 METERS ABOVE BED. WATER DEPTH Ø21.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'41"N 122 26'17"W
METER TYPE: AANDERAA
WATER DEPTH: 21.0 M (MLLW)
METER DEPTH: 18.9 M (BELOW MLLW)
START TIME OF SERIES: 4/ 4/80 1224 PST JULIAN DAY= 95
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

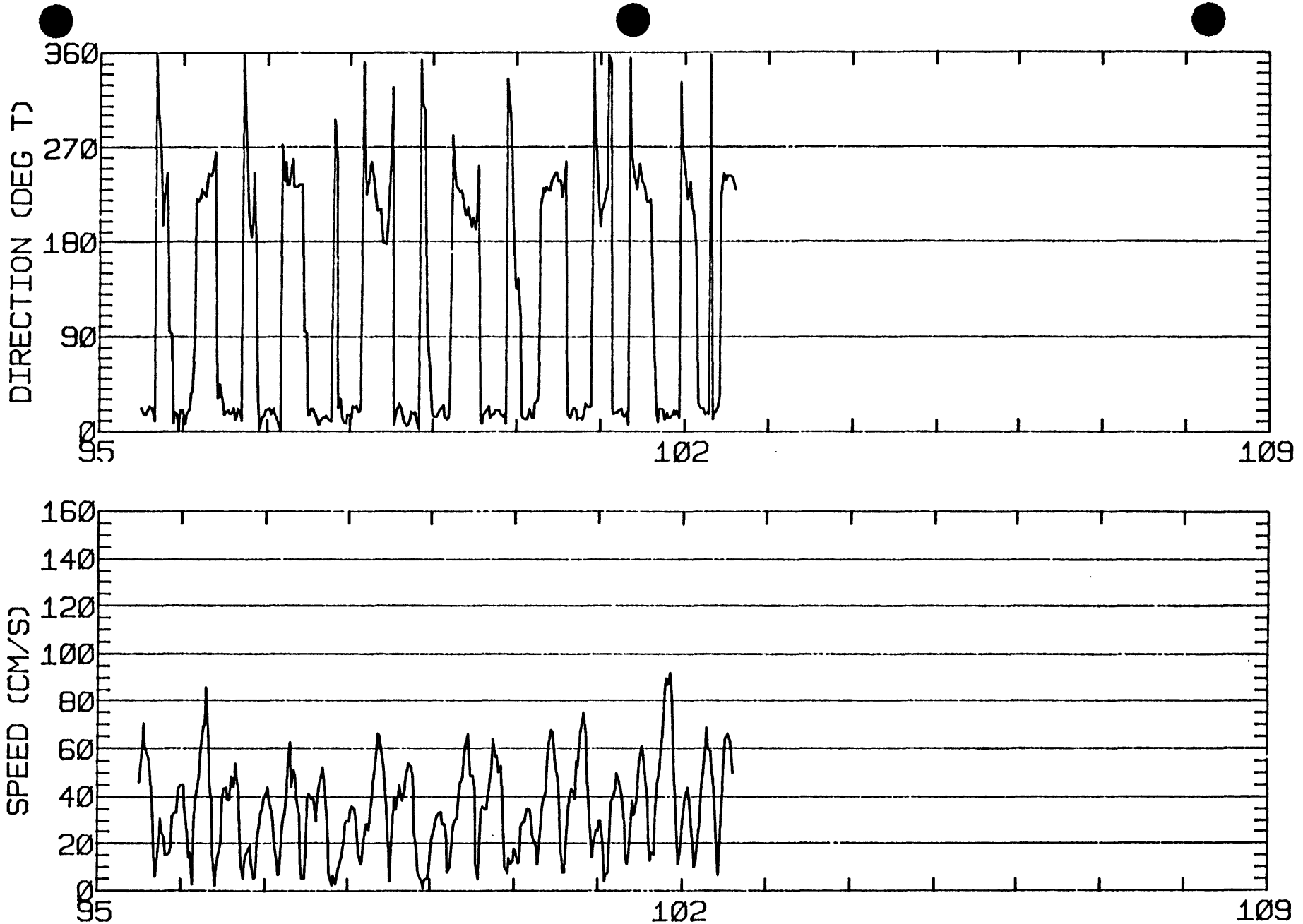
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.69	2.39	31.8	19.3	CLOCKWISE
K1	18.19	0.07	37.5	39.6	ANTI-CLOCKWISE
N2	20.55	6.29	80.2	212.1	ANTI-CLOCKWISE
M2	62.29	2.16	49.1	296.4	ANTI-CLOCKWISE
S2	22.62	0.21	52.6	300.1	ANTI-CLOCKWISE
M4	4.85	2.32	36.4	38.9	ANTI-CLOCKWISE

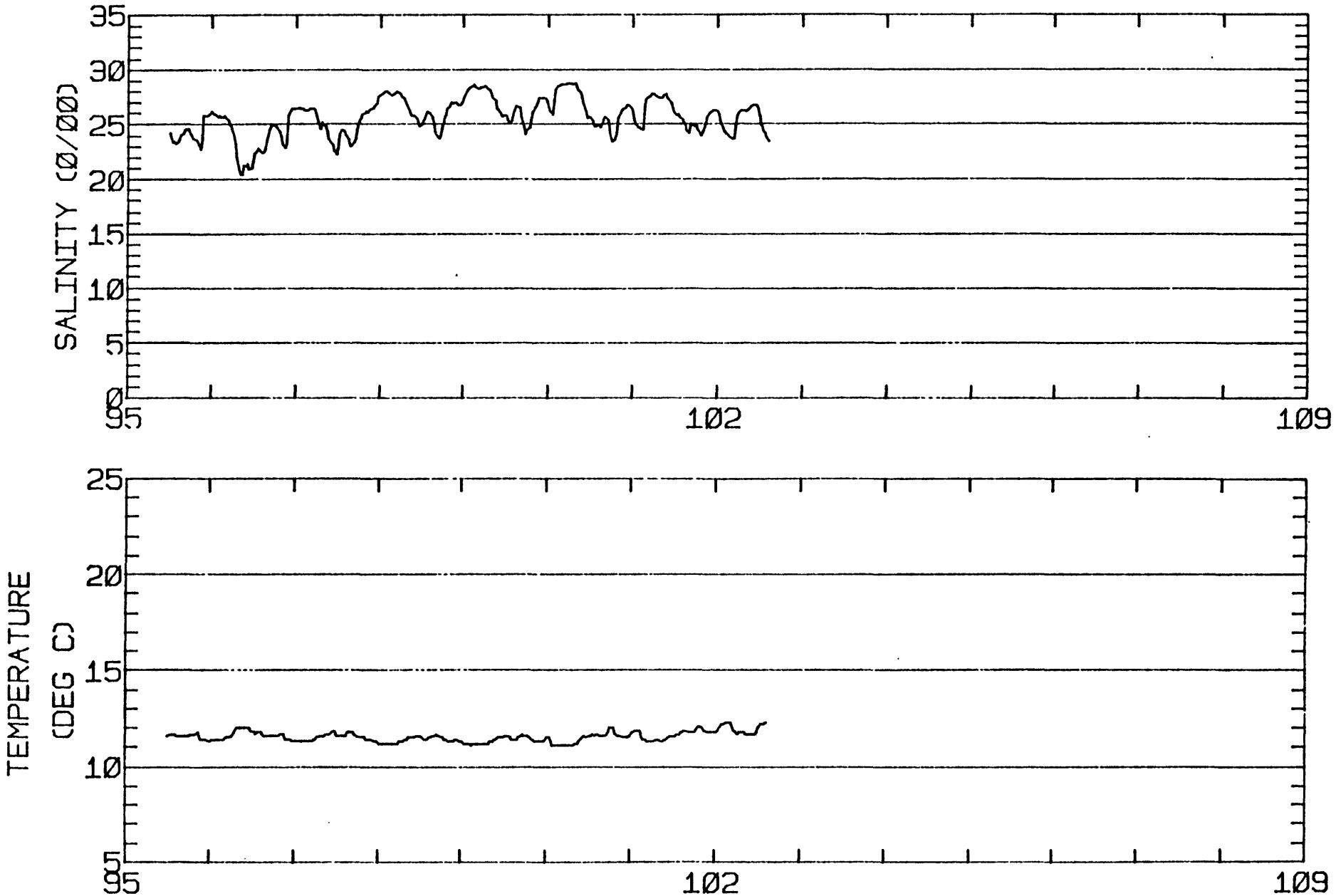
RMS SPEED: 37.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 120.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 45.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 7.85 CM/SEC
STANDARD DEVIATION V SERIES: 9.57 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.3	10.0	1105.
ALL	12	-3.3	10.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-41N 122-26-17W
METER 002.1 METERS ABOVE BED. WATER DEPTH 021.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-41N 122-26-17W
METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø21.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'41"N 122 26'18"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 4/11/80 1550 PST JULIAN DAY=102
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

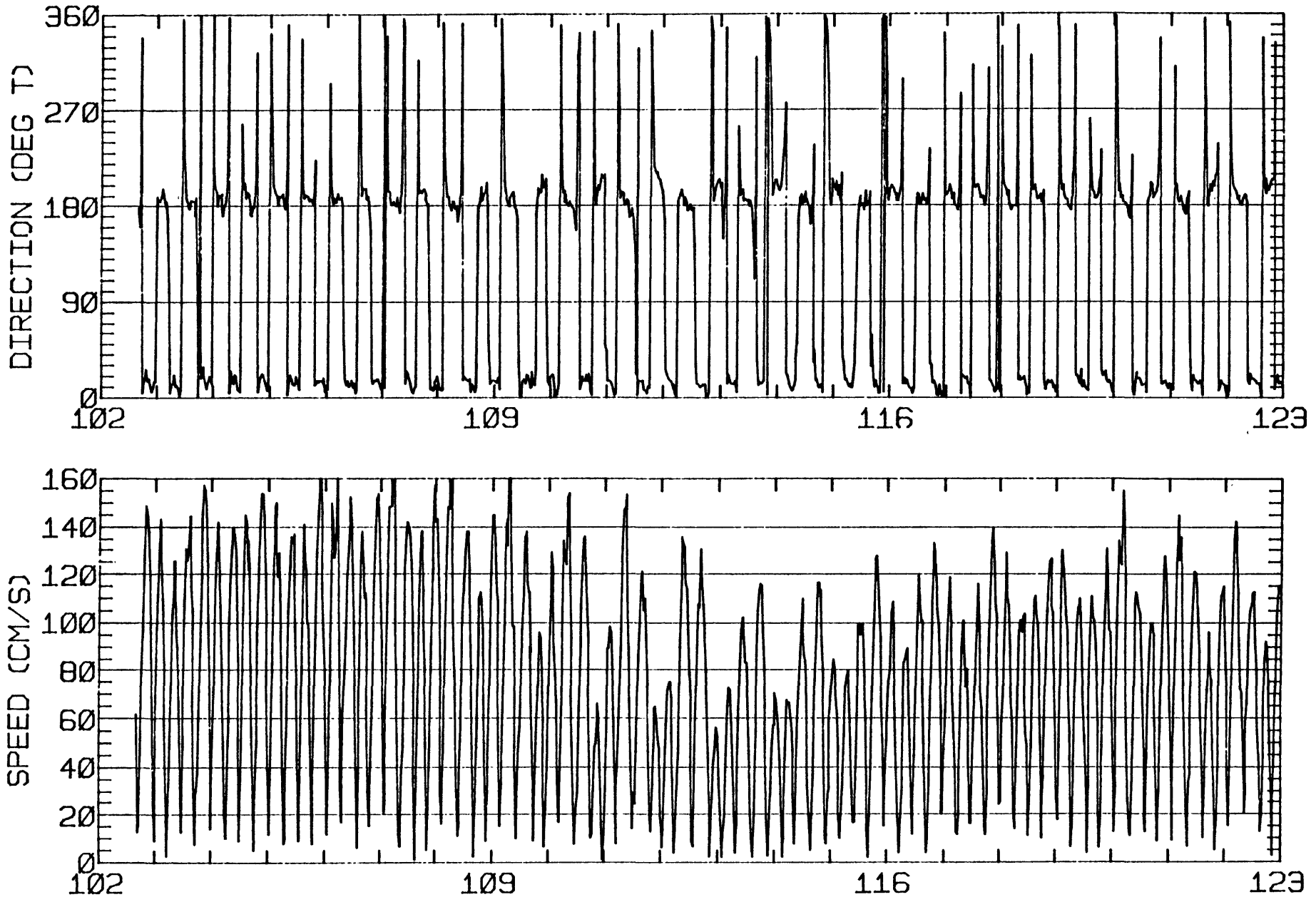
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.64	3.26	359.5	47.1	ANTI-CLOCKWISE
K1	30.07	4.25	2.3	38.0	ANTI-CLOCKWISE
N2	20.23	0.03	9.7	281.7	CLOCKWISE
M2	101.81	3.69	11.1	321.7	ANTI-CLOCKWISE
S2	27.85	0.78	10.9	304.9	ANTI-CLOCKWISE
M4	6.24	3.25	340.2	47.4	ANTI-CLOCKWISE

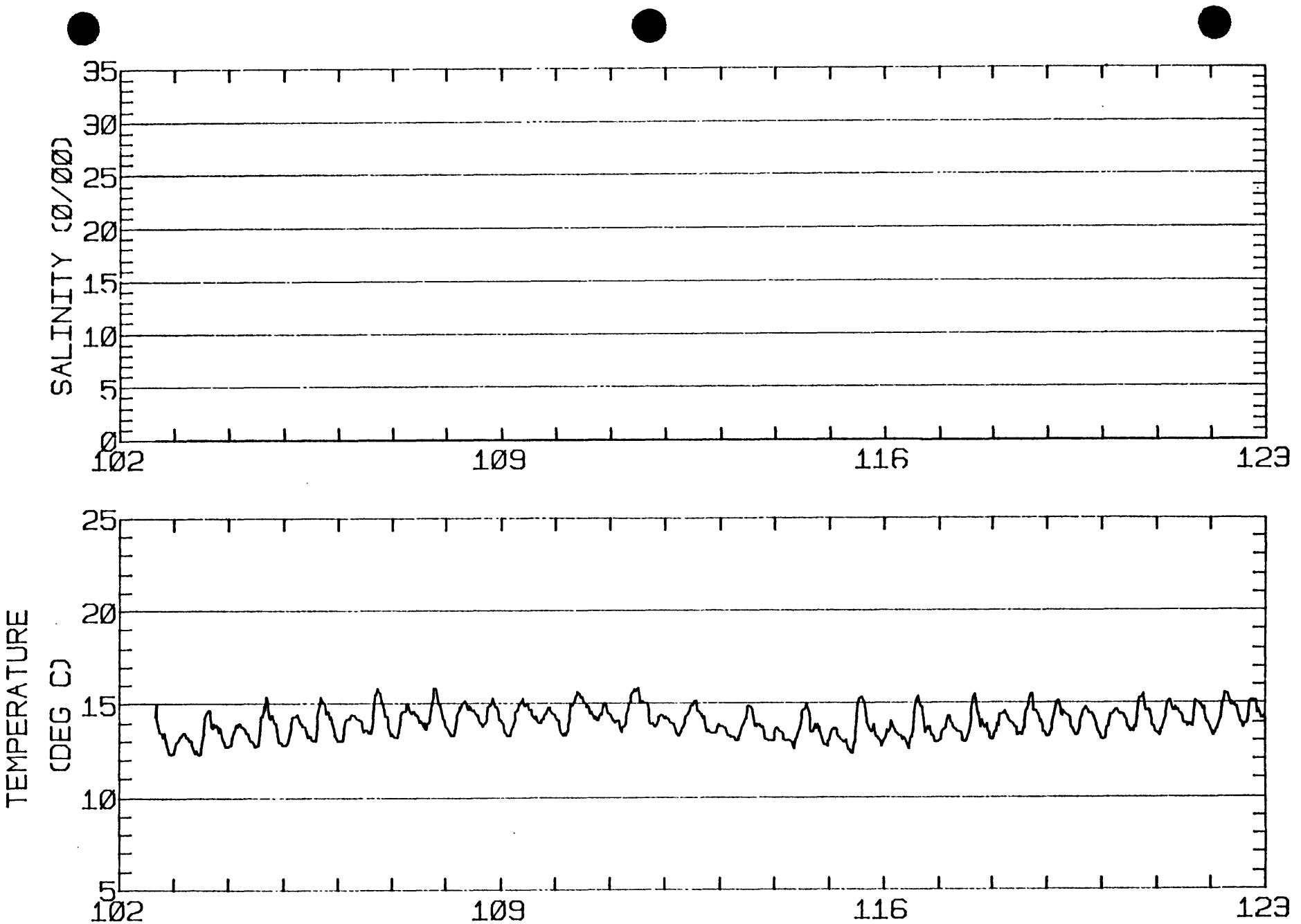
RMS SPEED: 87.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 178.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 62.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 8.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 10.15 CM/SEC
STANDARD DEVIATION V SERIES: 12.28 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.1	4.1	769.
2	12	2.4	3.2	680.
3	12	1.8	-0.4	642.
4	4	1.9	1.6	576.
ALL	40	3.3	2.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-41N 122-26-18W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-41N 122-26-18W
METER Ø15.1 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'41"N 122 26'18"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.2 M (BELOW MLLW)
START TIME OF SERIES: 4/11/80 1604 PST JULIAN DAY=102
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

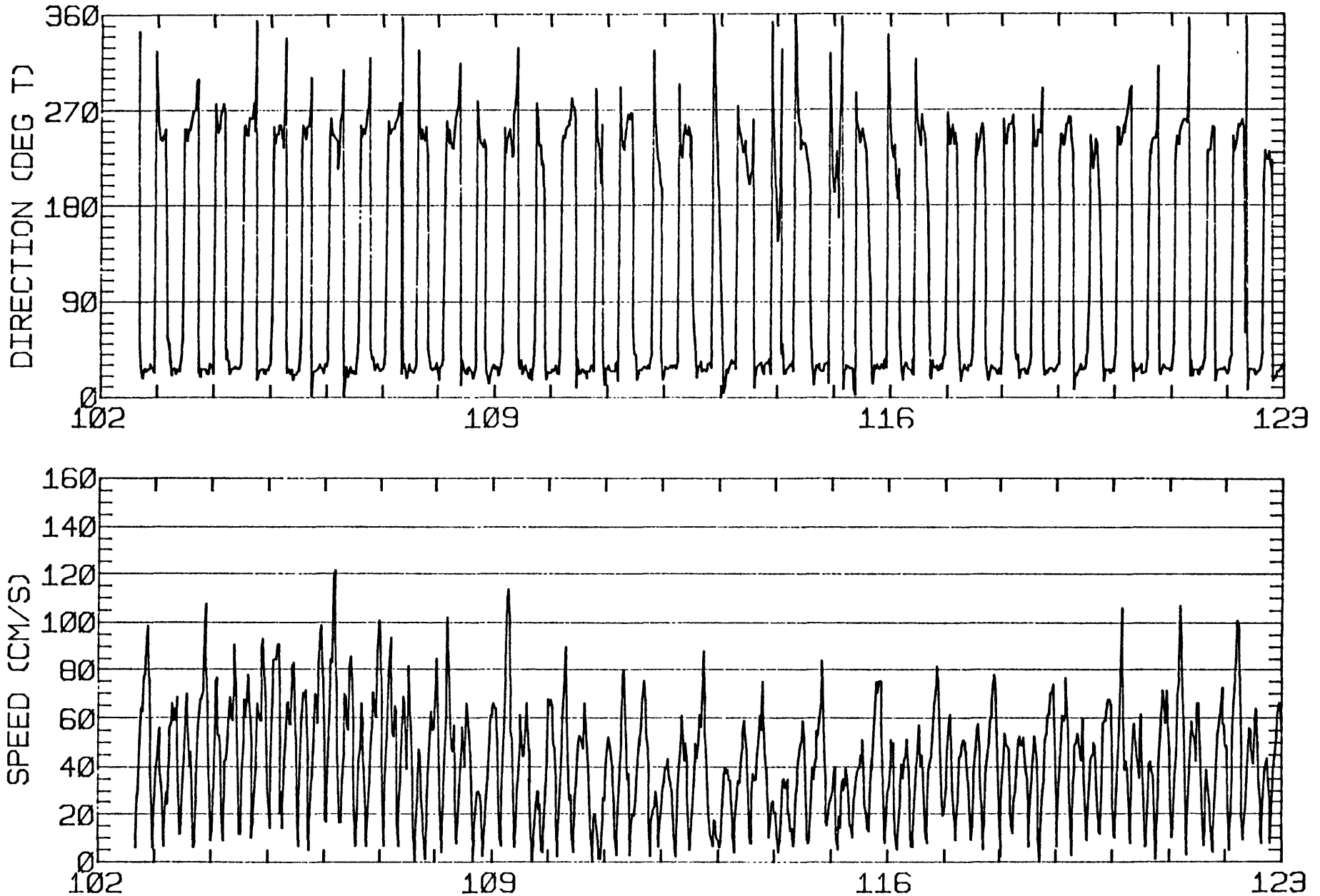
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.07	4.31	65.1	56.4	CLOCKWISE
K1	18.73	0.24	53.5	42.9	CLOCKWISE
N2	8.37	0.87	39.7	275.3	CLOCKWISE
M2	48.58	1.46	44.9	308.8	ANTI-CLOCKWISE
S2	15.32	2.36	44.7	292.4	CLOCKWISE
M4	9.28	2.60	87.8	64.1	CLOCKWISE

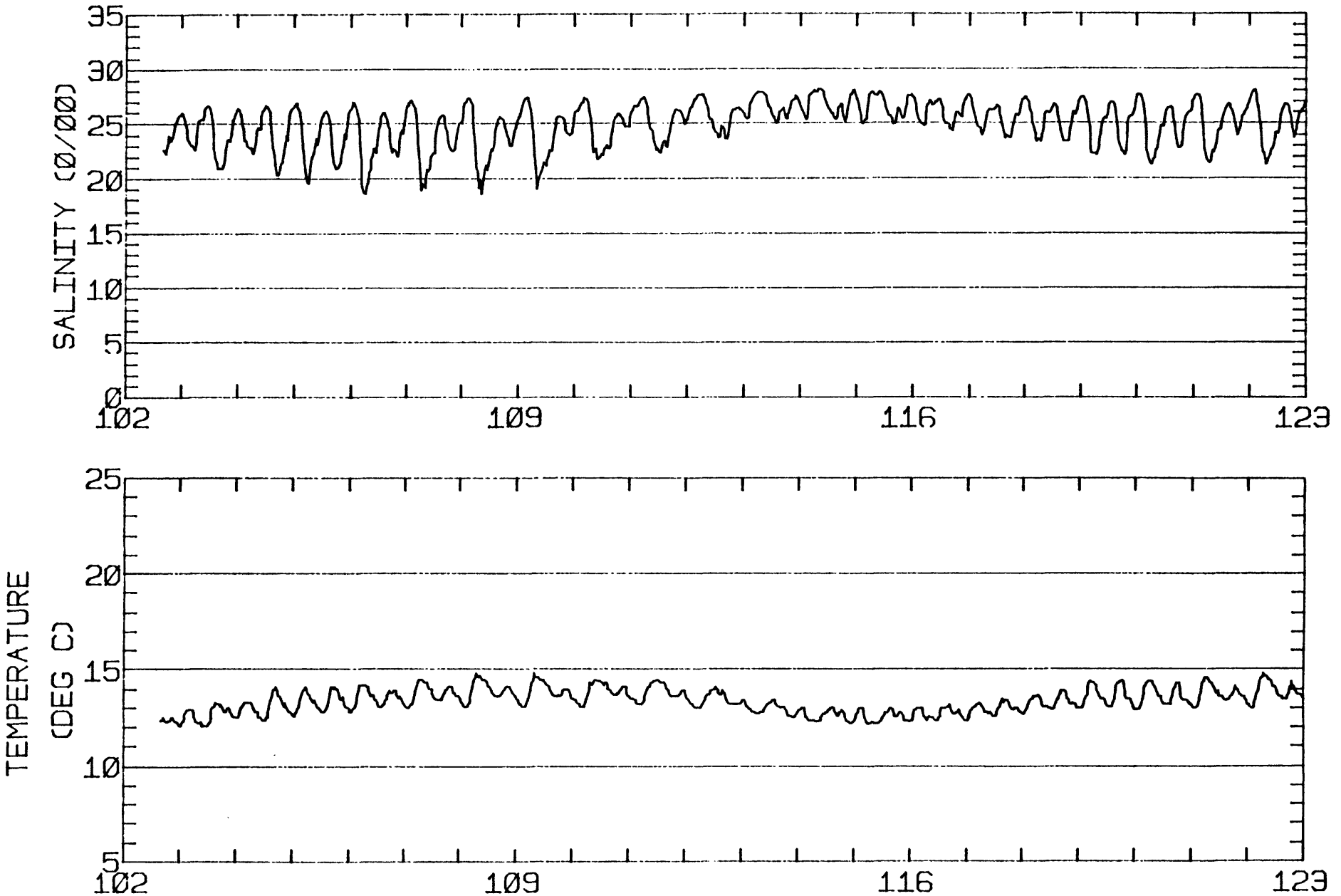
RMS SPEED: 48.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 93.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 49.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 9.33 CM/SEC
STANDARD DEVIATION V SERIES: 10.48 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.8	21.1	769.
2	12	-0.5	14.1	680.
3	12	-3.3	14.3	642.
4	4	-3.7	16.3	576.
ALL	40	-2.9	16.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-41N 122-26-18W
METER 002.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-41N 122-26-18W
METER ØØ2.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'46"N 122 26'19"W
METER TYPE: AANDERAA
WATER DEPTH: 20.4 M (MLLW)
METER DEPTH: 5.2 M (BELOW MLLW)
START TIME OF SERIES: 5/ 2/80 1400 PST JULIAN DAY=123
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

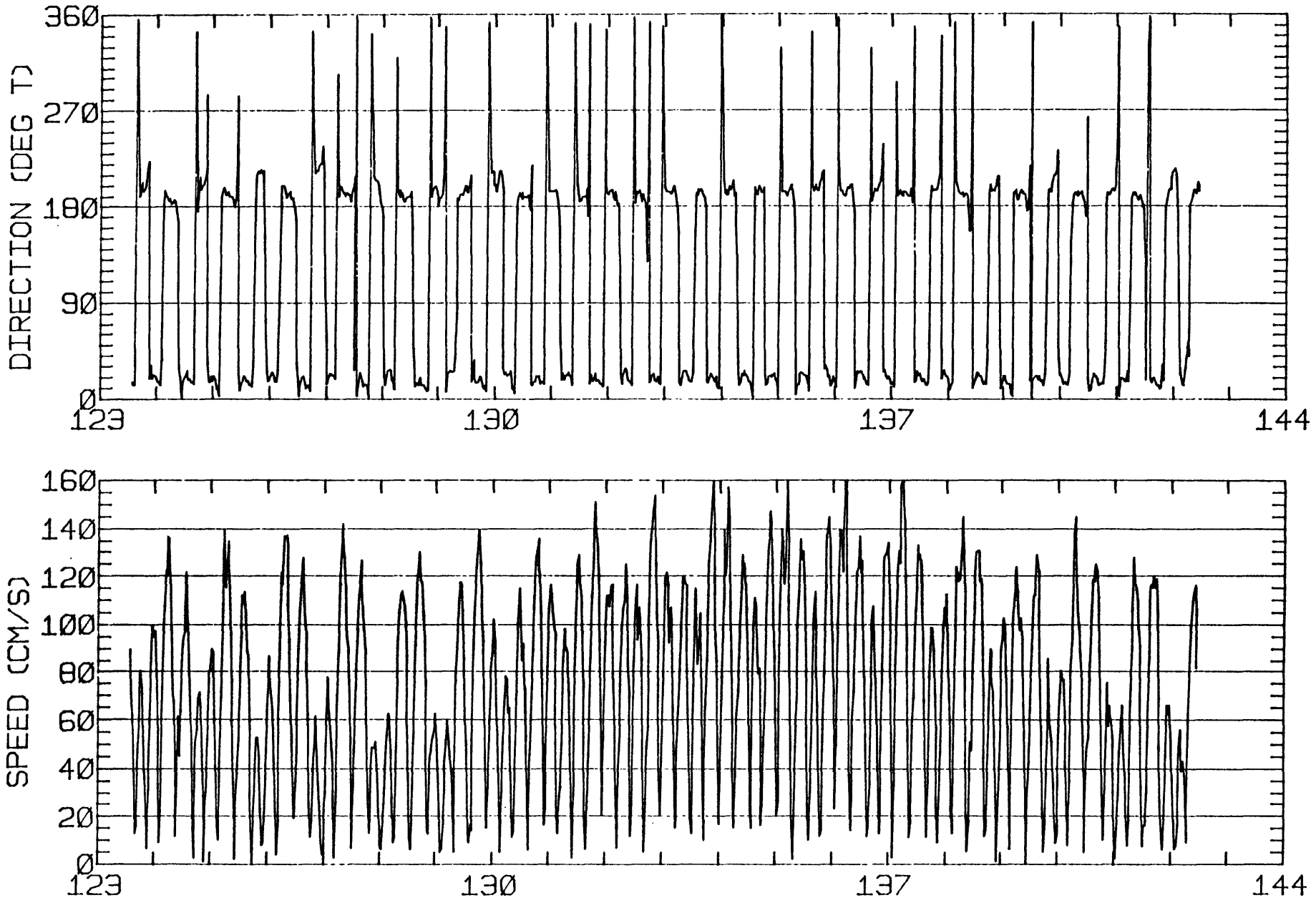
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.32	0.04	9.1	17.4	ANTI-CLOCKWISE
K1	38.80	3.59	11.3	38.8	ANTI-CLOCKWISE
N2	21.41	0.76	22.3	288.9	ANTI-CLOCKWISE
M2	95.55	1.09	16.3	312.6	ANTI-CLOCKWISE
S2	16.03	0.59	17.7	302.7	ANTI-CLOCKWISE
M4	5.03	2.59	344.5	20.4	ANTI-CLOCKWISE

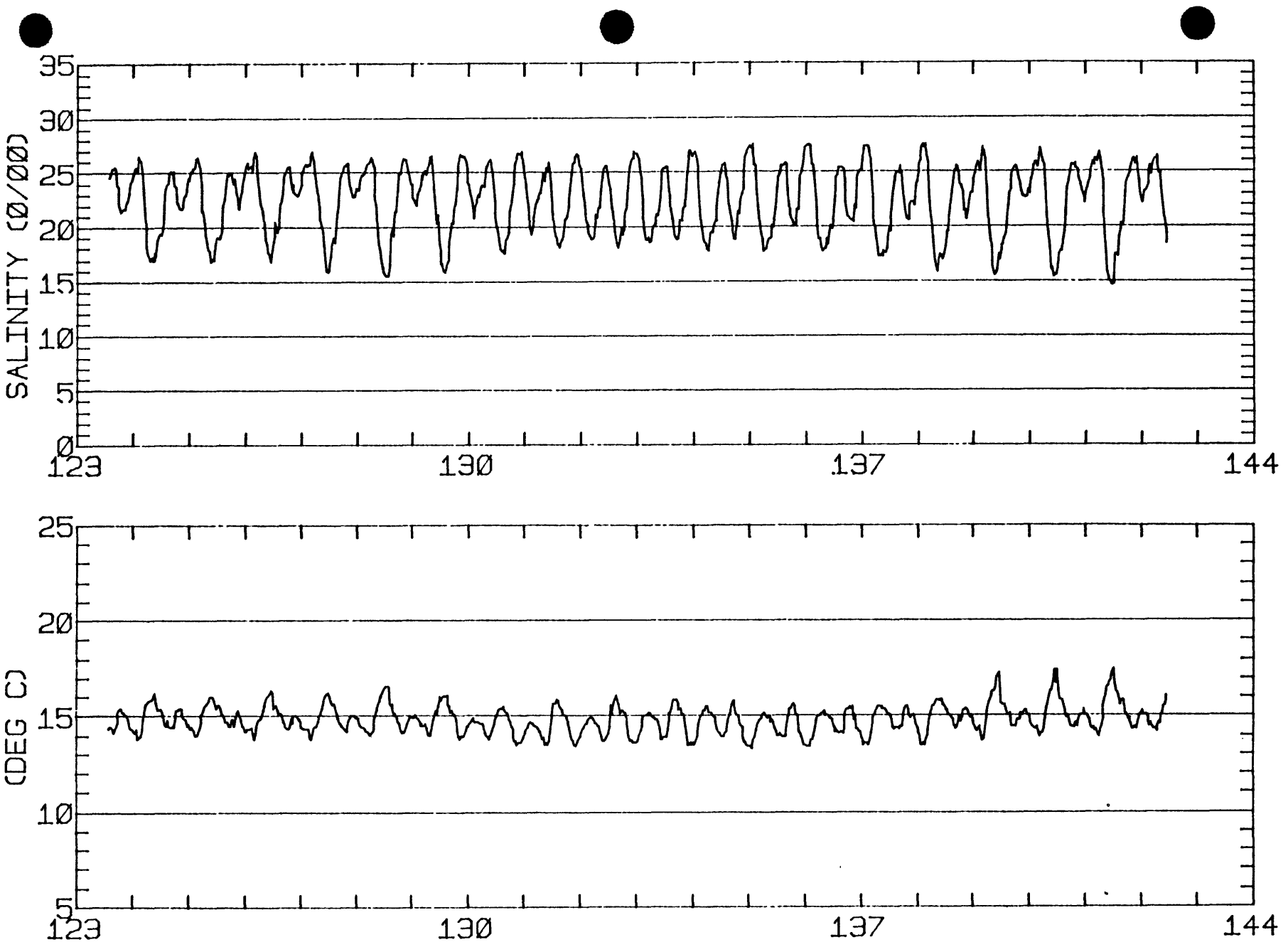
RMS SPEED: 83.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 167.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 58.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 14.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.50
STANDARD DEVIATION U-SERIES: 8.09 CM/SEC
STANDARD DEVIATION V SERIES: 13.35 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.2	0.8	544.
2	12	5.1	5.9	673.
3	12	3.2	1.2	695.
ALL	36	3.5	2.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-19W
METER 015.2 METERS ABOVE BED. WATER DEPTH 020.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-19W
METER Ø15.2 METERS ABOVE BED. WATER DEPTH Ø20.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'46"N 122 26'19"W
METER TYPE: AANDERAA
WATER DEPTH: 20.4 M (MLLW)
METER DEPTH: 11.3 M (BELOW MLLW)
START TIME OF SERIES: 5/ 2/80 1232 PST JULIAN DAY=123
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

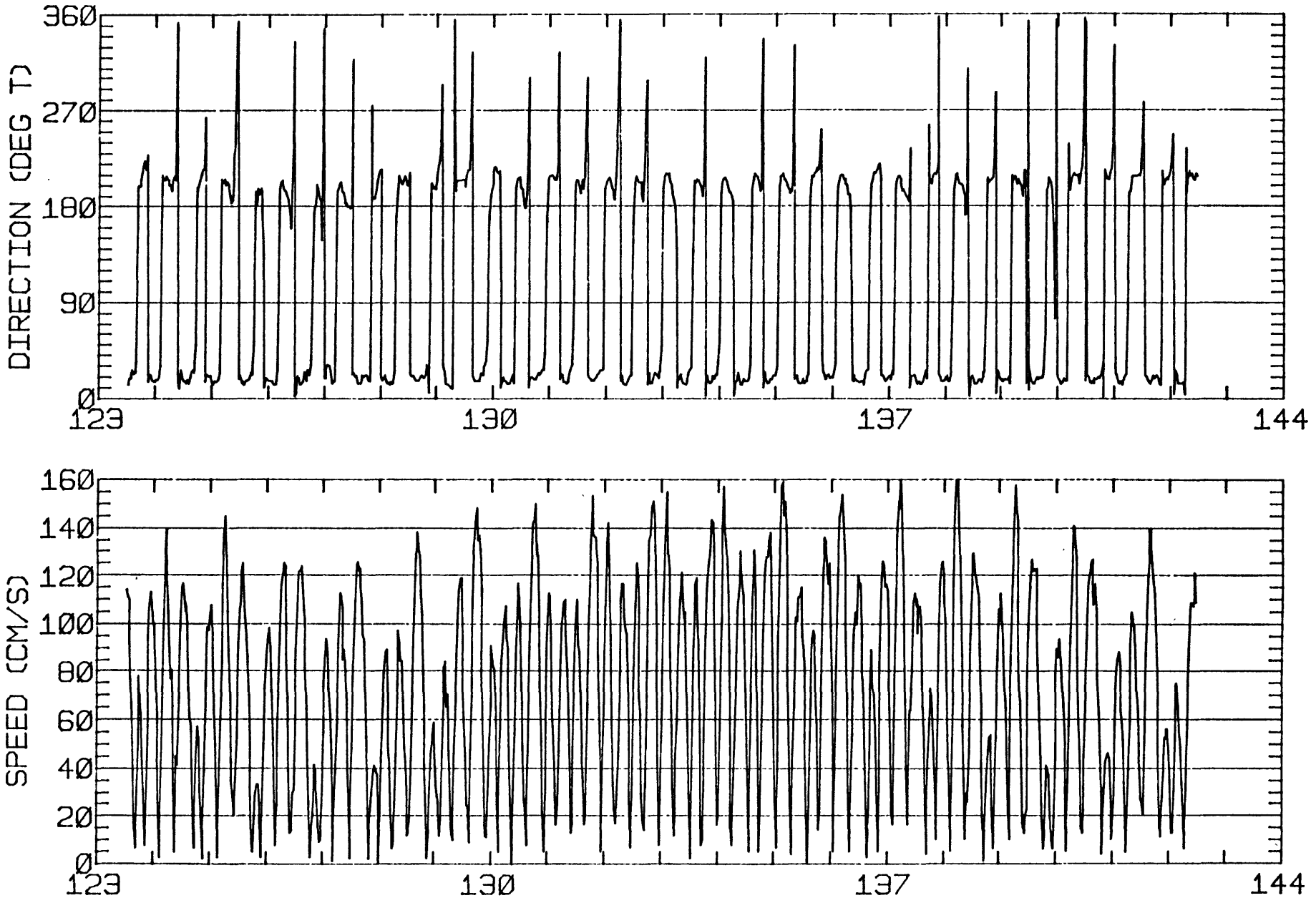
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.74	1.27	19.6	30.9	ANTI-CLOCKWISE
K1	39.45	0.47	20.3	40.1	CLOCKWISE
N2	20.14	2.02	18.4	292.7	ANTI-CLOCKWISE
M2	94.04	1.99	20.8	310.8	CLOCKWISE
S2	17.76	1.54	26.4	302.2	ANTI-CLOCKWISE
M4	4.28	0.53	52.7	66.8	ANTI-CLOCKWISE

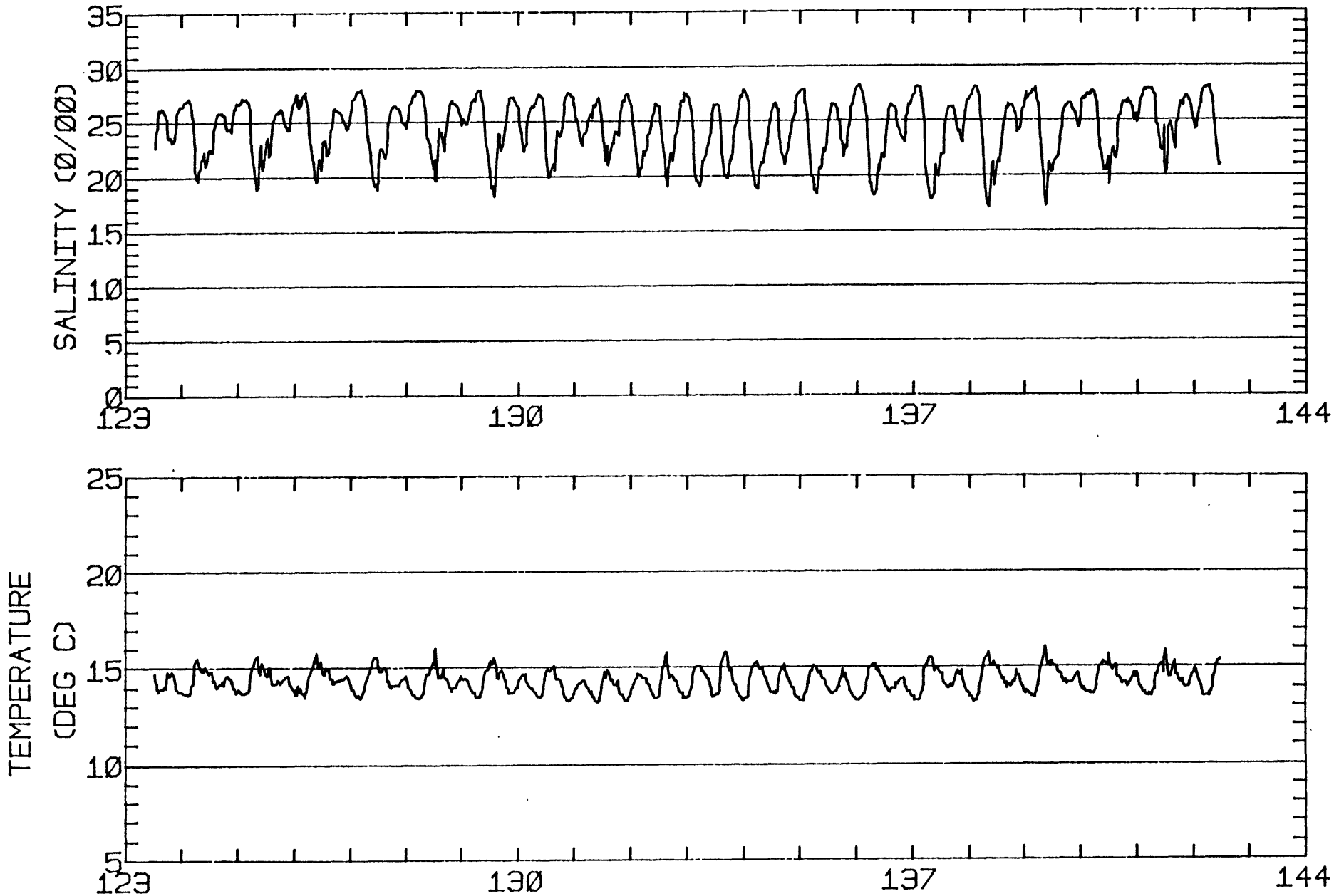
RMS SPEED: 83.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 167.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 52.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 21.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 11.05 CM/SEC
STANDARD DEVIATION V SERIES: 12.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.3	14.8	544.
2	12	1.9	13.8	673.
3	12	1.0	13.7	695.
ALL	36	2.4	14.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-19W
METER 009.0 METERS ABOVE BED. WATER DEPTH 020.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-19W
METER ØØ9.Ø METERS ABOVE BED. WATER DEPTH Ø2Ø.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'46"N 122 26'19"W
METER TYPE: AANDERAA
WATER DEPTH: 20.4 M (MLLW)
METER DEPTH: 18.3 M (BELOW MLLW)
START TIME OF SERIES: 5/ 2/80 1314 PST JULIAN DAY=123
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

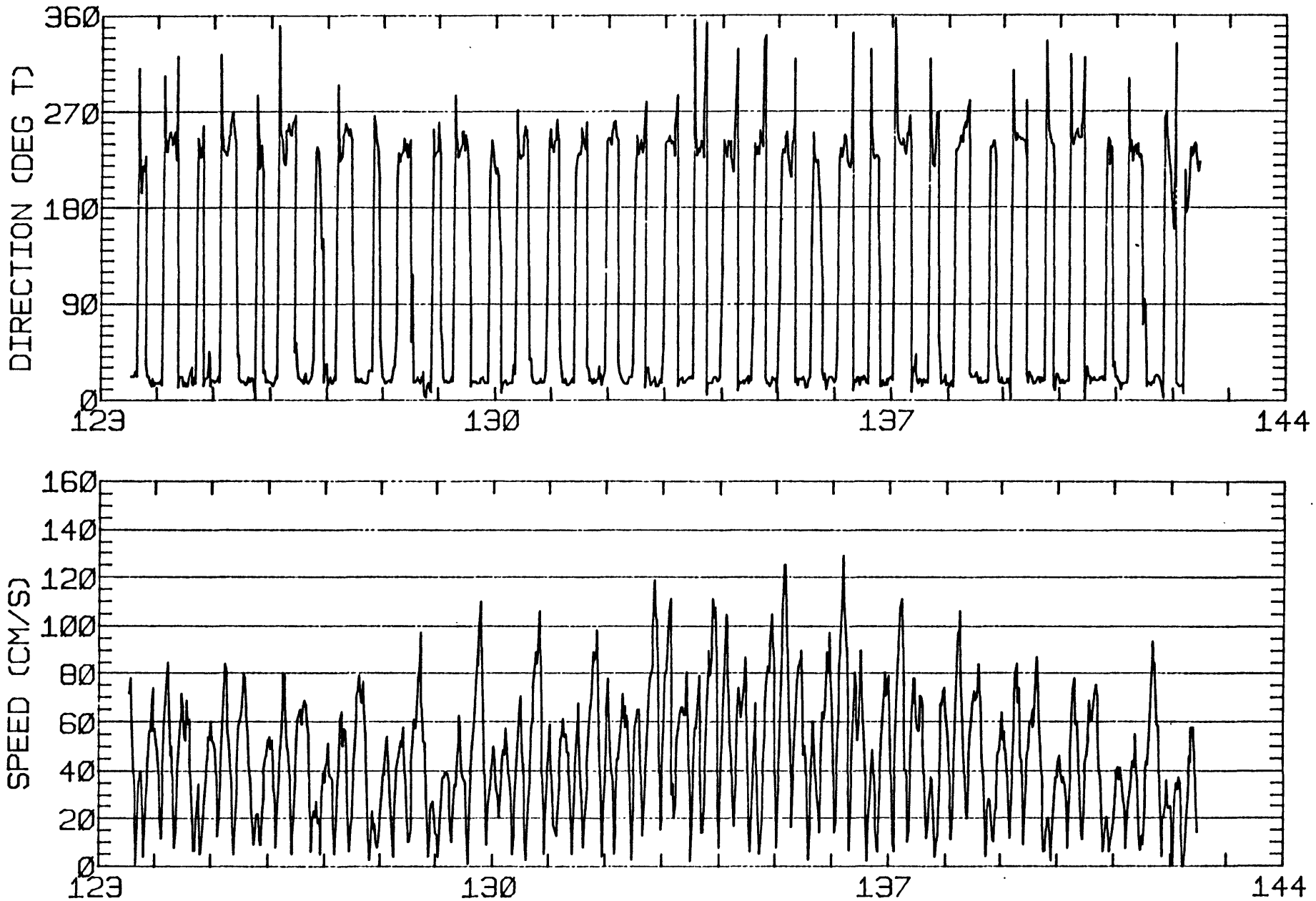
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.61	5.41	73.2	43.6	CLOCKWISE
K1	24.83	0.54	42.8	36.5	CLOCKWISE
N2	14.20	0.73	35.1	283.2	ANTI-CLOCKWISE
M2	51.30	1.97	34.8	302.4	ANTI-CLOCKWISE
S2	13.52	1.68	40.4	299.1	CLOCKWISE
M4	8.75	0.69	52.4	44.5	CLOCKWISE

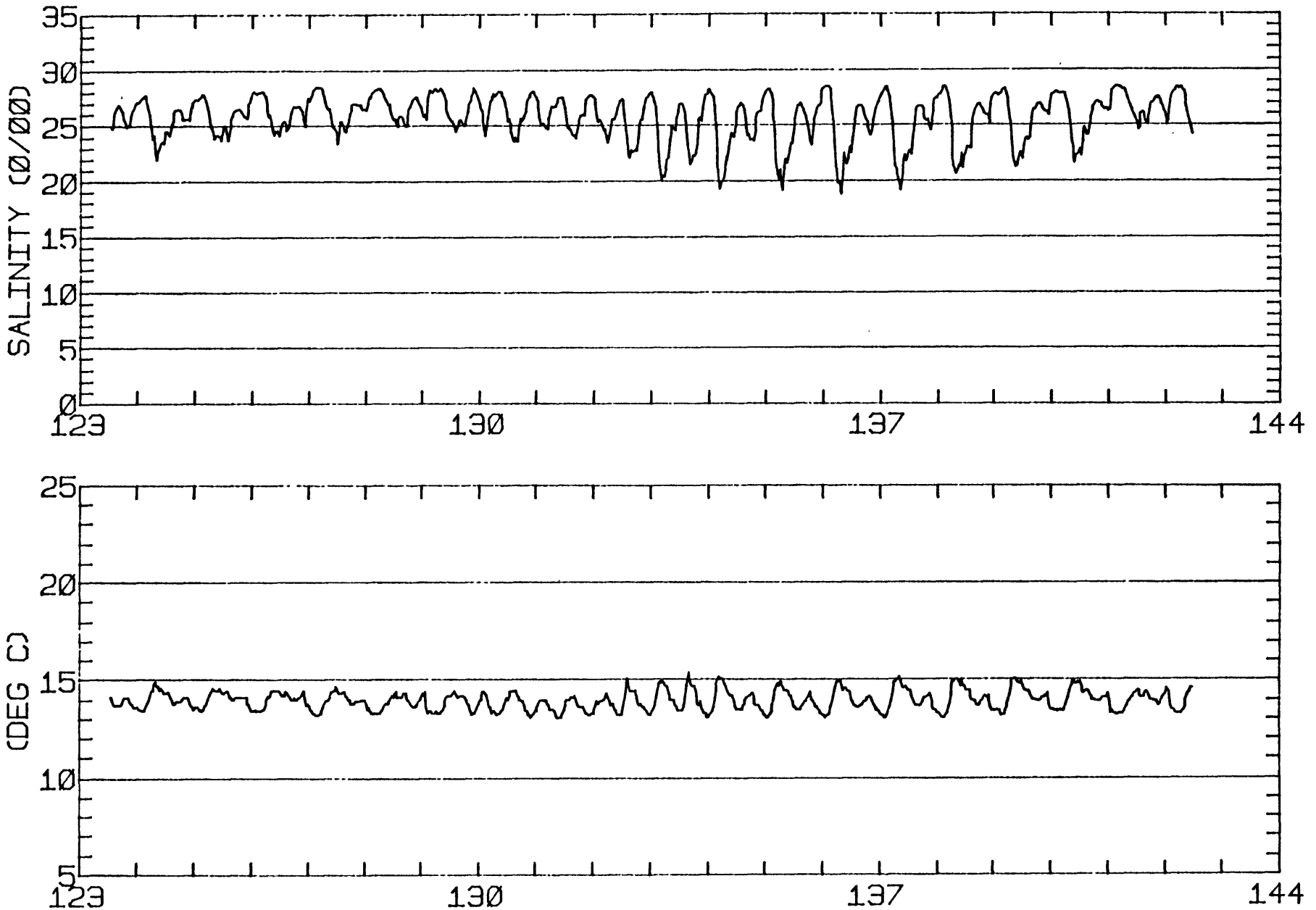
RMS SPEED: 52.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 99.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 41.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.53
STANDARD DEVIATION U-SERIES: 9.15 CM/SEC
STANDARD DEVIATION V SERIES: 10.44 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.7	18.0	544.
2	12	-4.9	21.0	673.
3	12	-4.7	18.4	695.
ALL	36	-4.1	19.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-19W
METER 002.1 METERS ABOVE BED. WATER DEPTH 020.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-19W
METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø20.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'44"N 122 26'18"W
METER TYPE: AANDERAA
WATER DEPTH: 21.0 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 5/21/80 1330 PST JULIAN DAY=142
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

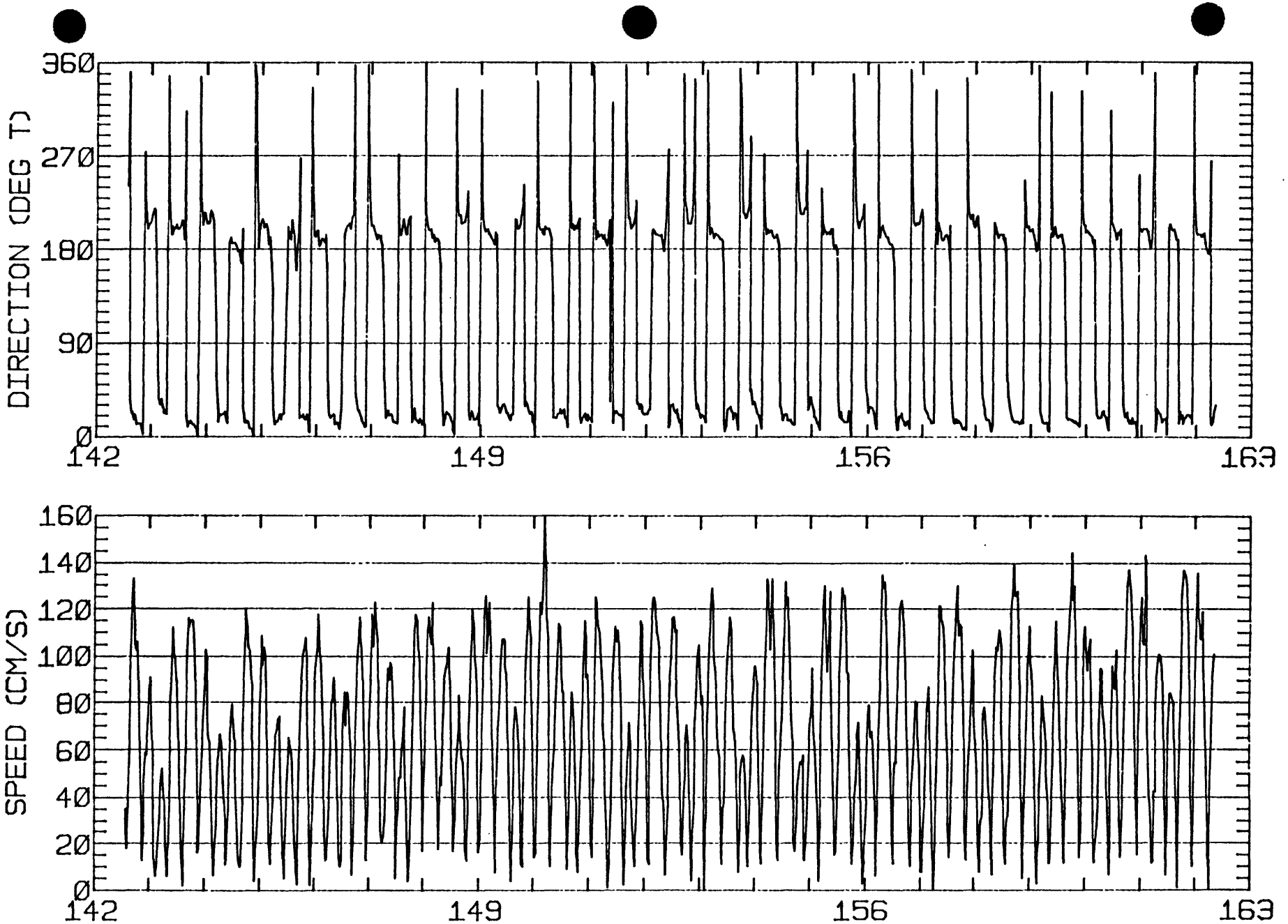
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.78	0.31	9.0	30.2	ANTI-CLOCKWISE
K1	40.35	3.70	11.1	44.4	ANTI-CLOCKWISE
N2	21.03	0.69	16.3	275.3	ANTI-CLOCKWISE
M2	99.34	4.45	18.7	321.1	ANTI-CLOCKWISE
S2	19.36	1.22	21.8	306.9	CLOCKWISE
M4	2.97	0.97	354.6	11.9	ANTI-CLOCKWISE

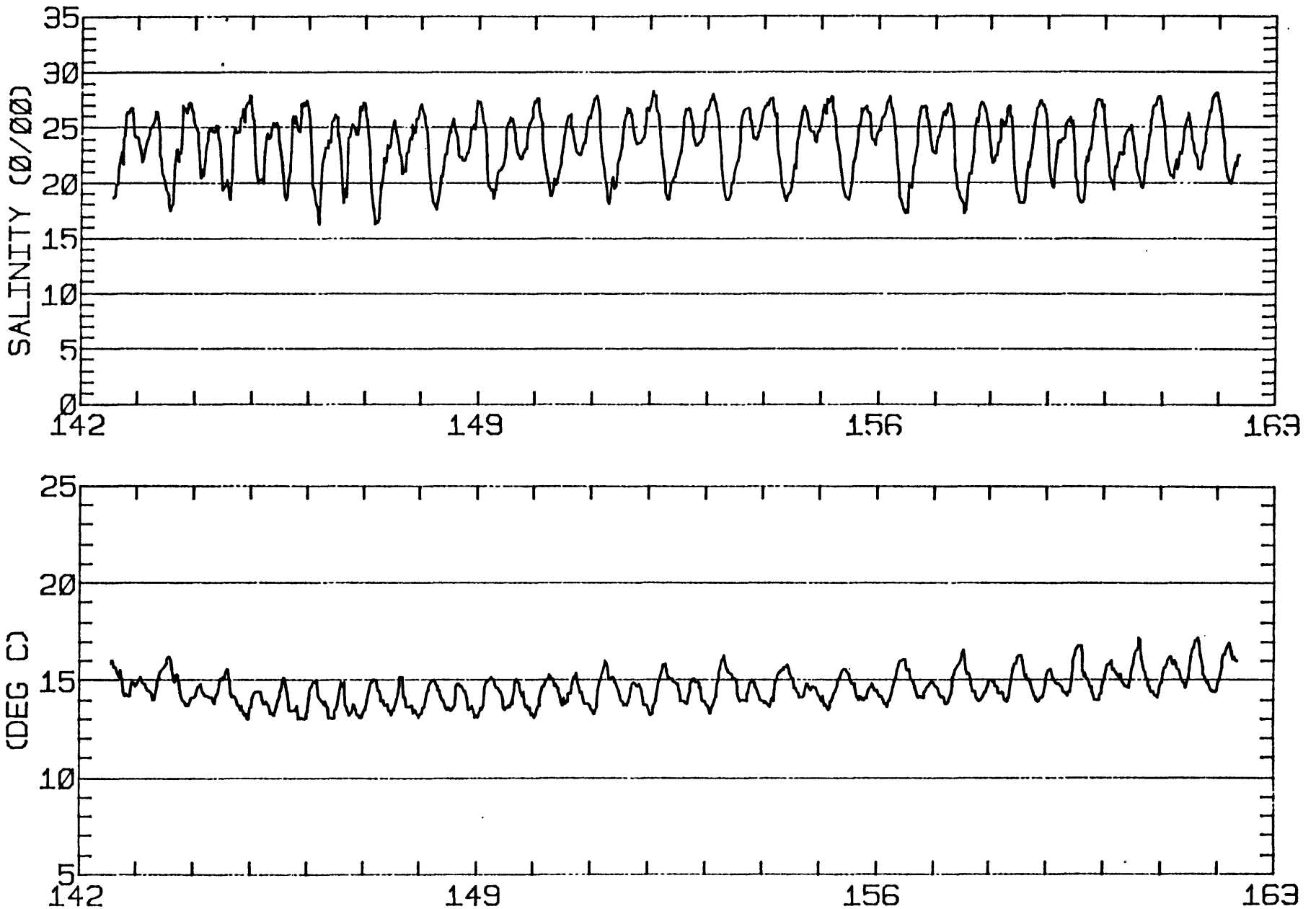
RMS SPEED: 76.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 174.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 55.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 16.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 9.47 CM/SEC
STANDARD DEVIATION V SERIES: 13.18 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.0	2.6	563.
2	12	3.3	5.0	453.
3	12	0.8	2.2	403.
4	2	4.7	5.5	397.
ALL	38	1.2	3.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-44N 122-26-18W
METER 015.2 METERS ABOVE BED. WATER DEPTH 021.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-44N 122-26-18W
METER Ø15.2 METERS ABOVE BED. WATER DEPTH Ø21.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'44"N 122 26'18"W
METER TYPE: AANDERAA
WATER DEPTH: 21.0 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 5/21/80 1322 PST JULIAN DAY=142
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

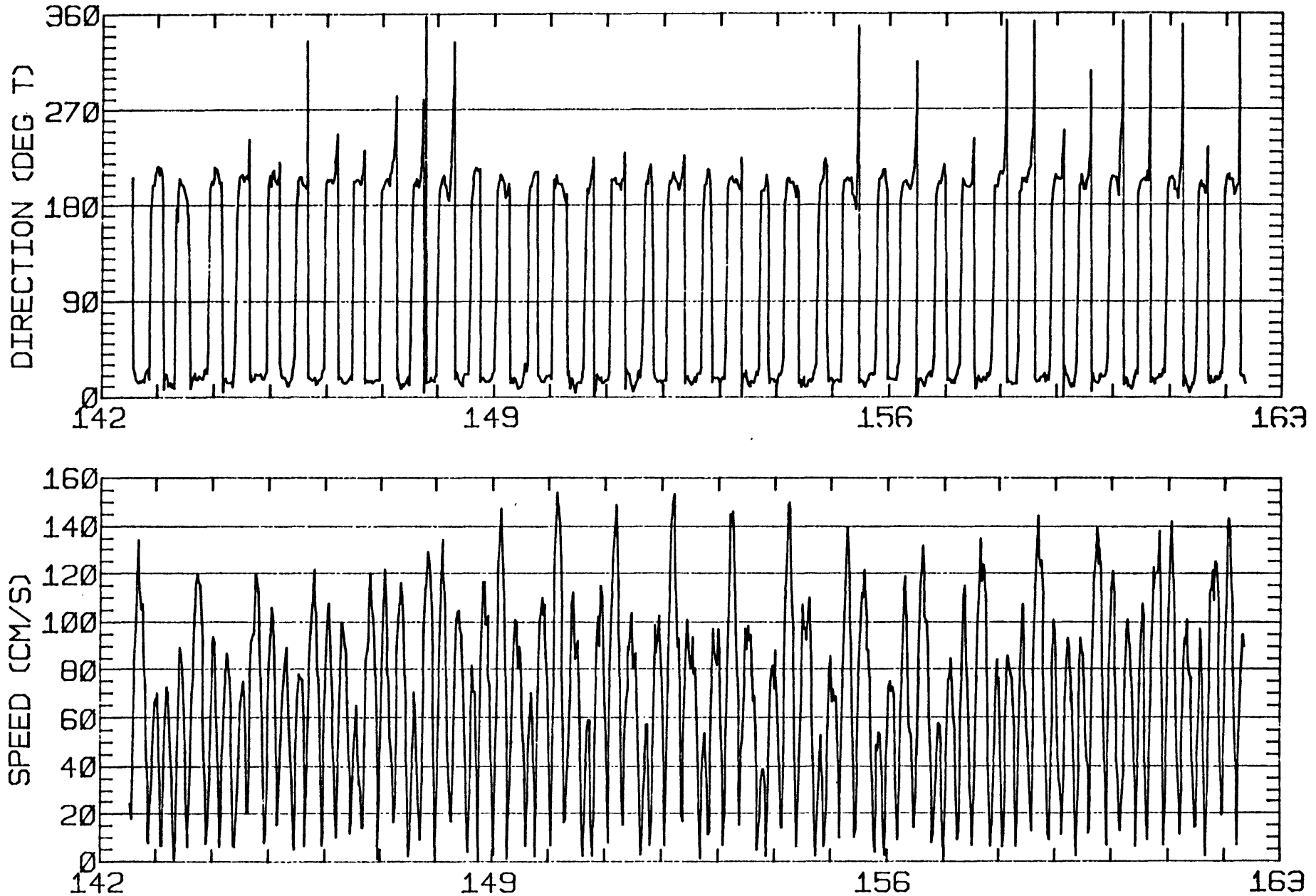
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.64	0.17	17.4	40.7	ANTI-CLOCKWISE
K1	40.48	0.07	20.5	42.9	CLOCKWISE
N2	20.98	0.70	20.7	262.3	CLOCKWISE
M2	97.50	2.11	18.8	314.0	CLOCKWISE
S2	22.28	0.96	19.1	298.5	ANTI-CLOCKWISE
M4	4.50	0.14	46.8	89.4	ANTI-CLOCKWISE

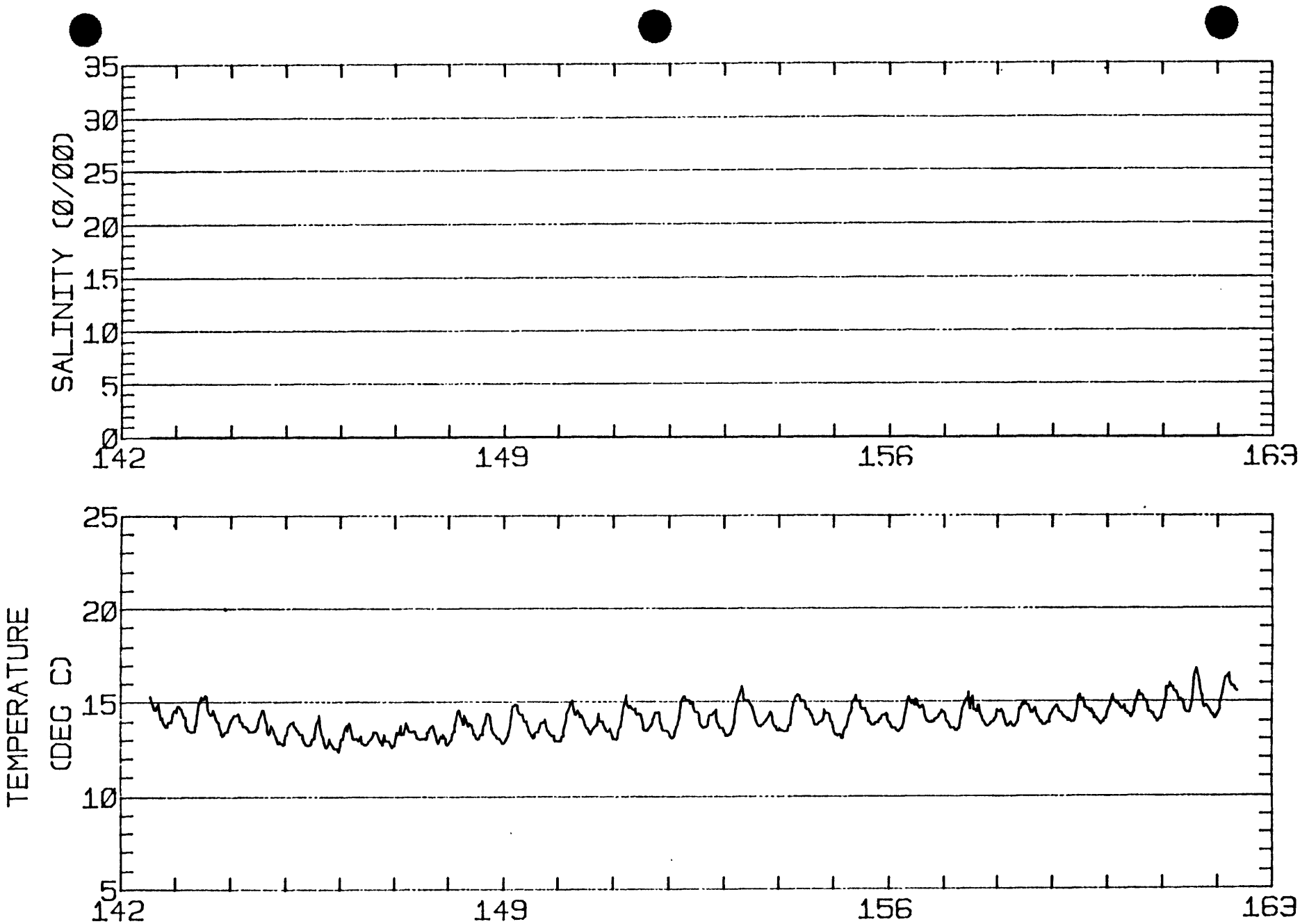
RMS SPEED: 76.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 176.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 51.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 19.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 9.25 CM/SEC
STANDARD DEVIATION V SERIES: 11.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	15.0	563.
2	12	0.0	10.6	453.
3	12	0.3	12.1	403.
4	2	-0.4	9.3	397.
ALL	38	0.2	12.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-44N 122-26-18W
METER 009.1 METERS ABOVE BED. WATER DEPTH 021.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-44N 122-26-18W
METER ØØ9.1 METERS ABOVE BED. WATER DEPTH Ø21.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'43"N 122 26'16"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 6/10/80 1040 PST JULIAN DAY=162
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

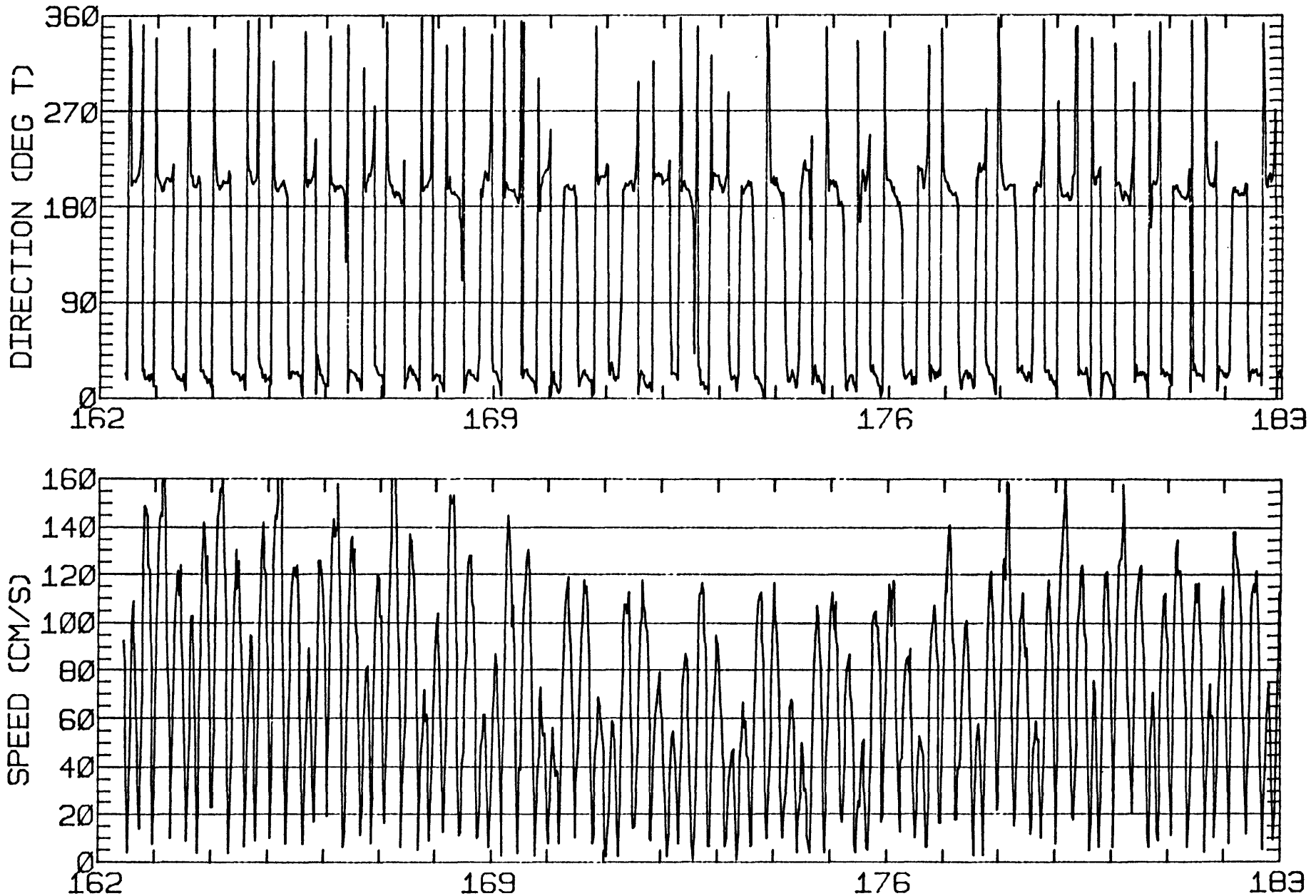
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.34	0.59	13.7	55.2	ANTI-CLOCKWISE
K1	46.35	4.05	15.9	55.2	ANTI-CLOCKWISE
N2	14.45	0.83	24.7	288.4	CLOCKWISE
M2	98.40	2.57	20.5	322.7	ANTI-CLOCKWISE
S2	14.36	0.37	15.7	310.1	CLOCKWISE
M4	3.10	0.31	313.5	43.3	ANTI-CLOCKWISE

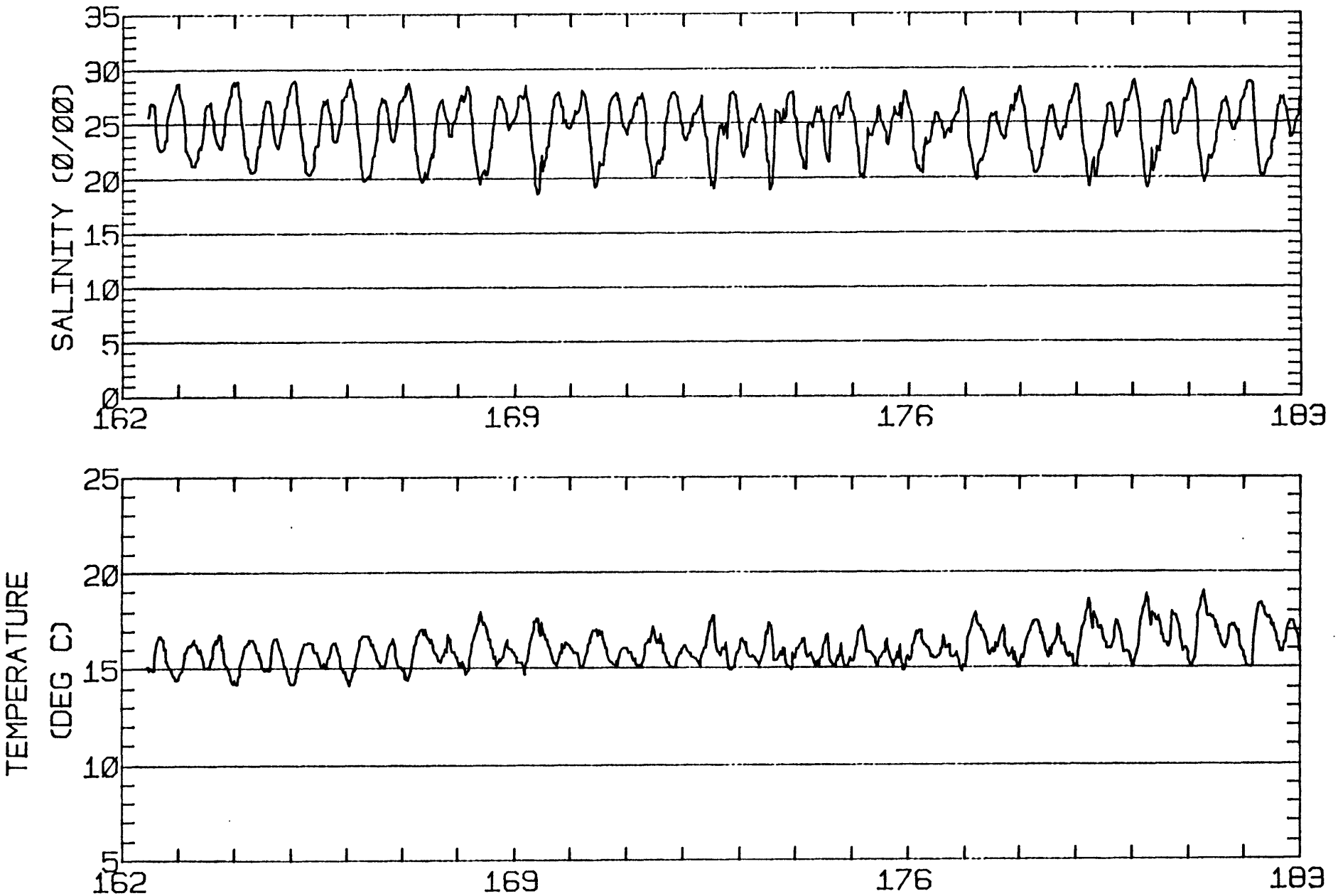
RMS SPEED: 81.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 175.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 54.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 18.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.56
STANDARD DEVIATION U-SERIES: 10.06 CM/SEC
STANDARD DEVIATION V SERIES: 12.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.8	3.6	402.
2	12	-1.2	2.2	443.
3	12	3.0	3.9	449.
4	4	4.0	2.4	419.
ALL	40	1.2	3.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-43N 122-26-16W
METER 015.3 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-43N 122-26-16W
METER Ø15.3 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'43"N 122 26'16"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 6/10/80 1022 PST JULIAN DAY=162
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

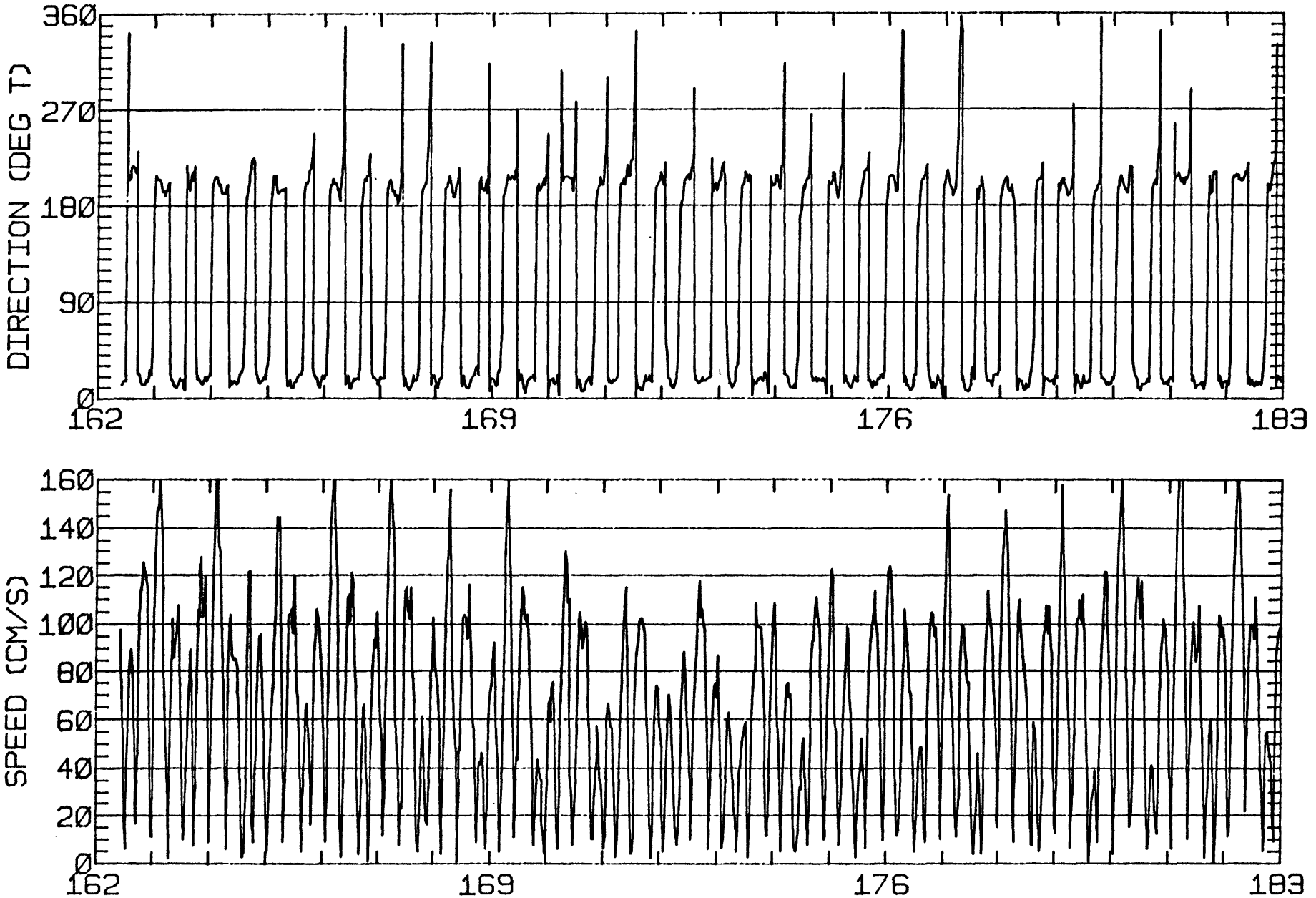
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.83	1.04	21.8	48.0	ANTI-CLOCKWISE
K1	43.82	1.73	18.6	57.9	CLOCKWISE
N2	10.40	0.13	23.8	288.7	ANTI-CLOCKWISE
M2	91.98	0.89	19.3	316.2	CLOCKWISE
S2	13.12	0.87	15.9	294.0	ANTI-CLOCKWISE
M4	6.44	0.95	38.8	108.4	ANTI-CLOCKWISE

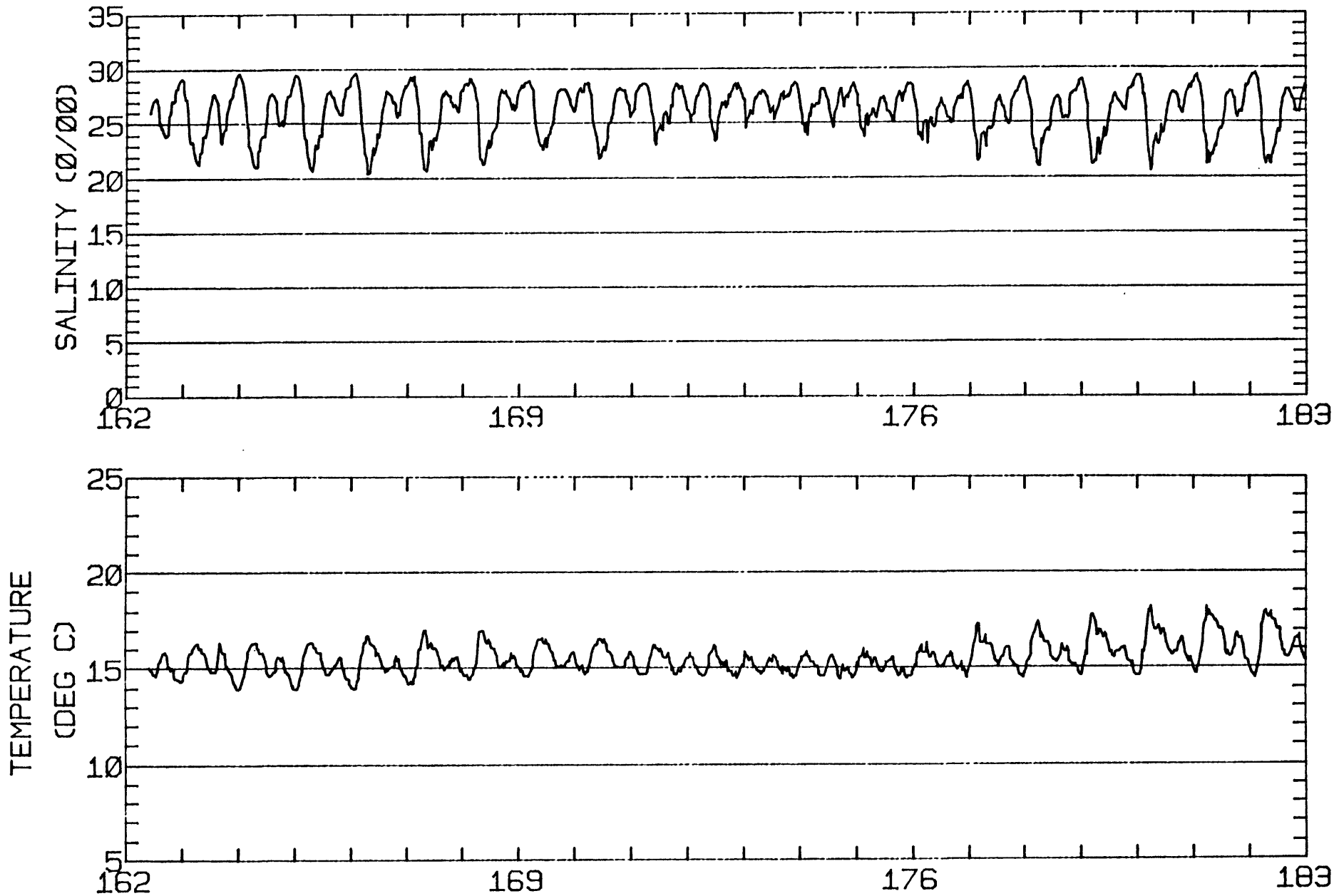
RMS SPEED: 77.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 166.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 52.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 19.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.59
STANDARD DEVIATION U-SERIES: 10.65 CM/SEC
STANDARD DEVIATION V SERIES: 12.90 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	6.8	402.
2	12	-0.5	11.6	443.
3	12	0.9	13.8	449.
4	4	-6.2	4.5	419.
ALL	40	-0.7	10.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-43N 122-26-16W
METER 009.2 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-43N 122-26-16W
METER ØØ9.2 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'43"N 122 26'16"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 19.5 M (BELOW MLLW)
START TIME OF SERIES: 6/10/80 1024 PST JULIAN DAY=162
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

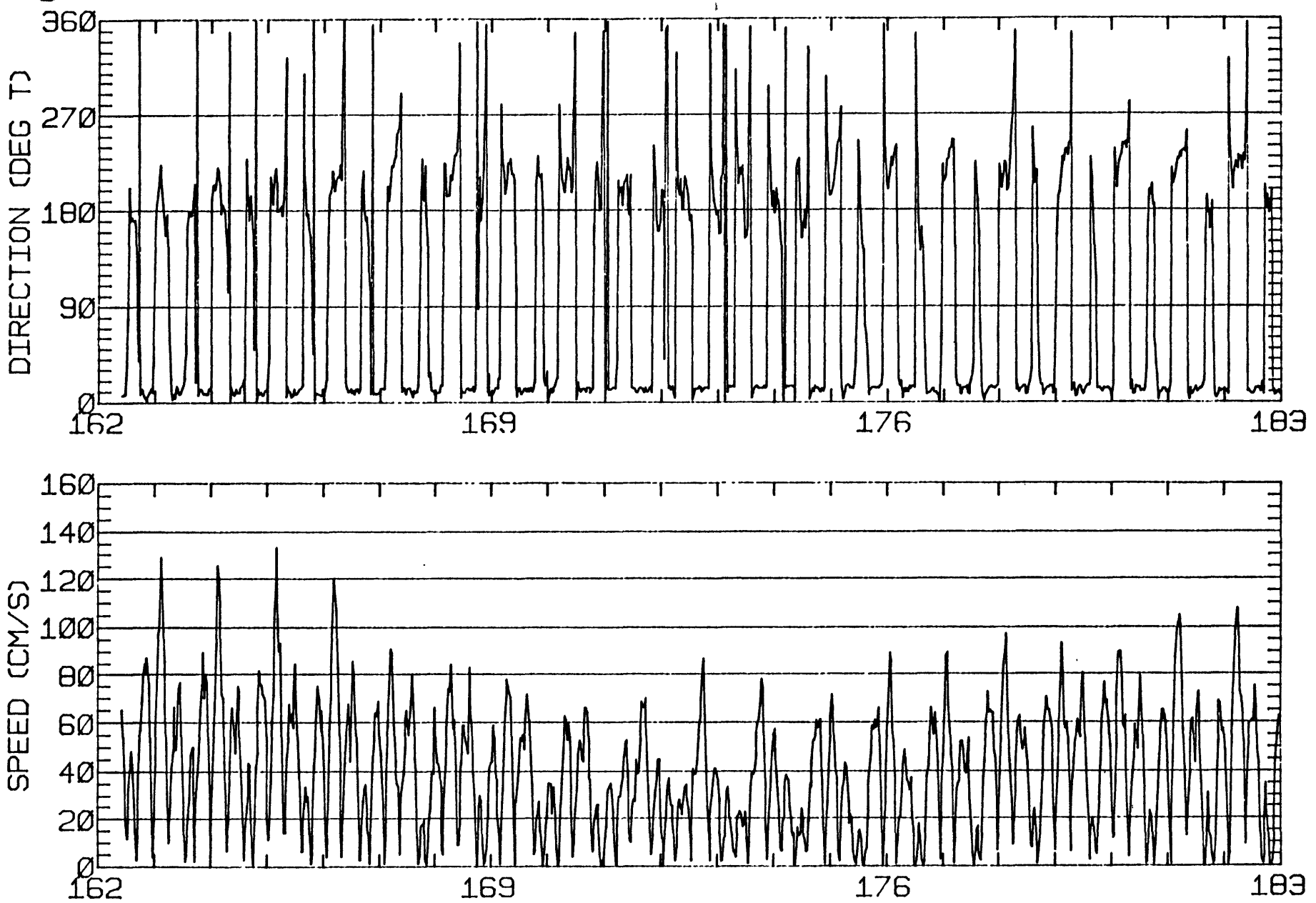
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.26	0.99	51.1	53.0	CLOCKWISE
K1	29.04	1.63	25.8	57.4	CLOCKWISE
N2	9.22	1.75	2.0	284.2	CLOCKWISE
M2	52.74	0.20	17.9	307.8	CLOCKWISE
S2	8.99	1.29	24.0	299.5	CLOCKWISE
M4	5.58	0.82	44.9	61.7	ANTI-CLOCKWISE

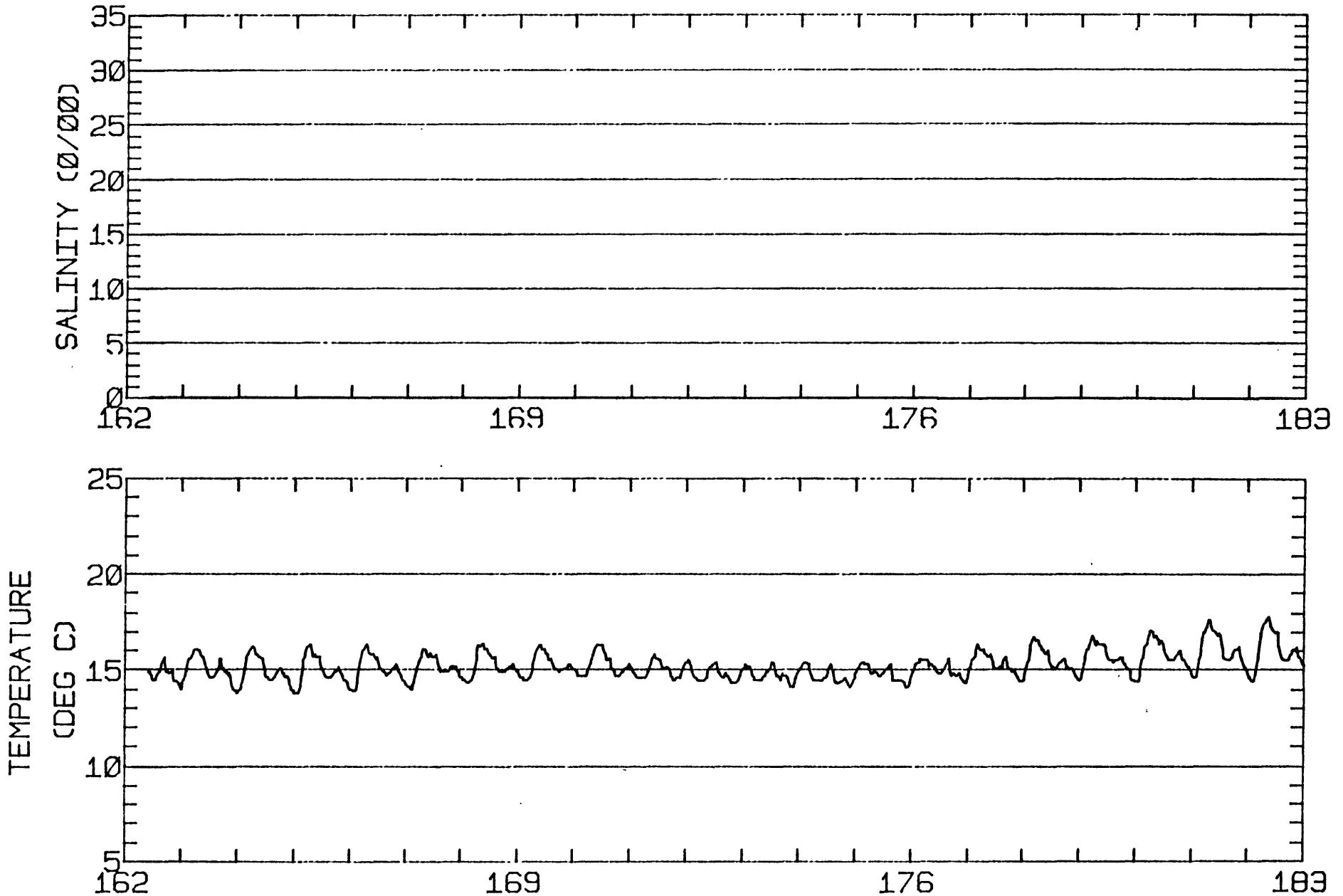
RMS SPEED: 48.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 24.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.65
STANDARD DEVIATION U-SERIES: 10.18 CM/SEC
STANDARD DEVIATION V SERIES: 10.93 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.3	9.1	402.
2	12	0.6	9.5	443.
3	12	-3.1	14.3	449.
4	4	-9.0	9.3	419.
ALL	40	-2.1	10.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-43N 122-26-16W
METER 002.2 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-43N 122-26-16W
METER ØØ2.2 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'46"N 122 26'15"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 7/ 1/80 1150 PST JULIAN DAY=183
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

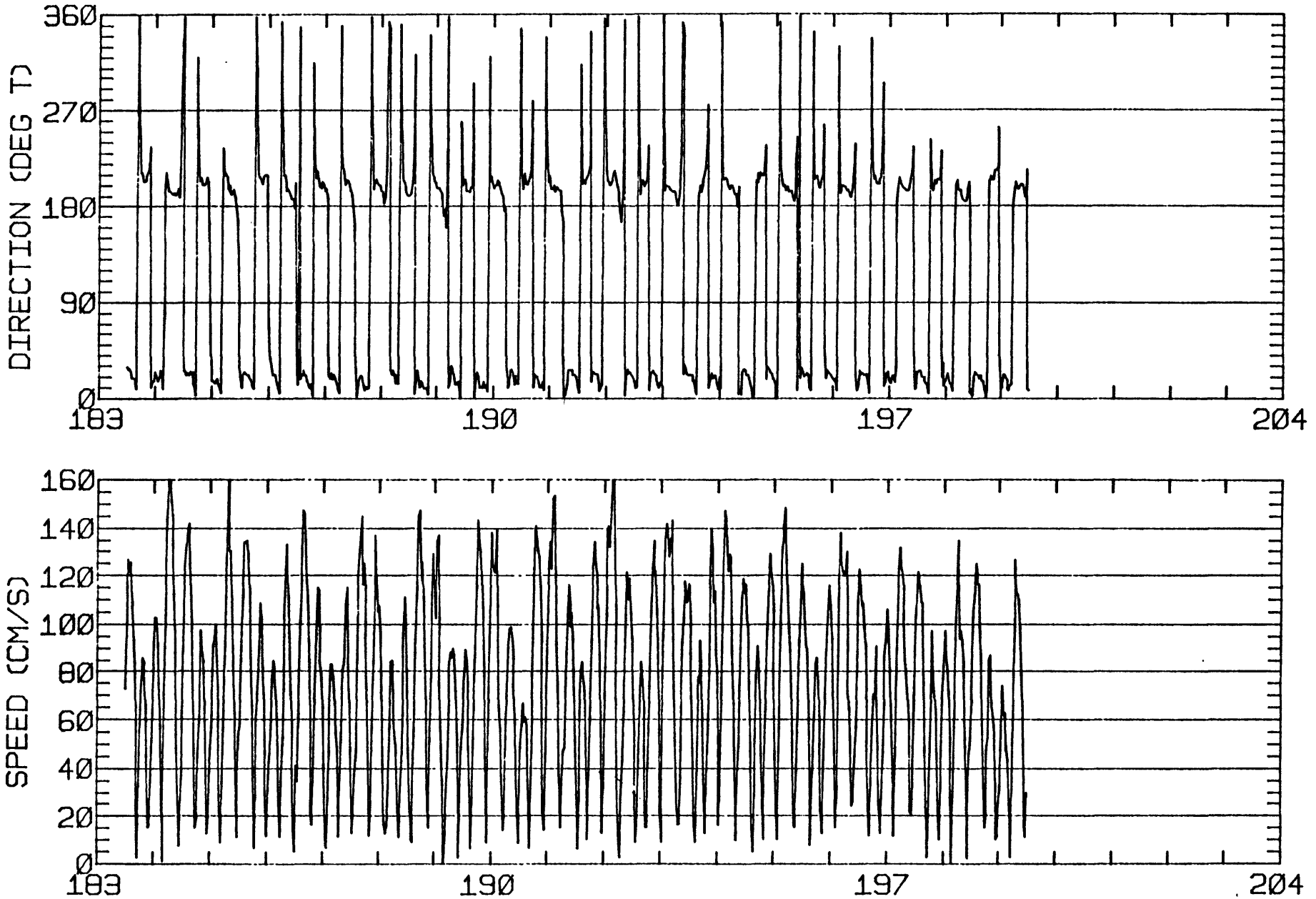
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.75	0.38	15.7	62.9	ANTI-CLOCKWISE
K1	44.90	5.00	15.3	70.7	ANTI-CLOCKWISE
N2	19.84	2.65	19.8	309.4	ANTI-CLOCKWISE
M2	96.39	1.99	18.9	320.3	ANTI-CLOCKWISE
S2	15.33	0.75	23.4	341.7	CLOCKWISE
M4	4.08	1.82	340.7	56.8	ANTI-CLOCKWISE

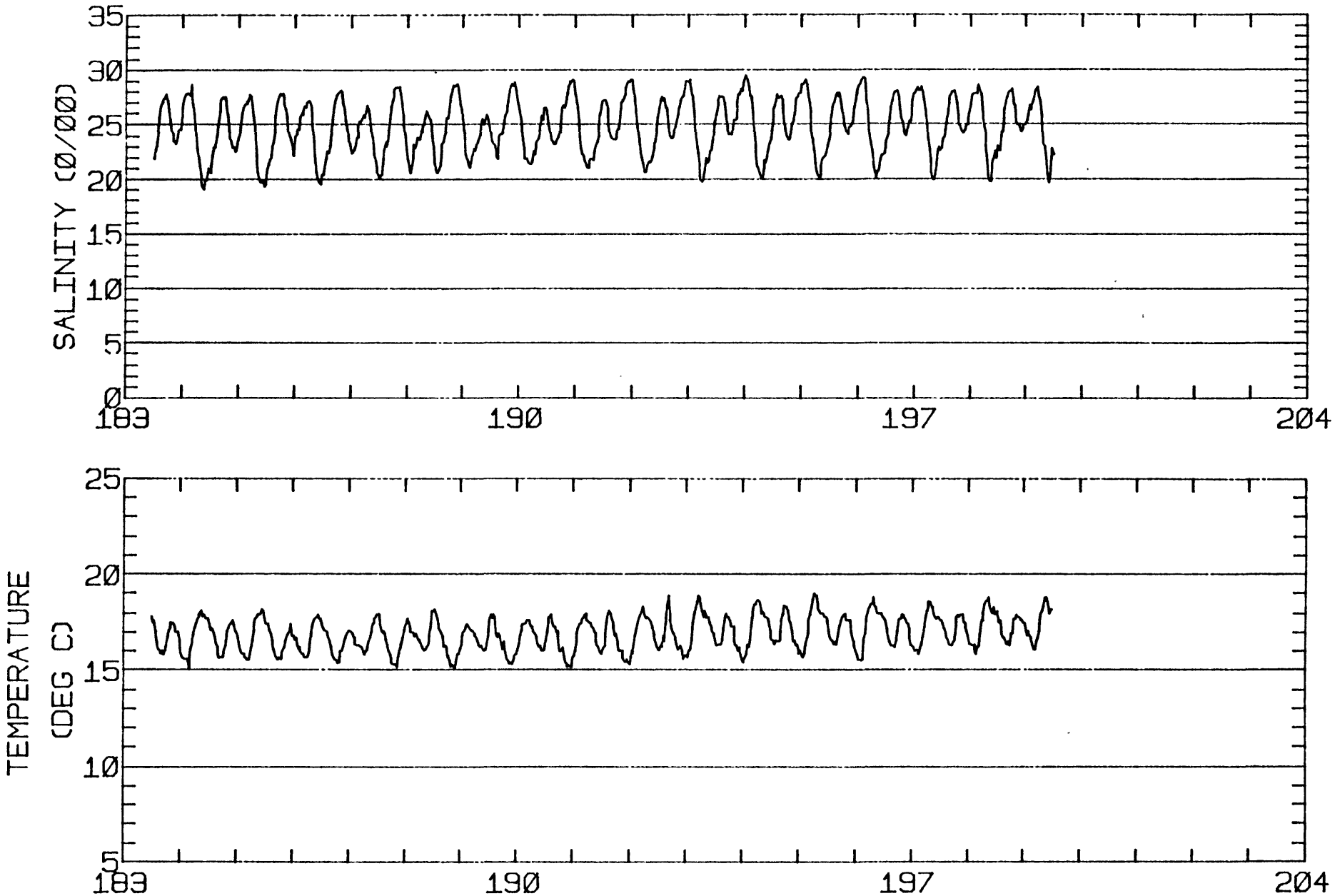
RMS SPEED: 85.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 169.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 18.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 10.05 CM/SEC
STANDARD DEVIATION V SERIES: 14.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.2	3.8	407.
2	12	0.1	5.4	300.
3	6	1.1	4.1	264.
ALL	30	0.4	4.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-15W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-15W
METER Ø15.1 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'46"N 122 26'15"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.2 M (BELOW MLLW)
START TIME OF SERIES: 7/ 1/80 1144 PST JULIAN DAY=183
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

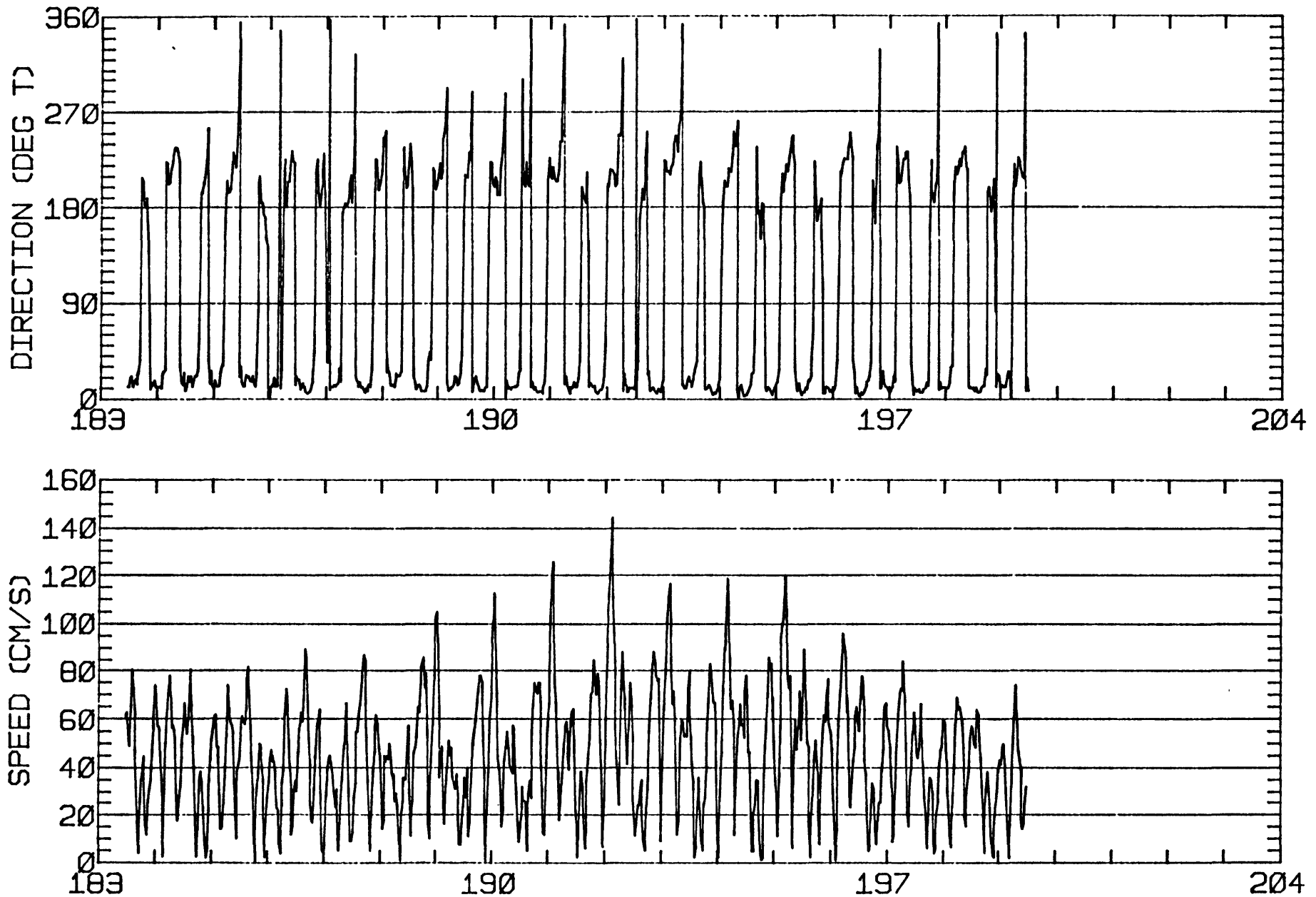
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.87	1.00	53.3	67.8	ANTI-CLOCKWISE
K1	29.64	2.47	32.2	68.6	CLOCKWISE
N2	12.36	1.00	19.9	283.3	CLOCKWISE
M2	52.33	2.58	20.8	304.8	CLOCKWISE
S2	11.86	1.57	29.0	309.4	CLOCKWISE
M4	8.15	1.75	42.0	76.9	CLOCKWISE

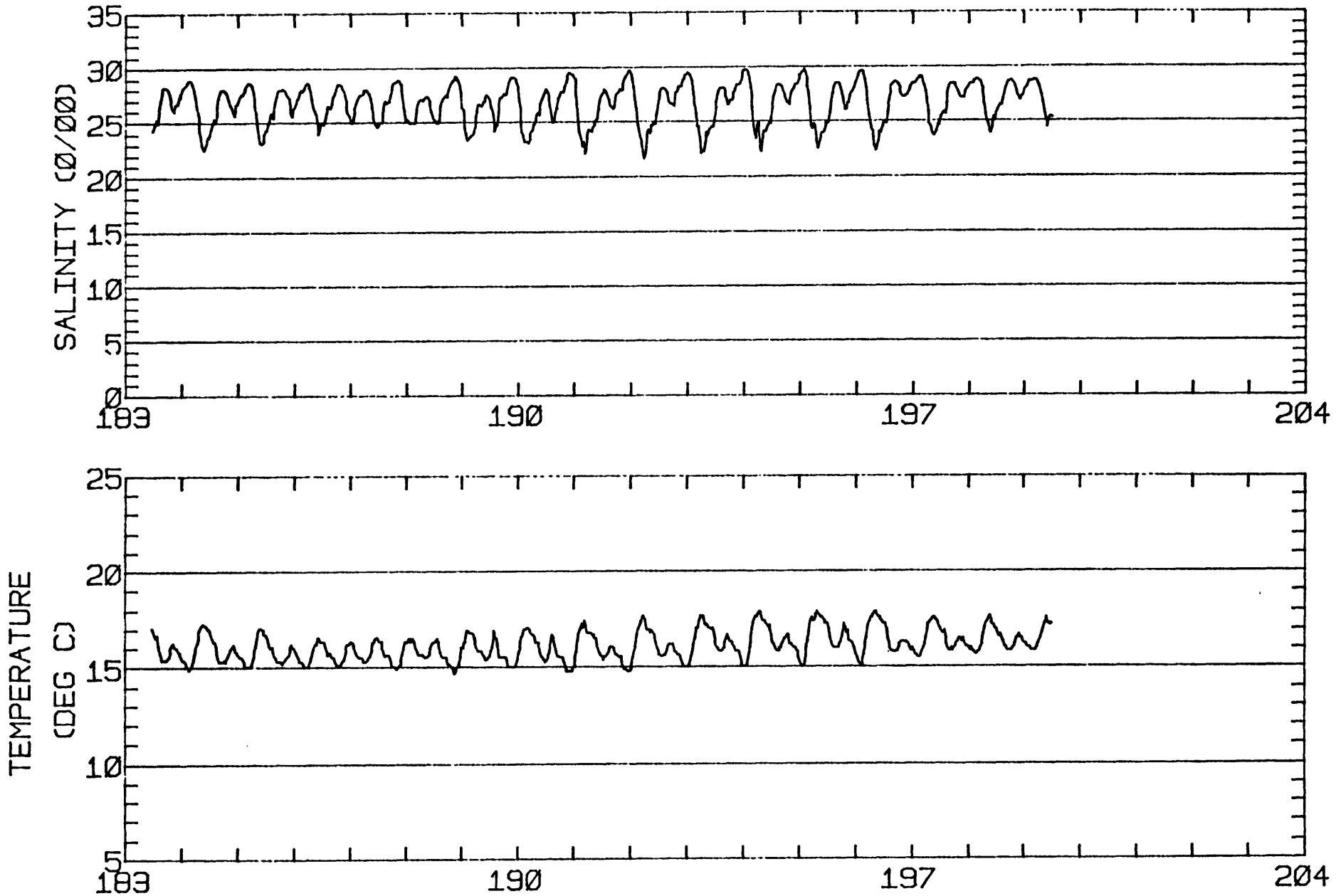
RMS SPEED: 52.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 108.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 29.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.69
STANDARD DEVIATION U-SERIES: 9.88 CM/SEC
STANDARD DEVIATION V SERIES: 11.95 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.3	12.6	407.
2	12	-6.3	12.0	300.
3	6	-5.3	13.4	264.
ALL	30	-3.7	12.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-15W
METER 002.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-15W
METER ØØ2.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'45"N 122 26'15"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 7/17/80 1310 PST JULIAN DAY=199
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

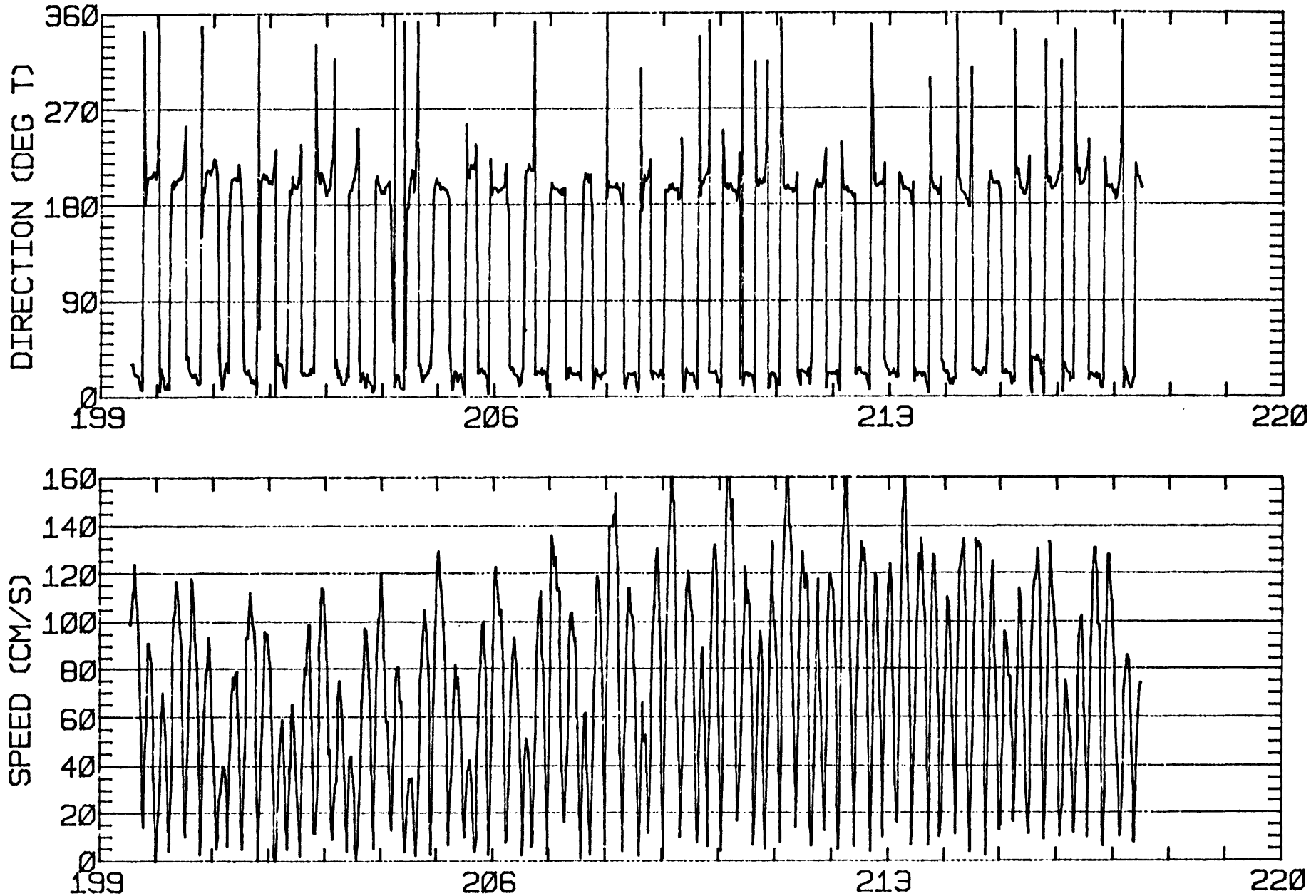
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.18	0.29	7.3	55.3	CLOCKWISE
K1	42.95	1.47	16.8	75.7	ANTI-CLOCKWISE
N2	17.91	2.23	18.2	279.0	ANTI-CLOCKWISE
M2	104.53	2.06	20.3	321.2	ANTI-CLOCKWISE
S2	15.36	0.27	16.3	330.9	CLOCKWISE
M4	5.12	1.35	350.7	32.0	ANTI-CLOCKWISE

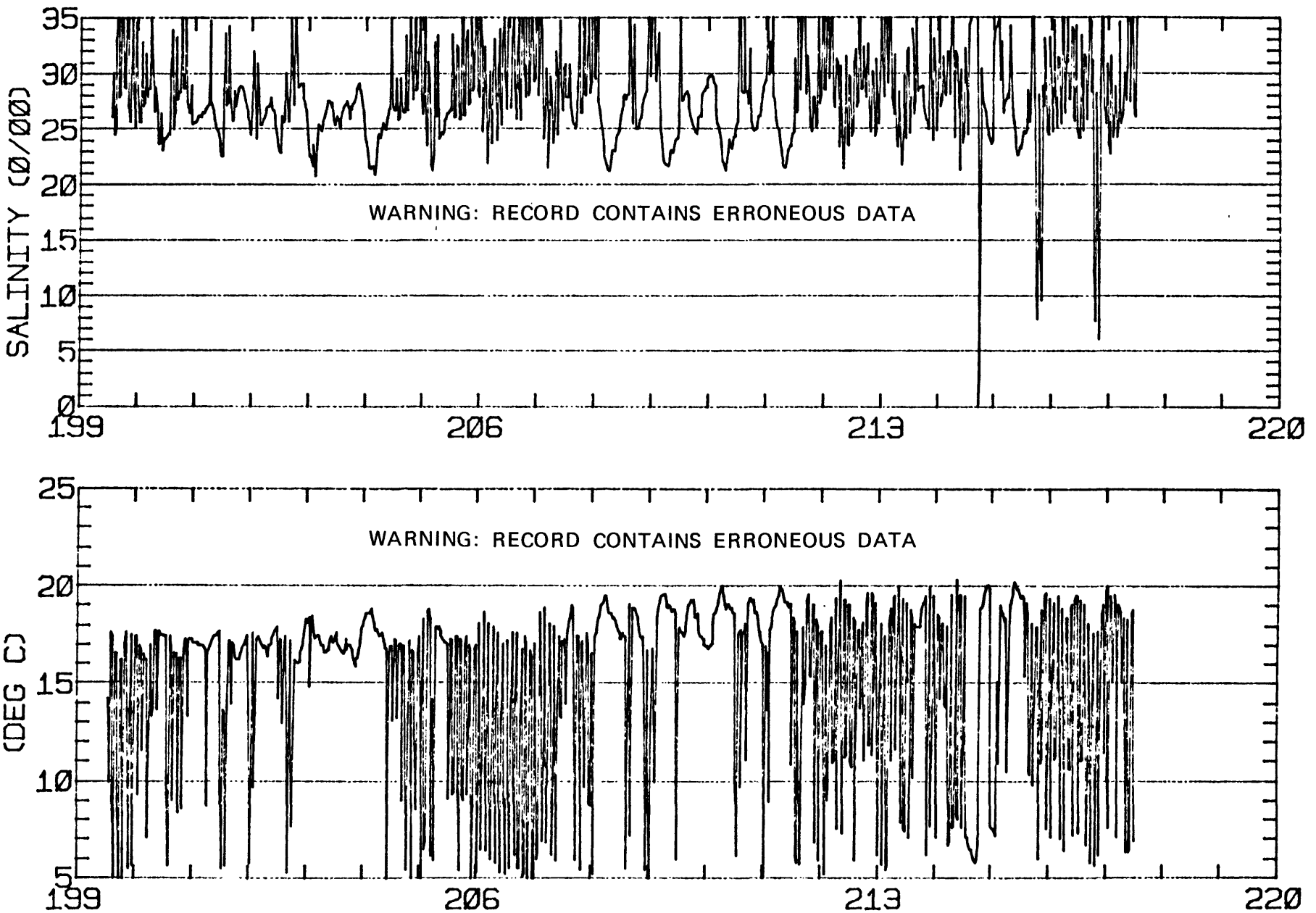
RMS SPEED: 80.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 182.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 65.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 17.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 9.21 CM/SEC
STANDARD DEVIATION V SERIES: 12.12 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS.
1	12	-2.0	1.3	297.
2	12	2.0	1.5	309.
3	10	2.6	-0.9	237.
ALL	34	0.8	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-15W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-15W
METER Ø15.1 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'45"N 122 26'15"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 7/17/80 1312 PST JULIAN DAY=199
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

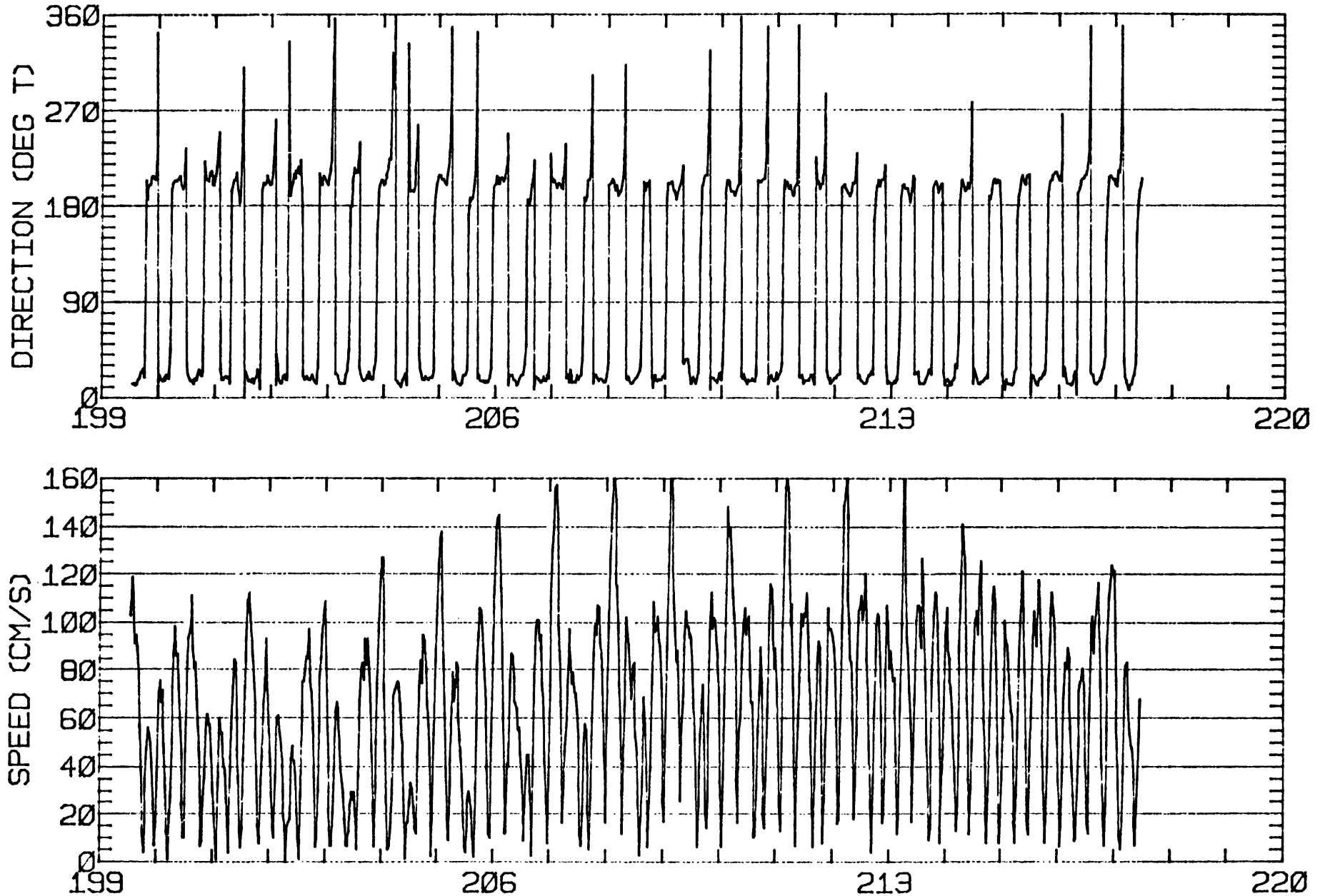
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.63	1.49	18.4	54.2	CLOCKWISE
K1	41.98	1.24	20.0	75.3	ANTI-CLOCKWISE
N2	13.91	0.37	19.0	279.9	ANTI-CLOCKWISE
M2	95.21	1.64	19.6	313.1	CLOCKWISE
S2	13.20	1.12	13.4	315.0	ANTI-CLOCKWISE
M4	8.06	0.12	29.1	96.4	CLOCKWISE

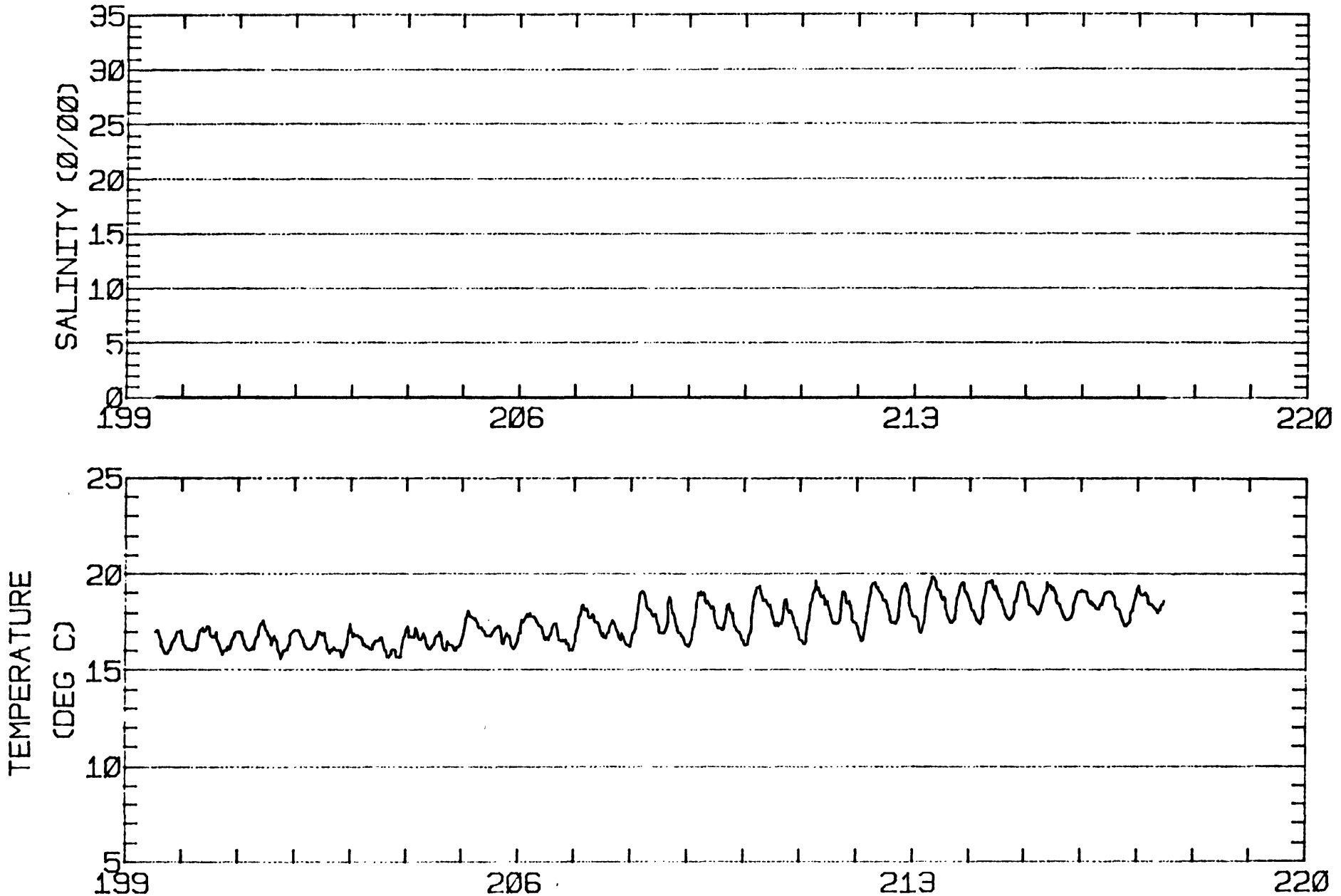
RMS SPEED: 75.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 171.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 60.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 19.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.58
STANDARD DEVIATION U-SERIES: 8.54 CM/SEC
STANDARD DEVIATION V SERIES: 11.97 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.5	10.3	297.
2	12	1.0	6.7	309.
3	10	-1.2	3.8	237.
ALL	34	0.2	7.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-15W
METER 009.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-15W
METER Ø09.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'45"N 122 26'15"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.2 M (BELOW MLLW)
START TIME OF SERIES: 7/17/80 1314 PST JULIAN DAY=199
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

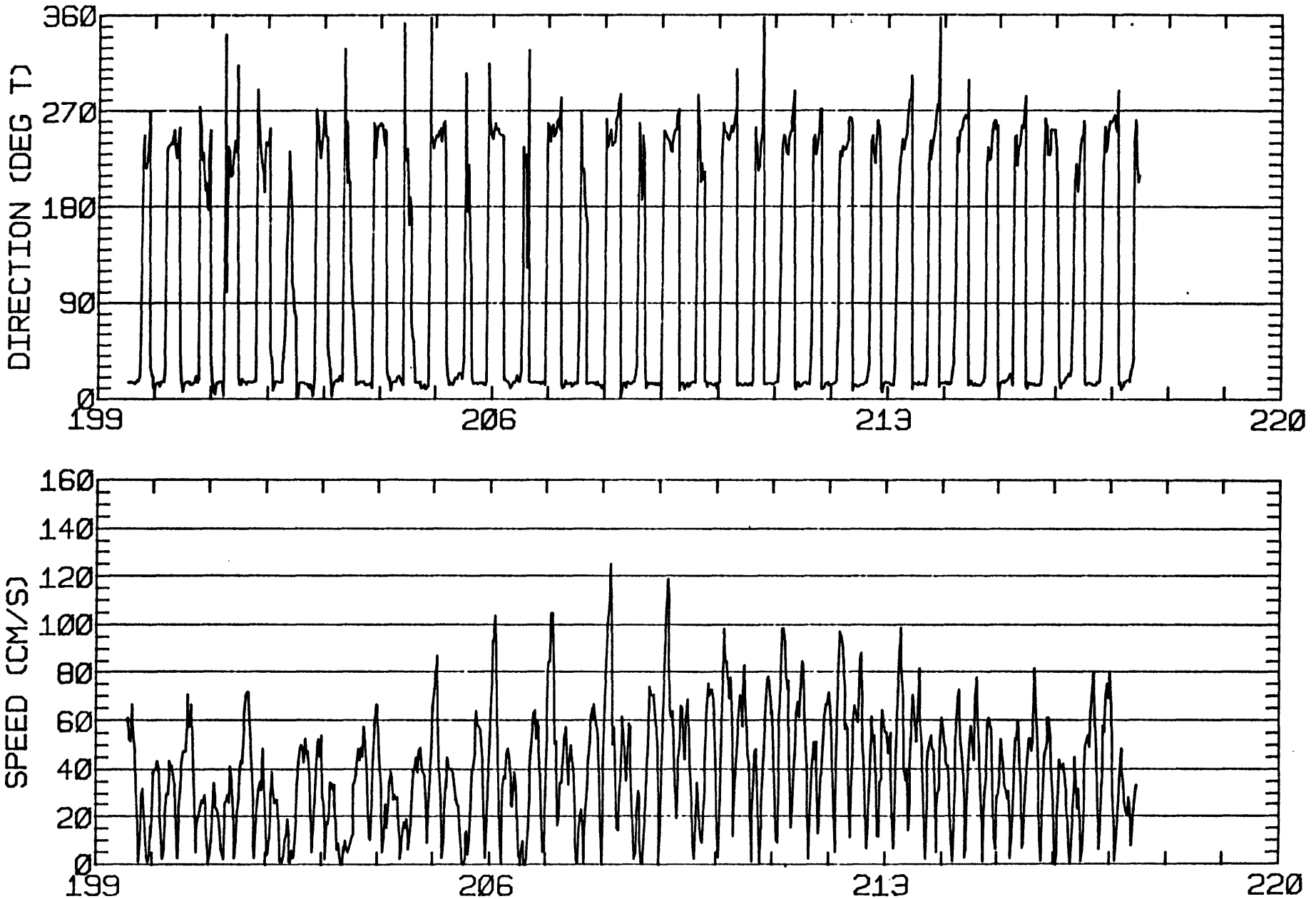
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.87	0.67	80.6	55.4	CLOCKWISE
K1	24.98	1.22	50.5	75.3	ANTI-CLOCKWISE
N2	8.42	2.10	53.2	300.7	CLOCKWISE
M2	48.84	2.94	35.0	304.1	CLOCKWISE
S2	9.34	0.15	38.7	315.2	ANTI-CLOCKWISE
M4	7.72	1.97	83.6	60.8	CLOCKWISE

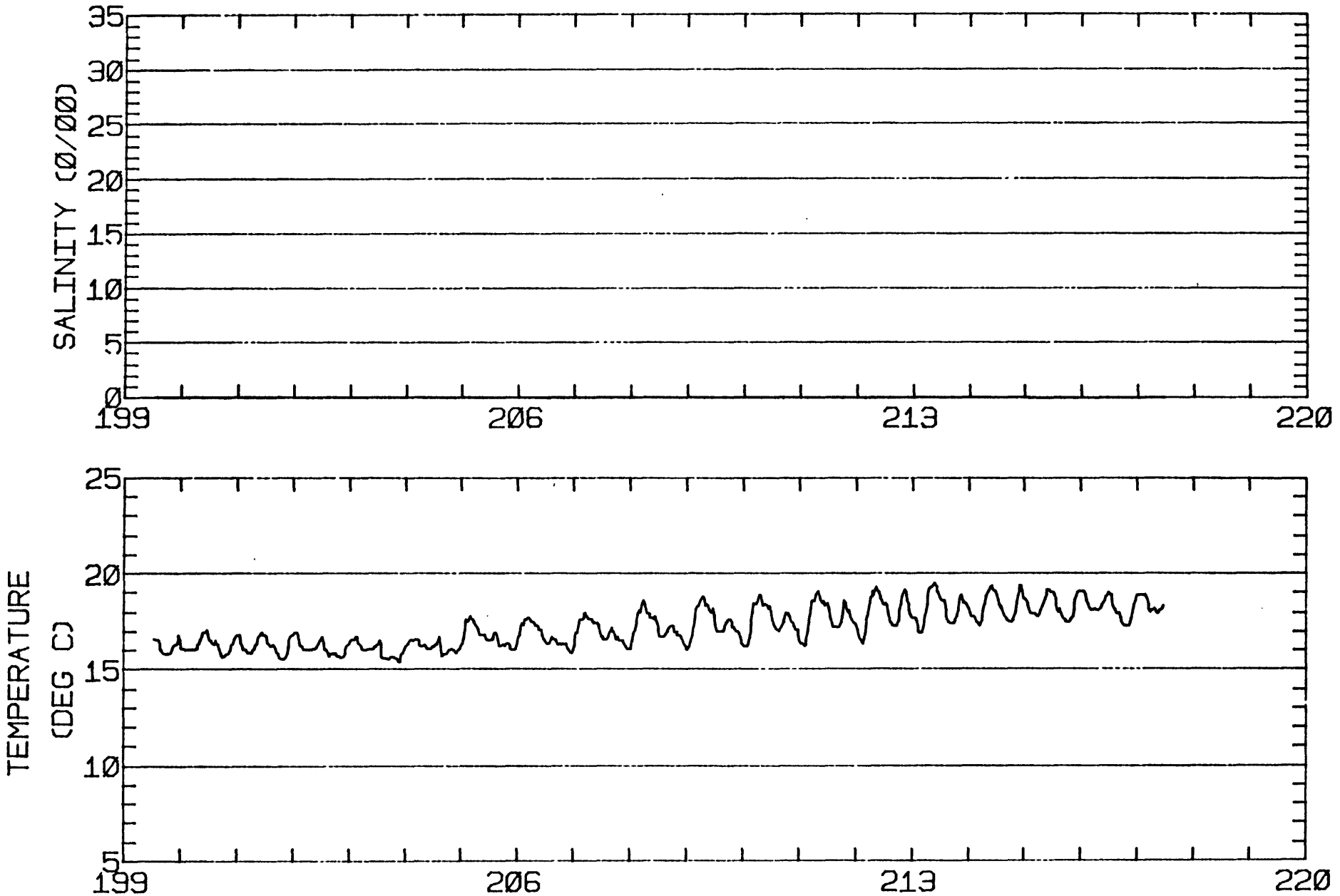
RMS SPEED: 46.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 99.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 46.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.70
STANDARD DEVIATION U-SERIES: 9.56 CM/SEC
STANDARD DEVIATION V SERIES: 9.21 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.2	13.6	297.
2	12	-10.5	18.6	309.
3	10	-10.7	15.0	237.
ALL	34	-7.6	15.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-15W
METER 002.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-15W
METER ØØ2.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'45"N 122 26'14"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 8/ 4/80 1550 PST JULIAN DAY=217
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

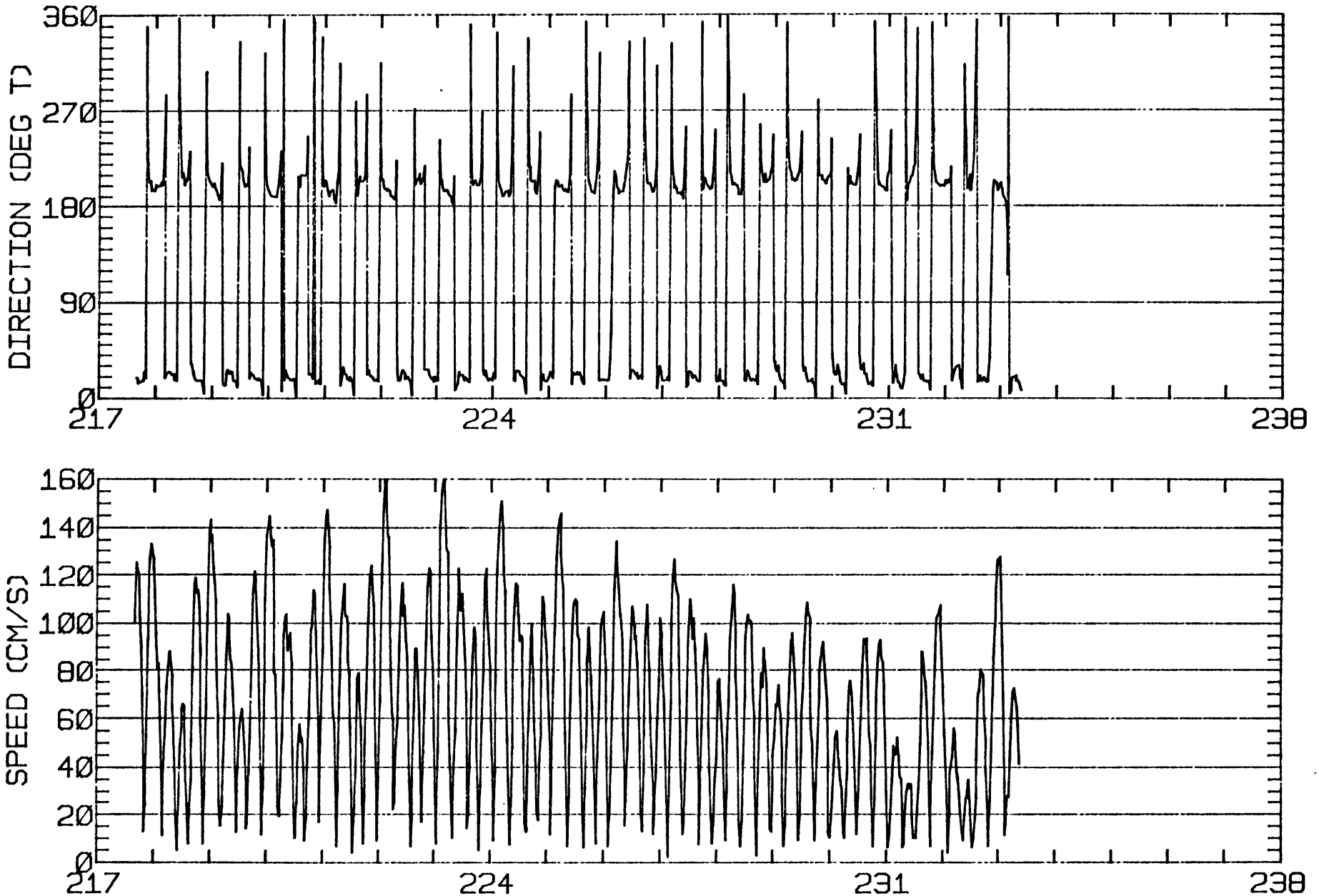
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.93	1.25	11.5	58.2	ANTI-CLOCKWISE
K1	36.55	2.46	15.4	80.5	ANTI-CLOCKWISE
N2	17.65	1.00	19.0	324.5	CLOCKWISE
M2	101.79	1.10	19.7	318.9	ANTI-CLOCKWISE
S2	22.34	0.87	18.9	336.3	CLOCKWISE
M4	3.69	1.29	352.5	65.7	ANTI-CLOCKWISE

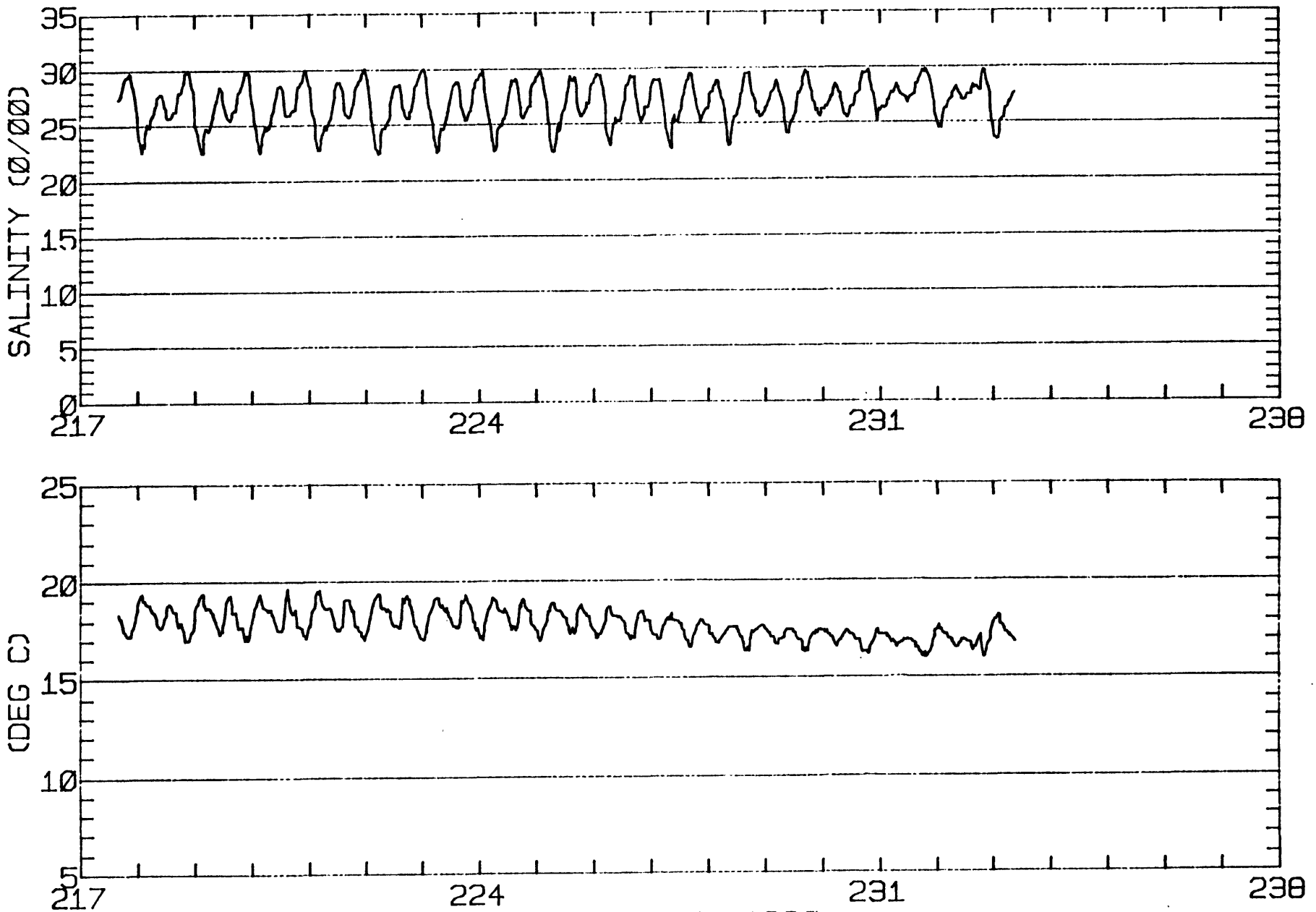
RMS SPEED: 77.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 179.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 61.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 17.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.45
STANDARD DEVIATION U-SERIES: 8.24 CM/SEC
STANDARD DEVIATION V SERIES: 11.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	2.2	154.
2	12	-1.5	-0.4	107.
3	6	-2.0	-2.5	76.
ALL	30	-0.9	0.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-14W
METER 015.3 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-14W
METER 015.3 METERS ABOVE BED. WATER DEPTH 021.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'45"N 122 26'14"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 8/ 4/80 1552 PST JULIAN DAY=217
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

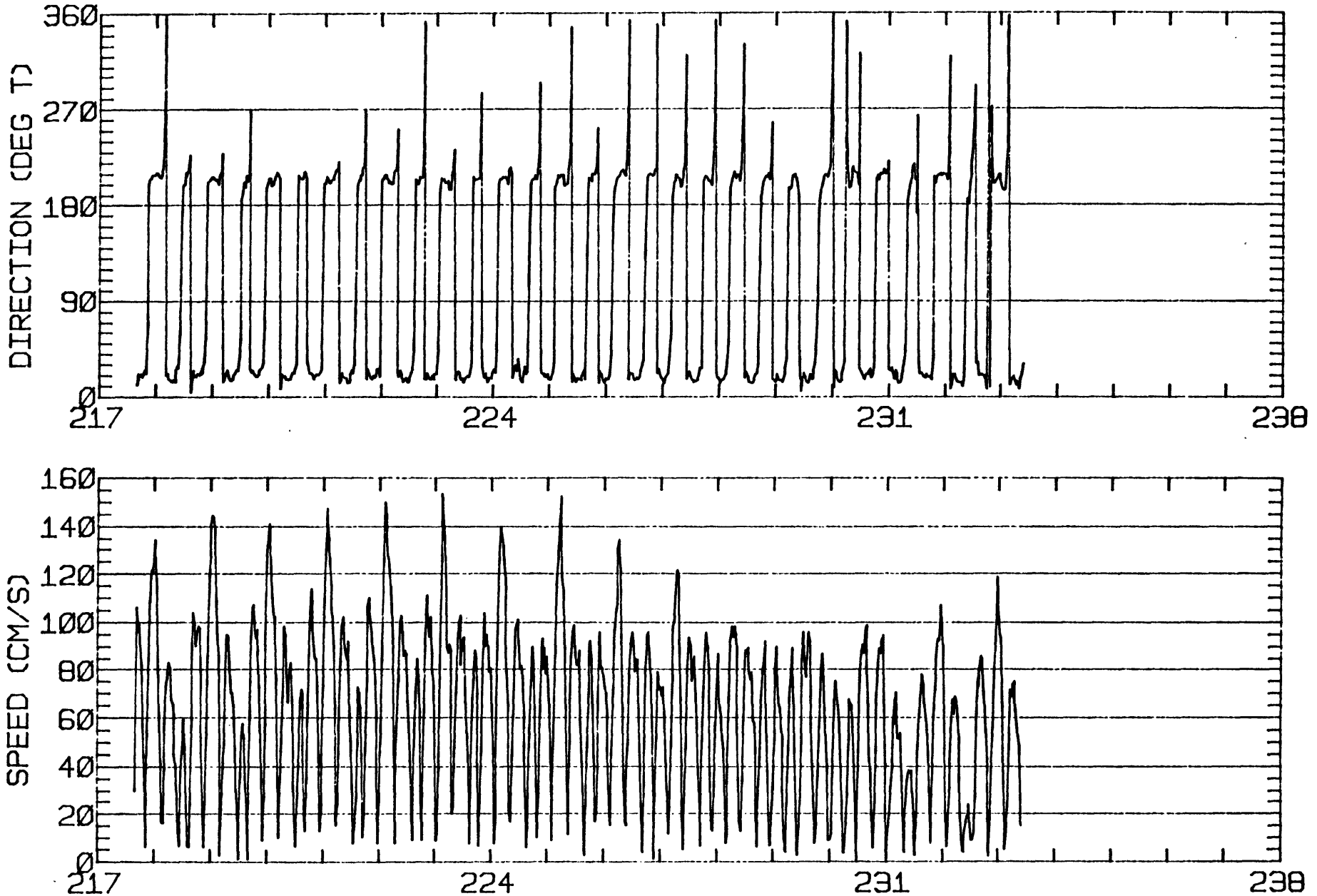
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.89	0.85	23.9	63.1	CLOCKWISE
K1	32.71	0.32	24.2	80.9	CLOCKWISE
N2	17.77	0.16	23.8	327.8	ANTI-CLOCKWISE
M2	95.95	1.95	22.8	317.2	CLOCKWISE
S2	19.46	0.95	22.3	338.2	CLOCKWISE
M4	7.08	0.60	39.1	126.7	ANTI-CLOCKWISE

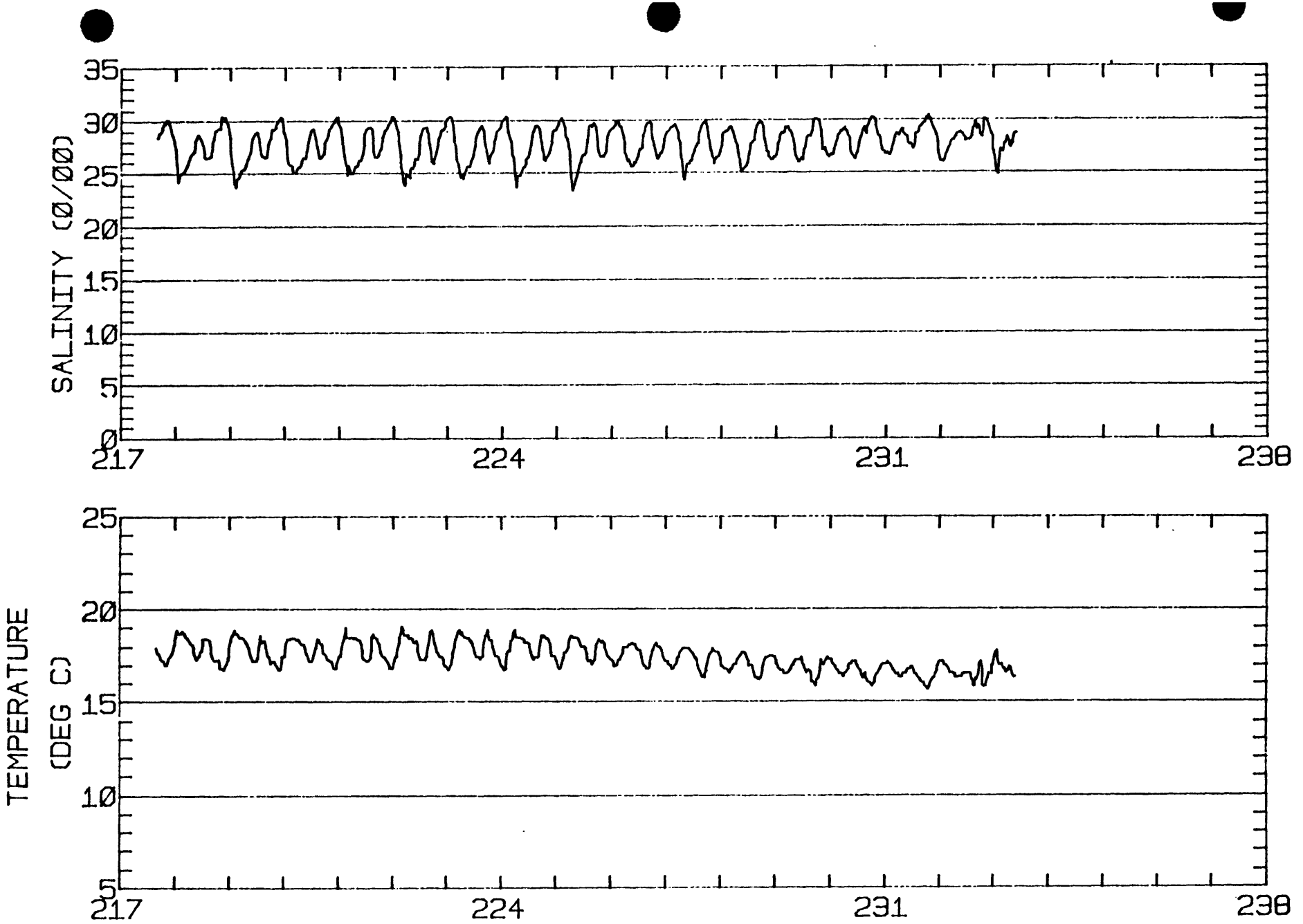
RMS SPEED: 72.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 169.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 64.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 23.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 8.39 CM/SEC
STANDARD DEVIATION V SERIES: 11.03 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.5	5.1	154.
2	12	-2.7	3.5	107.
3	6	-1.4	5.1	76.
ALL	30	-2.0	4.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-14W
METER 009.2 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-14W
METER ØØ9.2 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'45"N 122 26'14"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 19.5 M (BELOW MLLW)
START TIME OF SERIES: 8/ 4/80 1524 PST JULIAN DAY=217
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

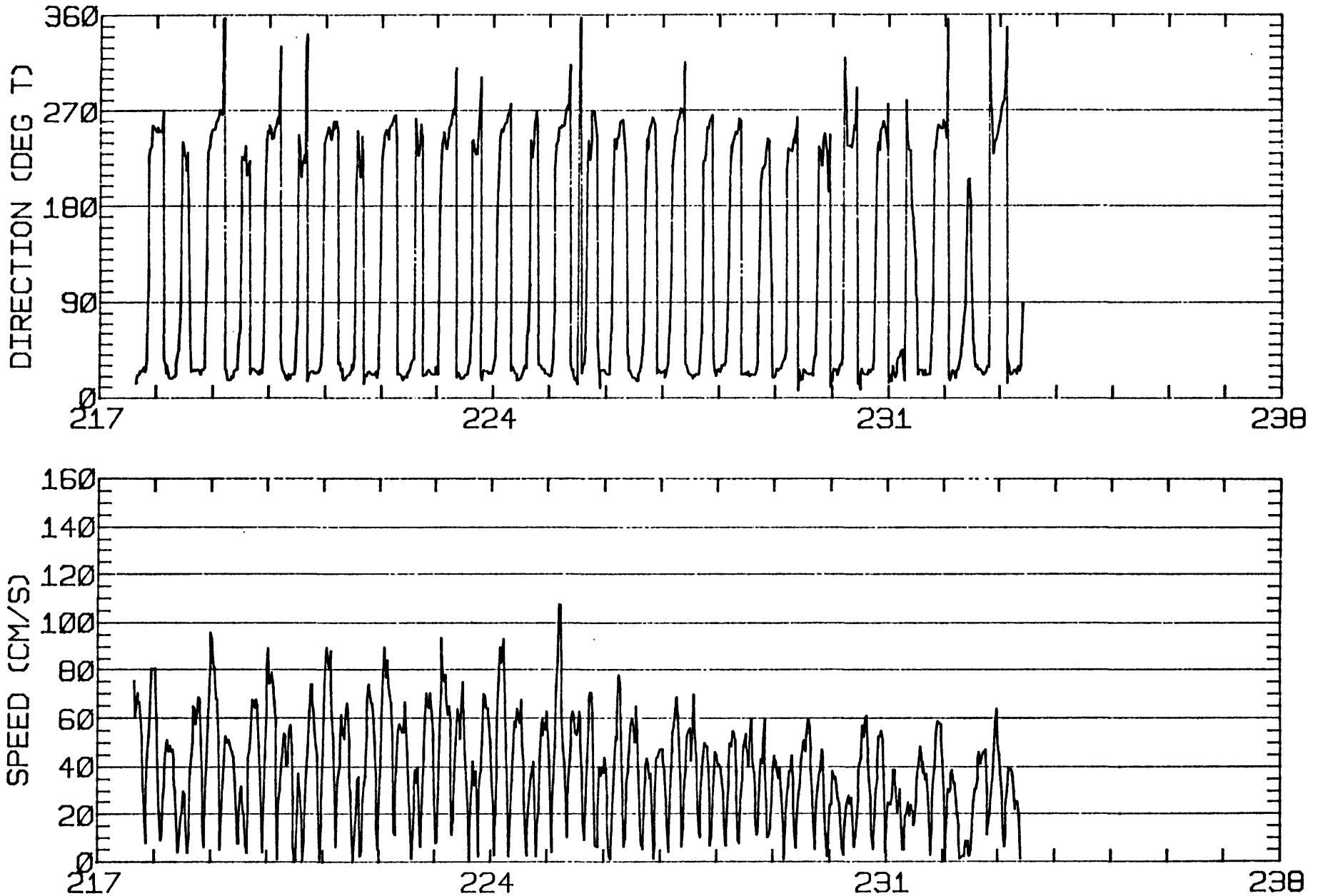
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.95	0.52	80.1	68.1	CLOCKWISE
K1	20.04	1.20	57.0	82.2	CLOCKWISE
N2	12.18	0.60	42.7	311.6	ANTI-CLOCKWISE
M2	52.81	2.98	43.7	308.8	CLOCKWISE
S2	11.01	0.71	48.3	334.2	CLOCKWISE
M4	7.93	0.99	102.2	100.2	CLOCKWISE

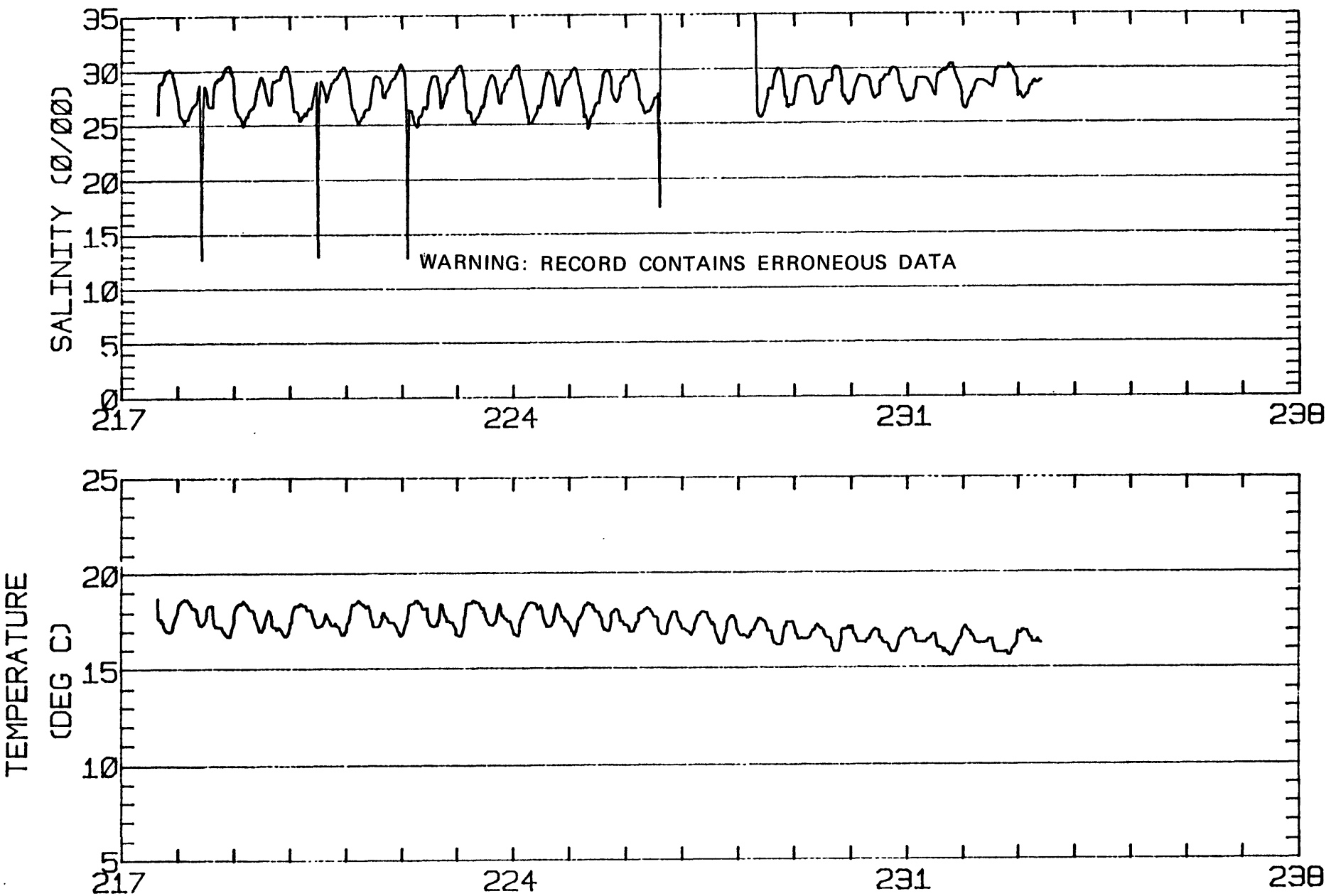
RMS SPEED: 45.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 97.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 52.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.53
STANDARD DEVIATION U-SERIES: 10.03 CM/SEC
STANDARD DEVIATION V SERIES: 8.77 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.1	16.5	154.
2	12	-6.4	14.1	107.
3	6	-2.9	10.7	76.
ALL	30	-6.0	14.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-14W
METER 002.2 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-45N 122-26-14W
METER ØØ2.2 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'46"N 122 26'14"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 8/20/80 1100 PST JULIAN DAY=233
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

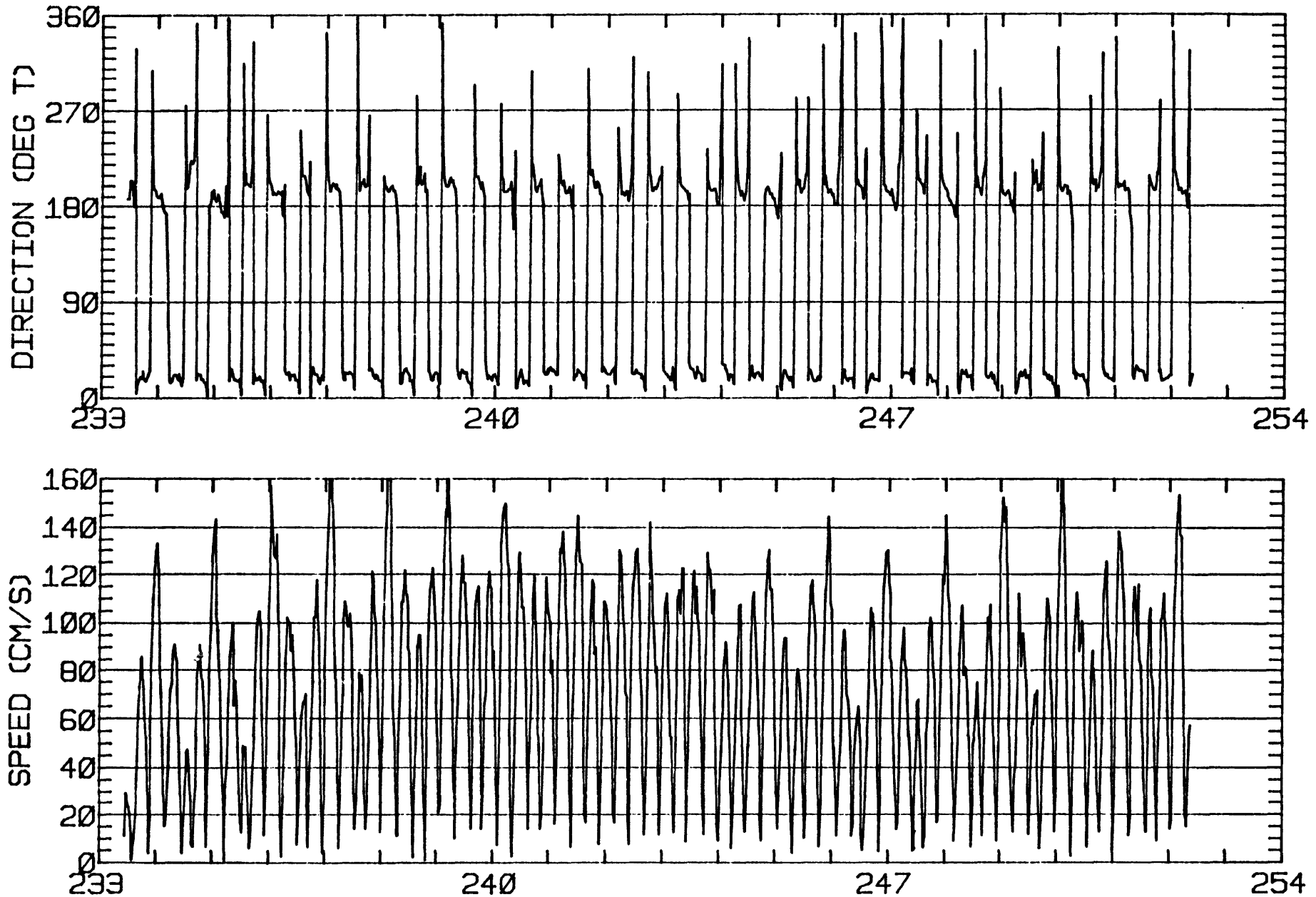
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.60	2.10	9.5	57.0	ANTI-CLOCKWISE
K1	31.44	1.62	13.1	80.8	ANTI-CLOCKWISE
N2	24.63	0.06	20.6	300.9	CLOCKWISE
M2	89.89	4.01	18.5	322.7	ANTI-CLOCKWISE
S2	23.50	0.21	25.1	315.9	CLOCKWISE
M4	4.72	1.92	356.9	79.5	ANTI-CLOCKWISE

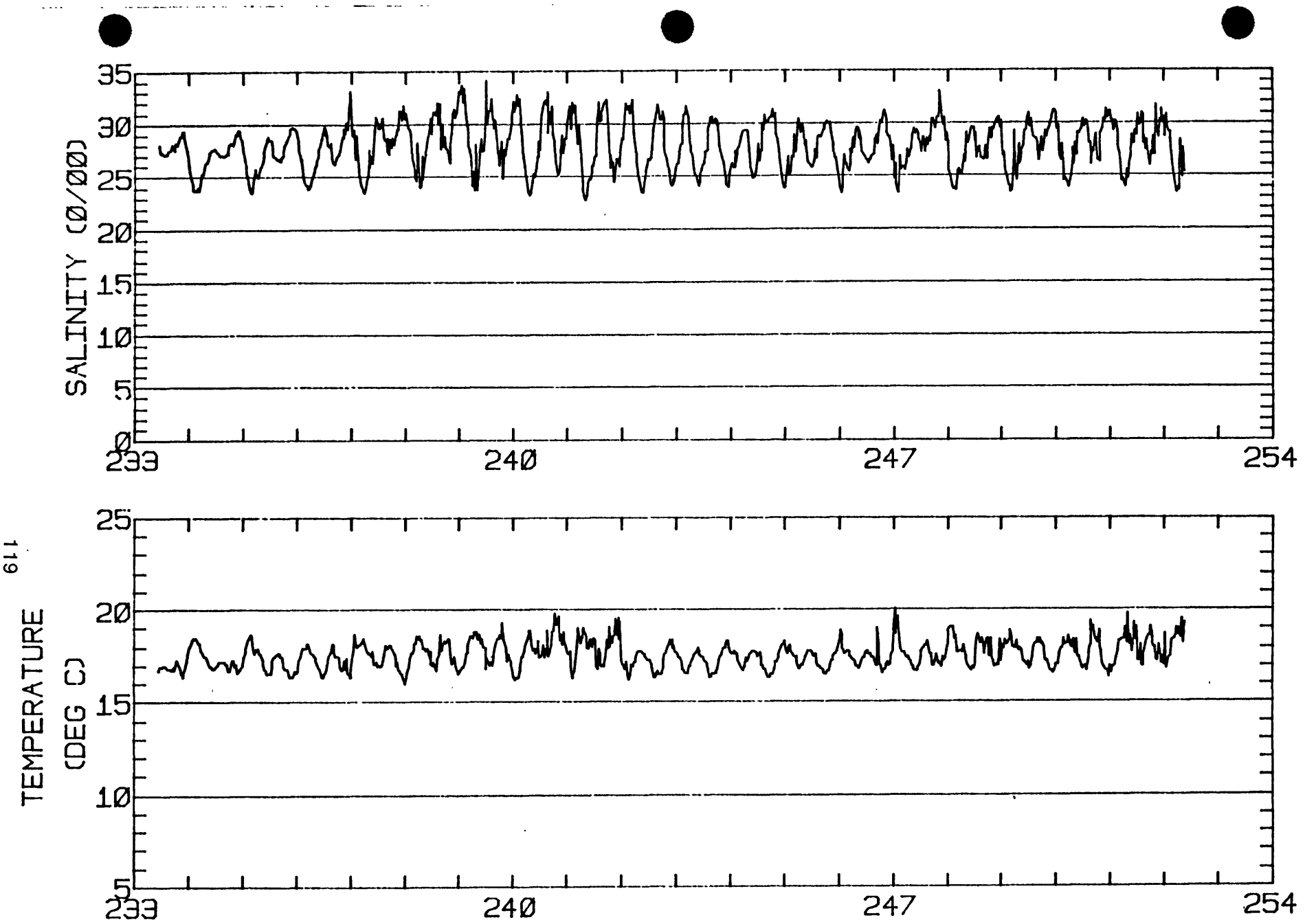
RMS SPEED: 81.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 163.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 53.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 17.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 8.57 CM/SEC
STANDARD DEVIATION V SERIES: 13.29 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.4	2.4	107.
2	12	2.9	0.3	120.
3	12	2.8	1.2	204.
ALL	36	2.7	1.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-14W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 18 37-58-46N 122-26-14W

METER Ø15.1 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'46"N 122 26'14"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.2 M (BELOW MLLW)
START TIME OF SERIES: 8/20/80 1044 PST JULIAN DAY=233
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

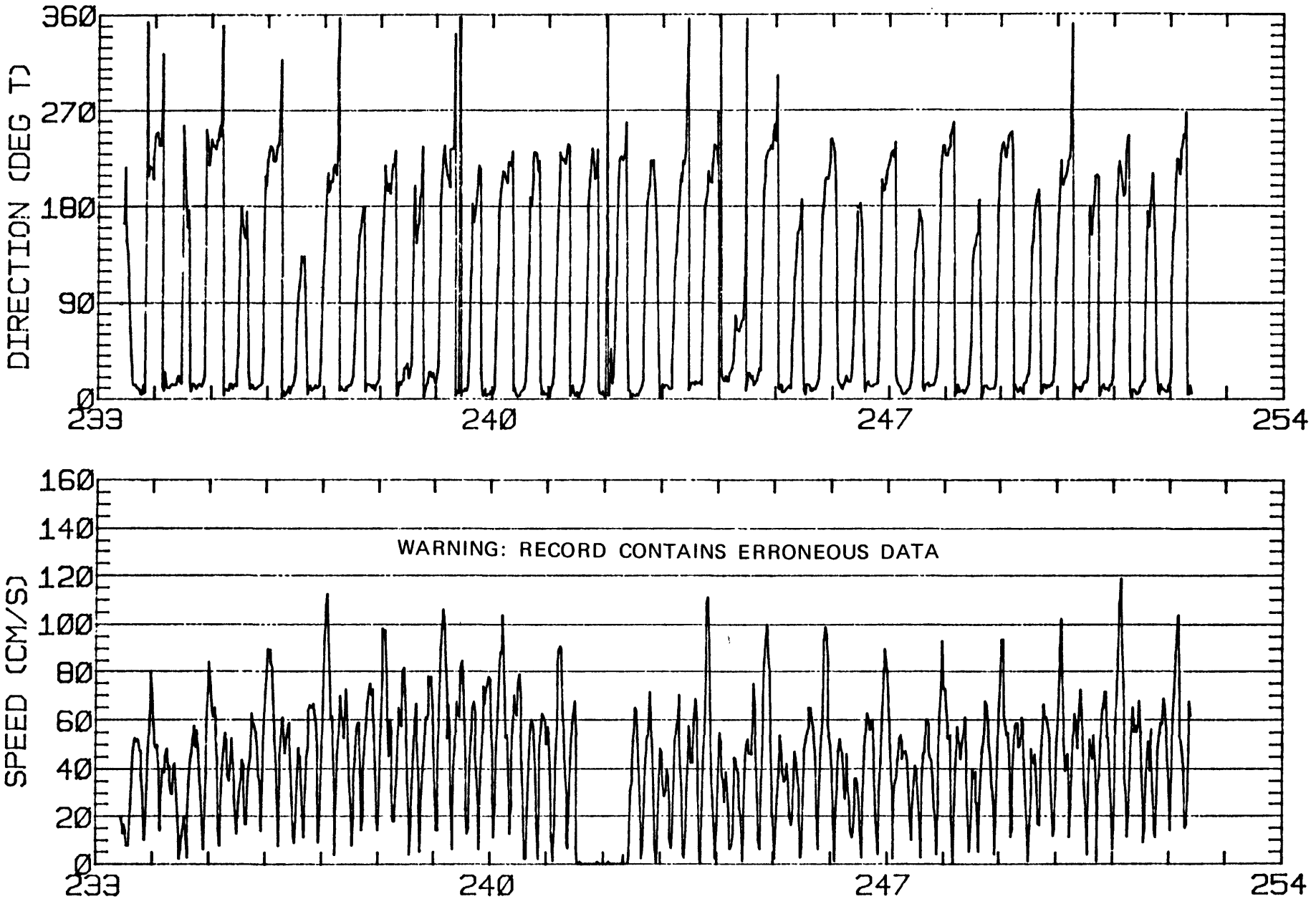
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.07	6.07	56.3	44.3	CLOCKWISE
K1	18.54	2.50	39.3	93.4	ANTI-CLOCKWISE
N2	15.71	0.26	123.7	184.7	ANTI-CLOCKWISE
M2	56.41	5.53	38.8	298.1	CLOCKWISE
S2	17.43	9.58	358.9	318.9	CLOCKWISE
M4	4.19	0.13	28.3	80.9	ANTI-CLOCKWISE

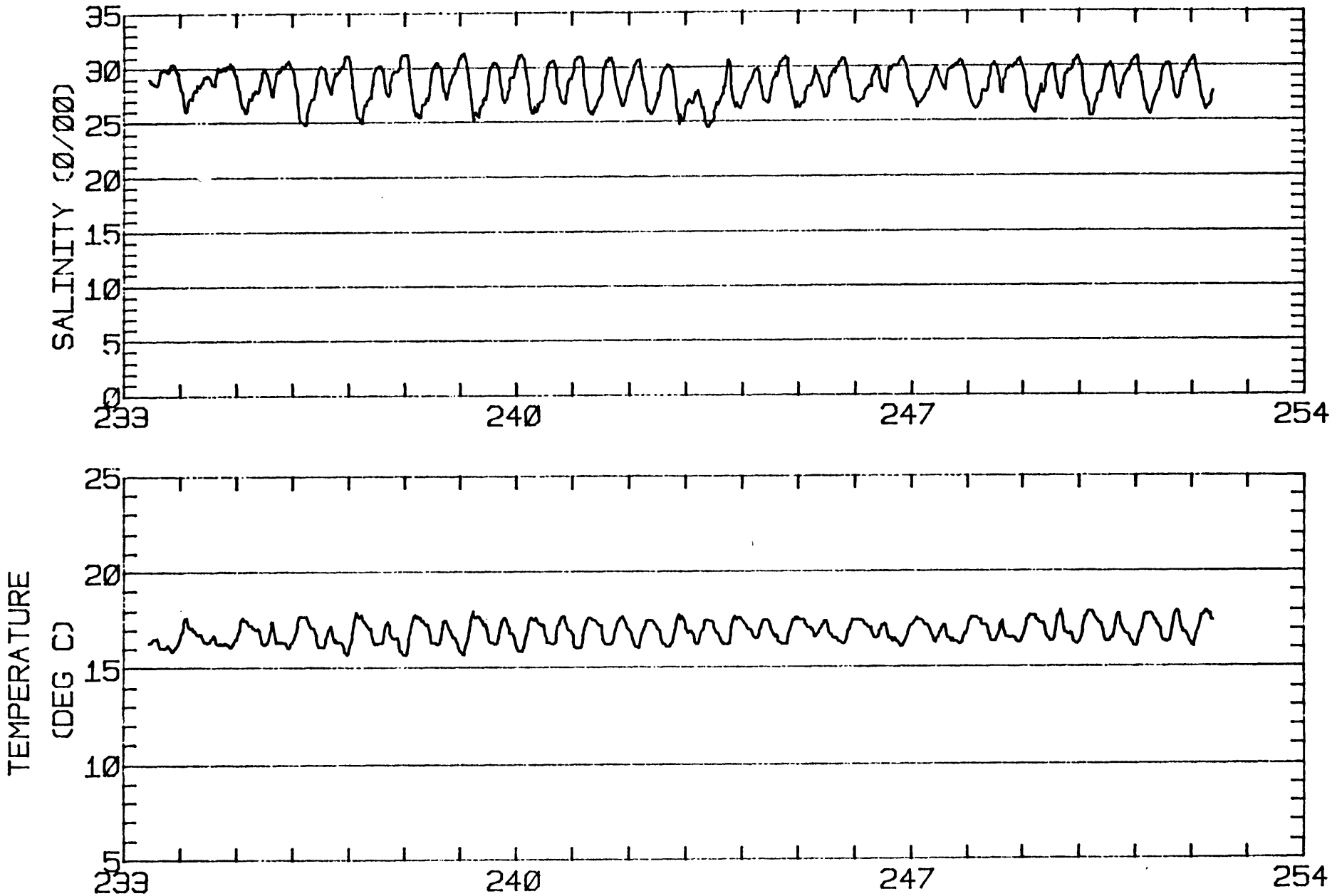
RMS SPEED: 52.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 112.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 40.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 35.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 12.99 CM/SEC
STANDARD DEVIATION V SERIES: 11.42 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.2	9.5	107.
ALL	12	-2.2	9.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-14W
METER 002.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-46N 122-26-14W
METER ØØ2.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'47"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/ 8/80 1140 PST JULIAN DAY=252
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

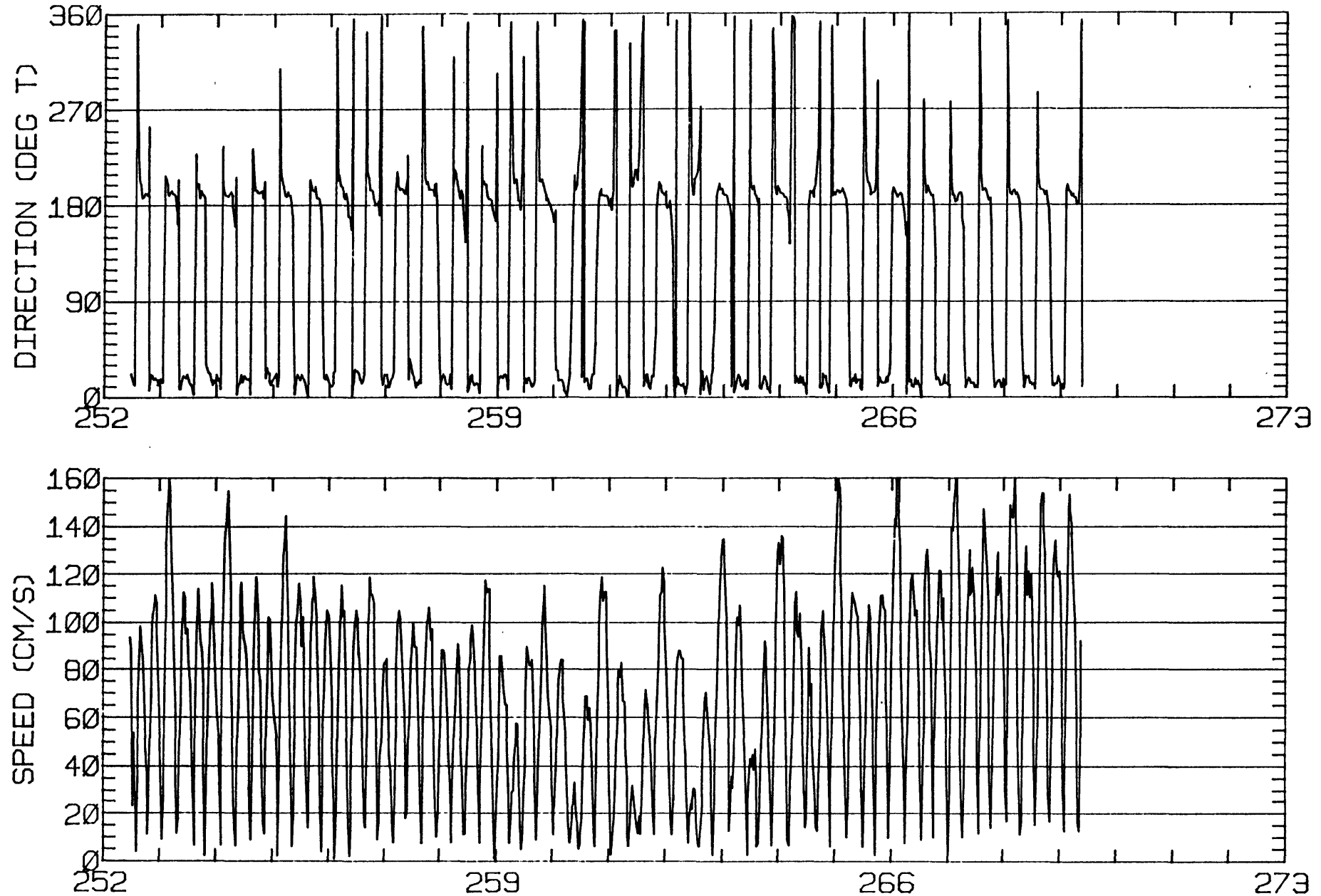
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	23.81	1.54	7.6	39.6	ANTI-CLOCKWISE
K1	26.07	0.94	8.3	68.2	ANTI-CLOCKWISE
N2	18.29	1.48	10.8	296.9	ANTI-CLOCKWISE
M2	104.47	4.87	13.4	317.3	ANTI-CLOCKWISE
S2	25.78	0.68	16.5	326.6	ANTI-CLOCKWISE
M4	6.45	2.10	358.6	81.8	ANTI-CLOCKWISE

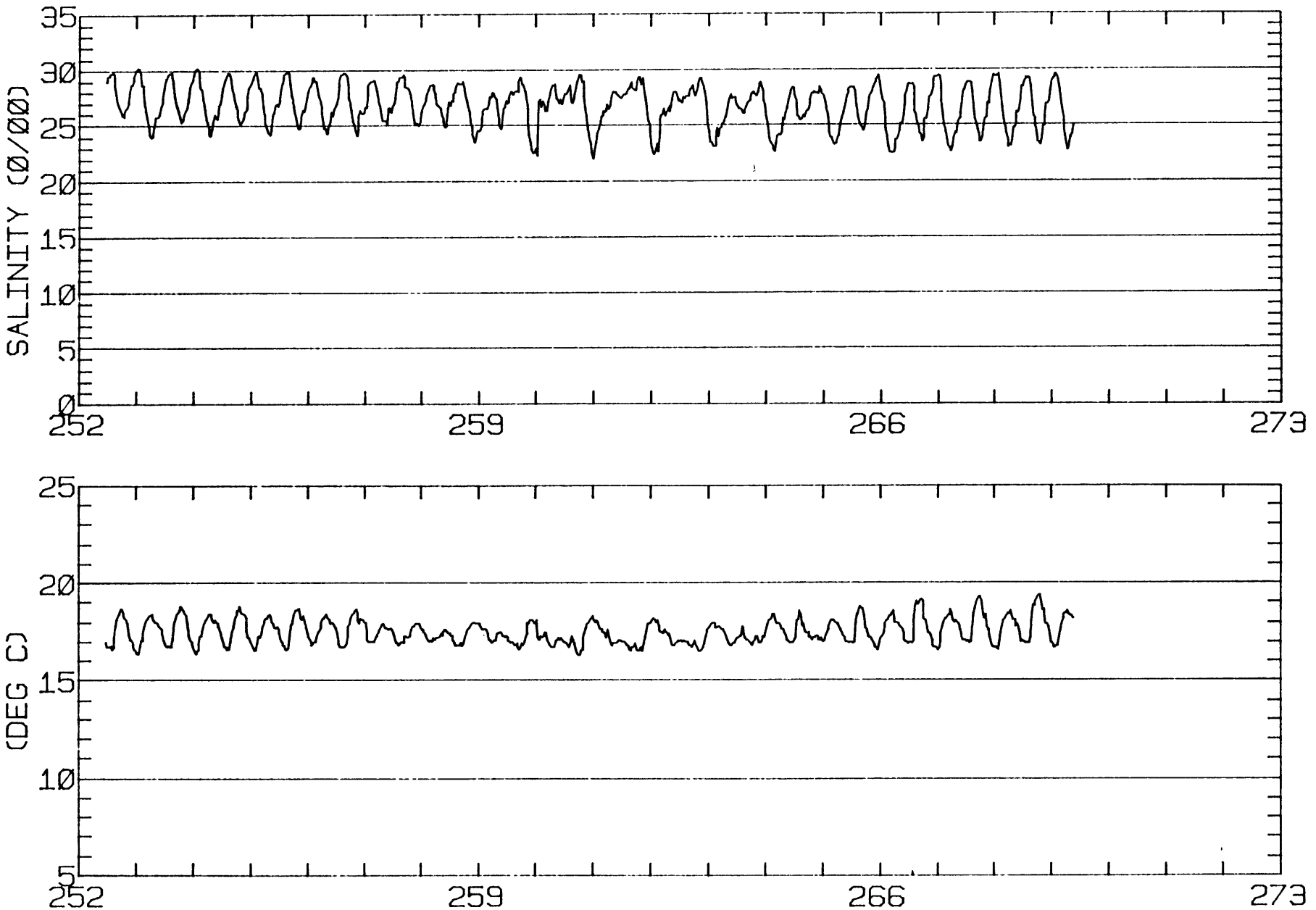
RMS SPEED: 79.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 180.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 76.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 12.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 7.39 CM/SEC
STANDARD DEVIATION V SERIES: 11.42 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.3	-0.3	247.
2	12	1.6	1.4	307.
3	8	2.3	-1.5	288.
ALL	32	2.0	0.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-12W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-12W
METER Ø15.1 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'47"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/ 8/80 1052 PST JULIAN DAY=252
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

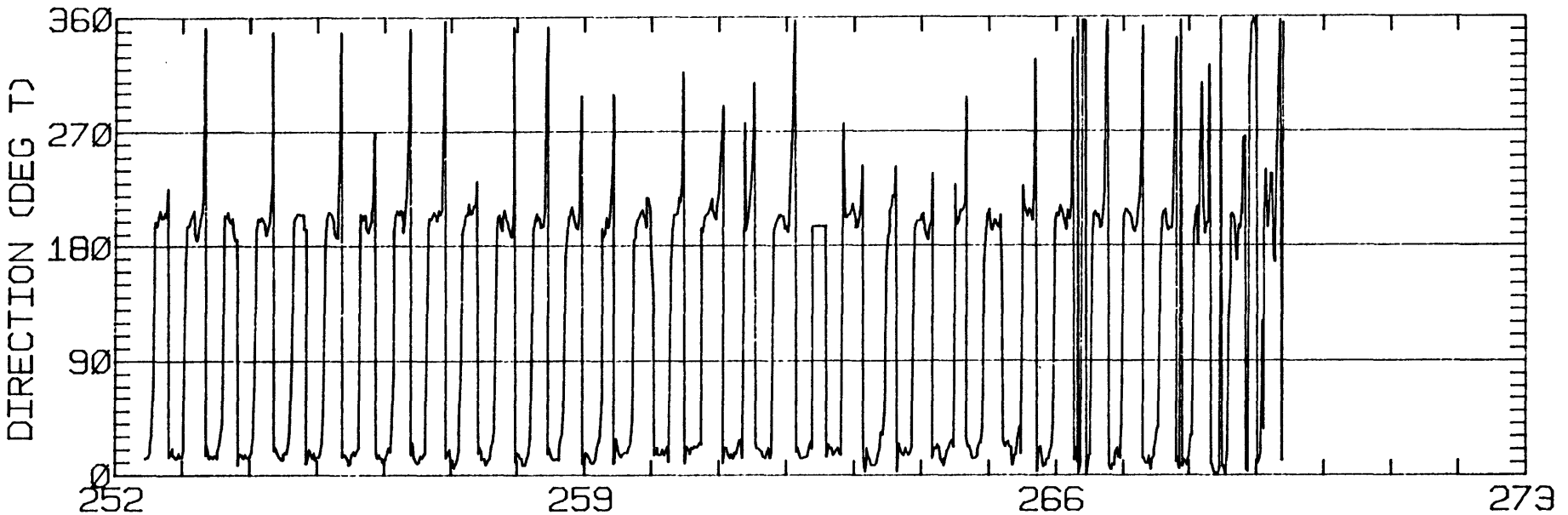
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

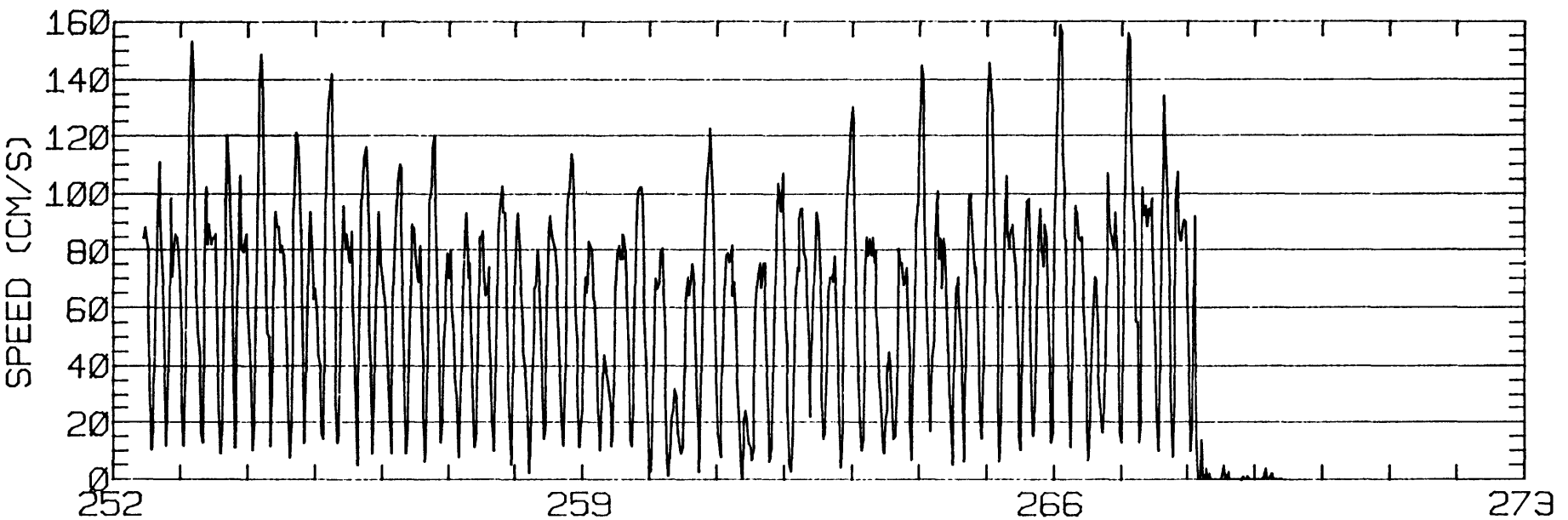
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.65	1.06	19.6	40.1	CLOCKWISE
K1	23.44	0.07	21.0	66.6	ANTI-CLOCKWISE
N2	16.04	0.76	15.1	300.6	CLOCKWISE
M2	94.37	1.08	18.6	311.7	CLOCKWISE
S2	20.87	1.39	14.8	331.8	CLOCKWISE
M4	9.78	1.43	36.0	92.0	ANTI-CLOCKWISE

RMS SPEED: 69.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 159.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 70.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 18.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 9.52 CM/SEC
STANDARD DEVIATION V SERIES: 13.14 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.0	1.8	247.
2	12	-0.9	6.0	307.
3	4	-4.5	2.7	278.
ALL	28	-2.3	3.7	



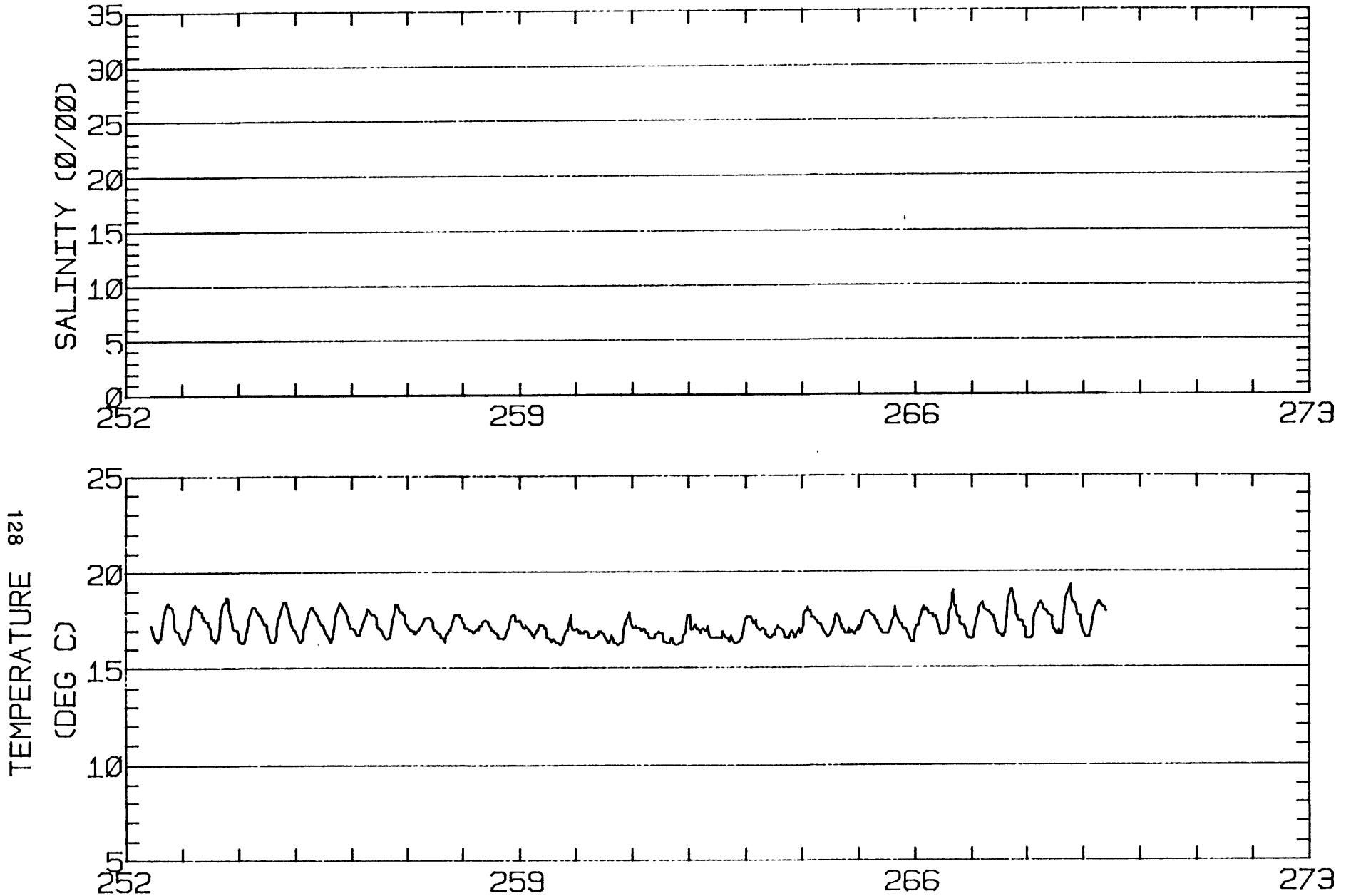


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 18 37-58-47N 122-26-12W

METER 009.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-12W
METER ØØ9.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'47"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.2 M (BELOW MLLW)
START TIME OF SERIES: 9/ 8/80 1104 PST JULIAN DAY=252
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

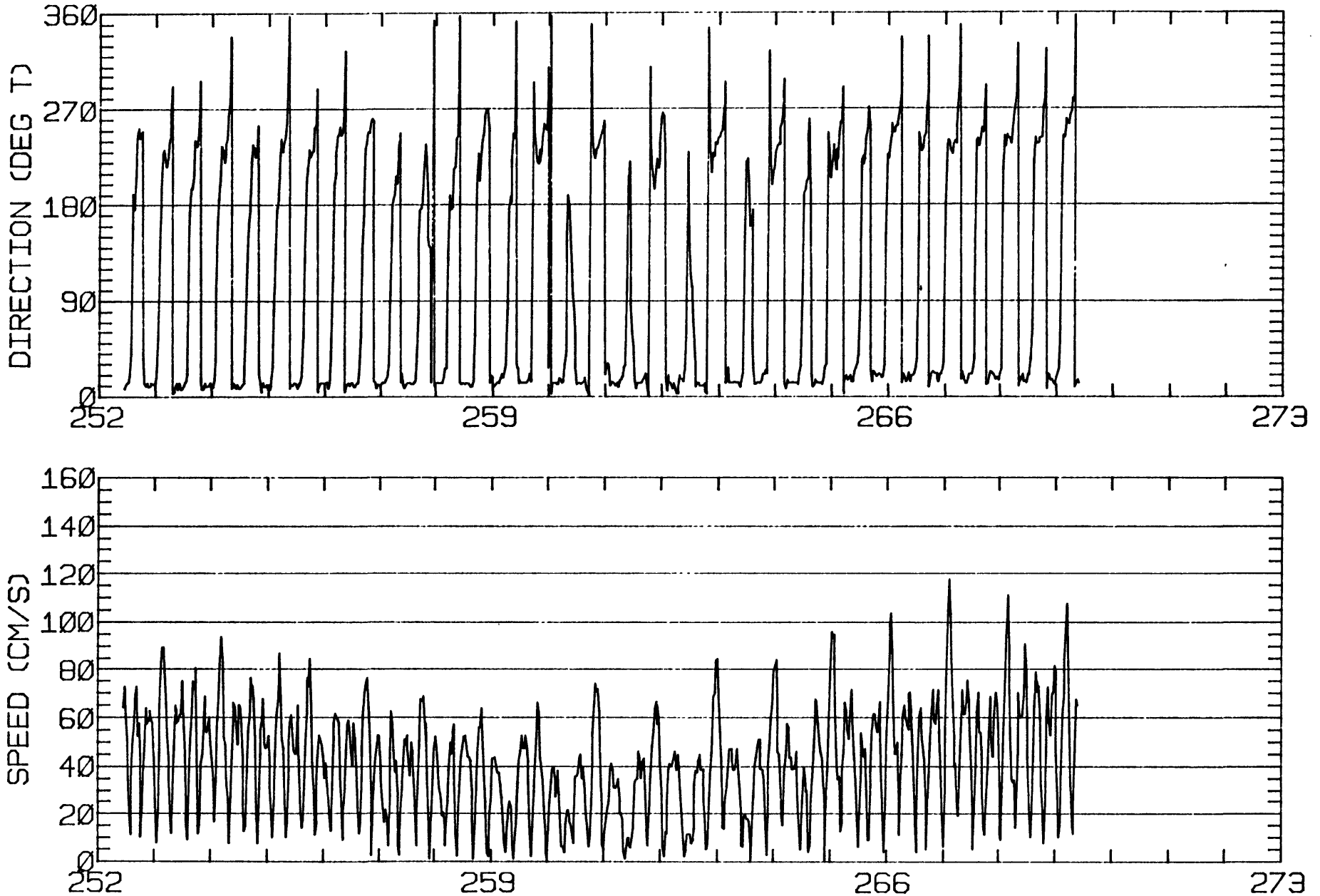
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.05	2.27	55.7	43.2	CLOCKWISE
K1	15.31	0.48	44.5	67.6	CLOCKWISE
N2	13.80	2.17	55.8	282.6	CLOCKWISE
M2	55.41	7.61	33.3	304.7	CLOCKWISE
S2	15.22	0.21	33.4	324.9	CLOCKWISE
M4	9.86	3.34	69.9	76.2	CLOCKWISE

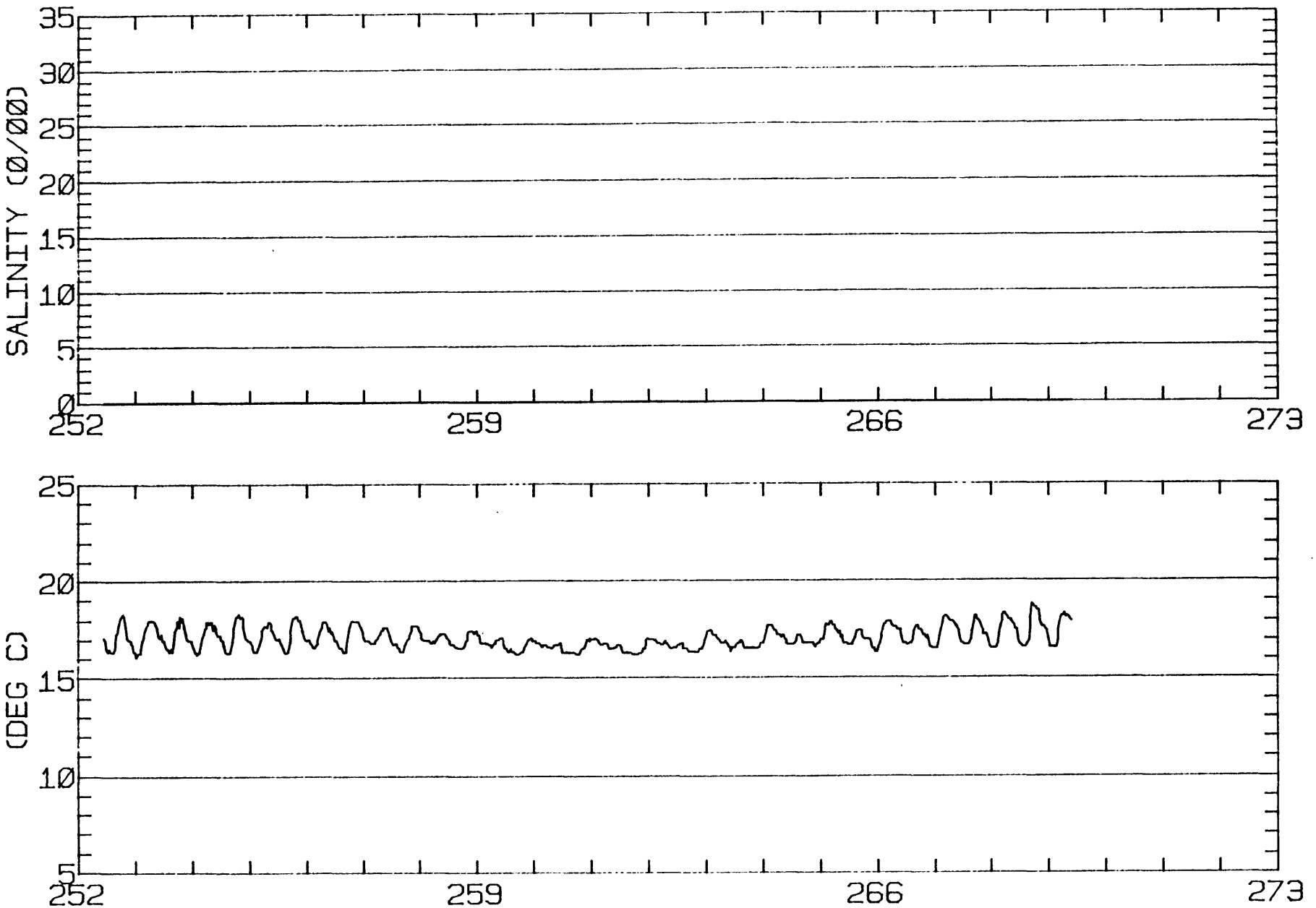
RMS SPEED: 47.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 100.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 38.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 38.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 11.24 CM/SEC
STANDARD DEVIATION V SERIES: 10.13 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.1	9.6	247.
2	12	-4.8	11.1	307.
3	8	-11.0	15.2	288.
ALL	32	-7.2	11.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-12W
METER 002.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-12W
METER 002.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'49"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/25/80 1110 PST JULIAN DAY=269
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

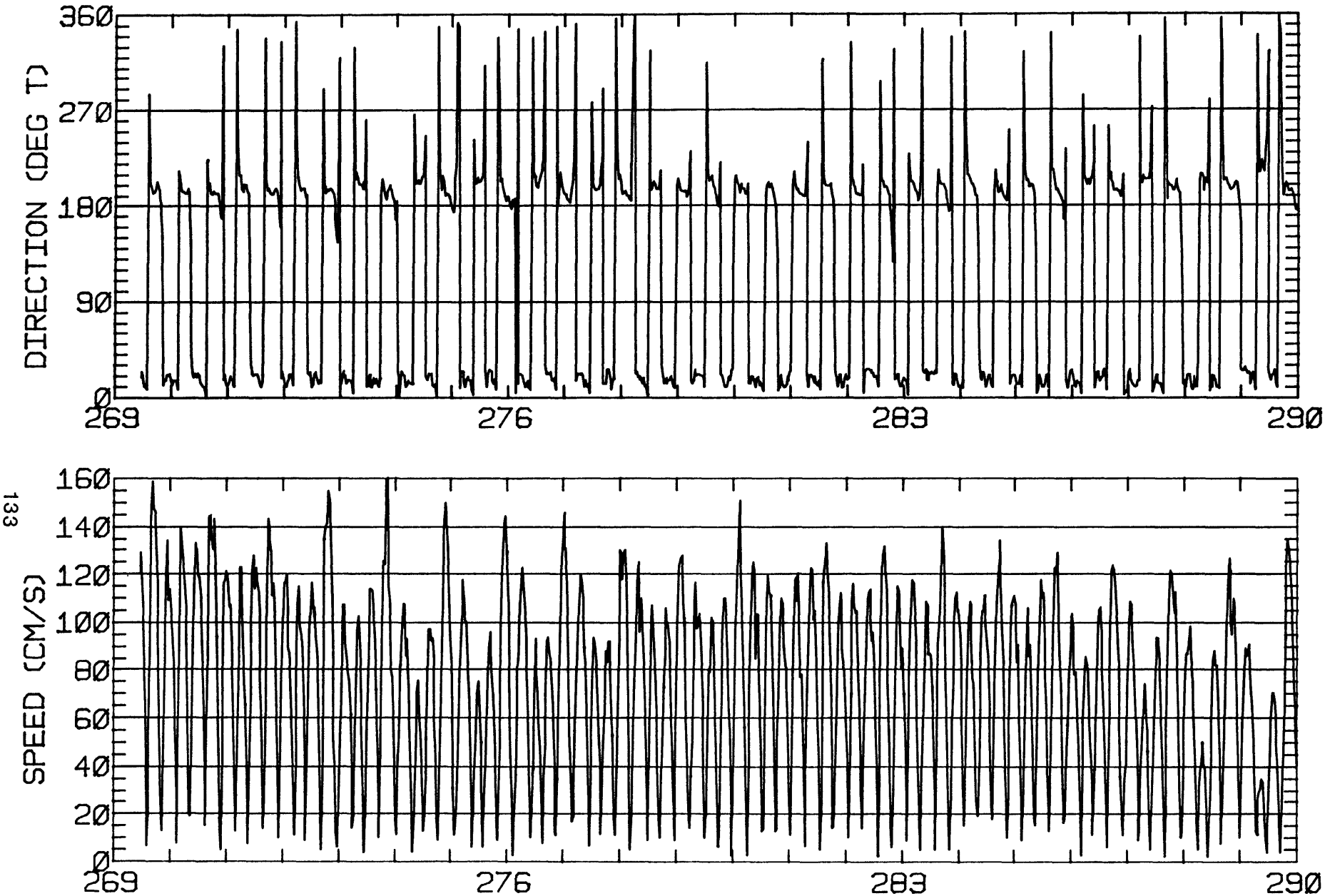
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.81	2.48	8.3	52.2	ANTI-CLOCKWISE
K1	24.18	1.32	13.5	52.6	ANTI-CLOCKWISE
N2	24.65	0.03	16.2	312.5	CLOCKWISE
M2	105.33	3.70	17.0	323.0	ANTI-CLOCKWISE
S2	32.52	1.14	18.7	309.0	ANTI-CLOCKWISE
M4	5.03	1.81	9.0	97.9	ANTI-CLOCKWISE

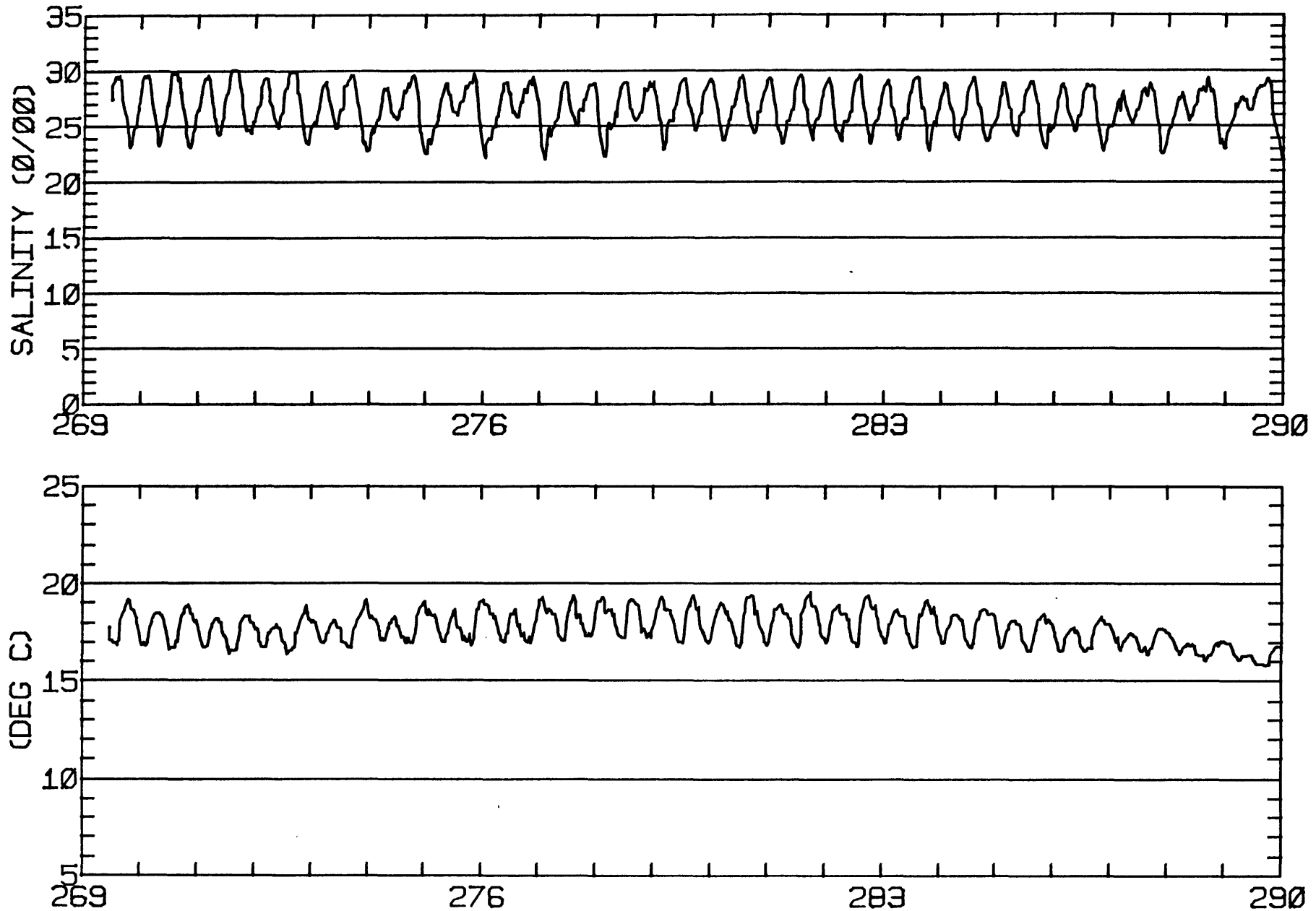
RMS SPEED: 82.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 182.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 69.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 15.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 8.93 CM/SEC
STANDARD DEVIATION V SERIES: 12.83 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	1.8	364.
2	12	0.7	0.6	251.
3	12	0.5	1.7	275.
4	4	-1.0	0.0	218.
ALL	40	0.8	1.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-49N 122-26-12W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-49N 122-26-12W
METER Ø15.1 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'49"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/25/80 1112 PST JULIAN DAY=269
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

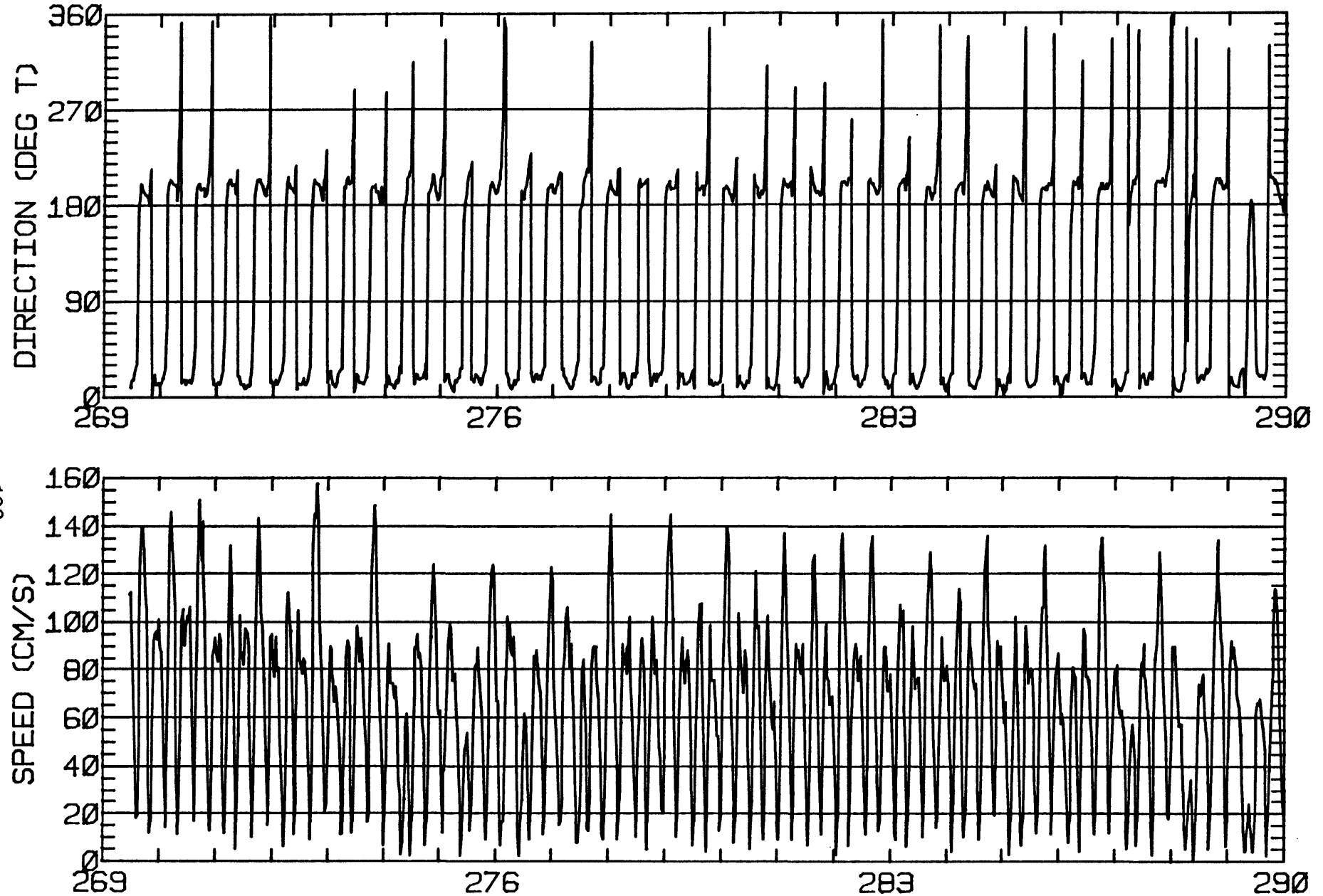
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
01	19.22	0.16	17.0	55.5	CLOCKWISE
K1	22.60	1.44	15.3	52.6	CLOCKWISE
N2	21.39	0.07	18.3	306.3	ANTI-CLOCKWISE
M2	92.84	1.25	16.0	316.6	CLOCKWISE
S2	28.20	0.43	15.0	307.8	CLOCKWISE
M4	10.42	0.79	20.5	105.4	ANTI-CLOCKWISE

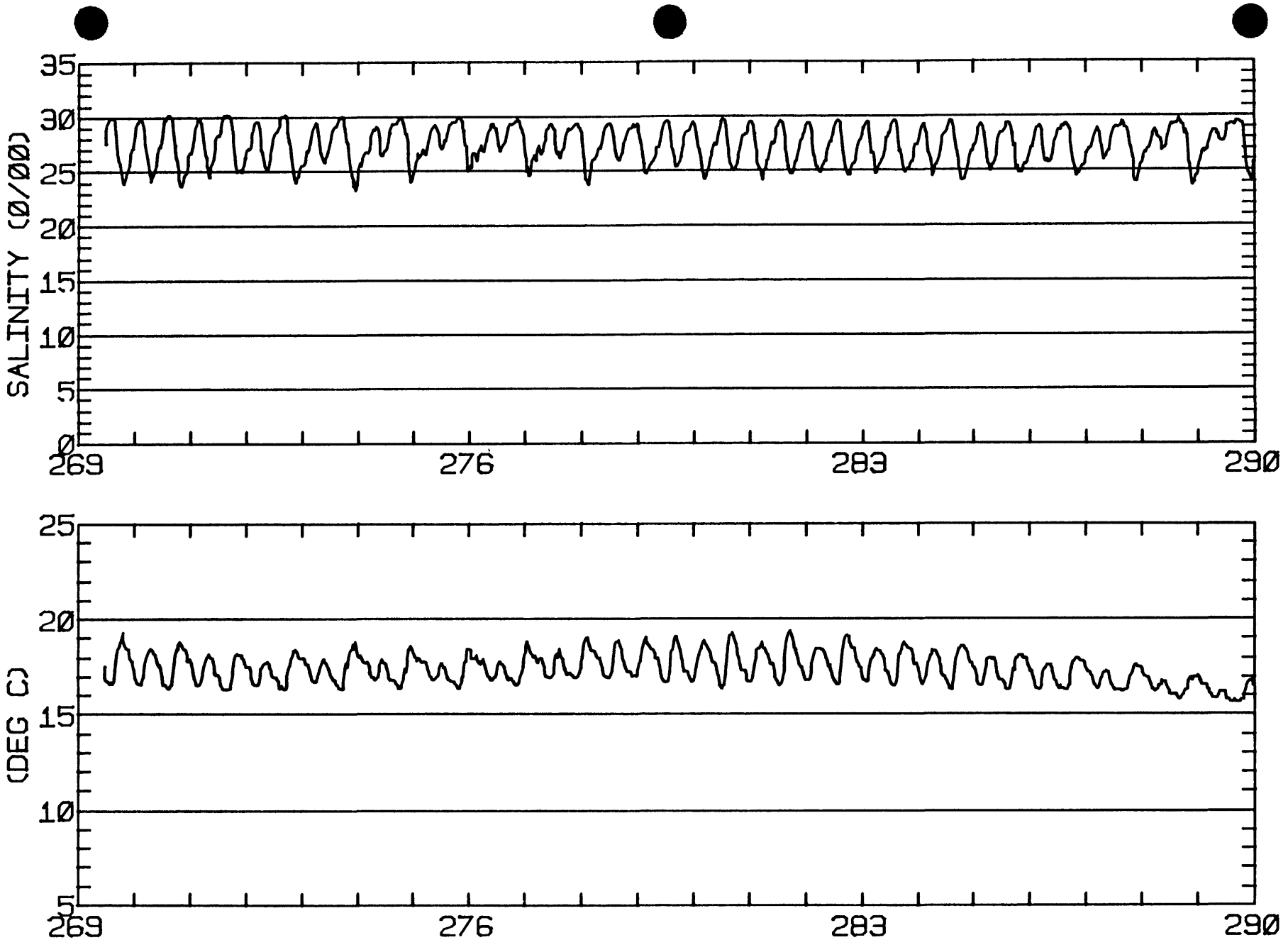
RMS SPEED: 74.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 162.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 61.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 15.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 9.44 CM/SEC
STANDARD DEVIATION V SERIES: 13.71 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.6	3.1	364.
2	12	-0.2	2.9	251.
3	12	-2.1	2.3	275.
4	4	2.0	7.6	218.
ALL	40	-0.7	3.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-49N 122-26-12W
METER 009.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-49N 122-26-12W
METER ØØ9.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'49"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.2 M (BELOW MLLW)
START TIME OF SERIES: 9/25/80 1134 PST JULIAN DAY=269
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

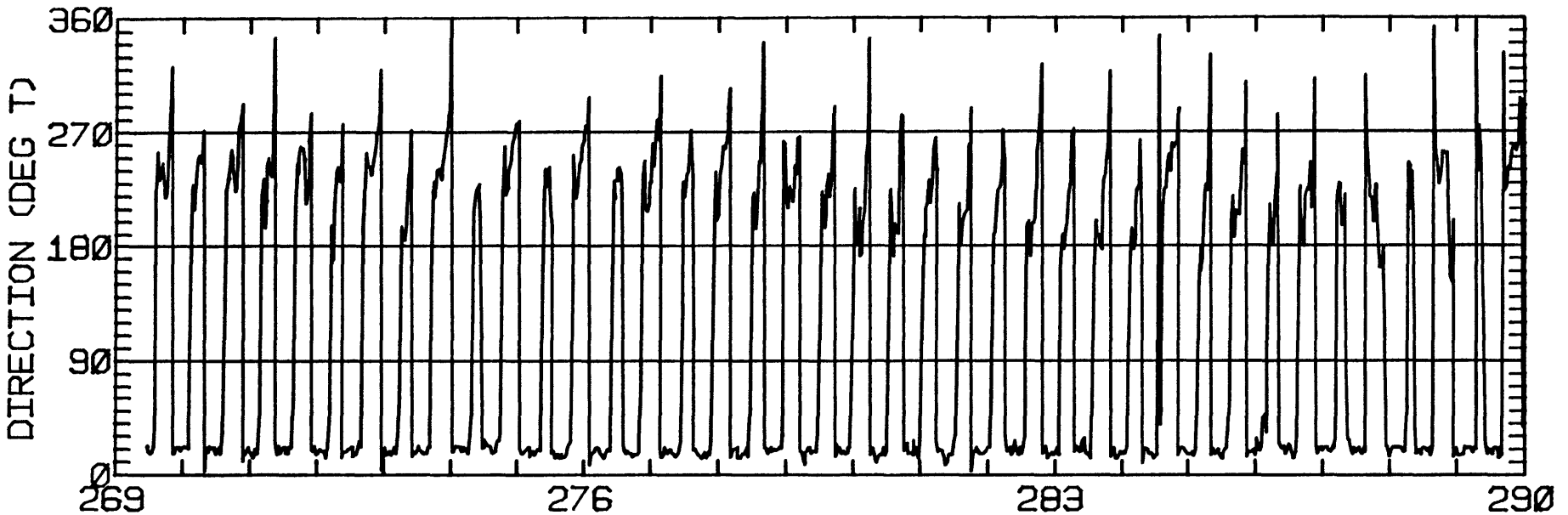
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

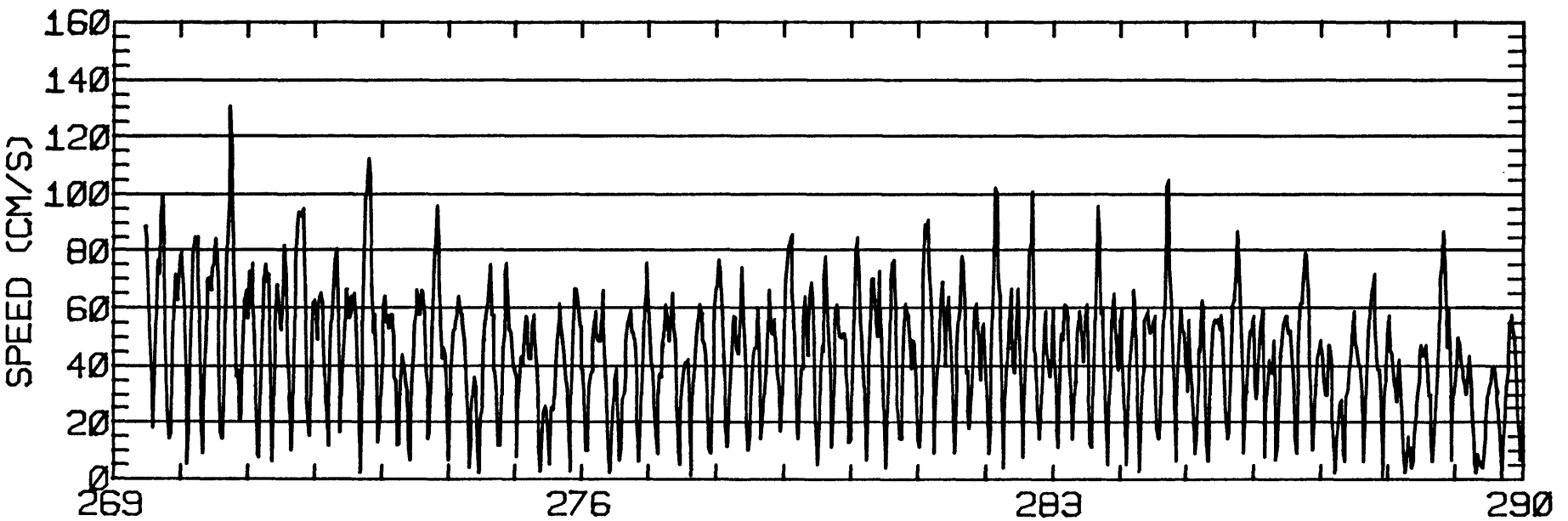
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.22	2.11	55.8	61.5	CLOCKWISE
K1	13.49	0.10	45.3	47.9	ANTI-CLOCKWISE
N2	14.33	0.48	54.8	292.8	ANTI-CLOCKWISE
M2	55.03	1.64	31.7	310.3	CLOCKWISE
S2	18.61	4.11	26.2	304.6	CLOCKWISE
M4	8.54	2.89	44.3	87.3	CLOCKWISE

RMS SPEED: 49.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 98.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 35.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 12.90 CM/SEC
STANDARD DEVIATION V SERIES: 12.48 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.7	15.7	364.
2	12	-4.8	11.8	251.
3	12	-2.4	8.1	275.
4	4	-2.3	13.0	218.
ALL	40	-5.0	12.0	



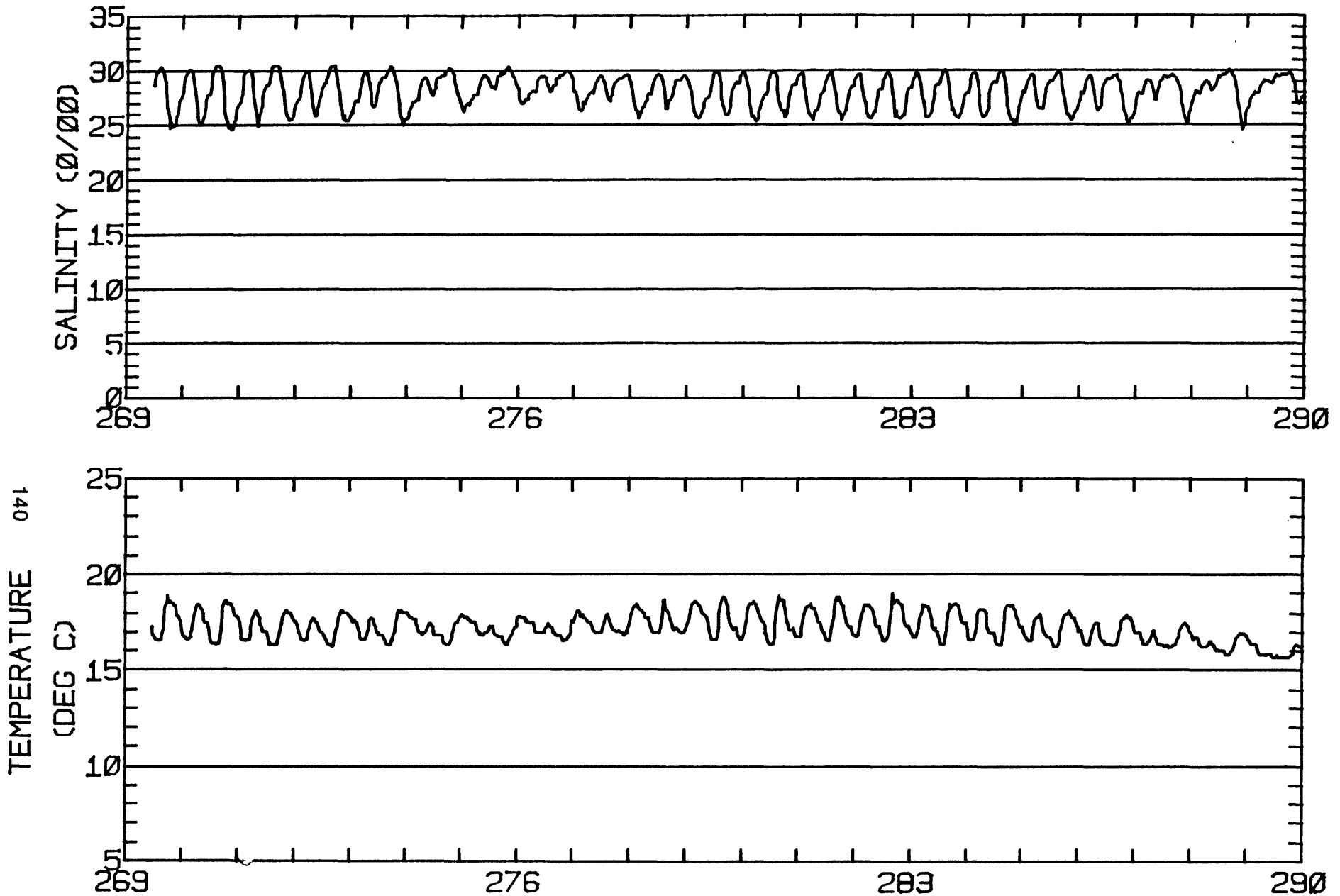


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 18 37-58-49N 122-26-12W

METER 002.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-49N 122-26-12W
METER ØØ2.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'48"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:10/16/80 1252 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

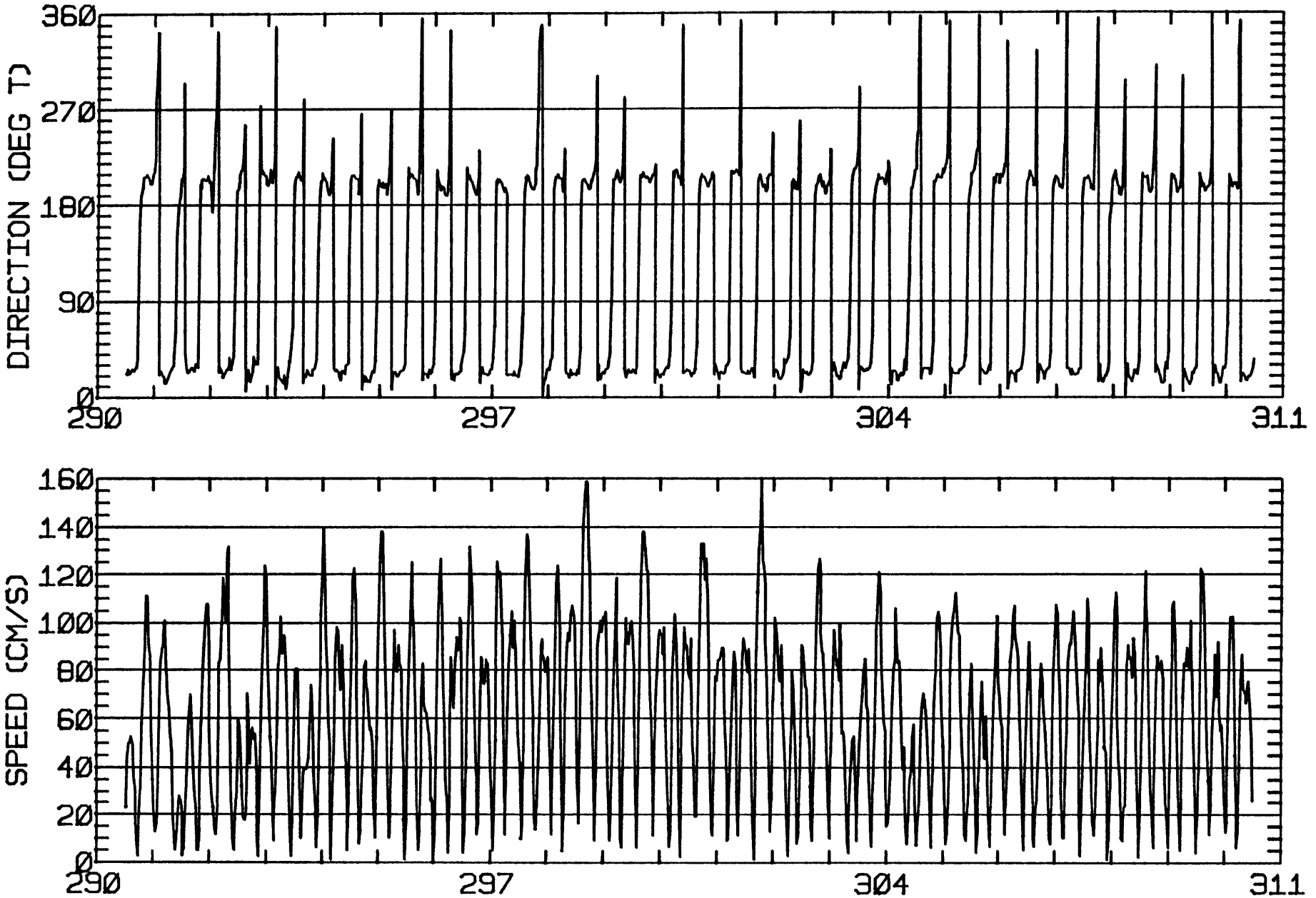
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.86	0.55	22.5	47.2	CLOCKWISE
K1	29.71	0.37	24.2	45.7	CLOCKWISE
N2	20.56	0.47	24.2	277.7	CLOCKWISE
M2	80.61	2.15	22.9	317.7	CLOCKWISE
S2	17.49	0.21	18.9	296.1	CLOCKWISE
M4	8.50	0.51	24.1	95.1	ANTI-CLOCKWISE

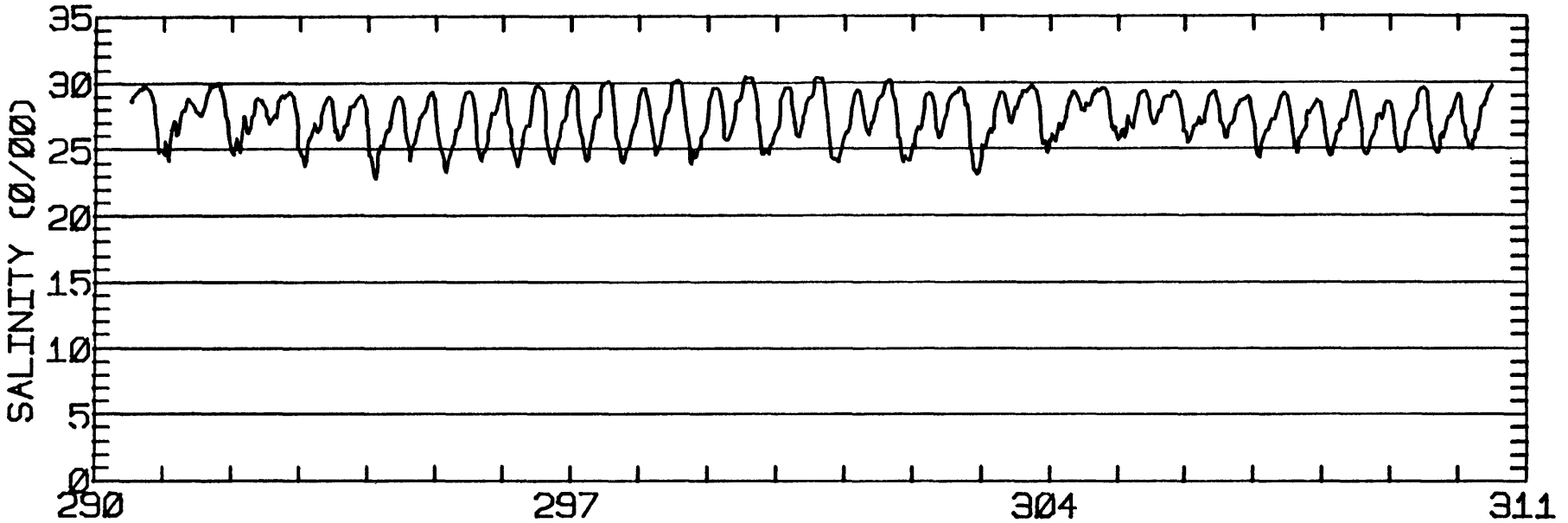
RMS SPEED: 71.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 145.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 51.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 22.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 10.05 CM/SEC
STANDARD DEVIATION V SERIES: 13.54 CM/SEC

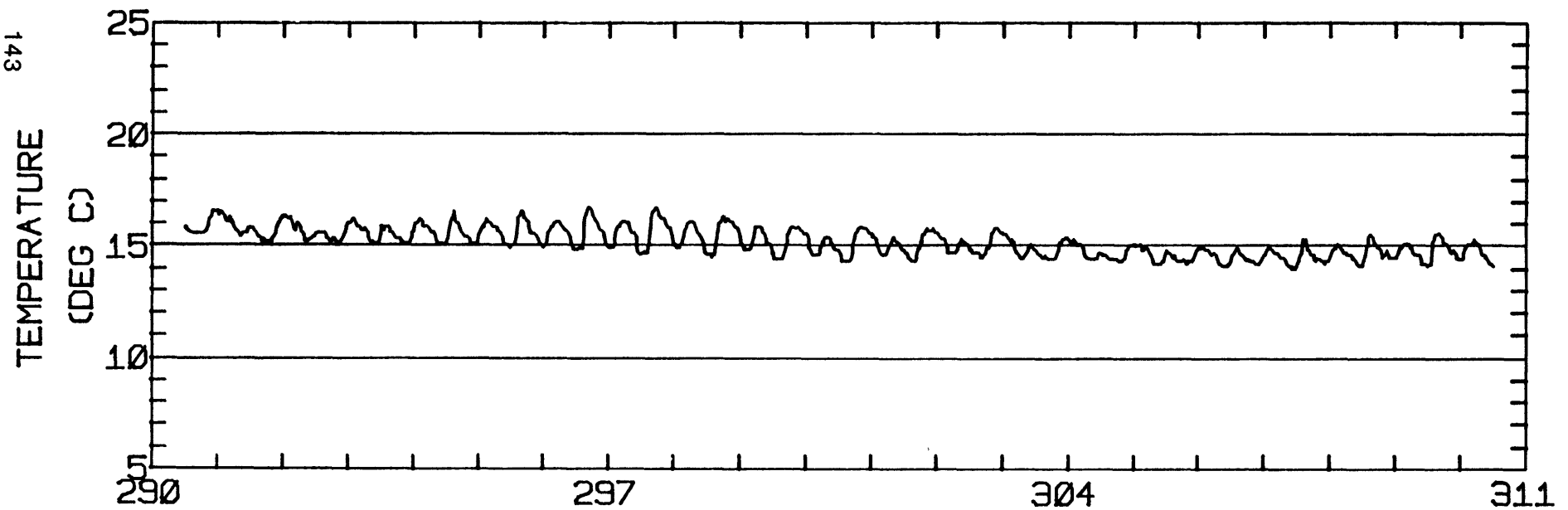
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.4	1.4	157.
2	12	-0.3	0.2	176.
3	12	2.4	7.8	157.
4	2	2.5	5.2	159.
ALL	38	0.9	3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-48N 122-26-12W
METER 009.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-48N 122-26-12W
METER ØØ9.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'48"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.2 M (BELOW MLLW)
START TIME OF SERIES: 10/16/80 1514 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 8 M2-CYCLES

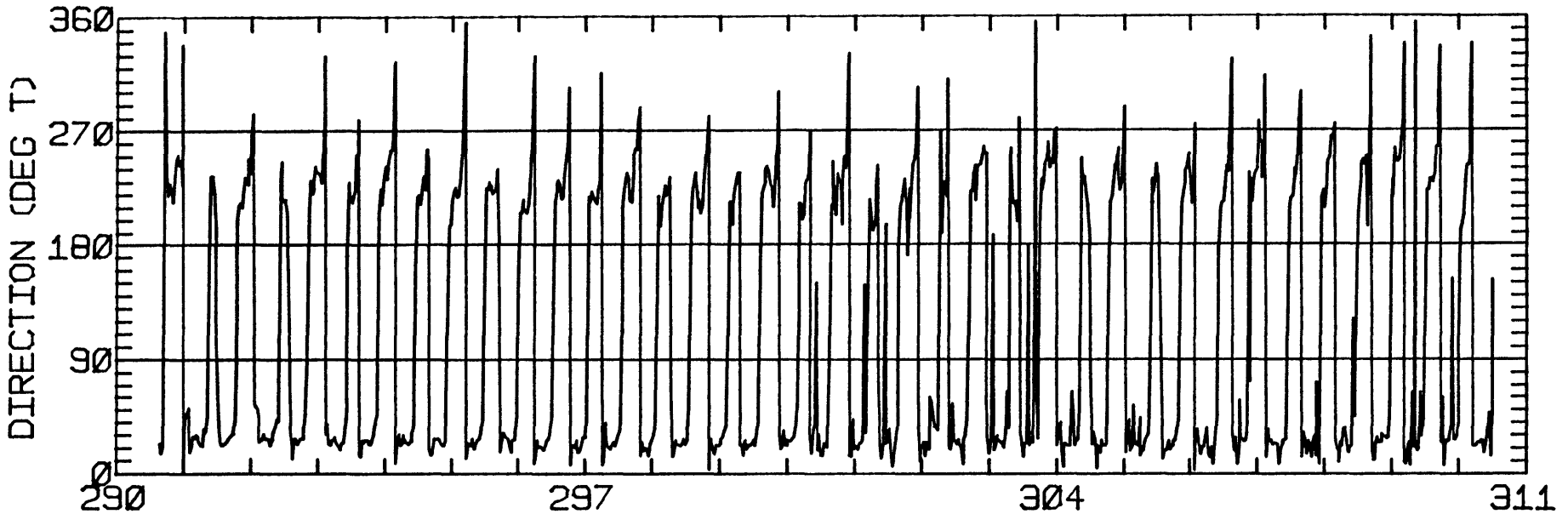
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

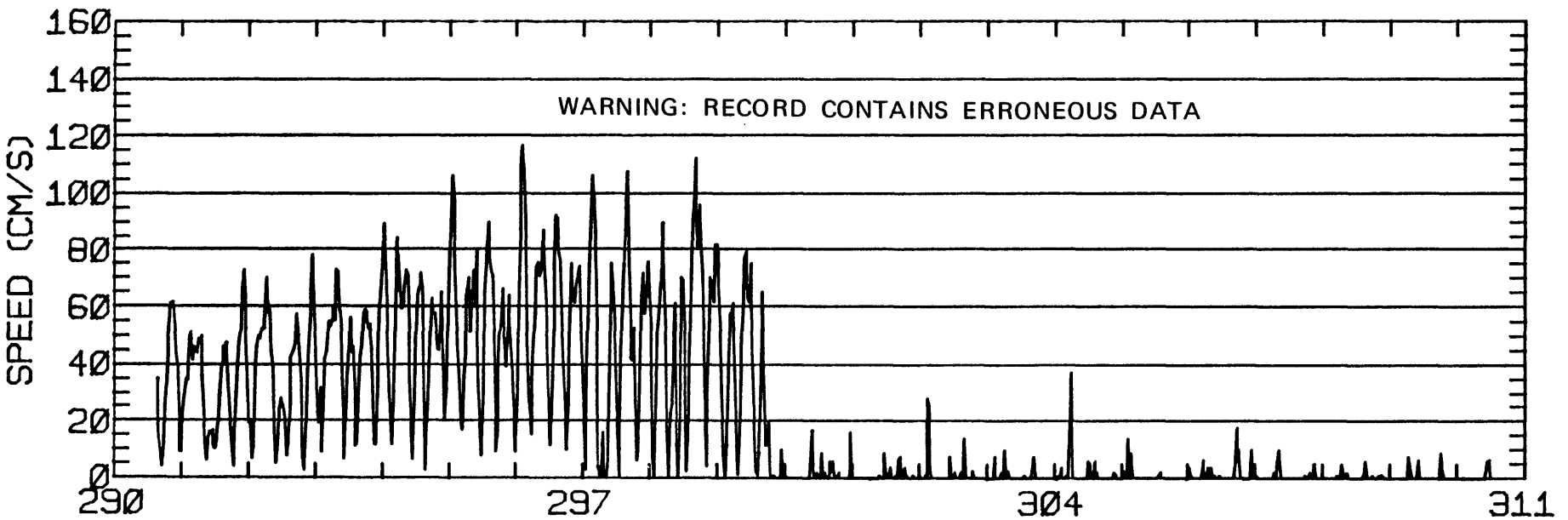
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.27	0.54	52.7	23.3	CLOCKWISE
K1	17.41	0.02	32.3	25.5	ANTI-CLOCKWISE
N2	25.53	3.35	59.5	278.5	ANTI-CLOCKWISE
M2	57.17	16.69	54.3	305.2	CLOCKWISE
S2	22.95	11.83	42.6	302.6	CLOCKWISE
M4	8.29	0.81	62.3	53.9	CLOCKWISE

RMS SPEED: 44.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 114.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 48.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 8.09 CM/SEC
STANDARD DEVIATION V SERIES: 9.50 CM/SEC

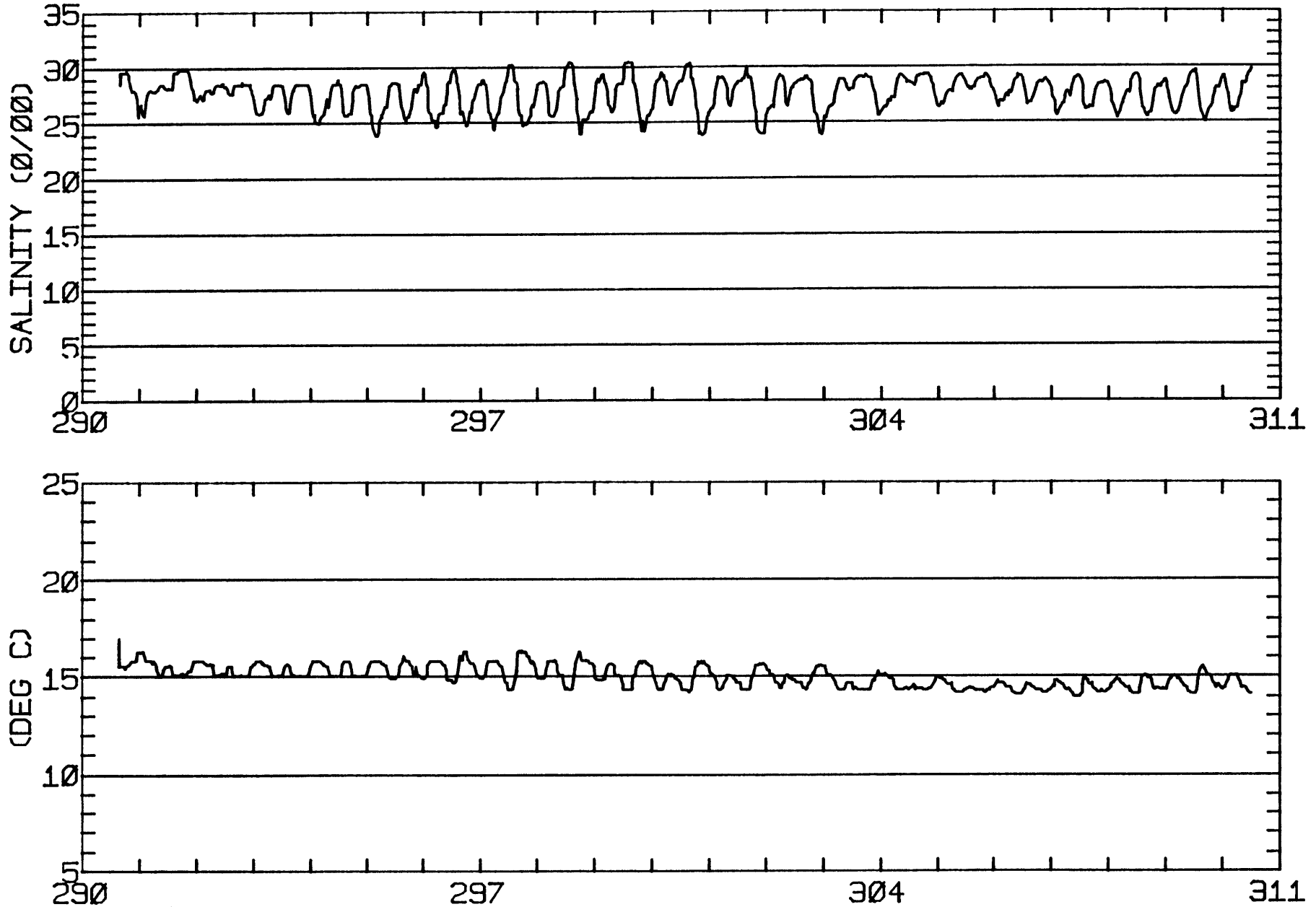
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	8	-1.1	11.6	173.
ALL	8	-1.1	11.6	





JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-48N 122-26-12W
METER 002.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-48N 122-26-12W
METER ØØ2.Ø METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'47"N 122 26'13"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:11/ 5/80 1400 PST JULIAN DAY=310
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

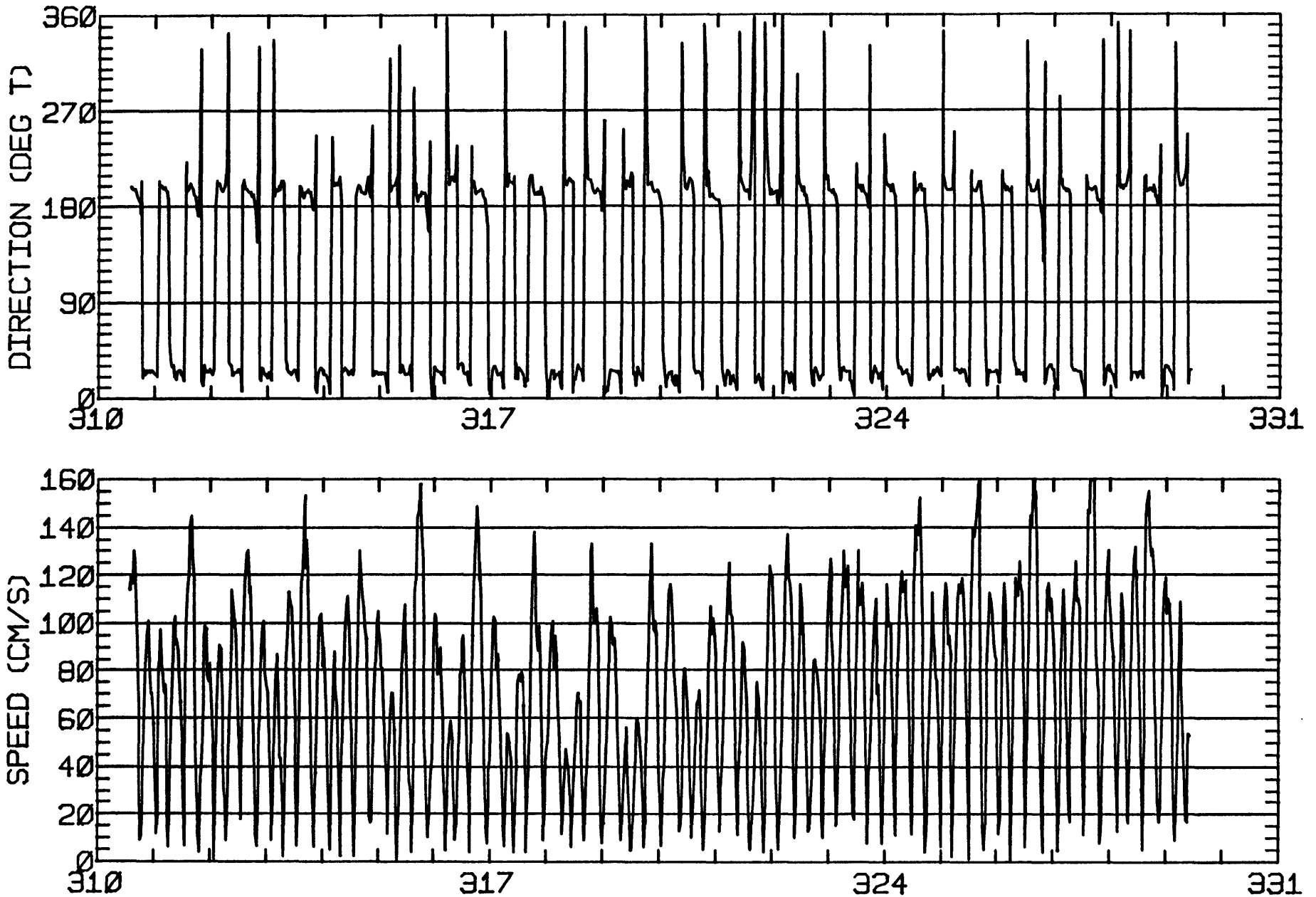
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.97	1.41	10.6	33.2	ANTI-CLOCKWISE
K1	39.11	1.46	16.4	44.1	ANTI-CLOCKWISE
N2	15.33	1.70	19.9	296.3	ANTI-CLOCKWISE
M2	94.33	2.61	20.3	315.9	ANTI-CLOCKWISE
S2	20.38	0.42	20.4	304.2	CLOCKWISE
M4	6.89	1.35	357.4	70.9	ANTI-CLOCKWISE

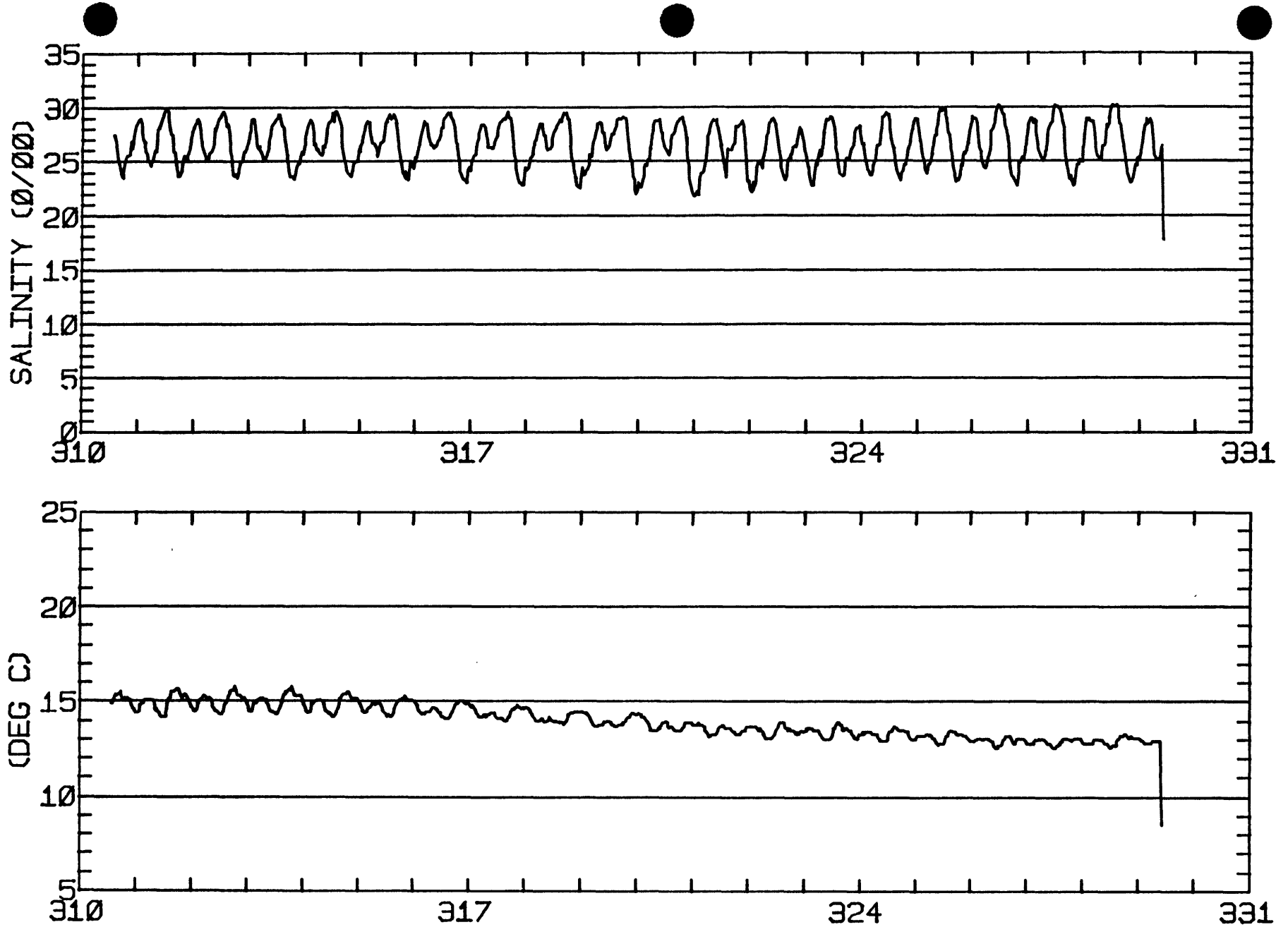
RMS SPEED: 80.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 170.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 51.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 18.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 8.58 CM/SEC
STANDARD DEVIATION V SERIES: 13.34 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.4	-2.4	192.
2	12	3.1	1.6	193.
3	12	5.5	0.2	170.
ALL	36	4.3	-0.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-13W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-13W
METER 015.1 METERS ABOVE BED. WATER DEPTH 021.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 18
POSITION: 37 58'47"N 122 26'13"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 5/80 1402 PST JULIAN DAY=310
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

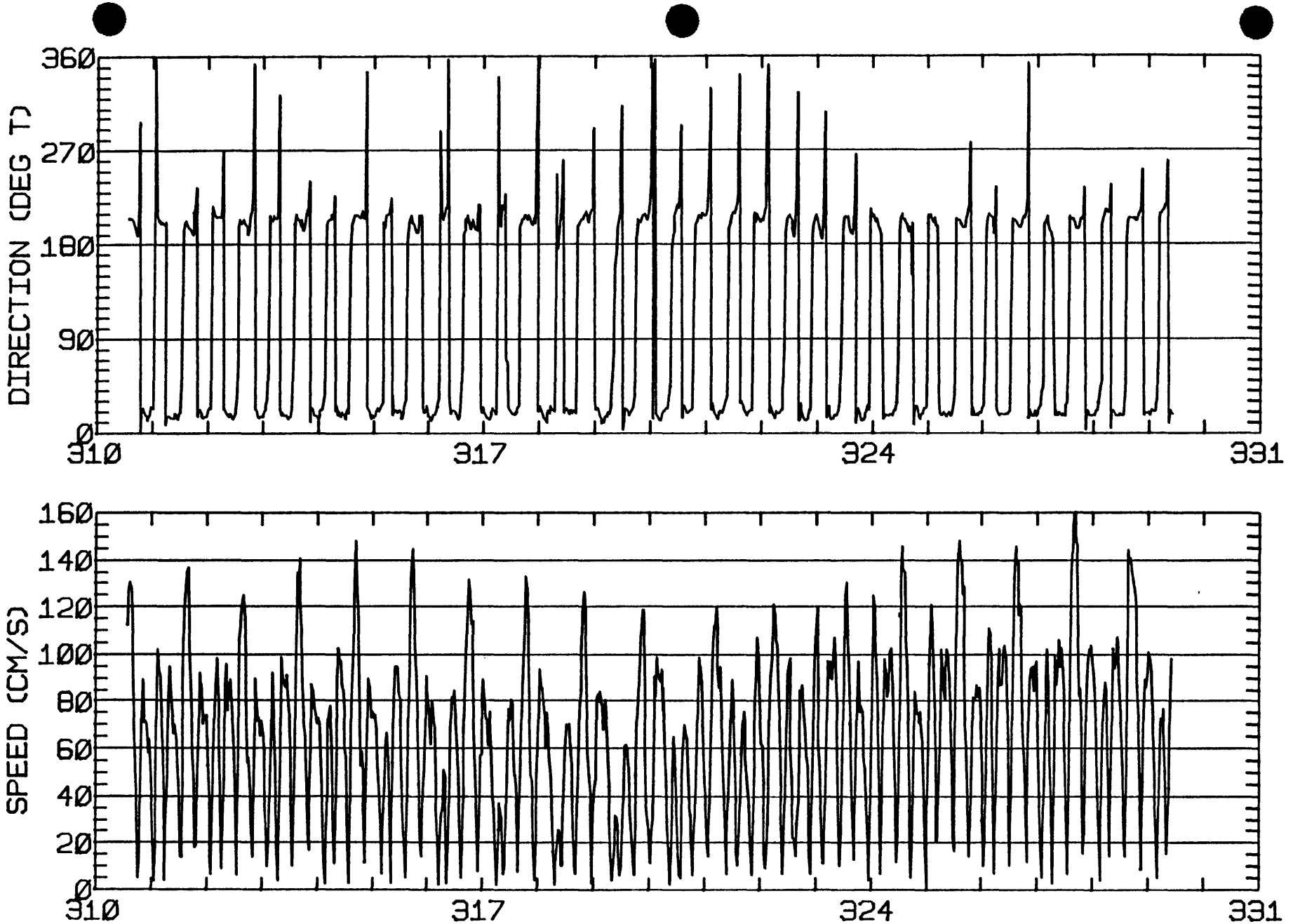
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.98	0.17	25.7	37.1	ANTI-CLOCKWISE
K1	37.83	1.28	21.2	45.6	CLOCKWISE
N2	15.25	0.82	22.1	294.0	CLOCKWISE
M2	83.15	0.88	20.9	309.9	CLOCKWISE
S2	20.98	0.52	18.9	308.3	CLOCKWISE
M4	10.31	0.69	32.3	84.7	ANTI-CLOCKWISE

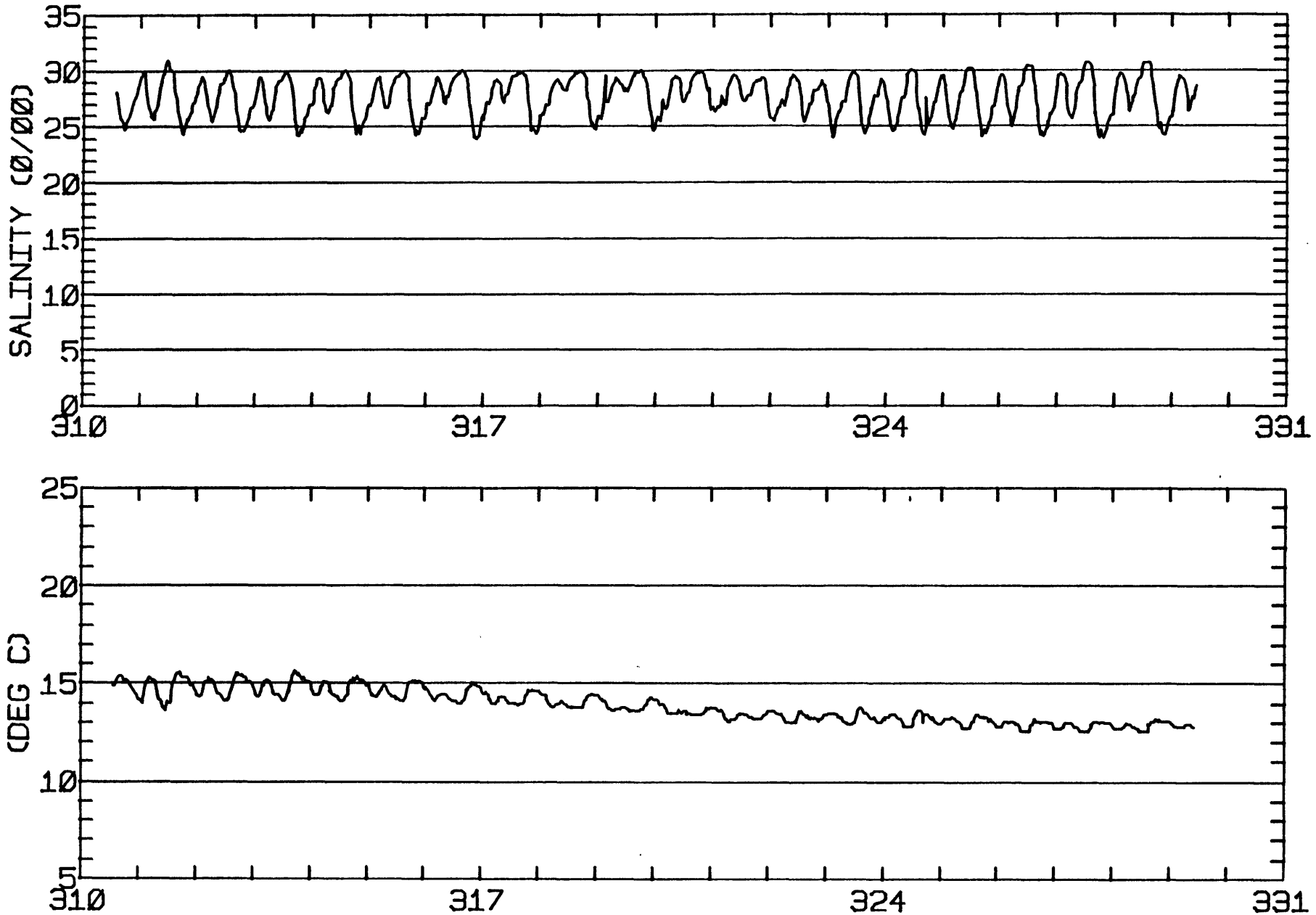
RMS SPEED: 74.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 158.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 21.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.53
STANDARD DEVIATION U-SERIES: 9.35 CM/SEC
STANDARD DEVIATION V SERIES: 13.39 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.1	1.8	192.
2	12	0.4	9.9	193.
3	12	-1.4	1.9	170.
ALL	36	-1.0	4.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-13W
METER 009.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 18 37-58-47N 122-26-13W
METER 009.0 METERS ABOVE BED. WATER DEPTH 021.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 19
POSITION: 38 1'36"N 122 25'29"W
METER TYPE: AANDERAA
WATER DEPTH: 3.4 M (MLLW)
METER DEPTH: 2.4 M (BELOW MLLW)
START TIME OF SERIES: 3/21/79 1210 PST JULIAN DAY= 80
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

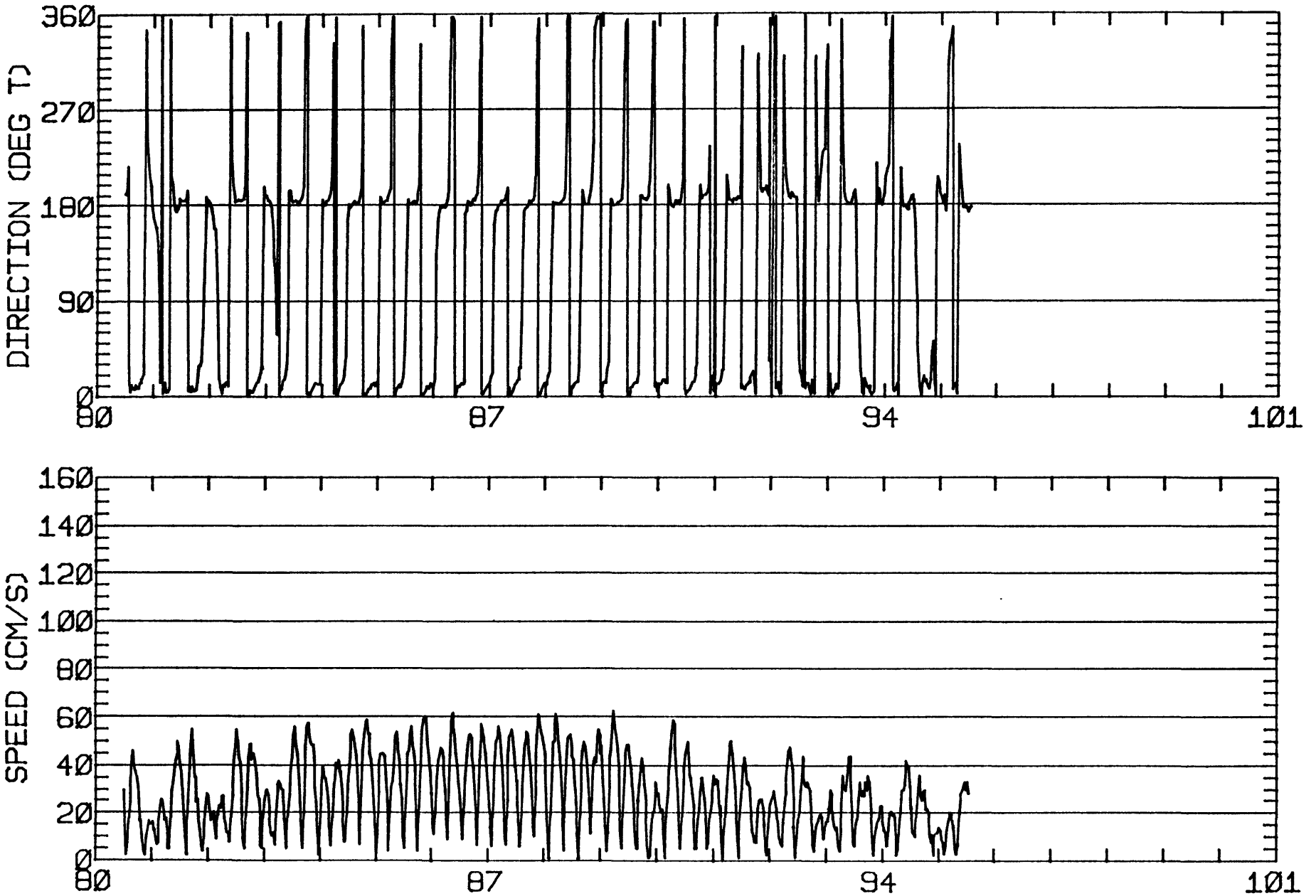
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

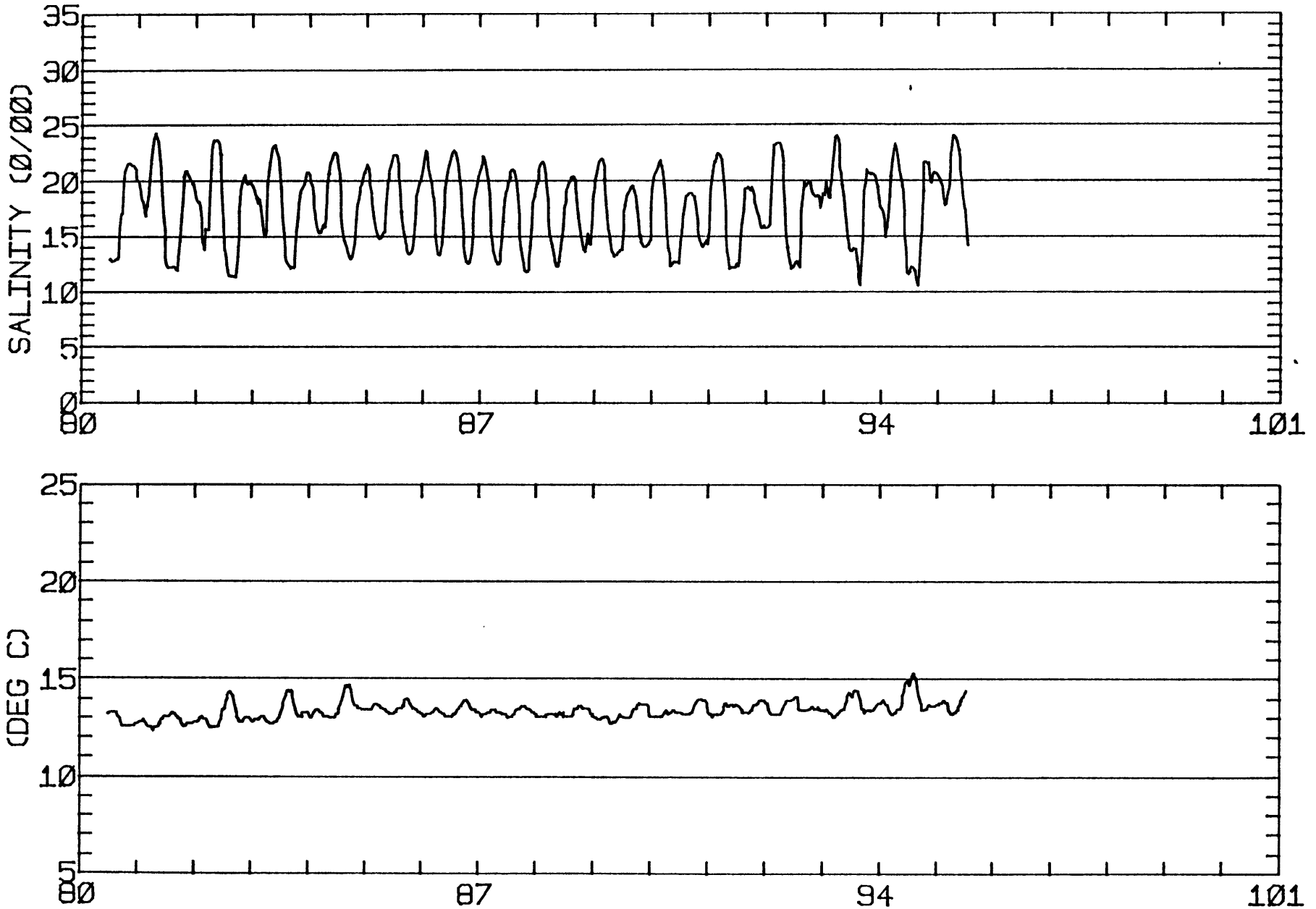
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.63	1.00	11.9	22.1	ANTI-CLOCKWISE
K1	10.30	0.14	3.6	33.5	ANTI-CLOCKWISE
N2	8.85	0.82	3.8	275.0	CLOCKWISE
M2	36.26	1.36	7.3	304.1	CLOCKWISE
S2	10.34	2.04	1.9	305.7	CLOCKWISE
M4	3.11	0.25	351.1	127.4	ANTI-CLOCKWISE

RMS SPEED: 33.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 64.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 6.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 3.28 CM/SEC
STANDARD DEVIATION V SERIES: 5.27 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.6	2.1	754.
2	12	0.5	1.4	1057.
3	4	0.9	1.3	861.
ALL	28	1.0	1.7	


DIRECTION (DEG T)
360
270
180
90
0
80
87
94
101
SPEED (CM/S)
160
140
120
100
80
60
40
20
0
80
87
94
101
JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 19 38- 1-36N 122-25-29W
METER 001.0 METERS ABOVE BED. WATER DEPTH 003.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 19 38- 1-36N 122-25-29W
METER ØØ1.Ø METERS ABOVE BED. WATER DEPTH ØØ3.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 19
POSITION: 38 1'24"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 3.4 M (MLLW)
METER DEPTH: 1.8 M (BELOW MLLW)
START TIME OF SERIES: 9/11/80 910 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

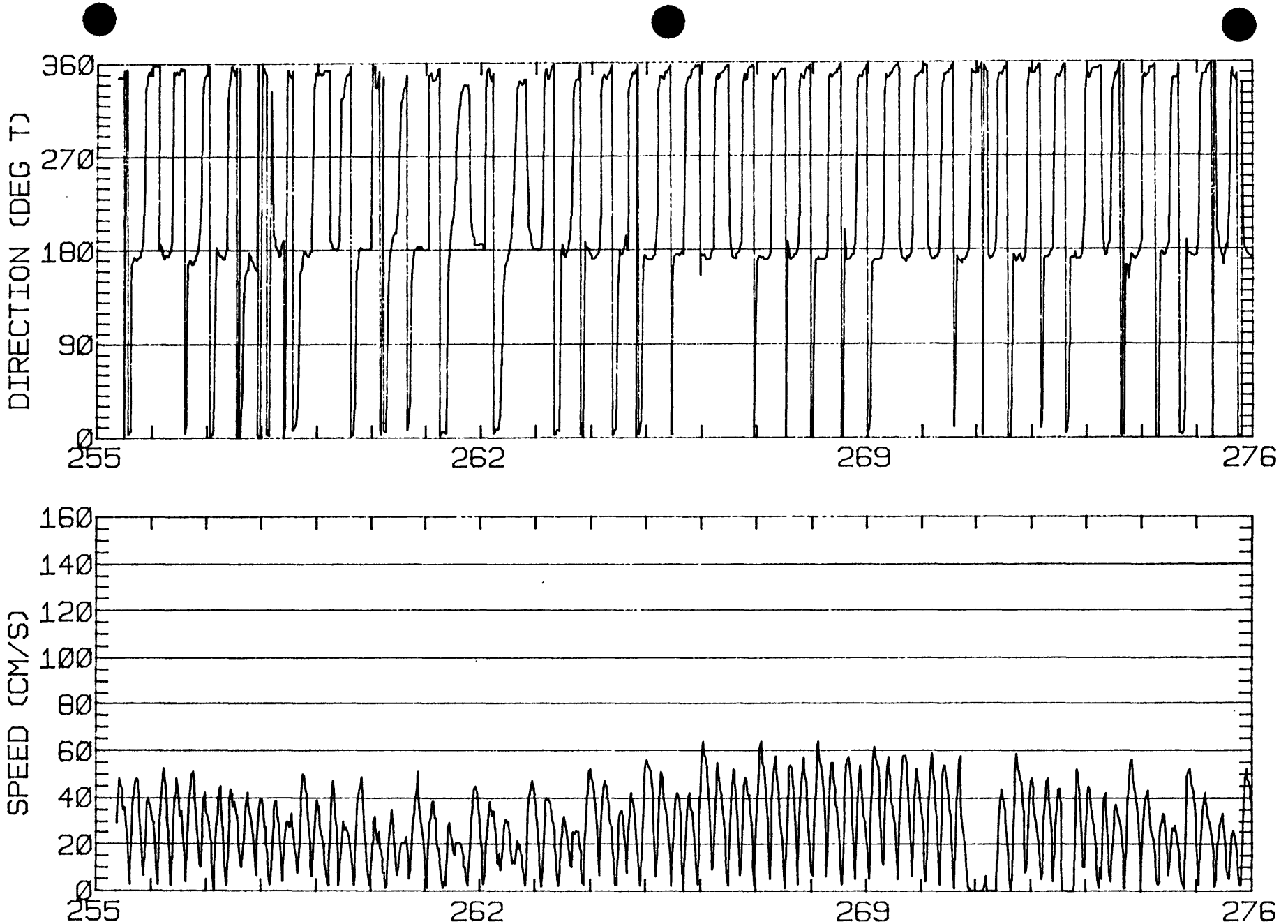
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.45	0.91	356.2	6.7	ANTI-CLOCKWISE
K1	7.84	0.42	354.1	45.6	ANTI-CLOCKWISE
N2	5.28	0.10	335.4	269.5	ANTI-CLOCKWISE
M2	43.13	1.51	353.3	296.2	CLOCKWISE
S2	11.05	0.13	349.6	304.1	CLOCKWISE
M4	3.12	1.01	335.9	99.6	ANTI-CLOCKWISE

RMS SPEED: 32.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 69.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 353.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.28
STANDARD DEVIATION U-SERIES: 3.44 CM/SEC
STANDARD DEVIATION V SERIES: 5.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.3	-0.3	285.
2	12	-1.7	-2.3	302.
3	2	-0.5	-2.5	312.
ALL	26	-1.4	-1.4	

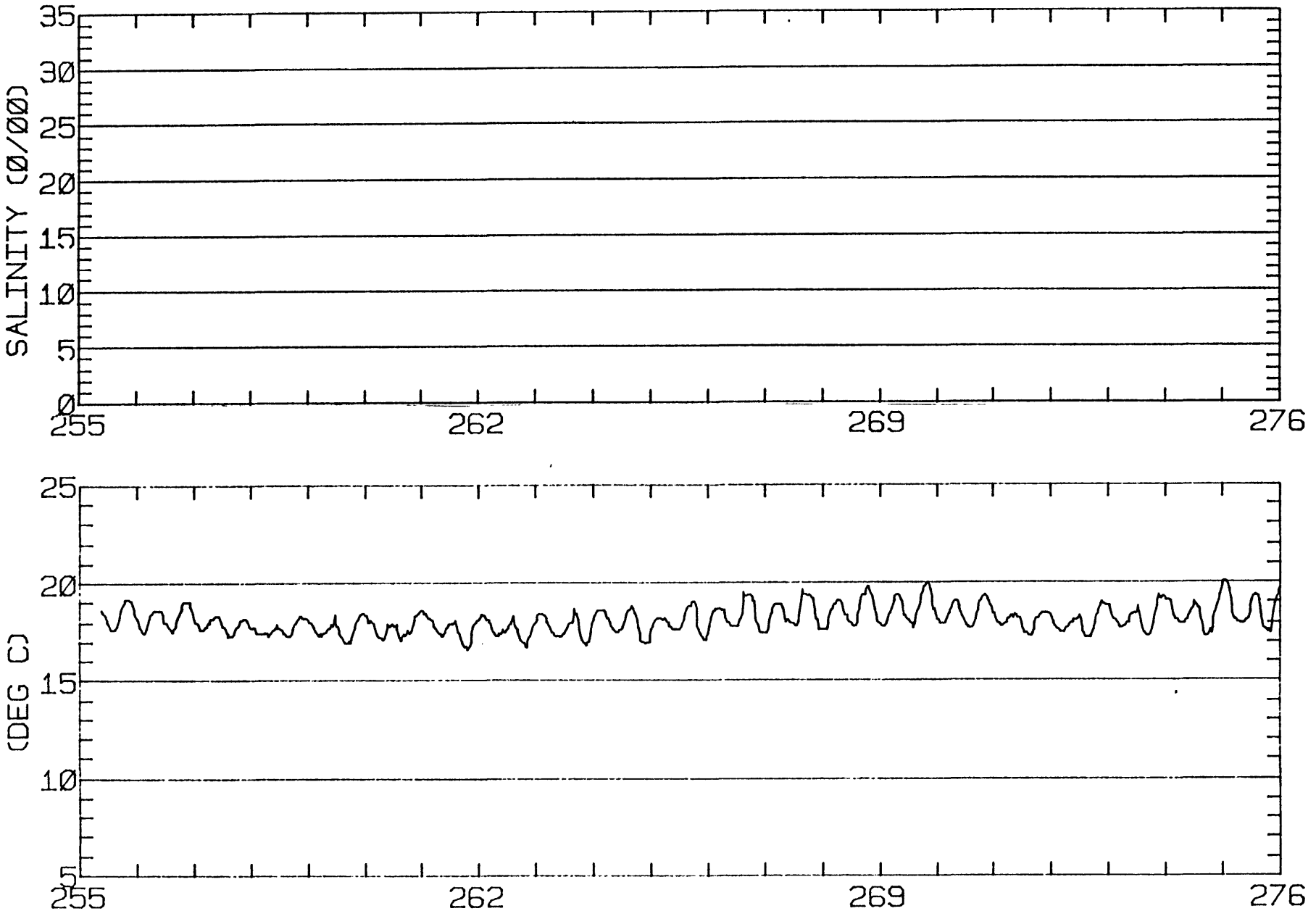


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 19 38- 1-24N 122-26-12W

METER 001.6 METERS ABOVE BED. WATER DEPTH 003.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 19 38- 1-24N 122-26-12W
METER 001.6 METERS ABOVE BED. WATER DEPTH 003.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 19
POSITION: 38 1'24"N 122 26'12"W
METER TYPE: AANDERAA
WATER DEPTH: 3.4 M (MLLW)
METER DEPTH: 1.8 M (BELOW MLLW)
START TIME OF SERIES:10/ 2/80 1010 PST JULIAN DAY=276
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

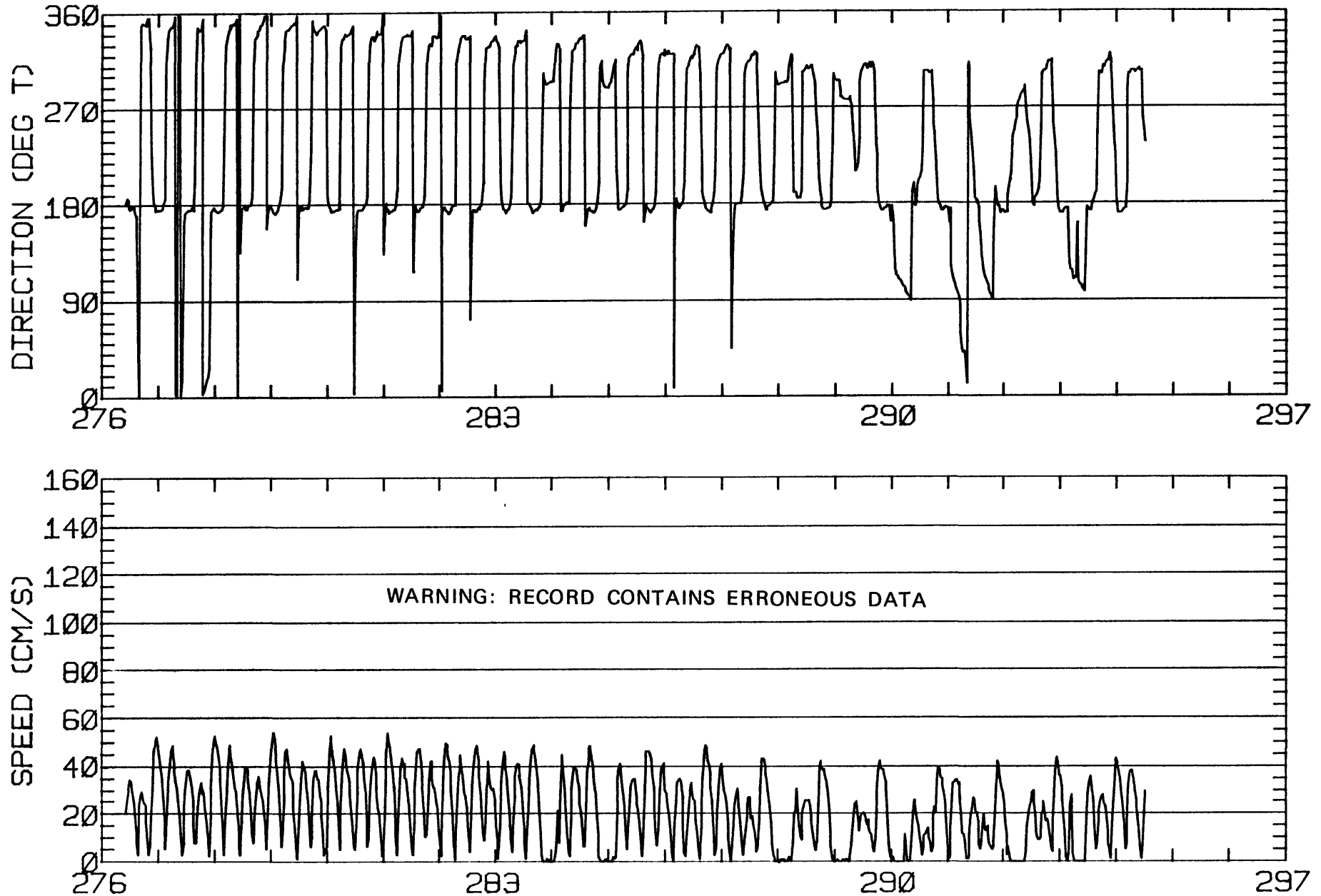
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.20	1.06	354.2	34.7	CLOCKWISE
K1	6.87	0.52	357.2	25.7	CLOCKWISE
N2	9.95	3.09	13.7	316.9	ANTI-CLOCKWISE
M2	42.95	1.53	350.5	313.8	ANTI-CLOCKWISE
S2	9.50	0.02	347.0	278.3	ANTI-CLOCKWISE
M4	2.92	1.66	334.2	171.9	ANTI-CLOCKWISE

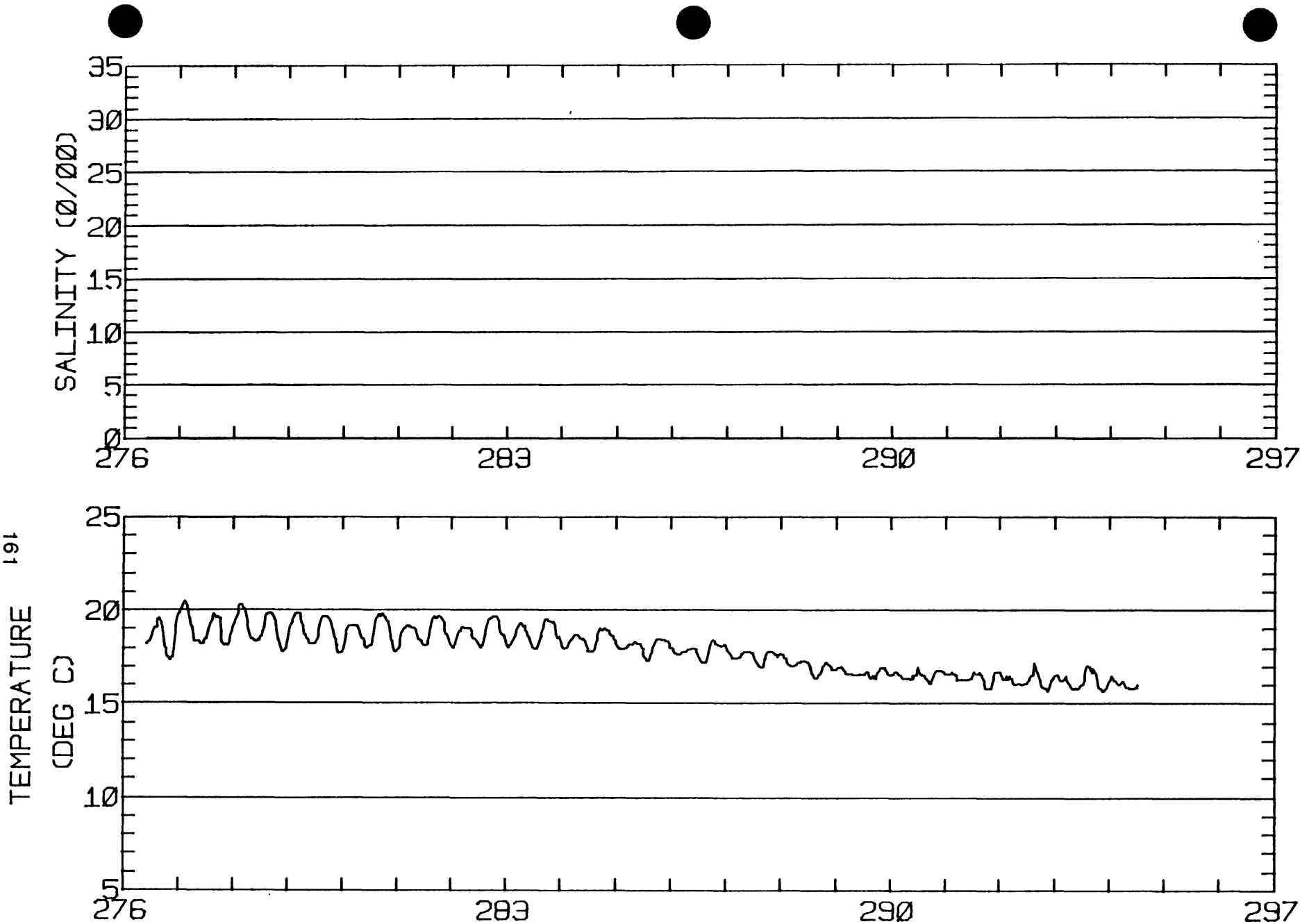
RMS SPEED: 32.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 66.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 33.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 351.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 2.81 CM/SEC
STANDARD DEVIATION V SERIES: 4.39 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.0	-2.4	254.
ALL	12	-3.0	-2.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 19 38- 1-24N 122-26-12W
METER 001.6 METERS ABOVE BED. WATER DEPTH 003.4 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 19 38- 1-24N 122-26-12W
METER ØØ1.6 METERS ABOVE BED. WATER DEPTH ØØ3.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 20
POSITION: 38 6'38"N 122 29'35"W
METER TYPE: AANDERAA
WATER DEPTH: 3.0 M (MLLW)
METER DEPTH: 2.1 M (BELOW MLLW)
START TIME OF SERIES: 3/28/79 1200 PST JULIAN DAY= 87
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

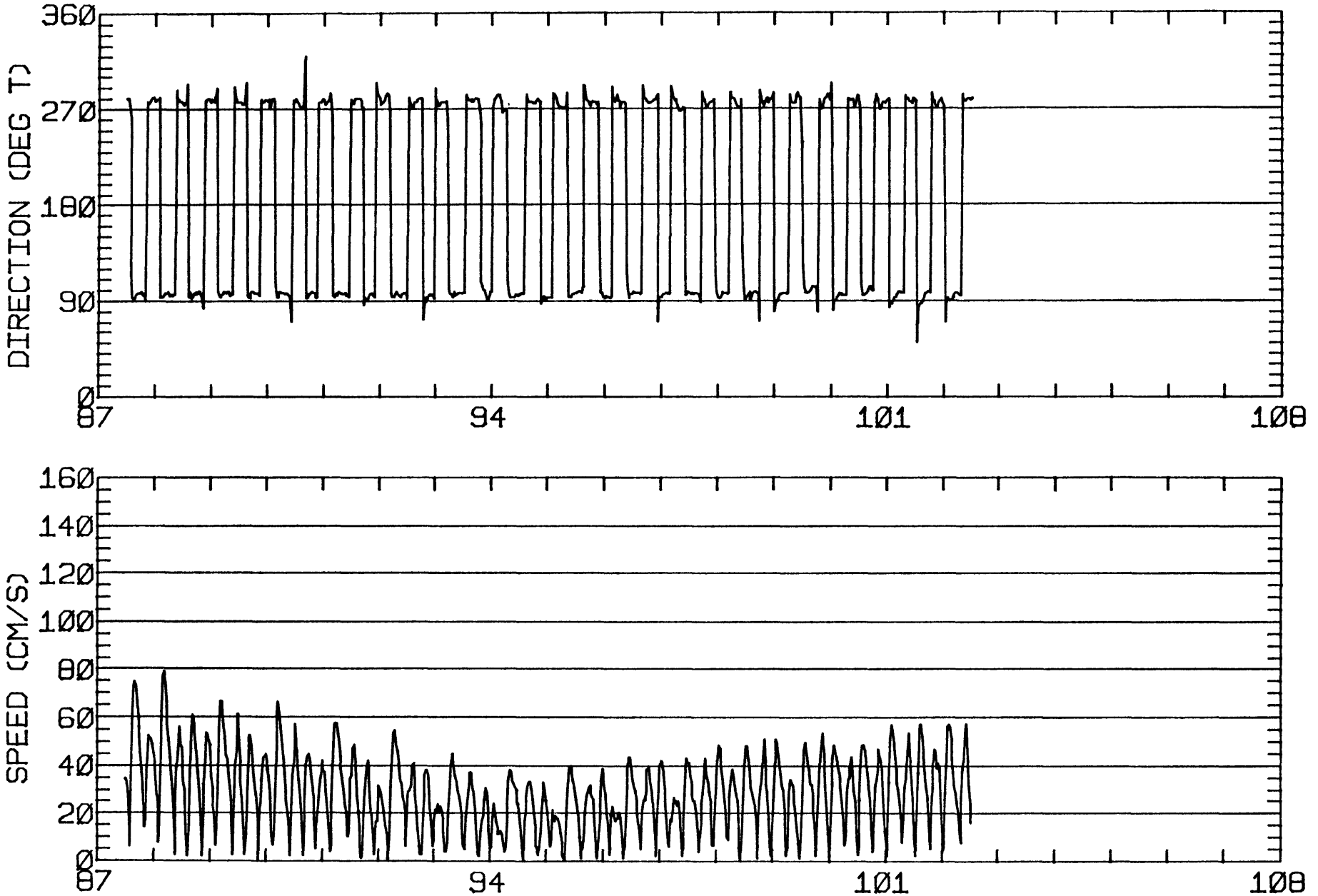
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.08	0.29	100.7	228.9	ANTI-CLOCKWISE
K1	8.45	0.43	98.0	216.0	CLOCKWISE
N2	5.44	0.09	95.5	124.9	ANTI-CLOCKWISE
M2	44.11	0.16	96.7	126.6	CLOCKWISE
S2	12.35	0.48	97.6	135.7	CLOCKWISE
M4	1.73	0.06	80.1	168.4	CLOCKWISE

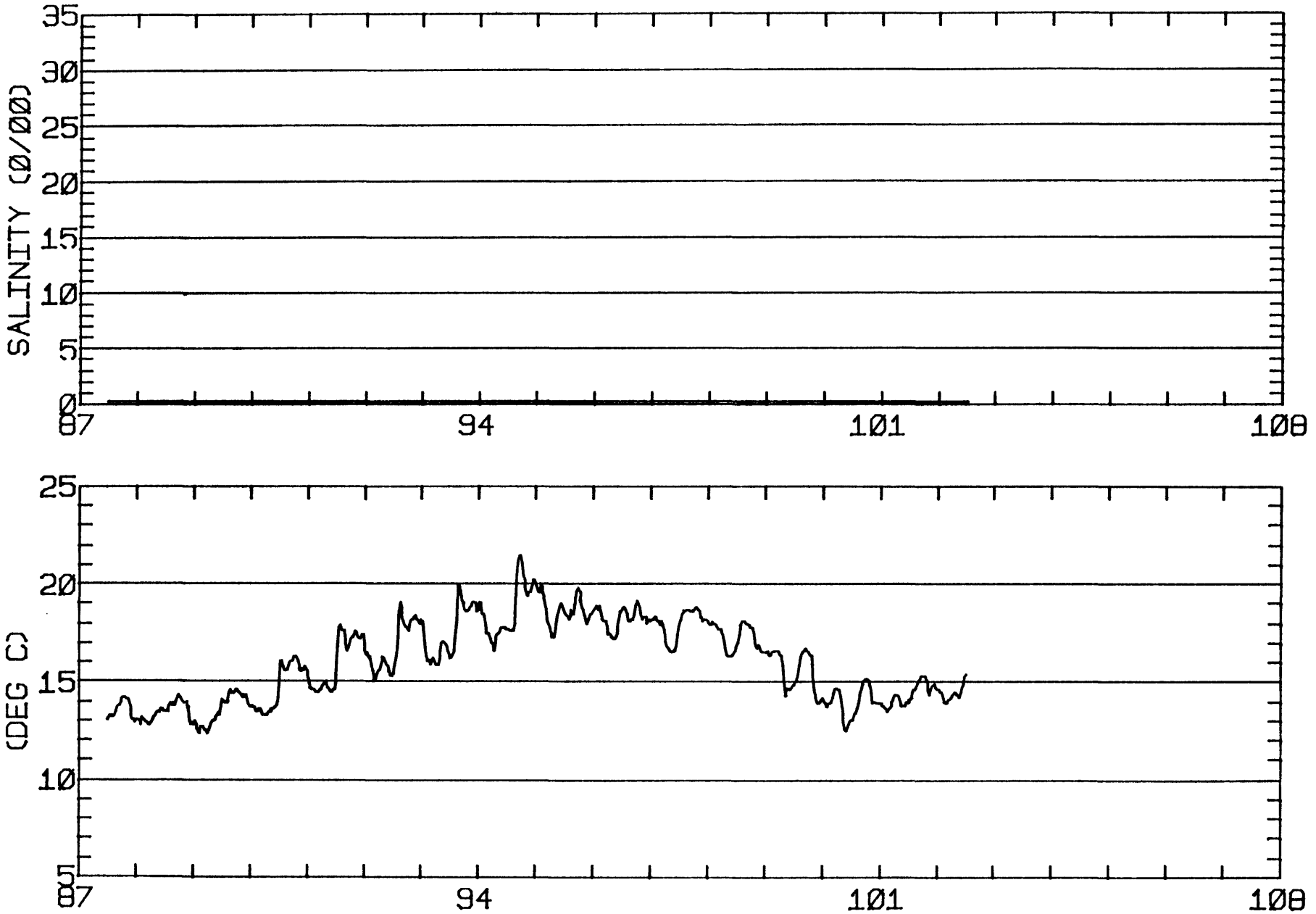
RMS SPEED: 33.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 70.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 97.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 6.86 CM/SEC
STANDARD DEVIATION V SERIES: 1.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.4	-0.1	1099.
2	12	3.2	-0.2	681.
3	4	2.9	0.4	470.
ALL	28	4.1	-0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 20 38- 6-38N 122-29-35W
METER 000.9 METERS ABOVE BED. WATER DEPTH 003.0 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 2Ø 38- 6-38N 122-29-35W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ3.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 22
POSITION: 38 1'51"N 122 22'38"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 10.1 M (BELOW MLLW)
START TIME OF SERIES: 3/22/79 1340 PST JULIAN DAY= 81
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

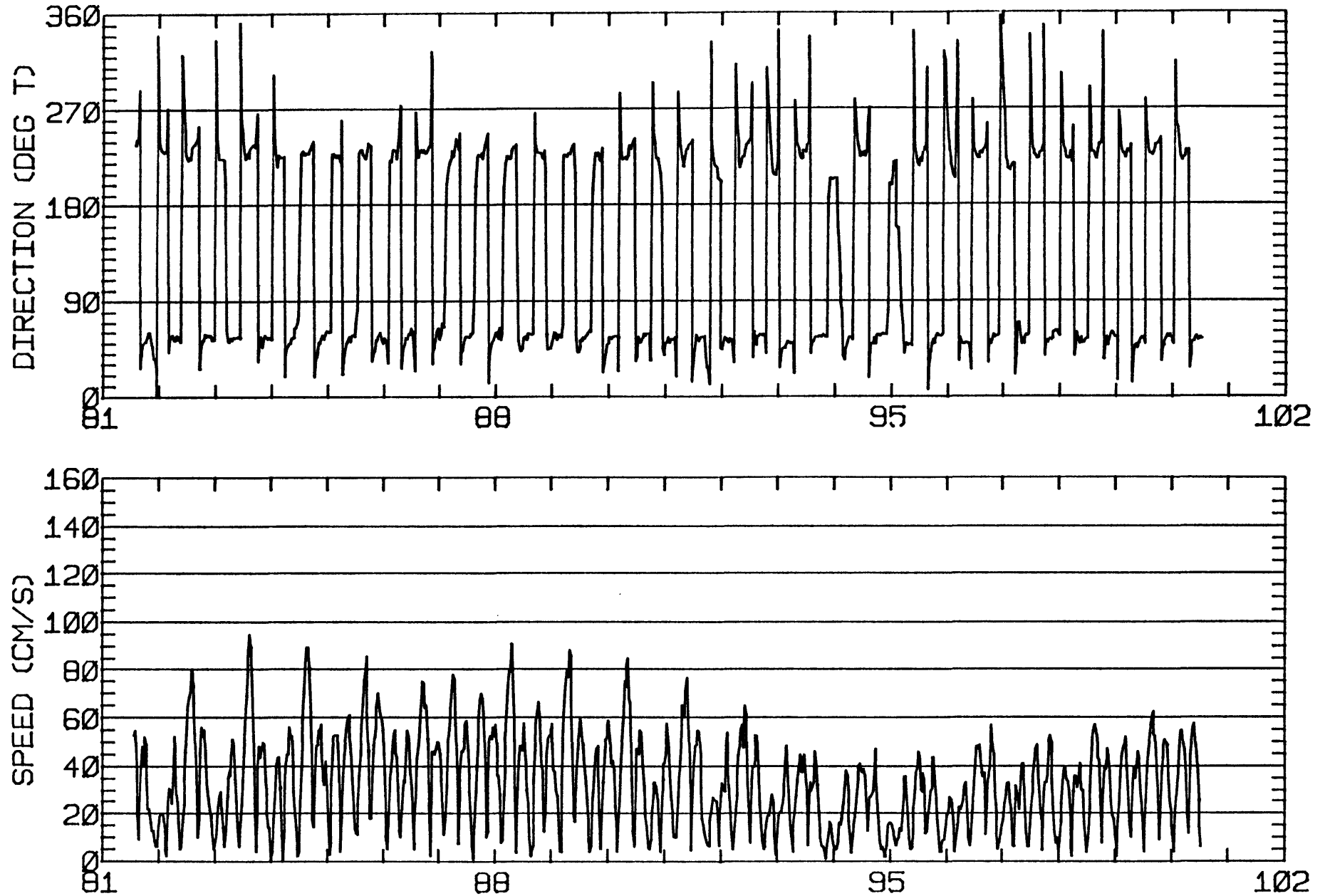
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.98	0.31	56.0	75.8	CLOCKWISE
K1	11.17	0.80	55.7	74.1	CLOCKWISE
N2	6.77	1.83	51.3	306.8	CLOCKWISE
M2	46.55	0.96	52.6	332.5	CLOCKWISE
S2	11.62	0.95	52.7	340.2	CLOCKWISE
M4	7.37	2.37	36.8	200.4	CLOCKWISE

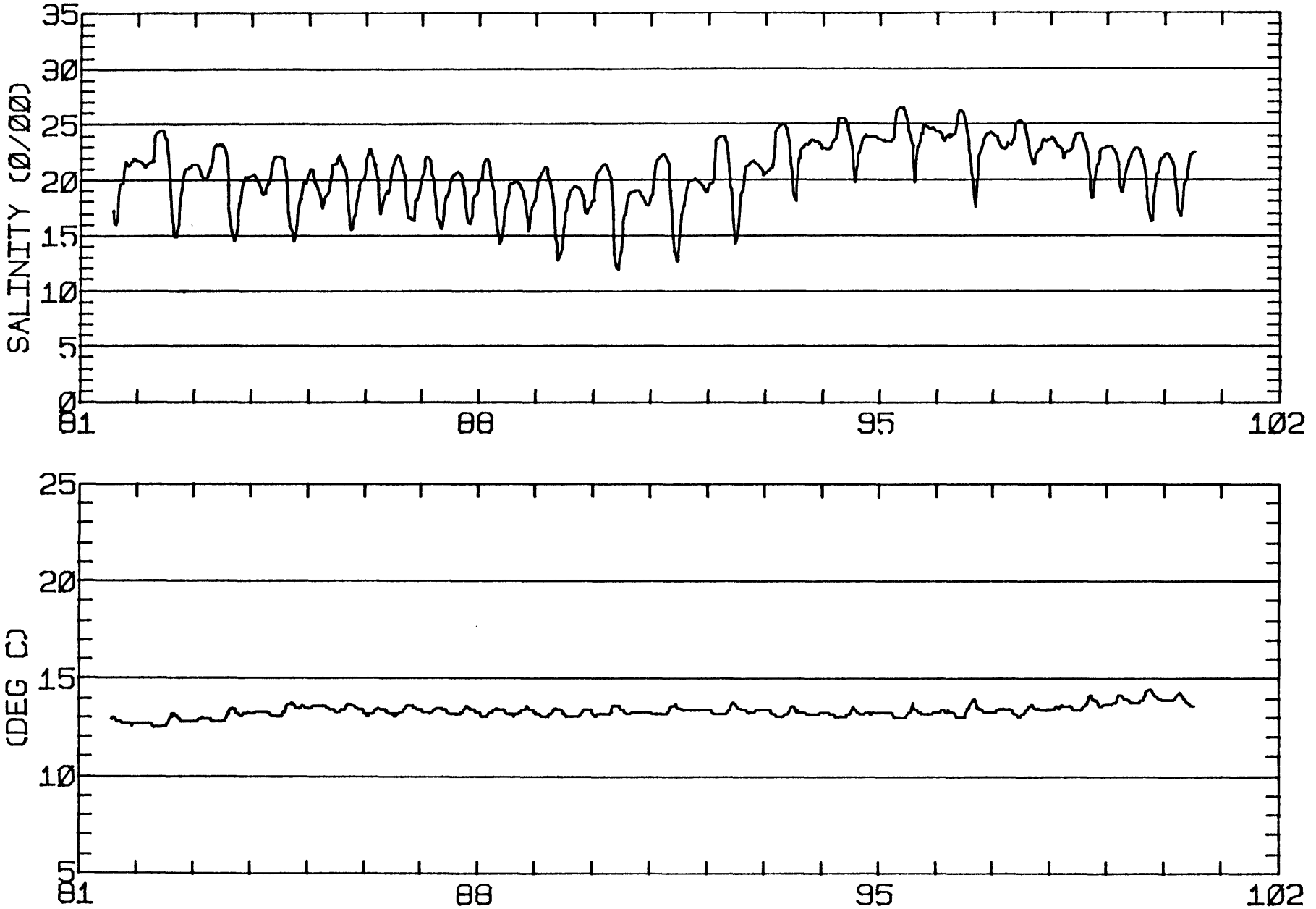
RMS SPEED: 39.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 79.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 33.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 53.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 7.98 CM/SEC
STANDARD DEVIATION V SERIES: 6.81 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	-1.2	706.
2	12	0.3	-0.3	1099.
3	12	0.1	-0.3	681.
ALL	36	-0.1	-0.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 22 38- 1-51N 122-22-38W
METER 001.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 22 38- 1-51N 122-22-38W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 22
POSITION: 38 2' 6"N 122 22'42"W
METER TYPE: AANDERAA
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 9/ 9/80 1110 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

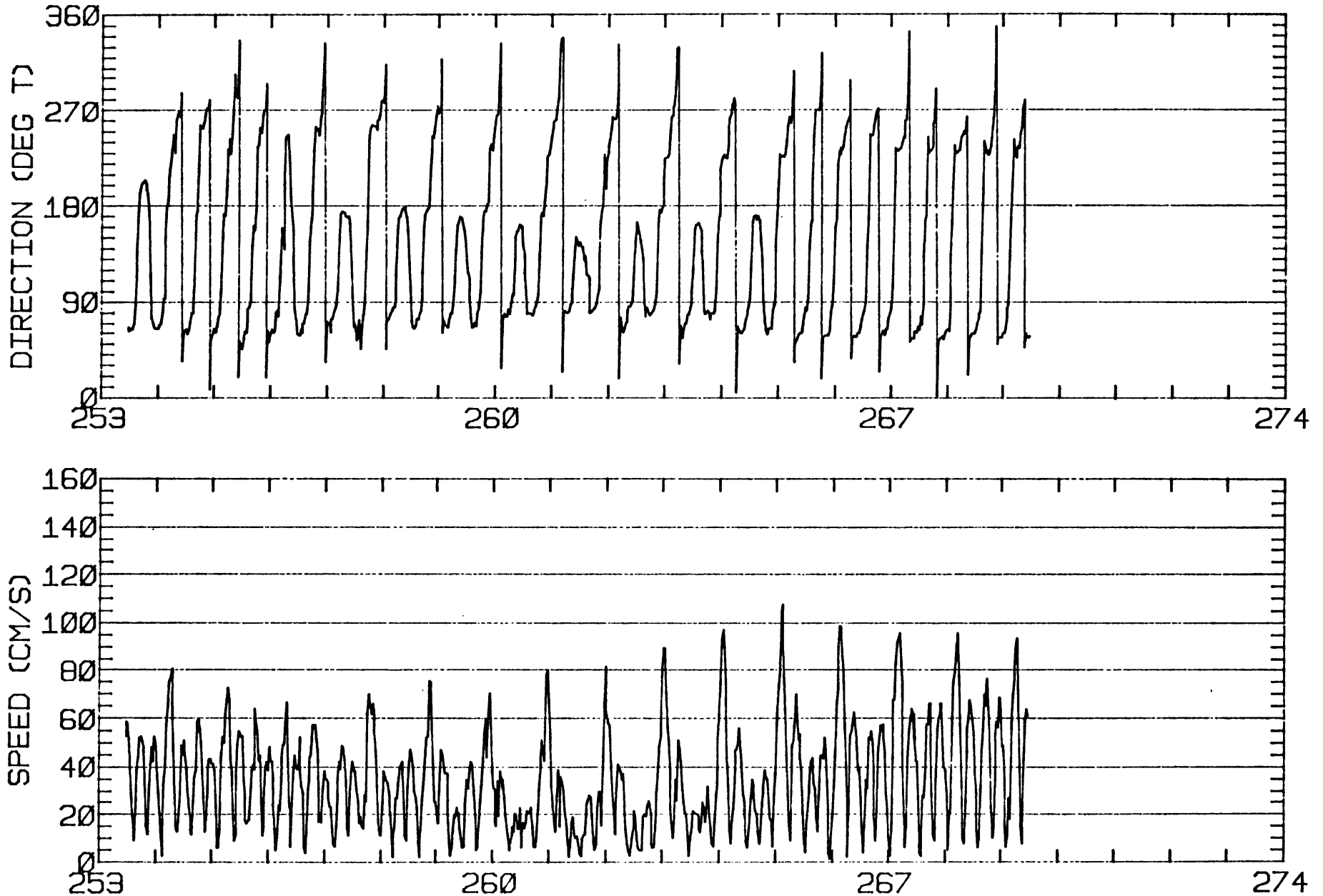
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.24	7.51	65.4	66.9	CLOCKWISE
K1	18.16	1.98	70.4	85.3	CLOCKWISE
N2	11.44	0.26	61.6	305.1	CLOCKWISE
M2	49.17	10.19	55.6	340.9	CLOCKWISE
S2	13.00	0.52	59.2	336.8	CLOCKWISE
M4	6.48	2.75	87.7	205.4	CLOCKWISE

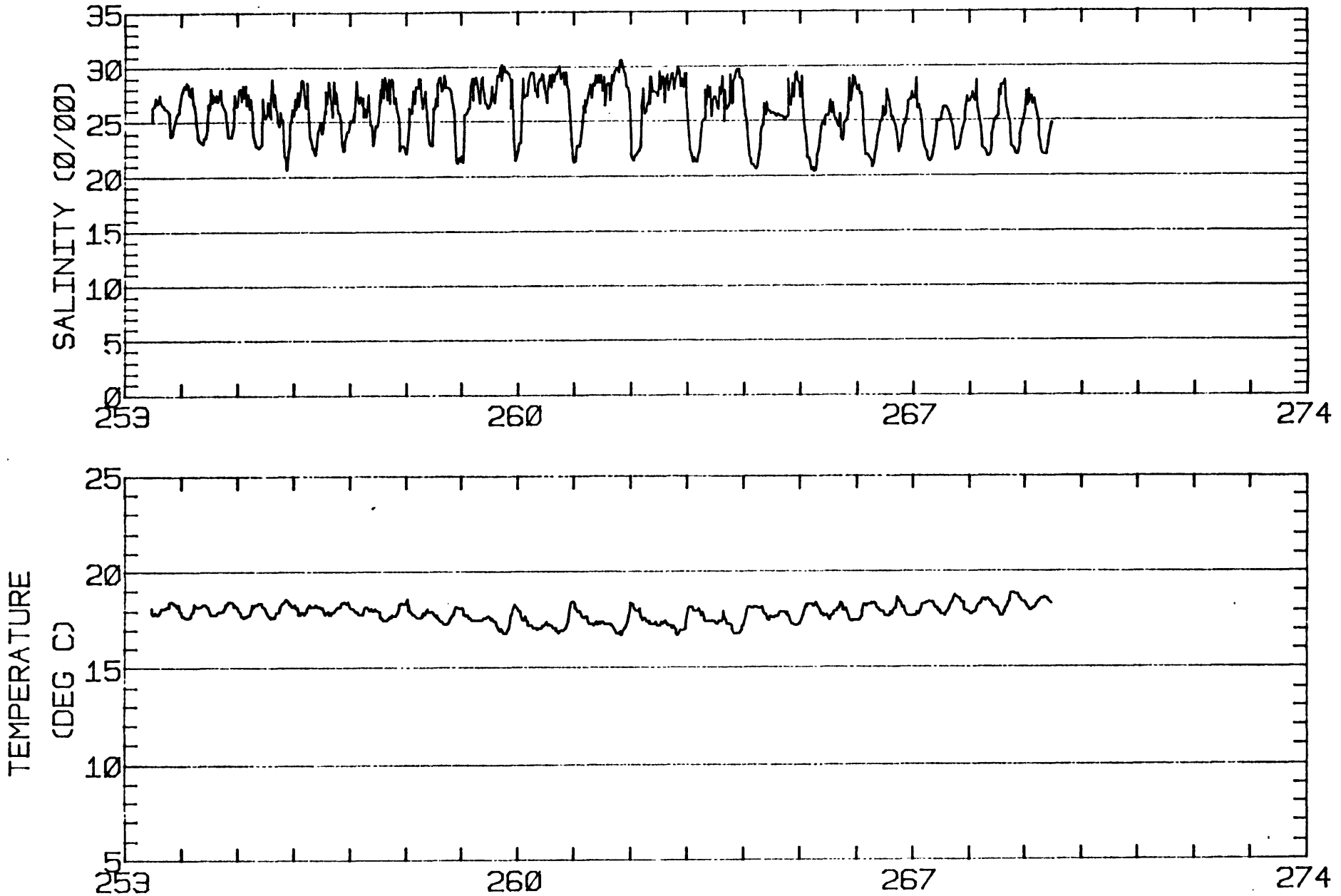
RMS SPEED: 41.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 95.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 33.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.54
STANDARD DEVIATION U-SERIES: 11.24 CM/SEC
STANDARD DEVIATION V SERIES: 8.42 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.6	-5.5	260.
2	12	1.2	-7.0	309.
3	6	-2.2	-3.4	285.
ALL	30	1.5	-5.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 22 38- 2- 6N 122-22-42W
METER 003.0 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 22 38- 2- 6N 122-22-42W
METER ØØ3.Ø METERS ABOVE BED. WATER DEPTH ØØ8.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 22
POSITION: 38 2' 2"N 122 22'45"W
METER TYPE: AANDERAA
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/25/80 1250 PST JULIAN DAY=269
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

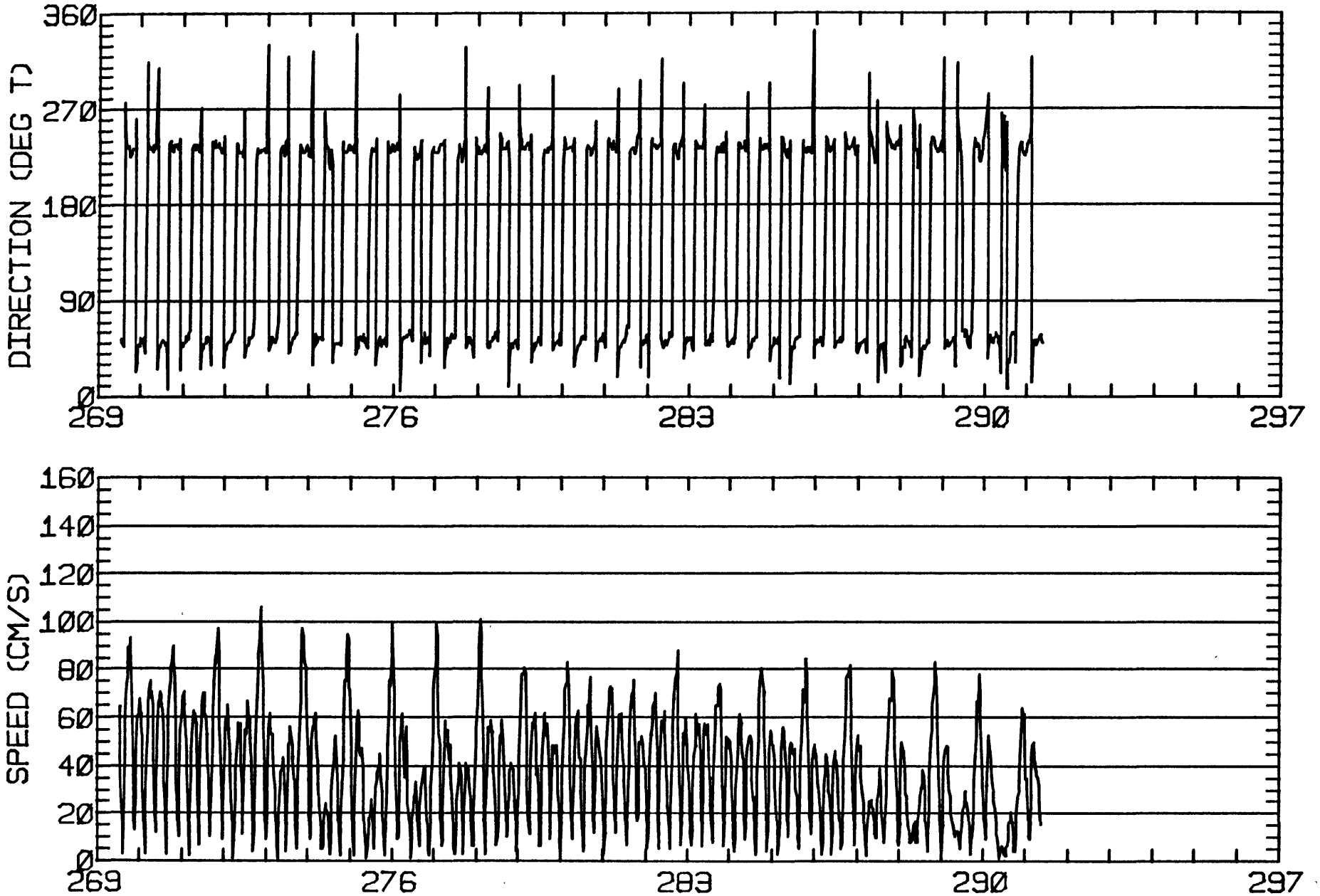
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.83	0.10	55.2	64.0	ANTI-CLOCKWISE
K1	16.96	0.64	53.6	58.9	CLOCKWISE
N2	14.48	0.40	53.6	319.7	CLOCKWISE
M2	57.23	1.84	52.8	338.1	CLOCKWISE
S2	18.15	0.48	53.3	330.4	CLOCKWISE
M4	4.80	0.80	43.2	211.8	CLOCKWISE

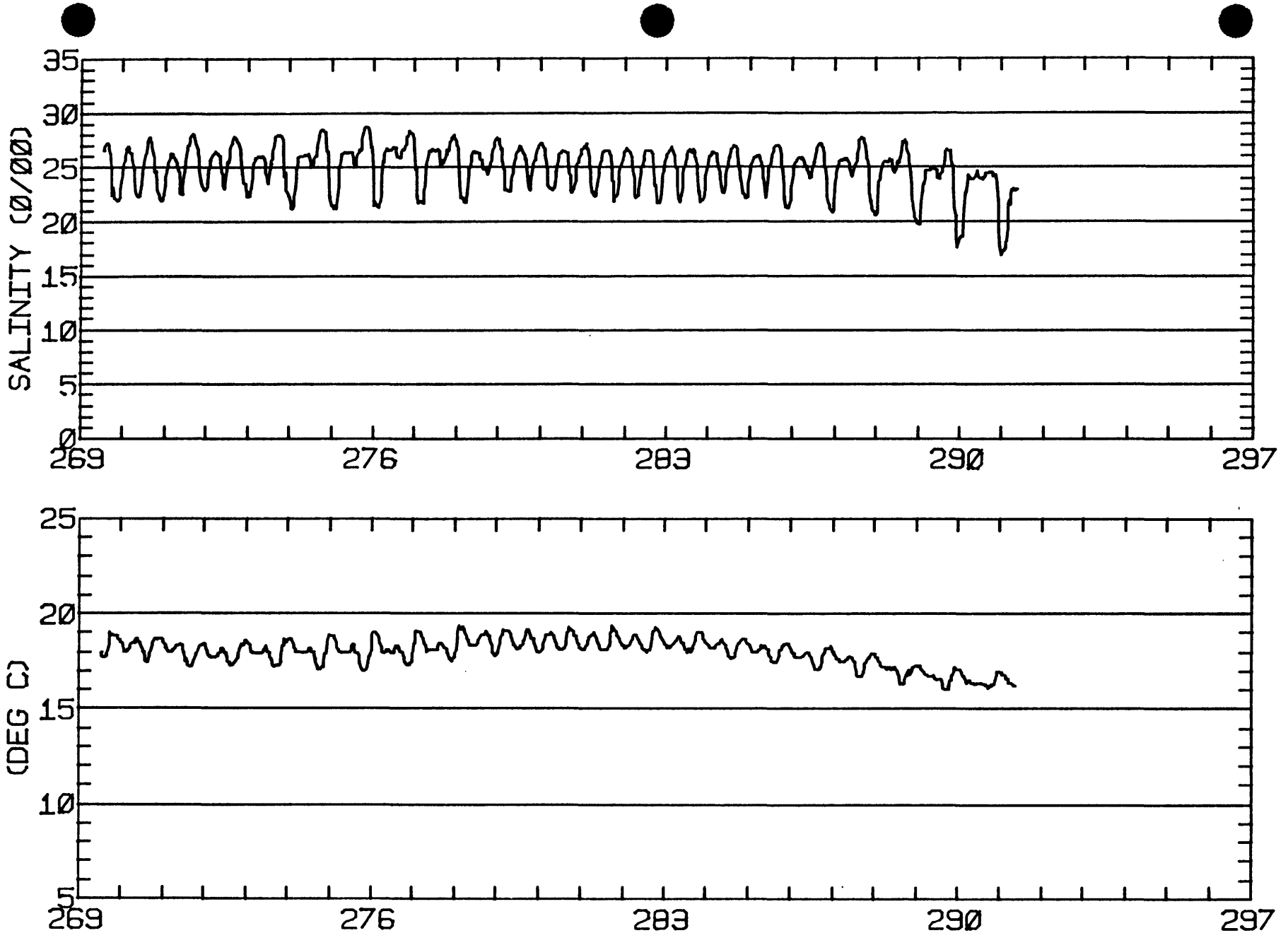
RMS SPEED: 46.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 106.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 53.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 6.18 CM/SEC
STANDARD DEVIATION V SERIES: 5.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.4	-1.3	364.
2	12	-5.3	-2.5	251.
3	12	-5.5	-2.2	275.
4	6	-2.5	-0.4	220.
ALL	42	-4.4	-1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 22 38- 2- 2N 122-22-45W
METER 002.7 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 22 38- 2- 2N 122-22-45W
METER 002.7 METERS ABOVE BED. WATER DEPTH 008.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 23
POSITION: 38 4'28"N 122 20'33"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 3/21/79 1410 PST JULIAN DAY= 80
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

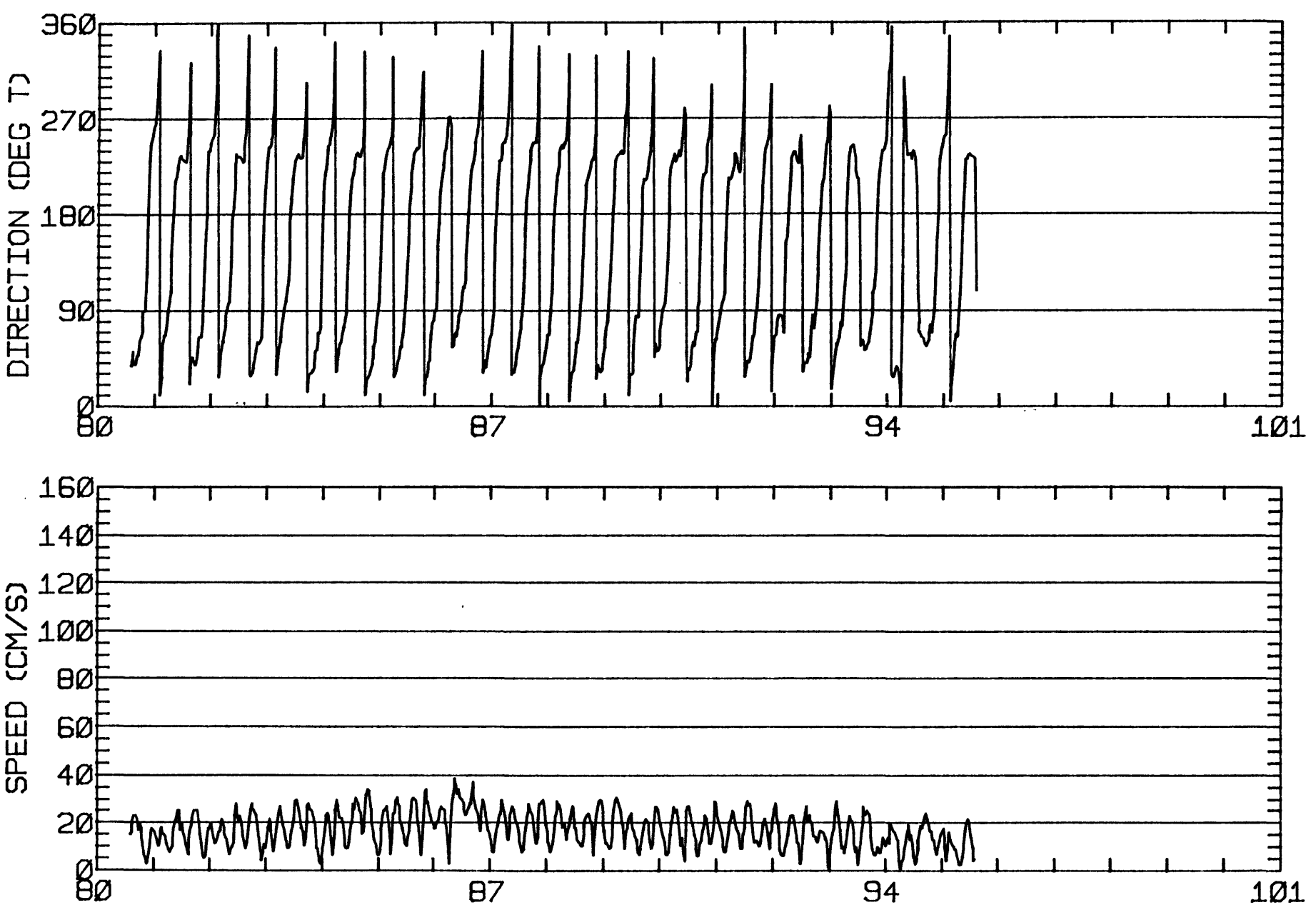
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.92	1.83	52.7	36.1	CLOCKWISE
K1	4.29	0.23	41.5	42.1	ANTI-CLOCKWISE
N2	3.03	2.17	33.0	268.0	CLOCKWISE
M2	21.78	6.26	57.0	305.9	CLOCKWISE
S2	3.86	2.09	46.8	312.5	CLOCKWISE
M4	2.87	0.24	51.4	155.9	ANTI-CLOCKWISE

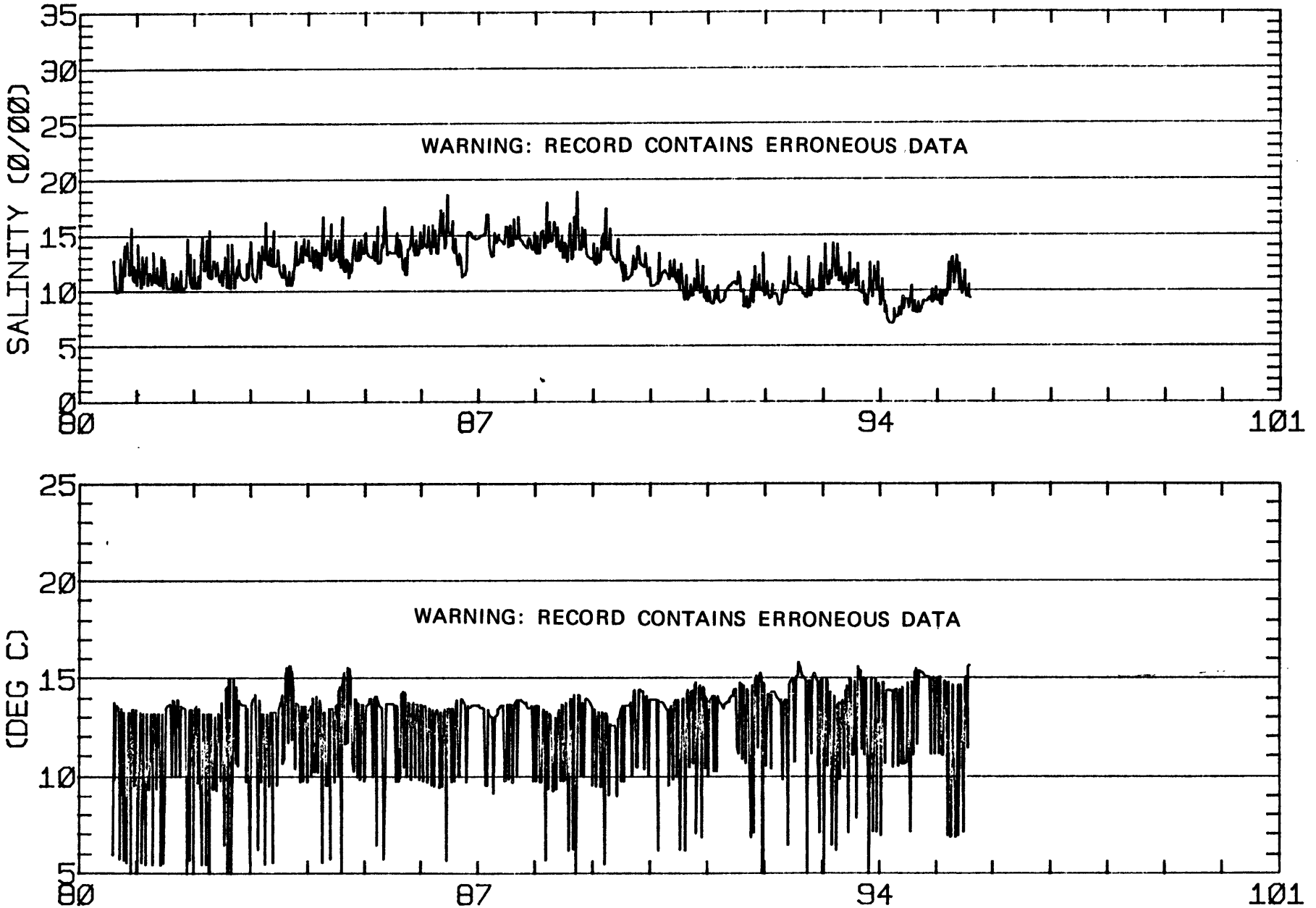
RMS SPEED: 19.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 33.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 17.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 53.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 4.93 CM/SEC
STANDARD DEVIATION V SERIES: 3.91 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.9	0.4	754.
2	12	0.5	-0.2	1057.
3	4	3.0	1.4	749.
ALL	28	1.0	0.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 23 38- 4-28N 122-20-33W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



176

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION · 23 38- 4-28N 122-20-33W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 23
POSITION: 38 4'28"N 122 20'42"W
METER TYPE: AANDERAA
WATER DEPTH: 1.8 M (MLLW)
METER DEPTH: .9 M (BELOW MLLW)
START TIME OF SERIES: 9/30/80 1110 PST JULIAN DAY=274
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

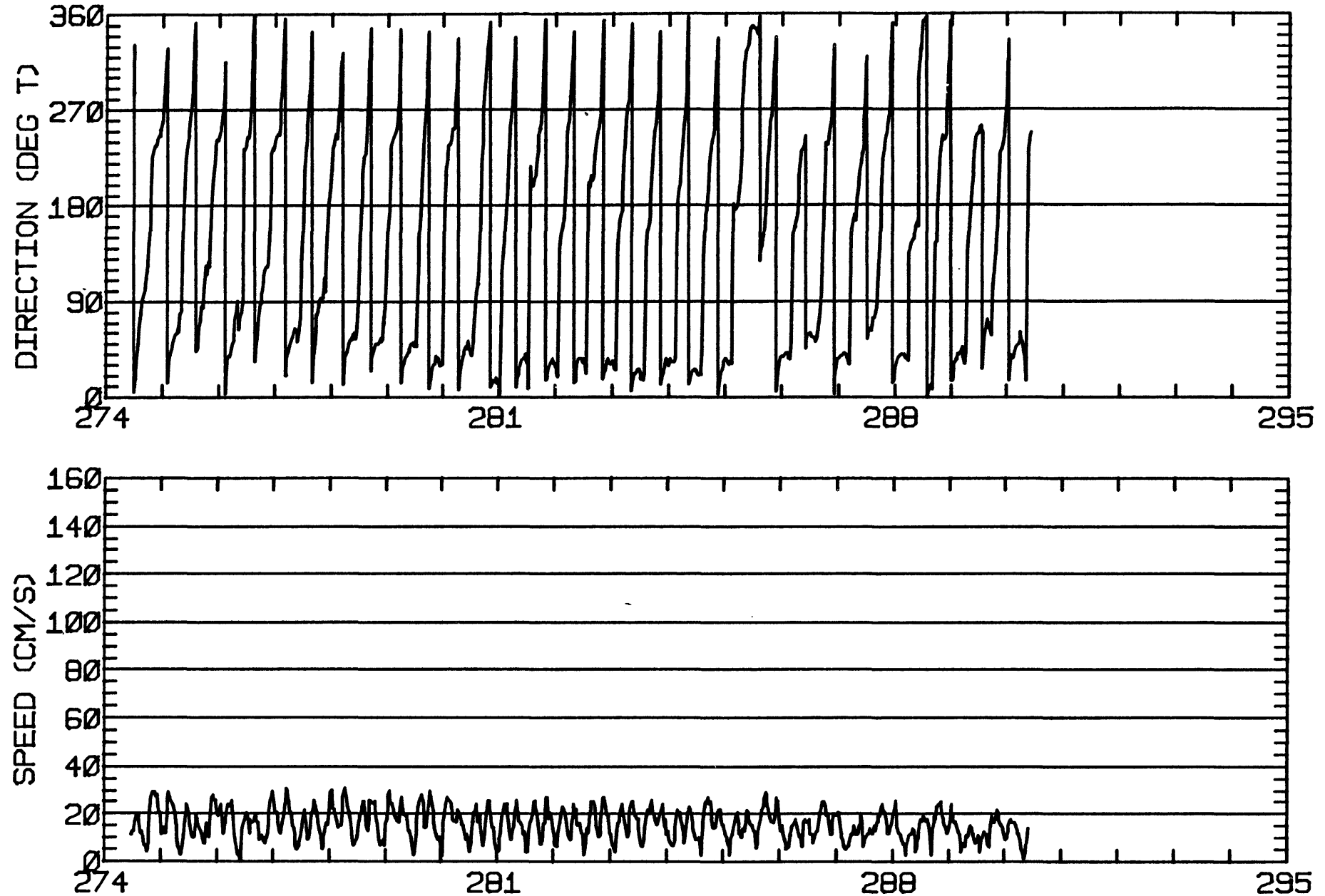
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.16	1.88	47.4	37.8	CLOCKWISE
K1	2.77	1.66	45.3	35.2	CLOCKWISE
N2	4.98	0.81	74.8	307.8	CLOCKWISE
M2	20.34	7.53	44.7	320.2	CLOCKWISE
S2	4.82	0.46	9.5	304.6	CLOCKWISE
M4	3.46	1.90	80.8	189.3	CLOCKWISE

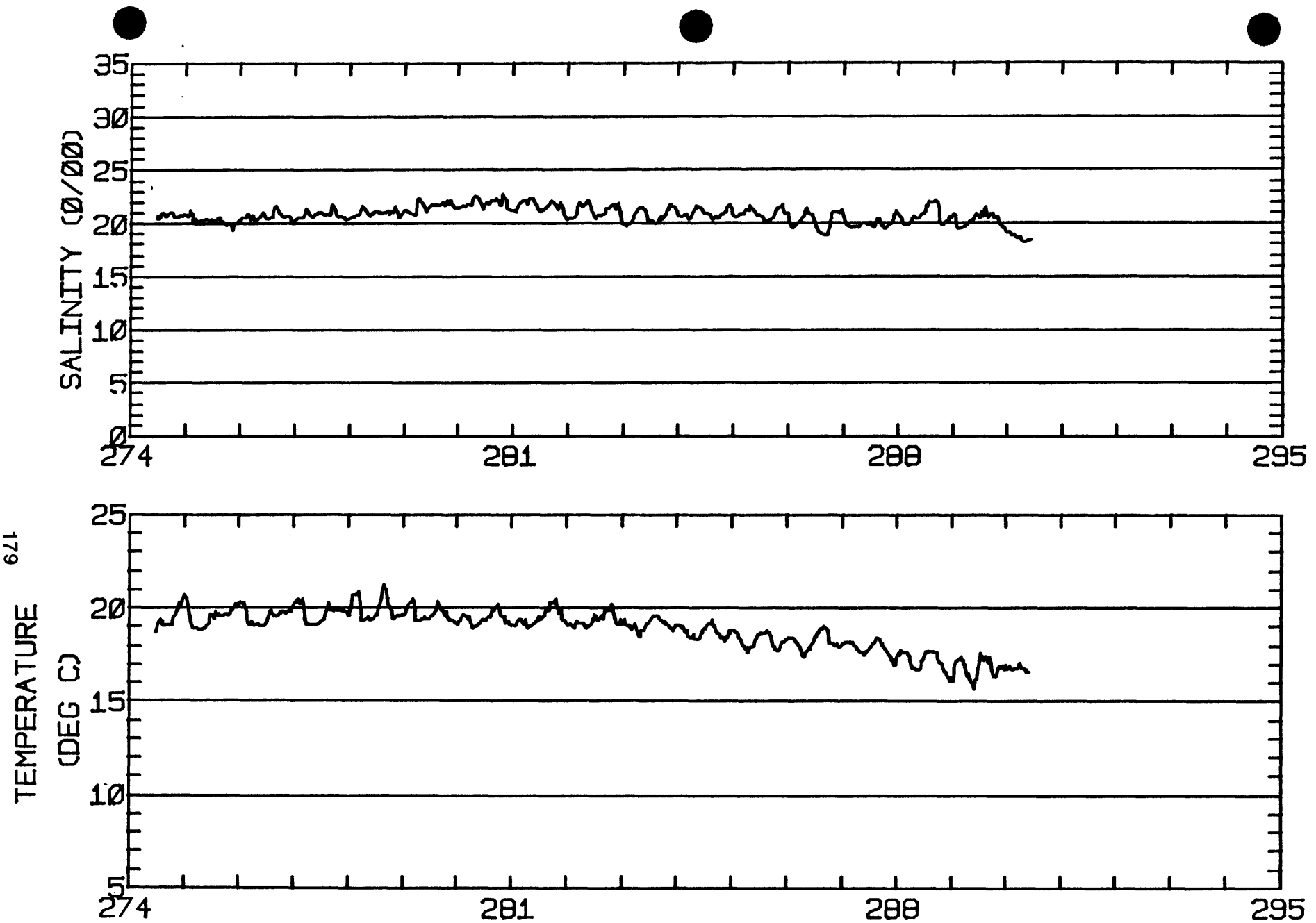
RMS SPEED: 17.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 32.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 16.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 39.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.28
STANDARD DEVIATION U-SERIES: 6.19 CM/SEC
STANDARD DEVIATION V SERIES: 4.78 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.6	2.1	244.
2	12	-1.0	2.9	277.
3	6	0.5	1.3	234.
ALL	30	-0.0	2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 23 38- 4-28N 122-20-42W
METER 000.9 METERS ABOVE BED. WATER DEPTH 001.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 23 38- 4-28N 122-20-42W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ1.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 23
POSITION: 38 4'28"N 122 20'42"W
METER TYPE: AANDERAA
WATER DEPTH: 1.8 M (MLLW)
METER DEPTH: .9 M (BELOW MLLW)
START TIME OF SERIES:10/16/80 1100 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

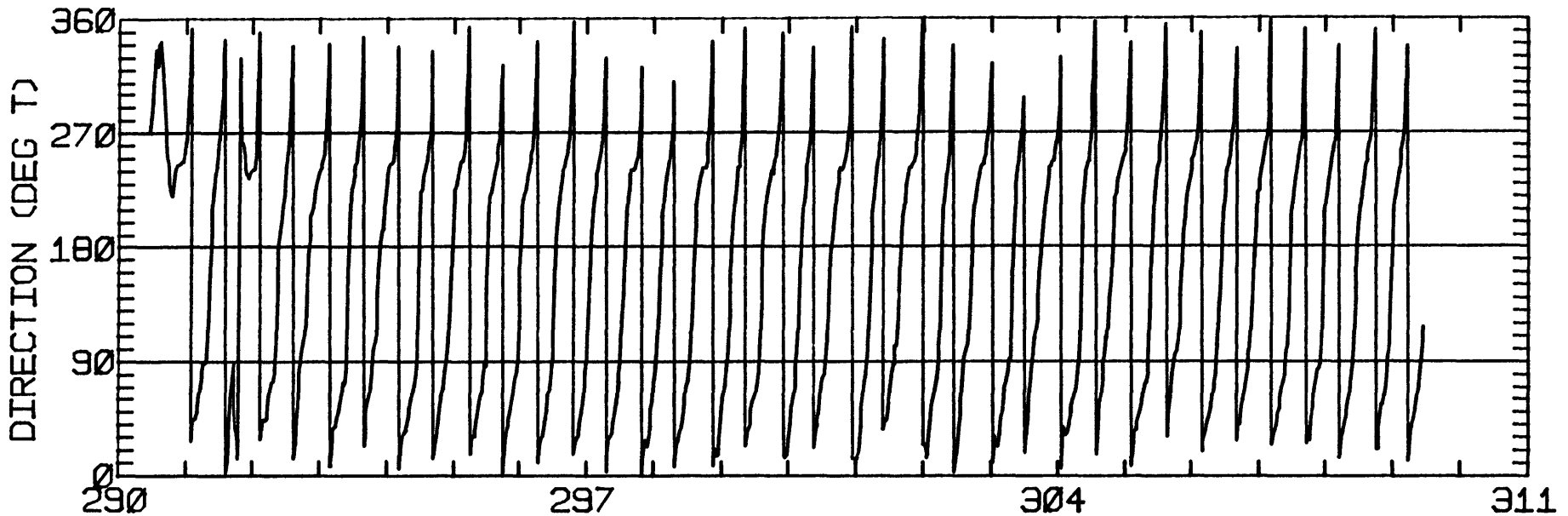
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

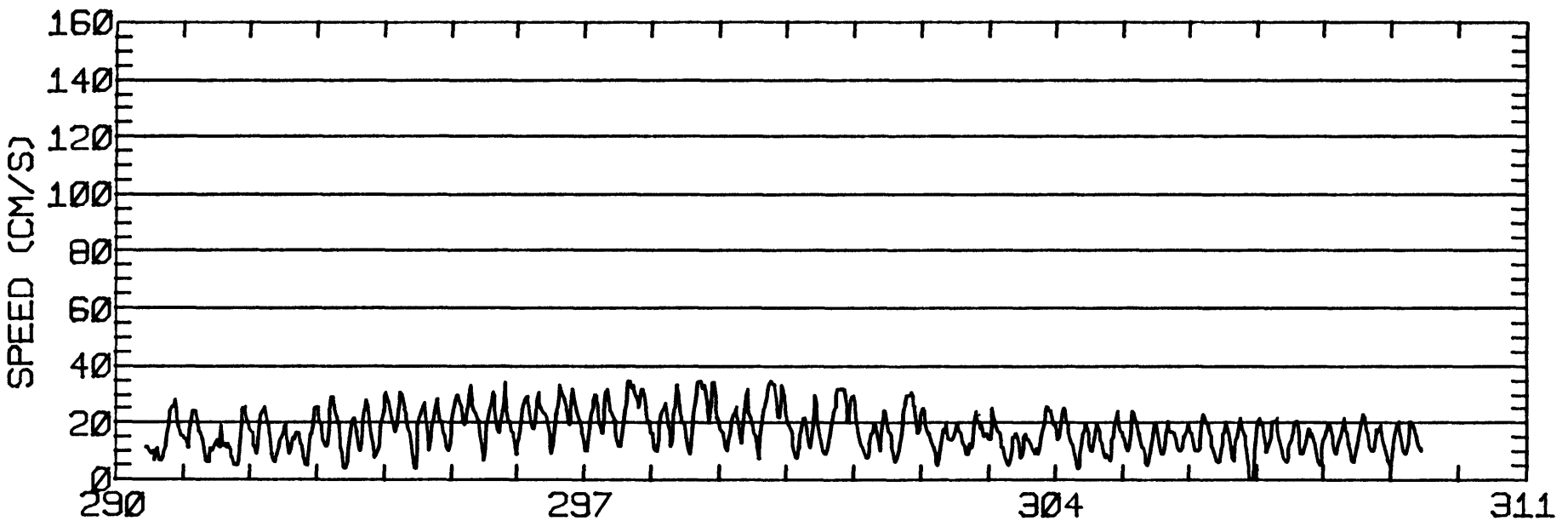
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.50	2.55	45.5	49.0	CLOCKWISE
K1	6.39	2.24	54.8	37.5	CLOCKWISE
N2	5.75	2.07	52.9	295.3	CLOCKWISE
M2	19.69	8.89	54.4	310.1	CLOCKWISE
S2	4.59	1.28	37.5	286.4	CLOCKWISE
M4	3.37	0.67	50.2	155.5	CLOCKWISE

RMS SPEED: 19.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 34.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 12.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 51.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 4.34 CM/SEC
STANDARD DEVIATION V SERIES: 3.07 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.5	1.5	157.
2	12	-2.3	1.6	176.
3	12	-0.2	1.1	157.
ALL	36	-1.3	1.4	



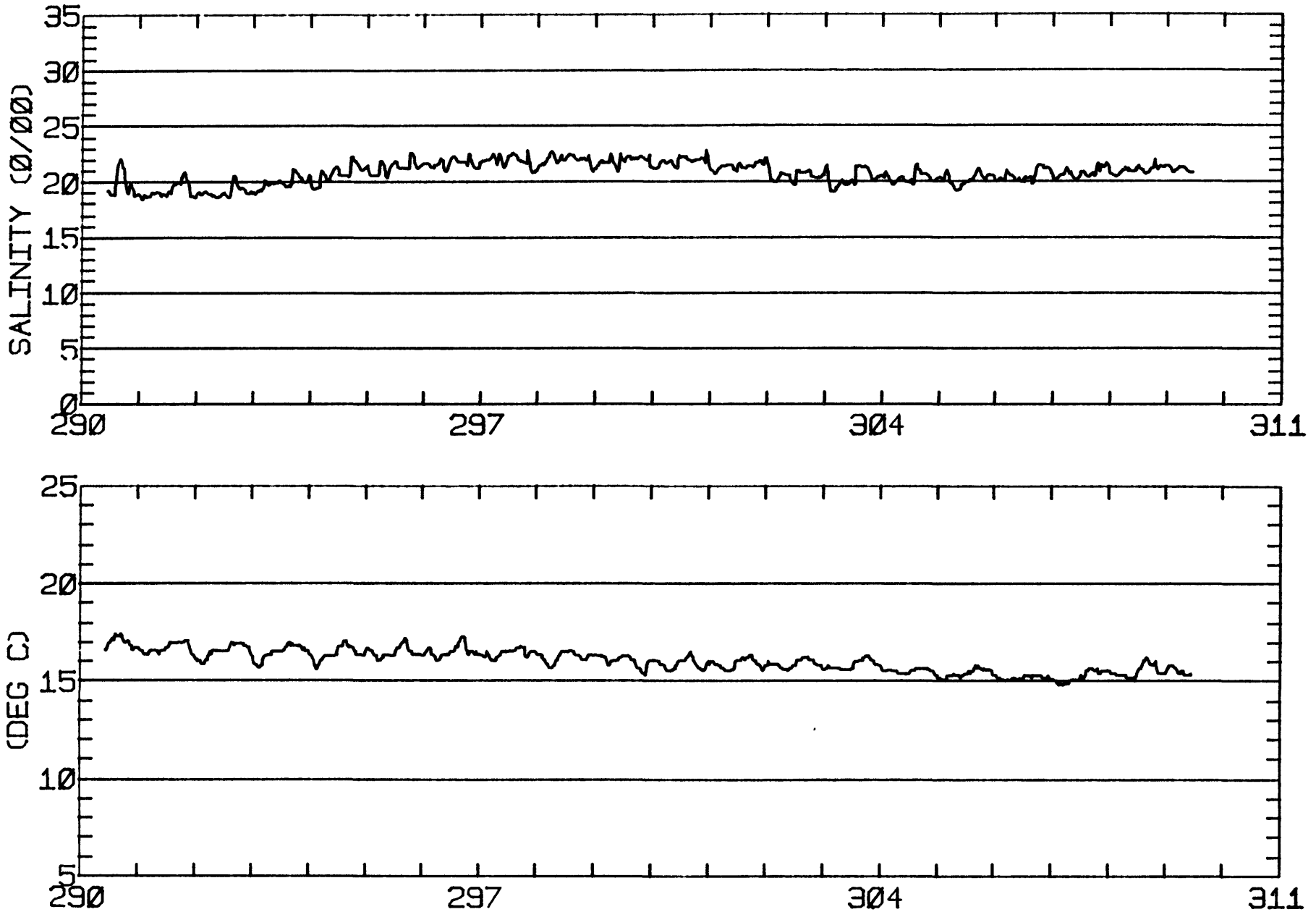


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 23 38- 4-28N 122-20-42W

METER 000.9 METERS ABOVE BED. WATER DEPTH 001.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 23 38- 4-28N 122-20-42W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ1.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'43"N 122 13' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 22.6 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 3/20/79 1050 PST JULIAN DAY= 79
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

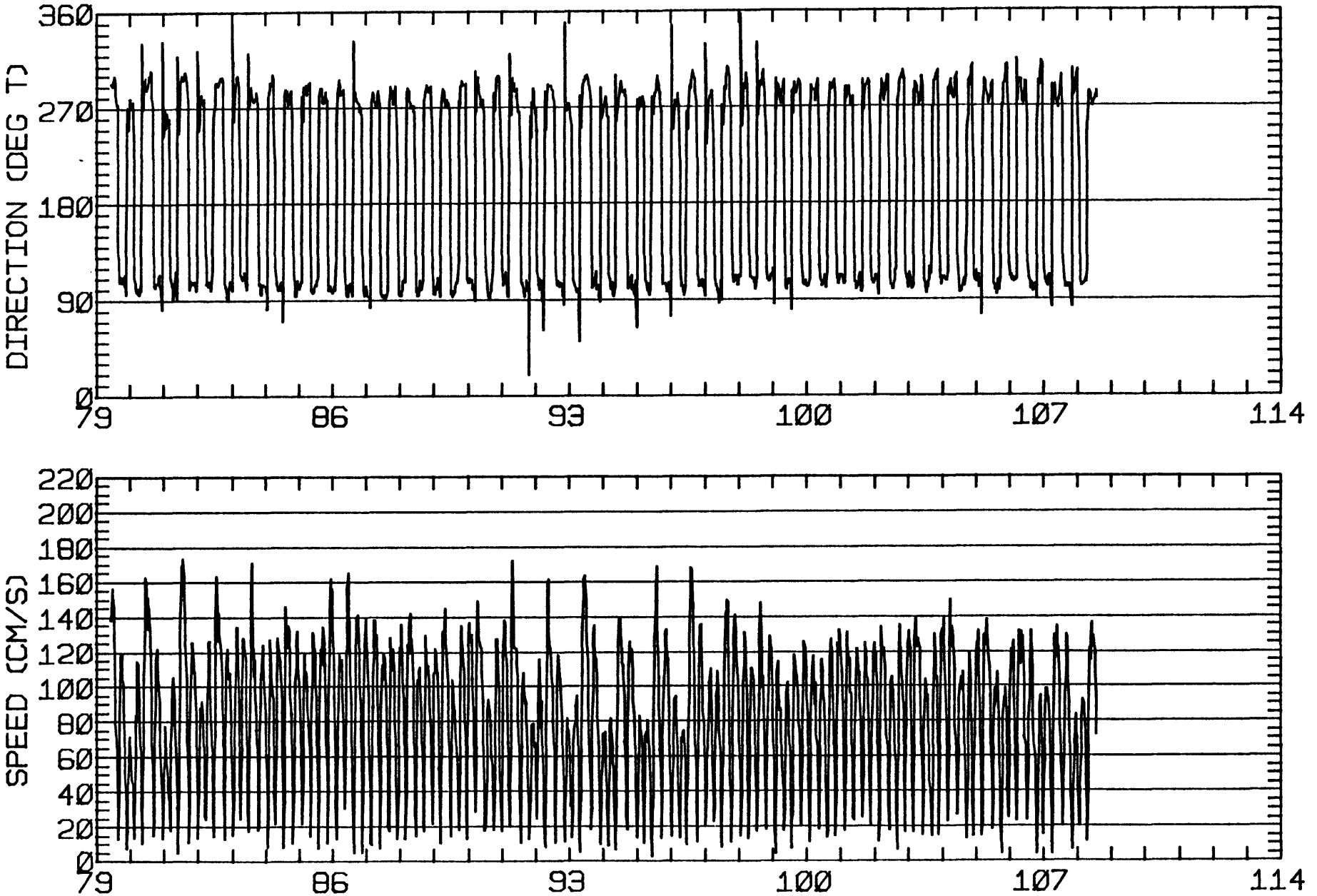
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	23.86	0.24	110.3	75.5	ANTI-CLOCKWISE
K1	30.61	3.02	107.7	80.2	CLOCKWISE
N2	20.12	0.17	95.8	321.5	CLOCKWISE
M2	110.94	1.29	105.3	7.9	ANTI-CLOCKWISE
S2	23.62	1.13	105.8	354.4	ANTI-CLOCKWISE
M4	3.98	1.60	54.9	2.8	ANTI-CLOCKWISE

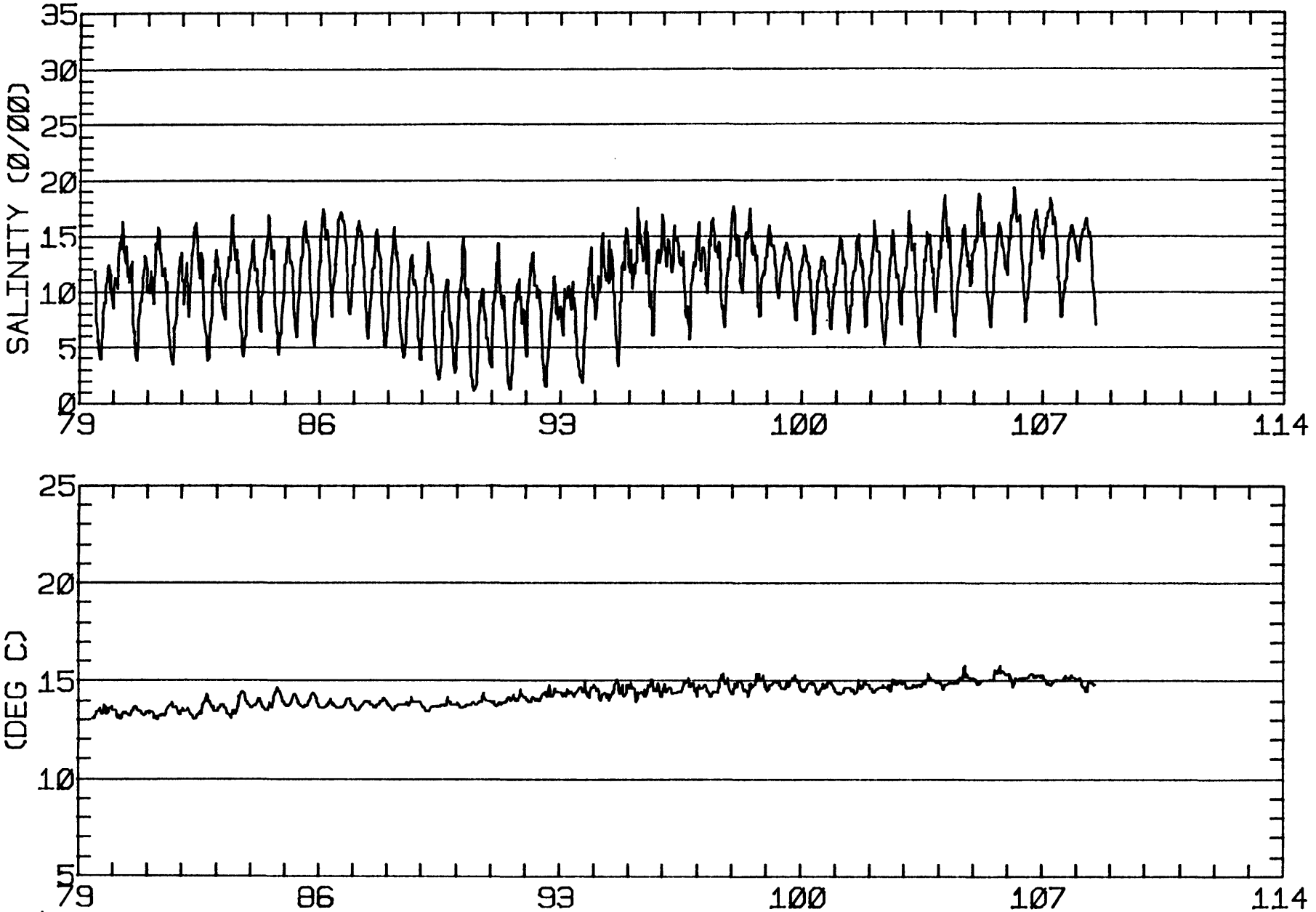
RMS SPEED: 91.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 189.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 80.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 106.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 17.73 CM/SEC
STANDARD DEVIATION V SERIES: 15.48 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.2	2.7	825.
2	12	-4.9	1.4	974.
3	12	-4.3	1.0	823.
4	12	-3.2	0.9	418.
5	8	-1.7	0.8	225.
ALL	56	-3.8	1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-43N 122-13- 7W
METER 016.8 METERS ABOVE BED. WATER DEPTH 022.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-43N 122-13- 7W
METER 016.8 METERS ABOVE BED. WATER DEPTH 022.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'43"N 122 13' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 22.6 M (MLLW)
METER DEPTH: 20.4 M (BELOW MLLW)
START TIME OF SERIES: 3/20/79 1054 PST JULIAN DAY= 79
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

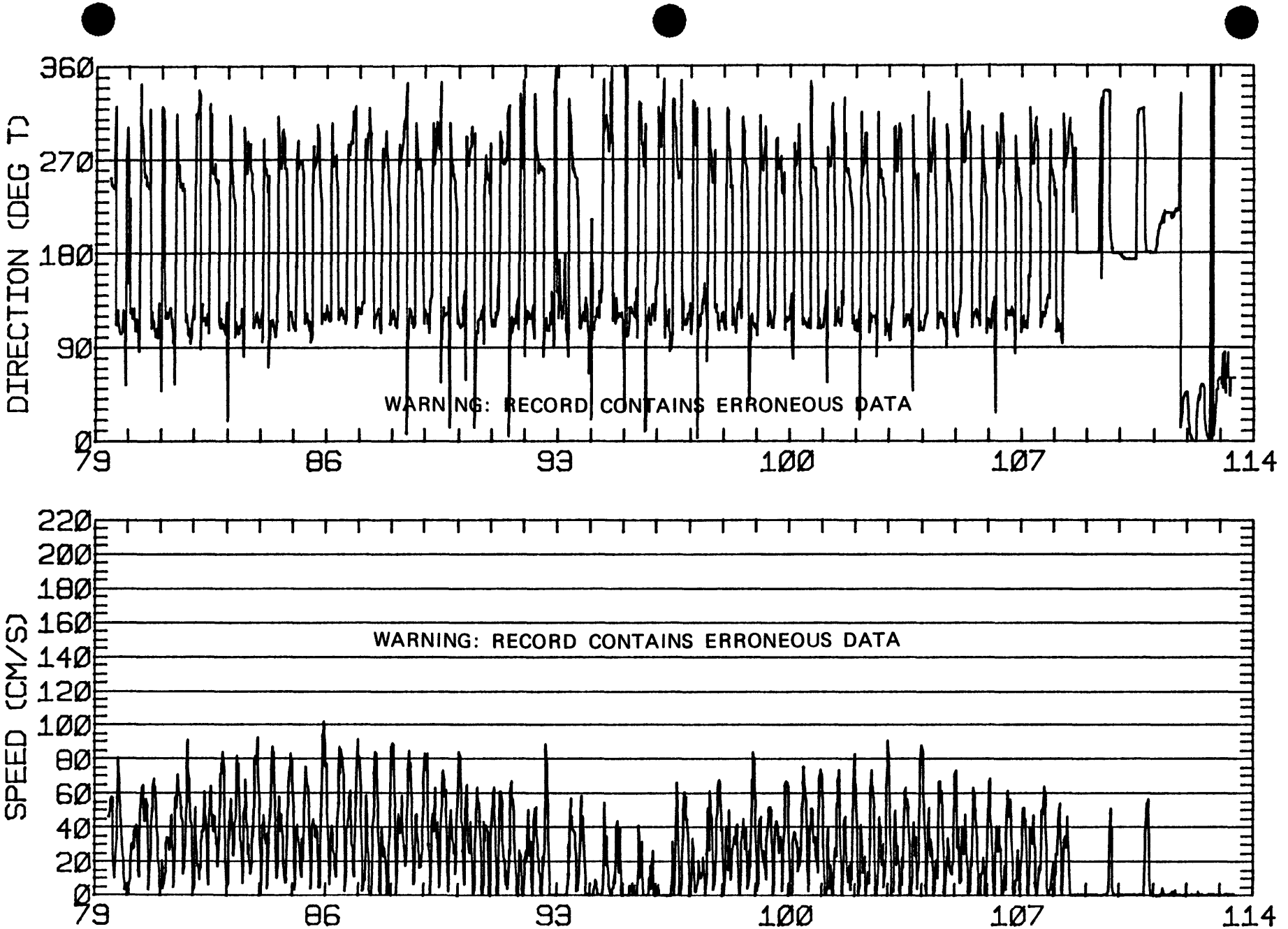
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.41	7.49	86.6	75.9	ANTI-CLOCKWISE
K1	15.81	0.79	79.9	56.2	CLOCKWISE
N2	17.11	13.78	62.6	35.9	ANTI-CLOCKWISE
M2	37.57	12.57	112.8	349.4	CLOCKWISE
S2	12.58	4.36	94.6	332.3	CLOCKWISE
M4	6.01	1.61	124.6	37.1	ANTI-CLOCKWISE

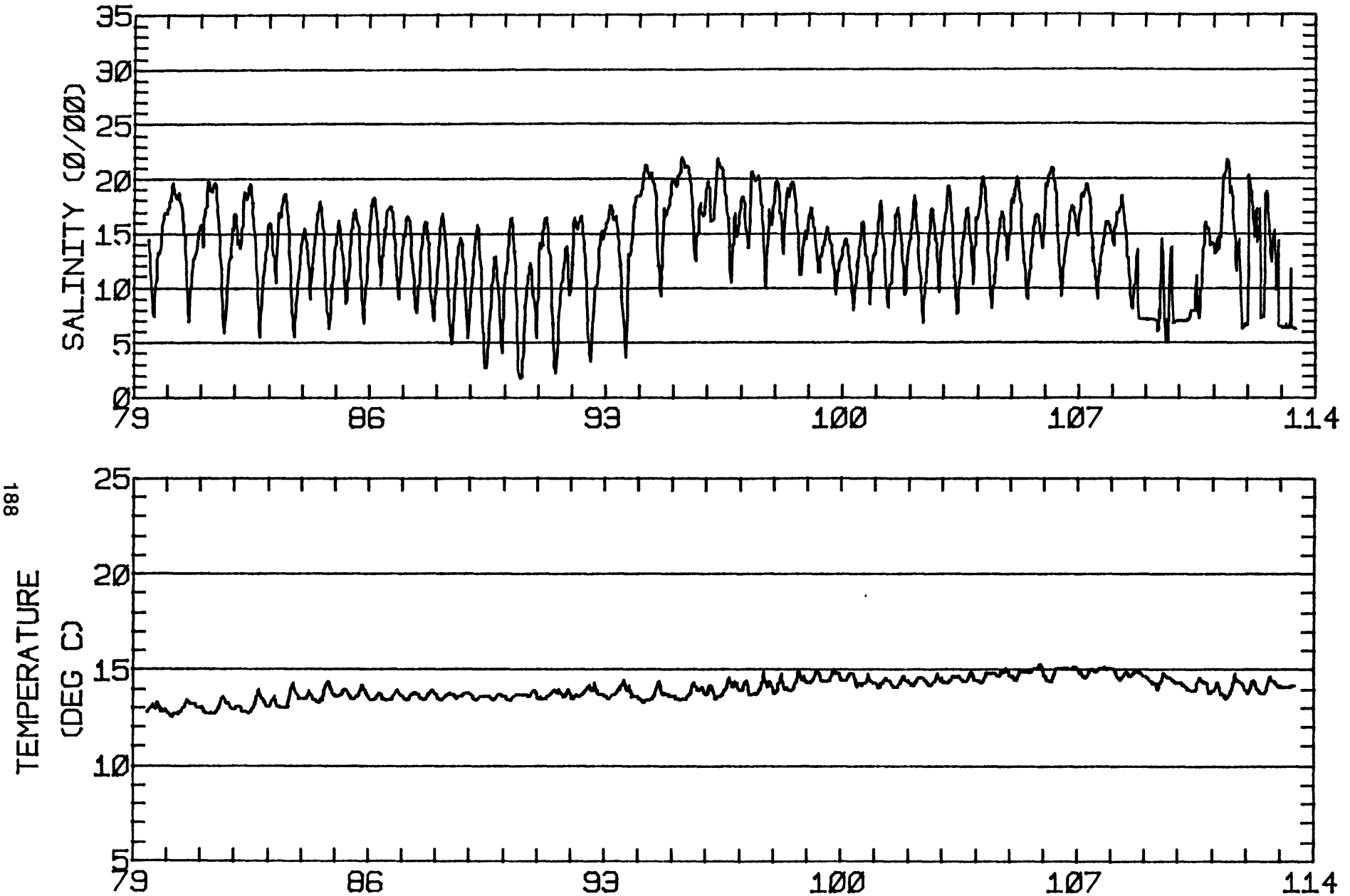
RMS SPEED: 46.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 83.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 98.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.66
STANDARD DEVIATION U-SERIES: 10.75 CM/SEC
STANDARD DEVIATION V SERIES: 9.59 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.6	-10.5	825.
2	2	16.0	-16.6	582.
ALL	14	9.6	-11.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-43N 122-13- 7W
METER 002.2 METERS ABOVE BED. WATER DEPTH 022.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-43N 122-13- 7W
METER ØØ2.2 METERS ABOVE BED. WATER DEPTH Ø22.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 12'57"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 5.2 M (BELOW MLLW)
START TIME OF SERIES: 4/18/79 1600 PST JULIAN DAY=108
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

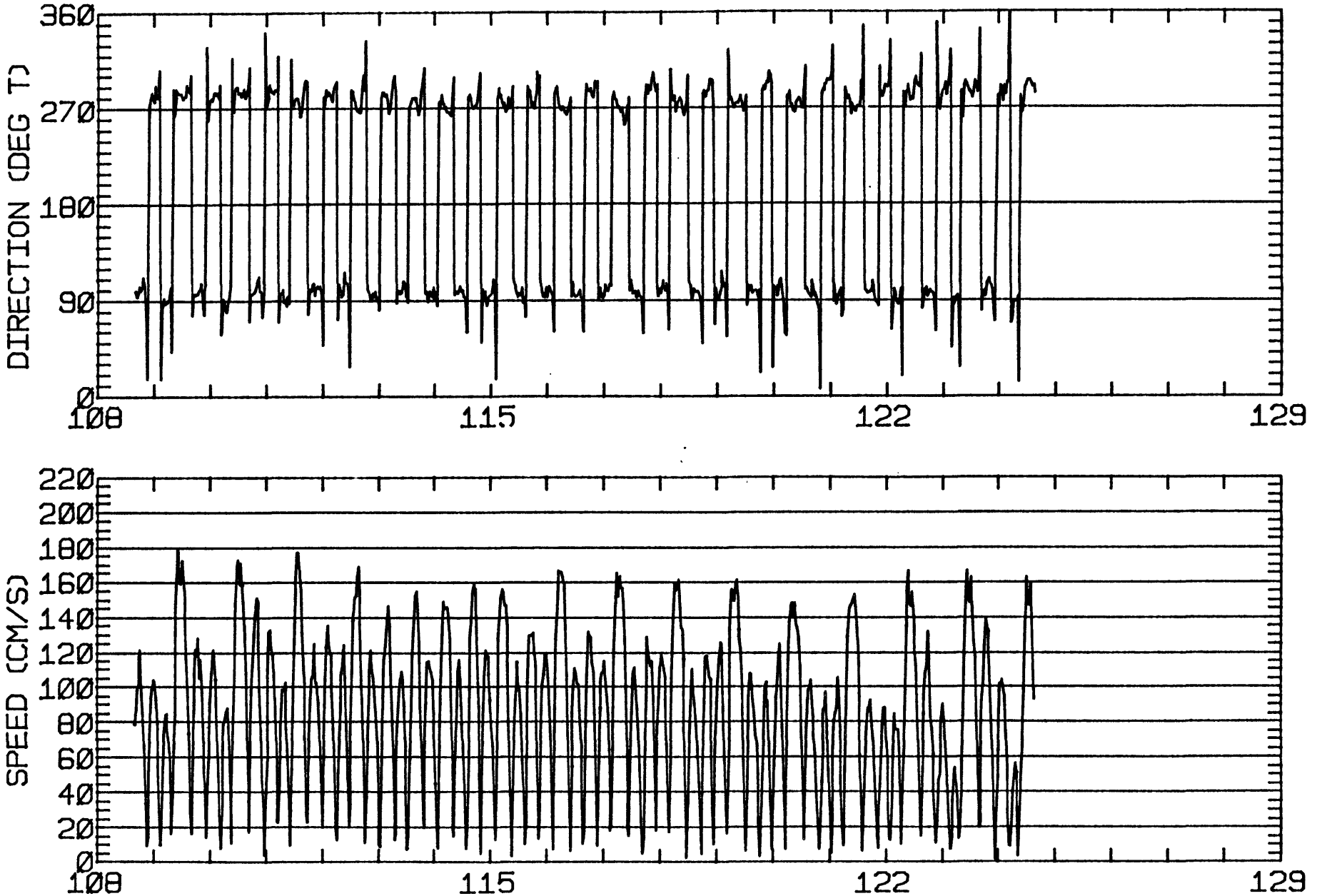
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	22.21	7.23	96.9	75.0	ANTI-CLOCKWISE
K1	41.09	1.23	91.9	75.0	CLOCKWISE
N2	12.51	0.22	82.1	0.2	CLOCKWISE
M2	117.45	2.61	99.7	10.6	CLOCKWISE
S2	12.68	1.83	88.7	355.2	ANTI-CLOCKWISE
M4	4.86	2.15	119.1	341.6	CLOCKWISE

RMS SPEED: 97.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 193.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 85.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 97.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 15.43 CM/SEC
STANDARD DEVIATION V SERIES: 13.79 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-17.8	5.9	227.
2	12	-14.9	3.2	304.
3	6	-18.2	9.4	256.
ALL	30	-16.7	5.5	

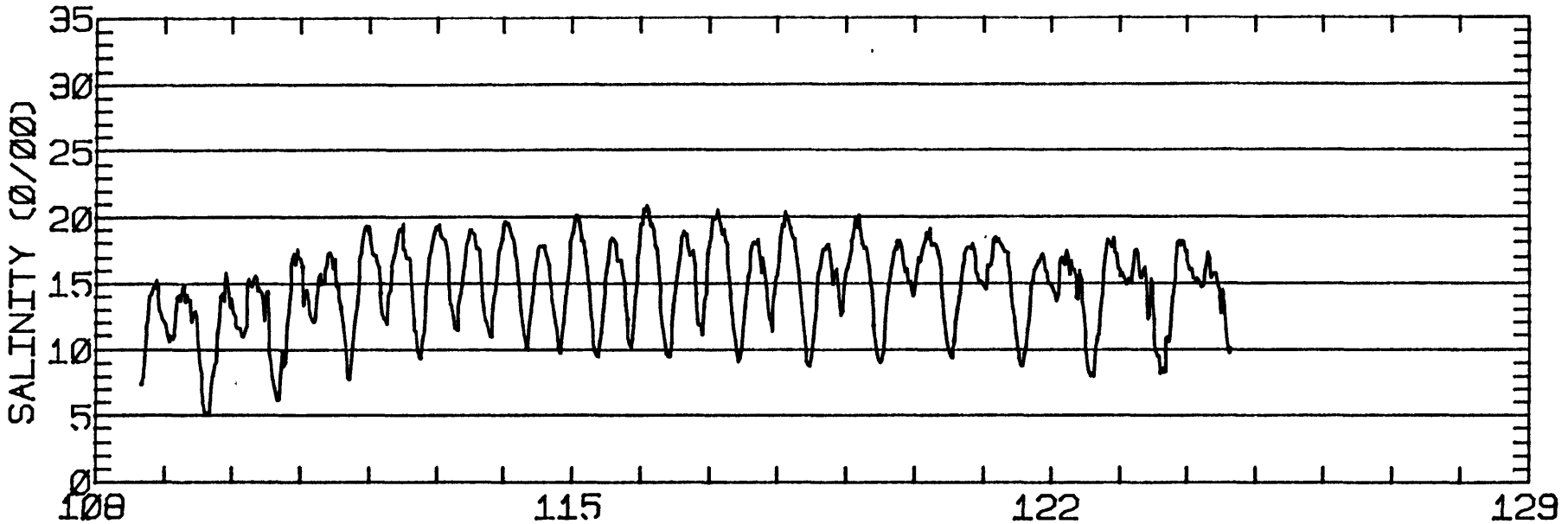


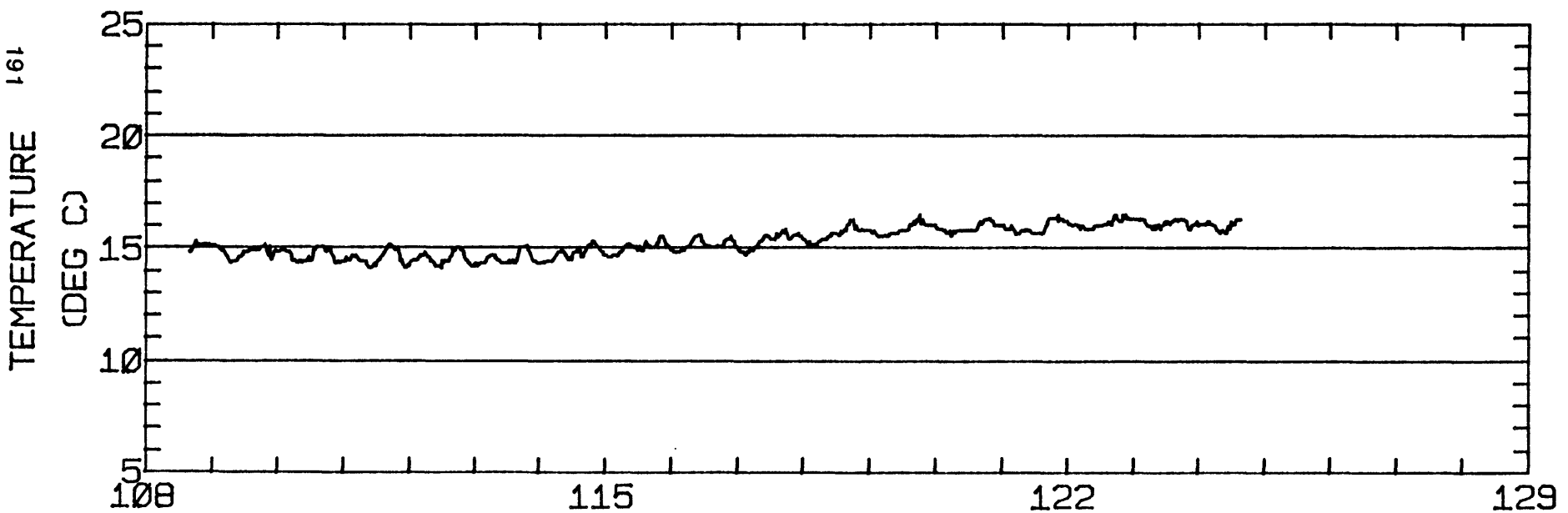
JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-39N 122-12-57W

METER 012.5 METERS ABOVE BED. WATER DEPTH 017.7 METERS.





191

JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-39N 122-12-57W

METER Ø12.5 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 12'57"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 11.3 M (BELOW MLLW)
START TIME OF SERIES: 4/18/79 1552 PST JULIAN DAY=108
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

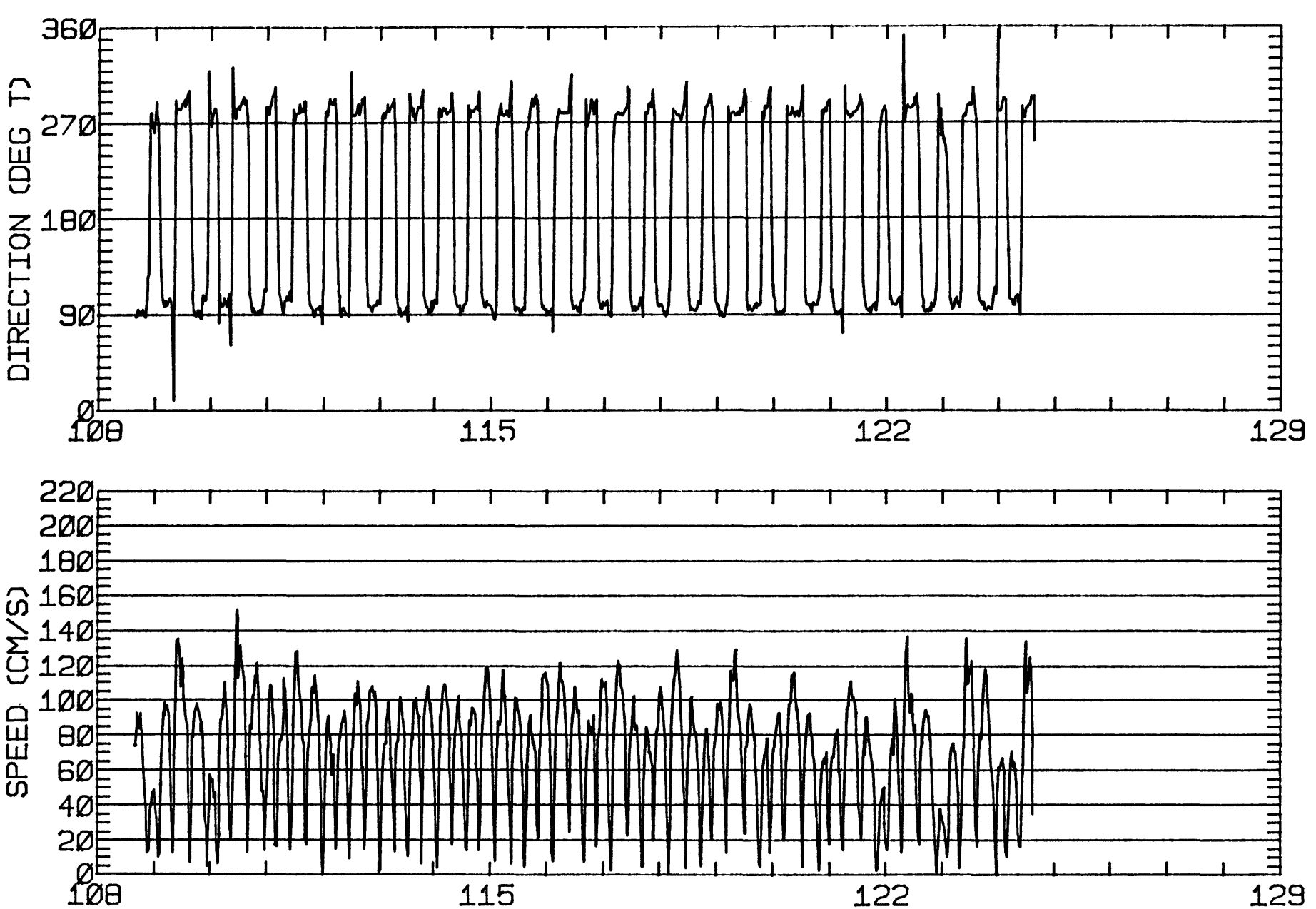
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.63	0.19	104.7	82.7	CLOCKWISE
K1	34.87	2.00	101.0	77.6	CLOCKWISE
N2	10.82	1.67	103.6	355.2	CLOCKWISE
M2	94.13	0.79	100.3	2.9	ANTI-CLOCKWISE
S2	9.90	0.29	93.3	5.3	CLOCKWISE
M4	5.46	3.10	156.0	249.1	ANTI-CLOCKWISE

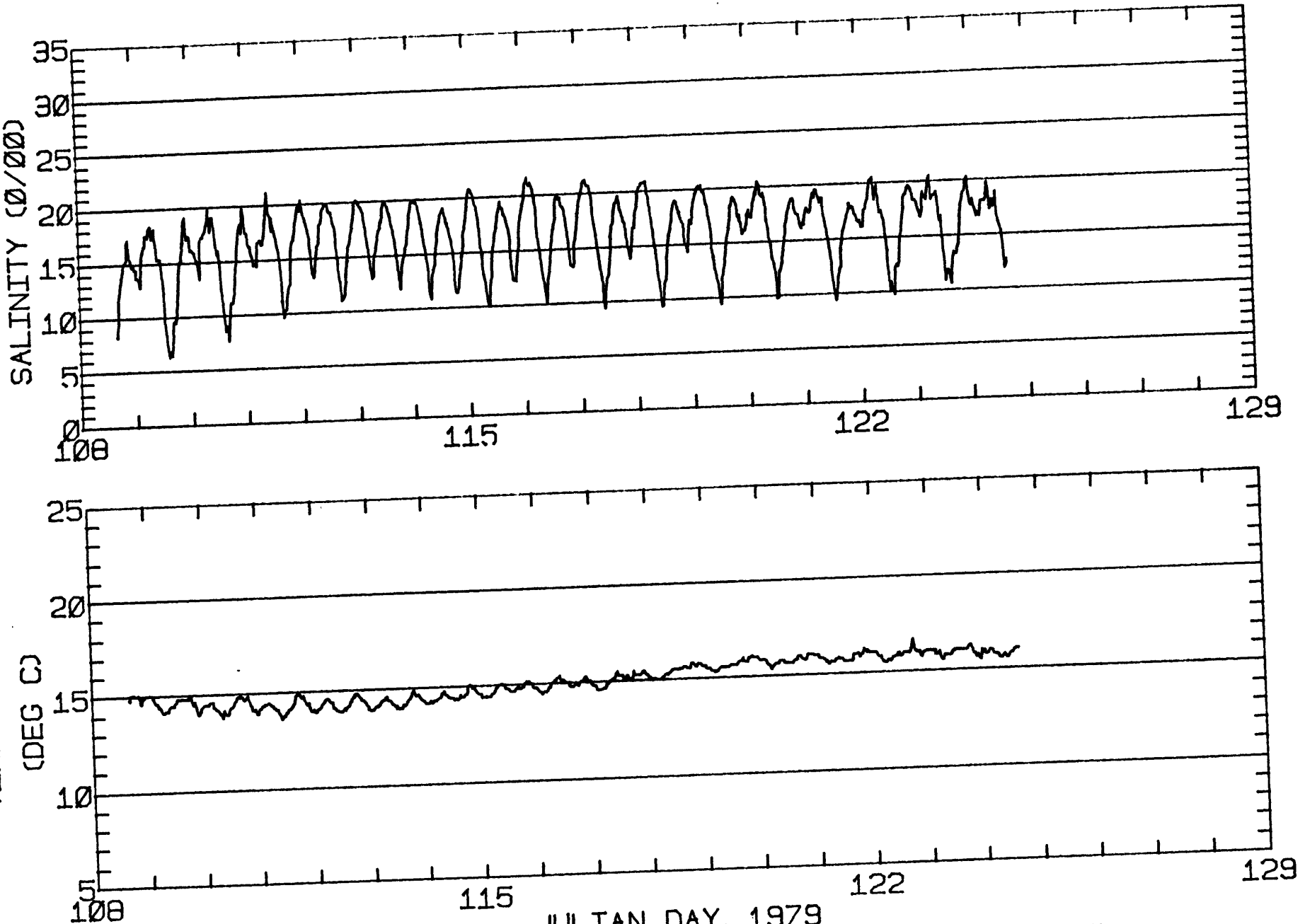
RMS SPEED: 77.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 158.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 69.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 100.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 14.65 CM/SEC
STANDARD DEVIATION V SERIES: 9.52 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.6	3.3	227.
2	12	1.8	2.4	304.
3	6	2.7	1.1	256.
ALL	30	2.7	2.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-12-57W
METER 006.4 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-12-57W
METER ØØ6.4 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13'16"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:10/23/79 1320 PST JULIAN DAY=296
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

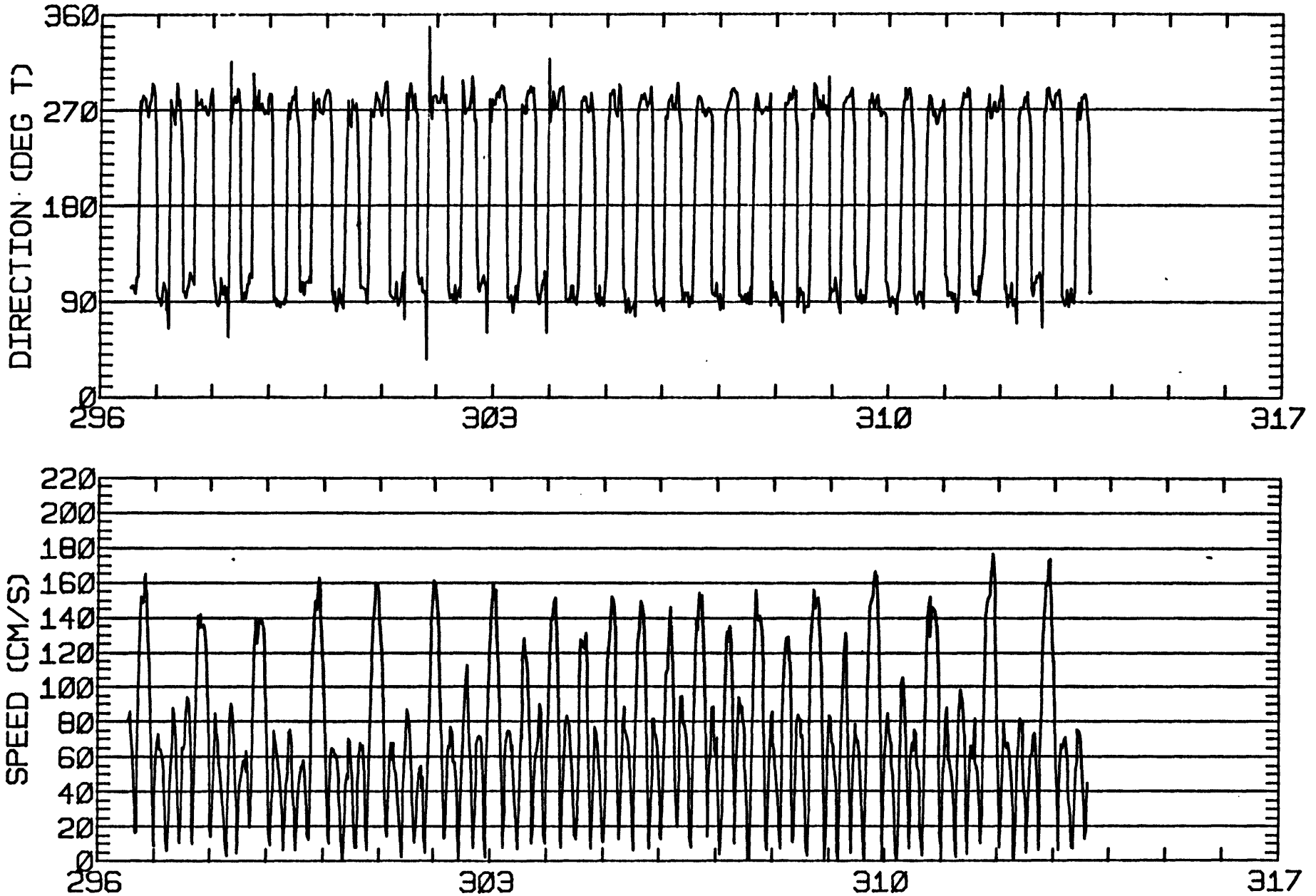
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	23.81	1.36	99.2	81.4	ANTI-CLOCKWISE
K1	34.68	4.13	90.7	82.0	CLOCKWISE
N2	18.71	1.41	93.9	358.2	CLOCKWISE
M2	87.84	1.01	98.5	6.7	ANTI-CLOCKWISE
S2	15.67	2.03	94.7	1.4	ANTI-CLOCKWISE
M4	5.29	0.53	111.3	254.6	CLOCKWISE

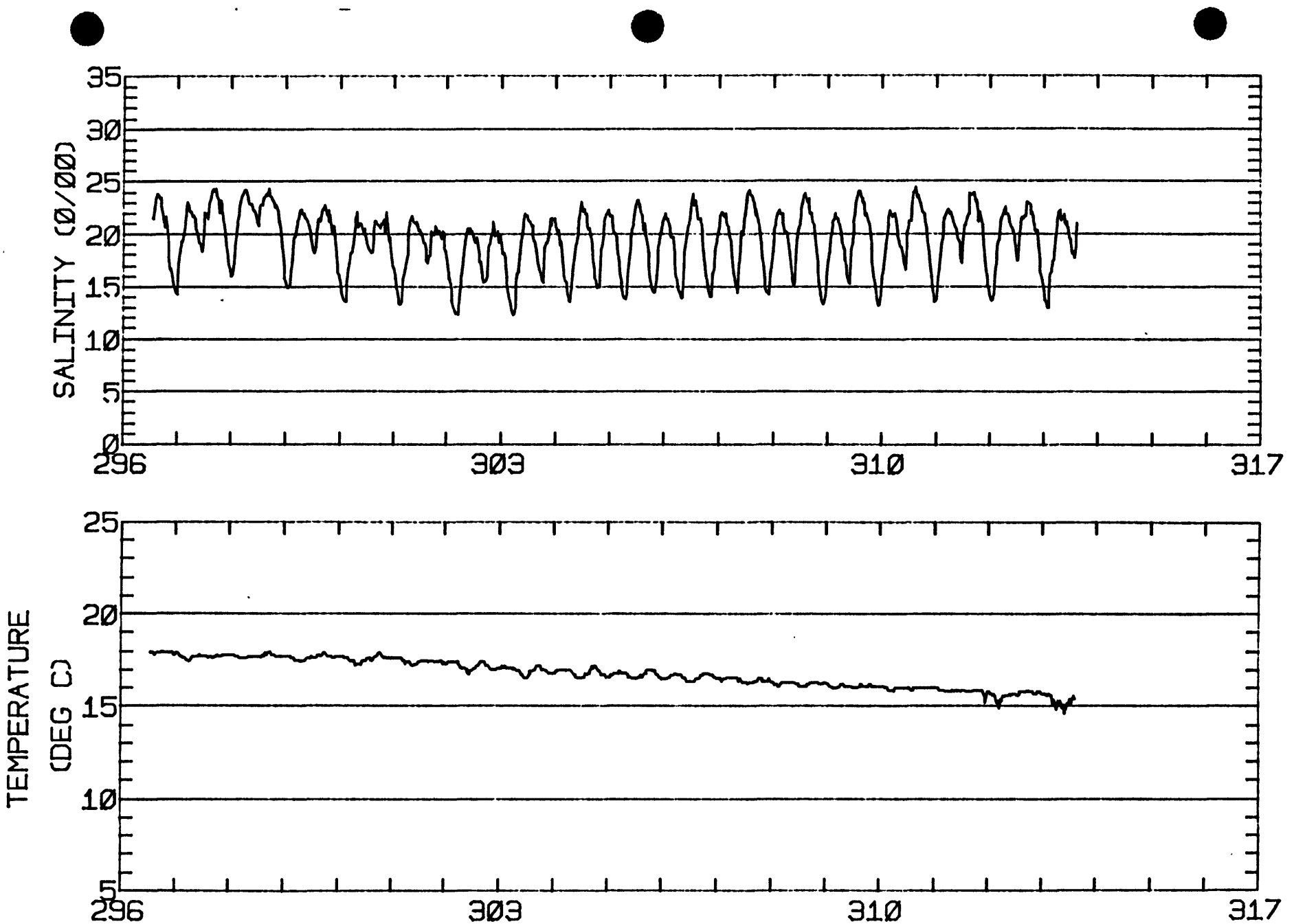
RMS SPEED: 84.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 162.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 61.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 96.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.57
STANDARD DEVIATION U-SERIES: 13.06 CM/SEC
STANDARD DEVIATION V SERIES: 12.55 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-24.0	2.4	304.
2	12	-27.0	5.7	257.
3	8	-25.9	2.2	278.
ALL	32	-25.6	3.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13-16W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13-16W
·METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13'16"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:10/23/79 1312 PST JULIAN DAY=296
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

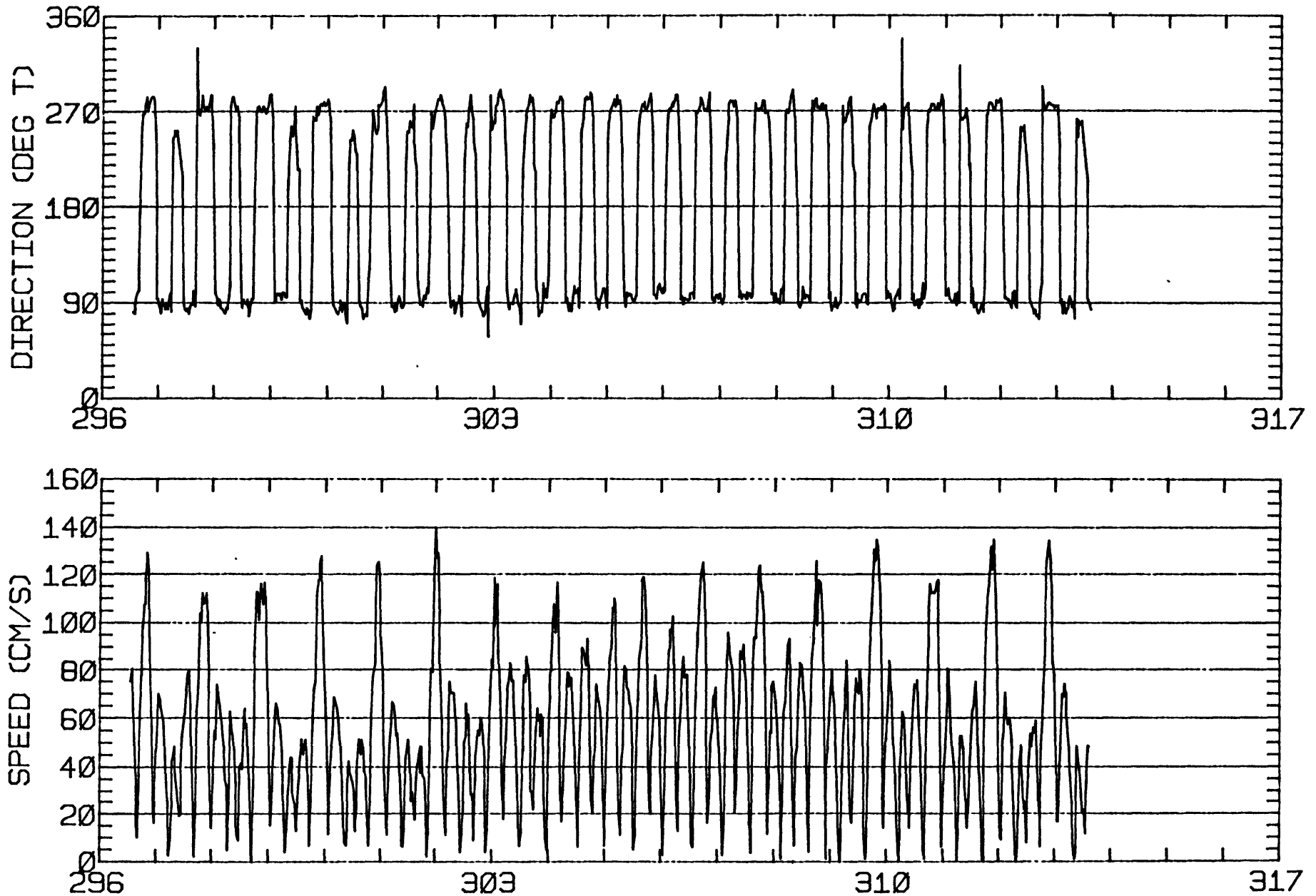
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.74	0.26	100.2	85.2	CLOCKWISE
K1	33.52	0.93	96.4	79.5	CLOCKWISE
N2	16.76	0.52	96.2	352.6	ANTI-CLOCKWISE
M2	68.89	1.14	93.0	1.3	CLOCKWISE
S2	14.12	2.60	100.2	358.4	ANTI-CLOCKWISE
M4	4.62	2.35	126.1	217.9	ANTI-CLOCKWISE

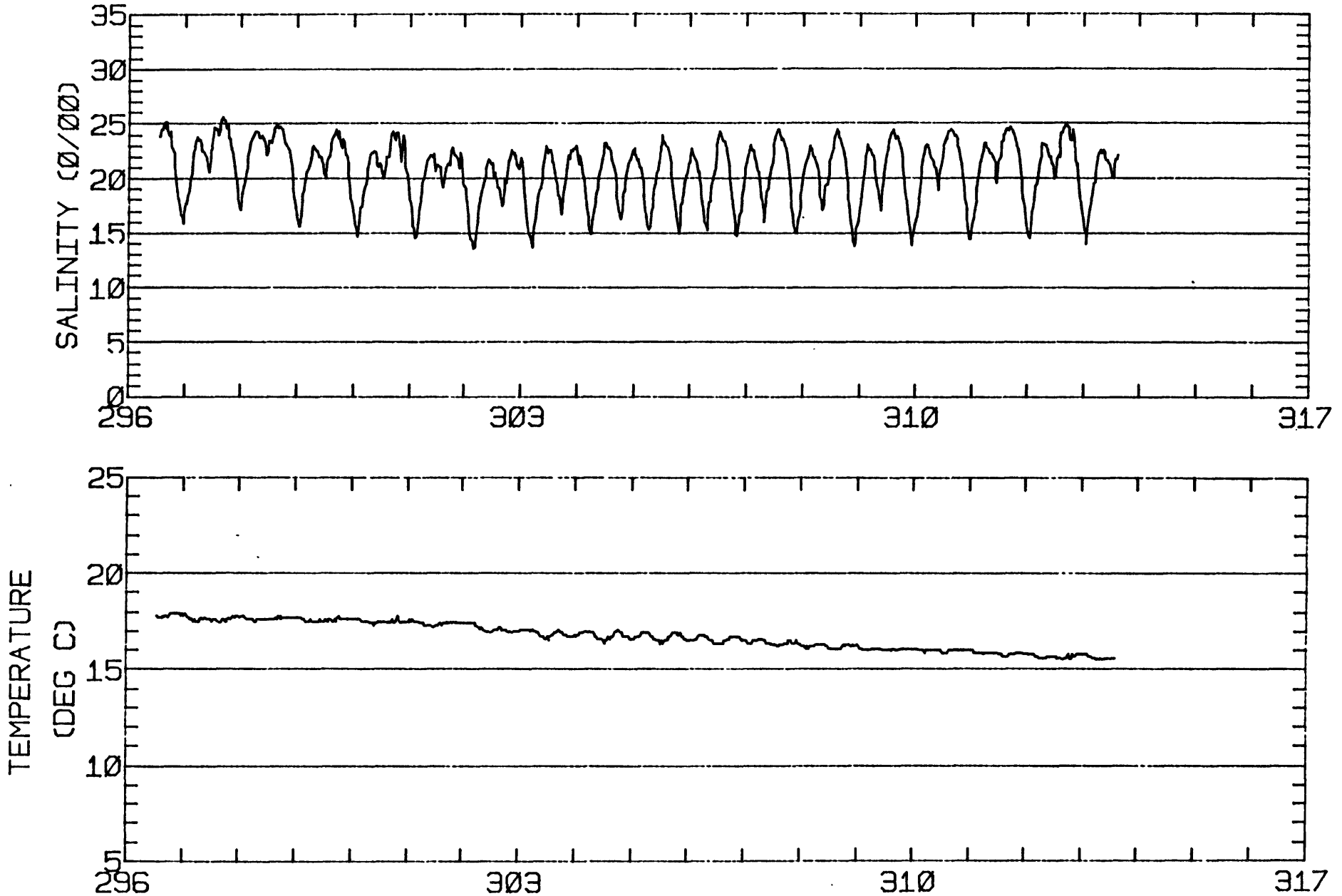
RMS SPEED: 66.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 136.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 95.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.64
STANDARD DEVIATION U-SERIES: 10.36 CM/SEC
STANDARD DEVIATION V SERIES: 8.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.5	0.1	304.
2	12	-11.6	0.7	257.
3	8	-9.9	0.4	278.
ALL	32	-9.6	0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13-16W
METER 009.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13-16W
METER ØØ9.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 12'59"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:11/ 2/79 1340 PST JULIAN DAY=306
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

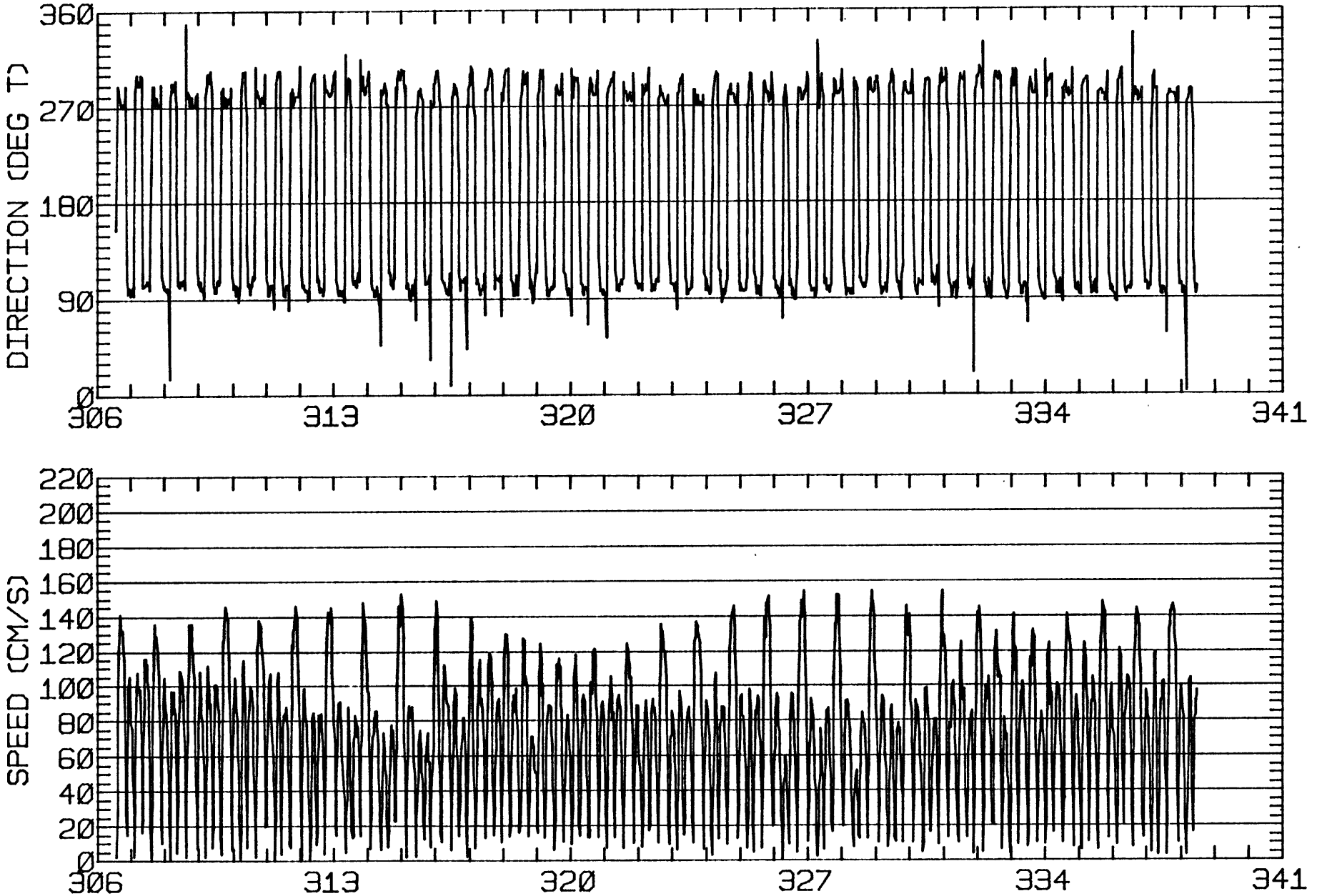
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	21.05	3.67	103.6	84.2	ANTI-CLOCKWISE
K1	40.08	4.10	98.4	82.4	CLOCKWISE
N2	14.59	1.78	105.8	322.2	ANTI-CLOCKWISE
M2	97.78	1.04	105.0	8.7	ANTI-CLOCKWISE
S2	16.04	2.91	97.0	344.7	ANTI-CLOCKWISE
M4	5.39	1.80	147.7	229.6	ANTI-CLOCKWISE

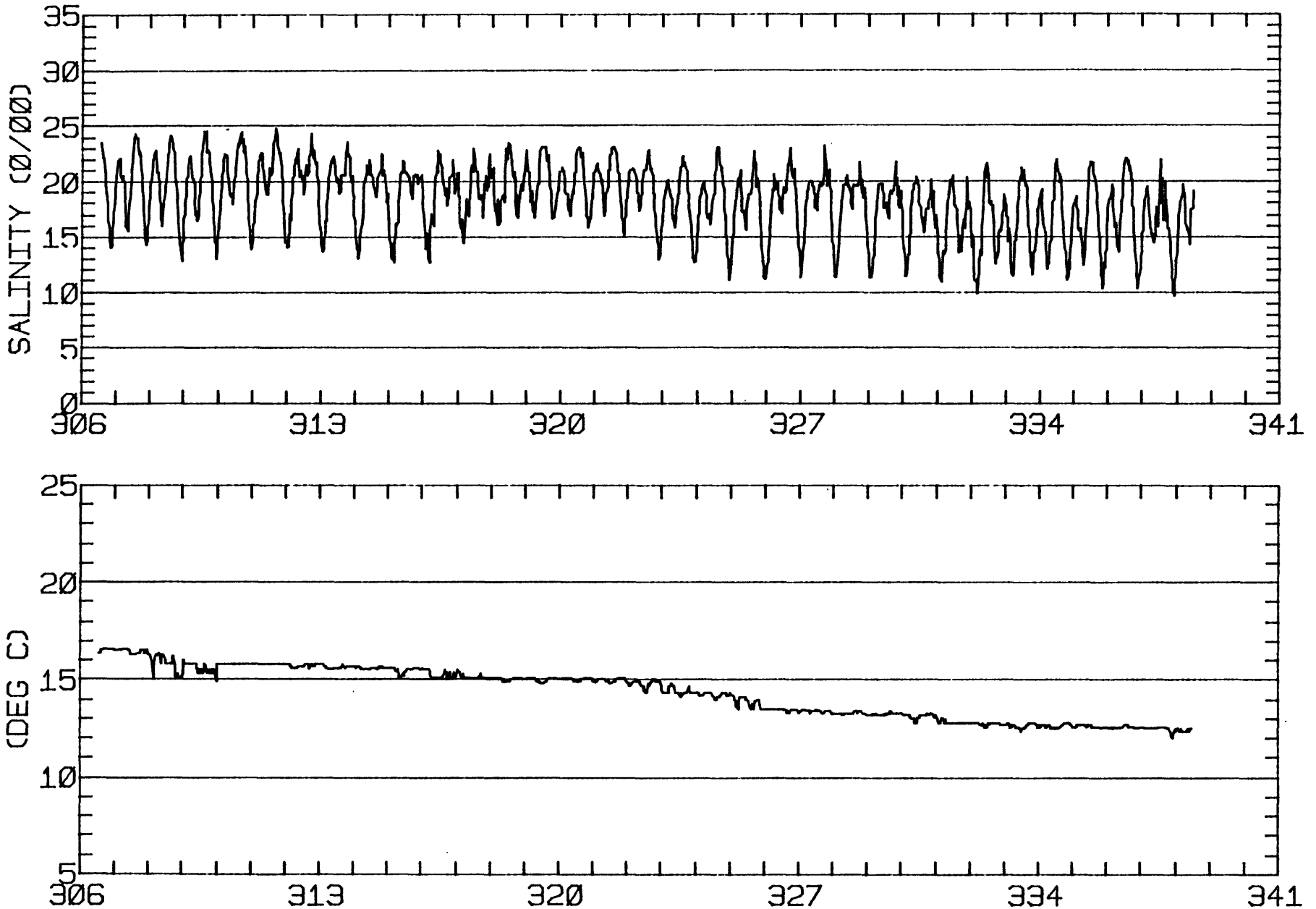
RMS SPEED: 82.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 175.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 62.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 102.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.54
STANDARD DEVIATION U-SERIES: 14.93 CM/SEC
STANDARD DEVIATION V SERIES: 13.41 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.9	3.2	243.
2	12	-5.7	7.6	307.
3	12	-9.8	5.0	293.
4	12	-7.9	5.9	411.
5	10	-8.7	9.3	493.
ALL	58	-8.2	6.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-12-59W
METER 011.0 METERS ABOVE BED. WATER DEPTH 017.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-12-59W
METER Ø11.Ø METERS ABOVE BED. WATER DEPTH Ø17.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 12'59"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 2/79 1402 PST JULIAN DAY=306
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

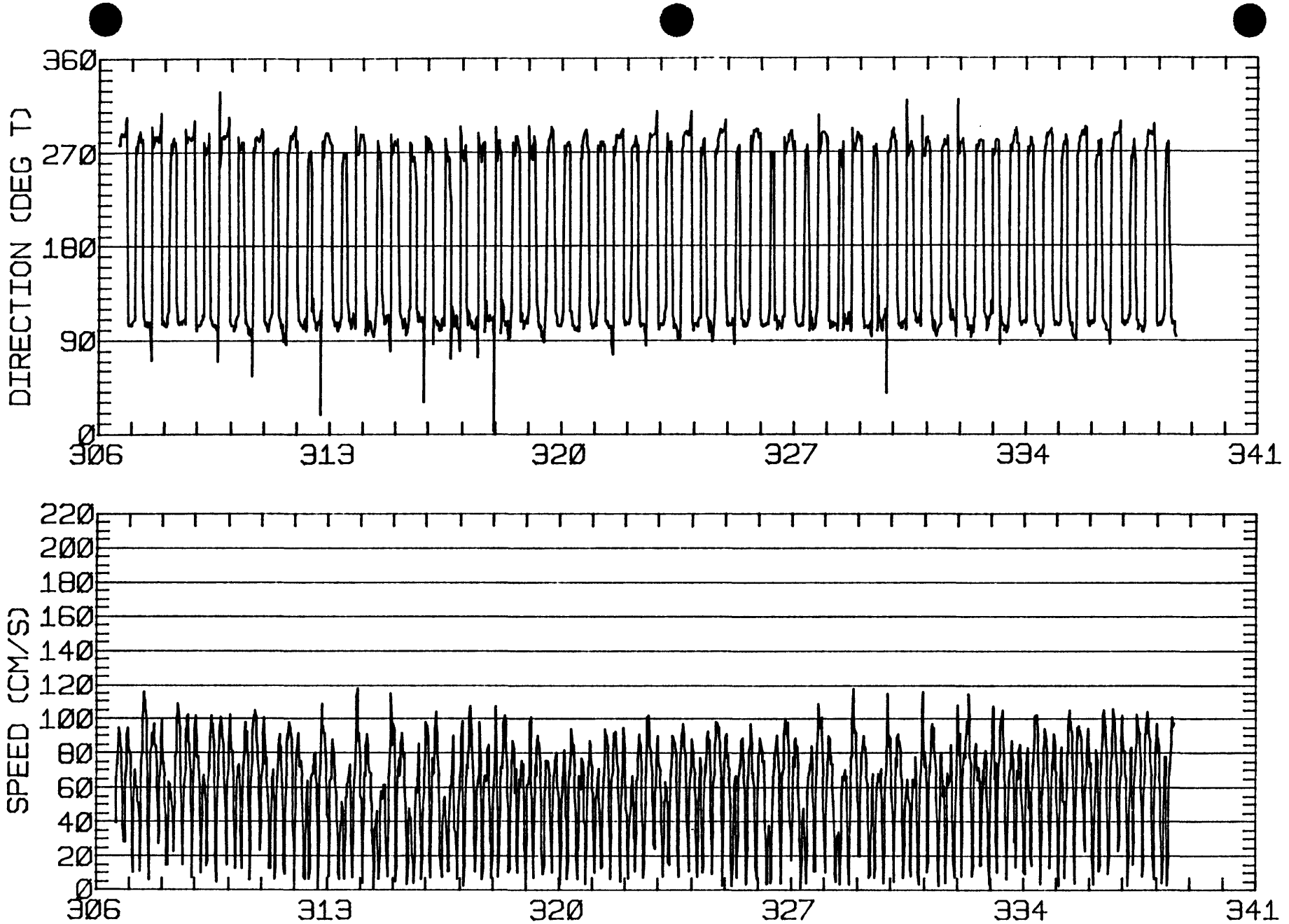
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.70	3.15	114.5	81.0	CLOCKWISE
K1	33.55	0.73	105.6	78.5	ANTI-CLOCKWISE
N2	11.36	0.90	99.9	316.2	CLOCKWISE
M2	78.19	0.12	103.0	2.1	ANTI-CLOCKWISE
S2	12.98	1.39	101.9	339.2	CLOCKWISE
M4	3.28	0.68	134.0	233.8	CLOCKWISE

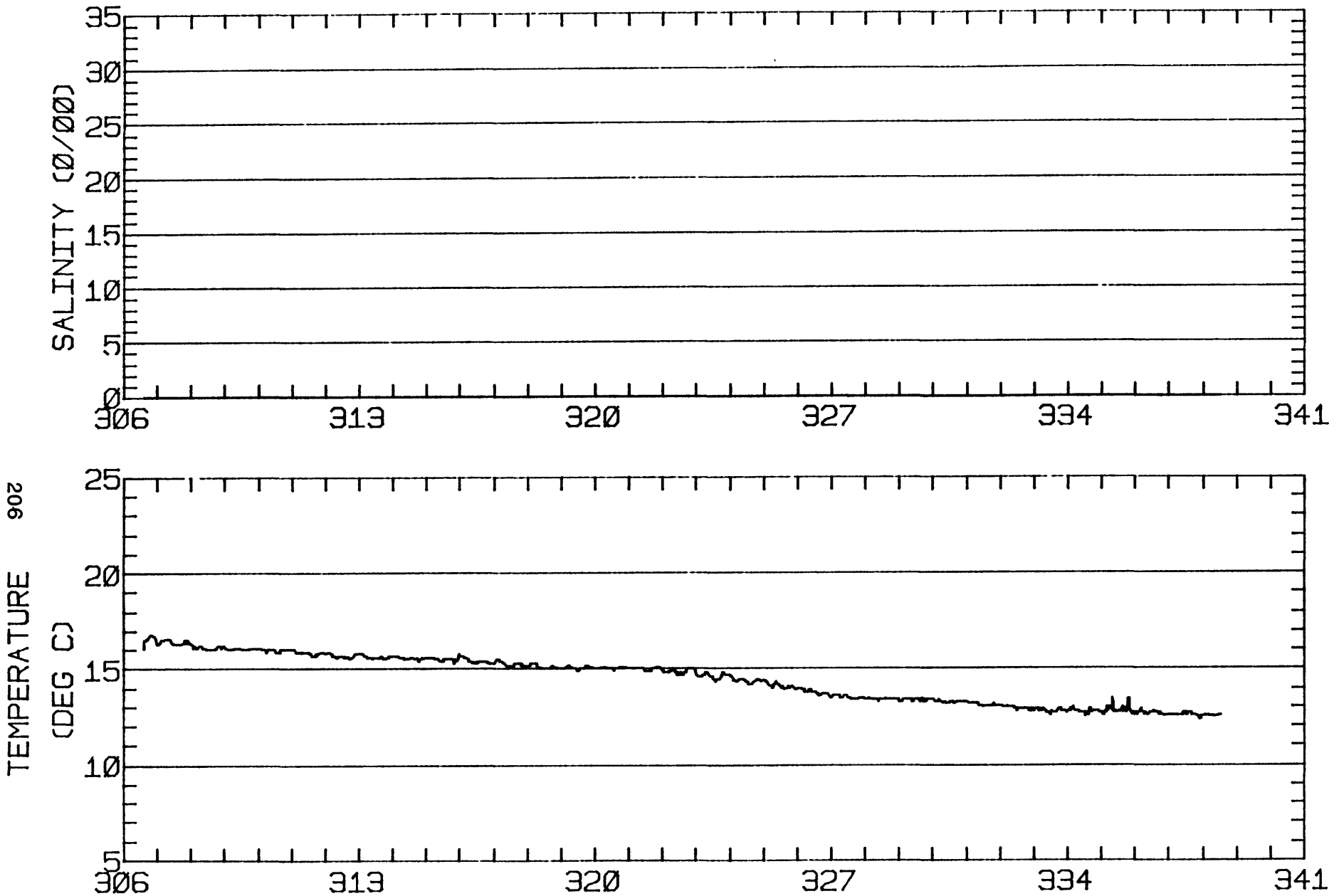
RMS SPEED: 65.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 140.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 104.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.54
STANDARD DEVIATION U-SERIES: 14.48 CM/SEC
STANDARD DEVIATION V SERIES: 6.73 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.0	-3.5	243.
2	12	7.2	-7.3	307.
3	12	3.9	-2.2	293.
4	12	7.0	-5.2	411.
5	10	6.8	-4.2	493.
ALL	58	6.0	-4.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-12-59W
METER 004.9 METERS ABOVE BED. WATER DEPTH 017.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-12-59W
METER Ø04.9 METERS ABOVE BED. WATER DEPTH Ø17.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 12'59"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 15.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 2/79 1344 PST JULIAN DAY=306
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

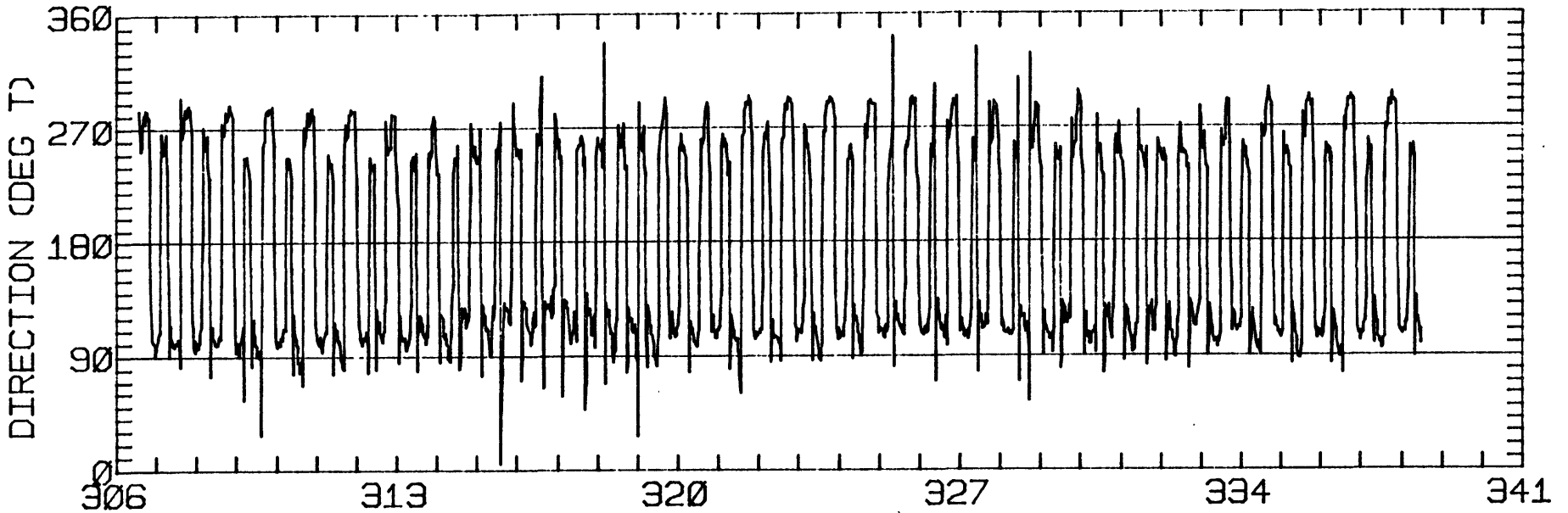
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

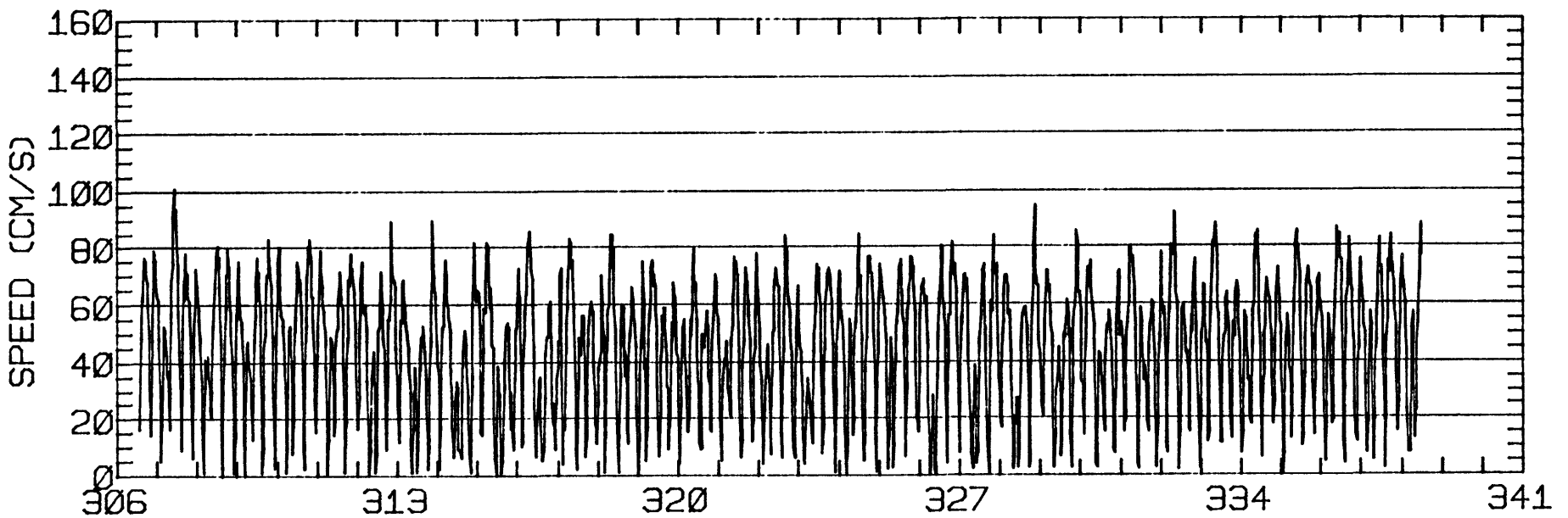
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.87	4.78	115.2	85.2	CLOCKWISE
K1	27.25	2.48	104.4	75.3	ANTI-CLOCKWISE
N2	8.05	1.44	88.8	316.9	CLOCKWISE
M2	57.61	2.39	99.4	358.9	ANTI-CLOCKWISE
S2	10.00	1.22	96.1	338.9	CLOCKWISE
M4	2.35	1.12	2.2	104.5	CLOCKWISE

RMS SPEED: 51.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 106.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 102.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.58
STANDARD DEVIATION U-SERIES: 9.81 CM/SEC
STANDARD DEVIATION V SERIES: 9.99 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

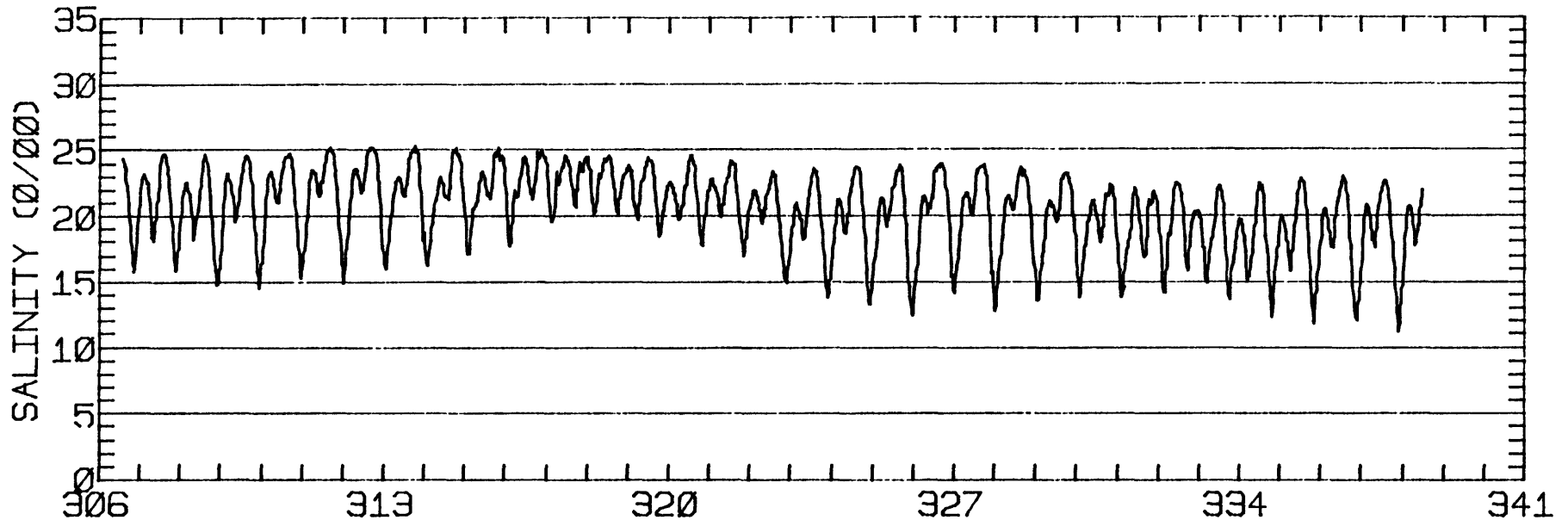
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.3	-5.8	243.
2	12	7.9	-14.0	307.
3	12	5.8	-6.6	293.
4	12	7.1	-10.8	411.
5	10	8.7	-11.4	493.
ALL	58	7.1	-9.7	

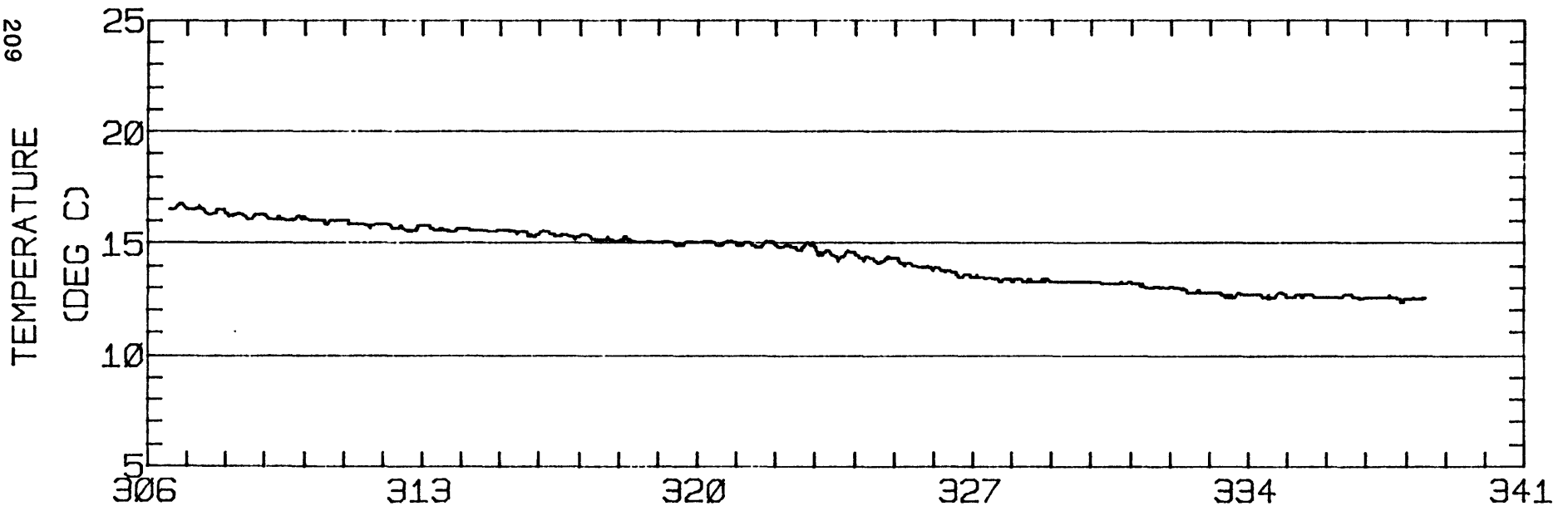




JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-12-59W
METER 001.9 METERS ABOVE BED. WATER DEPTH 017.1 METERS.





209

JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3--38N 122-12-59W
METER ØØ1.9 METERS ABOVE BED. WATER DEPTH Ø17.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.3 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 4/ 2/80 1540 PST JULIAN DAY= 93
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

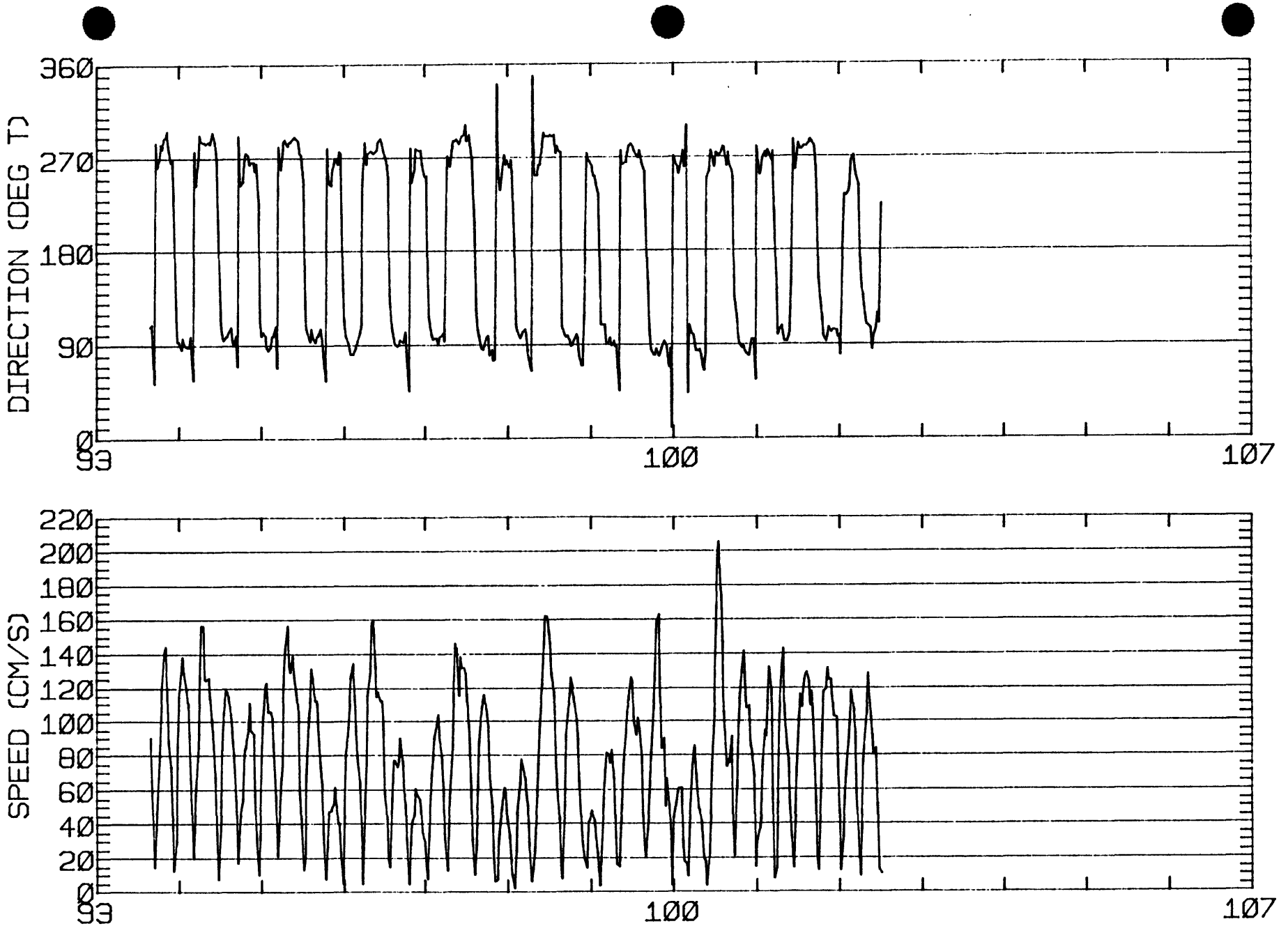
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	27.04	7.53	105.3	61.6	CLOCKWISE
K1	35.35	3.12	97.3	77.6	ANTI-CLOCKWISE
N2	20.48	10.79	97.8	324.3	ANTI-CLOCKWISE
M2	129.02	7.61	101.0	2.8	ANTI-CLOCKWISE
S2	38.64	1.12	100.9	6.0	ANTI-CLOCKWISE
M4	7.42	3.45	57.1	336.4	ANTI-CLOCKWISE

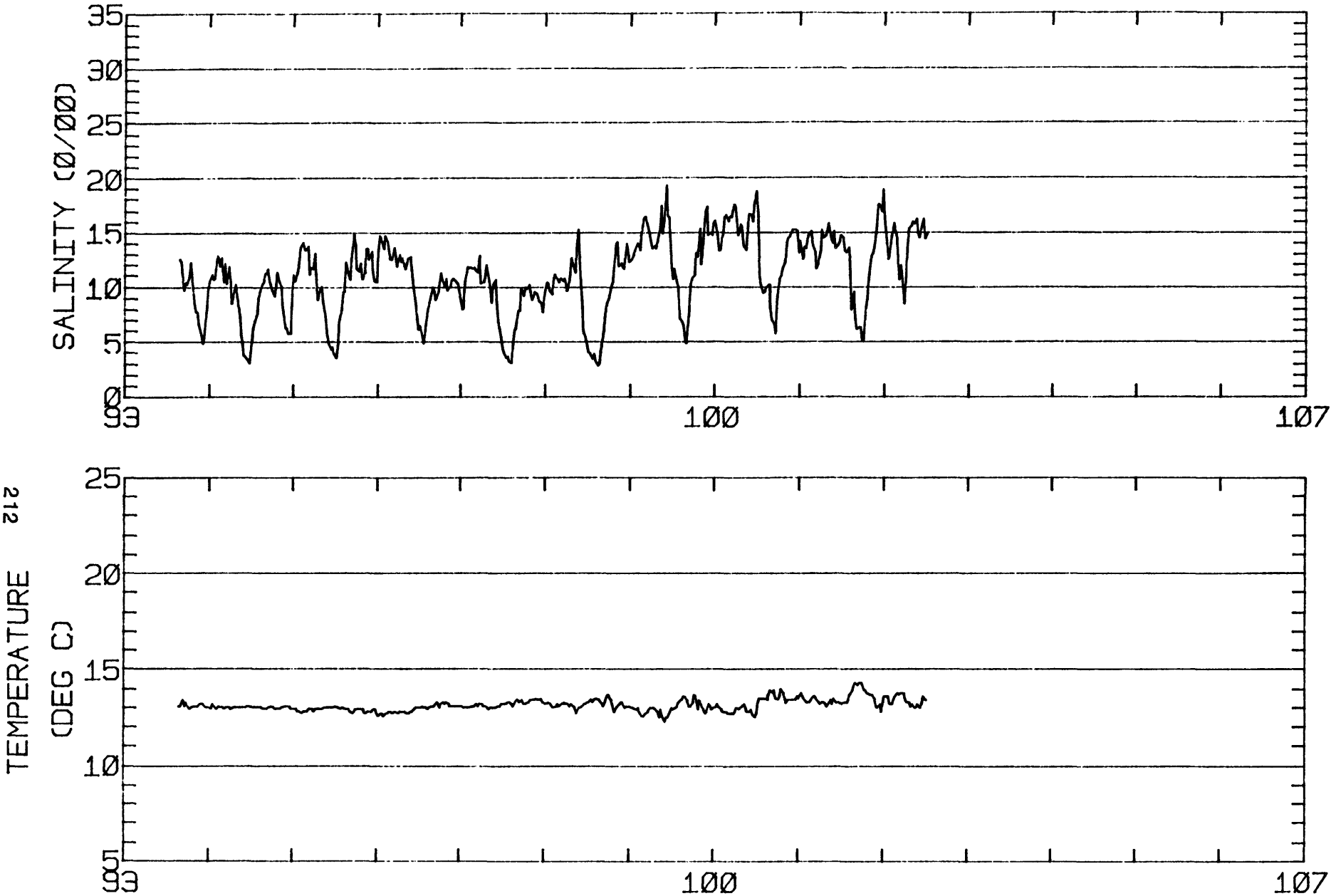
RMS SPEED: 87.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 230.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 82.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 100.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 17.59 CM/SEC
STANDARD DEVIATION V SERIES: 13.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.5	3.2	1058.
2	4	-4.7	-1.2	1125.
ALL	16	-4.6	2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 6W
METER 011.8 METERS ABOVE BED. WATER DEPTH 018.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 6W
METER 011.8 METERS ABOVE BED. WATER DEPTH 018.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.3 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 4/ 2/80 1532 PST JULIAN DAY= 93
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

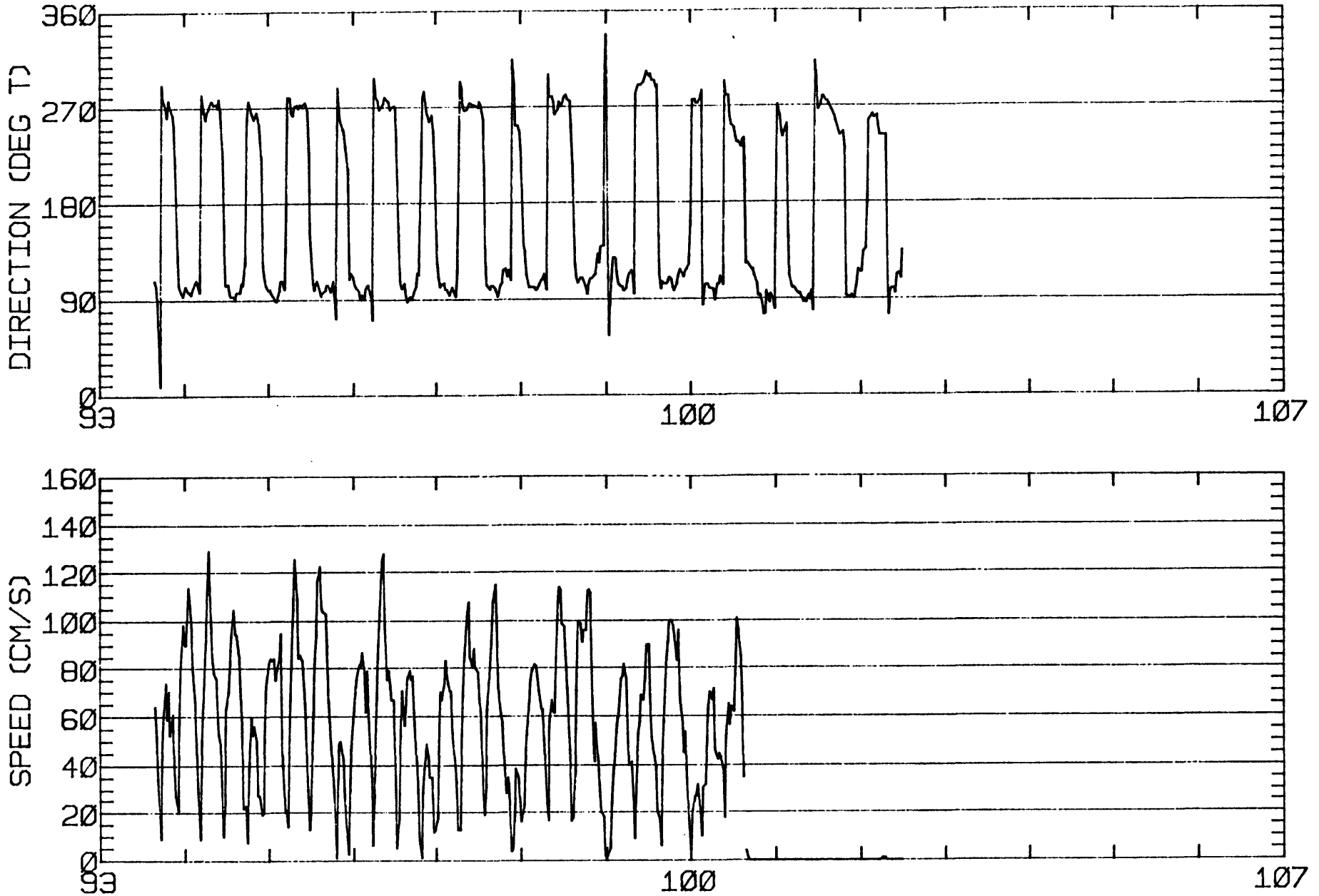
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	21.09	2.07	96.1	68.2	ANTI-CLOCKWISE
K1	27.99	0.71	101.2	67.7	CLOCKWISE
N2	41.47	6.13	113.5	302.4	ANTI-CLOCKWISE
M2	128.77	5.54	103.6	354.1	ANTI-CLOCKWISE
S2	31.85	7.12	101.0	338.4	ANTI-CLOCKWISE
M4	2.31	0.83	102.4	82.6	CLOCKWISE

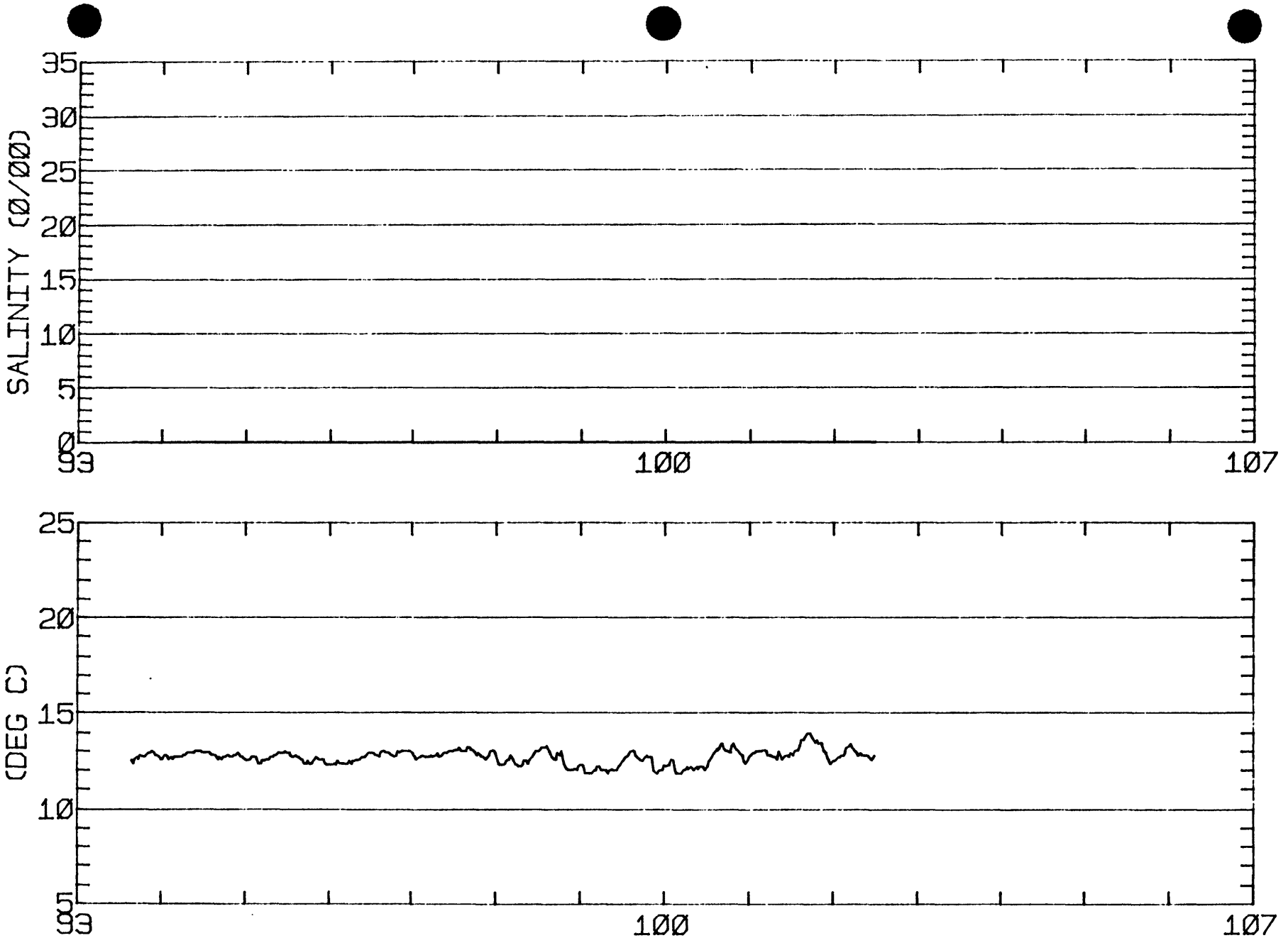
RMS SPEED: 69.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 209.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 90.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 102.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 13.26 CM/SEC
STANDARD DEVIATION V SERIES: 7.38 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	9.3	-7.0	1038.
ALL	10	9.3	-7.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 6W
METER 005.7 METERS ABOVE BED. WATER DEPTH 018.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 6W
METER Ø05.7 METERS ABOVE BED. WATER DEPTH Ø18.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.3 M (MLLW)
METER DEPTH: 16.2 M (BELOW MLLW)
START TIME OF SERIES: 4/ 2/80 1534 PST JULIAN DAY= 93
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

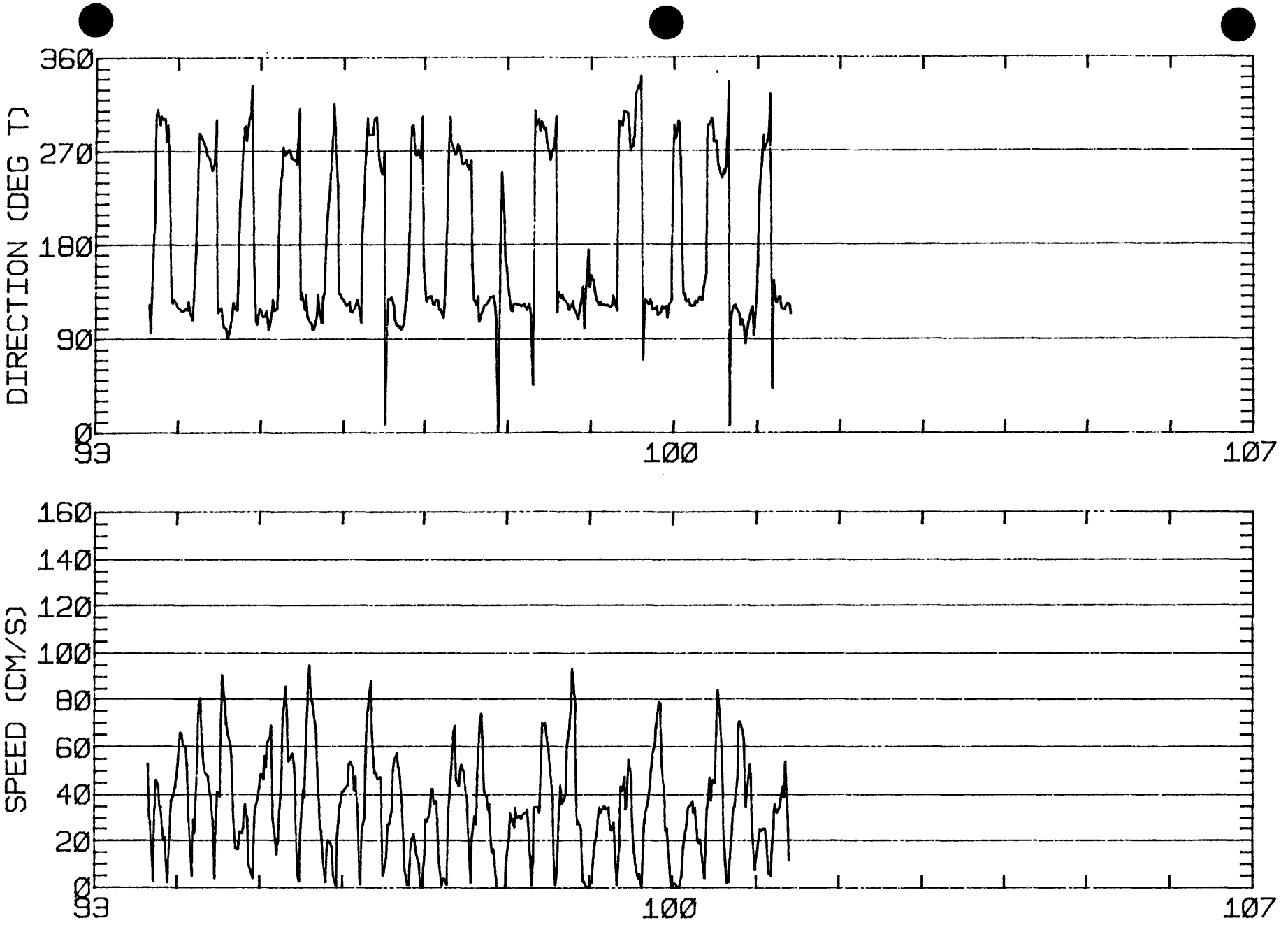
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.40	4.50	103.0	50.3	ANTI-CLOCKWISE
K1	20.86	2.57	108.1	65.5	CLOCKWISE
N2	9.29	0.23	93.3	279.4	ANTI-CLOCKWISE
M2	56.28	3.27	103.1	348.9	ANTI-CLOCKWISE
S2	17.20	1.96	99.1	5.7	CLOCKWISE
M4	4.42	0.36	120.1	60.8	ANTI-CLOCKWISE

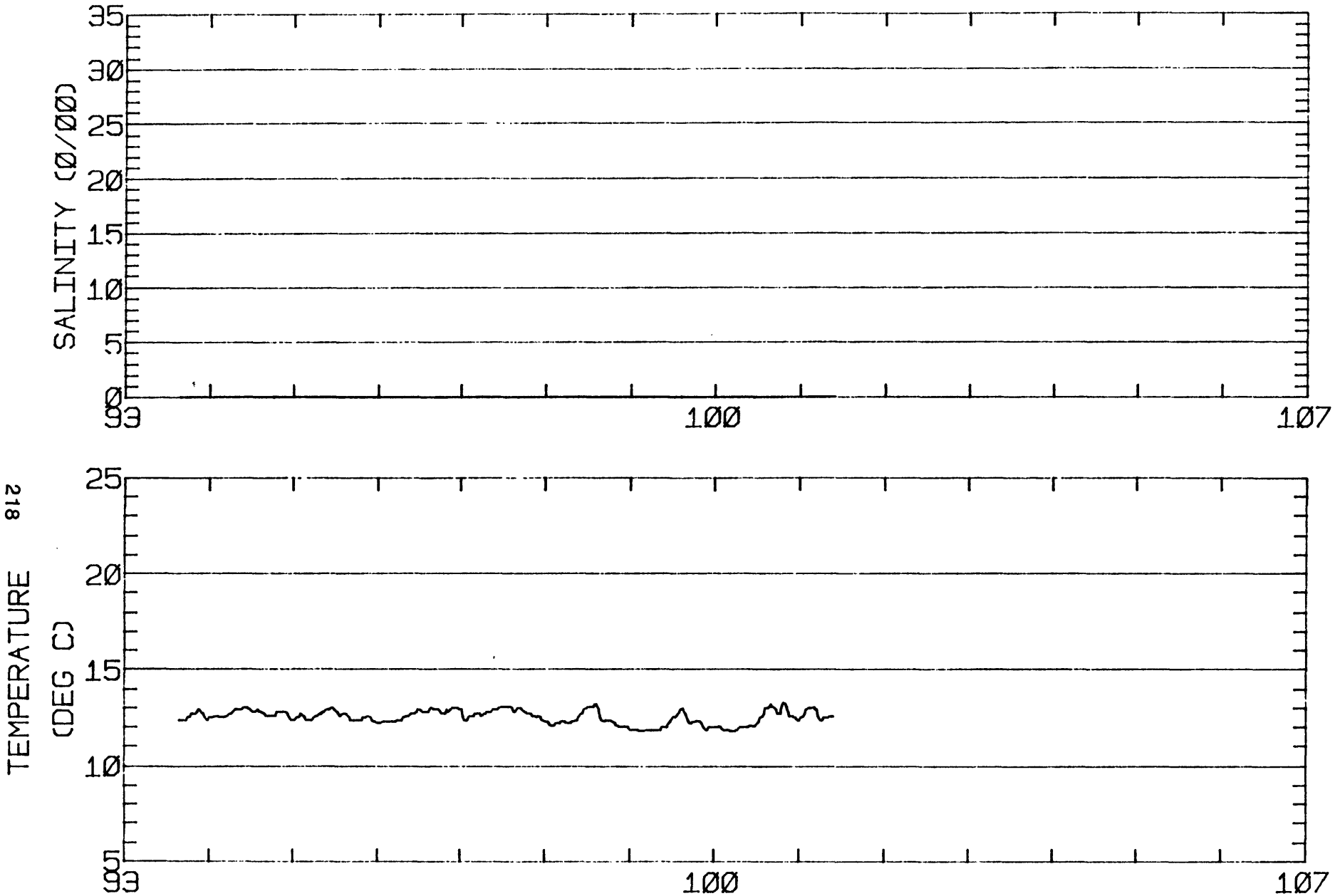
RMS SPEED: 42.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 108.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 103.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 10.40 CM/SEC
STANDARD DEVIATION V SERIES: 9.49 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.7	-8.7	1058.
2	2	6.5	-9.3	1141.
ALL	14	6.7	-8.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 6W
METER 002.0 METERS ABOVE BED. WATER DEPTH 018.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 6W
METER ØØ2.Ø METERS ABOVE BED. WATER DEPTH Ø18.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 16.8 M (MLLW)
METER DEPTH: 4.9 M (BELOW MLLW)
START TIME OF SERIES: 4/11/80 1400 PST JULIAN DAY=102
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

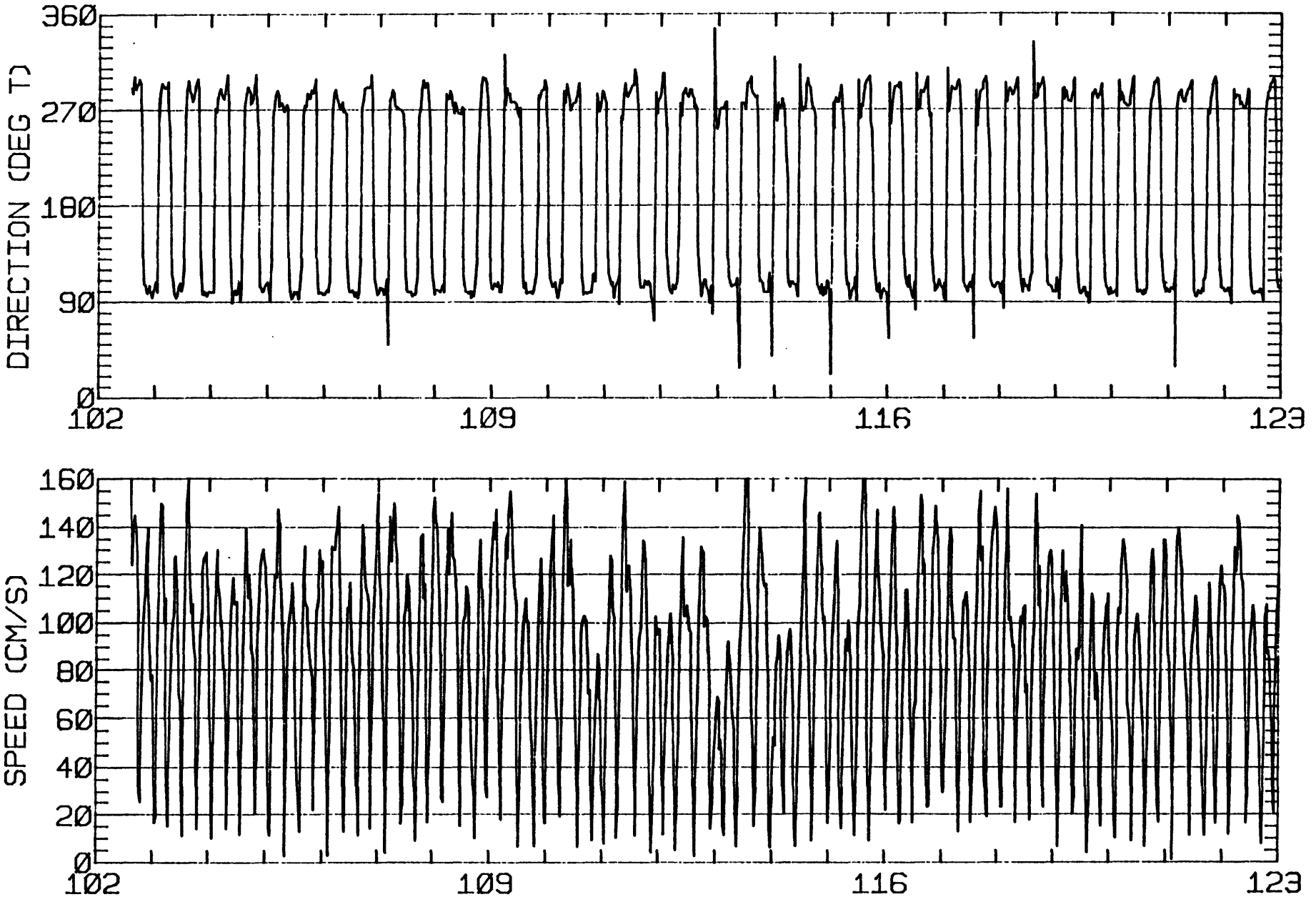
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.47	1.78	104.7	84.0	ANTI-CLOCKWISE
K1	33.62	2.85	100.1	77.4	CLOCKWISE
N2	19.19	3.15	100.5	303.9	ANTI-CLOCKWISE
M2	106.90	0.91	103.8	10.4	CLOCKWISE
S2	26.91	2.36	105.5	329.6	ANTI-CLOCKWISE
M4	3.74	2.88	3.1	55.2	ANTI-CLOCKWISE

RMS SPEED: 94.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 185.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 64.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 103.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 18.05 CM/SEC
STANDARD DEVIATION V SERIES: 14.35 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.8	2.6	769.
2	12	-1.2	-1.0	680.
3	12	-3.0	2.7	642.
4	2	-2.0	2.2	581.
ALL	38	-3.2	1.5	

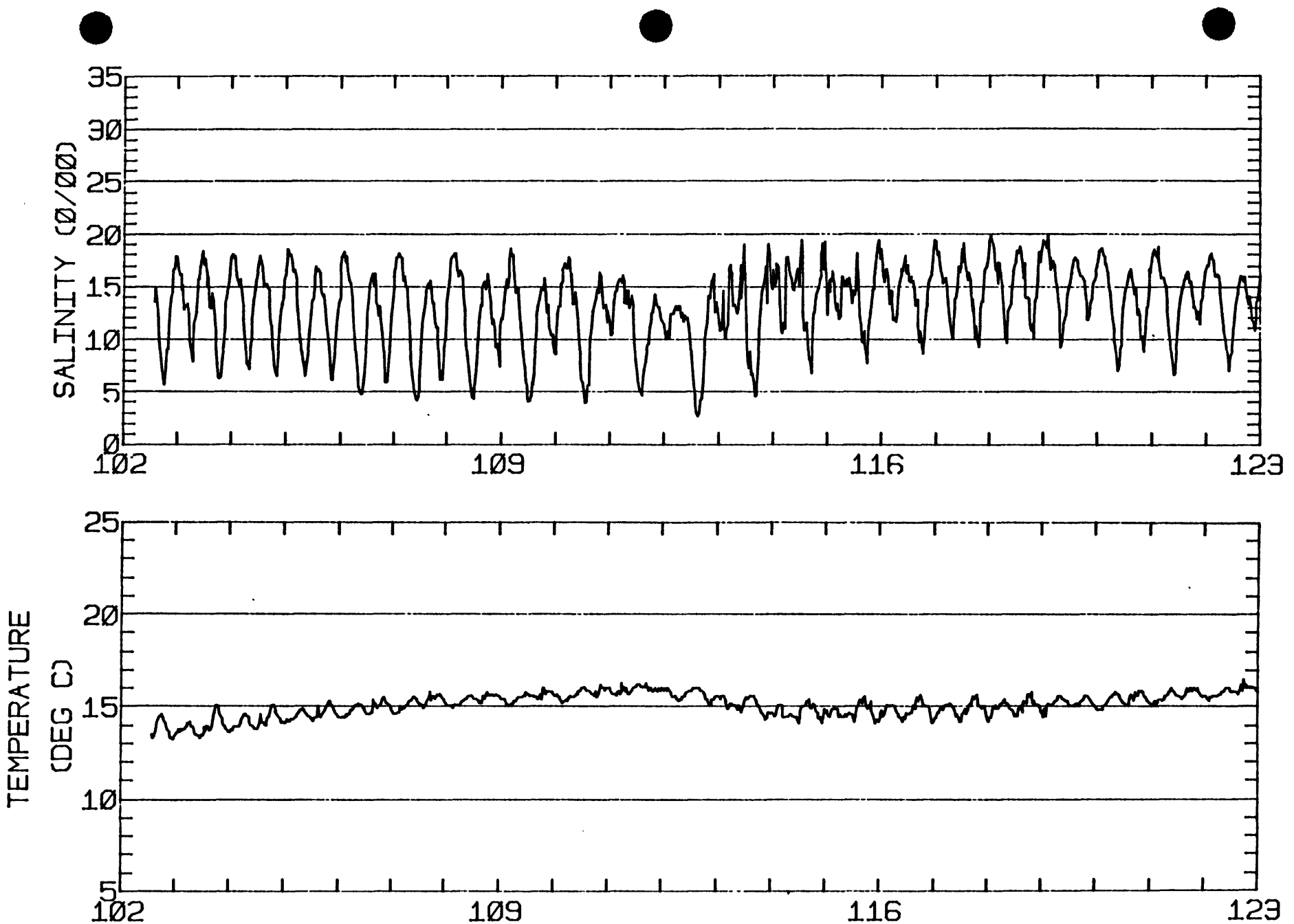


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-41N 122-13- 5W

METER 011.8 METERS ABOVE BED. WATER DEPTH 016.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
METER Ø11.8 METERS ABOVE BED. WATER DEPTH Ø16.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 16.8 M (MLLW)
METER DEPTH: 11.0 M (BELOW MLLW)
START TIME OF SERIES: 4/11/80 1352 PST JULIAN DAY=102
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

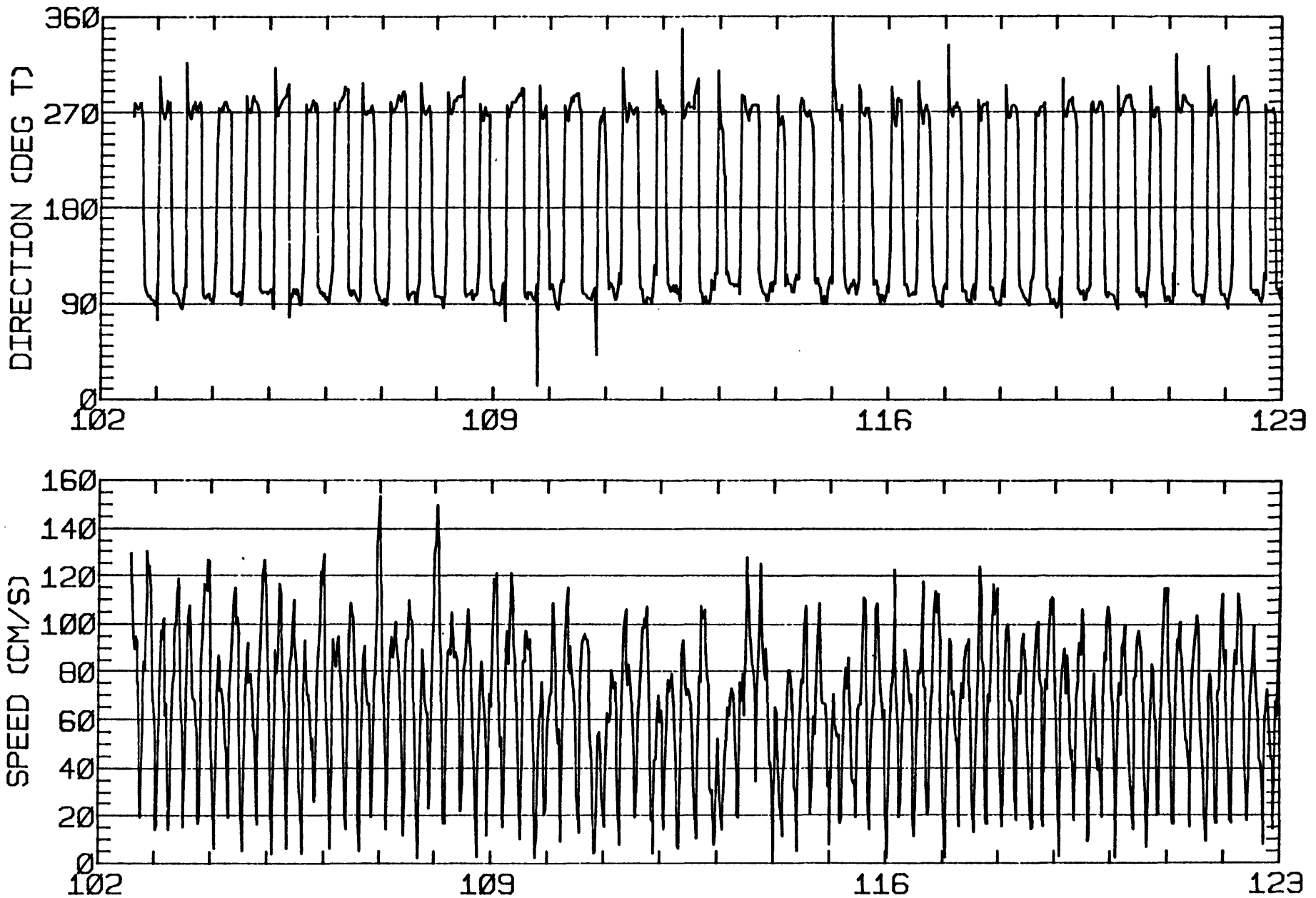
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.77	3.19	103.4	89.7	CLOCKWISE
K1	26.31	0.08	99.2	75.0	CLOCKWISE
N2	13.20	1.03	93.5	309.2	CLOCKWISE
M2	83.95	1.16	97.3	2.5	ANTI-CLOCKWISE
S2	19.89	0.41	91.8	327.8	CLOCKWISE
M4	4.33	2.15	124.2	292.1	ANTI-CLOCKWISE

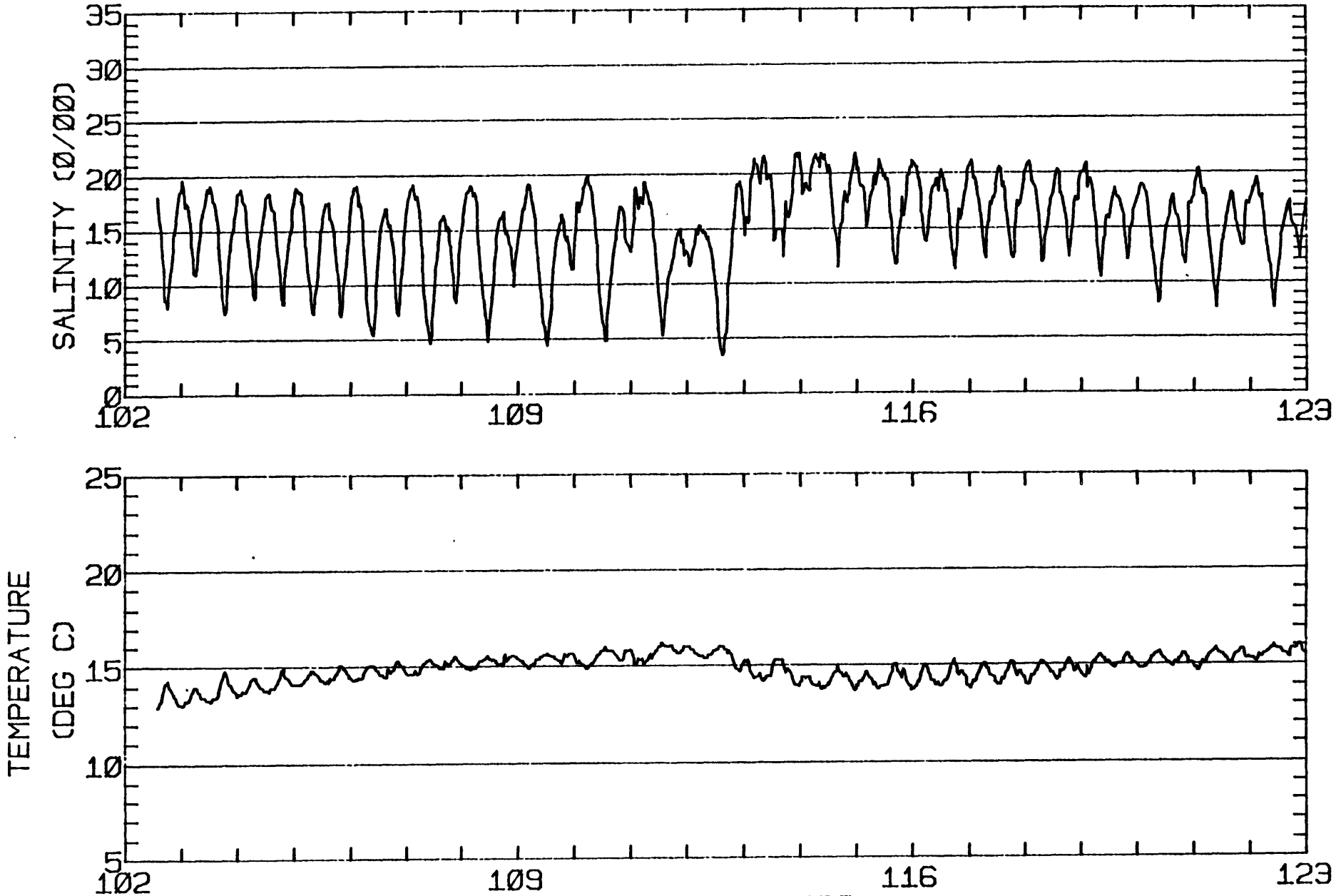
RMS SPEED: 73.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 146.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 54.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 97.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 16.00 CM/SEC
STANDARD DEVIATION V SERIES: 7.80 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.1	-2.1	769.
2	12	7.5	-5.4	680.
3	12	6.7	-3.9	642.
4	2	6.9	-2.2	581.
ALL	38	7.1	-3.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
METER 005.7 METERS ABOVE BED. WATER DEPTH 016.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
.METER Ø05.7 METERS ABOVE BED. WATER DEPTH Ø16.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 16.8 M (MLLW)
METER DEPTH: 14.6 M (BELOW MLLW)
START TIME OF SERIES: 4/11/80 1404 PST JULIAN DAY=102
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

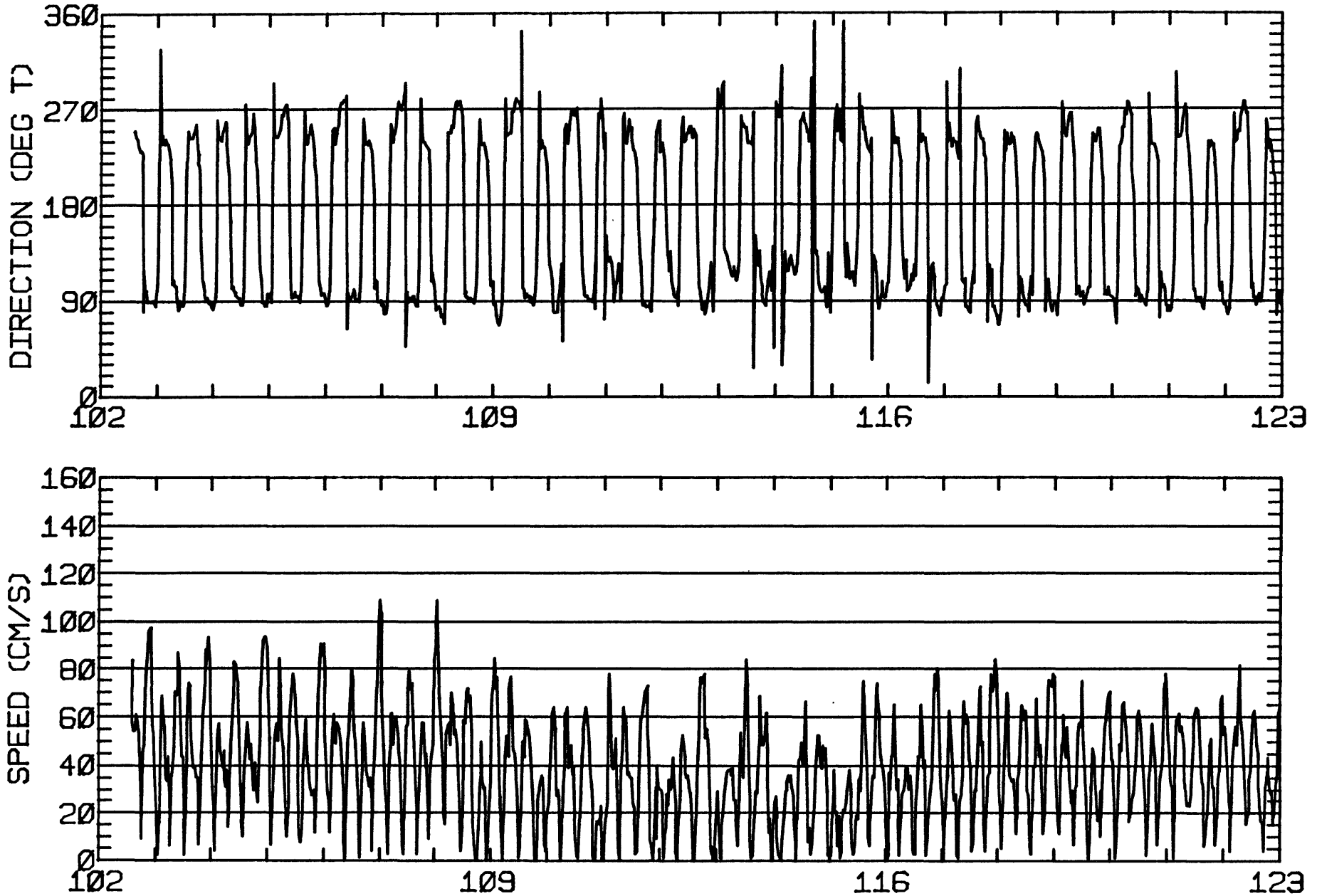
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.61	3.11	83.7	73.3	CLOCKWISE
K1	17.75	0.93	88.0	66.2	ANTI-CLOCKWISE
N2	8.36	0.24	89.4	330.7	CLOCKWISE
M2	50.09	1.70	83.7	357.2	ANTI-CLOCKWISE
S2	14.02	0.38	72.2	336.7	ANTI-CLOCKWISE
M4	2.77	1.07	78.0	27.3	ANTI-CLOCKWISE

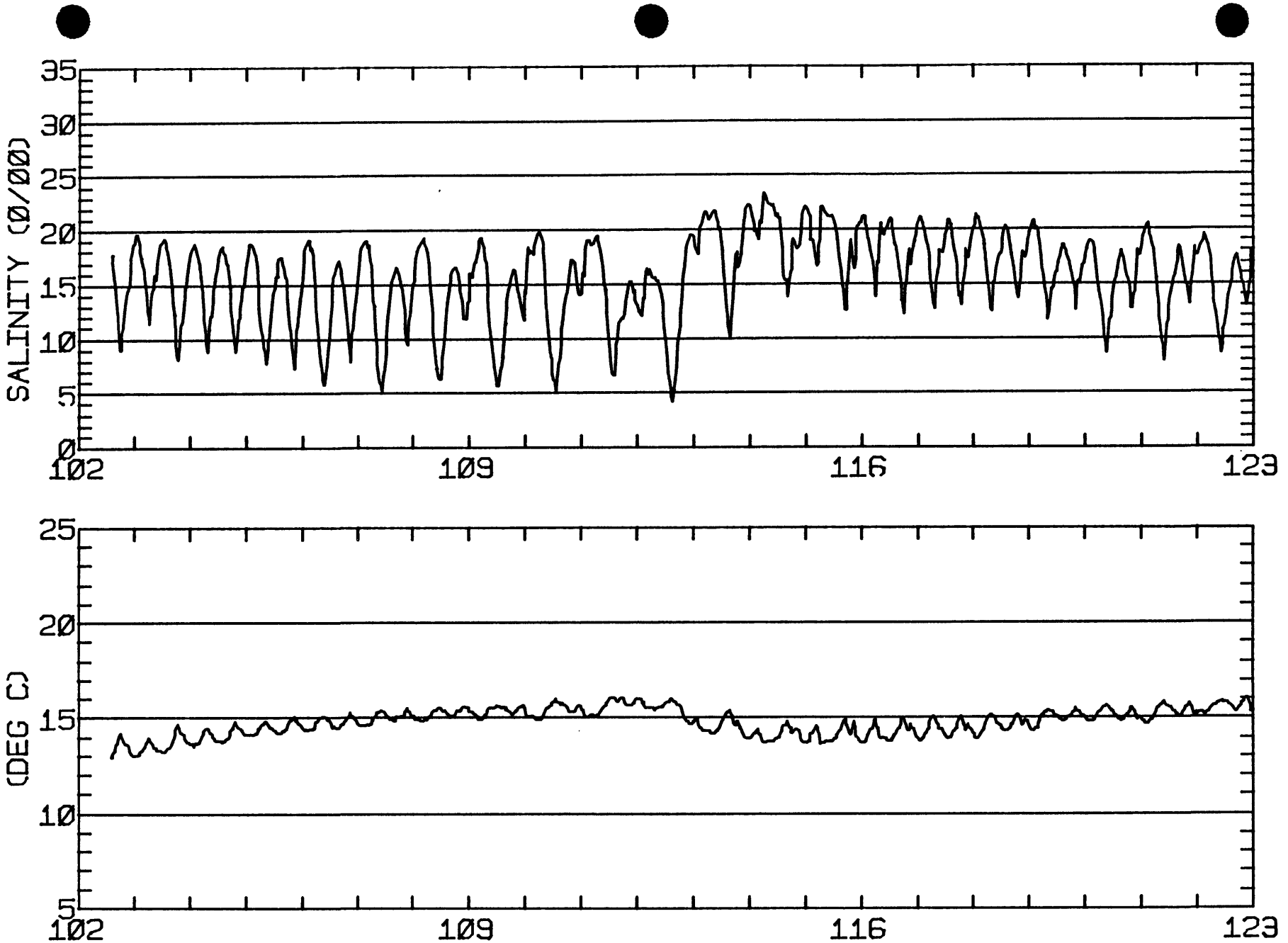
RMS SPEED: 45.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 90.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 82.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 9.37 CM/SEC
STANDARD DEVIATION V SERIES: 9.63 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.4	-8.4	769.
2	12	7.0	-7.5	680.
3	12	6.9	-9.1	642.
4	2	6.7	-8.9	581.
ALL	38	7.7	-8.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
METER 002.1 METERS ABOVE BED. WATER DEPTH 016.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
METER 002.1 METERS ABOVE BED. WATER DEPTH 016.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 5/ 2/80 930 PST JULIAN DAY=123
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

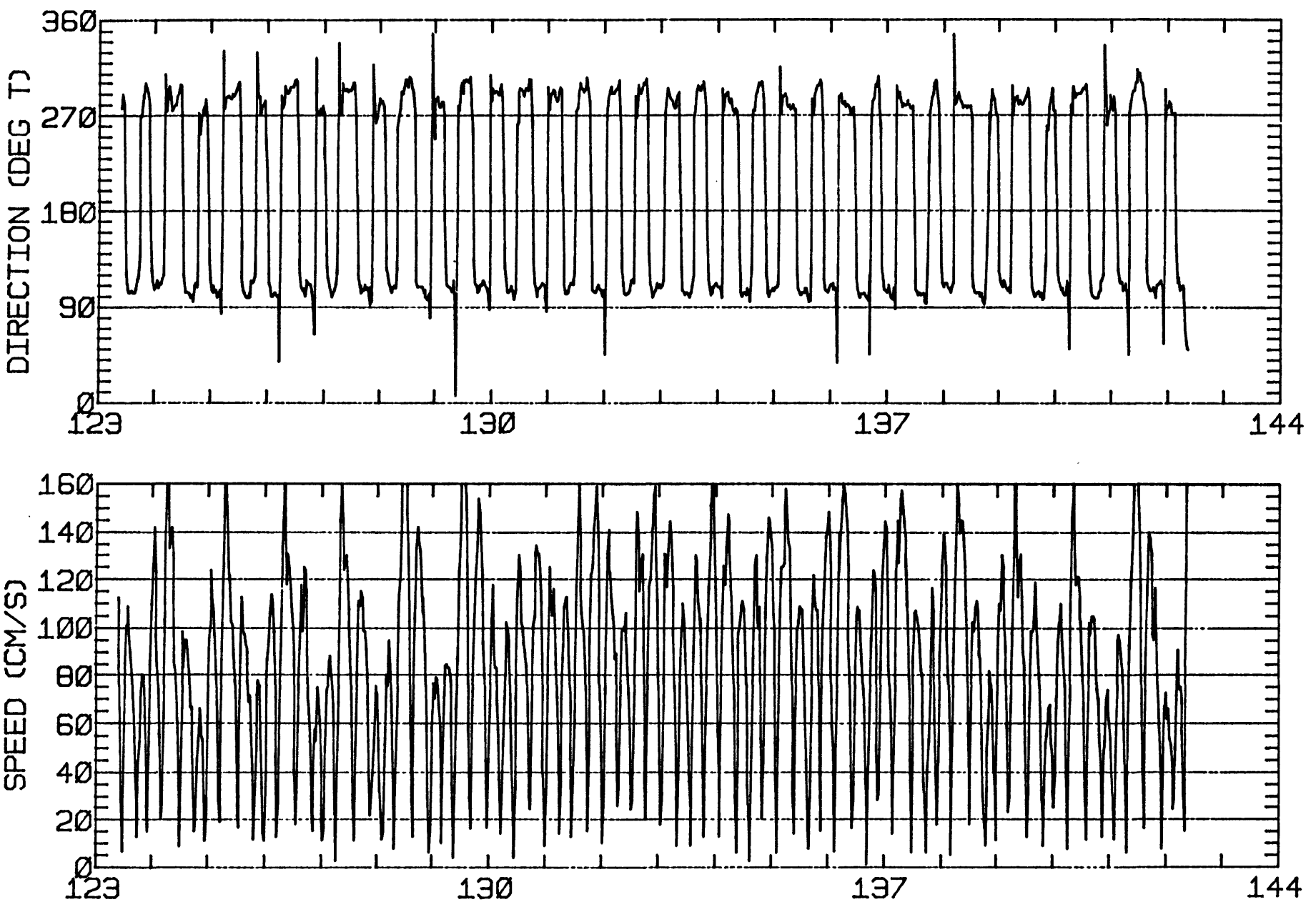
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.65	3.70	120.1	65.7	ANTI-CLOCKWISE
K1	46.40	6.44	107.7	82.9	CLOCKWISE
N2	22.37	1.52	107.6	351.9	CLOCKWISE
M2	105.59	3.23	108.5	0.4	ANTI-CLOCKWISE
S2	14.62	3.43	102.2	353.8	ANTI-CLOCKWISE
M4	5.38	3.13	85.8	321.0	ANTI-CLOCKWISE

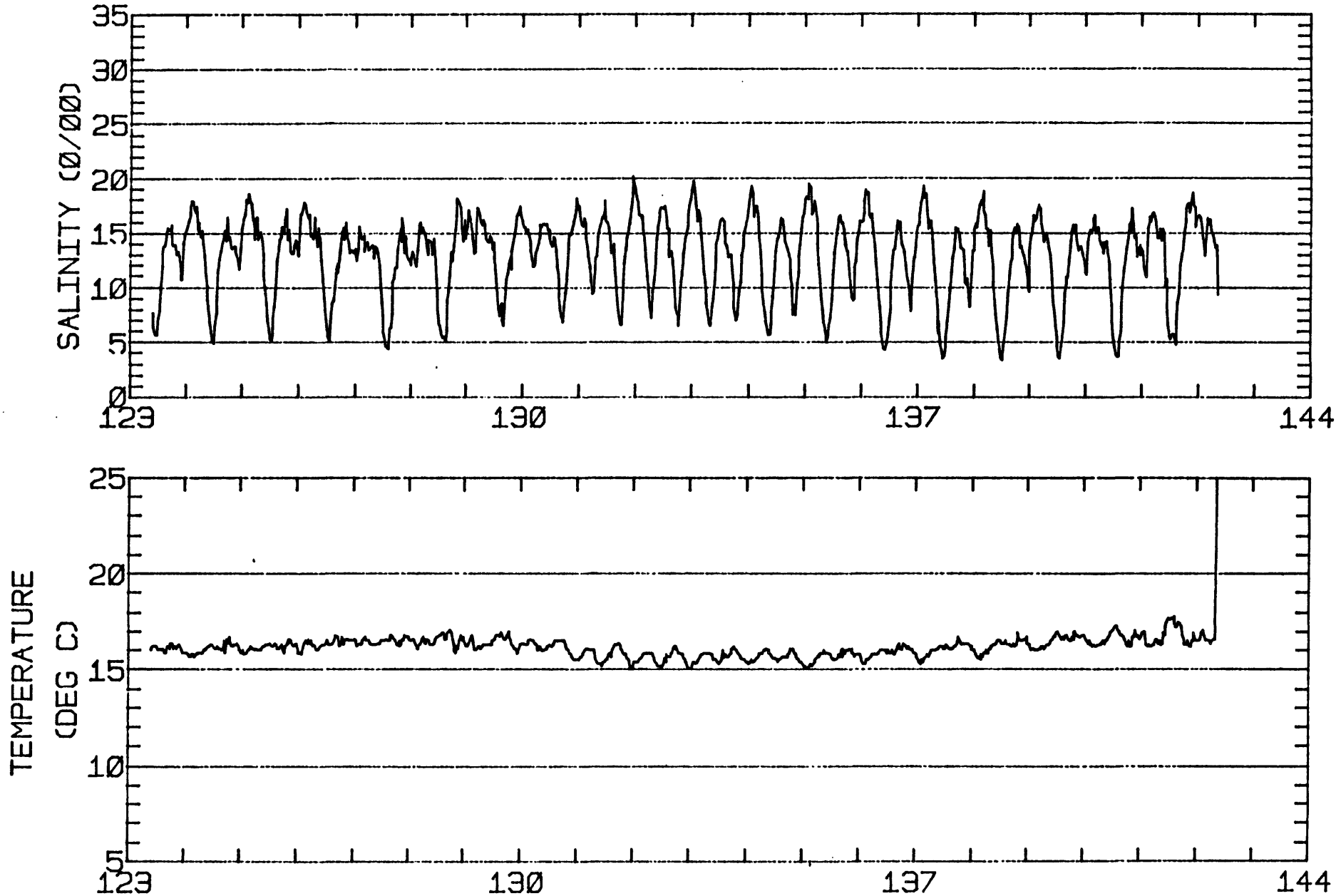
RMS SPEED: 94.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 184.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 62.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 108.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.53
STANDARD DEVIATION U-SERIES: 17.71 CM/SEC
STANDARD DEVIATION V SERIES: 14.01 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.4	2.7	544.
2	12	-1.4	2.4	673.
3	12	-3.0	0.2	695.
ALL	36	-2.6	1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
.METER 011.9 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 5/ 2/80 932 PST JULIAN DAY=123
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

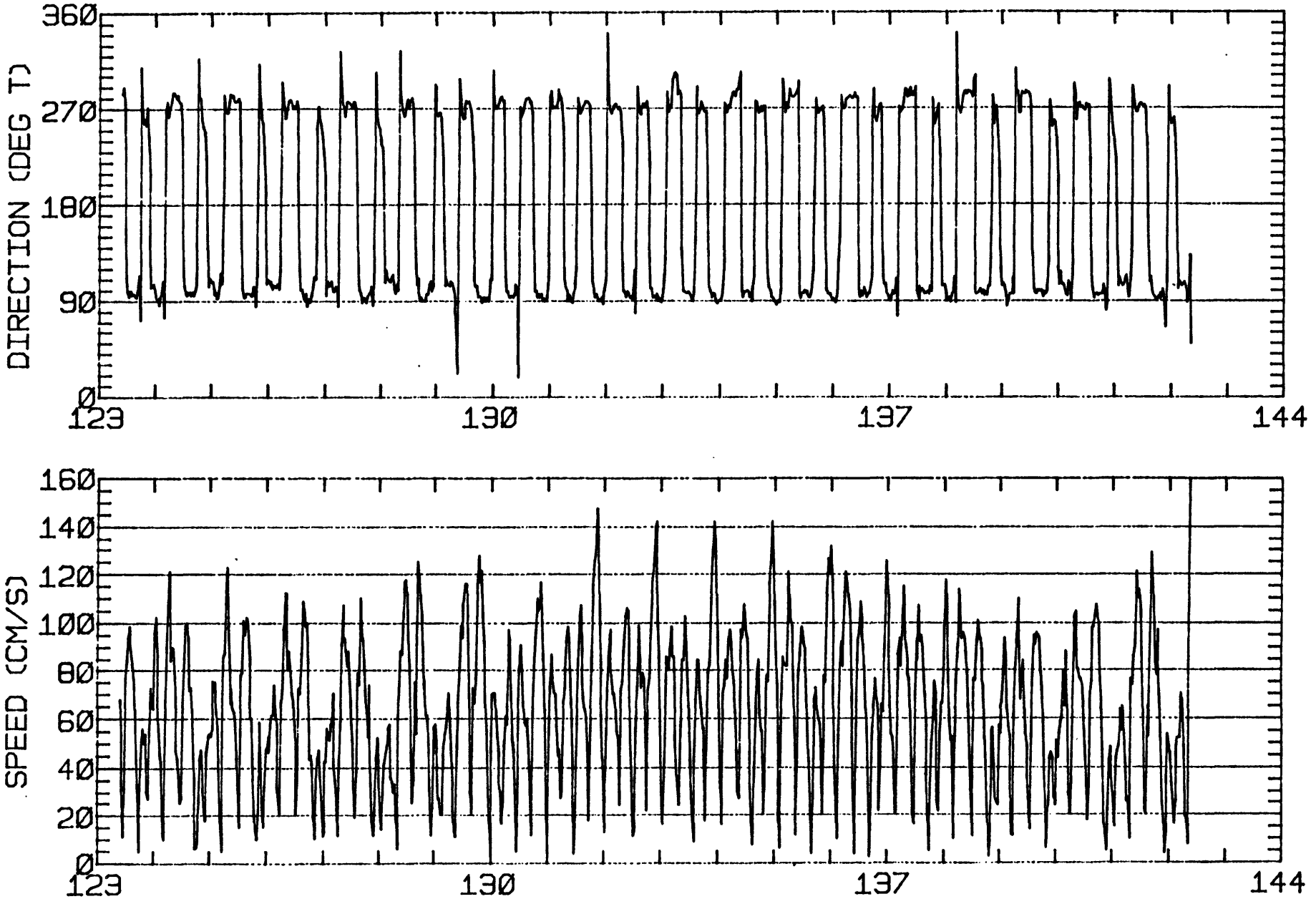
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.07	5.31	102.4	61.8	CLOCKWISE
K1	37.82	0.77	100.1	74.5	ANTI-CLOCKWISE
N2	19.00	0.31	97.6	343.2	ANTI-CLOCKWISE
M2	77.78	0.91	94.6	354.0	ANTI-CLOCKWISE
S2	11.31	2.20	98.6	347.1	CLOCKWISE
M4	2.79	2.19	67.6	330.7	ANTI-CLOCKWISE

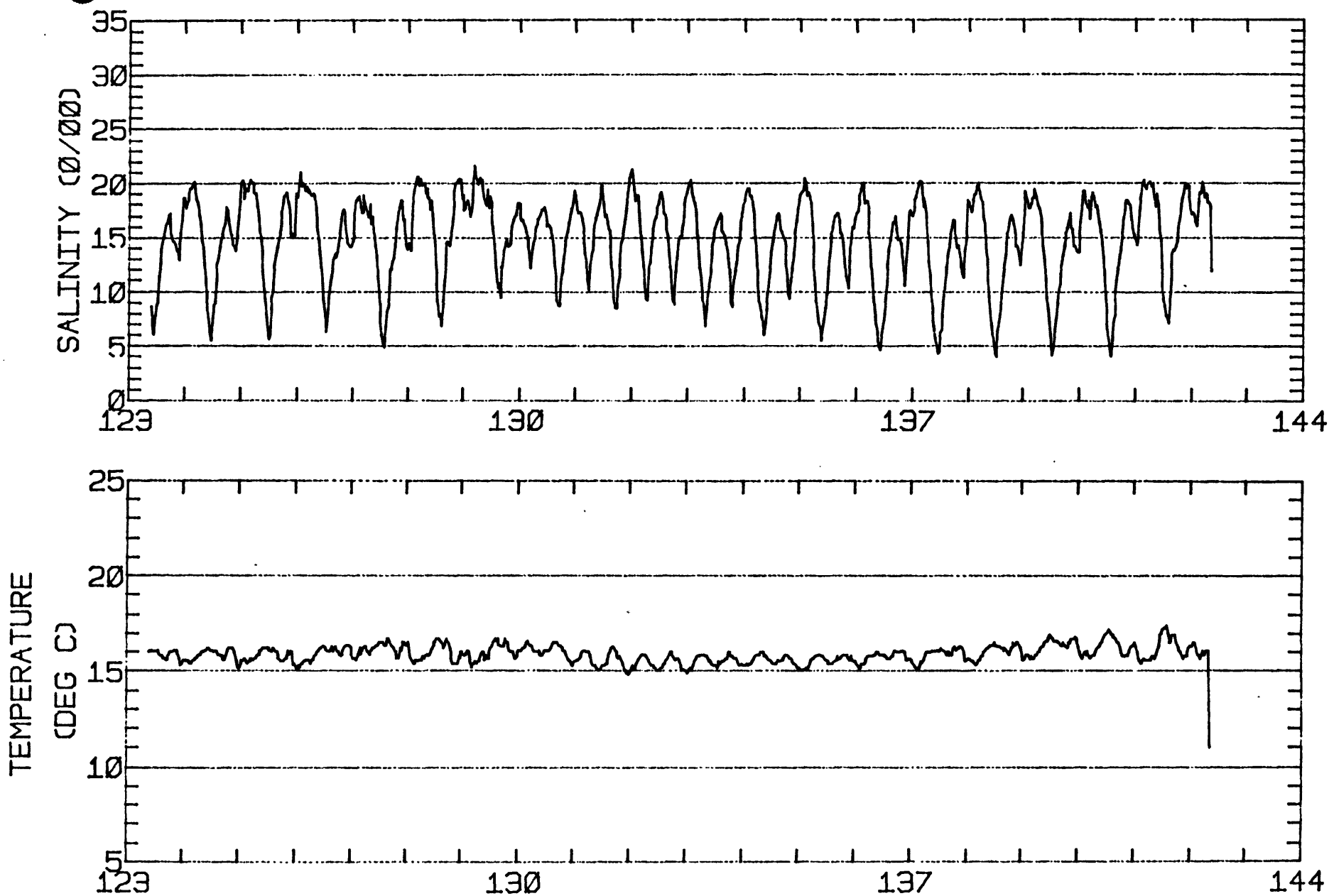
RMS SPEED: 71.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 141.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 42.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 97.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.58
STANDARD DEVIATION U-SERIES: 16.36 CM/SEC
STANDARD DEVIATION V SERIES: 7.97 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.7	-4.6	544.
2	12	10.0	-1.5	673.
3	12	8.3	-3.7	695.
ALL	36	8.0	-3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
METER 005.8 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-41N 122-13- 5W

METER Ø05.8 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'41"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 15.6 M (BELOW MLLW)
START TIME OF SERIES: 5/ 2/80 934 PST JULIAN DAY=123
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

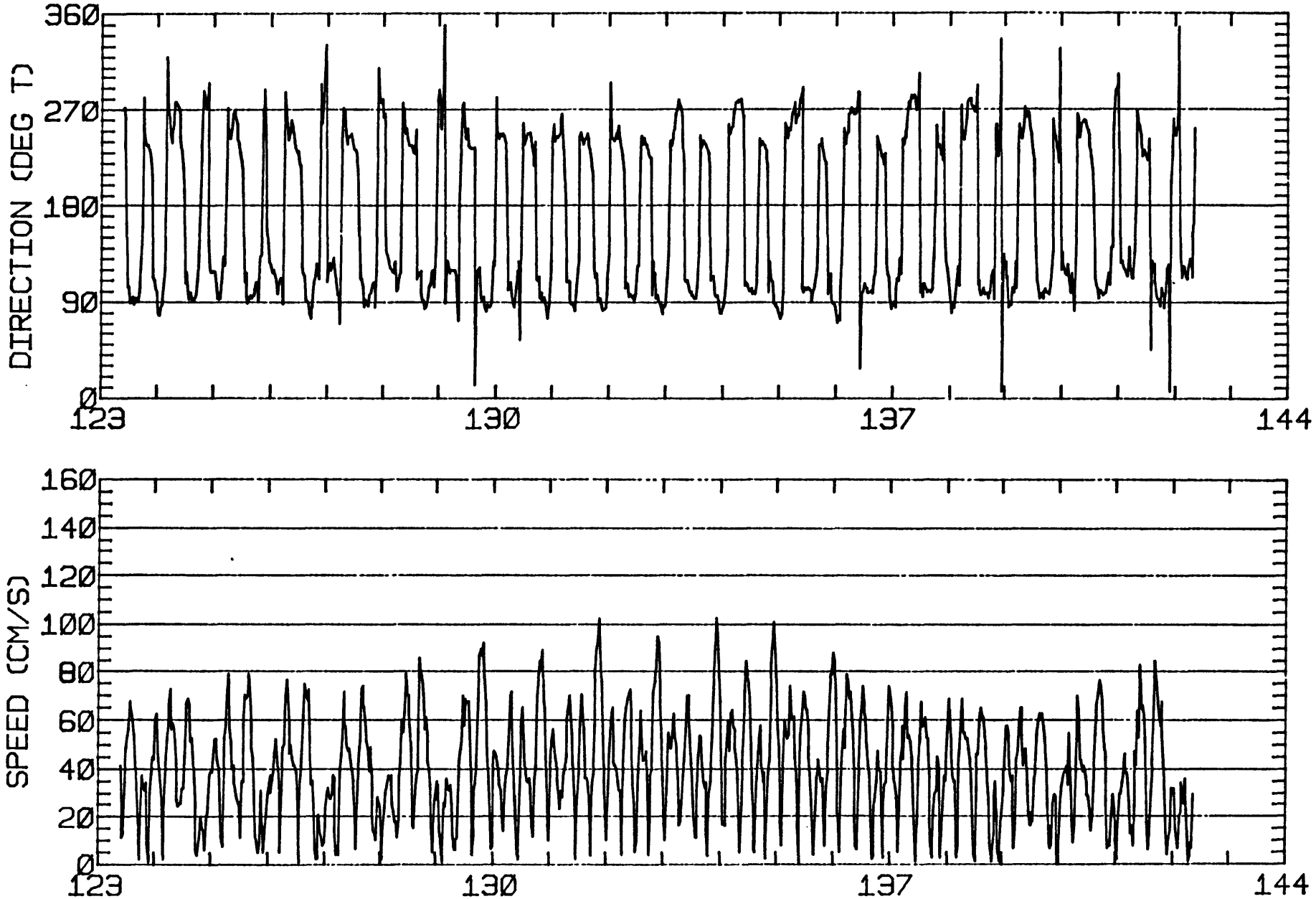
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.82	3.80	66.7	39.0	CLOCKWISE
K1	25.01	4.10	88.1	69.1	ANTI-CLOCKWISE
N2	12.59	1.31	90.0	343.7	ANTI-CLOCKWISE
M2	47.26	0.71	84.3	352.6	ANTI-CLOCKWISE
S2	7.60	3.36	76.9	335.8	CLOCKWISE
M4	3.55	1.20	68.1	18.7	ANTI-CLOCKWISE

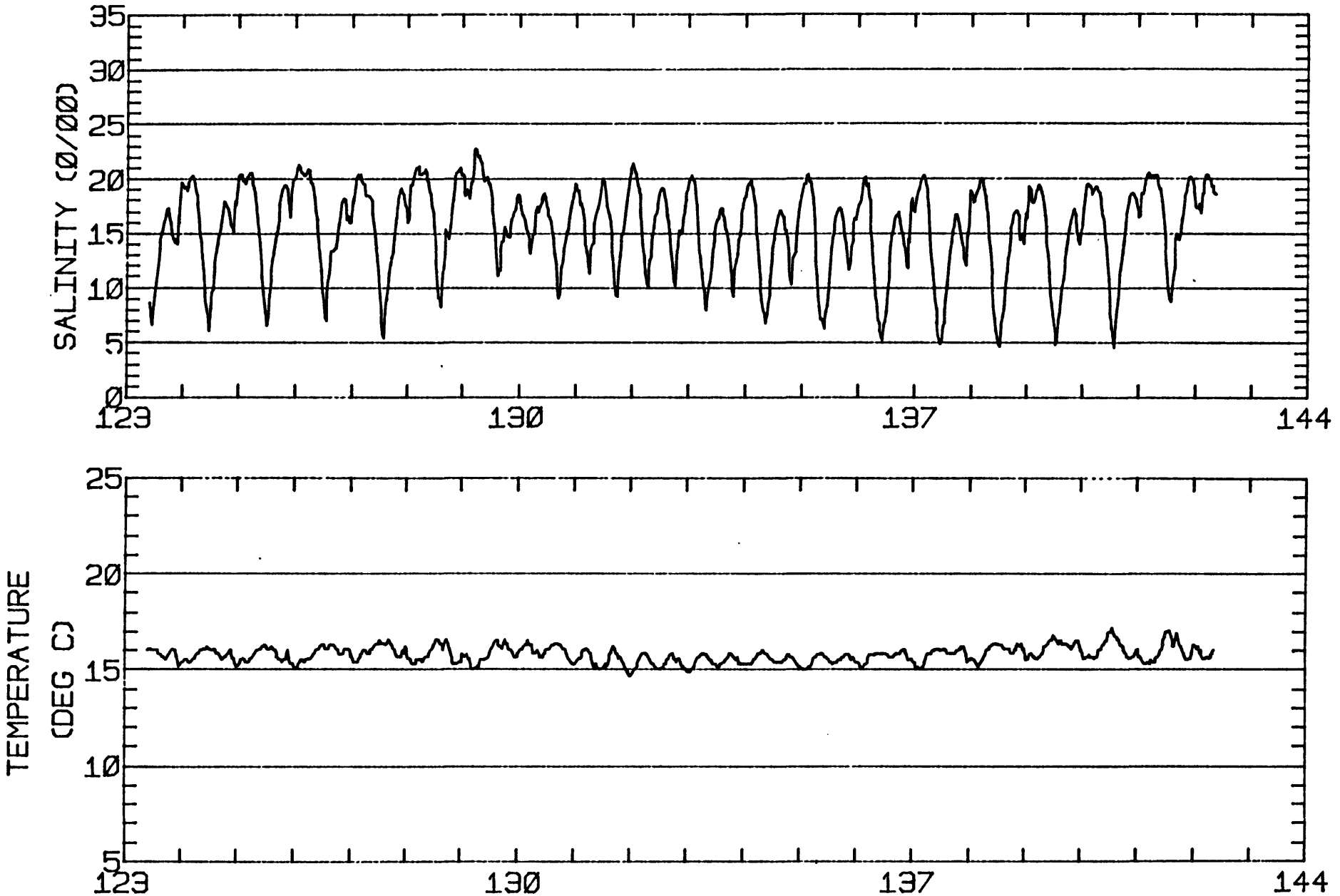
RMS SPEED: 46.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 88.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 83.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.62
STANDARD DEVIATION U-SERIES: 9.81 CM/SEC
STANDARD DEVIATION V SERIES: 9.39 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.2	-9.7	544.
2	12	10.5	-9.6	673.
3	12	7.7	-9.1	695.
ALL	36	8.1	-9.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
.METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-41N 122-13- 5W
METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 5/21/80 1010 PST JULIAN DAY=142
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

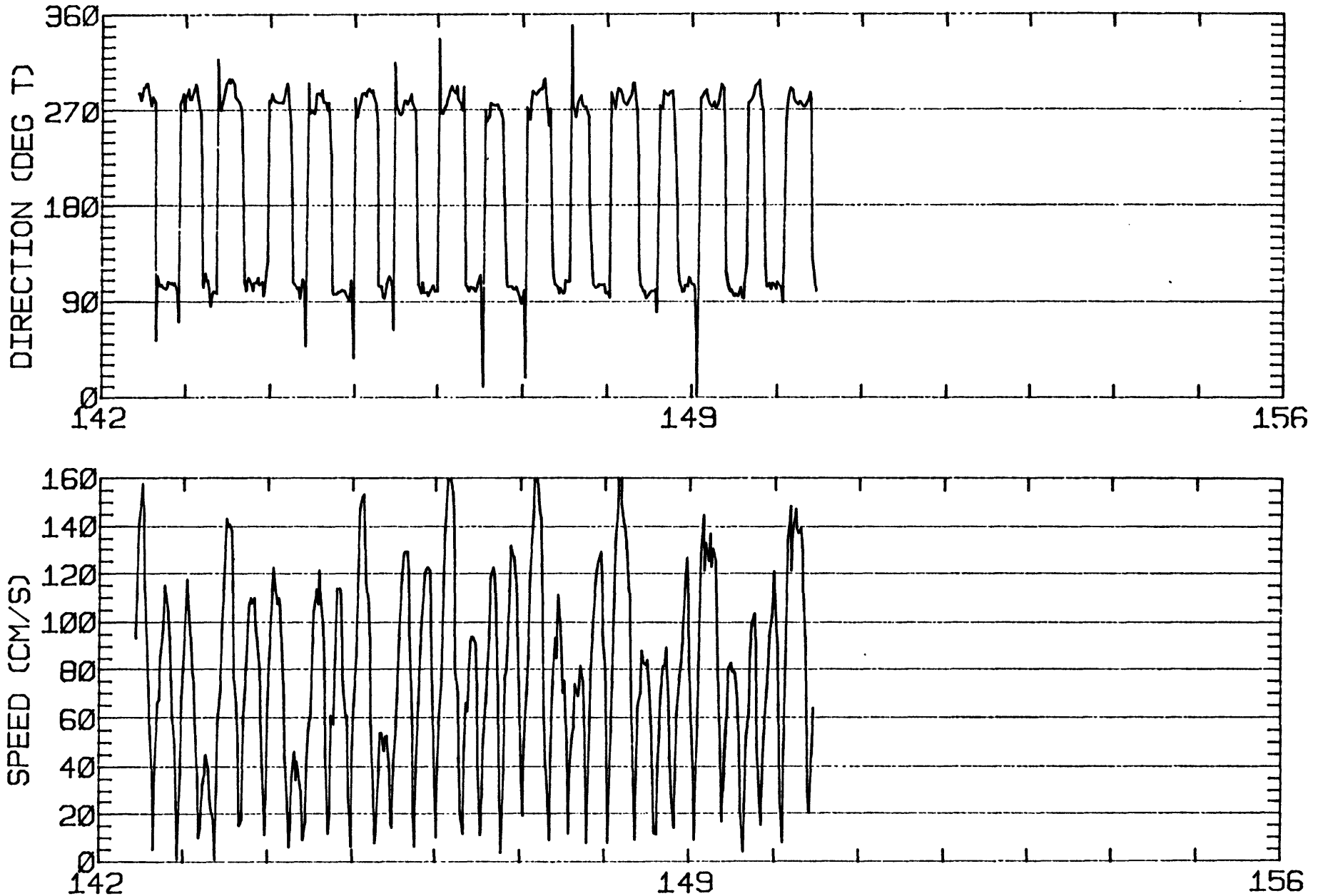
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.08	3.37	108.1	79.9	CLOCKWISE
K1	51.70	1.17	107.1	72.3	CLOCKWISE
N2	31.18	11.26	118.9	272.5	CLOCKWISE
M2	89.74	7.51	111.6	357.4	ANTI-CLOCKWISE
S2	34.69	4.87	101.8	323.5	CLOCKWISE
M4	3.30	0.50	154.5	275.9	ANTI-CLOCKWISE

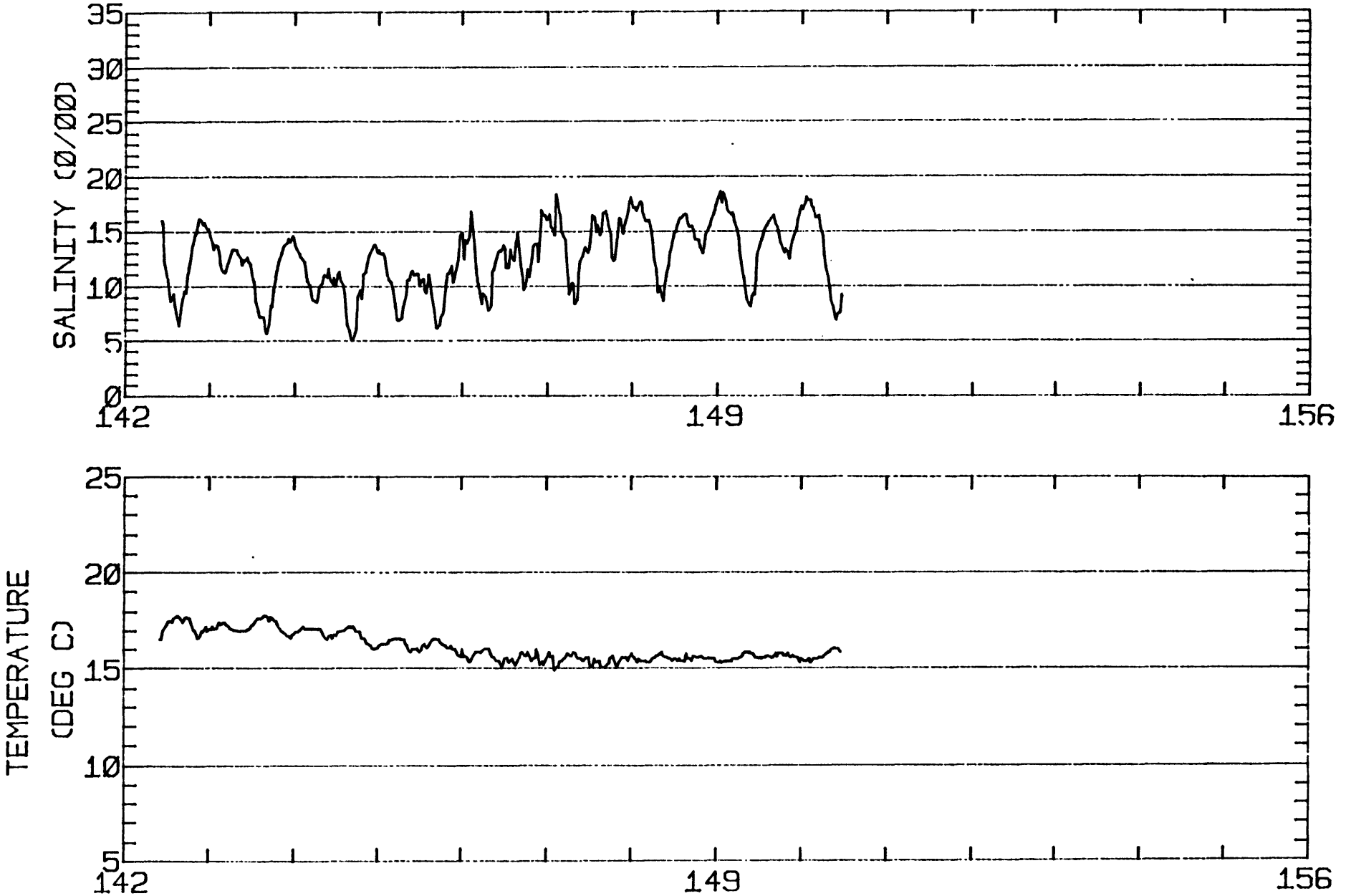
RMS SPEED: 87.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 195.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 108.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.57
STANDARD DEVIATION U-SERIES: 11.98 CM/SEC
STANDARD DEVIATION V SERIES: 11.42 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-15.5	3.3	563.
2	2	-11.0	0.7	472.
ALL	14	-14.9	2.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
METER 011.9 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
. METER 011.9 METERS ABOVE BED. WATER DEPTH 017.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 5/21/80 1002 PST JULIAN DAY=142
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

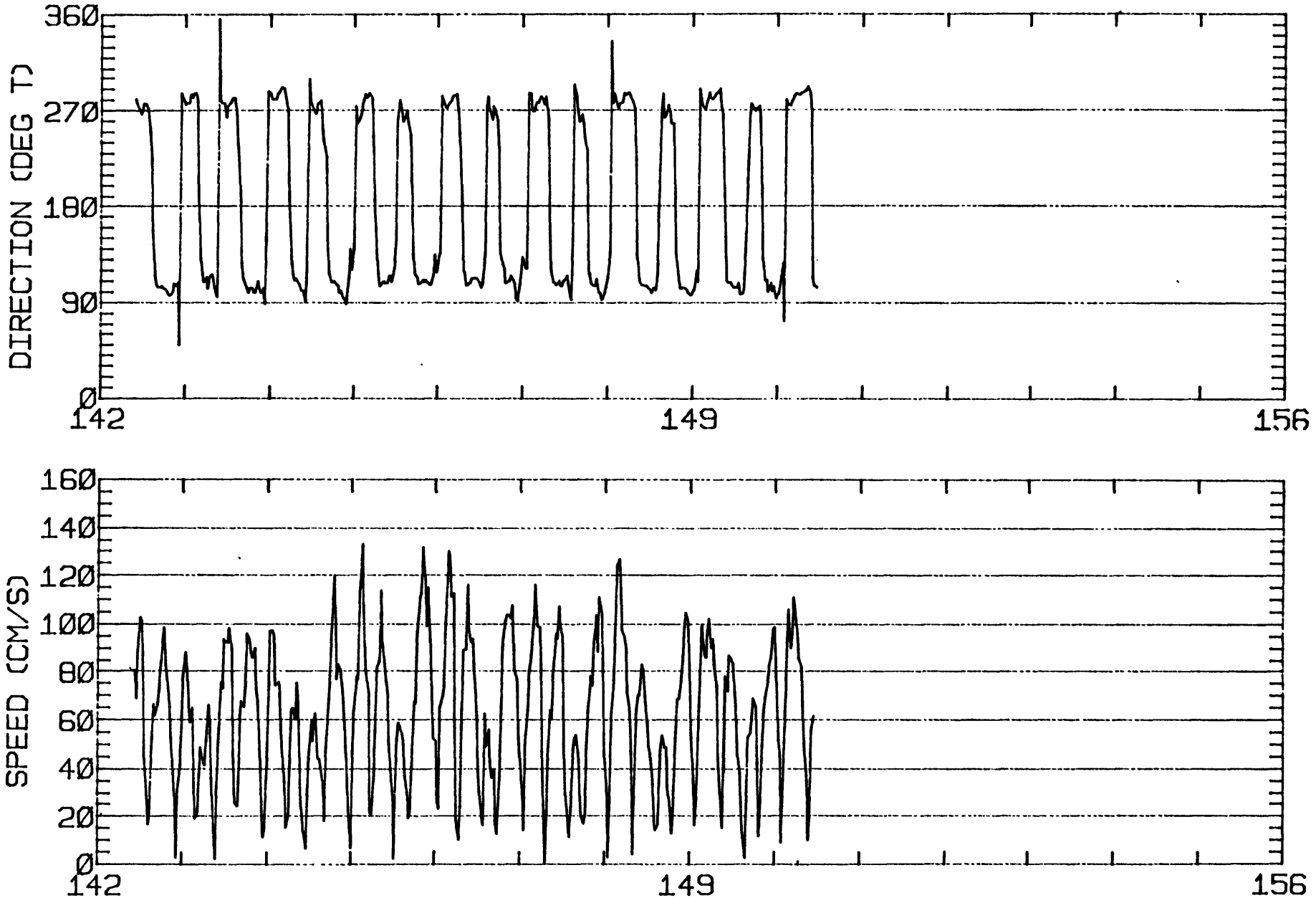
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.55	2.62	100.9	111.4	CLOCKWISE
K1	38.86	1.88	102.5	61.0	ANTI-CLOCKWISE
N2	21.27	4.70	108.6	269.1	ANTI-CLOCKWISE
M2	75.47	4.88	98.6	353.6	ANTI-CLOCKWISE
S2	22.57	0.67	107.8	313.6	ANTI-CLOCKWISE
M4	4.15	0.91	127.2	251.4	CLOCKWISE

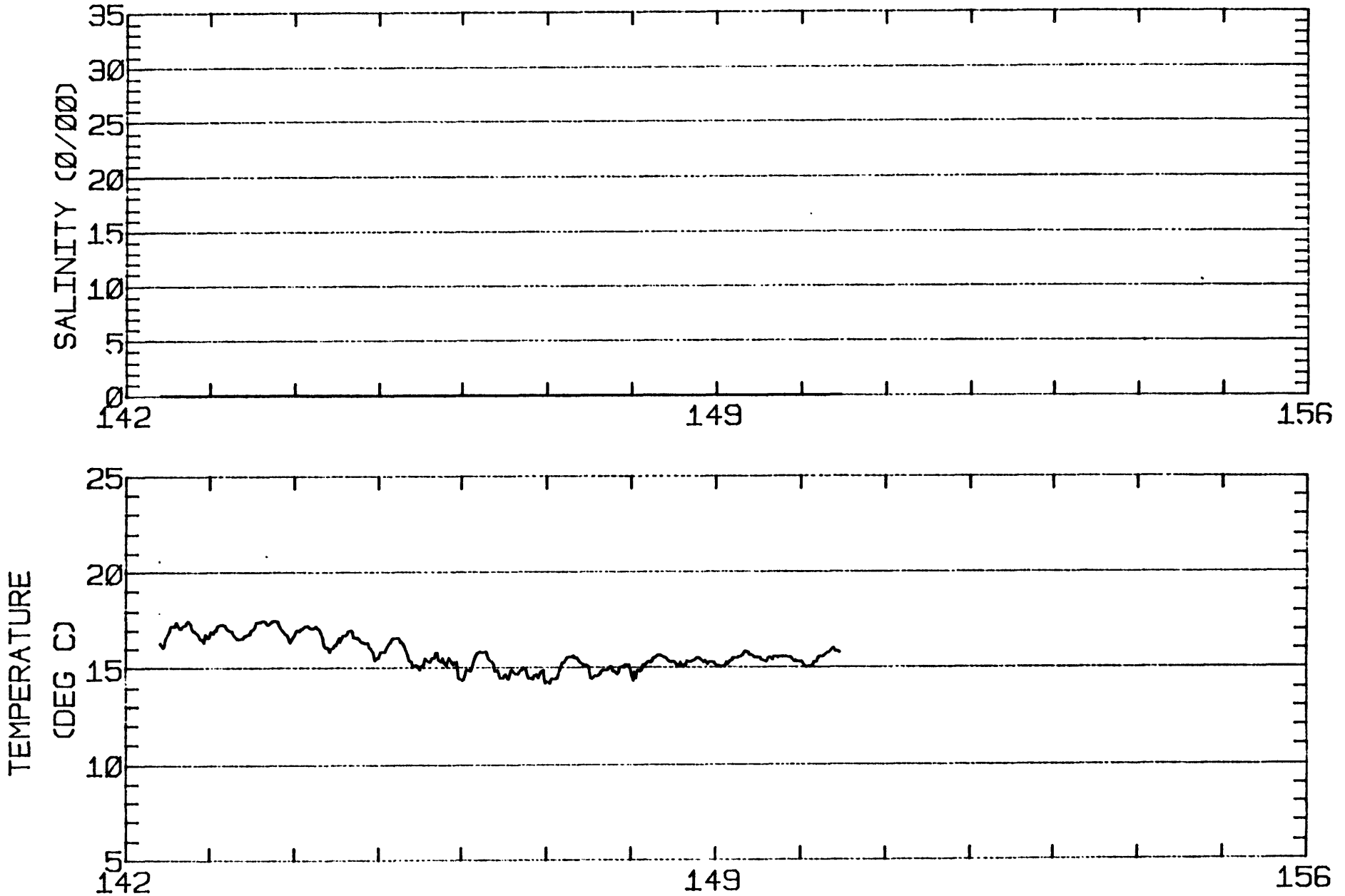
RMS SPEED: 69.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 148.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 101.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 14.22 CM/SEC
STANDARD DEVIATION V SERIES: 9.61 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.1	-8.5	563.
2	2	3.5	-4.7	472.
ALL	14	5.8	-7.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
METER 005.8 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
METER 005.8 METERS ABOVE BED. WATER DEPTH 017.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 15.6 M (BELOW MLLW)
START TIME OF SERIES: 5/21/80 1004 PST JULIAN DAY=142
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

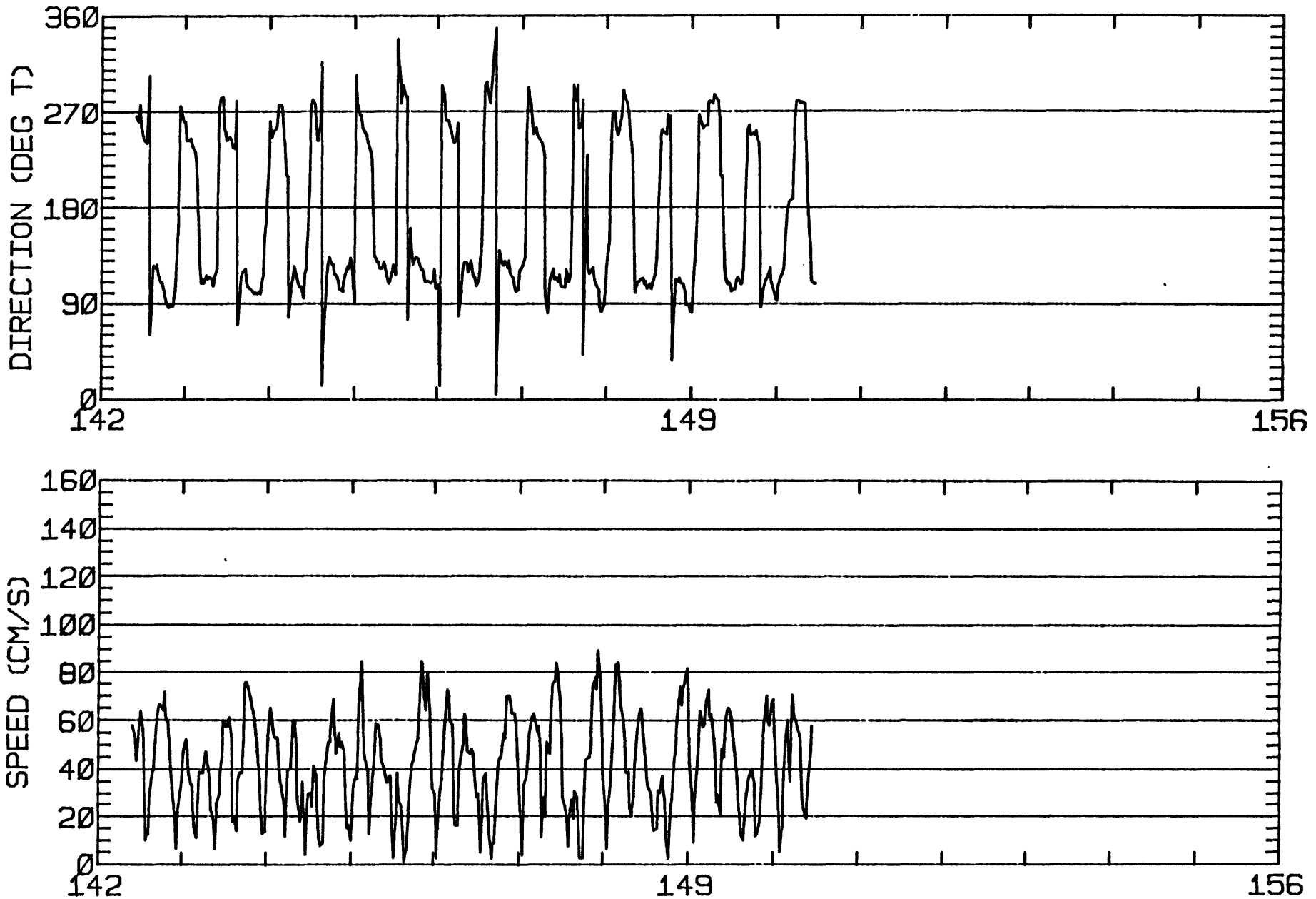
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.30	2.98	101.2	106.7	ANTI-CLOCKWISE
K1	23.42	0.04	92.8	59.4	CLOCKWISE
N2	26.00	3.31	46.7	337.6	ANTI-CLOCKWISE
M2	69.52	0.59	78.7	355.8	ANTI-CLOCKWISE
S2	12.21	8.67	66.5	18.7	ANTI-CLOCKWISE
M4	2.11	0.56	93.4	185.2	CLOCKWISE

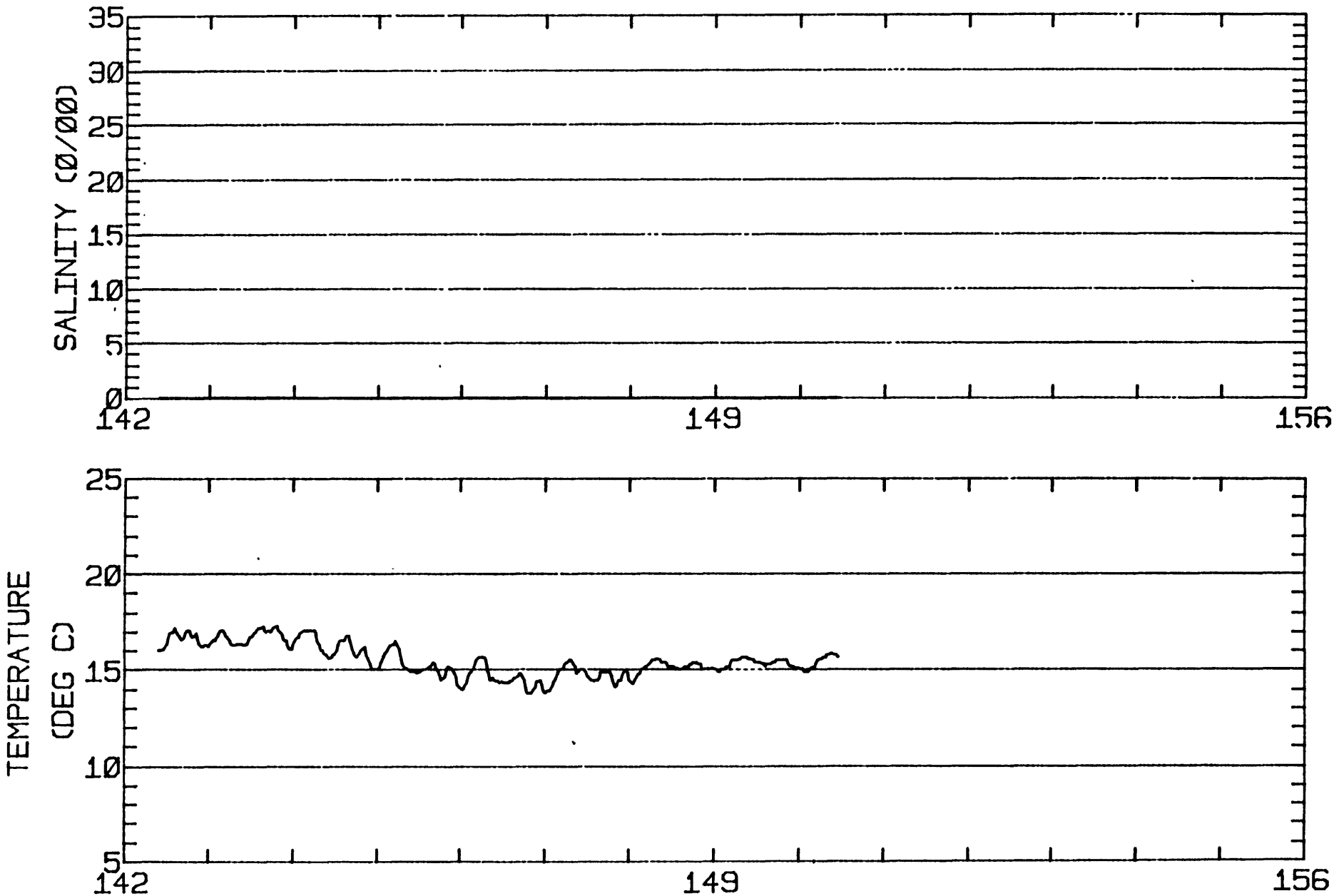
RMS SPEED: 46.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 111.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 40.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 81.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 10.63 CM/SEC
STANDARD DEVIATION V SERIES: 10.63 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.4	-13.1	563.
2	2	7.2	-7.9	472.
ALL	14	9.1	-12.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 5/29/80 1300 PST JULIAN DAY=150
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

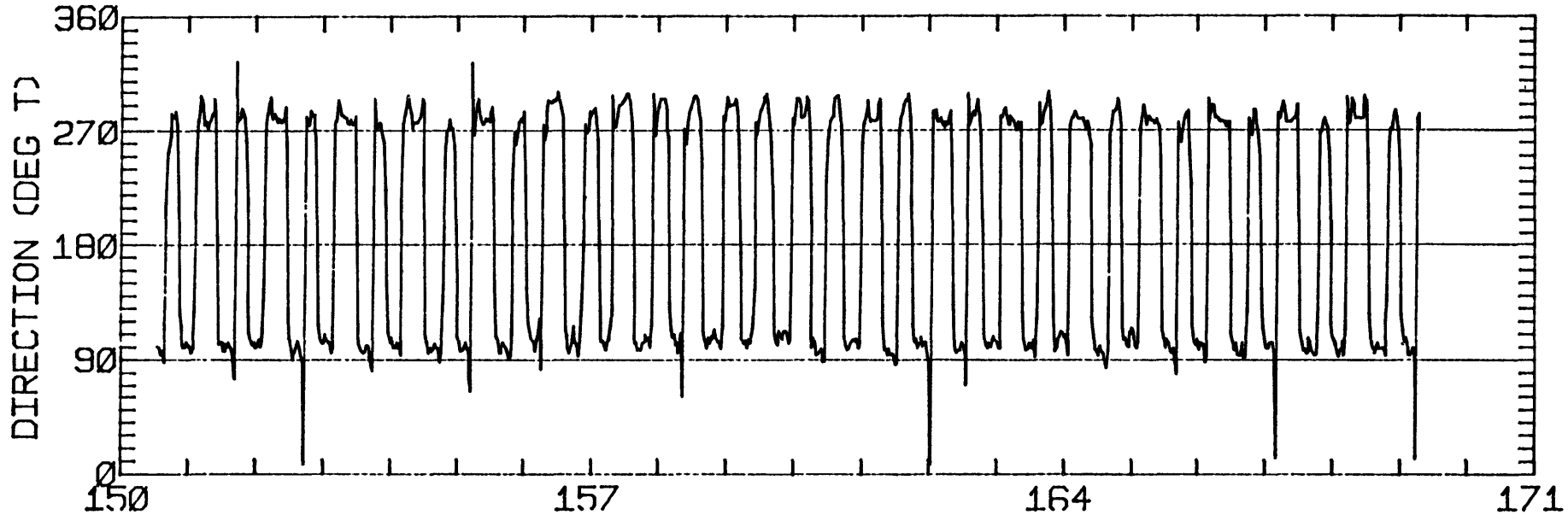
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

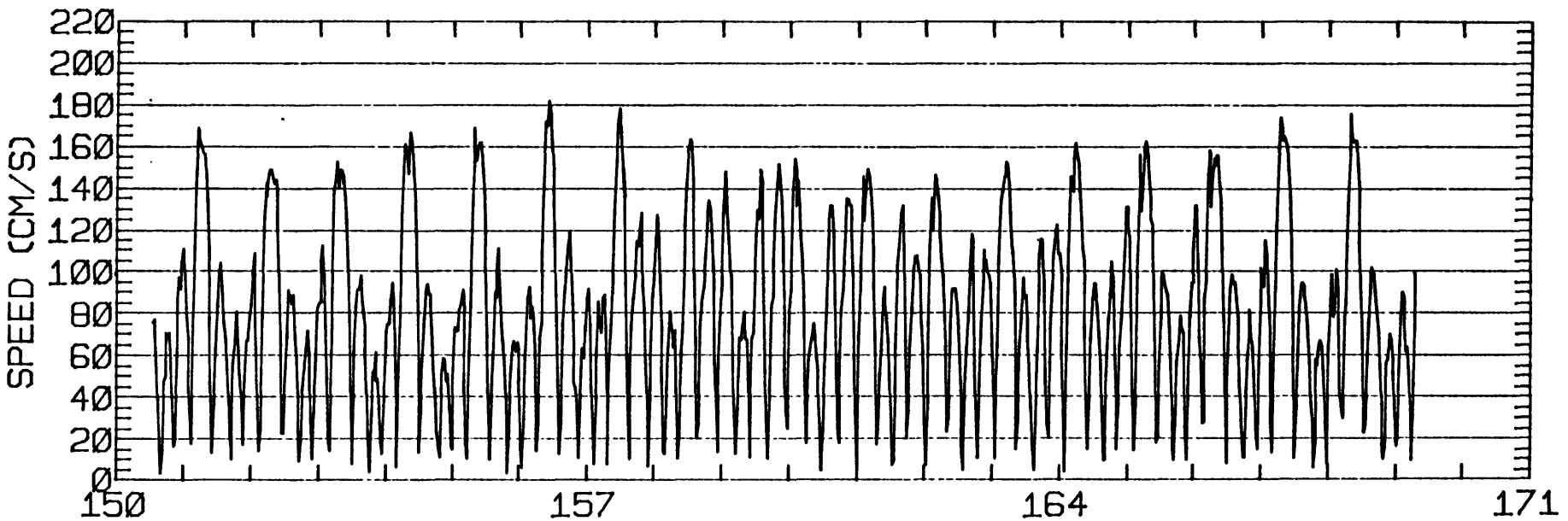
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.82	2.98	102.4	83.1	ANTI-CLOCKWISE
K1	52.67	3.47	103.9	93.1	CLOCKWISE
N2	20.65	0.94	107.5	355.8	CLOCKWISE
M2	98.51	3.06	103.2	3.5	ANTI-CLOCKWISE
S2	10.75	4.24	84.3	14.9	ANTI-CLOCKWISE
M4	2.77	1.01	80.1	312.5	ANTI-CLOCKWISE

RMS SPEED: 91.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 182.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 55.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 102.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.67
STANDARD DEVIATION U-SERIES: 15.84 CM/SEC
STANDARD DEVIATION V SERIES: 12.71 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-12.6	3.1	427.
2	12	-10.1	4.3	397.
3	12	-13.7	1.4	402.
ALL	36	-12.1	2.9	



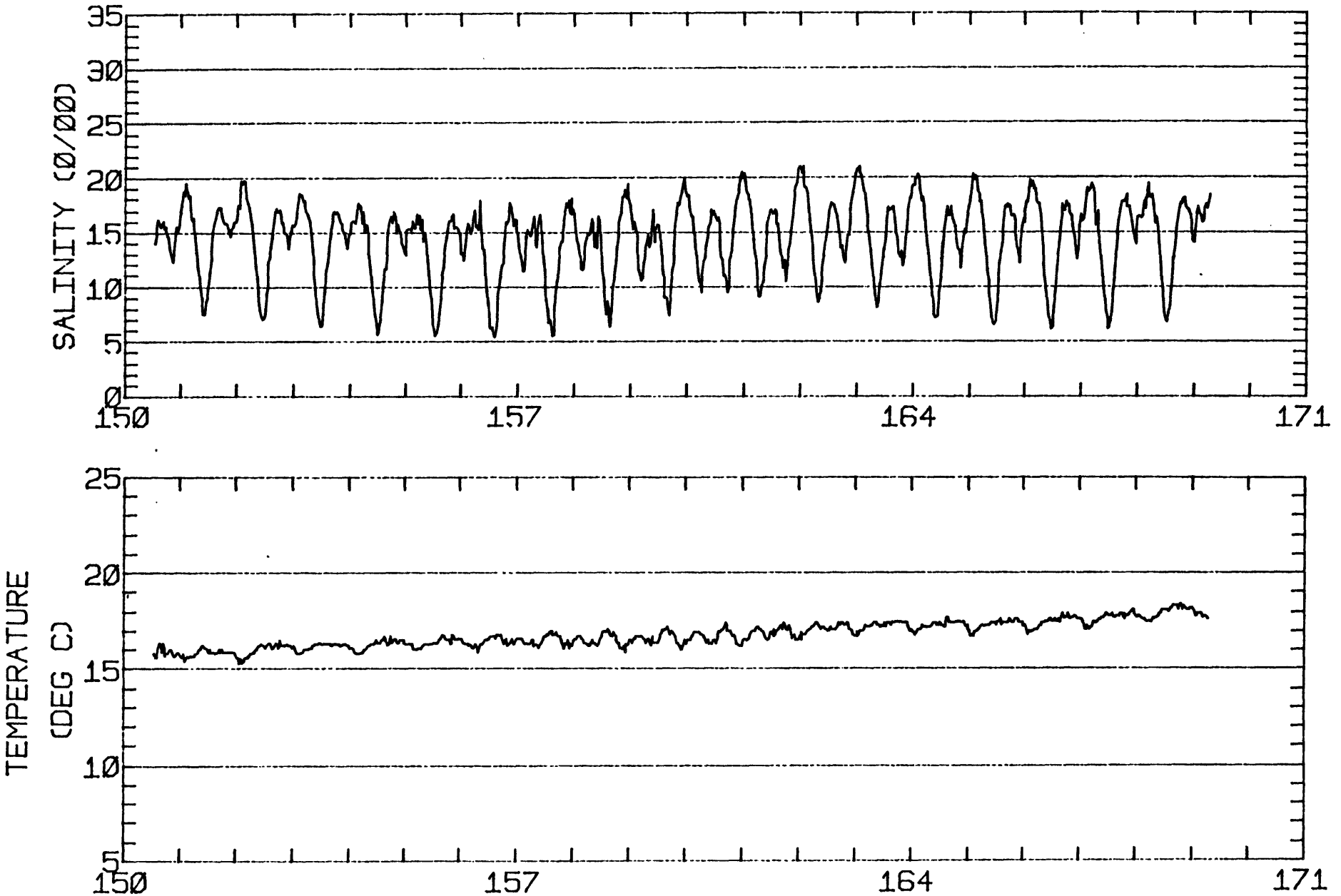


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-39N 122-13- 6W

METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-39N 122-13- 6W

METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 5/29/80 1302 PST JULIAN DAY=150
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

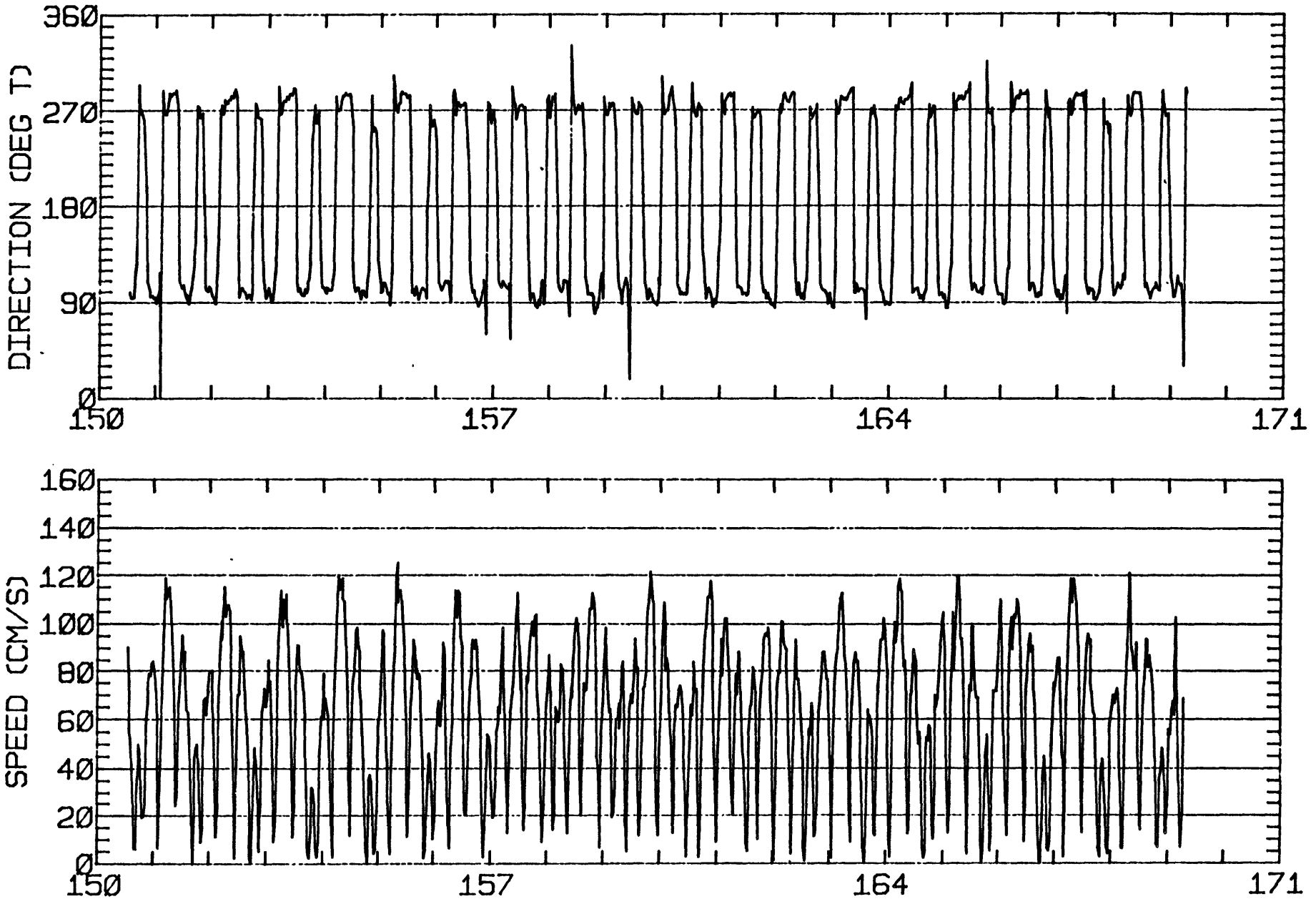
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.33	2.50	114.4	84.7	CLOCKWISE
K1	42.14	0.51	99.6	87.9	ANTI-CLOCKWISE
N2	16.80	0.84	97.1	350.7	ANTI-CLOCKWISE
M2	73.13	0.65	97.3	357.1	ANTI-CLOCKWISE
S2	8.99	2.77	106.8	15.8	CLOCKWISE
M4	2.32	0.29	164.5	236.0	ANTI-CLOCKWISE

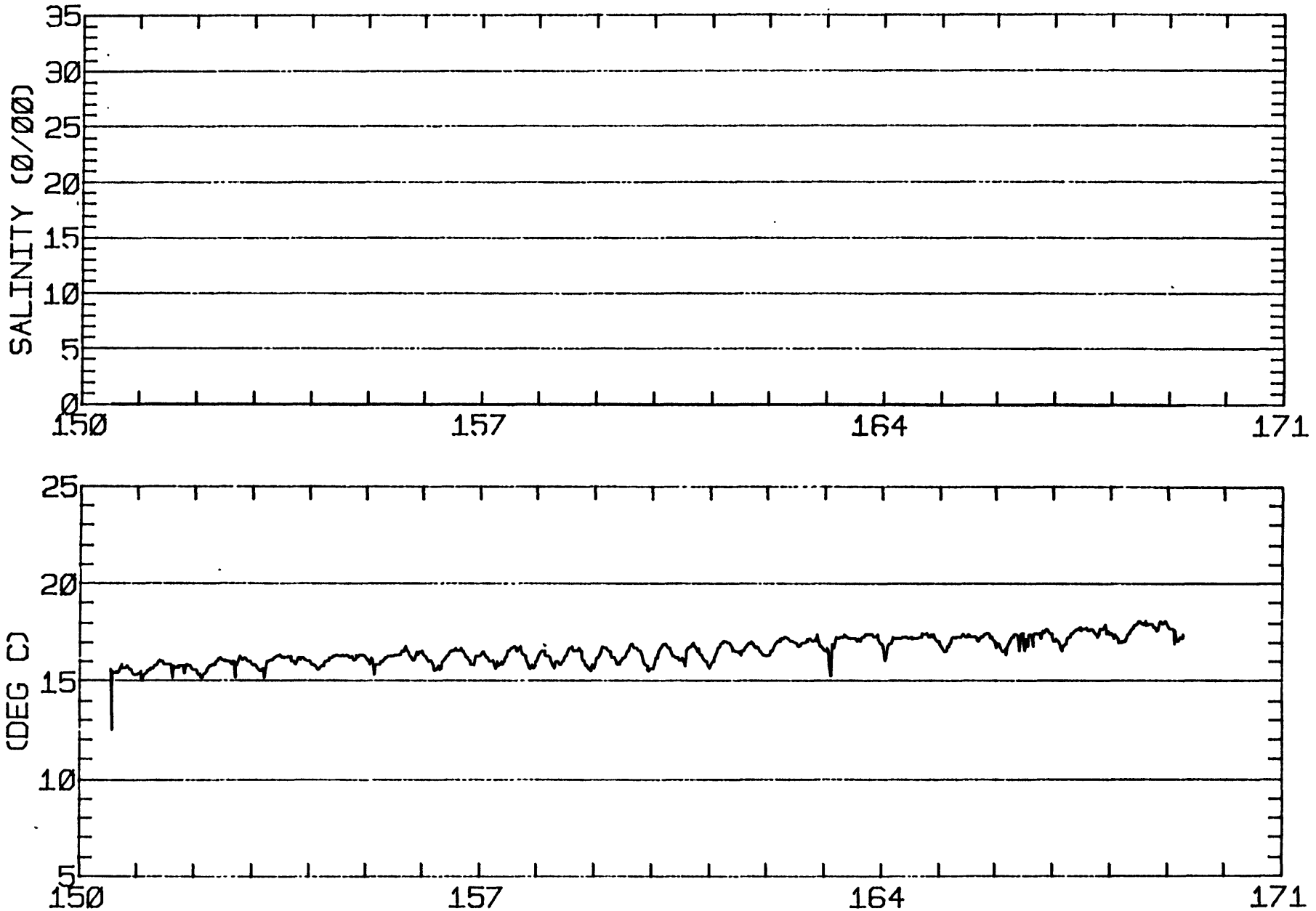
RMS SPEED: 69.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 141.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 100.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.72
STANDARD DEVIATION U-SERIES: 14.04 CM/SEC
STANDARD DEVIATION V SERIES: 7.92 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.6	-2.2	427.
2	12	6.8	-3.8	397.
3	12	2.9	-1.6	402.
ALL	36	4.1	-2.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 15.9 M (BELOW MLLW)
START TIME OF SERIES: 5/29/80 1304 PST JULIAN DAY=150
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

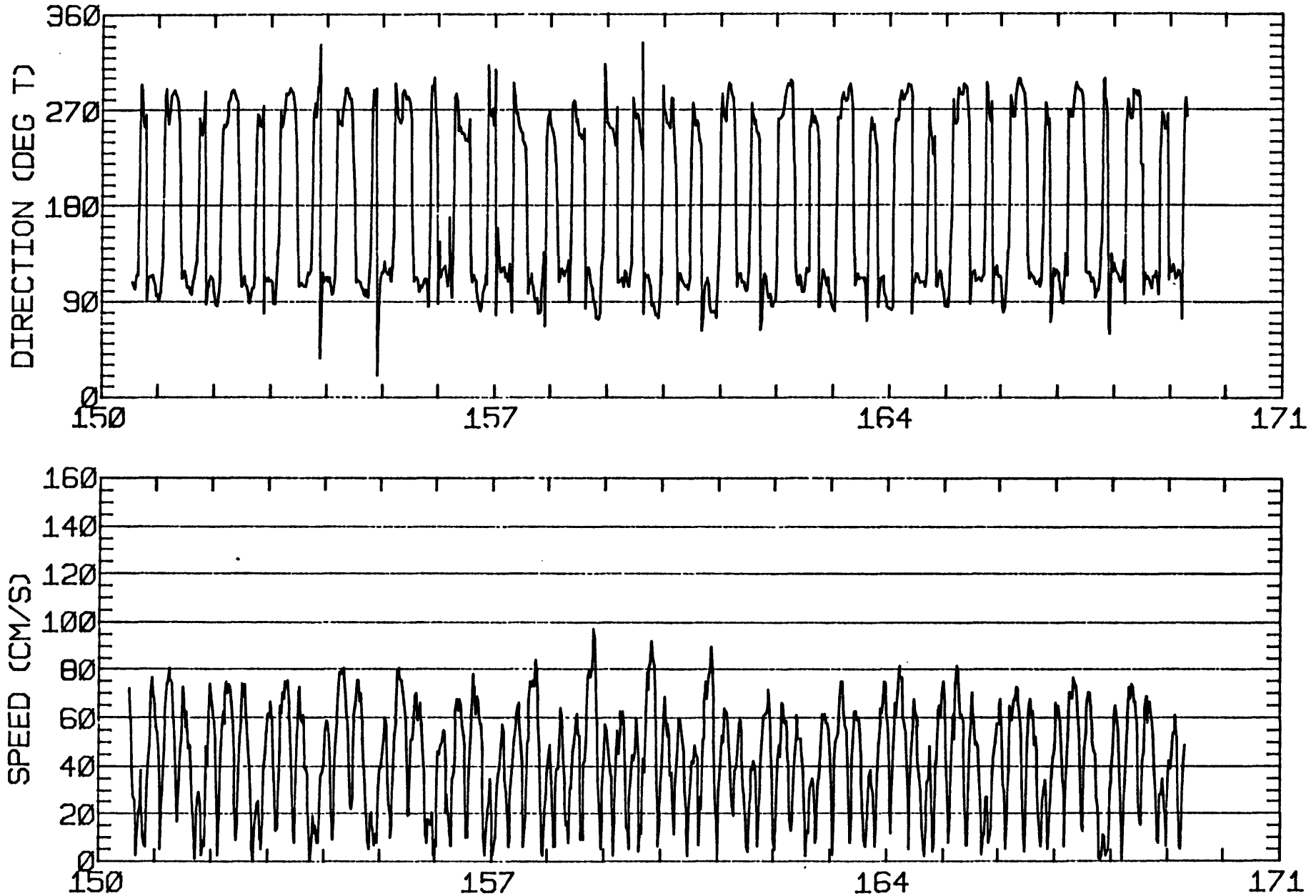
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.44	3.27	126.3	88.9	CLOCKWISE
K1	30.01	2.65	95.9	34.6	ANTI-CLOCKWISE
N2	10.42	1.68	92.6	349.7	ANTI-CLOCKWISE
M2	48.33	0.72	98.5	353.2	ANTI-CLOCKWISE
S2	8.19	2.79	134.1	33.6	CLOCKWISE
M4	3.65	0.30	4.2	59.1	ANTI-CLOCKWISE

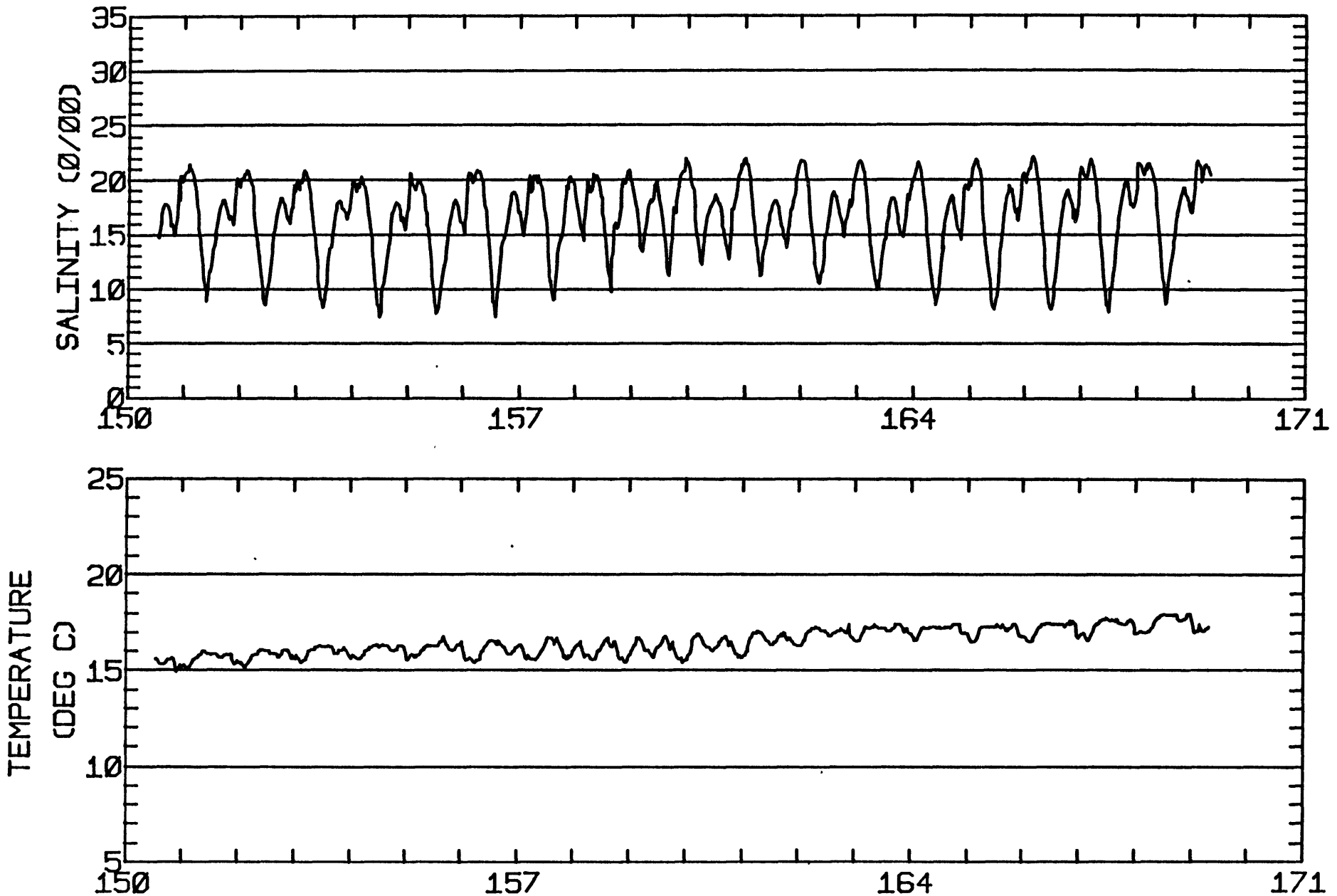
RMS SPEED: 48.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 98.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 21.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 103.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.73
STANDARD DEVIATION U-SERIES: 9.52 CM/SEC
STANDARD DEVIATION V SERIES: 9.67 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.9	-6.7	427.
2	12	9.6	-7.4	397.
3	12	4.4	-5.5	402.
ALL	36	6.7	-6.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
.METER 002.1 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 6W
METER 002.1 METERS ABOVE BED. WATER DEPTH 018.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 4"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 6/17/80 850 PST JULIAN DAY=169
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

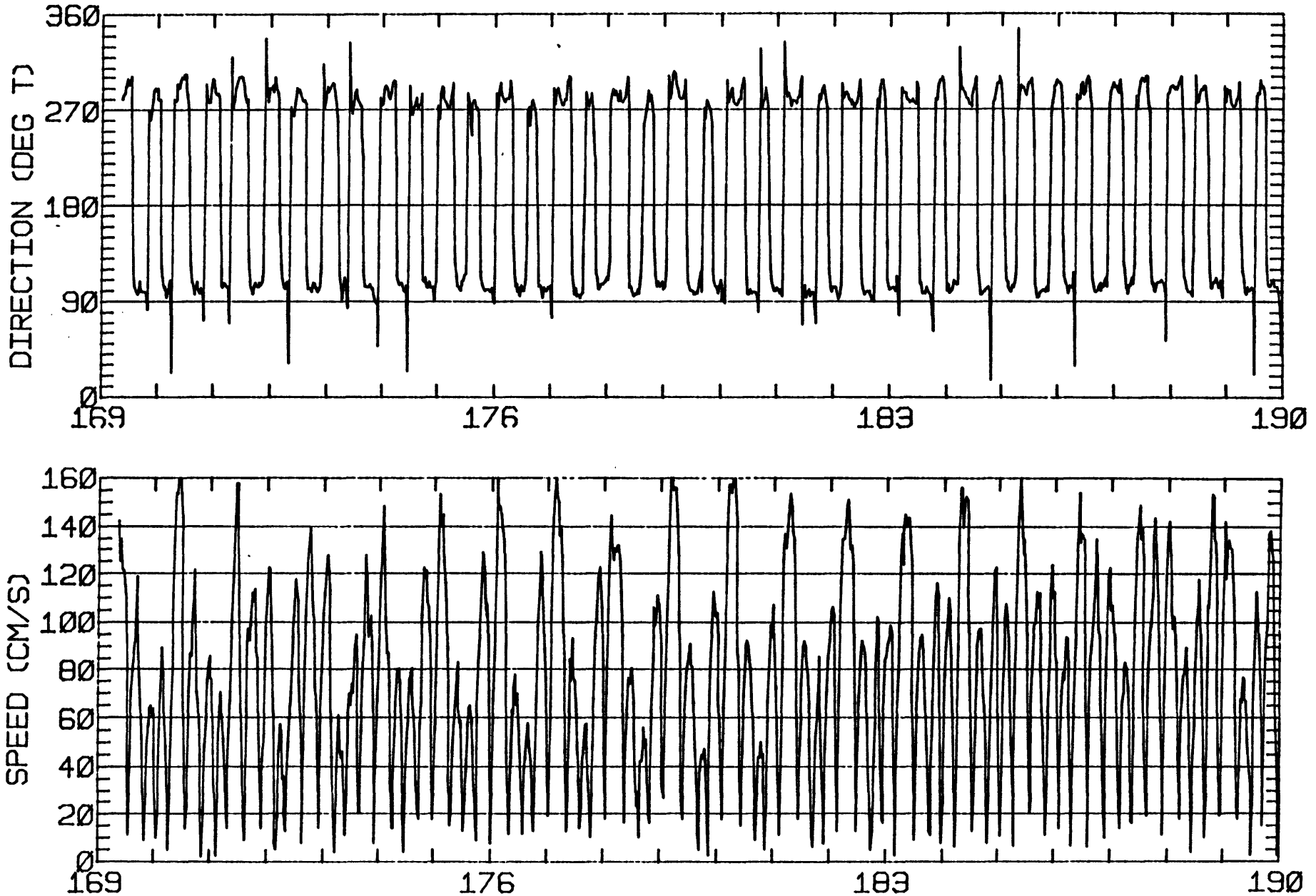
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	22.19	1.73	107.9	102.0	CLOCKWISE
K1	54.75	0.19	104.9	95.1	CLOCKWISE
N2	19.09	0.13	112.4	312.5	ANTI-CLOCKWISE
M2	110.67	0.97	104.7	6.2	ANTI-CLOCKWISE
S2	13.56	0.90	89.8	344.1	ANTI-CLOCKWISE
M4	2.75	1.81	88.0	317.6	ANTI-CLOCKWISE

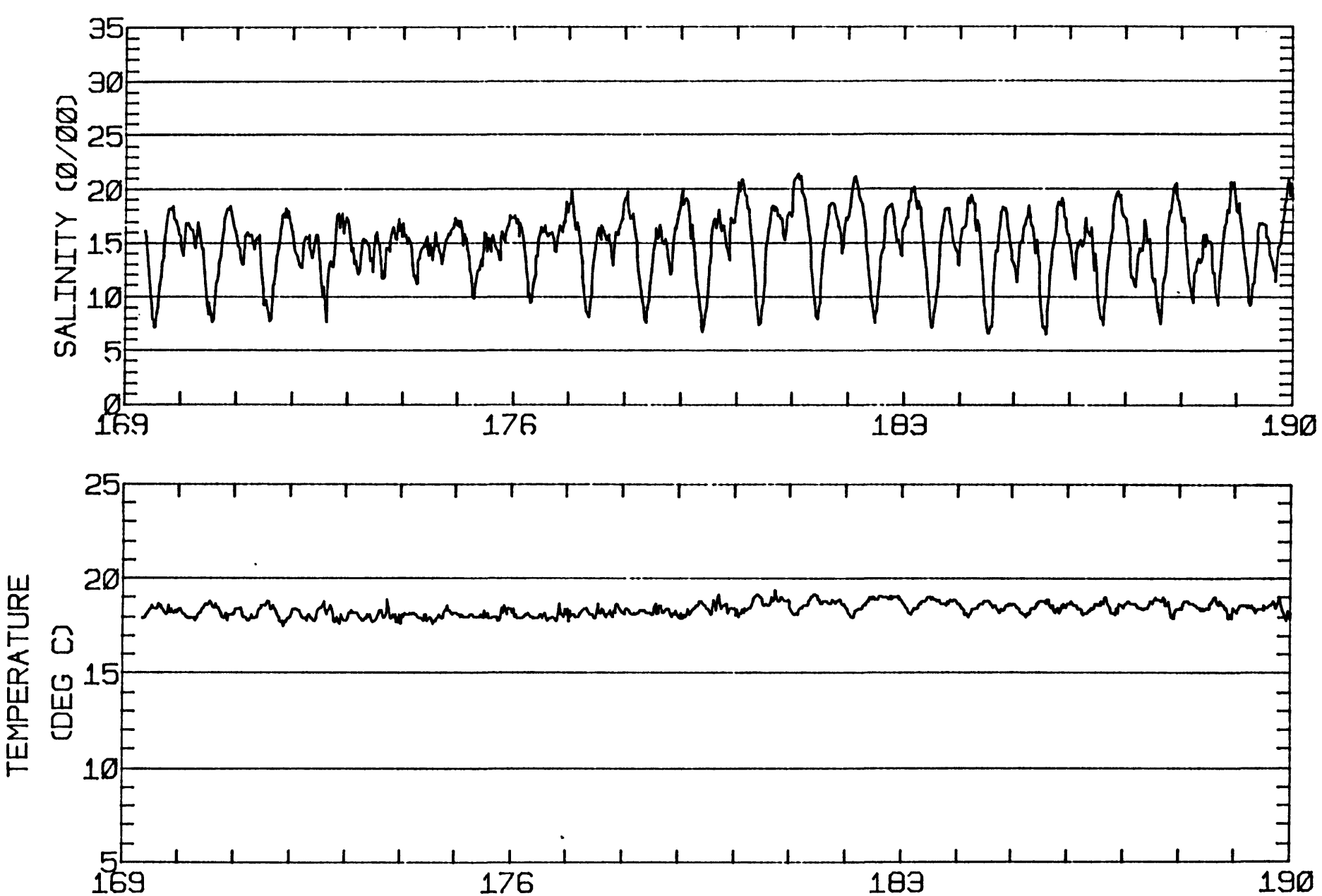
RMS SPEED: 87.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 201.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 64.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 104.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.62
STANDARD DEVIATION U-SERIES: 15.18 CM/SEC
STANDARD DEVIATION V SERIES: 13.20 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-9.0	4.5	445.
2	12	-7.4	1.9	447.
3	12	-10.2	5.6	408.
4	4	-6.6	2.0	416.
ALL	40	-8.6	3.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 4W
METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 4W
.METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 4"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 7/ 3/80 612 PST JULIAN DAY=185
APPROXIMATE RECORD LENGTH IS 8 M2-CYCLES

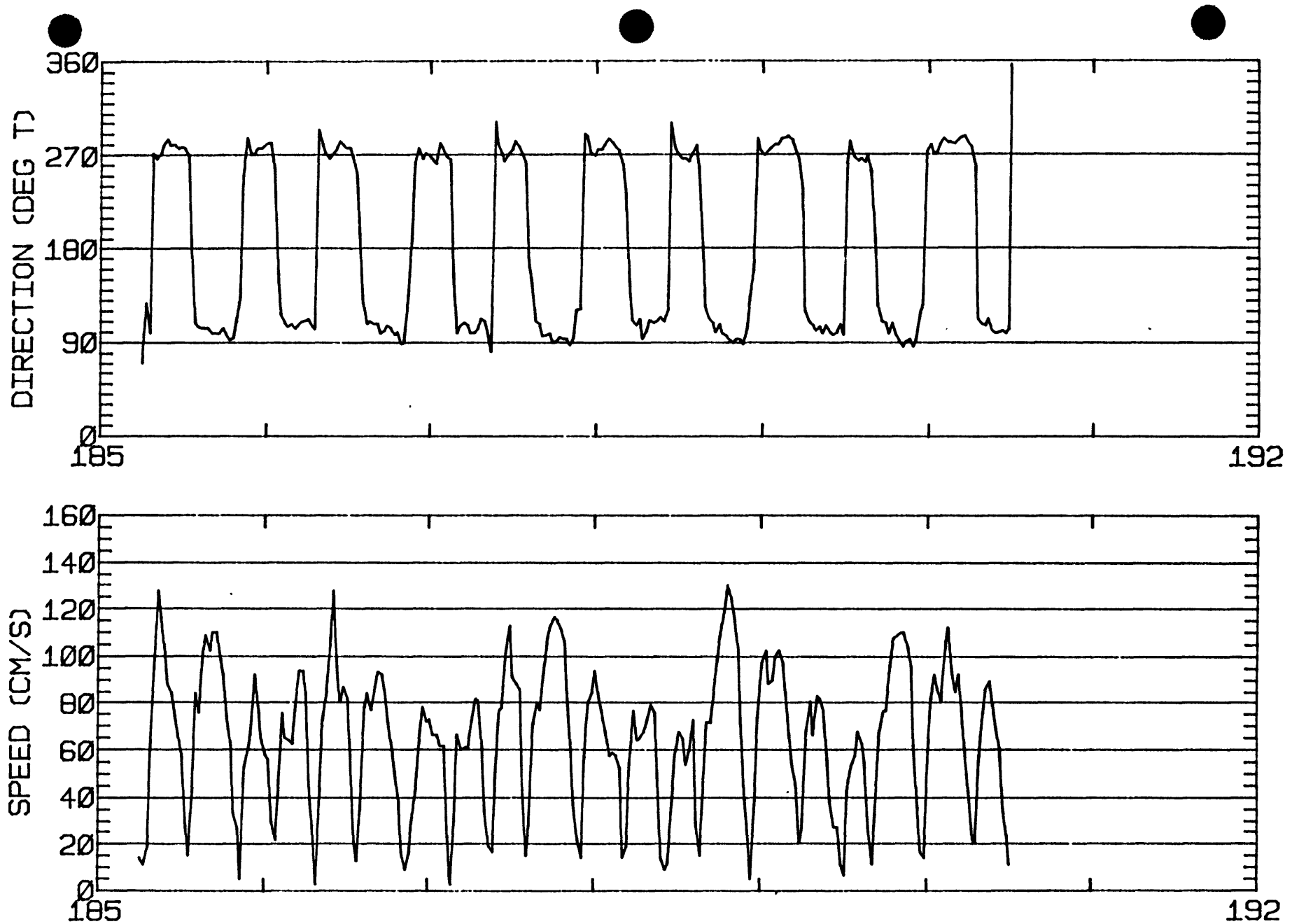
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	24.84	3.29	112.4	106.3	ANTI-CLOCKWISE
K1	45.93	3.56	102.3	102.3	ANTI-CLOCKWISE
N2	39.34	12.46	99.0	303.3	ANTI-CLOCKWISE
M2	88.89	2.86	111.6	28.6	CLOCKWISE
S2	24.34	3.05	125.5	57.8	ANTI-CLOCKWISE
M4	4.54	3.04	81.1	118.0	CLOCKWISE

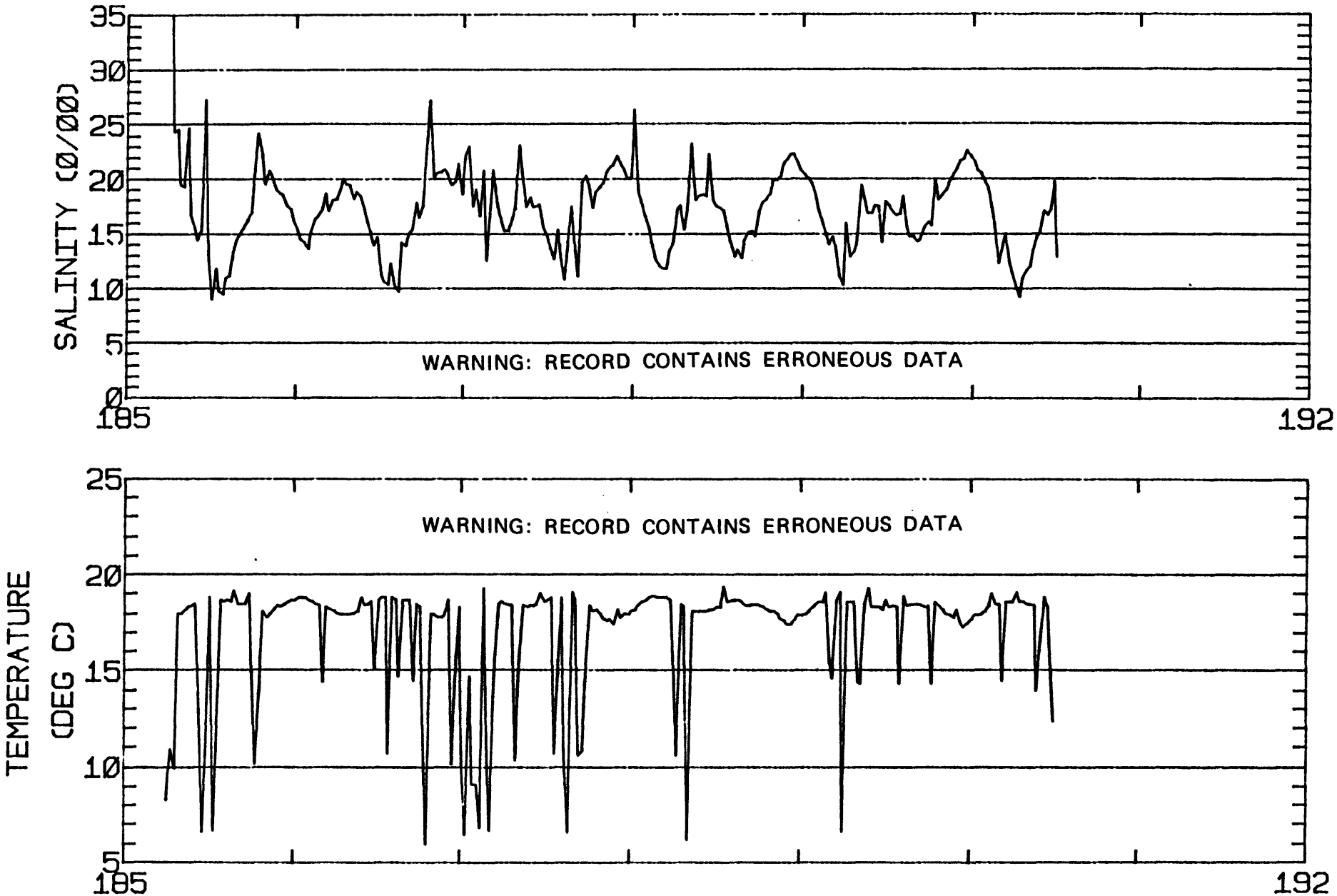
RMS SPEED: 72.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 184.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 43.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 111.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.62
STANDARD DEVIATION U-SERIES: 15.47 CM/SEC
STANDARD DEVIATION V SERIES: 8.42 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	8	3.4	-5.6	427.
ALL	8	3.4	-5.6	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 4W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.


SALINITY (Ø/ØØ)
35
30
25
20
15
10
5
0
WARNING: RECORD CONTAINS ERRONEOUS DATA
185
192
TEMPERATURE (DEG C)
25
20
15
10
5
WARNING: RECORD CONTAINS ERRONEOUS DATA
185
192
JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 4W
METER Ø05.8 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13' 3"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 7/ 8/80 1350 PST JULIAN DAY=190
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

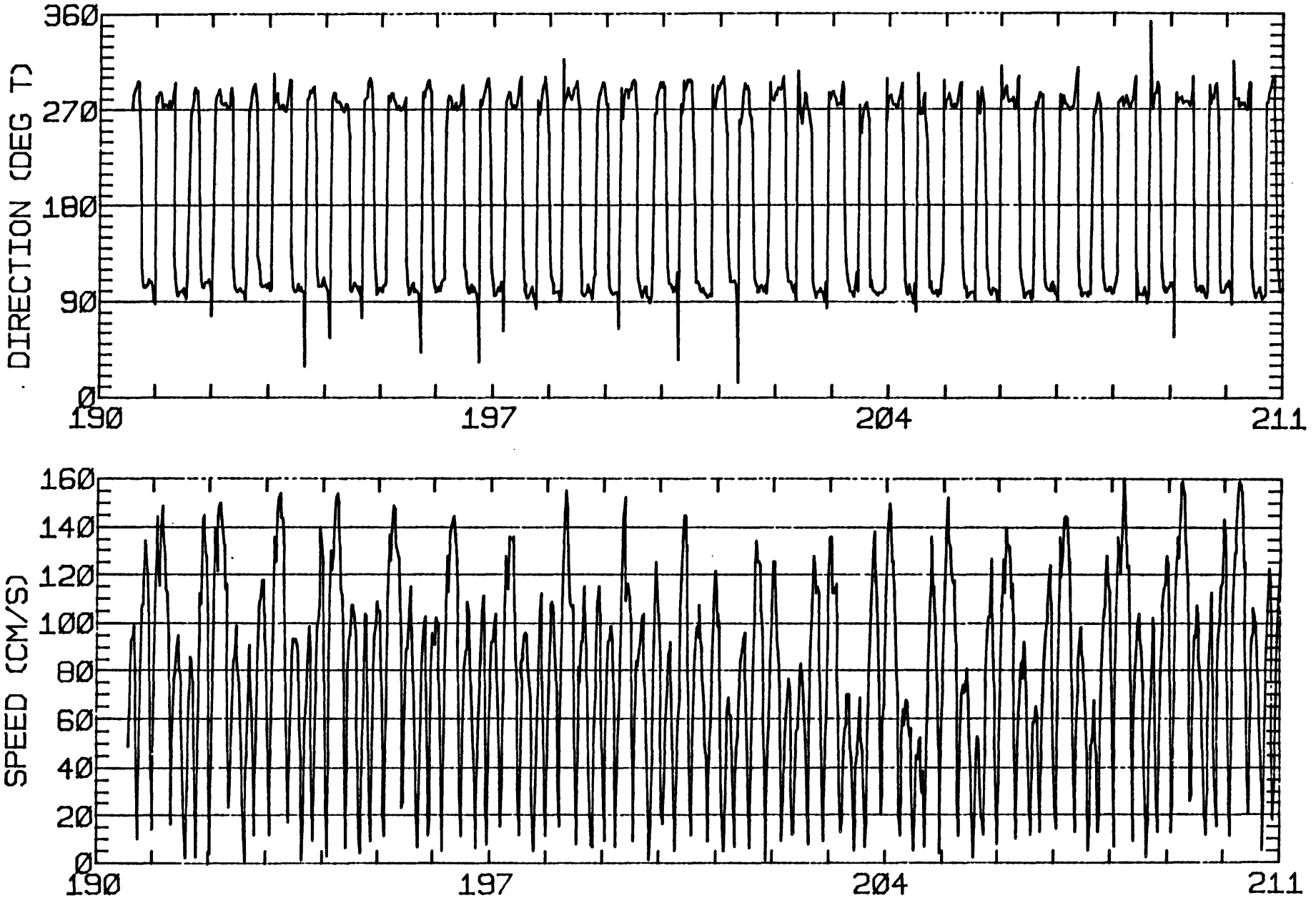
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	22.73	2.59	97.6	108.3	CLOCKWISE
K1	47.88	0.41	97.9	106.6	ANTI-CLOCKWISE
N2	10.26	2.19	98.3	2.4	ANTI-CLOCKWISE
M2	106.59	2.79	101.7	8.0	ANTI-CLOCKWISE
S2	10.14	2.34	101.8	40.5	CLOCKWISE
M4	4.21	0.68	99.1	325.7	ANTI-CLOCKWISE

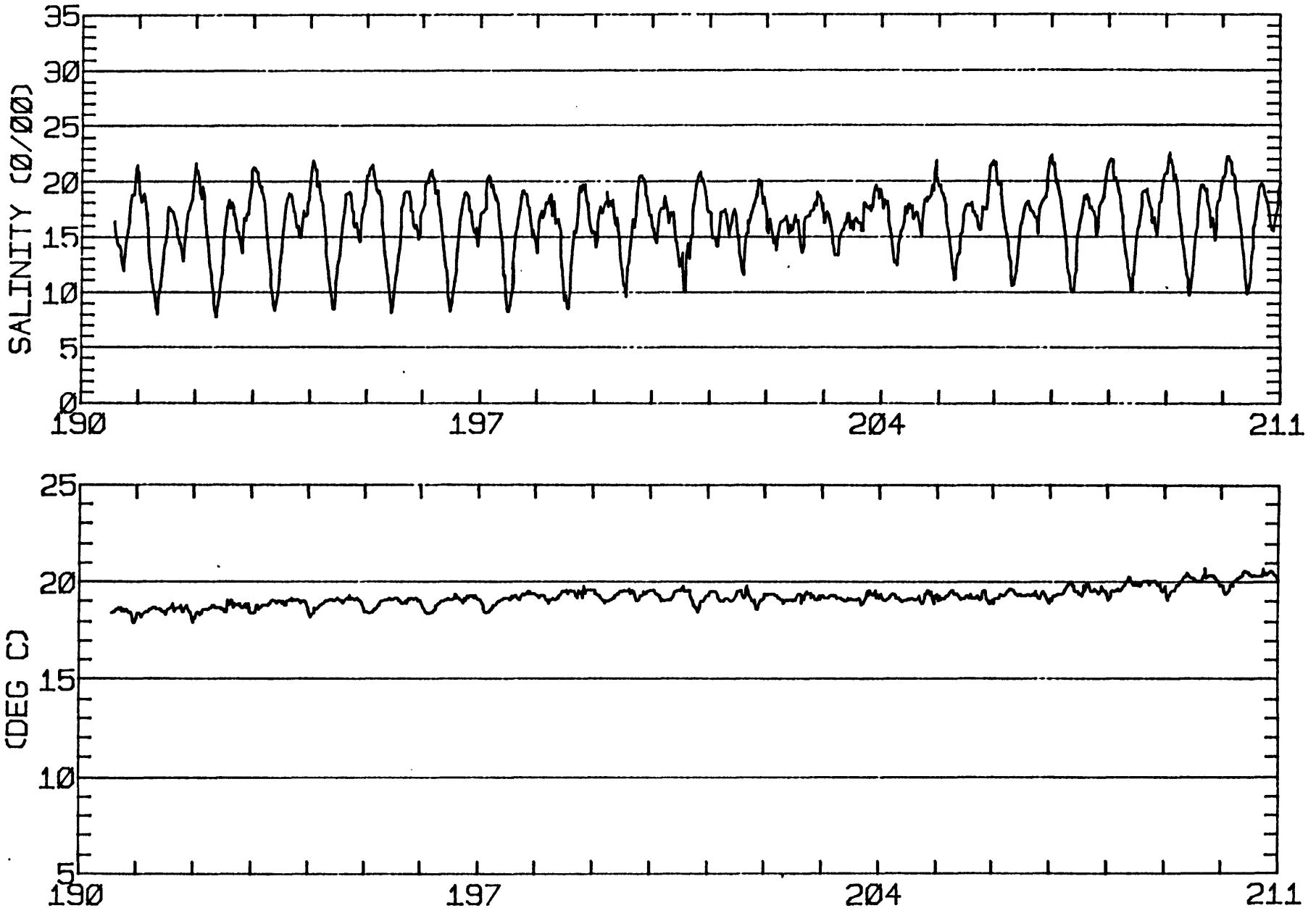
RMS SPEED: 87.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 187.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 71.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 100.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.60
STANDARD DEVIATION U-SERIES: 17.41 CM/SEC
STANDARD DEVIATION V SERIES: 12.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.8	-1.2	286.
2	12	-6.3	3.6	286.
3	12	-4.8	-1.1	301.
4	4	-9.0	0.0	313.
ALL	40	-6.8	0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 3W
METER 011.9 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 3W
METER 011.9 METERS ABOVE BED. WATER DEPTH 017.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13' 3"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 15.6 M (BELOW MLLW)
START TIME OF SERIES: 7/ 8/80 1334 PST JULIAN DAY=190
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

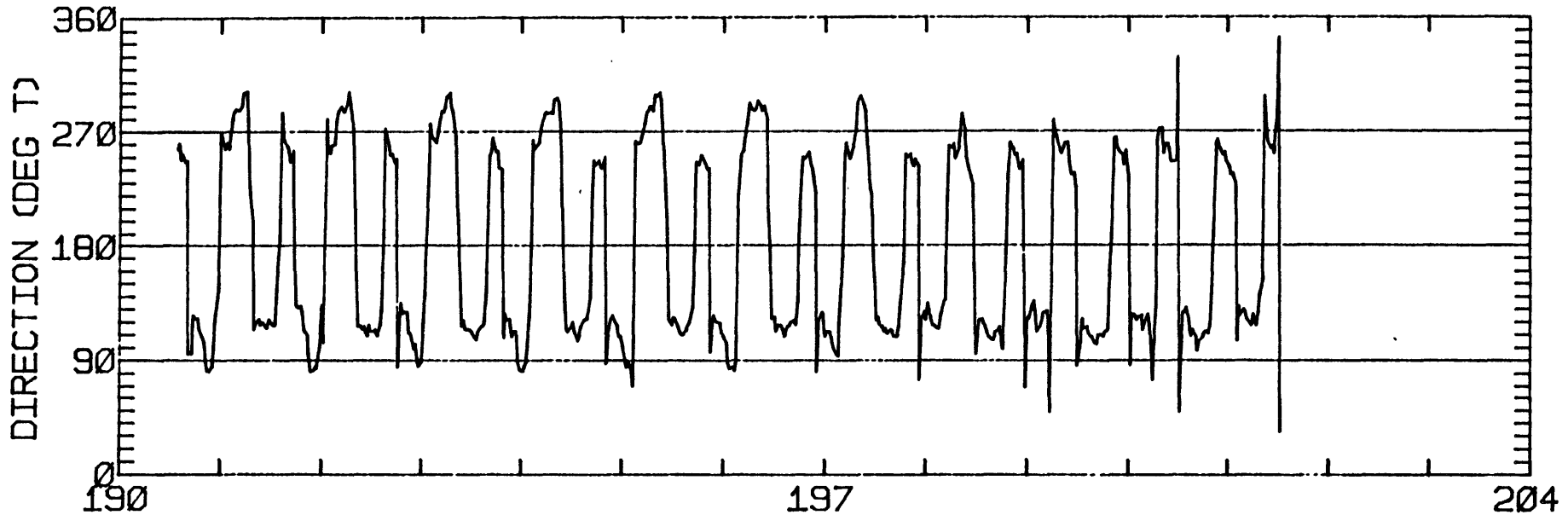
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

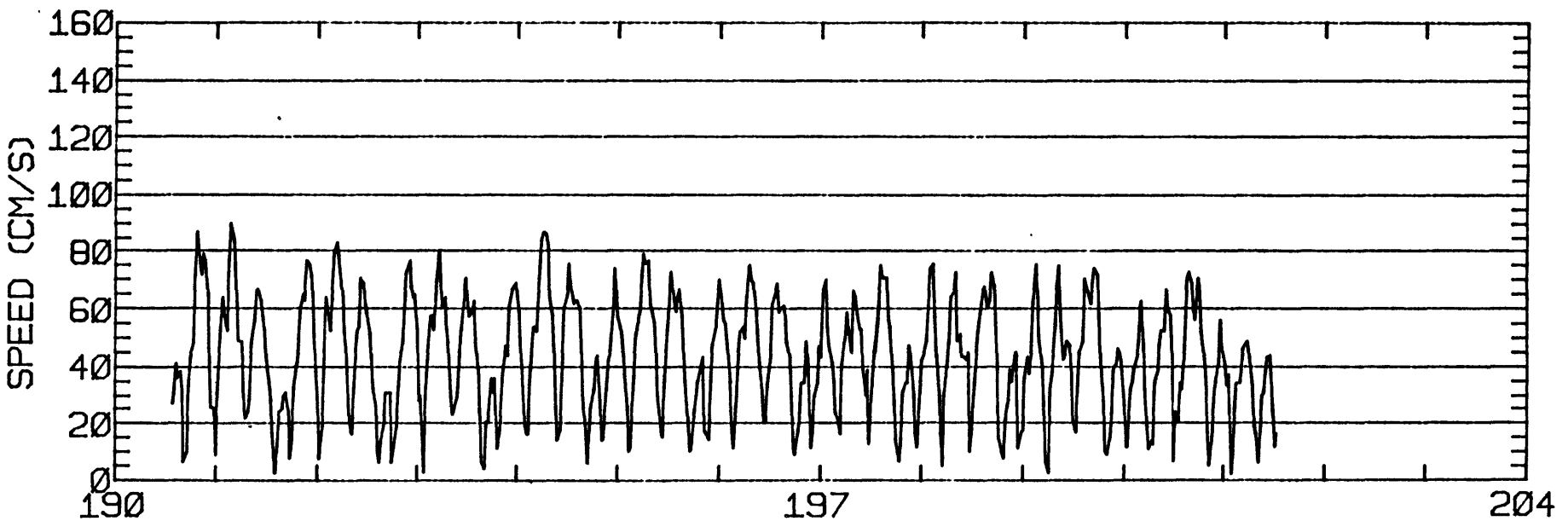
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.69	0.86	128.3	91.6	ANTI-CLOCKWISE
K1	27.78	3.55	106.4	97.6	ANTI-CLOCKWISE
N2	10.24	1.46	95.2	32.2	ANTI-CLOCKWISE
M2	59.18	0.05	98.7	355.2	ANTI-CLOCKWISE
S2	6.28	1.39	130.7	34.7	ANTI-CLOCKWISE
M4	4.39	0.14	4.7	76.8	CLOCKWISE

RMS SPEED: 48.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 104.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 106.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.60
STANDARD DEVIATION U-SERIES: 9.37 CM/SEC
STANDARD DEVIATION V SERIES: 10.35 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.9	-7.5	286.
2	8	7.0	-14.5	279.
ALL	20	5.8	-10.3	



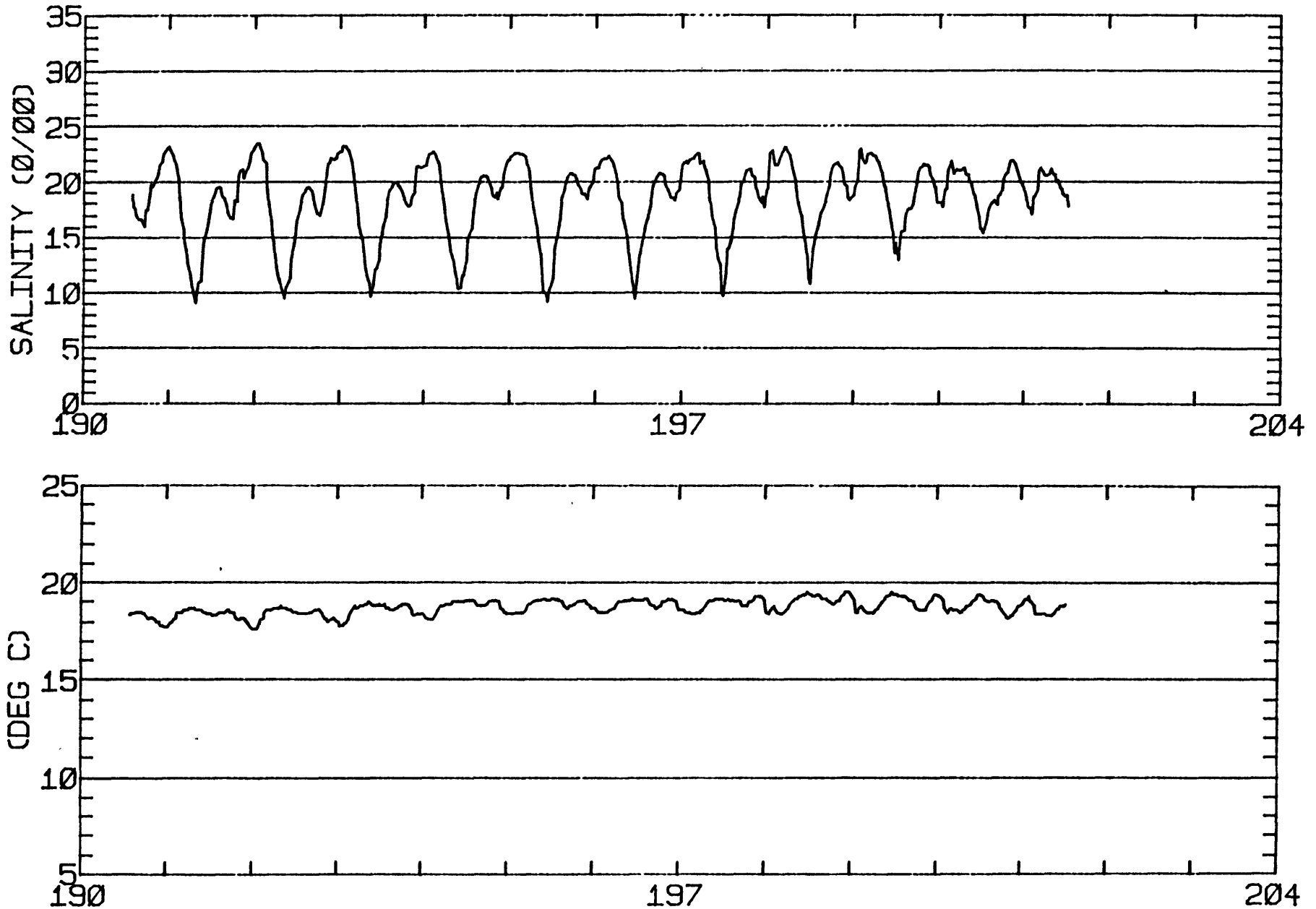


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-40N 122-13- 3W

METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 3W
METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 7/29/80 1540 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

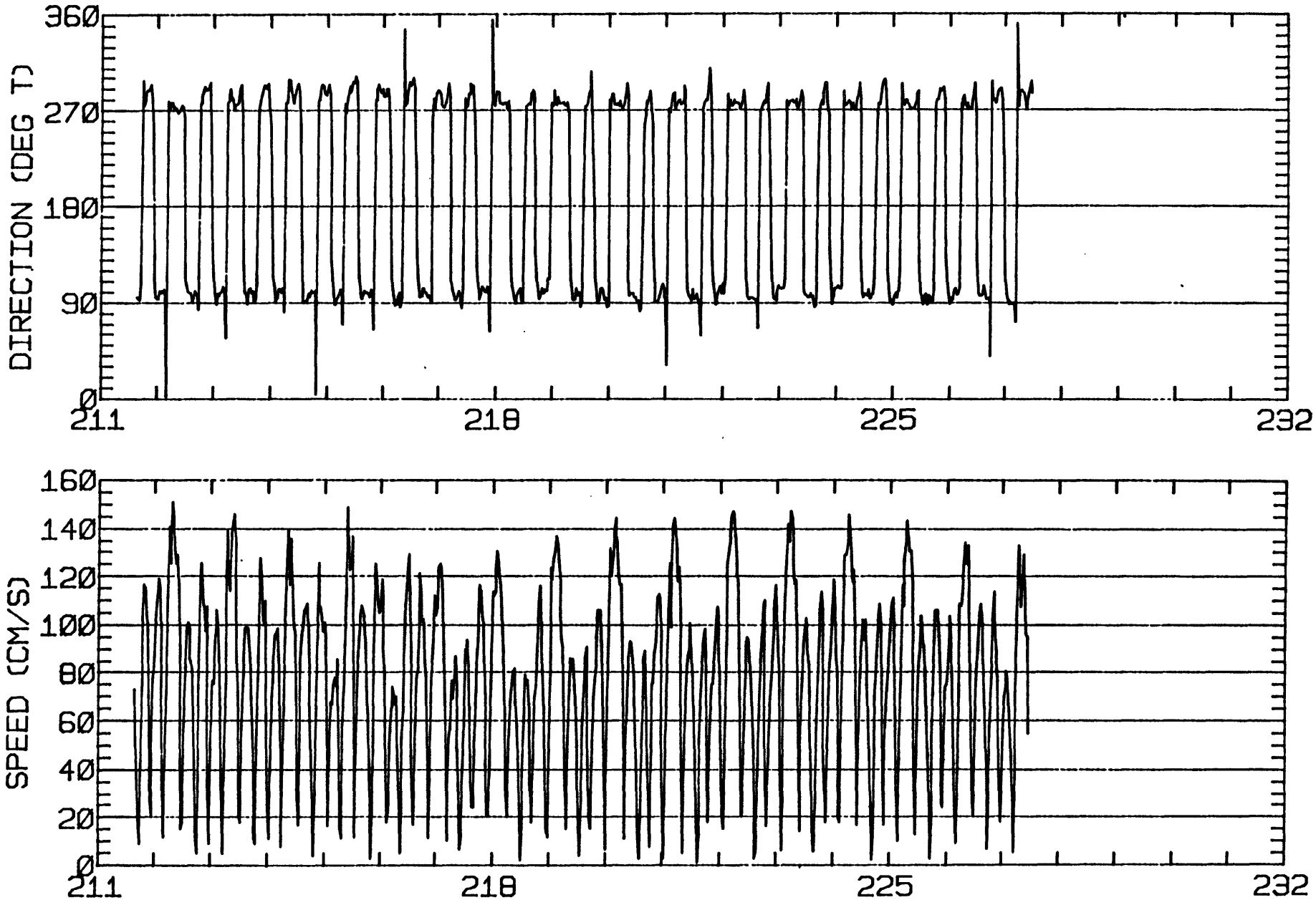
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	22.11	2.90	94.6	105.7	CLOCKWISE
K1	38.93	0.07	95.7	117.1	CLOCKWISE
N2	19.16	0.29	107.5	358.6	CLOCKWISE
M2	97.11	2.53	100.0	9.1	ANTI-CLOCKWISE
S2	22.36	2.37	96.1	28.6	CLOCKWISE
M4	2.39	1.67	21.0	2.1	ANTI-CLOCKWISE

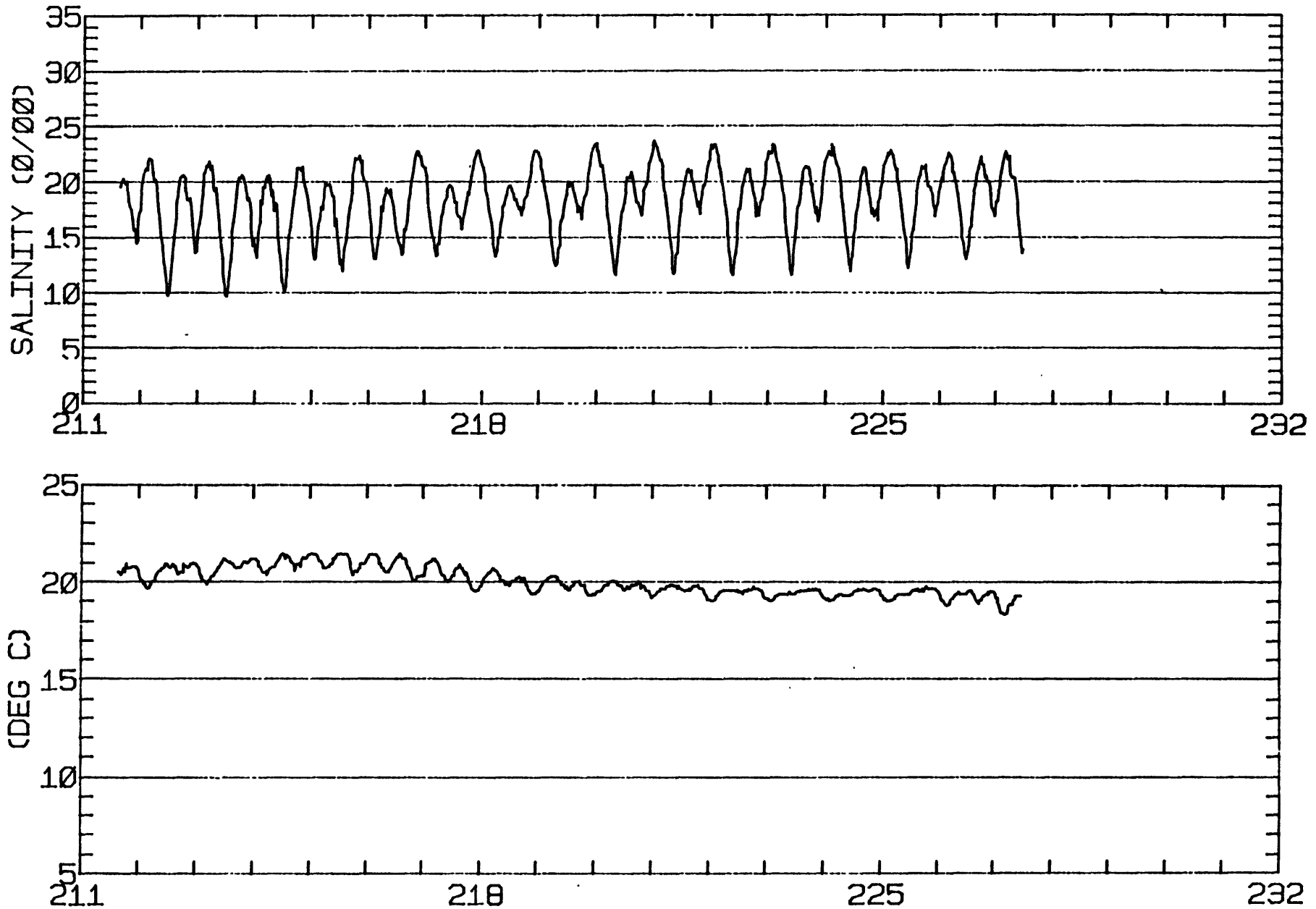
RMS SPEED: 85.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 180.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 57.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 97.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 15.21 CM/SEC
STANDARD DEVIATION V SERIES: 11.65 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.5	5.9	227.
2	12	-9.5	1.7	154.
3	6	-10.3	2.9	115.
ALL	30	-9.3	3.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 5W
METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 5W
METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 7/29/80 1542 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

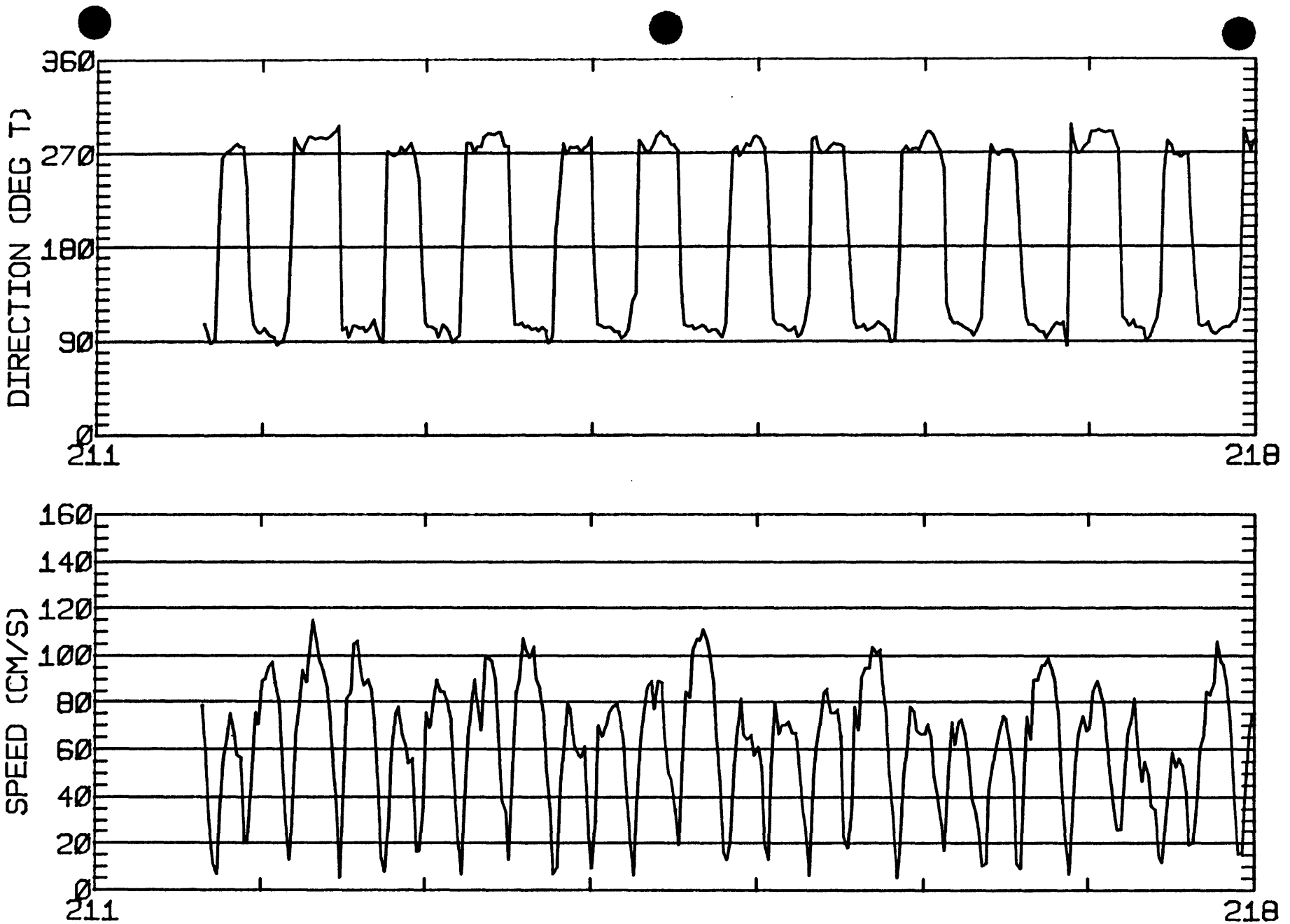
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.74	0.28	115.2	90.5	ANTI-CLOCKWISE
K1	38.44	0.68	109.6	109.8	ANTI-CLOCKWISE
N2	28.15	1.66	102.4	327.7	ANTI-CLOCKWISE
M2	66.70	1.99	101.1	13.7	CLOCKWISE
S2	18.69	0.10	103.1	35.3	CLOCKWISE
M4	2.66	0.36	155.7	234.8	ANTI-CLOCKWISE

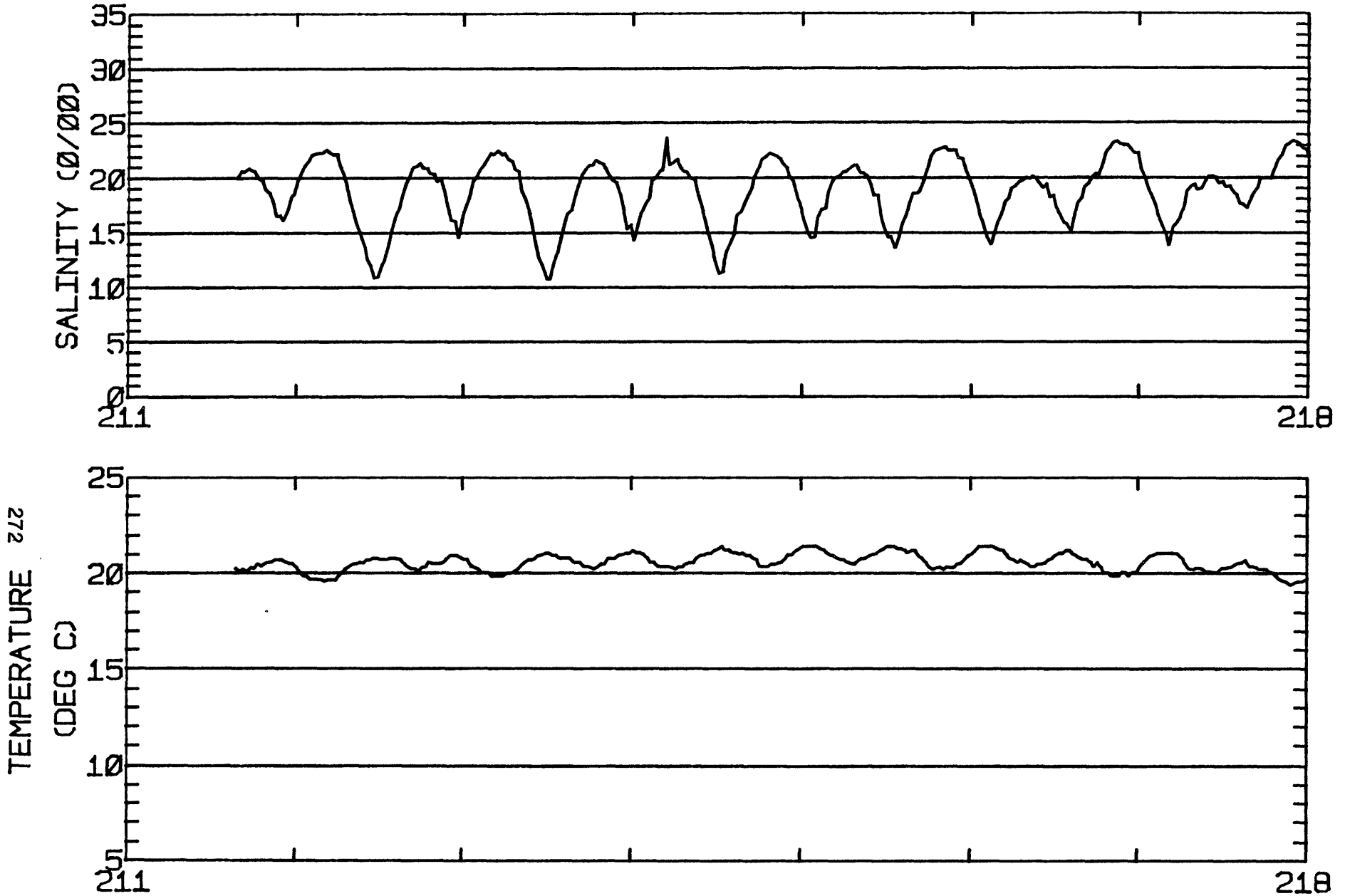
RMS SPEED: 66.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 143.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 105.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.68
STANDARD DEVIATION U-SERIES: 12.24 CM/SEC
STANDARD DEVIATION V SERIES: 6.66 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.3	-3.6	227.
2	2	0.8	-1.6	178.
ALL	14	5.5	-3.3	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 5W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



272

JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 5W
METER Ø05.8 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 15.6 M (BELOW MLLW)
START TIME OF SERIES: 7/29/80 1534 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

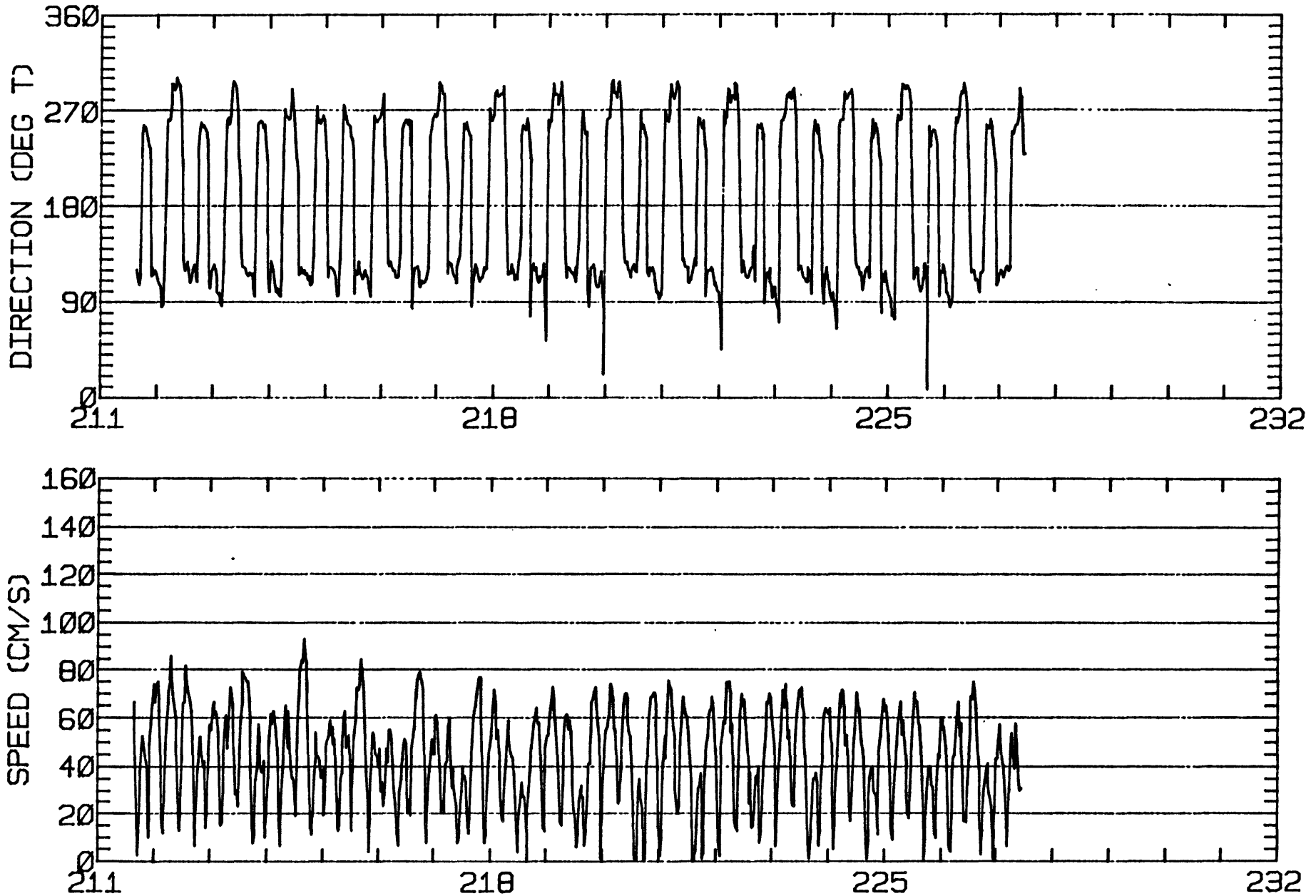
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.51	3.64	112.3	92.8	ANTI-CLOCKWISE
K1	25.07	2.01	114.3	109.8	ANTI-CLOCKWISE
N2	12.98	0.44	109.8	349.0	ANTI-CLOCKWISE
M2	50.88	1.91	103.3	354.1	ANTI-CLOCKWISE
S2	12.76	2.41	104.3	13.5	ANTI-CLOCKWISE
M4	3.12	0.72	14.1	93.4	ANTI-CLOCKWISE

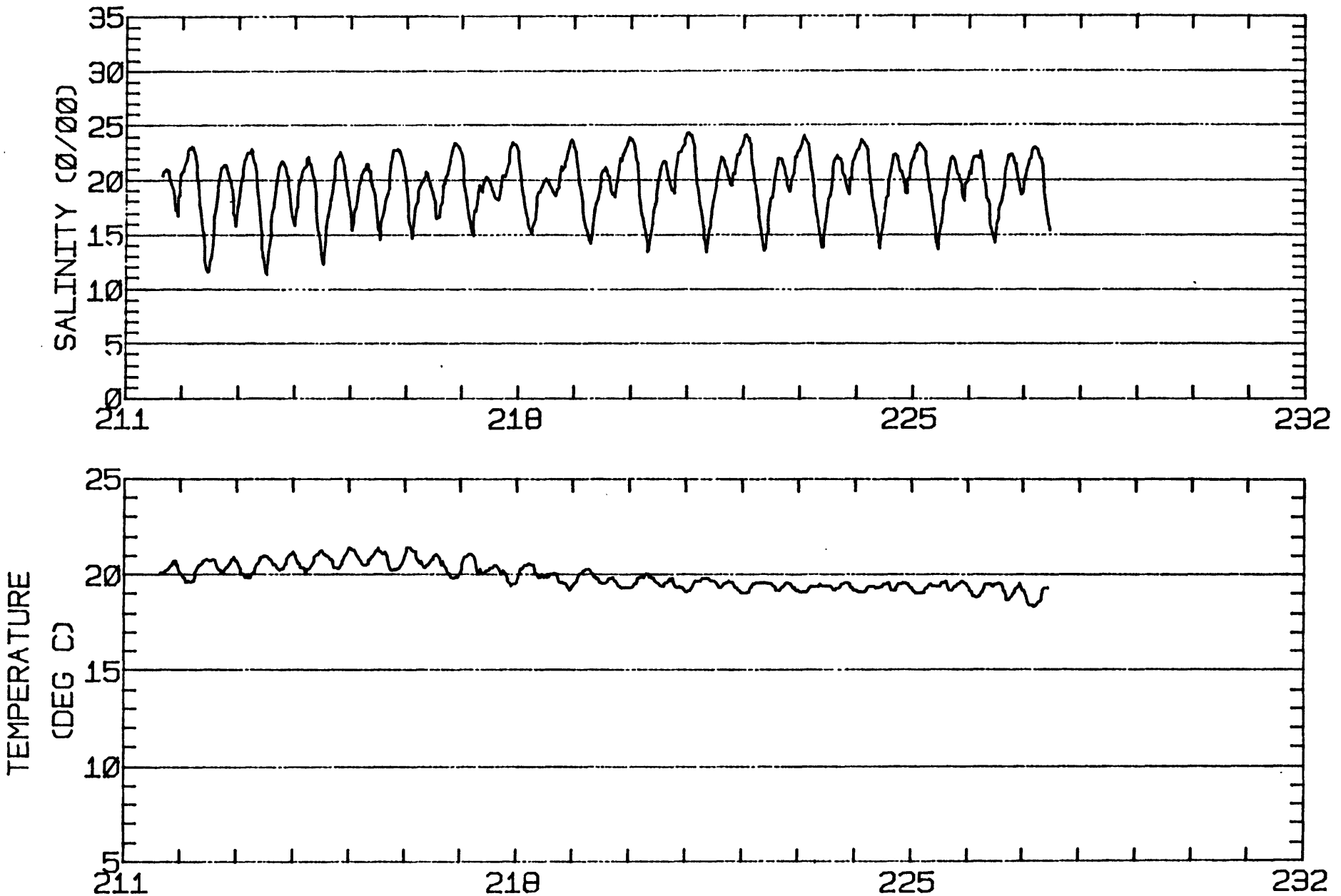
RMS SPEED: 48.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 100.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 24.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 107.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.57
STANDARD DEVIATION U-SERIES: 8.13 CM/SEC
STANDARD DEVIATION V SERIES: 8.98 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.1	-13.5	227.
2	12	5.0	-9.1	154.
3	6	5.2	-8.8	115.
ALL	30	5.9	-10.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 5W
.METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 5W
METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 8/14/80 1300 PST JULIAN DAY=227
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

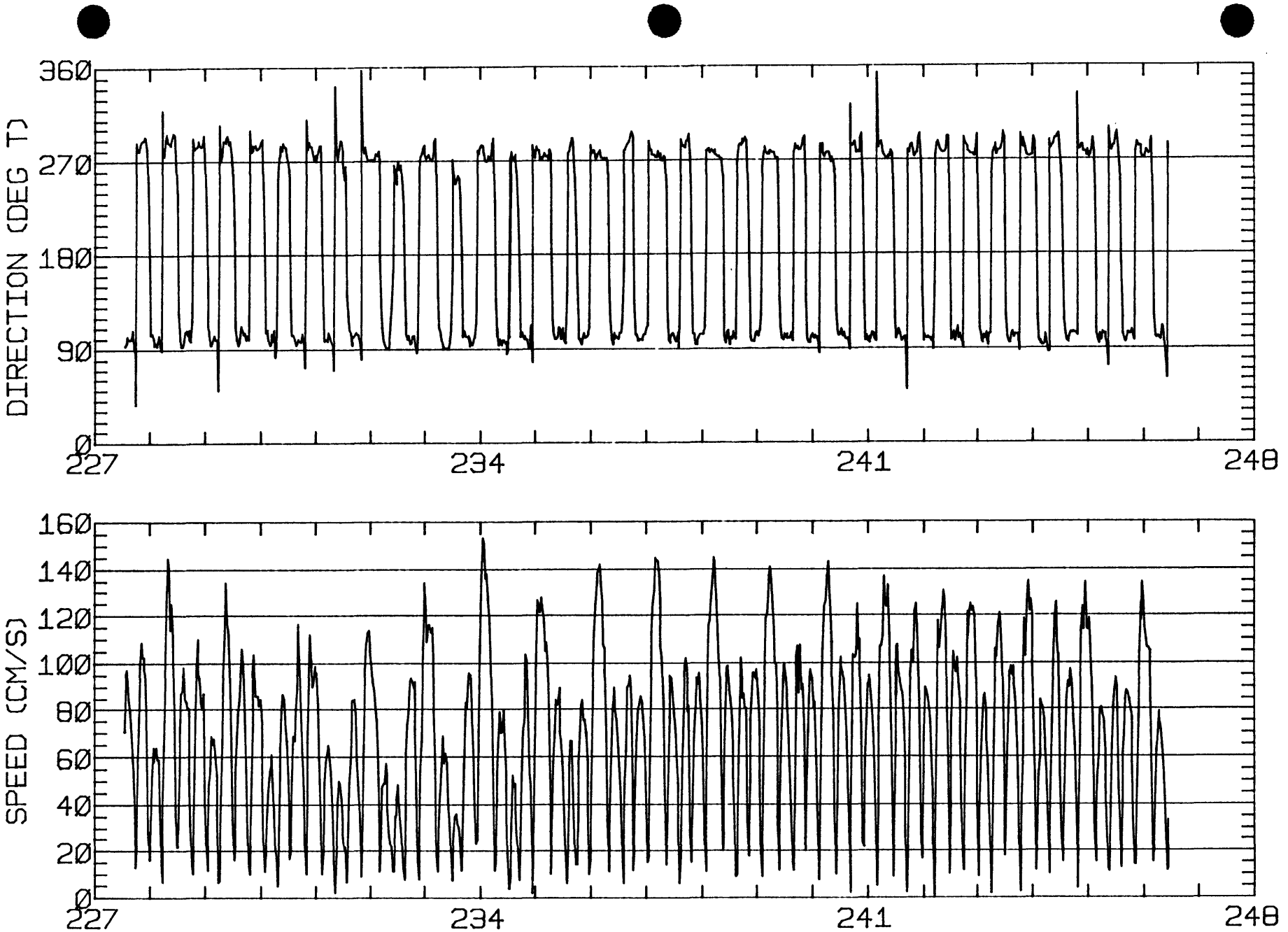
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	24.36	0.62	91.5	86.5	CLOCKWISE
K1	37.62	1.09	97.3	108.7	ANTI-CLOCKWISE
N2	7.98	0.68	100.1	347.3	ANTI-CLOCKWISE
M2	97.21	2.07	100.3	358.5	ANTI-CLOCKWISE
S2	14.03	1.80	106.1	23.6	CLOCKWISE
M4	1.81	0.21	64.8	275.5	ANTI-CLOCKWISE

RMS SPEED: 79.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 173.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 69.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 98.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.56
STANDARD DEVIATION U-SERIES: 13.78 CM/SEC
STANDARD DEVIATION V SERIES: 9.87 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.5	1.3	81.
2	12	-12.5	-0.2	107.
3	12	-15.6	2.0	120.
ALL	36	-11.5	1.1	

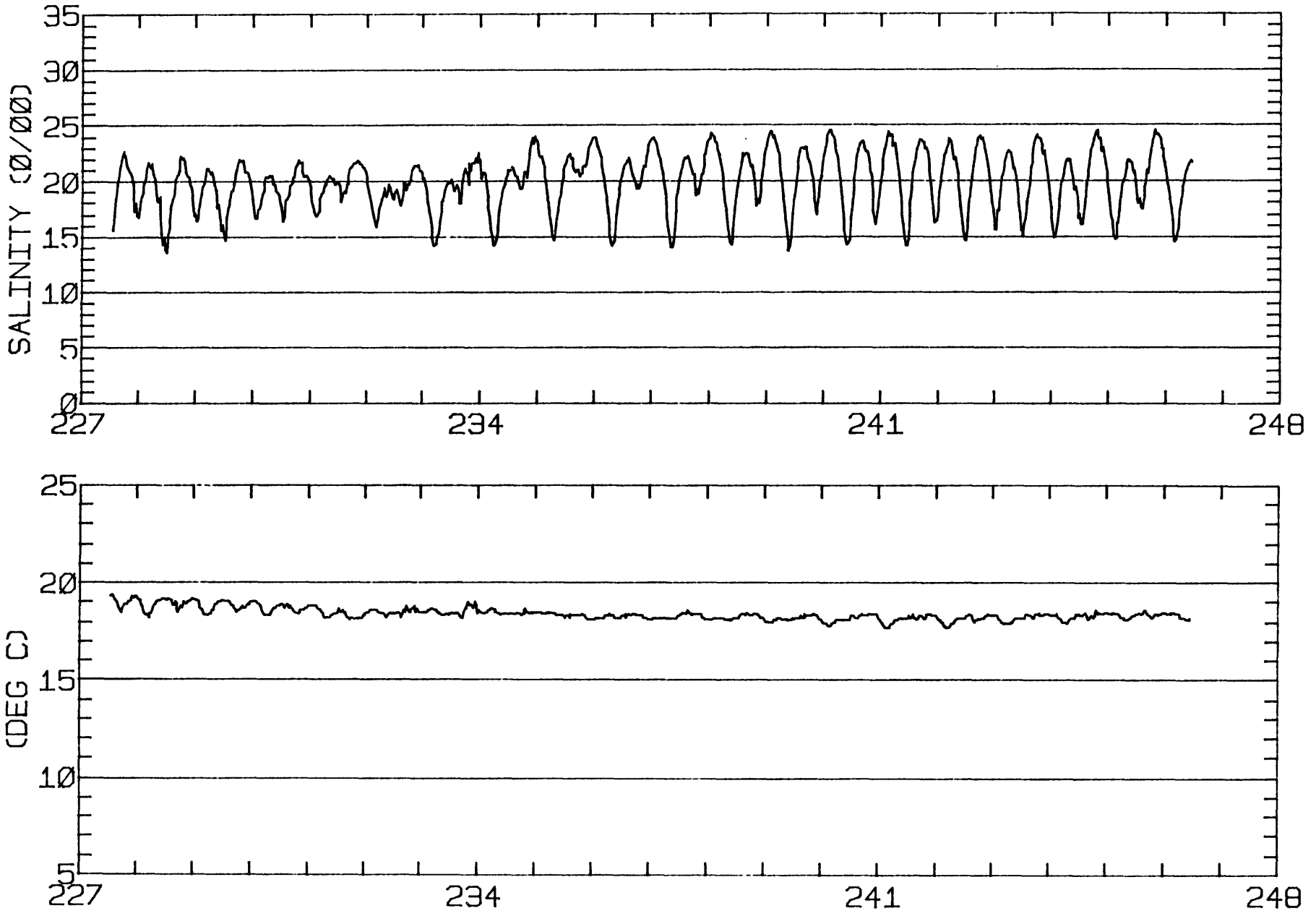


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-38N 122-13- 6W

METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 6W
METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 8/14/80 1302 PST JULIAN DAY=227
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

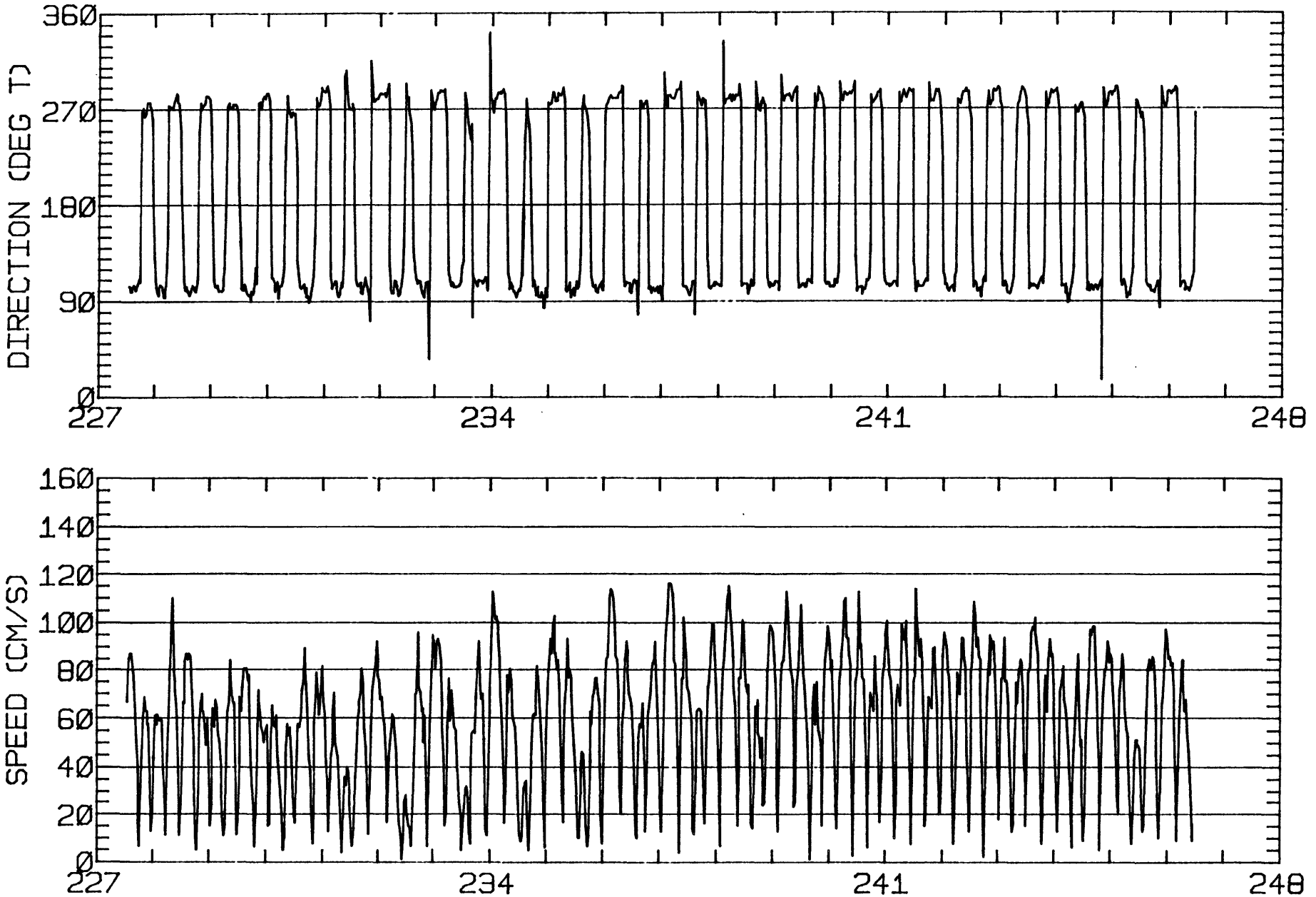
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	21.59	0.77	109.2	84.5	CLOCKWISE
K1	31.97	0.32	105.8	108.6	CLOCKWISE
N2	8.18	0.31	115.7	356.9	CLOCKWISE
M2	80.33	0.99	101.5	358.2	CLOCKWISE
S2	13.53	0.16	106.0	17.1	CLOCKWISE
M4	2.23	1.38	122.1	283.0	ANTI-CLOCKWISE

RMS SPEED: 65.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 147.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 56.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 104.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.57
STANDARD DEVIATION U-SERIES: 12.39 CM/SEC
STANDARD DEVIATION V SERIES: 6.67 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.2	-3.8	81.
2	12	0.2	-2.2	107.
3	12	0.8	-2.1	120.
ALL	36	1.7	-2.7	

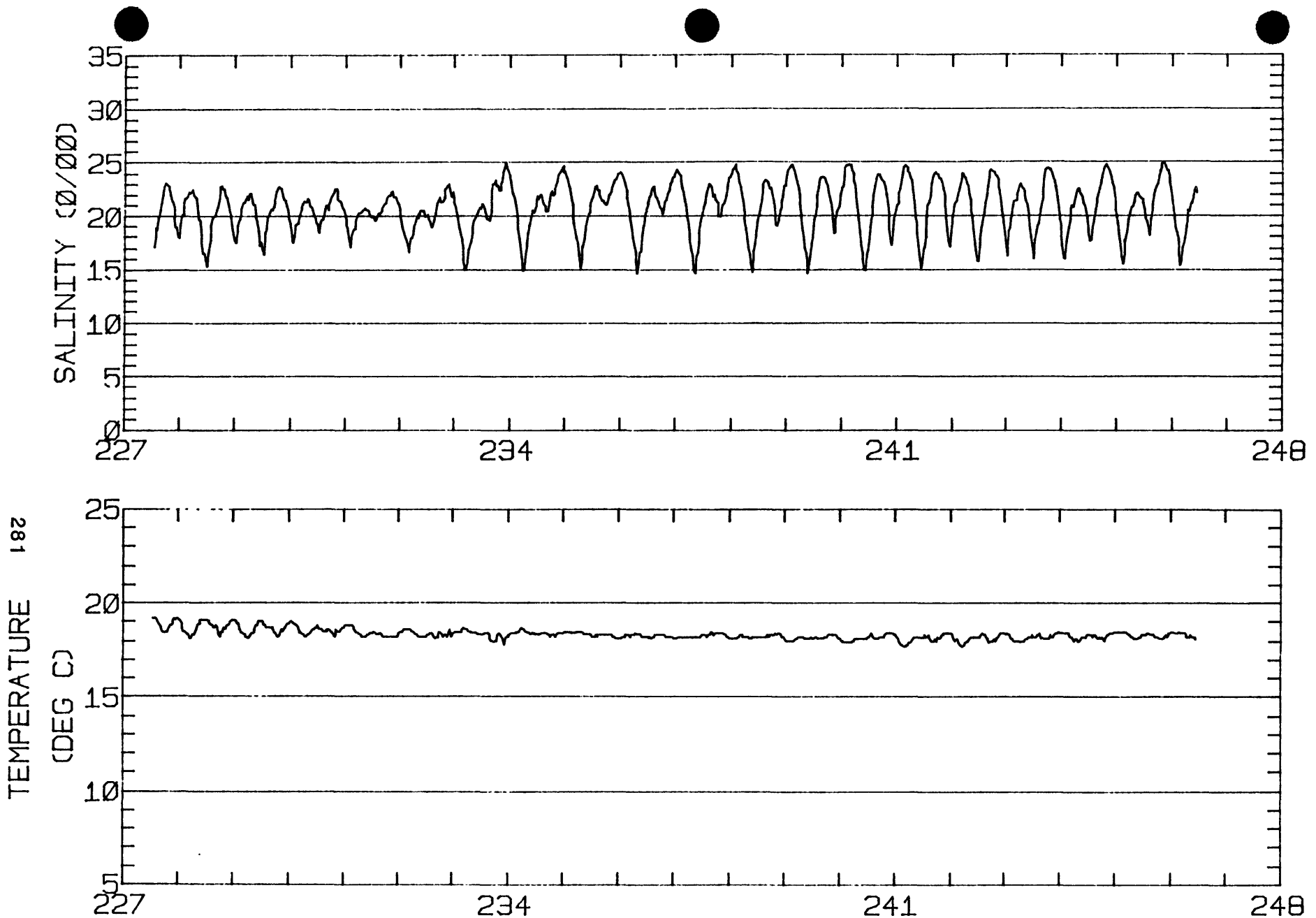


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-38N 122-13- 6W

METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 6W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 15.9 M (BELOW MLLW)
START TIME OF SERIES: 8/14/80 1254 PST JULIAN DAY=227
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

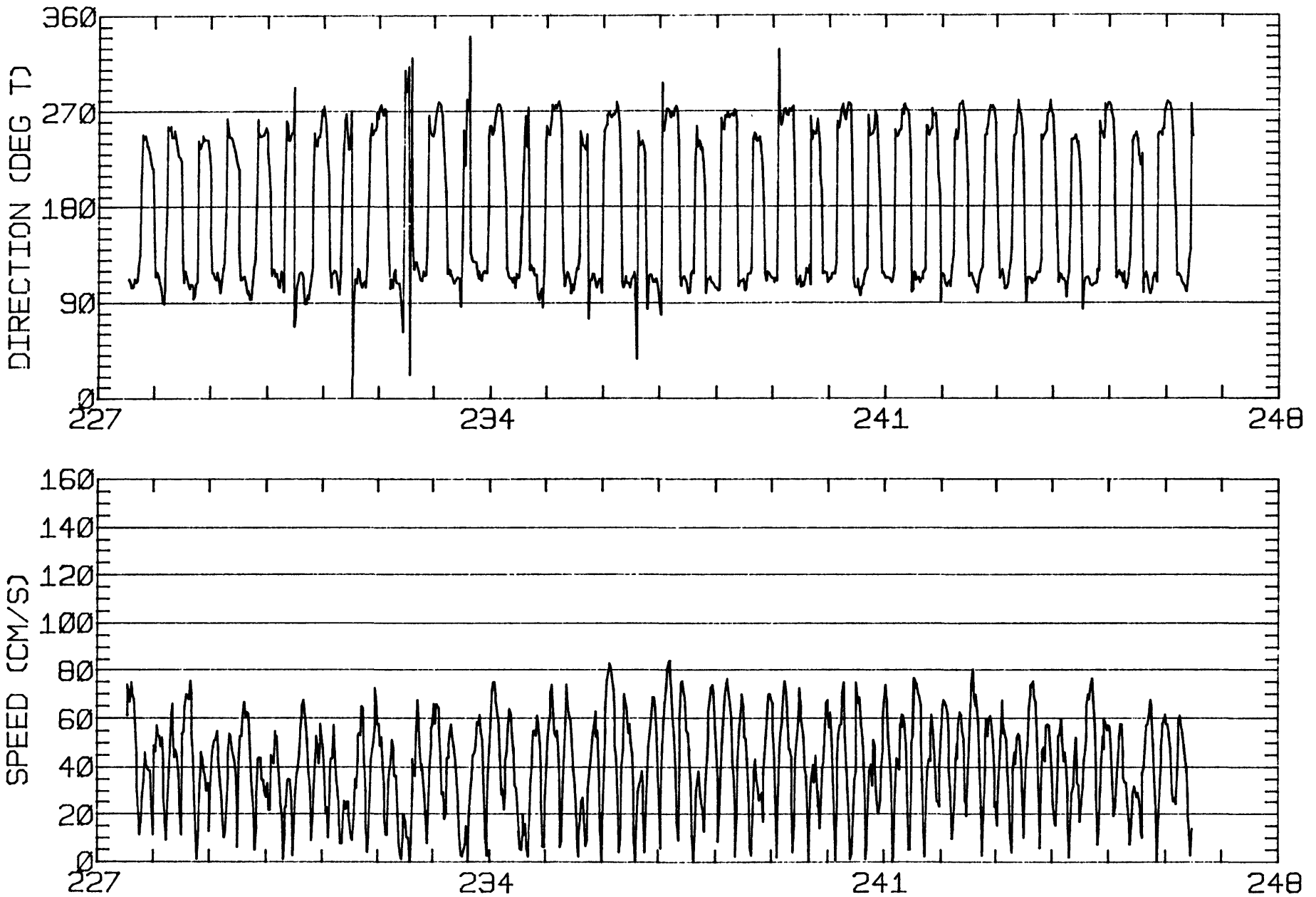
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
01	15.05	0.40	100.7	80.7	ANTI-CLOCKWISE
K1	22.71	1.59	98.5	105.7	CLOCKWISE
N2	4.57	0.63	118.9	13.2	CLOCKWISE
M2	52.91	0.55	96.7	354.0	ANTI-CLOCKWISE
S2	8.32	1.10	95.9	13.9	ANTI-CLOCKWISE
M4	2.87	0.78	164.1	292.8	ANTI-CLOCKWISE

RMS SPEED: 46.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 99.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 97.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.62
STANDARD DEVIATION U-SERIES: 7.63 CM/SEC
STANDARD DEVIATION V SERIES: 7.60 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.9	-13.0	81.
2	12	3.4	-11.4	107.
3	12	3.9	-12.5	120.
ALL	36	4.8	-12.3	

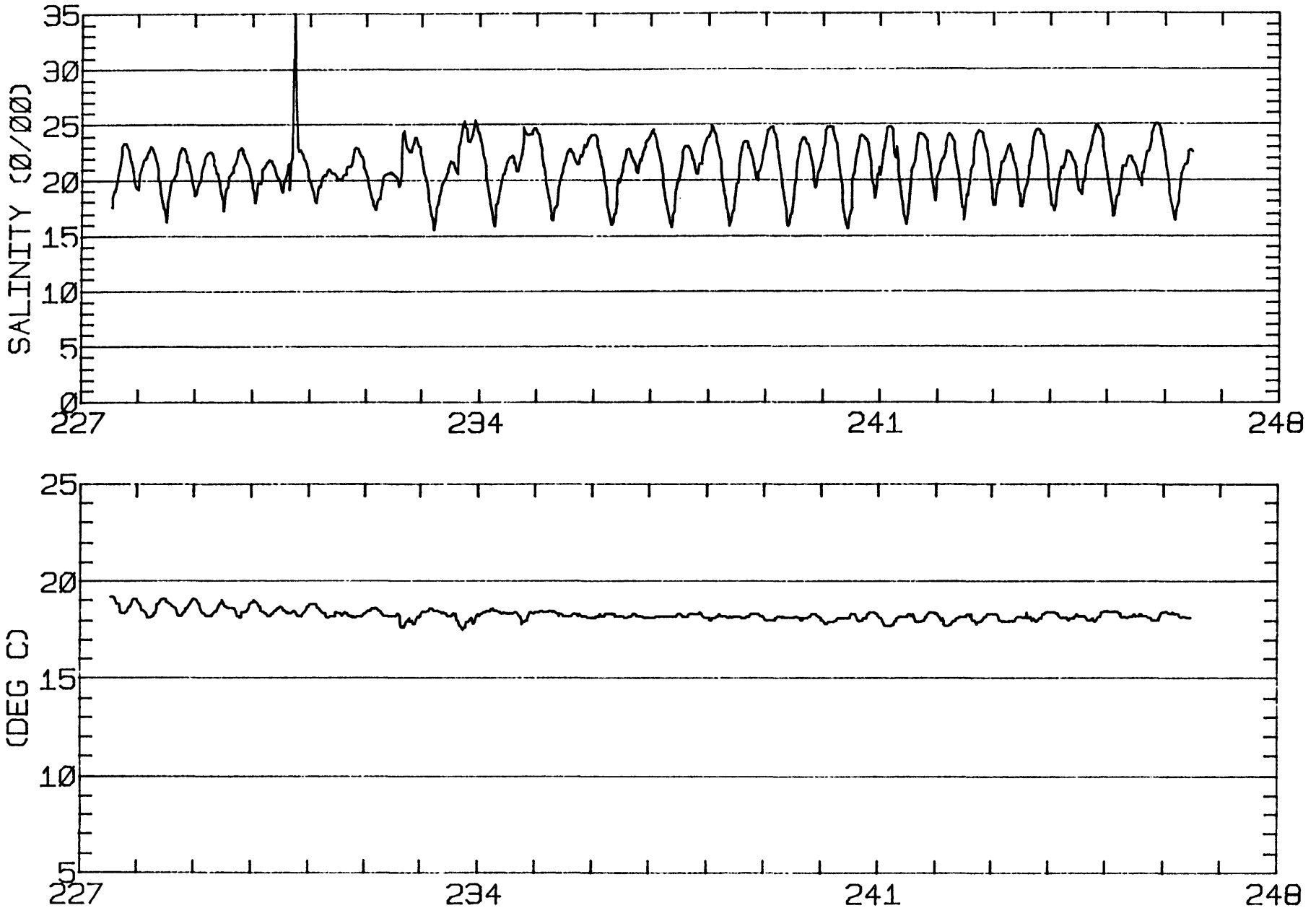


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-38N 122-13- 6W

METER 002.1 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 6W
METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/ 2/80 1240 PST JULIAN DAY=246
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

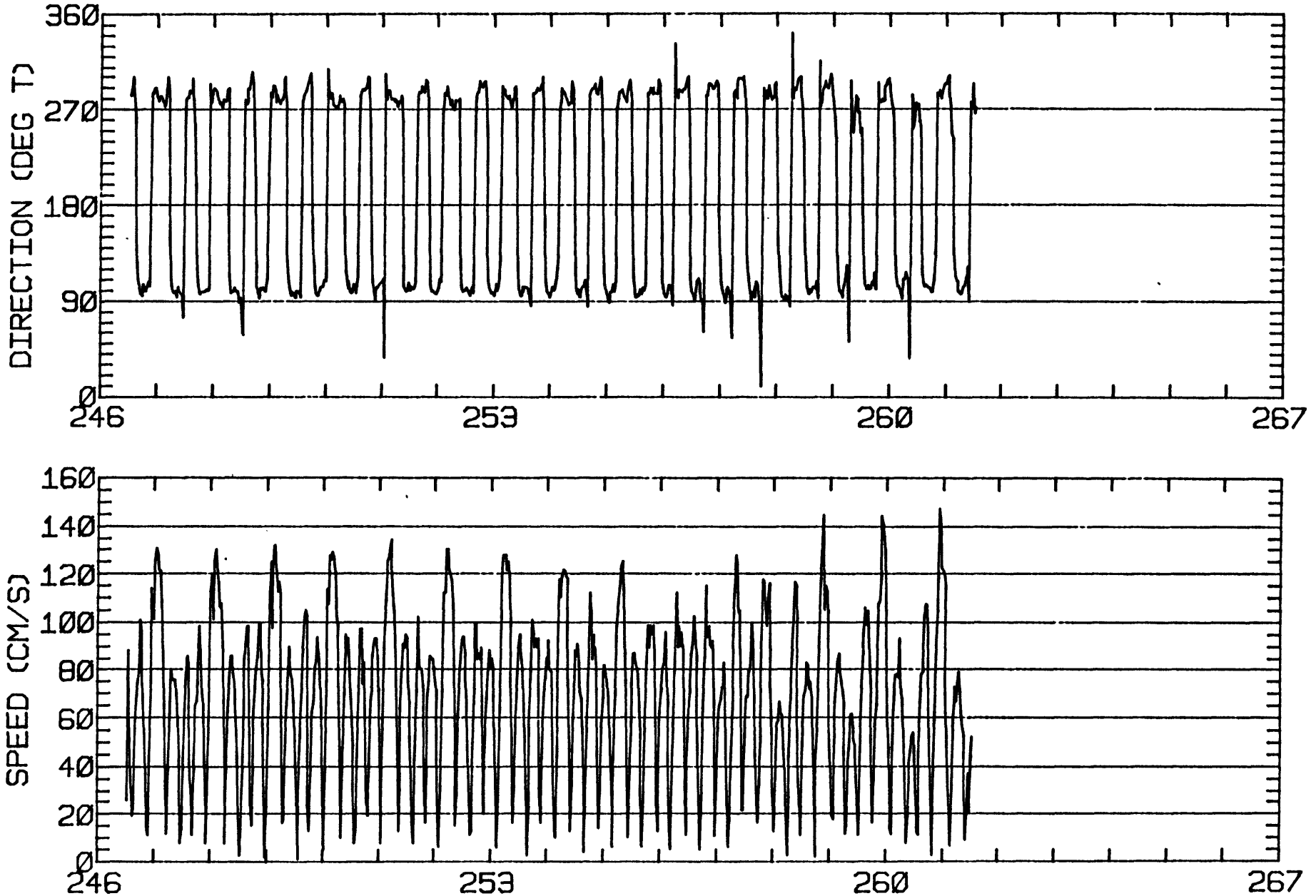
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	22.71	1.71	98.6	95.8	CLOCKWISE
K1	24.96	2.90	99.5	112.1	ANTI-CLOCKWISE
N2	27.40	0.99	102.6	25.3	CLOCKWISE
M2	107.62	1.28	103.9	10.1	ANTI-CLOCKWISE
S2	24.60	1.66	104.2	27.3	CLOCKWISE
M4	3.39	0.30	33.2	345.9	ANTI-CLOCKWISE

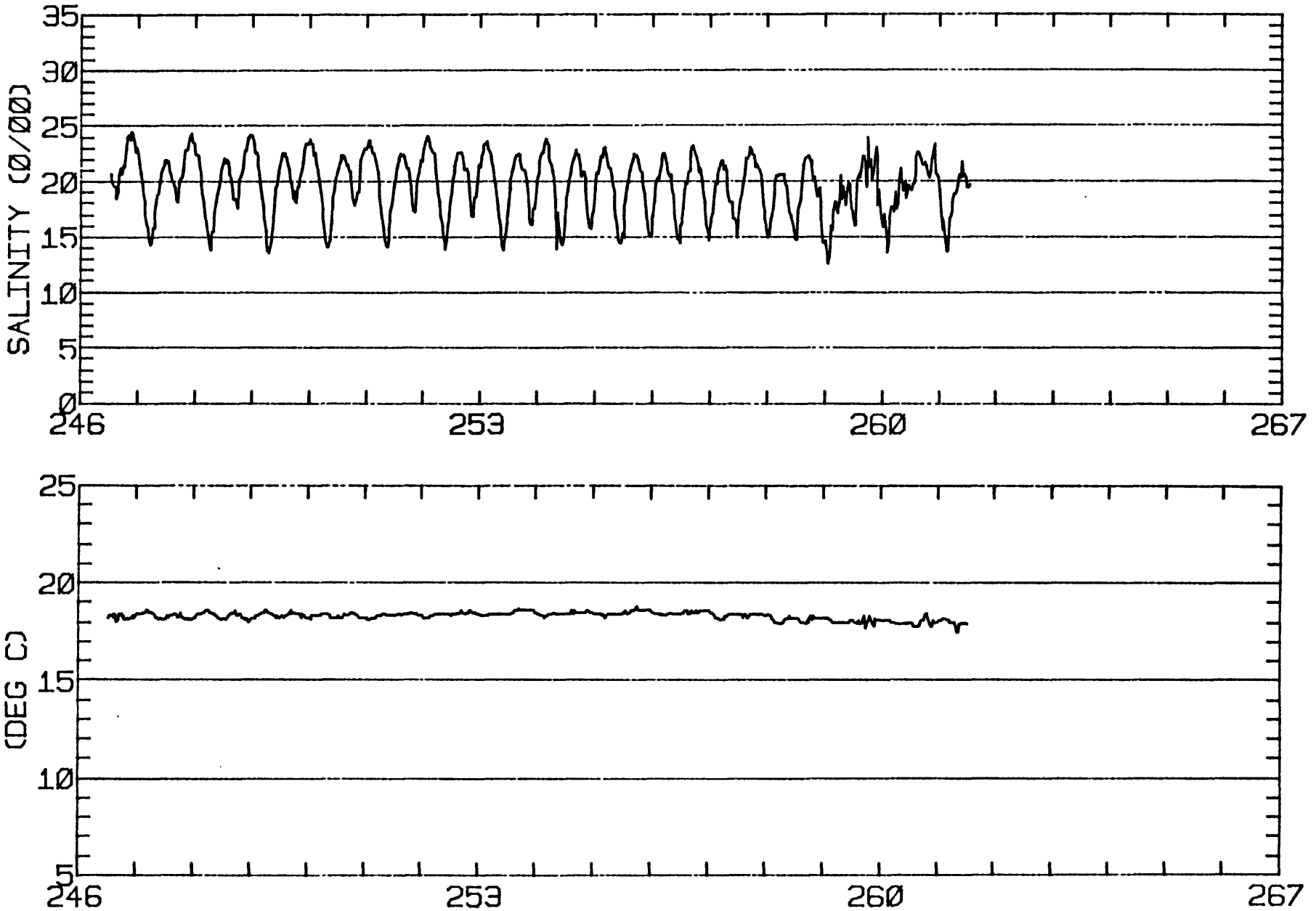
RMS SPEED: 77.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 179.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 80.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 102.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 12.18 CM/SEC
STANDARD DEVIATION V SERIES: 11.76 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-9.3	3.0	214.
2	12	-10.9	7.3	247.
3	4	-0.1	-1.9	286.
ALL	28	-8.7	4.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
.METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/ 2/80 1302 PST JULIAN DAY=246
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

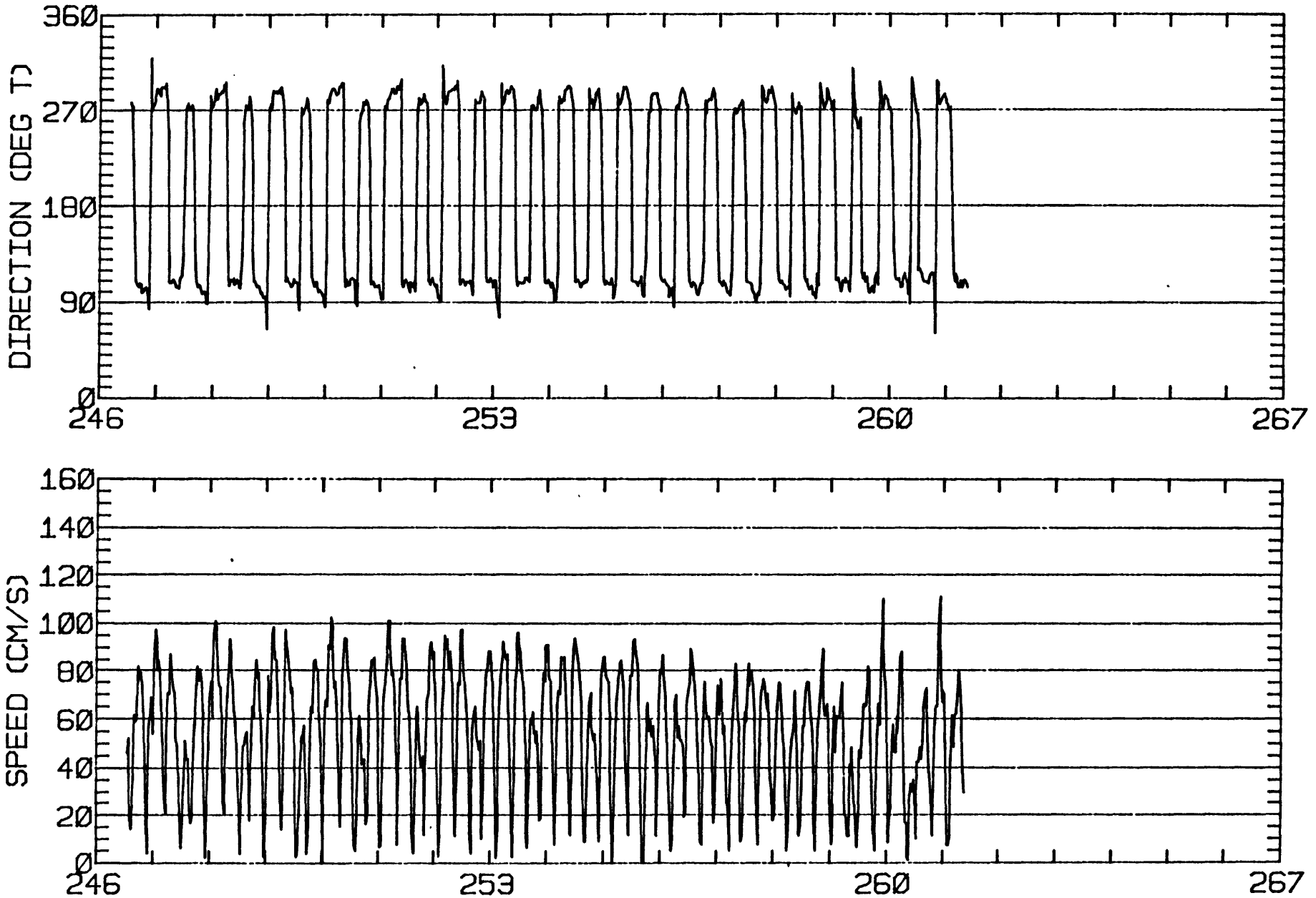
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.79	1.45	115.3	83.2	ANTI-CLOCKWISE
K1	19.82	0.14	111.0	108.1	CLOCKWISE
N2	20.54	1.17	103.2	13.5	ANTI-CLOCKWISE
M2	83.02	1.32	103.8	3.4	ANTI-CLOCKWISE
S2	22.45	0.80	108.6	12.9	ANTI-CLOCKWISE
M4	2.33	1.75	111.9	341.6	ANTI-CLOCKWISE

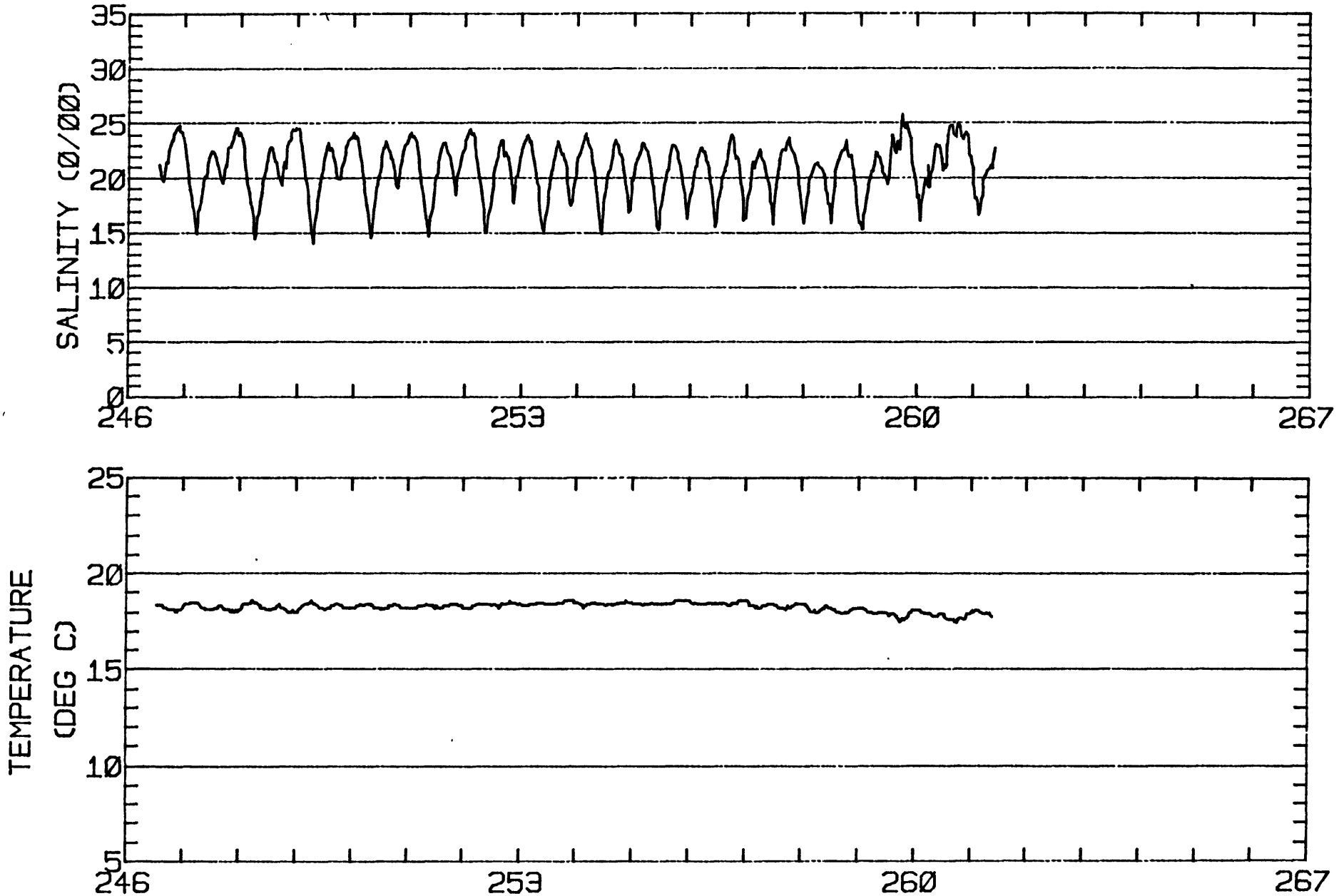
RMS SPEED: 61.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 144.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 59.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 107.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 11.57 CM/SEC
STANDARD DEVIATION V SERIES: 6.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.0	-2.4	214.
2	12	3.3	-3.9	247.
3	4	7.6	-6.9	286.
ALL	28	4.2	-3.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 15.9 M (BELOW MLLW)
START TIME OF SERIES: 9/ 2/80 1244 PST JULIAN DAY=246
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

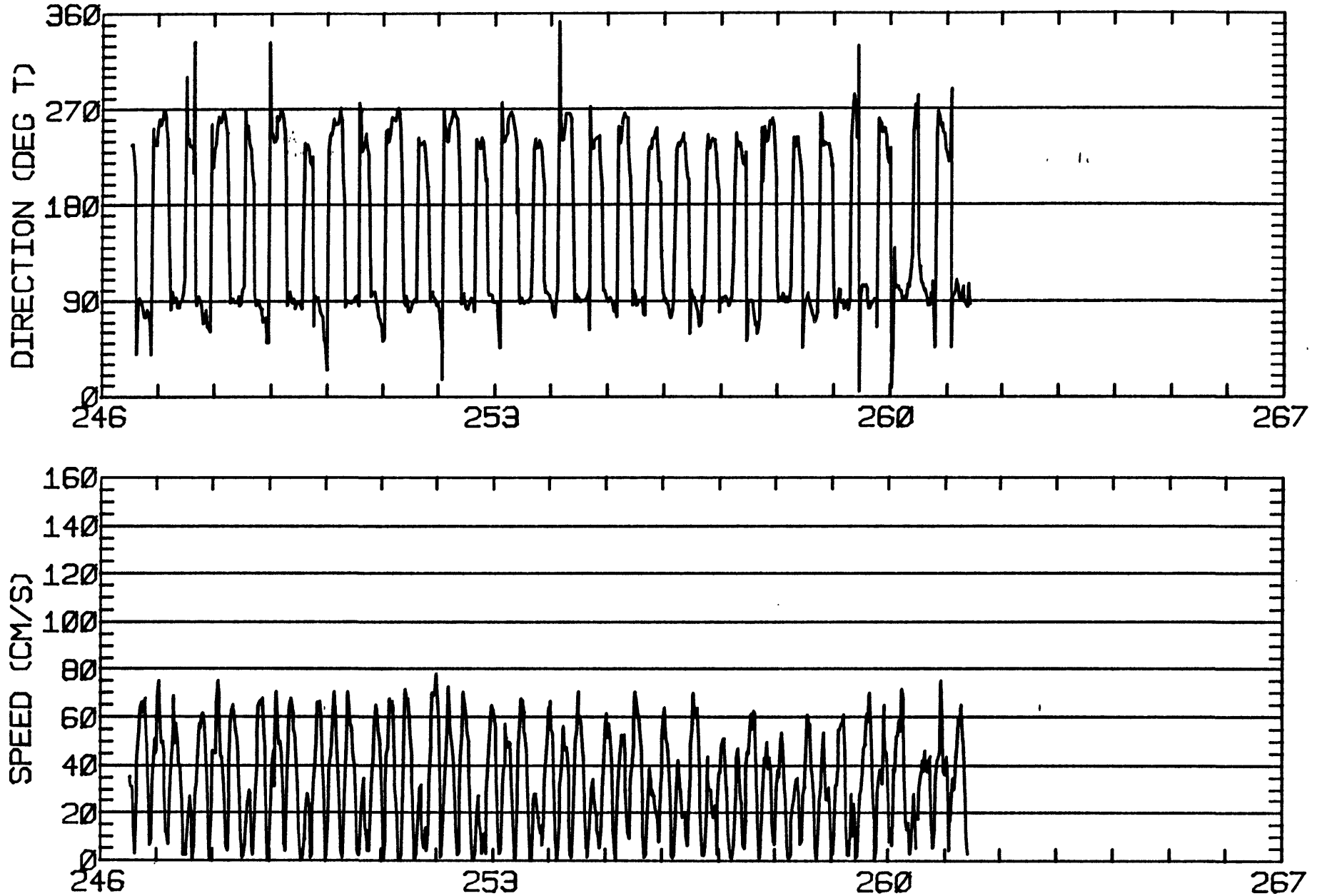
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.59	2.13	89.9	82.3	ANTI-CLOCKWISE
K1	13.56	0.24	83.7	110.8	CLOCKWISE
N2	16.25	0.68	81.4	5.8	ANTI-CLOCKWISE
M2	52.98	2.04	79.9	359.1	ANTI-CLOCKWISE
S2	11.90	0.94	85.4	11.5	ANTI-CLOCKWISE
M4	3.00	2.17	131.5	341.6	ANTI-CLOCKWISE

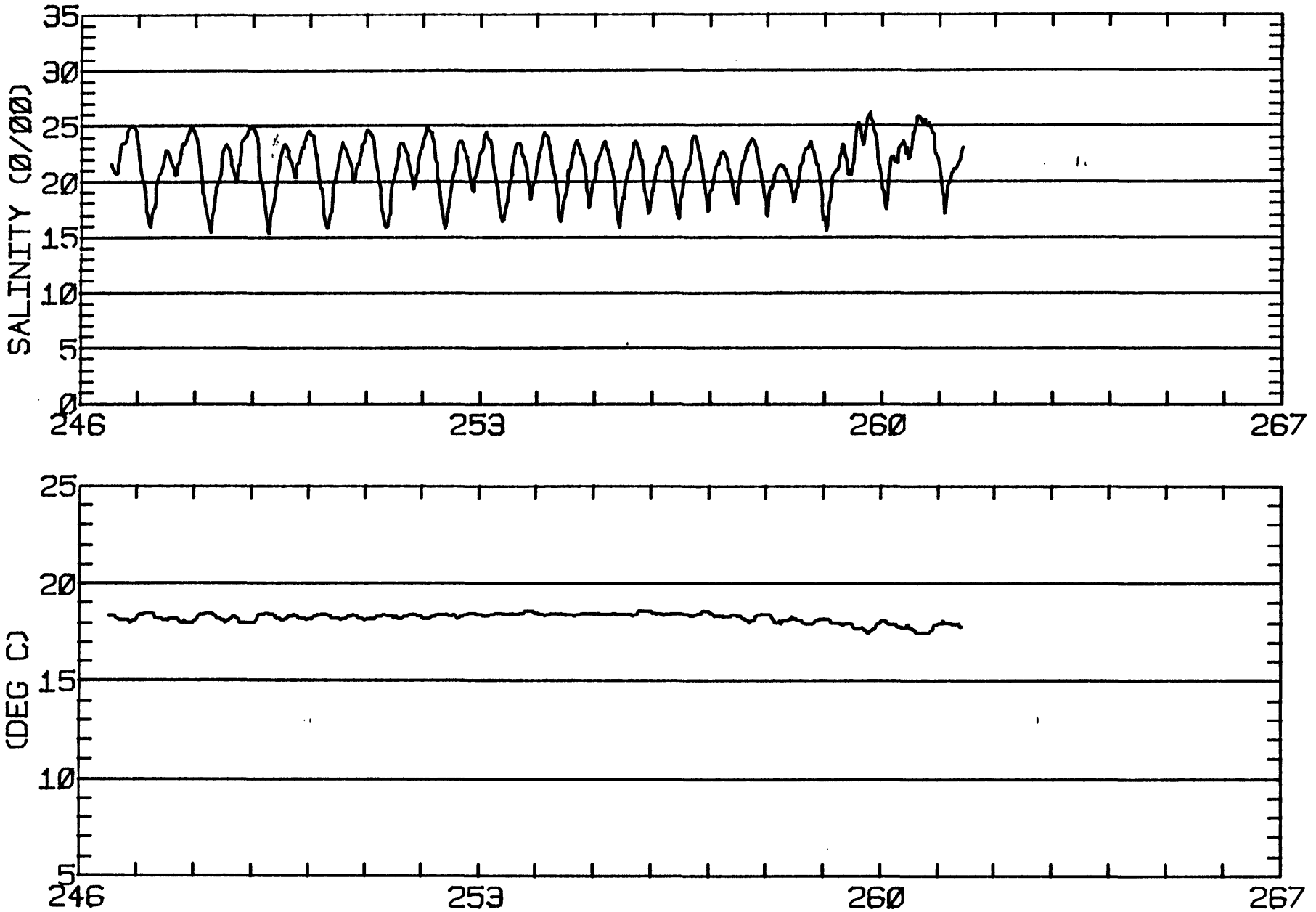
RMS SPEED: 40.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 91.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 40.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 82.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 7.91 CM/SEC
STANDARD DEVIATION V SERIES: 6.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.1	-2.4	214.
2	12	9.4	-4.6	247.
3	4	12.0	-5.8	286.
ALL	28	9.6	-3.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER 002.1 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/17/80 1440 PST JULIAN DAY=261
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

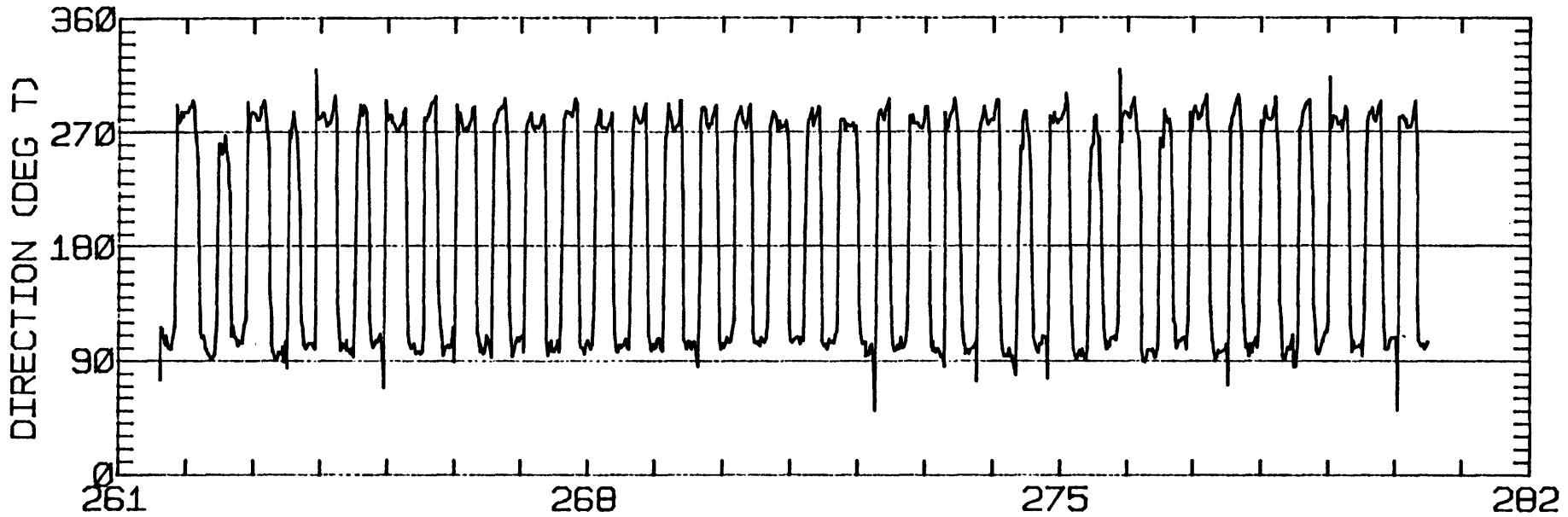
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

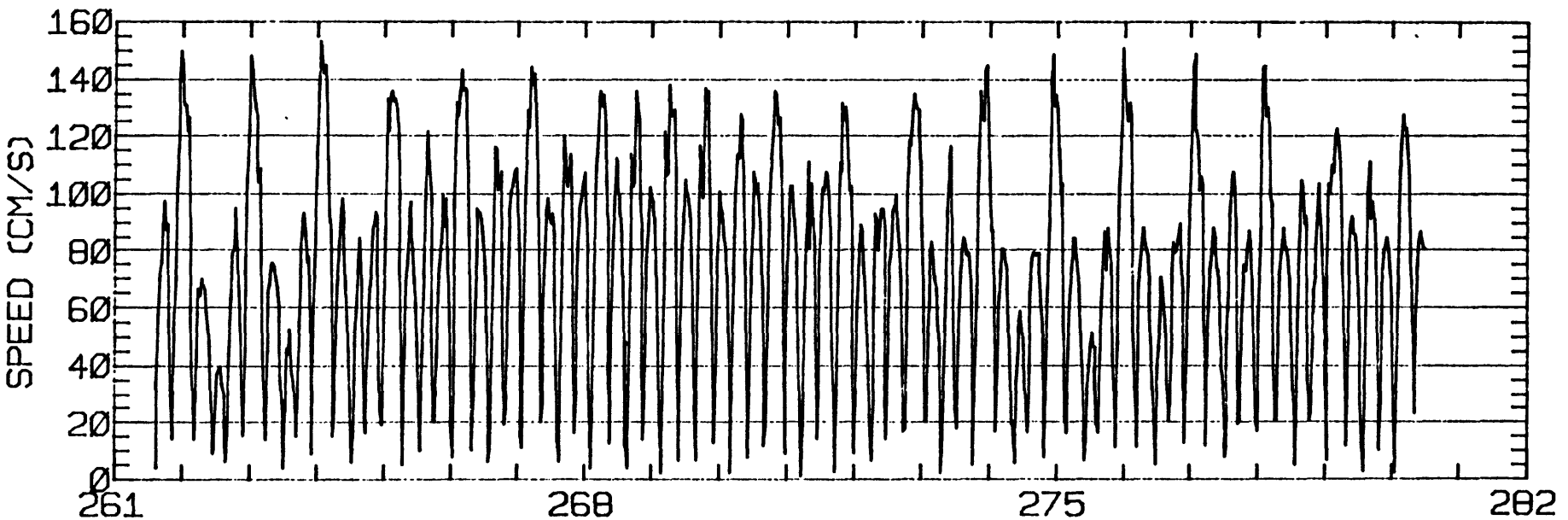
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	24.79	2.91	101.6	92.4	CLOCKWISE
K1	27.78	0.58	101.6	98.8	CLOCKWISE
N2	22.74	0.27	102.5	342.4	ANTI-CLOCKWISE
M2	92.18	0.86	101.8	5.2	ANTI-CLOCKWISE
S2	19.65	0.39	101.7	344.8	ANTI-CLOCKWISE
M4	3.42	0.24	120.8	272.4	CLOCKWISE

RMS SPEED: 83.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 164.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 69.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 101.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 14.34 CM/SEC
STANDARD DEVIATION V SERIES: 11.35 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-10.9	1.5	302.
2	12	-12.0	0.2	367.
3	12	-7.1	1.6	244.
ALL	36	-10.0	1.1	



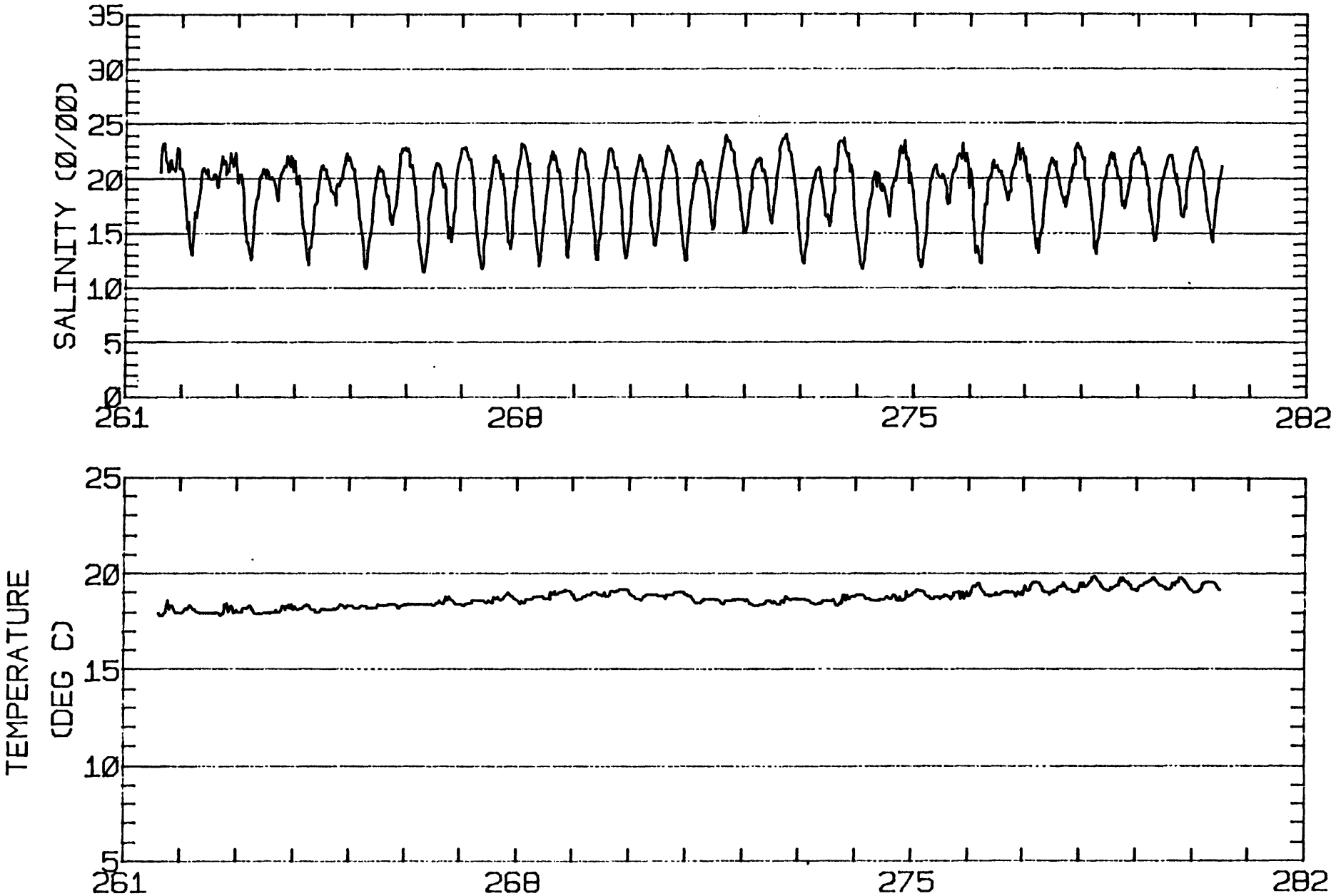


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-40N 122-13- 7W

METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/17/80 1442 PST JULIAN DAY=261
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

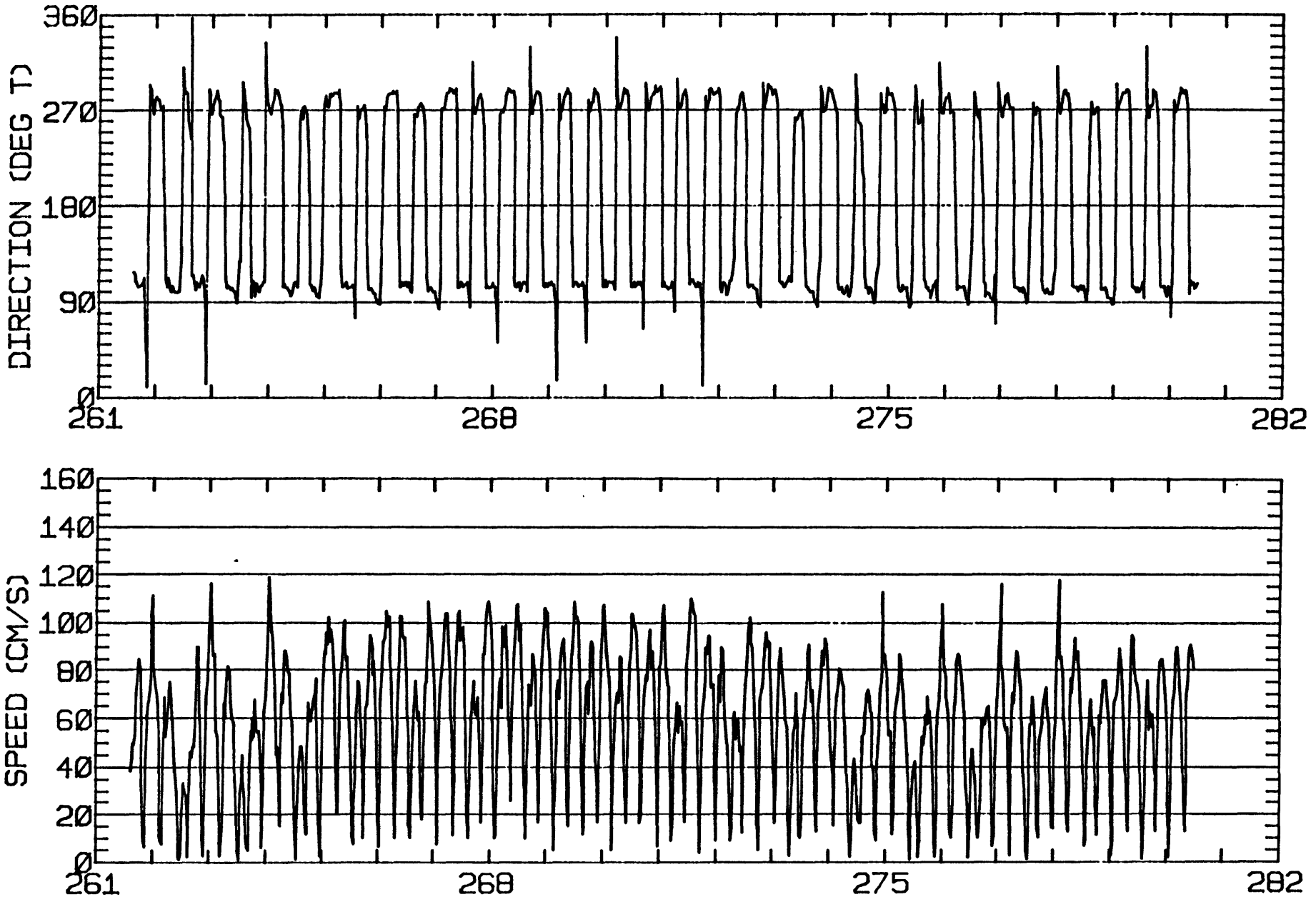
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.45	0.35	106.2	80.6	ANTI-CLOCKWISE
K1	21.83	0.43	106.3	92.4	CLOCKWISE
N2	19.00	1.23	102.7	345.0	CLOCKWISE
M2	73.40	2.09	102.1	2.9	ANTI-CLOCKWISE
S2	17.26	2.06	105.2	350.1	CLOCKWISE
M4	3.54	1.63	133.6	277.5	ANTI-CLOCKWISE

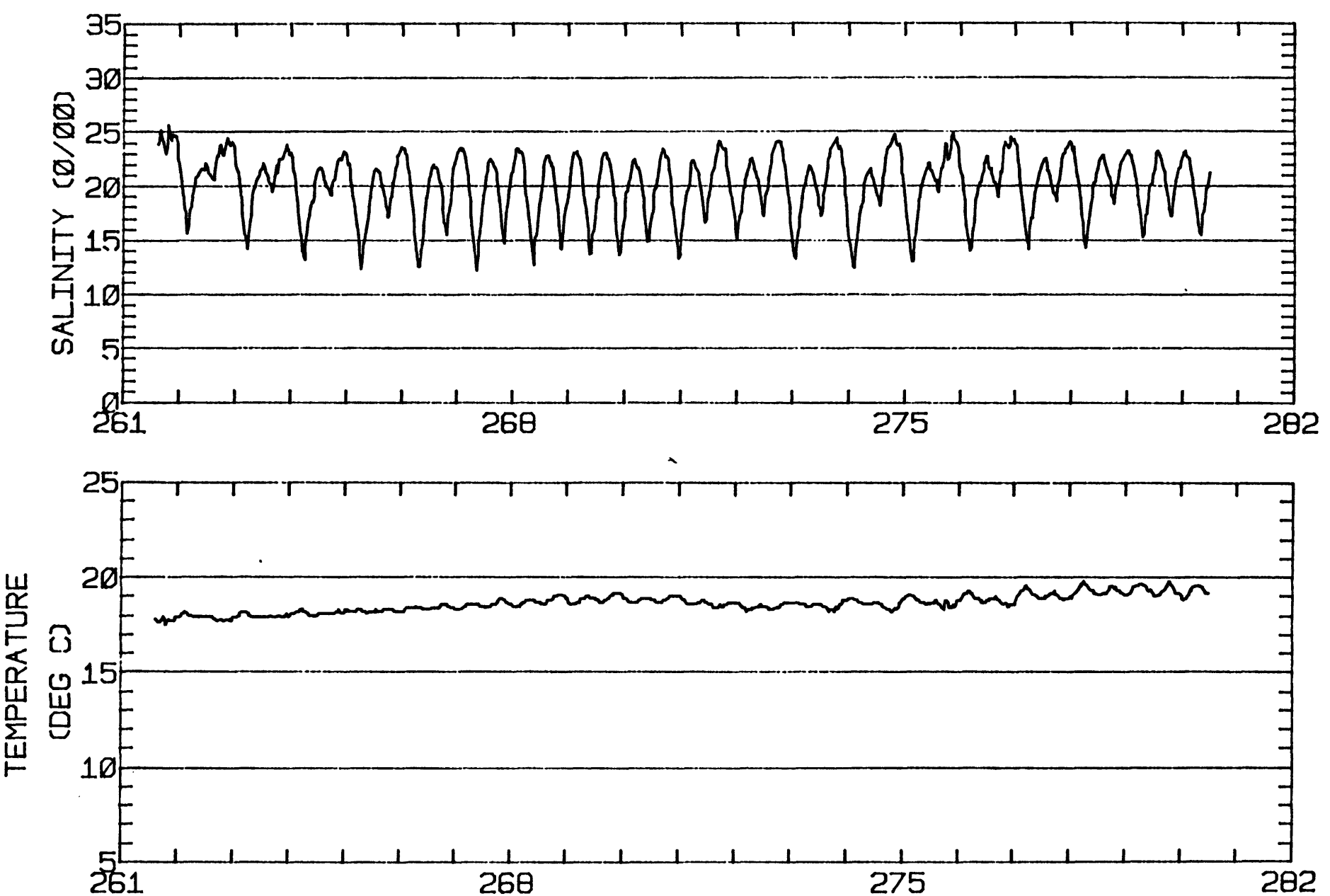
RMS SPEED: 66.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 130.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 52.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 103.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 12.49 CM/SEC
STANDARD DEVIATION V SERIES: 7.08 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.5	-3.2	302.
2	12	5.4	-3.5	367.
3	12	6.2	-3.9	244.
ALL	36	5.0	-3.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'40"N 122 13' 7"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 15.9 M (BELOW MLLW)
START TIME OF SERIES: 9/17/80 1434 PST JULIAN DAY=261
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

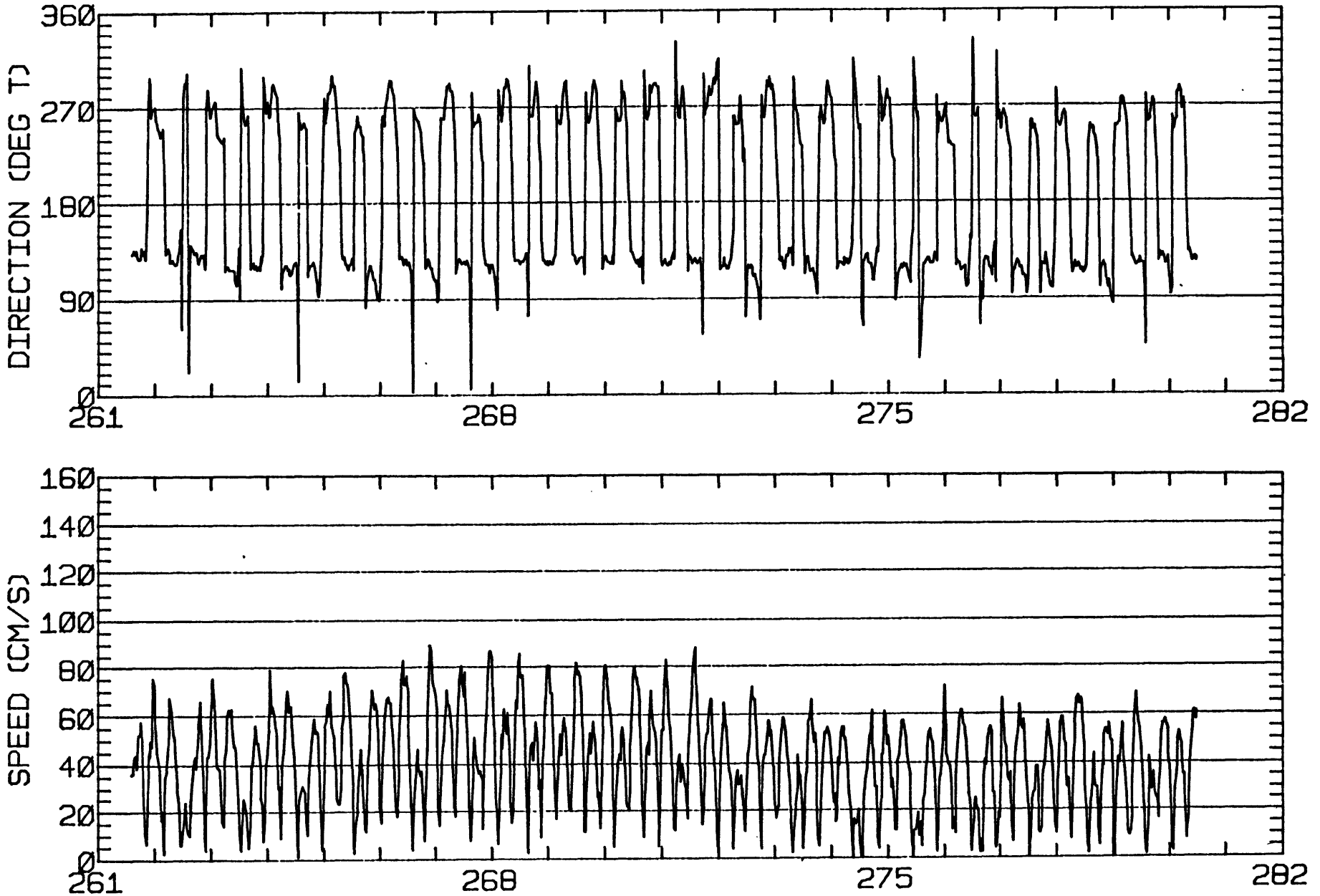
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.31	1.59	100.5	77.3	ANTI-CLOCKWISE
K1	13.99	0.53	108.5	92.5	ANTI-CLOCKWISE
N2	12.21	1.66	111.2	354.5	CLOCKWISE
M2	47.82	3.16	110.1	358.1	ANTI-CLOCKWISE
S2	12.18	1.84	111.1	350.0	CLOCKWISE
M4	2.23	0.57	173.4	321.4	ANTI-CLOCKWISE

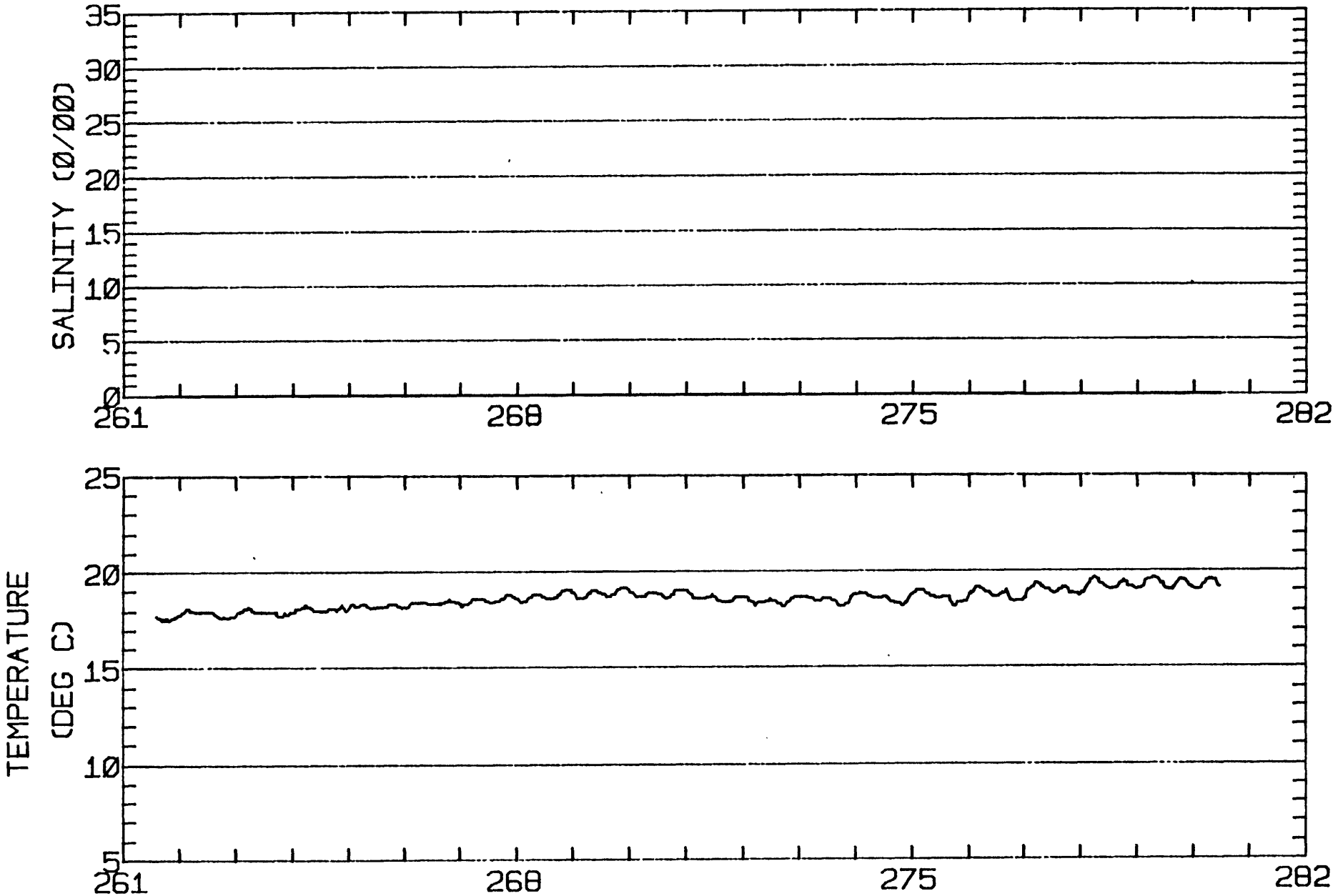
RMS SPEED: 45.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 86.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 108.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 7.96 CM/SEC
STANDARD DEVIATION V SERIES: 9.22 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.0	-13.3	302.
2	12	4.7	-13.5	367.
3	12	6.9	-13.3	244.
ALL	36	5.2	-13.3	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER 002.1 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-40N 122-13- 7W
METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES:10/ 6/80 1320 PST JULIAN DAY=280
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

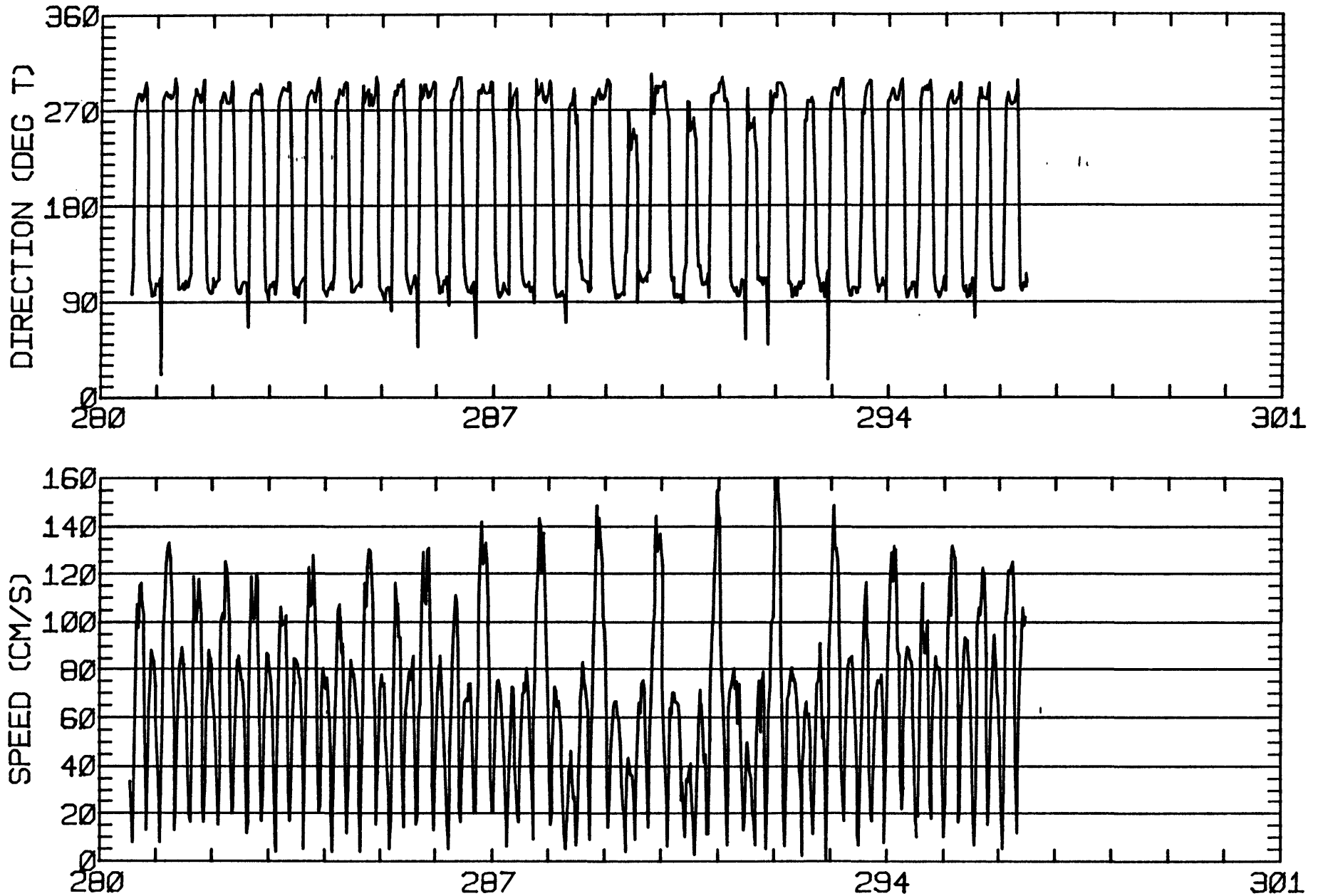
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
01	26.69	2.25	110.6	72.5	CLOCKWISE
K1	30.55	2.51	109.5	83.1	CLOCKWISE
N2	21.40	0.01	107.9	348.5	ANTI-CLOCKWISE
M2	99.48	0.62	105.3	4.8	ANTI-CLOCKWISE
S2	25.51	0.95	108.3	12.1	CLOCKWISE
M4	4.71	1.93	141.0	220.9	ANTI-CLOCKWISE

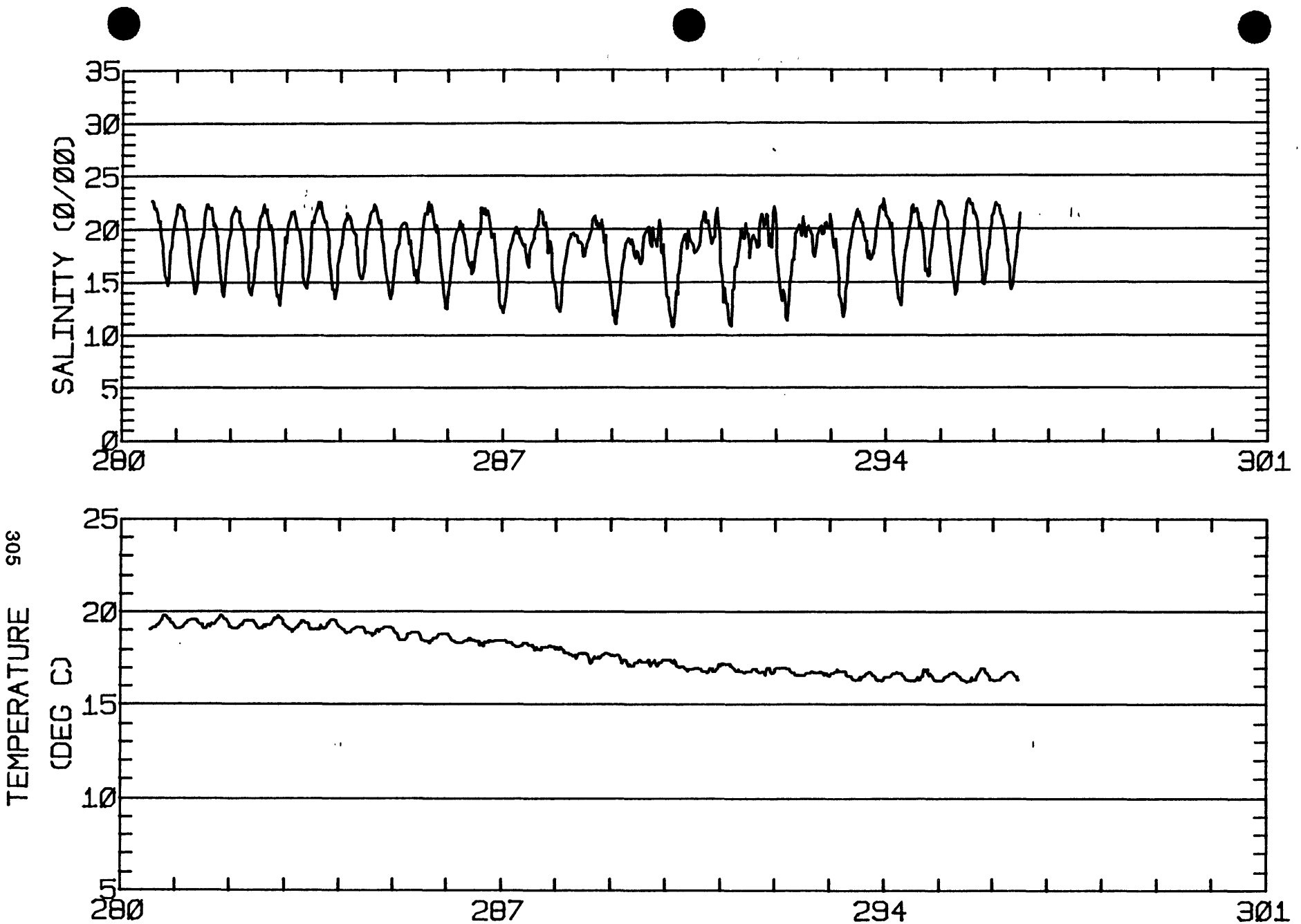
RMS SPEED: 76.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 182.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 70.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 107.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 11.61 CM/SEC
STANDARD DEVIATION V SERIES: 11.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-12.4	5.3	277.
2	12	-8.3	1.5	224.
3	6	-11.2	4.7	123.
ALL	30	-10.5	3.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 8W
METER 011.9 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 8W
METER 011.9 METERS ABOVE BED. WATER DEPTH 017.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES:10/ 6/80 1302 PST JULIAN DAY=280
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

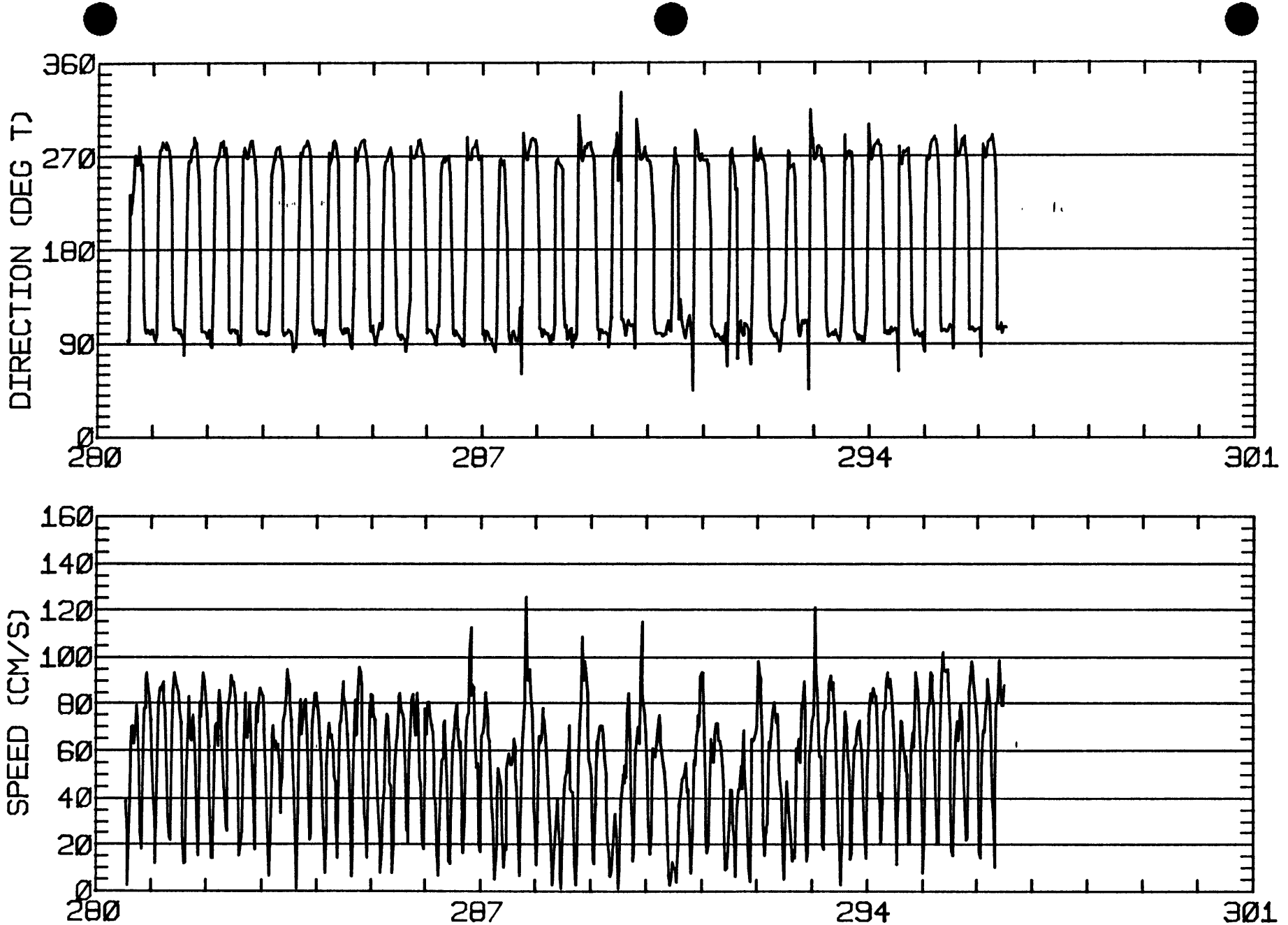
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.70	0.60	100.2	60.1	CLOCKWISE
K1	23.07	0.07	99.3	71.3	ANTI-CLOCKWISE
N2	18.48	0.96	103.1	335.9	ANTI-CLOCKWISE
M2	81.18	2.03	98.4	356.9	ANTI-CLOCKWISE
S2	23.00	0.51	100.7	3.5	ANTI-CLOCKWISE
M4	3.17	0.30	136.7	232.2	ANTI-CLOCKWISE

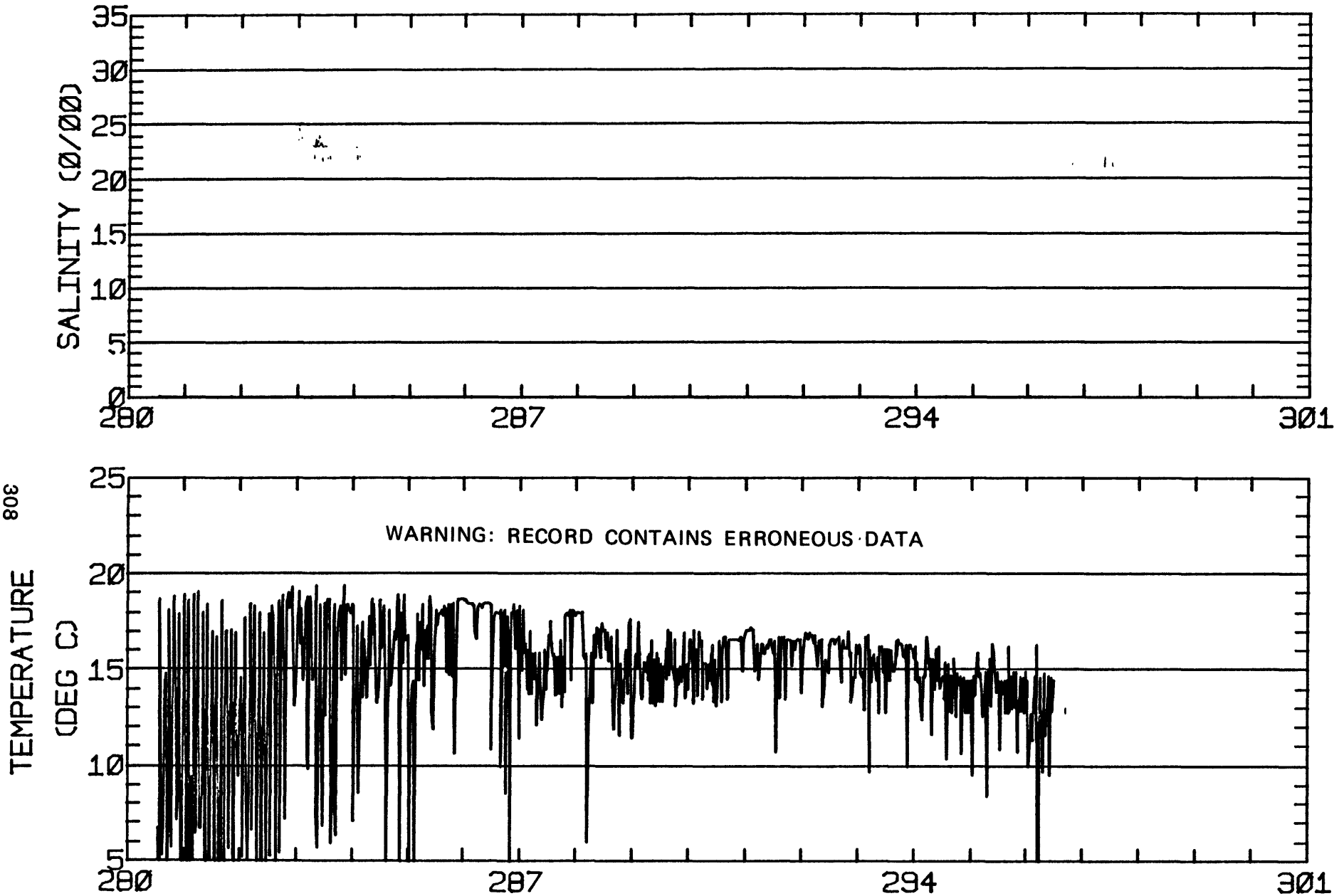
RMS SPEED: 61.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 146.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 54.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 99.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 11.59 CM/SEC
STANDARD DEVIATION V SERIES: 7.41 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.6	-4.4	277.
2	12	4.5	-4.7	224.
3	6	5.8	-4.1	123.
ALL	30	4.8	-4.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 8W
METER 005.8 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 8W
METER Ø05.8 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'39"N 122 13' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 15.6 M (BELOW MLLW)
START TIME OF SERIES:10/ 6/80 1304 PST JULIAN DAY=280
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

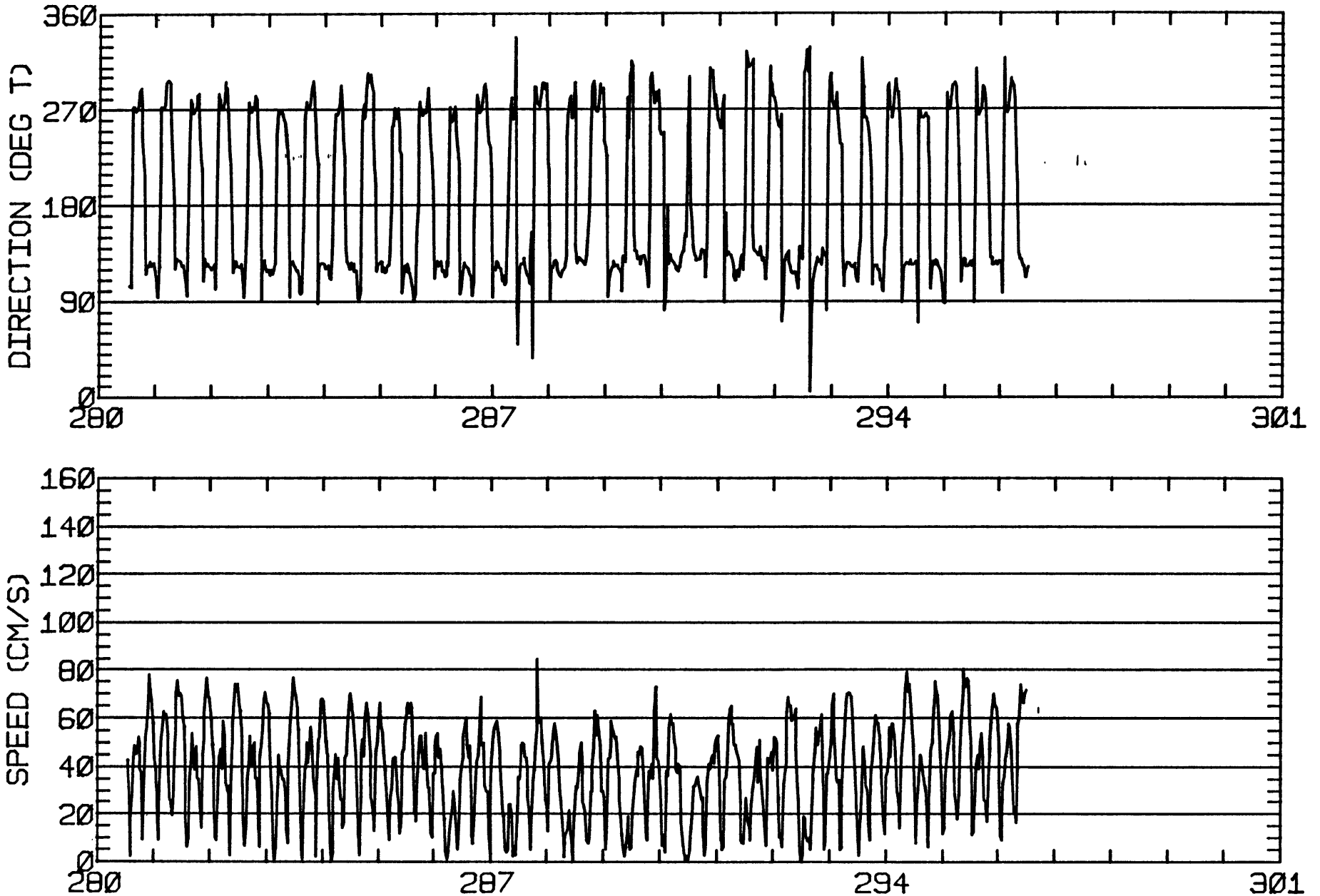
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.77	1.20	108.3	53.2	ANTI-CLOCKWISE
K1	15.97	1.23	107.0	67.6	ANTI-CLOCKWISE
N2	13.95	0.10	112.8	324.0	CLOCKWISE
M2	54.77	3.26	111.9	353.8	ANTI-CLOCKWISE
S2	16.34	1.59	109.2	357.5	ANTI-CLOCKWISE
M4	2.18	0.46	25.5	127.4	CLOCKWISE

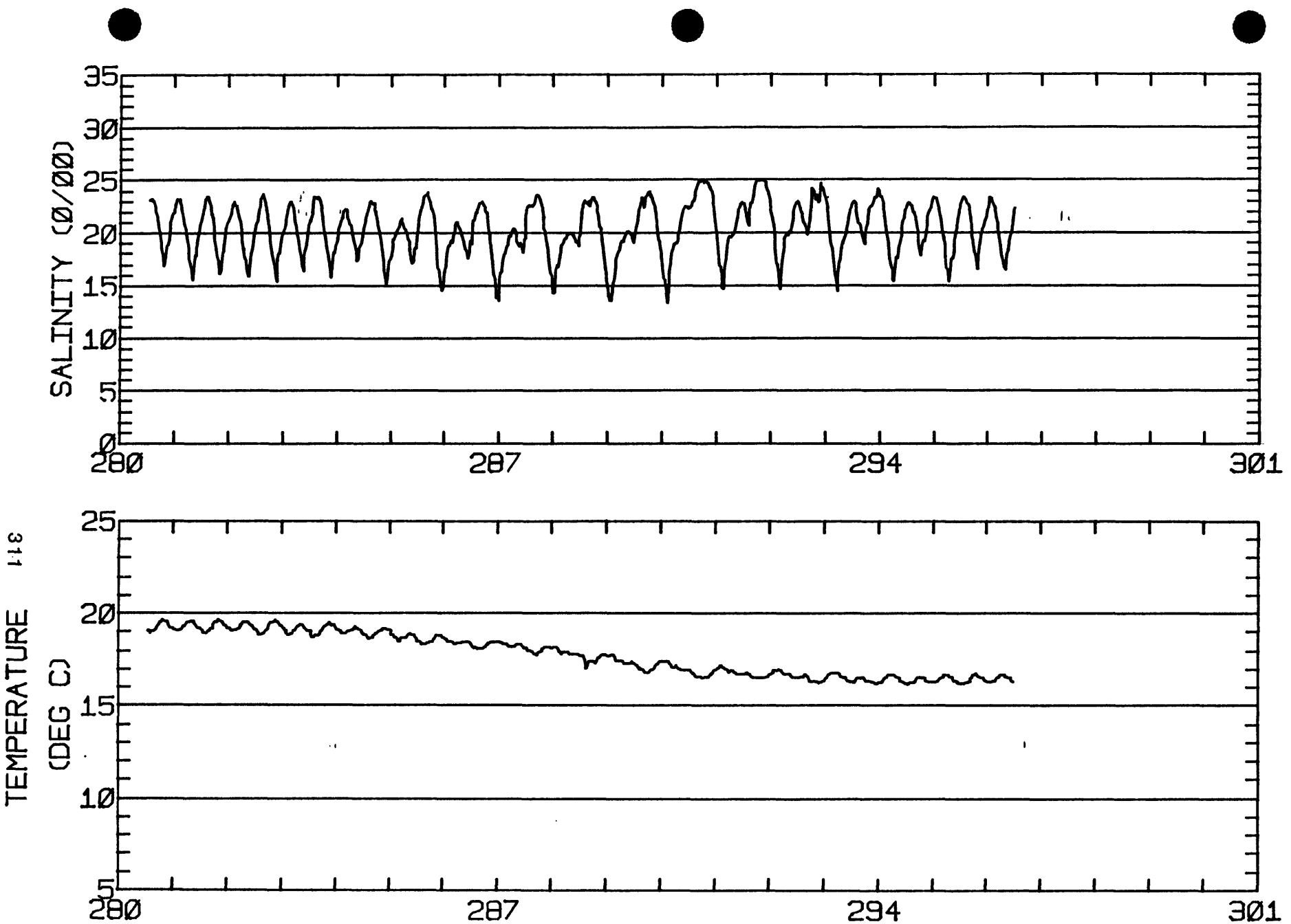
RMS SPEED: 43.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 99.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 110.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 7.38 CM/SEC
STANDARD DEVIATION V SERIES: 8.72 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.1	-12.3	277.
2	12	5.9	-10.5	224.
3	6	6.5	-14.2	123.
ALL	30	6.1	-12.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 8W
METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-39N 122-13- 8W
METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES:10/22/80 1300 PST JULIAN DAY=296
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

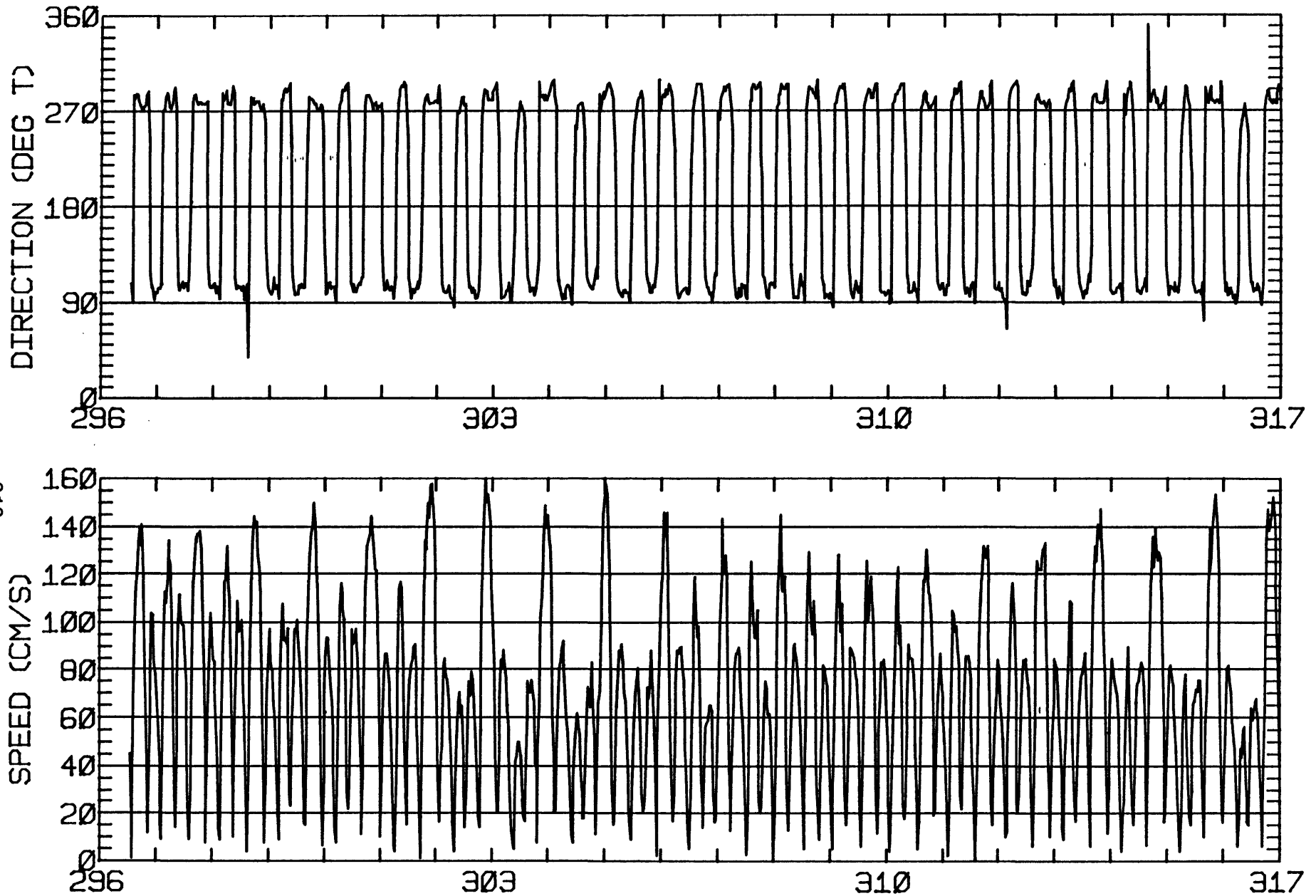
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	22.03	2.16	105.1	91.3	ANTI-CLOCKWISE
K1	32.93	3.61	99.9	81.8	CLOCKWISE
N2	18.54	1.88	103.0	339.5	ANTI-CLOCKWISE
M2	94.87	0.34	103.0	11.6	ANTI-CLOCKWISE
S2	23.84	2.29	105.5	339.3	ANTI-CLOCKWISE
M4	4.67	0.83	128.0	269.9	ANTI-CLOCKWISE

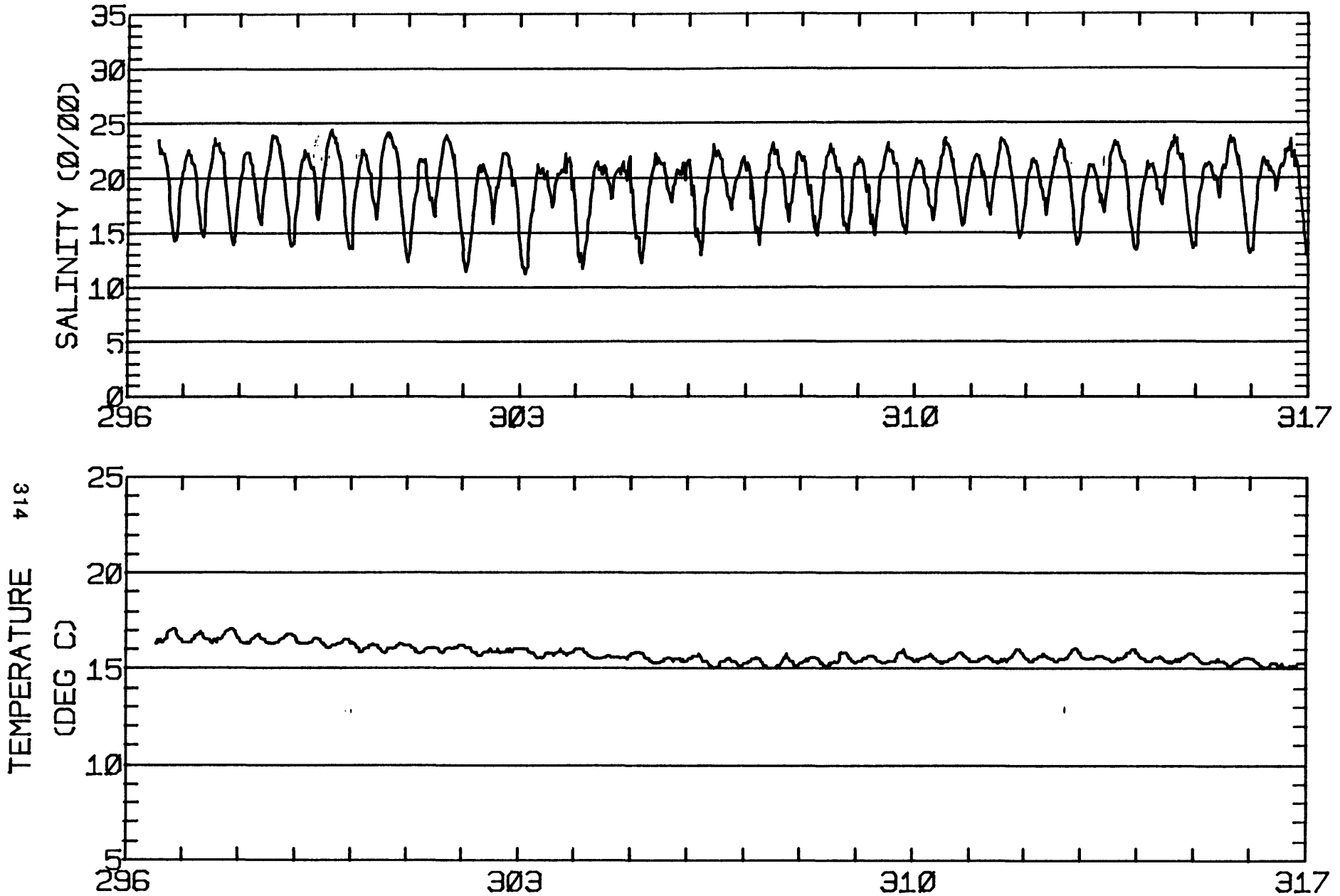
RMS SPEED: 81.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 173.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 60.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 103.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 13.22 CM/SEC
STANDARD DEVIATION V SERIES: 11.28 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-16.0	0.9	176.
2	12	-11.8	4.7	157.
3	12	-13.5	3.6	186.
4	4	-13.9	2.1	202.
ALL	40	-13.8	3.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 8W
METER 011.9 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 8W
METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø17.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES:10/22/80 1312 PST JULIAN DAY=296
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

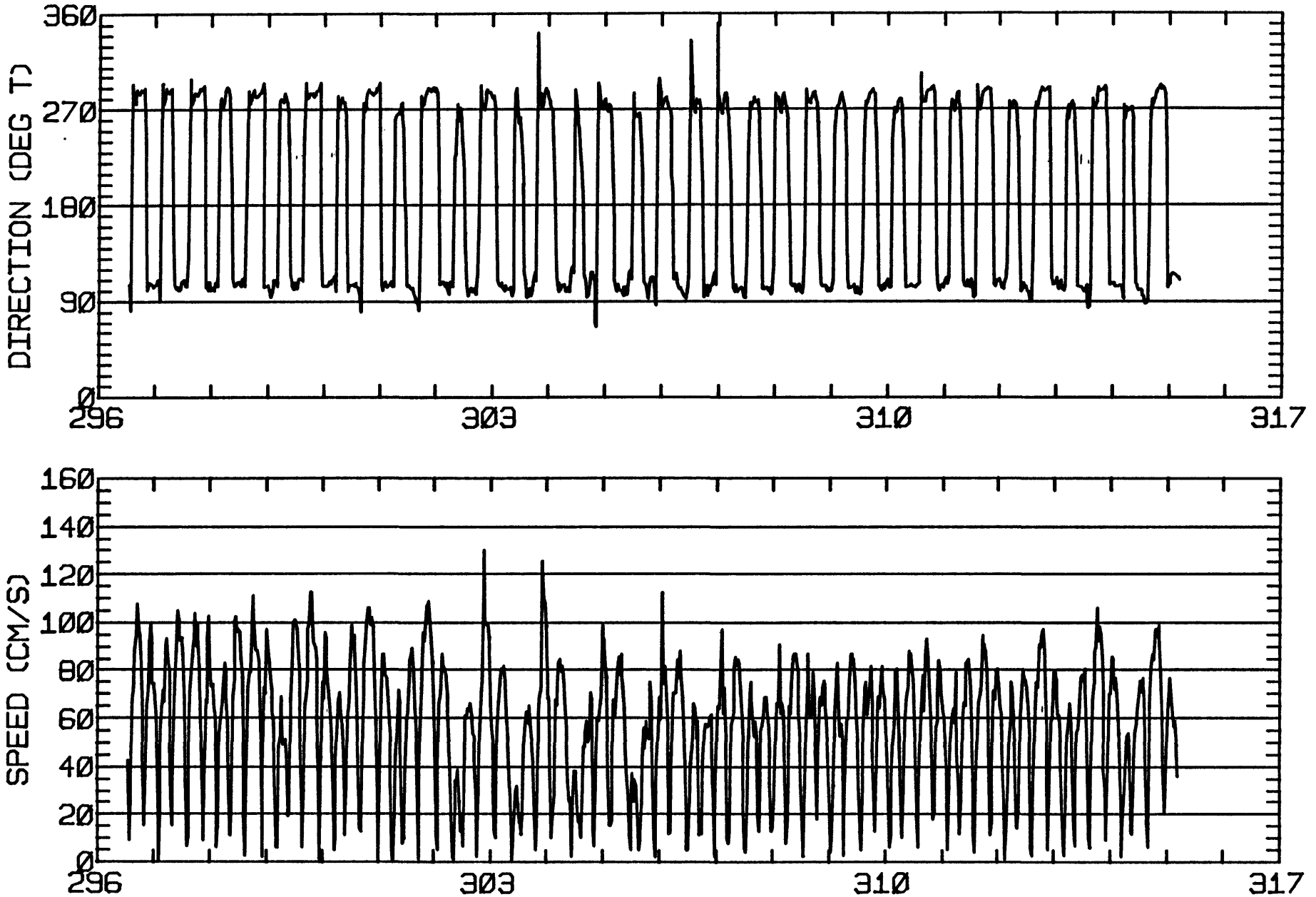
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.66	2.09	107.9	91.5	CLOCKWISE
K1	27.48	1.22	107.1	75.7	ANTI-CLOCKWISE
N2	12.95	1.52	99.2	328.0	CLOCKWISE
M2	73.22	1.61	103.4	6.8	ANTI-CLOCKWISE
S2	18.28	1.85	102.9	336.1	CLOCKWISE
M4	3.49	1.08	113.8	274.2	ANTI-CLOCKWISE

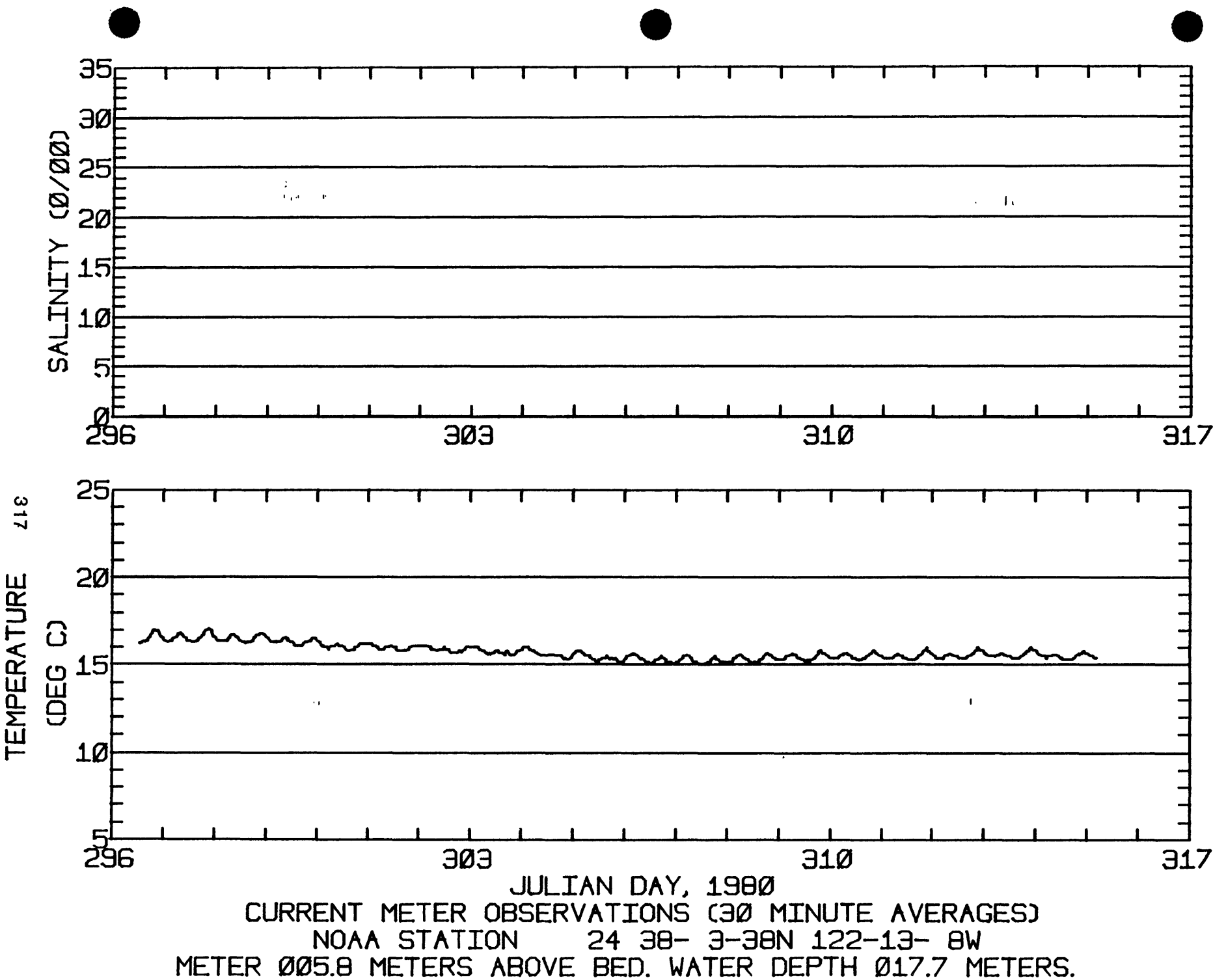
RMS SPEED: 63.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 135.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 104.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 10.99 CM/SEC
STANDARD DEVIATION V SERIES: 6.57 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.0	-1.1	176.
2	12	4.0	-4.4	157.
3	10	2.0	-2.5	
ALL	34	2.4	-2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 8W
METER 005.8 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 8W
METER 005.8 METERS ABOVE BED. WATER DEPTH 017.7 METERS.

317

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 17.7 M (MLLW)
METER DEPTH: 15.6 M (BELOW MLLW)
START TIME OF SERIES:10/22/80 1304 PST JULIAN DAY=296
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

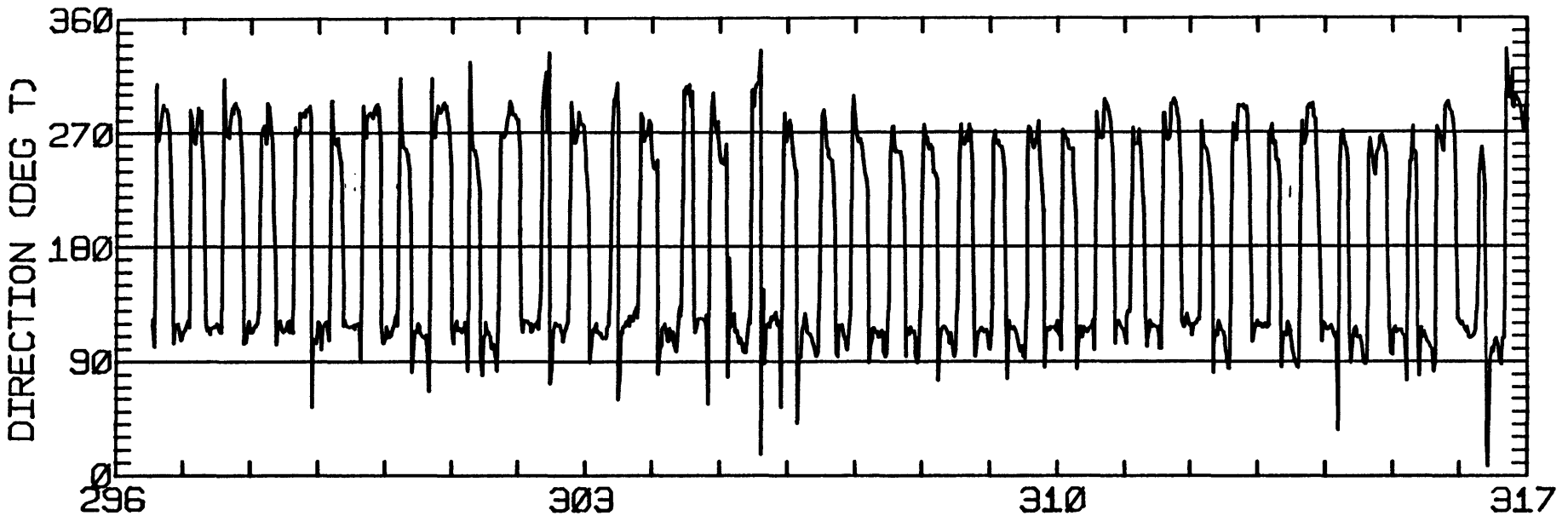
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

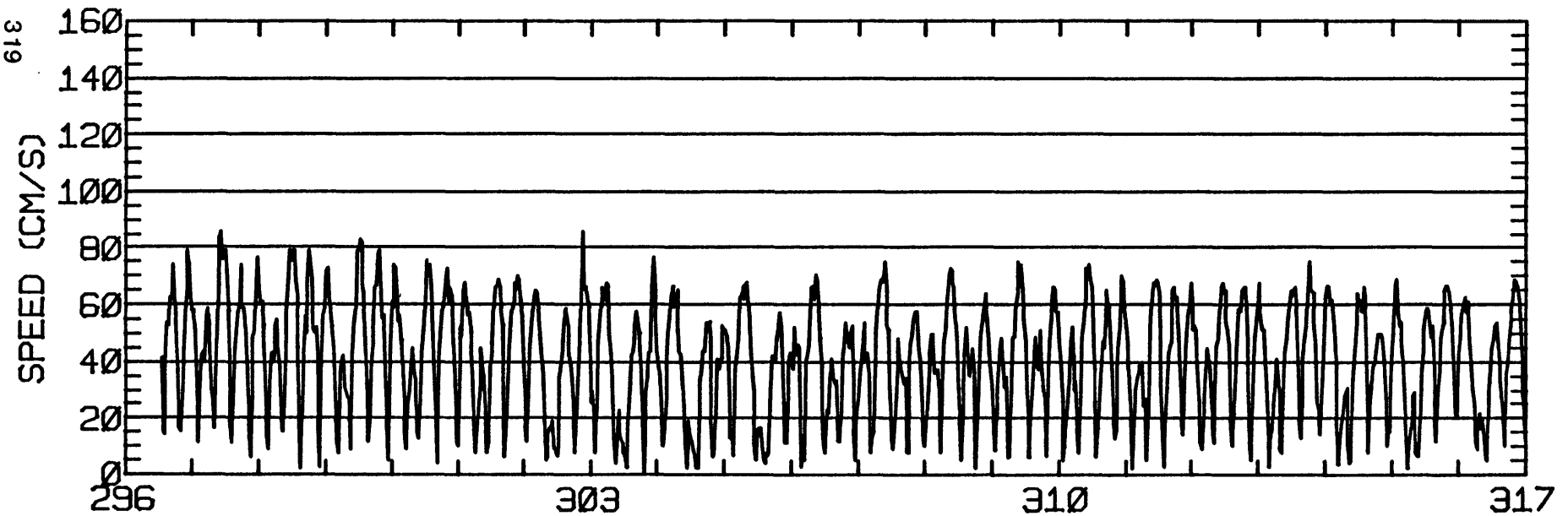
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.41	1.94	103.1	86.0	CLOCKWISE
K1	20.27	2.95	107.3	70.4	ANTI-CLOCKWISE
N2	8.82	0.56	110.6	332.4	CLOCKWISE
M2	51.76	2.29	105.8	1.2	ANTI-CLOCKWISE
S2	13.59	0.71	100.3	336.8	CLOCKWISE
M4	1.28	0.39	17.0	185.7	CLOCKWISE

RMS SPEED: 46.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 96.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 105.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 7.79 CM/SEC
STANDARD DEVIATION V SERIES: 9.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.2	-8.2	176.
2	12	8.8	-10.7	157.
3	12	7.2	-10.2	186.
4	4	6.6	-2.1	202.
ALL	40	7.0	-8.9	



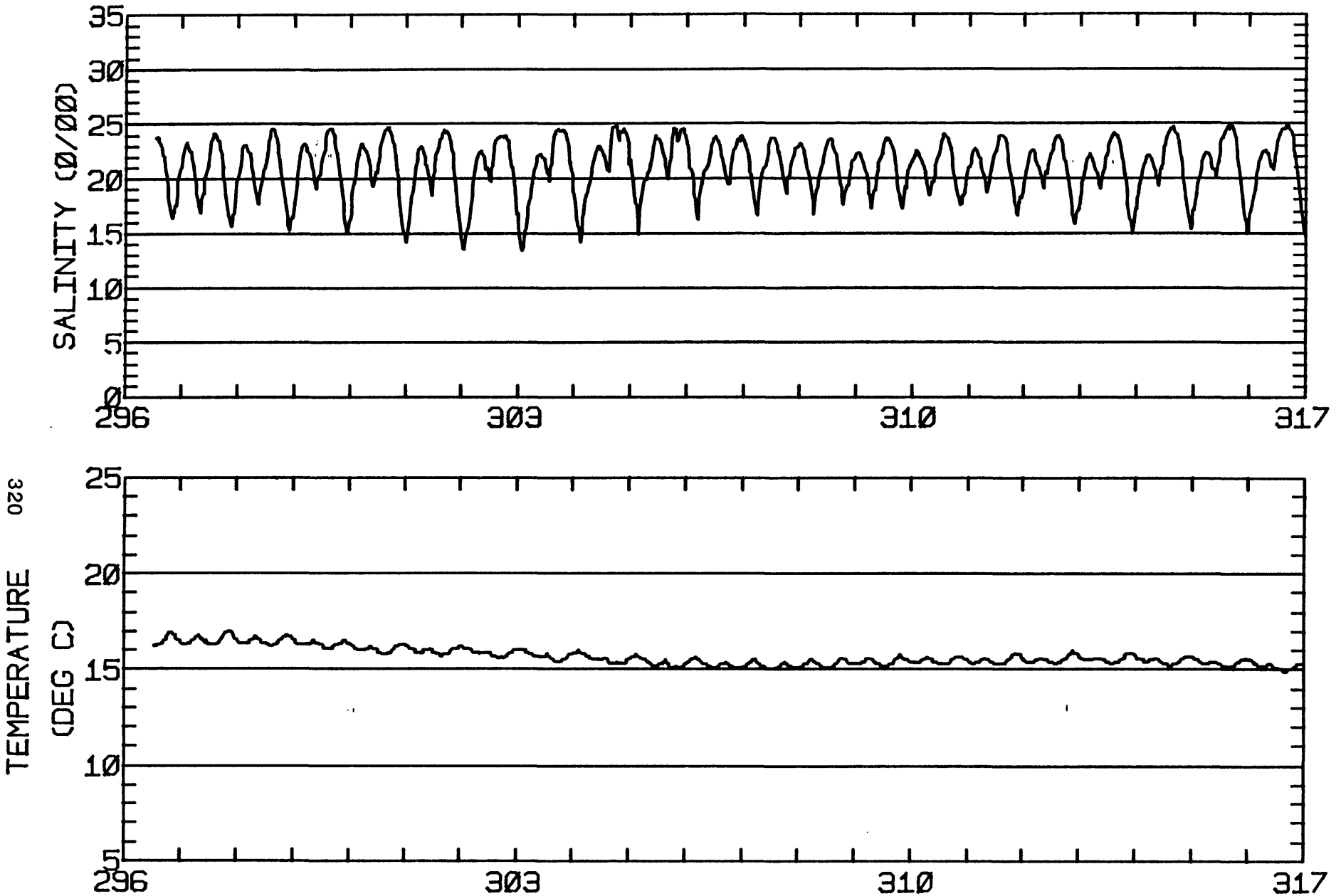


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-38N 122-13- 8W

METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 8W
METER 002.1 METERS ABOVE BED. WATER DEPTH 017.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:11/12/80 1500 PST JULIAN DAY=317
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

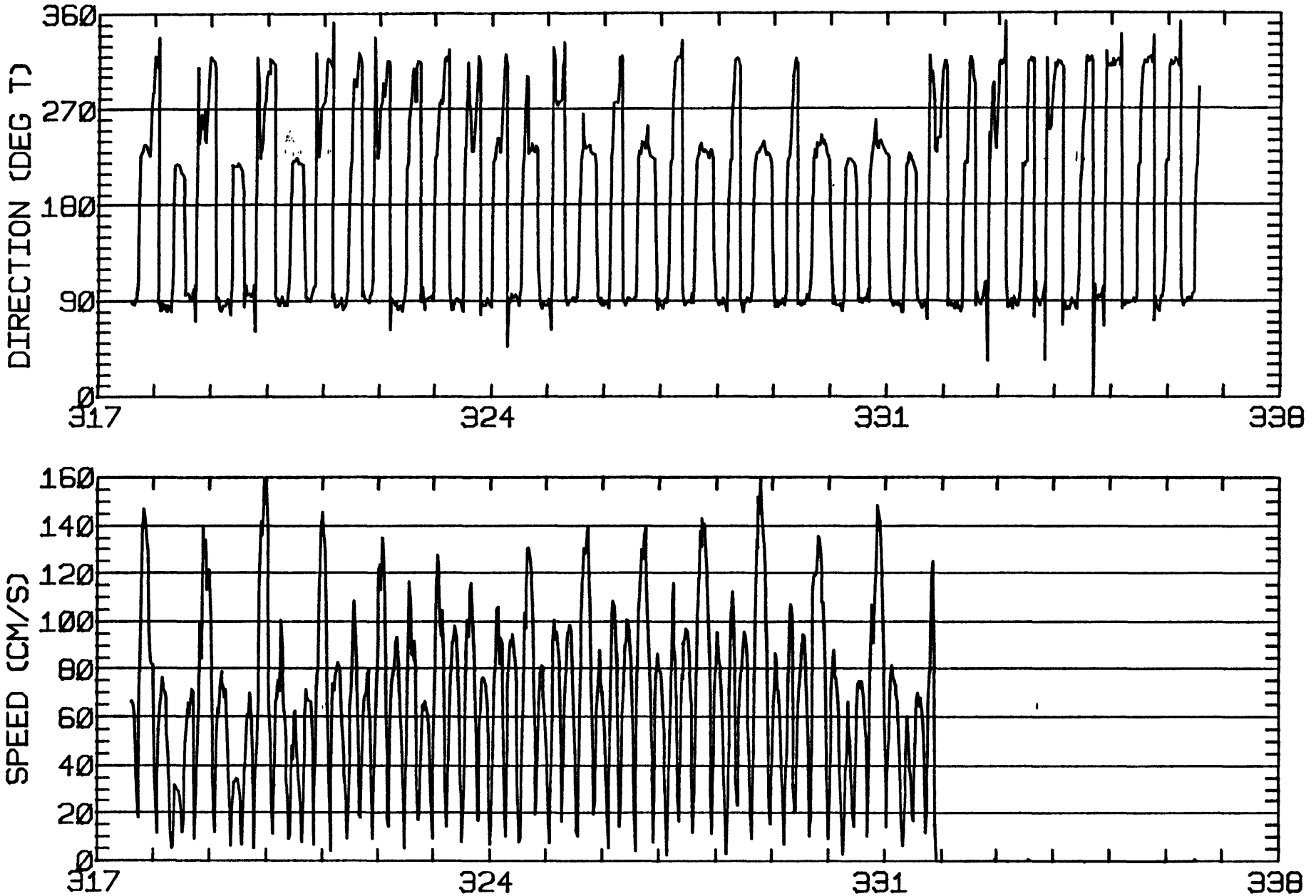
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.86	6.69	87.1	74.7	ANTI-CLOCKWISE
K1	38.25	13.48	70.4	78.9	CLOCKWISE
N2	26.55	9.36	108.1	41.2	CLOCKWISE
M2	65.56	1.68	75.4	353.6	ANTI-CLOCKWISE
S2	16.20	14.13	171.6	238.9	ANTI-CLOCKWISE
M4	9.55	0.48	174.7	264.6	CLOCKWISE

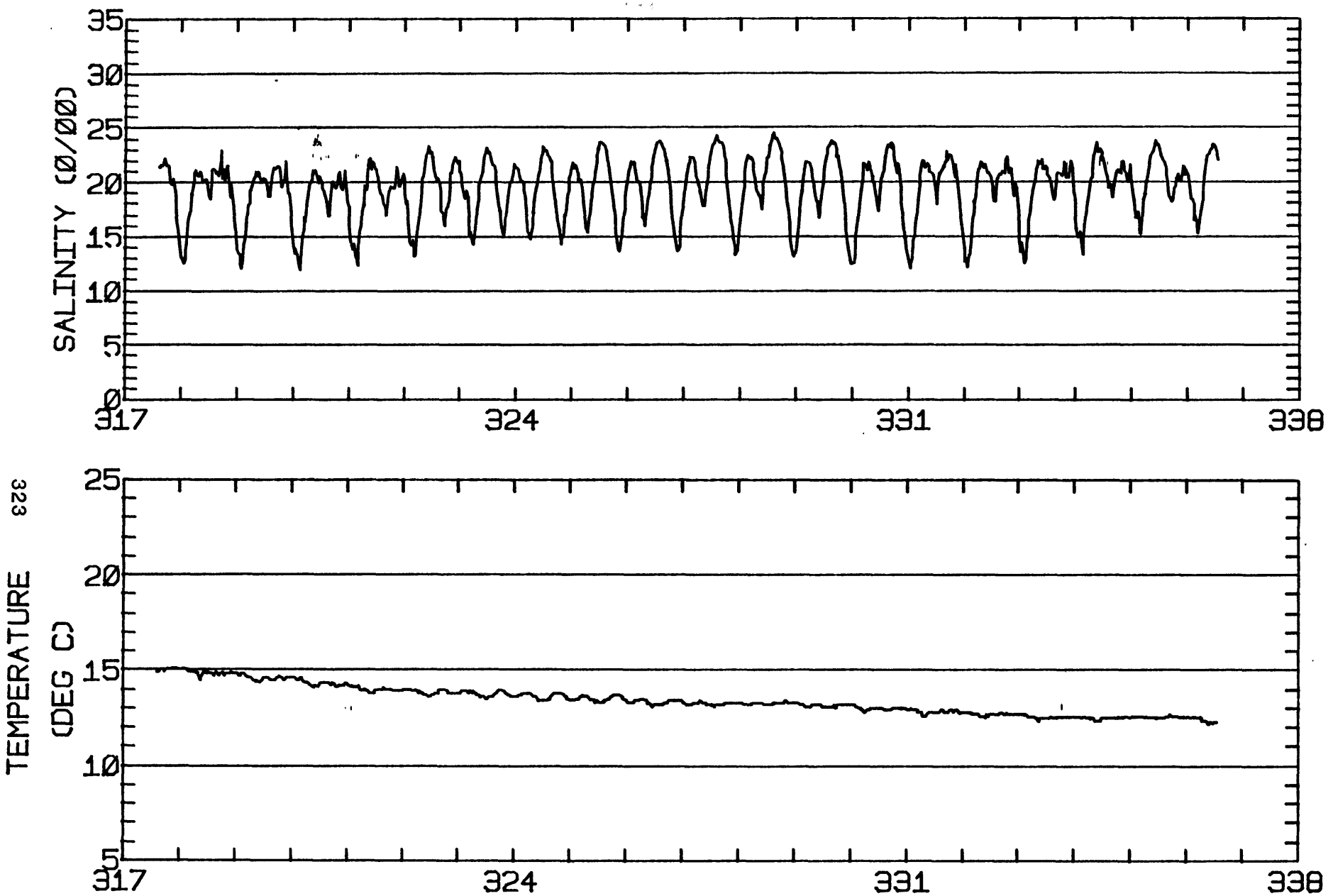
RMS SPEED: 76.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 139.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 86.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.71
STANDARD DEVIATION U-SERIES: 13.13 CM/SEC
STANDARD DEVIATION V SERIES: 26.87 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.9	0.8	197.
2	6	-5.9	-13.5	173.
ALL	18	-5.2	-4.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 6W
METER 011.9 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 6W
METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:11/12/80 1502 PST JULIAN DAY=317
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

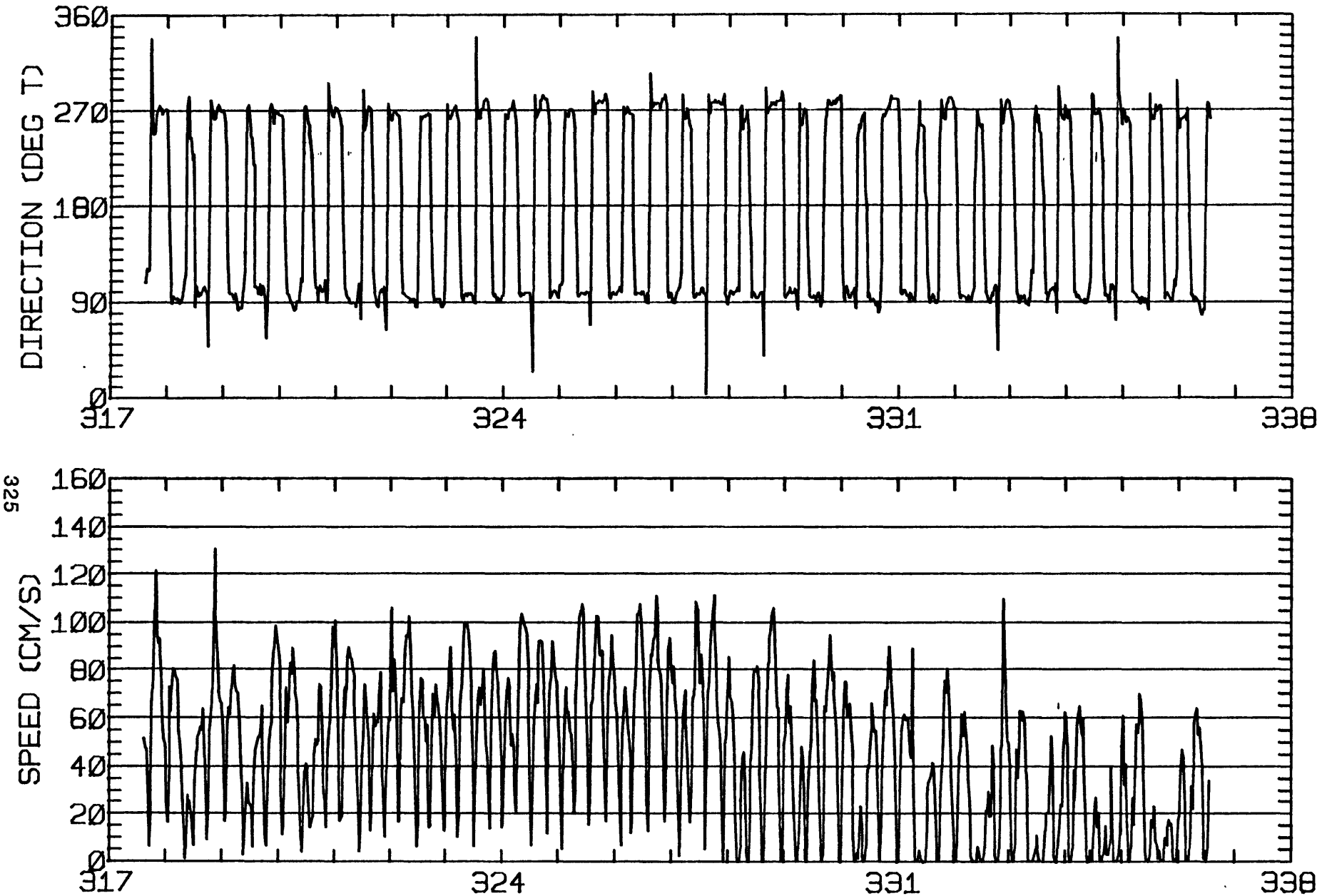
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.33	4.60	93.6	71.8	CLOCKWISE
K1	36.34	0.61	96.0	76.0	CLOCKWISE
N2	23.59	5.53	90.6	16.2	ANTI-CLOCKWISE
M2	59.18	2.59	96.6	351.5	CLOCKWISE
S2	13.57	3.82	95.1	322.8	CLOCKWISE
M4	1.62	0.56	126.5	221.4	CLOCKWISE

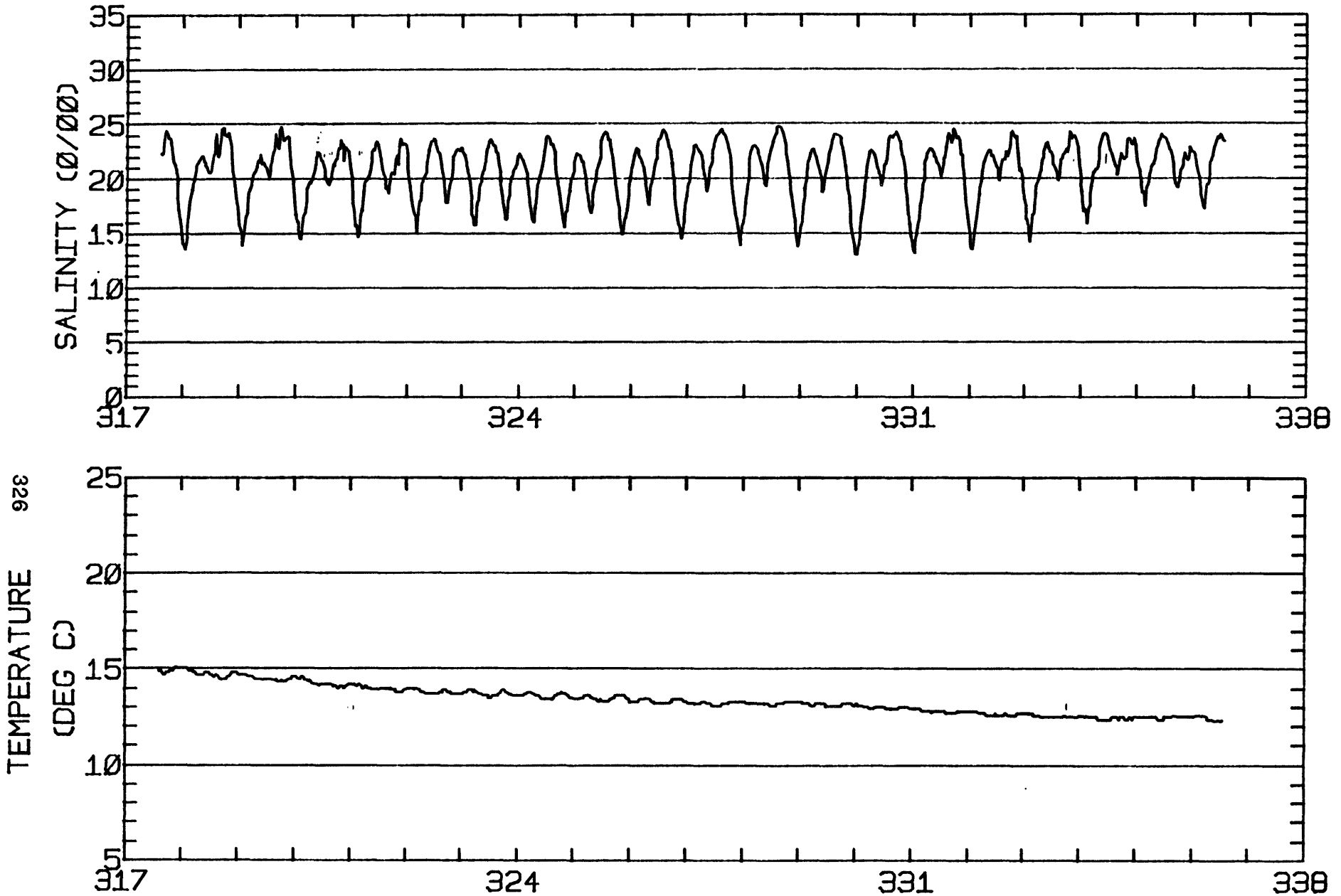
RMS SPEED: 64.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 126.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 95.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.74
STANDARD DEVIATION U-SERIES: 11.53 CM/SEC
STANDARD DEVIATION V SERIES: 6.23 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.6	-4.7	197.
2	6	4.2	-2.7	173.
ALL	18	4.5	-4.1	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 6W
METER 005.8 METERS ABOVE BED. WATER DEPTH 018.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 24 38- 3-38N 122-13- 6W
METER Ø05.8 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 24
POSITION: 38 3'38"N 122 13' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 18.0 M (MLLW)
METER DEPTH: 15.9 M (BELOW MLLW)
START TIME OF SERIES:11/12/80 1454 PST JULIAN DAY=317
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

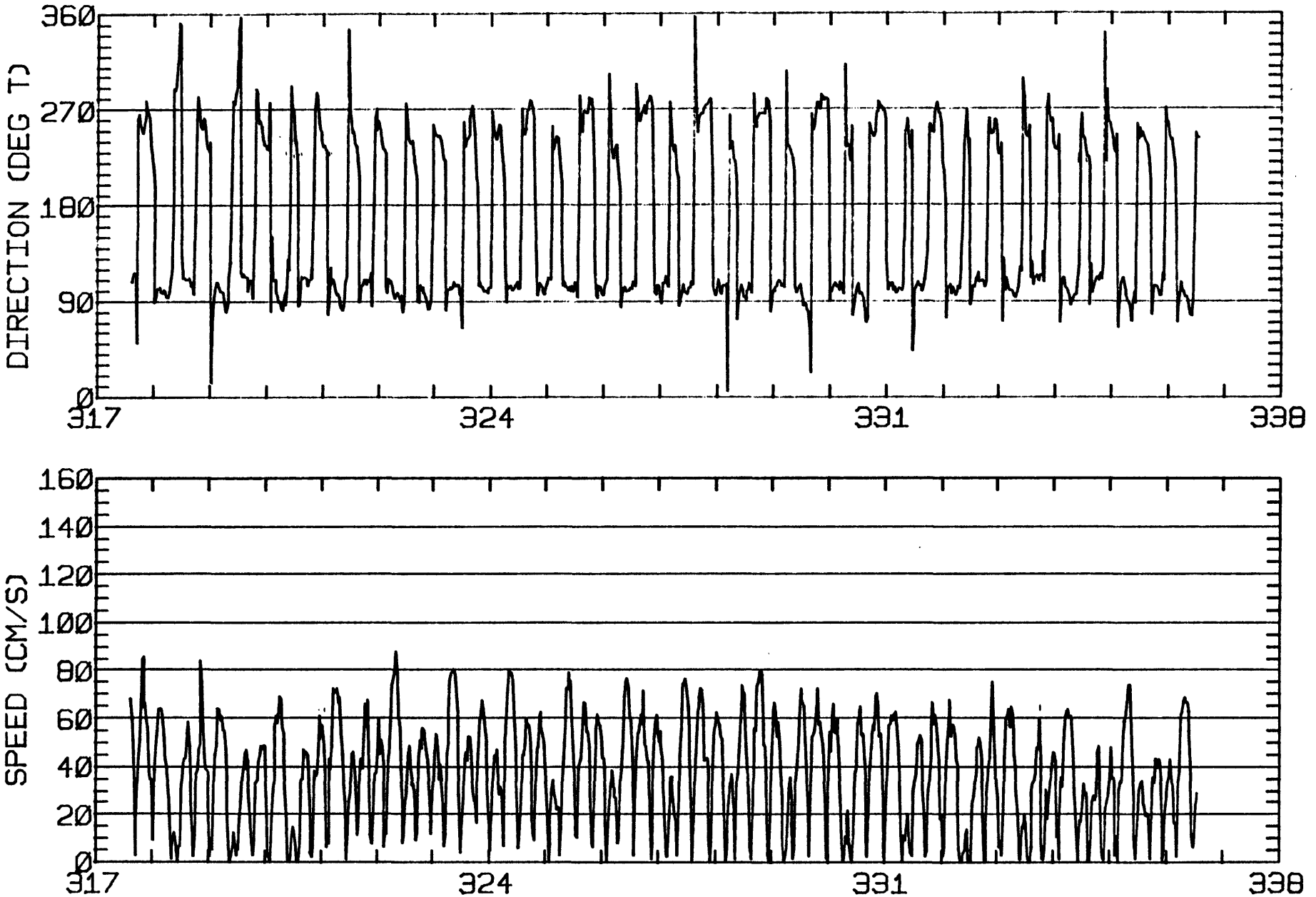
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.40	3.42	95.3	87.7	CLOCKWISE
K1	24.99	1.71	93.4	76.2	ANTI-CLOCKWISE
N2	11.61	0.16	96.9	342.6	ANTI-CLOCKWISE
M2	44.47	0.89	90.0	354.7	ANTI-CLOCKWISE
S2	6.15	2.78	84.6	335.2	CLOCKWISE
M4	3.32	0.70	156.0	353.0	ANTI-CLOCKWISE

RMS SPEED: 43.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 85.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 91.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.68
STANDARD DEVIATION U-SERIES: 8.48 CM/SEC
STANDARD DEVIATION V SERIES: 7.80 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.6	-9.4	197.
2	12	6.9	-7.3	170.
3	12	10.3	-7.7	209.
ALL	36	9.0	-8.1	



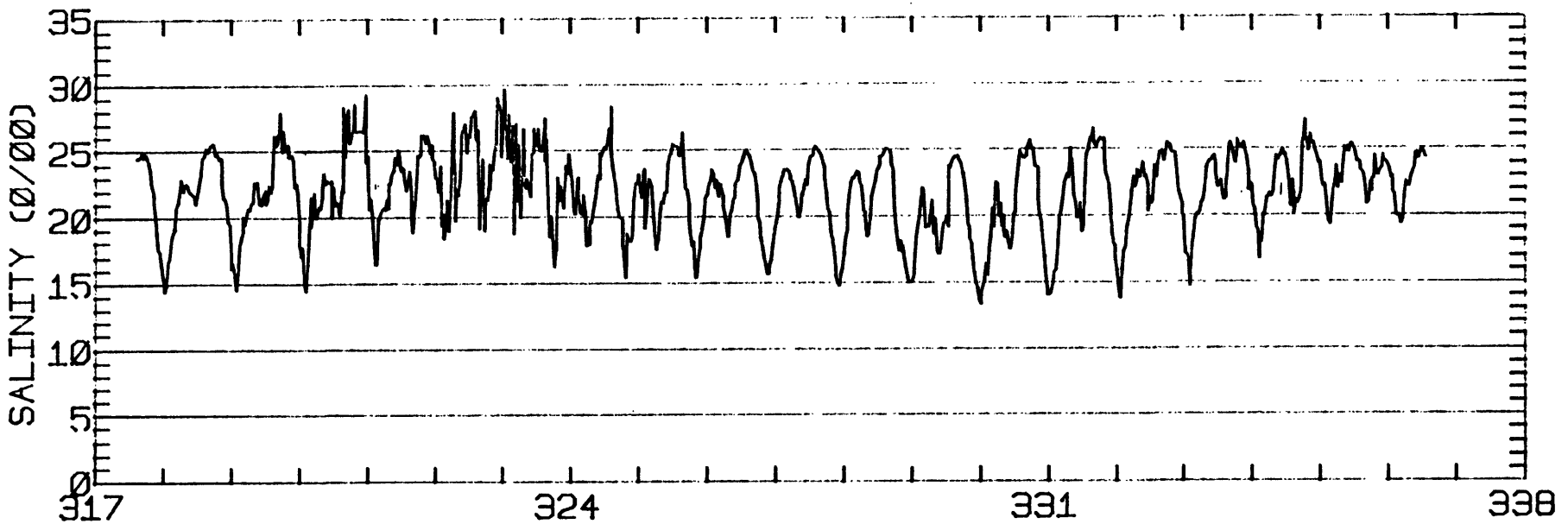
328

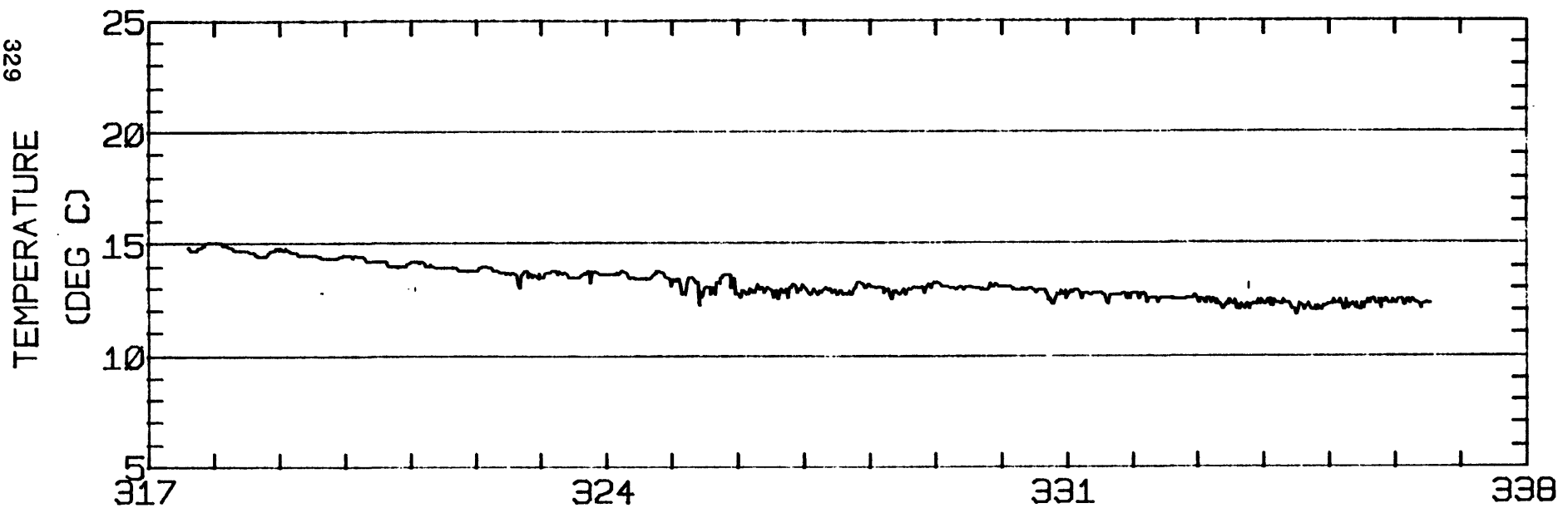
JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-38N 122-13- 6W

METER 002.1 METERS ABOVE BED. WATER DEPTH 018.0 METERS.





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 24 38- 3-38N 122-13- 6W

METER ØØ2.1 METERS ABOVE BED. WATER DEPTH Ø18.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 314
POSITION: 38 3'41"N 122 25'28"W
METER TYPE: AANDERAA
WATER DEPTH: 2.4 M (MLLW)
METER DEPTH: 1.5 M (BELOW MLLW)
START TIME OF SERIES:10/ 9/80 1250 PST JULIAN DAY=283
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

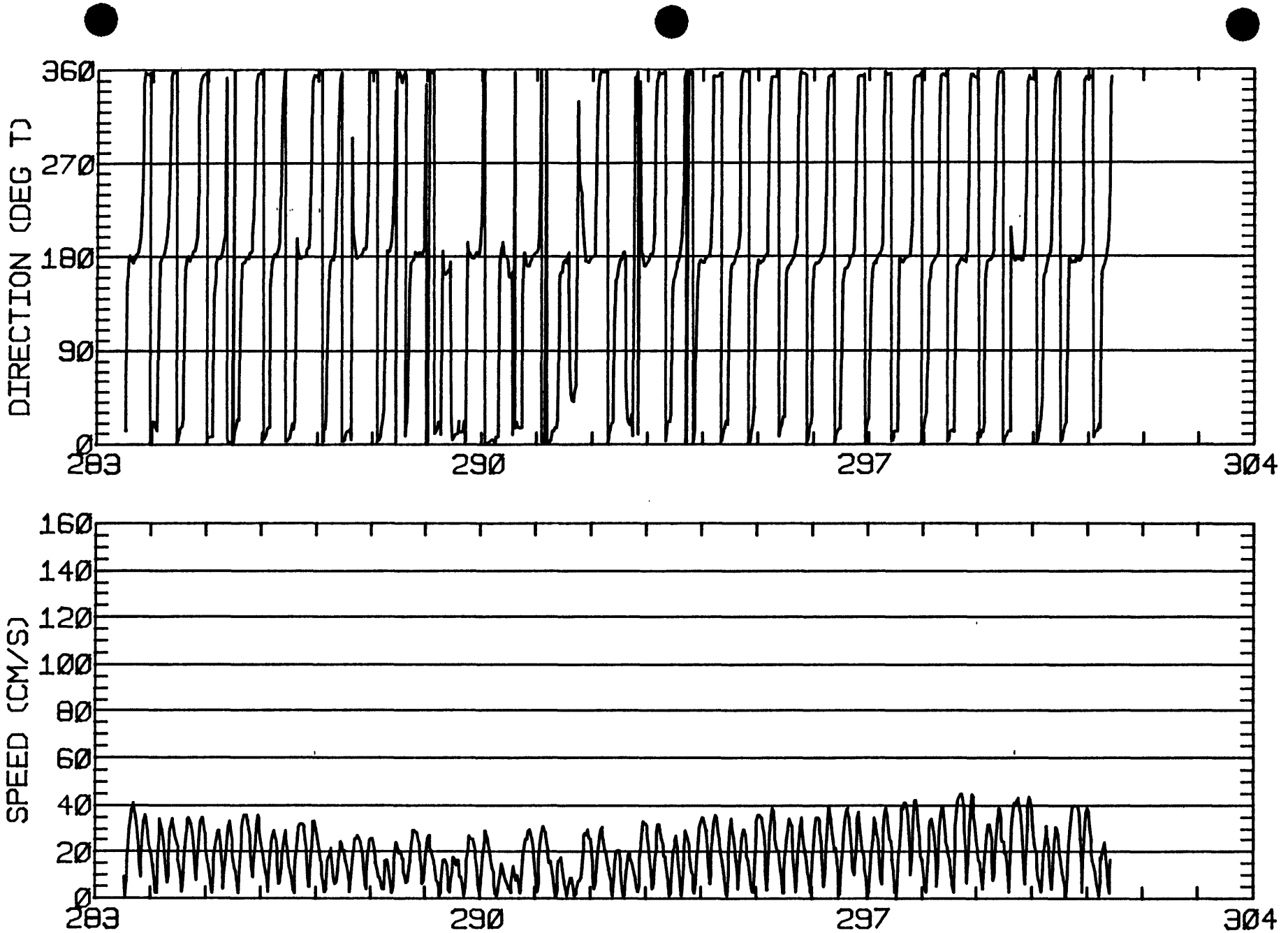
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.59	0.48	2.7	20.2	CLOCKWISE
K1	8.03	0.91	1.4	28.7	CLOCKWISE
N2	3.96	0.64	350.5	293.9	CLOCKWISE
M2	26.97	1.62	258.7	297.1	CLOCKWISE
S2	7.06	1.55	357.9	306.1	CLOCKWISE
M4	4.28	0.46	359.8	117.7	CLOCKWISE

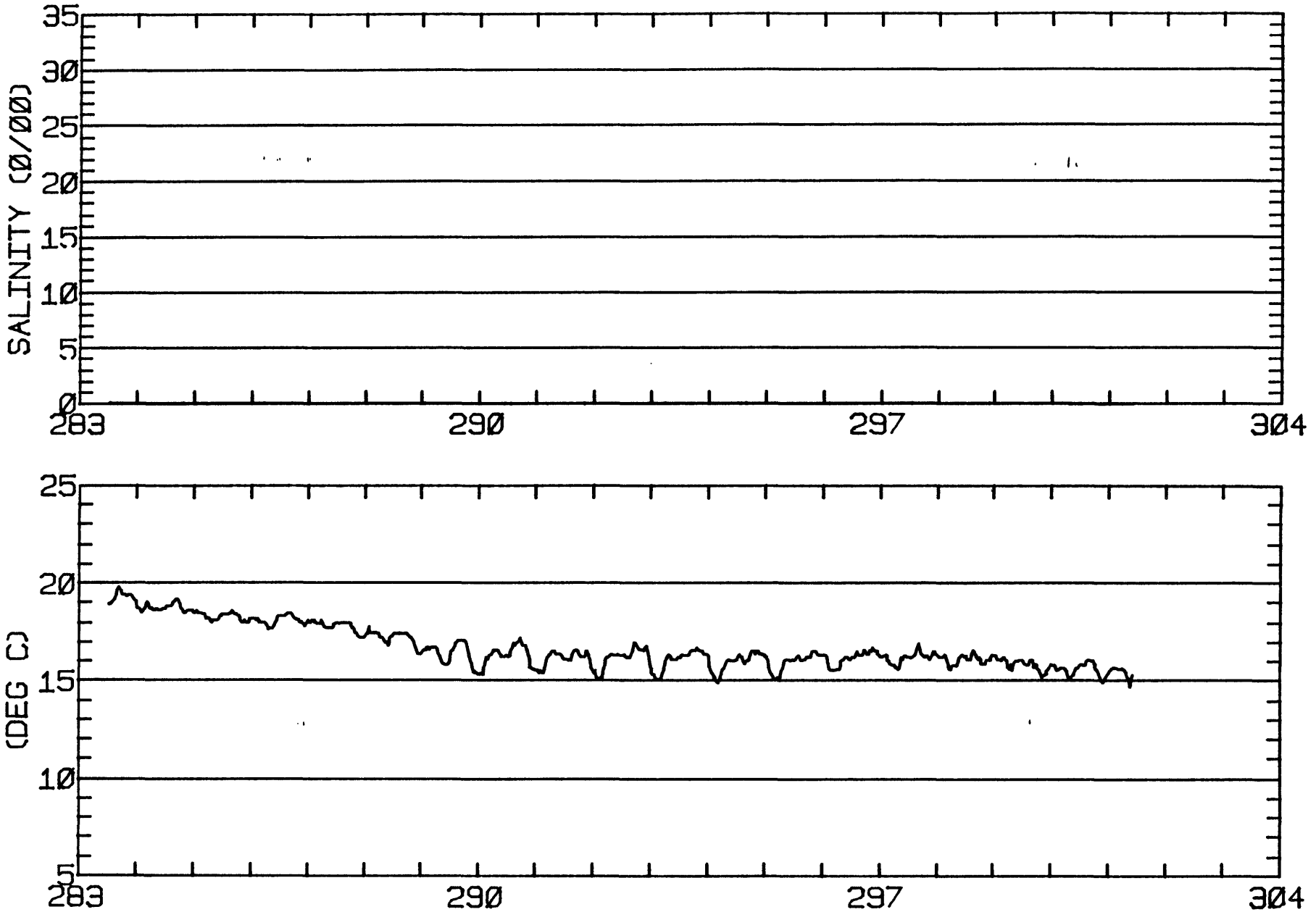
RMS SPEED: 23.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 46.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 16.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 359.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 2.12 CM/SEC
STANDARD DEVIATION V SERIES: 4.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.4	0.6	254.
2	12	0.5	-0.2	169.
3	10	-0.2	-0.2	163.
ALL	34	-0.0	0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 314 38- 3-41N 122-25-28W
METER 000.9 METERS ABOVE BED. WATER DEPTH 002.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 314 38- 3-41N 122-25-28W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ2.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 315
POSITION: 38 2'15"N 122 19' 2"W
METER TYPE: AANDERAA
WATER DEPTH: 4.6 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES:10/16/80 1030 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

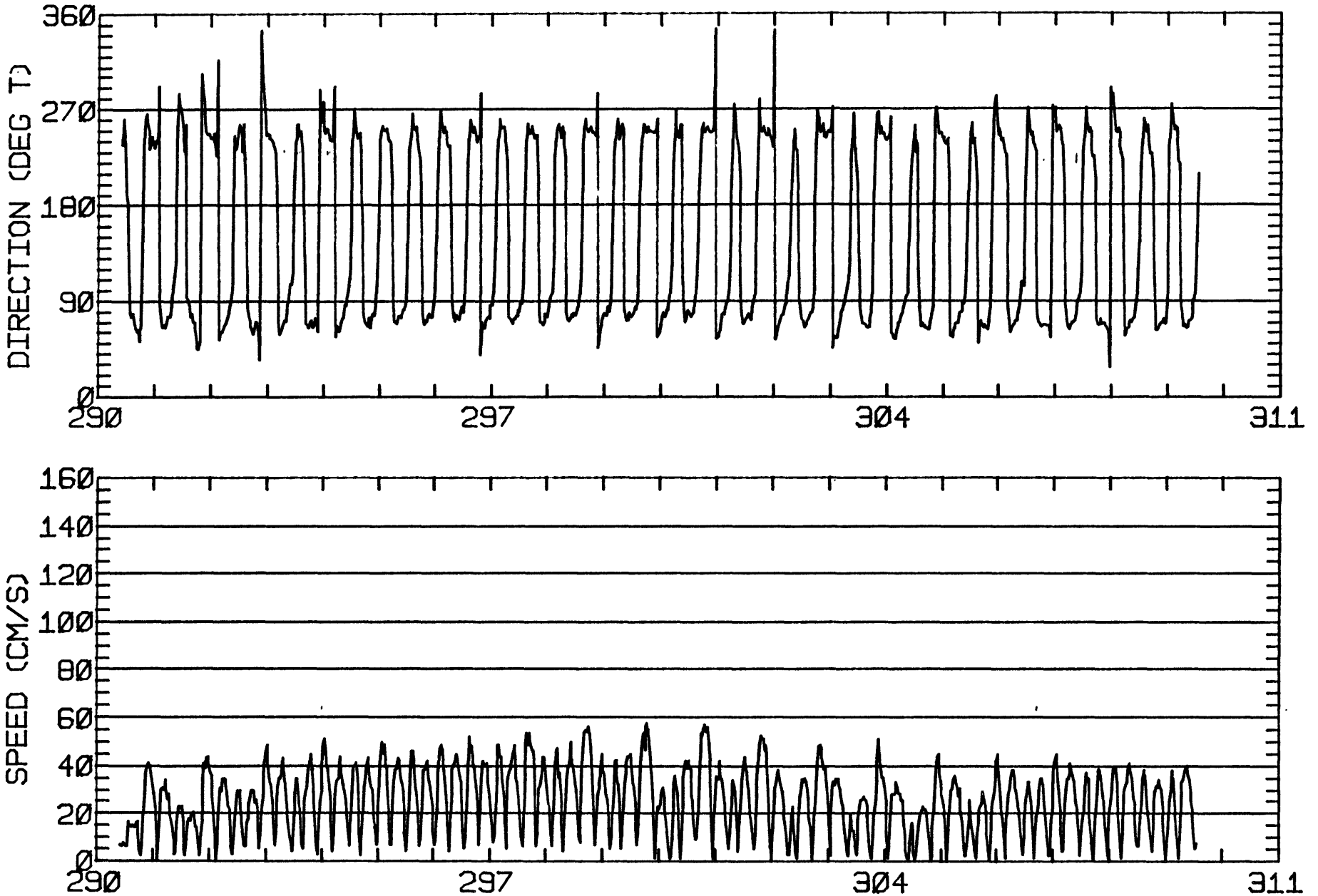
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
01	8.06	0.49	71.2	84.3	ANTI-CLOCKWISE
K1	12.37	0.47	78.9	65.2	CLOCKWISE
N2	8.80	0.61	74.5	313.0	CLOCKWISE
M2	32.97	0.29	70.7	333.7	CLOCKWISE
S2	6.74	0.84	74.0	307.9	CLOCKWISE
M4	2.79	2.45	43.0	192.6	ANTI-CLOCKWISE

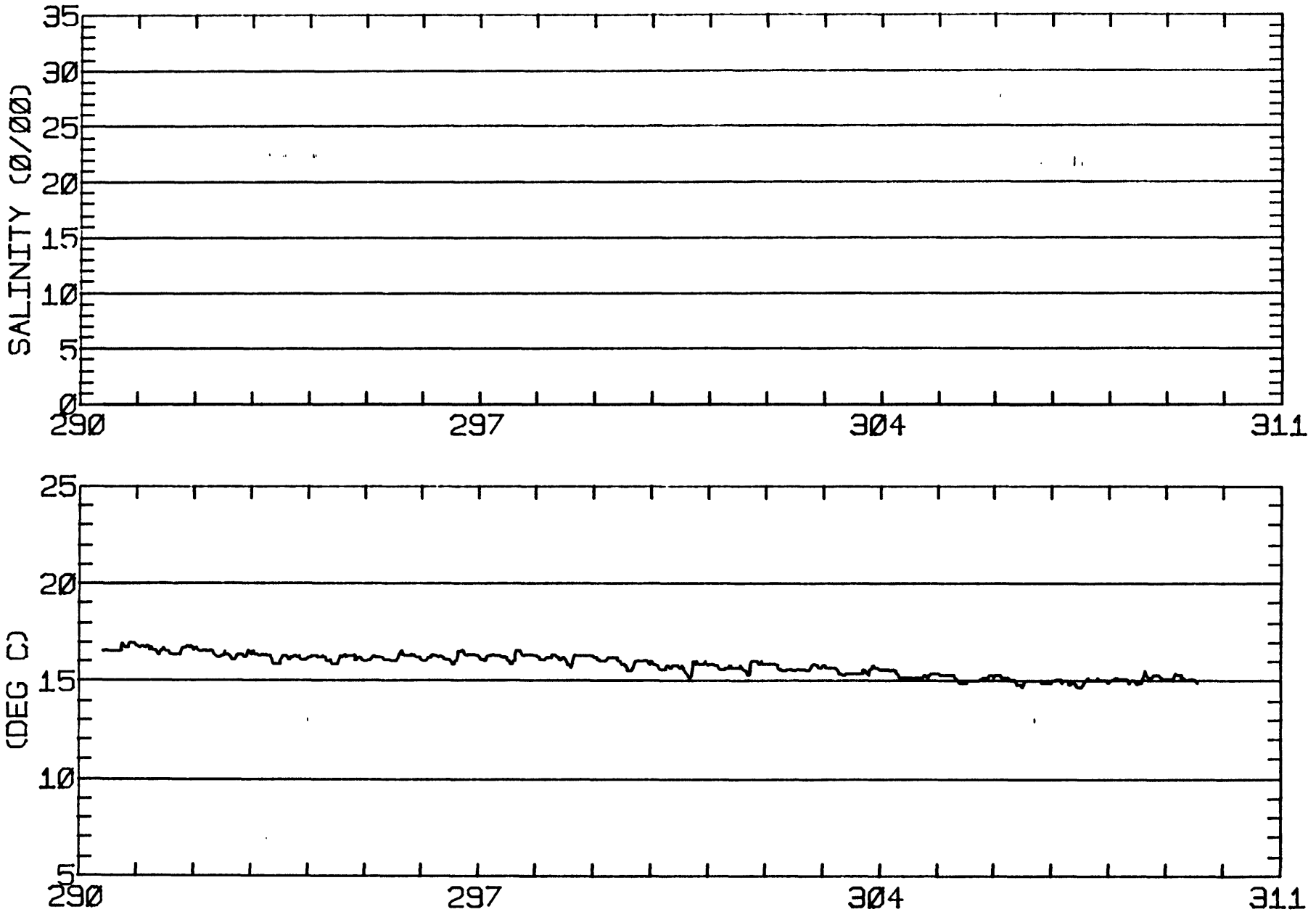
RMS SPEED: 29.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 60.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 21.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 72.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 5.23 CM/SEC
STANDARD DEVIATION V SERIES: 3.93 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.4	-1.1	157.
2	12	0.4	-2.0	176.
3	12	2.7	0.2	157.
ALL	36	1.5	-1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 315 38- 2-15N 122-19- 2W
METER 001.5 METERS ABOVE BED. WATER DEPTH 004.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 315 38- 2-15N 122-19- 2W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ4.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 316
POSITION: 38 3'43"N 122 16'36"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 8/27/80 1330 PST JULIAN DAY=240
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

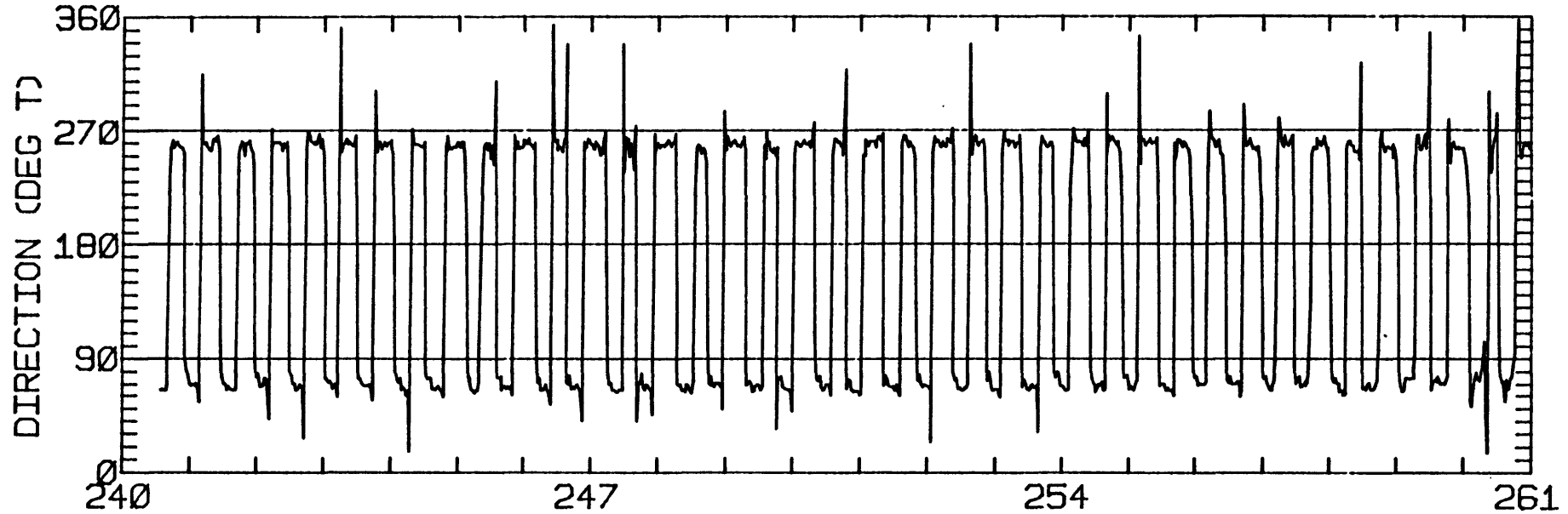
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

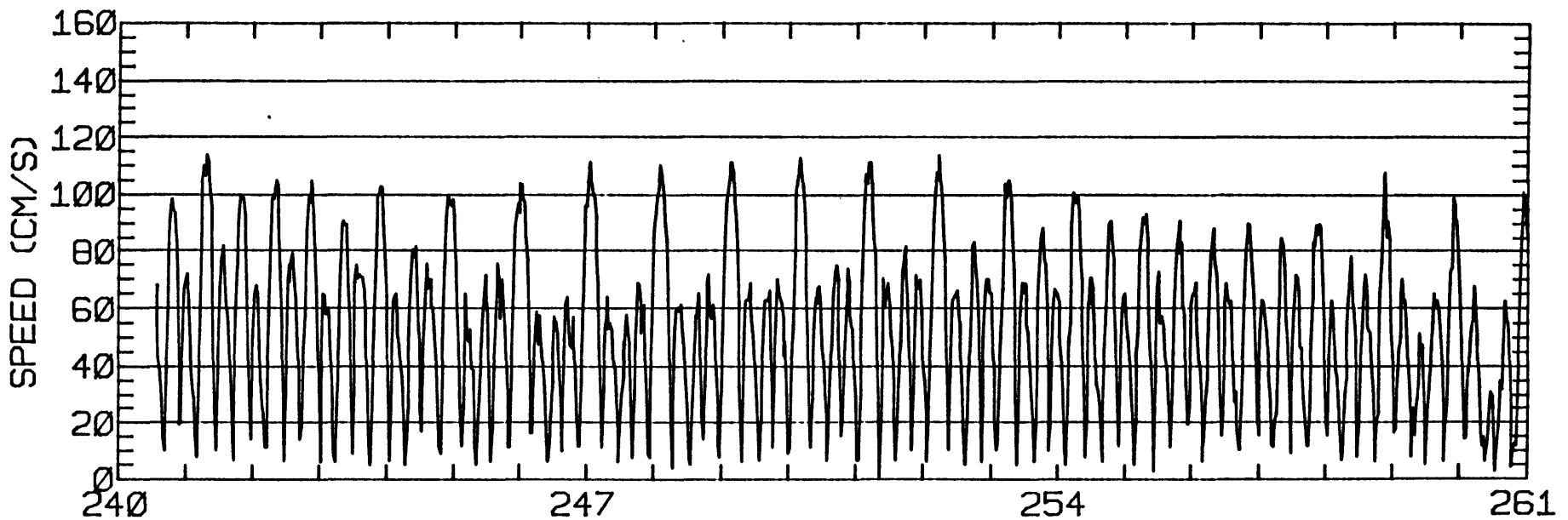
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.19	0.60	80.0	88.0	ANTI-CLOCKWISE
K1	22.18	0.63	75.9	106.0	CLOCKWISE
N2	15.77	0.10	74.4	4.4	CLOCKWISE
M2	74.38	1.11	75.6	359.0	ANTI-CLOCKWISE
S2	20.81	0.24	77.3	5.0	ANTI-CLOCKWISE
M4	5.41	1.69	89.3	234.3	ANTI-CLOCKWISE

RMS SPEED: 60.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 135.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 11.51 CM/SEC
STANDARD DEVIATION V SERIES: 5.34 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-12.1	1.7	129.
2	12	-12.3	2.1	214.
3	12	-10.9	1.1	247.
4	4	-3.3	1.0	292.
ALL	40	-10.9	1.6	



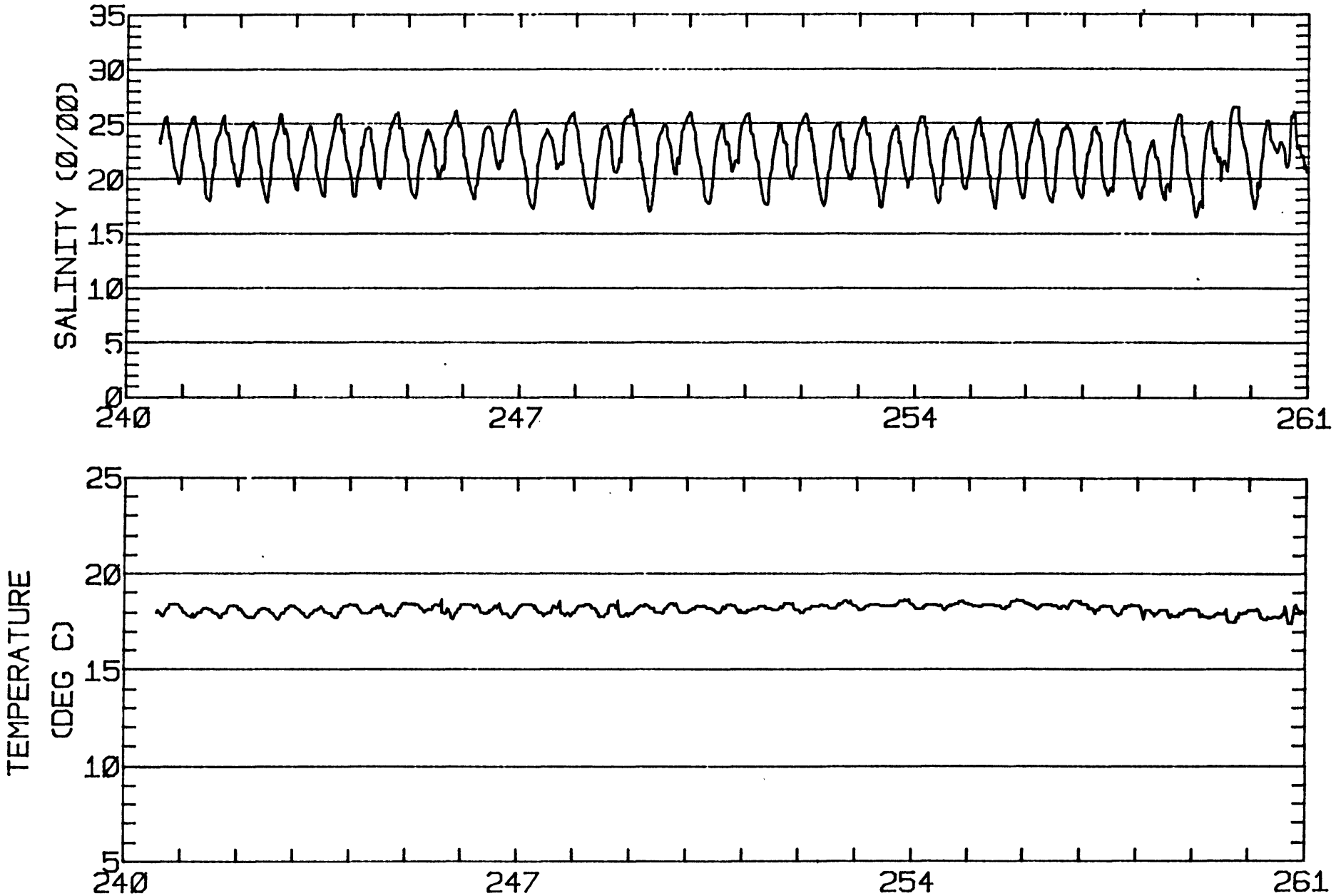


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 316 38- 3-43N 122-16-36W

· METER 005.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-36W
METER Ø05.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 316
POSITION: 38 3'43"N 122 16'36"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 10.1 M (BELOW MLLW)
START TIME OF SERIES: 8/27/80 1332 PST JULIAN DAY=240
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

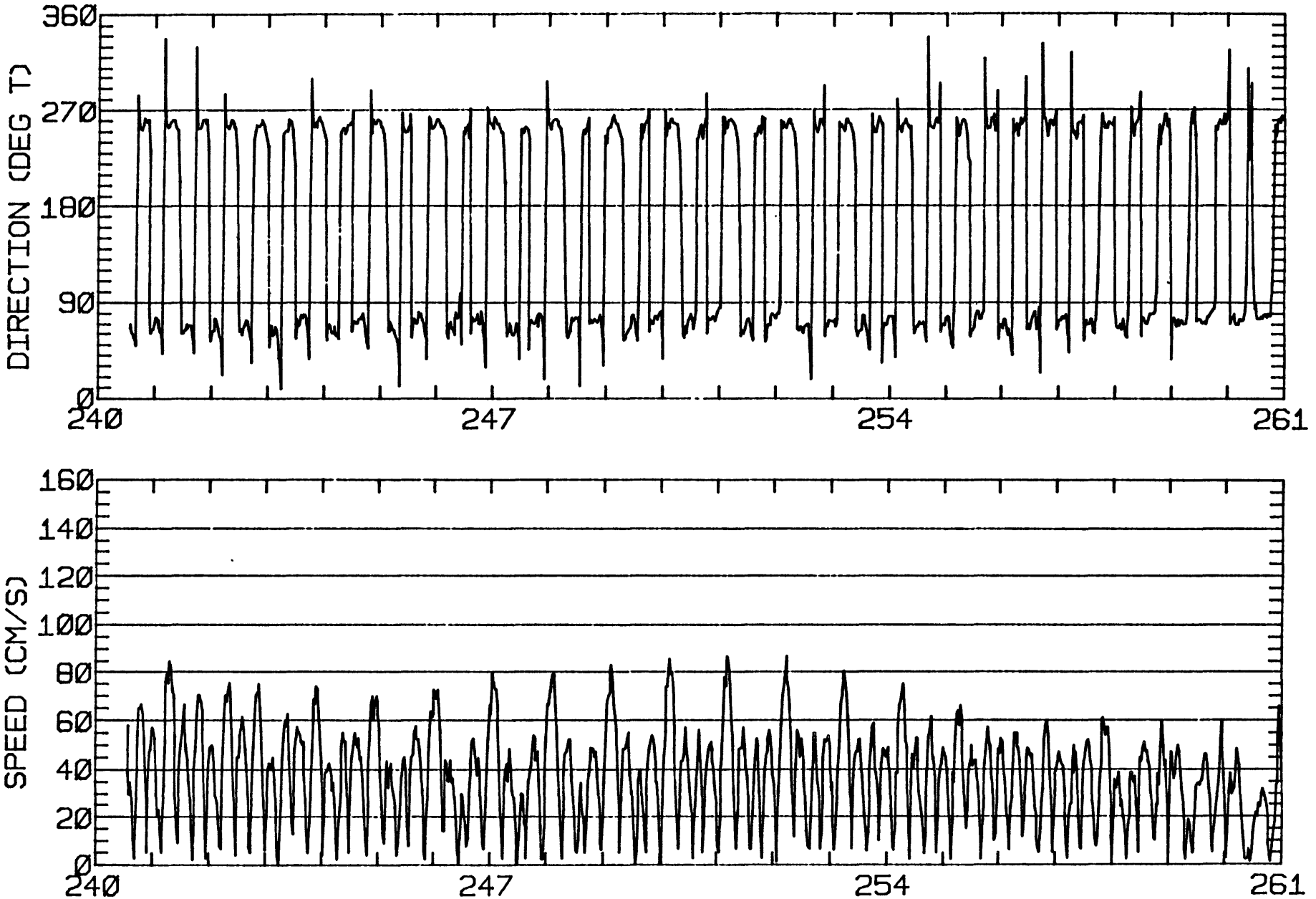
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.19	0.93	75.6	89.7	CLOCKWISE
K1	17.95	0.02	76.0	112.1	CLOCKWISE
N2	12.43	0.51	70.3	355.2	ANTI-CLOCKWISE
M2	51.06	0.35	74.2	355.4	ANTI-CLOCKWISE
S2	16.44	0.28	72.9	0.3	CLOCKWISE
M4	4.40	0.24	92.6	208.6	ANTI-CLOCKWISE

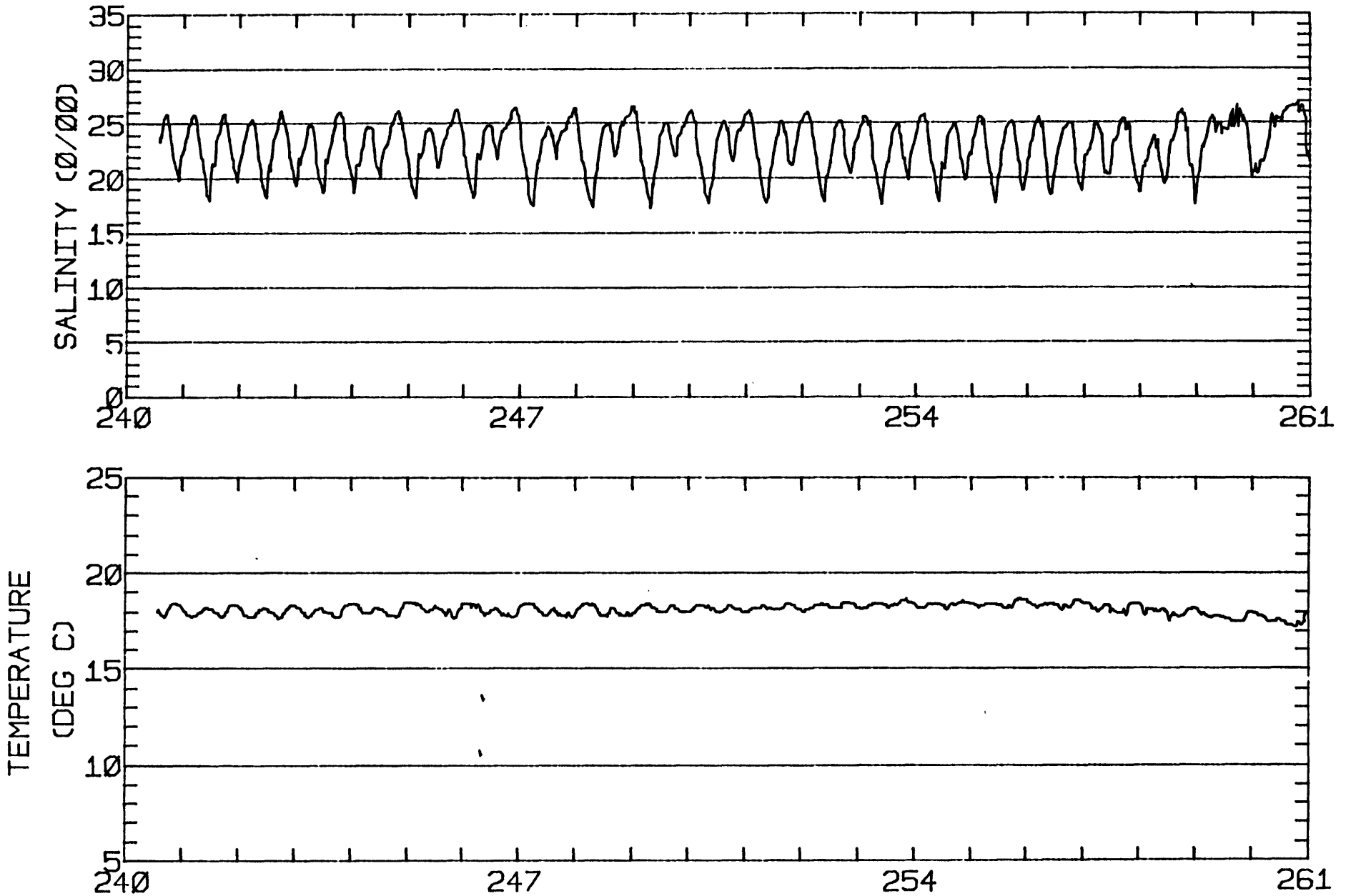
RMS SPEED: 42.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 100.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 74.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 9.28 CM/SEC
STANDARD DEVIATION V SERIES: 5.45 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.9	1.6	129.
2	12	-3.2	0.7	214.
3	12	-1.8	1.2	247.
4	4	7.8	3.0	292.
ALL	40	-1.9	1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-36W
METER 001.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-36W
.METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 316
POSITION: 38 3'43"N 122 16'40"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 9/17/80 1254 PST JULIAN DAY=261
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

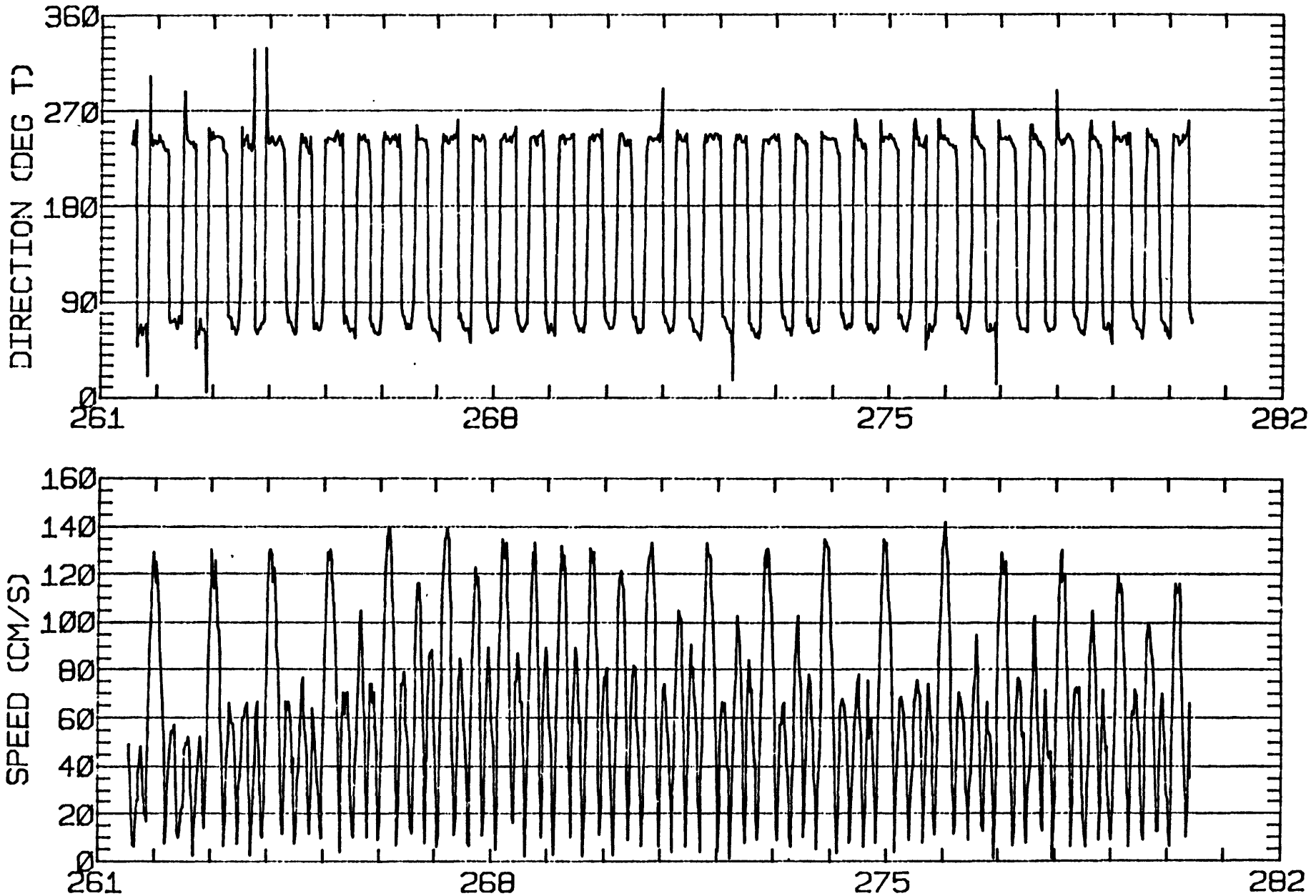
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.62	0.91	66.0	82.9	ANTI-CLOCKWISE
K1	22.56	1.12	64.8	88.4	ANTI-CLOCKWISE
N2	21.73	0.27	64.4	336.9	ANTI-CLOCKWISE
M2	76.67	2.13	65.3	7.1	ANTI-CLOCKWISE
S2	18.74	0.22	64.5	337.8	CLOCKWISE
M4	1.97	0.38	89.8	272.5	ANTI-CLOCKWISE

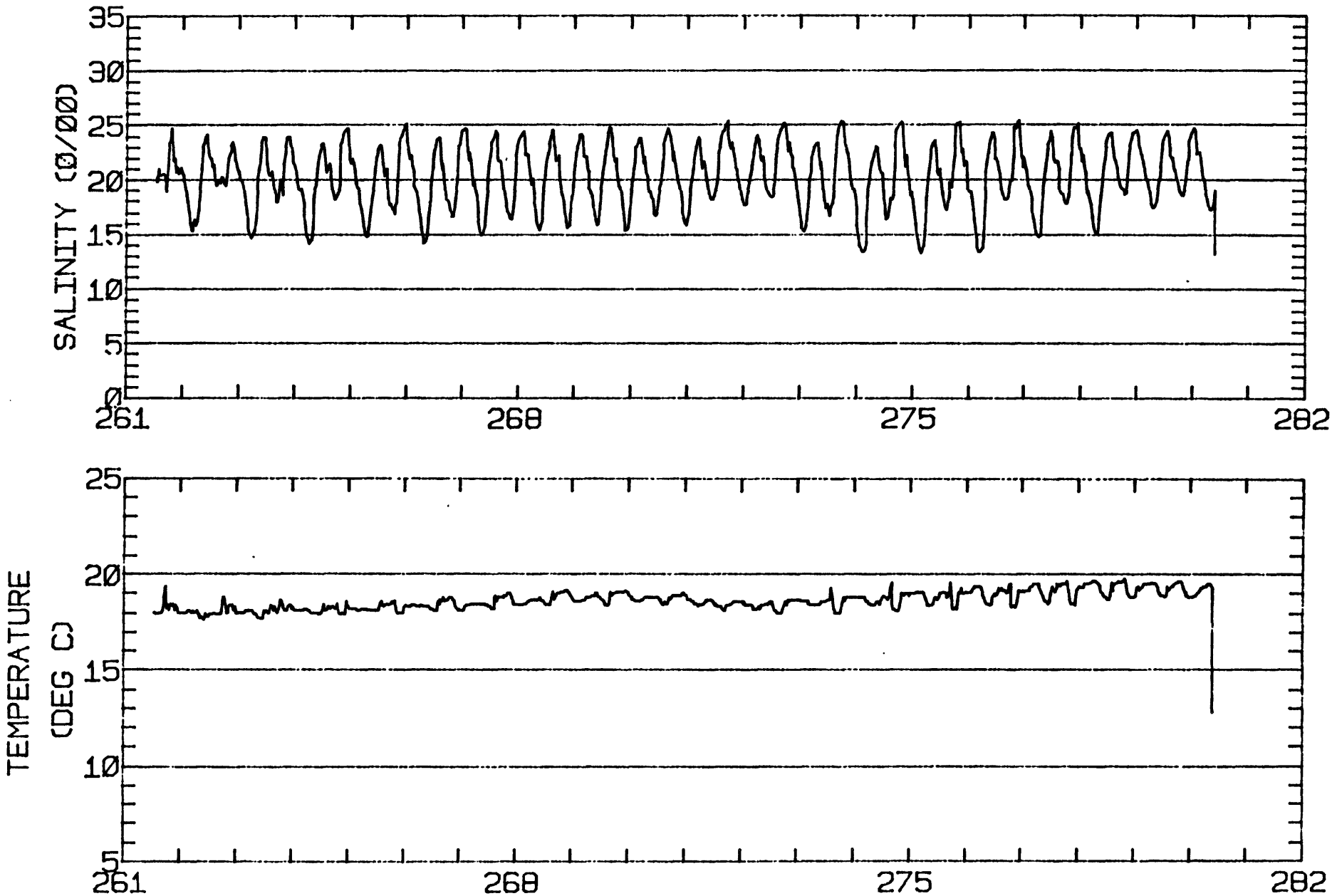
RMS SPEED: 71.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 136.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 54.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 10.37 CM/SEC
STANDARD DEVIATION V SERIES: - 6.57 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-18.6	-11.1	302.
2	12	-18.8	-10.6	367.
3	12	-16.8	-10.6	273.
ALL	36	-18.1	-10.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-40W
METER 008.6 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-40W
METER ØØ8.6 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 316
POSITION: 38 3'43"N 122 16'40"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/17/80 1250 PST JULIAN DAY=261
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

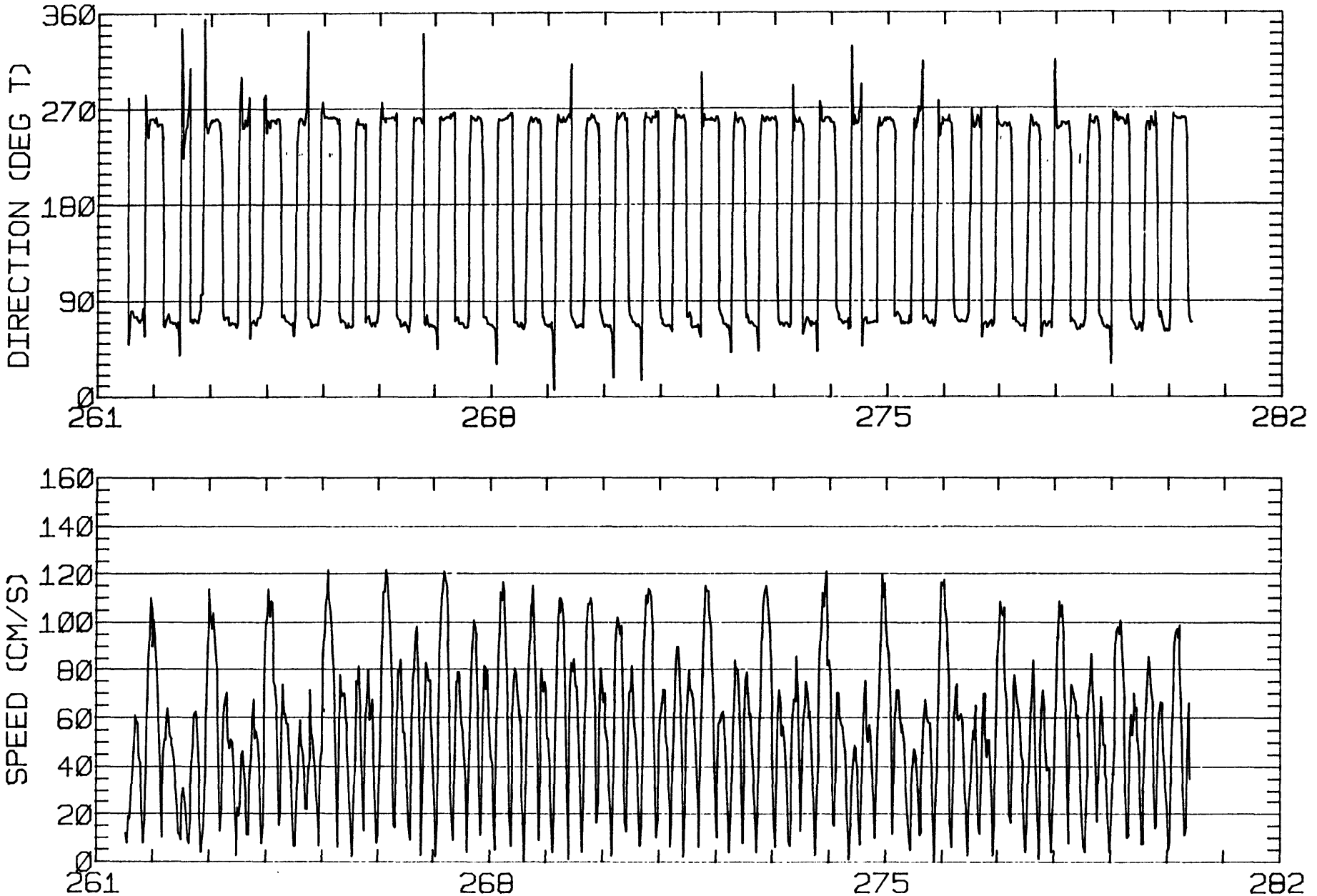
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.19	0.57	77.7	82.7	ANTI-CLOCKWISE
K1	22.37	0.23	76.0	87.5	CLOCKWISE
N2	18.53	1.05	75.1	329.7	CLOCKWISE
M2	69.60	1.56	75.8	355.6	ANTI-CLOCKWISE
S2	14.86	0.44	76.5	333.6	CLOCKWISE
M4	7.05	1.79	91.1	230.4	ANTI-CLOCKWISE

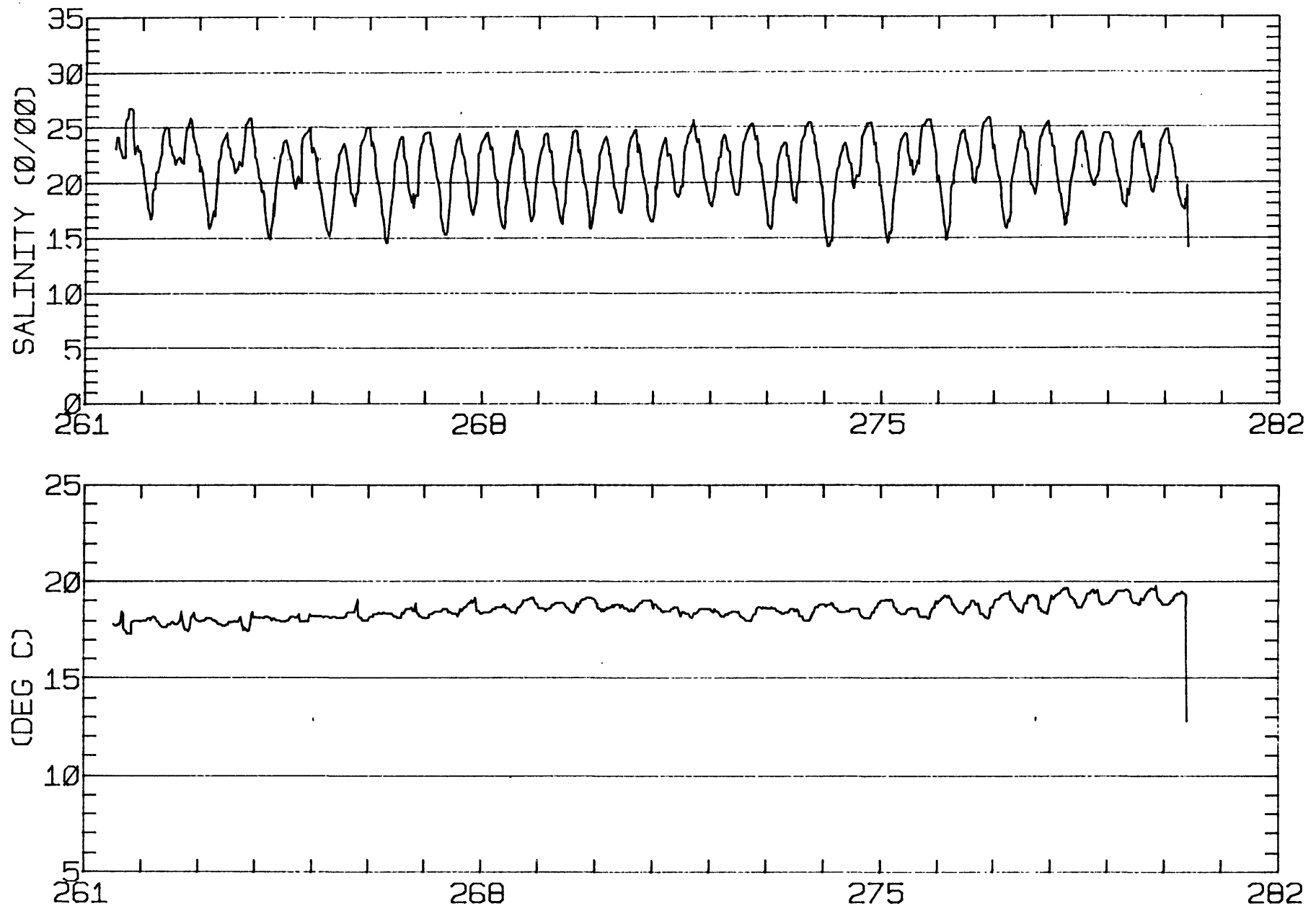
RMS SPEED: 63.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 126.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 51.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 11.56 CM/SEC
STANDARD DEVIATION V SERIES: 4.75 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.5	2.5	302.
2	12	-13.0	2.8	367.
3	12	-6.7	1.7	273.
ALL	36	-9.4	2.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-40W
METER 005.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-40W
METER Ø05.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 316
POSITION: 38 3'43"N 122 16'40"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 10.1 M (BELOW MLLW)
START TIME OF SERIES: 9/17/80 1302 PST JULIAN DAY=261
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

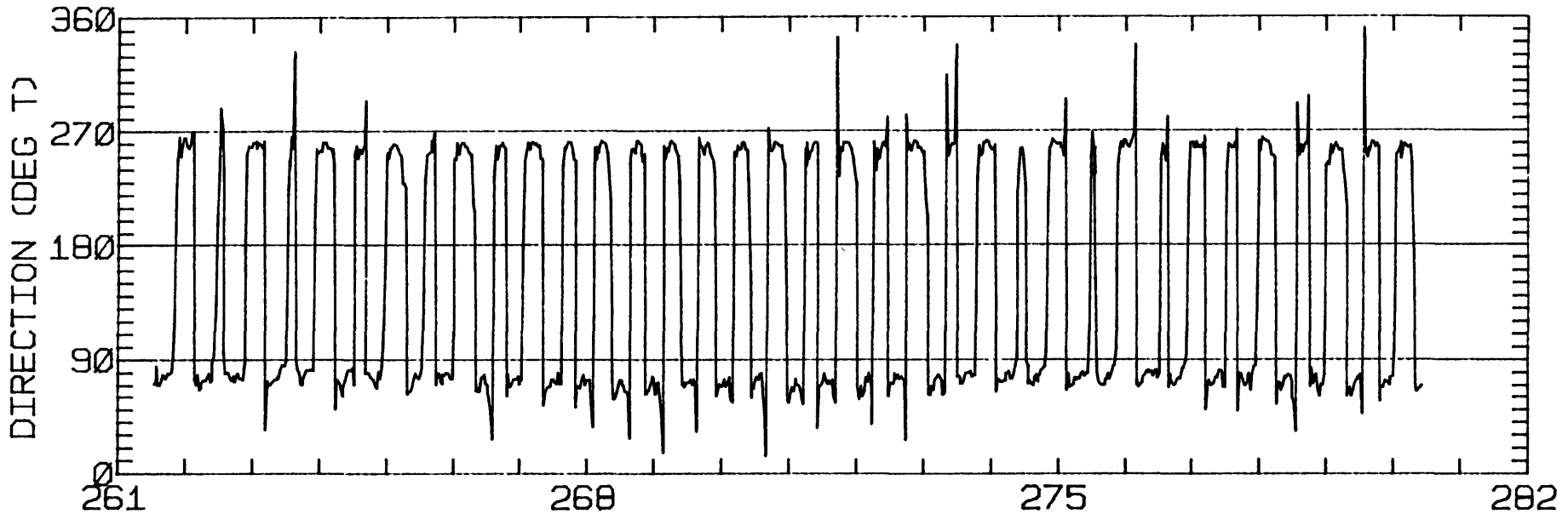
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

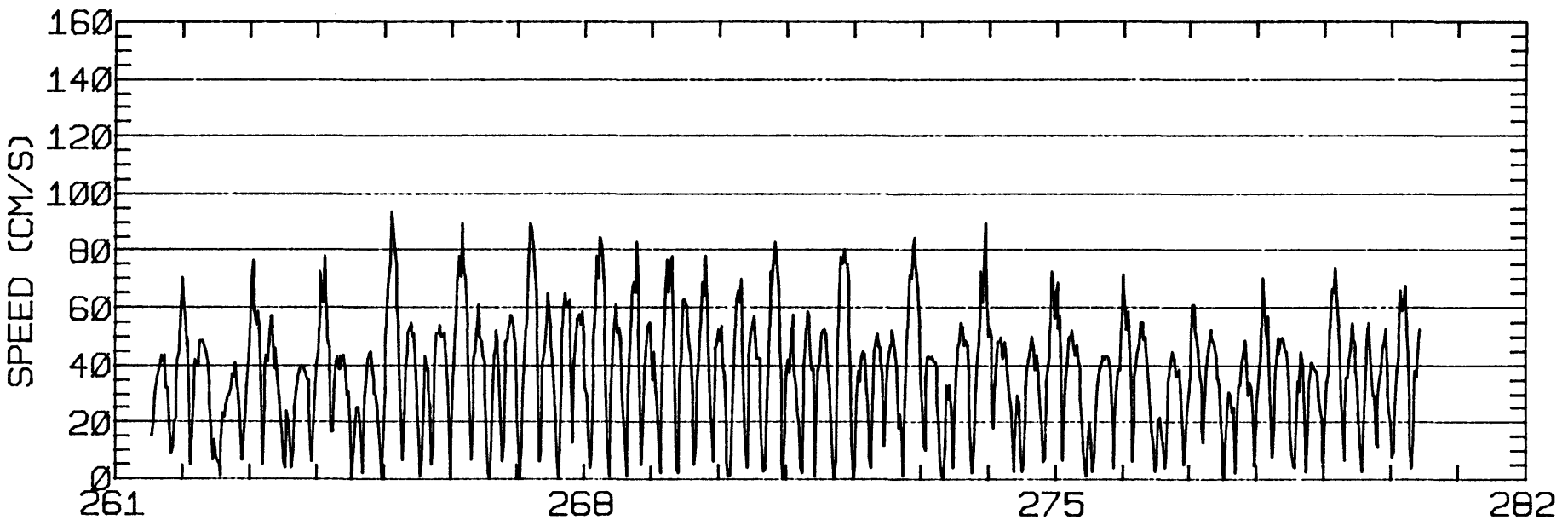
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.32	0.81	78.6	81.9	CLOCKWISE
K1	16.90	0.20	78.2	94.6	CLOCKWISE
N2	11.77	0.13	77.3	338.0	ANTI-CLOCKWISE
M2	46.31	0.90	75.7	355.3	CLOCKWISE
S2	10.13	0.58	74.5	347.4	ANTI-CLOCKWISE
M4	5.43	1.55	85.3	210.8	ANTI-CLOCKWISE

RMS SPEED: 42.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 88.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.57
STANDARD DEVIATION U-SERIES: 9.46 CM/SEC
STANDARD DEVIATION V SERIES: 4.21 CM/SEC

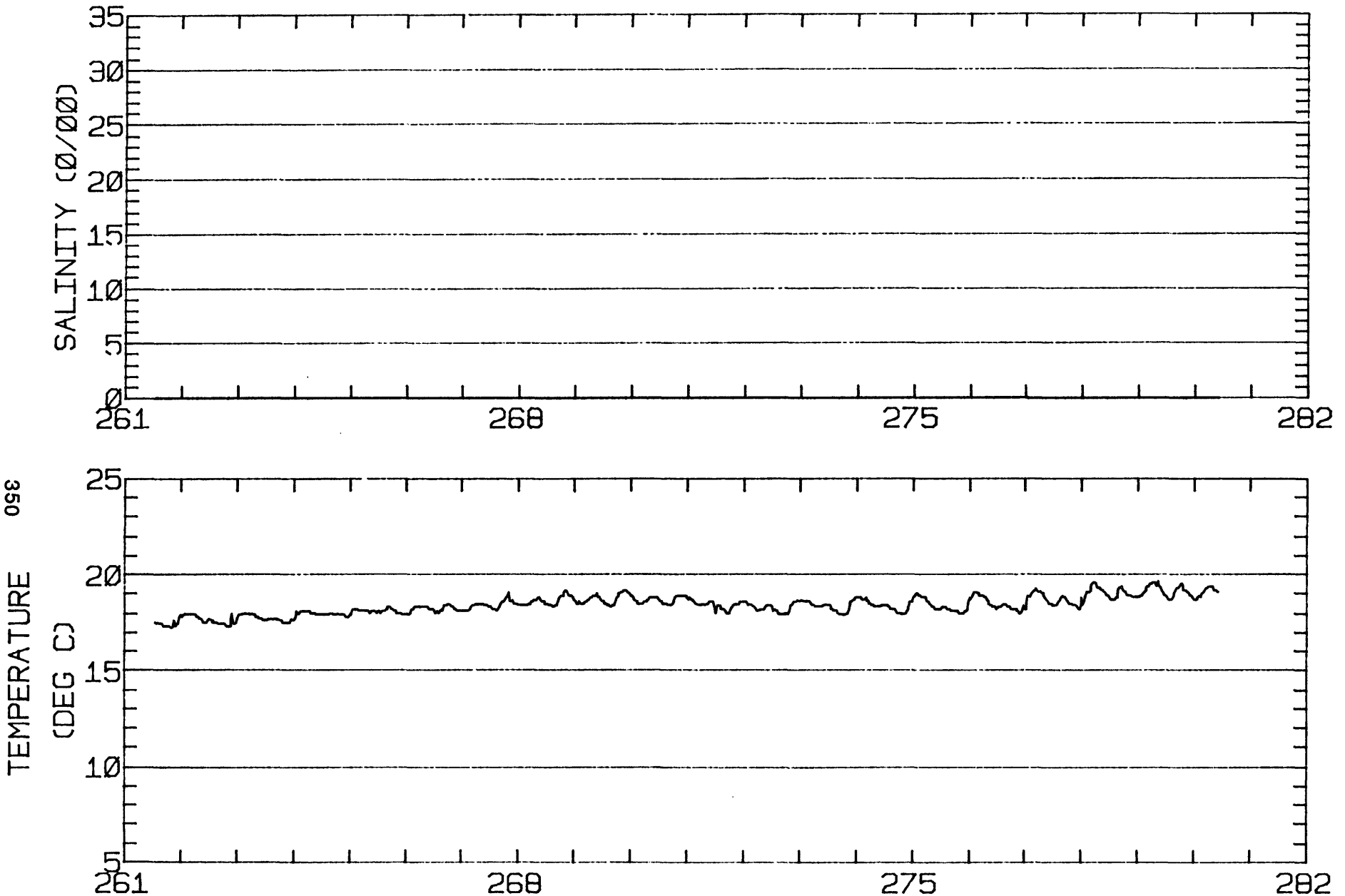
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.4	1.1	302.
2	12	-4.3	1.0	367.
3	12	4.2	1.9	273.
ALL	36	0.4	1.3	





JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-40W
METER 001.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 316 38- 3-43N 122-16-40W

METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 316
POSITION: 38 3'43"N 122 16'38"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES:10/ 6/80 1104 PST JULIAN DAY=280
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

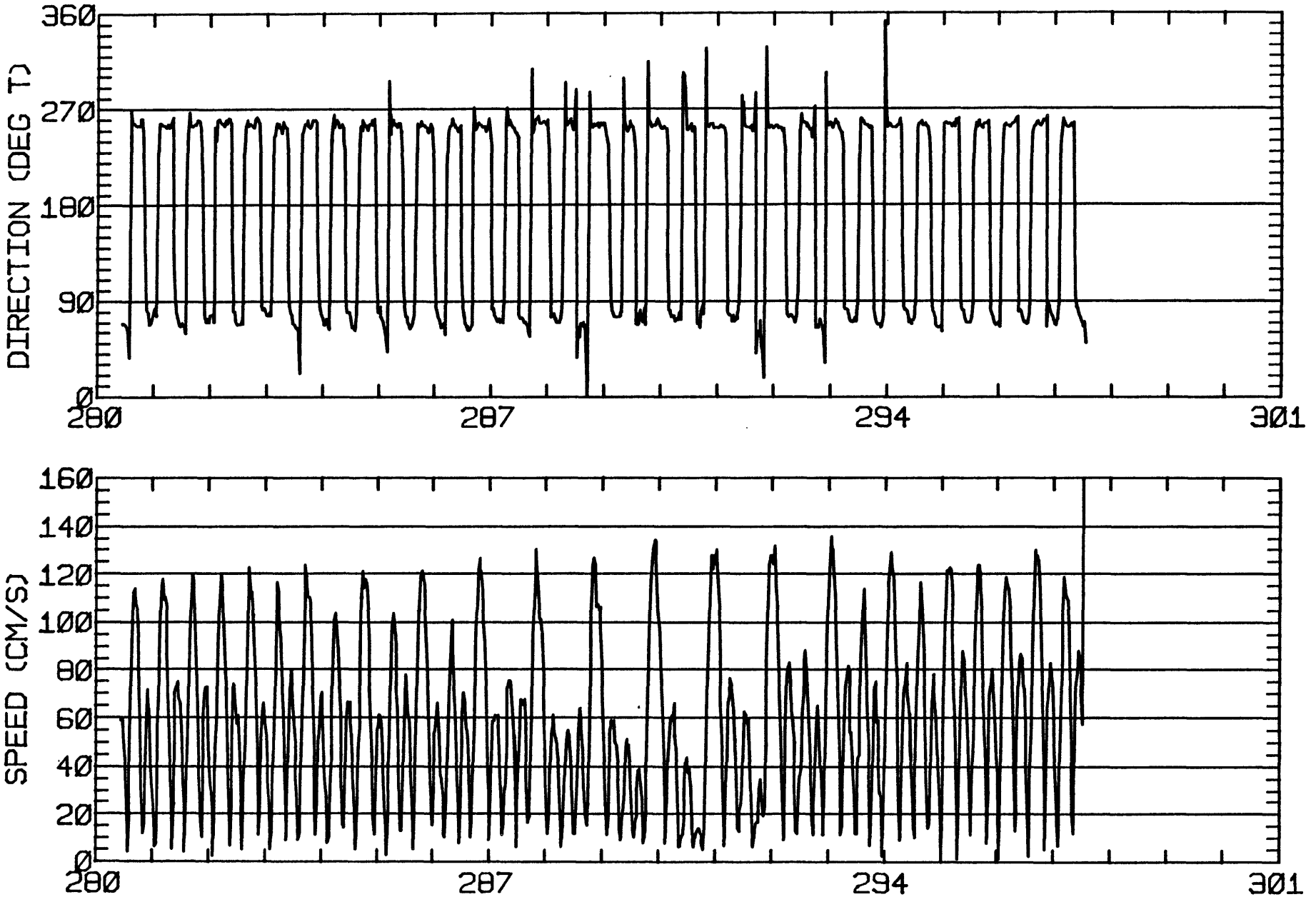
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
01	20.63	1.28	76.5	60.5	ANTI-CLOCKWISE
K1	26.31	1.72	75.9	69.8	ANTI-CLOCKWISE
N2	14.52	0.42	75.4	345.1	ANTI-CLOCKWISE
M2	85.35	2.28	74.7	359.6	ANTI-CLOCKWISE
S2	19.28	0.03	77.2	358.3	ANTI-CLOCKWISE
M4	3.10	1.71	95.3	269.1	ANTI-CLOCKWISE

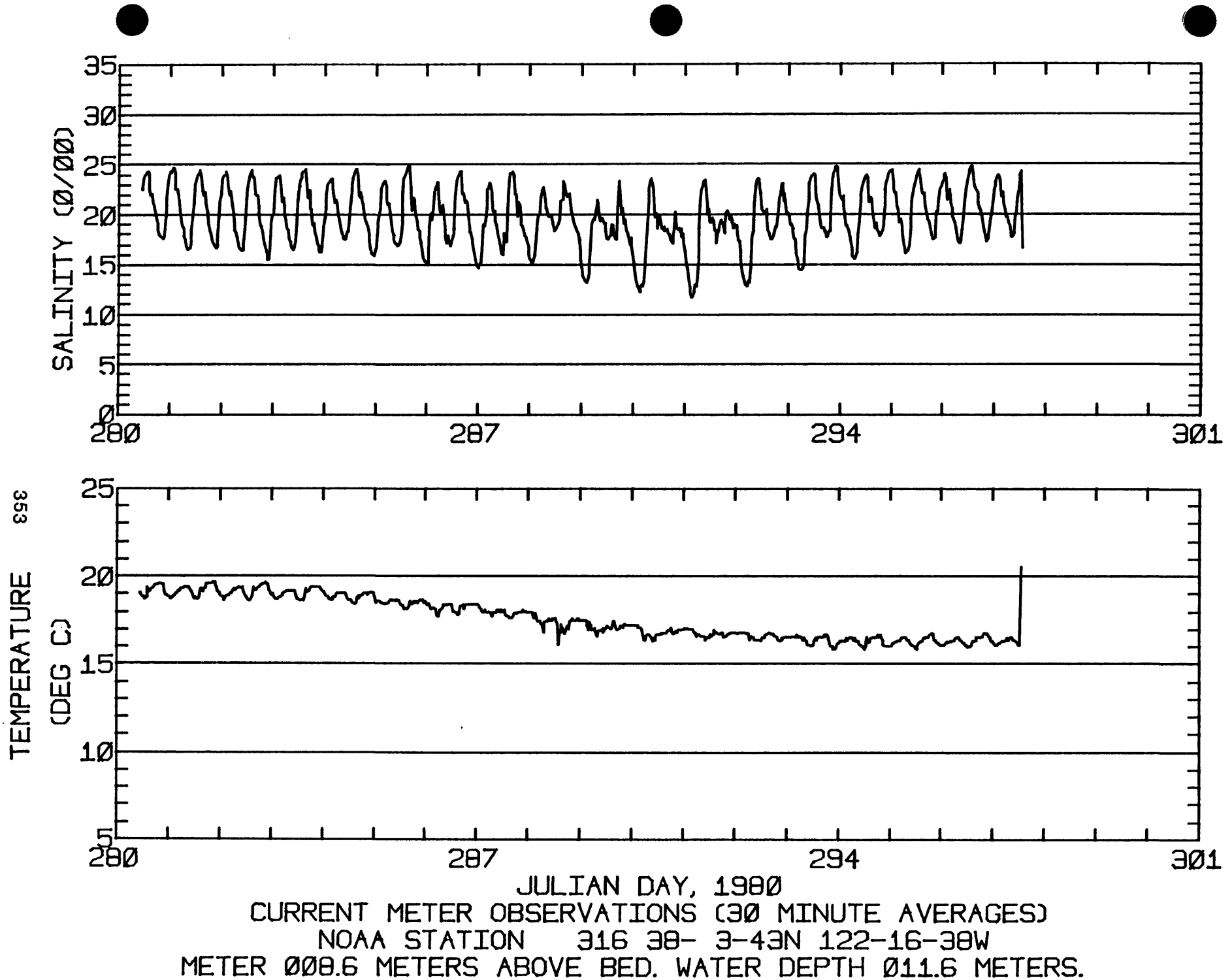
RMS SPEED: 69.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 151.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 60.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.45
STANDARD DEVIATION U-SERIES: 9.89 CM/SEC
STANDARD DEVIATION V SERIES: 5.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-19.7	-4.3	277.
2	12	-21.3	-5.0	224.
3	8	-20.8	-4.8	128.
ALL	32	-20.6	-4.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-38W
METER 008.6 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-38W
METER ØØ8.6 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 316
POSITION: 38 3'43"N 122 16'38"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:10/ 6/80 1110 PST JULIAN DAY=280
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

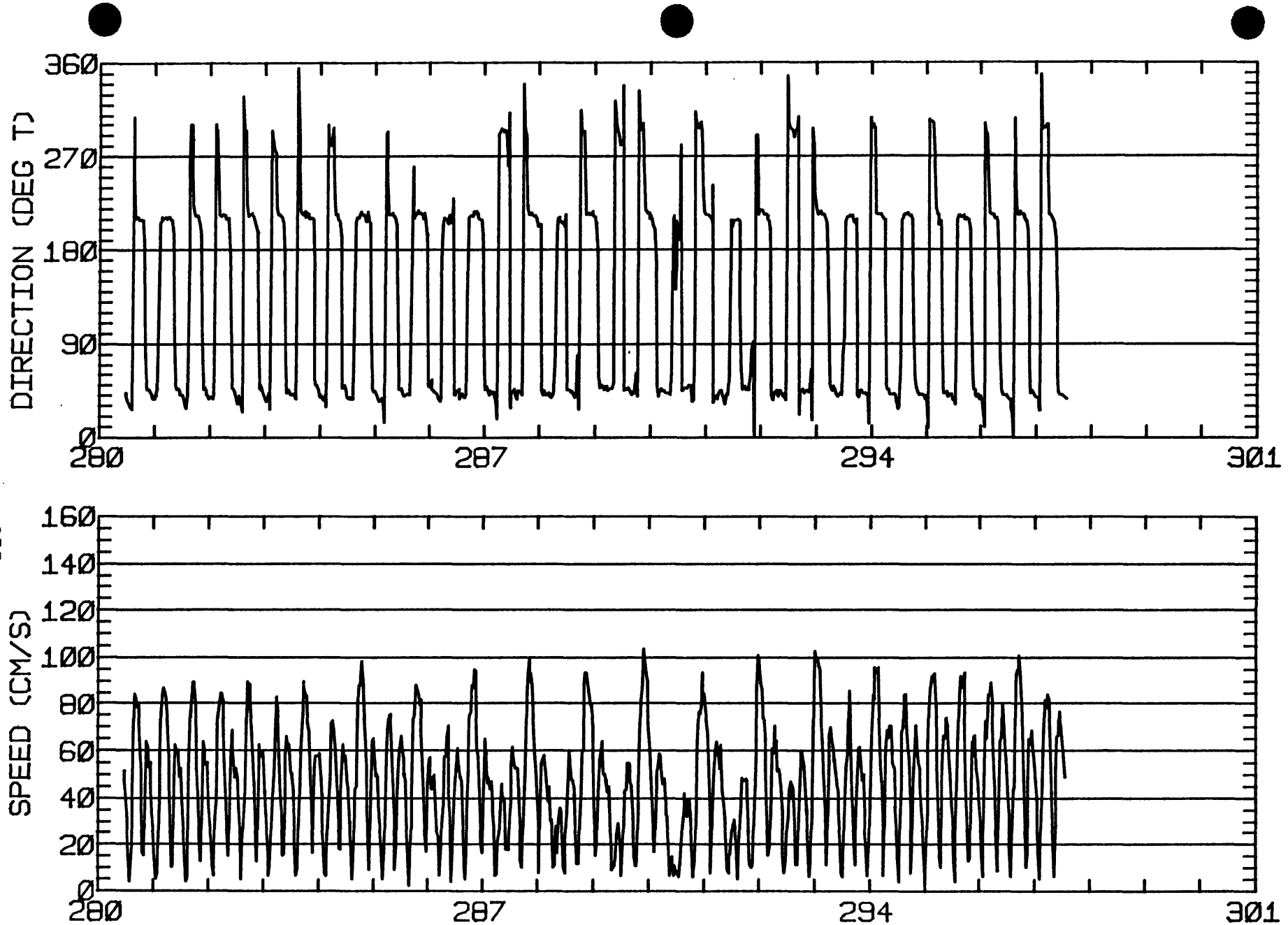
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.46	5.57	35.7	80.4	ANTI-CLOCKWISE
K1	20.30	0.65	40.0	71.6	CLOCKWISE
N2	11.61	1.14	45.5	353.8	ANTI-CLOCKWISE
M2	62.95	7.68	43.0	357.0	ANTI-CLOCKWISE
S2	16.15	1.68	36.4	5.6	ANTI-CLOCKWISE
M4	8.84	0.04	20.7	235.6	ANTI-CLOCKWISE

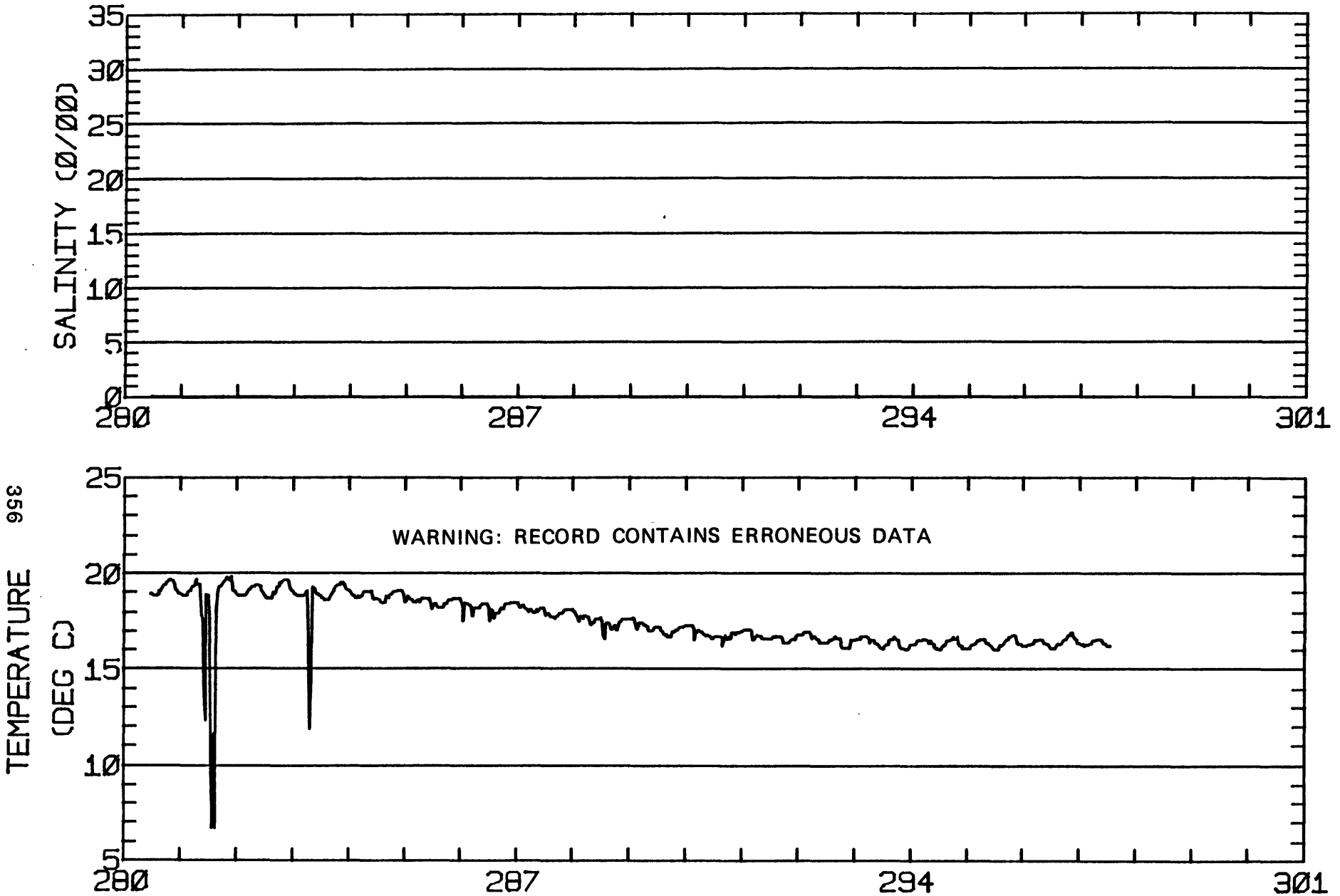
RMS SPEED: 53.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 116.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 40.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 7.90 CM/SEC
STANDARD DEVIATION V SERIES: 16.63 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.4	-5.5	277.
2	12	-0.4	2.0	224.
3	8	-3.6	-3.5	128.
ALL	32	-1.9	-2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-38W
METER 005.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 316 38- 3-43N 122-16-38W
METER Ø05.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 317
POSITION: 38 4'27"N 122 14'34"W
METER TYPE: AANDERAA
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 9/ 5/80 1000 PST JULIAN DAY=249
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

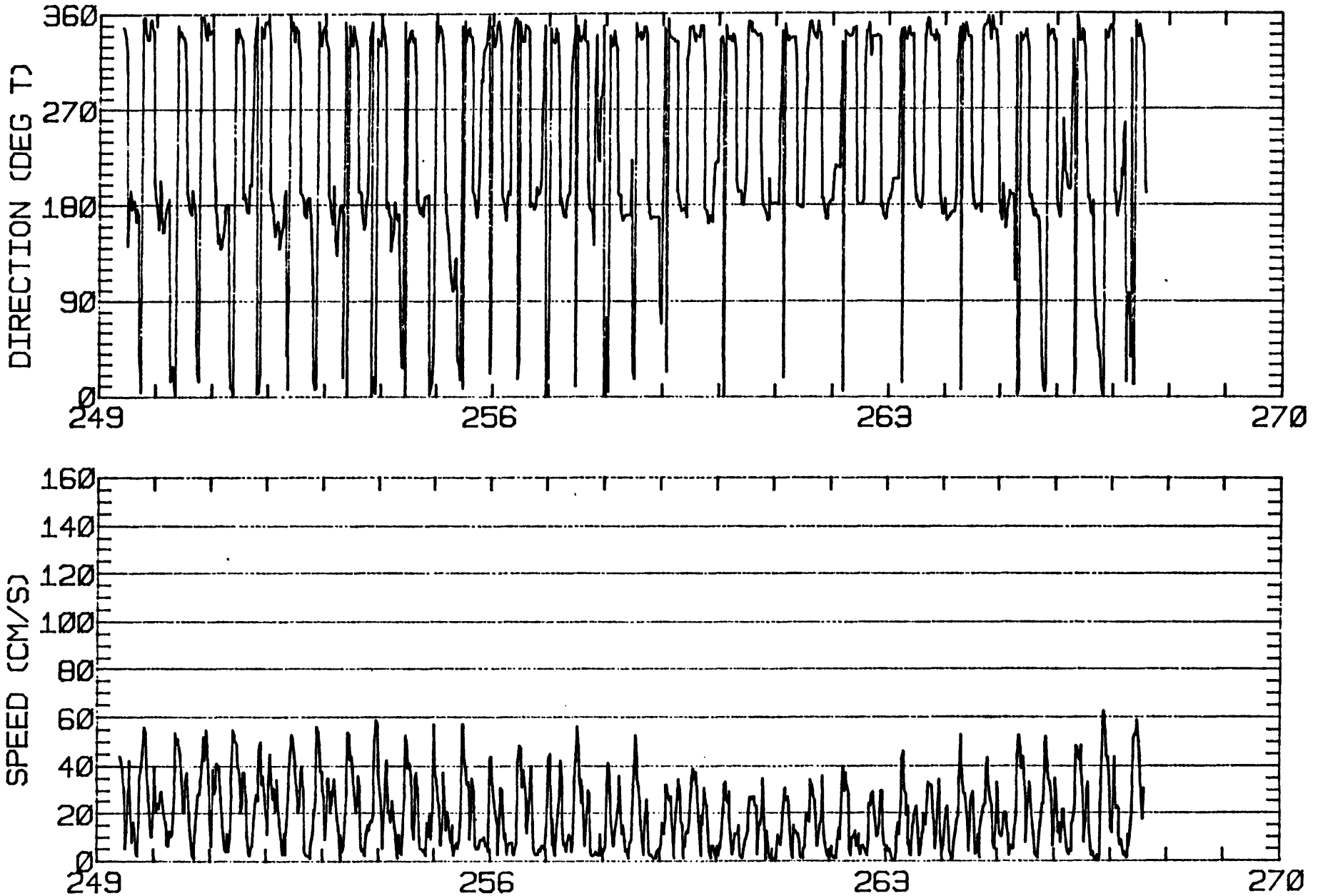
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.90	0.47	339.6	36.6	CLOCKWISE
K1	5.12	0.15	338.1	111.3	CLOCKWISE
N2	7.14	0.59	344.9	305.2	ANTI-CLOCKWISE
M2	28.16	2.71	347.4	323.0	ANTI-CLOCKWISE
S2	8.92	1.83	345.6	330.0	ANTI-CLOCKWISE
M4	7.59	0.19	344.4	348.3	CLOCKWISE

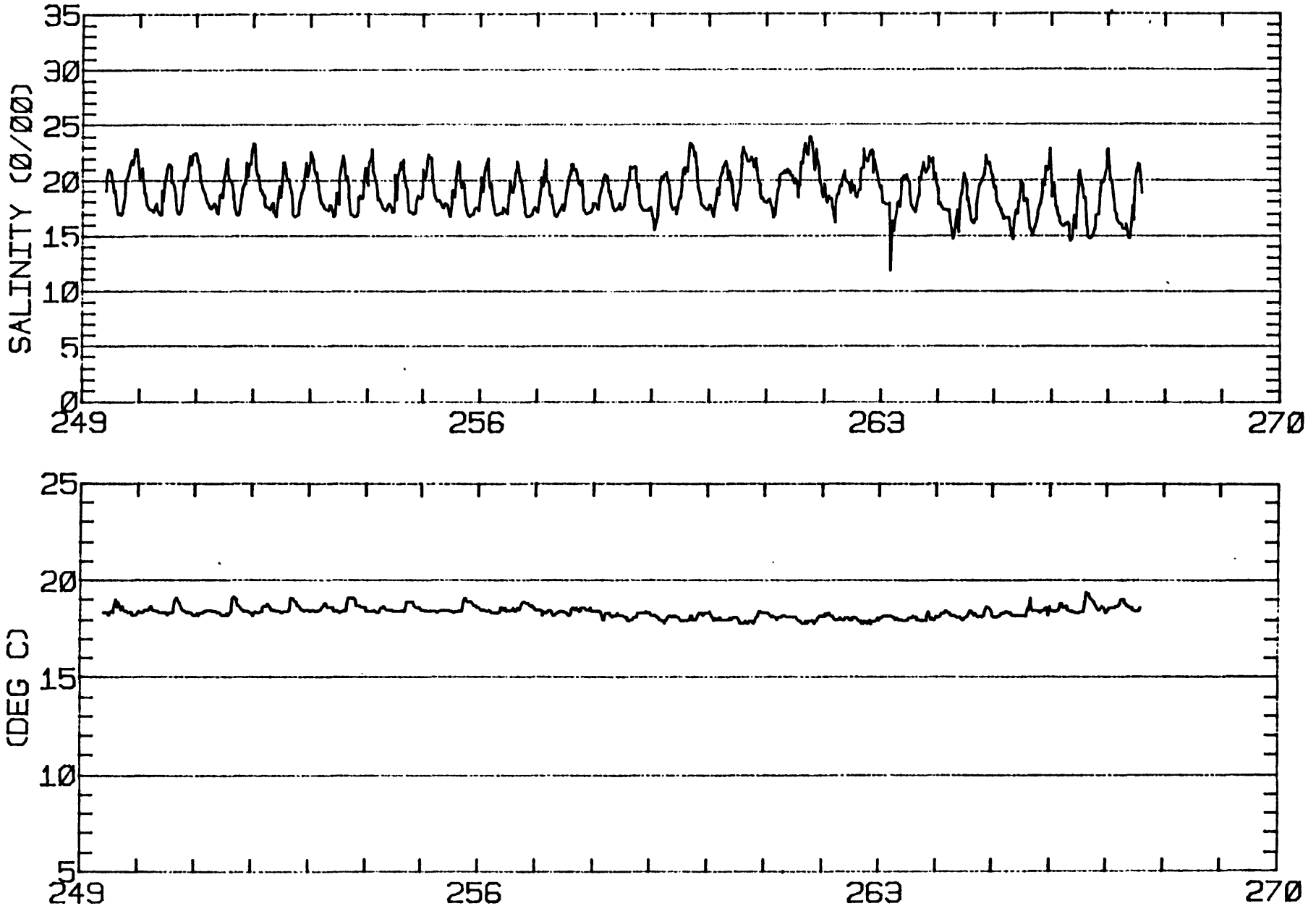
RMS SPEED: 25.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 46.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 345.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 5.19 CM/SEC
STANDARD DEVIATION V SERIES: 10.29 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.8	6.5	215.
2	12	-3.5	4.9	285.
3	10	-3.7	6.0	305.
ALL	34	-3.3	5.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 317 38- 4-27N 122-14-34W
.METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 317 38- 4-27N 122-14-34W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 317
POSITION: 38 4'26"N 122 14'32"W
METER TYPE: AANDERAA
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 9/23/80 1610 PST JULIAN DAY=267
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

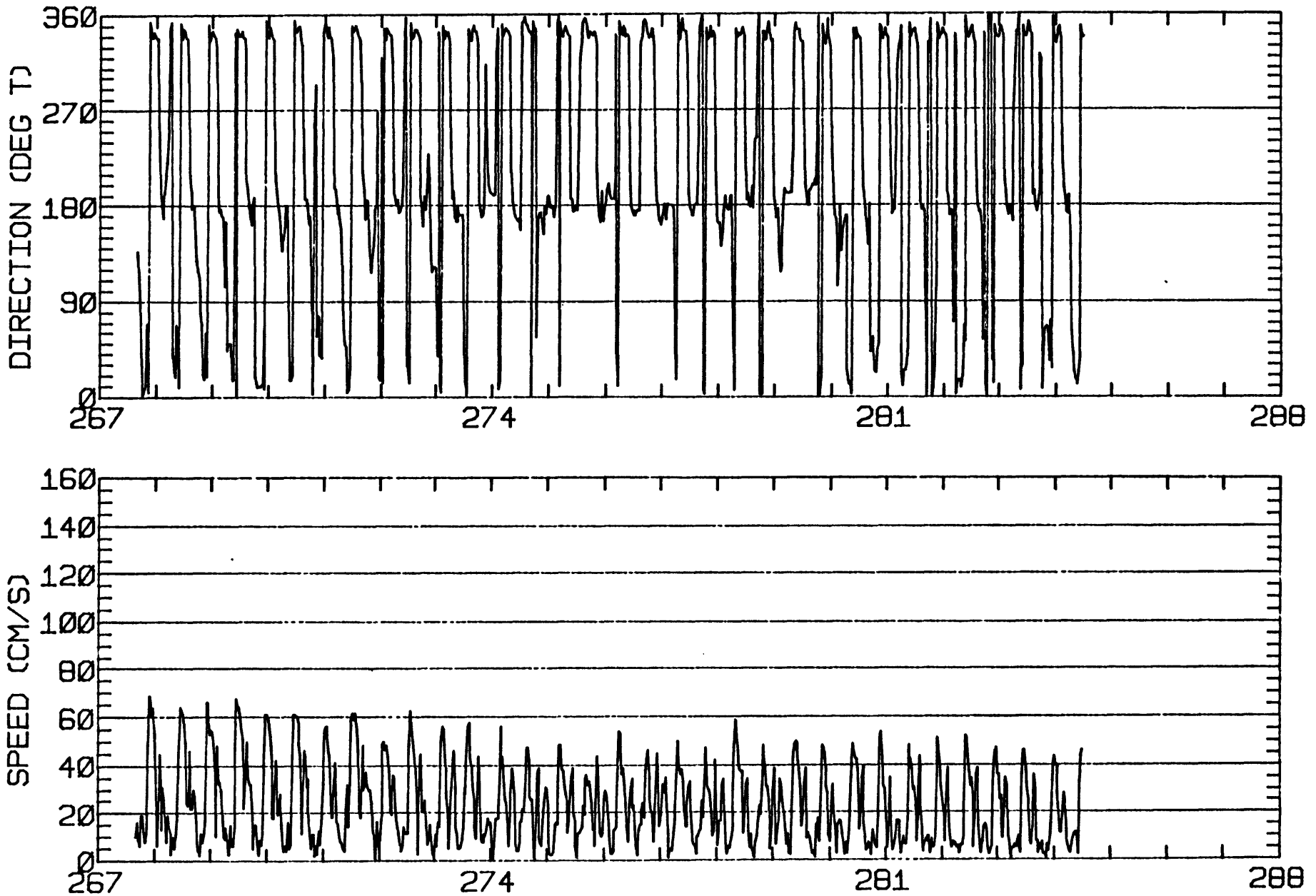
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.91	0.20	347.5	87.1	CLOCKWISE
K1	4.96	0.03	344.7	90.7	CLOCKWISE
N2	10.29	1.75	355.0	308.4	ANTI-CLOCKWISE
M2	25.73	3.99	346.8	324.9	ANTI-CLOCKWISE
S2	5.69	2.28	351.4	305.7	ANTI-CLOCKWISE
M4	12.46	0.83	347.6	5.6	ANTI-CLOCKWISE

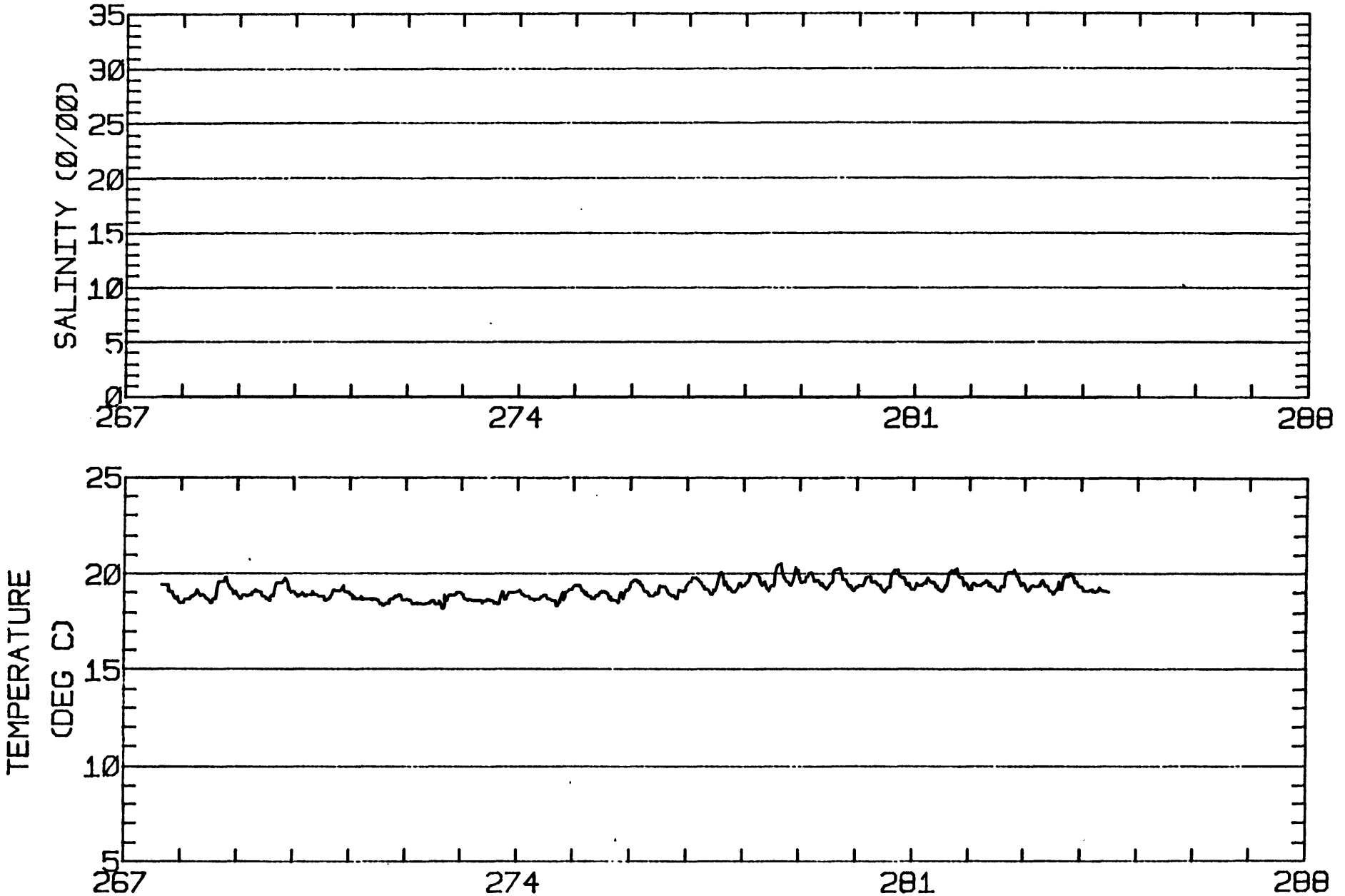
RMS SPEED: 29.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 41.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 20.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 347.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 5.50 CM/SEC
STANDARD DEVIATION V SERIES: 12.39 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.4	9.6	367.
2	12	-3.4	4.8	273.
3	8	-3.1	8.3	281.
ALL	32	-3.3	7.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 317 38- 4-26N 122-14-32W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 317 38- 4-26N 122-14-32W
. METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 317
POSITION: 38 4'26"N 122 14'32"W
METER TYPE: AANDERAA
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES:10/10/80 1210 PST JULIAN DAY=284
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

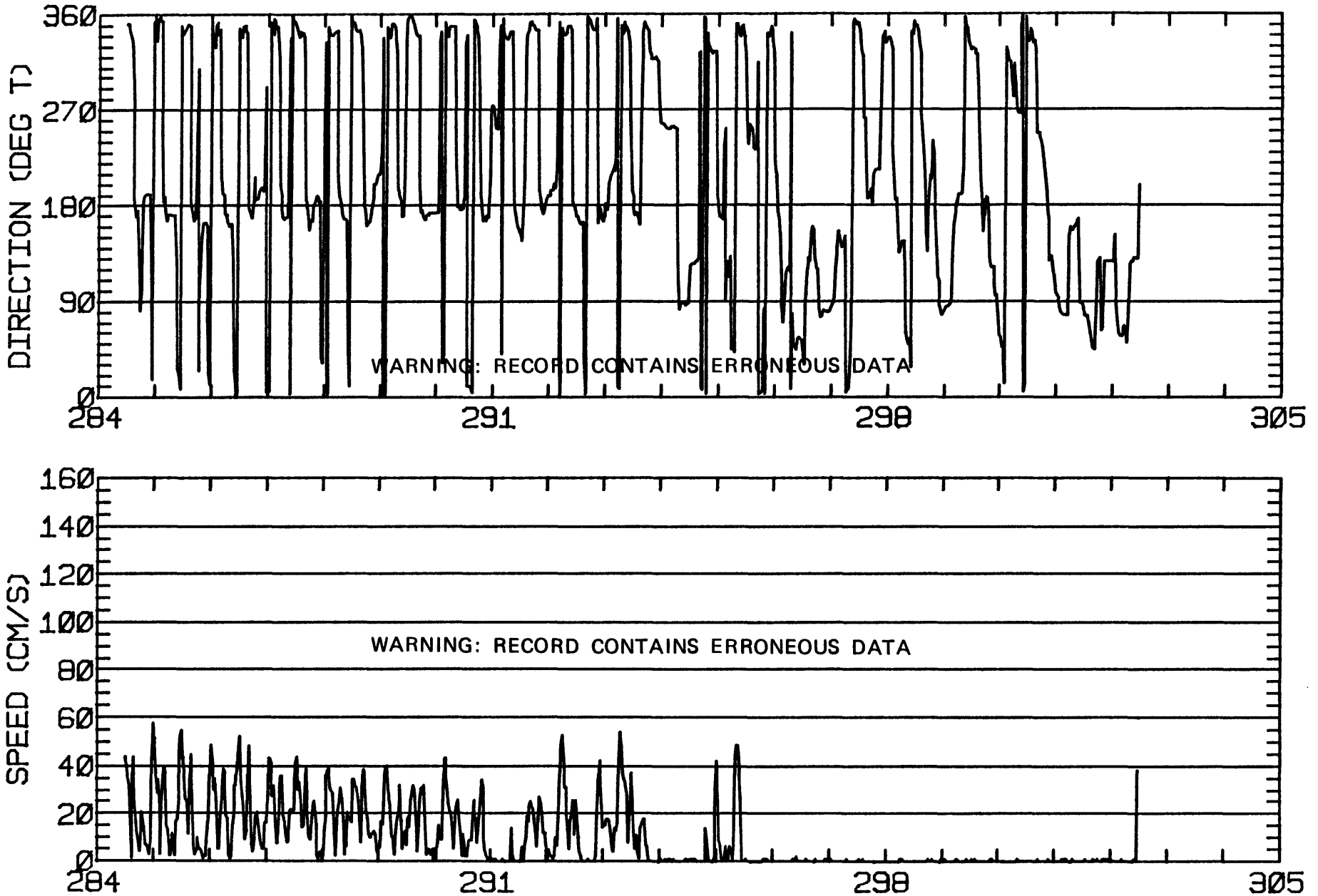
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.96	0.16	356.8	9.4	ANTI-CLOCKWISE
K1	6.76	0.06	359.0	77.2	CLOCKWISE
N2	18.17	0.10	353.7	339.4	ANTI-CLOCKWISE
M2	38.24	1.19	351.4	347.8	ANTI-CLOCKWISE
S2	13.15	1.10	350.9	320.4	ANTI-CLOCKWISE
M4	8.72	0.24	343.3	309.6	ANTI-CLOCKWISE

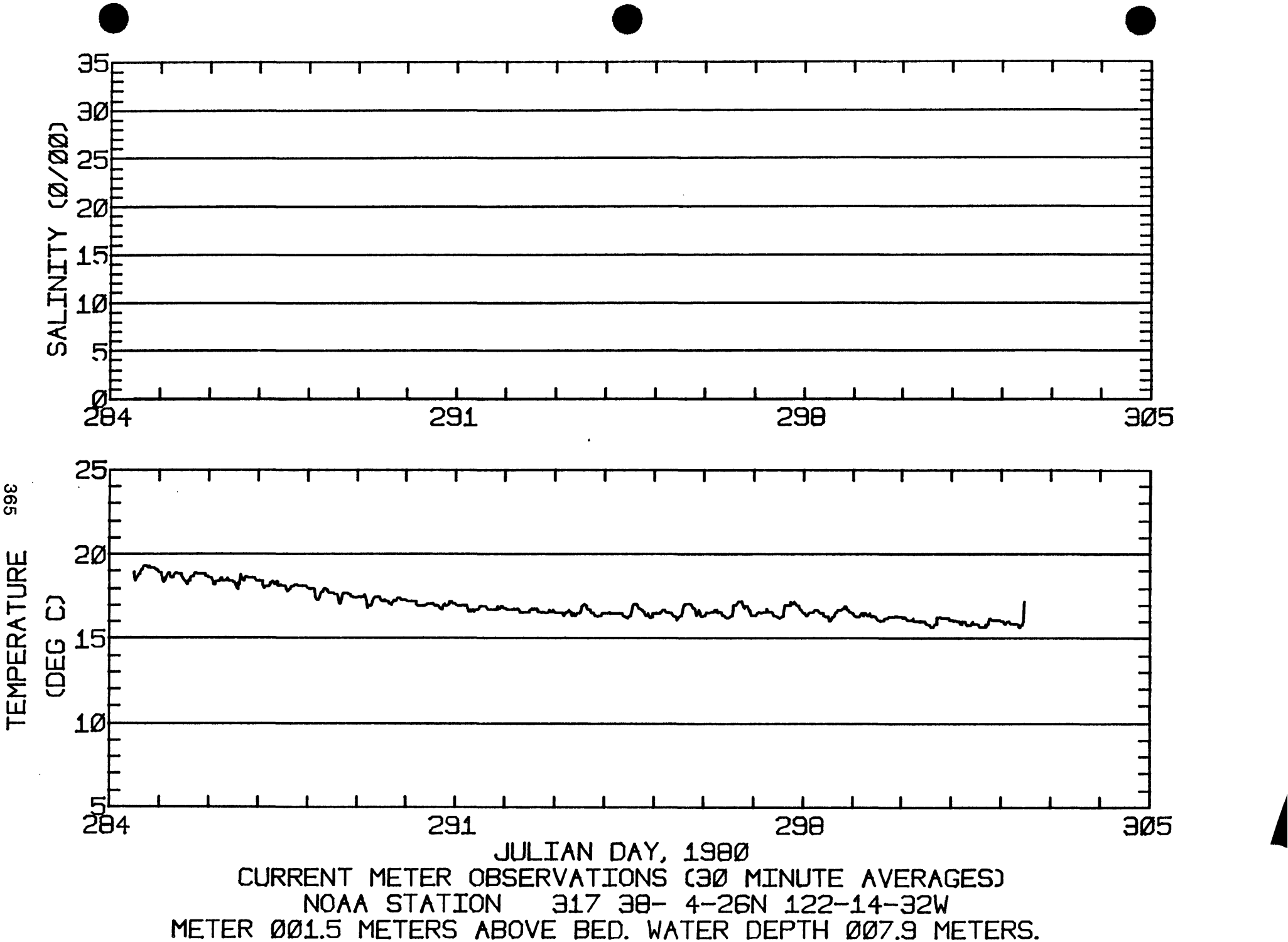
RMS SPEED: 25.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 62.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 352.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.21
STANDARD DEVIATION U-SERIES: 4.31 CM/SEC
STANDARD DEVIATION V SERIES: 11.02 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	-2.0	4.4	248.
ALL	10	-2.0	4.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 317 38- 4-26N 122-14-32W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 317 38- 4-26N 122-14-32W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 320
POSITION: 38 0'29"N 122 23'23"W
METER TYPE: AANDERAA
WATER DEPTH: 7.3 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES:10/ 2/80 1040 PST JULIAN DAY=276
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

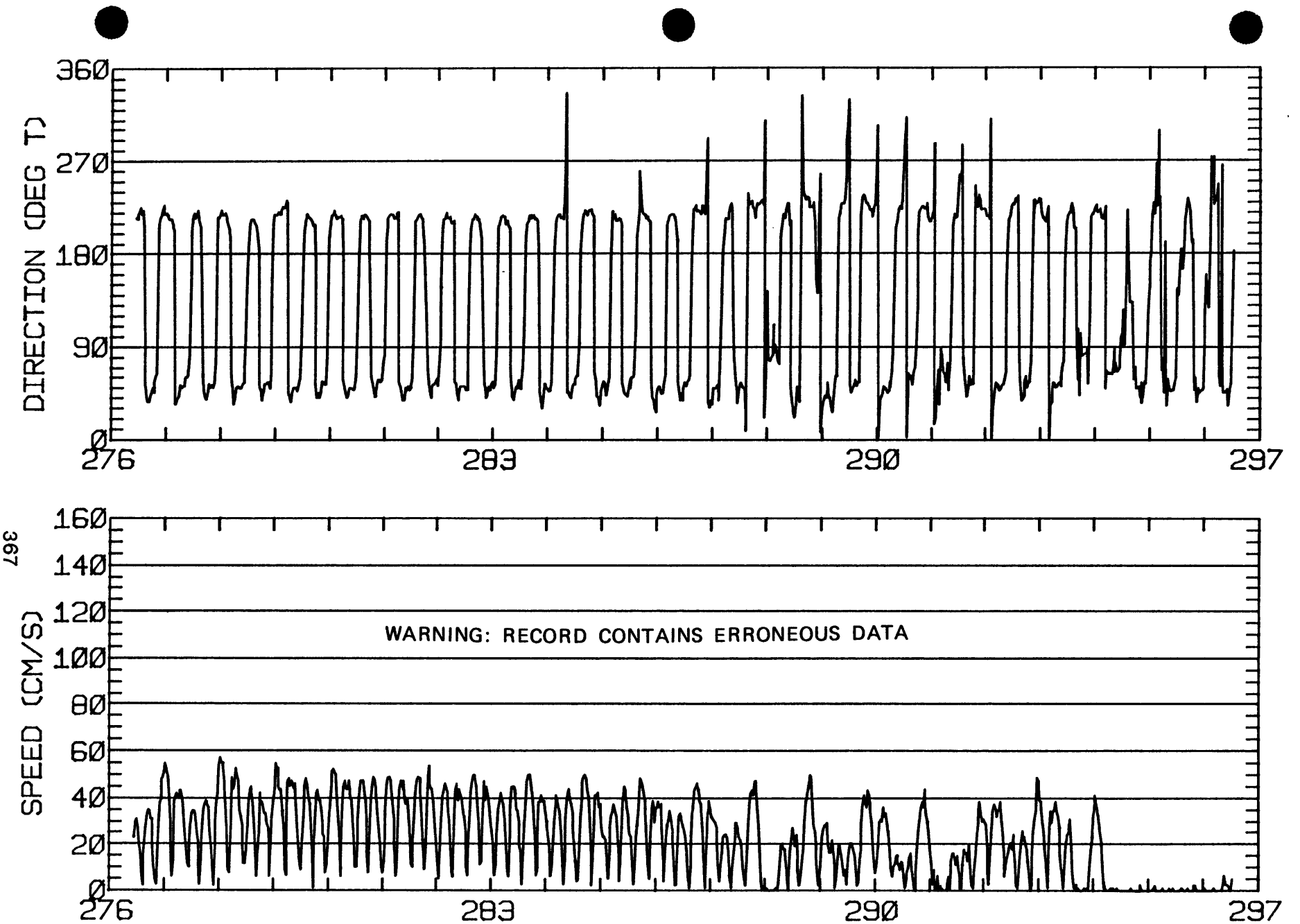
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.31	0.17	51.8	49.5	ANTI-CLOCKWISE
K1	8.77	0.37	45.0	45.9	CLOCKWISE
N2	12.21	1.03	43.5	298.5	CLOCKWISE
M2	44.66	1.31	43.1	312.8	CLOCKWISE
S2	13.32	0.20	42.5	300.3	CLOCKWISE
M4	3.36	0.67	27.0	160.8	ANTI-CLOCKWISE

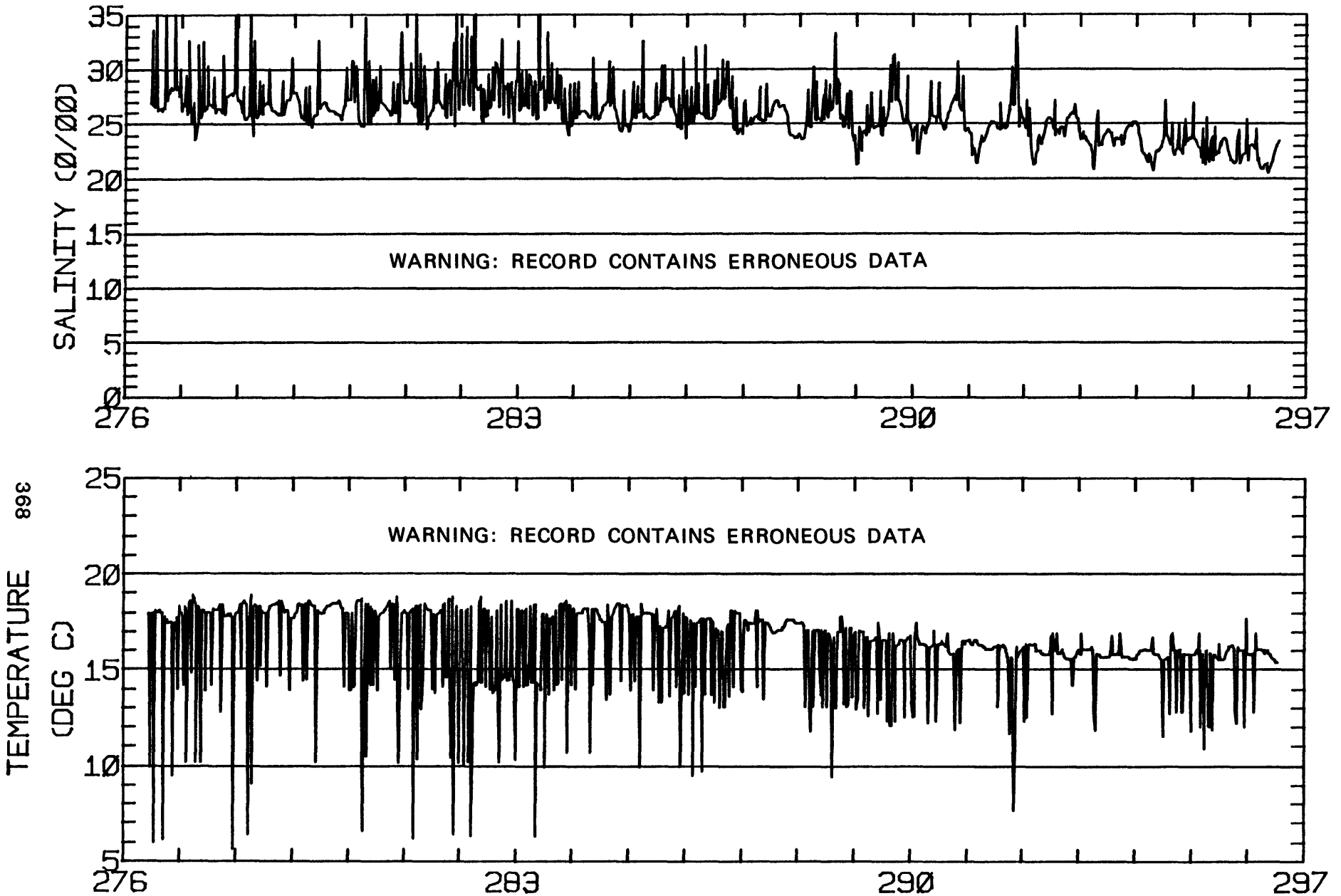
RMS SPEED: 34.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 75.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 44.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.29
STANDARD DEVIATION U-SERIES: 3.97 CM/SEC
STANDARD DEVIATION V SERIES: 5.02 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.4	-2.8	254.
2	8	1.9	-2.6	277.
ALL	20	2.8	-2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 320 38- 0-29N 122-23-23W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.3 METERS.

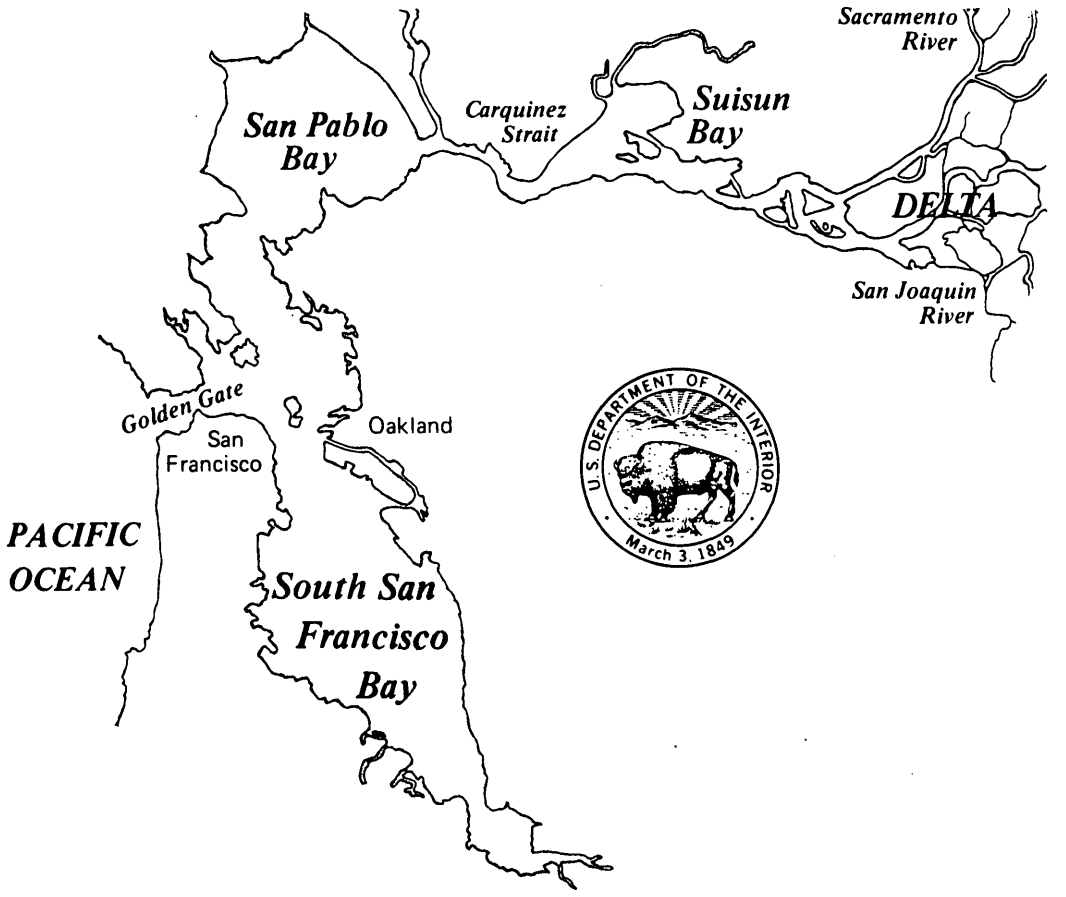


CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 320 38- 0-29N 122-23-23W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.3 METERS.

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART IV. RESULTS OF MEASUREMENTS IN CENTRAL BAY REGION

U. S. GEOLOGICAL SURVEY
WATER RESOURCES INVESTIGATIONS REPORT 84-4339



February 1984

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY, CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART IV. RESULTS OF MEASUREMENTS IN CENTRAL BAY REGION

by Ralph T. Cheng and Jeffrey W. Gartner

U. S. Geological Survey

Water Resources Investigations Report 84-4339

February 1984

UNITED STATES DEPARTMENT OF THE INTERIOR
William P. Clark, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

WATER RESOURCES INVESTIGATIONS REPORT

For additional information
write to:

Regional Hydrologist
Water Resources Division
U.S. Geological Survey
345 Middlefield Road, MS 466
Menlo Park, CA 94025

Copies of this report
can be purchased from:

Open-File Services Section
Western Distribution Branch
U.S. Geological Survey
Box 25425, Federal Center
Lakewood, CO 80225

CONTENTS

PART IV. RESULTS OF MEASUREMENTS IN CENTRAL BAY REGION

TABLES

ILLUSTRATIONS

APPENDICES

FIELD DATA

In Part IV of this report, we include data collected in the Central Bay region, which is the deepest and most complex embayment of the San Francisco Bay estuarine system (fig. IV.1). The Central Bay region is the junction between the Bay system and the Pacific Ocean. This region is also the junction of the northern reach of San Francisco Bay and South San Francisco Bay. For the purpose of this report, the area of coverage extends from Point San Pablo in the north to the Oakland-San Francisco Bay Bridge in the south, and a small region to the west of Golden Gate as indicated in figure IV.2. There is a small semi-enclosed sub-embayment (Richardson Bay) within Central Bay due north of Golden Gate and there are several islands within the region; namely, Angel Island, Treasure Island, and Alcatraz Island. Between Angel Island and the Tiburon Peninsula is Raccoon Strait where the tidal current is swift and the channel is as deep as 55 m. The water surrounding all sides of Angel Island is quite deep; however, the area to the southwest is more shallow and has a mean depth of 20 m. The deep regions east of Golden Gate take the form of a "T". There is a sill between Golden Gate and Alcatraz Island. Alcatraz Island is a small island; its existence is an indication that the bathymetry in the area surrounding Alcatraz varies rapidly. To the east of the deep zone in Central Bay is a vast area of shallow shoals (fig. IV.2). Because of the complicated basin bathymetry, the tidal circulation patterns are very complex in this region.

The region to the west of Golden Gate is a relatively deep outer basin which widens rapidly to the west of the narrow constriction at Golden Gate.

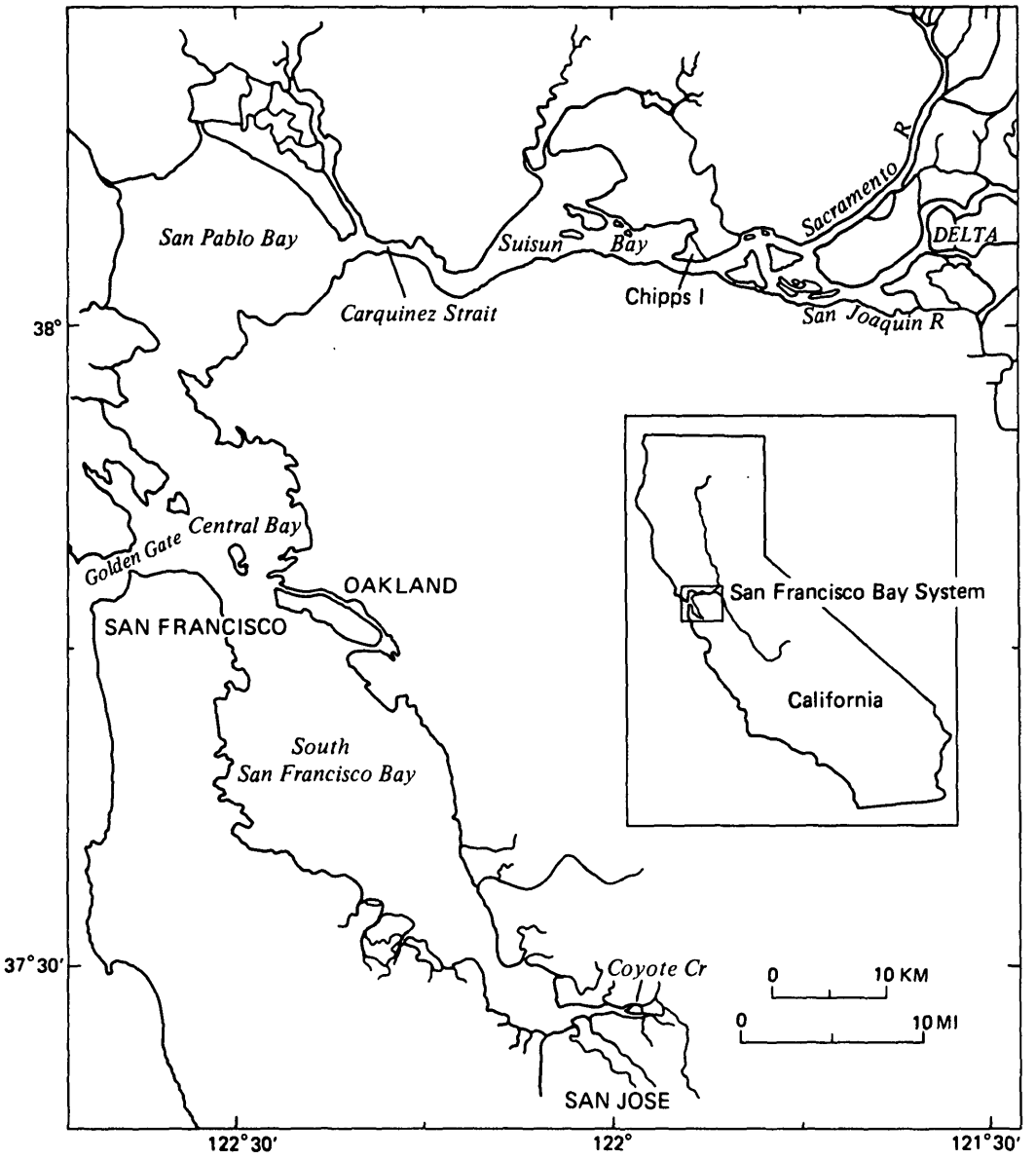


Figure IV.1. Map of San Francisco Bay estuarine system.

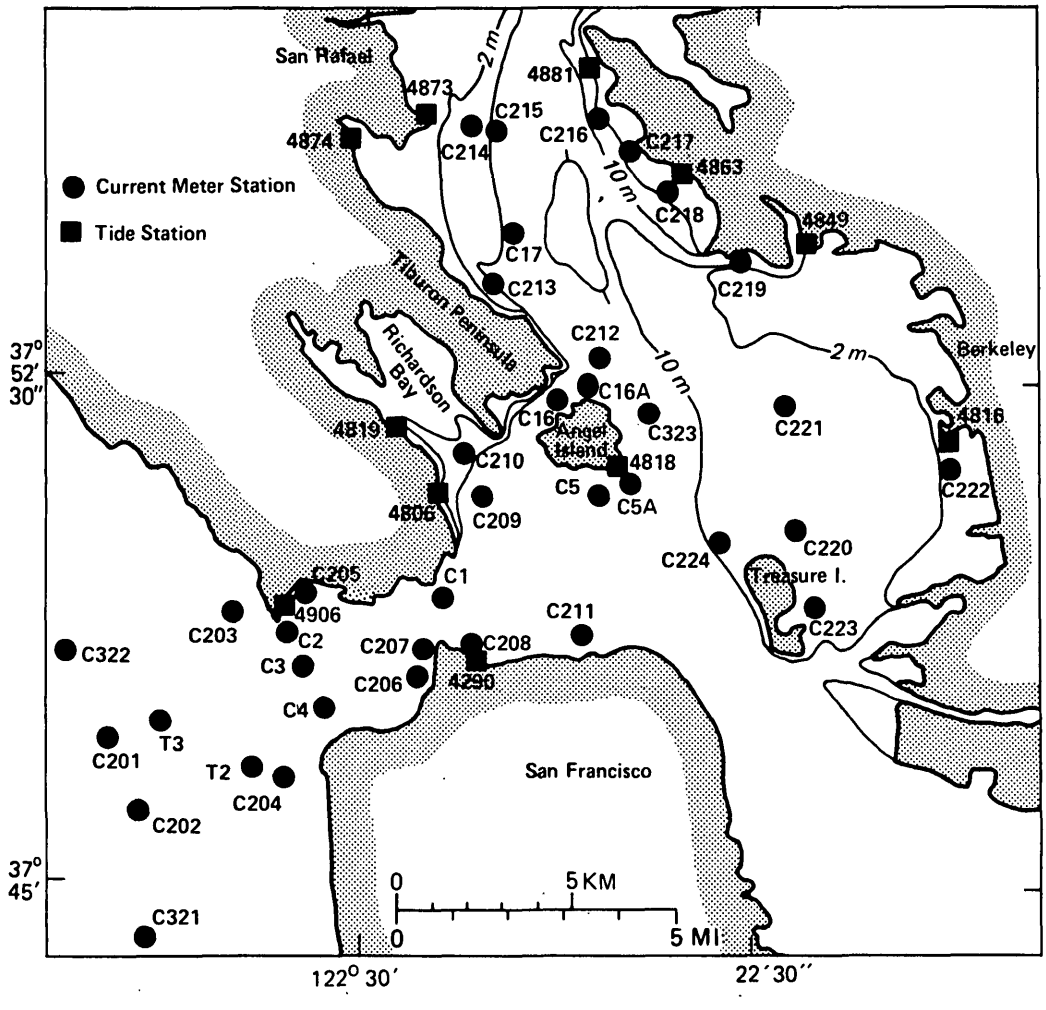


Figure IV.2. Map of Central Bay region and the location of current-meter moorings and tide stations.

The boundary of the outer basin narrows again where the Bay system actually meets the Pacific Ocean. Therefore the outer basin is really a unique sub-embayment of this region. The topographic features of the outer basin create some local circulation patterns which further complicate the complex circulation pattern in the region. The bathymetry in the Pacific Ocean near the mouth of the Bay system is also quite complex; there is a horse-shoe shaped region which is substantially shallower than the surrounding area. To facilitate further understanding of the flows in the Bay system, some current-meters have been deployed in this outer basin and in an area immediately outside of the opening of the Bay in the Pacific Ocean. Generally, the bathmetry in a tidal basin plays a dominant role in controlling the properties of tidal currents. The complex bathymetry within the Central Bay region is responsible for the complicated tidal circulation in this reigon.

As pointed out previously, in Central Bay there is a longitudinal salinity gradient along the main channel and salinity stratification in the vertical throughout the year. When the Delta outflows are at low values, the vertical salinity stratification diminishes, and salinity distribution along the main channel is influenced more by the oceanic salinity values of the Pacific Ocean. When Delta outflows are at peak values, the vertical salinity structure intensifies in response to the influx of the low salinity water from the Delta. When Delta outflows are high, the surface salinity values near the entrance of the Bay can be depressed to 20 o/oo (Dedini and others, 1981)*. Because water depth in this region is generally deeper than in other sub-embayments of the Bay, tidal circulation in this region exhibits characteristics of three-dimensional flow. The three-dimensional features become even more pronounced when the residual

*All references are listed in Part I of this report.

circulation due to density stratification (gravitational circulation) is examined.

Other than in winter months, the prevailing wind over the Central Bay region is westerly and steady, and there is a diurnal pattern in wind speed during the summer and fall months. In winter months, the climate in this region is strongly affected by the storms originating in the Pacific Ocean. In summary, there are four important factors which influence circulation and affect the current-meter data in the Central Bay region; they are the basin bathymetry, tides, winds, and salinity stratification. The depth and rapid variation of the basin bathymetry are responsible for the unique three-dimensional characteristics of the tidal circulation in the Central Bay region of the San Francisco Bay system.

Current-meter data

Thirty-eight (38) current-meter stations were deployed in the Central Bay region by the USGS and NOS/NOAA during the combined current survey in 1979 and 1980. Because this embayment is generally deep, several multiple current-meter stations were deployed in Central Bay region. In addition, several current-meter stations were deployed west of Golden Gate adjacent to the opening of the Bay. The minimum length of current-meter deployment was fifteen days, and the maximum deployment was not to exceed thirty-five days. Figure IV.2 depicts the approximate geographic location of the current-meter stations in this region. The precise latitude and longitude, and the water depth for each current-meter station at MLLW are compiled in table IV.1. Also inlcuded in table IV.1 are the depths at which the current meters were deployed, and the deployment and recovery dates for all data included in this part of the report. Figure IV.3 is a chronolgoical

TABLE IV.1. Endeco current meter deployments between 1 January 1979 and 31 December 1980 in Central Bay.

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
GSC1	37°	49.2'	122°	28.4'	92 80	106 80	GSC001B1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	106 80	127 80	GSC001C1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	127 80	148 80	GSC001D1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	149 80	168 80	GSC001E1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	168 80	191 80	GSC001F1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	191 80	212 80	GSC001G1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	212 80	225 80	GSC001H1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	226 80	241 80	GSC001I1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	241 80	260 80	GSC001J1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	260 80	273 80	GSC001K1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	273 80	289 80	GSC001L1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	289 80	303 80	GSC001M1	97.5	85.4
GSC1	37°	49.2'	122°	28.4'	303 80	324 80	GSC001N1	97.5	85.4
GSC5A	37°	50.7'	122°	25.4'	254 79	283 79	GSC05AA1	24.3	18.3
GSC5A	37°	50.8'	122°	25.4'	134 80	143 80	GSC05AC1	24.3	18.3
GSC201	37°	46.9'	122°	37.0'	256 79	271 79	GSC201A1	11.2	4.2
GSC201	37°	46.9'	122°	37.0'	271 79	298 79	GSC201B1	11.2	4.2
GSC202	37°	45.5'	122°	36.3'	256 79	271 79	GSC202A1	11.5	4.2
GSC202	37°	45.5'	122°	36.3'	271 79	275 79	GSC202B1	11.5	4.2
GSC202	37°	45.5'	122°	36.3'	276 79	295 79	GSC202C1	11.5	4.5
GSC203	37°	49.0'	122°	32.7'	255 79	271 79	GSC203A1	10.6	4.2
GSC203	37°	49.0'	122°	32.7'	271 79	275 79	GSC203B1	10.6	4.6
GSC204	37°	46.1'	122°	31.5'	271 79	298 79	GSC204B1	14.3	4.6
GSC209	37°	50.7'	122°	27.5'	253 79	268 79	GSC209A1	24.3	21.3
GSC209	37°	50.7'	122°	27.5'	253 79	268 79	GSC209A2	24.3	12.2
GSC211	37°	48.9'	122°	25.8'	254 79	285 79	GSC211A1	21.6	15.6
GSC211	37°	48.9'	122°	25.8'	285 79	312 79	GSC211B1	21.6	15.6
GSC211	37°	48.9'	122°	25.9'	312 79	341 79	GSC211C1	21.6	15.6
GSC211	37°	48.9'	122°	25.9'	341 79	16 80	GSC211D1	21.6	7.6
GSC211	37°	48.9'	122°	26.8'	16 80	51 80	GSC211E2	16.4	2.7
GSC212	37°	53.1'	122°	24.7'	318 80	336 80	GSC212A1	11.8	7.6
GSC215	37°	56.5'	122°	27.3'	264 79	295 79	GSC215A1	12.5	5.8
GSC217	37°	55.9'	122°	24.6'	270 79	290 79	GSC217A1	6.7	3.7
GSC220	37°	50.7'	122°	21.7'	282 79	299 79	GSC220A1	5.7	2.7

*Water depth in meters referenced to MLLW

†Meter depth in meters above bed

TABLE IV.1 (cont) . Aanderaa current meter deployments between 1 January 1979 and 31 December 1980 in Central Bay.

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C001	37°	49.2'	122°	28.5'	36 79	56 79	1672	97.6	91.5
C001	37°	49.2'	122°	28.5'	36 79	47 79	1673	97.6	85.4
C001	37°	49.2'	122°	28.5'	36 79	58 79	1674	97.6	45.8
C001	37°	49.2'	122°	28.5'	36 79	58 79	1675	97.9	7.6
C001	37°	49.2'	122°	28.5'	54 79	58 79	1700	97.6	91.5
C001	37°	49.2'	122°	28.5'	47 79	58 79	1689	97.6	85.4
C001	37°	49.2'	122°	28.4'	58 79	88 79	1711	98.8	91.5
C001	37°	49.2'	122°	28.4'	58 79	88 79	1712	98.8	85.4
C001	37°	49.3'	122°	28.3'	88 79	115 79	1739	97.9	91.5
C001	37°	49.3'	122°	28.3'	88 79	117 79	1741	97.9	45.7
C001	37°	49.3'	122°	28.5'	88 79	117 79	1742	97.9	7.6
C001	37°	49.2'	122°	28.3'	117 79	127 79	1763	97.6	91.5
C001	37°	49.2'	122°	28.3'	115 79	127 79	1764	97.9	85.4
C001	37°	49.2'	122°	28.3'	117 79	127 79	1765	97.6	45.8
C001	37°	49.2'	122°	28.3'	117 79	127 79	1766	97.6	7.6
C001	37°	49.2'	122°	28.4'	253 79	285 79	1823	97.3	85.4
C001	37°	49.2'	122°	28.4'	253 79	285 79	1824	97.3	76.3
C001	37°	49.2'	122°	28.4'	253 79	285 79	1825	97.3	7.6
C001	37°	49.2'	122°	28.4'	292 79	312 79	1892	95.5	85.4
C001	37°	49.2'	122°	28.4'	292 79	312 79	1893	95.5	76.3
C001	37°	49.2'	122°	28.4'	292 79	312 79	1894	95.5	7.6
C001	37°	49.2'	122°	28.4'	311 79	334 79	1924	97.6	85.4
C001	37°	49.2'	122°	28.4'	311 79	334 79	1925	97.6	76.3
C001	37°	49.2'	122°	28.4'	311 79	334 79	1926	97.6	7.7
C001	37°	49.2'	122°	28.4'	333 79	341 79	1941	96.1	85.4
C001	37°	49.2'	122°	28.4'	333 79	341 79	1942	96.1	76.3
C001	37°	49.2'	122°	28.4'	333 79	341 79	1943	96.1	7.7
C001	37°	49.2'	122°	28.4'	92 80	106 80	1955	99.4	76.2
C001	37°	49.2'	122°	28.4'	92 80	106 80	1957	99.4	7.6
C001	37°	49.2'	122°	28.3'	106 80	127 80	1988	95.5	45.8
C001	37°	49.2'	122°	28.3'	106 80	127 80	1989	95.5	7.7
C001	37°	49.2'	122°	28.4'	148 80	168 80	2051	97.6	76.3
C001	37°	49.2'	122°	28.4'	148 80	168 80	2053	97.6	7.6
C001	37°	49.2'	122°	28.4'	168 80	191 80	2087	97.0	7.6
C001	37°	49.2'	122°	28.4'	191 80	196 80	2121	97.9	76.2
C001	37°	49.2'	122°	28.4'	191 80	196 80	2122	97.9	45.7
C001	37°	49.2'	122°	28.4'	196 80	212 80	2135	97.3	76.3
C001	37°	49.2'	122°	28.4'	196 80	212 80	2136	97.3	45.8
C001	37°	49.2'	122°	28.4'	196 80	212 80	2137	97.3	7.6
C001	37°	49.2'	122°	28.4'	212 80	225 80	2162	98.2	76.2
C001	37°	49.2'	122°	28.4'	212 80	225 80	2164	98.2	7.6
C001	37°	49.2'	122°	28.4'	225 80	241 80	2187	97.0	76.0
C001	37°	49.2'	122°	28.4'	225 80	241 80	2188	97.0	45.8
C001	37°	49.2'	122°	28.4'	241 80	261 80	2216	97.3	76.3
C001	37°	49.2'	122°	28.4'	260 80	273 80	2247	97.0	76.3
C001	37°	49.2'	122°	28.4'	260 80	273 80	2248	97.0	45.8
C001	37°	49.2'	122°	28.4'	260 80	273 80	2249	97.0	7.6

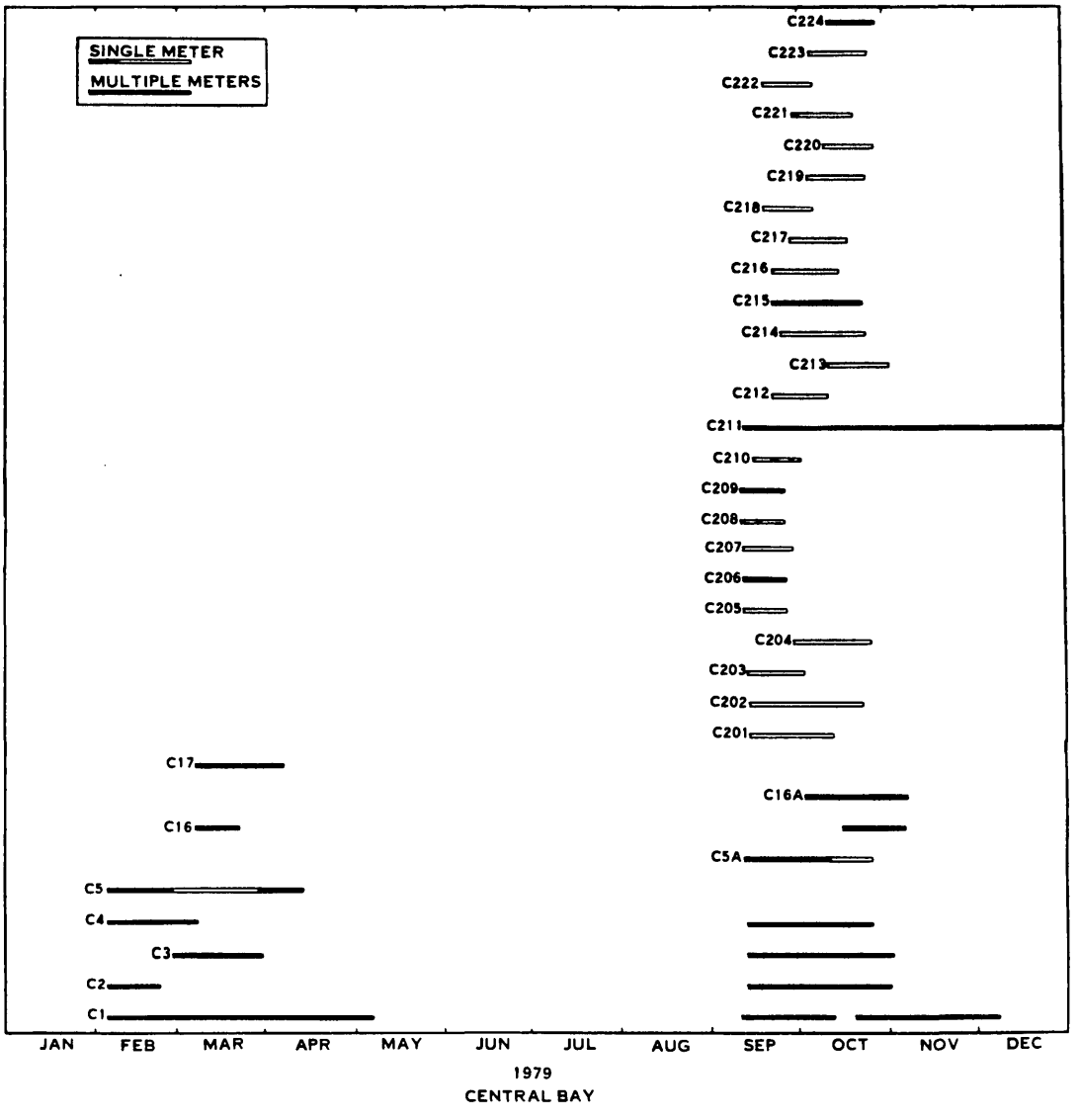
STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C001	37°	49.2'	122°	28.3'	273 80	289 80	2271	97.6	45.8
C001	37°	49.2'	122°	28.3'	273 80	289 80	2272	97.6	7.6
C001	37°	49.2'	122°	28.3'	288 80	303 80	2296	97.6	7.6
C001	37°	49.2'	122°	28.3'	303 80	324 80	2320	97.6	76.3
C001	37°	49.2'	122°	28.3'	302 80	324 80	2321	97.6	45.8
C001	37°	49.2'	122°	28.3'	302 80	324 80	2322	97.6	7.6
C002	37°	48.7'	122°	31.7'	36 79	54 79	1676	18.9	12.2
C002	37°	48.7'	122°	31.7'	36 79	54 79	1677	18.9	6.1
C002	37°	48.7'	122°	31.3'	255 79	289 79	1835	35.7	23.5
C002	37°	48.7'	122°	31.3'	255 79	289 79	1836	35.7	7.6
C002	37°	48.7'	122°	31.3'	255 79	289 79	1837	35.4	1.9
C002	37°	48.7'	122°	31.3'	289 79	304 79	1882	36.6	23.5
C002	37°	48.7'	122°	31.3'	289 79	304 79	1883	36.6	7.6
C002	37°	48.7'	122°	31.3'	289 79	298 79	1884	36.6	1.8
T002	37°	46.3'	122°	32.1'	105 80	130 80	1983	15.2	1.5
C003	37°	48.1'	122°	31.0'	58 79	89 79	1702	36.9	31.1
C003	37°	48.1'	122°	31.0'	58 79	89 79	1704	36.9	7.6
C003	37°	48.1'	122°	31.1'	255 79	289 79	1839	37.2	25.0
C003	37°	48.1'	122°	31.1'	255 79	289 79	1840	37.2	11.9
C003	37°	48.1'	122°	31.1'	284 79	304 79	1878	37.8	31.1
C003	37°	48.1'	122°	31.1'	284 79	305 79	1879	37.8	25.0
C003	37°	48.1'	122°	31.1'	284 79	305 79	1880	37.8	11.9
C003	37°	48.1'	122°	31.1'	94 80	107 80	1966	36.3	31.1
C003	37°	48.1'	122°	31.1'	94 80	107 80	1967	36.3	25.0
C003	37°	48.1'	122°	31.1'	94 80	107 80	1968	36.3	7.5
C003	37°	48.1'	122°	31.1'	107 80	134 80	1993	36.9	31.1
C003	37°	48.1'	122°	31.1'	107 80	134 80	1994	36.9	25.0
C003	37°	48.1'	122°	31.1'	107 80	134 80	1995	36.9	7.6
T003	37°	47.3'	122°	35.3'	105 80	129 80	1985	15.2	1.5
C004	37°	47.8'	122°	30.7'	36 79	67 79	1681	48.2	42.1
C004	37°	47.8'	122°	30.7'	36 79	67 79	1682	48.2	36.0
C004	37°	47.8'	122°	30.7'	36 79	67 79	1683	48.2	7.6
C004	37°	47.8'	122°	30.7'	255 79	265 79	1841	48.2	42.1
C004	37°	47.8'	122°	30.7'	255 79	290 79	1842	48.2	36.0
C004	37°	47.8'	122°	30.7'	255 79	290 79	1843	48.2	7.6
C004	37°	47.7'	122°	30.7'	289 79	298 79	1885	46.7	42.1
C004	37°	47.7'	122°	30.7'	289 79	298 79	1886	46.7	36.0
C004	37°	47.7'	122°	30.7'	289 79	298 79	1887	46.7	7.7
C004	37°	47.7'	122°	30.7'	289 79	304 79	1888	46.7	1.9
C005	37°	51.0'	122°	24.8'	36 79	52 79	1685	37.5	25.0
C005	37°	51.0'	122°	24.8'	36 79	52 79	1686	37.5	7.6
C005	37°	51.0'	122°	24.8'	36 79	52 79	1687	37.5	1.5
C005	37°	51.2'	122°	24.8'	52 79	58 79	1696	37.2	25.0
C005	37°	51.2'	122°	24.8'	52 79	58 79	1698	37.2	1.5
C005	37°	51.1'	122°	24.8'	58 79	88 79	1708	36.9	25.0
C005	37°	51.2'	122°	24.7'	88 79	102 79	1735	37.5	31.1
C005	37°	51.2'	122°	24.7'	88 79	103 79	1736	37.5	25.0
C005	37°	51.2'	122°	24.7'	88 79	103 79	1737	37.5	7.6
C005	37°	51.2'	122°	24.7'	88 79	103 79	1738	37.5	1.5
C05A	37°	50.7'	122°	25.4'	253 79	283 79	1827	30.8	1.5
C05A	37°	50.7'	122°	25.4'	282 79	298 79	1871	29.9	17.7

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C05A	37°	50.7'	122°	25.4'	151 80	168 80	2063	32.3	25.9
C05A	37°	50.7'	122°	25.4'	150 80	168 80	2061	32.3	7.6
C05A	37°	50.7'	122°	25.4'	150 80	168 80	2062	32.3	1.6
C016	37°	52.4'	122°	26.3'	66 79	81 79	1715	31.7	25.6
C016	37°	52.3'	122°	26.3'	66 79	81 79	1716	31.7	19.5
C016	37°	52.3'	122°	26.3'	66 79	81 79	1717	31.7	7.6
C016	37°	52.3'	122°	26.3'	66 79	81 79	1718	31.7	1.5
C016	37°	52.4'	122°	26.4'	288 79	310 79	1881	28.7	22.3
C016	37°	52.4'	122°	26.4'	288 79	309 79	1863A	29.0	16.8
C016	37°	52.6'	122°	26.5'	288 79	309 79	1864A	29.0	7.7
C016	37°	52.3'	122°	26.5'	92 80	116 80	1958	31.4	22.9
C016	37°	52.3'	122°	26.5'	92 80	116 80	1959	31.4	16.8
C016	37°	52.3'	122°	26.5'	92 80	116 80	1960	31.4	7.6
C016	37°	52.4'	122°	26.5'	116 80	135 80	1996	29.3	22.9
C016	37°	52.4'	122°	26.5'	116 80	135 80	1996	29.3	16.8
C016	37°	52.4'	122°	26.5'	116 80	135 80	1998	29.3	7.6
C016	37°	52.2'	122°	26.7'	135 80	163 80	2028	29.3	22.9
C016	37°	52.2'	122°	26.7'	135 80	163 80	2029	29.3	16.8
C016	37°	52.4'	122°	26.4'	162 80	183 80	2076	29.3	16.8
C016	37°	52.4'	122°	26.4'	199 80	217 80	2141	29.6	22.9
C016	37°	52.4'	122°	26.4'	199 80	217 80	2142	29.6	16.8
C016	37°	52.4'	122°	26.4'	199 80	217 80	2143	29.6	7.6
C016	37°	52.4'	122°	26.4'	217 80	232 80	2173	29.0	22.9
C016	37°	52.4'	122°	26.4'	217 80	233 80	2174	29.0	16.8
C016	37°	52.4'	122°	26.4'	233 80	252 80	2204	29.3	22.9
C016	37°	52.4'	122°	26.4'	252 80	268 80	2232	29.0	22.9
C016	37°	52.4'	122°	26.4'	252 80	268 80	2233	29.0	16.8
C016	37°	52.4'	122°	26.4'	252 80	268 80	2234	29.0	7.7
C016	37°	52.4'	122°	26.4'	267 80	290 80	2262	29.3	22.9
C016	37°	52.4'	122°	26.4'	267 80	290 80	2263	29.3	16.8
C016	37°	52.4'	122°	26.4'	267 80	290 80	2264	29.3	7.6
C016	37°	52.4'	122°	26.4'	290 80	310 80	2302	29.0	22.9
C016	37°	52.4'	122°	26.4'	290 80	310 80	2303	29.0	16.8
C016	37°	52.4'	122°	26.4'	290 80	310 80	2304	29.0	7.7
C016	37°	52.4'	122°	26.4'	309 80	329 80	2334	29.0	16.8
C016	37°	52.4'	122°	26.4'	309 80	329 80	2335	29.0	7.7
C16A	37°	52.6'	122°	25.8'	275 79	288 79	1862	36.6	22.9
C16A	37°	52.6'	122°	25.8'	275 79	310 79	1863	36.6	16.8
C16A	37°	52.6'	122°	25.8'	275 79	310 79	1864	36.6	7.6
C017	37°	54.9'	122°	26.9'	66 79	96 79	1705	11.6	5.2
C017	37°	54.9'	122°	26.9'	66 79	96 79	1706	11.6	1.5
C205	37°	49.3'	122°	31.0'	254 79	269 79	1828	14.3	7.6
C205	37°	49.3'	122°	31.0'	254 79	269 79	1829	14.3	1.8
C206	37°	47.9'	122°	29.3'	254 79	269 79	1830	17.1	7.6
C206	37°	47.8'	122°	29.3'	254 79	269 79	1831	17.1	1.9
C207	37°	48.4'	122°	29.0'	254 79	271 79	1832	30.5	7.6
C208	37°	48.7'	122°	28.0'	253 79	268 79	1820	24.4	7.6
C209	37°	50.7'	122°	27.5'	253 79	268 79	1821	20.4	11.3
C209	37°	50.7'	122°	27.4'	316 80	336 80	2348R	17.1	11.3
C209	37°	50.7'	122°	27.4'	316 80	336 80	2350	17.1	1.5
C210	37°	51.6'	122°	28.1'	257 79	274 79	1845	4.0	1.6
C211	37°	48.9'	122°	25.9'	254 79	286 79	1833	21.7	9.5
C211	37°	48.9'	122°	25.9'	282 79	312 79	1873	21.3	9.4

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C211	37°	48.9'	122°	25.9'	282 79	312 79	1874	21.3	1.5
C211	37°	48.9'	122°	25.9'	312 79	341 79	1927	21.7	9.5
C211	37°	48.9'	122°	25.9'	312 79	341 79	1928	21.7	1.5
C211	37°	48.9'	122°	25.9'	341 79	24 80	1945	21.7	1.6
C211	37°	48.9'	122°	25.9'	92 80	106 80	1954	21.7	1.6
C211	37°	48.9'	122°	26.1'	106 80	130 80	1980	21.3	15.5
C211	37°	48.9'	122°	26.1'	106 80	130 80	1991	21.3	9.4
C211	37°	48.9'	122°	26.1'	106 80	130 80	1992	21.3	1.5
C211	37°	49.0'	122°	25.9'	154 80	175 80	2064	21.7	15.6
C211	37°	49.0'	122°	25.9'	149 80	175 80	2055	21.7	9.5
C211	37°	48.9'	122°	25.9'	175 80	191 80	2092	22.3	16.8
C211	37°	48.9'	122°	25.9'	175 80	191 80	2093	22.3	10.7
C211	37°	48.9'	122°	25.9'	191 80	212 80	2124	21.7	15.6
C211	37°	48.9'	122°	25.9'	191 80	212 80	2125	21.7	9.5
C211	37°	48.9'	122°	25.9'	212 80	232 80	2165	21.3	15.5
C211	37°	48.9'	122°	25.9'	212 80	232 80	2167	21.3	1.5
C211	37°	48.9'	122°	25.9'	231 80	247 80	2197	21.7	15.6
C211	37°	48.9'	122°	25.9'	231 80	247 80	2198	21.7	9.5
C211	37°	48.9'	122°	25.9'	247 80	266 80	2225	21.7	15.6
C211	37°	48.9'	122°	25.9'	246 80	266 80	2226	21.7	9.5
C211	37°	48.9'	122°	25.9'	246 80	266 80	2227	21.7	1.6
C211	37°	48.9'	122°	25.9'	266 80	276 80	2254	21.7	15.6
C211	37°	48.9'	122°	25.9'	276 80	296 80	2277	21.7	15.6
C211	37°	48.9'	122°	25.9'	276 80	296 80	2278	21.7	9.5
C211	37°	48.9'	122°	25.9'	295 80	311 80	2306	22.3	15.6
C211	37°	48.9'	122°	25.9'	295 80	311 80	2307	22.3	9.5
C211	37°	48.9'	122°	26.0'	311 80	330 80	2339	21.7	15.6
C211	37°	48.9'	122°	26.0'	311 80	330 80	2340	21.7	9.5
C212	37°	53.2'	122°	24.8'	264 79	283 79	1856	12.2	5.8
C212	37°	53.1'	122°	24.7'	318 80	337 80	2347	11.9	5.8
C213	37°	54.2'	122°	27.5'	283 79	304 79	1875	10.4	4.6
C214	37°	56.4'	122°	27.7'	262 79	296 79	1849	6.1	1.5
C215	37°	56.5'	122°	27.2'	263 79	296 79	1851	12.5	6.1
C215	37°	56.5'	122°	27.2'	217 80	235 80	2180	13.1	1.5
C215	37°	56.5'	122°	27.2'	235 80	255 80	2210	13.1	6.1
C215	37°	56.5'	122°	27.2'	254 80	275 80	2239	13.1	6.1
C215	37°	56.5'	122°	27.2'	254 80	275 80	2240	13.1	1.5
C216	37°	56.5'	122°	25.6'	264 79	282 79	1853	13.7	6.1
C216	37°	56.4'	122°	25.6'	240 80	259 80	2215	14.0	1.5
C216	37°	56.4'	122°	25.6'	256 80	275 80	2243	14.0	7.9
C218	37°	55.3'	122°	23.8'	261 79	278 79	1848	2.1	0.9
C219	37°	54.2'	122°	22.4'	276 79	296 79	1866	1.8	1.5
C221	37°	52.6'	122°	21.5'	271 79	292 79	1860	2.4	1.5
C222	37°	51.1'	122°	18.7'	261 79	278 79	1847	1.8	0.9
C222	37°	51.2'	122°	18.9'	315 80	336 80	2346R	1.8	0.9
C223	37°	49.5'	122°	20.8'	277 79	297 79	1867	4.6	0.9
C224	37°	50.3'	122°	23.4'	283 79	300 79	1876	9.1	6.1
C224	37°	50.3'	122°	23.4'	283 79	300 79	1877	9.1	3.0
C321	37°	43.2'	122°	35.9'	108 80	140 80	1999	19.5	7.6
C322	37°	48.3'	122°	38.3'	94 80	108 80	1964	19.5	7.6
C323	37°	52.4'	122°	24.2'	218 80	234 80	2182	14.6	7.9
C323	37°	52.4'	122°	24.2'	218 80	234 80	2183	14.3	1.5
C323	37°	52.4'	122°	24.3'	234 80	255 80	2208	14.0	7.9
C323	37°	52.4'	122°	24.3'	253 80	270 80	2238	14.0	1.5

*Water depth in meters referenced to MLLW

†Meter depth in meters above bed



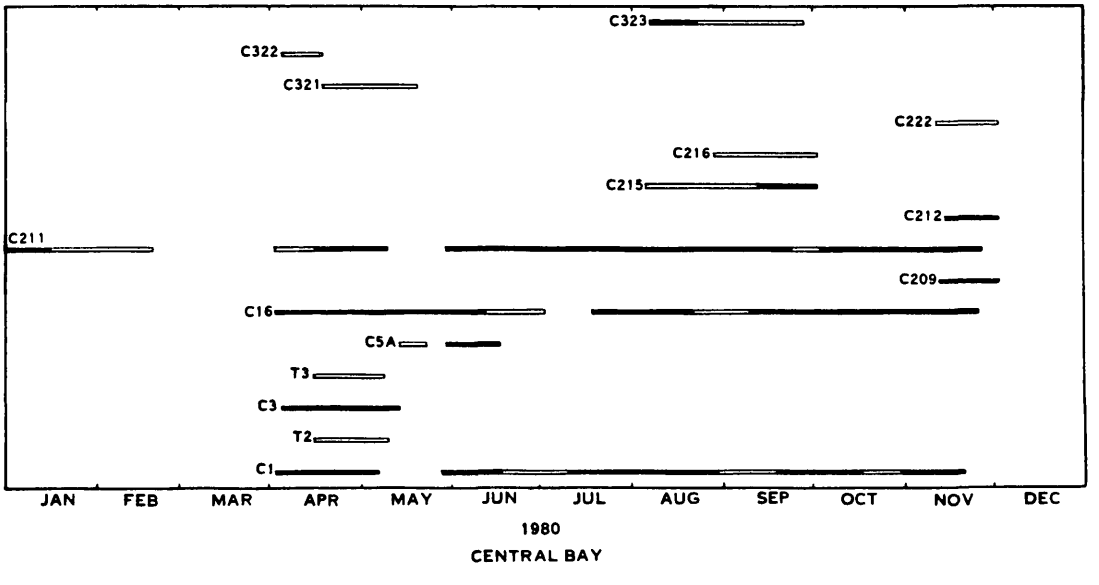


Figure IV.3. Bargraph of periods when current-meter arrays were deployed in the Central Bay region. Solid bars indicate multiple meters were used.

bargraph which indicates the availability of the current-meter data in 1979 and 1980. The solid bars on the bargraph indicate current-meter stations where multiple current meters were used for the indicated period of time. Table IV.1, figure IV.2, and figure IV.3 define the complete spatial and temporal distributions of the current-meter data. Table IV.1, figure IV.2, and figure IV.3 also define other pertinent information for each current-meter reocrd.

Water-level (tide) data

Water-level data from eleven (11) stage stations located around the perimeter of Central Bay have been analyzed and are presented in this part of the report. The locations of these tide stations are shown in figure IV.2, and the latitude and longitude of each station are given in table IV.2. Because tides in the Bay system are the result of forced oscillations generated by tides in the Pacific Ocean which propagate into the Bay system through Golden Gate, the properties of the tides at Golden Gate (Presidio, Station 4290, fig. IV.2) are used as the reference values for tides at other locations in the Bay system. As mentioned previously, the water-level data were received from NOS/NOAA on a standard 9-track computer tape in the form of hourly water levels at various stage stations. These data covered different periods of time and might contain record gaps. Because the tide data are usually quite long and generally quite accurate, the results derived from the least-squares harmonic analyses are not affected by the presence of a record gap if the record gap is only a small fraction of the total record analyzed. Figure IV.2 and table IV.2 define the spatial and temporal distributions of the stage data included in Part IV of this report. The exact period of time and the length of the record

TABLE IV.2. Central Bay stage stations, 1979-1980

STATION NUMBER	STATION NAME	LATITUDE	LONGITUDE	START DATE	RECORD LENGTH (DAYS)
4290(78)	Golden Gate	37°48.4′	122°27.9′	1/4/78	275
4290(79)	Golden Gate	37°48.4′	122°27.9′	1/1/79	365
4290(80)	Golden Gate	37°48.4′	122°27.9′	1/1/80	366
4816	Berkeley	37°51.8′	122°18.7′	2/8/79	204
4818	Angel Island	37°51.8′	122°25.1′	1/19/79	288
4819	Richardson Bay	37°51.9′	122°29.7′	9/1/78	266
4849	Richmond In. Hbr.	37°54.5′	122°21.4′	1/11/79	124
4863	Richmond	37°55.7′	122°24.0′	2/15/79	182
4873	Point San Quentin	37°56.7′	122°28.5′	9/1/78	94
4874	San Quentin	37°56.6′	122°30.9′	9/1/78	101
4881	Point Orient	37°57.1′	122°25.5′	9/1/78	249
4906	Point Bonita	37°49.1′	122°31.7′	2/6/79	90
4806	Sausalito	37°50.8′	122°28.6′	11/1/78	365

analyzed for each stage station are given in the harmonic analysis summary sheet for each stage station.

RESULTS

Tides in Central Bay

Least-squares harmonic analyses were applied to each of three, yearlong (or nearly yearlong) water-level records at Presidio (Golden Gate), the entrance to the Bay system from the Pacific Ocean. The computed results have been given in Part I, table I.2 of this report. We have used only the Presidio tide data for 1979 for comparison with results of the harmonic analyses at other stations. The tides entering the Bay have a form number of 0.84, which indicates that the tides are typically mixed diurnal and semidiurnal without a clear inclination toward either type. It is interesting to note that the lower low water usually follows the occurrence of the higher high water; the tidal currents usually have a stronger ebbing current than flooding current.

Harmonic analyses were made of all the tide data as indicated in table IV.2. The results of the analyses are compiled in Appendix IV.A in terms of the harmonic constants for each tide station. As discussed previously, the harmonic constants can be used for prediction of tides at these stations (see Part I of this report). The properties of the tides in Central Bay can be summarized by showing the spatial distributions of the phase and amplitude of the two most important partial tides (M_2 and K_1) over a map of the Central Bay region (fig. IV.4). The results for tides at Presidio (Golden Gate) are used as reference values. Shown in figure IV.4 are the form number, the modified epoch, κ', and the amplitudes of M_2 and K_1 partial tides. The tidal phase shift, $\Delta\kappa'$, (the modified epoch at

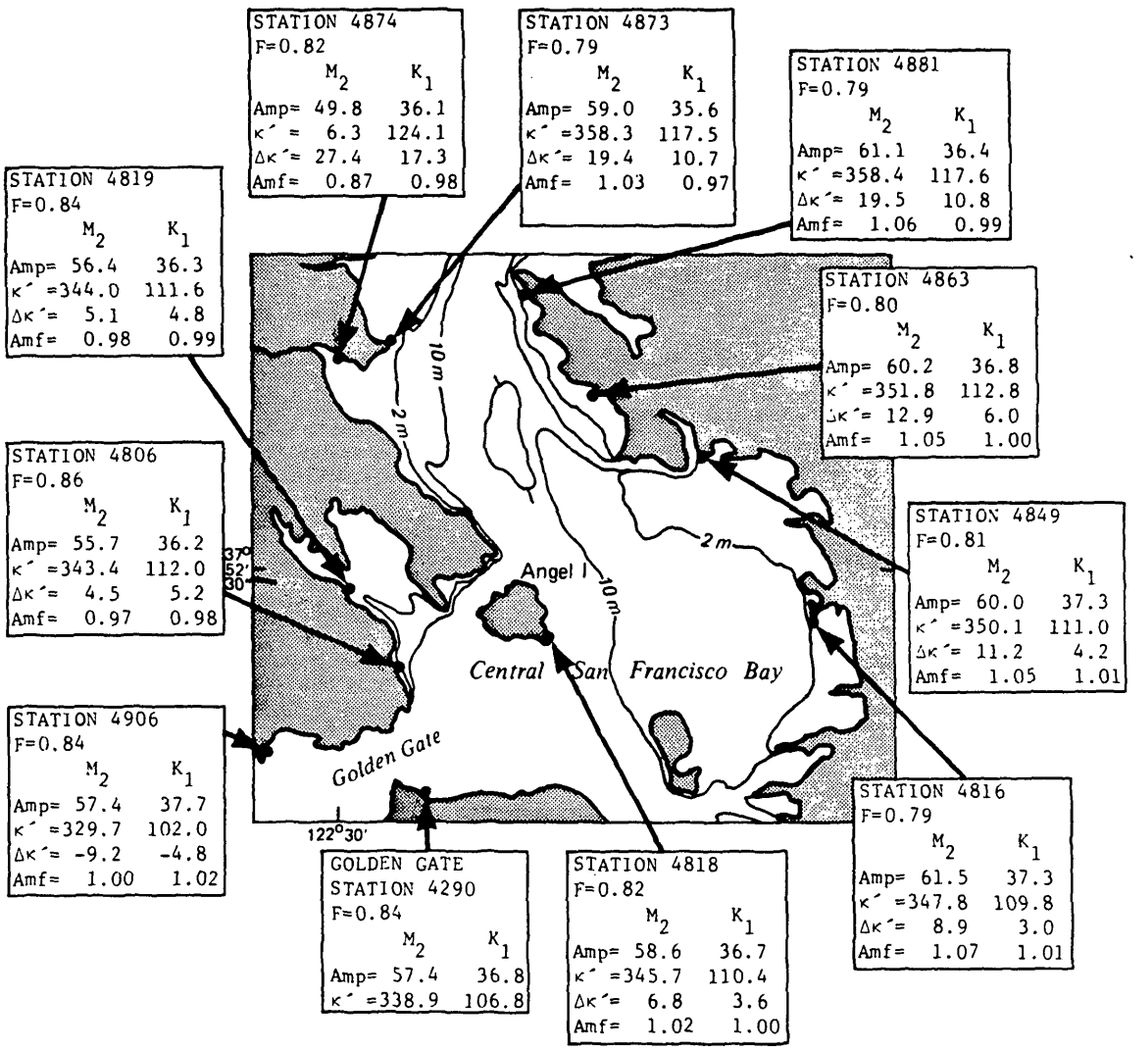


Figure IV.4. Spatial distribution of properties of M_2 and K_1 tides in Central Bay, California.

station minus the modified epoch at Golden Gate) and the amplitude amplification factor, amf, (the ratio of the amplitude at station to the amplitude at Golden Gate) are depicted in figure IV.4. Due to the lack of data in the middle of the basin, co-tidal and co-range charts for Central Bay have not been constructed. Nevertheless, the present results give a general description of the properties of tides in Central Bay, California.

The form numbers for tides in Central Bay range between 0.79 and 0.86 indicating that the tides retain the mixed semidiurnal and diurnal characteristics of the tides at the Golden Gate as they propagate into the Bay from the Pacific Ocean. As the tides propagate through the constriction at Golden Gate (Presidio) and along the main channel, they move like progressive waves. The tidal waves then propagate as ideal gravity waves at the same time to both the northern reach and the South Bay. There is little change in the amplitudes of the M_2 and K_1 partial tides, and the net phase shifts indicate that the tides are slightly more progressive as they propagate toward the northern reach. The properties for other partial tides are similar; specific values of amplitude amplification and phase shift for other partial tides can be deduced from the results of the harmonic analyses given in the summary sheets (Appendix IV.A).

Tidal current in Central Bay

The results of tidal-current measurements are presented in two forms. For each current-meter data file analyzed (tab. IV.1), the results of the harmonic analyses are compiled on a summary sheet and are given in Appendix IV.B. The summary lists the pertinent notes concerning the current-meter deployment and recovery. It includes the station location, water depth,

meter depth, deployment and recovery dates, and the approximate record length. The harmonic constants for O_1, K_1, N_2, M_2, S_2, and M_4 are given for the tidal current components in the directions where the major and minor axes of the tidal current ellipses are defined (see Part I). As explained in Part I of this report, with the values for the major and minor axes, modified epoch (phase), and the sense of rotation for each partial tidal current ellipse, Eqs. (6) and (7) in Part I can be used for predicting the tidal current at the station. Additional general properties of tidal current including root-mean-squares (RMS) current speed, spring and neap tidal current limits, principal tidal current direction, and tidal current form number are also given in the summary sheet.

At almost all stations, the tidal currents show a strong bi-directional tendency. The principal current direction depends strongly on the local basin bathymetry. There is a spring and neap variation of the tidal current speed up to a factor of about two. As the form numbers indicate, the tidal currents in Central Bay are mixed semi-diurnal and diurnal types; however, for most of the cases the tidal current type is closer to semidiurnal than diurnal.

Following the summary of the results of harmonic analyses, the current-meter data are presented graphically in the form of time-series plots (Appendix IV.B). For each data file, the time variations of the tidal current speed and direction are plotted versus time. Water temperature and salinity are plotted versus time on a separate page. As mentioned before, the time-series plots are used to provide users with a visual display of the temporal variations of tidal currents and their associated properties. No effort was given to edit the data in the file. Portions of the data may be invalid due to marine fouling, malfunction of a

sensor, or some other unknown reasons. It was our intention to leave the data close to their original form; users need to judge the validity of the data based on general principles of estuarine-physical oceanography. Only valid data (our own best judgement) were used in the harmonic analyses. Data users may need to edit out any invalid portions of the data given in the time-series plots before using the data for their intended applications.

The most important properties of tidal currents in Central Bay can be characterized by five variables: (1) the amplitude of M_2 tidal current ellipse (magnitude of semi-major axis of the M_2 tidal current ellipse), (2) the RMS tidal current speed, (3) and (4) the spring and neap tidal current speed limits, and (5) the principal tidal current direction. The spatial distribution of these quantities is plotted on a map of the Central Bay region (fig. IV.5) in which the M_2, RMS, and the estimated spring and neap tidal current vectors are plotted in the principal tidal current direction at each station. The spatial distribution of the tidal current suggests that the tidal current is strongly dependent on the basin bathymetry.

The correlation of the depth-averaged tidal current and the water depth is more complex in this region. Only those current-meter data when the current meters were placed between 35 percent and 65 percent of the local water depth were used as approximations to the depth-averaged tidal currents. The results of a linear regression of the RMS current speed versus the local mean water depth at MLLW suggest that there are possibly two types of relations. For currents in water depth shallower than 20 m, a simple linear regression of RMS current speed over the water depth gives a slope of 3.57 (cm/sec)/m, and the measure of the goodness of fit for regression, r^2 = 0.88 (fig. IV.6a). For currents in the deeper region

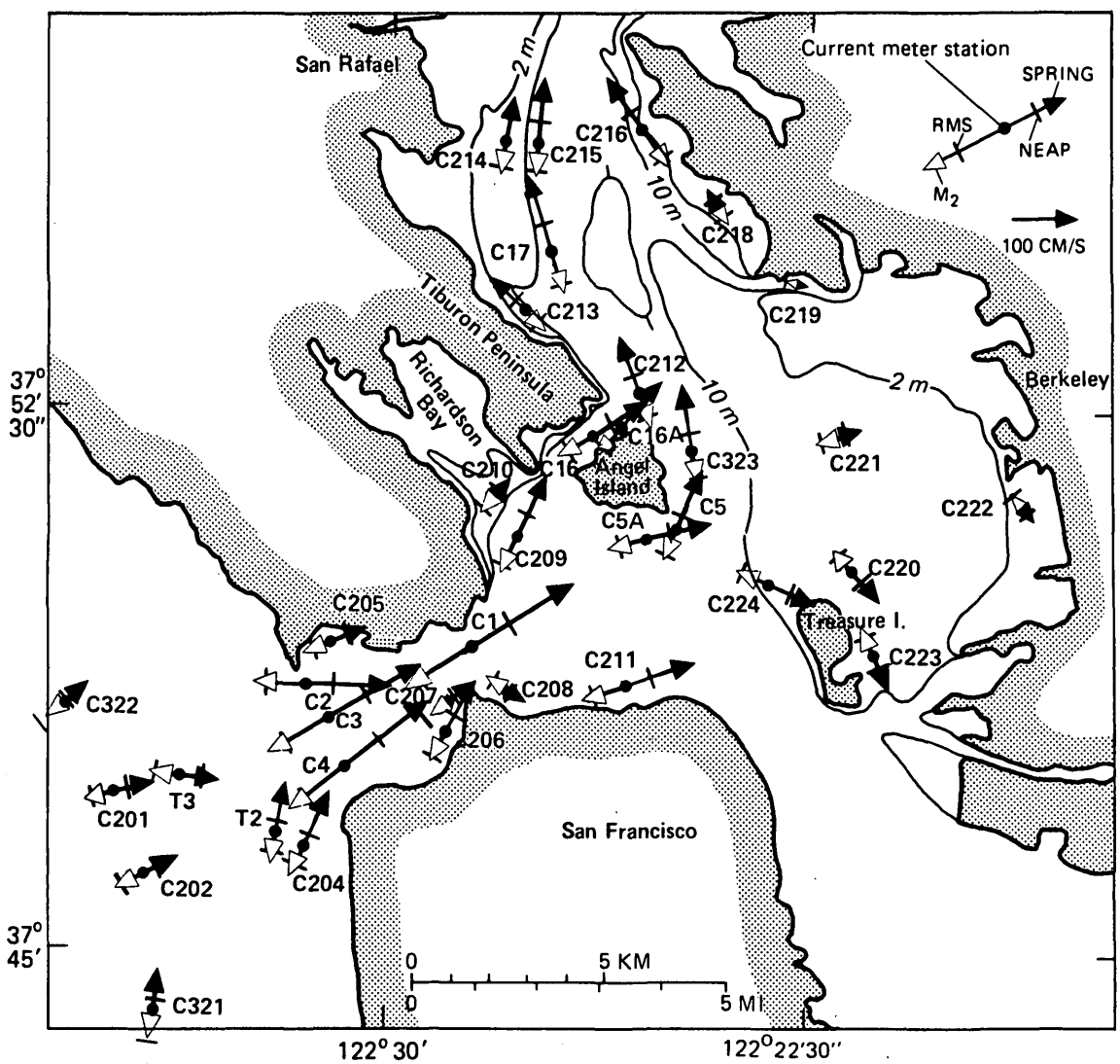


Figure IV.5. Spatial distribution of tidal-current properties in Central Bay, California. The legend and scale of the velocity vectors are defined in the upper right hand corner of the figure.

where the local water depth is greater than 20 m., the slope of the RMS current speed over the water depth becomes 0.46 (cm/sec)/m, and the measure of the goodness of fit for regression for this sub-set r^2 = 0.88 (fig. IV.6b). Thus, when the water depth is shallower than 20 m., the RMS speed and depth relation is comparable to the relations for other shallow sub-embayments of the Bay system (see Part II, III, V of this report). A similar relation holds true for areas of deeper water (depth >20 m), only the slope of the correlation between RMS speed and water depth is different. The three-dimensional flow properties in the deep region might be the cause of the difference. This sub-set of the current-meter data has confirmed the dependency of the tidal current speed and direction on basin bathymetry in Central Bay, California, although there seem to be sub-divisions of the tidal current properties. These relations between the tidal current RMS speed and the local water depth can be used to estimate tidal current speed and direction elsewhere in the basin where field data are not available (Cheng and Gartner, 1982).

Eulerian residual current in Central Bay

As discussed in Part I of this report, the Eulerian residual current is defined as the vectorial average of the current-meter data made over several even M_2 tidal cycles. The computed Eulerian residual currents are given in the summary for each current-meter data file. As the Delta outflow is one of the variables which affect the Eulerian residual current in Central Bay, the averaged values of the Delta outflow at the corresponding periods of time have been computed from Dayflow (1982) and are given in the summary sheets.

The factors which affect the Eulerian residual currents in Central Bay

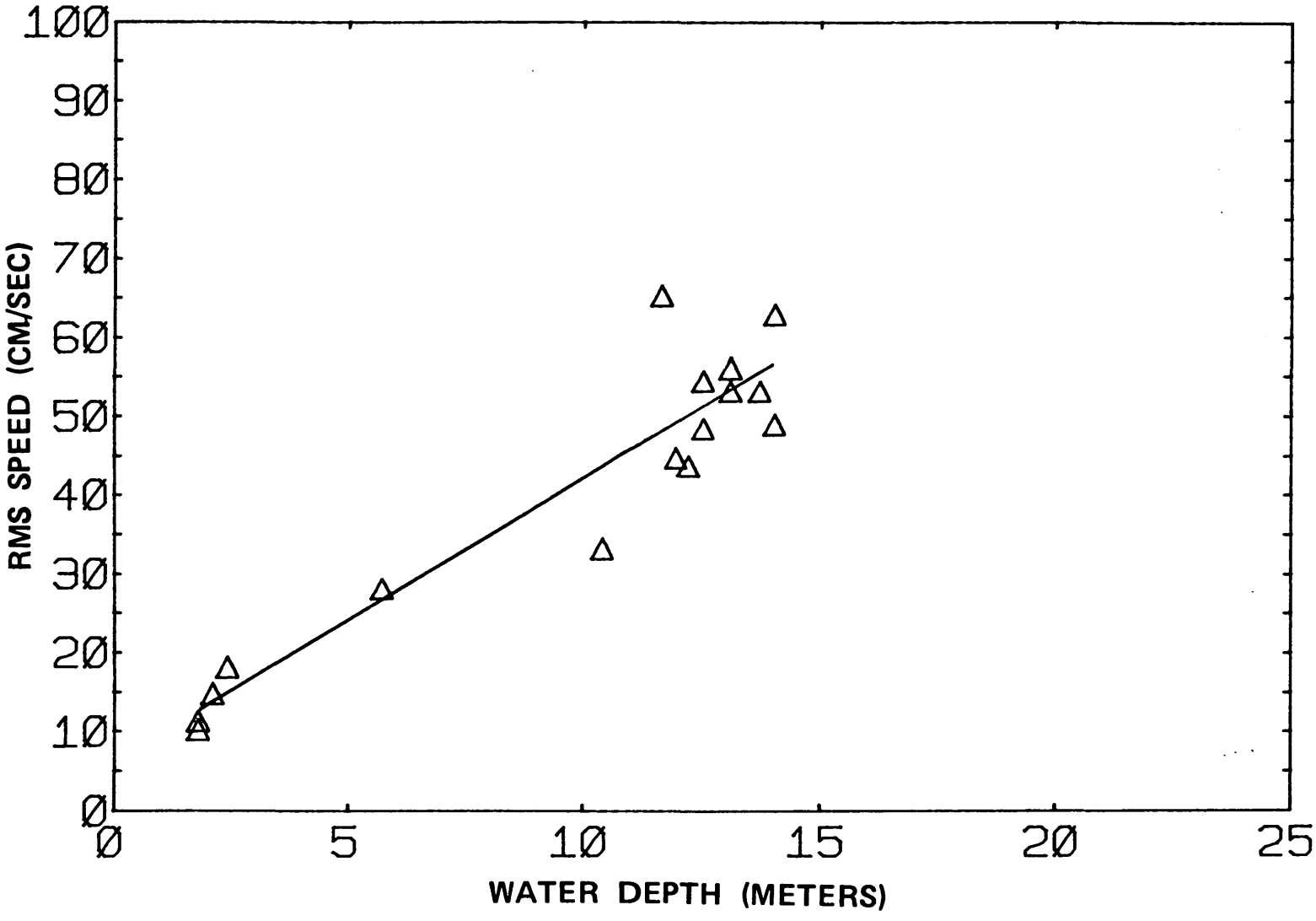


Figure IV.6a. Relation between RMS current speed and mean-water depth (MLLW) (Shallow water stations) at deployment sites in Central Bay, California.

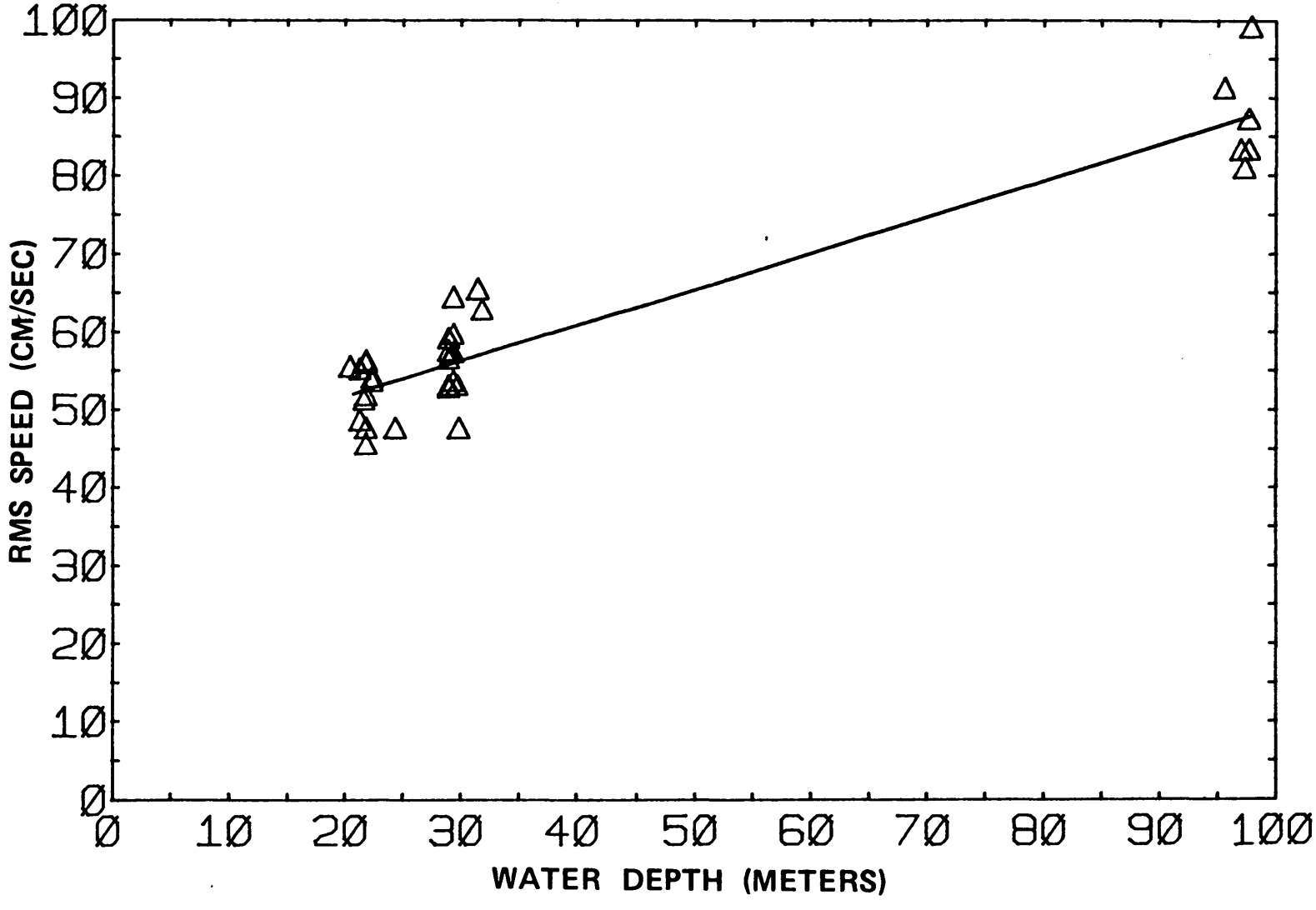


Figure IV.6b. Relation between RMS current speed and mean-water depth (MLLW) (deep water stations) at deployment sites in Central Bay, California.

are even more complex than the generation mechanism of the Eulerian residual currents in other sub-basins of the Bay system. Basin bathymetry, Delta outflow, spatial distribution of tidal currents (tidal current shear), temporal variations of tidal currents (spring and neap variations), and external wind forcing are all important factors which may have effects on the magnitude and spatial distribution of the Eulerian residual currents. The vertical salinity stratification generates variations of the Eulerian residual distribution in the vertical plane. Although a general pattern of the Eulerian residual current exists, it is difficult to draw a simple conclusion from these data as to what are the dominant factors which govern the generation mechanism of the Eulerian residual current in Central Bay. In other words, the computed Eulerian residual currents include all of the above mentioned factors; it is not possible to delineate the individual effects solely based upon examination of these data. The use of mathematical models is a possible way to resolve this question. Indeed, one of the purposes of this data collection program is to support mathematical modeling research.

SUMMARY

In Part IV, the observations from moored current meters and water-level stations in Central Bay are given. The main purposes of this part of the report are: (1) to document the data set collected in Central Bay, California during the intensive current survey which was conducted jointly by the USGS and NOS/NOAA; (2) to present the basic data in a form useful to users; and (3) to document results from harmonic analyses of these data. The tabulated harmonic constants given in Part IV can be used to predict tides and tidal currents in Central Bay. The results from the harmonic analyses have led to the conclusion that tides in Central Bay retain the characteristics of the tides which originate in the Pacific Ocean and propagate through the Golden Gate. The tidal waves in the main channel propagate as ideal gravity waves. The tidal circulation is more complex which is a function of the complicated basin bathymetry. Whereas the Eulerian residual current is affected by basin bathymetry, Delta outflow, salinity stratification, tidal currents, and wind forcings, a simple conclusion concerning the dominance of any of these factors cannot be reached from these analyses. The generation of the Eulerian residual currents is probably a combination of all the above mentioned mechanisms.

APPENDIX IV.A

RESULTS OF HARMONIC ANALYSES OF TIDES (STAGE) IN CENTRAL BAY, CALIFORNIA

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414290
START TIME OF SERIES (PST):
YEAR=1978
MONTH= 4
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 275 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 27 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 7.74 CM
TIME SERIES MEAN: 271.87 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.84	82.30	97.58
O1	0.92954	23.32	85.98	96.90
M1	0.96645	1.11	101.36	107.85
P1	0.99726	11.89	100.00	102.80
K1	1.00274	37.05	103.92	106.05
J1	1.03903	2.32	124.46	122.24
MU2	1.86455	0.82	202.08	223.27
N2	1.89598	12.43	299.38	316.79
NU2	1.90084	2.16	310.86	327.69
M2	1.93227	57.50	324.74	337.80
L2	1.96857	1.60	351.25	359.95
T2	1.99726	0.92	314.10	319.36
S2	2.00000	13.55	331.25	336.18
K2	2.00548	3.95	328.95	333.22
M4	3.86455	2.52	18.52	44.64
MK3	2.93501	2.17	115.92	131.11

****
* SUMMARY OF HARMONIC ANALYSIS *
*   WATER LEVEL STATIONS   *
****

STAGE STATION: 9414290
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 365 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 27 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 9.26 CM
TIME SERIES MEAN: 272.92 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.15	82.14	97.42
O1	0.92954	22.87	86.32	97.24
M1	0.96645	1.35	111.31	117.80
P1	0.99726	11.46	101.64	104.43
K1	1.00274	36.73	104.26	106.40
J1	1.03903	1.99	130.29	128.07
MU2	1.86455	0.80	231.49	252.68
N2	1.89598	12.44	299.88	317.29
NU2	1.90084	2.27	306.50	323.33
M2	1.93227	57.79	324.77	337.82
L2	1.96857	2.40	349.83	358.53
T2	1.99726	1.12	324.04	329.30
S2	2.00000	13.48	331.70	336.63
K2	2.00548	3.85	327.31	331.58
M4	3.86455	2.37	19.03	45.14
MK3	2.93501	2.09	126.13	141.33

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414290
START TIME OF SERIES (PST):
YEAR=1980
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 366 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 27 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 11.16 CM
TIME SERIES MEAN: 275.10 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.07	80.48	95.76
O1	0.92954	22.94	86.99	97.91
M1	0.96645	1.45	115.44	121.93
P1	0.99726	11.81	102.30	105.09
K1	1.00274	36.77	103.48	105.61
J1	1.03903	2.13	122.73	120.51
MU2	1.86455	1.12	252.73	273.91
N2	1.89598	12.18	298.74	316.15
NU2	1.90084	2.81	311.19	328.02
M2	1.93227	56.96	324.45	337.50
L2	1.96857	2.45	349.24	357.94
T2	1.99726	0.81	312.83	318.09
S2	2.00000	13.39	330.20	335.13
K2	2.00548	4.15	322.33	326.60
M4	3.86455	2.54	13.82	39.94
MK3	2.93501	2.04	123.16	138.36

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414816
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 2
DAY= 8
HOUR= 0
APPROXIMATE RECORD LENGTH: 204 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 18 MIN 42 SEC
STANDARD DEVIATION OF THE TIME SERIES: 8.08 CM
TIME SERIES MEAN: 240.44 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.85	85.34	100.46
O1	0.92954	22.39	92.49	103.26
M1	0.96645	1.30	114.19	120.53
P1	0.99726	12.16	109.50	112.14
K1	1.00274	37.31	107.80	109.78
J1	1.03903	1.84	128.91	126.54
MU2	1.86455	0.61	198.23	219.11
N2	1.89598	12.77	310.24	327.35
NU2	1.90084	2.55	320.72	337.24
M2	1.93227	61.52	335.07	347.82
L2	1.96857	2.61	1.79	10.19
T2	1.99726	1.01	319.63	324.59
S2	2.00000	13.81	344.39	349.02
K2	2.00548	4.39	333.13	337.10
M4	3.86455	1.19	62.59	88.09
MK3	2.93501	1.05	129.89	144.62

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414818
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY=19
HOUR= 0
APPROXIMATE RECORD LENGTH: 288 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 25 MIN 6 SEC
STANDARD DEVIATION OF THE TIME SERIES: 8.27 CM
TIME SERIES MEAN: 274.47 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.02	85.85	101.08
O1	0.92954	22.51	90.35	101.22
M1	0.96645	1.47	119.56	126.01
P1	0.99726	11.37	107.73	110.48
K1	1.00274	36.70	108.26	110.35
J1	1.03903	2.00	120.34	118.08
MU2	1.86455	0.62	217.98	239.07
N2	1.89598	12.60	308.02	325.34
NU2	1.90084	2.38	312.96	329.70
M2	1.93227	58.60	332.72	345.68
L2	1.96857	2.60	5.95	14.56
T2	1.99726	1.02	323.27	328.44
S2	2.00000	13.17	339.25	344.08
K2	2.00548	3.89	333.10	337.28
M4	3.86455	1.83	67.55	93.48
MK3	2.93501	1.36	157.92	172.97

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414819
START TIME OF SERIES (PST):
YEAR=1978
MONTH= 9
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 266 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 29 MIN 40 SEC
STANDARD DEVIATION OF THE TIME SERIES: 9.33 CM
TIME SERIES MEAN: 418.69 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.64	80.72	96.03
O1	0.92954	22.29	87.96	98.92
M1	0.96645	1.31	121.95	128.47
P1	0.99726	11.40	105.54	108.36
K1	1.00274	36.26	109.47	111.64
J1	1.03903	2.03	126.80	124.61
MU2	1.86455	0.49	222.32	243.57
N2	1.89598	12.03	305.20	322.67
NU2	1.90084	2.13	315.46	332.35
M2	1.93227	56.37	330.89	344.00
L2	1.96857	1.83	1.78	10.54
T2	1.99726	0.70	346.70	352.01
S2	2.00000	12.96	337.72	342.71
K2	2.00548	4.39	332.99	337.32
M4	3.86455	1.69	51.18	77.42
MK3	2.93501	1.07	134.97	150.26

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414849
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY=11
HOUR= 0
APPROXIMATE RECORD LENGTH: 124 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 21 MIN 25 SEC
STANDARD DEVIATION OF THE TIME SERIES: 10.00 CM
TIME SERIES MEAN: 168.03 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.82	79.74	94.91
O1	0.92954	22.47	94.43	105.24
M1	0.96645	1.28	110.65	117.04
P1	0.99726	11.48	112.60	115.29
K1	1.00274	37.28	108.96	110.99
J1	1.03903	2.03	134.46	132.14
MU2	1.86455	0.47	281.53	302.49
N2	1.89598	12.36	310.30	327.50
NU2	1.90084	2.50	327.58	344.19
M2	1.93227	59.97	337.28	350.12
L2	1.96857	2.66	13.60	22.08
T2	1.99726	0.88	314.38	319.42
S2	2.00000	13.58	347.28	351.99
K2	2.00548	4.06	330.59	334.65
M4	3.86455	1.34	81.99	107.67
MK3	2.93501	1.04	151.35	166.21

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414863
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 2
DAY=15
HOUR= 0
APPROXIMATE RECORD LENGTH: 182 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 24 MIN 0 SEC
STANDARD DEVIATION OF THE TIME SERIES: 7.97 CM
TIME SERIES MEAN: 439.33 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.66	89.73	104.94
O1	0.92954	21.99	94.01	104.87
M1	0.96645	1.05	118.44	124.87
P1	0.99726	11.27	112.88	115.61
K1	1.00274	36.76	110.76	112.83
J1	1.03903	1.72	134.70	132.42
MU2	1.86455	0.87	179.87	200.92
N2	1.89598	12.42	314.45	331.73
NU2	1.90084	2.52	320.65	337.35
M2	1.93227	60.15	338.92	351.84
L2	1.96857	2.53	5.34	13.91
T2	1.99726	1.14	329.93	335.06
S2	2.00000	13.48	346.98	351.78
K2	2.00548	3.91	338.49	342.63
M4	3.86455	1.48	84.96	110.82
MK3	2.93501	1.10	143.07	158.07

****
* SUMMARY OF HARMONIC ANALYSIS *
*   WATER LEVEL STATIONS   *
****

STAGE STATION: 9414873
START TIME OF SERIES (PST):
YEAR=1978
MONTH= 9
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 94 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 28 MIN 30 SEC
STANDARD DEVIATION OF THE TIME SERIES: 5.77 CM
TIME SERIES MEAN: 338.16 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.34	95.86	111.15
O1	0.92954	21.68	96.03	106.96
M1	0.96645	0.82	133.56	140.06
P1	0.99726	10.95	108.98	111.78
K1	1.00274	35.60	115.38	117.53
J1	1.03903	1.73	147.57	145.36
MU2	1.86455	1.54	150.41	171.61
N2	1.89598	12.57	320.01	337.44
NU2	1.90084	3.02	322.85	339.70
M2	1.93227	58.99	345.17	358.25
L2	1.96857	2.21	17.68	26.40
T2	1.99726	1.16	337.60	342.88
S2	2.00000	13.34	357.15	2.10
K2	2.00548	4.30	339.35	343.64
M4	3.86455	1.43	84.16	110.32
MK3	2.93501	1.32	129.74	144.96

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414874
START TIME OF SERIES (PST):
YEAR=1978
MONTH= 9
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 101 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 30 MIN 52 SEC
STANDARD DEVIATION OF THE TIME SERIES: 21.64 CM
TIME SERIES MEAN: 383.35 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.53	102.08	117.40
O1	0.92954	18.23	103.67	114.64
M1	0.96645	0.86	122.32	128.86
P1	0.99726	14.03	99.99	102.83
K1	1.00274	36.05	121.95	124.13
J1	1.03903	1.48	178.45	176.28
MU2	1.86455	2.25	133.67	154.95
N2	1.89598	12.85	333.87	351.38
NU2	1.90084	3.21	346.63	3.56
M2	1.93227	49.81	353.15	6.31
L2	1.96857	2.92	29.17	37.97
T2	1.99726	6.61	209.36	214.72
S2	2.00000	16.17	337.01	342.04
K2	2.00548	1.53	167.27	171.64
M4	3.86455	1.40	250.19	276.50
MK3	2.93501	1.23	71.16	86.50

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414881
START TIME OF SERIES (PST):
YEAR=1978
MONTH= 9
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 249 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 25 MIN 30 SEC
STANDARD DEVIATION OF THE TIME SERIES: 9.55 CM
TIME SERIES MEAN: 316.66 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.56	89.01	104.25
O1	0.92954	22.39	93.68	104.56
M1	0.96645	1.03	117.17	123.63
P1	0.99726	11.25	112.09	114.84
K1	1.00274	36.42	115.50	117.60
J1	1.03903	1.77	141.82	139.56
MU2	1.86455	0.94	178.48	199.59
N2	1.89598	12.49	320.16	337.49
NU2	1.90084	2.76	332.24	348.99
M2	1.93227	61.11	345.43	358.41
L2	1.96857	2.62	12.29	20.91
T2	1.99726	0.89	333.42	338.59
S2	2.00000	13.43	354.26	359.11
K2	2.00548	4.28	352.62	356.81
M4	3.86455	1.94	73.63	99.59
MK3	2.93501	1.82	144.86	159.93

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414906
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 2
DAY= 6
HOUR= 0
APPROXIMATE RECORD LENGTH: 90 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 31 MIN 42 SEC
STANDARD DEVIATION OF THE TIME SERIES: 10.29 CM
TIME SERIES MEAN: 233.81 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.75	57.74	73.07
O1	0.92954	23.01	84.06	95.05
M1	0.96645	1.41	92.77	99.33
P1	0.99726	11.53	102.98	105.84
K1	1.00274	37.74	99.75	101.95
J1	1.03903	2.34	118.71	116.56
MU2	1.86455	1.15	303.28	324.59
N2	1.89598	12.96	293.02	310.56
NU2	1.90084	3.03	290.07	307.03
M2	1.93227	57.37	316.51	329.69
L2	1.96857	2.25	4.14	12.97
T2	1.99726	3.04	344.25	349.63
S2	2.00000	14.80	312.87	317.92
K2	2.00548	3.59	329.47	333.87
M4	3.86455	2.42	25.16	51.53
MK3	2.93501	1.41	142.63	158.02

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414806
START TIME OF SERIES (PST):
YEAR=1978
MONTH=11
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 365 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 28 MIN 36 SEC
STANDARD DEVIATION OF THE TIME SERIES: 8.47 CM
TIME SERIES MEAN: 183.38 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.93	80.03	95.32
O1	0.92954	22.30	85.80	96.73
M1	0.96645	1.35	116.95	123.45
P1	0.99726	11.48	103.78	106.58
K1	1.00274	36.22	109.87	112.02
J1	1.03903	2.06	129.46	127.26
MU2	1.86455	0.86	223.26	244.47
N2	1.89598	11.91	304.59	322.03
NU2	1.90084	2.30	313.43	330.28
M2	1.93227	55.70	330.33	343.41
L2	1.96857	2.18	354.64	3.37
T2	1.99726	0.86	327.03	332.31
S2	2.00000	12.67	336.94	341.90
K2	2.00548	3.74	333.94	338.23
M4	3.86455	1.91	45.23	71.39
MK3	2.93501	1.49	141.19	156.42

APPENDIX IV.B

The current-meter data are presented chronologically and station-by-station in Appendix IV.B. For each file, the measured data and the results of analyses are presented in two forms: (1) results from the harmonic analyses; and (2) time series plots of tidal-current velocity (speed and direction) versus time, and salinity and temperature versus time. These results are given in the order of station numbers as listed in table IV.1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 4/ 1/80 1713 PST JULIAN DAY= 92
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

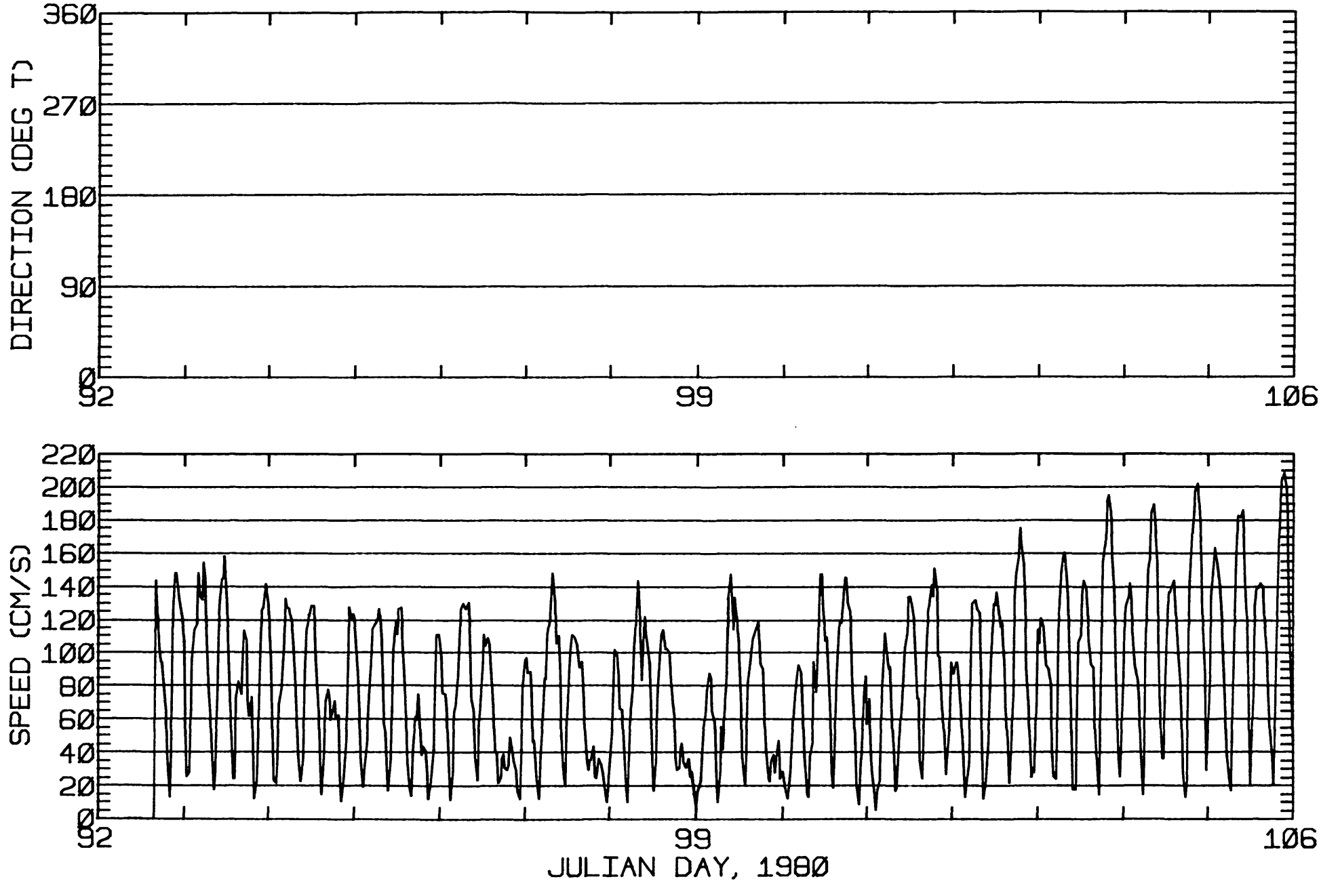
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

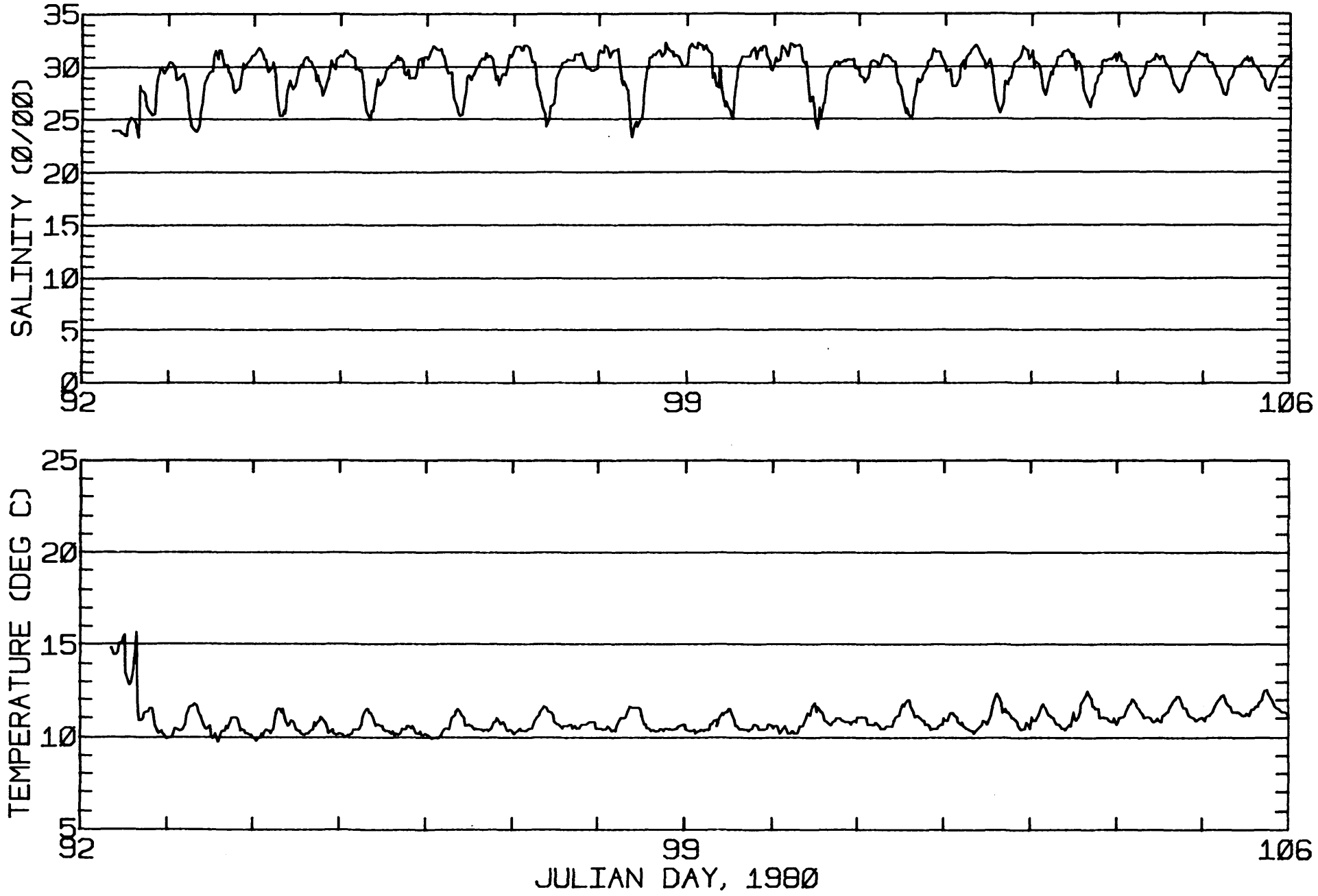
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	2			
ALL	26			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER85.3 METERS ABOVE BEDTAPE NUMBER GSC001B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 4/15/80 1439 PST JULIAN DAY=106
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

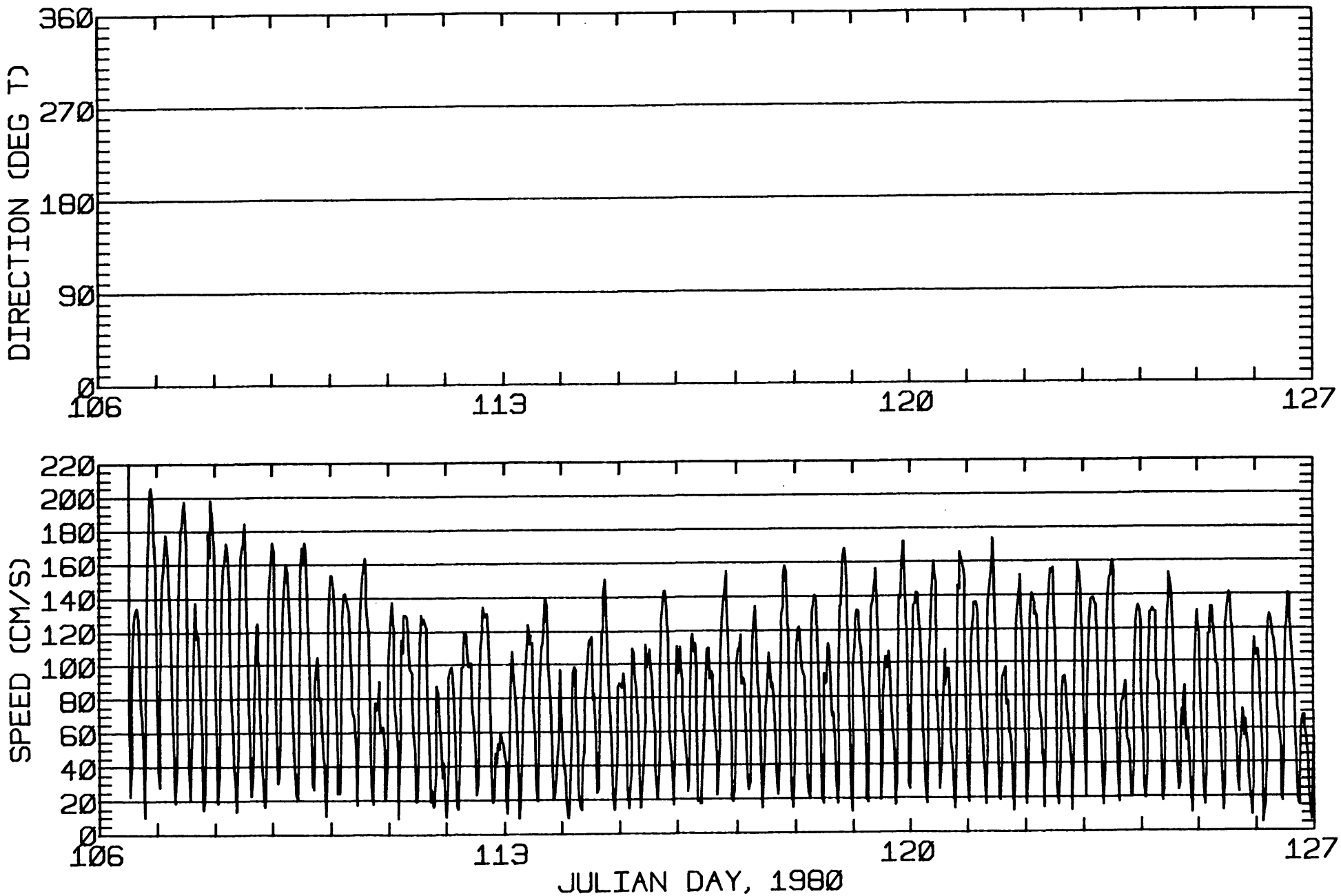
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

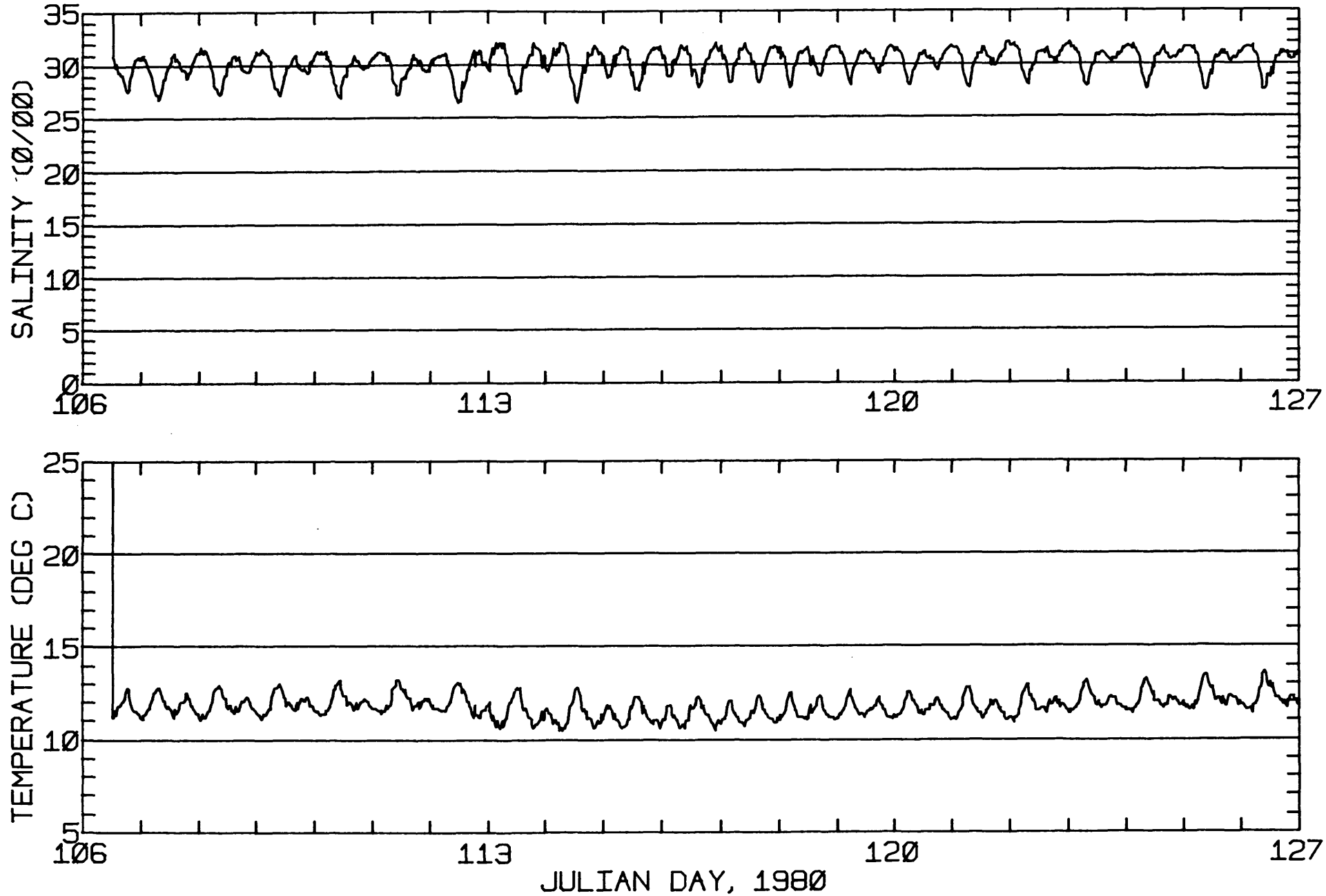
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	12			
4	2			
ALL	38			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001C1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001C1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 5/ 6/80 1411 PST JULIAN DAY=127
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

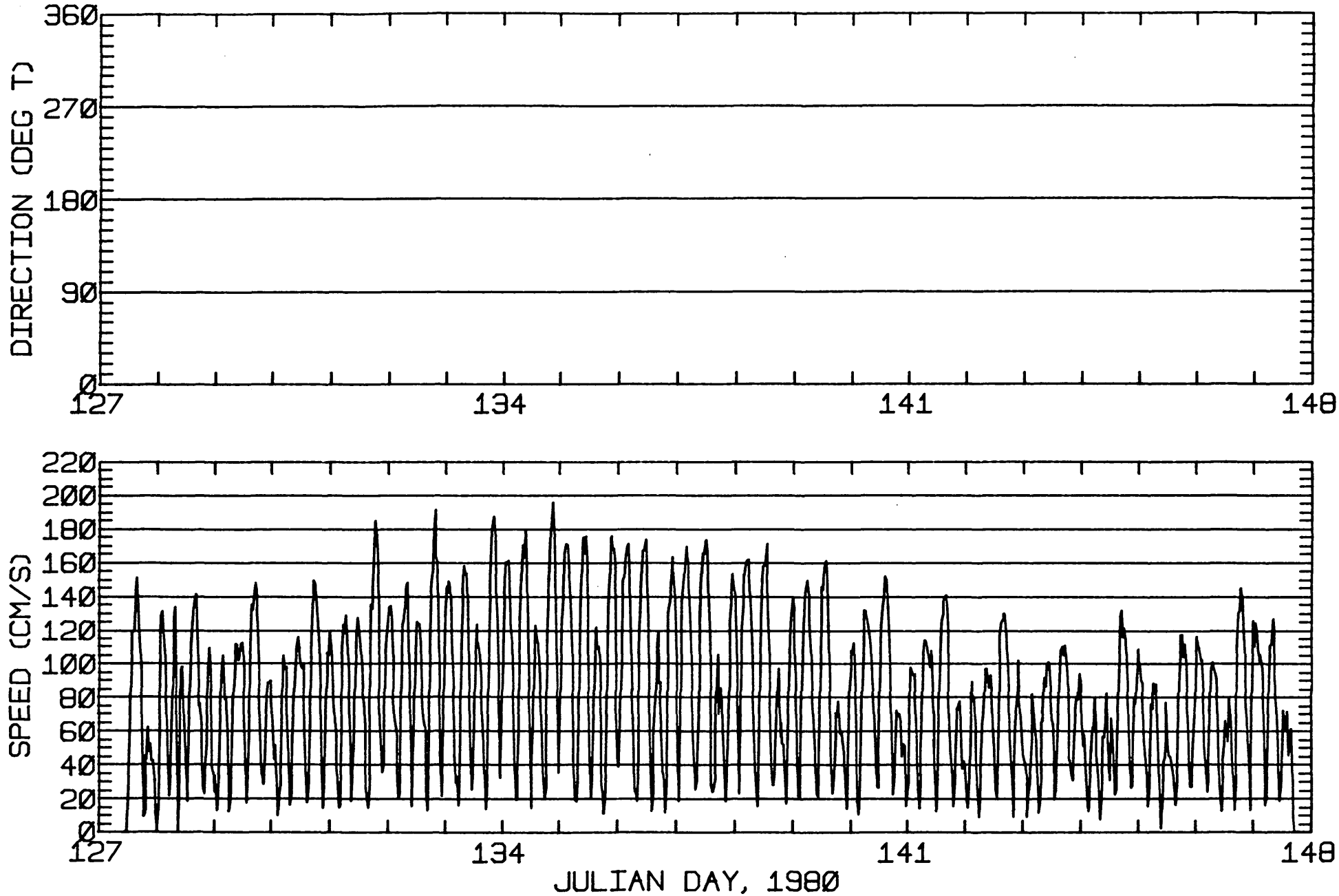
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

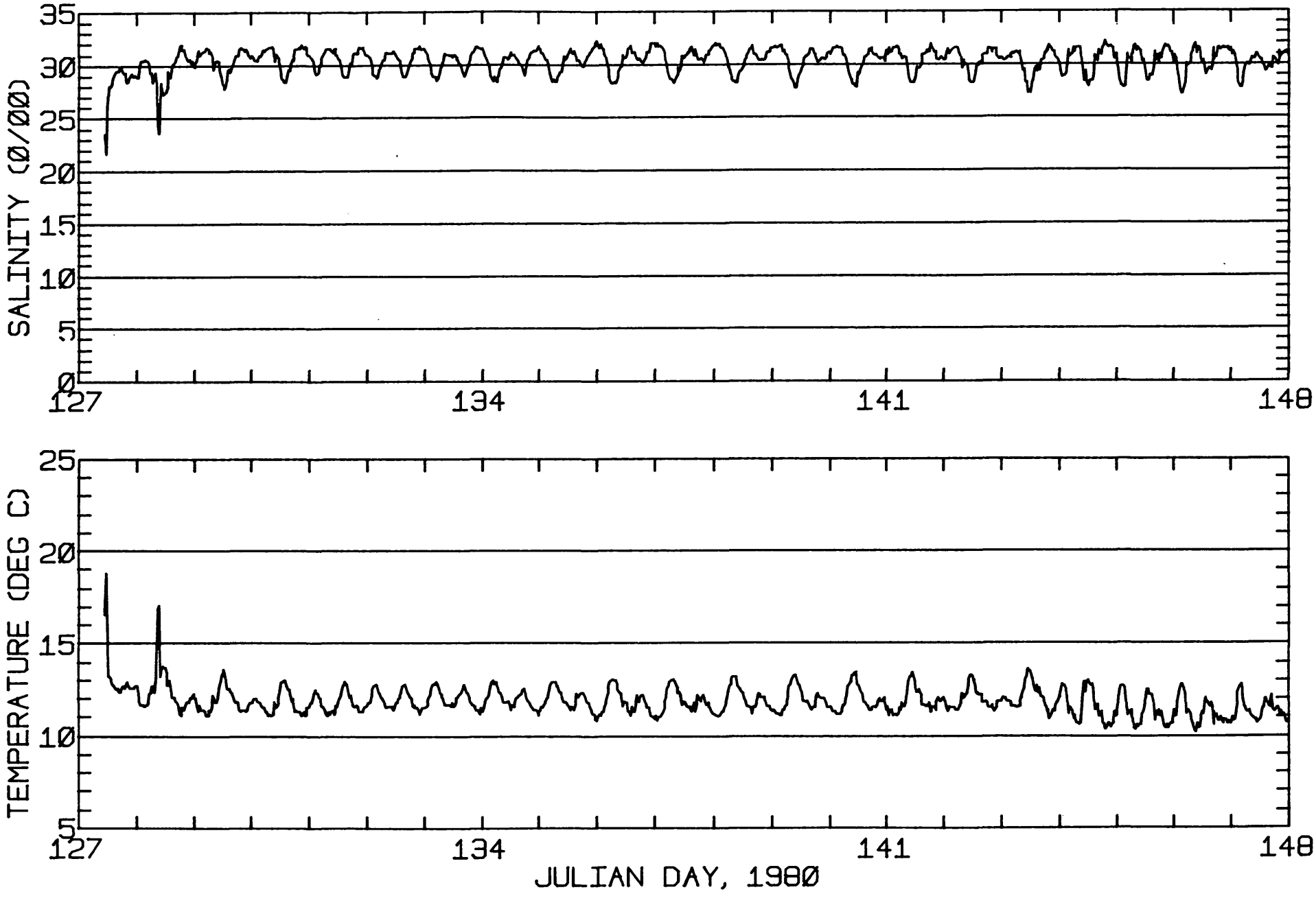
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	12			
4	2			
ALL	38			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001D1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001D1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 5/28/80 1738 PST JULIAN DAY=149
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

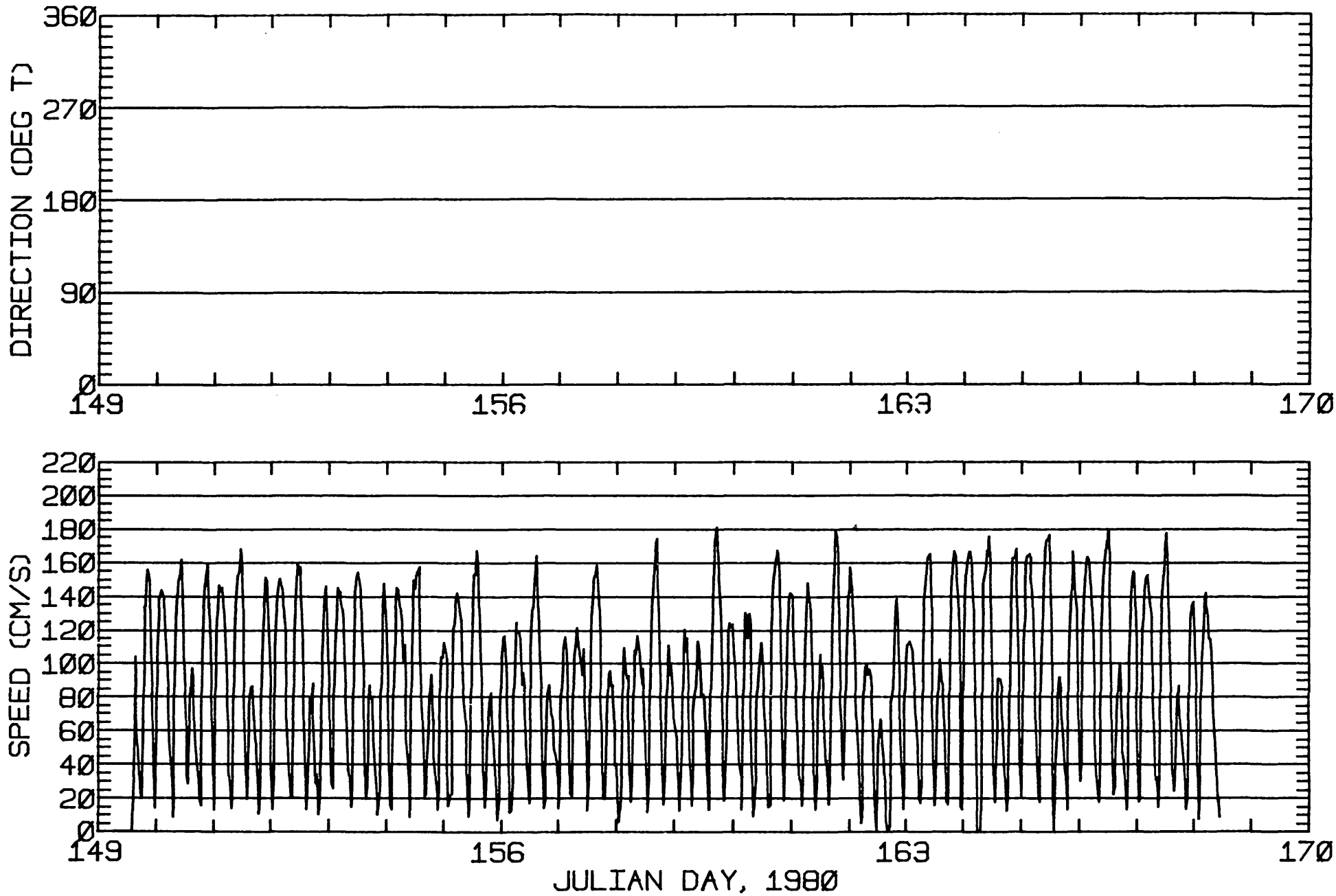
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

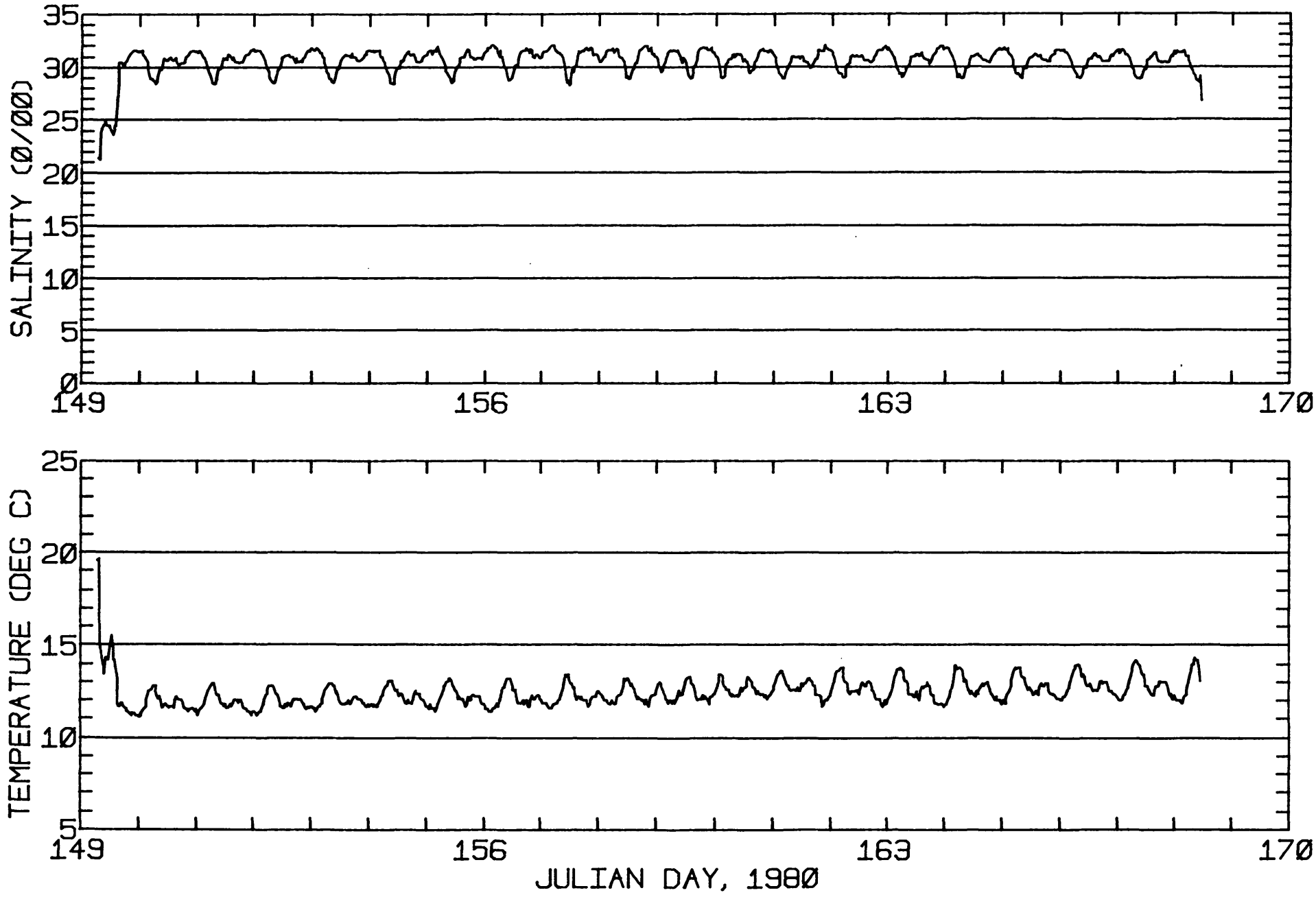
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	10			
ALL	34			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001E1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001E1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 6/16/80 1612 PST JULIAN DAY=168
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

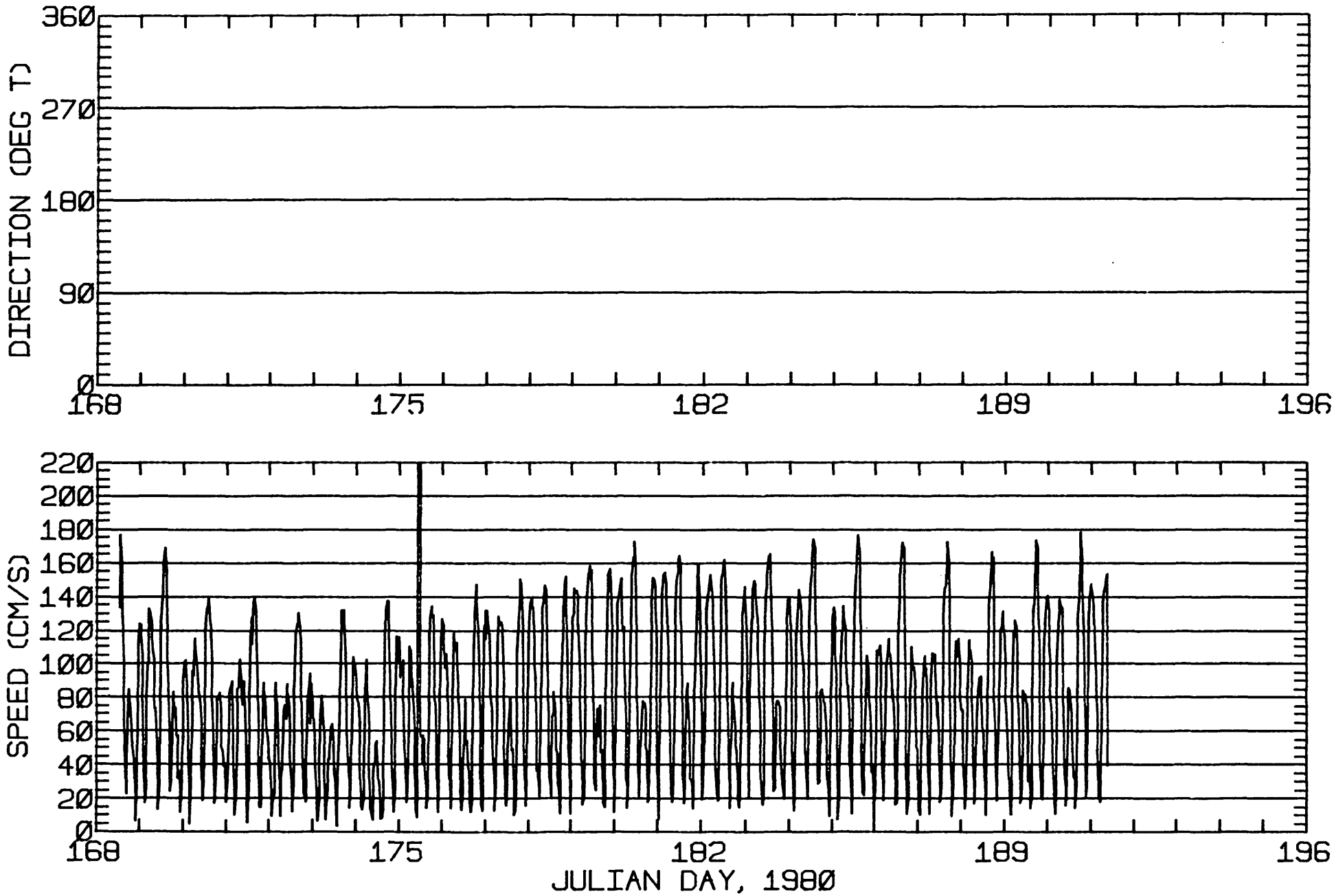
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

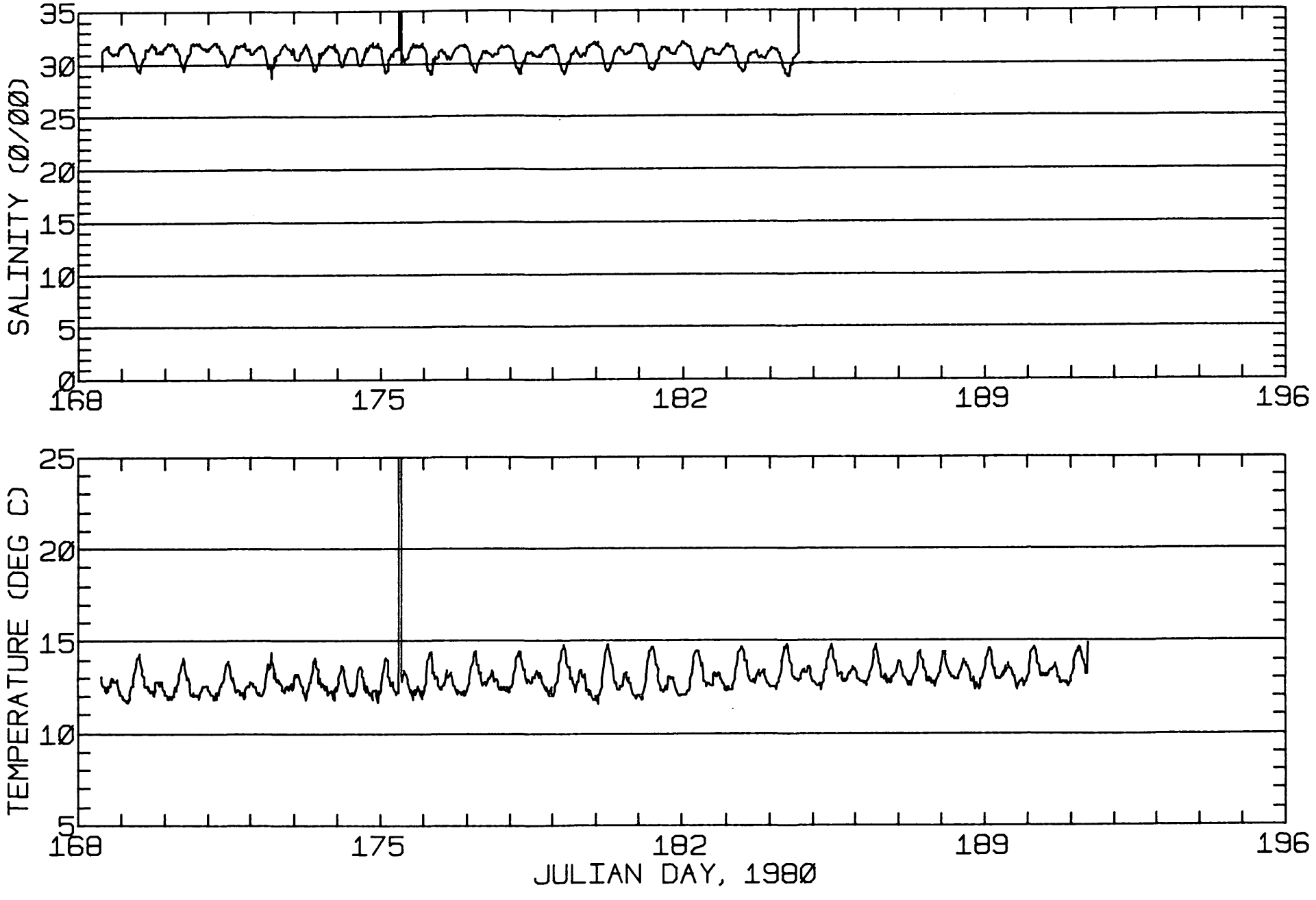
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	12			
4	6			
ALL	42			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001F1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER85.3 METERS ABOVE BED TAPE NUMBER GSC001F1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 7/ 9/80 1159 PST JULIAN DAY=191
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

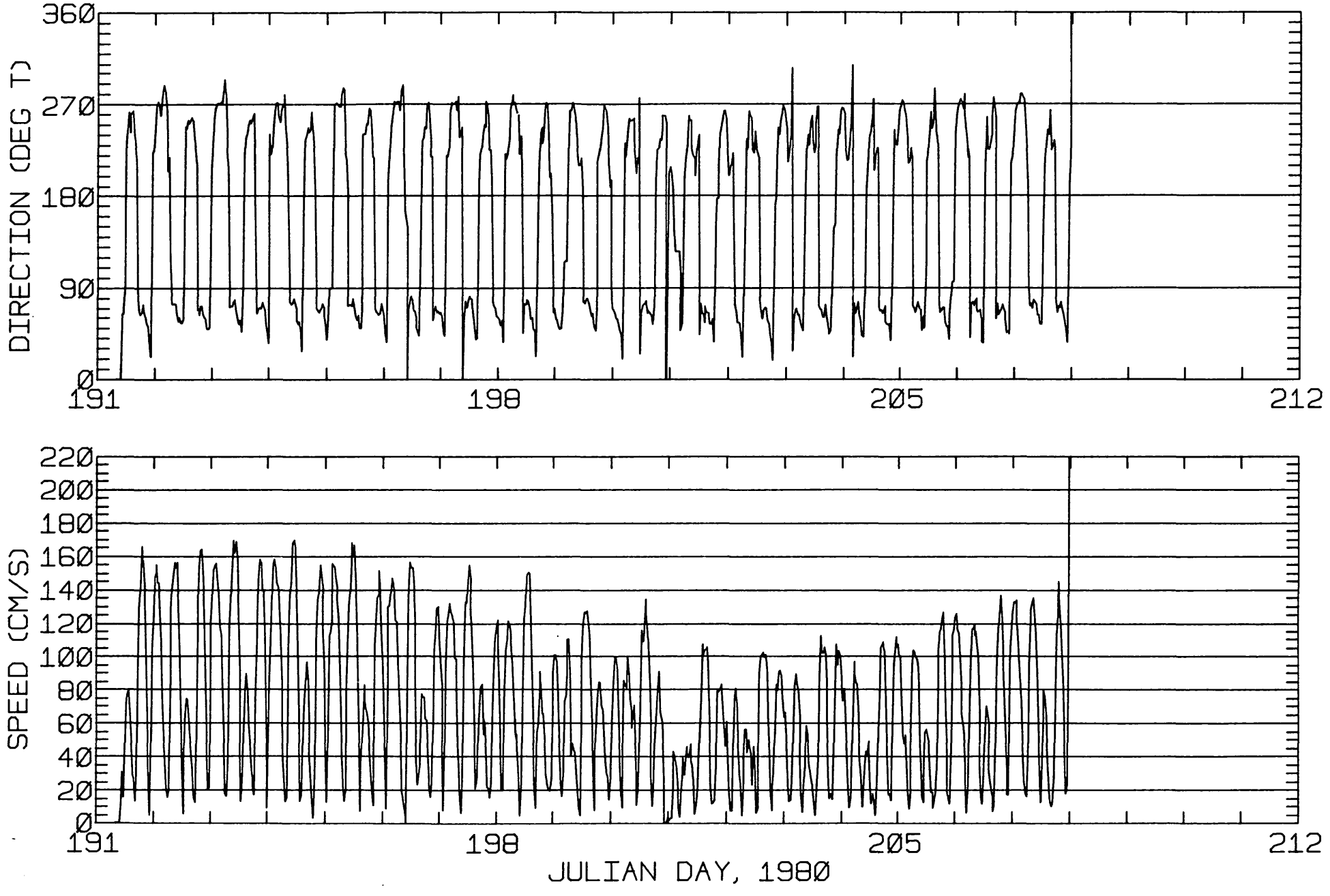
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.43	0.93	94.7	45.7	ANTI-CLOCKWISE
K1	37.93	0.23	77.4	55.1	CLOCKWISE
N2	19.16	2.63	83.0	280.4	ANTI-CLOCKWISE
M2	108.27	3.08	71.8	292.5	ANTI-CLOCKWISE
S2	20.27	1.06	82.3	308.8	ANTI-CLOCKWISE
M4	14.40	0.01	33.4	269.2	CLOCKWISE

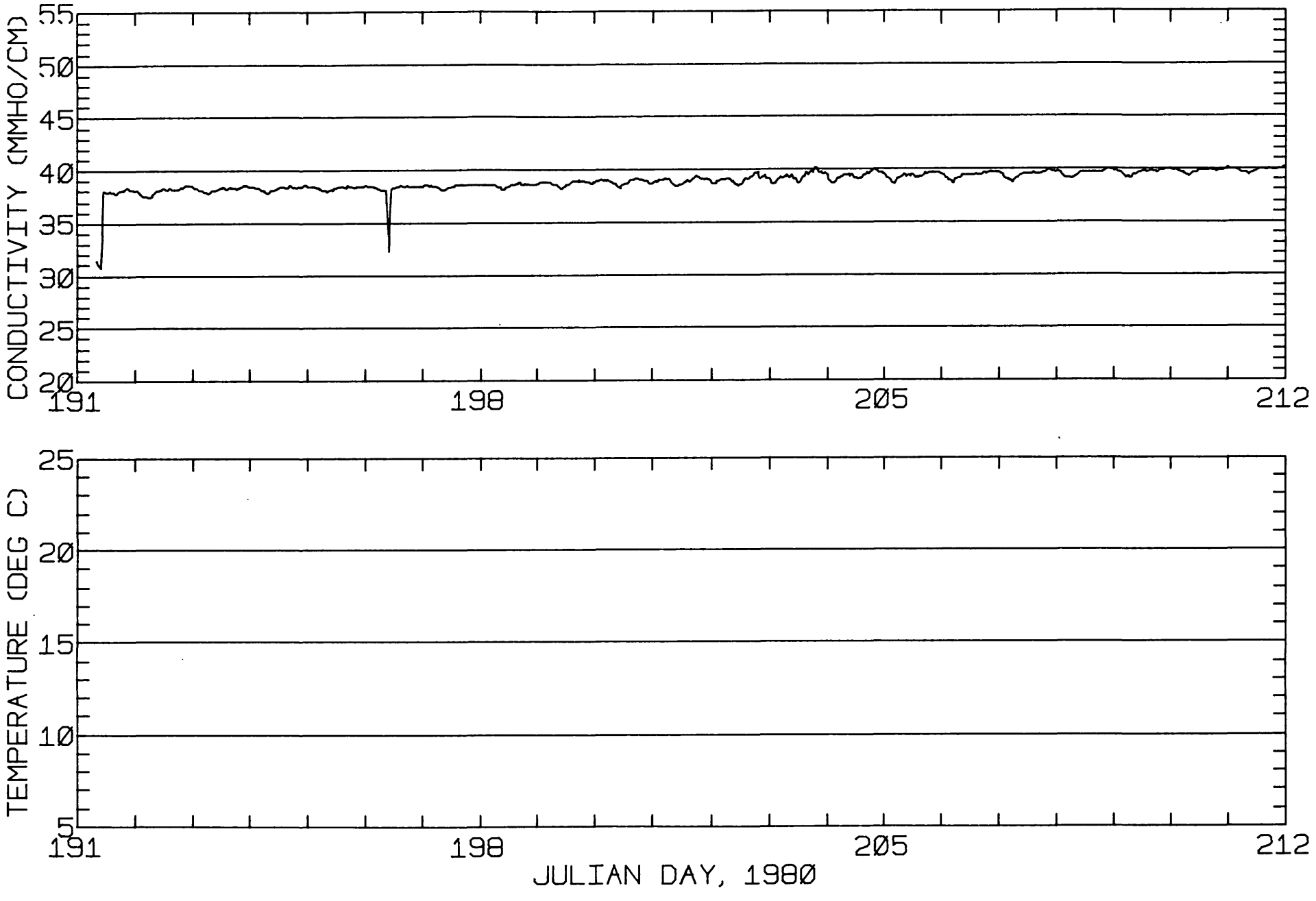
RMS SPEED: 85.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 180.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 64.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 19.27 CM/SEC
STANDARD DEVIATION V SERIES: 20.40 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.7	11.4	279.
2	12	5.0	1.4	291.
3	6	4.7	4.1	305.
ALL	30	6.4	5.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER **85.3 METERS ABOVE BED** TAPE NUMBER GSC001G1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001G1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 7/30/80 1318 PST JULIAN DAY=212
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

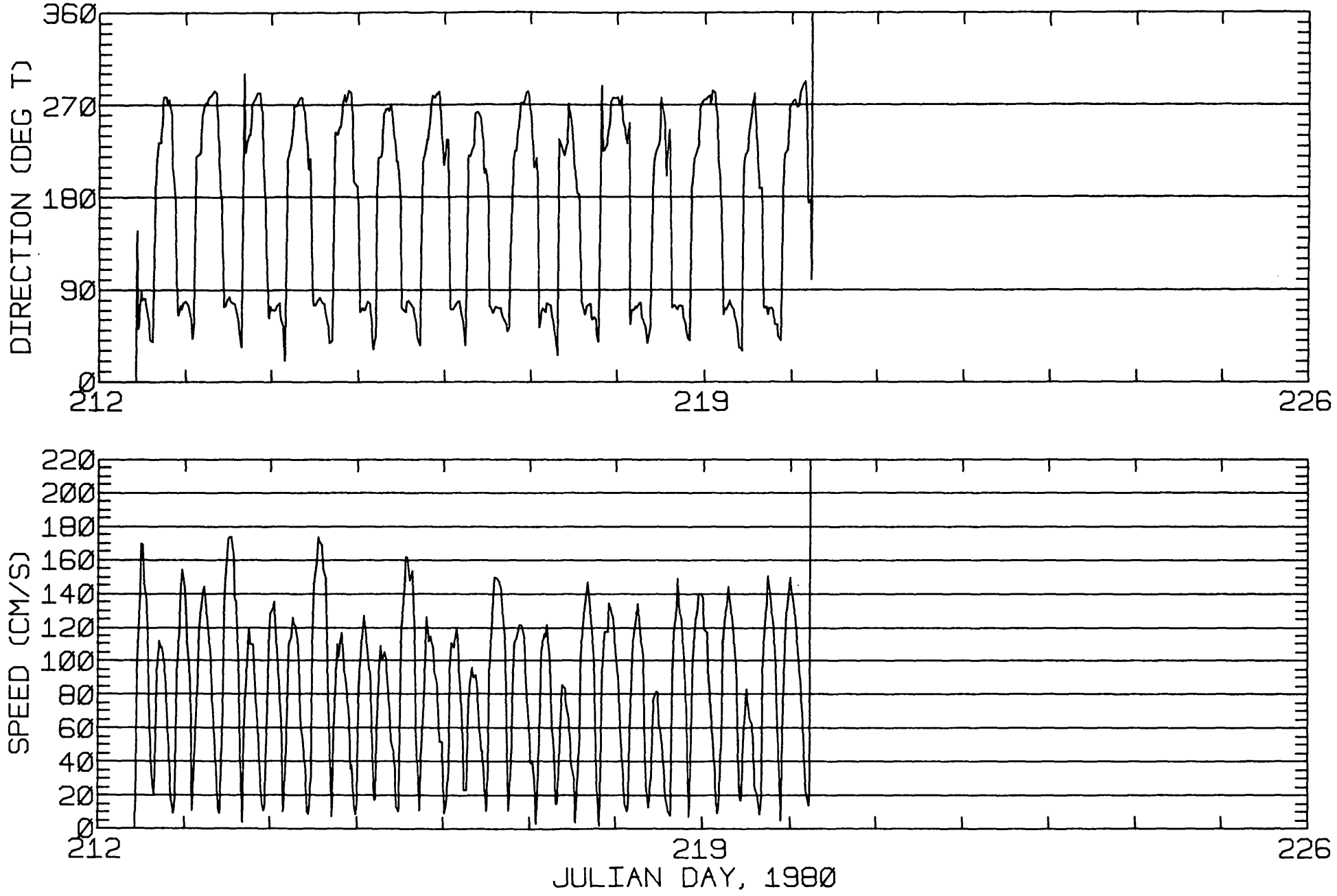
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.29	5.41	98.0	37.6	CLOCKWISE
K1	41.88	0.59	83.5	58.0	CLOCKWISE
N2	31.18	2.28	57.8	260.3	CLOCKWISE
M2	105.91	1.64	81.6	295.5	ANTI-CLOCKWISE
S2	28.28	0.73	88.3	306.7	ANTI-CLOCKWISE
M4	19.91	2.47	26.5	267.0	ANTI-CLOCKWISE

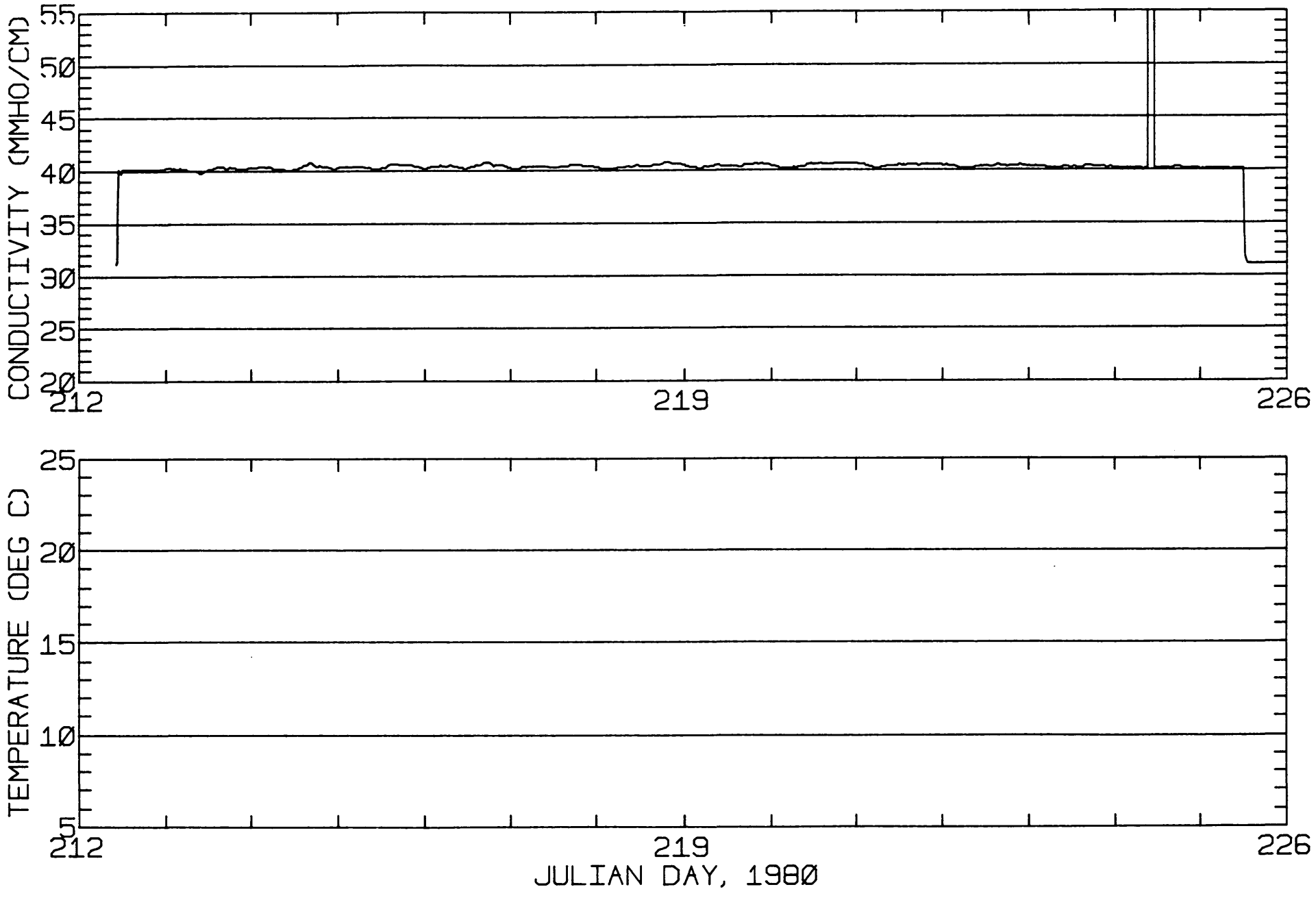
RMS SPEED:	94.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	194.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	54.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	84.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.45
STANDARD DEVIATION U-SERIES:	14.14 CM/SEC
STANDARD DEVIATION V SERIES:	22.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.2	5.9	207.
2	2	3.9	8.4	153
ALL	14	7.6	6.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001H1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001H1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 8/13/80 1058 PST JULIAN DAY=226
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

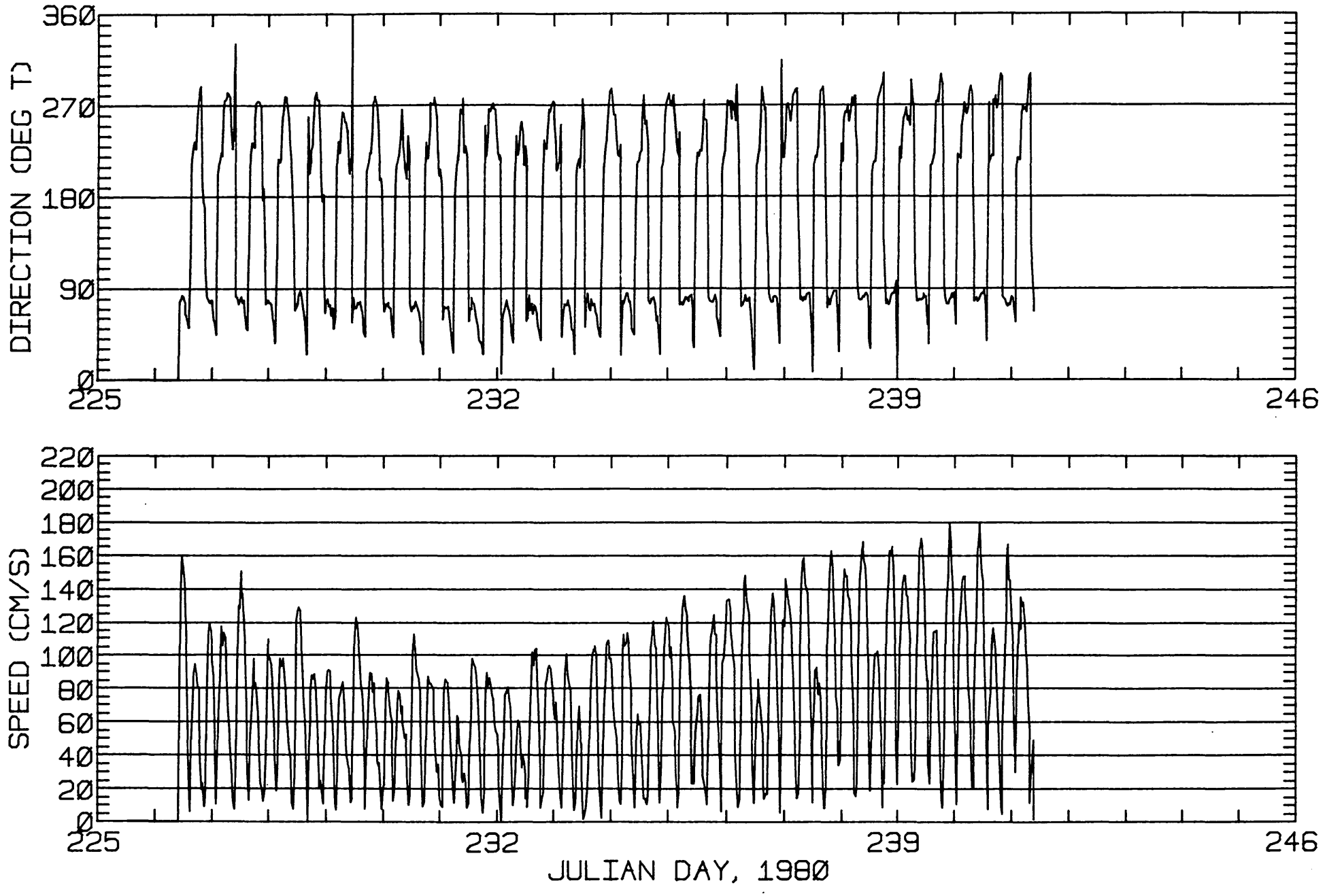
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.52	1.71	91.8	27.7	CLOCKWISE
K1	30.45	0.68	81.6	65.6	ANTI-CLOCKWISE
N2	17.83	4.17	100.6	272.3	CLOCKWISE
M2	109.33	9.54	76.9	286.1	CLOCKWISE
S2	25.94	3.48	87.5	300.8	CLOCKWISE
M4	15.74	3.45	30.9	253.4	ANTI-CLOCKWISE

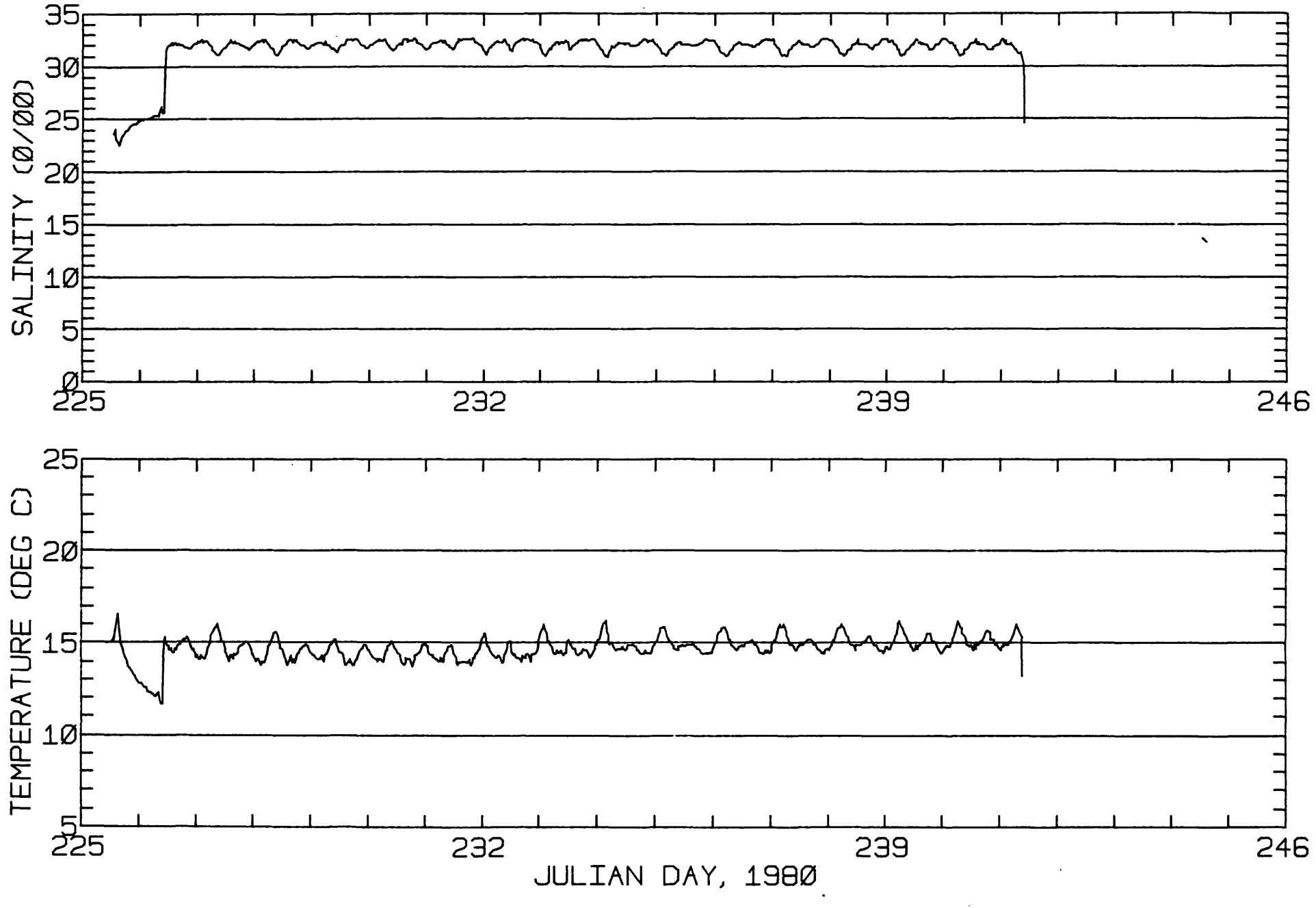
RMS SPEED:	85.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	183.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	70.5 CM/SEC
PRINCIPAL CURRENT DIRECTION:	80.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.35
STANDARD DEVIATION U-SERIES:	12.85 CM/SEC
STANDARD DEVIATION V SERIES:	20.62 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.0	-0.1	81.
2	12	8.7	1.3	106.
3	4	12.1	1.3	101.
ALL	28	8.4	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001I1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001I1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 8/28/80 1239 PST JULIAN DAY=241
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

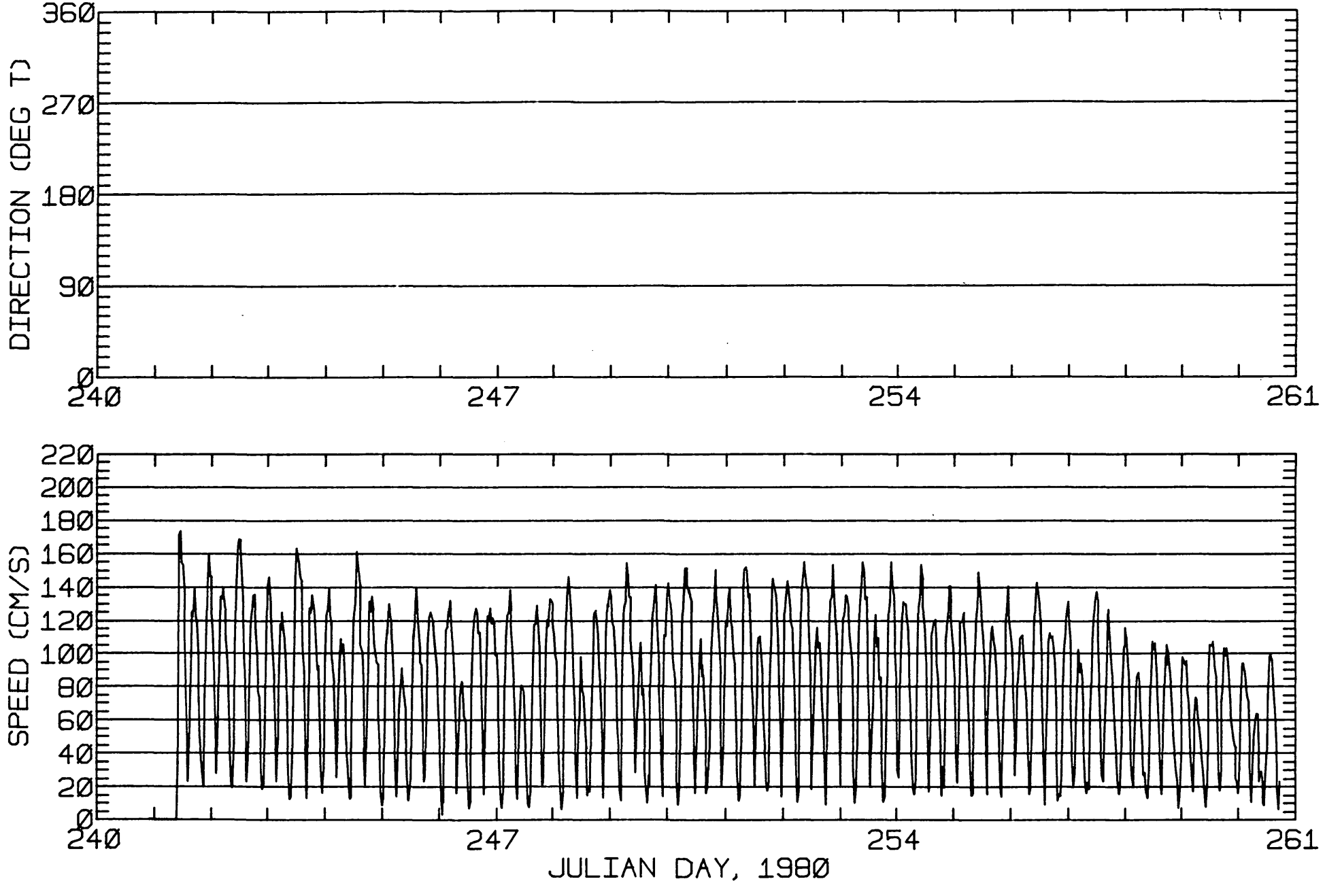
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

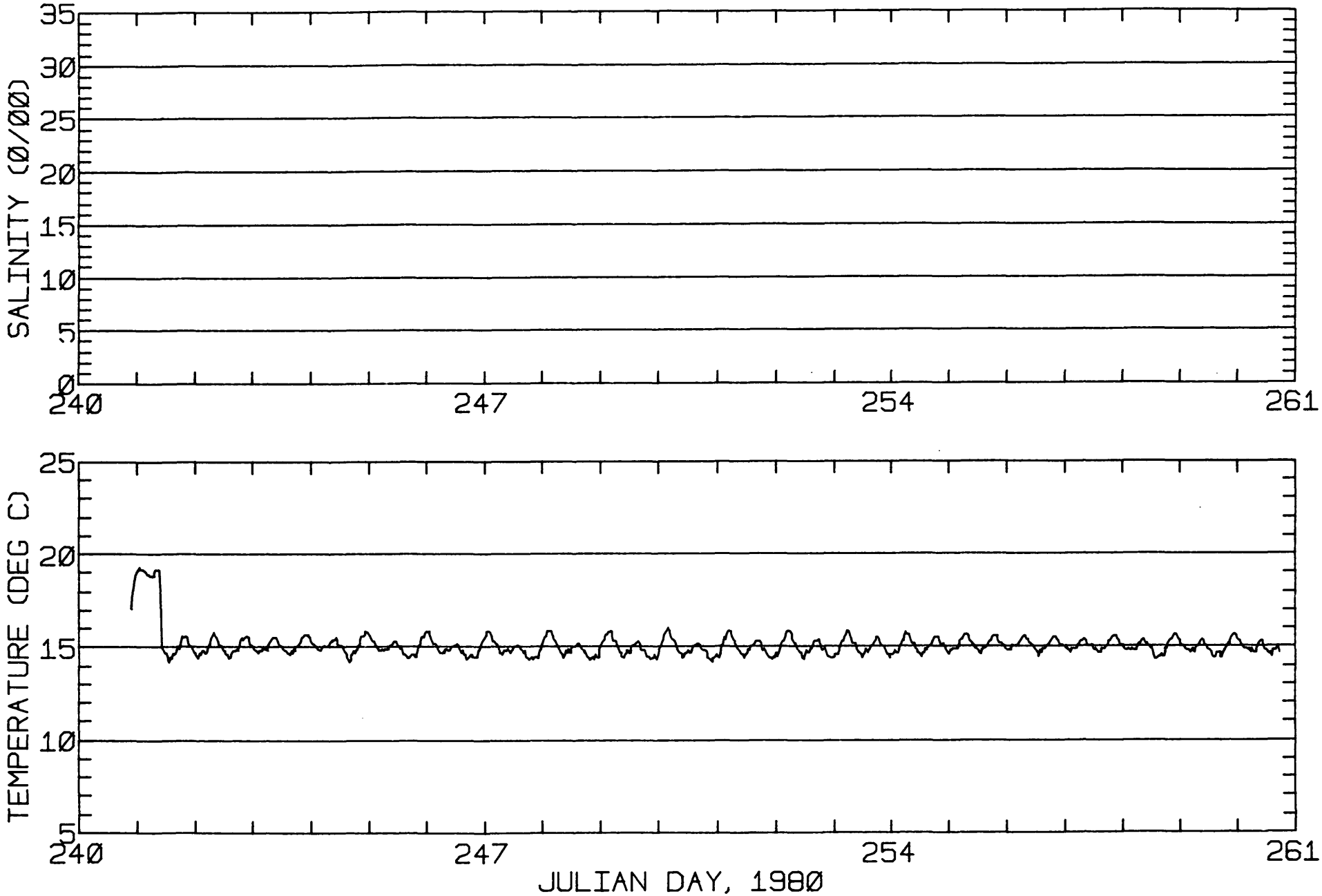
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	12			
ALL	36			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001J1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001J1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 9/16/80 2156 PST JULIAN DAY=260
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

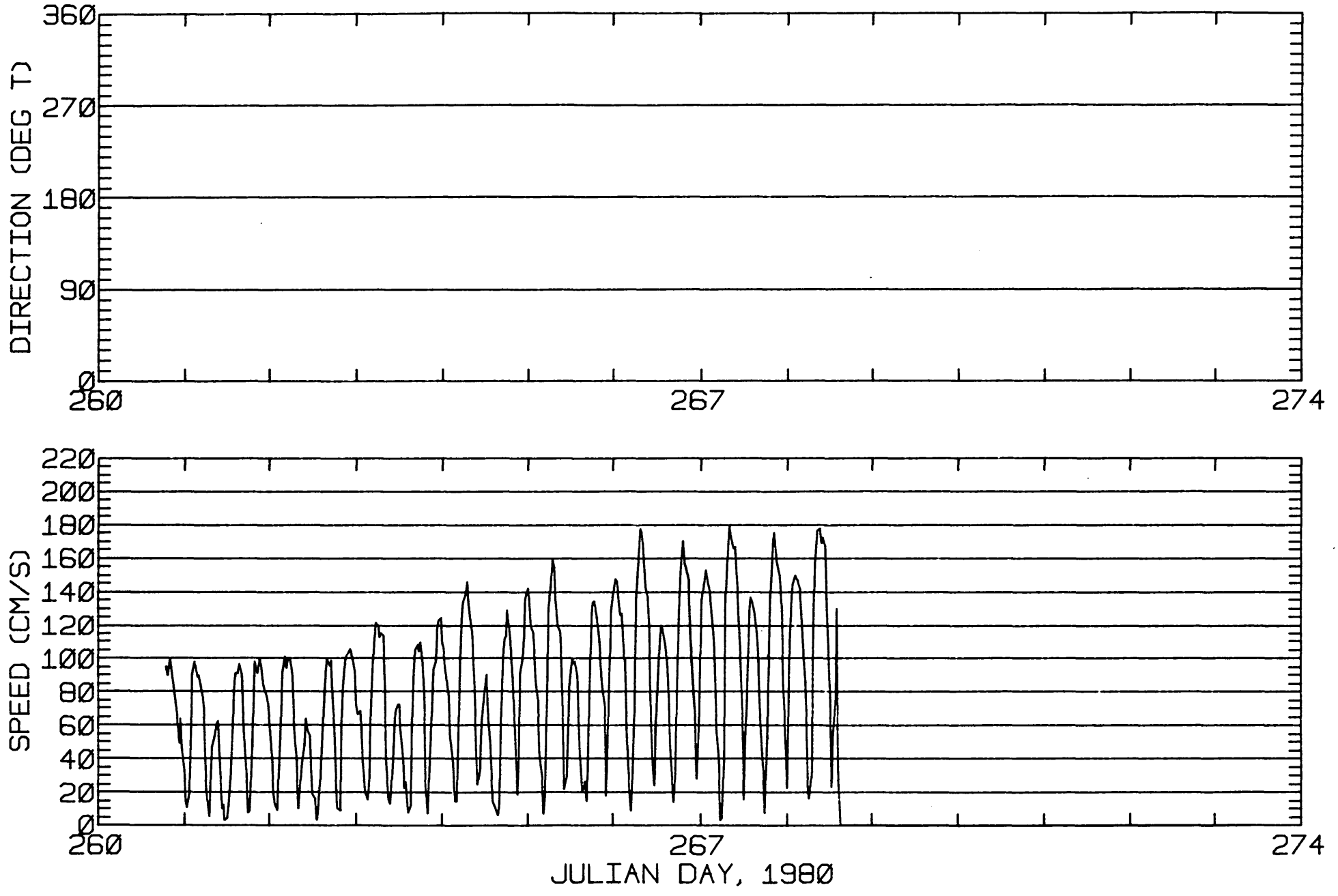
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

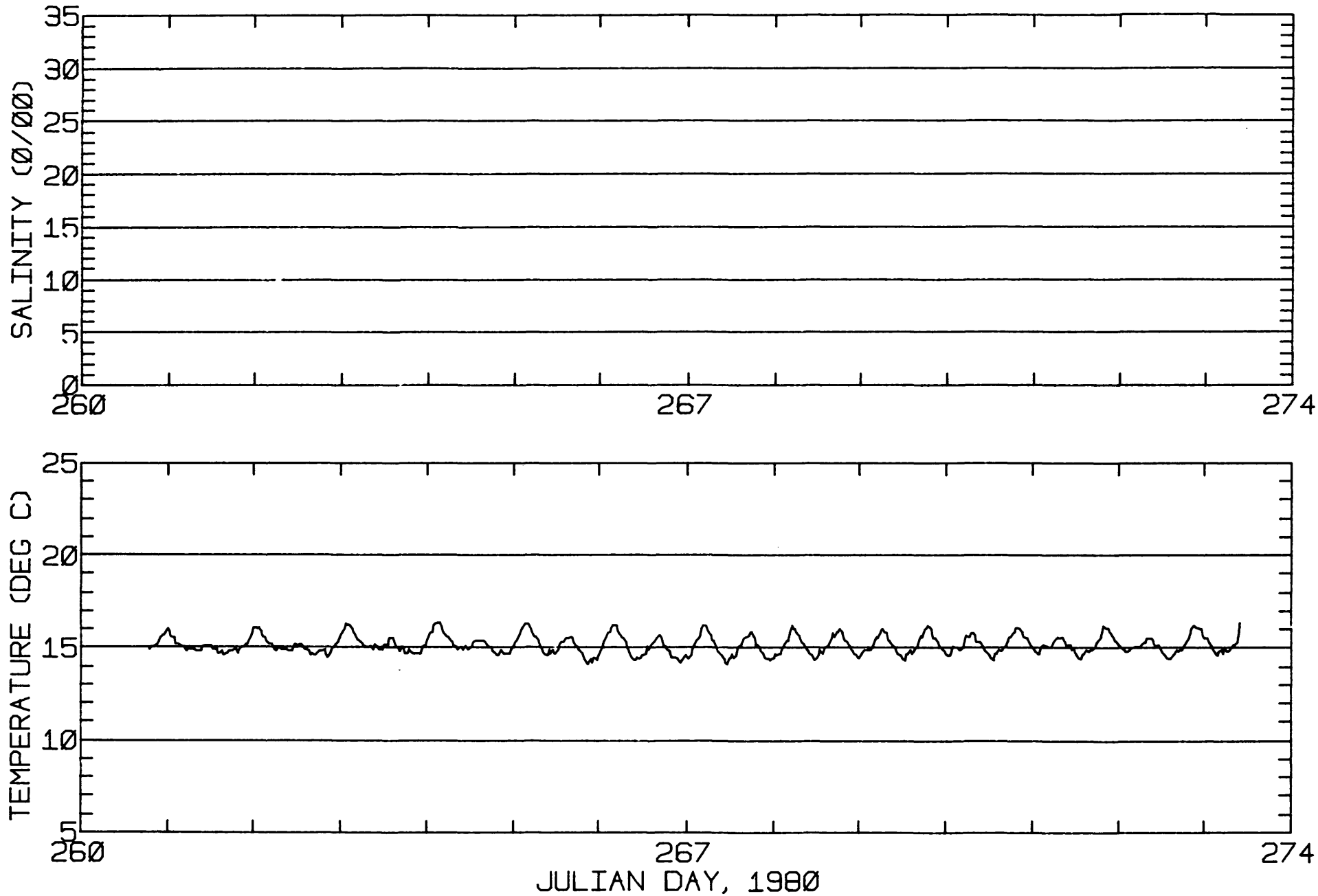
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
ALL	12			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001K1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001K1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 9/29/80 1240 PST JULIAN DAY=273
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

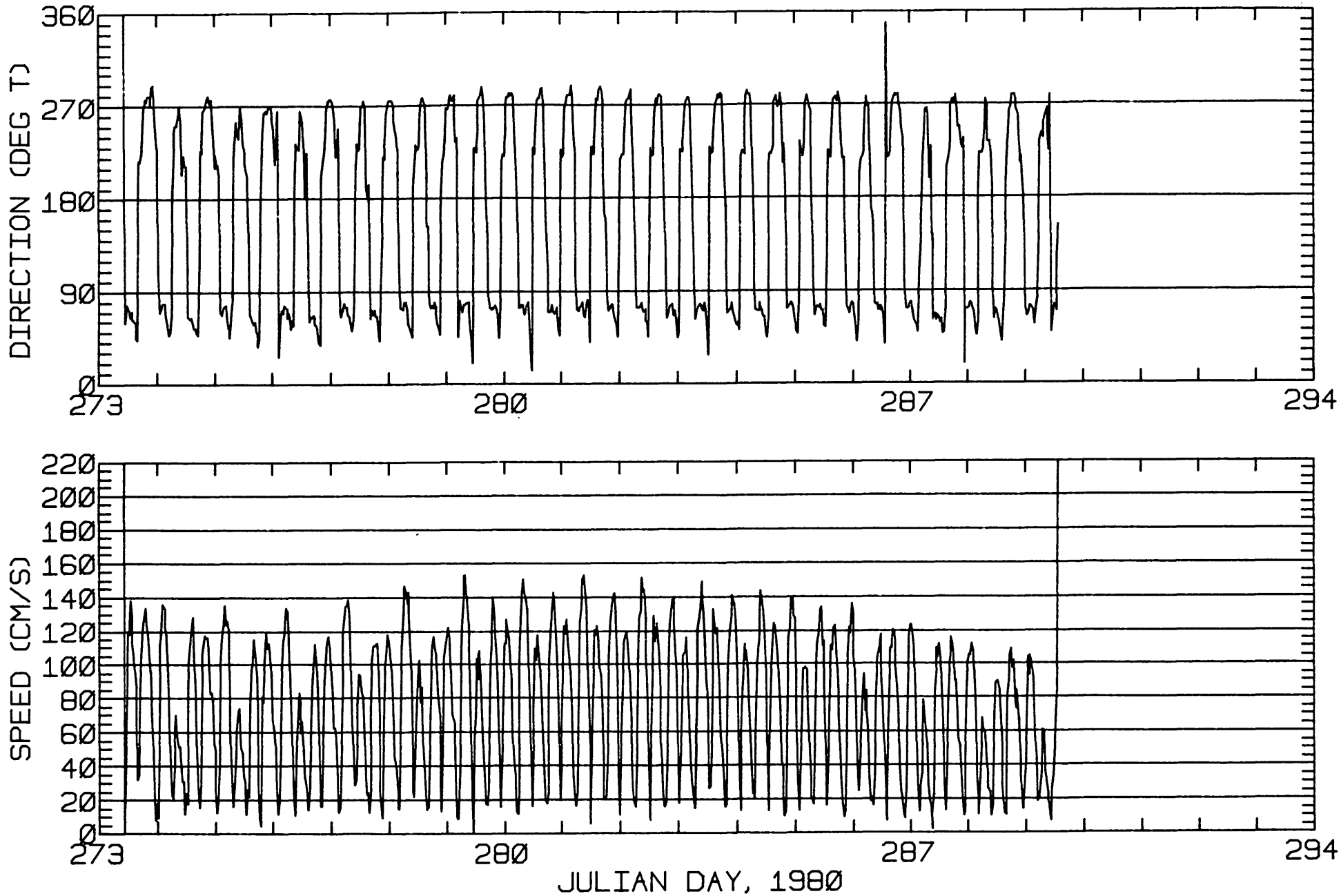
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.86	1.90	86.5	37.2	CLOCKWISE
K1	20.27	0.54	85.0	32.5	CLOCKWISE
N2	26.35	2.91	70.4	288.4	ANTI-CLOCKWISE
M2	113.33	1.91	73.9	293.5	CLOCKWISE
S2	35.55	2.96	78.5	278.0	CLOCKWISE
M4	17.63	0.56	25.6	282.1	CLOCKWISE

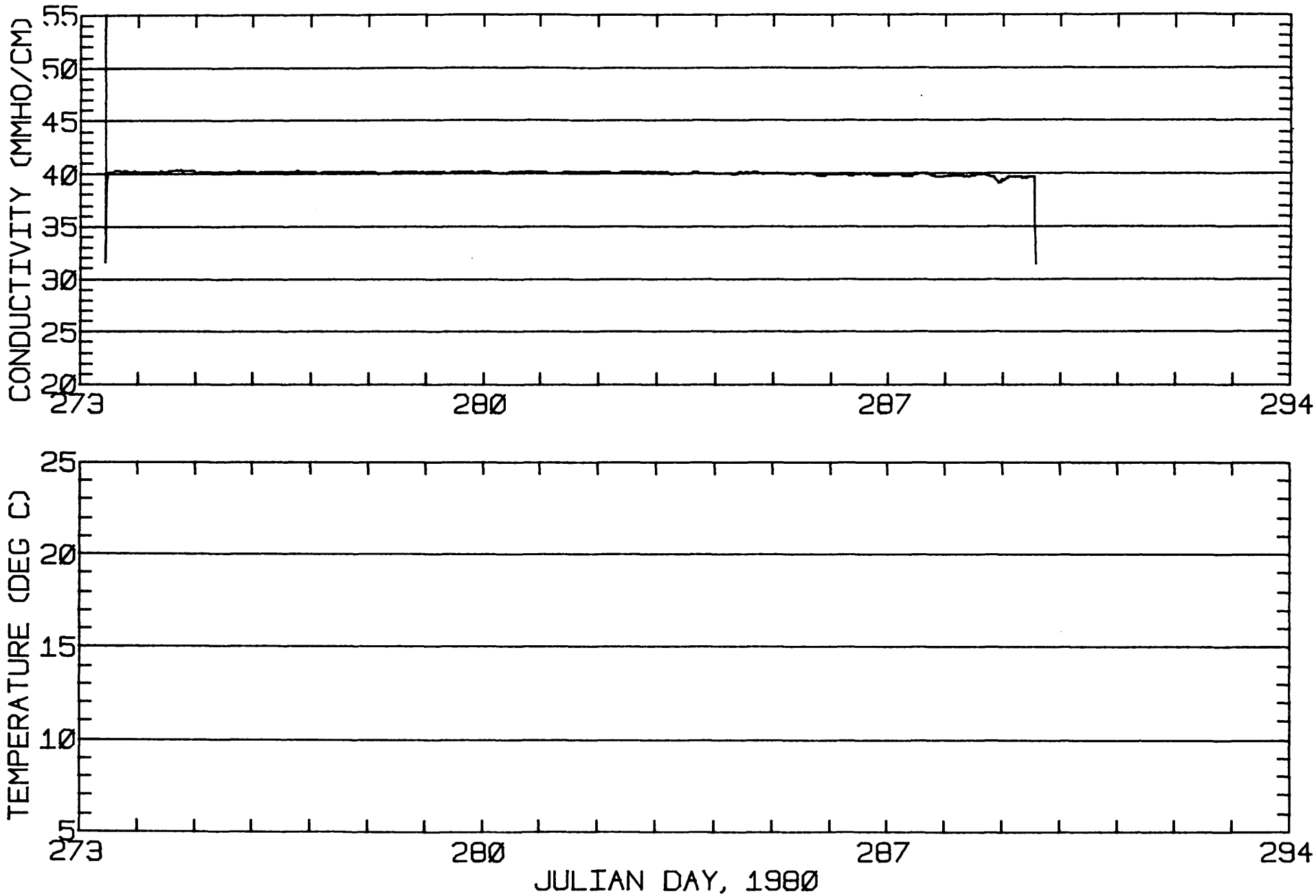
RMS SPEED: 87.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 187.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 75.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 77.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 13.44 CM/SEC
STANDARD DEVIATION V SERIES: 23.07 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.2	5.8	273.
2	12	8.7	7.3	270.
3	6	4.9	3.5	242.
ALL	30	6.1	6.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001L1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-12N 122-28-22W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001L1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'14"N 122 28'20"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 10/15/80 1601 PST JULIAN DAY=289
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

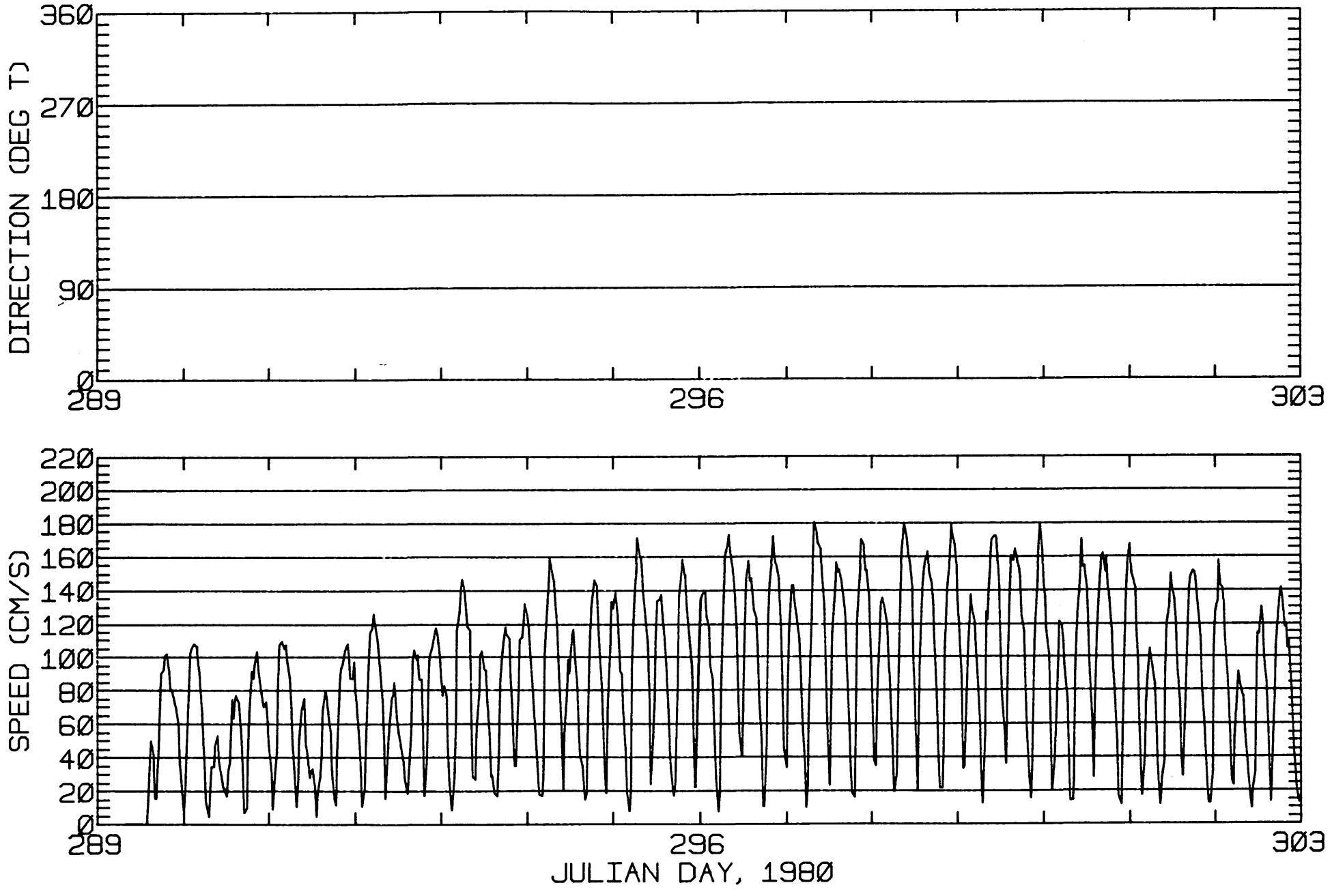
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

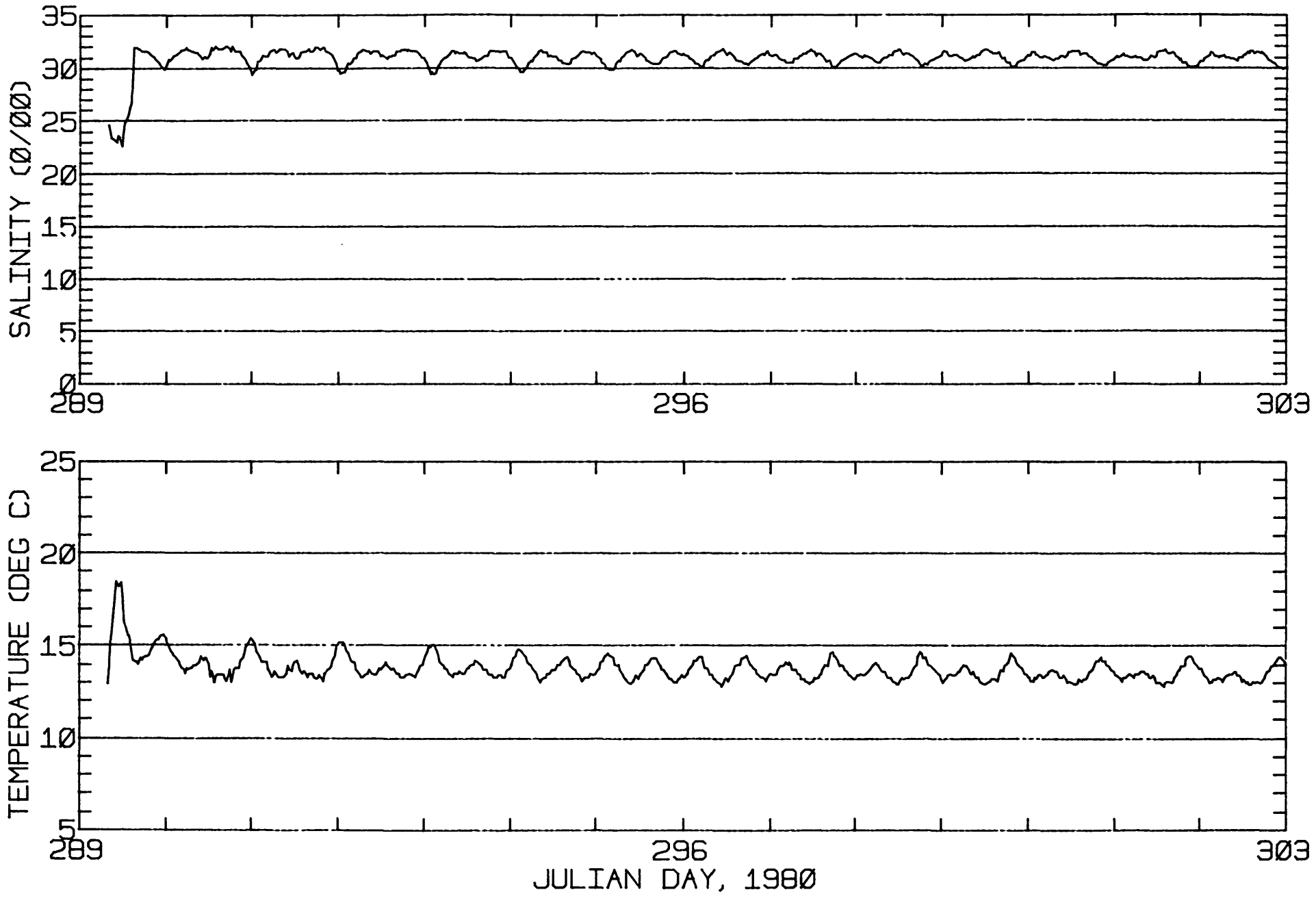
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	2			
ALL	26			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-14N 122-28-20W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001M1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-14N 122-28-20W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001M1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C001
POSITION: 37 49'14"N 122 28'20"W
METER TYPE: ENDECO
WATER DEPTH: 97.5 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 10/29/80 1833 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

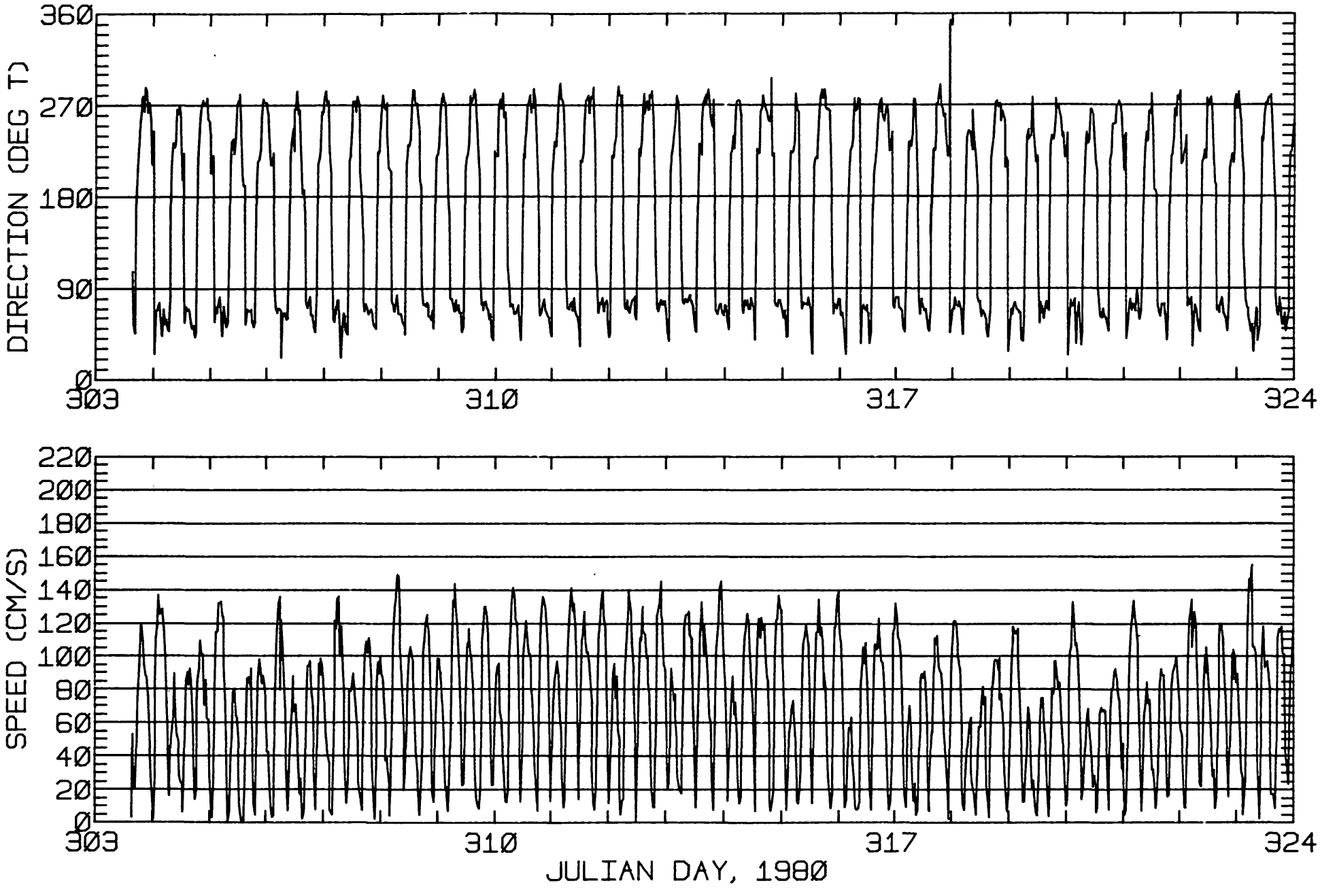
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.69	4.91	84.1	30.1	CLOCKWISE
K1	30.07	0.87	80.0	22.2	CLOCKWISE
N2	24.65	1.87	69.1	265.2	ANTI-CLOCKWISE
M2	105.48	0.07	73.7	290.1	CLOCKWISE
S2	29.78	3.98	78.6	276.0	CLOCKWISE
M4	12.73	1.12	25.9	273.9	ANTI-CLOCKWISE

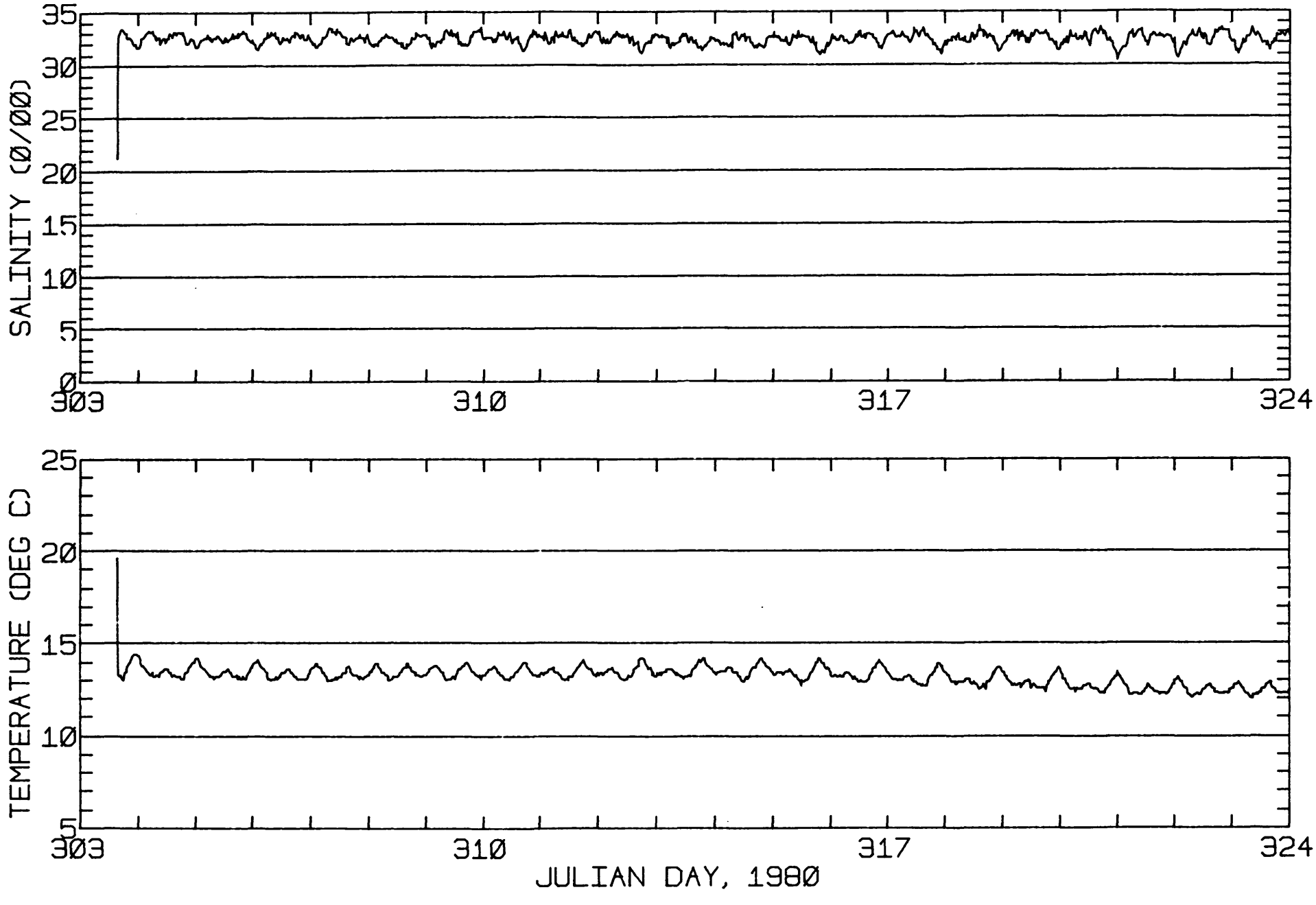
RMS SPEED:	80.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	181.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	61.3 CM/SEC
PRINCIPAL CURRENT DIRECTION:	76.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.34
STANDARD DEVIATION U-SERIES:	14.67 CM/SEC
STANDARD DEVIATION V SERIES:	20.87 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.4	8.3	160.
2	12	9.0	6.4	184.
3	12	5.5	3.6	193.
4	2	8.2	9.9	196.
ALL	38	7.3	6.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-14N 122-28-20W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001N1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
GOLDEN GATE 37-49-14N 122-28-20W
METER 85.3 METERS ABOVE BED TAPE NUMBER GSC001N1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C05A
POSITION: 37 50'45"N 122 25'26"W
METER TYPE: ENDECO
WATER DEPTH: 24.3 M (MLLW)
METER DEPTH: 6.0 M (BELOW MLLW)
START TIME OF SERIES: 9/21/79 201 PST JULIAN DAY=264
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

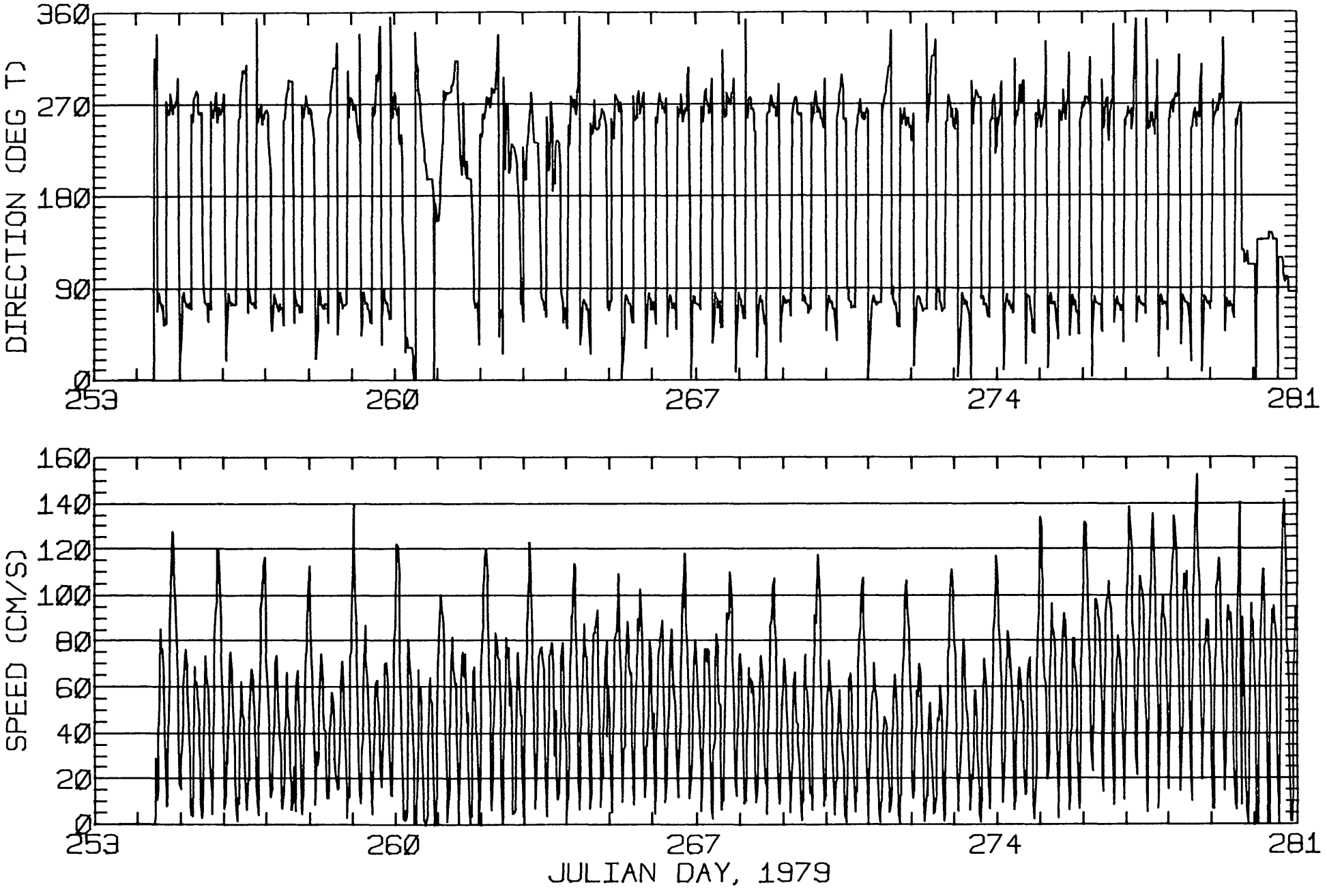
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.26	0.14	83.1	24.6	CLOCKWISE
K1	20.54	1.17	73.7	44.7	CLOCKWISE
N2	19.60	0.80	77.2	269.0	CLOCKWISE
M2	75.65	1.06	80.2	299.2	CLOCKWISE
S2	20.71	2.28	83.5	307.3	CLOCKWISE
M4	1.37	0.91	98.9	14.3	ANTI-CLOCKWISE

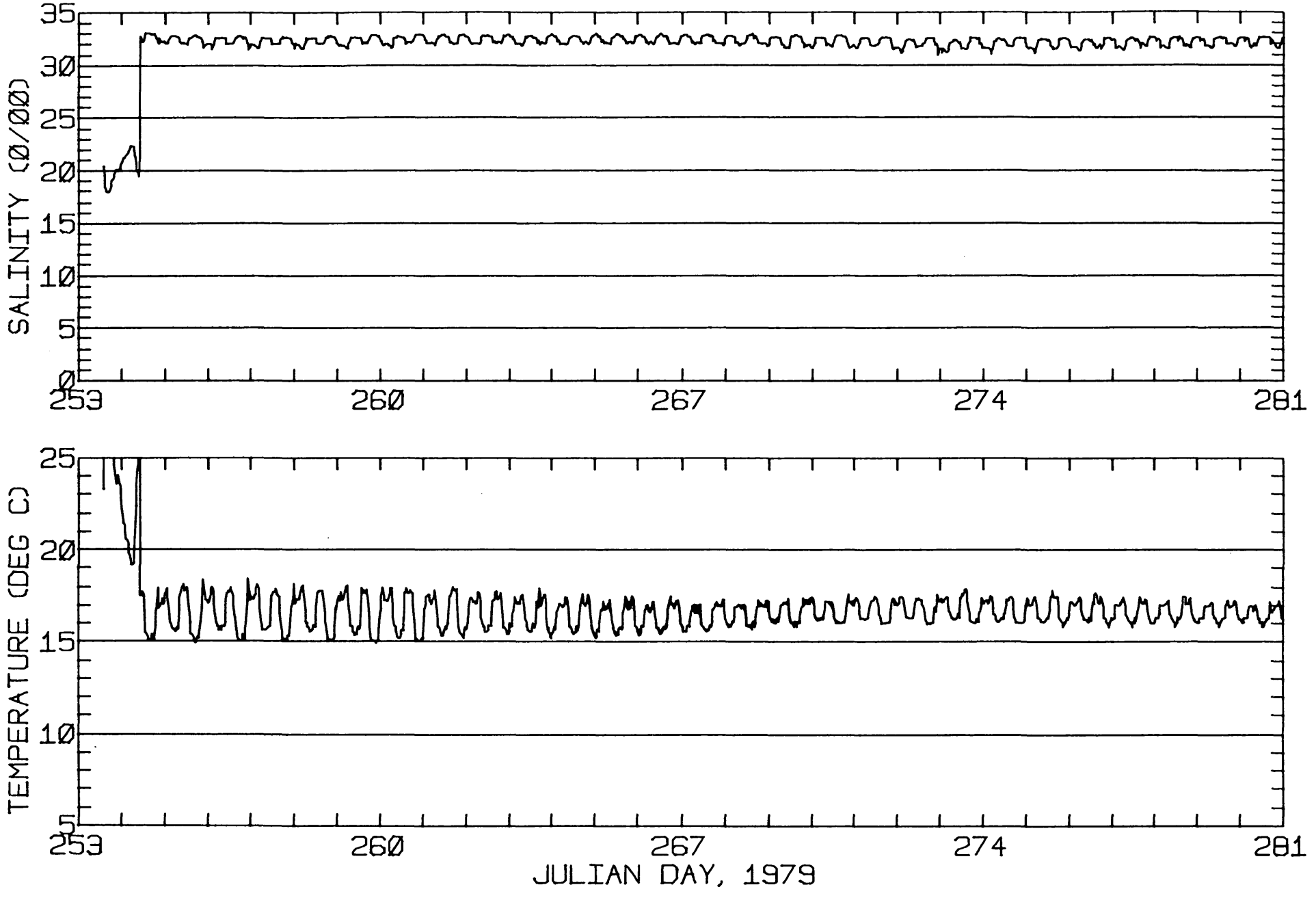
RMS SPEED: 62.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 131.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 80.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 13.73 CM/SEC
STANDARD DEVIATION V SERIES: 11.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-11.9	4.7	136.
2	12	-7.4	3.5	141.
3	4	-12.2	3.7	153.
ALL	28	-10.0	4.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
ANGEL ISLAND 37-50-45N 122-25-26W
METER 18.3 METERS ABOVE BED TAPE NUMBER GSC05AA1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
ANGEL ISLAND 37-50-45N 122-25-26W
METER 18.3 METERS ABOVE BEDTAPE NUMBER GSC05AA1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C05A
POSITION: 37 50'46"N 122 25'26"W
METER TYPE: ENDECO
WATER DEPTH: 24.3 M (MLLW)
METER DEPTH: 6.0 M (BELOW MLLW)
START TIME OF SERIES: 5/13/80 1103 PST JULIAN DAY=134
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

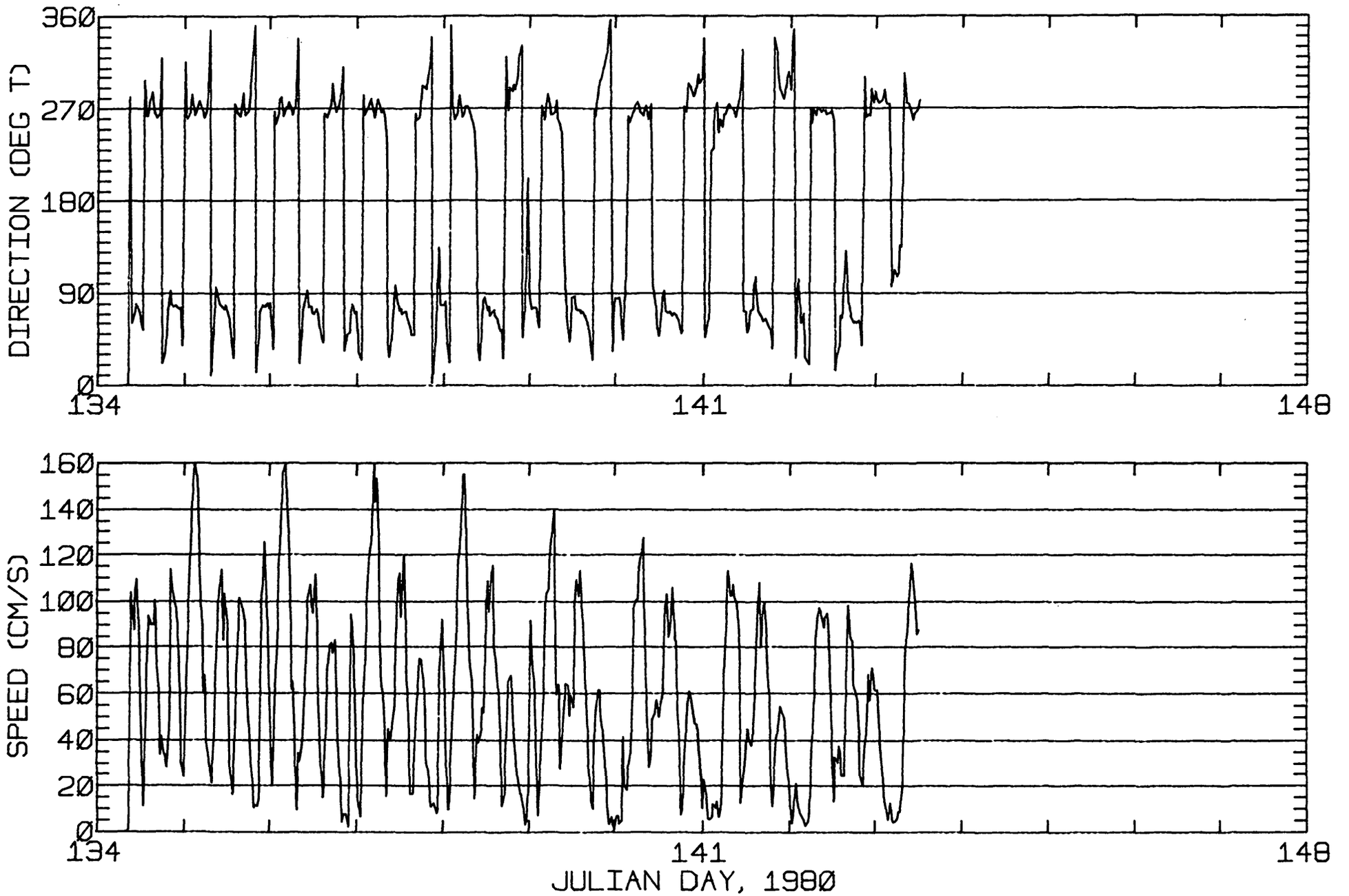
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.78	1.79	65.9	358.6	CLOCKWISE
K1	39.00	4.28	80.1	17.5	ANTI-CLOCKWISE
N2	19.84	3.49	66.1	311.2	CLOCKWISE
M2	80.58	6.34	88.3	295.3	CLOCKWISE
S2	14.59	3.33	92.3	289.1	ANTI-CLOCKWISE
M4	13.32	0.70	76.3	359.1	CLOCKWISE

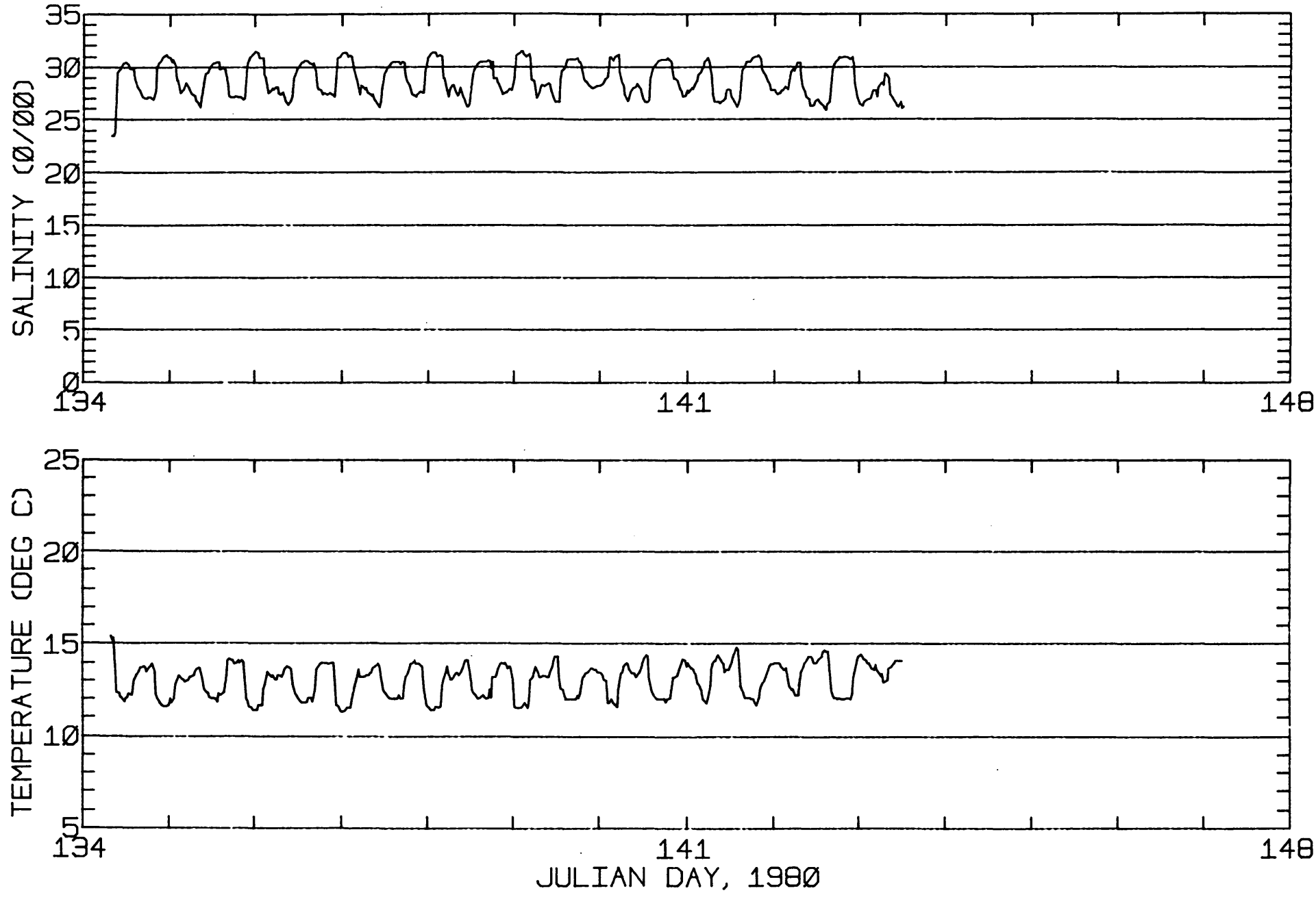
RMS SPEED:	73.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	152.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	44.8 CM/SEC
PRINCIPAL CURRENT DIRECTION:	84.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.60
STANDARD DEVIATION U-SERIES:	17.28 CM/SEC
STANDARD DEVIATION V SERIES:	11.81 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.7	10.7	718.
2	2	-9.3	10.5	654.
ALL	14	-7.9	10.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
ANGEL ISLAND 37-50-46N 122-25-26W
METER18.3 METERS ABOVE BEDTAPE NUMBER GSC05AC1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
ANGEL ISLAND 37-50-46N 122-25-26W
METER18.3 METERS ABOVE BEDTAPE NUMBER GSC05AC1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C201
POSITION: 37 46'56"N 122 37' 2"W
METER TYPE: ENDECO
WATER DEPTH: 11.2 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 9/13/79 1121 PST JULIAN DAY=256
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

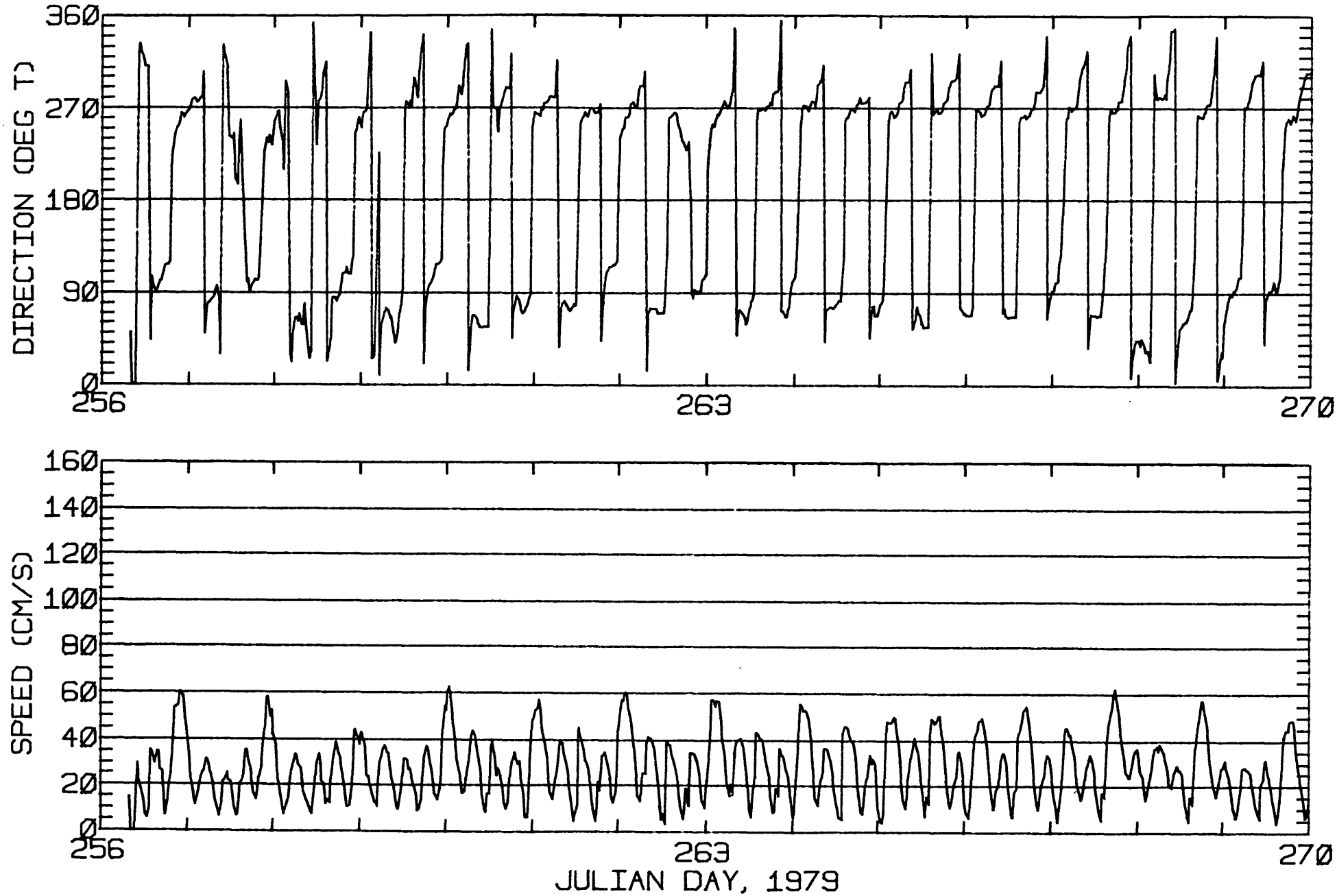
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.97	3.83	73.8	40.2	CLOCKWISE
K1	8.86	3.26	60.3	57.9	CLOCKWISE
N2	8.75	1.86	79.8	274.5	CLOCKWISE
M2	36.67	6.17	82.8	302.1	CLOCKWISE
S2	10.63	1.15	76.4	300.3	CLOCKWISE
M4	3.60	0.28	83.1	340.3	CLOCKWISE

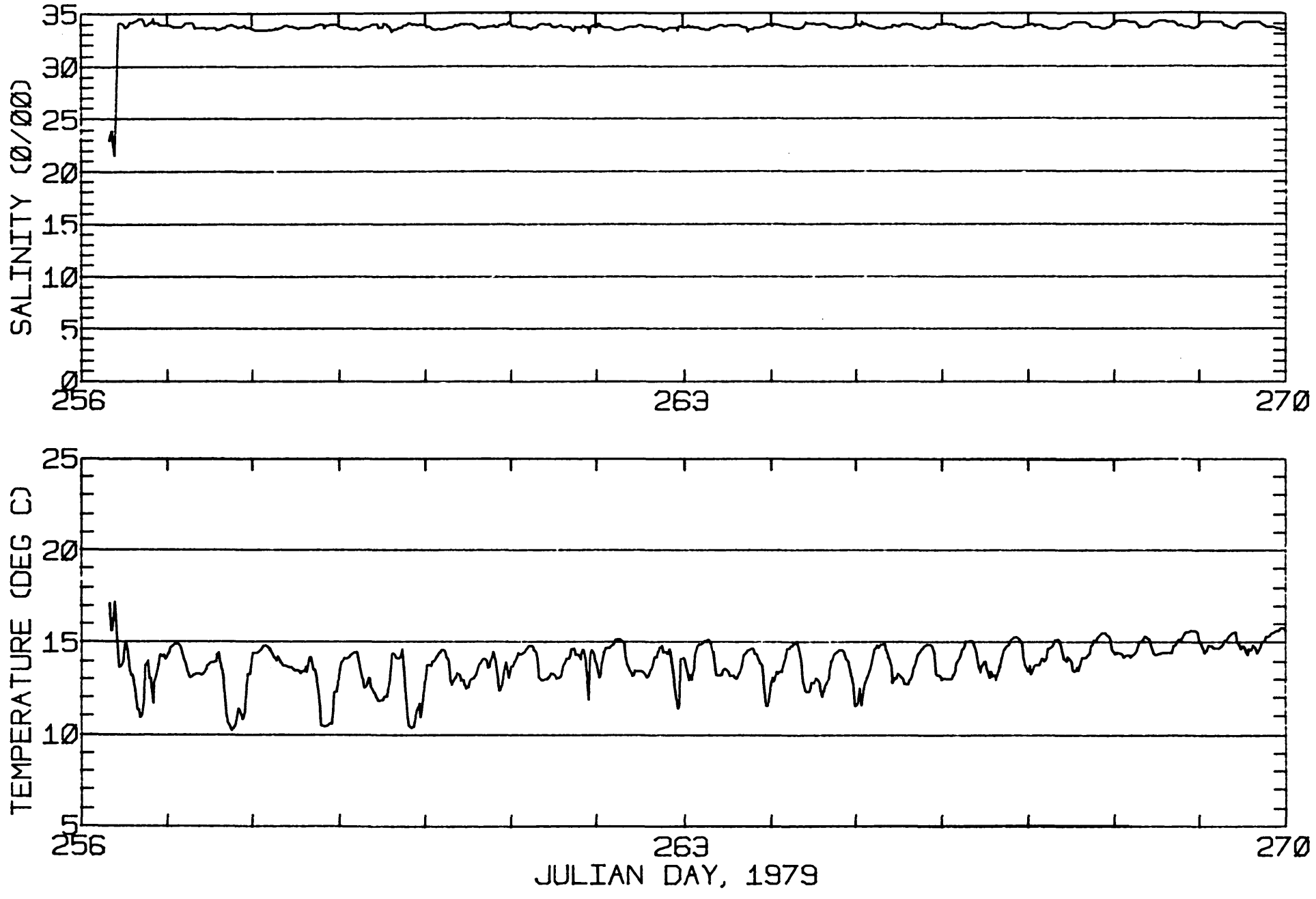
RMS SPEED:	30.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	64.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	25.1 CM/SEC
PRINCIPAL CURRENT DIRECTION:	77.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.36
STANDARD DEVIATION U-SERIES:	10.69 CM/SEC
STANDARD DEVIATION V SERIES:	6.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.6	1.0	197.
2	12	-10.6	4.4	146.
3	4	-6.5	1.8	133.
ALL	28	-7.4	2.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FOURFATHOM BANK 37-46-56N 122-37- 2W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC201A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FOURFATHOM BANK 37-46-56N 122-37- 2W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC201A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C201
POSITION: 37 46'56"N 122 37' 2"W
METER TYPE: ENDECO
WATER DEPTH: 11.2 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 9/28/79 1338 PST JULIAN DAY=271
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

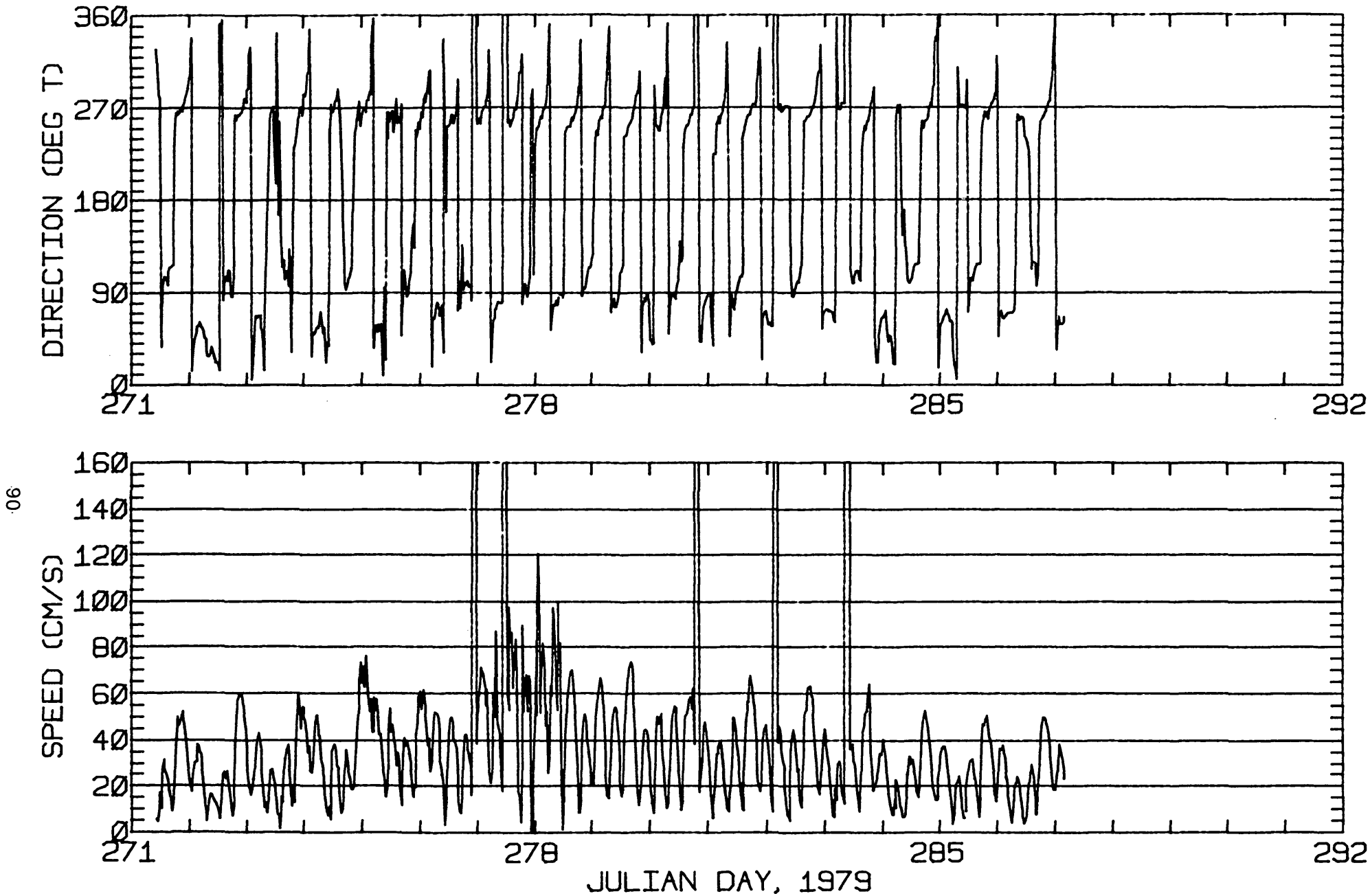
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.89	7.80	112.6	55.3	CLOCKWISE
K1	13.56	6.18	59.1	25.1	CLOCKWISE
N2	8.93	3.01	81.1	303.4	CLOCKWISE
M2	40.85	5.76	83.5	276.5	CLOCKWISE
S2	15.09	3.65	82.2	291.3	CLOCKWISE
M4	2.30	0.77	118.7	211.9	ANTI-CLOCKWISE

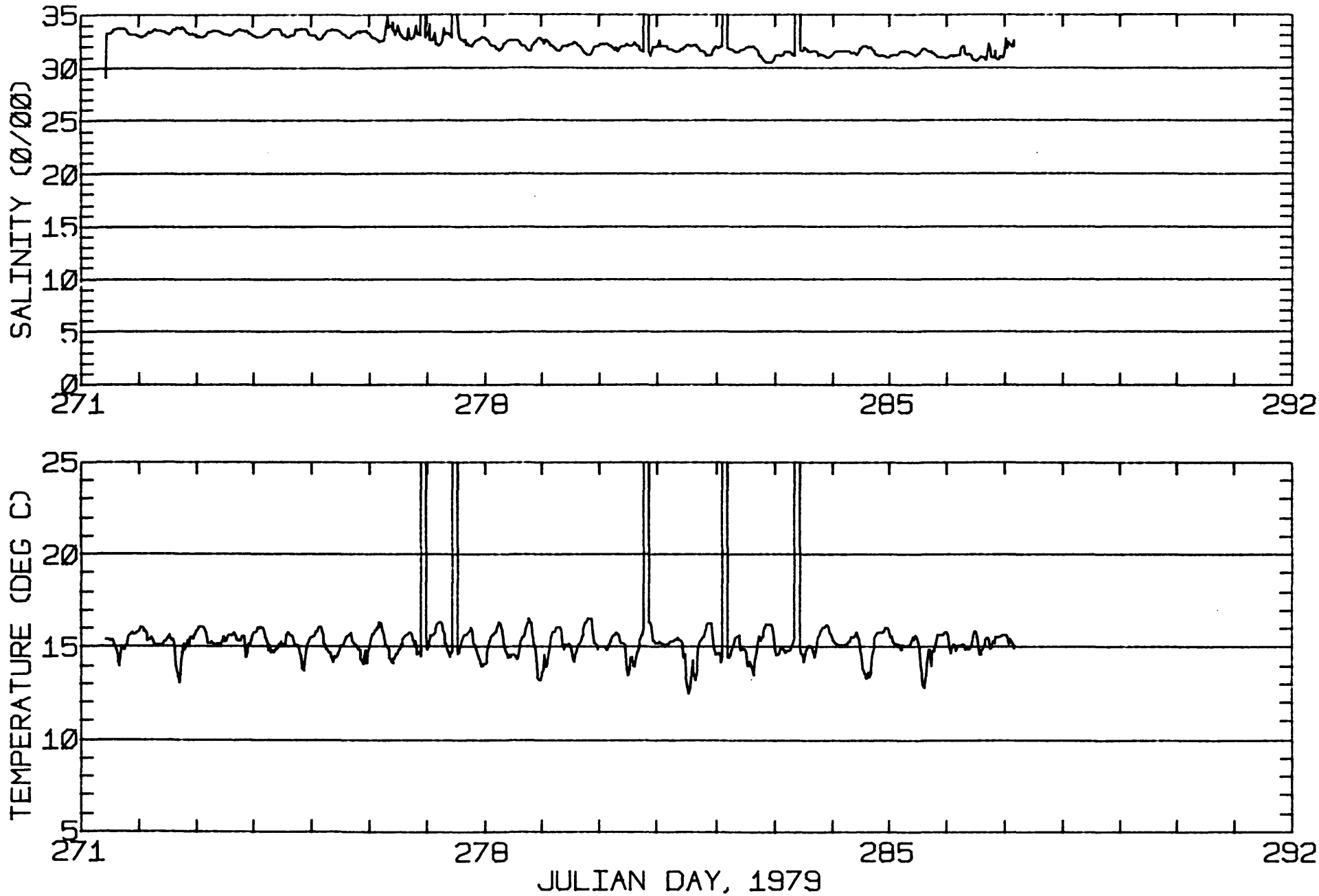
RMS SPEED: 40.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 79.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 82.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 13.25 CM/SEC
STANDARD DEVIATION V SERIES: 7.42 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.1	2.9	149.
2	12	-4.2	-0.3	154.
3	4	-1.0	1.1	184.
ALL	28	-5.0	1.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FOURFATHOM BANK 37-46-56N 122-37- 2W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC201B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FOURFATHOM BANK 37-46-56N 122-37- 2W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC201B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C202
POSITION: 37 45'32"N 122 36'20"W
METER TYPE: ENDECO
WATER DEPTH: 11.5 M (MLLW)
METER DEPTH: 7.3 M (BELOW MLLW)
START TIME OF SERIES: 9/13/79 1156 PST JULIAN DAY=256
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

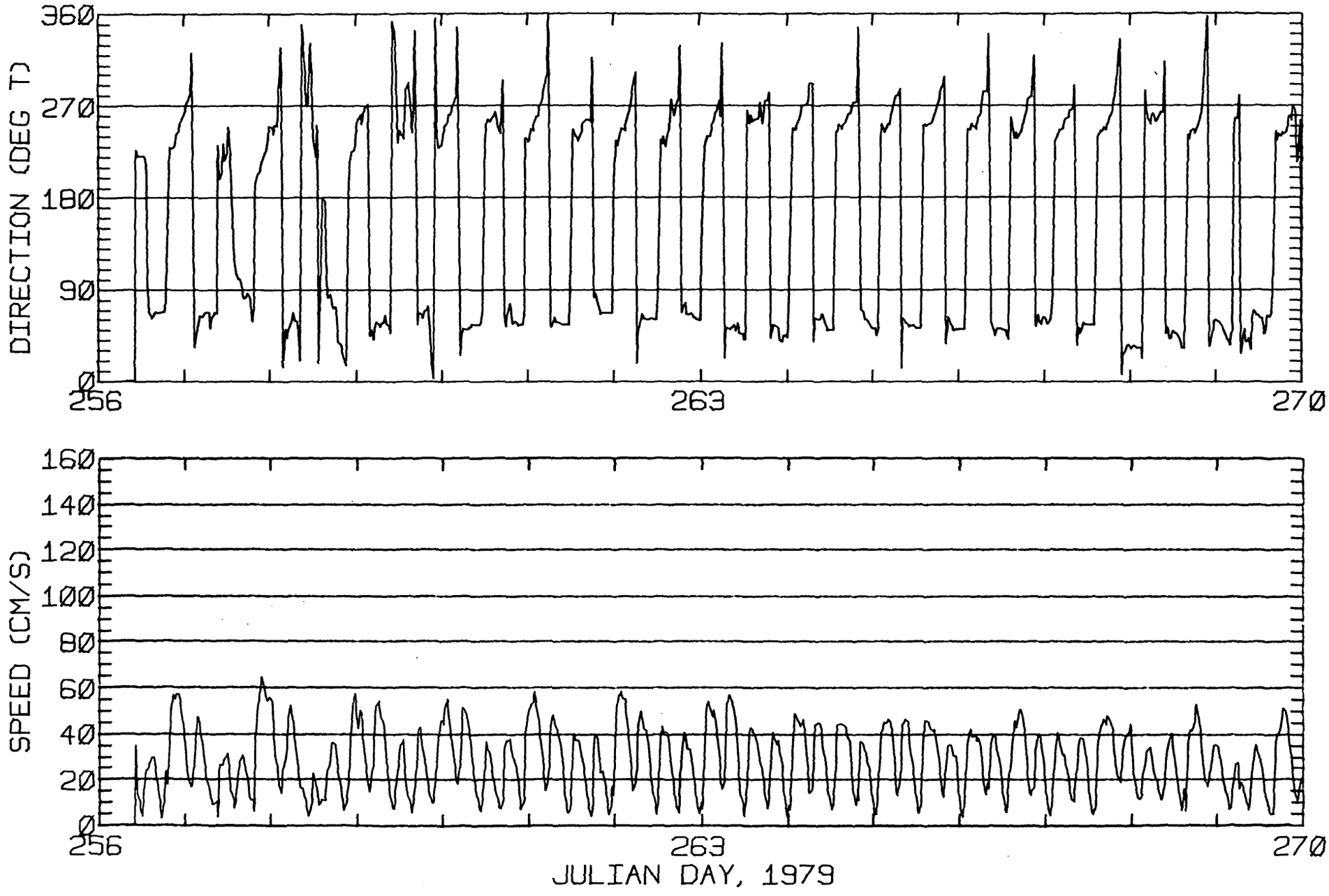
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.09	3.57	66.9	46.4	CLOCKWISE
K1	9.82	3.06	54.6	39.1	CLOCKWISE
N2	10.20	0.69	56.5	260.7	CLOCKWISE
M2	40.11	4.30	62.6	290.5	CLOCKWISE
S2	11.63	1.50	66.5	277.2	CLOCKWISE
M4	1.91	0.47	125.2	164.3	CLOCKWISE

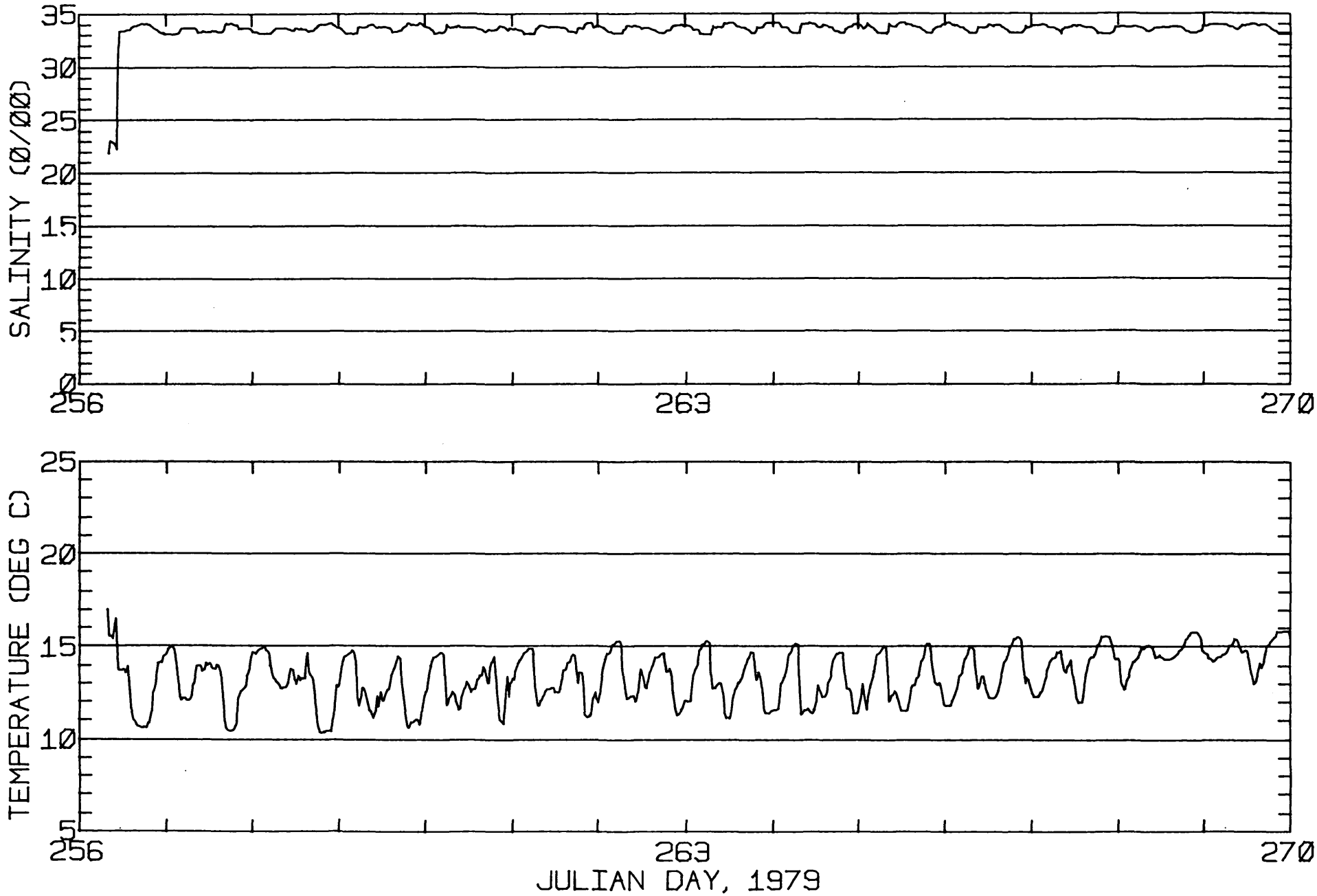
RMS SPEED:	32.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	70.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	27.8 CM/SEC
PRINCIPAL CURRENT DIRECTION:	62.7 DEGREES TRUE
TIDAL FORM NUMBER:	0.37
STANDARD DEVIATION U-SERIES:	9.36 CM/SEC
STANDARD DEVIATION V SERIES:	7.54 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.3	0.2	197.
2	12	-6.6	3.9	146.
3	4	-0.7	2.6	133.
ALL	28	-3.9	2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POINT LOBOS 37-45-32N 122-36-20W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC202A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POINT LOBOS 37-45-32N 122-36-20W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC202A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C202
POSITION: 37 45'32"N 122 36'20"W
METER TYPE: ENDECO
WATER DEPTH: 11.5 M (MLLW)
METER DEPTH: 7.3 M (BELOW MLLW)
START TIME OF SERIES: 9/28/79 1301 PST JULIAN DAY=271
APPROXIMATE RECORD LENGTH IS 6 M2-CYCLES

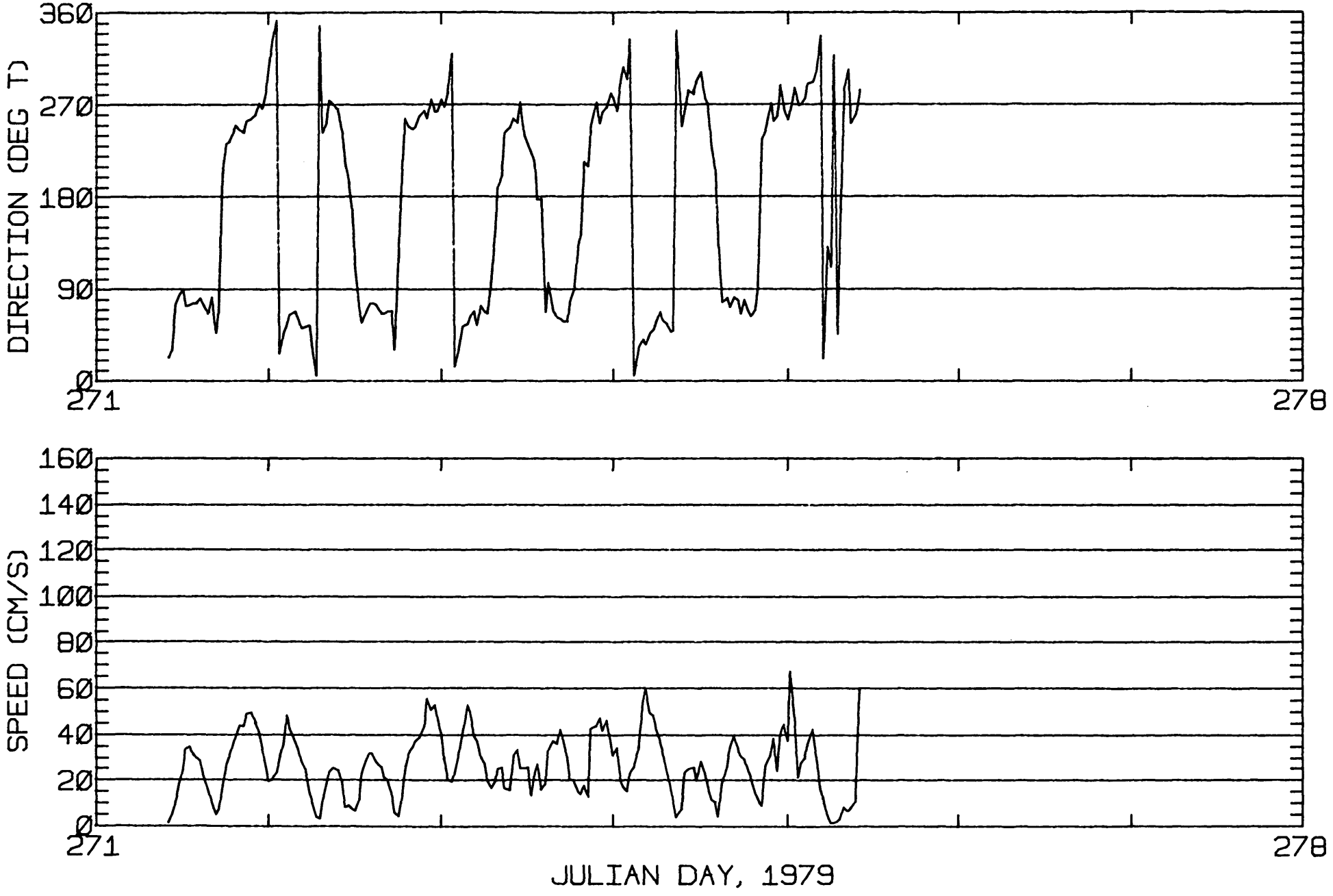
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

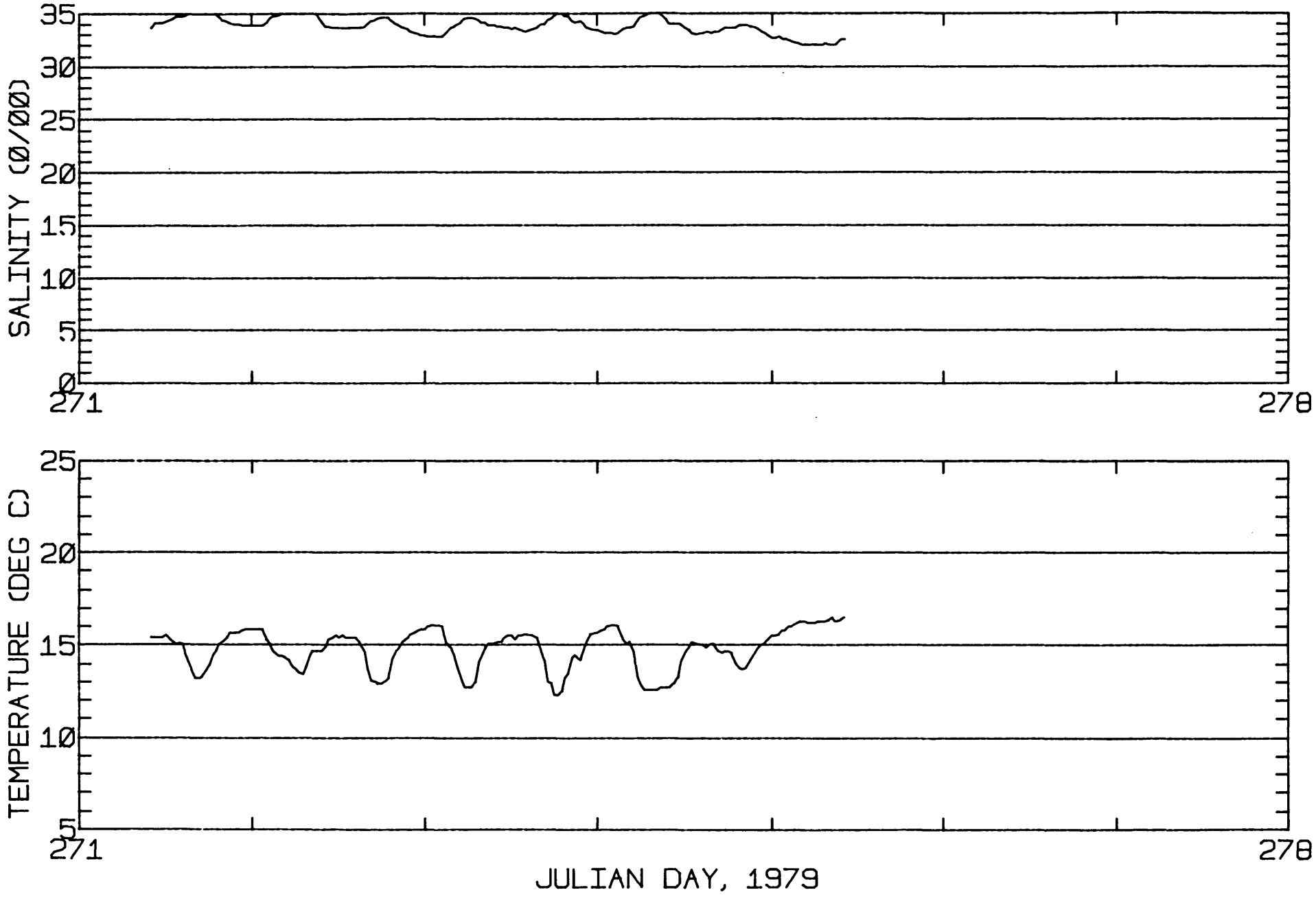
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1				
ALL				



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POINT LOBOS 37-45-32N 122-36-20W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC202B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POINT LOBOS 37-45-32N 122-36-20W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC202B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C202
POSITION: 37 45'32"N 122 36'20"W
METER TYPE: ENDECO
WATER DEPTH: 11.5 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 10/ 3/79 1349 PST JULIAN DAY=276
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

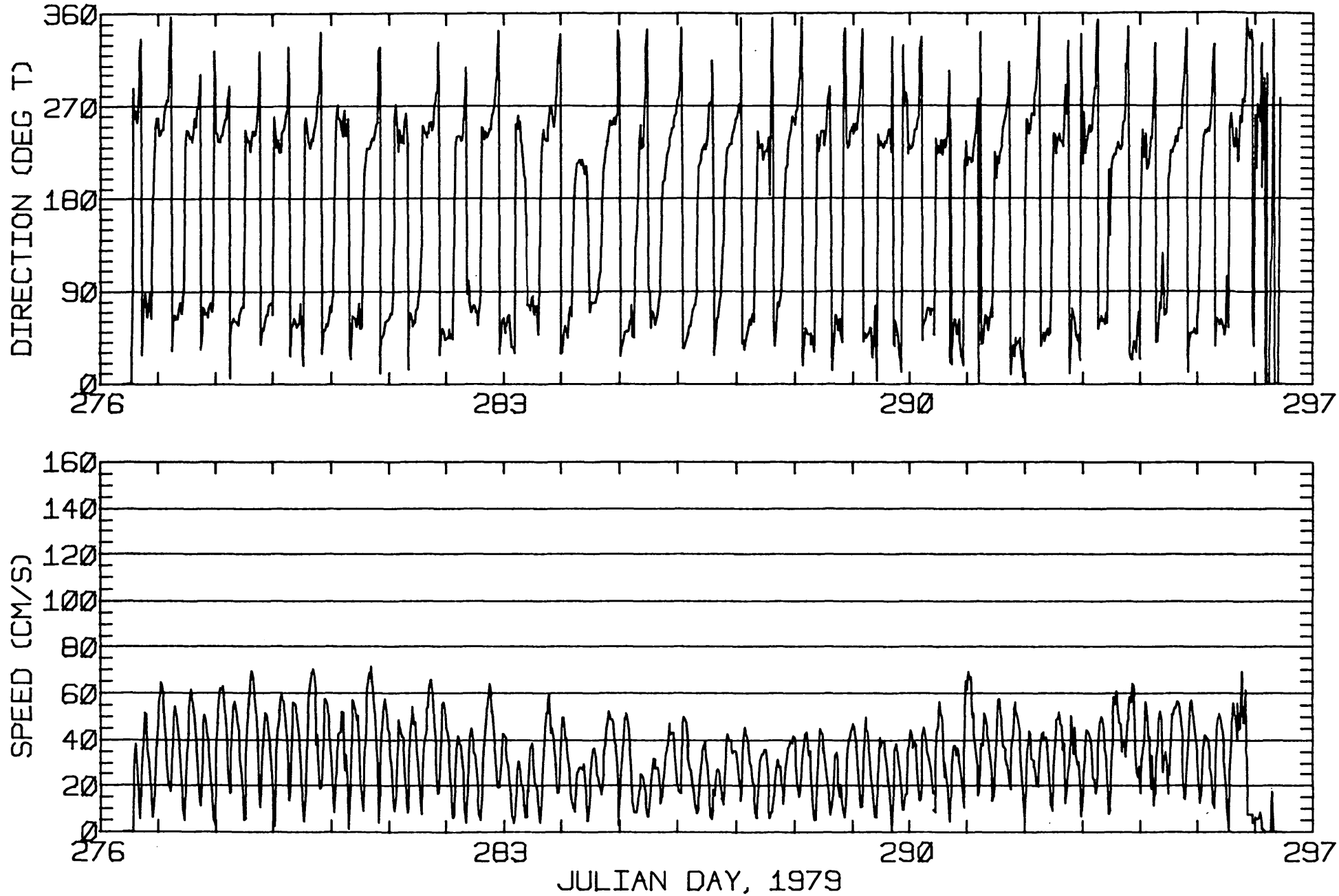
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.15	4.53	64.2	41.1	CLOCKWISE
K1	10.07	6.14	57.5	15.3	CLOCKWISE
N2	6.83	0.75	85.2	240.4	CLOCKWISE
M2	40.87	4.45	57.8	281.2	CLOCKWISE
S2	11.00	2.42	58.2	259.6	CLOCKWISE
M4	2.15	0.24	113.7	189.8	CLOCKWISE

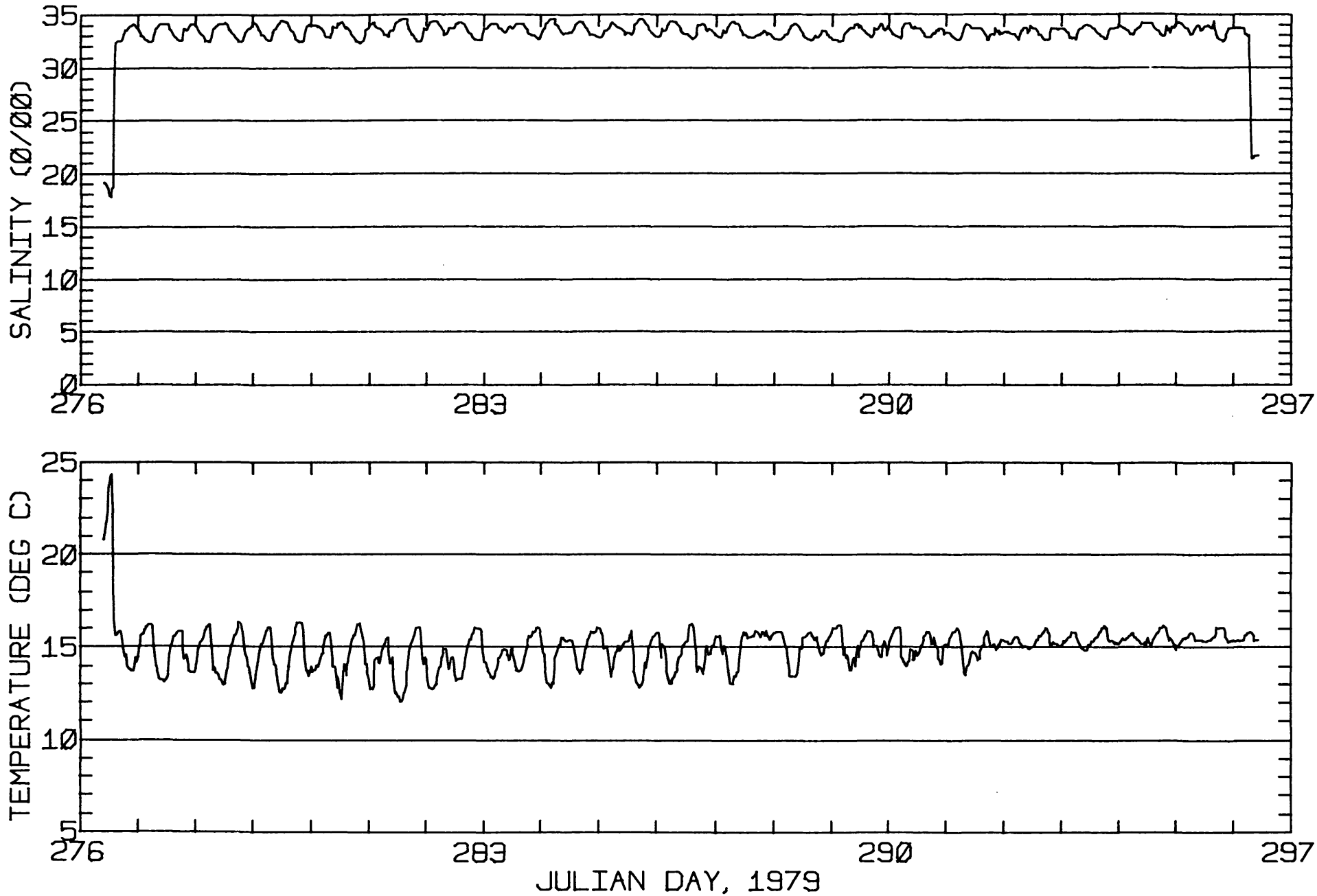
RMS SPEED:	36.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	69.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	27.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	58.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.33
STANDARD DEVIATION U-SERIES:	7.14 CM/SEC
STANDARD DEVIATION V SERIES:	7.98 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.8	-0.4	152.
2	12	-2.8	-0.5	194.
3	12	-4.9	0.7	197.
ALL	36	-4.2	-0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POINT LOBOS 37-45-32N 122-36-20W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC202C1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POINT LOBOS 37-45-32N 122-36-20W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC202C1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C203
POSITION: 37 48'58"N 122 32'41"W
METER TYPE: ENDECO
WATER DEPTH: 10.6 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 1646 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

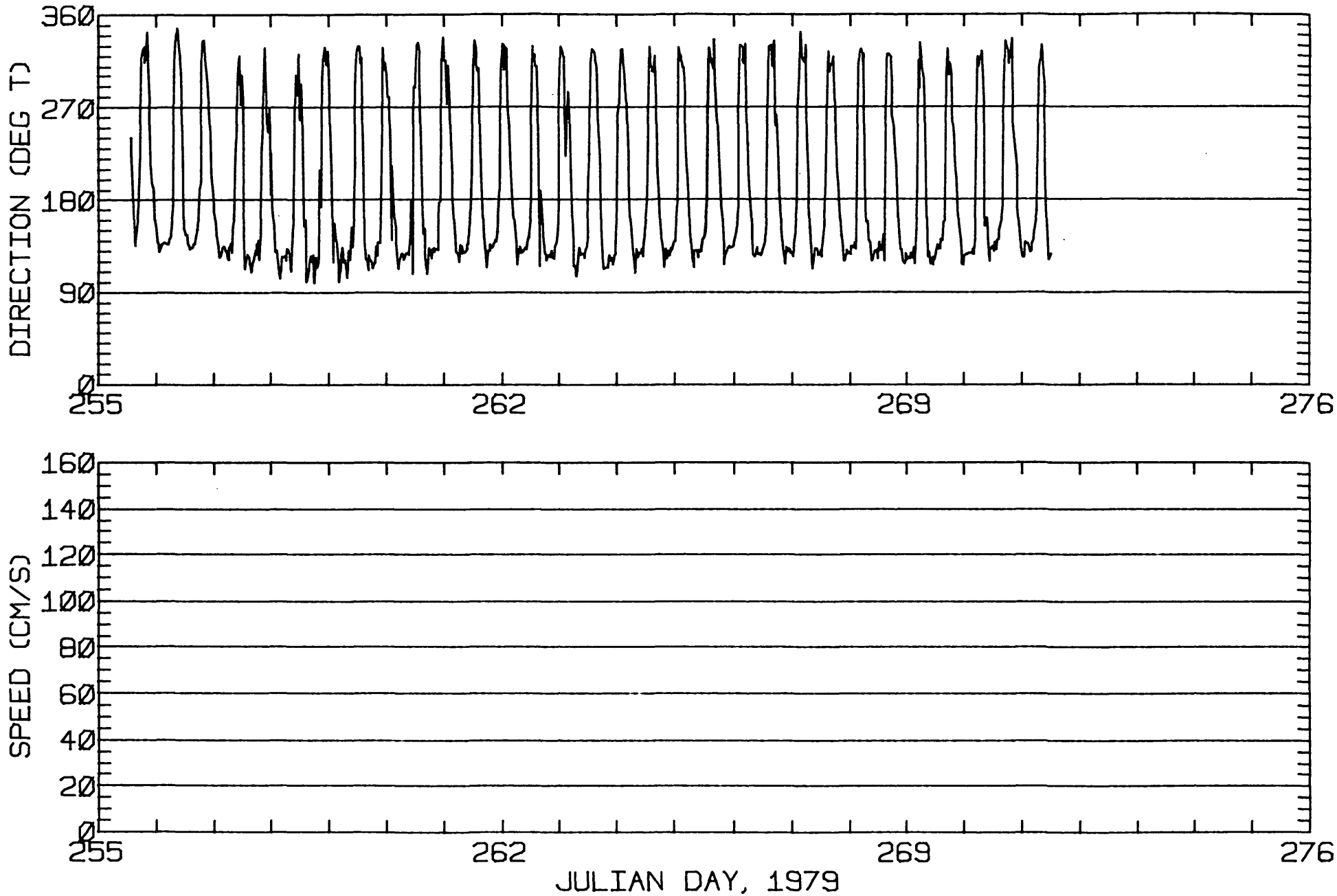
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

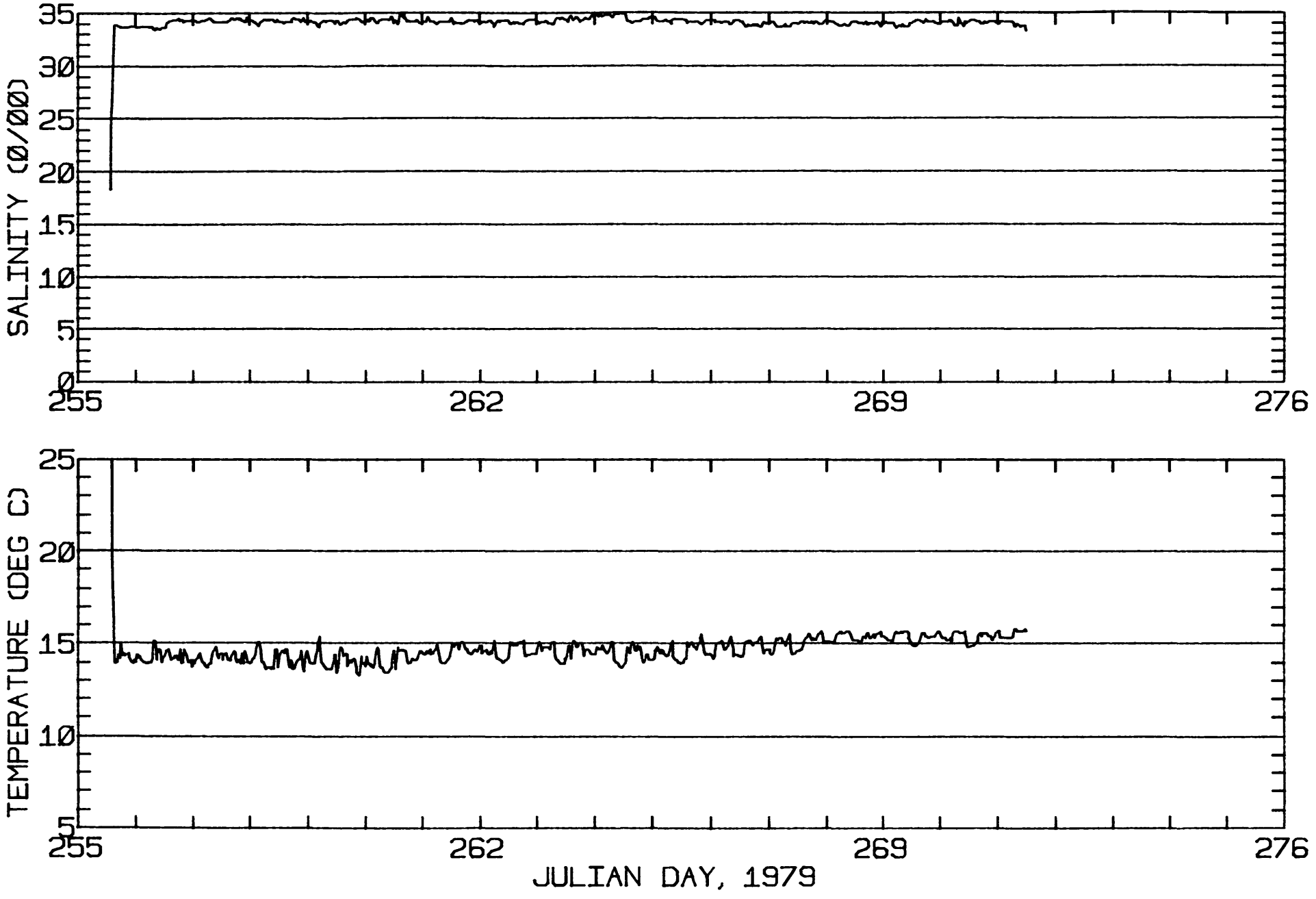
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	6			
ALL	30			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FOURFATHOM BANK 37-48-58N 122-32-41W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC203A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FOURFATHOM BANK 37-48-58N 122-32-41W
METER 4.3 METERS ABOVE BED TAPE NUMBER GSC203A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C203
POSITION: 37 48'58"N 122 32'41"W
METER TYPE: ENDECO
WATER DEPTH: 10.6 M (MLLW)
METER DEPTH: 6.0 M (BELOW MLLW)
START TIME OF SERIES: 9/28/79 1429 PST JULIAN DAY=271
APPROXIMATE RECORD LENGTH IS 4 M2-CYCLES

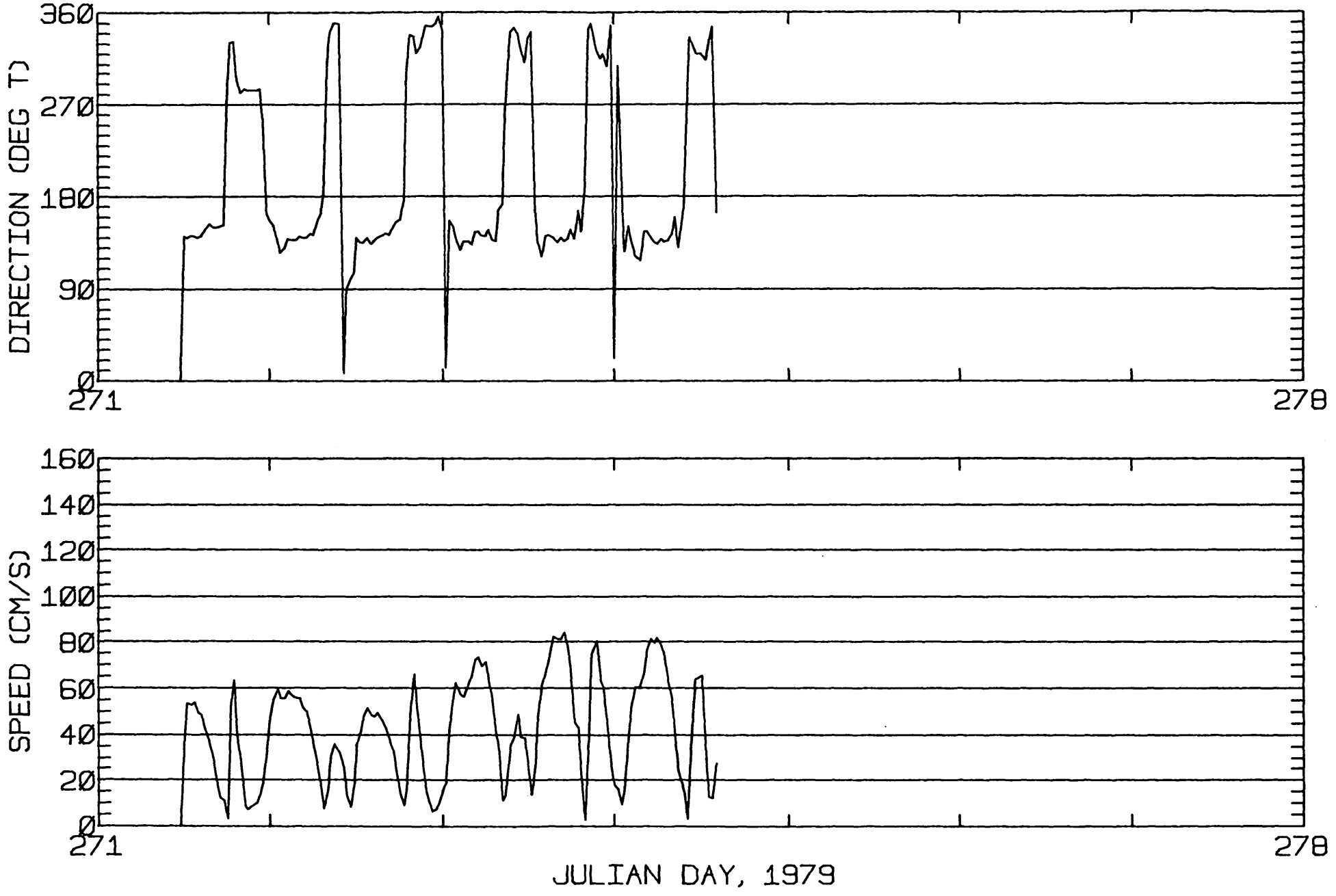
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

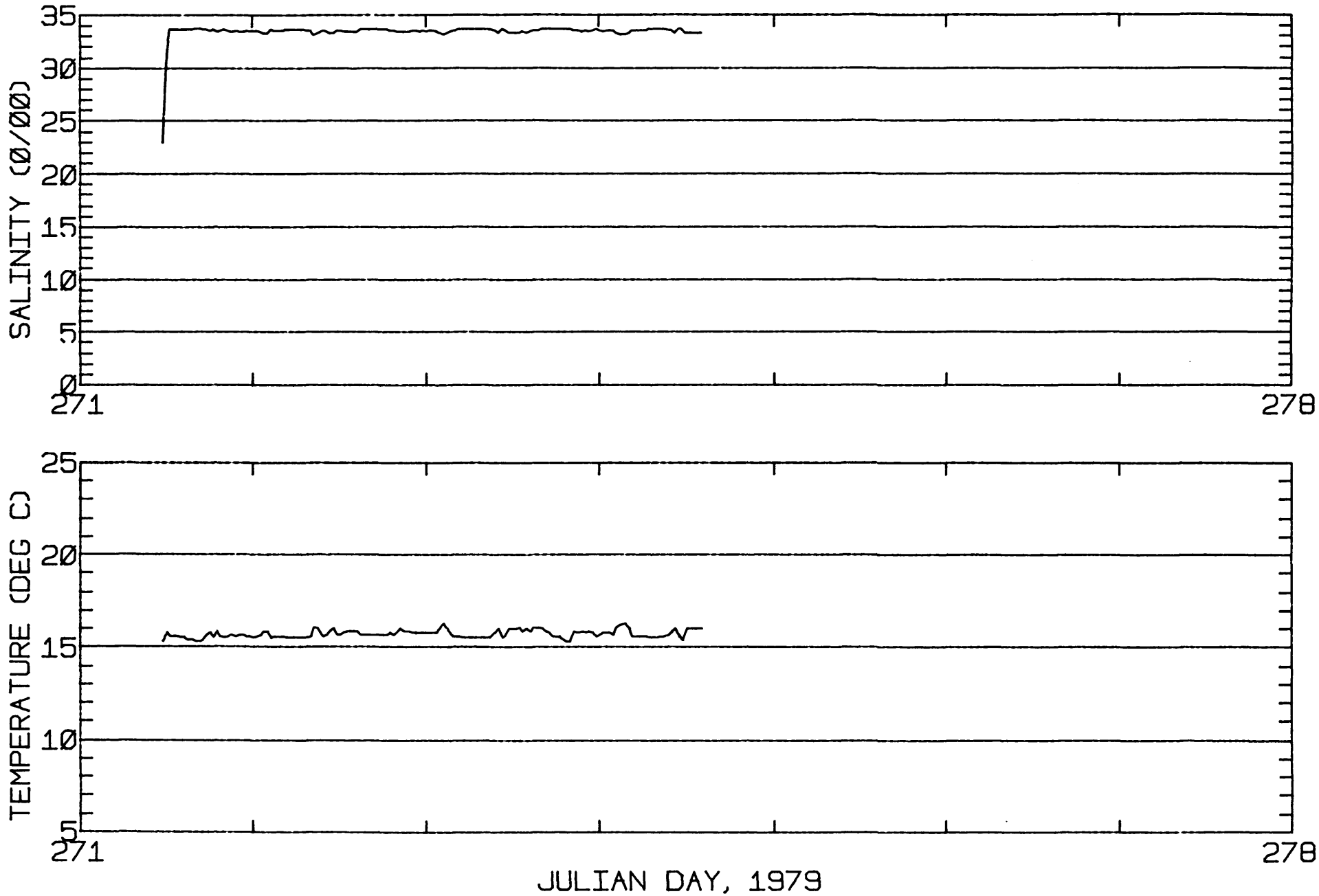
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	4			
ALL	4			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FOURFATHOM BANK 37-48-58N 122-32-41W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC203B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FOURFATHOM BANK 37-48-58N 122-32-41W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC203B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C204
POSITION: 37 46' 8"N 122 31'32"W
METER TYPE: ENDECO
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 9.7 M (BELOW MLLW)
START TIME OF SERIES: 9/28/79 1552 PST JULIAN DAY=271
APPROXIMATE RECORD LENGTH IS 6 M2-CYCLES

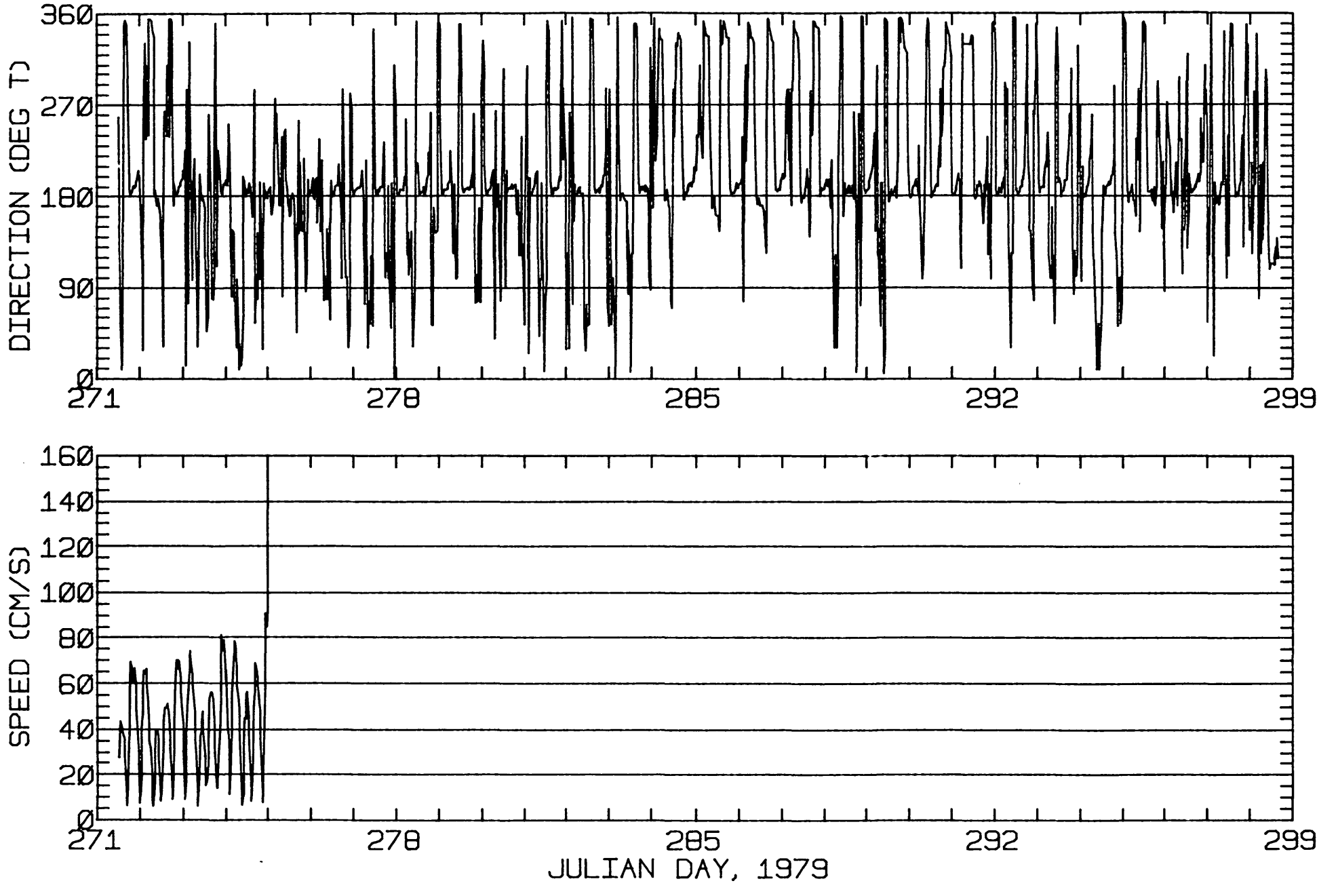
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.71	1.63	8.1	21.9	ANTI-CLOCKWISE
K1	14.28	5.12	7.0	22.1	CLOCKWISE
N2	21.03	7.40	135.7	152.4	ANTI-CLOCKWISE
M2	55.98	14.28	27.8	263.1	CLOCKWISE
S2	19.23	10.66	24.4	253.2	CLOCKWISE
M4	3.13	0.14	13.0	91.5	ANTI-CLOCKWISE

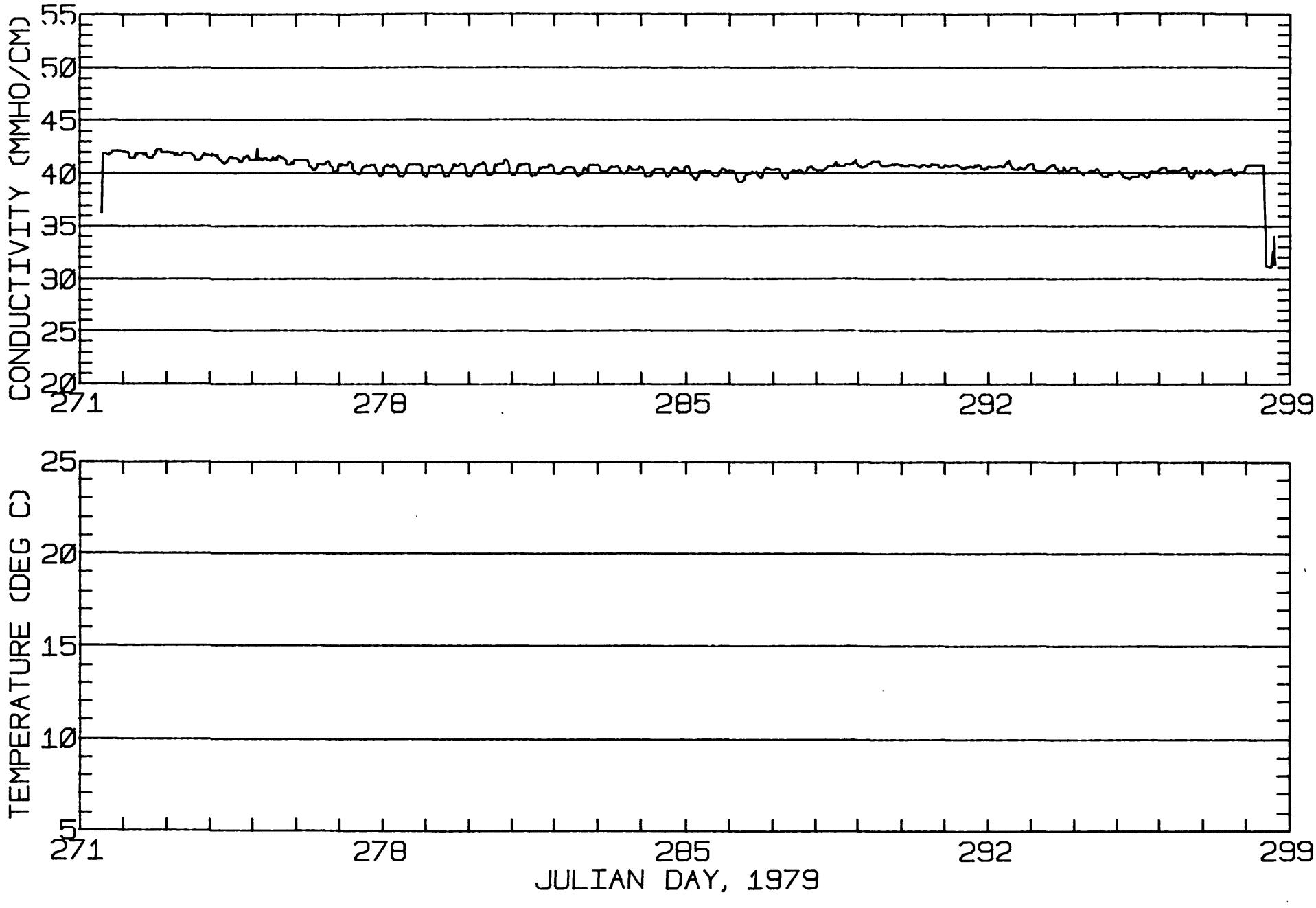
RMS SPEED: 46.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 21.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 4.32 CM/SEC
STANDARD DEVIATION V SERIES: 7.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	6	-2.2	3.0	141.
ALL	6	-2.2	3.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POINT LOBOS 37-46- 8N 122-31-32W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC204B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POINT LOBOS 37-46- 8N 122-31-32W
METER 4.6 METERS ABOVE BED TAPE NUMBER GSC204B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C209
POSITION: 37 50'42"N 122 27'29"W
METER TYPE: ENDECO
WATER DEPTH: 24.3 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 9/10/79 1310 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

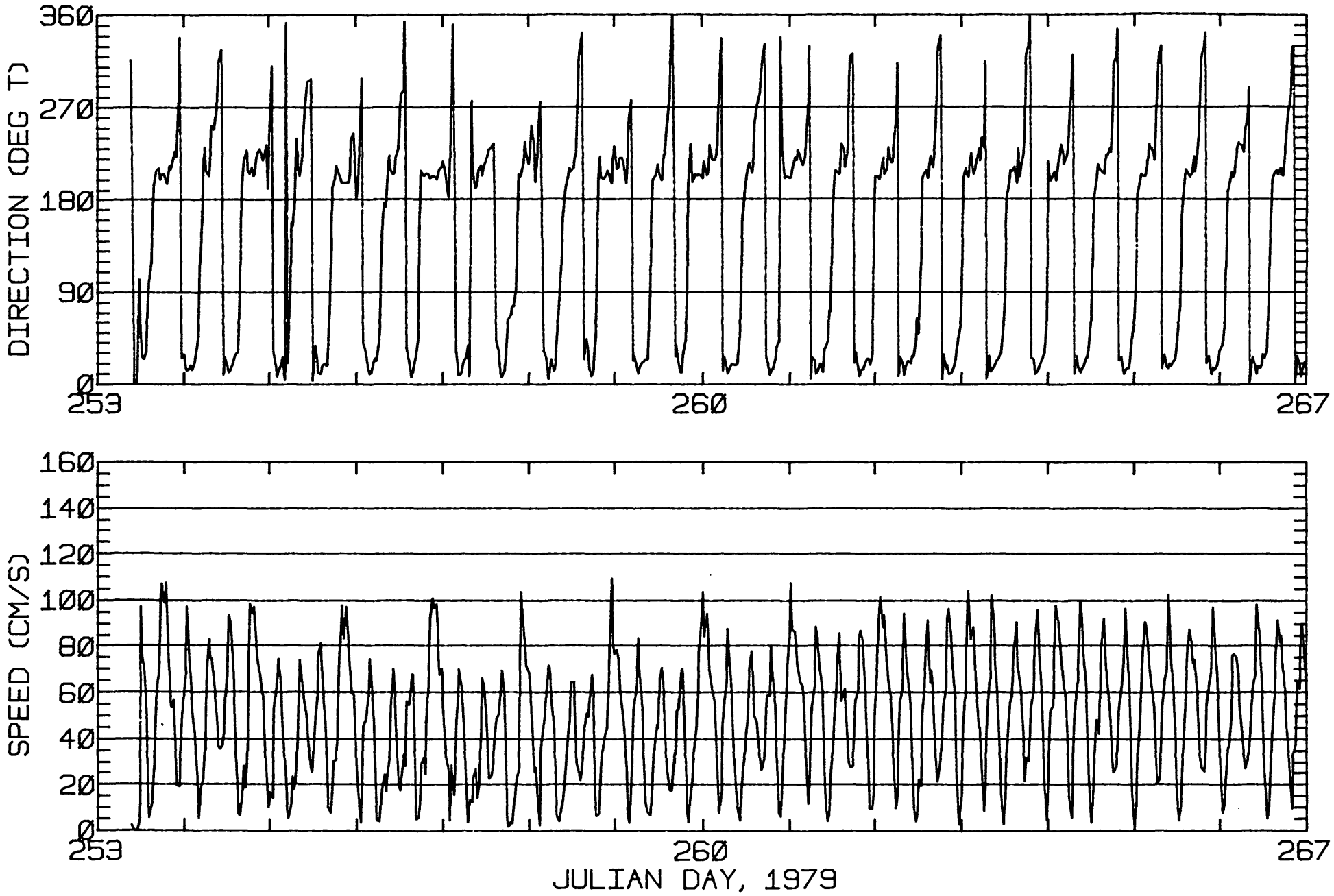
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.08	1.63	21.2	51.5	ANTI-CLOCKWISE
K1	12.63	0.71	23.2	55.3	CLOCKWISE
N2	15.39	2.76	20.3	269.4	CLOCKWISE
M2	72.01	11.43	25.0	282.3	CLOCKWISE
S2	20.54	3.41	21.2	273.8	CLOCKWISE
M4	3.71	3.25	117.9	105.2	ANTI-CLOCKWISE

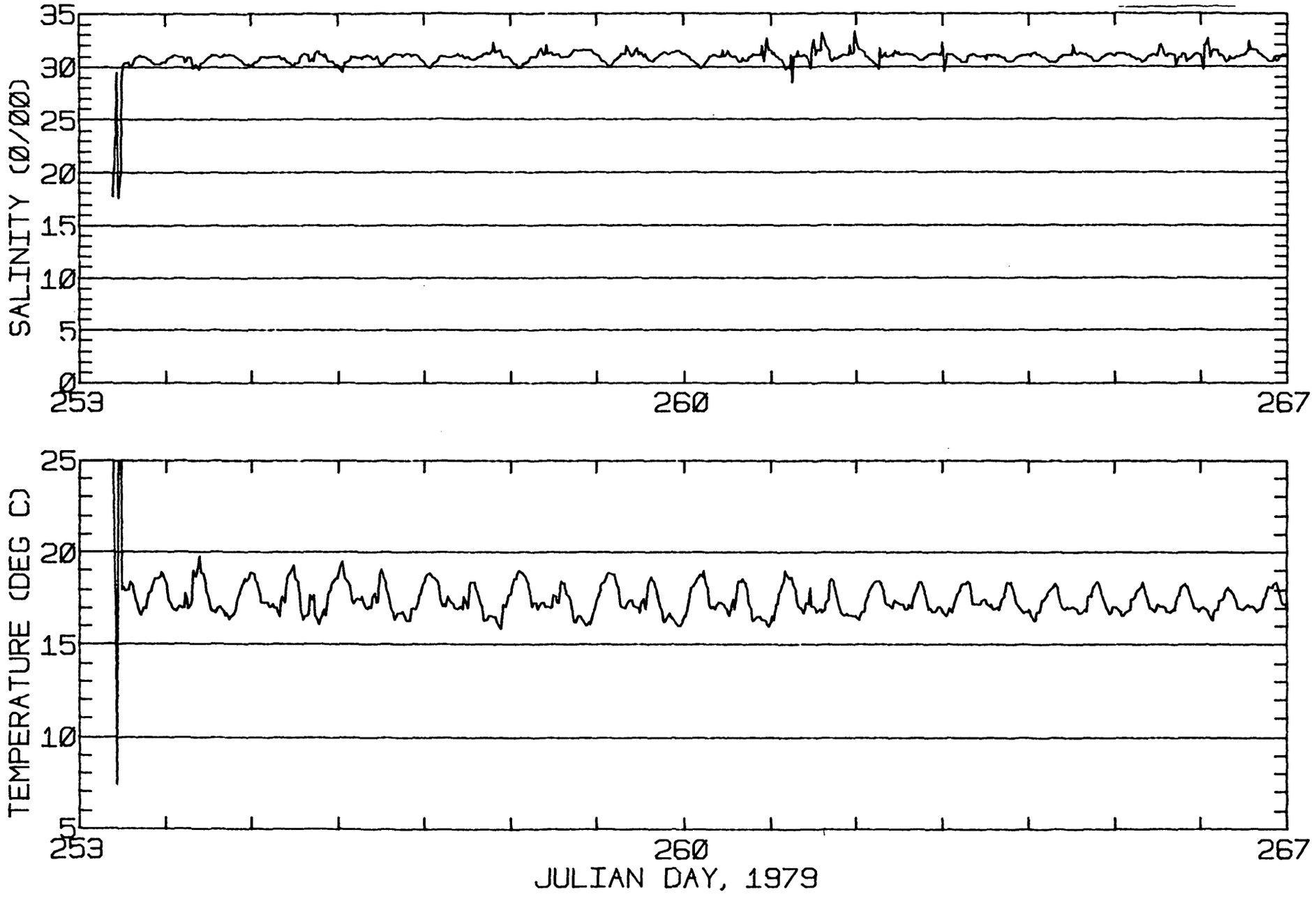
RMS SPEED:	55.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	119.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	52.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	23.7 DEGREES TRUE
TIDAL FORM NUMBER:	0.29
STANDARD DEVIATION U-SERIES:	9.50 CM/SEC
STANDARD DEVIATION V SERIES:	14.22 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.8	-5.7	184.
2	12	-8.8	-0.6	176.
3	4	-7.5	4.9	134.
ALL	28	-8.6	-2.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT BAKER 37-50-42N 122-27-29W
METER 21.3 METERS ABOVE BED TAPE NUMBER GSC209A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT BAKER 37-50-42N 122-27-29W
METER 21.3 METERS ABOVE BED TAPE NUMBER GSC209A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C209
POSITION: 37 50'42"N 122 27'29"W
METER TYPE: ENDECO
WATER DEPTH: 24.3 M (MLLW)
METER DEPTH: 12.1 M (BELOW MLLW)
START TIME OF SERIES: 9/10/79 1335 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 22 M2-CYCLES

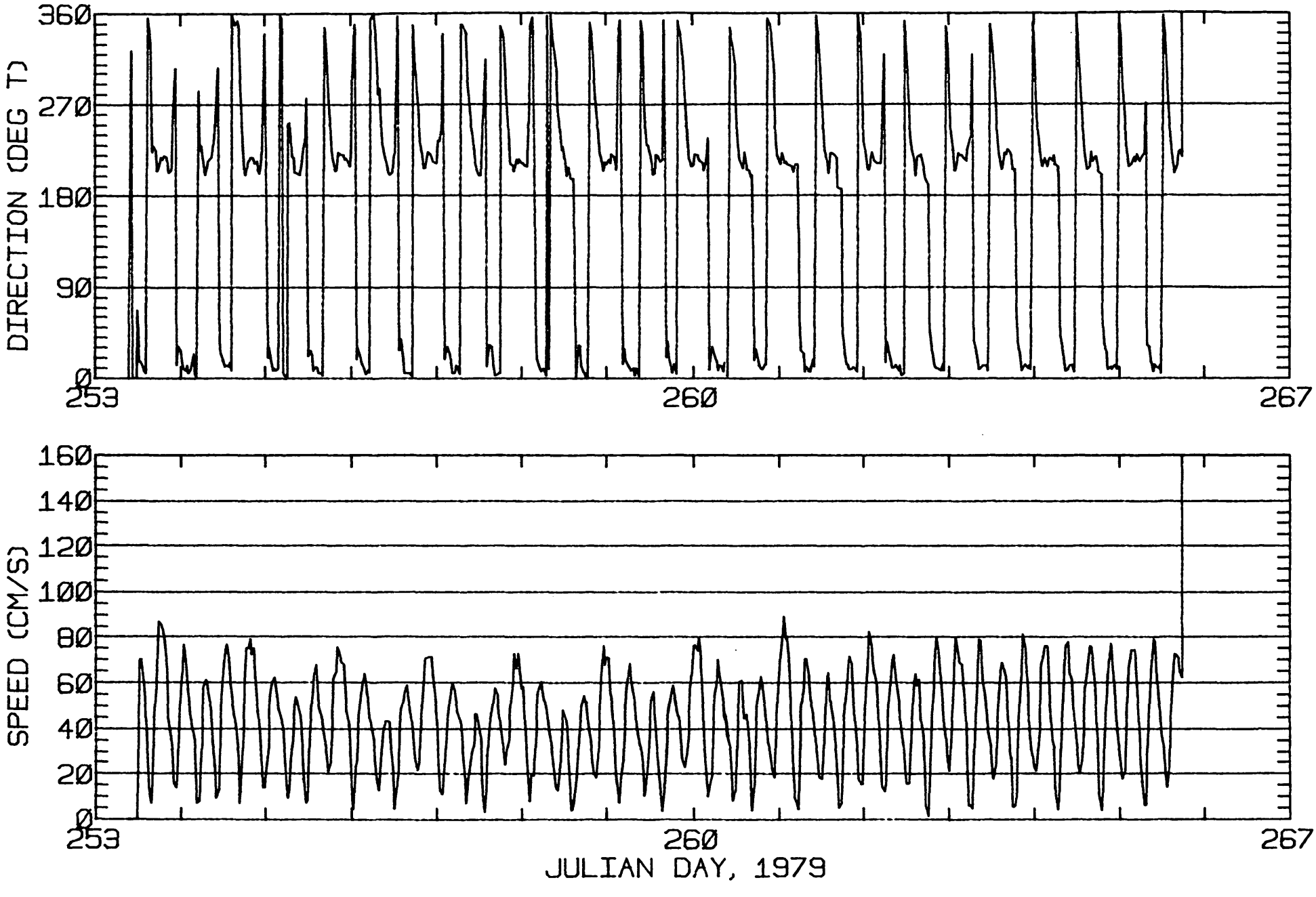
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.21	0.19	31.5	52.4	CLOCKWISE
K1	12.10	0.35	28.7	45.1	ANTI-CLOCKWISE
N2	14.99	0.60	17.3	269.1	CLOCKWISE
M2	63.57	4.71	25.0	290.1	ANTI-CLOCKWISE
S2	16.77	0.67	20.8	287.6	ANTI-CLOCKWISE
M4	3.11	0.55	77.7	108.8	ANTI-CLOCKWISE

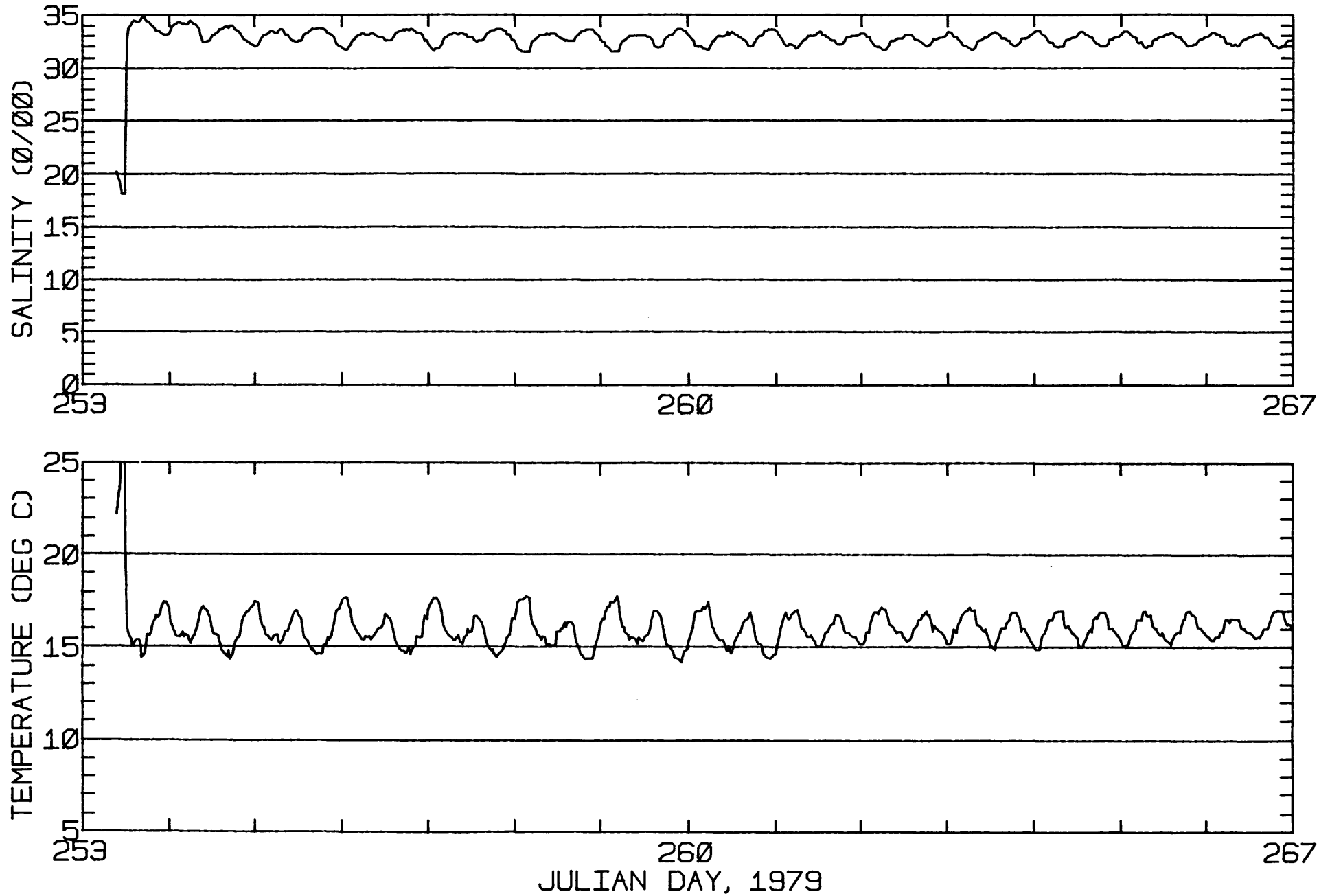
RMS SPEED:	47.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	102.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	44.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	25.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.28
STANDARD DEVIATION U-SERIES:	5.45 CM/SEC
STANDARD DEVIATION V SERIES:	8.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-9.1	4.7	184.
2	10	-9.3	4.4	179.
ALL	22	-9.2	4.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT BAKER 37-50-42N 122-27-29W
METER 12.2 METERS ABOVE BED TAPE NUMBER GSC209A2.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT BAKER 37-50-42N 122-27-29W
METER 12.2 METERS ABOVE BED TAPE NUMBER GSC209A2.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C211
POSITION: 37 48'52"N 122 25'51"W
METER TYPE: ENDECO
WATER DEPTH: 21.6 M (MLLW)
METER DEPTH: 6.0 M (BELOW MLLW)
START TIME OF SERIES: 9/11/79 1850 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

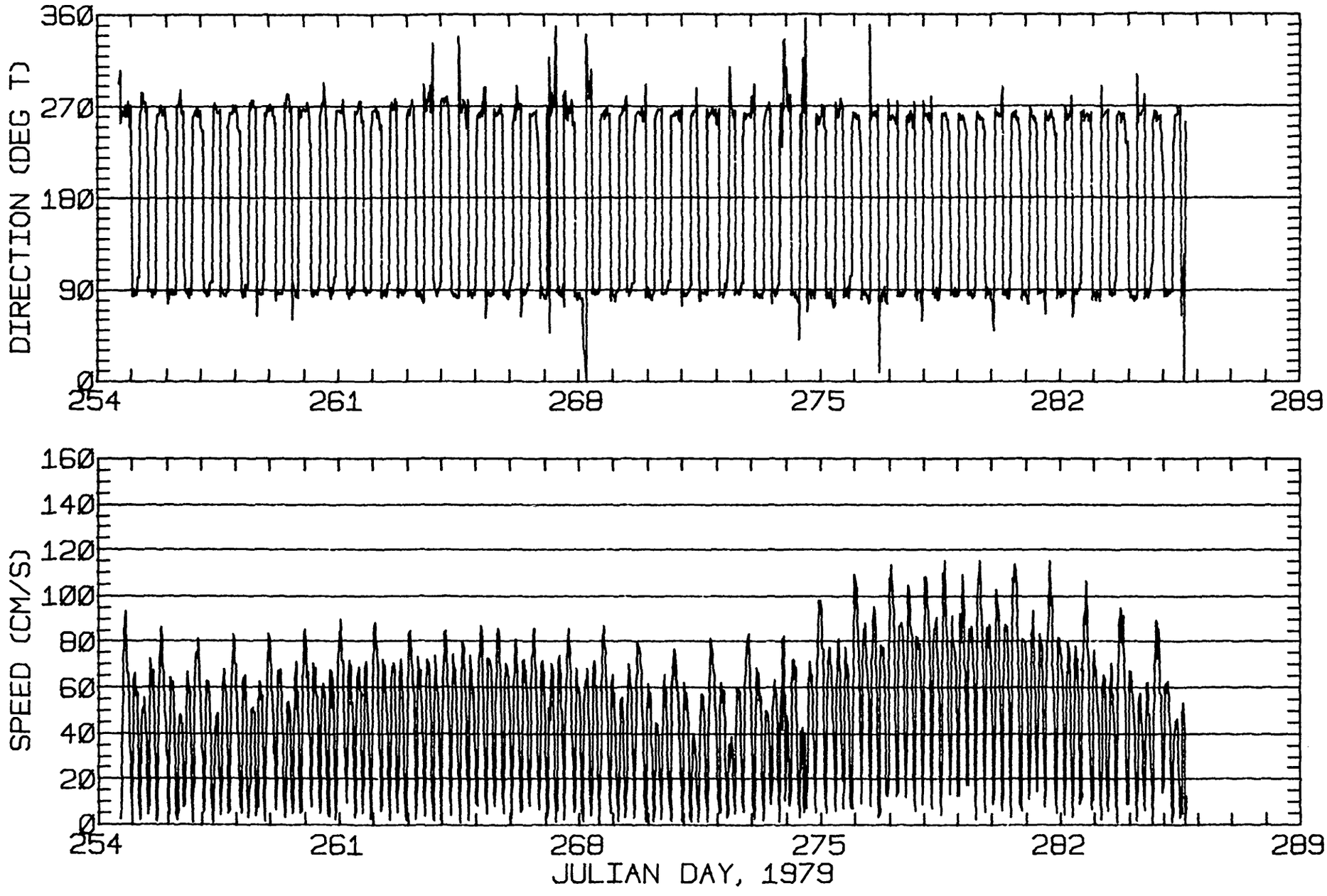
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.35	0.29	79.6	40.1	ANTI-CLOCKWISE
K1	15.19	0.58	81.1	40.9	CLOCKWISE
N2	15.74	0.39	79.8	252.5	ANTI-CLOCKWISE
M2	66.95	0.26	85.8	279.1	CLOCKWISE
S2	17.69	0.72	85.3	278.7	ANTI-CLOCKWISE
M4	1.25	0.26	141.1	101.5	ANTI-CLOCKWISE

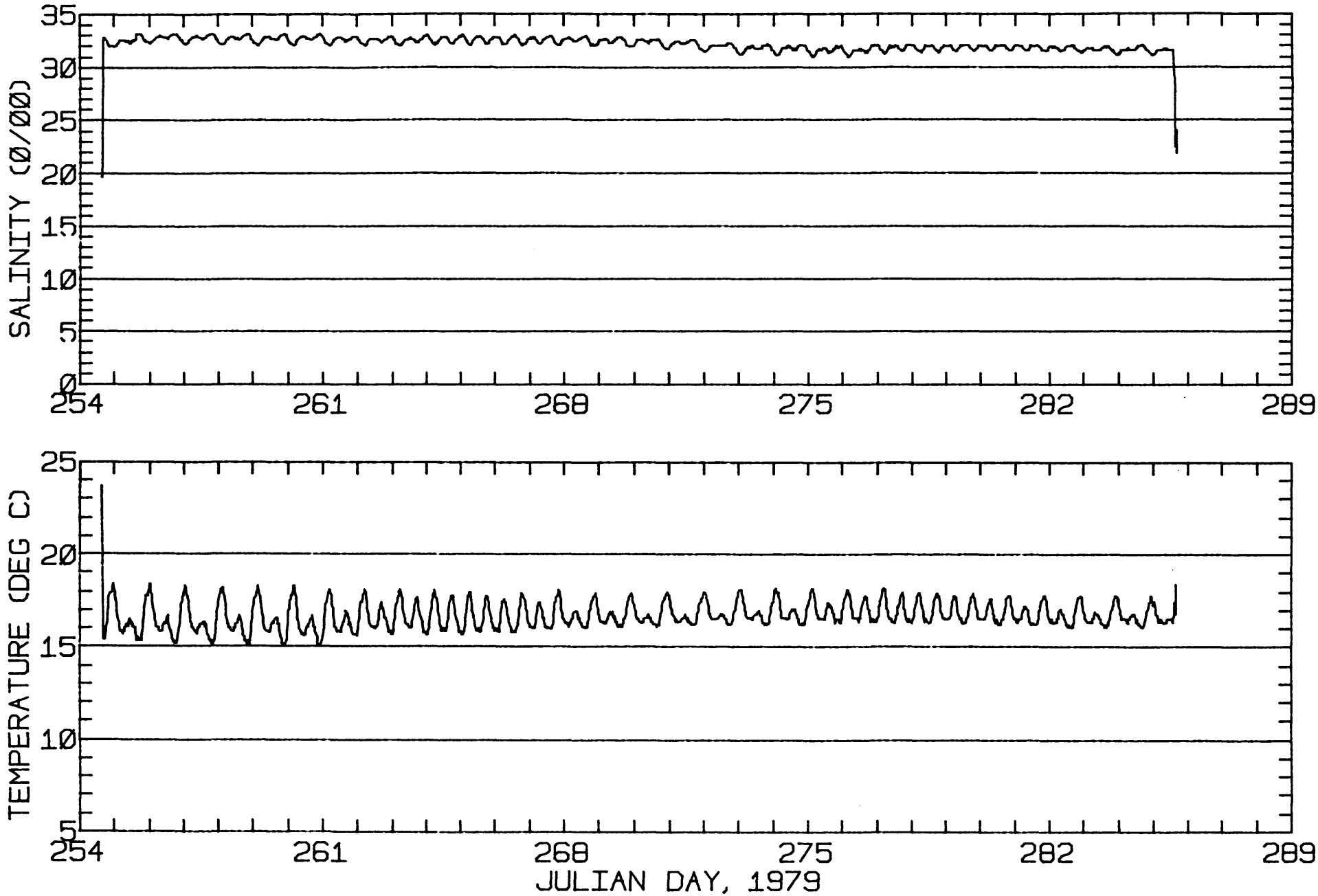
RMS SPEED:	56.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	114.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	48.4 CM/SEC
PRINCIPAL CURRENT DIRECTION:	84.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.35
STANDARD DEVIATION U-SERIES:	13.52 CM/SEC
STANDARD DEVIATION V SERIES:	7.13 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.9	-0.5	190.
2	12	-4.9	-0.4	167.
3	12	-1.3	-0.1	131.
4	12	-3.0	-2.2	153.
5	8	-6.0	-3.7	156.
ALL	56	-3.7	-1.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-52N 122-25-51W
METER 15.5 METERS ABOVE BED TAPE NUMBER GSC211A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-52N 122-25-51W
METER 15.5 METERS ABOVE BED TAPE NUMBER GSC211A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C211
POSITION: 37 48'52"N 122 25'56"W
METER TYPE: ENDECO
WATER DEPTH: 21.6 M (MLLW)
METER DEPTH: 6.0 M (BELOW MLLW)
START TIME OF SERIES: 10/12/79 1920 PST JULIAN DAY=285
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

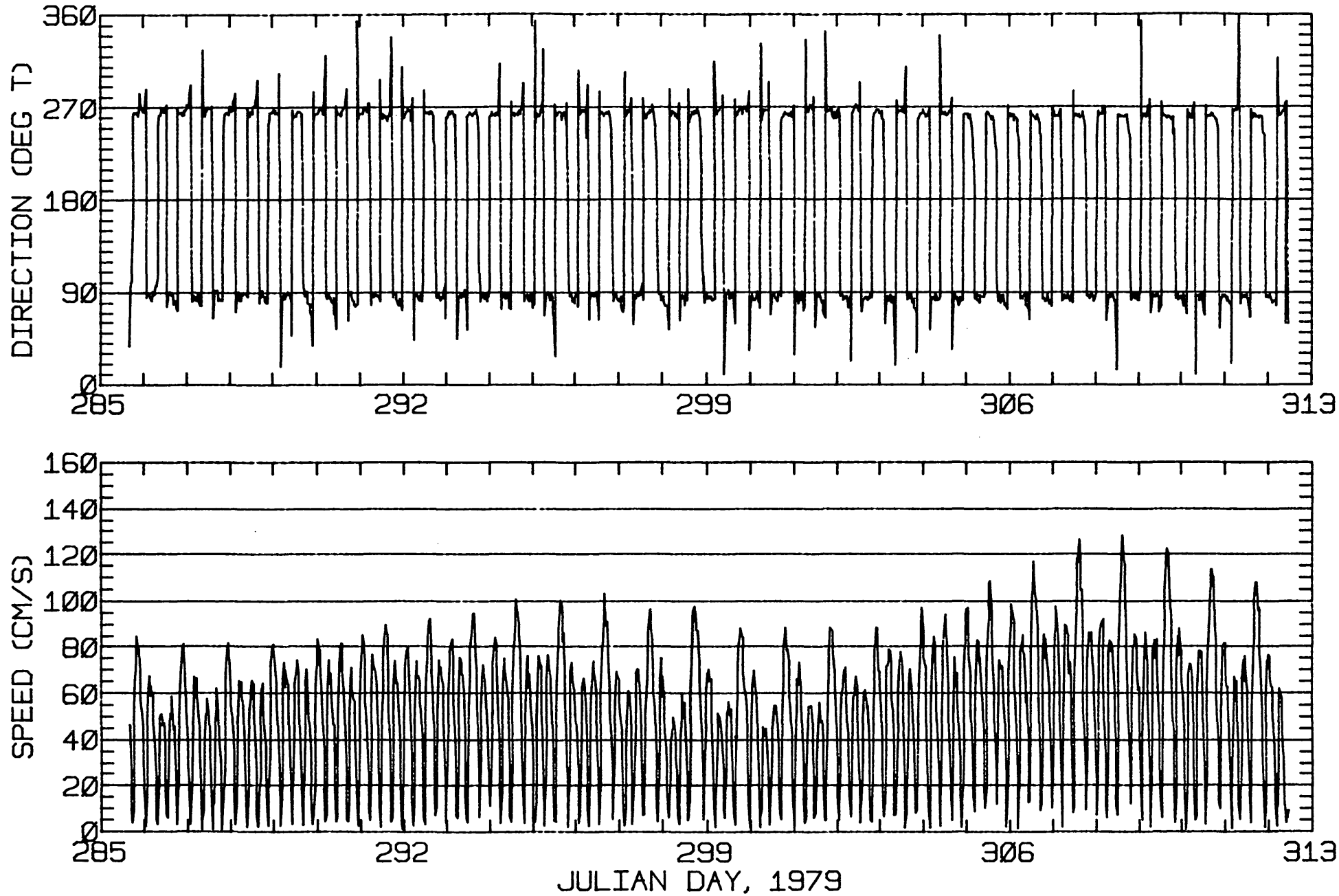
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.90	0.56	82.9	40.4	ANTI-CLOCKWISE
K1	18.62	0.17	81.6	22.0	CLOCKWISE
N2	14.71	0.34	84.2	252.6	ANTI-CLOCKWISE
M2	70.17	0.55	84.6	276.6	ANTI-CLOCKWISE
S2	18.66	0.30	83.4	264.9	ANTI-CLOCKWISE
M4	1.42	0.65	64.9	34.6	CLOCKWISE

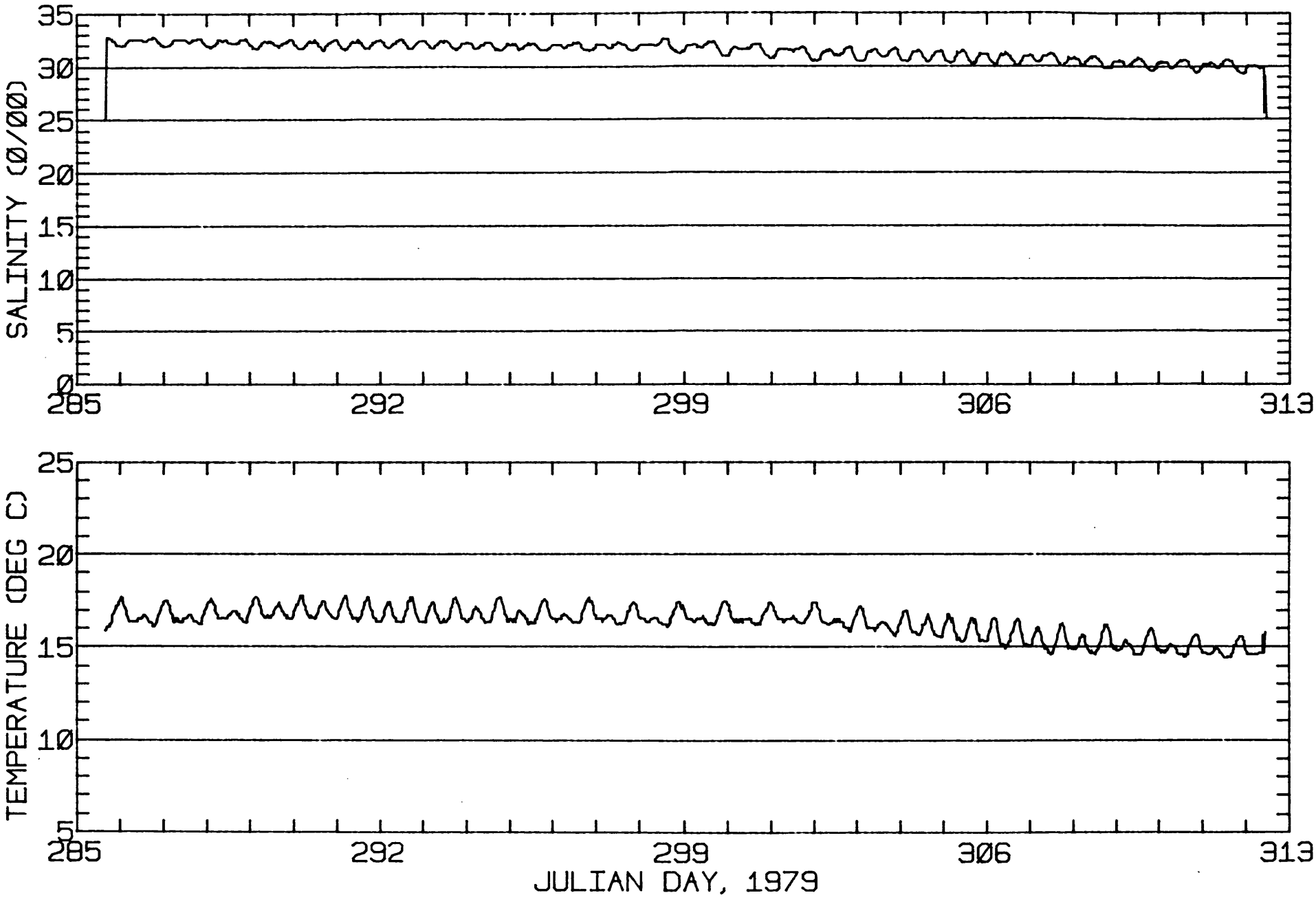
RMS SPEED: 58.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 121.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 46.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 83.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 11.05 CM/SEC
STANDARD DEVIATION V SERIES: 4.00 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.1	-0.3	207.
2	12	-6.6	-1.2	219.
3	12	-4.9	0.4	330.
4	12	-6.9	-2.5	227.
5	2	-5.5	-1.3	249.
ALL	50	-5.9	-0.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-52N 122-25-56W
METER15.5 METERS ABOVE BED TAPE NUMBER GSC211B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-52N 122-25-56W
METER 15.5 METERS ABOVE BED TAPE NUMBER GSC211B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C211
POSITION: 37 48'53"N 122 25'54"W
METER TYPE: ENDECO
WATER DEPTH: 21.6 M (MLLW)
METER DEPTH: 6.0 M (BELOW MLLW)
START TIME OF SERIES: 11/ 8/79 1339 PST JULIAN DAY=312
APPROXIMATE RECORD LENGTH IS 54 M2-CYCLES

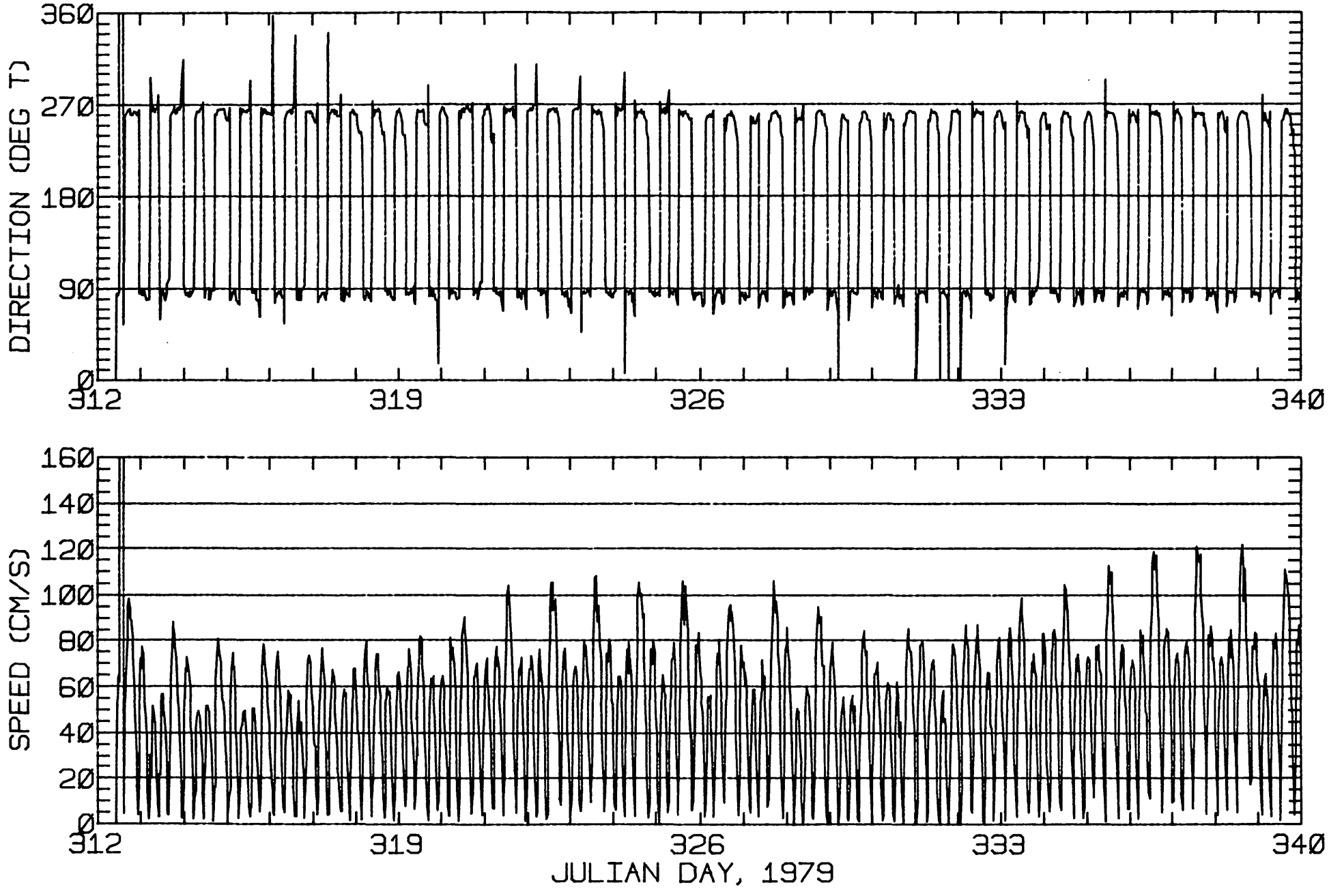
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.73	0.12	81.1	37.2	ANTI-CLOCKWISE
K1	23.46	0.15	82.5	17.3	ANTI-CLOCKWISE
N2	13.23	0.35	80.0	223.1	ANTI-CLOCKWISE
M2	69.79	0.66	83.2	259.3	ANTI-CLOCKWISE
S2	15.27	0.90	83.9	241.4	ANTI-CLOCKWISE
M4	1.37	0.02	83.1	211.8	ANTI-CLOCKWISE

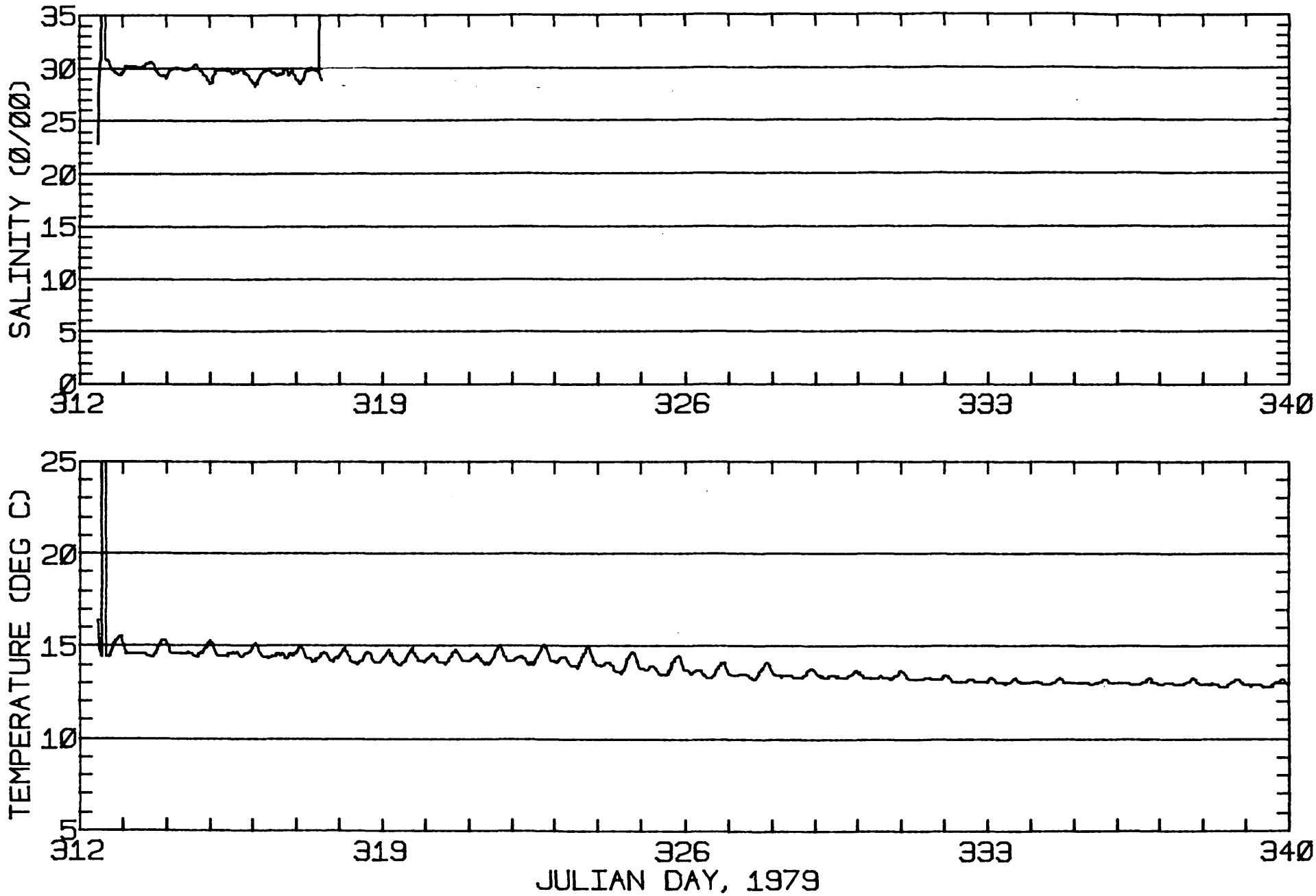
RMS SPEED:	57.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	122.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	44.8 CM/SEC
PRINCIPAL CURRENT DIRECTION:	82.9 DEGREES TRUE
TIDAL FORM NUMBER:	0.44
STANDARD DEVIATION U-SERIES:	11.03 CM/SEC
STANDARD DEVIATION V SERIES:	4.05 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.3	-1.3	307.
2	12	-6.1	-1.5	293.
3	12	-3.9	-3.0	413.
4	12	-4.8	-3.0	464.
5	6	-5.2	-4.6	309.
ALL	54	-5.3	-2.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-53N 122-25-54W
METER 15.5 METERS ABOVE BED TAPE NUMBER GSC211C1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-53N 122-25-54W
METER 15.5 METERS ABOVE BED TAPE NUMBER GSC211C1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C211
POSITION: 37 48'52"N 122 25'53"W
METER TYPE: ENDECO
WATER DEPTH: 21.6 M (MLLW)
METER DEPTH: 14.0 M (BELOW MLLW)
START TIME OF SERIES: 12/ 7/79 1220 PST JULIAN DAY=341
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

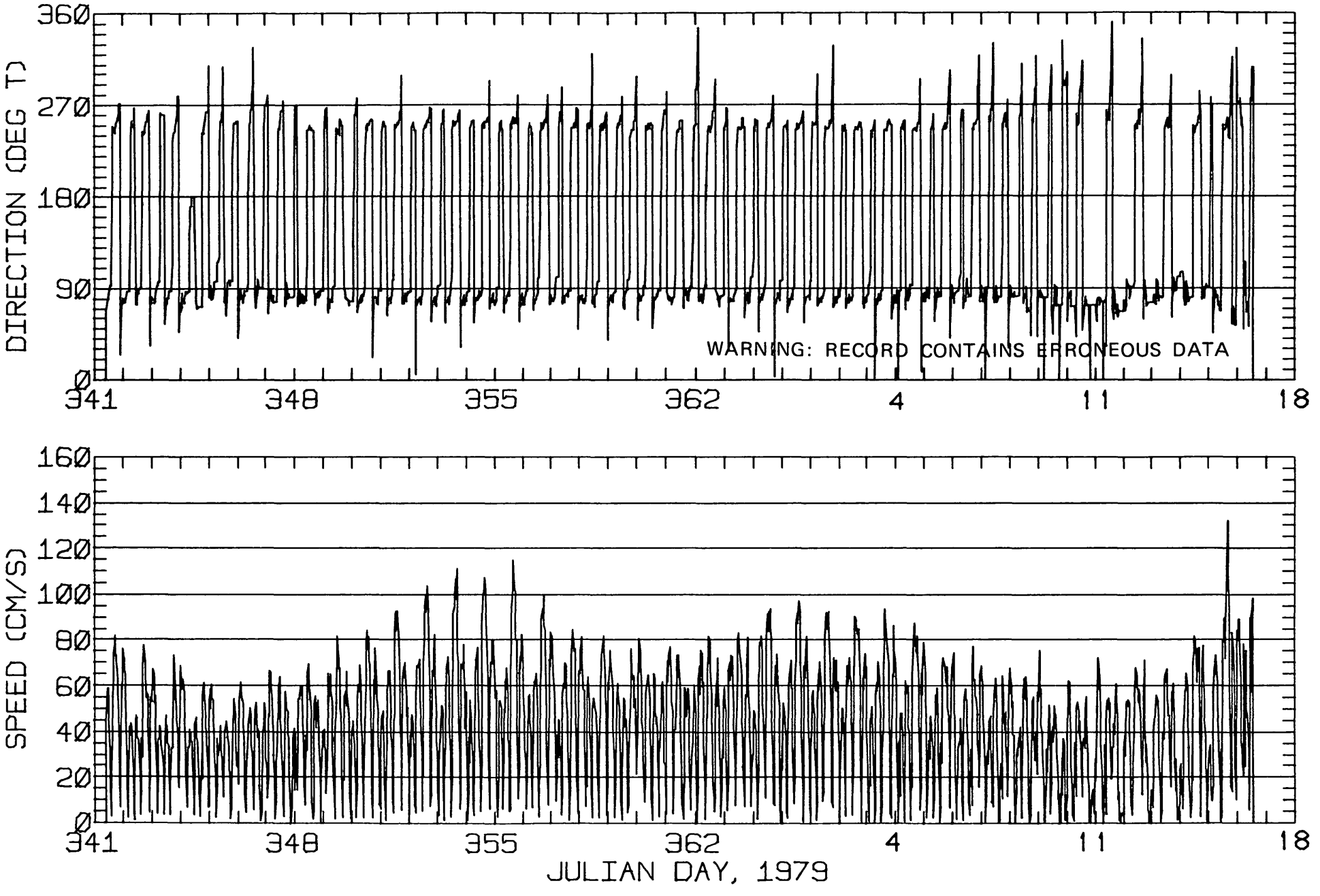
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.11	0.05	76.9	42.3	ANTI-CLOCKWISE
K1	27.04	1.41	73.4	42.2	CLOCKWISE
N2	11.85	1.02	77.0	264.7	CLOCKWISE
M2	56.37	3.87	73.5	284.4	CLOCKWISE
S2	12.16	0.19	74.1	279.5	CLOCKWISE
M4	7.65	2.91	89.1	118.9	CLOCKWISE

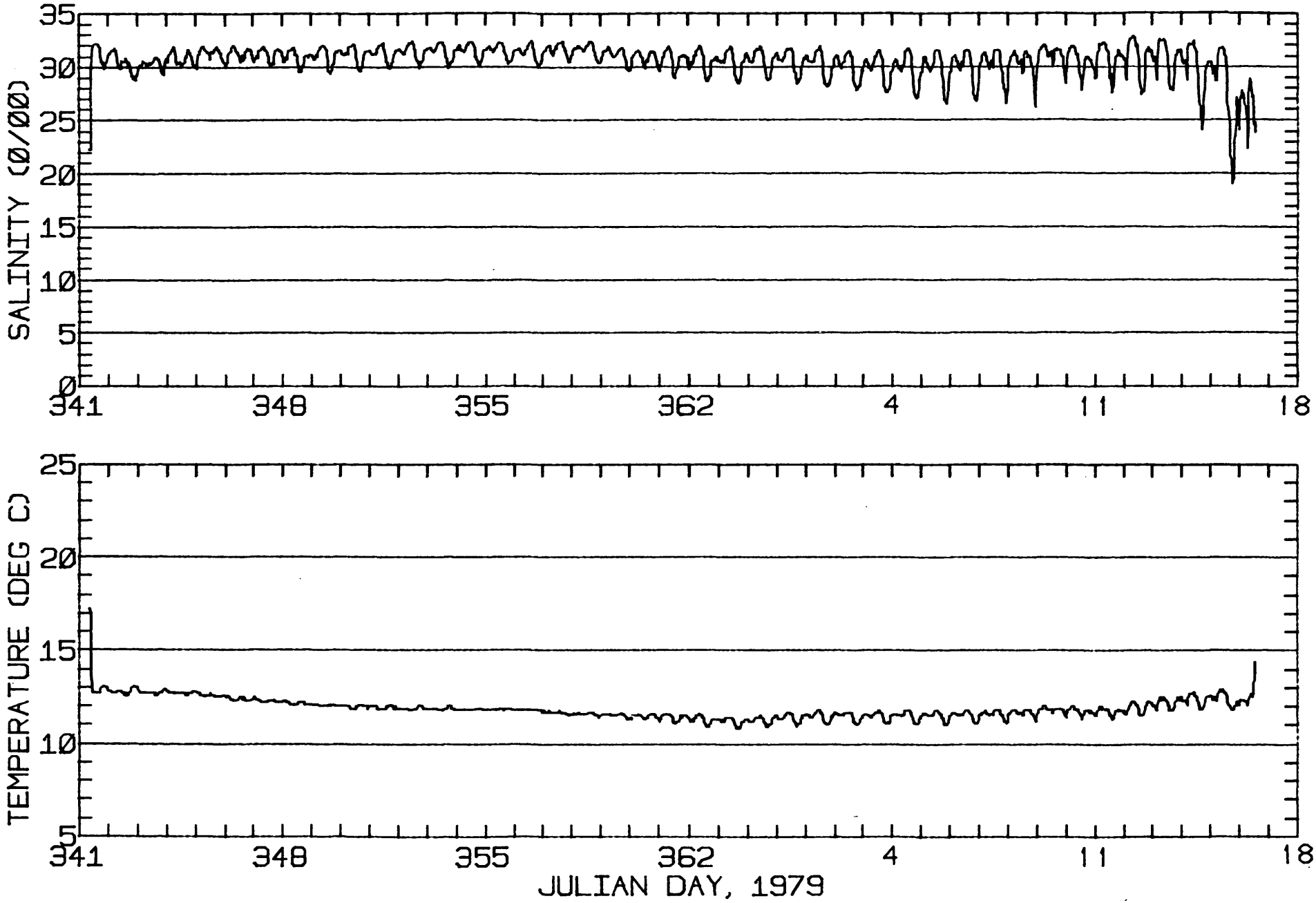
RMS SPEED: 51.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 110.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 74.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.62
STANDARD DEVIATION U-SERIES: 17.07 CM/SEC
STANDARD DEVIATION V SERIES: 6.10 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.6	-2.7	277.
2	12	7.1	-2.3	224.
3	12	3.3	-3.4	398.
4	12	5.8	-3.5	1381.
5	8	3.0	-4.2	1291.
ALL	56	5.7	-3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-52N 122-25-53W
METER 7.6 METERS ABOVE BED TAPE NUMBER GSC211D1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-52N 122-25-53W
METER 7.6 METERS ABOVE BED TAPE NUMBER GSC211D1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C211
POSITION: 37 48'55"N 122 26'52"W
METER TYPE: ENDECO
WATER DEPTH: 16.4 M (MLLW)
METER DEPTH: 13.7 M (BELOW MLLW)
START TIME OF SERIES: 1/16/80 1533 PST JULIAN DAY= 16
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

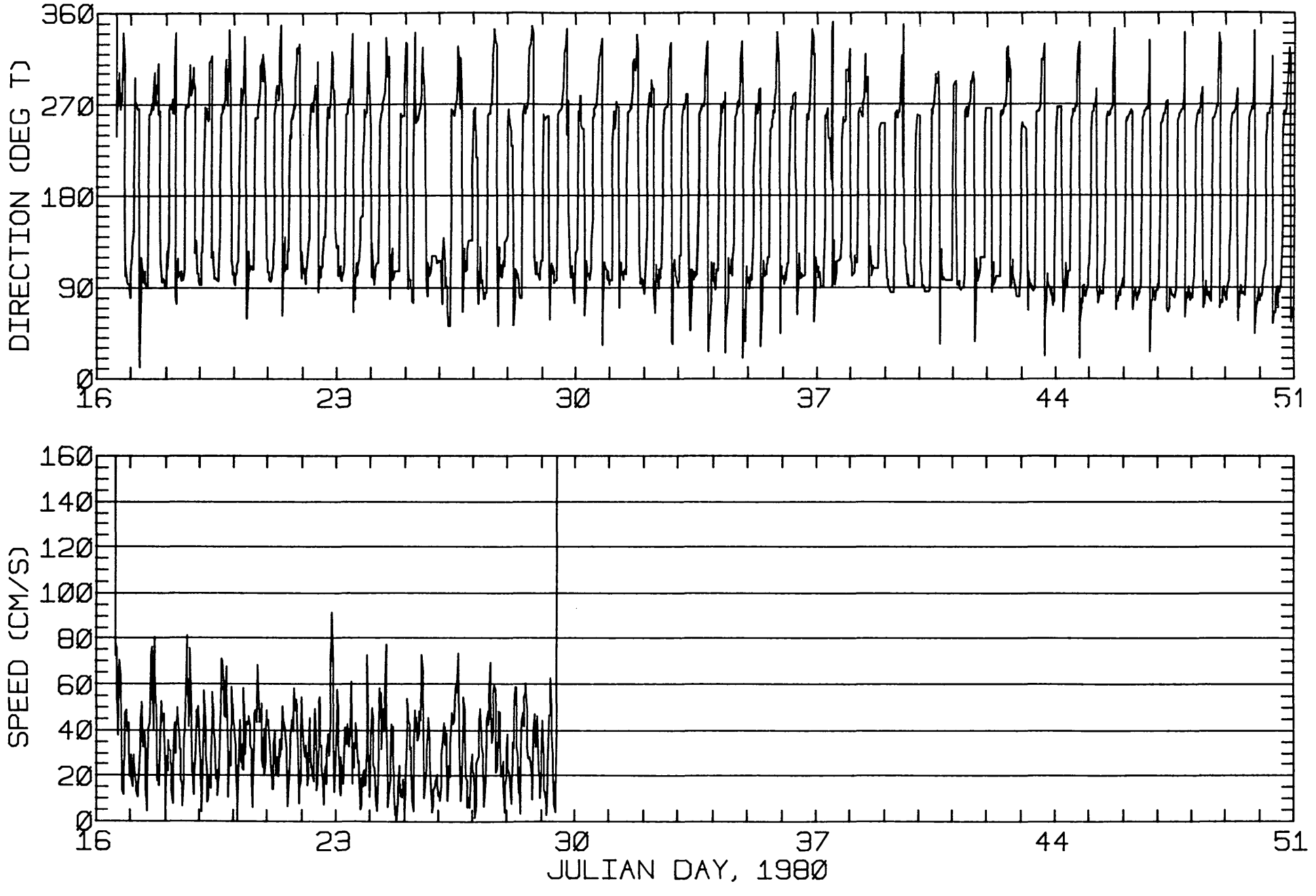
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.23	1.12	93.5	48.4	CLOCKWISE
K1	15.15	0.34	99.6	55.0	CLOCKWISE
N2	11.13	5.98	143.1	264.3	CLOCKWISE
M2	36.82	8.18	93.6	302.3	CLOCKWISE
S2	9.93	4.27	82.5	290.3	CLOCKWISE
M4	8.61	3.28	164.4	139.3	ANTI-CLOCKWISE

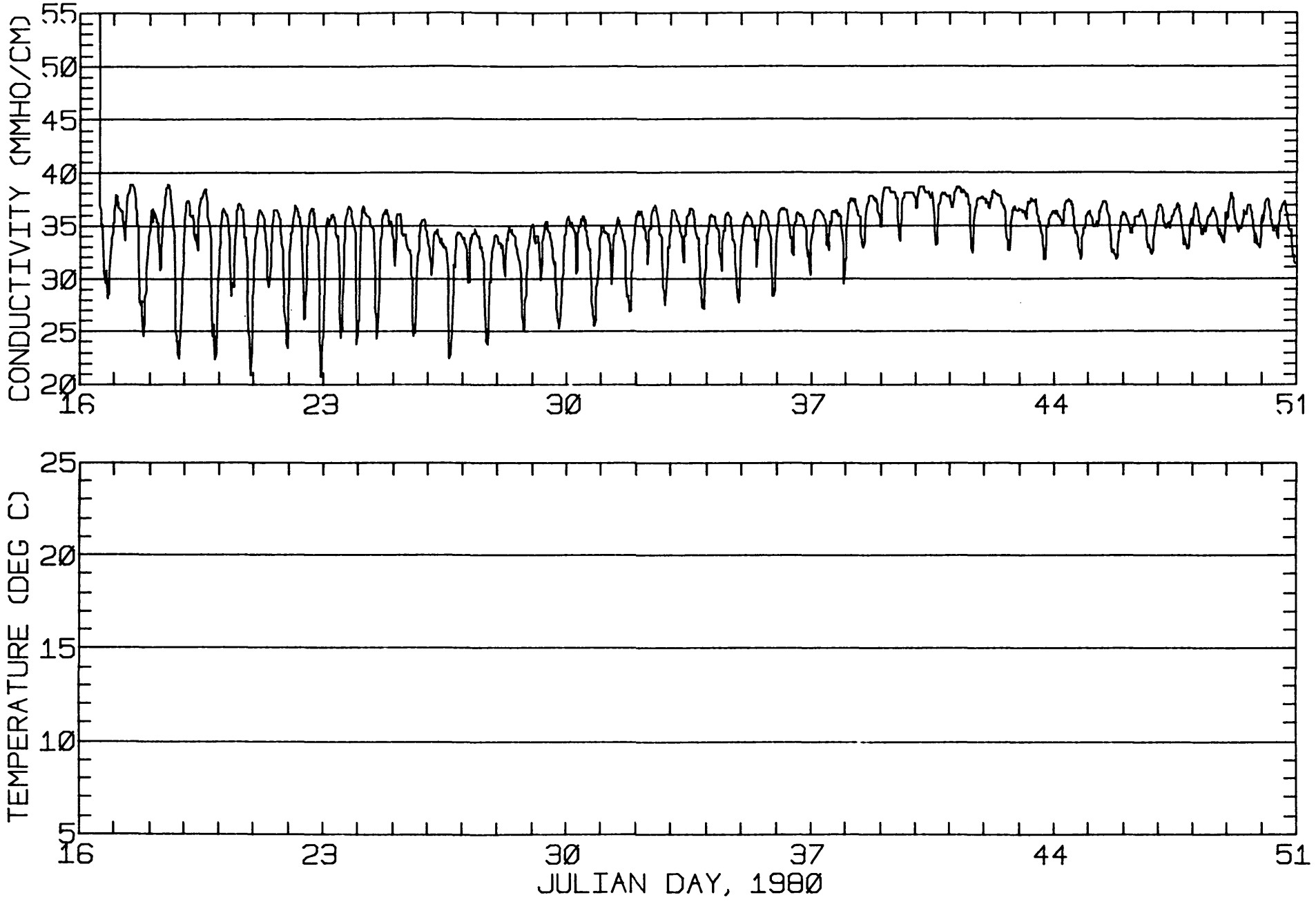
RMS SPEED:	37.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	77.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	27.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	93.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.65
STANDARD DEVIATION U-SERIES:	12.37 CM/SEC
STANDARD DEVIATION V SERIES:	9.31 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.9	-0.3	7184.
2	4	-4.2	0.7	3980.
ALL	16	-3.2	-0.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-55N 122-26-52W
METER 2.7 METERS ABOVE BED TAPE NUMBER GSC211E2.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
FORT MASON 37-48-55N 122-26-52W
METER 2.7 METERS ABOVE BED TAPE NUMBER GSC211E2.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C212
POSITION: 37 53' 5"N 122 24'42"W
METER TYPE: ENDECO
WATER DEPTH: 11.8 M (MLLW)
METER DEPTH: 4.2 M (BELOW MLLW)
START TIME OF SERIES: 11/13/80 1813 PST JULIAN DAY=318
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

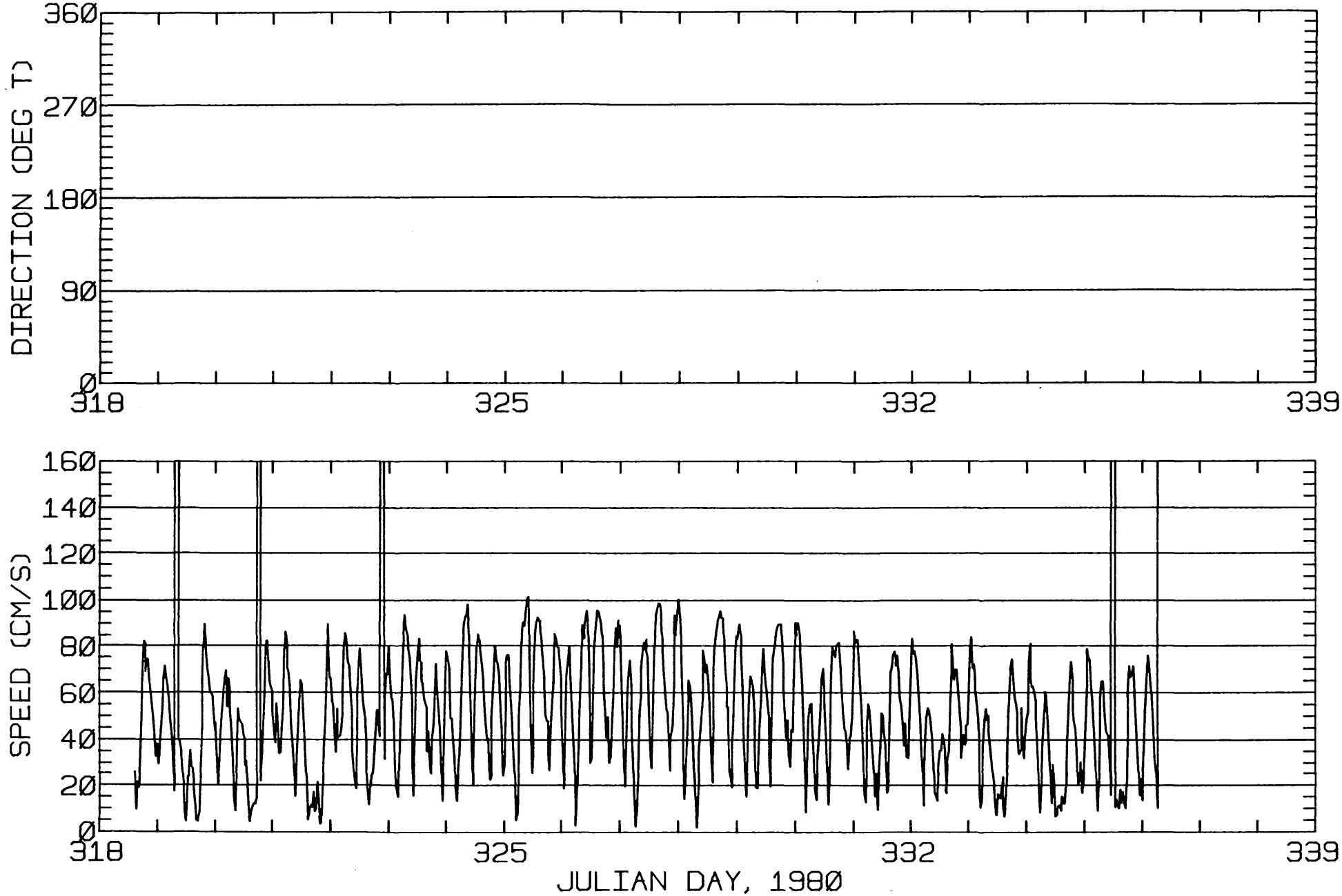
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

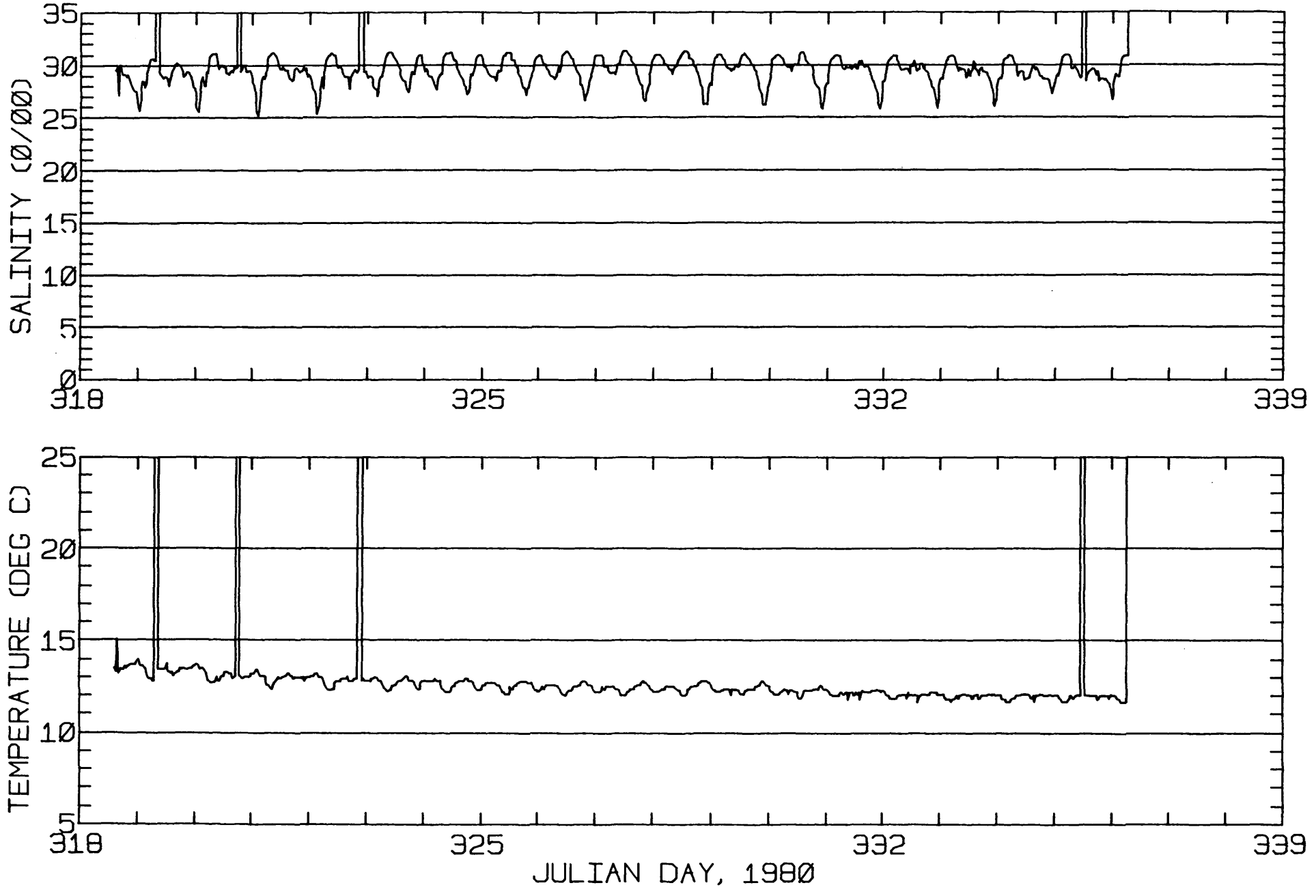
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	8			
ALL	32			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
ANGEL ISLAND 37-53- 5N 122-24-42W
METER 7.6 METERS ABOVE BED TAPE NUMBER GSC212A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
ANGEL ISLAND 37-53- 5N 122-24-42W
METER 7.6 METERS ABOVE BED TAPE NUMBER GSC212A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C215
POSITION: 37 56'27"N 122 27'18"W
METER TYPE: ENDECO
WATER DEPTH: 12.5 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 9/21/79 1241 PST JULIAN DAY=264
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

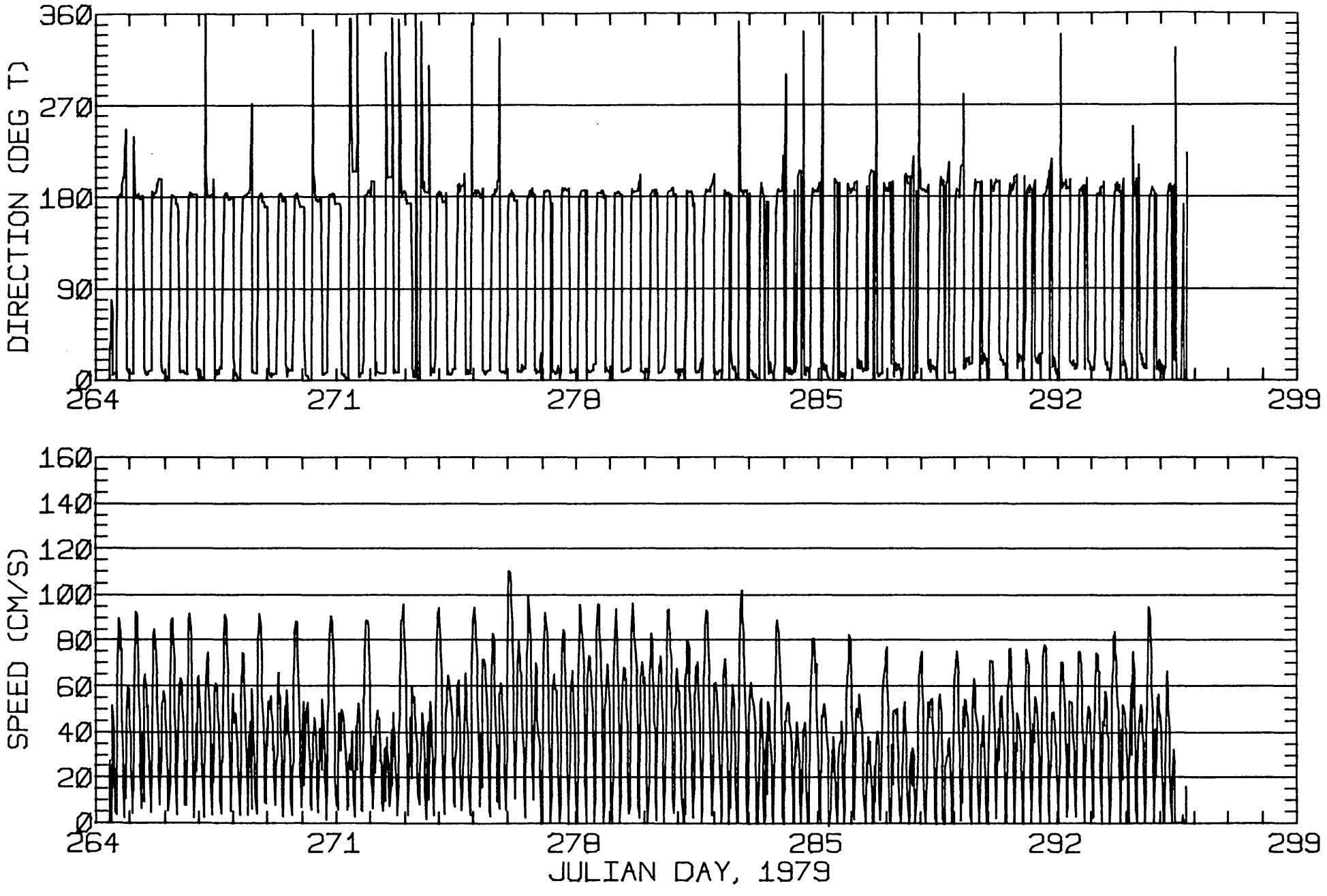
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.04	1.08	359.4	42.1	ANTI-CLOCKWISE
K1	16.14	0.48	6.1	49.2	ANTI-CLOCKWISE
N2	9.22	1.04	9.9	286.2	ANTI-CLOCKWISE
M2	53.57	1.98	6.4	329.7	CLOCKWISE
S2	15.05	0.31	7.5	315.7	ANTI-CLOCKWISE
M4	2.93	0.20	344.9	44.1	CLOCKWISE

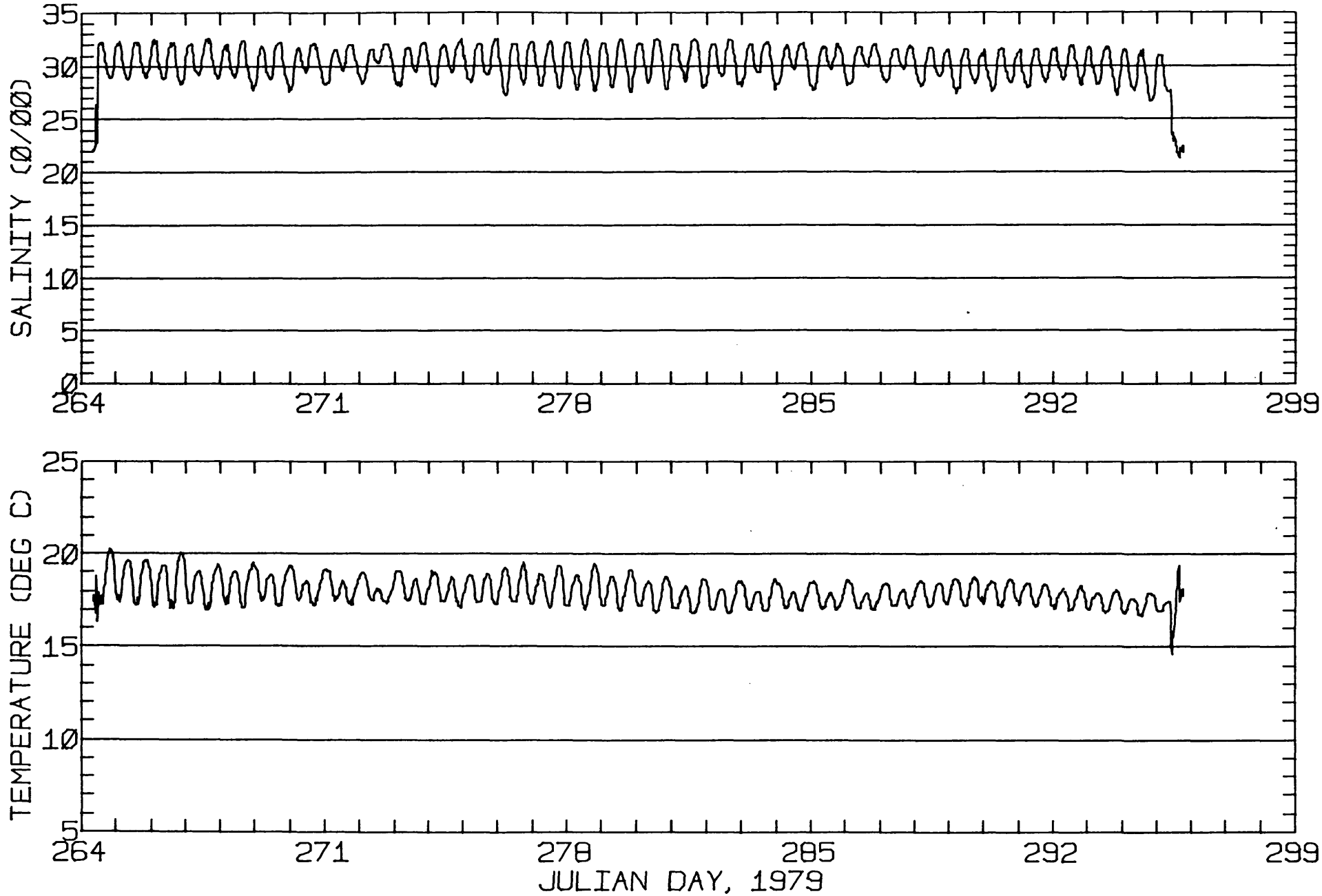
RMS SPEED:	48.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	98.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	36.4 CM/SEC
PRINCIPAL CURRENT DIRECTION:	5.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.44
STANDARD DEVIATION U-SERIES:	7.23 CM/SEC
STANDARD DEVIATION V SERIES:	20.32 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.2	-9.6	136.
2	12	0.7	-8.5	141.
3	12	0.8	-7.3	152.
4	12	-0.3	-4.5	200.
5	8	2.5	-7.1	182.
ALL	56	1.1	-7.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
TIBURON 37-56-27N 122-27-18W
METER 5.8 METERS ABOVE BED TAPE NUMBER GSC215A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
TIBURON 37-56-27N 122-27-18W
METER 5.8 METERS ABOVE BED TAPE NUMBER GSC215A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C217
POSITION: 37 55'56"N 122 24'38"W
METER TYPE: ENDECO
WATER DEPTH: 6.7 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES:10/ 3/79 1938 PST JULIAN DAY=276
APPROXIMATE RECORD LENGTH IS 6 M2-CYCLES

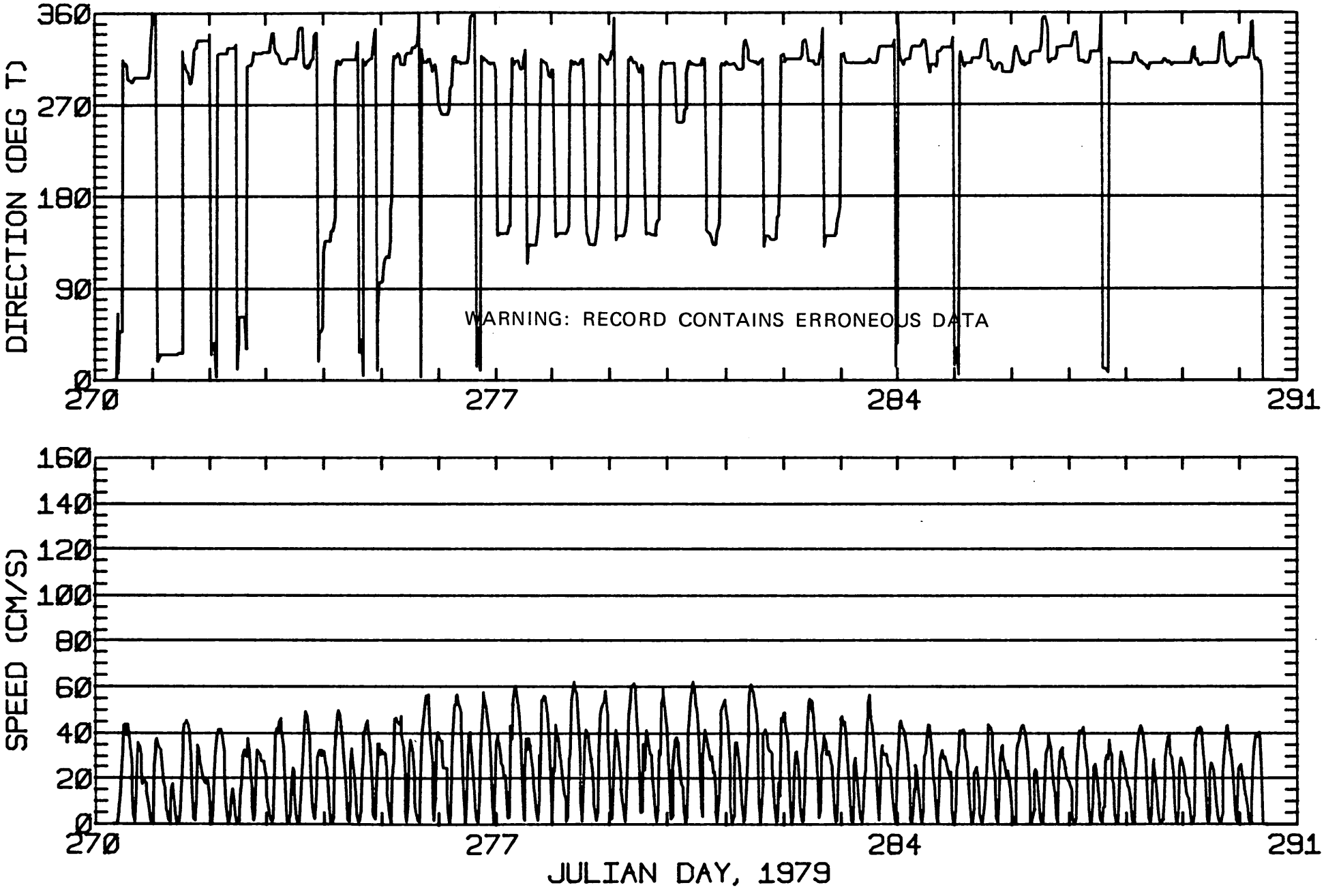
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

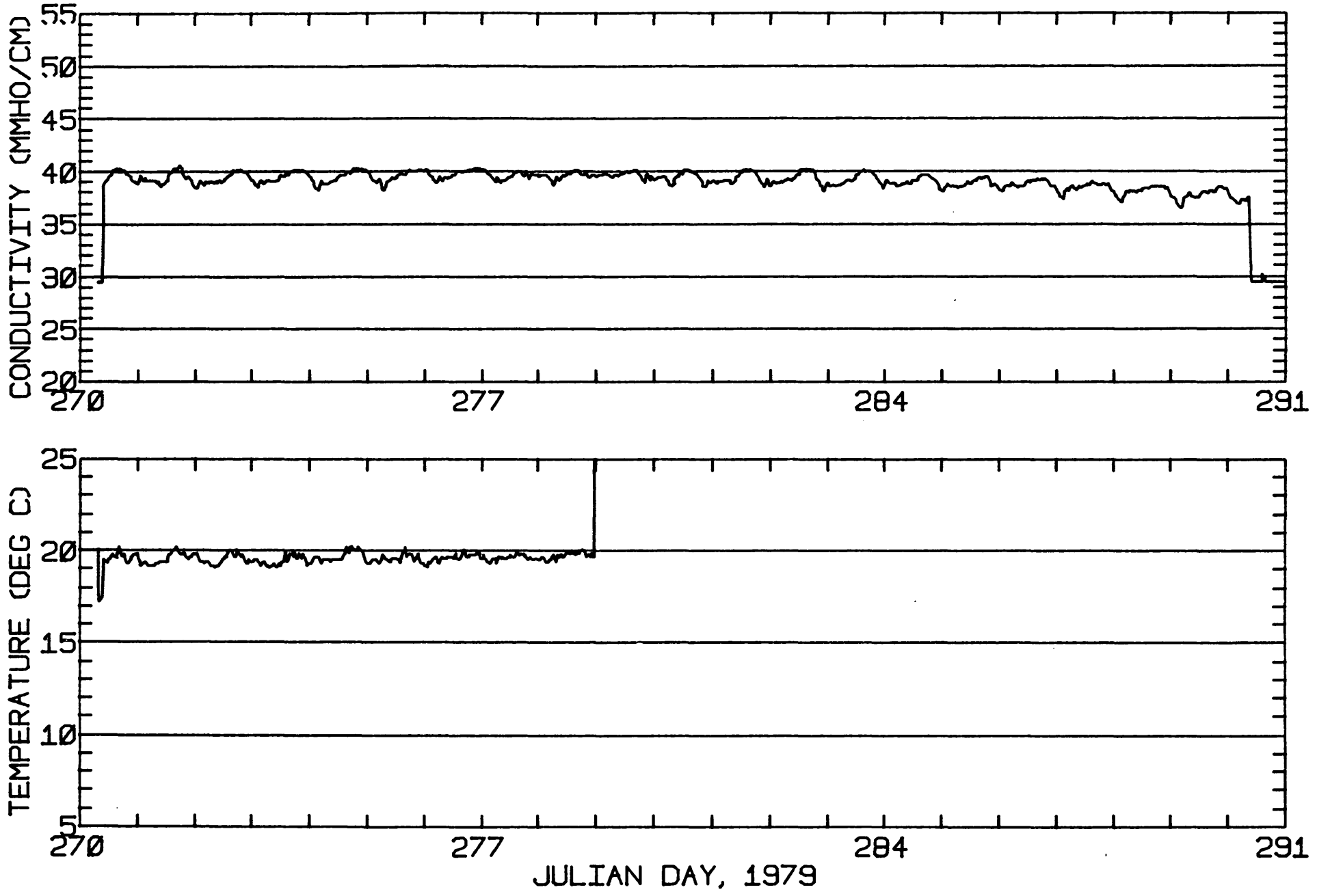
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1				
ALL				



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RICHMOND 37-55-56N 122-24-38W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC217A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RICHMOND 37-55-56N 122-24-38W
METER 3.7 METERS ABOVE BED TAPE NUMBER GSC217A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C220
POSITION: 37 50'40"N 122 21'41"W
METER TYPE: ENDECO
WATER DEPTH: 5.7 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 10/ 9/79 1110 PST JULIAN DAY=282
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

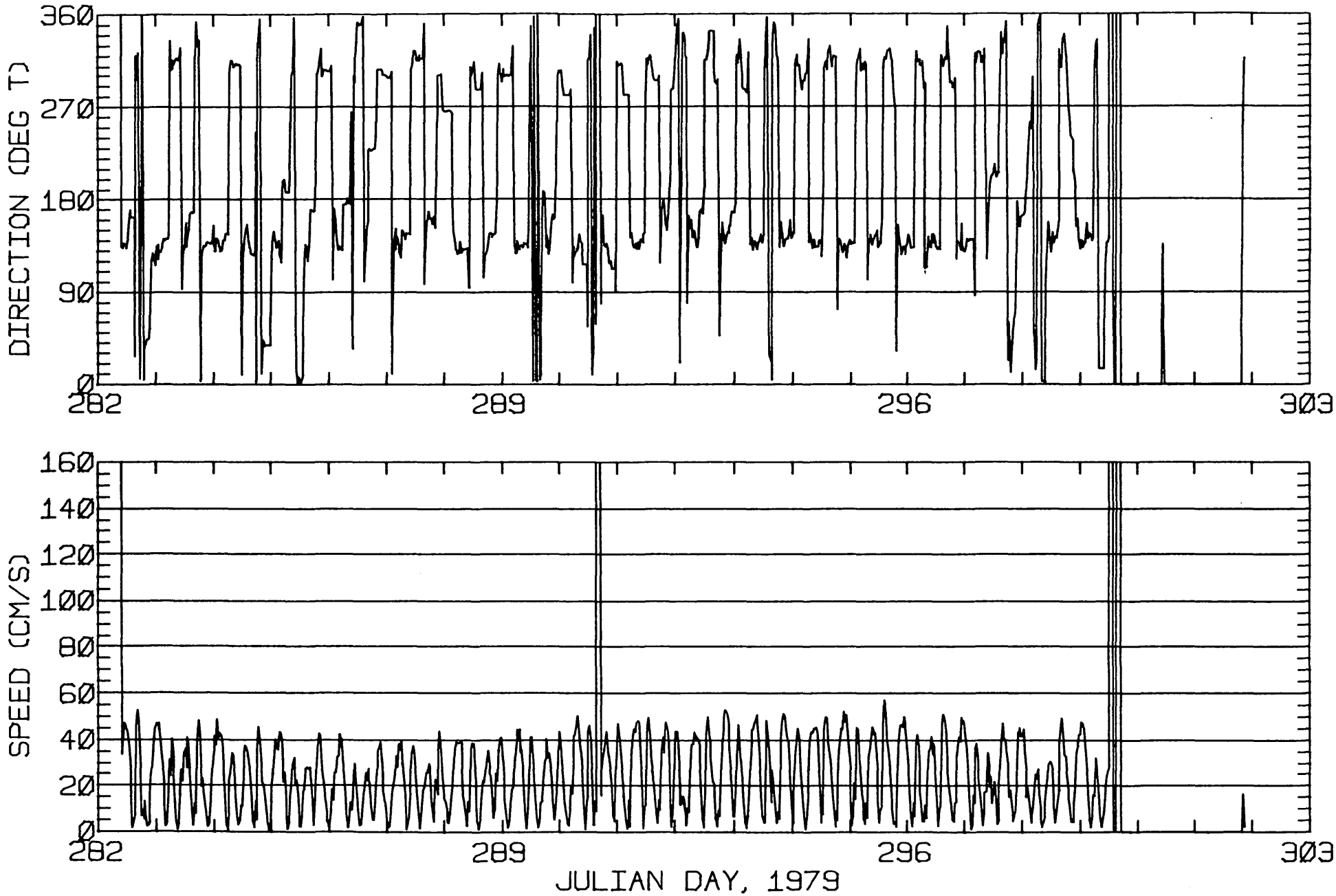
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.87	1.02	119.3	338.7	CLOCKWISE
K1	6.12	1.35	152.3	344.0	ANTI-CLOCKWISE
N2	7.35	2.16	152.3	265.2	CLOCKWISE
M2	32.44	1.37	142.4	281.8	CLOCKWISE
S2	11.95	0.72	140.4	261.9	CLOCKWISE
M4	3.63	0.70	140.2	263.2	CLOCKWISE

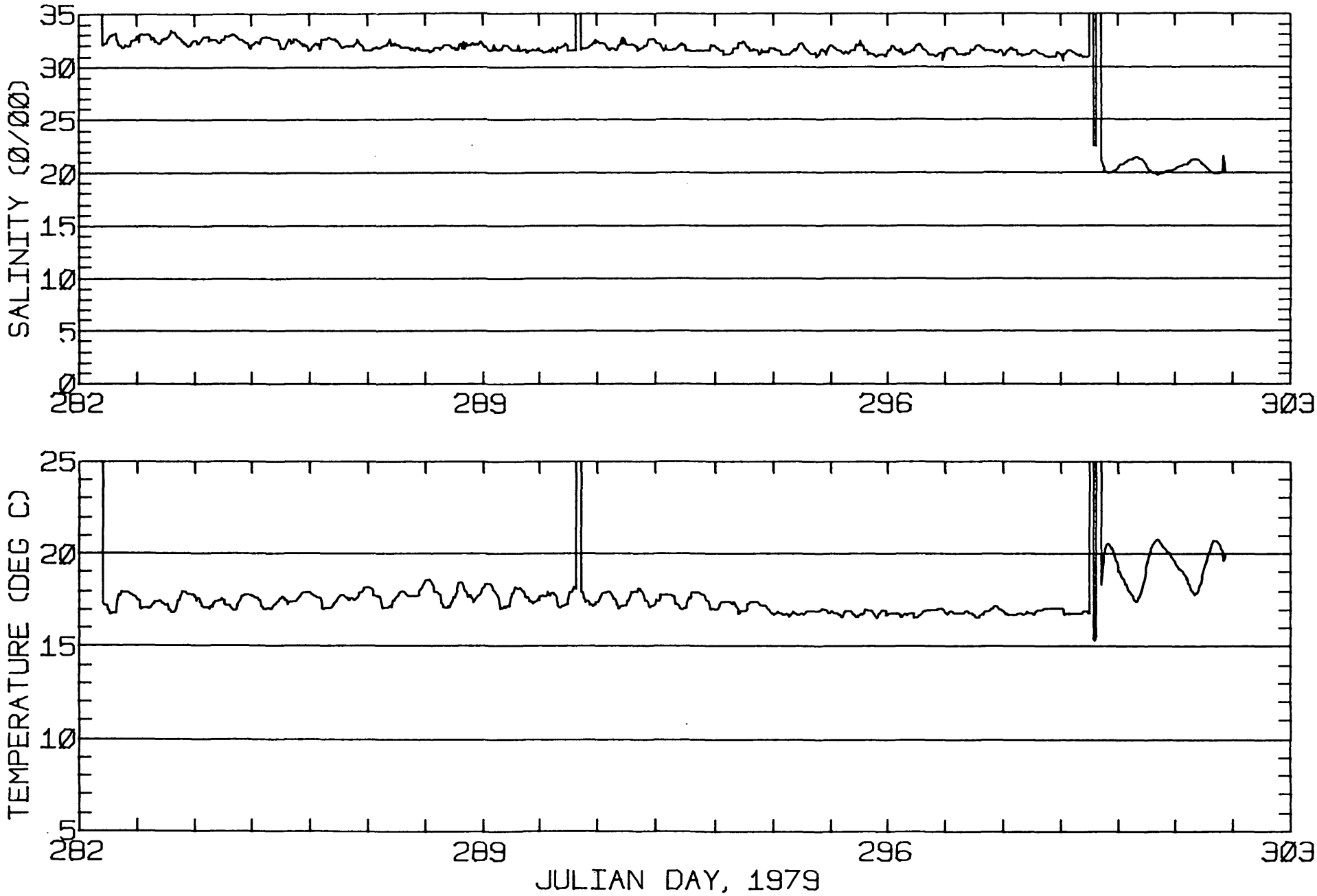
RMS SPEED:	28.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	57.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	21.2 CM/SEC
PRINCIPAL CURRENT DIRECTION:	140.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.29
STANDARD DEVIATION U-SERIES:	10.50 CM/SEC
STANDARD DEVIATION V SERIES:	9.66 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.5	-3.7	194.
2	12	3.2	-4.6	190.
3	8	2.0	-3.5	238.
ALL	32	2.7	-4.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
TREASURE ISLAND 37-50-40N 122-21-41W
METER 2.7 METERS ABOVE BED TAPE NUMBER GSC220A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
TREASURE ISLAND 37-50-40N 122-21-41W
METER 2.7 METERS ABOVE BED TAPE NUMBER GSC220A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'15"N 122 28'30"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 940 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

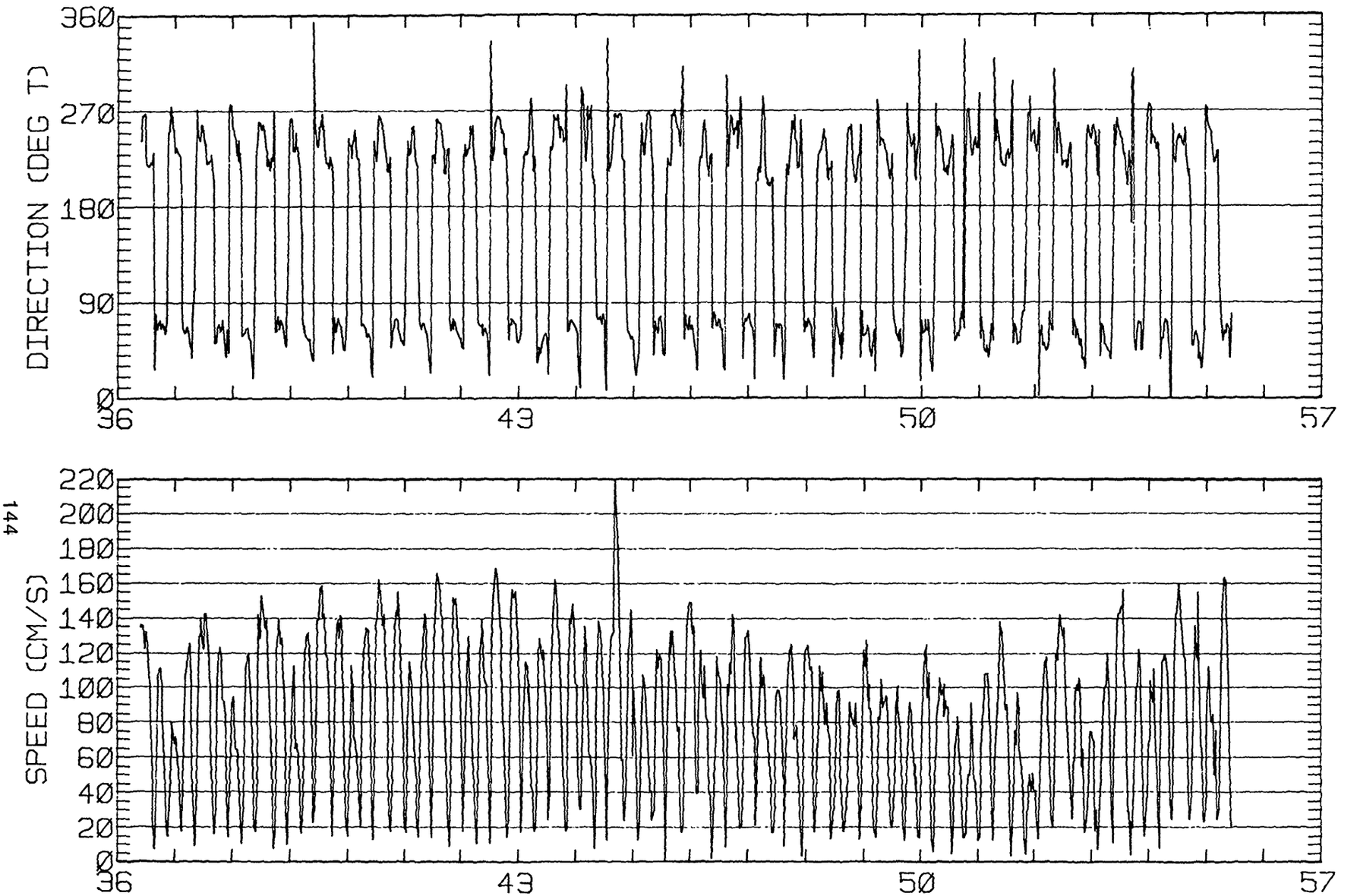
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.18	8.06	74.3	32.2	ANTI-CLOCKWISE
K1	33.77	1.28	62.0	70.2	CLOCKWISE
N2	28.37	8.95	50.4	265.4	ANTI-CLOCKWISE
M2	117.54	12.27	63.2	290.9	ANTI-CLOCKWISE
S2	39.09	0.65	68.6	303.2	ANTI-CLOCKWISE
M4	9.63	2.85	35.0	246.9	CLOCKWISE

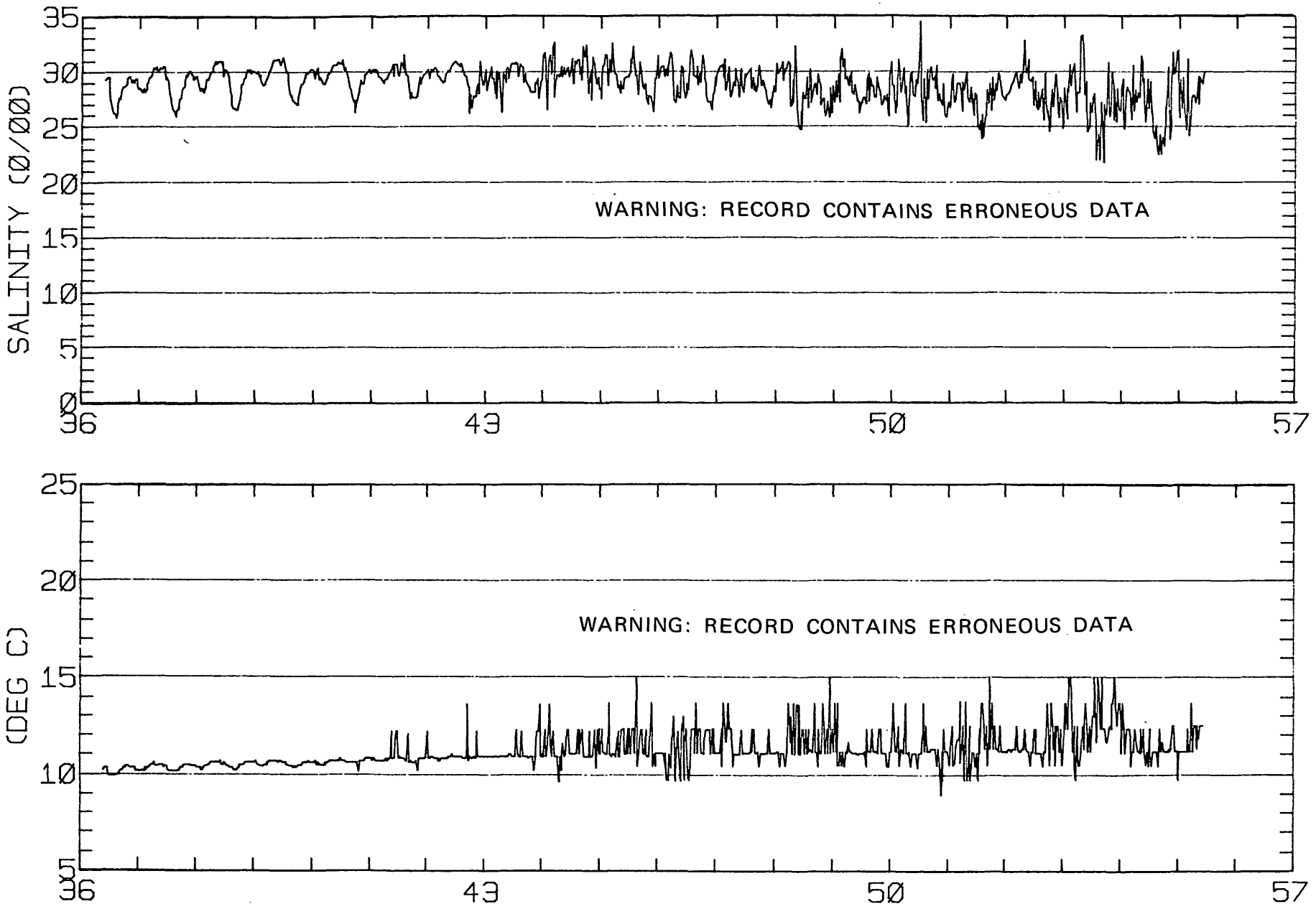
RMS SPEED: 91.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 207.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 61.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 64.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 17.75 CM/SEC
STANDARD DEVIATION V SERIES: 21.25 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.8	-3.4	415.
2	12	-5.6	-0.5	728.
3	12	-4.9	-2.8	1902.
ALL	36	-5.1	-2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER 091.5 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-3ØW
METER Ø91.5 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'15"N 122 28'30"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 952 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

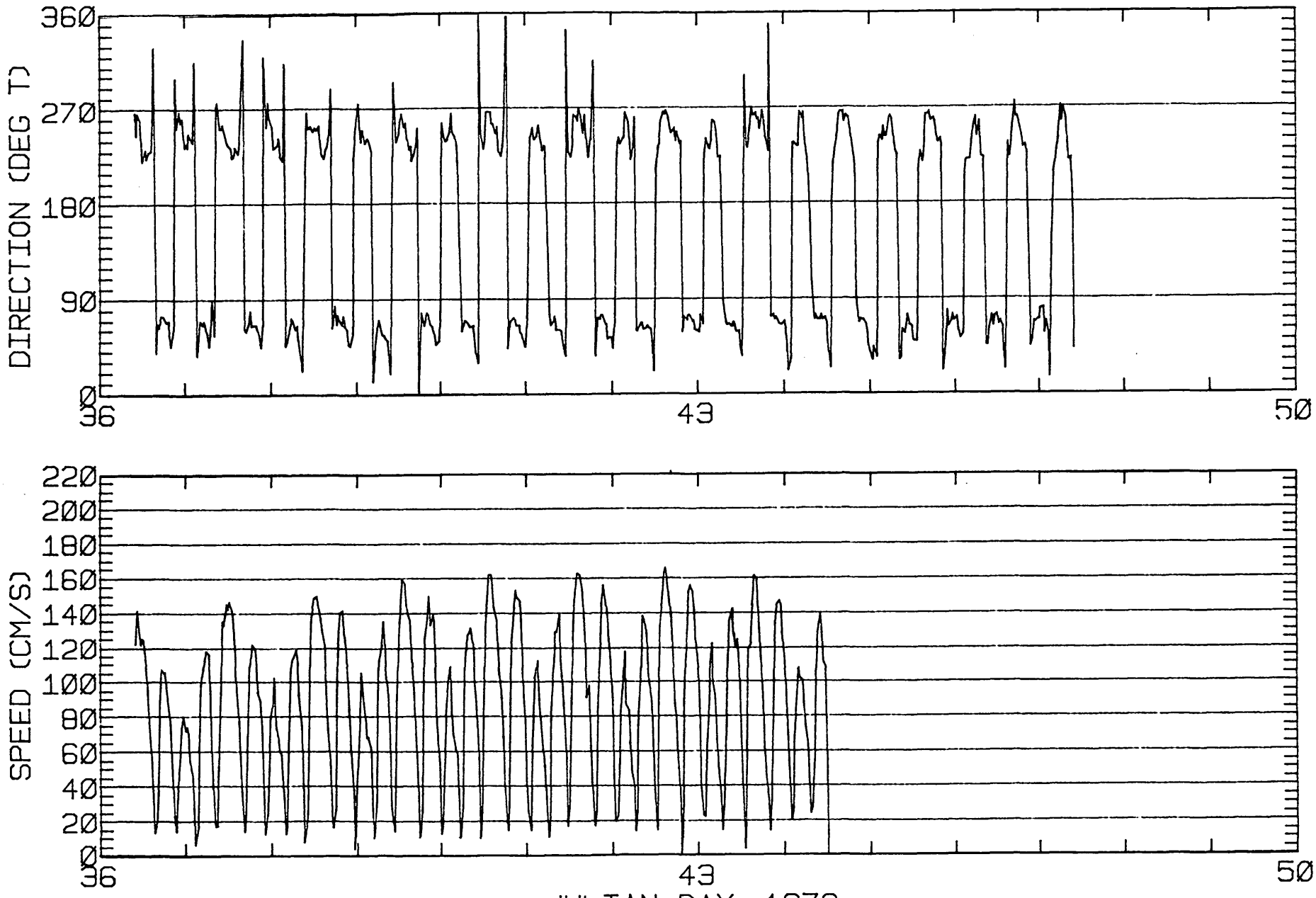
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.63	9.46	86.9	33.9	ANTI-CLOCKWISE
K1	34.27	3.09	67.1	64.7	CLOCKWISE
N2	37.30	4.02	51.9	287.0	CLOCKWISE
M2	132.87	0.55	66.2	294.0	CLOCKWISE
S2	38.87	0.12	62.2	300.2	CLOCKWISE
M4	9.61	5.30	67.5	298.8	CLOCKWISE

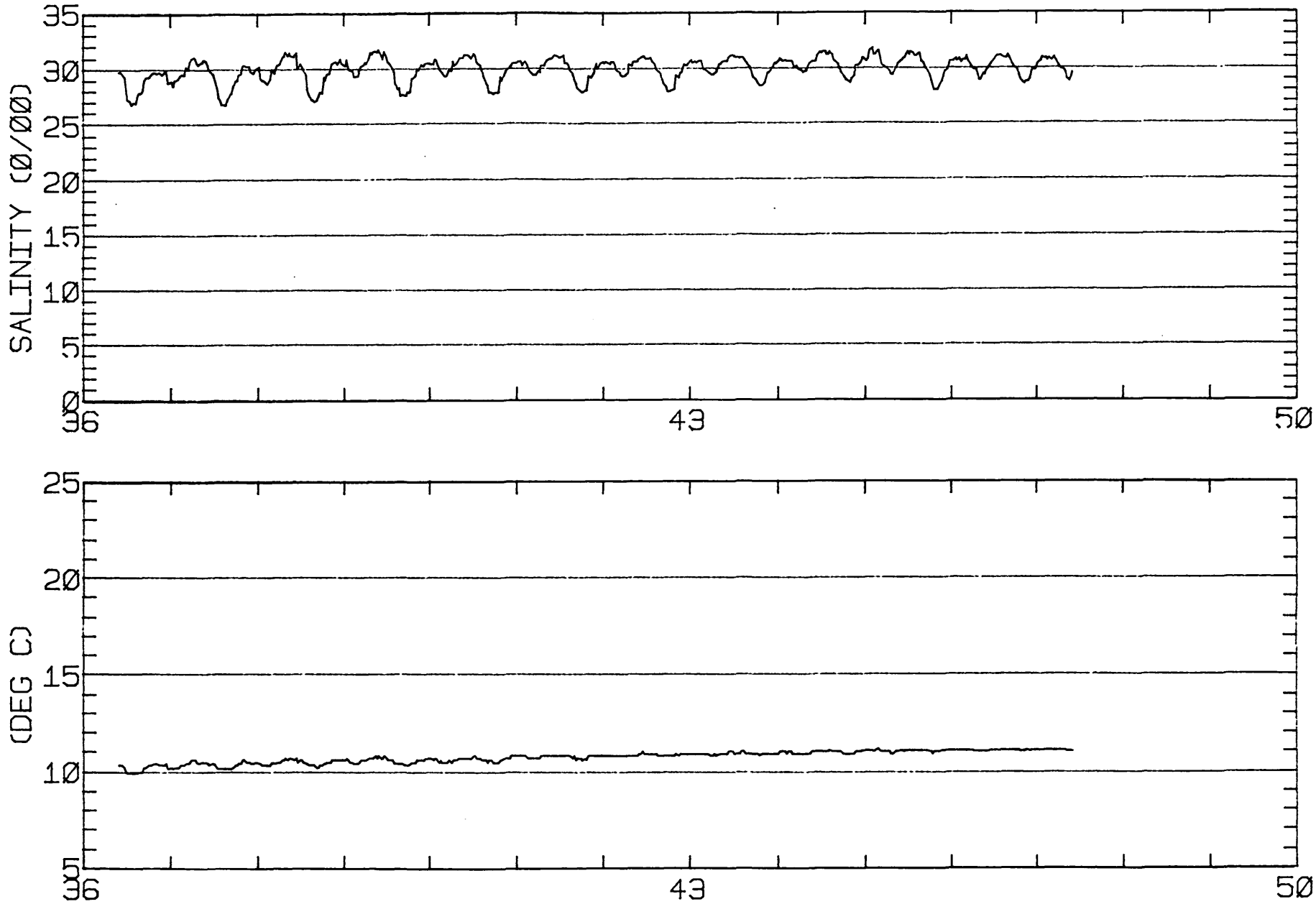
RMS SPEED: 98.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 225.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 79.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 67.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 14.28 CM/SEC
STANDARD DEVIATION V SERIES: 16.98 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.3	0.9	415.
2	2	1.9	4.0	346.
ALL	14	-4.3	1.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER 085.4 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-3ØW
METER Ø85.4 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'15"N 122 28'30"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 51.8 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 934 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 8 M2-CYCLES

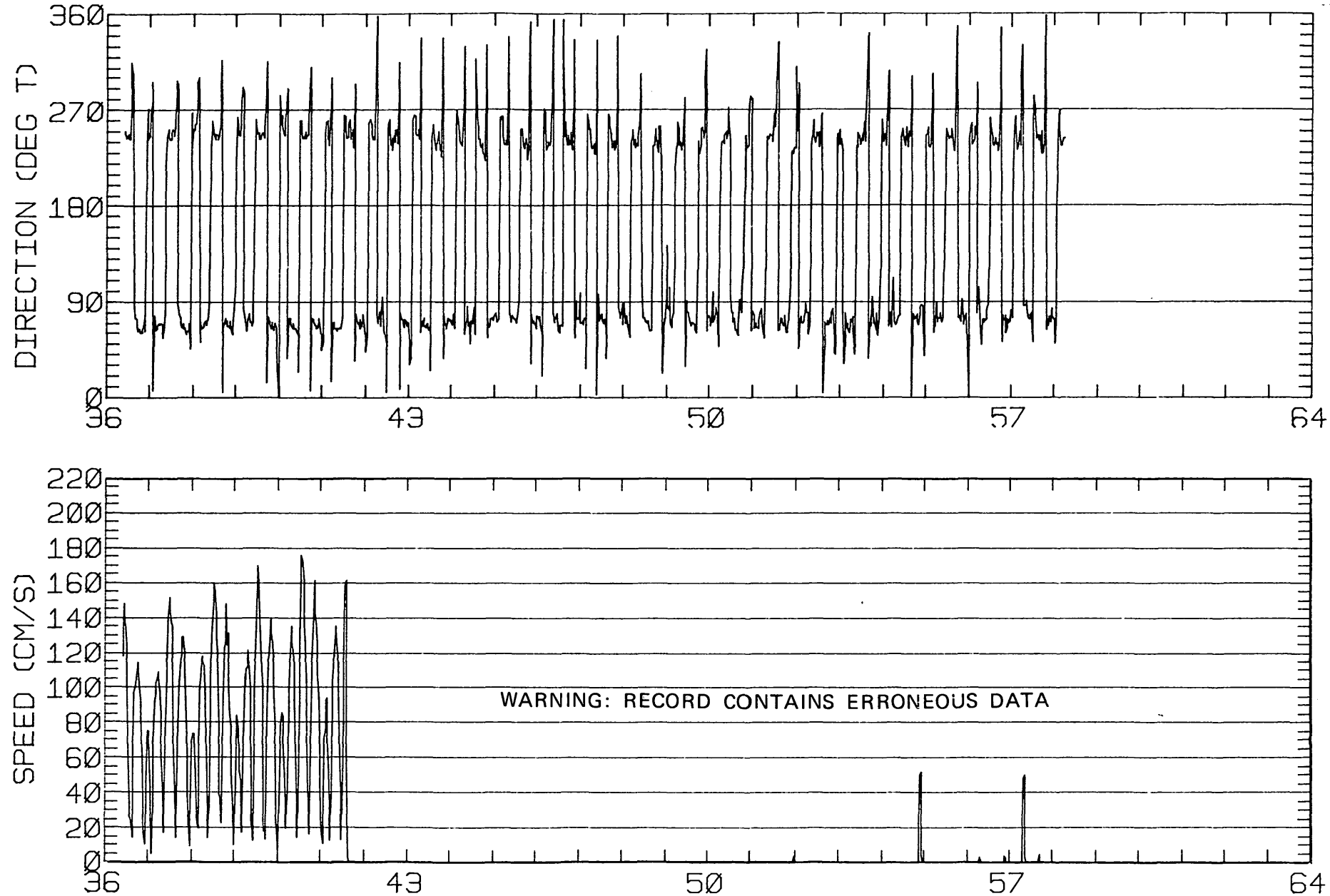
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	25.93	0.44	60.1	70.3	ANTI-CLOCKWISE
K1	30.51	0.98	66.2	41.2	CLOCKWISE
N2	50.59	4.19	106.4	258.2	CLOCKWISE
M2	115.90	39.80	78.2	277.6	ANTI-CLOCKWISE
S2	43.38	2.27	95.1	286.0	ANTI-CLOCKWISE
M4	6.69	4.01	20.0	72.3	CLOCKWISE

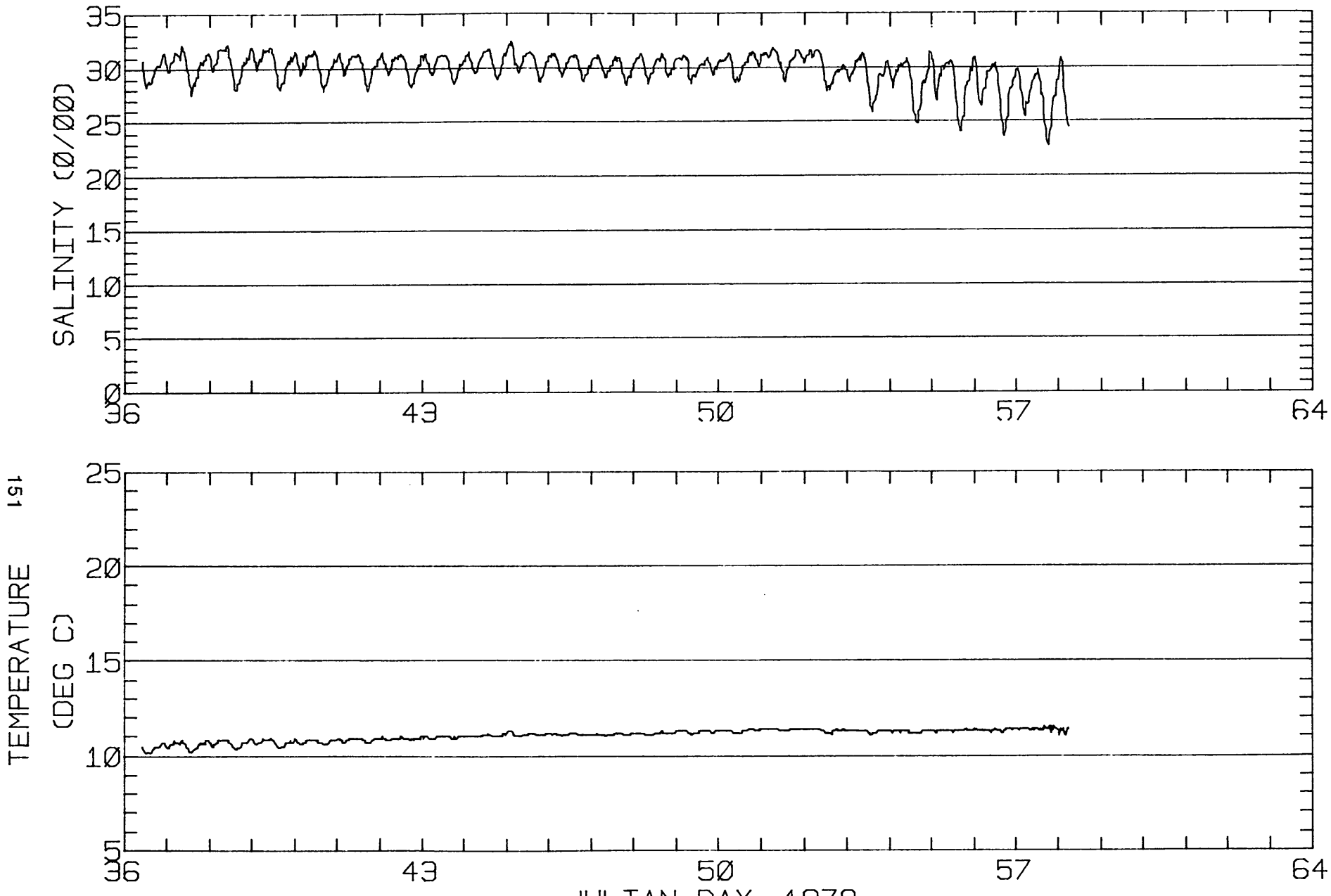
RMS SPEED: 91.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 215.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 67.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 77.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 12.53 CM/SEC
STANDARD DEVIATION V SERIES: 9.08 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	8	8.7	6.7	421.
ALL	8	8.7	6.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER 045.8 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER Ø45.8 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'15"N 122 28'30"W
METER TYPE: AANDERAA
WATER DEPTH: 97.9 M (MLLW)
METER DEPTH: 90.3 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 956 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

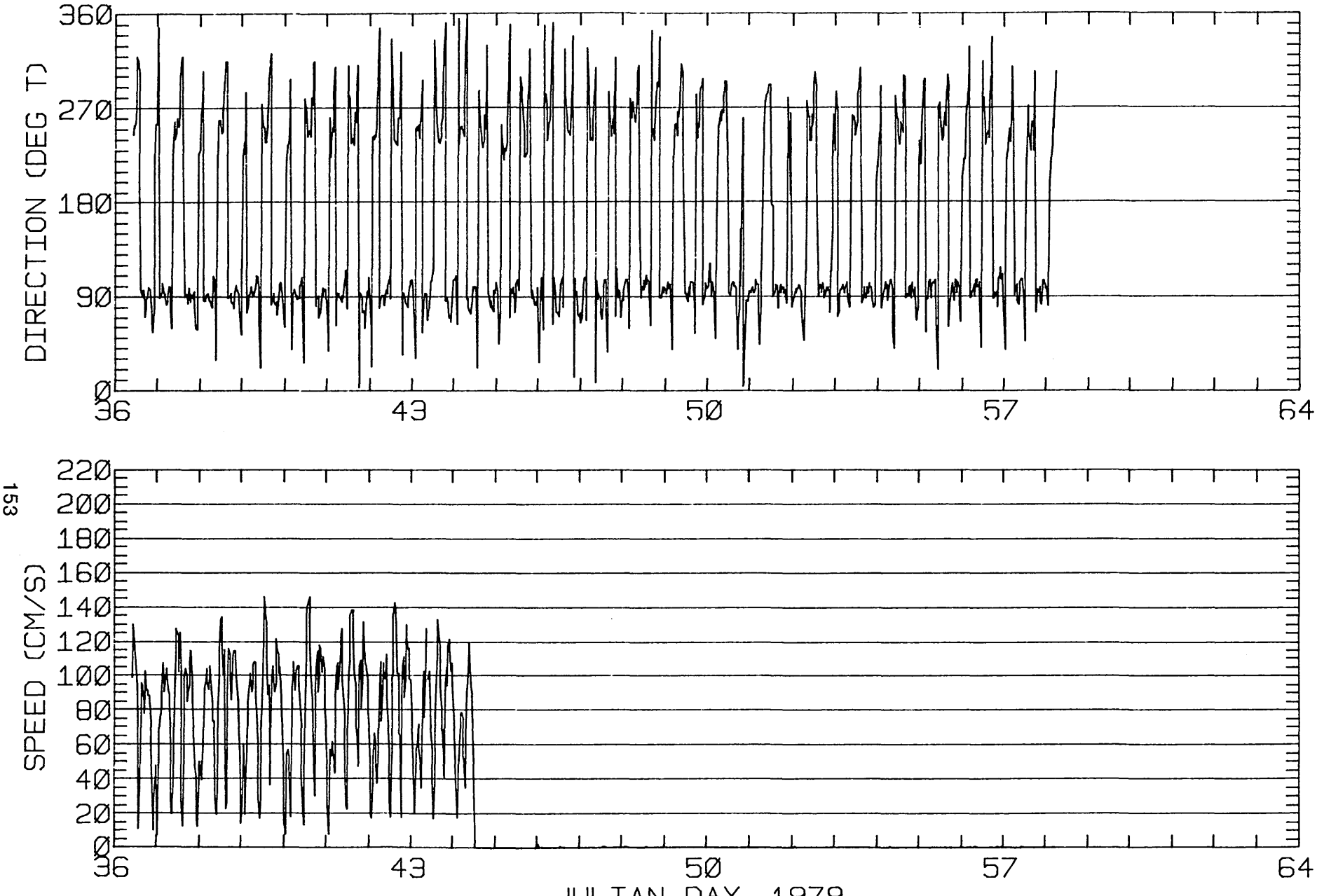
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	21.31	9.31	79.8	54.7	CLOCKWISE
K1	37.59	0.16	88.6	55.4	ANTI-CLOCKWISE
N2	22.58	1.93	101.1	272.4	ANTI-CLOCKWISE
M2	104.76	4.69	85.9	282.9	CLOCKWISE
S2	22.57	1.44	77.9	297.6	CLOCKWISE
M4	20.22	6.32	59.2	73.5	CLOCKWISE

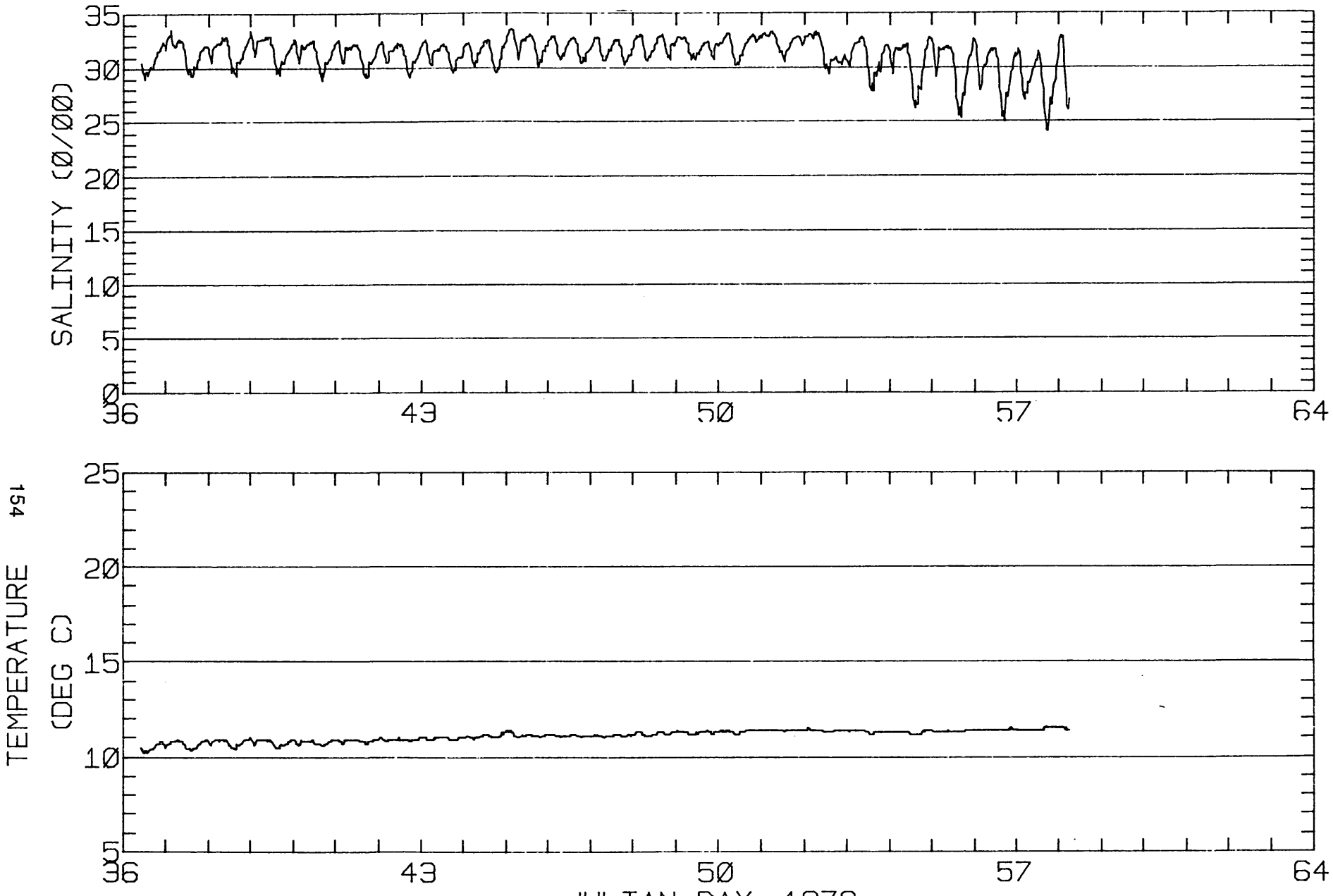
RMS SPEED: 87.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 186.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 65.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 84.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 16.42 CM/SEC
STANDARD DEVIATION V SERIES: 21.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	26.2	-2.0	415.
2	2	22.9	-6.8	346.
ALL	14	25.7	-2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER 007.5 METERS ABOVE BED. WATER DEPTH 097.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø97.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'15"N 122 28'30"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 2/24/79 1040 PST JULIAN DAY= 55
APPROXIMATE RECORD LENGTH IS 4 M2-CYCLES

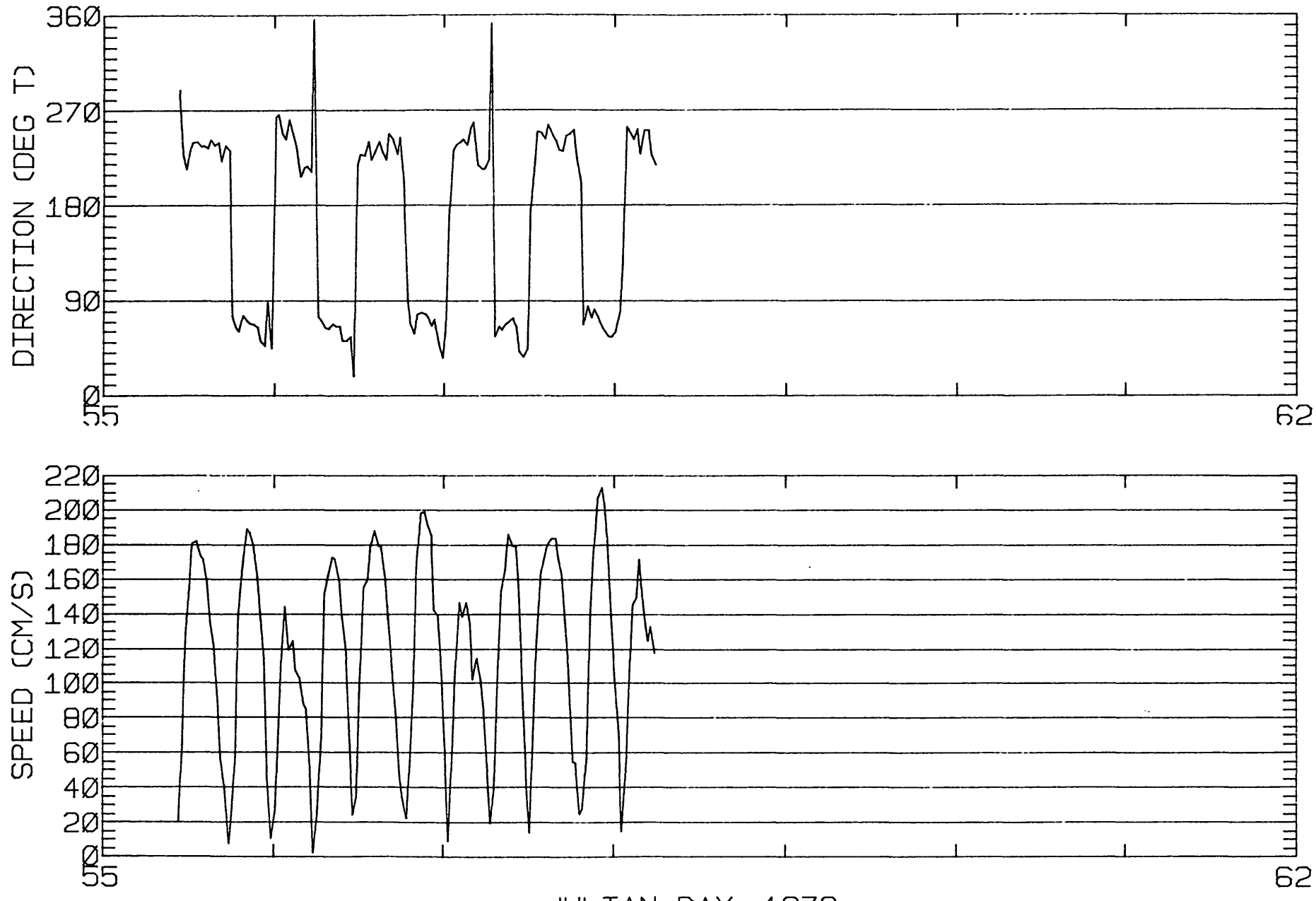
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

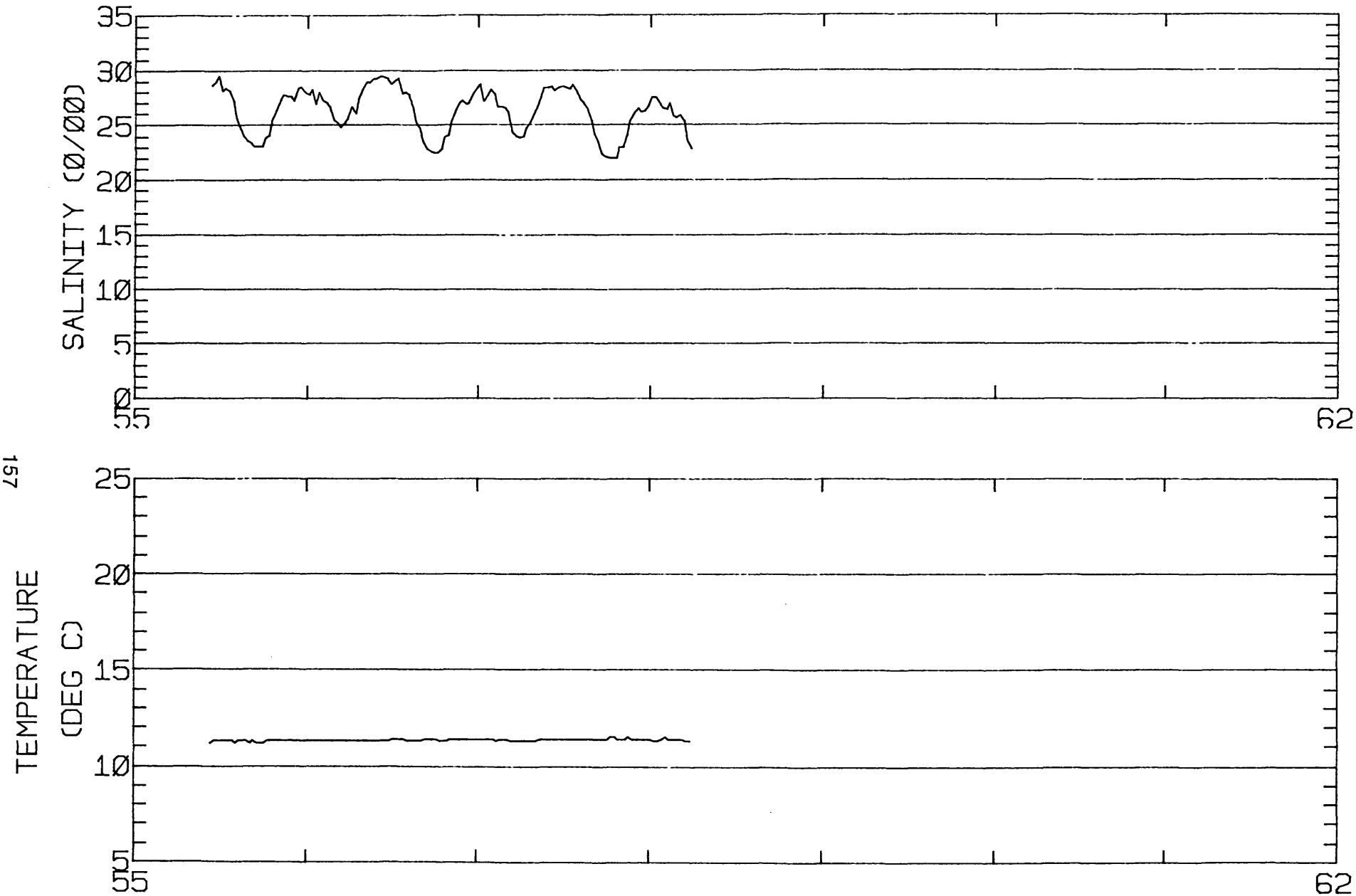
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1				
ALL				



JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER 091.5 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)

NOAA STATION 1 37-49-15N 122-28-3ØW

METER Ø91.5 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'15"N 122 28'30"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 2/16/79 1020 PST JULIAN DAY= 47
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

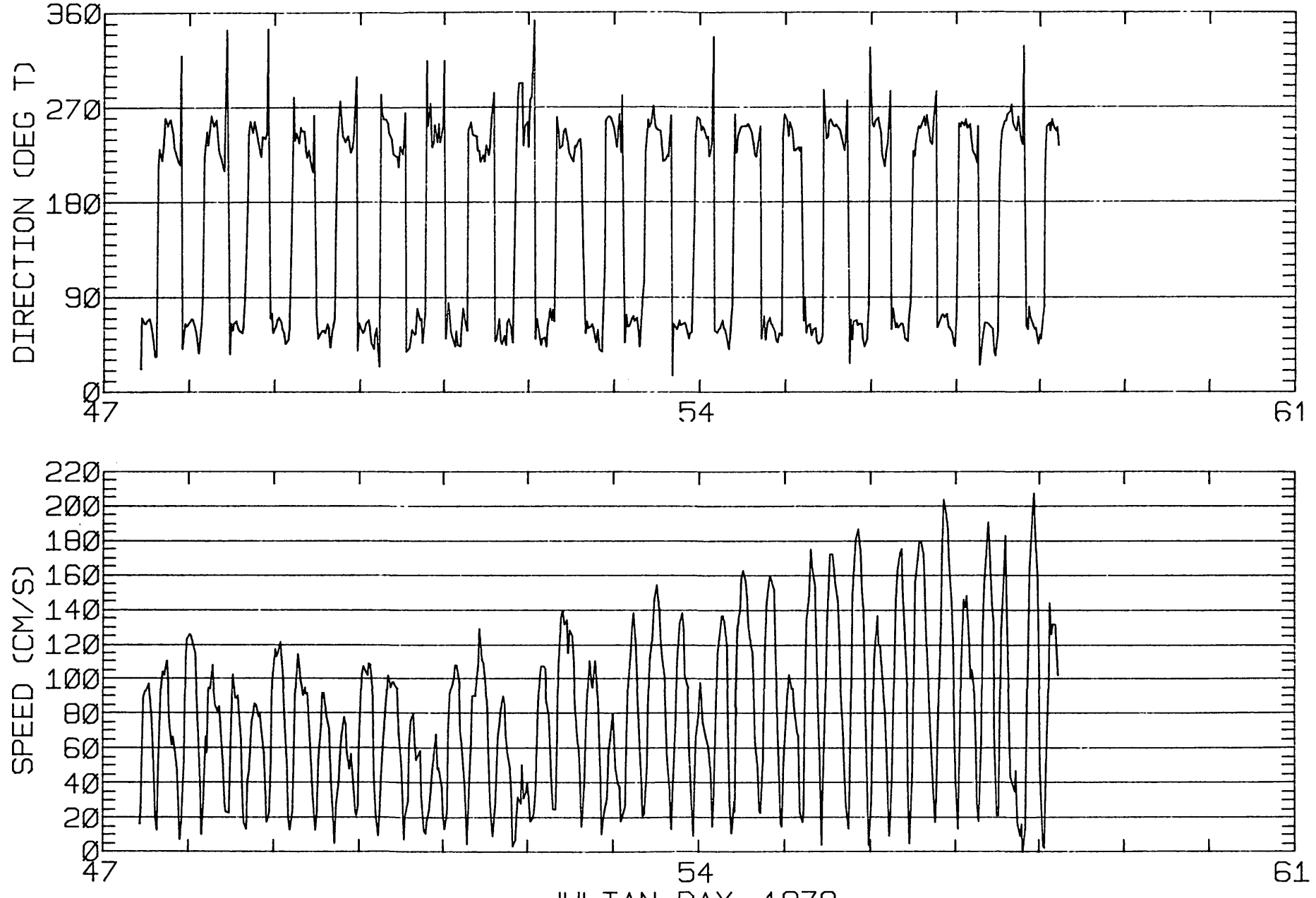
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.80	4.60	59.2	49.1	ANTI-CLOCKWISE
K1	32.73	1.79	59.9	55.2	CLOCKWISE
N2	16.92	8.58	53.2	286.0	ANTI-CLOCKWISE
M2	110.02	3.35	66.9	282.9	ANTI-CLOCKWISE
S2	32.47	0.31	72.8	294.9	ANTI-CLOCKWISE
M4	10.73	3.93	63.5	233.2	CLOCKWISE

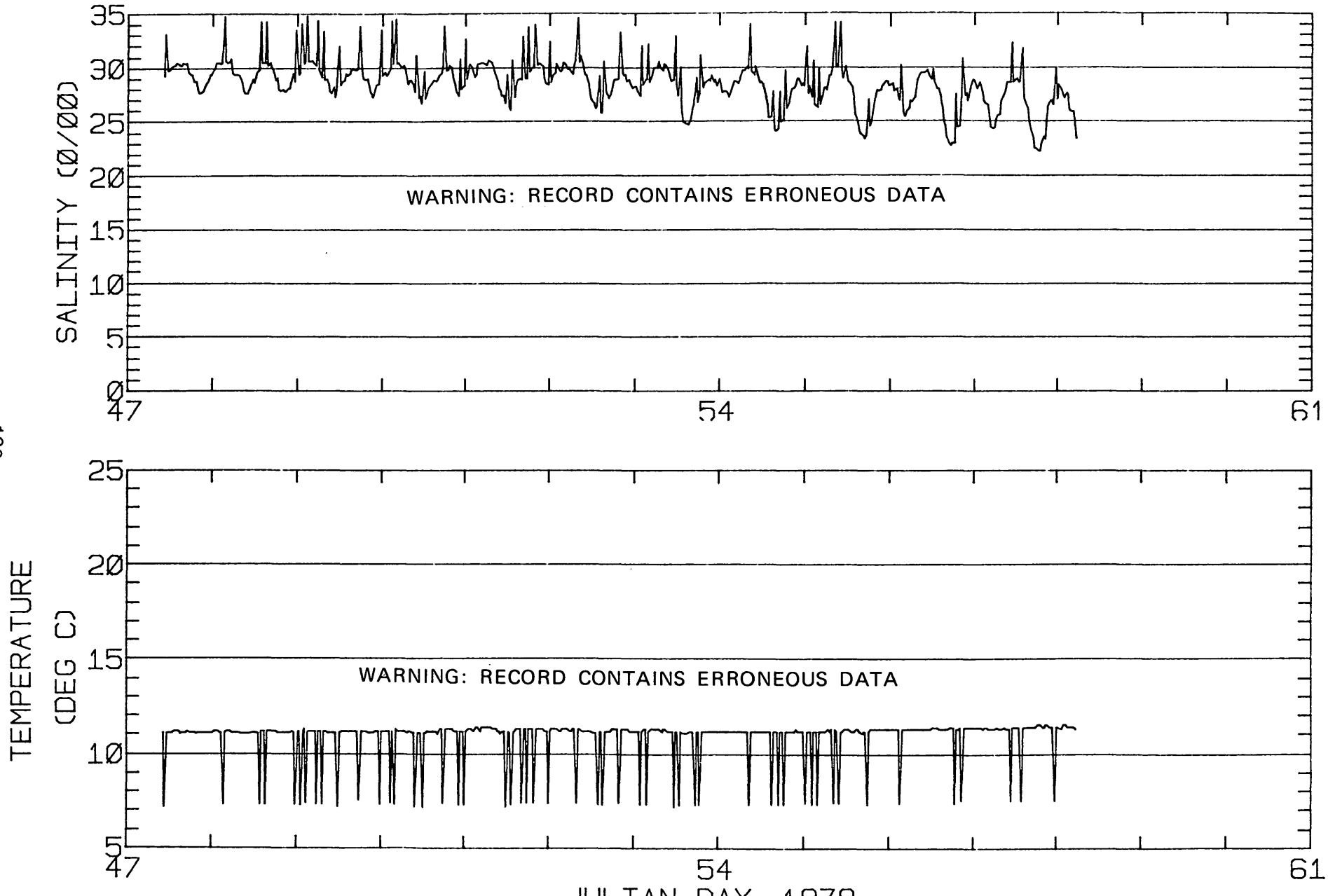
RMS SPEED: 92.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 187.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 56.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 66.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 17.42 CM/SEC
STANDARD DEVIATION V SERIES: 17.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.1	0.2	1711.
2	8	0.3	7.6	2997.
ALL	20	-1.2	3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER 085.4 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-30W
METER Ø85.4 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'15"N 122 28'24"W
METER TYPE: AANDERAA
WATER DEPTH: 98.8 M (MLLW)
METER DEPTH: 7.3 M (BELOW MLLW)
START TIME OF SERIES: 2/27/79 1720 PST JULIAN DAY= 58
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

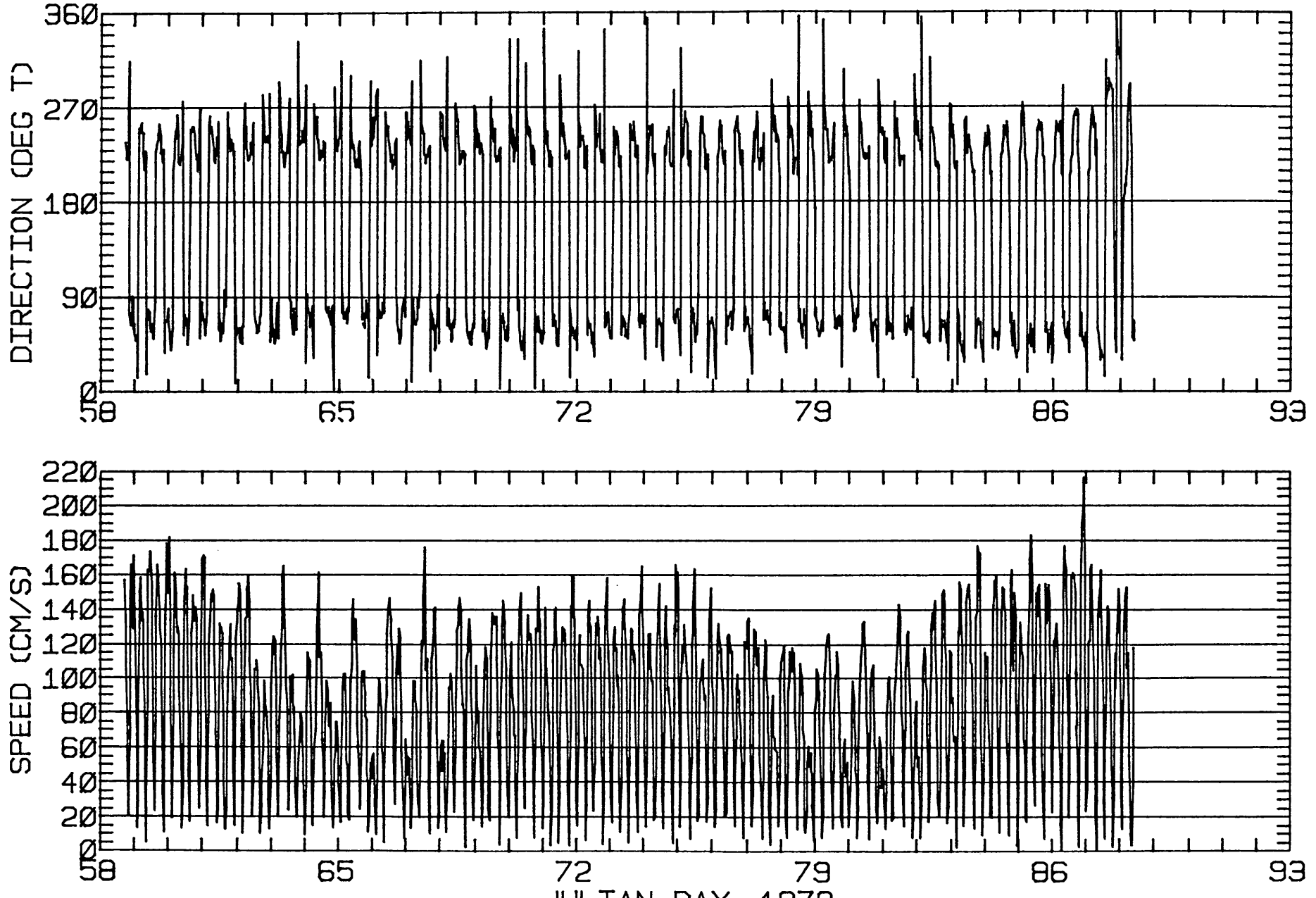
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.56	4.72	44.0	51.1	ANTI-CLOCKWISE
K1	27.49	2.31	51.5	56.2	ANTI-CLOCKWISE
N2	27.95	0.42	63.1	261.7	ANTI-CLOCKWISE
M2	115.09	10.68	59.7	295.4	ANTI-CLOCKWISE
S2	32.36	0.35	62.1	294.3	ANTI-CLOCKWISE
M4	10.99	4.24	63.9	242.5	CLOCKWISE

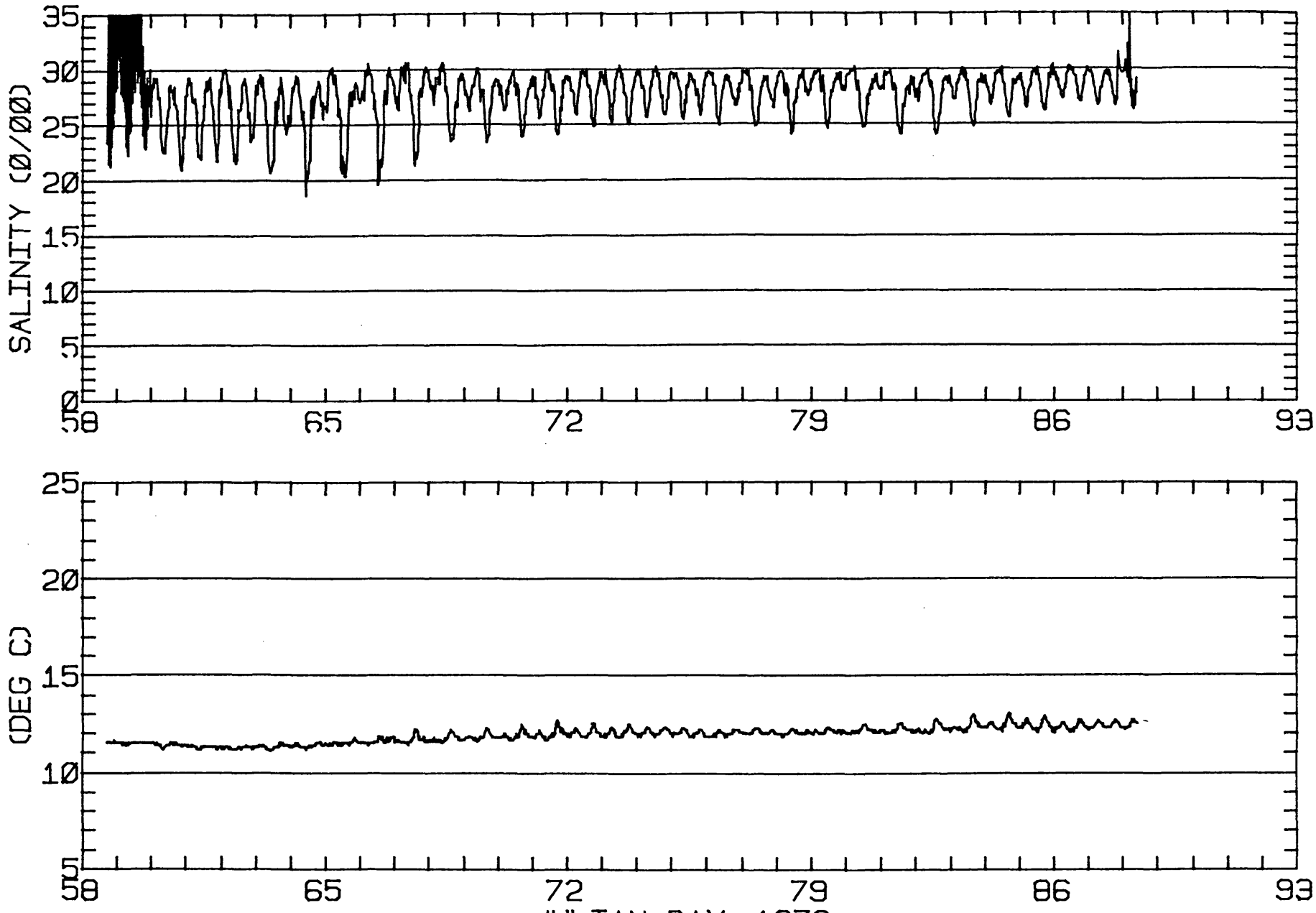
RMS SPEED: 97.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 195.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 75.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 57.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 17.75 CM/SEC
STANDARD DEVIATION V SERIES: 21.87 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.7	-7.7	2039.
2	12	-0.5	-4.8	1210.
3	12	0.5	-4.6	756.
4	12	0.8	-3.5	914.
5	8	-3.0	12.7	654.
ALL	56	-0.6	-2.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-24W
METER 091.5 METERS ABOVE BED. WATER DEPTH 098.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-24W
METER Ø91.5 METERS ABOVE BED. WATER DEPTH Ø98.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'15"N 122 28'24"W
METER TYPE: AANDERAA
WATER DEPTH: 98.8 M (MLLW)
METER DEPTH: 13.4 M (BELOW MLLW)
START TIME OF SERIES: 2/27/79 1722 PST JULIAN DAY= 58
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

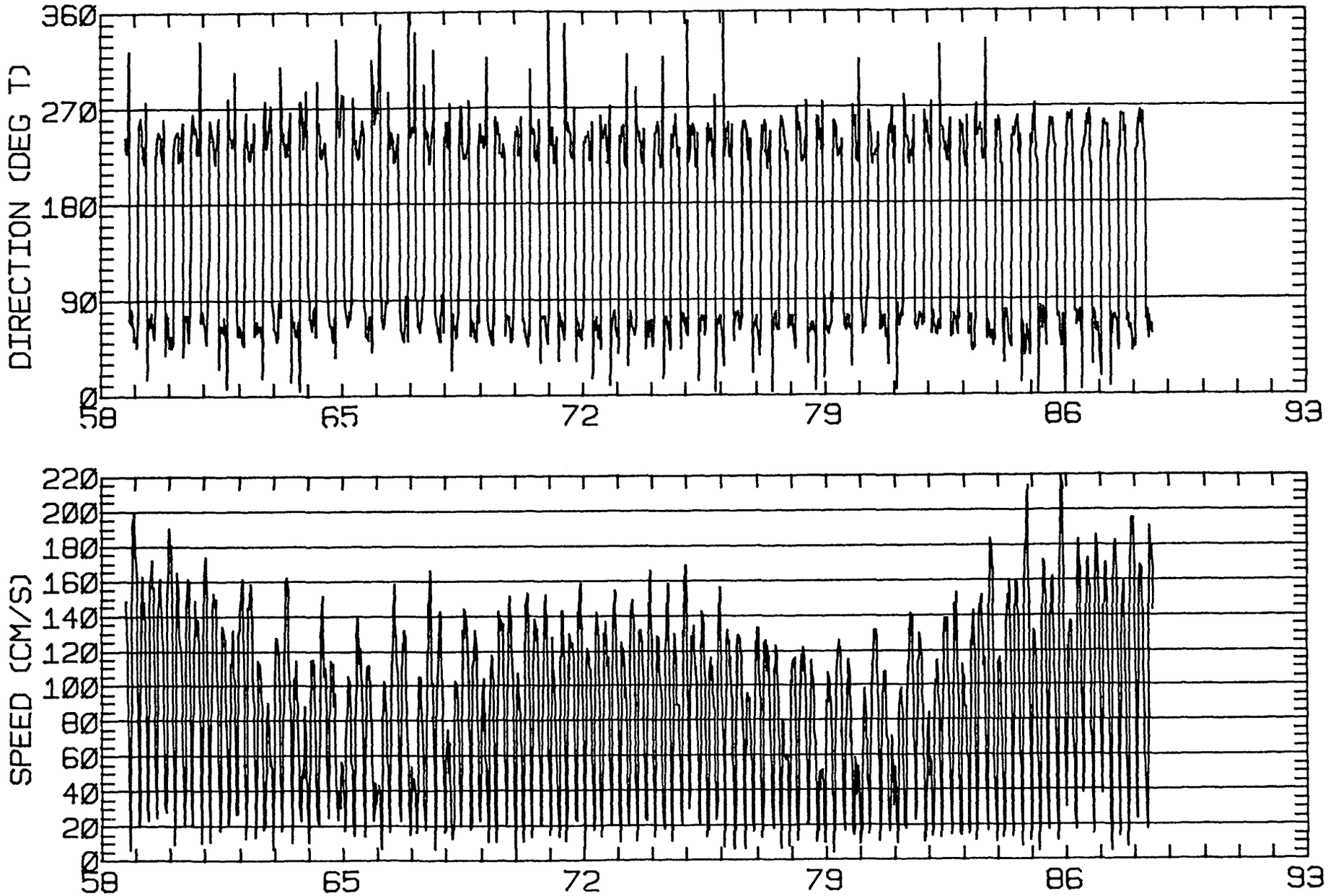
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.16	2.73	53.4	44.8	ANTI-CLOCKWISE
K1	28.95	0.04	51.9	52.7	CLOCKWISE
N2	28.96	0.33	66.5	260.2	CLOCKWISE
M2	118.34	6.67	63.2	294.3	ANTI-CLOCKWISE
S2	34.14	1.78	66.9	294.5	ANTI-CLOCKWISE
M4	9.06	1.52	77.5	244.0	CLOCKWISE

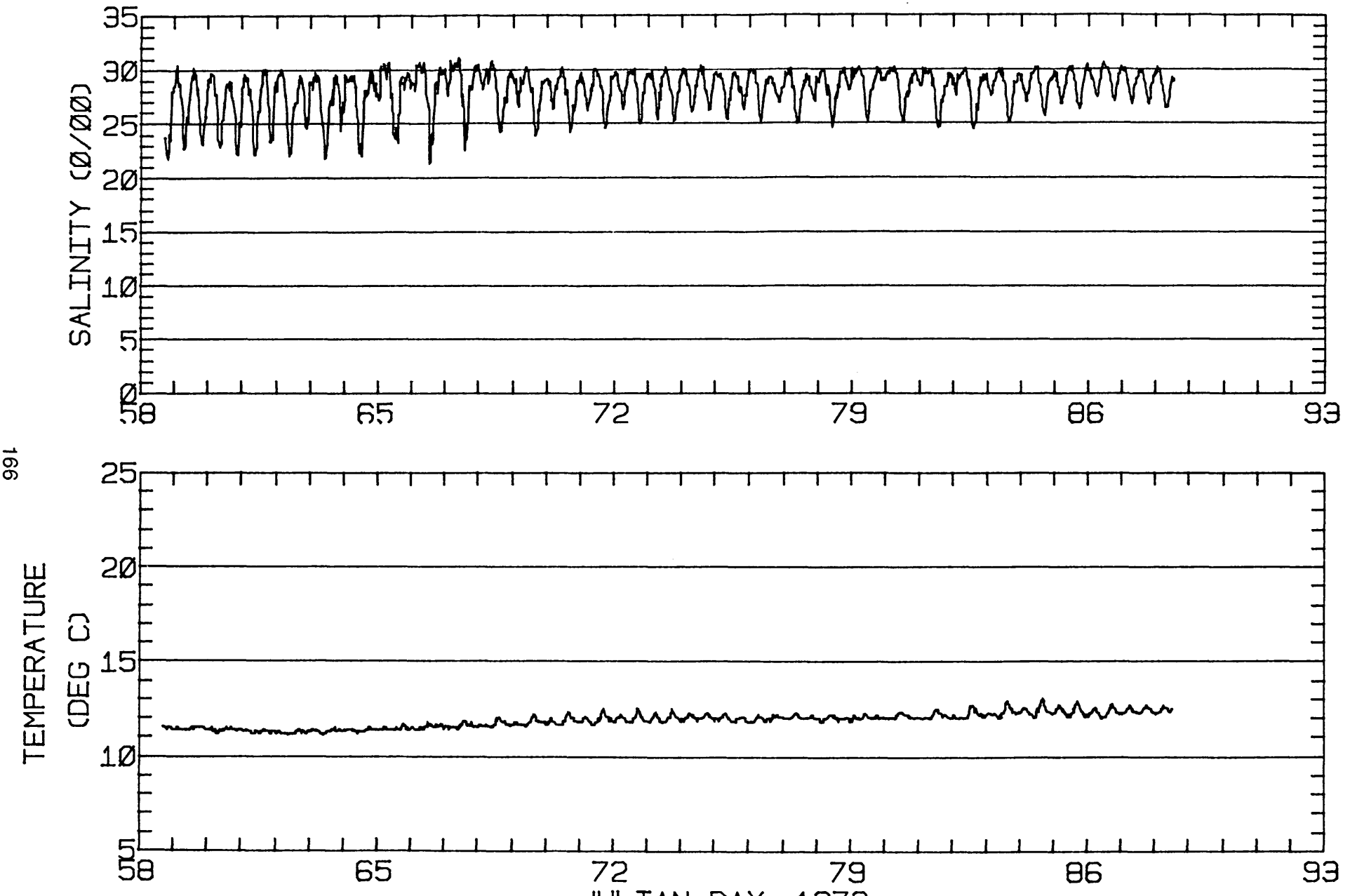
RMS SPEED: 98.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 201.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 75.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 61.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 15.44 CM/SEC
STANDARD DEVIATION V SERIES: 18.90 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.4	-2.3	2039.
2	12	2.9	-2.6	1210.
3	12	1.7	-3.4	756.
4	12	3.6	-3.4	914.
5	8	4.1	5.4	654.
ALL	56	2.7	-1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-24W
METER 085.4 METERS ABOVE BED. WATER DEPTH 098.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-15N 122-28-24W
METER Ø85.4 METERS ABOVE BED. WATER DEPTH Ø98.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'18"N 122 28'27"W
METER TYPE: AANDERAA
WATER DEPTH: 97.9 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 3/29/79 1510 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

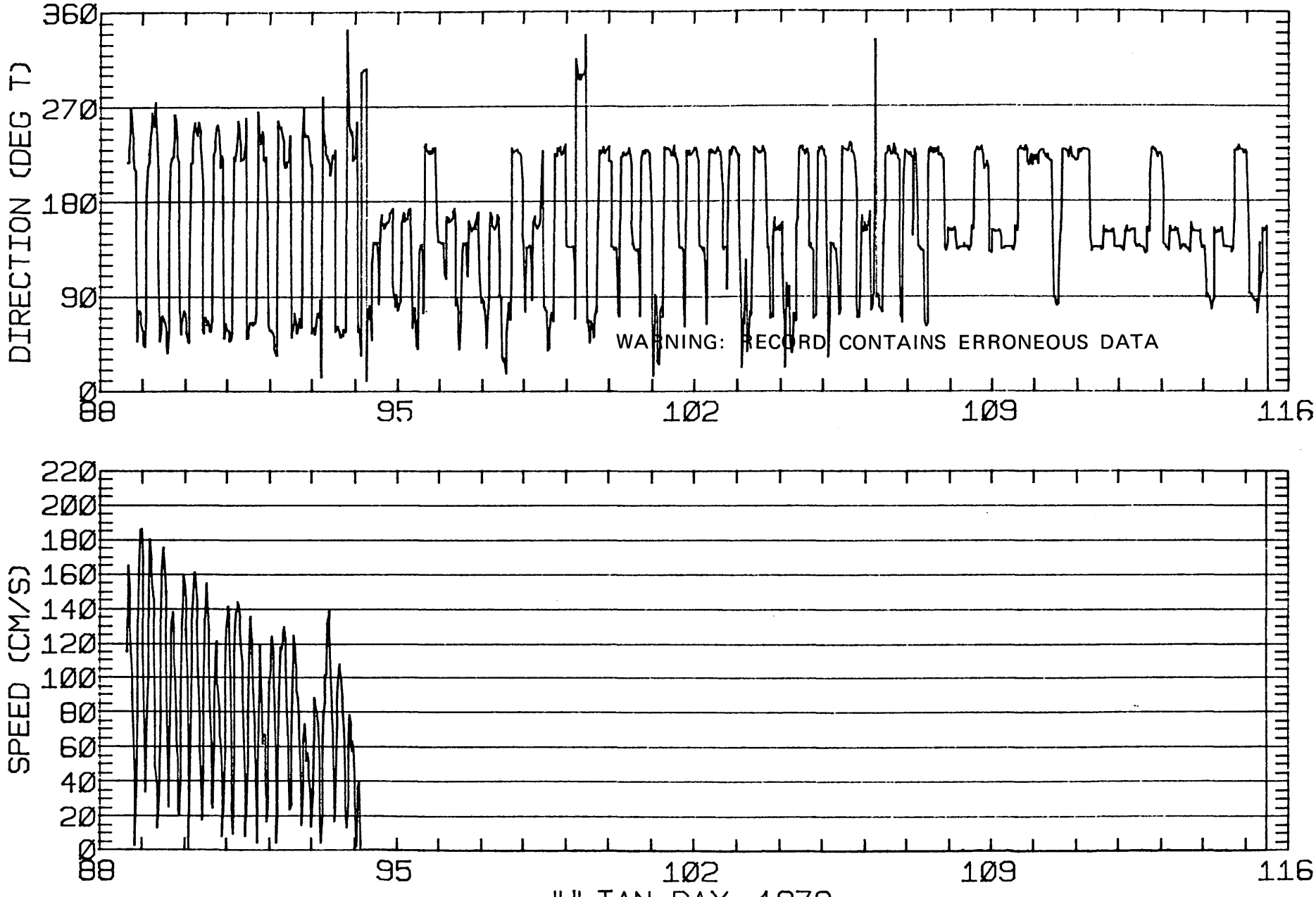
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	26.73	4.78	18.5	28.4	CLOCKWISE
K1	25.43	19.02	47.0	51.5	ANTI-CLOCKWISE
N2	49.53	7.22	36.4	222.6	CLOCKWISE
M2	86.85	12.51	77.2	302.9	CLOCKWISE
S2	38.44	4.02	92.2	303.2	ANTI-CLOCKWISE
M4	14.39	2.11	48.2	263.8	CLOCKWISE

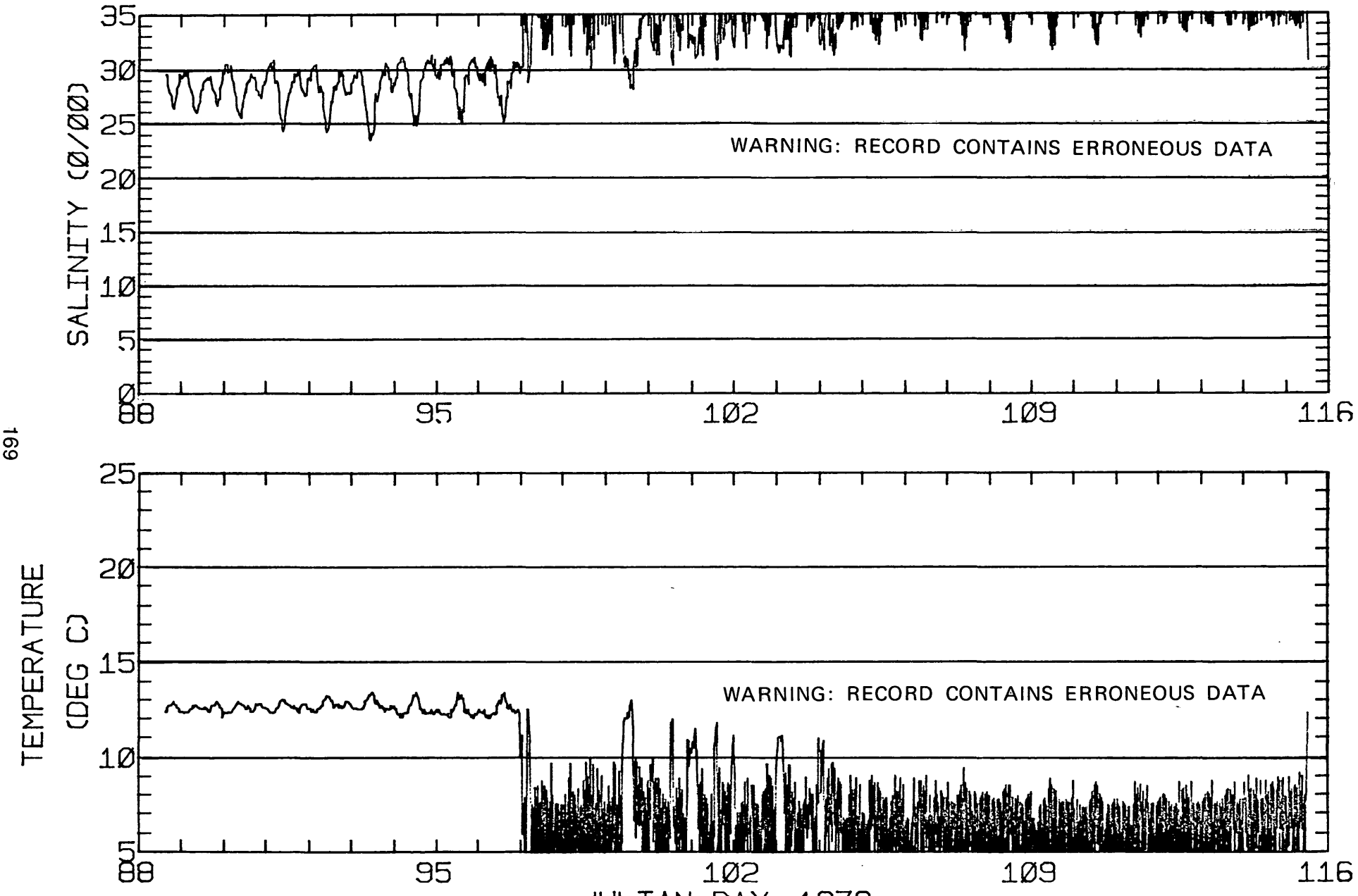
RMS SPEED: 99.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 177.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 67.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 13.61 CM/SEC
STANDARD DEVIATION V SERIES: 19.82 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	0.6	-4.7	1132.
ALL	10	0.6	-4.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-18N 122-28-27W
METER 091.5 METERS ABOVE BED. WATER DEPTH 097.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-18N 122-28-27W
METER Ø91.5 METERS ABOVE BED. WATER DEPTH Ø97.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'18"N 122 28'27"W
METER TYPE: AANDERAA
WATER DEPTH: 97.9 M (MLLW)
METER DEPTH: 52.2 M (BELOW MLLW)
START TIME OF SERIES: 3/29/79 1504 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 54 M2-CYCLES

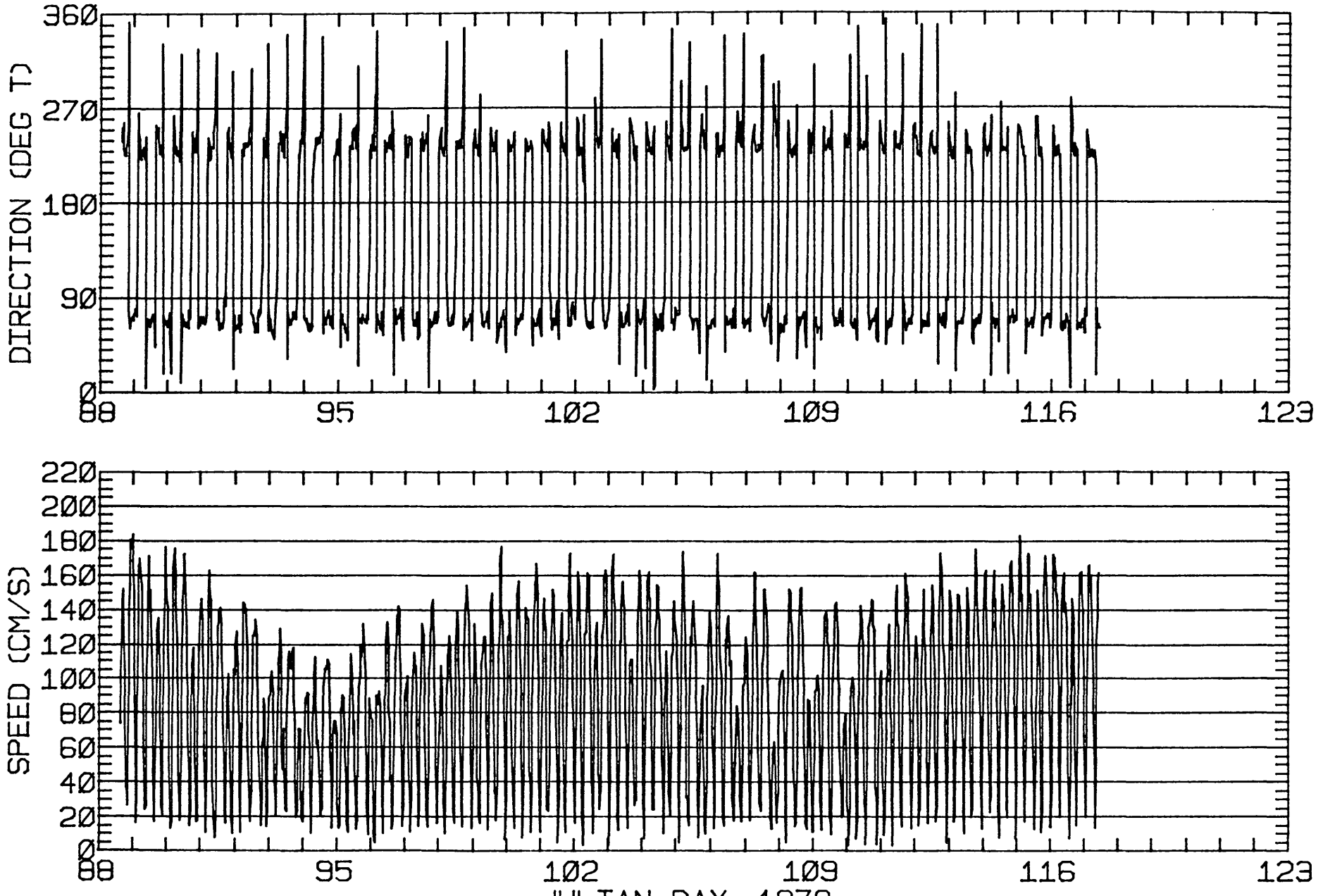
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.52	3.91	58.1	20.9	ANTI-CLOCKWISE
K1	30.07	0.16	61.0	20.7	CLOCKWISE
N2	20.41	0.65	60.4	252.0	ANTI-CLOCKWISE
M2	122.79	2.21	62.3	286.9	CLOCKWISE
S2	31.70	1.24	61.1	285.6	ANTI-CLOCKWISE
M4	7.30	1.94	7.2	40.2	ANTI-CLOCKWISE

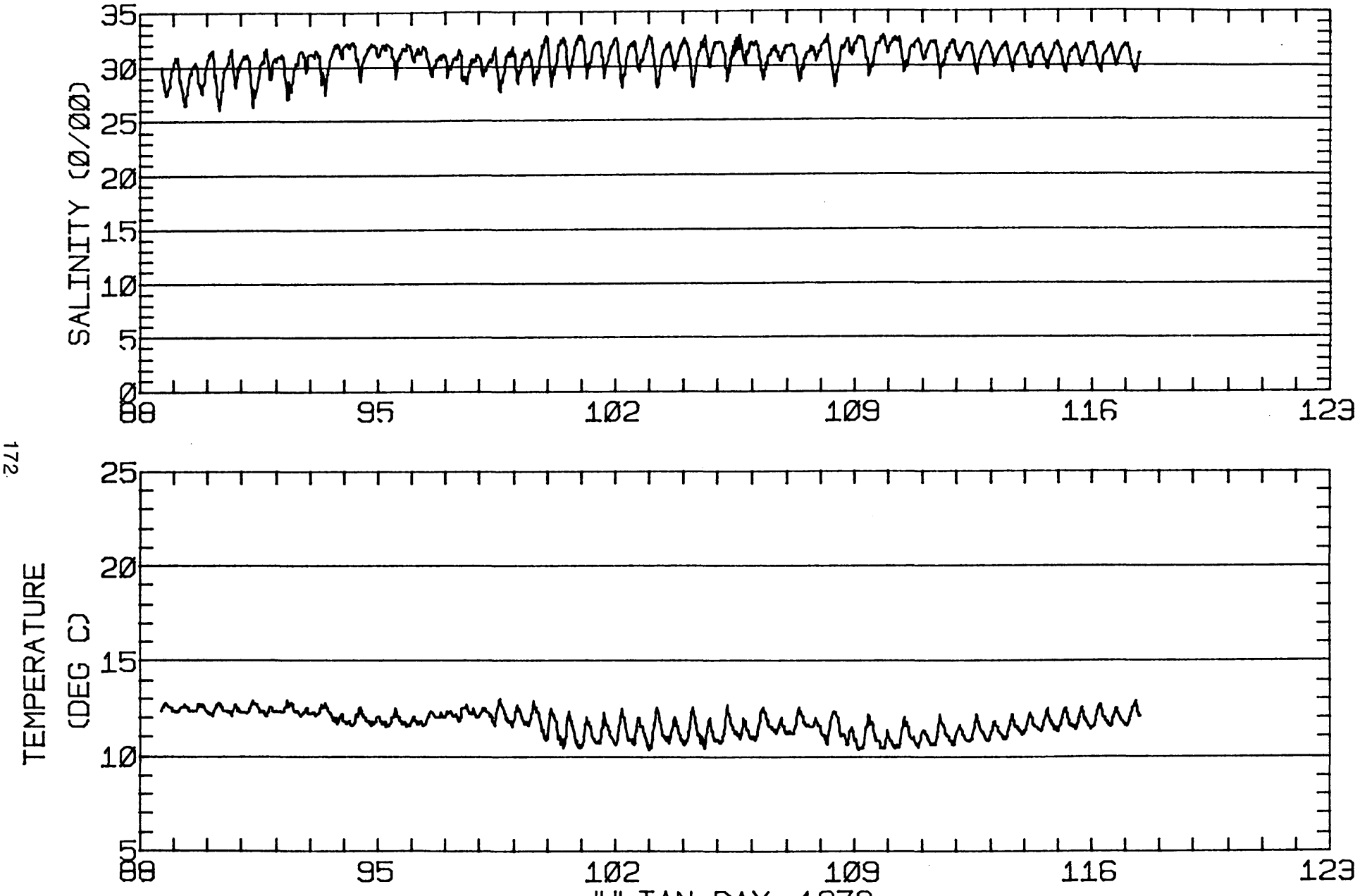
RMS SPEED: 99.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 204.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 80.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 61.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 14.55 CM/SEC
STANDARD DEVIATION V SERIES: 14.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	15.9	-0.2	1082.
2	12	15.8	-0.4	623.
3	12	16.8	-1.0	281.
4	12	17.0	-0.2	232.
5	6	16.0	-5.5	248.
ALL	54	16.3	-1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-18N 122-28-27W
METER 045.7 METERS ABOVE BED. WATER DEPTH 097.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-18N 122-28-27W
METER Ø45.7 METERS ABOVE BED. WATER DEPTH Ø97.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'18"N 122 28'30"W
METER TYPE: AANDERAA
WATER DEPTH: 97.9 M (MLLW)
METER DEPTH: 90.3 M (BELOW MLLW)
START TIME OF SERIES: 3/29/79 1506 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 54 M2-CYCLES

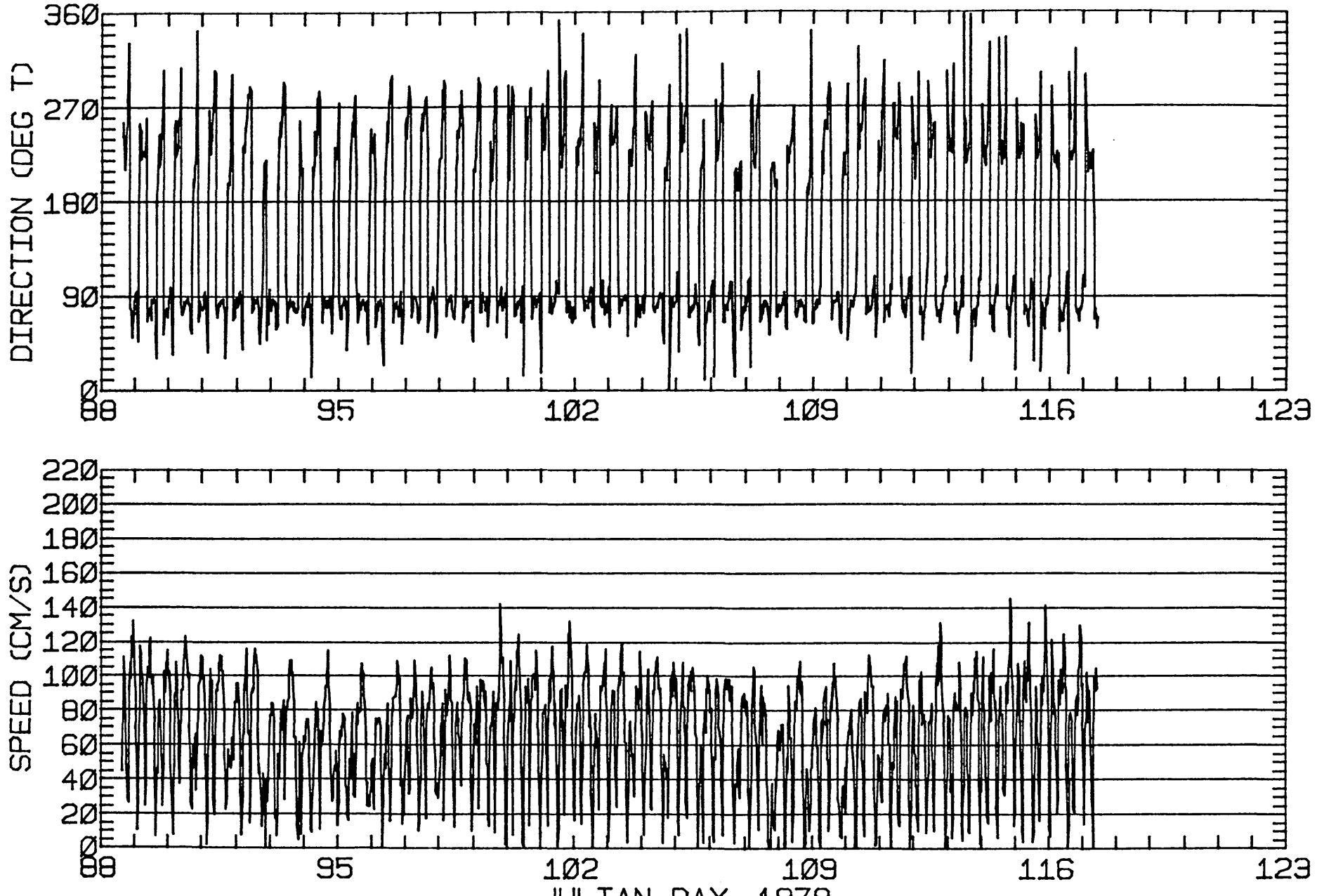
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.48	0.17	83.7	17.8	CLOCKWISE
K1	20.78	1.77	79.9	14.3	CLOCKWISE
N2	11.49	0.33	56.4	237.5	ANTI-CLOCKWISE
M2	81.14	7.30	75.9	279.1	CLOCKWISE
S2	21.62	1.61	71.7	284.3	CLOCKWISE
M4	11.55	4.32	45.1	30.5	CLOCKWISE

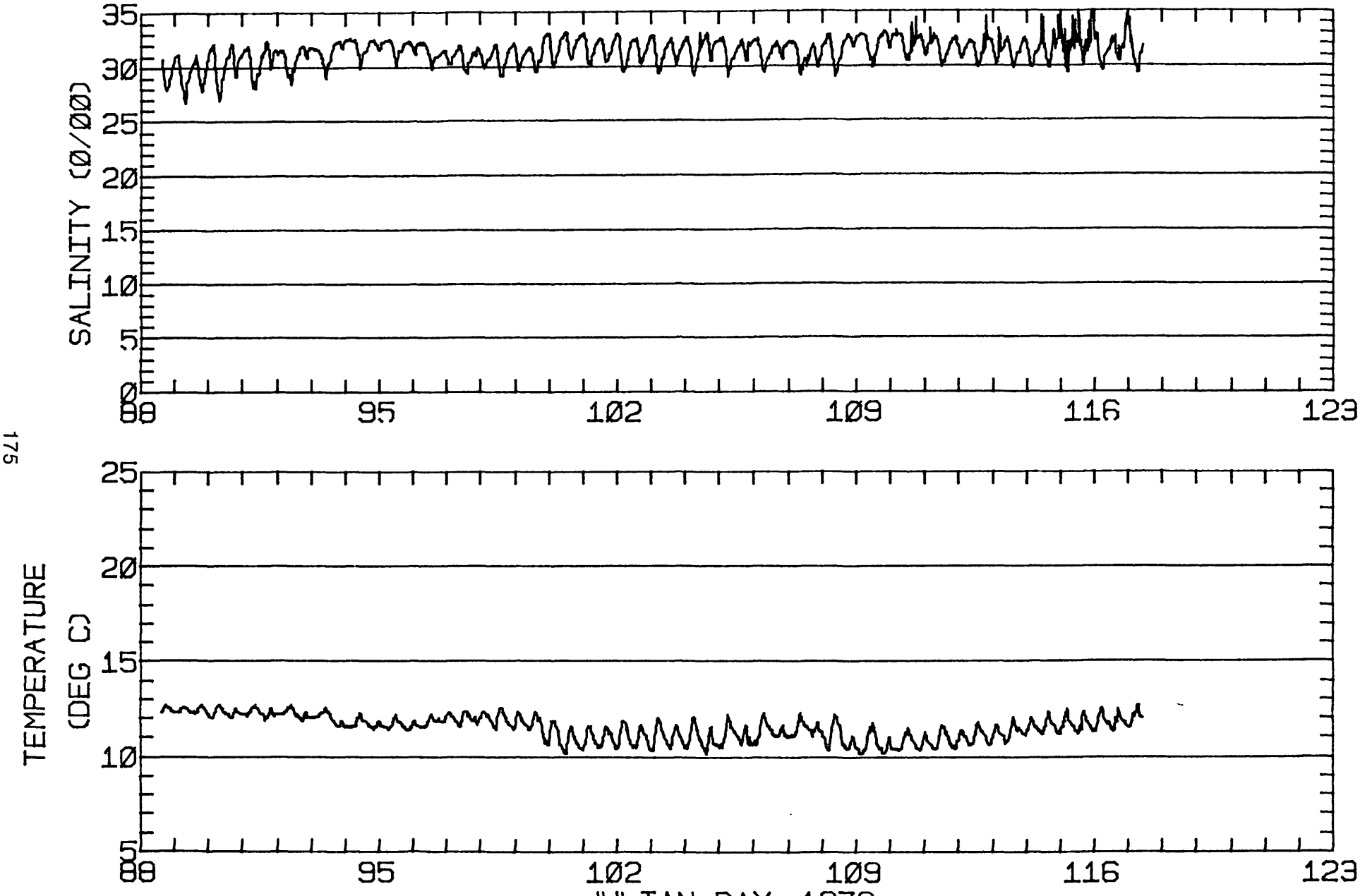
RMS SPEED: 73.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 138.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 53.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 18.34 CM/SEC
STANDARD DEVIATION V SERIES: 17.17 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	28.3	0.3	1082.
2	12	27.1	1.8	623.
3	12	27.3	-3.1	281.
4	12	24.8	-0.6	232.
5	6	27.3	-7.2	248.
ALL	54	26.9	-1.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-18N 122-28-30W
METER 007.5 METERS ABOVE BED. WATER DEPTH 097.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-18N 122-28-30W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø97.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'27"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 4/27/79 1330 PST JULIAN DAY=117
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

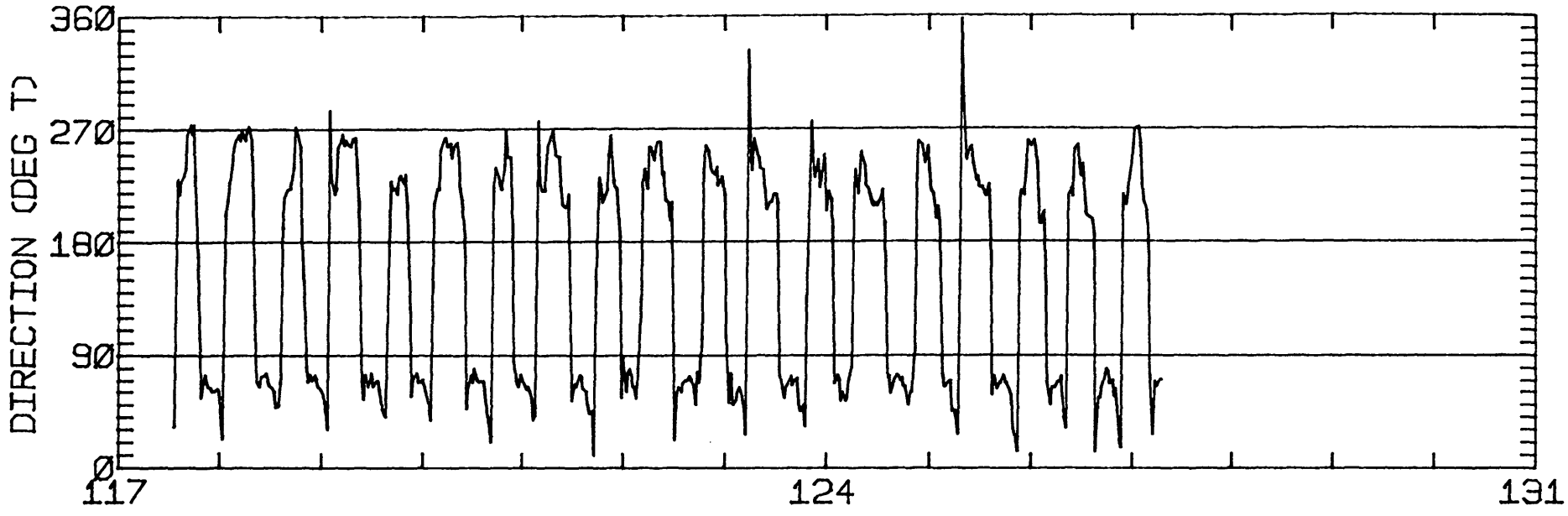
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

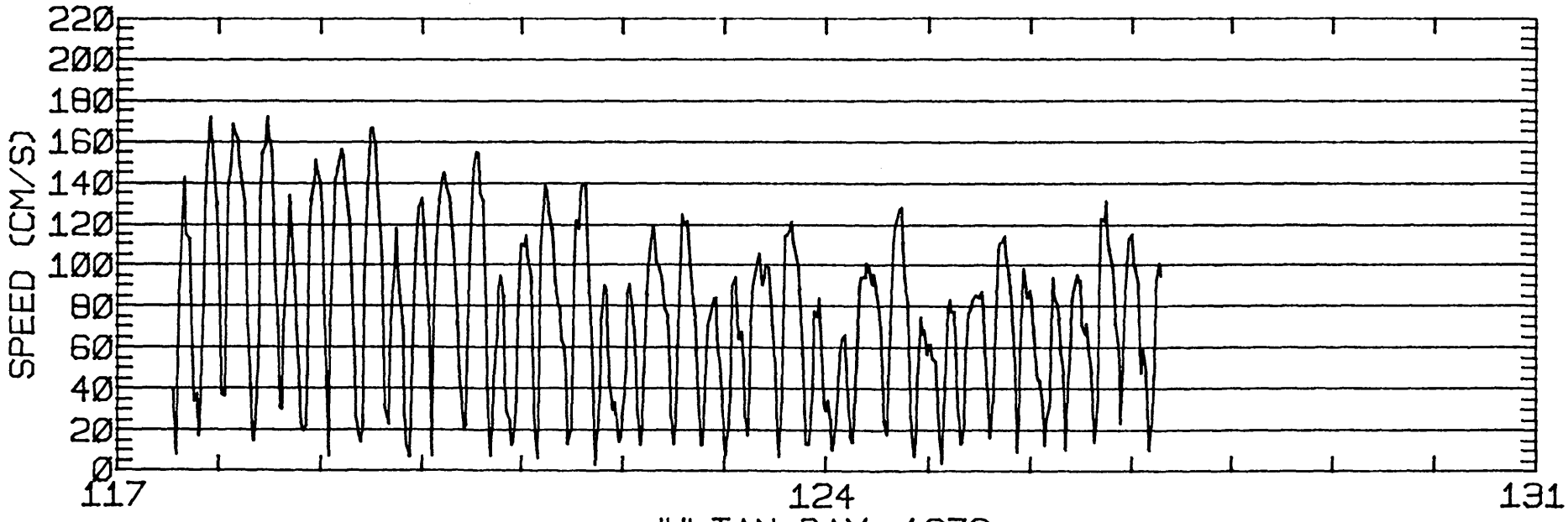
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.85	7.04	59.7	31.2	CLOCKWISE
K1	35.93	4.94	79.4	18.3	ANTI-CLOCKWISE
N2	21.98	14.34	71.4	245.5	CLOCKWISE
M2	115.80	2.76	72.2	288.7	ANTI-CLOCKWISE
S2	25.15	4.12	81.4	277.8	CLOCKWISE
M4	11.96	1.35	54.5	264.3	CLOCKWISE

RMS SPEED: 87.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 193.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 71.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 73.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 12.64 CM/SEC
STANDARD DEVIATION V SERIES: 21.27 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.0	-0.5	306.
2	6	4.2	-5.7	256.
ALL	18	3.4	-2.2	.



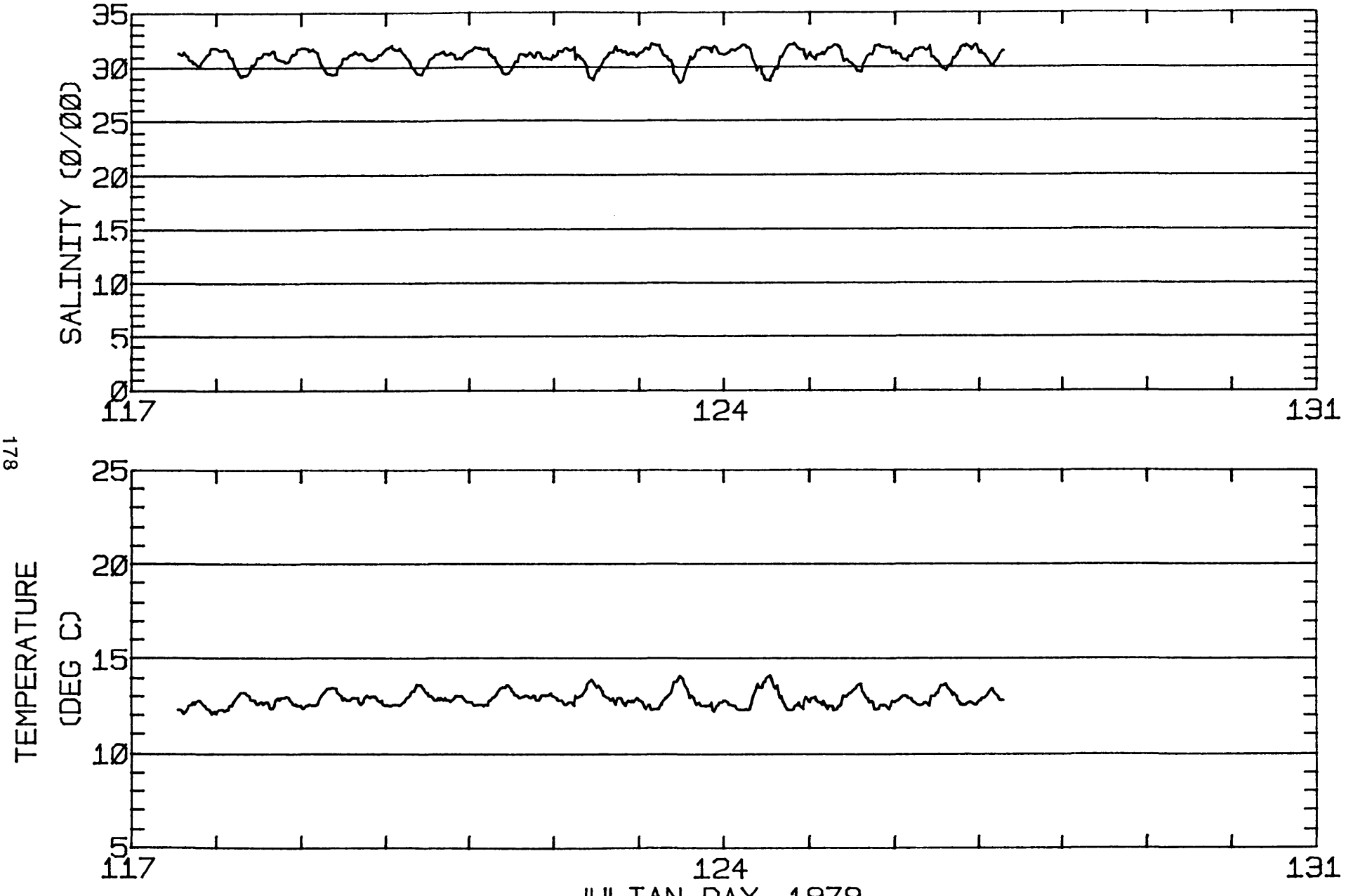


JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 1 37-49-14N 122-28-27W

METER 091.5 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-27W
METER Ø91.5 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'27"W
METER TYPE: AANDERAA
WATER DEPTH: 97.9 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 4/27/79 1322 PST JULIAN DAY=117
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

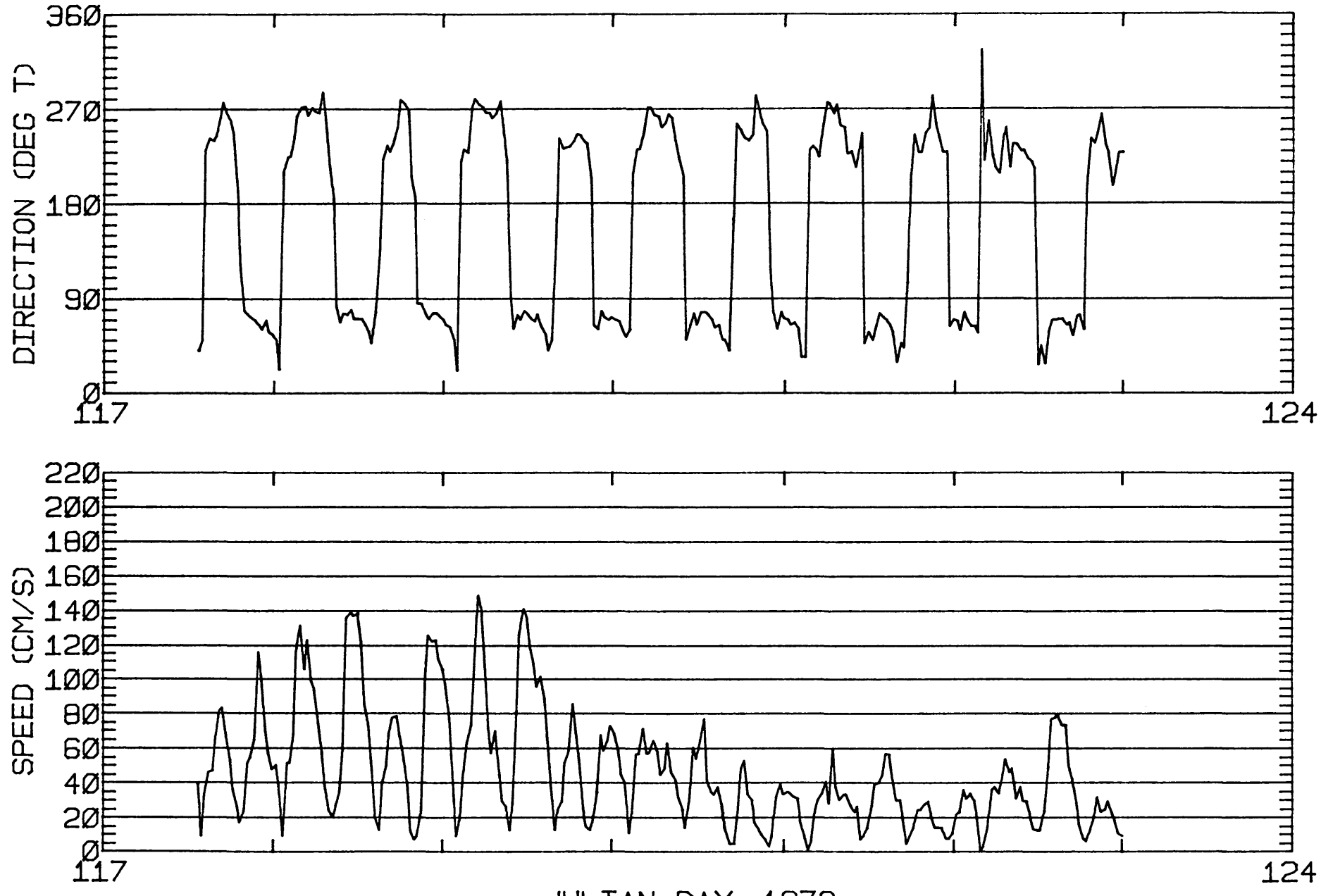
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.37	6.68	102.9	101.8	CLOCKWISE
K1	22.51	4.49	91.6	340.1	ANTI-CLOCKWISE
N2	26.53	4.23	72.4	273.7	ANTI-CLOCKWISE
M2	77.65	4.06	69.2	289.7	CLOCKWISE
S2	32.59	3.07	85.9	273.6	CLOCKWISE
M4	6.79	1.26	34.6	244.4	ANTI-CLOCKWISE

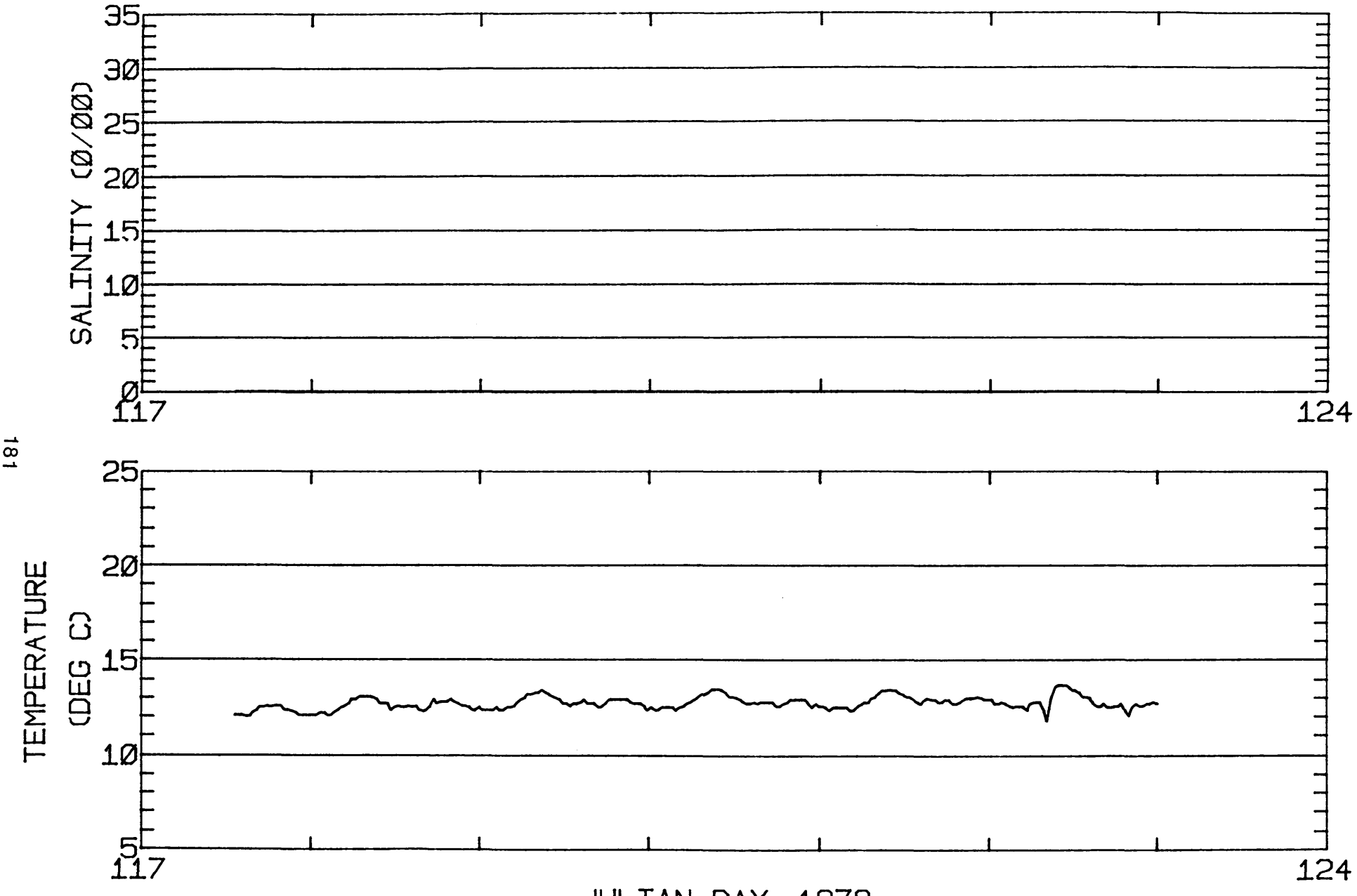
RMS SPEED: 59.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 148.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 79.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 15.94 CM/SEC
STANDARD DEVIATION V SERIES: 13.22 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	3.1	3.1	312.
ALL	10	3.1	3.1	



JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-27W
METER 085.4 METERS ABOVE BED. WATER DEPTH 097.9 METERS.



JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 1 37-49-14N 122-28-27W

METER Ø85.4 METERS ABOVE BED. WATER DEPTH Ø97.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'27"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 51.8 M (BELOW MLLW)
START TIME OF SERIES: 4/27/79 1314 PST JULIAN DAY=117
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

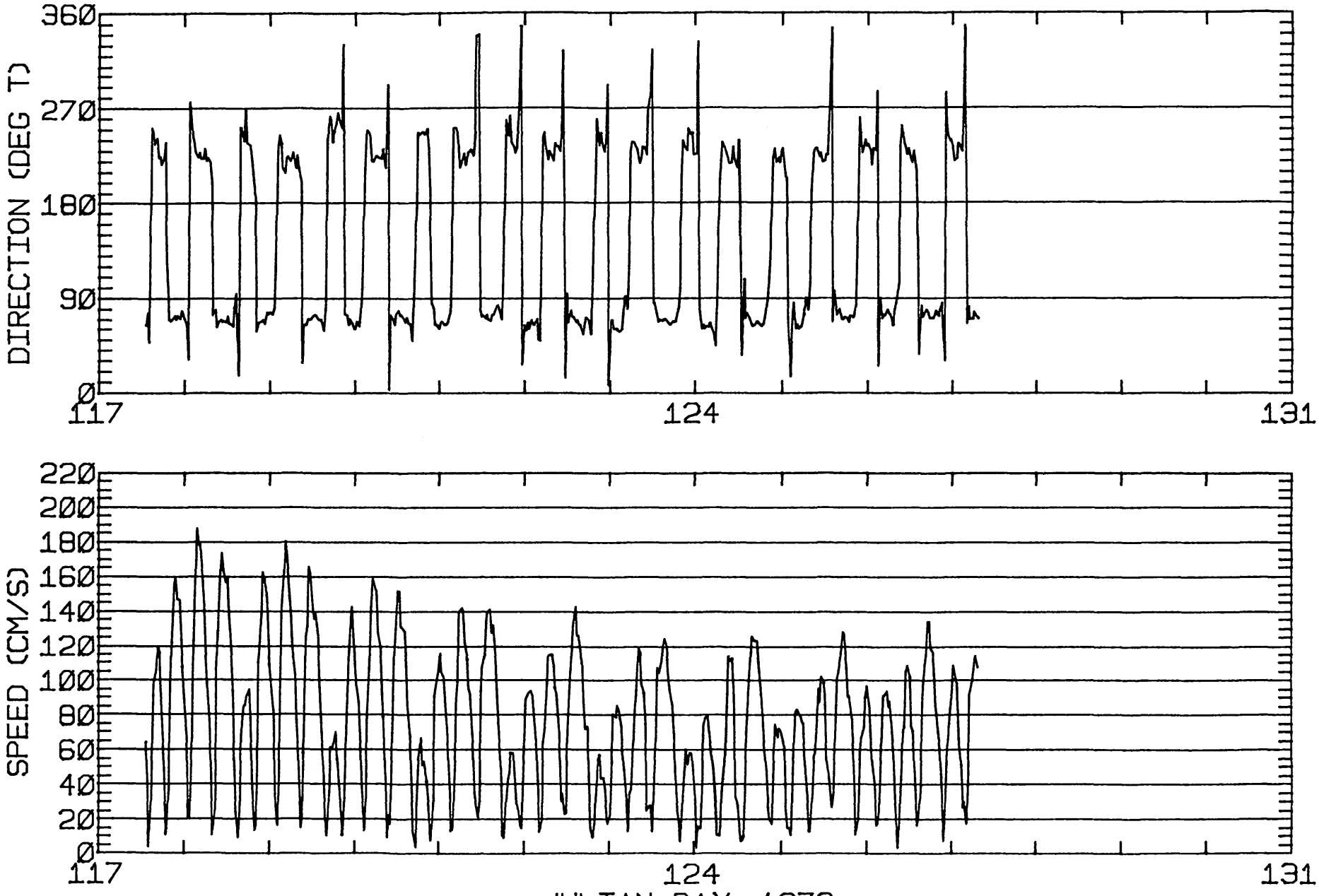
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.95	6.90	38.5	48.9	ANTI-CLOCKWISE
K1	39.03	0.60	55.5	14.5	ANTI-CLOCKWISE
N2	16.52	5.46	73.4	275.5	ANTI-CLOCKWISE
M2	123.27	4.72	60.5	290.3	ANTI-CLOCKWISE
S2	27.03	3.06	55.5	280.3	ANTI-CLOCKWISE
M4	7.07	2.46	146.7	215.6	CLOCKWISE

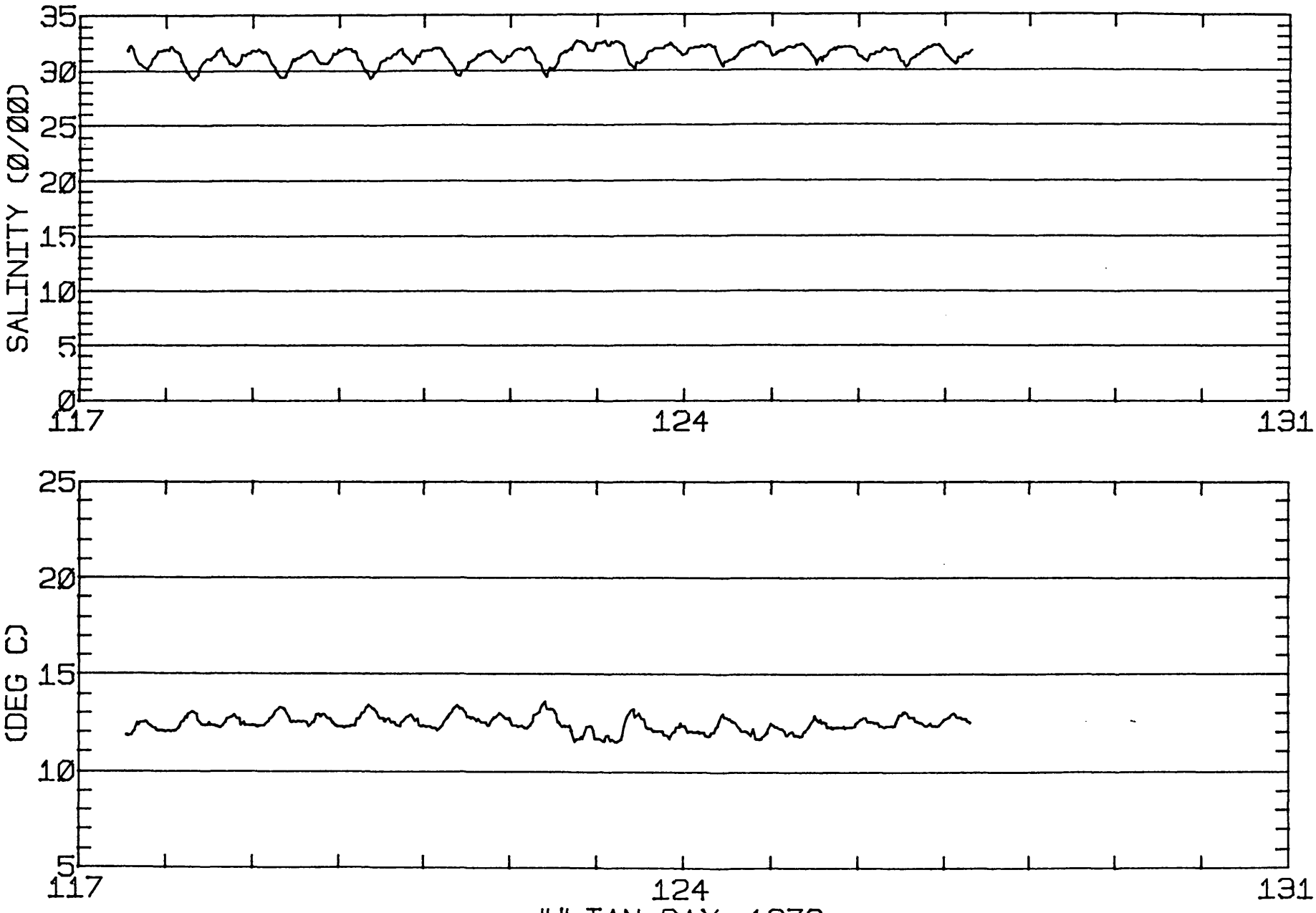
RMS SPEED: 87.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 209.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 77.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 56.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 12.20 CM/SEC
STANDARD DEVIATION V SERIES: 14.10 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	17.7	-4.3	306.
2	6	17.1	-4.3	256.
ALL	18	17.5	-4.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-27W
METER 045.8 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-27W
METER Ø45.8 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'27"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 90.0 M (BELOW MLLW)
START TIME OF SERIES: 4/27/79 1316 PST JULIAN DAY=117
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

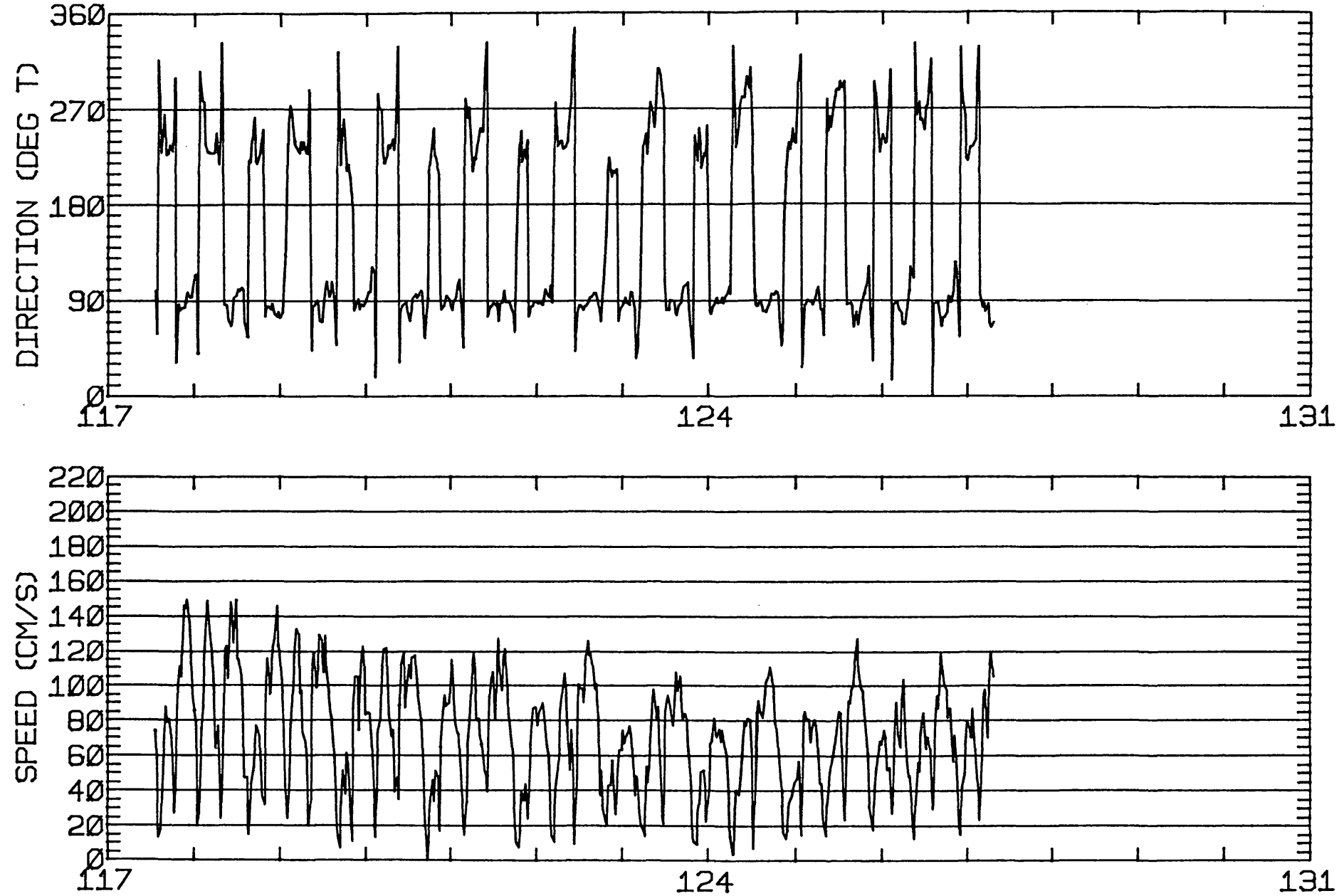
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.11	6.47	88.9	34.4	ANTI-CLOCKWISE
K1	29.81	8.35	71.3	15.1	CLOCKWISE
N2	12.65	4.22	25.9	304.2	CLOCKWISE
M2	101.30	8.83	75.2	289.2	CLOCKWISE
S2	26.58	1.11	68.8	279.9	ANTI-CLOCKWISE
M4	12.15	2.81	55.3	71.2	CLOCKWISE

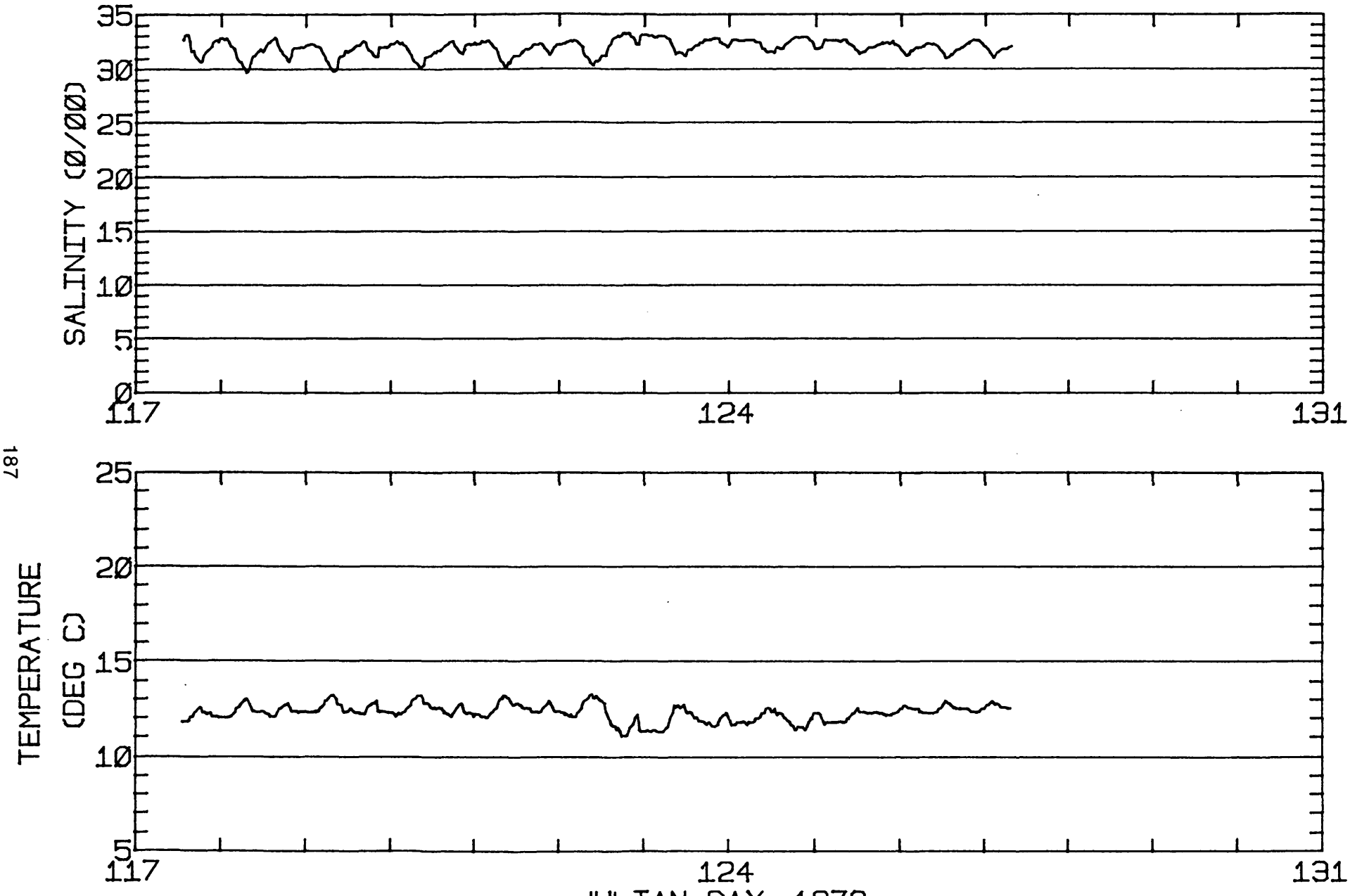
RMS SPEED: 79.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 175.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 63.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 17.23 CM/SEC
STANDARD DEVIATION V SERIES: 20.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	29.1	-8.3	306.
2	6	23.2	3.1	256.
ALL	18	27.1	-4.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-27W
METER 007.5 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-27W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 97.3 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 9/10/79 1430 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

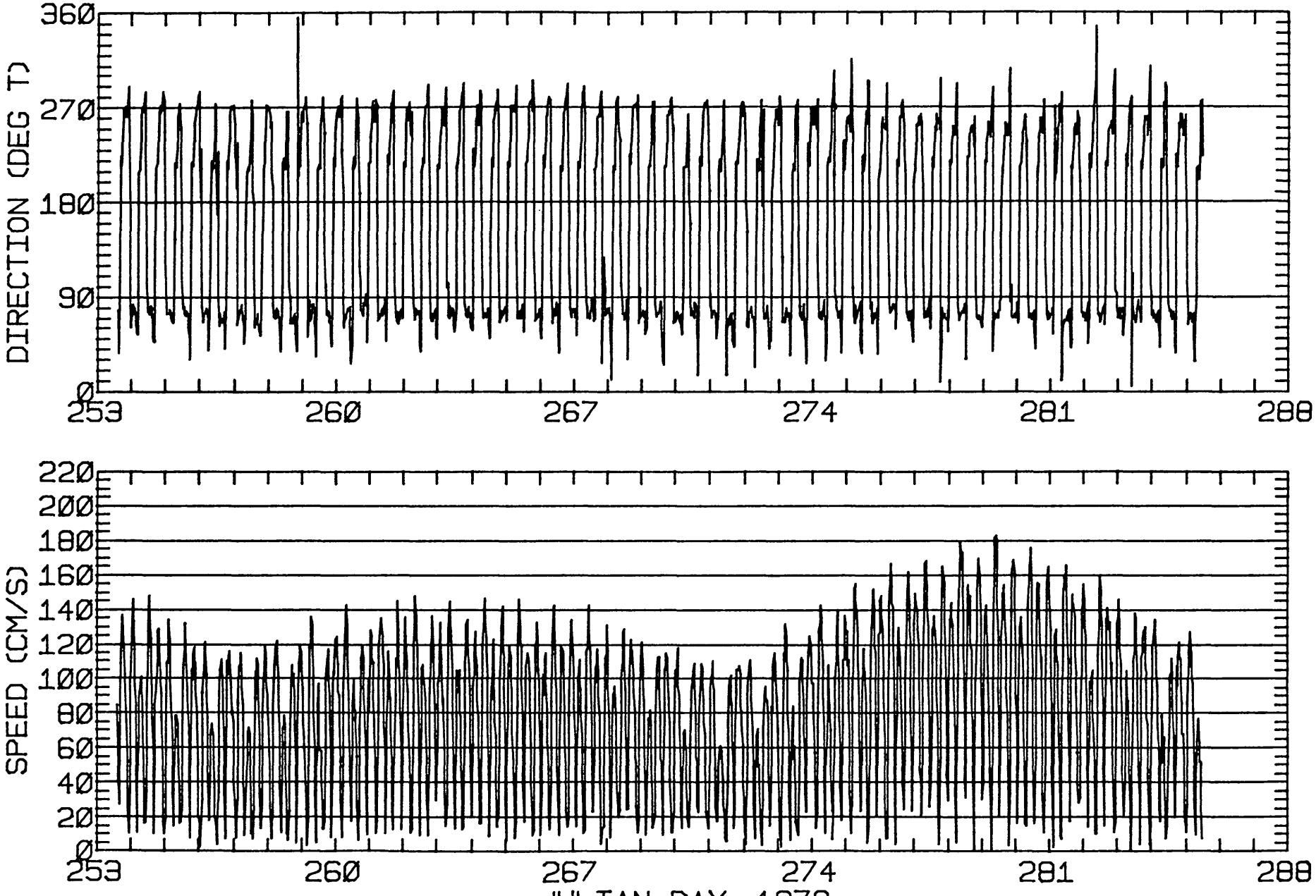
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.20	1.18	83.2	39.2	CLOCKWISE
K1	22.55	1.41	84.1	49.7	CLOCKWISE
N2	26.98	2.12	68.4	263.5	CLOCKWISE
M2	108.77	9.42	73.4	289.5	CLOCKWISE
S2	30.43	3.78	72.6	287.3	CLOCKWISE
M4	13.71	1.22	20.4	281.5	ANTI-CLOCKWISE

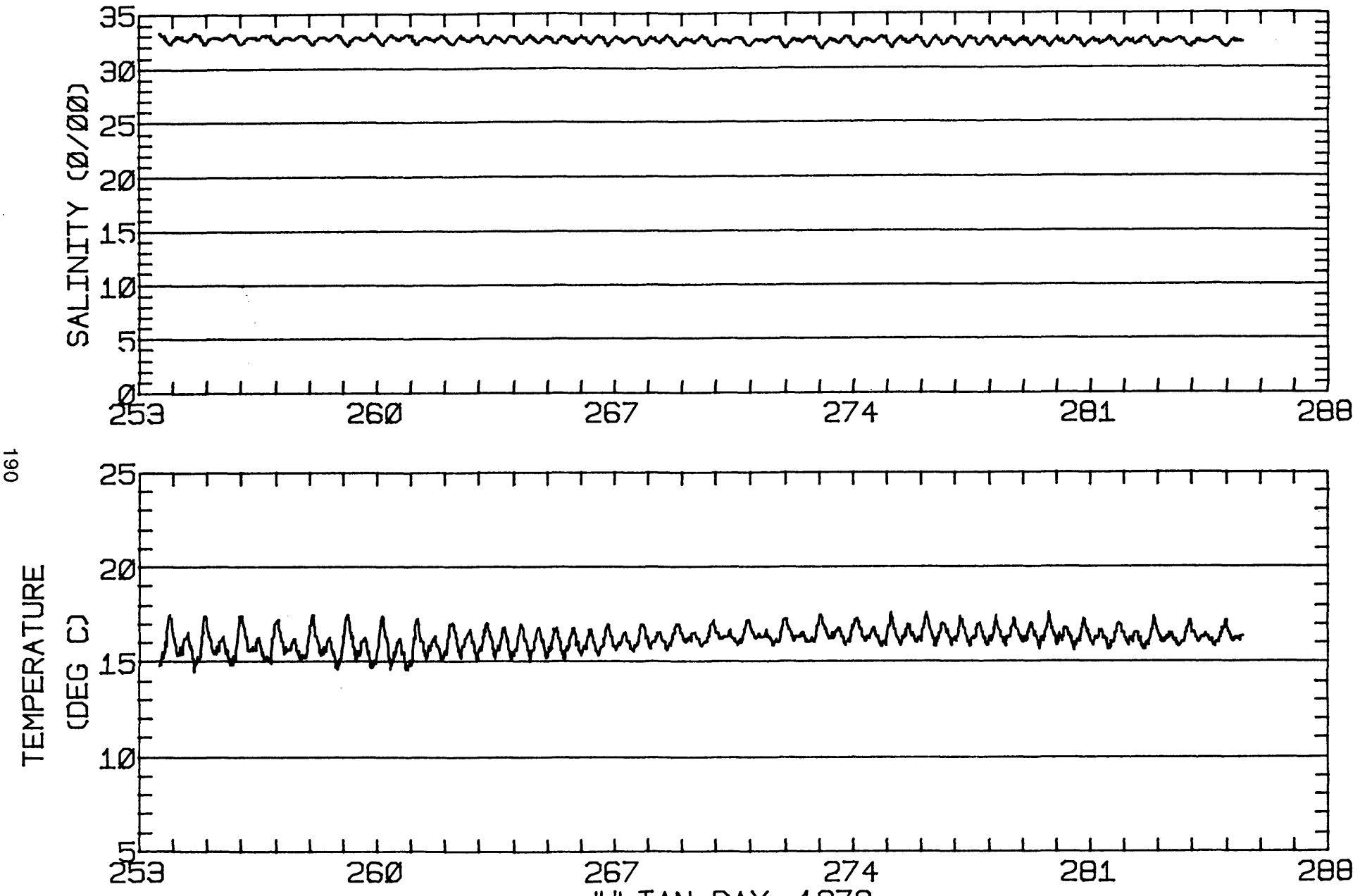
RMS SPEED: 91.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 180.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 74.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.29
STANDARD DEVIATION U-SERIES: 12.71 CM/SEC
STANDARD DEVIATION V SERIES: 20.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.9	0.5	184.
2	12	9.3	1.9	176.
3	12	7.4	-0.1	129.
4	12	10.4	-0.7	149.
5	10	13.5	-3.1	156.
ALL	58	9.4	-0.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER 085.4 METERS ABOVE BED. WATER DEPTH 097.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER 085.4 METERS ABOVE BED. WATER DEPTH 097.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 97.3 M (MLLW)
METER DEPTH: 21.0 M (BELOW MLLW)
START TIME OF SERIES: 9/10/79 1432 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

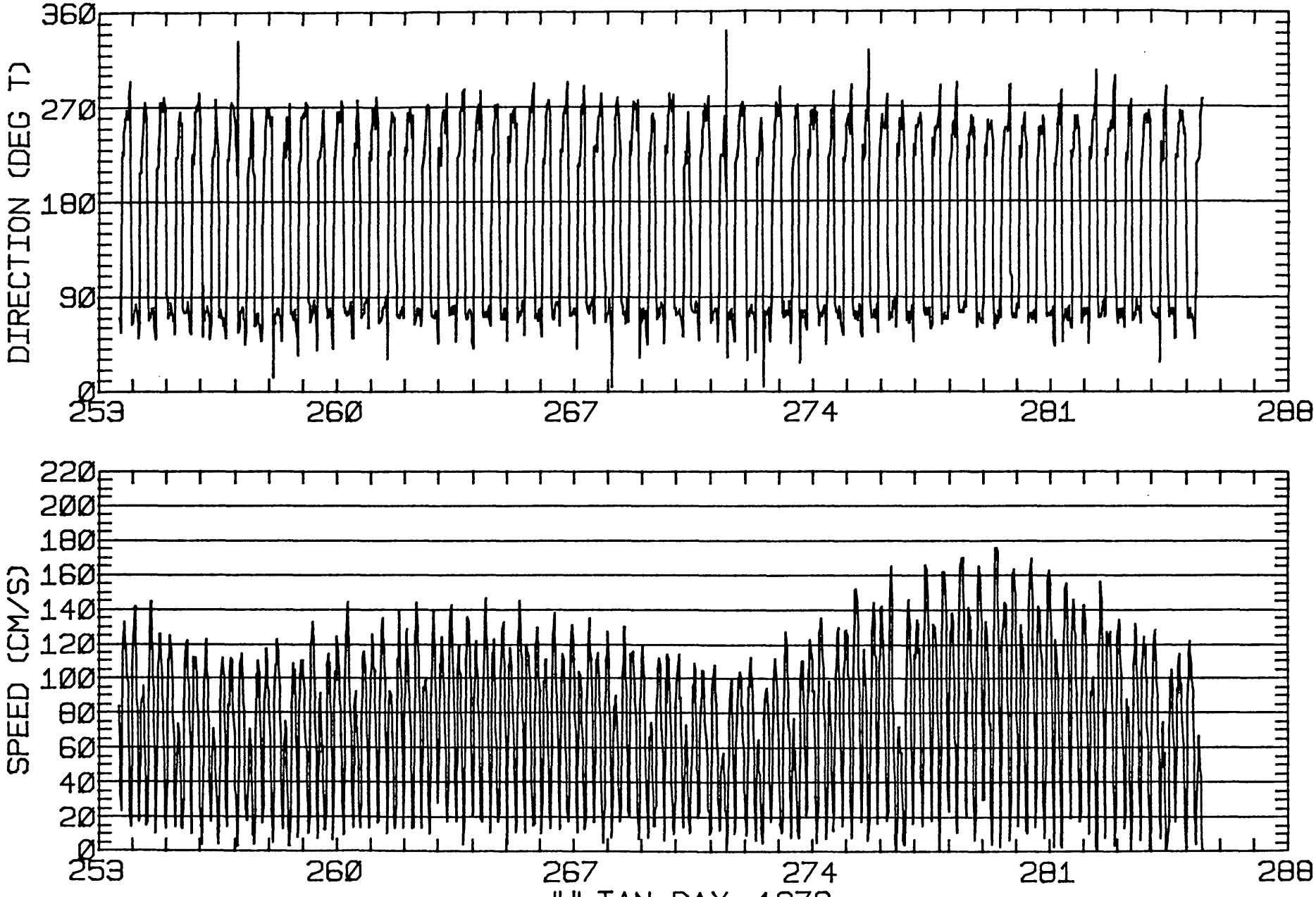
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.37	0.97	80.0	36.7	CLOCKWISE
K1	22.20	1.50	83.7	48.1	CLOCKWISE
N2	24.83	1.56	69.5	262.2	CLOCKWISE
M2	106.00	6.70	74.0	289.1	CLOCKWISE
S2	28.91	3.08	72.1	287.1	CLOCKWISE
M4	9.98	1.11	25.8	276.7	ANTI-CLOCKWISE

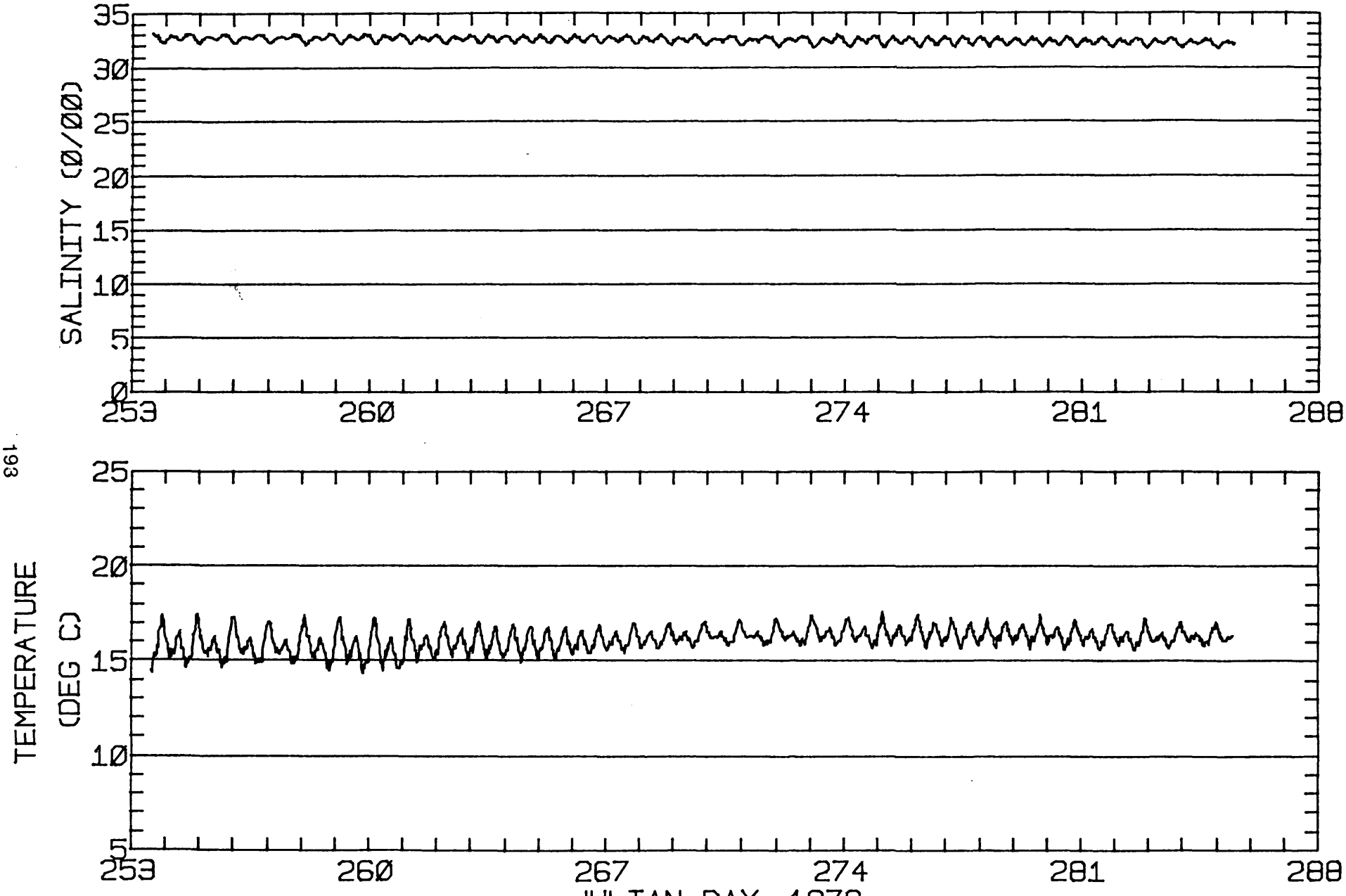
RMS SPEED: 88.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 175.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 73.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 12.82 CM/SEC
STANDARD DEVIATION V SERIES: 16.87 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.9	1.4	184.
2	12	9.4	1.3	176.
3	12	7.9	0.2	129.
4	12	11.6	0.6	149.
5	10	13.7	-2.3	156.
ALL	58	10.0	0.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER 076.3 METERS ABOVE BED. WATER DEPTH 097.3 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø97.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 97.3 M (MLLW)
METER DEPTH: 89.7 M (BELOW MLLW)
START TIME OF SERIES: 9/10/79 1424 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

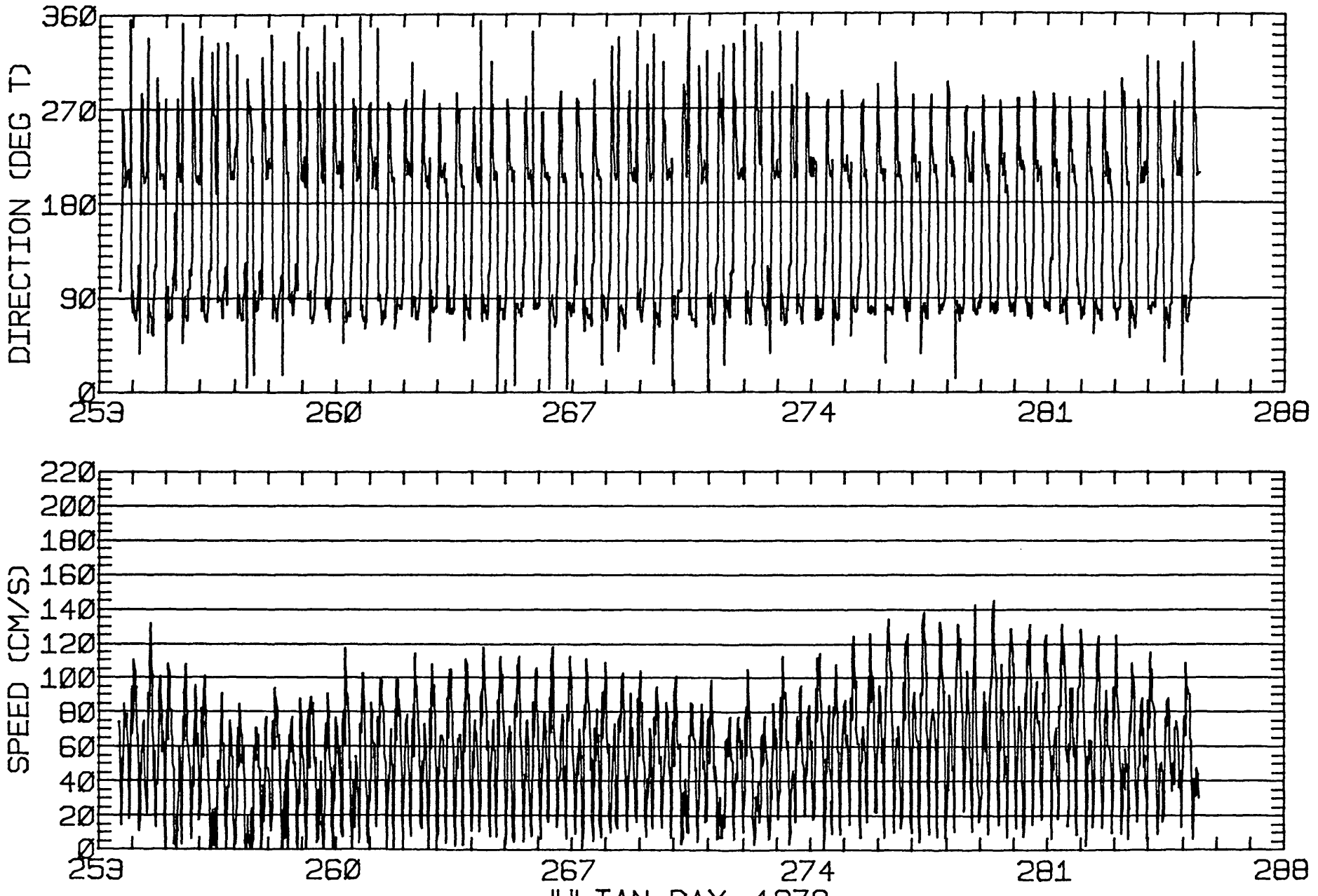
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.20	3.37	49.5	32.6	ANTI-CLOCKWISE
K1	14.78	1.56	52.2	41.8	ANTI-CLOCKWISE
N2	16.55	1.38	64.4	267.6	ANTI-CLOCKWISE
M2	71.05	3.45	65.6	285.4	ANTI-CLOCKWISE
S2	19.44	2.58	64.3	292.3	ANTI-CLOCKWISE
M4	8.42	4.21	155.0	266.4	CLOCKWISE

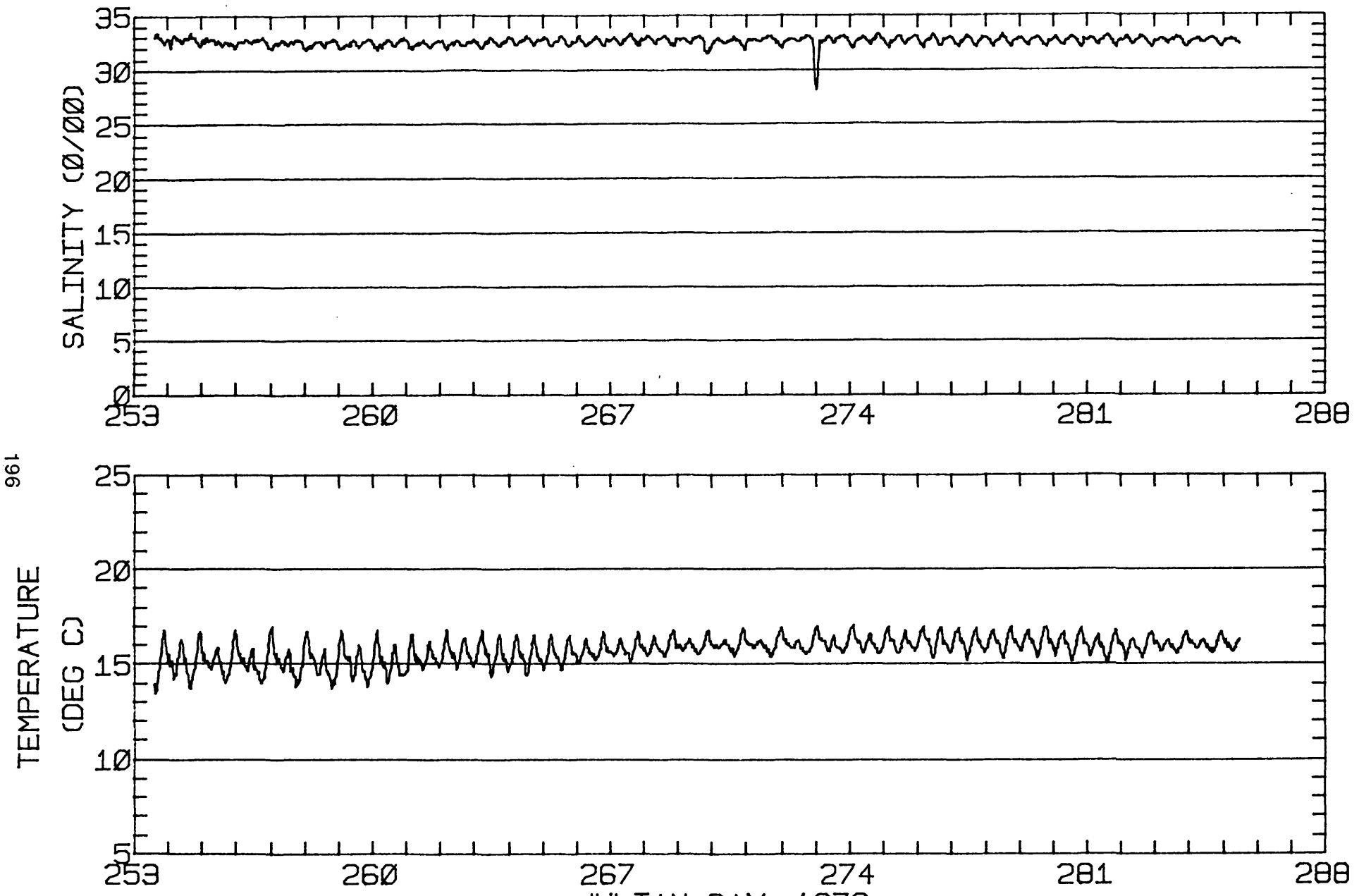
RMS SPEED: 66.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 115.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 62.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.28
STANDARD DEVIATION U-SERIES: 14.94 CM/SEC
STANDARD DEVIATION V SERIES: 16.79 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	21.2	-9.3	184.
2	12	23.7	-10.2	176.
3	12	21.1	-8.9	129.
4	12	25.5	-11.0	149.
5	10	26.3	-12.5	156.
ALL	58	23.5	-10.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER 007.6 METERS ABOVE BED. WATER DEPTH 097.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER Ø07.6 METERS ABOVE BED. WATER DEPTH Ø97.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'26"W
METER TYPE: AANDERAA
WATER DEPTH: 95.5 M (MLLW)
METER DEPTH: 10.1 M (BELOW MLLW)
START TIME OF SERIES:10/19/79 1410 PST JULIAN DAY=292
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

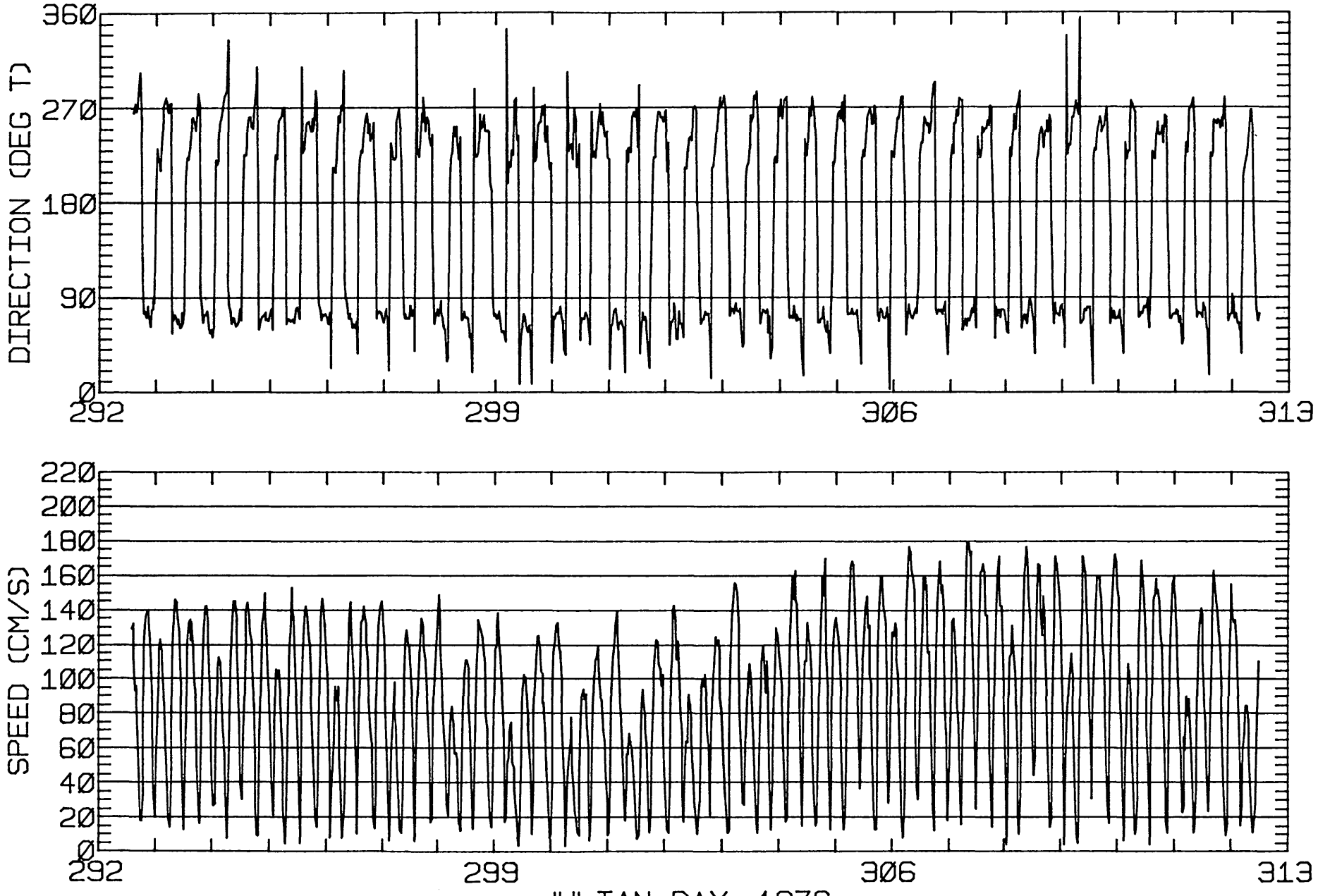
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.55	1.46	74.0	23.9	ANTI-CLOCKWISE
K1	33.55	0.63	71.3	24.5	CLOCKWISE
N2	21.15	2.51	80.0	265.3	ANTI-CLOCKWISE
M2	111.12	7.41	72.7	287.0	CLOCKWISE
S2	28.99	1.02	77.8	280.8	CLOCKWISE
M4	11.42	3.66	22.5	268.5	ANTI-CLOCKWISE

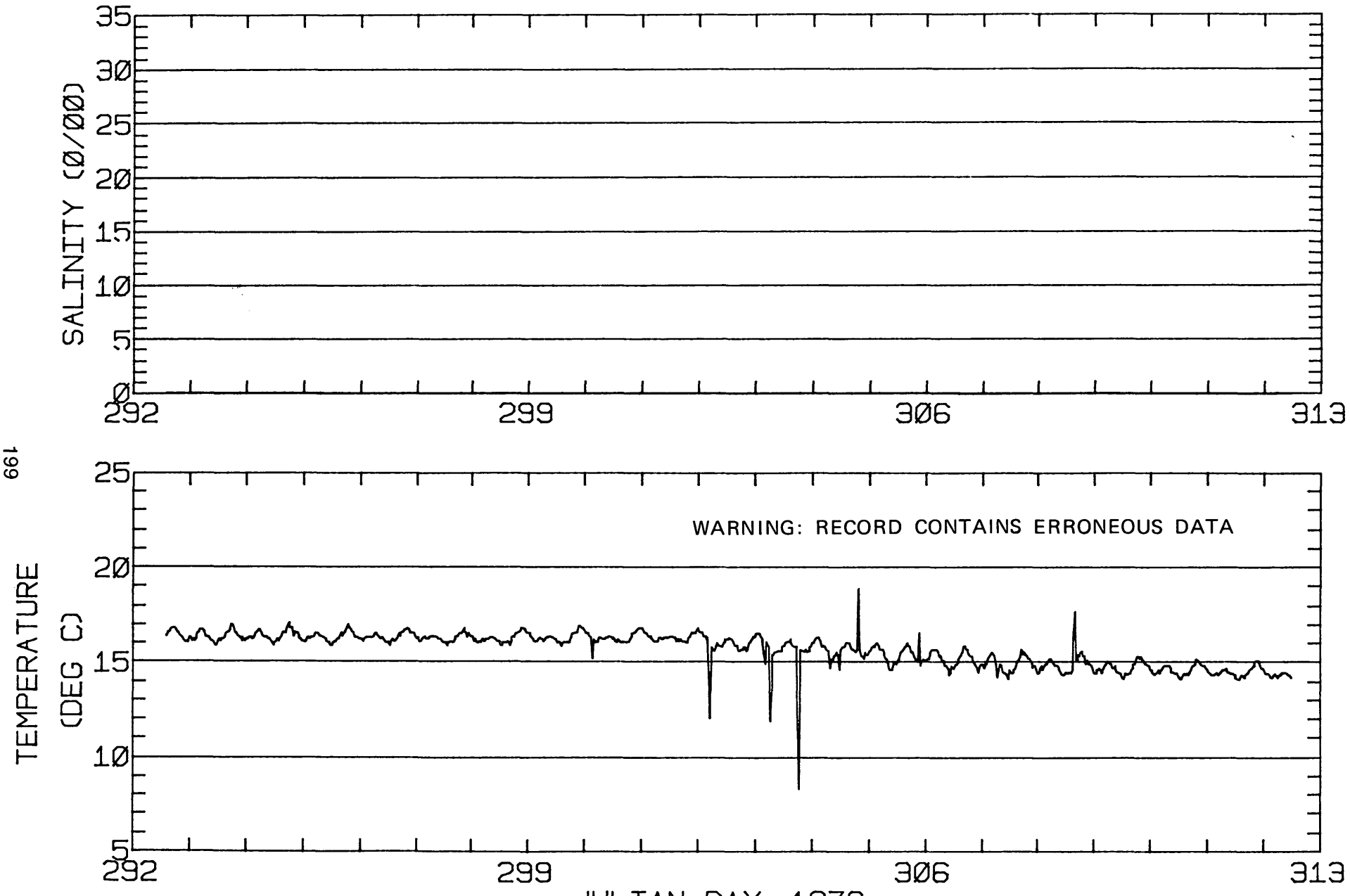
RMS SPEED: 99.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 192.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 67.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 73.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 13.12 CM/SEC
STANDARD DEVIATION V SERIES: 20.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.8	1.4	221.
2	12	6.9	3.0	365.
3	12	10.4	0.5	218.
4	2	7.2	0.4	335.
ALL	38	7.7	1.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-26W
METER 085.4 METERS ABOVE BED. WATER DEPTH 095.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-26W
METER Ø85.4 METERS ABOVE BED. WATER DEPTH Ø95.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'26"W
METER TYPE: AANDERAA
WATER DEPTH: 95.5 M (MLLW)
METER DEPTH: 19.2 M (BELOW MLLW)
START TIME OF SERIES:10/19/79 1412 PST JULIAN DAY=292
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

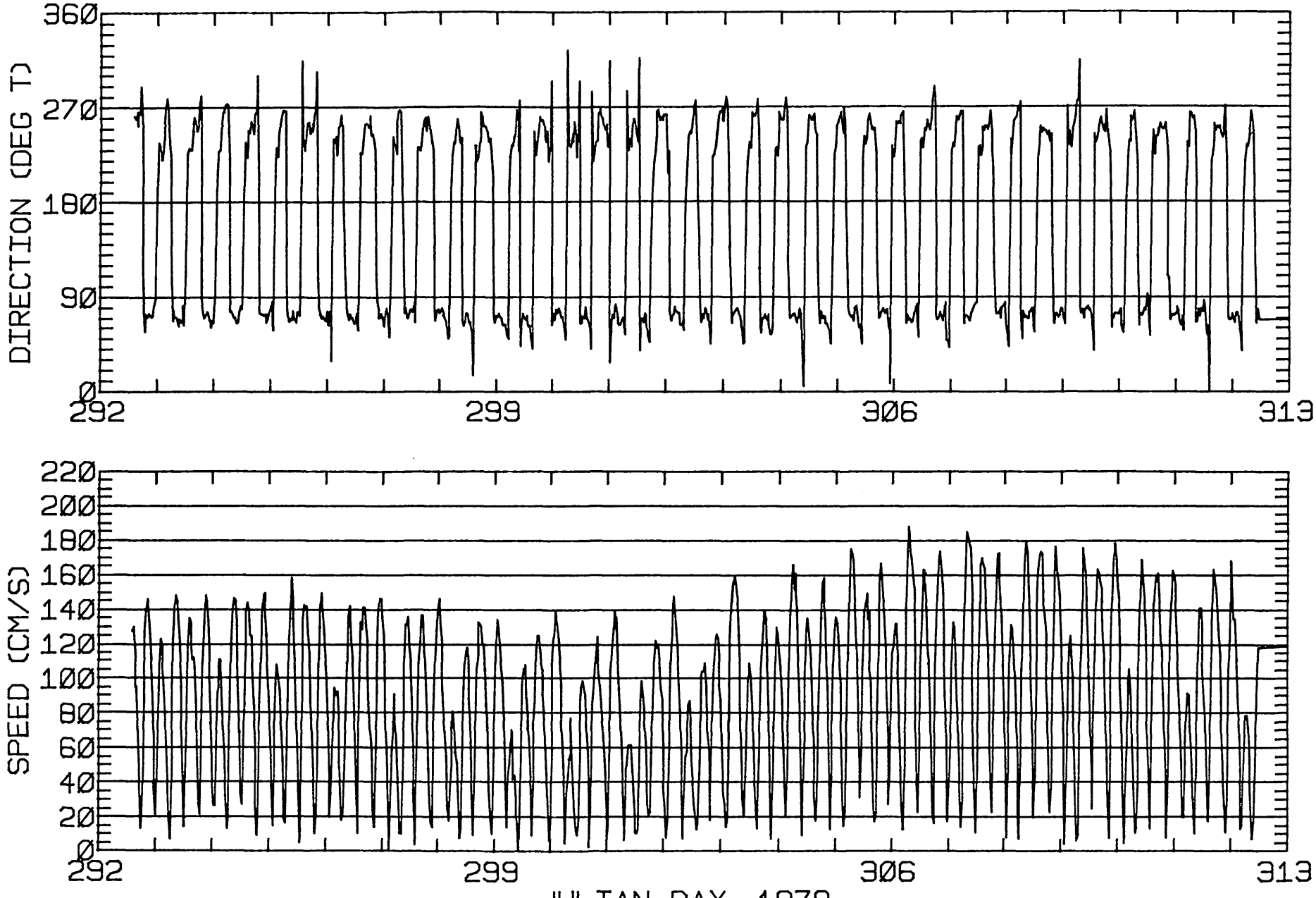
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.16	1.57	70.7	24.4	ANTI-CLOCKWISE
K1	34.85	0.78	70.6	23.5	CLOCKWISE
N2	21.96	2.09	76.8	265.3	ANTI-CLOCKWISE
M2	113.90	4.44	72.5	287.0	CLOCKWISE
S2	29.46	0.82	73.0	278.6	CLOCKWISE
M4	7.29	3.05	28.5	253.3	ANTI-CLOCKWISE

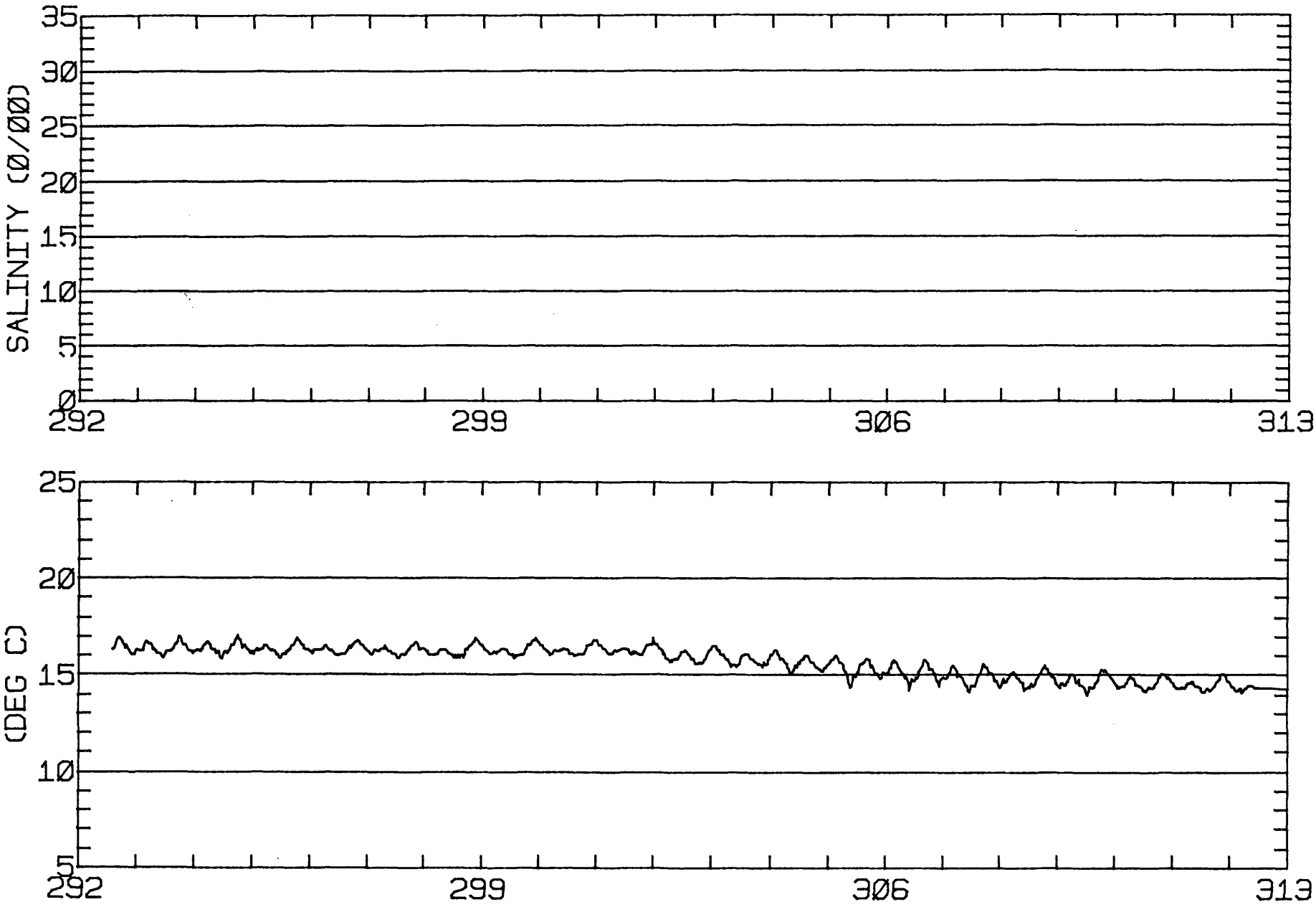
RMS SPEED: 100.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 197.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 68.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 72.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 12.52 CM/SEC
STANDARD DEVIATION V SERIES: 15.65 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.1	0.2	221.
2	12	9.7	3.5	365.
3	12	12.2	-0.2	218.
4	2	9.1	-0.4	335.
ALL	38	10.0	1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-26W
METER 076.3 METERS ABOVE BED. WATER DEPTH 095.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-26W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø95.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'26"W
METER TYPE: AANDERAA
WATER DEPTH: 95.5 M (MLLW)
METER DEPTH: 87.8 M (BELOW MLLW)
START TIME OF SERIES:10/19/79 1414 PST JULIAN DAY=292
APPROXIMATE RECORD LENGTH IS 6 M2-CYCLES

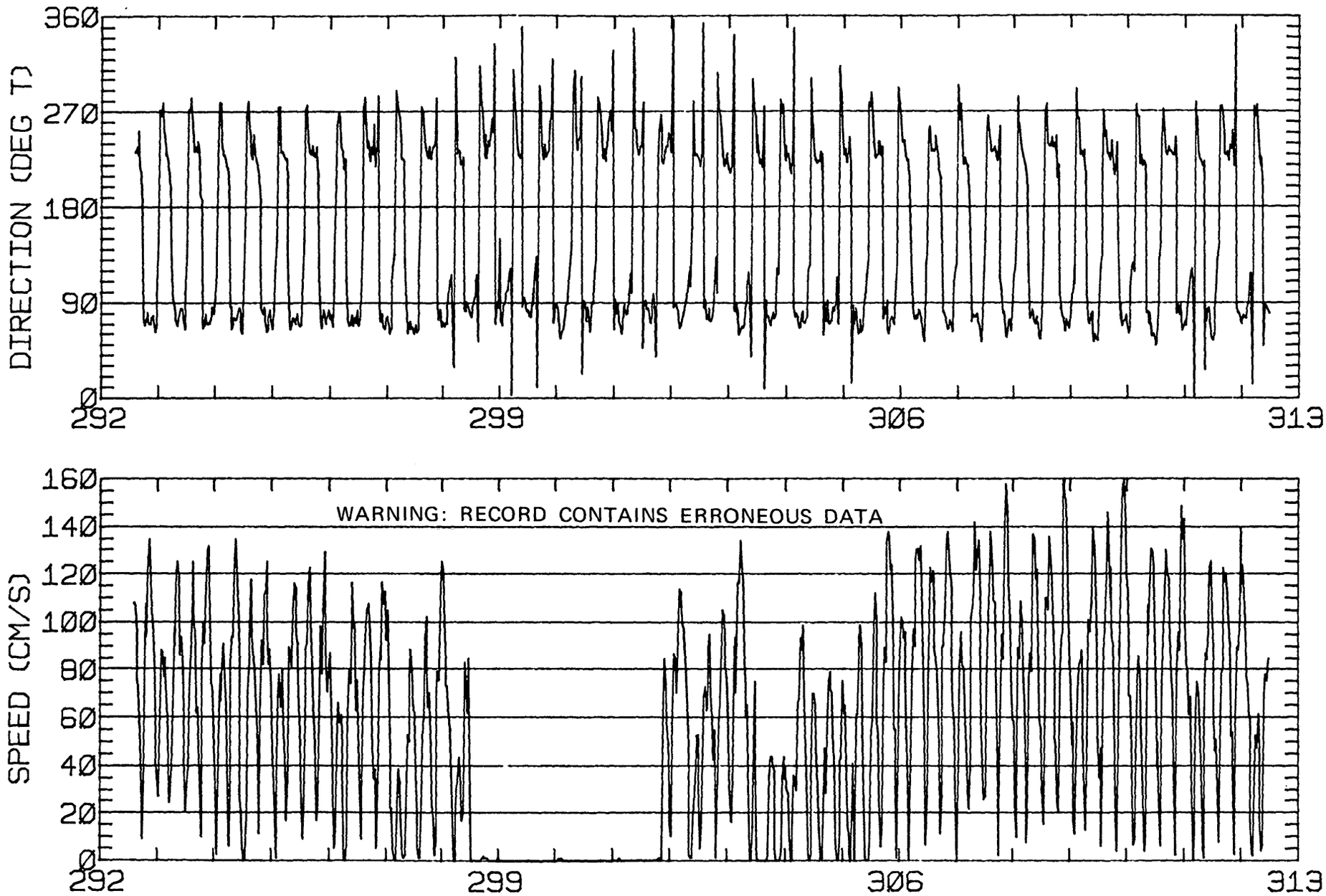
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
01	20.90	4.84	46.2	40.2	ANTI-CLOCKWISE
K1	20.07	7.54	64.5	38.9	ANTI-CLOCKWISE
N2	65.27	48.98	50.0	226.7	ANTI-CLOCKWISE
M2	163.79	70.80	57.3	277.6	ANTI-CLOCKWISE
S2	20.90	1.02	155.3	340.4	ANTI-CLOCKWISE
M4	11.58	1.17	12.9	92.7	ANTI-CLOCKWISE

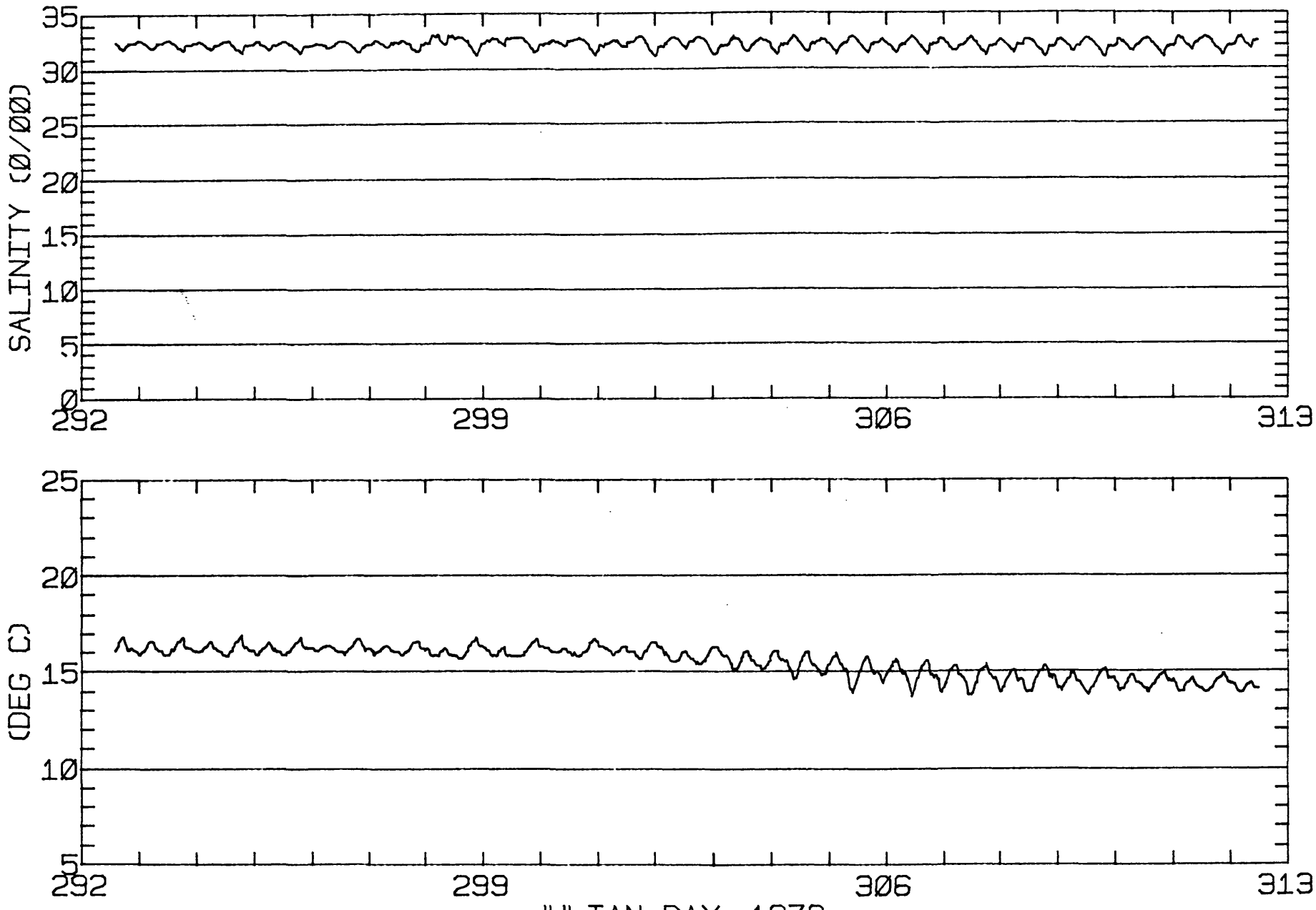
RMS SPEED: 80.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 225.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 143.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 66.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.22
STANDARD DEVIATION U-SERIES: 11.55 CM/SEC
STANDARD DEVIATION V SERIES: 13.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	6	16.3	-5.5	207.
ALL	6	16.3	-5.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-26W
METER 007.6 METERS ABOVE BED. WATER DEPTH 095.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-26W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø95.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 8/79 2020 PST JULIAN DAY=312
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

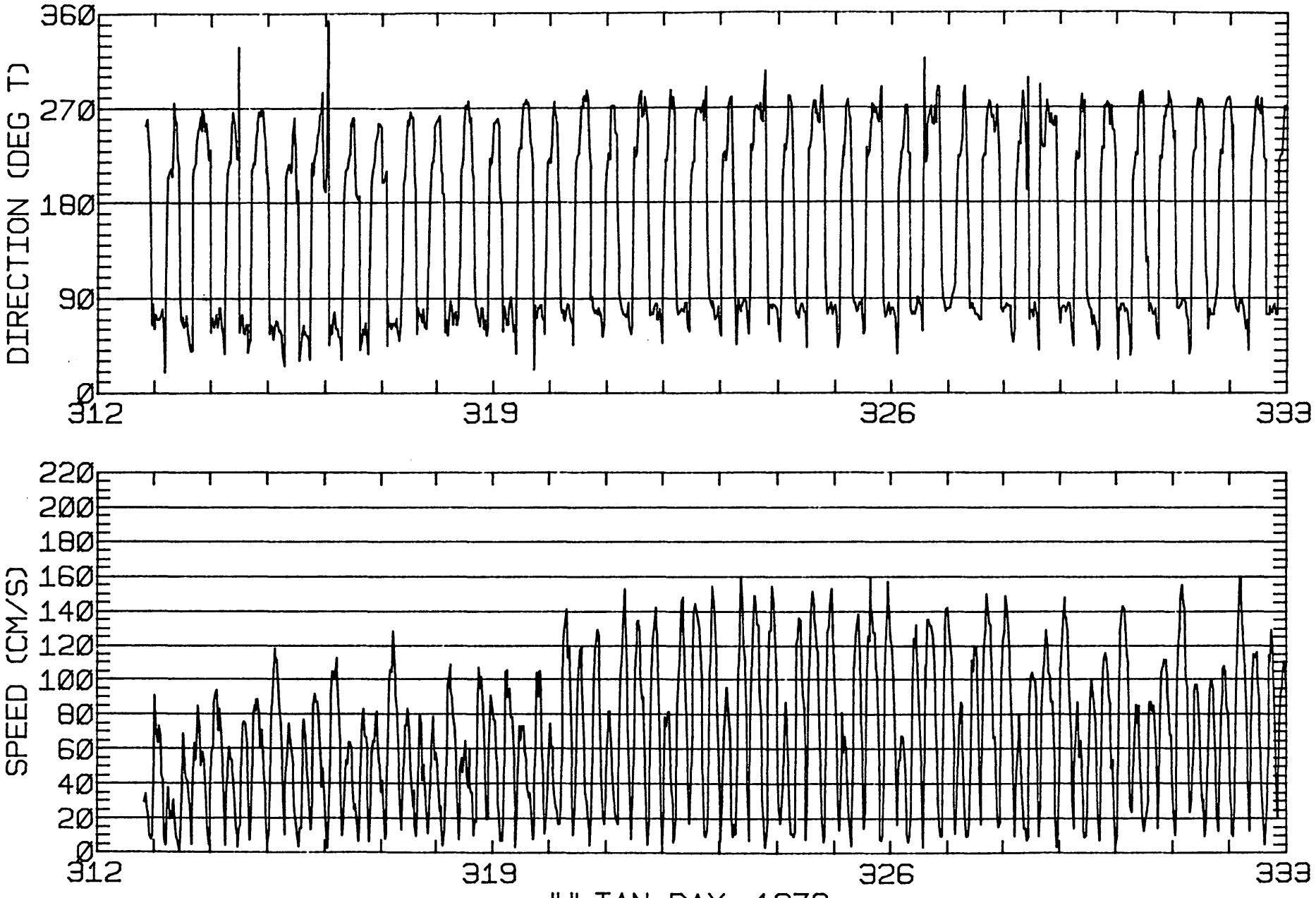
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.26	3.83	82.1	30.6	CLOCKWISE
K1	34.19	0.25	83.9	26.0	ANTI-CLOCKWISE
N2	21.96	7.26	87.2	276.9	CLOCKWISE
M2	101.07	4.22	76.7	289.4	CLOCKWISE
S2	24.88	4.27	85.2	273.4	CLOCKWISE
M4	12.26	1.51	38.9	267.6	ANTI-CLOCKWISE

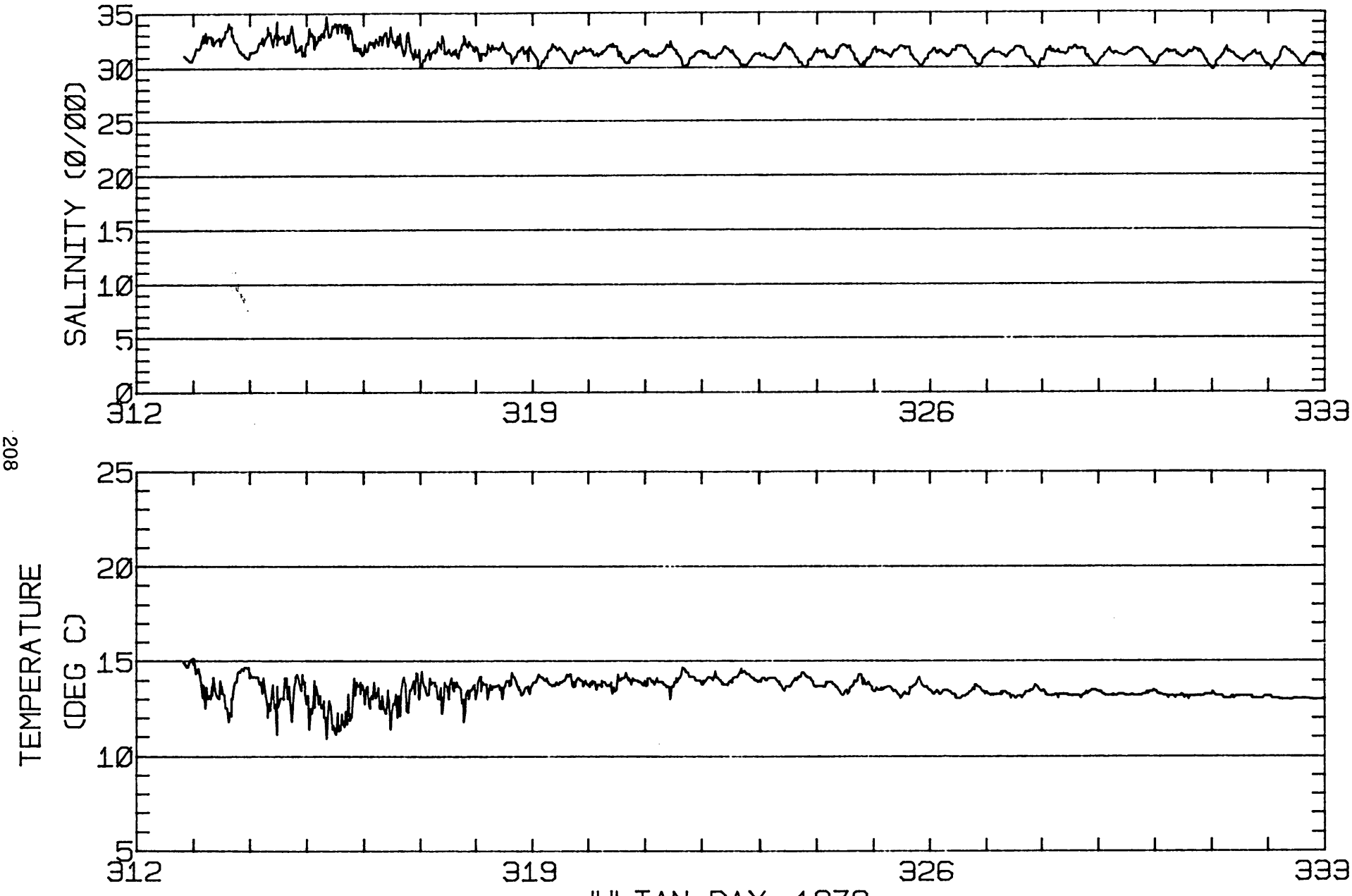
RMS SPEED: 78.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 176.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 58.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 79.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 15.22 CM/SEC
STANDARD DEVIATION V SERIES: 17.61 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.9	0.5	307.
2	12	10.3	2.5	342.
3	12	8.1	0.3	411.
4	2	9.8	1.3	585.
ALL	38	8.2	1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-22W
METER 085.4 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-22W
METER Ø85.4 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 21.3 M (BELOW MLLW)
START TIME OF SERIES:11/ 8/79 1402 PST JULIAN DAY=312
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

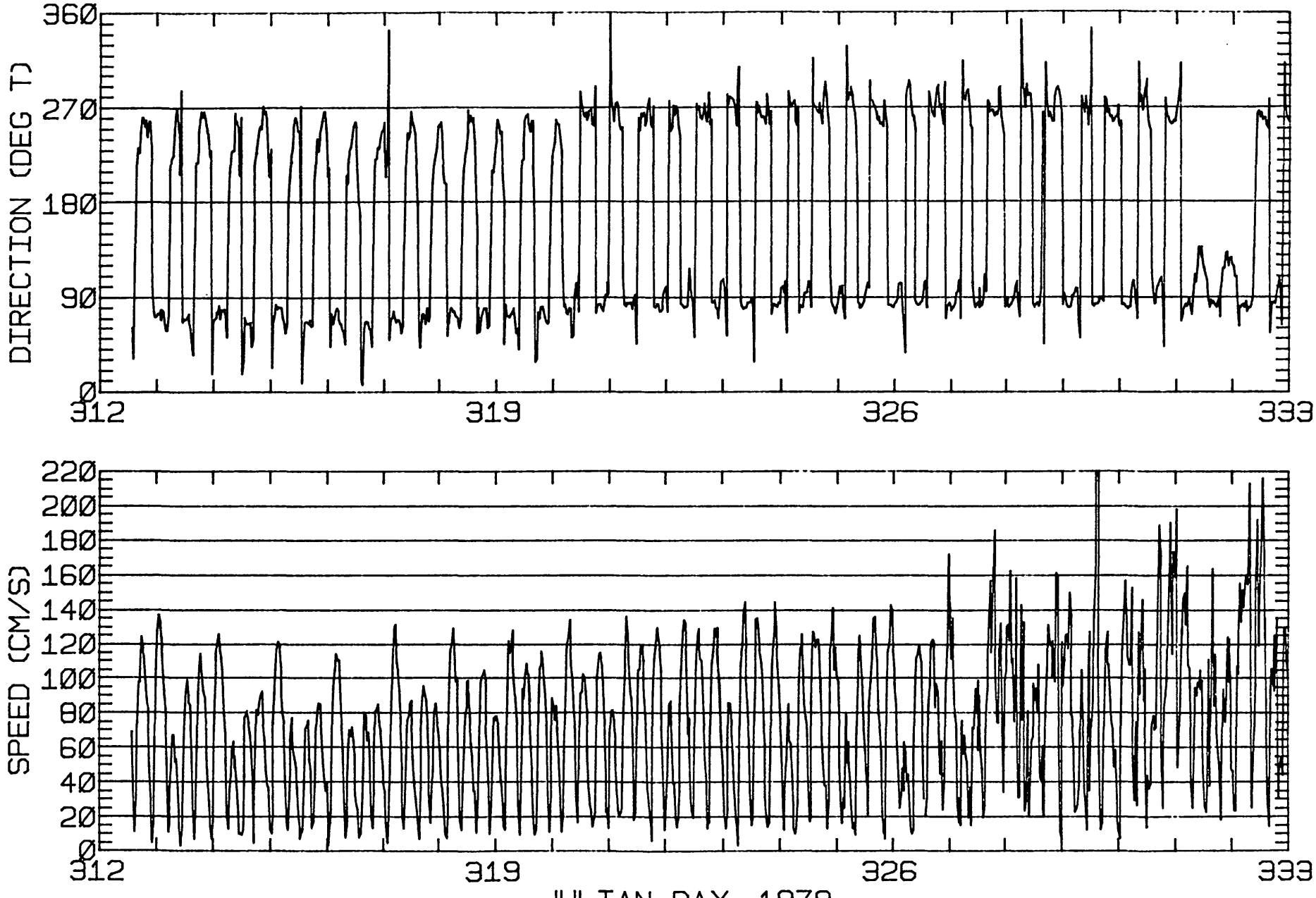
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.95	2.37	78.3	30.8	CLOCKWISE
K1	32.81	2.37	80.3	20.9	ANTI-CLOCKWISE
N2	14.38	11.04	53.5	217.9	CLOCKWISE
M2	98.55	5.55	79.0	291.9	CLOCKWISE
S2	20.91	5.23	91.1	270.4	CLOCKWISE
M4	6.79	0.42	58.8	272.5	ANTI-CLOCKWISE

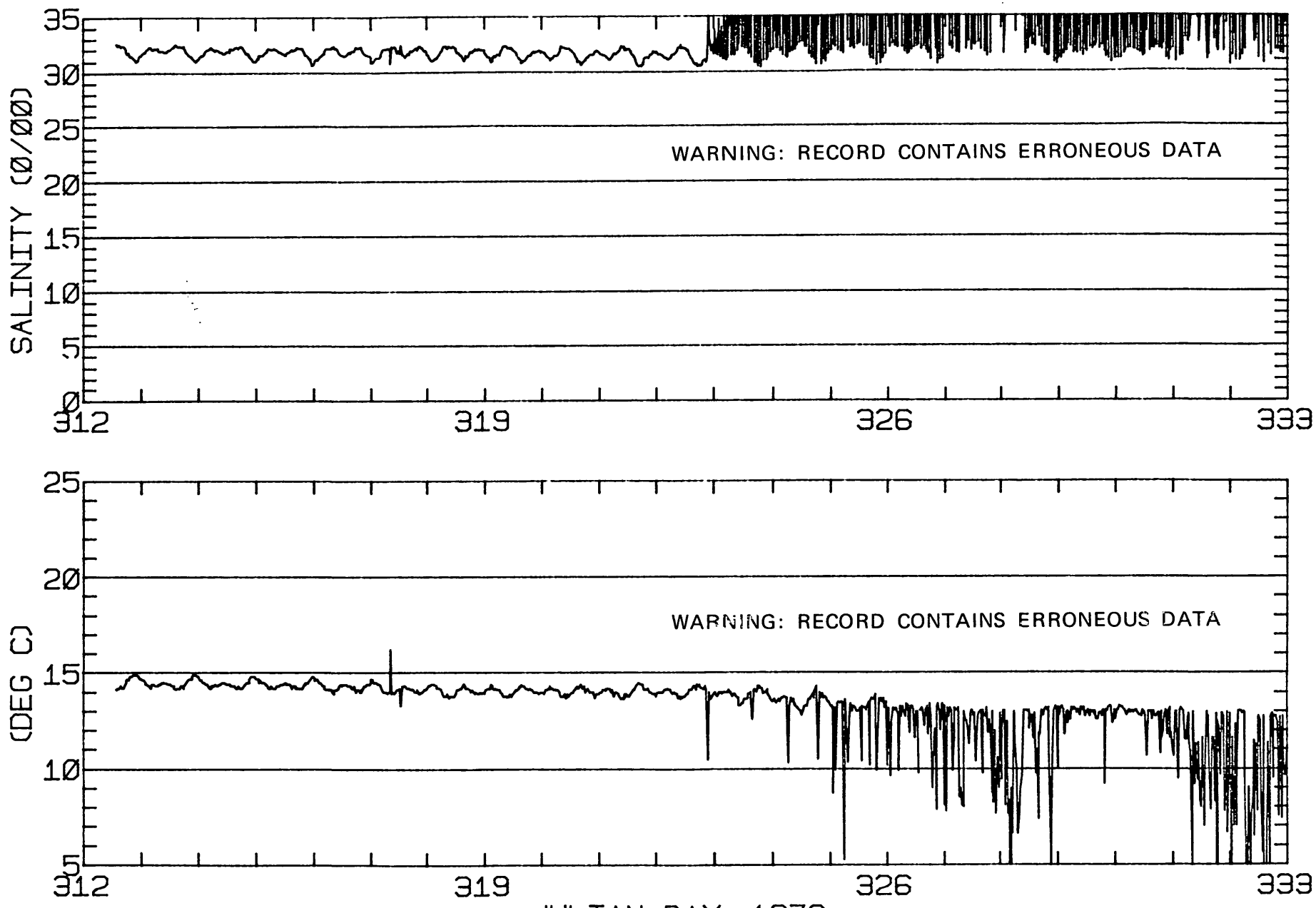
RMS SPEED: 77.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 167.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 59.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 80.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 15.77 CM/SEC
STANDARD DEVIATION V SERIES: 13.36 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.3	-0.6	307.
2	12	10.5	1.7	293.
3	2	8.5	2.0	477.
ALL	26	8.9	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-22W
METER 076.3 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-22W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 89.9 M (BELOW MLLW)
START TIME OF SERIES:11/ 8/79 1414 PST JULIAN DAY=312
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

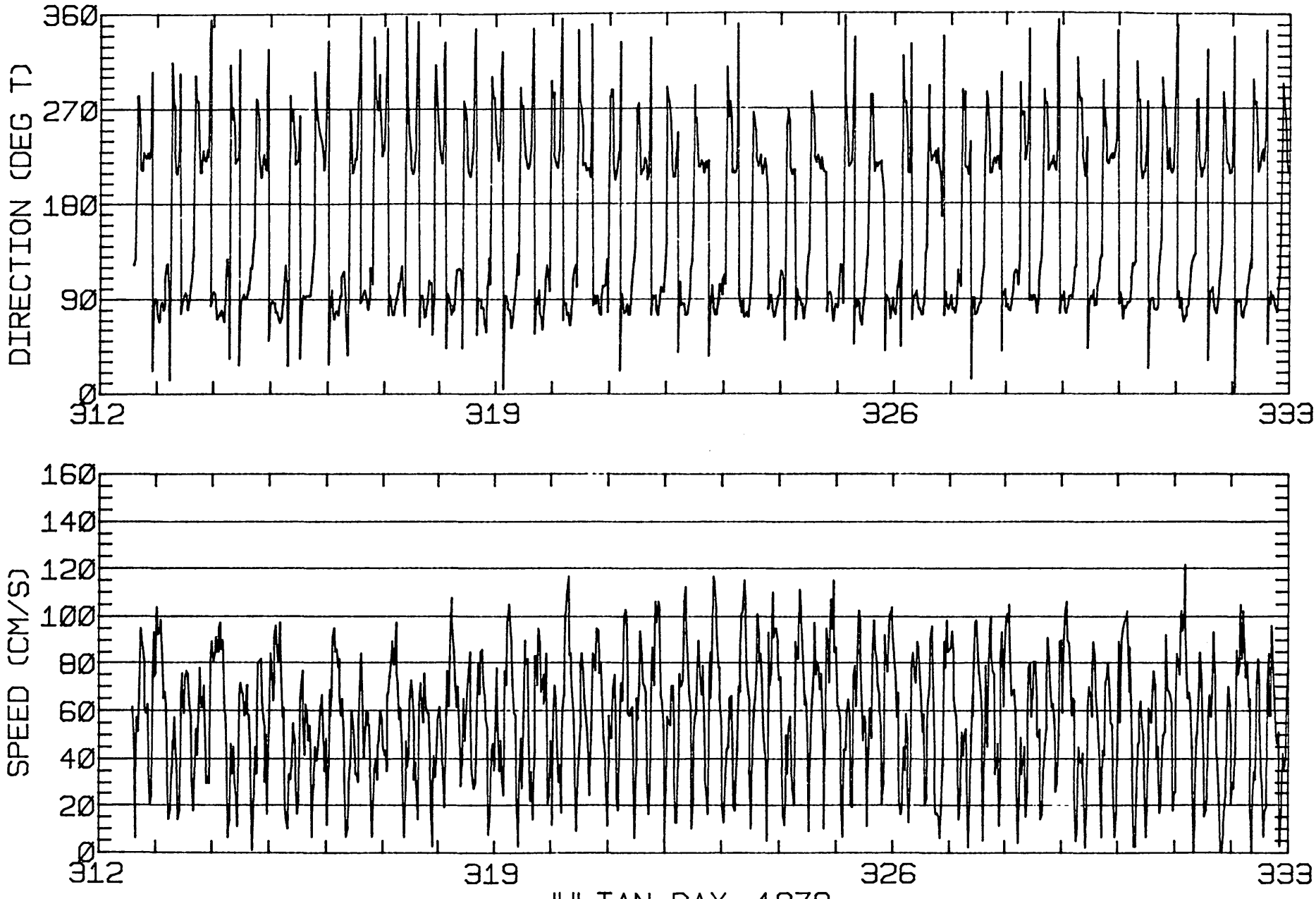
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.54	5.25	72.2	17.4	ANTI-CLOCKWISE
K1	22.70	0.06	60.3	17.8	ANTI-CLOCKWISE
N2	12.83	1.28	77.4	230.8	ANTI-CLOCKWISE
M2	74.56	2.09	72.8	283.3	CLOCKWISE
S2	17.47	1.53	70.9	263.8	ANTI-CLOCKWISE
M4	8.79	2.16	16.5	96.6	CLOCKWISE

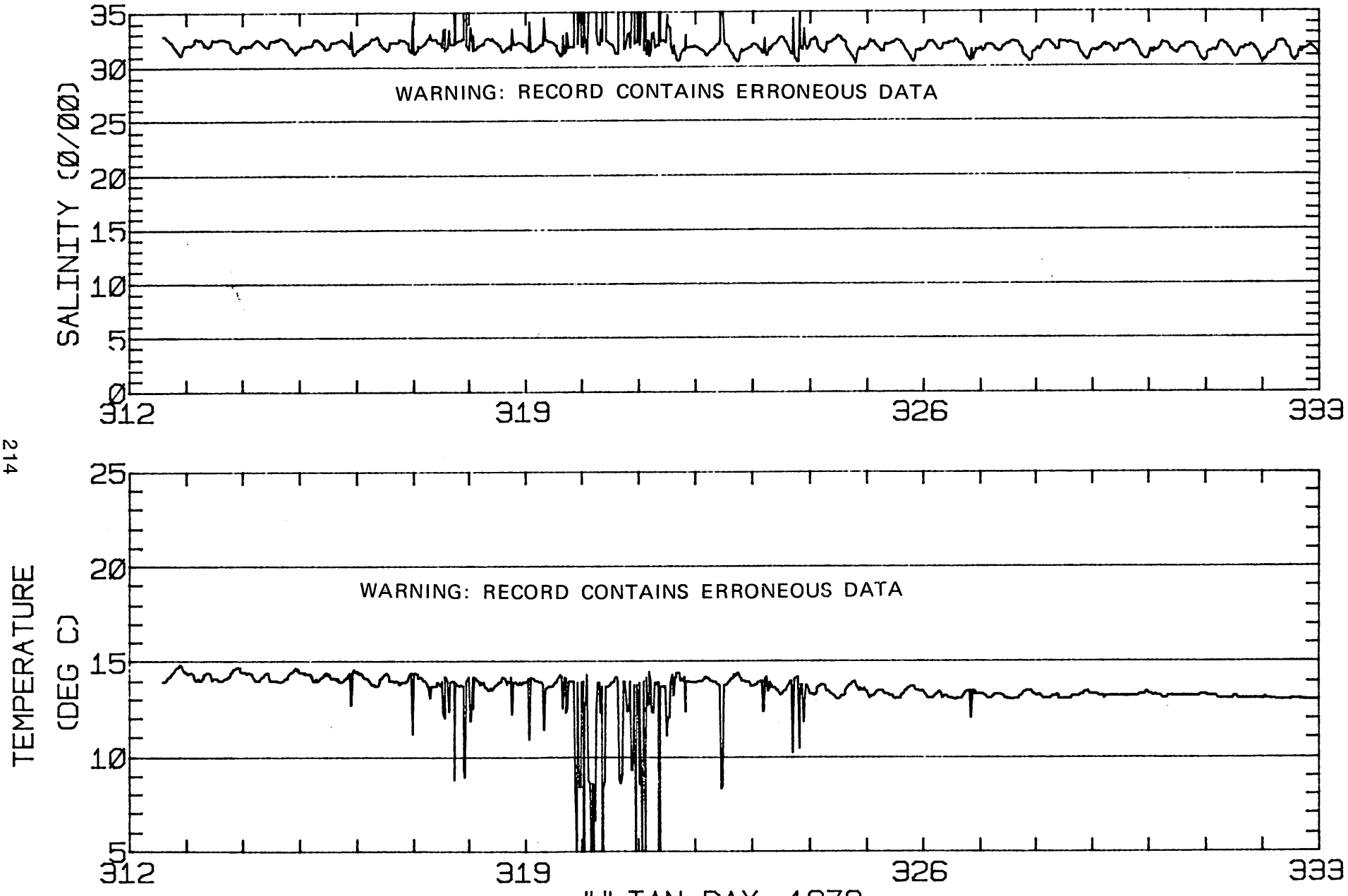
RMS SPEED: 63.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 126.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 45.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 70.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 14.95 CM/SEC
STANDARD DEVIATION V SERIES: 19.15 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	18.6	-7.8	307.
2	12	21.8	-12.3	293.
3	12	22.3	-10.6	411.
4	4	22.0	-10.2	572.
ALL	40	21.0	-10.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-22W
METER 7.7 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-22W
METER 7.7 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 96.1 M (MLLW)
METER DEPTH: 10.7 M (BELOW MLLW)
START TIME OF SERIES:11/30/79 1040 PST JULIAN DAY=334
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

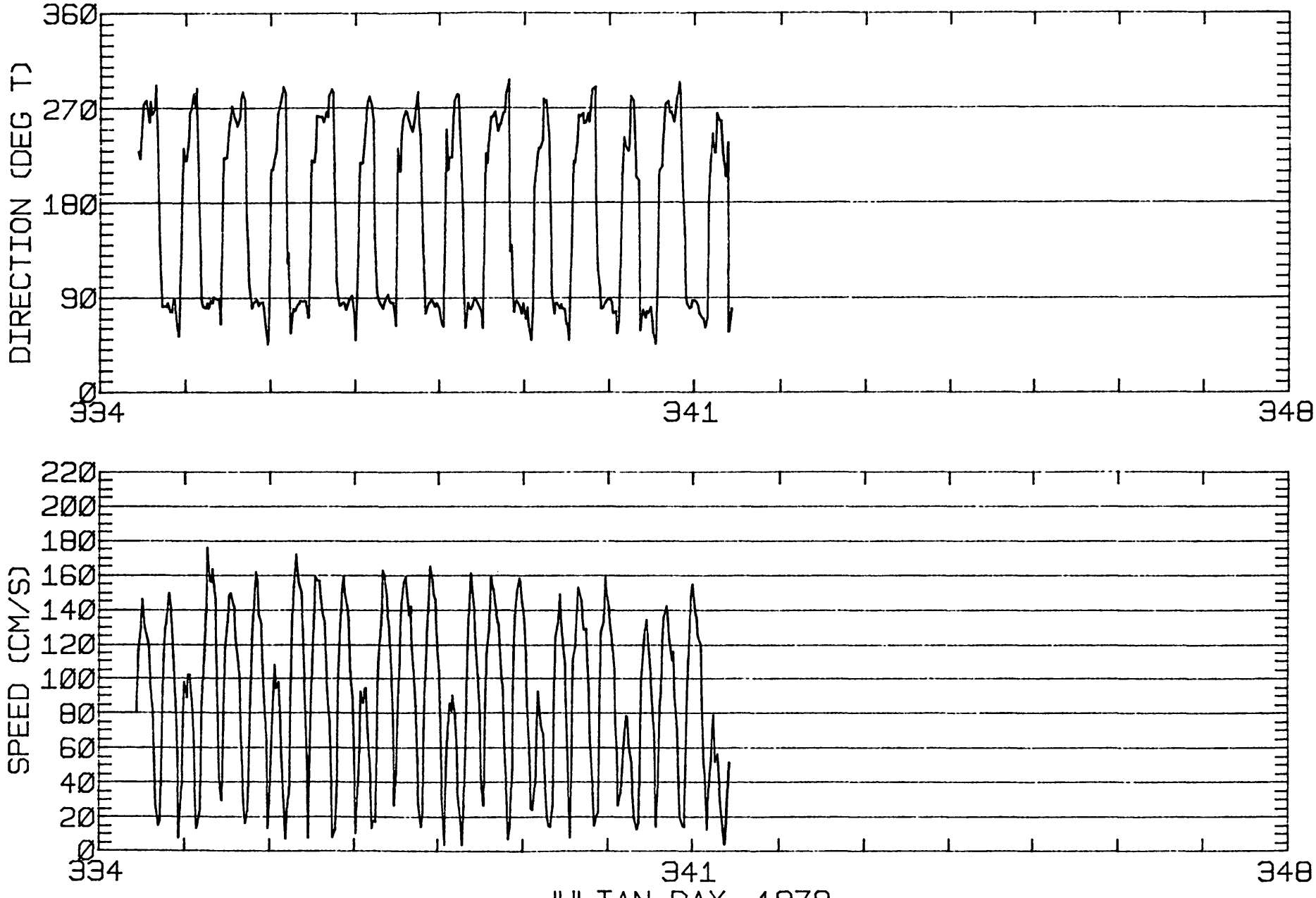
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.67	0.07	62.6	43.5	ANTI-CLOCKWISE
K1	43.19	0.01	84.0	33.9	ANTI-CLOCKWISE
N2	18.31	3.48	100.9	293.4	ANTI-CLOCKWISE
M2	116.55	4.90	76.1	288.9	CLOCKWISE
S2	15.62	4.80	103.5	283.6	ANTI-CLOCKWISE
M4	12.73	5.07	36.1	302.8	ANTI-CLOCKWISE

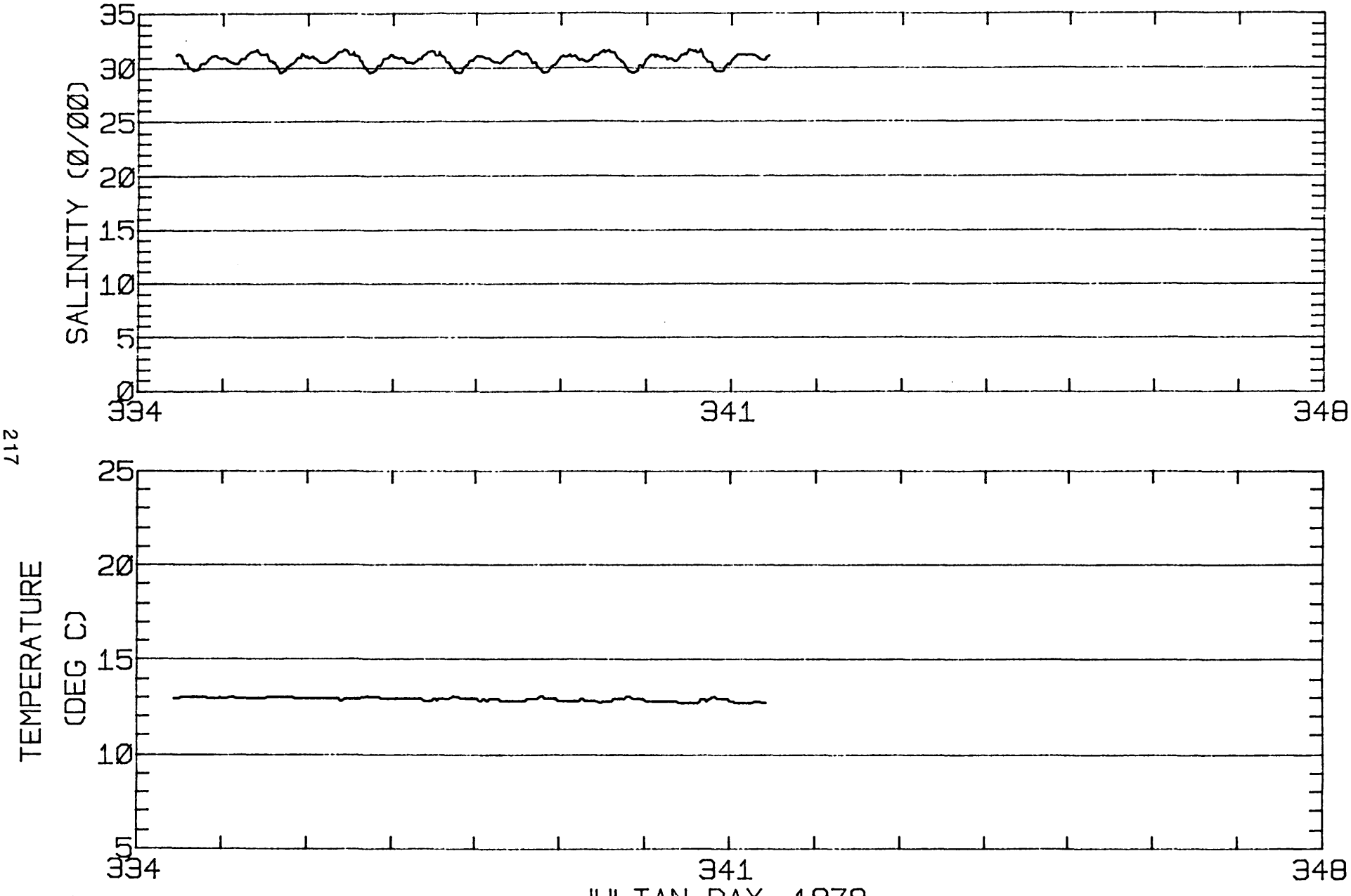
RMS SPEED: 103.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 191.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 73.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 79.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.45
STANDARD DEVIATION U-SERIES: 14.22 CM/SEC
STANDARD DEVIATION V SERIES: 20.30 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	11.4	-2.5	342.
ALL	12	11.4	-2.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER 085.4 METERS ABOVE BED. WATER DEPTH 096.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER Ø85.4 METERS ABOVE BED. WATER DEPTH Ø96.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 96.1 M (MLLW)
METER DEPTH: 19.8 M (BELOW MLLW)
START TIME OF SERIES:11/30/79 1042 PST JULIAN DAY=334
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

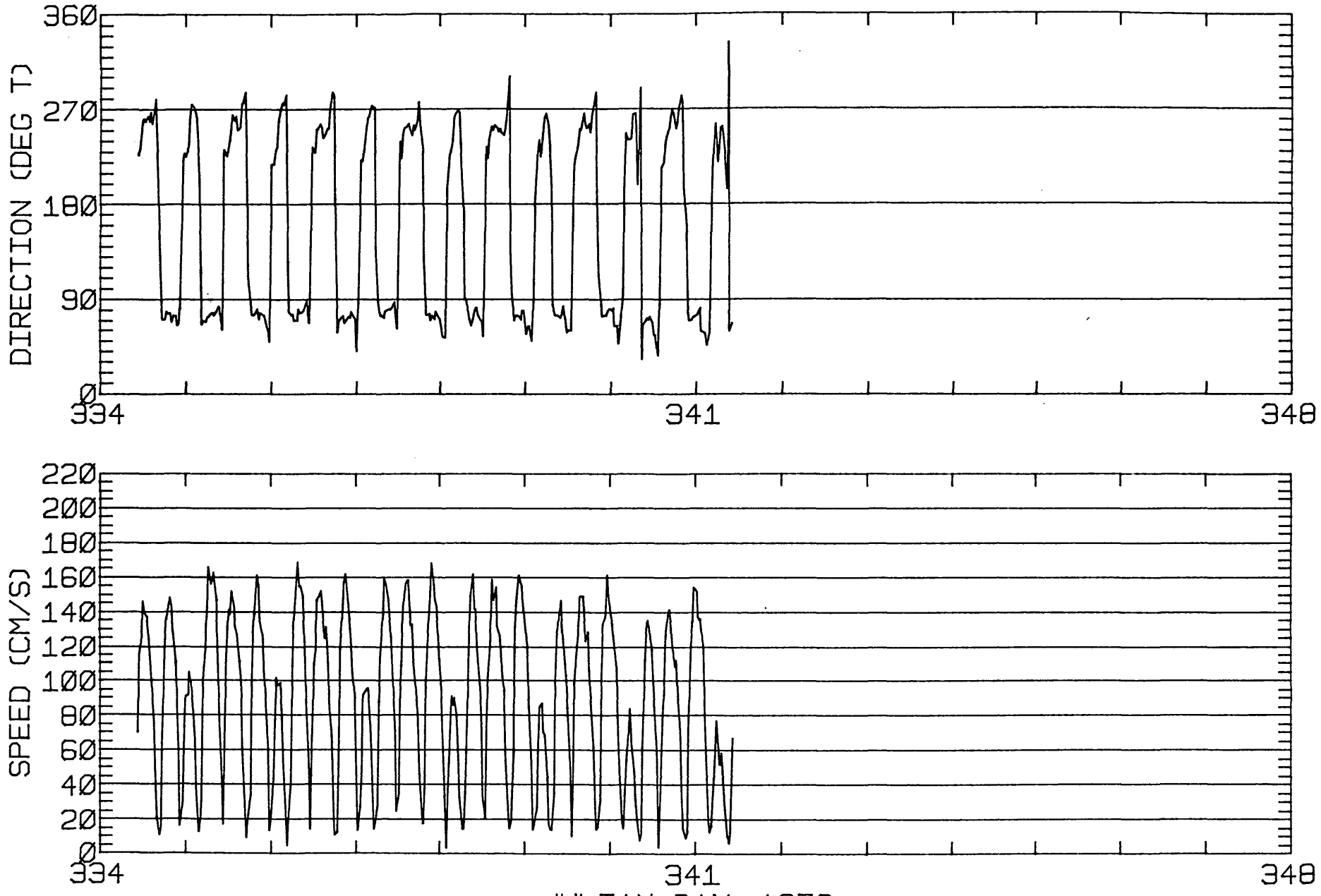
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.80	0.40	53.7	41.0	ANTI-CLOCKWISE
K1	43.02	0.51	75.6	32.0	CLOCKWISE
N2	15.11	2.78	80.1	310.7	CLOCKWISE
M2	121.29	7.42	74.3	290.2	CLOCKWISE
S2	13.20	5.07	85.6	280.9	ANTI-CLOCKWISE
M4	8.87	3.28	34.8	292.9	ANTI-CLOCKWISE

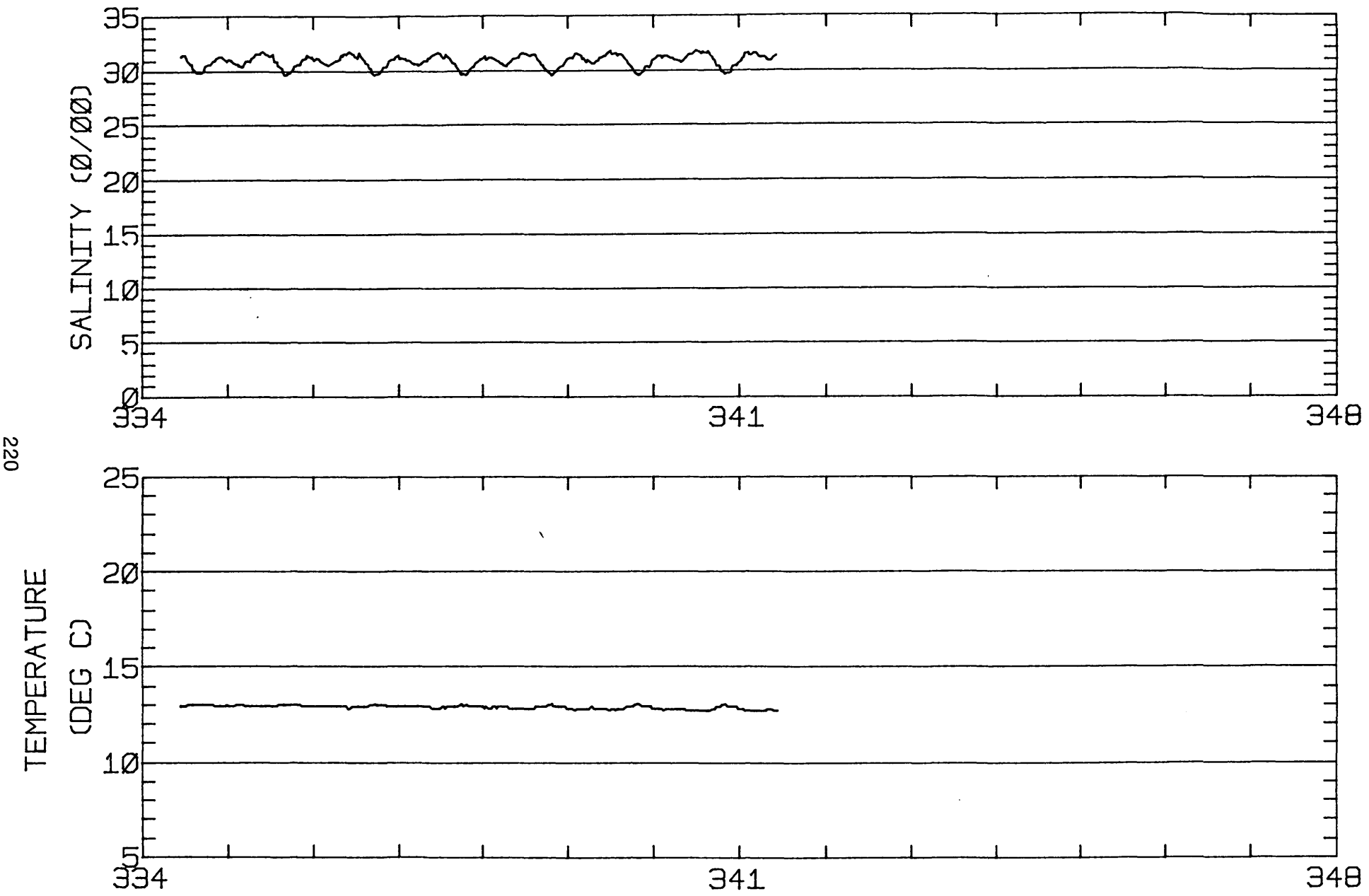
RMS SPEED: 103.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 193.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 80.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 73.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 14.12 CM/SEC
STANDARD DEVIATION V SERIES: 16.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	12.2	1.9	342.
ALL	12	12.2	1.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER 076.3 METERS ABOVE BED. WATER DEPTH 096.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø96.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 96.1 M (MLLW)
METER DEPTH: 88.4 M (BELOW MLLW)
START TIME OF SERIES:11/30/79 1014 PST JULIAN DAY=334
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

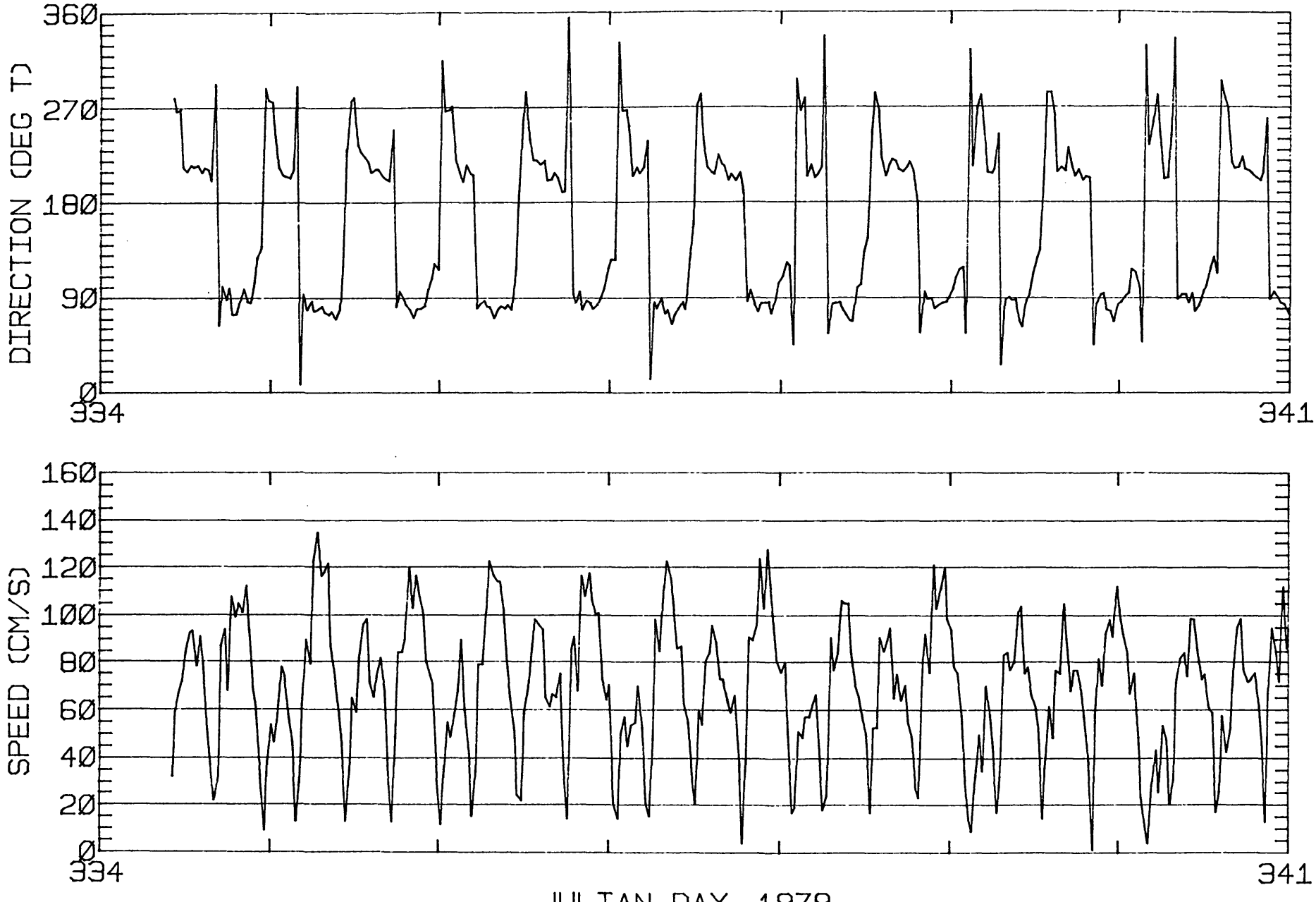
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.63	3.76	68.8	26.4	ANTI-CLOCKWISE
K1	24.84	5.37	55.9	35.2	ANTI-CLOCKWISE
N2	18.88	5.59	90.7	325.6	CLOCKWISE
M2	81.89	11.23	78.5	280.7	ANTI-CLOCKWISE
S2	12.99	6.41	22.2	248.7	CLOCKWISE
M4	11.30	5.14	354.9	125.1	CLOCKWISE

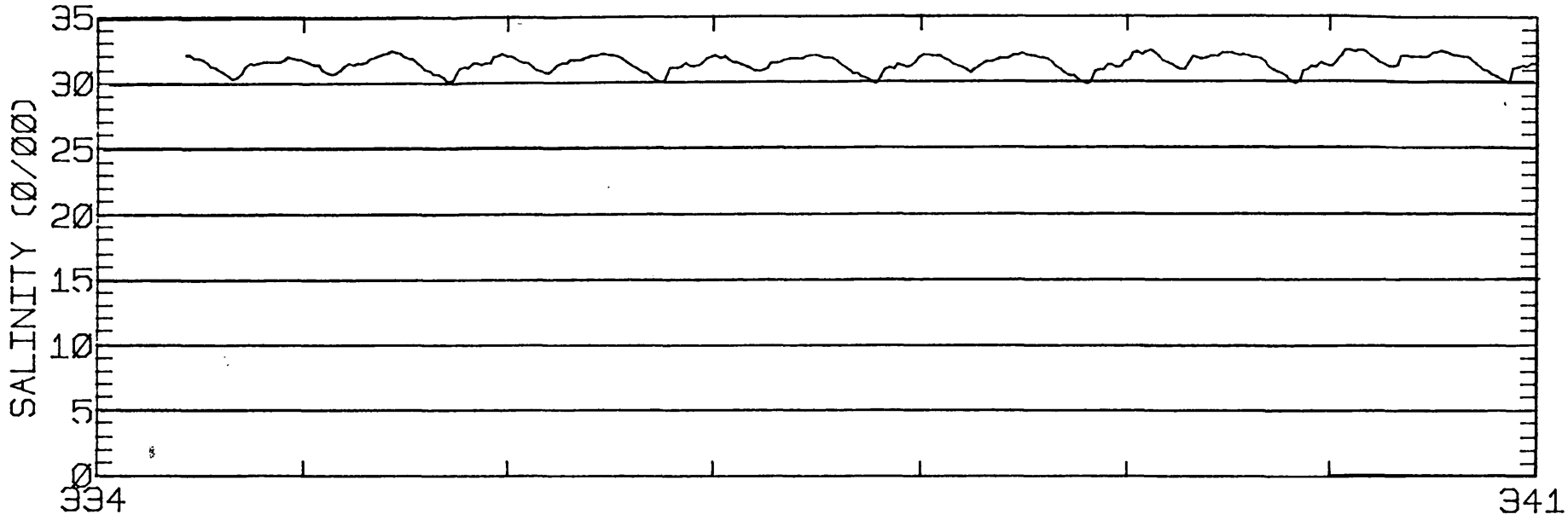
RMS SPEED: 75.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 130.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 54.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 67.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 17.74 CM/SEC
STANDARD DEVIATION V SERIES: 18.27 CM/SEC

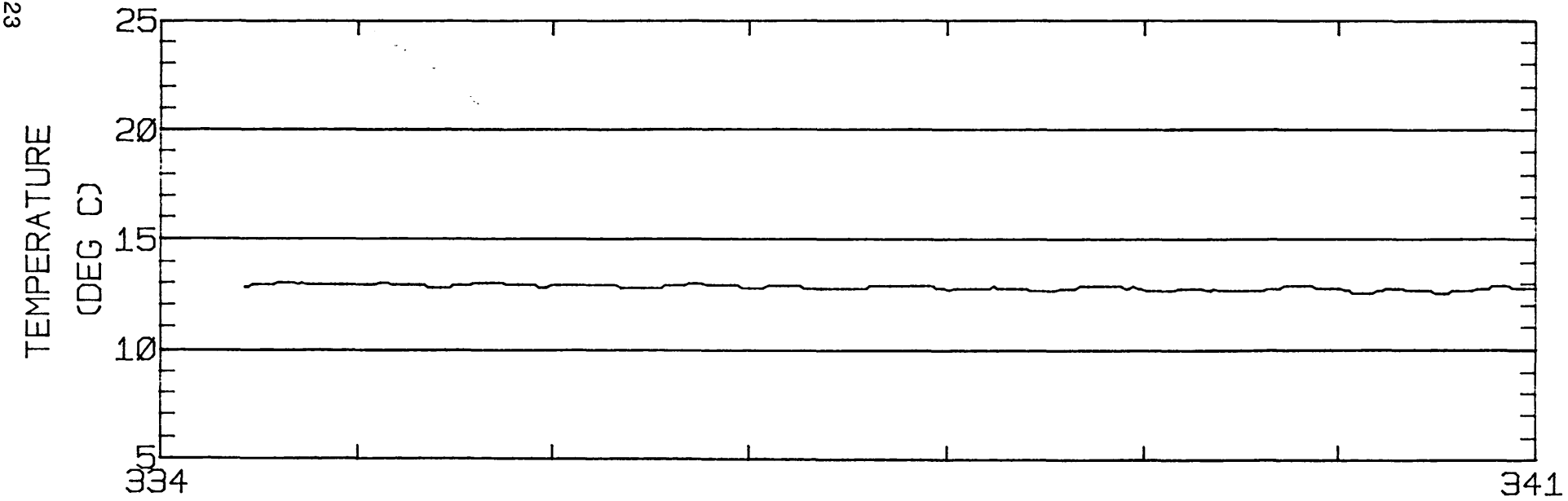
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	24.7	-15.2	342.
ALL	12	24.7	-15.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER 7.7 METERS ABOVE BED. WATER DEPTH 096.1 METERS.





JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 1 37-49-12N 122-28-22W

METER 7.7 METERS ABOVE BED. WATER DEPTH Ø96.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 99.4 M (MLLW)
METER DEPTH: 23.2 M (BELOW MLLW)
START TIME OF SERIES: 4/ 2/80 1230 PST JULIAN DAY= 93
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

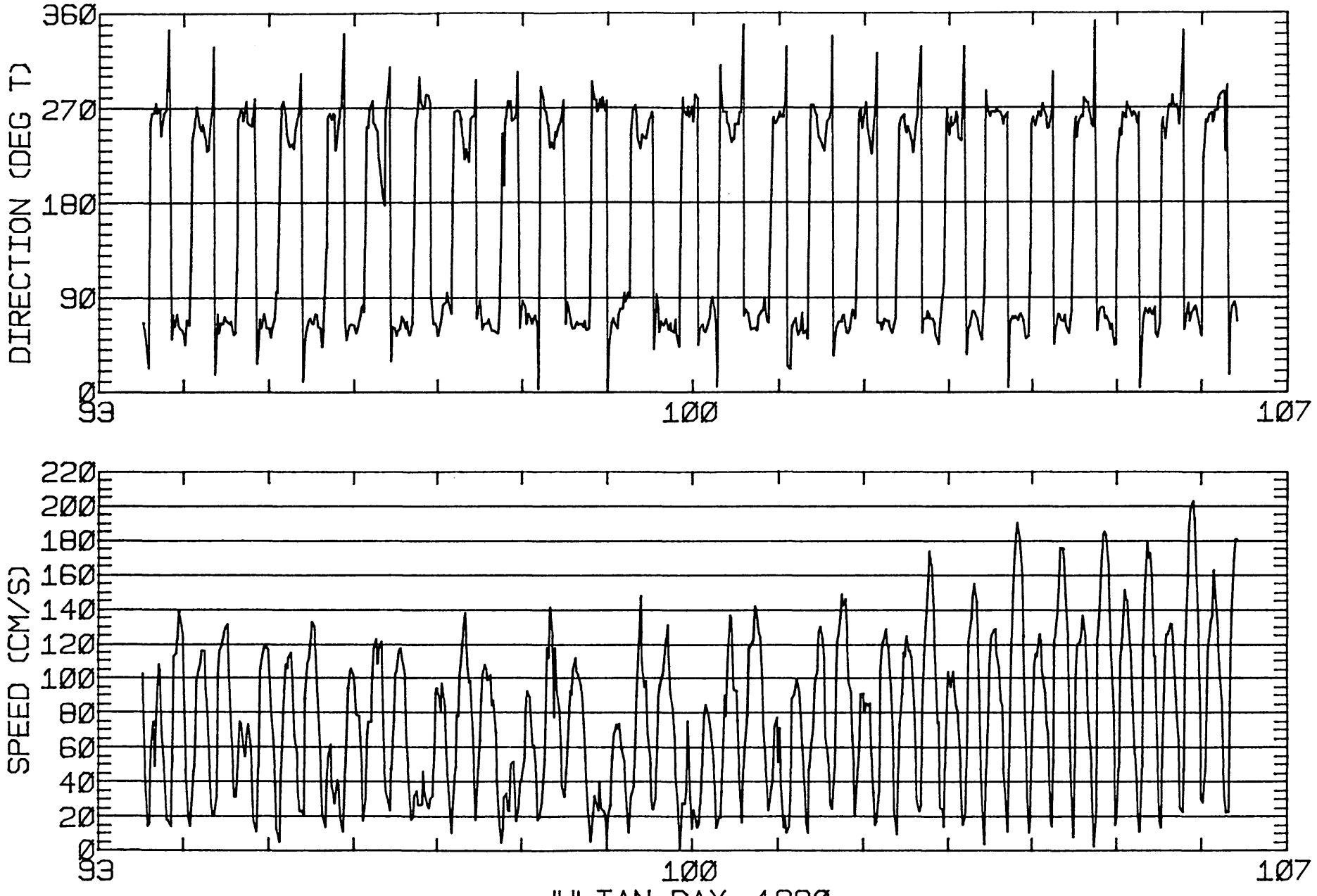
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.18	2.99	61.0	16.4	ANTI-CLOCKWISE
K1	26.36	0.94	61.6	26.9	CLOCKWISE
N2	20.71	5.80	93.8	253.5	ANTI-CLOCKWISE
M2	110.82	5.71	73.6	286.3	CLOCKWISE
S2	30.82	0.10	79.8	287.6	CLOCKWISE
M4	5.77	1.00	94.6	201.9	ANTI-CLOCKWISE

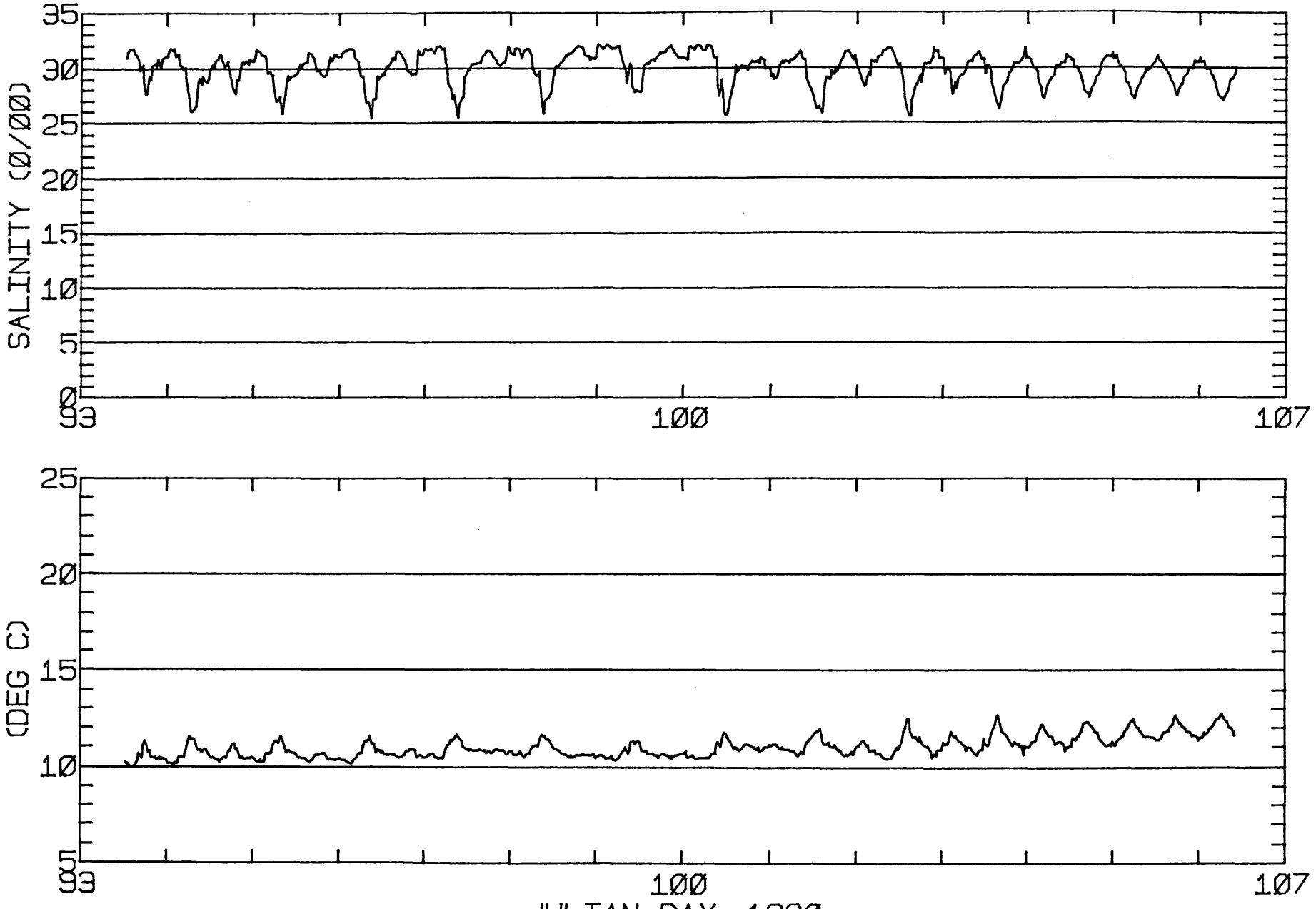
RMS SPEED: 88.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 187.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 72.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 71.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 13.79 CM/SEC
STANDARD DEVIATION V SERIES: 16.31 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.8	7.0	1058.
2	12	9.9	11.5	915.
ALL	24	8.8	9.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-22W
METER 076.2 METERS ABOVE BED. WATER DEPTH 099.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-22W
METER Ø76.2 METERS ABOVE BED. WATER DEPTH Ø99.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 99.4 M (MLLW)
METER DEPTH: 91.8 M (BELOW MLLW)
START TIME OF SERIES: 4/ 1/80 1644 PST JULIAN DAY= 92
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

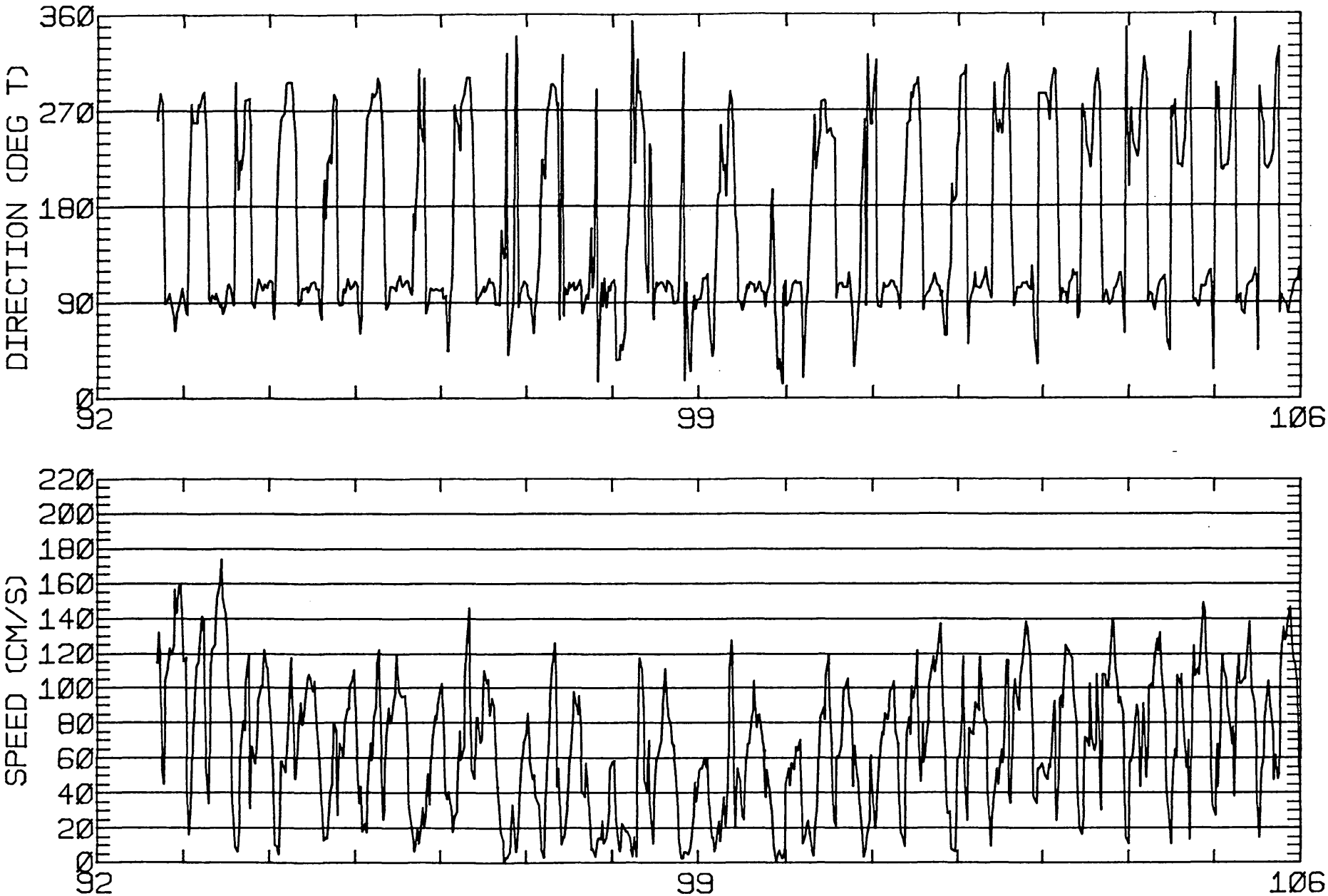
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.65	1.16	93.4	14.6	CLOCKWISE
K1	21.30	4.21	99.5	13.4	ANTI-CLOCKWISE
N2	13.87	5.62	52.3	195.6	CLOCKWISE
M2	86.00	2.18	91.5	272.9	CLOCKWISE
S2	31.23	4.24	86.0	288.5	CLOCKWISE
M4	8.39	1.58	61.9	30.3	CLOCKWISE

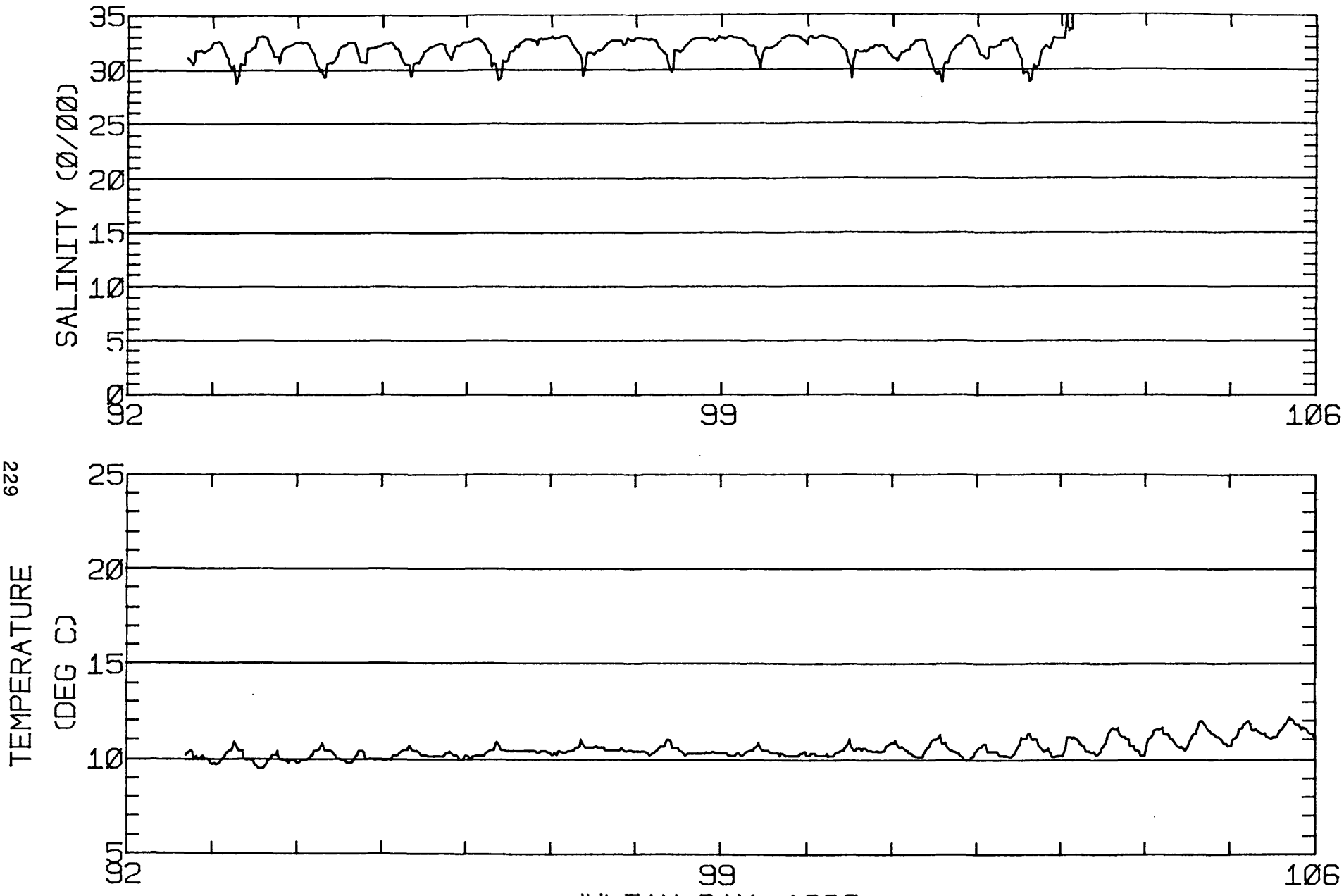
RMS SPEED: 78.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 157.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 52.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 91.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 25.80 CM/SEC
STANDARD DEVIATION V SERIES: 23.31 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	25.6	-5.7	1048.
2	12	23.8	-9.4	981.
3	2	29.6	-18.2	755.
ALL	26	25.1	-8.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-22W
METER 007.5 METERS ABOVE BED. WATER DEPTH 099.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-22W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø99.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'19"W
METER TYPE: AANDERAA
WATER DEPTH: 95.5 M (MLLW)
METER DEPTH: 49.7 M (BELOW MLLW)
START TIME OF SERIES: 4/15/80 1202 PST JULIAN DAY=106
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

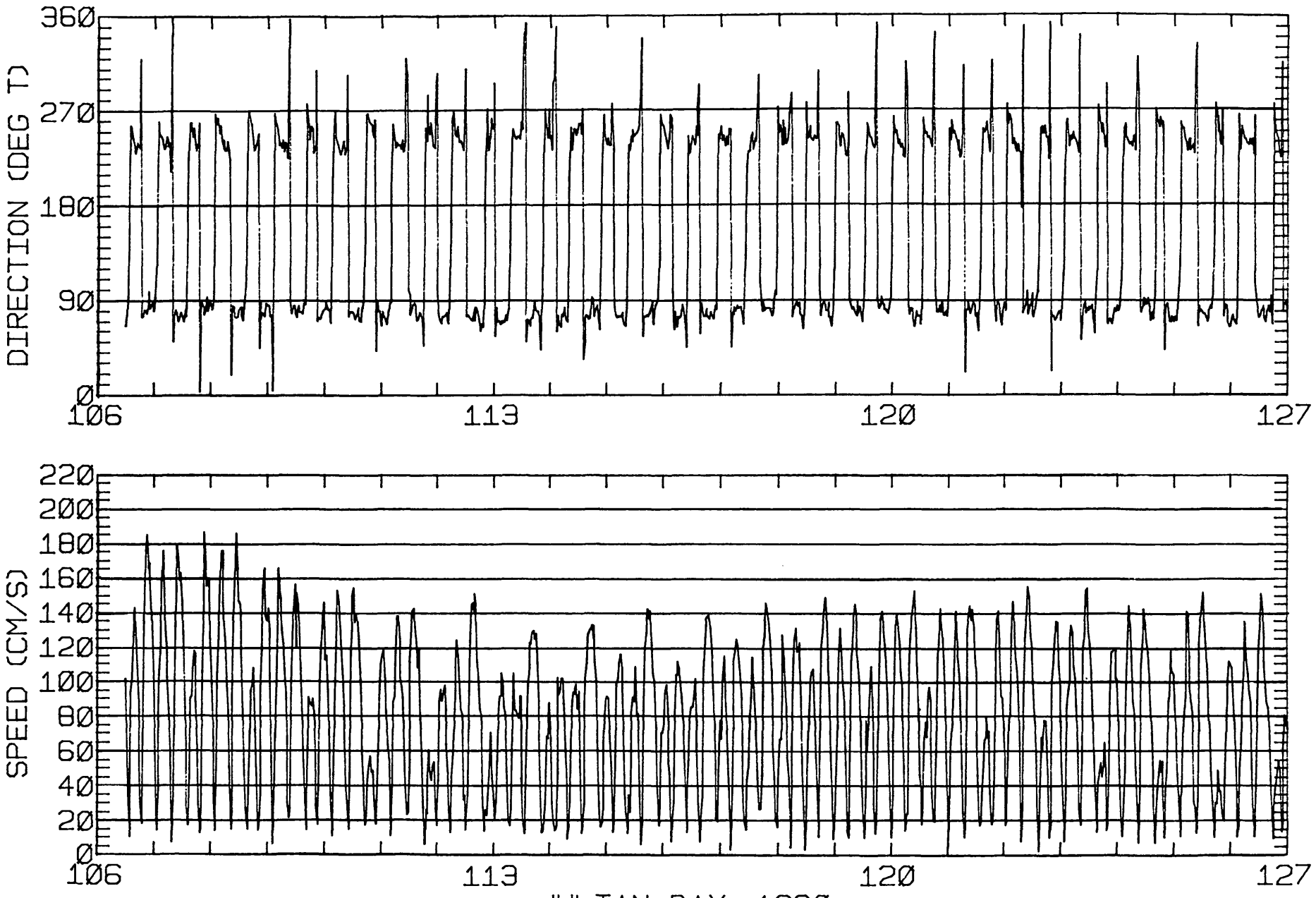
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.39	4.38	65.2	31.5	ANTI-CLOCKWISE
K1	29.95	0.71	68.7	16.7	ANTI-CLOCKWISE
N2	25.68	0.78	72.4	257.4	CLOCKWISE
M2	114.17	0.62	73.2	289.1	CLOCKWISE
S2	30.15	2.00	75.8	275.1	ANTI-CLOCKWISE
M4	7.18	3.77	164.9	227.8	CLOCKWISE

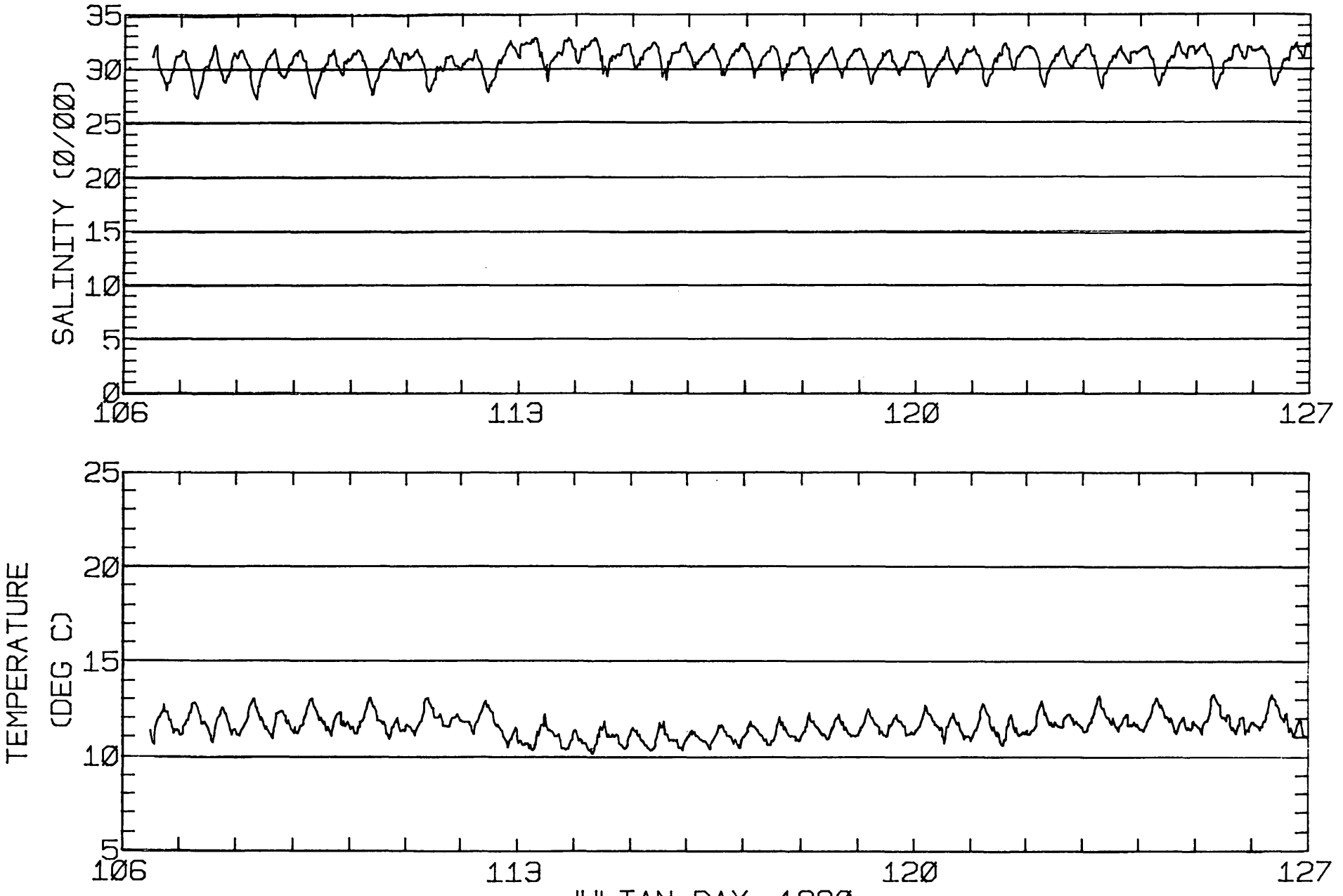
RMS SPEED: 91.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 192.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 72.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 72.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 13.38 CM/SEC
STANDARD DEVIATION V SERIES: 13.41 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	17.9	-6.3	708.
2	12	20.0	-0.5	658.
3	12	18.6	-5.4	610.
4	4	20.1	-2.7	523.
ALL	40	19.0	-3.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-19W
METER 045.8 METERS ABOVE BED. WATER DEPTH 095.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-19W
METER Ø45.8 METERS ABOVE BED. WATER DEPTH Ø95.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'19"W
METER TYPE: AANDERAA
WATER DEPTH: 95.5 M (MLLW)
METER DEPTH: 87.8 M (BELOW MLLW)
START TIME OF SERIES: 4/15/80 1214 PST JULIAN DAY=106
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

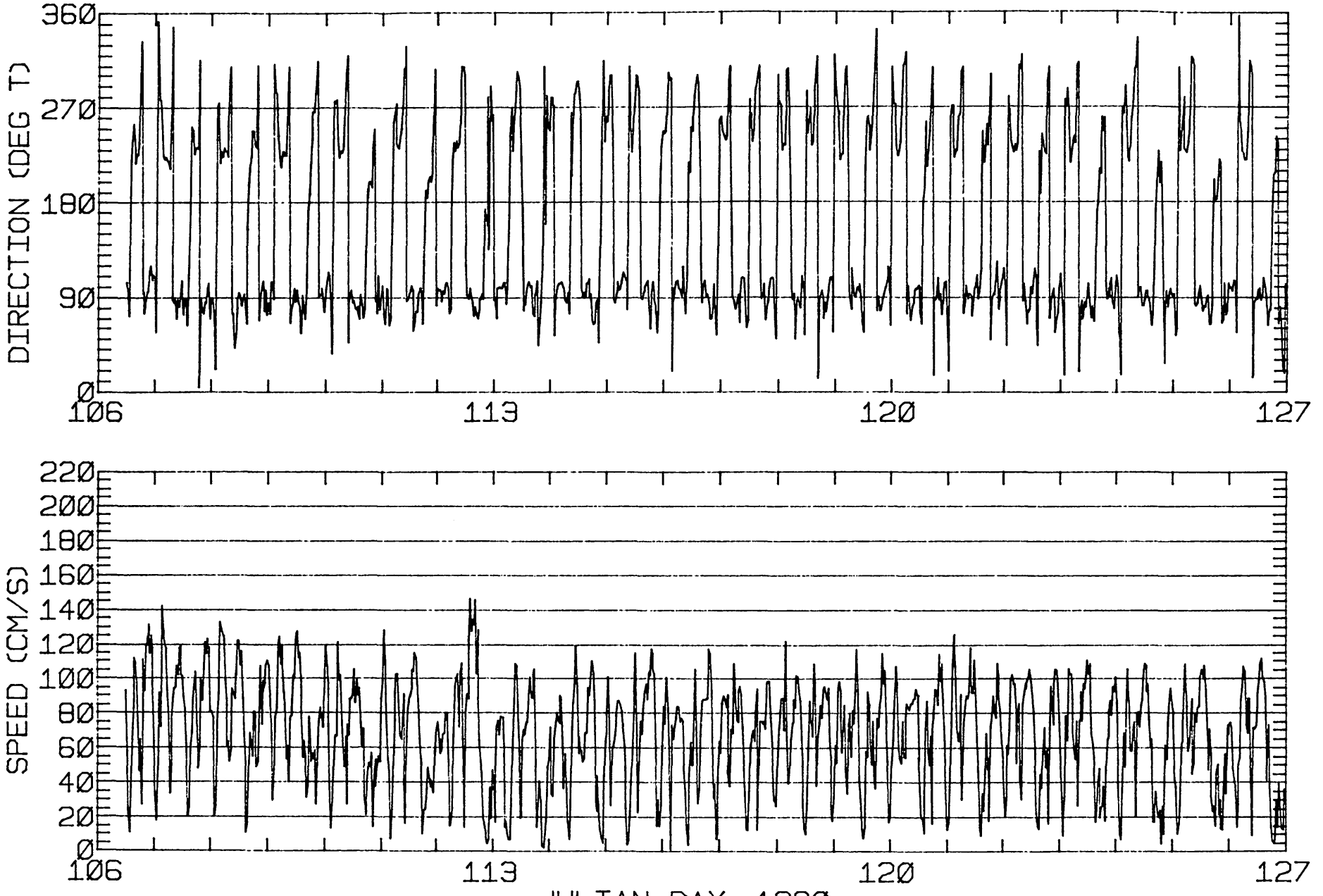
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.98	0.66	83.2	28.2	CLOCKWISE
K1	25.69	3.69	77.6	6.1	CLOCKWISE
N2	16.74	3.77	70.9	246.8	ANTI-CLOCKWISE
M2	80.16	6.98	82.1	284.9	CLOCKWISE
S2	20.90	3.19	78.2	273.9	ANTI-CLOCKWISE
M4	12.68	6.88	0.5	354.5	CLOCKWISE

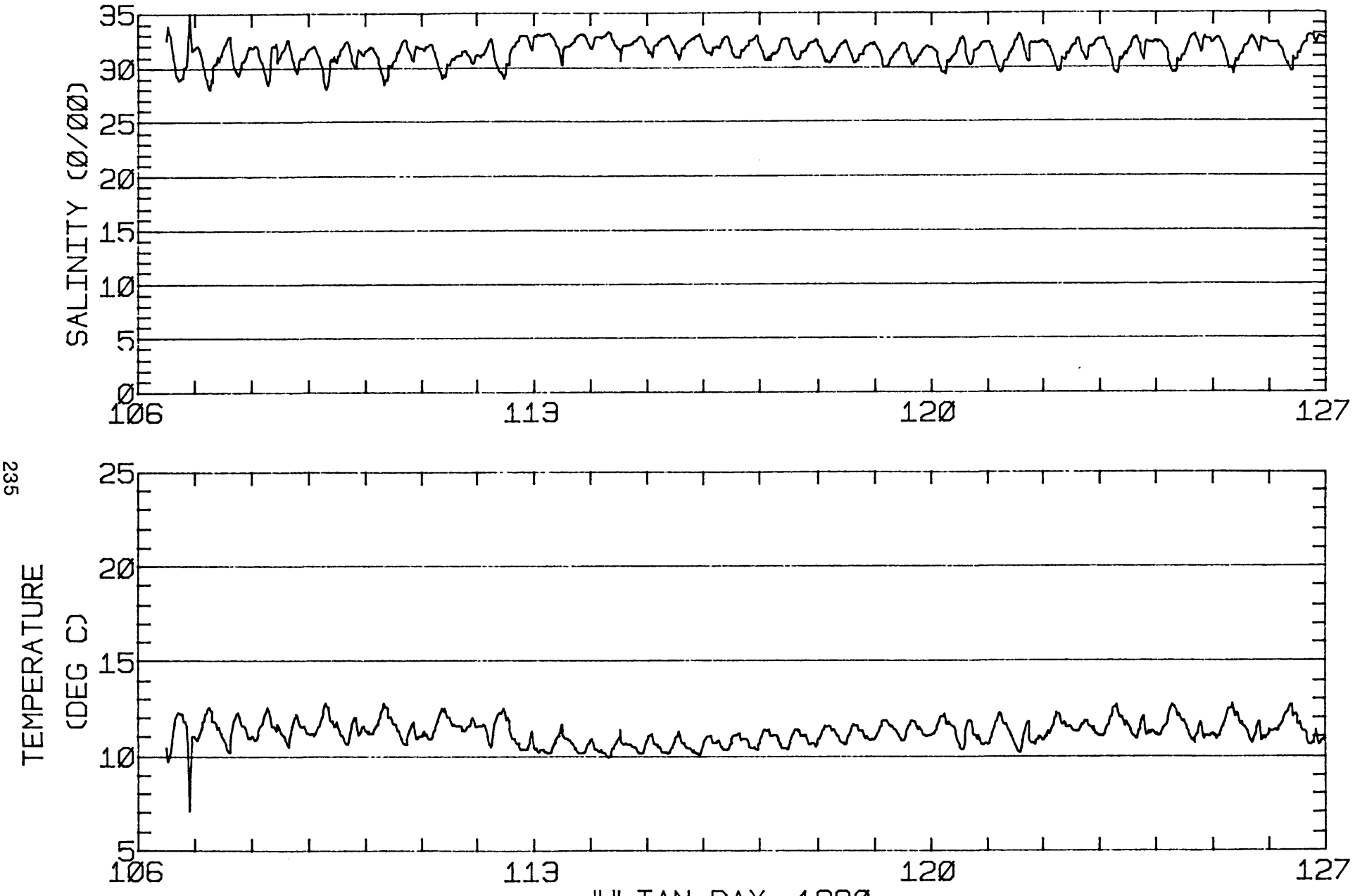
RMS SPEED: 74.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 139.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 46.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 80.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 20.68 CM/SEC
STANDARD DEVIATION V SERIES: 24.29 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	23.4	-9.5	708.
2	12	21.4	-0.0	658.
3	12	21.4	-5.7	610.
4	4	17.6	-2.9	523.
ALL	40	21.6	-4.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-19W
METER 007.6 METERS ABOVE BED. WATER DEPTH 095.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-19W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø95.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'11"N 122 28'24"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 21.3 M (BELOW MLLW)
START TIME OF SERIES: 5/28/80 1610 PST JULIAN DAY=149
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

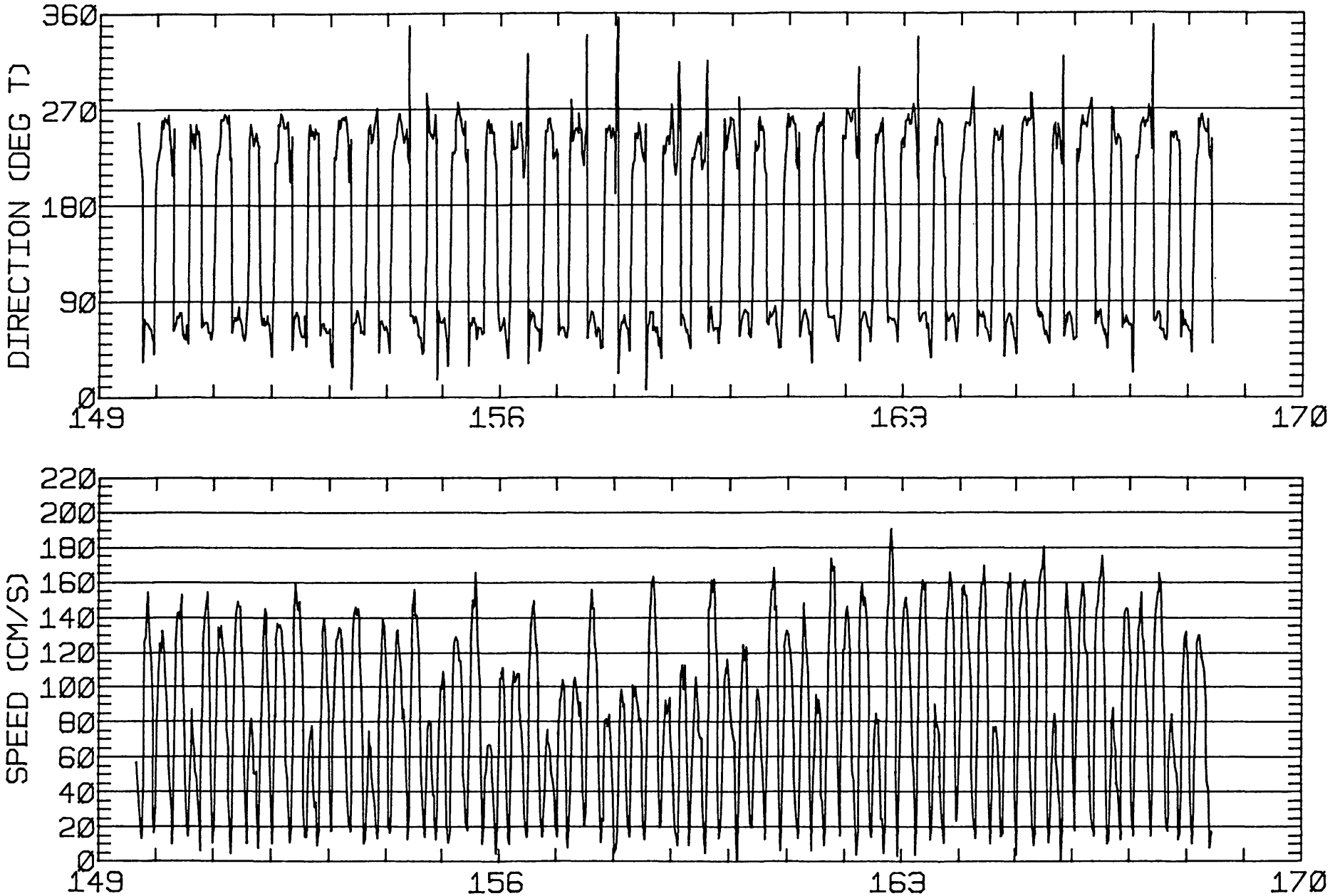
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.64	4.33	71.1	27.2	CLOCKWISE
K1	41.99	1.82	73.9	32.9	ANTI-CLOCKWISE
N2	20.16	3.24	75.3	268.4	ANTI-CLOCKWISE
M2	106.40	0.94	71.1	288.8	ANTI-CLOCKWISE
S2	19.36	1.00	79.0	293.7	ANTI-CLOCKWISE
M4	10.97	2.66	50.9	238.5	ANTI-CLOCKWISE

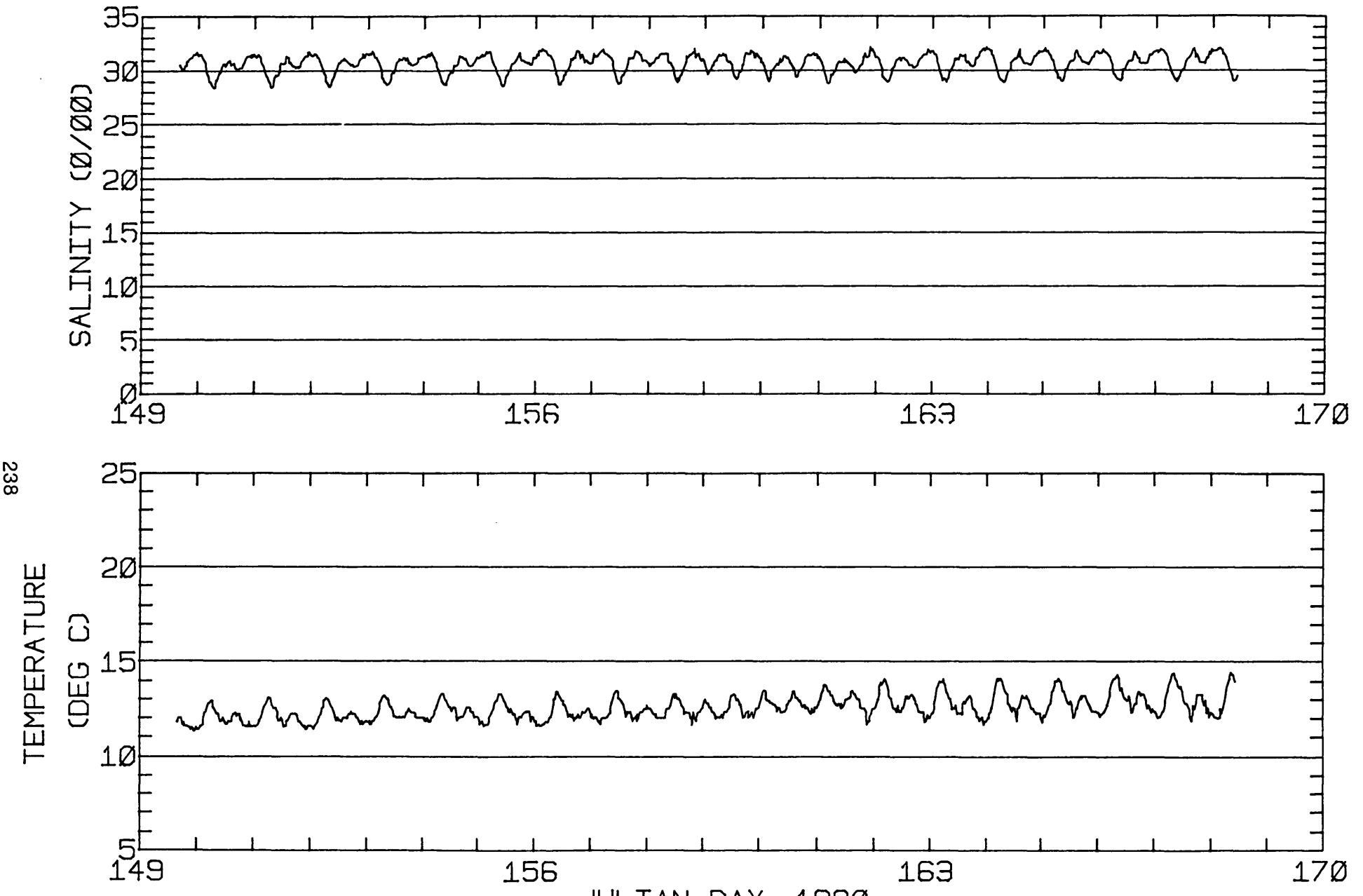
RMS SPEED: 96.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 181.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 58.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 72.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 15.09 CM/SEC
STANDARD DEVIATION V SERIES: 17.76 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.0	5.0	443.
2	12	9.3	1.2	399.
3	12	11.1	5.8	402.
ALL	36	9.5	4.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-24W
METER 076.3 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-24W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'11"N 122 28'24"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 90.0 M (BELOW MLLW)
START TIME OF SERIES: 5/28/80 1734 PST JULIAN DAY=149
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

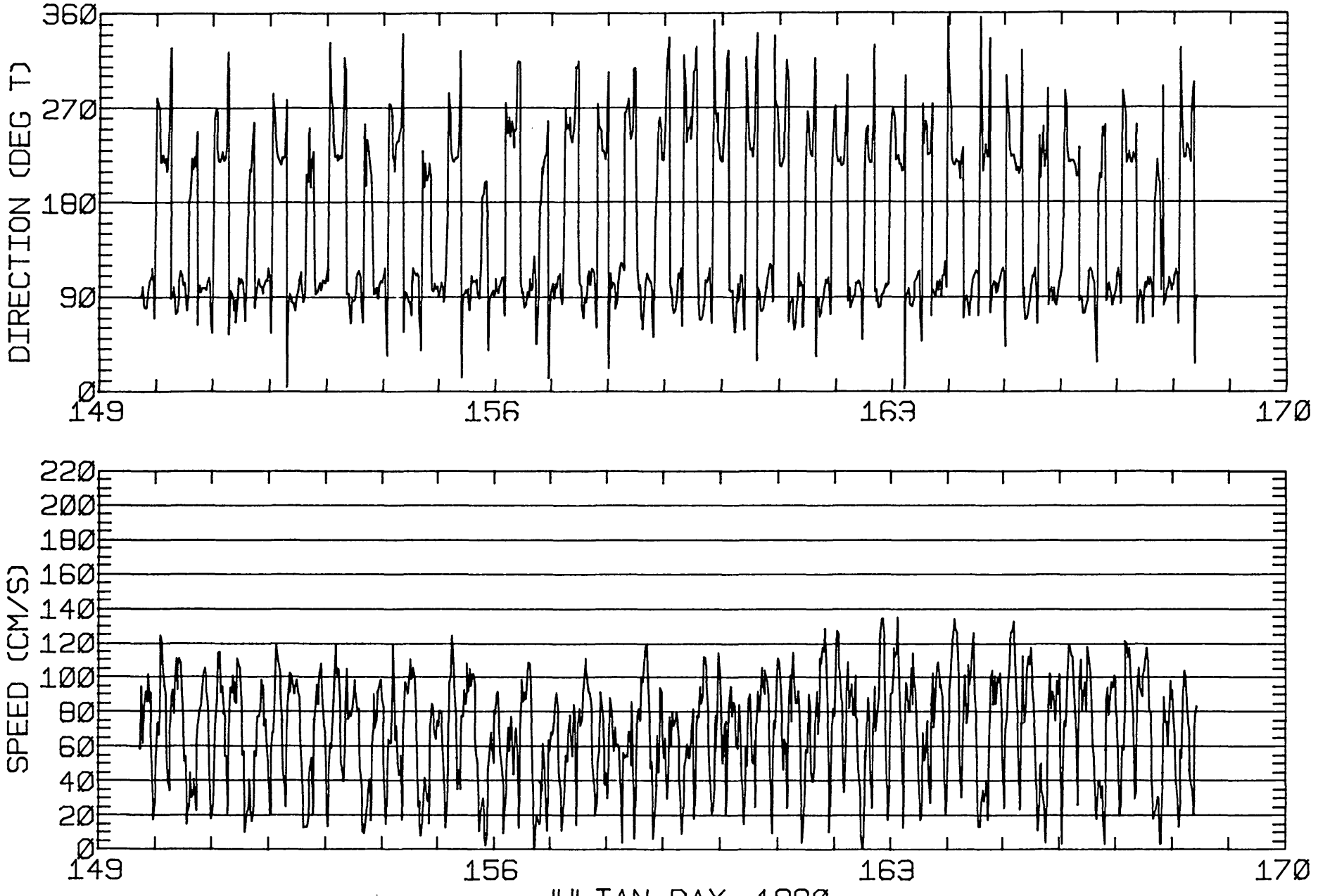
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.73	6.11	65.7	40.9	ANTI-CLOCKWISE
K1	31.69	4.82	72.0	31.6	CLOCKWISE
N2	17.45	4.91	78.9	268.5	CLOCKWISE
M2	67.66	1.02	78.9	280.3	CLOCKWISE
S2	14.83	1.90	61.7	279.1	ANTI-CLOCKWISE
M4	13.32	0.11	21.2	54.8	ANTI-CLOCKWISE

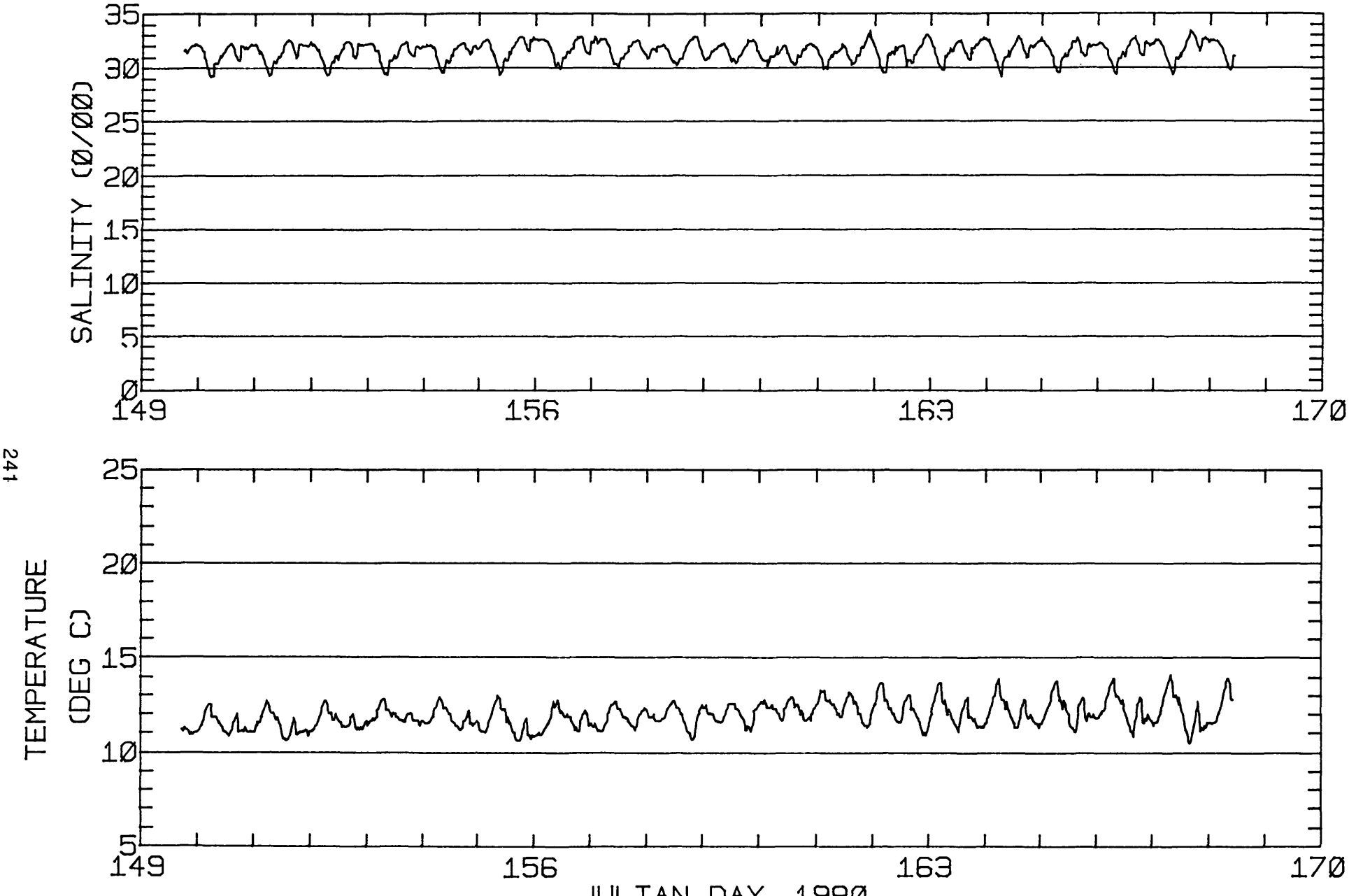
RMS SPEED: 76.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 128.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 73.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.56
STANDARD DEVIATION U-SERIES: 18.22 CM/SEC
STANDARD DEVIATION V SERIES: 24.22 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	27.3	-16.9	443.
2	12	18.1	-9.5	399.
3	10	24.1	-23.1	409.
ALL	34	23.1	-16.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-24W
METER 007.5 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-24W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'11"N 122 28'21"W
METER TYPE: AANDERAA
WATER DEPTH: 97.0 M (MLLW)
METER DEPTH: 89.4 M (BELOW MLLW)
START TIME OF SERIES: 6/16/80 1314 PST JULIAN DAY=168
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

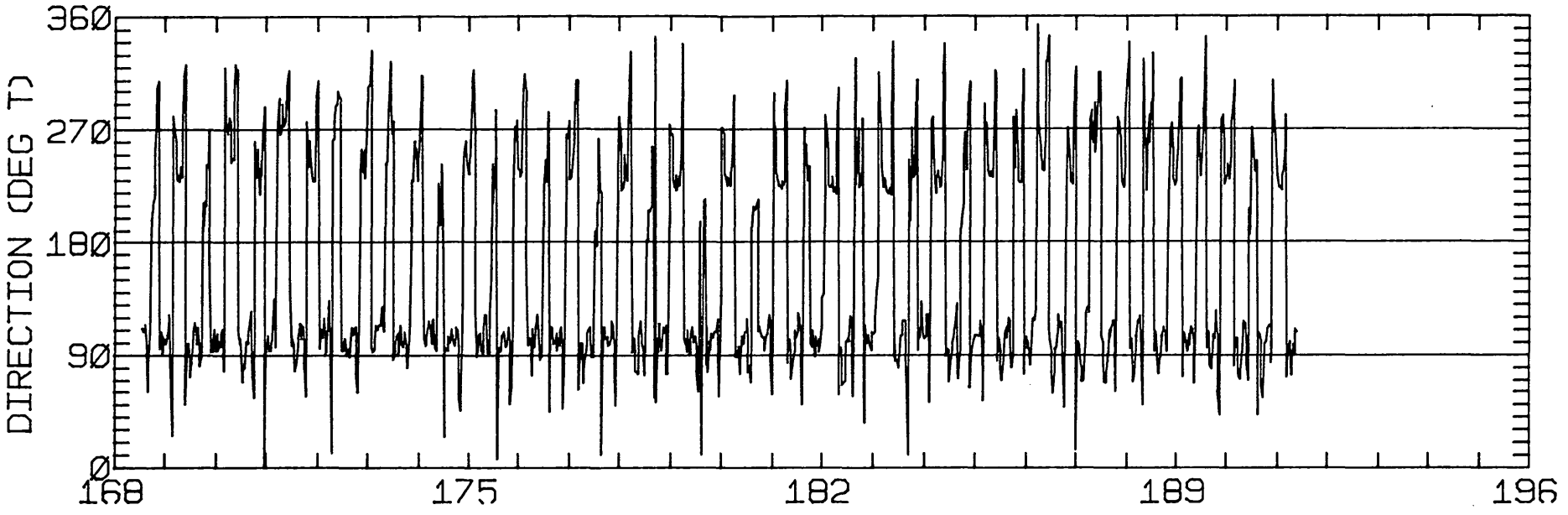
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

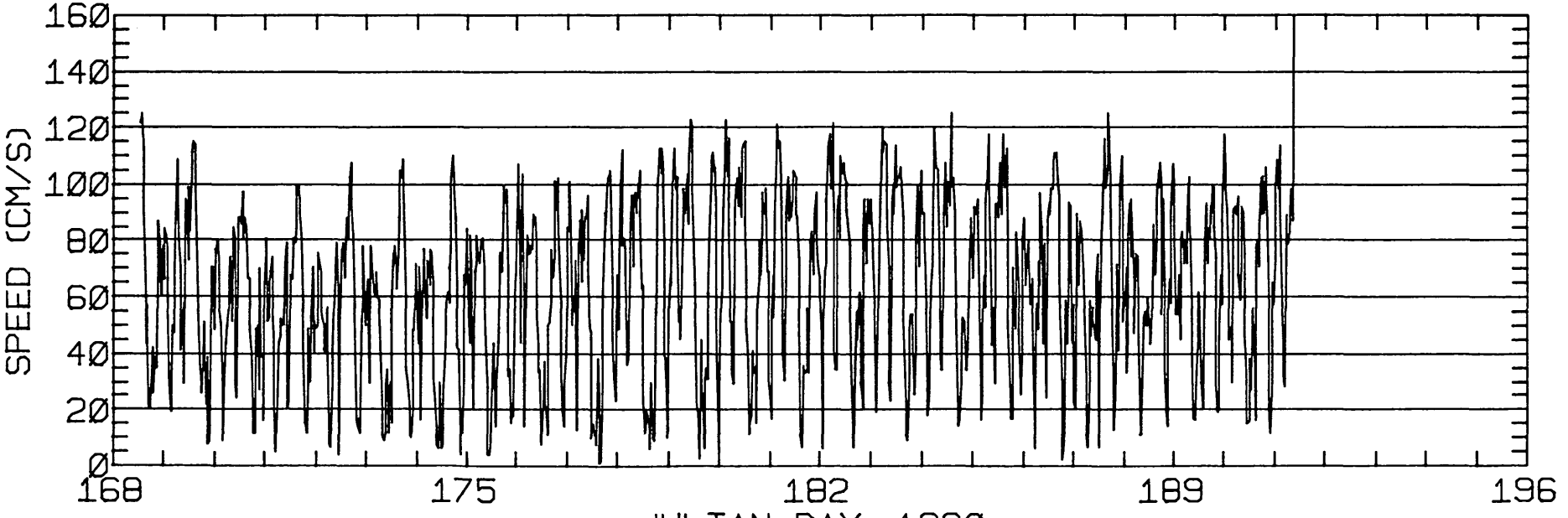
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.94	0.27	74.8	30.7	CLOCKWISE
K1	34.26	3.27	81.2	35.0	CLOCKWISE
N2	12.25	3.08	78.5	249.6	ANTI-CLOCKWISE
M2	76.68	4.94	87.6	282.1	CLOCKWISE
S2	11.90	3.12	65.0	288.3	ANTI-CLOCKWISE
M4	12.78	2.67	27.4	47.0	CLOCKWISE

RMS SPEED: 70.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 137.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 45.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 82.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.56
STANDARD DEVIATION U-SERIES: 17.26 CM/SEC
STANDARD DEVIATION V SERIES: 23.02 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	23.8	-8.8	443.
2	12	25.1	-14.1	449.
3	12	19.7	-16.8	406.
4	6	16.8	-8.7	391.
ALL	42	22.0	-12.6	



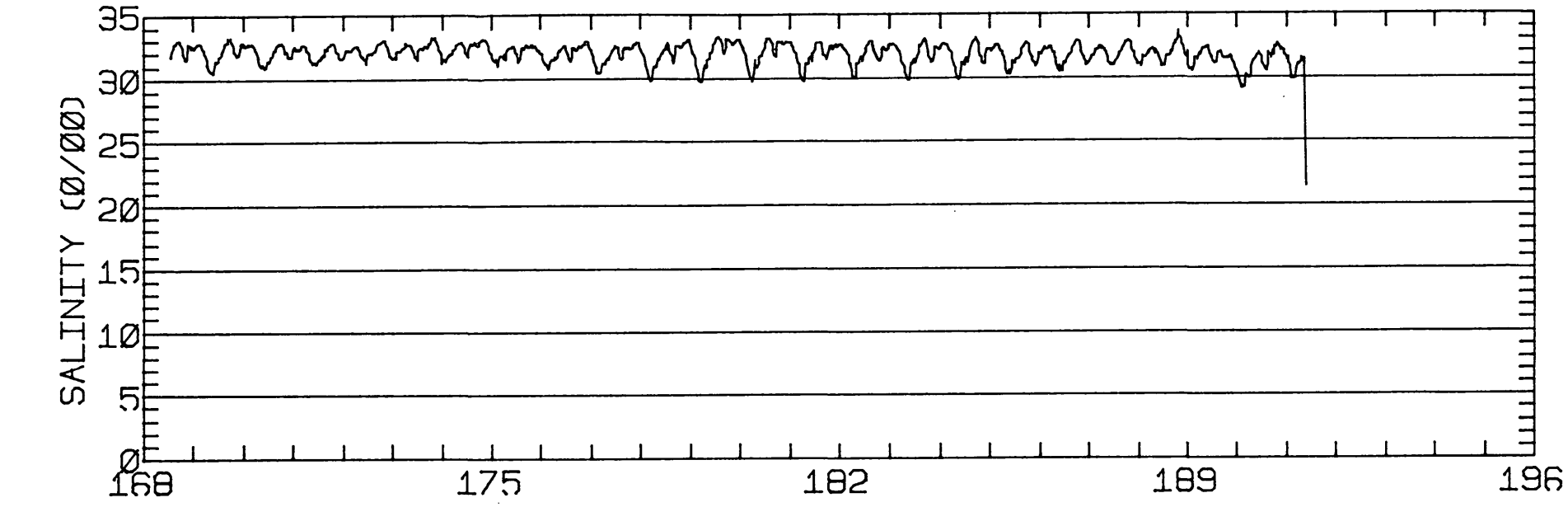


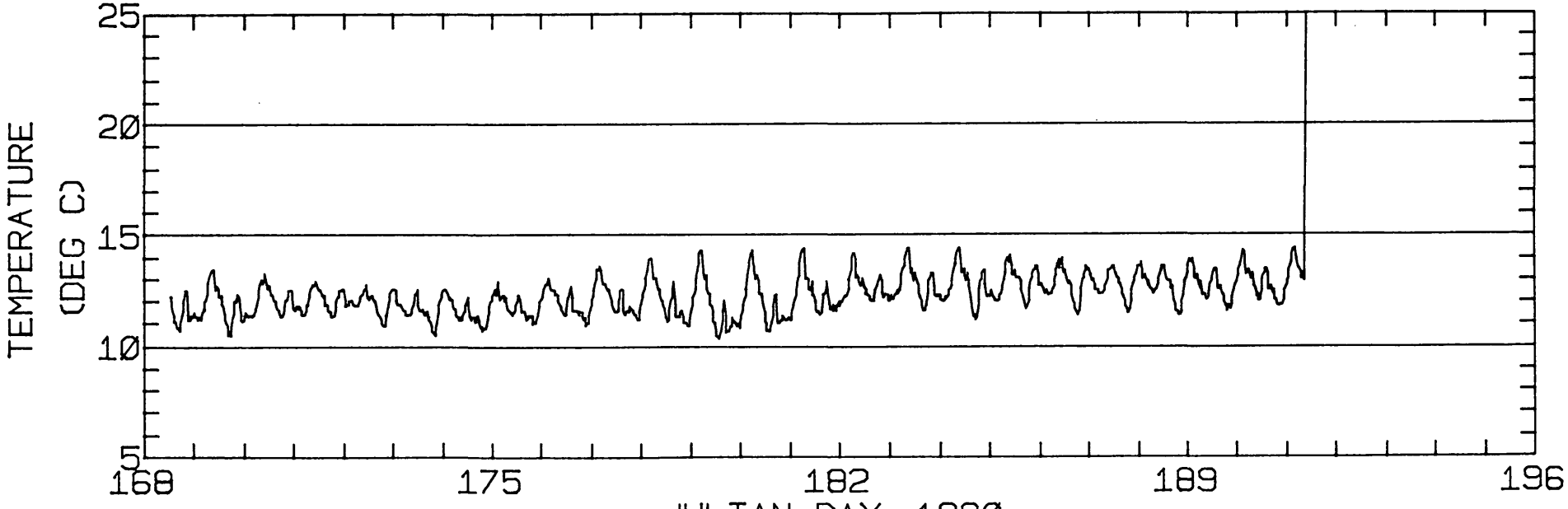
JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 1 37-49-11N 122-28-21W

METER 007.5 METERS ABOVE BED. WATER DEPTH 097.0 METERS.





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-21W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø97.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'24"W
METER TYPE: AANDERAA
WATER DEPTH: 97.9 M (MLLW)
METER DEPTH: 21.7 M (BELOW MLLW)
START TIME OF SERIES: 7/ 9/80 1050 PST JULIAN DAY=191
APPROXIMATE RECORD LENGTH IS 8 M2-CYCLES

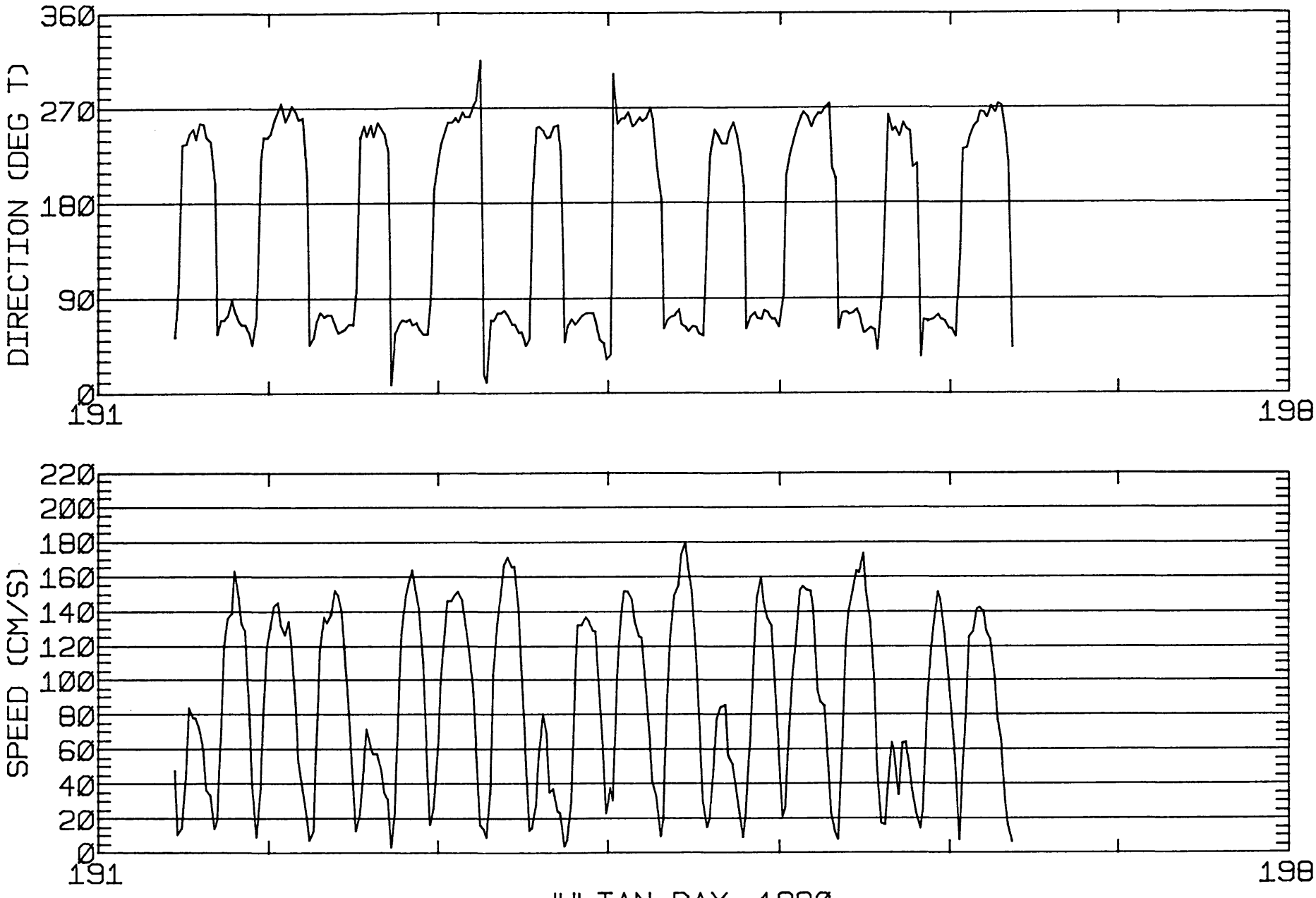
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	23.12	7.26	80.2	47.1	CLOCKWISE
K1	35.60	1.19	75.7	50.1	ANTI-CLOCKWISE
N2	36.40	15.65	108.1	354.6	CLOCKWISE
M2	148.12	3.67	85.9	288.1	ANTI-CLOCKWISE
S2	16.47	9.54	92.4	10.6	CLOCKWISE
M4	12.67	4.26	45.4	297.2	ANTI-CLOCKWISE

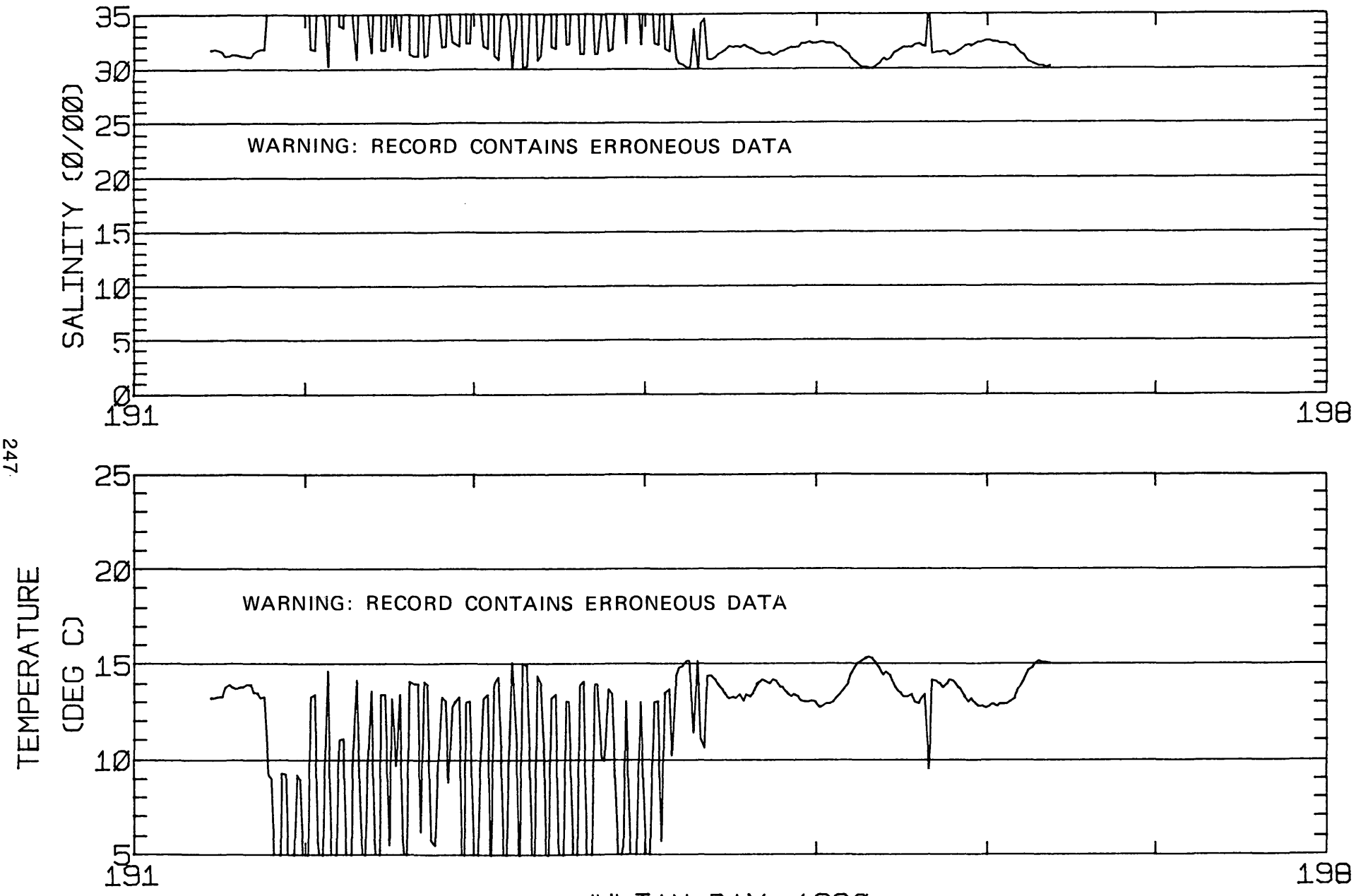
RMS SPEED: 103.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 223.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 119.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 84.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 15.92 CM/SEC
STANDARD DEVIATION V SERIES: 17.40 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	8	12.4	9.4	292.
ALL	8	12.4	9.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-24W
METER 076.2 METERS ABOVE BED. WATER DEPTH 097.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-24W
METER Ø76.2 METERS ABOVE BED. WATER DEPTH Ø97.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'24"W
METER TYPE: AANDERAA
WATER DEPTH: 97.9 M (MLLW)
METER DEPTH: 52.2 M (BELOW MLLW)
START TIME OF SERIES: 7/ 9/80 1102 PST JULIAN DAY=191
APPROXIMATE RECORD LENGTH IS 8 M2-CYCLES

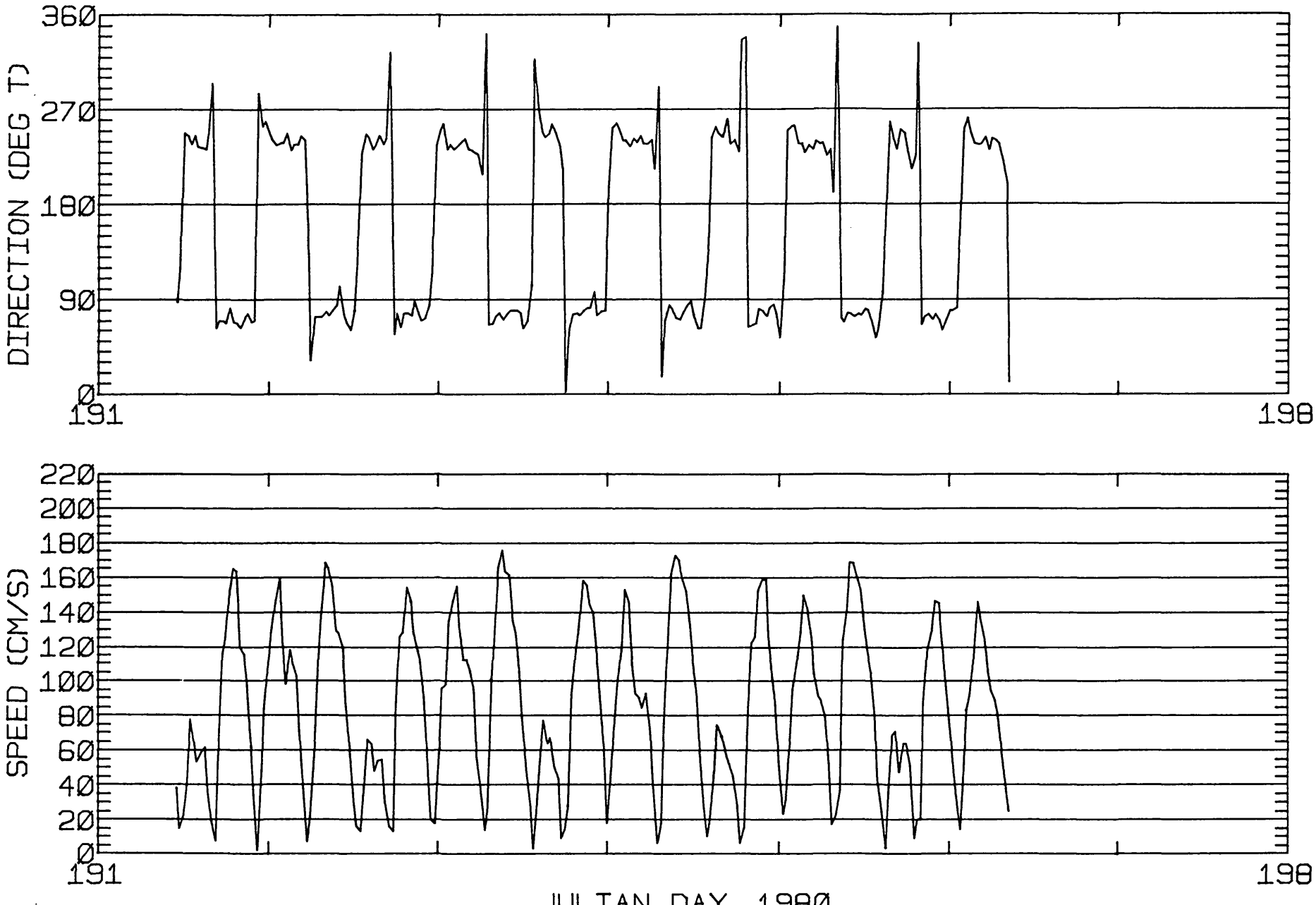
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	21.40	2.01	72.7	57.1	CLOCKWISE
K1	34.61	6.31	57.6	45.2	ANTI-CLOCKWISE
N2	37.40	22.46	44.8	351.3	ANTI-CLOCKWISE
M2	146.76	14.34	56.6	286.6	ANTI-CLOCKWISE
S2	18.06	12.09	111.7	324.9	ANTI-CLOCKWISE
M4	14.08	3.57	108.1	245.8	CLOCKWISE

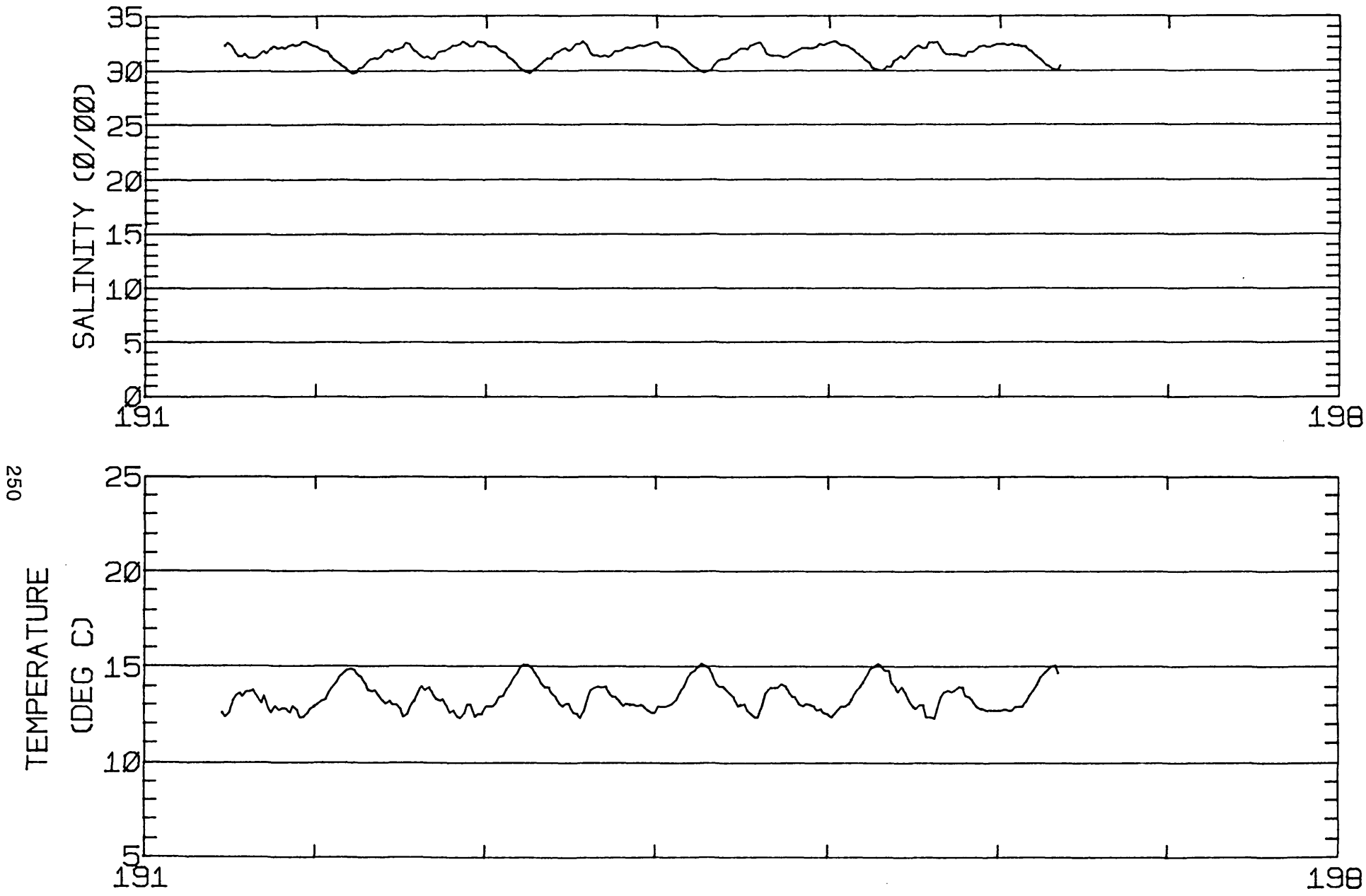
RMS SPEED: 101.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 220.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 115.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 62.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 16.56 CM/SEC
STANDARD DEVIATION V SERIES: 12.95 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	8	21.3	-3.6	292.
ALL	8	21.3	-3.6	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-24W
METER 045.7 METERS ABOVE BED. WATER DEPTH 097.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-24W
METER Ø45.7 METERS ABOVE BED. WATER DEPTH Ø97.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'21"W
METER TYPE: AANDERAA
WATER DEPTH: 97.3 M (MLLW)
METER DEPTH: 21.0 M (BELOW MLLW)
START TIME OF SERIES: 7/14/80 1050 PST JULIAN DAY=196
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

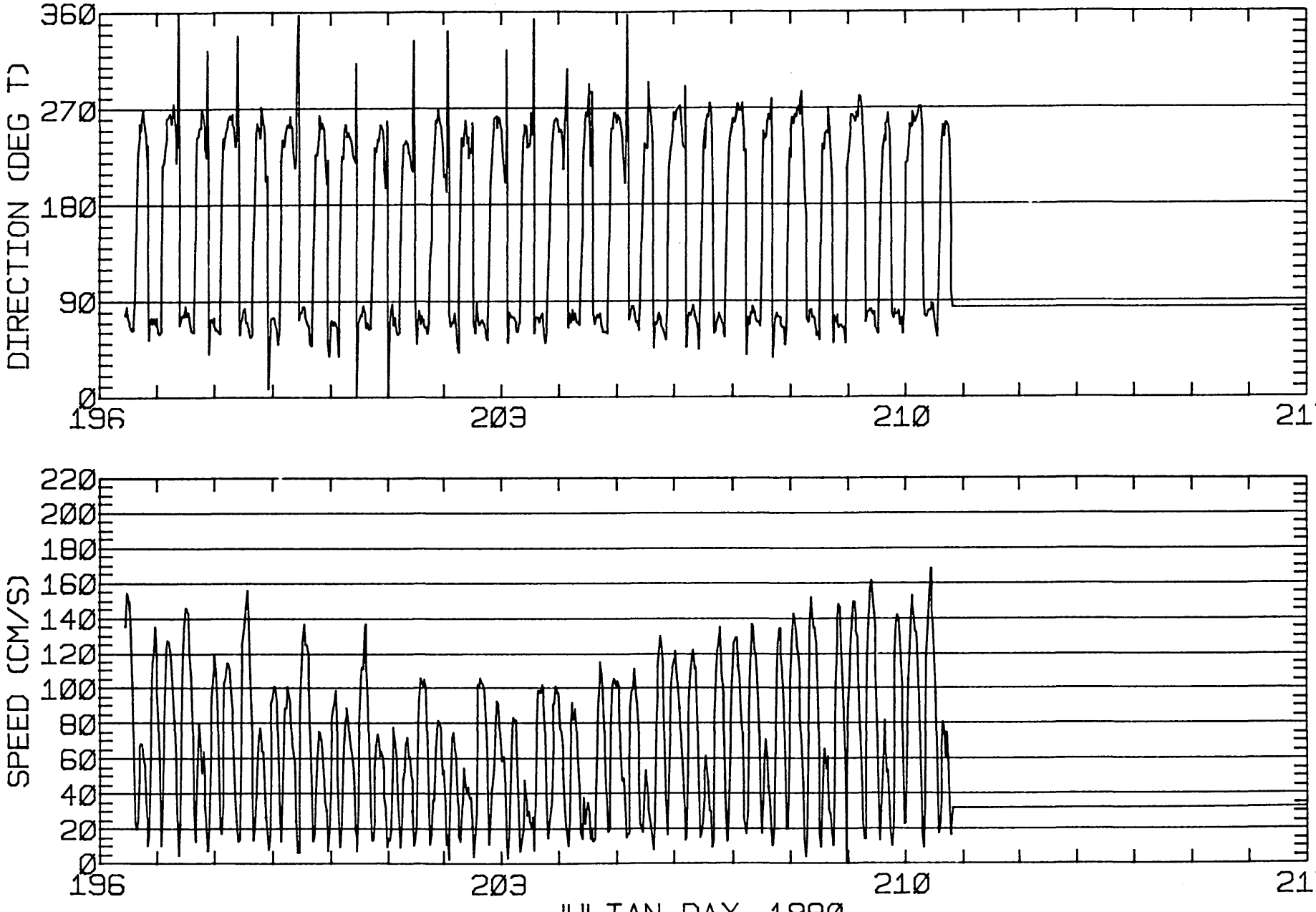
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.61	0.70	84.1	35.0	ANTI-CLOCKWISE
K1	40.24	1.44	76.5	53.8	ANTI-CLOCKWISE
N2	18.29	2.84	82.2	268.6	CLOCKWISE
M2	109.00	2.54	74.3	289.4	CLOCKWISE
S2	18.72	0.90	87.3	308.5	ANTI-CLOCKWISE
M4	11.10	1.55	45.1	251.3	ANTI-CLOCKWISE

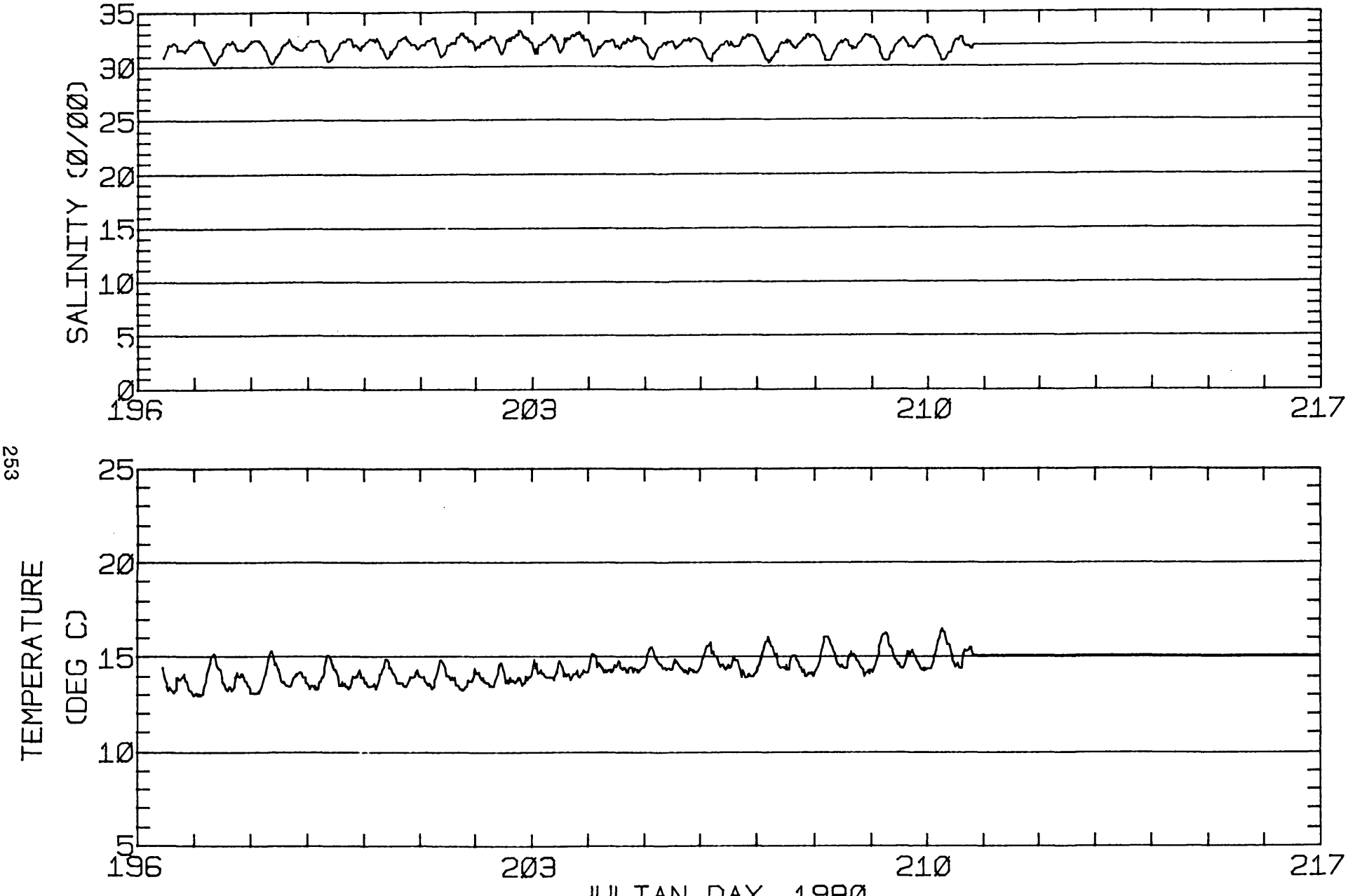
RMS SPEED: 78.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 184.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 66.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 77.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.45
STANDARD DEVIATION U-SERIES: 12.07 CM/SEC
STANDARD DEVIATION V SERIES: 14.14 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.8	0.7	286.
2	12	8.5	3.0	301.
3	2	9.5	3.9	308.
ALL	26	9.2	2.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-21W
METER 076.3 METERS ABOVE BED. WATER DEPTH 097.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-21W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø97.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'21"W
METER TYPE: AANDERAA
WATER DEPTH: 97.3 M (MLLW)
METER DEPTH: 51.5 M (BELOW MLLW)
START TIME OF SERIES: 7/14/80 1042 PST JULIAN DAY=196
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

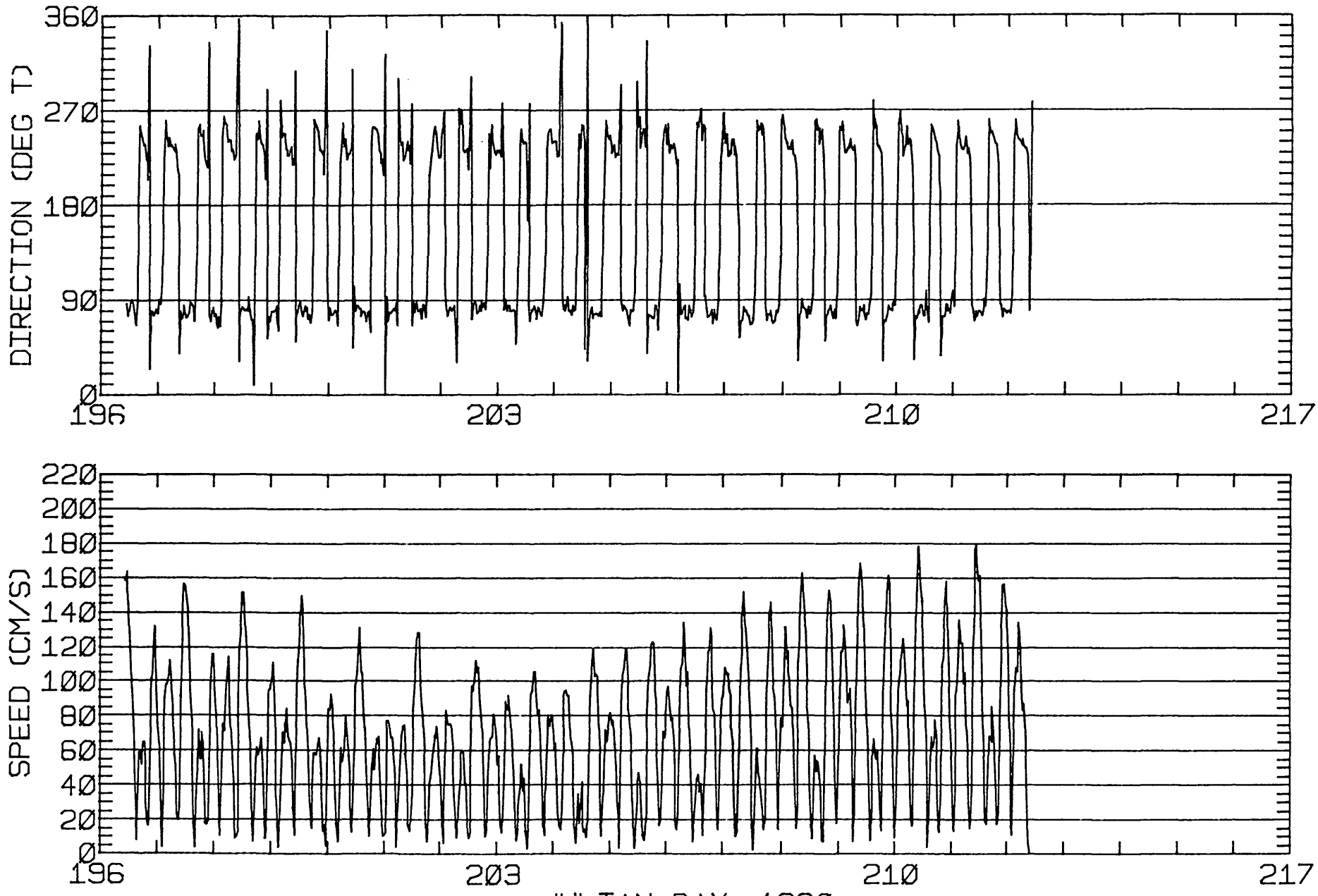
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.91	2.92	53.8	33.5	ANTI-CLOCKWISE
K1	36.53	2.09	68.0	52.3	ANTI-CLOCKWISE
N2	15.48	0.50	73.1	261.1	ANTI-CLOCKWISE
M2	104.32	2.35	72.1	287.8	ANTI-CLOCKWISE
S2	15.76	0.06	70.4	304.3	ANTI-CLOCKWISE
M4	9.61	4.14	106.9	208.2	CLOCKWISE

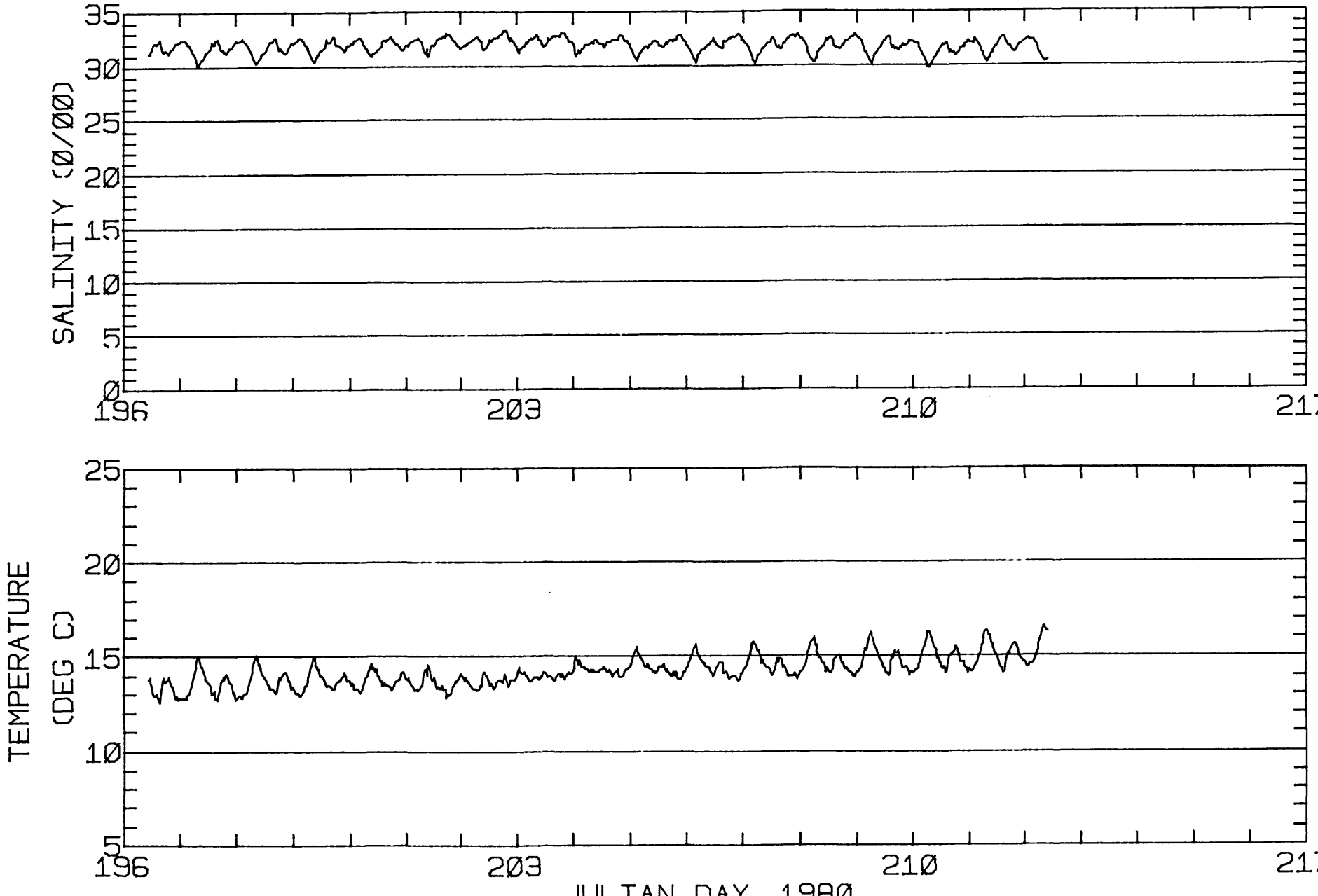
RMS SPEED: 81.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 170.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 65.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 69.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 14.10 CM/SEC
STANDARD DEVIATION V SERIES: 10.51 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	19.2	-4.6	286.
2	12	20.7	-3.0	301.
3	6	23.7	-7.8	311.
ALL	30	20.7	-4.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-21W
METER 045.8 METERS ABOVE BED. WATER DEPTH 097.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-21W
METER Ø45.8 METERS ABOVE BED. WATER DEPTH Ø97.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'21"W
METER TYPE: AANDERAA
WATER DEPTH: 97.3 M (MLLW)
METER DEPTH: 89.7 M (BELOW MLLW)
START TIME OF SERIES: 7/14/80 1044 PST JULIAN DAY=196
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

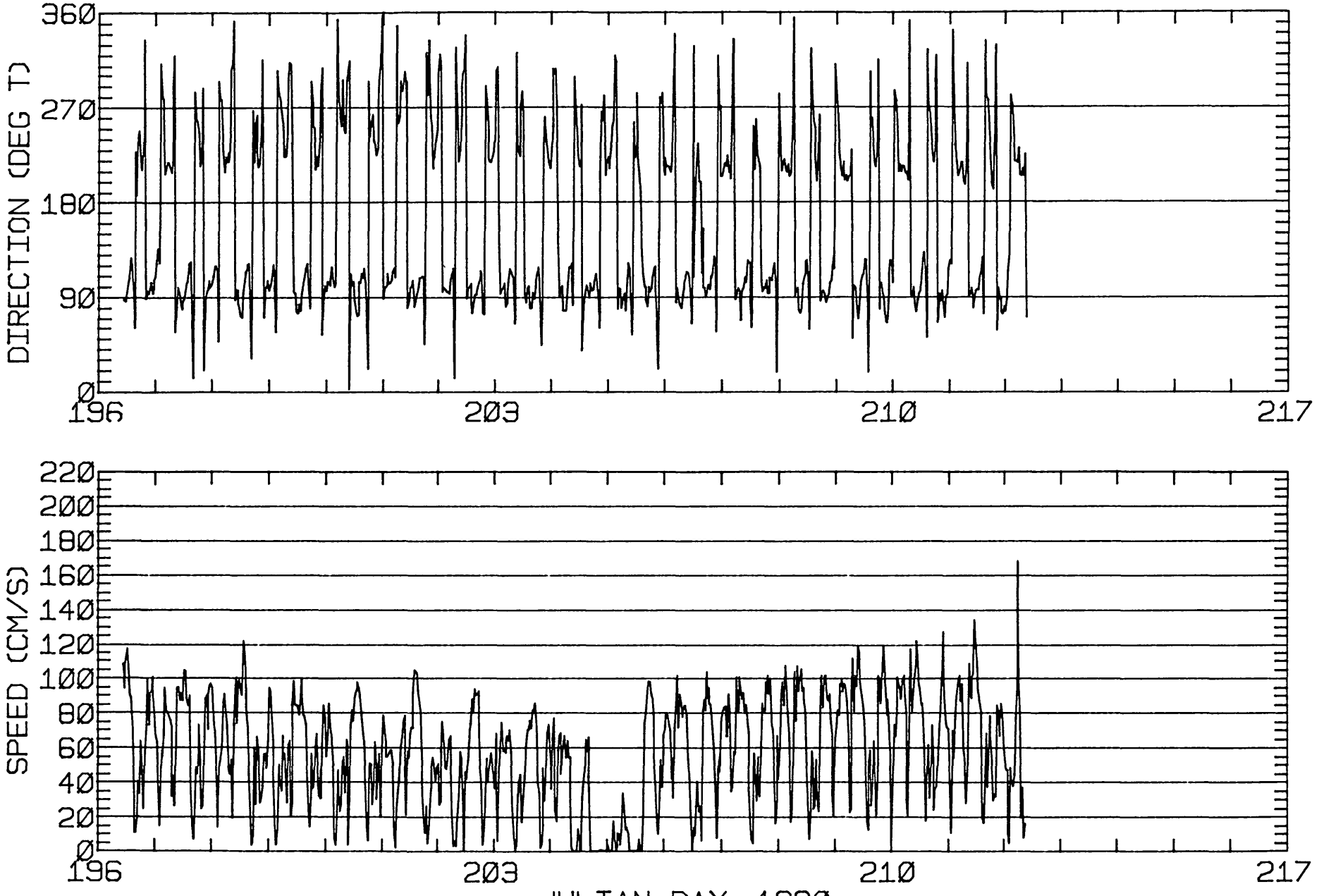
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.97	2.00	40.2	36.0	ANTI-CLOCKWISE
K1	25.73	0.31	73.6	52.0	CLOCKWISE
N2	11.44	5.78	67.4	255.6	ANTI-CLOCKWISE
M2	70.23	0.58	81.9	280.5	CLOCKWISE
S2	13.09	3.28	52.8	317.5	CLOCKWISE
M4	11.65	3.46	17.2	77.2	CLOCKWISE

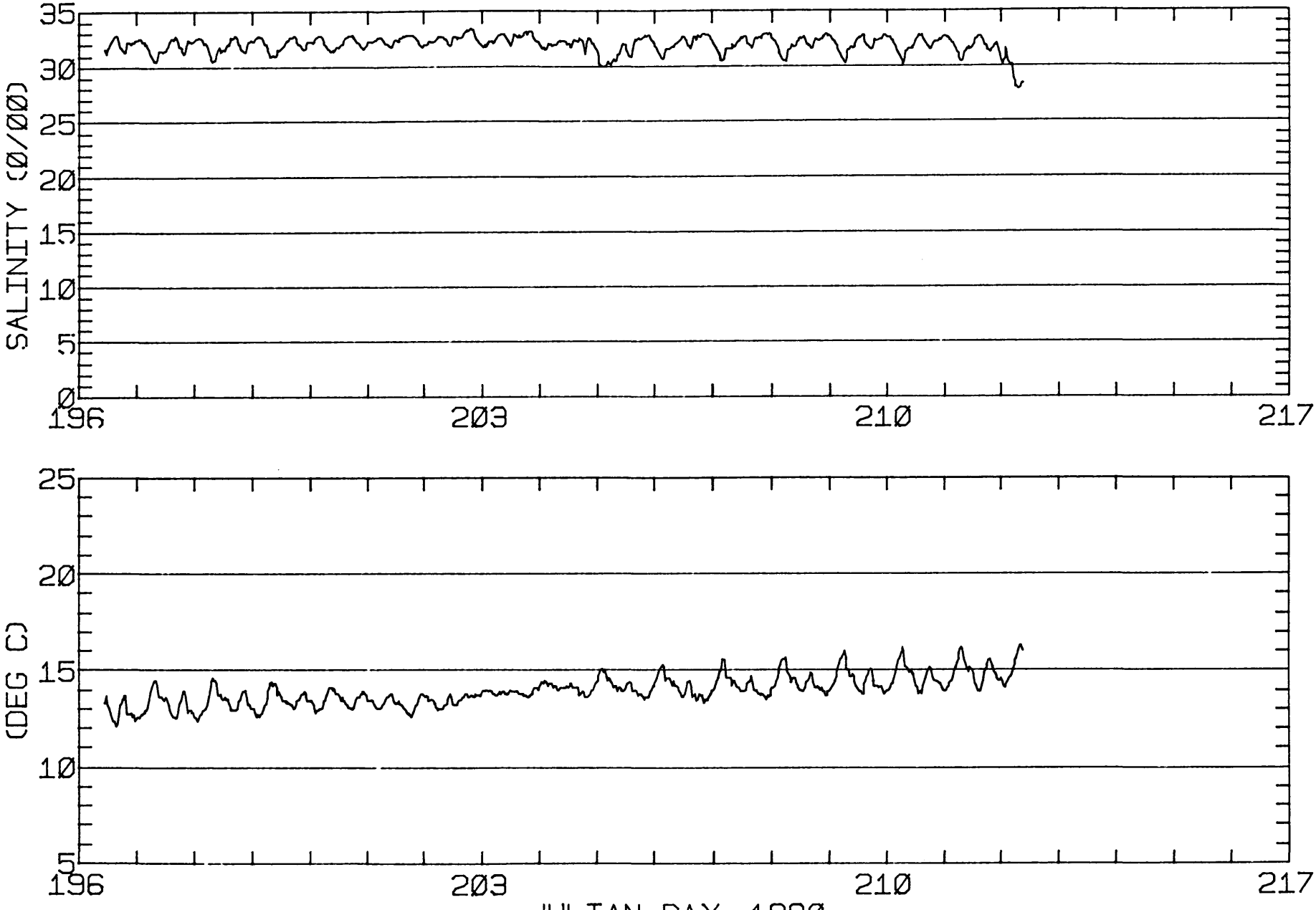
RMS SPEED: 66.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 119.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 73.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 20.44 CM/SEC
STANDARD DEVIATION V SERIES: 22.05 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	23.4	-9.8	286.
2	12	22.5	-12.5	301.
3	6	24.7	-21.7	311.
ALL	30	23.3	-13.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-21W
METER 007.6 METERS ABOVE BED. WATER DEPTH 097.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-21W
METER Ø07.6 METERS ABOVE BED. WATER DEPTH Ø97.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'11"N 122 28'25"W
METER TYPE: AANDERAA
WATER DEPTH: 98.2 M (MLLW)
METER DEPTH: 22.0 M (BELOW MLLW)
START TIME OF SERIES: 7/30/80 1140 PST JULIAN DAY=212
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

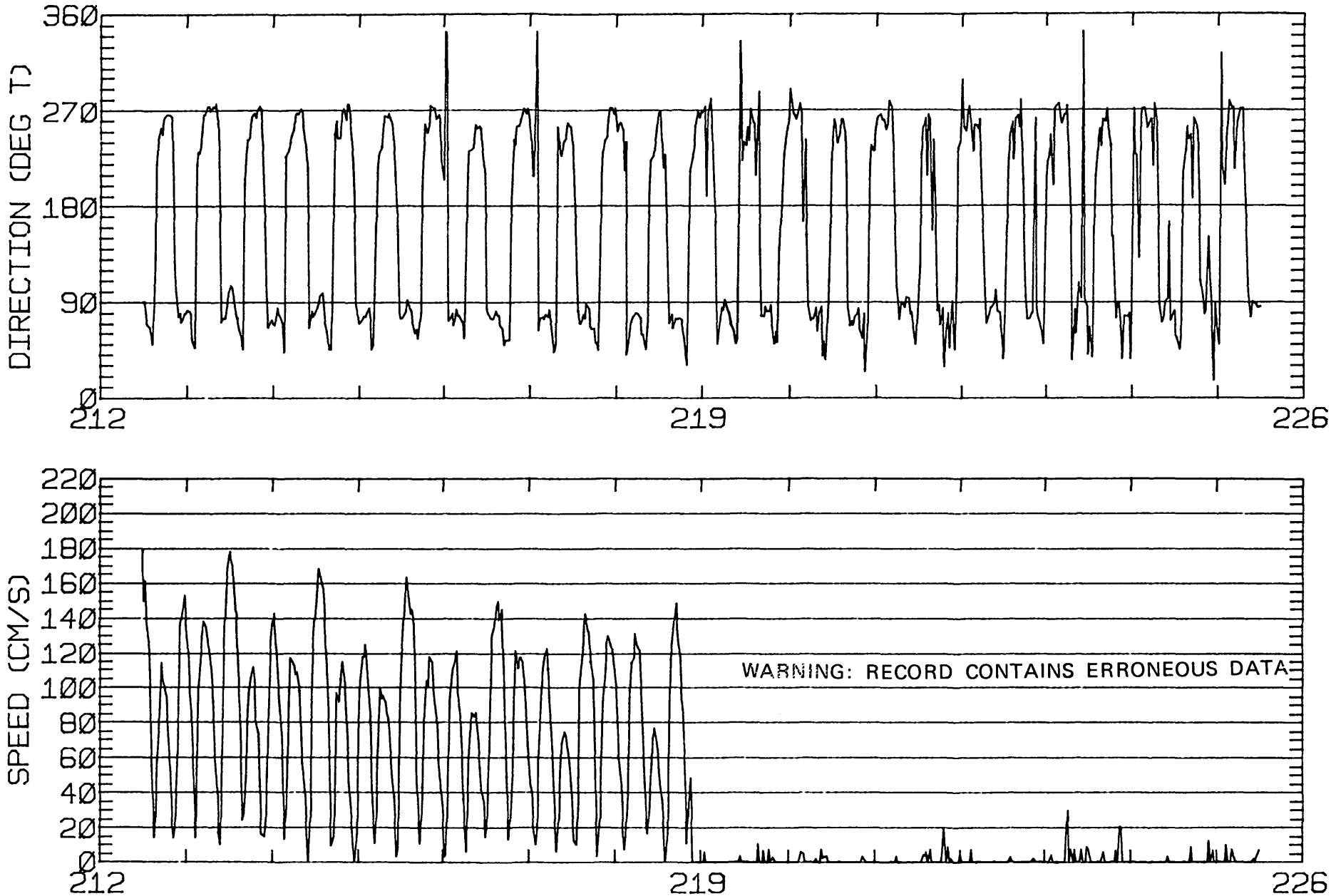
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	22.20	6.56	87.4	39.6	ANTI-CLOCKWISE
K1	45.35	9.57	87.0	58.2	ANTI-CLOCKWISE
N2	38.39	17.28	30.1	191.3	CLOCKWISE
M2	128.84	28.19	68.6	300.5	ANTI-CLOCKWISE
S2	36.38	2.79	68.4	295.4	CLOCKWISE
M4	11.95	4.14	32.1	258.8	ANTI-CLOCKWISE

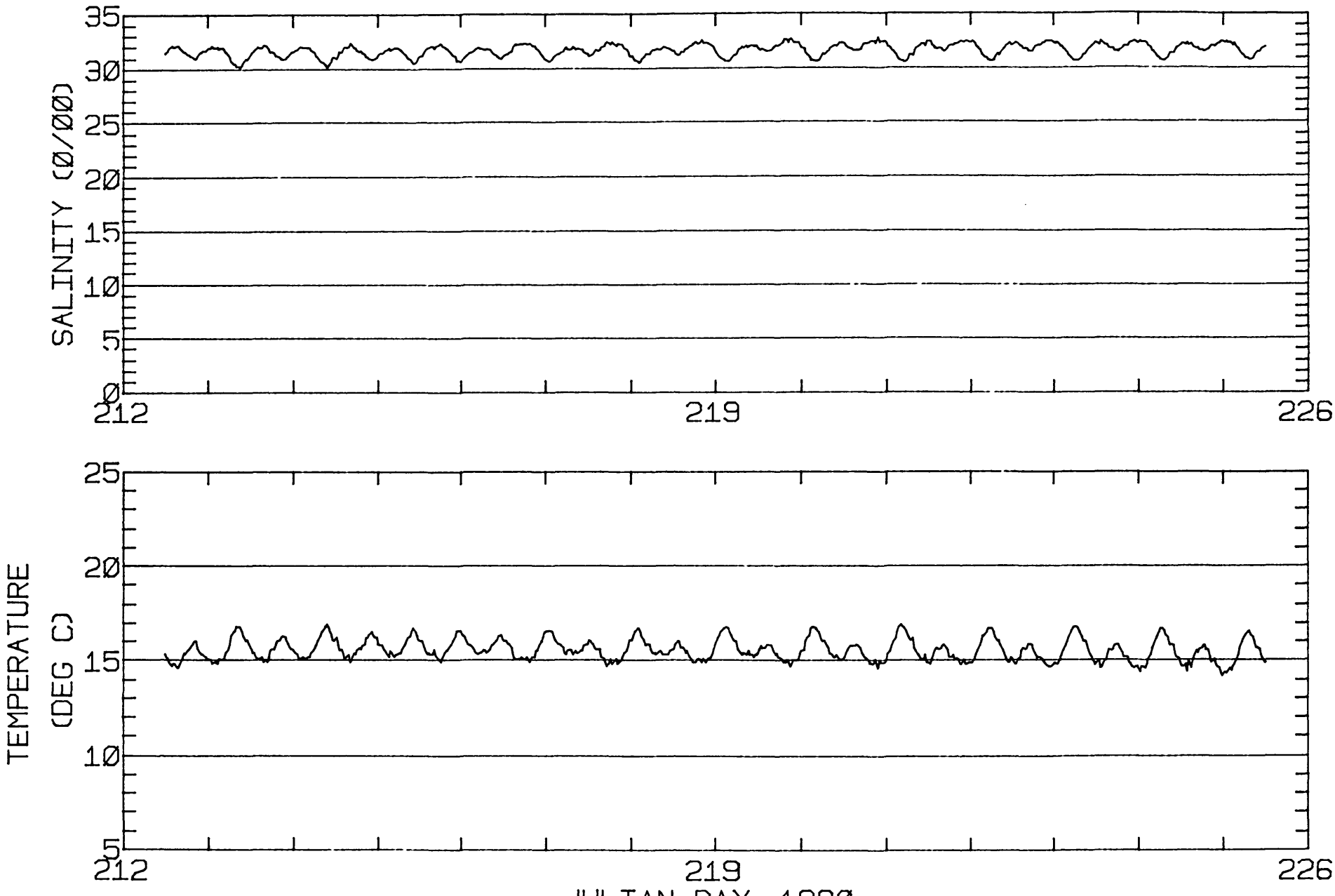
RMS SPEED: 94.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 232.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 69.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 74.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 11.27 CM/SEC
STANDARD DEVIATION V SERIES: 18.36 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	12.8	2.6	214.
ALL	10	12.8	2.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-25W
METER 076.2 METERS ABOVE BED. WATER DEPTH 098.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-25W
METER Ø76.2 METERS ABOVE BED. WATER DEPTH Ø98.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'11"N 122 28'25"W
METER TYPE: AANDERAA
WATER DEPTH: 98.2 M (MLLW)
METER DEPTH: 90.6 M (BELOW MLLW)
START TIME OF SERIES: 7/30/80 1144 PST JULIAN DAY=212
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

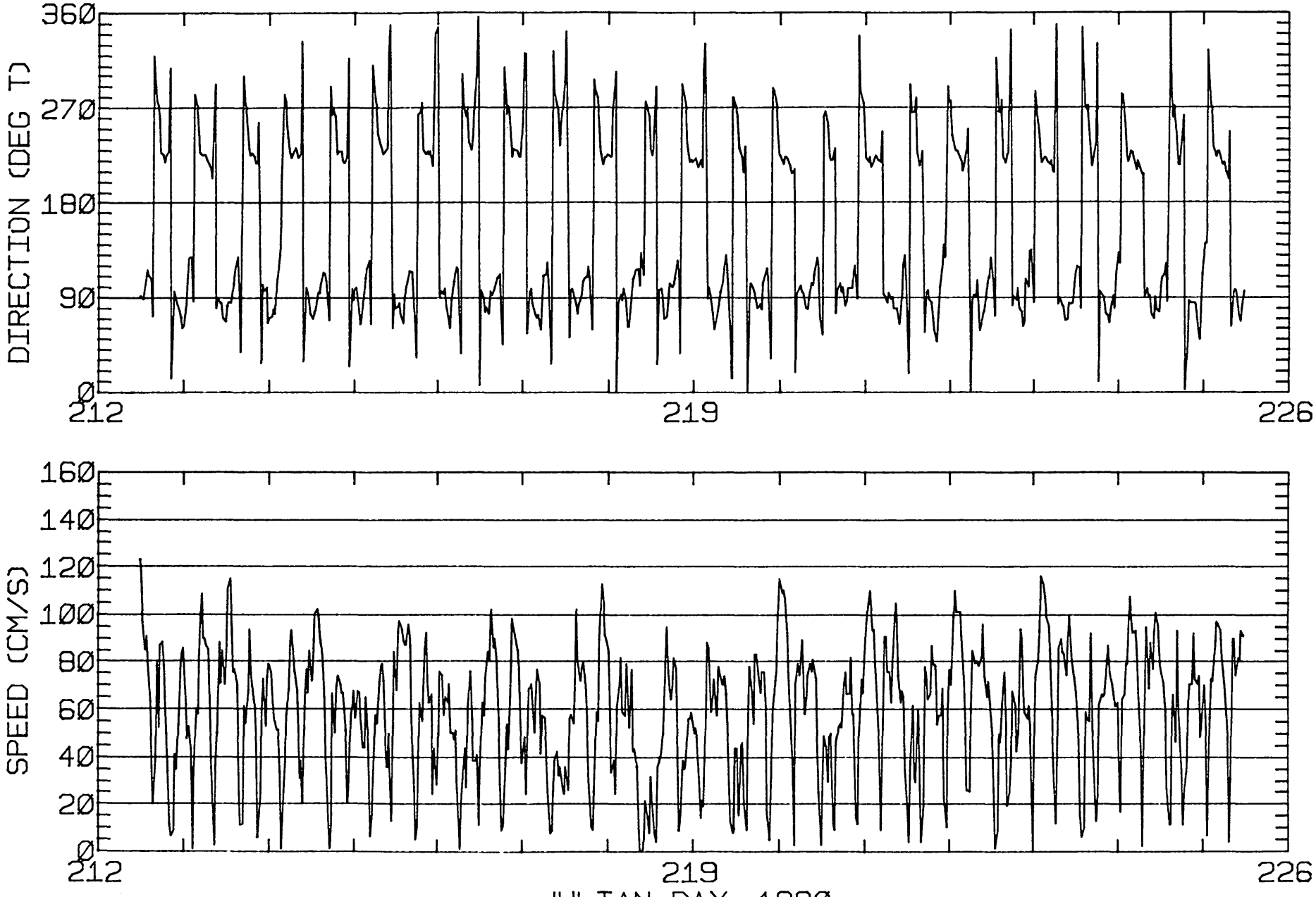
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
01	13.10	4.27	33.3	44.7	ANTI-CLOCKWISE
K1	25.26	2.57	68.9	51.9	ANTI-CLOCKWISE
N2	11.03	0.44	86.0	279.8	CLOCKWISE
M2	68.14	0.17	72.2	281.9	ANTI-CLOCKWISE
S2	16.52	0.65	57.6	304.3	ANTI-CLOCKWISE
M4	10.87	1.59	17.1	90.6	ANTI-CLOCKWISE

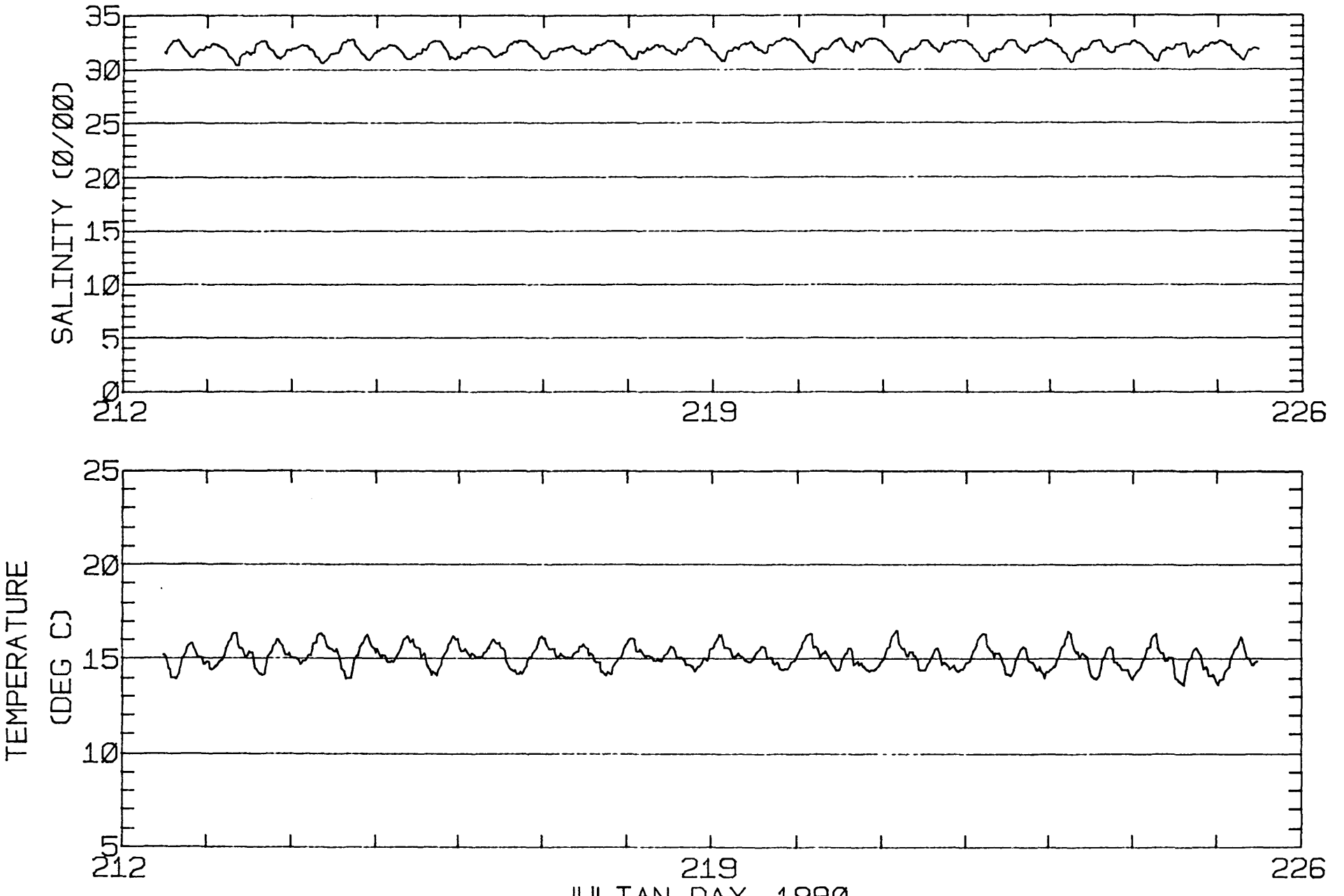
RMS SPEED: 65.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 123.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.45
STANDARD DEVIATION U-SERIES: 14.92 CM/SEC
STANDARD DEVIATION V SERIES: 20.43 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	14.2	-9.5	207.
2	12	16.1	-14.3	145.
ALL	24	15.2	-11.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-25W
METER 007.5 METERS ABOVE BED. WATER DEPTH 098.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-25W
METER Ø07.5 METERS ABOVE BED. WATER DEPTH Ø98.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'11"N 122 28'23"W
METER TYPE: AANDERAA
WATER DEPTH: 97.0 M (MLLW)
METER DEPTH: 21.0 M (BELOW MLLW)
START TIME OF SERIES: 8/13/80 1050 PST JULIAN DAY=226
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

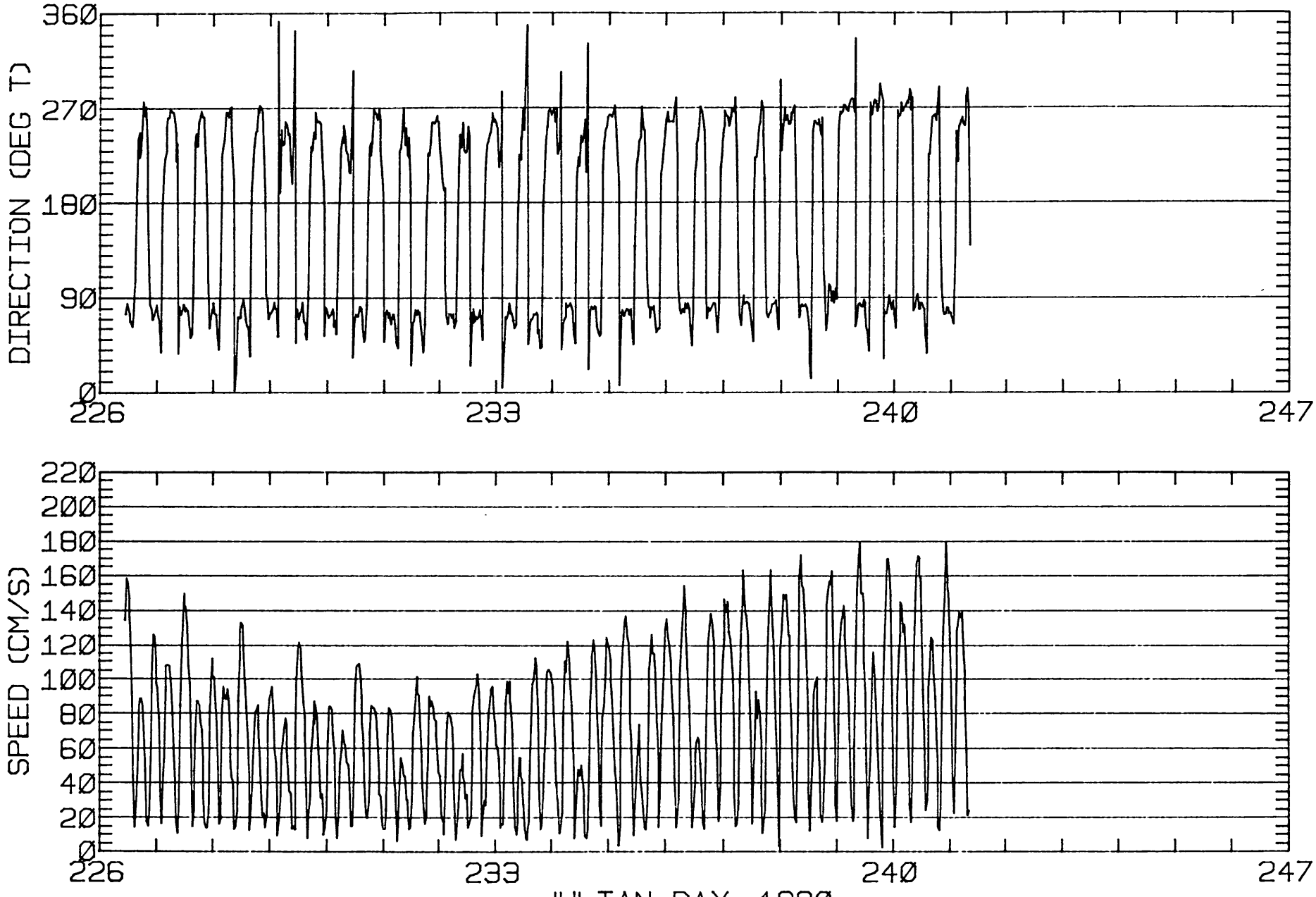
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.50	0.27	86.8	26.6	CLOCKWISE
K1	31.11	0.77	78.3	62.8	CLOCKWISE
N2	17.67	0.86	107.5	270.2	CLOCKWISE
M2	108.86	6.38	79.2	286.1	CLOCKWISE
S2	25.28	0.68	91.2	301.3	CLOCKWISE
M4	9.12	2.35	57.4	243.8	ANTI-CLOCKWISE

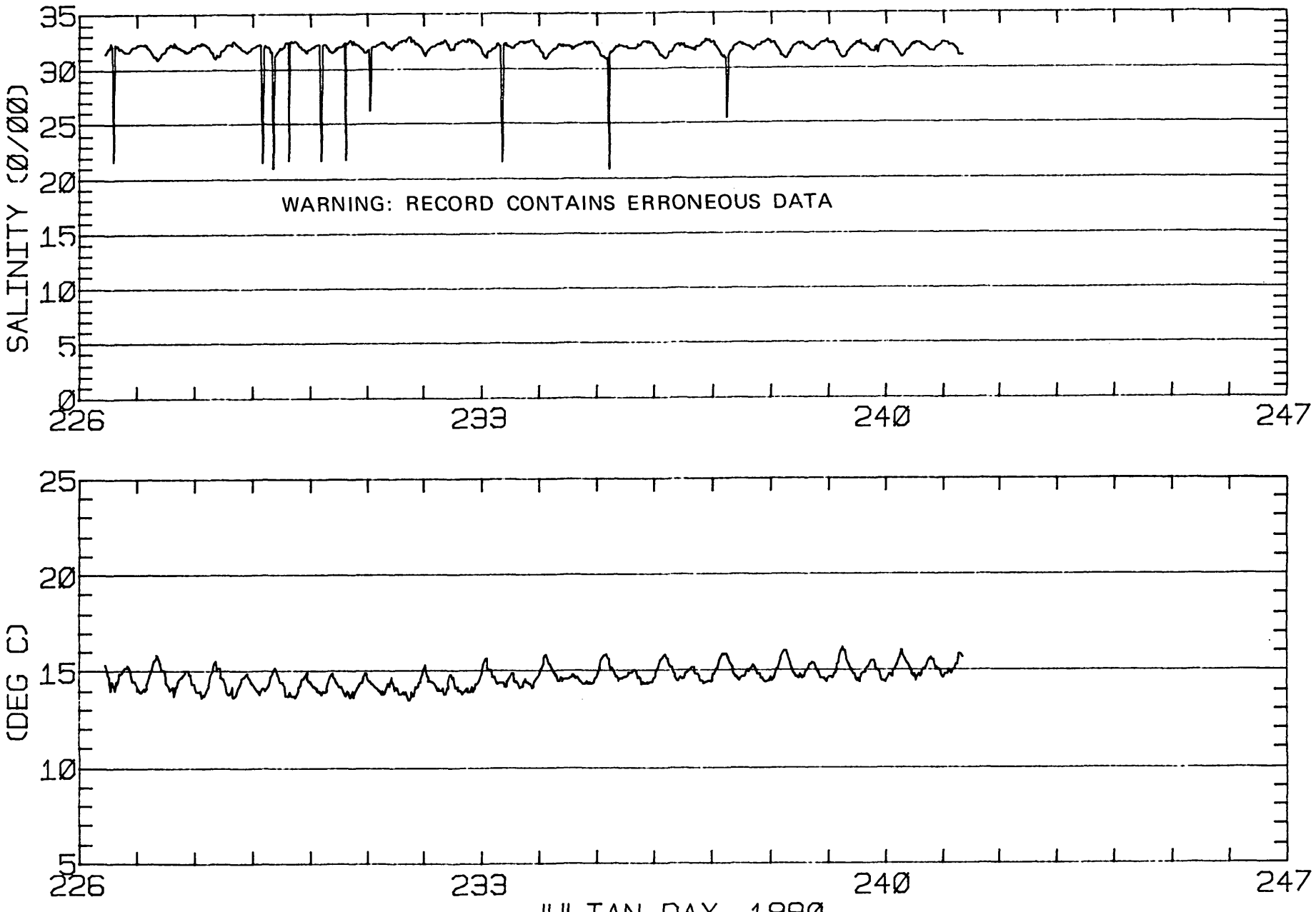
RMS SPEED: 84.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 183.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 71.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 81.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 12.98 CM/SEC
STANDARD DEVIATION V SERIES: 15.40 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.4	-0.1	81.
2	12	10.0	0.3	106.
3	4	10.6	6.4	101.
ALL	28	9.8	1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-23W
METER 076.0 METERS ABOVE BED. WATER DEPTH 097.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-23W
METER Ø76.Ø METERS ABOVE BED. WATER DEPTH Ø97.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'11"N 122 28'23"W
METER TYPE: AANDERAA
WATER DEPTH: 97.0 M (MLLW)
METER DEPTH: 51.2 M (BELOW MLLW)
START TIME OF SERIES: 8/13/80 1052 PST JULIAN DAY=226
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

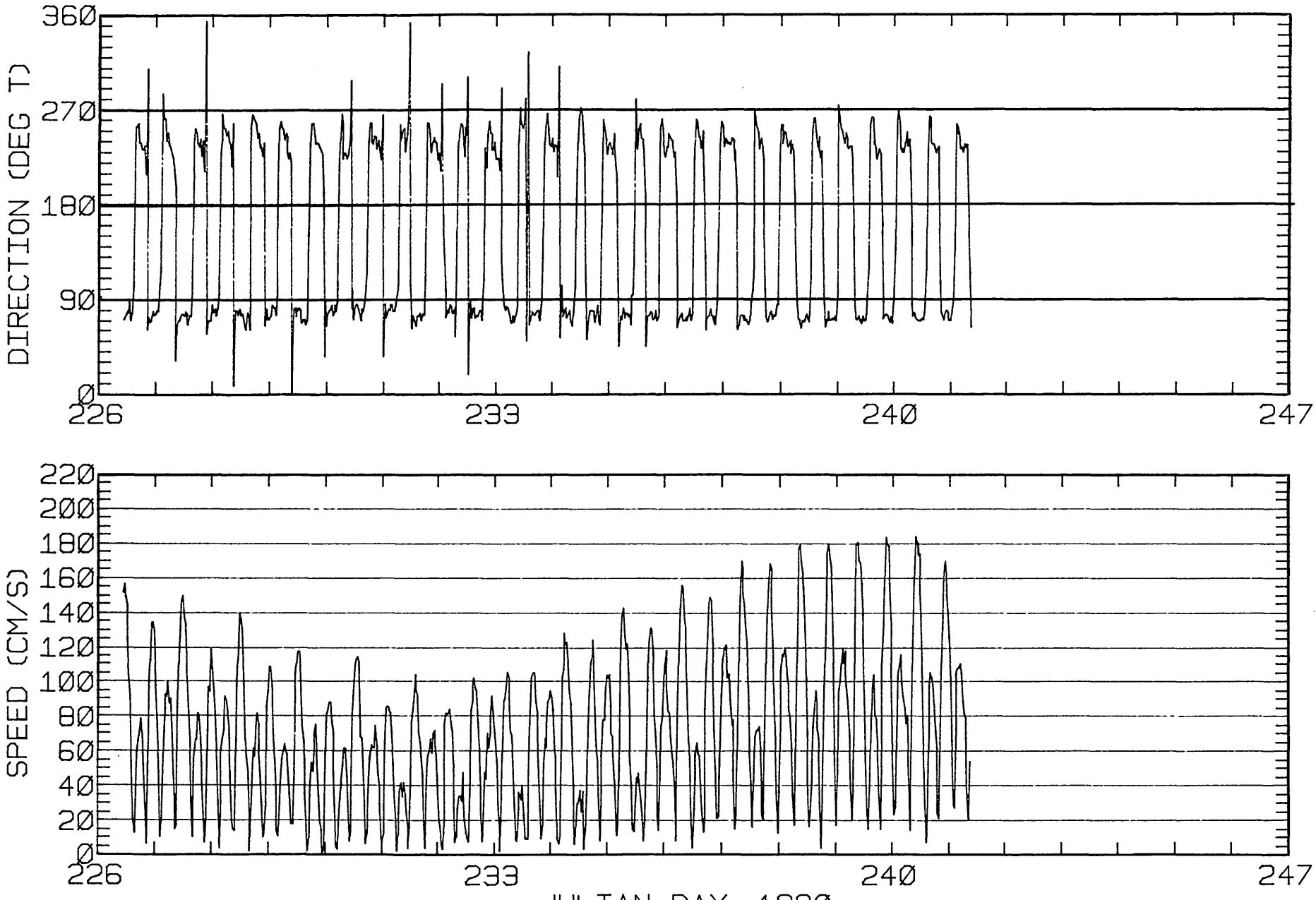
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.17	1.30	62.8	25.9	ANTI-CLOCKWISE
K1	28.31	1.09	63.5	59.6	ANTI-CLOCKWISE
N2	16.61	1.72	60.3	266.6	ANTI-CLOCKWISE
M2	107.98	4.84	69.4	286.7	ANTI-CLOCKWISE
S2	24.50	0.71	66.4	304.0	ANTI-CLOCKWISE
M4	8.68	3.39	90.8	198.2	CLOCKWISE

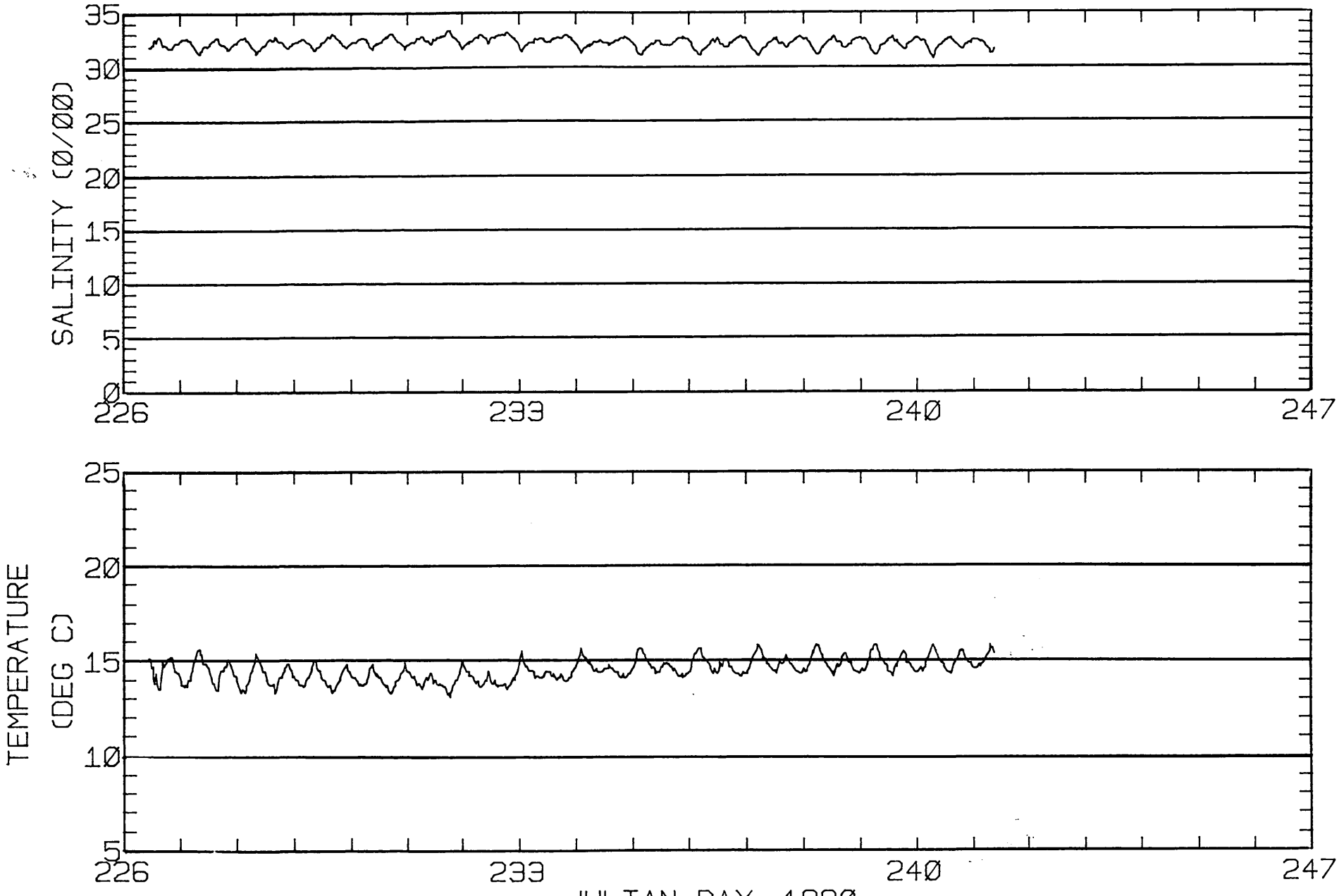
RMS SPEED: 83.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 177.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 71.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 67.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 13.59 CM/SEC
STANDARD DEVIATION V SERIES: 9.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	18.7	-1.4	81.
2	12	21.2	-1.4	106.
3	4	27.4	-1.5	101.
ALL	28	21.0	-1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-23W
METER 045.8 METERS ABOVE BED. WATER DEPTH 097.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-11N 122-28-23W
METER Ø45.8 METERS ABOVE BED. WATER DEPTH Ø97.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'22"W
METER TYPE: AANDERAA
WATER DEPTH: 97.3 M (MLLW)
METER DEPTH: 21.0 M (BELOW MLLW)
START TIME OF SERIES: 8/28/80 1030 PST JULIAN DAY=241
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

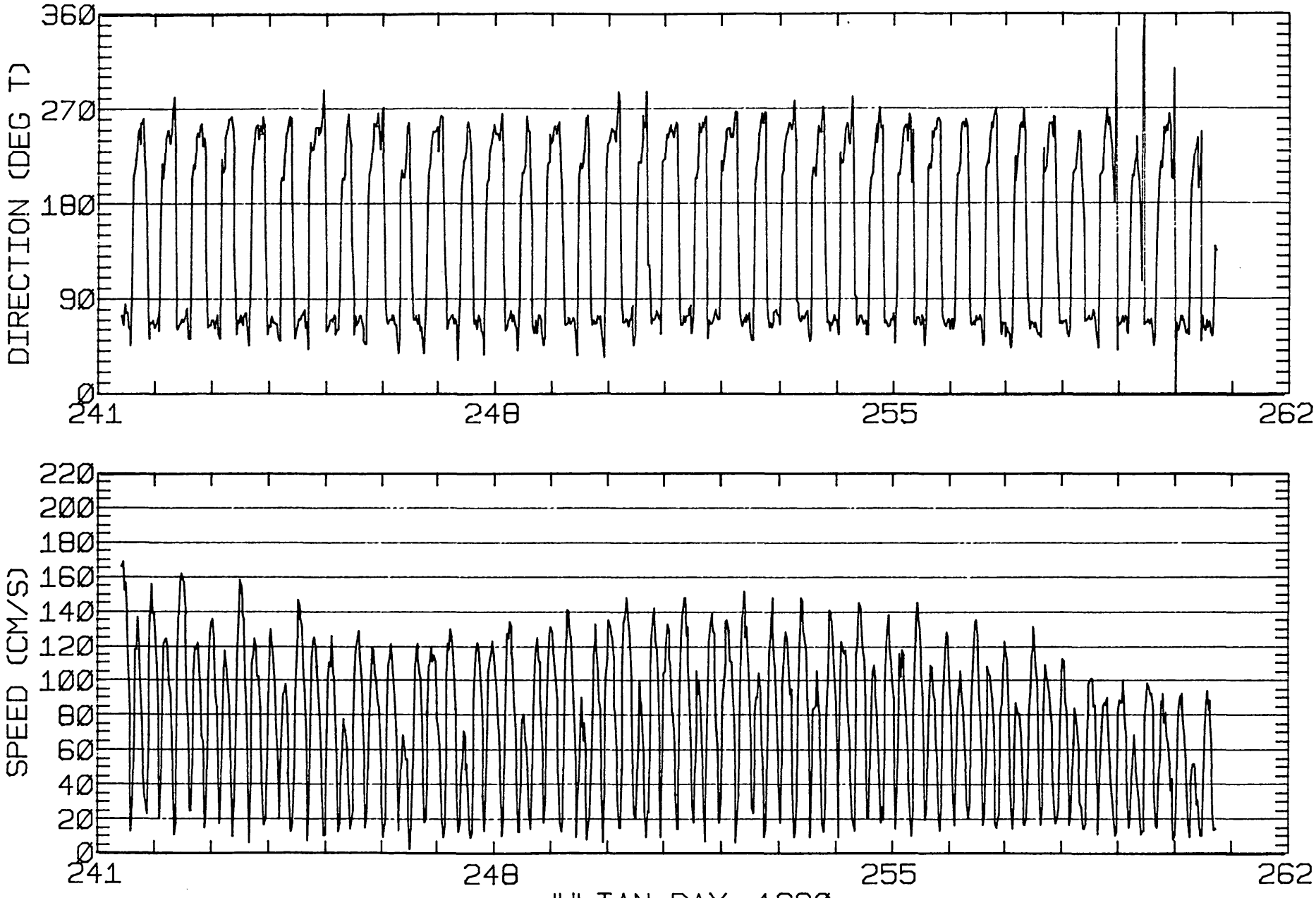
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.89	1.07	71.3	44.9	CLOCKWISE
K1	25.33	0.08	71.6	61.2	CLOCKWISE
N2	22.73	0.55	68.0	275.9	ANTI-CLOCKWISE
M2	107.27	6.50	66.1	290.2	CLOCKWISE
S2	33.95	1.88	68.5	297.1	CLOCKWISE
M4	8.46	1.56	22.4	281.3	ANTI-CLOCKWISE

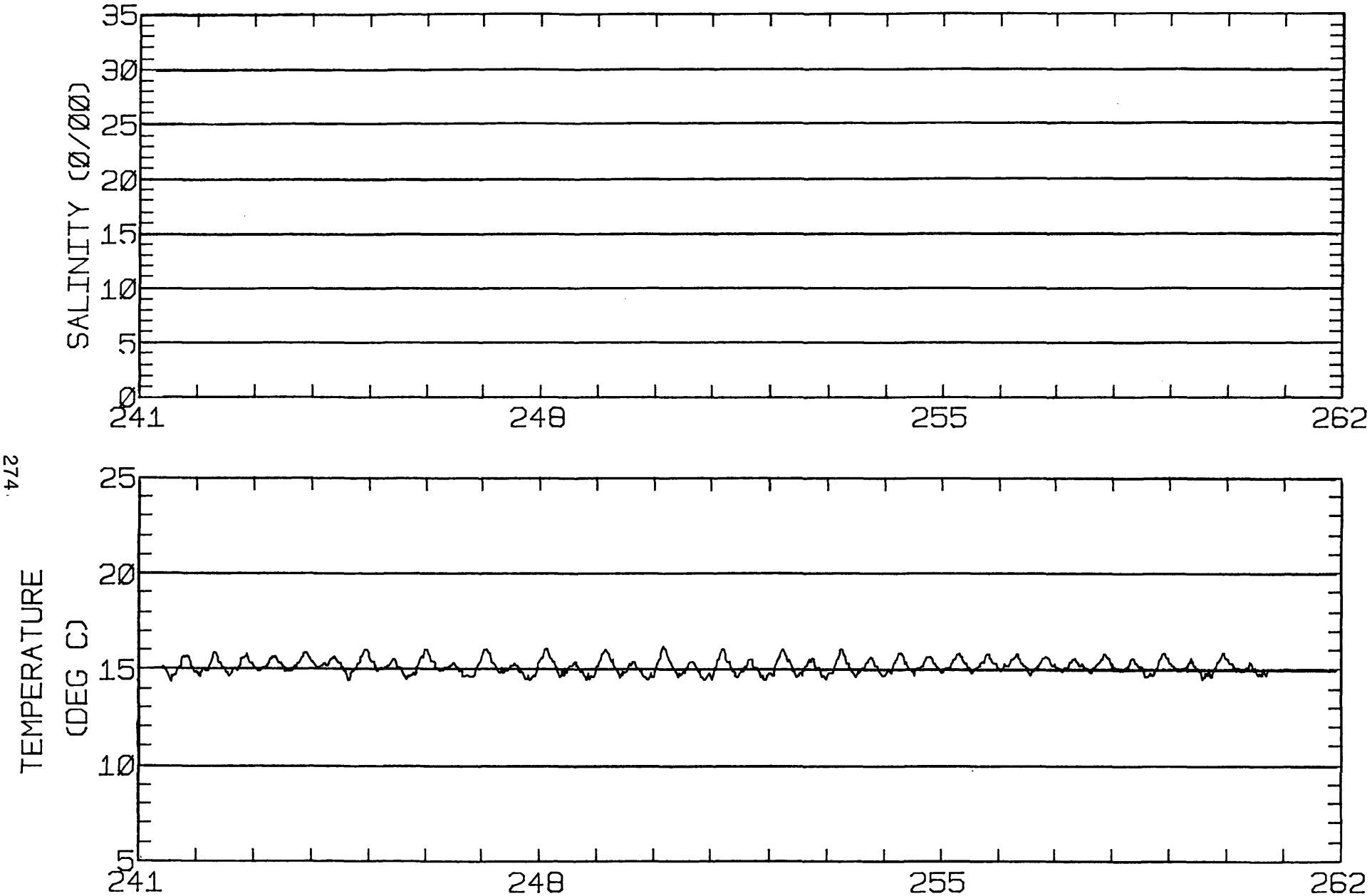
RMS SPEED: 87.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 185.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 66.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 67.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 10.88 CM/SEC
STANDARD DEVIATION V SERIES: 16.48 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	12.7	0.3	144.
2	12	12.0	-0.3	217.
3	12	11.5	-0.1	260.
ALL	36	12.1	-0.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER 076.3 METERS ABOVE BED. WATER DEPTH 097.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-22W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø97.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'23"W
METER TYPE: AANDERAA
WATER DEPTH: 97.0 M (MLLW)
METER DEPTH: 20.7 M (BELOW MLLW)
START TIME OF SERIES: 9/16/80 1850 PST JULIAN DAY=260
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

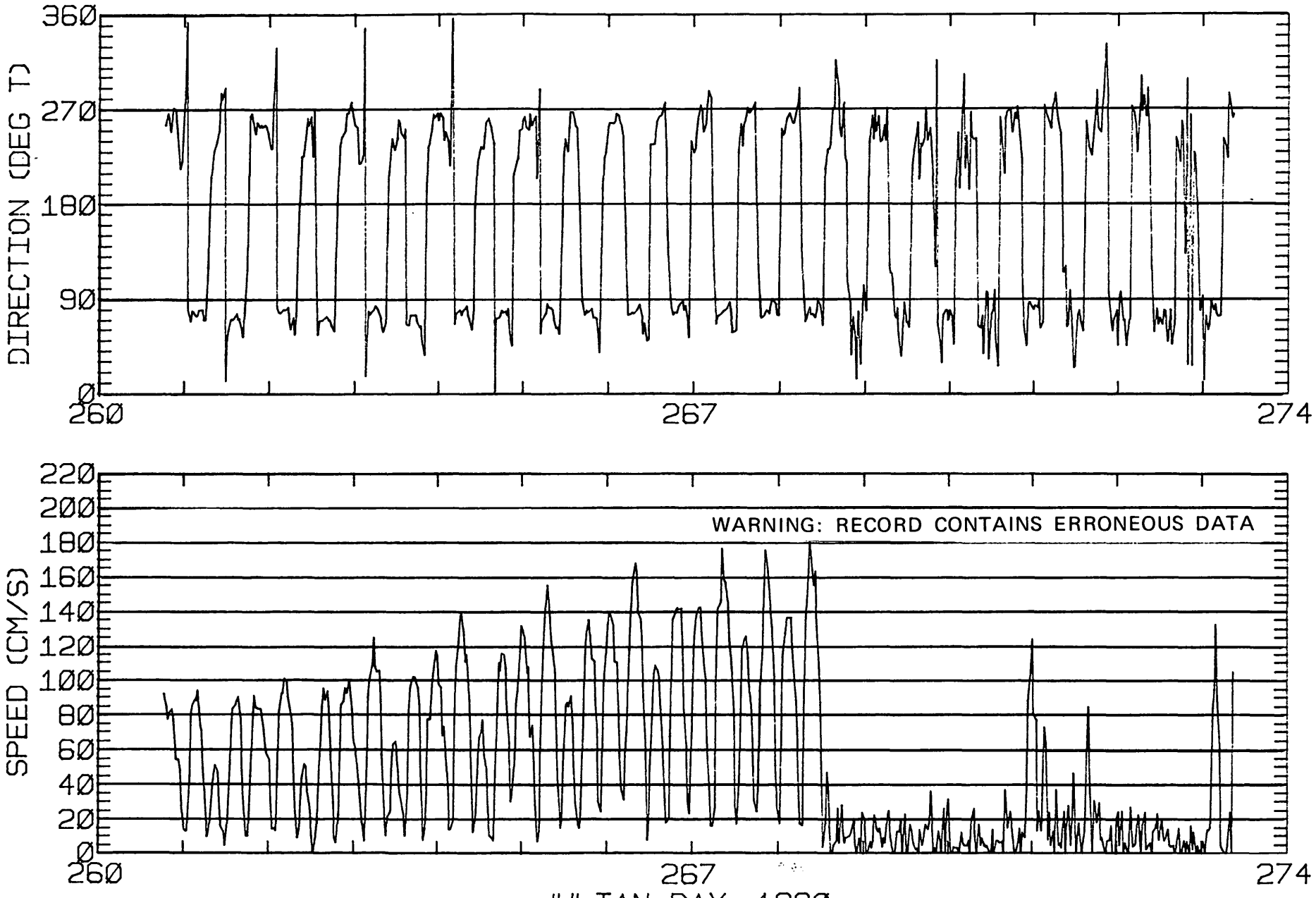
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.21	1.51	88.9	9.8	CLOCKWISE
K1	23.55	3.00	71.8	59.2	ANTI-CLOCKWISE
N2	15.60	4.39	105.8	220.5	ANTI-CLOCKWISE
M2	119.20	0.87	80.9	280.6	CLOCKWISE
S2	35.68	3.17	83.7	289.4	CLOCKWISE
M4	8.13	1.65	60.3	249.0	ANTI-CLOCKWISE

RMS SPEED: 80.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 195.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 77.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 81.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 11.61 CM/SEC
STANDARD DEVIATION V SERIES: 13.48 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.8	0.9	305.
ALL	12	9.8	0.9	

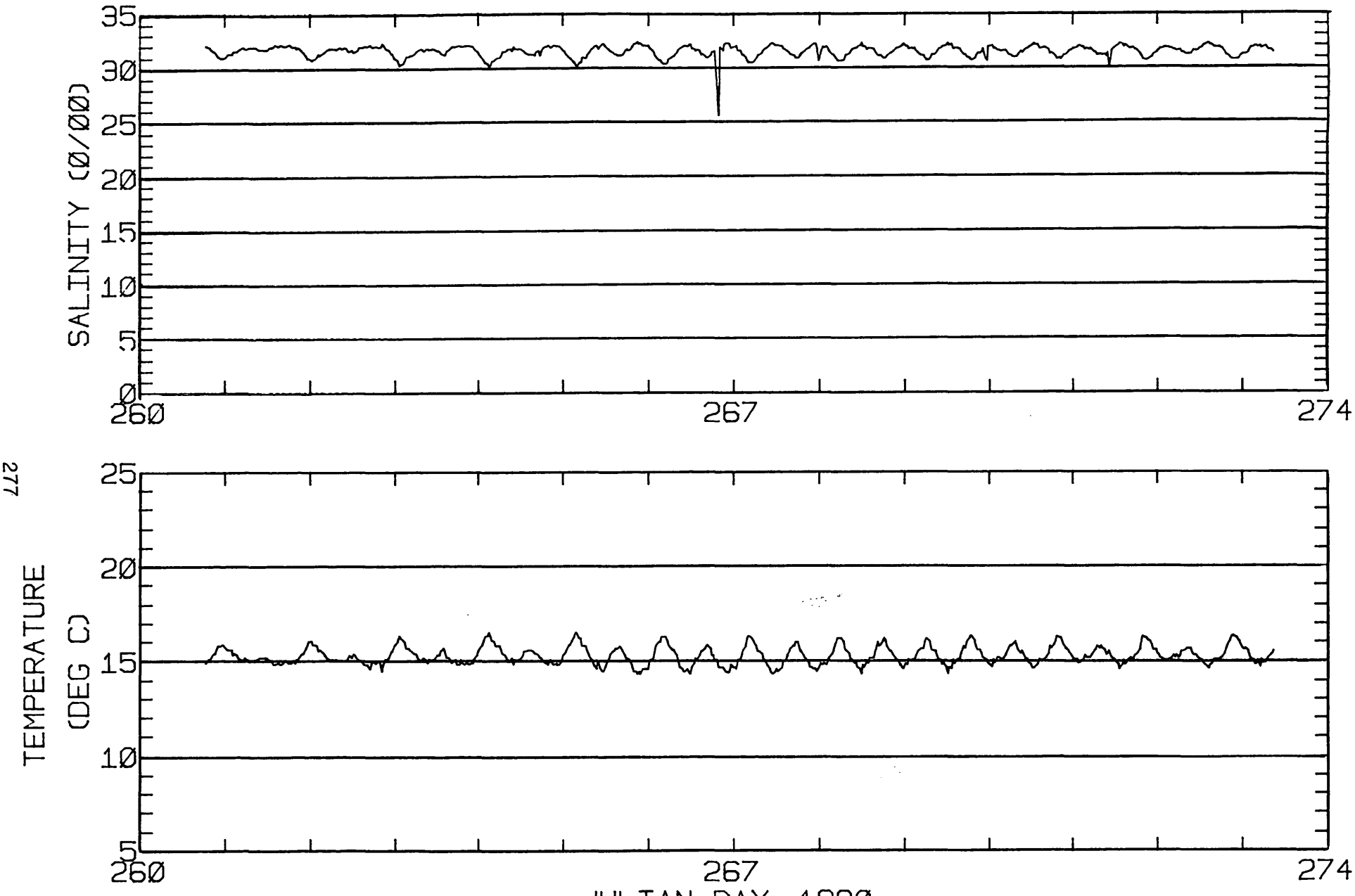


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 1 37-49-12N 122-28-23W

METER 076.3 METERS ABOVE BED. WATER DEPTH 097.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-23W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø97.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'23"W
METER TYPE: AANDERAA
WATER DEPTH: 97.0 M (MLLW)
METER DEPTH: 51.2 M (BELOW MLLW)
START TIME OF SERIES: 9/16/80 1902 PST JULIAN DAY=260
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

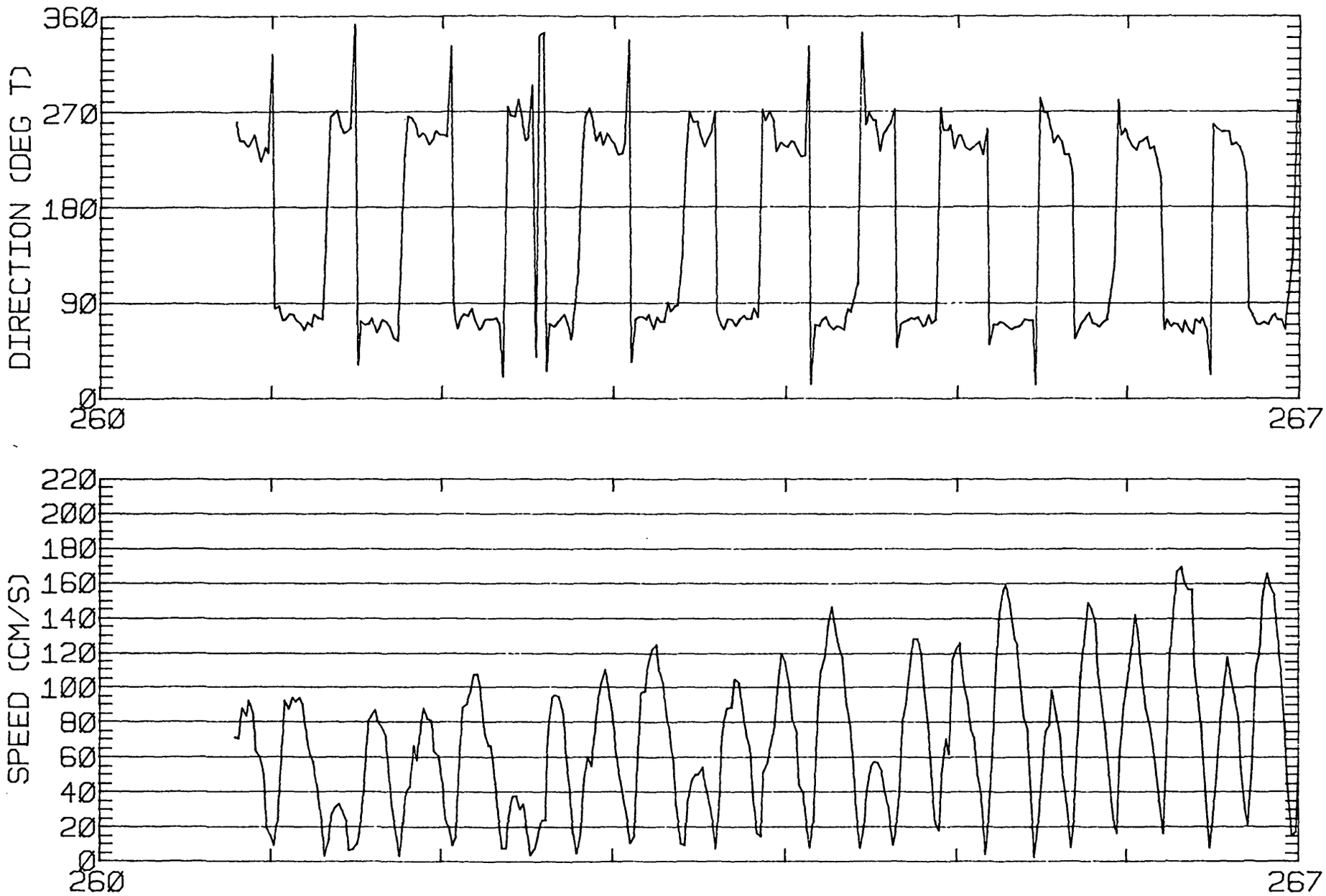
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	20.30	1.16	77.2	16.1	CLOCKWISE
K1	21.10	5.28	56.1	44.1	ANTI-CLOCKWISE
N2	17.99	2.28	42.9	234.7	ANTI-CLOCKWISE
M2	120.06	9.97	67.1	280.8	ANTI-CLOCKWISE
S2	35.98	4.77	69.4	290.9	ANTI-CLOCKWISE
M4	5.43	2.95	76.7	182.0	CLOCKWISE

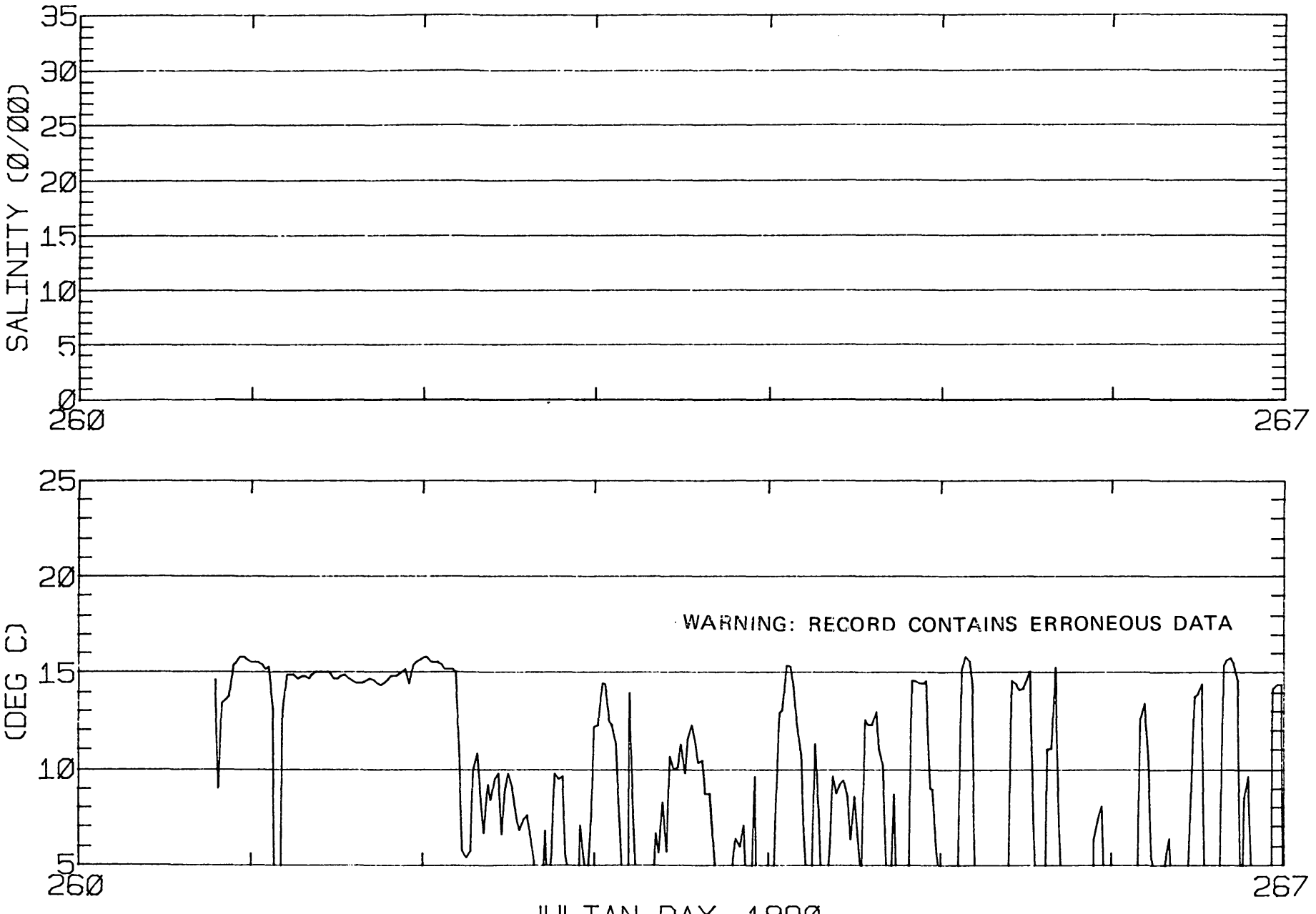
RMS SPEED: 80.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 197.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 83.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 67.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 12.07 CM/SEC
STANDARD DEVIATION V SERIES: 9.52 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	16.2	2.5	305.
ALL	12	16.2	2.5	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-23W
METER 045.8 METERS ABOVE BED. WATER DEPTH 097.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-23W
METER Ø45.8 METERS ABOVE BED. WATER DEPTH Ø97.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'23"W
METER TYPE: AANDERAA
WATER DEPTH: 97.0 M (MLLW)
METER DEPTH: 89.4 M (BELOW MLLW)
START TIME OF SERIES: 9/16/80 1854 PST JULIAN DAY=260
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

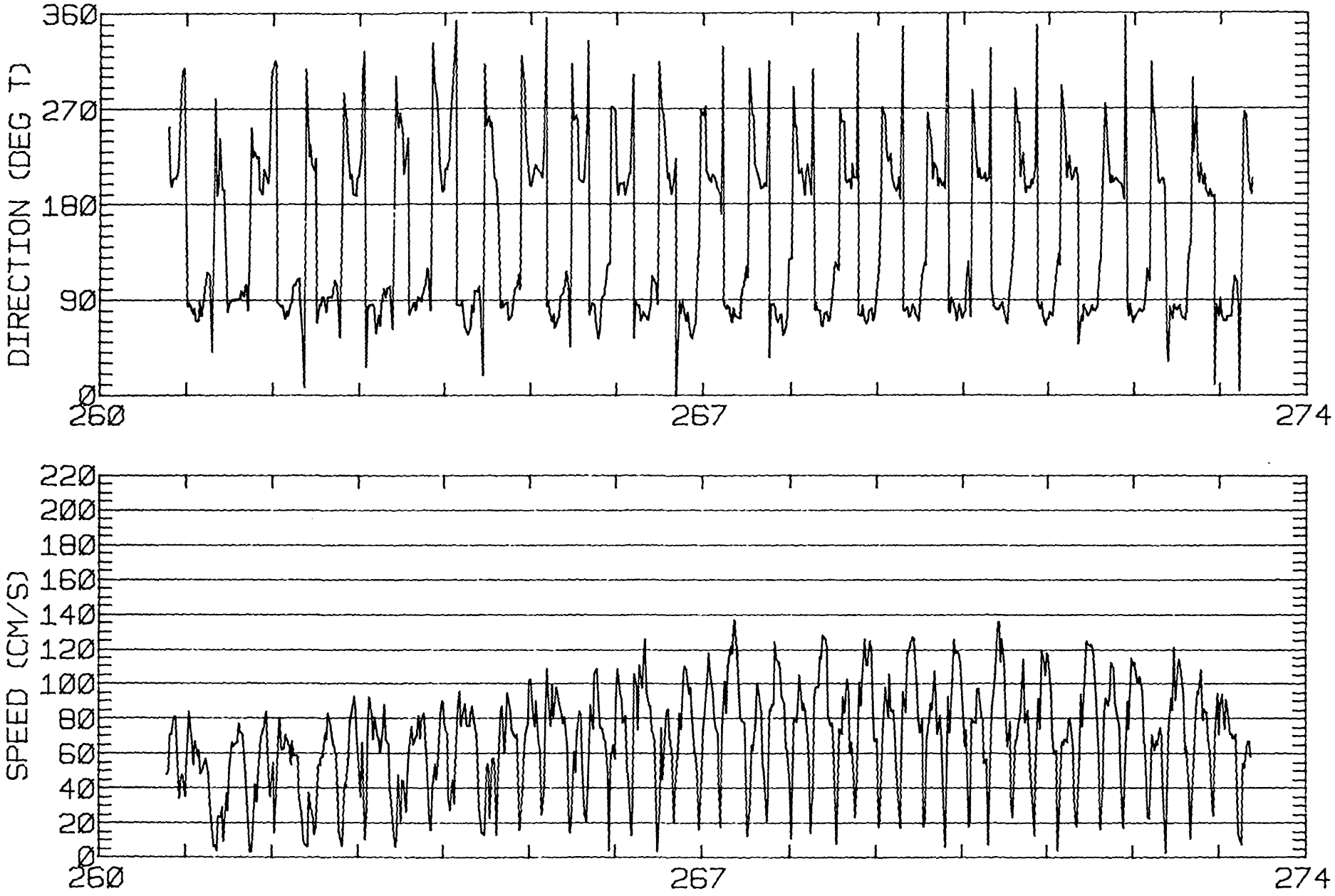
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.97	0.67	40.0	27.3	ANTI-CLOCKWISE
K1	16.82	1.78	57.0	39.8	CLOCKWISE
N2	19.60	2.22	43.2	276.6	ANTI-CLOCKWISE
M2	69.58	2.16	66.0	283.3	ANTI-CLOCKWISE
S2	16.68	1.37	48.6	290.3	ANTI-CLOCKWISE
M4	11.98	2.25	353.4	67.1	CLOCKWISE

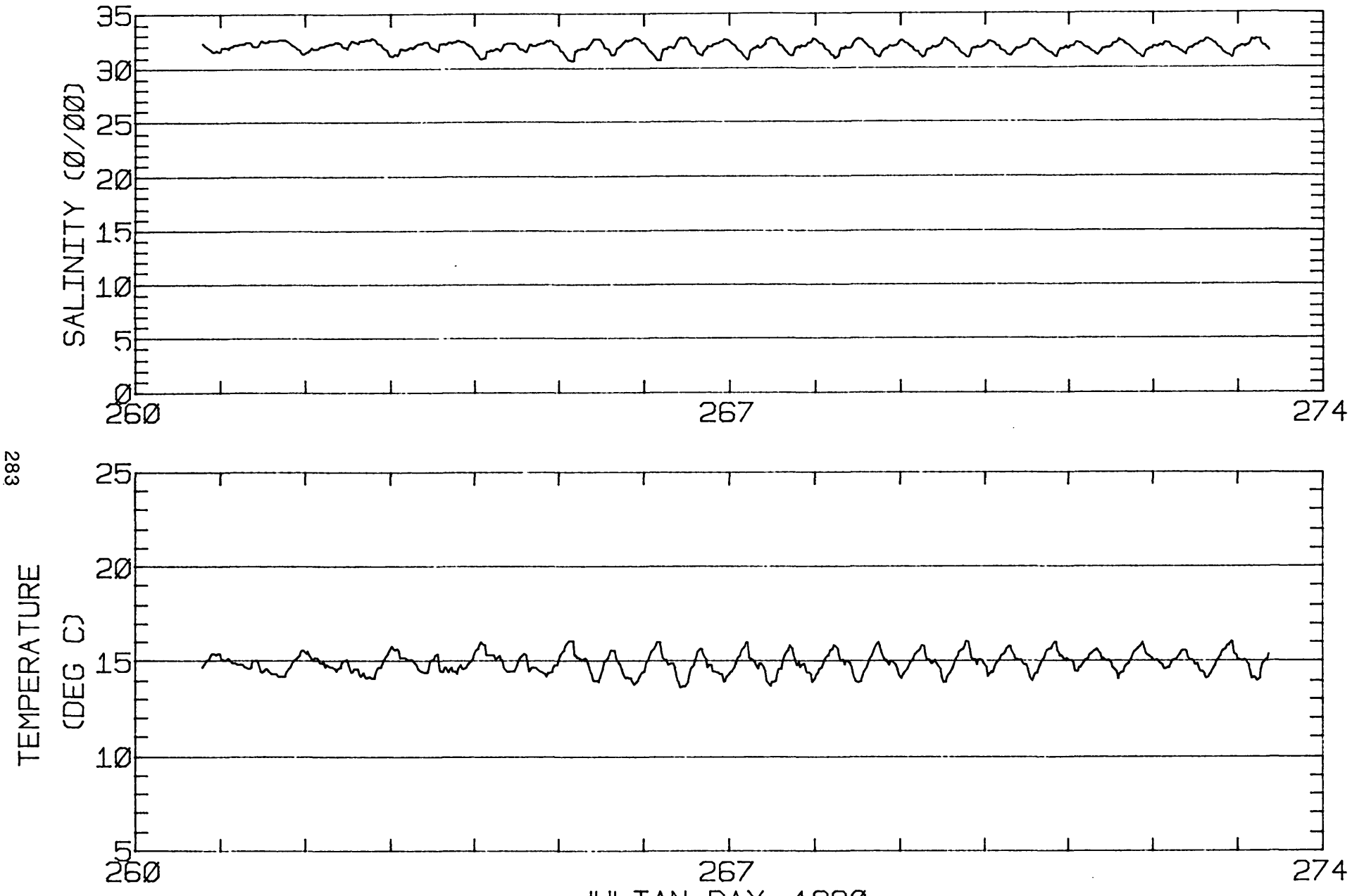
RMS SPEED: 75.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 116.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 59.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 18.46 CM/SEC
STANDARD DEVIATION V SERIES: 20.30 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	25.0	-9.9	305.
2	12	28.3	-17.3	331.
ALL	24	26.6	-13.6	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-23W
METER 007.5 METERS ABOVE BED. WATER DEPTH 097.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-23W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø97.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'20"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 51.8 M (BELOW MLLW)
START TIME OF SERIES: 9/29/80 1112 PST JULIAN DAY=273
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

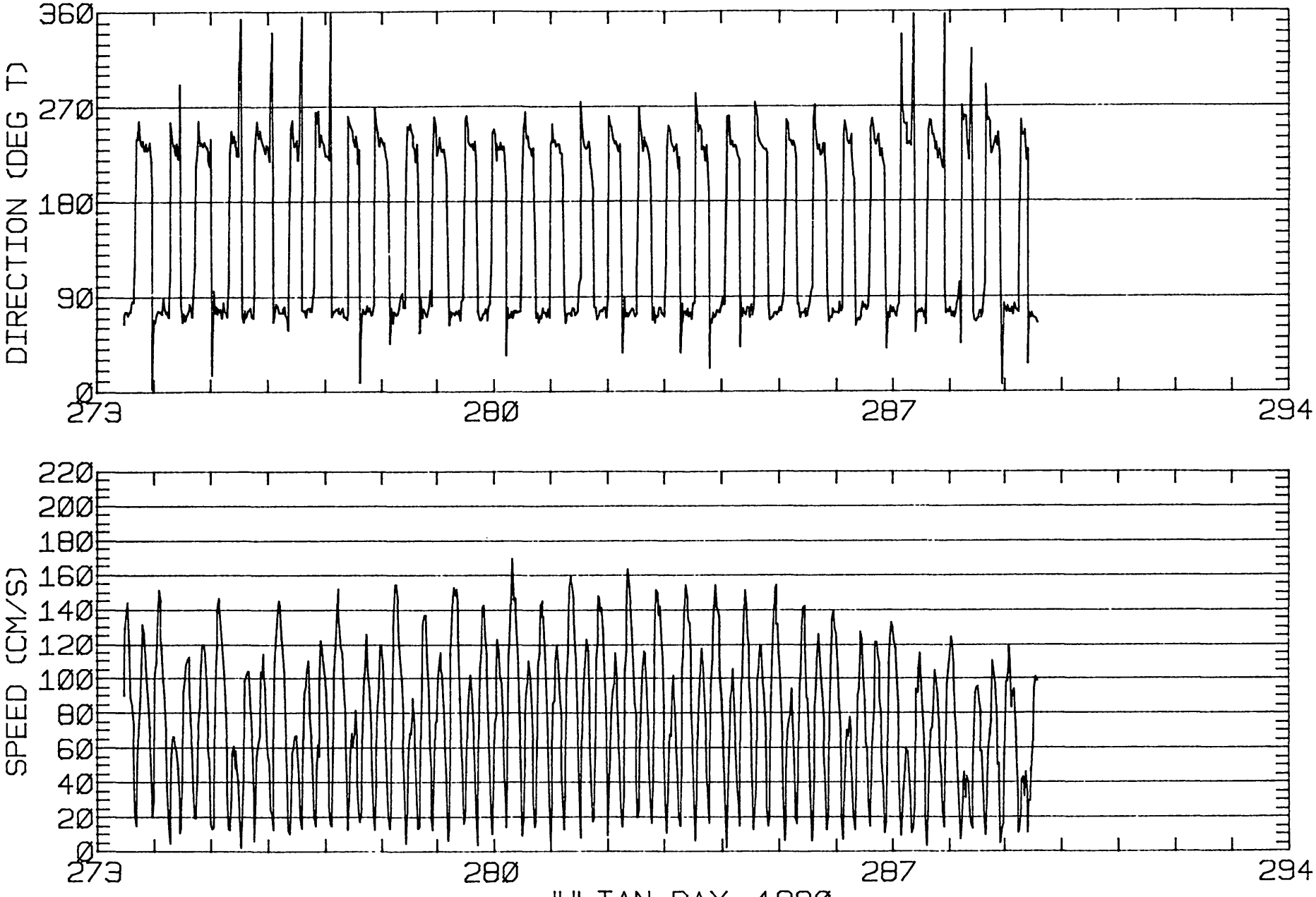
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.60	3.07	62.3	32.4	ANTI-CLOCKWISE
K1	20.60	2.20	64.9	25.7	ANTI-CLOCKWISE
N2	27.63	0.96	69.4	281.1	CLOCKWISE
M2	114.81	1.54	68.2	292.8	ANTI-CLOCKWISE
S2	37.11	1.20	65.9	283.7	ANTI-CLOCKWISE
M4	7.32	3.00	155.0	275.4	CLOCKWISE

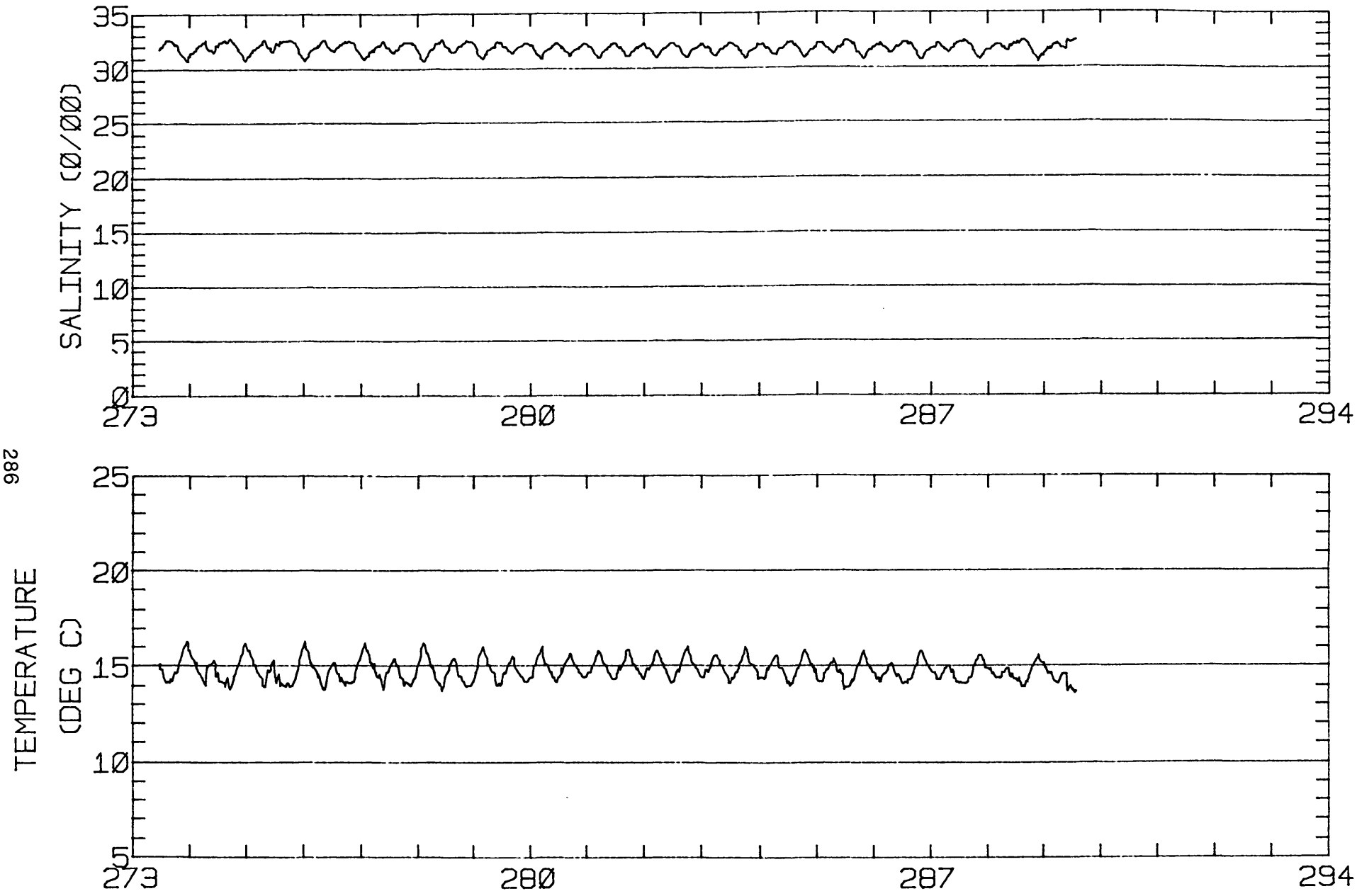
RMS SPEED: 87.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 191.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 75.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 66.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 11.53 CM/SEC
STANDARD DEVIATION V SERIES: 9.85 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	18.8	-5.9	273.
2	12	22.7	-5.7	270.
3	6	17.4	-3.3	242.
ALL	30	20.1	-5.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-20W
METER 045.8 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-2ØW
METER Ø45.8 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'12"N 122 28'20"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 90.0 M (BELOW MLLW)
START TIME OF SERIES: 9/29/80 1104 PST JULIAN DAY=273
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

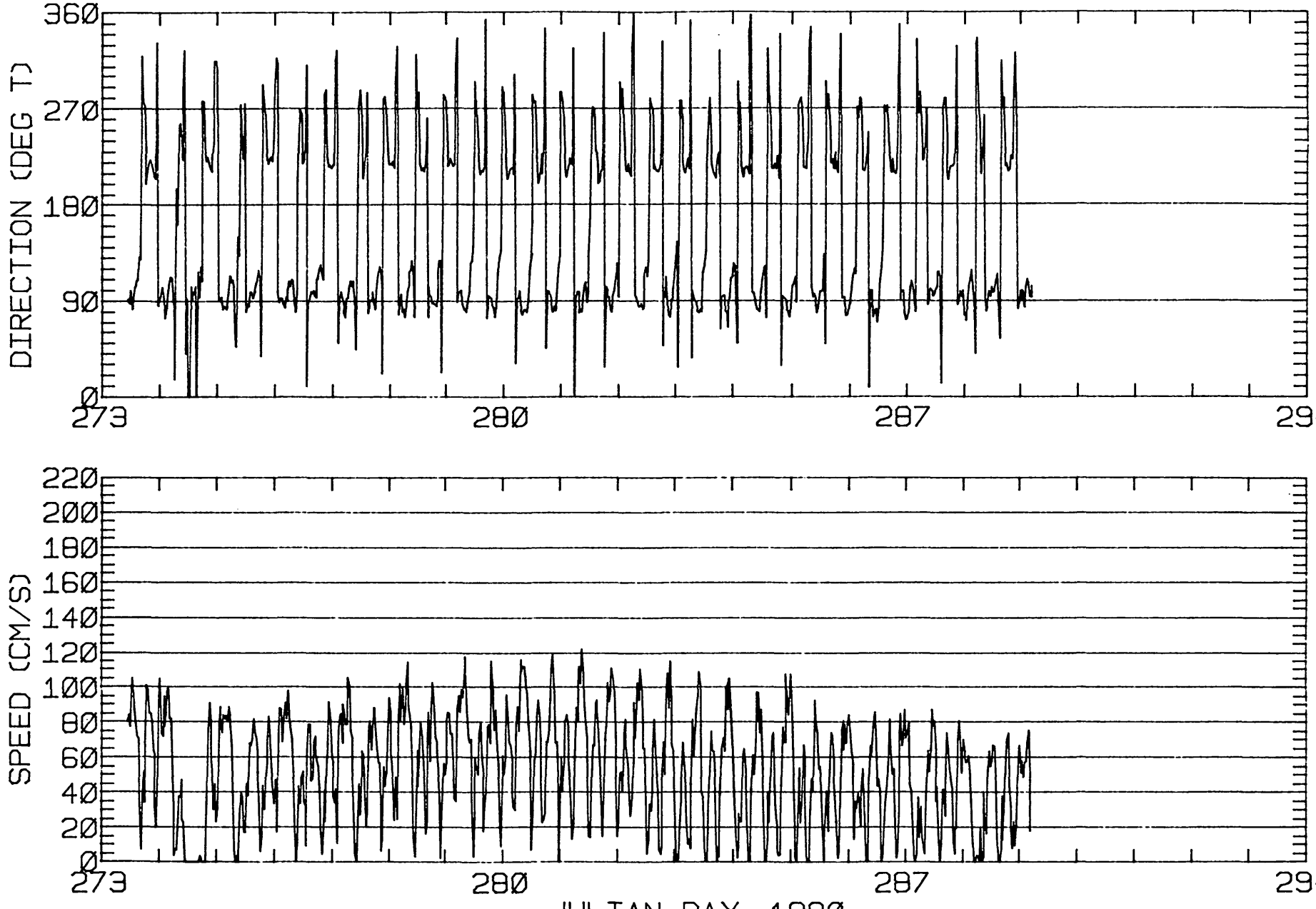
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.68	2.26	78.8	12.6	ANTI-CLOCKWISE
K1	12.94	0.10	66.9	18.4	ANTI-CLOCKWISE
N2	17.94	3.29	82.6	265.7	CLOCKWISE
M2	66.83	1.48	77.6	287.3	CLOCKWISE
S2	24.72	1.09	72.9	271.1	ANTI-CLOCKWISE
M4	8.54	2.71	5.8	102.7	CLOCKWISE

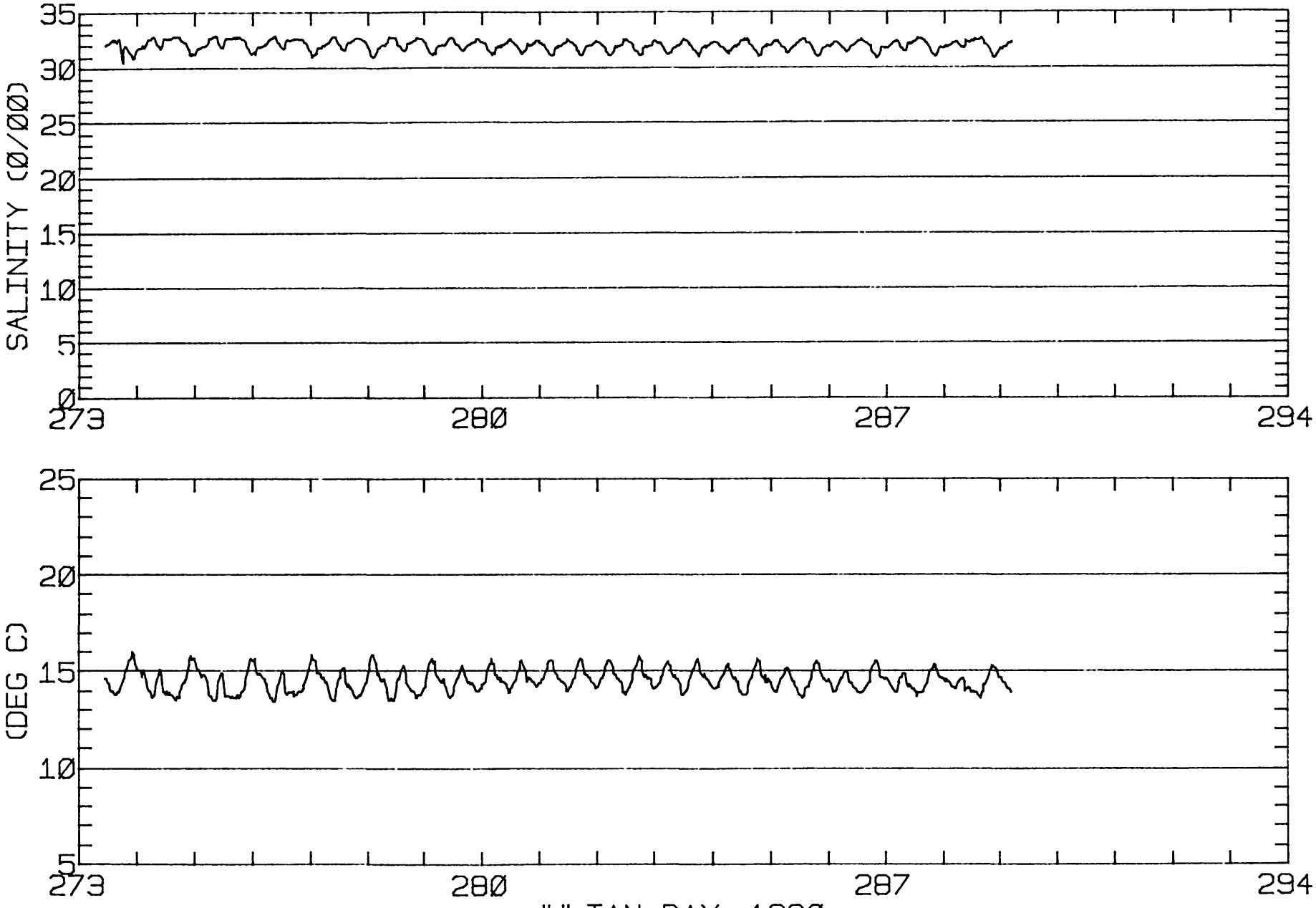
RMS SPEED: 61.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 117.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.28
STANDARD DEVIATION U-SERIES: 15.71 CM/SEC
STANDARD DEVIATION V SERIES: 19.28 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	20.9	-13.7	273.
2	12	22.9	-12.5	270.
3	6	19.4	-9.2	242.
ALL	30	21.4	-12.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-20W
METER 007.5 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 1 37-49-12N 122-28-2ØW
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'13"N 122 28'20"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 90.0 M (BELOW MLLW)
START TIME OF SERIES:10/15/80 1454 PST JULIAN DAY=289
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

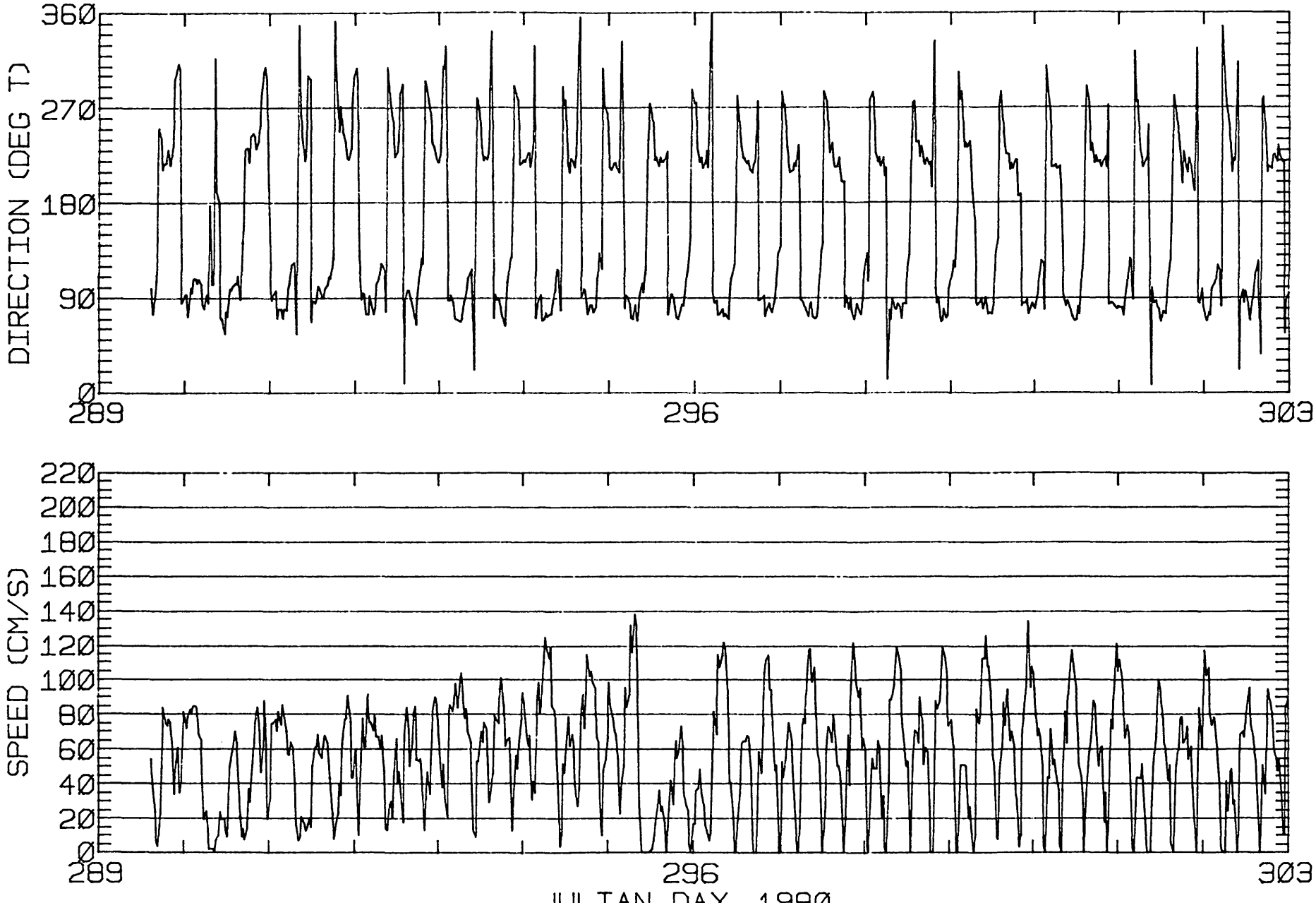
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.23	1.66	81.3	8.5	ANTI-CLOCKWISE
K1	20.84	1.28	66.3	29.6	ANTI-CLOCKWISE
N2	15.25	1.76	45.9	278.3	CLOCKWISE
M2	62.17	0.24	76.3	280.2	ANTI-CLOCKWISE
S2	10.84	0.49	49.5	281.8	ANTI-CLOCKWISE
M4	4.52	3.79	94.6	178.1	CLOCKWISE

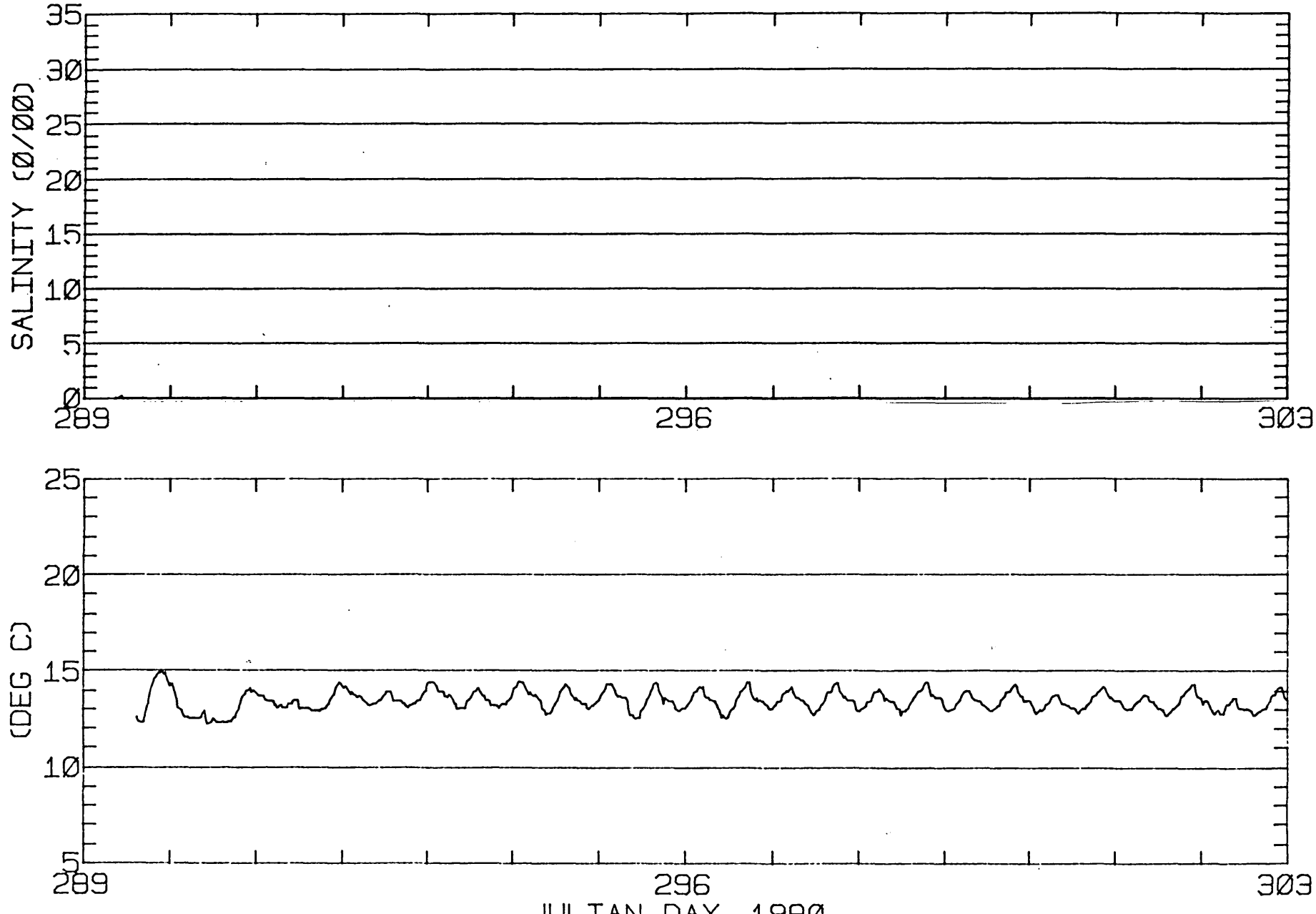
RMS SPEED: 64.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 105.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 72.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 16.64 CM/SEC
STANDARD DEVIATION V SERIES: 18.49 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	19.1	-6.6	169.
2	12	23.0	-9.0	170.
3	2	20.2	-12.2	172.
ALL	26	21.0	-8.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-20W
METER 007.5 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-13N 122-28-20W
METER Ø07.5 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'20"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 21.3 M (BELOW MLLW)
START TIME OF SERIES:10/29/80 1620 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

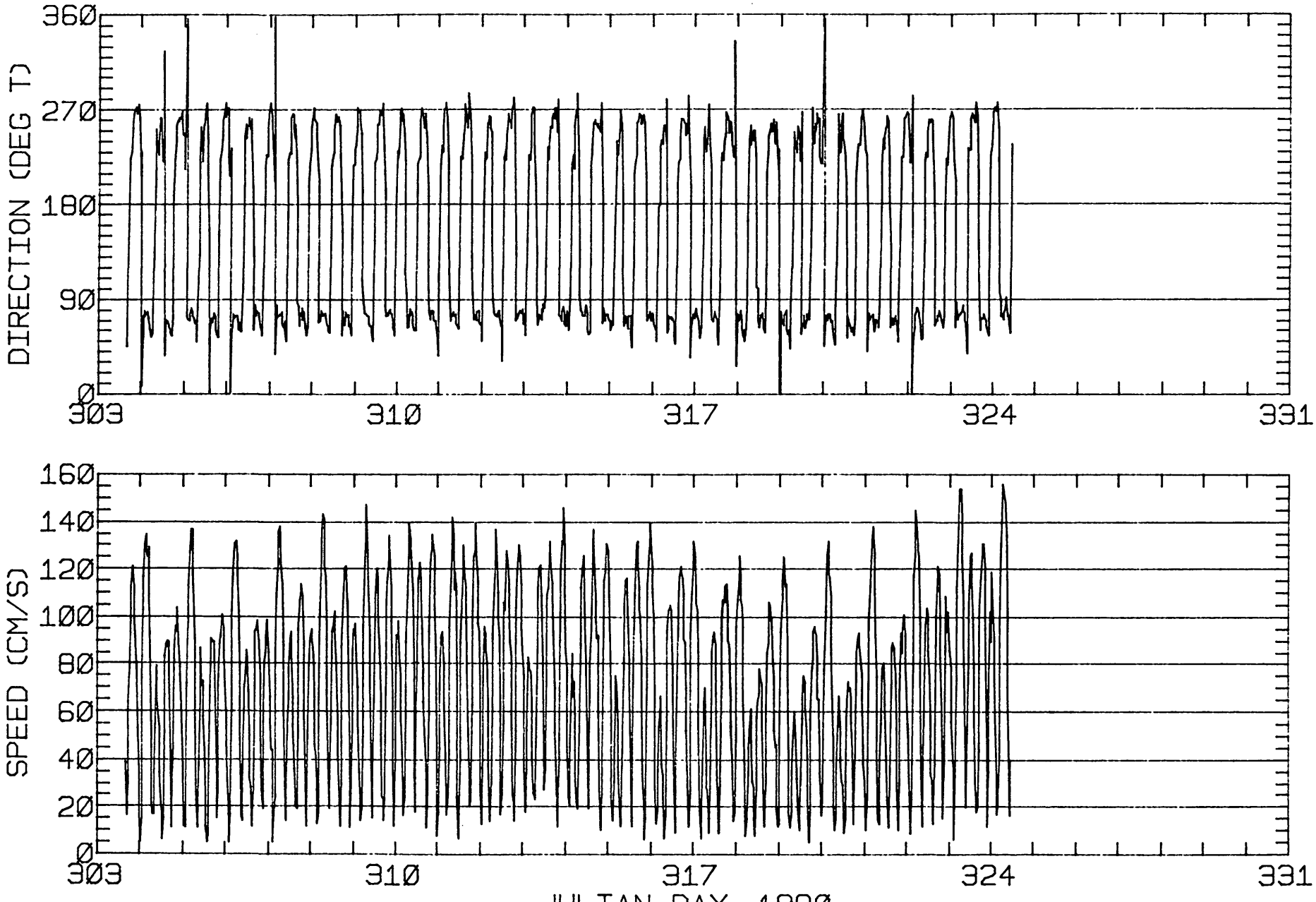
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.43	3.13	71.9	23.7	CLOCKWISE
K1	32.15	1.27	76.4	21.5	CLOCKWISE
N2	26.83	1.86	73.1	263.5	ANTI-CLOCKWISE
M2	108.64	1.03	73.8	290.1	CLOCKWISE
S2	30.47	0.54	77.3	274.7	CLOCKWISE
M4	7.81	1.17	26.6	284.3	ANTI-CLOCKWISE

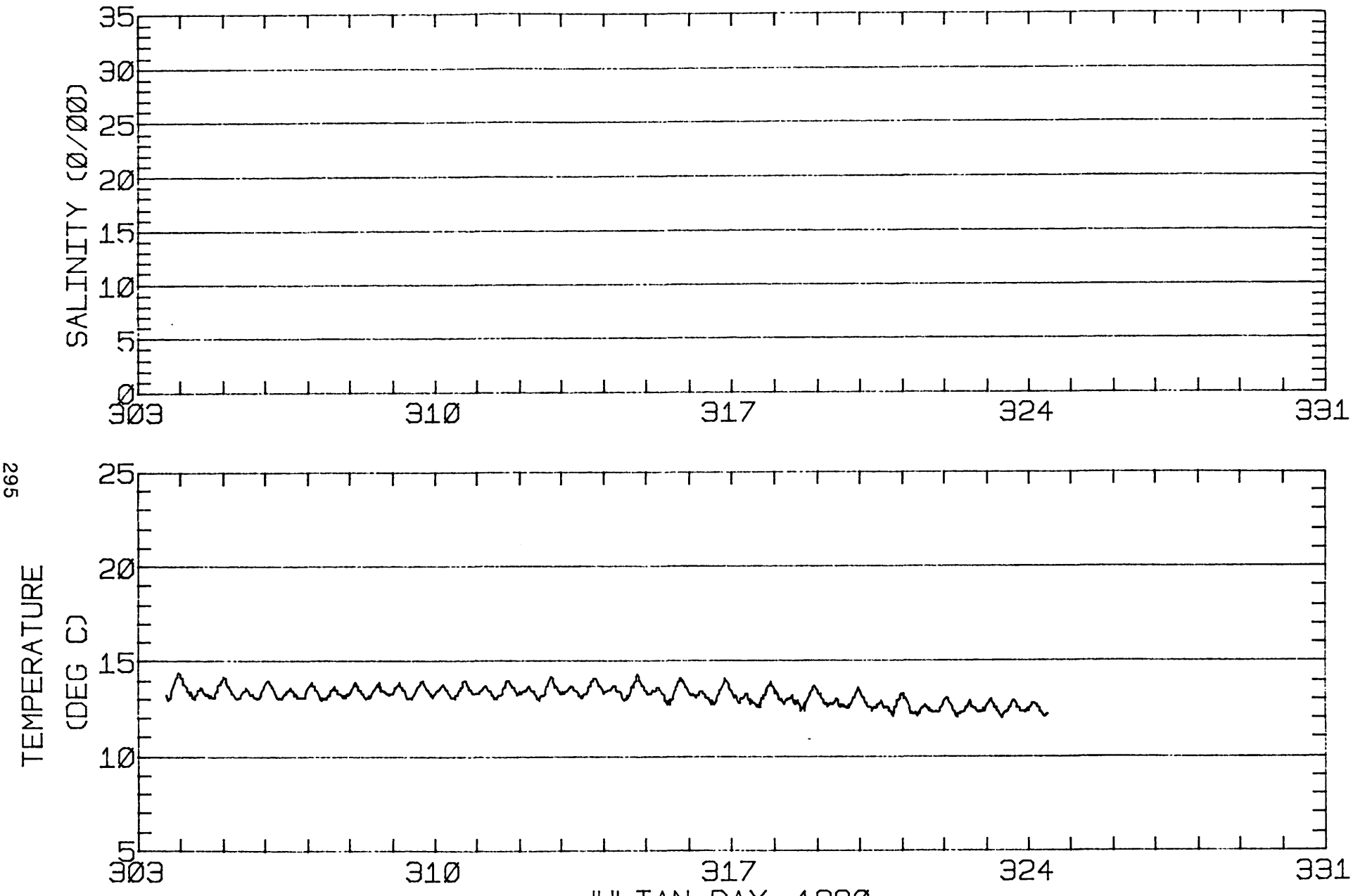
RMS SPEED: 82.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 187.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 62.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 74.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 11.79 CM/SEC
STANDARD DEVIATION V SERIES: 16.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	10.0	2.8	160.
2	12	11.6	2.1	184.
3	12	7.5	1.1	193.
4	4	15.1	2.2	196.
ALL	40	10.2	2.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-20W
METER 076.3 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-20W
METER Ø76.3 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'20"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 51.8 M (BELOW MLLW)
START TIME OF SERIES:10/29/80 1602 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

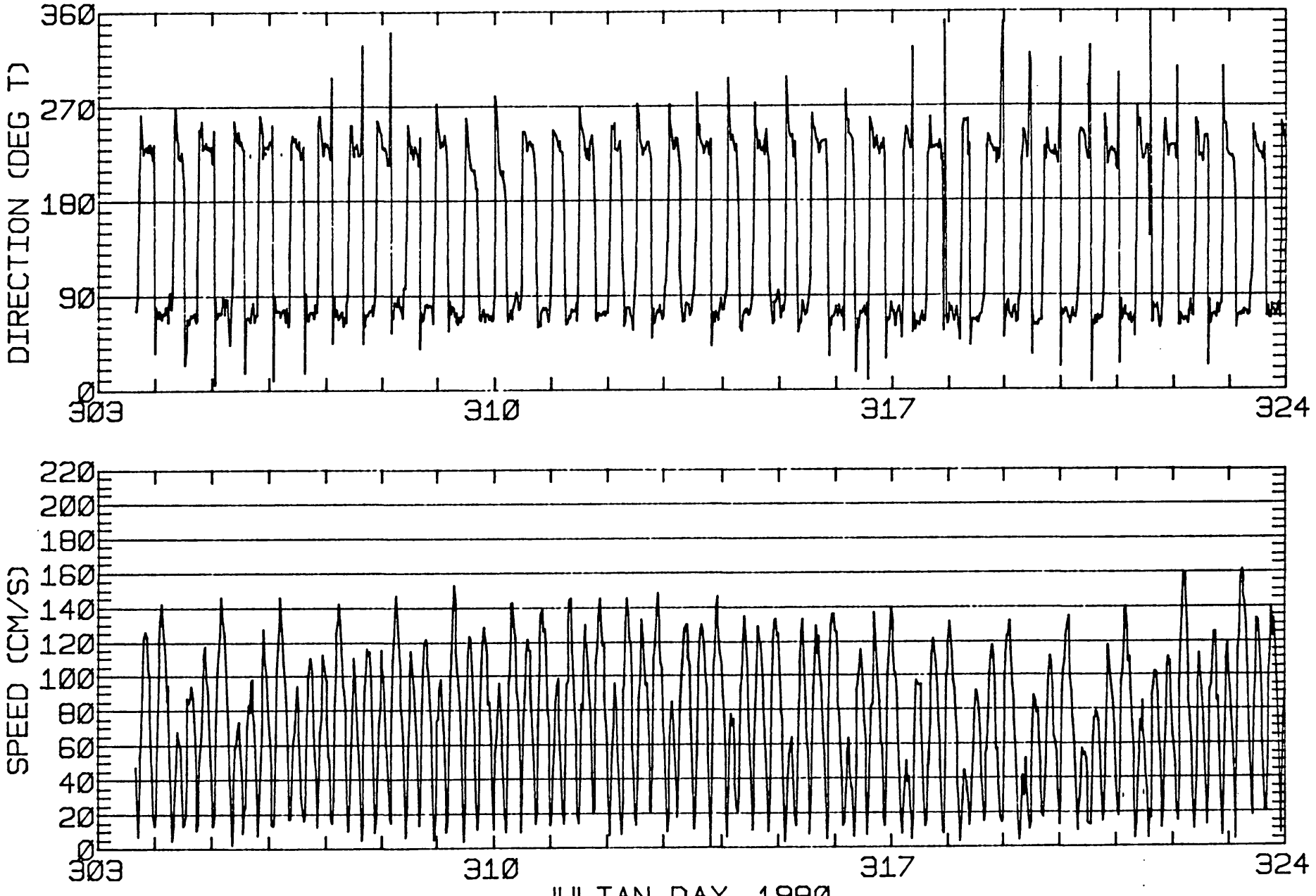
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.07	3.41	58.5	26.8	ANTI-CLOCKWISE
K1	31.84	2.16	62.0	20.9	ANTI-CLOCKWISE
N2	29.27	0.43	60.2	261.6	ANTI-CLOCKWISE
M2	109.85	0.62	64.3	289.1	ANTI-CLOCKWISE
S2	30.22	0.49	64.1	275.9	ANTI-CLOCKWISE
M4	7.37	3.14	159.7	253.6	CLOCKWISE

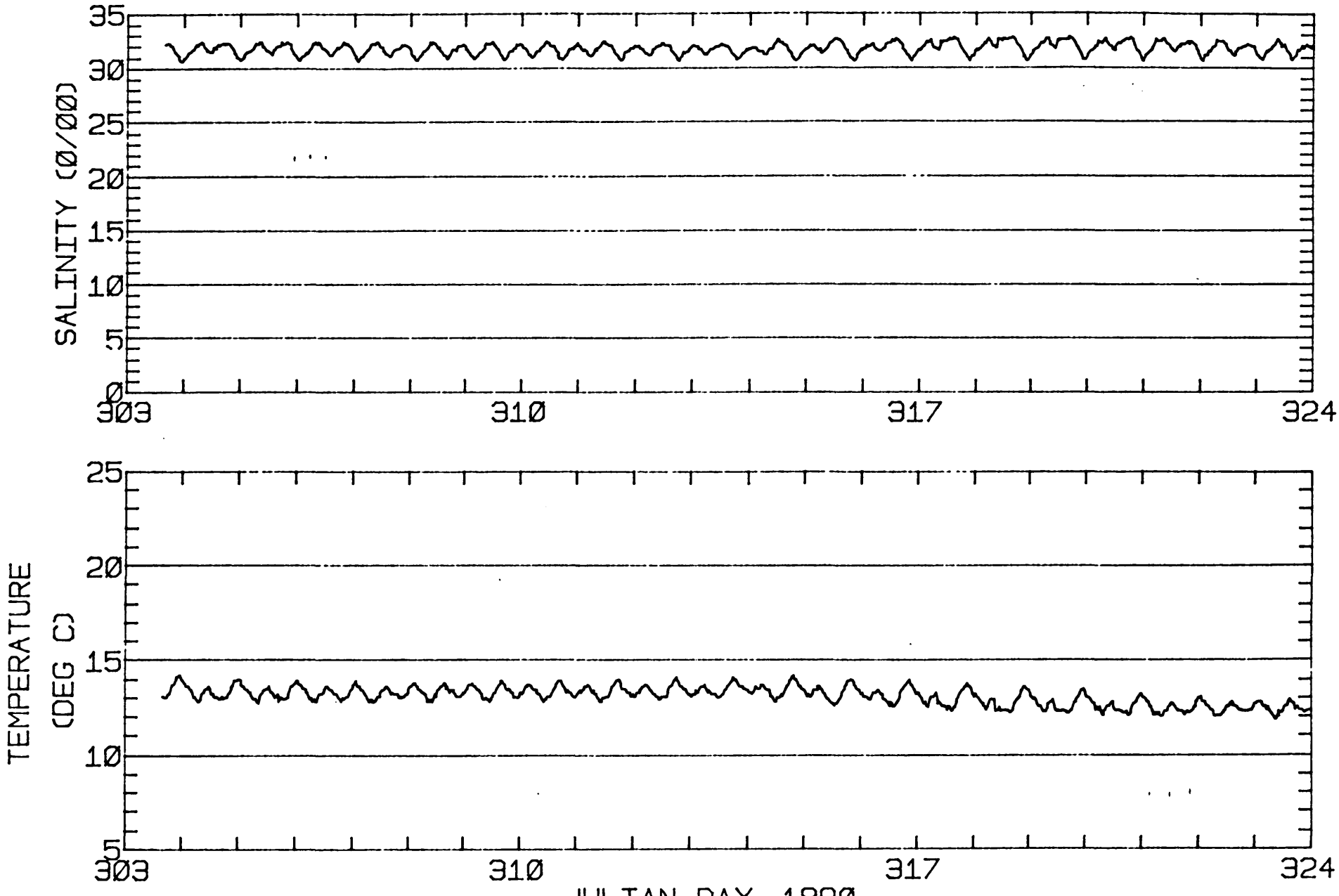
RMS SPEED: 83.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 189.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 64.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 63.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 12.45 CM/SEC
STANDARD DEVIATION V SERIES: 12.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	16.3	-6.0	160.
2	12	20.2	-6.5	184.
3	12	15.8	-2.1	193.
4	4	25.1	-6.4	196.
ALL	40	18.2	-5.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-20W
METER 045.8 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-20W
METER Ø45.8 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 1
POSITION: 37 49'14"N 122 28'20"W
METER TYPE: AANDERAA
WATER DEPTH: 97.6 M (MLLW)
METER DEPTH: 90.0 M (BELOW MLLW)
START TIME OF SERIES:10/29/80 1604 PST JULIAN DAY=303
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

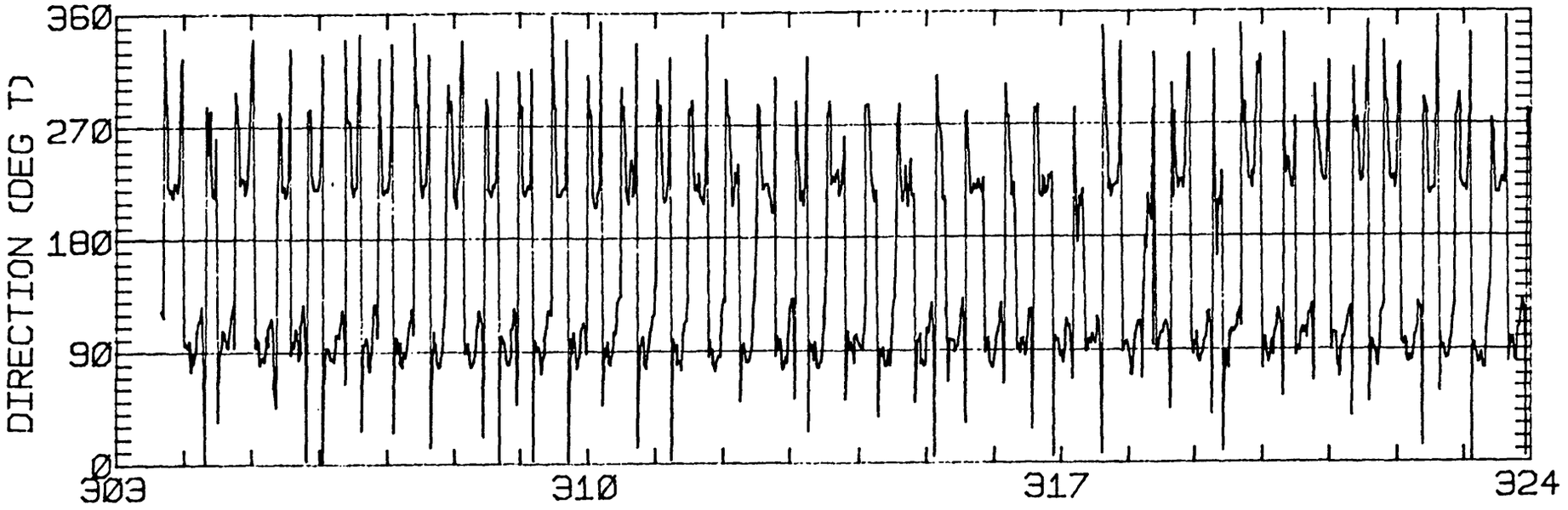
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

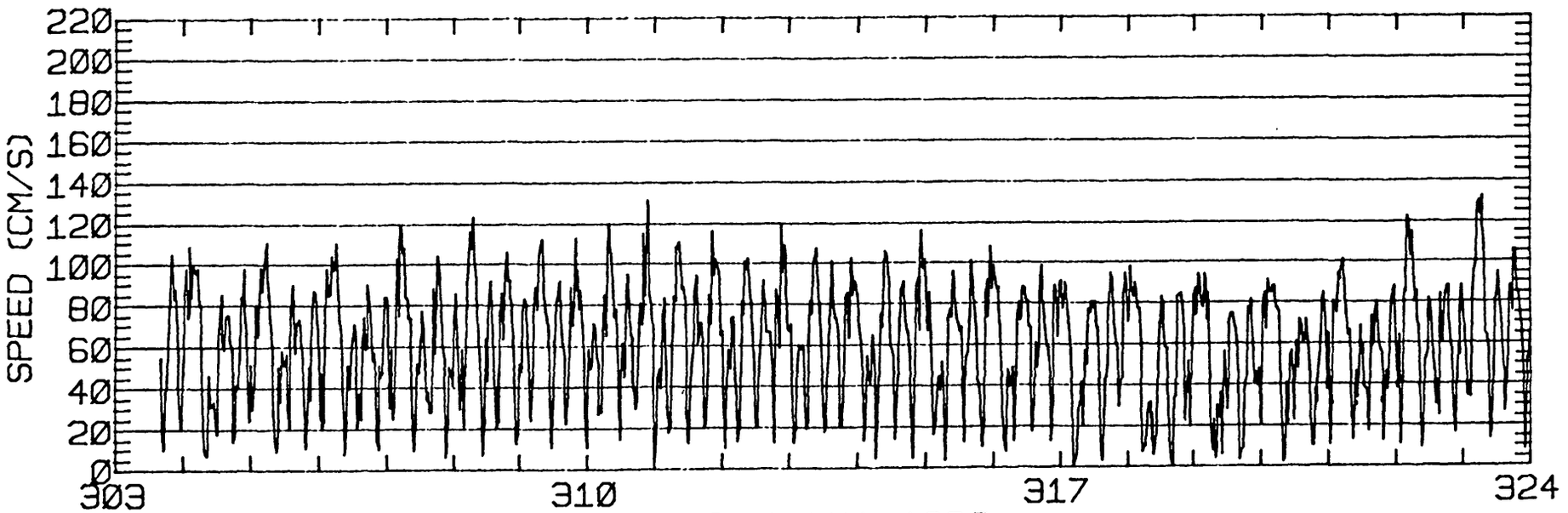
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.54	3.55	79.5	11.9	ANTI-CLOCKWISE
K1	22.28	0.40	70.8	20.8	CLOCKWISE
N2	21.43	3.03	80.1	253.2	CLOCKWISE
M2	78.41	4.11	77.3	284.1	CLOCKWISE
S2	22.42	0.37	72.4	271.0	ANTI-CLOCKWISE
M4	8.16	0.73	7.8	93.5	CLOCKWISE

RMS SPEED: 67.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 134.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 45.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 14.49 CM/SEC
STANDARD DEVIATION V SERIES: 22.19 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	21.2	-12.8	160.
2	12	22.3	-15.1	184.
3	12	22.3	-12.2	193.
4	4	24.5	-12.1	196.
ALL	40	22.2	-13.2	



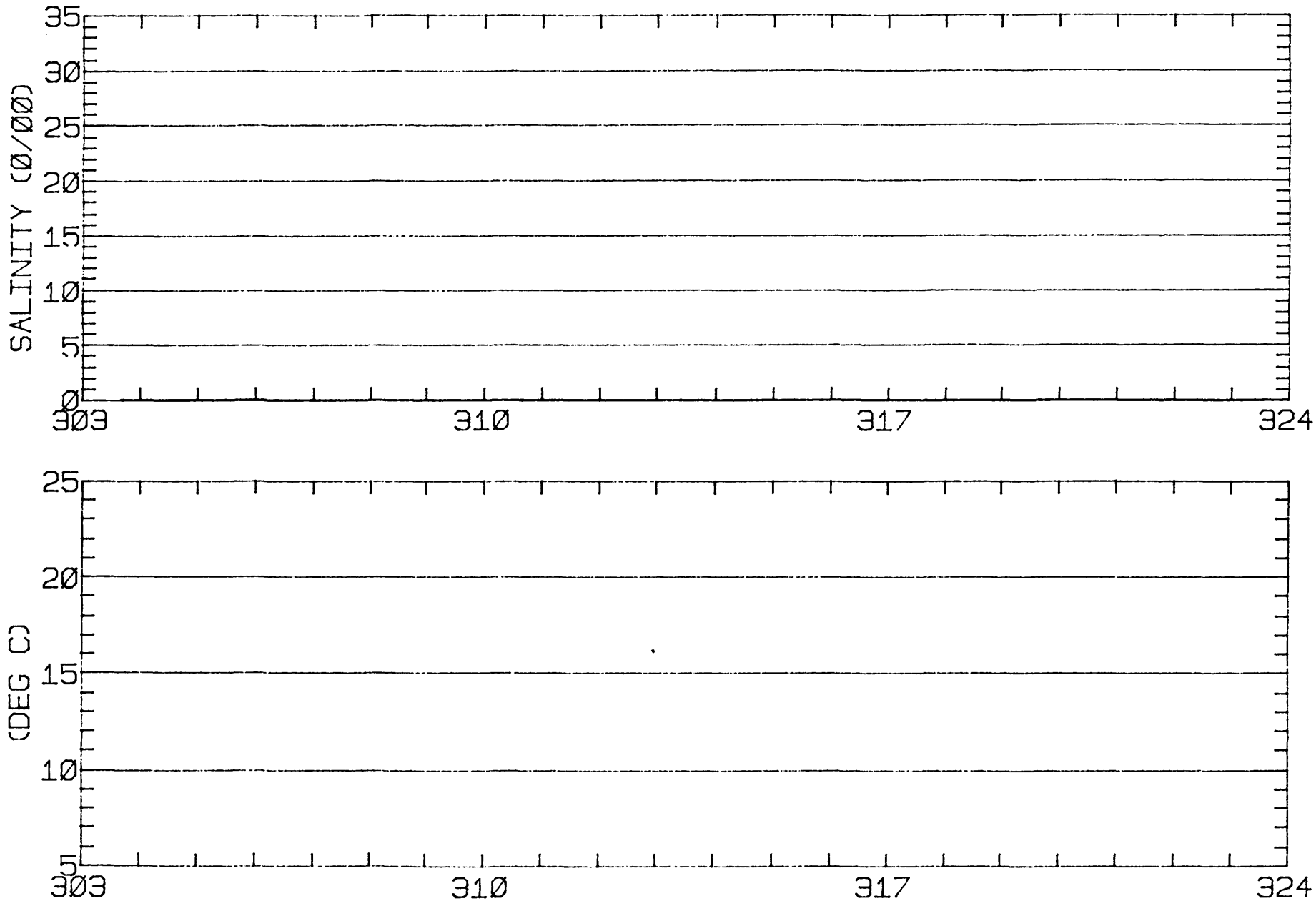


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 1 37-49-14N 122-28-20W

METER 007.5 METERS ABOVE BED. WATER DEPTH 097.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 1 37-49-14N 122-28-20W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø97.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 2
POSITION: 37 48'44"N 122 31'44"W
METER TYPE: AANDERAA
WATER DEPTH: 18.9 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 1130 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

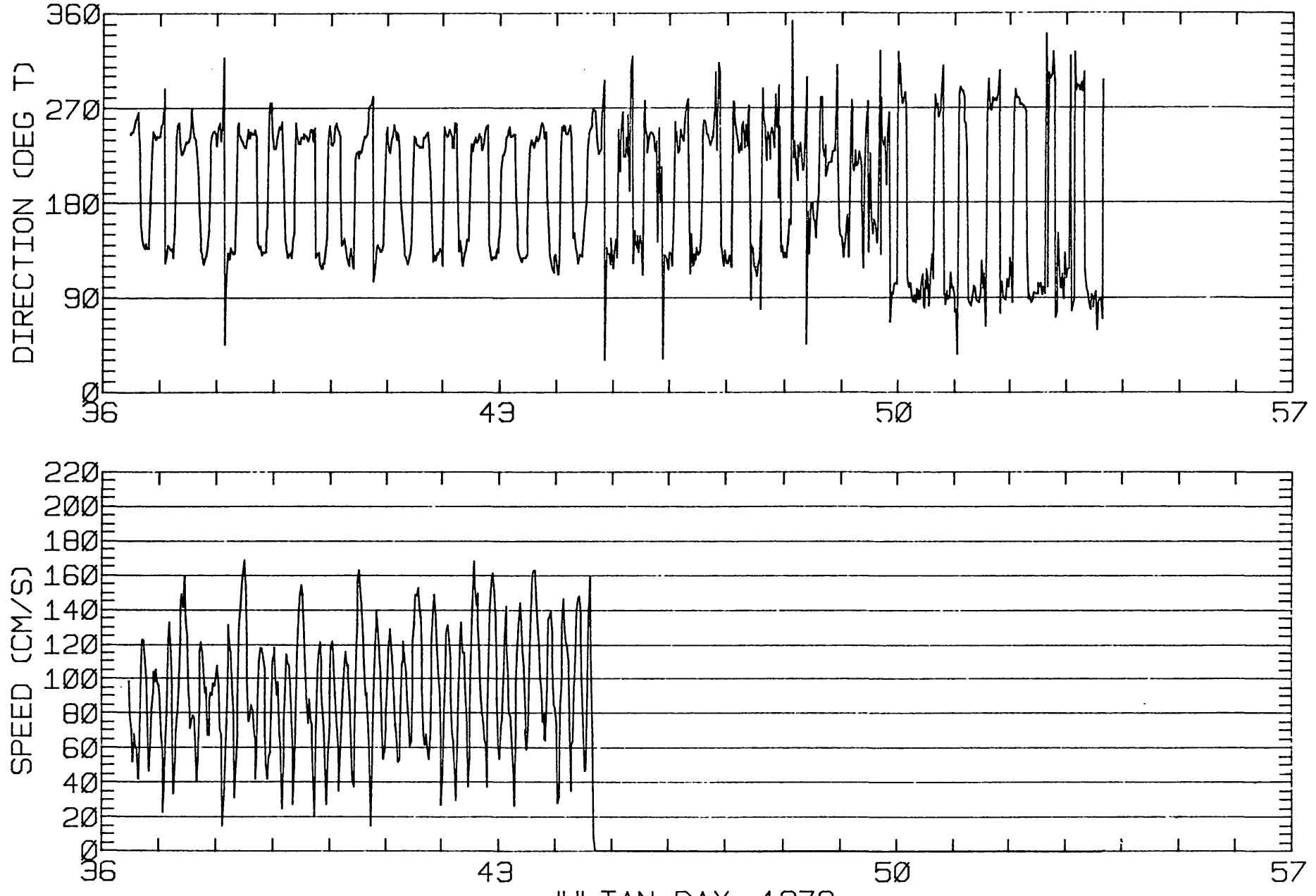
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.02	1.38	88.0	72.4	CLOCKWISE
K1	22.74	0.66	72.1	45.1	ANTI-CLOCKWISE
N2	29.10	20.07	74.0	244.7	CLOCKWISE
M2	106.34	32.08	99.1	272.5	CLOCKWISE
S2	29.65	3.76	77.2	285.5	CLOCKWISE
M4	22.80	11.88	144.1	231.9	ANTI-CLOCKWISE

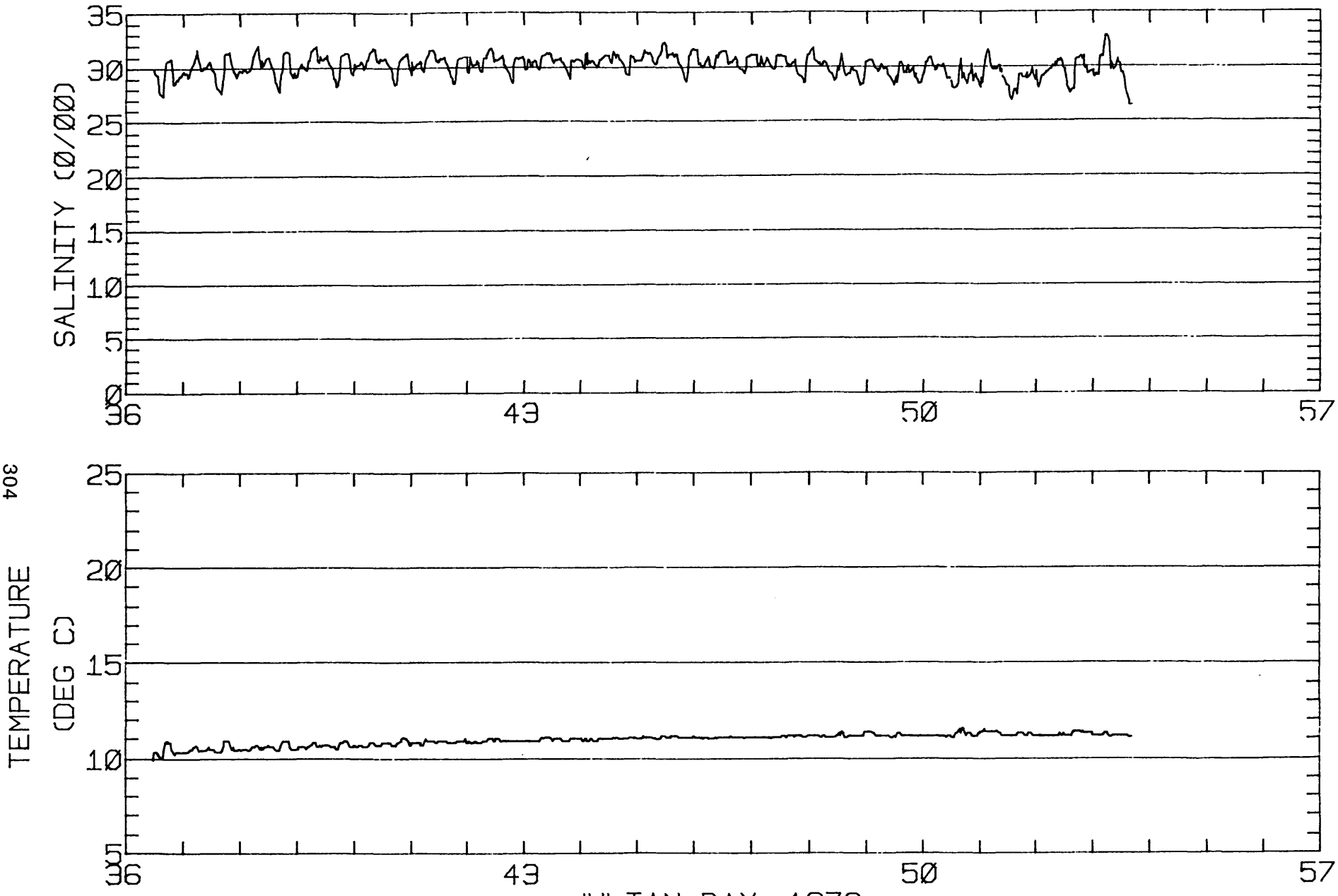
RMS SPEED: 98.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 168.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 64.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 91.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 22.48 CM/SEC
STANDARD DEVIATION V SERIES: 18.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-23.9	-50.7	415.
ALL	12	-23.9	-50.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-44N 122-31-44W
METER 012.2 METERS ABOVE BED. WATER DEPTH 018.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-44N 122-31-44W
METER Ø12.2 METERS ABOVE BED. WATER DEPTH Ø18.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 2
POSITION: 37 48'44"N 122 31'44"W
METER TYPE: AANDERAA
WATER DEPTH: 18.9 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 1122 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

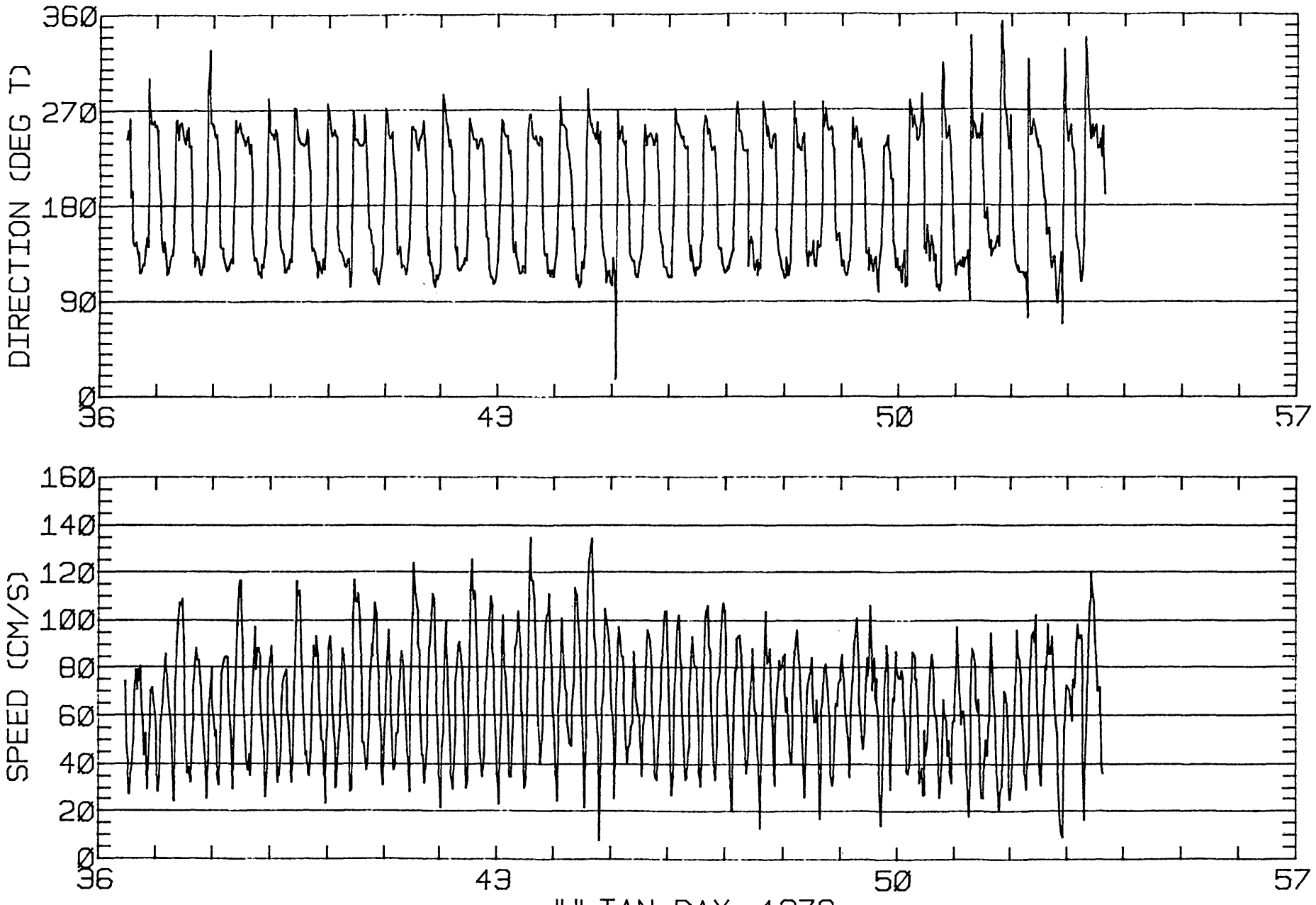
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.95	1.81	78.0	9.9	ANTI-CLOCKWISE
K1	17.24	1.64	81.4	47.6	ANTI-CLOCKWISE
N2	21.94	1.15	113.1	238.2	ANTI-CLOCKWISE
M2	83.93	7.51	98.8	261.1	ANTI-CLOCKWISE
S2	26.28	1.89	90.7	283.1	ANTI-CLOCKWISE
M4	8.10	4.95	48.5	307.1	ANTI-CLOCKWISE

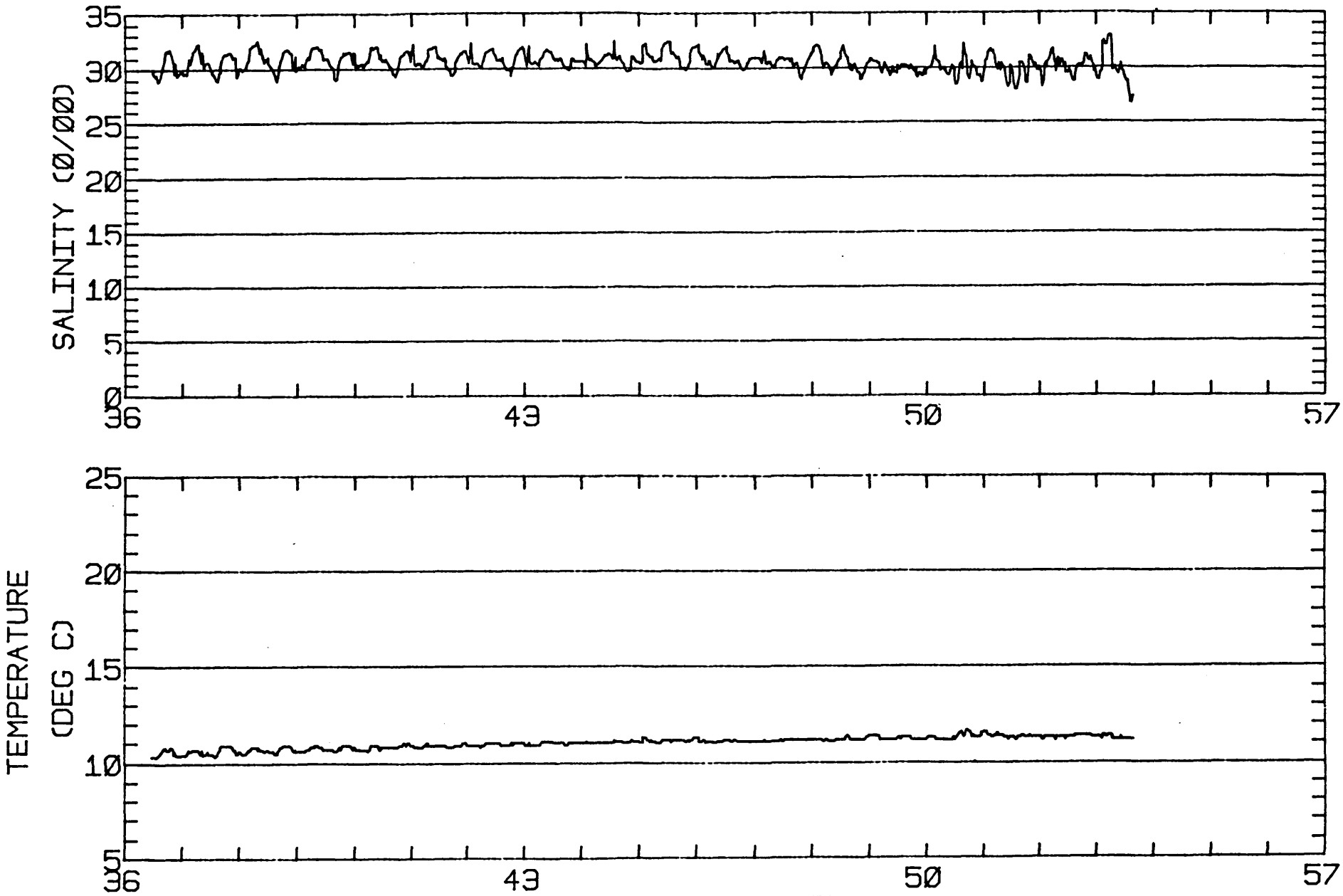
RMS SPEED: 70.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 139.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 52.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 93.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 14.83 CM/SEC
STANDARD DEVIATION V SERIES: 13.40 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.6	-33.1	415.
2	12	-3.2	-33.3	728.
3	8	5.3	-30.4	1630.
ALL	32	-1.6	-32.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-44N 122-31-44W
METER 006.0 METERS ABOVE BED. WATER DEPTH 018.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-44N 122-31-44W
METER ØØ6.Ø METERS ABOVE BED. WATER DEPTH Ø18.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 2
POSITION: 37 48'40"N 122 31'19"W
METER TYPE: AANDERAA
WATER DEPTH: 35.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 1200 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

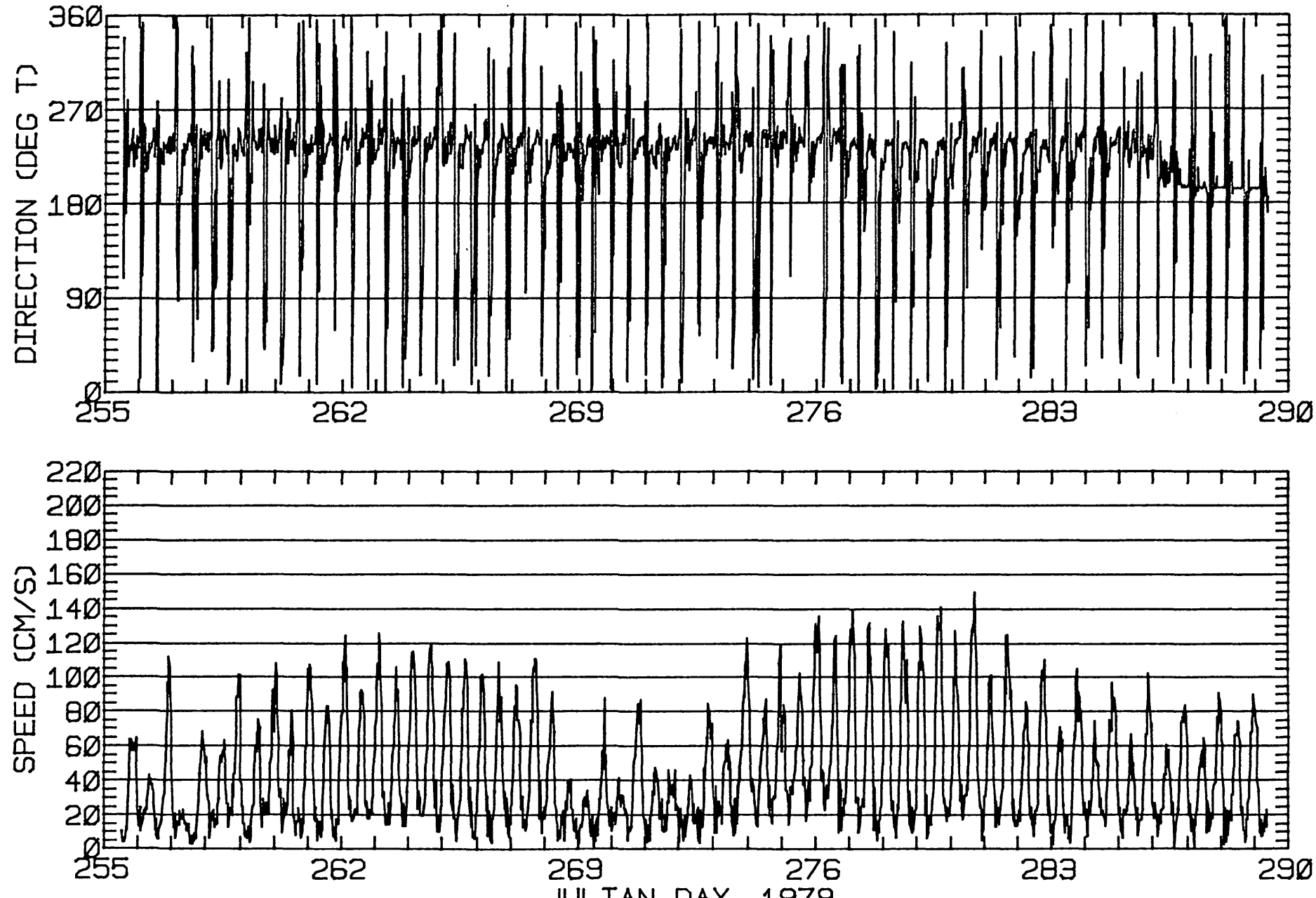
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.91	0.31	57.7	31.7	CLOCKWISE
K1	9.50	0.38	58.9	42.8	CLOCKWISE
N2	9.14	1.18	54.6	231.7	CLOCKWISE
M2	42.10	7.16	59.7	263.7	CLOCKWISE
S2	14.38	2.40	60.2	266.8	CLOCKWISE
M4	9.53	1.20	48.1	54.9	ANTI-CLOCKWISE

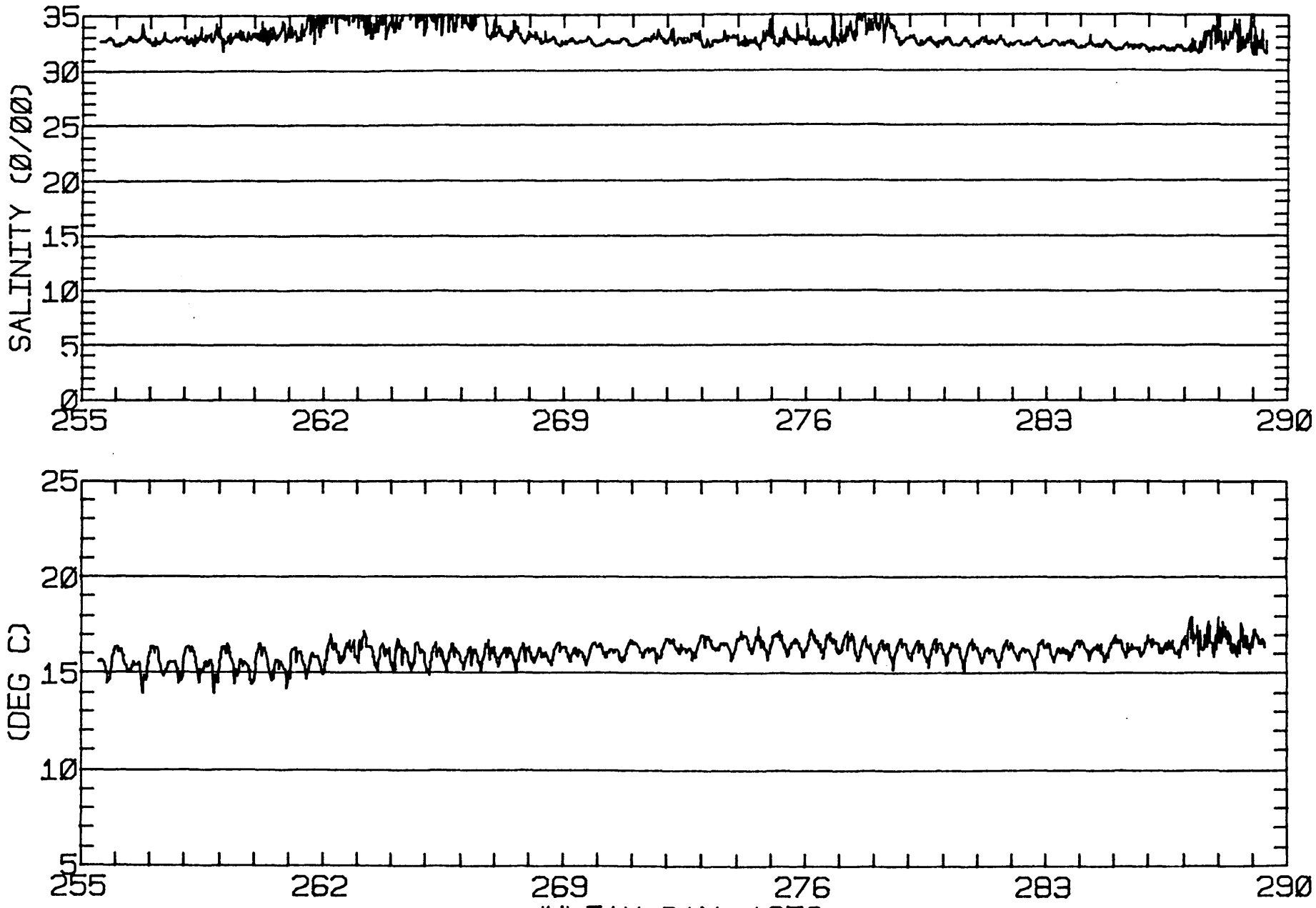
RMS SPEED: 56.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 73.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 59.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 15.53 CM/SEC
STANDARD DEVIATION V SERIES: 13.76 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-26.4	-15.9	197.
2	12	-38.2	-19.8	157.
3	12	-23.8	-13.8	131.
4	12	-43.0	-25.8	153.
5	10	-33.0	-23.2	168.
ALL	58	-32.9	-19.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-40N 122-31-19W
METER 023.5 METERS ABOVE BED. WATER DEPTH 035.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-40N 122-31-19W
METER Ø23.5 METERS ABOVE BED. WATER DEPTH Ø35.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 2
POSITION: 37 48'40"N 122 31'19"W
METER TYPE: AANDERAA
WATER DEPTH: 35.7 M (MLLW)
METER DEPTH: 28.1 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 1202 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

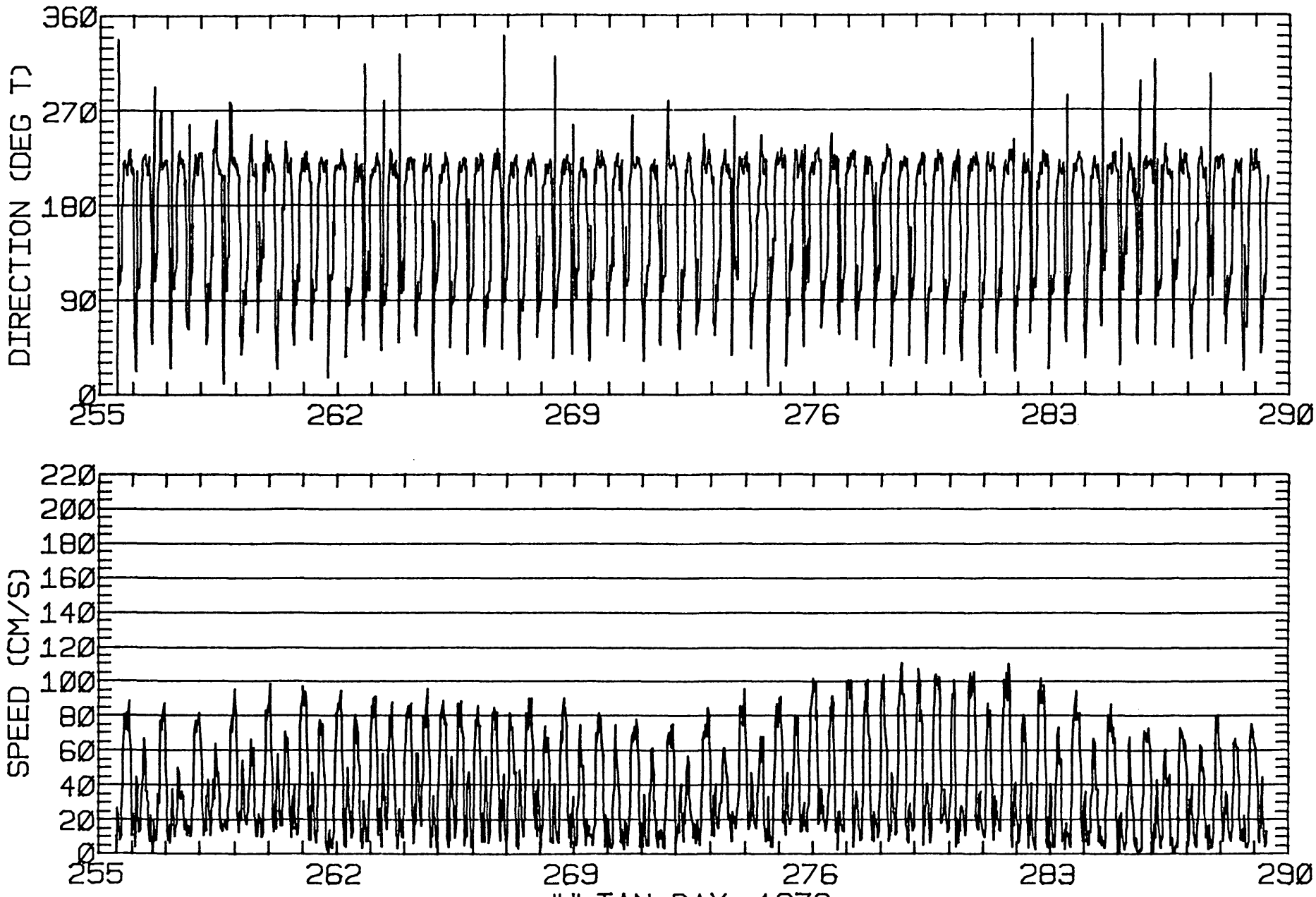
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.02	1.68	46.8	31.0	ANTI-CLOCKWISE
K1	12.54	0.43	53.9	34.1	ANTI-CLOCKWISE
N2	9.65	0.19	49.8	236.4	CLOCKWISE
M2	46.70	1.36	50.9	261.1	CLOCKWISE
S2	13.51	0.38	50.0	266.0	CLOCKWISE
M4	4.11	0.47	4.6	21.2	CLOCKWISE

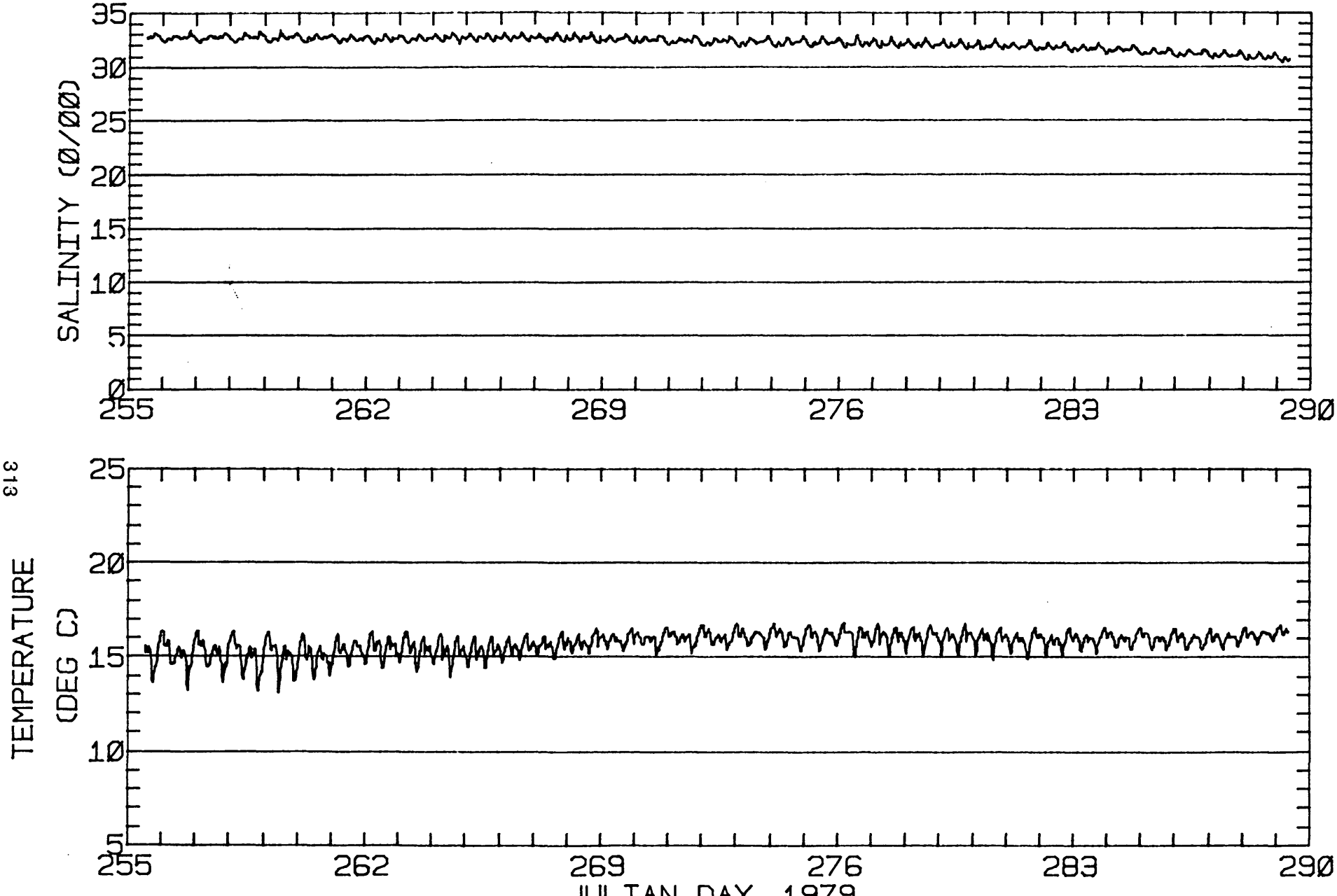
RMS SPEED: 50.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 81.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 50.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 9.85 CM/SEC
STANDARD DEVIATION V SERIES: 10.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-12.3	-24.3	197.
2	12	-12.9	-27.3	157.
3	12	-12.3	-23.5	131.
4	12	-16.3	-29.5	153.
5	10	-15.3	-26.8	168.
ALL	58	-13.8	-26.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-40N 122-31-19W
METER 007.6 METERS ABOVE BED. WATER DEPTH 035.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-40N 122-31-19W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø35.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 2
POSITION: 37 48'40"N 122 31'19"W
METER TYPE: AANDERAA
WATER DEPTH: 35.4 M (MLLW)
METER DEPTH: 33.5 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 934 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

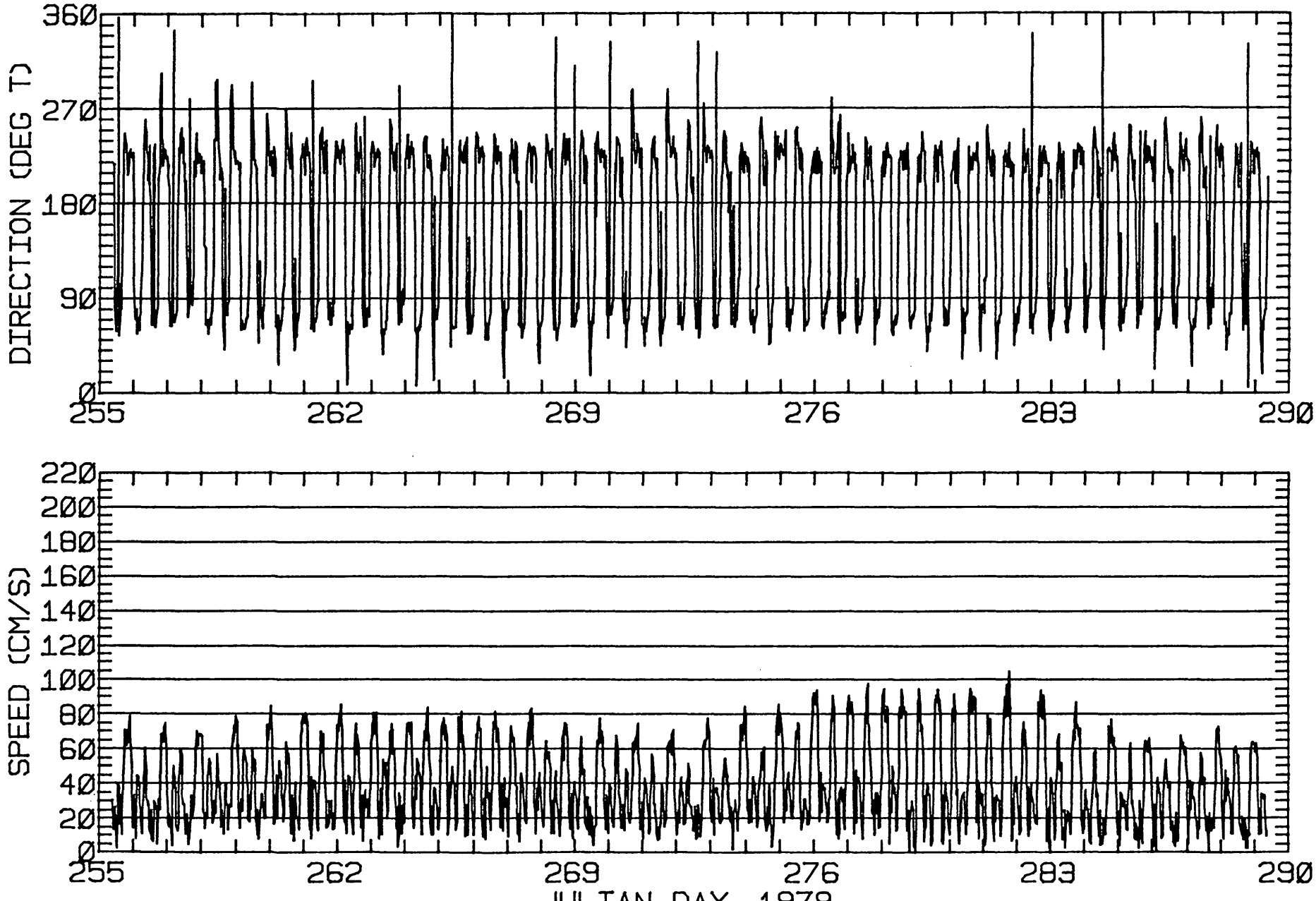
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.96	1.02	56.0	18.8	ANTI-CLOCKWISE
K1	13.10	0.84	50.8	33.3	ANTI-CLOCKWISE
N2	10.71	0.26	51.5	243.3	ANTI-CLOCKWISE
M2	50.04	0.96	53.3	264.3	ANTI-CLOCKWISE
S2	14.07	0.56	48.2	267.2	CLOCKWISE
M4	3.34	1.53	139.8	257.9	ANTI-CLOCKWISE

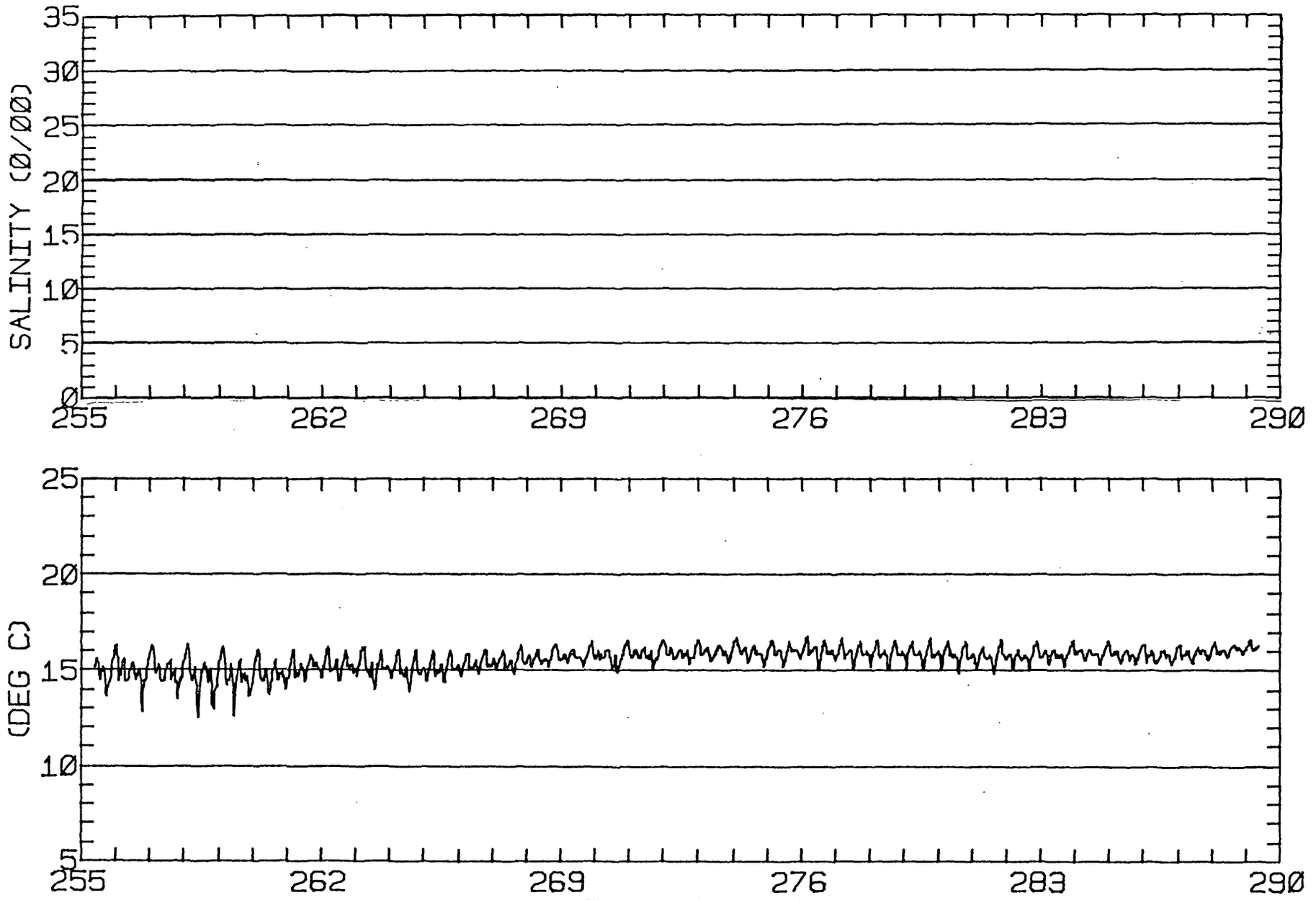
RMS SPEED: 47.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 87.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 52.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 12.68 CM/SEC
STANDARD DEVIATION V SERIES: 9.99 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.1	-13.5	197.
2	12	-10.5	-16.0	157.
3	12	-7.5	-13.5	131.
4	12	-12.0	-20.7	153.
5	10	-10.3	-18.8	168.
ALL	58	-9.2	-16.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-40N 122-31-19W
METER 001.9 METERS ABOVE BED. WATER DEPTH 035.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-40N 122-31-19W
METER ØØ1.9 METERS ABOVE BED. WATER DEPTH Ø35.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 2
POSITION: 37 48'43"N 122 31'16"W
METER TYPE: AANDERAA
WATER DEPTH: 36.6 M (MLLW)
METER DEPTH: 13.1 M (BELOW MLLW)
START TIME OF SERIES:10/16/79 1240 PST JULIAN DAY=289
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

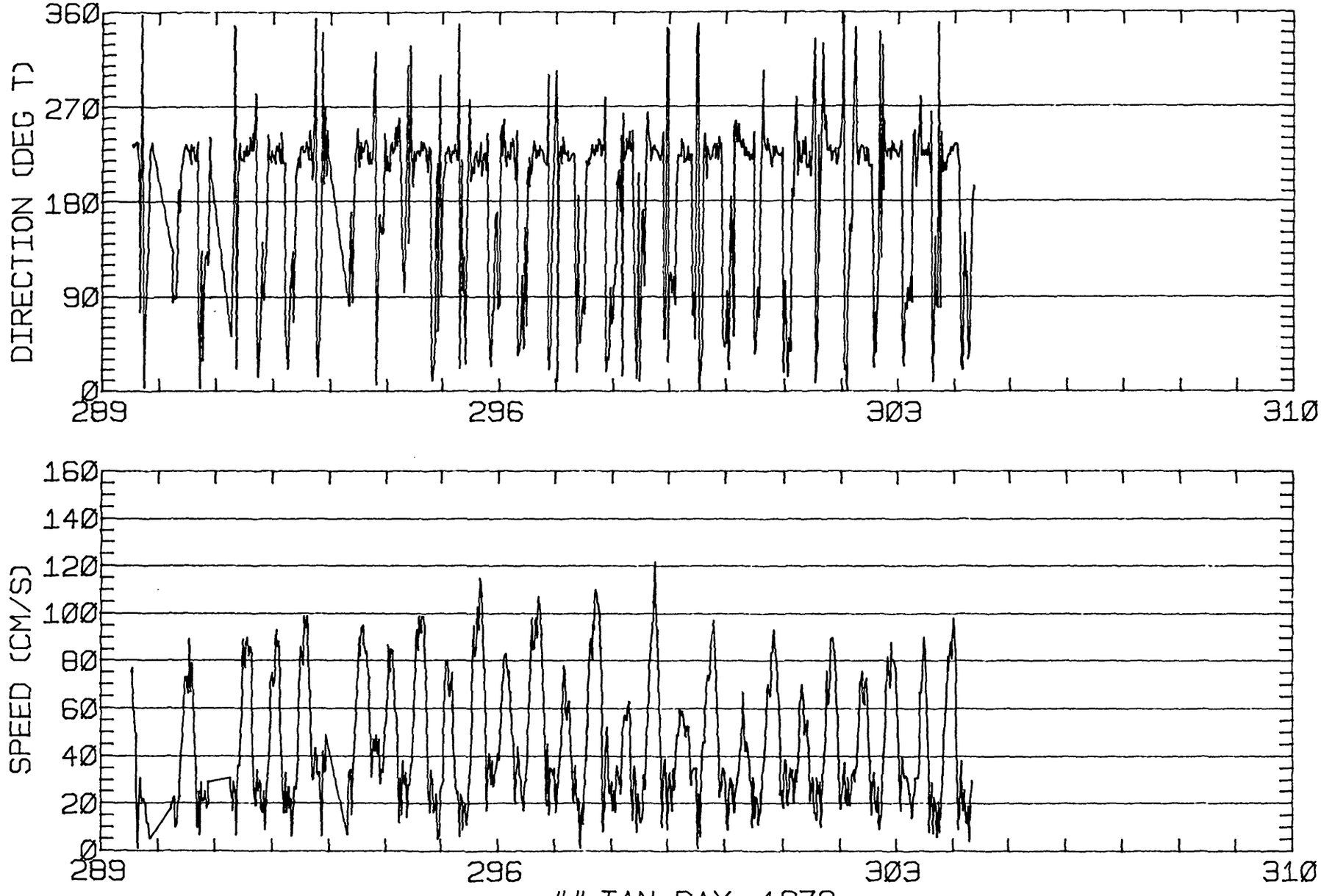
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.65	0.88	48.8	33.3	ANTI-CLOCKWISE
K1	10.48	0.40	51.7	17.4	CLOCKWISE
N2	10.12	2.56	62.6	204.5	ANTI-CLOCKWISE
M2	51.37	2.02	54.0	253.1	CLOCKWISE
S2	13.06	0.10	51.8	259.9	CLOCKWISE
M4	8.21	1.33	33.1	49.1	CLOCKWISE

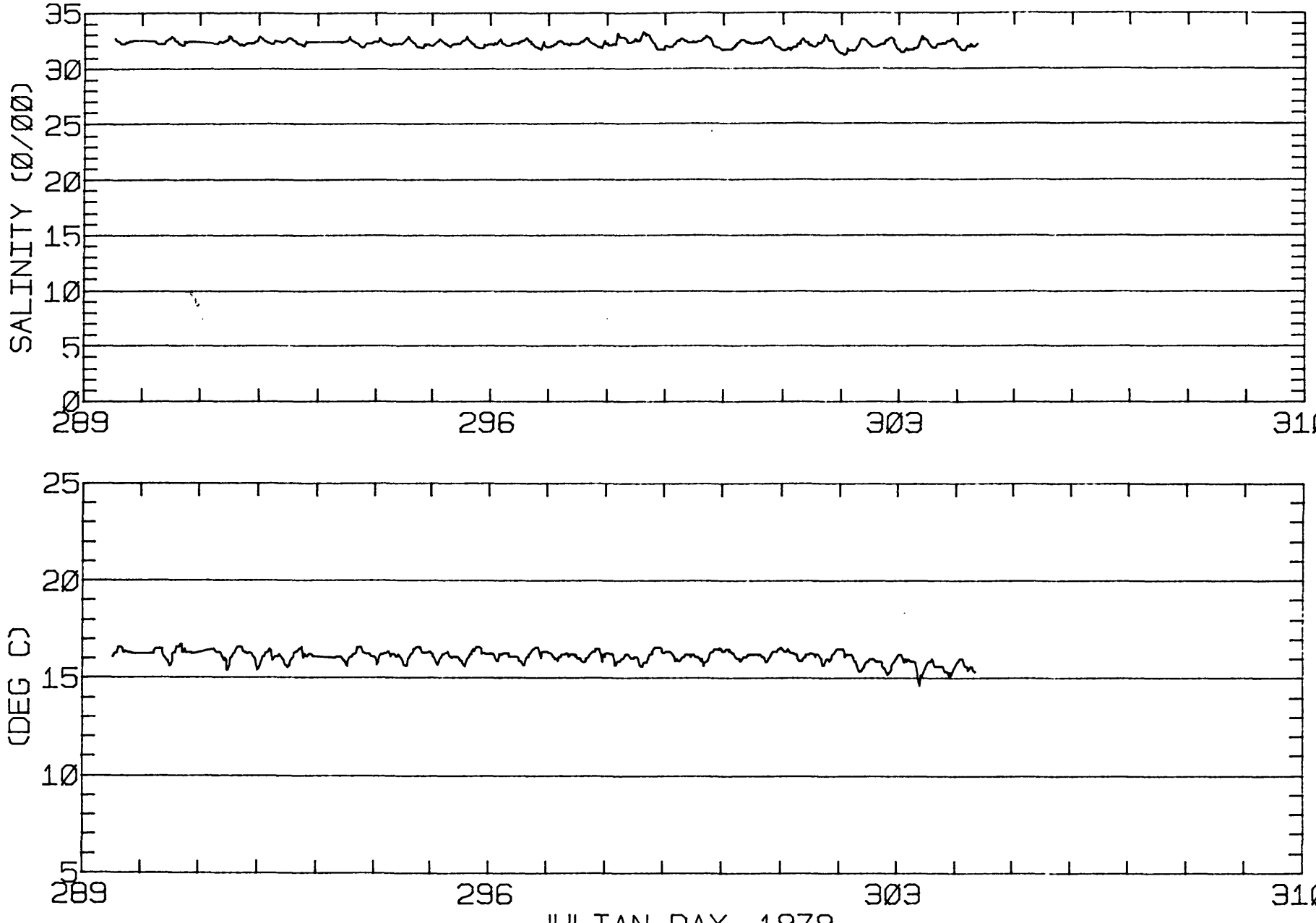
RMS SPEED: 53.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 86.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 52.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 15.62 CM/SEC
STANDARD DEVIATION V SERIES: 15.62 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-23.9	-24.7	197.
2	12	-22.9	-20.9	274.
3	4	-8.8	-14.1	440.
ALL	28	-21.3	-21.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-43N 122-31-16W
METER 023.4 METERS ABOVE BED. WATER DEPTH 036.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-43N 122-31-16W
METER Ø23.4 METERS ABOVE BED. WATER DEPTH Ø36.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 2
POSITION: 37 48'43"N 122 31'16"W
METER TYPE: AANDERAA
WATER DEPTH: 36.6 M (MLLW)
METER DEPTH: 29.0 M (BELOW MLLW)
START TIME OF SERIES:10/16/79 1252 PST JULIAN DAY=289
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

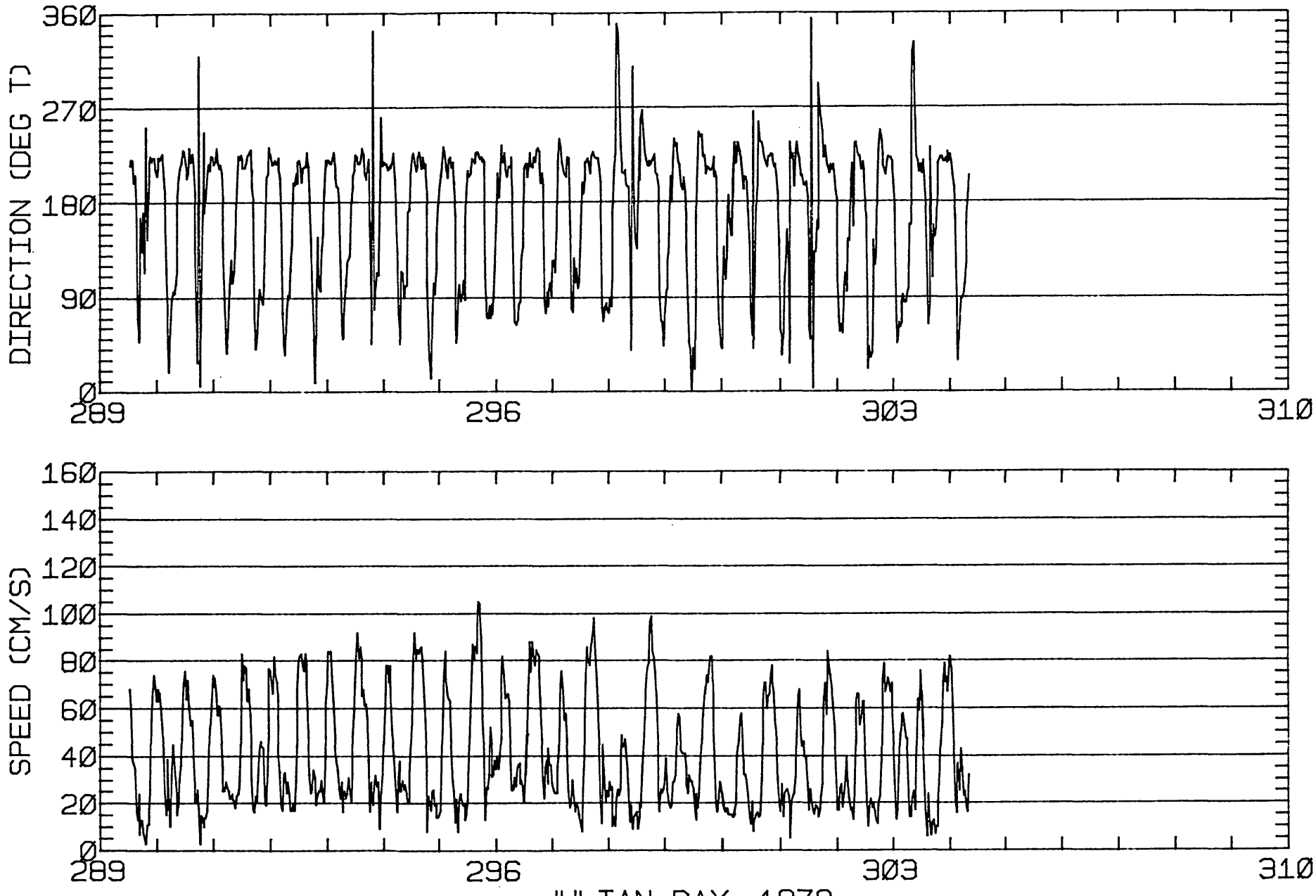
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.50	2.25	41.4	16.6	ANTI-CLOCKWISE
K1	14.41	0.64	55.8	8.6	ANTI-CLOCKWISE
N2	8.63	1.50	55.0	215.8	ANTI-CLOCKWISE
M2	47.91	1.44	50.7	253.0	ANTI-CLOCKWISE
S2	13.86	1.40	54.8	253.1	CLOCKWISE
M4	6.42	0.30	11.5	34.5	ANTI-CLOCKWISE

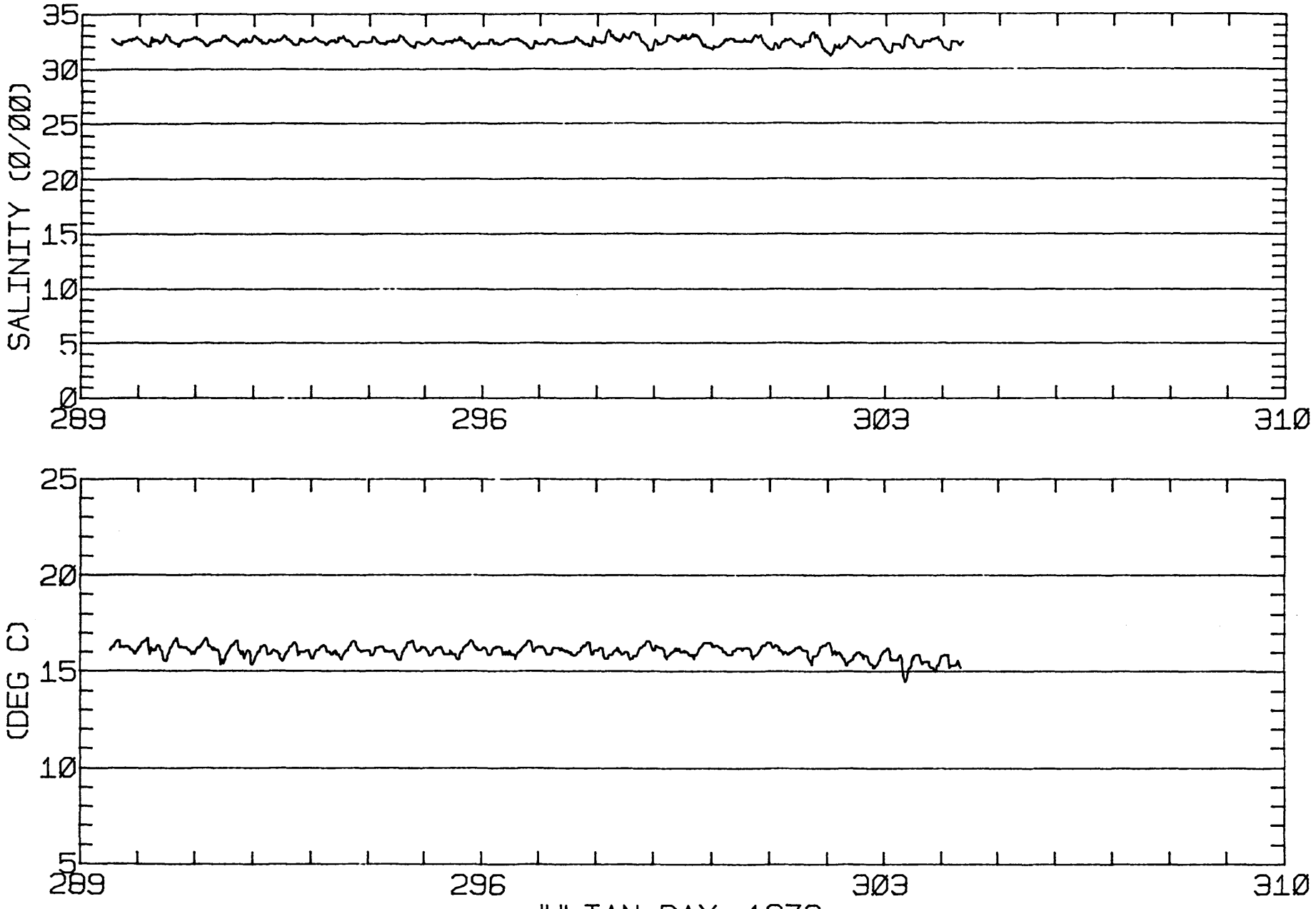
RMS SPEED: 47.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 84.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 51.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 10.26 CM/SEC
STANDARD DEVIATION V SERIES: 11.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-13.2	-27.0	197.
2	12	-11.6	-24.3	274.
3	4	-7.8	-21.3	440.
ALL	28	-11.7	-25.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-43N 122-31-16W
METER 007.5 METERS ABOVE BED. WATER DEPTH 036.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-43N 122-31-16W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø36.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 2
POSITION: 37 48'43"N 122 31'16"W
METER TYPE: AANDERAA
WATER DEPTH: 36.6 M (MLLW)
METER DEPTH: 34.8 M (BELOW MLLW)
START TIME OF SERIES:10/16/79 1254 PST JULIAN DAY=289
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

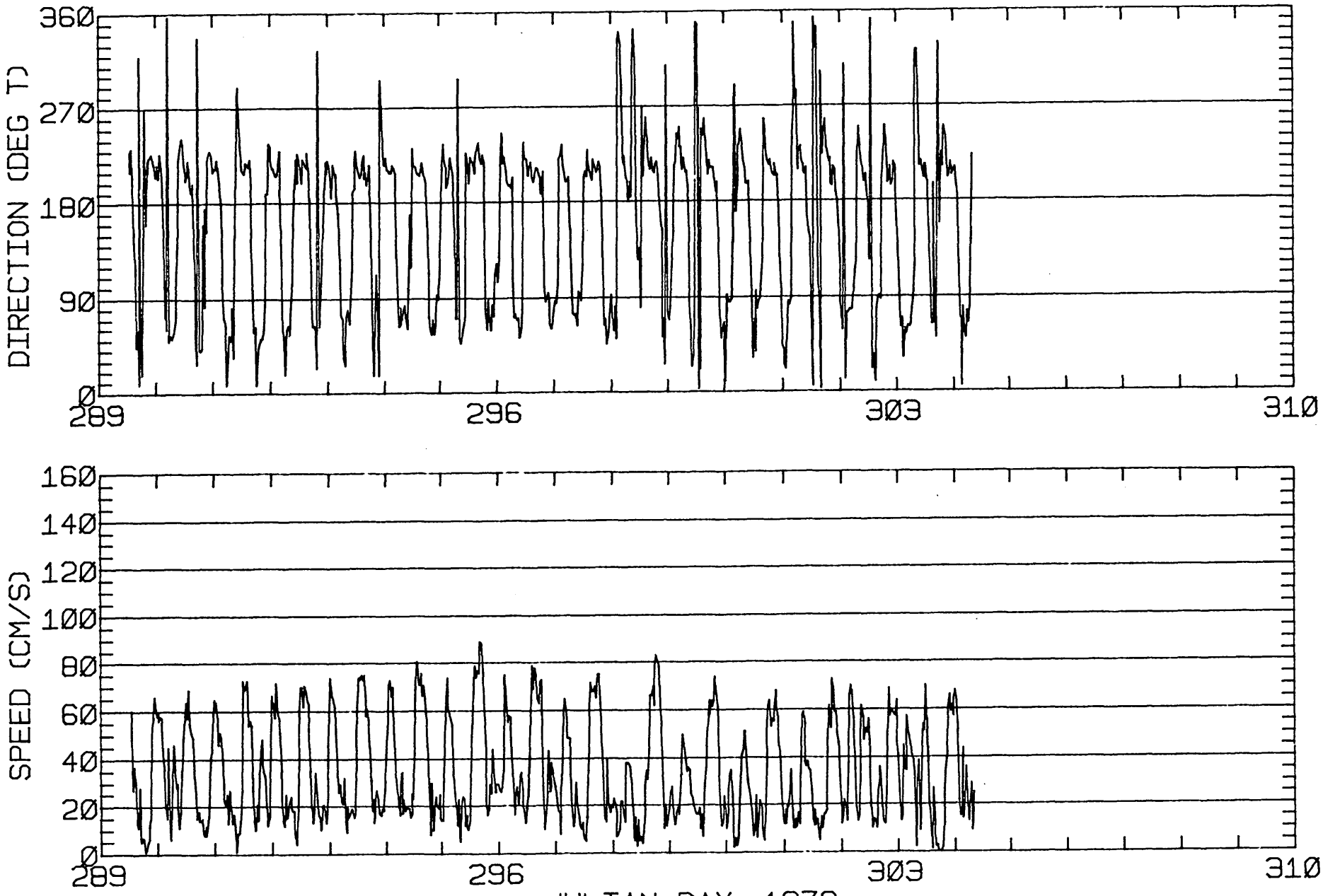
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.15	2.87	33.6	8.1	ANTI-CLOCKWISE
K1	13.98	2.21	46.1	7.5	ANTI-CLOCKWISE
N2	8.58	1.70	43.0	222.7	ANTI-CLOCKWISE
M2	43.50	5.07	42.2	257.3	ANTI-CLOCKWISE
S2	12.74	0.29	40.9	245.8	CLOCKWISE
M4	4.62	2.80	6.1	14.3	ANTI-CLOCKWISE

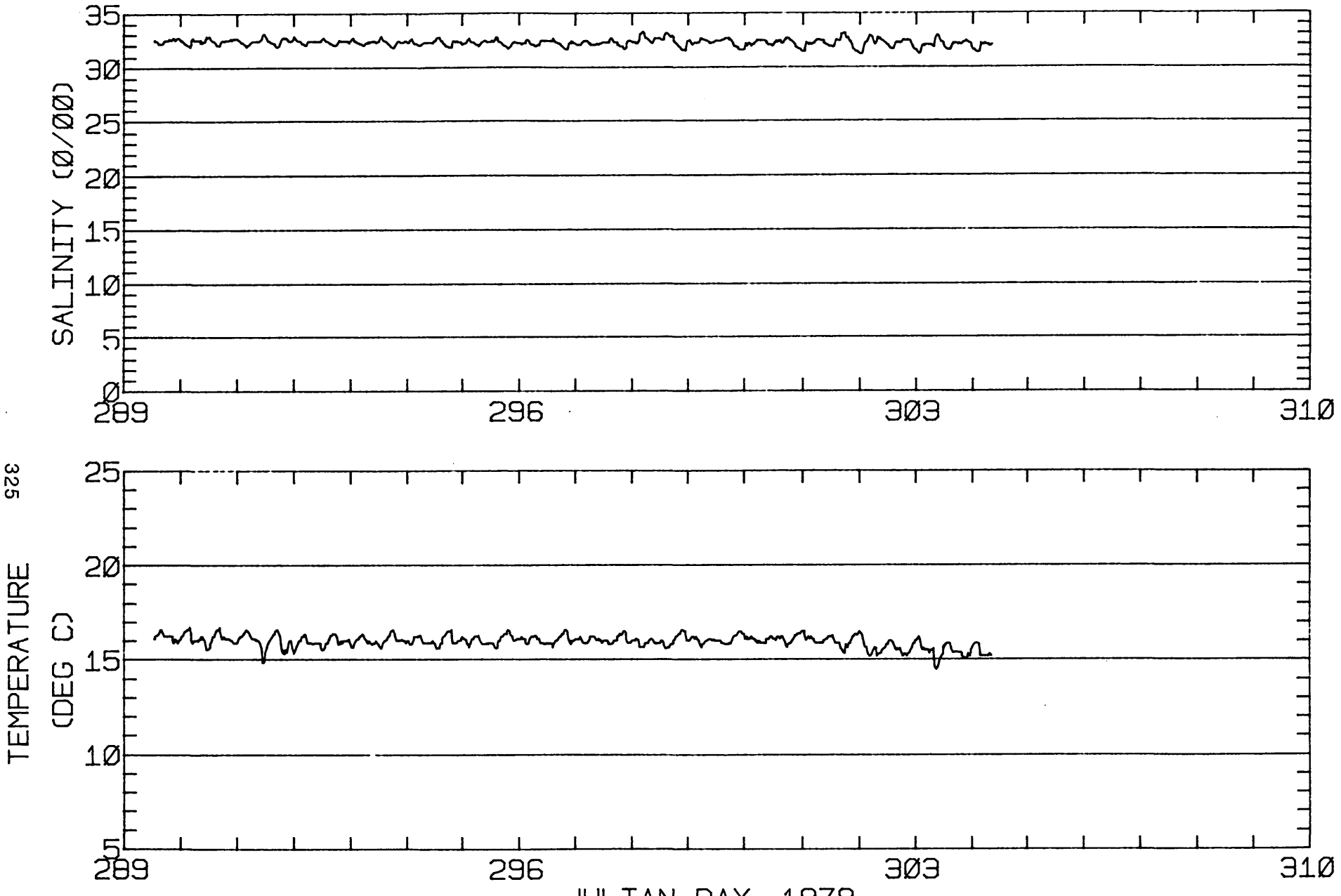
RMS SPEED: 41.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 78.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 24.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 41.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 11.92 CM/SEC
STANDARD DEVIATION V SERIES: 9.86 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.4	-20.1	197.
2	12	-6.5	-17.8	274.
3	4	0.5	-14.1	440.
ALL	28	-6.3	-18.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-43N 122-31-16W
METER 001.7 METERS ABOVE BED. WATER DEPTH 036.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 2 37-48-43N 122-31-16W
METER ØØ1.7 METERS ABOVE BED. WATER DEPTH Ø36.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: T2
POSITION: 37 46'18"N 122 32' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 15.2 M (MLLW)
METER DEPTH: 13.7 M (BELOW MLLW)
START TIME OF SERIES: 4/14/80 1110 PST JULIAN DAY=105
APPROXIMATE RECORD LENGTH IS 48 M2-CYCLES

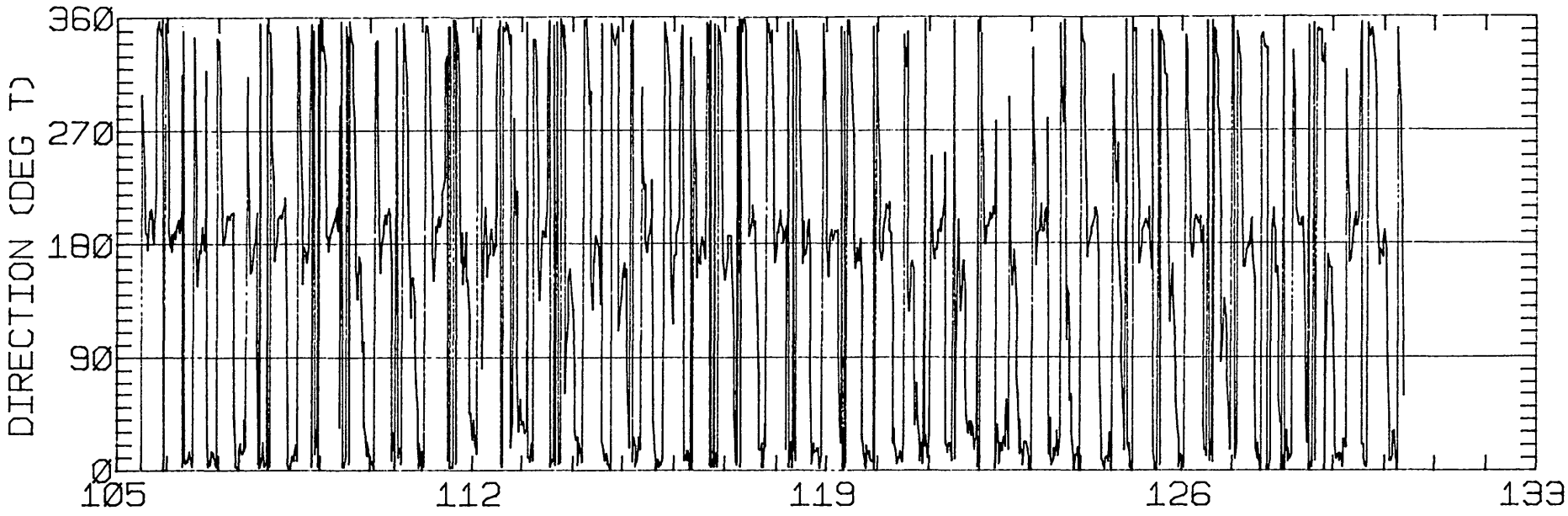
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

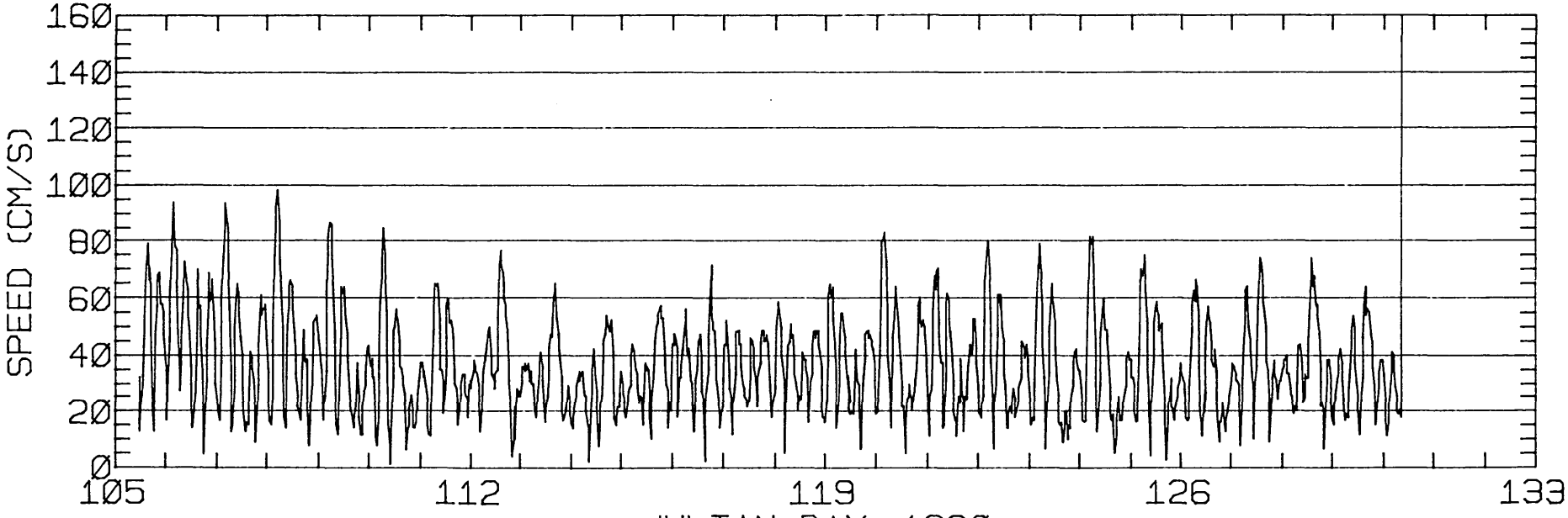
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.84	3.08	38.2	62.3	CLOCKWISE
K1	18.55	1.97	12.9	16.4	CLOCKWISE
N2	10.29	0.52	2.4	248.7	CLOCKWISE
M2	47.16	3.82	5.3	280.2	ANTI-CLOCKWISE
S2	12.39	0.92	16.3	283.7	CLOCKWISE
M4	3.65	2.12	159.8	215.6	CLOCKWISE

RMS SPEED: 41.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 88.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 12.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 10.36 CM/SEC
STANDARD DEVIATION V SERIES: 9.85 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

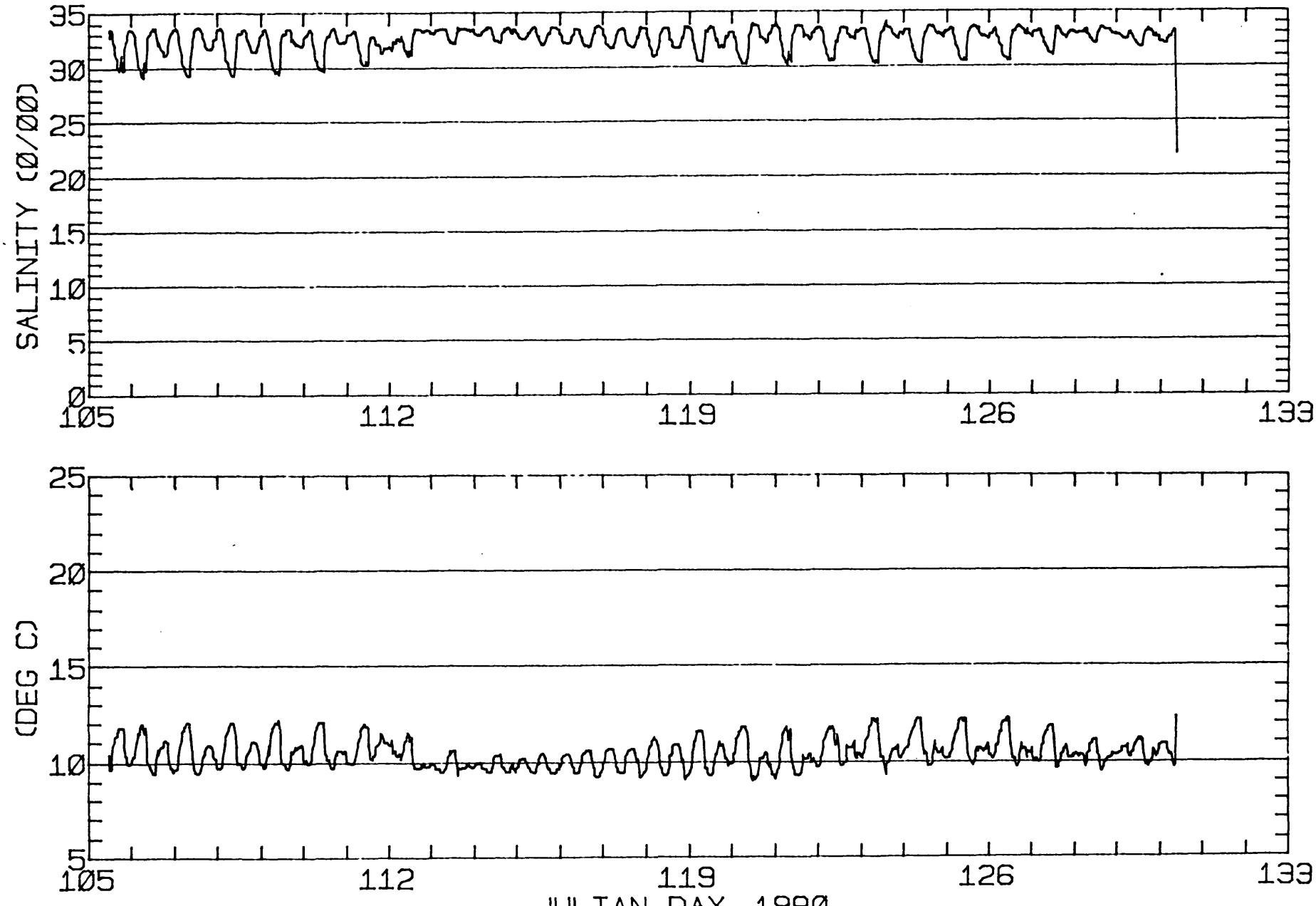
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.4	2.0	725.
2	12	1.6	11.6	662.
3	12	1.4	5.1	615.
4	12	-0.5	6.8	528.
ALL	48	-0.2	6.4	





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION T2 37-46-18N 122-32- 8W
METER 001.5 METERS ABOVE BED. WATER DEPTH 015.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION T2 37-46-18N 122-32- 8W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø15.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 0"W
METER TYPE: AANDERAA
WATER DEPTH: 36.9 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 2/27/79 1120 PST JULIAN DAY= 58
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

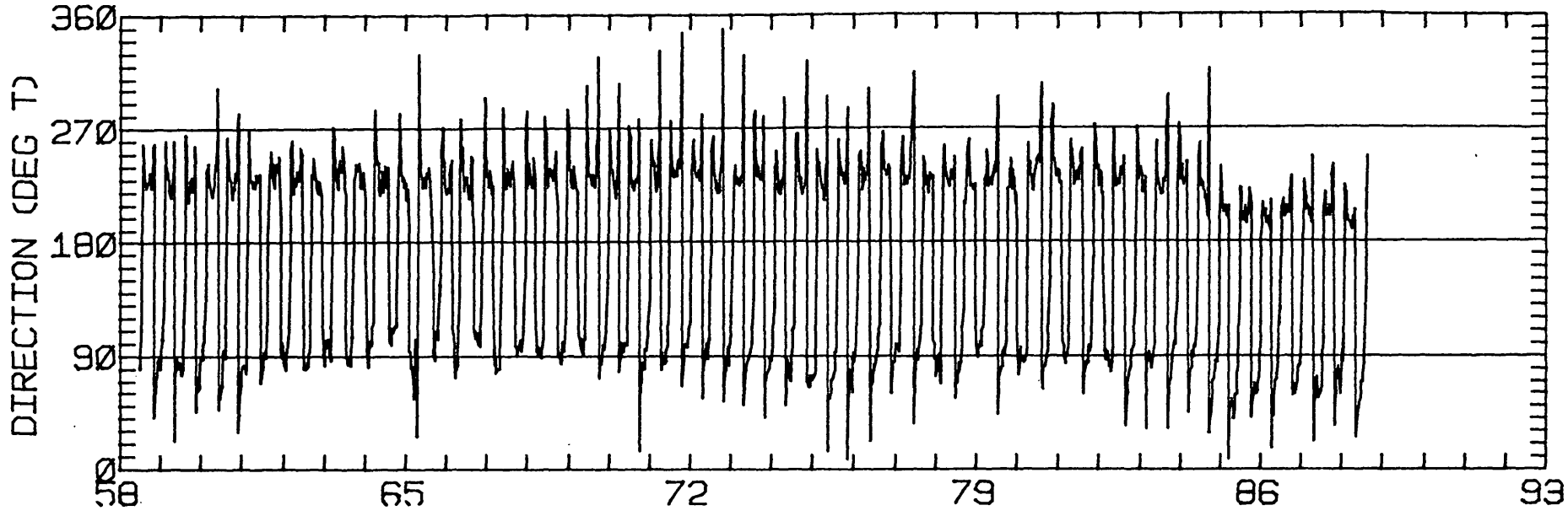
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

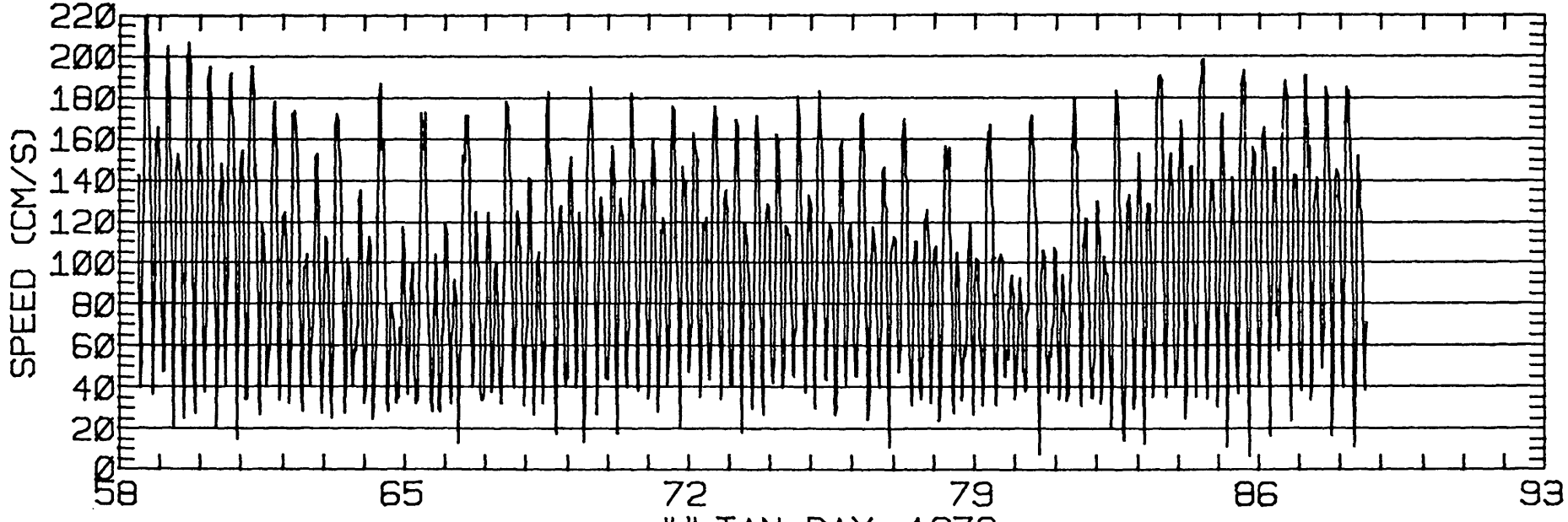
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.65	0.61	63.4	43.8	ANTI-CLOCKWISE
K1	22.16	0.64	67.7	59.3	CLOCKWISE
N2	29.09	1.24	45.2	265.9	CLOCKWISE
M2	119.23	5.24	63.8	293.3	CLOCKWISE
S2	33.24	3.07	51.5	292.1	CLOCKWISE
M4	17.04	3.90	145.1	250.3	CLOCKWISE

RMS SPEED: 108.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 190.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 79.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 62.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.25
STANDARD DEVIATION U-SERIES: 25.00 CM/SEC
STANDARD DEVIATION V SERIES: 22.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-14.9	-40.0	2039.
2	12	-12.1	-37.3	1210.
3	12	-3.6	-28.6	767.
4	12	-10.1	-31.0	914.
5	10	10.7	-38.4	710.
ALL	58	-6.6	-35.0	



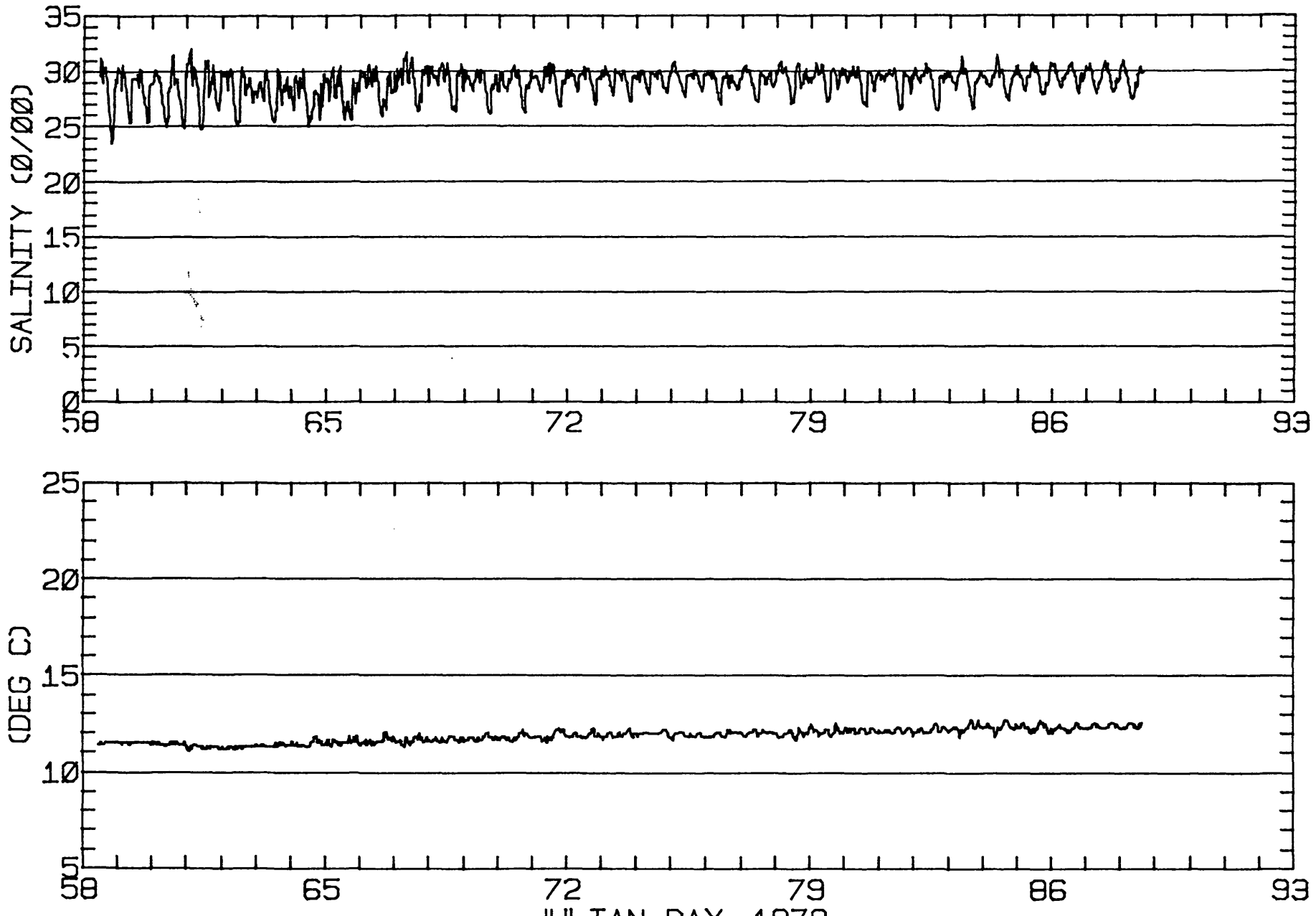


JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 3 37-48- 5N 122-31- 0W

METER 031.1 METERS ABOVE BED. WATER DEPTH 036.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- ØW
METER Ø31.1 METERS ABOVE BED. WATER DEPTH Ø36.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 0"W
METER TYPE: AANDERAA
WATER DEPTH: 36.9 M (MLLW)
METER DEPTH: 29.3 M (BELOW MLLW)
START TIME OF SERIES: 2/27/79 1114 PST JULIAN DAY= 58
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

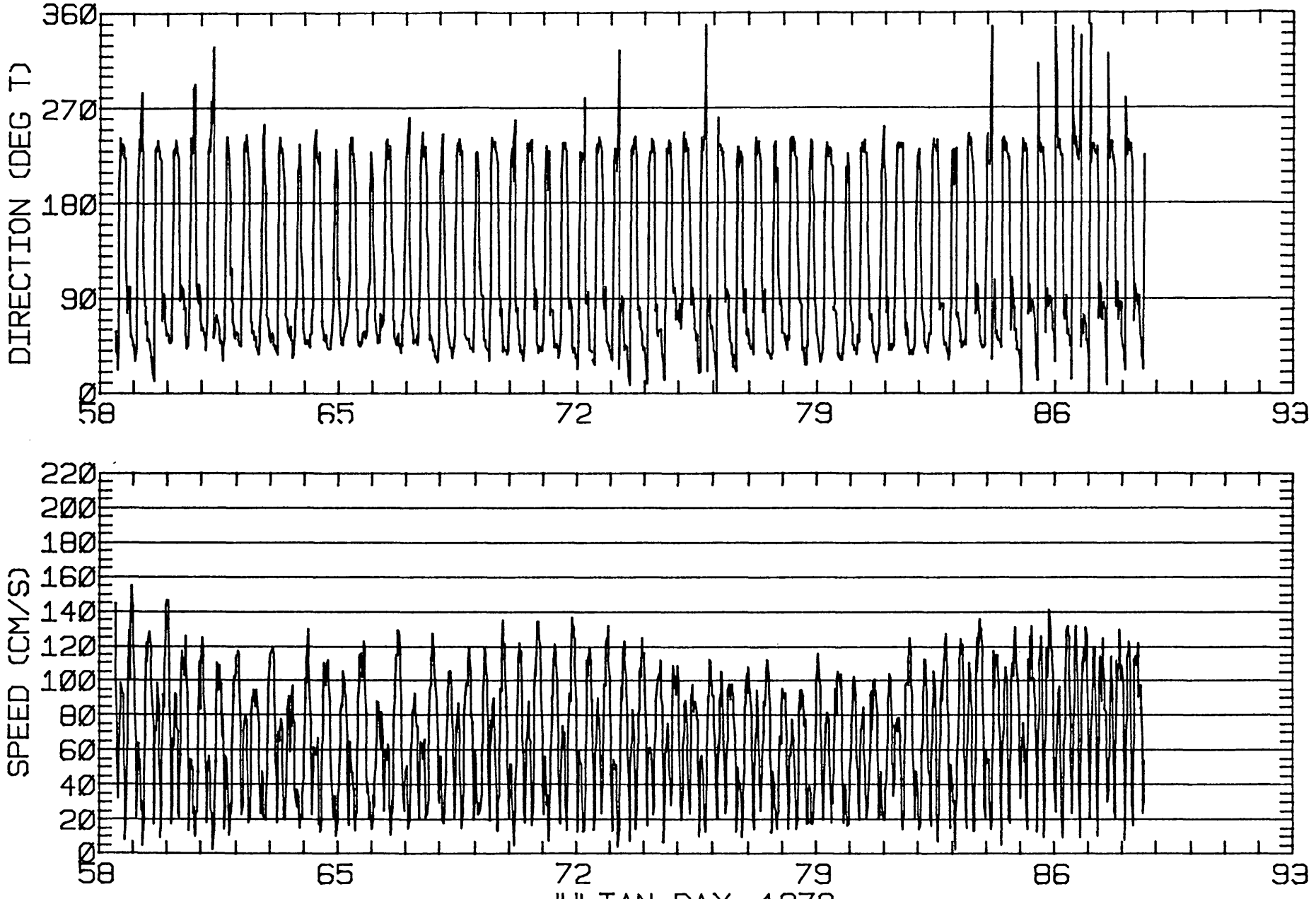
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.53	0.39	46.2	25.8	ANTI-CLOCKWISE
K1	19.83	0.54	53.1	40.1	CLOCKWISE
N2	16.03	0.95	75.2	253.5	ANTI-CLOCKWISE
M2	81.20	13.37	52.2	284.1	ANTI-CLOCKWISE
S2	20.75	5.26	68.5	288.1	ANTI-CLOCKWISE
M4	10.14	6.77	16.1	318.1	CLOCKWISE

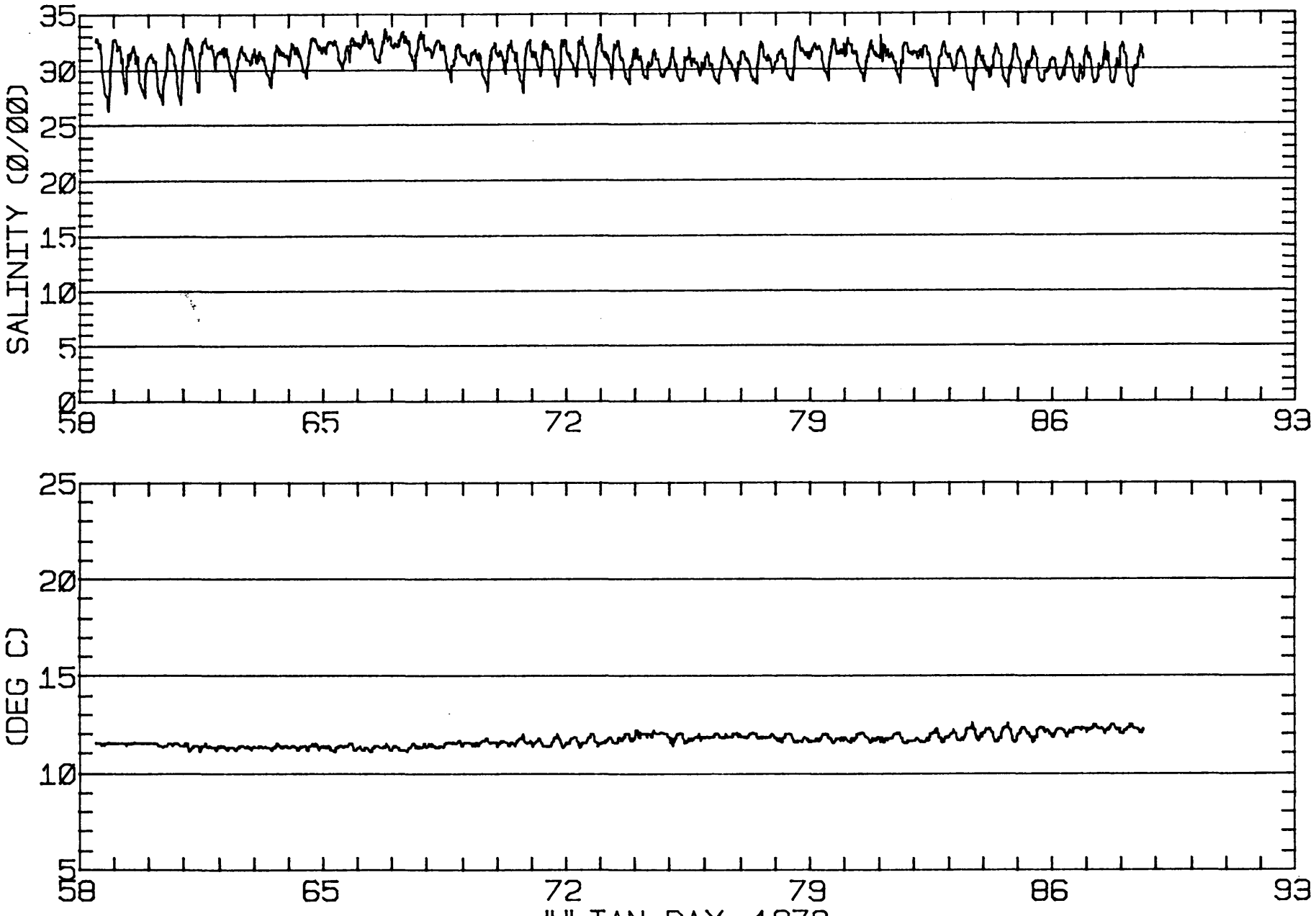
RMS SPEED: 76.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 138.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 57.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 54.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 12.86 CM/SEC
STANDARD DEVIATION V SERIES: 19.48 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	28.8	15.2	2039.
2	12	28.2	17.8	1210.
3	12	24.9	14.8	767.
4	12	22.0	14.7	914.
5	10	22.3	1.5	710.
ALL	58	25.3	13.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 0W
METER 007.6 METERS ABOVE BED. WATER DEPTH 036.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- ØW
METER Ø07.6 METERS ABOVE BED. WATER DEPTH Ø36.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48′ 5"N 122 31′ 4"W
METER TYPE: AANDERAA
WATER DEPTH: 37.2 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 1102 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

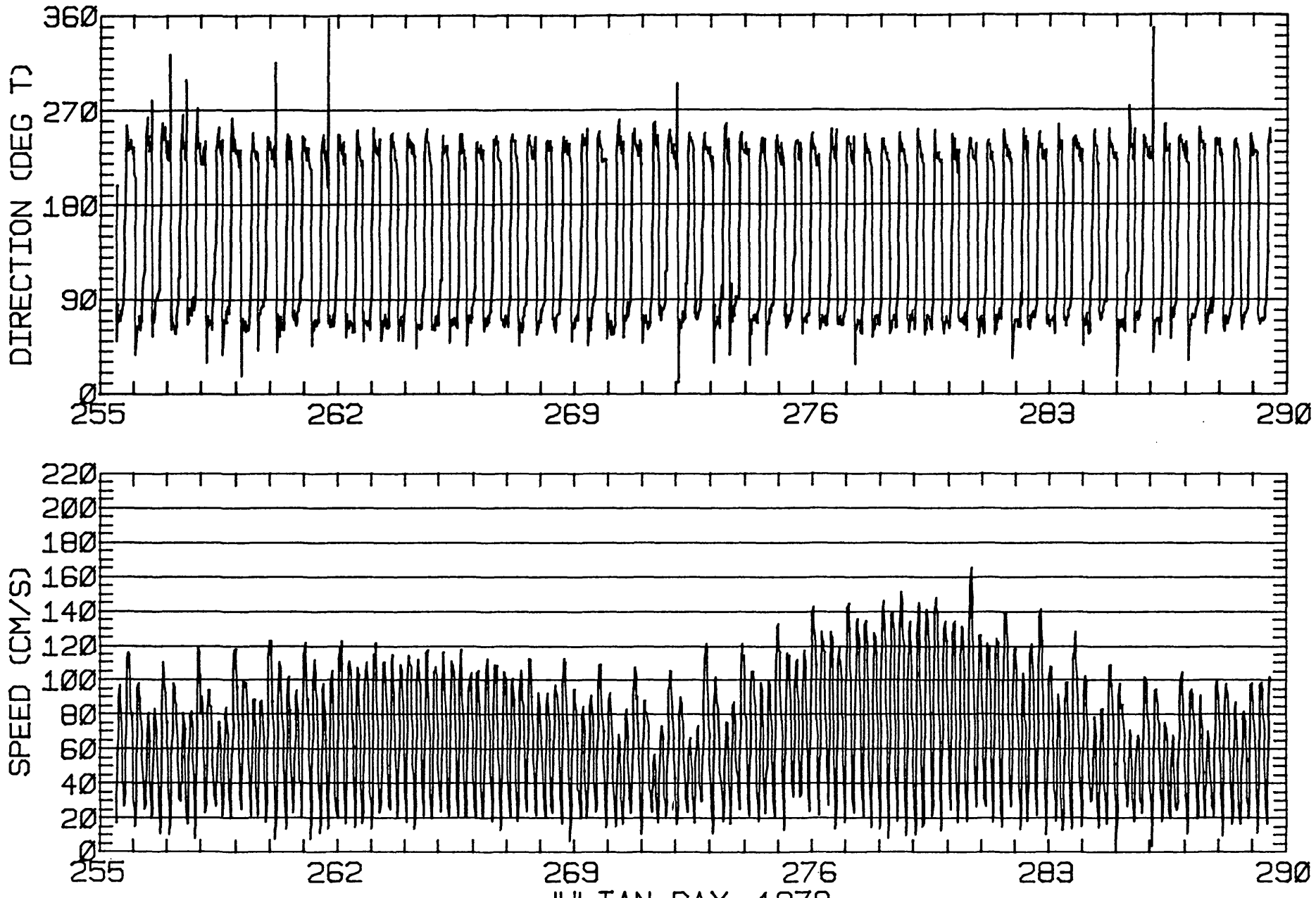
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.83	0.98	56.5	27.2	CLOCKWISE
K1	20.18	0.82	58.1	38.9	CLOCKWISE
N2	22.49	0.11	61.0	263.6	CLOCKWISE
M2	95.17	0.51	62.8	289.7	CLOCKWISE
S2	26.12	0.66	58.0	286.6	ANTI-CLOCKWISE
M4	4.98	2.36	157.9	280.4	ANTI-CLOCKWISE

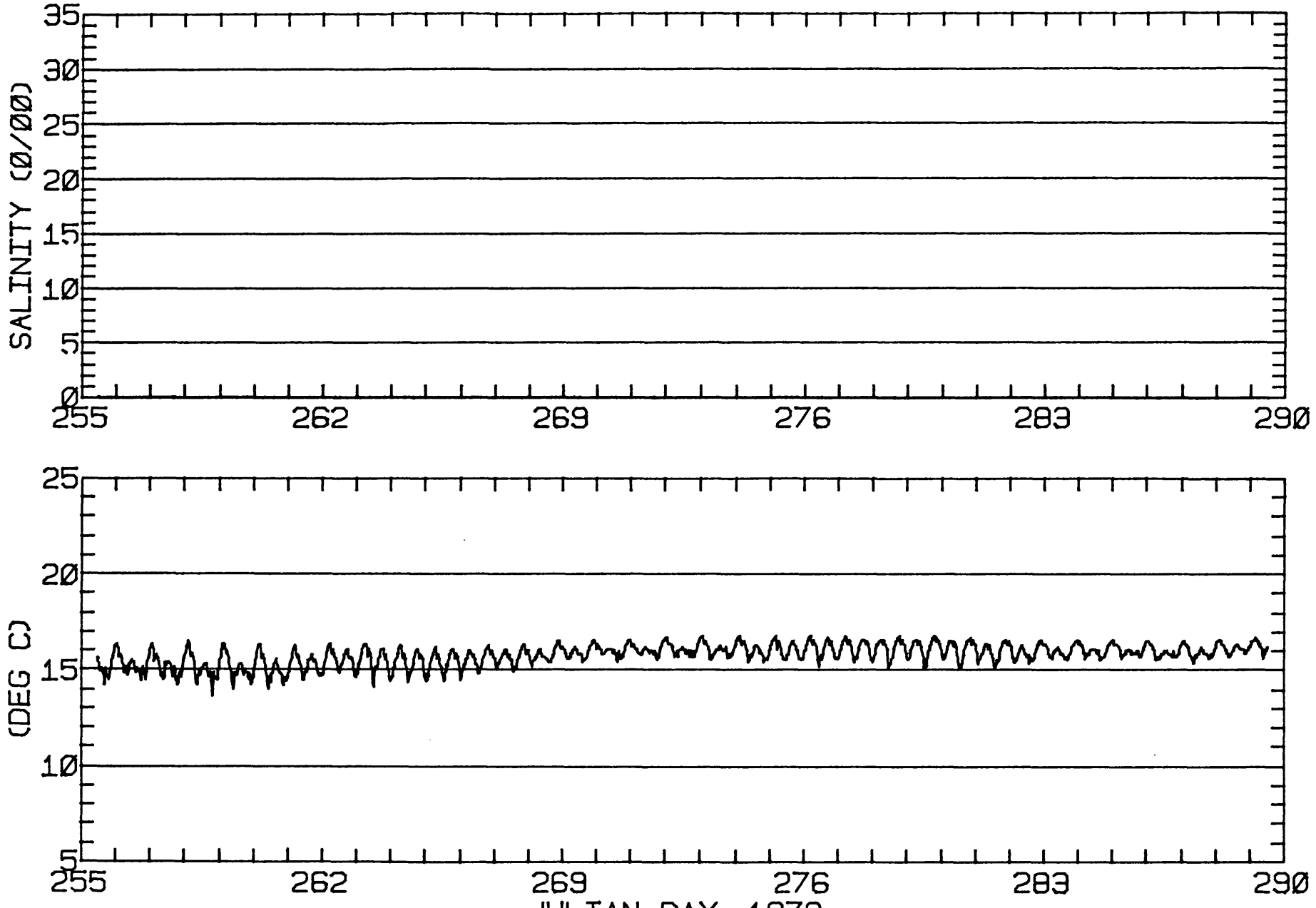
RMS SPEED: 78.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 159.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 66.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 13.27 CM/SEC
STANDARD DEVIATION V SERIES: 10.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.7	-10.5	197.
2	12	7.3	-7.8	157.
3	12	4.0	-9.5	131.
4	12	7.0	-12.5	153.
5	10	7.2	-10.0	168.
ALL	58	5.8	-10.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER 025.0 METERS ABOVE BED. WATER DEPTH 037.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER Ø25.Ø METERS ABOVE BED. WATER DEPTH Ø37.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 4"W
METER TYPE: AANDERAA
WATER DEPTH: 37.2 M (MLLW)
METER DEPTH: 25.3 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 1104 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

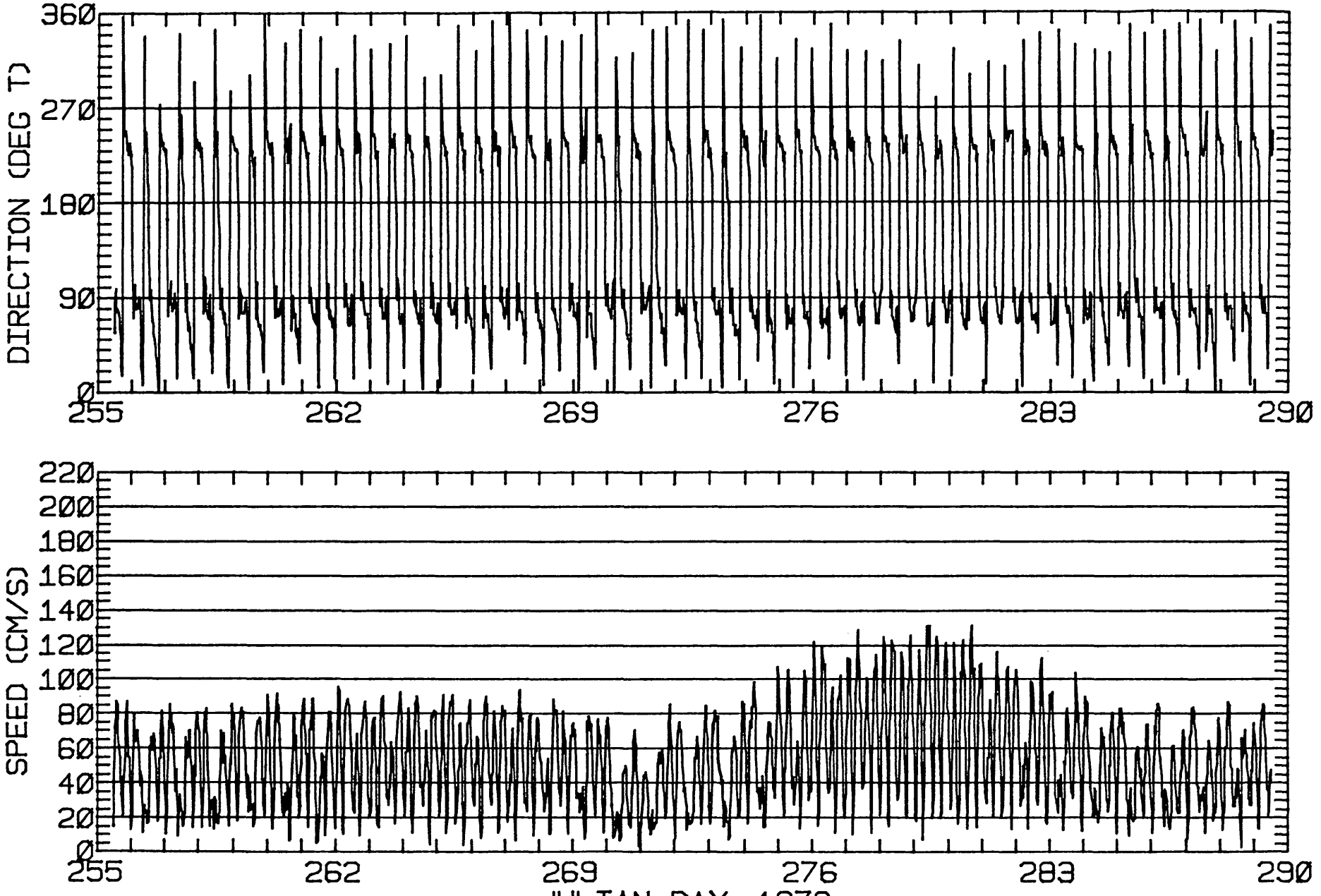
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.67	4.14	65.9	36.1	ANTI-CLOCKWISE
K1	16.84	4.32	63.6	48.8	ANTI-CLOCKWISE
N2	17.23	2.21	64.0	260.0	ANTI-CLOCKWISE
M2	71.28	11.26	66.0	287.0	ANTI-CLOCKWISE
S2	20.39	1.50	66.1	289.5	ANTI-CLOCKWISE
M4	4.14	1.44	18.8	66.5	CLOCKWISE

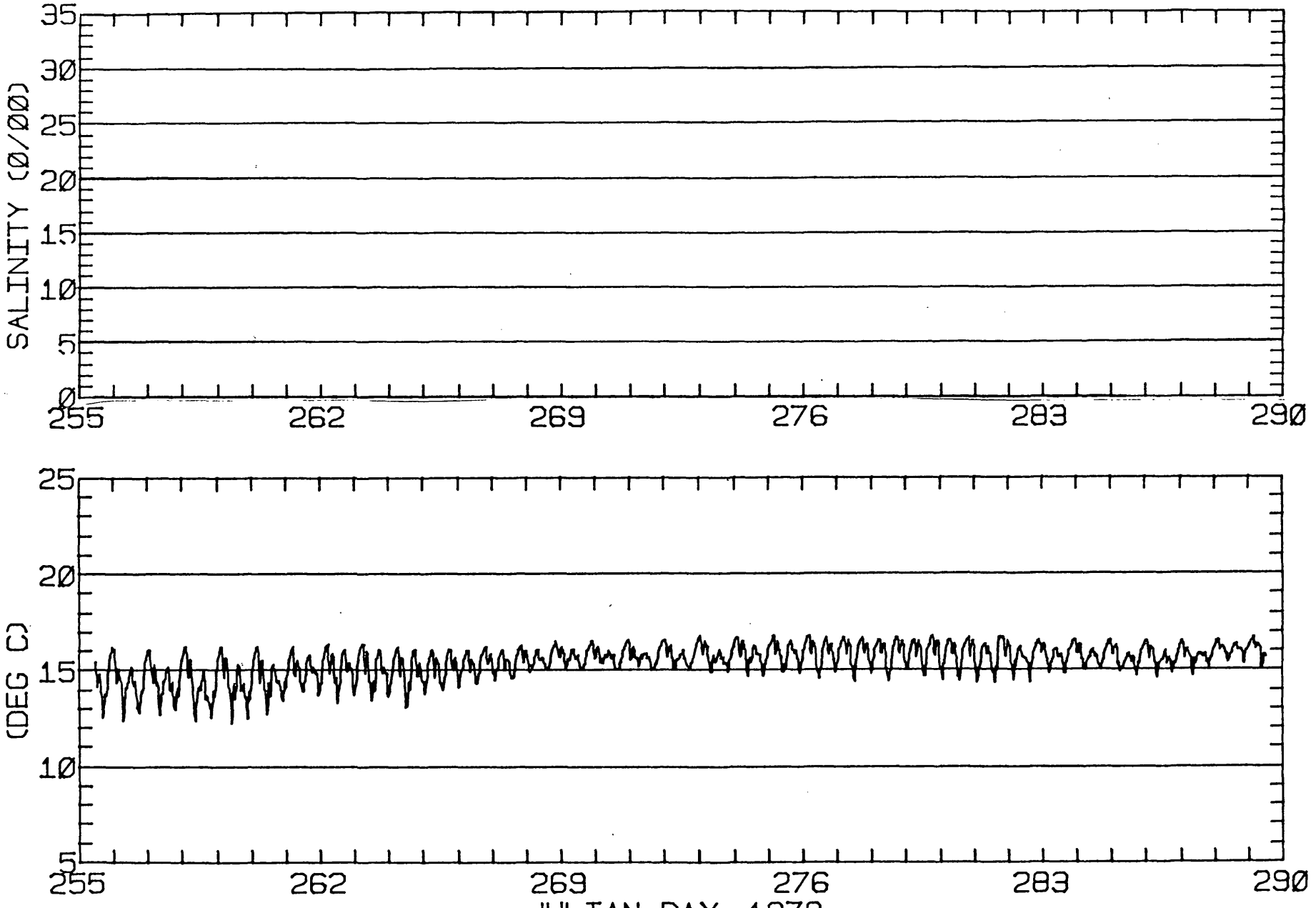
RMS SPEED: 61.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 123.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 8.84 CM/SEC
STANDARD DEVIATION V SERIES: 12.79 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	13.2	-0.5	197.
2	12	14.2	-2.2	157.
3	12	11.5	0.4	131.
4	12	12.7	-4.1	153.
5	10	14.2	-2.5	168.
ALL	58	13.1	-1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER 011.9 METERS ABOVE BED. WATER DEPTH 037.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø37.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 4"N 122 31' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 37.8 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES:10/16/79 1510 PST JULIAN DAY=289
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

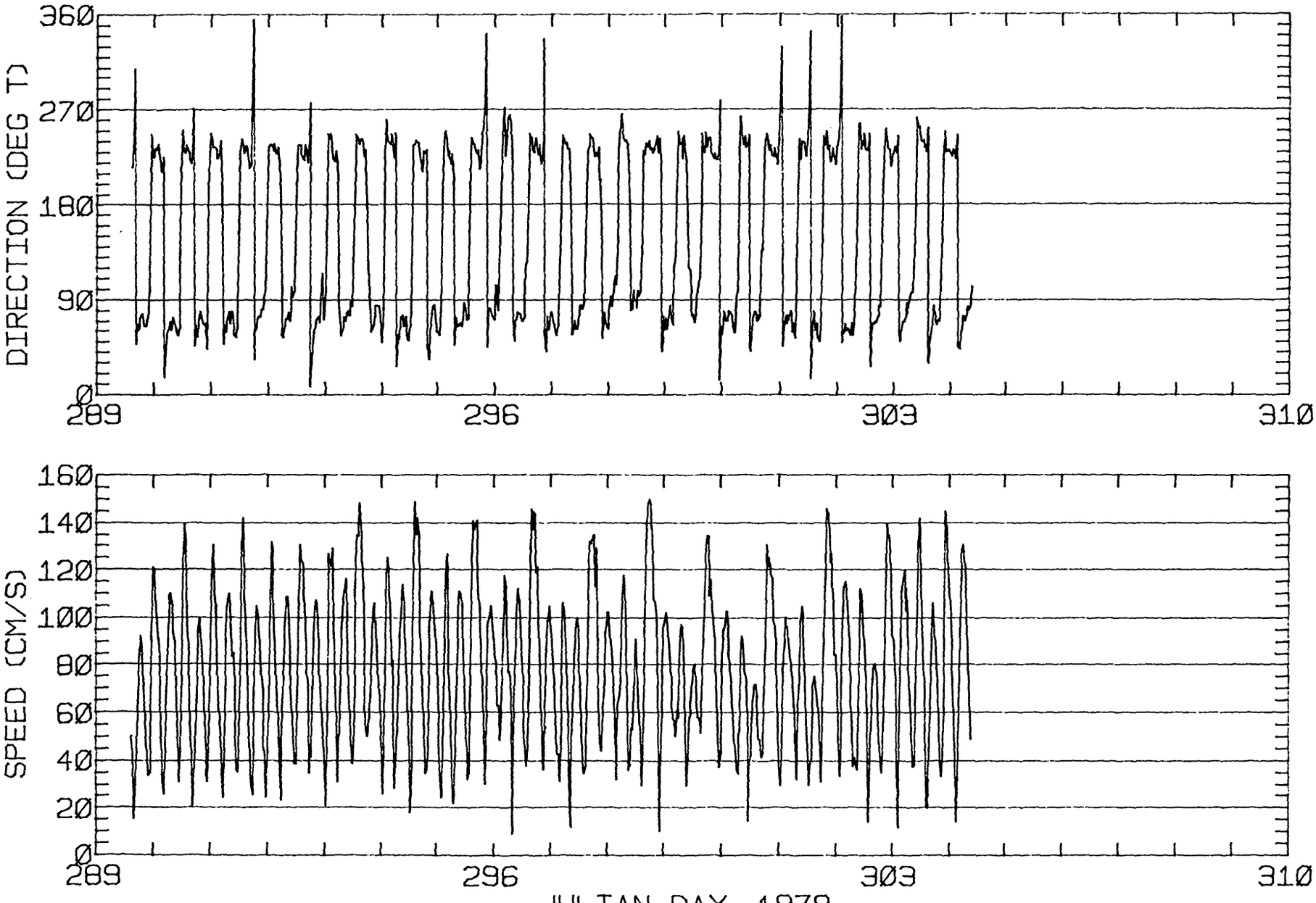
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.28	0.71	54.4	18.4	ANTI-CLOCKWISE
K1	26.44	0.11	59.6	22.7	ANTI-CLOCKWISE
N2	24.40	4.78	59.2	257.7	CLOCKWISE
M2	109.73	4.65	61.6	290.7	CLOCKWISE
S2	28.91	3.24	64.3	279.7	CLOCKWISE
M4	8.65	2.23	3.4	76.0	ANTI-CLOCKWISE

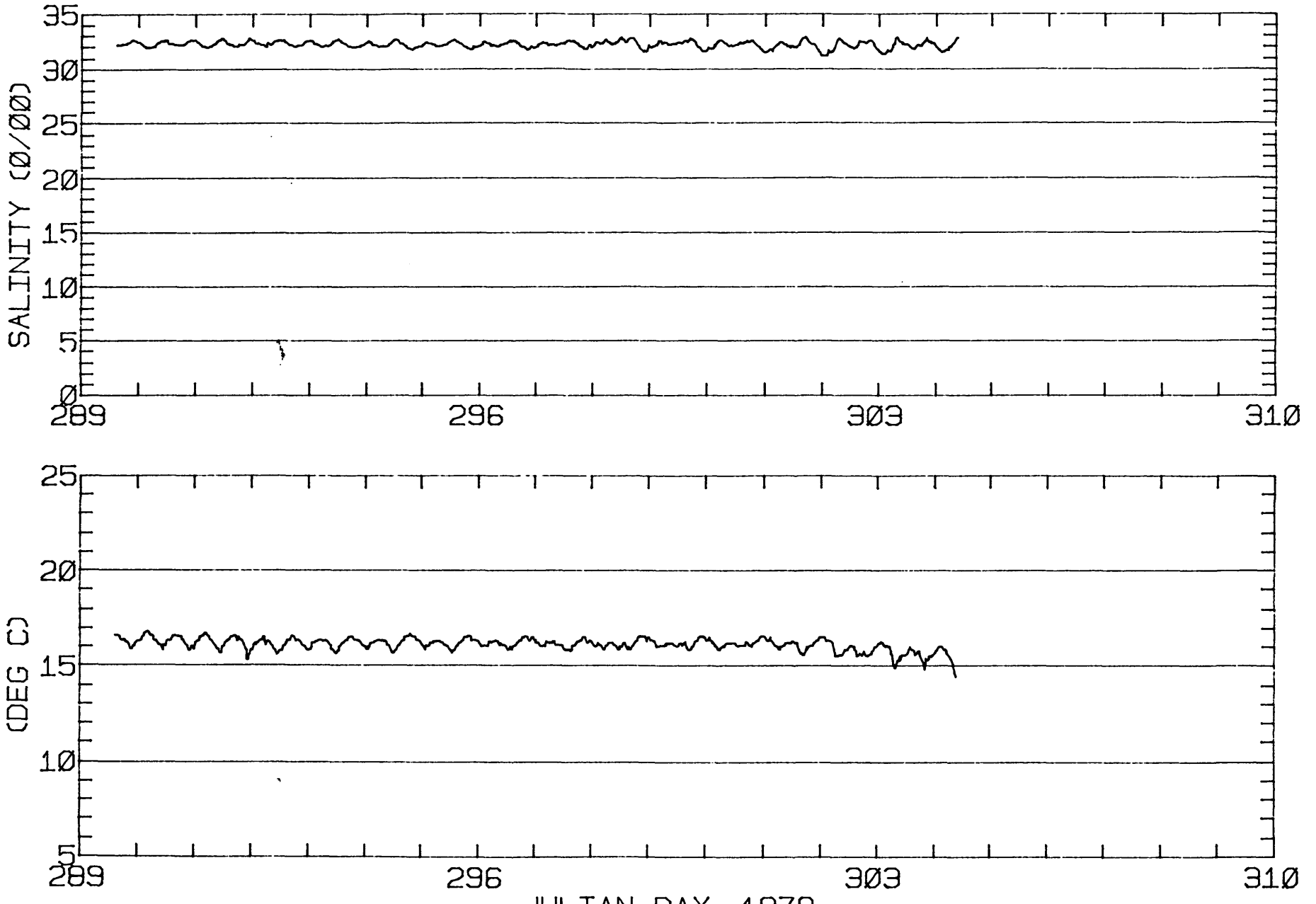
RMS SPEED: 85.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 183.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 72.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 61.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 17.74 CM/SEC
STANDARD DEVIATION V SERIES: 15.45 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.5	-12.5	197.
2	12	-3.9	-17.5	274.
3	4	-1.6	-12.5	440.
ALL	28	-0.8	-14.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 4N 122-31- 8W
METER 031.1 METERS ABOVE BED. WATER DEPTH 037.8 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 3 37-48- 4N 122-31- 8W
METER Ø31.1 METERS ABOVE BED. WATER DEPTH Ø37.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 4"N 122 31' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 37.8 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES:10/16/79 1502 PST JULIAN DAY=289
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

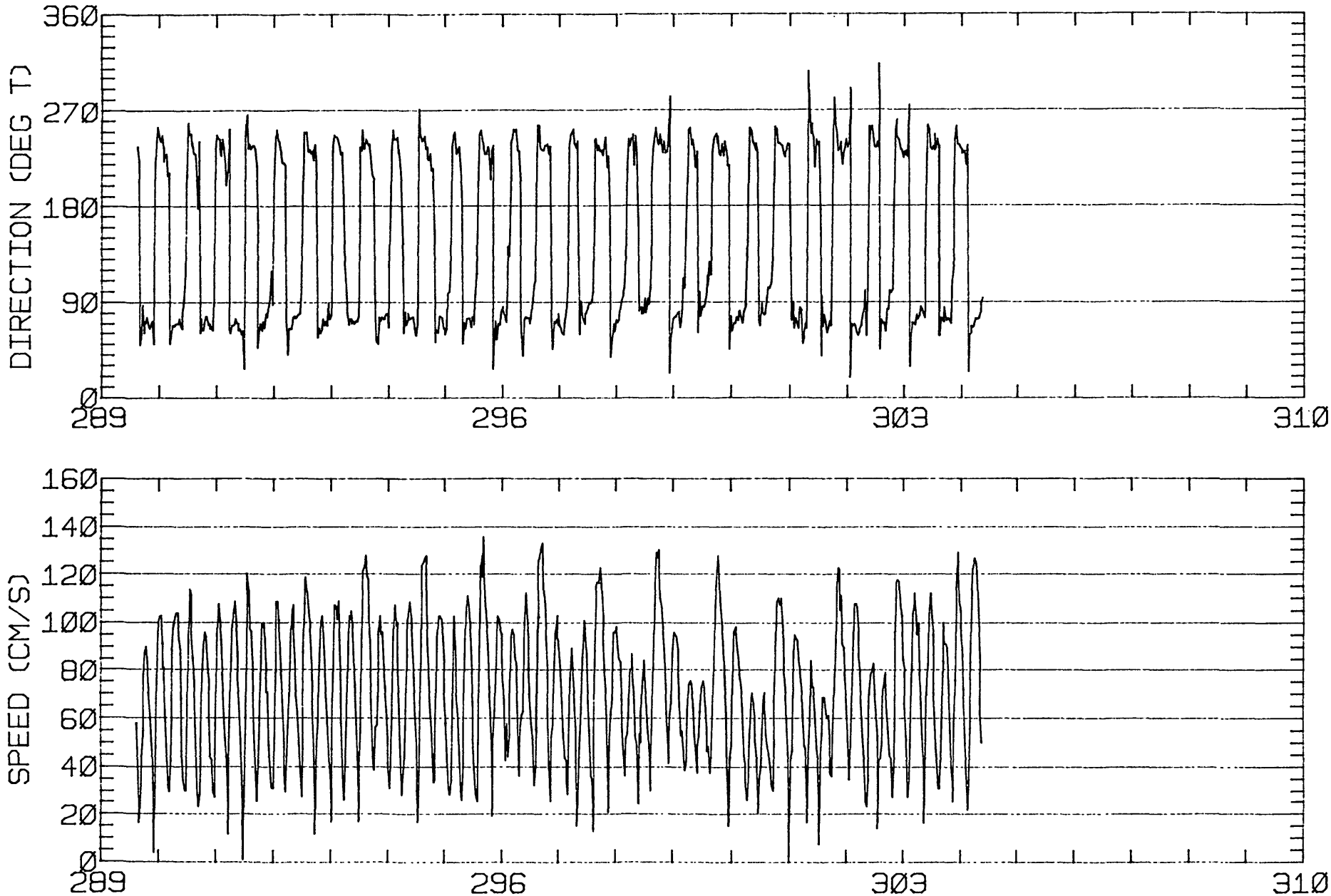
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.77	1.71	59.4	17.8	CLOCKWISE
K1	25.01	0.50	63.1	20.9	CLOCKWISE
N2	21.72	2.33	60.4	253.5	CLOCKWISE
M2	100.28	0.13	64.5	288.9	ANTI-CLOCKWISE
S2	27.27	0.70	61.1	278.7	CLOCKWISE
M4	6.46	3.39	19.2	71.7	ANTI-CLOCKWISE

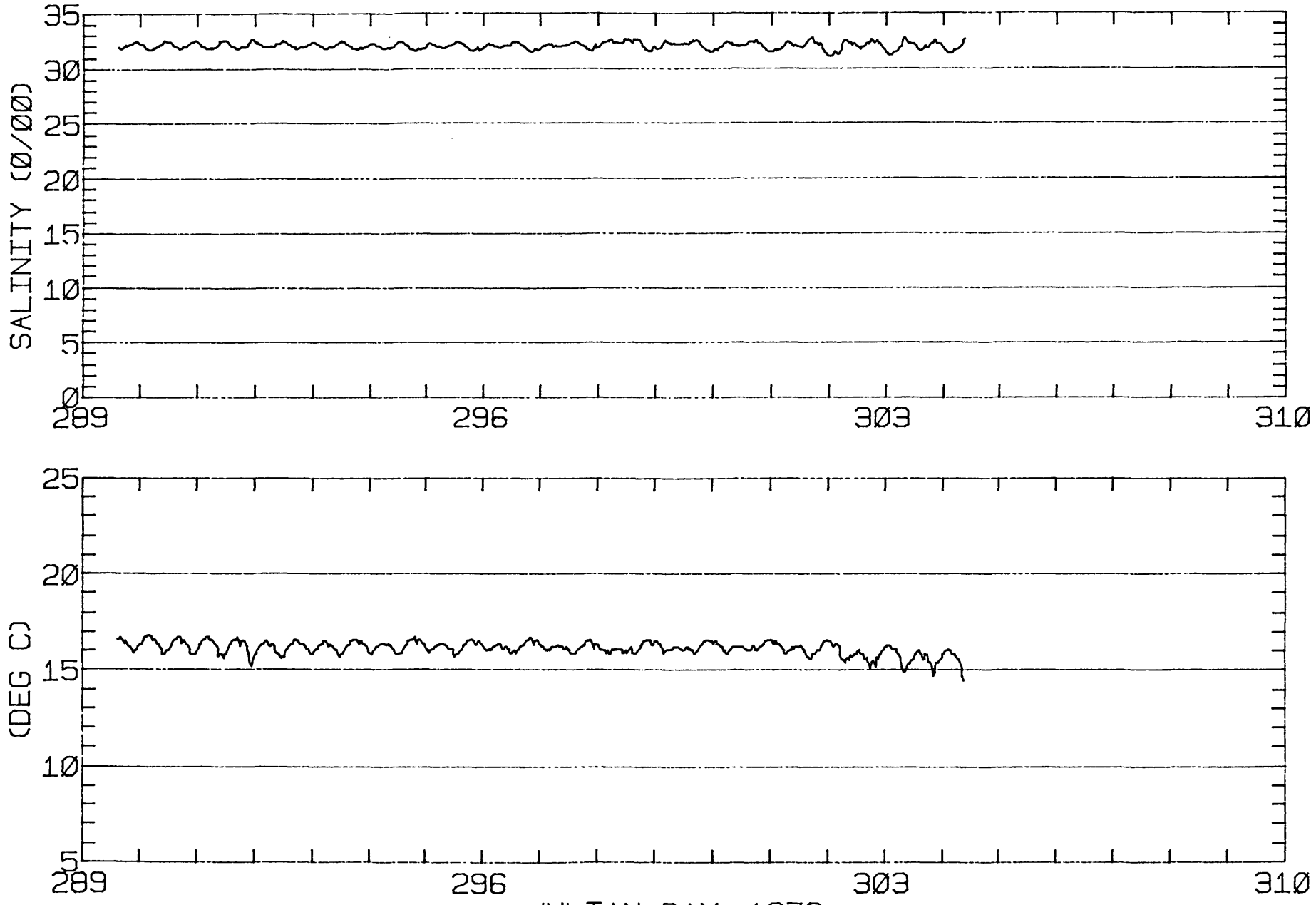
RMS SPEED: 76.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 170.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 65.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 63.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 14.45 CM/SEC
STANDARD DEVIATION V SERIES: 12.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.2	-9.2	197.
2	12	1.8	-12.3	274.
3	4	3.9	-8.4	440.
ALL	28	3.6	-10.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 4N 122-31- 8W
METER 024.9 METERS ABOVE BED. WATER DEPTH 037.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 4N 122-31- 8W
METER Ø24.9 METERS ABOVE BED. WATER DEPTH Ø37.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 4"N 122 31' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 37.8 M (MLLW)
METER DEPTH: 25.9 M (BELOW MLLW)
START TIME OF SERIES:10/16/79 1504 PST JULIAN DAY=289
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

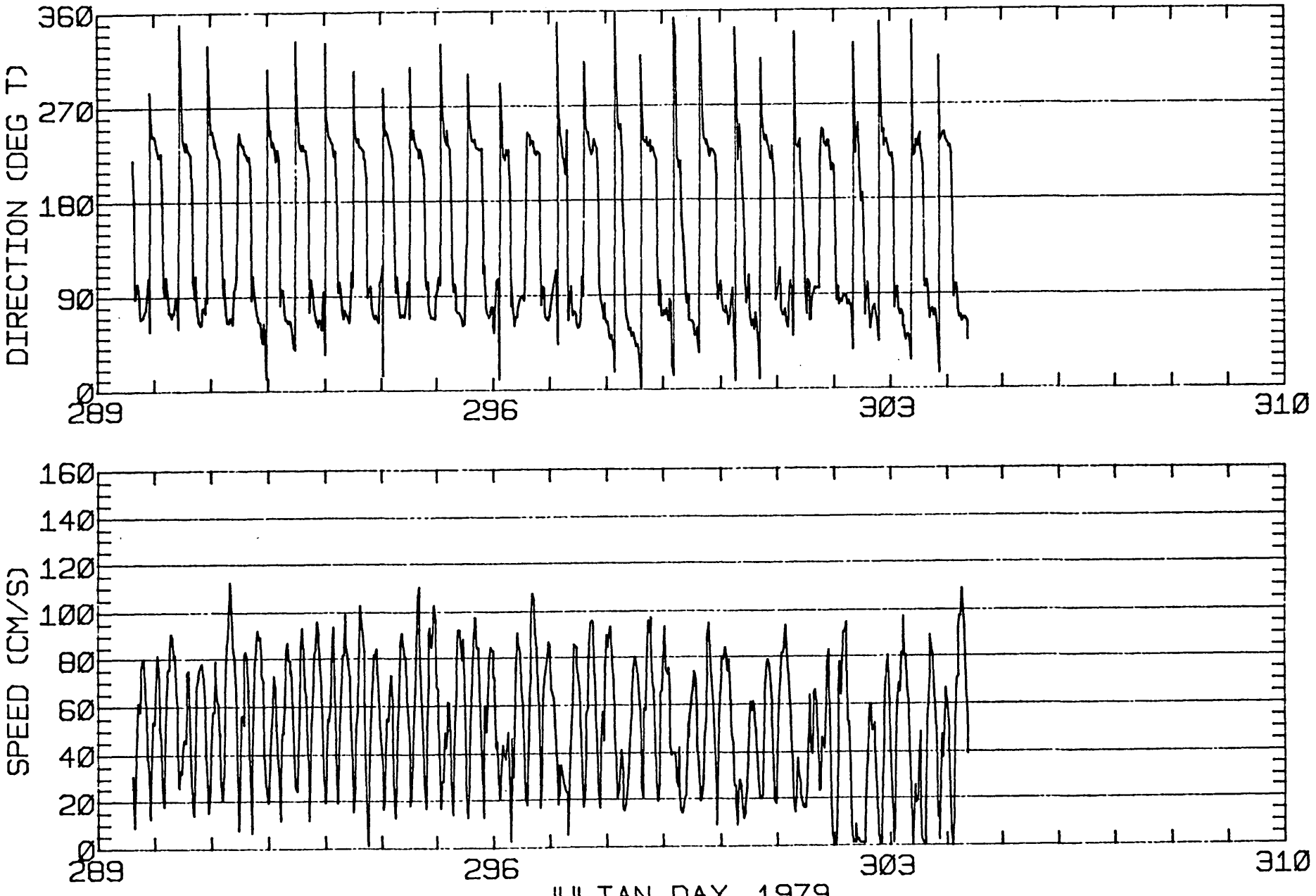
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.00	4.63	55.7	29.0	ANTI-CLOCKWISE
K1	21.07	2.57	60.4	25.9	ANTI-CLOCKWISE
N2	12.46	2.14	69.0	228.0	ANTI-CLOCKWISE
M2	72.97	8.35	66.1	282.6	ANTI-CLOCKWISE
S2	22.80	4.26	64.6	286.5	ANTI-CLOCKWISE
M4	1.99	0.38	23.4	41.0	ANTI-CLOCKWISE

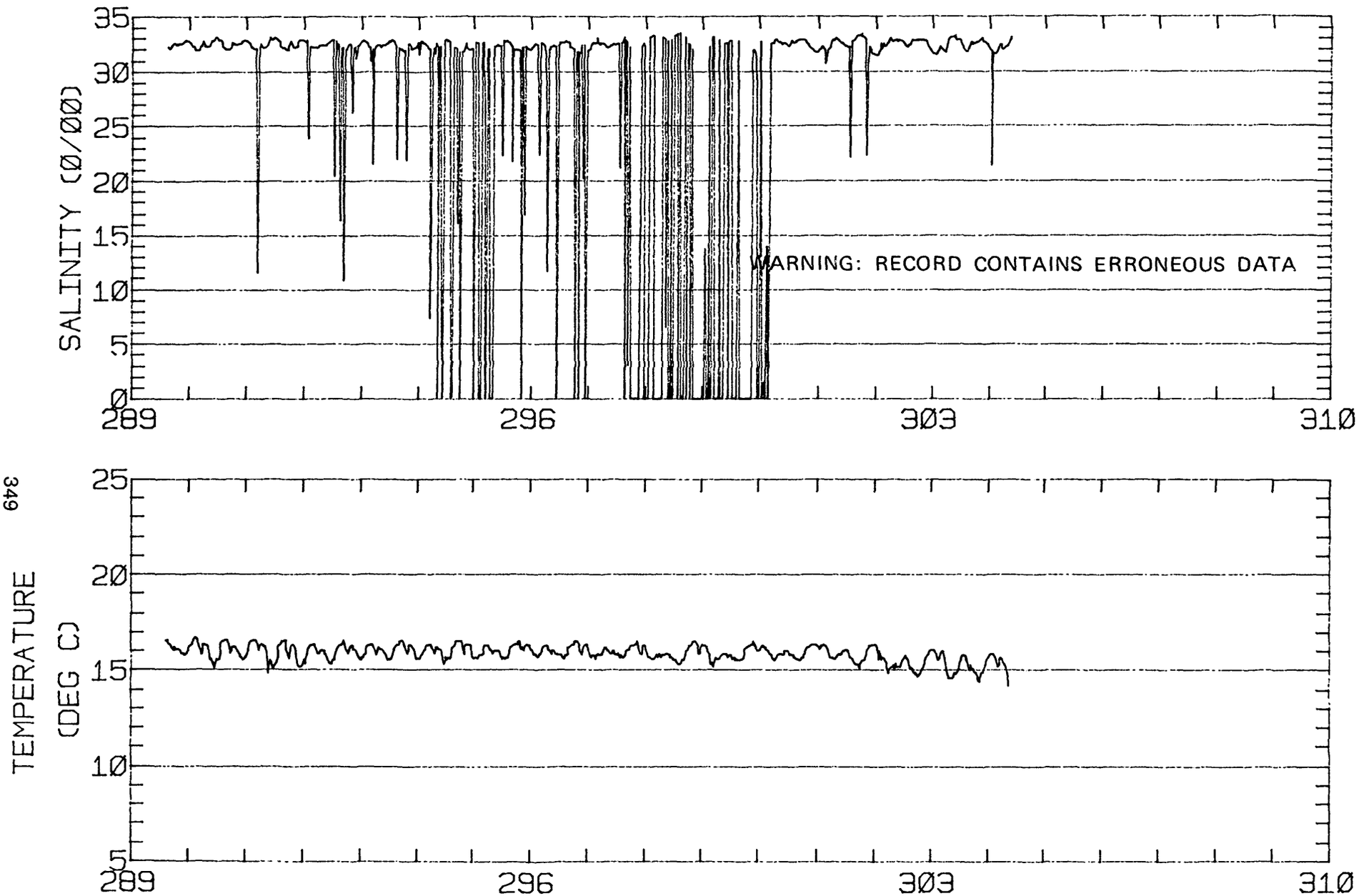
RMS SPEED: 58.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 132.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 45.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 63.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 9.19 CM/SEC
STANDARD DEVIATION V SERIES: 13.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	13.2	-6.2	197.
2	12	14.3	-1.6	274.
3	4	17.6	0.5	440.
ALL	28	14.3	-3.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 4N 122-31- 8W
METER 011.9 METERS ABOVE BED. WATER DEPTH 037.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 4N 122-31- 8W
METER Ø11.9 METERS ABOVE BED. WATER DEPTH Ø37.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 36.3 M (MLLW)
METER DEPTH: 5.2 M (BELOW MLLW)
START TIME OF SERIES: 4/ 3/80 1520 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

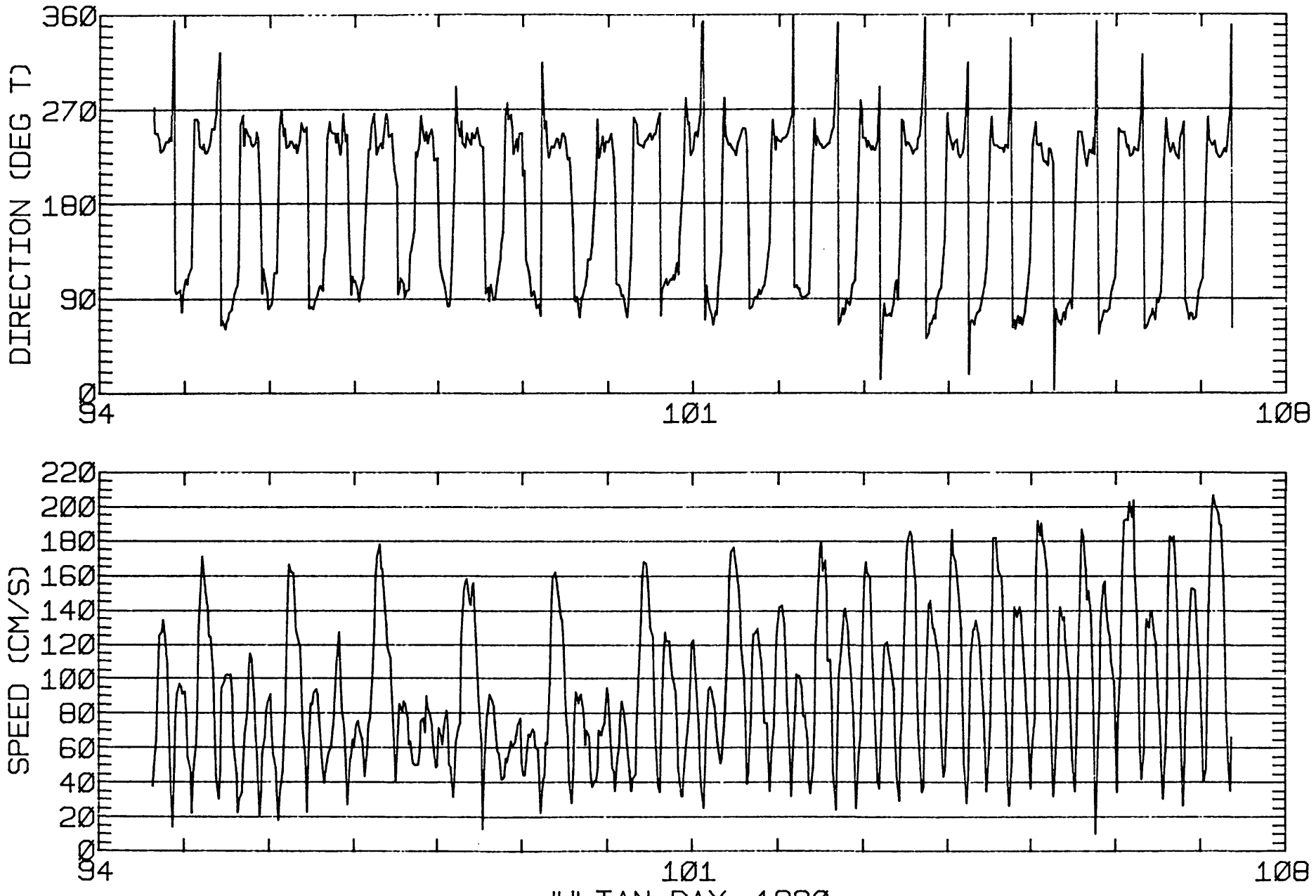
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.91	2.75	60.9	38.4	ANTI-CLOCKWISE
K1	25.89	0.96	76.4	31.3	CLOCKWISE
N2	19.43	13.66	42.8	248.0	CLOCKWISE
M2	120.48	1.04	65.8	286.3	ANTI-CLOCKWISE
S2	28.54	0.11	58.9	288.0	CLOCKWISE
M4	10.70	5.99	2.4	76.2	CLOCKWISE

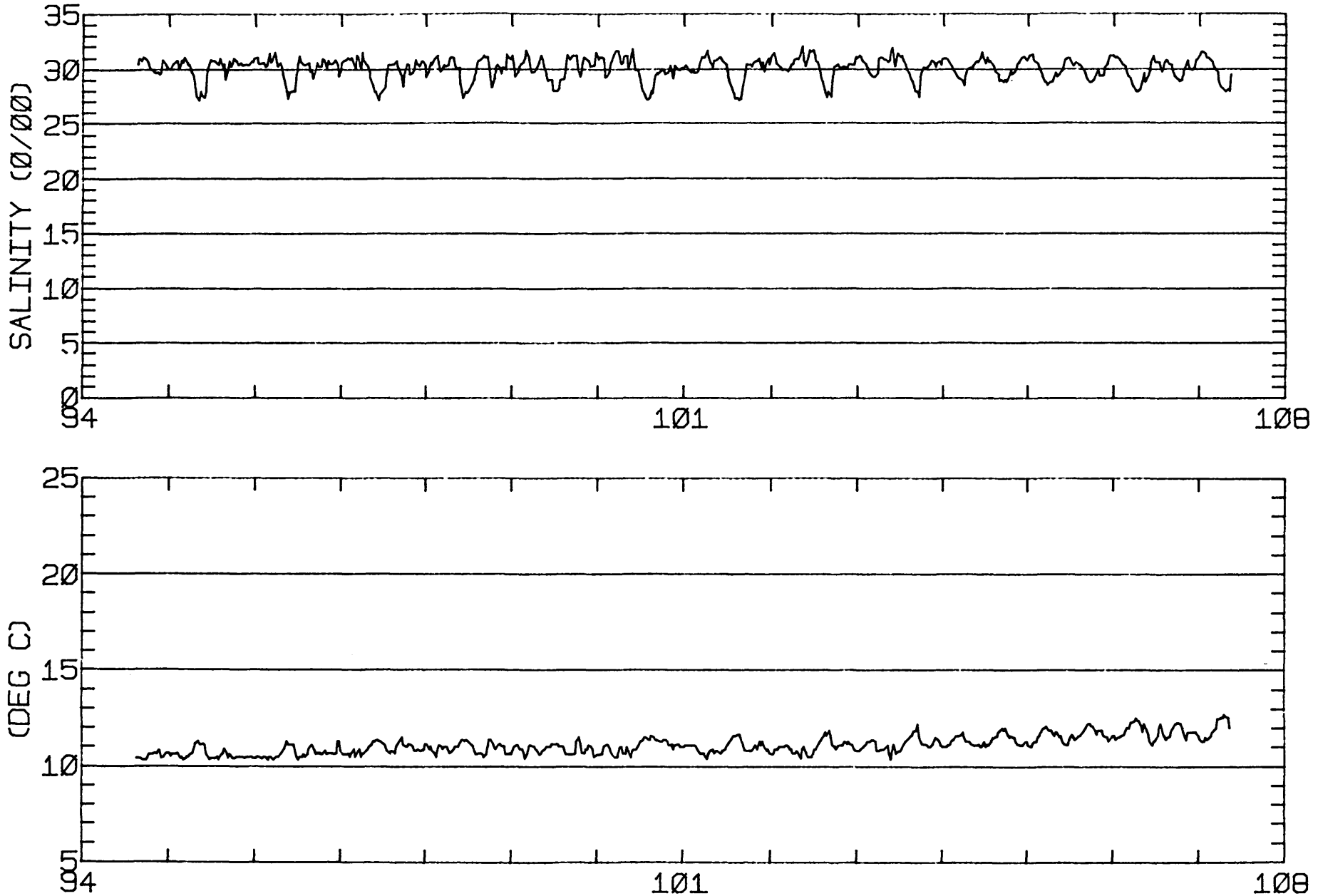
RMS SPEED: 103.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 194.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 86.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 17.16 CM/SEC
STANDARD DEVIATION V SERIES: 20.12 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-17.9	-29.1	1078.
2	12	-7.6	-26.4	851.
ALL	24	-12.8	-27.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 6W
METER 031.1 METERS ABOVE BED. WATER DEPTH 036.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 6W
METER Ø31.1 METERS ABOVE BED. WATER DEPTH Ø36.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 36.3 M (MLLW)
METER DEPTH: 11.3 M (BELOW MLLW)
START TIME OF SERIES: 4/ 3/80 1522 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

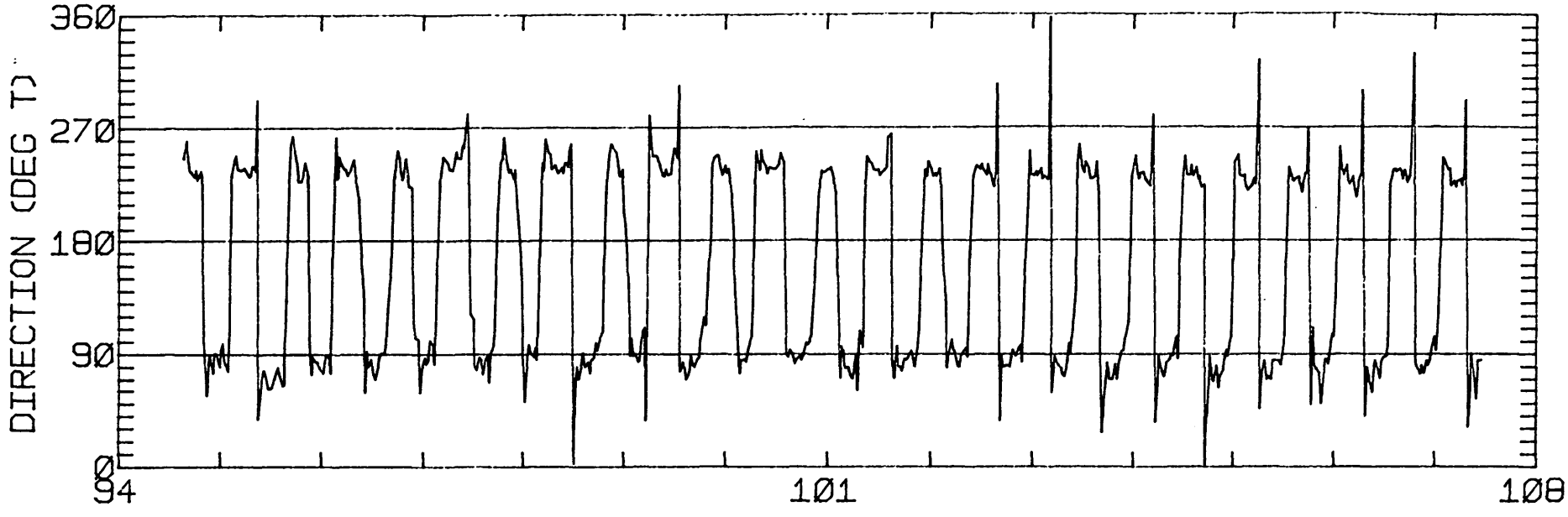
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

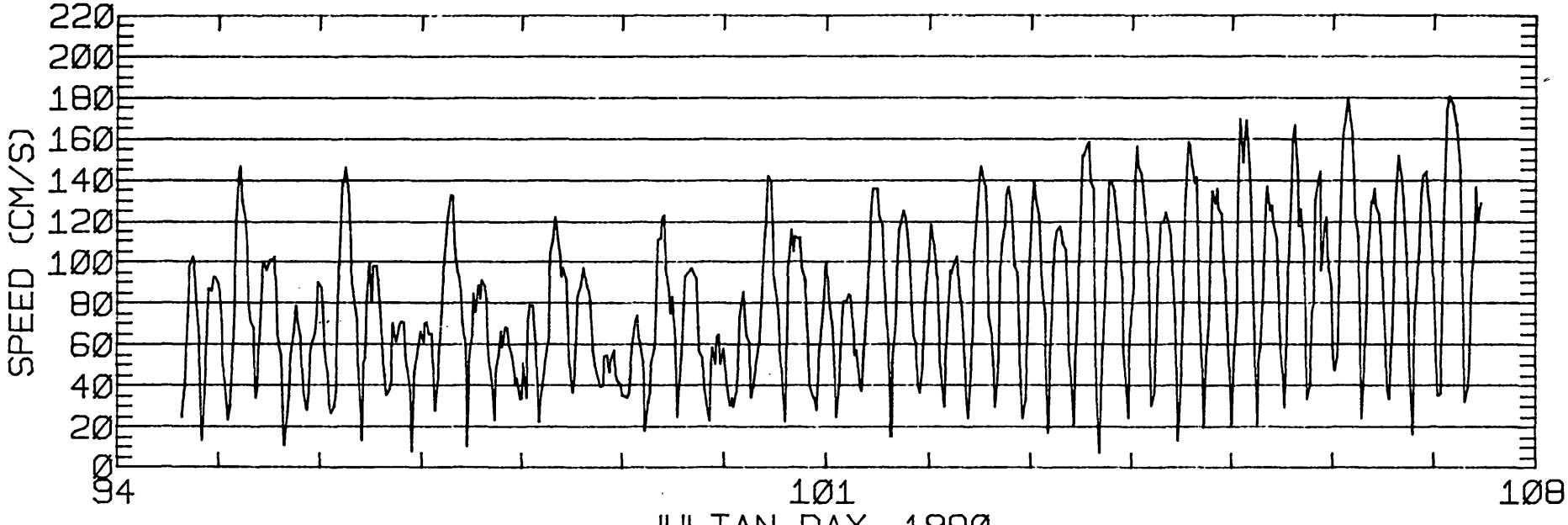
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.57	1.45	72.2	11.6	ANTI-CLOCKWISE
K1	23.32	3.44	68.2	16.5	CLOCKWISE
N2	19.84	8.81	69.4	276.2	CLOCKWISE
M2	102.64	0.28	64.9	281.5	ANTI-CLOCKWISE
S2	26.17	1.01	59.8	286.2	ANTI-CLOCKWISE
M4	8.00	0.72	15.1	59.3	CLOCKWISE

RMS SPEED: 89.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 169.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 70.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 13.60 CM/SEC
STANDARD DEVIATION V SERIES: 15.22 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

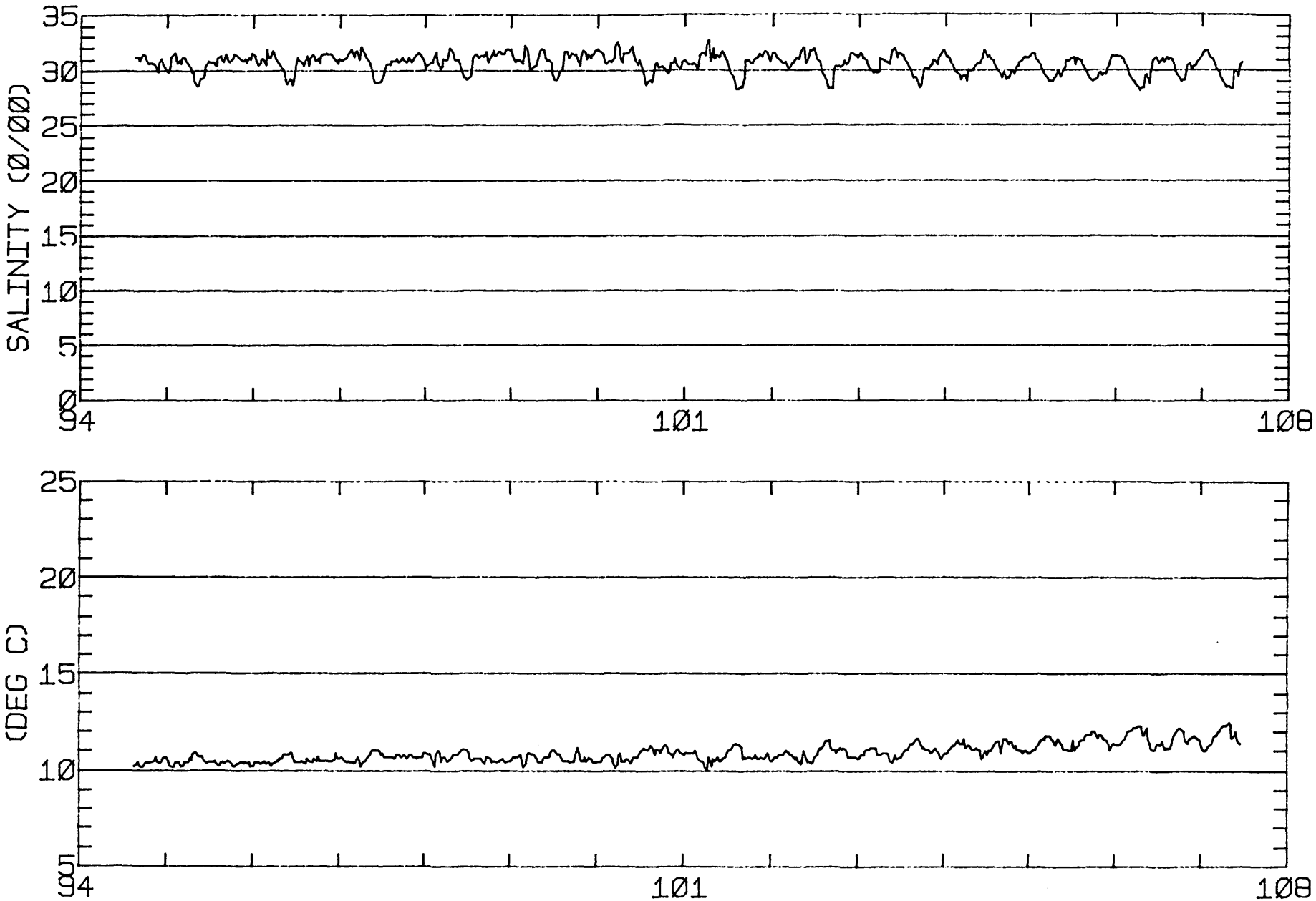
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.5	-16.0	1078.
2	12	6.2	-22.0	851.
ALL	24	3.3	-19.0	





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 6W
METER 024.9 METERS ABOVE BED. WATER DEPTH 036.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 6W
METER Ø24.9 METERS ABOVE BED. WATER DEPTH Ø36.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 6"W
METER TYPE: AANDERAA
WATER DEPTH: 36.3 M (MLLW)
METER DEPTH: 28.7 M (BELOW MLLW)
START TIME OF SERIES: 4/ 3/80 1524 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

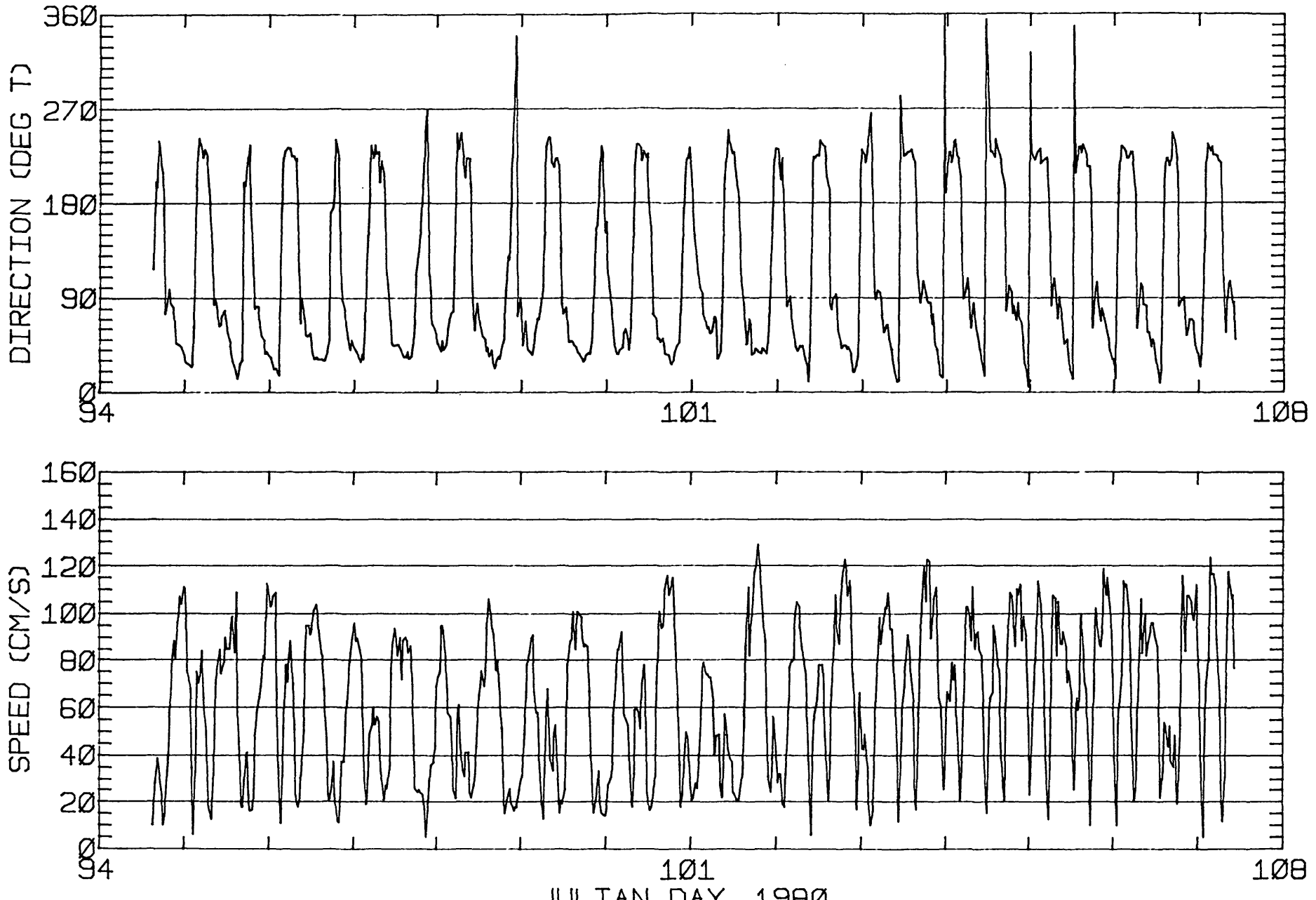
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.77	1.14	44.3	4.8	CLOCKWISE
K1	19.86	0.70	43.1	15.3	CLOCKWISE
N2	18.59	12.50	25.9	309.3	ANTI-CLOCKWISE
M2	64.19	10.34	54.9	274.3	ANTI-CLOCKWISE
S2	17.92	8.70	66.3	282.2	ANTI-CLOCKWISE
M4	9.75	4.96	21.6	328.1	CLOCKWISE

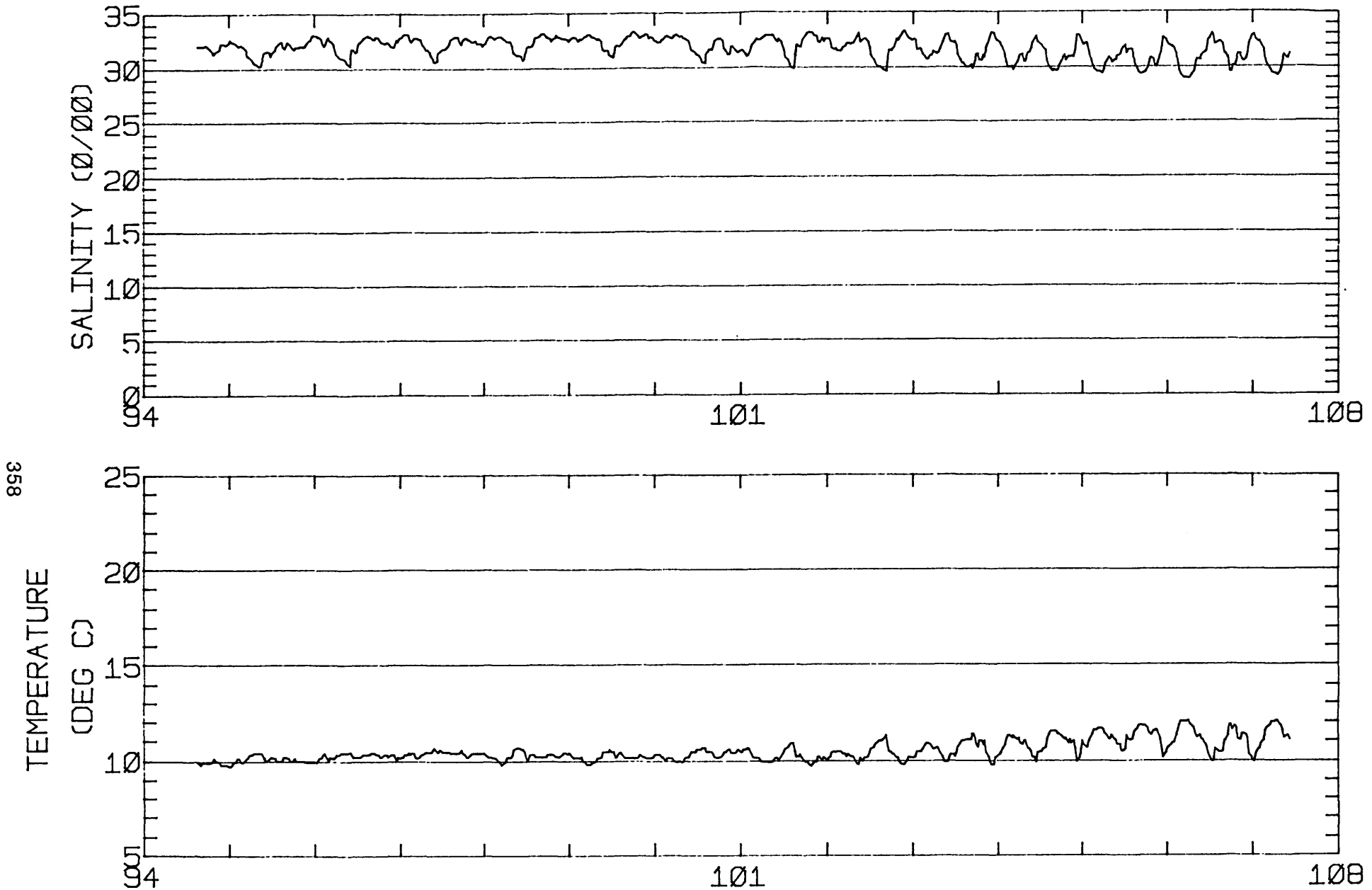
RMS SPEED: 70.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 113.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 38.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 53.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 13.54 CM/SEC
STANDARD DEVIATION V SERIES: 19.00 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	24.7	21.2	1078.
2	12	24.5	8.6	851.
ALL	24	24.6	14.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 6W
METER 007.5 METERS ABOVE BED. WATER DEPTH 036.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 6W
METER Ø07.5 METERS ABOVE BED. WATER DEPTH Ø36.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 4"W
METER TYPE: AANDERAA
WATER DEPTH: 36.9 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 4/16/80 1210 PST JULIAN DAY=107
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

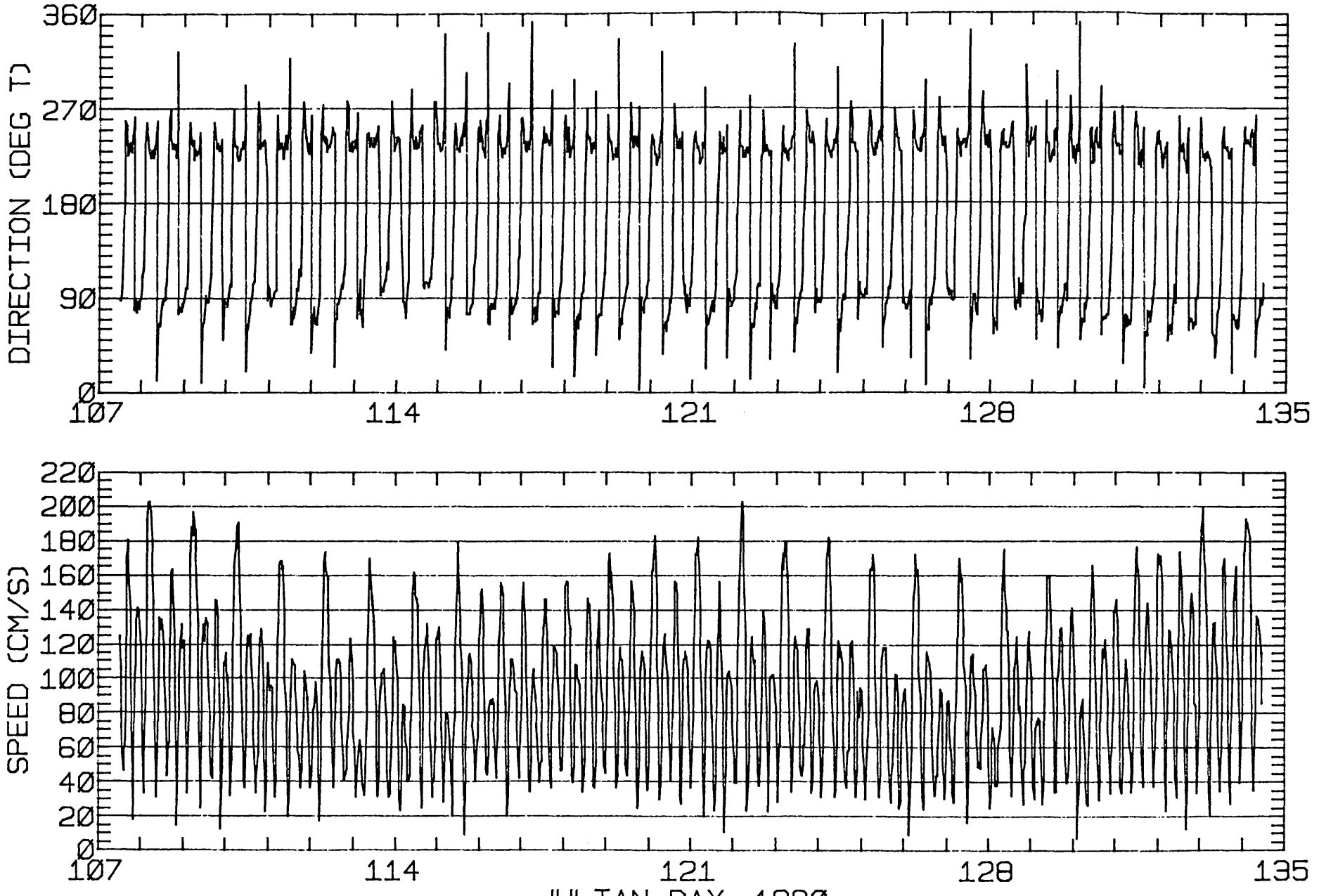
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.52	4.58	53.8	34.8	ANTI-CLOCKWISE
K1	29.18	4.12	70.1	22.7	CLOCKWISE
N2	28.20	0.79	65.7	261.7	ANTI-CLOCKWISE
M2	124.57	8.00	66.1	292.5	CLOCKWISE
S2	31.38	2.32	60.8	281.5	CLOCKWISE
M4	12.36	3.26	173.5	279.1	CLOCKWISE

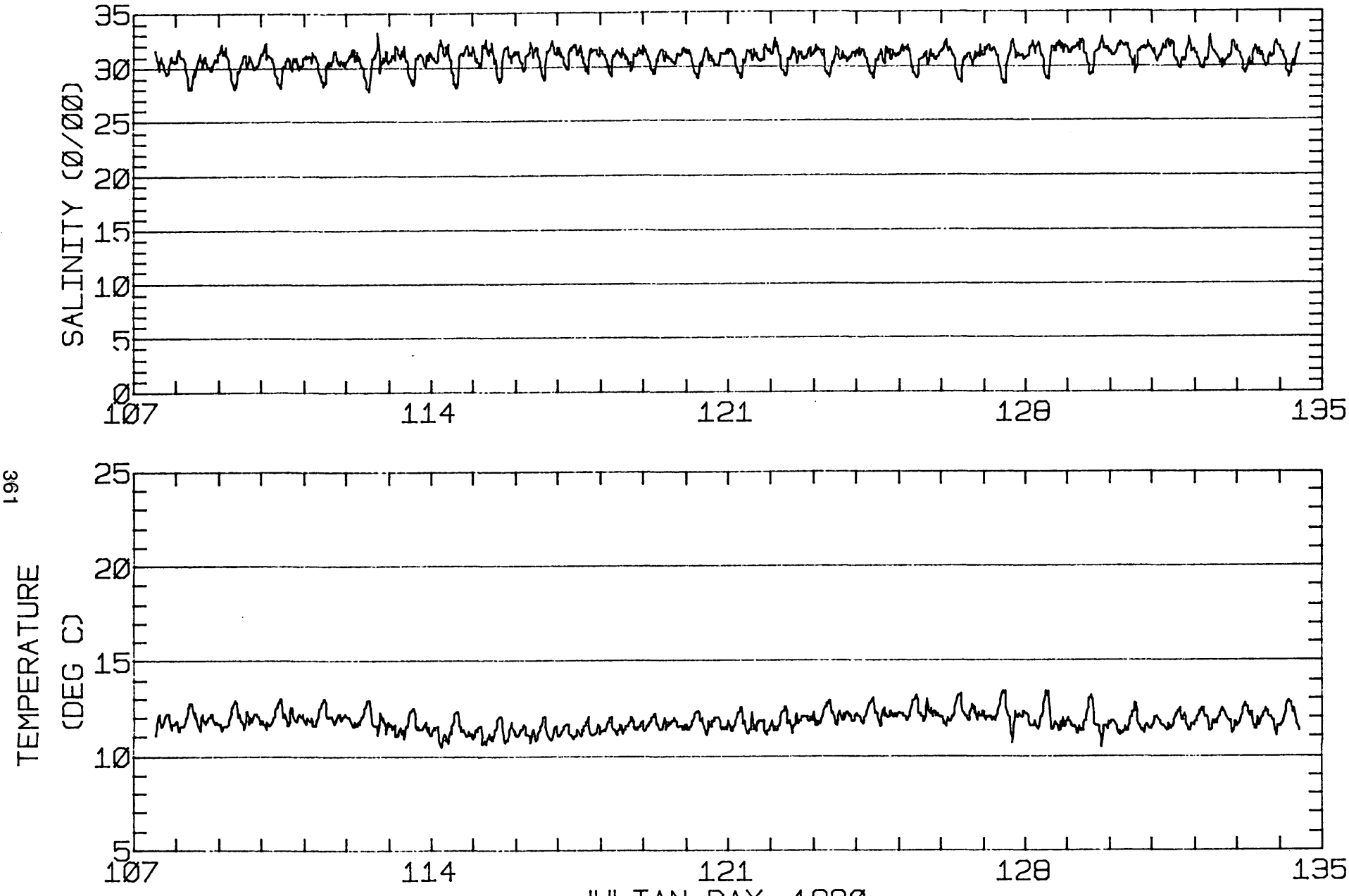
RMS SPEED: 102.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 203.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 82.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 64.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 17.82 CM/SEC
STANDARD DEVIATION V SERIES: 20.57 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-10.5	-30.2	693.
2	12	-8.5	-24.1	658.
3	12	-6.7	-28.4	594.
4	12	-11.0	-23.6	551.
5	2	-2.5	-24.0	734.
ALL	50	-8.9	-26.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER 031.1 METERS ABOVE BED. WATER DEPTH 036.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER Ø31.1 METERS ABOVE BED. WATER DEPTH Ø36.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 4"W
METER TYPE: AANDERAA
WATER DEPTH: 36.9 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 4/16/80 1202 PST JULIAN DAY=107
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

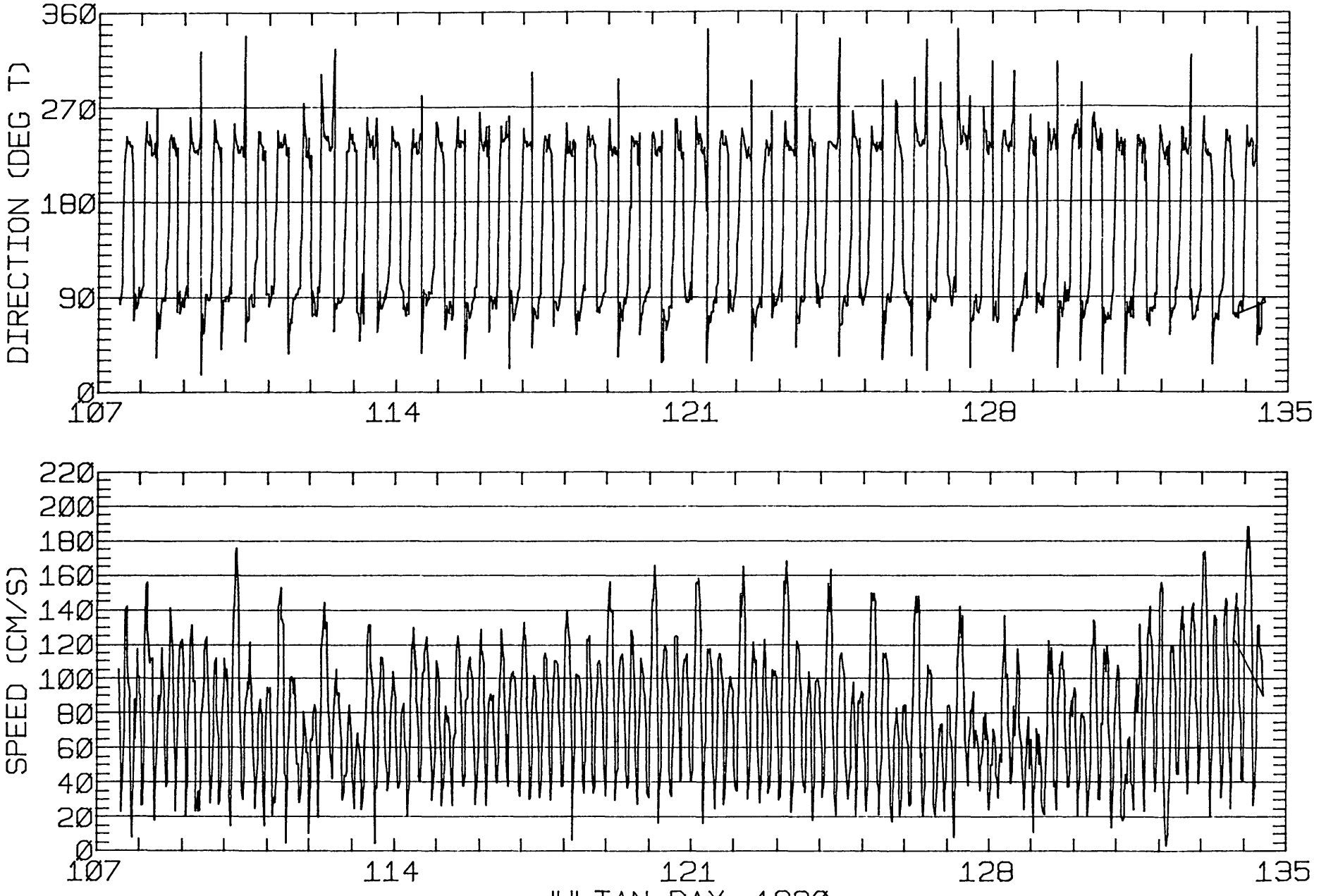
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	16.60	0.69	64.6	20.4	ANTI-CLOCKWISE
K1	27.87	5.02	71.0	18.5	CLOCKWISE
N2	20.25	0.64	69.6	257.2	CLOCKWISE
M2	107.40	5.40	68.1	288.5	CLOCKWISE
S2	28.26	1.63	65.4	278.4	CLOCKWISE
M4	9.34	1.09	5.5	75.1	ANTI-CLOCKWISE

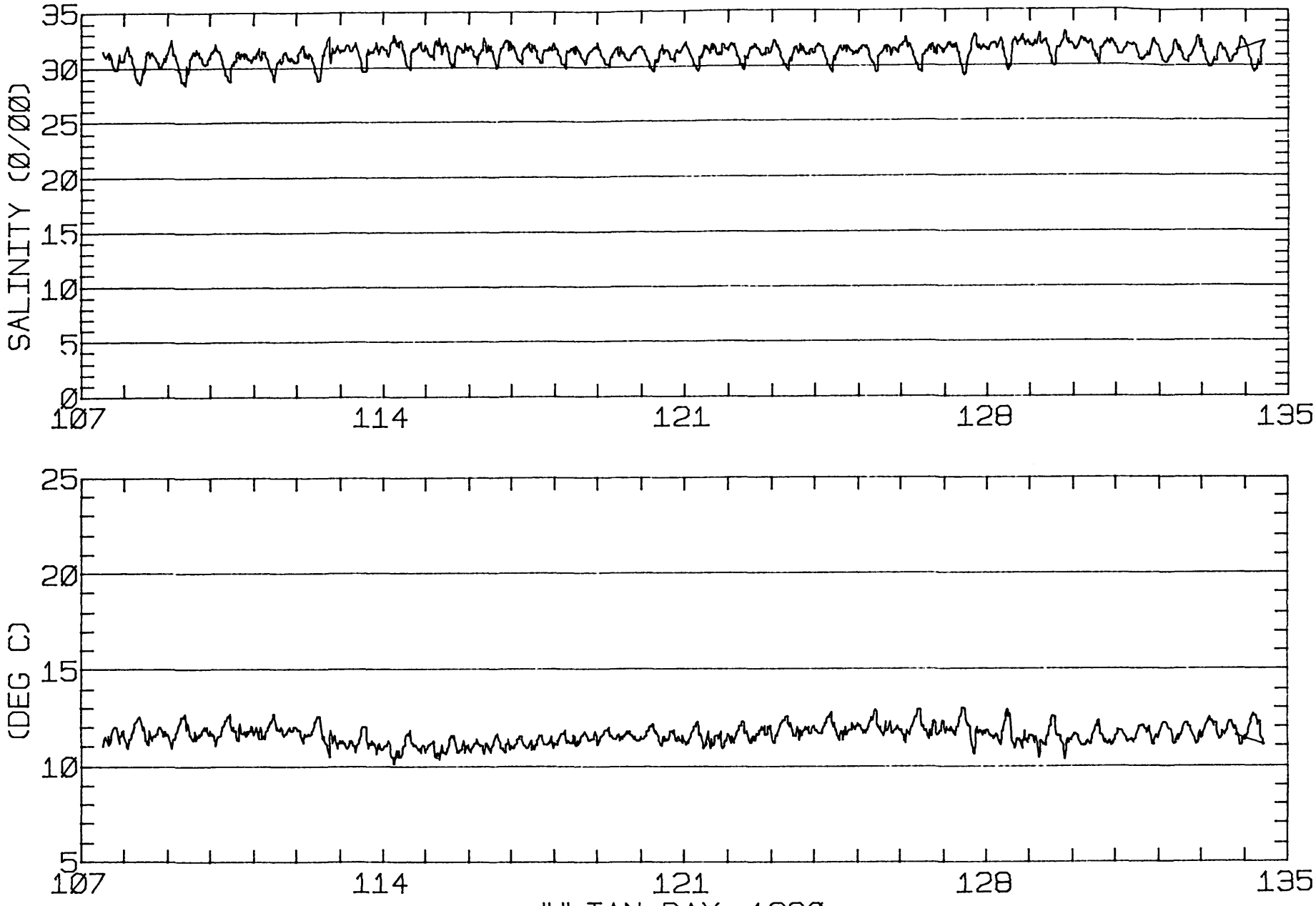
RMS SPEED: 87.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 180.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 67.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 67.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 16.84 CM/SEC
STANDARD DEVIATION V SERIES: 16.38 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.7	-20.4	693.
2	12	5.0	-19.6	658.
3	12	3.5	-21.4	594.
4	12	-0.3	-15.0	551.
5	2	5.3	-24.5	734.
ALL	50	2.6	-19.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER 025.0 METERS ABOVE BED. WATER DEPTH 036.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER Ø25.Ø METERS ABOVE BED. WATER DEPTH Ø36.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 3
POSITION: 37 48' 5"N 122 31' 4"W
METER TYPE: AANDERAA
WATER DEPTH: 36.9 M (MLLW)
METER DEPTH: 29.3 M (BELOW MLLW)
START TIME OF SERIES: 4/16/80 1204 PST JULIAN DAY=107
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

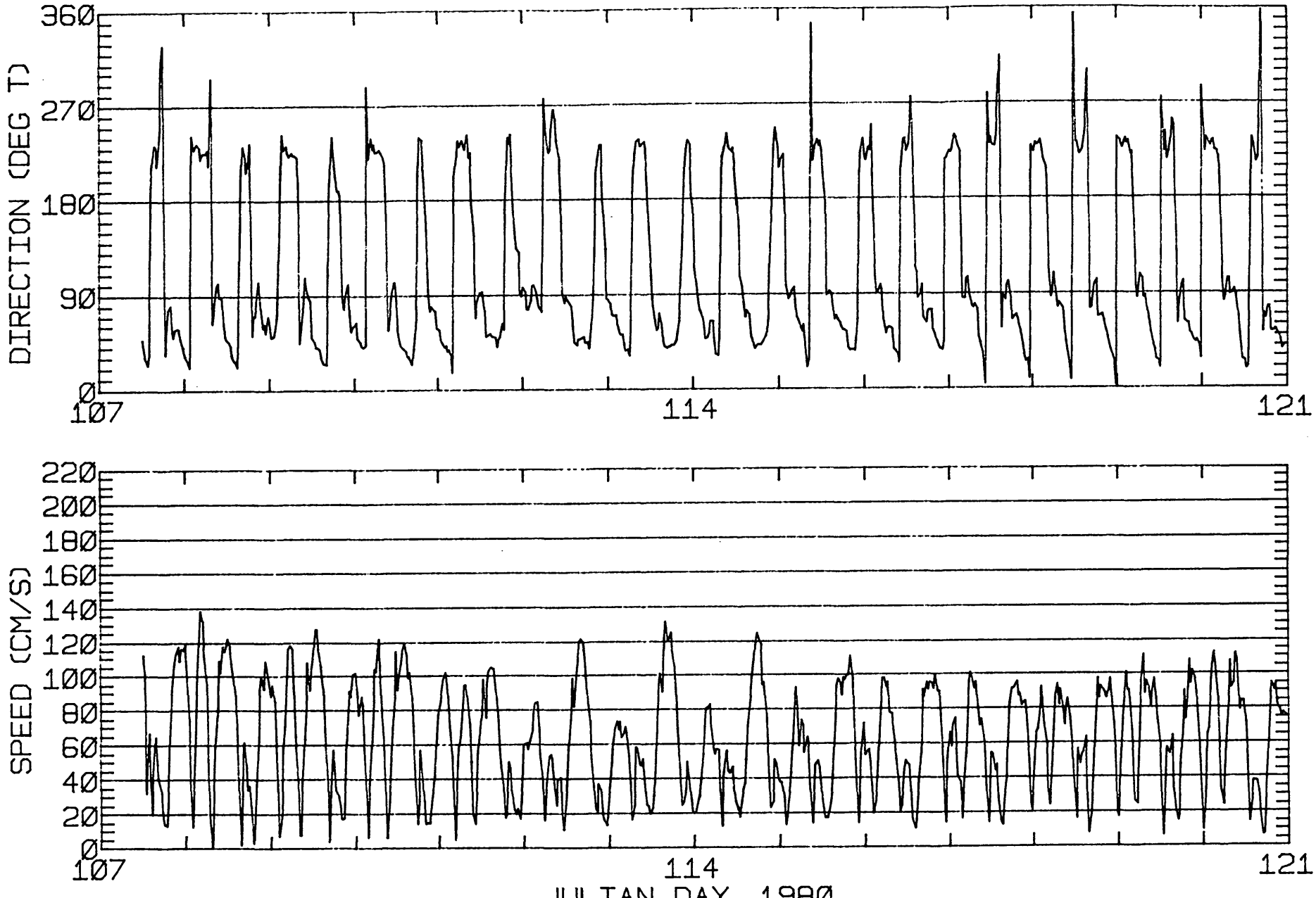
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.43	0.42	64.5	46.8	ANTI-CLOCKWISE
K1	28.15	1.21	42.0	9.8	ANTI-CLOCKWISE
N2	14.73	2.51	45.9	245.2	CLOCKWISE
M2	77.02	17.27	59.9	280.9	ANTI-CLOCKWISE
S2	18.31	4.98	68.9	266.1	ANTI-CLOCKWISE
M4	14.04	6.57	8.9	340.8	CLOCKWISE

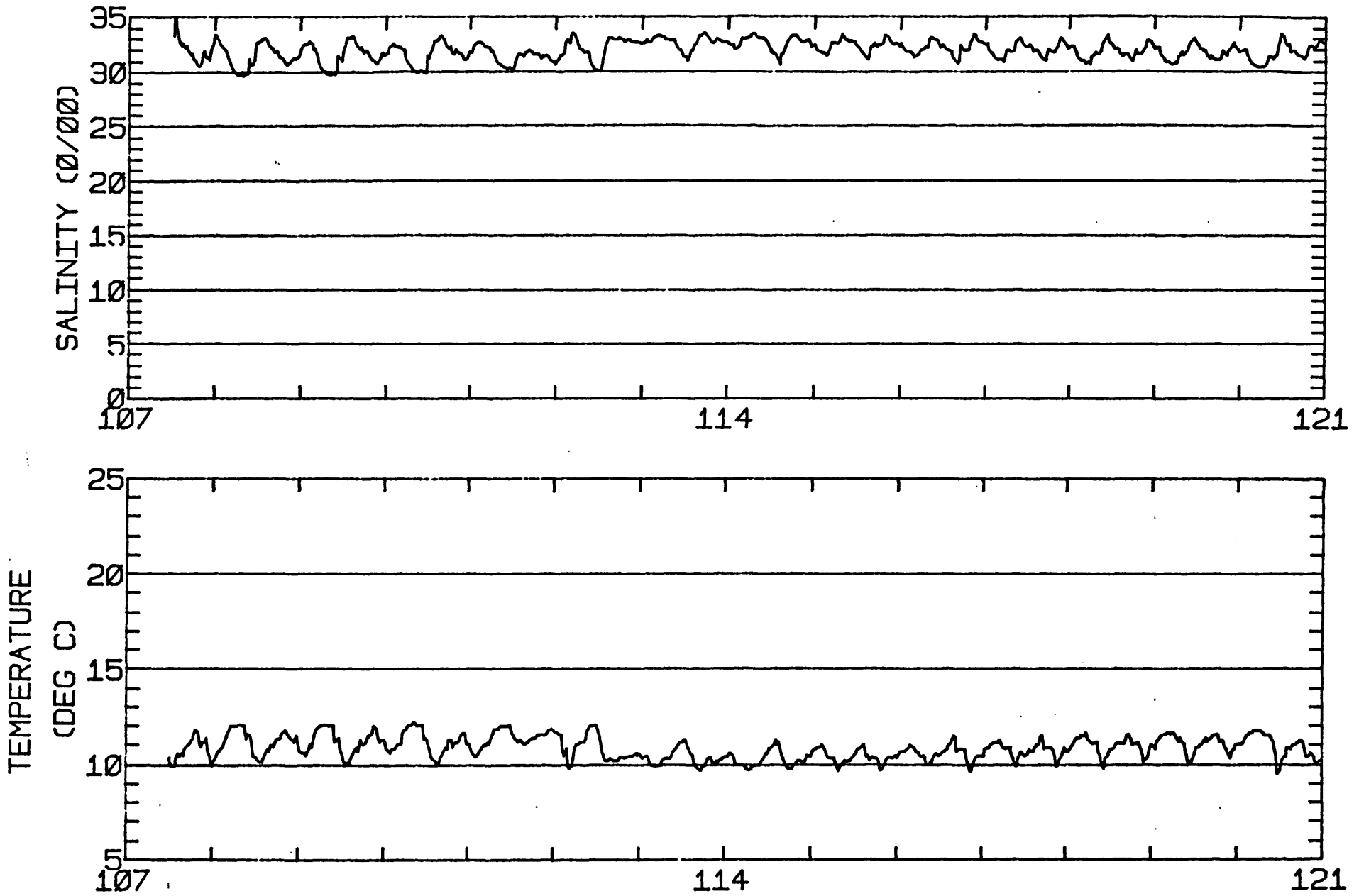
RMS SPEED: 70.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 134.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 42.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 57.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 11.31 CM/SEC
STANDARD DEVIATION V SERIES: 16.27 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	25.3	11.0	693.
2	12	26.3	10.0	658.
ALL	24	25.8	10.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER 007.6 METERS ABOVE BED. WATER DEPTH 036.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3 37-48- 5N 122-31- 4W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø36.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: T3
POSITION: 37 47'15"N 122 35'19"W
METER TYPE: AANDERAA
WATER DEPTH: 15.2 M (MLLW)
METER DEPTH: 13.7 M (BELOW MLLW)
START TIME OF SERIES: 4/14/80 1450 PST JULIAN DAY=105
APPROXIMATE RECORD LENGTH IS 22 M2-CYCLES

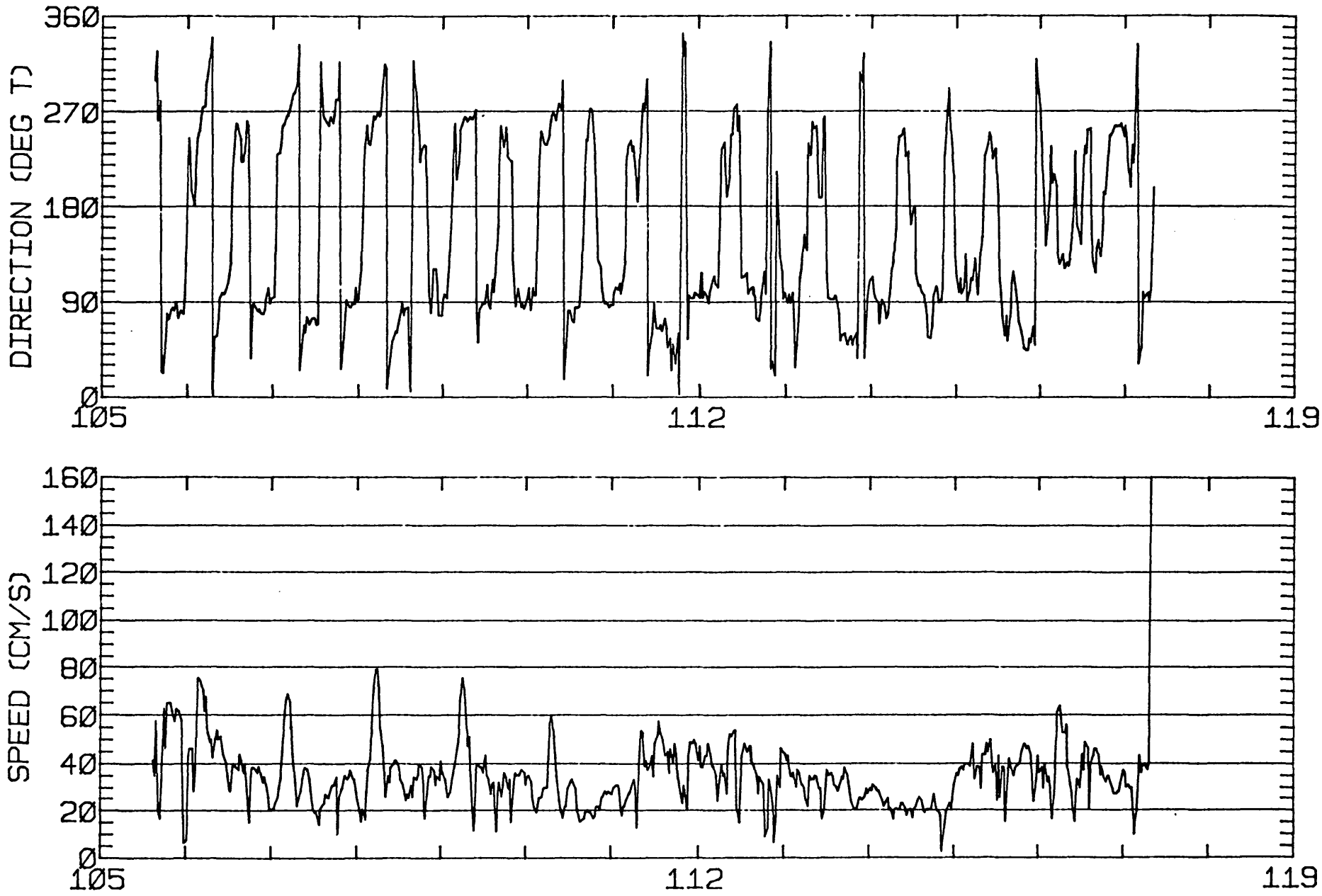
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.12	8.52	141.3	130.7	CLOCKWISE
K1	12.92	0.07	69.8	30.2	CLOCKWISE
N2	12.12	8.70	25.1	243.9	CLOCKWISE
M2	36.64	9.90	91.4	263.6	CLOCKWISE
S2	7.19	1.21	103.8	308.6	CLOCKWISE
M4	4.64	0.19	74.9	26.4	CLOCKWISE

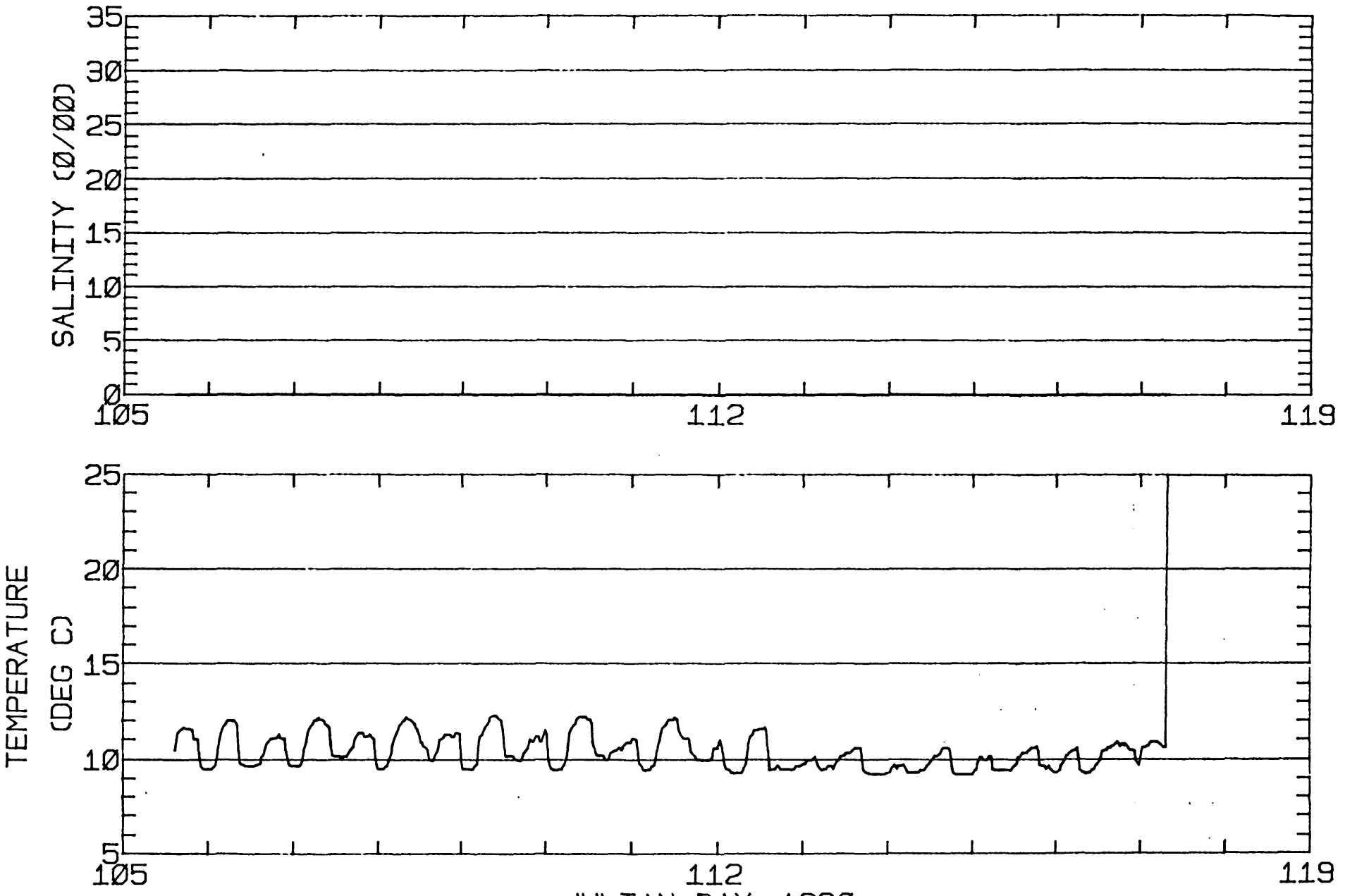
RMS SPEED:	37.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	68.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	28.7 CM/SEC
PRINCIPAL CURRENT DIRECTION:	97.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.57
STANDARD DEVIATION U-SERIES:	17.34 CM/SEC
STANDARD DEVIATION V SERIES:	13.21 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.5	0.5	725.
2	10	12.2	-7.7	664.
ALL	22	6.9	-3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION T3 37-47-15N 122-35-19W
METER 001.5 METERS ABOVE BED. WATER DEPTH 015.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION T3 37-47-15N 122-35-19W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø15.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'51"N 122 30'40"W
METER TYPE: AANDERAA
WATER DEPTH: 48.2 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 1500 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

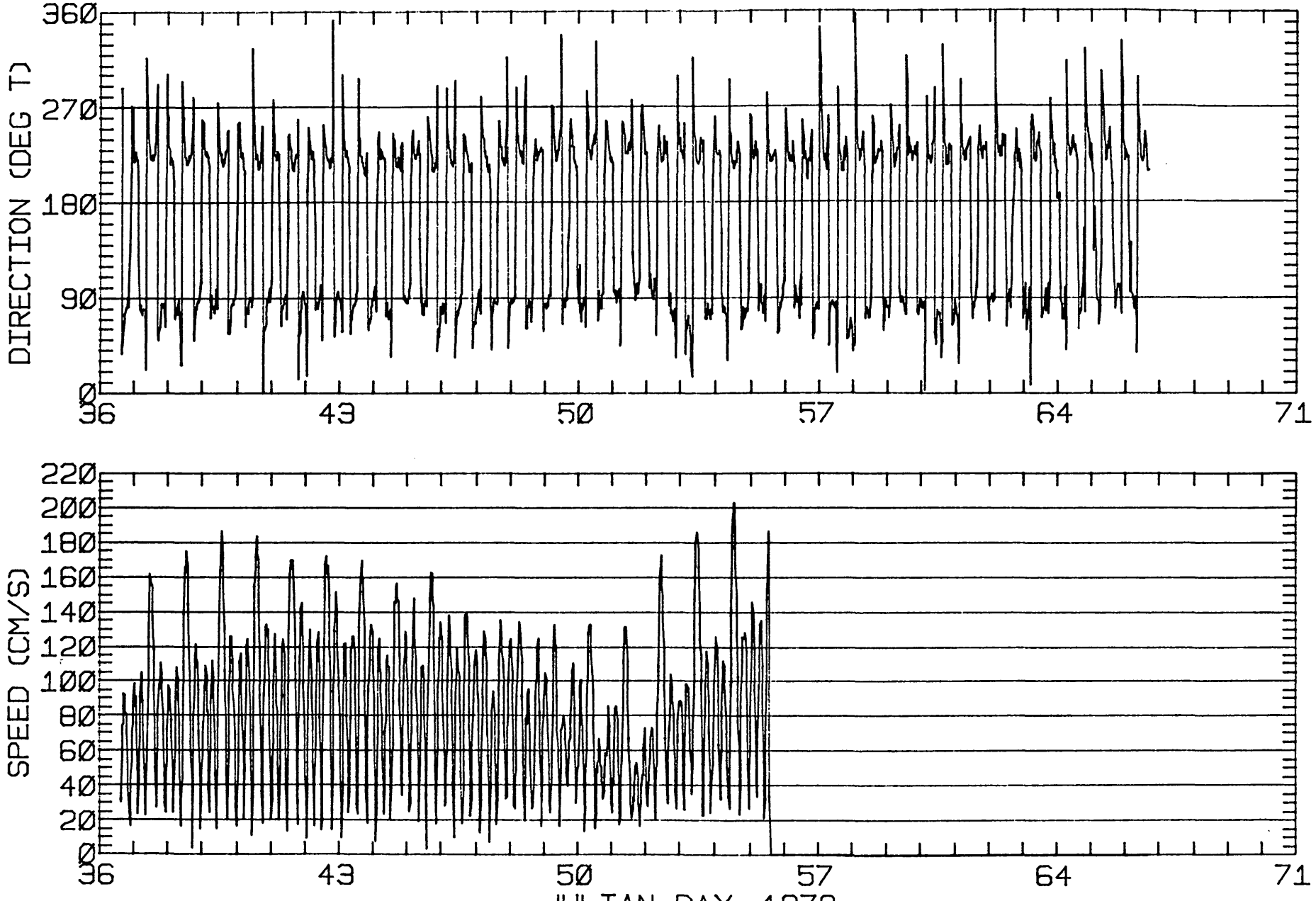
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.83	1.41	40.5	28.8	CLOCKWISE
K1	29.93	3.70	59.3	63.9	ANTI-CLOCKWISE
N2	30.53	0.70	61.8	263.8	ANTI-CLOCKWISE
M2	117.91	2.02	61.0	291.9	ANTI-CLOCKWISE
S2	38.14	2.66	60.1	309.2	CLOCKWISE
M4	13.32	2.19	146.4	243.9	CLOCKWISE

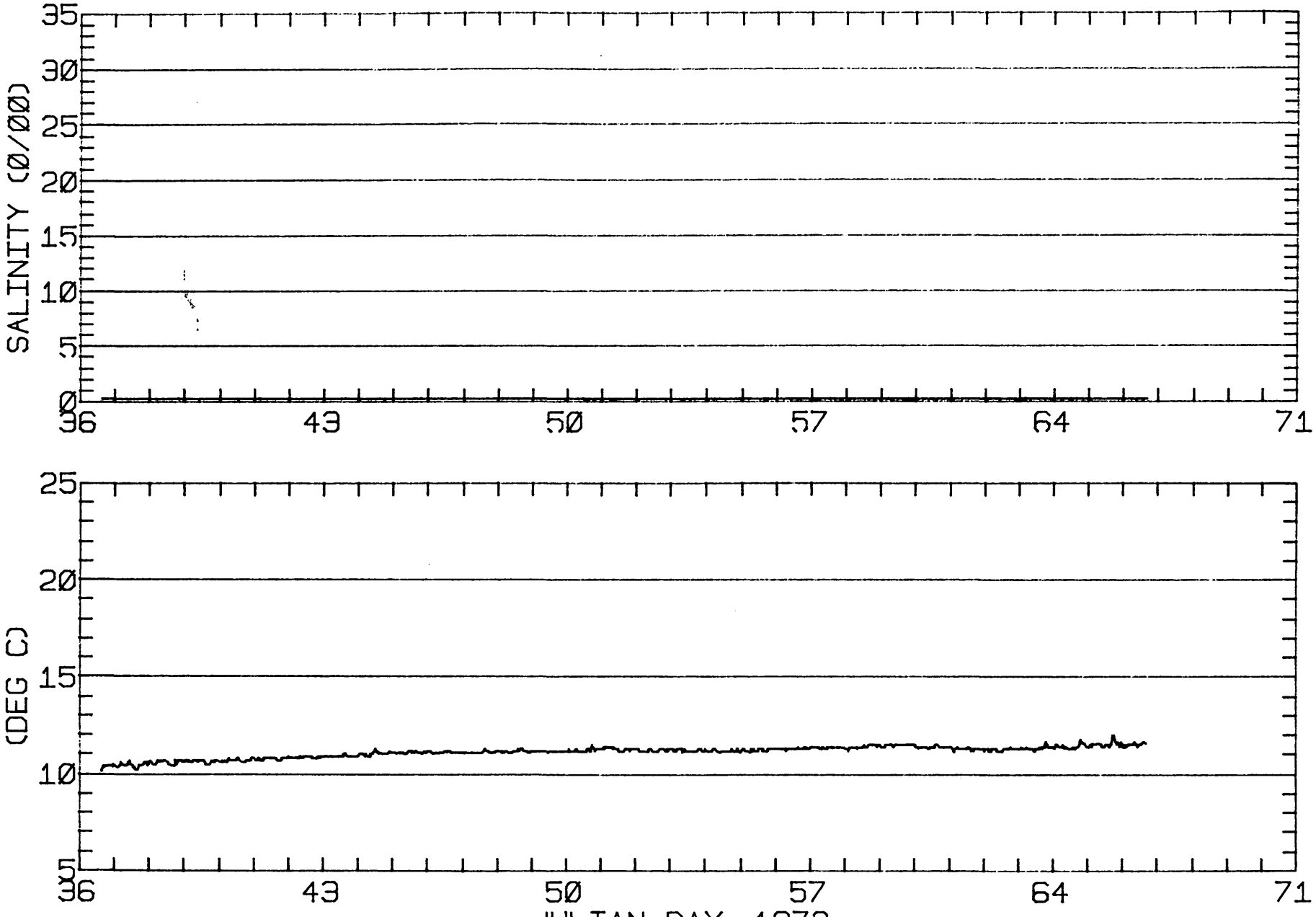
RMS SPEED: 93.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 204.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 68.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 58.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 15.32 CM/SEC
STANDARD DEVIATION V SERIES: 19.72 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.5	-28.1	415.
2	12	5.2	-27.0	728.
3	12	-7.7	-26.1	2173.
ALL	36	-0.7	-27.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-51N 122-30-40W
METER 042.1 METERS ABOVE BED. WATER DEPTH 048.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-51N 122-30-40W
METER Ø42.1 METERS ABOVE BED. WATER DEPTH Ø48.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'51"N 122 30'40"W
METER TYPE: AANDERAA
WATER DEPTH: 48.2 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 1452 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

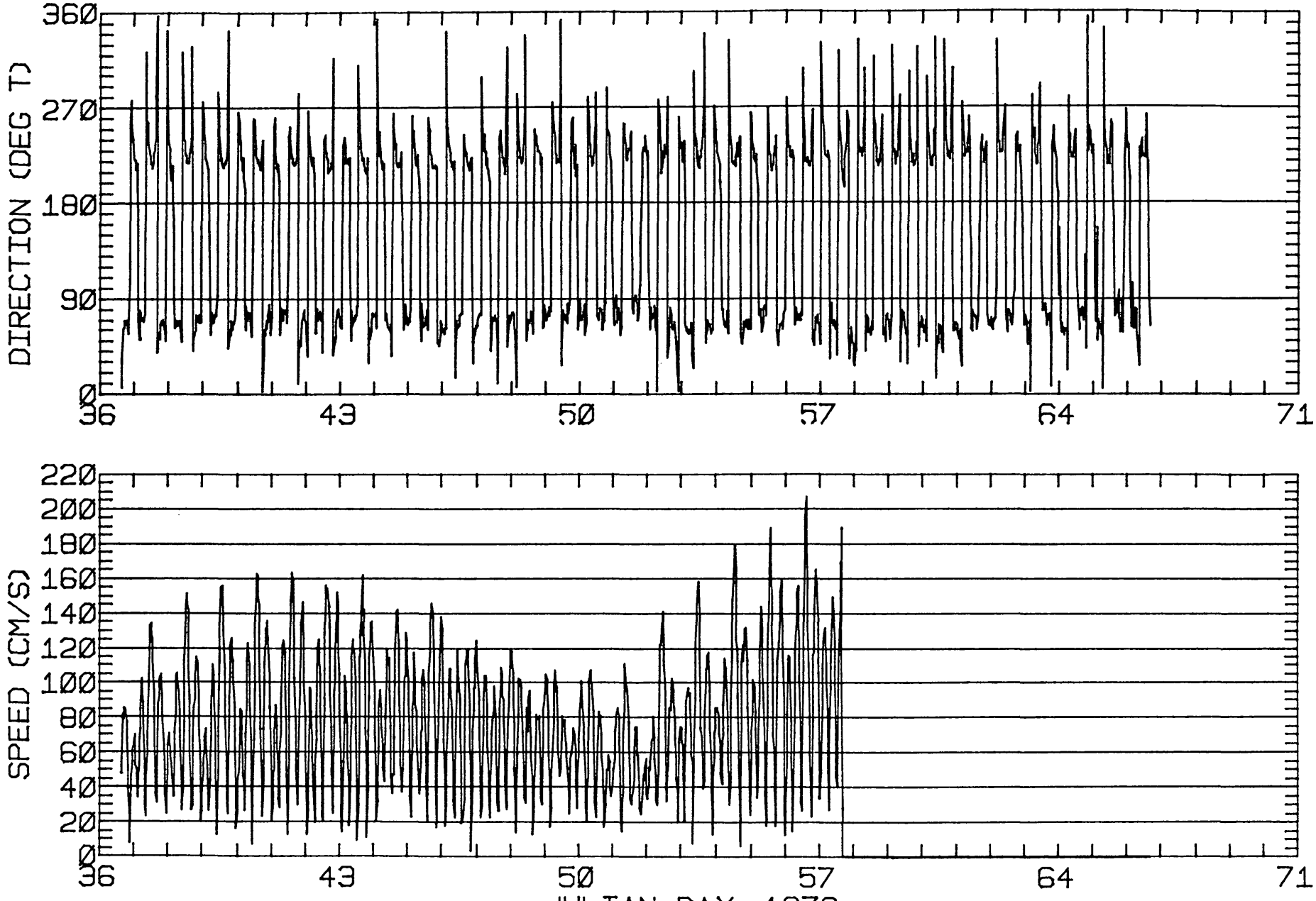
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.29	3.03	44.8	17.2	CLOCKWISE
K1	29.39	0.31	55.0	60.6	ANTI-CLOCKWISE
N2	28.34	0.59	58.9	251.5	CLOCKWISE
M2	110.79	3.37	56.4	284.8	ANTI-CLOCKWISE
S2	34.94	0.95	55.1	309.2	CLOCKWISE
M4	9.59	1.20	149.5	242.7	ANTI-CLOCKWISE

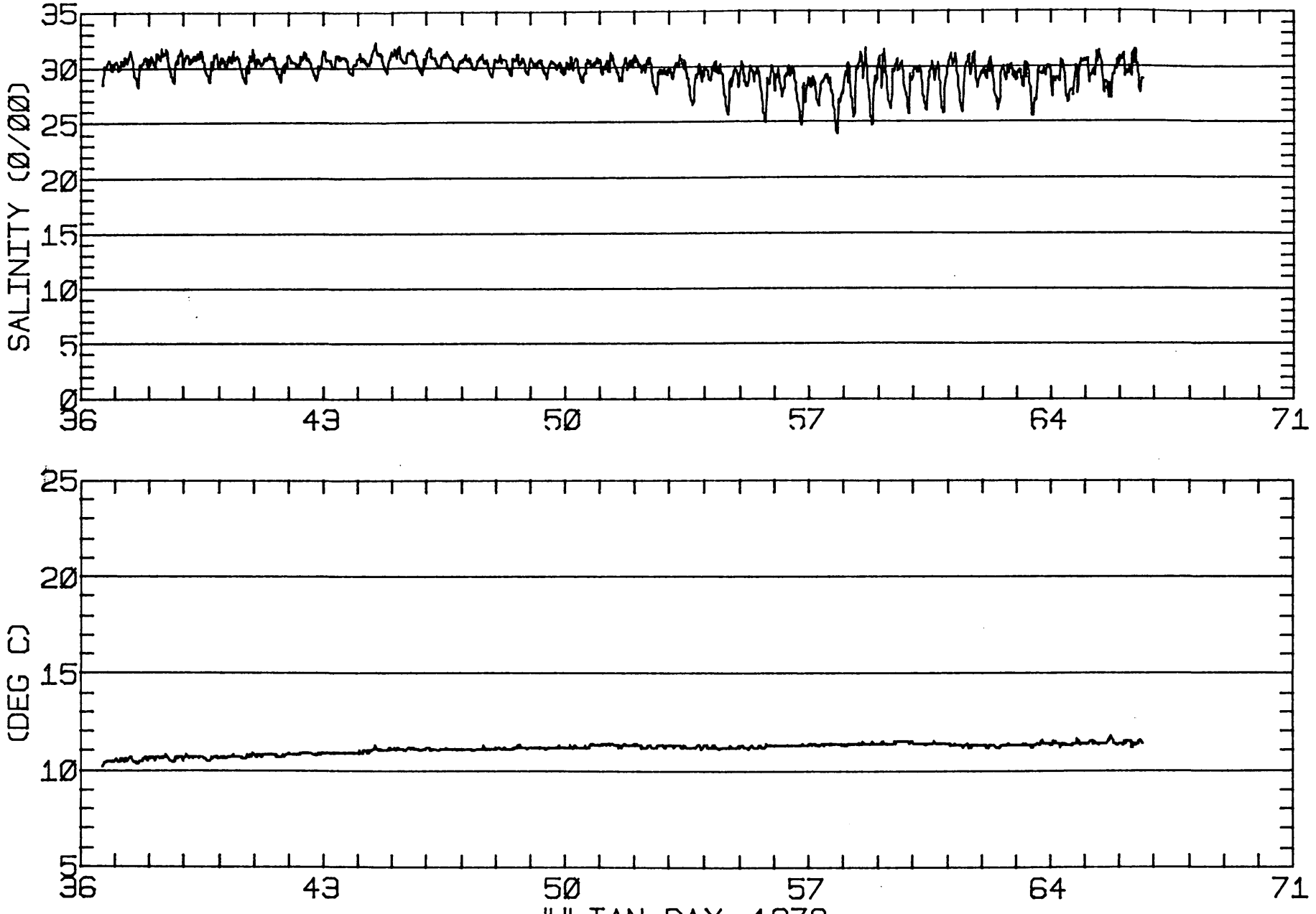
RMS SPEED: 85.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 194.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 65.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 54.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 13.69 CM/SEC
STANDARD DEVIATION V SERIES: 16.68 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.1	-11.8	415.
2	12	12.0	-11.2	728.
3	12	6.5	-10.4	2173.
4	2	10.7	-15.7	3152.
ALL	38	9.3	-11.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-51N 122-30-40W
METER 036.0 METERS ABOVE BED. WATER DEPTH 048.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-51N 122-30-40W
METER Ø36.Ø METERS ABOVE BED. WATER DEPTH Ø48.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'51"N 122 30'40"W
METER TYPE: AANDERAA
WATER DEPTH: 48.2 M (MLLW)
METER DEPTH: 40.6 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 1504 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

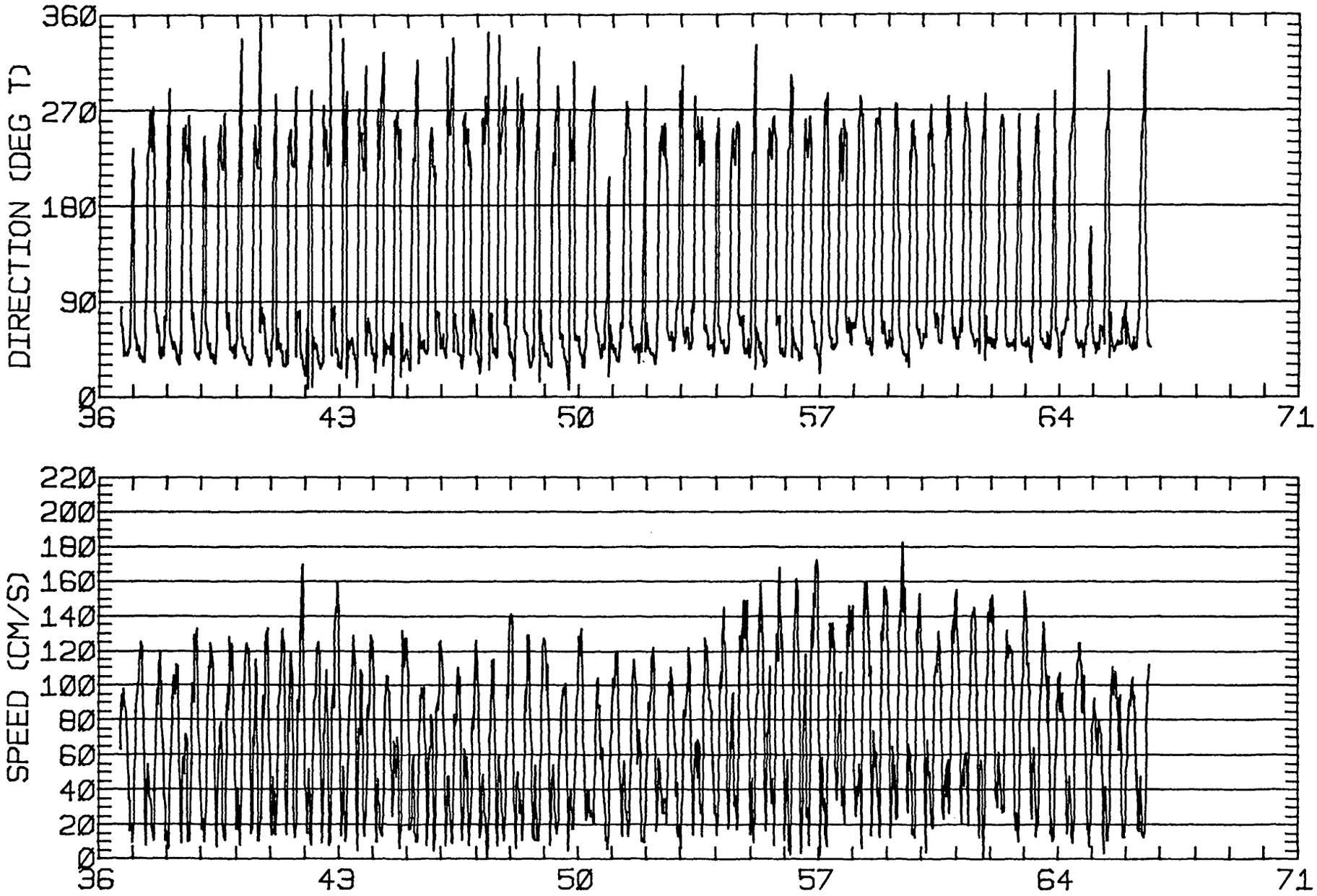
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.72	3.04	46.9	35.9	ANTI-CLOCKWISE
K1	24.14	5.41	52.4	60.0	ANTI-CLOCKWISE
N2	16.86	0.54	58.6	249.2	CLOCKWISE
M2	77.37	6.25	51.1	274.0	ANTI-CLOCKWISE
S2	23.15	2.55	51.2	304.8	ANTI-CLOCKWISE
M4	6.62	4.11	113.7	37.2	CLOCKWISE

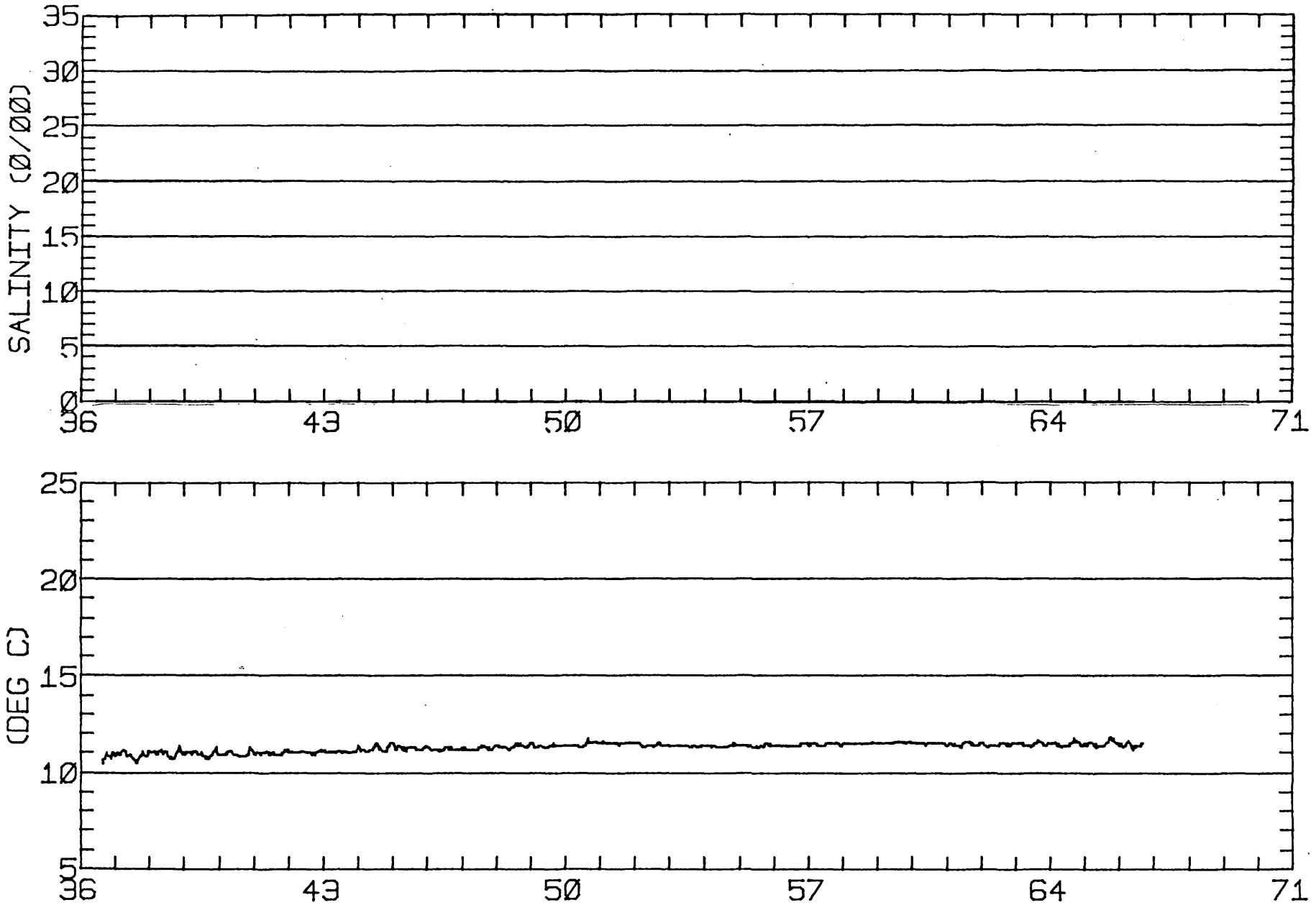
RMS SPEED: 81.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 142.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 50.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 15.53 CM/SEC
STANDARD DEVIATION V SERIES: 19.61 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	26.4	28.4	415.
2	12	23.6	28.3	728.
3	12	31.4	29.1	2173.
4	12	36.1	30.4	2534.
5	8	45.4	35.9	1895.
ALL	56	31.7	30.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-51N 122-30-40W
METER 007.6 METERS ABOVE BED. WATER DEPTH 048.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-51N 122-30-40W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø48.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'45"N 122 30'43"W
METER TYPE: AANDERAA
WATER DEPTH: 48.2 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 1340 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

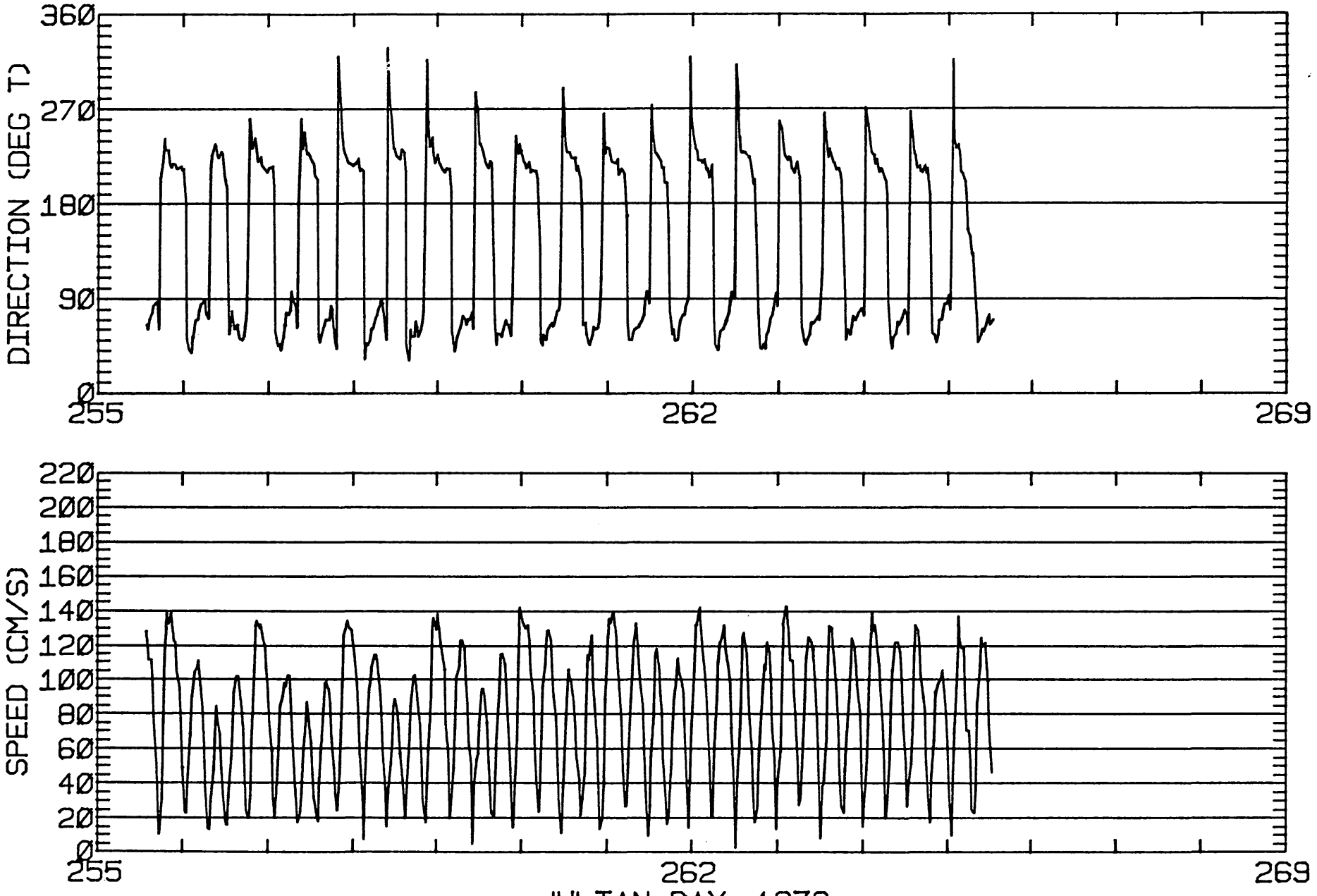
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.43	3.72	46.5	56.6	ANTI-CLOCKWISE
K1	23.16	3.33	49.0	52.9	ANTI-CLOCKWISE
N2	32.64	0.54	54.7	270.5	CLOCKWISE
M2	118.56	1.18	53.3	291.9	ANTI-CLOCKWISE
S2	33.19	0.51	49.6	286.4	ANTI-CLOCKWISE
M4	14.65	1.17	135.2	323.7	CLOCKWISE

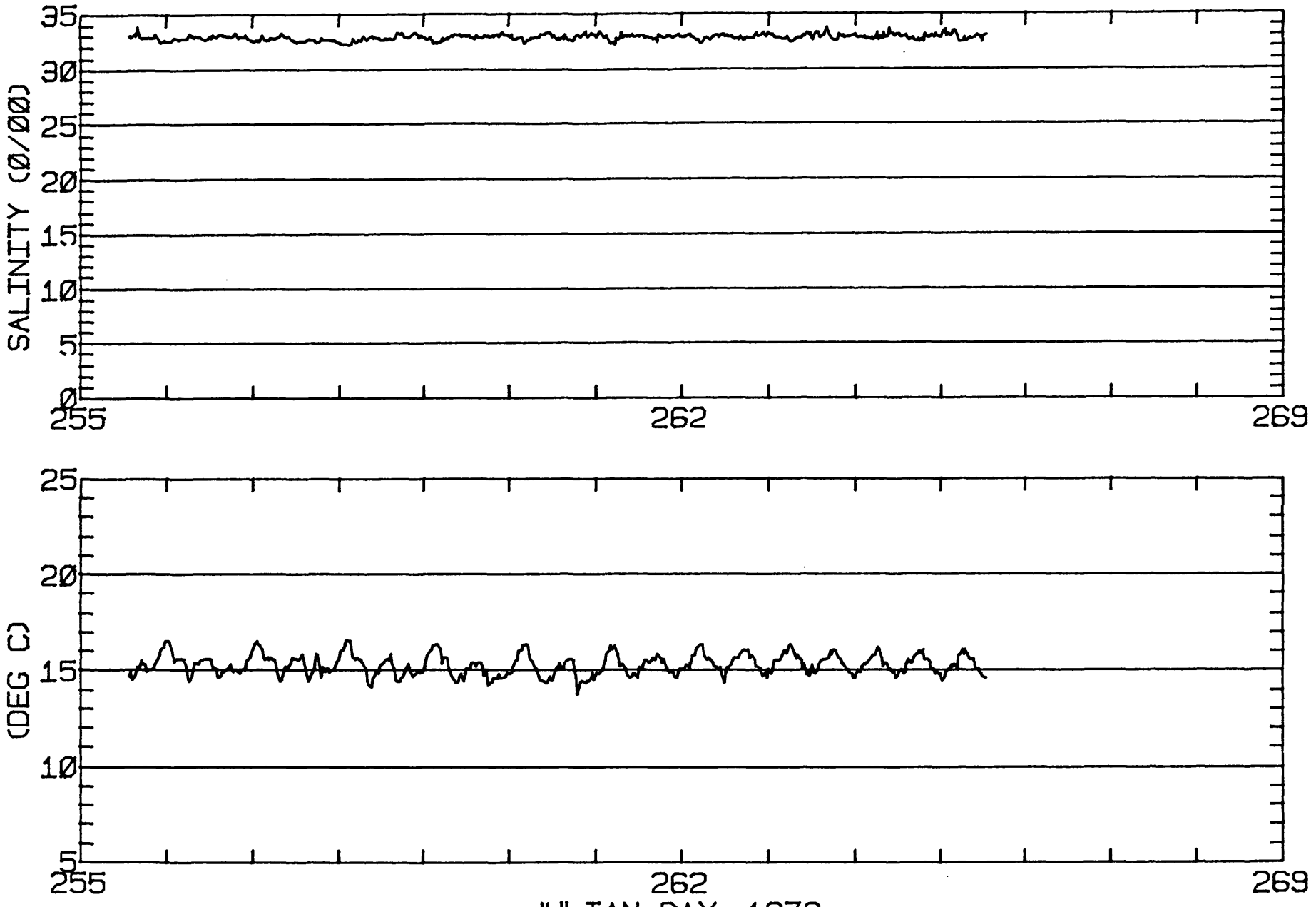
RMS SPEED: 87.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 194.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 81.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 51.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.28
STANDARD DEVIATION U-SERIES: 11.66 CM/SEC
STANDARD DEVIATION V SERIES: 11.92 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.3	-13.5	197.
2	6	7.8	-14.1	171.
ALL	18	6.2	-13.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-45N 122-30-43W
METER 042.1 METERS ABOVE BED. WATER DEPTH 048.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-45N 122-30-43W
METER 042.1 METERS ABOVE BED. WATER DEPTH 048.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'45"N 122 30'43"W
METER TYPE: AANDERAA
WATER DEPTH: 48.2 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 1342 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

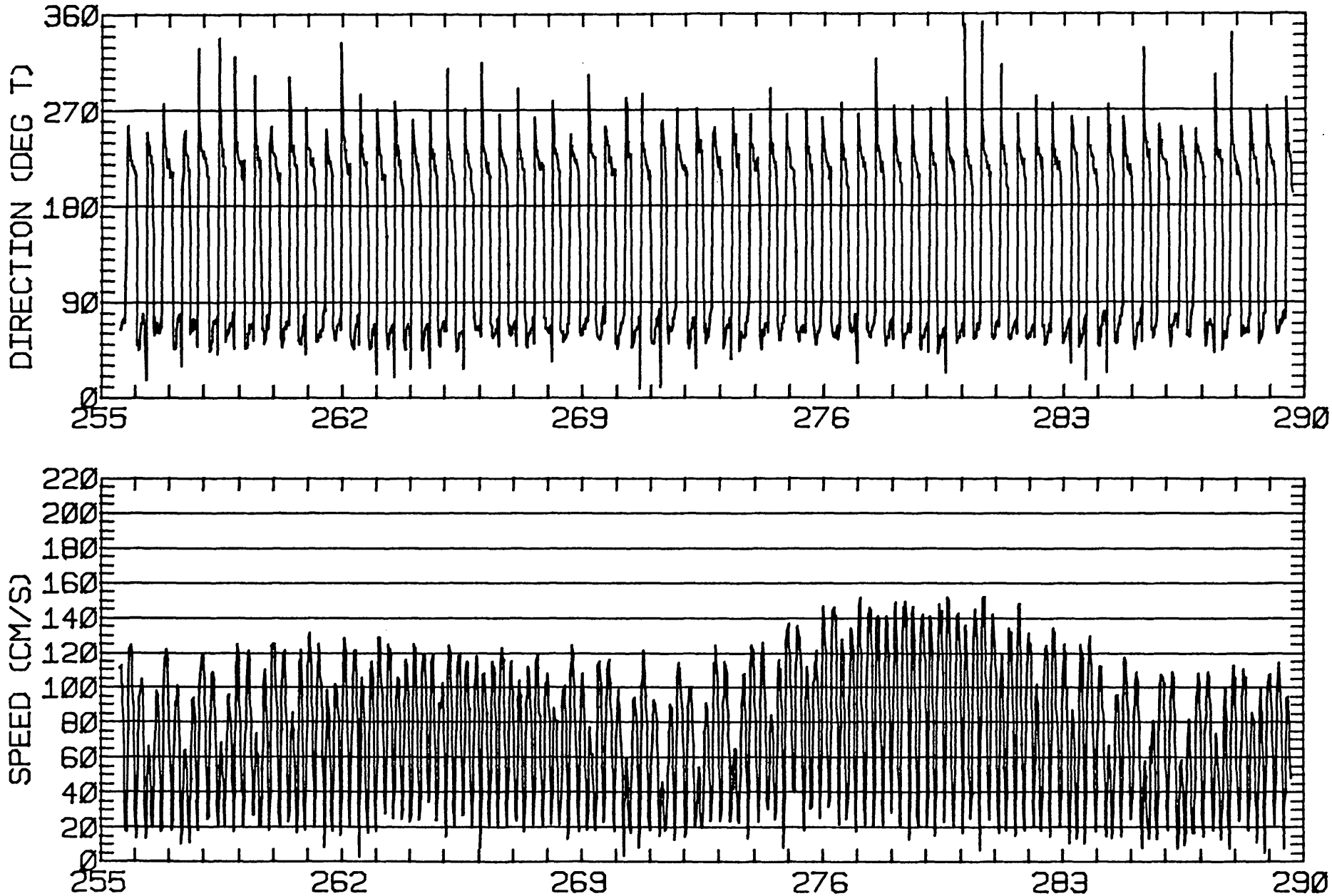
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	19.26	2.66	48.8	35.6	ANTI-CLOCKWISE
K1	22.89	1.73	48.3	43.6	ANTI-CLOCKWISE
N2	23.54	0.75	56.7	262.5	ANTI-CLOCKWISE
M2	102.68	4.88	54.4	290.0	ANTI-CLOCKWISE
S2	26.15	2.03	50.1	288.5	ANTI-CLOCKWISE
M4	11.68	1.45	123.1	296.4	ANTI-CLOCKWISE

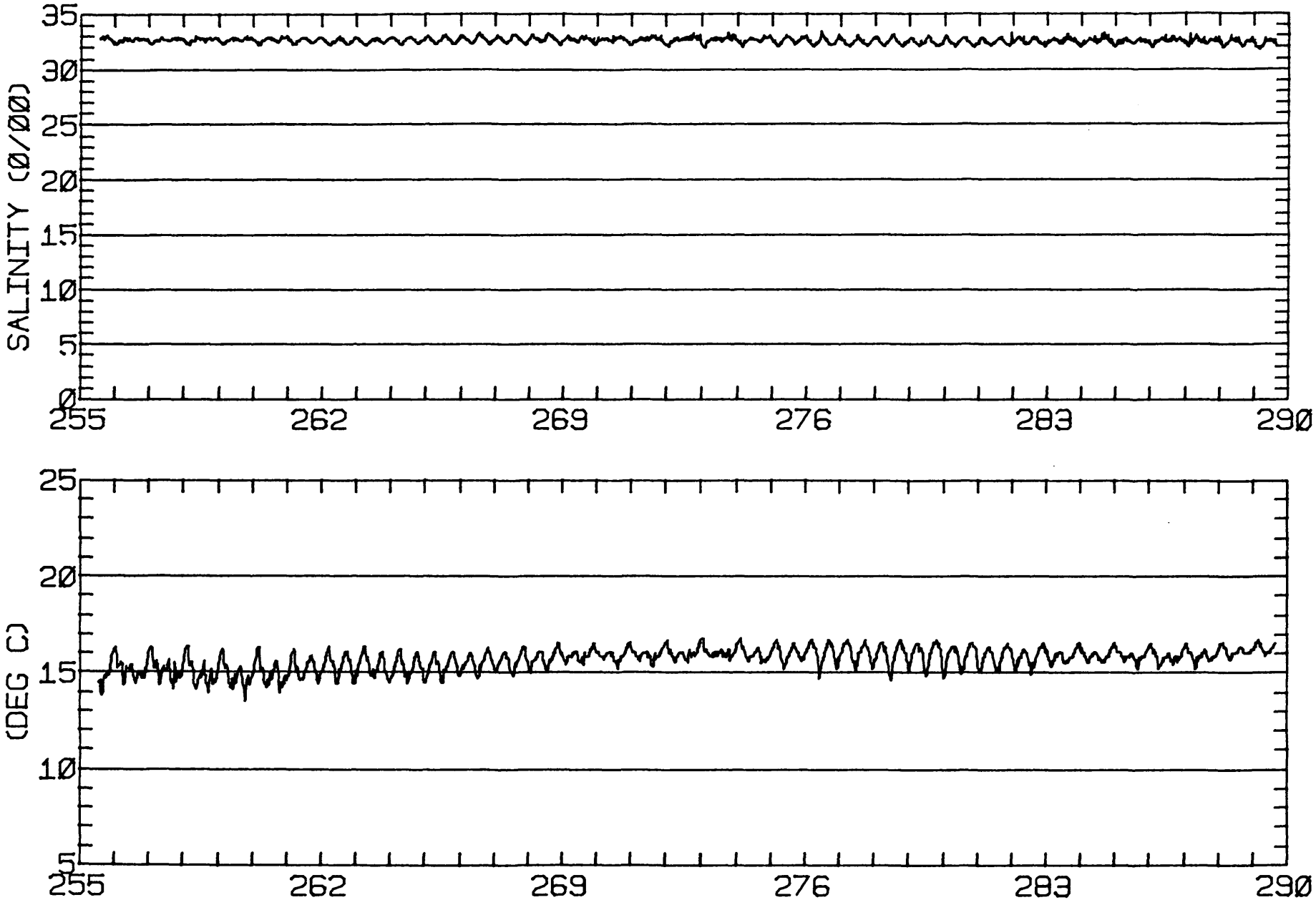
RMS SPEED: 84.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 171.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 72.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 52.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 12.62 CM/SEC
STANDARD DEVIATION V SERIES: 10.43 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.4	-6.8	197.
2	12	9.5	-7.7	157.
3	12	8.0	-5.7	131.
4	12	14.1	-5.6	153.
5	10	12.4	-4.7	157.
ALL	58	10.4	-6.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-45N 122-30-43W
METER 036.0 METERS ABOVE BED. WATER DEPTH 048.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-45N 122-30-43W
METER Ø36.Ø METERS ABOVE BED. WATER DEPTH Ø48.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'45"N 122 30'43"W
METER TYPE: AANDERAA
WATER DEPTH: 48.2 M (MLLW)
METER DEPTH: 40.6 M (BELOW MLLW)
START TIME OF SERIES: 9/12/79 1344 PST JULIAN DAY=255
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

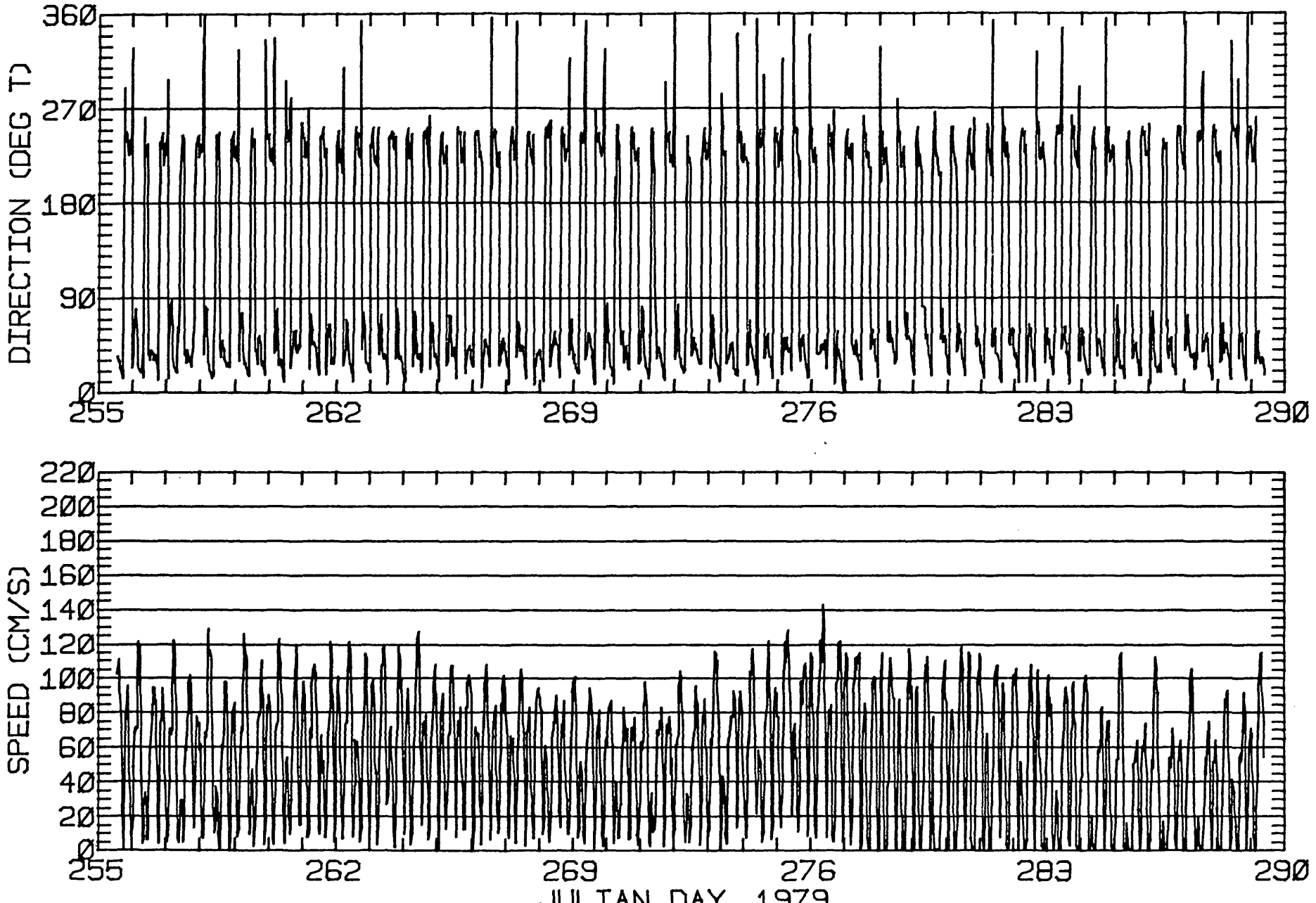
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.77	0.37	38.4	27.3	ANTI-CLOCKWISE
K1	18.63	1.80	45.4	49.0	ANTI-CLOCKWISE
N2	21.49	3.31	43.6	252.5	ANTI-CLOCKWISE
M2	83.57	12.60	46.5	285.7	ANTI-CLOCKWISE
S2	24.61	2.08	49.7	290.1	ANTI-CLOCKWISE
M4	10.15	0.49	17.7	328.3	CLOCKWISE

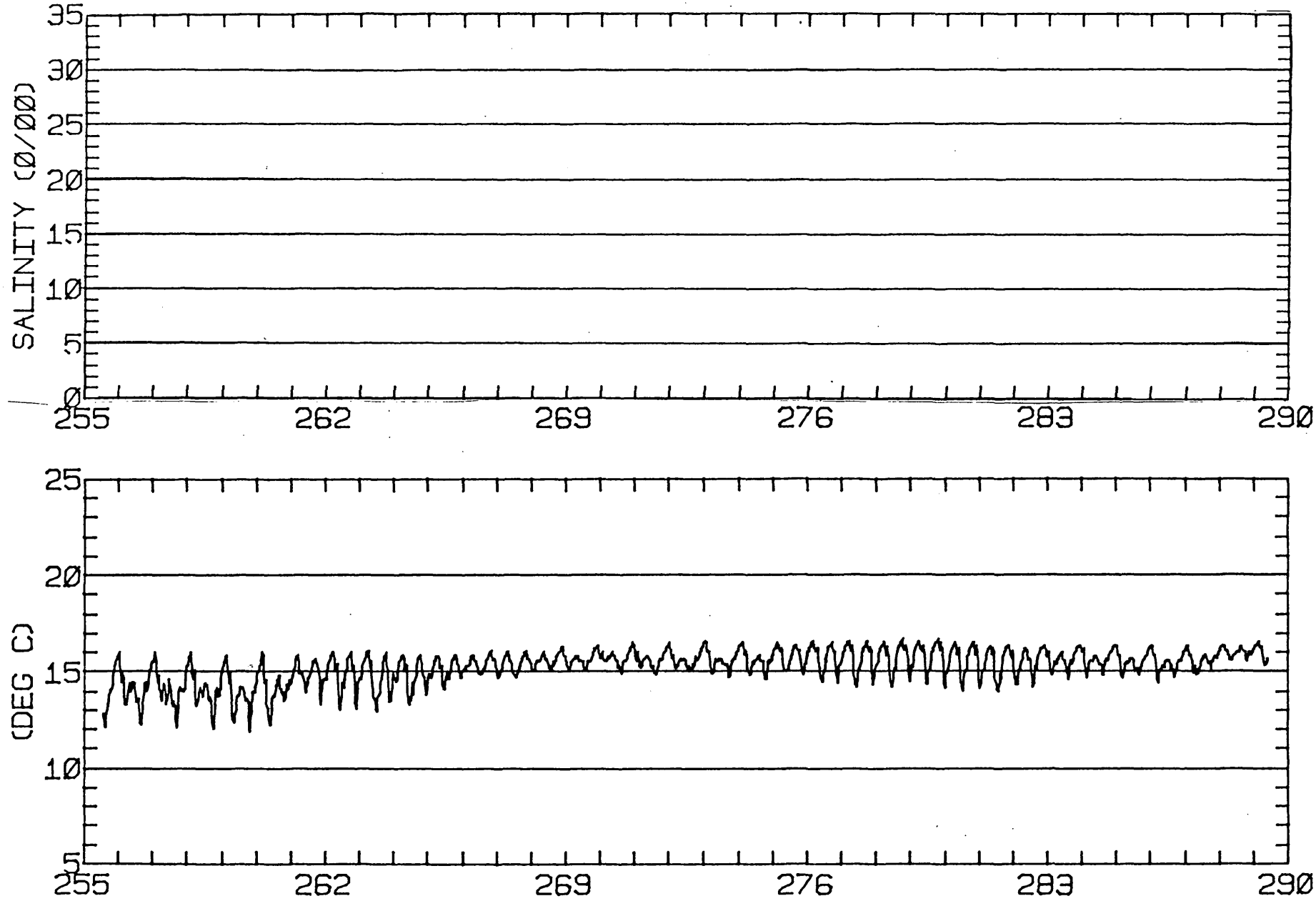
RMS SPEED: 67.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 142.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 56.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 46.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 10.30 CM/SEC
STANDARD DEVIATION V SERIES: 14.88 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.7	21.2	197.
2	12	6.9	18.6	157.
3	12	7.7	18.5	131.
4	4	8.5	23.7	144.
ALL	40	7.9	19.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-45N 122-30-43W
METER 007.6 METERS ABOVE BED. WATER DEPTH 048.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-45N 122-30-43W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø48.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'43"N 122 30'41"W
METER TYPE: AANDERAA
WATER DEPTH: 46.7 M (MLLW)
METER DEPTH: 4.6 M (BELOW MLLW)
START TIME OF SERIES:10/17/79 1040 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

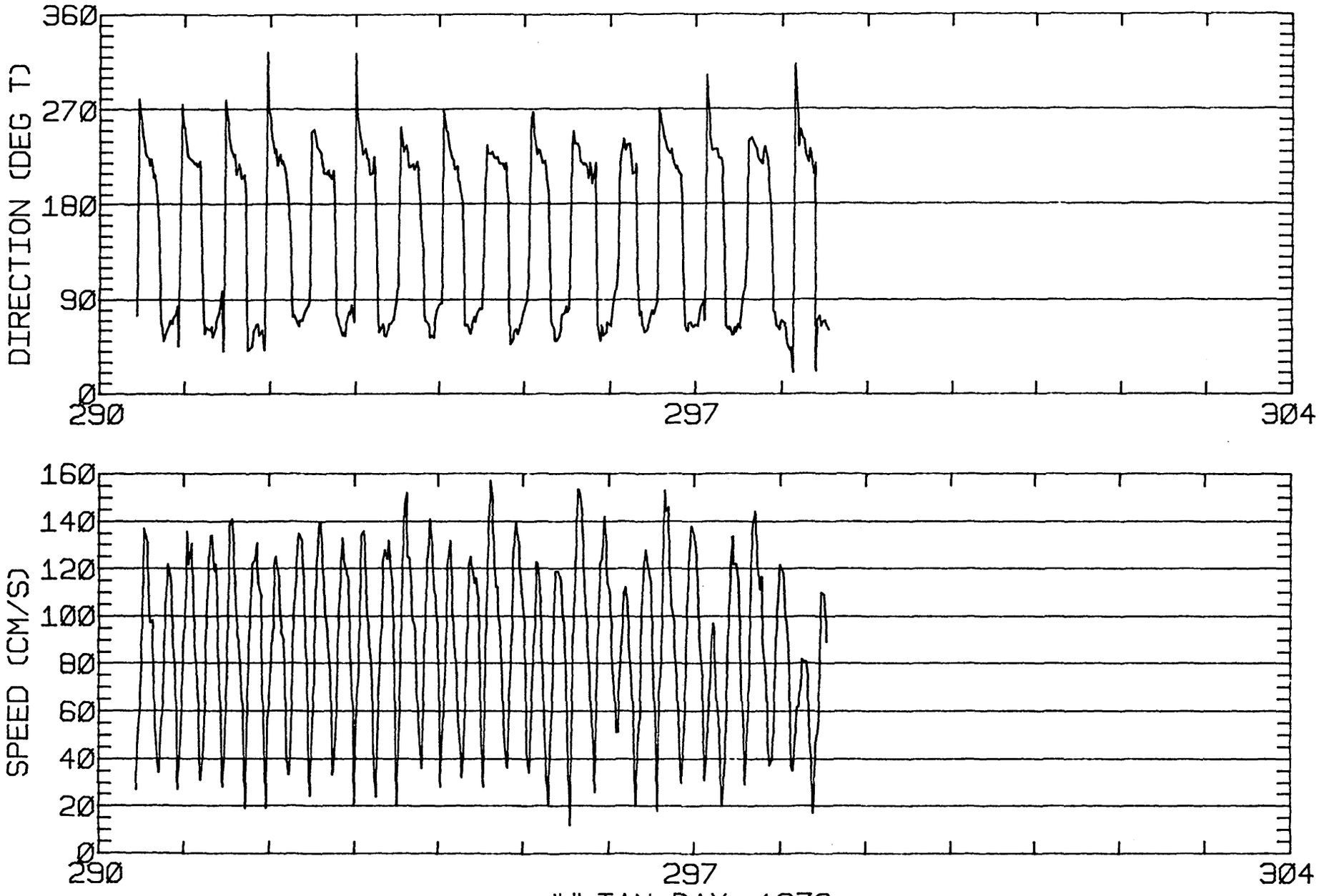
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.21	7.02	54.9	21.9	ANTI-CLOCKWISE
K1	23.25	1.01	61.2	21.6	ANTI-CLOCKWISE
N2	34.42	7.77	68.8	240.6	ANTI-CLOCKWISE
M2	131.60	16.96	62.5	286.5	ANTI-CLOCKWISE
S2	31.98	3.46	36.5	277.6	CLOCKWISE
M4	15.89	1.47	120.9	285.6	CLOCKWISE

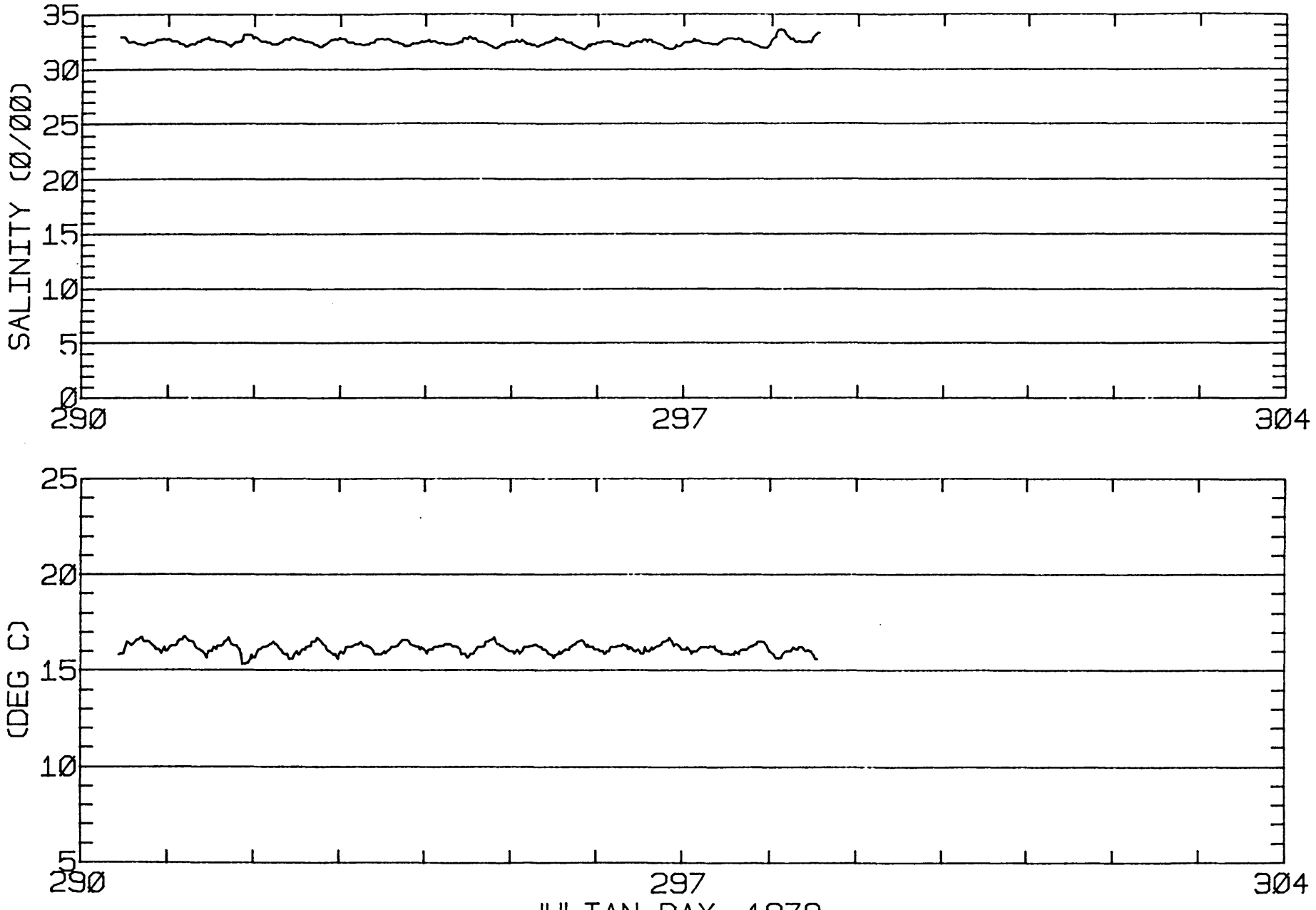
RMS SPEED: 95.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 205.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 94.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 57.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.25
STANDARD DEVIATION U-SERIES: 14.81 CM/SEC
STANDARD DEVIATION V SERIES: 12.76 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.5	-14.5	208.
2	2	14.2	-7.9	277.
ALL	14	9.4	-13.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-43N 122-30-41W
METER 042.1 METERS ABOVE BED. WATER DEPTH 046.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-43N 122-30-41W
METER Ø42.1 METERS ABOVE BED. WATER DEPTH Ø46.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'43"N 122 30'41"W
METER TYPE: AANDERAA
WATER DEPTH: 46.7 M (MLLW)
METER DEPTH: 10.7 M (BELOW MLLW)
START TIME OF SERIES:10/17/79 1042 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

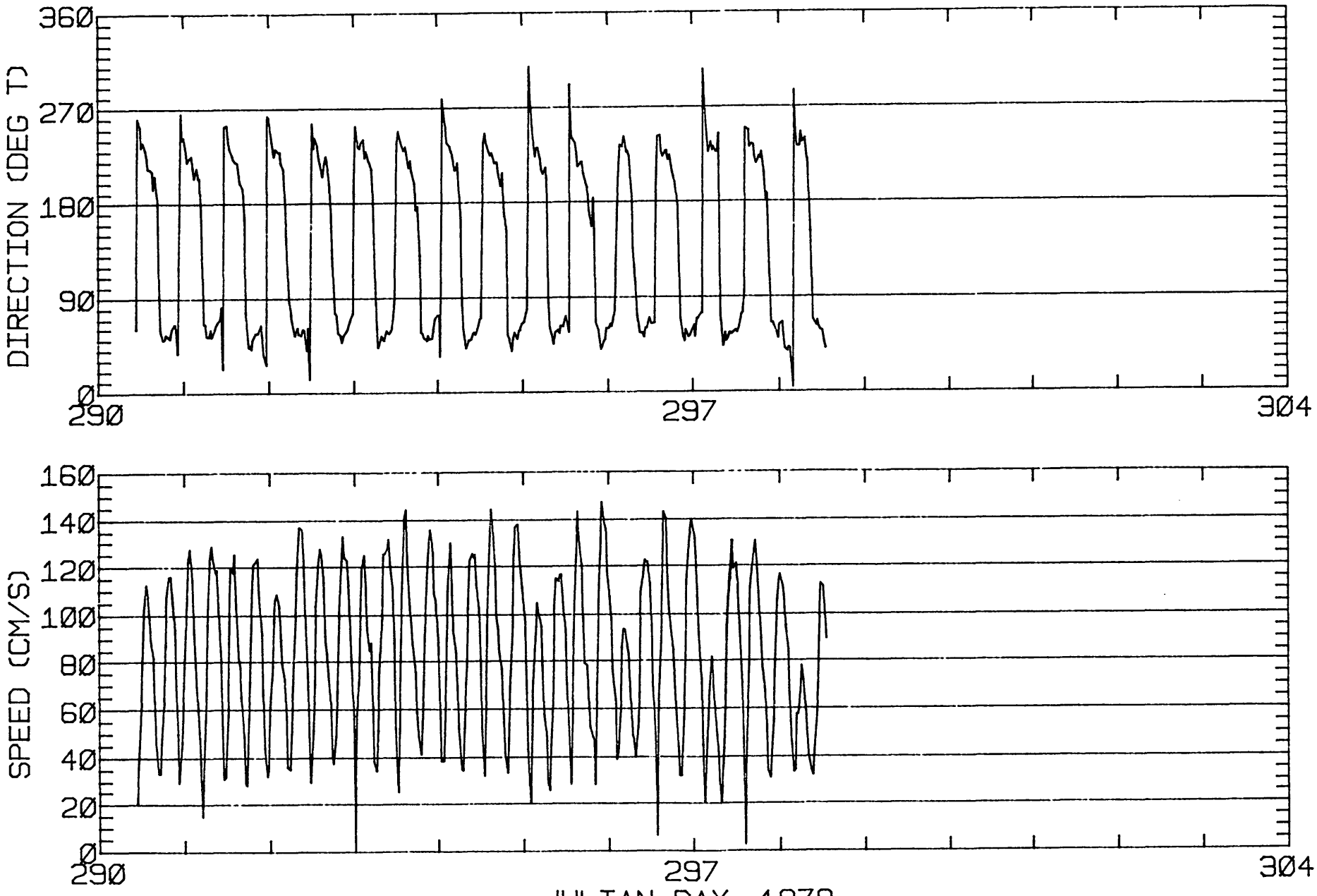
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.68	5.97	50.6	14.0	ANTI-CLOCKWISE
K1	22.68	2.00	48.7	19.3	ANTI-CLOCKWISE
N2	29.78	2.84	59.5	243.2	ANTI-CLOCKWISE
M2	120.68	10.13	55.6	286.4	ANTI-CLOCKWISE
S2	32.42	2.29	41.7	279.2	ANTI-CLOCKWISE
M4	13.72	2.23	110.3	299.2	CLOCKWISE

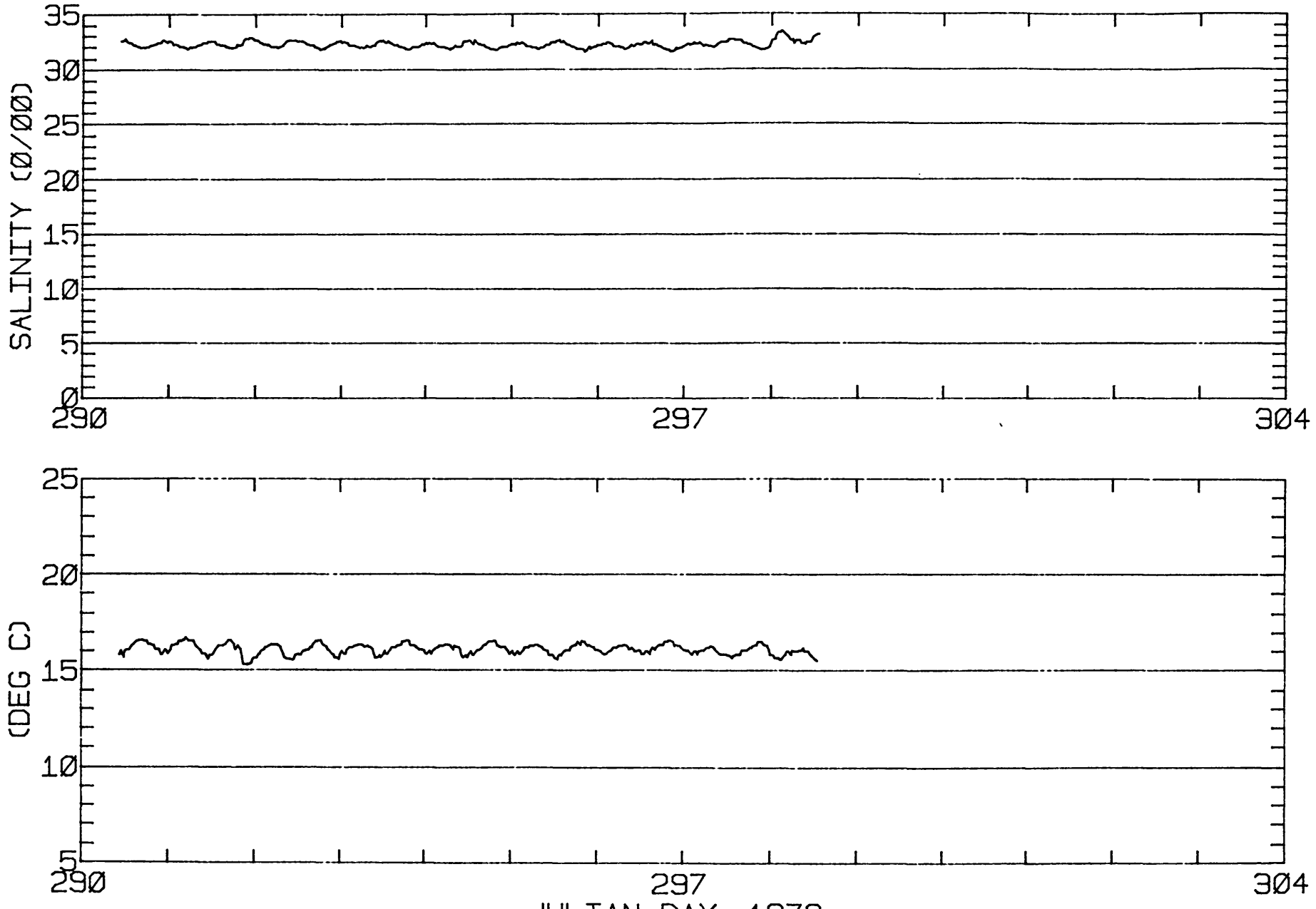
RMS SPEED: 91.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 194.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 84.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 52.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 14.84 CM/SEC
STANDARD DEVIATION V SERIES: 11.55 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	11.1	-4.6	208.
2	2	17.1	2.4	277.
ALL	14	11.9	-3.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-43N 122-30-41W
METER 036.0 METERS ABOVE BED. WATER DEPTH 046.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-43N 122-30-41W
METER Ø36.Ø METERS ABOVE BED. WATER DEPTH Ø46.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'43"N 122 30'41"W
METER TYPE: AANDERAA
WATER DEPTH: 46.7 M (MLLW)
METER DEPTH: 39.0 M (BELOW MLLW)
START TIME OF SERIES:10/17/79 1046 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

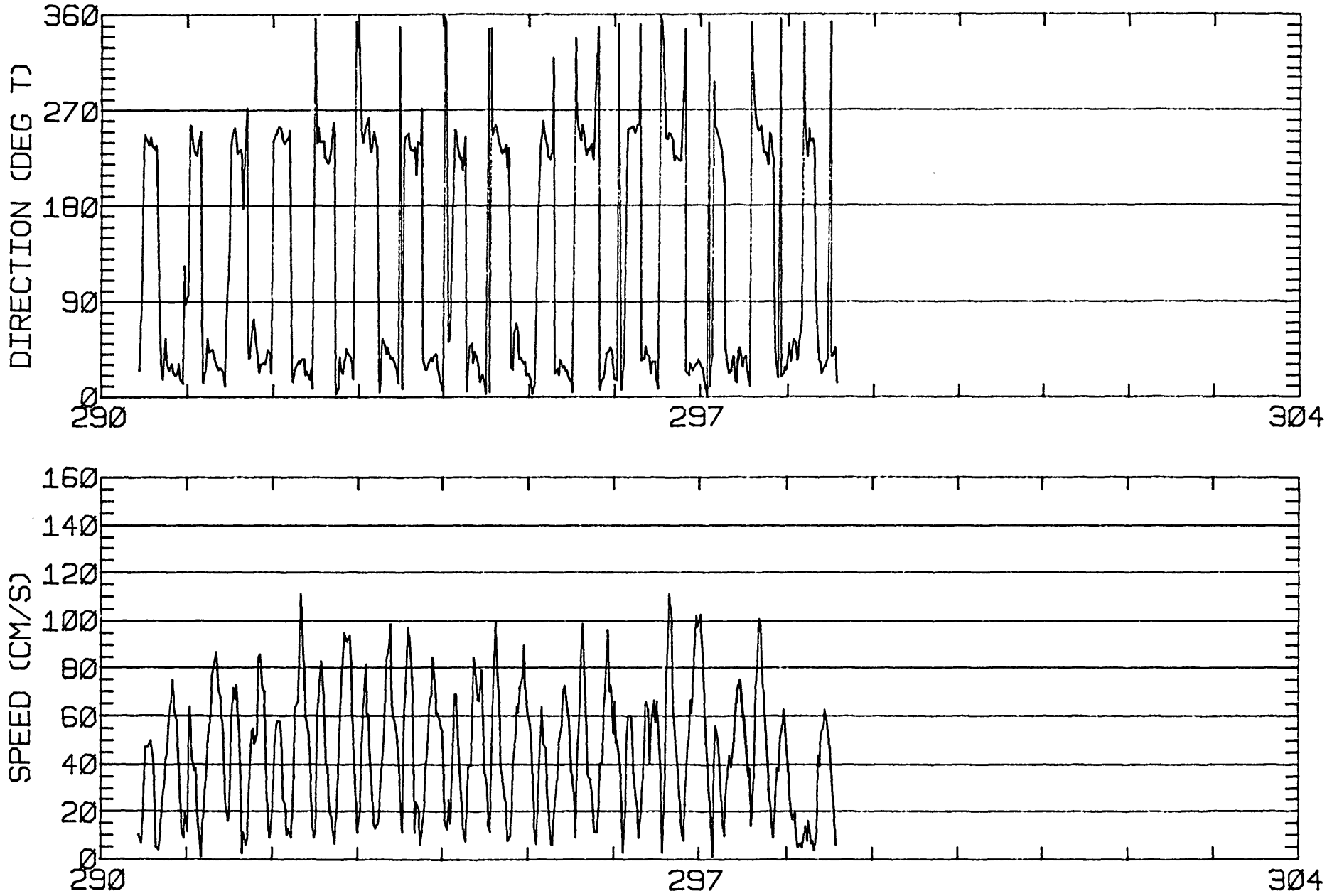
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.83	1.68	51.7	359.3	CLOCKWISE
K1	16.23	0.25	42.2	0.4	CLOCKWISE
N2	14.96	2.37	35.9	235.4	CLOCKWISE
M2	62.09	2.57	39.5	280.3	ANTI-CLOCKWISE
S2	19.26	4.29	55.0	281.5	ANTI-CLOCKWISE
M4	5.81	2.01	23.2	299.7	CLOCKWISE

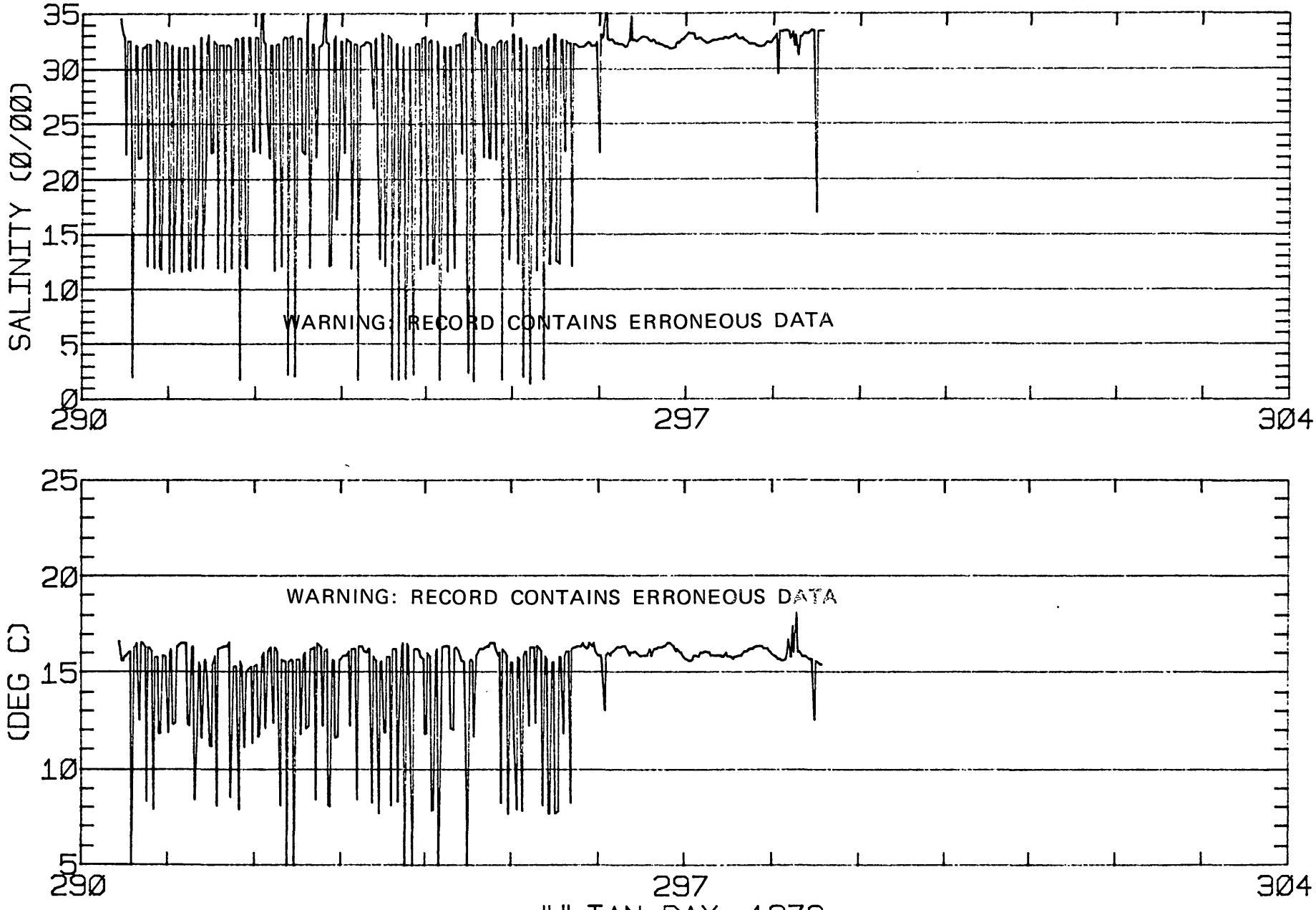
RMS SPEED: 53.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 109.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 38.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 44.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 14.29 CM/SEC
STANDARD DEVIATION V SERIES: 8.61 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.1	16.3	208.
2	2	-1.0	21.1	277.
ALL	14	-1.1	17.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-43N 122-30-41W
METER 007.7 METERS ABOVE BED. WATER DEPTH 046.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-43N 122-30-41W
METER Ø07.7 METERS ABOVE BED. WATER DEPTH Ø46.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 4
POSITION: 37 47'43"N 122 30'41"W
METER TYPE: AANDERAA
WATER DEPTH: 46.7 M (MLLW)
METER DEPTH: 44.8 M (BELOW MLLW)
START TIME OF SERIES:10/17/79 1046 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

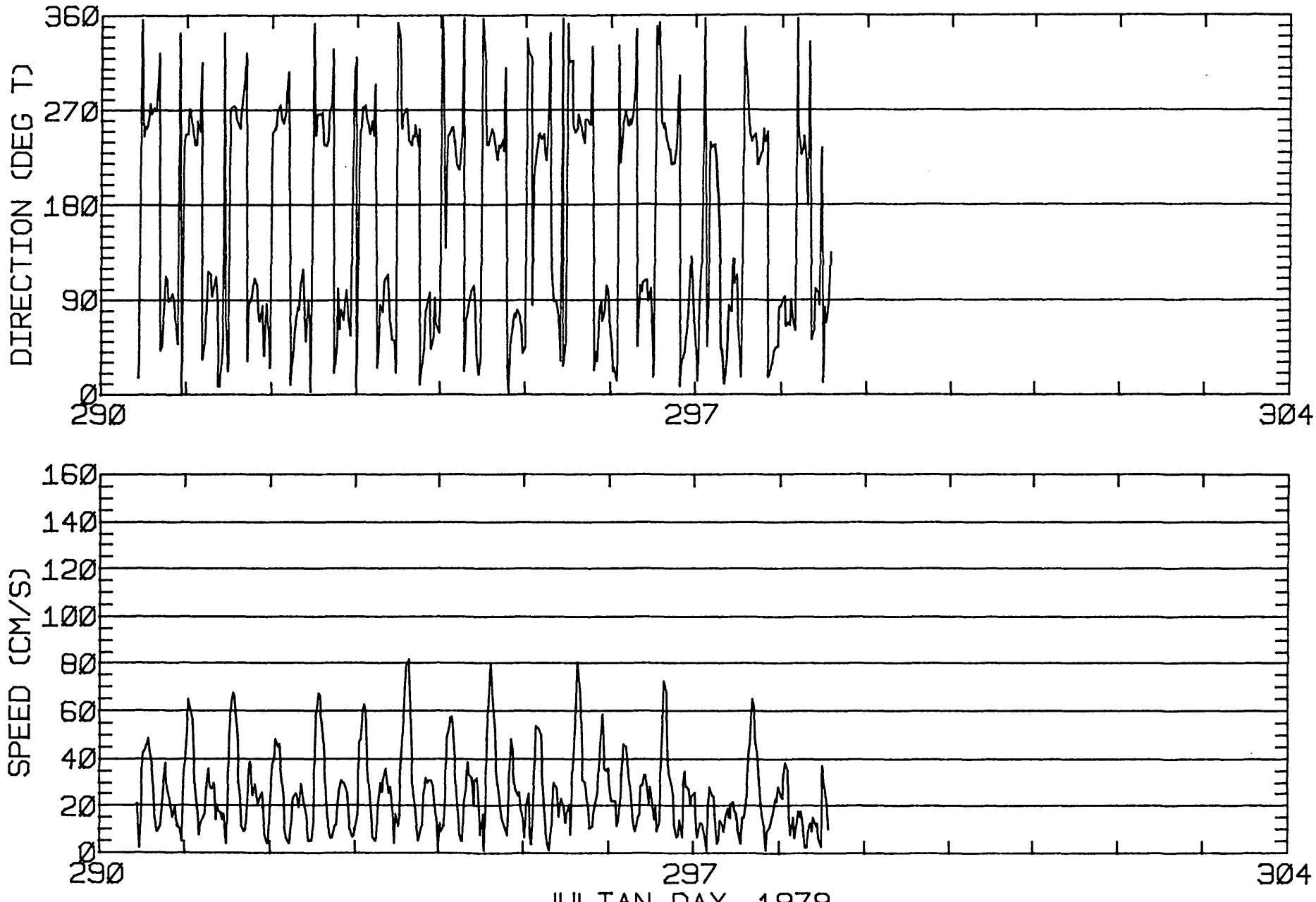
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.37	0.20	62.3	12.2	CLOCKWISE
K1	7.12	0.59	72.1	4.4	ANTI-CLOCKWISE
N2	7.09	2.79	169.8	217.2	ANTI-CLOCKWISE
M2	26.33	0.41	94.7	284.1	ANTI-CLOCKWISE
S2	17.90	6.60	68.9	261.6	ANTI-CLOCKWISE
M4	7.40	2.19	35.8	8.2	CLOCKWISE

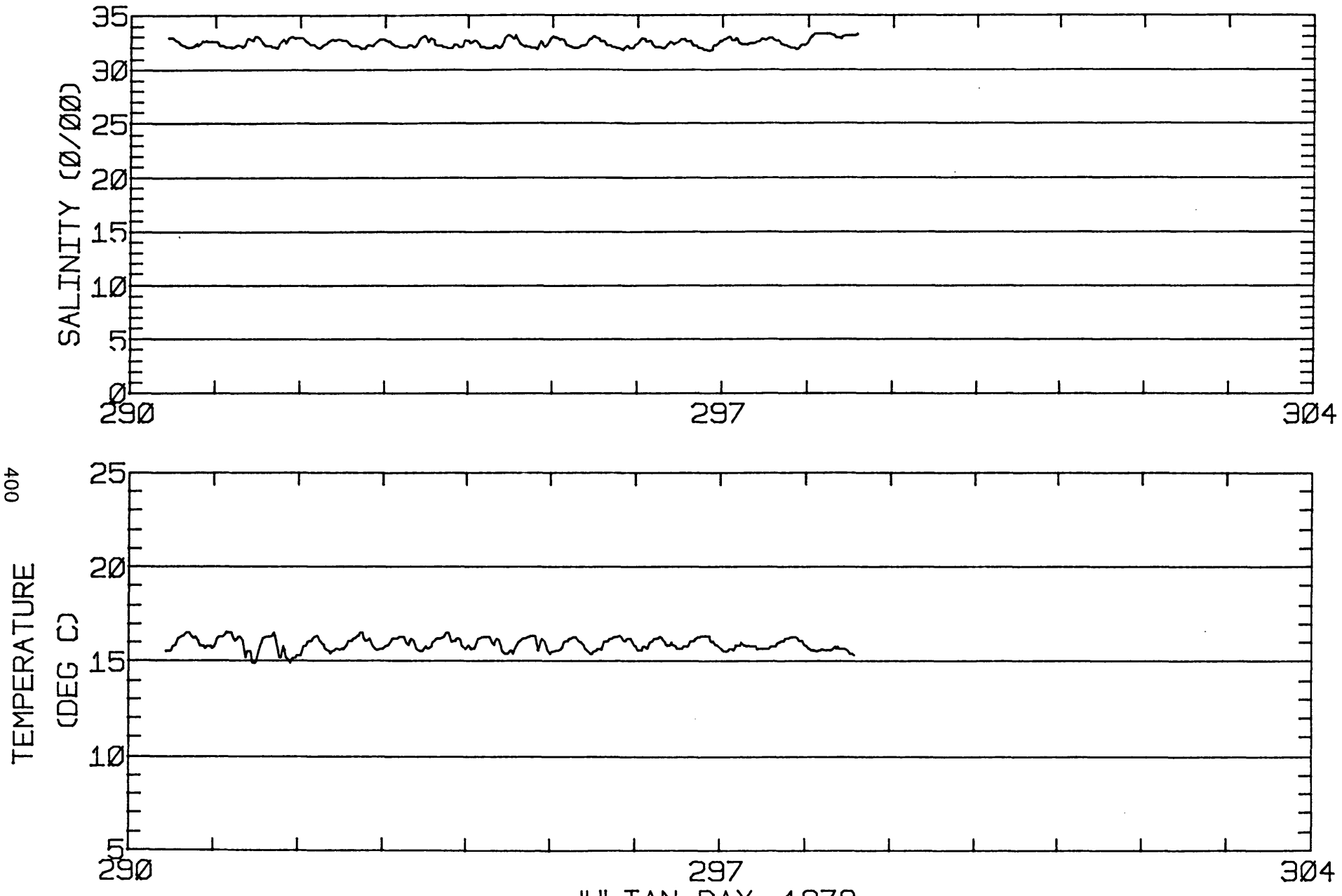
RMS SPEED: 32.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 58.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 8.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 80.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 9.85 CM/SEC
STANDARD DEVIATION V SERIES: 8.92 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.1	-0.3	208.
2	2	-2.4	-2.7	277.
ALL	14	-5.6	-0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-43N 122-30-41W
METER 001.9 METERS ABOVE BED. WATER DEPTH 046.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 4 37-47-43N 122-30-41W
METER ØØ1.9 METERS ABOVE BED. WATER DEPTH Ø46.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51' 2"N 122 24'48"W
METER TYPE: AANDERAA
WATER DEPTH: 37.5 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 1842 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

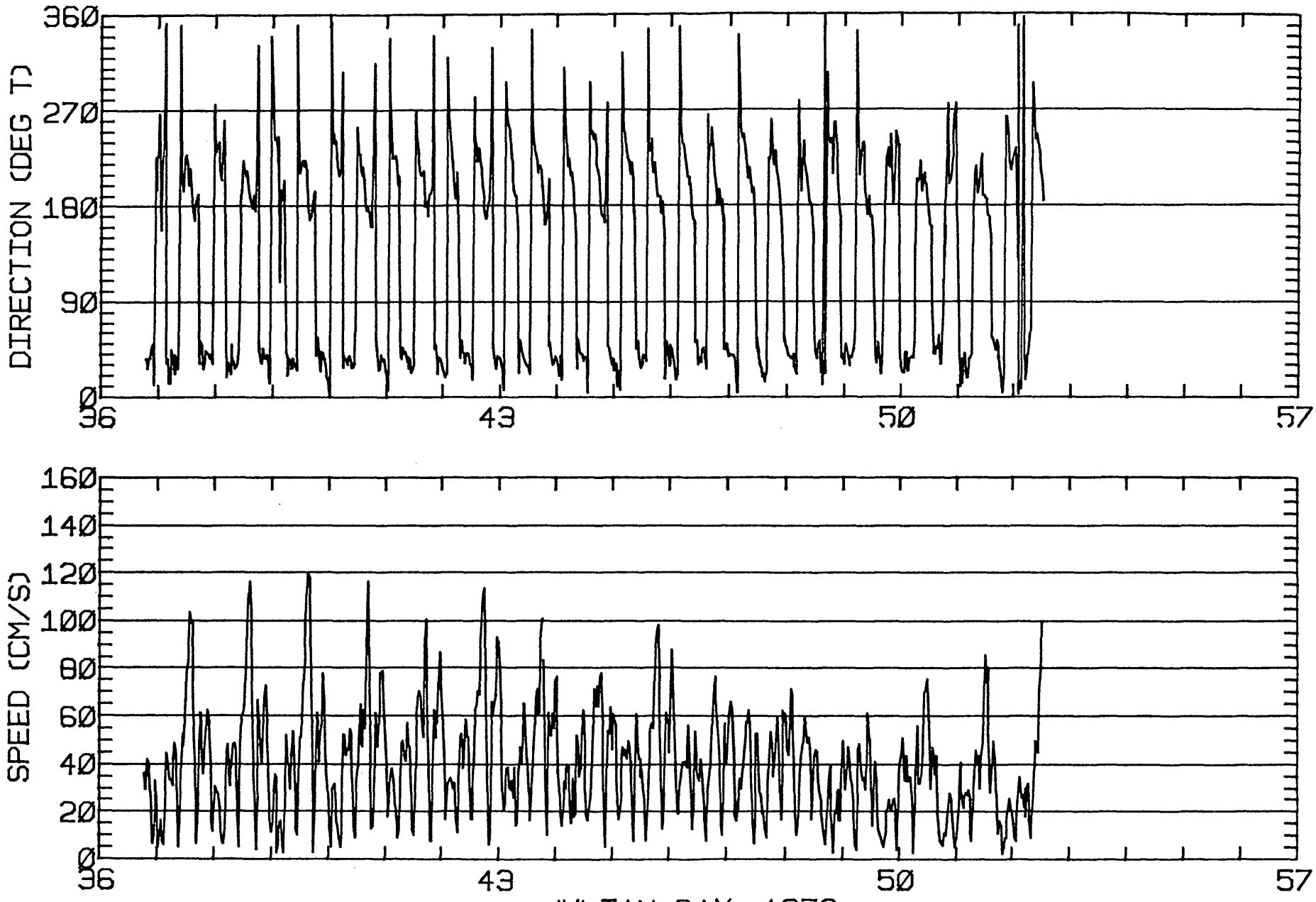
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.67	3.41	3.6	55.3	ANTI-CLOCKWISE
K1	24.42	3.71	14.4	82.3	ANTI-CLOCKWISE
N2	13.38	1.06	31.6	275.6	CLOCKWISE
M2	54.12	10.97	30.4	310.8	ANTI-CLOCKWISE
S2	19.72	4.51	33.4	328.6	ANTI-CLOCKWISE
M4	6.53	1.13	327.5	167.3	ANTI-CLOCKWISE

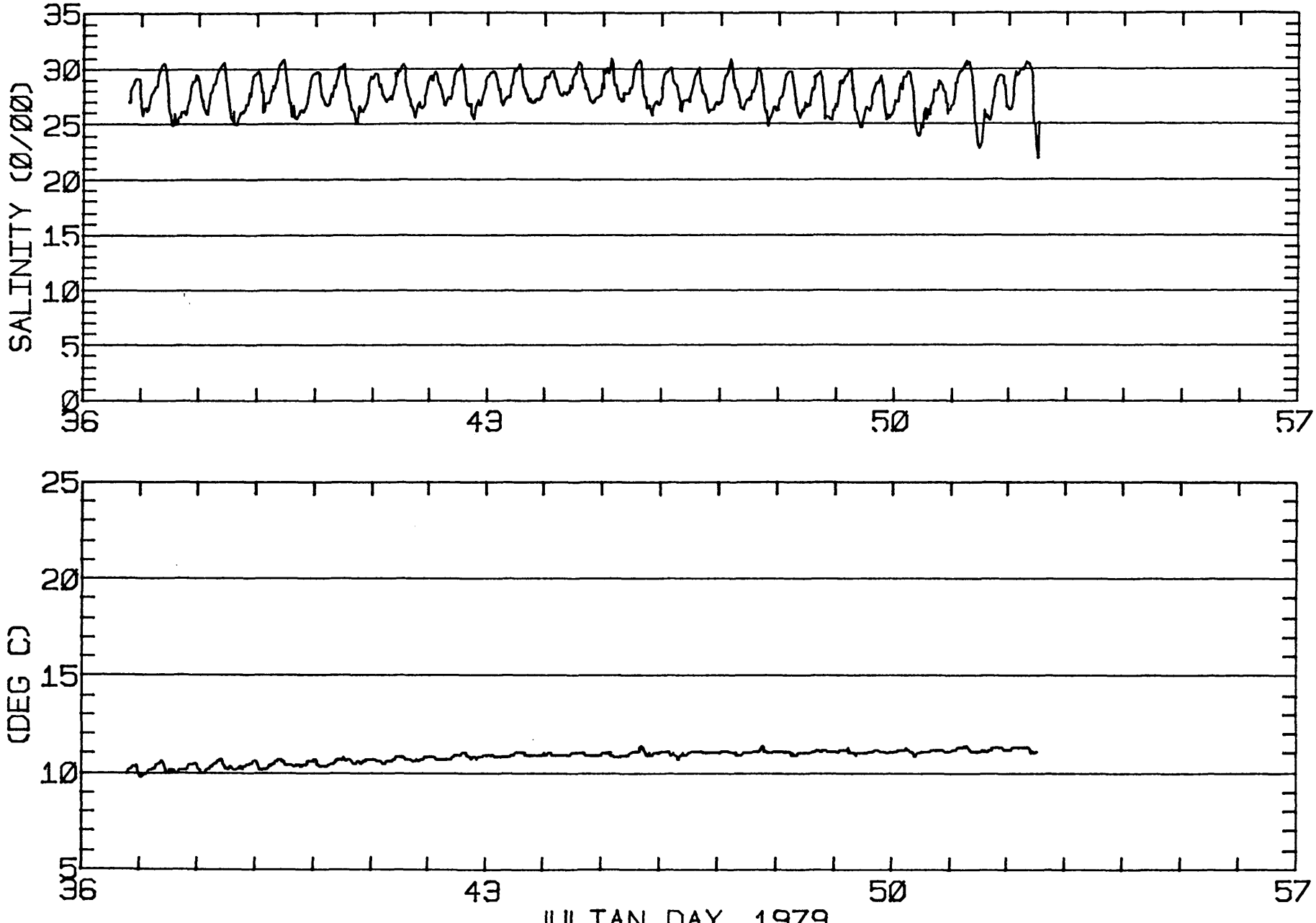
RMS SPEED: 46.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 112.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 24.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 24.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.53
STANDARD DEVIATION U-SERIES: 10.84 CM/SEC
STANDARD DEVIATION V SERIES: 12.60 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.7	-1.4	415.
2	12	2.0	-1.2	728.
3	6	2.4	-4.9	1664.
ALL	30	3.2	-2.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51- 2N 122-24-48W
METER 025.0 METERS ABOVE BED. WATER DEPTH 037.5 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 5 37-51- 2N 122-24-48W
METER Ø25.Ø METERS ABOVE BED. WATER DEPTH Ø37.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51' 2"N 122 24'48"W
METER TYPE: AANDERAA
WATER DEPTH: 37.5 M (MLLW)
METER DEPTH: 29.9 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 1624 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

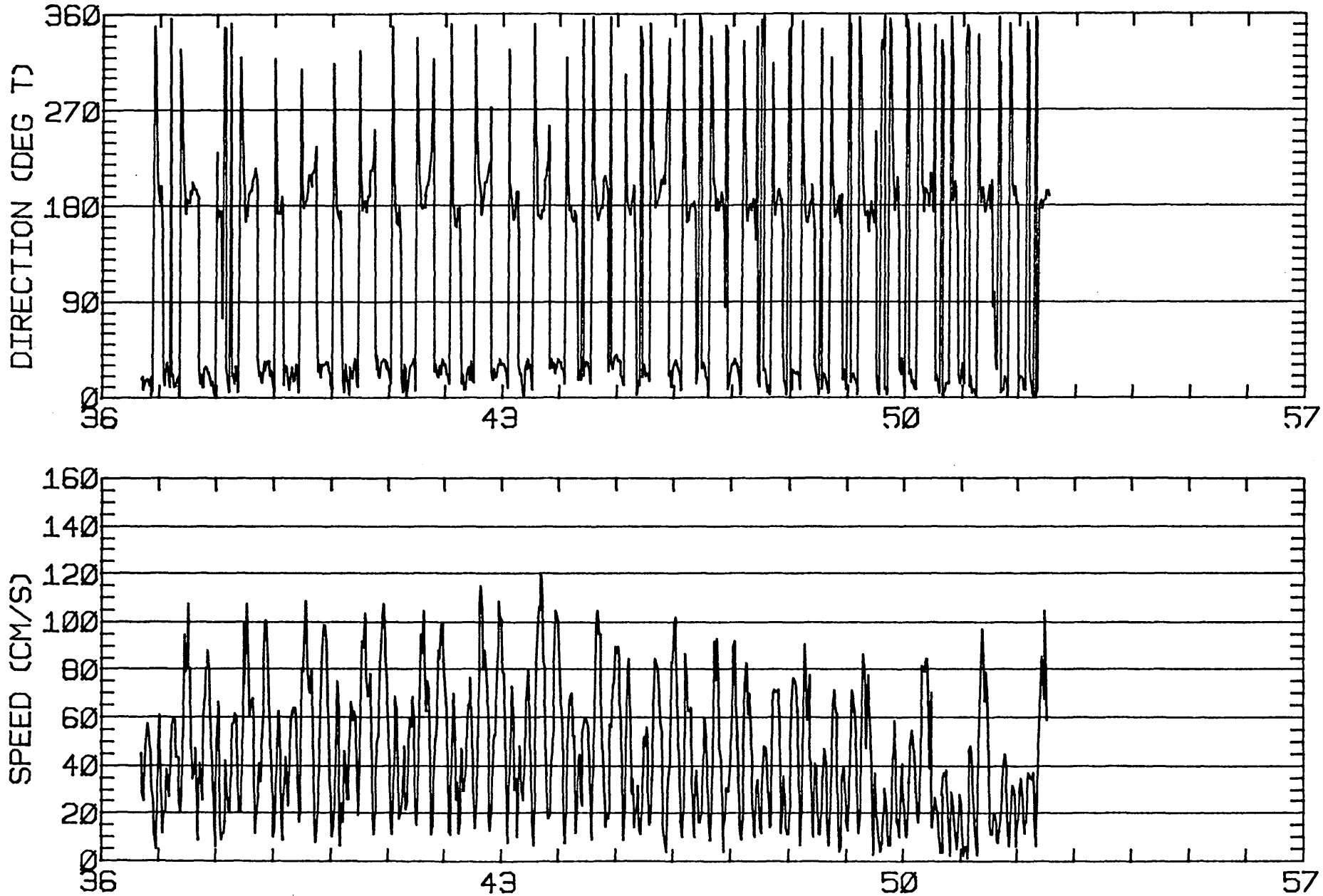
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.53	3.26	20.6	31.3	ANTI-CLOCKWISE
K1	27.22	1.80	22.4	68.5	CLOCKWISE
N2	14.62	3.74	15.2	266.9	ANTI-CLOCKWISE
M2	62.26	1.25	13.5	305.1	CLOCKWISE
S2	24.08	0.31	20.1	324.4	CLOCKWISE
M4	11.56	4.59	355.3	12.8	ANTI-CLOCKWISE

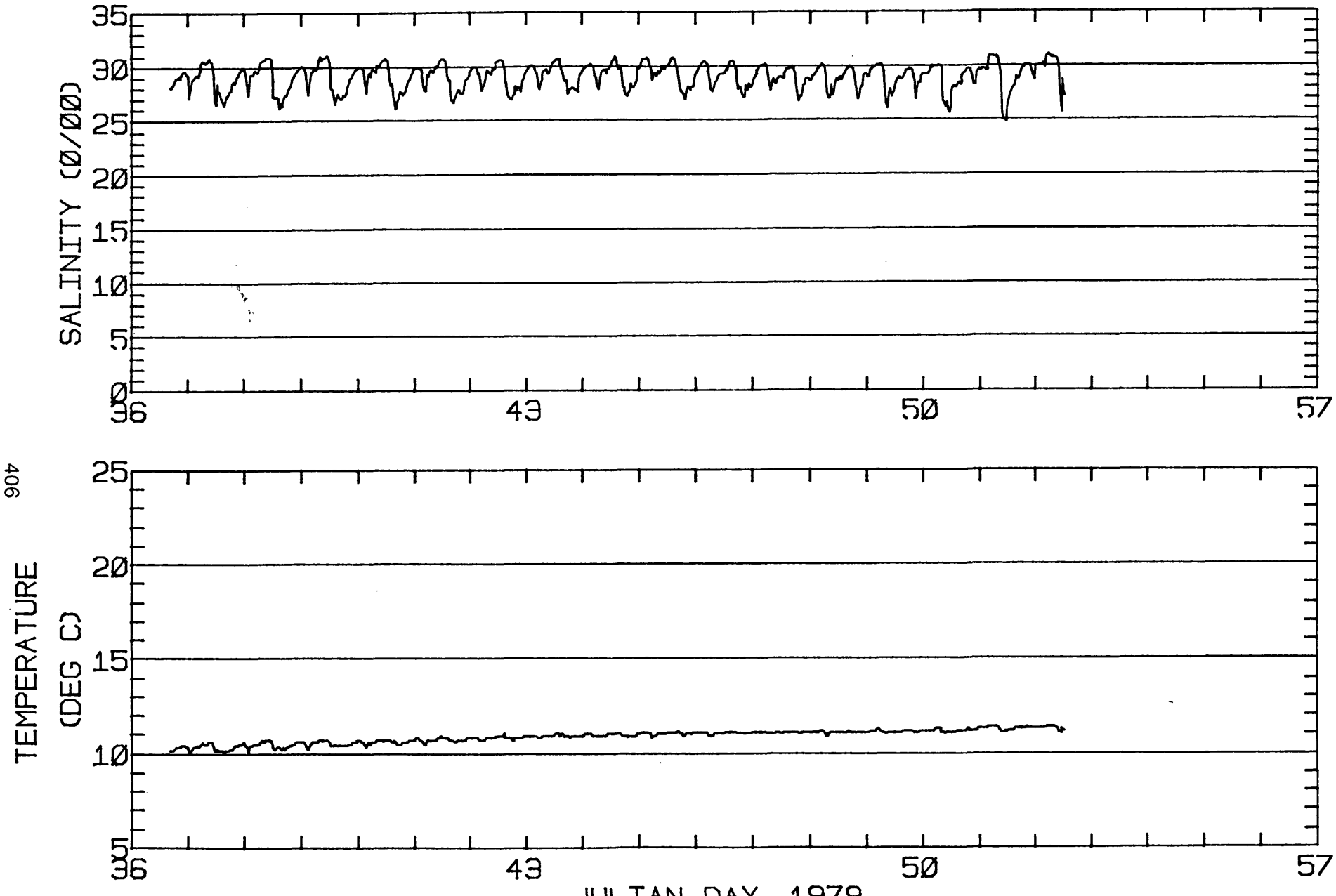
RMS SPEED: 53.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 127.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 24.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 17.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 11.82 CM/SEC
STANDARD DEVIATION V SERIES: 15.94 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.3	4.8	415.
2	12	8.4	1.2	728.
3	6	1.1	-1.1	1664.
ALL	30	6.1	2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51- 2N 122-24-48W
METER 007.6 METERS ABOVE BED. WATER DEPTH 037.5 METERS.



406

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51- 2N 122-24-48W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø37.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51' 2"N 122 24'48"W
METER TYPE: AANDERAA
WATER DEPTH: 37.5 M (MLLW)
METER DEPTH: 36.0 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/79 1626 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

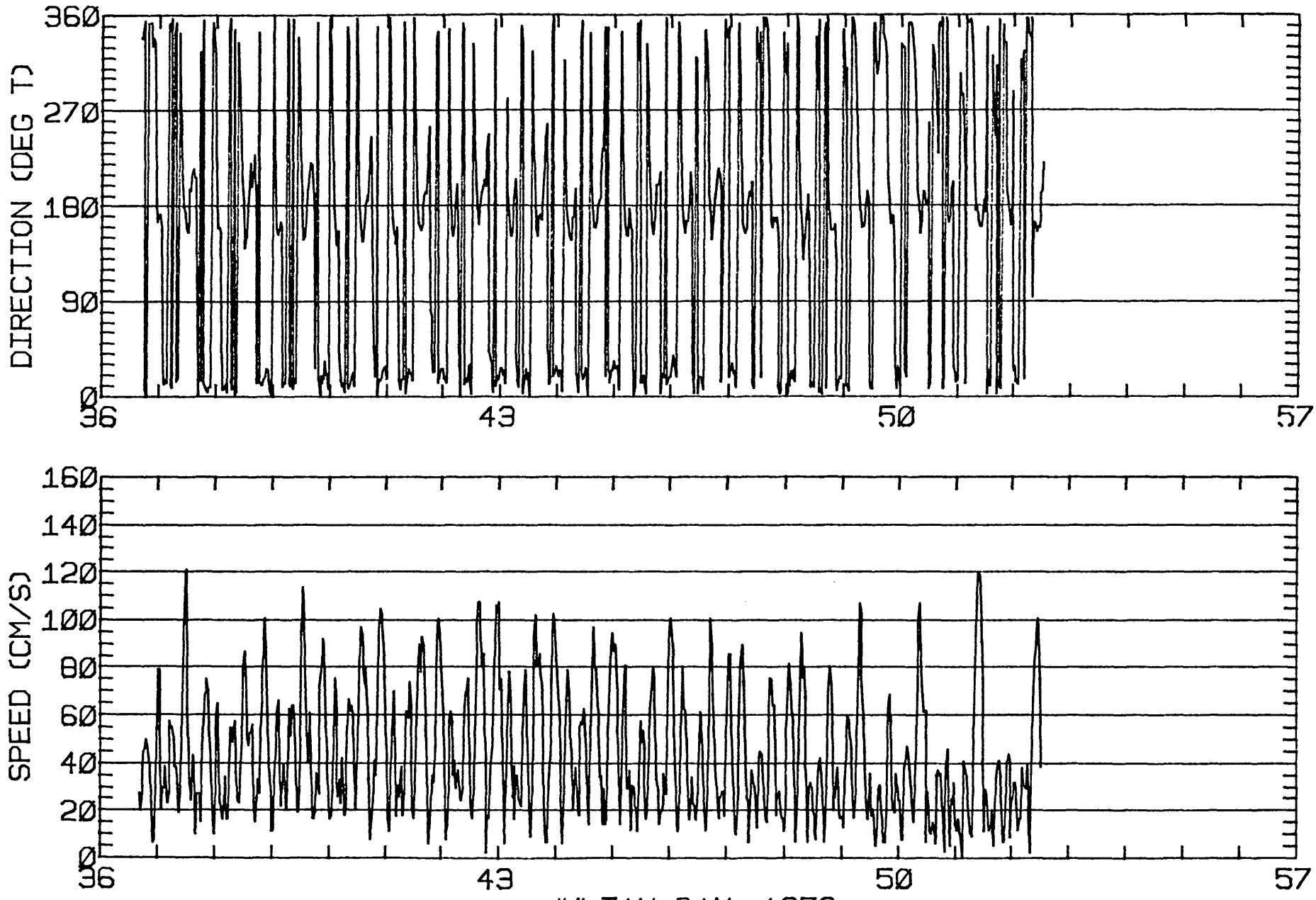
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.29	2.78	11.0	34.2	ANTI-CLOCKWISE
K1	23.88	3.12	15.6	65.6	CLOCKWISE
N2	15.24	3.97	348.5	270.0	ANTI-CLOCKWISE
M2	58.23	3.35	359.2	302.4	CLOCKWISE
S2	22.74	1.86	13.6	326.3	CLOCKWISE
M4	13.26	4.66	346.2	4.8	ANTI-CLOCKWISE

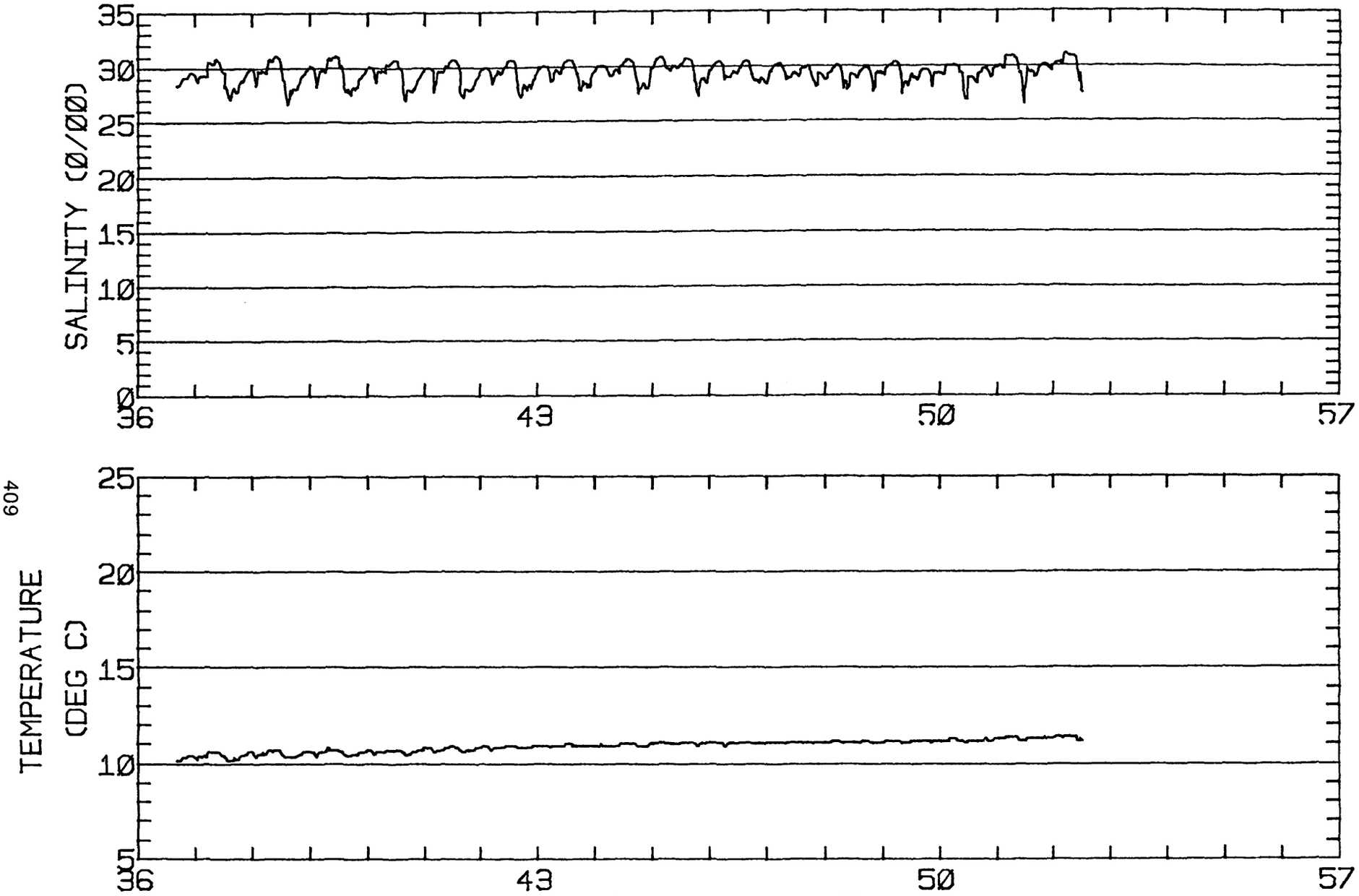
RMS SPEED: 51.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 116.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 6.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 15.52 CM/SEC
STANDARD DEVIATION V SERIES: 17.94 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.0	5.6	415.
2	12	7.7	4.3	728.
3	6	-0.0	-3.7	1664.
ALL	30	5.0	3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51- 2N 122-24-48W
METER 001.5 METERS ABOVE BED. WATER DEPTH 037.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51- 2N 122-24-48W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø37.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51'10"N 122 24'47"W
METER TYPE: AANDERAA
WATER DEPTH: 37.2 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 2/21/79 1512 PST JULIAN DAY= 52
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

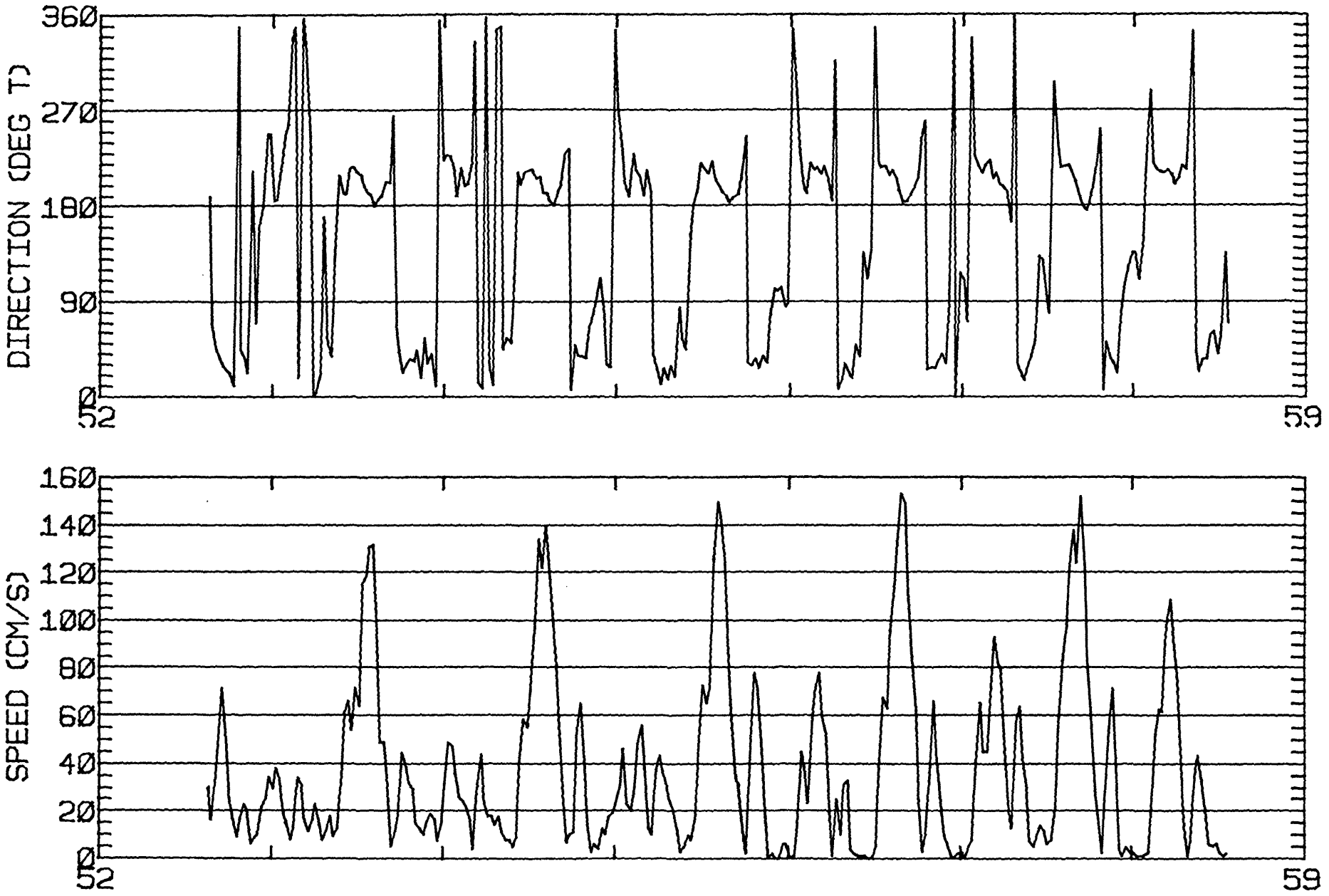
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.22	3.17	14.6	59.1	ANTI-CLOCKWISE
K1	22.69	3.95	11.8	59.7	ANTI-CLOCKWISE
N2	17.71	3.62	14.2	140.5	ANTI-CLOCKWISE
M2	78.42	9.95	19.7	298.3	ANTI-CLOCKWISE
S2	14.06	5.36	20.5	18.0	ANTI-CLOCKWISE
M4	19.09	2.01	2.6	120.6	ANTI-CLOCKWISE

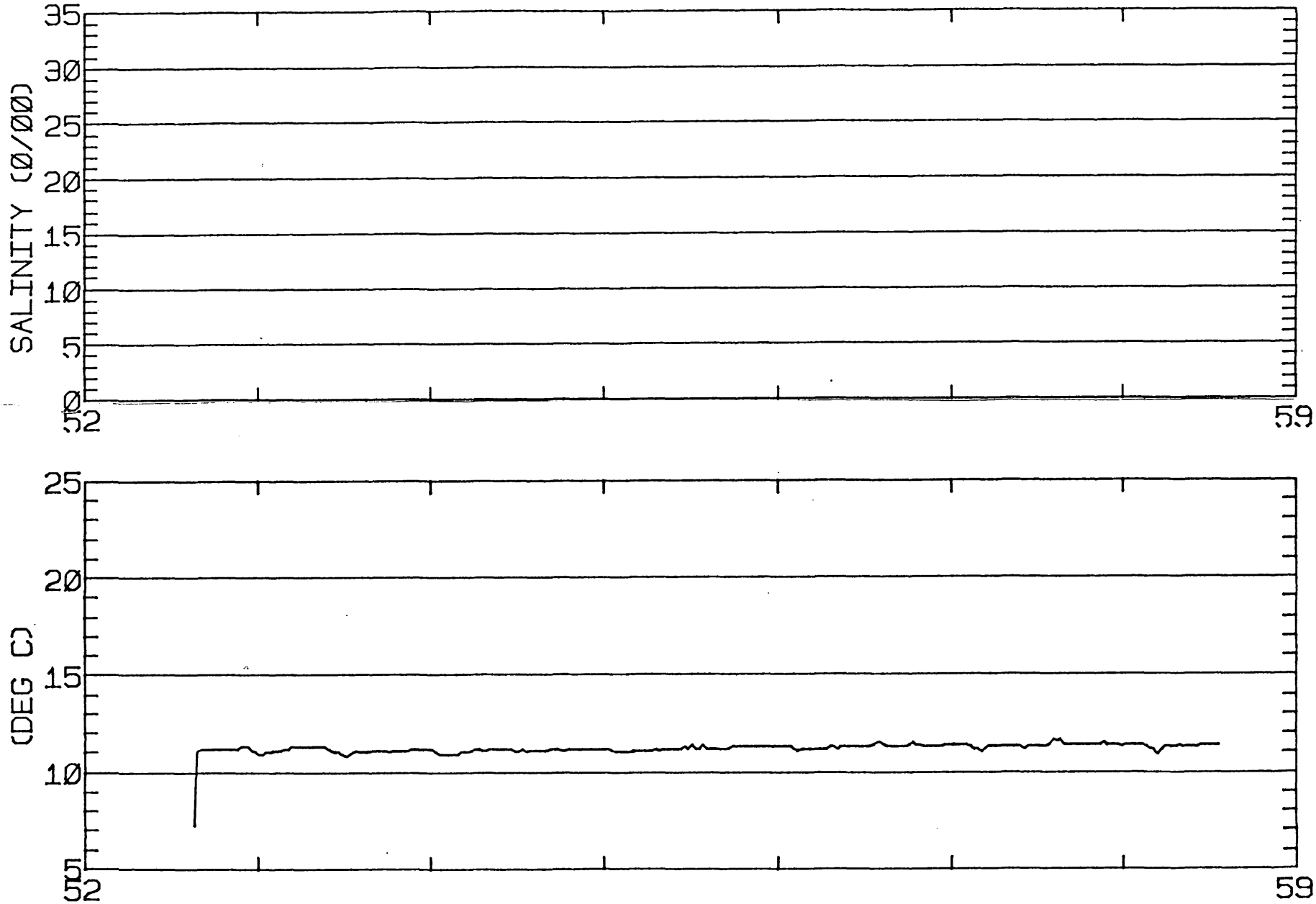
RMS SPEED: 54.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 133.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 59.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 17.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 11.21 CM/SEC
STANDARD DEVIATION V SERIES: 16.32 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	-6.5	-19.1	2859.
ALL	10	-6.5	-19.1	



JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-47W
METER 025.0 METERS ABOVE BED. WATER DEPTH 037.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-47W
METER Ø25.Ø METERS ABOVE BED. WATER DEPTH Ø37.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51'10"N 122 24'47"W
METER TYPE: AANDERAA
WATER DEPTH: 37.2 M (MLLW)
METER DEPTH: 35.7 M (BELOW MLLW)
START TIME OF SERIES: 2/21/79 1516 PST JULIAN DAY= 52
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

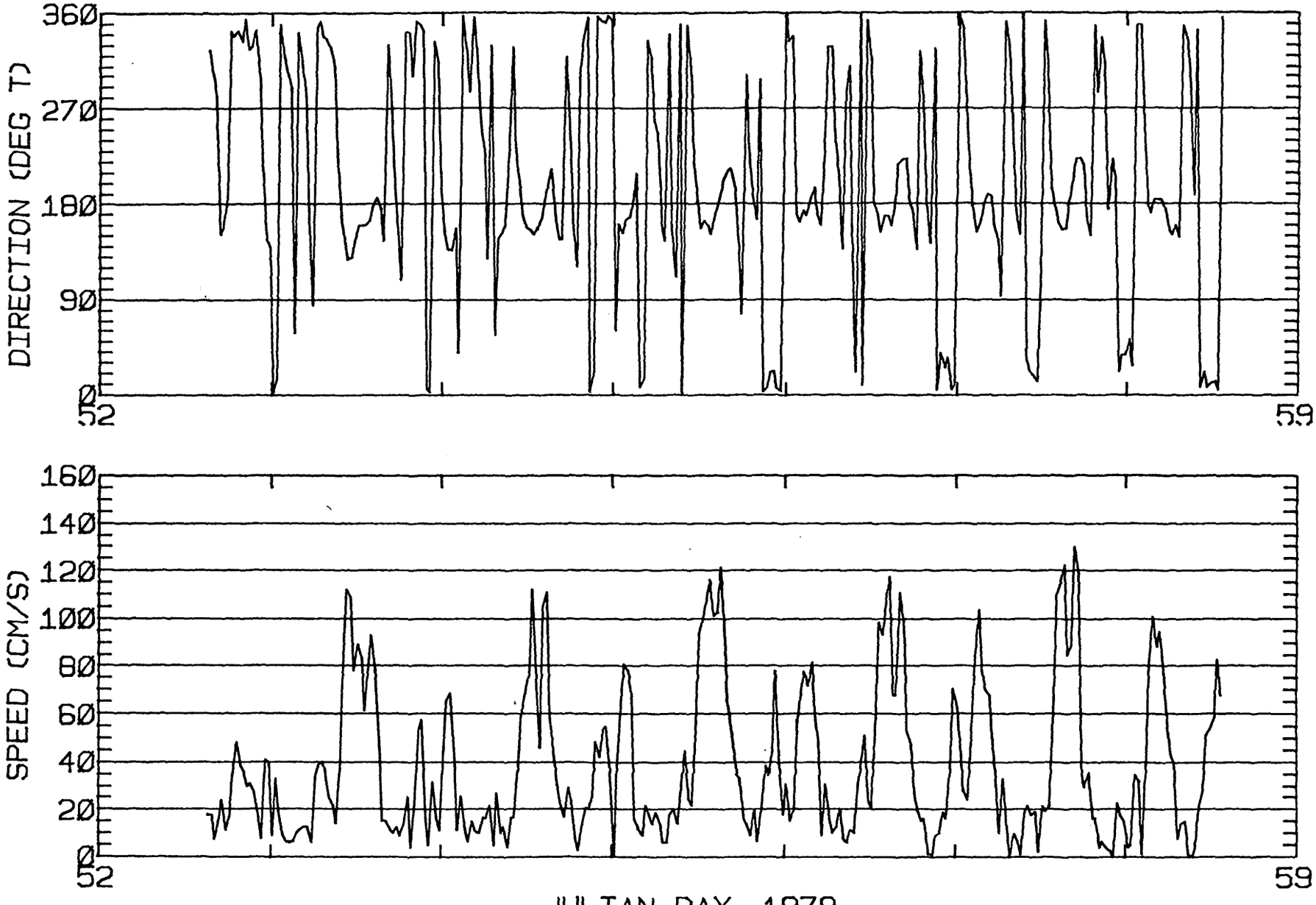
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.57	7.02	337.2	76.0	ANTI-CLOCKWISE
K1	25.47	7.95	339.7	43.6	CLOCKWISE
N2	14.53	0.94	116.5	234.0	CLOCKWISE
M2	49.05	11.58	348.8	283.2	CLOCKWISE
S2	20.17	0.06	15.6	345.6	CLOCKWISE
M4	22.65	4.50	338.1	30.6	CLOCKWISE

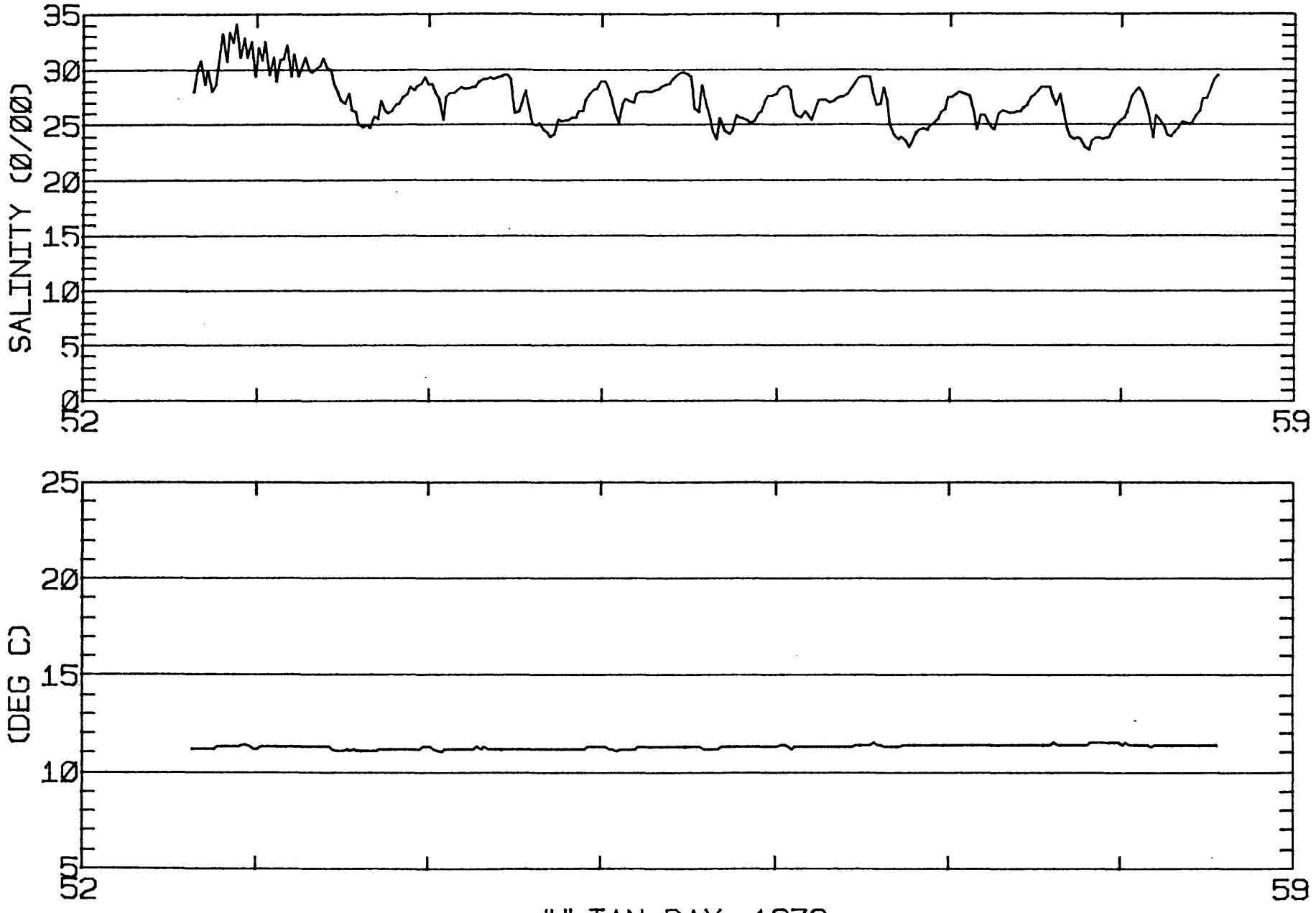
RMS SPEED: 51.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 112.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 21.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 169.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.62
STANDARD DEVIATION U-SERIES: 18.02 CM/SEC
STANDARD DEVIATION V SERIES: 18.28 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	1.0	-16.0	2859.
ALL	10	1.0	-16.0	



JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-47W
METER 001.5 METERS ABOVE BED. WATER DEPTH 037.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-47W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø37.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51' 9"N 122 24'46"W
METER TYPE: AANDERAA
WATER DEPTH: 36.9 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 2/27/79 1542 PST JULIAN DAY= 58
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

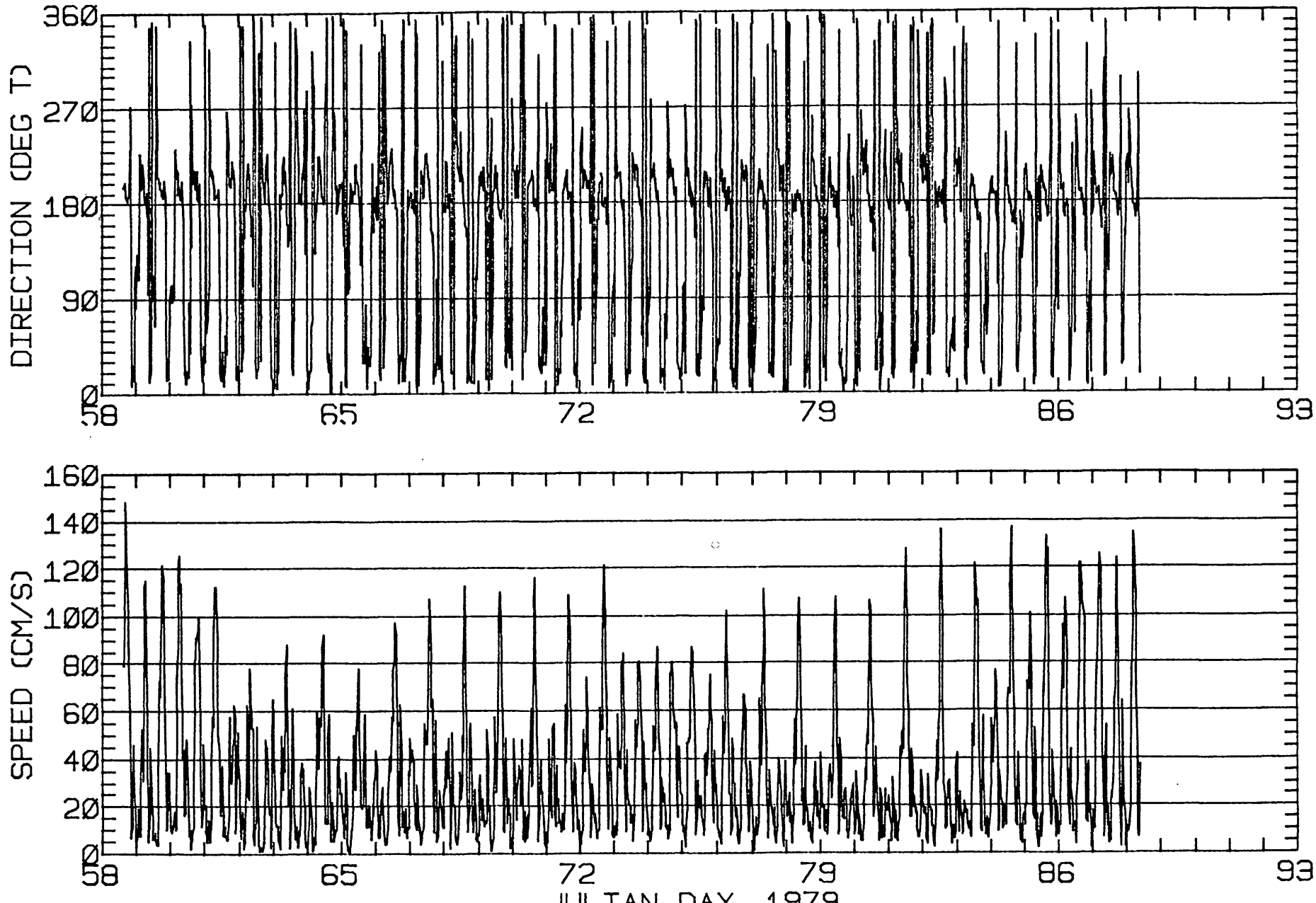
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.50	3.13	1.9	50.4	ANTI-CLOCKWISE
K1	13.39	2.14	8.0	64.4	ANTI-CLOCKWISE
N2	6.67	1.71	10.7	268.1	ANTI-CLOCKWISE
M2	41.49	3.74	14.4	303.1	ANTI-CLOCKWISE
S2	11.99	0.16	15.7	322.0	CLOCKWISE
M4	13.05	2.71	353.5	133.0	ANTI-CLOCKWISE

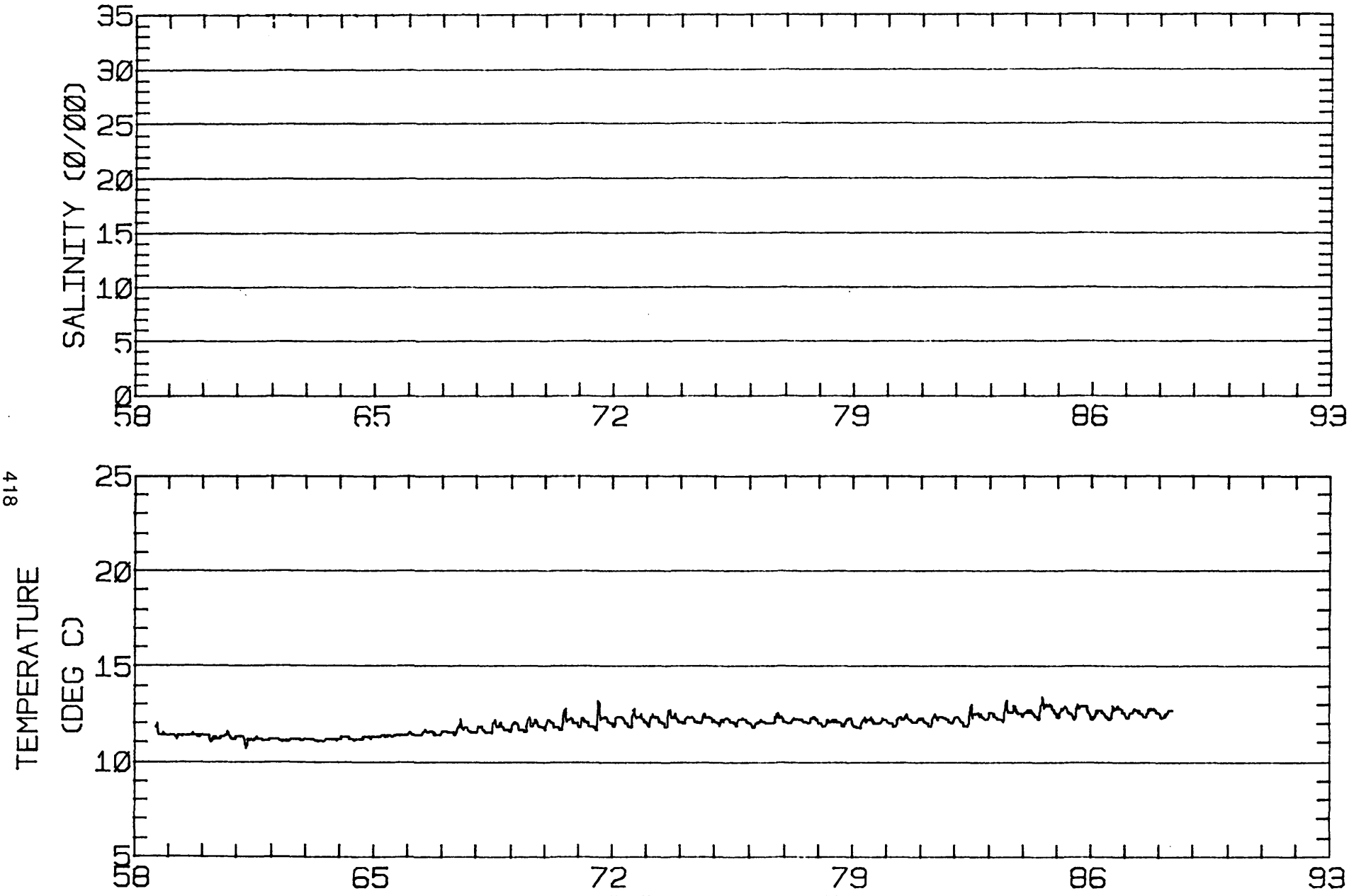
RMS SPEED:	44.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	80.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	29.6 CM/SEC
PRINCIPAL CURRENT DIRECTION:	11.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.50
STANDARD DEVIATION U-SERIES:	9.49 CM/SEC
STANDARD DEVIATION V SERIES:	17.44 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.6	-18.5	2039.
2	12	-1.4	-12.7	1210.
3	12	-3.7	-17.7	756.
4	12	-1.4	-13.0	914.
5	8	0.1	-30.7	654.
ALL	56	-2.2	-17.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51- 9N 122-24-46W
METER 025.0 METERS ABOVE BED. WATER DEPTH 036.9 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 5 37-51- 9N 122-24-46W
METER Ø25.Ø METERS ABOVE BED. WATER DEPTH Ø36.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51'10"N 122 24'44"W
METER TYPE: AANDERAA
WATER DEPTH: 37.5 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 3/29/79 1120 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

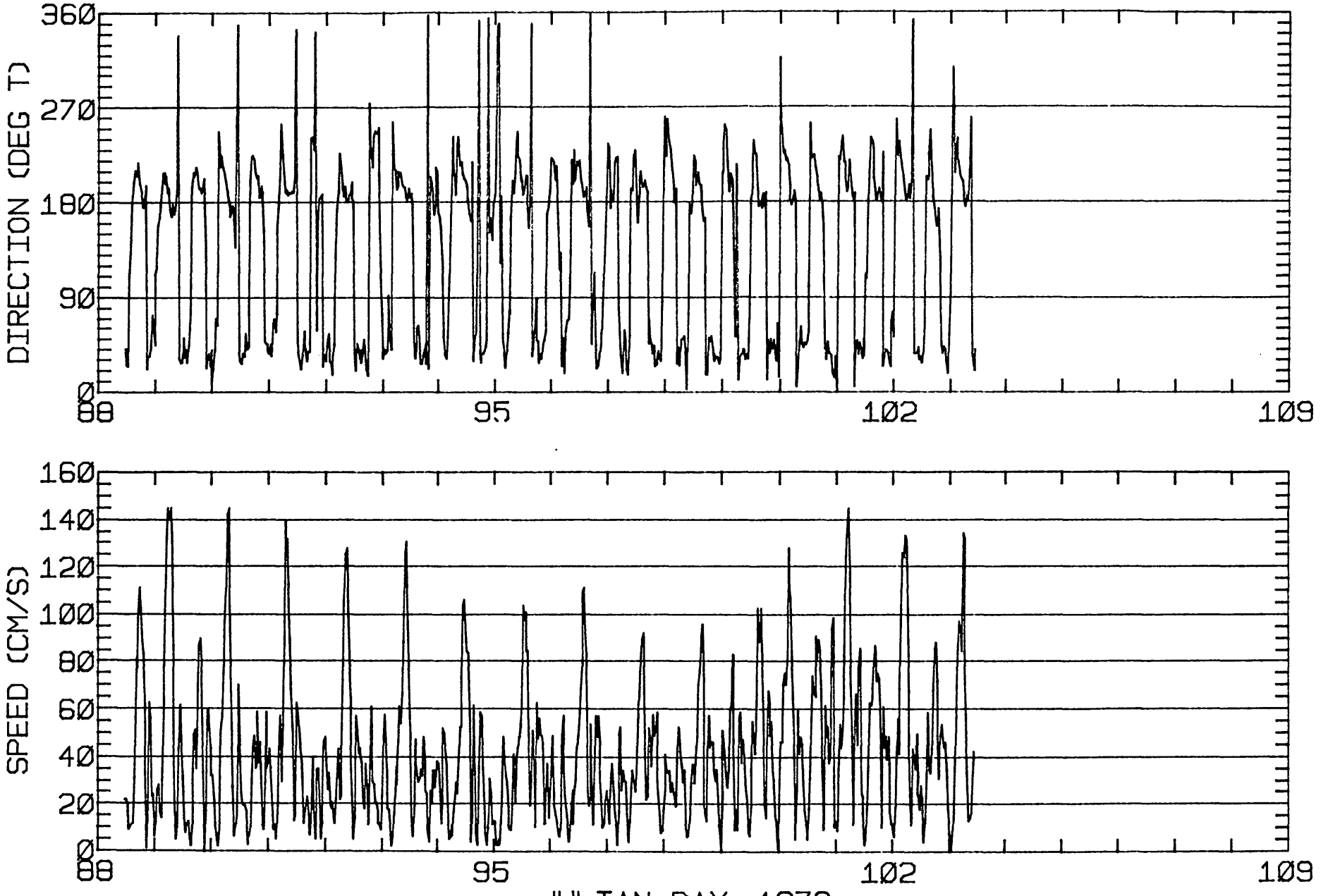
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	18.22	1.42	10.5	70.0	ANTI-CLOCKWISE
K1	19.38	2.93	18.7	57.0	ANTI-CLOCKWISE
N2	4.96	0.41	9.7	279.0	CLOCKWISE
M2	54.64	7.69	24.7	316.3	ANTI-CLOCKWISE
S2	16.01	5.03	21.3	309.2	ANTI-CLOCKWISE
M4	13.93	0.78	357.3	164.4	CLOCKWISE

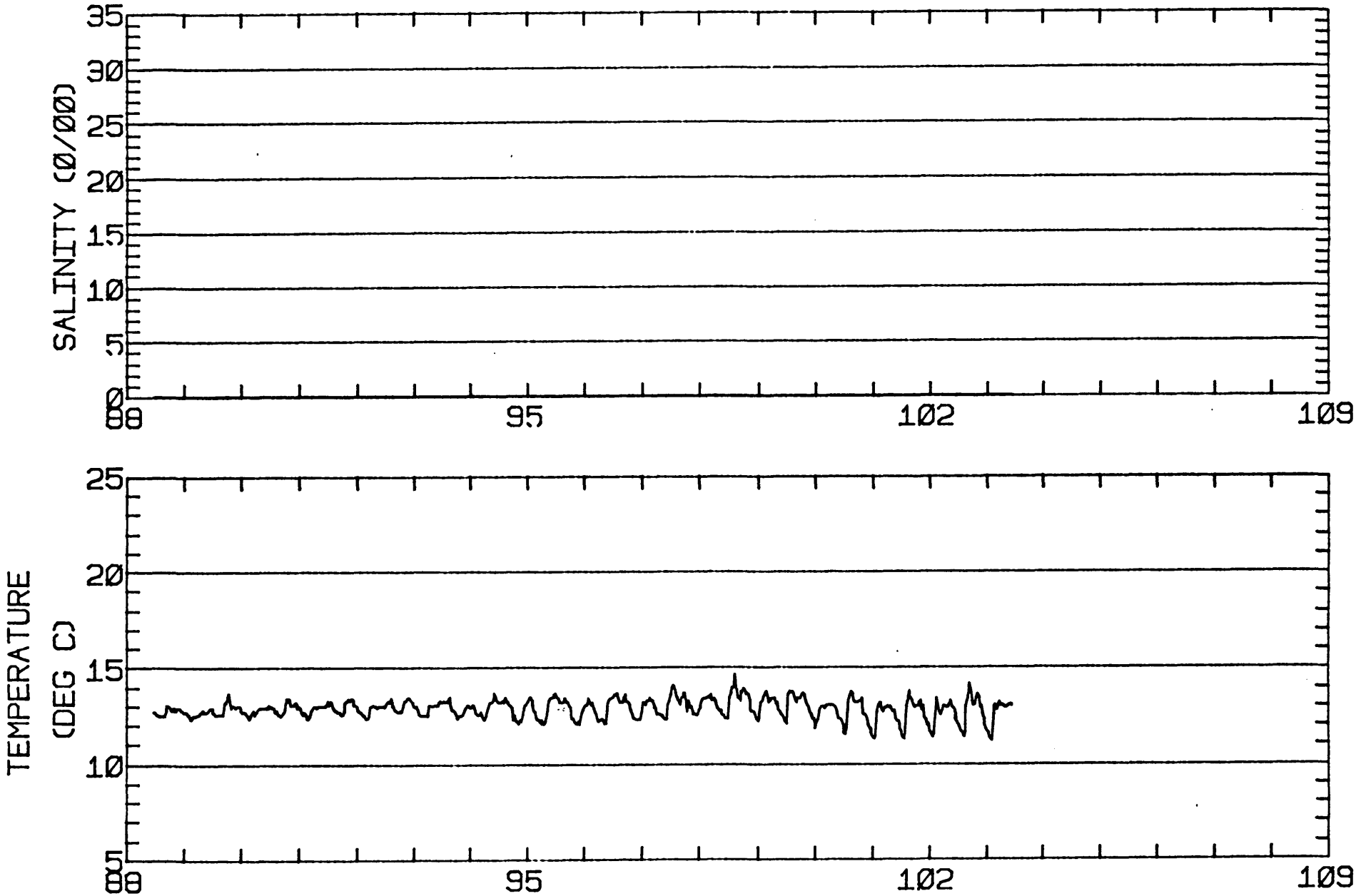
RMS SPEED: 52.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 108.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 20.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.53
STANDARD DEVIATION U-SERIES: 12.76 CM/SEC
STANDARD DEVIATION V SERIES: 18.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.7	-18.3	1082.
2	12	3.1	-10.0	623.
3	4	-1.6	-18.1	429.
ALL	28	1.4	-14.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-44W
METER 031.1 METERS ABOVE BED. WATER DEPTH 037.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-44W
METER 031.1 METERS ABOVE BED. WATER DEPTH 037.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51'10"N 122 24'44"W
METER TYPE: AANDERAA
WATER DEPTH: 37.5 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 3/29/79 1122 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

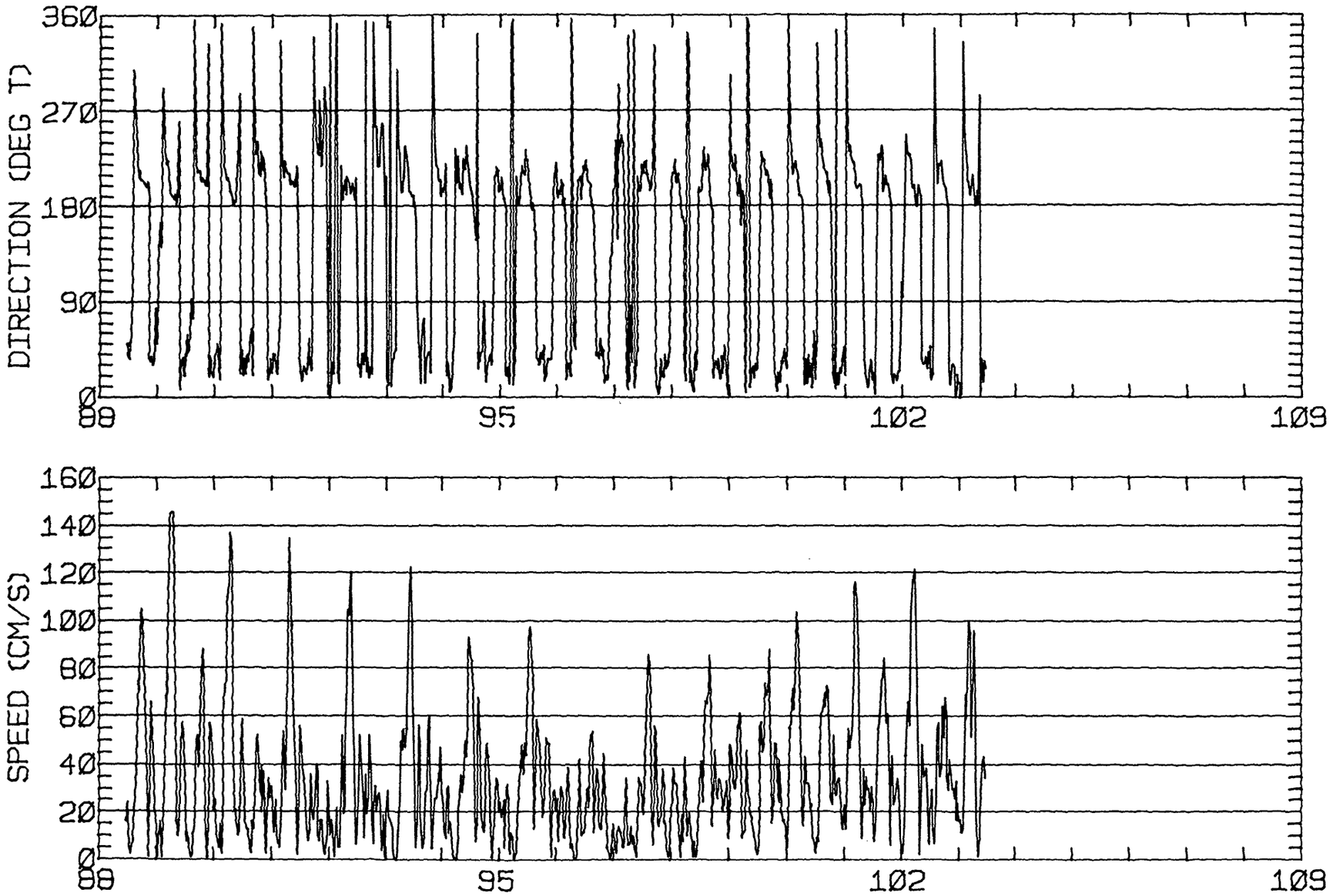
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.89	3.89	12.9	63.5	ANTI-CLOCKWISE
K1	17.32	1.99	19.9	40.0	ANTI-CLOCKWISE
N2	6.89	0.36	34.3	285.1	ANTI-CLOCKWISE
M2	47.50	6.04	26.8	311.9	ANTI-CLOCKWISE
S2	13.67	1.58	24.8	318.5	ANTI-CLOCKWISE
M4	13.46	3.77	8.0	147.8	ANTI-CLOCKWISE

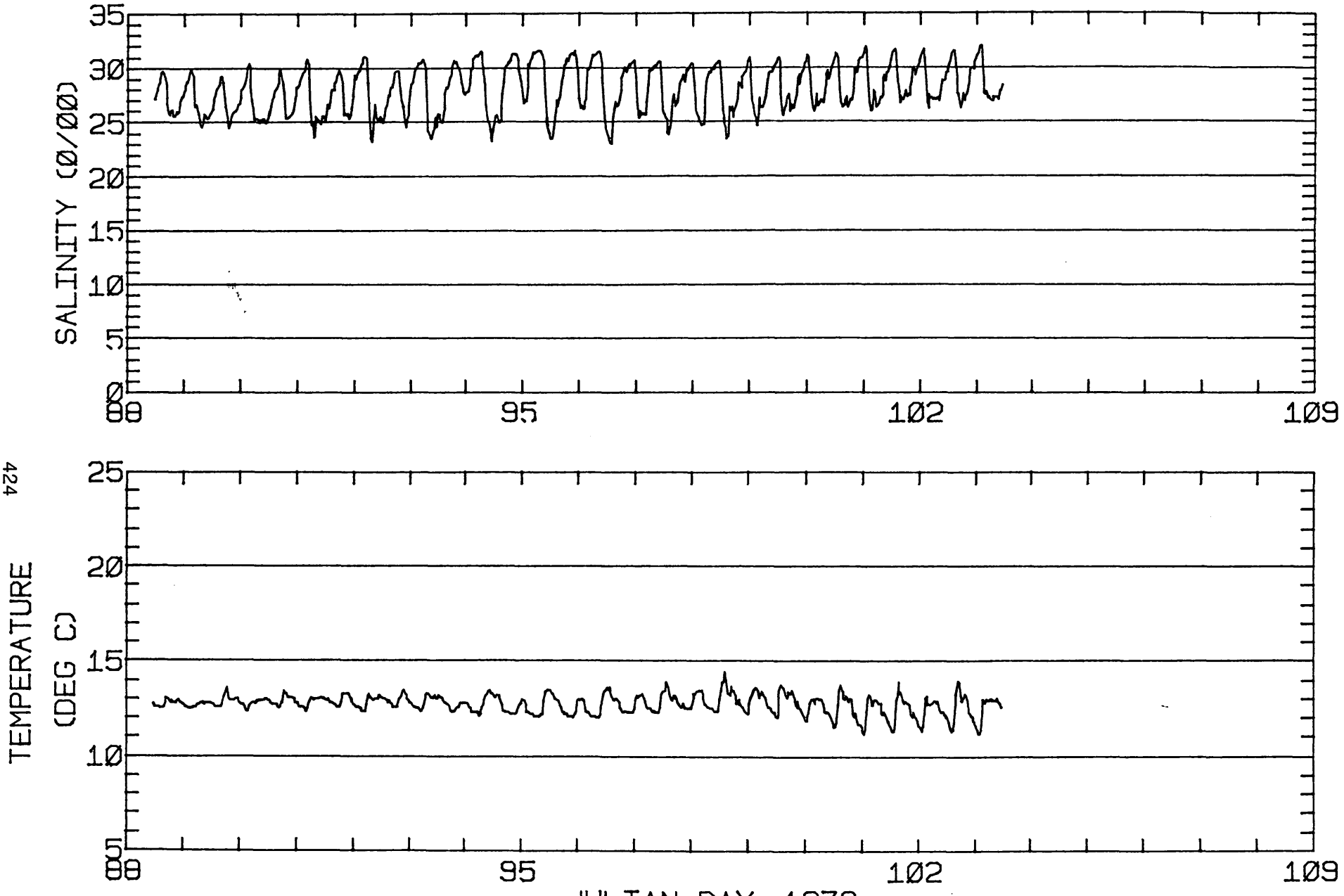
RMS SPEED: 44.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 92.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 23.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 9.53 CM/SEC
STANDARD DEVIATION V SERIES: 17.31 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.4	-13.9	1082.
2	12	-2.5	-6.9	623.
3	4	-7.3	-15.9	429.
ALL	28	-4.4	-11.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-44W
METER 025.0 METERS ABOVE BED. WATER DEPTH 037.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-44W
METER 025.0 METERS ABOVE BED. WATER DEPTH 037.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51'10"N 122 24'44"W
METER TYPE: AANDERAA
WATER DEPTH: 37.5 M (MLLW)
METER DEPTH: 29.9 M (BELOW MLLW)
START TIME OF SERIES: 3/29/79 1114 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

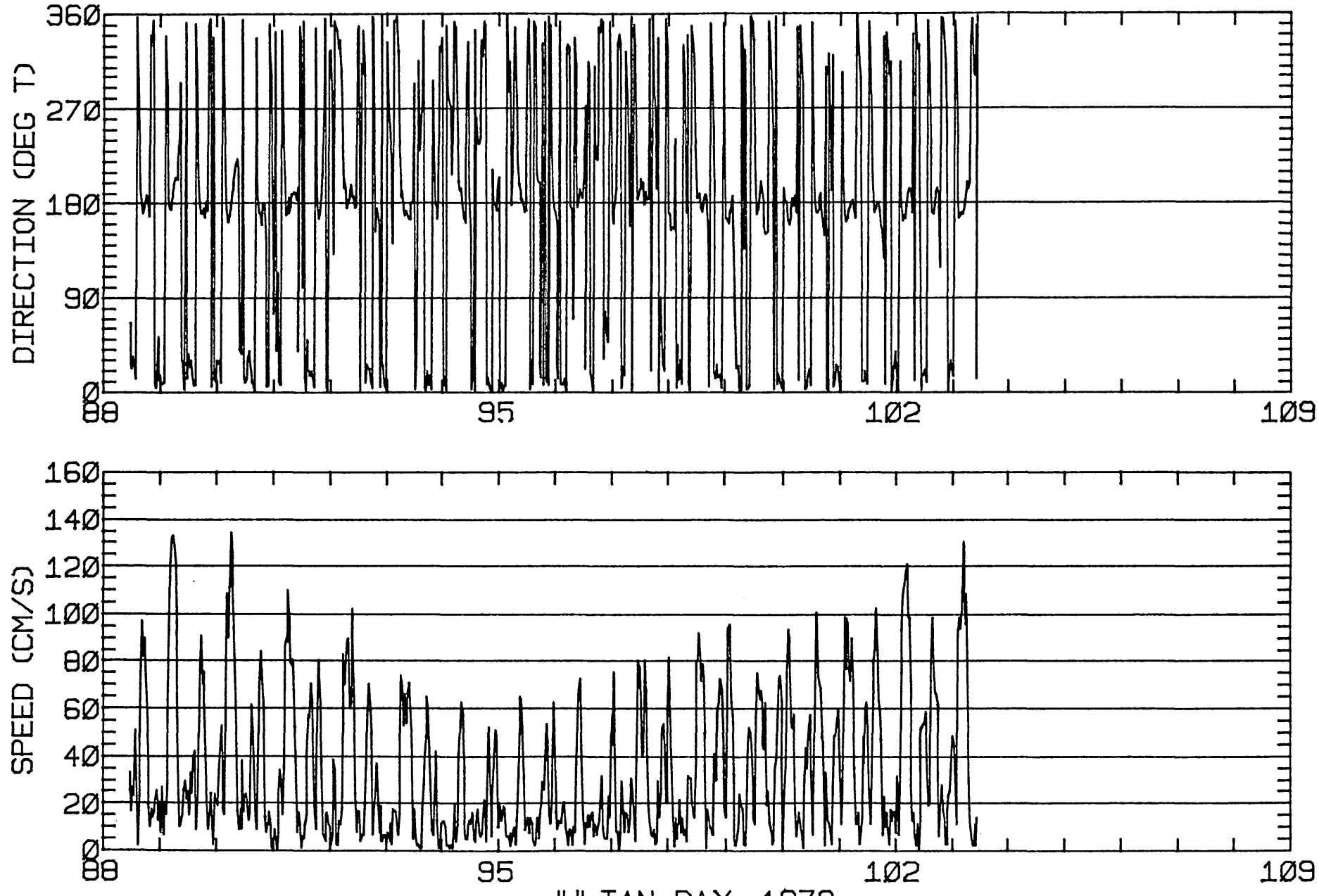
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.97	1.02	12.7	53.8	ANTI-CLOCKWISE
K1	15.14	0.95	14.9	33.2	CLOCKWISE
N2	9.61	1.50	11.8	336.4	ANTI-CLOCKWISE
M2	46.87	0.98	3.6	312.7	CLOCKWISE
S2	17.30	1.94	5.0	331.8	CLOCKWISE
M4	22.27	1.11	359.9	49.0	ANTI-CLOCKWISE

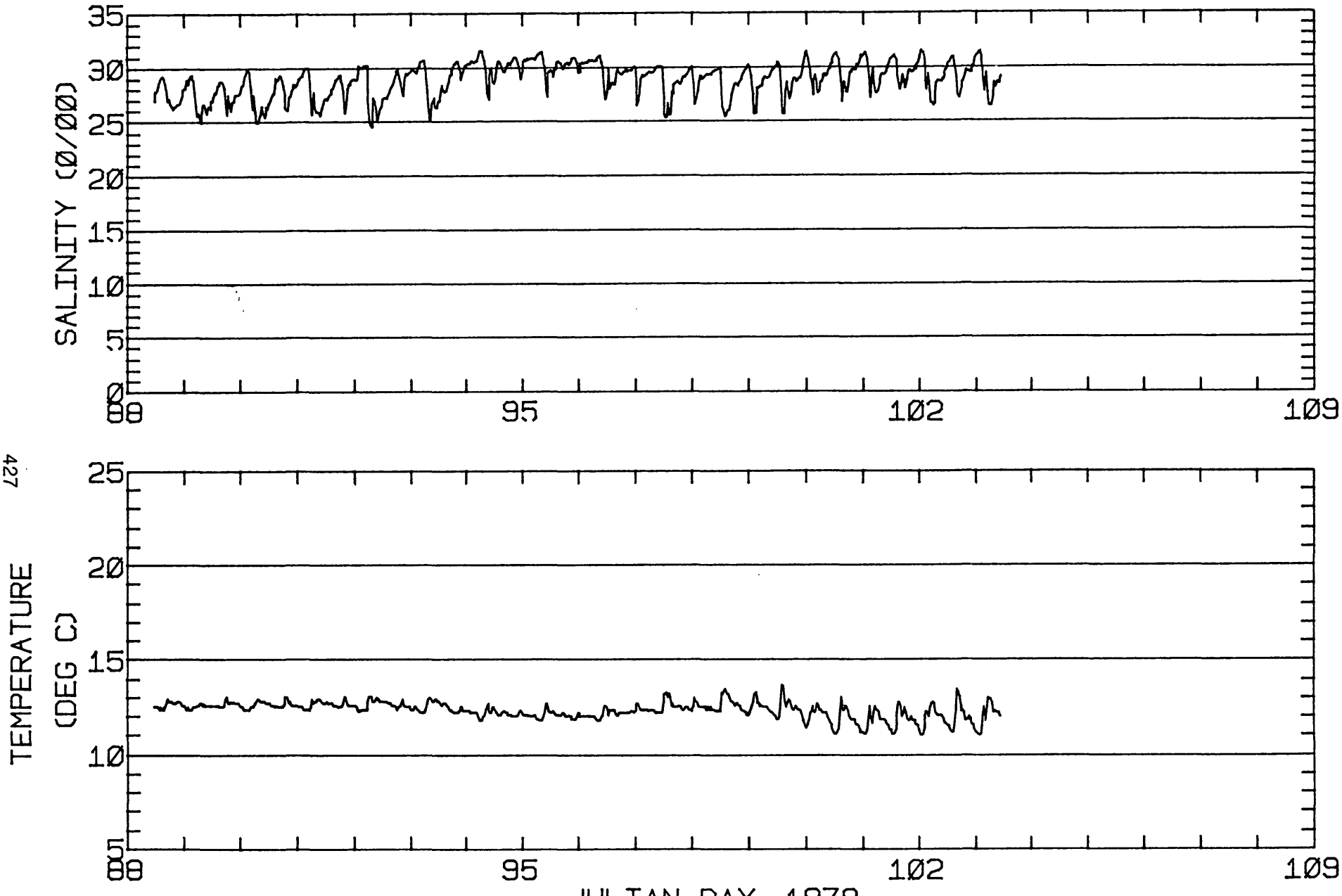
RMS SPEED: 45.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 94.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 7.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 10.08 CM/SEC
STANDARD DEVIATION V SERIES: 18.48 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.5	-11.6	1082.
2	12	0.3	-5.5	623.
3	4	3.0	-15.8	429.
ALL	28	0.3	-9.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-44W
METER 007.6 METERS ABOVE BED. WATER DEPTH 037.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-44W
METER 007.6 METERS ABOVE BED. WATER DEPTH 037.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5
POSITION: 37 51'10"N 122 24'44"W
METER TYPE: AANDERAA
WATER DEPTH: 37.5 M (MLLW)
METER DEPTH: 36.0 M (BELOW MLLW)
START TIME OF SERIES: 3/29/79 1116 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

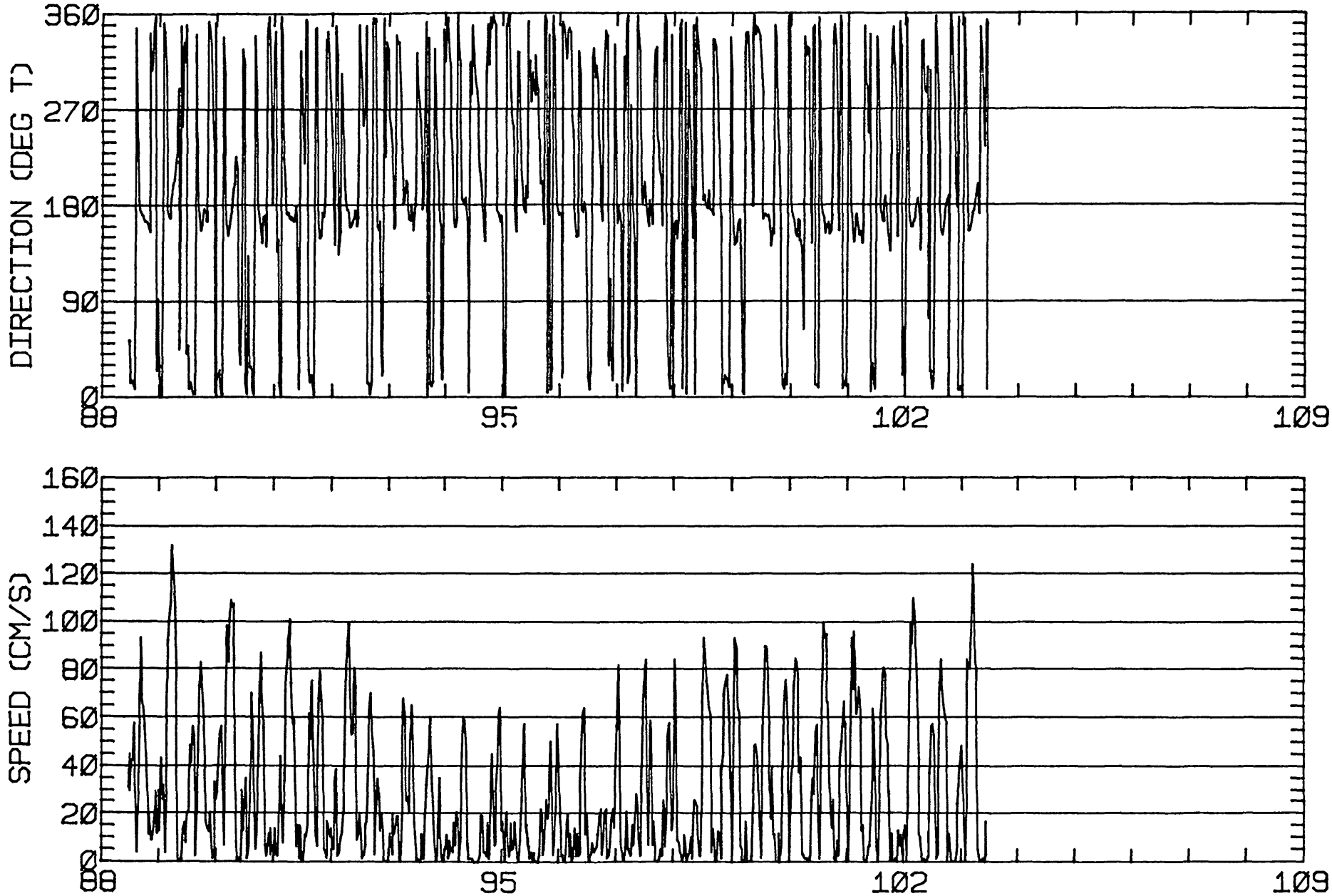
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.59	0.79	8.2	47.4	ANTI-CLOCKWISE
K1	12.43	1.02	10.9	28.6	CLOCKWISE
N2	9.87	1.23	8.4	331.1	ANTI-CLOCKWISE
M2	40.89	1.47	356.2	313.5	CLOCKWISE
S2	16.28	2.12	358.0	330.7	CLOCKWISE
M4	21.59	2.61	352.7	41.0	ANTI-CLOCKWISE

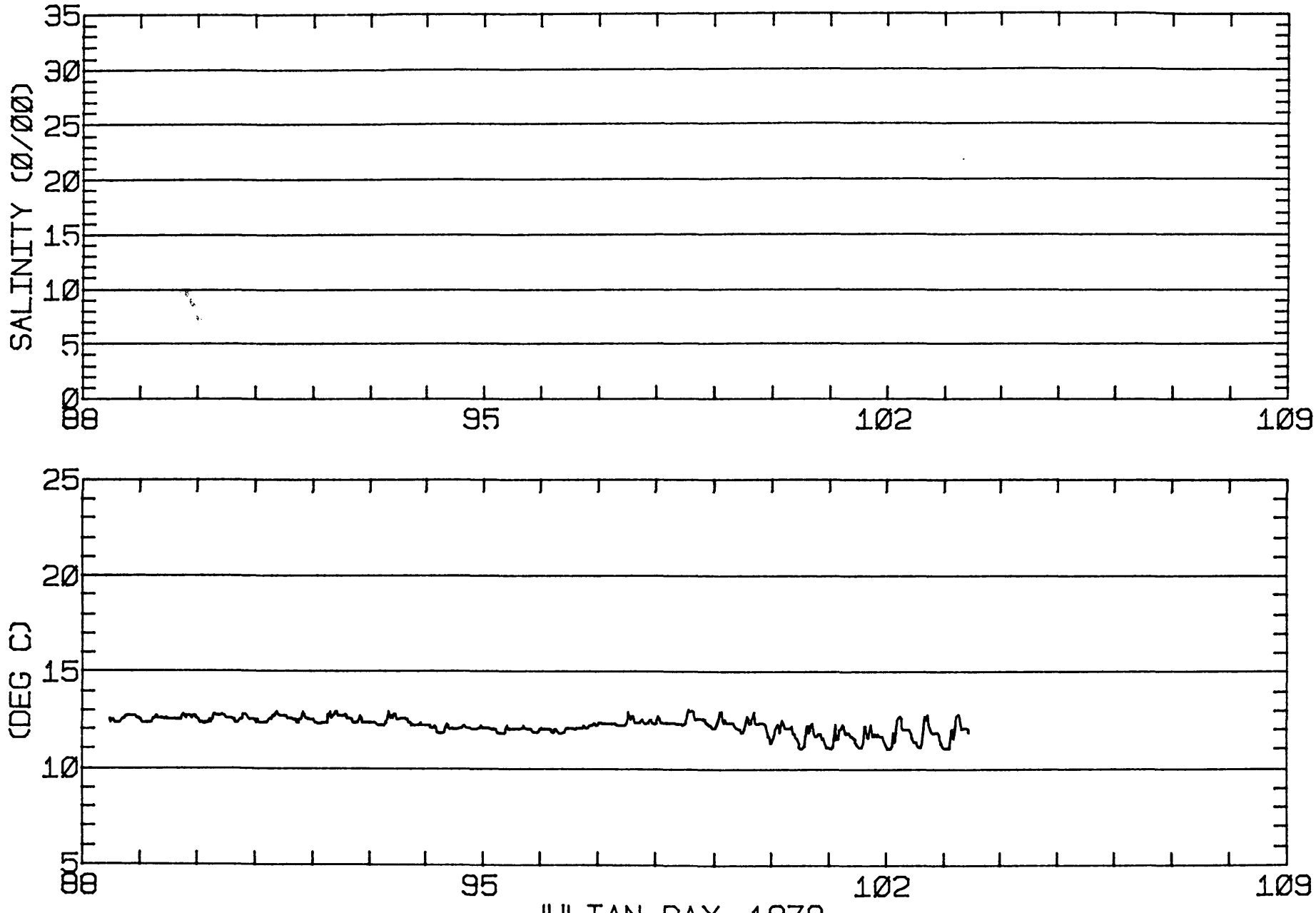
RMS SPEED: 41.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 81.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 0.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 11.22 CM/SEC
STANDARD DEVIATION V SERIES: 18.44 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.0	-9.1	1082.
2	12	2.3	-6.7	623.
3	4	6.8	-14.2	429.
ALL	28	2.4	-8.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-44W
METER 001.5 METERS ABOVE BED. WATER DEPTH 037.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5 37-51-10N 122-24-44W
METER 001.5 METERS ABOVE BED. WATER DEPTH 037.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5A
POSITION: 37 50'45"N 122 25'26"W
METER TYPE: AANDERAA
WATER DEPTH: 30.8 M (MLLW)
METER DEPTH: 29.3 M (BELOW MLLW)
START TIME OF SERIES: 9/11/79 1332 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 8 M2-CYCLES

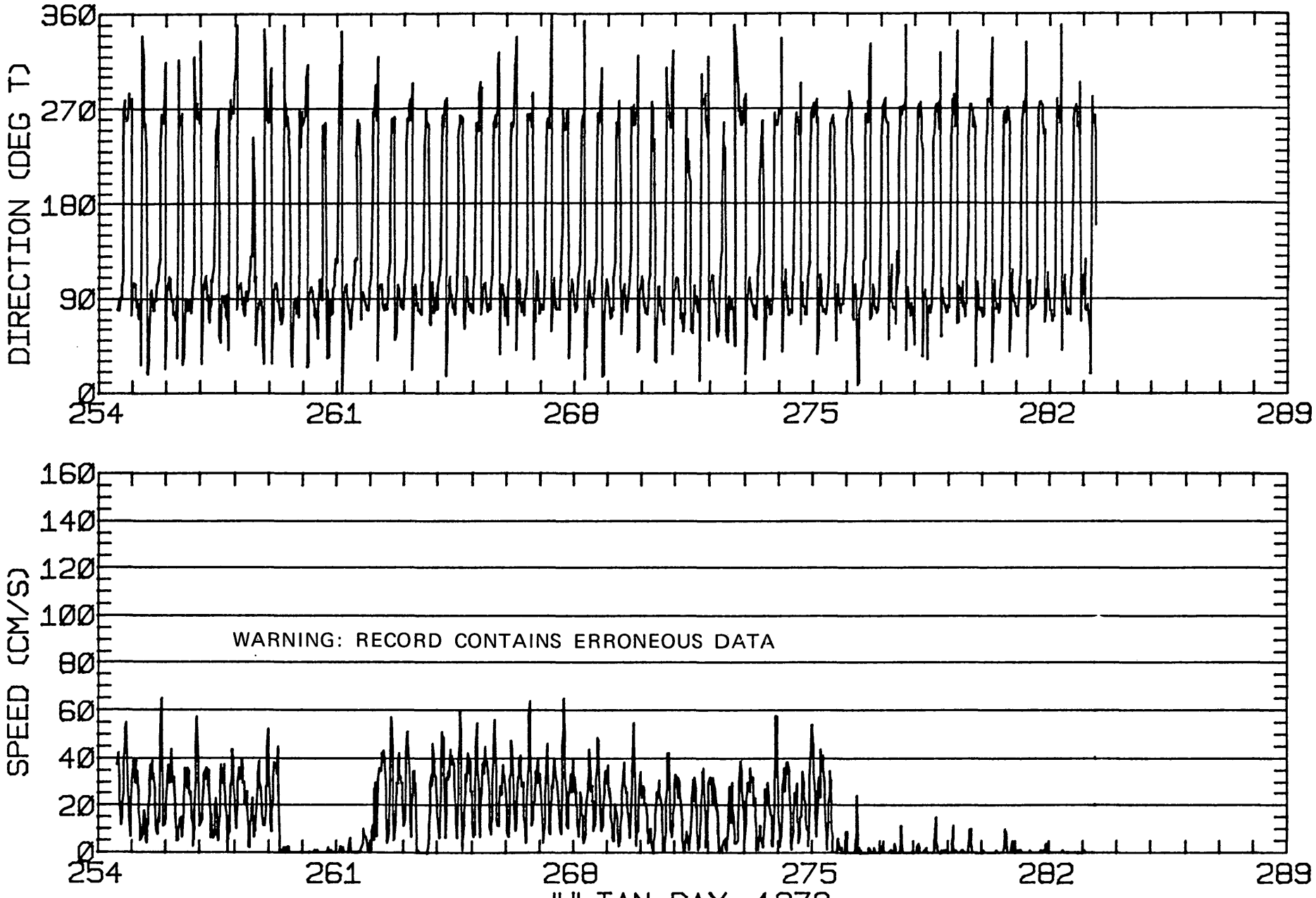
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.06	0.98	154.9	336.5	ANTI-CLOCKWISE
K1	11.83	5.11	91.5	39.1	CLOCKWISE
N2	26.06	8.19	104.6	238.3	CLOCKWISE
M2	22.73	5.34	127.3	216.1	ANTI-CLOCKWISE
S2	5.74	3.47	155.5	164.2	CLOCKWISE
M4	5.85	2.98	62.2	48.8	CLOCKWISE

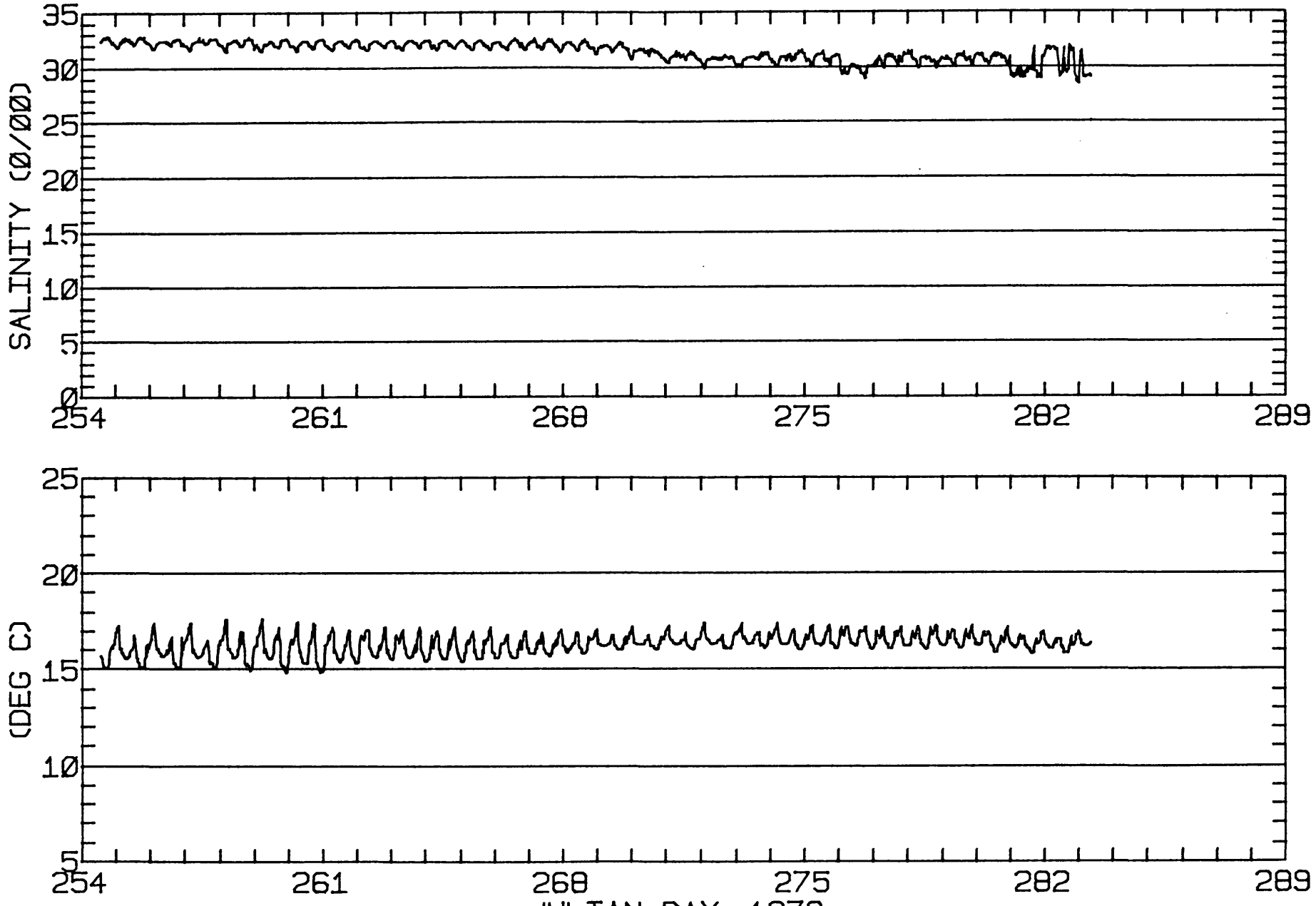
RMS SPEED: 27.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 48.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 13.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 126.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.70
STANDARD DEVIATION U-SERIES: 7.66 CM/SEC
STANDARD DEVIATION V SERIES: 5.55 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	8	8.7	-0.1	184.
ALL	8	8.7	-0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-45N 122-25-26W
METER 001.5 METERS ABOVE BED. WATER DEPTH 030.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-45N 122-25-26W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø3Ø.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5A
POSITION: 37 50'44"N 122 25'24"W
METER TYPE: AANDERAA
WATER DEPTH: 29.9 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:10/10/79 1310 PST JULIAN DAY=283
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

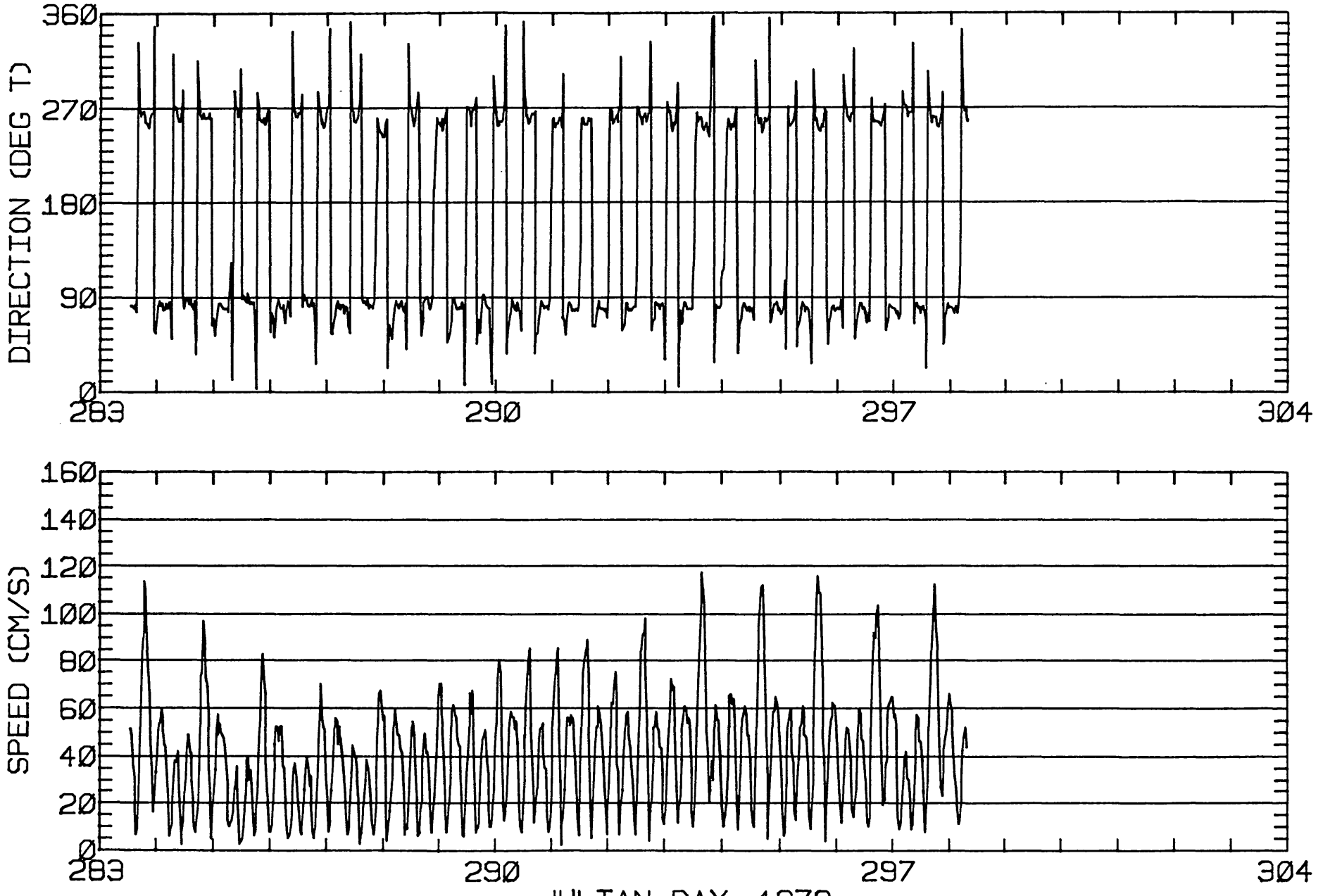
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.81	0.65	76.0	48.9	CLOCKWISE
K1	18.57	0.42	77.5	19.9	ANTI-CLOCKWISE
N2	13.33	1.80	83.4	271.1	ANTI-CLOCKWISE
M2	63.37	0.28	79.9	294.0	CLOCKWISE
S2	18.25	0.85	79.9	285.2	CLOCKWISE
M4	6.87	0.26	56.1	66.5	CLOCKWISE

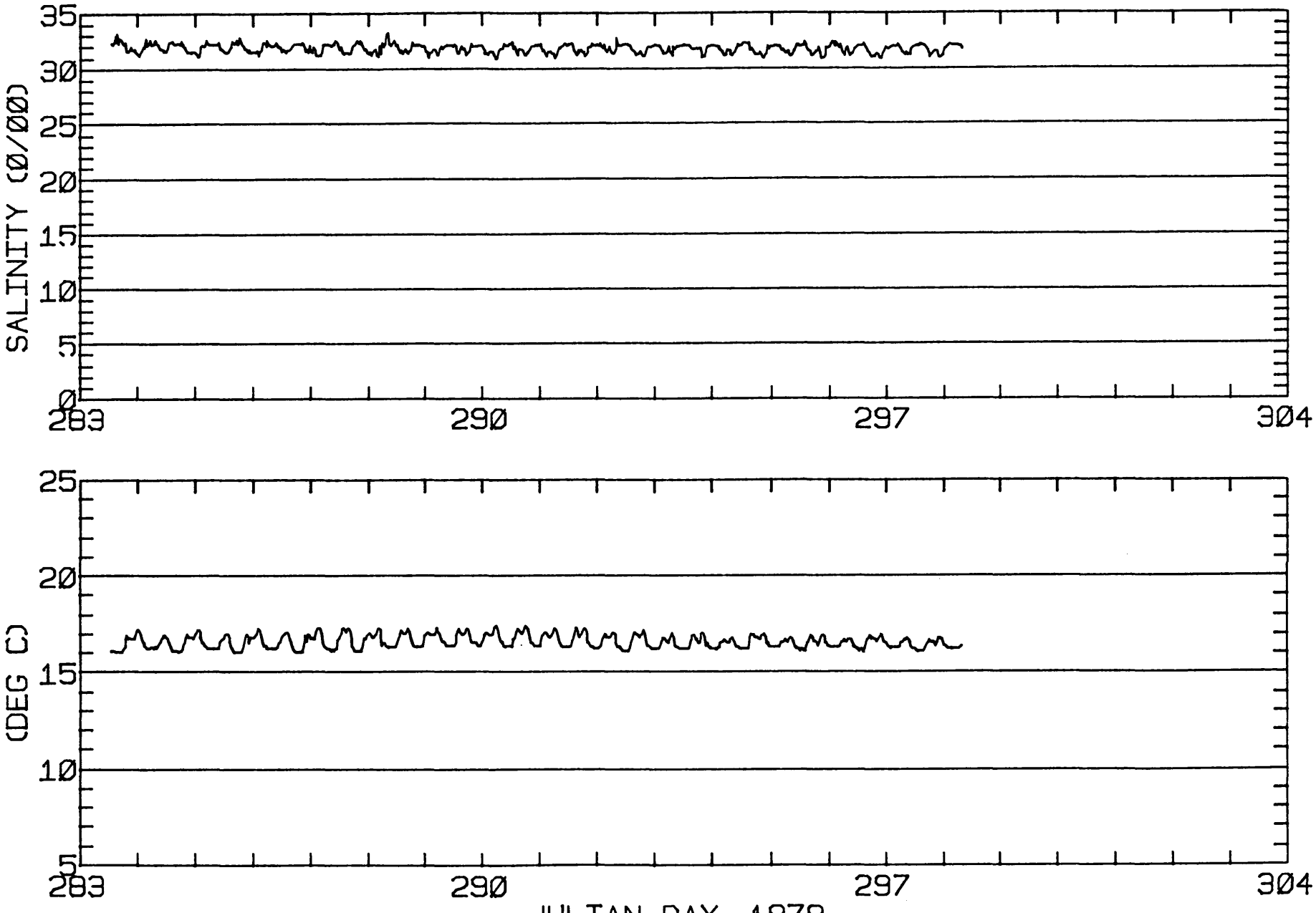
RMS SPEED: 47.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 111.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 79.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 8.94 CM/SEC
STANDARD DEVIATION V SERIES: 5.97 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.1	0.6	200.
2	12	-3.6	-0.2	197.
3	4	-2.7	1.5	271.
ALL	28	-1.9	0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-44N 122-25-24W
METER 017.7 METERS ABOVE BED. WATER DEPTH 029.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-44N 122-25-24W
METER Ø17.7 METERS ABOVE BED. WATER DEPTH Ø29.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5A
POSITION: 37 50'44"N 122 25'23"W
METER TYPE: AANDERAA
WATER DEPTH: 32.3 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 5/30/80 1216 PST JULIAN DAY=151
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

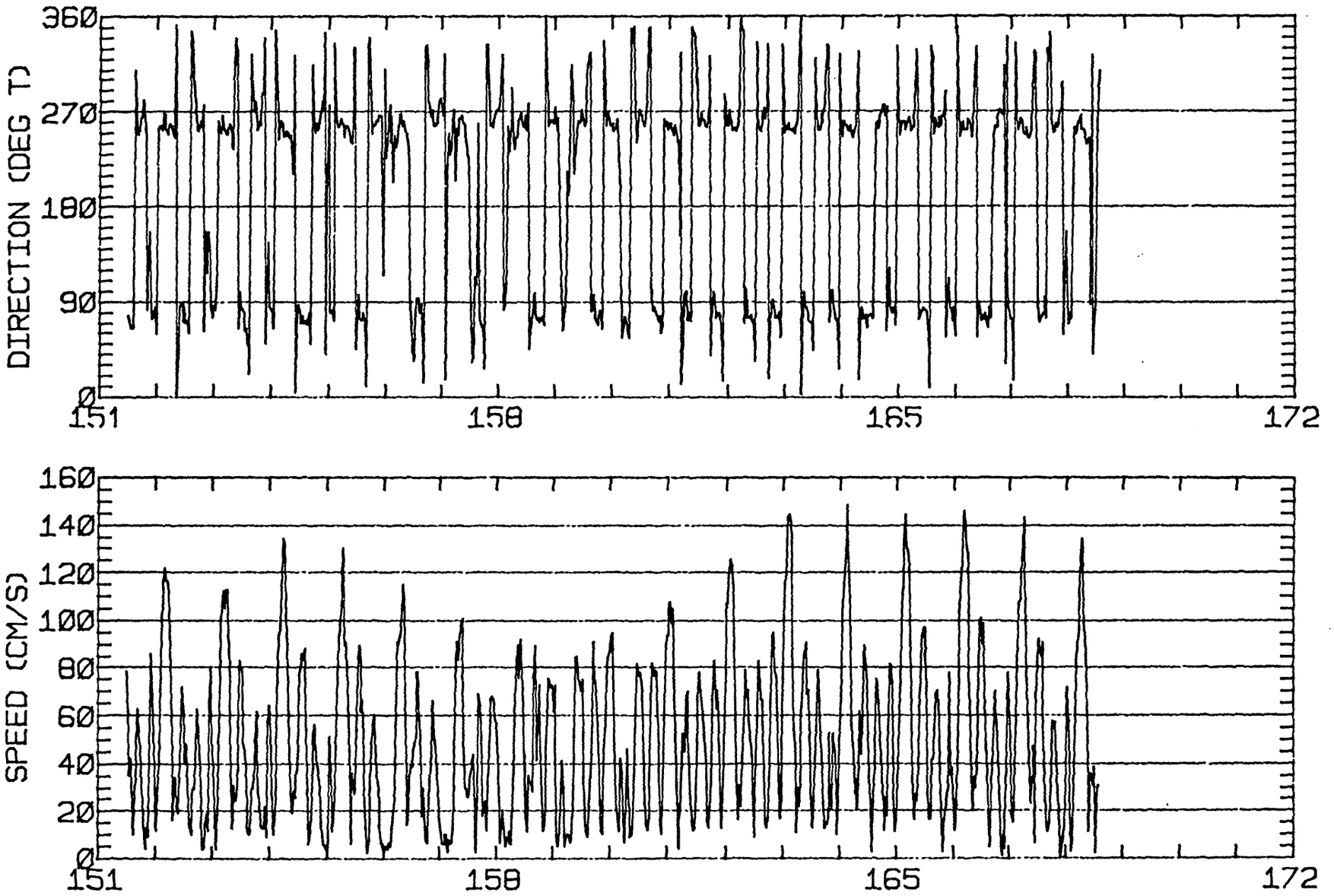
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.51	0.19	68.5	17.9	CLOCKWISE
K1	34.19	0.17	73.3	35.2	CLOCKWISE
N2	14.53	0.43	83.3	261.7	CLOCKWISE
M2	59.94	0.50	76.9	301.9	ANTI-CLOCKWISE
S2	13.15	0.39	74.4	312.3	ANTI-CLOCKWISE
M4	5.82	2.66	36.4	15.2	ANTI-CLOCKWISE

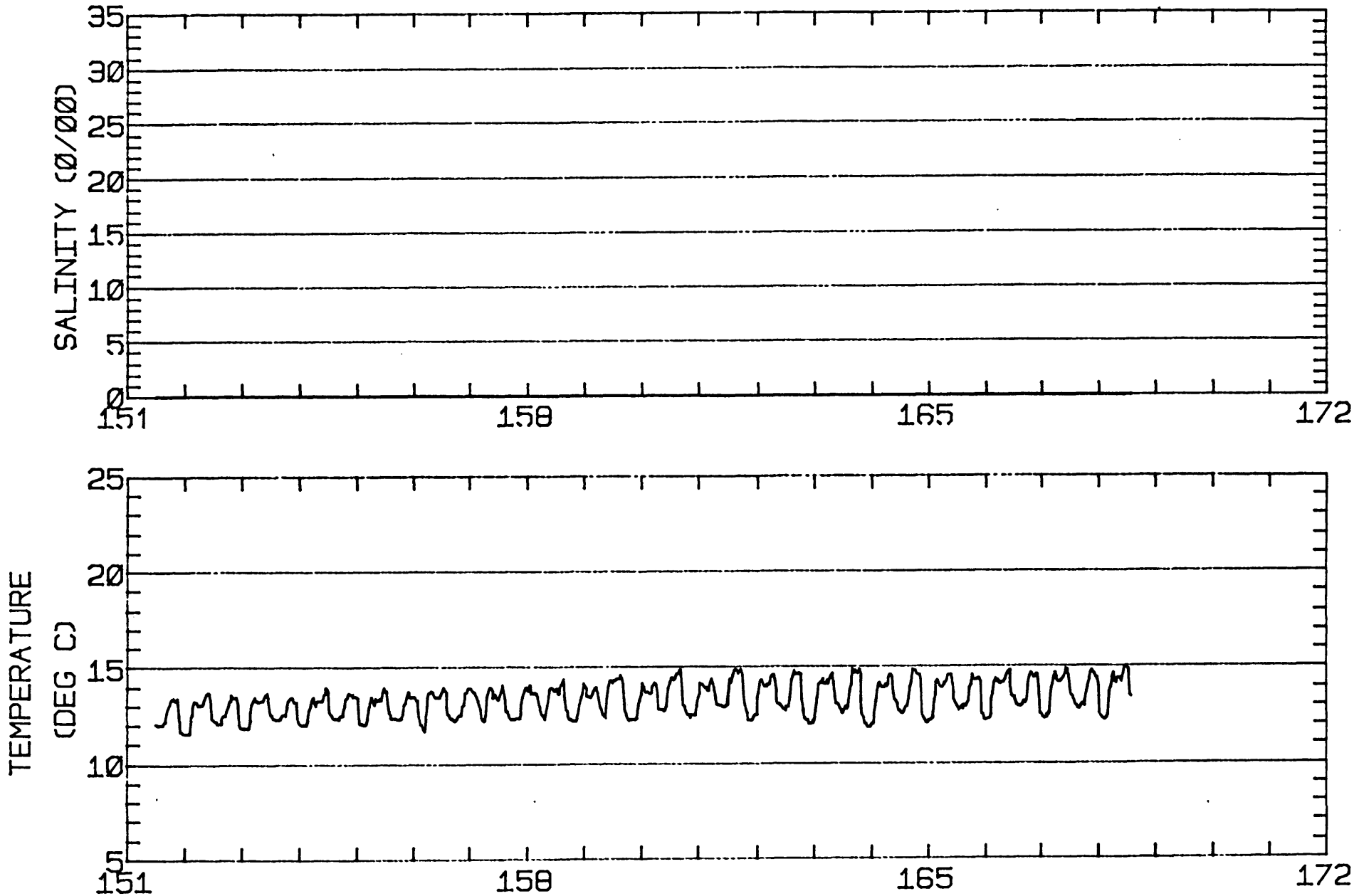
RMS SPEED: 60.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 119.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 74.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.64
STANDARD DEVIATION U-SERIES: 15.20 CM/SEC
STANDARD DEVIATION V SERIES: 9.35 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-13.3	-1.9	419.
2	12	-12.7	0.3	398.
3	8	-15.5	-1.6	405.
ALL	32	-13.6	-1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-44N 122-25-23W
METER 025.8 METERS ABOVE BED. WATER DEPTH 032.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-44N 122-25-23W
METER Ø25.8 METERS ABOVE BED. WATER DEPTH Ø32.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5A
POSITION: 37 50'44"N 122 25'23"W
METER TYPE: AANDERAA
WATER DEPTH: 32.3 M (MLLW)
METER DEPTH: 24.7 M (BELOW MLLW)
START TIME OF SERIES: 5/30/80 1222 PST JULIAN DAY=151
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

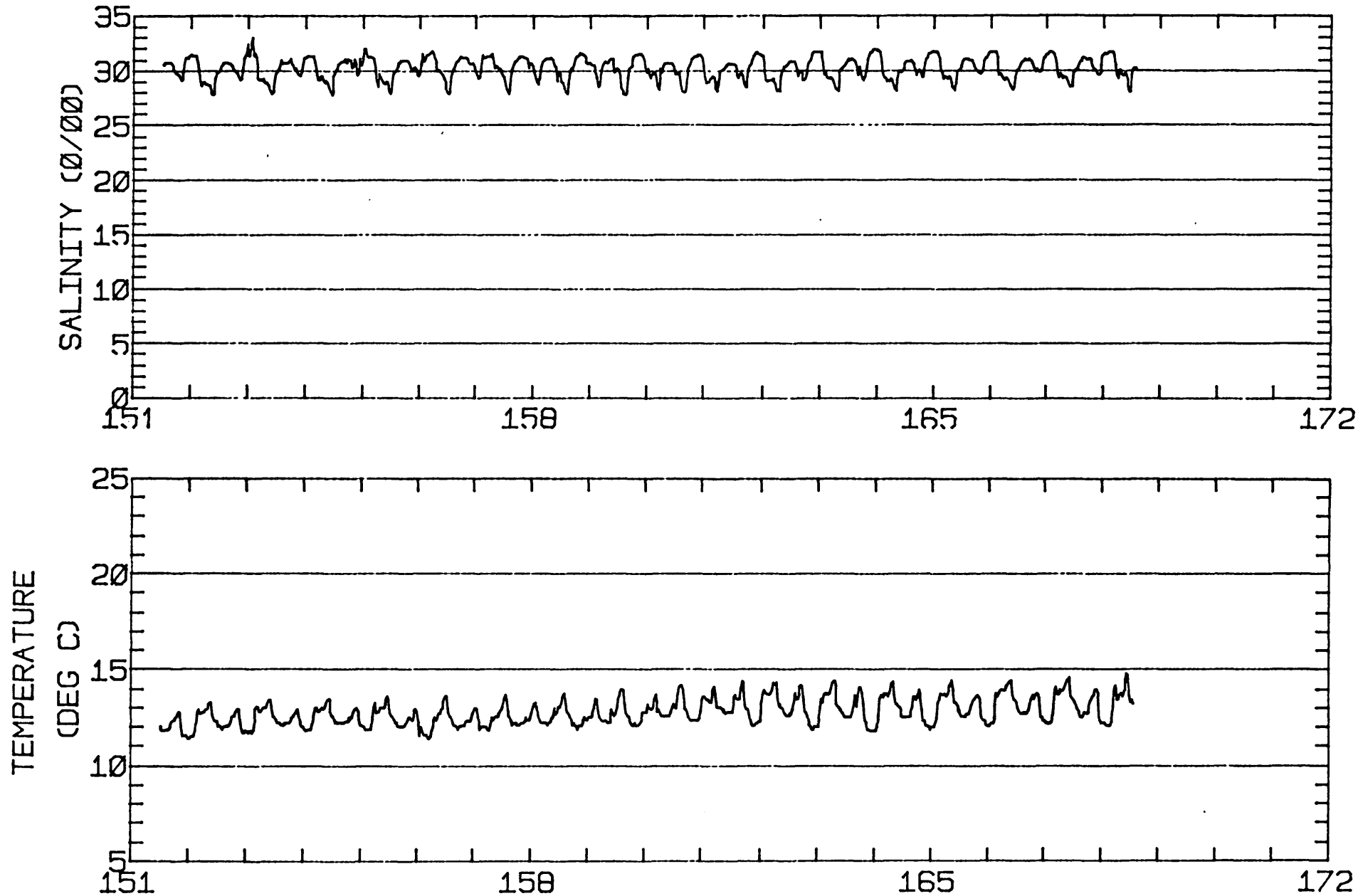
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.79	0.21	87.0	50.9	CLOCKWISE
K1	16.88	0.08	86.9	32.3	ANTI-CLOCKWISE
N2	9.41	1.39	80.1	264.3	CLOCKWISE
M2	37.99	0.23	85.4	285.0	ANTI-CLOCKWISE
S2	8.71	0.36	77.4	296.1	ANTI-CLOCKWISE
M4	3.41	1.30	69.0	34.5	CLOCKWISE

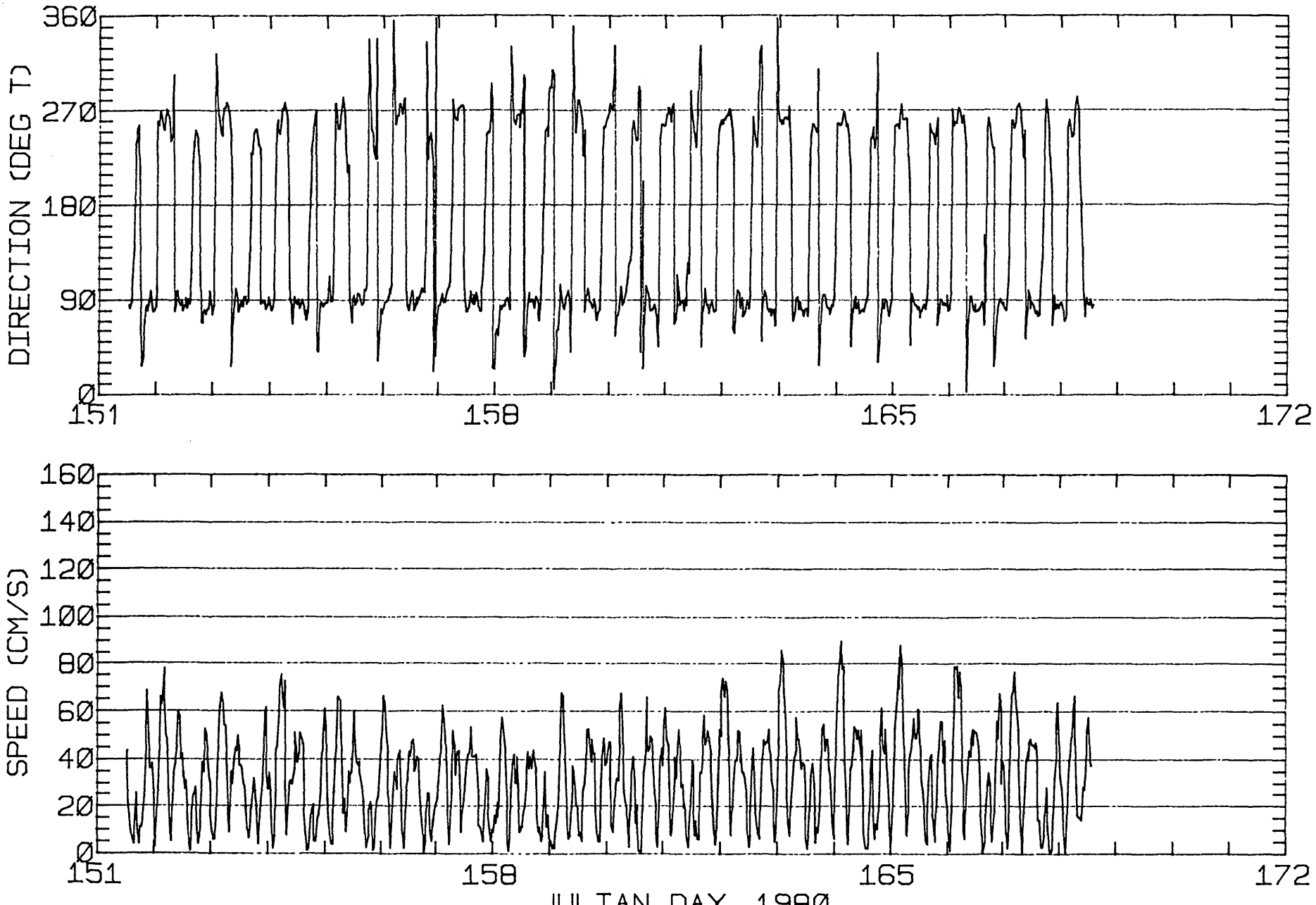
RMS SPEED: 37.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 74.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 85.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.59
STANDARD DEVIATION U-SERIES: 9.50 CM/SEC
STANDARD DEVIATION V SERIES: 5.62 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	8.3	-0.6	419.
2	12	7.1	-0.2	398.
3	8	4.7	-0.8	405.
ALL	32	6.9	-0.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-44N 122-25-23W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø32.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-44N 122-25-23W
METER 007.5 METERS ABOVE BED. WATER DEPTH 032.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 5A
POSITION: 37 50'44"N 122 25'23"W
METER TYPE: AANDERAA
WATER DEPTH: 32.3 M (MLLW)
METER DEPTH: 30.8 M (BELOW MLLW)
START TIME OF SERIES: 5/30/80 1214 PST JULIAN DAY=151
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

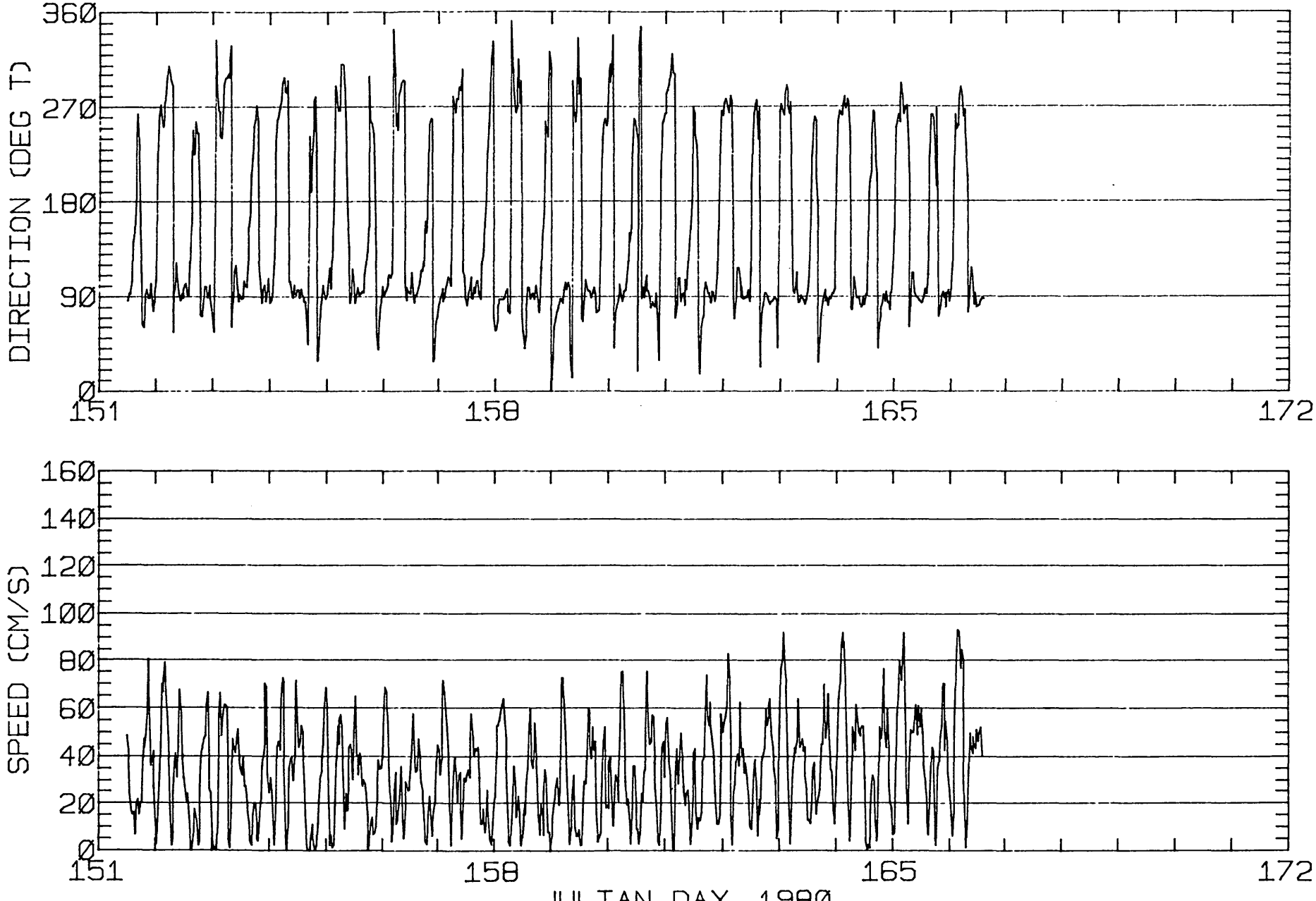
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.25	0.92	96.4	59.3	ANTI-CLOCKWISE
K1	17.05	0.29	99.2	29.6	ANTI-CLOCKWISE
N2	10.21	2.43	77.0	242.8	CLOCKWISE
M2	36.64	0.51	93.0	275.9	CLOCKWISE
S2	9.70	0.21	90.4	283.3	ANTI-CLOCKWISE
M4	3.43	2.10	105.4	30.6	CLOCKWISE

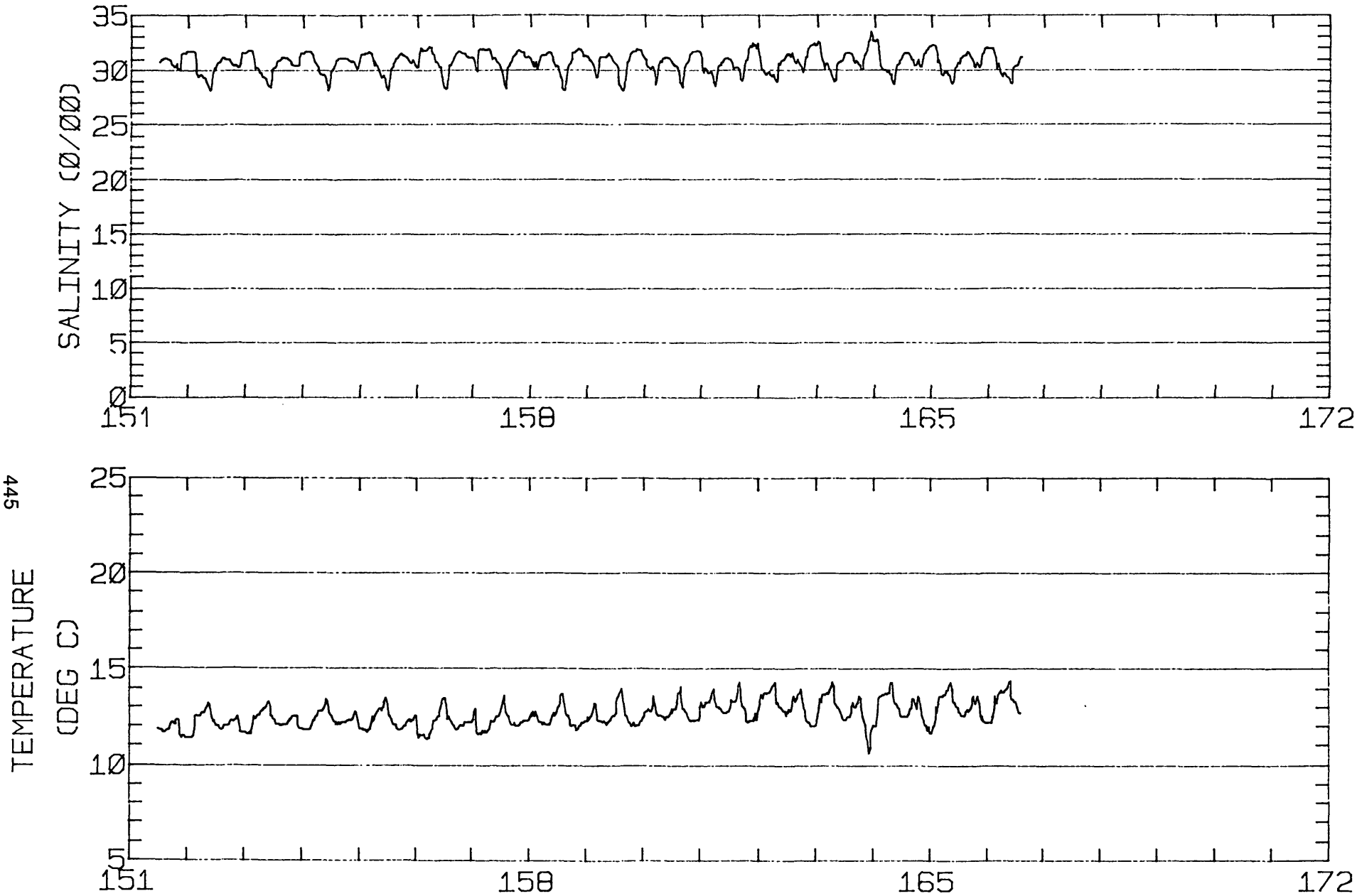
RMS SPEED:	39.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	74.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	21.1 CM/SEC
PRINCIPAL CURRENT DIRECTION:	94.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.61
STANDARD DEVIATION U-SERIES:	11.80 CM/SEC
STANDARD DEVIATION V SERIES:	8.54 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	13.5	-0.9	419.
2	12	12.9	-0.3	398.
3	4	8.3	-1.4	443.
ALL	28	12.5	-0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-44N 122-25-23W
METER 001.5 METERS ABOVE BED. WATER DEPTH 032.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 5A 37-50-44N 122-25-23W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø32.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'21"N 122 26'20"W
METER TYPE: AANDERAA
WATER DEPTH: 31.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 3/15/79 1430 PST JULIAN DAY= 74
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

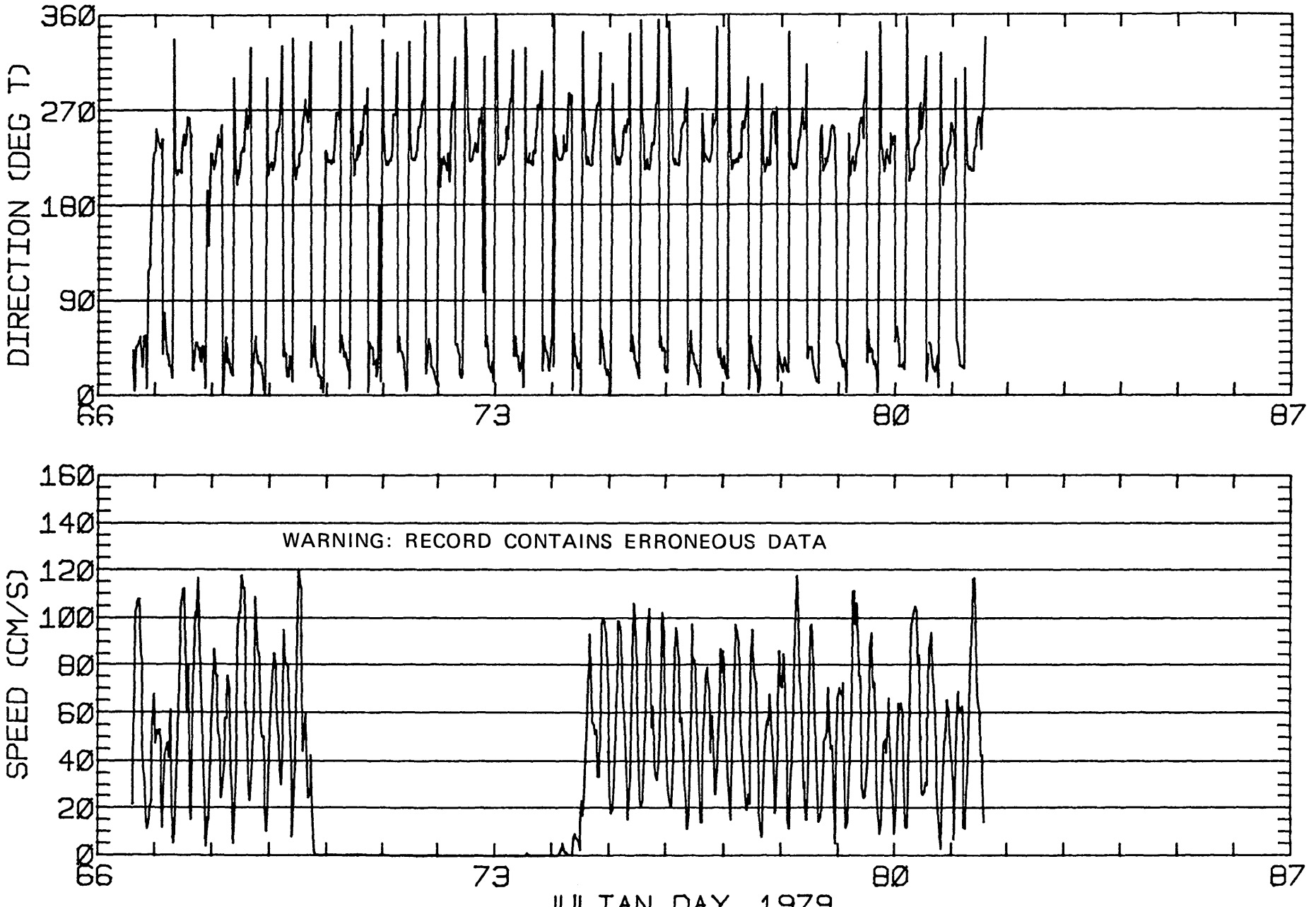
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.42	5.49	48.8	337.5	CLOCKWISE
K1	17.05	3.89	37.9	20.8	CLOCKWISE
N2	13.46	1.71	66.7	257.3	ANTI-CLOCKWISE
M2	74.25	9.49	45.6	264.9	CLOCKWISE
S2	13.58	1.35	38.9	284.7	ANTI-CLOCKWISE
M4	13.02	6.44	141.0	51.3	ANTI-CLOCKWISE

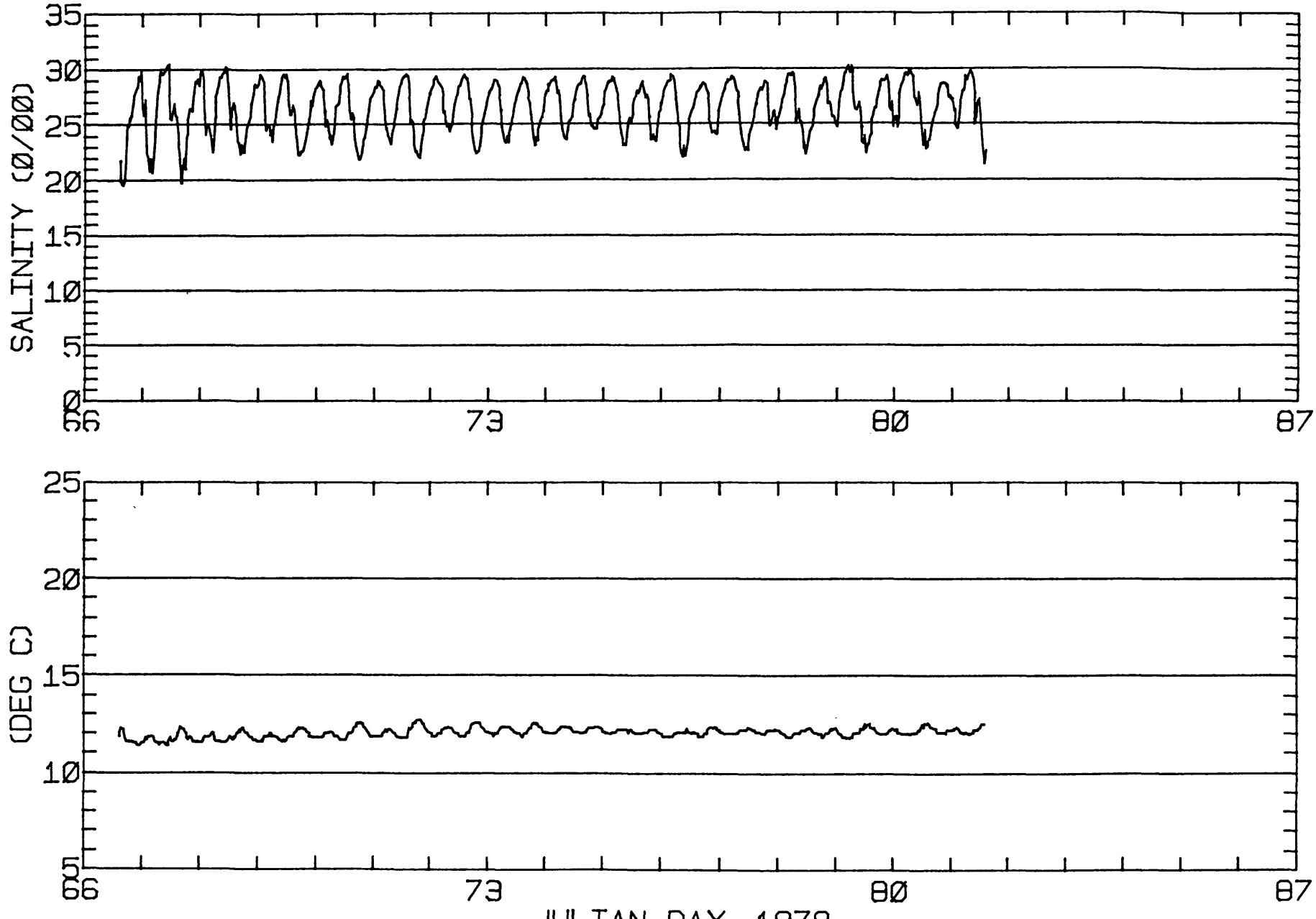
RMS SPEED: 61.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 117.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 56.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 44.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 9.54 CM/SEC
STANDARD DEVIATION V SERIES: 11.12 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-11.6	4.9	870.
ALL	12	-11.6	4.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-20W
METER 025.6 METERS ABOVE BED. WATER DEPTH 031.7 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-2ØW
METER Ø25.6 METERS ABOVE BED. WATER DEPTH Ø31.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'21"N 122 26'20"W
METER TYPE: AANDERAA
WATER DEPTH: 31.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 3/ 7/79 1442 PST JULIAN DAY= 66
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

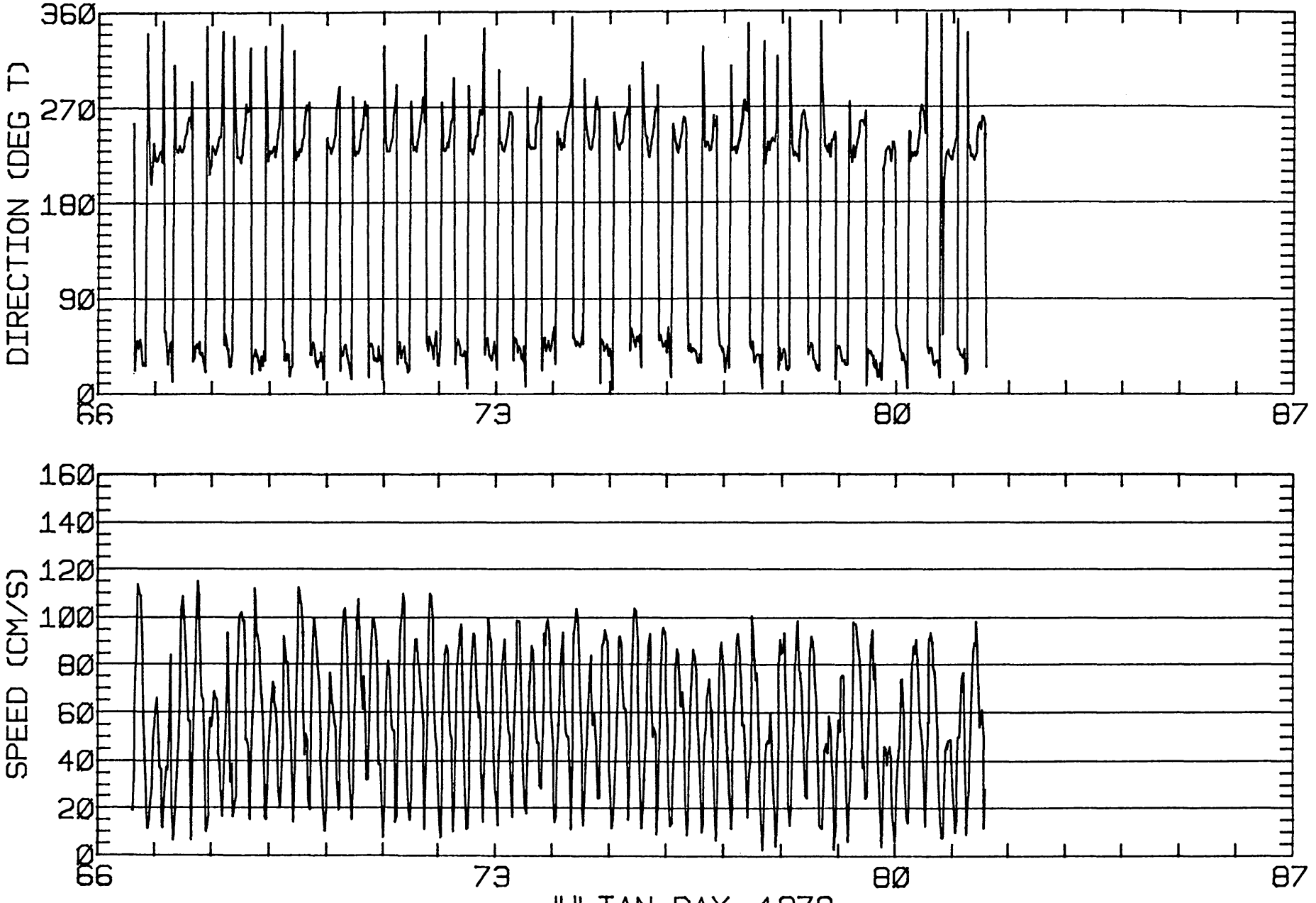
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.55	3.85	55.0	4.7	CLOCKWISE
K1	13.00	3.68	51.6	18.7	CLOCKWISE
N2	23.30	0.62	41.1	245.6	CLOCKWISE
M2	85.56	2.98	47.7	278.0	CLOCKWISE
S2	24.54	3.99	54.4	277.4	CLOCKWISE
M4	6.06	4.46	114.8	110.8	ANTI-CLOCKWISE

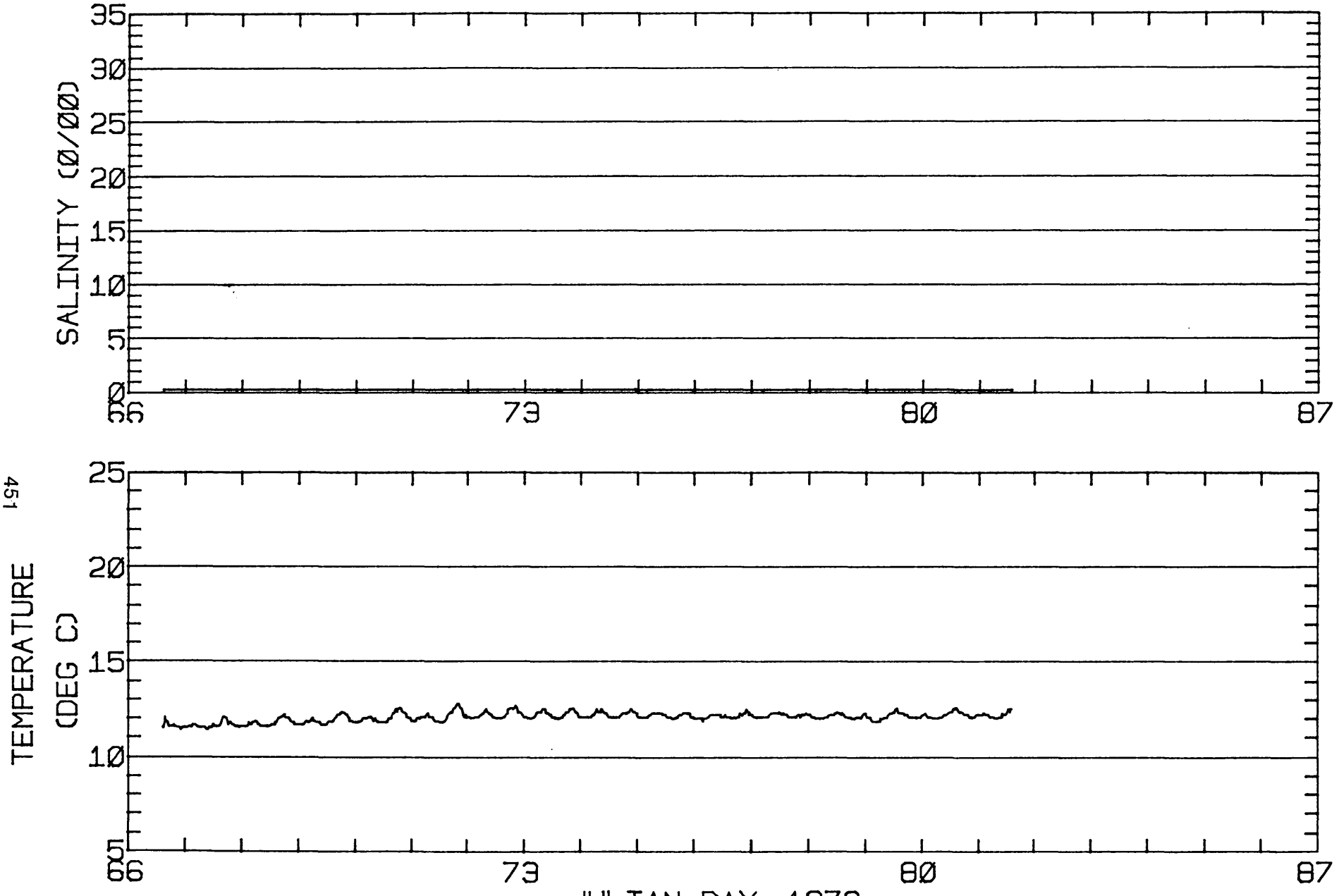
RMS SPEED: 62.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 135.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 60.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 49.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 9.85 CM/SEC
STANDARD DEVIATION V SERIES: 11.31 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.9	9.5	1027.
2	12	-4.8	9.7	768.
3	4	-7.9	7.1	967.
ALL	28	-6.2	9.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-20W
METER 019.5 METERS ABOVE BED. WATER DEPTH 031.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-20W
METER Ø19.5 METERS ABOVE BED. WATER DEPTH Ø31.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'21"N 122 26'20"W
METER TYPE: AANDERAA
WATER DEPTH: 31.7 M (MLLW)
METER DEPTH: 24.1 M (BELOW MLLW)
START TIME OF SERIES: 3/ 7/79 1444 PST JULIAN DAY= 66
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

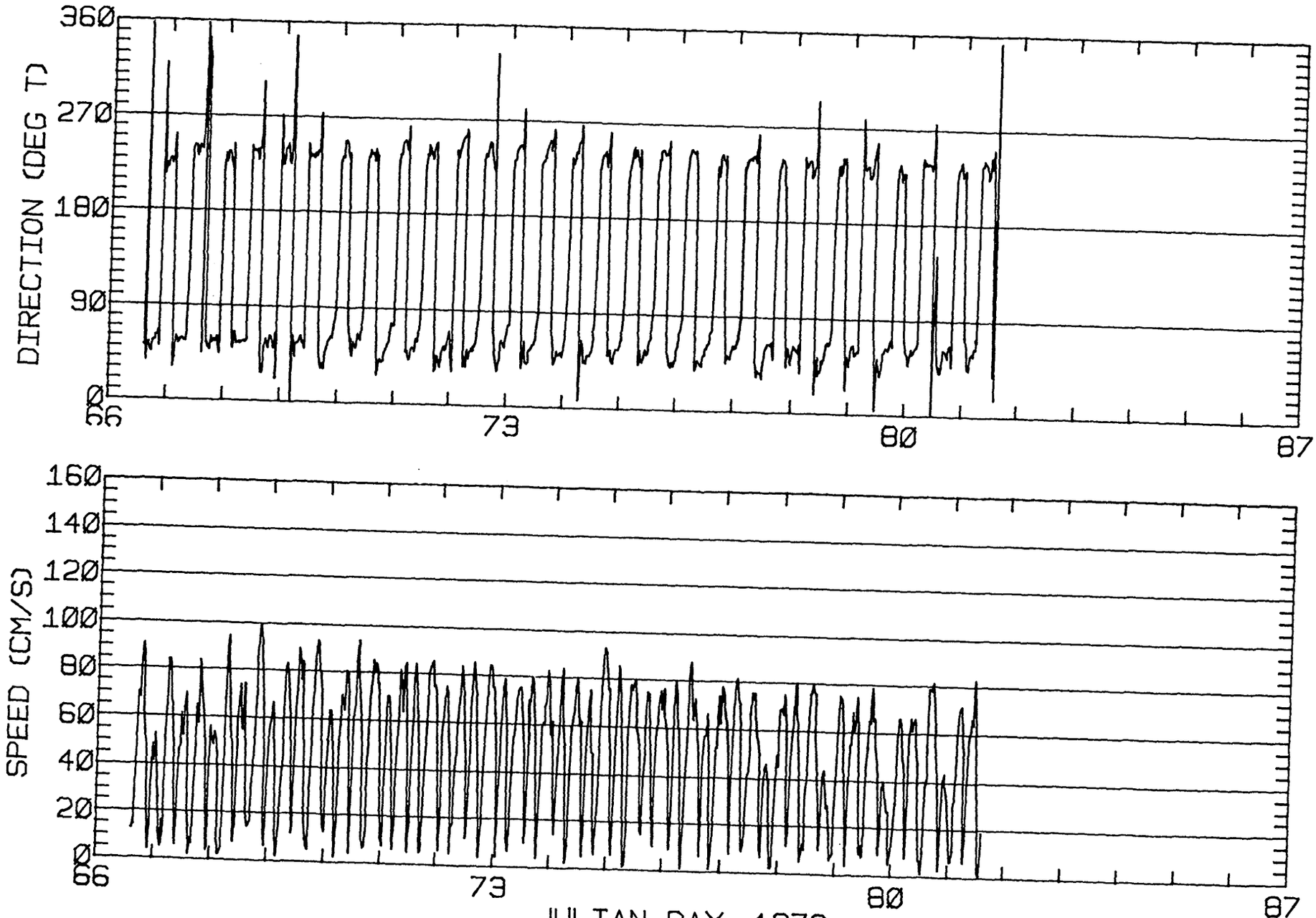
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.81	2.23	57.5	5.9	CLOCKWISE
K1	10.47	0.91	62.0	29.3	CLOCKWISE
N2	20.08	0.34	51.0	254.2	CLOCKWISE
M2	73.66	4.31	56.4	281.3	CLOCKWISE
S2	24.09	2.83	56.6	278.5	CLOCKWISE
M4	8.32	0.39	80.4	317.4	ANTI-CLOCKWISE

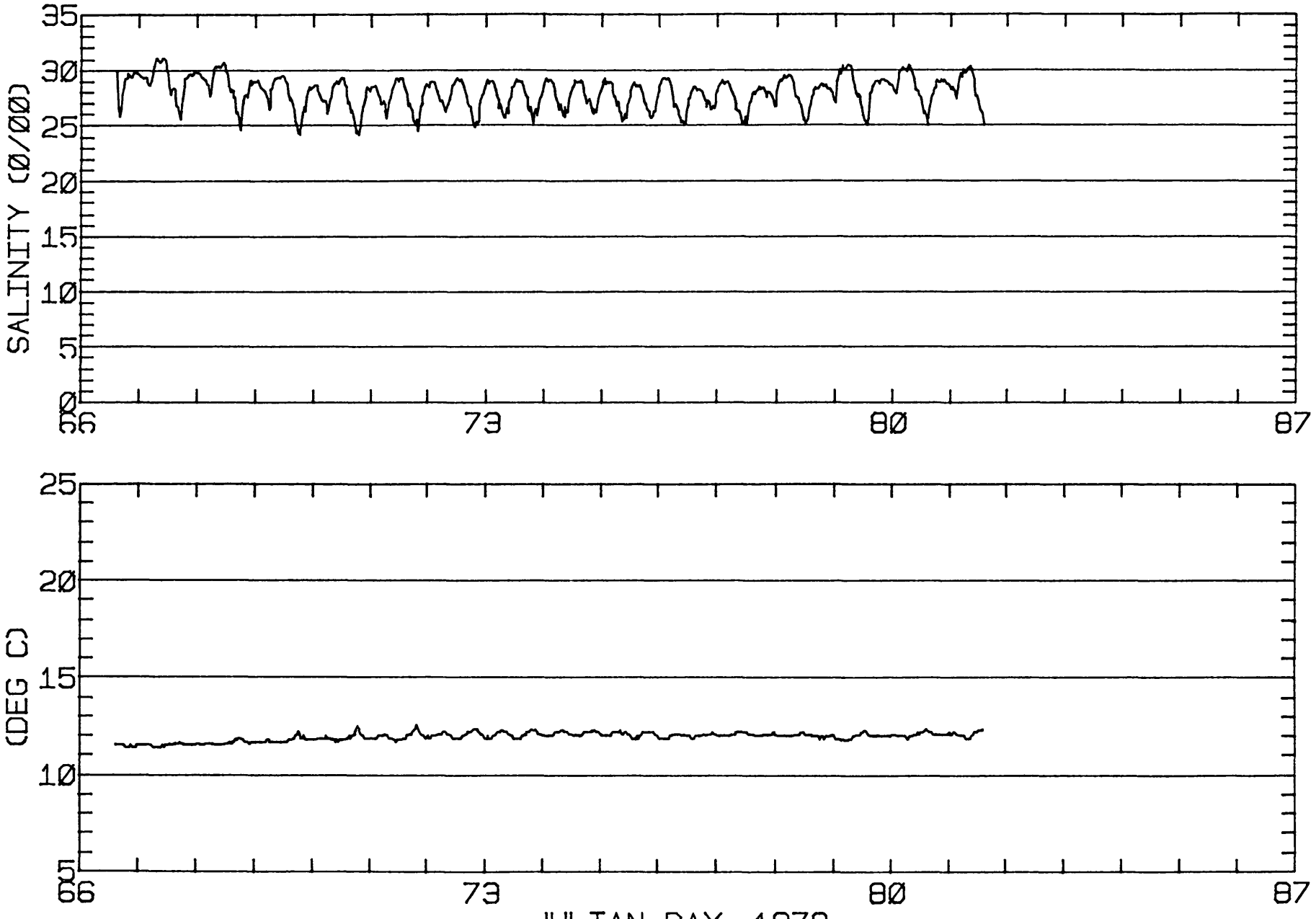
RMS SPEED: 55.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 117.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 57.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.20
STANDARD DEVIATION U-SERIES: 10.38 CM/SEC
STANDARD DEVIATION V SERIES: 6.86 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.1	6.5	1027.
2	12	9.1	7.7	768.
3	4	7.6	3.7	967.
ALL	28	8.0	6.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-20W
METER 007.6 METERS ABOVE BED. WATER DEPTH 031.7 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-2ØW
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø31.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'21"N 122 26'20"W
METER TYPE: AANDERAA
WATER DEPTH: 31.7 M (MLLW)
METER DEPTH: 30.2 M (BELOW MLLW)
START TIME OF SERIES: 3/ 7/79 1446 PST JULIAN DAY= 66
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

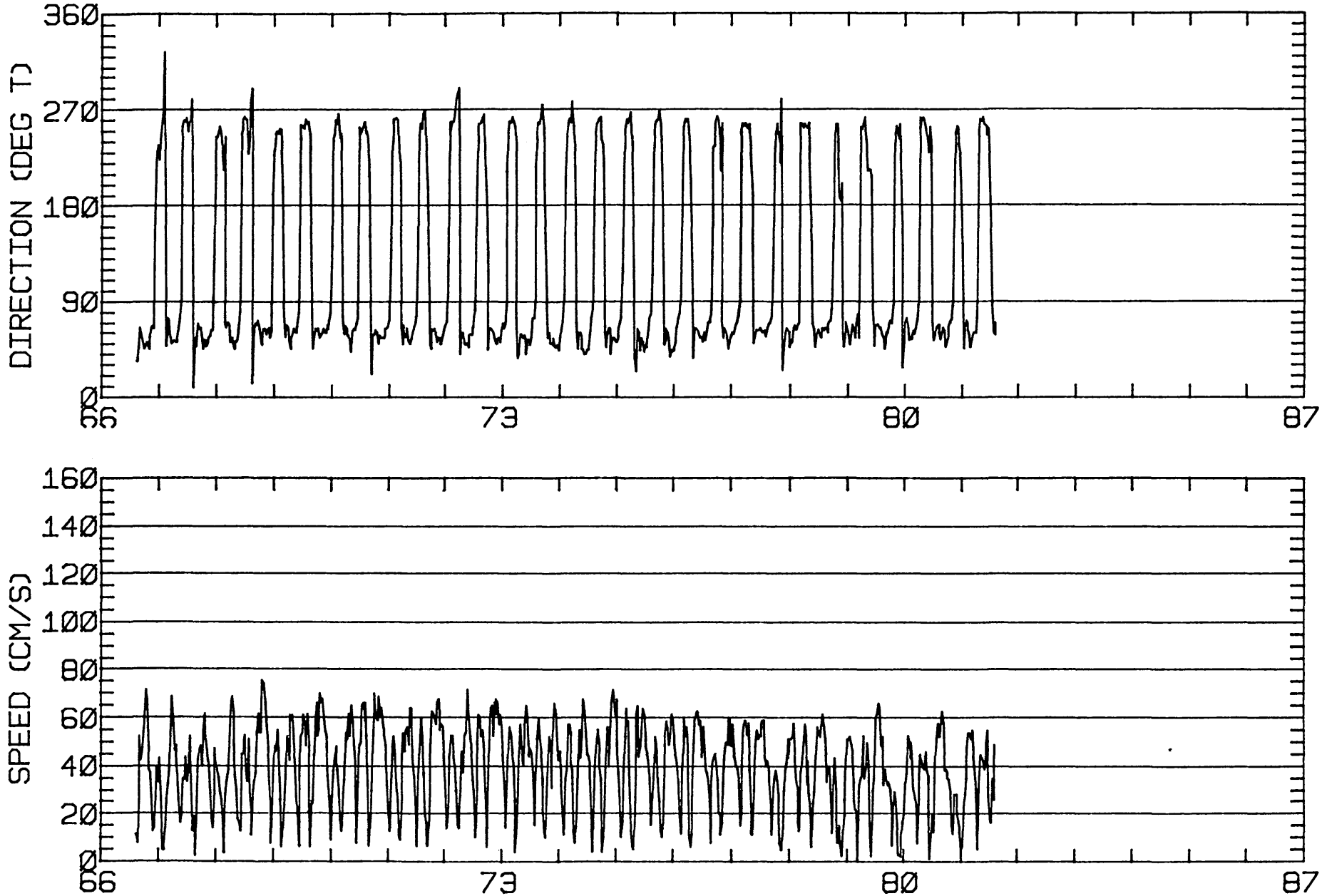
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.14	0.74	69.8	346.6	CLOCKWISE
K1	8.34	0.06	73.5	15.1	CLOCKWISE
N2	13.22	1.51	59.1	238.0	ANTI-CLOCKWISE
M2	53.61	0.53	62.4	274.7	ANTI-CLOCKWISE
S2	17.00	1.03	62.9	279.0	CLOCKWISE
M4	8.55	0.28	86.1	351.8	CLOCKWISE

RMS SPEED: 43.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 86.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 64.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.22
STANDARD DEVIATION U-SERIES: 11.71 CM/SEC
STANDARD DEVIATION V SERIES: 6.57 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	10.6	9.4	1027.
2	12	12.4	10.3	768.
3	4	11.3	6.2	967.
ALL	28	11.5	9.3	

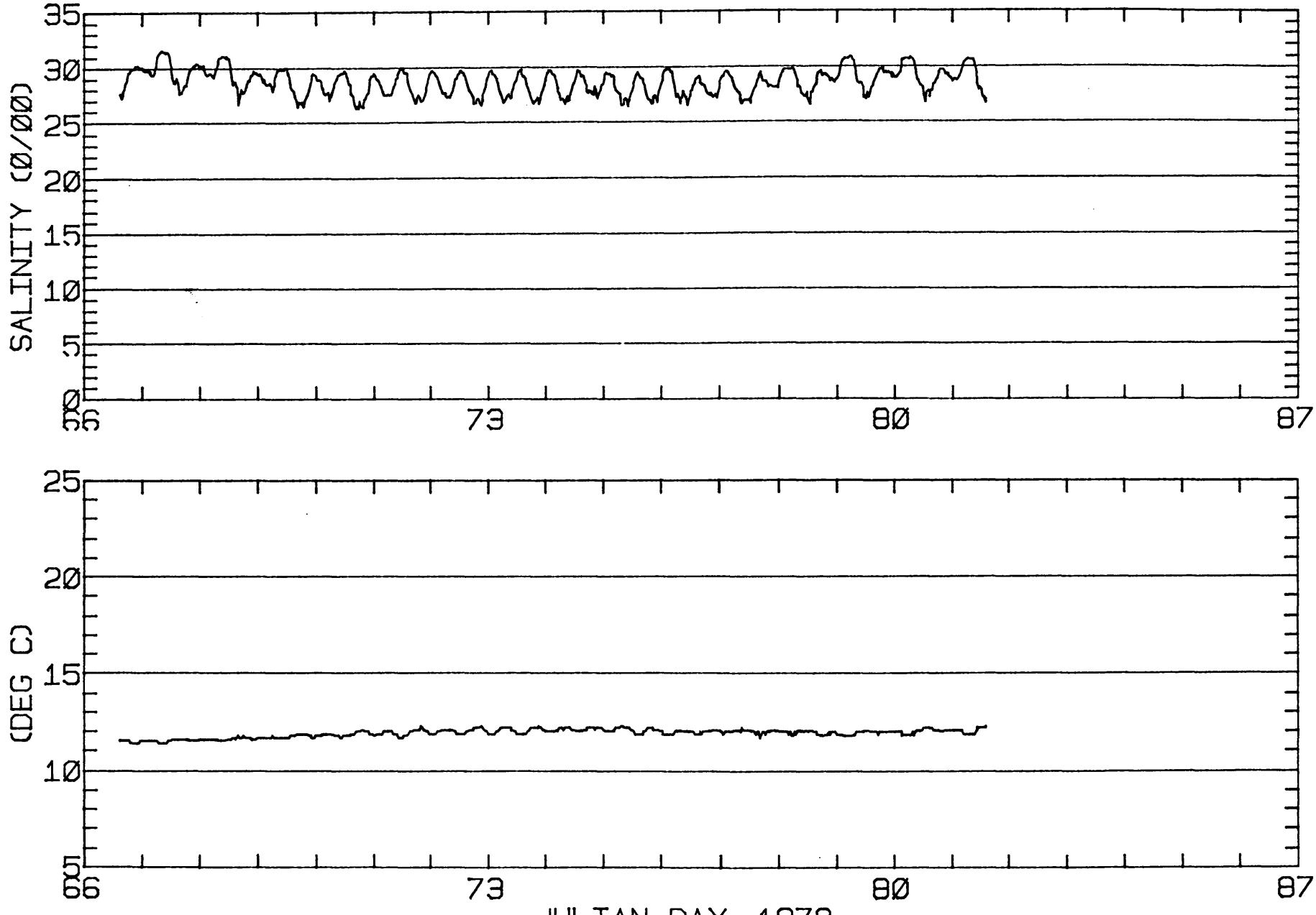


JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 16 37-52-21N 122-26-20W

METER 001.5 METERS ABOVE BED. WATER DEPTH 031.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-20W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø31.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'21"N 122 26'24"W
METER TYPE: AANDERAA
WATER DEPTH: 28.7 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES:10/15/79 1320 PST JULIAN DAY=288
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

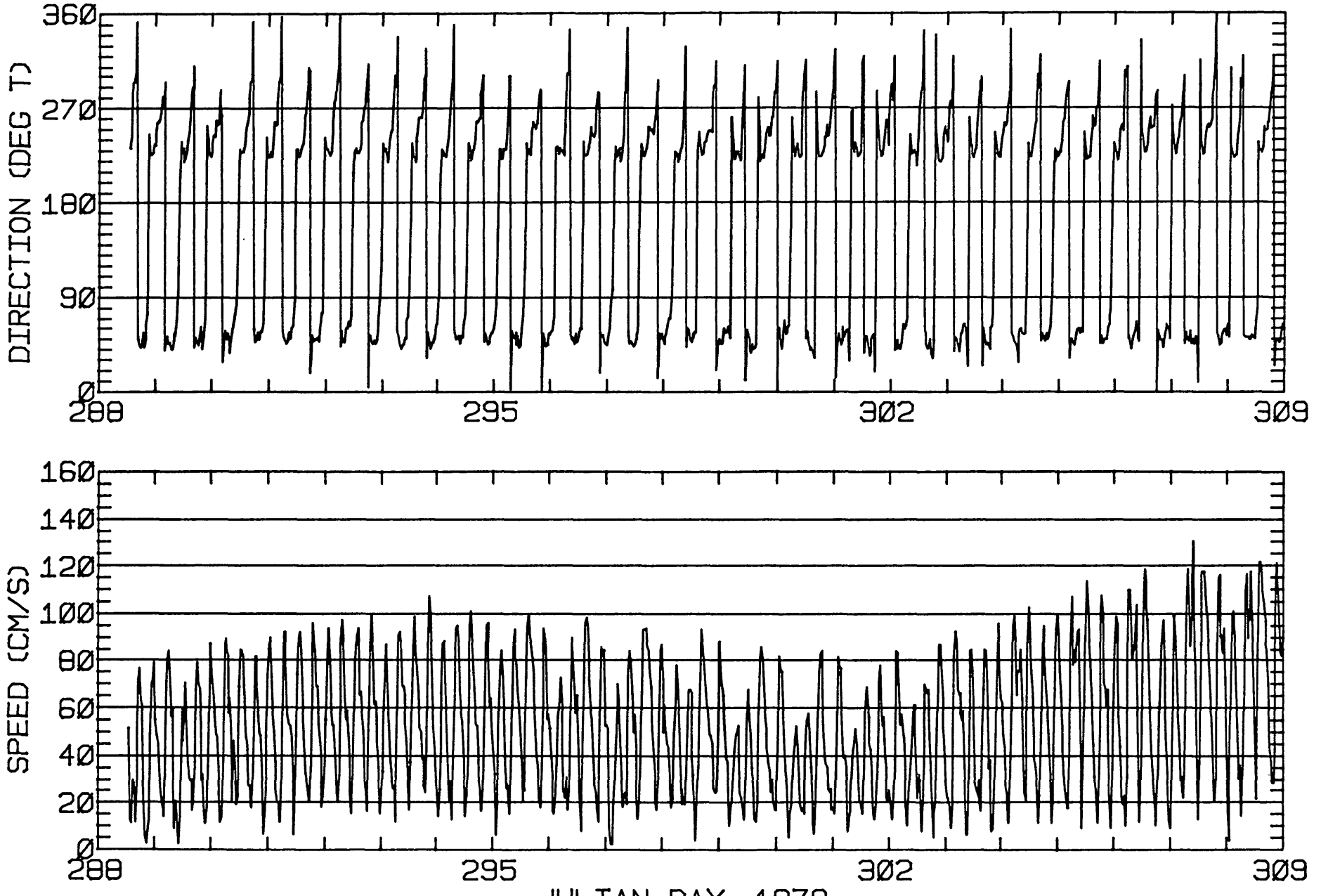
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.02	2.84	68.5	27.9	CLOCKWISE
K1	17.57	1.42	66.9	25.3	CLOCKWISE
N2	13.22	0.22	56.0	248.5	ANTI-CLOCKWISE
M2	70.03	10.04	54.9	282.2	CLOCKWISE
S2	21.41	3.52	57.8	281.9	CLOCKWISE
M4	4.64	1.51	8.7	294.7	ANTI-CLOCKWISE

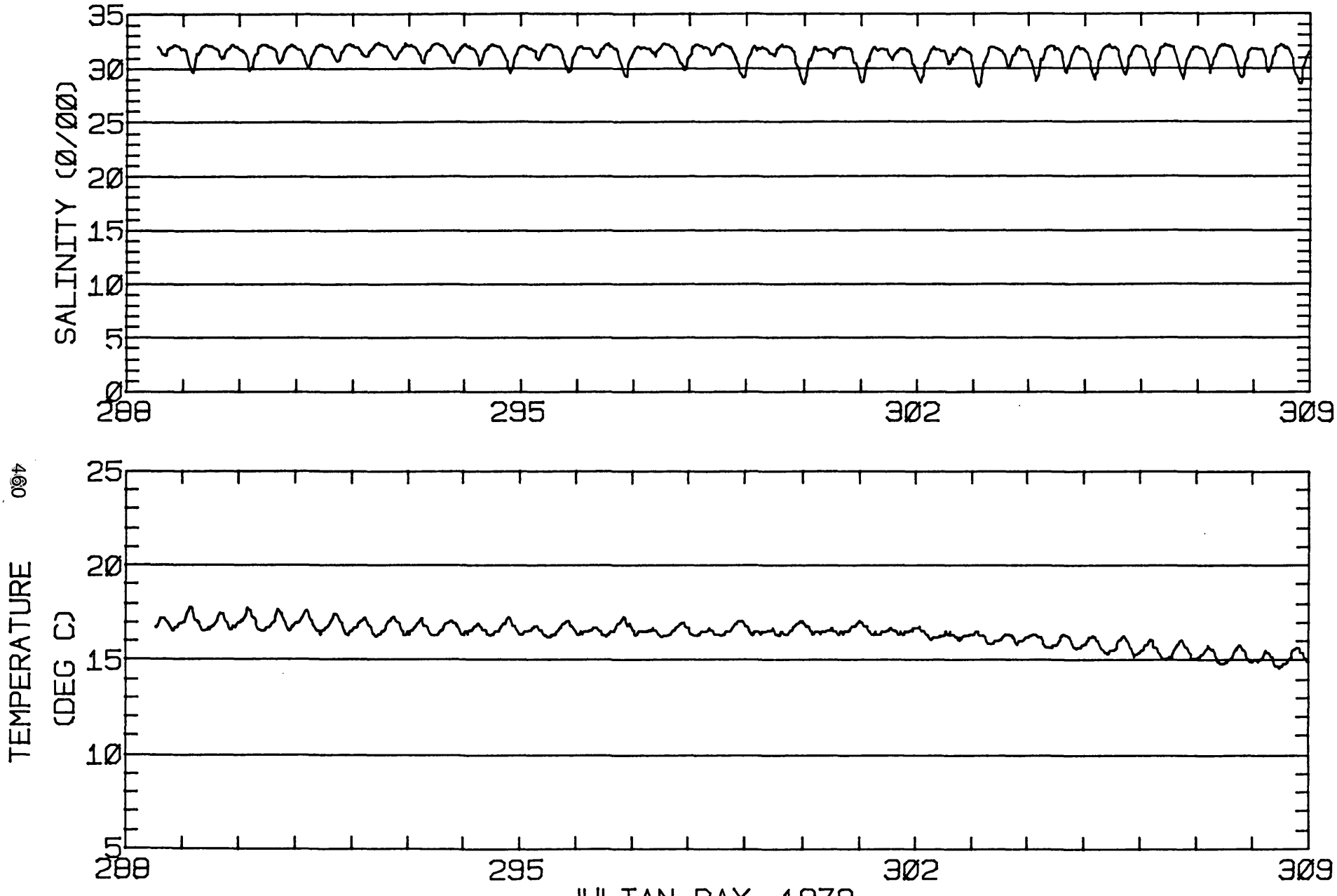
RMS SPEED: 60.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 118.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 40.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 58.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.29
STANDARD DEVIATION U-SERIES: 11.71 CM/SEC
STANDARD DEVIATION V SERIES: 12.67 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.9	3.9	190.
2	12	-4.4	2.1	250.
3	12	-0.4	5.1	338.
4	4	-0.2	10.1	211.
ALL	40	-2.3	4.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-24W
METER 022.3 METERS ABOVE BED. WATER DEPTH 028.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-21N 122-26-24W
METER Ø22.3 METERS ABOVE BED. WATER DEPTH Ø28.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'22"N 122 26'25"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:10/15/79 1312 PST JULIAN DAY=288
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

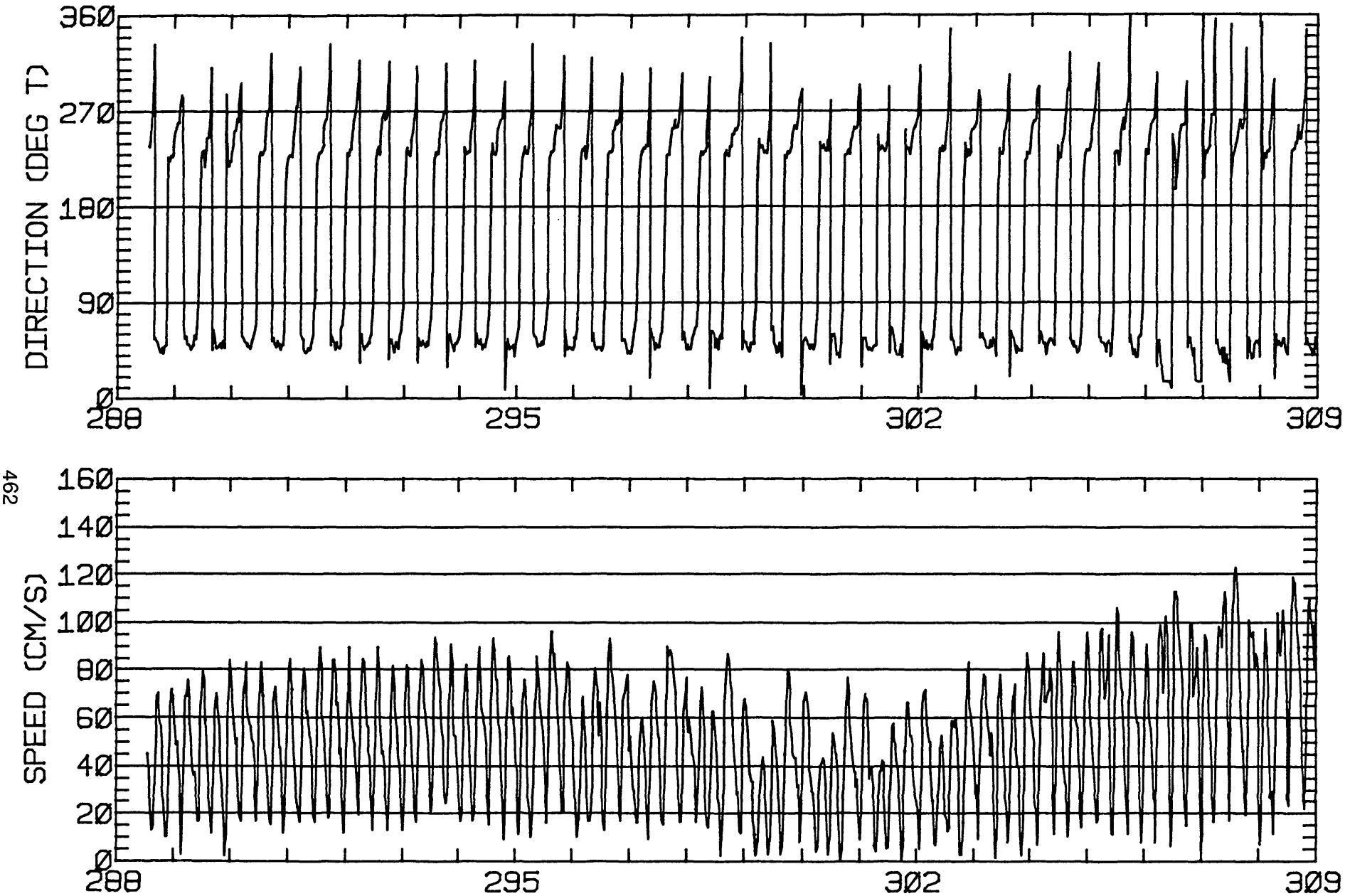
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.12	3.16	73.5	31.5	CLOCKWISE
K1	17.11	2.30	65.1	24.7	CLOCKWISE
N2	12.78	0.82	49.6	245.8	ANTI-CLOCKWISE
M2	67.17	5.83	56.0	281.4	CLOCKWISE
S2	20.79	3.49	55.6	280.1	CLOCKWISE
M4	6.27	3.05	144.2	102.8	CLOCKWISE

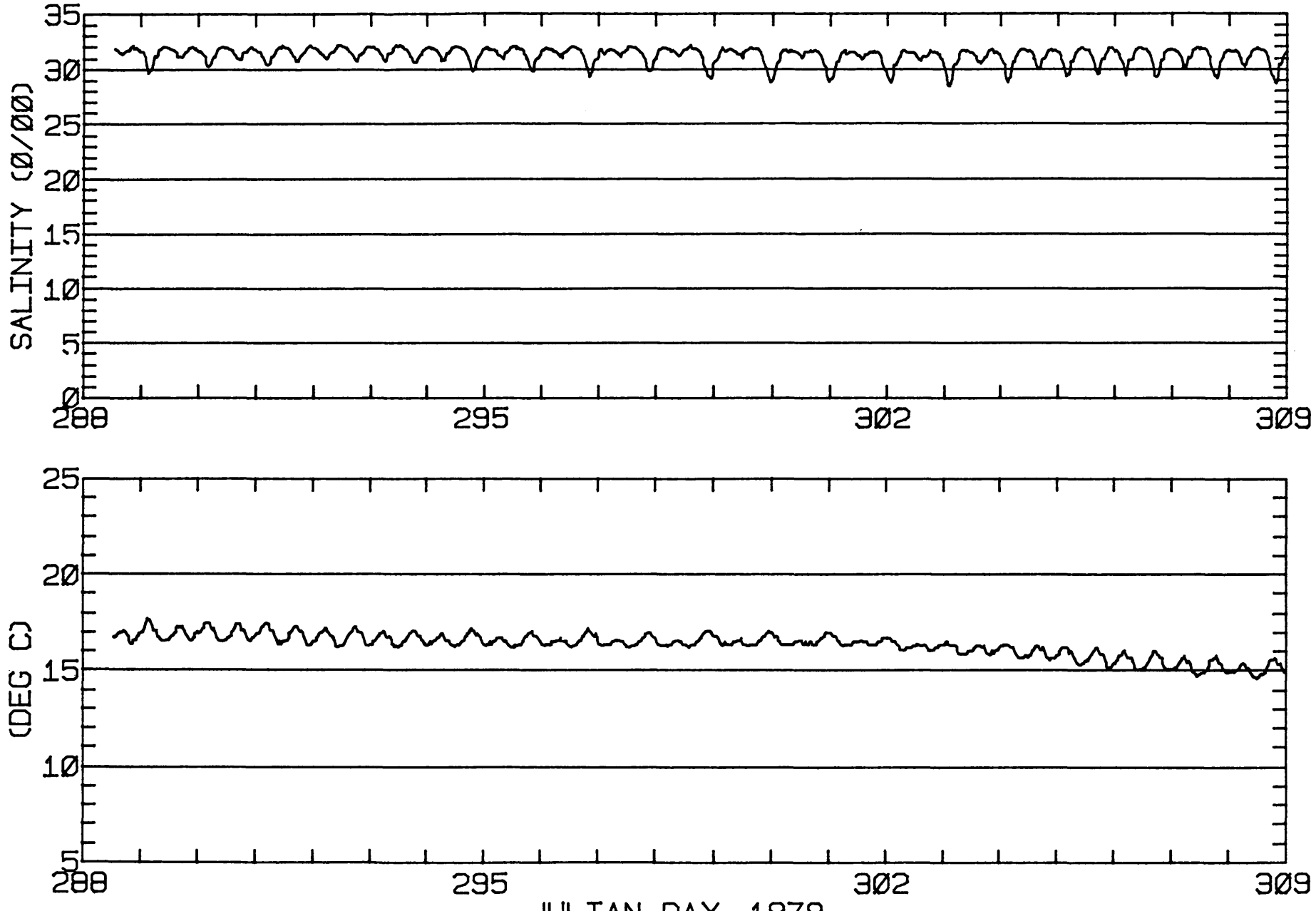
RMS SPEED: 57.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 115.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 58.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 10.54 CM/SEC
STANDARD DEVIATION V SERIES: 12.22 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.4	5.6	190.
2	12	-2.8	3.7	250.
3	12	-1.3	8.9	338.
4	4	-0.6	14.0	211.
ALL	40	-1.7	6.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-22N 122-26-25W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-22N 122-26-25W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'22"N 122 26'25"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 21.3 M (BELOW MLLW)
START TIME OF SERIES:10/15/79 1314 PST JULIAN DAY=288
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

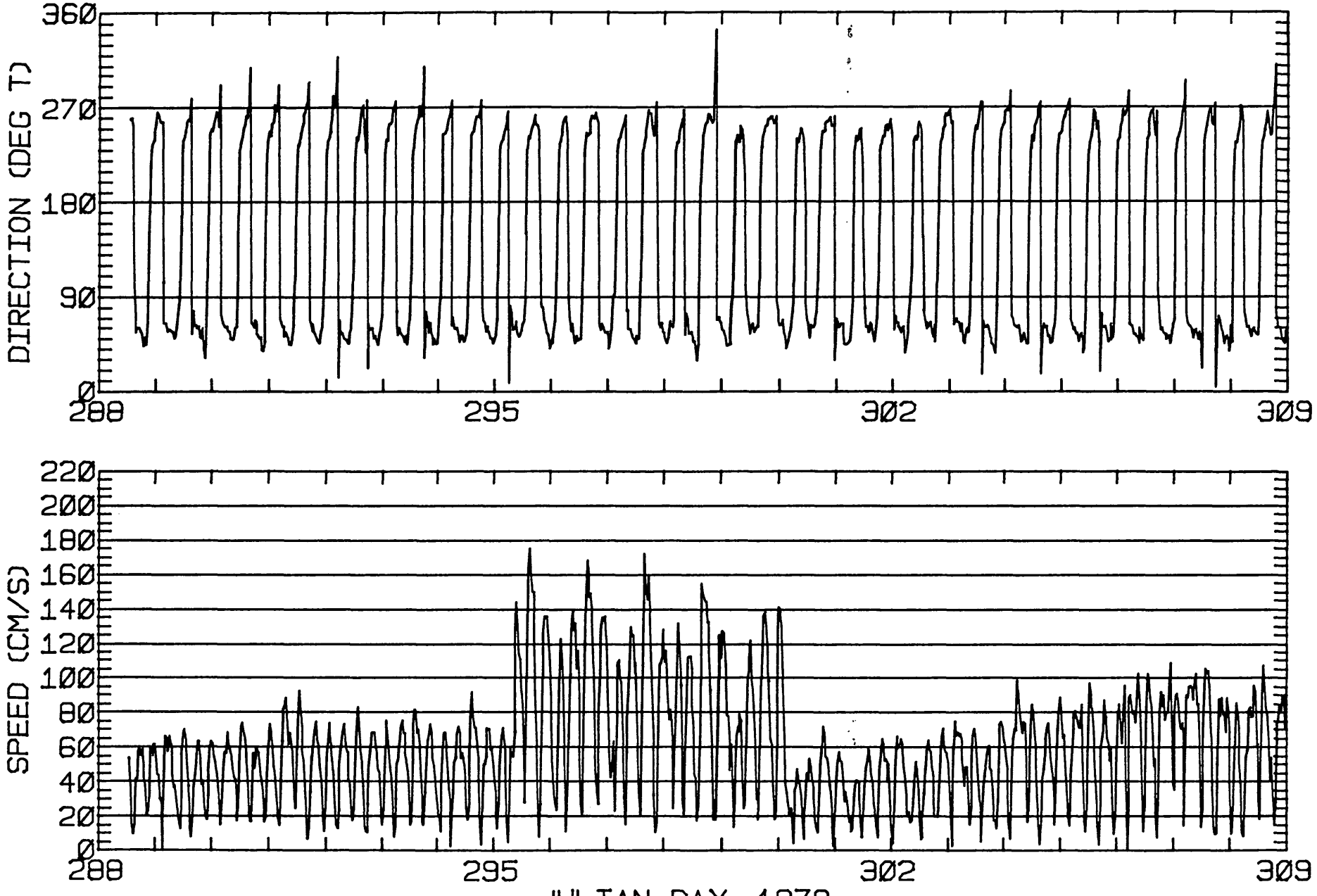
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.48	1.78	75.6	25.0	CLOCKWISE
K1	21.91	1.46	70.0	20.2	CLOCKWISE
N2	13.67	1.10	65.5	283.3	ANTI-CLOCKWISE
M2	75.08	2.55	64.1	272.9	CLOCKWISE
S2	28.70	1.16	64.0	305.6	CLOCKWISE
M4	11.28	3.33	107.7	42.8	CLOCKWISE

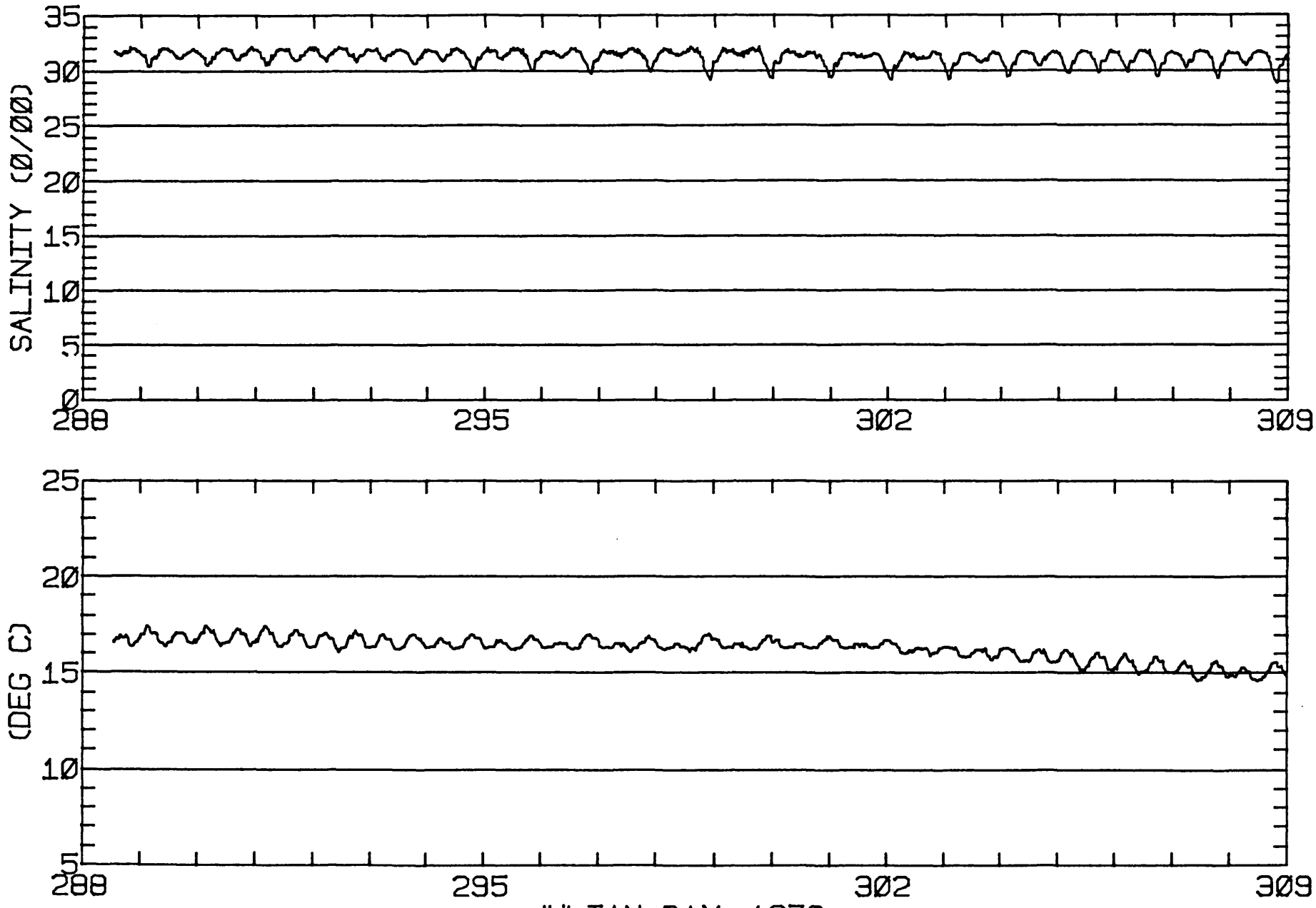
RMS SPEED: 68.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 141.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 40.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 66.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 19.39 CM/SEC
STANDARD DEVIATION V SERIES: 12.86 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	7.9	190.
2	12	2.3	8.7	250.
3	12	4.4	8.6	338.
4	4	9.1	14.7	211.
ALL	40	3.5	9.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-22N 122-26-25W
METER 007.7 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-22N 122-26-25W
METER ØØ7.7 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'18"N 122 26'31"W
METER TYPE: AANDERAA
WATER DEPTH: 31.4 M (MLLW)
METER DEPTH: 8.5 M (BELOW MLLW)
START TIME OF SERIES: 4/ 1/80 1850 PST JULIAN DAY= 92
APPROXIMATE RECORD LENGTH IS 44 M2-CYCLES

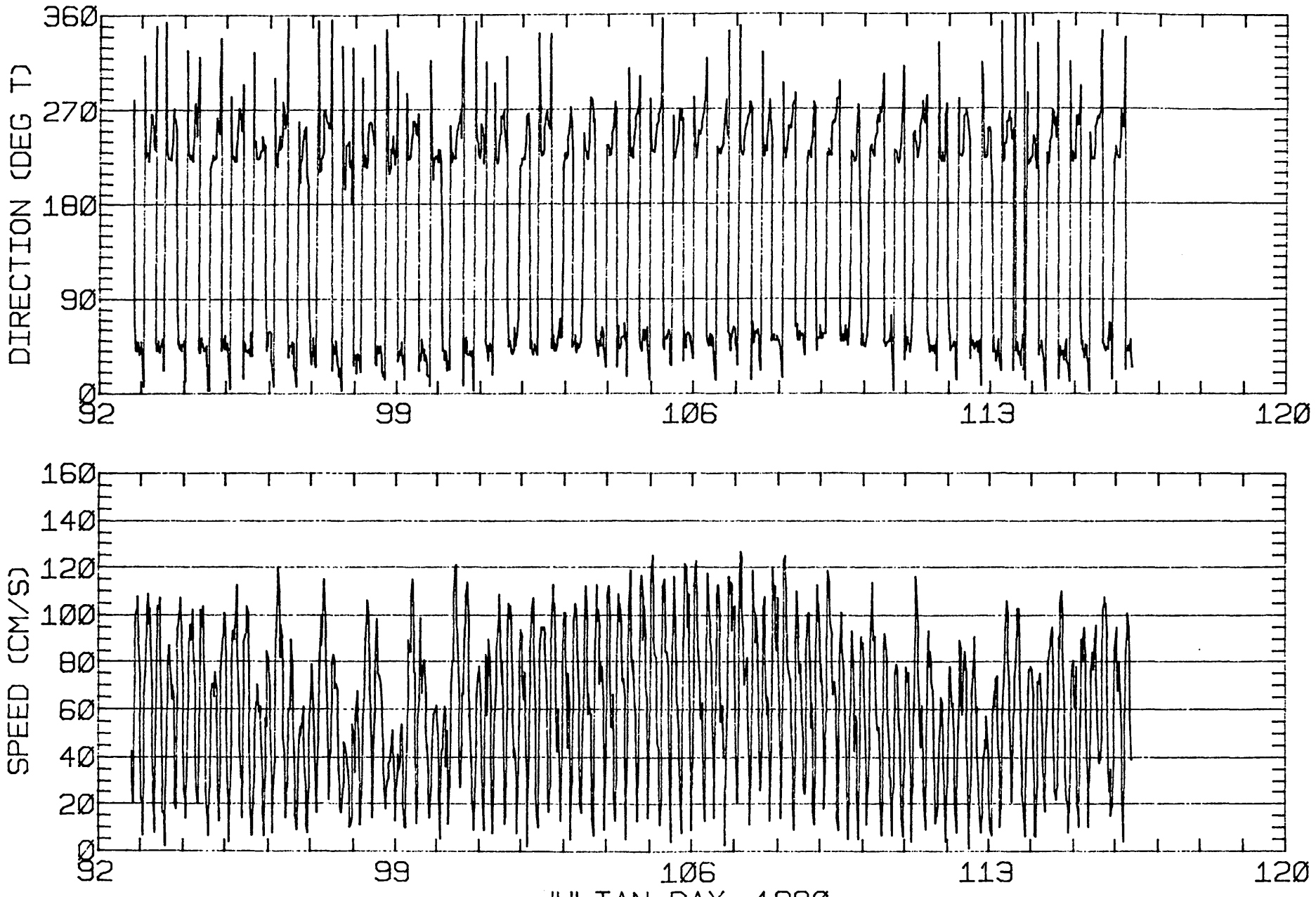
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.94	5.34	79.2	23.6	CLOCKWISE
K1	16.62	4.98	61.9	20.1	CLOCKWISE
N2	18.39	0.34	60.4	268.7	ANTI-CLOCKWISE
M2	80.01	7.48	54.0	280.5	CLOCKWISE
S2	15.70	3.56	62.4	281.7	CLOCKWISE
M4	7.29	3.71	162.3	83.7	ANTI-CLOCKWISE

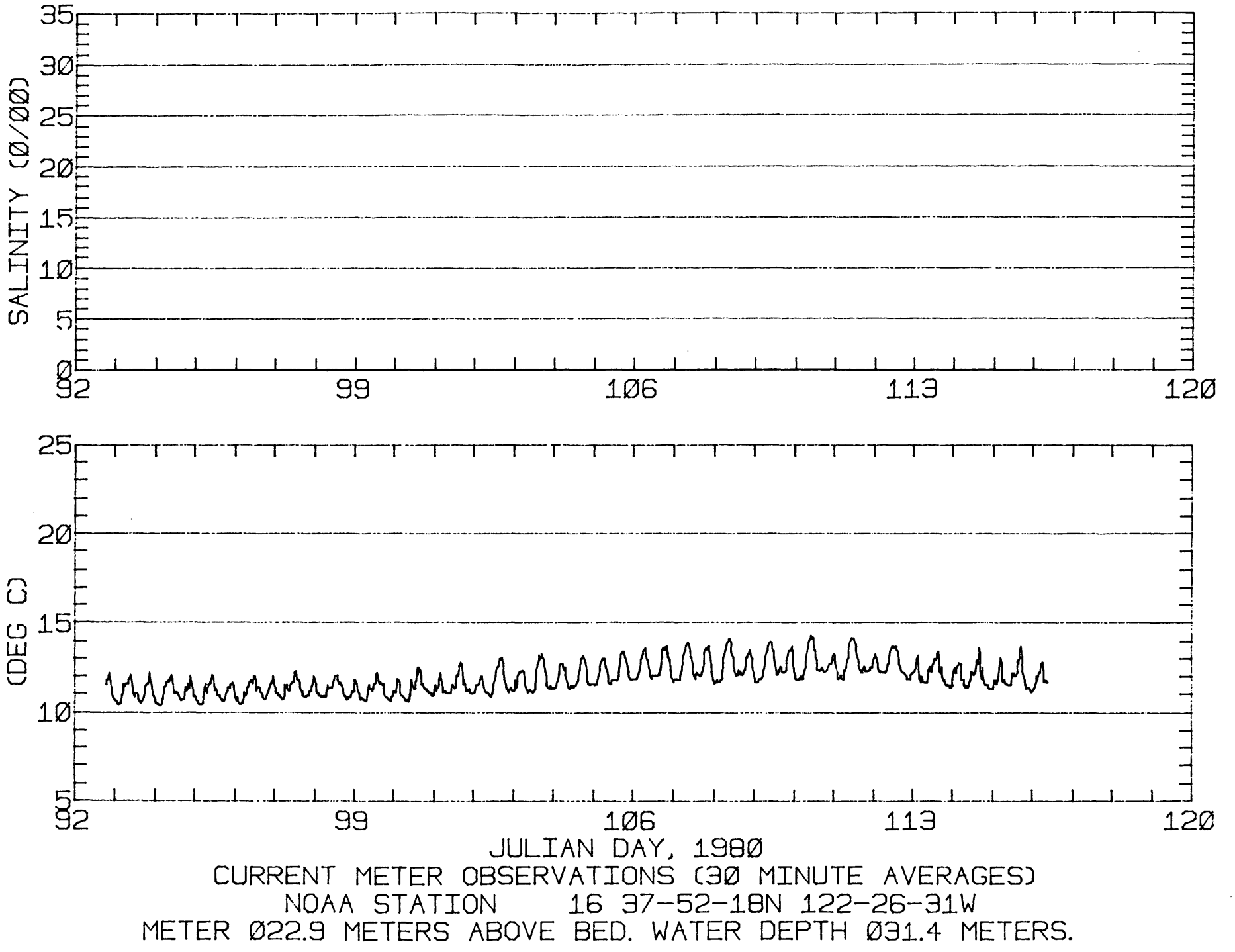
RMS SPEED: 68.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 121.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 56.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 58.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 14.12 CM/SEC
STANDARD DEVIATION V SERIES: 17.14 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.4	7.0	1048.
2	12	-6.7	7.3	981.
3	12	-5.1	5.7	725.
4	8	-5.6	8.8	664.
ALL	44	-6.5	7.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-18N 122-26-31W
METER 022.9 METERS ABOVE BED. WATER DEPTH 031.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-18N 122-26-31W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø31.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'18"N 122 26'31"W
METER TYPE: AANDERAA
WATER DEPTH: 31.4 M (MLLW)
METER DEPTH: 14.6 M (BELOW MLLW)
START TIME OF SERIES: 4/ 1/80 1842 PST JULIAN DAY= 92
APPROXIMATE RECORD LENGTH IS 44 M2-CYCLES

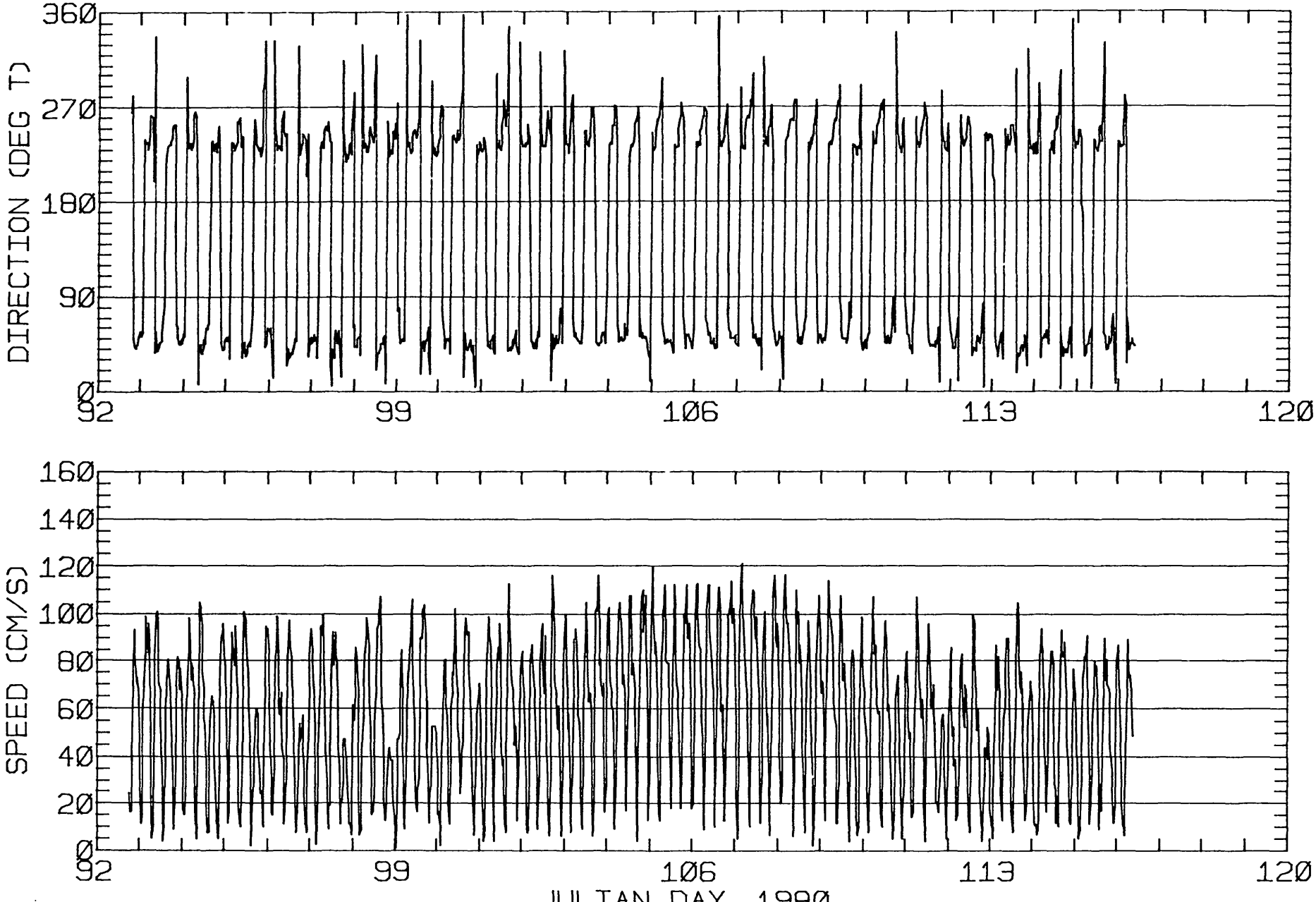
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.79	5.32	70.2	26.1	CLOCKWISE
K1	15.35	3.09	59.0	15.8	CLOCKWISE
N2	16.91	0.56	59.8	268.5	ANTI-CLOCKWISE
M2	78.99	4.83	54.7	279.9	CLOCKWISE
S2	15.28	2.42	63.0	277.4	CLOCKWISE
M4	4.96	0.28	161.7	62.1	ANTI-CLOCKWISE

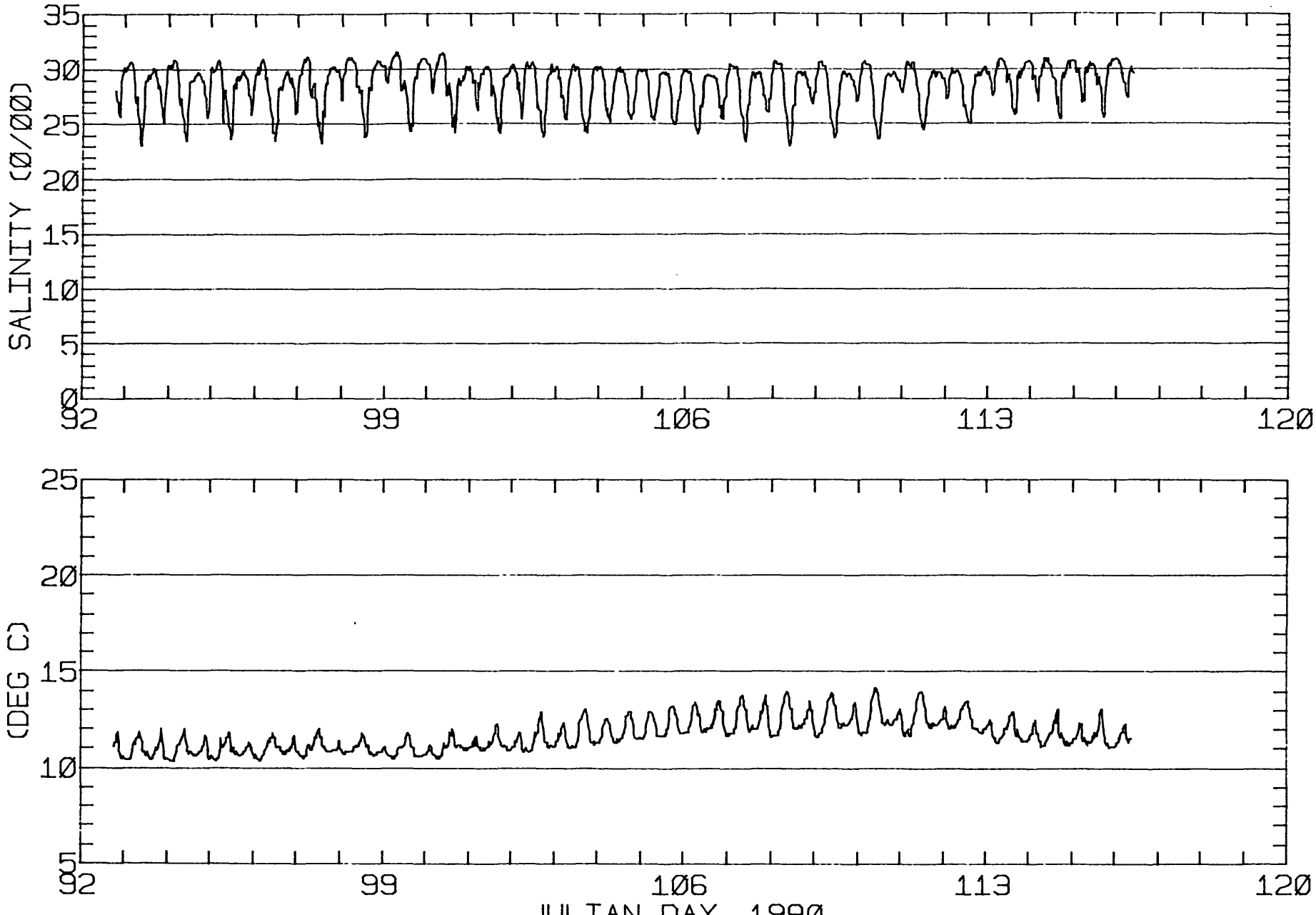
RMS SPEED: 65.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 118.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 57.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 57.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 11.95 CM/SEC
STANDARD DEVIATION V SERIES: 13.64 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.6	8.1	1048.
2	12	-1.2	8.9	981.
3	12	-1.5	9.5	725.
4	8	1.1	9.4	664.
ALL	44	-0.7	8.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-18N 122-26-31W
METER 016.8 METERS ABOVE BED. WATER DEPTH 031.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-18N 122-26-31W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø31.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'18"N 122 26'31"W
METER TYPE: AANDERAA
WATER DEPTH: 31.4 M (MLLW)
METER DEPTH: 23.8 M (BELOW MLLW)
START TIME OF SERIES: 4/ 1/80 1844 PST JULIAN DAY= 92
APPROXIMATE RECORD LENGTH IS 44 M2-CYCLES

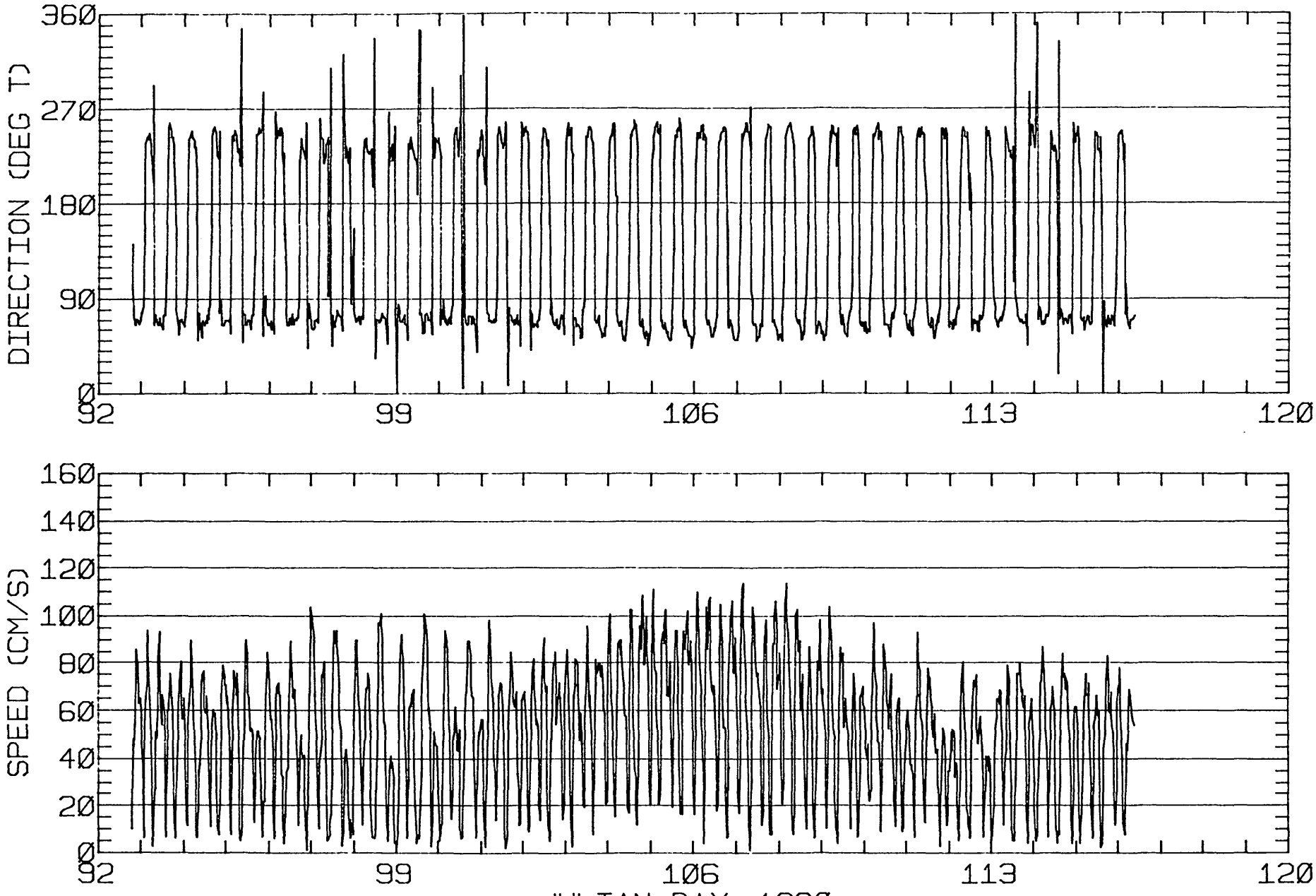
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.60	0.20	65.8	13.6	ANTI-CLOCKWISE
K1	12.56	0.98	65.6	7.1	ANTI-CLOCKWISE
N2	13.65	0.17	61.1	259.0	ANTI-CLOCKWISE
M2	70.78	1.16	65.0	276.4	ANTI-CLOCKWISE
S2	14.89	1.11	63.9	265.4	ANTI-CLOCKWISE
M4	6.73	1.11	83.0	4.3	CLOCKWISE

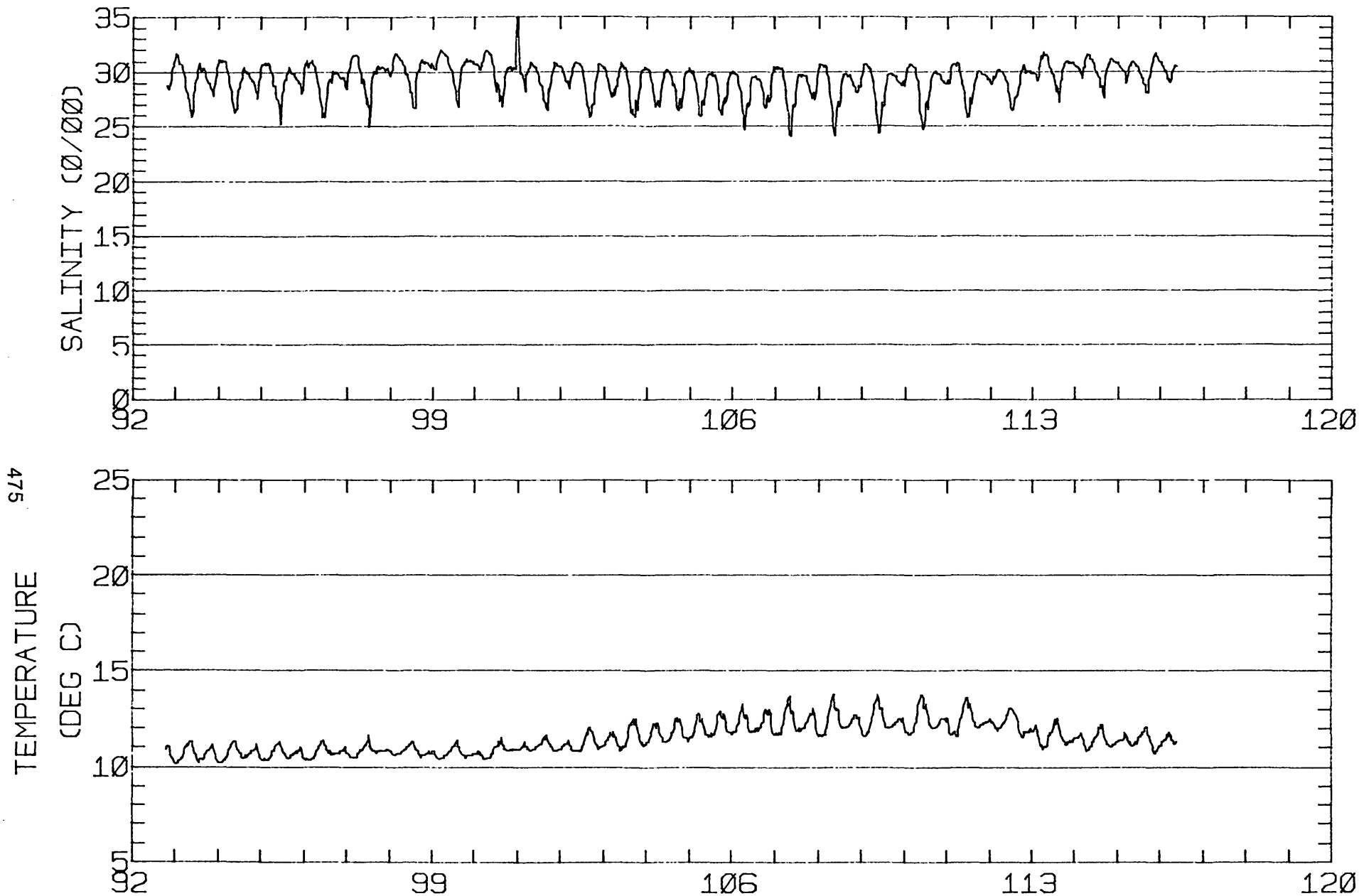
RMS SPEED: 59.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 105.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 50.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 15.80 CM/SEC
STANDARD DEVIATION V SERIES: 8.83 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	14.2	1.6	1048.
2	12	12.4	3.5	981.
3	12	8.7	5.9	725.
4	8	13.9	2.1	664.
ALL	44	12.2	3.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-18N 122-26-31W
METER 007.6 METERS ABOVE BED. WATER DEPTH 031.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-18N 122-26-31W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø31.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'23"N 122 26'31"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 4/25/80 1030 PST JULIAN DAY=116
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

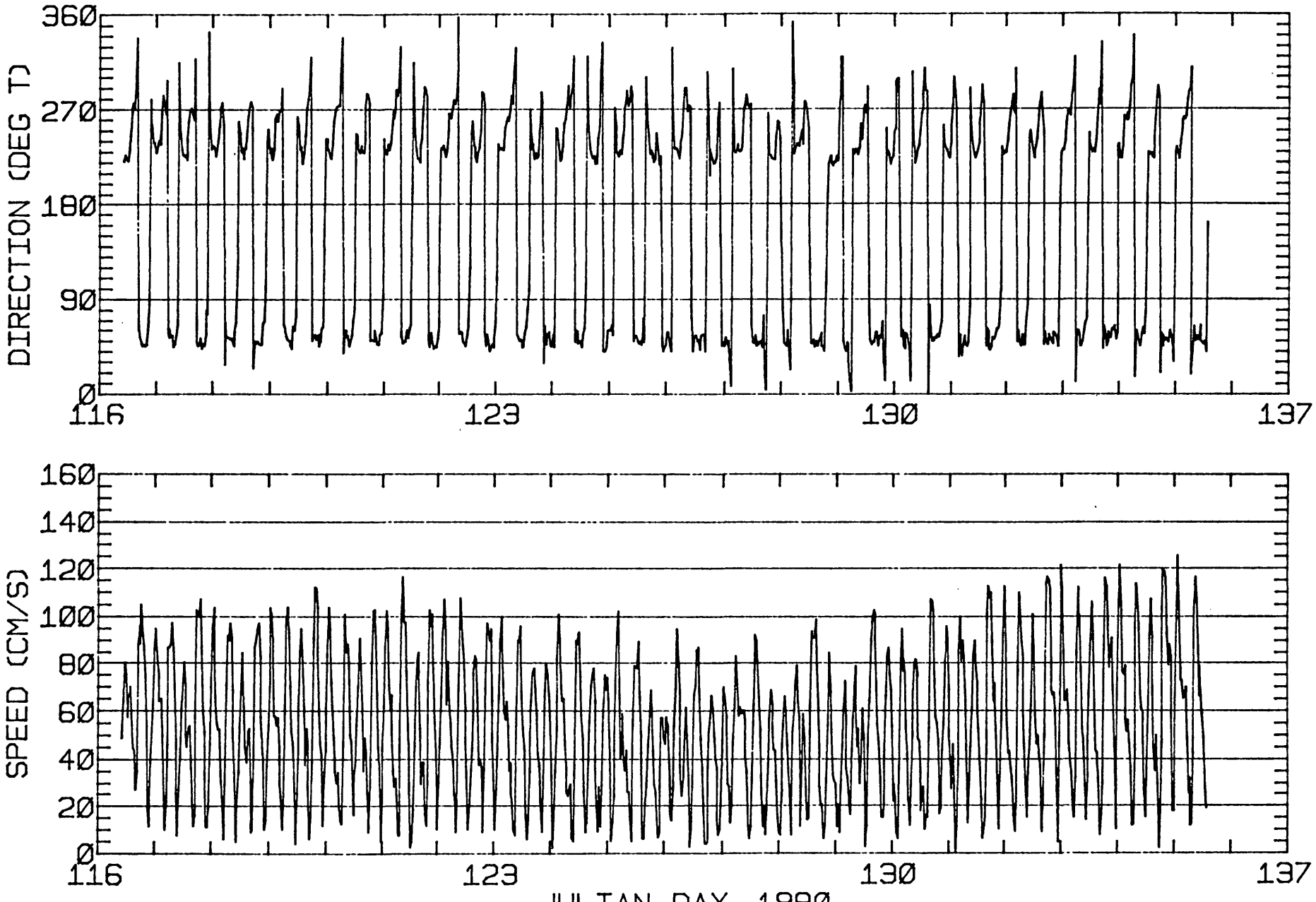
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.18	4.27	48.6	319.9	CLOCKWISE
K1	15.37	3.33	67.1	5.3	CLOCKWISE
N2	12.55	0.68	59.8	232.0	CLOCKWISE
M2	74.82	8.11	55.7	270.9	CLOCKWISE
S2	18.29	3.21	60.7	265.6	CLOCKWISE
M4	10.13	5.40	42.3	222.0	ANTI-CLOCKWISE

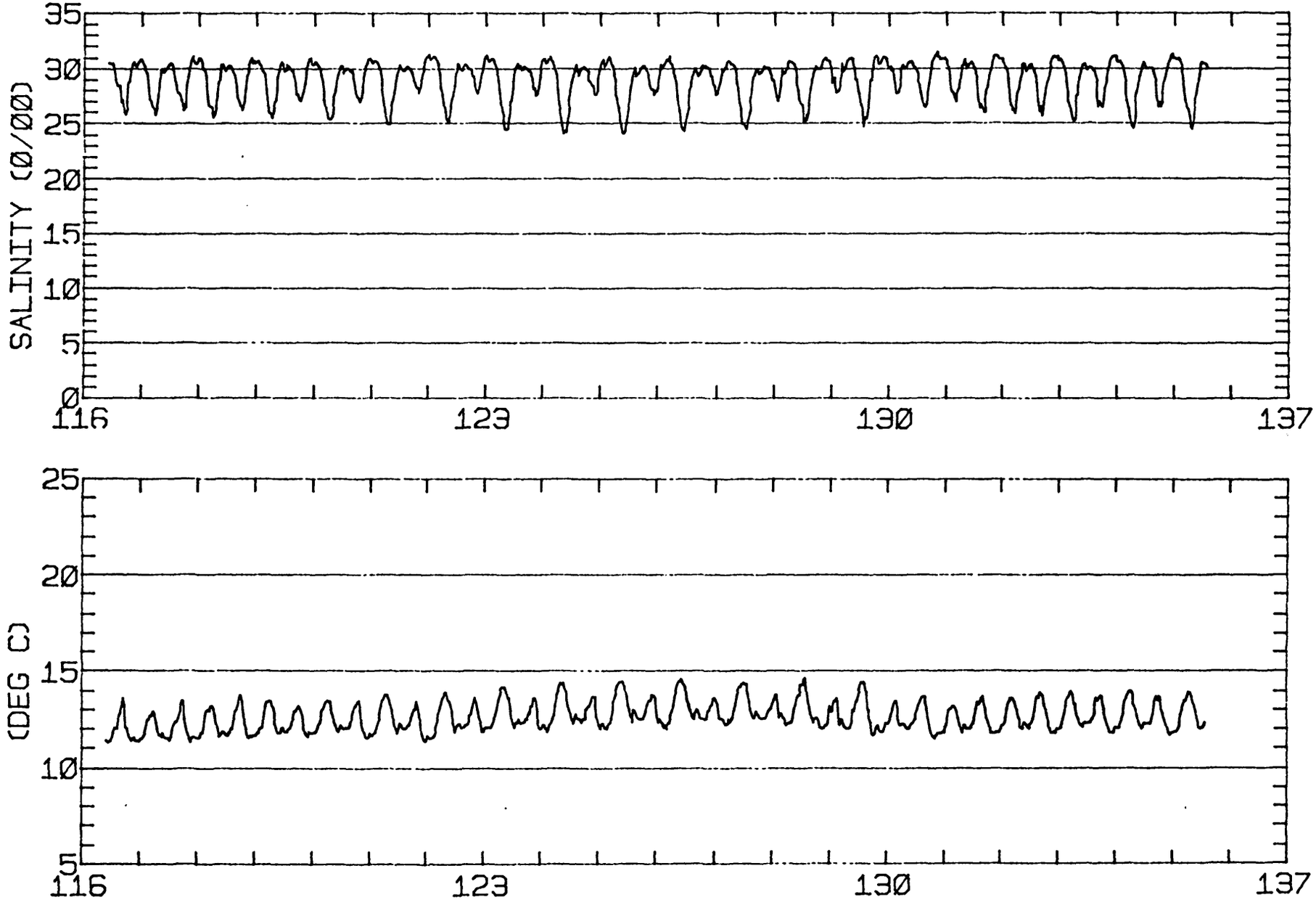
RMS SPEED: 61.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 113.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 46.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 57.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.22
STANDARD DEVIATION U-SERIES: 12.88 CM/SEC
STANDARD DEVIATION V SERIES: 14.86 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.4	5.0	628.
2	12	-4.0	3.6	551.
3	12	0.5	6.4	629.
ALL	36	-2.3	5.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-31W
METER 022.9 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-31W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'23"N 122 26'31"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 4/25/80 1032 PST JULIAN DAY=116
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

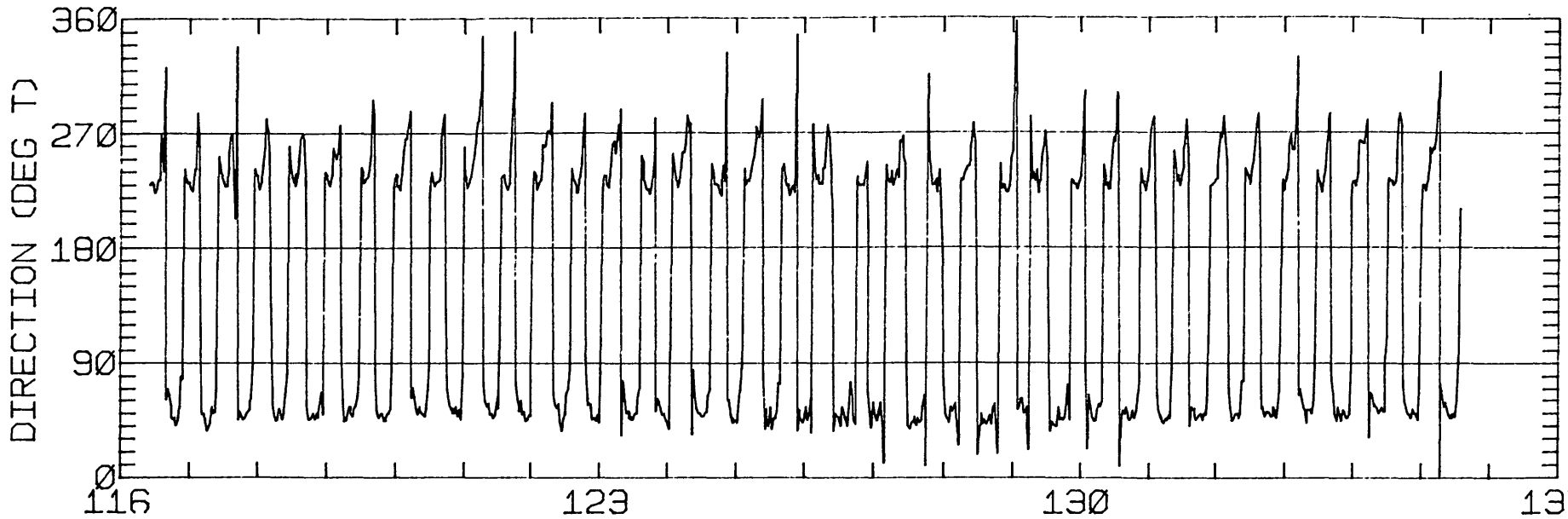
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

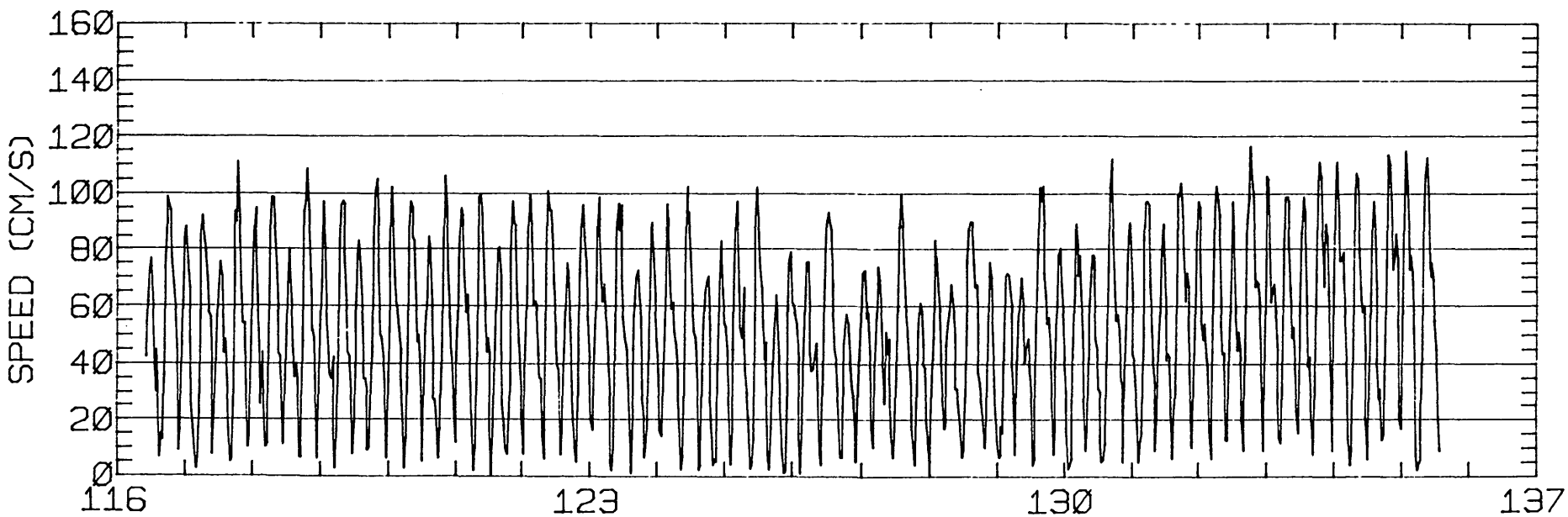
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.10	4.20	70.1	356.4	CLOCKWISE
K1	15.19	2.63	63.4	3.3	CLOCKWISE
N2	12.49	0.76	57.0	237.5	CLOCKWISE
M2	73.71	4.49	54.5	269.5	CLOCKWISE
S2	17.28	1.64	60.4	267.2	CLOCKWISE
M4	5.35	1.01	176.2	61.4	ANTI-CLOCKWISE

RMS SPEED: 59.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 112.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 57.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 11.28 CM/SEC
STANDARD DEVIATION V SERIES: 13.18 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.9	6.6	628.
2	12	2.0	6.6	551.
3	12	4.0	8.8	629.
ALL	36	2.7	7.4	



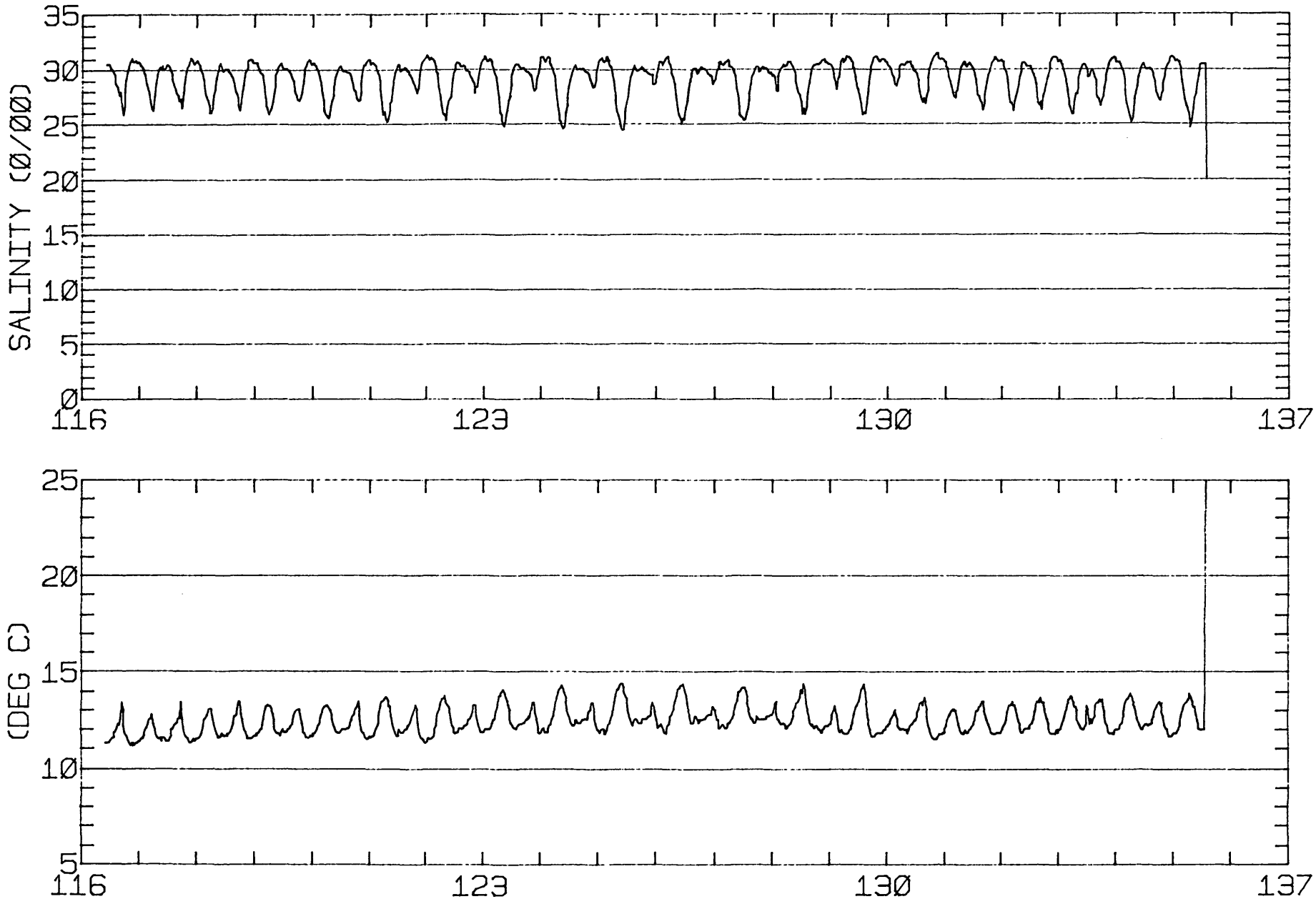


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 16 37-52-23N 122-26-31W

METER 016.8 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-31W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'23"N 122 26'31"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 21.7 M (BELOW MLLW)
START TIME OF SERIES: 4/25/80 1034 PST JULIAN DAY=116
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

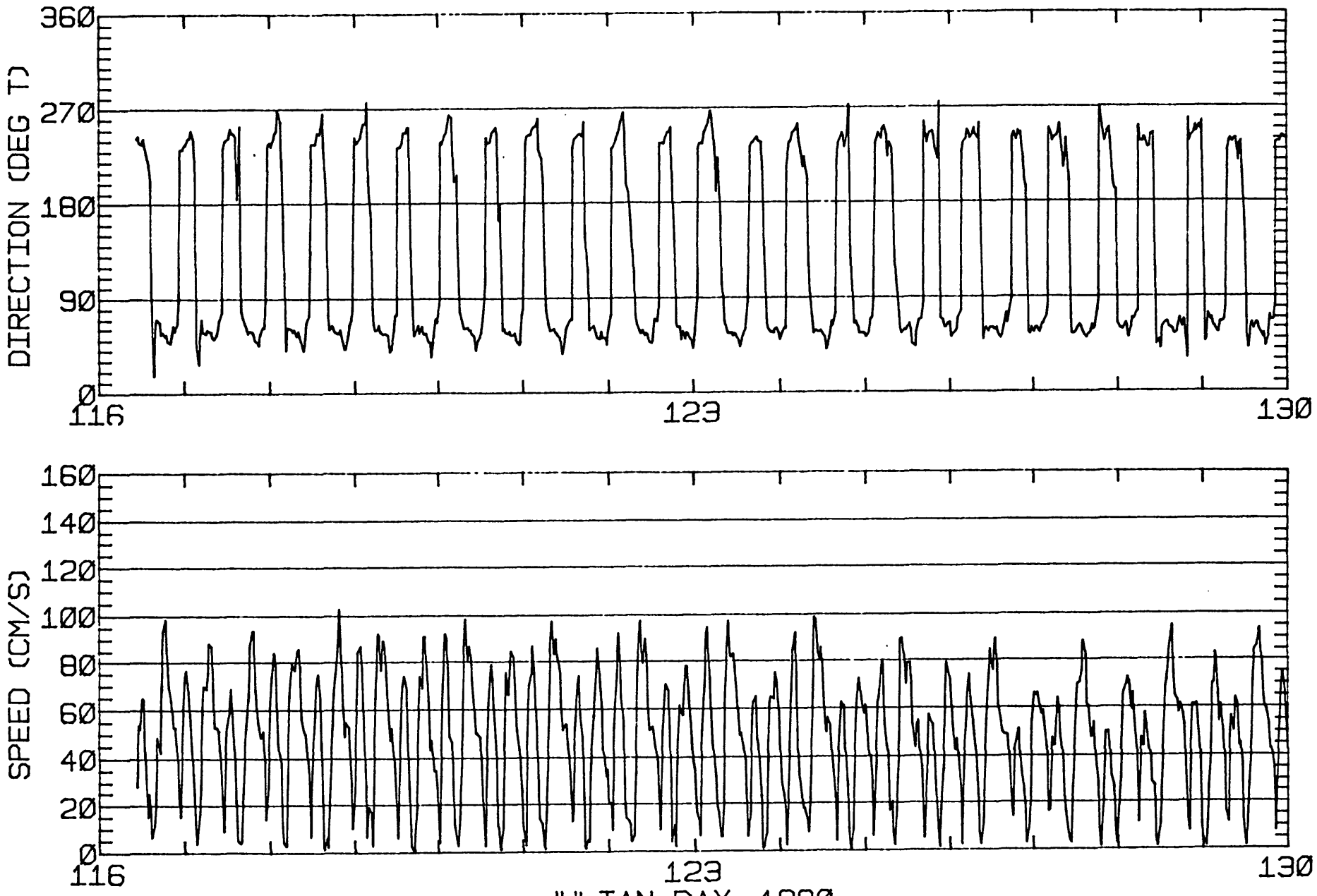
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.51	0.87	58.5	347.3	CLOCKWISE
K1	13.17	0.56	61.5	338.0	ANTI-CLOCKWISE
N2	17.76	0.95	61.6	247.9	CLOCKWISE
M2	71.09	0.56	59.7	273.8	ANTI-CLOCKWISE
S2	18.56	0.74	62.1	256.5	ANTI-CLOCKWISE
M4	6.67	0.47	86.5	15.8	CLOCKWISE

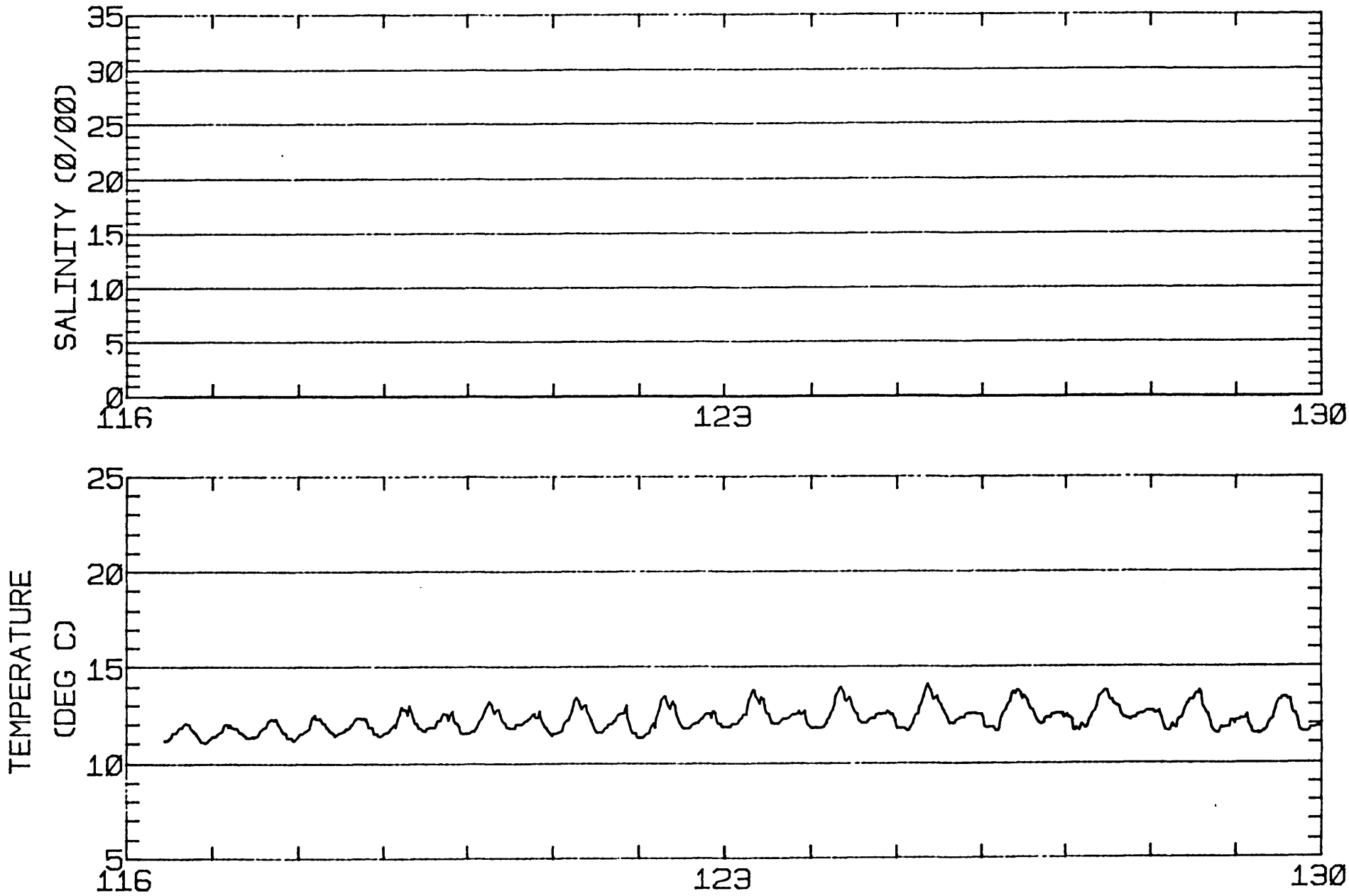
RMS SPEED: 54.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 112.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.25
STANDARD DEVIATION U-SERIES: 14.25 CM/SEC
STANDARD DEVIATION V SERIES: 7.93 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	12.1	9.5	628.
2	12	12.7	8.0	551.
3	2	13.8	7.5	526.
ALL	26	12.5	8.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-31W
METER 007.5 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-31W
METER Ø07.5 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'10"N 122 26'40"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 5/14/80 1540 PST JULIAN DAY=135
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

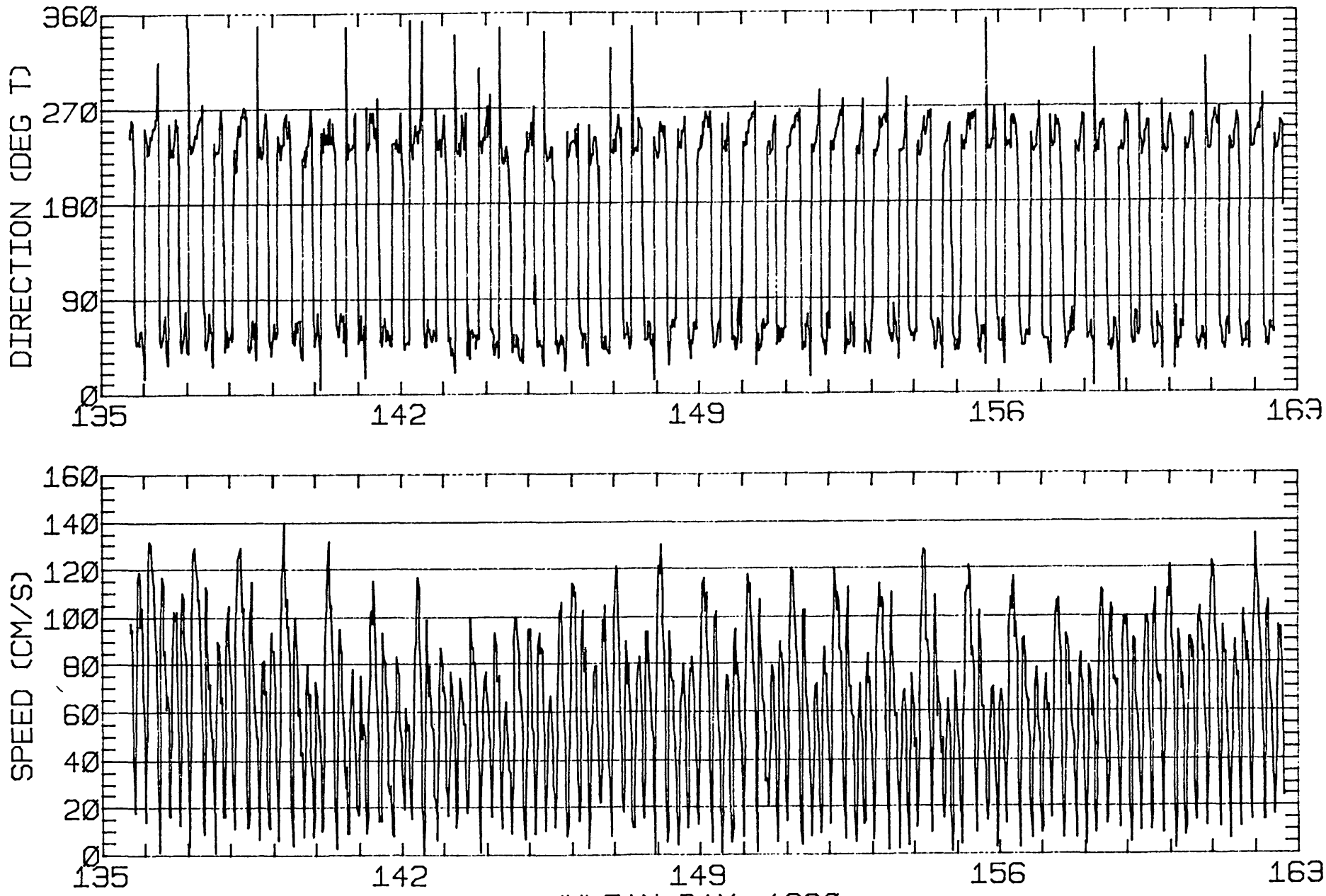
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.67	2.00	74.7	44.5	CLOCKWISE
K1	28.94	2.68	66.2	31.0	CLOCKWISE
N2	13.75	2.46	53.2	246.1	CLOCKWISE
M2	85.71	5.87	58.7	287.9	CLOCKWISE
S2	12.86	4.50	50.5	265.6	CLOCKWISE
M4	4.74	2.63	95.1	129.0	ANTI-CLOCKWISE

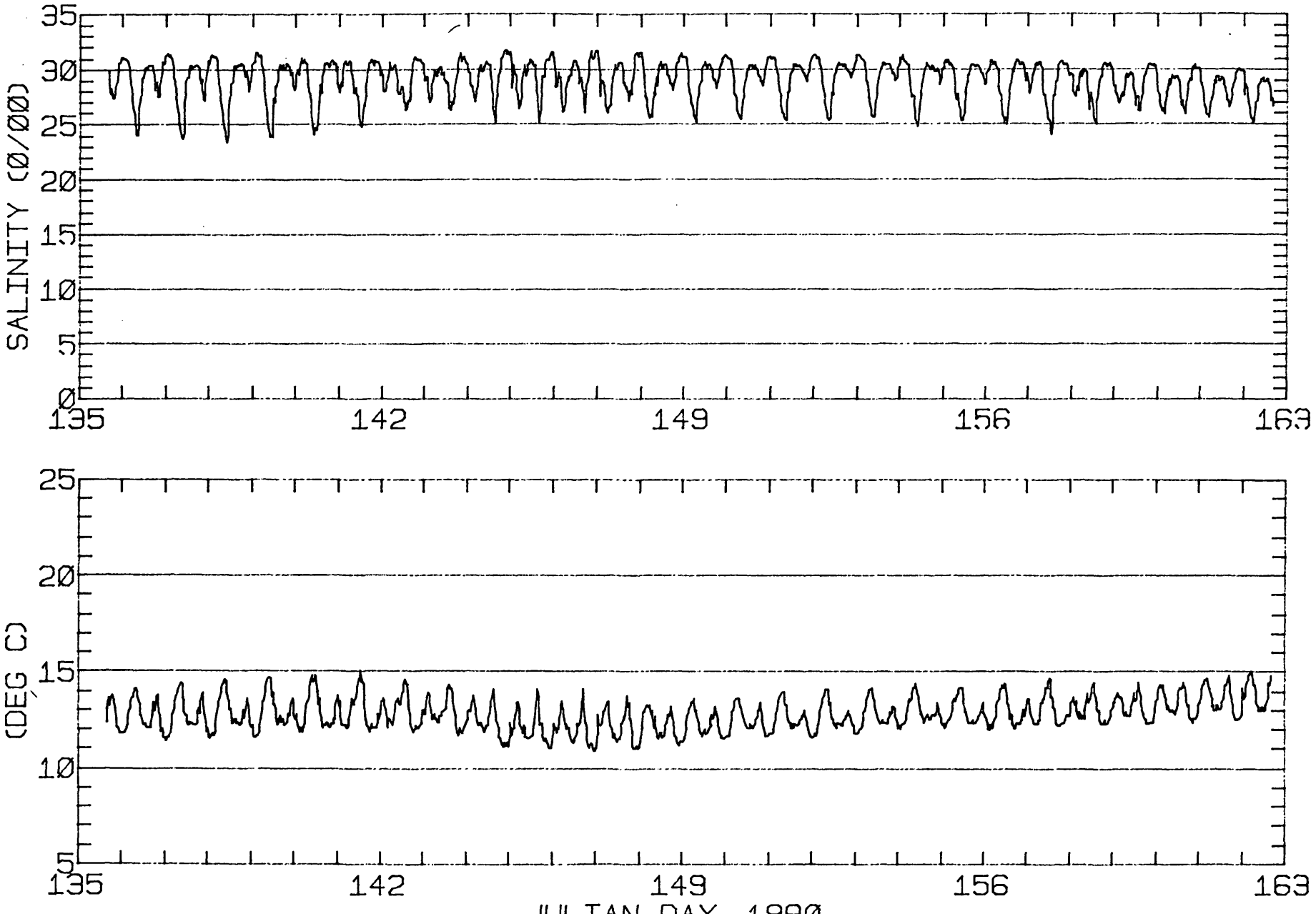
RMS SPEED: 69.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 139.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 55.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 12.71 CM/SEC
STANDARD DEVIATION V SERIES: 15.48 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-10.9	-0.4	695.
2	12	-2.6	2.8	583.
3	12	-10.9	0.2	453.
4	12	-7.7	1.7	403.
5	4	-8.8	3.8	392.
ALL	52	-8.1	1.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-10N 122-26-40W
METER 022.9 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-10N 122-26-40W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'10"N 122 26'40"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 5/14/80 1532 PST JULIAN DAY=135
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

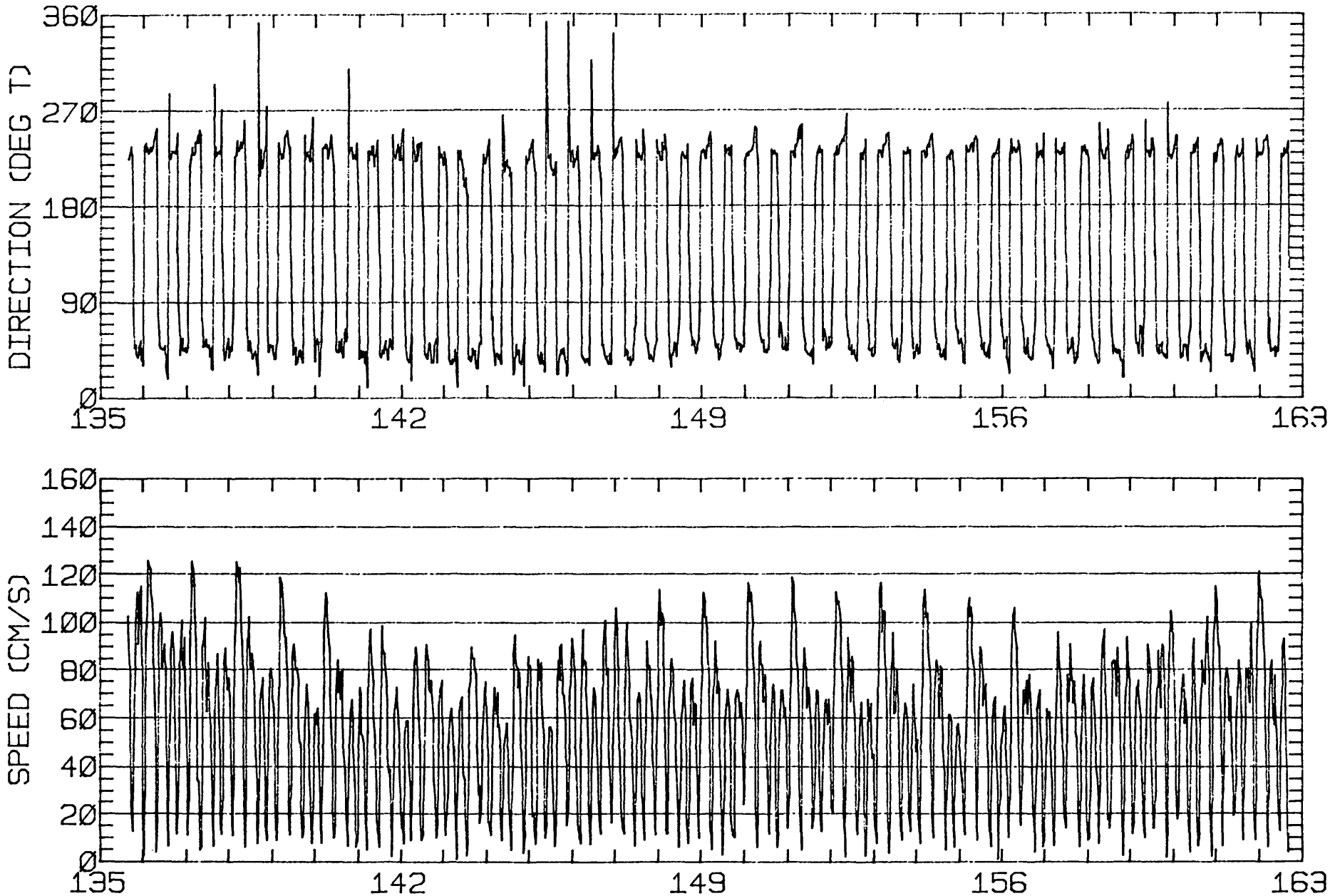
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.82	2.75	57.1	25.2	CLOCKWISE
K1	27.53	1.09	52.0	22.0	CLOCKWISE
N2	12.55	1.66	50.4	244.7	CLOCKWISE
M2	80.88	2.06	48.8	285.3	ANTI-CLOCKWISE
S2	13.99	3.07	53.7	275.2	CLOCKWISE
M4	5.52	2.56	92.9	60.7	CLOCKWISE

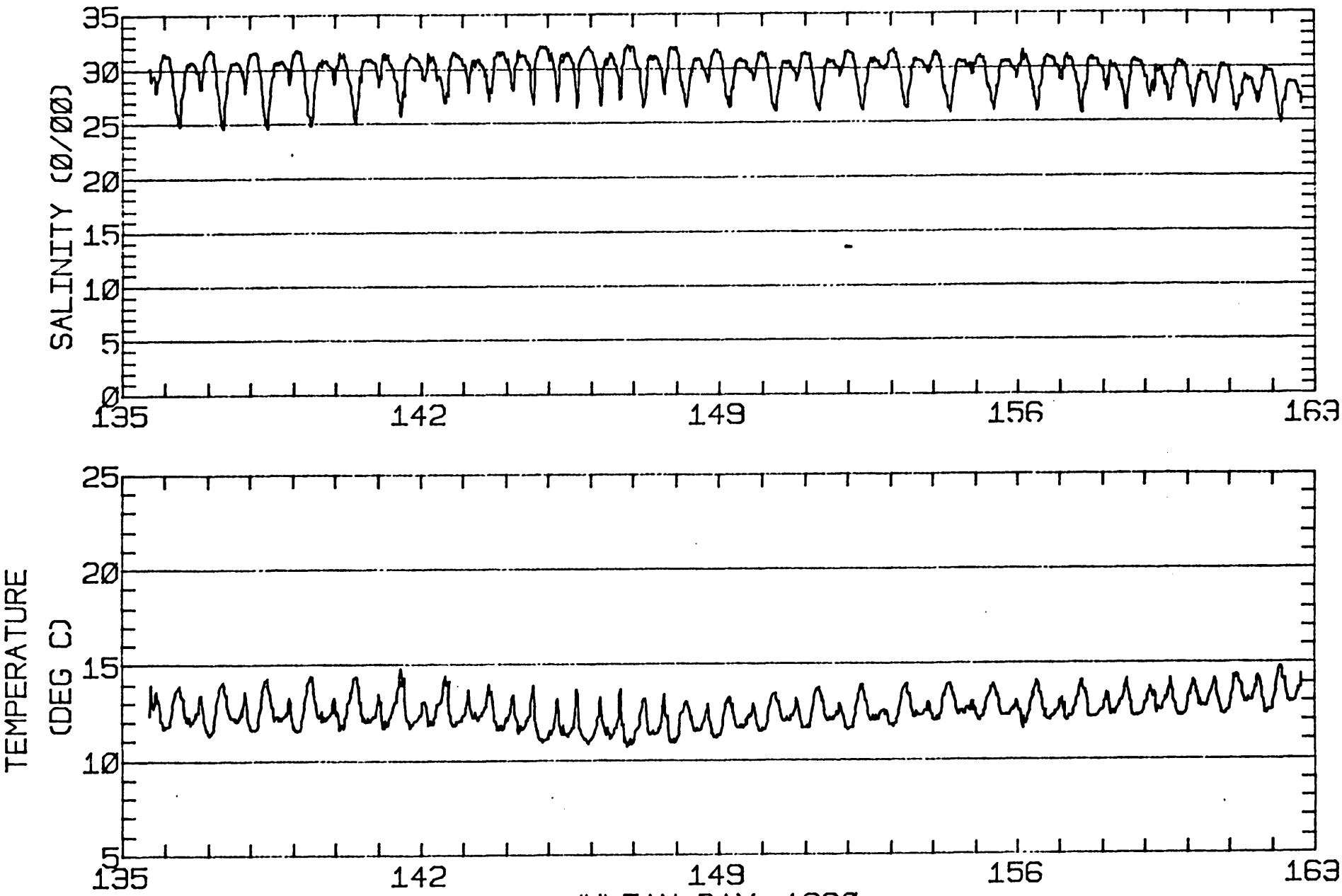
RMS SPEED: 64.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 133.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 50.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 50.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 11.19 CM/SEC
STANDARD DEVIATION V SERIES: 11.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.5	3.5	695.
2	12	1.7	6.2	583.
3	12	-3.9	-0.6	453.
4	12	0.9	3.3	403.
5	4	-2.3	4.0	392.
ALL	52	-1.1	3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-10N 122-26-40W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-10N 122-26-40W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'24"N 122 26'25"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 6/12/80 1942 PST JULIAN DAY=164
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

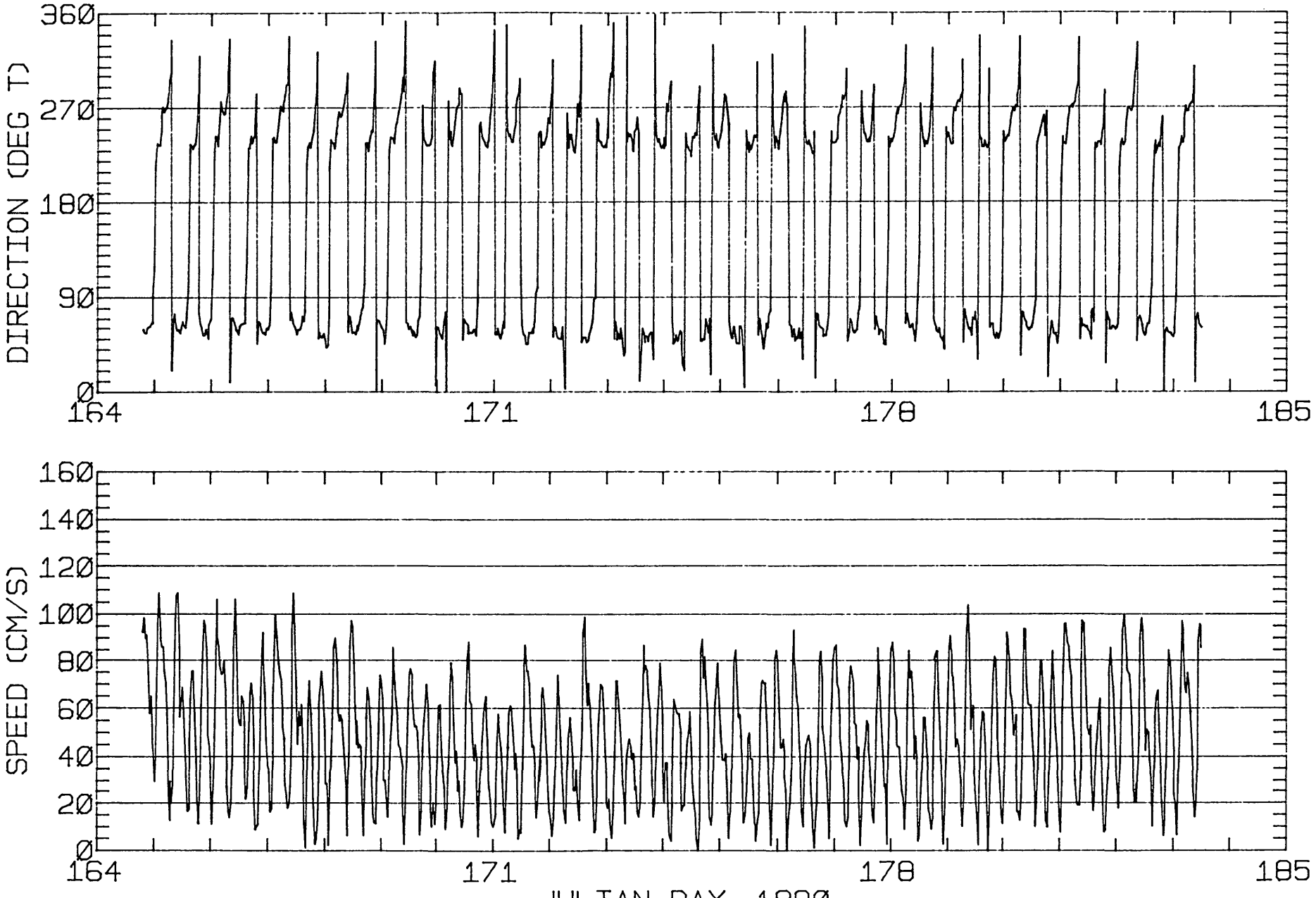
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.46	1.62	90.0	33.3	CLOCKWISE
K1	20.98	4.14	72.5	24.3	CLOCKWISE
N2	9.43	3.69	75.9	252.5	CLOCKWISE
M2	67.21	5.44	63.8	282.6	CLOCKWISE
S2	7.56	3.71	69.7	260.4	CLOCKWISE
M4	4.18	1.16	13.0	259.6	ANTI-CLOCKWISE

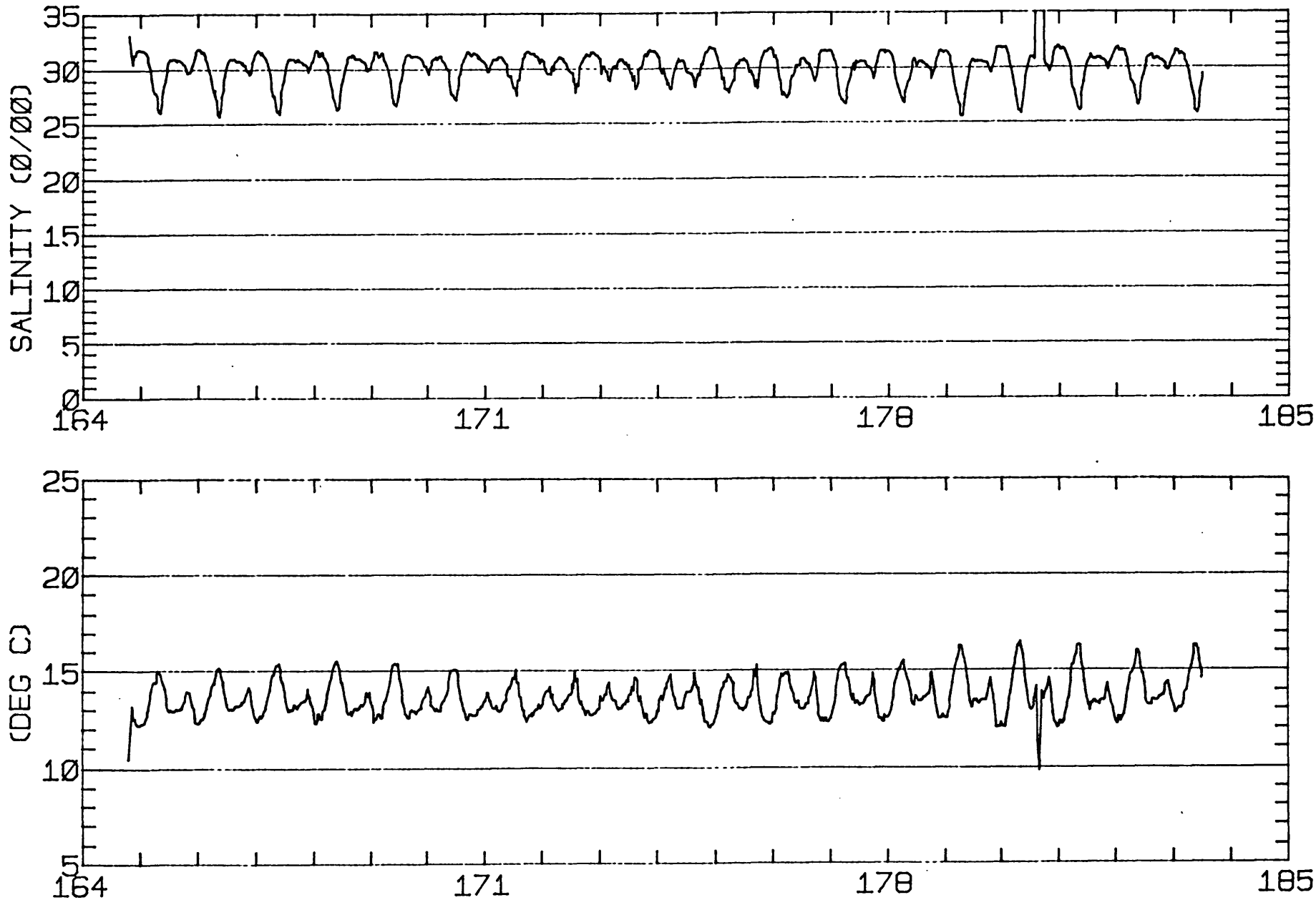
RMS SPEED: 53.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 104.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 68.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 12.43 CM/SEC
STANDARD DEVIATION V SERIES: 11.88 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.2	5.7	397.
2	12	0.8	5.5	446.
3	10	-1.0	4.7	447.
ALL	34	0.4	5.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-25W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-25W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'25"N 122 26'22"W
METER TYPE: AANDERAA
WATER DEPTH: 29.6 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 7/19/80 1810 PST JULIAN DAY=201
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

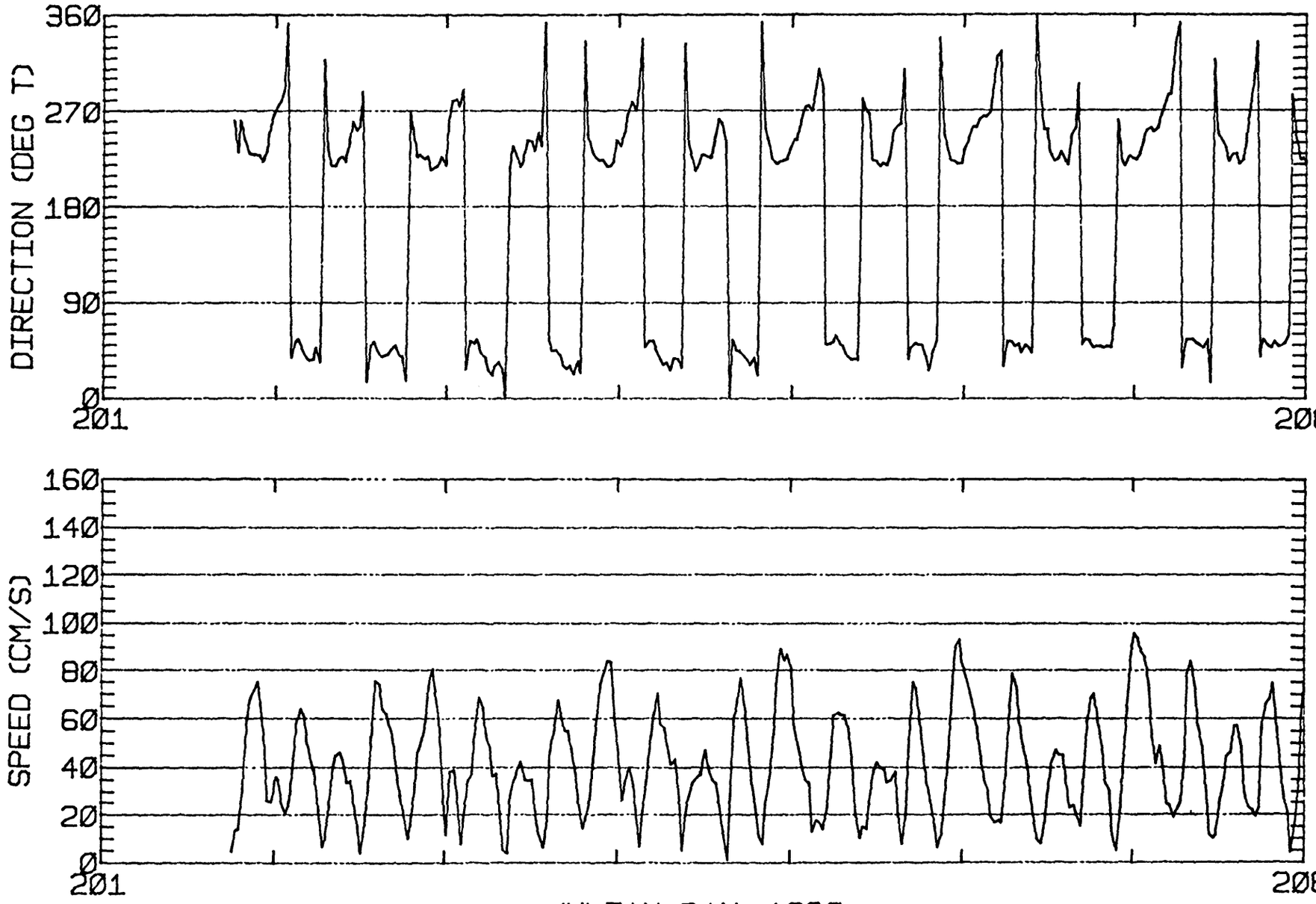
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.33	0.84	73.8	42.7	CLOCKWISE
K1	17.70	4.61	52.4	29.0	CLOCKWISE
N2	11.40	8.82	39.0	194.2	CLOCKWISE
M2	70.44	12.30	52.9	275.5	CLOCKWISE
S2	9.72	3.78	69.0	297.4	CLOCKWISE
M4	5.67	3.85	142.8	161.7	ANTI-CLOCKWISE

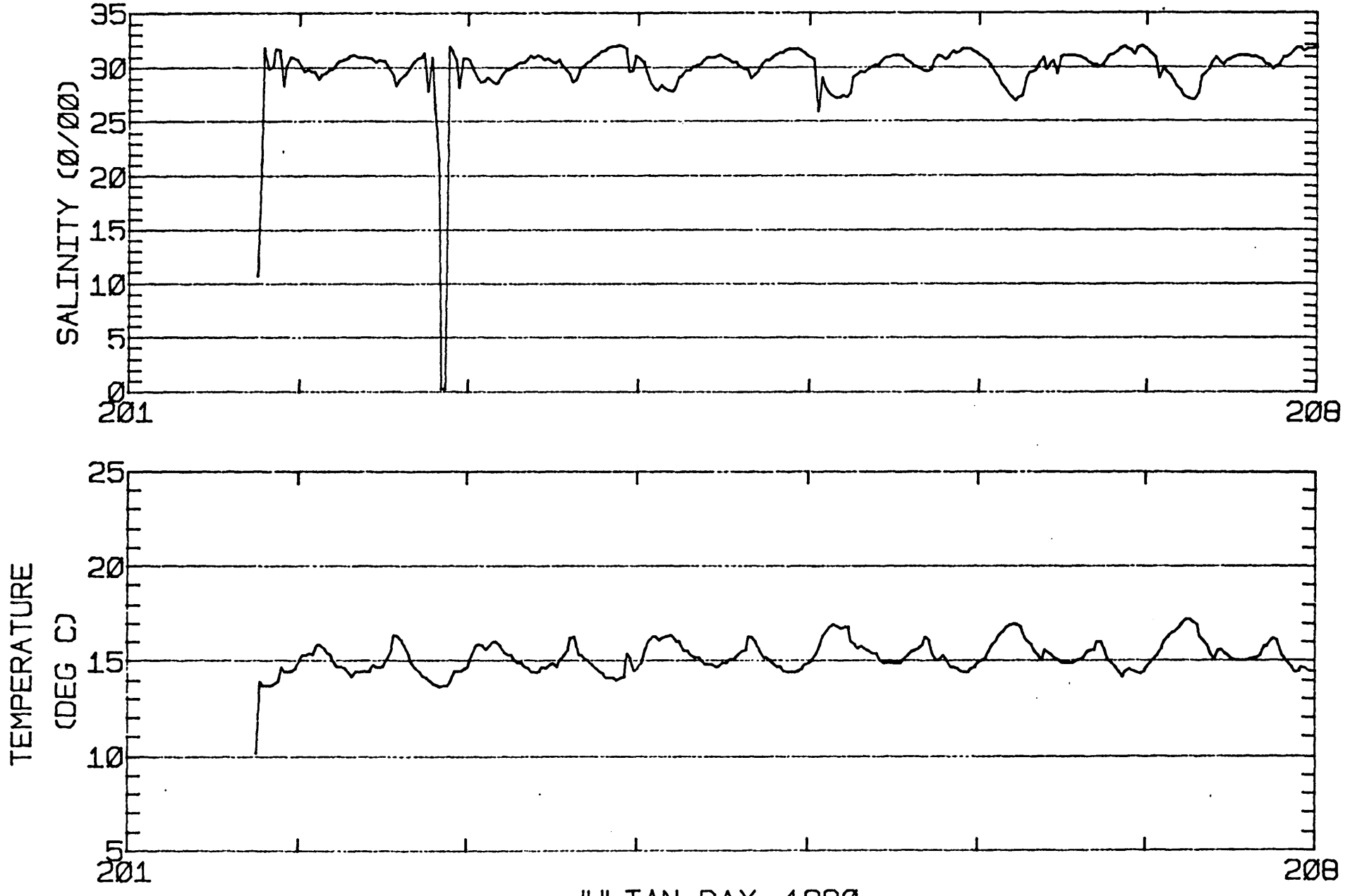
RMS SPEED: 47.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 107.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 52.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 56.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 9.82 CM/SEC
STANDARD DEVIATION V SERIES: 10.52 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.2	2.6	300.
ALL	12	-5.2	2.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-25N 122-26-22W
METER 022.9 METERS ABOVE BED. WATER DEPTH 029.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-25N 122-26-22W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'25"N 122 26'22"W
METER TYPE: AANDERAA
WATER DEPTH: 29.6 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES: 7/17/80 1052 PST JULIAN DAY=199
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

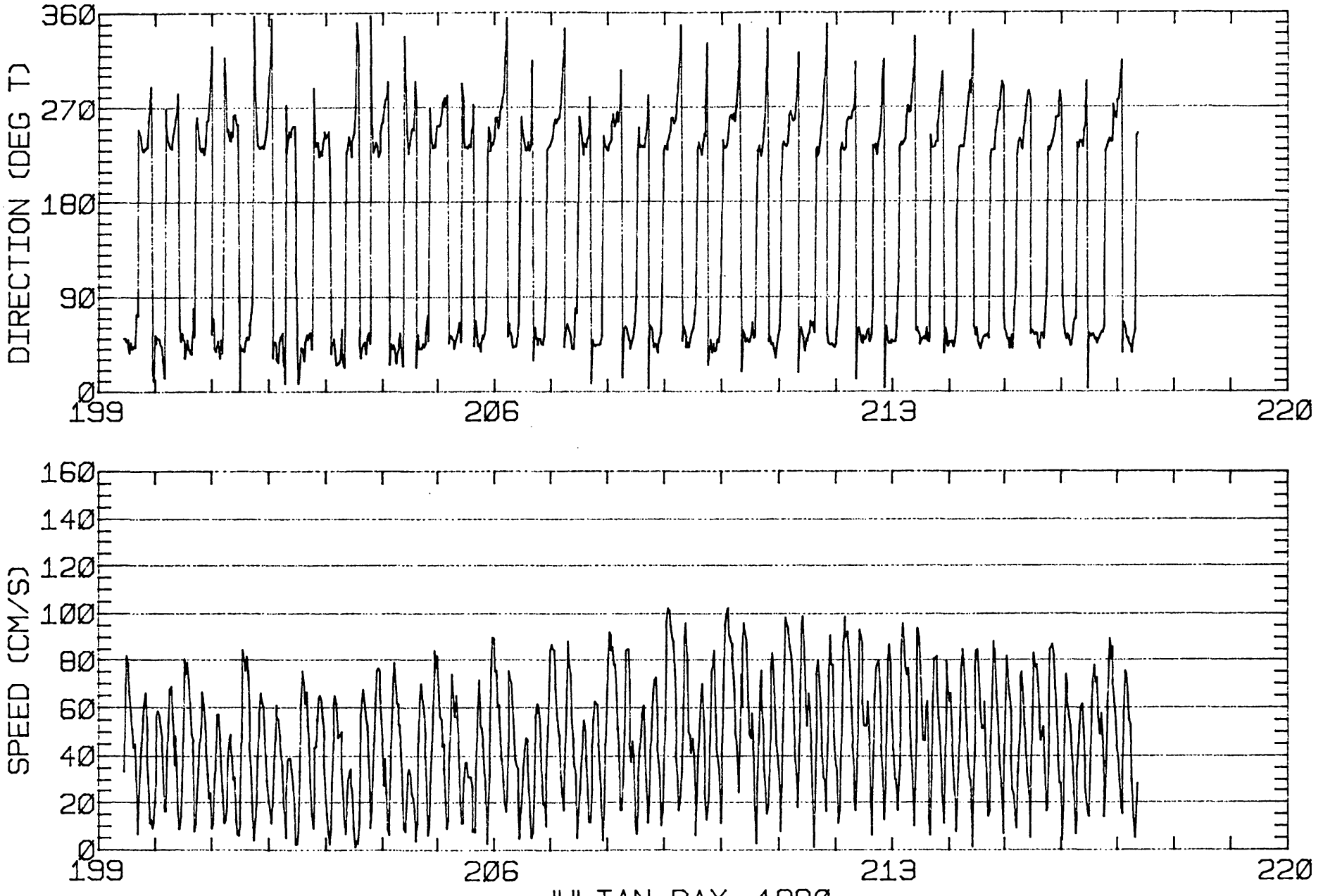
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.54	1.30	74.0	25.2	CLOCKWISE
K1	22.41	3.95	66.4	42.0	CLOCKWISE
N2	7.35	4.26	58.1	234.2	CLOCKWISE
M2	67.33	8.05	55.4	278.0	CLOCKWISE
S2	9.11	2.35	63.9	291.9	CLOCKWISE
M4	4.27	0.95	141.2	66.1	CLOCKWISE

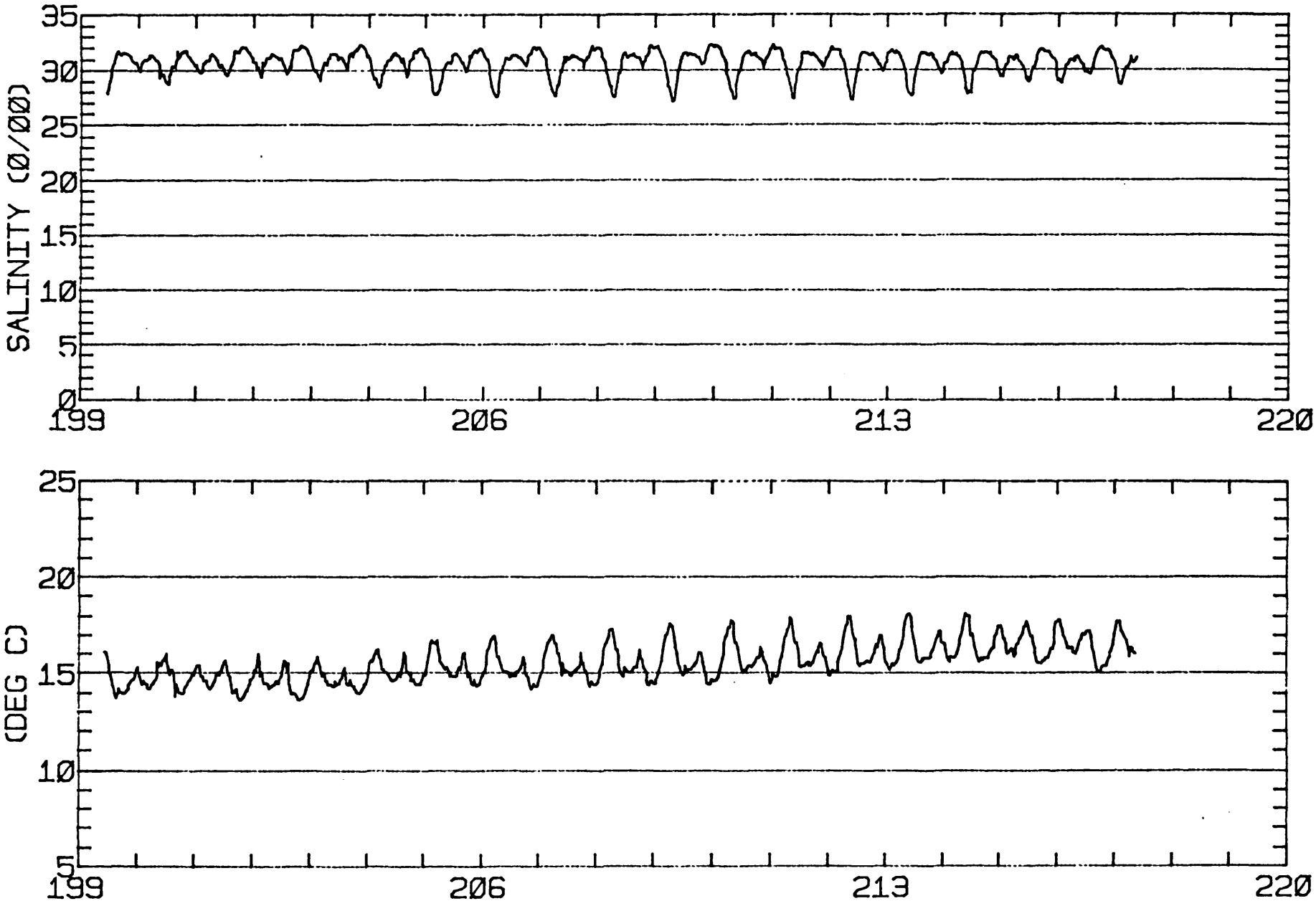
RMS SPEED: 53.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 110.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 9.91 CM/SEC
STANDARD DEVIATION V SERIES: 10.85 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.5	7.8	297.
2	12	-5.2	5.9	309.
3	10	-3.2	7.4	237.
ALL	34	-3.0	7.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-25N 122-26-22W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-25N 122-26-22W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø29.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'25"N 122 26'22"W
METER TYPE: AANDERAA
WATER DEPTH: 29.6 M (MLLW)
METER DEPTH: 22.0 M (BELOW MLLW)
START TIME OF SERIES: 7/17/80 1054 PST JULIAN DAY=199
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

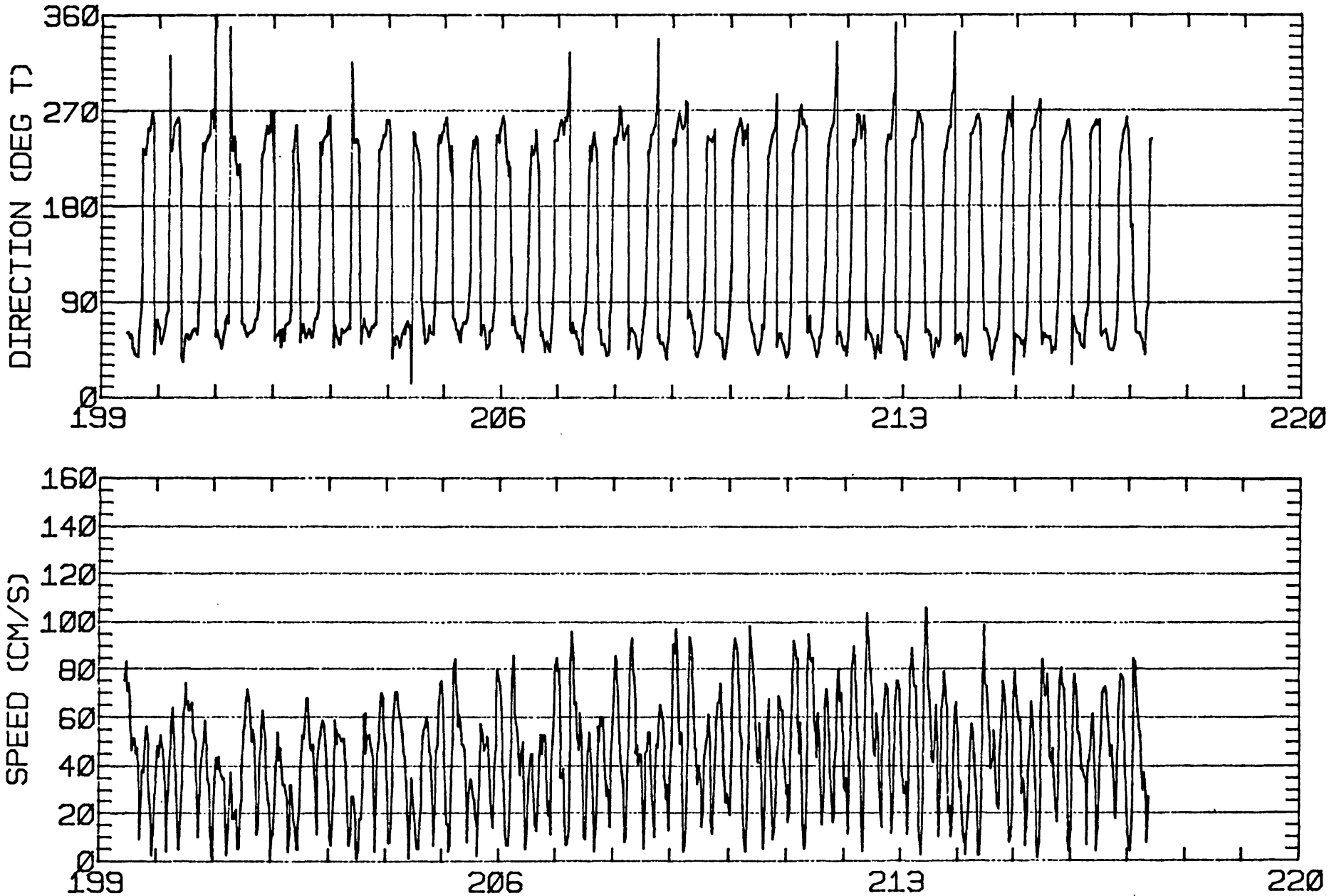
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.60	0.68	76.7	8.2	CLOCKWISE
K1	21.10	1.33	69.5	26.9	CLOCKWISE
N2	7.35	0.03	67.1	217.5	CLOCKWISE
M2	62.61	1.78	62.4	274.1	CLOCKWISE
S2	8.68	0.34	56.5	281.5	ANTI-CLOCKWISE
M4	10.18	0.15	107.0	28.1	CLOCKWISE

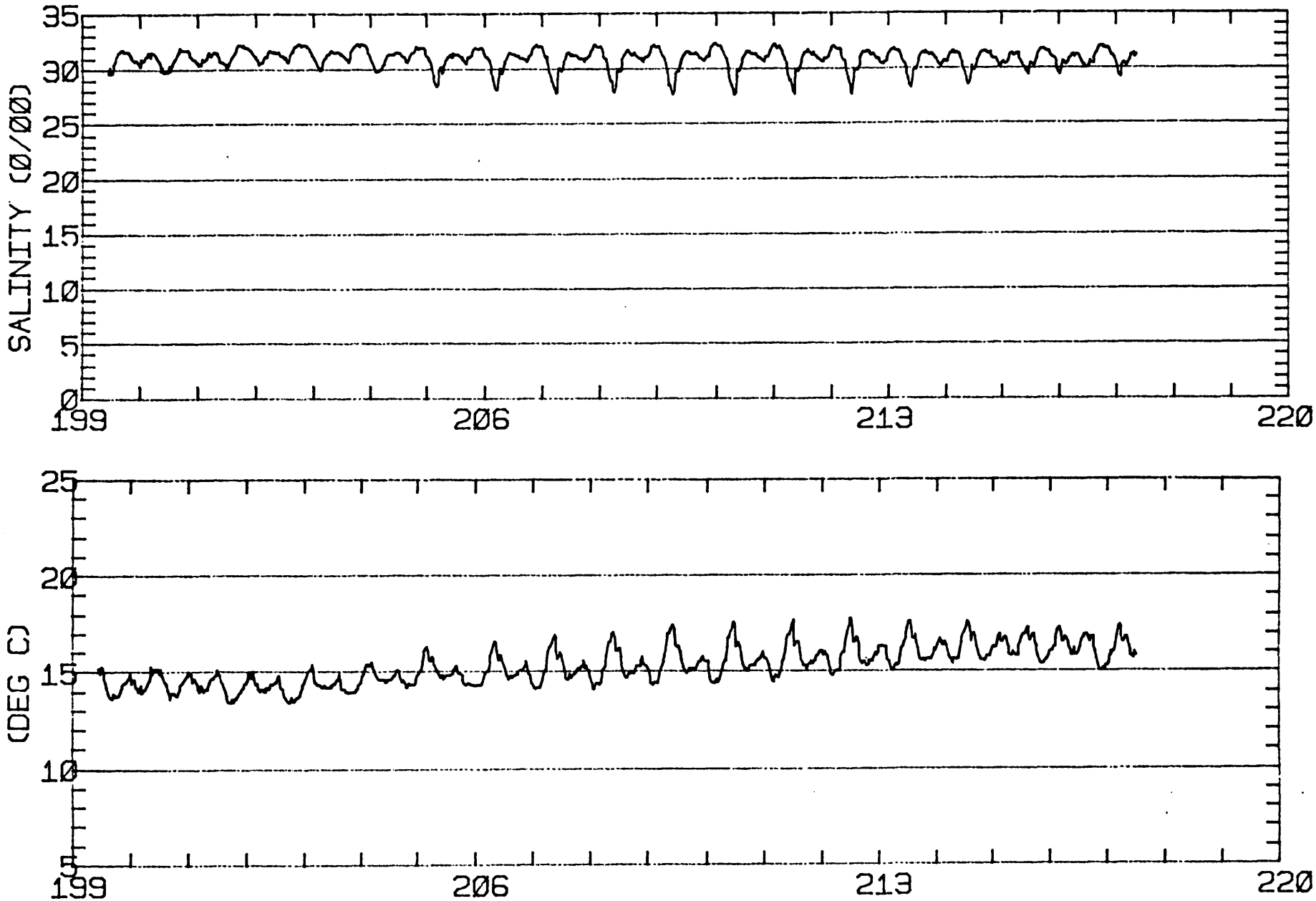
RMS SPEED: 50.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 42.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 64.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 12.80 CM/SEC
STANDARD DEVIATION V SERIES: 8.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	10.2	6.2	297.
2	12	3.1	7.0	309.
3	10	4.9	9.2	237.
ALL	34	6.2	7.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-25N 122-26-22W
METER 007.6 METERS ABOVE BED. WATER DEPTH 029.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-25N 122-26-22W
METER 007.6 METERS ABOVE BED. WATER DEPTH 029.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'24"N 122 26'24"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 8/ 4/80 1000 PST JULIAN DAY=217
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

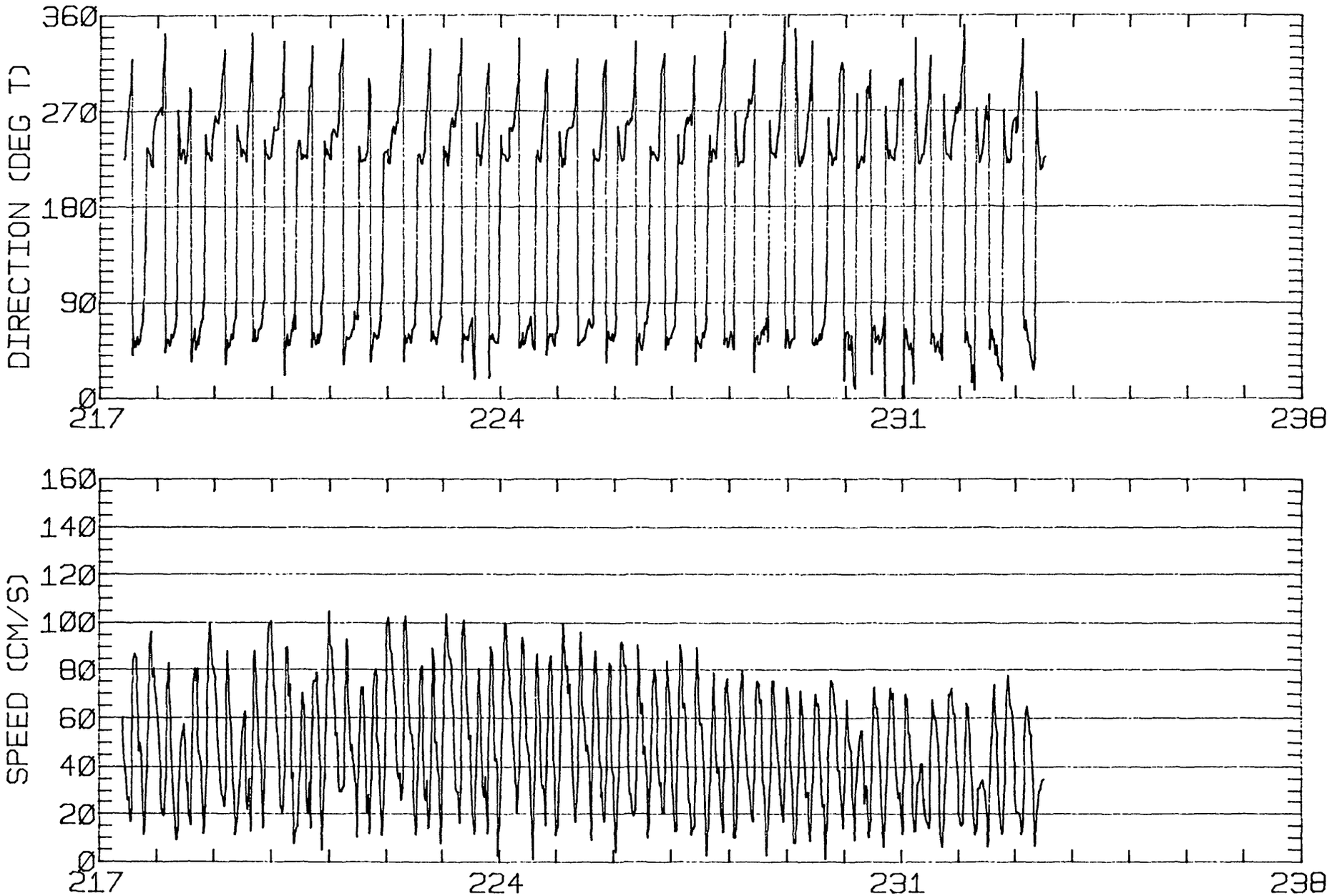
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.76	2.92	67.7	32.1	CLOCKWISE
K1	19.28	3.74	69.8	54.8	CLOCKWISE
N2	14.19	0.64	62.1	295.5	CLOCKWISE
M2	70.89	11.51	57.6	278.3	CLOCKWISE
S2	14.71	2.25	63.2	303.6	CLOCKWISE
M4	4.77	3.34	140.8	138.3	ANTI-CLOCKWISE

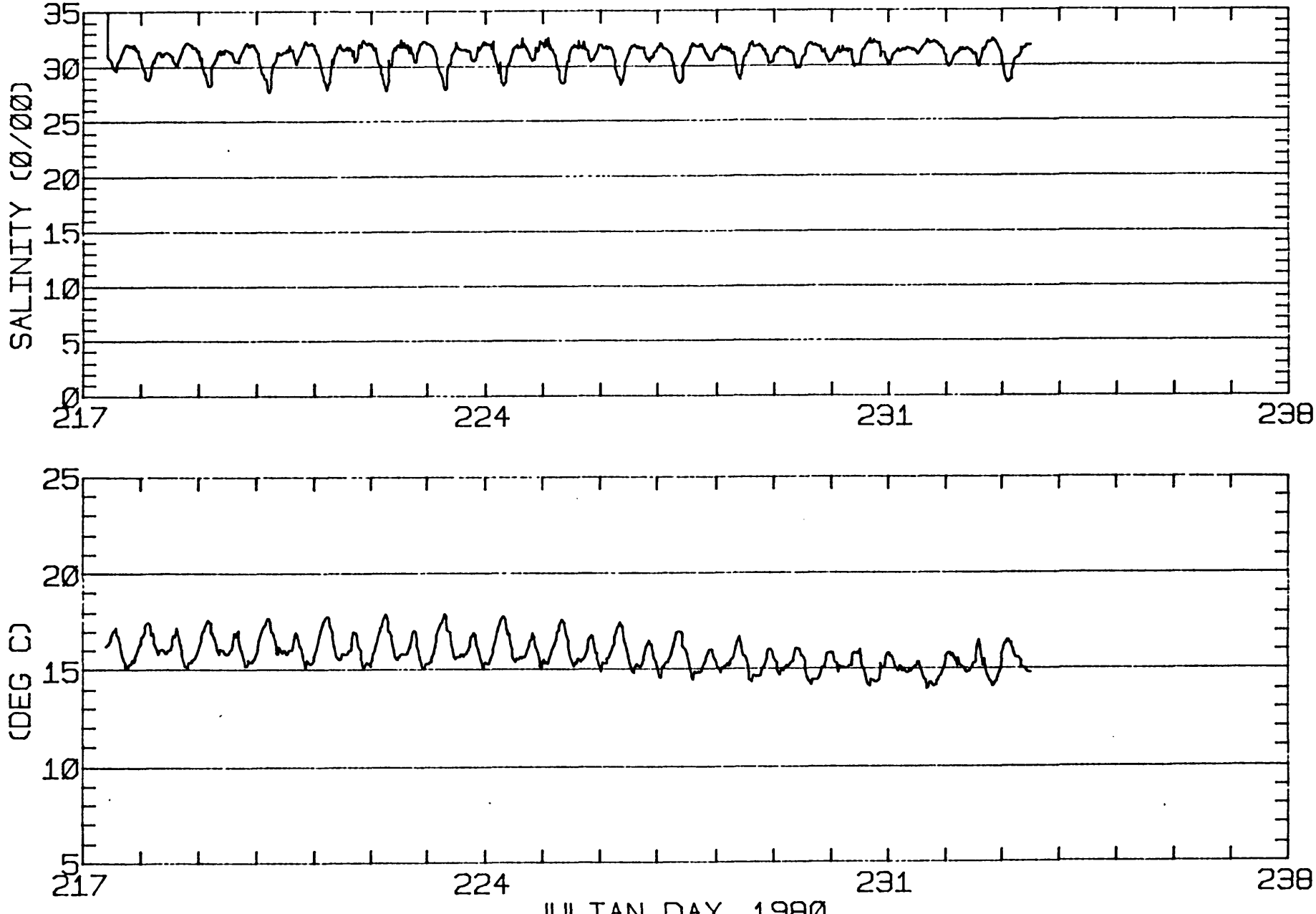
RMS SPEED: 53.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 115.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 61.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 10.41 CM/SEC
STANDARD DEVIATION V SERIES: 11.80 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.4	1.8	154.
2	12	-4.4	0.8	107.
3	6	-3.7	4.3	74.
ALL	30	-4.3	1.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-24W
METER 022.9 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-24W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'24"N 122 26'24"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 8/ 4/80 1002 PST JULIAN DAY=217
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

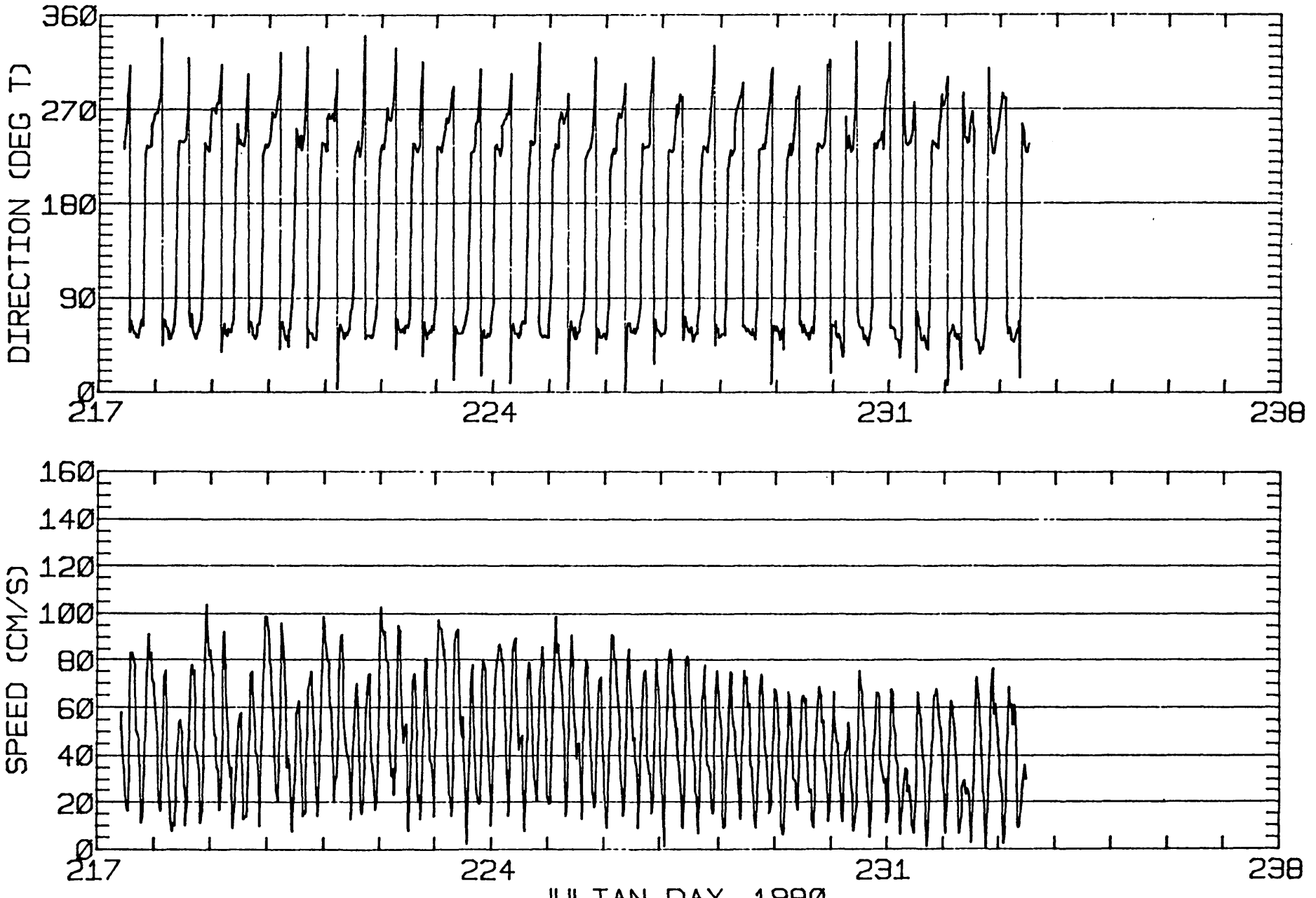
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.01	2.52	73.8	35.7	CLOCKWISE
K1	19.09	2.53	73.0	55.9	CLOCKWISE
N2	13.65	0.43	66.7	295.4	CLOCKWISE
M2	69.89	8.76	61.6	281.4	CLOCKWISE
S2	15.66	2.15	63.9	305.5	CLOCKWISE
M4	6.17	1.05	141.0	112.9	ANTI-CLOCKWISE

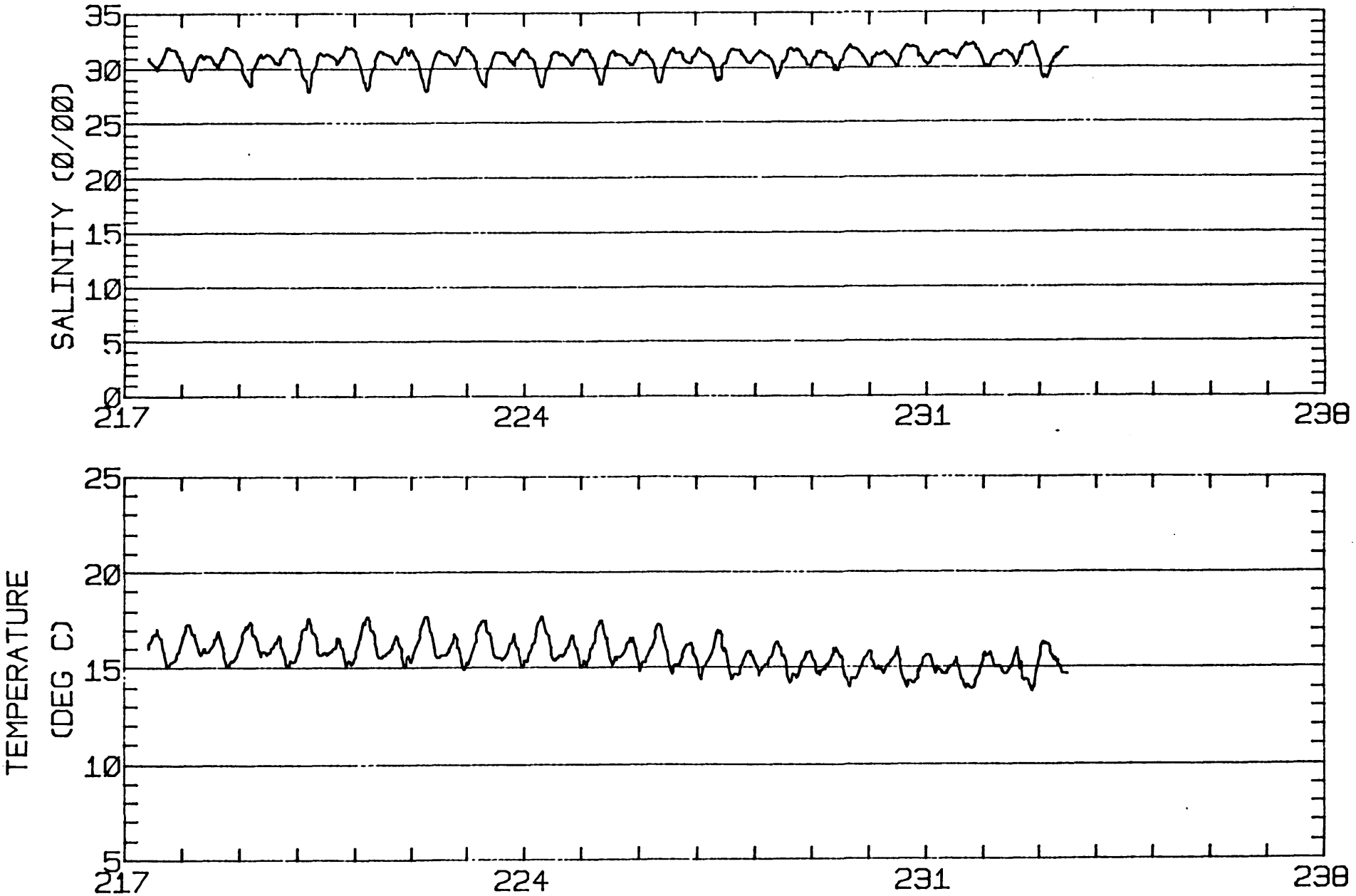
RMS SPEED: 52.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 116.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 9.15 CM/SEC
STANDARD DEVIATION V SERIES: 10.26 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.8	4.1	154.
2	12	-2.9	3.1	107.
3	6	-0.2	5.9	74.
ALL	30	-2.3	4.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-24W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-24W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'22"N 122 26'25"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 8/20/80 1300 PST JULIAN DAY=233
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

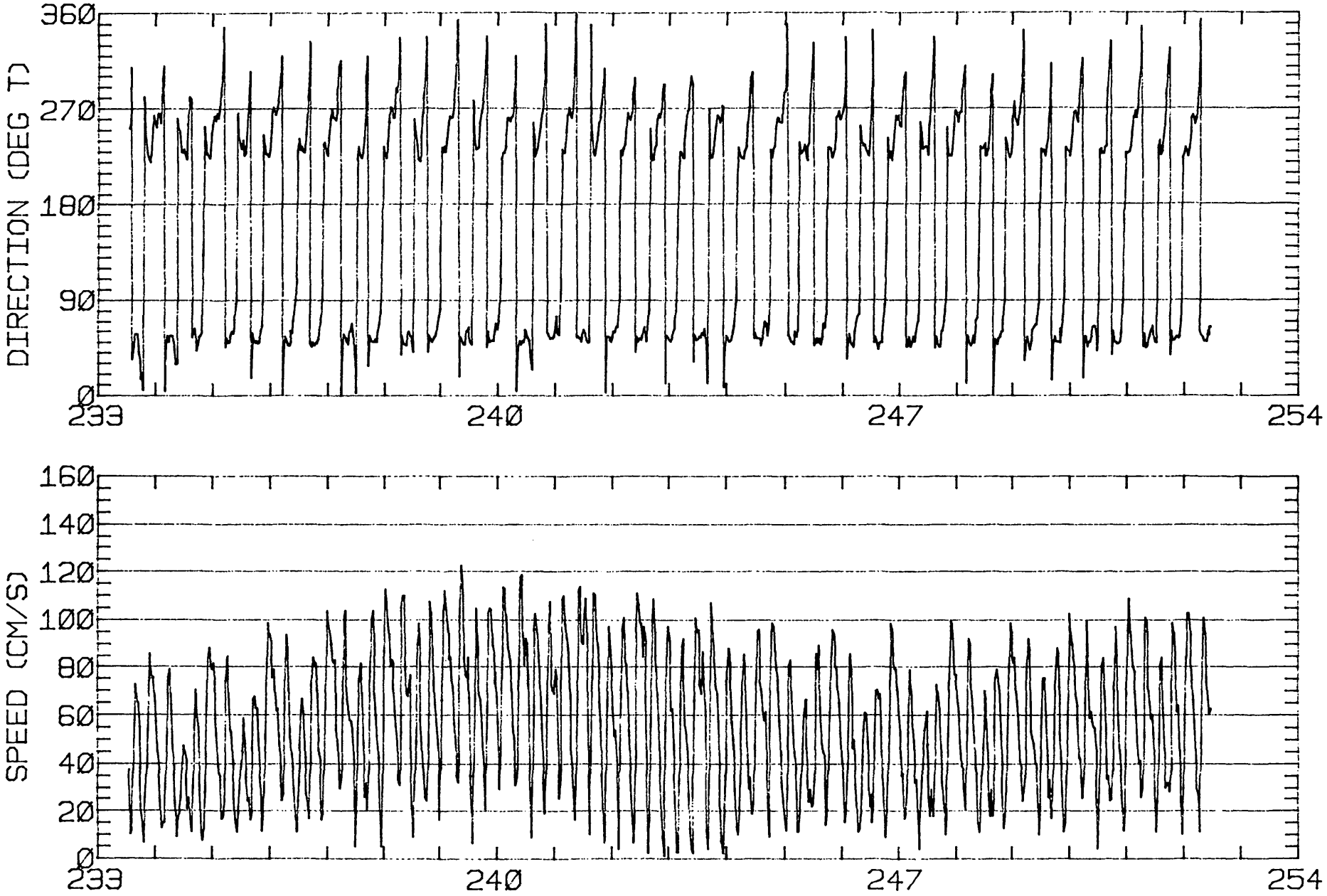
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.68	3.28	86.6	40.2	CLOCKWISE
K1	19.15	3.67	65.7	60.6	CLOCKWISE
N2	16.86	3.53	61.9	271.9	CLOCKWISE
M2	68.60	10.19	59.0	286.9	CLOCKWISE
S2	16.06	3.26	68.8	300.1	CLOCKWISE
M4	5.69	1.58	5.9	284.3	ANTI-CLOCKWISE

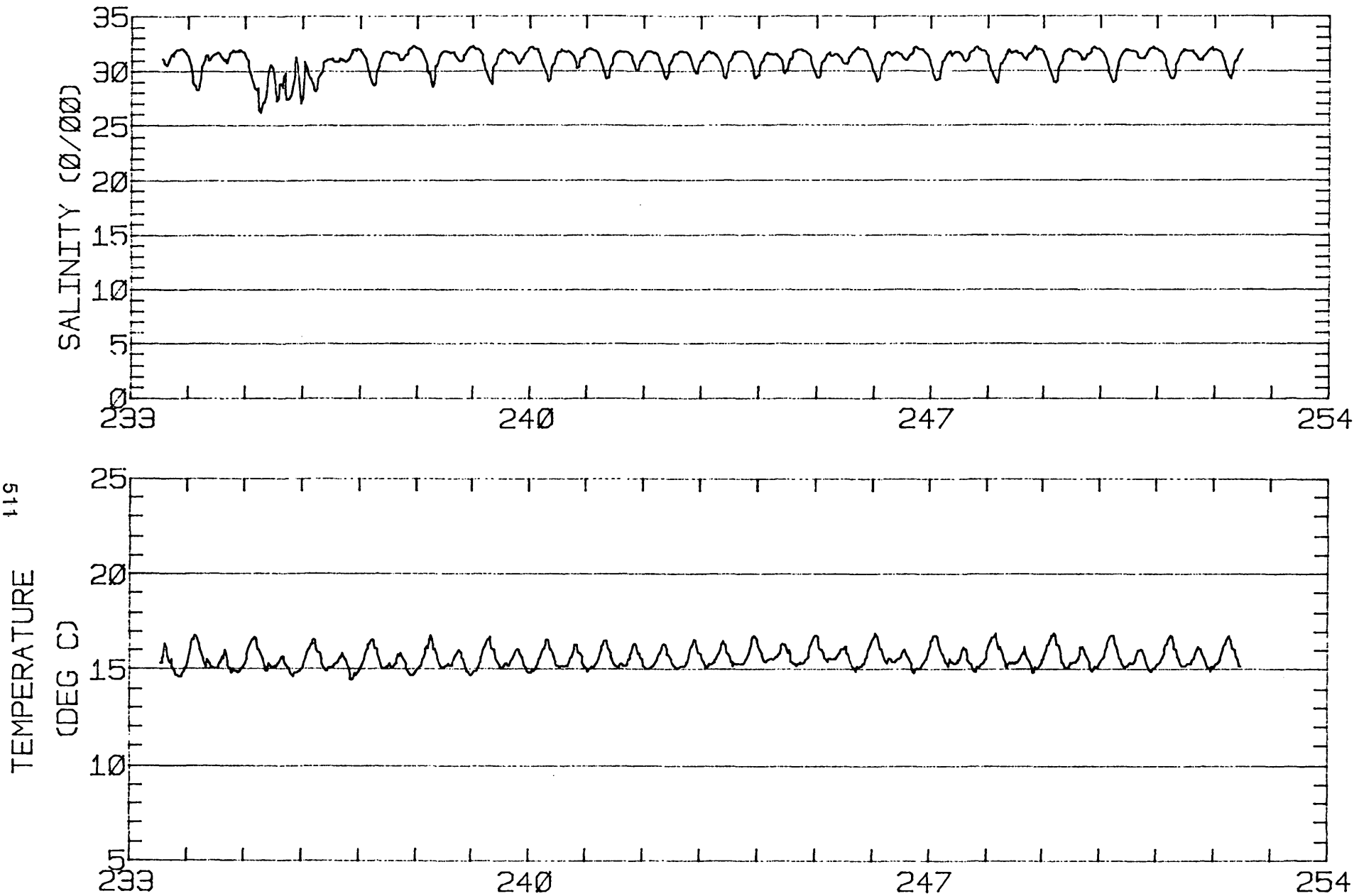
RMS SPEED: 63.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 114.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 64.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 11.19 CM/SEC
STANDARD DEVIATION V SERIES: 14.65 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.4	6.1	107.
2	12	-0.7	6.7	120.
3	12	-5.0	4.7	204.
ALL	36	-3.7	5.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-22N 122-26-25W
METER 022.9 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-22N 122-26-25W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'24"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/ 8/80 1250 PST JULIAN DAY=252
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

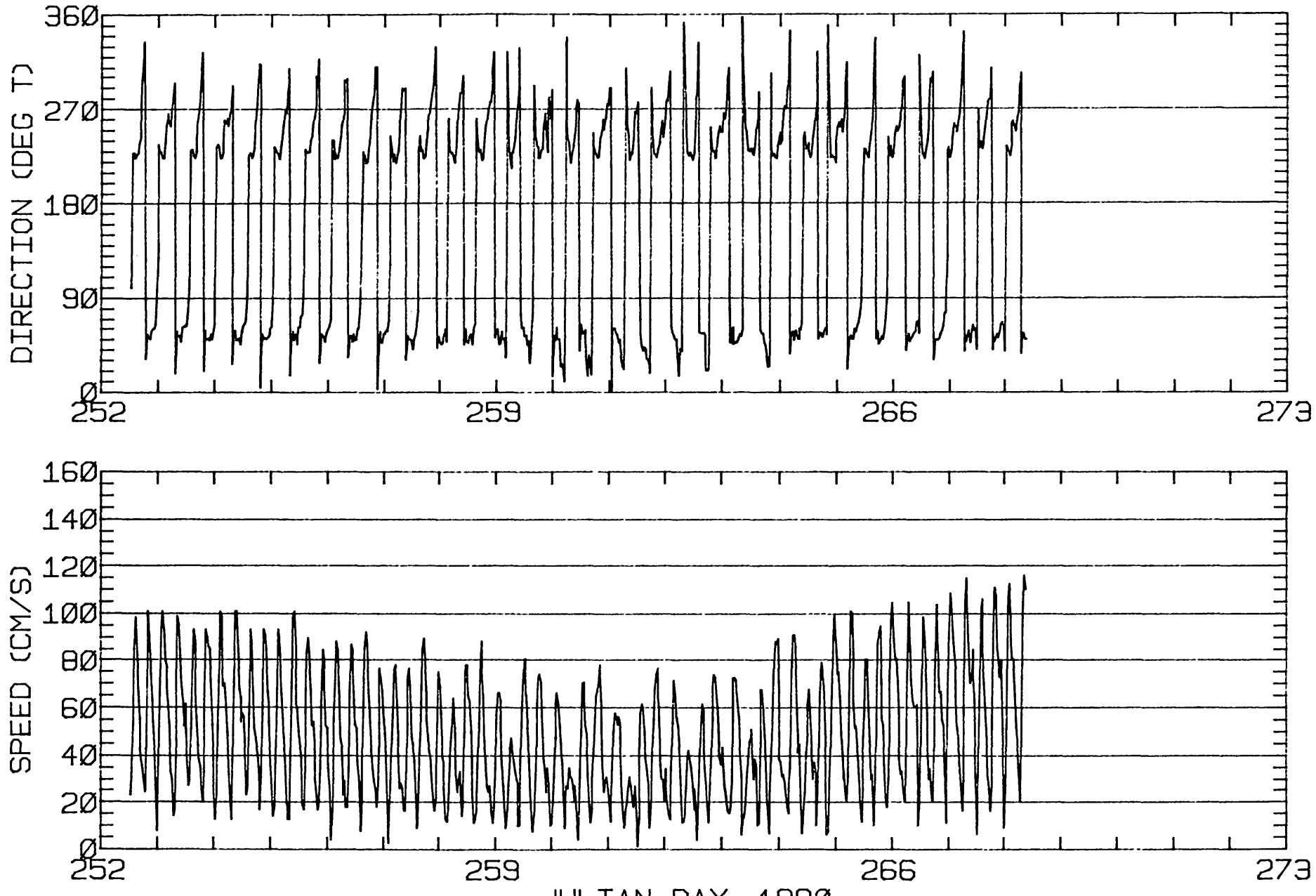
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.91	1.48	58.5	10.0	CLOCKWISE
K1	13.46	1.99	62.6	43.3	CLOCKWISE
N2	14.73	1.03	72.4	265.5	CLOCKWISE
M2	71.45	11.14	57.4	279.9	CLOCKWISE
S2	19.71	3.74	62.5	296.2	CLOCKWISE
M4	6.19	3.54	2.0	273.2	ANTI-CLOCKWISE

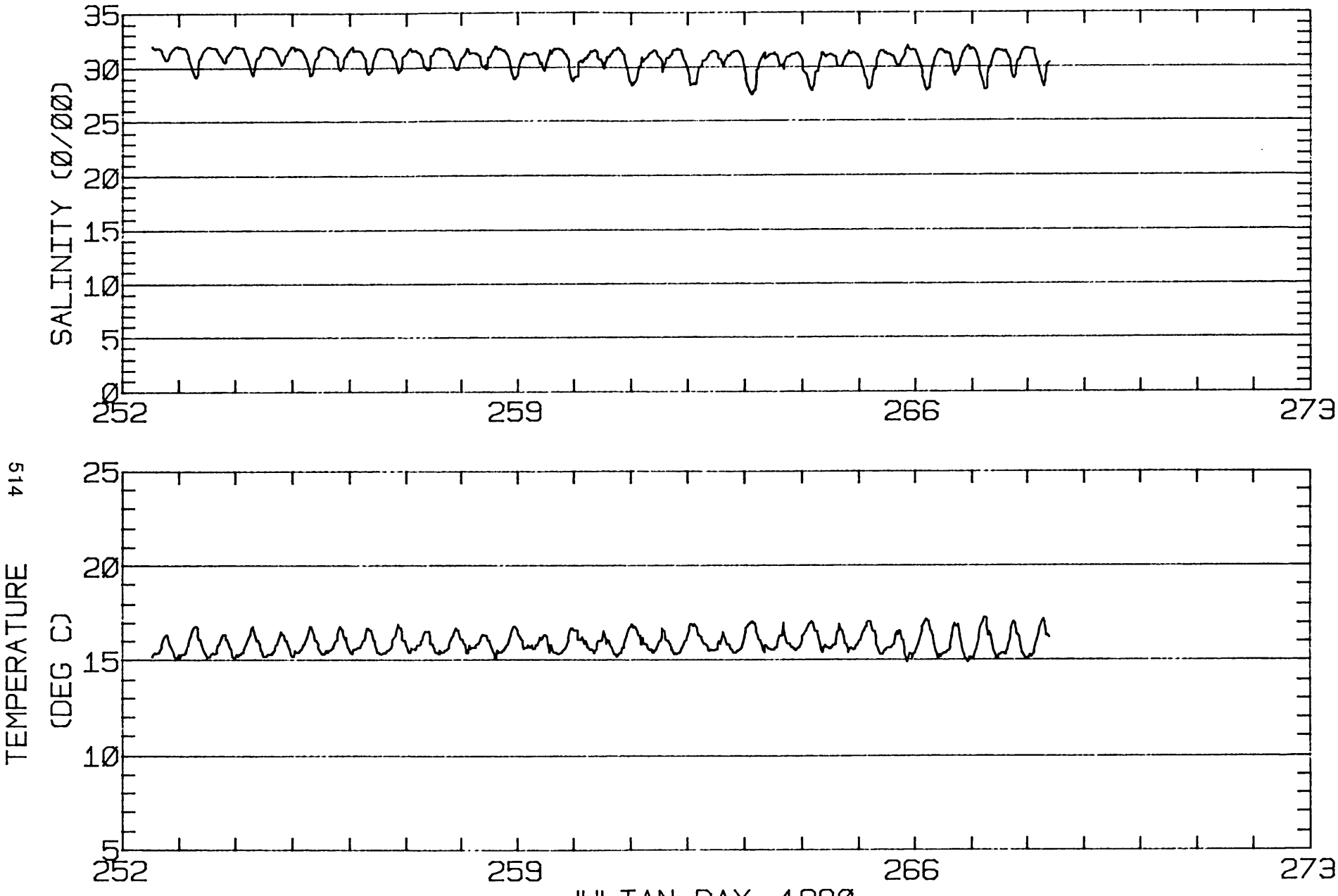
RMS SPEED: 54.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 115.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 59.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 10.77 CM/SEC
STANDARD DEVIATION V SERIES: 11.79 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.6	3.1	247.
2	12	-3.7	3.7	307.
3	6	-0.6	6.1	280.
ALL	30	-2.7	3.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-23W
METER 022.9 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



514

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-23W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'24"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/ 8/80 1242 PST JULIAN DAY=252
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

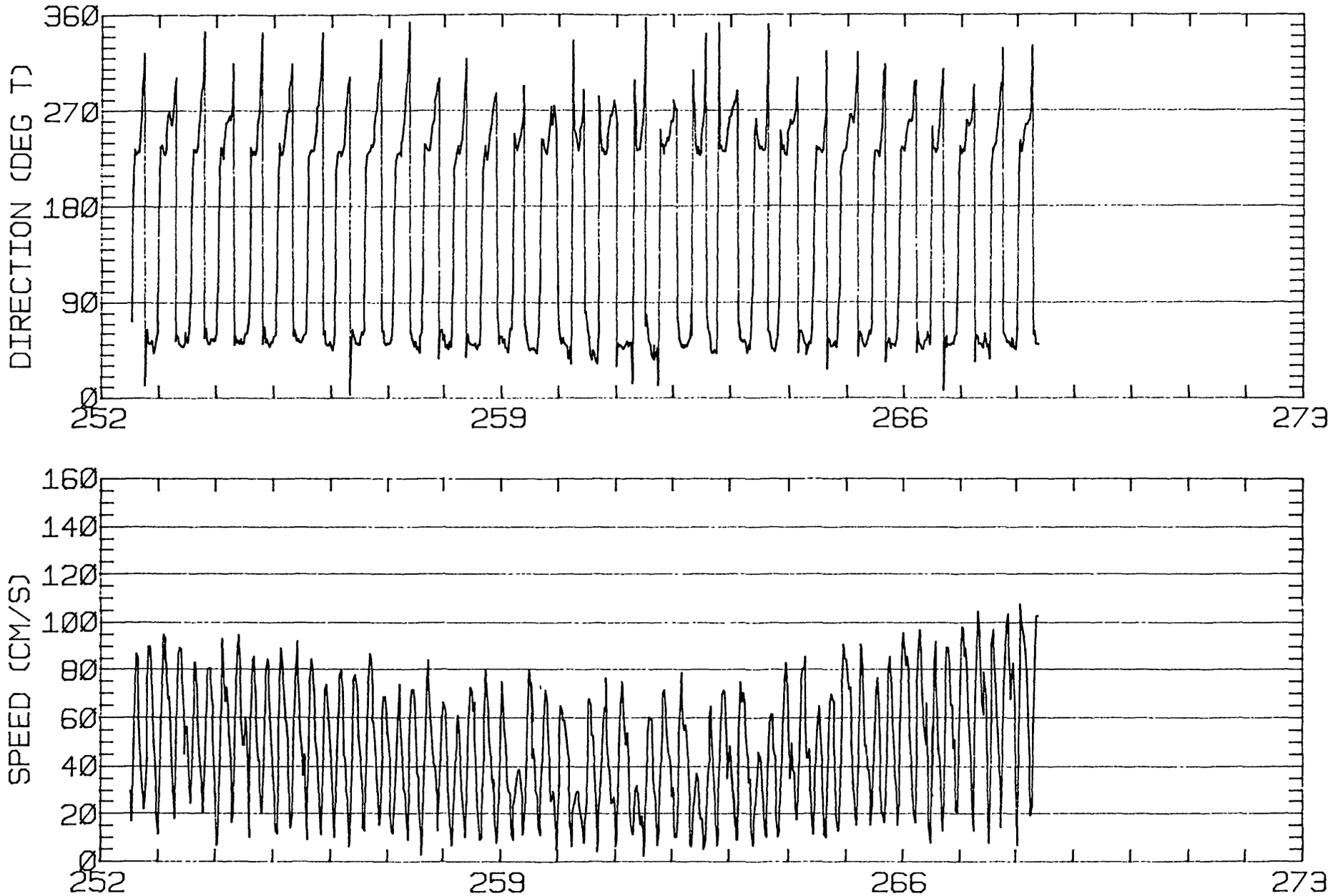
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.11	1.40	67.9	13.8	CLOCKWISE
K1	13.25	2.02	65.9	44.4	CLOCKWISE
N2	13.51	0.52	68.0	269.7	CLOCKWISE
M2	69.03	8.44	58.9	278.6	CLOCKWISE
S2	18.94	2.89	62.3	295.6	CLOCKWISE
M4	6.16	0.00	145.7	88.2	ANTI-CLOCKWISE

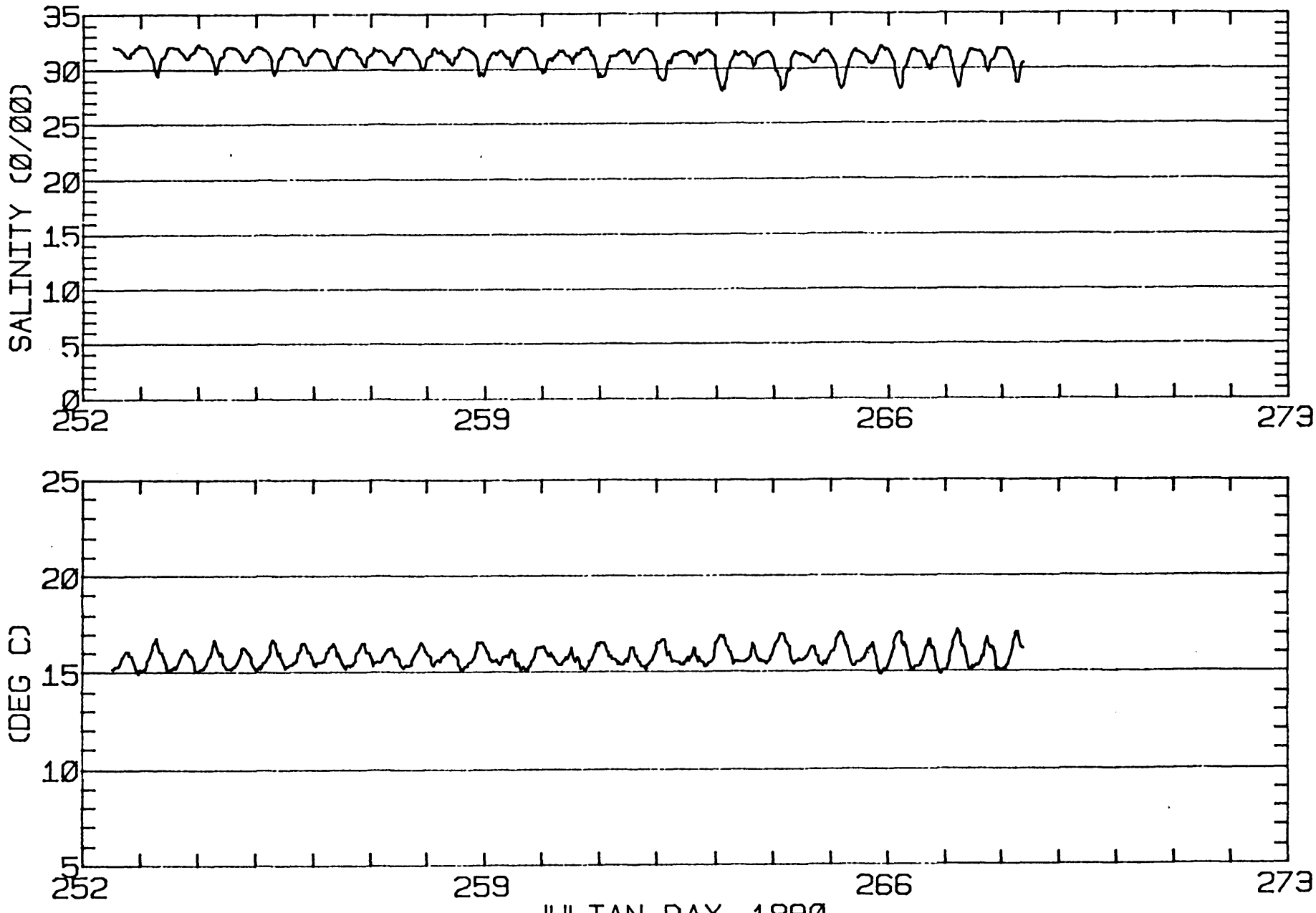
RMS SPEED: 53.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 113.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 61.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.29
STANDARD DEVIATION U-SERIES: 9.46 CM/SEC
STANDARD DEVIATION V SERIES: 10.72 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.2	5.5	247.
2	12	0.1	6.2	307.
3	6	-0.1	9.0	280.
ALL	30	-0.5	6.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-23W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-23W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'24"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 21.3 M (BELOW MLLW)
START TIME OF SERIES: 9/ 8/80 1244 PST JULIAN DAY=252
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

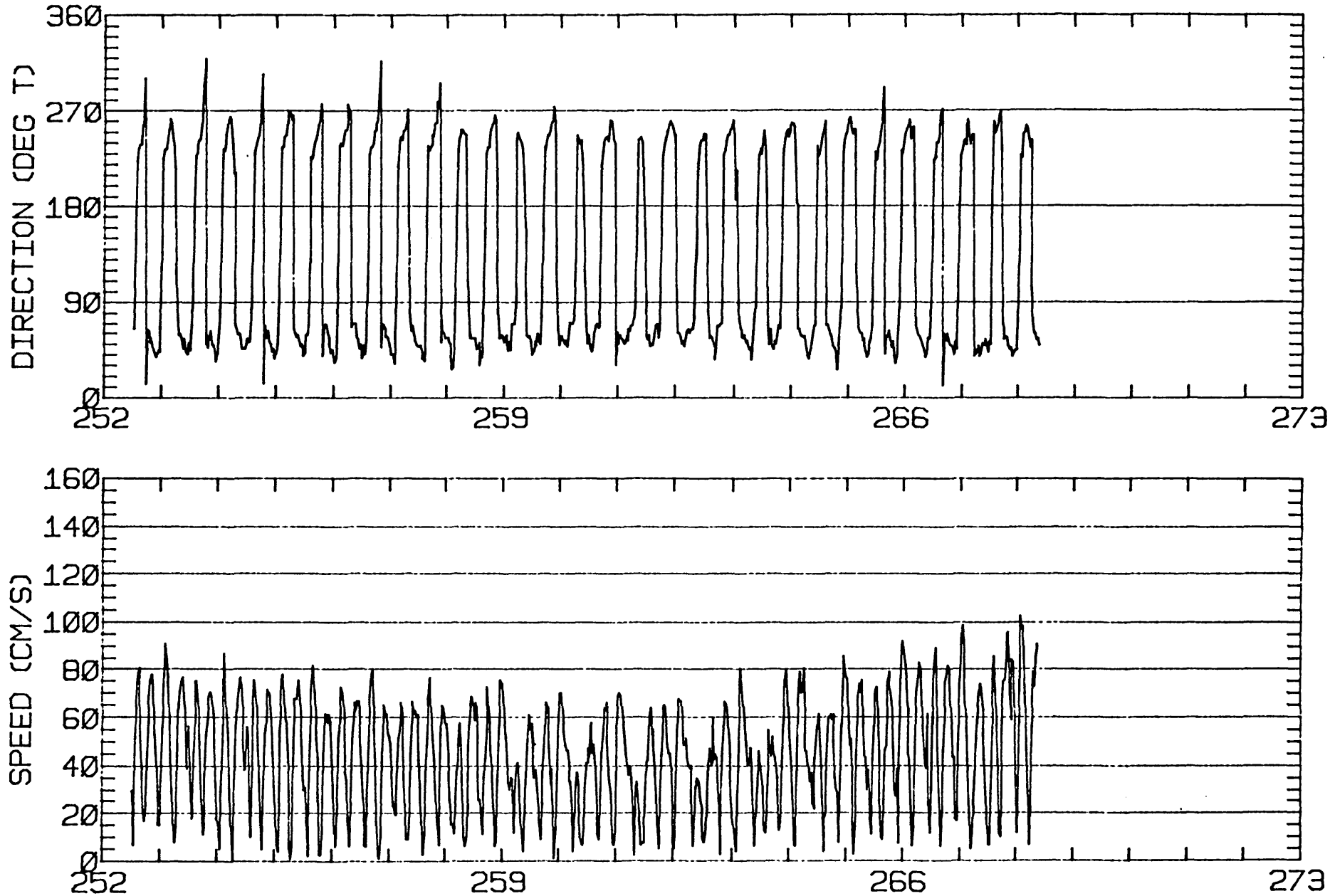
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.98	0.77	66.4	6.7	CLOCKWISE
K1	11.44	0.93	70.4	30.5	CLOCKWISE
N2	11.52	0.81	58.4	277.1	CLOCKWISE
M2	62.63	1.43	58.7	274.6	CLOCKWISE
S2	16.16	0.91	56.6	292.7	CLOCKWISE
M4	9.11	1.56	102.7	34.2	CLOCKWISE

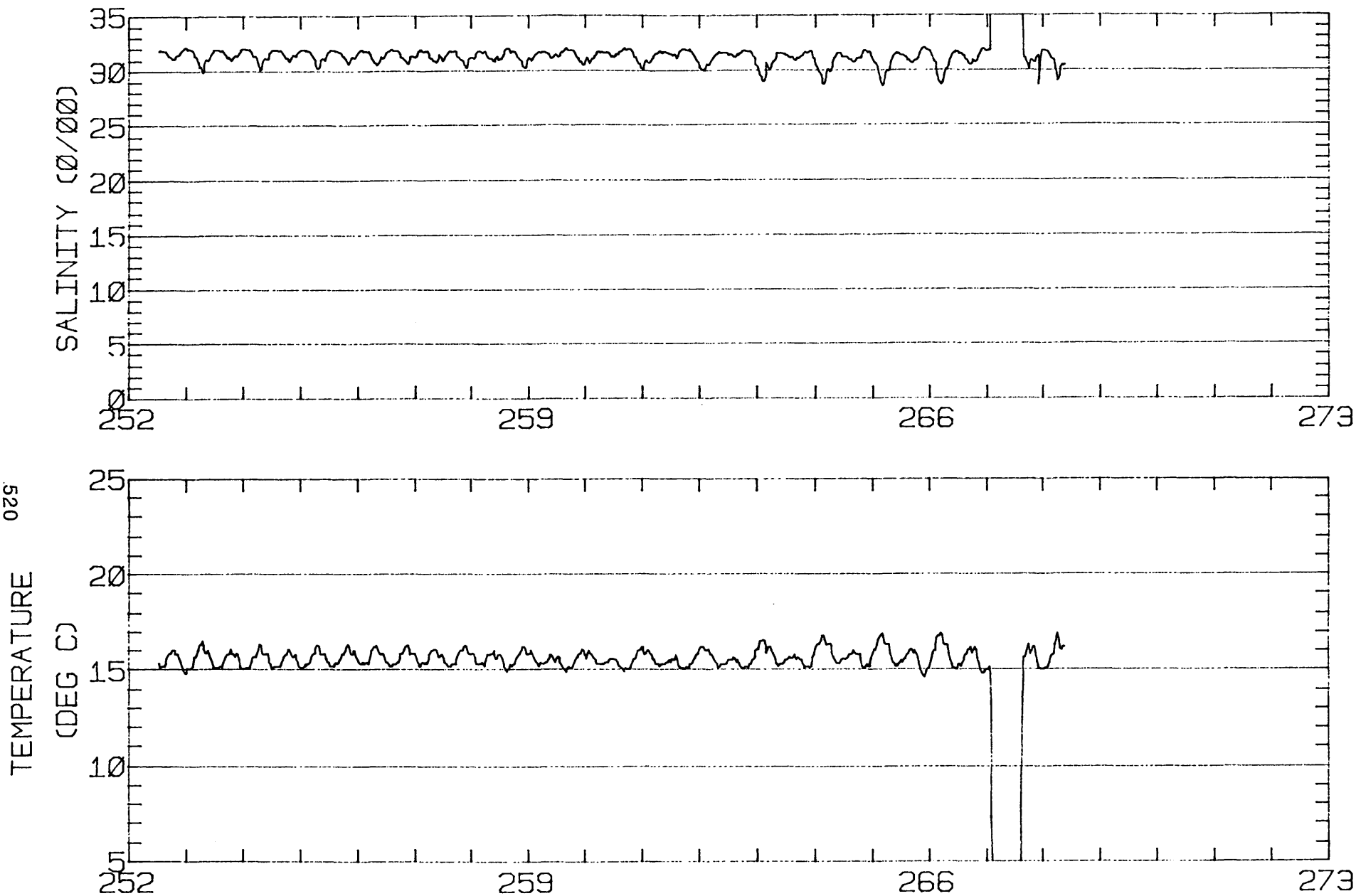
RMS SPEED: 49.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 60.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 11.64 CM/SEC
STANDARD DEVIATION V SERIES: 8.54 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.3	7.2	247.
2	12	7.9	7.3	307.
3	6	2.9	9.2	280.
ALL	30	4.6	7.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-23W
METER 007.7 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-24N 122-26-23W
METER ØØ7.7 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'23"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 9/24/80 1030 PST JULIAN DAY=268
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

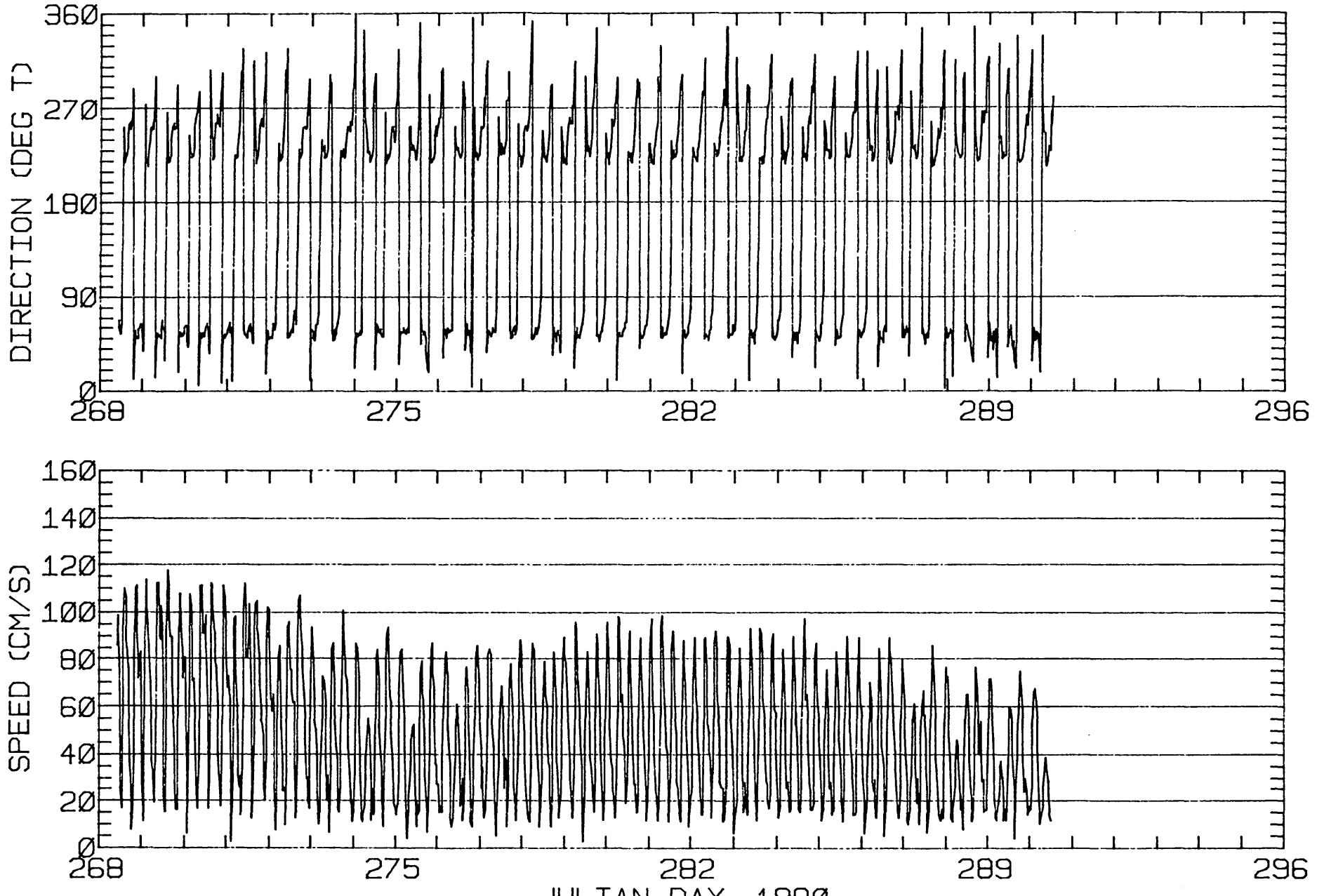
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
01	7.30	2.00	57.8	29.2	CLOCKWISE
K1	12.51	1.28	62.2	26.9	CLOCKWISE
N2	17.86	0.87	60.3	280.3	CLOCKWISE
M2	69.73	9.01	55.1	282.5	CLOCKWISE
S2	19.55	3.86	55.4	275.2	CLOCKWISE
M4	6.15	3.44	27.6	277.7	ANTI-CLOCKWISE

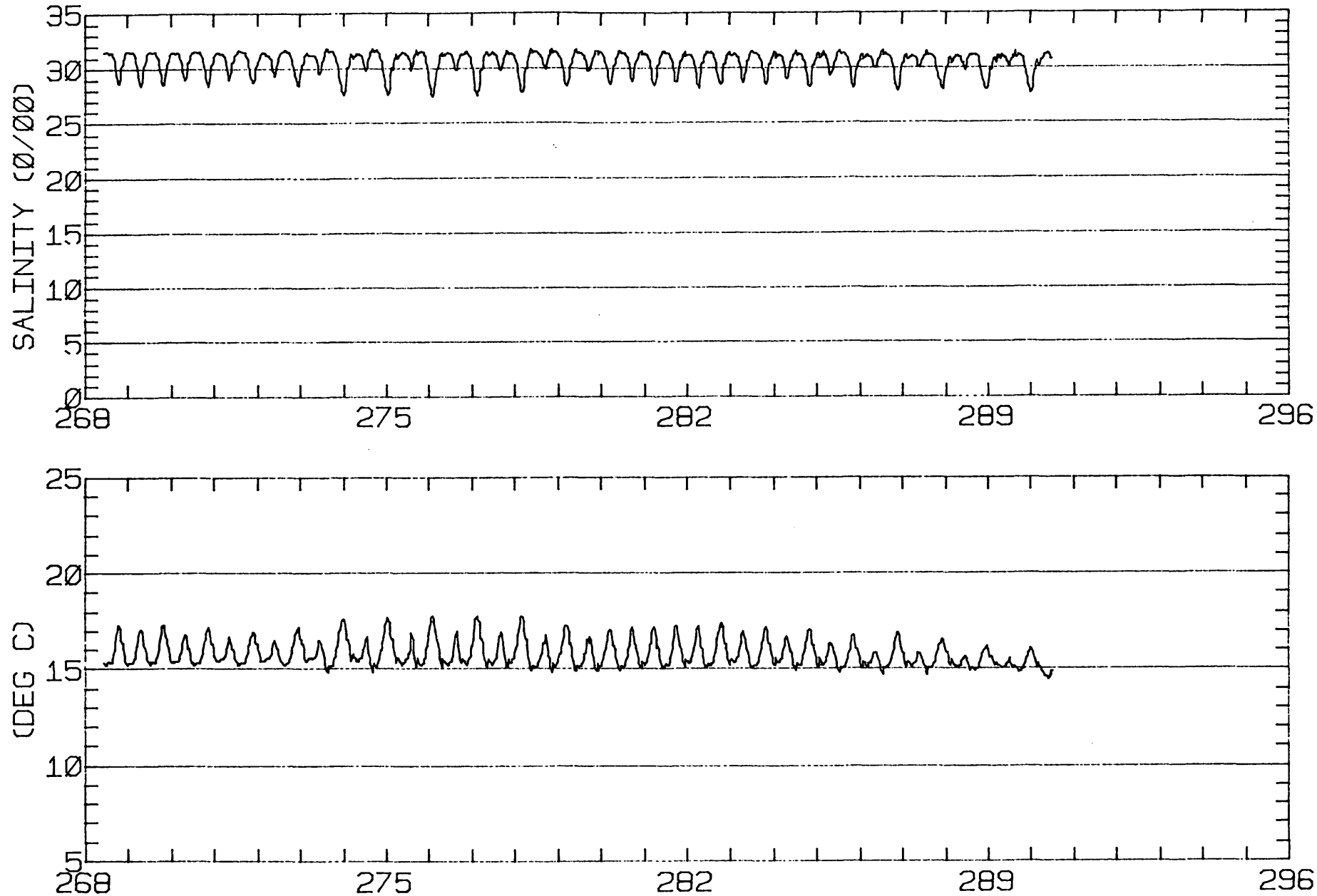
RMS SPEED: 56.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 109.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 45.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 56.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.22
STANDARD DEVIATION U-SERIES: 11.07 CM/SEC
STANDARD DEVIATION V SERIES: 12.61 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.1	4.5	379.
2	12	-2.4	0.7	244.
3	12	-1.9	1.1	277.
4	6	-1.7	2.1	221.
ALL	42	-1.2	2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-23W
METER 022.9 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-23W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'23"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 9/24/80 1012 PST JULIAN DAY=268
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

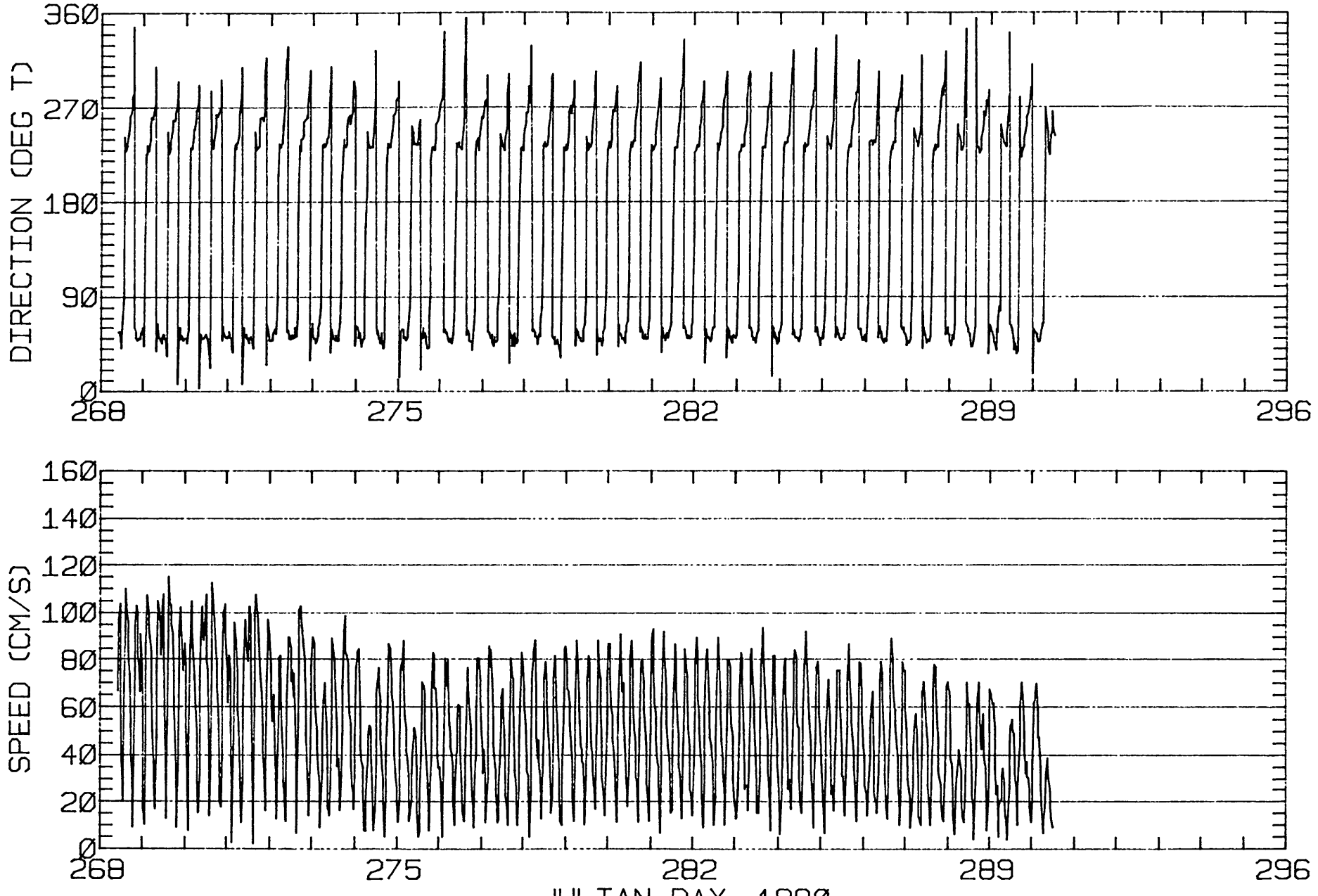
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.44	2.34	75.4	37.4	CLOCKWISE
K1	12.97	1.56	68.5	29.8	CLOCKWISE
N2	17.96	0.56	61.3	280.6	CLOCKWISE
M2	70.68	7.58	58.4	281.8	CLOCKWISE
S2	19.74	3.00	60.9	274.2	CLOCKWISE
M4	6.19	0.68	159.9	98.6	CLOCKWISE

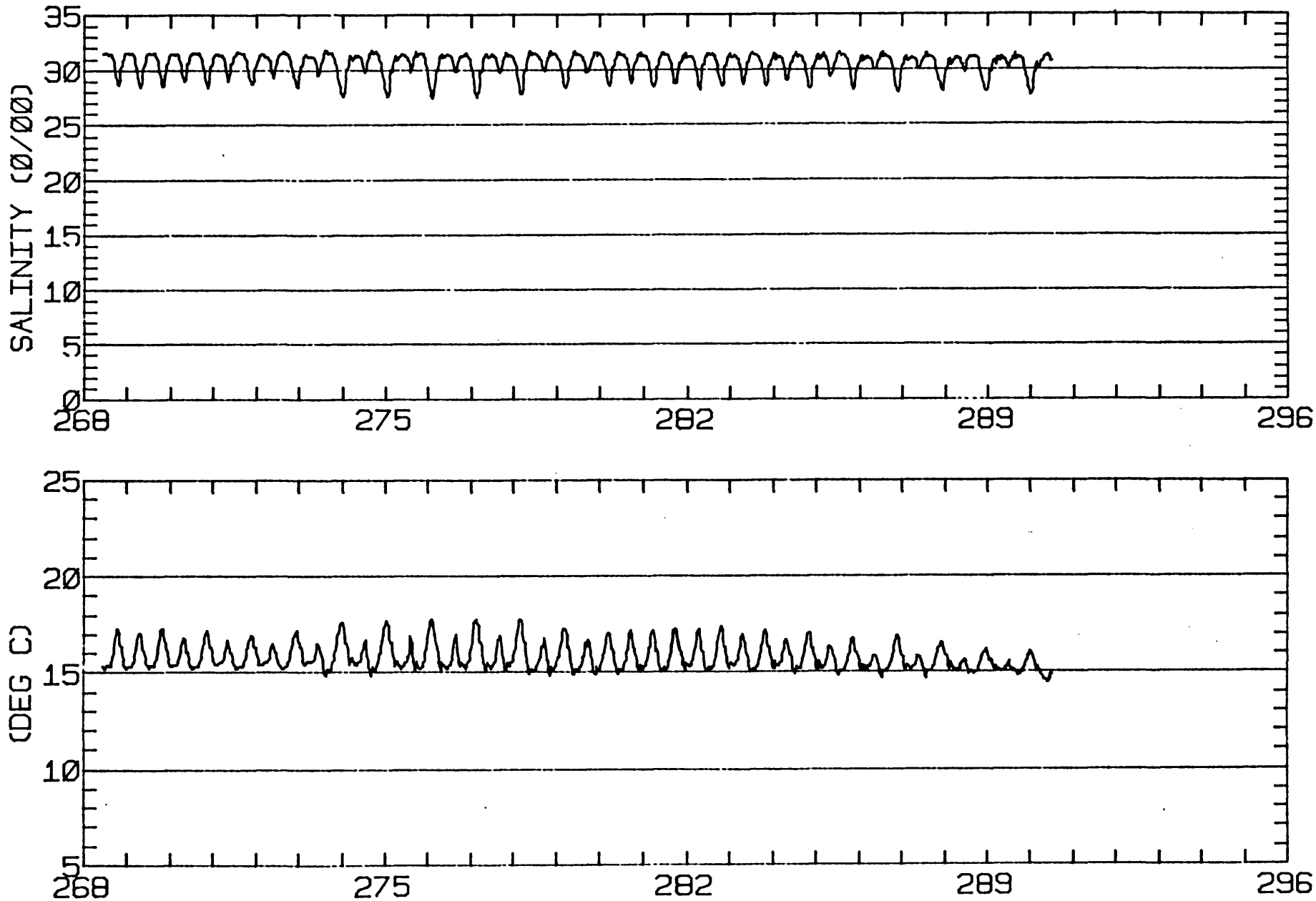
RMS SPEED: 57.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 111.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 46.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 61.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 10.25 CM/SEC
STANDARD DEVIATION V SERIES: 11.27 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	11.1	379.
2	12	-2.3	5.9	244.
3	12	-2.3	5.8	277.
4	6	-0.5	5.3	221.
ALL	42	-1.3	7.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-23W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-23W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'23"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.3 M (MLLW)
METER DEPTH: 21.7 M (BELOW MLLW)
START TIME OF SERIES: 9/24/80 1024 PST JULIAN DAY=268
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

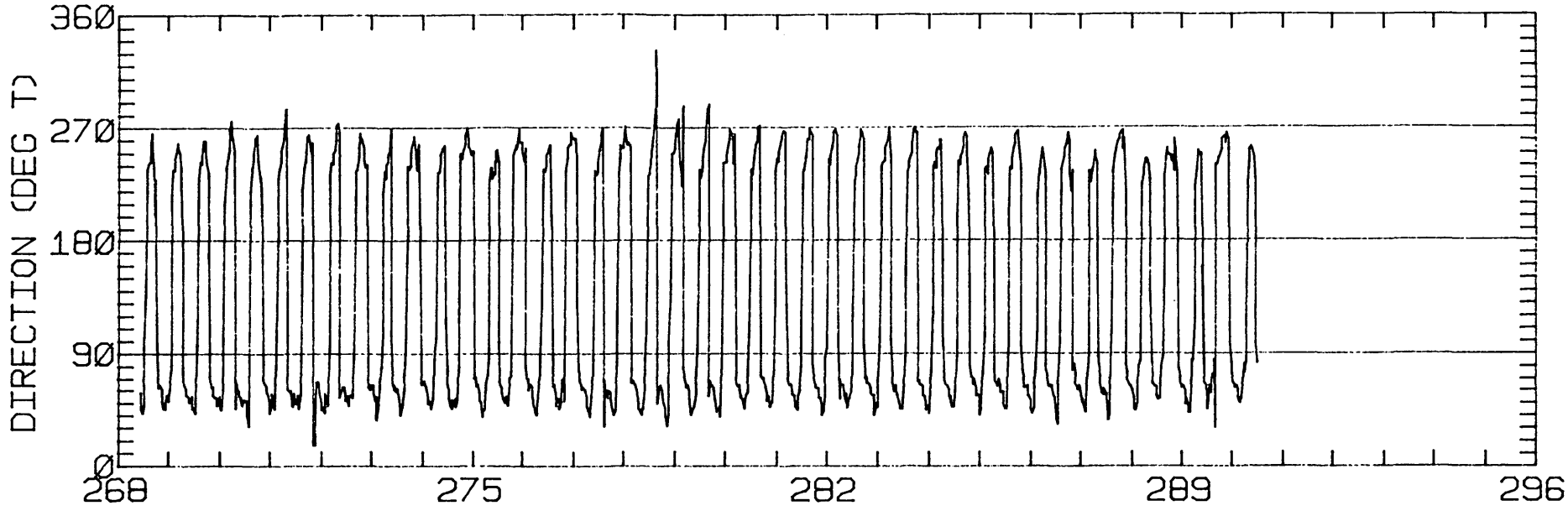
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

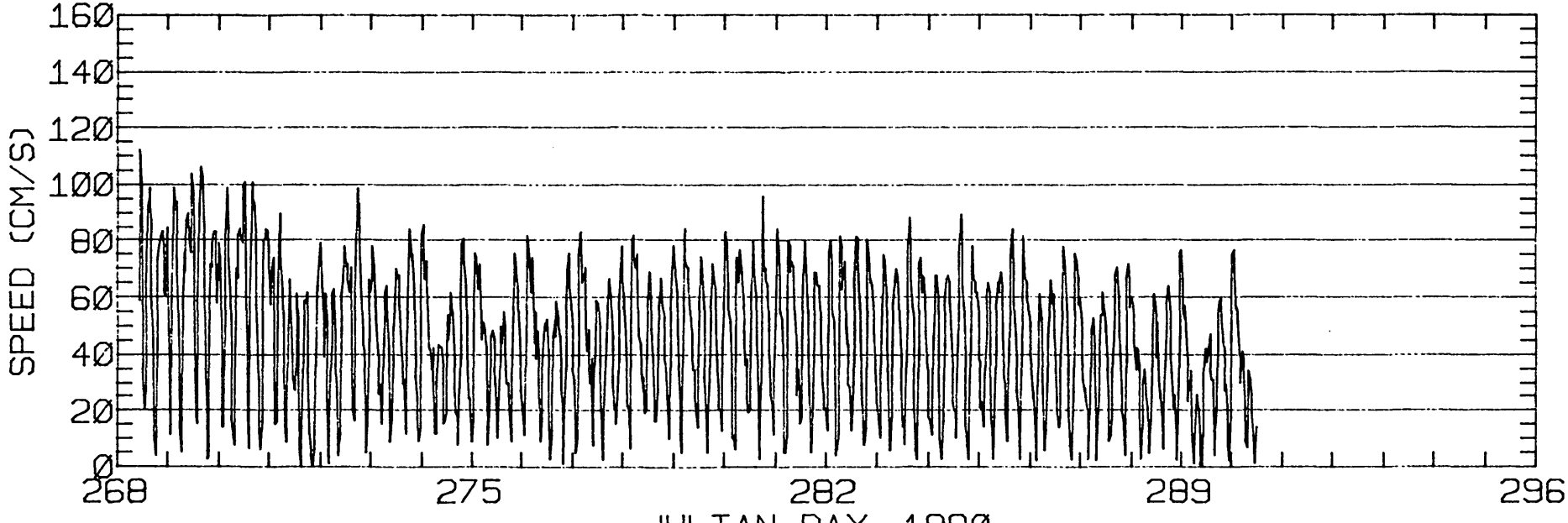
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.18	0.82	76.7	10.5	CLOCKWISE
K1	11.25	1.01	69.7	15.2	CLOCKWISE
N2	14.77	0.36	61.6	282.6	ANTI-CLOCKWISE
M2	63.45	0.25	63.1	278.2	ANTI-CLOCKWISE
S2	18.25	0.17	64.7	261.5	CLOCKWISE
M4	8.72	2.69	110.0	50.5	CLOCKWISE

RMS SPEED: 52.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 43.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.25
STANDARD DEVIATION U-SERIES: 13.50 CM/SEC
STANDARD DEVIATION V SERIES: 8.73 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.8	9.8	379.
2	12	3.7	7.3	244.
3	12	4.5	6.5	277.
4	6	7.2	5.2	221.
ALL	42	5.3	7.5	



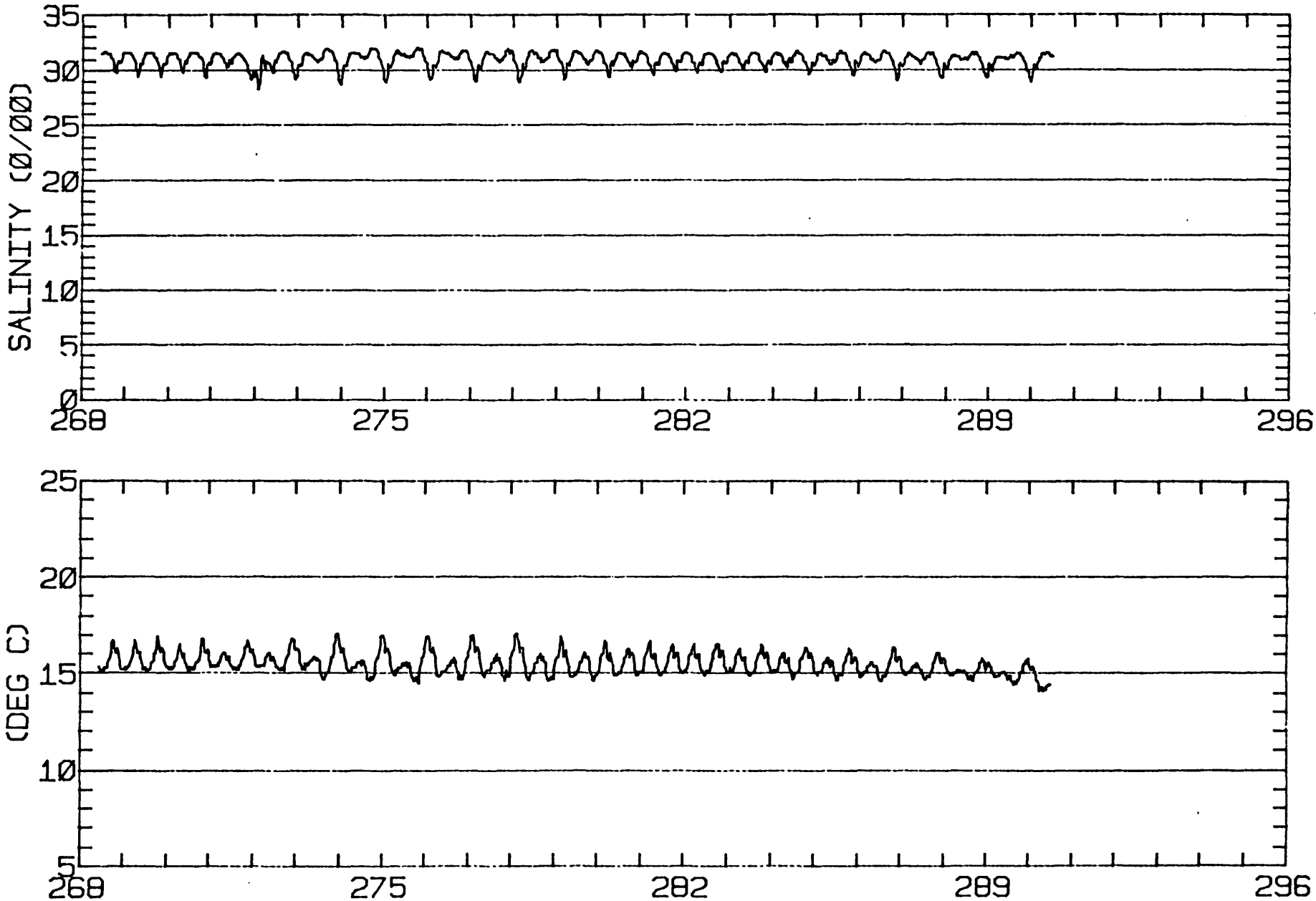


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 16 37-52-23N 122-26-23W

METER 007.5 METERS ABOVE BED. WATER DEPTH 029.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-23W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø29.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'26"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:10/16/80 1320 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

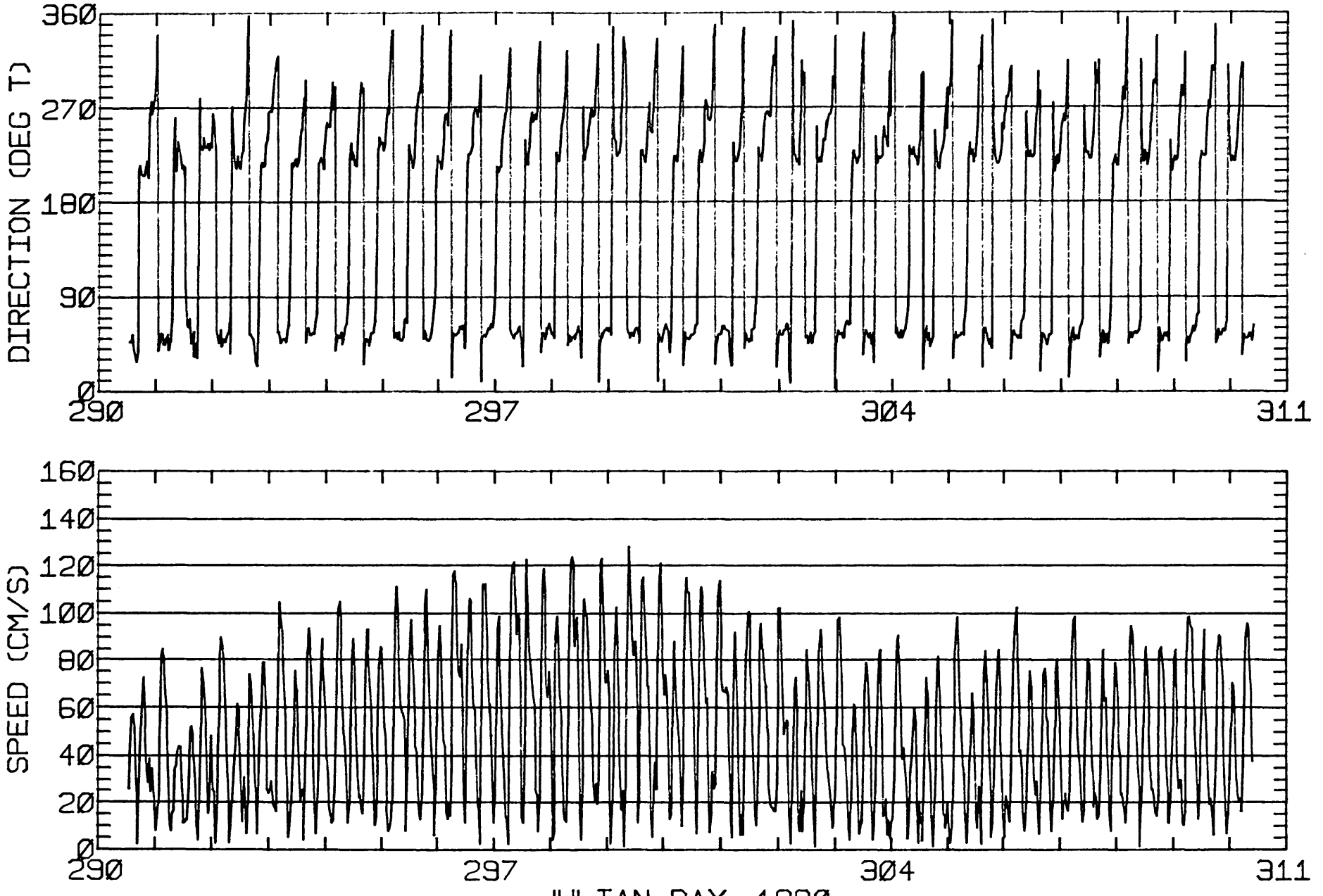
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.54	3.73	71.2	33.0	CLOCKWISE
K1	16.90	1.70	65.6	21.2	CLOCKWISE
N2	17.03	2.11	58.9	255.6	CLOCKWISE
M2	64.31	7.38	54.6	282.7	CLOCKWISE
S2	14.67	4.42	63.1	263.8	CLOCKWISE
M4	8.31	2.64	37.7	277.1	ANTI-CLOCKWISE

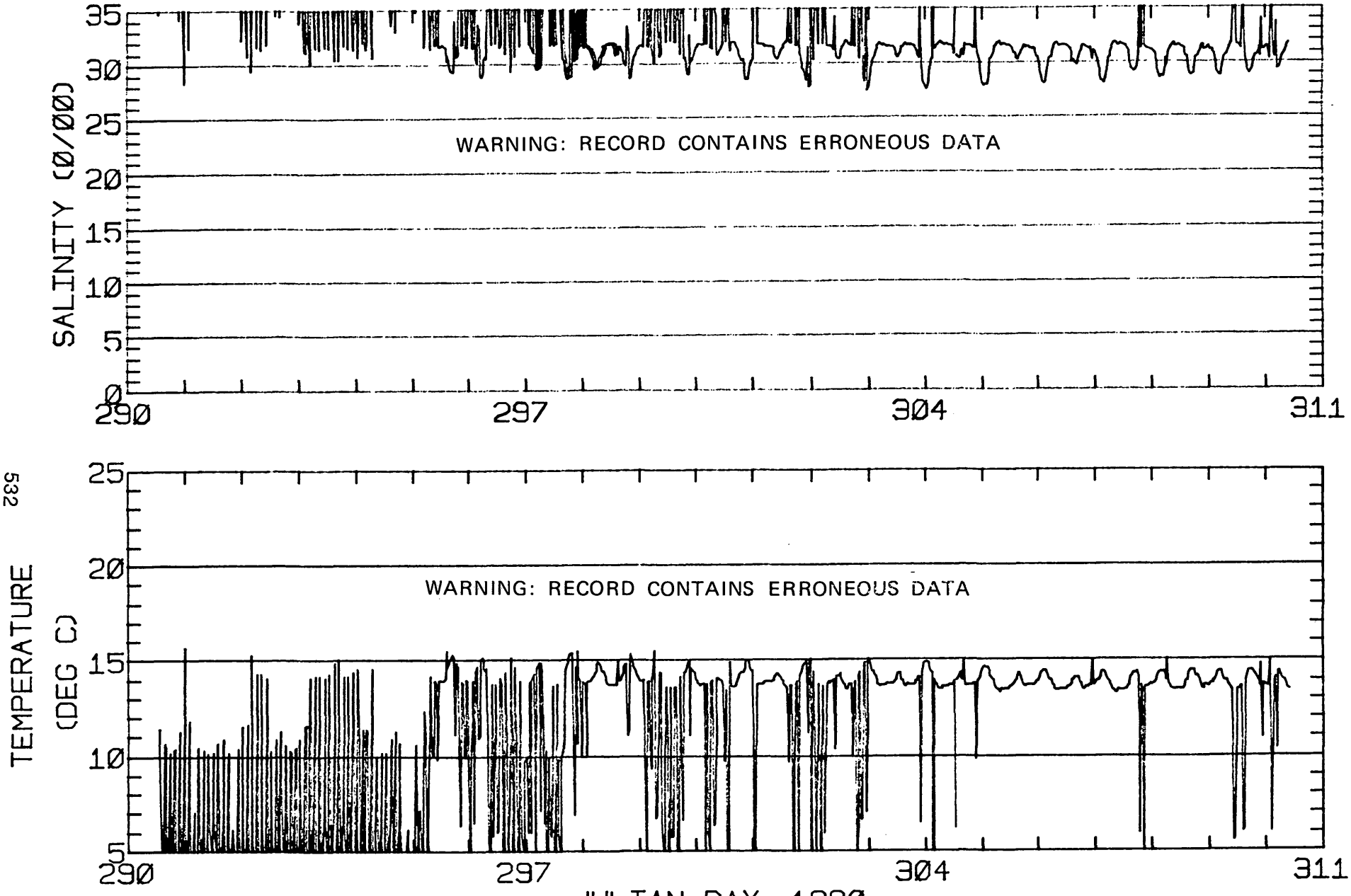
RMS SPEED: 58.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 58.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 12.86 CM/SEC
STANDARD DEVIATION V SERIES: 15.46 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	3.6	157.
2	12	6.3	9.4	176.
3	12	3.8	3.7	157.
4	2	7.0	6.3	159.
ALL	38	4.1	5.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-26N 122-26-23W
METER 022.9 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-26N 122-26-23W
METER Ø22.9 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'26"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:10/16/80 1312 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

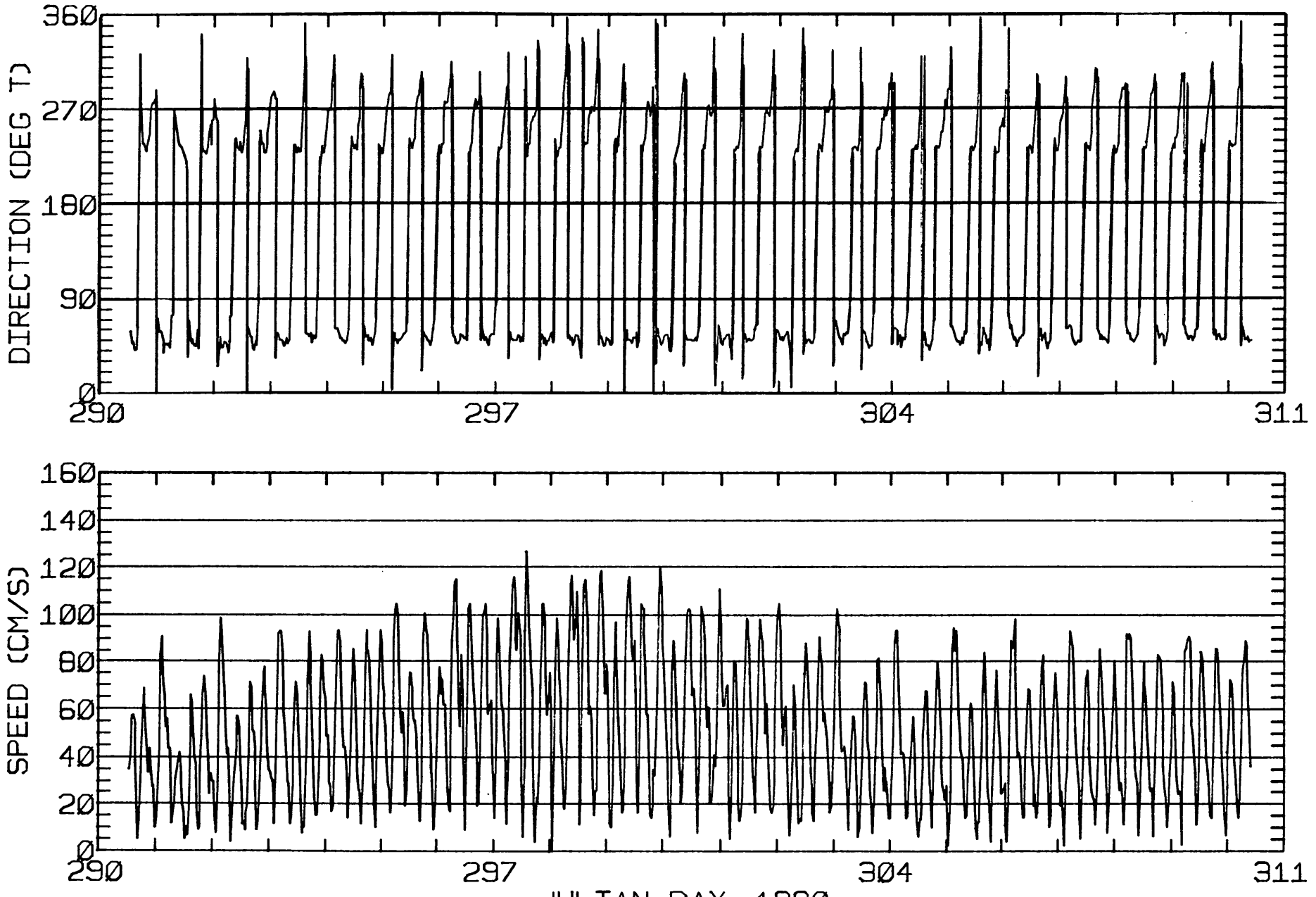
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.43	3.81	72.9	19.0	CLOCKWISE
K1	16.35	1.96	66.0	17.2	CLOCKWISE
N2	17.00	1.60	59.4	252.2	CLOCKWISE
M2	65.09	5.70	59.1	281.0	CLOCKWISE
S2	13.08	2.84	66.4	262.8	CLOCKWISE
M4	6.69	0.10	174.1	94.7	ANTI-CLOCKWISE

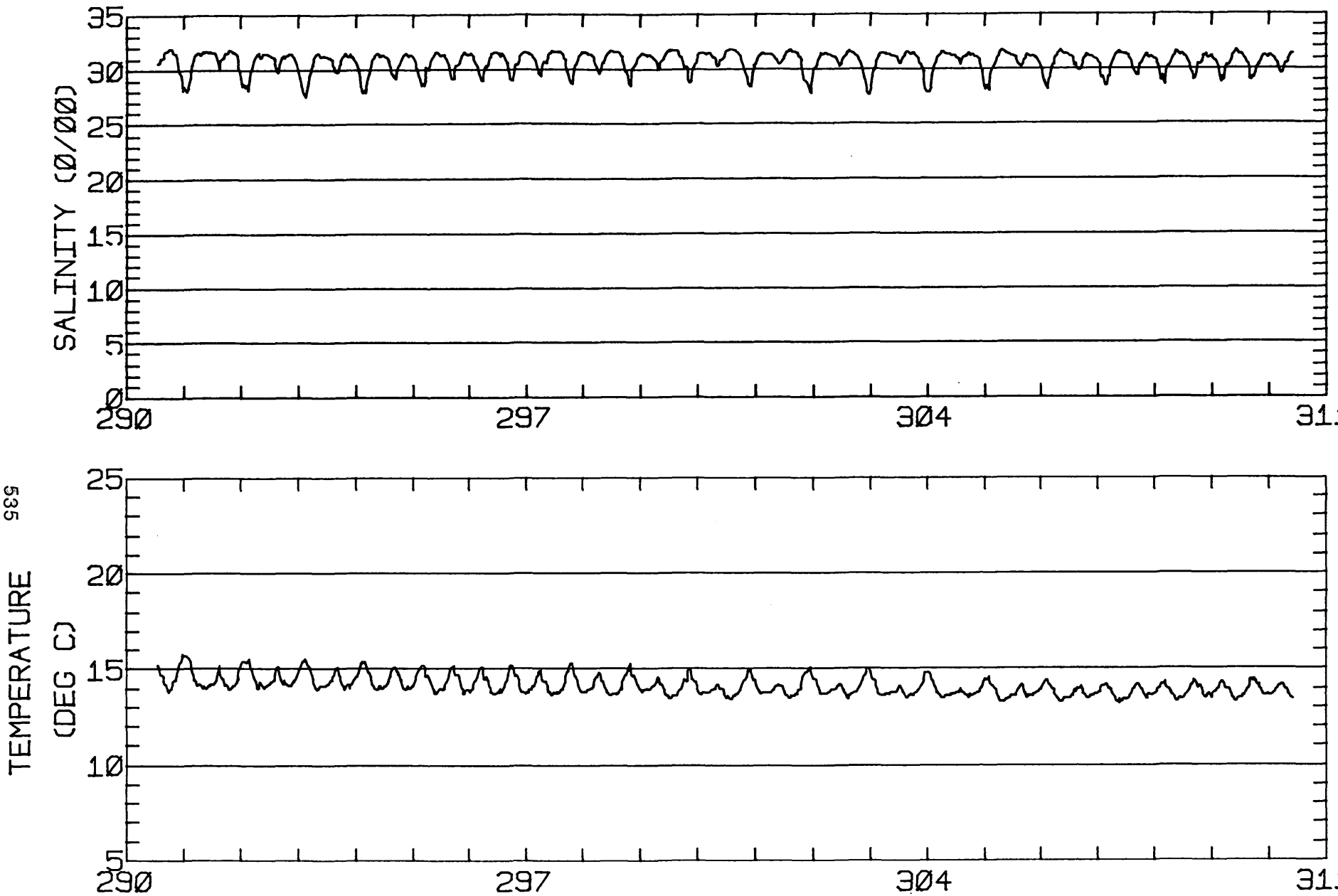
RMS SPEED: 59.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 103.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 62.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 12.31 CM/SEC
STANDARD DEVIATION V SERIES: 13.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.9	9.2	157.
2	12	5.5	15.5	176.
3	12	4.3	8.2	157.
4	2	5.6	9.6	159.
ALL	38	3.7	10.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-26N 122-26-23W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-26N 122-26-23W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'26"N 122 26'23"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 21.3 M (BELOW MLLW)
START TIME OF SERIES:10/16/80 1254 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

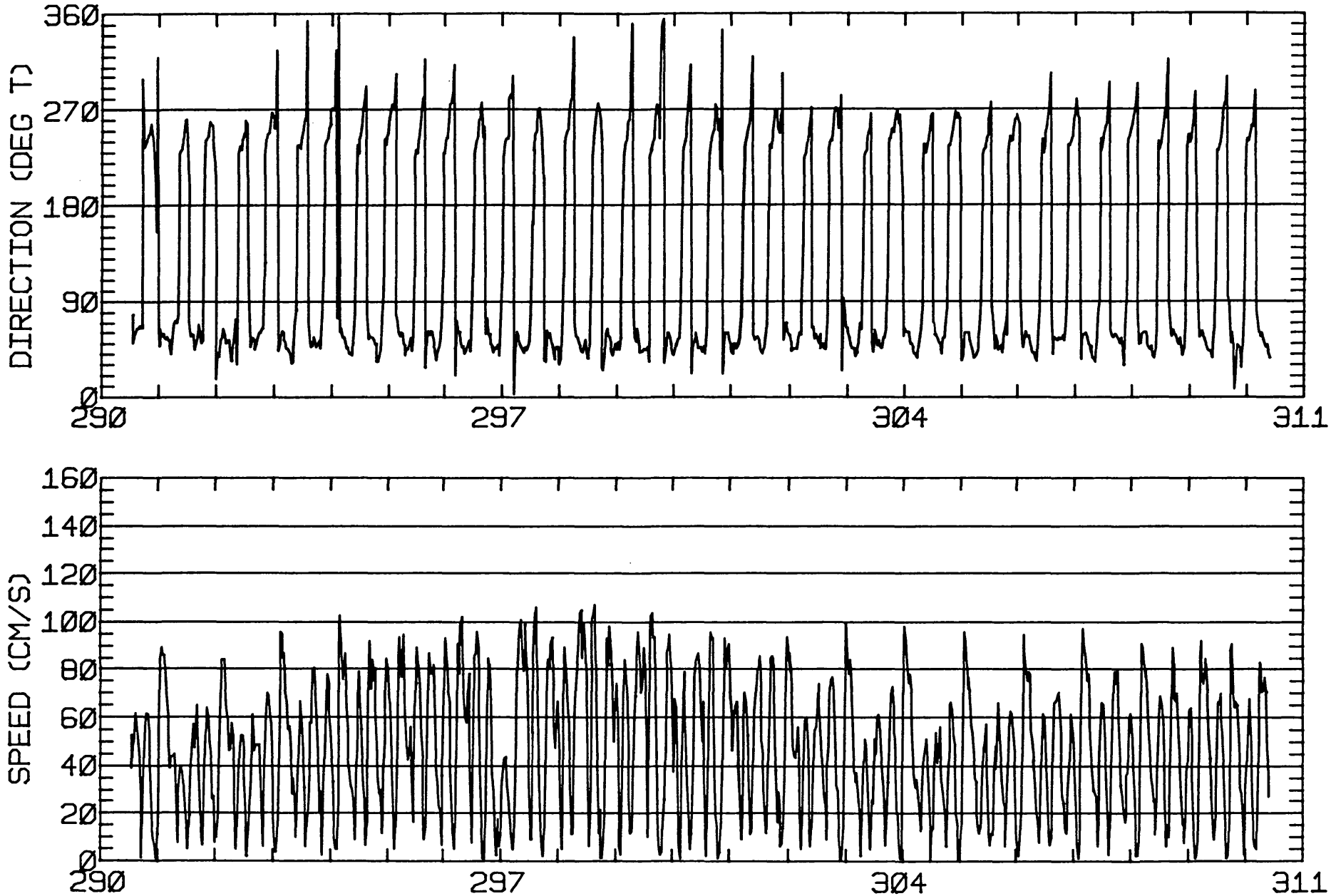
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.98	2.10	65.5	347.9	CLOCKWISE
K1	14.27	0.24	62.6	8.8	CLOCKWISE
N2	13.38	0.33	58.5	246.5	CLOCKWISE
M2	59.07	0.20	60.3	275.7	CLOCKWISE
S2	9.01	0.34	62.3	243.3	CLOCKWISE
M4	8.71	1.33	118.3	56.5	CLOCKWISE

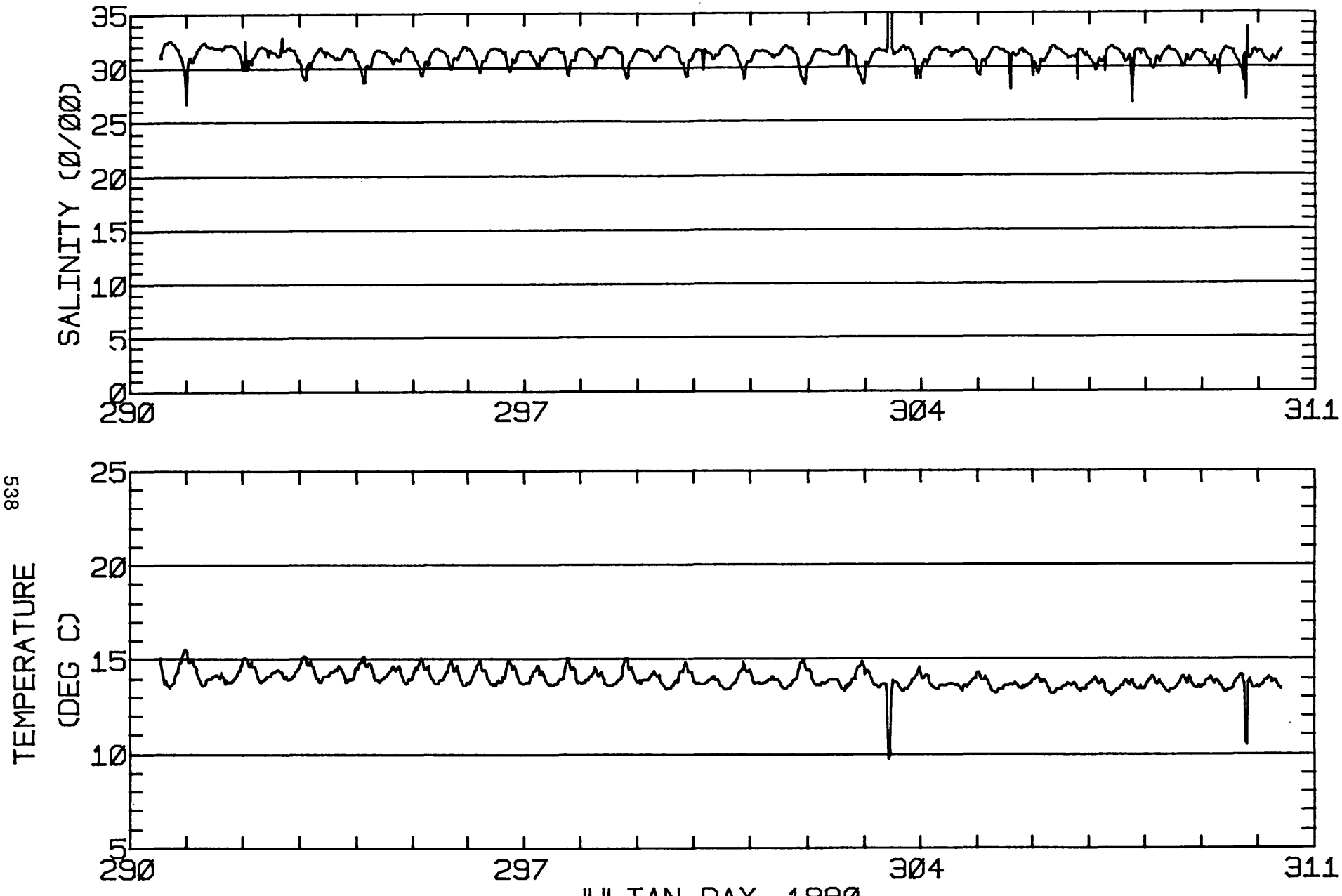
RMS SPEED: 54.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 89.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 42.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 61.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 15.49 CM/SEC
STANDARD DEVIATION V SERIES: 10.78 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	7.8	12.0	157.
2	12	8.3	16.1	176.
3	12	9.0	11.7	157.
4	2	7.2	15.3	159.
ALL	38	8.3	13.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-26N 122-26-23W
METER 007.7 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-26N 122-26-23W
METER Ø07.7 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'23"N 122 26'24"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 5/80 1312 PST JULIAN DAY=310
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

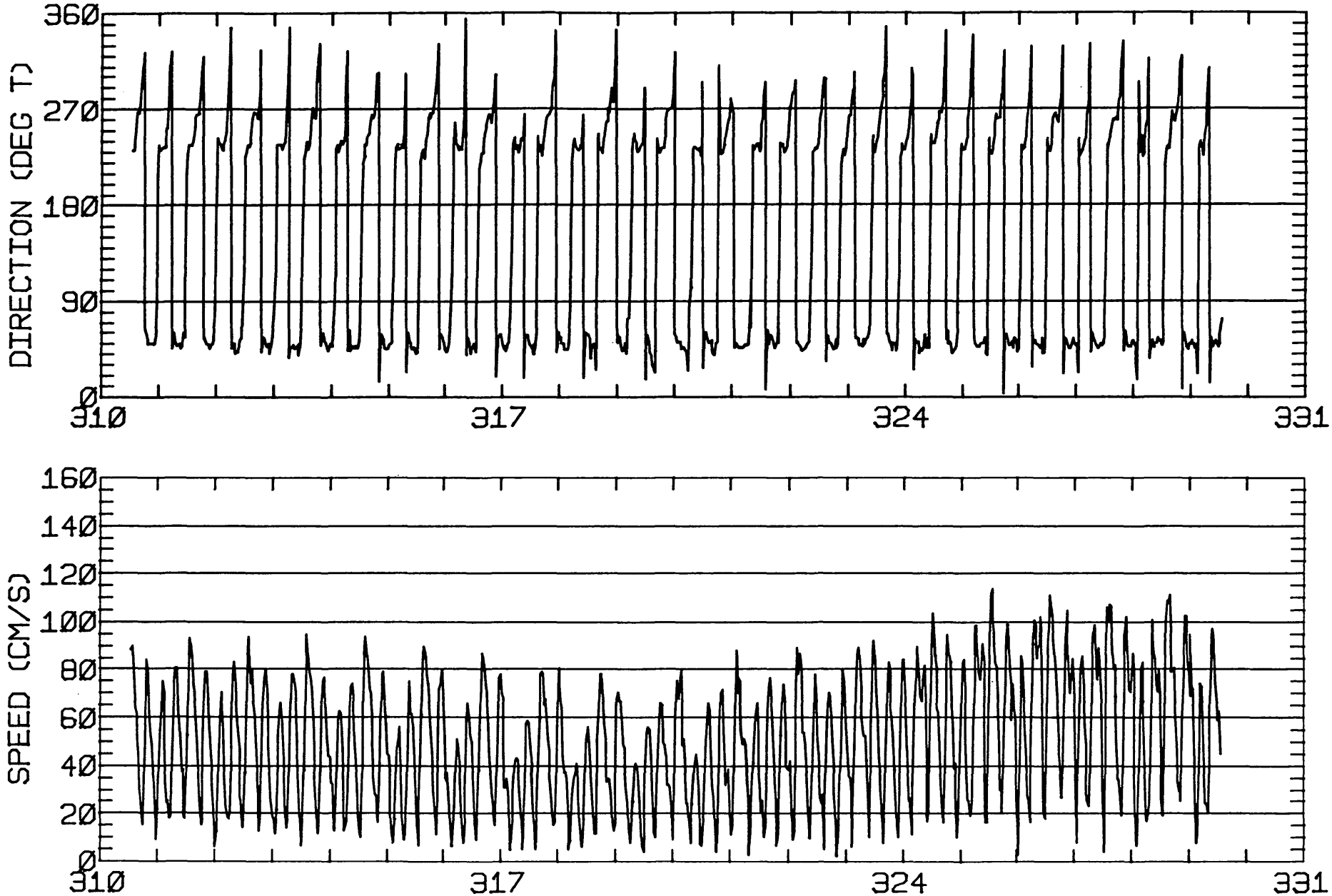
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.47	4.20	85.4	32.8	CLOCKWISE
K1	20.11	2.86	67.9	22.1	CLOCKWISE
N2	13.80	0.03	59.3	269.1	ANTI-CLOCKWISE
M2	63.07	6.86	58.3	278.0	CLOCKWISE
S2	15.40	2.42	64.9	276.7	CLOCKWISE
M4	5.50	1.03	137.8	71.0	CLOCKWISE

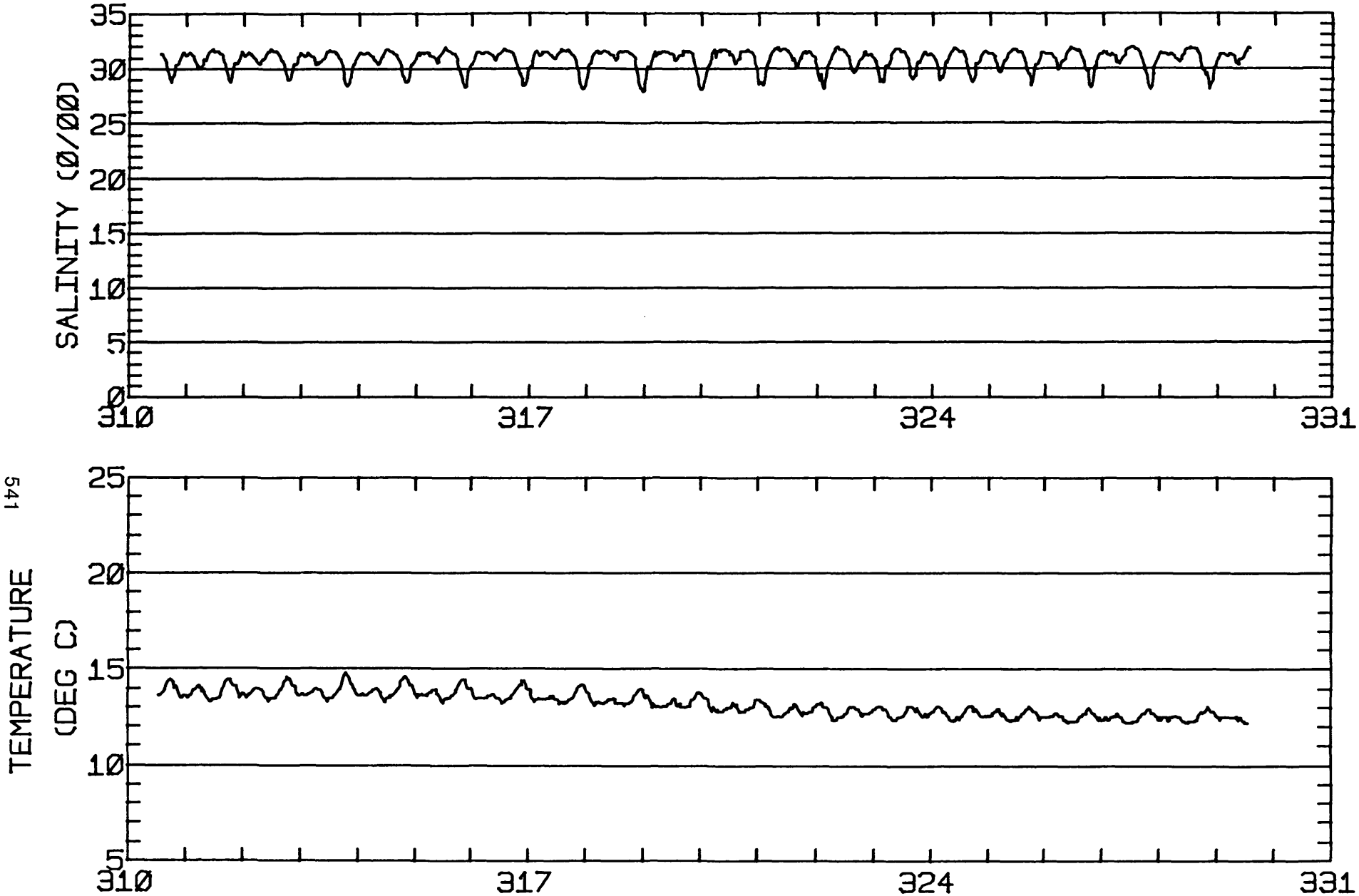
RMS SPEED: 56.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 107.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 63.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 10.04 CM/SEC
STANDARD DEVIATION V SERIES: 12.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.6	5.9	192.
2	12	-0.4	6.6	193.
3	12	0.8	14.0	180.
ALL	36	-1.4	8.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-24W
METER 016.8 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-24W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16
POSITION: 37 52'23"N 122 26'24"W
METER TYPE: AANDERAA
WATER DEPTH: 29.0 M (MLLW)
METER DEPTH: 21.3 M (BELOW MLLW)
START TIME OF SERIES:11/ 5/80 1144 PST JULIAN DAY=310
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

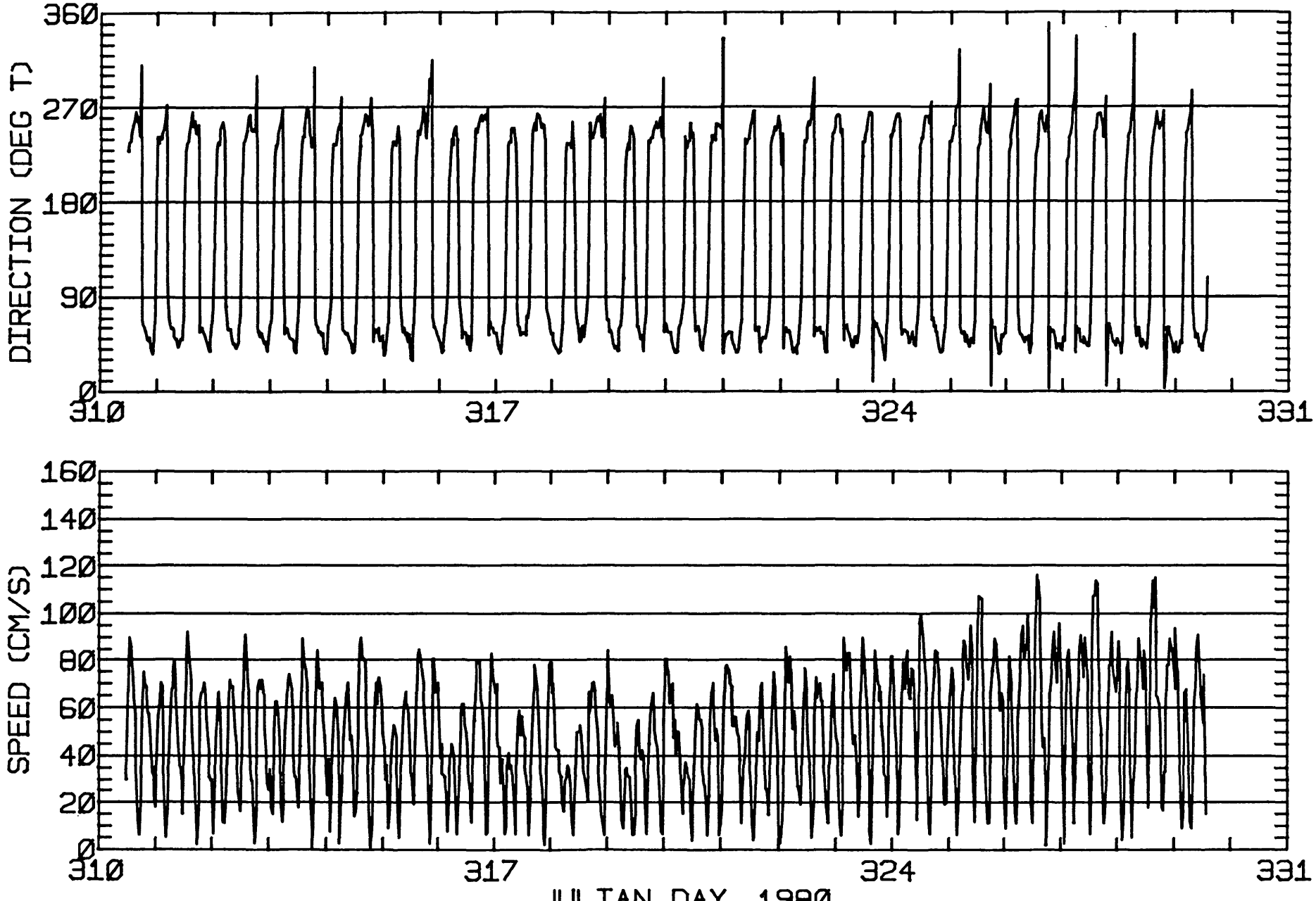
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.55	3.26	72.3	5.8	CLOCKWISE
K1	19.92	1.68	64.2	15.5	CLOCKWISE
N2	13.08	0.06	58.9	267.4	ANTI-CLOCKWISE
M2	61.58	0.22	59.9	274.0	ANTI-CLOCKWISE
S2	14.64	0.27	65.1	277.5	CLOCKWISE
M4	11.08	2.27	101.3	35.0	CLOCKWISE

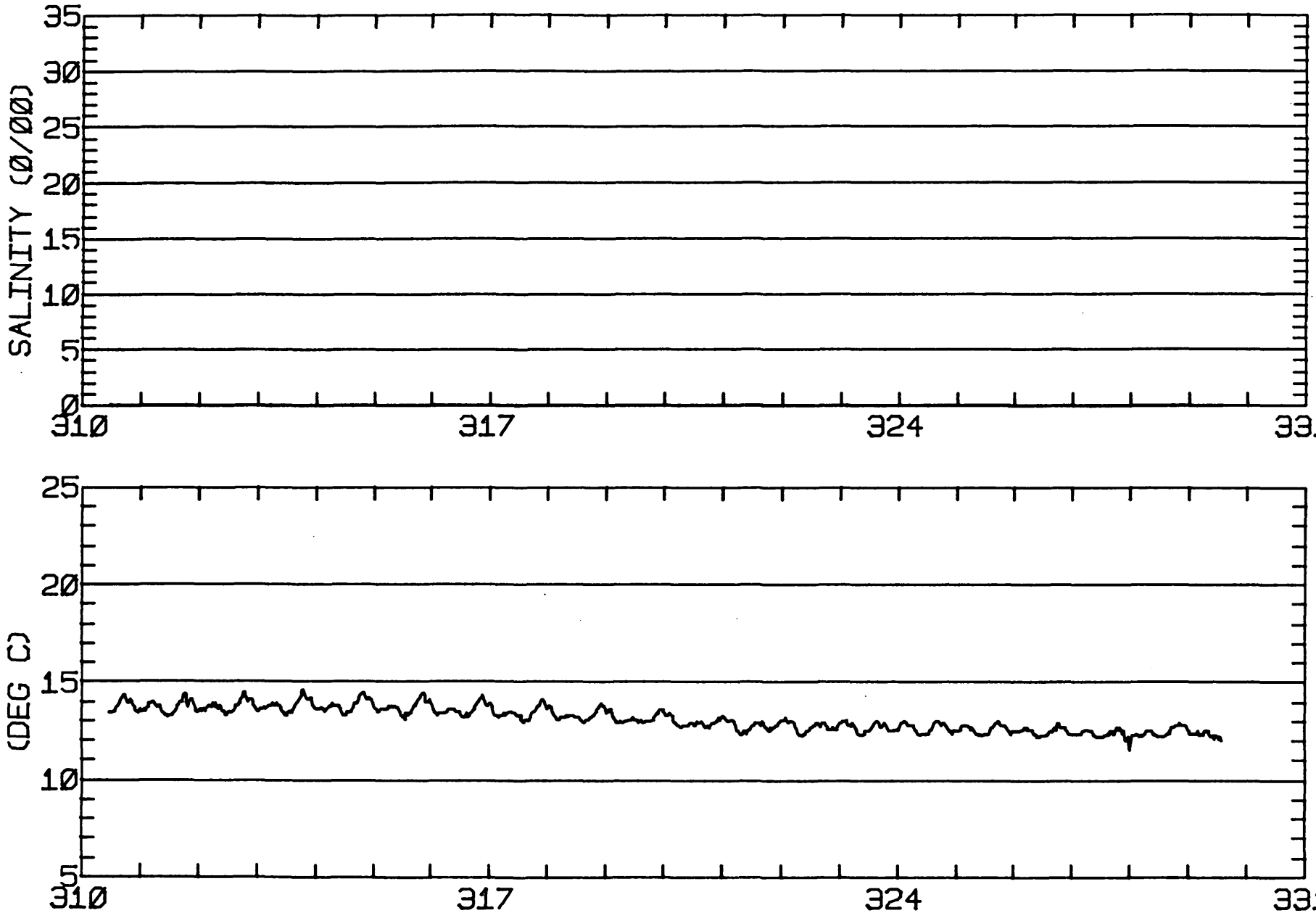
RMS SPEED: 56.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 104.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 62.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 12.56 CM/SEC
STANDARD DEVIATION V SERIES: 10.58 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.5	7.4	192.
2	12	5.9	8.9	193.
3	12	5.1	15.0	180.
ALL	36	4.2	10.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-24W
METER 007.7 METERS ABOVE BED. WATER DEPTH 029.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16 37-52-23N 122-26-24W
METER ØØ7.7 METERS ABOVE BED. WATER DEPTH Ø29.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16A
POSITION: 37 52'34"N 122 25'47"W
METER TYPE: AANDERAA
WATER DEPTH: 36.6 M (MLLW)
METER DEPTH: 13.7 M (BELOW MLLW)
START TIME OF SERIES:10/ 6/79 2130 PST JULIAN DAY=279
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

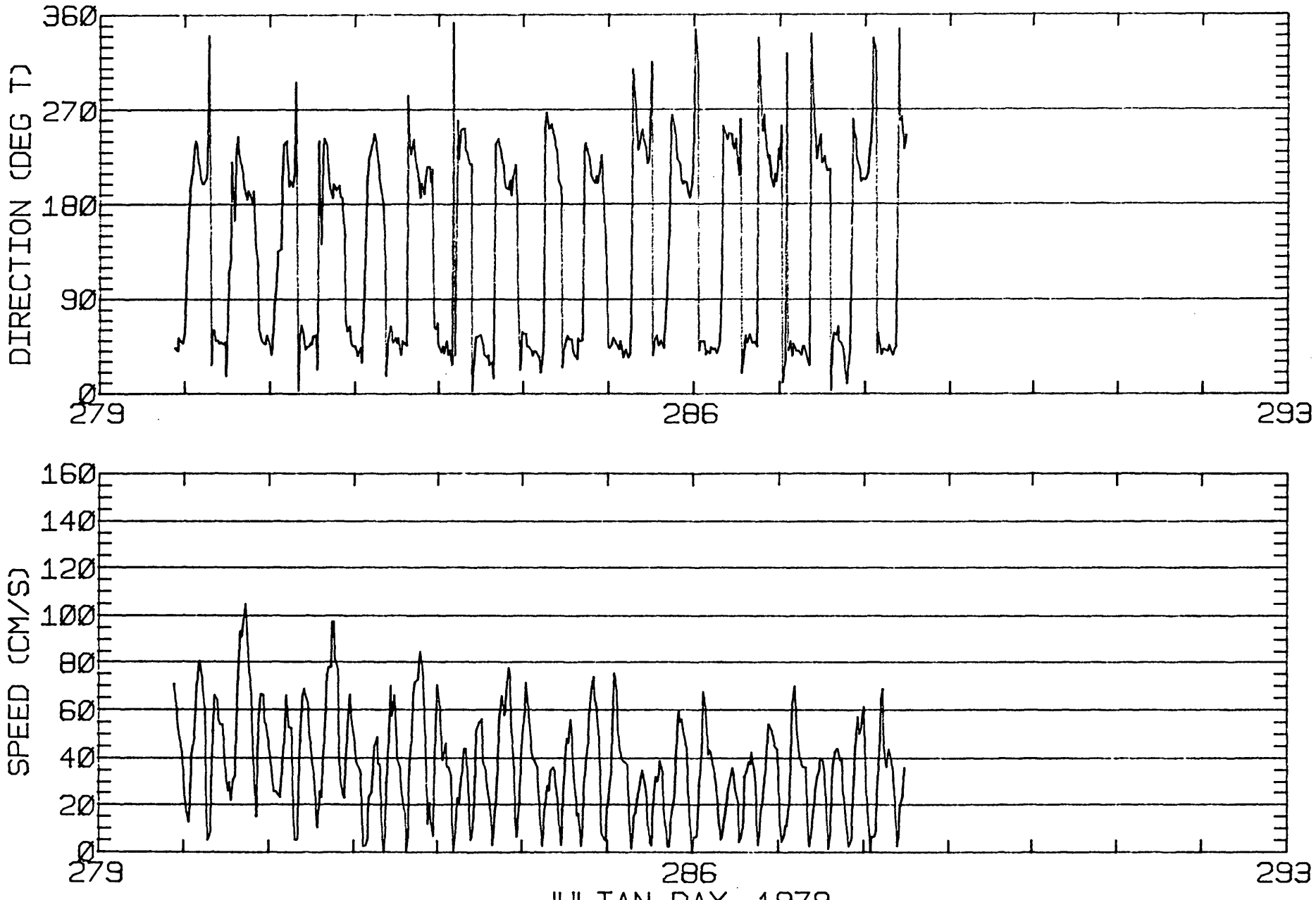
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.47	3.56	18.1	58.6	ANTI-CLOCKWISE
K1	17.19	1.14	22.2	21.0	ANTI-CLOCKWISE
N2	8.83	5.79	27.6	243.7	ANTI-CLOCKWISE
M2	49.17	0.51	37.7	289.6	CLOCKWISE
S2	11.78	0.17	44.6	279.0	ANTI-CLOCKWISE
M4	5.63	1.74	10.0	102.1	CLOCKWISE

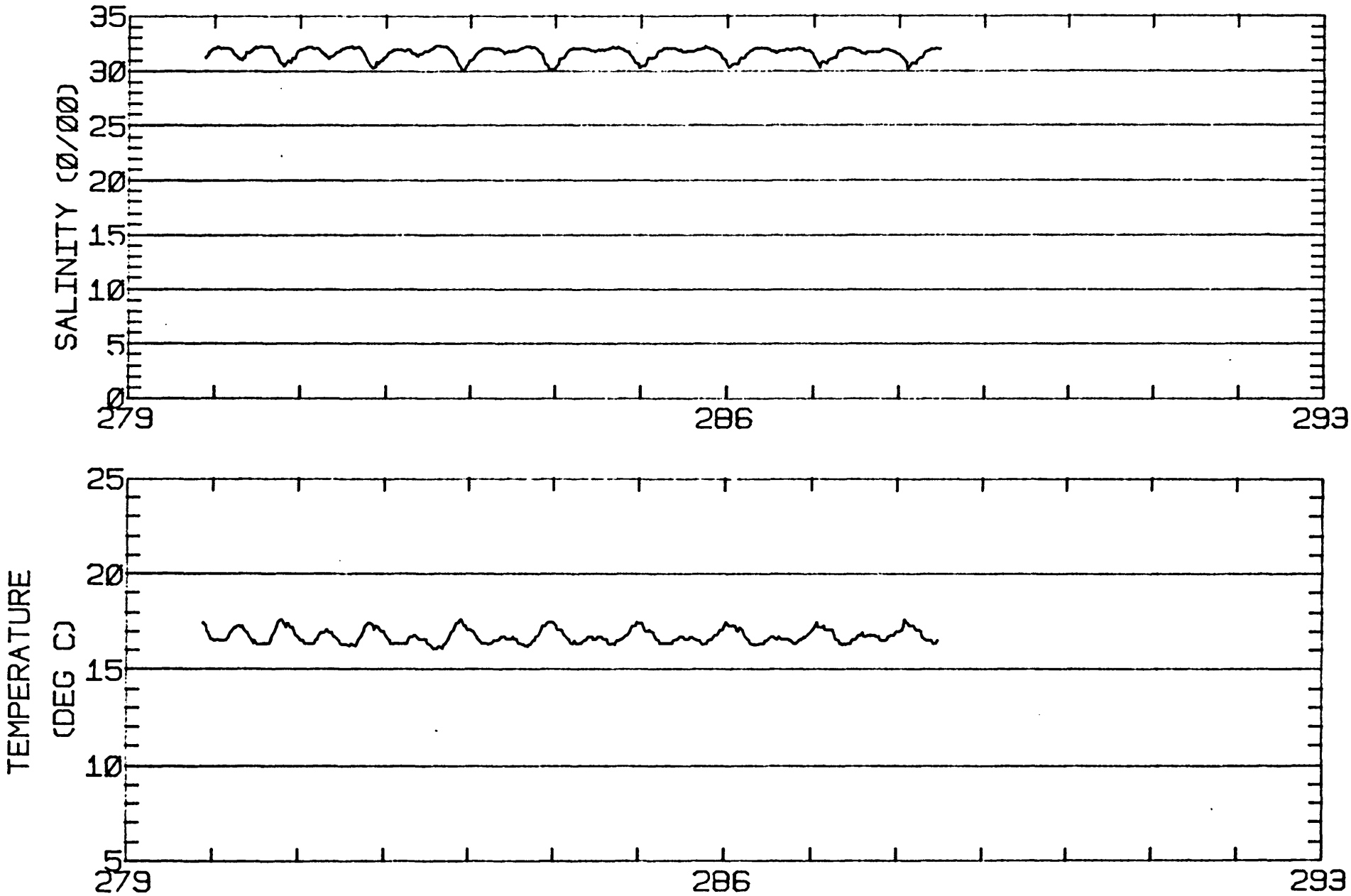
RMS SPEED: 43.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 83.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 34.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 9.47 CM/SEC
STANDARD DEVIATION V SERIES: 10.20 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.7	-4.5	165.
2	4	2.0	2.5	191.
ALL	16	3.3	-2.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16A 37-52-34N 122-25-47W
METER Ø22.8 METERS ABOVE BED. WATER DEPTH Ø36.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16A 37-52-34N 122-25-47W
METER Ø22.8 METERS ABOVE BED. WATER DEPTH Ø36.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16A
POSITION: 37 52'34"N 122 25'47"W
METER TYPE: AANDERAA
WATER DEPTH: 36.6 M (MLLW)
METER DEPTH: 19.8 M (BELOW MLLW)
START TIME OF SERIES:10/ 6/79 2132 PST JULIAN DAY=279
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

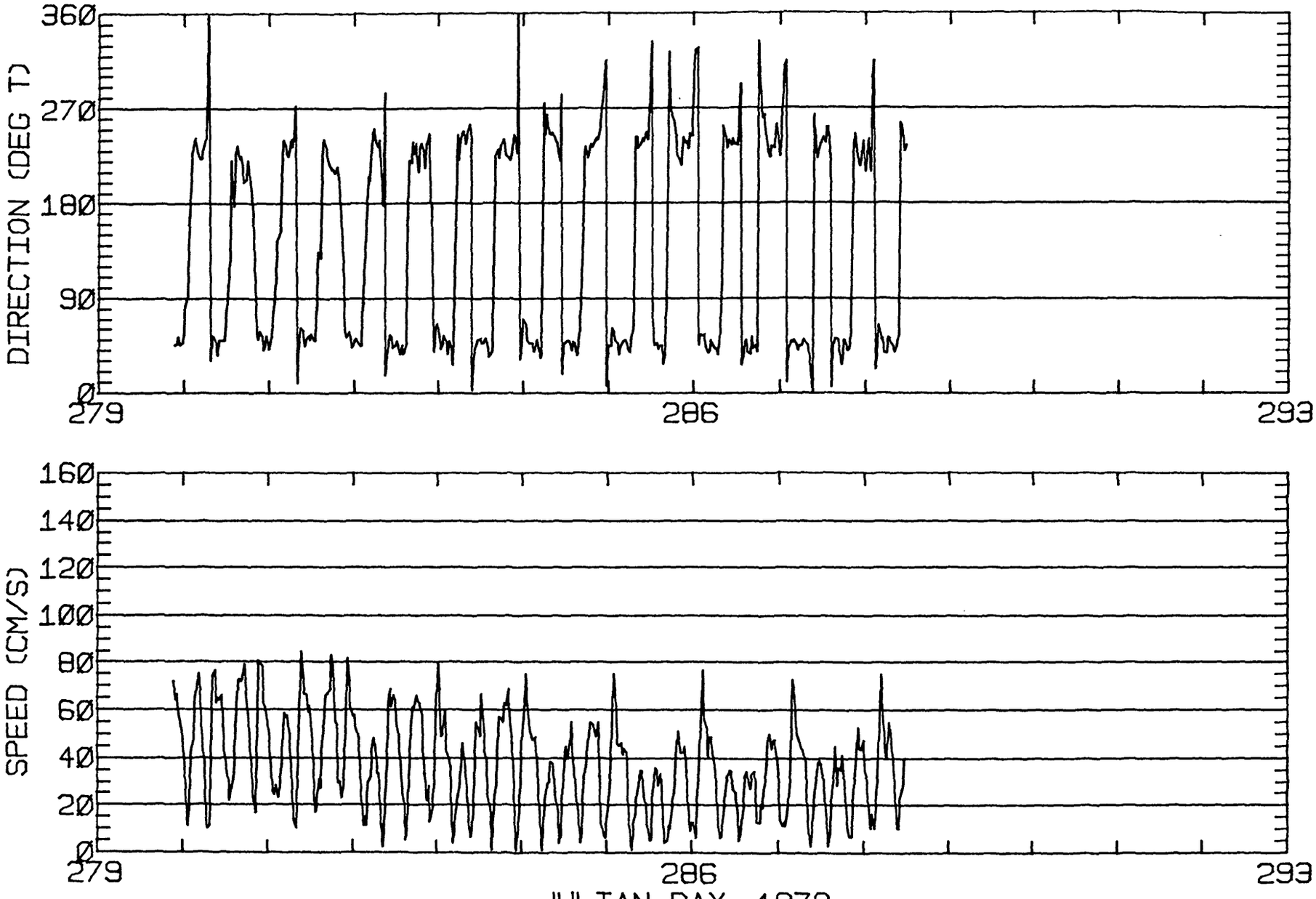
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.70	2.87	86.7	3.0	ANTI-CLOCKWISE
K1	15.41	1.41	37.2	18.5	CLOCKWISE
N2	10.71	6.10	47.4	237.1	ANTI-CLOCKWISE
M2	49.60	5.45	43.5	287.2	CLOCKWISE
S2	12.84	3.64	47.6	280.0	CLOCKWISE
M4	3.47	0.89	63.3	112.4	ANTI-CLOCKWISE

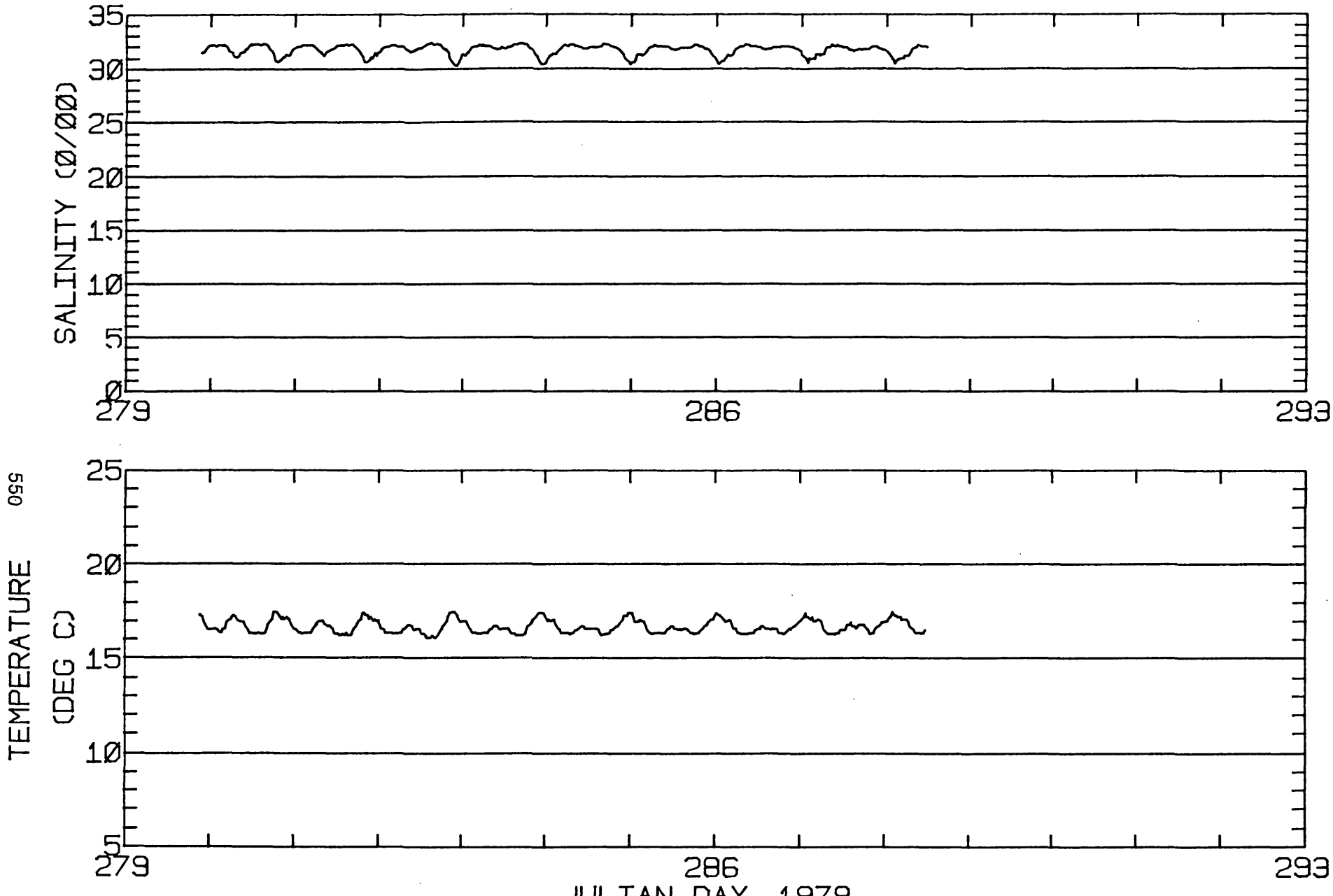
RMS SPEED: 42.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 84.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 46.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 8.48 CM/SEC
STANDARD DEVIATION V SERIES: 8.00 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.0	1.3	165.
2	4	0.8	4.9	191.
ALL	16	2.5	2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16A 37-52-34N 122-25-47W
METER 016.8 METERS ABOVE BED. WATER DEPTH 036.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16A 37-52-34N 122-25-47W
METER 016.8 METERS ABOVE BED. WATER DEPTH 036.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 16A
POSITION: 37 52'34"N 122 25'47"W
METER TYPE: AANDERAA
WATER DEPTH: 36.6 M (MLLW)
METER DEPTH: 29.0 M (BELOW MLLW)
START TIME OF SERIES:10/ 7/79 1624 PST JULIAN DAY=280
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

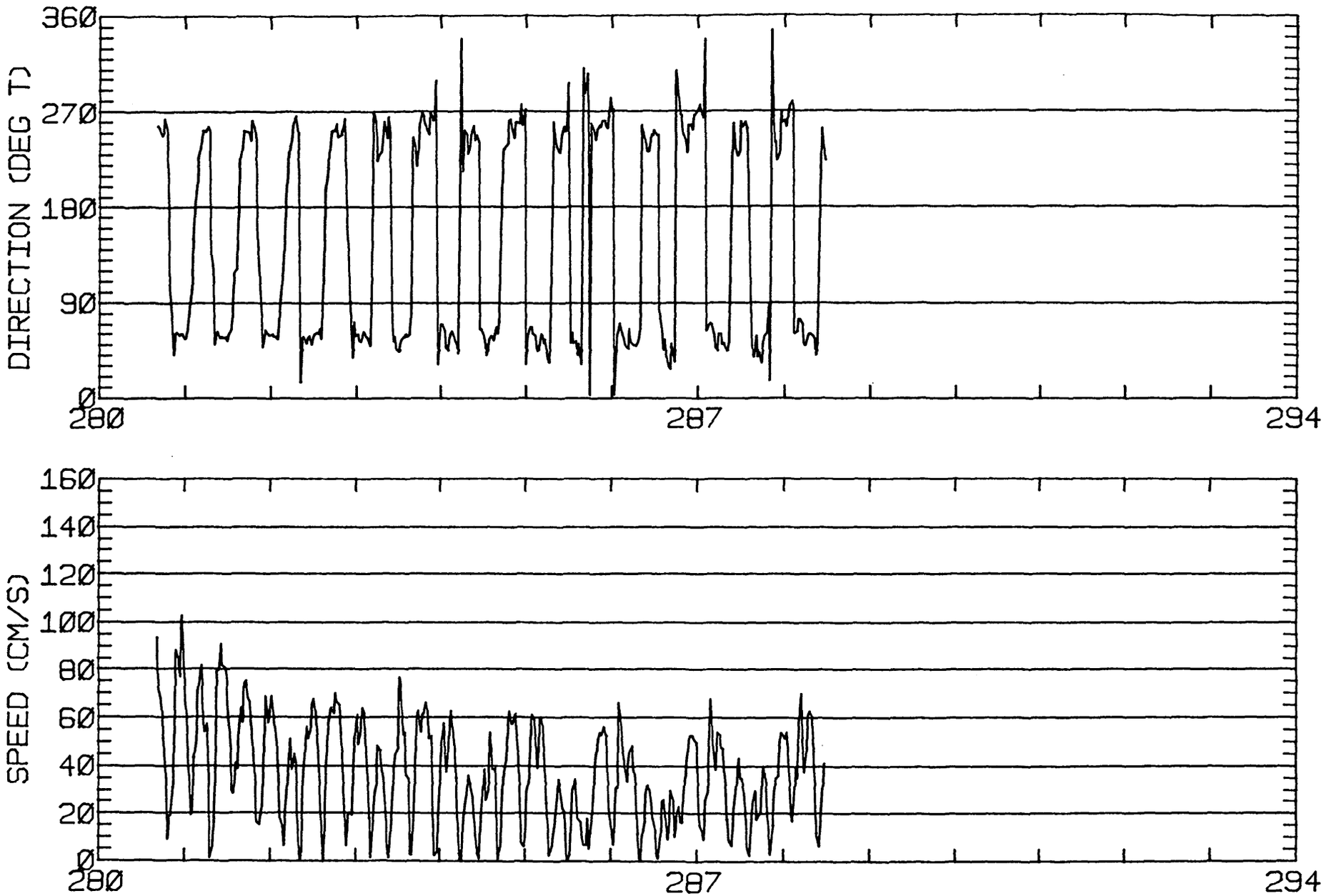
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.25	1.83	85.7	5.3	CLOCKWISE
K1	16.69	1.37	63.9	30.5	CLOCKWISE
N2	16.34	1.65	45.3	269.8	CLOCKWISE
M2	57.20	8.43	63.6	283.9	CLOCKWISE
S2	15.63	3.84	63.9	273.2	CLOCKWISE
M4	4.71	0.08	126.5	70.1	ANTI-CLOCKWISE

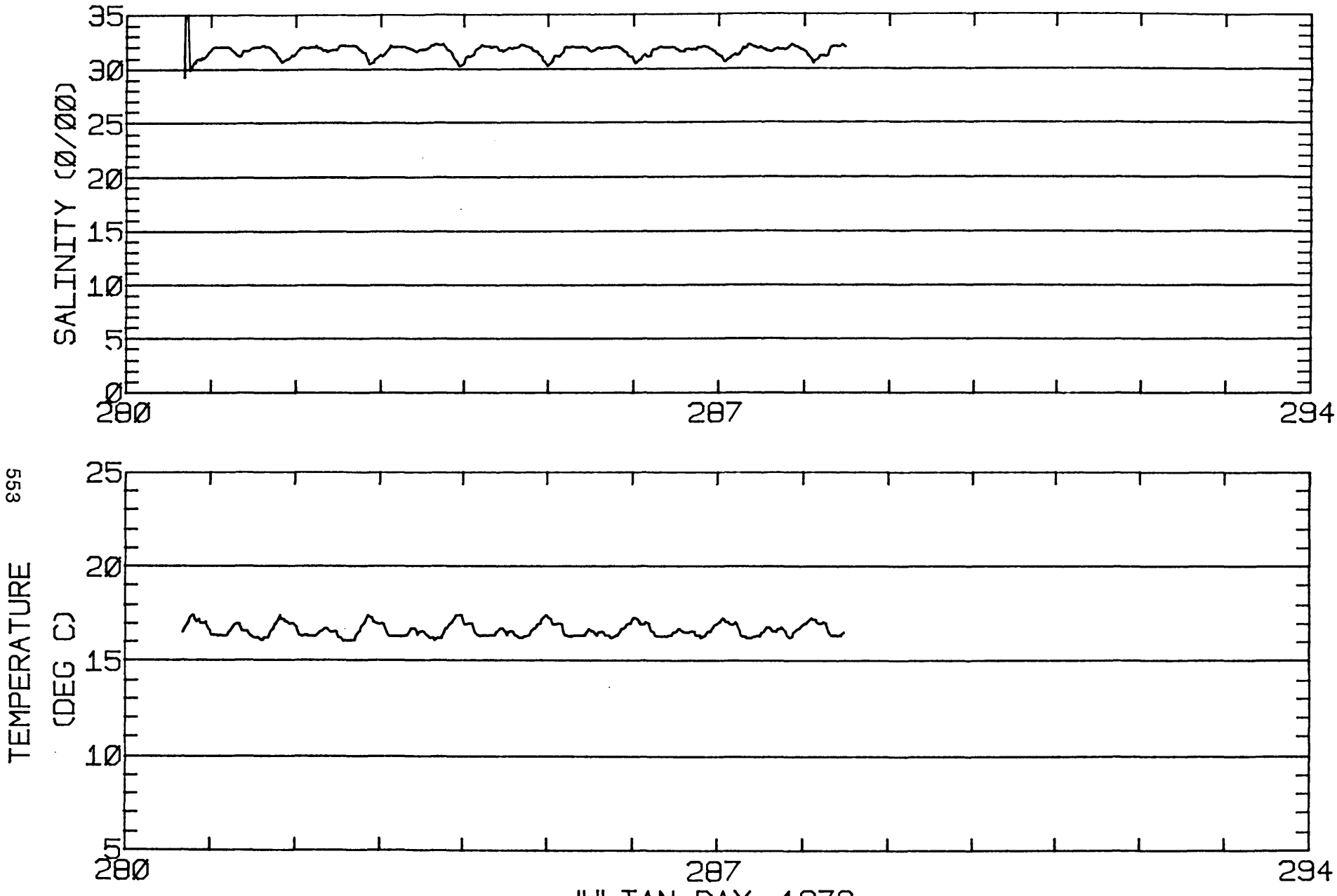
RMS SPEED: 43.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 96.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 65.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 9.38 CM/SEC
STANDARD DEVIATION V SERIES: 7.88 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.7	4.1	180.
2	2	1.3	6.4	191.
ALL	14	1.6	4.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16A 37-52-34N 122-25-47W
METER 007.5 METERS ABOVE BED. WATER DEPTH 036.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 16A 37-52-34N 122-25-47W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø36.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 17
POSITION: 37 54'54"N 122 26'52"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 3/ 7/79 1630 PST JULIAN DAY= 66
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

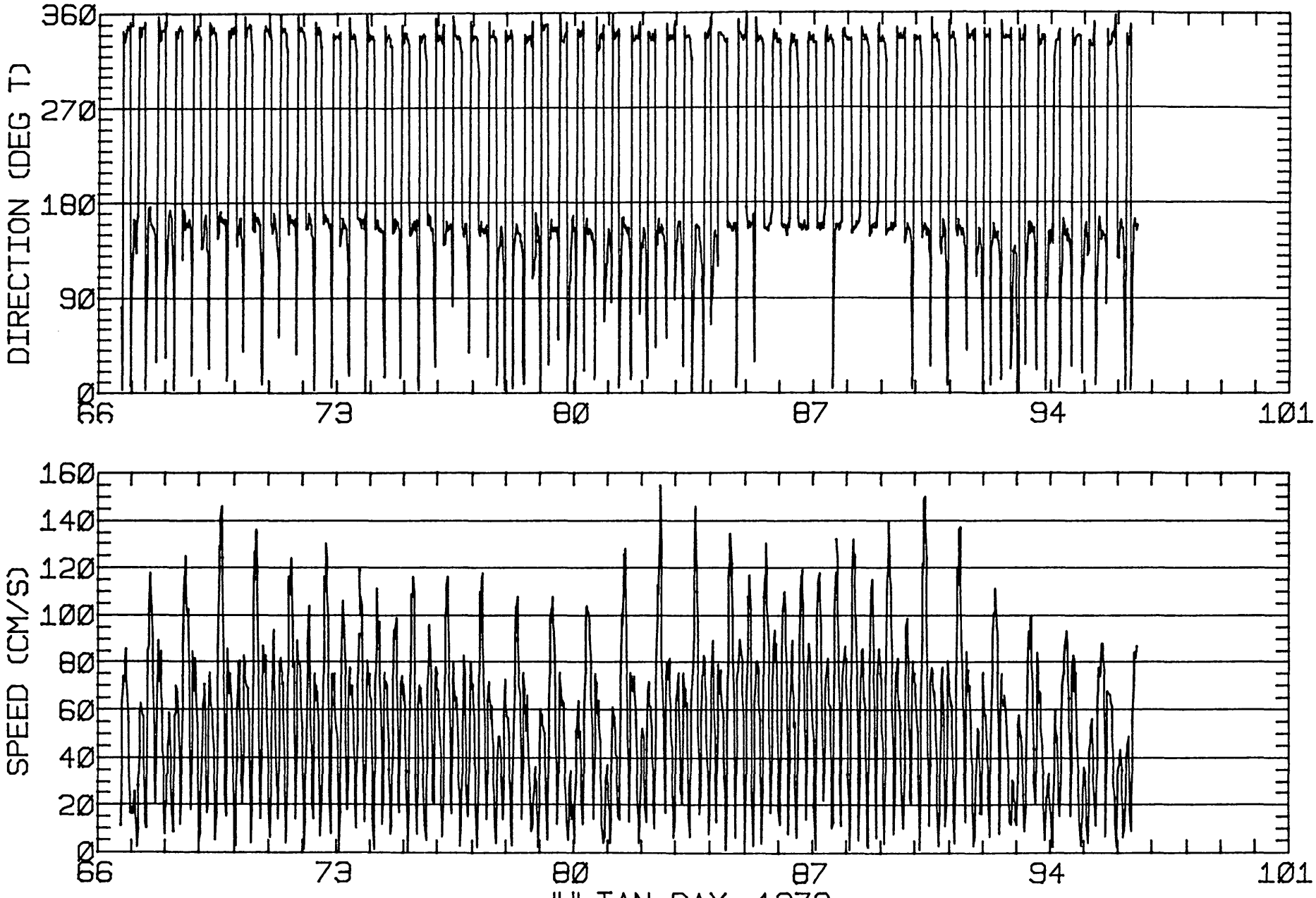
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	21.90	1.28	338.8	54.8	ANTI-CLOCKWISE
K1	21.35	0.76	338.9	61.0	CLOCKWISE
N2	14.37	0.46	331.1	279.0	ANTI-CLOCKWISE
M2	77.37	1.78	337.8	313.7	ANTI-CLOCKWISE
S2	22.58	1.85	344.0	314.2	ANTI-CLOCKWISE
M4	6.72	0.98	353.8	131.4	ANTI-CLOCKWISE

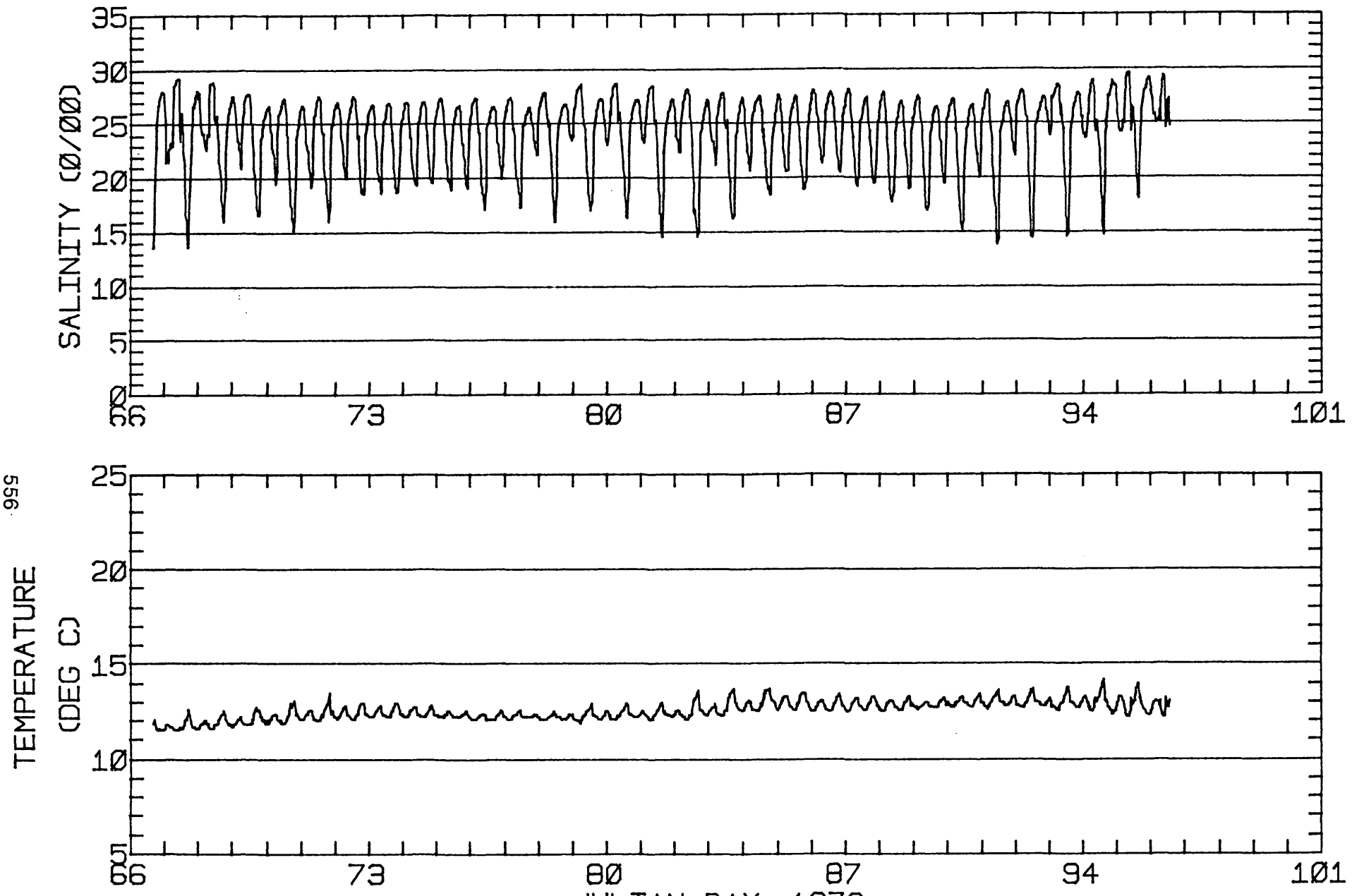
RMS SPEED: 65.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 143.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 55.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 339.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 7.76 CM/SEC
STANDARD DEVIATION V SERIES: 13.16 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.0	-3.4	1027.
2	12	3.0	-2.2	768.
3	12	6.5	-3.8	882.
4	12	4.6	-9.6	974.
5	8	4.6	0.5	897.
ALL	56	4.5	-4.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 17 37-54-54N 122-26-52W
METER 005.2 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 17 37-54-54N 122-26-52W
METER Ø05.2 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 17
POSITION: 37 54'54"N 122 26'52"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 10.1 M (BELOW MLLW)
START TIME OF SERIES: 3/ 7/79 1332 PST JULIAN DAY= 66
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

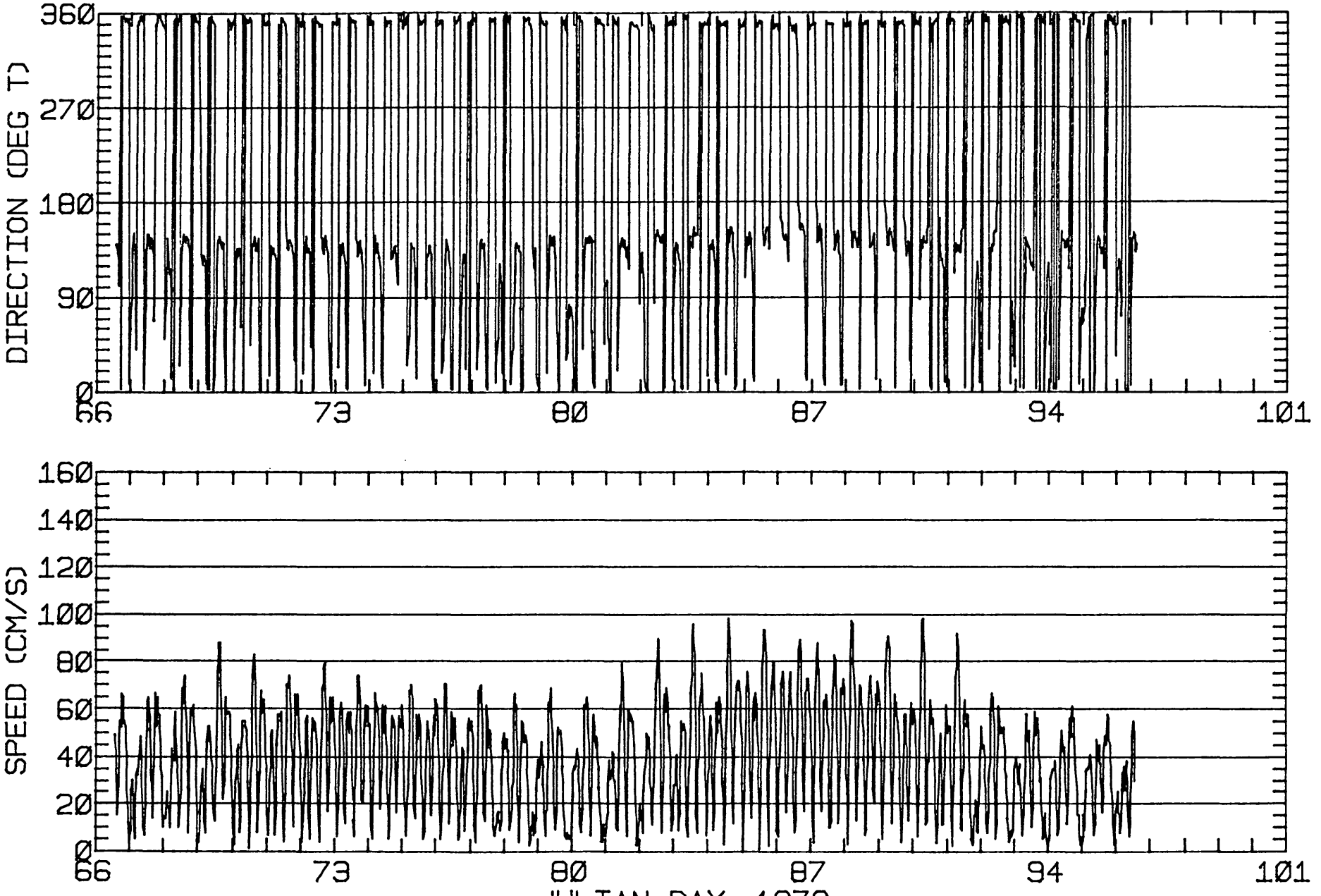
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.83	1.32	331.8	46.2	ANTI-CLOCKWISE
K1	15.16	0.29	335.8	57.0	ANTI-CLOCKWISE
N2	10.94	1.14	343.2	274.8	ANTI-CLOCKWISE
M2	51.96	2.76	338.1	307.5	ANTI-CLOCKWISE
S2	16.36	2.14	335.4	309.1	ANTI-CLOCKWISE
M4	5.38	1.78	320.1	107.1	CLOCKWISE

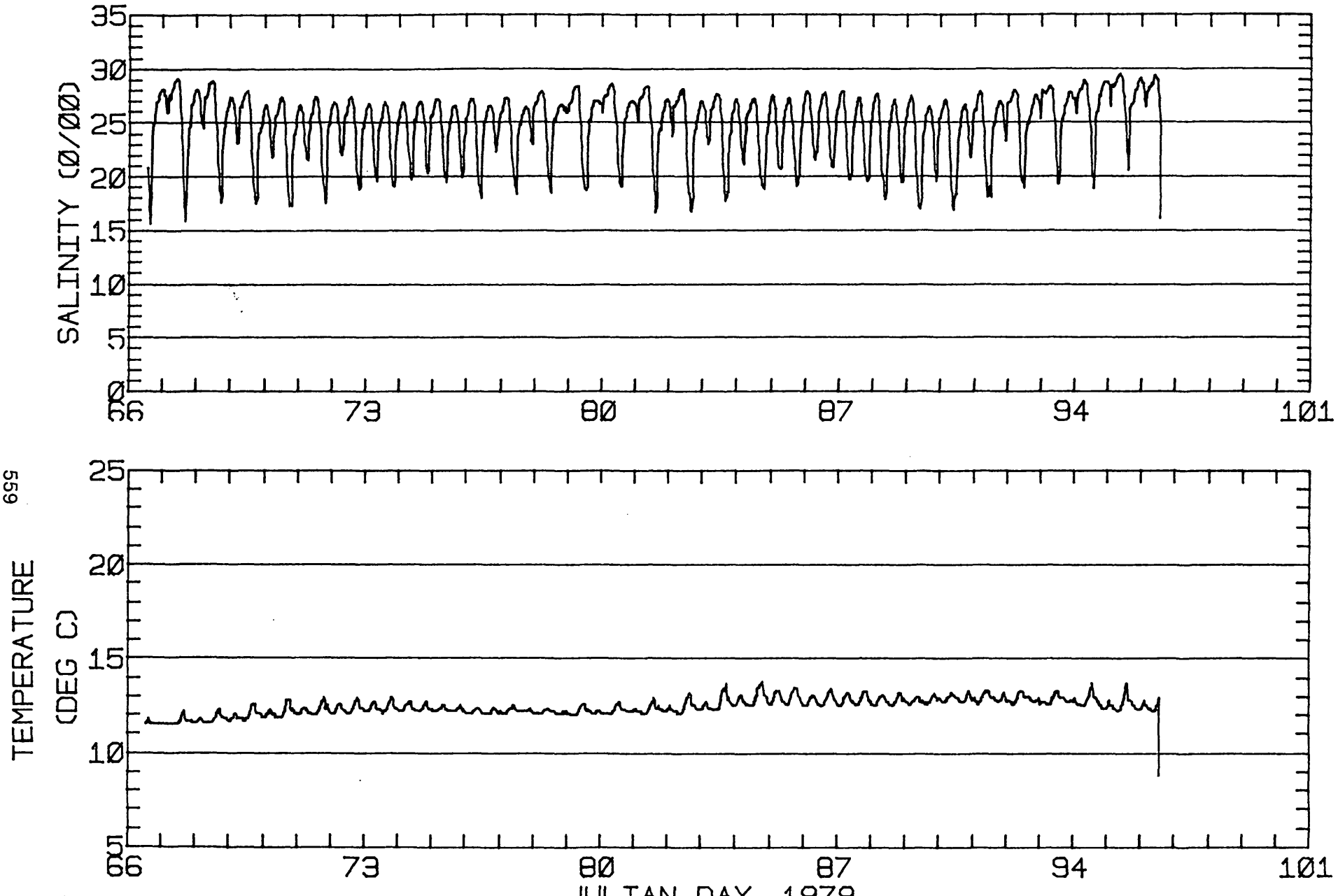
RMS SPEED: 46.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 97.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 336.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 6.33 CM/SEC
STANDARD DEVIATION V SERIES: 8.55 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.6	10.1	1027.
2	12	10.3	12.7	768.
3	12	8.7	8.2	882.
4	12	10.6	3.6	974.
5	8	5.6	14.5	897.
ALL	56	9.2	9.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 17 37-54-54N 122-26-52W
METER 001.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



559

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 17 37-54-54N 122-26-52W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 205
POSITION: 37 49'15"N 122 30'58"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 9/11/79 1320 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

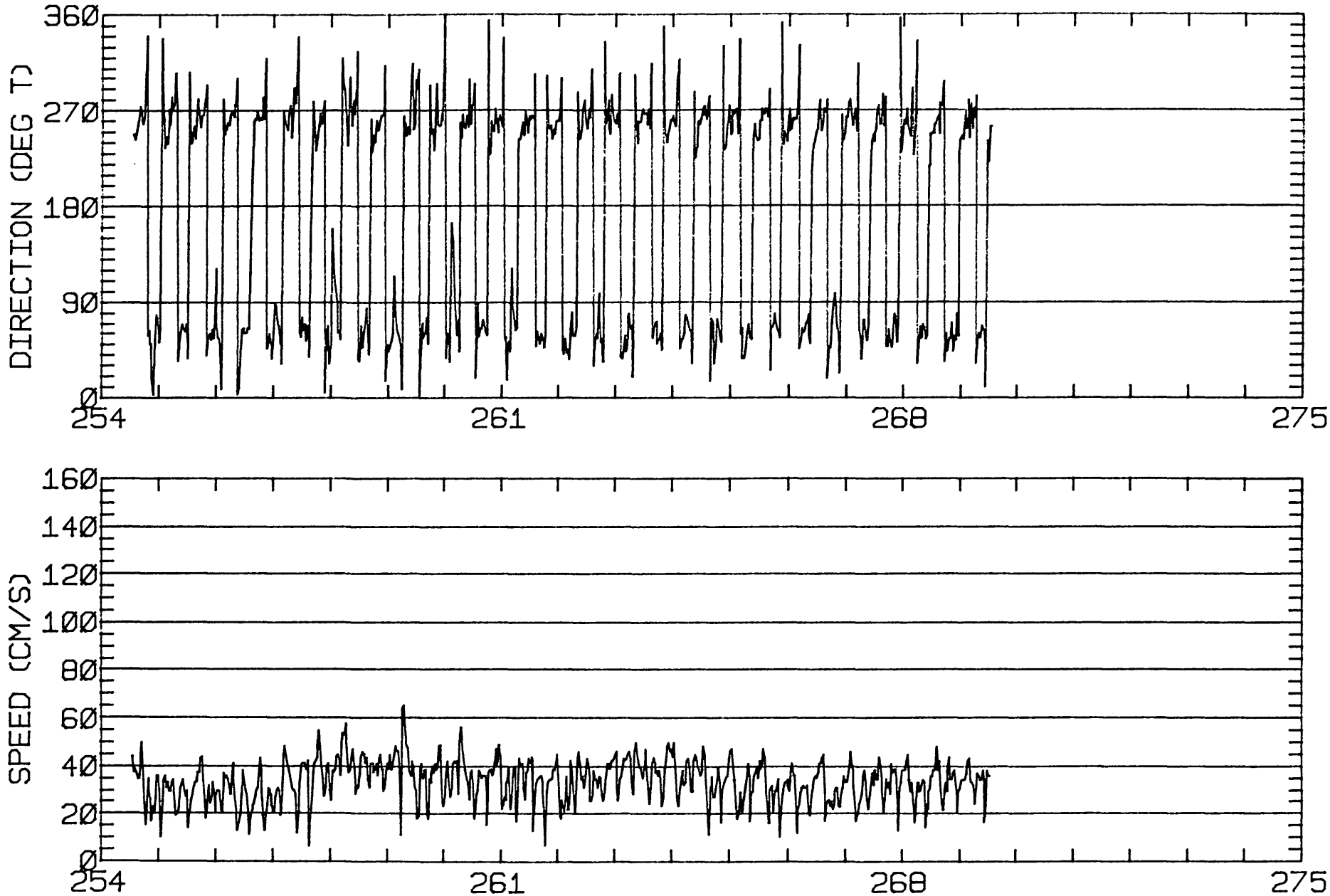
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	2.86	0.97	87.2	245.7	ANTI-CLOCKWISE
K1	3.24	0.01	79.1	271.3	ANTI-CLOCKWISE
N2	10.94	1.40	74.5	146.8	CLOCKWISE
M2	43.64	5.23	73.7	170.5	CLOCKWISE
S2	11.21	0.38	70.5	153.6	CLOCKWISE
M4	2.05	0.07	110.0	7.2	CLOCKWISE

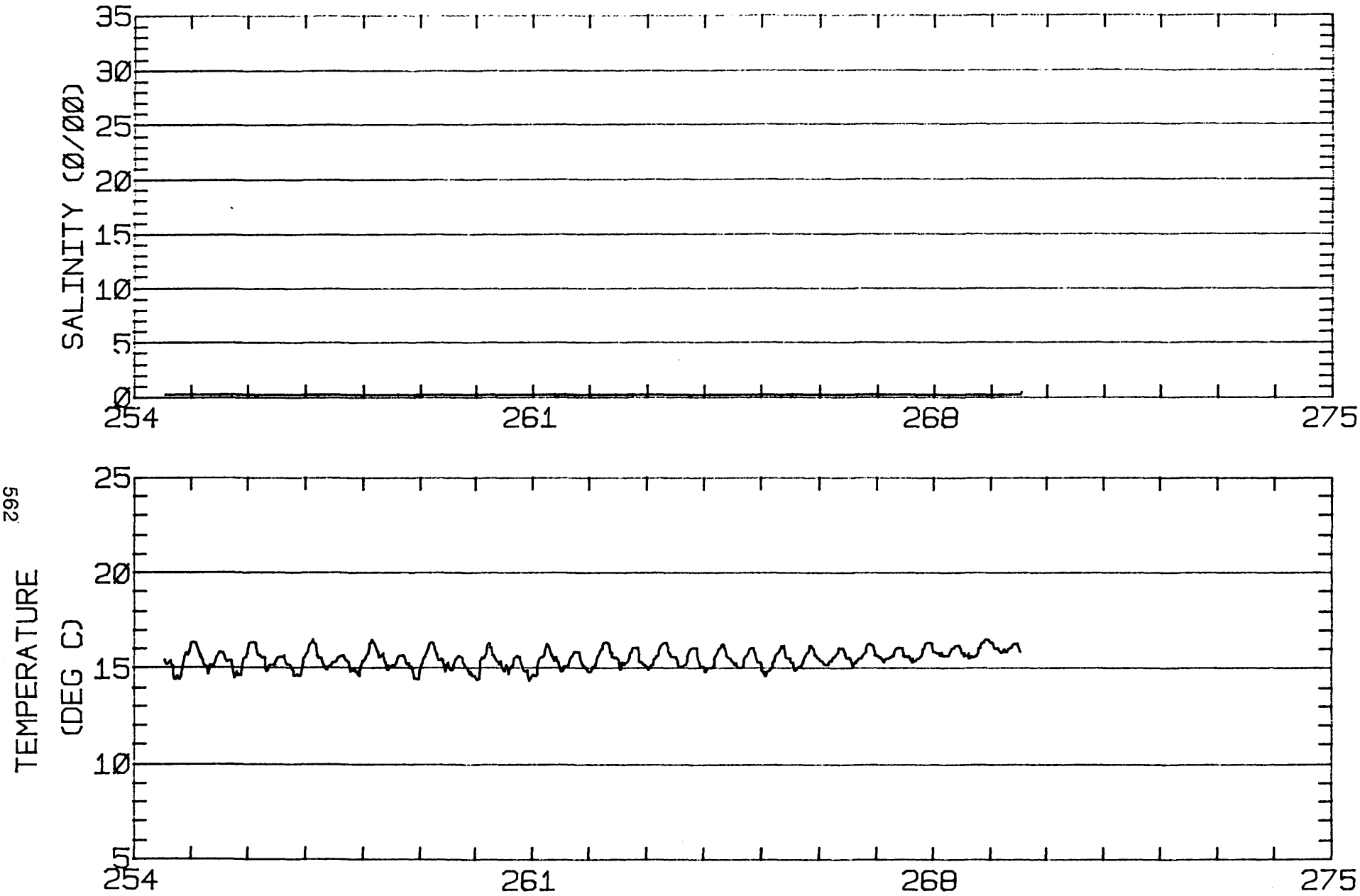
RMS SPEED:	35.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	61.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	32.1 CM/SEC
PRINCIPAL CURRENT DIRECTION:	74.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.11
STANDARD DEVIATION U-SERIES:	12.06 CM/SEC
STANDARD DEVIATION V SERIES:	10.01 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.8	5.3	190.
2	12	-8.7	3.8	167.
3	4	-6.9	3.5	126.
ALL	28	-7.2	4.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 205 37-49-15N 122-30-58W
METER 007.6 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 205 37-49-15N 122-30-58W
METER 007.6 METERS ABOVE BED. WATER DEPTH 014.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 205
POSITION: 37 49'15"N 122 30'58"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 9/11/79 1302 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

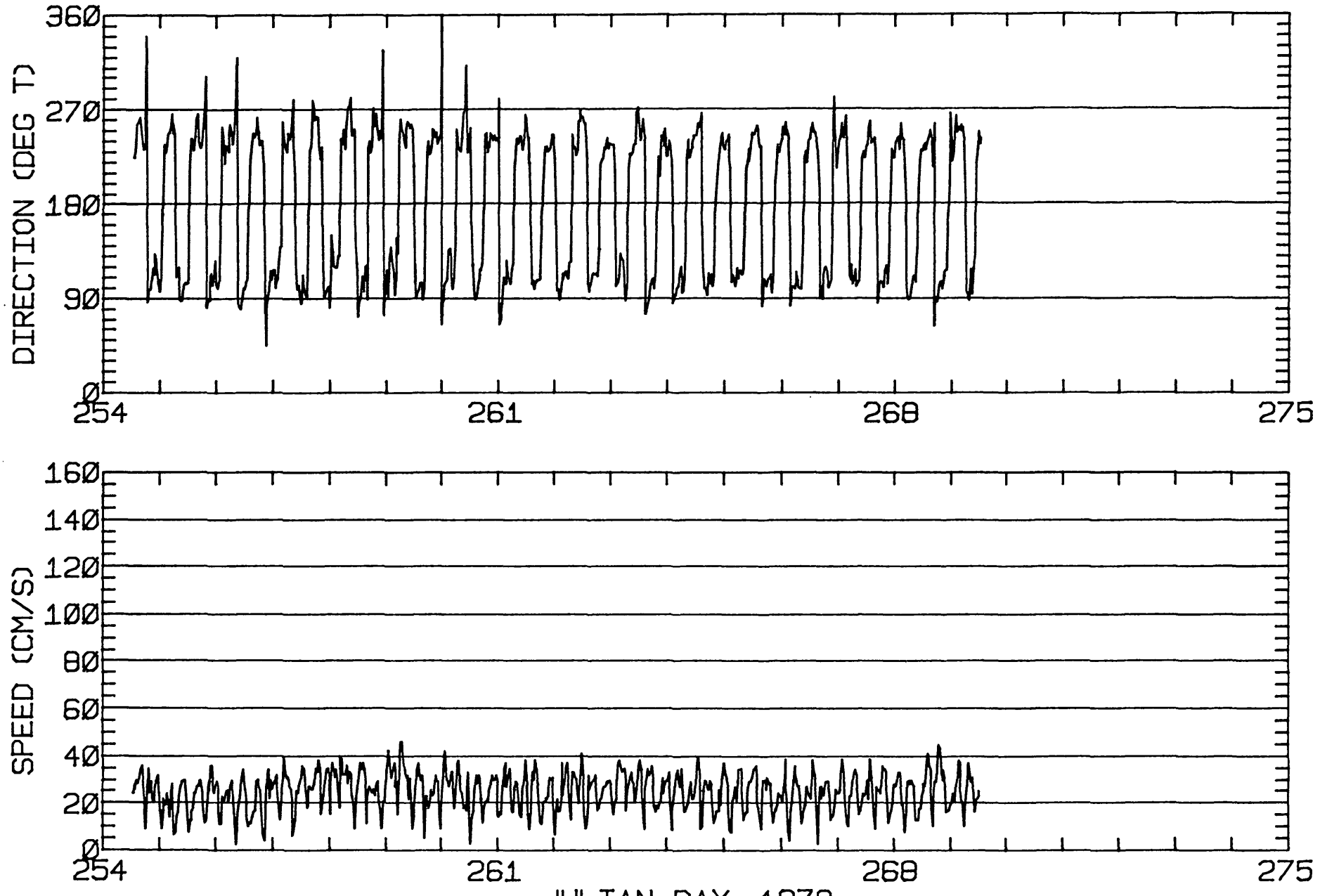
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	1.87	0.38	121.3	227.8	CLOCKWISE
K1	3.58	1.15	114.1	265.3	CLOCKWISE
N2	9.05	0.26	90.7	134.4	CLOCKWISE
M2	33.25	3.05	86.4	158.6	CLOCKWISE
S2	7.34	0.25	90.5	151.9	CLOCKWISE
M4	1.84	1.12	119.2	315.2	CLOCKWISE

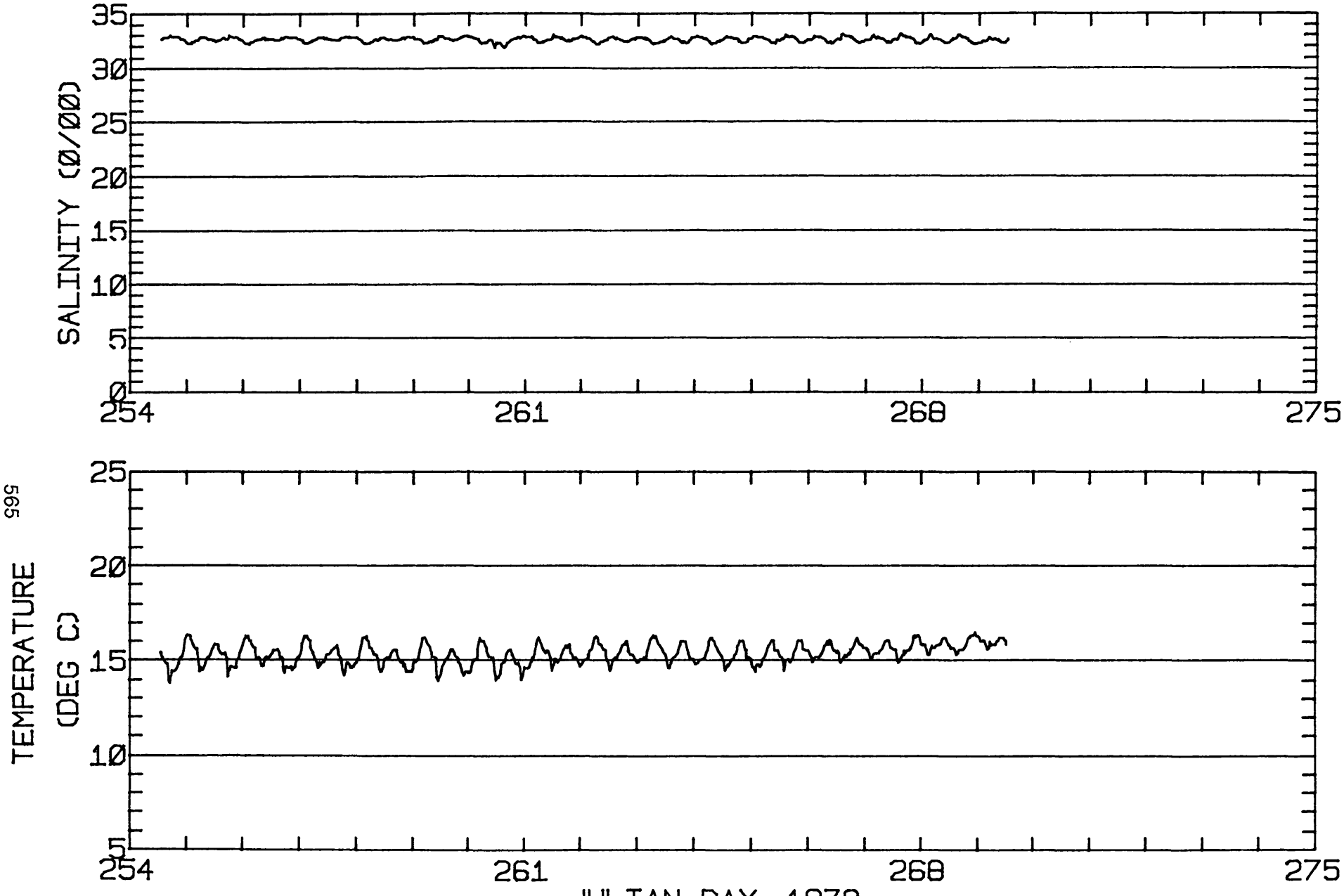
RMS SPEED: 26.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 46.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 24.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 90.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.13
STANDARD DEVIATION U-SERIES: 8.22 CM/SEC
STANDARD DEVIATION V SERIES: 5.52 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	-8.4	190.
2	12	-0.9	-10.2	167.
3	4	0.2	-10.5	126.
ALL	28	-0.2	-9.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 205 37-49-15N 122-30-58W
METER 001.8 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 205 37-49-15N 122-30-58W
METER ØØ1.8 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 206
POSITION: 37 47'52"N 122 29'19"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 9.5 M (BELOW MLLW)
START TIME OF SERIES: 9/11/79 1420 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

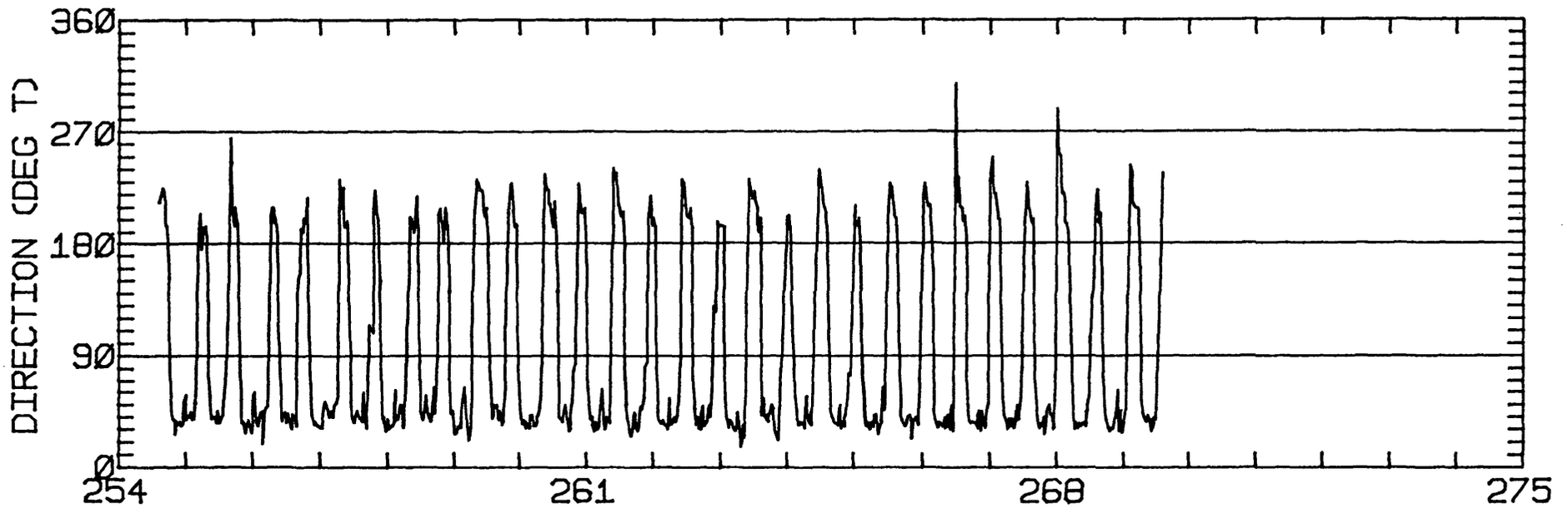
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

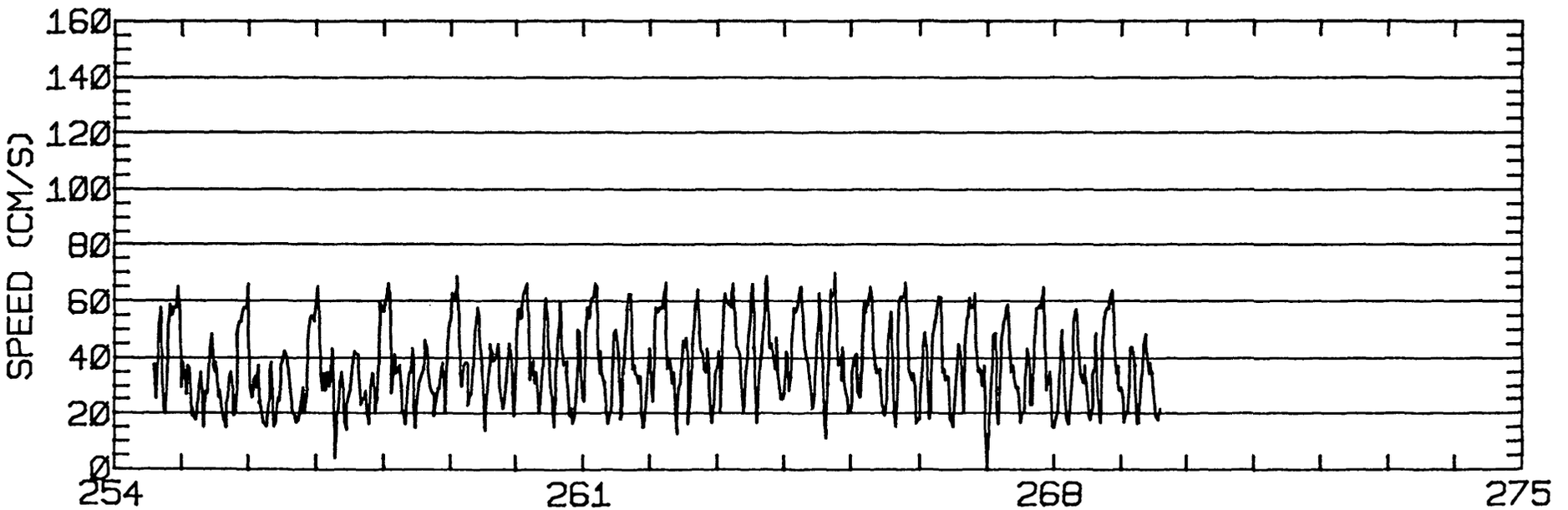
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.77	2.17	19.5	242.8	ANTI-CLOCKWISE
K1	12.34	1.17	38.8	266.2	ANTI-CLOCKWISE
N2	9.19	0.30	34.2	173.2	ANTI-CLOCKWISE
M2	44.03	0.61	31.8	190.0	ANTI-CLOCKWISE
S2	15.47	0.42	34.8	178.7	ANTI-CLOCKWISE
M4	10.08	1.93	36.5	246.5	ANTI-CLOCKWISE

RMS SPEED: 41.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 78.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 32.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 10.03 CM/SEC
STANDARD DEVIATION V SERIES: 11.39 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	13.9	9.4	190.
2	12	14.9	11.7	167.
3	4	13.2	10.9	135.
ALL	28	14.2	10.6	



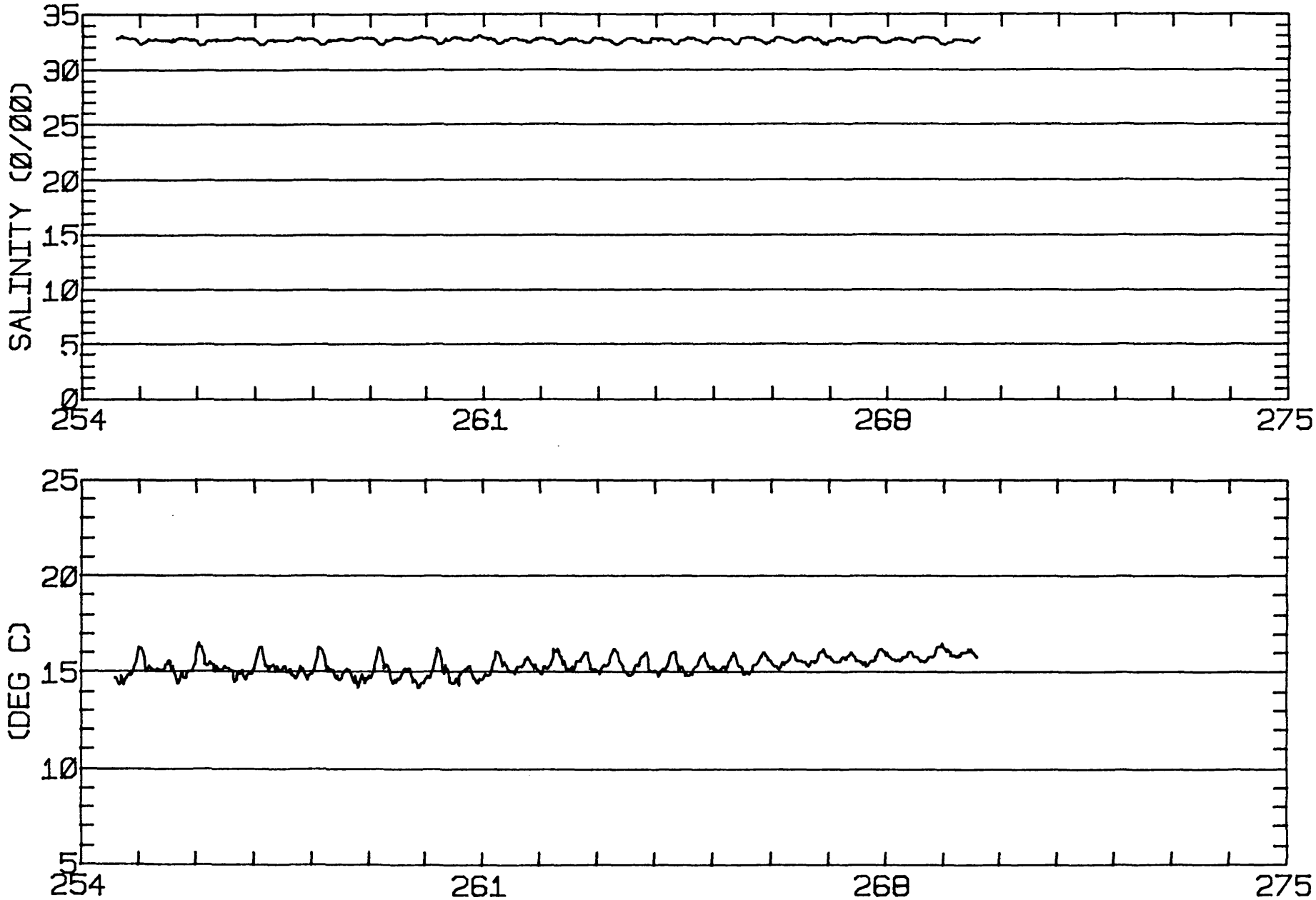


JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 206 37-47-52N 122-29-19W

METER 007.6 METERS ABOVE BED. WATER DEPTH 017.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 206 37-47-52N 122-29-19W
METER 007.6 METERS ABOVE BED. WATER DEPTH 017.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 206
POSITION: 37 47'52"N 122 29'19"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 15.2 M (BELOW MLLW)
START TIME OF SERIES: 9/11/79 1422 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

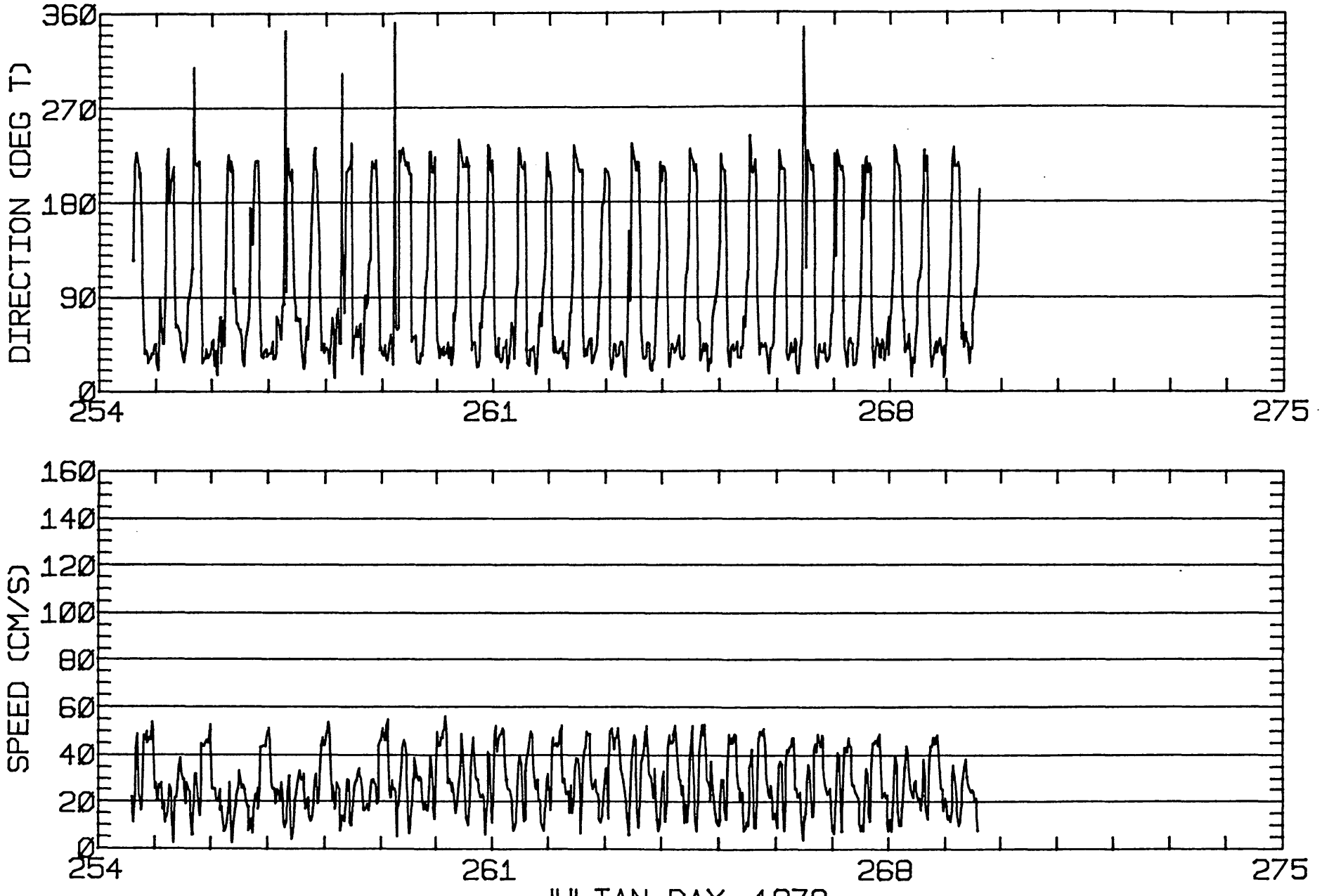
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.88	1.79	28.7	245.2	ANTI-CLOCKWISE
K1	9.06	0.77	37.0	268.6	ANTI-CLOCKWISE
N2	6.98	0.18	35.4	169.4	CLOCKWISE
M2	33.09	1.37	34.9	188.5	CLOCKWISE
S2	11.04	0.32	34.0	176.0	CLOCKWISE
M4	8.81	0.02	50.9	254.2	CLOCKWISE

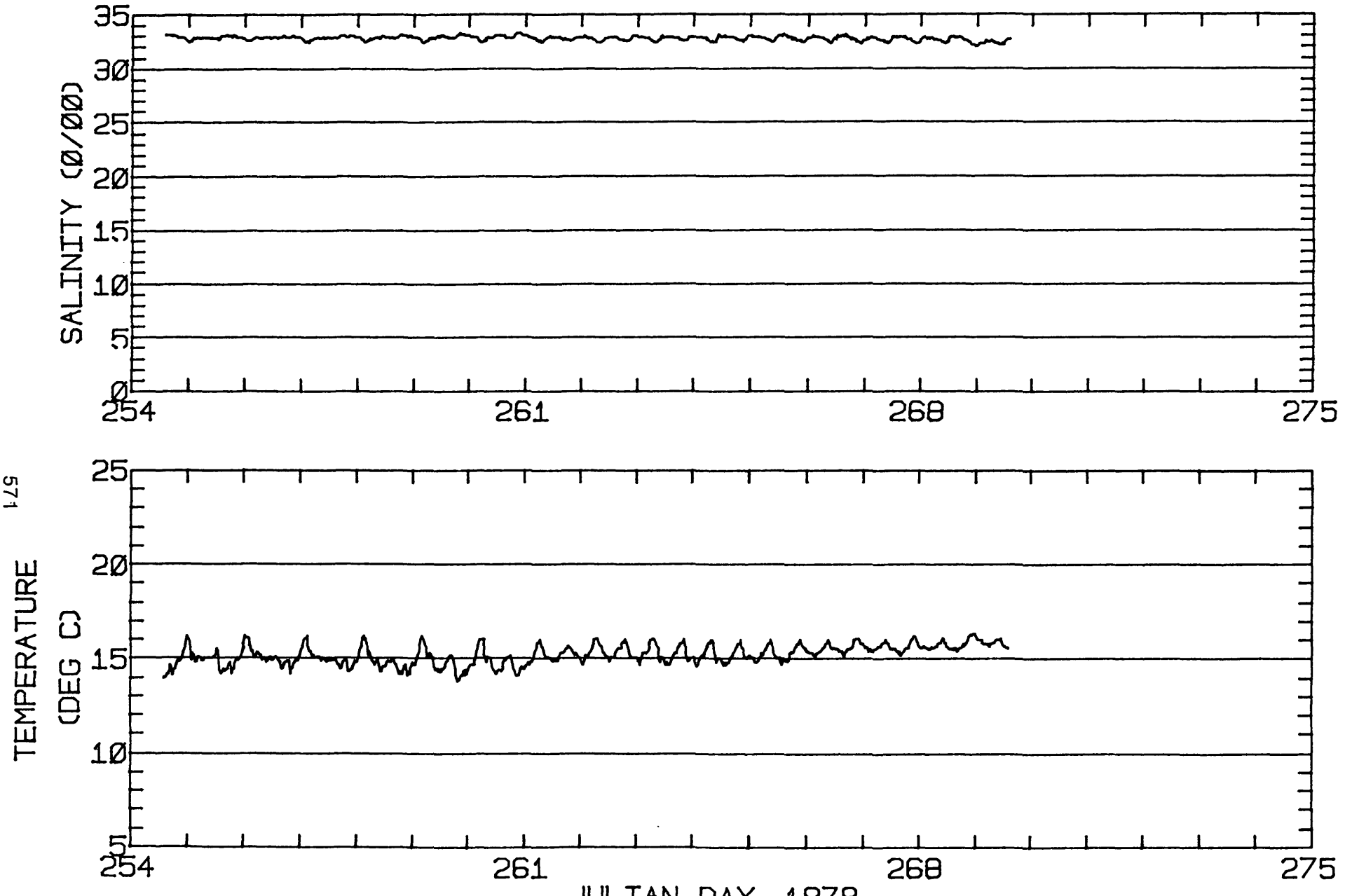
RMS SPEED: 32.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 59.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 34.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 8.95 CM/SEC
STANDARD DEVIATION V SERIES: 9.25 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	10.9	7.7	190.
2	12	11.7	10.1	167.
3	4	11.2	8.7	135.
ALL	28	11.3	8.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 206 37-47-52N 122-29-19W
METER 001.9 METERS ABOVE BED. WATER DEPTH 017.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 206 37-47-52N 122-29-19W
METER ØØ1.9 METERS ABOVE BED. WATER DEPTH Ø17.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 207
POSITION: 37 48'33"N 122 28'58"W
METER TYPE: AANDERAA
WATER DEPTH: 30.5 M (MLLW)
METER DEPTH: 22.9 M (BELOW MLLW)
START TIME OF SERIES: 9/11/79 1530 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

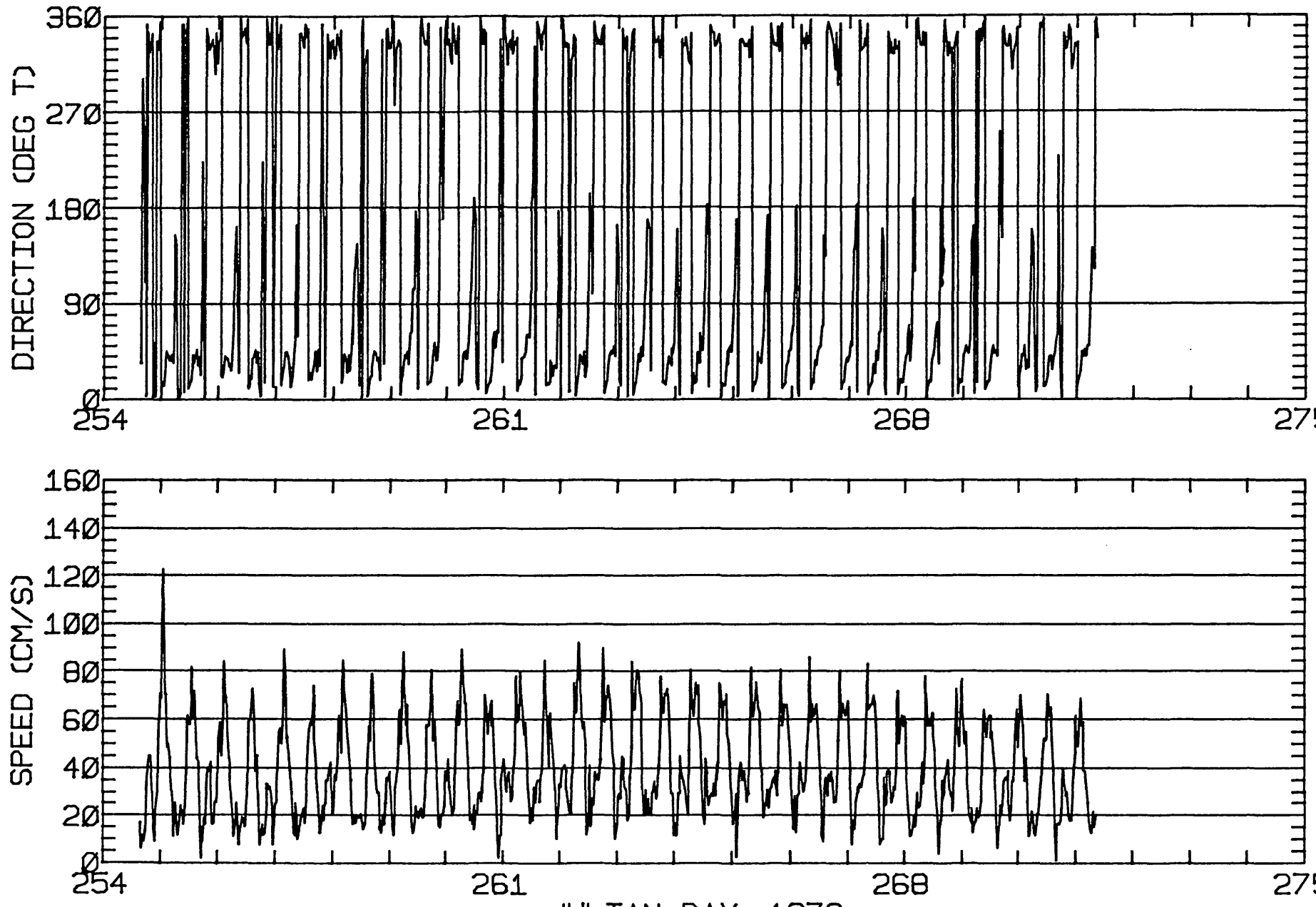
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.64	0.81	106.9	39.9	CLOCKWISE
K1	5.94	1.68	105.1	57.0	CLOCKWISE
N2	8.72	3.09	31.6	238.1	CLOCKWISE
M2	30.68	19.62	43.9	265.4	CLOCKWISE
S2	8.28	7.81	36.2	250.4	CLOCKWISE
M4	9.03	2.42	32.9	192.4	CLOCKWISE

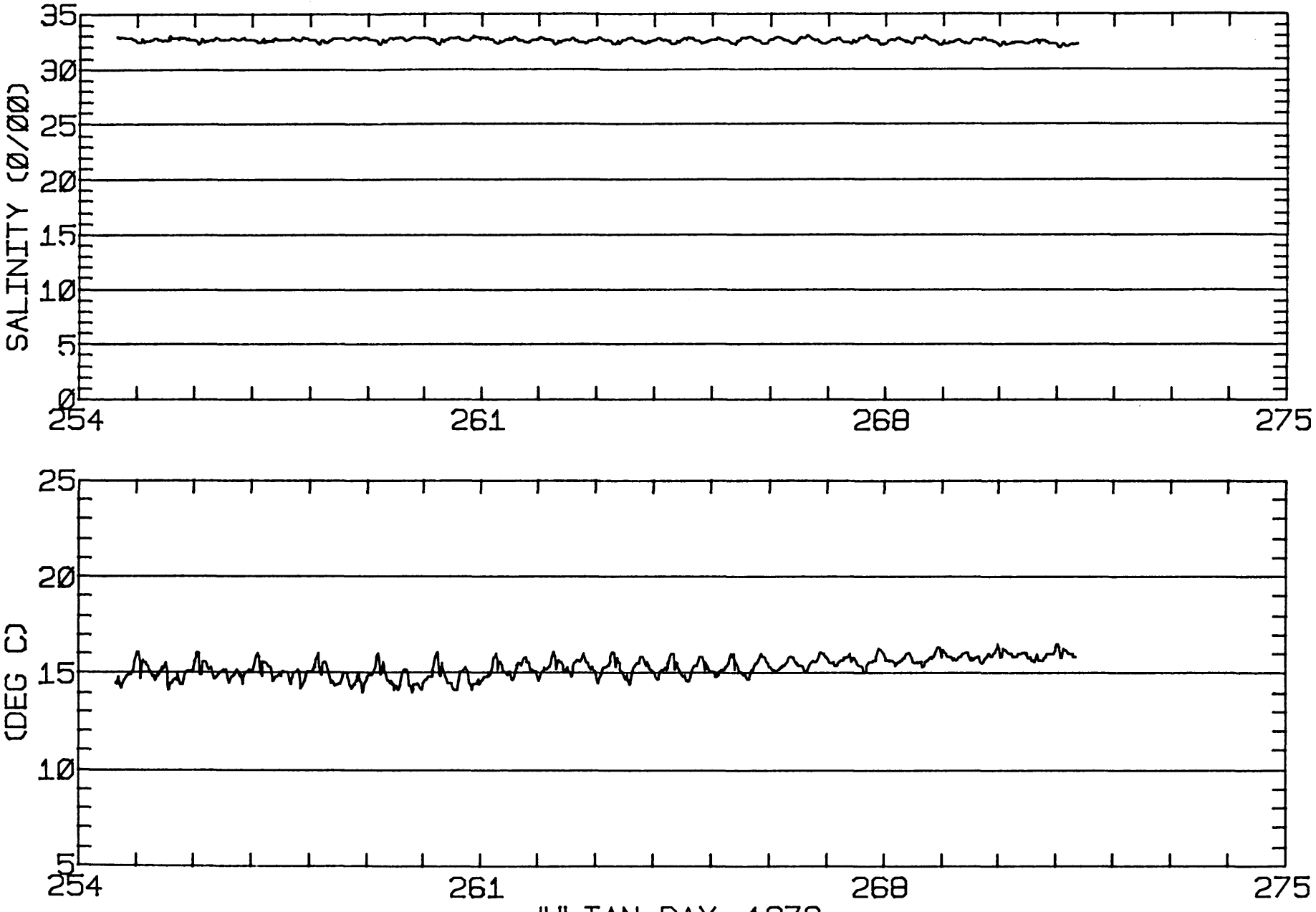
RMS SPEED: 45.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 49.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 21.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 55.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 8.43 CM/SEC
STANDARD DEVIATION V SERIES: 13.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	10.0	29.4	190.
2	12	9.1	33.9	167.
3	8	8.4	30.5	127.
ALL	32	9.2	31.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 207 37-48-33N 122-28-58W
METER 007.6 METERS ABOVE BED. WATER DEPTH 030.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 207 37-48-33N 122-28-58W
METER 007.6 METERS ABOVE BED. WATER DEPTH 030.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 208
POSITION: 37 48'42"N 122 27'59"W
METER TYPE: AANDERAA
WATER DEPTH: 24.4 M (MLLW)
METER DEPTH: 16.8 M (BELOW MLLW)
START TIME OF SERIES: 9/10/79 1030 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

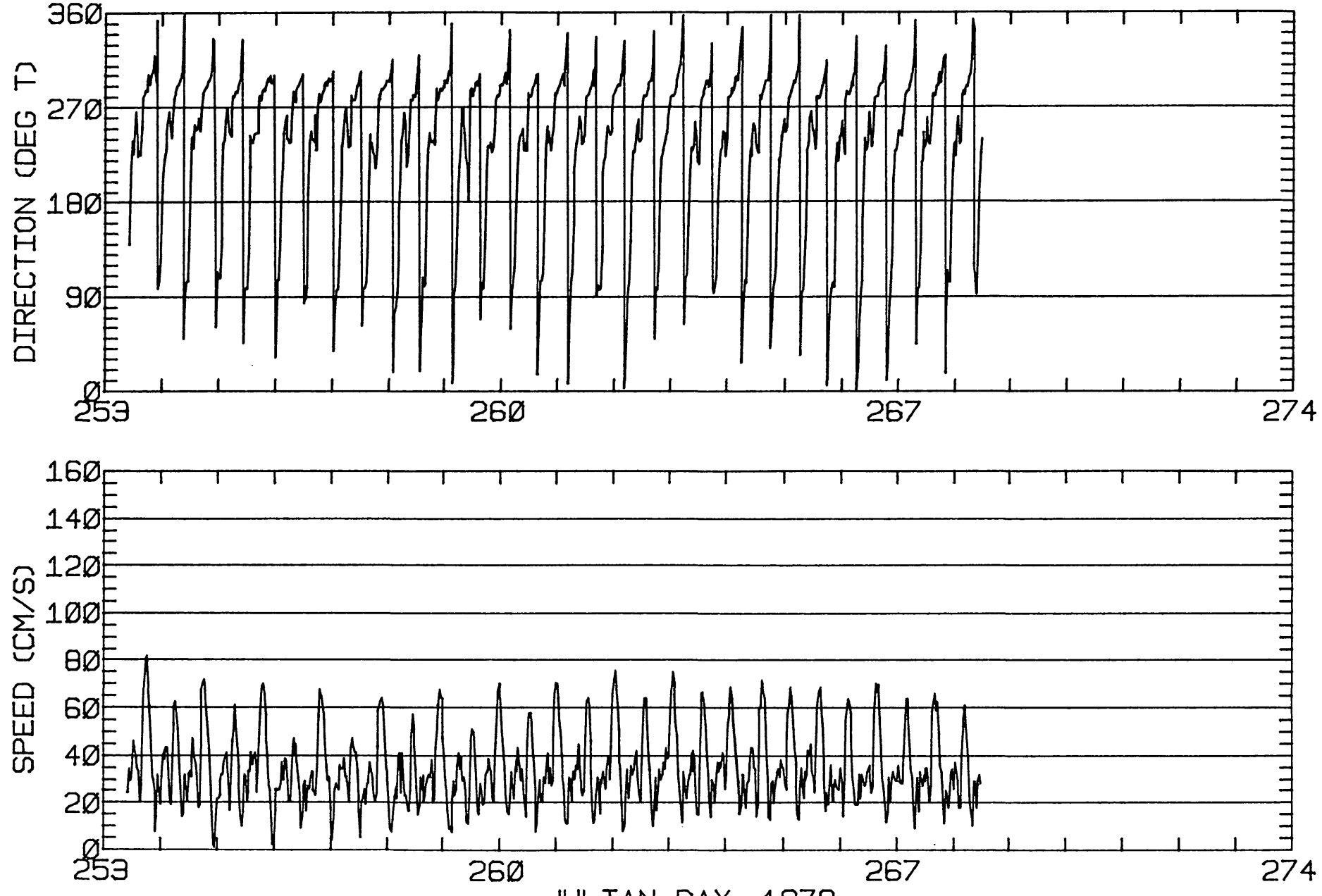
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.99	0.50	123.6	29.8	CLOCKWISE
K1	4.51	1.29	127.8	39.7	CLOCKWISE
N2	6.57	3.33	121.7	226.6	CLOCKWISE
M2	32.21	17.66	117.5	242.8	CLOCKWISE
S2	8.00	5.37	120.6	242.8	CLOCKWISE
M4	13.57	0.41	95.5	48.4	CLOCKWISE

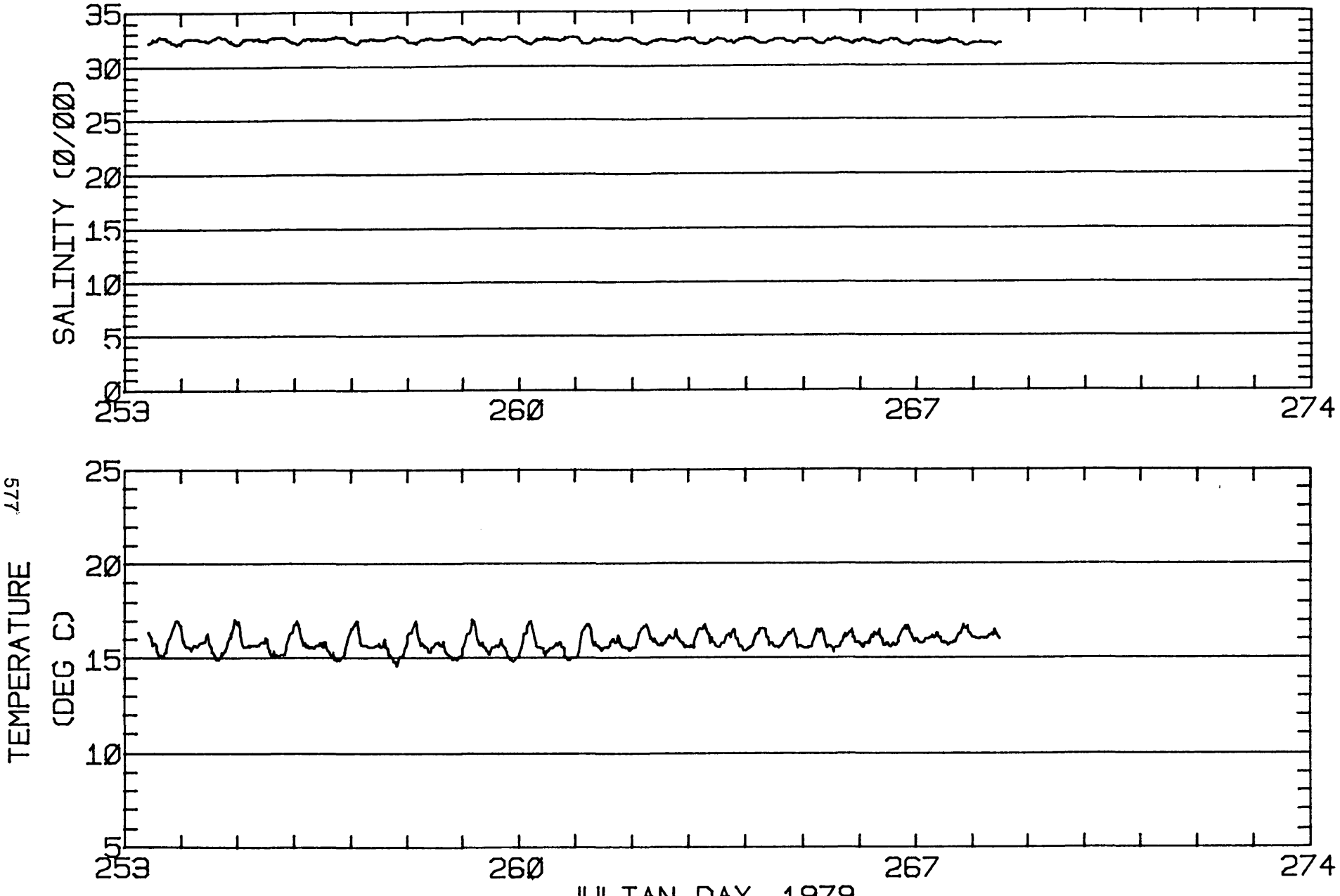
RMS SPEED: 38.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 50.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 119.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 12.04 CM/SEC
STANDARD DEVIATION V SERIES: 5.67 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-23.1	0.1	184.
2	12	-23.1	0.4	176.
3	4	-23.0	1.7	165.
ALL	28	-23.1	0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 208 37-48-42N 122-27-59W
METER 007.6 METERS ABOVE BED. WATER DEPTH 024.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 208 37-48-42N 122-27-59W
METER Ø07.6 METERS ABOVE BED. WATER DEPTH Ø24.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 209
POSITION: 37 50'42"N 122 27'29"W
METER TYPE: AANDERAA
WATER DEPTH: 20.4 M (MLLW)
METER DEPTH: 9.1 M (BELOW MLLW)
START TIME OF SERIES: 9/10/79 1250 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

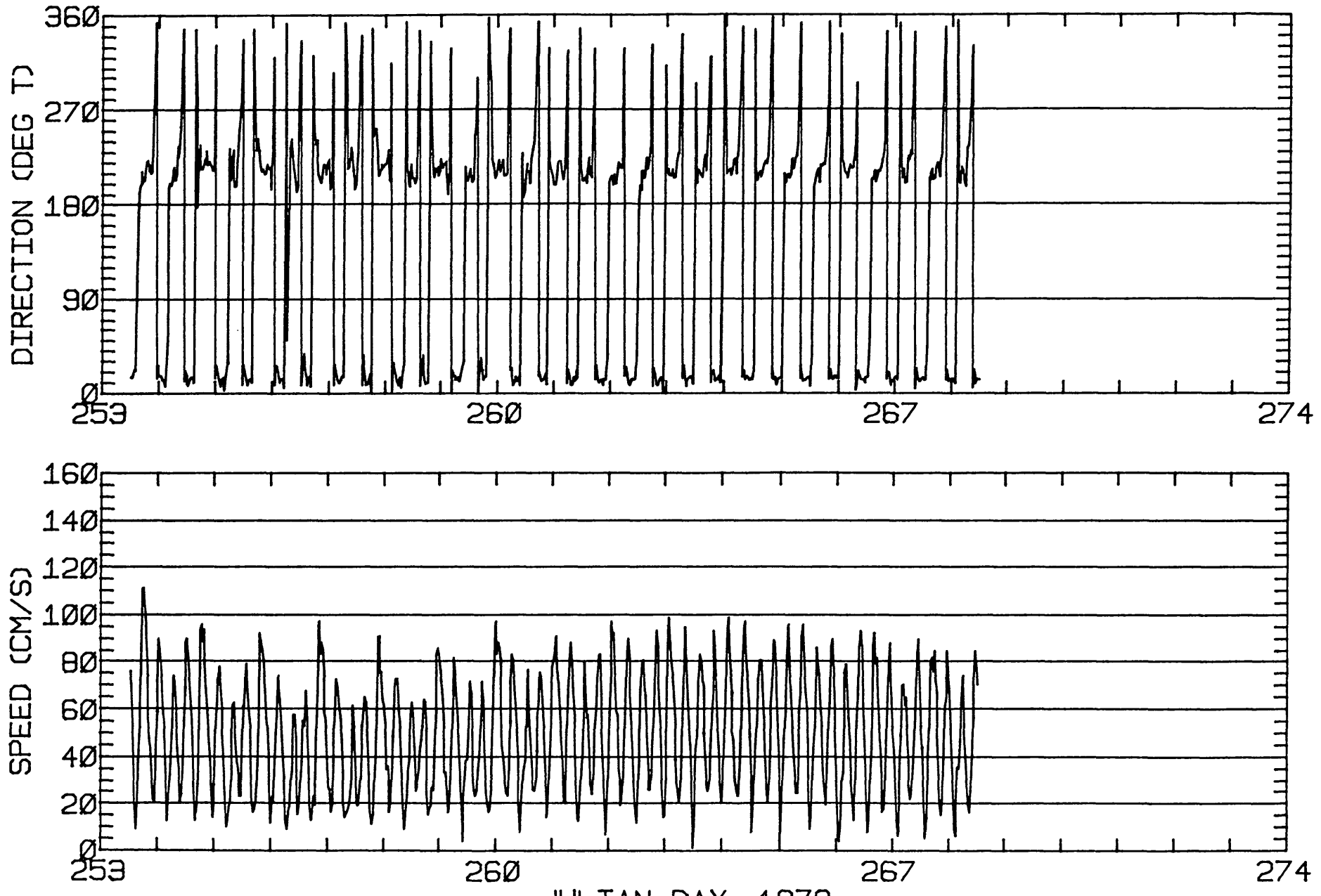
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.23	0.56	29.2	50.4	ANTI-CLOCKWISE
K1	13.67	0.14	29.8	47.3	ANTI-CLOCKWISE
N2	15.90	0.25	23.1	265.4	CLOCKWISE
M2	74.20	3.52	23.9	283.5	CLOCKWISE
S2	20.49	2.57	20.7	277.7	CLOCKWISE
M4	3.16	2.32	113.8	102.1	ANTI-CLOCKWISE

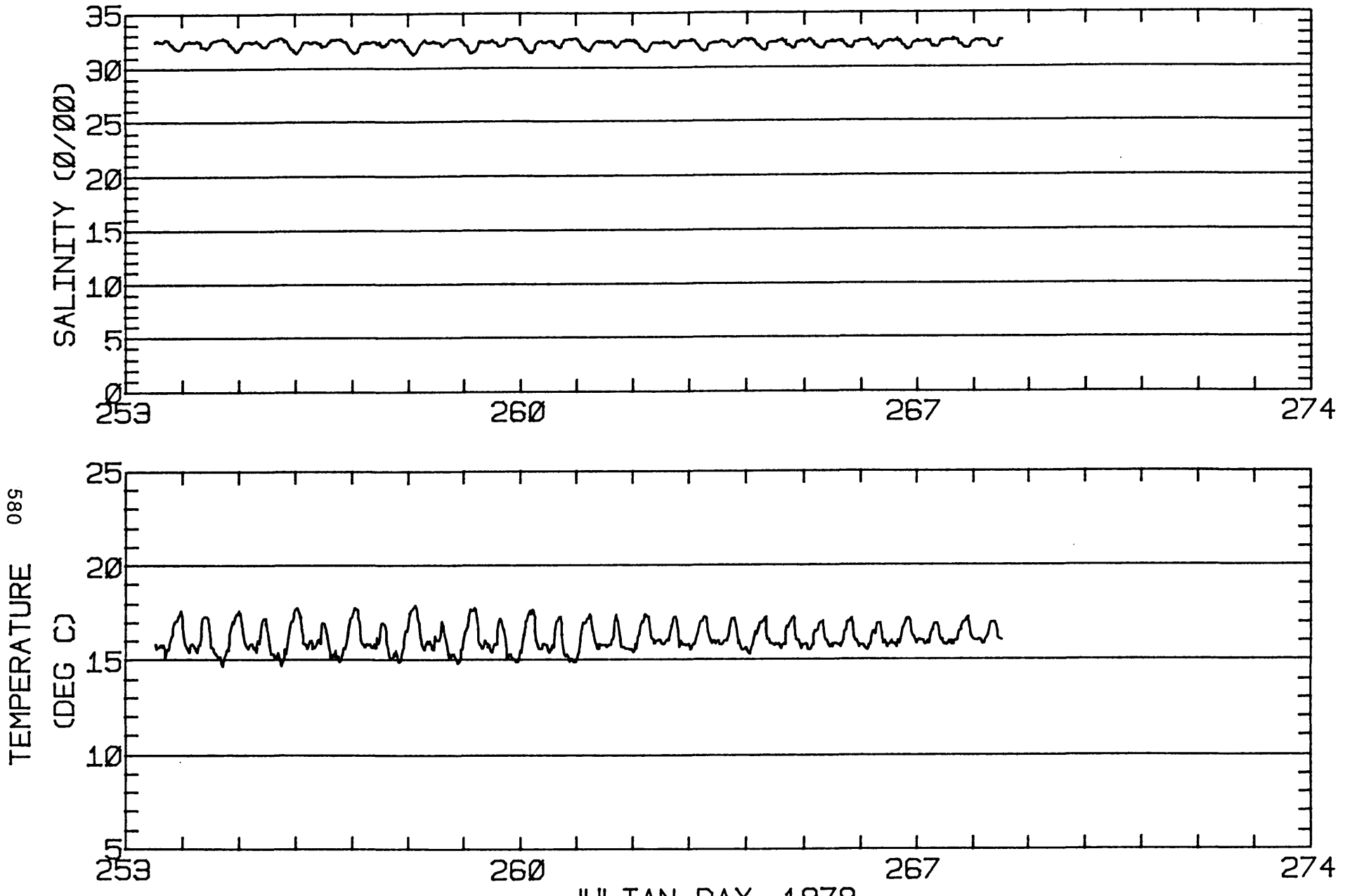
RMS SPEED: 55.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 120.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 52.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 24.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 6.47 CM/SEC
STANDARD DEVIATION V SERIES: 9.22 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-9.4	1.1	184.
2	12	-10.1	2.8	176.
3	4	-8.1	4.7	165.
ALL	28	-9.6	2.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 209 37-50-42N 122-27-29W
METER 011.2 METERS ABOVE BED. WATER DEPTH 020.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 209 37-50-42N 122-27-29W
METER Ø11.2 METERS ABOVE BED. WATER DEPTH Ø20.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 209
POSITION: 37 50'44"N 122 27'26"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES:11/12/80 1040 PST JULIAN DAY=317
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

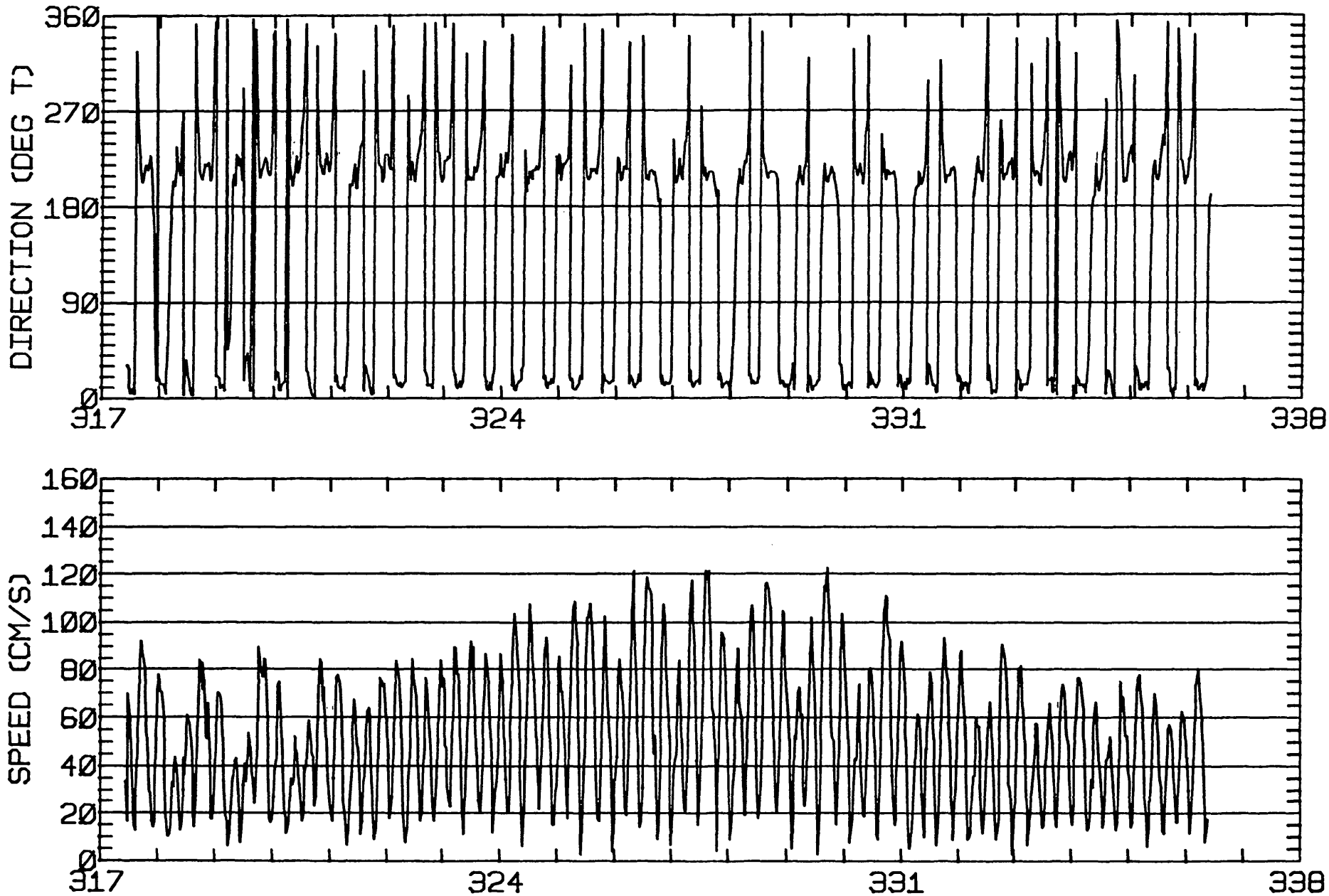
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.15	2.72	31.8	48.4	ANTI-CLOCKWISE
K1	20.66	0.35	26.4	25.4	CLOCKWISE
N2	17.38	1.73	22.0	249.4	CLOCKWISE
M2	67.01	0.47	24.1	281.0	CLOCKWISE
S2	11.61	0.11	32.3	266.5	ANTI-CLOCKWISE
M4	5.05	2.45	145.0	44.7	ANTI-CLOCKWISE

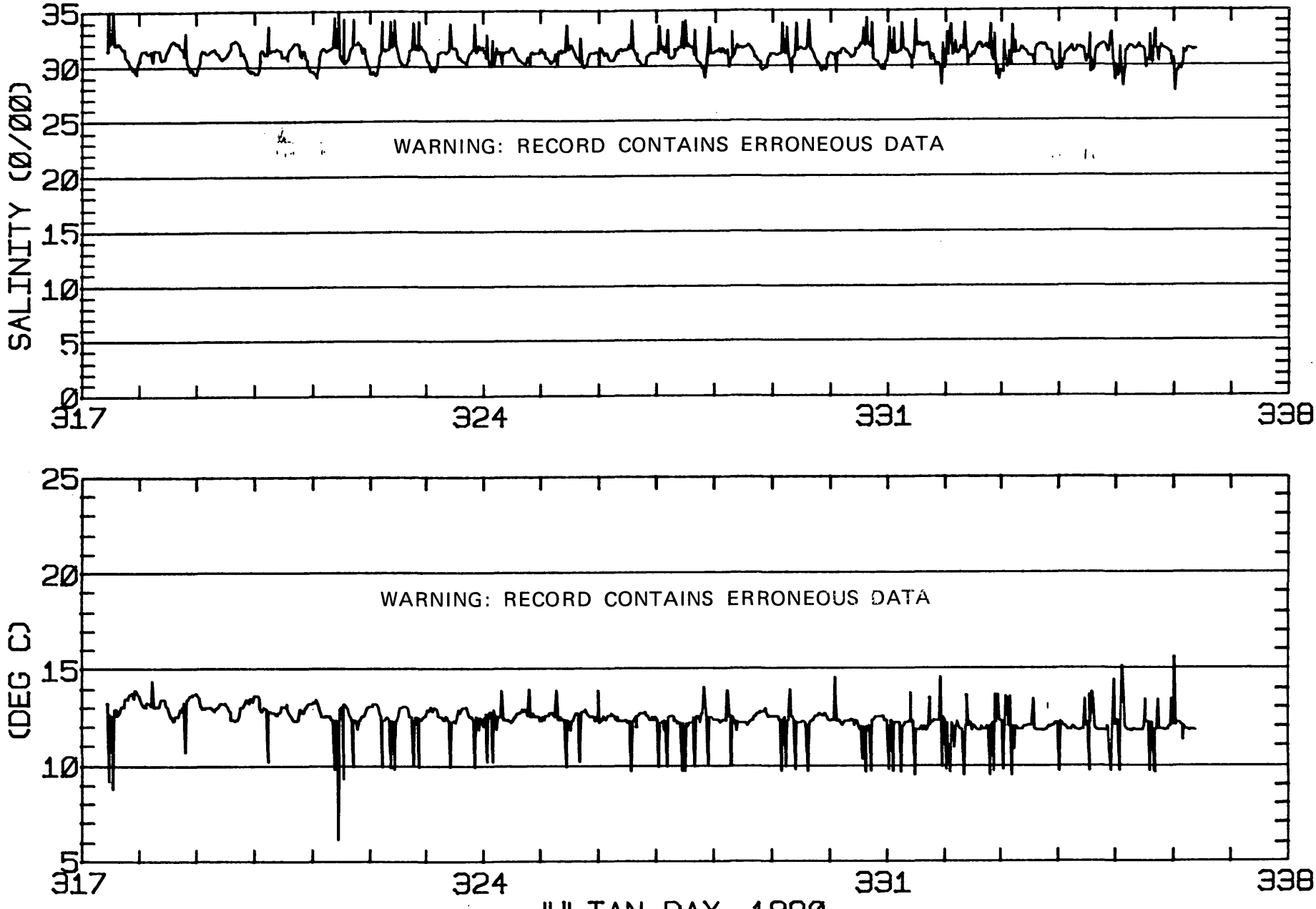
RMS SPEED: 58.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 109.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 26.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 7.39 CM/SEC
STANDARD DEVIATION V SERIES: 9.41 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-11.0	1.9	197.
2	12	-10.4	2.2	170.
3	12	-7.7	3.8	211.
ALL	36	-9.7	2.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 209 37-50-44N 122-27-26W
METER 011.3 METERS ABOVE BED. WATER DEPTH 017.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 209 37-50-44N 122-27-26W
METER Ø11.3 METERS ABOVE BED. WATER DEPTH Ø17.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 209
POSITION: 37 50'44"N 122 27'26"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 15.6 M (BELOW MLLW)
START TIME OF SERIES:11/12/80 1124 PST JULIAN DAY=317
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

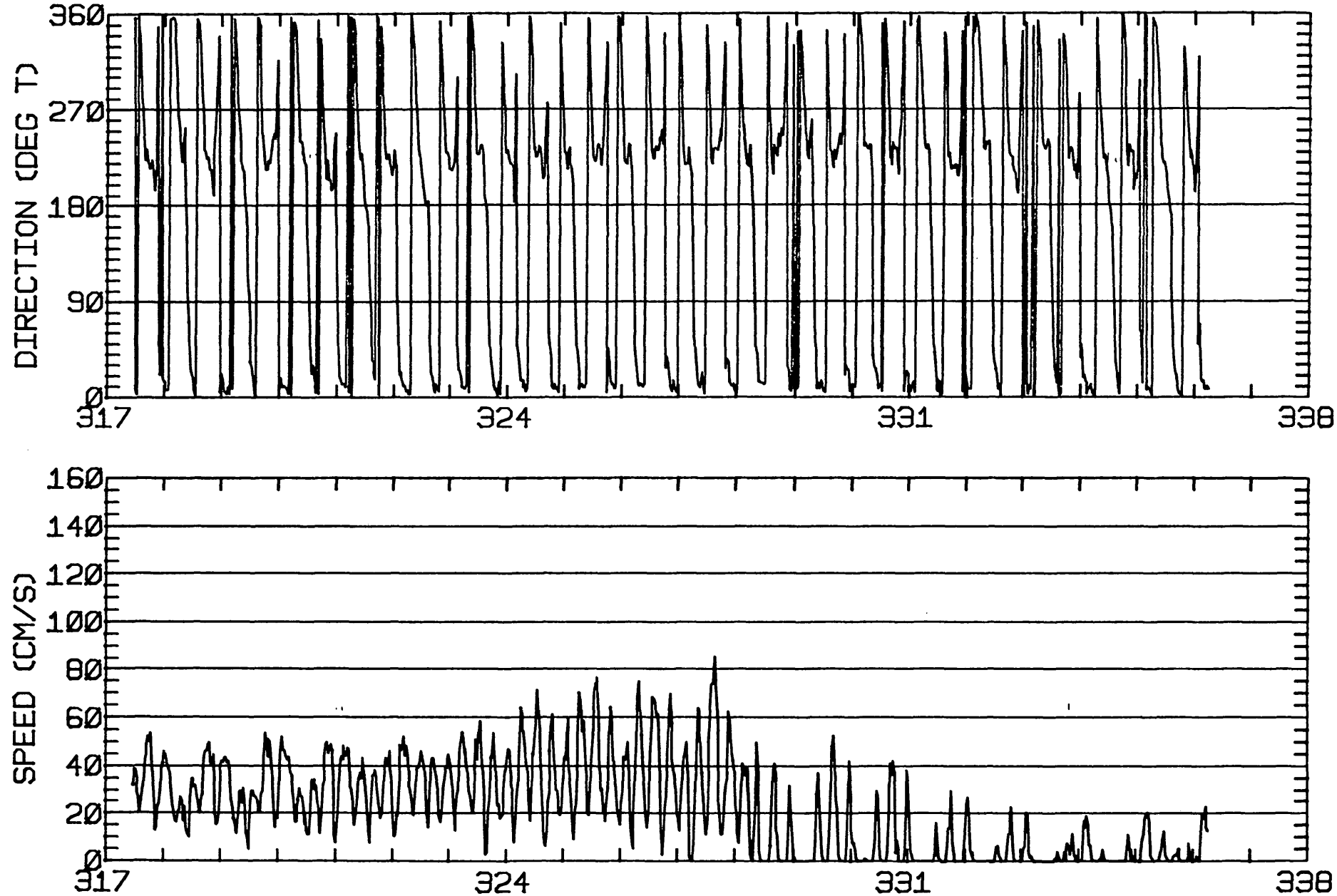
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.42	5.15	37.2	0.8	CLOCKWISE
K1	14.52	1.04	31.9	18.9	CLOCKWISE
N2	9.79	8.16	101.9	235.0	ANTI-CLOCKWISE
M2	38.04	1.19	27.4	271.3	CLOCKWISE
S2	11.17	1.22	16.9	257.2	CLOCKWISE
M4	4.24	0.79	95.3	32.1	ANTI-CLOCKWISE

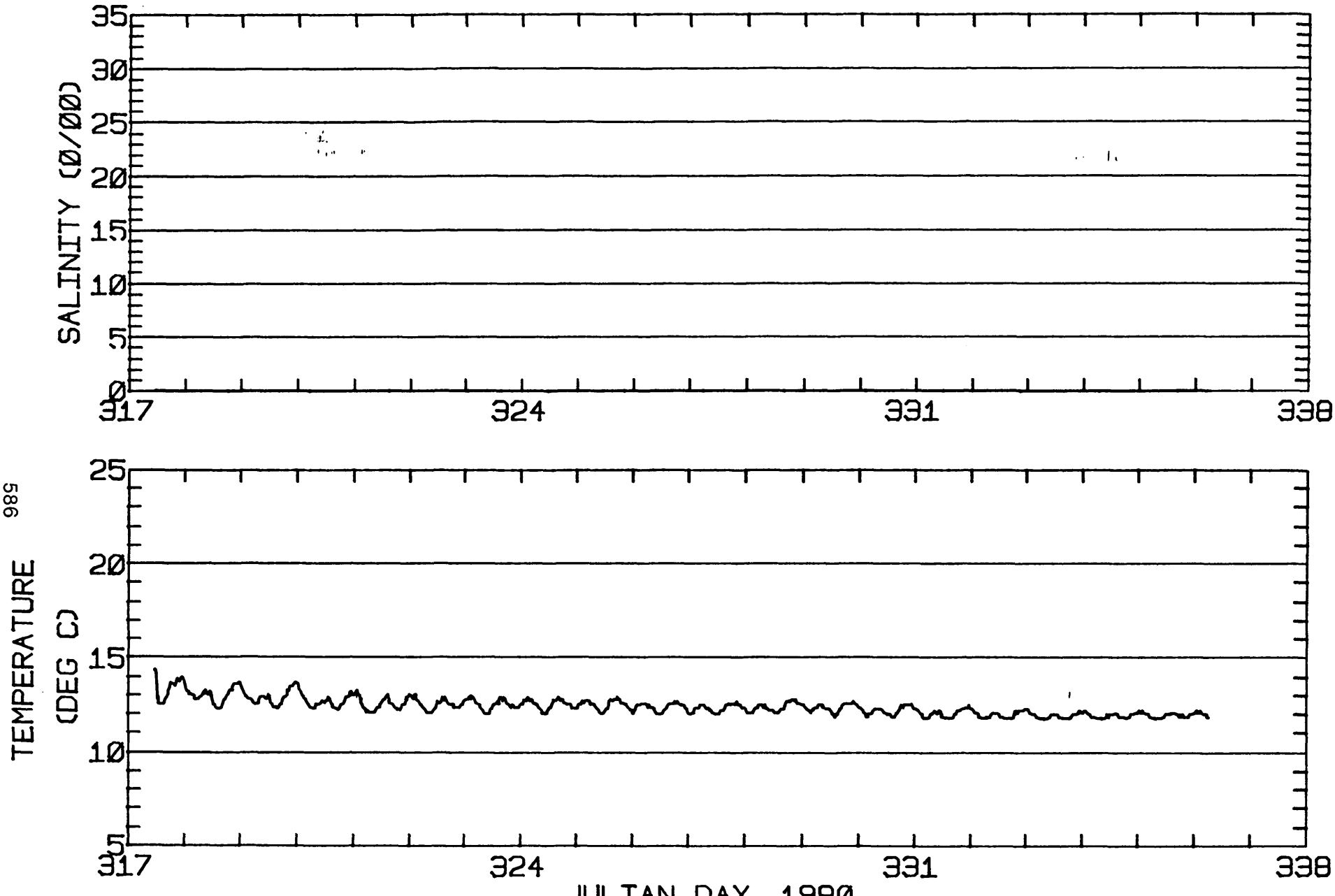
RMS SPEED: 37.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 70.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 27.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 6.14 CM/SEC
STANDARD DEVIATION V SERIES: 7.19 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.7	5.4	197.
2	6	-10.3	7.0	173.
ALL	18	-8.6	6.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 209 37-50-44N 122-27-26W
METER 001.5 METERS ABOVE BED. WATER DEPTH 017.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 209 37-50-44N 122-27-26W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø17.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 210
POSITION: 37 51'34"N 122 28' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 4.0 M (MLLW)
METER DEPTH: 2.4 M (BELOW MLLW)
START TIME OF SERIES: 9/14/79 1020 PST JULIAN DAY=257
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

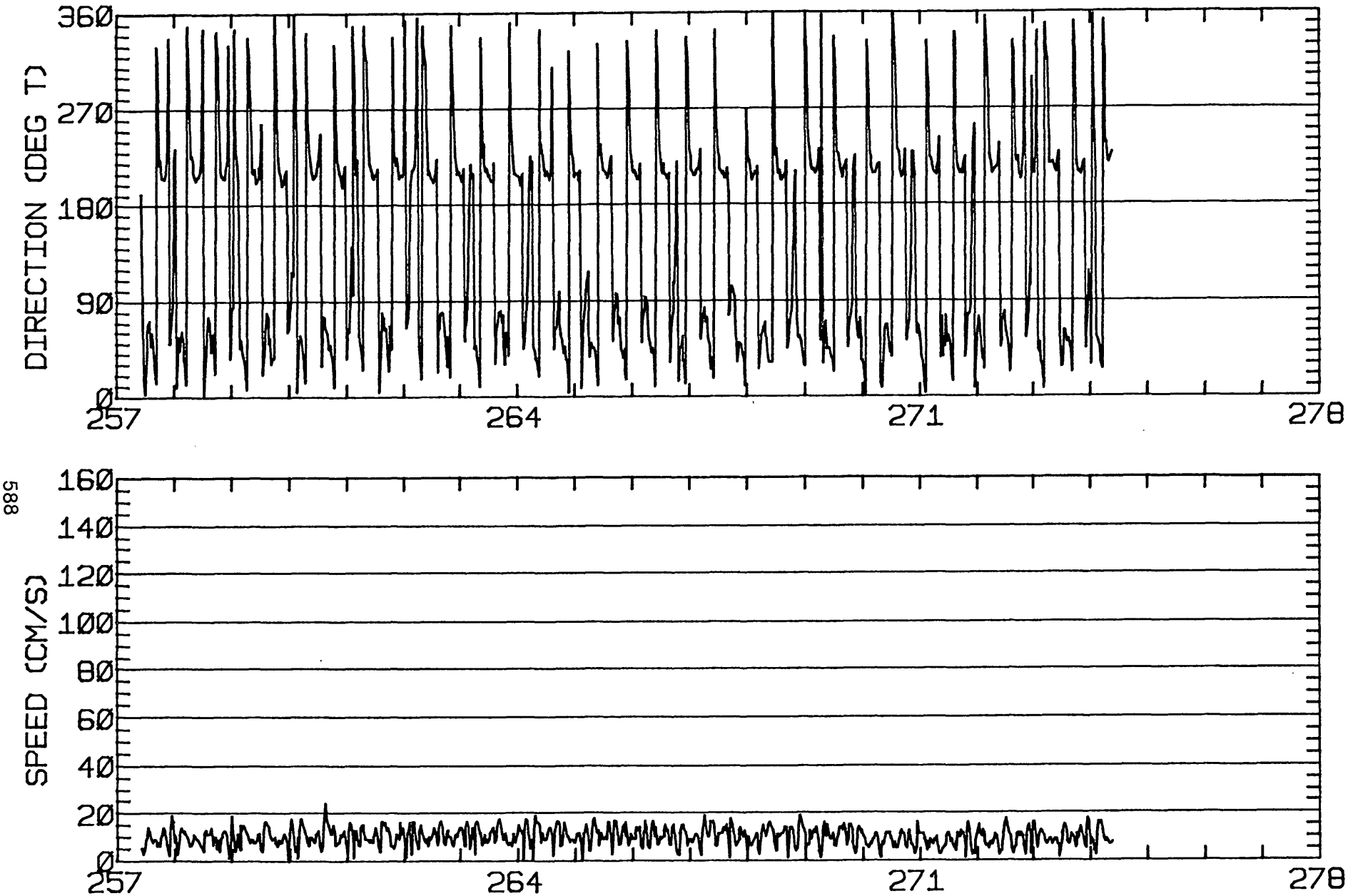
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	1.04	0.02	12.4	14.9	ANTI-CLOCKWISE
K1	1.28	0.04	117.5	199.7	ANTI-CLOCKWISE
N2	3.00	0.44	44.6	189.3	ANTI-CLOCKWISE
M2	11.35	3.64	43.7	194.4	ANTI-CLOCKWISE
S2	3.46	1.51	43.6	194.6	ANTI-CLOCKWISE
M4	3.01	0.21	27.1	166.4	ANTI-CLOCKWISE

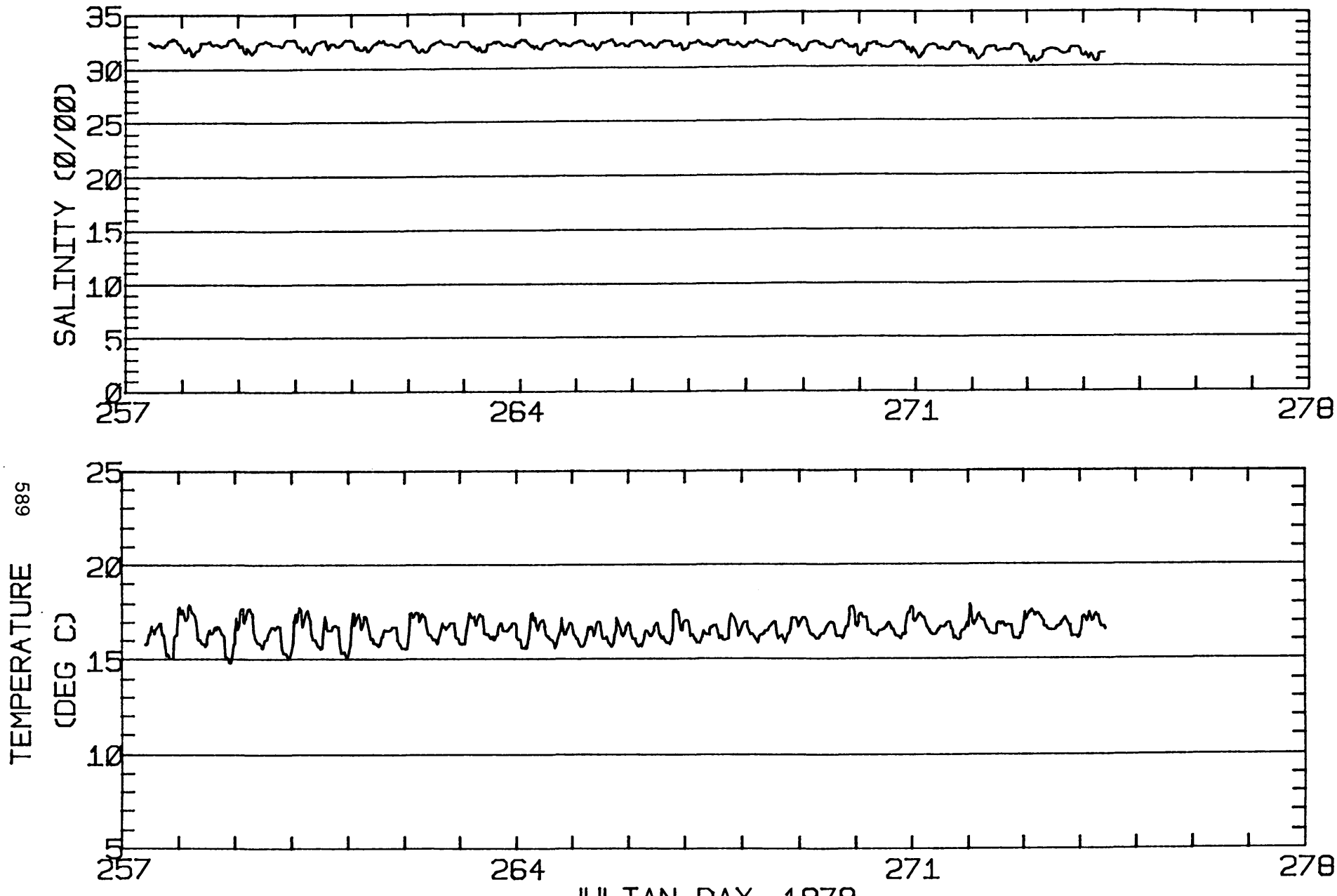
RMS SPEED: 11.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 17.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 7.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 47.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.16
STANDARD DEVIATION U-SERIES: 5.24 CM/SEC
STANDARD DEVIATION V SERIES: 4.95 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.3	0.1	193.
2	12	2.1	-0.1	142.
3	8	1.2	0.5	129.
ALL	32	1.6	0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 210 37-51-34N 122-28- 5W
METER 001.5 METERS ABOVE BED. WATER DEPTH 004.0 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 21Ø 37-51-34N 122-28- 5W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ4.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'51"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/11/79 1630 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

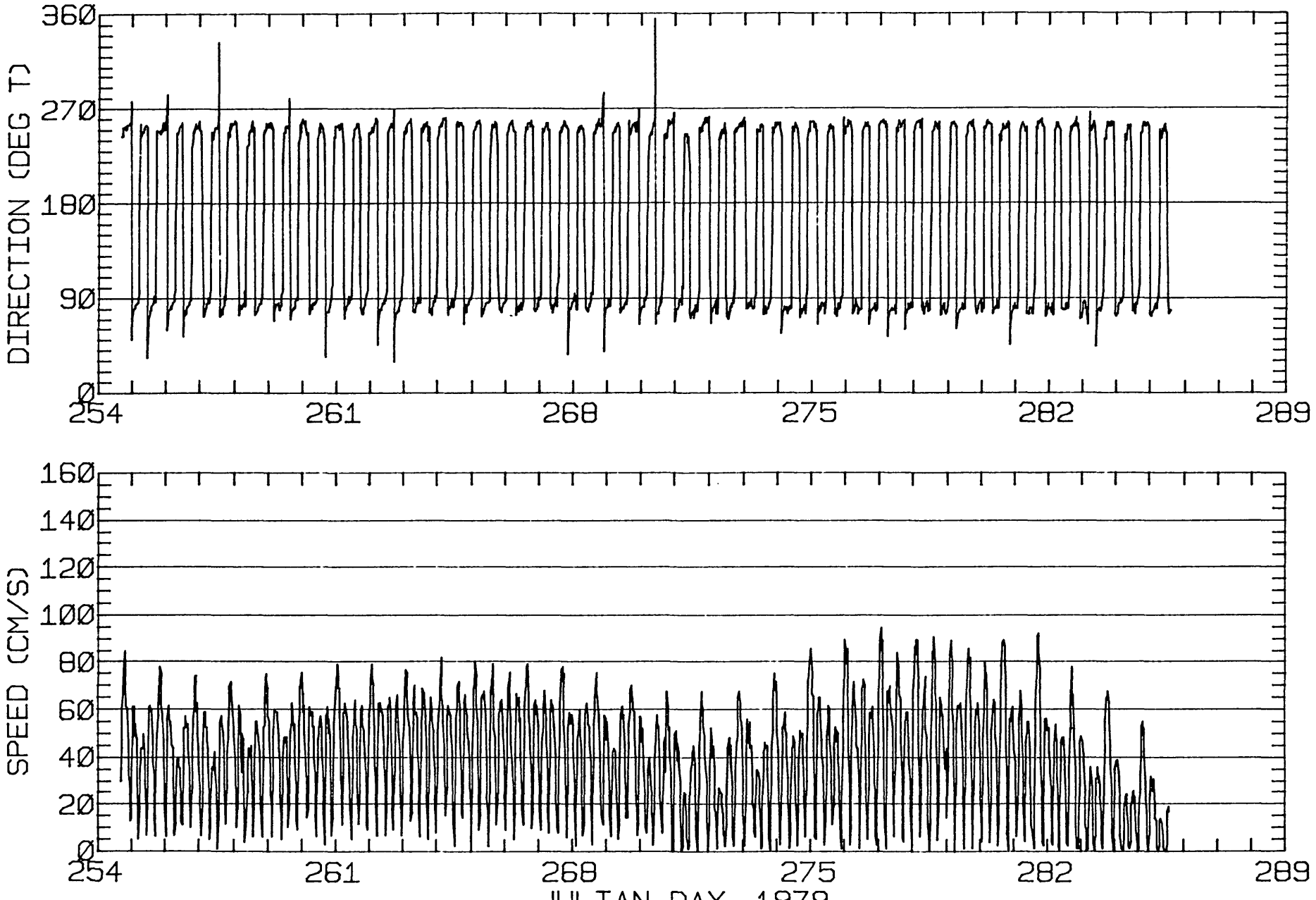
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.54	0.16	77.9	32.7	ANTI-CLOCKWISE
K1	12.61	0.01	78.0	42.9	ANTI-CLOCKWISE
N2	11.16	0.35	77.6	249.3	CLOCKWISE
M2	58.91	2.27	77.9	273.1	CLOCKWISE
S2	16.13	0.18	78.2	277.6	CLOCKWISE
M4	2.27	0.22	58.3	61.8	CLOCKWISE

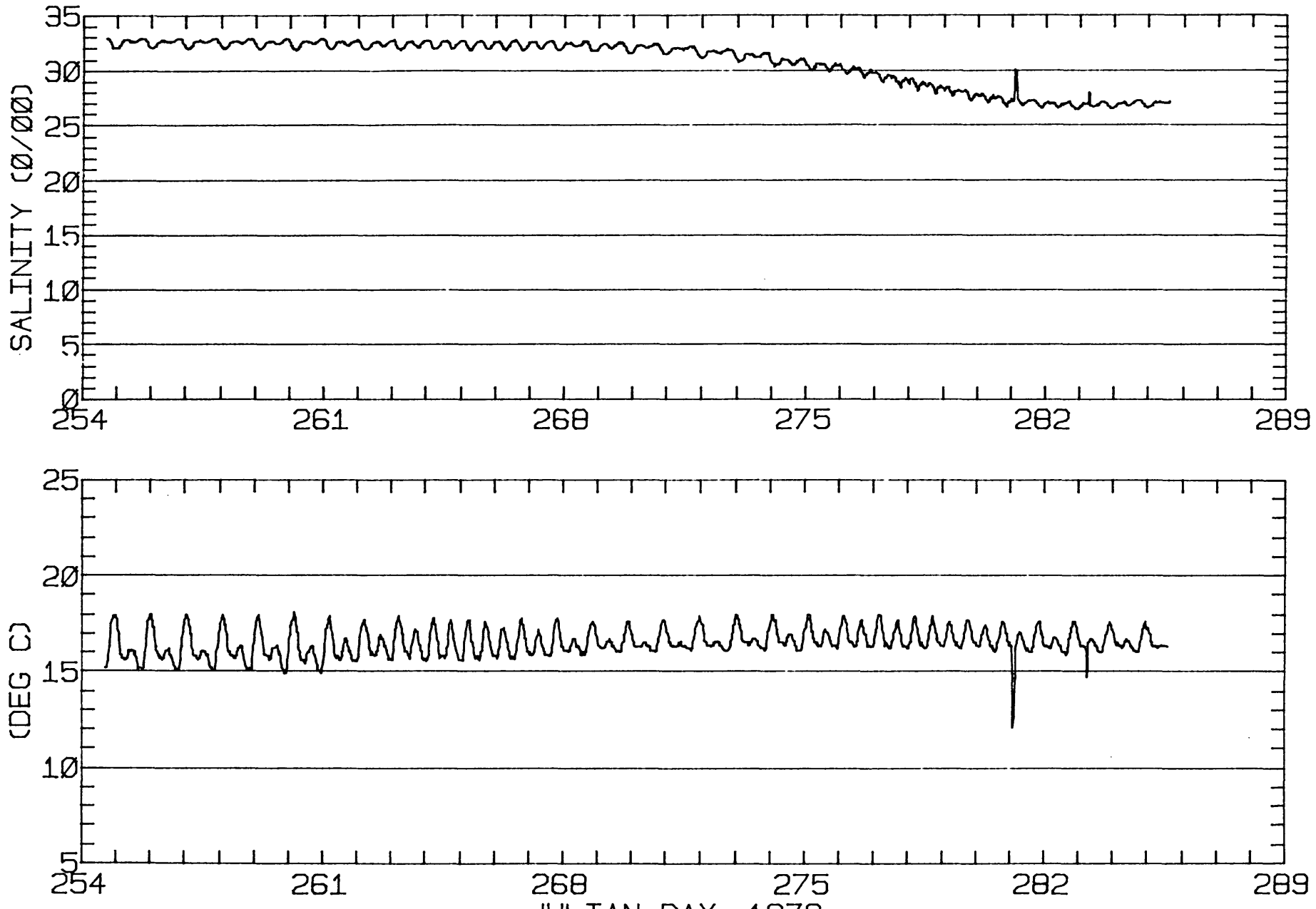
RMS SPEED: 47.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 99.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 78.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 9.13 CM/SEC
STANDARD DEVIATION V SERIES: 3.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.0	-4.2	190.
2	12	-1.3	-4.6	167.
3	12	-0.2	-3.4	131.
4	12	-2.4	-3.1	153.
5	4	-3.4	-3.5	141.
ALL	52	-1.4	-3.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-51W
METER 009.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-51W
METER ØØ9.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'54"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES:10/12/79 1620 PST JULIAN DAY=285
APPROXIMATE RECORD LENGTH IS 22 M2-CYCLES

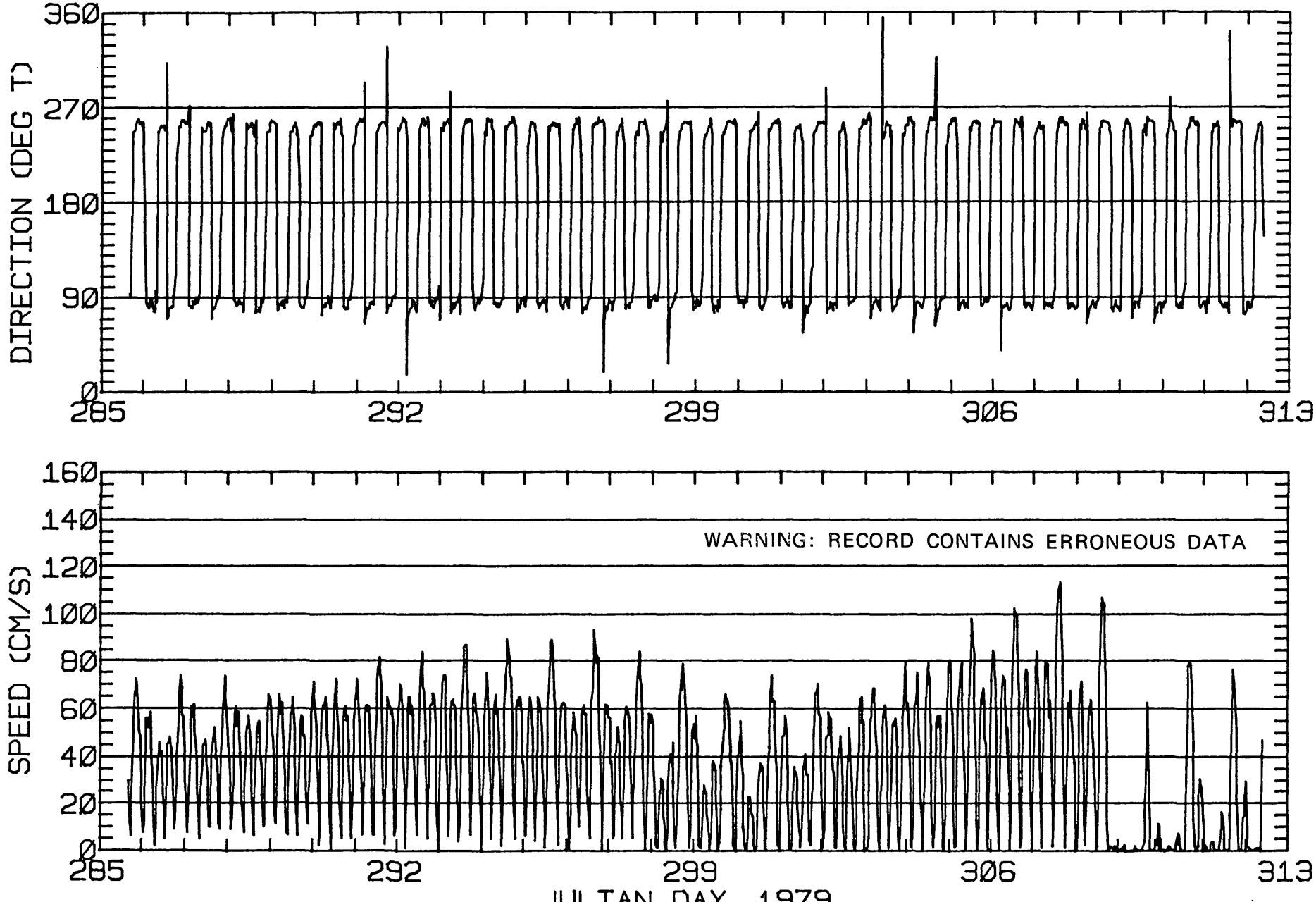
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.62	0.16	82.0	38.4	CLOCKWISE
K1	12.80	0.17	77.8	15.0	ANTI-CLOCKWISE
N2	14.49	0.16	80.8	243.4	CLOCKWISE
M2	67.33	1.82	79.8	273.8	CLOCKWISE
S2	17.12	0.38	81.2	255.6	CLOCKWISE
M4	2.45	0.15	64.2	76.3	CLOCKWISE

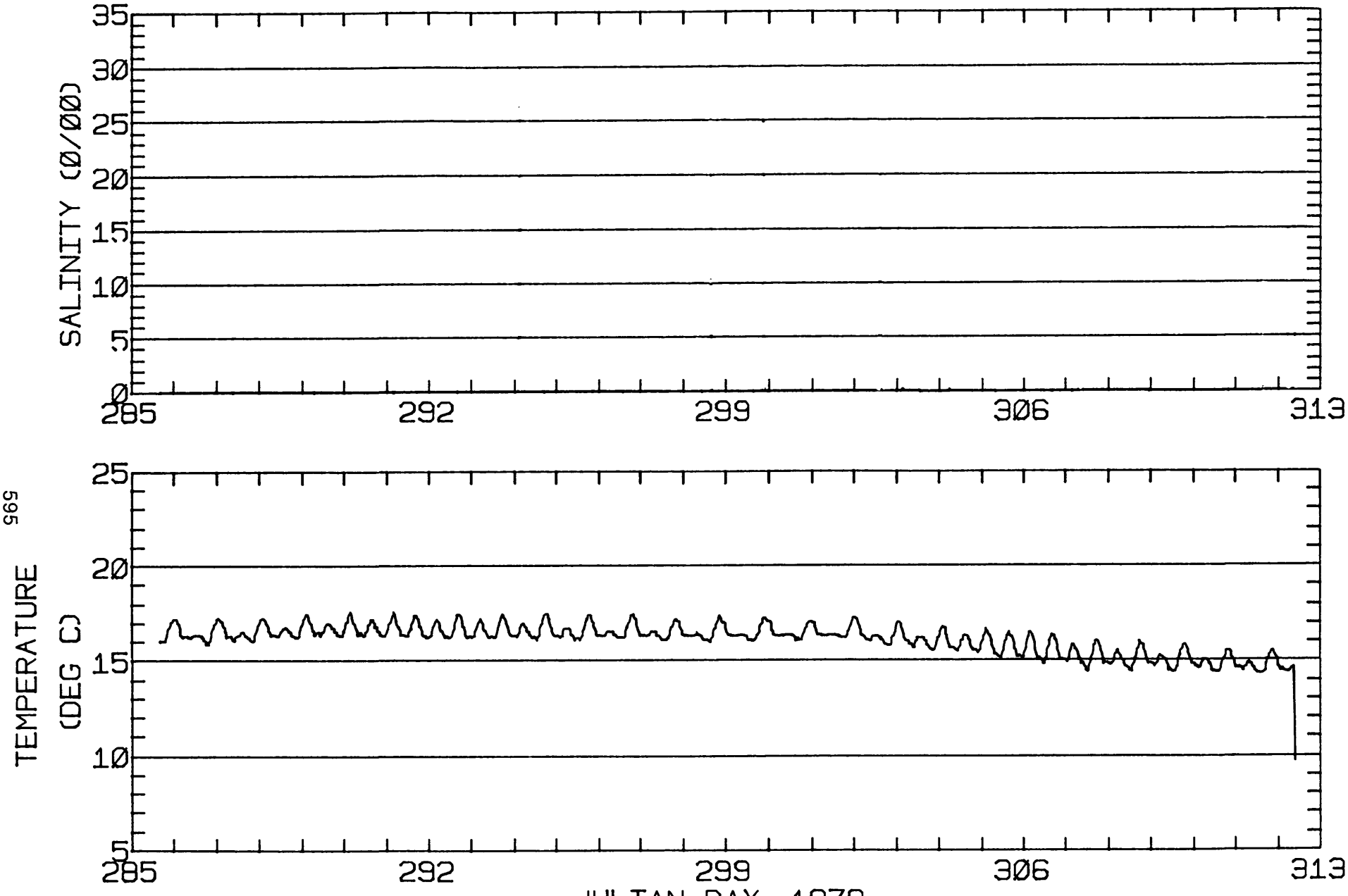
RMS SPEED: 48.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 107.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 80.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.28
STANDARD DEVIATION U-SERIES: 5.51 CM/SEC
STANDARD DEVIATION V SERIES: 3.26 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.3	-4.2	207.
2	10	-3.4	-4.6	162.
ALL	22	-2.3	-4.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER 009.4 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER ØØ9.4 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'54"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.8 M (BELOW MLLW)
START TIME OF SERIES:10/12/79 1622 PST JULIAN DAY=285
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

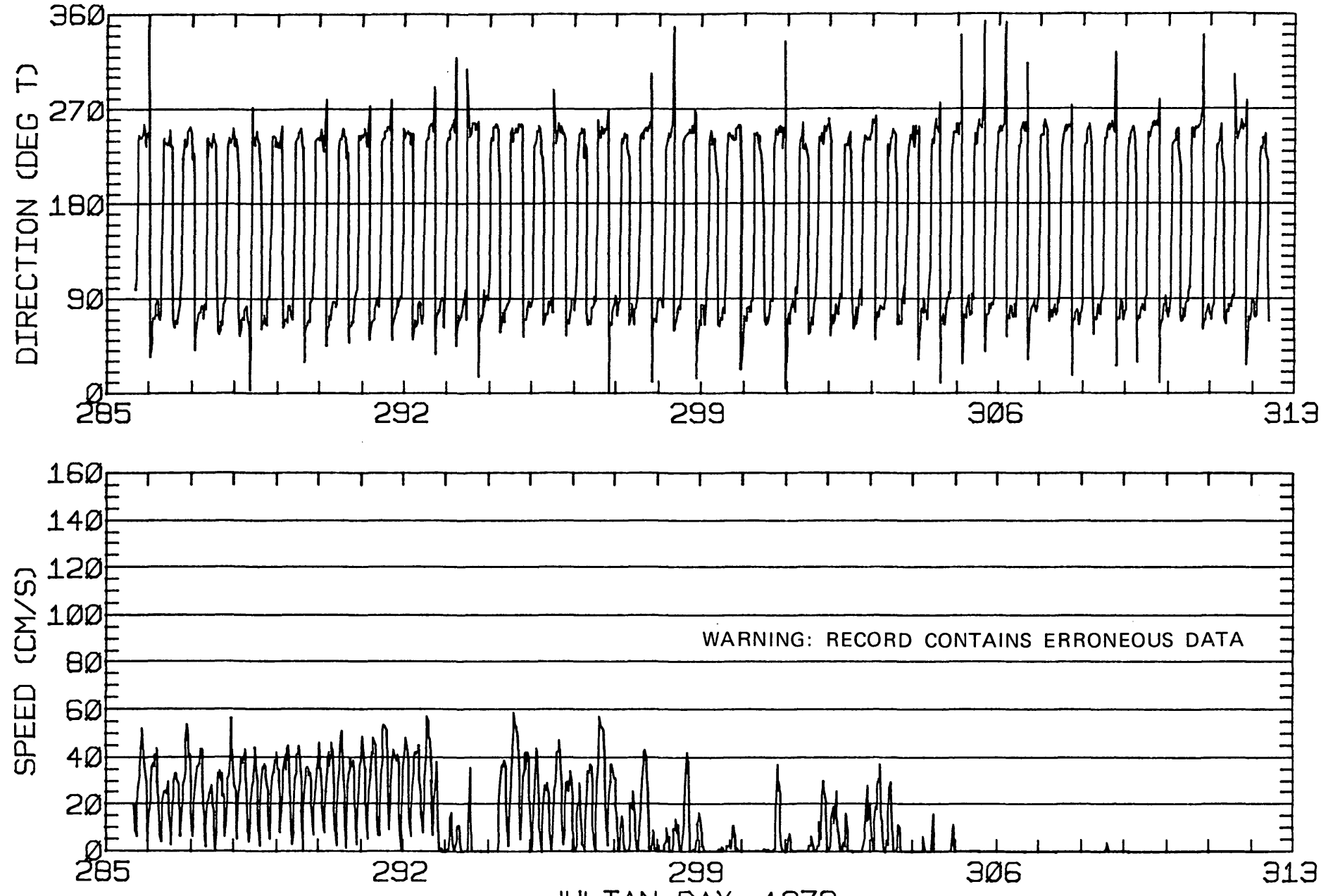
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.45	0.57	74.9	43.1	CLOCKWISE
K1	9.08	0.38	73.0	15.2	ANTI-CLOCKWISE
N2	16.36	6.39	58.9	239.9	CLOCKWISE
M2	52.60	11.20	73.5	264.2	CLOCKWISE
S2	14.49	4.10	64.3	257.6	CLOCKWISE
M4	3.53	0.38	12.2	108.3	ANTI-CLOCKWISE

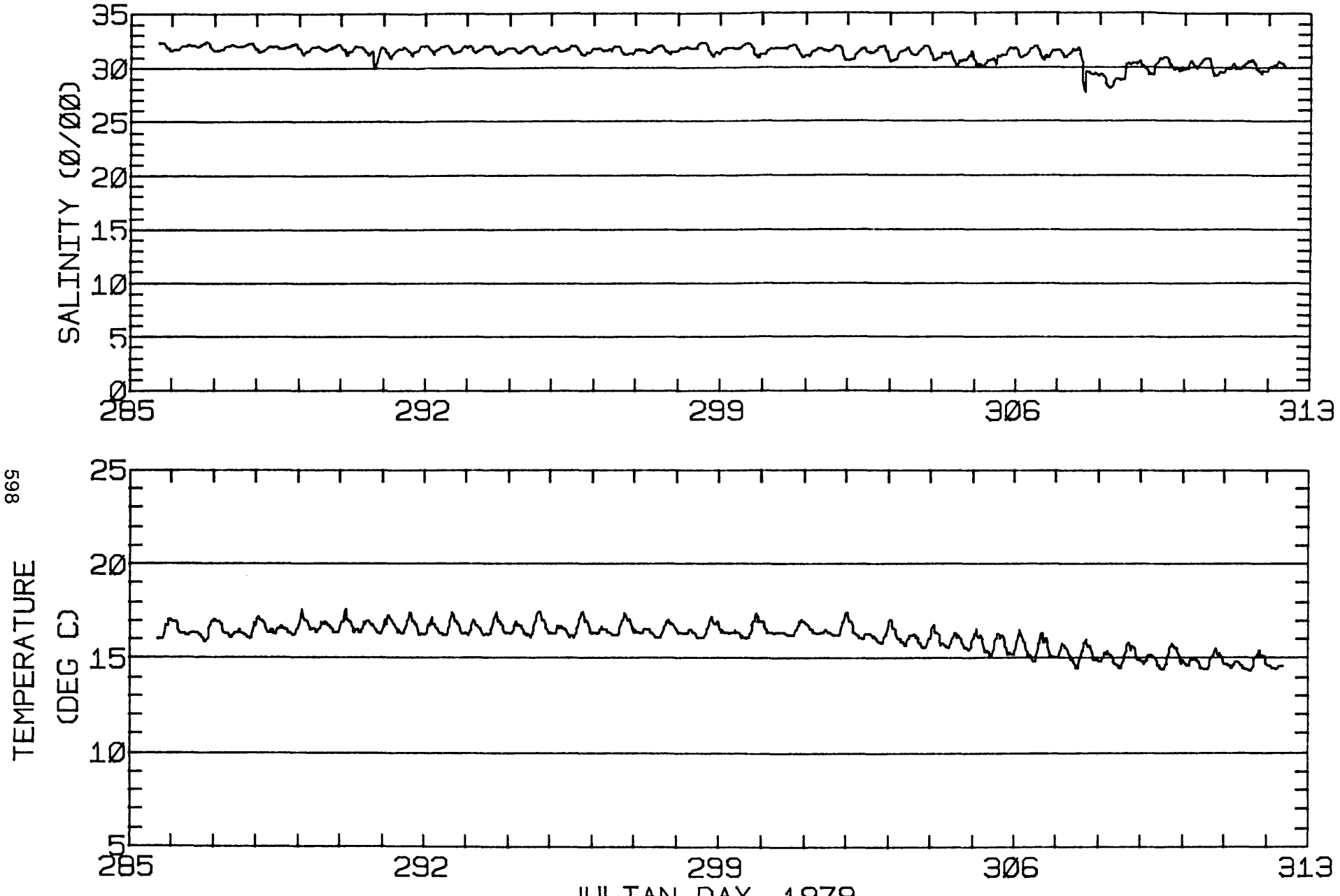
RMS SPEED: 31.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 81.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 71.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.22
STANDARD DEVIATION U-SERIES: 4.79 CM/SEC
STANDARD DEVIATION V SERIES: 3.55 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.9	-2.7	207.
ALL	12	0.9	-2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER 001.5 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'53"N 122 25'54"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 8/79 1110 PST JULIAN DAY=312
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

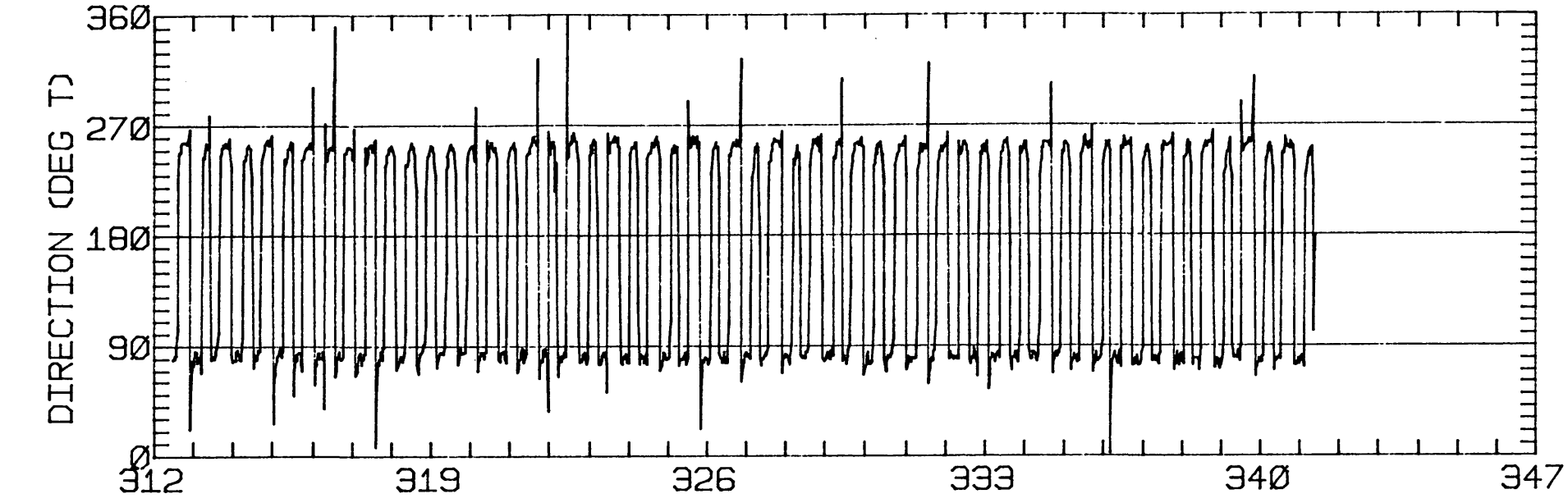
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

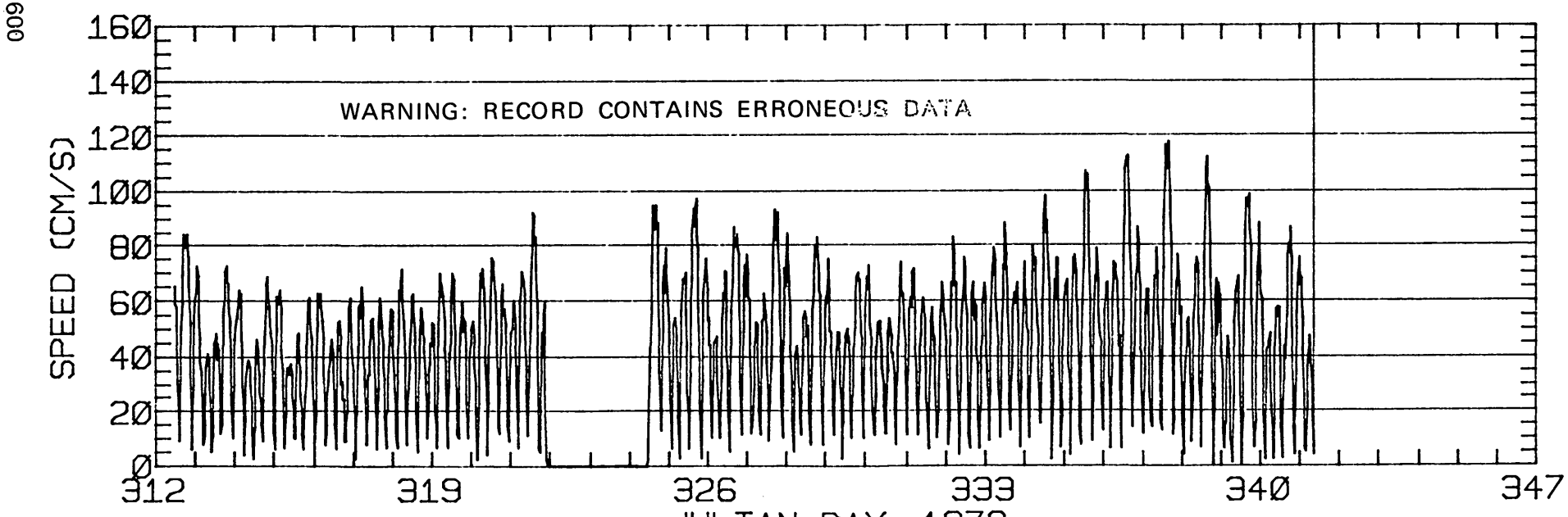
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.63	0.47	80.4	46.8	CLOCKWISE
K1	19.28	0.32	77.9	19.3	CLOCKWISE
N2	11.72	2.30	83.2	235.8	CLOCKWISE
M2	66.89	2.79	79.1	273.7	CLOCKWISE
S2	14.72	1.26	79.9	248.9	CLOCKWISE
M4	2.76	1.15	82.5	166.2	CLOCKWISE

RMS SPEED: 45.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 111.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 43.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 79.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 5.95 CM/SEC
STANDARD DEVIATION V SERIES: 3.62 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.6	-3.2	307.
2	6	0.3	-4.9	223.
ALL	18	-0.3	-3.7	



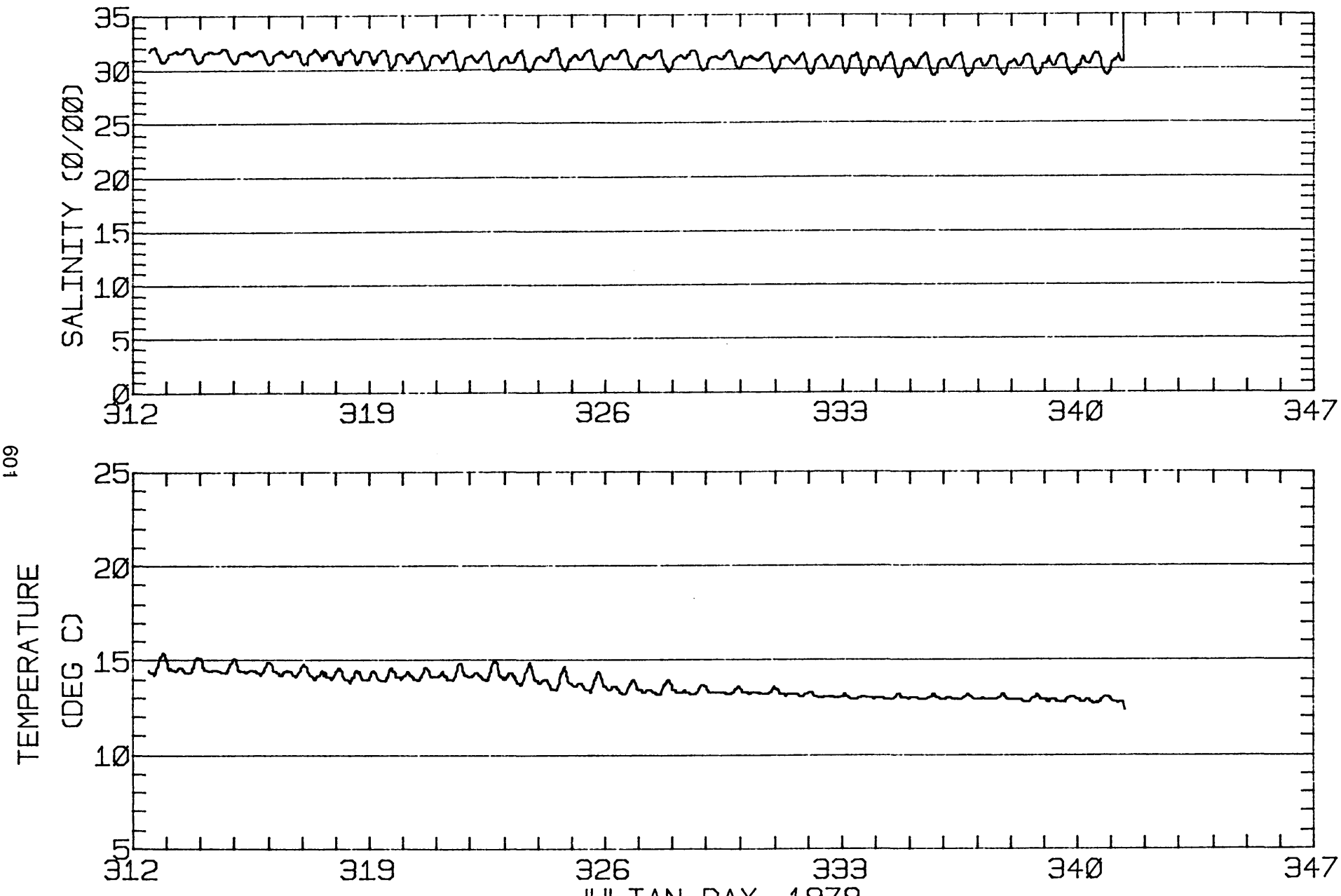


JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 211 37-48-53N 122-25-54W

METER 9.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-53N 122-25-54W
METER 9.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'53"N 122 25'54"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 20.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 8/79 1122 PST JULIAN DAY=312
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

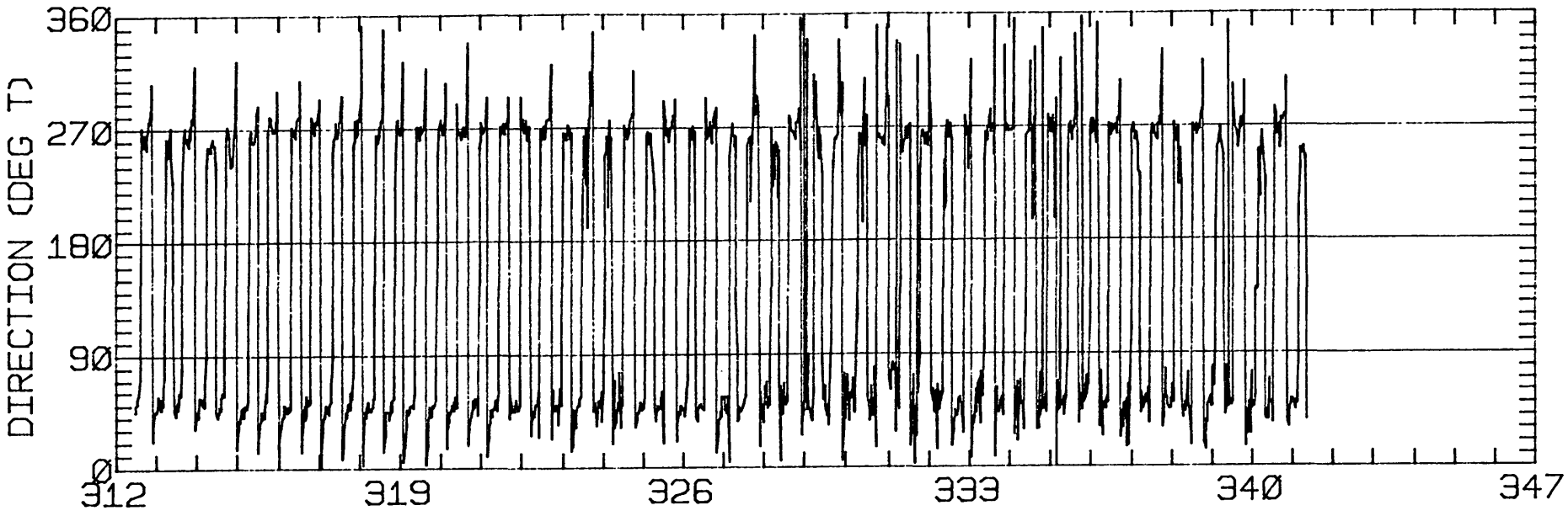
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

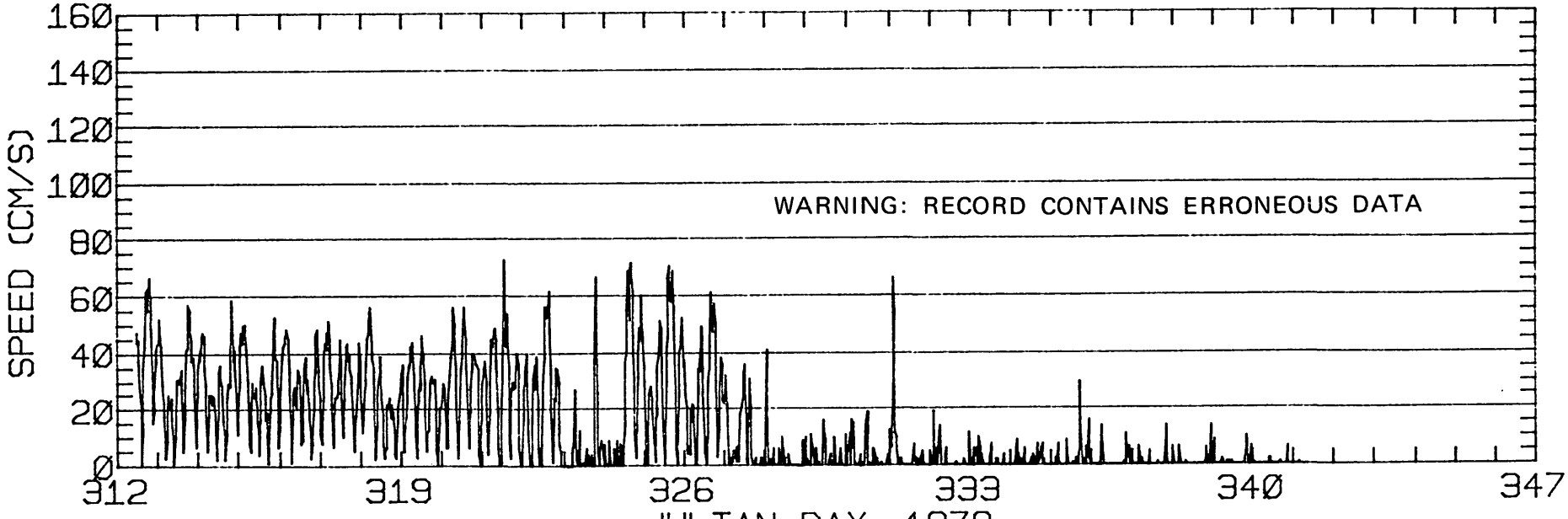
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.42	2.25	97.6	50.7	CLOCKWISE
K1	14.53	1.45	71.0	18.0	CLOCKWISE
N2	11.20	3.03	74.2	209.5	CLOCKWISE
M2	40.33	2.78	70.6	262.8	CLOCKWISE
S2	6.53	1.57	84.6	237.8	CLOCKWISE
M4	2.78	0.81	132.4	24.0	ANTI-CLOCKWISE

RMS SPEED: 31.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 68.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 74.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 5.48 CM/SEC
STANDARD DEVIATION V SERIES: 4.77 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

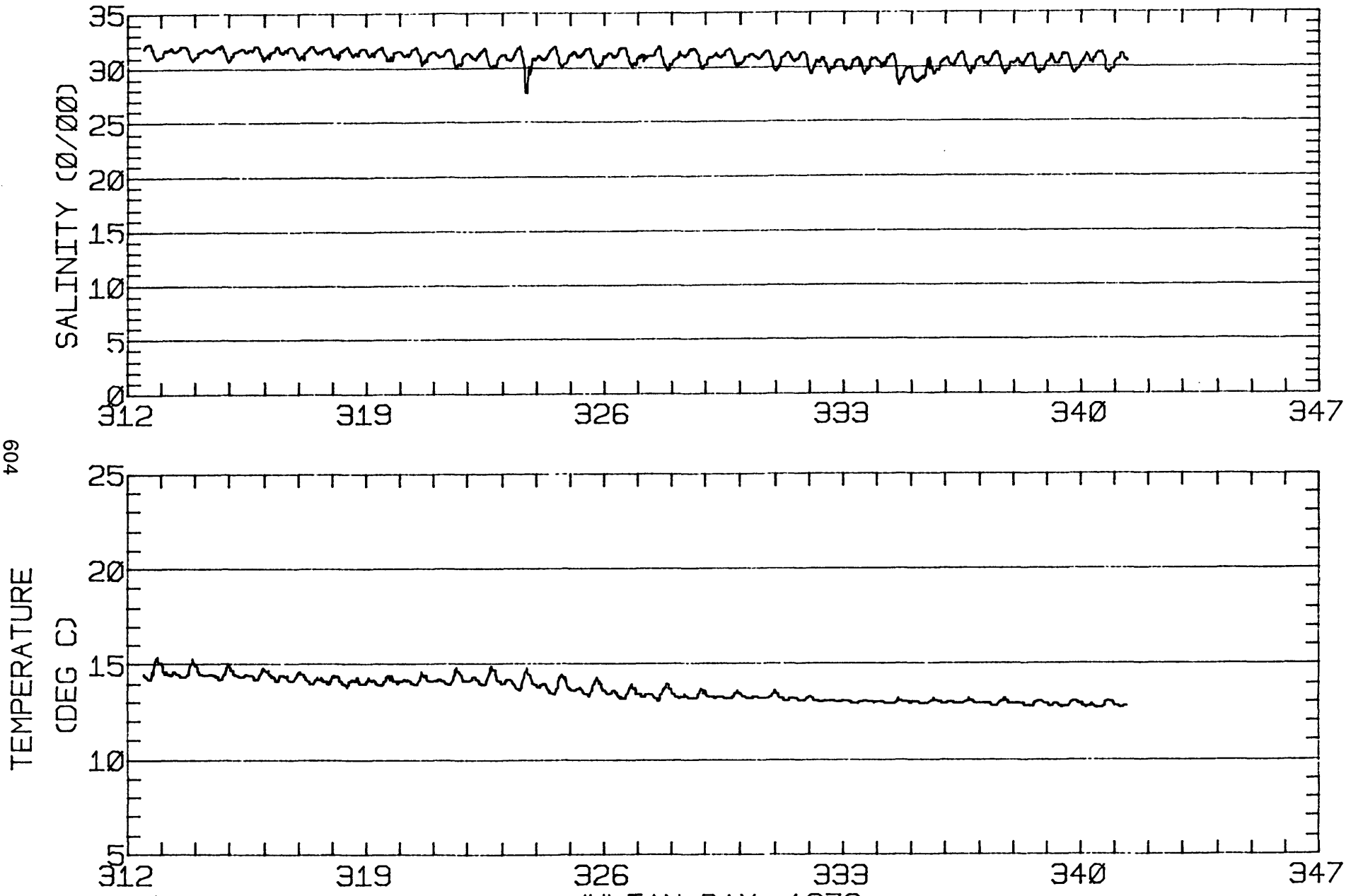
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.1	10.1	307.
2	4	-1.6	9.7	224.
ALL	16	-2.0	10.0	





JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-53N 122-25-54W
METER 001.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 211 37-48-53N 122-25-54W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'53"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 20.1 M (BELOW MLLW)
START TIME OF SERIES:12/ 7/79 1650 PST JULIAN DAY=341
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

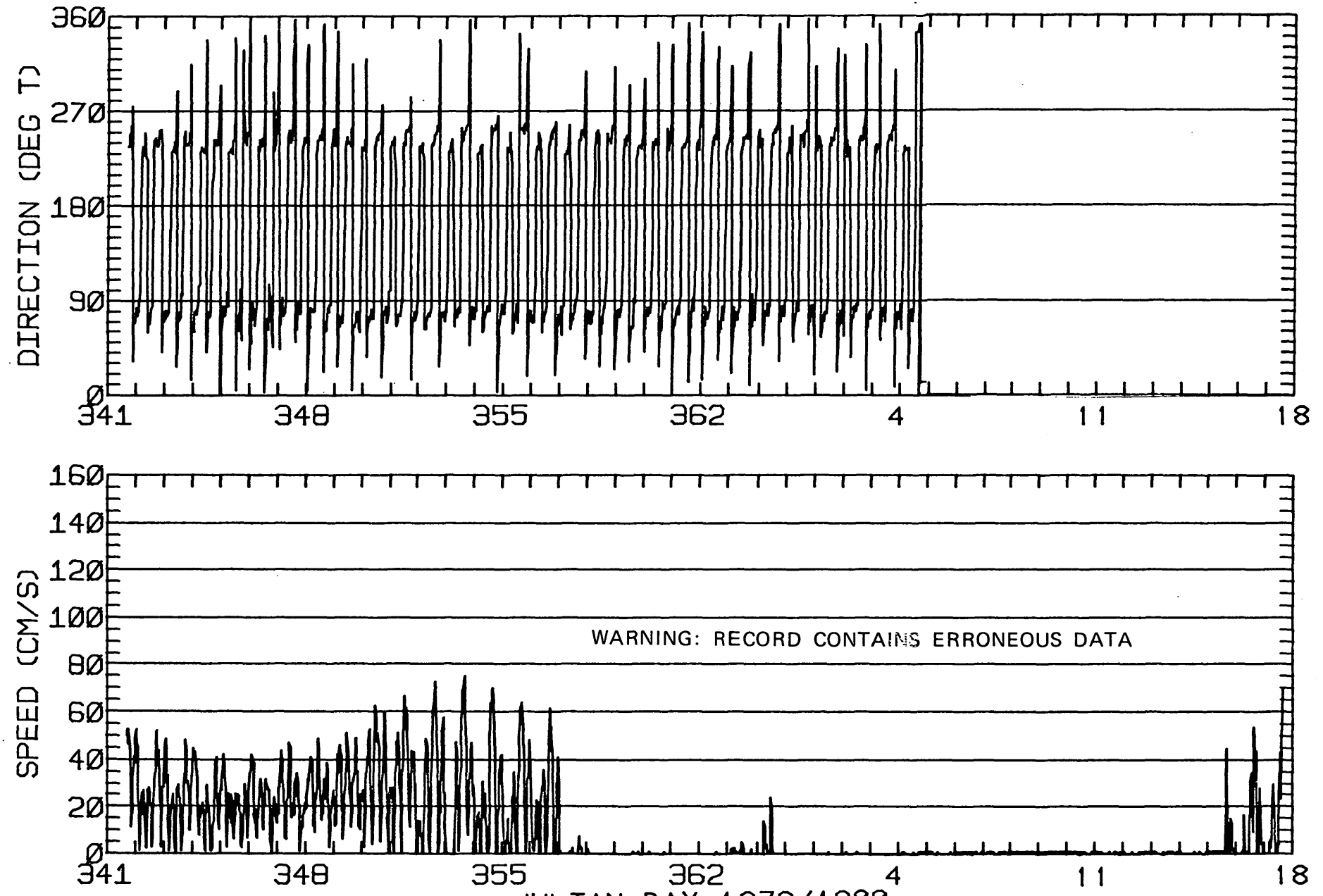
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.21	0.81	69.1	29.5	ANTI-CLOCKWISE
K1	15.12	1.45	71.4	21.1	CLOCKWISE
N2	8.78	0.09	46.7	283.1	CLOCKWISE
M2	43.40	3.78	65.7	273.4	CLOCKWISE
S2	6.74	1.13	60.3	290.1	ANTI-CLOCKWISE
M4	3.90	1.30	178.9	197.5	CLOCKWISE

RMS SPEED: 27.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 73.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 66.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 5.09 CM/SEC
STANDARD DEVIATION V SERIES: 4.71 CM/SEC

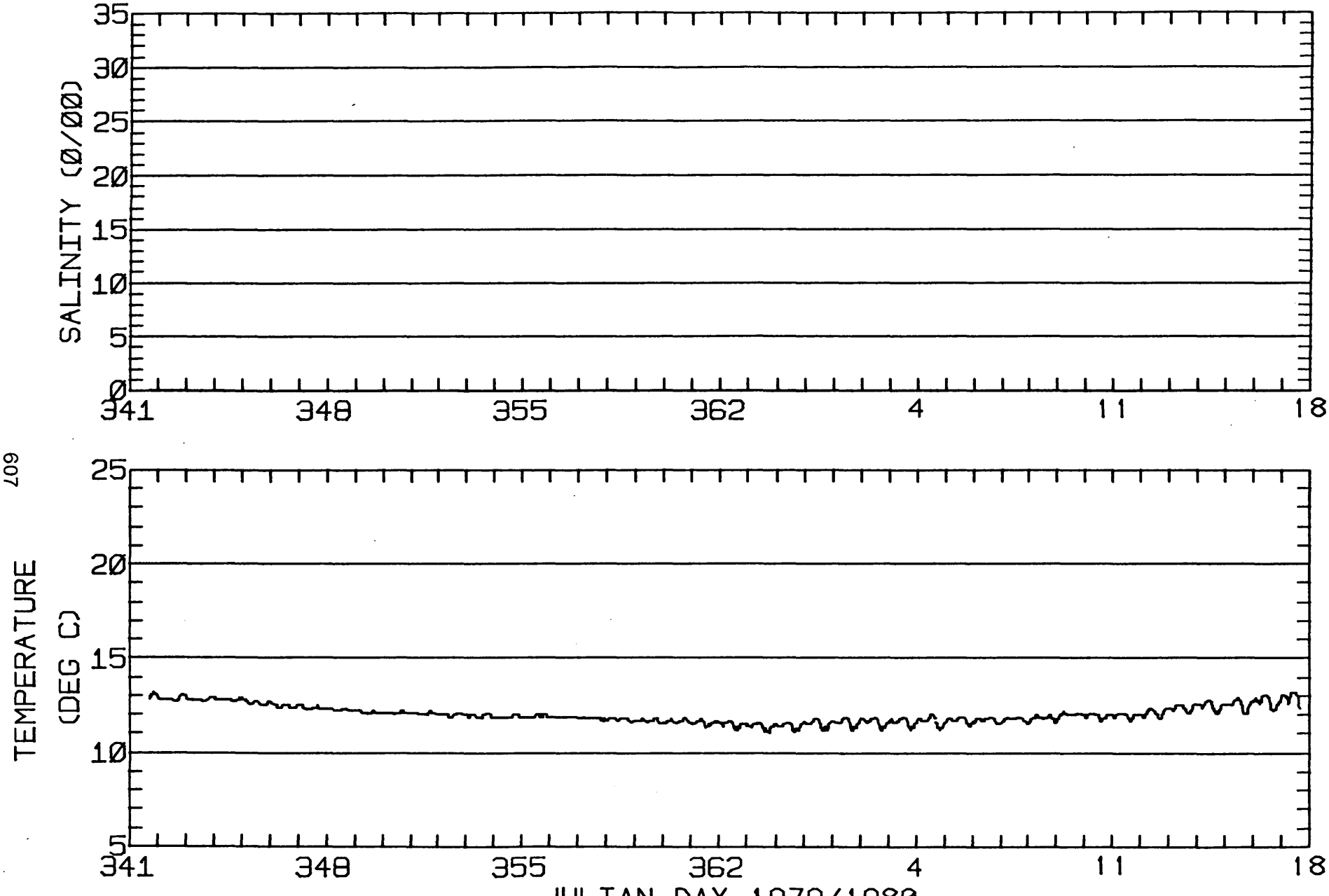
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.8	-0.9	277.
2	4	4.8	0.9	250.
ALL	16	3.3	-0.5	



909

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-53W
METER 001.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



607

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-53W
METER ØØ1.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'54"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 20.1 M (BELOW MLLW)
START TIME OF SERIES: 4/ 1/80 1504 PST JULIAN DAY= 92
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

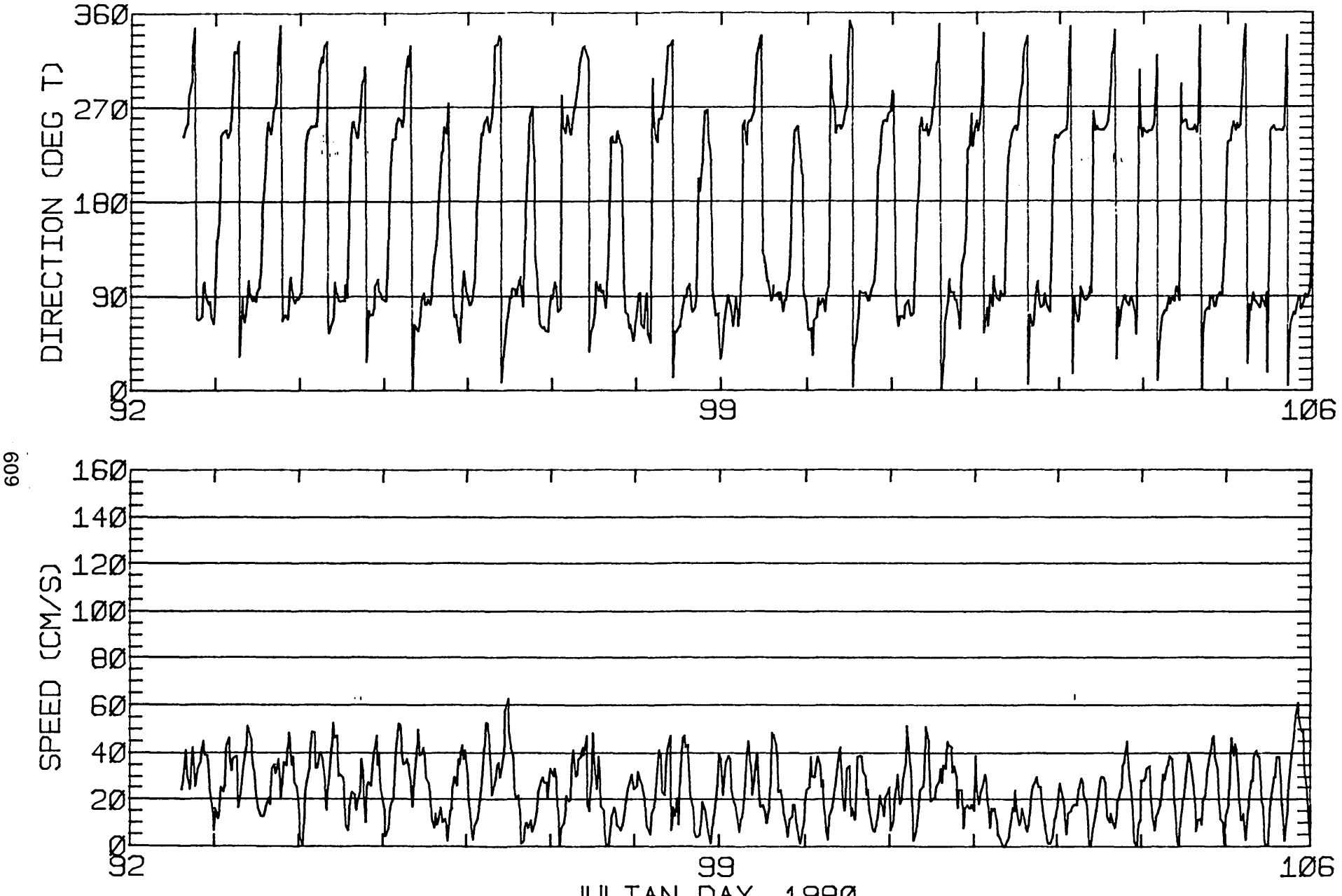
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.27	0.70	103.0	37.8	CLOCKWISE
K1	8.31	1.34	103.8	21.2	CLOCKWISE
N2	5.39	0.22	39.1	267.0	CLOCKWISE
M2	29.20	5.76	87.2	250.3	CLOCKWISE
S2	8.85	1.96	77.0	287.5	CLOCKWISE
M4	4.98	0.21	177.0	108.8	CLOCKWISE

RMS SPEED: 27.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 52.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 90.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 7.88 CM/SEC
STANDARD DEVIATION V SERIES: 7.52 CM/SEC

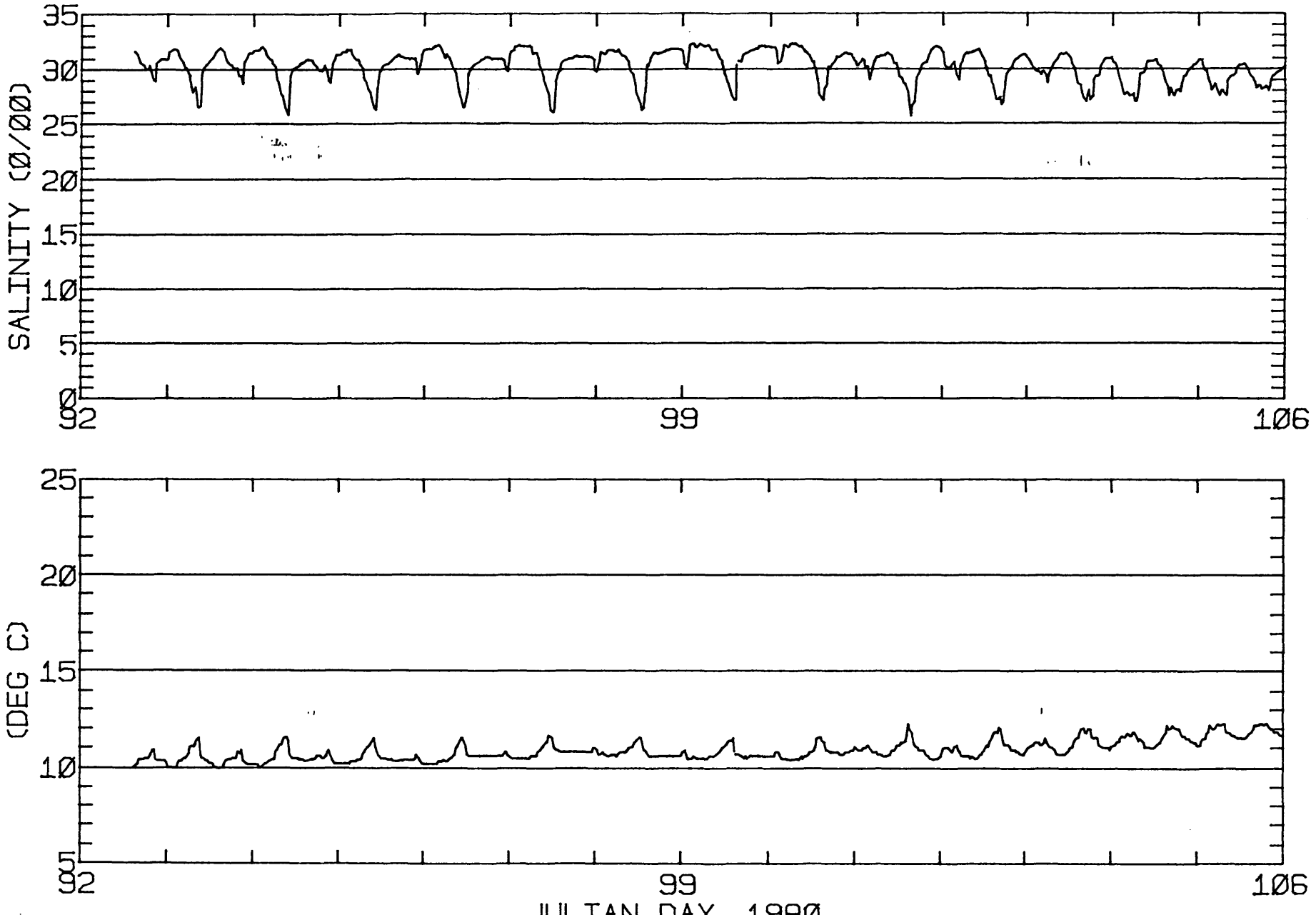
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	5.0	3.2	1048.
2	12	5.0	1.2	981.
3	2	5.8	-0.8	755.
ALL	26	5.1	1.9	



609

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER 001.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER ØØ1.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 26' 3"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 4/15/80 1520 PST JULIAN DAY=106
APPROXIMATE RECORD LENGTH IS 46 M2-CYCLES

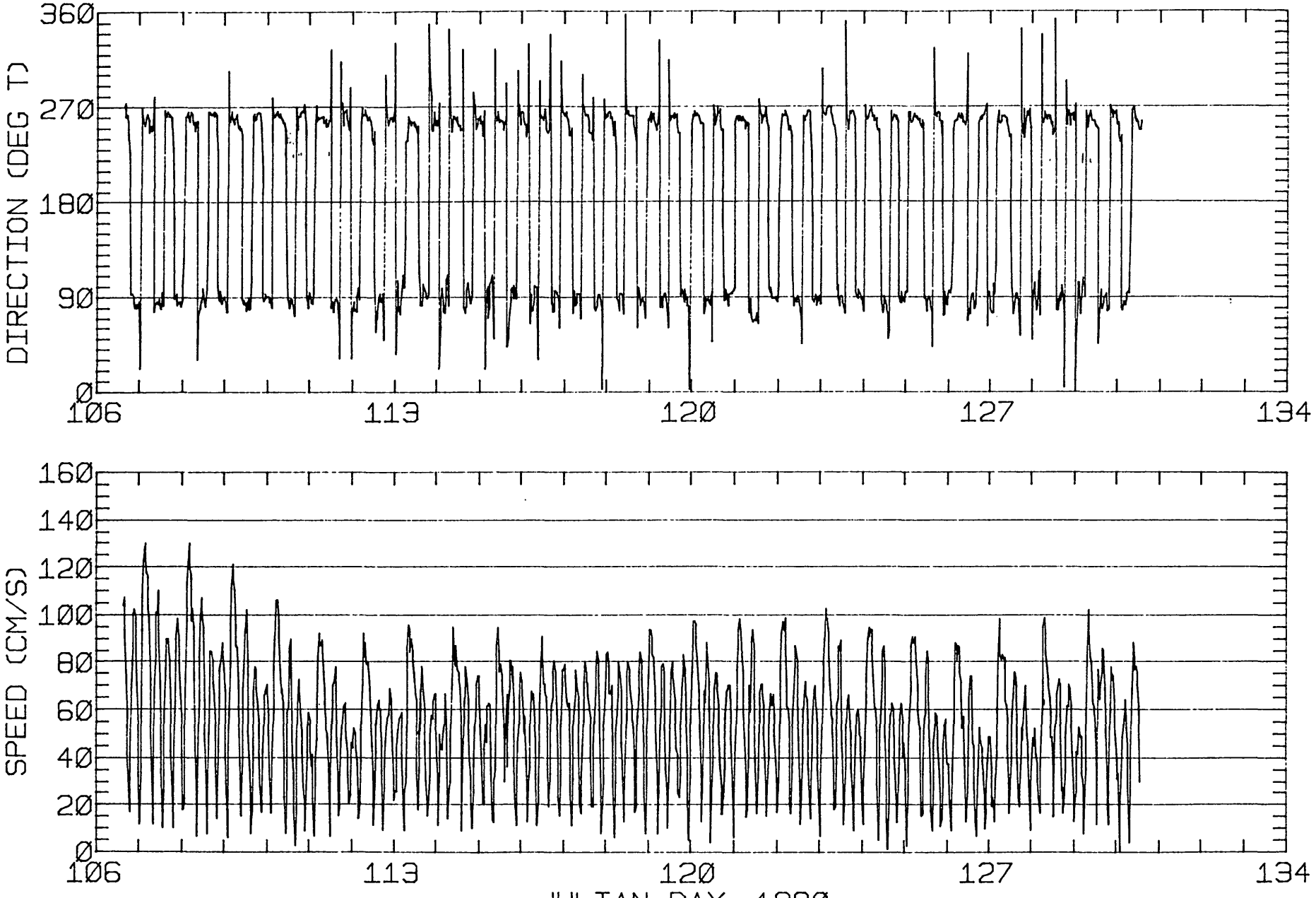
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.45	0.13	74.6	44.3	CLOCKWISE
K1	18.89	0.32	80.8	21.0	ANTI-CLOCKWISE
N2	18.37	0.45	84.7	241.6	CLOCKWISE
M2	77.59	2.07	83.8	275.2	ANTI-CLOCKWISE
S2	18.96	1.13	86.1	260.7	ANTI-CLOCKWISE
M4	5.52	2.41	96.6	226.1	CLOCKWISE

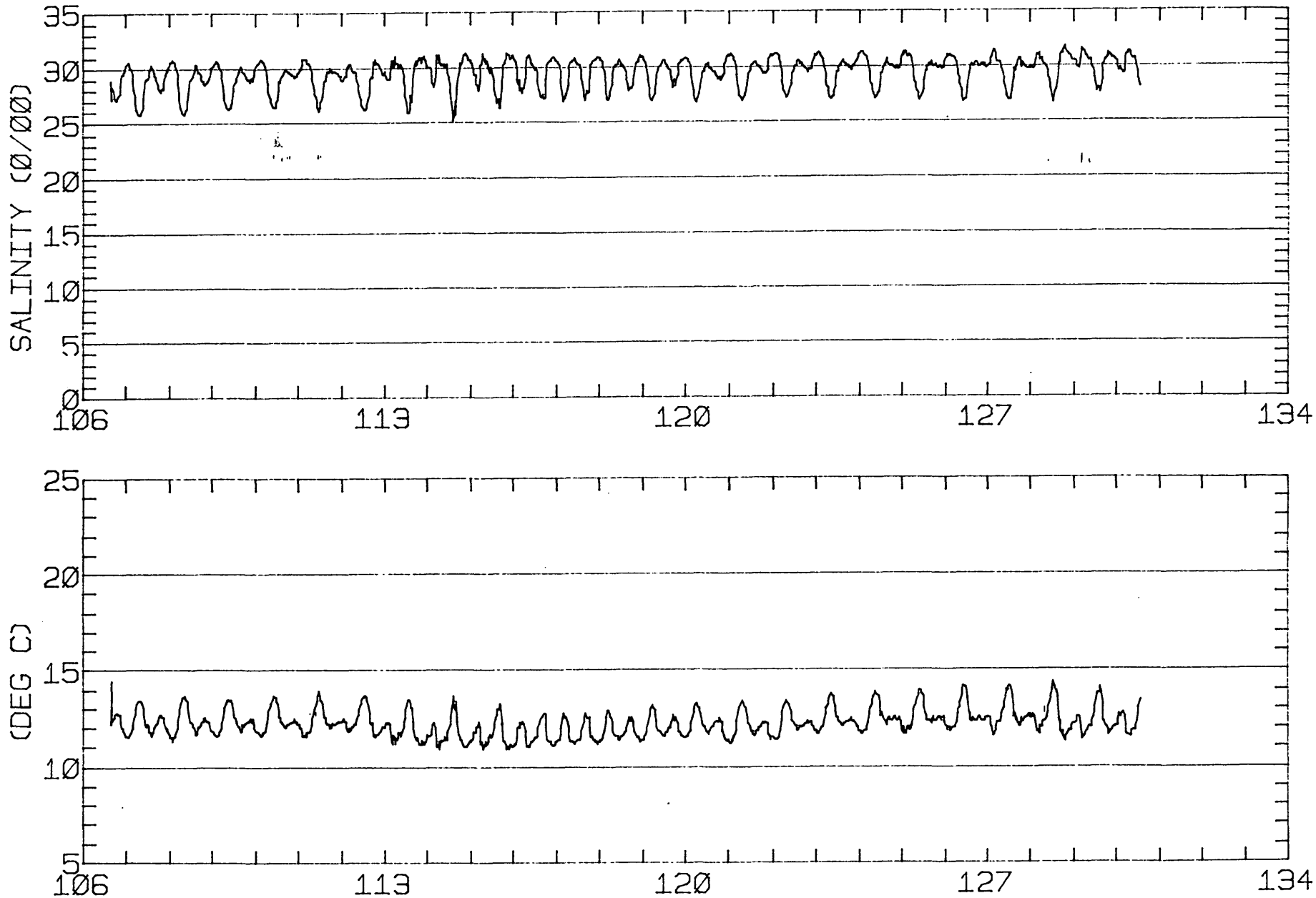
RMS SPEED: 60.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 128.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 53.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 82.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 11.61 CM/SEC
STANDARD DEVIATION V SERIES: 7.68 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-10.8	-4.3	708.
2	12	-8.5	-5.2	658.
3	12	-9.2	-4.4	594.
4	10	-9.1	-4.4	532.
ALL	46	-9.4	-4.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- 3W
METER 015.4 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- 3W
METER Ø15.4 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 26' 3"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 4/15/80 1512 PST JULIAN DAY=106
APPROXIMATE RECORD LENGTH IS 46 M2-CYCLES

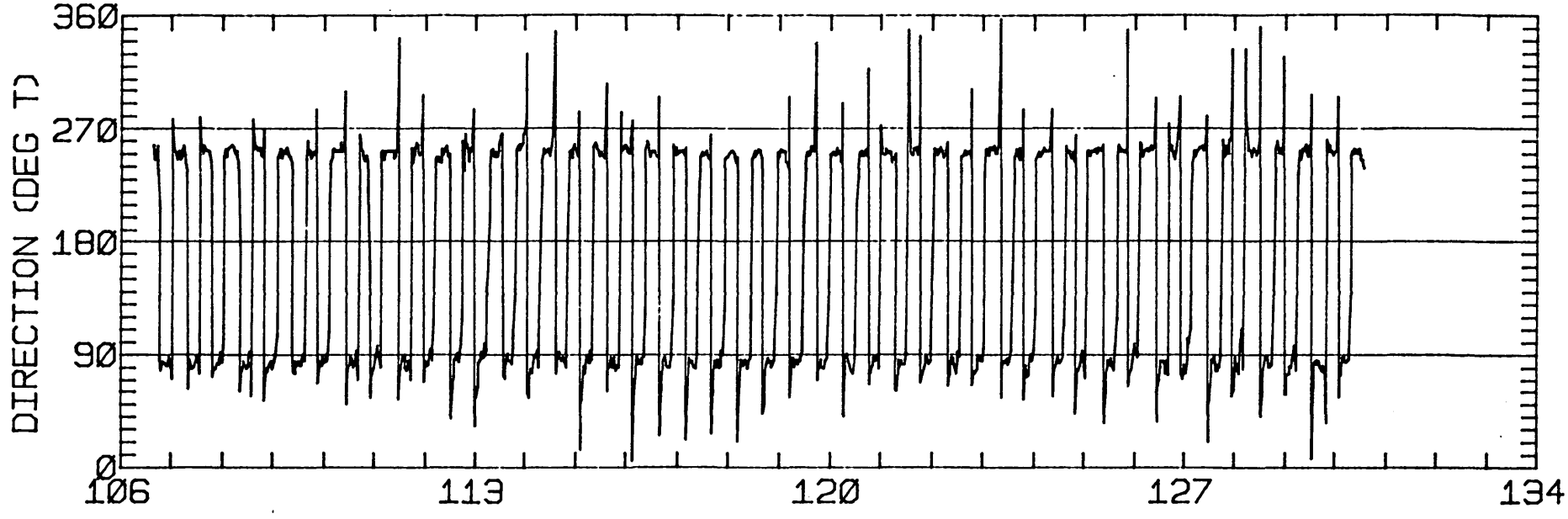
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

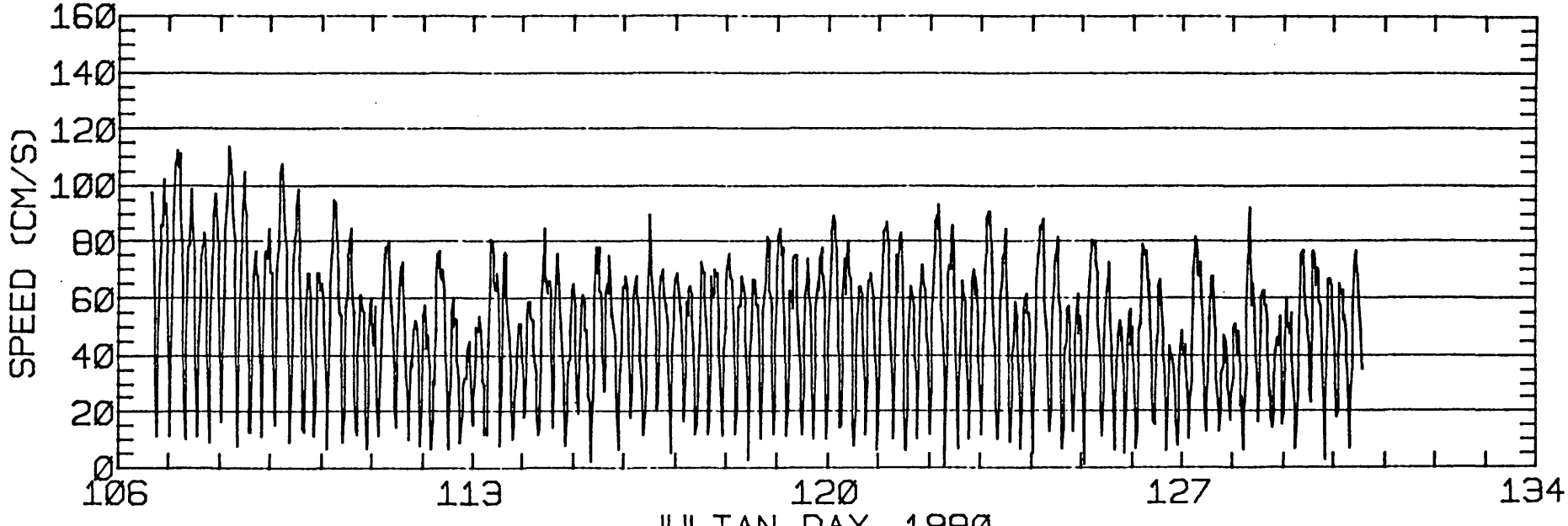
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.26	0.07	73.9	43.8	ANTI-CLOCKWISE
K1	16.23	0.24	74.8	17.0	ANTI-CLOCKWISE
N2	16.08	0.38	78.6	239.3	CLOCKWISE
M2	71.50	2.98	77.6	271.6	CLOCKWISE
S2	18.10	0.25	77.8	263.0	ANTI-CLOCKWISE
M4	3.39	1.85	157.5	199.5	CLOCKWISE

RMS SPEED: 55.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 119.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 50.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 10.61 CM/SEC
STANDARD DEVIATION V SERIES: 5.90 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

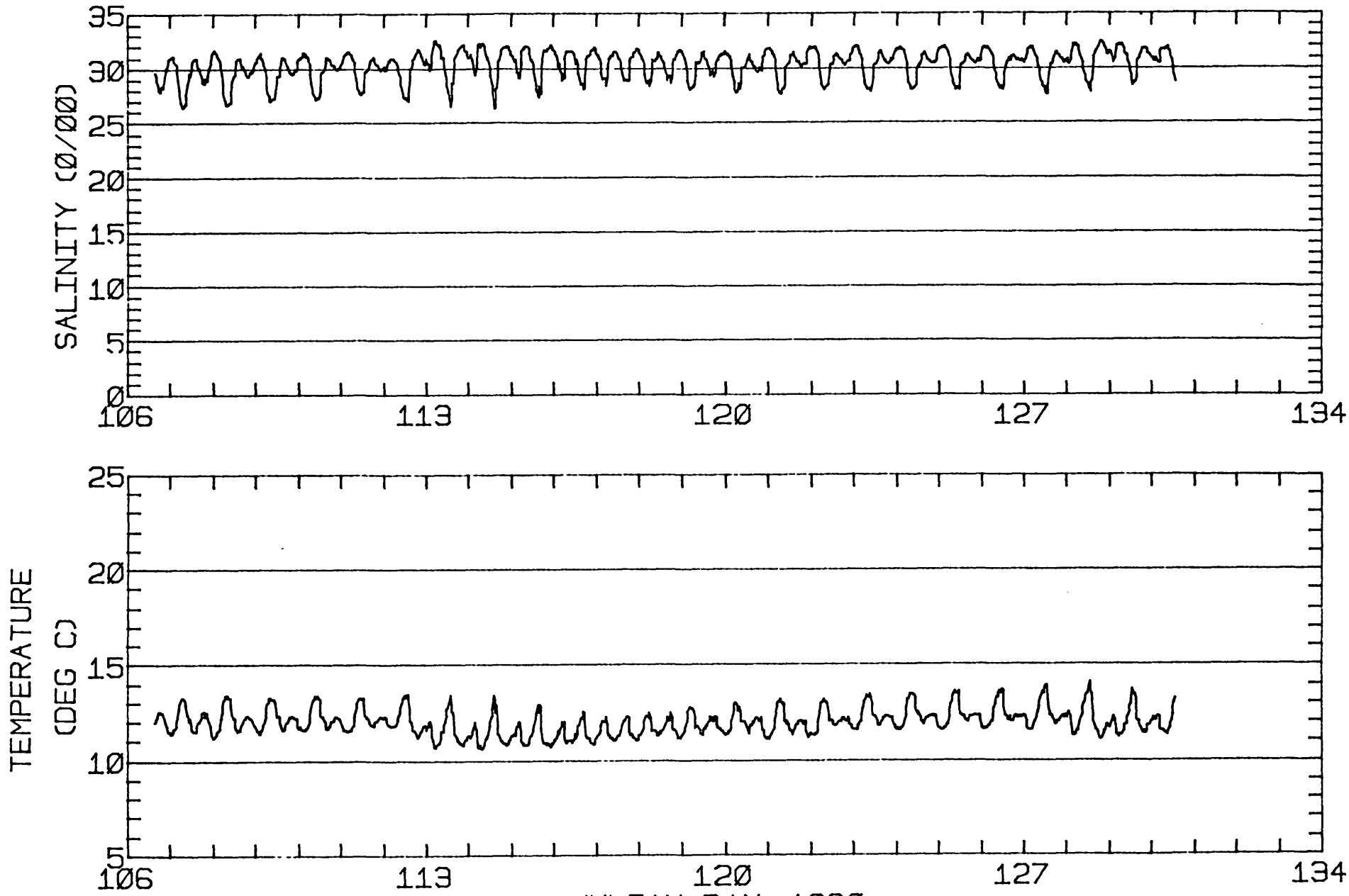
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.8	-6.2	708.
2	12	-0.2	-3.8	658.
3	12	-2.1	-5.6	594.
4	10	-2.0	-2.9	532.
ALL	46	-1.8	-4.7	





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- 3W
METER 009.4 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- 3W
METER ØØ9.4 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 26' 3"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.8 M (BELOW MLLW)
START TIME OF SERIES: 4/15/80 1514 PST JULIAN DAY=106
APPROXIMATE RECORD LENGTH IS 46 M2-CYCLES

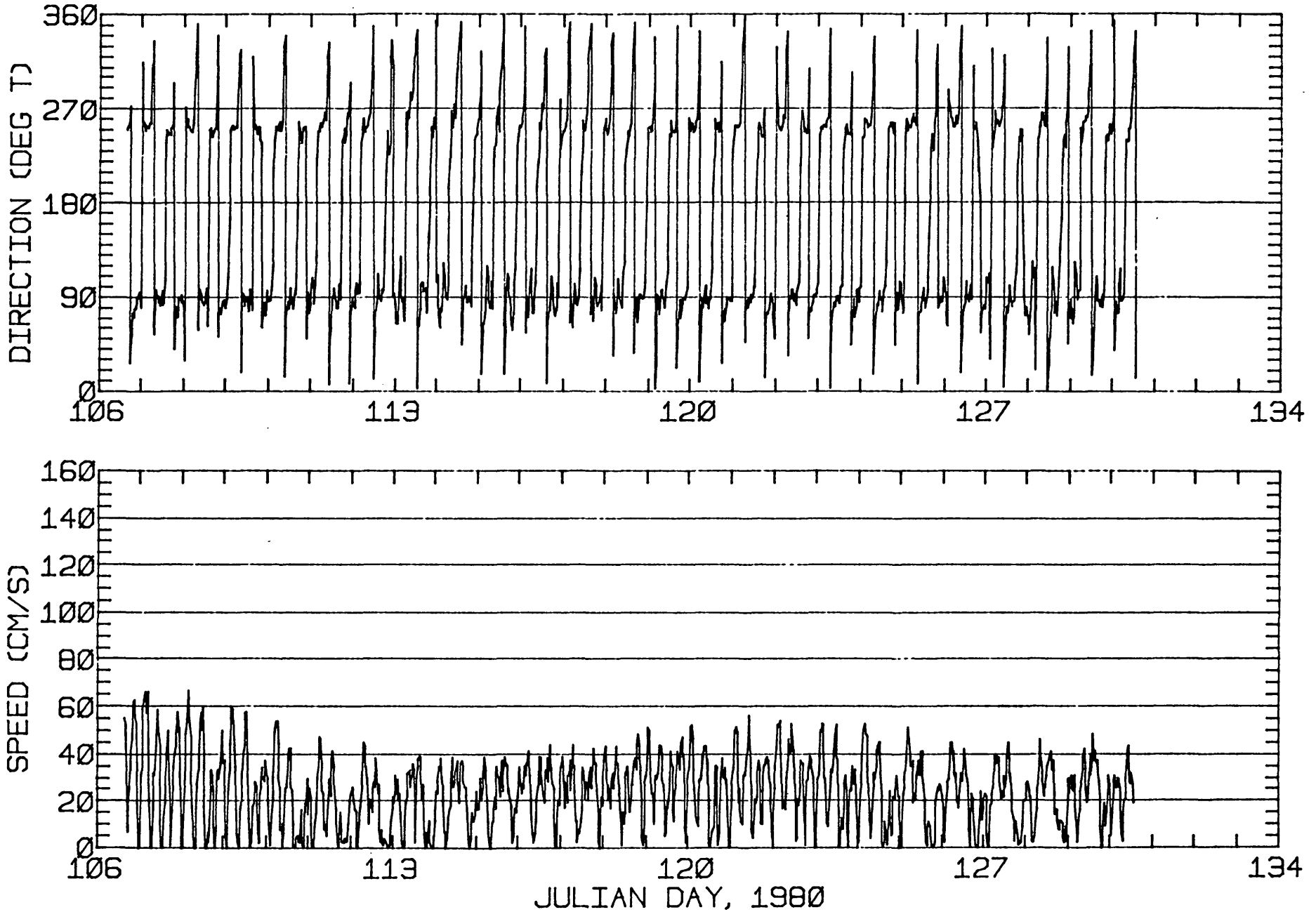
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.46	0.24	97.9	33.2	CLOCKWISE
K1	10.01	1.73	78.3	3.2	CLOCKWISE
N2	6.70	0.05	87.4	237.5	ANTI-CLOCKWISE
M2	33.63	5.12	83.2	257.6	CLOCKWISE
S2	10.32	0.61	84.9	259.1	ANTI-CLOCKWISE
M4	4.54	0.50	4.7	331.2	CLOCKWISE

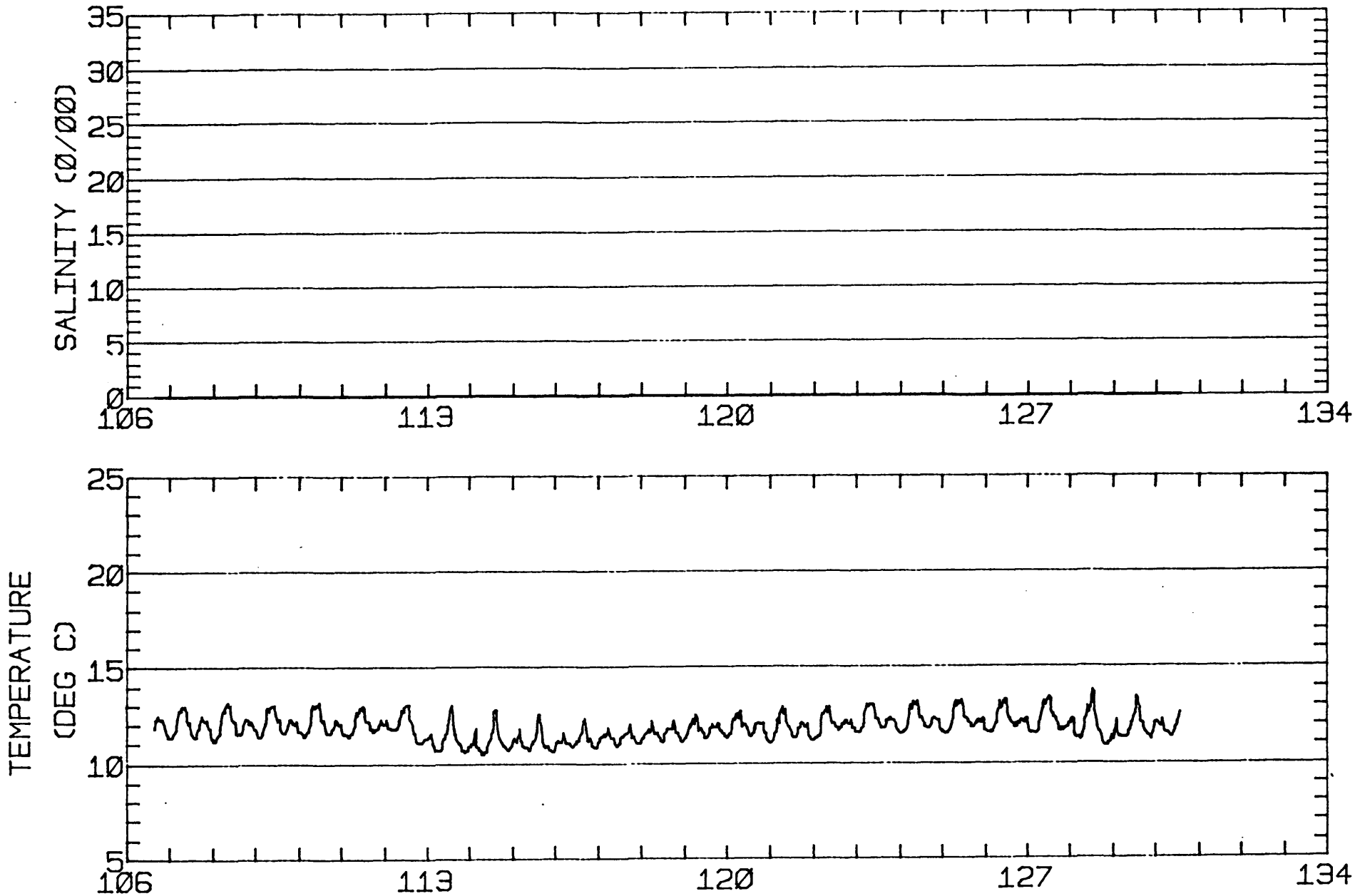
RMS SPEED: 28.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 62.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 21.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 84.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 7.61 CM/SEC
STANDARD DEVIATION V SERIES: 6.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.7	-1.4	708.
2	12	5.6	2.1	658.
3	12	2.5	-1.4	594.
4	10	4.1	0.3	532.
ALL	46	3.7	-0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- 3W
METER 001.5 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- 3W
METER Ø01.5 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'57"N 122 25'51"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 6/ 2/80 1510 PST JULIAN DAY=154
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

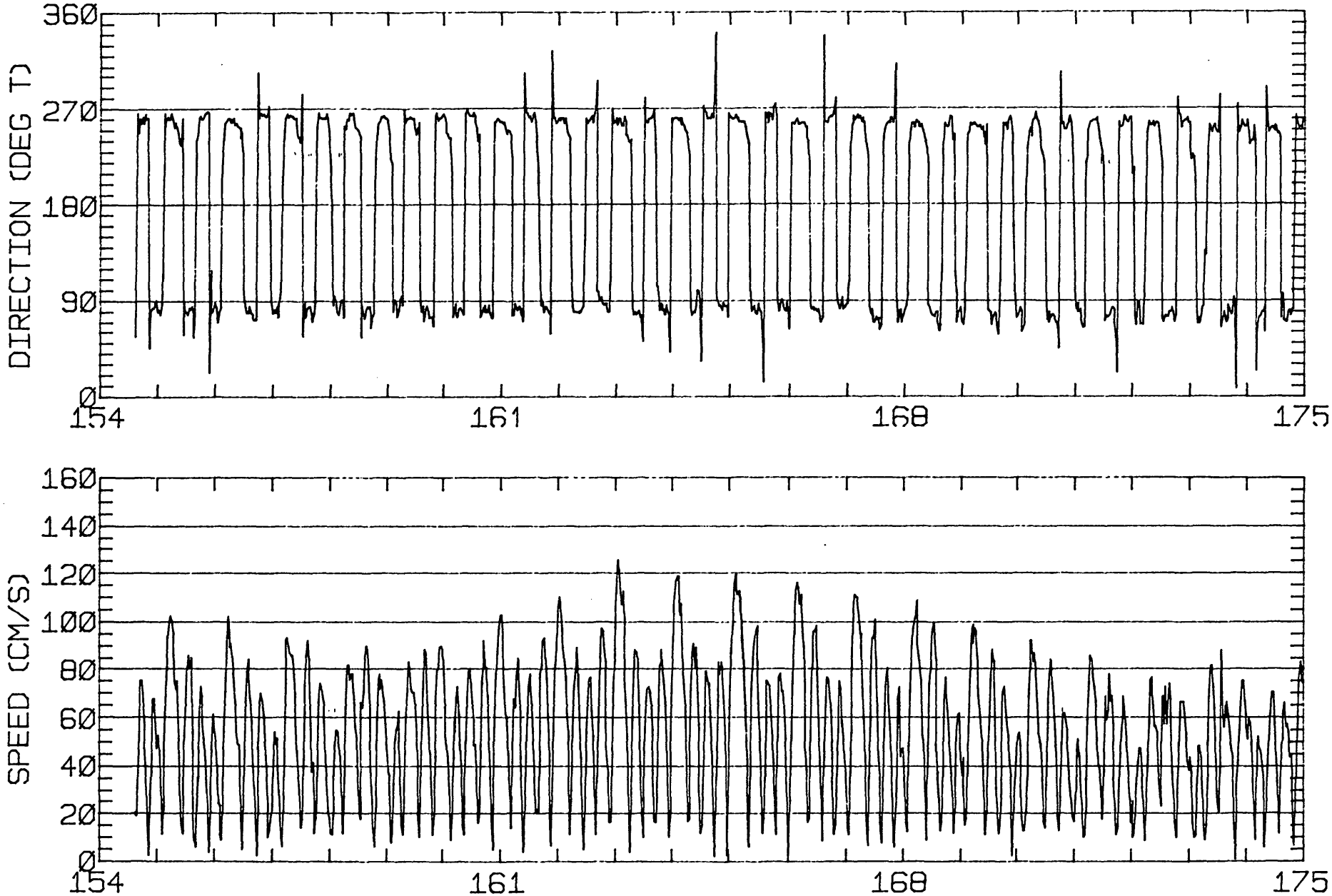
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.05	0.17	75.0	48.8	CLOCKWISE
K1	29.73	0.52	75.2	37.2	ANTI-CLOCKWISE
N2	11.22	0.69	90.4	250.7	CLOCKWISE
M2	73.39	3.69	80.0	275.8	ANTI-CLOCKWISE
S2	11.05	1.41	80.7	290.4	ANTI-CLOCKWISE
M4	5.01	1.38	65.1	233.8	CLOCKWISE

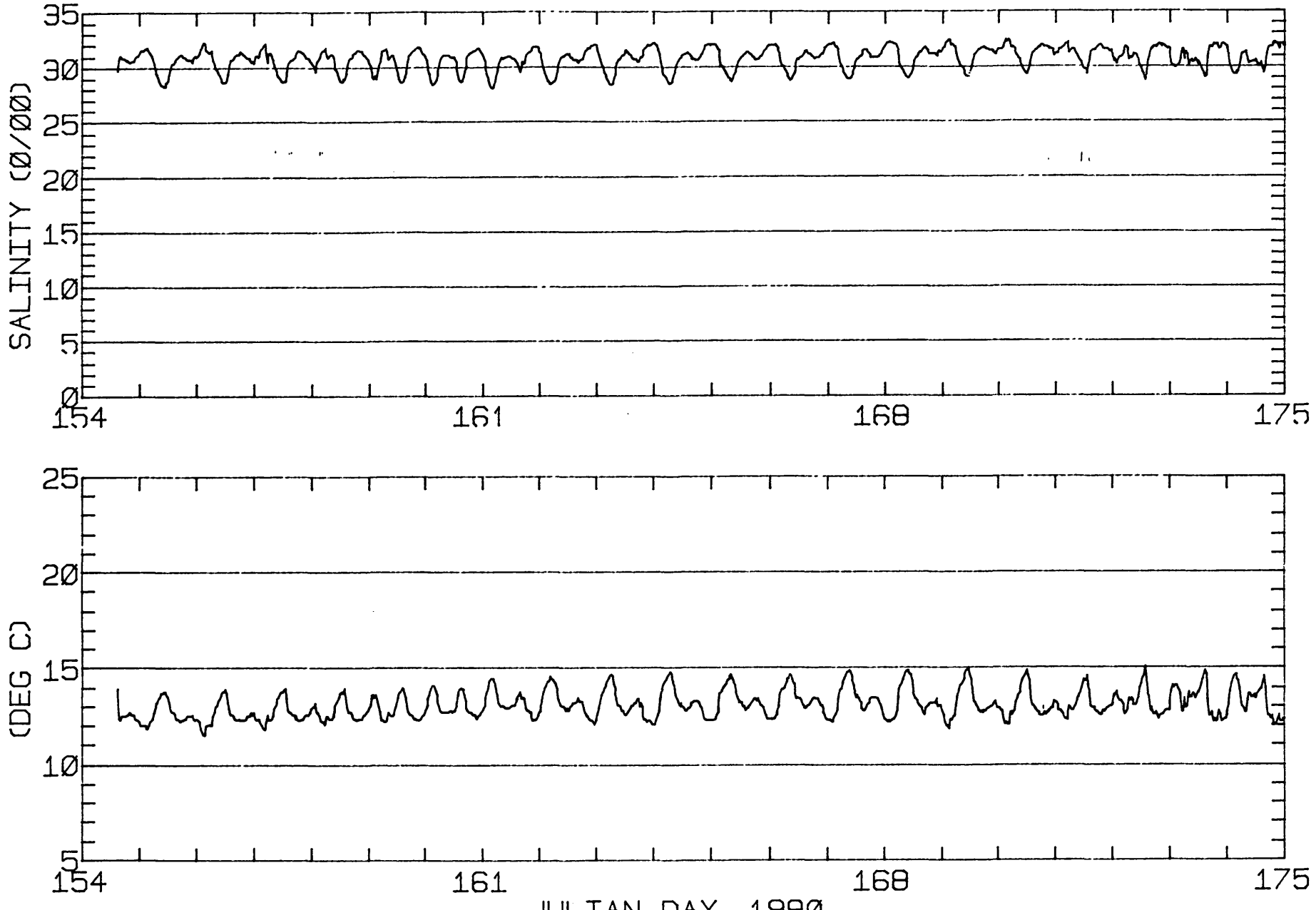
RMS SPEED: 61.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 127.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 45.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 78.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 12.20 CM/SEC
STANDARD DEVIATION V SERIES: 6.46 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-9.3	-2.8	403.
2	12	-8.9	-4.2	413.
3	12	-9.9	-4.1	429.
4	2	-9.5	-4.8	449.
ALL	38	-9.4	-3.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-57N 122-25-51W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-57N 122-25-51W
METER Ø15.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'57"N 122 25'51"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 5/28/80 1352 PST JULIAN DAY=149
APPROXIMATE RECORD LENGTH IS 48 M2-CYCLES

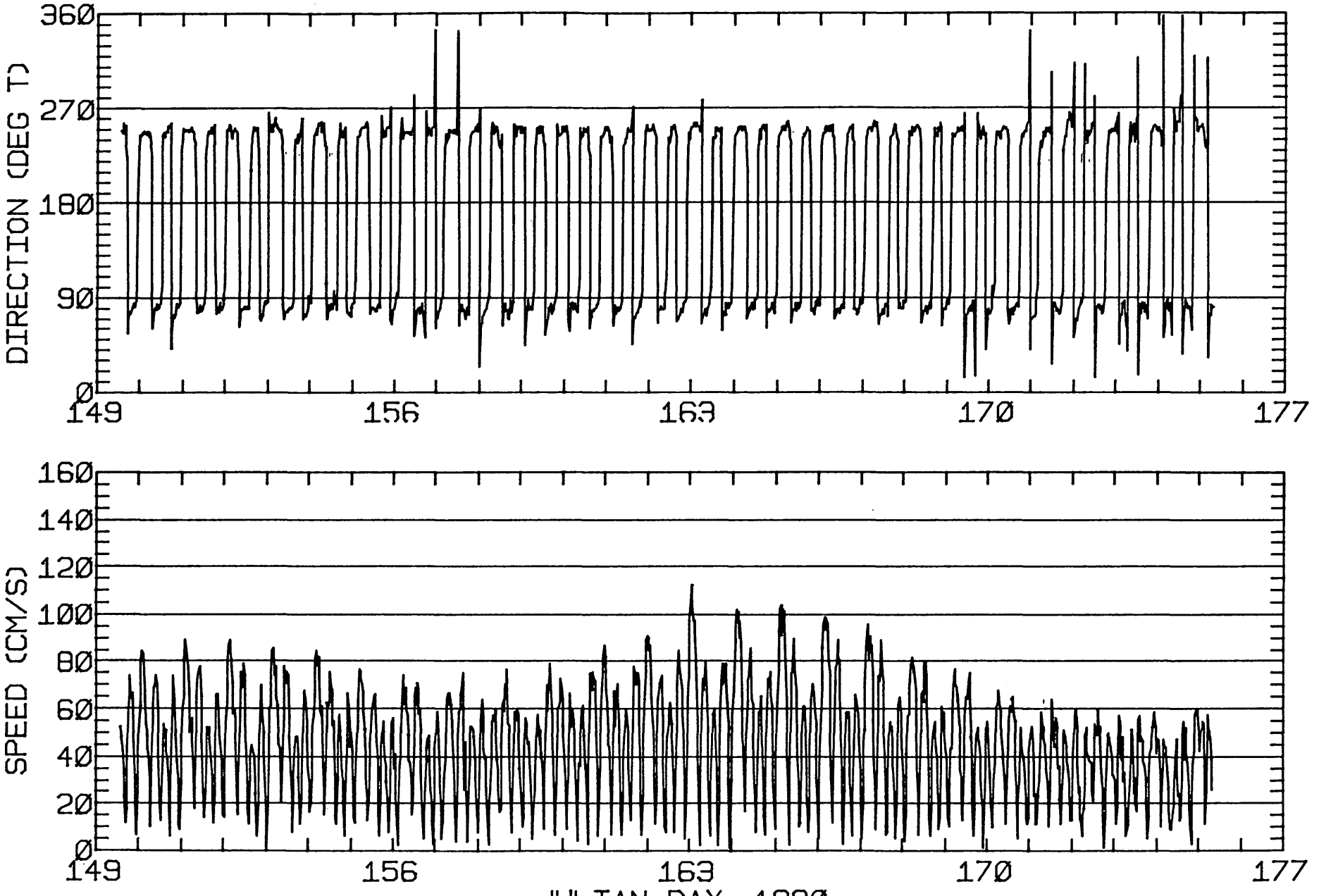
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.64	0.22	71.9	42.0	ANTI-CLOCKWISE
K1	23.58	0.23	73.6	28.0	ANTI-CLOCKWISE
N2	12.15	0.20	76.9	245.0	CLOCKWISE
M2	61.51	2.13	74.5	271.5	CLOCKWISE
S2	11.04	0.09	75.5	283.6	ANTI-CLOCKWISE
M4	2.43	1.19	98.9	158.9	CLOCKWISE

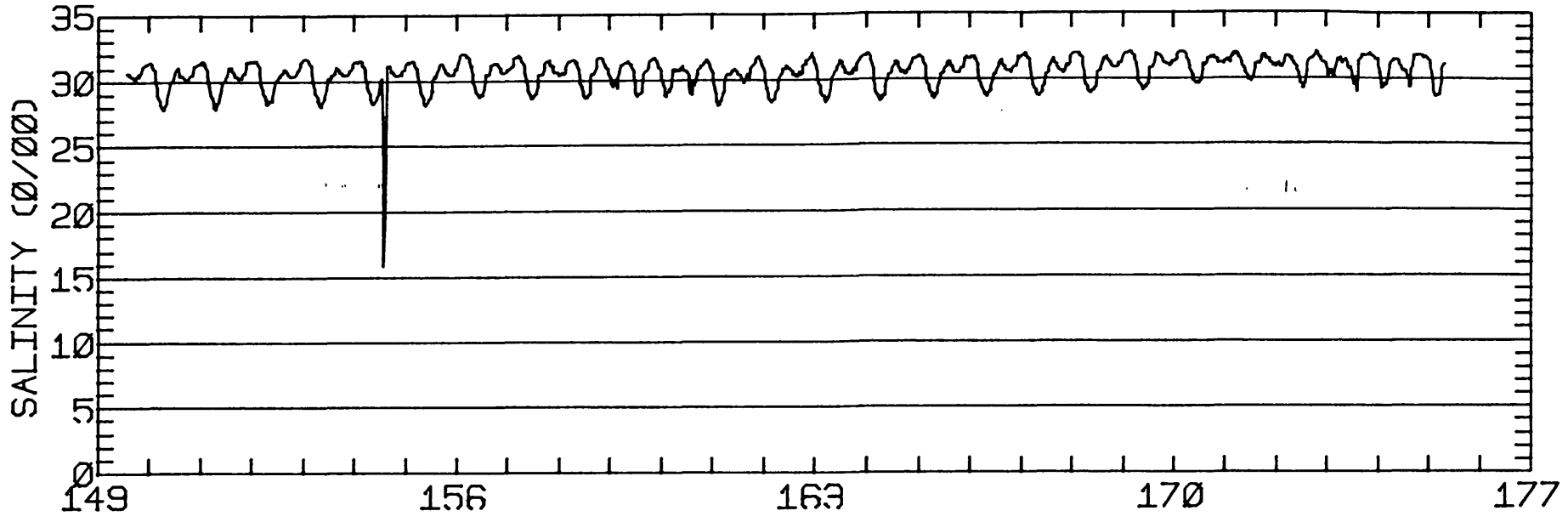
RMS SPEED: 51.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 108.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 74.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.50
STANDARD DEVIATION U-SERIES: 10.30 CM/SEC
STANDARD DEVIATION V SERIES: 5.63 CM/SEC

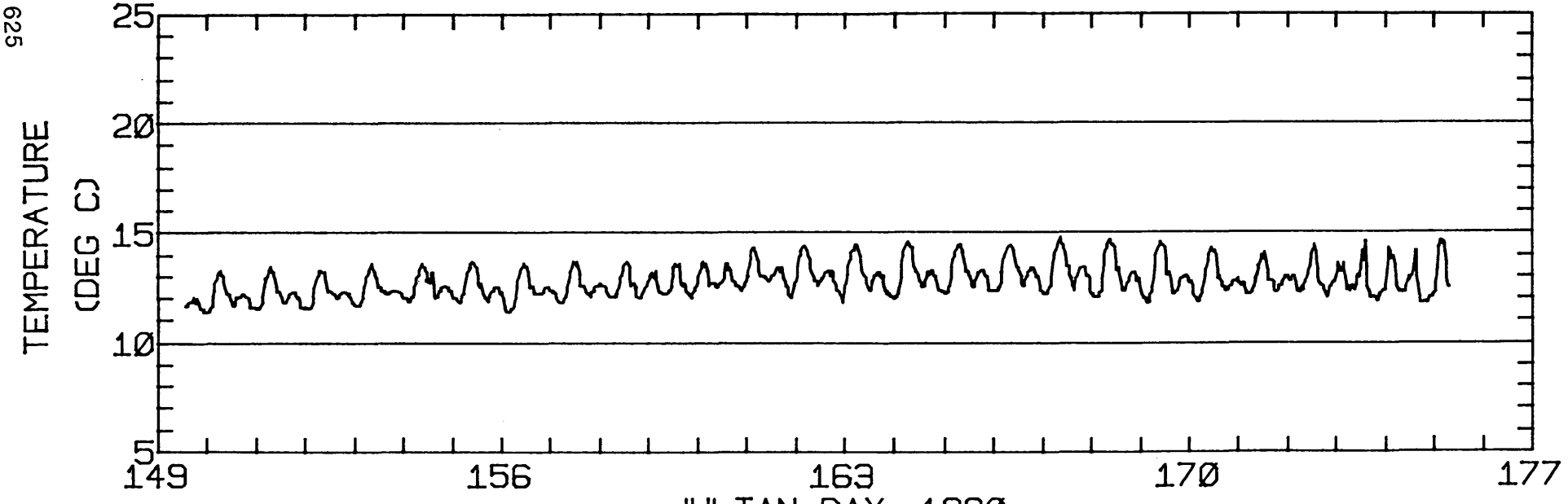
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.6	-5.6	443.
2	12	1.1	-3.6	399.
3	12	-3.3	-6.0	407.
4	12	-0.1	-2.8	443.
ALL	48	-1.0	-4.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-57N 122-25-51W
METER 009.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.





625

JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-57N 122-25-51W
METER ØØ9.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'53"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 22.3 M (MLLW)
METER DEPTH: 5.5 M (BELOW MLLW)
START TIME OF SERIES: 6/23/80 1040 PST JULIAN DAY=175
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

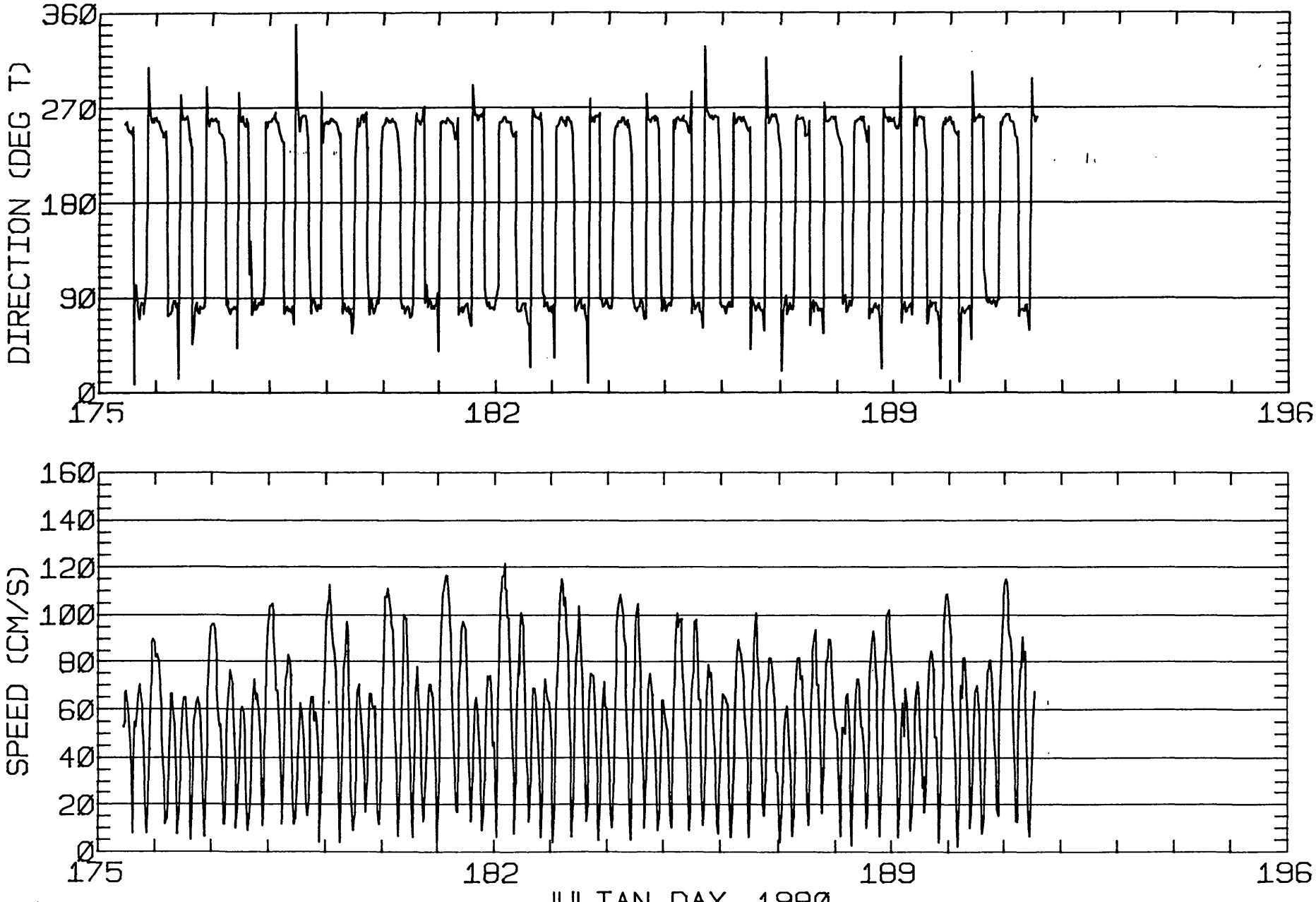
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.61	0.66	73.1	27.9	CLOCKWISE
K1	30.68	0.49	76.5	43.1	ANTI-CLOCKWISE
N2	12.97	0.11	81.5	253.7	CLOCKWISE
M2	75.85	2.64	80.0	277.4	ANTI-CLOCKWISE
S2	12.89	0.40	78.5	277.5	CLOCKWISE
M4	4.32	1.09	77.4	236.8	CLOCKWISE

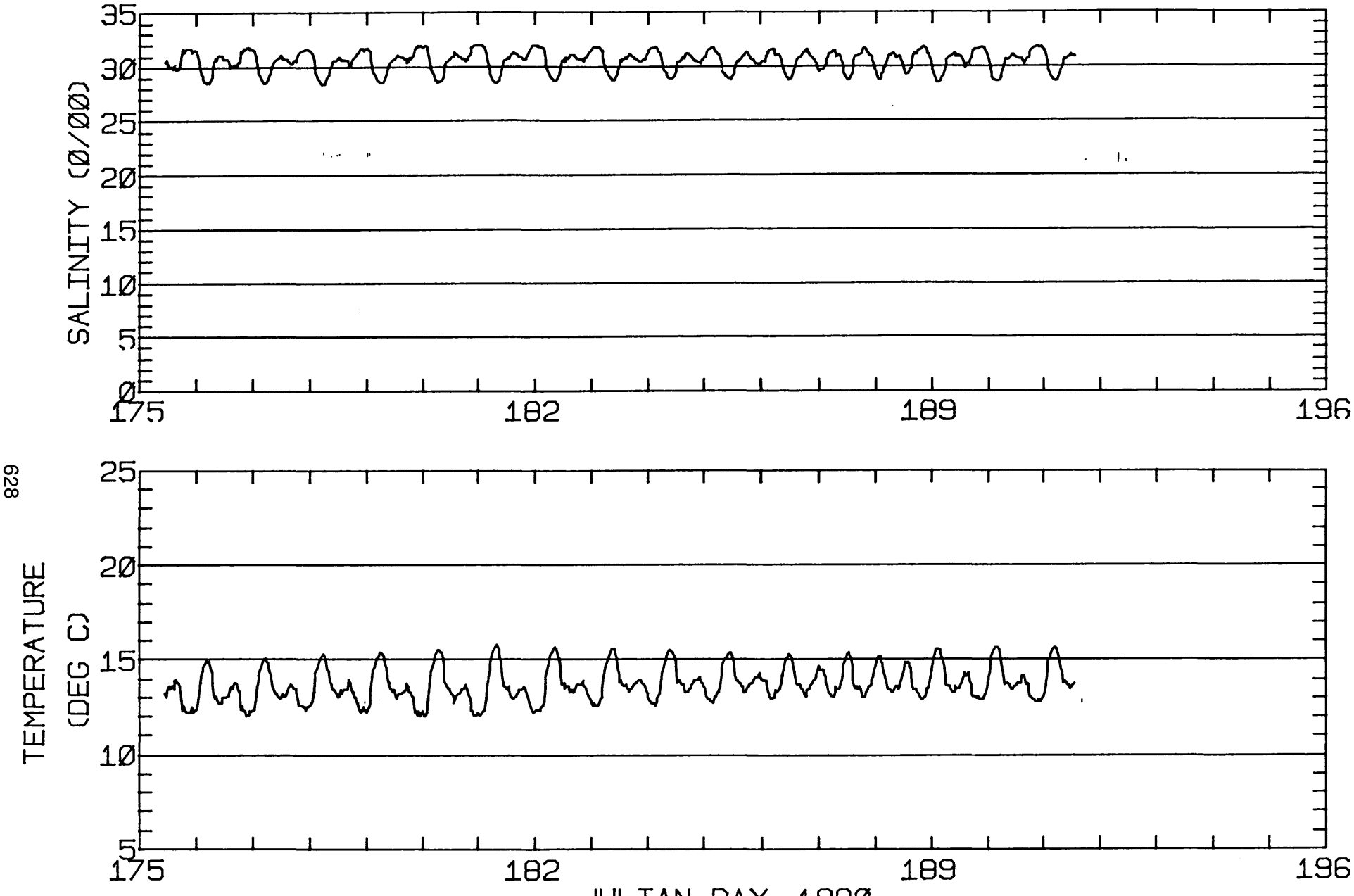
RMS SPEED: 63.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 134.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 46.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 78.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 10.50 CM/SEC
STANDARD DEVIATION V SERIES: 5.12 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.3	-3.9	447.
2	12	-7.3	-3.1	408.
3	6	-6.7	-3.3	348.
ALL	30	-7.6	-3.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-53N 122-25-55W
METER 016.8 METERS ABOVE BED. WATER DEPTH 022.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-53N 122-25-55W
METER Ø16.8 METERS ABOVE BED. WATER DEPTH Ø22.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'53"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 22.3 M (MLLW)
METER DEPTH: 11.6 M (BELOW MLLW)
START TIME OF SERIES: 6/23/80 1512 PST JULIAN DAY=175
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

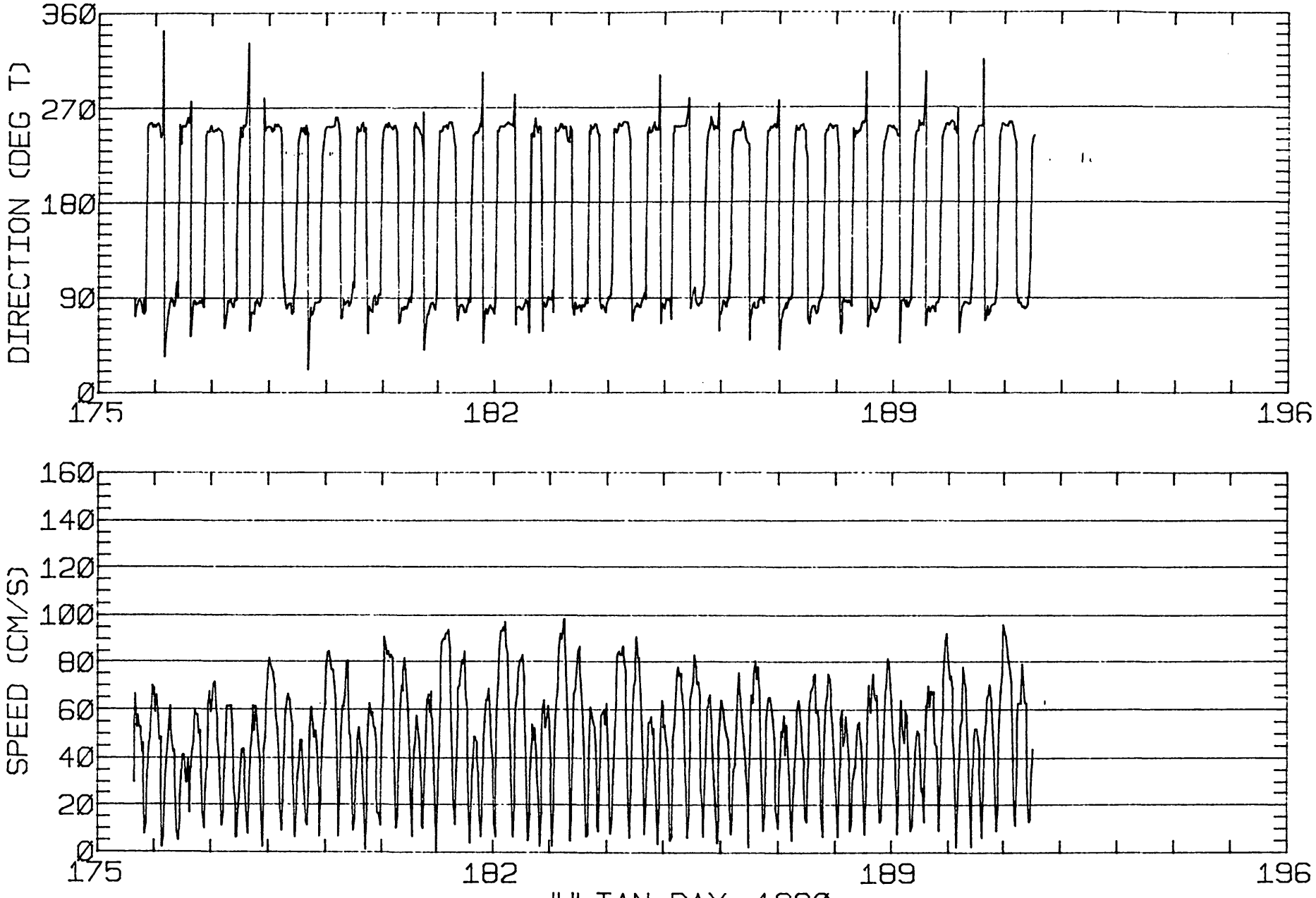
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.04	0.86	75.1	22.8	ANTI-CLOCKWISE
K1	26.92	0.45	76.7	39.0	ANTI-CLOCKWISE
N2	10.87	0.55	78.3	256.0	CLOCKWISE
M2	63.23	2.48	77.3	273.7	CLOCKWISE
S2	9.98	0.16	79.9	288.2	CLOCKWISE
M4	1.63	0.90	164.5	191.2	CLOCKWISE

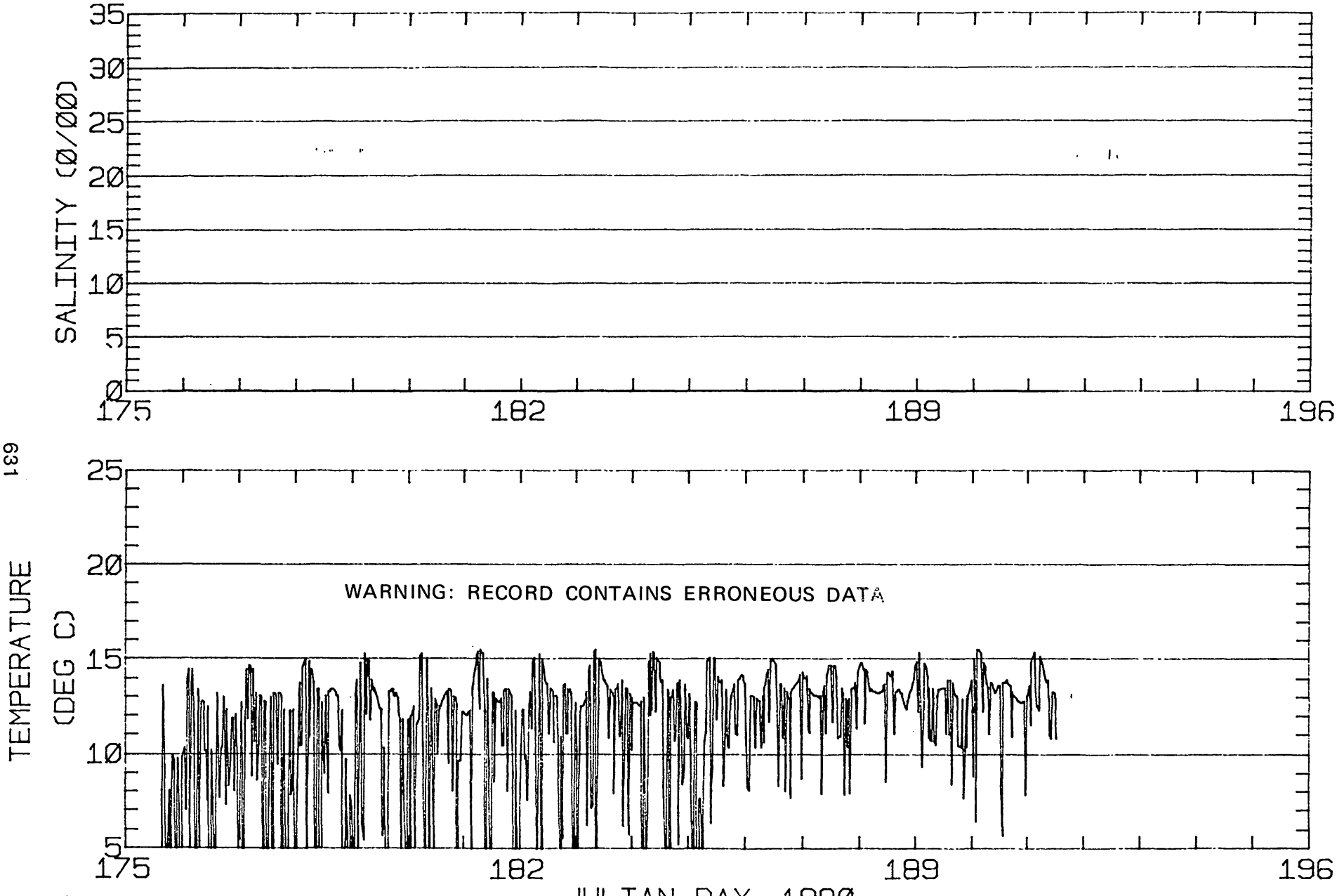
RMS SPEED: 53.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 113.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 77.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.55
STANDARD DEVIATION U-SERIES: 8.90 CM/SEC
STANDARD DEVIATION V SERIES: 4.61 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.8	-4.7	447.
2	12	-0.6	-5.5	408.
3	6	-0.9	-4.6	391.
ALL	30	-0.7	-5.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-53N 122-25-55W
METER 010.6 METERS ABOVE BED. WATER DEPTH 022.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-53N 122-25-55W
METER Ø10.6 METERS ABOVE BED. WATER DEPTH Ø22.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 7/ 9/80 1410 PST JULIAN DAY=191
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

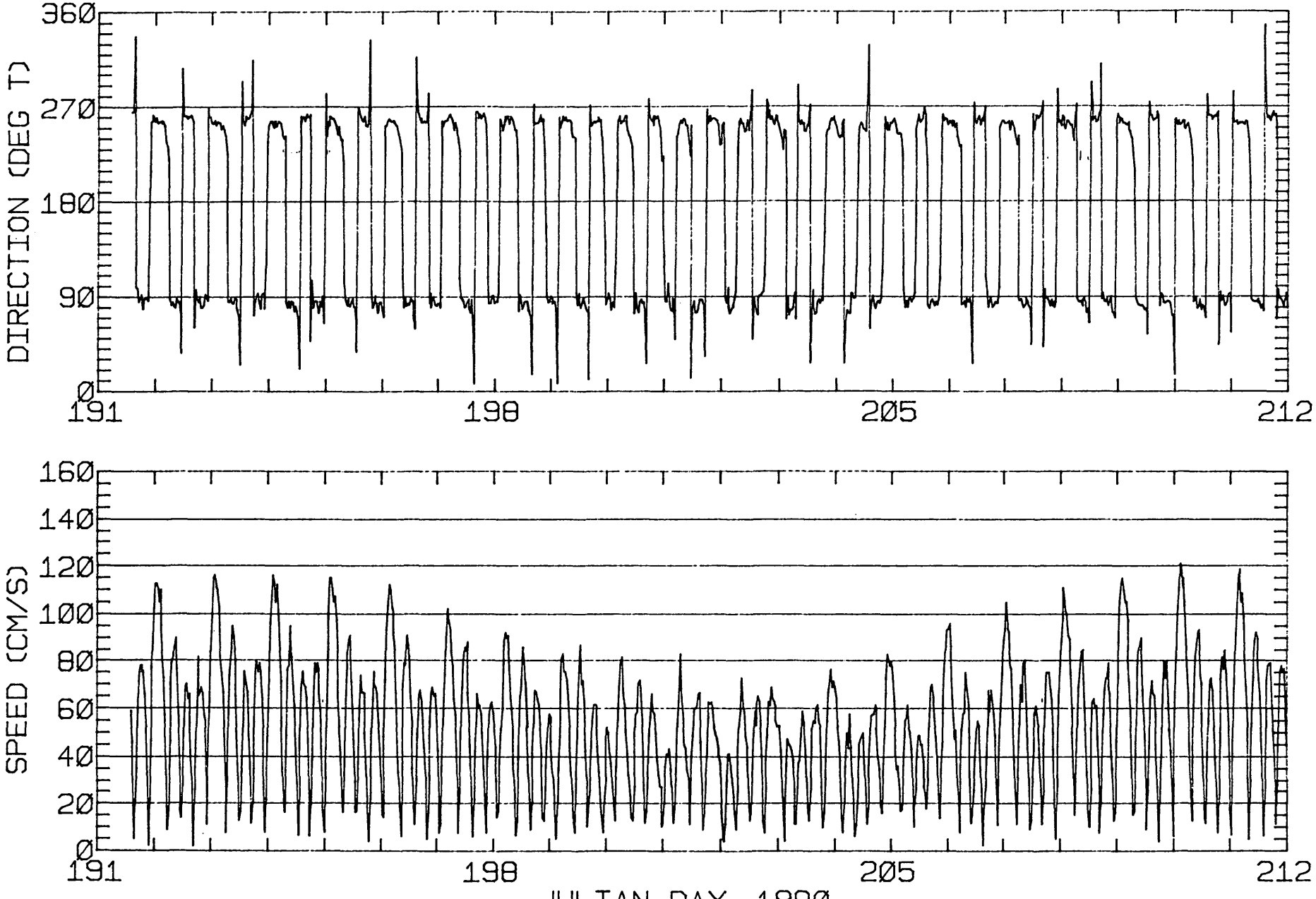
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.63	0.28	71.4	39.4	ANTI-CLOCKWISE
K1	26.77	0.70	74.2	56.7	ANTI-CLOCKWISE
N2	9.95	1.05	80.7	262.6	ANTI-CLOCKWISE
M2	73.72	2.63	80.4	276.5	ANTI-CLOCKWISE
S2	12.27	0.62	84.0	297.8	ANTI-CLOCKWISE
M4	3.42	0.09	85.9	249.2	ANTI-CLOCKWISE

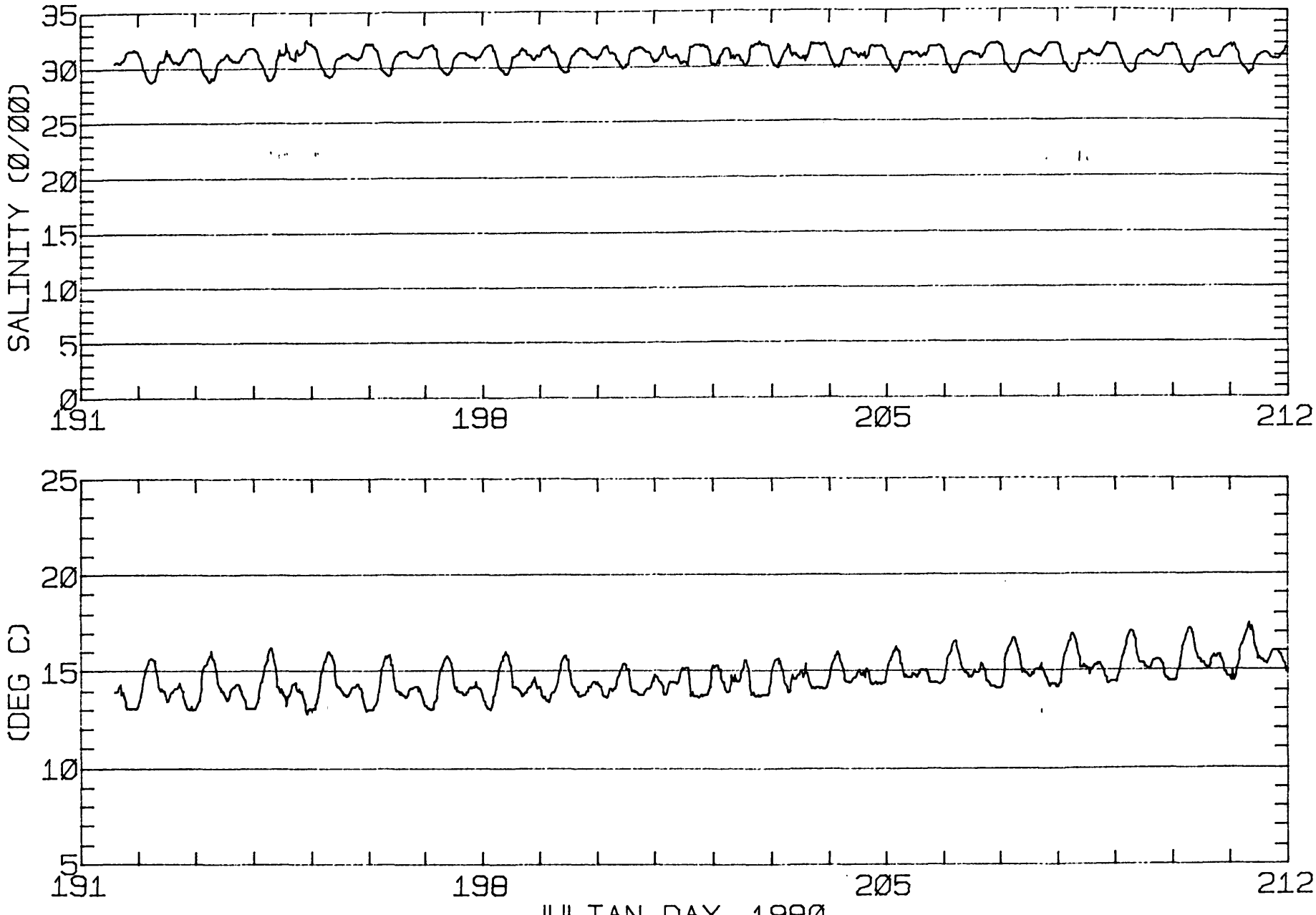
RMS SPEED: 60.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 126.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 78.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 10.29 CM/SEC
STANDARD DEVIATION V SERIES: 5.38 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.1	-5.3	279.
2	12	-7.1	-4.9	291.
3	12	-6.5	-5.8	308.
4	4	-7.2	-5.8	308.
ALL	40	-6.9	-5.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER Ø15.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 7/ 9/80 1402 PST JULIAN DAY=191
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

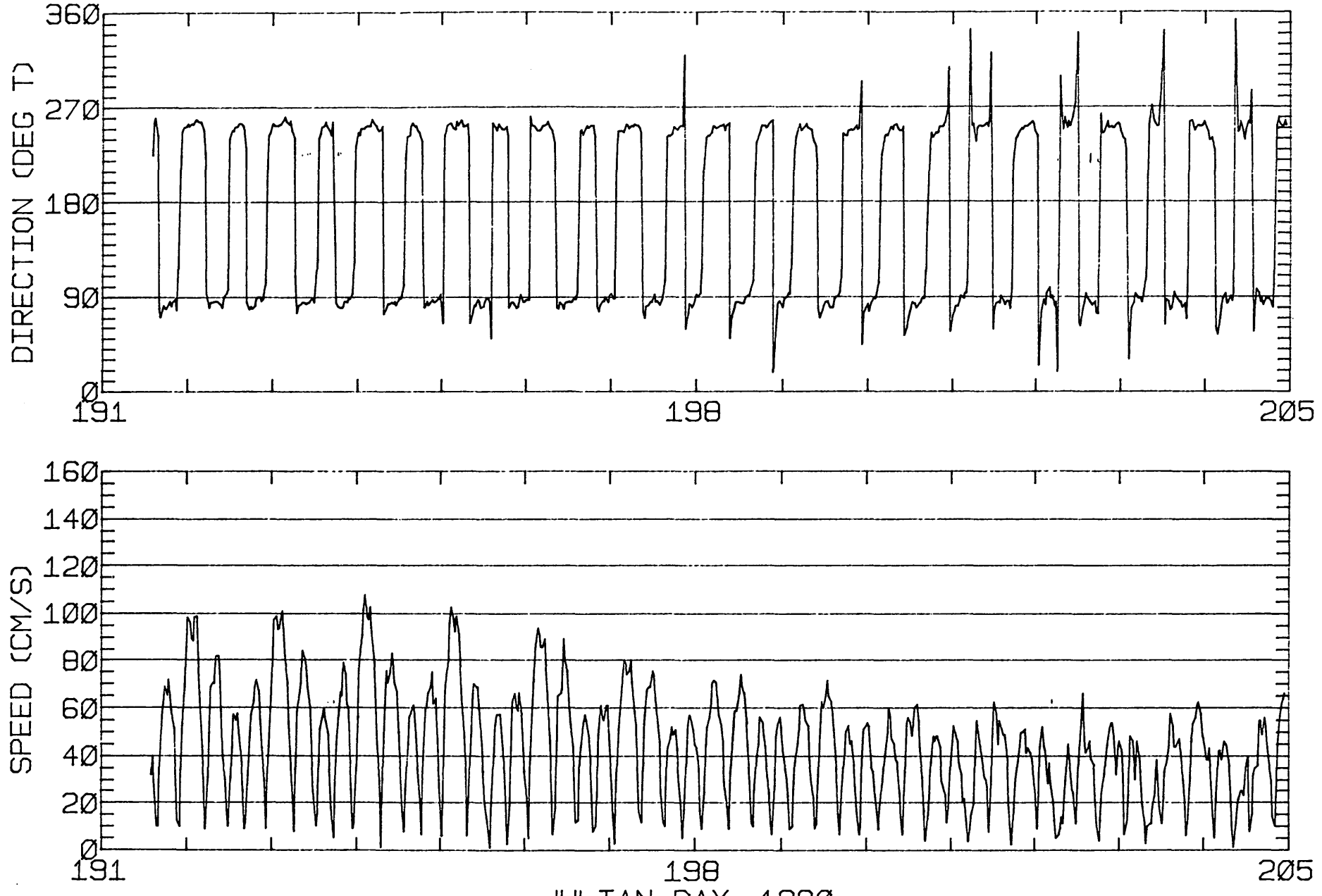
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.14	0.12	75.9	45.1	ANTI-CLOCKWISE
K1	23.40	0.40	76.7	46.6	CLOCKWISE
N2	11.02	0.26	83.9	280.9	CLOCKWISE
M2	65.68	1.97	79.2	275.4	CLOCKWISE
S2	13.50	0.29	72.9	303.4	ANTI-CLOCKWISE
M4	2.36	1.85	106.7	138.9	CLOCKWISE

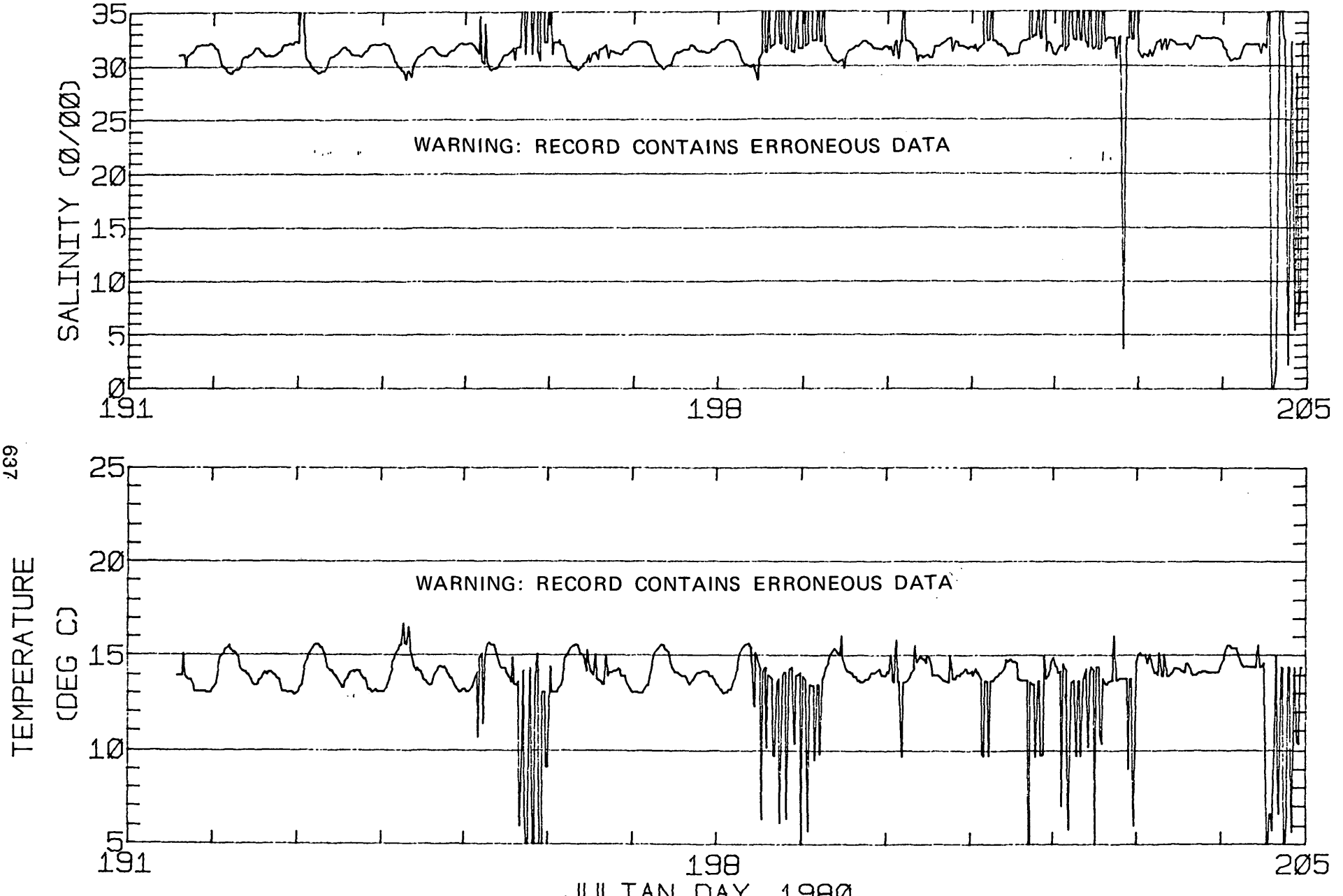
RMS SPEED: 50.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 115.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 77.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 8.76 CM/SEC
STANDARD DEVIATION V SERIES: 4.57 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.2	-6.6	279.
2	12	1.8	-3.7	291.
ALL	24	-0.2	-5.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER 009.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER ØØ9.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'51"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 8/10/80 710 PST JULIAN DAY=223
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

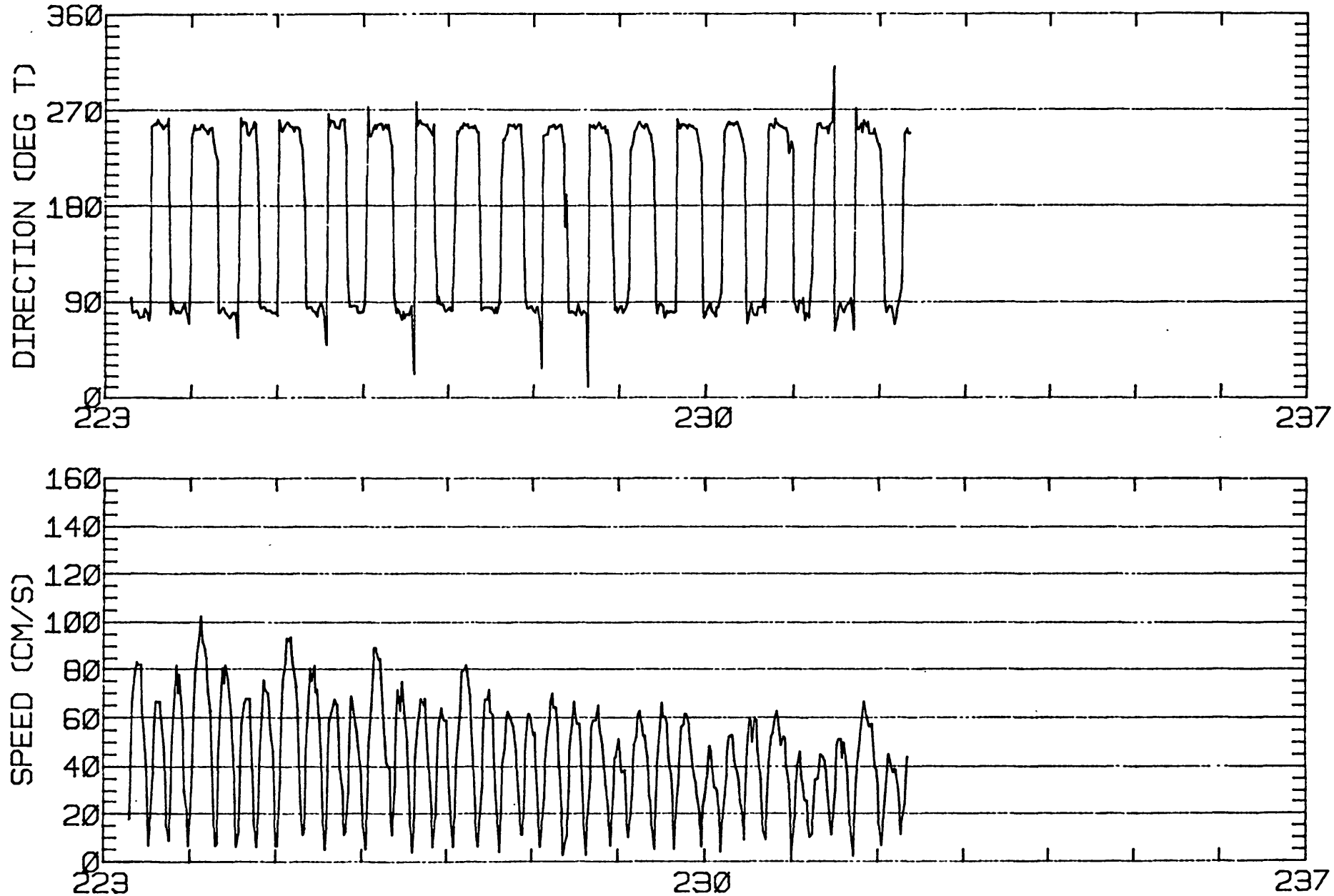
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.80	0.25	72.2	42.9	ANTI-CLOCKWISE
K1	19.50	0.10	71.8	63.4	ANTI-CLOCKWISE
N2	16.57	0.47	73.3	301.5	CLOCKWISE
M2	74.85	1.57	77.0	279.8	ANTI-CLOCKWISE
S2	18.32	0.50	78.8	285.1	CLOCKWISE
M4	2.39	0.03	78.0	170.1	ANTI-CLOCKWISE

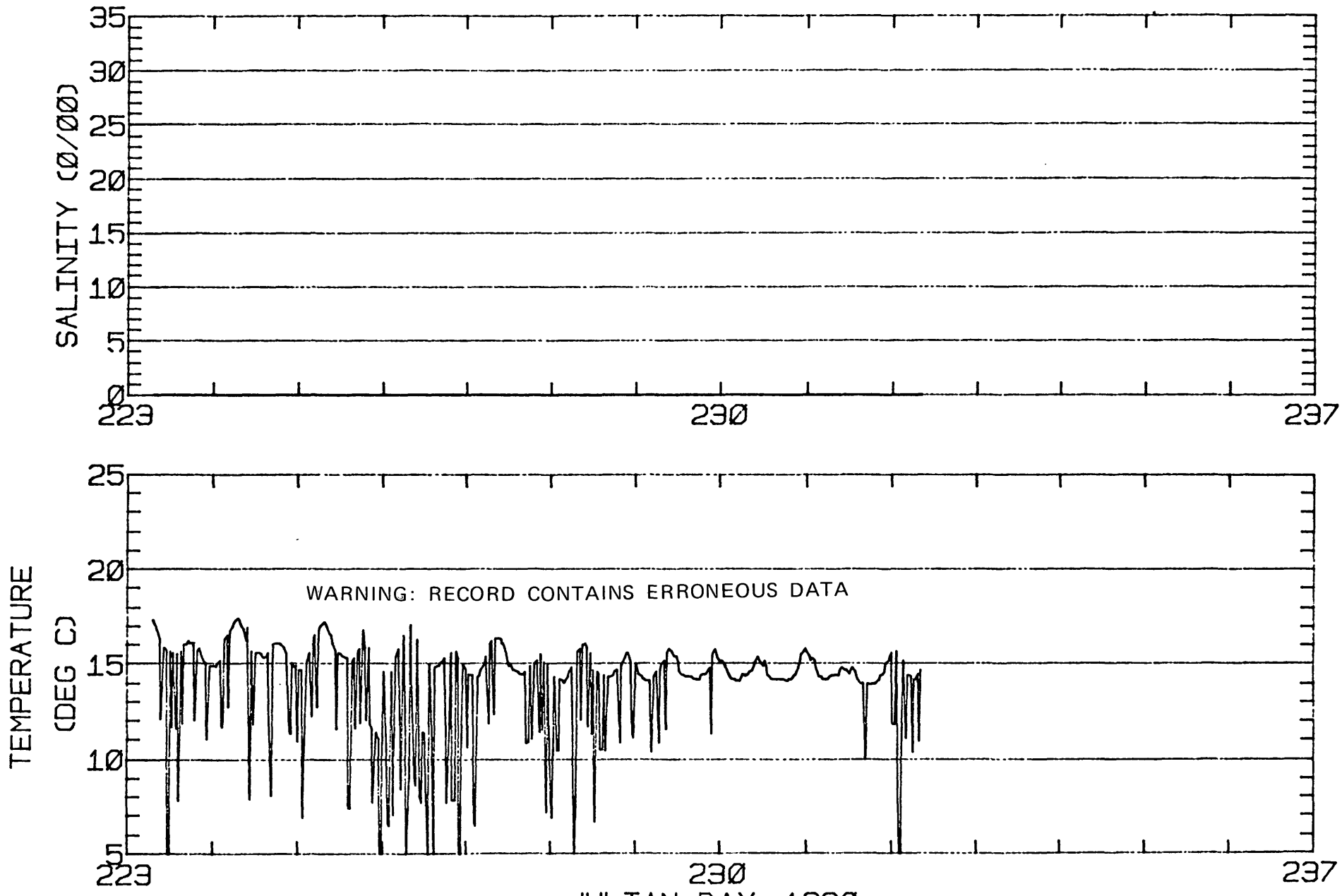
RMS SPEED: 50.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 124.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 6.47 CM/SEC
STANDARD DEVIATION V SERIES: 3.68 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.4	-4.4	107.
2	4	-4.2	-4.2	82.
ALL	16	-3.6	-4.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER 015.4 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER Ø15.4 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'51"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.3 M (MLLW)
METER DEPTH: 19.8 M (BELOW MLLW)
START TIME OF SERIES: 7/30/80 1524 PST JULIAN DAY=212
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

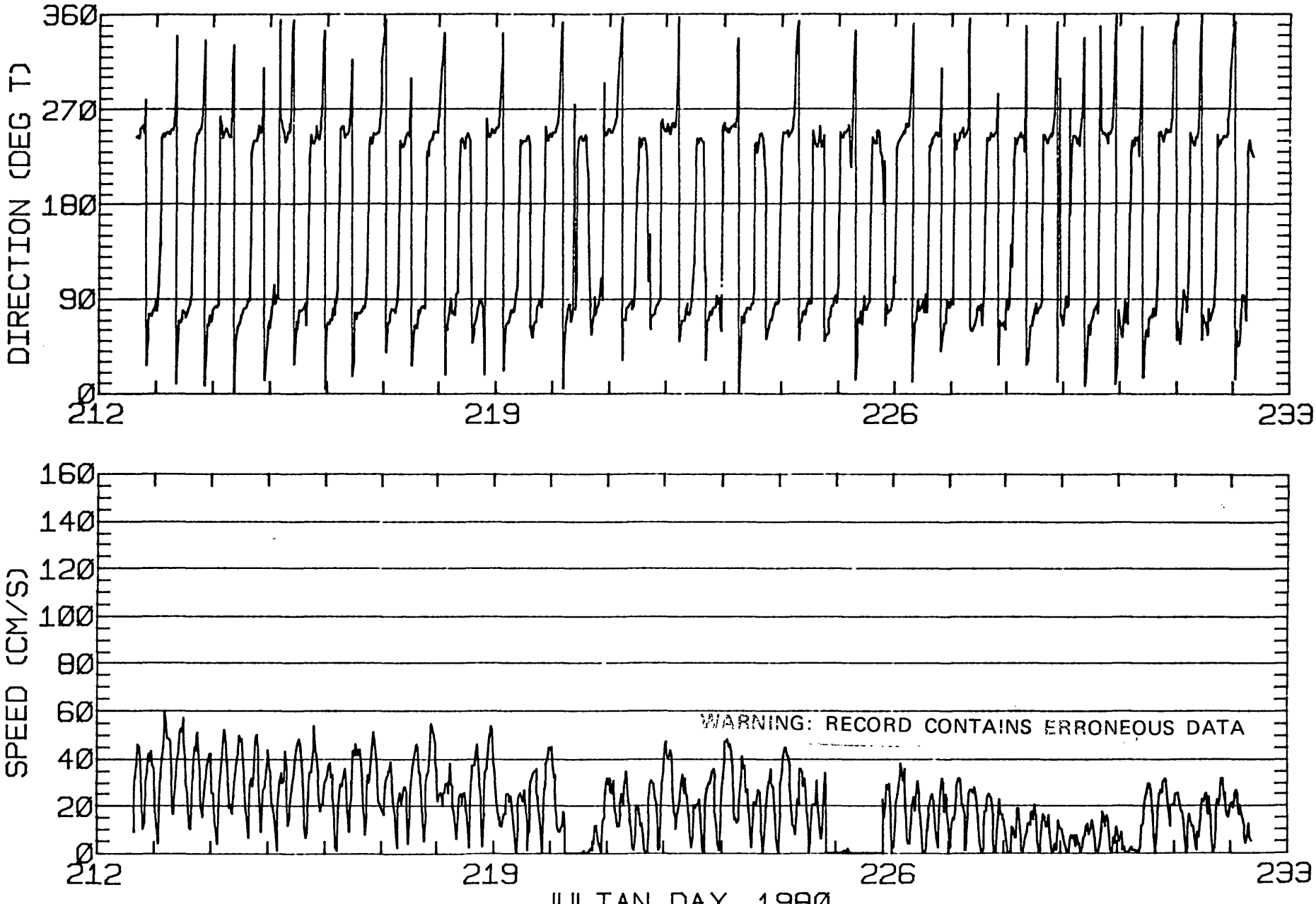
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.50	2.47	78.6	24.0	CLOCKWISE
K1	15.47	3.15	79.7	45.4	CLOCKWISE
N2	13.00	4.93	49.1	184.3	CLOCKWISE
M2	42.68	0.61	69.2	278.0	CLOCKWISE
S2	14.09	0.26	65.7	288.3	ANTI-CLOCKWISE
M4	4.88	0.62	7.5	351.0	CLOCKWISE

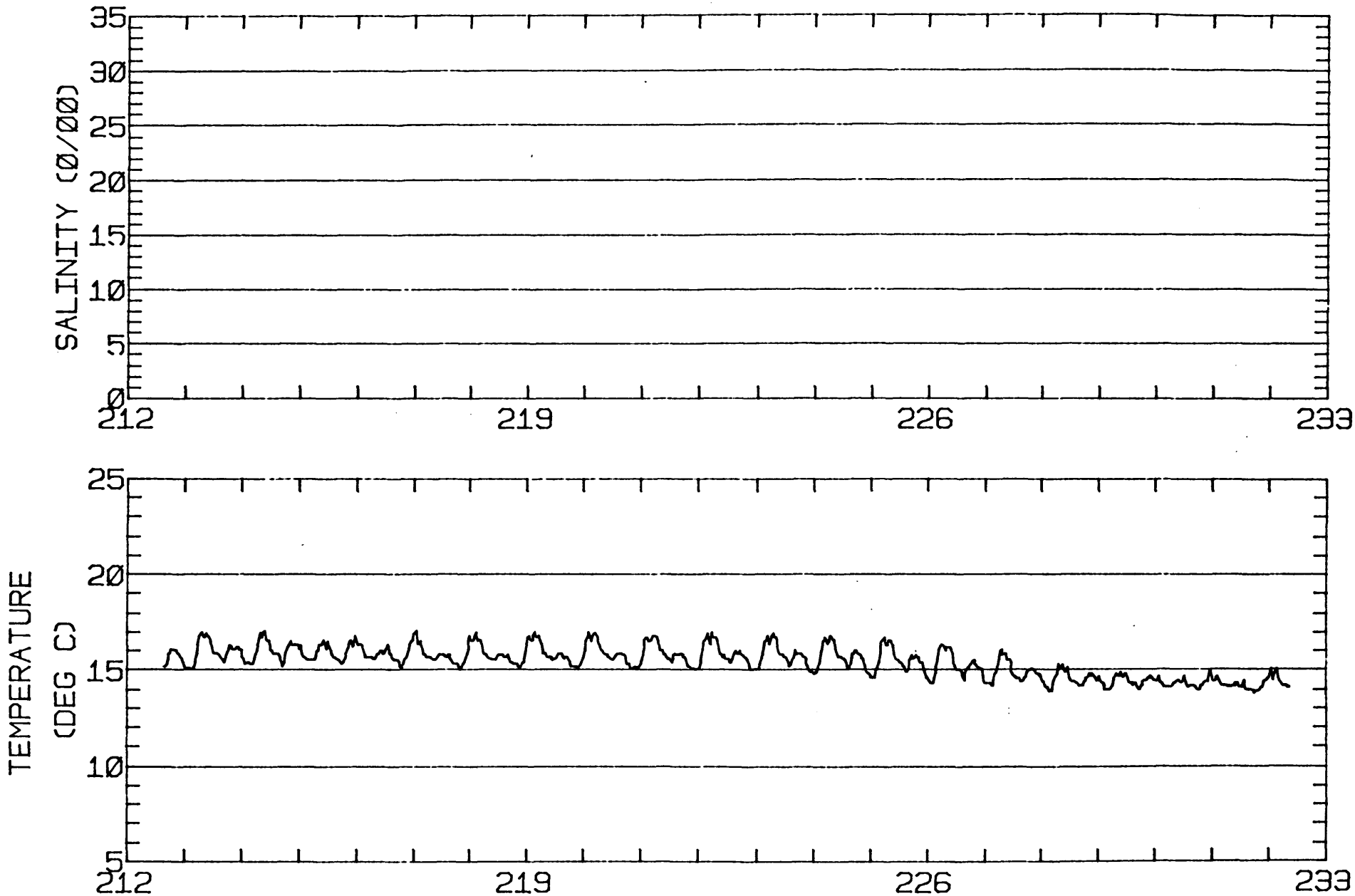
RMS SPEED: 32.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 80.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 21.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 71.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 4.98 CM/SEC
STANDARD DEVIATION V SERIES: 4.12 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.1	0.5	207.
ALL	12	1.1	0.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER 001.5 METERS ABOVE BED. WATER DEPTH 021.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER Ø01.5 METERS ABOVE BED. WATER DEPTH Ø21.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'54"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 8/19/80 1350 PST JULIAN DAY=232
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

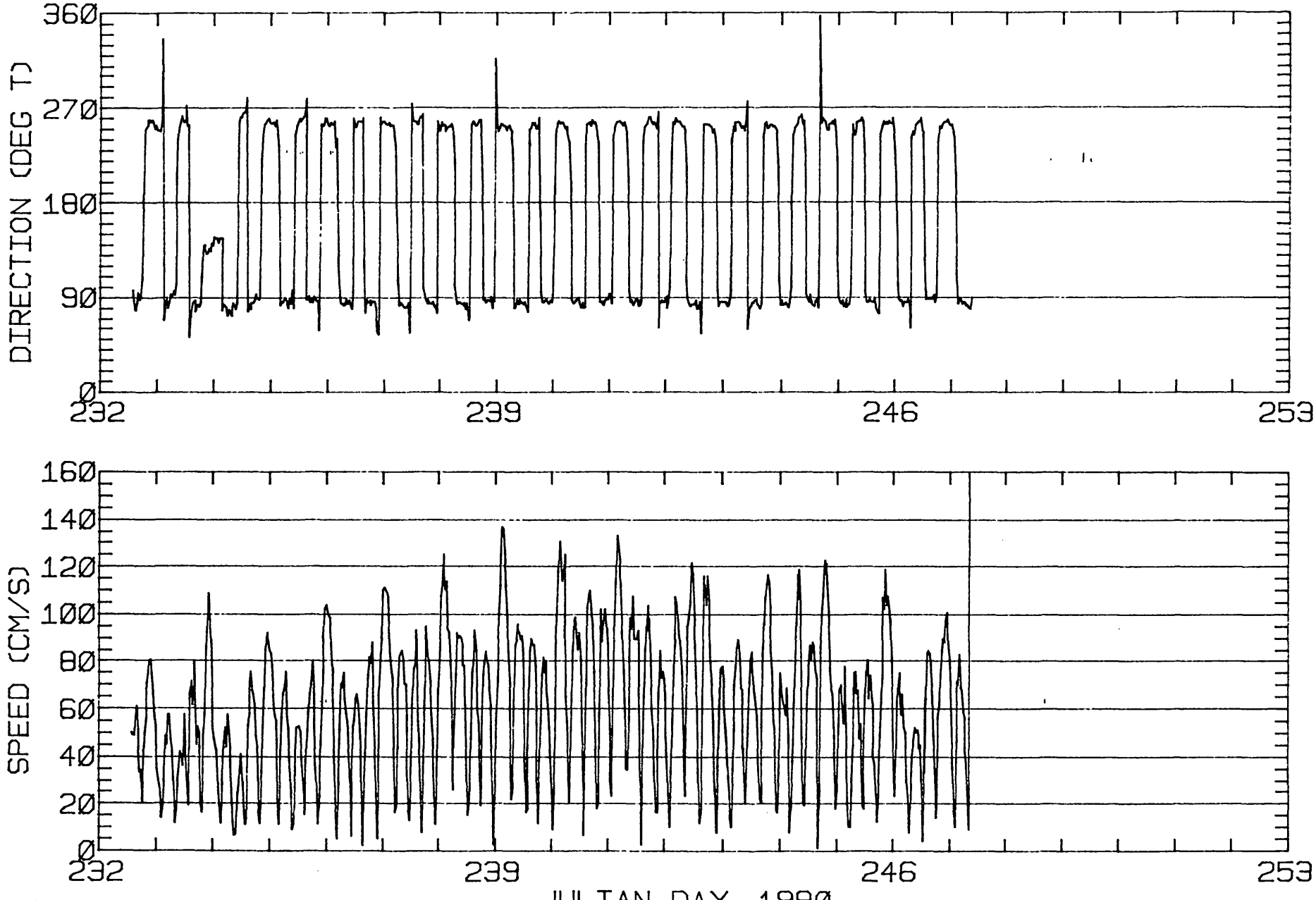
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.07	1.08	60.8	30.3	ANTI-CLOCKWISE
K1	21.61	0.47	71.3	64.4	CLOCKWISE
N2	21.43	2.33	84.3	255.7	ANTI-CLOCKWISE
M2	75.71	0.35	79.6	281.0	CLOCKWISE
S2	17.02	0.90	81.2	294.9	ANTI-CLOCKWISE
M4	1.73	1.06	104.6	110.1	CLOCKWISE

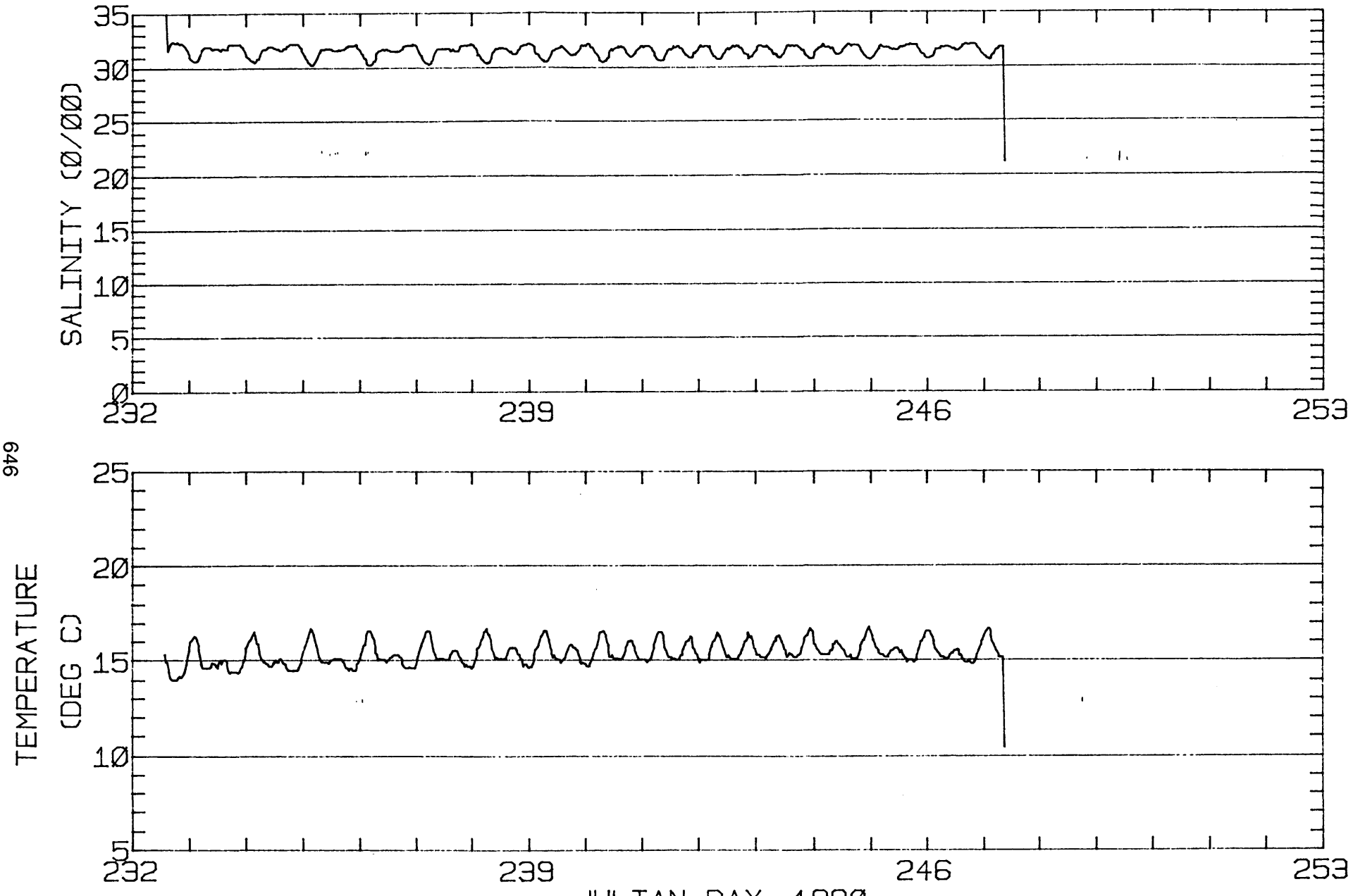
RMS SPEED: 69.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 126.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 20.21 CM/SEC
STANDARD DEVIATION V SERIES: 6.88 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	-7.3	106.
2	12	-7.5	-8.9	114.
3	4	-5.8	-8.0	148.
ALL	28	-3.9	-8.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER Ø15.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'54"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 8/19/80 1012 PST JULIAN DAY=232
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

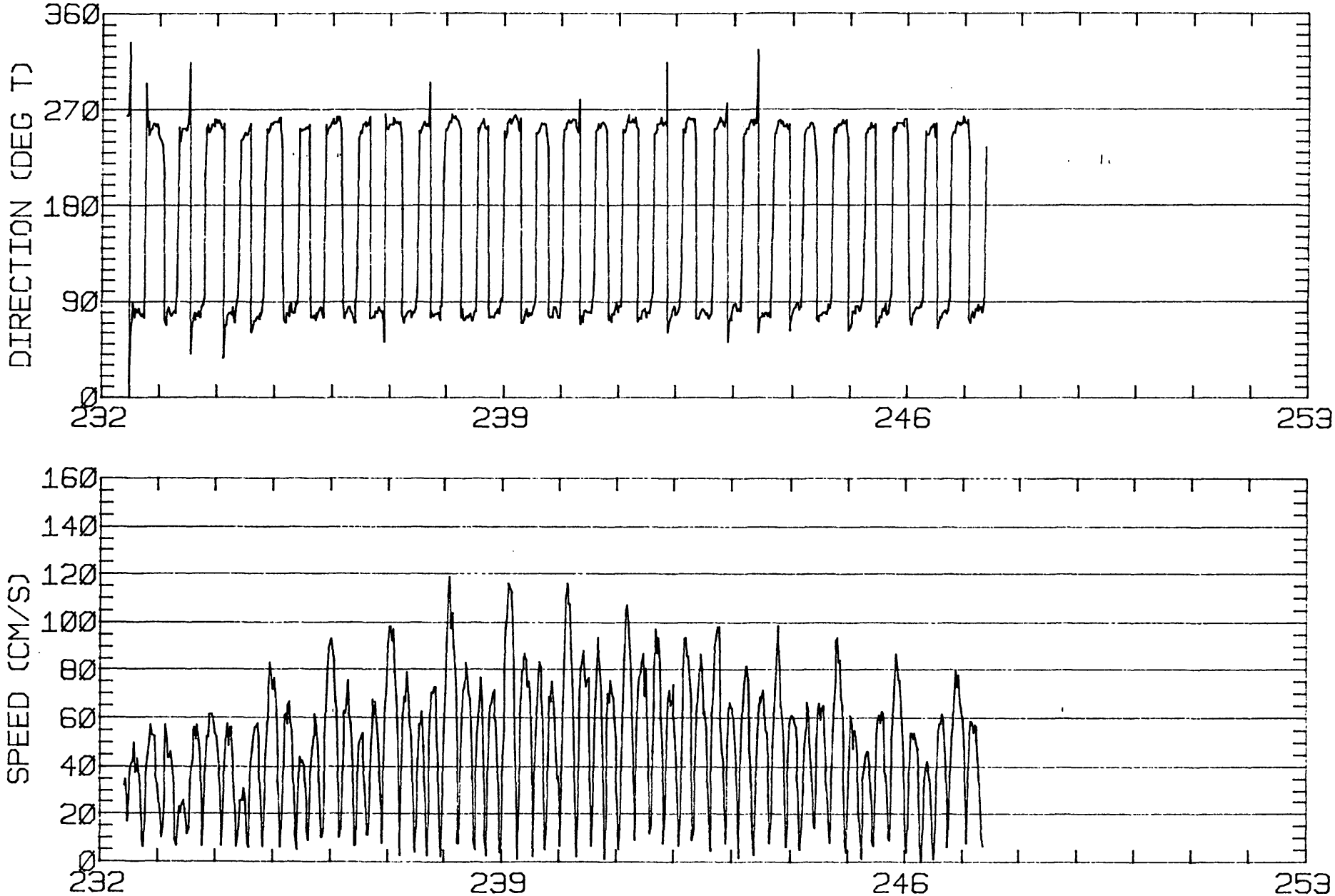
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.38	0.35	82.2	22.9	ANTI-CLOCKWISE
K1	21.25	0.46	78.6	56.9	CLOCKWISE
N2	13.52	0.10	81.9	273.0	CLOCKWISE
M2	63.91	2.49	78.2	274.7	CLOCKWISE
S2	14.35	0.09	79.8	291.7	CLOCKWISE
M4	2.92	0.16	78.6	27.3	ANTI-CLOCKWISE

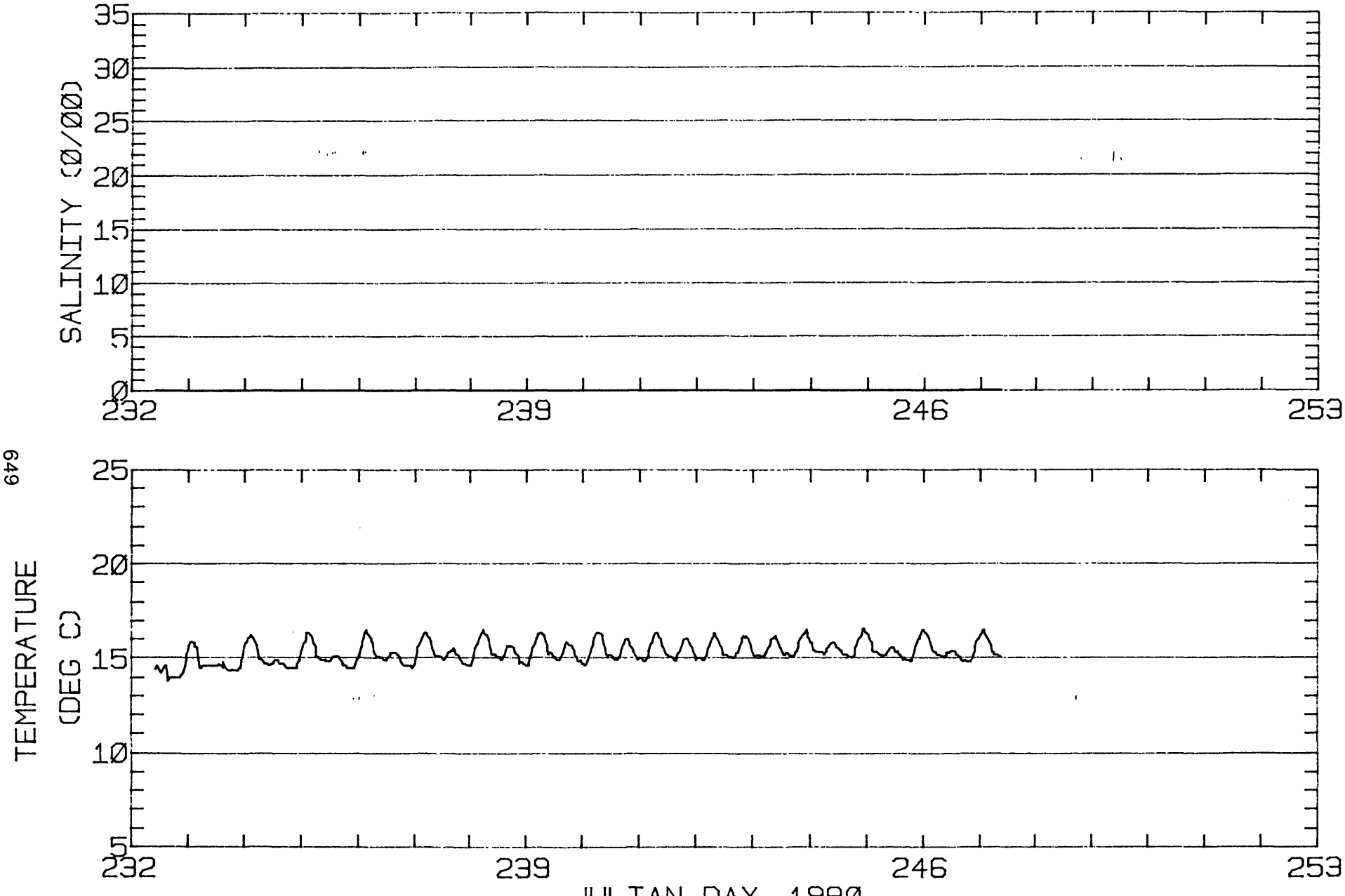
RMS SPEED: 56.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 112.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 78.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 7.83 CM/SEC
STANDARD DEVIATION V SERIES: 4.41 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.2	-1.0	106.
2	12	-3.3	-1.6	114.
3	4	-0.4	-2.1	148.
ALL	28	-2.0	-1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER 009.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-54W
METER ØØ9.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/ 3/80 1000 PST JULIAN DAY=247
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

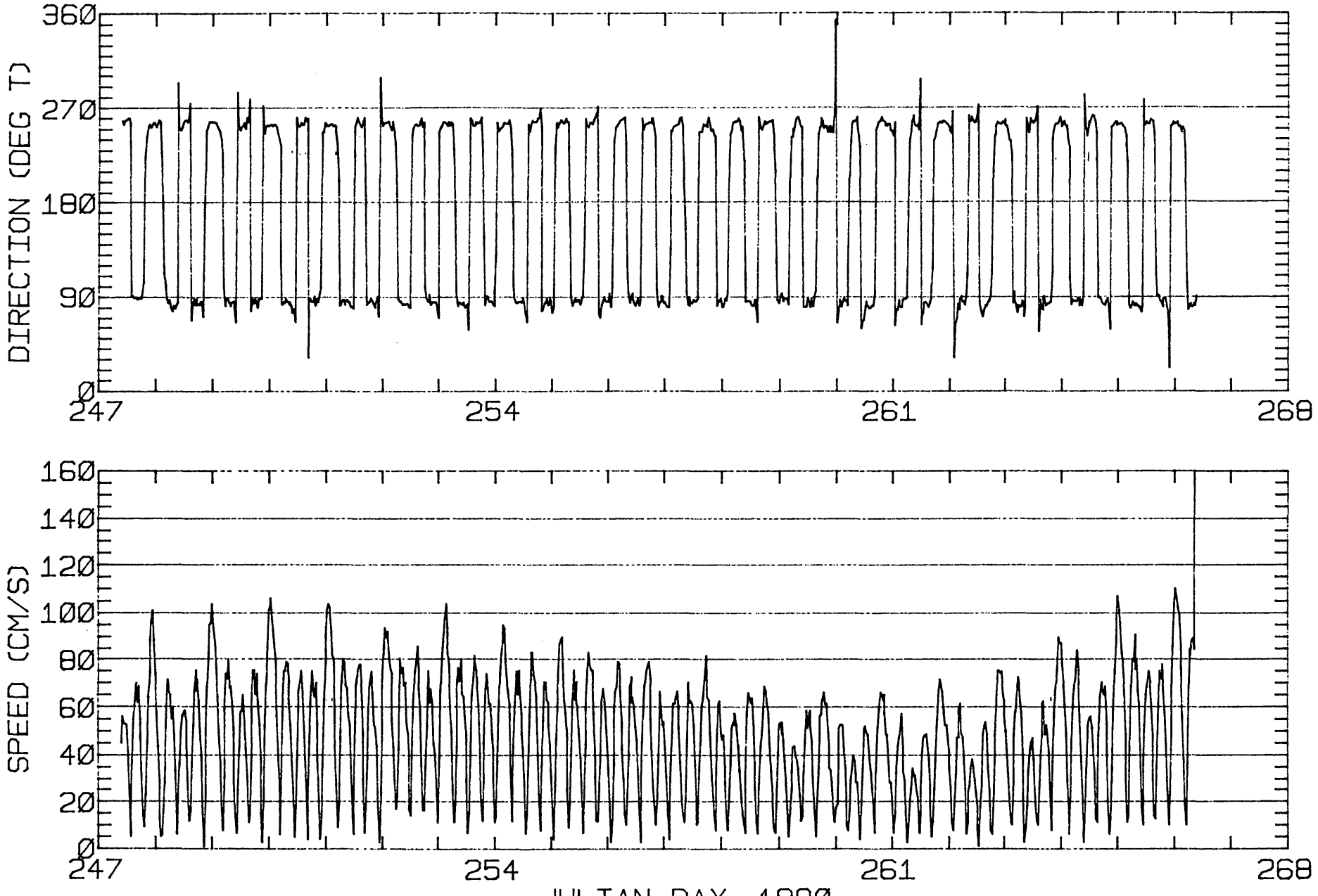
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.30	0.12	73.3	29.4	ANTI-CLOCKWISE
K1	15.15	0.66	76.7	56.0	ANTI-CLOCKWISE
N2	16.80	0.36	78.0	271.3	ANTI-CLOCKWISE
M2	73.13	0.35	80.0	276.0	ANTI-CLOCKWISE
S2	21.20	0.47	78.9	280.8	ANTI-CLOCKWISE
M4	1.28	0.30	125.0	169.5	CLOCKWISE

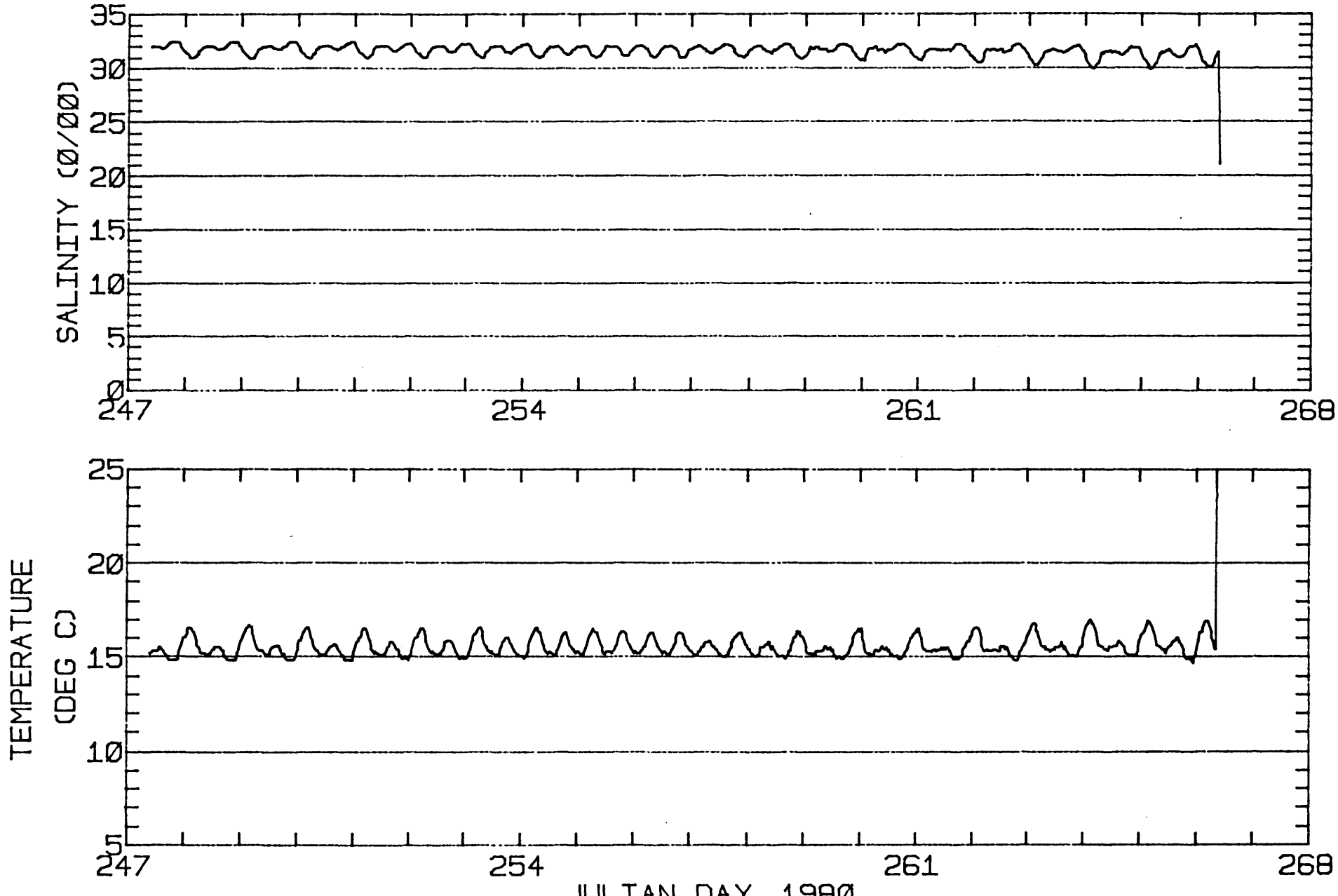
RMS SPEED: 53.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 122.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 50.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 78.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 8.12 CM/SEC
STANDARD DEVIATION V SERIES: 3.95 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.2	-6.0	217.
2	12	-4.6	-5.4	260.
3	12	-3.0	-4.1	309.
ALL	36	-3.9	-5.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER Ø15.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 9/ 3/80 1002 PST JULIAN DAY=247
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

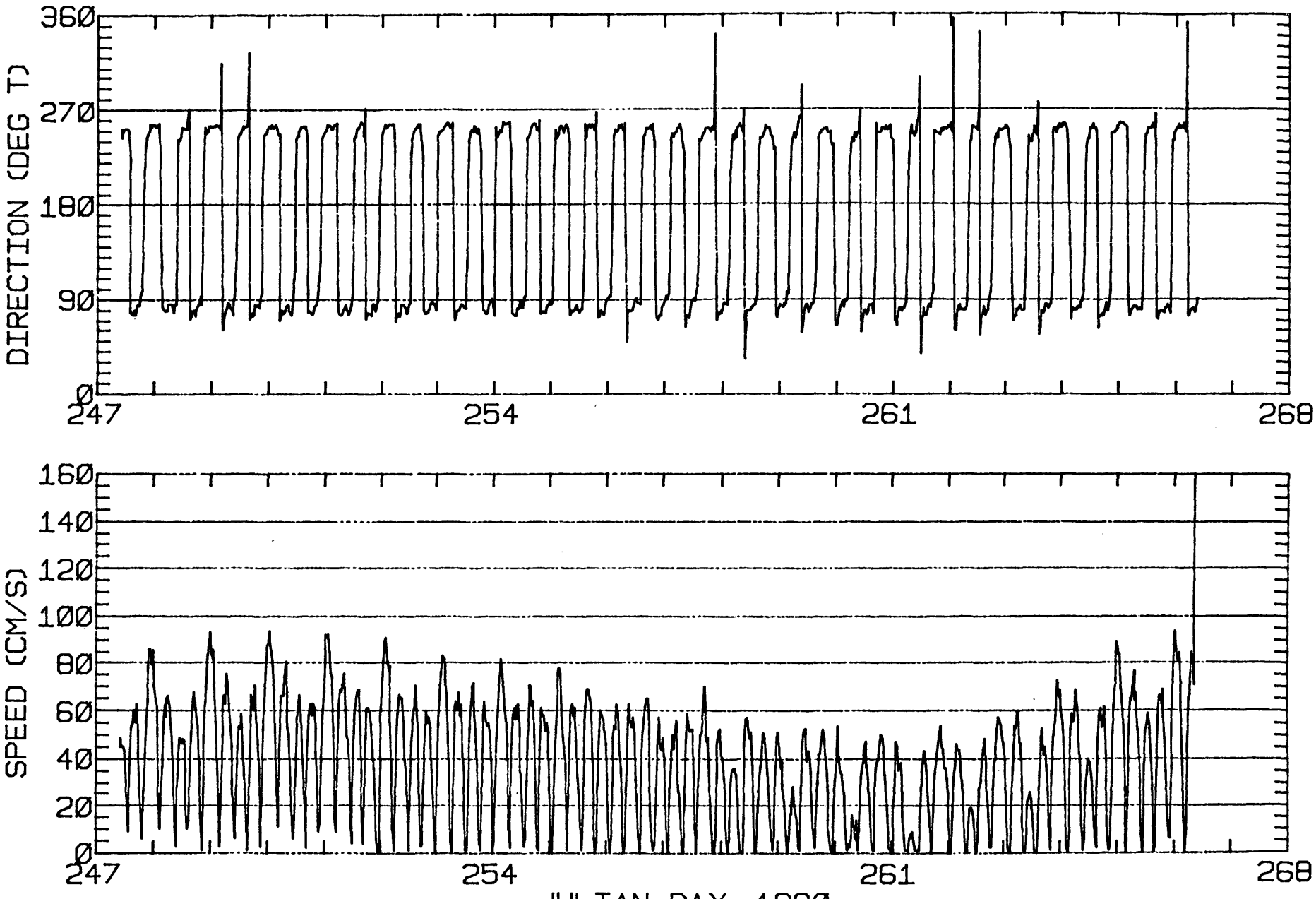
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.48	0.11	75.1	26.6	ANTI-CLOCKWISE
K1	13.35	0.32	76.3	53.0	CLOCKWISE
N2	17.36	0.22	76.4	259.4	CLOCKWISE
M2	61.31	2.22	77.0	272.7	CLOCKWISE
S2	20.95	0.51	77.5	275.4	CLOCKWISE
M4	2.03	1.03	69.1	102.9	CLOCKWISE

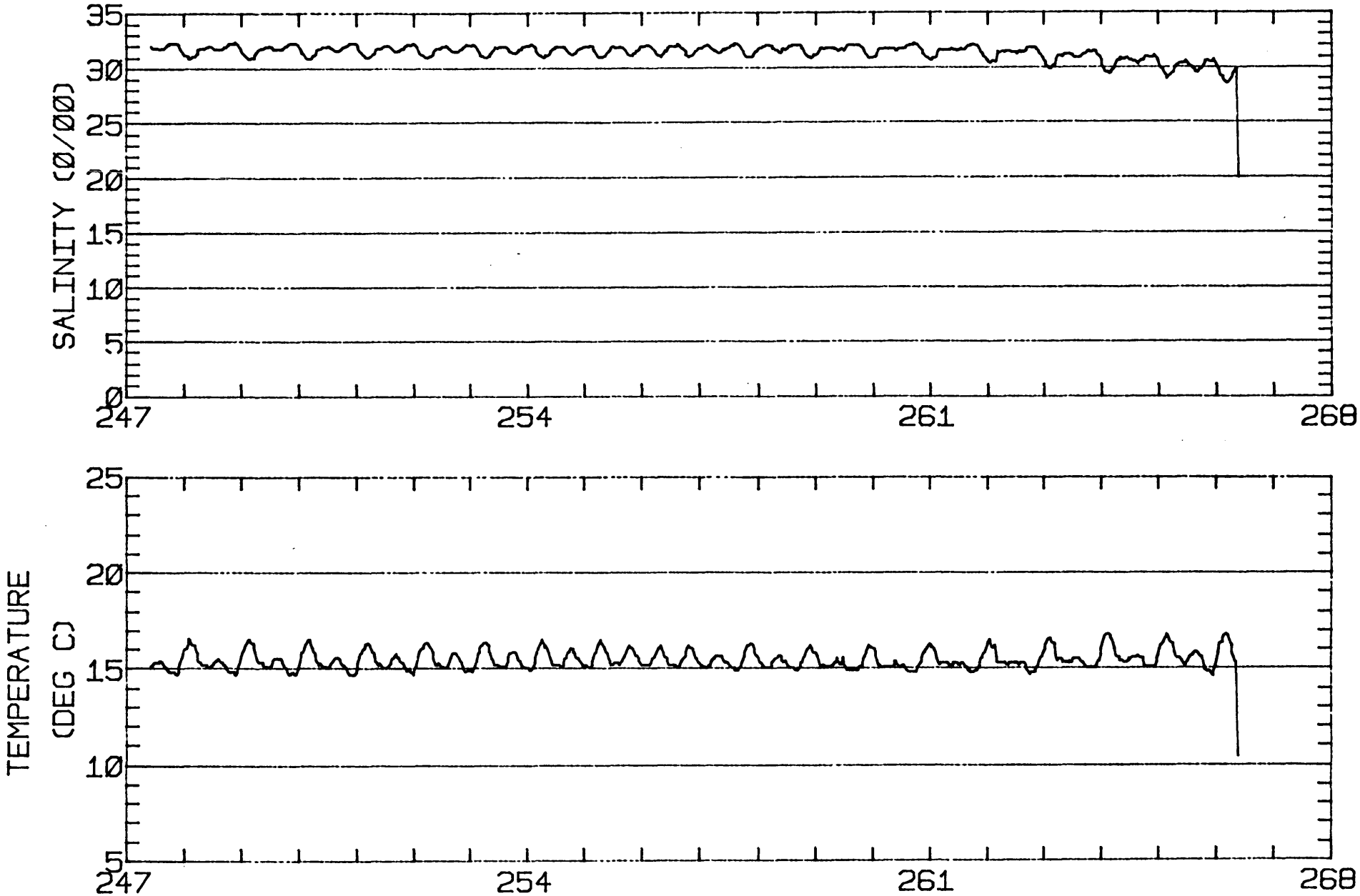
RMS SPEED: 45.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 108.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 7.12 CM/SEC
STANDARD DEVIATION V SERIES: 3.45 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.2	-4.0	217.
2	12	-0.3	-3.5	260.
3	12	2.2	-2.0	309.
ALL	36	-0.1	-3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER 009.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER ØØ9.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 20.1 M (BELOW MLLW)
START TIME OF SERIES: 9/ 3/80 1014 PST JULIAN DAY=247
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

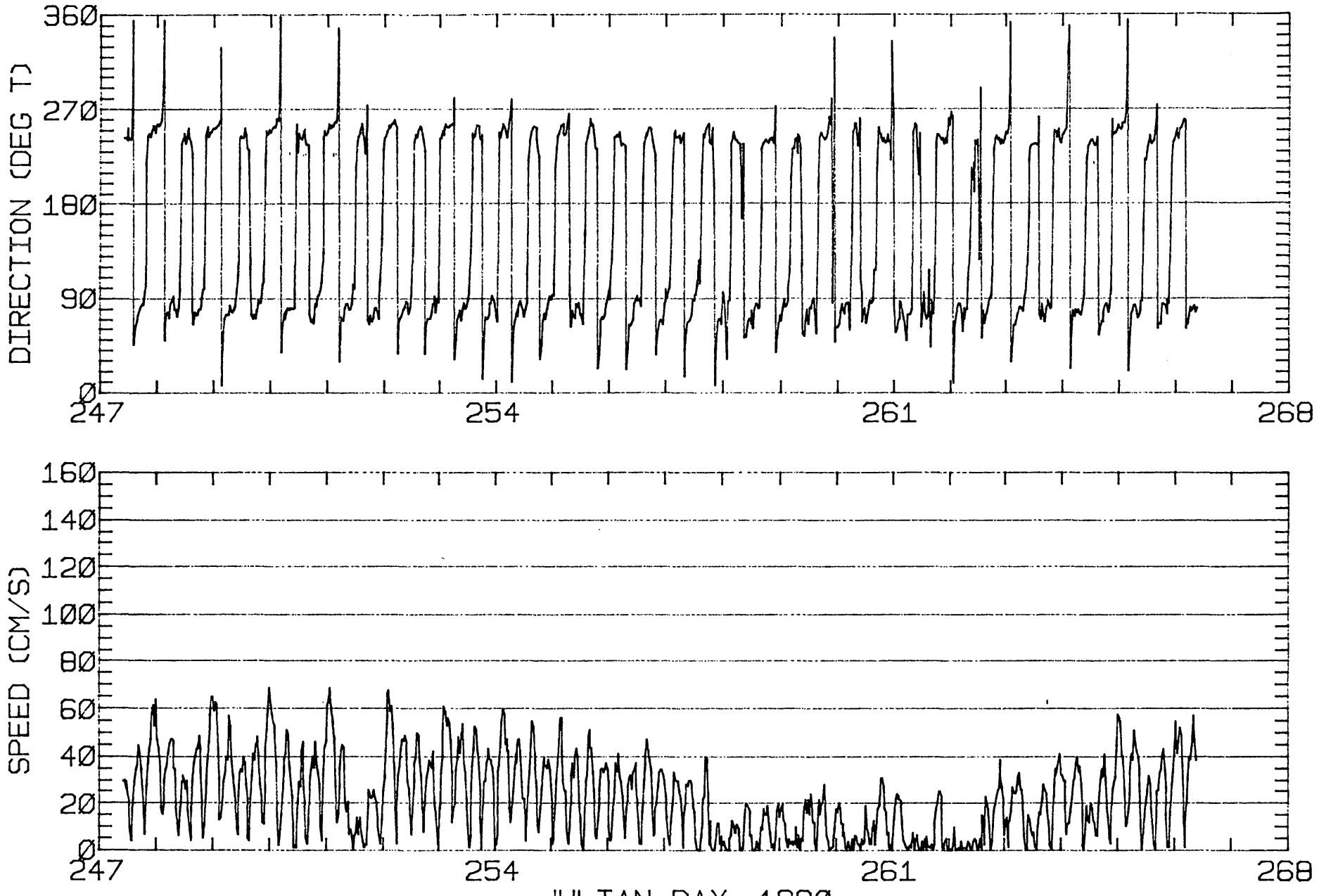
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.67	1.06	80.9	42.5	CLOCKWISE
K1	10.95	0.95	77.7	56.1	CLOCKWISE
N2	12.91	1.13	70.5	290.7	CLOCKWISE
M2	47.51	4.47	73.6	275.6	CLOCKWISE
S2	9.26	0.05	76.5	273.6	CLOCKWISE
M4	3.25	0.07	29.9	68.1	ANTI-CLOCKWISE

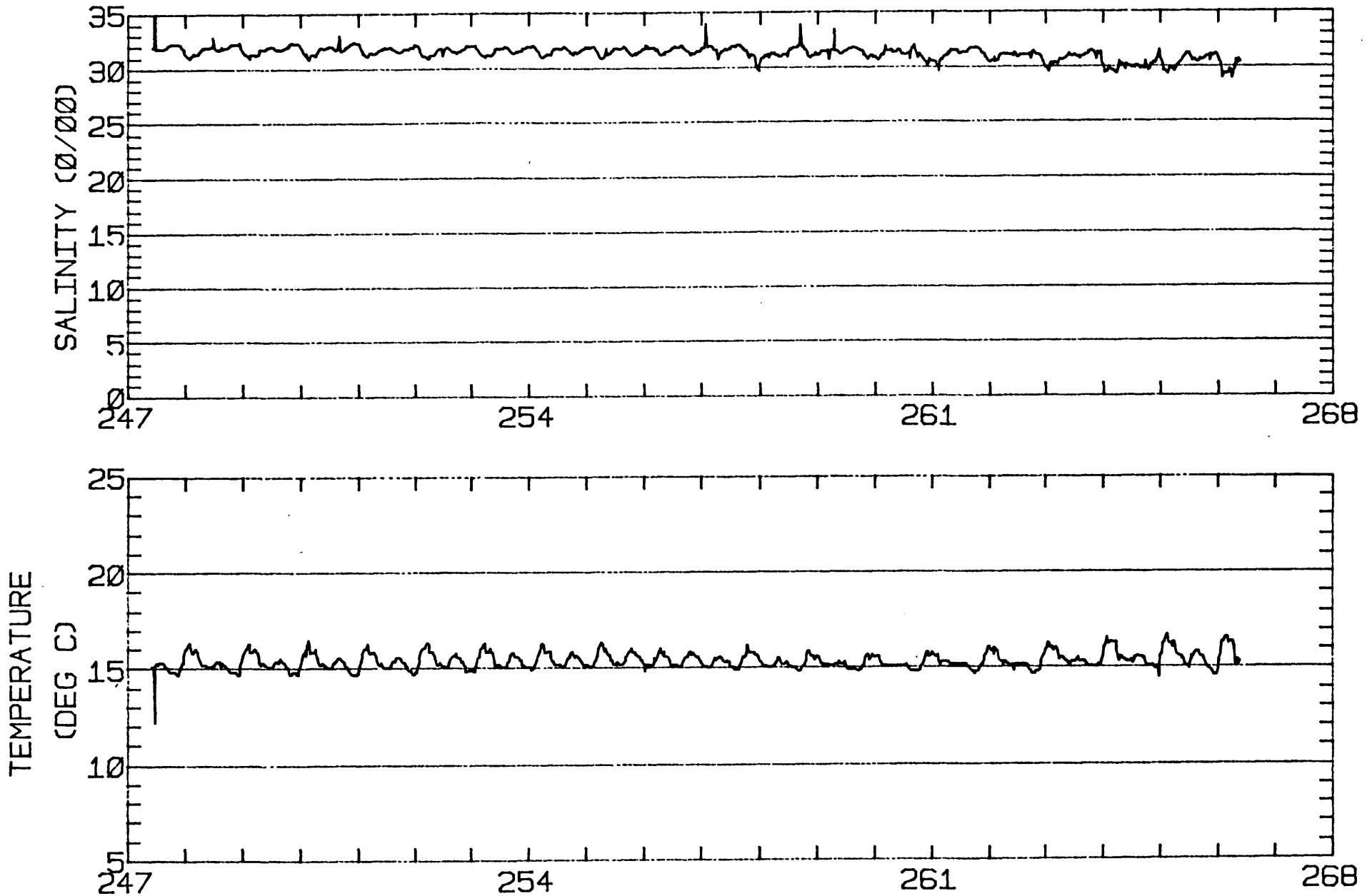
RMS SPEED: 35.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 77.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 7.08 CM/SEC
STANDARD DEVIATION V SERIES: 3.72 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.9	-2.2	217.
2	6	-0.8	-2.5	240.
ALL	18	-0.9	-2.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER 001.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER ØØ1.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'51"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/22/80 1040 PST JULIAN DAY=266
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

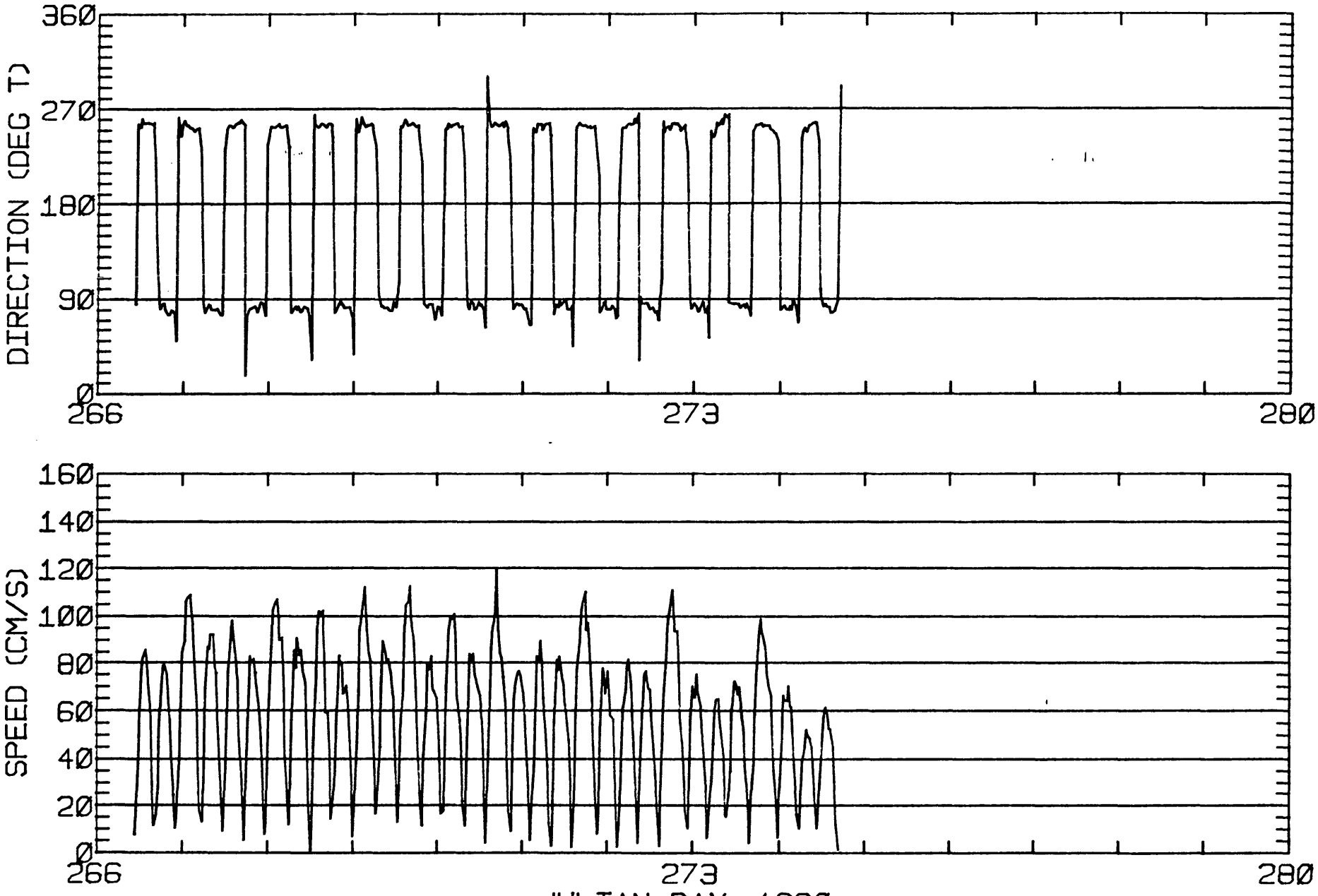
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	17.65	0.26	70.4	34.9	ANTI-CLOCKWISE
K1	21.19	0.98	73.5	47.9	ANTI-CLOCKWISE
N2	12.13	2.21	78.9	305.5	ANTI-CLOCKWISE
M2	75.09	0.24	77.1	266.7	ANTI-CLOCKWISE
S2	9.64	0.00	82.3	295.2	CLOCKWISE
M4	2.75	0.92	52.7	358.0	CLOCKWISE

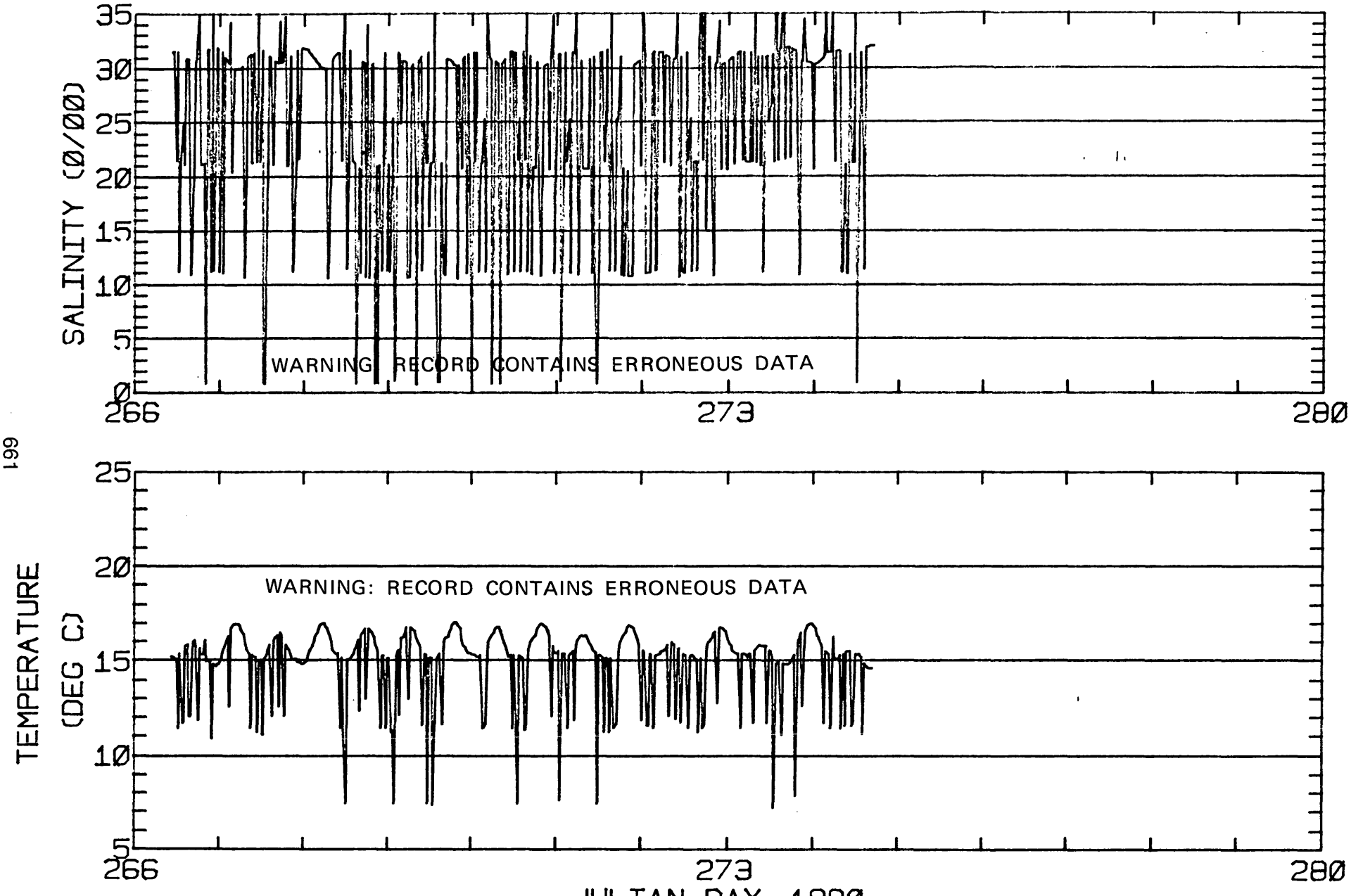
RMS SPEED: 66.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 123.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 61.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 7.33 CM/SEC
STANDARD DEVIATION V SERIES: 4.09 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.5	-5.3	331.
2	2	-5.3	-5.4	502.
ALL	14	-5.5	-5.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER Ø15.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:10/ 2/80 1000 PST JULIAN DAY=276
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

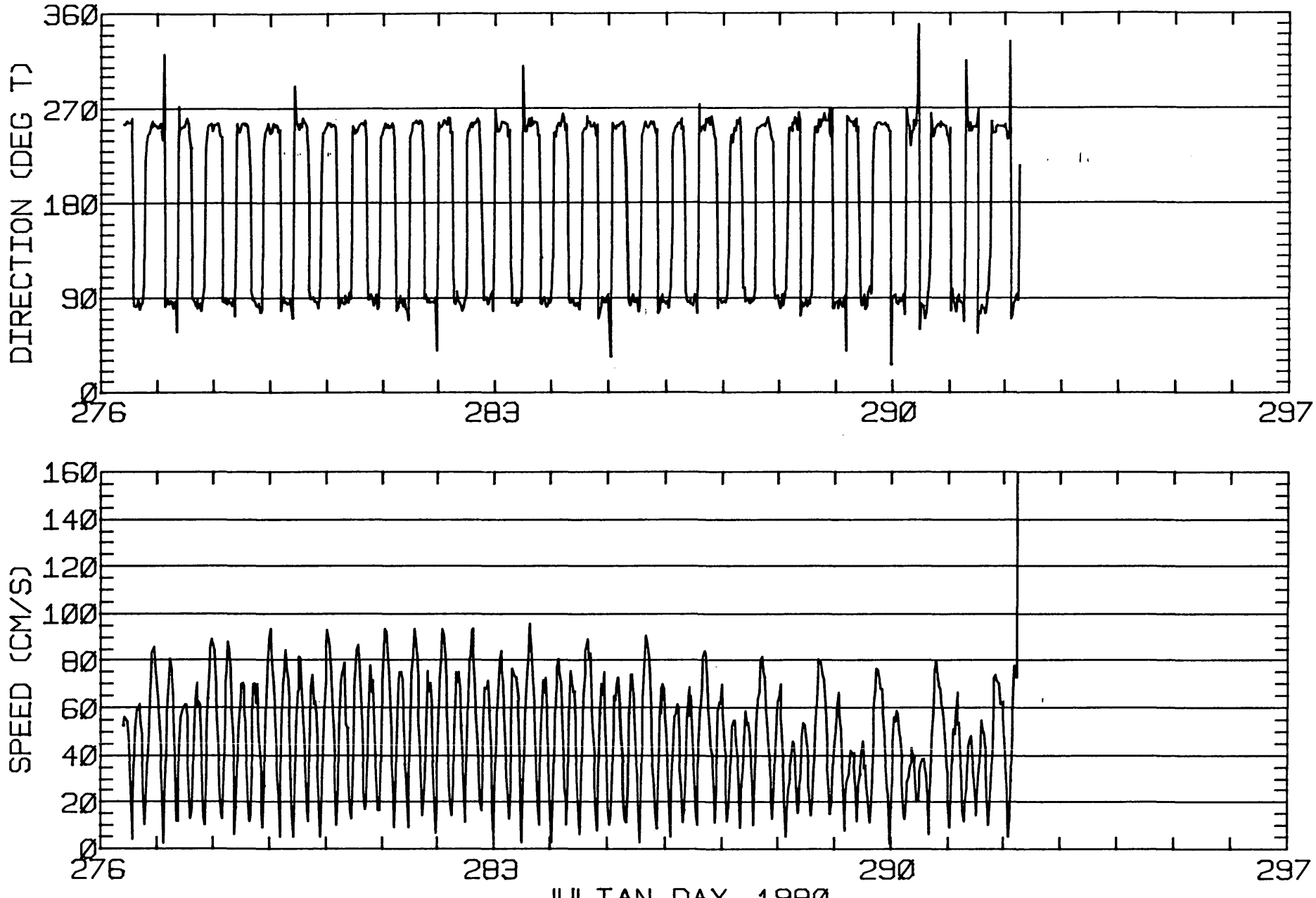
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.34	0.14	76.9	30.6	ANTI-CLOCKWISE
K1	13.63	0.86	78.5	25.4	ANTI-CLOCKWISE
N2	20.26	0.74	77.8	264.9	CLOCKWISE
M2	74.96	0.31	80.1	275.1	CLOCKWISE
S2	22.89	0.24	80.7	266.4	ANTI-CLOCKWISE
M4	1.86	0.40	106.0	189.8	ANTI-CLOCKWISE

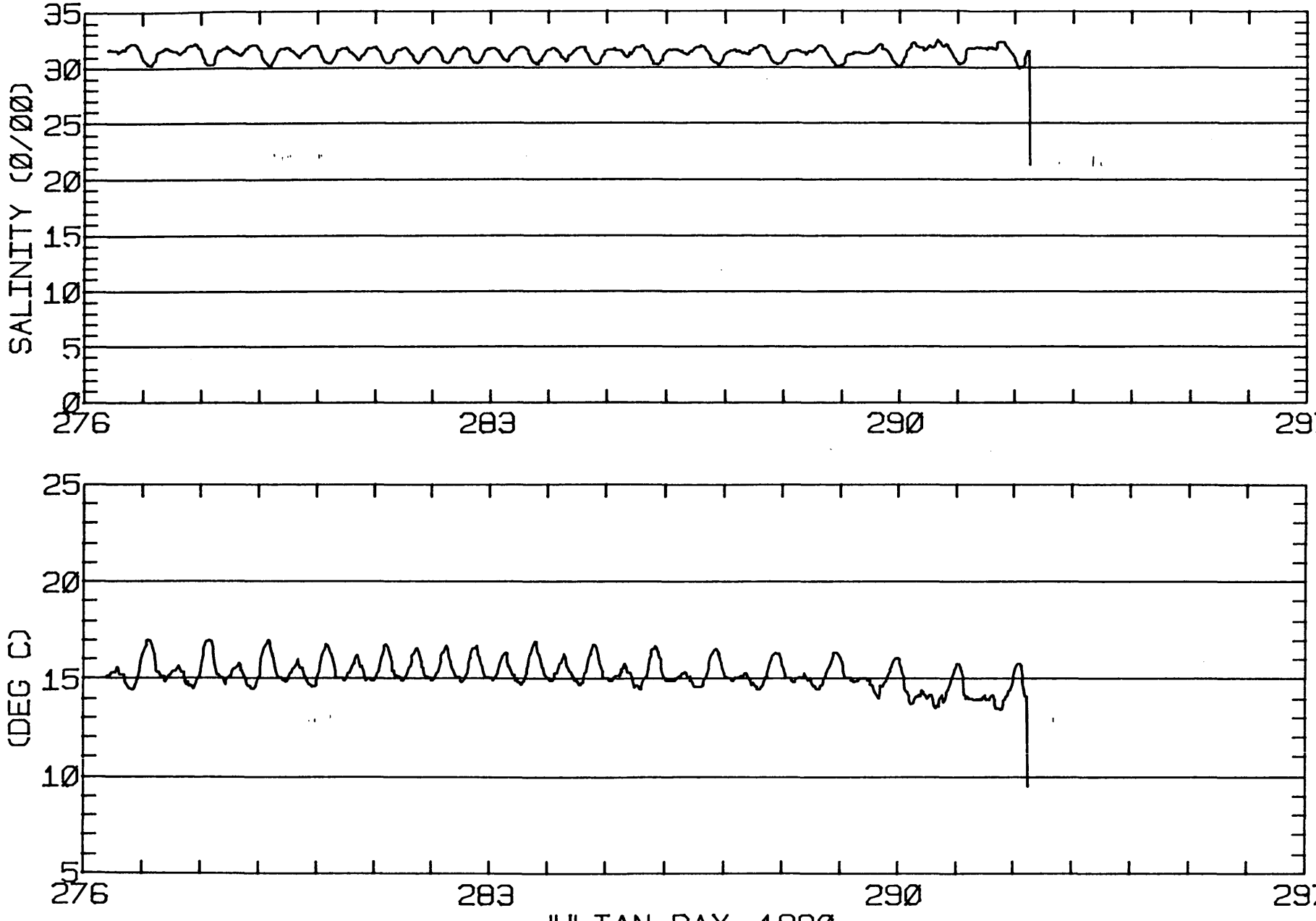
RMS SPEED: 53.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 123.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 50.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 79.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 8.39 CM/SEC
STANDARD DEVIATION V SERIES: 4.59 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.8	-6.8	254.
2	12	-6.4	-6.7	264.
3	6	-5.8	-5.2	220.
ALL	30	-6.0	-6.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:10/ 2/80 1112 PST JULIAN DAY=276
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

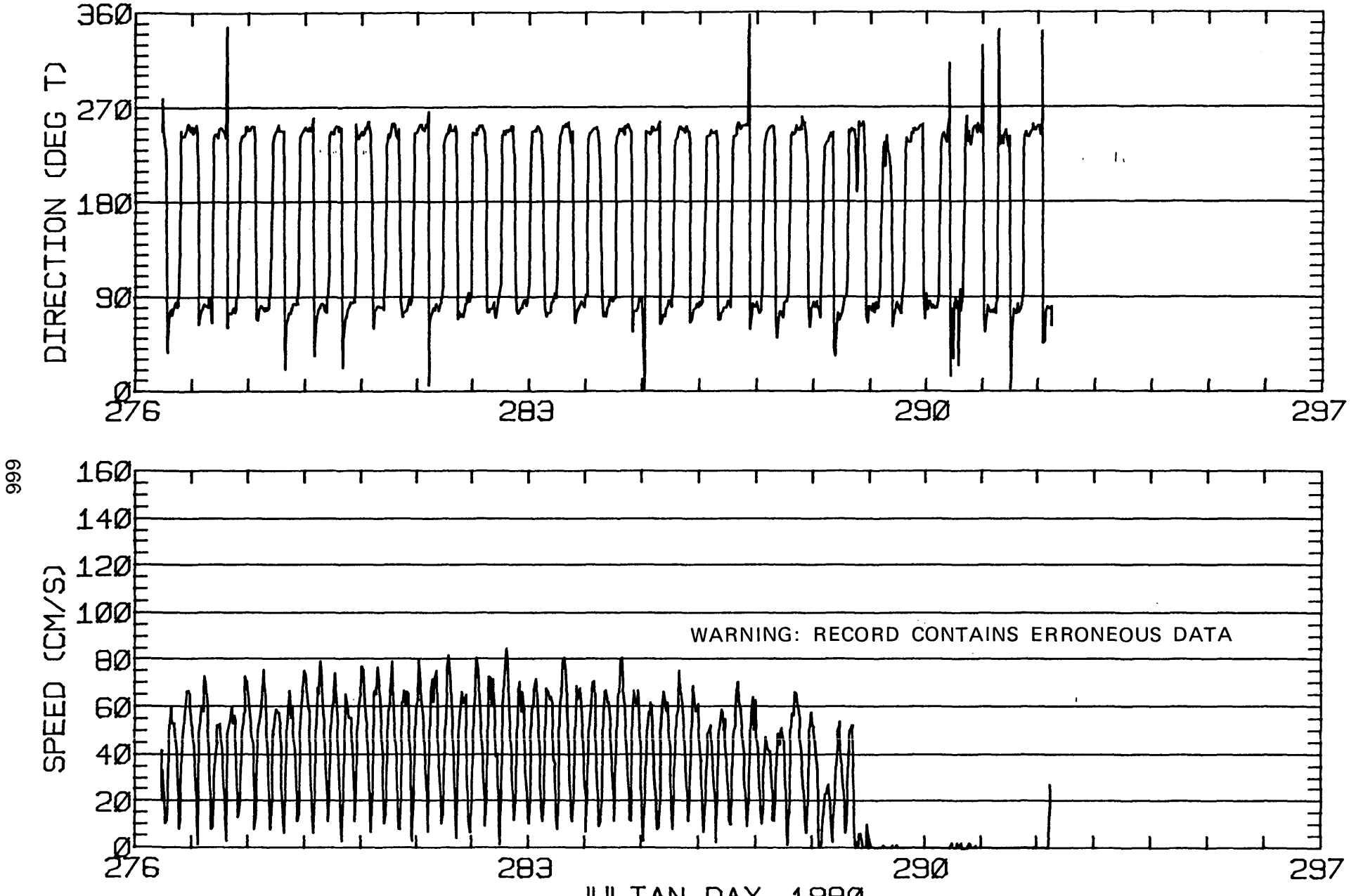
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.85	0.28	74.2	40.7	ANTI-CLOCKWISE
K1	9.85	0.43	75.0	31.3	ANTI-CLOCKWISE
N2	15.05	1.50	72.2	274.2	CLOCKWISE
M2	66.18	3.63	74.1	275.3	CLOCKWISE
S2	20.85	0.44	74.4	256.9	CLOCKWISE
M4	1.53	0.05	145.7	247.9	CLOCKWISE

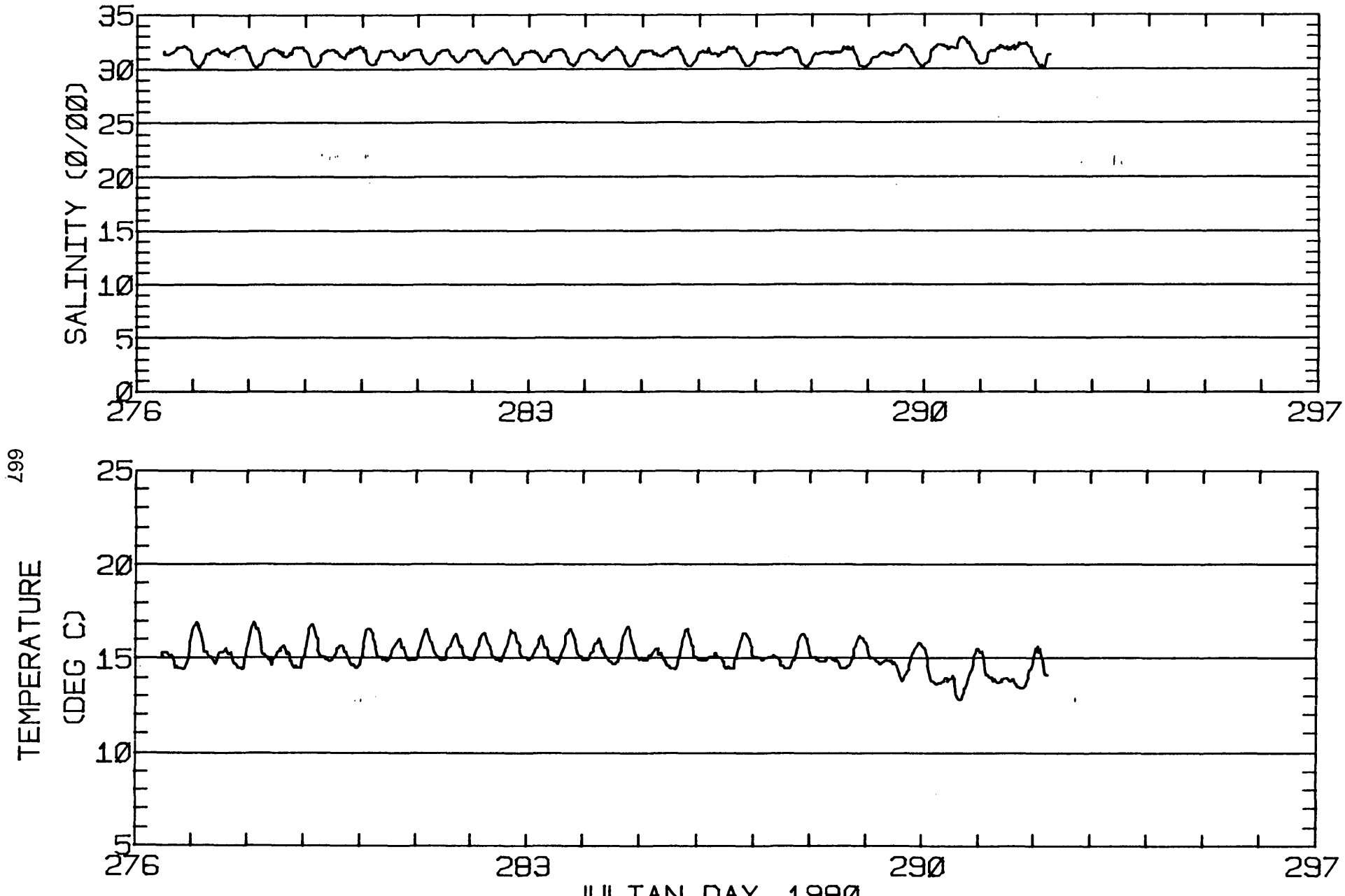
RMS SPEED: 50.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 105.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 74.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.21
STANDARD DEVIATION U-SERIES: 6.30 CM/SEC
STANDARD DEVIATION V SERIES: 4.10 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.5	-4.6	254.
2	8	-0.1	-5.1	277.
ALL	20	-0.4	-4.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER 009.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-25-55W
METER Ø09.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'51"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 22.3 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES:10/22/80 900 PST JULIAN DAY=296
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

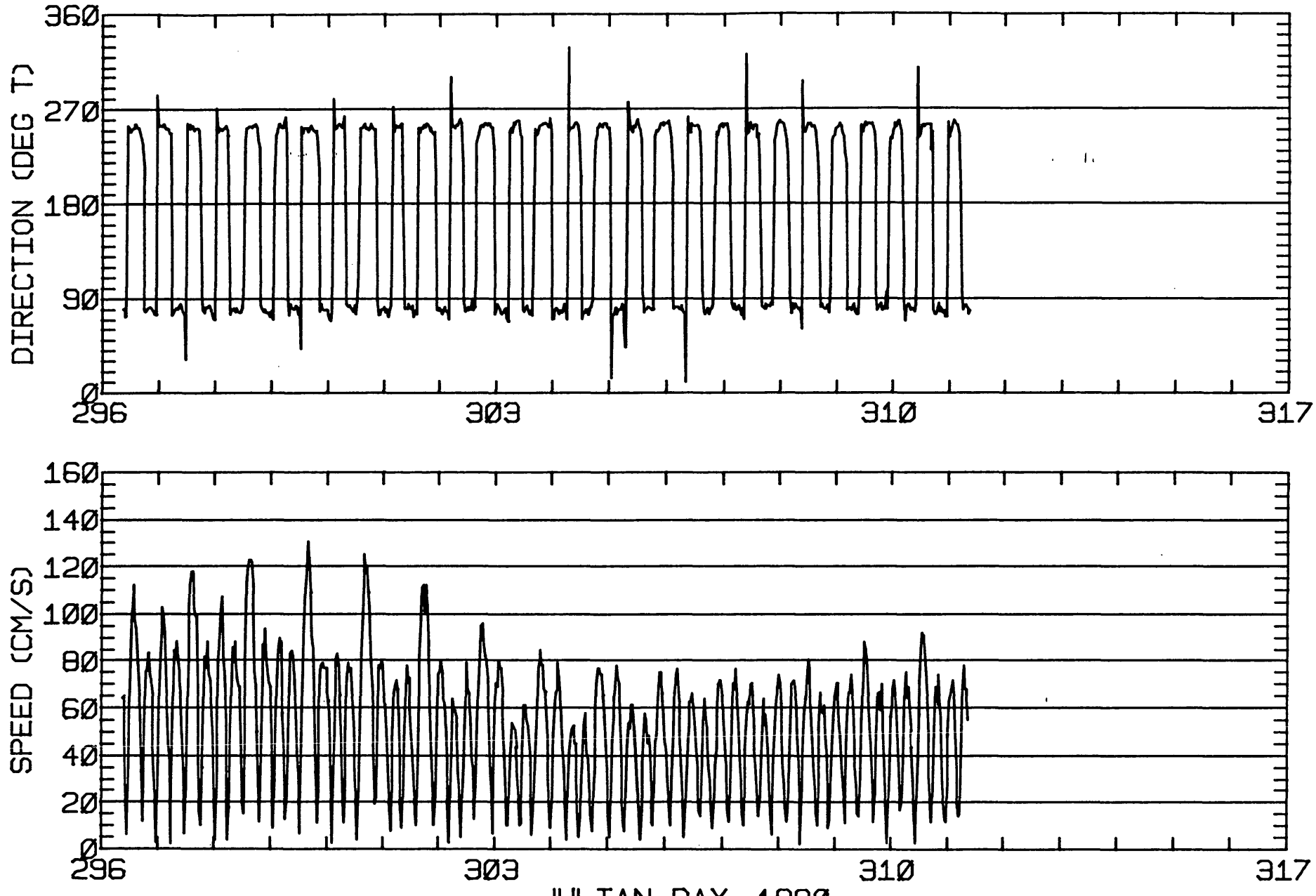
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.71	0.21	73.0	53.7	CLOCKWISE
K1	19.35	0.00	74.2	17.3	ANTI-CLOCKWISE
N2	15.43	0.74	76.0	252.7	ANTI-CLOCKWISE
M2	70.20	0.54	76.8	279.5	ANTI-CLOCKWISE
S2	14.87	0.95	75.4	258.9	ANTI-CLOCKWISE
M4	1.11	0.33	35.0	324.0	CLOCKWISE

RMS SPEED: 60.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 117.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 75.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 8.01 CM/SEC
STANDARD DEVIATION V SERIES: 4.35 CM/SEC

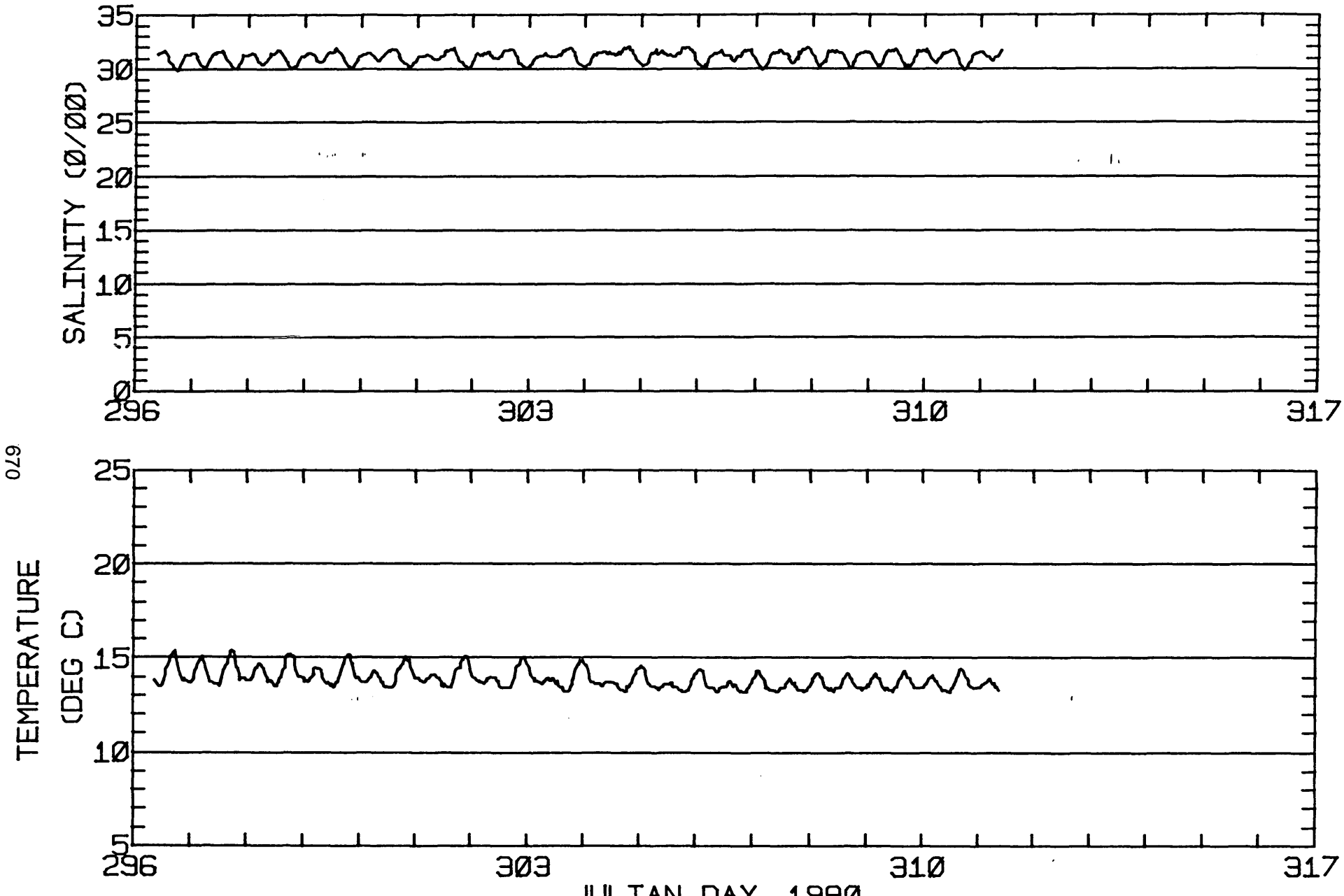
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.8	-5.3	176.
2	12	-4.8	-4.0	157.
3	4	-3.9	-5.1	174.
ALL	28	-5.1	-4.7	



699

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER 015.6 METERS ABOVE BED. WATER DEPTH 022.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER Ø15.6 METERS ABOVE BED. WATER DEPTH Ø22.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'51"N 122 25'55"W
METER TYPE: AANDERAA
WATER DEPTH: 22.3 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES:10/22/80 902 PST JULIAN DAY=296
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

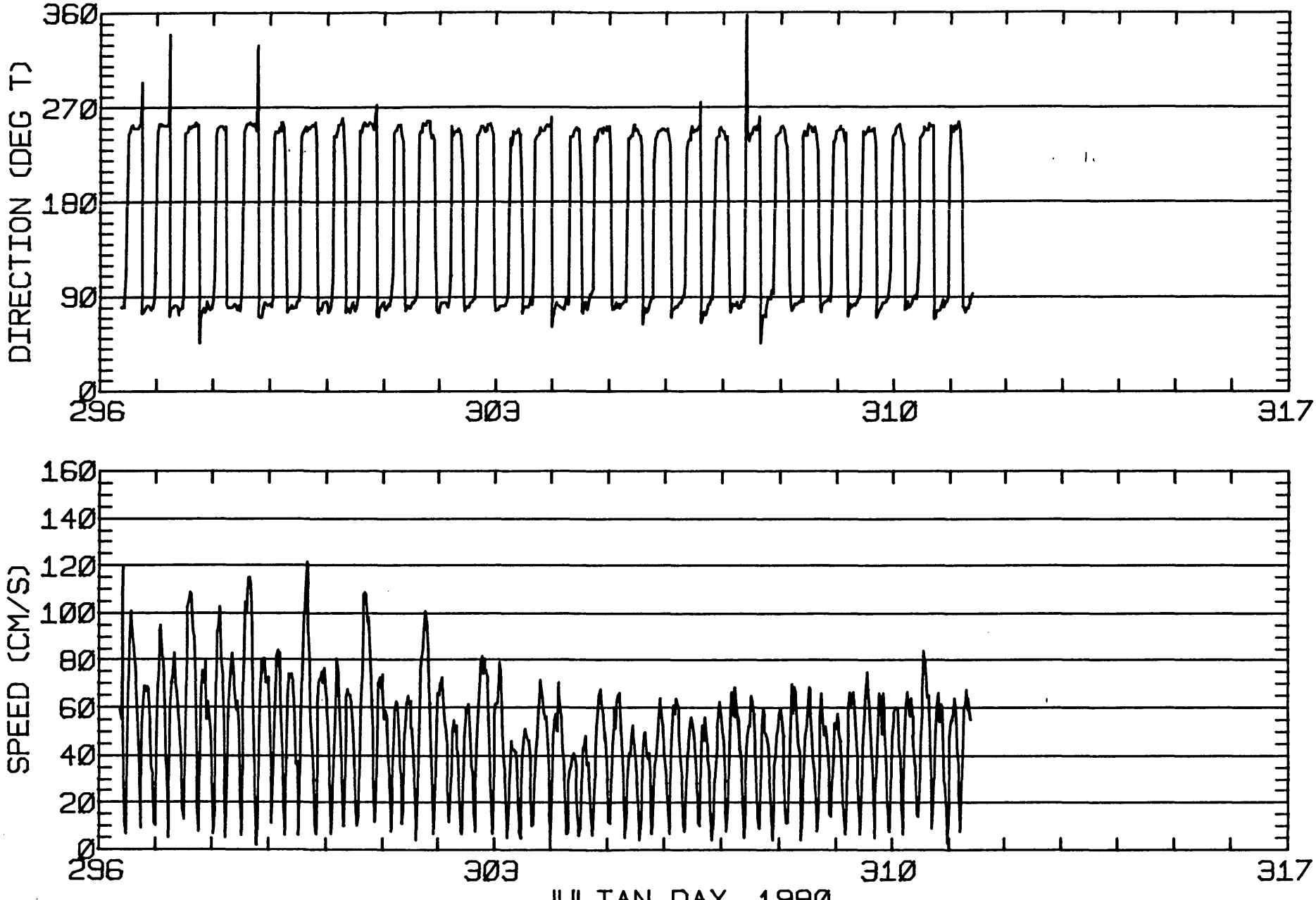
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.06	0.19	73.1	45.9	CLOCKWISE
K1	17.04	0.09	78.2	17.4	CLOCKWISE
N2	12.99	0.27	76.4	266.5	CLOCKWISE
M2	65.04	1.73	75.6	282.1	CLOCKWISE
S2	14.22	0.67	77.0	258.7	CLOCKWISE
M4	2.81	0.28	55.0	52.3	ANTI-CLOCKWISE

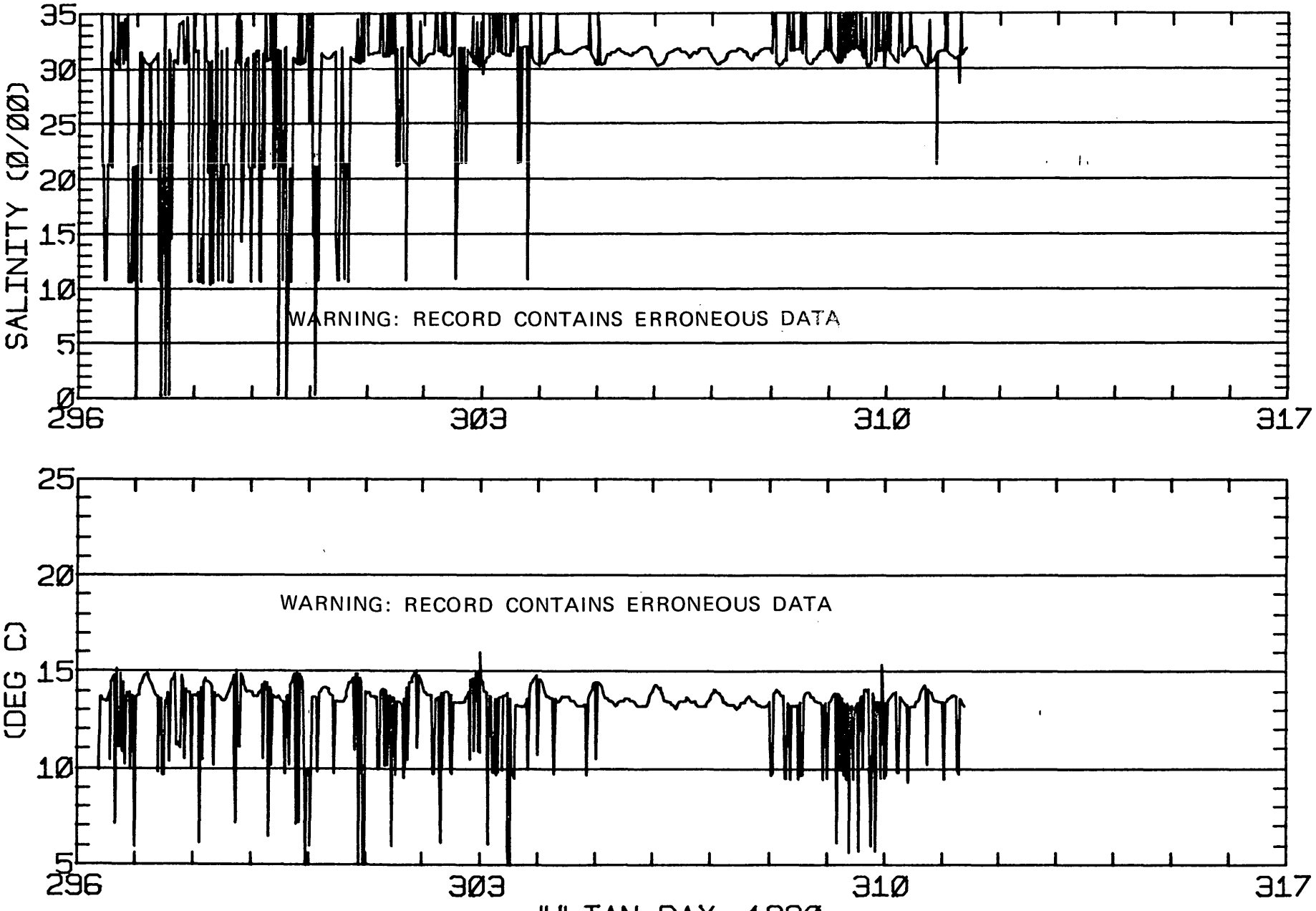
RMS SPEED: 54.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 106.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 43.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 76.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 8.85 CM/SEC
STANDARD DEVIATION V SERIES: 3.89 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.0	-5.2	176.
2	12	-0.6	-5.6	157.
3	4	2.0	-6.4	174.
ALL	28	-0.8	-5.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER 009.4 METERS ABOVE BED. WATER DEPTH 022.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-51N 122-25-55W
METER ØØ9.4 METERS ABOVE BED. WATER DEPTH Ø22.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 26' 0"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:11/ 6/80 1050 PST JULIAN DAY=311
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

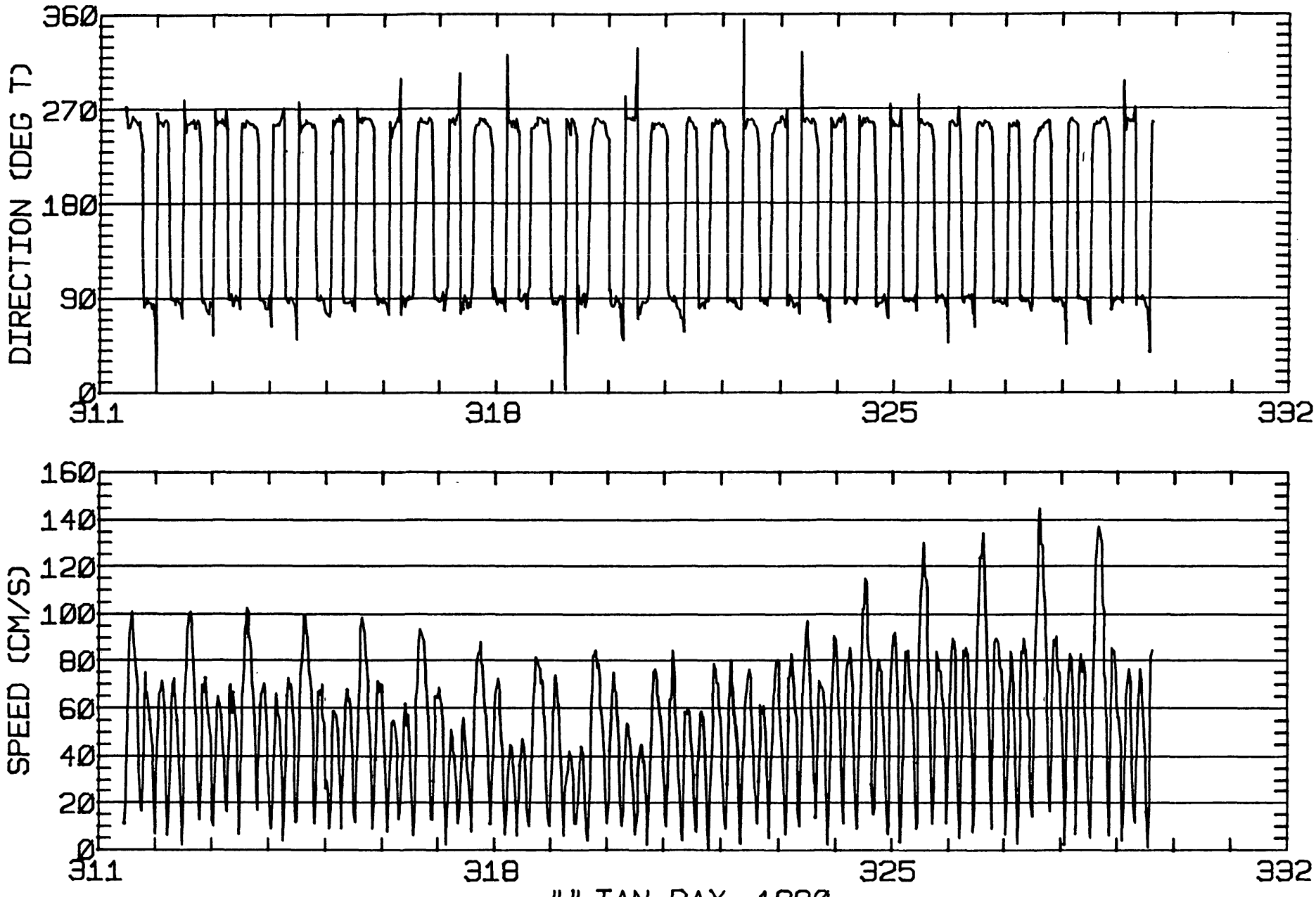
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.93	0.49	76.3	33.2	ANTI-CLOCKWISE
K1	24.62	0.80	79.1	23.3	ANTI-CLOCKWISE
N2	13.85	0.46	81.5	261.5	CLOCKWISE
M2	68.43	1.55	82.3	271.4	ANTI-CLOCKWISE
S2	16.89	0.07	80.5	269.0	ANTI-CLOCKWISE
M4	1.86	0.39	141.6	137.9	CLOCKWISE

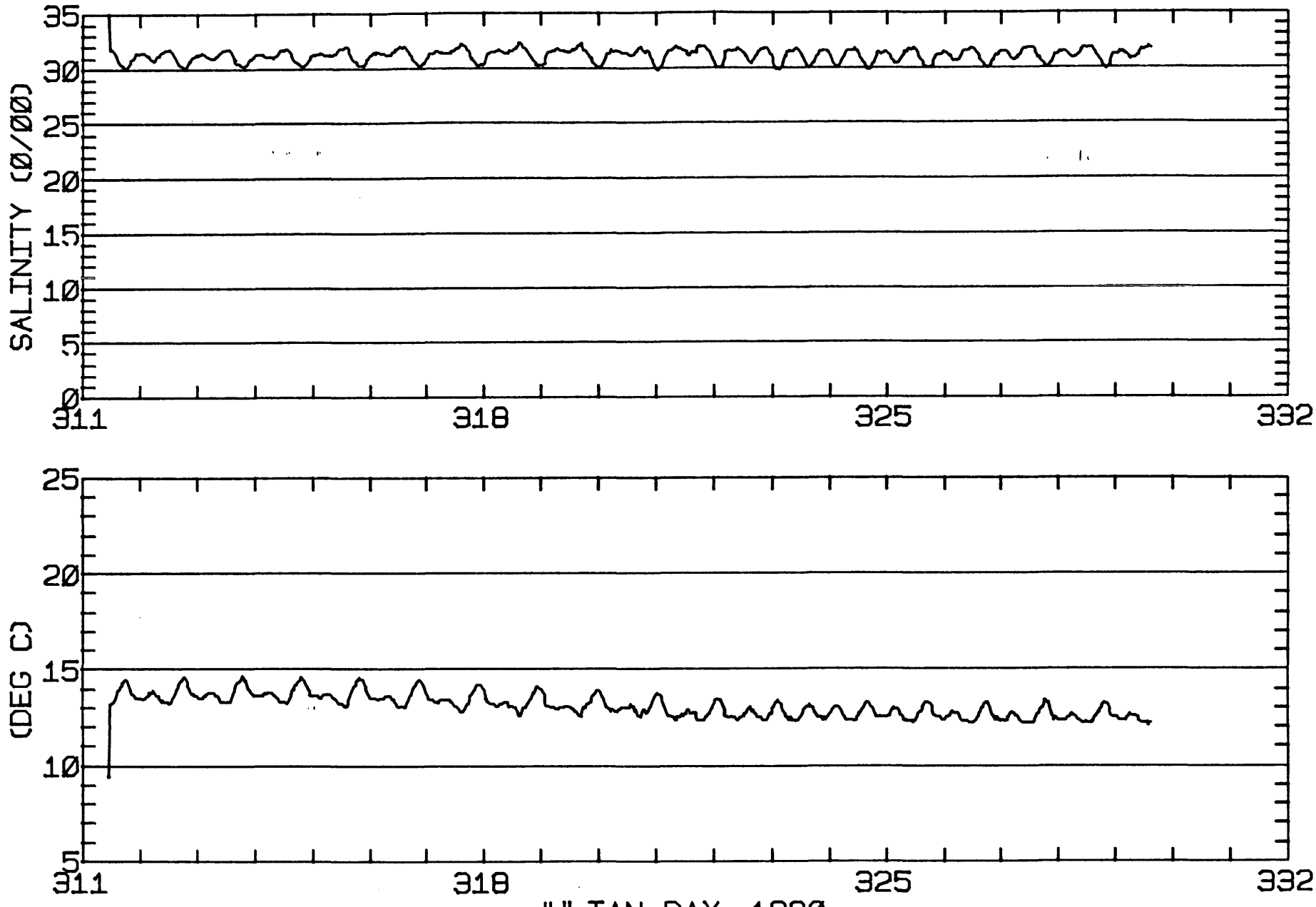
RMS SPEED: 60.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 122.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 80.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 9.33 CM/SEC
STANDARD DEVIATION V SERIES: 4.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.7	-4.9	194.
2	12	-6.3	-4.7	197.
3	10	-8.3	-8.0	172.
ALL	34	-7.0	-5.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- 0W
METER 015.6 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- ØW
METER Ø15.6 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 211
POSITION: 37 48'52"N 122 26' 0"W
METER TYPE: AANDERAA
WATER DEPTH: 21.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES:11/ 6/80 1042 PST JULIAN DAY=311
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

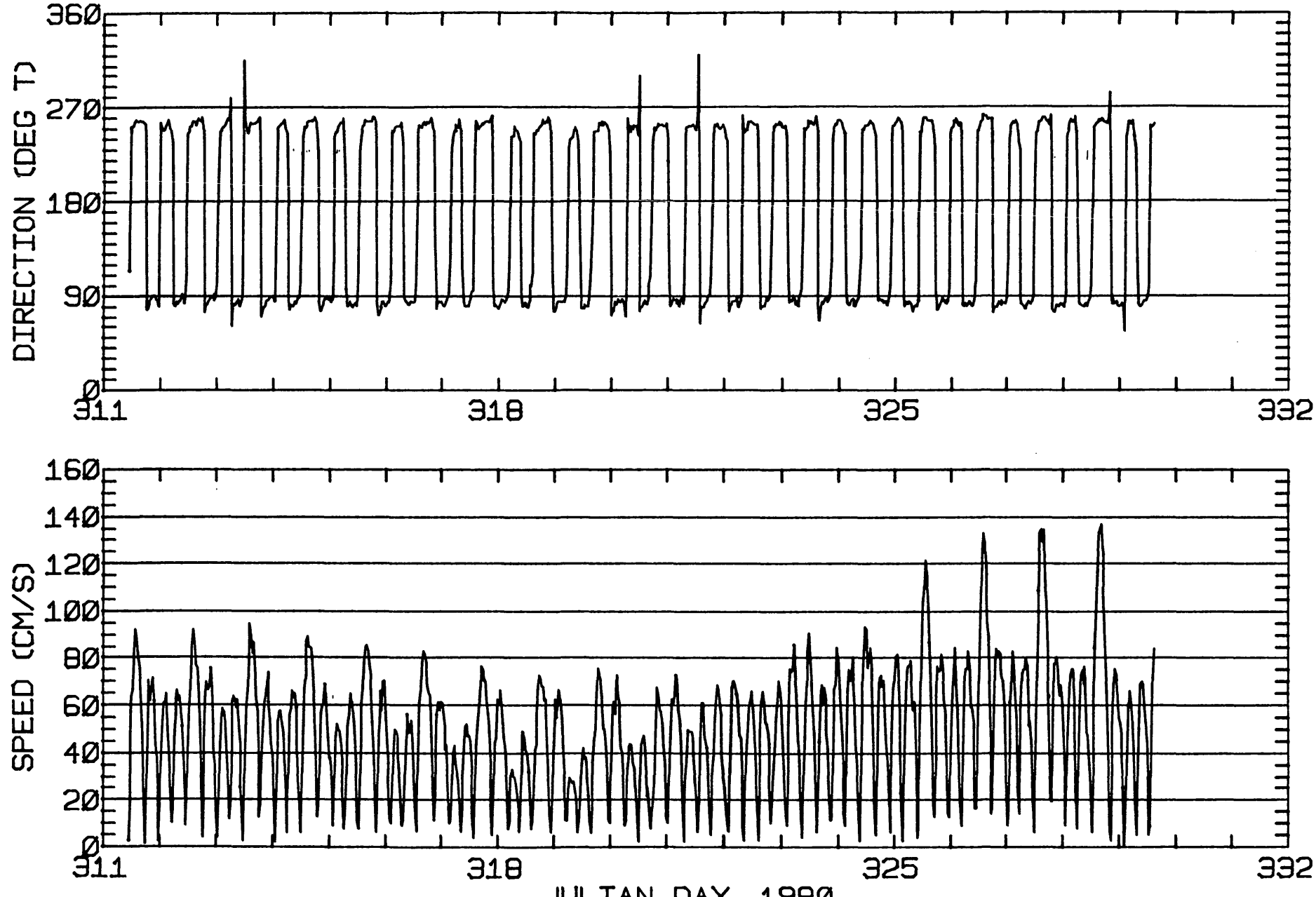
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.66	0.51	79.2	30.3	CLOCKWISE
K1	23.36	0.05	80.0	18.7	ANTI-CLOCKWISE
N2	13.66	0.48	77.7	251.5	ANTI-CLOCKWISE
M2	64.56	1.89	79.8	266.1	CLOCKWISE
S2	16.06	0.12	79.7	266.7	CLOCKWISE
M4	3.27	0.24	70.4	44.8	CLOCKWISE

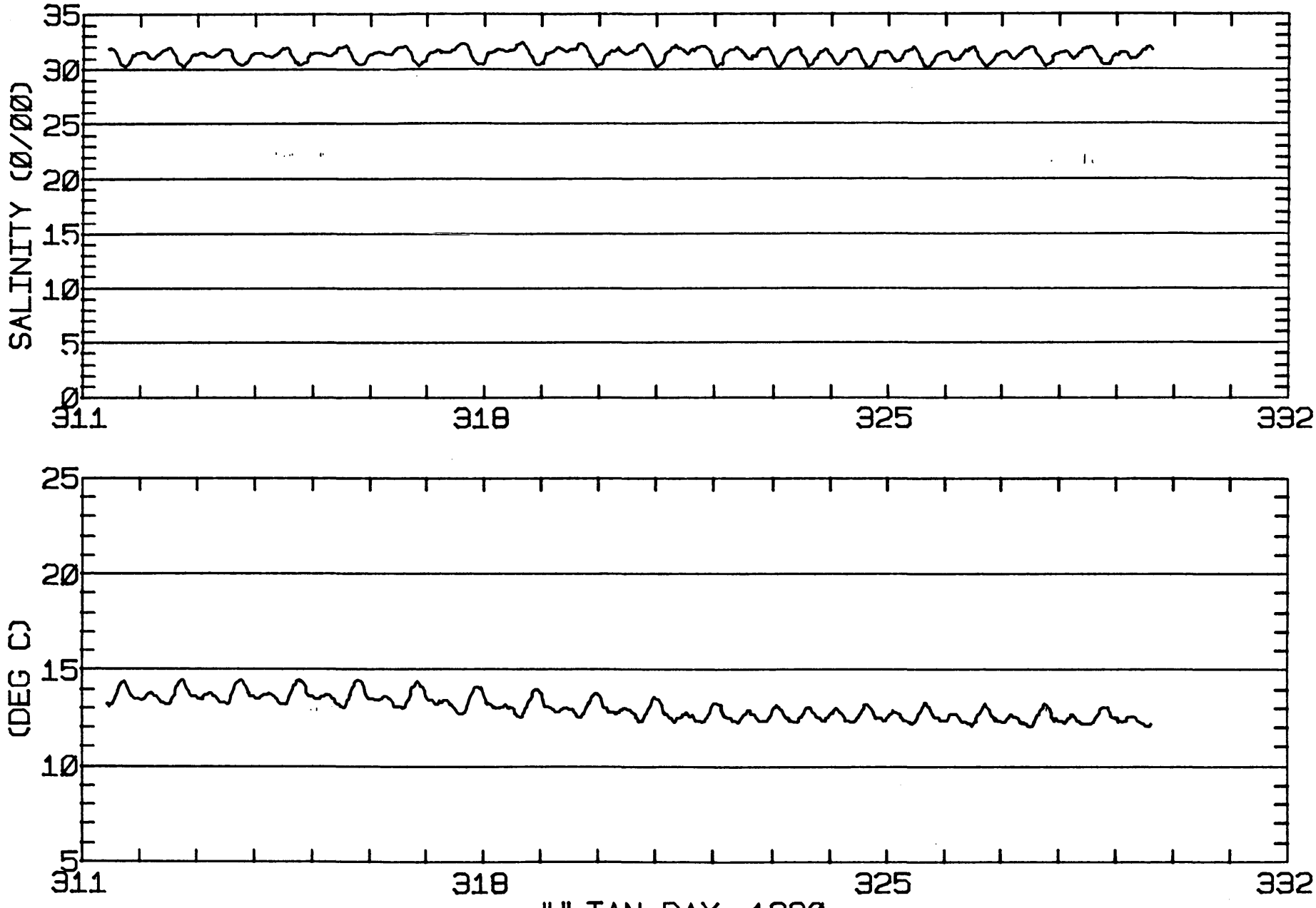
RMS SPEED: 56.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 115.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 79.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 9.68 CM/SEC
STANDARD DEVIATION V SERIES: 3.60 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.0	-4.8	194.
2	12	0.1	-4.8	197.
3	10	-6.0	-5.2	172.
ALL	34	-2.8	-4.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- 0W
METER 009.5 METERS ABOVE BED. WATER DEPTH 021.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 211 37-48-52N 122-26- ØW
METER ØØ9.5 METERS ABOVE BED. WATER DEPTH Ø21.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 212
POSITION: 37 53'14"N 122 24'47"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 9/24/79 1312 PST JULIAN DAY=267
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

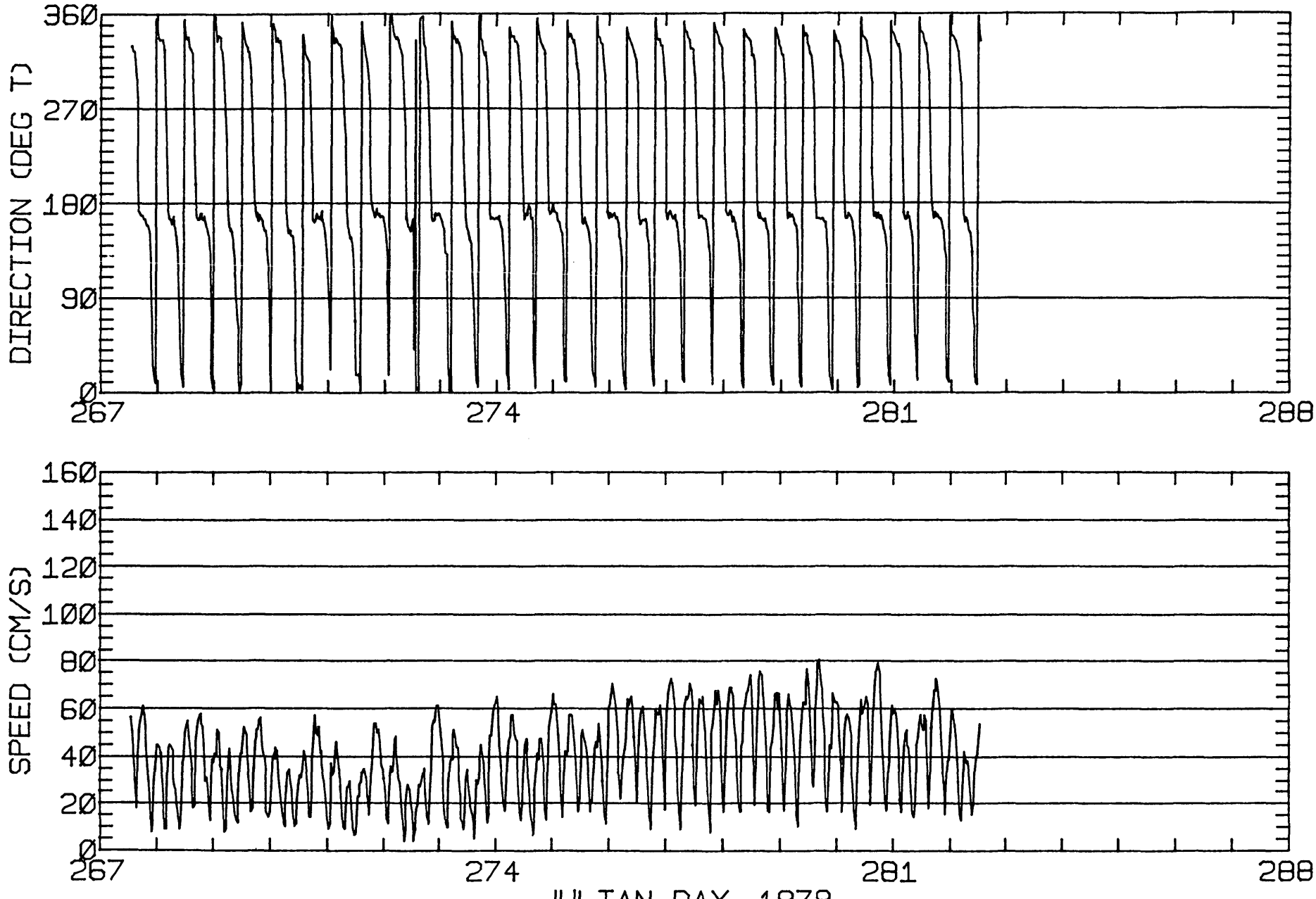
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.87	0.08	354.3	41.8	ANTI-CLOCKWISE
K1	13.88	1.28	345.5	54.9	ANTI-CLOCKWISE
N2	10.97	2.06	344.1	295.5	ANTI-CLOCKWISE
M2	47.62	9.83	341.8	311.7	ANTI-CLOCKWISE
S2	12.82	2.85	344.0	317.0	ANTI-CLOCKWISE
M4	5.14	1.49	298.6	337.1	CLOCKWISE

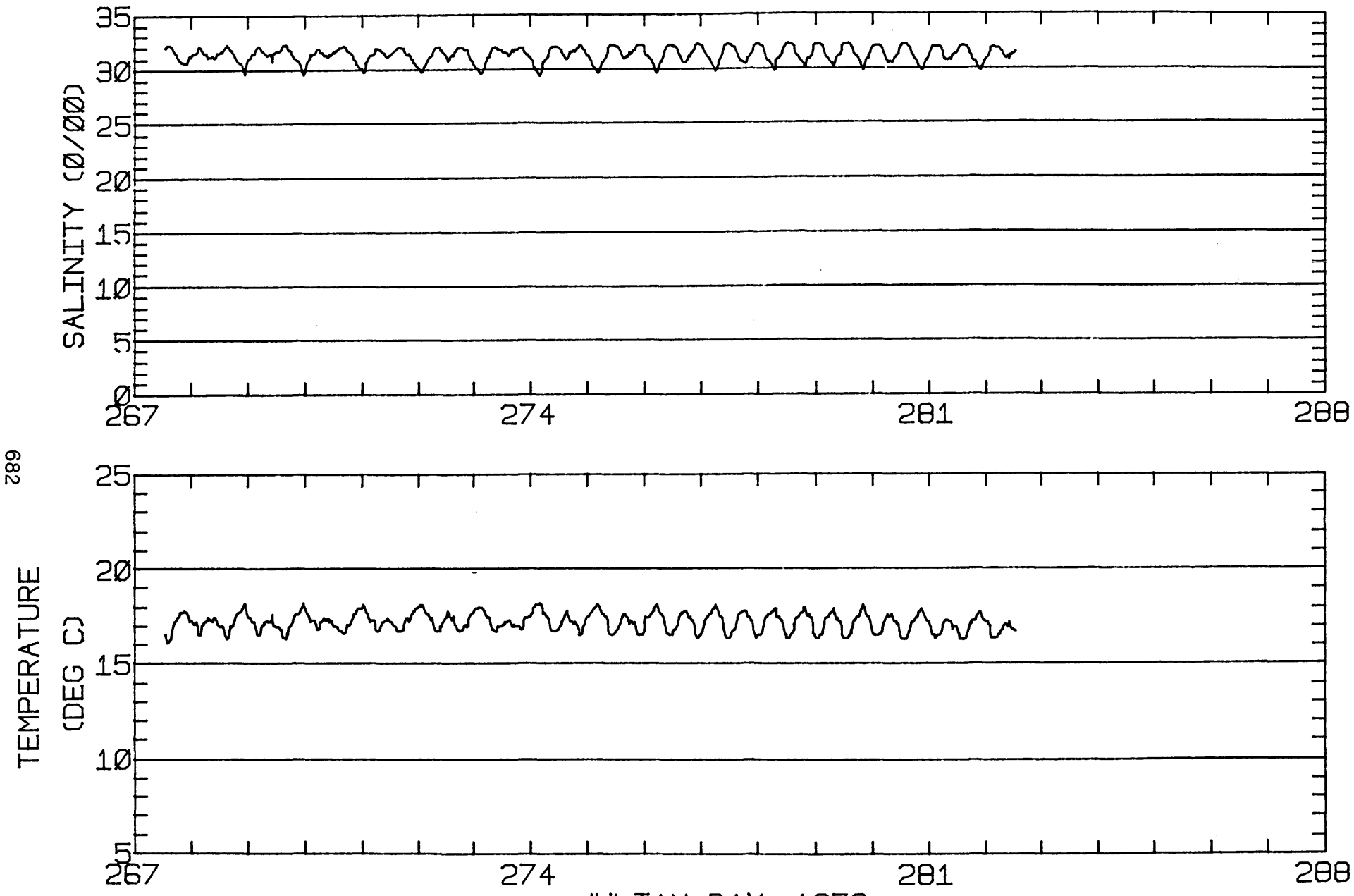
RMS SPEED: 43.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 84.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 344.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 5.09 CM/SEC
STANDARD DEVIATION V SERIES: 6.08 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	-0.7	131.
2	12	-2.2	-1.6	153.
3	4	-2.7	-1.2	141.
ALL	28	-1.6	-1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 212 37-53-14N 122-24-47W
METER 005.7 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 212 37-53-14N 122-24-47W
METER Ø05.7 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 212
POSITION: 37 53' 5"N 122 24'42"W
METER TYPE: AANDERAA
WATER DEPTH: 11.9 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:11/13/80 1510 PST JULIAN DAY=318
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

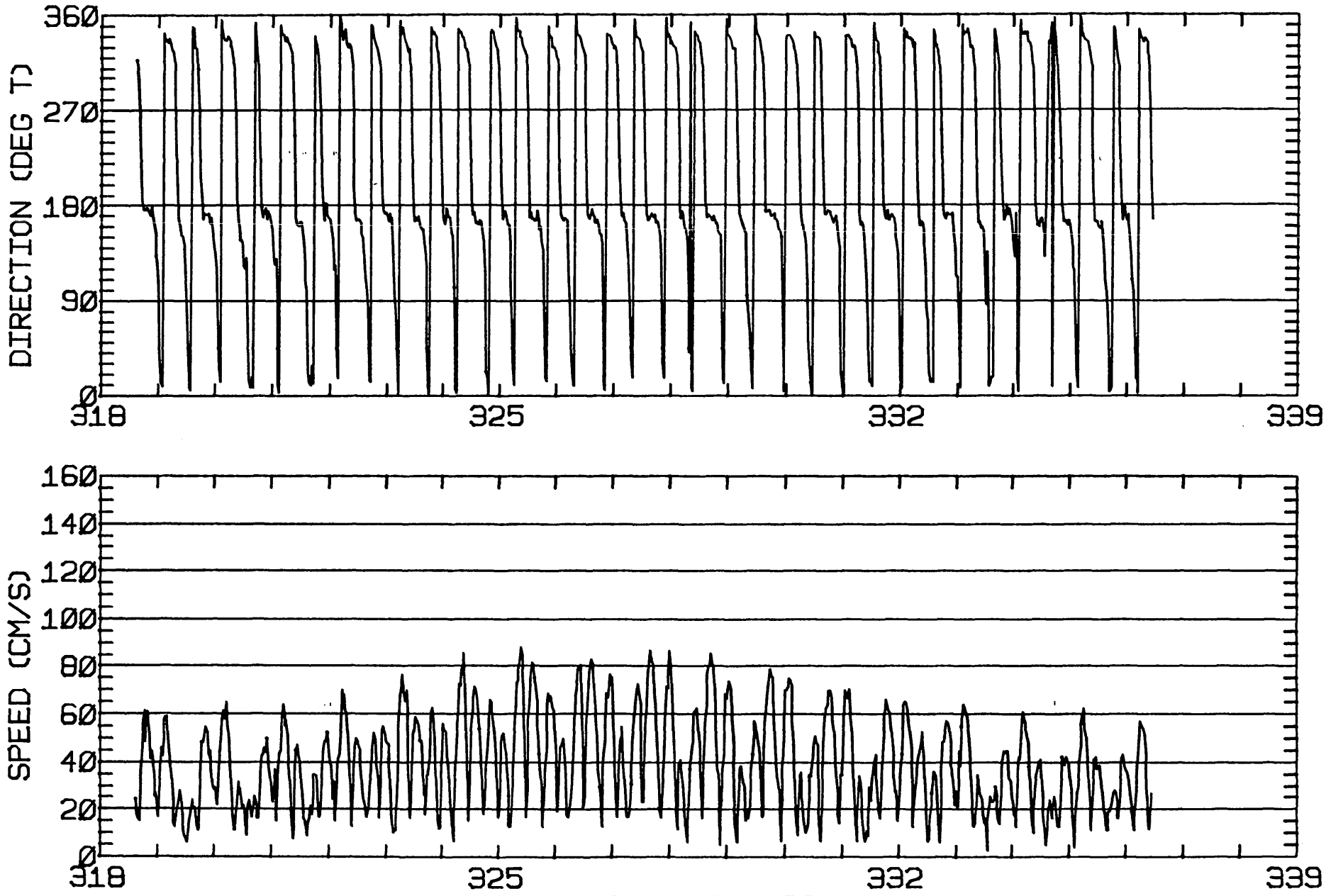
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.72	0.34	351.9	47.3	CLOCKWISE
K1	24.68	0.52	345.2	43.8	ANTI-CLOCKWISE
N2	12.38	1.89	345.2	290.9	ANTI-CLOCKWISE
M2	47.70	10.98	342.6	319.1	ANTI-CLOCKWISE
S2	9.29	0.51	342.0	296.2	ANTI-CLOCKWISE
M4	5.17	1.26	319.0	340.4	CLOCKWISE

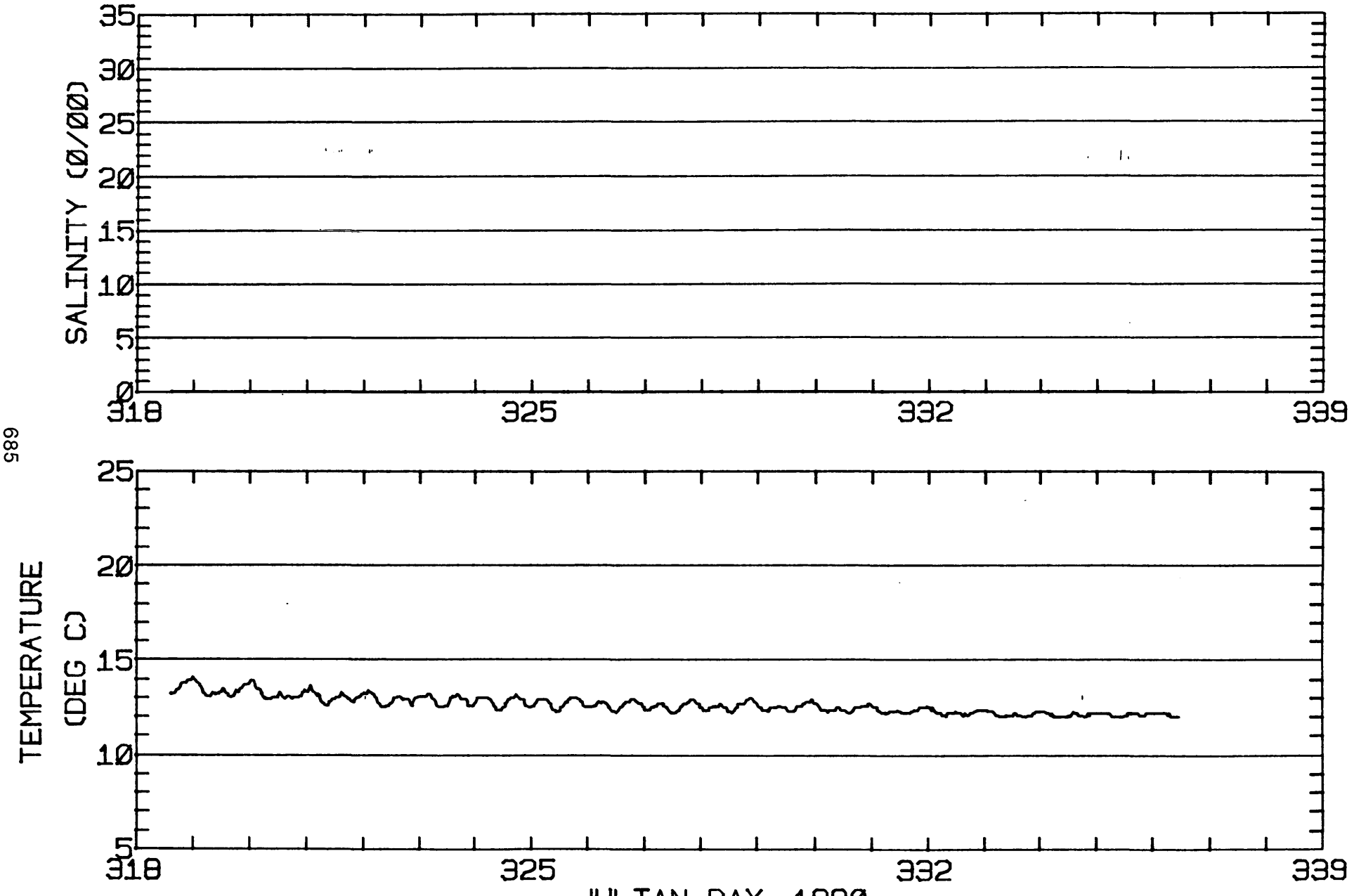
RMS SPEED: 44.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 91.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 344.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.60
STANDARD DEVIATION U-SERIES: 5.93 CM/SEC
STANDARD DEVIATION V SERIES: 7.29 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.0	-0.5	194.
2	12	-3.3	1.2	177.
3	10	-0.8	0.8	209.
ALL	34	-1.7	0.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 212 37-53- 5N 122-24-42W
METER 005.7 METERS ABOVE BED. WATER DEPTH 011.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 212 37-53- 5N 122-24-42W
METER Ø05.7 METERS ABOVE BED. WATER DEPTH Ø11.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 213
POSITION: 37 54'11"N 122 27'32"W
METER TYPE: AANDERAA
WATER DEPTH: 10.4 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES:10/11/79 1130 PST JULIAN DAY=284
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

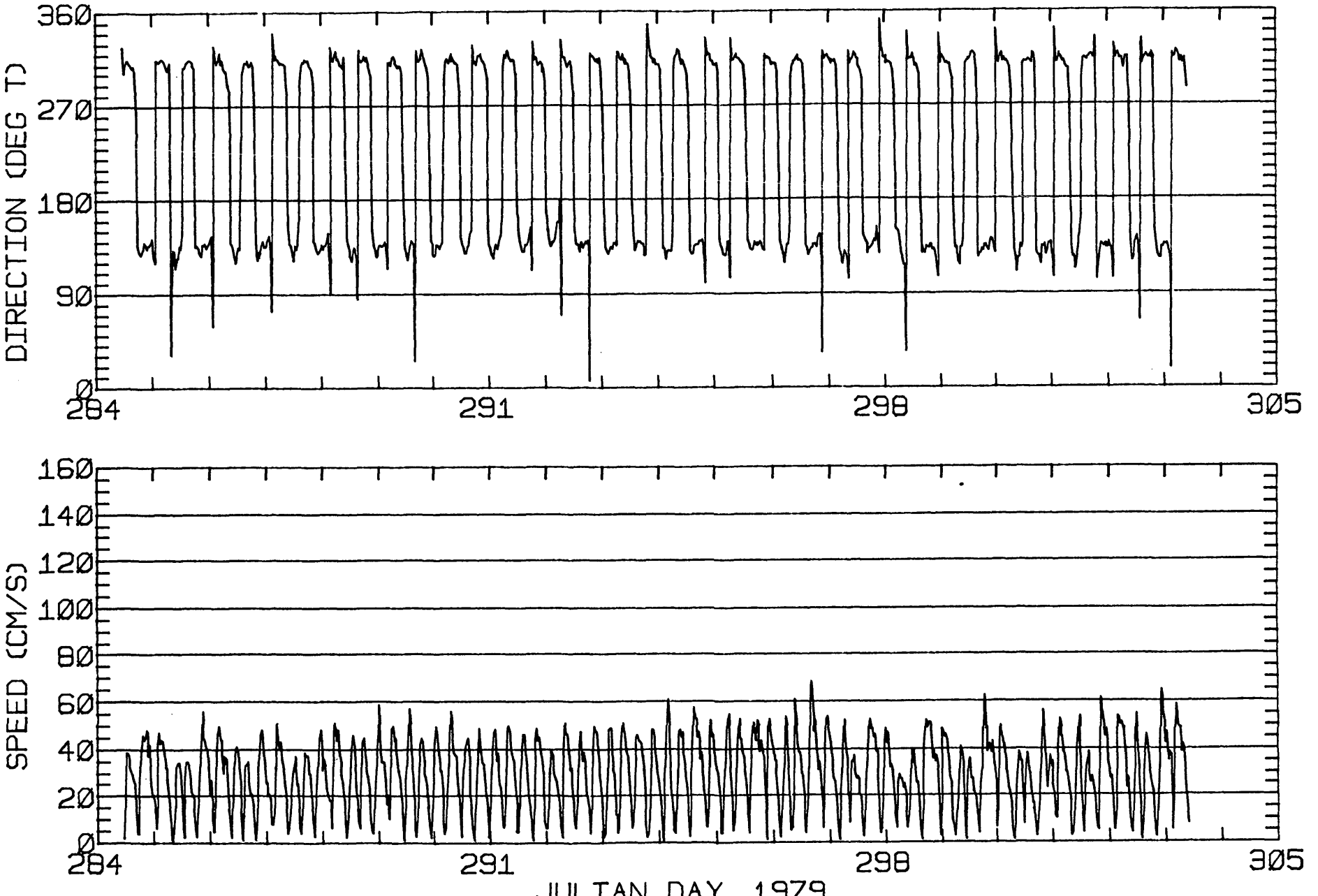
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.53	0.71	316.3	37.7	CLOCKWISE
K1	10.41	0.27	315.5	16.6	ANTI-CLOCKWISE
N2	10.69	0.04	312.8	271.6	ANTI-CLOCKWISE
M2	45.44	0.57	314.1	304.5	ANTI-CLOCKWISE
S2	10.91	0.45	316.7	285.1	ANTI-CLOCKWISE
M4	2.12	0.64	344.2	167.6	CLOCKWISE

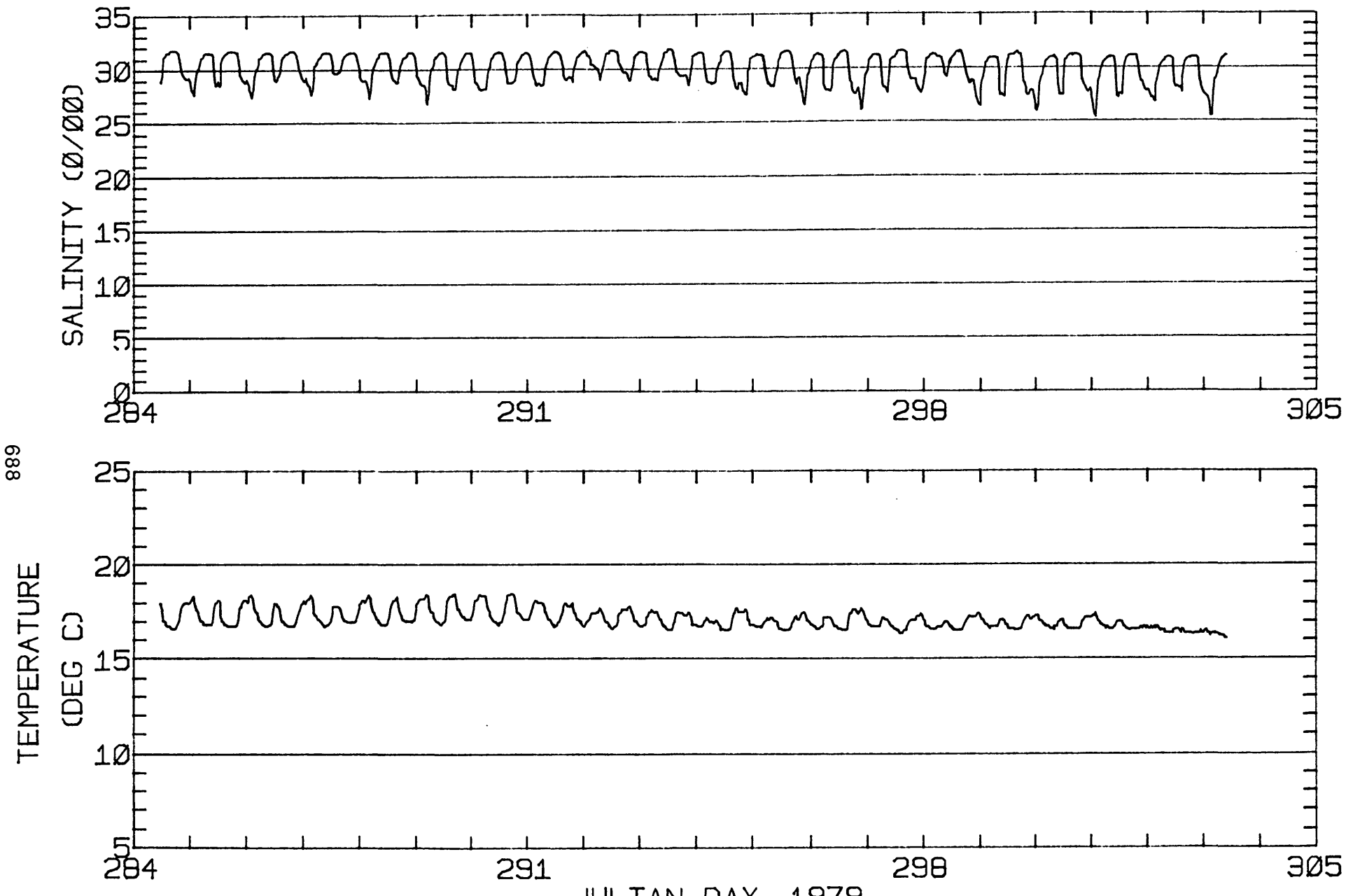
RMS SPEED: 33.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 75.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 314.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 7.37 CM/SEC
STANDARD DEVIATION V SERIES: 5.66 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.2	0.0	206.
2	12	-0.2	-0.4	208.
3	12	1.5	-0.8	304.
ALL	36	0.4	-0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 213 37-54-11N 122-27-32W
METER 004.5 METERS ABOVE BED. WATER DEPTH 010.4 METERS.



889

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 213 37-54-11N 122-27-32W
METER ØØ4.5 METERS ABOVE BED. WATER DEPTH Ø1Ø.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 214
POSITION: 37 56'28"N 122 27'42"W
METER TYPE: AANDERAA
WATER DEPTH: 6.1 M (MLLW)
METER DEPTH: 4.6 M (BELOW MLLW)
START TIME OF SERIES: 9/20/79 930 PST JULIAN DAY=263
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

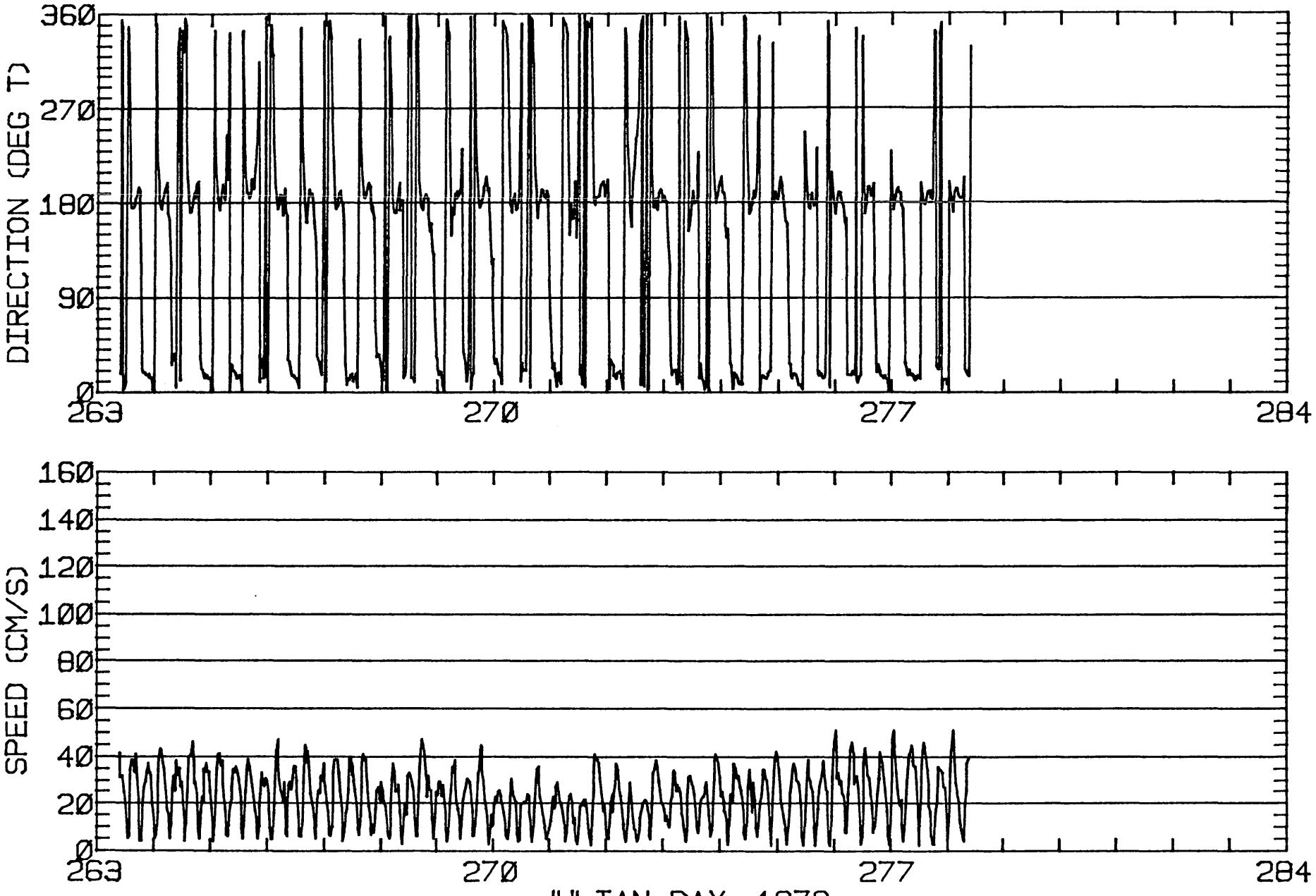
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.29	1.04	14.0	5.2	ANTI-CLOCKWISE
K1	5.74	1.01	9.4	39.9	ANTI-CLOCKWISE
N2	4.80	0.17	13.3	267.0	CLOCKWISE
M2	32.55	1.71	8.5	297.0	ANTI-CLOCKWISE
S2	9.16	0.66	11.8	308.9	ANTI-CLOCKWISE
M4	2.76	0.06	325.6	334.4	CLOCKWISE

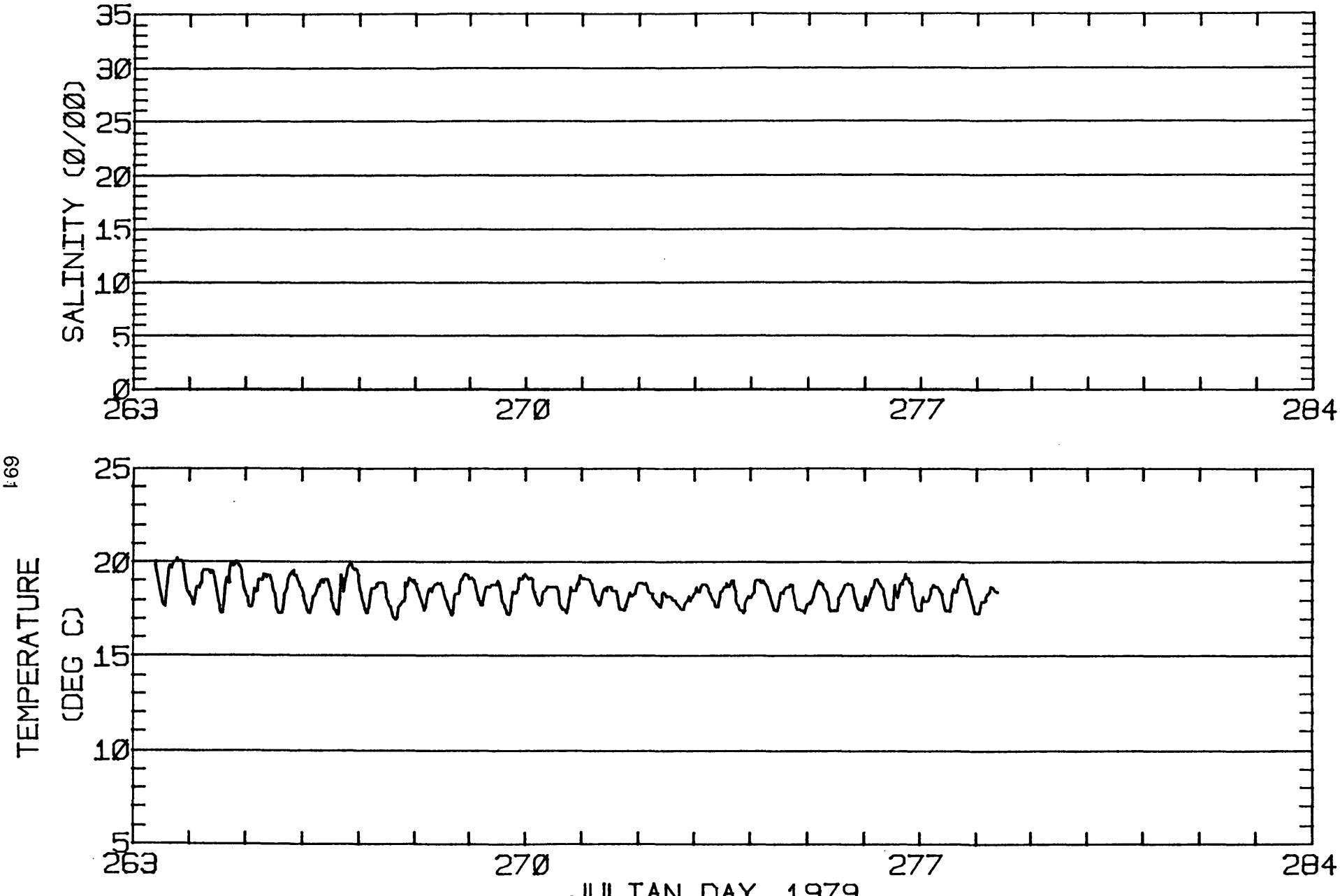
RMS SPEED: 25.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 52.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 9.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 4.99 CM/SEC
STANDARD DEVIATION V SERIES: 6.08 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.1	-0.7	142.
2	12	1.1	-0.5	134.
3	4	2.3	-0.0	164.
ALL	28	1.3	-0.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 214 37-56-28N 122-27-42W
METER 001.5 METERS ABOVE BED. WATER DEPTH 006.1 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 214 37-56-28N 122-27-42W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ6.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 215
POSITION: 37 56'27"N 122 27'11"W
METER TYPE: AANDERAA
WATER DEPTH: 12.5 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 9/21/79 1210 PST JULIAN DAY=264
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

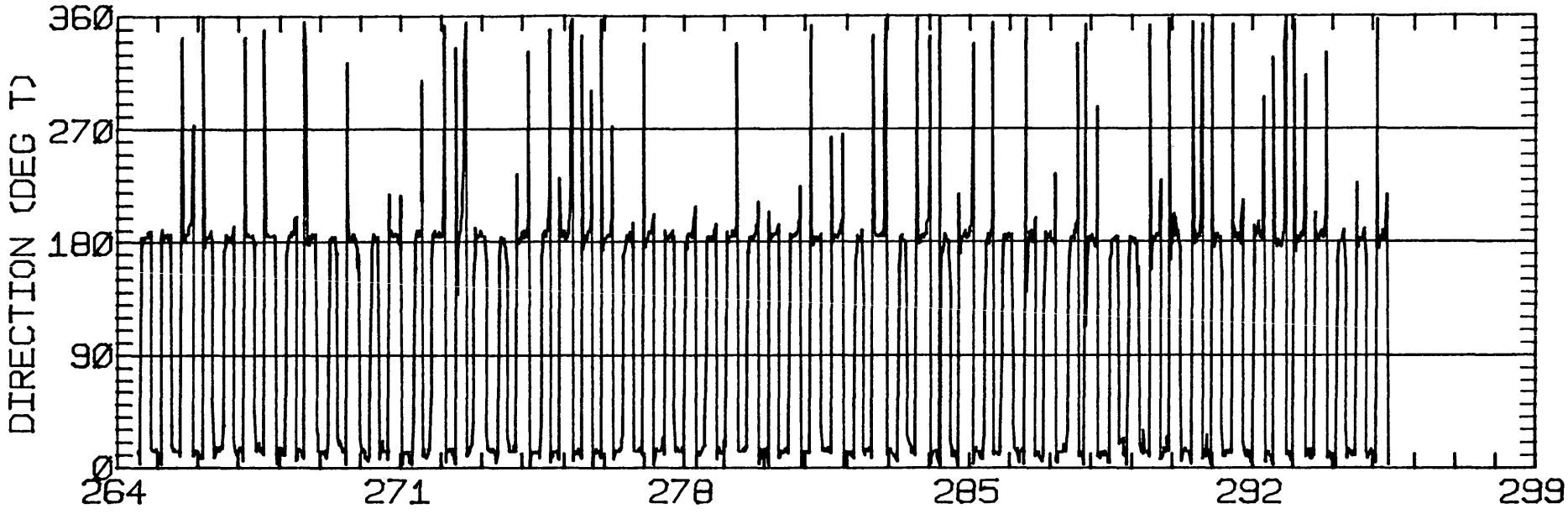
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

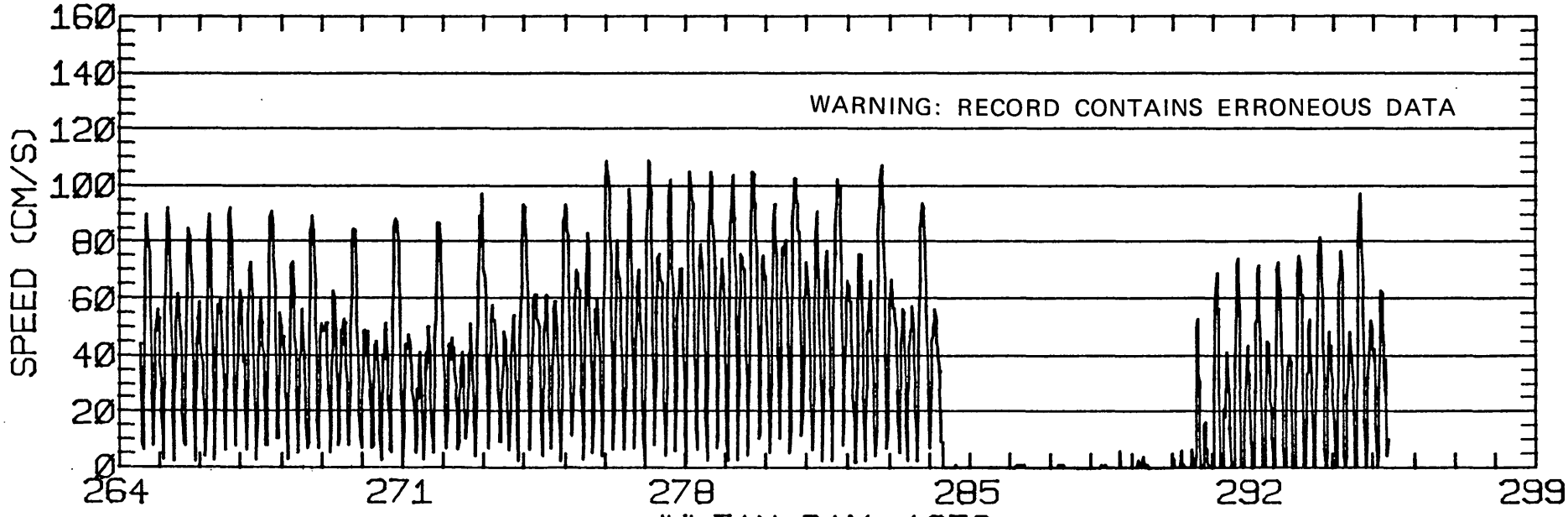
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.05	0.10	6.9	33.9	CLOCKWISE
K1	16.66	0.27	9.2	50.4	CLOCKWISE
N2	12.00	0.60	10.5	294.7	CLOCKWISE
M2	63.51	1.00	8.3	312.9	CLOCKWISE
S2	15.15	0.15	11.4	321.5	CLOCKWISE
M4	5.66	1.39	349.4	91.3	CLOCKWISE

RMS SPEED: 54.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 109.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 45.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 8.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 3.22 CM/SEC
STANDARD DEVIATION V SERIES: 7.57 CM/SEC

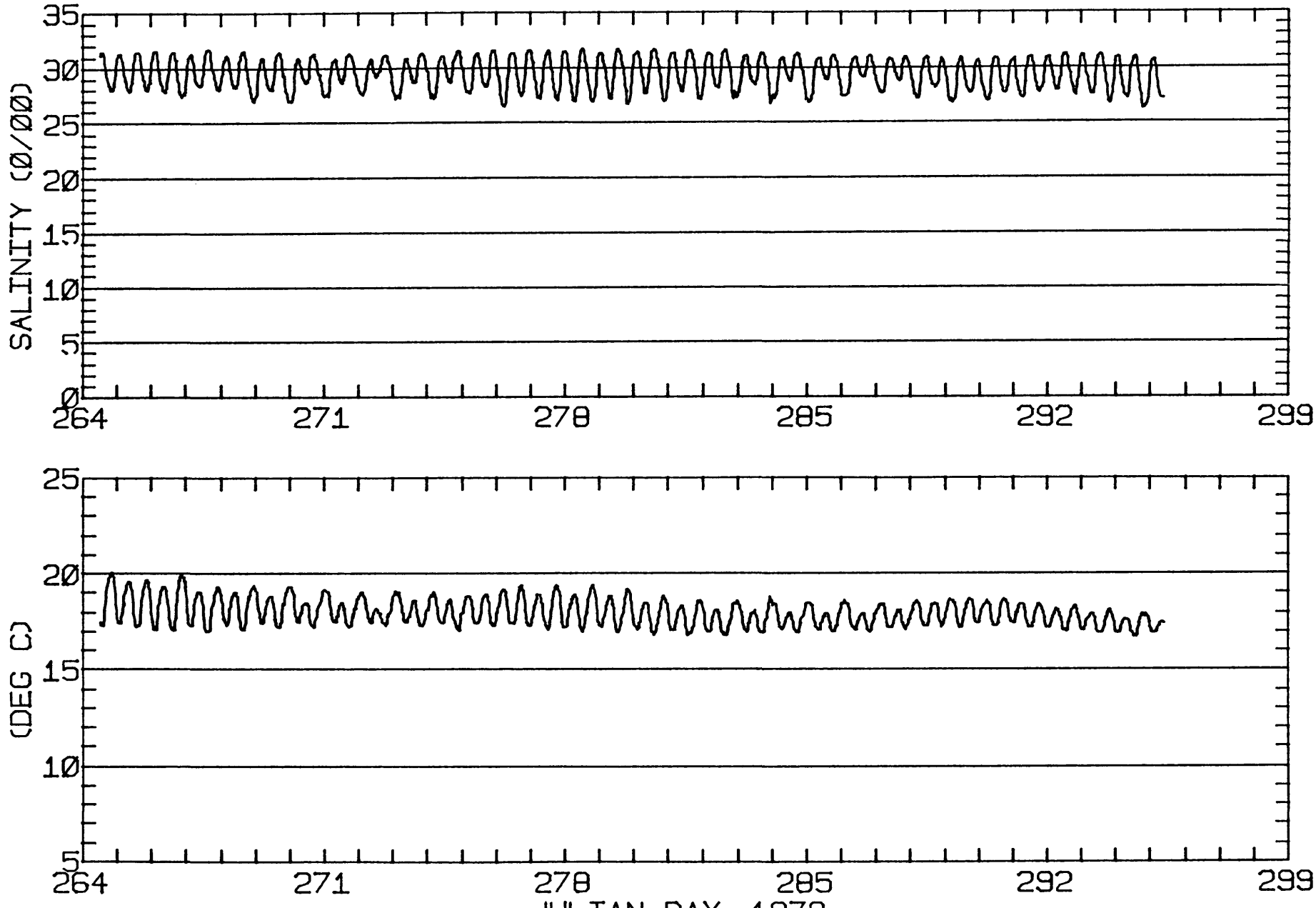
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.3	-6.2	136.
2	12	1.5	-6.7	141.
3	12	2.2	-9.0	152.
4	2	1.9	-7.4	163.
ALL	38	2.0	-7.3	





CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-27N 122-27-11W
METER 006.1 METERS ABOVE BED. WATER DEPTH 012.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-27N 122-27-11W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø12.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 215
POSITION: 37 56'32"N 122 27'10"W
METER TYPE: AANDERAA
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 11.6 M (BELOW MLLW)
START TIME OF SERIES: 8/ 5/80 1302 PST JULIAN DAY=218
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

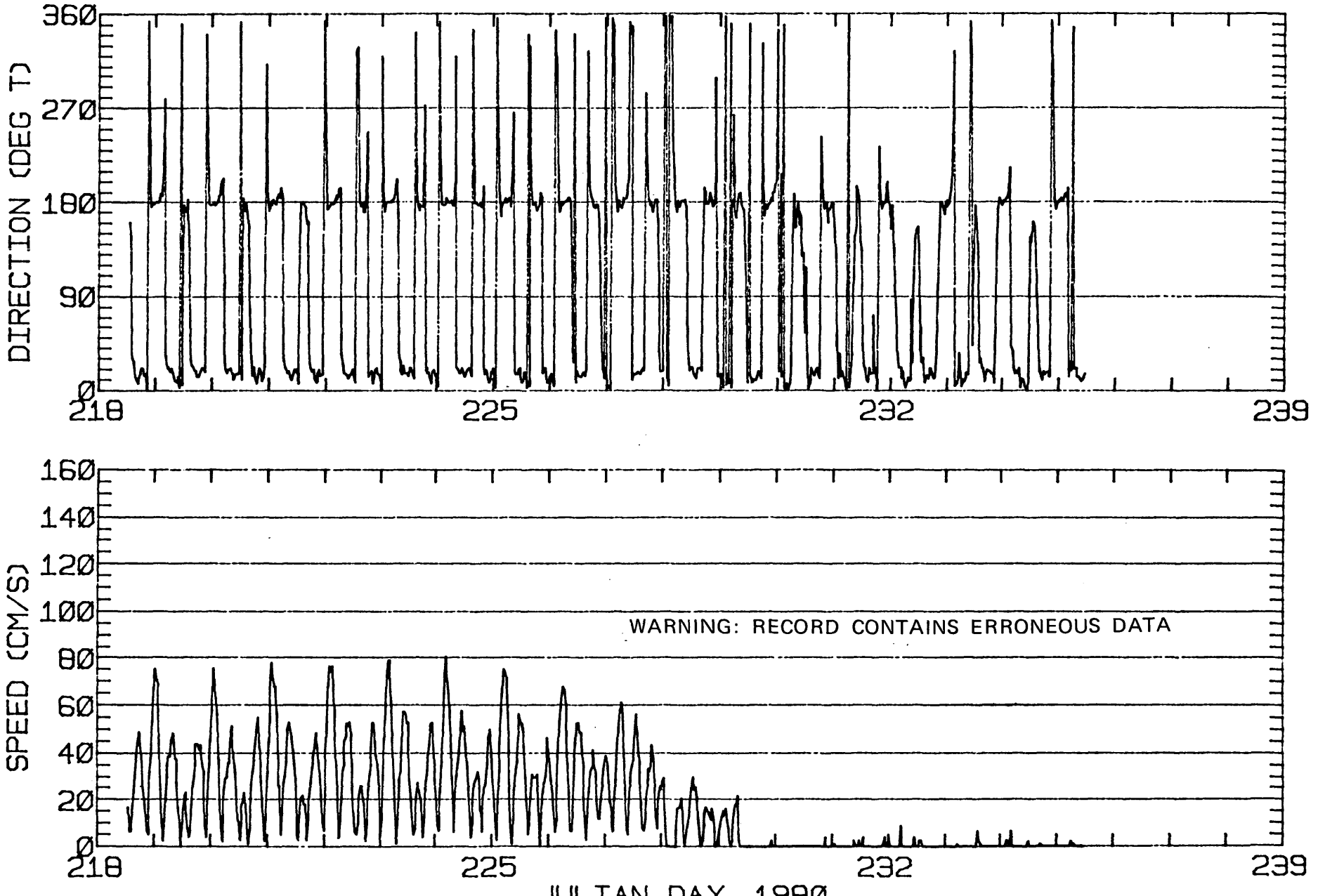
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.06	0.06	3.0	61.0	CLOCKWISE
K1	17.95	0.35	7.8	78.1	ANTI-CLOCKWISE
N2	5.48	1.51	20.6	324.5	ANTI-CLOCKWISE
M2	45.43	1.82	6.8	316.4	ANTI-CLOCKWISE
S2	8.07	0.14	14.9	340.1	ANTI-CLOCKWISE
M4	4.91	0.38	332.4	105.6	CLOCKWISE

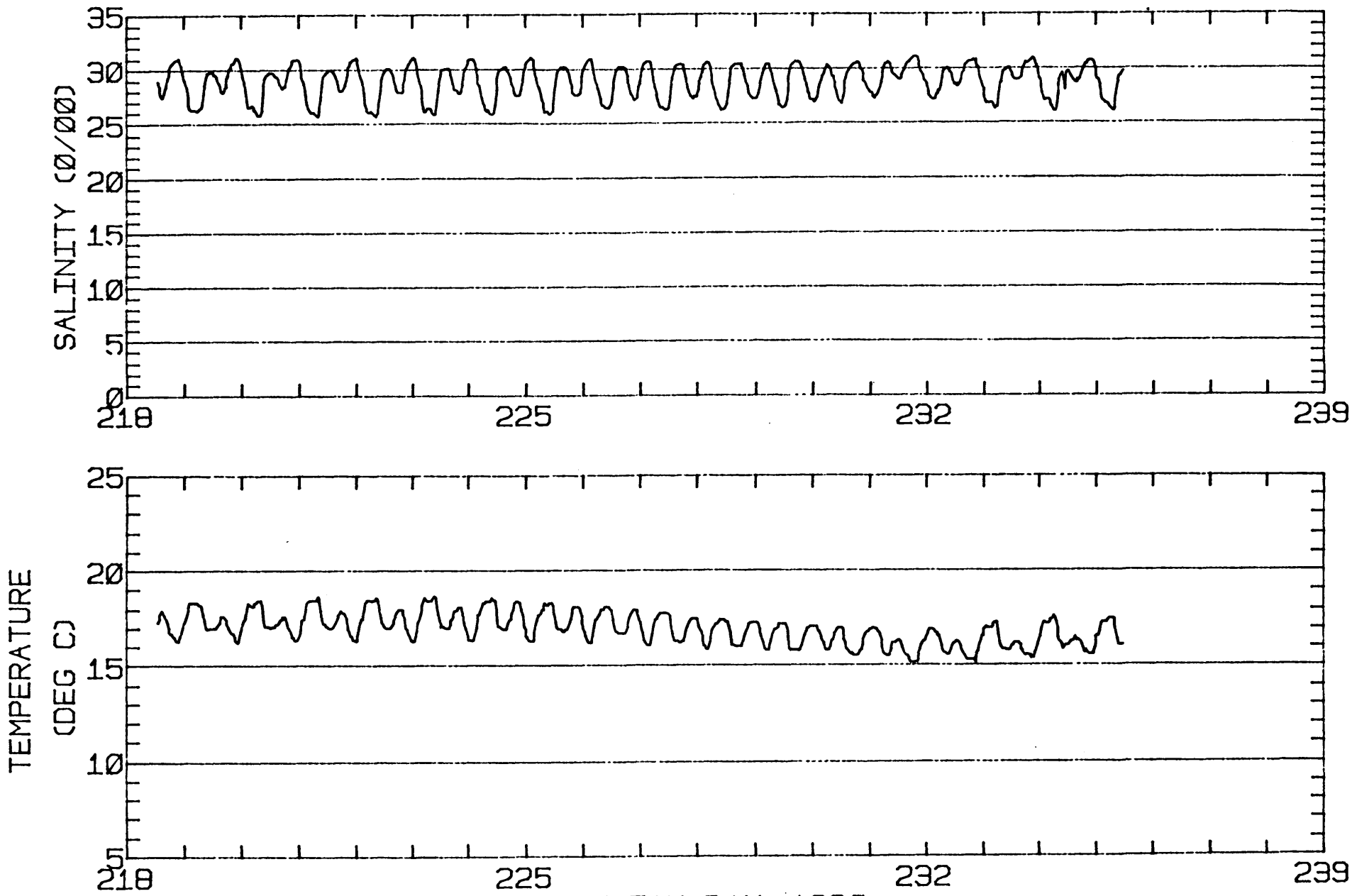
RMS SPEED: 38.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 82.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 7.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.54
STANDARD DEVIATION U-SERIES: 3.38 CM/SEC
STANDARD DEVIATION V SERIES: 4.31 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.8	2.5	145.
2	4	3.6	-0.8	127.
ALL	16	4.5	1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-32N 122-27-10W
METER 001.5 METERS ABOVE BED. WATER DEPTH 013.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-32N 122-27-10W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø13.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 215
POSITION: 37 56'32"N 122 27'10"W
METER TYPE: AANDERAA
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 8/22/80 1210 PST JULIAN DAY=235
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

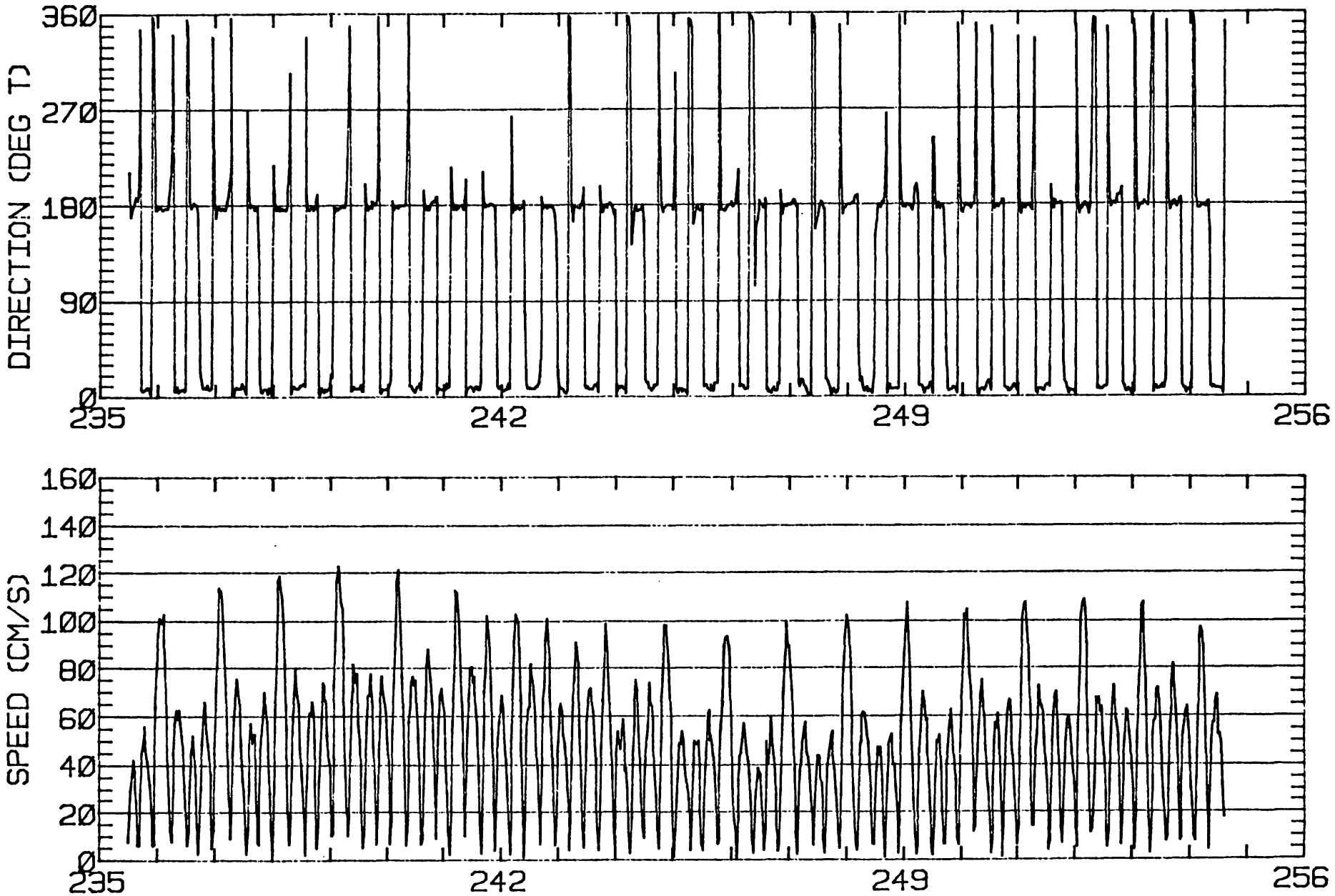
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.71	0.30	358.5	54.4	CLOCKWISE
K1	20.58	0.13	2.5	72.3	CLOCKWISE
N2	15.43	0.11	2.3	297.1	ANTI-CLOCKWISE
M2	60.90	0.54	3.0	317.2	CLOCKWISE
S2	16.46	0.65	4.1	316.4	CLOCKWISE
M4	5.79	1.15	343.4	110.9	CLOCKWISE

RMS SPEED: 56.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 111.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 2.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 3.27 CM/SEC
STANDARD DEVIATION V SERIES: 7.65 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.2	-5.2	106.
2	12	3.2	-4.0	144.
3	12	2.6	-4.6	217.
ALL	36	3.0	-4.6	

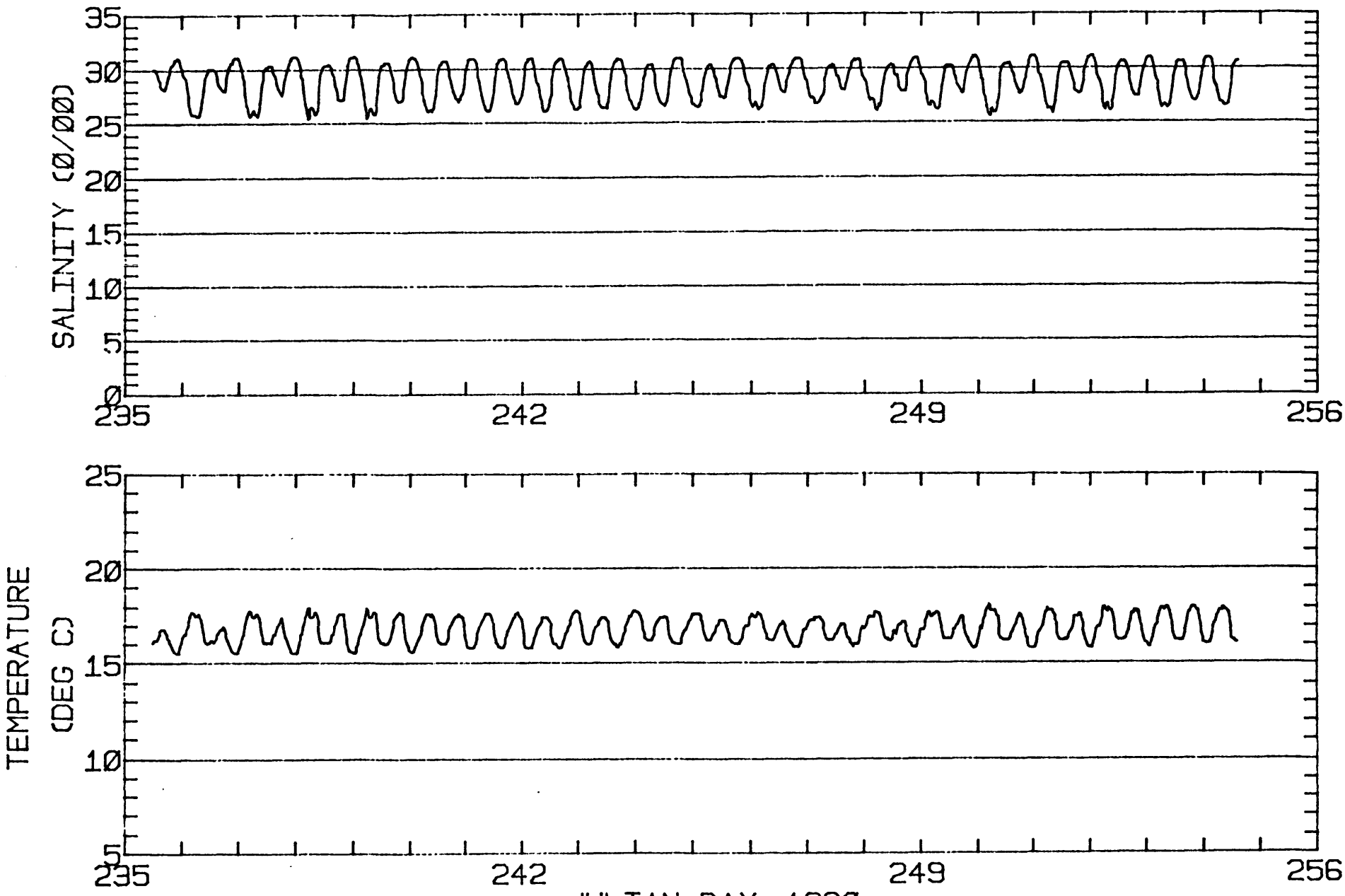


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 215 37-56-32N 122-27-10W

METER 006.1 METERS ABOVE BED. WATER DEPTH 013.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-32N 122-27-10W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø13.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 215
POSITION: 37 56'32"N 122 27'10"W
METER TYPE: AANDERAA
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 9/10/80 1520 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

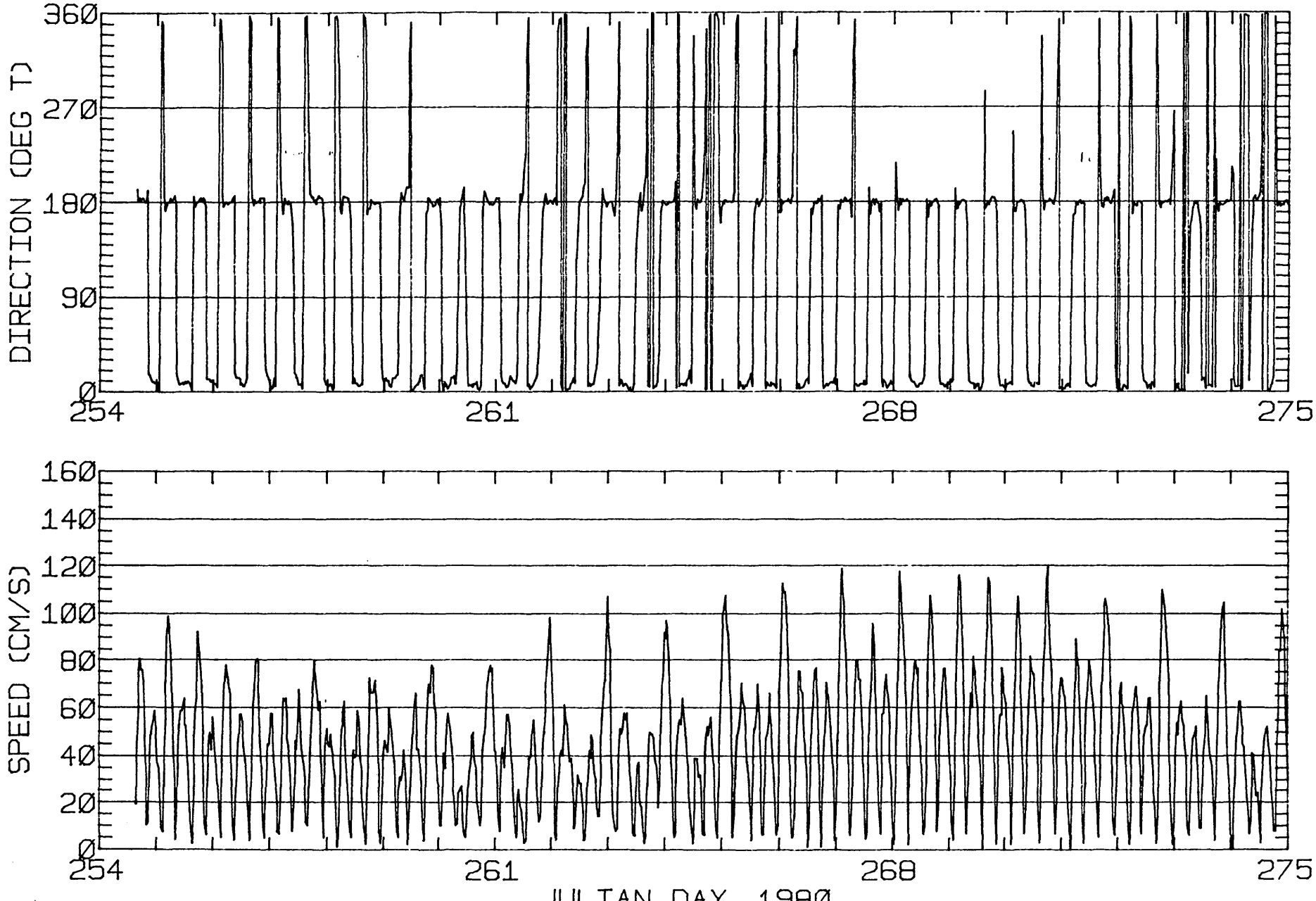
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.53	0.27	0.4	42.3	CLOCKWISE
K1	19.69	0.10	2.9	59.1	ANTI-CLOCKWISE
N2	9.88	0.53	355.4	292.9	CLOCKWISE
M2	66.08	0.21	3.0	312.6	CLOCKWISE
S2	12.95	0.28	7.0	314.2	ANTI-CLOCKWISE
M4	7.01	0.78	357.5	91.6	CLOCKWISE

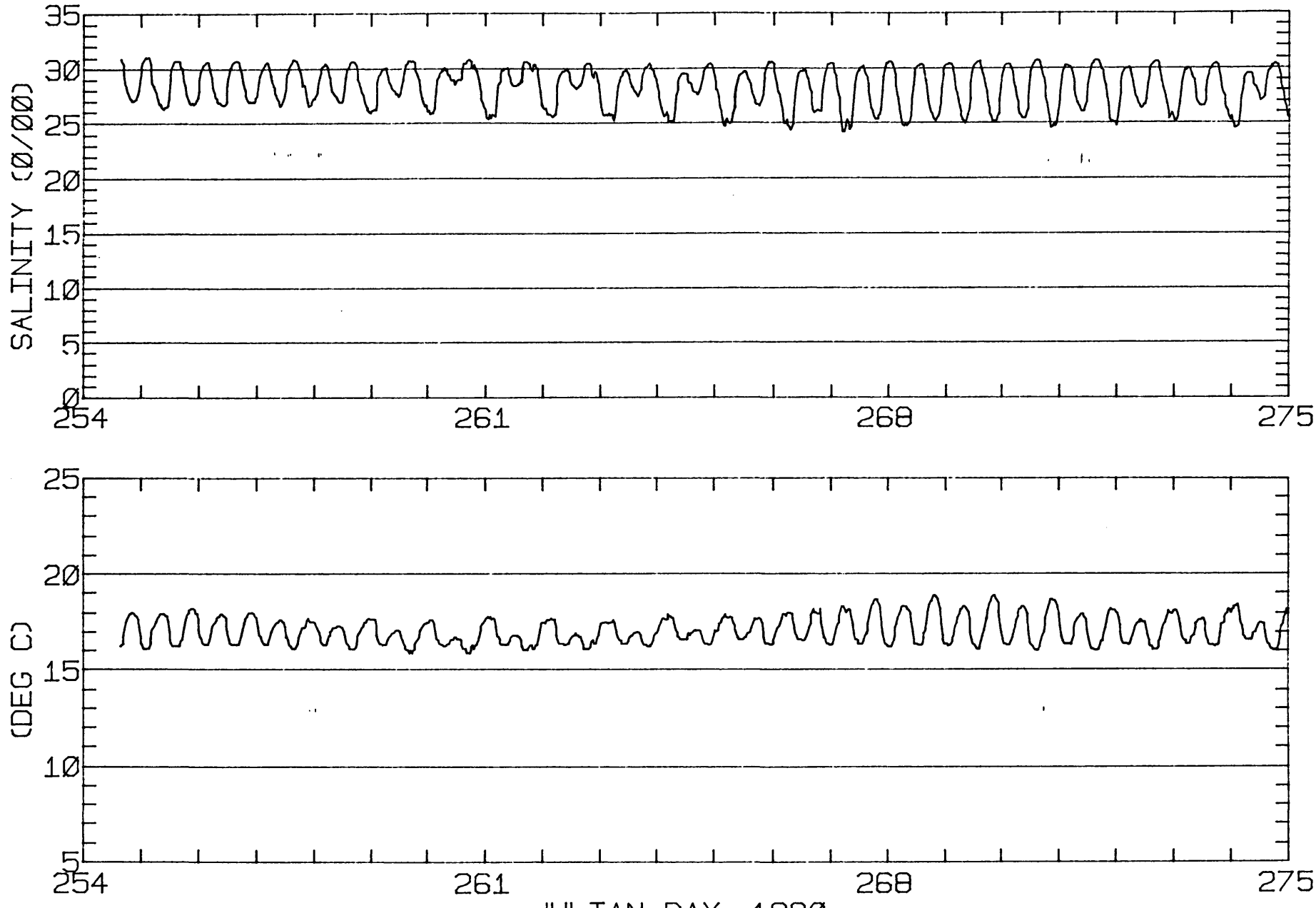
RMS SPEED: 53.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 114.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 3.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.45
STANDARD DEVIATION U-SERIES: 3.47 CM/SEC
STANDARD DEVIATION V SERIES: 7.98 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.0	-3.0	271.
2	12	2.3	-1.2	305.
3	12	2.4	-5.9	367.
4	2	1.6	-4.2	283.
ALL	38	2.2	-3.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-32N 122-27-10W
METER 006.1 METERS ABOVE BED. WATER DEPTH 013.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-32N 122-27-10W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø13.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 215
POSITION: 37 56'32"N 122 27'10"W
METER TYPE: AANDERAA
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 11.6 M (BELOW MLLW)
START TIME OF SERIES: 9/10/80 1512 PST JULIAN DAY=254
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

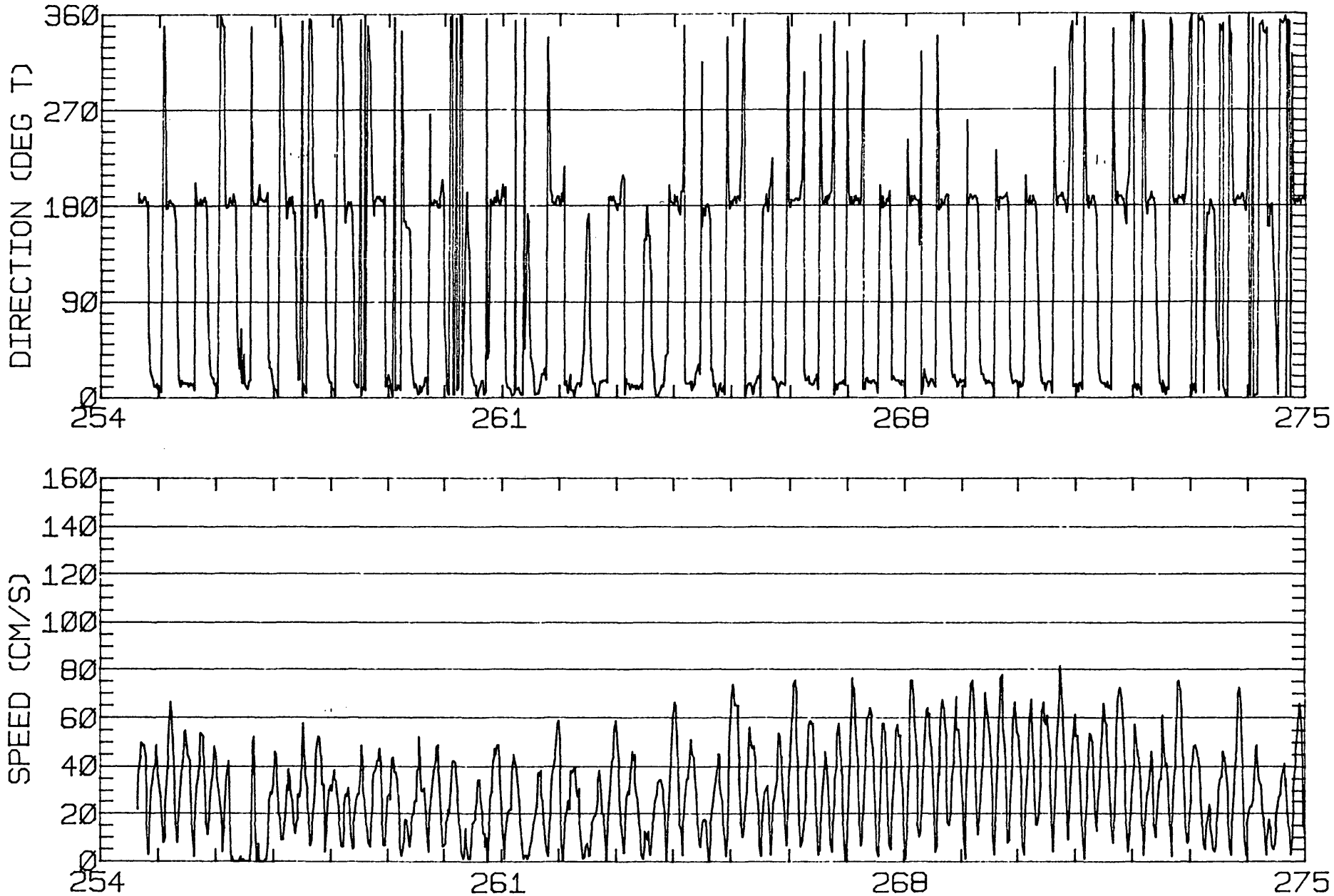
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.24	0.41	6.9	42.9	CLOCKWISE
K1	13.44	0.39	10.8	59.0	CLOCKWISE
N2	9.31	0.39	10.4	290.5	CLOCKWISE
M2	42.98	0.46	7.4	308.1	ANTI-CLOCKWISE
S2	10.79	0.90	19.2	305.0	ANTI-CLOCKWISE
M4	3.65	0.10	358.6	57.9	CLOCKWISE

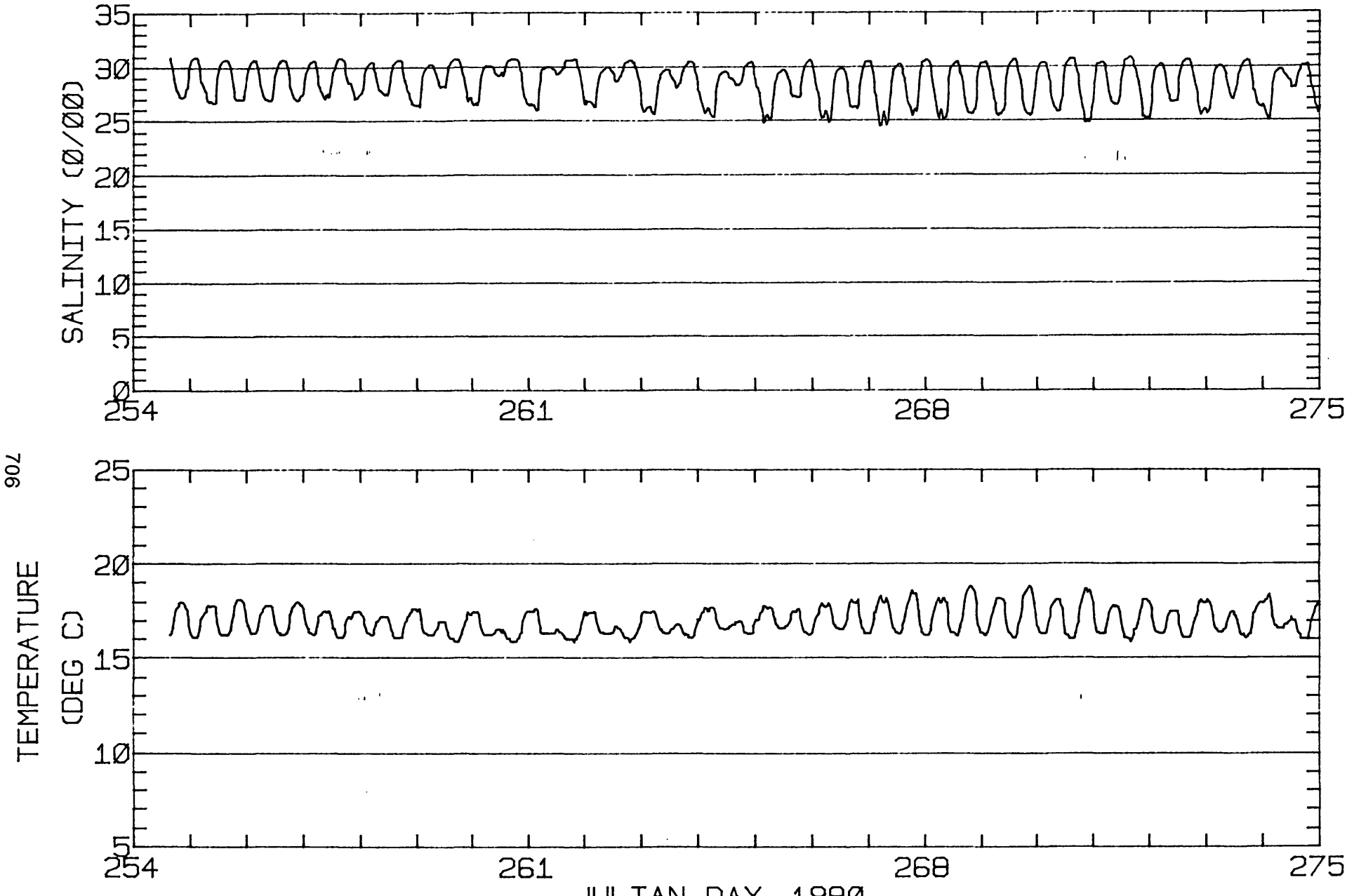
RMS SPEED: 36.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 79.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 9.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 4.16 CM/SEC
STANDARD DEVIATION V SERIES: 7.84 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	2.6	271.
2	12	2.1	3.8	305.
3	12	2.6	0.8	367.
4	2	-1.4	3.3	283.
ALL	38	2.0	2.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-32N 122-27-10W
METER 001.5 METERS ABOVE BED. WATER DEPTH 013.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 215 37-56-32N 122-27-10W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø13.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 216
POSITION: 37 56'28"N 122 25'36"W
METER TYPE: AANDERAA
WATER DEPTH: 13.7 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 9/21/79 1400 PST JULIAN DAY=264
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

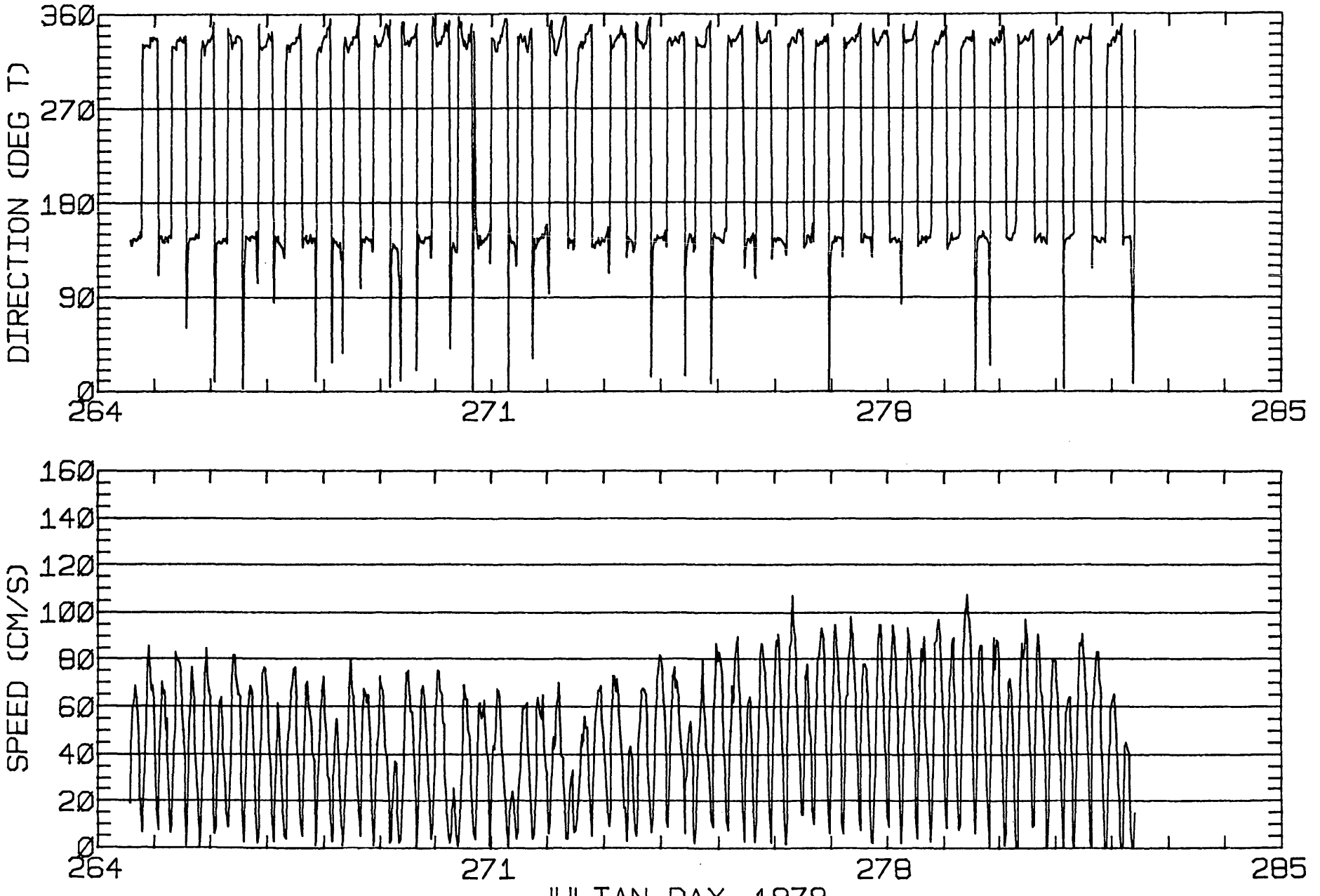
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.51	0.10	329.3	33.7	ANTI-CLOCKWISE
K1	14.99	0.54	332.3	52.2	ANTI-CLOCKWISE
N2	12.71	0.01	332.3	273.6	CLOCKWISE
M2	62.63	2.62	331.0	292.8	CLOCKWISE
S2	17.34	0.31	331.6	299.9	CLOCKWISE
M4	2.37	1.35	304.7	43.7	ANTI-CLOCKWISE

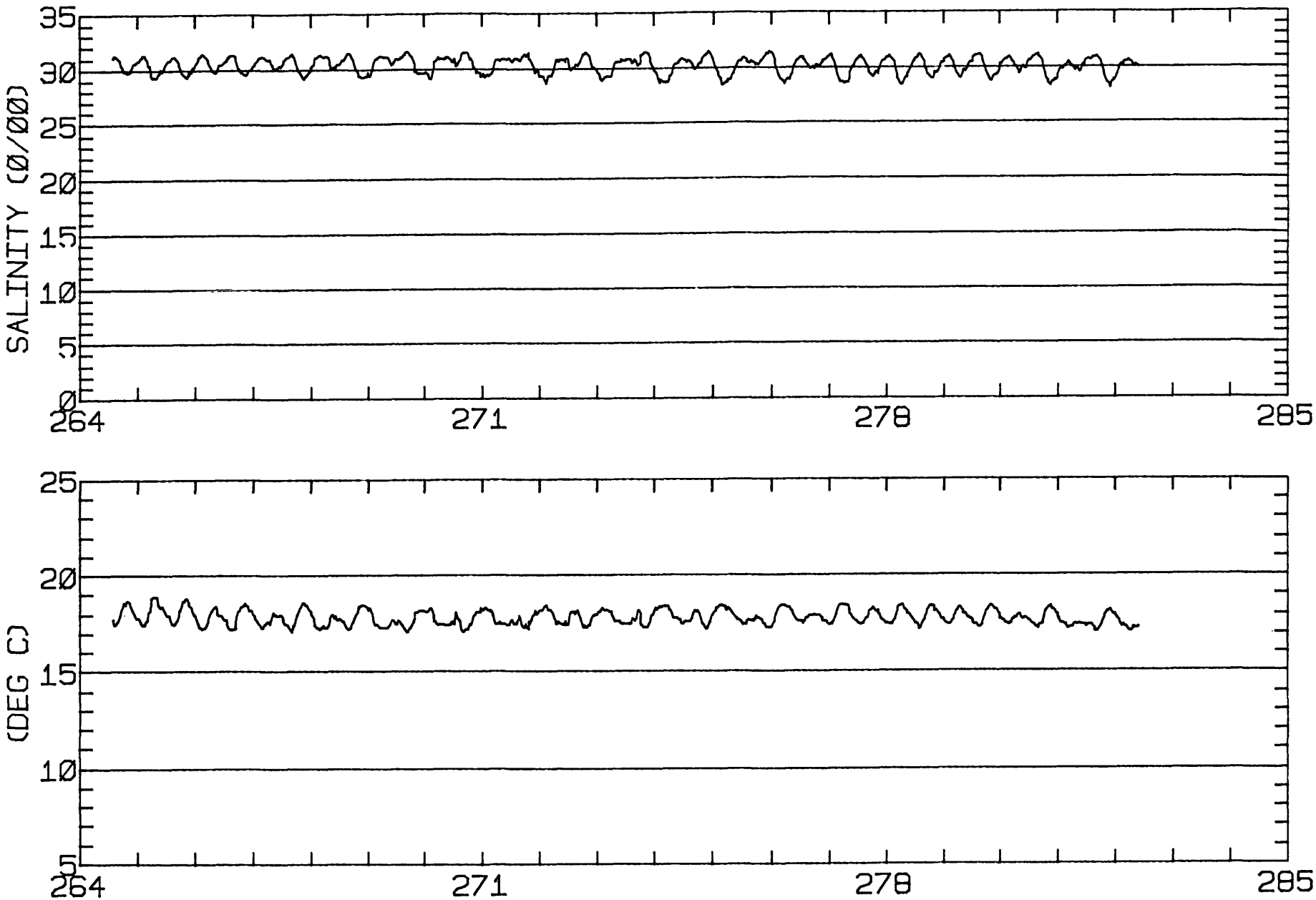
RMS SPEED: 53.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 108.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 43.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 331.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 4.93 CM/SEC
STANDARD DEVIATION V SERIES: 6.72 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.9	9.8	136.
2	12	-0.4	9.5	141.
3	6	1.1	9.3	150.
ALL	30	-0.3	9.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 216 37-56-28N 122-25-36W
METER 006.1 METERS ABOVE BED. WATER DEPTH 013.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 216 37-56-28N 122-25-36W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø13.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 216
POSITION: 37 56'23"N 122 25'36"W
METER TYPE: AANDERAA
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 9/ 2/80 1642 PST JULIAN DAY=246
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

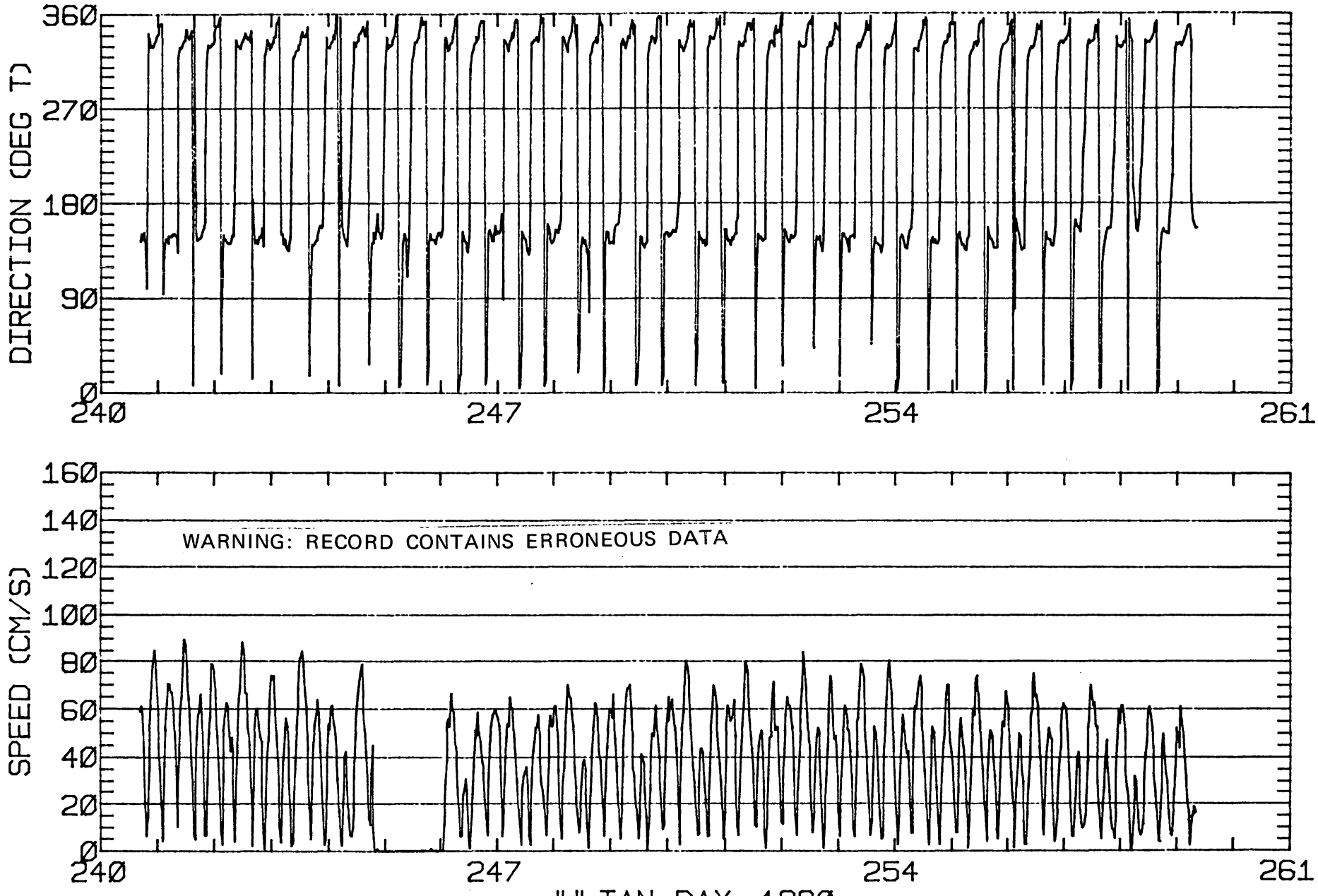
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.96	0.63	334.5	43.8	CLOCKWISE
K1	11.87	1.35	338.8	62.7	CLOCKWISE
N2	13.96	2.19	337.8	298.6	CLOCKWISE
M2	55.80	5.50	335.3	294.8	CLOCKWISE
S2	16.78	1.54	329.7	299.6	CLOCKWISE
M4	3.38	0.39	268.2	135.0	CLOCKWISE

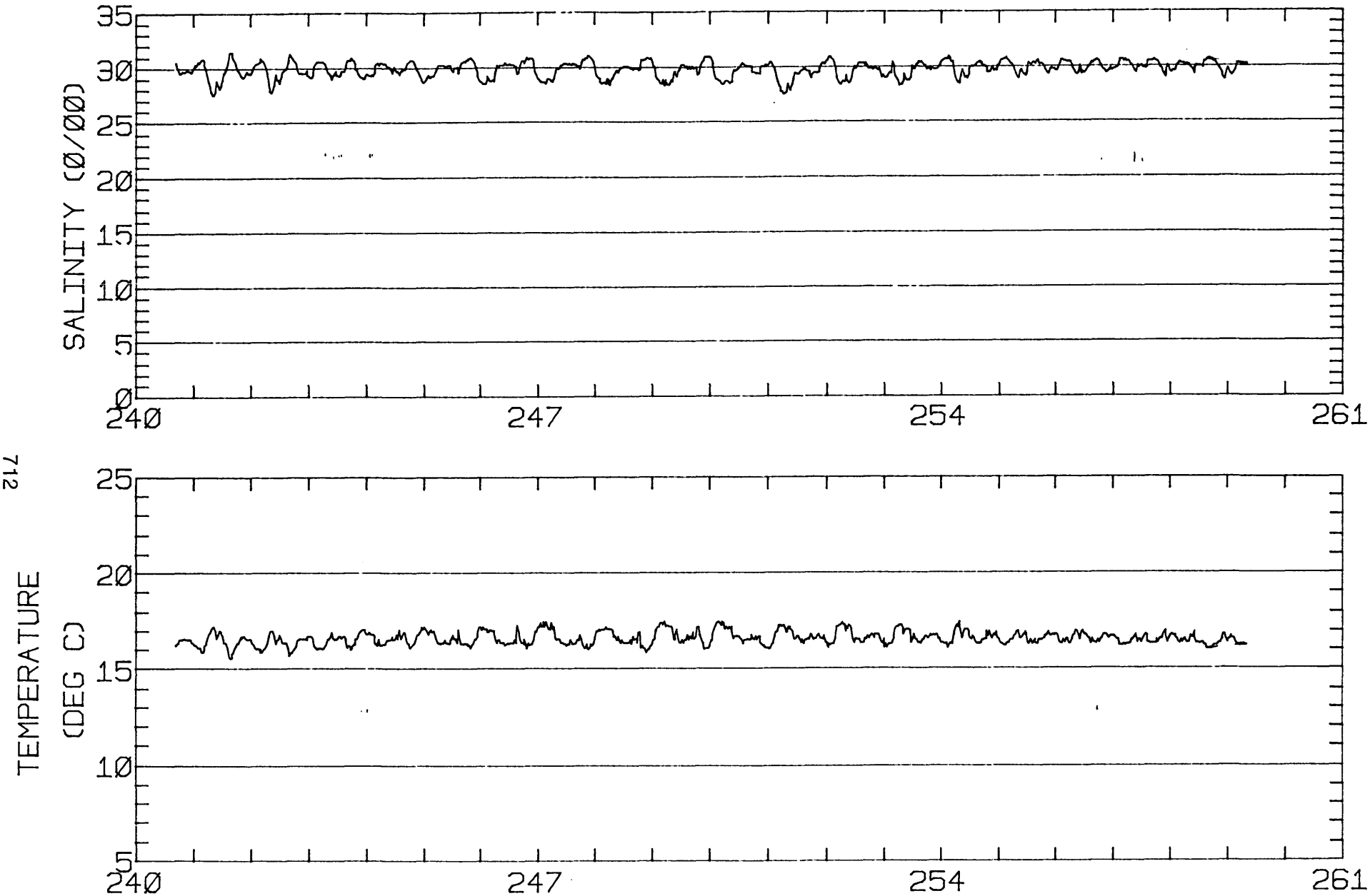
RMS SPEED: 43.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 95.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 38.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 334.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 5.56 CM/SEC
STANDARD DEVIATION V SERIES: 5.76 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.5	8.9	214.
2	12	-2.8	12.3	248.
ALL	24	-1.2	10.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 216 37-56-23N 122-25-36W
METER 001.5 METERS ABOVE BED. WATER DEPTH 014.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 216 37-56-23N 122-25-36W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø14.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 216
POSITION: 37 56'21"N 122 25'36"W
METER TYPE: AANDERAA
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 9/15/80 820 PST JULIAN DAY=259
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

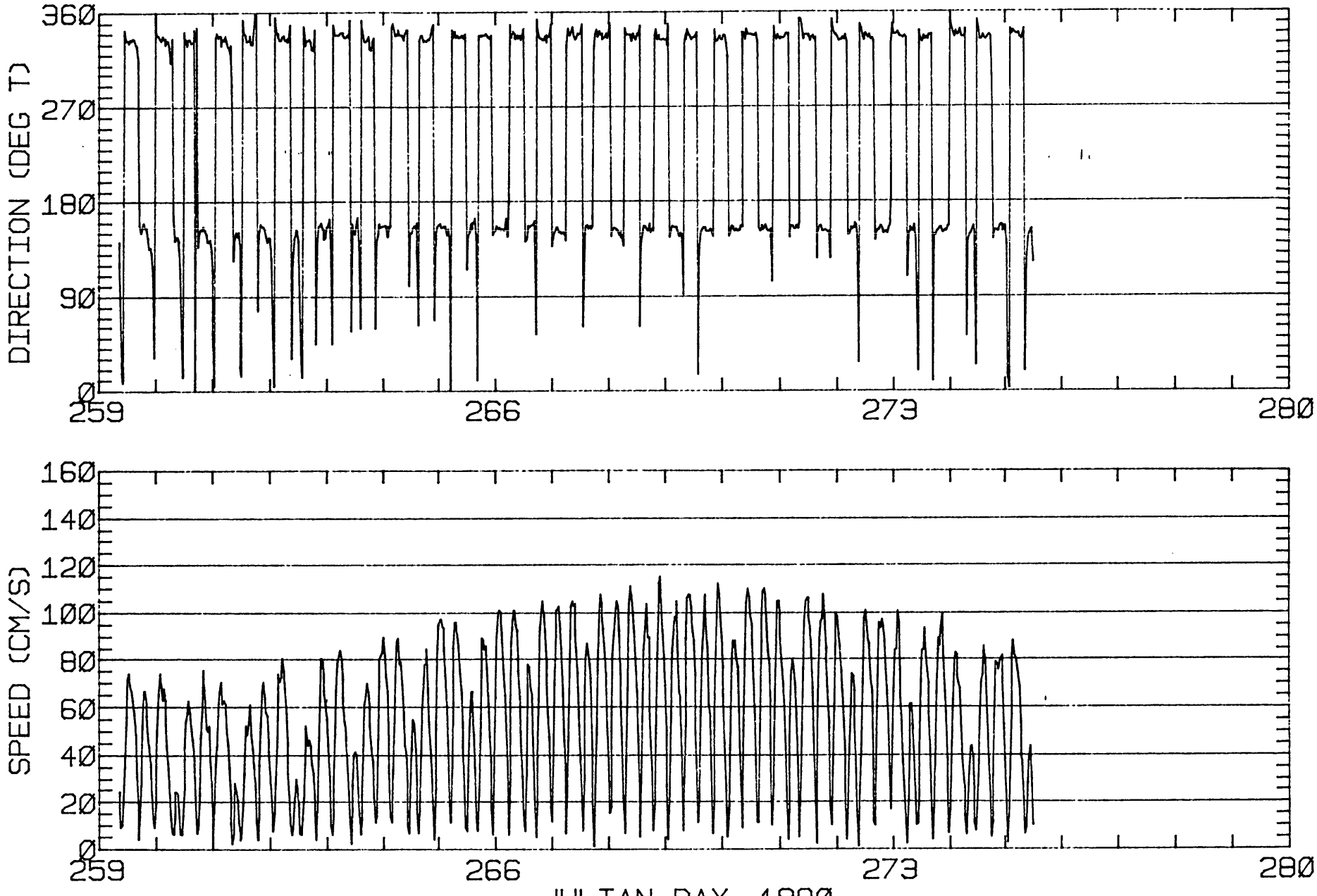
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	15.62	1.18	332.5	38.8	ANTI-CLOCKWISE
K1	18.71	0.69	336.7	52.9	ANTI-CLOCKWISE
N2	16.77	0.52	339.2	290.3	CLOCKWISE
M2	72.74	0.76	334.7	298.3	ANTI-CLOCKWISE
S2	16.67	0.36	339.4	301.3	ANTI-CLOCKWISE
M4	2.53	0.17	337.1	94.7	ANTI-CLOCKWISE

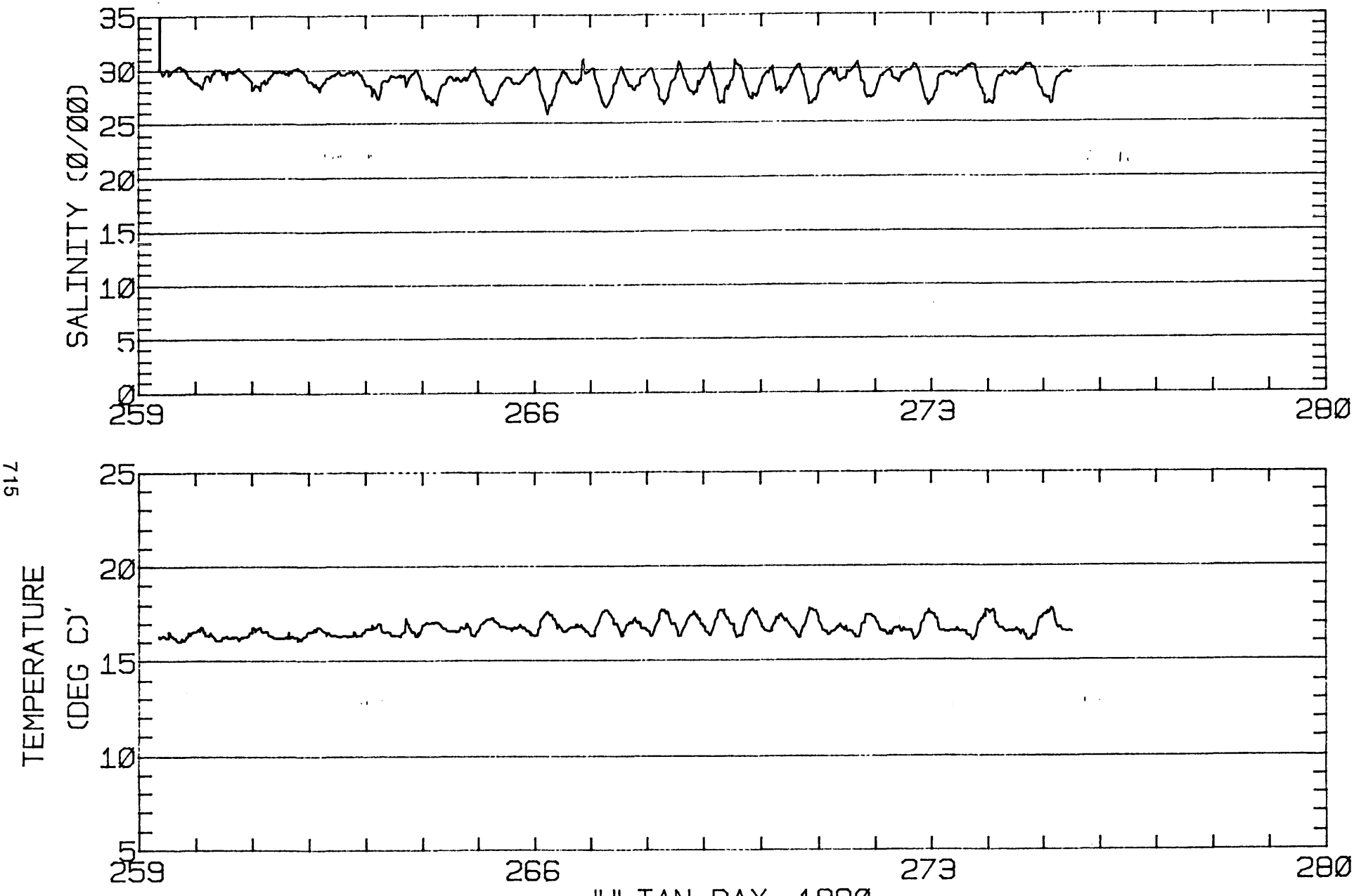
RMS SPEED: 63.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 123.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 53.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 335.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 4.69 CM/SEC
STANDARD DEVIATION V SERIES: 8.84 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.4	10.3	309.
2	12	-0.8	7.6	294.
3	6	-1.0	8.0	456.
ALL	30	-1.5	8.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 216 37-56-21N 122-25-36W
METER 007.9 METERS ABOVE BED. WATER DEPTH 014.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 216 37-56-21N 122-25-36W
METER ØØ7.9 METERS ABOVE BED. WATER DEPTH Ø14.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 218
POSITION: 37 55'15"N 122 23'48"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 9/19/79 820 PST JULIAN DAY=262
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

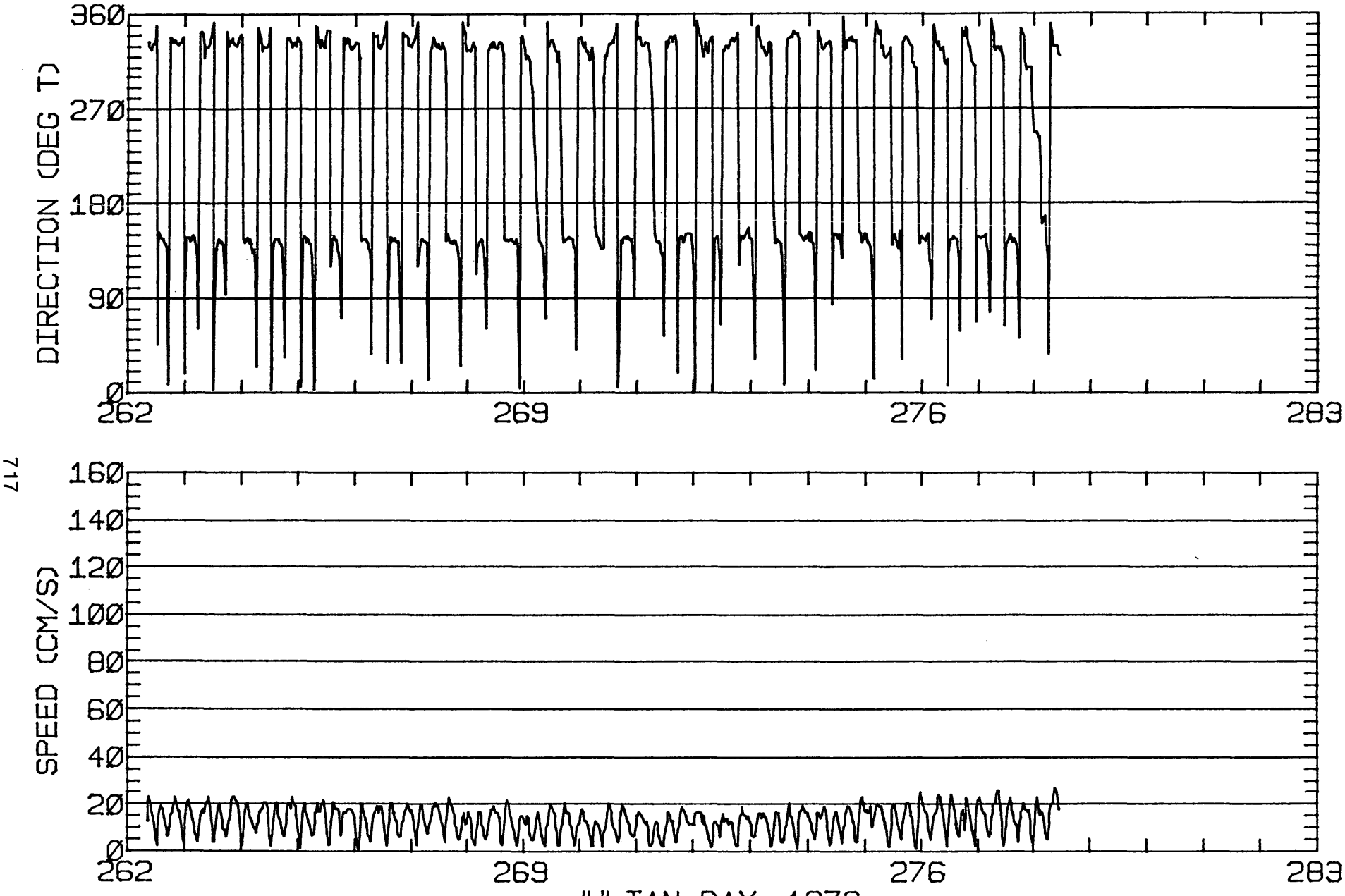
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.24	0.23	322.8	25.9	ANTI-CLOCKWISE
K1	3.26	0.12	325.1	39.9	CLOCKWISE
N2	3.53	0.39	333.8	249.4	ANTI-CLOCKWISE
M2	18.48	1.20	329.8	276.4	ANTI-CLOCKWISE
S2	5.37	0.23	326.0	290.9	ANTI-CLOCKWISE
M4	1.48	0.40	345.3	0.2	CLOCKWISE

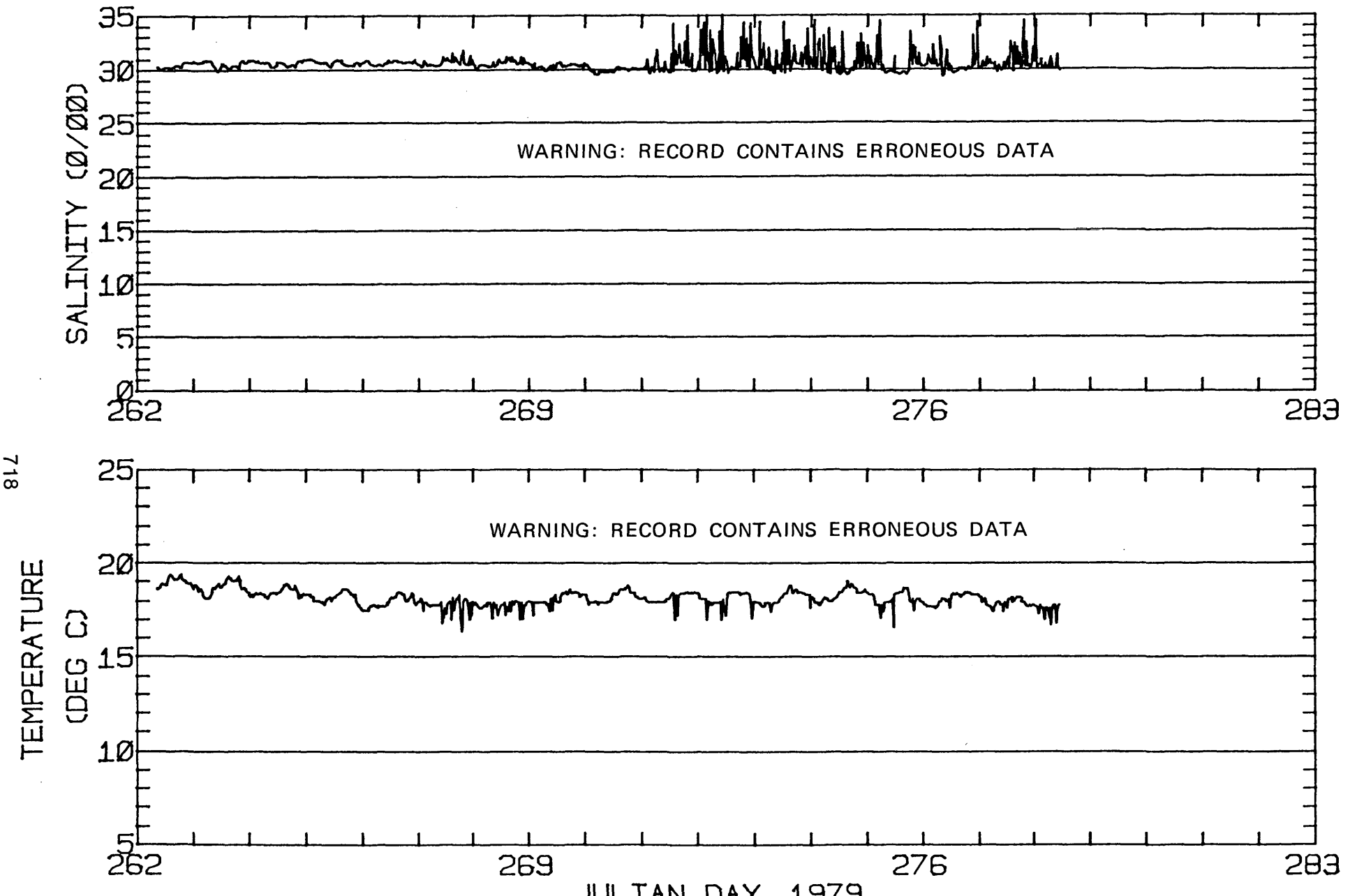
RMS SPEED: 14.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 30.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 13.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 327.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 2.27 CM/SEC
STANDARD DEVIATION V SERIES: 3.05 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.1	3.4	146.
2	12	0.1	1.4	135.
3	6	0.6	1.0	156.
ALL	30	0.2	2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 218 37-55-15N 122-23-48W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 218 37-55-15N 122-23-48W
METER ØØØ.8 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 219
POSITION: 37 54'11"N 122 22'21"W
METER TYPE: AANDERAA
WATER DEPTH: 1.8 M (MLLW)
METER DEPTH: .3 M (BELOW MLLW)
START TIME OF SERIES:10/ 5/79 2210 PST JULIAN DAY=278
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

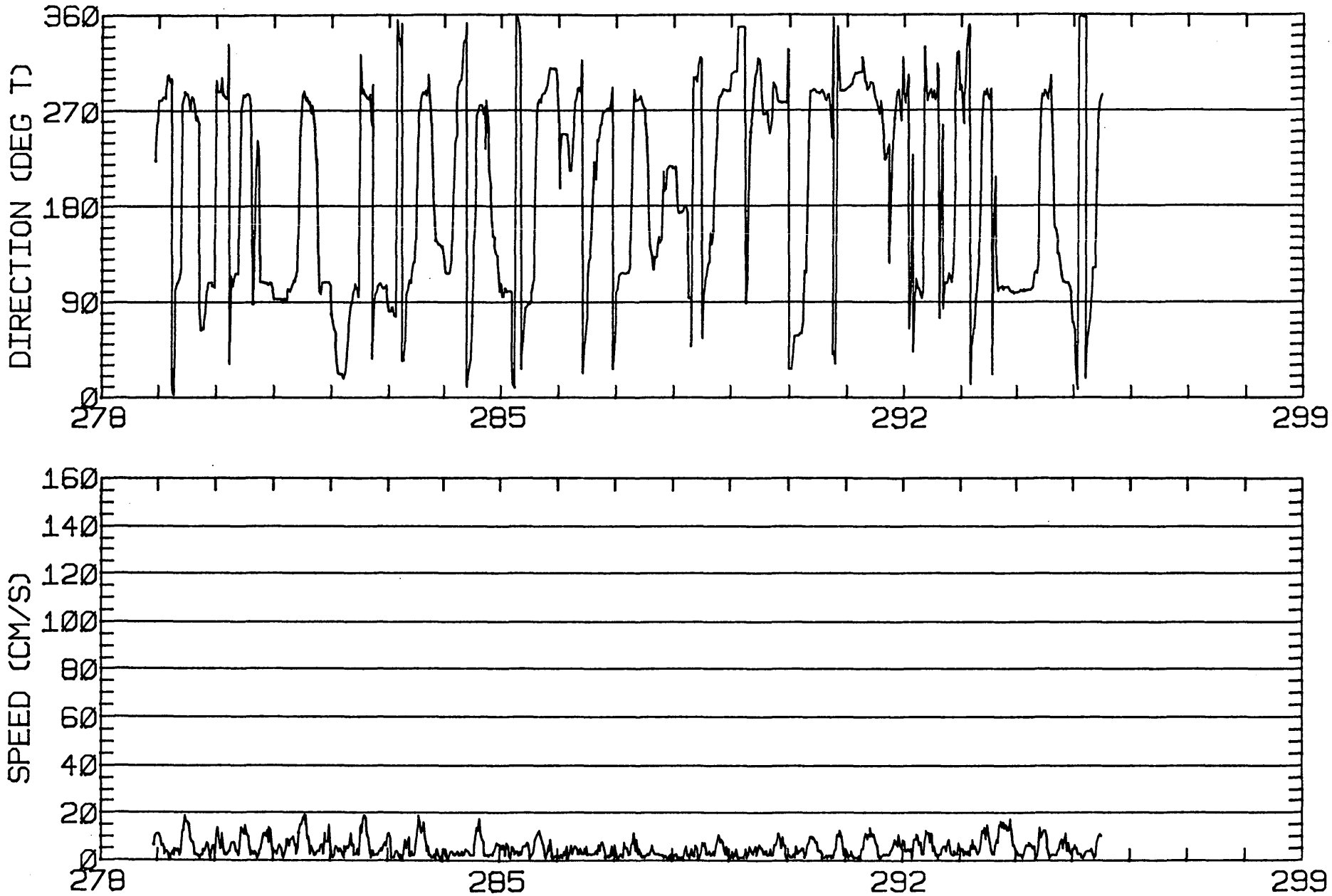
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.32	0.23	97.7	16.3	ANTI-CLOCKWISE
K1	3.38	0.87	93.9	311.9	ANTI-CLOCKWISE
N2	1.17	0.15	112.5	219.4	ANTI-CLOCKWISE
M2	5.98	0.63	105.4	195.0	CLOCKWISE
S2	2.14	0.22	102.4	207.2	ANTI-CLOCKWISE
M4	0.96	0.11	116.5	142.1	CLOCKWISE

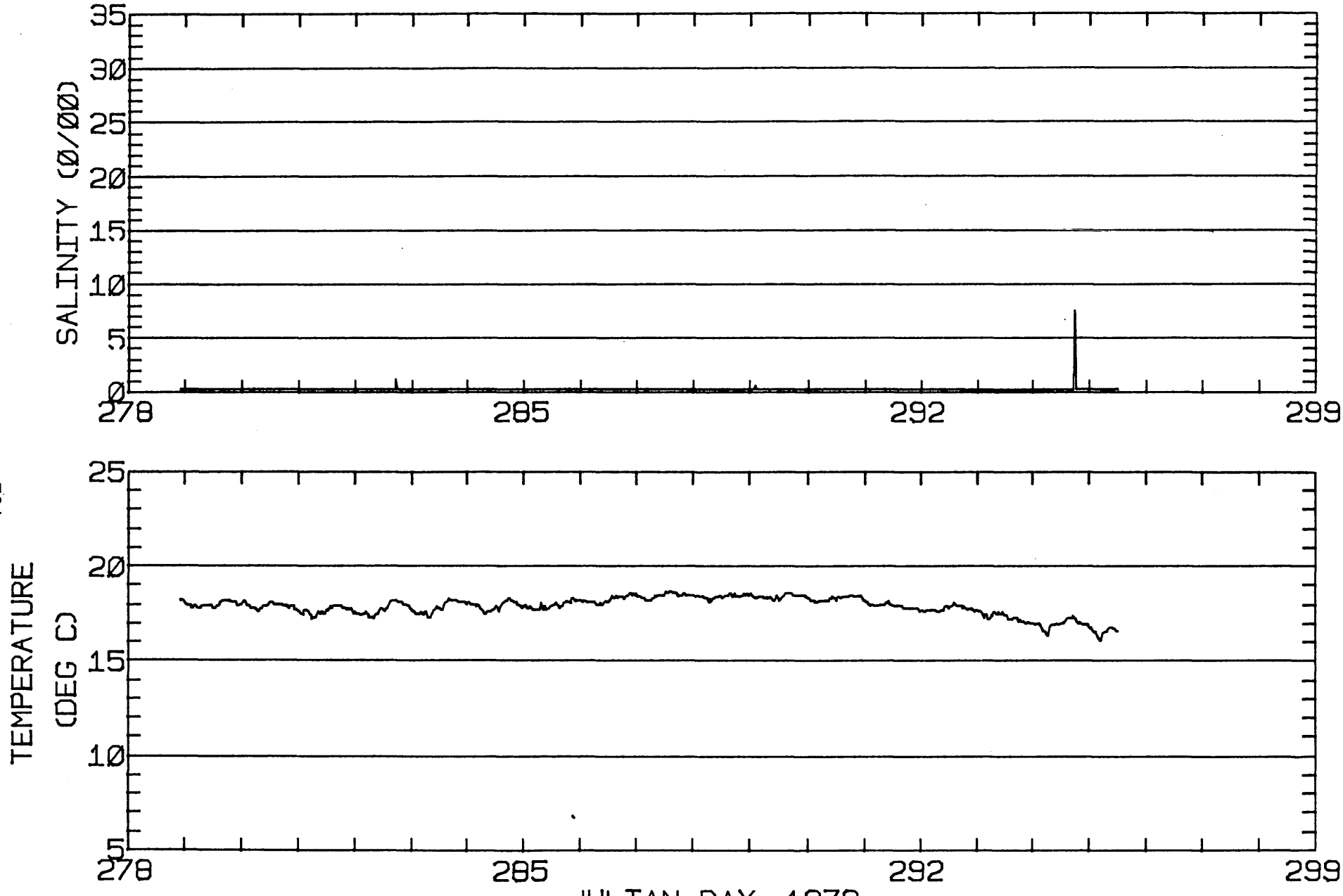
RMS SPEED: 7.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 14.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 3.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 100.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.82
STANDARD DEVIATION U-SERIES: 4.36 CM/SEC
STANDARD DEVIATION V SERIES: 2.05 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.6	0.1	157.
2	12	-1.9	0.4	207.
3	6	-0.0	0.1	174.
ALL	30	-1.0	0.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 219 37-54-11N 122-22-21W
METER 001.5 METERS ABOVE BED. WATER DEPTH 001.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 219 37-54-11N 122-22-21W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ1.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 221
POSITION: 37 52'37"N 122 21'32"W
METER TYPE: AANDERAA
WATER DEPTH: 2.4 M (MLLW)
METER DEPTH: .9 M (BELOW MLLW)
START TIME OF SERIES:10/ 2/79 1220 PST JULIAN DAY=275
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

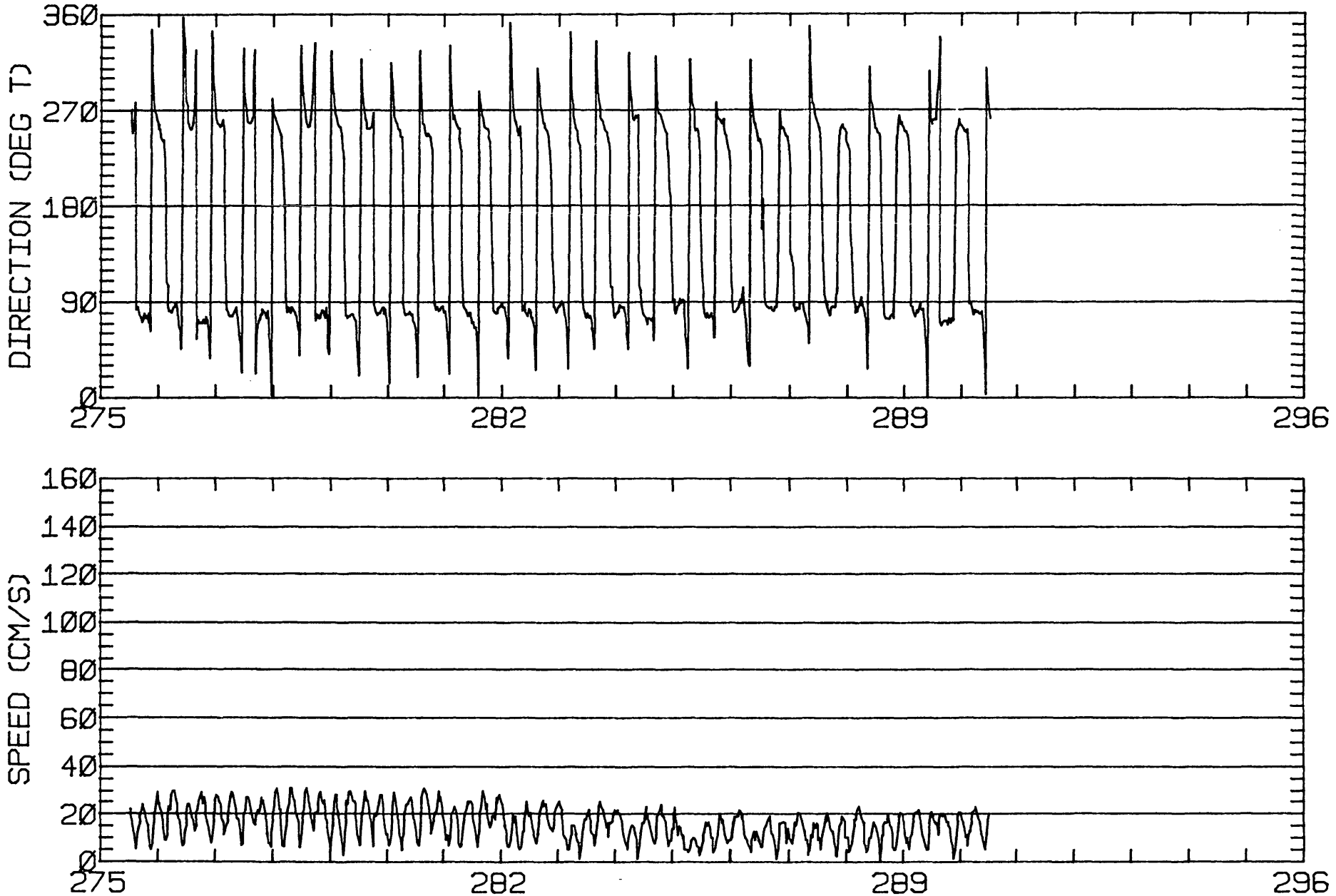
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	2.70	0.92	61.9	18.2	ANTI-CLOCKWISE
K1	3.44	1.77	86.8	8.8	ANTI-CLOCKWISE
N2	3.78	1.07	72.3	230.8	ANTI-CLOCKWISE
M2	20.71	1.89	79.3	268.0	ANTI-CLOCKWISE
S2	4.51	0.11	87.7	250.4	ANTI-CLOCKWISE
M4	2.40	0.68	50.5	35.4	ANTI-CLOCKWISE

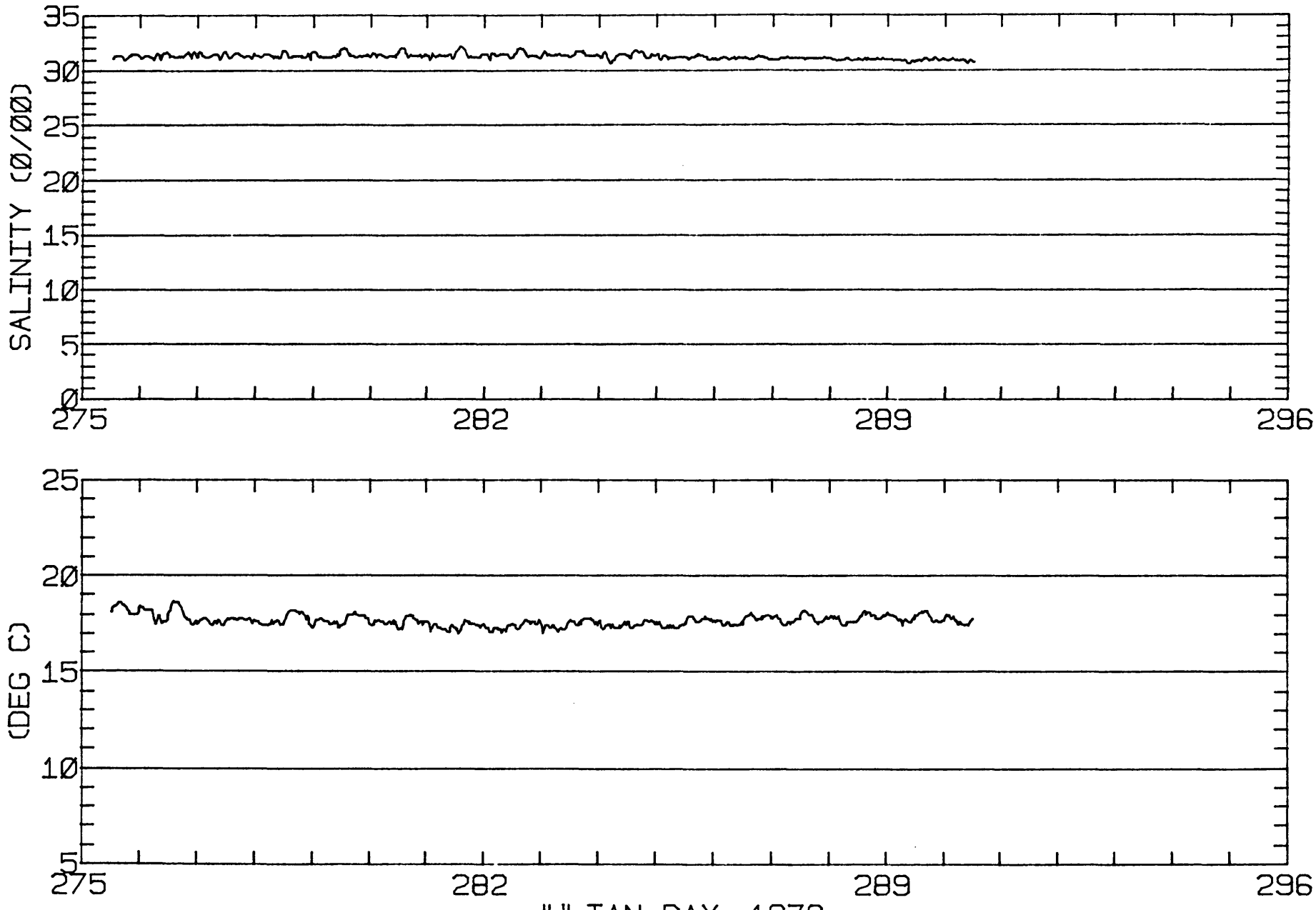
RMS SPEED: 18.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 31.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 15.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 79.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 3.05 CM/SEC
STANDARD DEVIATION V SERIES: 2.88 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.2	1.5	152.
2	12	2.8	-0.3	190.
3	4	2.3	0.3	200.
ALL	28	2.5	0.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 221 37-52-37N 122-21-32W
METER 001.5 METERS ABOVE BED. WATER DEPTH 002.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 221 37-52-37N 122-21-32W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ2.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 222
POSITION: 37 51' 8"N 122 18'40"W
METER TYPE: AANDERAA
WATER DEPTH: 1.8 M (MLLW)
METER DEPTH: .9 M (BELOW MLLW)
START TIME OF SERIES: 9/19/79 1220 PST JULIAN DAY=262
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

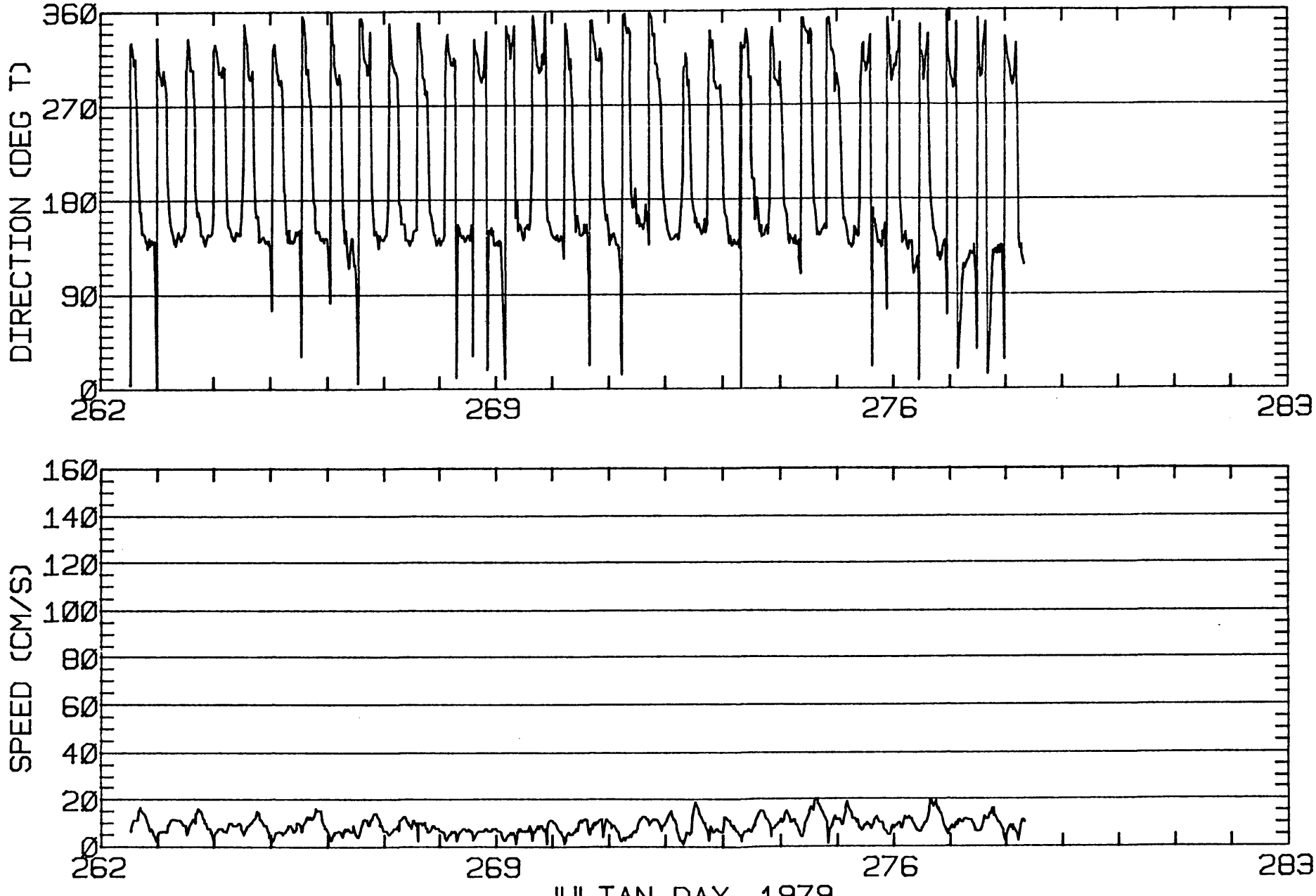
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	1.55	0.33	136.6	31.1	CLOCKWISE
K1	1.29	0.06	112.9	29.3	CLOCKWISE
N2	2.62	0.67	147.1	263.2	CLOCKWISE
M2	10.43	2.06	136.8	261.8	ANTI-CLOCKWISE
S2	2.07	0.24	125.6	271.3	CLOCKWISE
M4	2.02	0.74	139.9	9.7	ANTI-CLOCKWISE

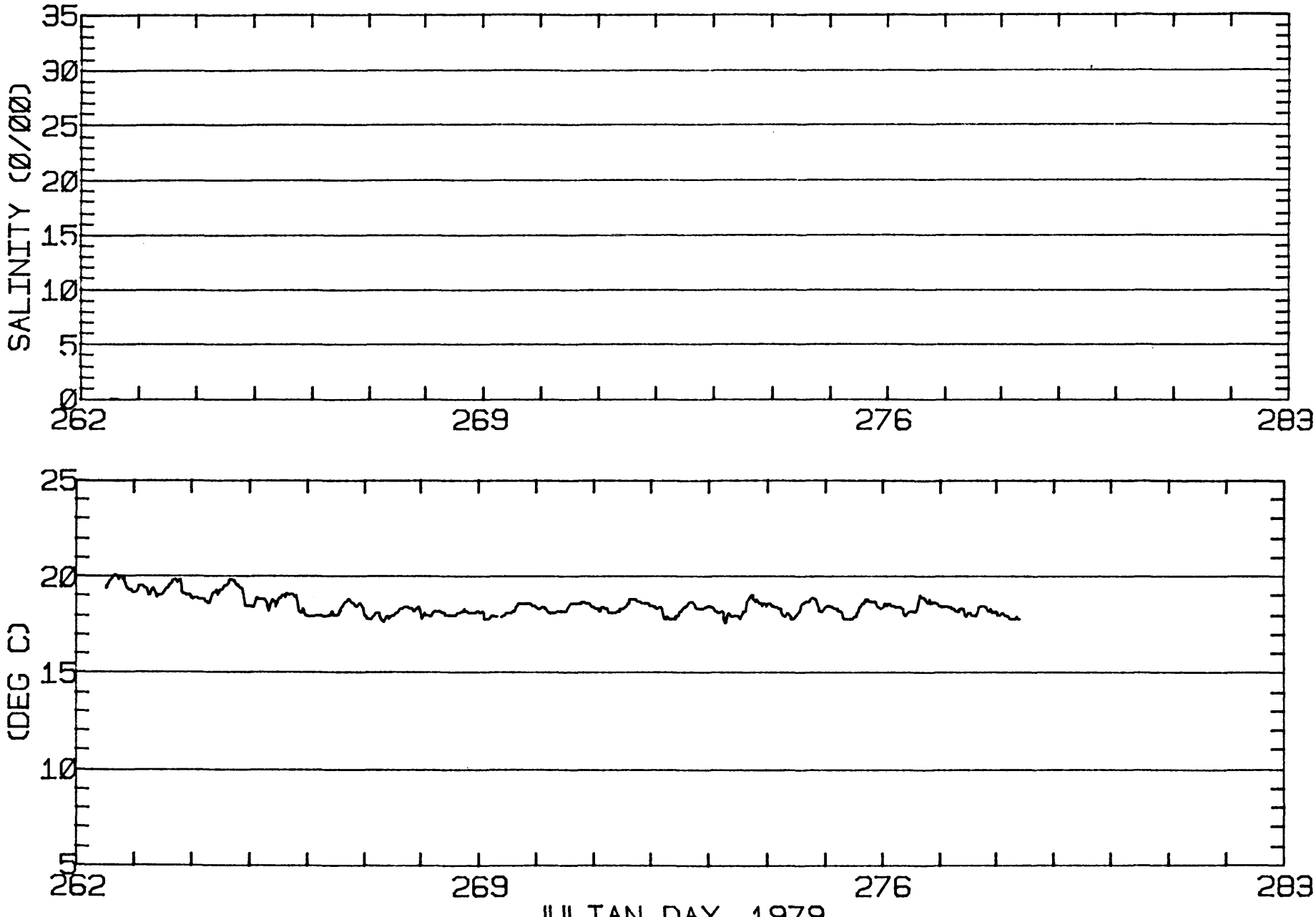
RMS SPEED: 10.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 15.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 8.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 133.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 2.15 CM/SEC
STANDARD DEVIATION V SERIES: 4.27 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.5	-3.1	146.
2	12	0.6	-3.1	135.
3	6	2.0	-2.0	156.
ALL	30	0.8	-2.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 222 37-51- 8N 122-18-40W
METER 000.9 METERS ABOVE BED. WATER DEPTH 001.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 222 37-51- 8N 122-18-40W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ1.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 222
POSITION: 37 51' 9"N 122 18'45"W
METER TYPE: AANDERAA
WATER DEPTH: 1.8 M (MLLW)
METER DEPTH: .9 M (BELOW MLLW)
START TIME OF SERIES:11/10/80 1350 PST JULIAN DAY=315
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

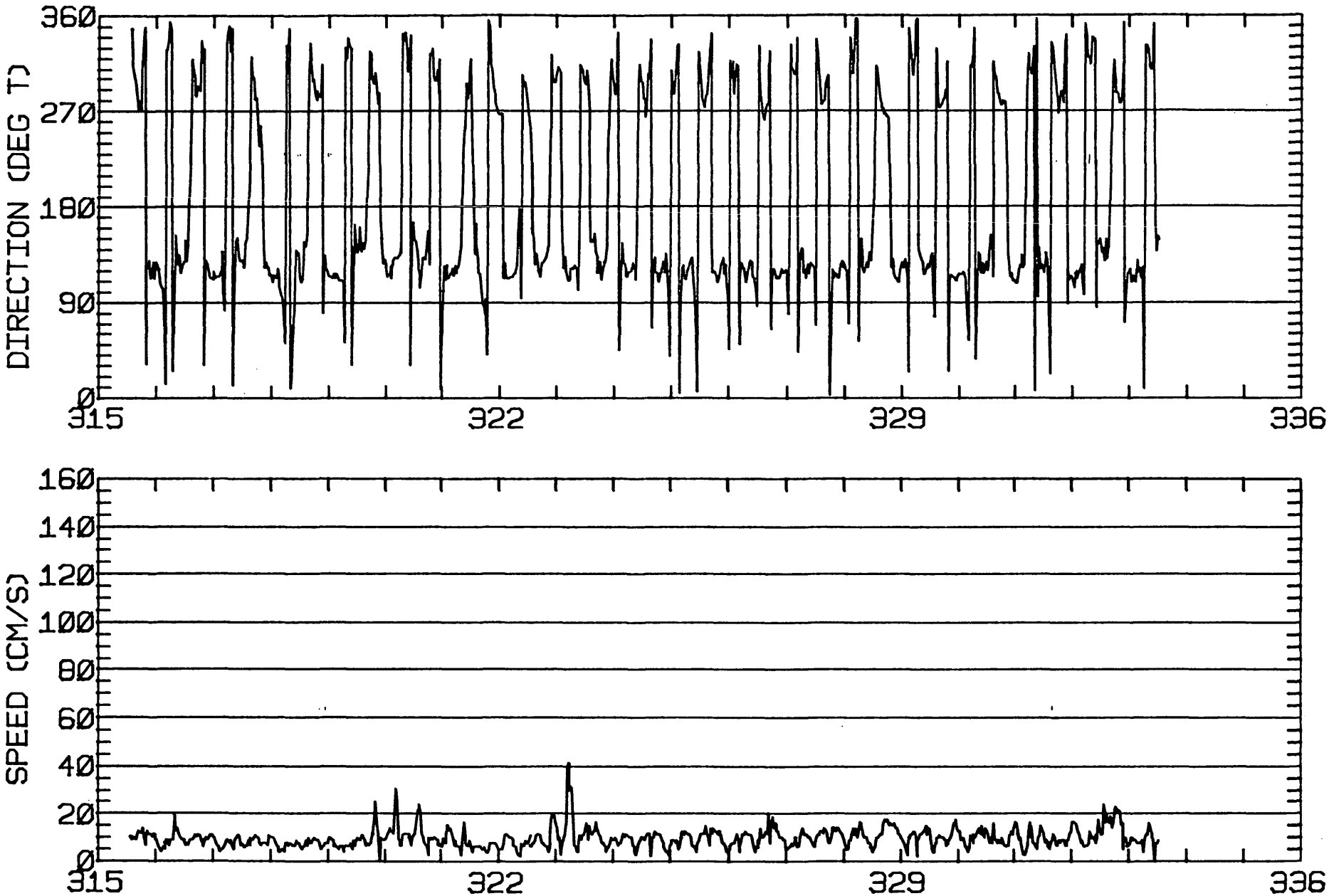
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	1.90	0.34	98.1	16.4	ANTI-CLOCKWISE
K1	3.64	0.35	89.0	23.4	CLOCKWISE
N2	2.49	0.13	116.5	252.0	CLOCKWISE
M2	10.94	0.09	122.8	267.3	ANTI-CLOCKWISE
S2	1.16	0.39	96.0	255.3	CLOCKWISE
M4	1.84	0.06	119.8	25.1	ANTI-CLOCKWISE

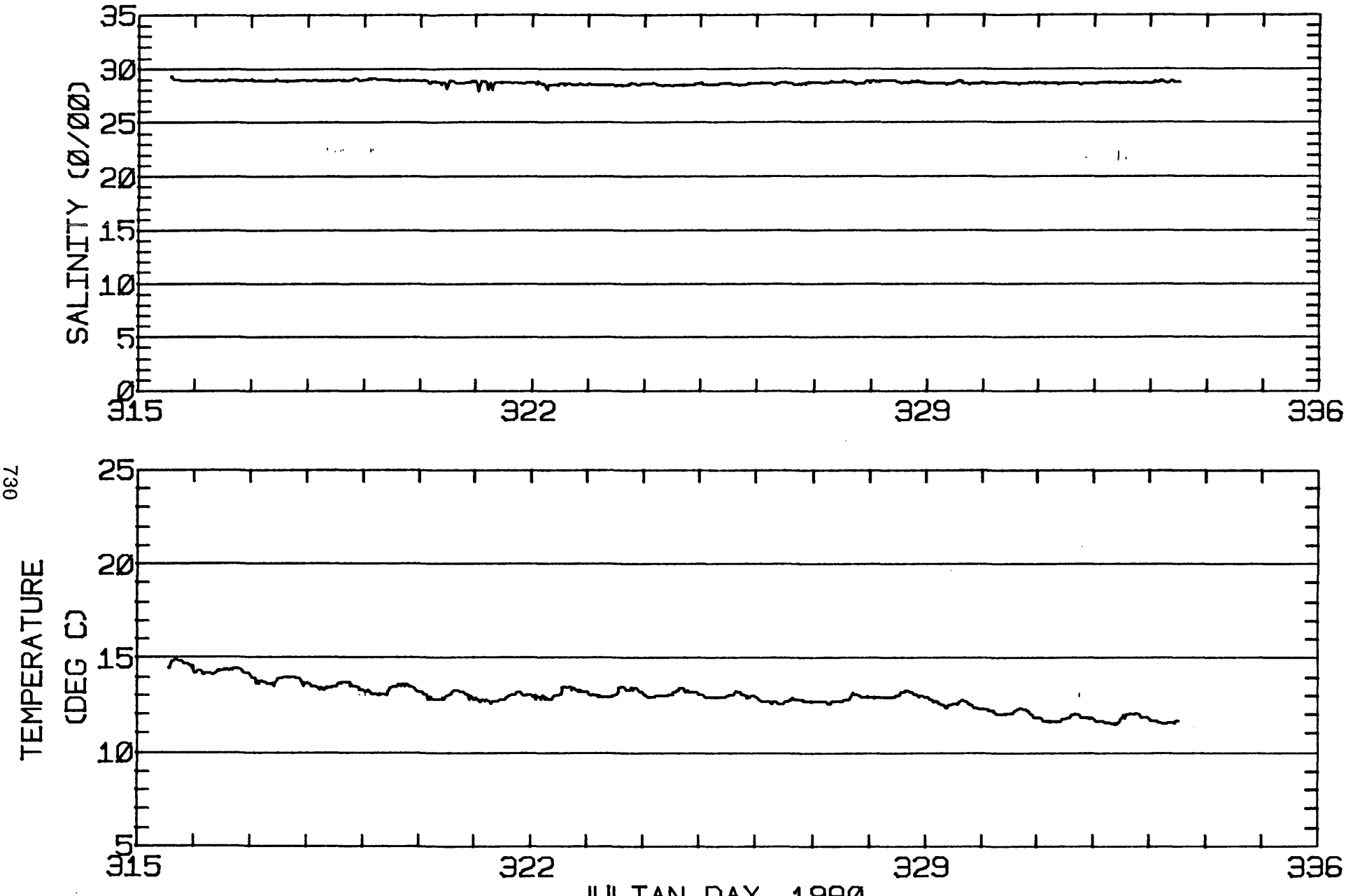
RMS SPEED: 11.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 17.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 8.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 111.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 3.77 CM/SEC
STANDARD DEVIATION V SERIES: 4.22 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.2	-1.3	198.
2	12	2.2	-1.4	182.
3	10	2.2	-1.4	193.
ALL	34	2.2	-1.4	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 222 37-51- 9N 122-18-45W
METER 000.9 METERS ABOVE BED. WATER DEPTH 001.8 METERS.



730

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 222 37-51- 9N 122-18-45W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ1.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 223
POSITION: 37 49'30"N 122 20'47"W
METER TYPE: AANDERAA
WATER DEPTH: 4.6 M (MLLW)
METER DEPTH: 3.7 M (BELOW MLLW)
START TIME OF SERIES:10/ 5/79 820 PST JULIAN DAY=278
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

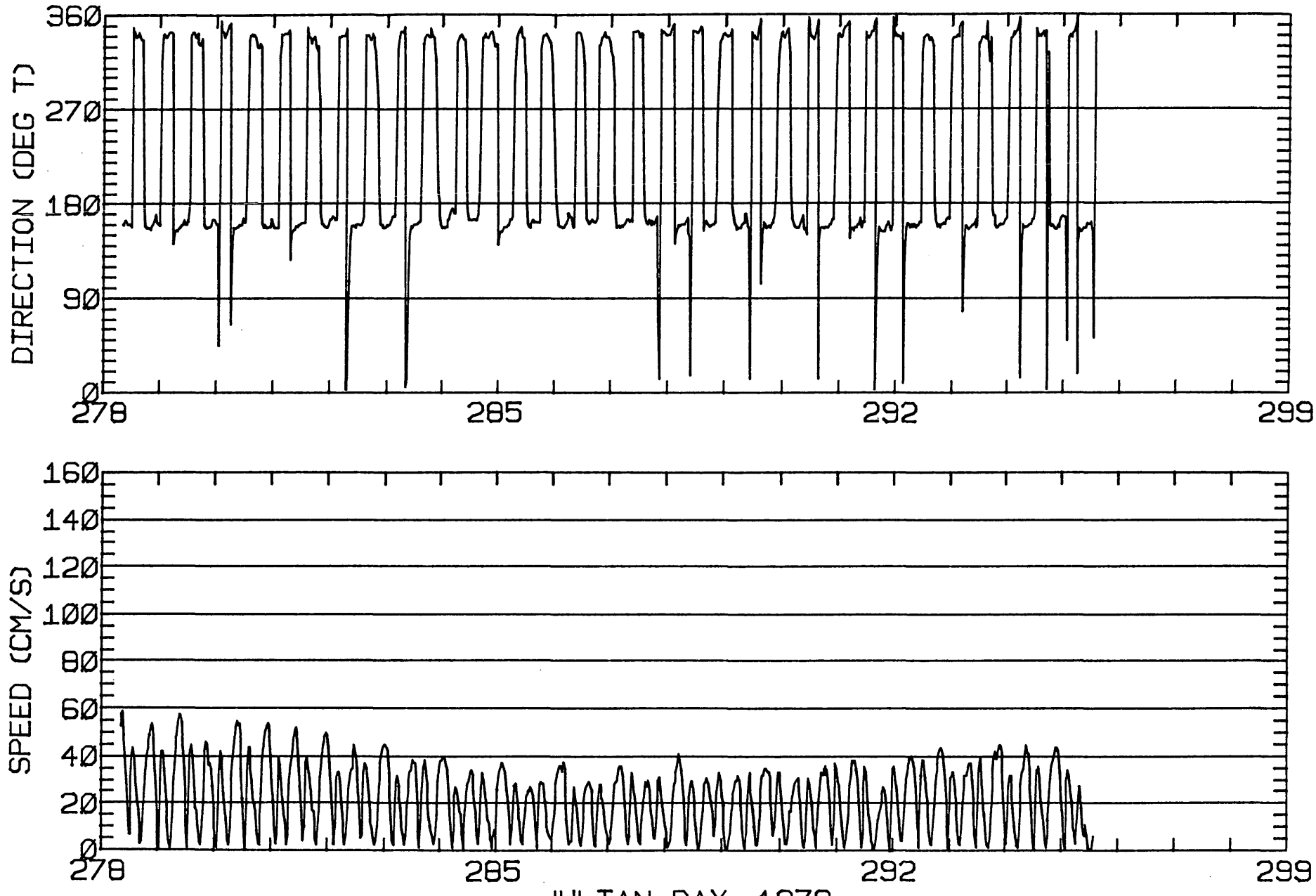
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.15	0.09	161.4	356.8	ANTI-CLOCKWISE
K1	4.56	0.30	155.5	4.5	ANTI-CLOCKWISE
N2	6.97	0.00	160.1	245.9	CLOCKWISE
M2	33.00	0.68	160.2	267.1	CLOCKWISE
S2	7.26	0.27	158.4	249.6	CLOCKWISE
M4	3.92	0.43	167.2	286.5	CLOCKWISE

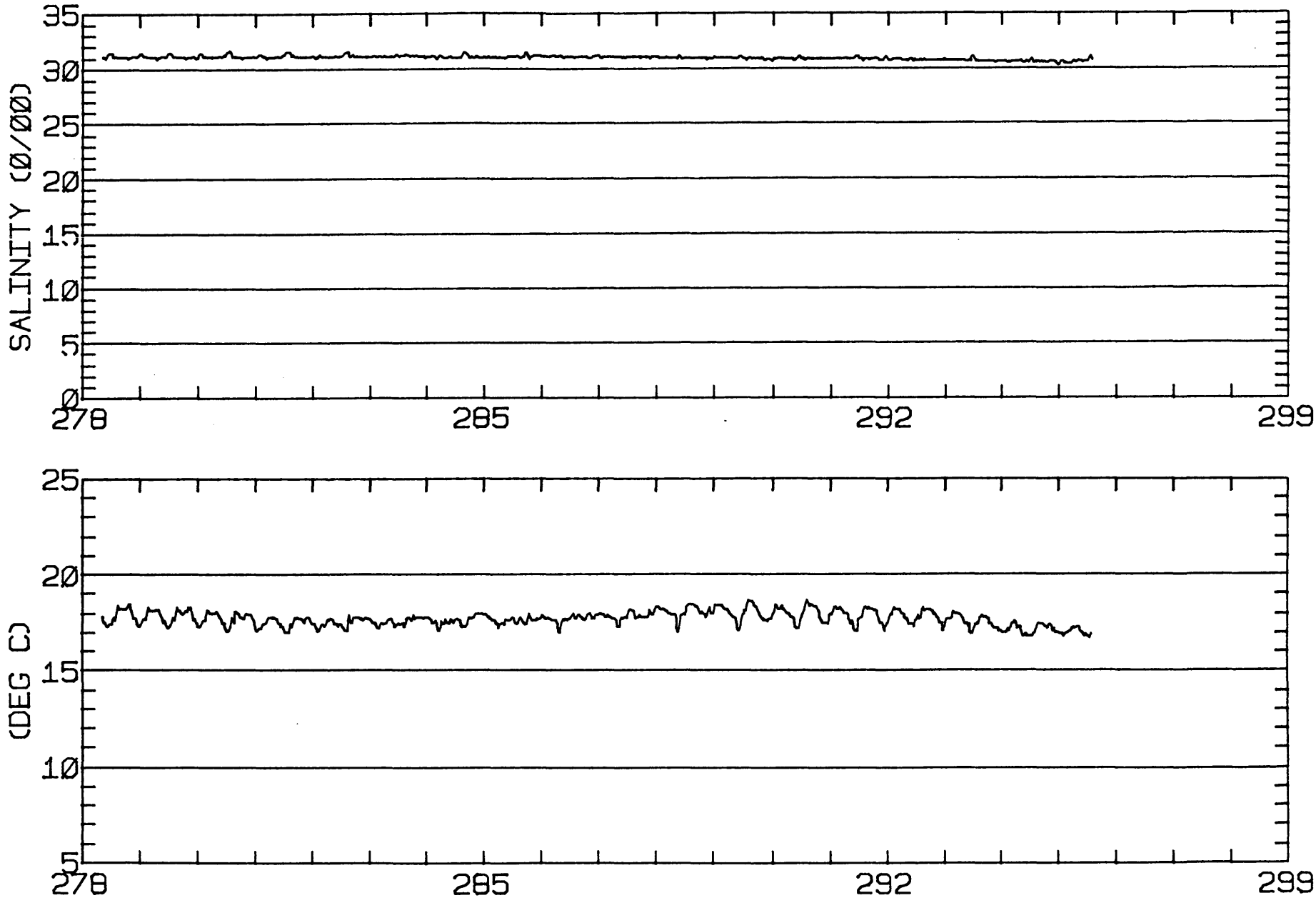
RMS SPEED: 26.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 49.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 159.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.22
STANDARD DEVIATION U-SERIES: 2.57 CM/SEC
STANDARD DEVIATION V SERIES: 6.03 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.8	-8.5	157.
2	12	1.3	-4.5	206.
3	8	2.3	-6.4	184.
ALL	32	2.1	-6.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 223 37-49-30N 122-20-47W
METER 000.8 METERS ABOVE BED. WATER DEPTH 004.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 223 37-49-30N 122-20-47W
METER ØØØ.8 METERS ABOVE BED. WATER DEPTH ØØ4.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 224
POSITION: 37 50'15"N 122 23'23"W
METER TYPE: AANDERAA
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES:10/11/79 932 PST JULIAN DAY=284
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

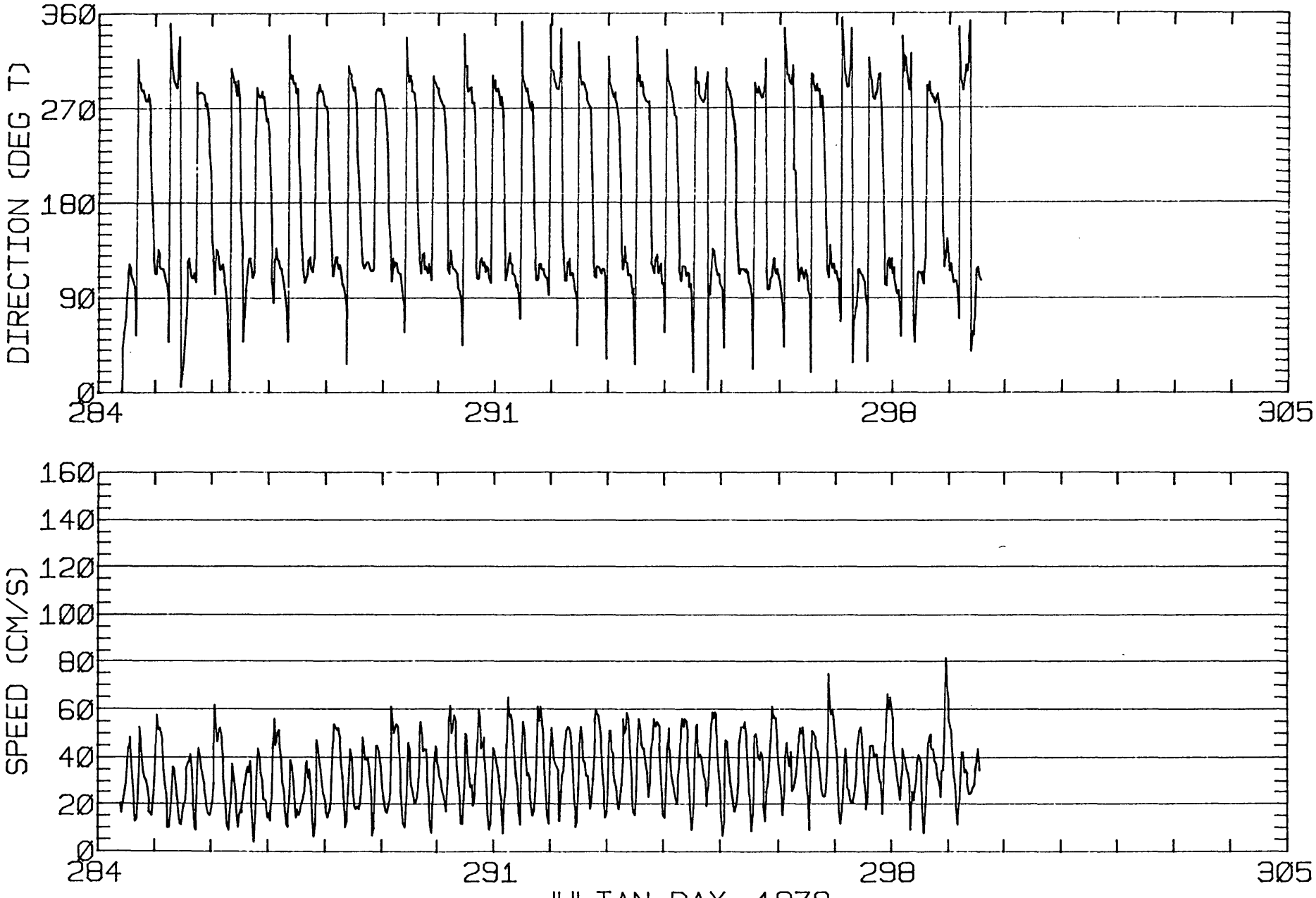
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.78	2.49	100.2	358.9	ANTI-CLOCKWISE
K1	8.10	4.16	106.7	356.6	ANTI-CLOCKWISE
N2	10.04	0.49	114.6	235.4	CLOCKWISE
M2	49.63	4.43	114.3	264.4	ANTI-CLOCKWISE
S2	12.71	2.83	109.2	250.1	ANTI-CLOCKWISE
M4	2.18	1.58	41.0	4.8	ANTI-CLOCKWISE

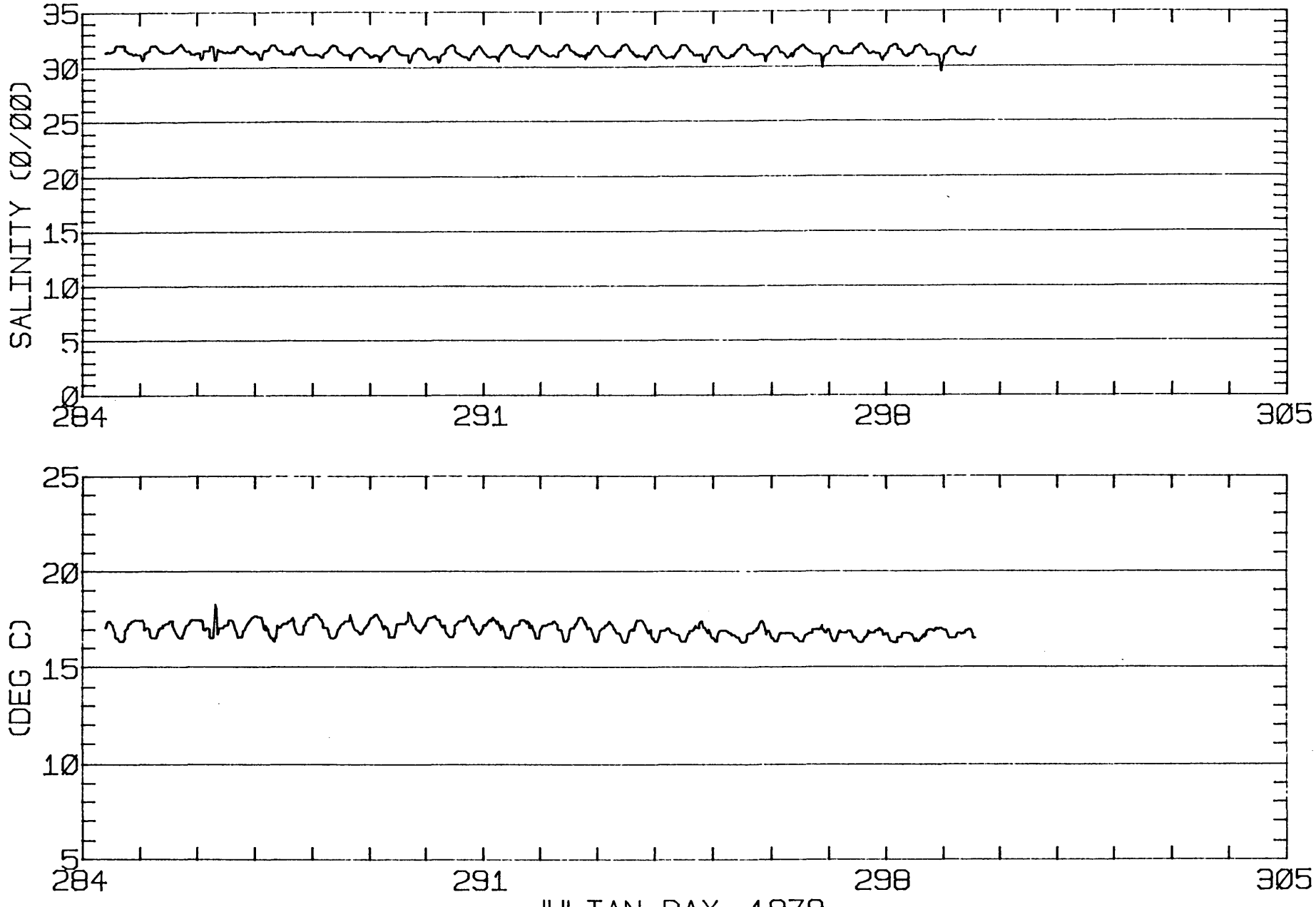
RMS SPEED: 37.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 77.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 111.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 6.78 CM/SEC
STANDARD DEVIATION V SERIES: 7.36 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.8	-4.6	206.
2	12	4.8	-4.6	208.
3	4	6.0	-1.7	220.
ALL	28	4.9	-4.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 224 37-50-15N 122-23-23W
METER 006.1 METERS ABOVE BED. WATER DEPTH 009.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 224 37-50-15N 122-23-23W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH ØØ9.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 224
POSITION: 37 50'15"N 122 23'23"W
METER TYPE: AANDERAA
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:10/11/79 934 PST JULIAN DAY=284
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

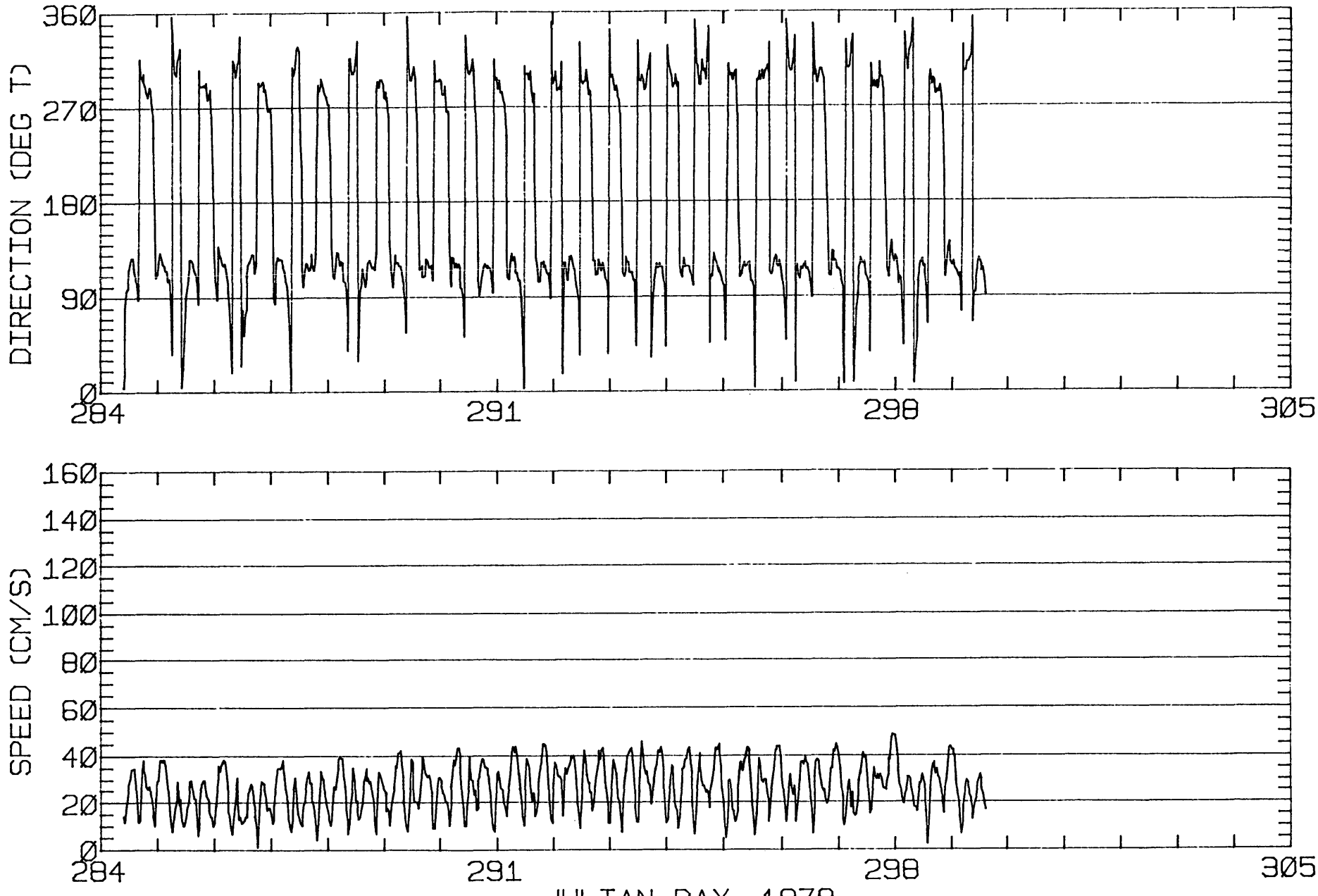
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.42	1.61	85.0	20.0	ANTI-CLOCKWISE
K1	6.22	3.30	109.3	4.8	ANTI-CLOCKWISE
N2	7.88	0.82	127.0	232.2	CLOCKWISE
M2	37.79	1.49	120.5	263.1	ANTI-CLOCKWISE
S2	9.77	0.16	113.6	248.6	ANTI-CLOCKWISE
M4	2.19	0.78	78.4	345.3	ANTI-CLOCKWISE

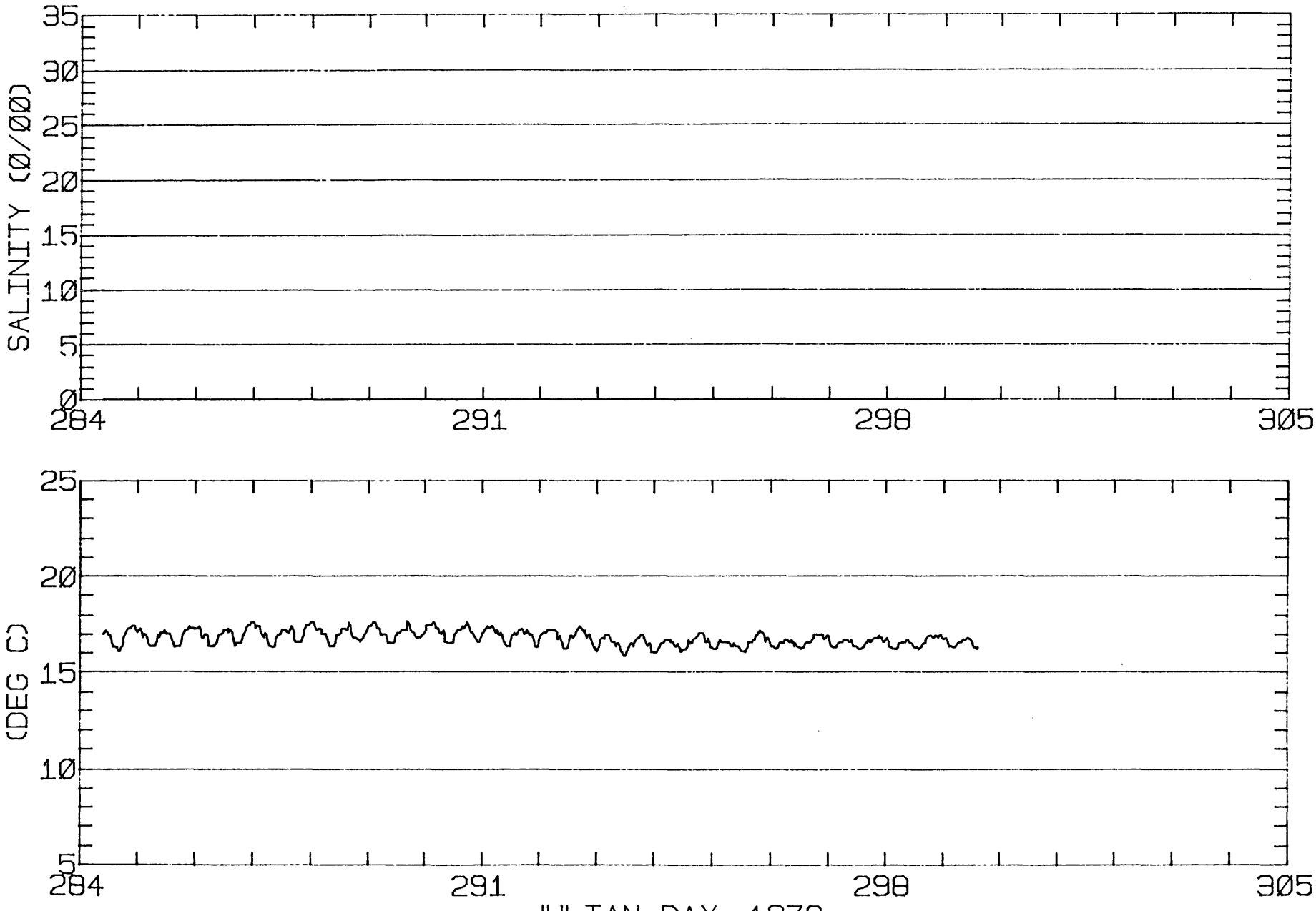
RMS SPEED: 28.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 60.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 114.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 6.03 CM/SEC
STANDARD DEVIATION V SERIES: 5.19 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.8	-2.0	206.
2	12	5.9	-1.9	208.
3	4	5.9	-0.9	220.
ALL	28	5.4	-1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 224 37-50-15N 122-23-23W
METER 003.0 METERS ABOVE BED. WATER DEPTH 009.1 METERS.



739

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 224 37-50-15N 122-23-23W
METER ØØ3.Ø METERS ABOVE BED. WATER DEPTH ØØ9.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 321
POSITION: 37 43'14"N 122 35'52"W
METER TYPE: AANDERAA
WATER DEPTH: 19.5 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 4/17/80 1530 PST JULIAN DAY=108
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

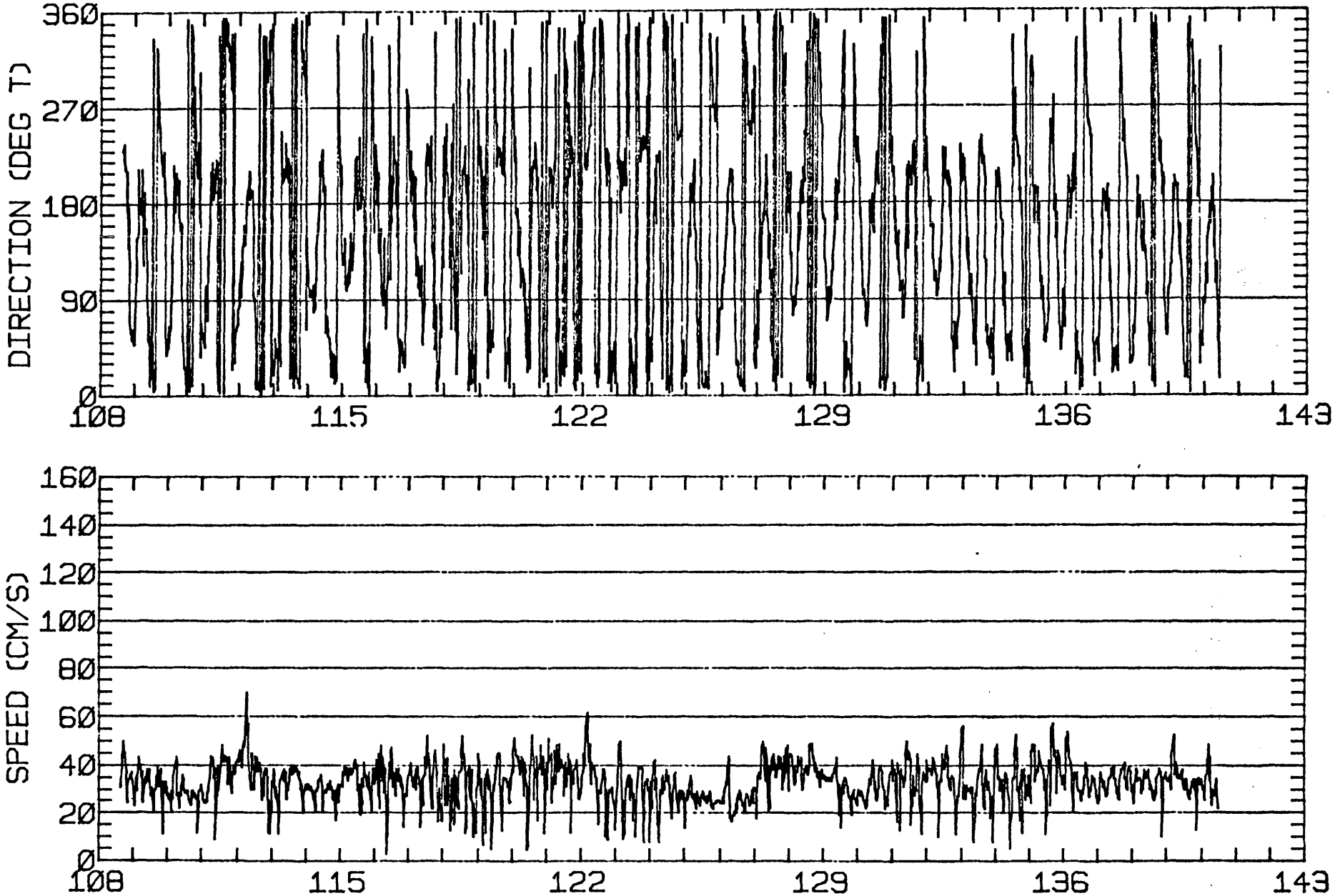
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.11	2.22	353.0	314.1	CLOCKWISE
K1	19.48	1.38	330.8	6.2	CLOCKWISE
N2	4.11	2.75	13.4	232.4	ANTI-CLOCKWISE
M2	30.42	4.41	40.5	252.2	ANTI-CLOCKWISE
S2	8.28	2.24	18.2	261.6	ANTI-CLOCKWISE
M4	2.51	2.18	62.9	324.9	ANTI-CLOCKWISE

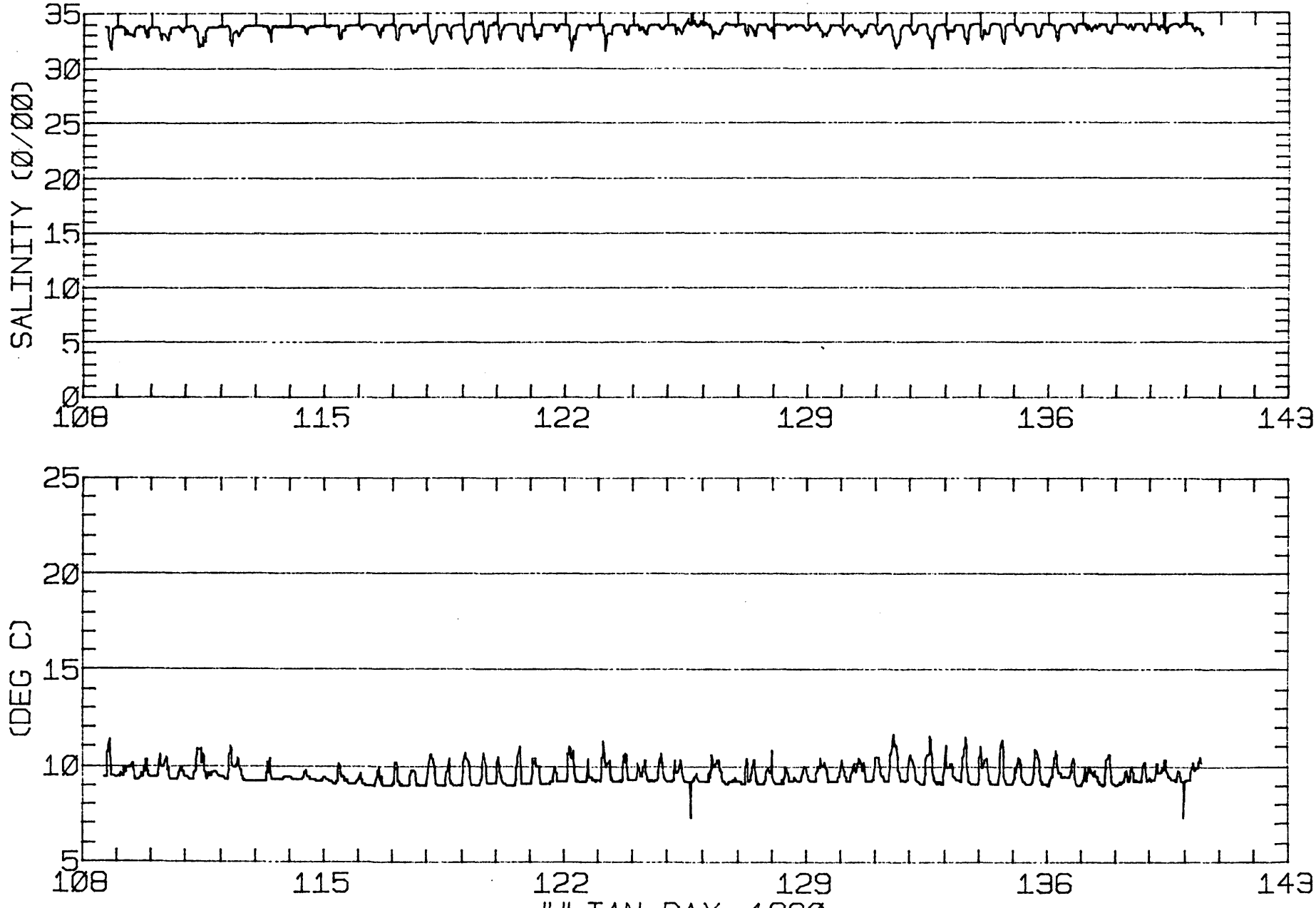
RMS SPEED: 34.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 70.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 14.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 10.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.82
STANDARD DEVIATION U-SERIES: 14.21 CM/SEC
STANDARD DEVIATION V SERIES: 14.36 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.0	2.2	680.
2	12	4.0	-6.7	651.
3	12	-3.6	4.5	561.
4	12	4.7	-5.3	586.
5	10	6.6	-3.9	747.
ALL	58	3.0	-1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 321 37-43-14N 122-35-52W
METER 007.6 METERS ABOVE BED. WATER DEPTH 019.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 321 37-43-14N 122-35-52W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø19.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 322
POSITION: 37 48'16"N 122 38'20"W
METER TYPE: AANDERAA
WATER DEPTH: 19.5 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 4/ 3/80 1200 PST JULIAN DAY= 94
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

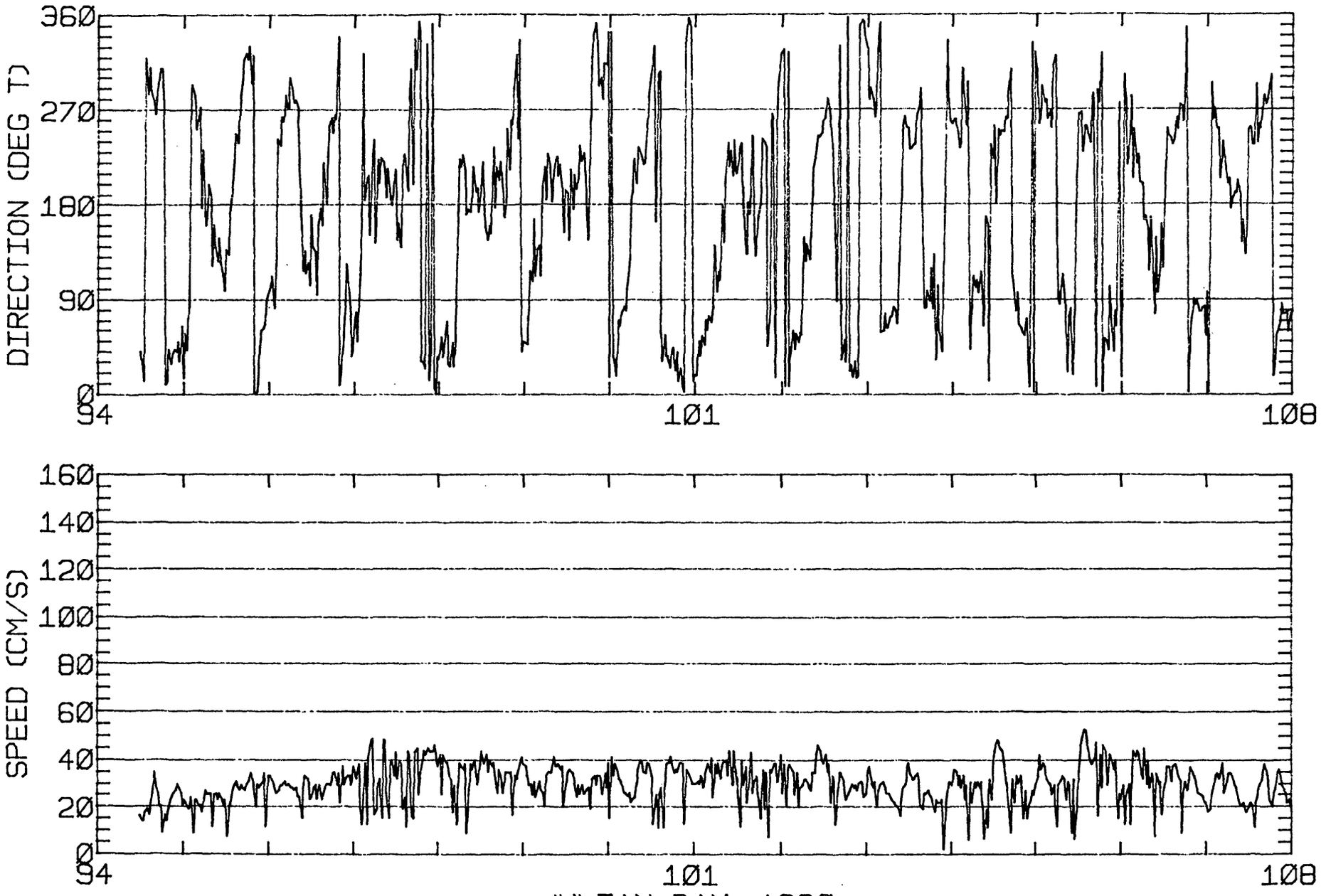
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.58	1.98	20.9	70.7	CLOCKWISE
K1	21.64	5.48	17.1	74.8	CLOCKWISE
N2	8.10	3.02	48.5	244.8	CLOCKWISE
M2	19.79	1.72	91.5	250.3	ANTI-CLOCKWISE
S2	7.11	1.77	86.4	263.3	ANTI-CLOCKWISE
M4	1.00	0.82	116.1	60.1	CLOCKWISE

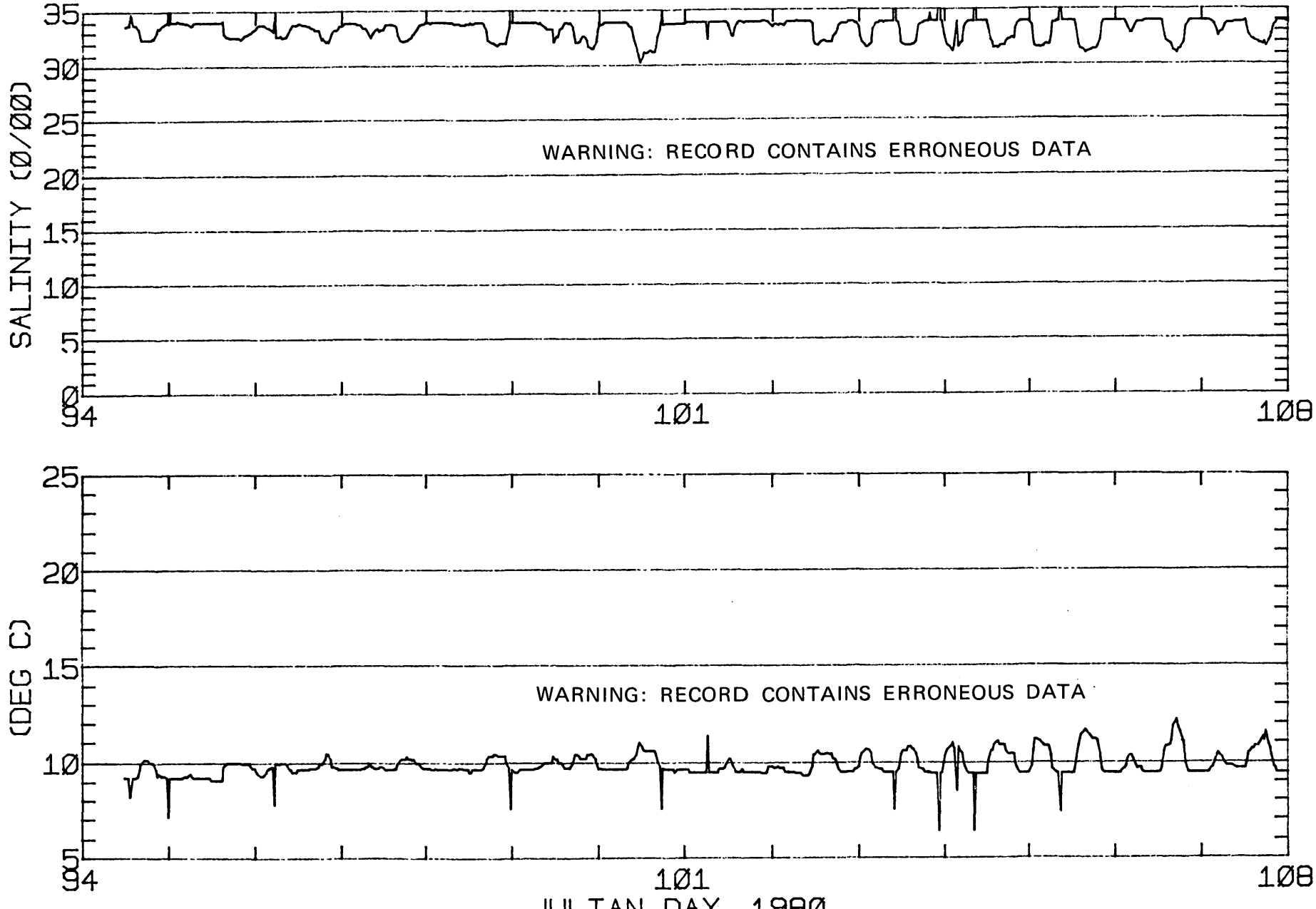
RMS SPEED: 31.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 58.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 0.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 51.5 DEGREES TRUE
TIDAL FORM NUMBER: 1.16
STANDARD DEVIATION U-SERIES: 13.15 CM/SEC
STANDARD DEVIATION V SERIES: 14.61 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.0	-3.7	1078.
2	12	-1.9	1.0	851.
3	2	-5.5	-5.7	745.
ALL	26	-2.2	-1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 322 37-48-16N 122-38-20W
METER 007.6 METERS ABOVE BED. WATER DEPTH 019.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 322 37-48-16N 122-38-20W
METER ØØ7.6 METERS ABOVE BED. WATER DEPTH Ø19.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 323
POSITION: 37 52'26"N 122 24'10"W
METER TYPE: AANDERAA
WATER DEPTH: 14.6 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 8/ 5/80 1440 PST JULIAN DAY=218
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

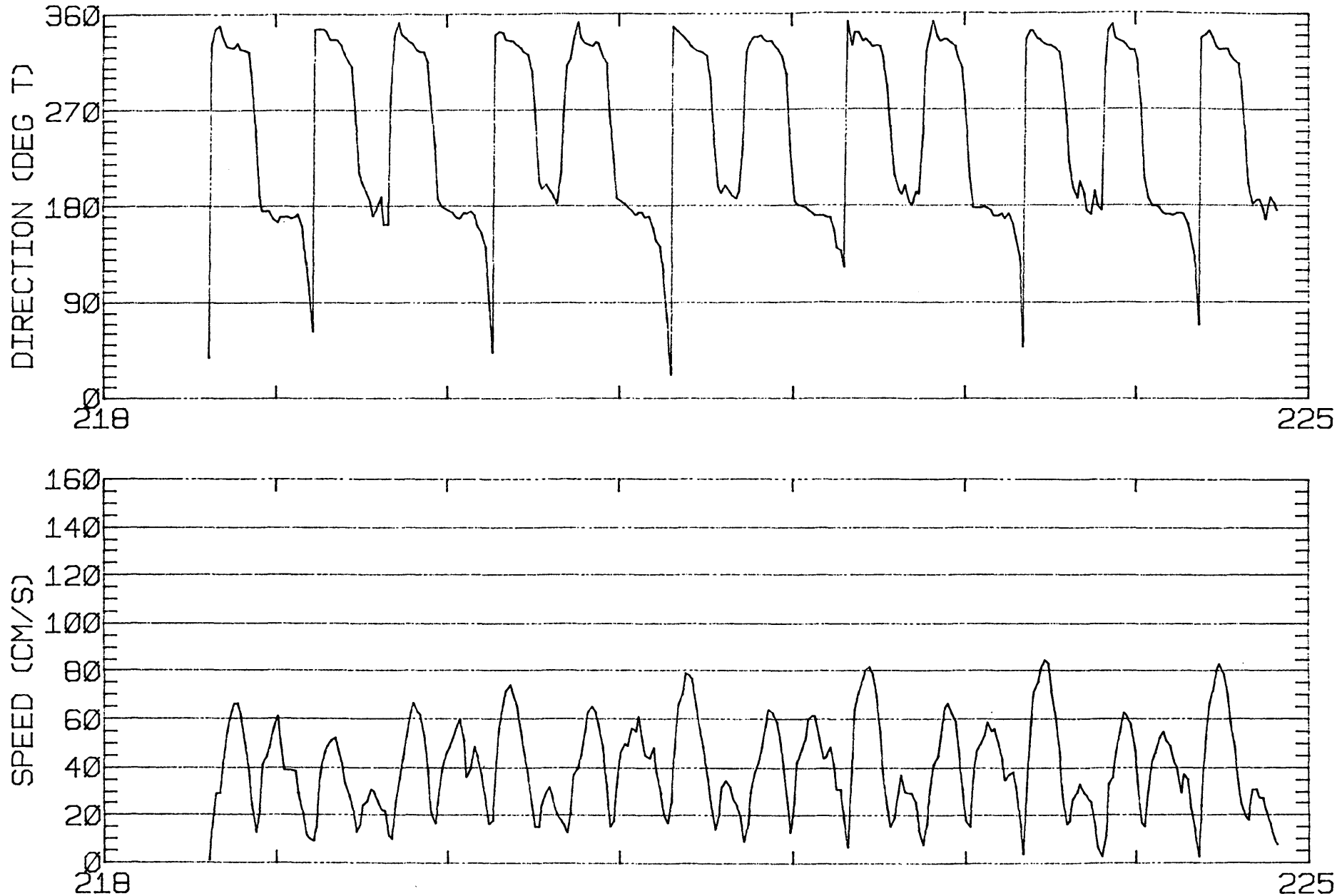
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.24	1.08	346.2	54.3	ANTI-CLOCKWISE
K1	20.51	2.83	334.3	77.9	ANTI-CLOCKWISE
N2	12.71	6.22	349.8	289.6	ANTI-CLOCKWISE
M2	43.92	5.12	335.5	312.0	ANTI-CLOCKWISE
S2	13.43	5.04	339.9	331.5	ANTI-CLOCKWISE
M4	8.23	0.59	320.4	337.0	ANTI-CLOCKWISE

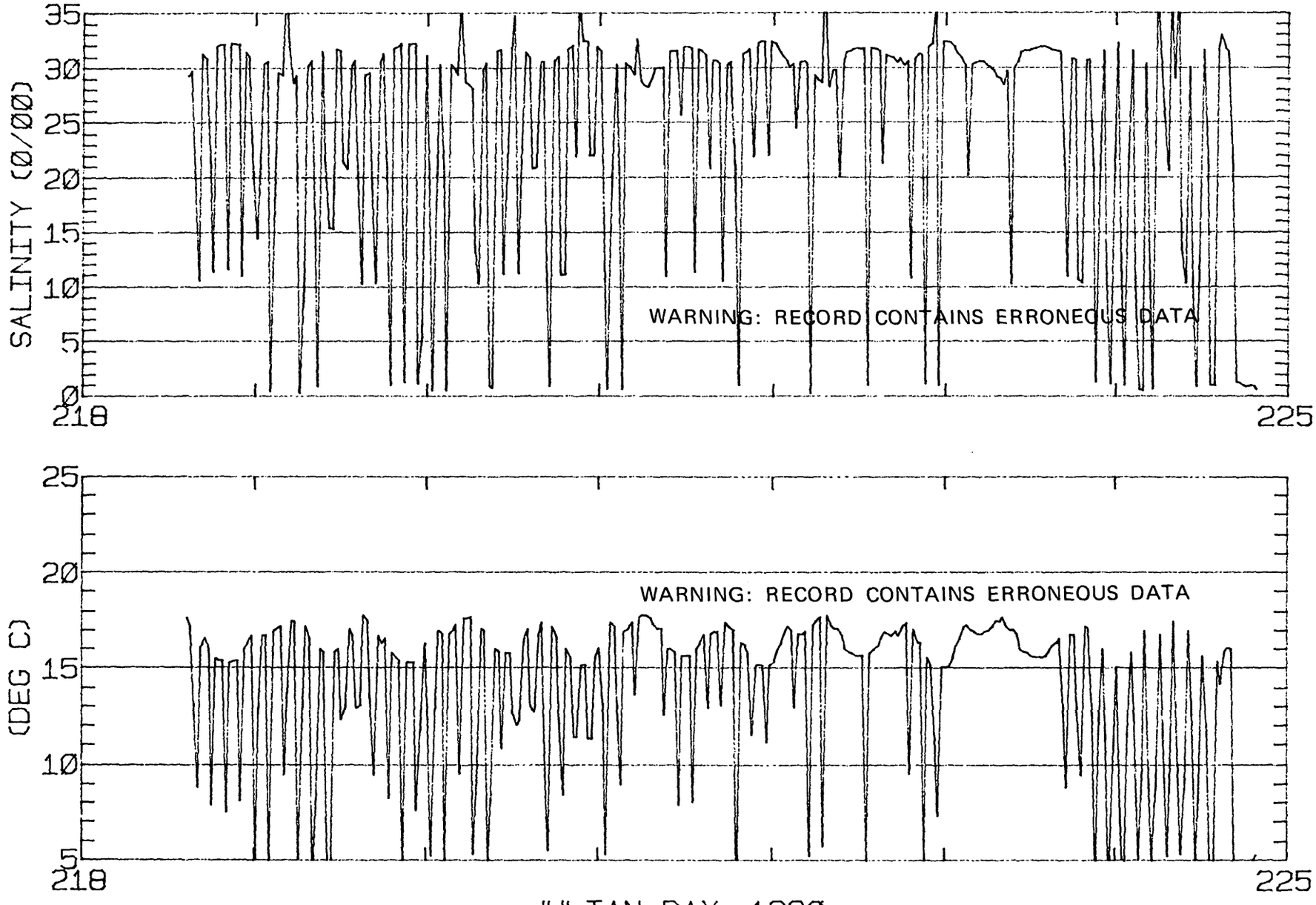
RMS SPEED: 45.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 85.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 17.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 336.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.48
STANDARD DEVIATION U-SERIES: 5.09 CM/SEC
STANDARD DEVIATION V SERIES: 8.16 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	-10.0	4.4	149.
ALL	10	-10.0	4.4	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 323 37-52-26N 122-24-10W
METER 007.9 METERS ABOVE BED. WATER DEPTH 014.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 323 37-52-26N 122-24-10W
METER ØØ7.9 METERS ABOVE BED. WATER DEPTH Ø14.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 323
POSITION: 37 52'26"N 122 24'10"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES: 8/ 5/80 1442 PST JULIAN DAY=218
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

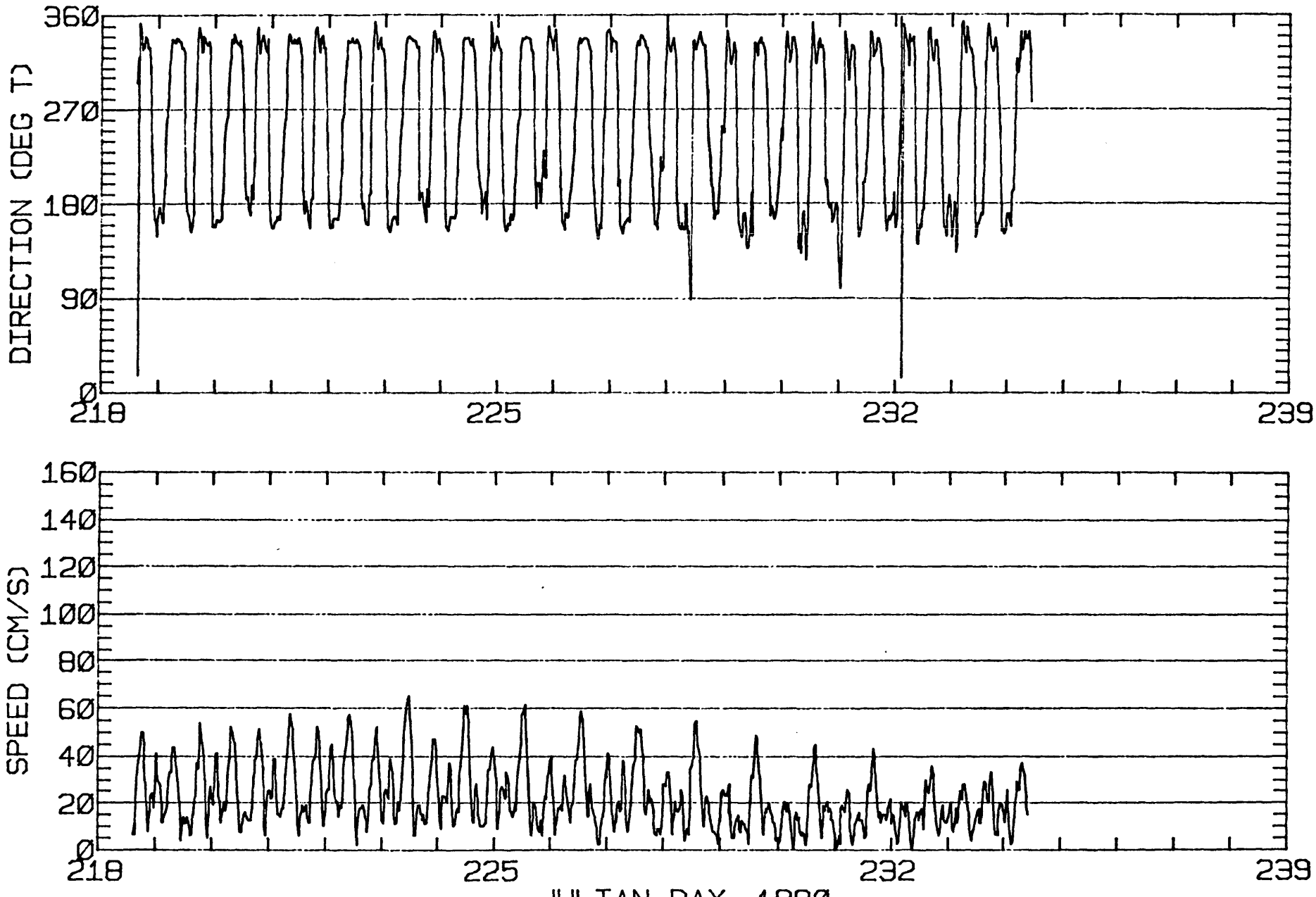
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.70	1.79	325.6	350.2	CLOCKWISE
K1	11.30	0.35	337.0	71.5	ANTI-CLOCKWISE
N2	5.56	0.22	342.3	299.5	CLOCKWISE
M2	32.29	0.42	340.2	313.5	CLOCKWISE
S2	7.34	0.17	351.5	328.7	CLOCKWISE
M4	3.09	1.41	356.1	298.0	ANTI-CLOCKWISE

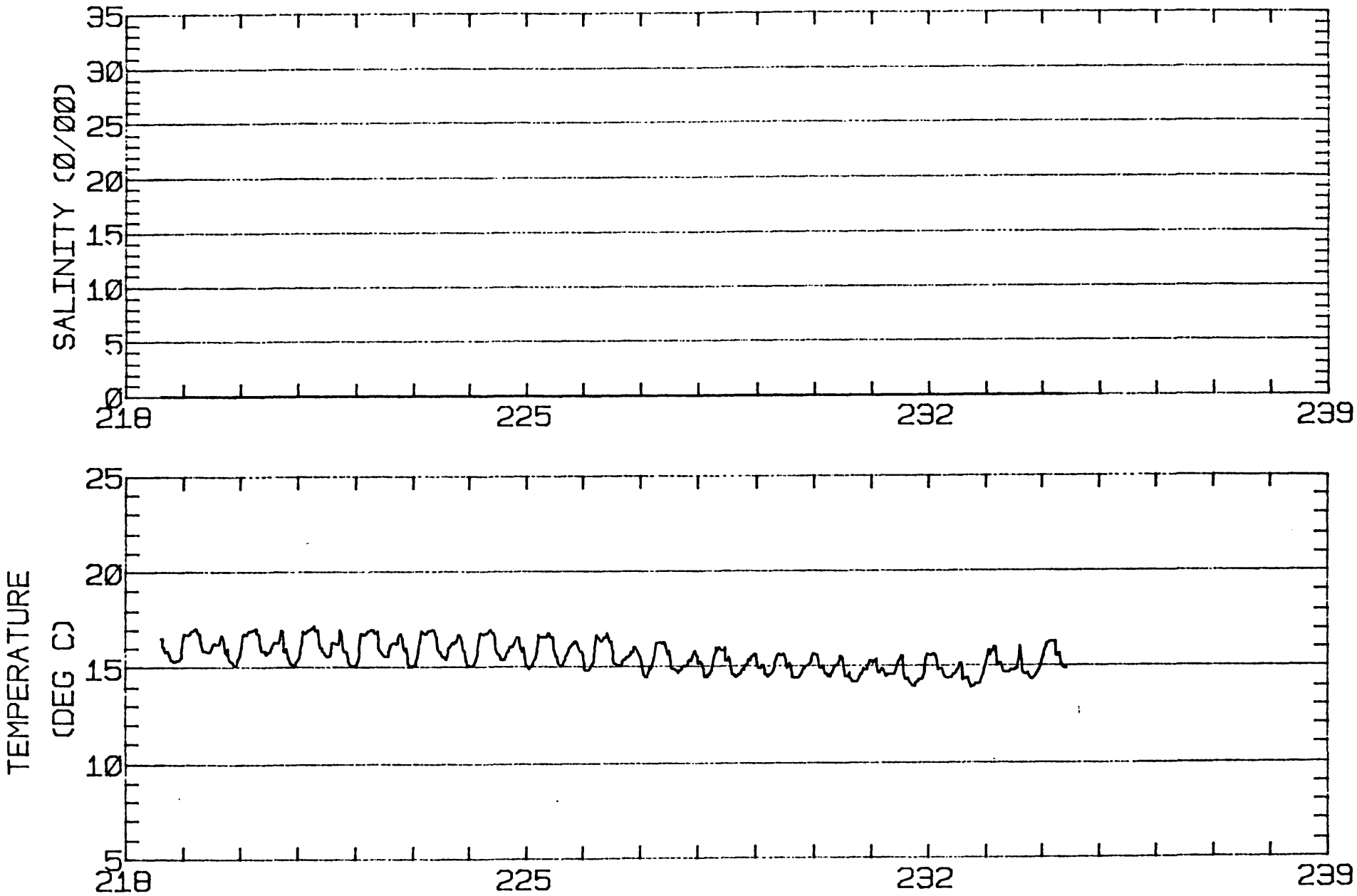
RMS SPEED: 26.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 54.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 17.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 340.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 4.46 CM/SEC
STANDARD DEVIATION V SERIES: 6.58 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.9	7.4	145.
2	12	-6.5	5.3	101.
3	6	-4.4	2.2	85.
ALL	30	-6.7	5.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 323 37-52-26N 122-24-10W
METER 001.5 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 323 37-52-26N 122-24-10W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 323
POSITION: 37 52'24"N 122 24'15"W
METER TYPE: AANDERAA
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 8/21/80 1250 PST JULIAN DAY=234
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

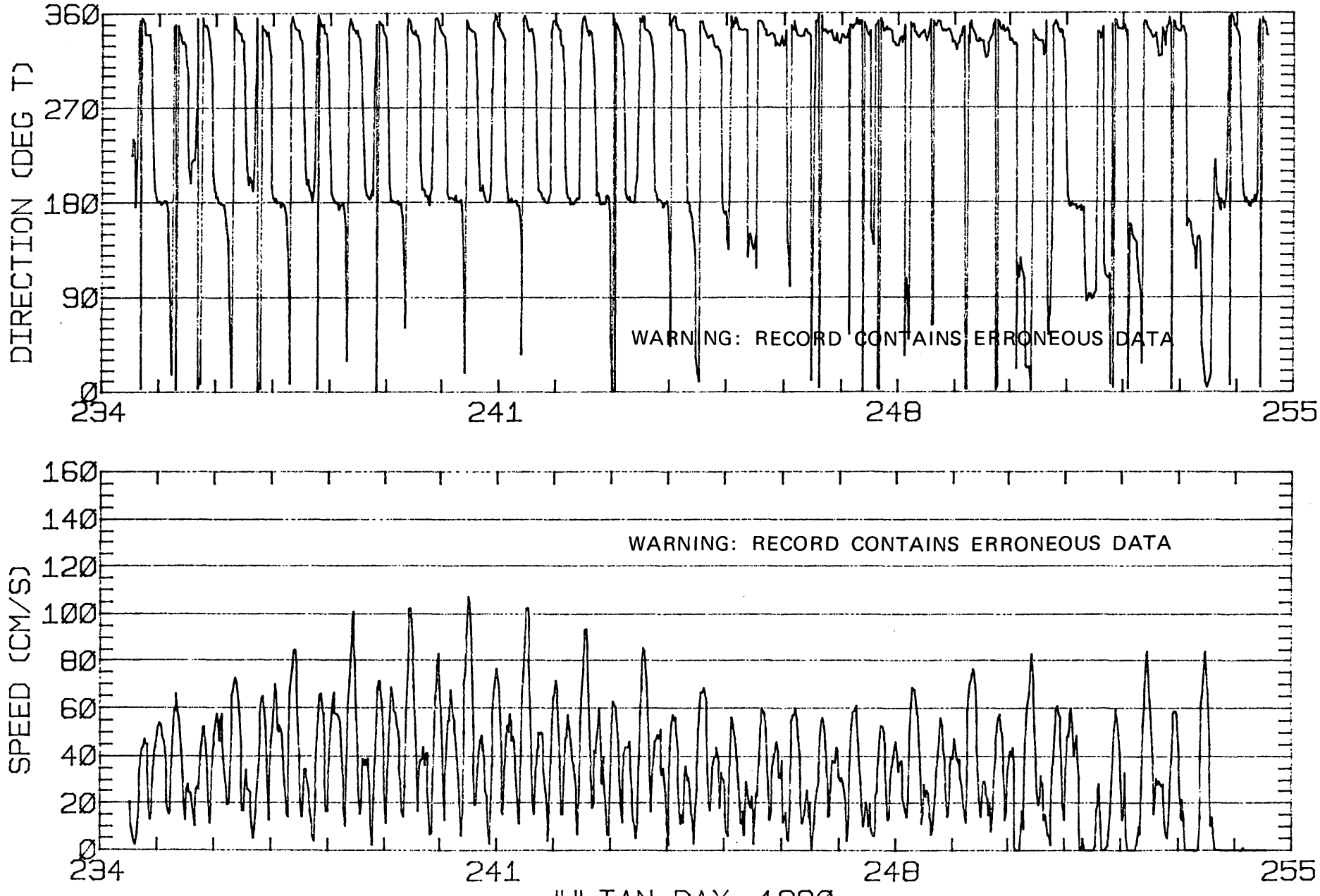
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.94	0.69	350.0	37.8	ANTI-CLOCKWISE
K1	19.51	1.42	345.8	75.2	ANTI-CLOCKWISE
N2	9.56	1.24	349.0	314.2	CLOCKWISE
M2	48.67	8.36	353.6	316.6	ANTI-CLOCKWISE
S2	11.98	0.65	347.5	339.7	ANTI-CLOCKWISE
M4	9.91	1.66	336.3	292.6	ANTI-CLOCKWISE

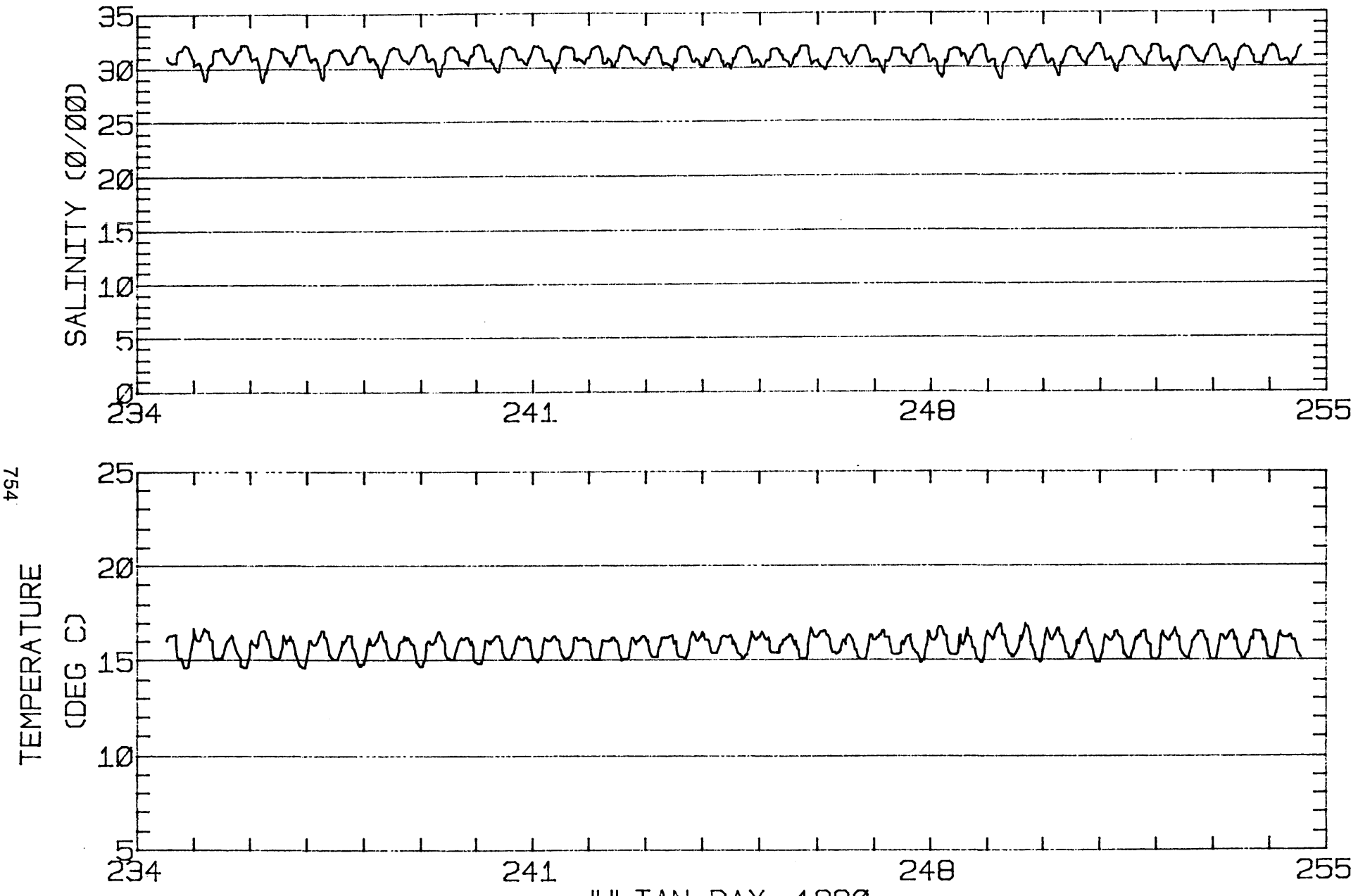
RMS SPEED: 49.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 90.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 350.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 3.59 CM/SEC
STANDARD DEVIATION V SERIES: 6.64 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.9	5.9	107.
2	6	-8.3	6.3	115.
ALL	18	-8.0	6.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 323 37-52-24N 122-24-15W
METER 007.9 METERS ABOVE BED. WATER DEPTH 014.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 323 37-52-24N 122-24-15W
METER ØØ7.9 METERS ABOVE BED. WATER DEPTH Ø14.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 323
POSITION: 37 52'24"N 122 24'15"W
METER TYPE: AANDERAA
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES: 9/ 9/80 1502 PST JULIAN DAY=253
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

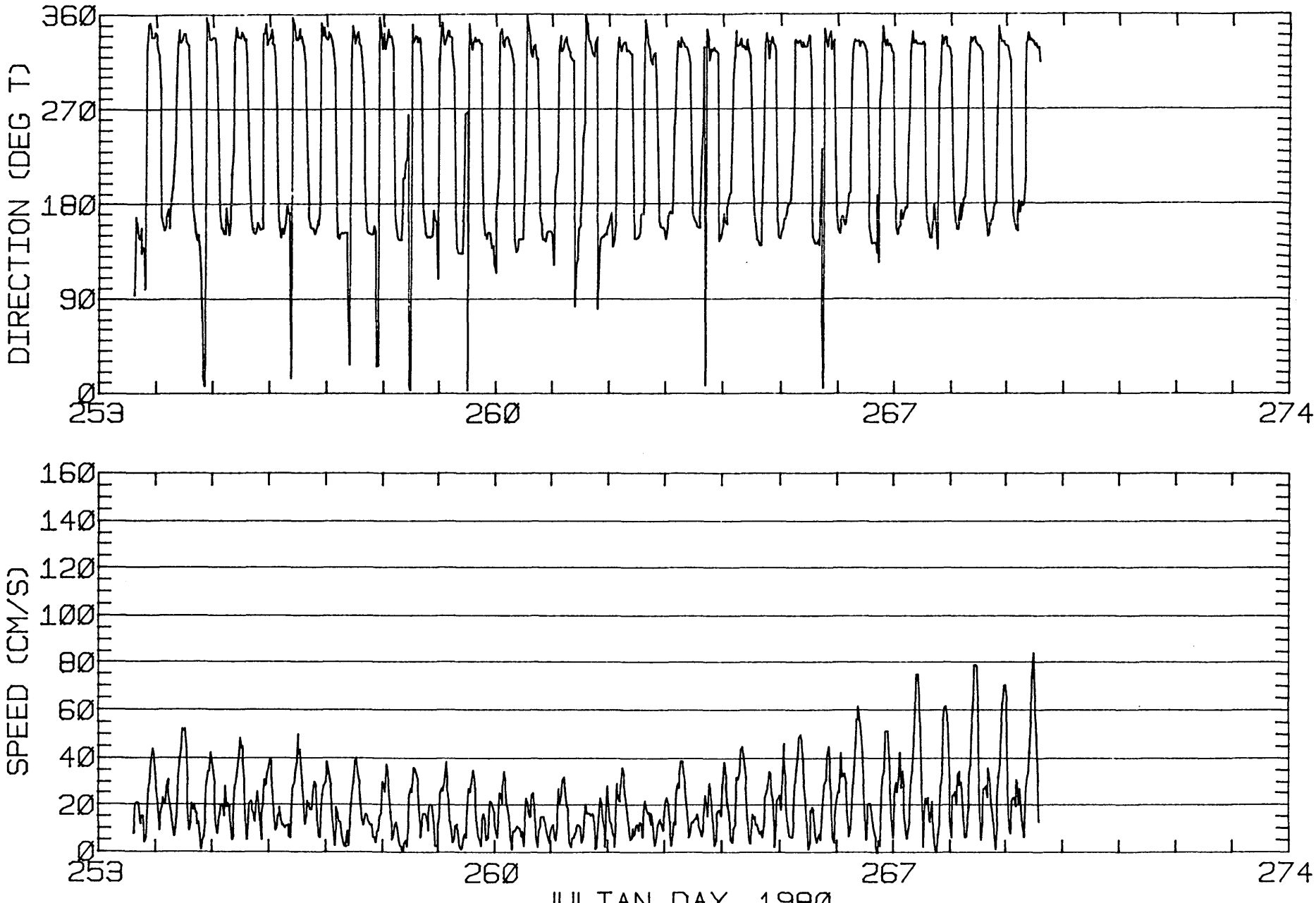
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.38	0.71	345.7	8.7	CLOCKWISE
K1	6.93	1.02	333.5	57.6	CLOCKWISE
N2	6.50	0.52	330.8	291.0	ANTI-CLOCKWISE
M2	31.31	1.19	336.1	318.9	ANTI-CLOCKWISE
S2	9.31	0.47	343.8	316.7	ANTI-CLOCKWISE
M4	4.61	1.43	339.1	292.8	ANTI-CLOCKWISE

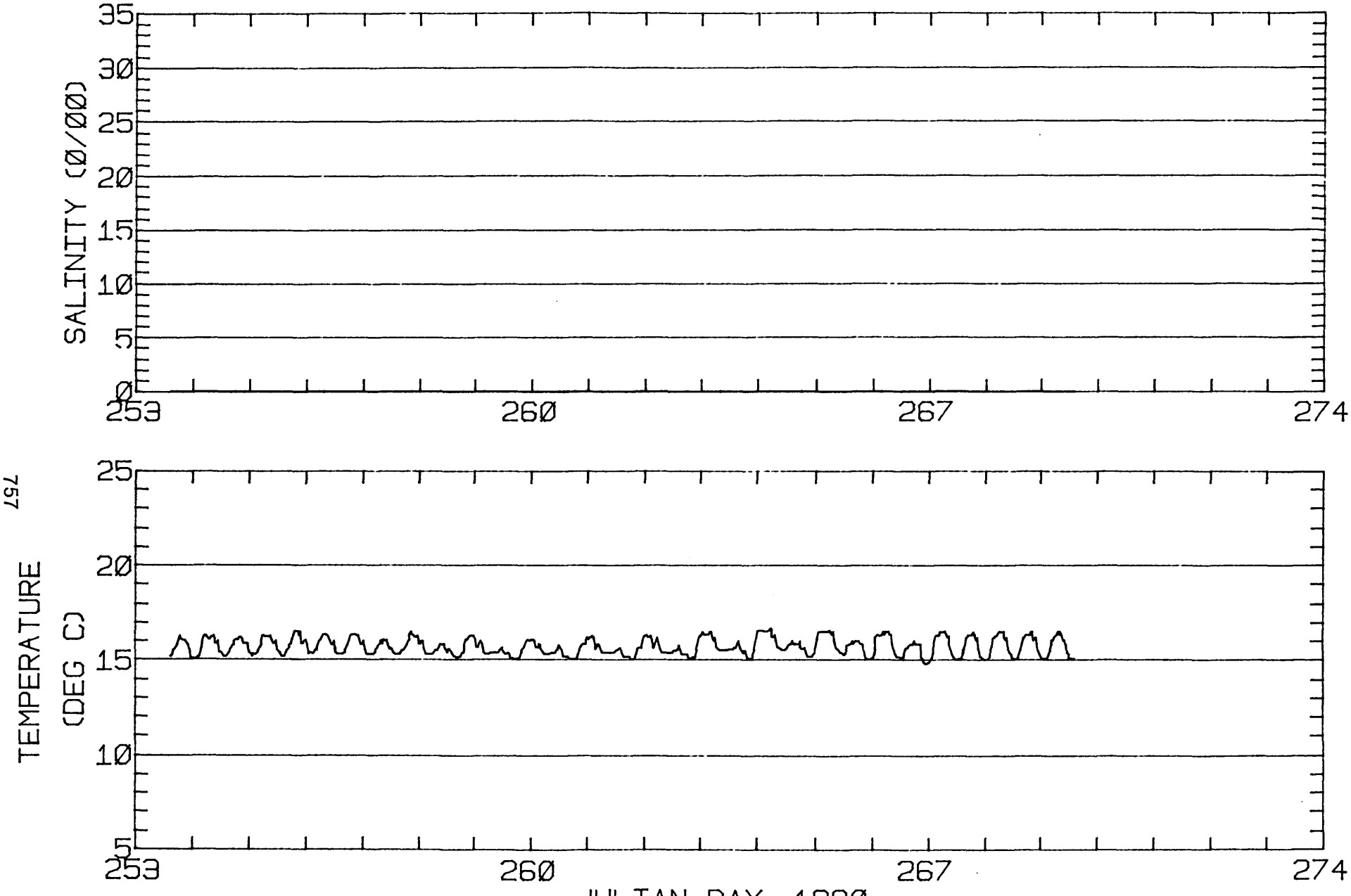
RMS SPEED: 25.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 52.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 20.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 338.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 3.99 CM/SEC
STANDARD DEVIATION V SERIES: 6.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.0	6.1	260.
2	12	-3.0	3.6	309.
3	6	-7.5	8.4	301.
ALL	30	-3.9	5.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 323 37-52-24N 122-24-15W
METER 001.5 METERS ABOVE BED. WATER DEPTH 014.0 METERS.

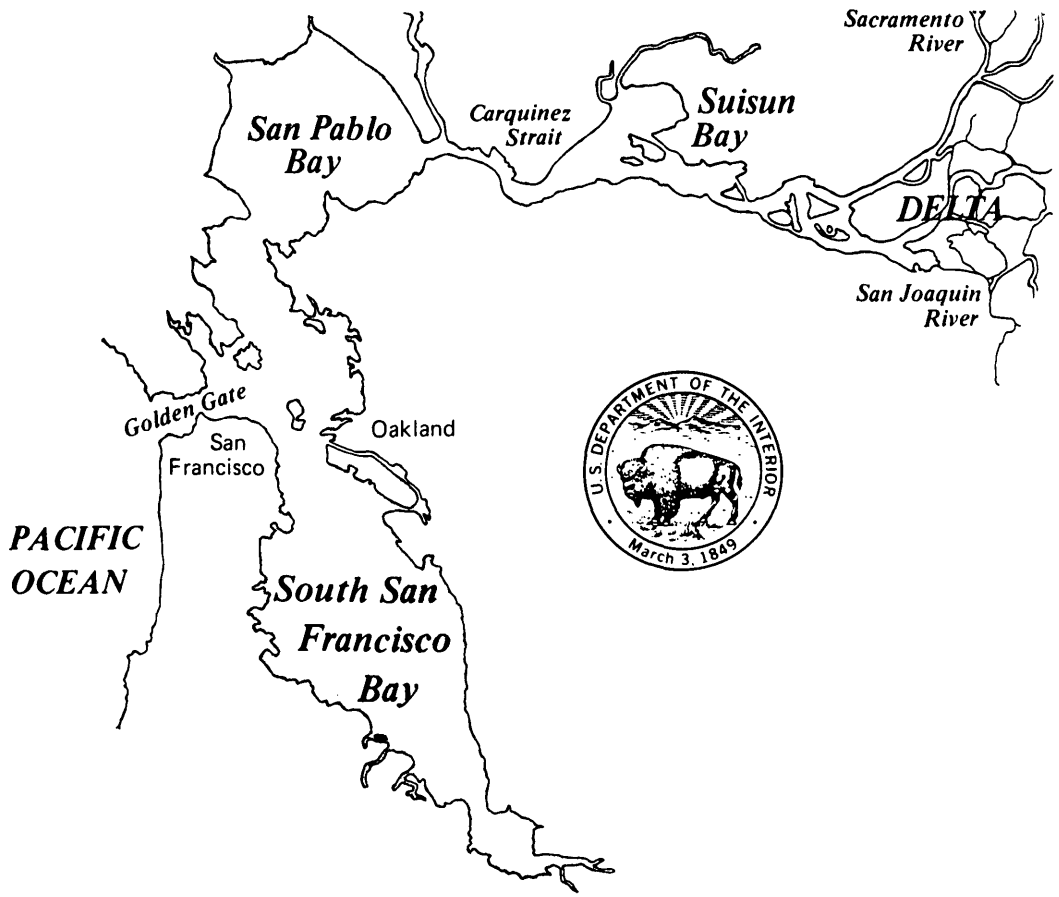


CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 323 37-52-24N 122-24-15W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø14.Ø METERS.

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART V. RESULTS OF MEASUREMENTS IN SOUTH BAY REGION

U. S. GEOLOGICAL SURVEY
WATER RESOURCES INVESTIGATIONS REPORT 84-4339



February 1984

TIDES, TIDAL AND RESIDUAL CURRENTS IN SAN FRANCISCO BAY, CALIFORNIA - RESULTS OF MEASUREMENTS, 1979 - 1980

PART V. RESULTS OF MEASUREMENTS IN SOUTH BAY REGION

by Ralph T. Cheng and Jeffrey W. Gartner

U. S. Geological Survey

Water Resources Investigations Report 84-4339

February 1984

UNITED STATES DEPARTMENT OF THE INTERIOR
William P. Clark, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

WATER RESOURCES INVESTIGATIONS REPORT

For additional information
write to:

Regional Hydrologist
Water Resources Division
U.S. Geological Survey
345 Middlefield Road, MS 466
Menlo Park, CA 94025

Copies of this report
can be purchased from:

Open-File Services Section
Western Distribution Branch
U.S. Geological Survey
Box 25425, Federal Center
Lakewood, CO 80225

CONTENTS

PART V. RESULTS OF MEASUREMENTS IN SOUTH BAY REGION

TABLES

ILLUSTRATIONS

APPENDICES

FIELD DATA

In Part V of this report, we include data collected in the South San Francisco Bay region (South Bay) (the sub-embayment south of the San Francisco-Oakland Bridge) of the San Francisco Bay estuarine system (fig. V.1). For the purpose of this report, the area of South Bay has a wetted surface area of approximately 554 sq km and a mean depth of 3.4 m at MLLW. South Bay is characterized by a deep region in the northern 1/3 of South Bay, a deep main channel (>10 m), and an expansive shoal to the east of the channel for the remainder of the Bay (fig. V.2).

The water properties of South Bay vary seasonally and are controlled in part by water exchange with the northern reach and the seasonal meteorological conditions of the region. There are no major tributaries in South Bay and the area receives more than 75 percent ($1.3\ km^3\ yr^{-1}$) of the total waste water discharged into the Bay system. During summer months sewage inflows exceed natural stream inflows. The salinity of South Bay is nearly isohaline and is near oceanic values for much of the year. However, significant stratification may exist in winter and early spring when maximum flux of Delta derived freshwater enters South Bay via the northern reach. Typical meteorological conditions for the South Bay region are characterized by prevailing westerly or northwesterly winds in the late spring, summer, and early fall with more variable winds in winter (Gartner and Cheng, 1983)*. Thus, there are four important factors which influence circulation and affect the current-meter data in South Bay; they are the basin bathymetry, tides, winds, and salinity stratification.

*All references are listed in Part I of this report.

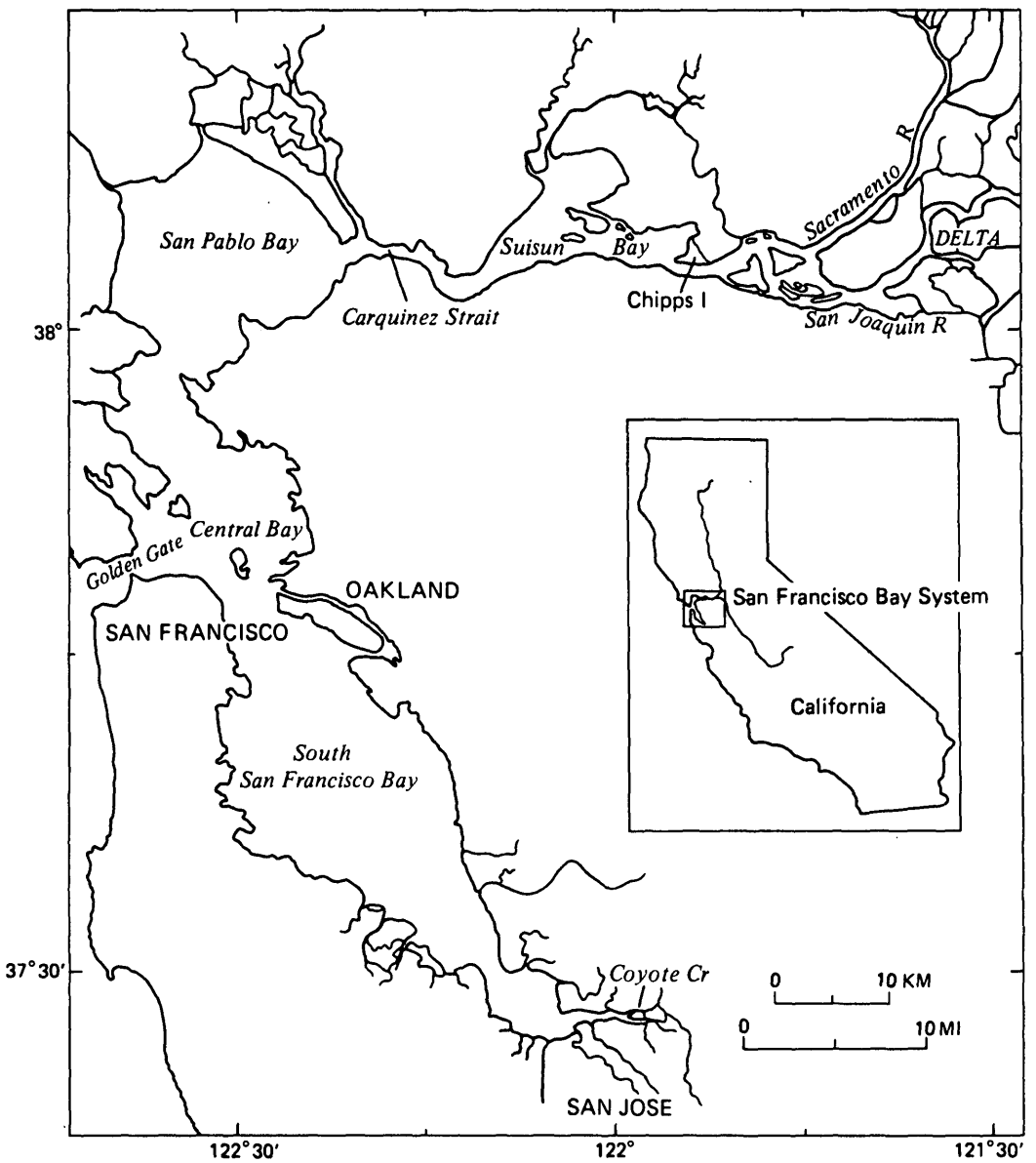


Figure V.1. Map of San Francisco Bay estuarine system.

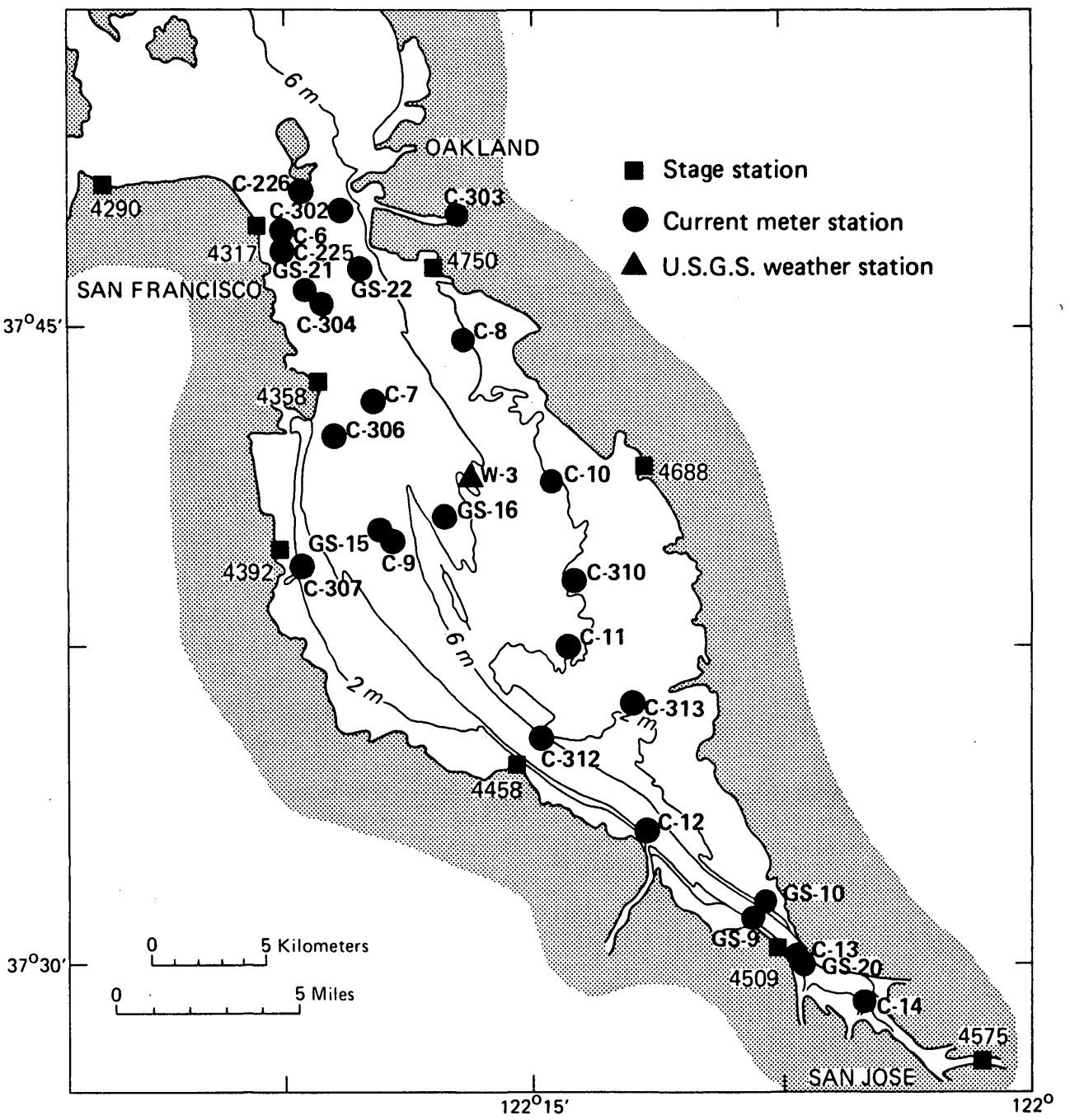


Figure V.2. Map of South Bay region and the location of current-meter moorings, tide stations, and a USGS weather station.

Current-meter data

Twenty six (26) current meter stations were deployed in the South Bay region by the USGS and NOS/NOAA during the combined current survey in 1979 and 1980. Multiple current meters were deployed at several current-meter stations in the main channel. The minimum length of current-meter deployment was fifteen days, and the maximum deployment was not to exceed thirty-five days. Figure V.2 depicts the approximate geographic location of the current-meter stations in this region. The precise latitude and longitude, and the water depth for each current-meter station at MLLW are compiled in table V.1. Also included in table V.1 are the depths at which the current meters were deployed, and the deployment and recovery dates for all data included in this part of the report. Figure V.3 is a chronological bargraph which indicates the availability of the current-meter data in 1979 and 1980. The solid bars on the bargraph indicate current-meter stations where multiple current meters were used for the indicated period of time. Table V.1, figure V.2, and figure V.3 define the complete spatial and temporal distributions of the current-meter data. In addition, table V.1, figure V.2, and figure V.3 define other pertinent information for each current-meter record.

Water-level (tide) data

Water-level data from eight (8) stage stations located around the perimeter of South Bay have been analyzed and are presented in this part of the report. The locations of these tide stations are shown in figure V.2, and the precise latitude and longitude of each station are given in table V.2. Because tides in the Bay system are the result of forced oscillations by tides in the Pacific Ocean which propagate into the Bay system through

TABLE V.1. Endeco current meter deployments between 1 January 1979 and 31 December 1980 in South Bay.

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
GSC7	37°	43.4'	122°	19.4'	192 80	211 80	GSC007A1	12.1	9.1
GSC7	37°	43.4'	122°	19.4'	211 80	232 80	GSC007B1	12.1	9.1
GSC9	37°	40.3'	122°	19.0'	352 79	11 80	GSC009A1	7.6	3.1
GSC9	37°	40.7'	122°	19.0'	11 80	44 80	GSC009B1	8.5	3.1
GSC9	37°	40.7'	122°	19.0'	44 80	73 80	GSC009C1	8.5	3.1
GSC9	37°	40.7'	122°	19.1'	73 80	101 80	GSC009D1	8.2	3.1
GSC9	37°	40.7'	122°	19.0'	101 80	140 80	GSC009E1	7.0	3.1
GSC9	37°	40.7'	122°	19.0'	172 80	204 80	GSC009G1	7.6	3.1
GSC9	37°	40.7'	122°	19.0'	204 80	235 80	GSC009H1	7.3	3.1
GSC9	37°	40.8'	122°	19.0'	235 80	252 80	GSC009I1	7.6	3.1
GSC9	37°	40.7'	122°	19.0'	252 80	277 80	GSC009J1	7.9	3.1
GSC9	37°	40.7'	122°	19.2'	280 80	308 80	GSC009K1	7.6	3.1
GSC9	37°	40.8'	122°	19.2'	311 80	333 80	GSC009L1	7.6	3.1
GS9	37°	30.9'	122°	8.0'	32 79	59 79	GS009A1	9.1	4.0
GS9	37°	30.9'	122°	8.0'	32 79	59 79	GS009A2	9.1	1.5
GS10	37°	31.0'	122°	7.7'	32 79	45 79	GS010A1	9.1	5.5
GS10	37°	31.0'	122°	7.7'	32 79	59 79	GS010A2	9.1	1.5
GSC13	37°	30.2'	122°	6.8'	352 79	15 80	GSC013A1	12.5	6.1
GSC13	37°	30.1'	122°	6.7'	18 80	44 80	GSC013B1	14.3	6.1
GSC13	37°	30.1'	122°	6.7'	73 80	102 80	GSC013D1	15.2	6.1
GSC13	37°	30.1'	122°	6.9'	102 80	127 80	GSC013E1	14.0	6.1
GSC13	37°	30.1'	122°	6.9'	127 80	154 80	GSC013F1	14.6	6.1
GSC13	37°	30.1'	122°	6.8'	154 80	191 80	GSC013G1	14.3	6.1
GSC13	37°	30.1'	122°	6.8'	191 80	221 80	GSC013H1	13.7	6.1
GSC13	37°	30.1'	122°	6.8'	252 80	280 80	GSC013J1	13.7	6.1
GSC13	37°	30.1'	122°	6.8'	280 80	312 80	GSC013K1	13.7	6.1
GSC13	37°	30.1'	122°	6.8'	317 80	337 80	GSC013L1	14.0	6.1
GS15	37°	40.2'	122°	19.8'	211 79	247 79	GS015A1	7.3	3.7
GS16	37°	40.8'	122°	17.5'	211 79	247 79	GS016A1	7.3	3.7
GS20	37°	30.1'	122°	6.8'	211 79	247 79	GS020A1	13.1	6.7
GS21	37°	46.2'	122°	21.8'	211 79	247 79	GS021A1	15.2	10.7
GS22	37°	46.3'	122°	20.4'	211 79	247 79	GS022A1	11.5	5.8
GSC302	37°	47.7'	122°	20.7'	204 80	224 80	GSC302A1	7.9	4.9

*Water depth in meters referenced to MLLW

†Meter depth in meters above bed

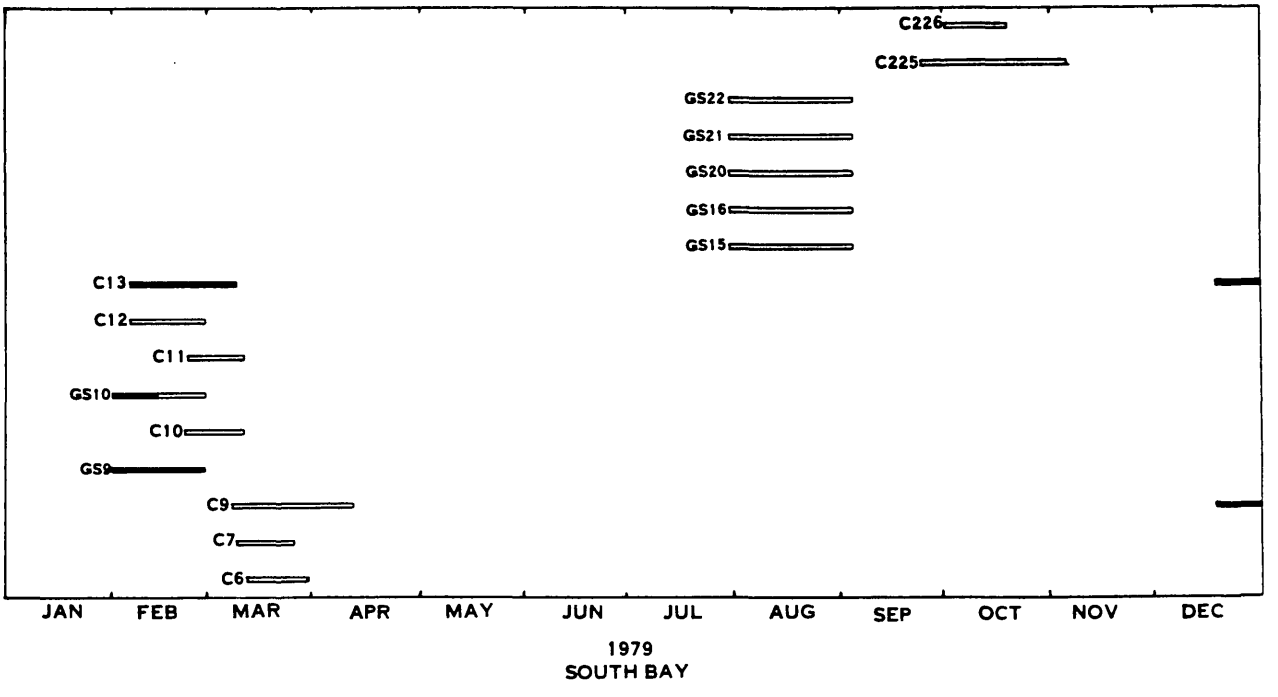
TABLE V.1 (cont). Aanderaa current meter deployments between 1 January 1979 and 31 December 1980 in South Bay.

STATION NUMBER	LATITUDE DEG MIN	LONGITUDE DEG MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C006	37° 47.4'	122° 22.4'	71 79	89 79	1724	19.2	1.7
C006	37° 47.3'	122° 22.4'	155 80	175 80	2065	19.8	13.6
C006	37° 47.4'	122° 22.4'	175 80	191 80	2096	19.8	13.6
C006	37° 47.4'	122° 22.4'	175 80	191 80	2097	19.8	7.5
C006	37° 47.4'	122° 22.4'	175 80	191 80	2098	19.8	2.0
C006	37° 47.5'	122° 22.4'	192 80	206 80	2130	19.8	13.6
C006	37° 47.5'	122° 22.4'	192 80	206 80	2131	19.8	7.5
C006	37° 47.4'	122° 22.4'	205 80	225 80	2151	18.9	13.7
C006	37° 47.4'	122° 22.4'	205 80	225 80	2152	18.9	7.5
C006	37° 47.5'	122° 22.4'	225 80	241 80	2184	19.8	13.7
C006	37° 47.5'	122° 22.4'	225 80	241 80	2185	19.8	7.6
C007	37° 43.3'	122° 19.5'	68 79	85 79	1720	12.2	6.1
C007	37° 43.4'	122° 19.5'	192 80	211 80	2128	12.5	6.1
C007	37° 43.4'	122° 19.5'	192 80	211 80	2129	12.5	1.5
C007	37° 43.4'	122° 19.4'	210 80	232 80	2157	12.5	6.1
C008	37° 44.7'	122° 17.0'	192 80	207 80	2127	2.1	0.9
C008	37° 44.7'	122° 17.0'	207 80	227 80	2154	2.1	0.9
C009	37° 39.9'	122° 19.3'	67 79	102 79	1719	7.6	1.5
C009	37° 40.3'	122° 19.0'	352 79	11 80	1946	7.6	1.5
C009	37° 40.7'	122° 19.0'	11 80	45 80	1948	8.5	1.5
C009	37° 40.7'	122° 19.1'	73 80	105 80	2009	8.2	1.5
C009	37° 40.7'	122° 19.1'	101 80	141 80	2048	7.0	1.5
C009	37° 40.7'	122° 19.0'	172 80	204 80	2133	7.9	1.5
C009	37° 40.8'	122° 19.0'	235 80	253 80	2195	7.6	1.5
C010	37° 41.4'	122° 14.1'	53 79	70 79	1690	2.4	0.9
C010	37° 40.9'	122° 13.9'	231 80	248 80	2196	2.1	1.5
C011	37° 37.4'	122° 13.9'	54 79	70 79	1699	2.1	0.9
C012	37° 33.3'	122° 11.8'	37 79	59 79	1693	11.0	0.9
C012	37° 33.5'	122° 11.9'	141 80	161 80	2037	14.3	8.5
C012	37° 33.5'	122° 11.9'	141 80	161 80	2038	14.3	1.5
C013	37° 30.1'	122° 6.9'	37 79	68 79	1691	14.3	6.7
C013	37° 30.1'	122° 6.9'	37 79	68 79	1692	14.3	1.5
C013	37° 30.3'	122° 6.8'	352 79	16 80	1947	12.5	1.5
C013	37° 30.1'	122° 6.7'	14 80	45 80	1949	14.3	1.5
C013	37° 30.1'	122° 6.8'	73 80	105 80	2010	15.2	1.5
C013	37° 30.1'	122° 6.9'	127 80	154 80	2078	14.6	1.5
C013	37° 30.1'	122° 6.8'	154 80	191 80	2103	14.3	1.5
C013	37° 30.1'	122° 6.8'	191 80	221 80	2171	13.7	1.5
C013	37° 30.2'	122° 6.8'	317 80	338 80	2313	14.0	1.5
C014	37° 29.3'	122° 4.9'	143 80	164 80	2050	6.4	1.5
C225	37° 47.5'	122° 22.4'	267 79	295 79	1857	19.8	13.1
C225	37° 47.4'	122° 22.3'	290 79	309 79	1889	19.2	13.1
C226	37° 48.3'	122° 21.4'	274 79	292 79	1861	8.5	1.5
C226	37° 48.3'	122° 21.5'	319 80	340 80	2354	8.5	1.5
C302	37° 40.7'	122° 20.7'	204 80	224 80	2149	7.9	1.5
C303	37° 47.7'	122° 17.2'	204 80	224 80	2150	11.6	1.5

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE	RECOVERY DATE	TAPE NUMBER	MLLW* DEPTH	METER† DEPTH
C304	37°	45.5'	122°	21.5'	189 80	206 80	2115	17.1	11.0
C304	37°	45.5'	122°	21.5'	189 80	206 80	2117	17.1	2.2
C306	37°	42.5'	122°	21.0'	196 80	213 80	2138	11.3	5.2
C306	37°	42.5'	122°	21.0'	196 80	213 80	2139	11.3	1.5
C306	37°	42.5'	122°	21.0'	213 80	232 80	2169	11.3	1.5
C307	37°	39.3'	122°	21.8'	218 80	235 80	2181	4.6	1.5
C310	37°	39.0'	122°	13.6'	163 80	183 80	2080	2.1	0.9
C310	37°	39.1'	122°	13.7'	179 80	198 80	2105	2.1	0.9
C312	37°	35.4'	122°	14.9'	141 80	157 80	2039	14.3	11.3
C312	37°	35.4'	122°	14.9'	141 80	157 80	2040	14.3	8.2
C312	37°	35.4'	122°	14.9'	141 80	157 80	2041	14.3	2.4
C312	37°	35.4'	122°	15.0'	157 80	176 80	2068	14.3	11.3
C312	37°	35.4'	122°	15.0'	157 80	176 80	2069	14.3	8.2
C312	37°	35.4'	122°	15.0'	176 80	192 80	2099	14.0	11.3
C312	37°	35.4'	122°	15.0'	176 80	192 80	2100	14.0	8.2
C312	37°	35.4'	122°	15.1'	311 80	331 80	2344R	13.7	2.4
C313	37°	35.9'	122°	12.3'	177 80	192 80	2102	2.1	0.9

*Water depth in meters referenced to MLLW

†Meter depth in meters above bed



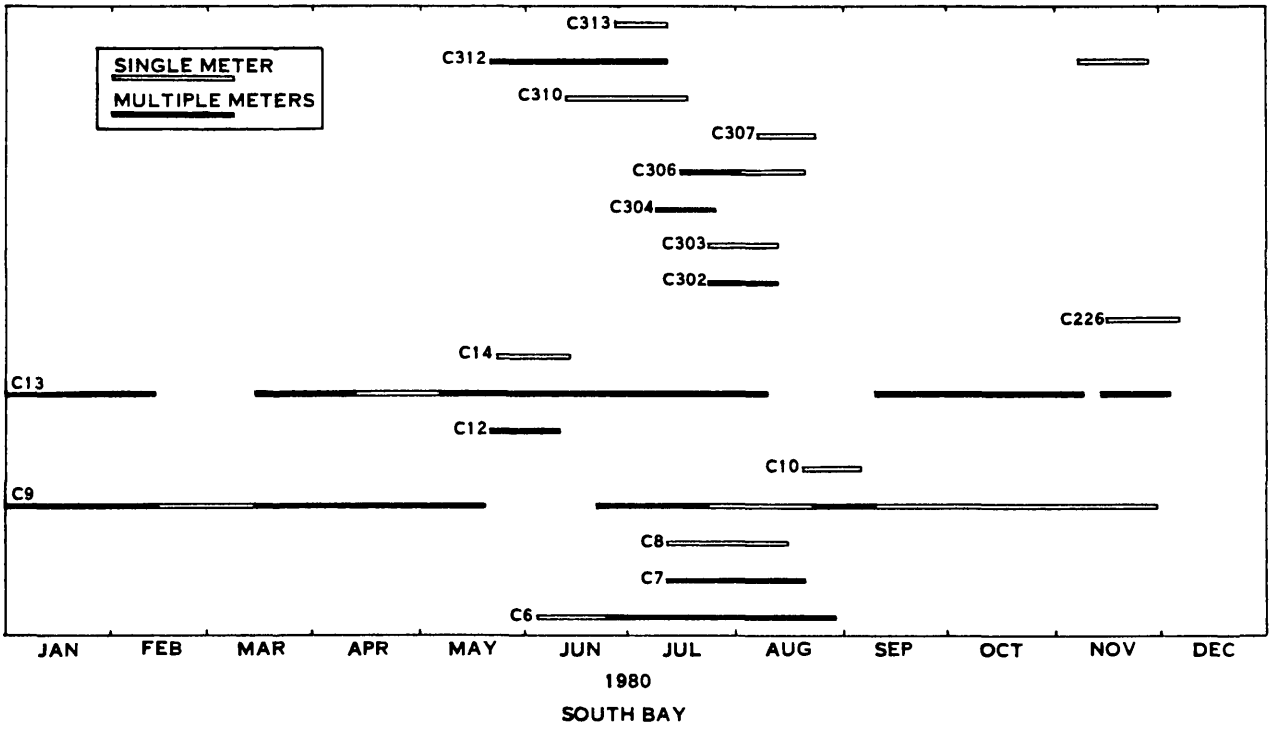


Figure V.3. Bargraph of periods when current-meter arrays were deployed in the South Bay region. Solid bars indicate multiple meters were used.

TABLE V.2. South San Francisco Bay stage stations, 1979-1980

STATION NUMBER	STATION NAME	LATITUDE	LONGITUDE	START DATE	RECORD LENGTH (DAYS)
4317	Bay Bridge	37°47.4′	122°22.2′	9/1/79	366
4358	Hunters Point	37°43.8′	122°21.4′	1/22/79	307
4392	Oyster Point	37°39.8′	122°22.7′	4/20/79	133
4458	San Mateo Bridge	37°34.8′	122°15.2′	4/20/79	315
4509	Dumbarton Bridge	37°30.4′	122°07.1′	1/1/80	366
4575	Coyote Creek	37°27.8′	122°01.4′	1/24/79	44
4688	San Leandro	37°41.7′	122°11.5′	5/1/79	365
4750	Alameda	37°46.3′	122°17.9′	1/1/80	366

Golden Gate, the tide data from the station at Golden Gate (Presidio, figure V.1) are also included in Part V of this report. The properties of the tides at Golden Gate are used as the reference values for tides at other locations in the Bay. As mentioned previously, the water-level data were received from NOS/NOAA on a standard 9-track computer tape in the form of hourly water levels at various stage stations. These data covered different periods of time in 1979 and 1980, and might contain record gaps. Since the tide records are usually quite long and generally quite accurate, the results derived from the least-squares harmonic analyses are not affected by the presence of a record gap if the record gap is only a small fraction of the total record analyzed. Figure V.2 and table V.2 define the spatial and temporal distribution of the stage data included in Part V of this report. The exact period of time and the length of the record analyzed for each stage station are given in the harmonic analysis summary sheet for each stage station.

RESULTS

Tides in South Bay

Least-squares harmonic analyses were applied to three yearlong (or nearly yearlong) water-level records at Presidio (Golden Gate), the entrance to the Bay system from the Pacific Ocean. The computed results have been given in Part I, table I.2 of this report. We have included only the summary sheet for tides at Presidio for 1979 for comparison with results of the harmonic analysis at other stations. The tides entering the Bay have a form number of 0.84, which indicates that tides are typically mixed diurnal and semidiurnal without a clear inclination toward either type. It is interesting to note that the lower low water usually follows the occurrence of the higher high water; the tidal currents usually have a stronger ebbing current than flooding current.

Harmonic analyses were performed for all the tide data as indicated in table V.2. The results of the analyses are compiled in Appendix V.A in terms of the harmonic constants for each tide station. As discussed previously, the harmonic constants can be used for prediction of tides at these stations (see Part I of this report). The properties of the tides in South Bay can be summarized by showing the spatial distributions of the phase and amplitude of the two most important partial tides (M_2 and K_1) over a map of the South Bay region (fig. V.4). The results for tides at Presidio (Golden Gate) are also included for reference. Shown in figure V.4 are the form number, the modified epoch, κ', and the amplitudes of M_2 and K_1 partial tides. The tidal phase shift, $\Delta\kappa'$, (the modified epoch at station minus the modified epoch at Golden Gate), and the amplitude amplification factor, amf, (the ratio of the amplitude at station to the

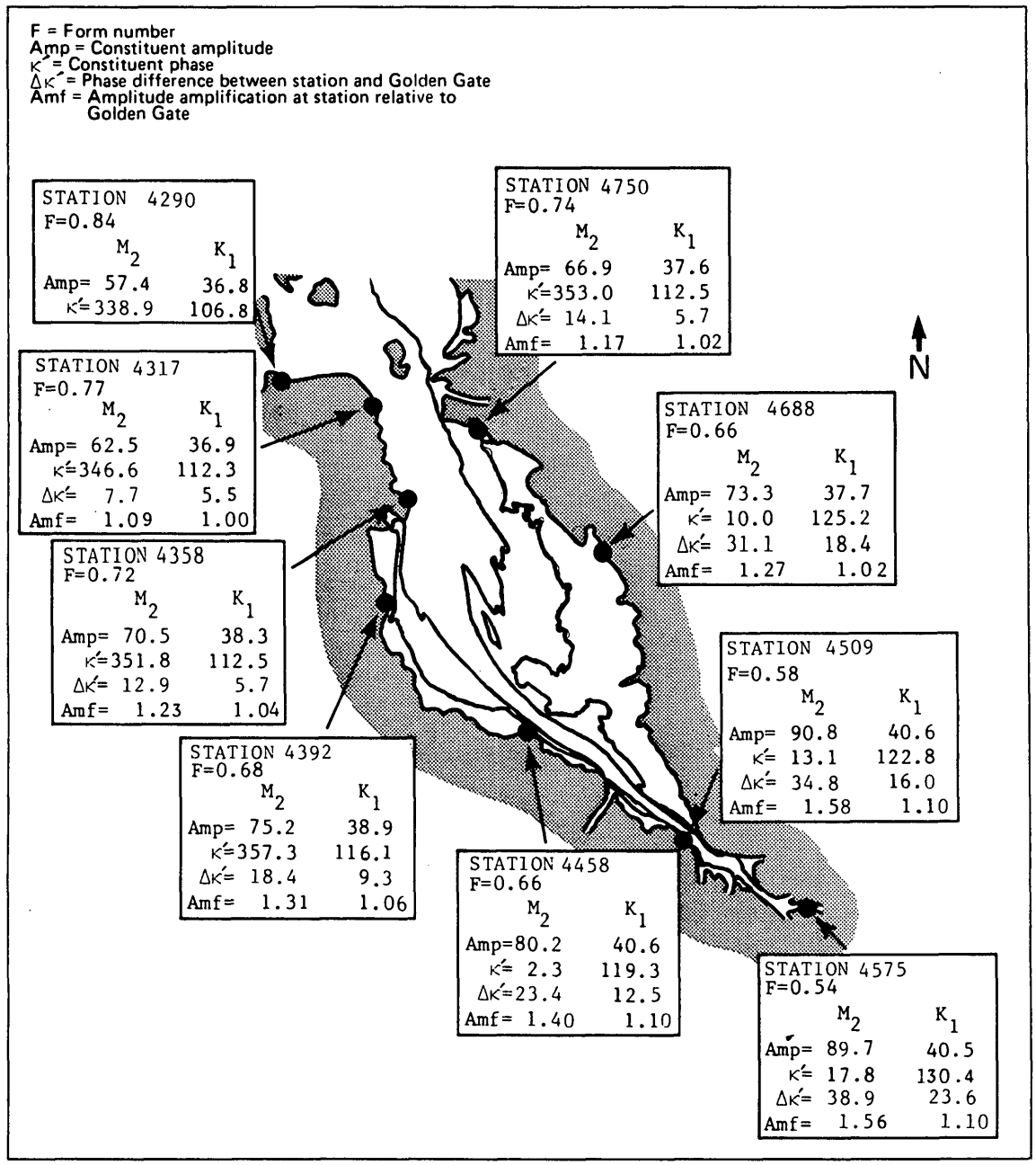


Figure V.4. Spatial distribution of properties of M_2 and K_1 tides in South Bay, California.

amplitude at Golden Gate) are depicted in figure V.4. Due to the lack of data in the middle of the basin, co-tidal and co-range charts for South Bay have not been constructed. Nevertheless, the present results give a general description of the properties of tides in South Bay, California.

The form numbers for tides in South Bay range between 0.60 and 0.81 indicating that the tides retain the same mixed semidiurnal and diurnal characteristics as the tides at Golden Gate. As the tides propagate through Central Bay into the South Bay region along the main channel, they take approximately 1 1/2 hours for the tides to reach the south end of South Bay. The reflections of the tidal waves are superimposed on the incoming tides; thus the tides in South Bay behave like standing waves. The amplitudes of tides are increasingly amplified southward. At the south end of South Bay (Station 4509), the amplitudes of M_2 and K_1 have increased to 1.58 and 1.10 times that of the respective amplitudes at Presidio (Station 4290). Because the amplification of the principal lunar semidiurnal partial tide, M_2, is greater than that of the luni-solar diurnal partial tide, K_1, the form number of the tides decreases toward the south end. The net phase shift in this region for M_2 (between Station 4317 and Station 4509) is about 27.1 degrees. Values for amplitude amplification and phase shift for K_1 are also given in figure V.4; the properties for other partial tides are similar. Specific values of amplitude amplification and phase shift for other partial tides can be deduced from the results of the harmonic analyses given in the summary sheets (Appendix V.A).

Tidal current in South Bay

The results of tidal-current measurements are presented in two forms. For each current-meter data file analyzed (tab. V.1), the results of the harmonic analyses are compiled in a summary sheet and are given in Appendix V.B. The summary lists the pertinent notes concerning the current-meter deployment and recovery. It includes the station location, water depth, meter depth, deployment and recovery dates, and the approximate record length. The harmonic constants for O_1, K_1, N_2, M_2, S_2, and M_4 are given for the tidal current components in the directions where the major and minor axes of the tidal current ellipses are defined (see Part I). As explained in Part I of this report, with the values for the major and minor axes, modified epoch (phase), and the sense of rotation for each partial tidal current ellipse, Eqs. (6) and (7) of Part I can be used for predicting the tidal current at the station. Additional general properties of tidal current including root-mean-squares (RMS) current speed, spring and neap tidal current limits, principal tidal current direction, and tidal current form number are also given in the summary sheet.

At almost all stations, the tidal currents show a strong bi-directional tendency. The principal current direction depends strongly on the local basin bathymetry. There is a spring and neap variation of the tidal current speed up to a factor of about two. As the form numbers indicate, the tidal currents in South Bay are mixed semidiurnal and diurnal types; however, for most of the cases the tidal current type is closer to semdiurnal than diurnal.

Following the summary of the results of the harmonic analyses, the current-meter data are presented graphically in the form of time-series plots (Appendix V.B). For each data file, the time variations of the

tidal-current speed and direction are plotted versus time. Water temperature and salinity are plotted versus time on a separate page. As mentioned before, the time-series plots are used to provide users with a visual display of temporal variations of tidal currents and their associated properties. No effort was given to edit the data in the file. Portions of the data may be invalid due to marine fouling, malfunction of instrument, or some other unknown reasons. It was our intention to leave the data close to their original form; users need to judge the validity of the data based on the general principles of estuarine-physical oceanography. Only valid data (our own best judgement) were used in the harmonic analyses. Data users may need to edit out any invalid portion of the data given in the time-series plots before using the data for their intended applications.

The most important properties of tidal current in South Bay can be characterized by five parameters: (1) the amplitude of M_2 tidal current ellipse (magnitude of semi-major axis of the M_2 tidal current ellipse), (2) the RMS tidal current speed, (3) and (4) spring and neap tidal current speed limits, and (5) the principal tidal current direction. The spatial distribution of these parameters is plotted on a map of the South Bay region (fig. V.5) in which the M_2, RMS, and the estimated spring and neap tidal current vectors are plotted in the principal tidal current direction at each station. The spatial distribution of the tidal current suggests that the tidal current is strongly dependent on the basin bathymetry. The correlation of the depth-averaged tidal current and the water depth is examined by a linear regression of the RMS current speed versus the local mean water depth at MLLW. Only those current-meter data when the current meters were placed between 35 percent and 65 percent of the local water

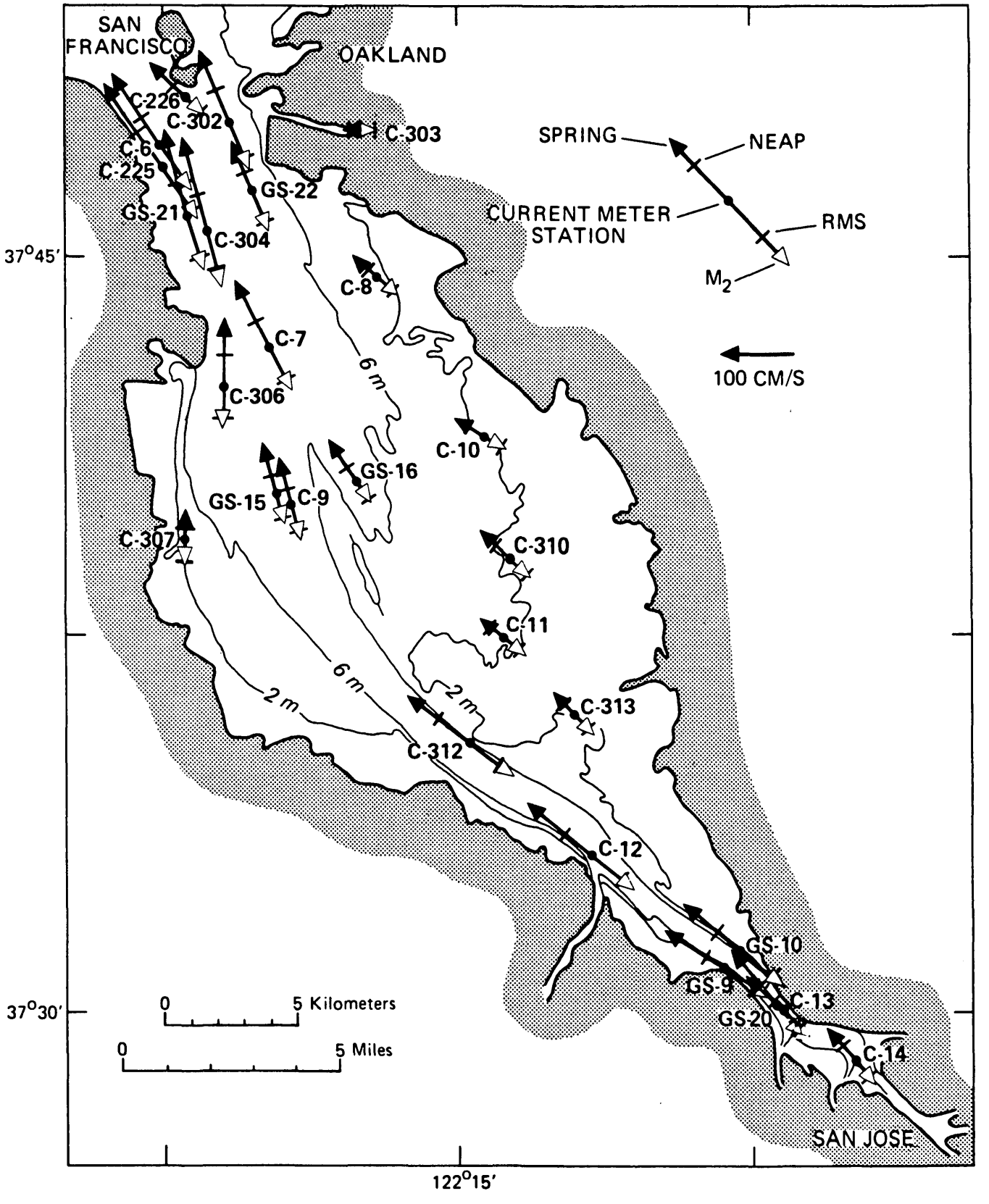


Figure V.5. Spatial distribution of tidal-current properties in South Bay, California. The legend and scale of the velocity vectors are defined in the upper right hand corner of the figure.

depth were used as approximations to the depth-averaged tidal currents. Simple linear regression of RMS current speed over the water depth gives a slope of 2.17 (cm/sec)/m, and the measure of the goodness of fit for the regression r^2 = 0.88 (fig. V.6). The present data set has confirmed the dependency of the tidal-current speed and direction on the basin bathymetry in South Bay, California. This is an important conclusion because this property can be used to estimate tidal current speed and direction elsewhere in the basin where actual field data are not available (Cheng and Gartner, 1982).

Eulerian residual current in South Bay

As discussed previously in Part I of this report, the Eulerian residual current is defined as the vectorial average of the current-meter data made over several even M_2 tidal cycles. The computed Eulerian residual currents are given in the summary for each current-meter data file. Since the Delta outflow is one of the variables which affect the Eulerian residual current in South Bay, the averaged values of the Delta outflow at the corresponding periods of time have been computed from Dayflow (1982) and are given in the summary sheets.

The factors which affect the Eulerian residual currents in South Bay are rather complex. Basin bathymetry, Delta outflow, spatial distribution of tidal currents (tidal current shear), long term temporal variations of tidal currents (spring and neap variations), and wind forcing at the water surface are all important factors which may have effects on the magnitude and spatial distribution of the Eulerian residual currents. Although a general pattern of the Eulerian residual current exists, it is difficult to draw a simple conclusion from these data as to what are the dominant

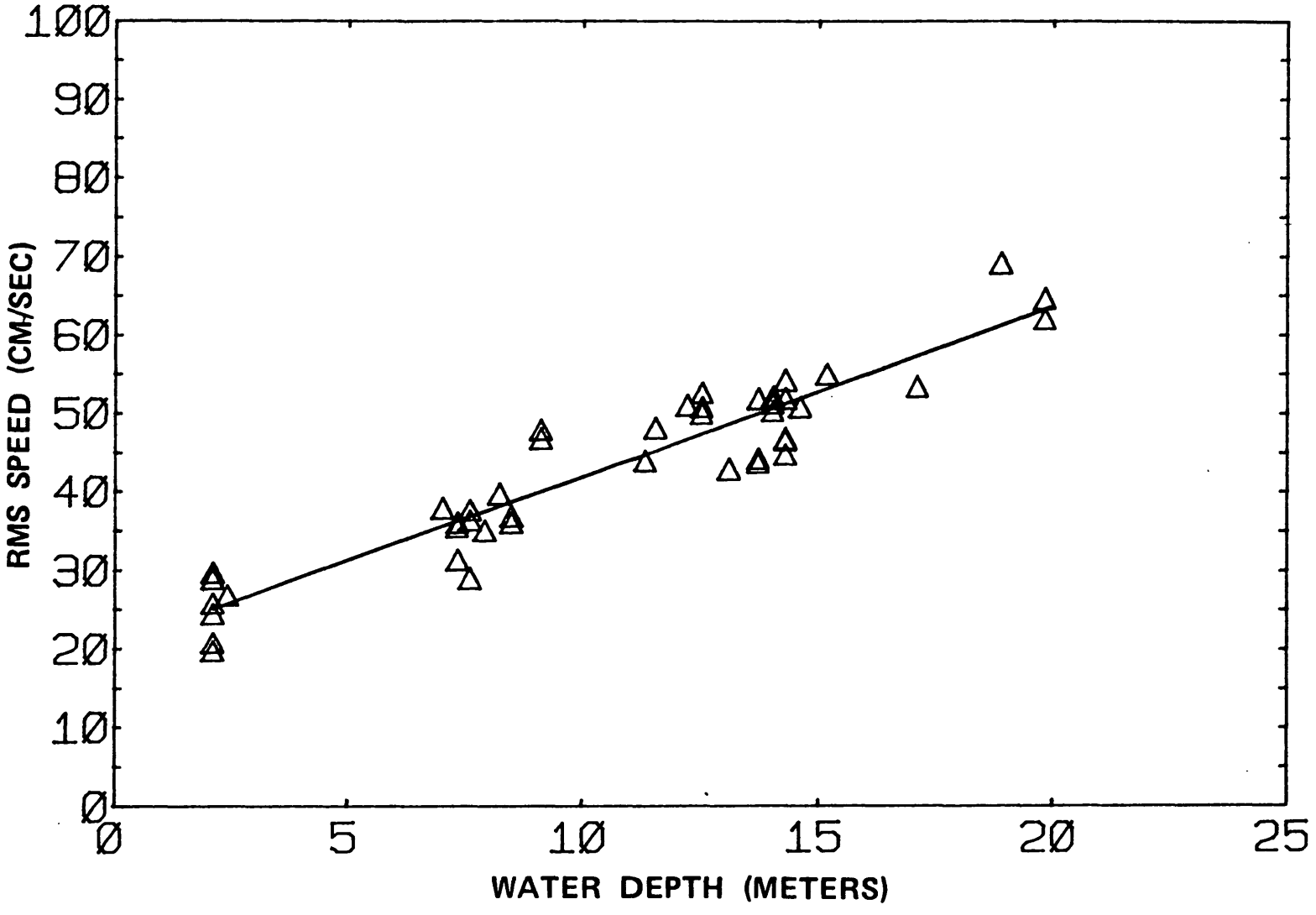


Figure V.6. Relation between RMS current speed and mean-water depth (MLLW) at deployment sites in South Bay, California.

factors which govern the generation mechanism of the Eulerian residual current in South Bay. In other words, the computed Eulerian residual currents include all of the above mentioned factors; it is not possible to delineate the individual effects solely based upon examination of these data. The use of mathematical models is a possible way to aid the understanding of the generation mechanism of the Eulerian residual currents in South San Francisco Bay. Indeed, one of the purposes of this data collection program is to support mathematical modeling research.

SUMMARY

In Part V, the observations from moored current meters and water-level stations in South Bay are given. The main purposes of this part of the report are: (1) to document the data set collected in South Bay, California during the intensive current survey which was conducted jointly by the USGS and NOS/NOAA; (2) to present the basic data in a form useful to users; and (3) to document results from harmonic analyses of these data. The tabulated harmonic constants given in Part V can be used to predict tides and tidal currents in South Bay. The results from the harmonic analyses have led to the conclusion that tides in South Bay are mixed progressive and standing waves in the main channel but closer to a standing wave, and the tidal currents are strongly dependent on the basin bathymetry. Whereas the Eulerian residual current is affected by basin bathymetry, Delta outflow, tidal currents, and wind forcings, a simple conclusion concerning the dominance of any one of these factors cannot be reached from these analyses. The generation of the Eulerian residual currents is probably a combination of all the above mentioned mechanisms.

APPENDIX V.A

RESULTS OF HARMONIC ANALYSES OF TIDES (STAGE) IN SOUTH BAY, CALIFORNIA

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414290
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 365 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 27 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 9.26 CM
TIME SERIES MEAN: 272.92 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.15	82.14	97.42
O1	0.92954	22.87	86.32	97.24
M1	0.96645	1.35	111.31	117.80
P1	0.99726	11.46	101.64	104.43
K1	1.00274	36.73	104.26	106.40
J1	1.03903	1.99	130.29	128.07
MU2	1.86455	0.80	231.49	252.68
N2	1.89598	12.44	299.88	317.29
NU2	1.90084	2.27	306.50	323.33
M2	1.93227	57.79	324.77	337.82
L2	1.96857	2.40	349.83	358.53
T2	1.99726	1.12	324.04	329.30
S2	2.00000	13.48	331.70	336.63
K2	2.00548	3.85	327.31	331.58
M4	3.86455	2.37	19.03	45.14
MK3	2.93501	2.09	126.13	141.33

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414317
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 9
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 366 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 22 MIN 12 SEC
STANDARD DEVIATION OF THE TIME SERIES: 24.98 CM
TIME SERIES MEAN: 215.64 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.78	88.01	103.19
O1	0.92954	22.02	88.91	99.74
M1	0.96645	1.26	137.64	144.04
P1	0.99726	11.61	105.96	108.66
K1	1.00274	36.94	110.22	112.27
J1	1.03903	2.16	145.17	142.85
MU2	1.86455	0.75	184.54	205.53
N2	1.89598	13.15	309.60	326.82
NU2	1.90084	3.04	310.22	326.86
M2	1.93227	62.48	333.72	346.59
L2	1.96857	2.96	1.67	10.18
T2	1.99726	1.13	326.07	331.14
S2	2.00000	14.19	341.70	346.44
K2	2.00548	4.60	330.38	334.47
M4	3.86455	2.39	10.53	36.26
MK3	2.93501	2.35	112.32	127.23

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414358
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY=22
HOUR= 0
APPROXIMATE RECORD LENGTH: 307 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 21 MIN 24 SEC
STANDARD DEVIATION OF THE TIME SERIES: 7.62 CM
TIME SERIES MEAN: 192.34 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.10	85.15	100.32
O1	0.92954	23.29	92.78	103.59
M1	0.96645	1.40	122.09	128.47
P1	0.99726	11.98	109.84	112.53
K1	1.00274	38.29	110.46	112.49
J1	1.03903	2.04	135.84	133.51
MU2	1.86455	0.62	136.36	157.32
N2	1.89598	14.45	314.89	332.09
NU2	1.90084	3.03	324.82	341.43
M2	1.93227	70.47	338.98	351.82
L2	1.96857	3.78	1.76	10.25
T2	1.99726	1.00	333.03	338.07
S2	2.00000	15.30	349.50	354.21
K2	2.00548	5.03	341.81	345.86
M4	3.86455	1.66	20.65	46.33
MK3	2.93501	2.03	106.16	121.03

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414392
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 4
DAY=20
HOUR= 0
APPROXIMATE RECORD LENGTH: 133 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 22 MIN 42 SEC
STANDARD DEVIATION OF THE TIME SERIES: 6.92 CM
TIME SERIES MEAN: 164.55 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.96	97.95	113.14
O1	0.92954	23.12	96.97	107.81
M1	0.96645	1.05	125.69	132.10
P1	0.99726	12.44	114.29	116.99
K1	1.00274	38.86	114.09	116.14
J1	1.03903	1.81	144.86	142.55
MU2	1.86455	1.64	139.58	160.59
N2	1.89598	15.37	322.55	339.79
NU2	1.90084	3.21	332.46	349.12
M2	1.93227	75.20	344.39	357.27
L2	1.96857	3.85	350.57	359.09
T2	1.99726	0.61	352.24	357.33
S2	2.00000	15.68	357.67	2.43
K2	2.00548	4.81	345.57	349.67
M4	3.86455	0.62	73.69	99.46
MK3	2.93501	2.07	83.15	98.09

****
* SUMMARY OF HARMONIC ANALYSIS *
*   WATER LEVEL STATIONS   *
****

STAGE STATION: 9414458
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 4
DAY=20
HOUR= 0
APPROXIMATE RECORD LENGTH: 315 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 15 MIN 18 SEC
STANDARD DEVIATION OF THE TIME SERIES: 13.01 CM
TIME SERIES MEAN: 569.80 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.14	96.87	111.94
O1	0.92954	23.97	100.47	111.18
M1	0.96645	1.31	131.79	138.07
P1	0.99726	11.83	115.25	117.83
K1	1.00274	40.57	117.33	119.25
J1	1.03903	1.92	154.68	152.25
MU2	1.86455	1.85	113.85	134.61
N2	1.89598	16.90	327.25	344.24
NU2	1.90084	3.54	337.74	354.15
M2	1.93227	80.20	349.65	2.29
L2	1.96857	4.54	3.70	11.99
T2	1.99726	1.66	343.84	348.68
S2	2.00000	17.39	4.54	9.05
K2	2.00548	5.72	341.98	345.83
M4	3.86455	0.22	228.46	253.73
MK3	2.93501	2.71	77.91	92.48

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414509
START TIME OF SERIES (PST):
YEAR=1980
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 366 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 7 MIN 6 SEC
STANDARD DEVIATION OF THE TIME SERIES: 12.81 CM
TIME SERIES MEAN: 173.27 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.33	101.13	116.06
O1	0.92954	23.93	105.19	115.77
M1	0.96645	1.78	143.75	149.90
P1	0.99726	12.92	122.79	125.24
K1	1.00274	40.62	121.04	122.83
J1	1.03903	2.14	154.43	151.86
MU2	1.86455	2.15	123.61	144.10
N2	1.89598	18.58	340.82	357.53
NU2	1.90084	3.47	338.49	354.62
M2	1.93227	90.77	0.74	13.10
L2	1.96857	6.73	356.35	4.36
T2	1.99726	1.28	306.71	311.27
S2	2.00000	20.19	17.34	21.58
K2	2.00548	6.71	2.99	6.57
M4	3.86455	1.51	246.03	270.76
MK3	2.93501	3.06	91.67	105.82

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414575
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 1
DAY=24
HOUR= 0
APPROXIMATE RECORD LENGTH: 44 DAYS*
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 1 MIN 24 SEC
STANDARD DEVIATION OF THE TIME SERIES: 21.63 CM
TIME SERIES MEAN: 268.76 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.49	102.37	117.21
O1	0.92954	23.13	111.09	121.57
M1	0.96645	1.64	119.87	125.92
P1	0.99726	13.40	127.34	129.69
K1	1.00274	40.47	128.66	130.35
J1	1.03903	1.83	137.37	134.71
MU2	1.86455	2.15	313.85	334.15
N2	1.89598	9.64	32.94	49.47
NU2	1.90084	1.87	29.28	45.22
M2	1.93227	89.74	5.59	17.76
L2	1.96857	2.51	338.24	346.06
T2	1.99726	1.36	55.26	59.64
S2	2.00000	23.08	57.33	61.38
K2	2.00548	6.28	61.52	64.91
M4	3.86455	5.68	268.14	292.49
MK3	2.93501	5.43	104.18	118.05

*Inference method

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414688
START TIME OF SERIES (PST):
YEAR=1979
MONTH= 5
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 365 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 11 MIN 30 SEC
STANDARD DEVIATION OF THE TIME SERIES: 23.54 CM
TIME SERIES MEAN: 266.24 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	3.25	100.33	115.33
O1	0.92954	21.76	104.25	114.90
M1	0.96645	0.75	143.93	150.14
P1	0.99726	10.40	123.61	126.13
K1	1.00274	37.67	123.31	125.17
J1	1.03903	2.13	194.39	191.89
MU2	1.86455	0.62	131.14	151.78
N2	1.89598	14.21	331.32	348.19
NU2	1.90084	5.15	355.08	11.36
M2	1.93227	73.29	357.44	9.95
L2	1.96857	6.47	4.66	12.81
T2	1.99726	1.89	318.14	322.86
S2	2.00000	16.71	11.44	15.82
K2	2.00548	5.18	349.42	353.14
M4	3.86455	0.60	263.13	288.15
MK3	2.93501	2.26	83.46	97.83

****
* SUMMARY OF HARMONIC ANALYSIS *
* WATER LEVEL STATIONS *
****

STAGE STATION: 9414750
START TIME OF SERIES (PST):
YEAR=1980
MONTH= 1
DAY= 1
HOUR= 0
APPROXIMATE RECORD LENGTH: 366 DAYS
TIME MERIDIAN: 120 W
STATION LONGITUDE: 122 DEGREES 17 MIN 54 SEC
STANDARD DEVIATION OF THE TIME SERIES: 11.38 CM
TIME SERIES MEAN: 206.32 CM

NAME	CYCLES PER DAY	H (CM)	KAPPA (DEG)	KAPPAP (DEG)
Q1	0.89324	4.06	89.30	104.41
O1	0.92954	22.82	94.49	105.24
M1	0.96645	1.49	128.34	134.67
P1	0.99726	11.98	110.73	113.35
K1	1.00274	37.60	110.57	112.54
J1	1.03903	2.06	137.45	135.06
MU2	1.86455	0.40	204.59	225.44
N2	1.89598	13.68	316.88	333.96
NU2	1.90084	3.20	325.06	341.56
M2	1.93227	66.89	340.22	352.94
L2	1.96857	3.78	350.10	358.47
T2	1.99726	1.09	315.60	320.52
S2	2.00000	14.97	350.05	354.65
K2	2.00548	4.71	339.40	343.34
M4	3.86455	2.03	22.48	47.93
MK3	2.93501	2.25	111.60	126.30

APPENDIX V.B

The current-meter data are presented chronologically and station-by-station in Appendix V.B. For each file, the measured data and the results of analyses are presented in two forms: (1) results from the harmonic analyses; and (2) time series plots of tidal-current velocity (speed and direction) versus time, and salinity and temperature versus time. These results are given in the order of station numbers as listed in table V.1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C007
POSITION: 37 43'20"N 122 19'35"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 7/10/80 1404 PST JULIAN DAY=192
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

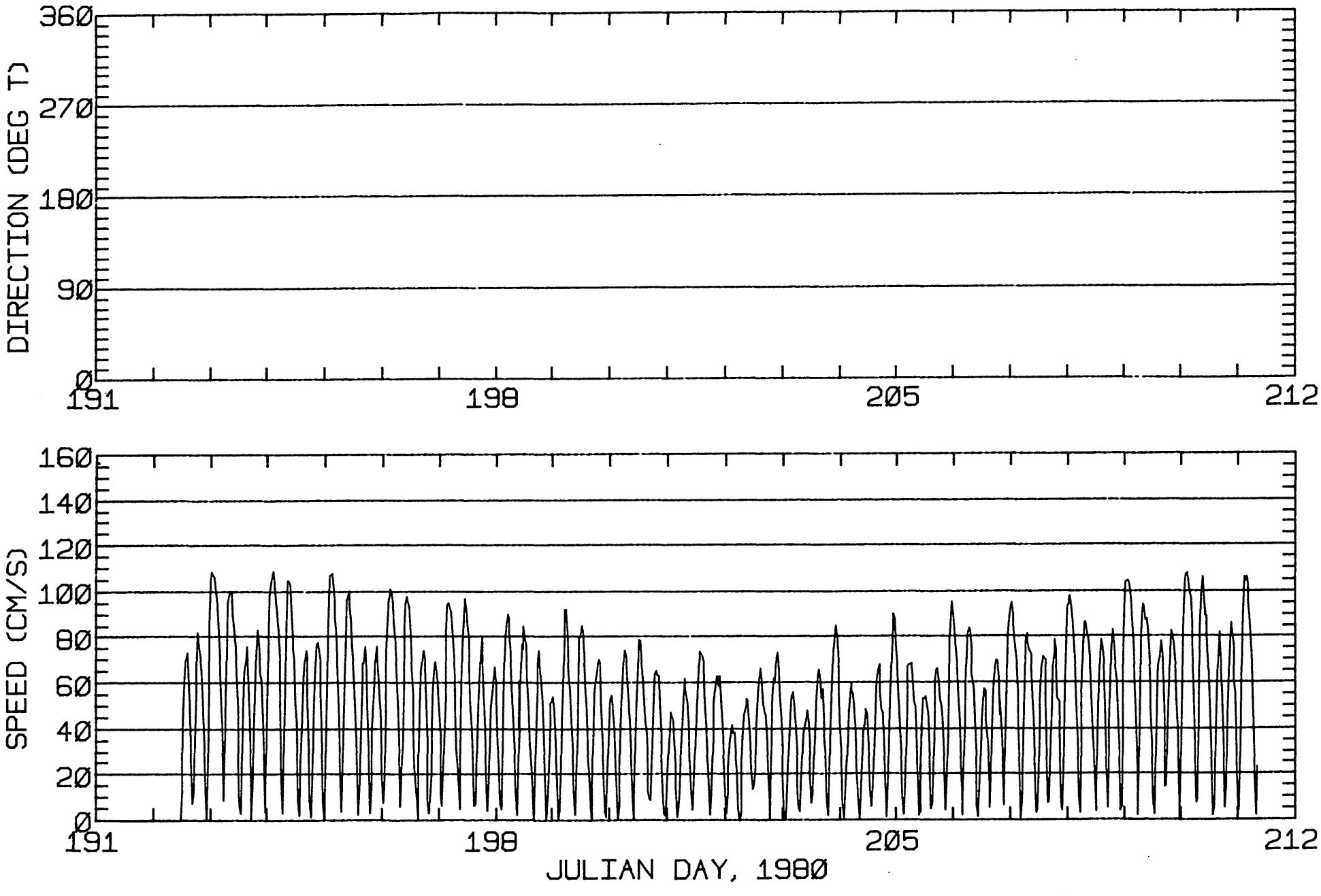
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

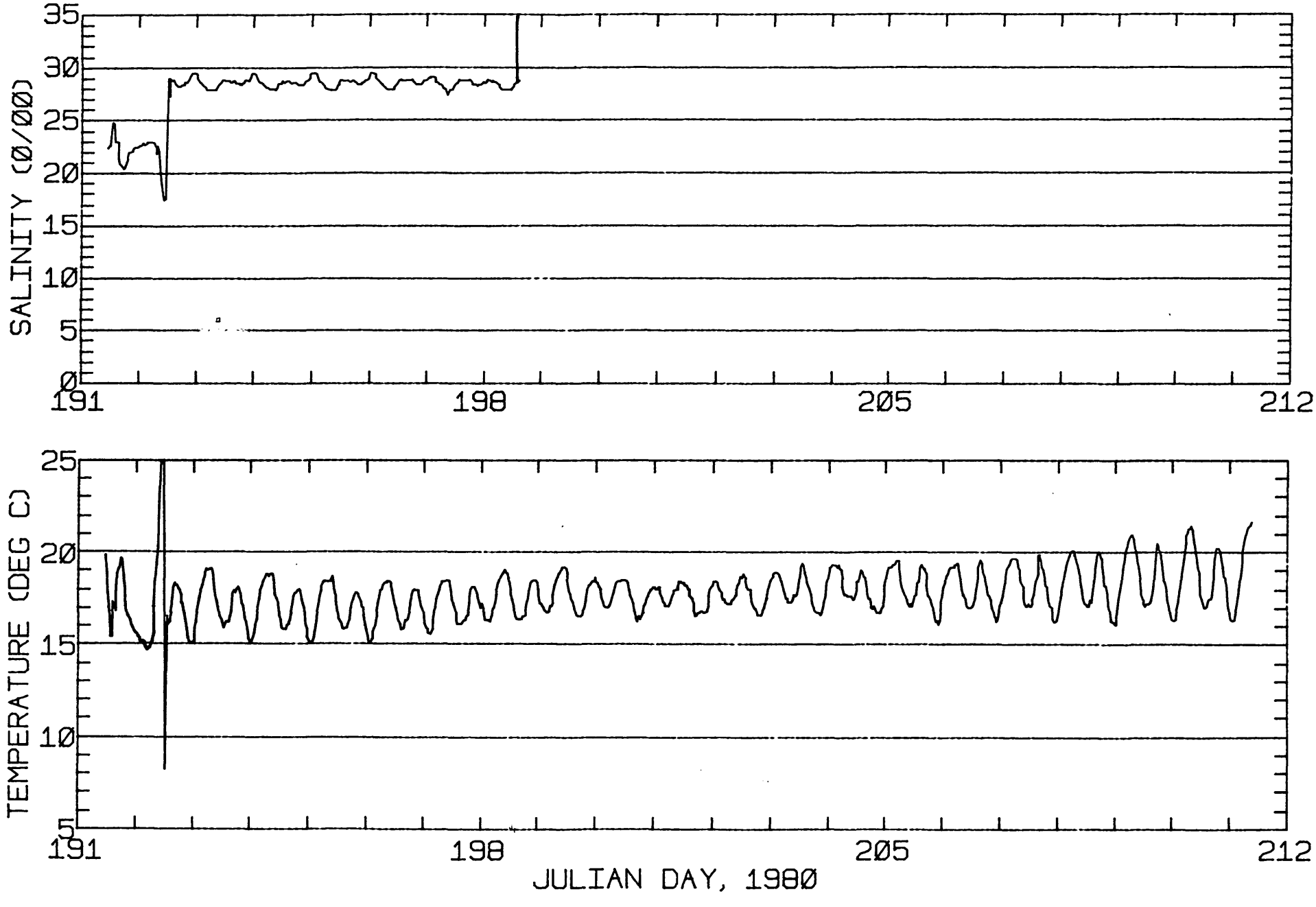
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	10			
ALL	34			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-43-20N 122-19-35W
METER 9.1 METERS ABOVE BEDTAPE NUMBER GSC007A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-43-20N 122-19-35W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC007A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C007
POSITION: 37 43'20"N 122 19'35"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 7/29/80 1249 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

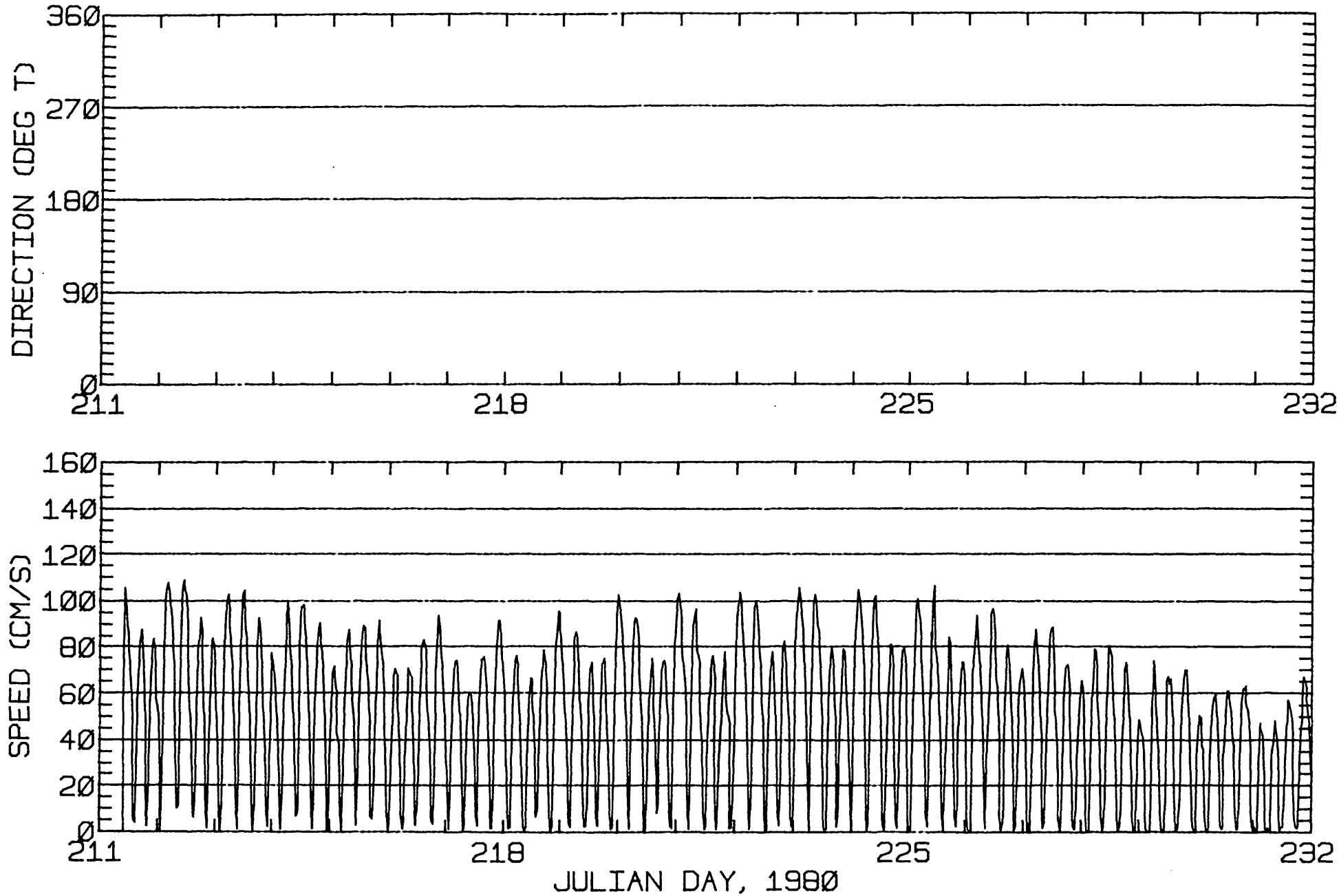
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1					
K1					
N2					
M2					
S2					
M4					

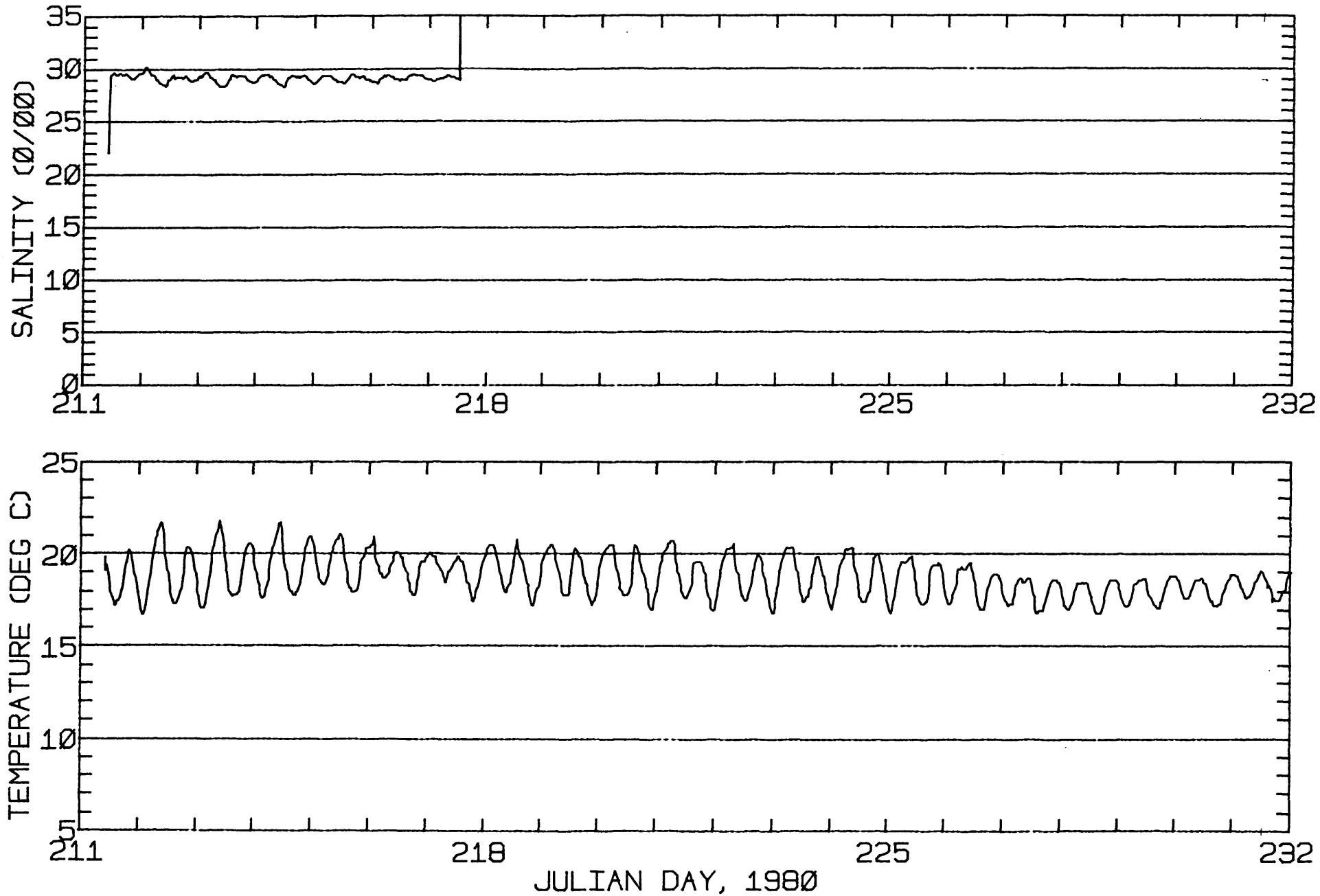
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12			
2	12			
3	12			
4	4			
ALL	40			



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-43-20N 122-19-35W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC007B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-43-20N 122-19-35W
METER 9.1 METERS ABOVE BED TAPE NUMBER GSC007B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'20"N 122 19' 2"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 4.5 M (BELOW MLLW)
START TIME OF SERIES: 12/18/79 1159 PST JULIAN DAY=352
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

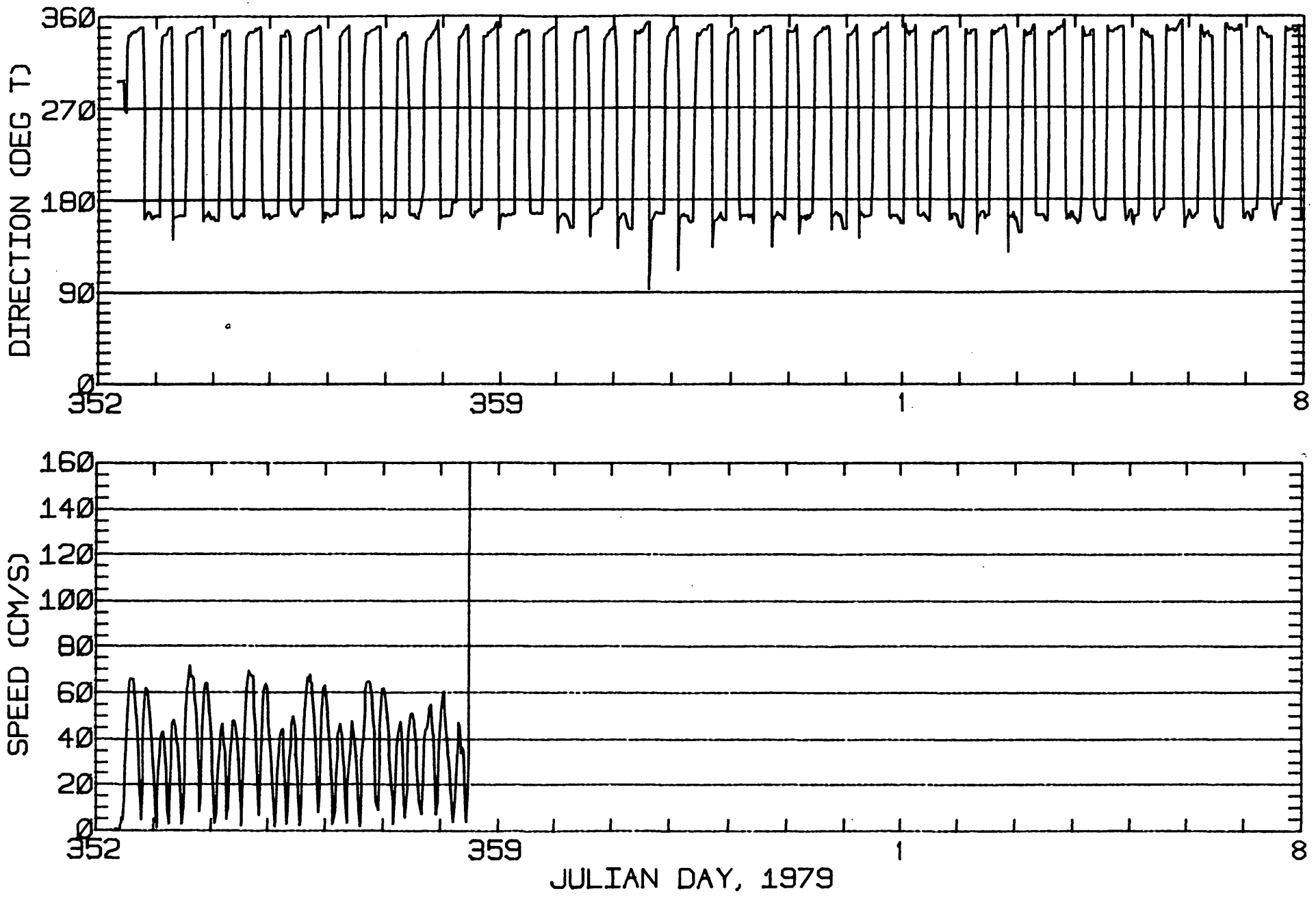
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.90	0.43	167.7	21.9	ANTI-CLOCKWISE
K1	13.68	0.77	162.4	28.3	CLOCKWISE
N2	8.58	1.49	168.0	190.2	CLOCKWISE
M2	54.55	3.56	163.8	280.0	CLOCKWISE
S2	3.63	0.83	180.3	307.3	ANTI-CLOCKWISE
M4	4.15	0.47	170.8	110.4	CLOCKWISE

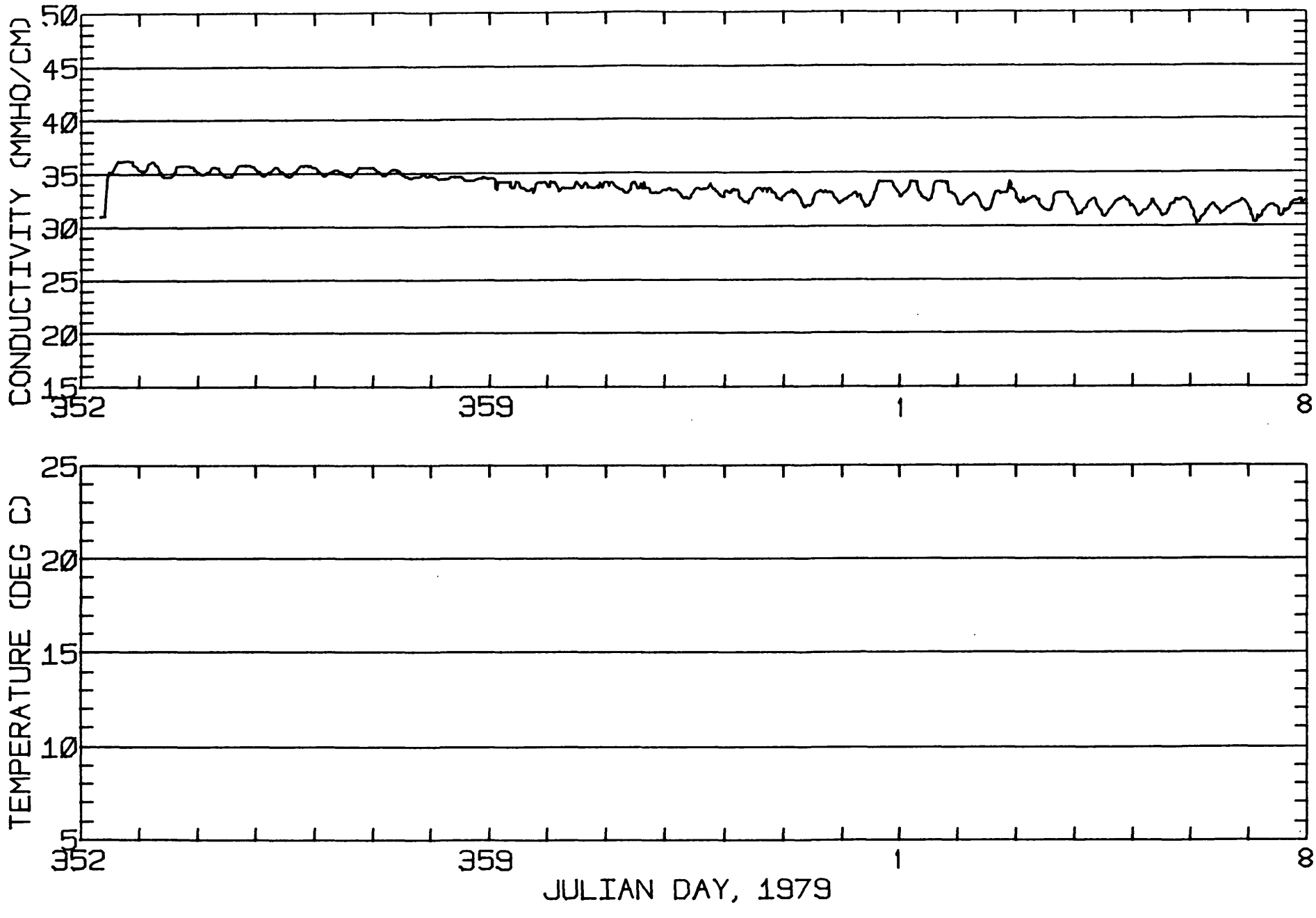
RMS SPEED:	41.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	83.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	49.1 CM/SEC
PRINCIPAL CURRENT DIRECTION:	164.8 DEGREES TRUE
TIDAL FORM NUMBER:	0.44
STANDARD DEVIATION U-SERIES:	2.72 CM/SEC
STANDARD DEVIATION V SERIES:	8.23 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	-0.4	1.3	301.
ALL	10	-0.4	1.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-20N 122-19- 2W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-20N 122-19- 2W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'40"N 122 18'58"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 5.4 M (BELOW MLLW)
START TIME OF SERIES: 1/11/80 1533 PST JULIAN DAY= 11
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

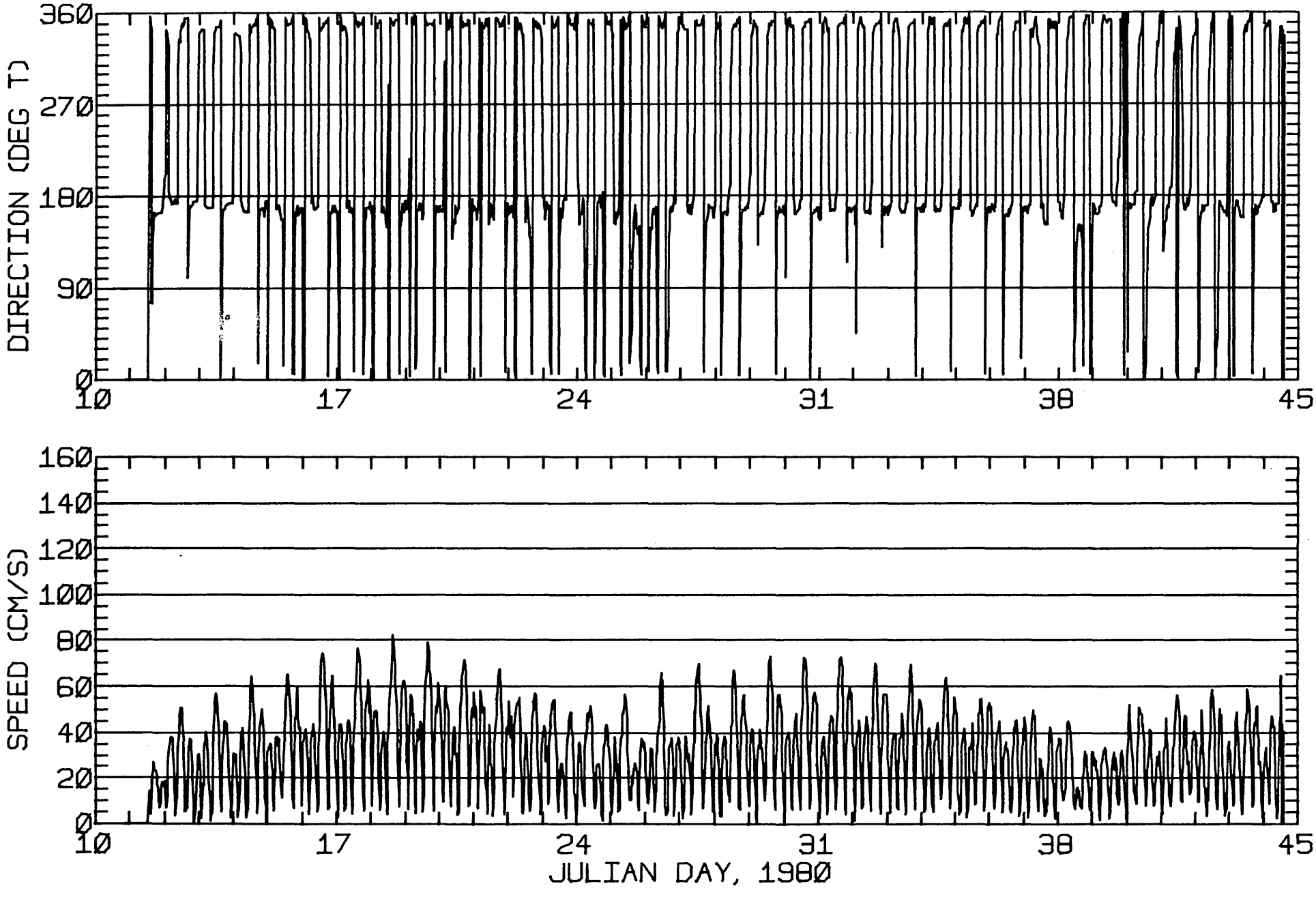
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.15	0.60	164.5	17.4	CLOCKWISE
K1	15.23	0.40	169.7	41.5	CLOCKWISE
N2	8.16	0.19	170.0	259.2	ANTI-CLOCKWISE
M2	43.45	0.46	167.6	280.5	CLOCKWISE
S2	13.45	0.34	169.1	298.0	CLOCKWISE
M4	0.77	0.01	171.0	87.1	CLOCKWISE

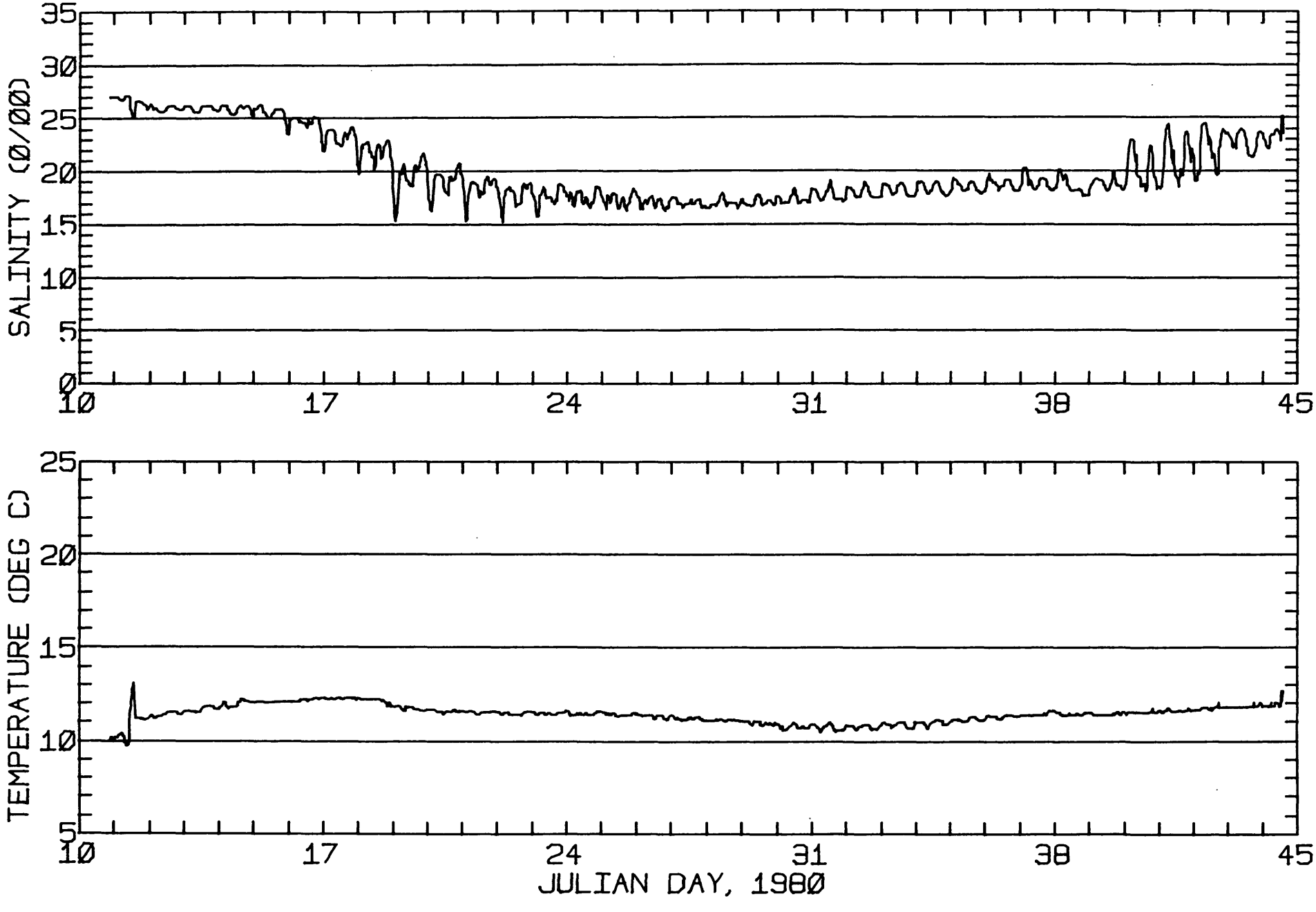
RMS SPEED: 36.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 80.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 167.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 3.35 CM/SEC
STANDARD DEVIATION V SERIES: 9.18 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.5	2.1	4749.
2	12	-0.1	8.5	6452.
3	12	0.1	6.8	2935.
4	12	0.7	0.1	1816.
5	8	-0.3	3.3	1240.
ALL	56	0.0	4.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-40N 122-18-58W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-40N 122-18-58W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'40"N 122 18'58"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 5.4 M (BELOW MLLW)
START TIME OF SERIES: 2/13/80 1709 PST JULIAN DAY= 44
APPROXIMATE RECORD LENGTH IS 54 M2-CYCLES

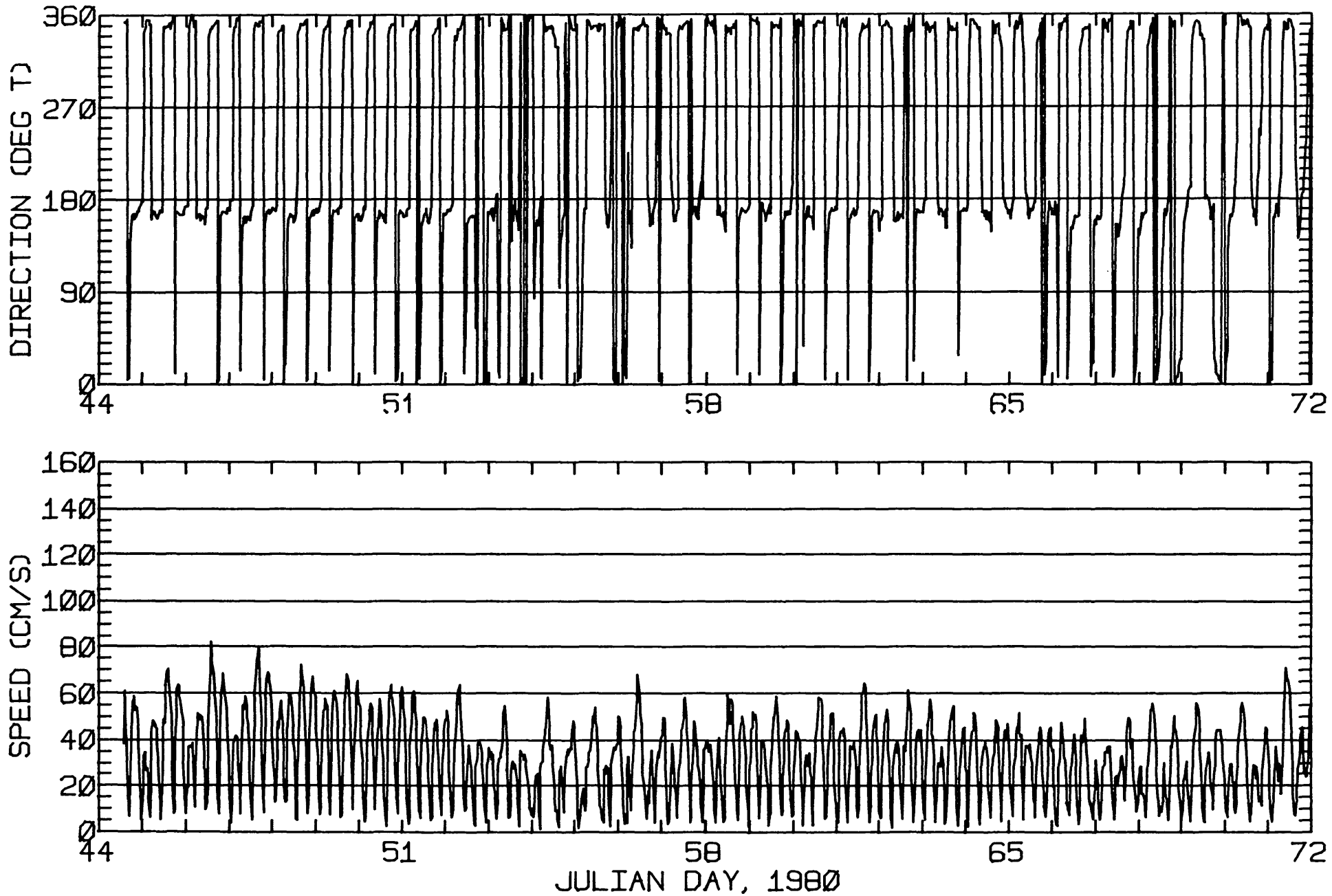
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.85	0.66	168.4	2.0	ANTI-CLOCKWISE
K1	7.13	0.01	169.9	48.4	CLOCKWISE
N2	8.06	0.89	163.5	288.3	CLOCKWISE
M2	42.93	1.53	168.5	278.0	CLOCKWISE
S2	12.92	0.22	166.2	298.2	CLOCKWISE
M4	0.72	0.40	228.4	48.9	ANTI-CLOCKWISE

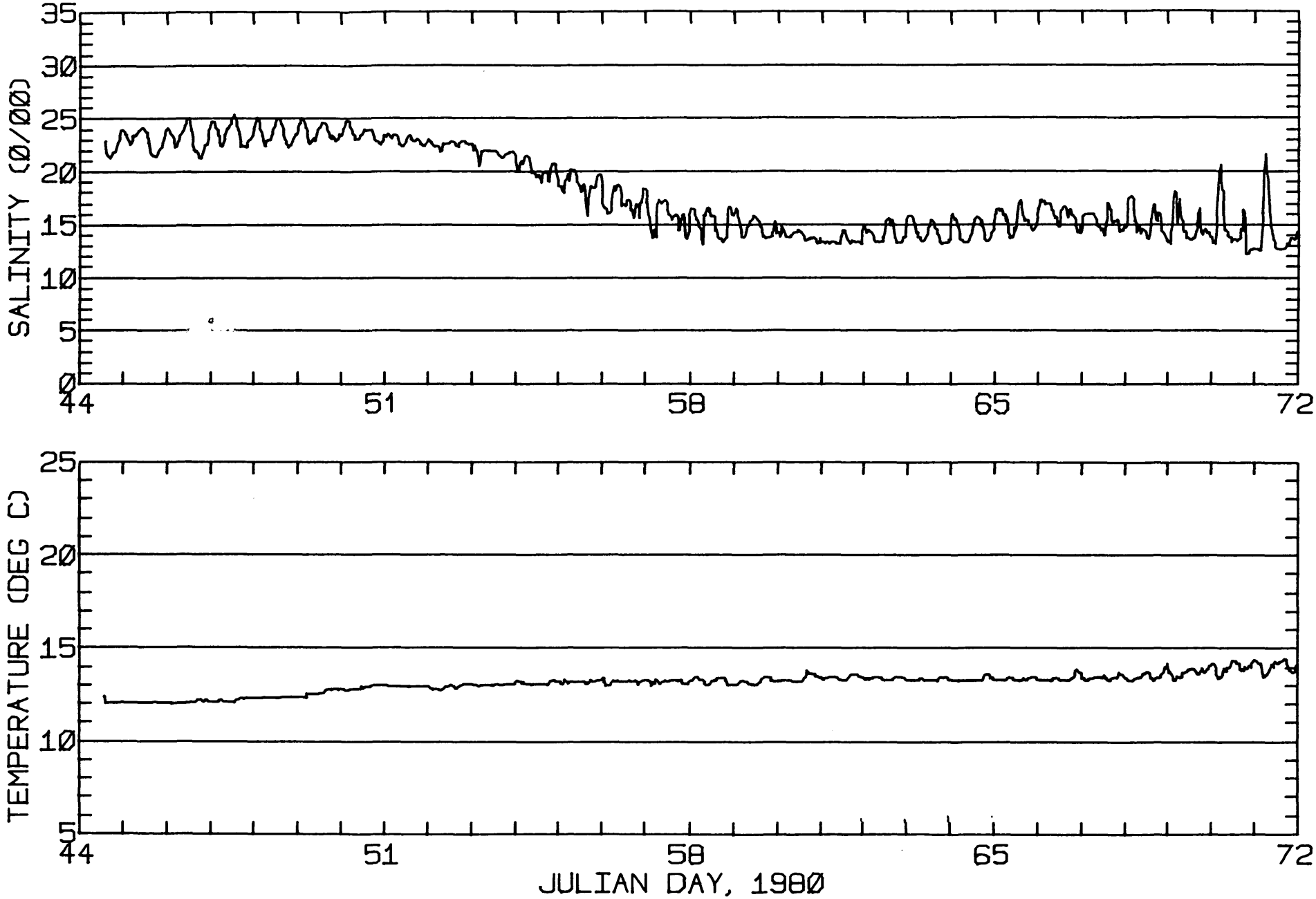
RMS SPEED:	36.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	68.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	28.7 CM/SEC
PRINCIPAL CURRENT DIRECTION:	168.2 DEGREES TRUE
TIDAL FORM NUMBER:	0.23
STANDARD DEVIATION U-SERIES:	3.97 CM/SEC
STANDARD DEVIATION V SERIES:	10.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.2	-1.8	1438.
2	12	-0.3	10.8	7992.
3	12	-0.4	5.5	5011.
4	12	-0.6	6.4	4312.
5	6	-2.3	10.5	3689.
ALL	54	-0.1	5.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-40N 122-18-58W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009C1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-40N 122-18-58W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009C1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'42"N 122 19' 3"W
METER TYPE: ENDECO
WATER DEPTH: 8.2 M (MLLW)
METER DEPTH: 5.1 M (BELOW MLLW)
START TIME OF SERIES: 3/13/80 1635 PST JULIAN DAY= 73
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

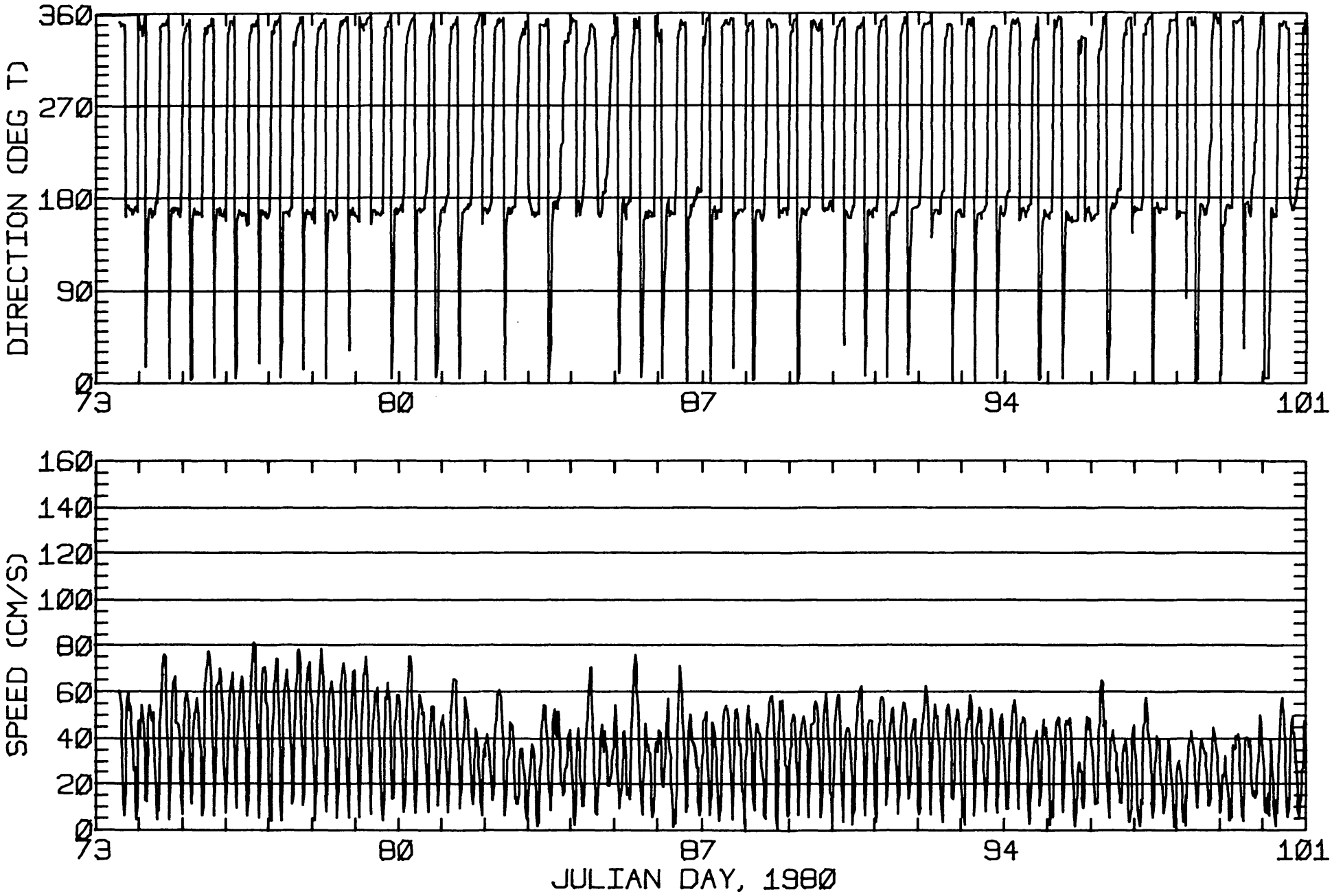
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.39	0.21	174.7	22.4	ANTI-CLOCKWISE
K1	6.36	0.34	179.8	23.2	ANTI-CLOCKWISE
N2	12.25	0.78	170.1	261.8	CLOCKWISE
M2	48.11	3.25	167.7	285.1	CLOCKWISE
S2	14.60	0.09	166.9	285.8	ANTI-CLOCKWISE
M4	3.66	0.49	186.6	75.9	CLOCKWISE

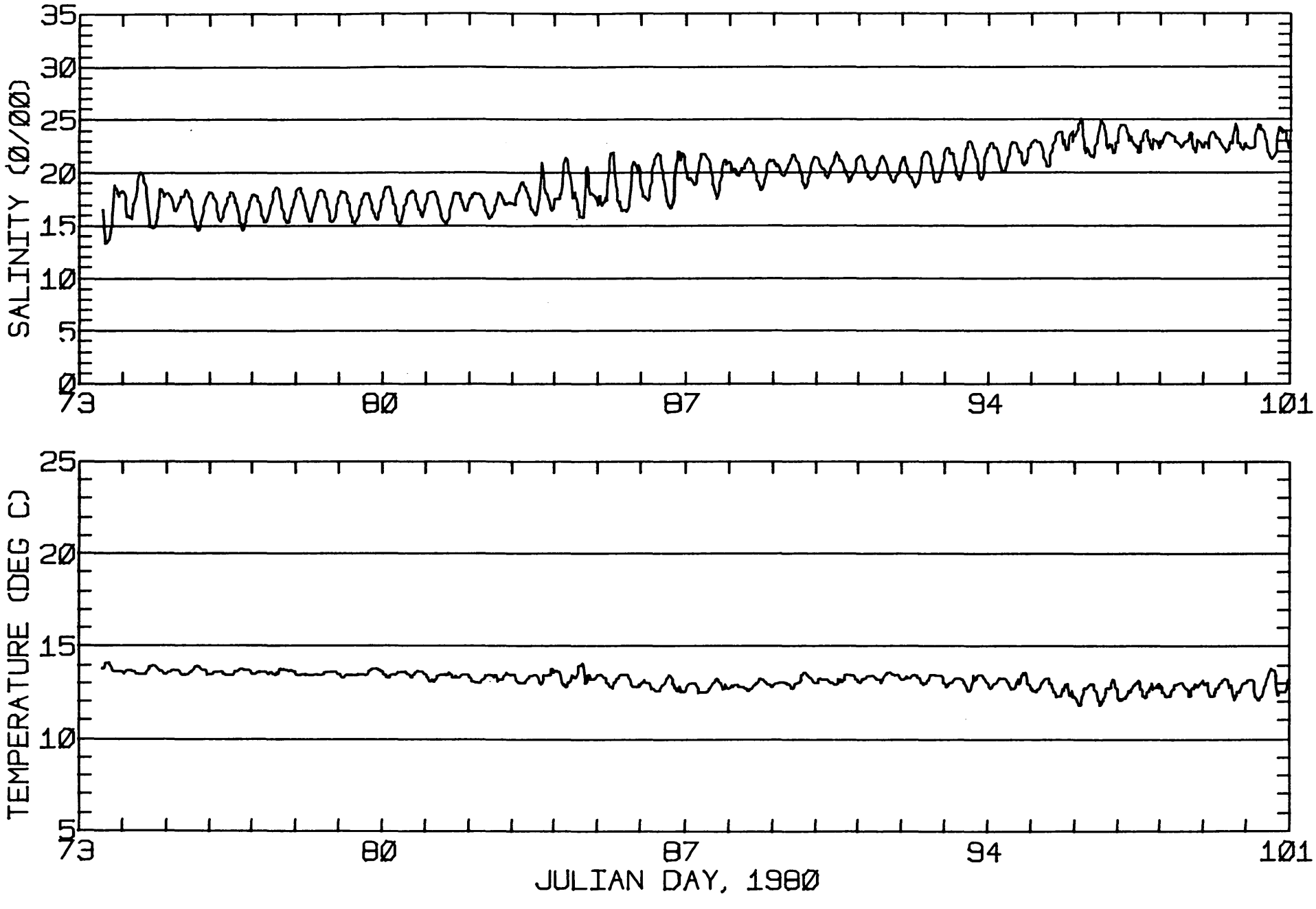
RMS SPEED: 39.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 75.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 33.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 169.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.20
STANDARD DEVIATION U-SERIES: 4.26 CM/SEC
STANDARD DEVIATION V SERIES: 8.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.3	0.8	2648.
2	12	-2.1	2.2	2018.
3	12	0.4	2.7	1416.
4	12	0.5	-0.2	1048.
5	4	-1.1	4.5	1150.
ALL	52	-0.1	1.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-42N 122-19- 3W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009D1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-42N 122-19- 3W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009D1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'41"N 122 19' 3"W
METER TYPE: ENDECO
WATER DEPTH: 7.0 M (MLLW)
METER DEPTH: 3.9 M (BELOW MLLW)
START TIME OF SERIES: 4/10/80 1649 PST JULIAN DAY=101
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

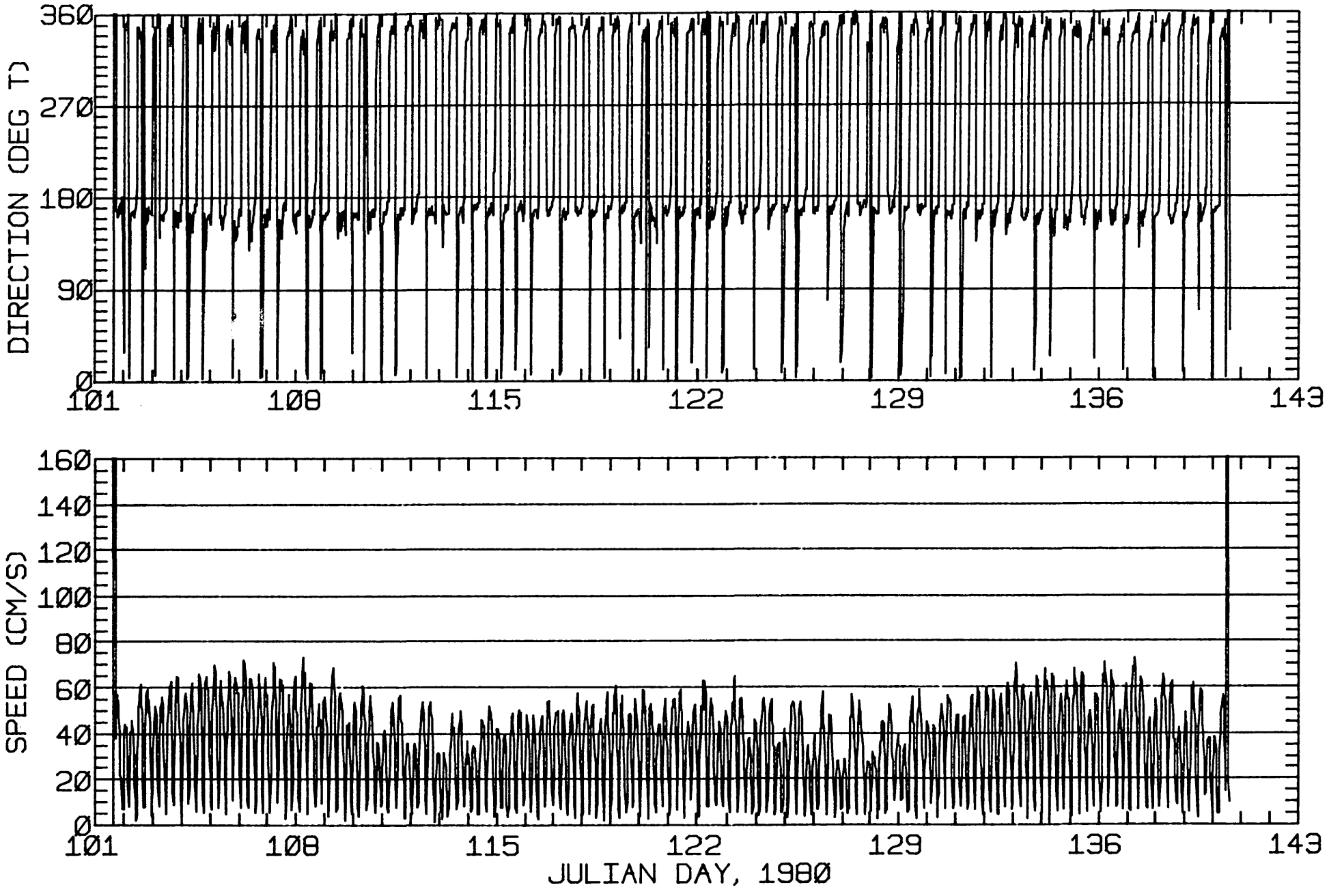
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.96	0.28	165.4	10.8	ANTI-CLOCKWISE
K1	10.43	0.31	166.0	10.6	CLOCKWISE
N2	9.52	0.64	157.9	251.3	CLOCKWISE
M2	46.90	2.90	163.6	284.5	CLOCKWISE
S2	11.65	0.09	158.1	276.0	ANTI-CLOCKWISE
M4	3.20	0.00	181.1	112.7	ANTI-CLOCKWISE

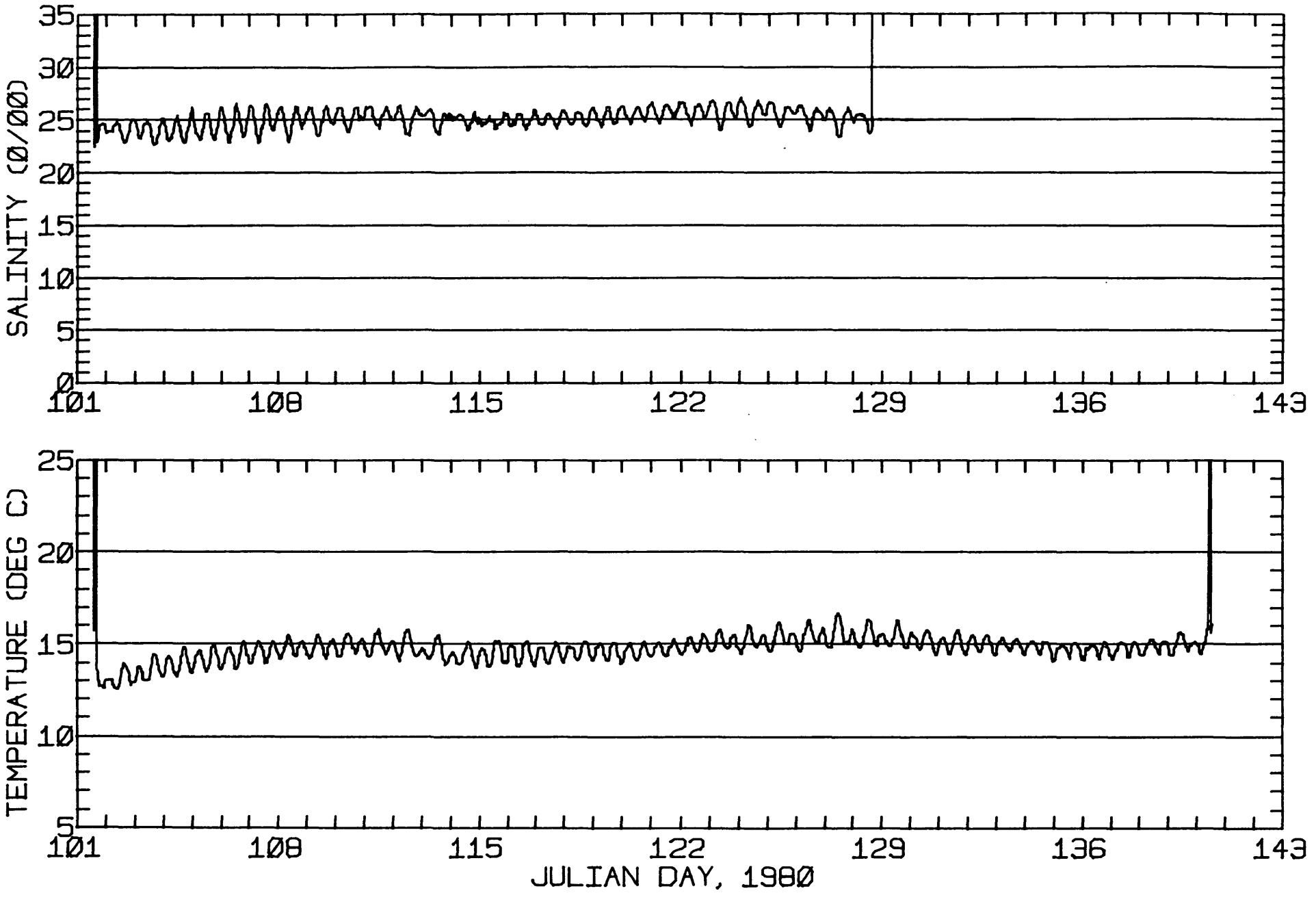
RMS SPEED:	37.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	75.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	31.8 CM/SEC
PRINCIPAL CURRENT DIRECTION:	163.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.30
STANDARD DEVIATION U-SERIES:	4.64 CM/SEC
STANDARD DEVIATION V SERIES:	6.37 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.6	-0.2	790.
2	12	0.7	0.2	693.
3	12	0.3	0.6	651.
4	12	0.4	0.1	579.
5	8	0.5	-0.2	520.
ALL	56	0.9	0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-41N 122-19- 3W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009E1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-41N 122-19- 3W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009E1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'43"N 122 19' 0"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 4.5 M (BELOW MLLW)
START TIME OF SERIES: 6/20/80 1151 PST JULIAN DAY=172
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

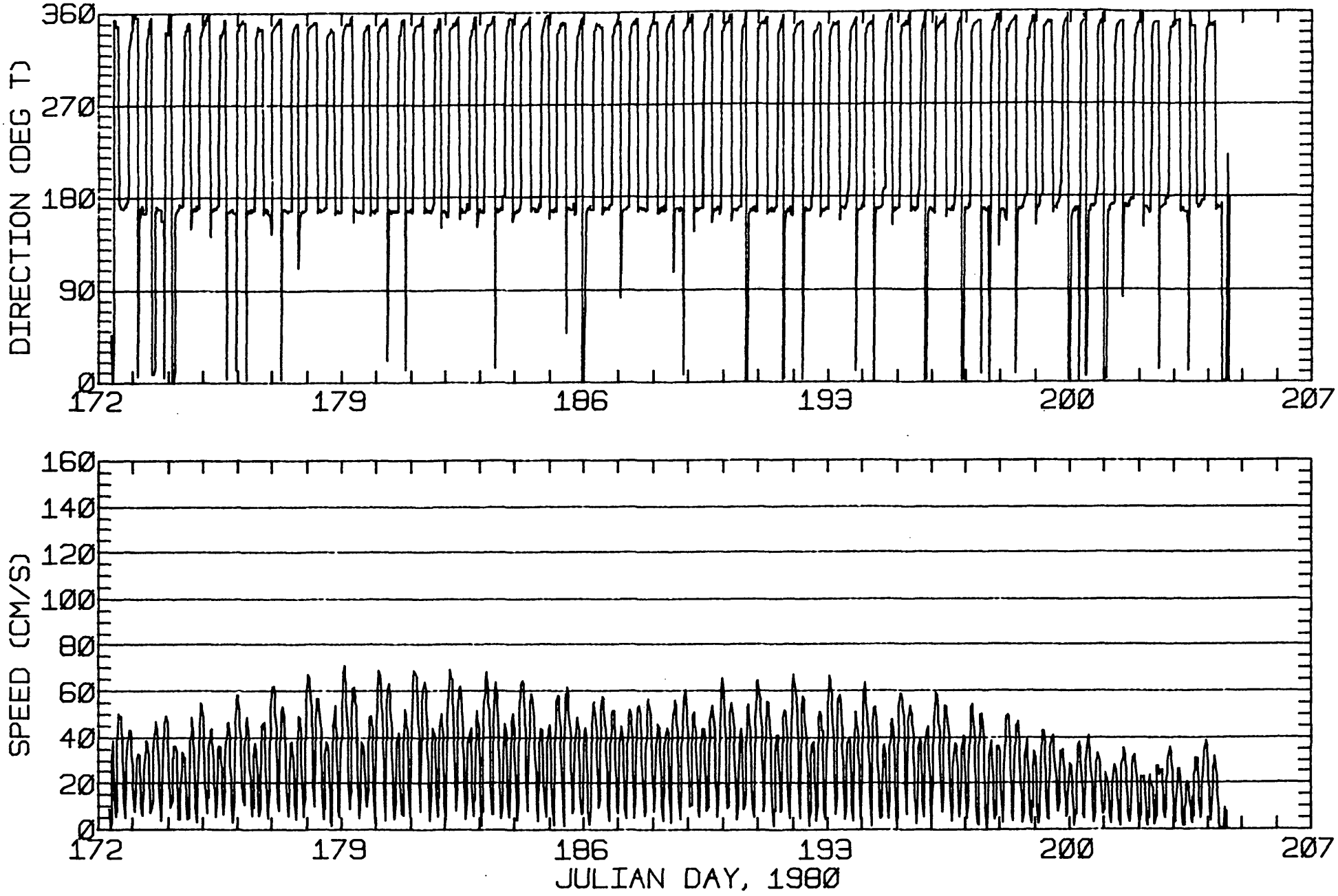
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.61	0.04	167.4	31.5	CLOCKWISE
K1	15.87	0.21	169.2	36.4	CLOCKWISE
N2	7.01	0.15	166.6	275.5	CLOCKWISE
M2	45.14	2.06	165.6	289.1	CLOCKWISE
S2	7.69	0.21	164.1	290.3	CLOCKWISE
M4	2.31	0.14	197.4	151.6	ANTI-CLOCKWISE

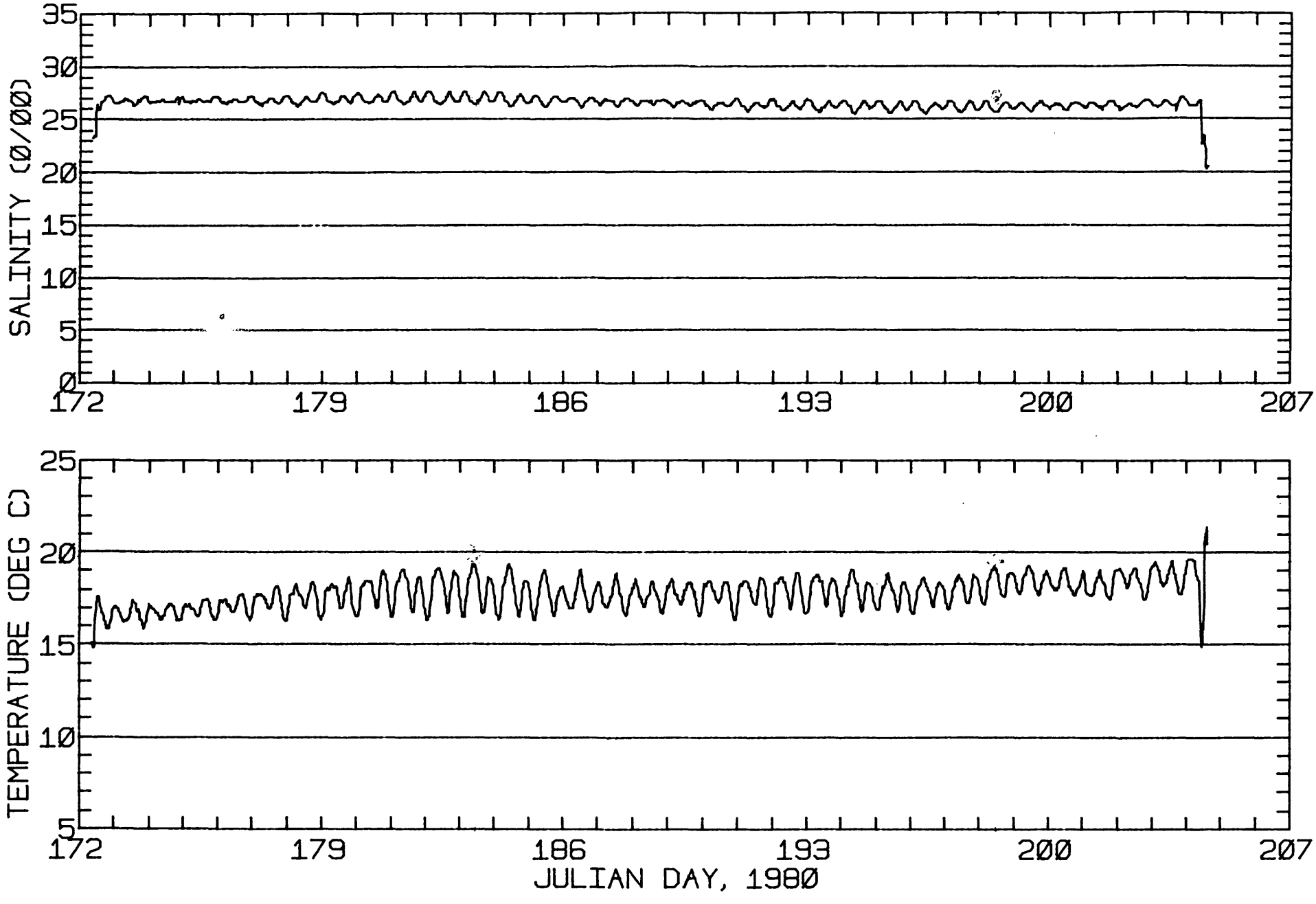
RMS SPEED: 36.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 75.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 166.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 2.97 CM/SEC
STANDARD DEVIATION V SERIES: 8.30 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.7	0.4	447.
2	12	-0.7	1.2	419.
3	12	-0.8	0.7	408.
4	12	-0.9	0.7	279.
5	8	-0.5	0.3	296.
ALL	56	-0.7	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-43N 122-19- 0W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009G1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-43N 122-19- ØW
METER 3.Ø METERS ABOVE BED TAPE NUMBER GSCØØ9G1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 49'45"N 122 19' 0"W
METER TYPE: ENDECO
WATER DEPTH: 7.3 M (MLLW)
METER DEPTH: 4.2 M (BELOW MLLW)
START TIME OF SERIES: 7/22/80 1232 PST JULIAN DAY=204
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

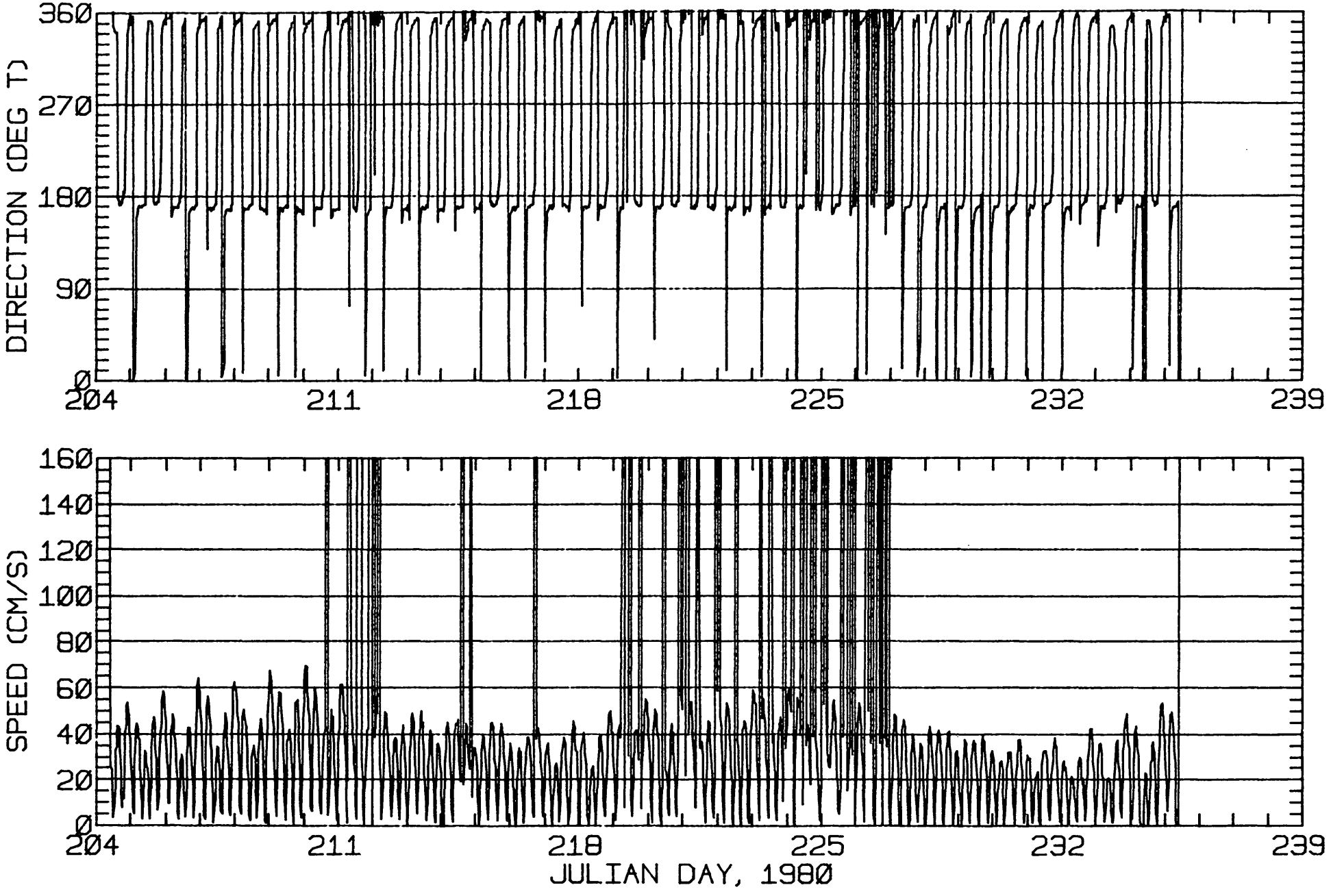
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.26	0.36	168.9	25.0	CLOCKWISE
K1	11.79	0.76	172.7	51.9	CLOCKWISE
N2	6.58	0.13	166.6	290.7	CLOCKWISE
M2	39.40	1.71	168.5	282.5	CLOCKWISE
S2	9.85	0.20	166.4	299.3	CLOCKWISE
M4	1.58	0.57	191.6	129.0	ANTI-CLOCKWISE

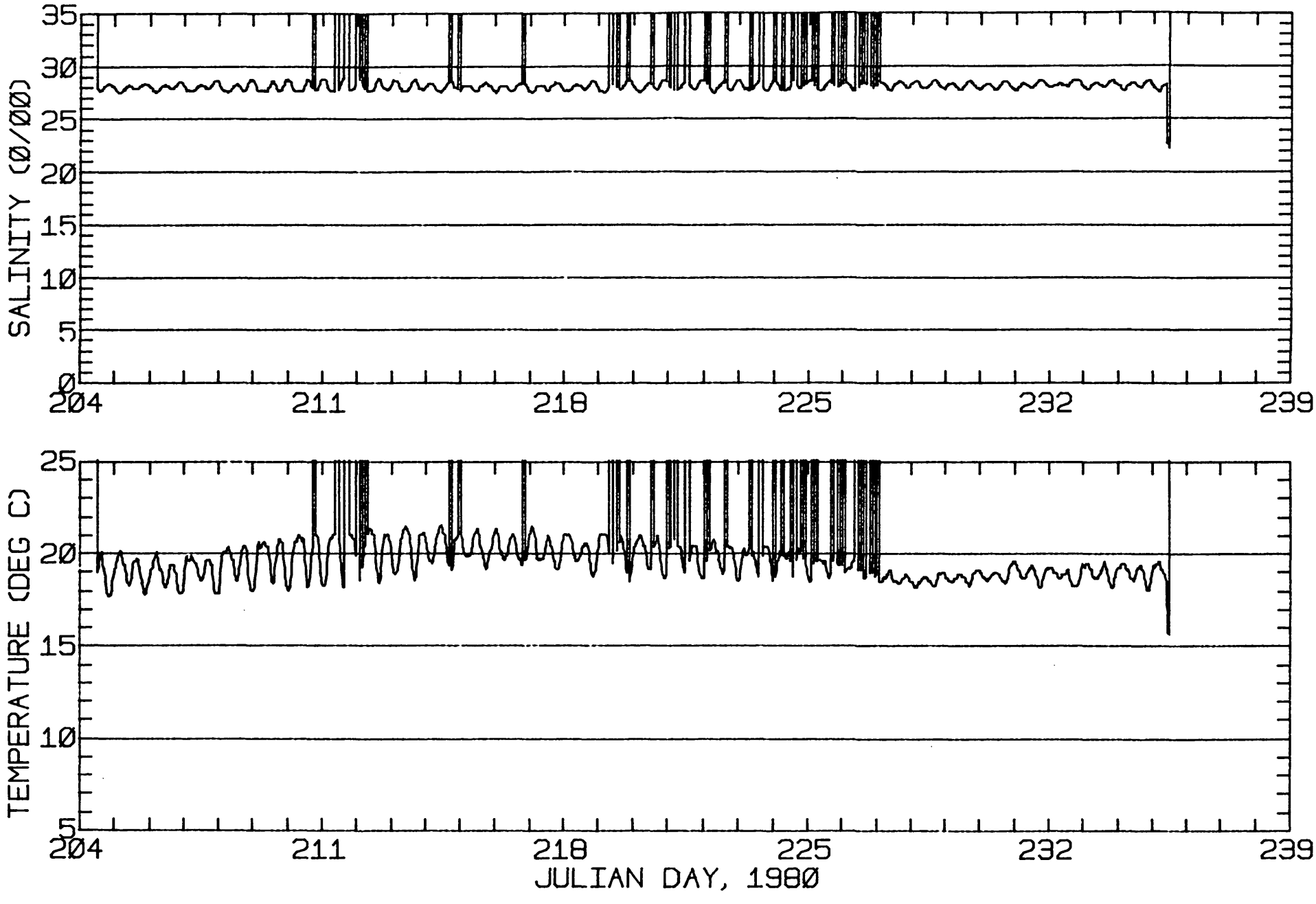
RMS SPEED:	31.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	67.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	24.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	168.9 DEGREES TRUE
TIDAL FORM NUMBER:	0.37
STANDARD DEVIATION U-SERIES:	2.01 CM/SEC
STANDARD DEVIATION V SERIES:	5.88 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.0	0.3	308.
2	12	0.4	-0.5	250.
3	12	0.0	-0.9	165.
4	12	0.1	-0.2	107.
5	8	-0.1	-0.6	79.
ALL	56	0.1	-0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-49-45N 122-19- 0W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009H1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-49-45N 122-19- ØW
METER 3.0 METERS ABOVE BED TAPE NUMBER GSCØØ9H1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'47"N 122 19' 0"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 4.5 M (BELOW MLLW)
START TIME OF SERIES: 8/22/80 1138 PST JULIAN DAY=235
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

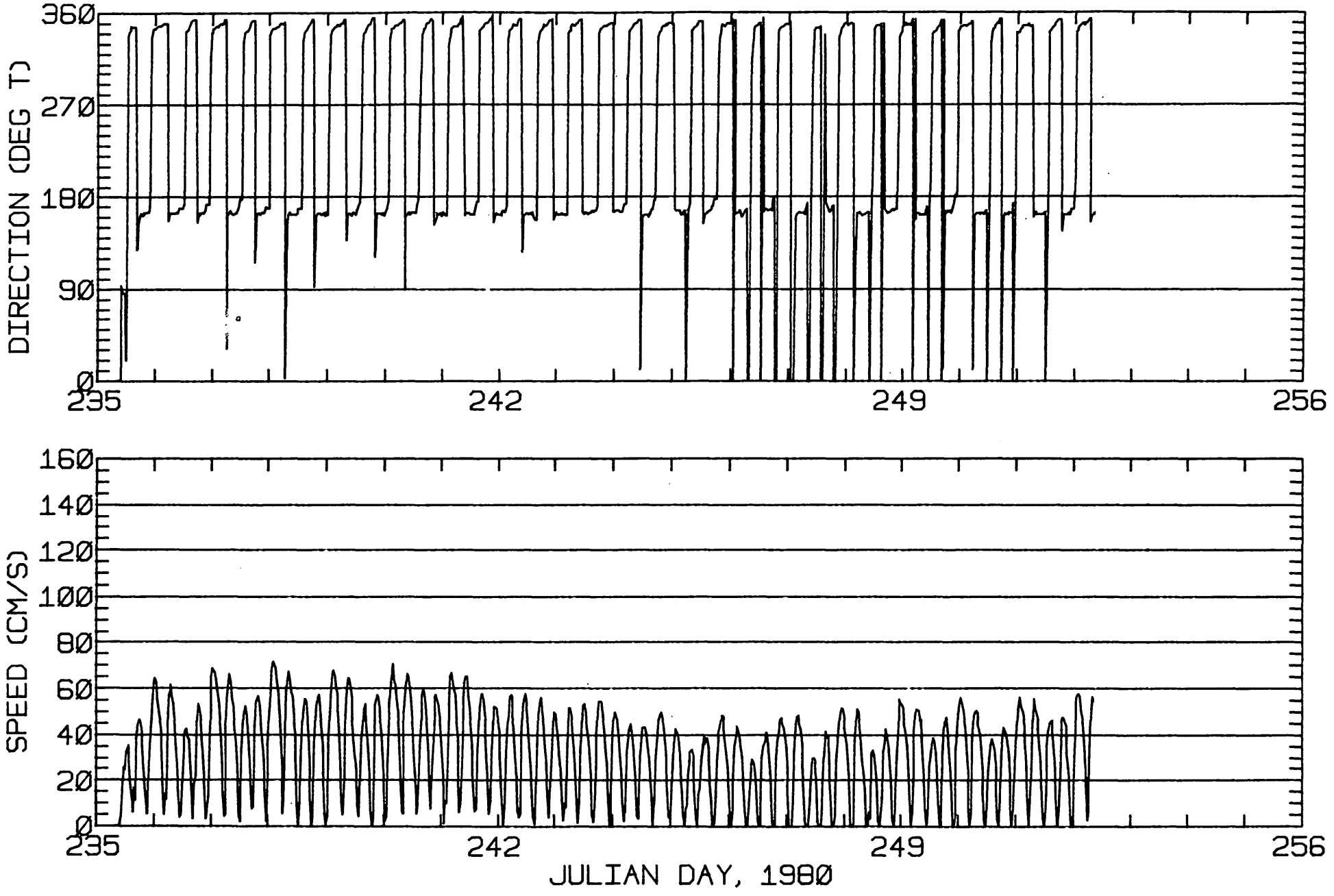
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.82	0.14	164.7	25.6	CLOCKWISE
K1	10.34	0.49	165.9	52.9	CLOCKWISE
N2	9.08	0.26	163.8	286.5	CLOCKWISE
M2	42.00	1.49	165.3	288.7	CLOCKWISE
S2	12.52	0.49	163.5	290.2	CLOCKWISE
M4	1.71	0.61	177.9	153.0	ANTI-CLOCKWISE

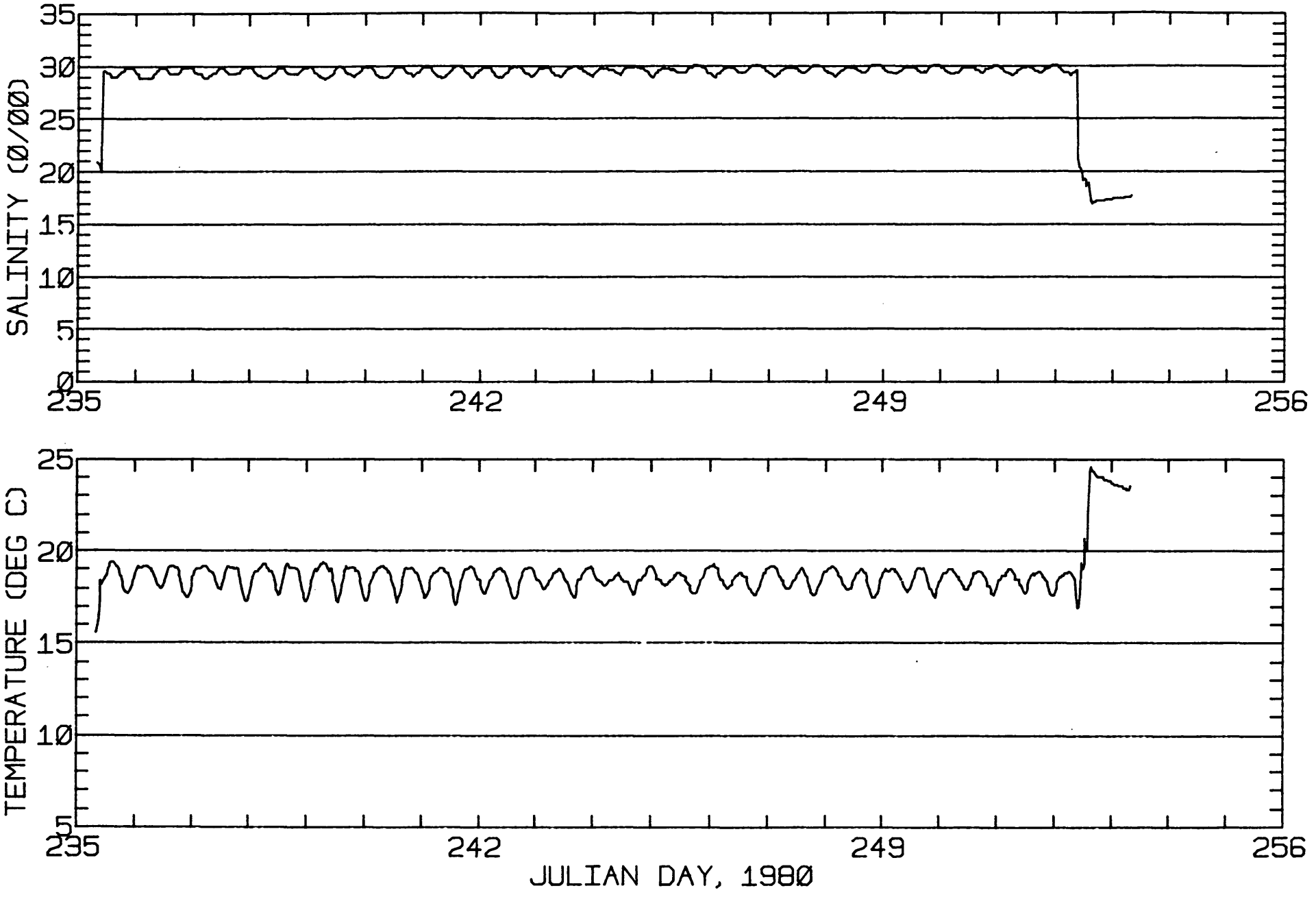
RMS SPEED:	37.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	71.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	26.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	165.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.31
STANDARD DEVIATION U-SERIES:	2.69 CM/SEC
STANDARD DEVIATION V SERIES:	7.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.5	1.0	106.
2	12	0.1	0.4	144.
3	8	0.2	0.5	219.
ALL	32	0.3	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-47N 122-19- 0W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009I1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-47N 122-19- ØW
METER 3.Ø METERS ABOVE BED TAPE NUMBER GSC009I1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'45"N 122 19' 0"W
METER TYPE: ENDECO
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 4.8 M (BELOW MLLW)
START TIME OF SERIES: 9/ 8/80 1127 PST JULIAN DAY=252
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

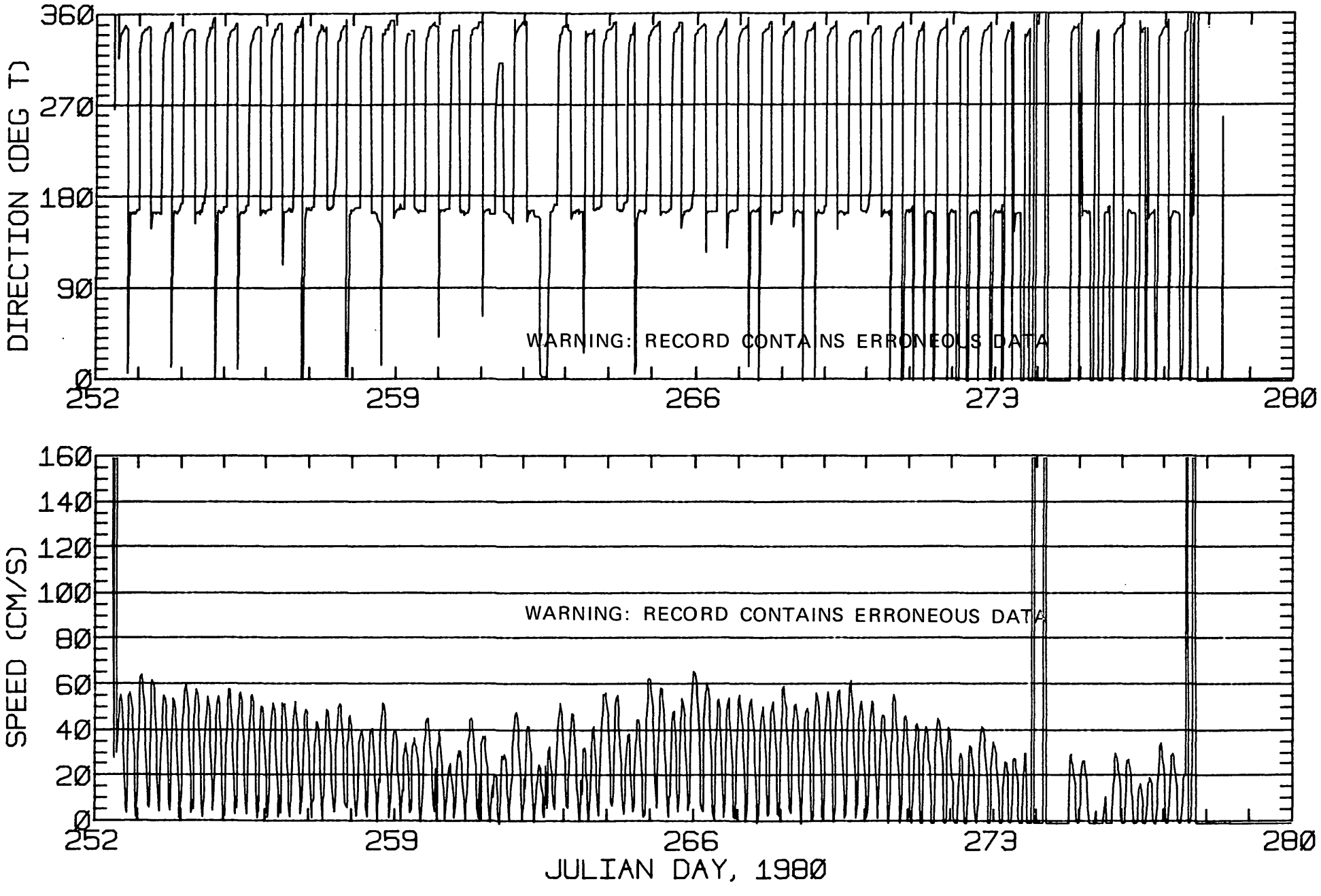
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.08	0.32	167.3	19.7	CLOCKWISE
K1	9.38	0.21	167.7	41.4	CLOCKWISE
N2	2.98	0.06	163.9	260.1	ANTI-CLOCKWISE
M2	42.67	1.61	165.5	285.8	CLOCKWISE
S2	10.46	0.37	164.7	284.1	CLOCKWISE
M4	2.00	0.50	198.0	143.9	ANTI-CLOCKWISE

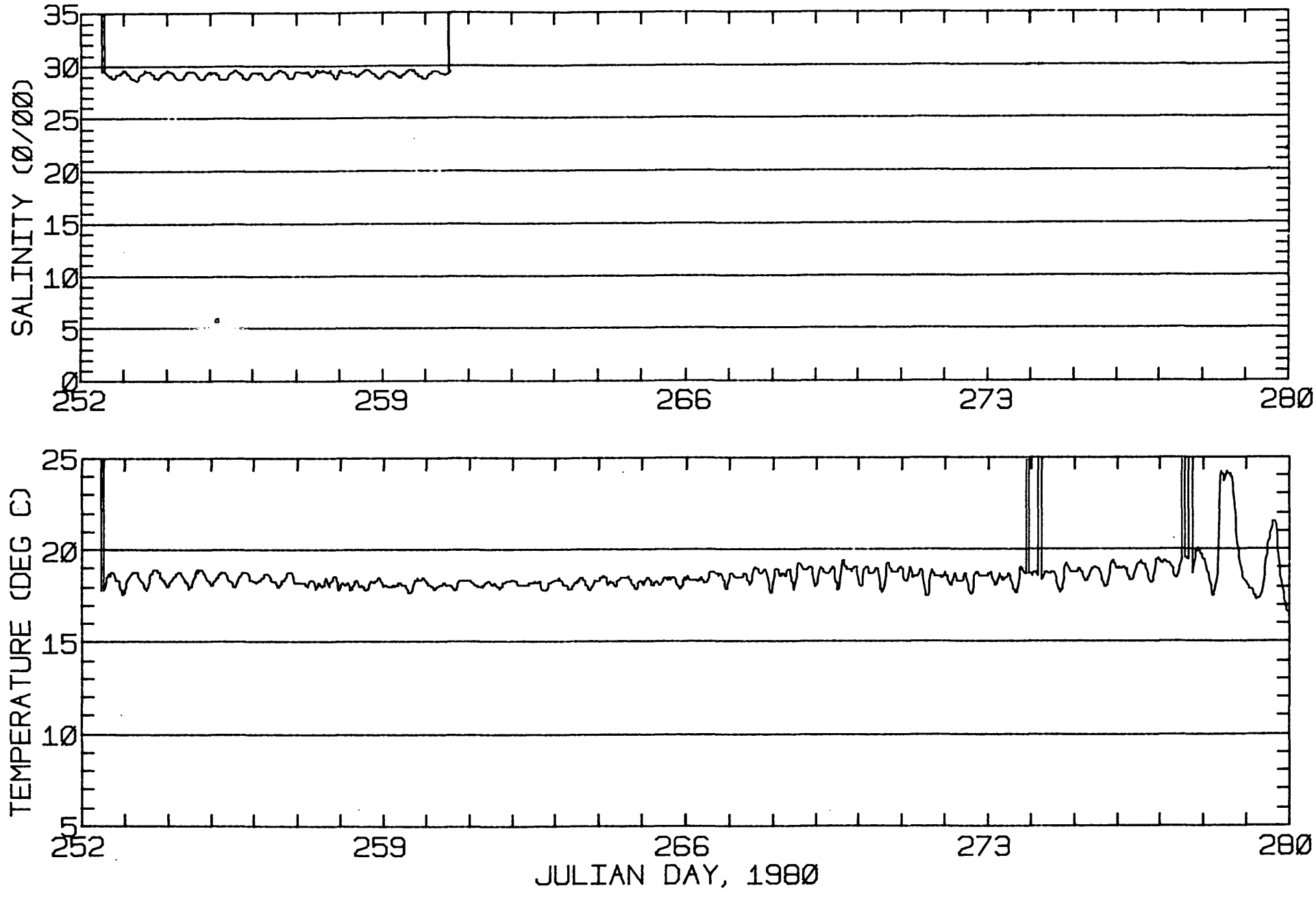
RMS SPEED: 35.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 70.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 165.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 3.32 CM/SEC
STANDARD DEVIATION V SERIES: 9.78 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.2	0.9	247.
2	12	-0.9	0.8	307.
3	12	-0.9	1.0	291.
4	4	-1.0	1.4	492.
ALL	40	-1.0	1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-45N 122-19- 0W
METER 3.0 METERS ABOVE BEDTAPE NUMBER GSC009J1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-45N 122-19- 0W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009J1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'42"N 122 19'12"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 4.5 M (BELOW MLLW)
START TIME OF SERIES: 10/ 6/80 1021 PST JULIAN DAY=280
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

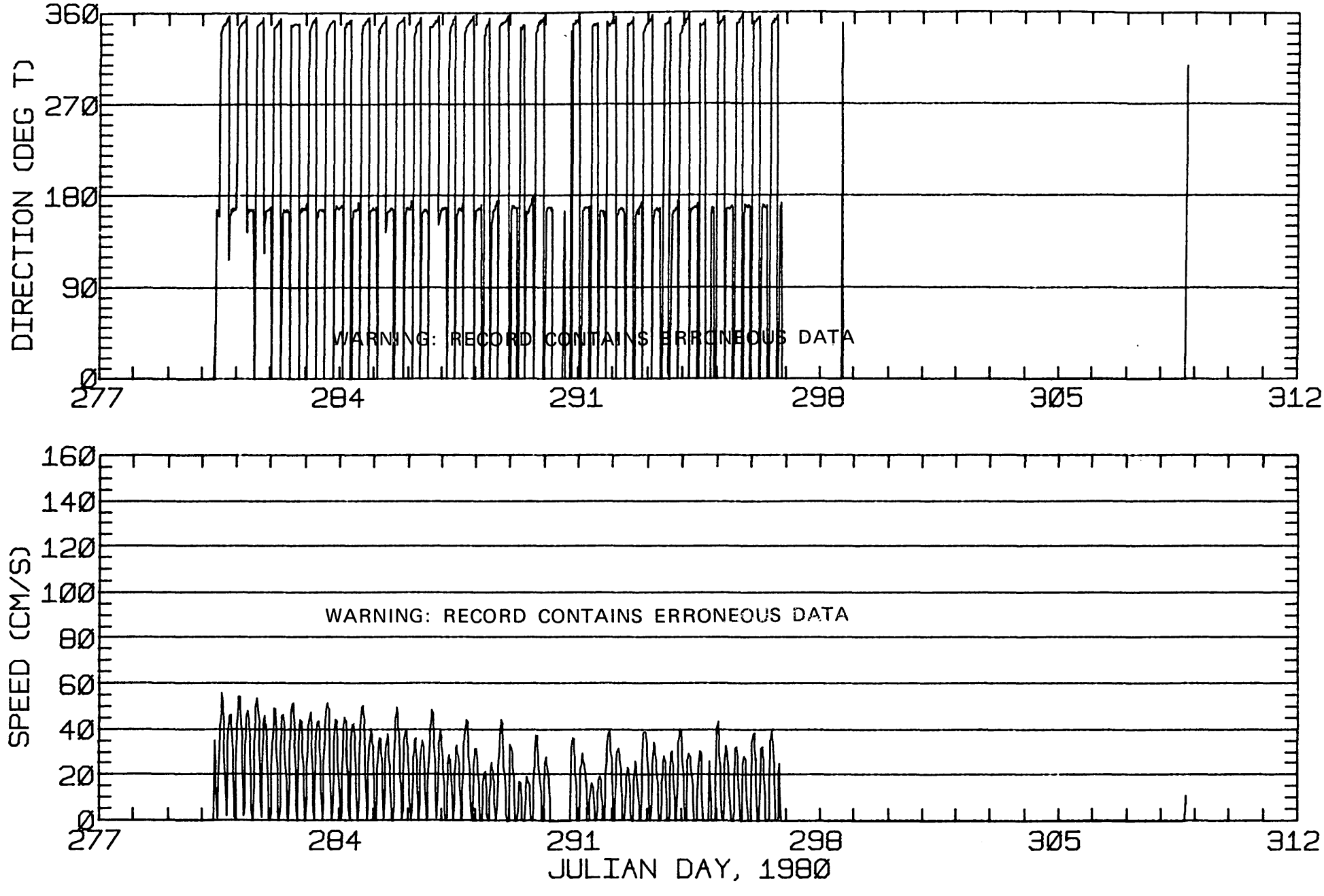
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.86	0.17	171.1	14.5	CLOCKWISE
K1	7.56	0.06	168.9	19.8	CLOCKWISE
N2	6.58	0.35	168.0	208.4	CLOCKWISE
M2	34.81	0.94	168.3	273.0	CLOCKWISE
S2	12.25	0.45	168.0	288.3	CLOCKWISE
M4	1.51	0.27	179.7	92.1	ANTI-CLOCKWISE

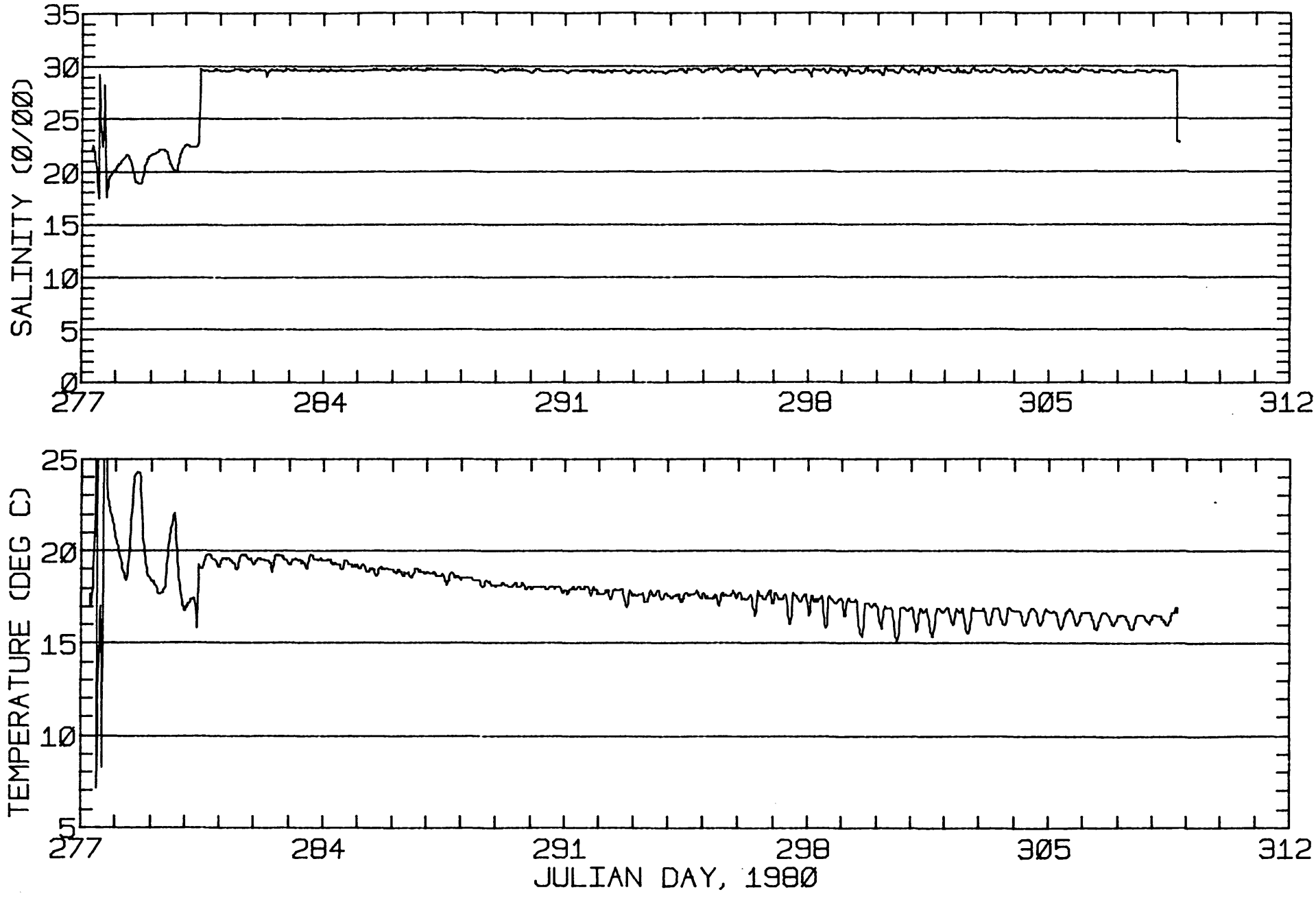
RMS SPEED:	26.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	60.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	20.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	168.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.29
STANDARD DEVIATION U-SERIES:	1.56 CM/SEC
STANDARD DEVIATION V SERIES:	5.90 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.4	2.4	277.
2	12	0.1	1.6	224.
3	6	-0.1	2.5	123.
ALL	30	0.2	2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-42N 122-19-12W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009K1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-42N 122-19-12W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009K1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C009
POSITION: 37 40'50"N 122 19'10"W
METER TYPE: ENDECO
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 4.5 M (BELOW MLLW)
START TIME OF SERIES: 11/ 6/80 1204 PST JULIAN DAY=311
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

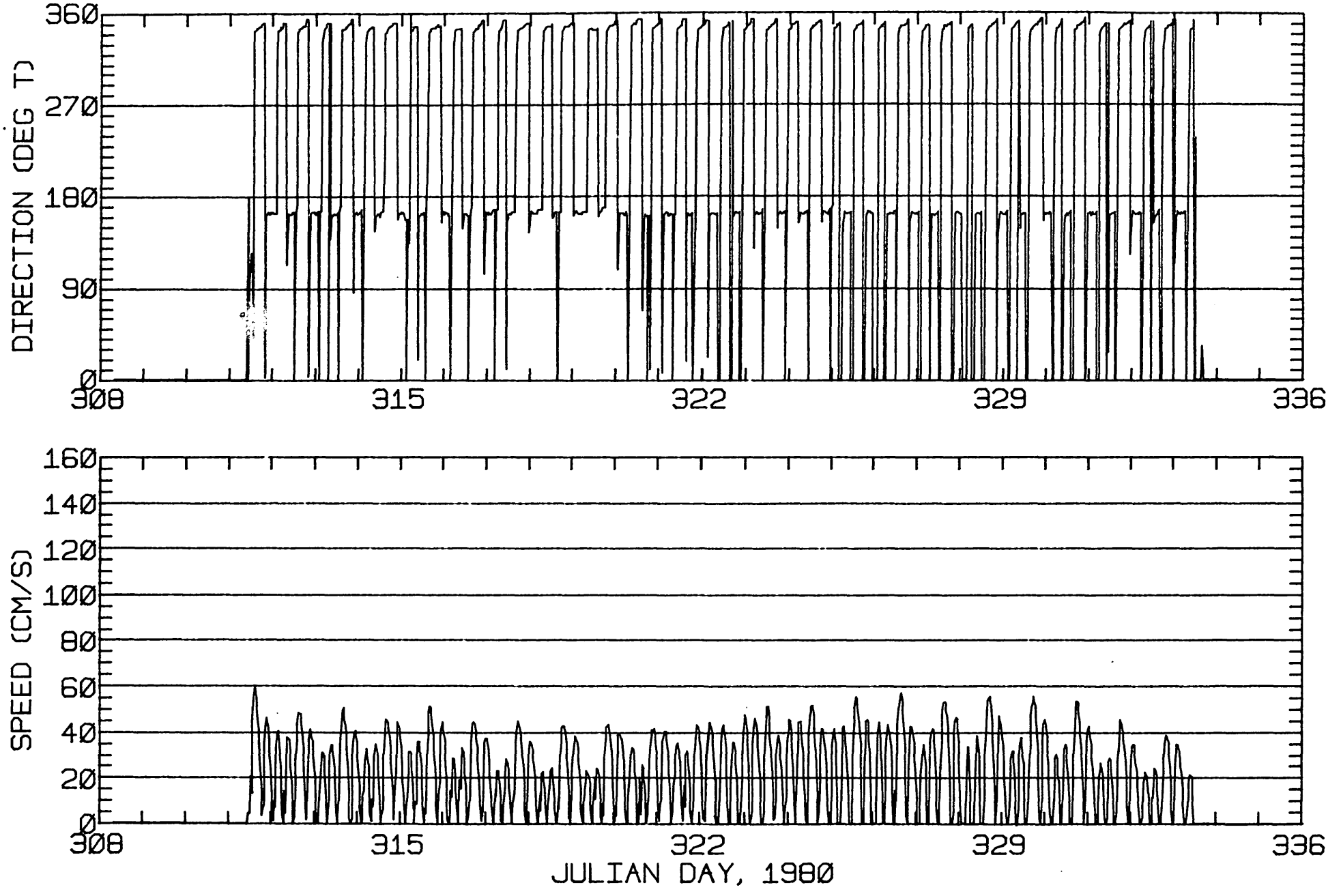
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.04	0.28	164.9	14.3	CLOCKWISE
K1	11.99	0.12	164.7	17.2	CLOCKWISE
N2	4.64	0.03	163.6	267.1	ANTI-CLOCKWISE
M2	33.26	0.82	164.1	283.8	CLOCKWISE
S2	5.73	0.02	163.9	273.7	CLOCKWISE
M4	2.24	0.28	167.9	130.1	ANTI-CLOCKWISE

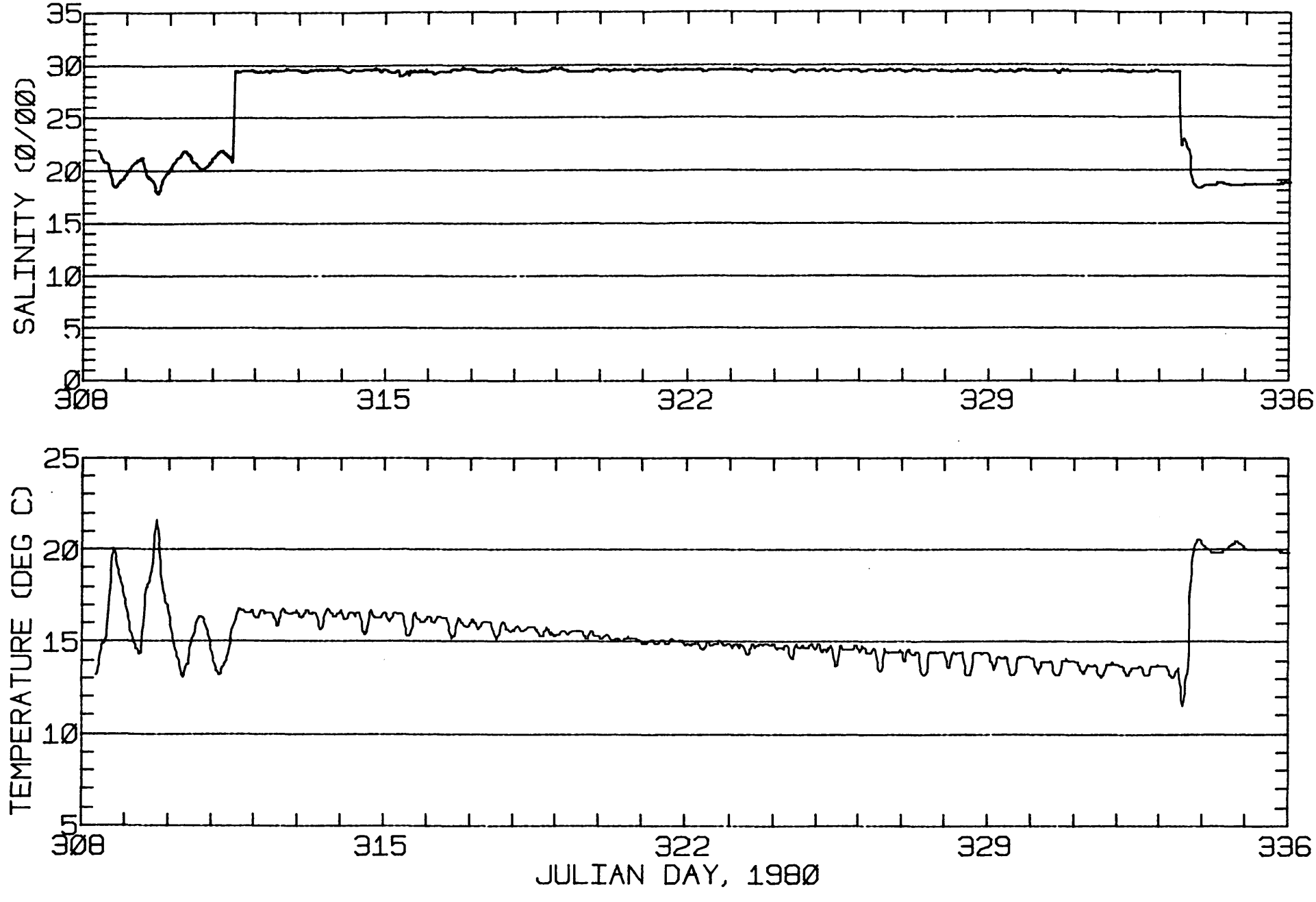
RMS SPEED: 28.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 56.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 20.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 164.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 2.68 CM/SEC
STANDARD DEVIATION V SERIES: 8.29 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.1	2.0	194.
2	12	-0.0	2.6	197.
3	12	0.1	2.4	170.
ALL	36	0.1	2.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-50N 122-19-10W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009L1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-50N 122-19-10W
METER 3.0 METERS ABOVE BED TAPE NUMBER GSC009L1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS009
POSITION: 37 30'52"N 122 7'57"W
METER TYPE: ENDECO
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 5.1 M (BELOW MLLW)
START TIME OF SERIES: 2/ 1/79 1144 PST JULIAN DAY= 32
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

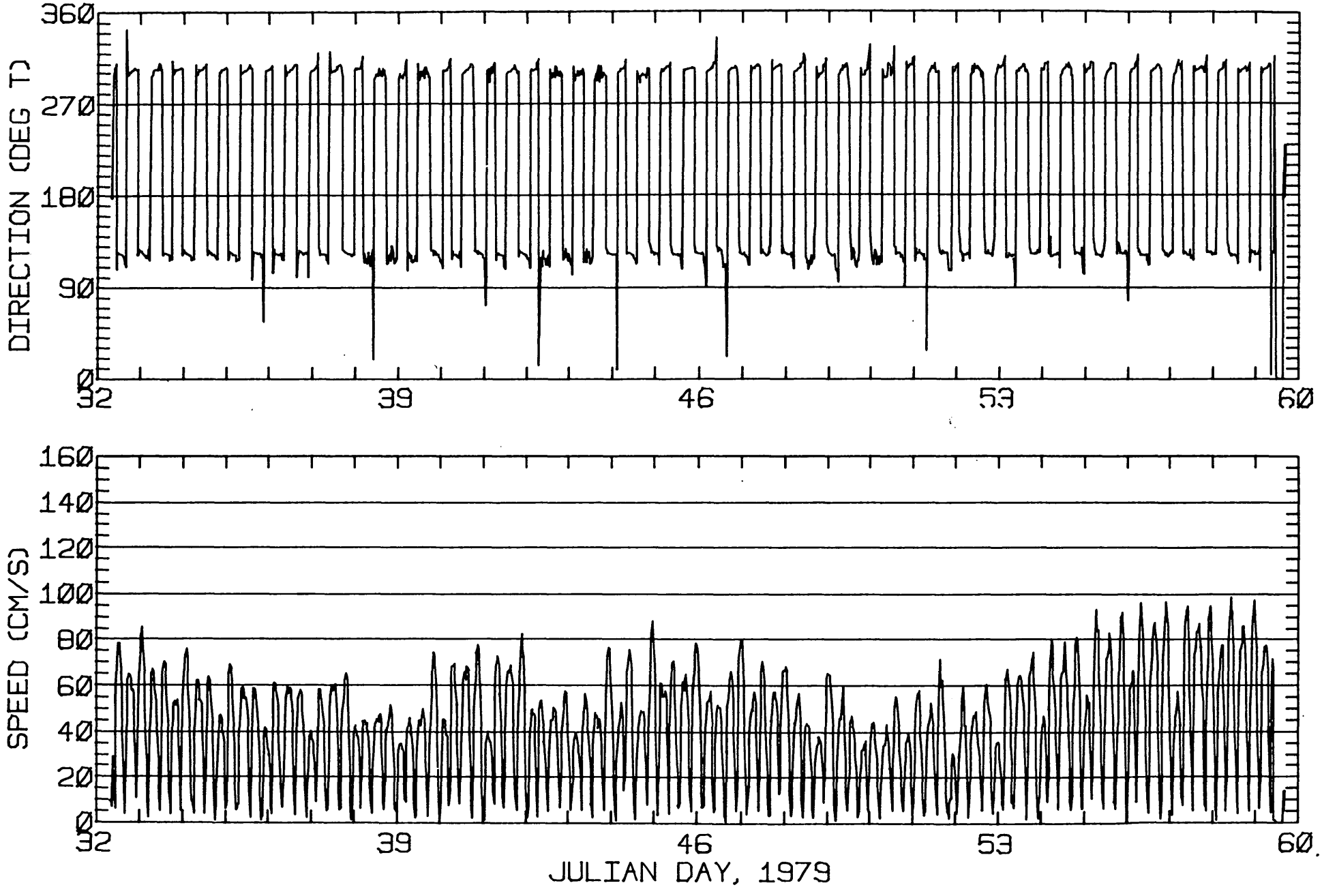
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.04	0.23	120.3	40.2	ANTI-CLOCKWISE
K1	12.59	0.56	123.3	61.0	ANTI-CLOCKWISE
N2	16.55	0.32	124.7	273.6	CLOCKWISE
M2	59.24	0.23	122.7	294.3	CLOCKWISE
S2	16.66	0.01	122.9	319.8	CLOCKWISE
M4	3.66	0.70	130.8	172.2	ANTI-CLOCKWISE

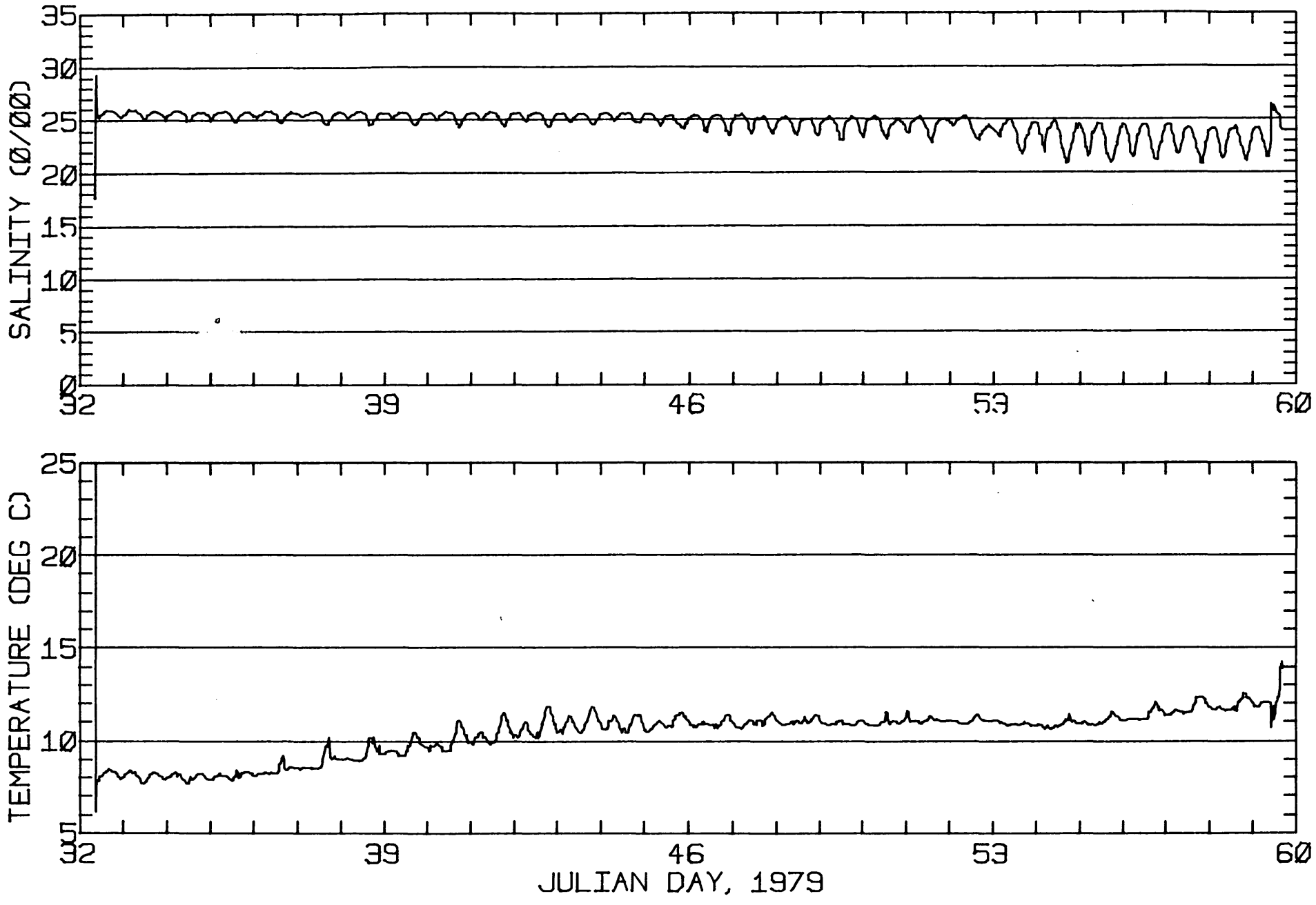
RMS SPEED: 46.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 95.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 122.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 8.75 CM/SEC
STANDARD DEVIATION V SERIES: 6.23 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	-0.5	488.
2	12	3.1	-1.9	386.
3	12	2.8	-0.8	1124.
4	12	3.7	-1.6	2680.
5	2	-0.6	1.2	2767.
ALL	50	2.7	-1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30-52N 122- 7-57W
METER 4.0 METERS ABOVE BED TAPE NUMBER GS009A1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30-52N 122- 7-57W
METER 4.0 METERS ABOVE BED TAPE NUMBER GS009A1 .

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS009
POSITION: 37 30'52"N 122 7'57"W
METER TYPE: ENDECO
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 2/ 1/79 1147 PST JULIAN DAY= 32
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

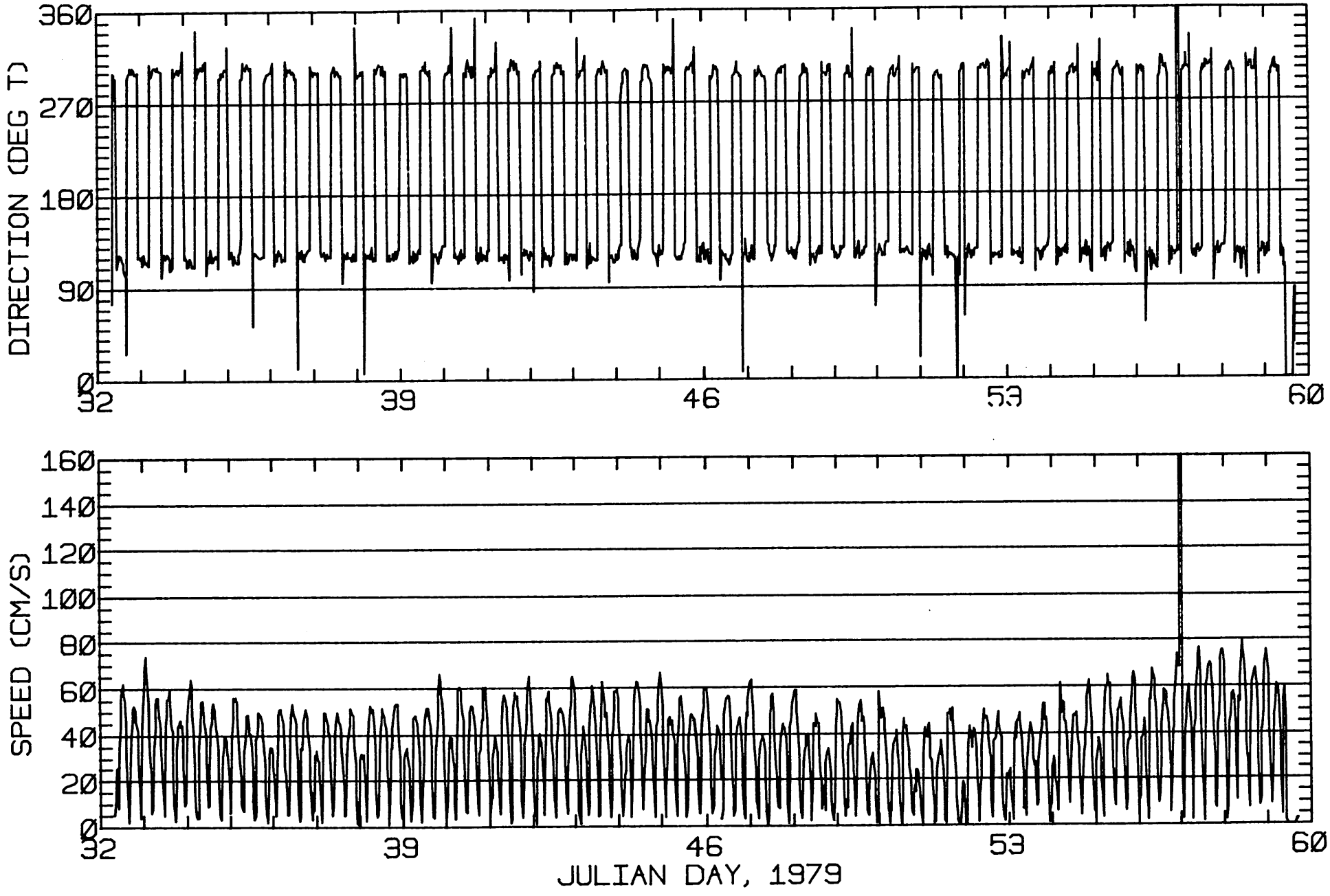
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.71	0.17	124.2	37.2	ANTI-CLOCKWISE
K1	10.29	0.07	123.1	61.9	CLOCKWISE
N2	12.91	0.06	121.3	261.0	CLOCKWISE
M2	48.56	0.44	121.1	291.5	CLOCKWISE
S2	14.41	0.03	121.9	319.6	CLOCKWISE
M4	2.27	0.14	130.5	107.4	ANTI-CLOCKWISE

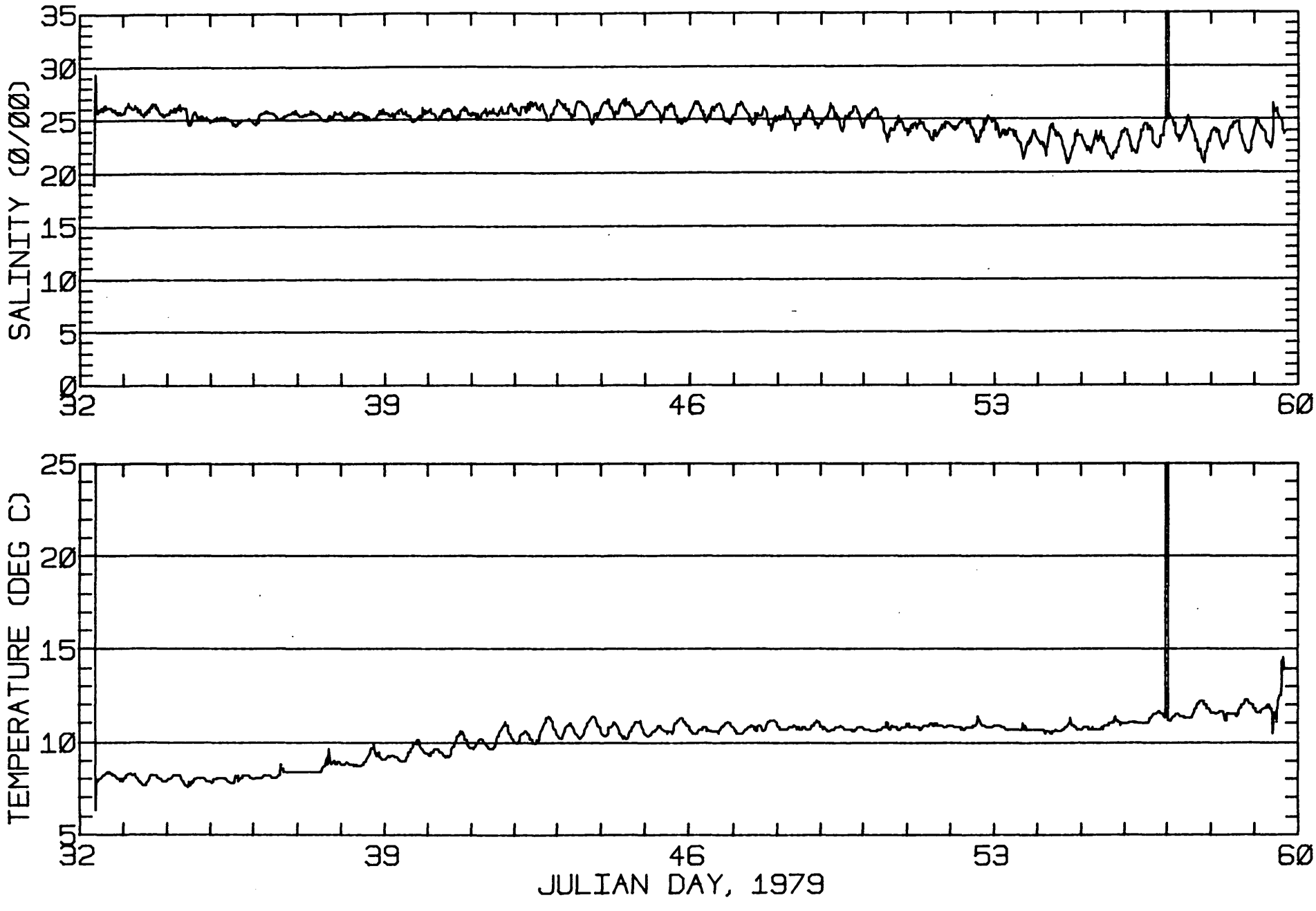
RMS SPEED:	39.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	80.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	30.6 CM/SEC
PRINCIPAL CURRENT DIRECTION:	121.8 DEGREES TRUE
TIDAL FORM NUMBER:	0.27
STANDARD DEVIATION U-SERIES:	8.21 CM/SEC
STANDARD DEVIATION V SERIES:	5.51 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.8	-1.6	488.
2	12	5.6	-2.9	386.
3	12	6.8	-4.5	1124.
4	12	6.6	-4.2	2680.
5	2	2.4	-2.4	2767.
ALL	50	5.6	-3.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30-52N 122- 7-57W
METER 1.5 METERS ABOVE BED TAPE NUMBER GS009A2 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30-52N 122- 7-57W
METER 1.5 METERS ABOVE BED TAPE NUMBER GS009A2 .

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS010
POSITION: 37 31' 2"N 122 7'42"W
METER TYPE: ENDECO
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 2/ 1/79 1153 PST JULIAN DAY= 32
APPROXIMATE RECORD LENGTH IS 22 M2-CYCLES

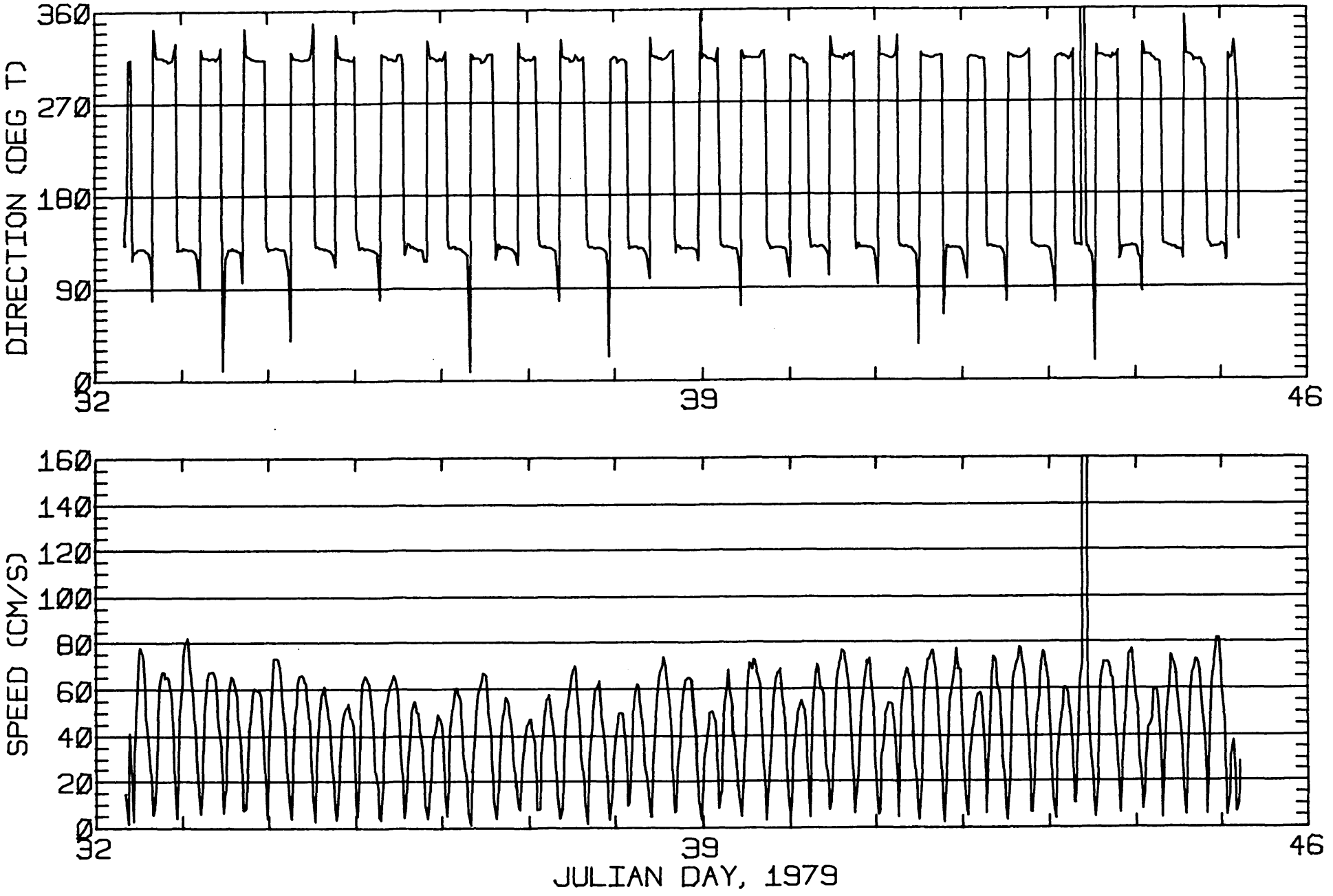
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.64	0.28	133.1	45.6	CLOCKWISE
K1	14.09	0.08	132.1	58.9	CLOCKWISE
N2	15.98	0.09	130.8	275.7	ANTI-CLOCKWISE
M2	65.54	1.01	130.8	295.9	ANTI-CLOCKWISE
S2	17.64	0.28	130.9	309.4	ANTI-CLOCKWISE
M4	4.00	0.02	133.3	174.5	CLOCKWISE

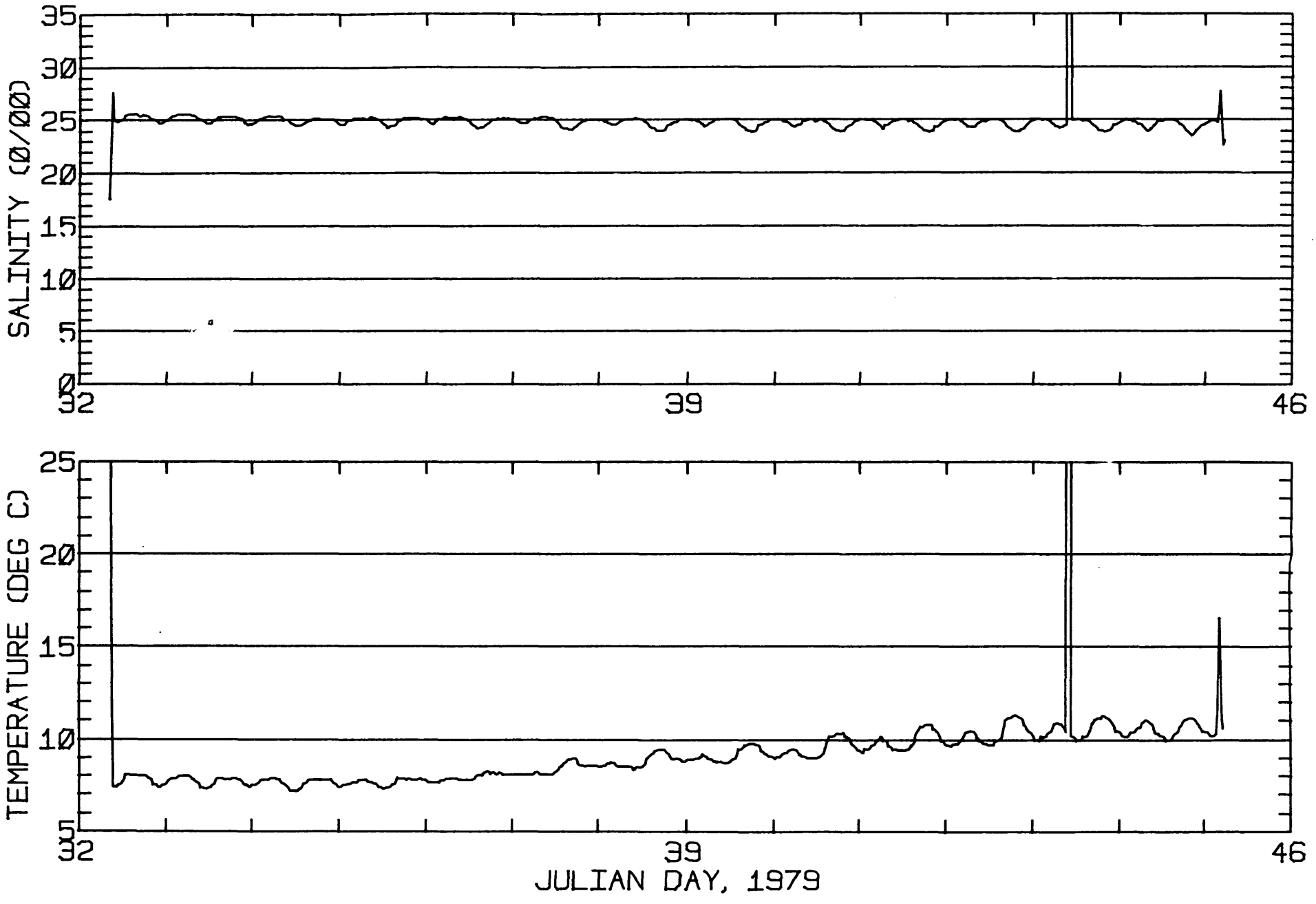
RMS SPEED:	48.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	104.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	41.4 CM/SEC
PRINCIPAL CURRENT DIRECTION:	131.1 DEGREES TRUE
TIDAL FORM NUMBER:	0.26
STANDARD DEVIATION U-SERIES:	5.19 CM/SEC
STANDARD DEVIATION V SERIES:	4.38 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.7	2.2	488.
2	10	1.0	2.2	397.
ALL	22	0.9	2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-31- 2N 122- 7-42W
METER 5.5 METERS ABOVE BED TAPE NUMBER GS010A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-31- 2N 122- 7-42W
METER 5.5 METERS ABOVE BED TAPE NUMBER GS010A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS010
POSITION: 37 31' 2"N 122 7'42"W
METER TYPE: ENDECO
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 2/ 1/79 1157 PST JULIAN DAY= 32
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

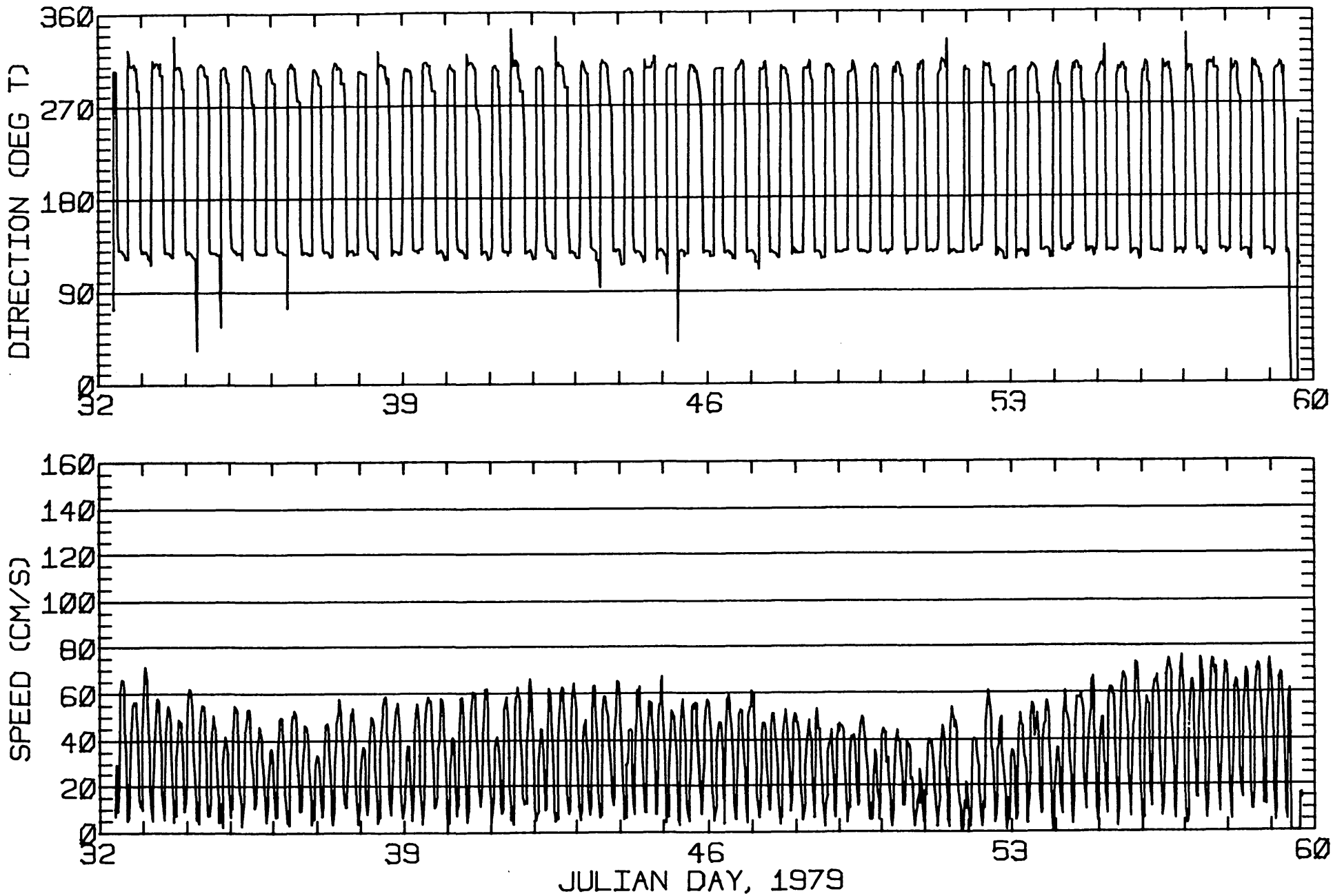
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.76	0.37	128.0	37.8	ANTI-CLOCKWISE
K1	11.27	0.36	128.7	66.9	ANTI-CLOCKWISE
N2	13.77	0.82	125.2	271.2	ANTI-CLOCKWISE
M2	47.31	1.60	127.8	296.3	ANTI-CLOCKWISE
S2	15.60	0.53	127.0	319.3	ANTI-CLOCKWISE
M4	2.83	0.43	140.5	107.7	ANTI-CLOCKWISE

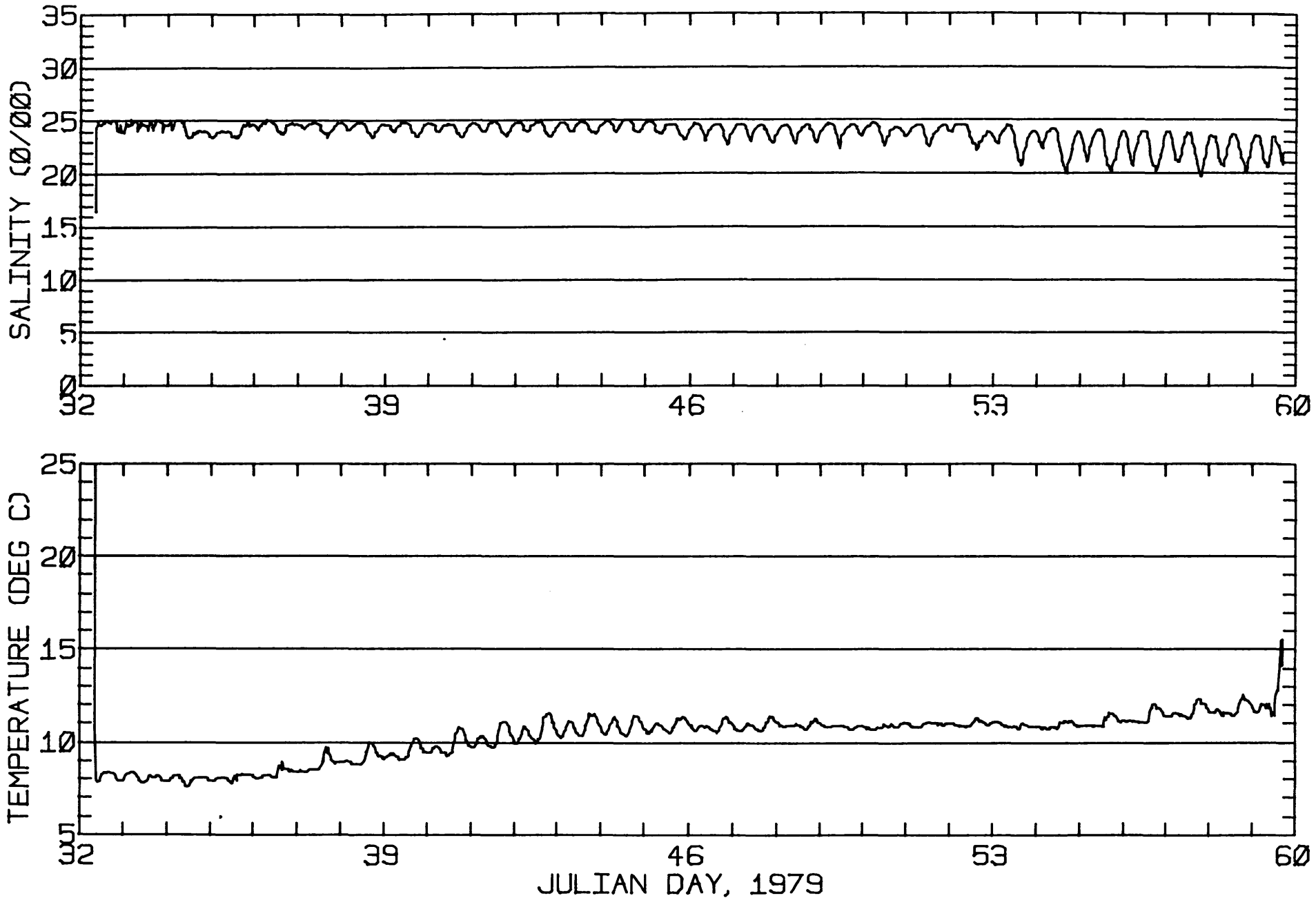
RMS SPEED:	38.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	81.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	28.2 CM/SEC
PRINCIPAL CURRENT DIRECTION:	127.8 DEGREES TRUE
TIDAL FORM NUMBER:	0.30
STANDARD DEVIATION U-SERIES:	9.22 CM/SEC
STANDARD DEVIATION V SERIES:	6.63 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.0	-1.1	488.
2	12	1.0	-2.0	386.
3	12	3.0	-3.1	1124.
4	12	1.8	-2.9	2680.
5	2	-1.7	0.2	2767.
ALL	50	1.3	-2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-31- 2N 122- 7-42W
METER 1.5 METERS ABOVE BEDTAPE NUMBER GS010A2 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-31- 2N 122- 7-42W
METER 1.5 METERS ABOVE BED TAPE NUMBER GS010A2 .

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30'15"N 122 6'50"W
METER TYPE: ENDECO
WATER DEPTH: 12.5 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 12/18/79 1413 PST JULIAN DAY=352
APPROXIMATE RECORD LENGTH IS 22 M2-CYCLES

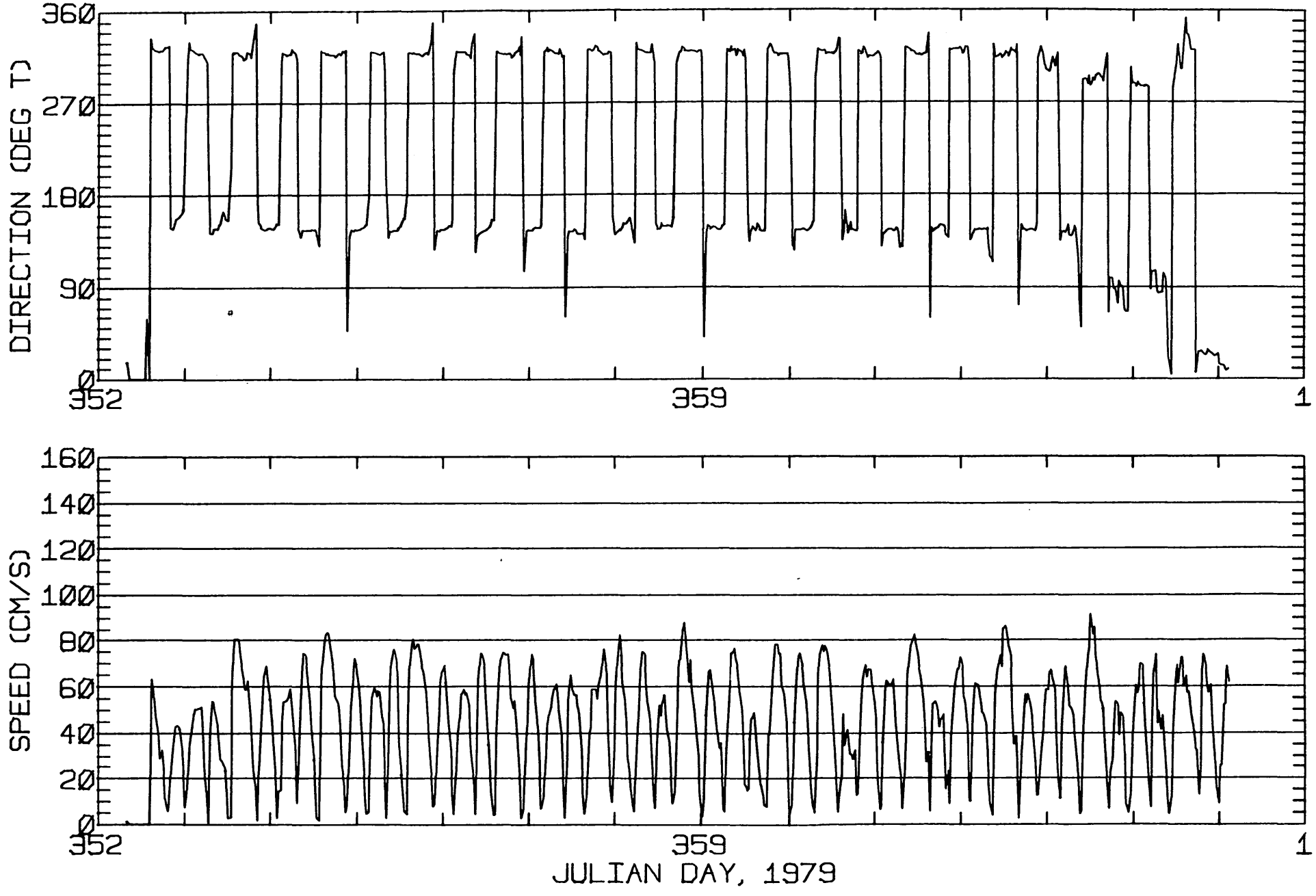
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.22	0.31	121.8	52.1	ANTI-CLOCKWISE
K1	16.75	1.42	140.9	55.9	CLOCKWISE
N2	22.34	6.86	134.7	273.8	CLOCKWISE
M2	46.36	6.01	136.2	300.8	ANTI-CLOCKWISE
S2	6.96	3.82	128.4	331.1	CLOCKWISE
M4	3.19	1.75	179.3	201.2	CLOCKWISE

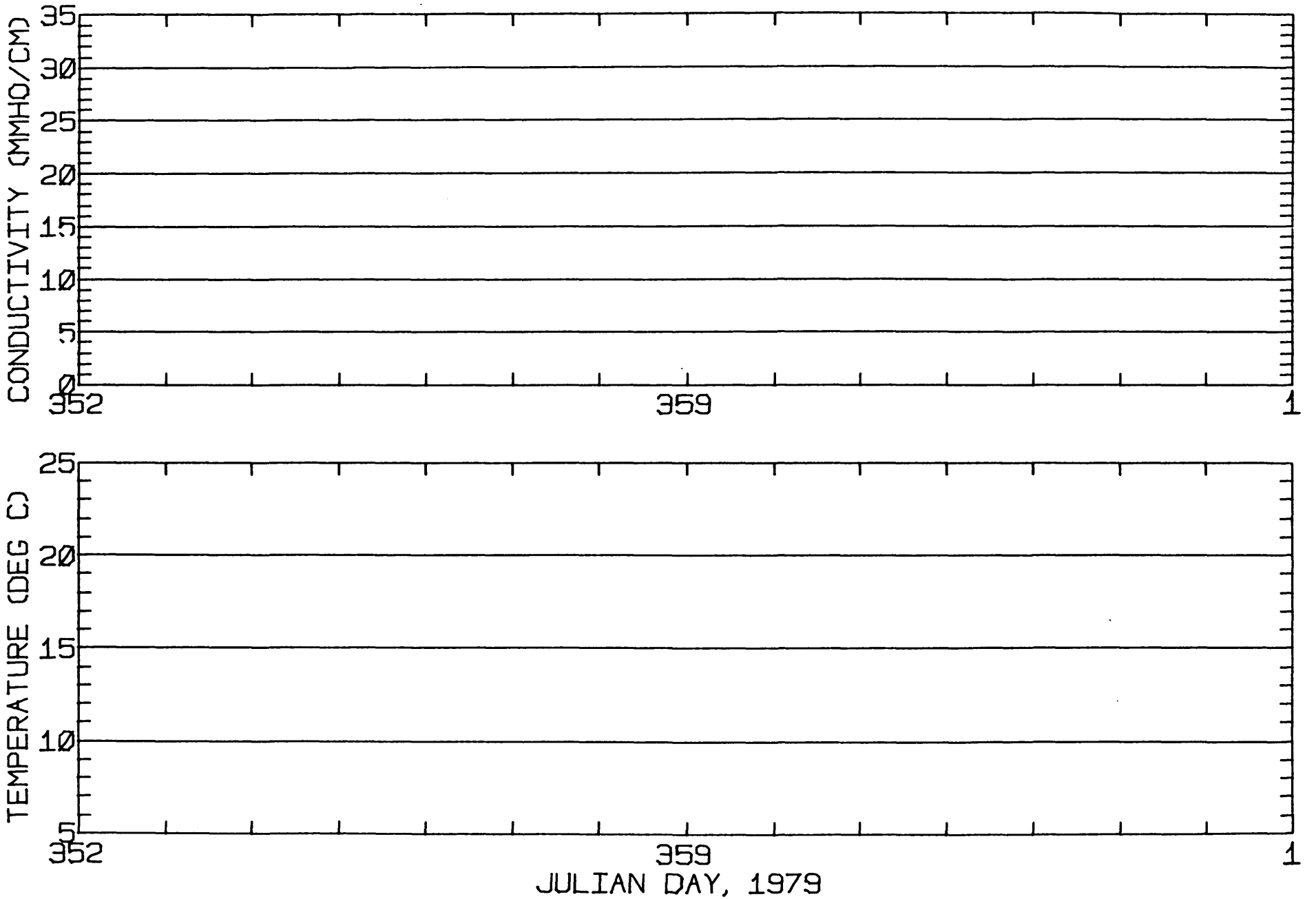
RMS SPEED:	50.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	75.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	27.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	135.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.41
STANDARD DEVIATION U-SERIES:	8.65 CM/SEC
STANDARD DEVIATION V SERIES:	11.68 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-6.5	3.7	329.
2	10	-9.0	6.5	1317.
ALL	22	-7.6	5.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30-15N 122- 6-50W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30-15N 122- 6-50W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 8"N 122 6'44"W
METER TYPE: ENDECO
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 8.2 M (BELOW MLLW)
START TIME OF SERIES: 1/18/80 1232 PST JULIAN DAY= 18
APPROXIMATE RECORD LENGTH IS 48 M2-CYCLES

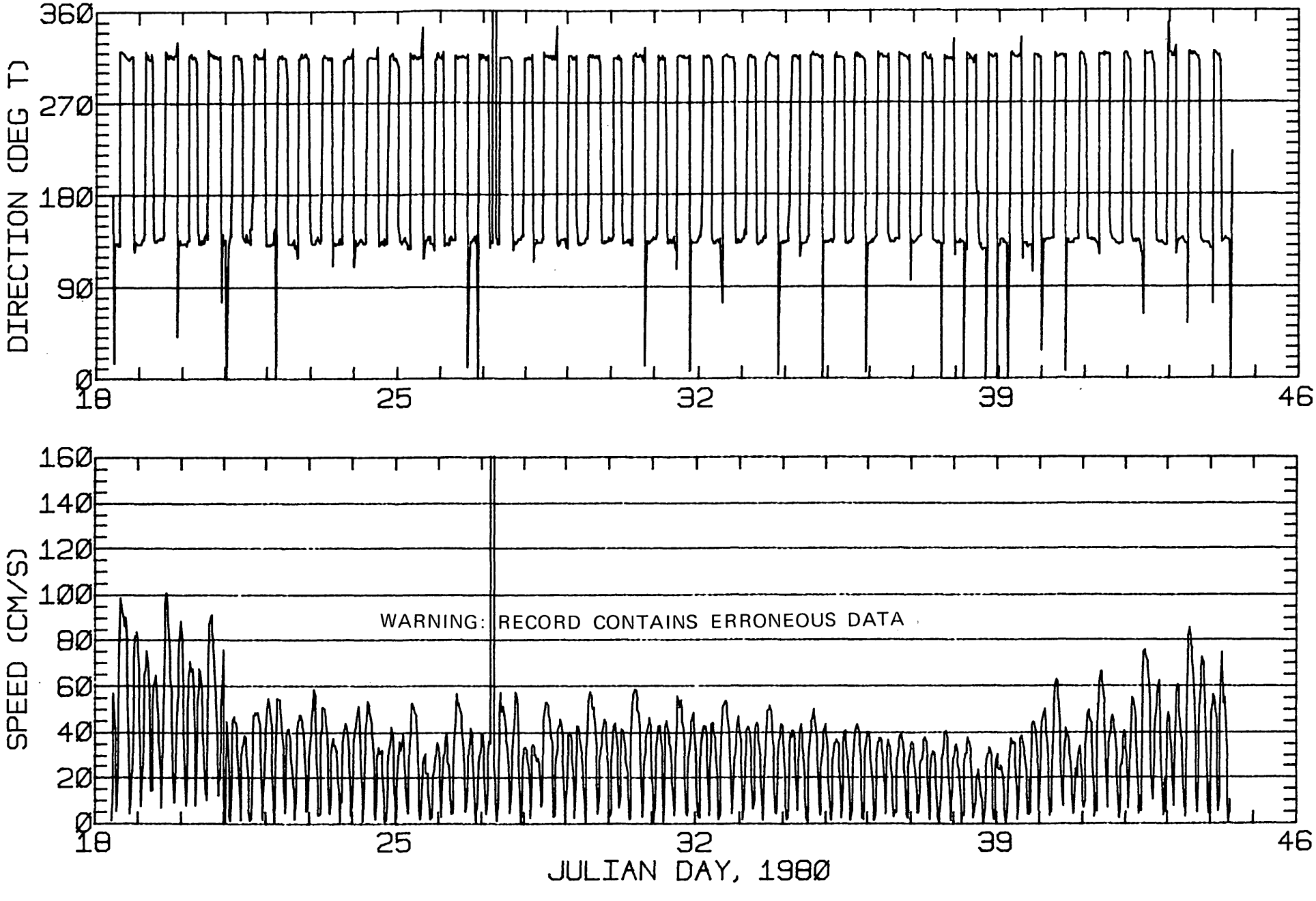
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.06	0.00	138.2	37.8	ANTI-CLOCKWISE
K1	13.11	0.25	136.3	58.2	CLOCKWISE
N2	11.74	0.12	137.0	311.5	CLOCKWISE
M2	46.30	0.10	135.5	291.0	ANTI-CLOCKWISE
S2	10.94	0.15	135.4	309.8	ANTI-CLOCKWISE
M4	2.26	0.51	131.5	85.6	ANTI-CLOCKWISE

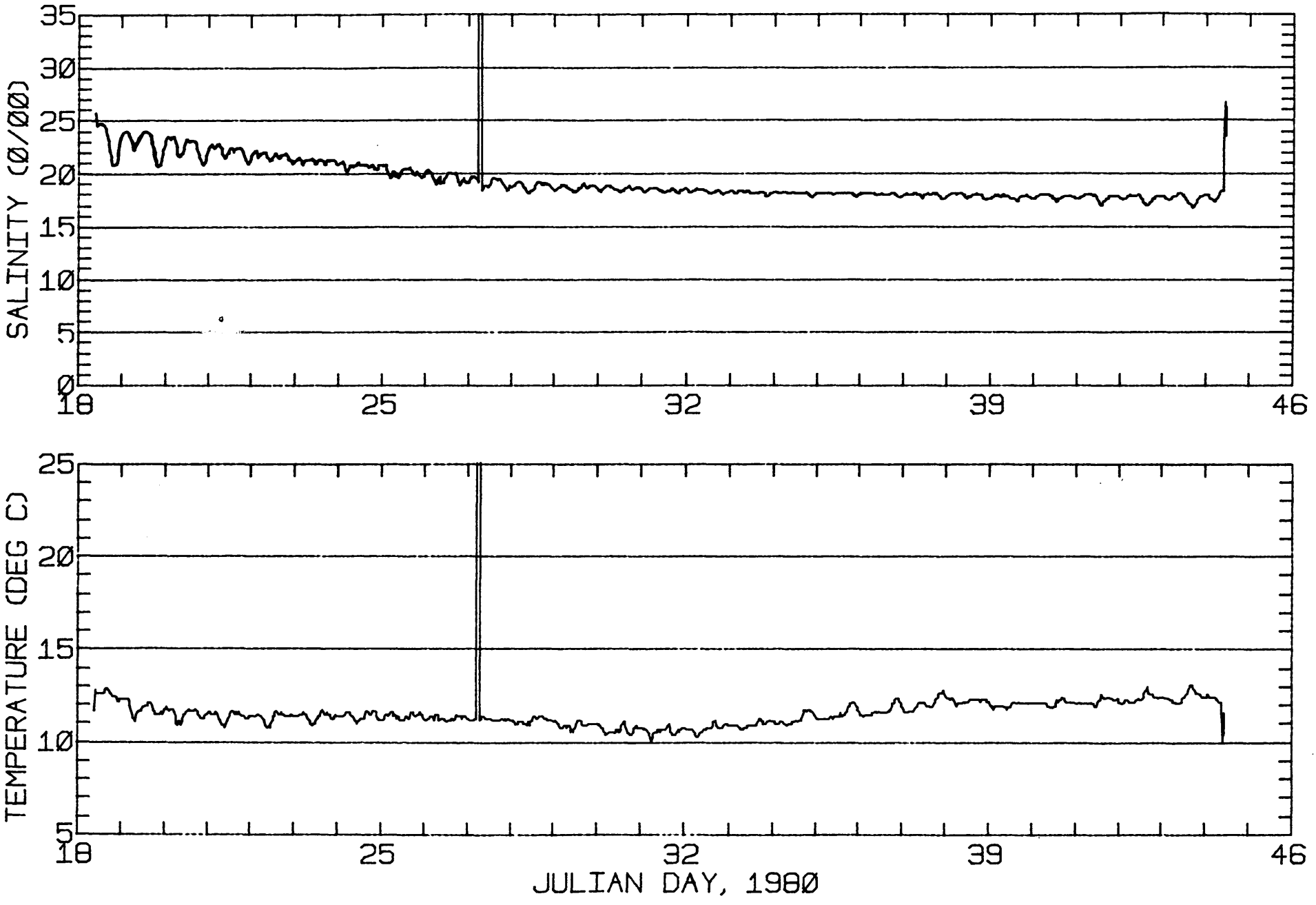
RMS SPEED:	37.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	78.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	30.3 CM/SEC
PRINCIPAL CURRENT DIRECTION:	135.9 DEGREES TRUE
TIDAL FORM NUMBER:	0.37
STANDARD DEVIATION U-SERIES:	7.22 CM/SEC
STANDARD DEVIATION V SERIES:	7.77 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.0	4.3	5646.
2	12	-2.6	2.9	2935.
3	12	-1.6	2.1	1816.
4	12	0.2	0.6	1140.
ALL	48	-1.8	2.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 8N 122- 6-44W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013B1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 8N 122- 6-44W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013B1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 7"N 122 6'46"W
METER TYPE: ENDECO
WATER DEPTH: 15.2 M (MLLW)
METER DEPTH: 9.1 M (BELOW MLLW)
START TIME OF SERIES: 3/13/80 1348 PST JULIAN DAY= 73
APPROXIMATE RECORD LENGTH IS 54 M2-CYCLES

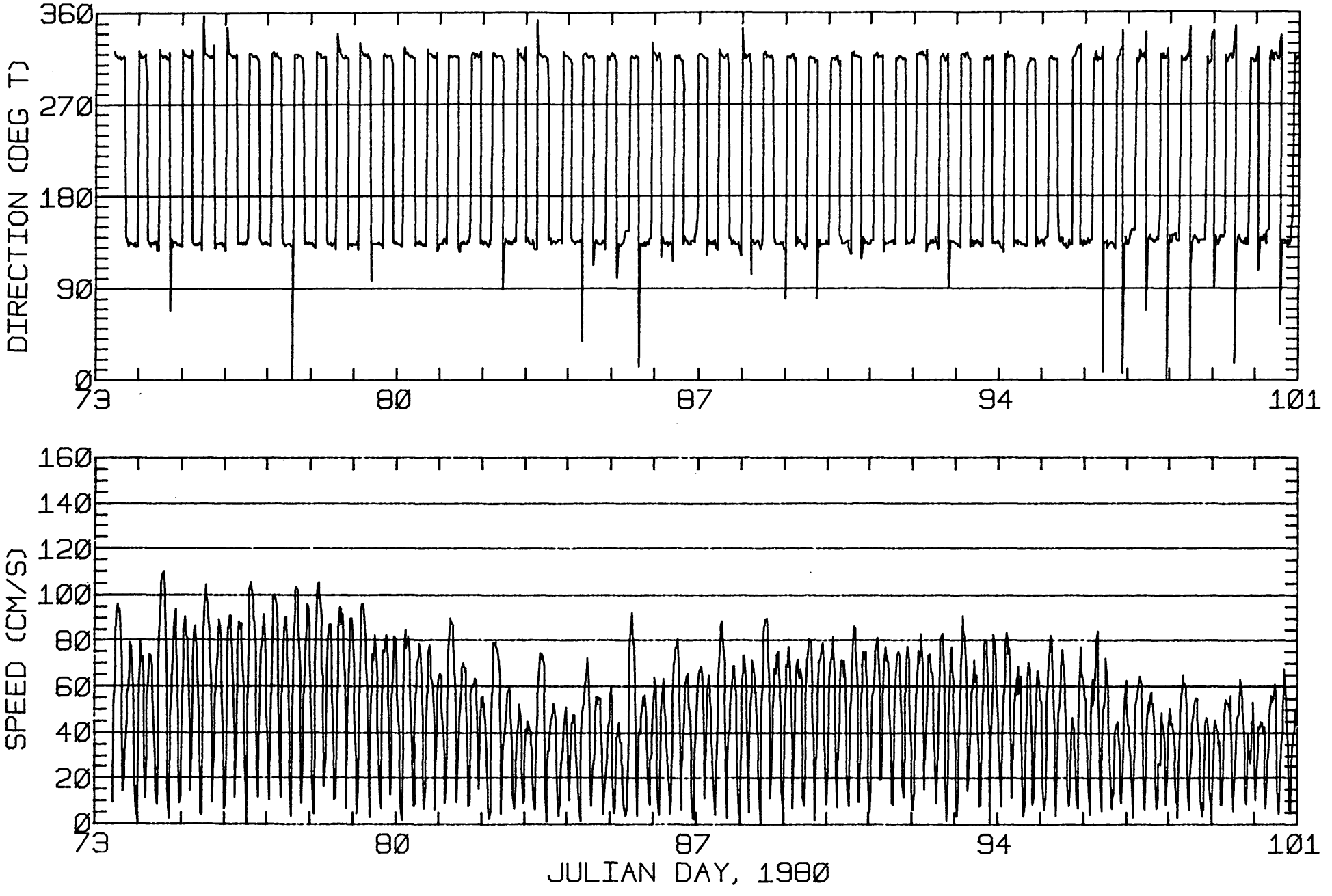
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.38	0.23	135.0	31.1	CLOCKWISE
K1	8.71	0.13	136.1	32.3	ANTI-CLOCKWISE
N2	15.71	0.03	135.5	270.6	ANTI-CLOCKWISE
M2	67.40	0.32	136.1	291.5	ANTI-CLOCKWISE
S2	21.22	0.27	135.2	303.9	ANTI-CLOCKWISE
M4	5.13	0.42	138.5	94.6	ANTI-CLOCKWISE

RMS SPEED: 55.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 106.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 46.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 135.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.20
STANDARD DEVIATION U-SERIES: 8.16 CM/SEC
STANDARD DEVIATION V SERIES: 8.13 CM/SEC

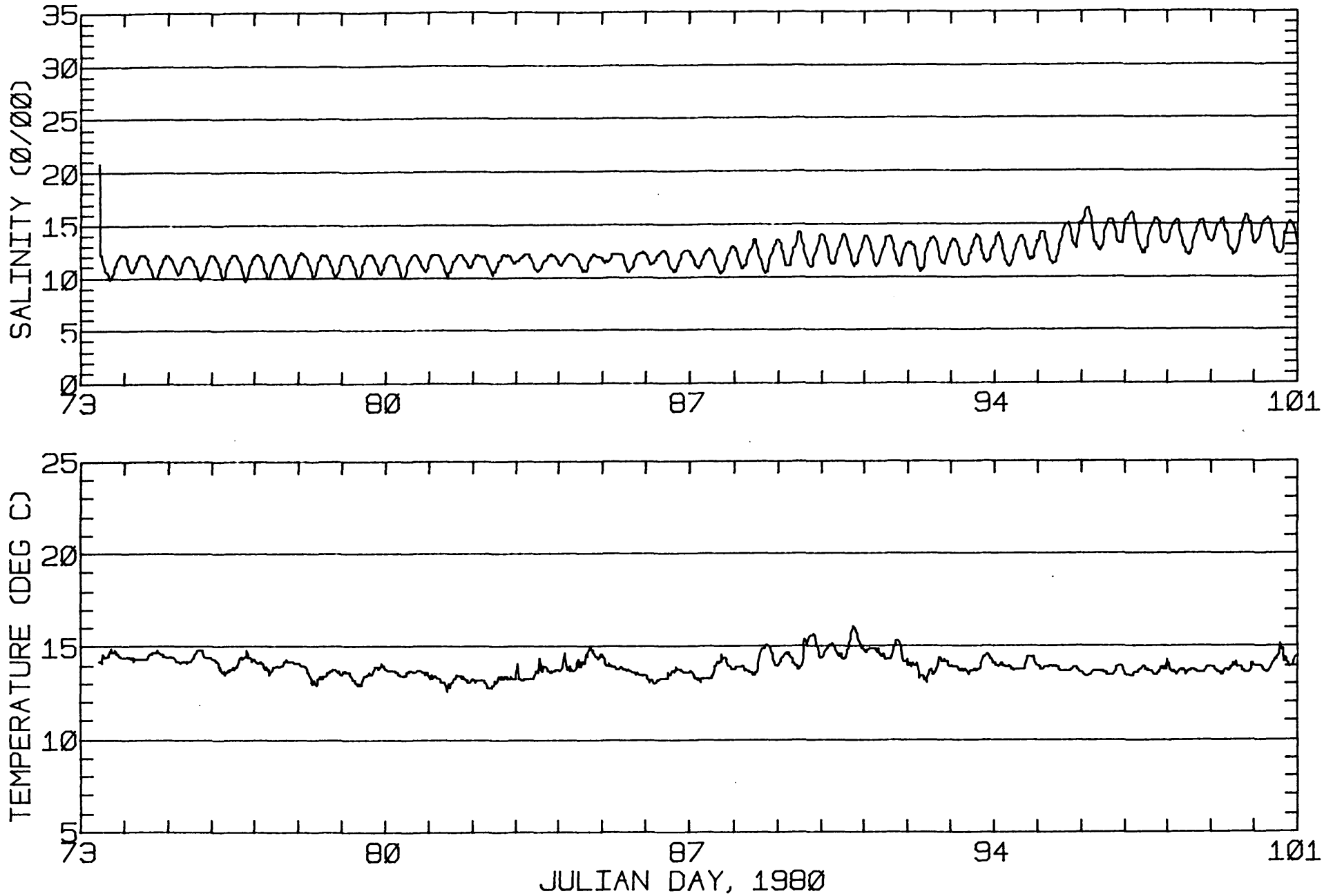
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.3	4.2	2648.
2	12	-1.0	2.7	2018.
3	12	-0.4	1.8	1490.
4	12	1.2	-0.5	1048.
5	6	1.3	-1.4	1136.
ALL	54	-0.2	1.7	



.06

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 7N 122- 6-46W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013D1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 7N 122- 6-46W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013D1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 6"N 122 6'51"W
METER TYPE: ENDECO
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 7.9 M (BELOW MLLW)
START TIME OF SERIES: 4/11/80 1203 PST JULIAN DAY=102
APPROXIMATE RECORD LENGTH IS 48 M2-CYCLES

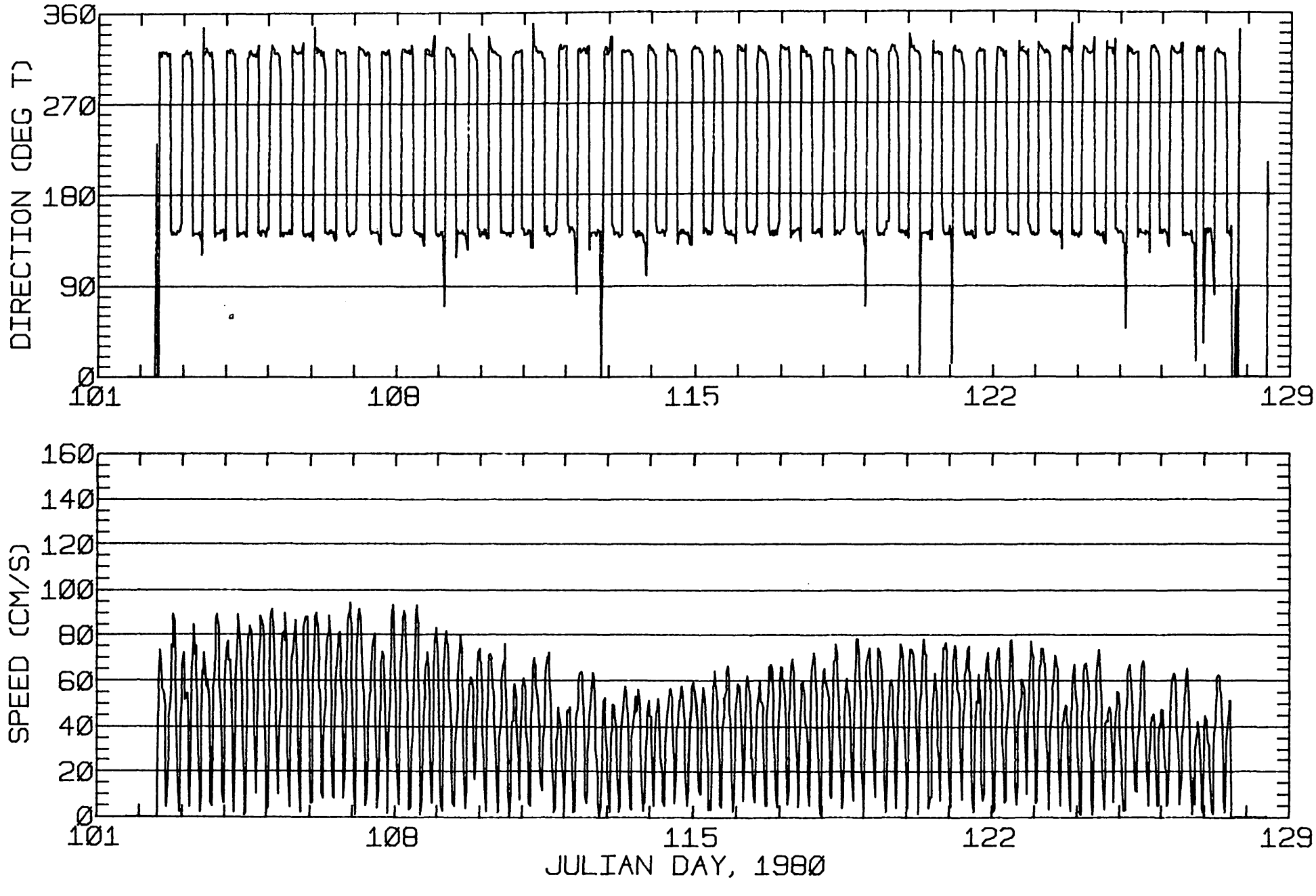
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.65	0.20	139.1	20.9	CLOCKWISE
K1	10.89	0.49	142.8	12.5	ANTI-CLOCKWISE
N2	11.22	0.24	142.6	261.6	ANTI-CLOCKWISE
M2	61.88	0.76	141.9	292.3	ANTI-CLOCKWISE
S2	16.47	0.19	141.9	283.9	ANTI-CLOCKWISE
M4	1.79	0.26	128.4	171.6	CLOCKWISE

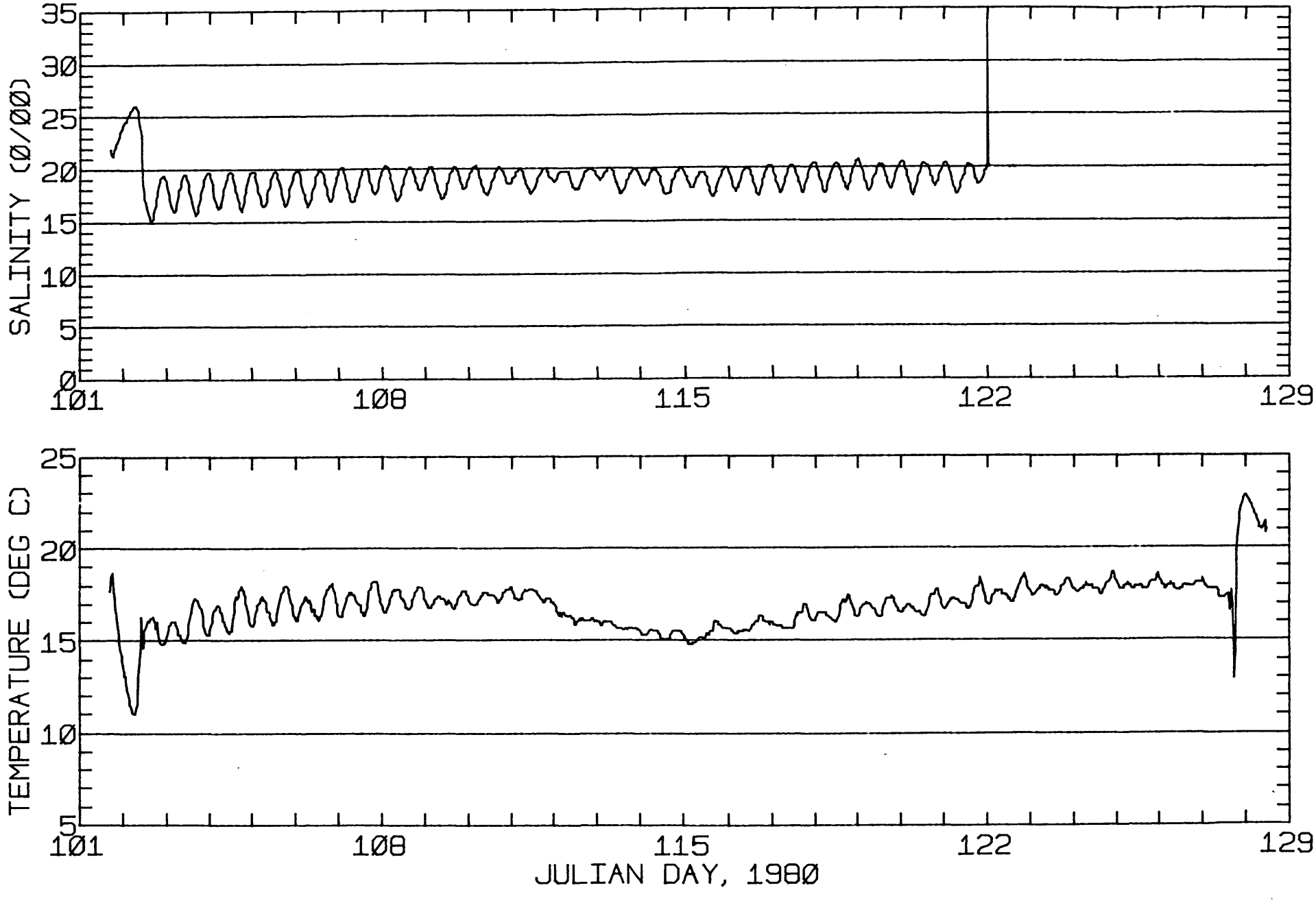
RMS SPEED: 50.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 95.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 141.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.22
STANDARD DEVIATION U-SERIES: 6.13 CM/SEC
STANDARD DEVIATION V SERIES: 7.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.7	-1.5	769.
2	12	0.7	-0.8	680.
3	12	0.7	-1.2	651.
4	12	0.3	-0.2	561.
ALL	48	0.6	-1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 6N 122- 6-51W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013E1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 6N 122- 6-51W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013E1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 8"N 122 6'51"W
METER TYPE: ENDECO
WATER DEPTH: 14.6 M (MLLW)
METER DEPTH: 8.5 M (BELOW MLLW)
START TIME OF SERIES: 5/ 6/80 1906 PST JULIAN DAY=127
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

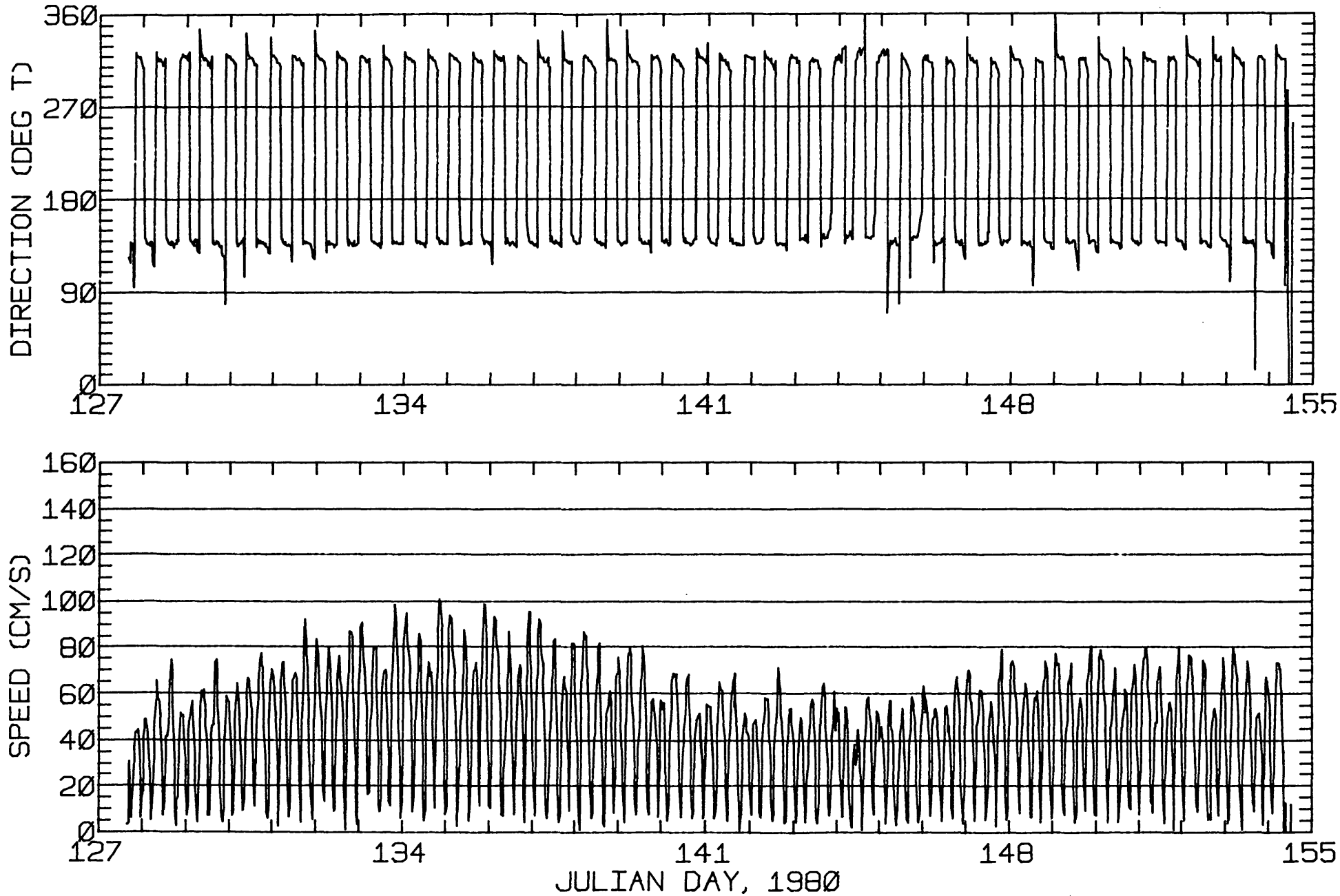
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.00	0.29	134.0	45.4	CLOCKWISE
K1	15.14	0.18	139.0	22.0	ANTI-CLOCKWISE
N2	11.07	0.54	138.4	262.5	ANTI-CLOCKWISE
M2	64.29	1.36	137.2	293.7	ANTI-CLOCKWISE
S2	9.98	0.68	136.2	294.7	ANTI-CLOCKWISE
M4	1.73	0.46	123.2	157.7	CLOCKWISE

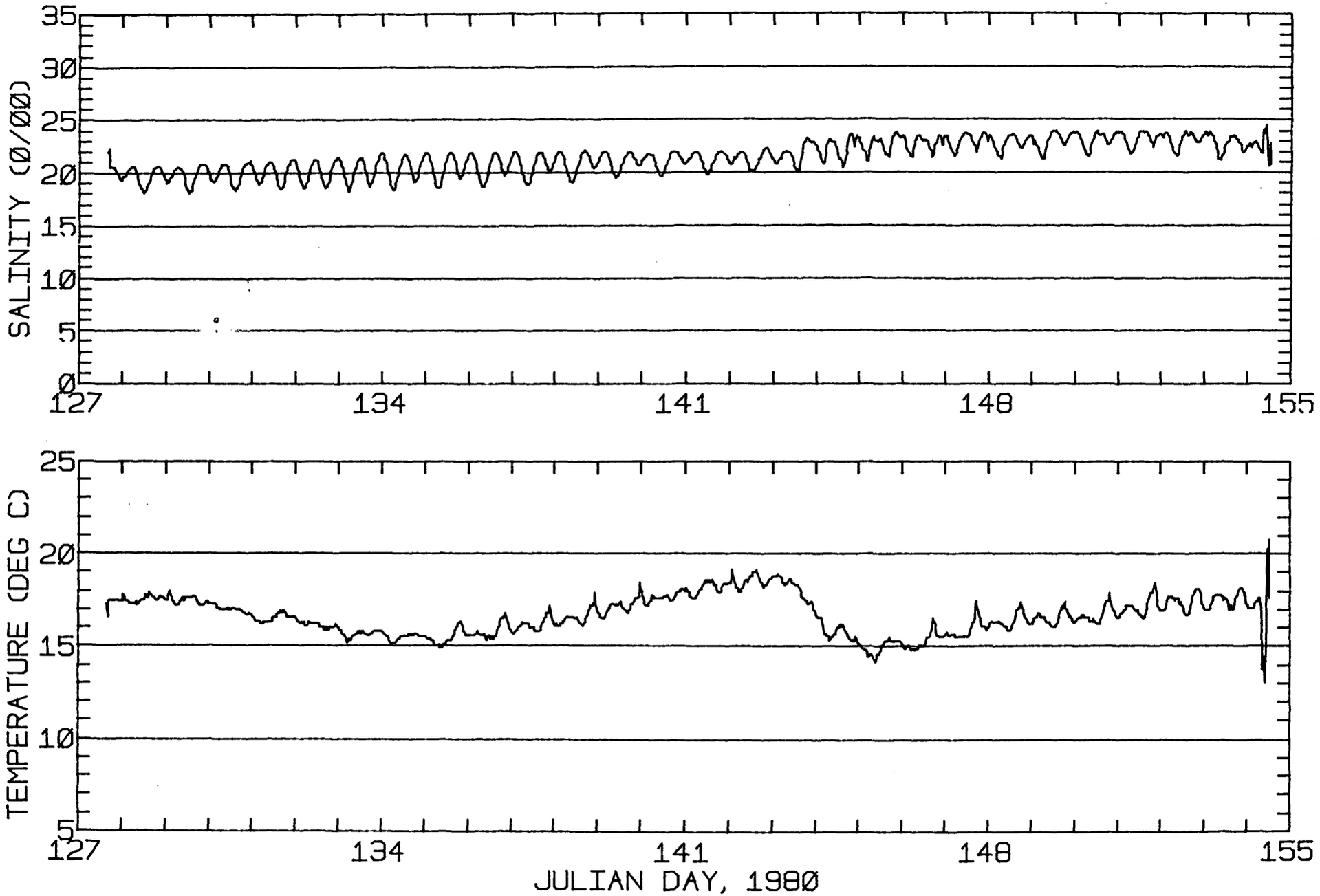
RMS SPEED:	50.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	95.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	45.2 CM/SEC
PRINCIPAL CURRENT DIRECTION:	137.2 DEGREES TRUE
TIDAL FORM NUMBER:	0.28
STANDARD DEVIATION U-SERIES:	7.15 CM/SEC
STANDARD DEVIATION V SERIES:	7.86 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.3	-1.5	586.
2	12	-1.7	0.7	736.
3	12	-1.3	-0.1	604.
4	12	-0.7	-0.6	484.
5	2	-0.4	-0.4	440.
ALL	50	-0.6	-0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 8N 122- 6-51W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013F1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 8N 122- 6-51W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013F1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 8"N 122 6'50"W
METER TYPE: ENDECO
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 8.2 M (BELOW MLLW)
START TIME OF SERIES: 6/ 2/80 1051 PST JULIAN DAY=154
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

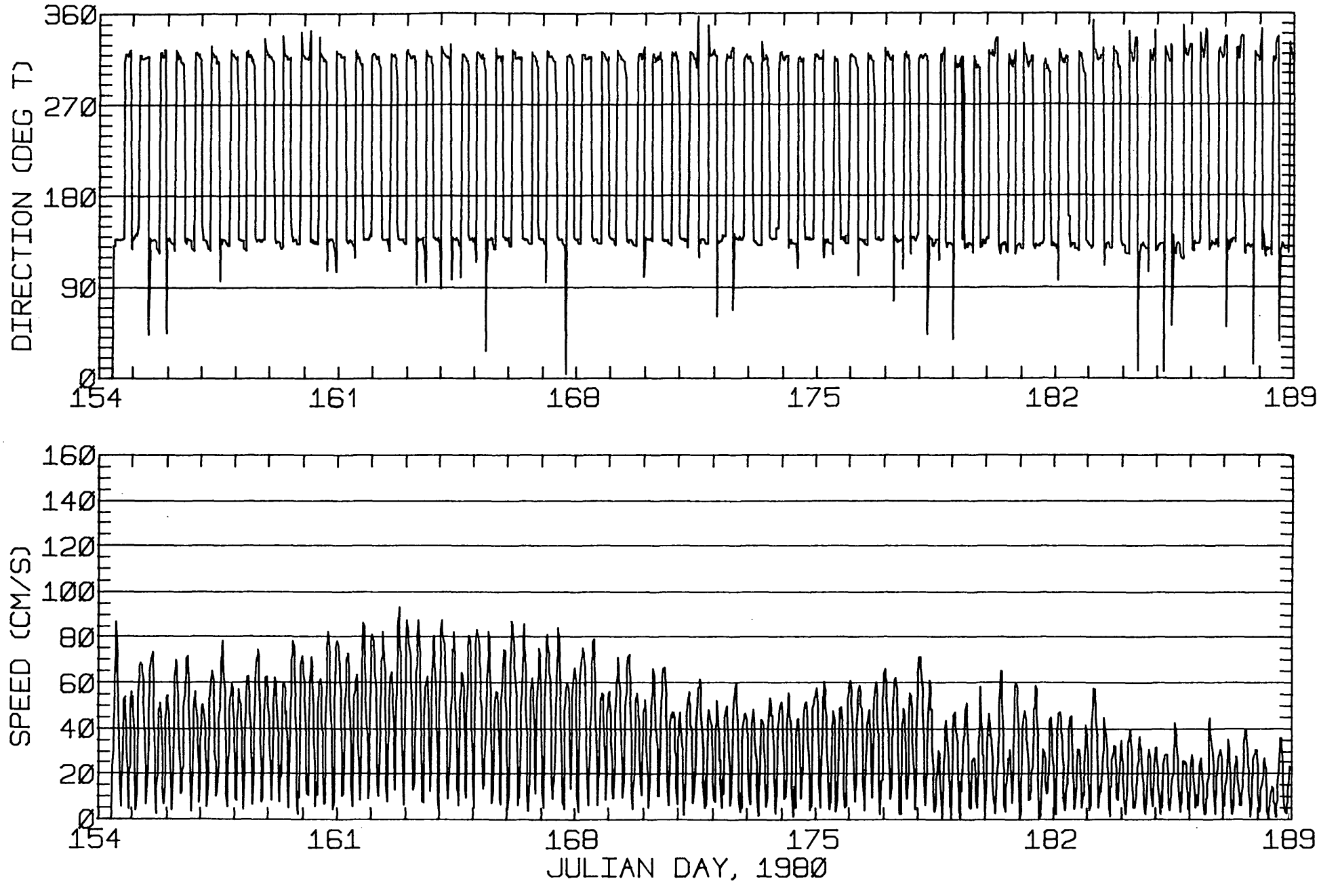
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.50	0.37	133.9	38.9	CLOCKWISE
K1	16.24	0.10	138.0	28.6	CLOCKWISE
N2	10.90	0.68	139.5	249.3	ANTI-CLOCKWISE
M2	55.44	1.21	136.8	297.8	ANTI-CLOCKWISE
S2	3.85	0.10	132.8	300.9	ANTI-CLOCKWISE
M4	2.18	0.07	122.2	173.4	CLOCKWISE

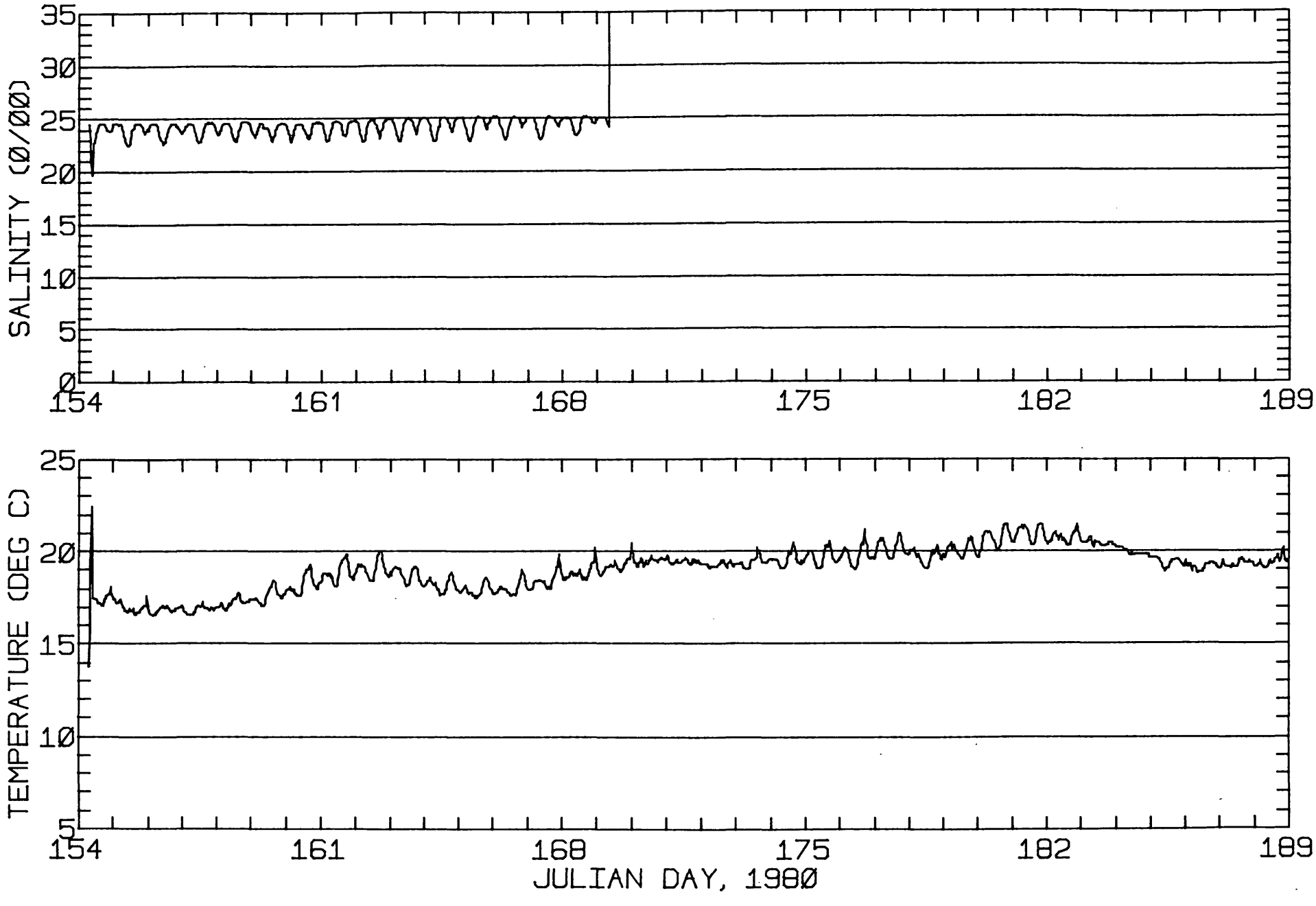
RMS SPEED: 44.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 82.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 136.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 8.98 CM/SEC
STANDARD DEVIATION V SERIES: 9.98 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	-0.8	403.
2	12	0.4	0.3	413.
3	12	0.5	-0.2	411.
4	12	1.3	-1.4	449.
5	8	2.2	-1.1	429.
ALL	56	1.2	-0.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 8N 122- 6-50W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013G1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 8N 122- 6-50W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013G1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 5"N 122 6'47"W
METER TYPE: ENDECO
WATER DEPTH: 13.7 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 7/ 9/80 1238 PST JULIAN DAY=191
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

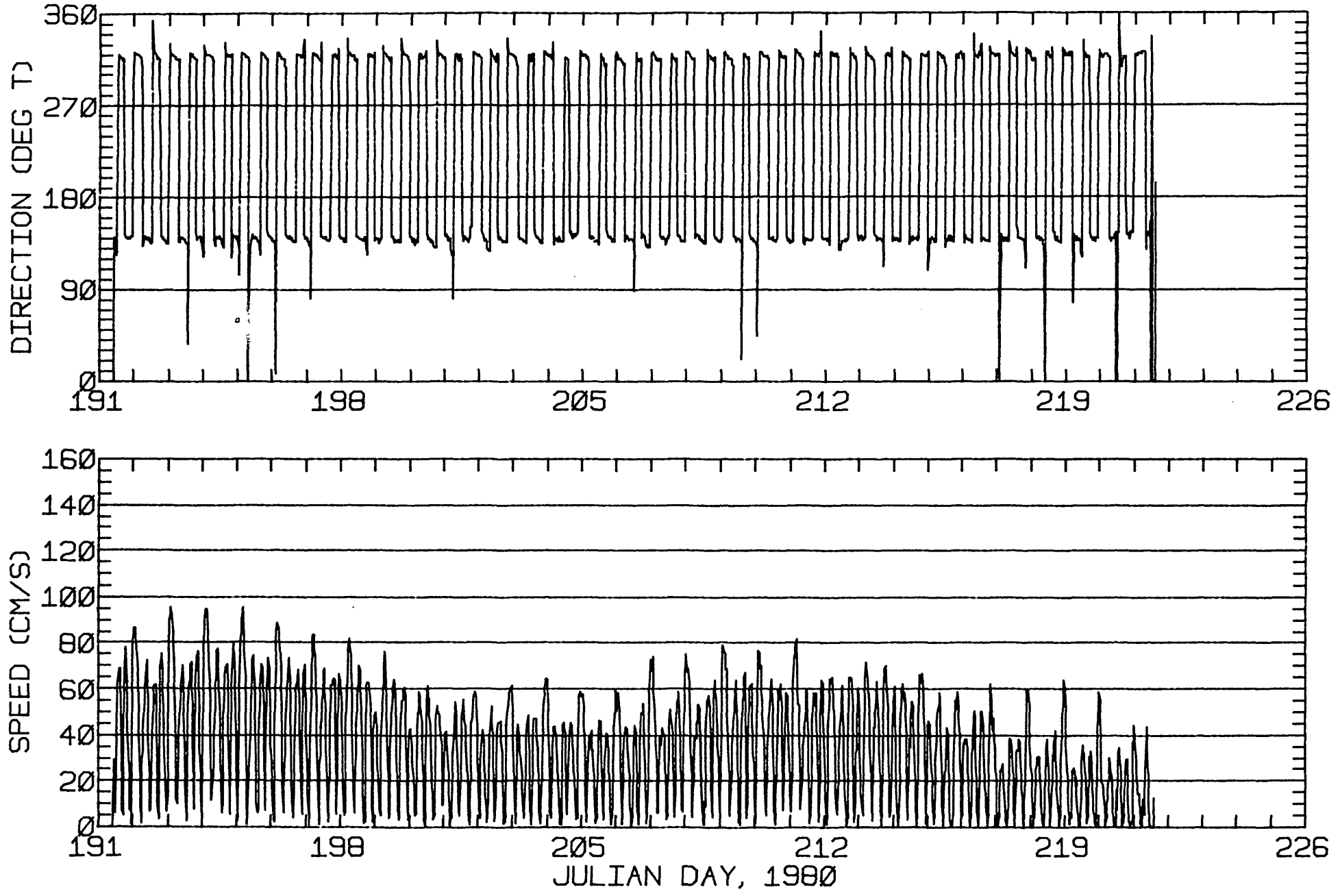
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.44	0.06	139.0	42.9	CLOCKWISE
K1	14.07	0.09	140.1	46.4	ANTI-CLOCKWISE
N2	3.97	0.08	142.1	262.5	ANTI-CLOCKWISE
M2	53.50	1.14	139.1	292.5	ANTI-CLOCKWISE
S2	12.91	0.18	138.4	328.3	ANTI-CLOCKWISE
M4	3.69	0.06	133.0	104.7	ANTI-CLOCKWISE

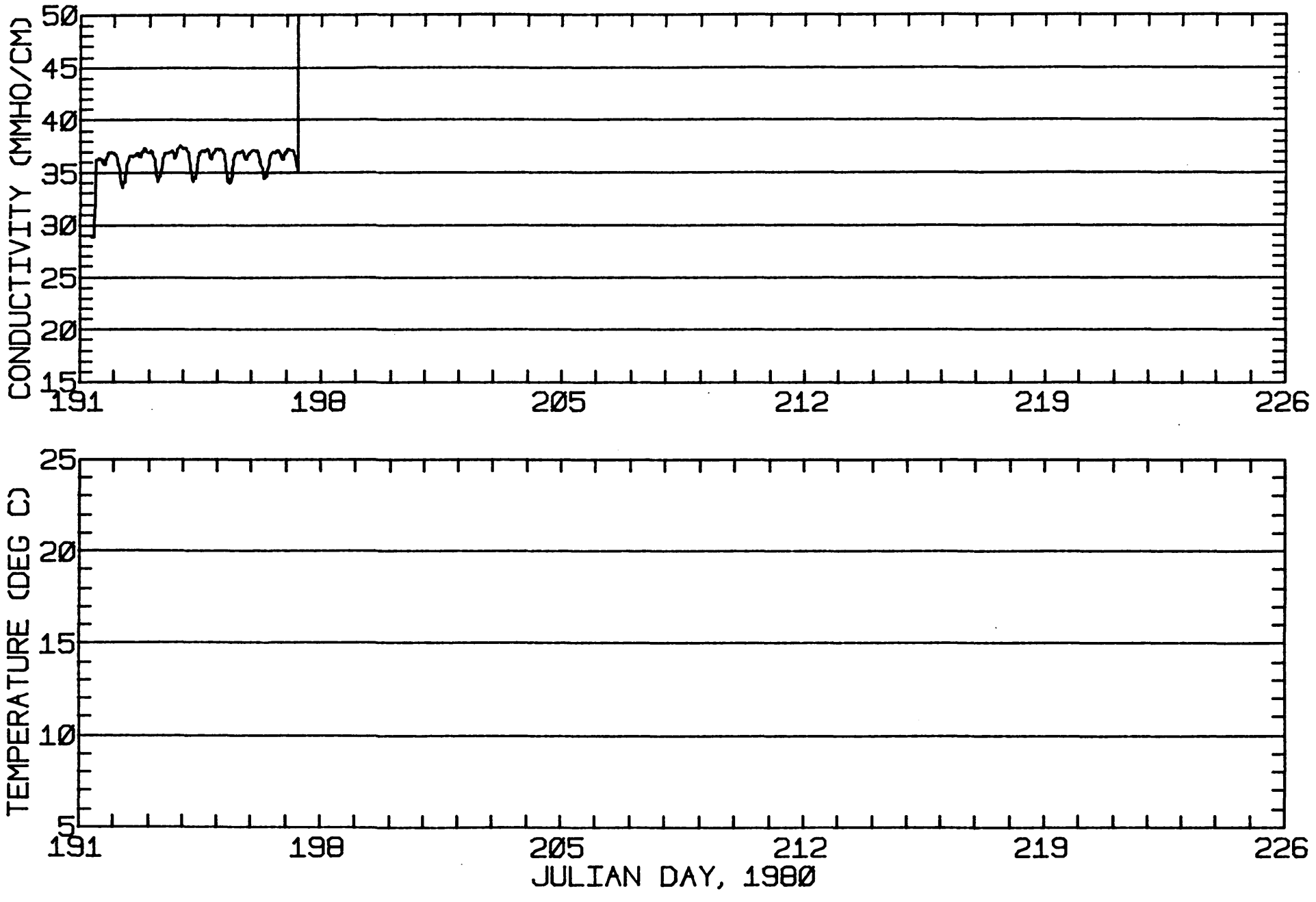
RMS SPEED:	43.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	86.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	33.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	139.2 DEGREES TRUE
TIDAL FORM NUMBER:	0.31
STANDARD DEVIATION U-SERIES:	7.99 CM/SEC
STANDARD DEVIATION V SERIES:	9.67 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.7	3.4	279.
2	12	-2.7	2.7	291.
3	12	-3.1	2.4	306.
4	12	-3.9	4.4	250.
5	8	-2.7	3.1	172.
ALL	56	-3.3	3.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 5N 122- 6-47W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013H1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 5N 122- 6-47W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013H1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 9"N 122 6'50"W
METER TYPE: ENDECO
WATER DEPTH: 13.7 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 9/ 8/80 1431 PST JULIAN DAY=252
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

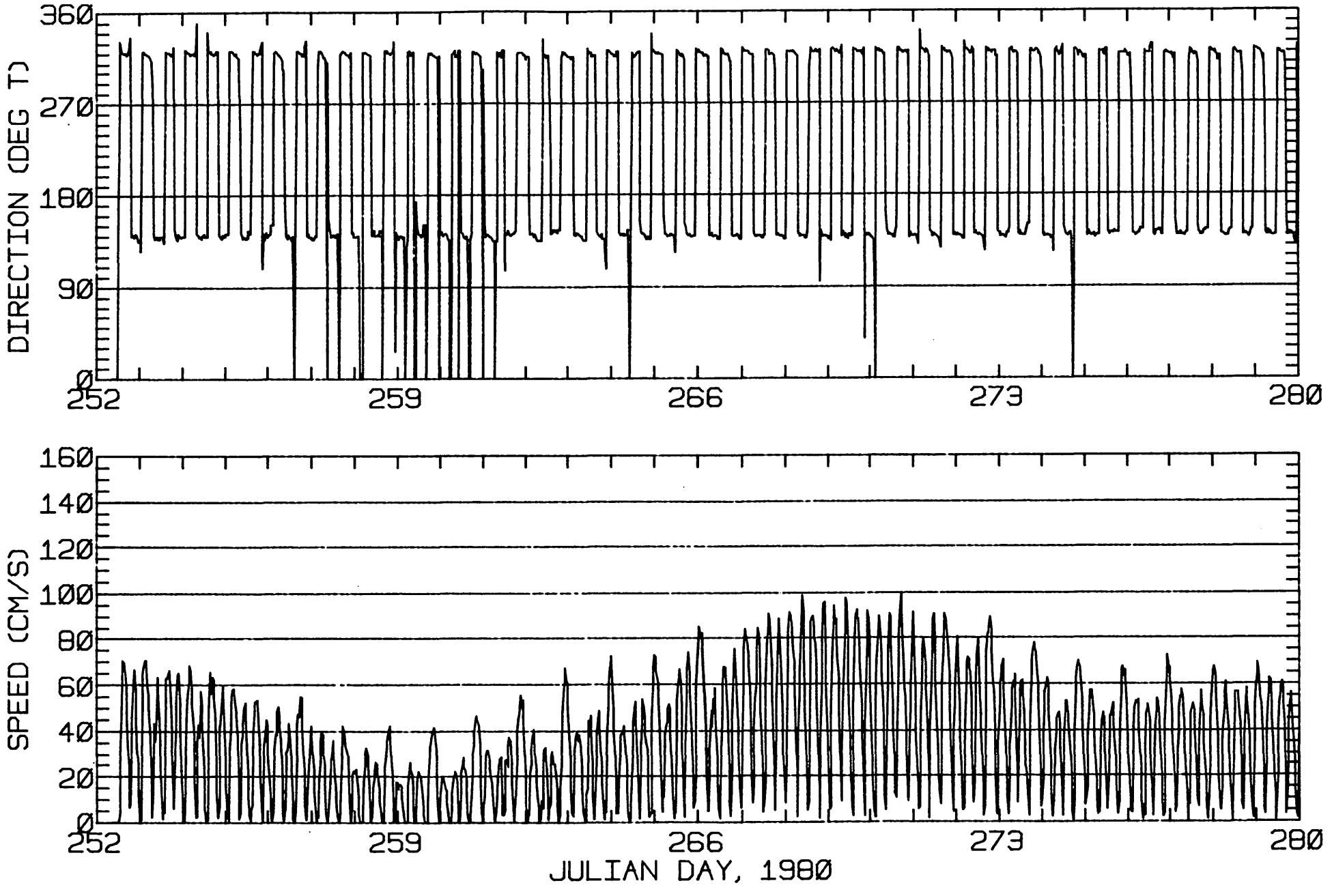
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.10	0.01	139.1	39.9	ANTI-CLOCKWISE
K1	9.33	0.02	139.9	46.2	ANTI-CLOCKWISE
N2	18.49	0.38	140.7	277.9	ANTI-CLOCKWISE
M2	53.59	0.72	140.0	296.5	ANTI-CLOCKWISE
S2	15.89	0.10	140.2	297.1	ANTI-CLOCKWISE
M4	2.50	0.12	135.9	114.1	ANTI-CLOCKWISE

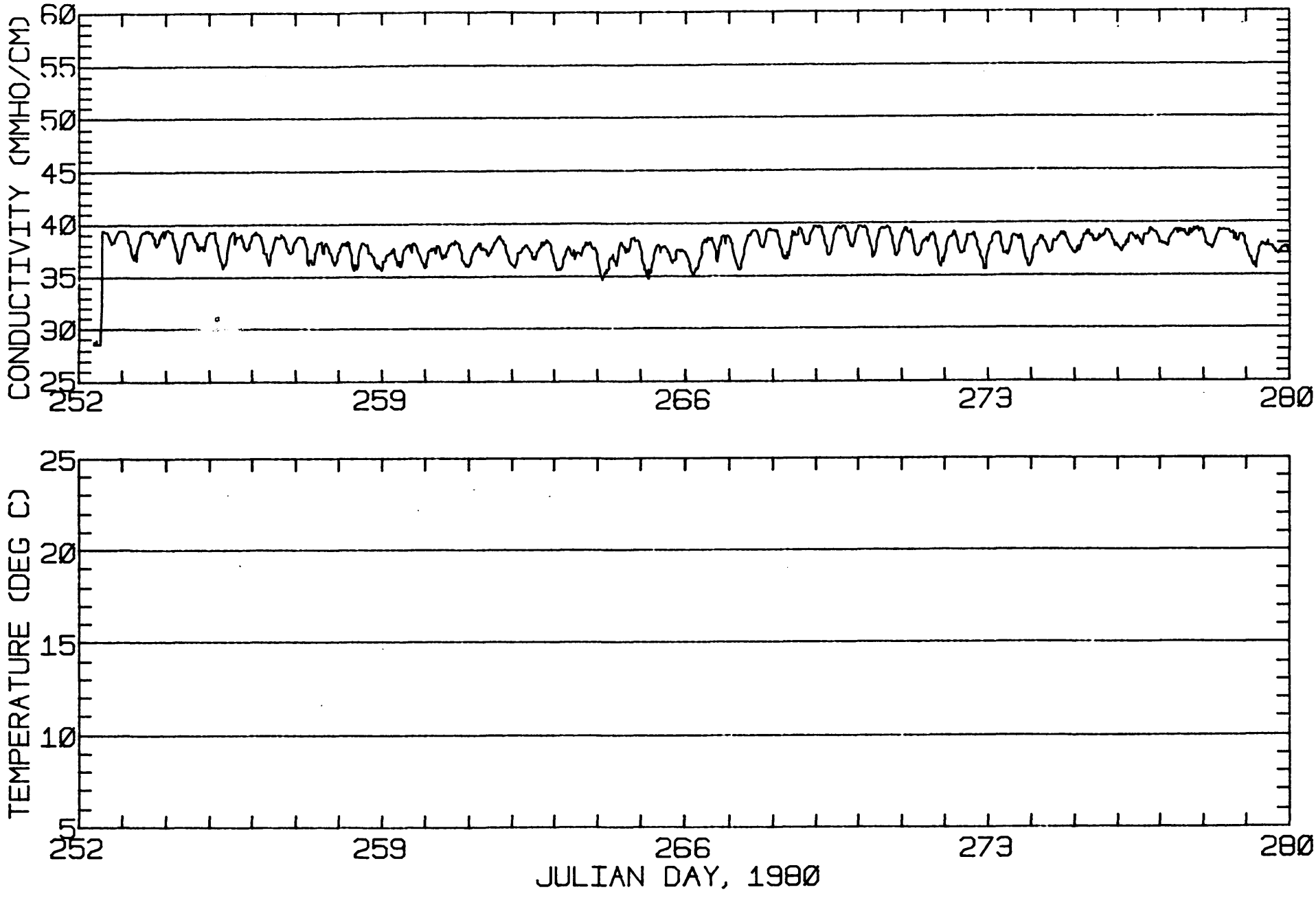
RMS SPEED:	44.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	86.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	36.5 CM/SEC
PRINCIPAL CURRENT DIRECTION:	140.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.25
STANDARD DEVIATION U-SERIES:	6.17 CM/SEC
STANDARD DEVIATION V SERIES:	7.64 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.6	4.1	247.
2	12	-2.3	1.9	307.
3	12	-3.2	3.7	294.
4	12	-2.2	1.8	352.
5	4	-2.2	1.7	255.
ALL	52	-2.8	2.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 9N 122- 6-50W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013J1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 9N 122- 6-50W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013J1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 9"N 122 6'50"W
METER TYPE: ENDECO
WATER DEPTH: 13.7 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 10/ 6/80 1307 PST JULIAN DAY=280
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

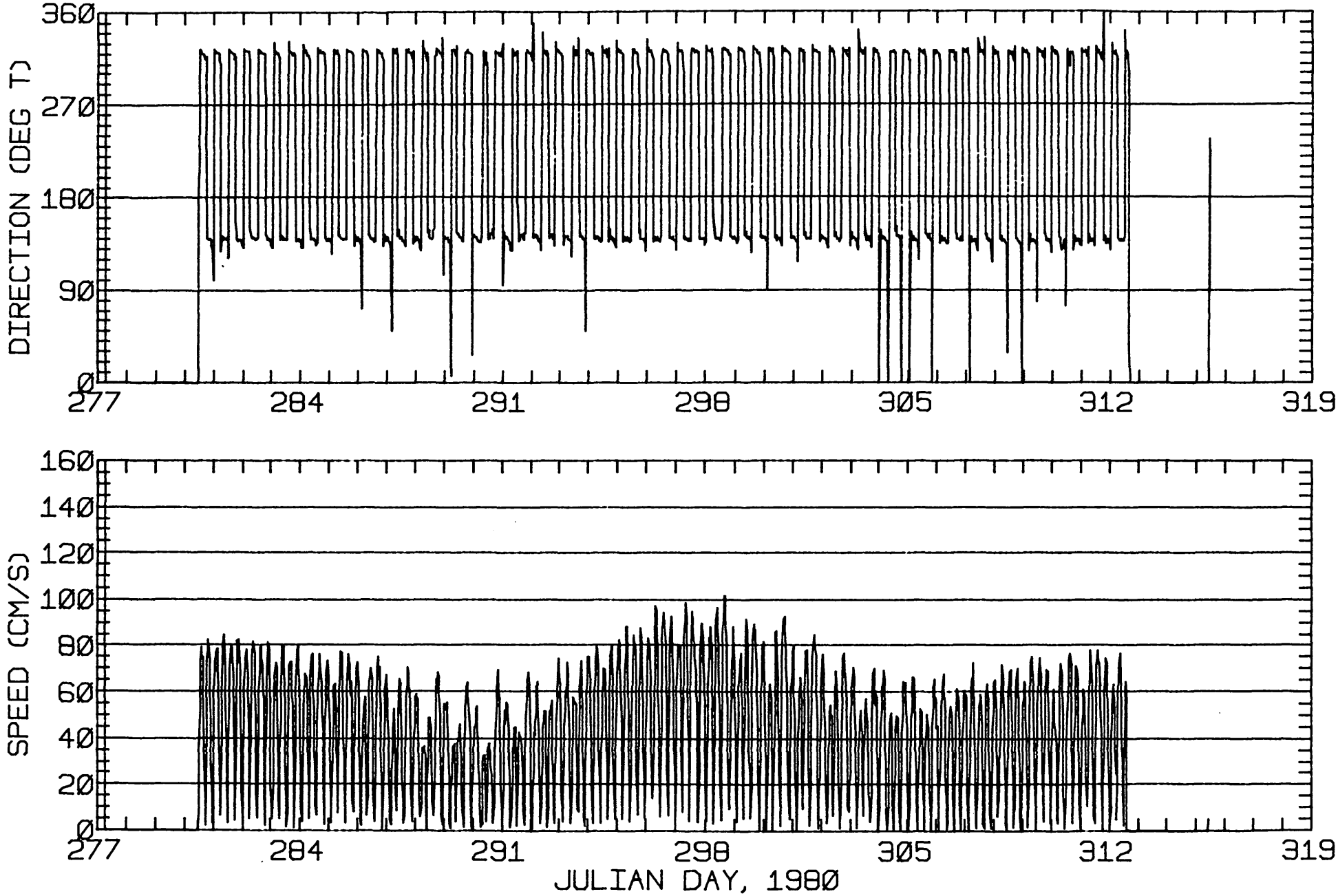
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.62	0.12	139.7	27.9	CLOCKWISE
K1	13.86	0.10	140.1	28.2	CLOCKWISE
N2	15.10	0.15	140.7	281.8	ANTI-CLOCKWISE
M2	63.67	1.27	140.5	293.0	ANTI-CLOCKWISE
S2	18.41	0.20	140.6	293.9	ANTI-CLOCKWISE
M4	1.70	0.22	135.3	131.4	ANTI-CLOCKWISE

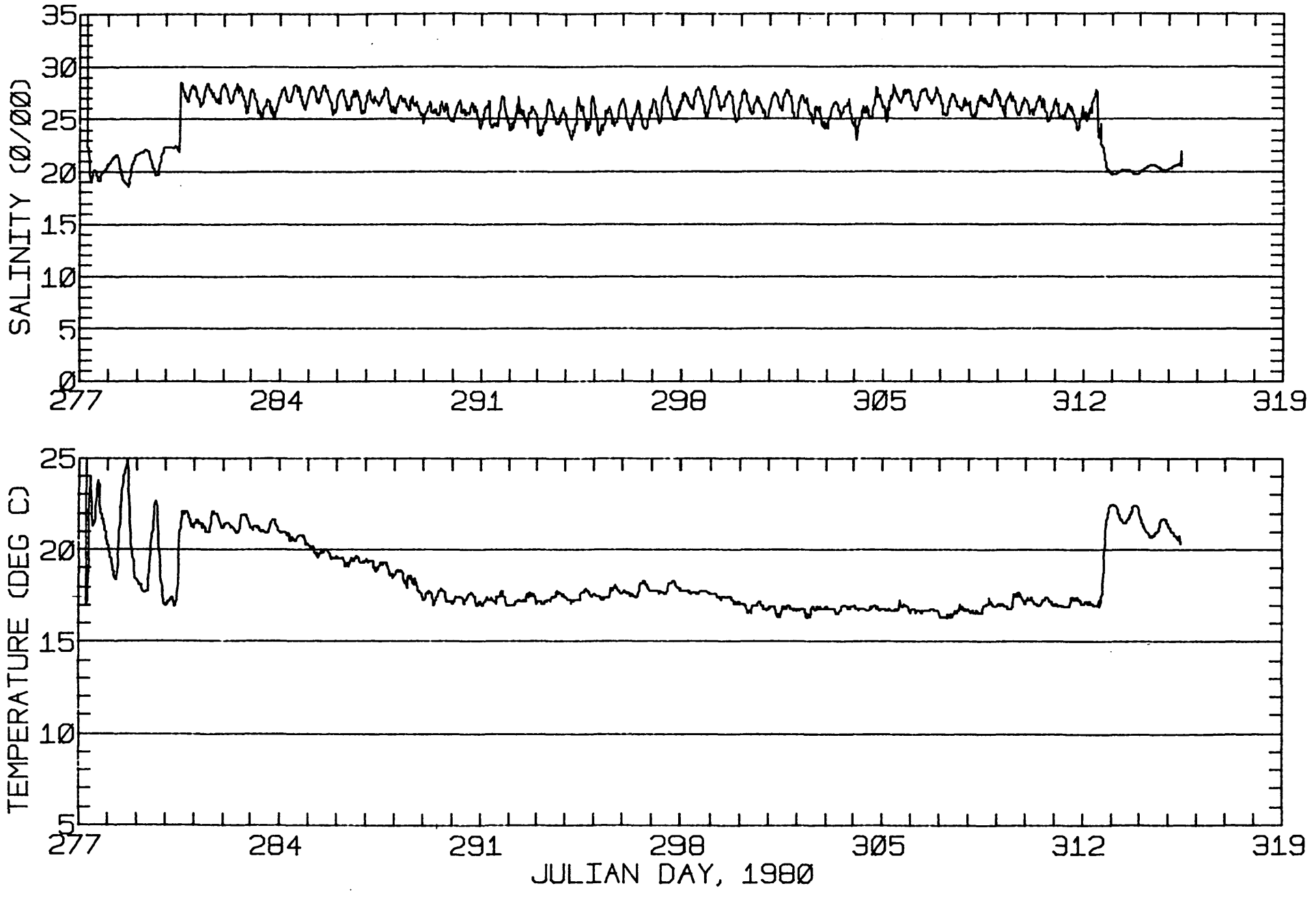
RMS SPEED: 51.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 104.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 40.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 140.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 5.98 CM/SEC
STANDARD DEVIATION V SERIES: 7.09 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.4	1.3	277.
2	12	0.4	-0.5	224.
3	12	-0.1	1.1	133.
4	12	0.0	0.5	177.
5	2	0.6	-0.6	158.
ALL	50	0.0	0.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 9N 122- 6-50W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013K1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 9N 122- 6-50W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013K1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C013
POSITION: 37 30' 9"N 122 6'47"W
METER TYPE: ENDECO
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 7.9 M (BELOW MLLW)
START TIME OF SERIES:11/12/80 1059 PST JULIAN DAY=317
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

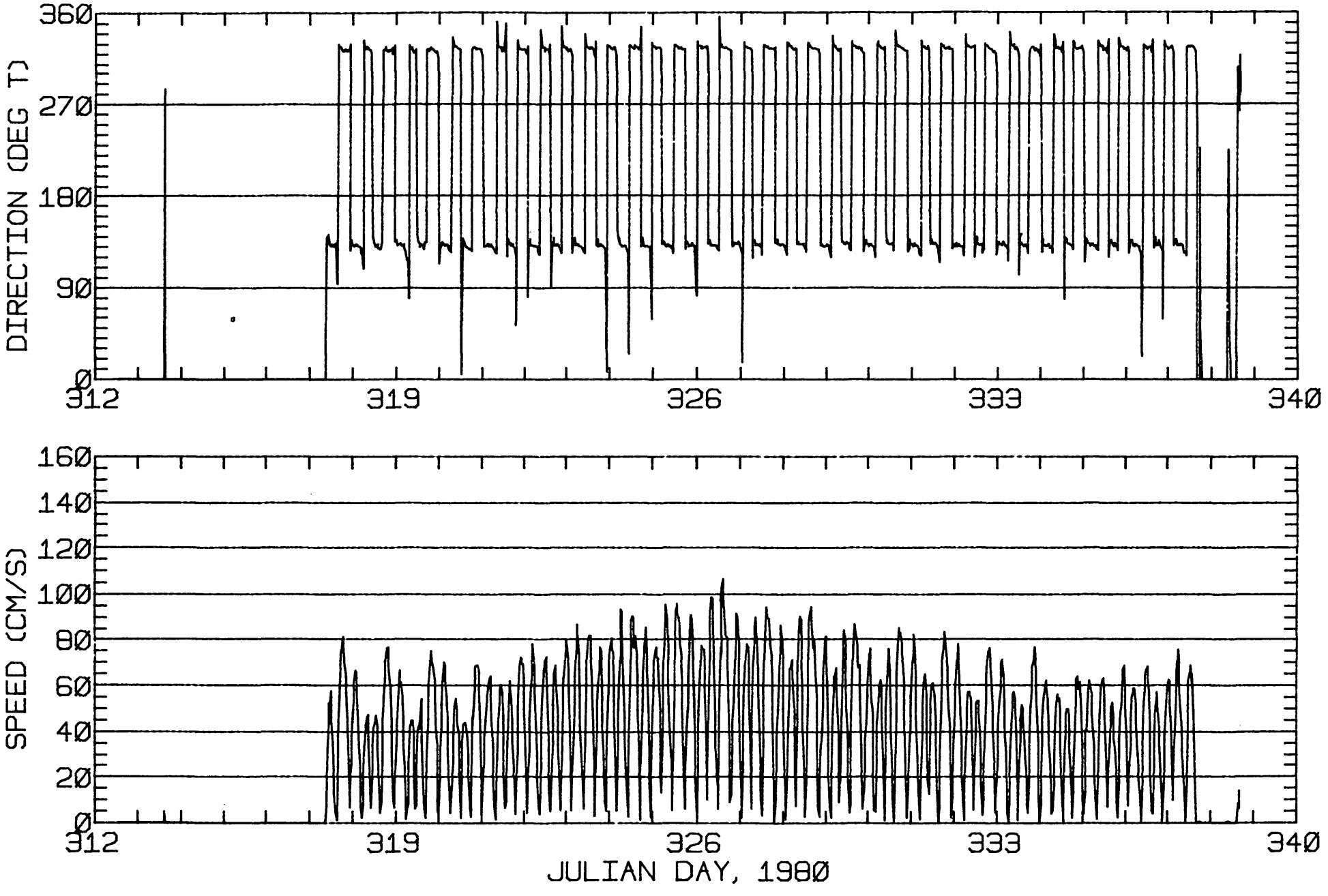
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.77	0.46	142.2	37.5	CLOCKWISE
K1	18.18	0.21	138.4	31.6	ANTI-CLOCKWISE
N2	14.37	0.43	138.9	272.1	ANTI-CLOCKWISE
M2	62.09	0.77	138.9	292.3	ANTI-CLOCKWISE
S2	9.75	0.09	140.9	288.2	ANTI-CLOCKWISE
M4	2.89	2.25	147.8	123.1	ANTI-CLOCKWISE

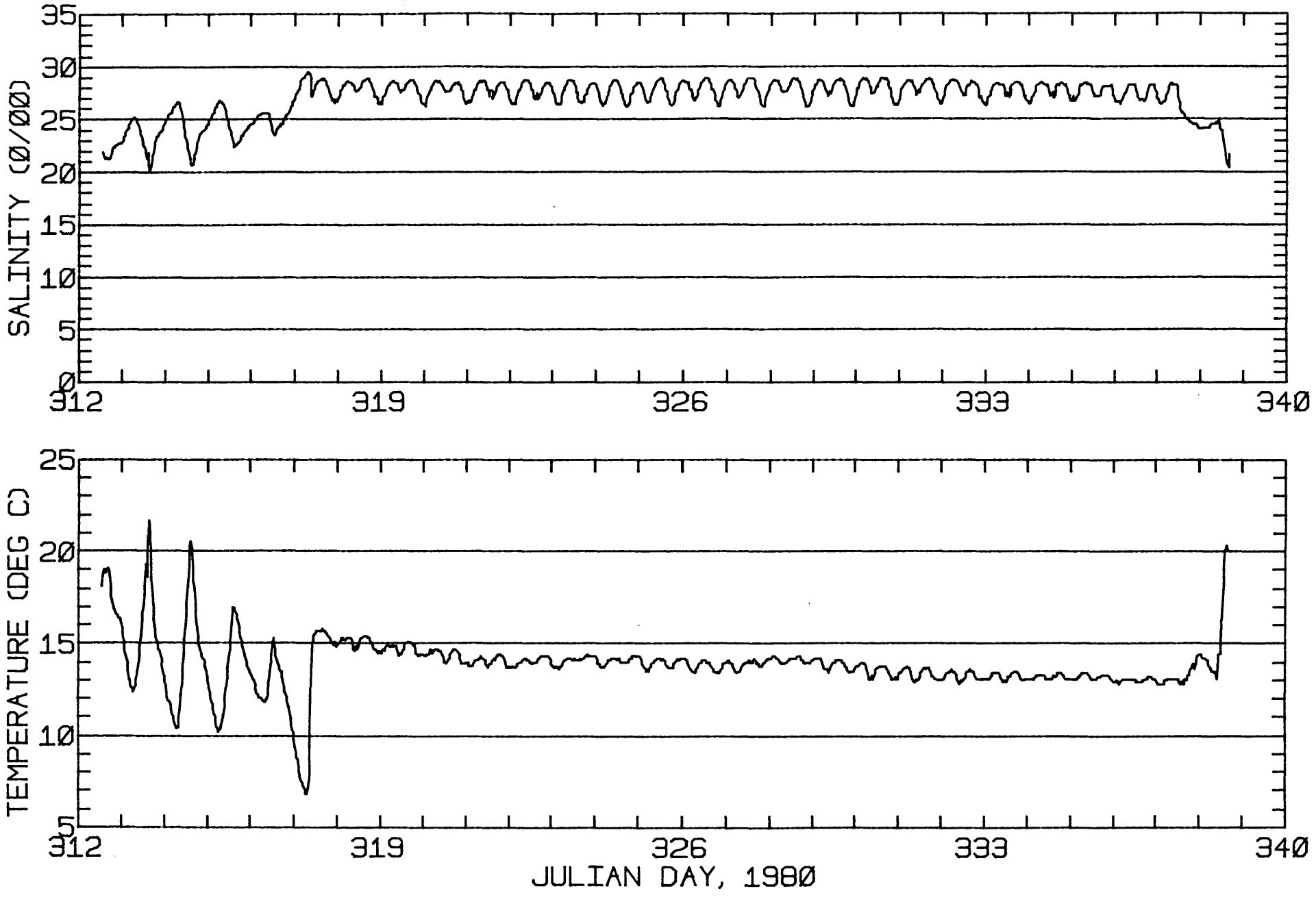
RMS SPEED:	52.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	97.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	41.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	139.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.36
STANDARD DEVIATION U-SERIES:	7.03 CM/SEC
STANDARD DEVIATION V SERIES:	8.09 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.2	5.7	197.
2	12	2.0	7.7	170.
3	12	1.8	4.9	211.
4	2	2.2	4.5	219.
ALL	38	1.7	6.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 9N 122- 6-47W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013L1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 9N 122- 6-47W
METER 6.1 METERS ABOVE BED TAPE NUMBER GSC013L1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS015
POSITION: 37 40' 9"N 122 19'47"W
METER TYPE: ENDECO
WATER DEPTH: 7.3 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 7/30/79 1103 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

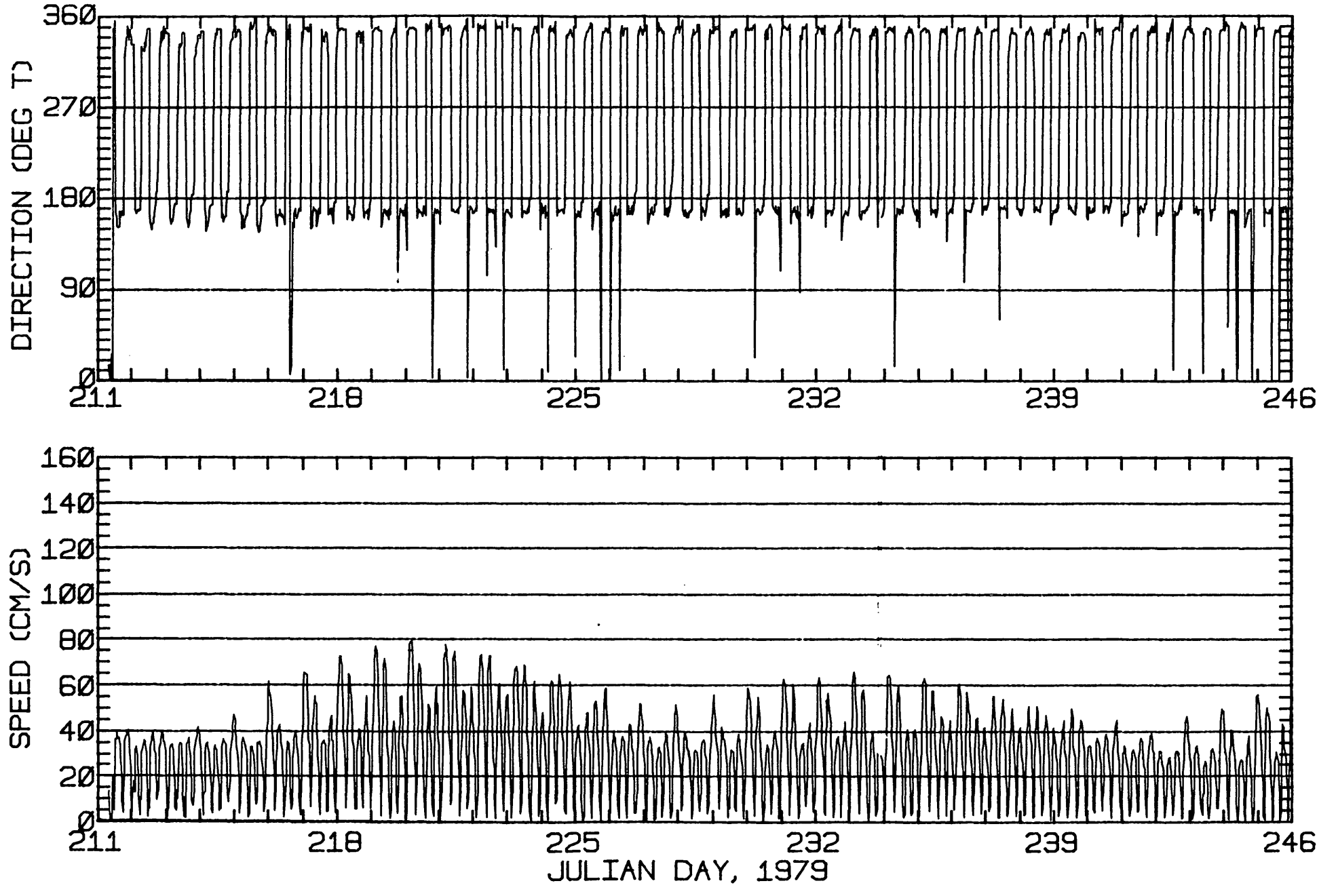
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.57	0.23	163.7	21.6	ANTI-CLOCKWISE
K1	13.02	0.55	165.8	55.6	CLOCKWISE
N2	9.68	0.51	165.2	275.7	ANTI-CLOCKWISE
M2	44.69	1.04	165.0	289.5	CLOCKWISE
S2	10.58	0.18	168.1	301.3	ANTI-CLOCKWISE
M4	1.83	0.23	170.7	124.0	ANTI-CLOCKWISE

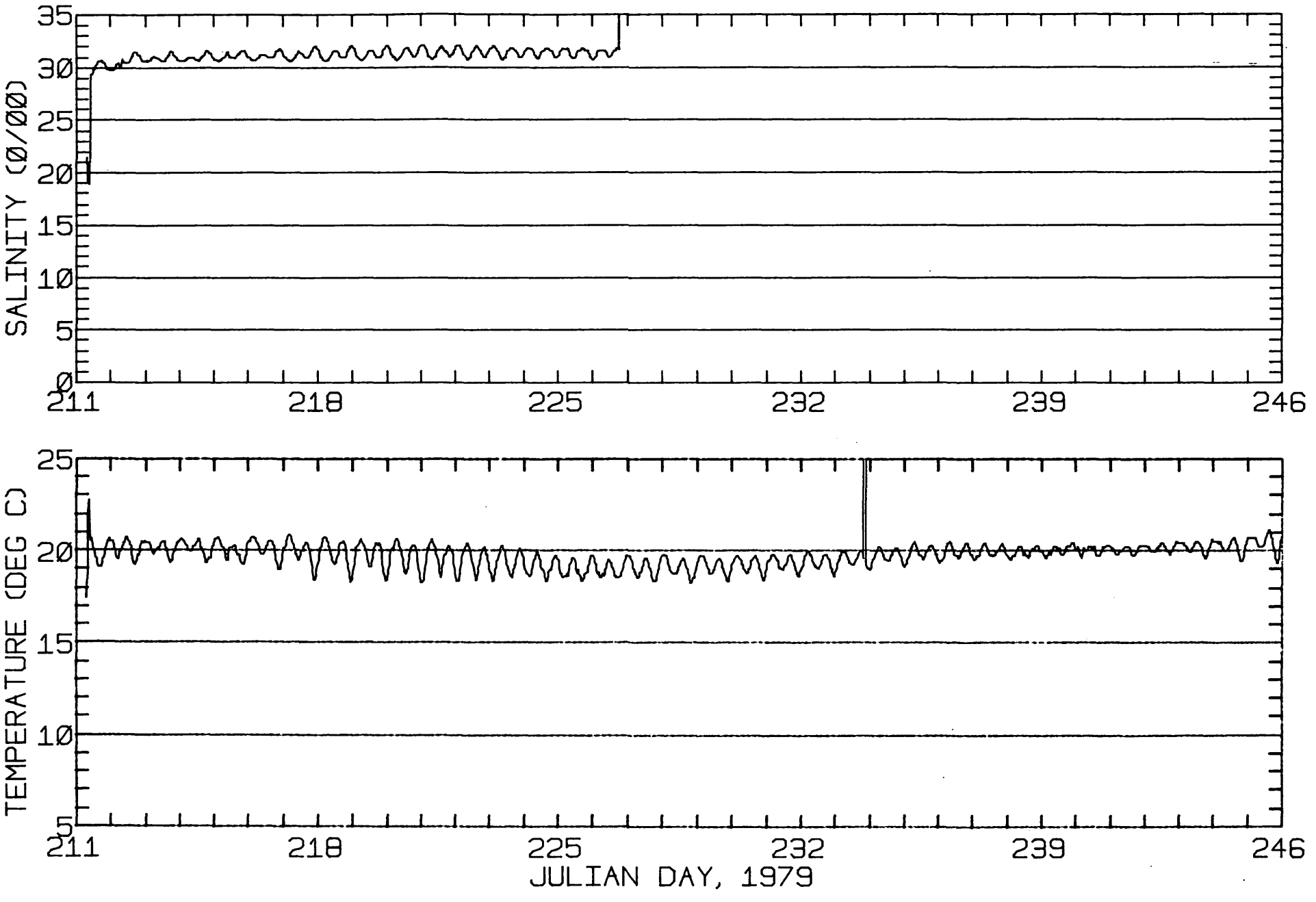
RMS SPEED:	36.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	75.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	28.7 CM/SEC
PRINCIPAL CURRENT DIRECTION:	165.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.37
STANDARD DEVIATION U-SERIES:	2.98 CM/SEC
STANDARD DEVIATION V SERIES:	5.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.9	1.5	125.
2	12	-0.5	2.2	156.
3	12	-0.8	1.6	122.
4	12	-1.0	2.4	77.
5	8	-1.4	0.3	47.
ALL	56	-0.9	1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SIERRA POINT 37-40- 9N 122-19-47W
METER 3.7 METERS ABOVE BED TAPE NUMBER GS015A1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SIERRA POINT 37-40- 9N 122-19-47W
METER 3.7 METERS ABOVE BED TAPE NUMBER GS015A1 .

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS016
POSITION: 37 40'45"N 122 17'30"W
METER TYPE: ENDECO
WATER DEPTH: 7.3 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 8/ 4/79 747 PST JULIAN DAY=216
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

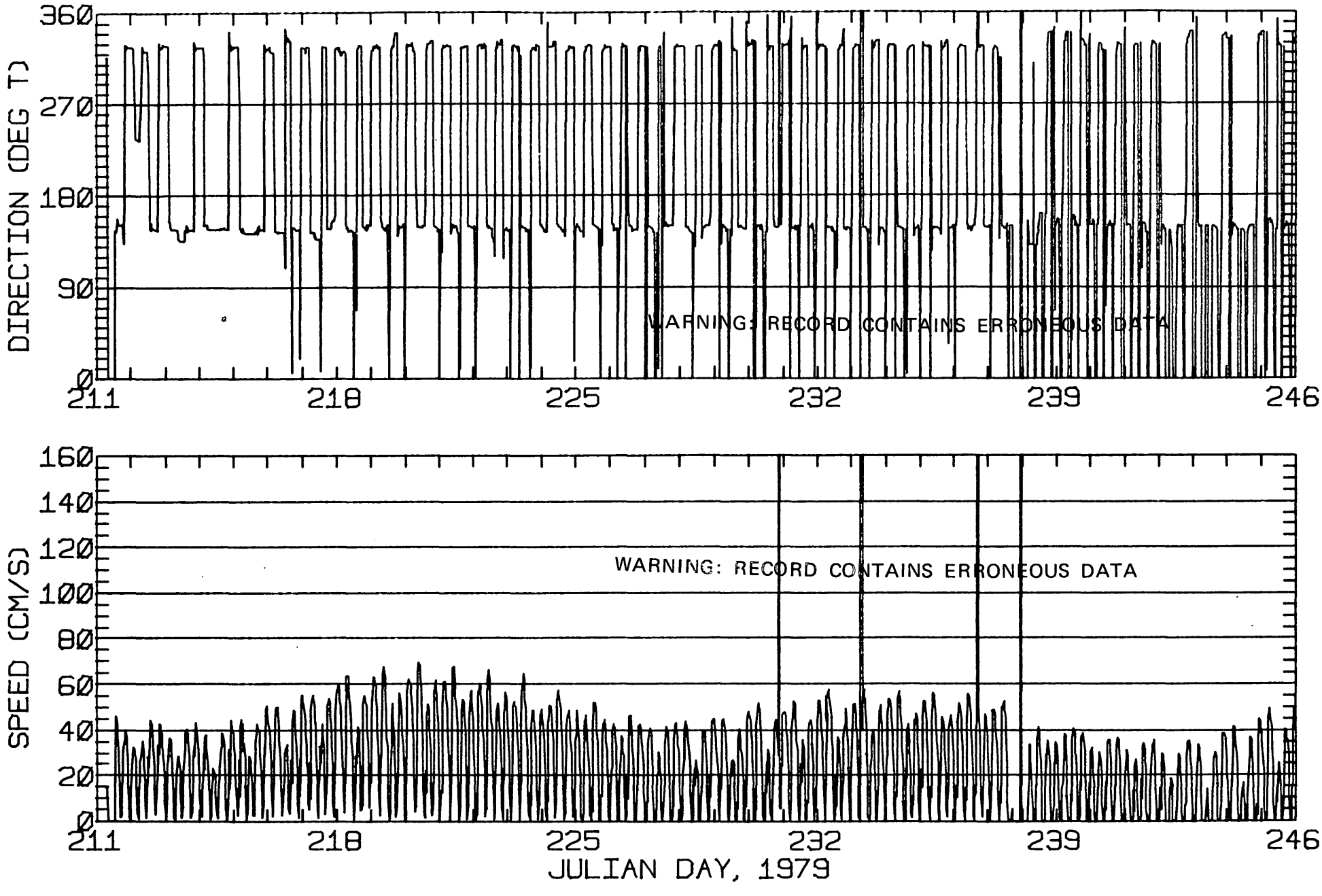
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.58	0.13	140.5	33.2	ANTI-CLOCKWISE
K1	11.87	0.15	145.5	50.5	CLOCKWISE
N2	7.40	0.24	148.7	275.3	ANTI-CLOCKWISE
M2	37.76	0.16	147.5	293.9	ANTI-CLOCKWISE
S2	11.36	0.01	147.2	301.2	ANTI-CLOCKWISE
M4	2.73	0.00	152.8	178.8	CLOCKWISE

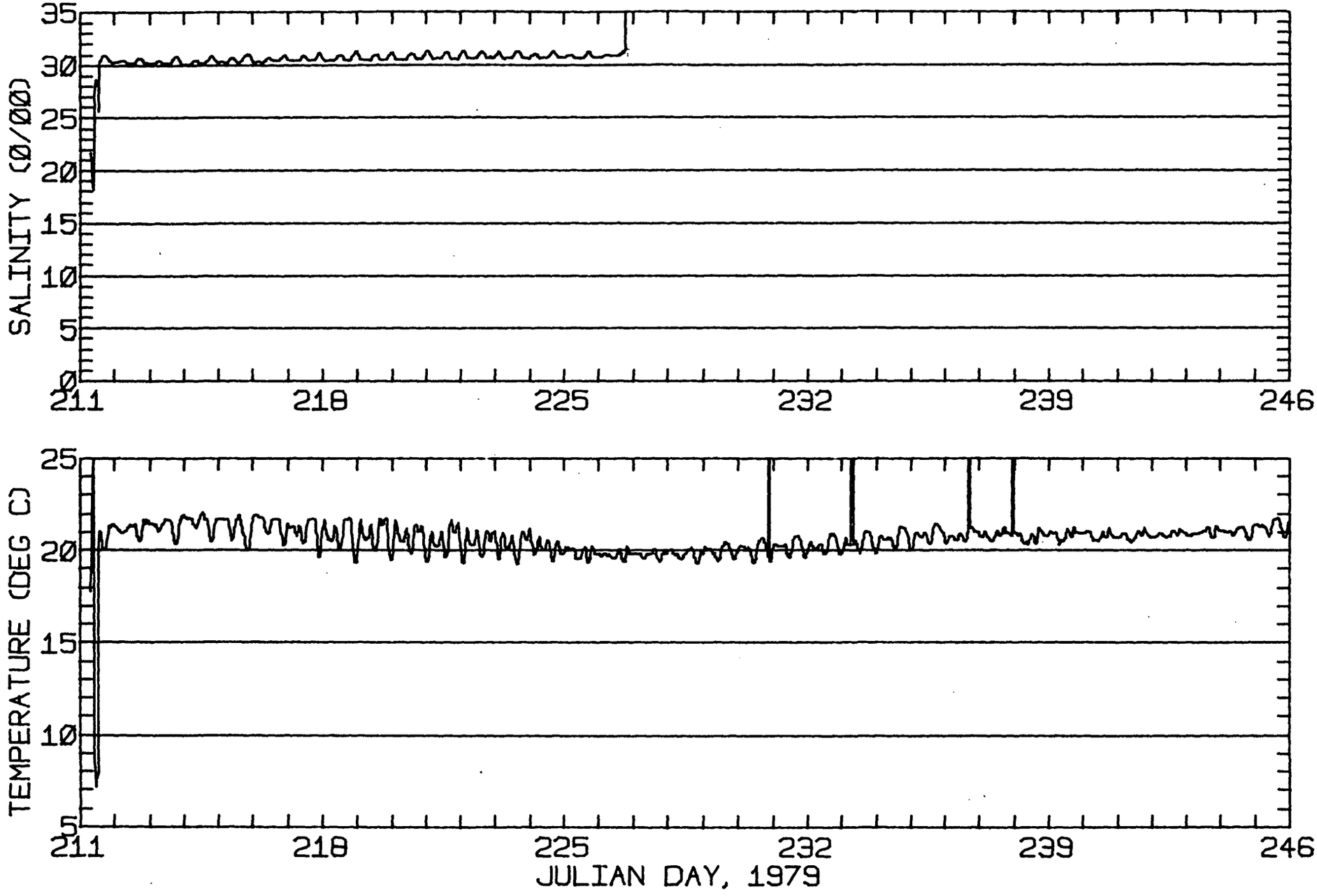
RMS SPEED:	35.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	67.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	21.1 CM/SEC
PRINCIPAL CURRENT DIRECTION:	146.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.38
STANDARD DEVIATION U-SERIES:	7.52 CM/SEC
STANDARD DEVIATION V SERIES:	10.85 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.4	-2.5	156.
2	12	0.8	-1.8	130.
3	12	1.6	-2.5	87.
4	4	0.8	-2.1	66.
ALL	40	1.2	-2.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-45N 122-17-30W
METER 3.7 METERS ABOVE BED TAPE NUMBER GS016A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-40-45N 122-17-30W
METER 3.7 METERS ABOVE BED TAPE NUMBER GS016A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS020
POSITION: 37 30' 4"N 122 6'50"W
METER TYPE: ENDECO
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 7/30/79 1057 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 54 M2-CYCLES

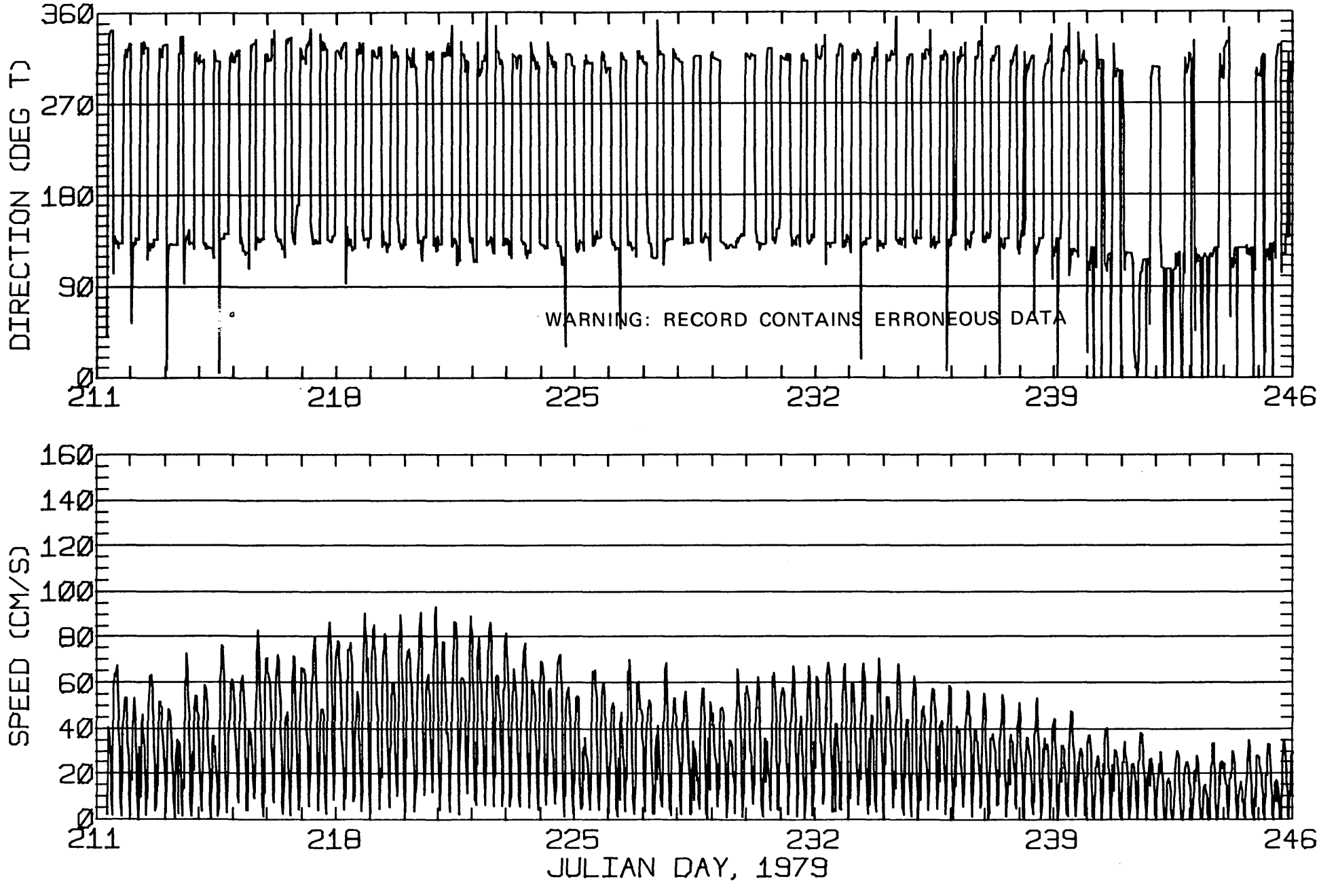
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.88	0.68	134.1	60.6	CLOCKWISE
K1	15.42	0.31	131.1	60.6	CLOCKWISE
N2	14.11	0.84	132.9	299.3	ANTI-CLOCKWISE
M2	47.17	0.22	135.1	305.0	ANTI-CLOCKWISE
S2	9.59	0.85	129.6	323.7	ANTI-CLOCKWISE
M4	3.03	0.24	136.6	215.6	ANTI-CLOCKWISE

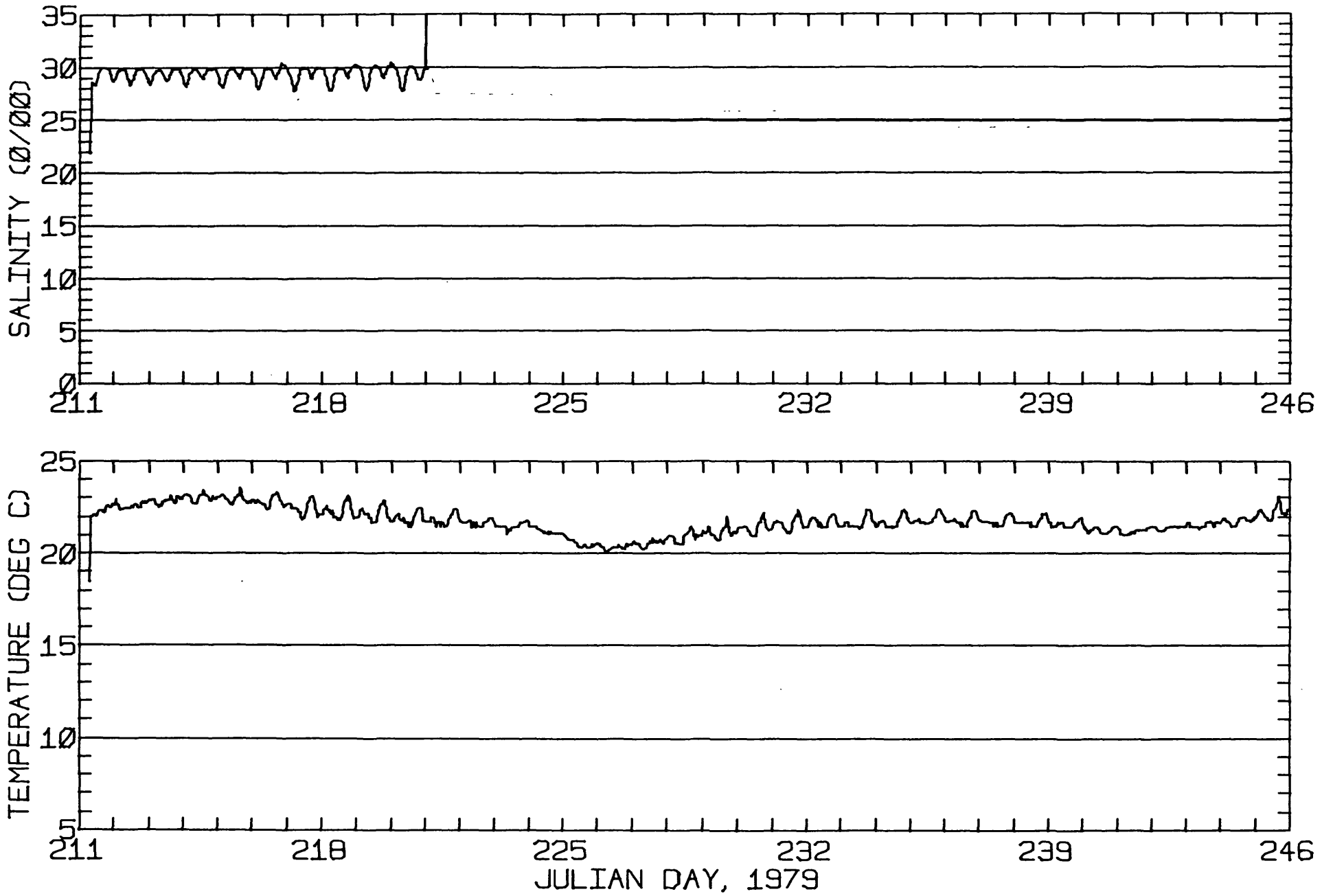
RMS SPEED:	42.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	82.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	32.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	133.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.45
STANDARD DEVIATION U-SERIES:	12.55 CM/SEC
STANDARD DEVIATION V SERIES:	13.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	6.3	-3.2	125.
2	12	4.2	-1.4	156.
3	12	4.2	-3.5	122.
4	12	4.5	-3.2	77.
5	6	2.8	-1.6	50.
ALL	54	4.6	-2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 4N 122- 6-50W
METER 6.7 METERS ABOVE BEDTAPE NUMBER GS020A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-30- 4N 122- 6-50W
METER 6.7 METERS ABOVE BED TAPE NUMBER GS020A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS021
POSITION: 37 46'14"N 122 21'50"W
METER TYPE: ENDECO
WATER DEPTH: 15.2 M (MLLW)
METER DEPTH: 4.5 M (BELOW MLLW)
START TIME OF SERIES: 7/30/79 1147 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

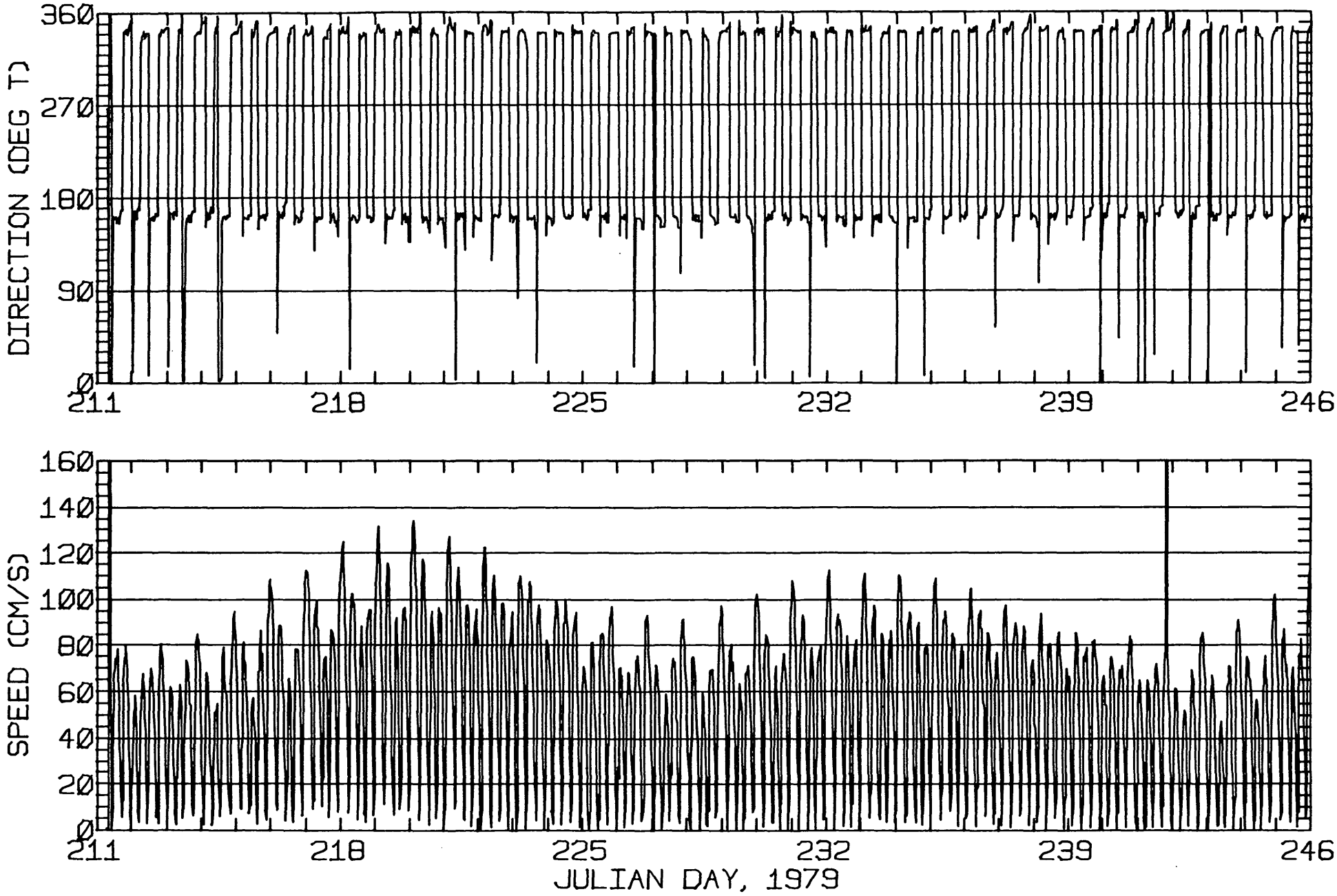
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.26	0.53	165.2	32.2	ANTI-CLOCKWISE
K1	24.04	0.59	162.8	57.4	CLOCKWISE
N2	15.96	0.00	158.4	277.9	CLOCKWISE
M2	77.54	0.38	161.0	288.9	CLOCKWISE
S2	19.06	0.02	160.5	298.8	CLOCKWISE
M4	1.12	0.00	154.5	307.9	CLOCKWISE

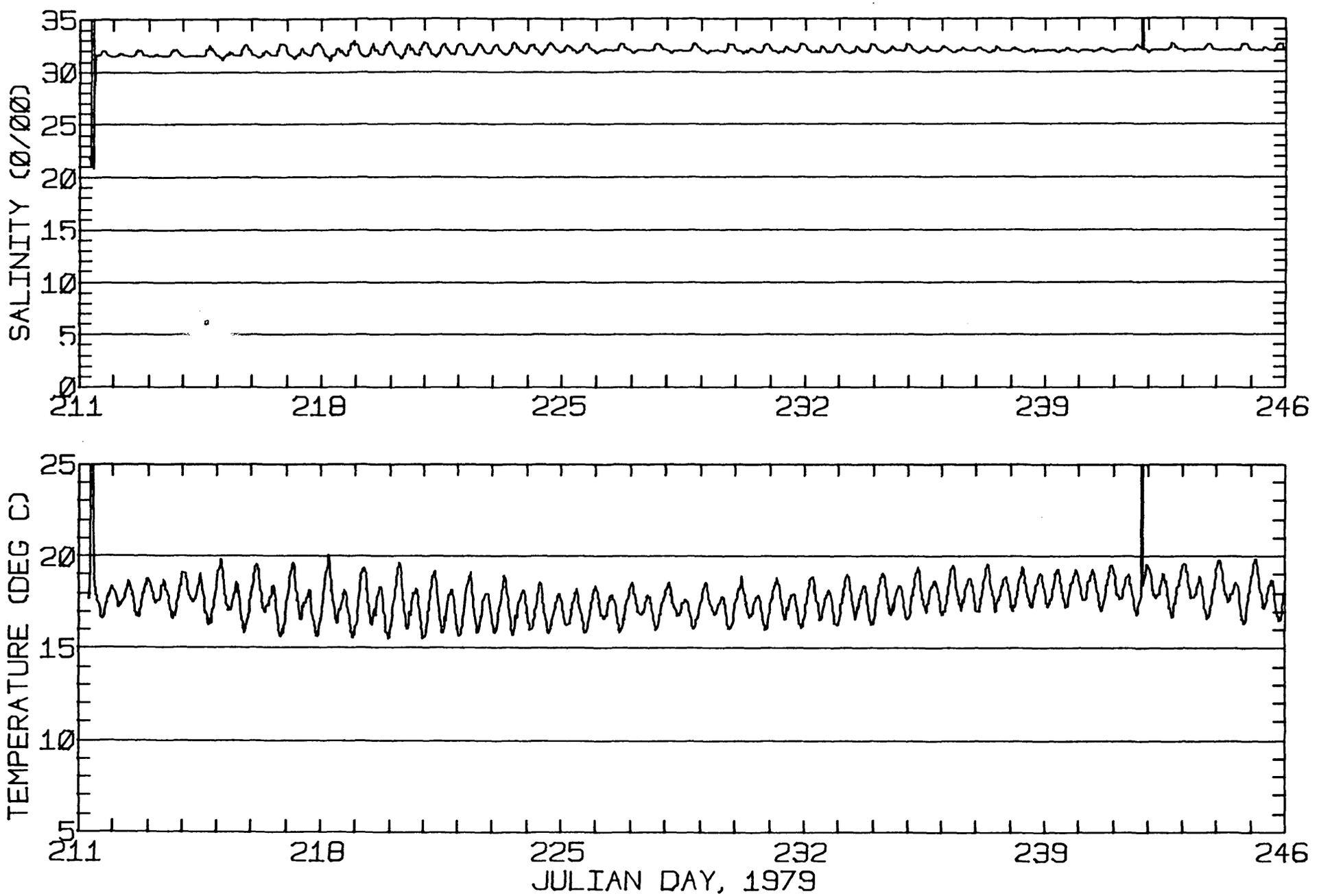
RMS SPEED: 64.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 133.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 161.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 6.29 CM/SEC
STANDARD DEVIATION V SERIES: 15.96 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.3	1.7	125.
2	12	0.3	3.5	156.
3	12	-0.6	2.1	122.
4	12	-0.2	2.3	77.
5	8	-0.6	2.4	47.
ALL	56	-0.2	2.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-46-14N 122-21-50W
METER10.7 METERS ABOVE BED TAPE NUMBER GS021A1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-46-14N 122-21-50W
METER 10.7 METERS ABOVE BED TAPE NUMBER GS021A1 .

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS022
POSITION: 37 46'20"N 122 20'25"W
METER TYPE: ENDECO
WATER DEPTH: 11.5 M (MLLW)
METER DEPTH: 5.7 M (BELOW MLLW)
START TIME OF SERIES: 7/30/79 1247 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

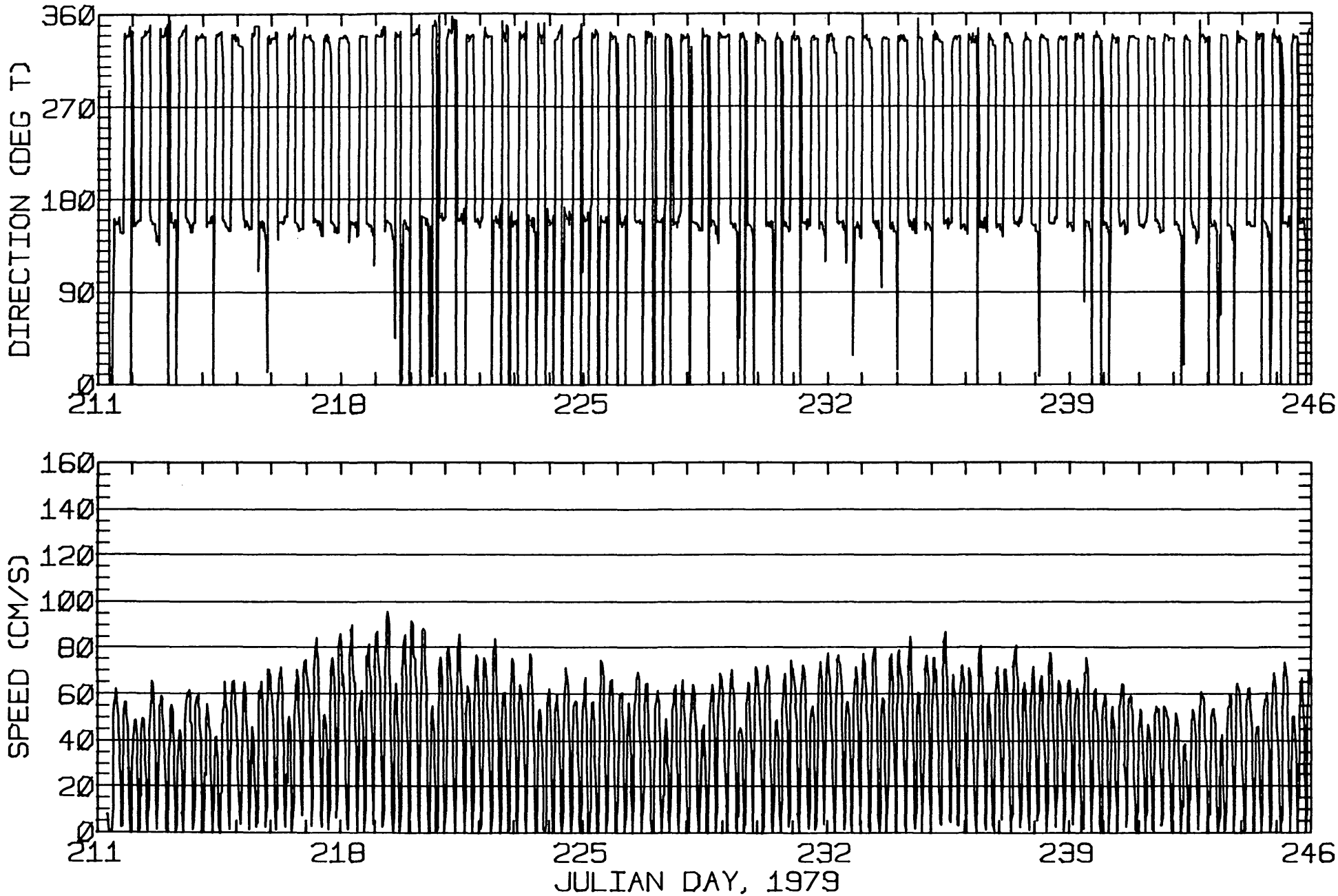
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.94	0.72	157.4	23.5	ANTI-CLOCKWISE
K1	15.33	0.47	158.5	46.8	ANTI-CLOCKWISE
N2	10.62	0.04	161.6	267.9	CLOCKWISE
M2	58.81	0.75	157.5	277.6	ANTI-CLOCKWISE
S2	13.74	0.17	156.2	283.9	CLOCKWISE
M4	3.28	0.14	149.9	232.2	ANTI-CLOCKWISE

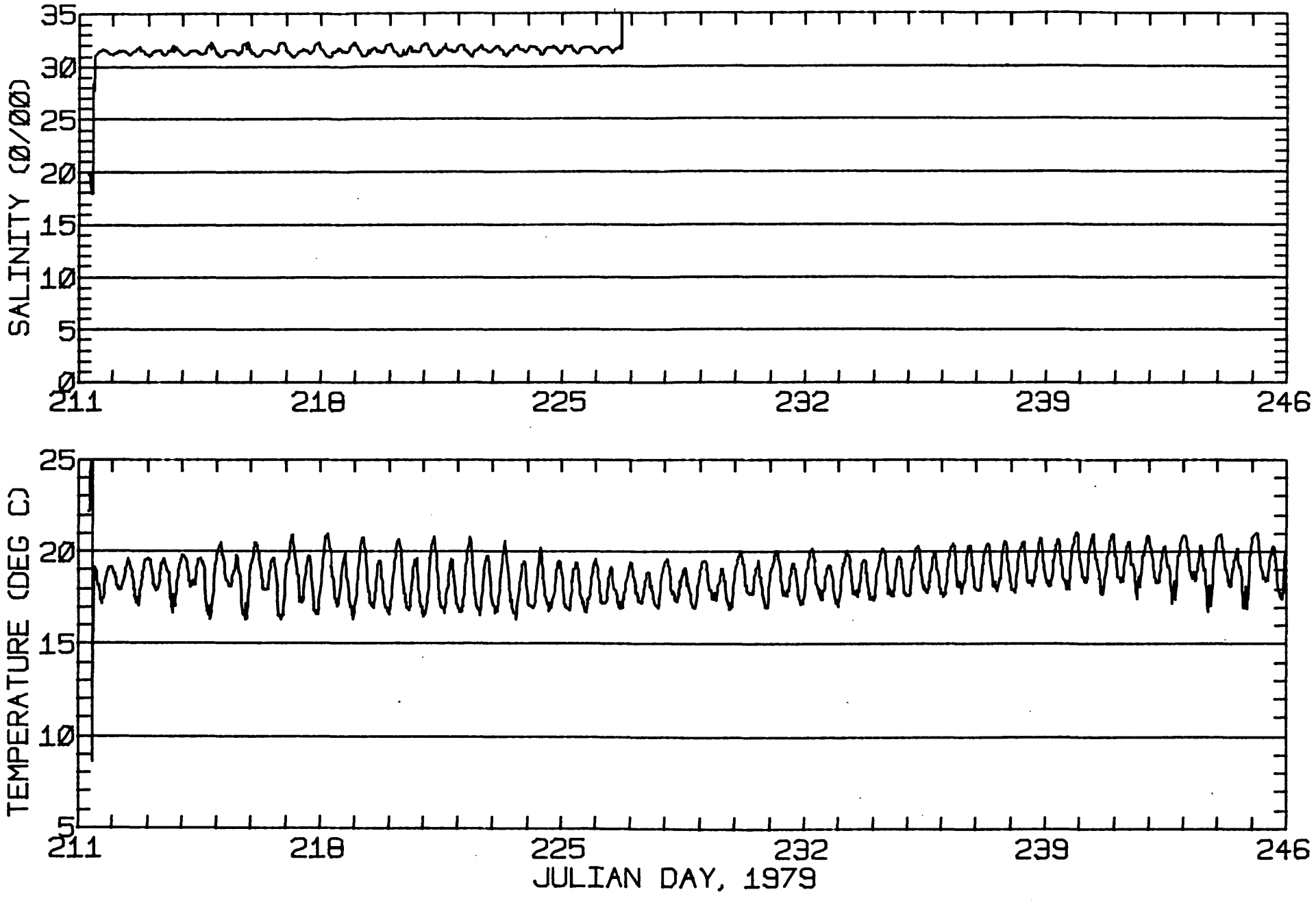
RMS SPEED:	48.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	96.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	38.7 CM/SEC
PRINCIPAL CURRENT DIRECTION:	157.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.33
STANDARD DEVIATION U-SERIES:	6.12 CM/SEC
STANDARD DEVIATION V SERIES:	12.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.8	-2.2	125.
2	12	2.4	-3.0	156.
3	12	1.1	-2.4	122.
4	12	1.7	-2.4	77.
5	8	2.3	-3.8	47.
ALL	56	1.8	-2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NAS ALAMEDA 37-46-20N 122-20-25W
METER 5.8 METERS ABOVE BED TAPE NUMBER GS022A1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NAS ALAMEDA 37-46-20N 122-20-25W
METER 5.8 METERS ABOVE BED TAPE NUMBER GS022A1 .

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: C302
POSITION: 37 47'45"N 122 20'40"W
METER TYPE: ENDECO
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 2.4 M (BELOW MLLW)
START TIME OF SERIES: 7/22/80 1141 PST JULIAN DAY=204
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

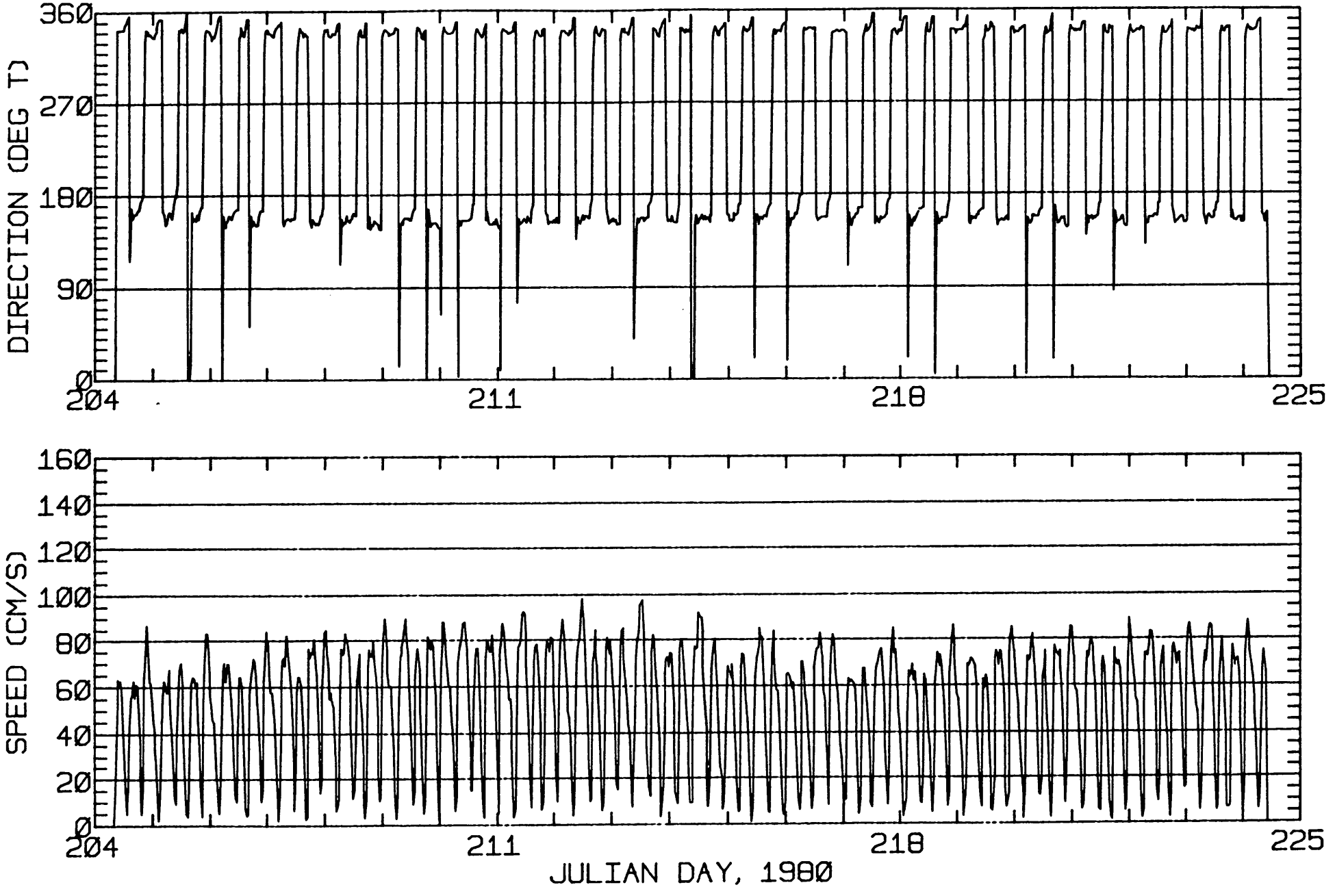
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.80	0.71	162.1	14.6	ANTI-CLOCKWISE
K1	17.29	0.62	160.1	43.4	CLOCKWISE
N2	13.09	0.12	157.1	260.4	ANTI-CLOCKWISE
M2	66.11	1.54	157.2	273.3	CLOCKWISE
S2	13.55	0.34	154.7	283.6	ANTI-CLOCKWISE
M4	3.57	0.83	169.6	290.7	CLOCKWISE

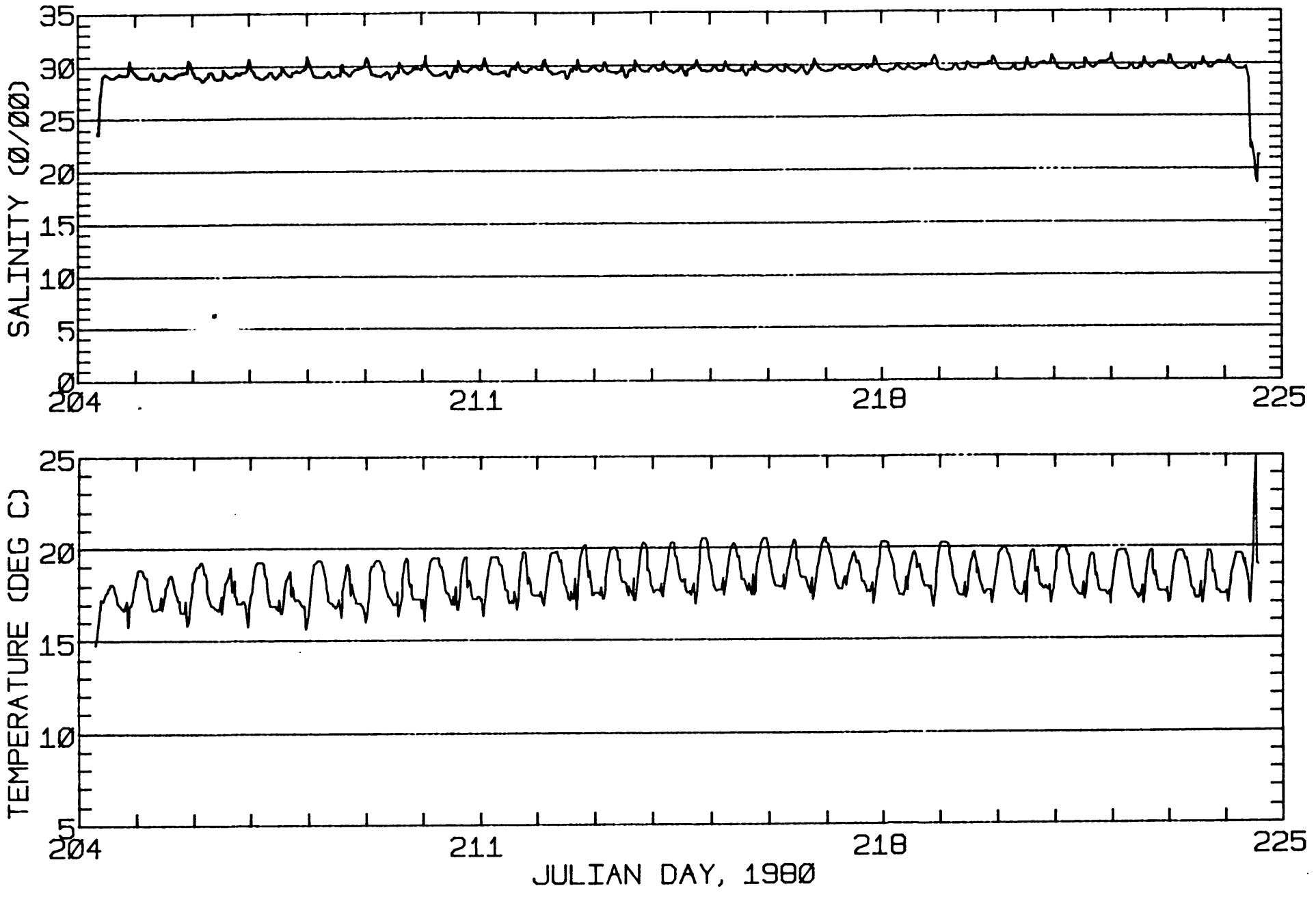
RMS SPEED: 57.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 104.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 43.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 157.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 5.82 CM/SEC
STANDARD DEVIATION V SERIES: 15.09 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.8	-3.4	308.
2	12	3.8	-5.7	227.
3	12	3.2	-4.0	154.
4	2	3.6	-5.0	134.
ALL	38	3.3	-4.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NAS ALAMEDA 37-47-45N 122-20-40W
METER 5.5 METERS ABOVE BED TAPE NUMBER GSC302A1.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NAS ALAMEDA 37-47-45N 122-20-40W
METER 5.5 METERS ABOVE BED TAPE NUMBER GSC302A1.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'28"N 122 22'23"W
METER TYPE: AANDERAA
WATER DEPTH: 19.2 M (MLLW)
METER DEPTH: 17.4 M (BELOW MLLW)
START TIME OF SERIES: 3/12/79 1114 PST JULIAN DAY= 71
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

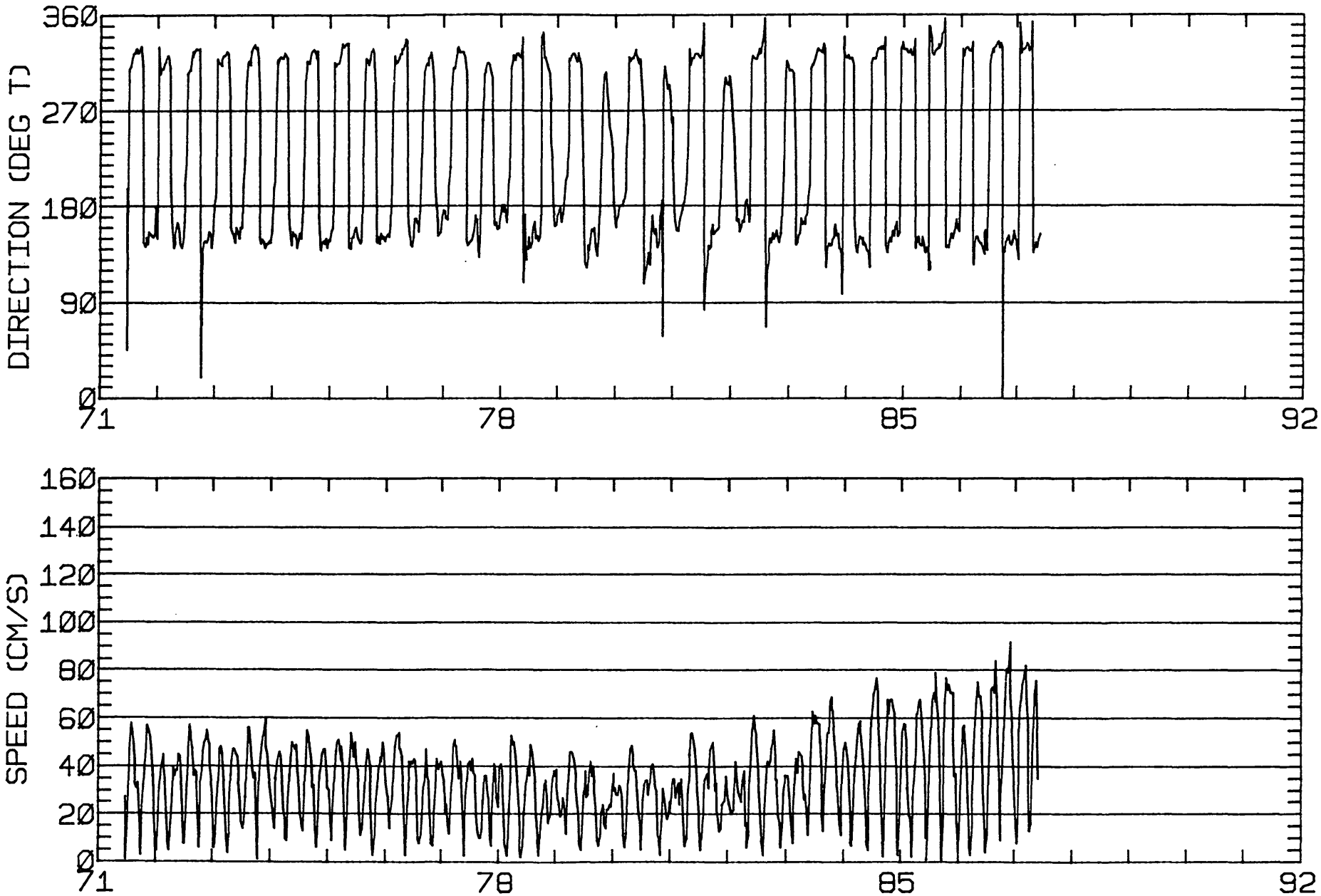
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.65	3.68	148.9	2.4	CLOCKWISE
K1	9.68	3.59	159.0	38.8	CLOCKWISE
N2	12.65	0.06	151.2	234.8	ANTI-CLOCKWISE
M2	45.37	2.35	148.3	273.0	CLOCKWISE
S2	16.65	1.68	148.4	289.2	CLOCKWISE
M4	2.89	0.61	128.8	349.3	ANTI-CLOCKWISE

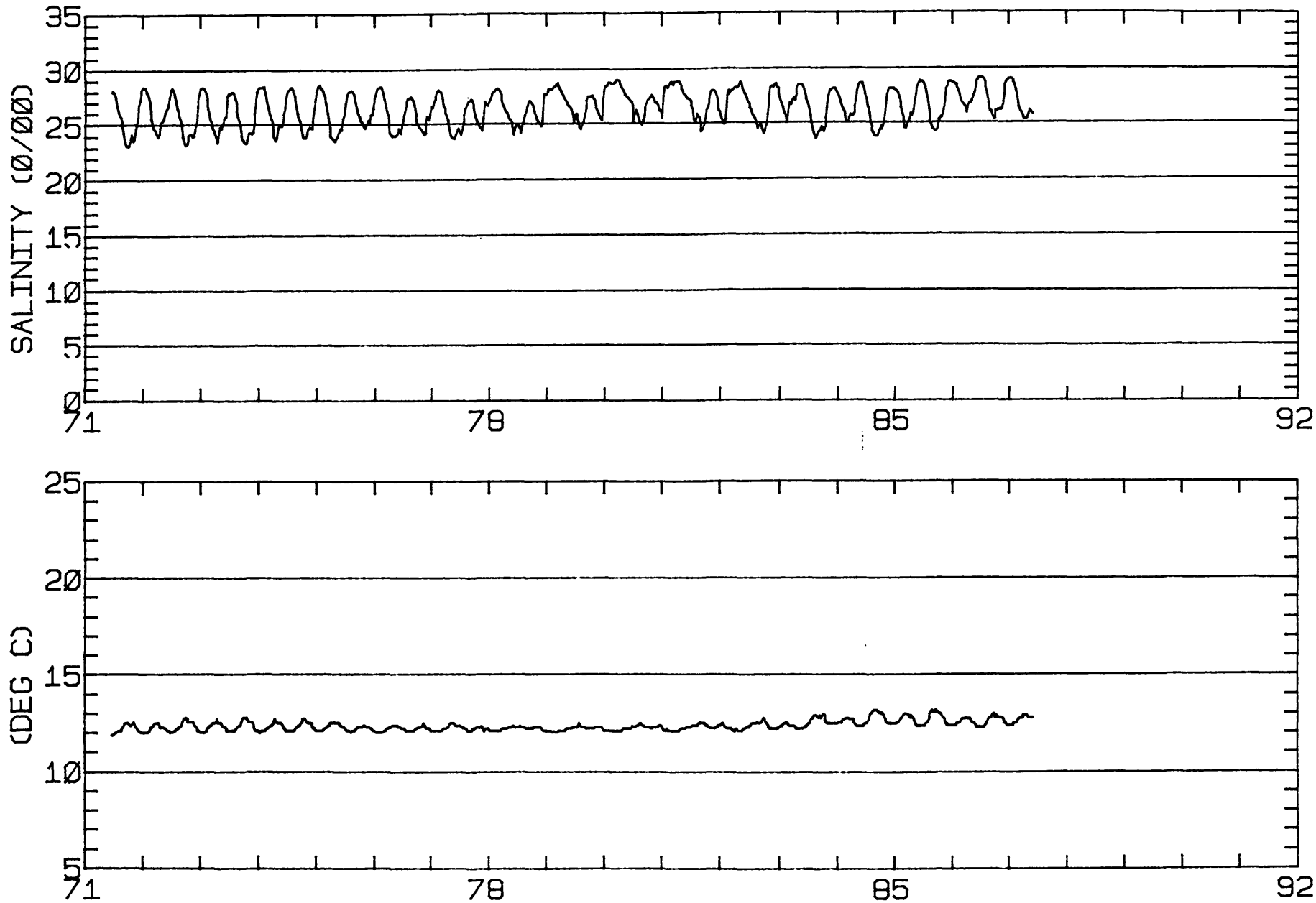
RMS SPEED: 38.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 82.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 149.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 6.27 CM/SEC
STANDARD DEVIATION V SERIES: 5.91 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.6	-4.1	756.
2	12	-3.8	-6.5	914.
3	6	2.4	-4.7	658.
ALL	30	-2.1	-5.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-28N 122-22-23W
METER 001.7 METERS ABOVE BED. WATER DEPTH 019.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-28N 122-22-23W
METER ØØ1.7 METERS ABOVE BED. WATER DEPTH Ø19.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'17"N 122 22'24"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 6/ 4/80 1450 PST JULIAN DAY=156
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

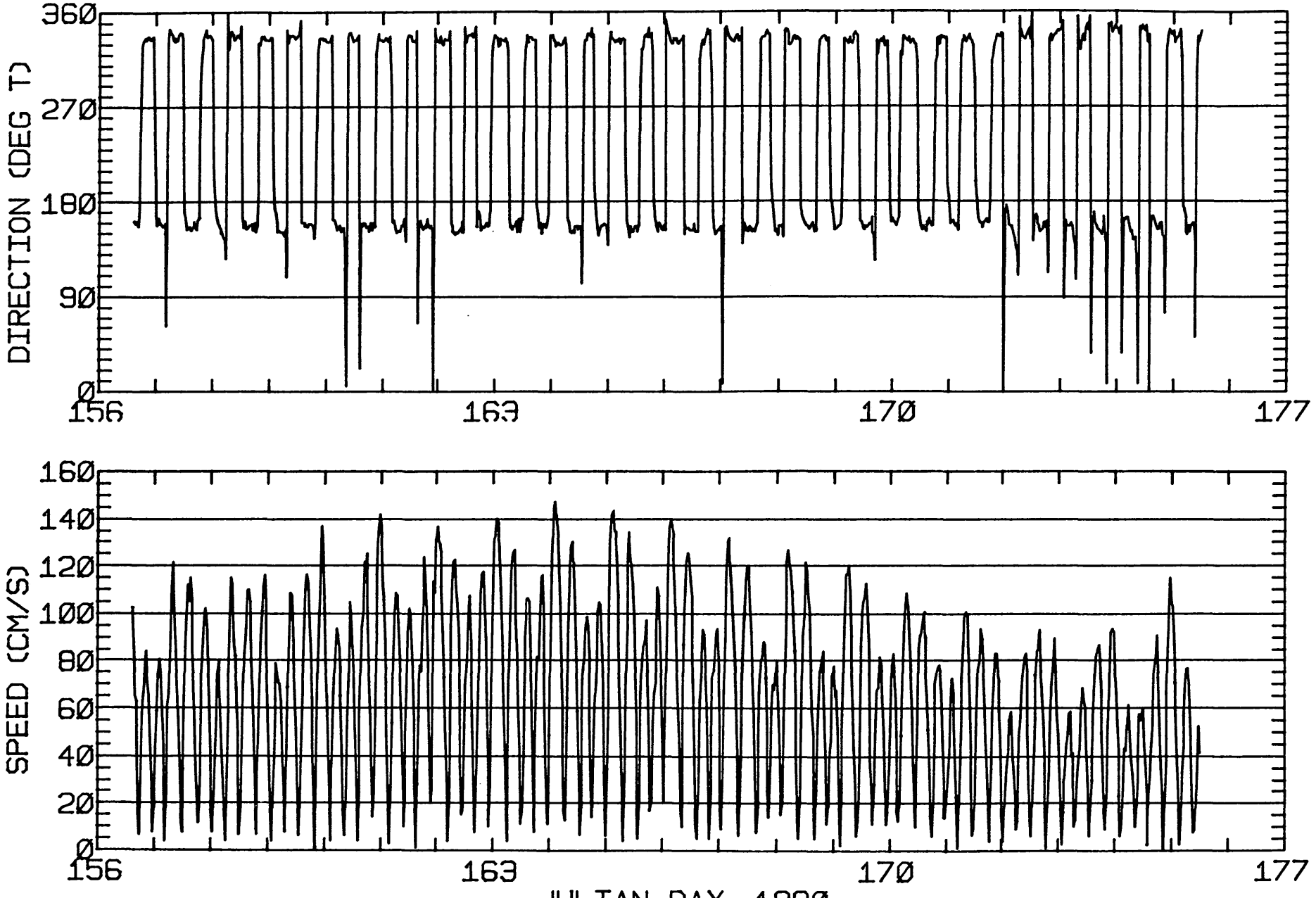
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.80	0.82	151.3	25.7	ANTI-CLOCKWISE
K1	31.85	1.01	155.4	23.1	CLOCKWISE
N2	15.86	0.37	152.8	257.3	CLOCKWISE
M2	94.45	0.76	156.0	282.3	ANTI-CLOCKWISE
S2	11.39	0.29	148.6	297.5	CLOCKWISE
M4	2.06	0.29	118.5	286.3	CLOCKWISE

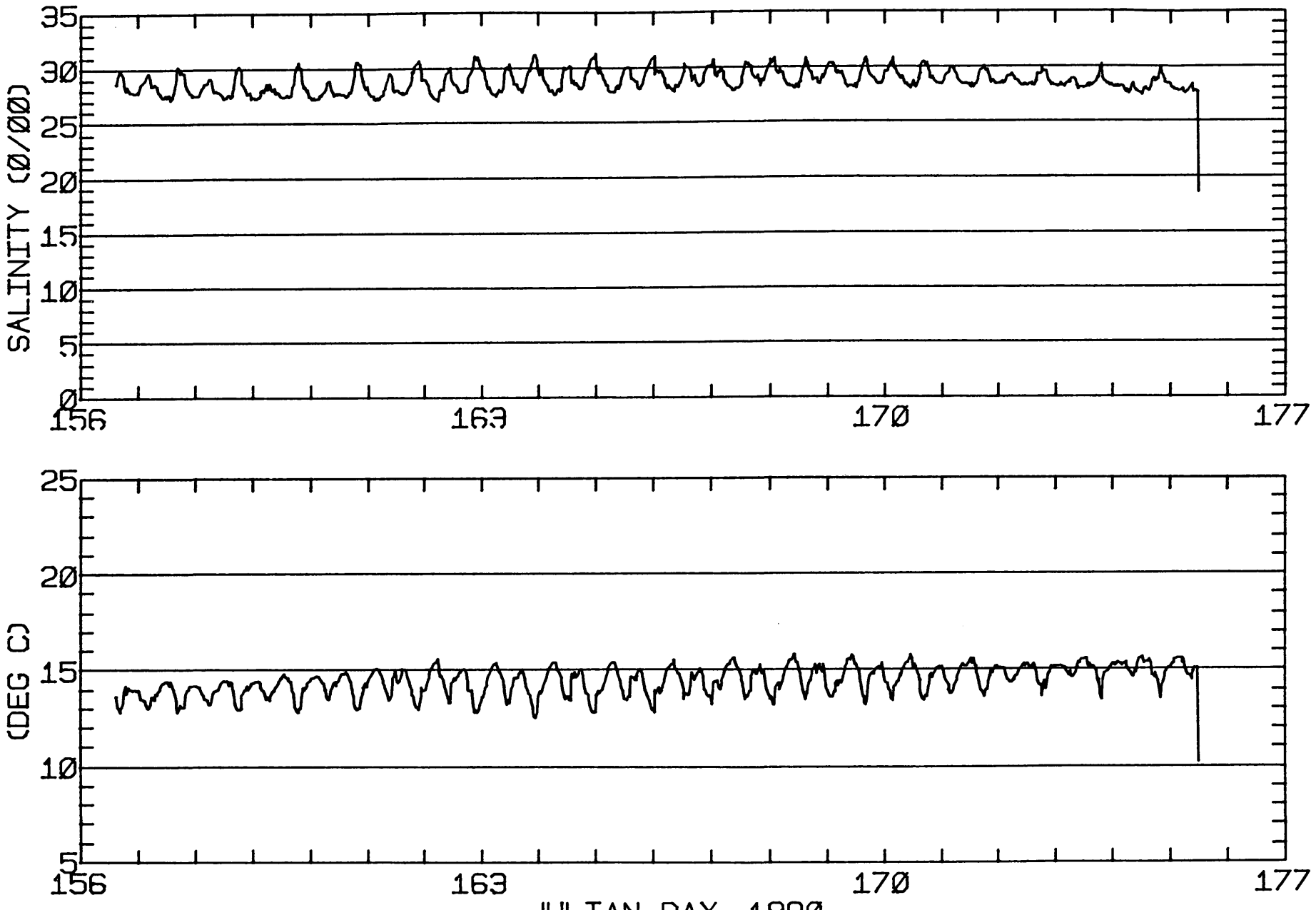
RMS SPEED: 74.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 150.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 64.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 154.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 5.66 CM/SEC
STANDARD DEVIATION V SERIES: 9.69 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.5	1.5	397.
2	12	-2.8	2.6	402.
3	12	-2.4	3.6	445.
ALL	36	-2.2	2.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-17N 122-22-24W
METER 013.6 METERS ABOVE BED. WATER DEPTH 019.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-17N 122-22-24W
METER Ø13.6 METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'25"N 122 22'24"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 6/23/80 1450 PST JULIAN DAY=175
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

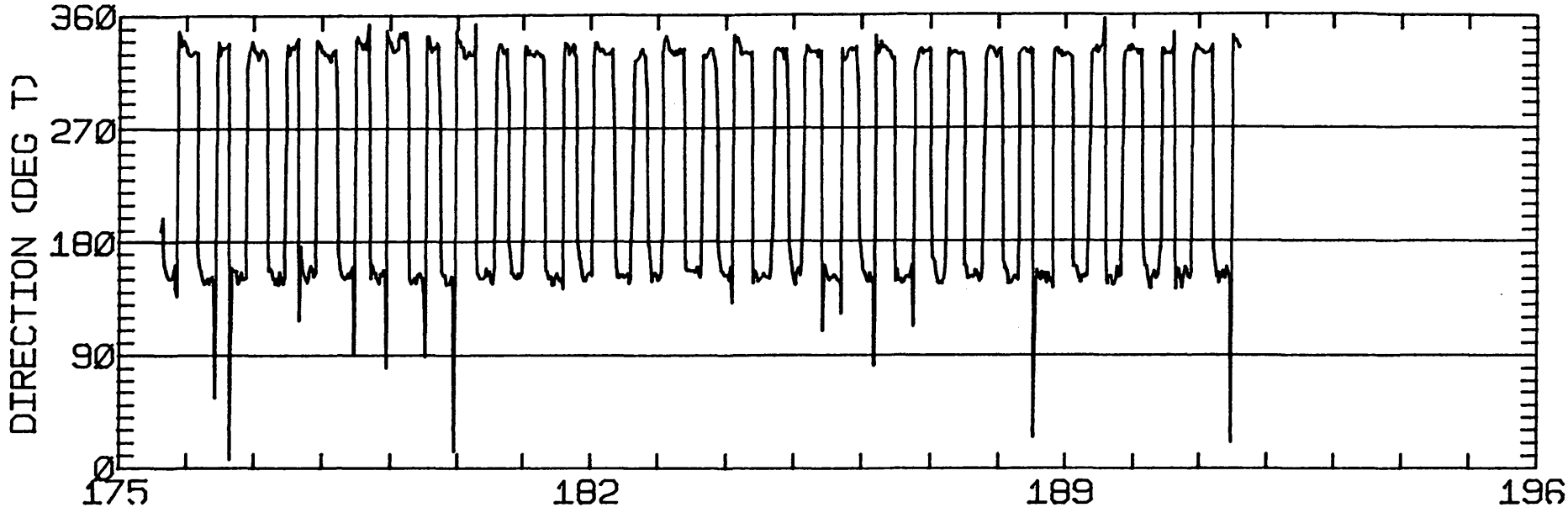
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

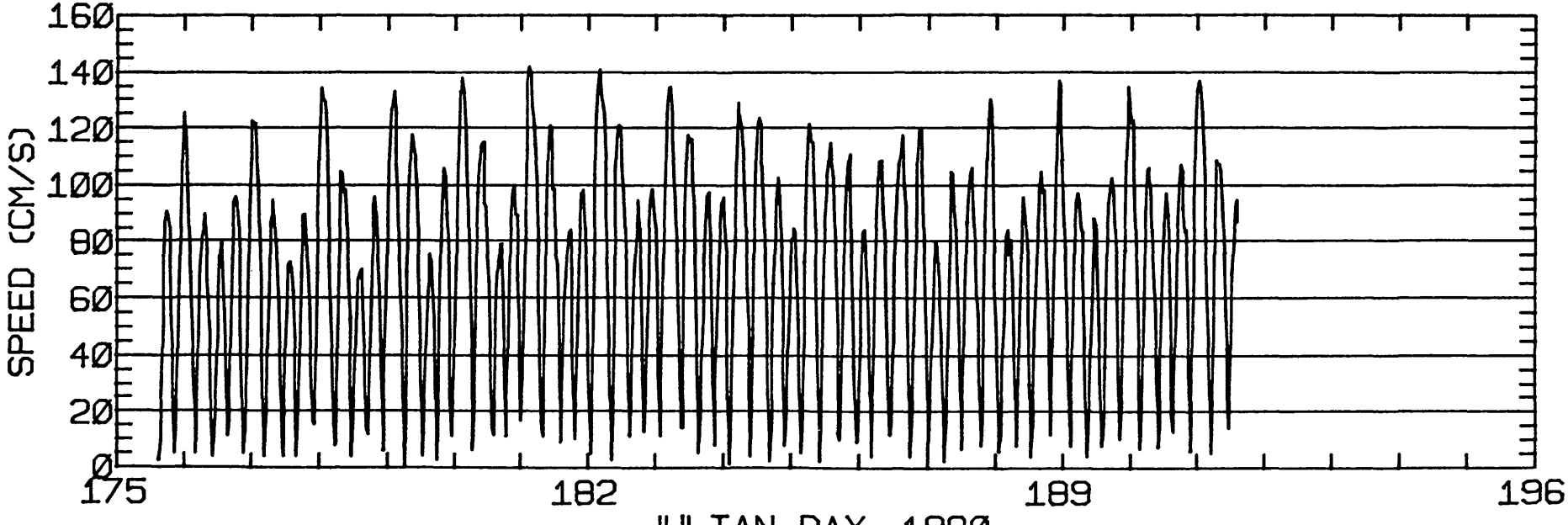
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.27	0.60	154.8	16.4	ANTI-CLOCKWISE
K1	33.95	0.53	152.5	31.4	CLOCKWISE
N2	15.78	0.25	151.2	253.1	CLOCKWISE
M2	95.44	1.35	152.2	281.0	ANTI-CLOCKWISE
S2	16.39	0.43	154.3	284.5	ANTI-CLOCKWISE
M4	0.91	0.42	160.2	75.7	ANTI-CLOCKWISE

RMS SPEED: 77.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 160.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 59.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 152.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 6.20 CM/SEC
STANDARD DEVIATION V SERIES: 9.40 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.0	2.9	447.
2	12	-3.4	3.0	408.
3	6	-1.9	2.0	348.
ALL	30	-2.1	2.8	



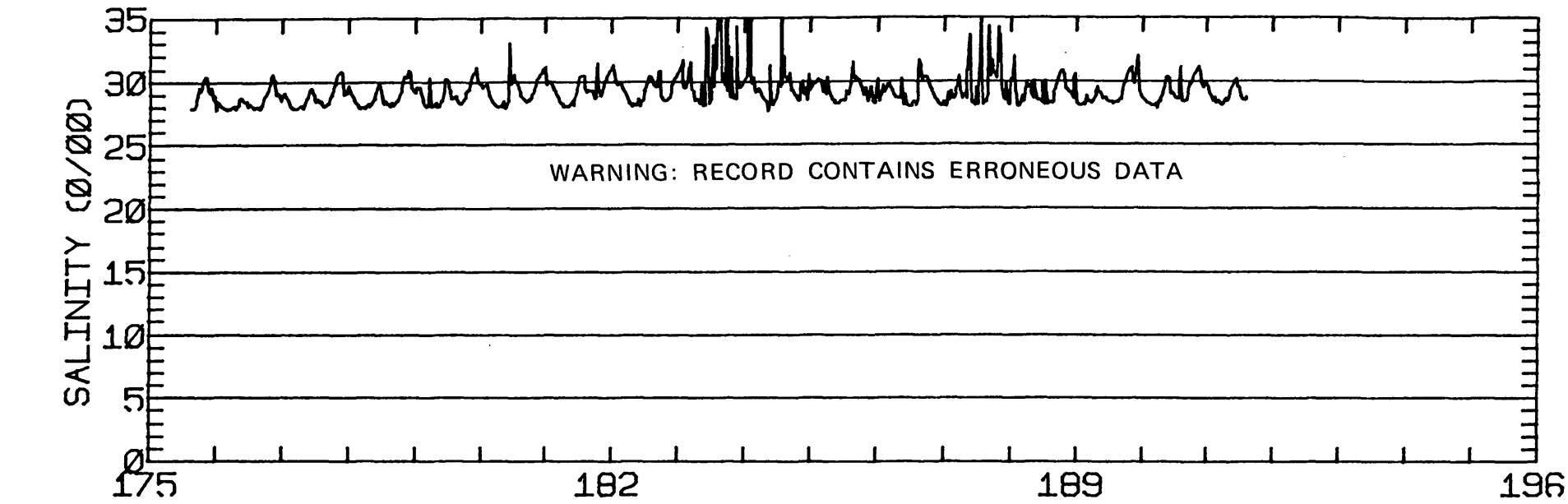


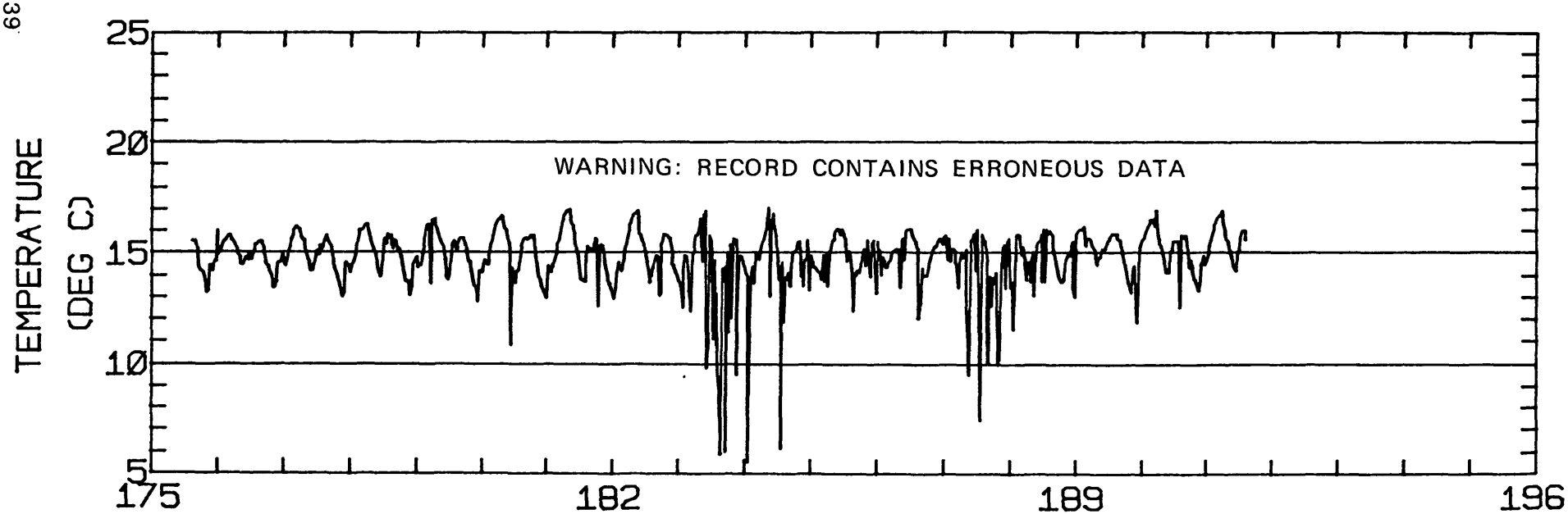
JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 6 37-47-25N 122-22-24W

METER 013.6 METERS ABOVE BED. WATER DEPTH 019.8 METERS.





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-25N 122-22-24W
METER Ø13.6 METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'25"N 122 22'24"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 6/23/80 1322 PST JULIAN DAY=175
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

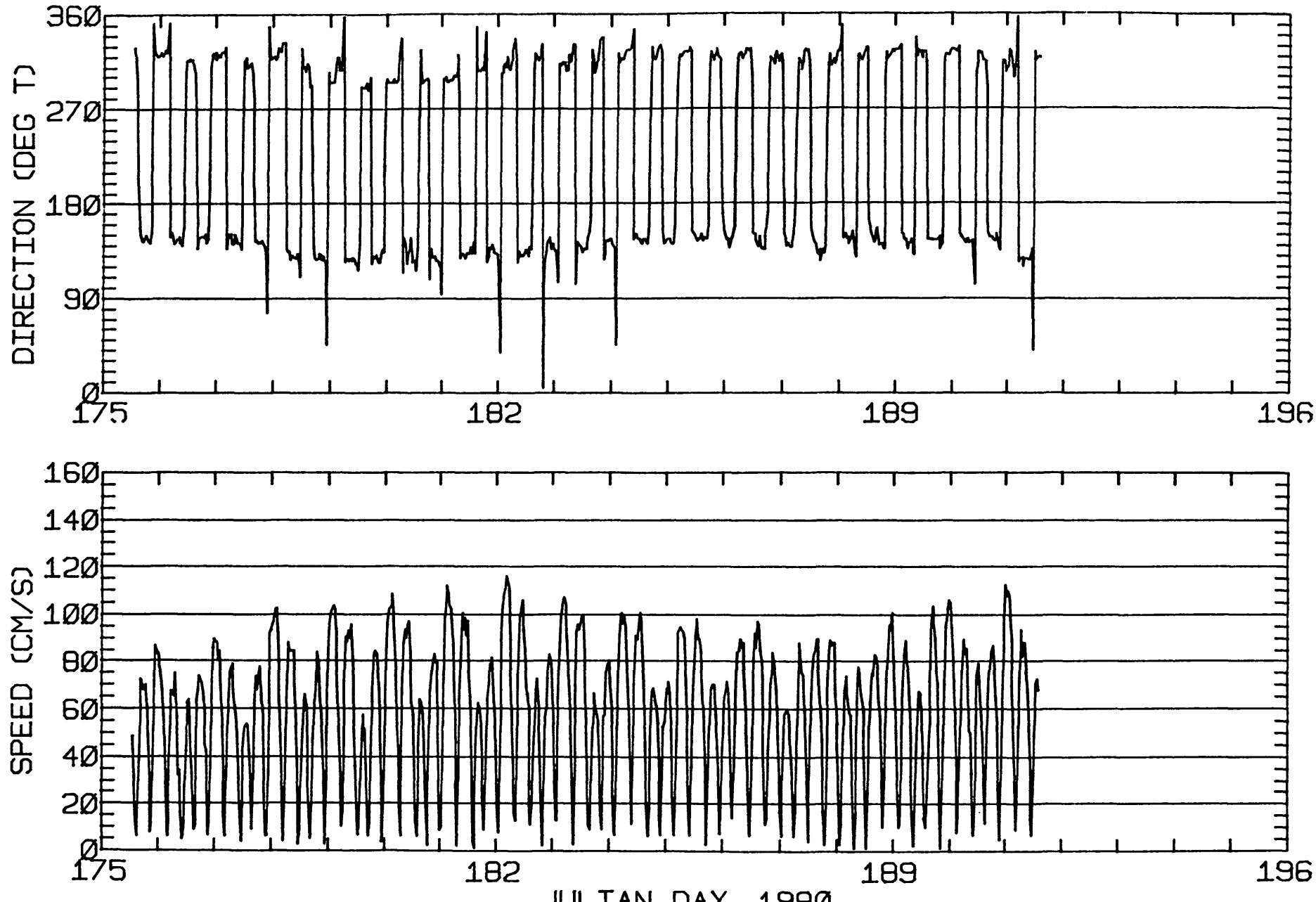
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.55	1.22	126.0	11.7	CLOCKWISE
K1	29.21	0.52	136.8	36.4	CLOCKWISE
N2	14.25	3.64	152.9	248.4	ANTI-CLOCKWISE
M2	78.69	4.00	139.5	279.3	CLOCKWISE
S2	14.73	0.86	117.1	281.7	ANTI-CLOCKWISE
M4	2.64	0.52	204.8	108.6	CLOCKWISE

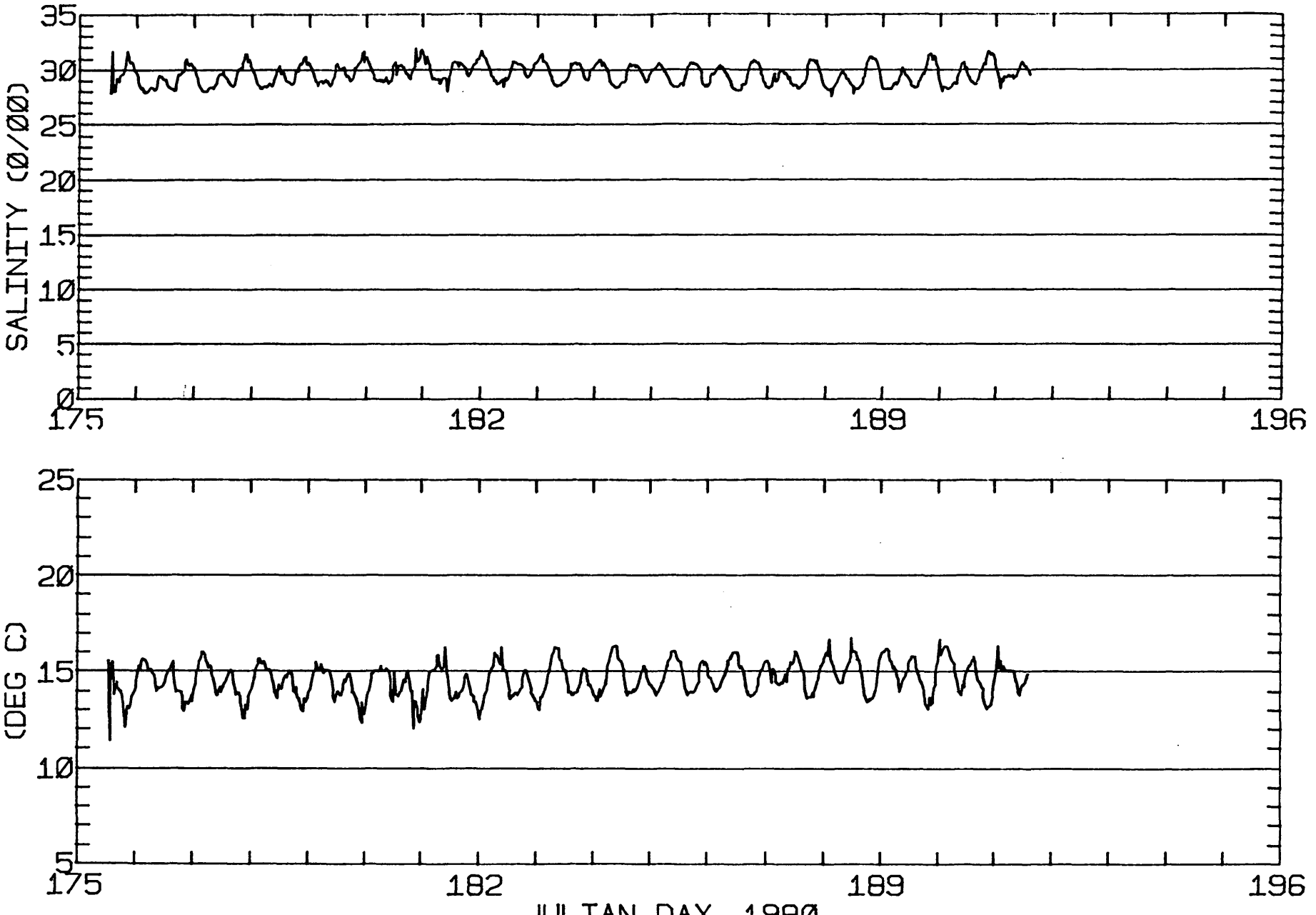
RMS SPEED: 64.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 136.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 48.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 135.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 7.85 CM/SEC
STANDARD DEVIATION V SERIES: 9.11 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.4	-3.2	447.
2	12	-0.6	-1.5	408.
3	6	-1.3	-1.7	391.
ALL	30	-0.6	-2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-25N 122-22-24W
METER 007.5 METERS ABOVE BED. WATER DEPTH 019.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-25N 122-22-24W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'25"N 122 22'24"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 17.7 M (BELOW MLLW)
START TIME OF SERIES: 6/23/80 1314 PST JULIAN DAY=175
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

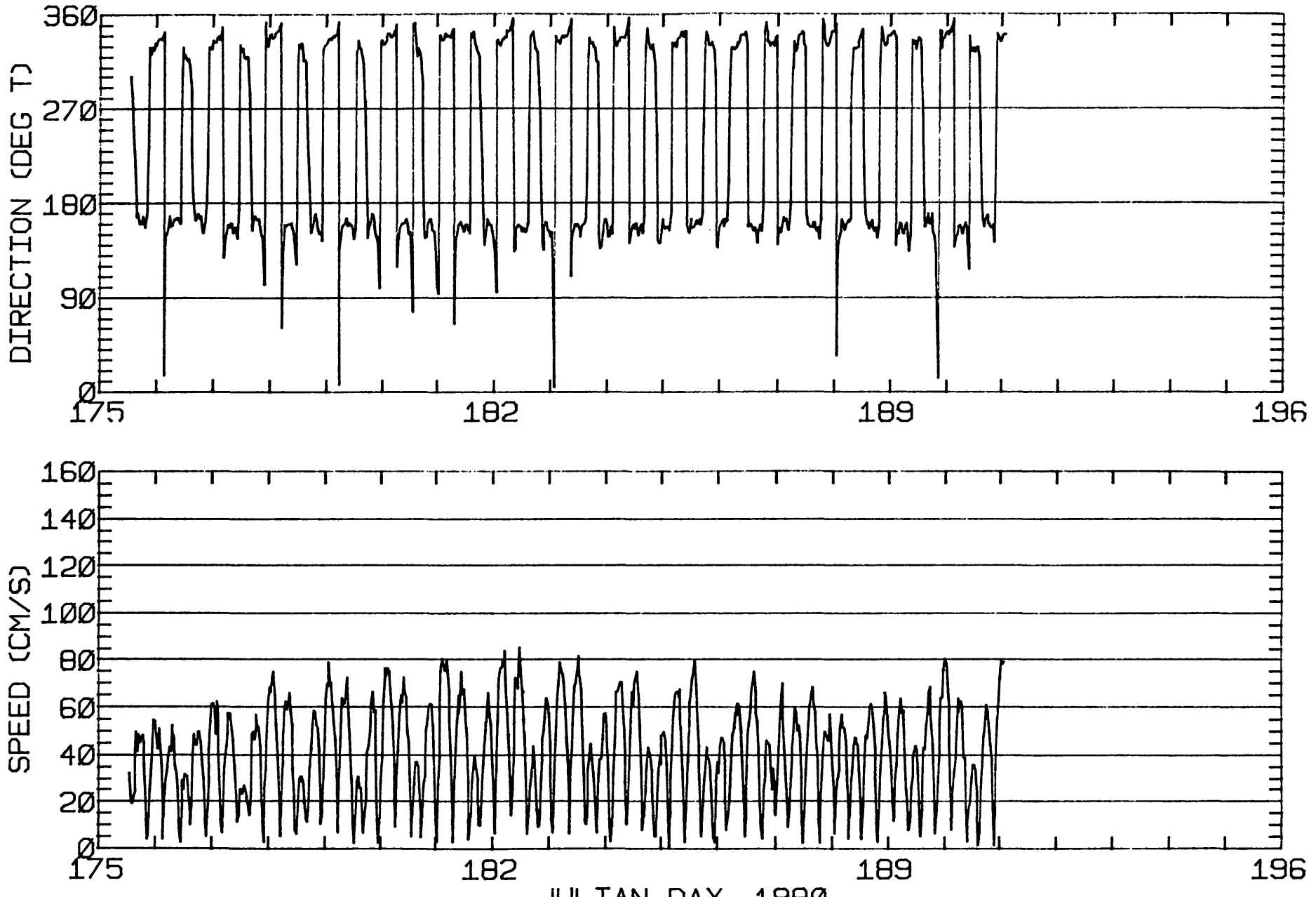
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.96	2.38	161.7	15.5	CLOCKWISE
K1	21.92	0.76	163.9	40.9	CLOCKWISE
N2	10.06	0.71	156.3	250.2	CLOCKWISE
M2	55.38	0.08	156.6	276.7	CLOCKWISE
S2	10.48	0.60	152.7	281.6	ANTI-CLOCKWISE
M4	1.31	0.38	247.4	155.9	ANTI-CLOCKWISE

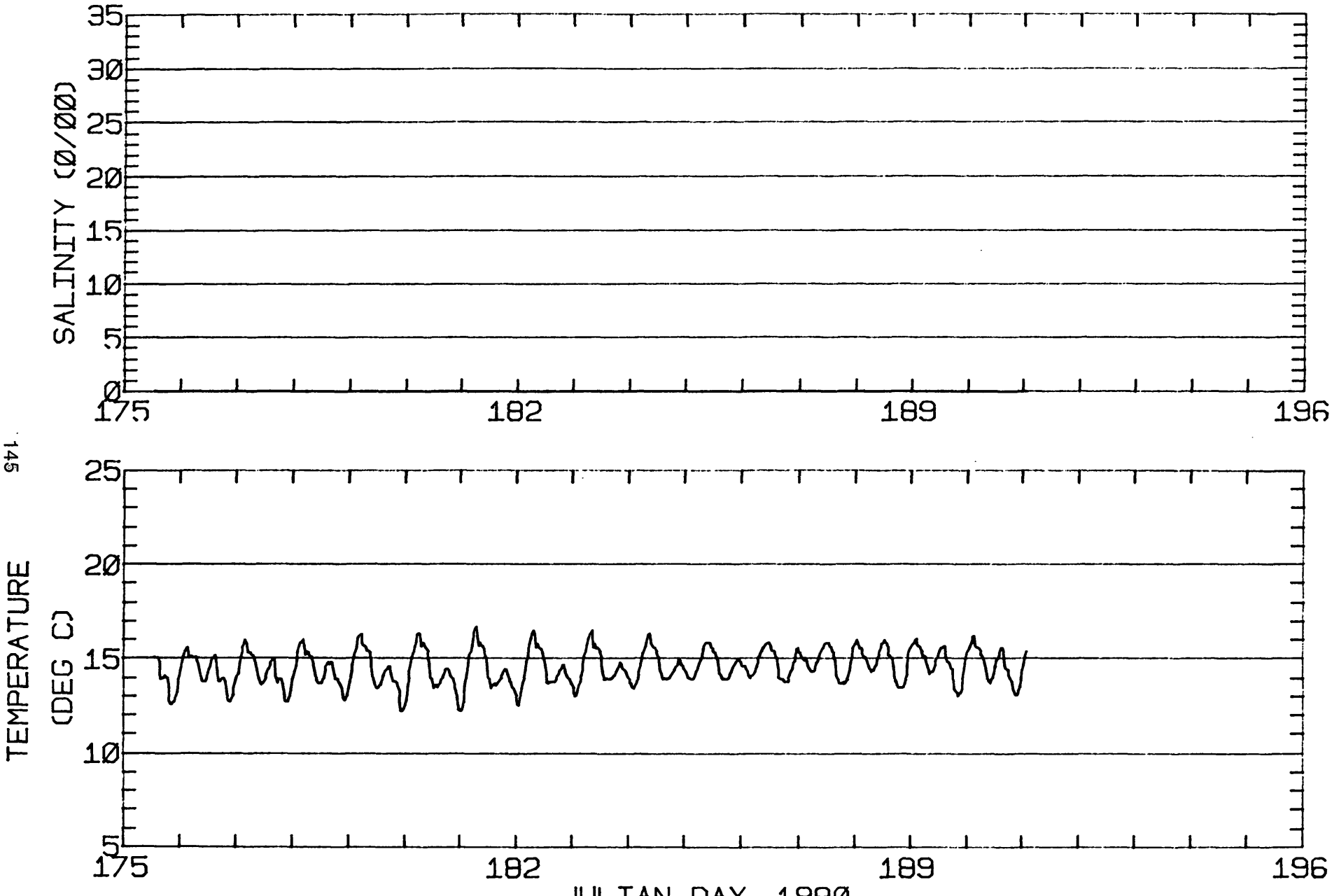
RMS SPEED: 45.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 99.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 158.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 5.18 CM/SEC
STANDARD DEVIATION V SERIES: 5.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.3	-4.5	447.
2	12	1.1	-3.8	408.
3	4	0.7	-2.7	416.
ALL	28	0.5	-3.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-25N 122-22-24W
METER 002.0 METERS ABOVE BED. WATER DEPTH 019.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-25N 122-22-24W
METER ØØ2.Ø METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'30"N 122 22'23"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 7/10/80 1400 PST JULIAN DAY=192
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

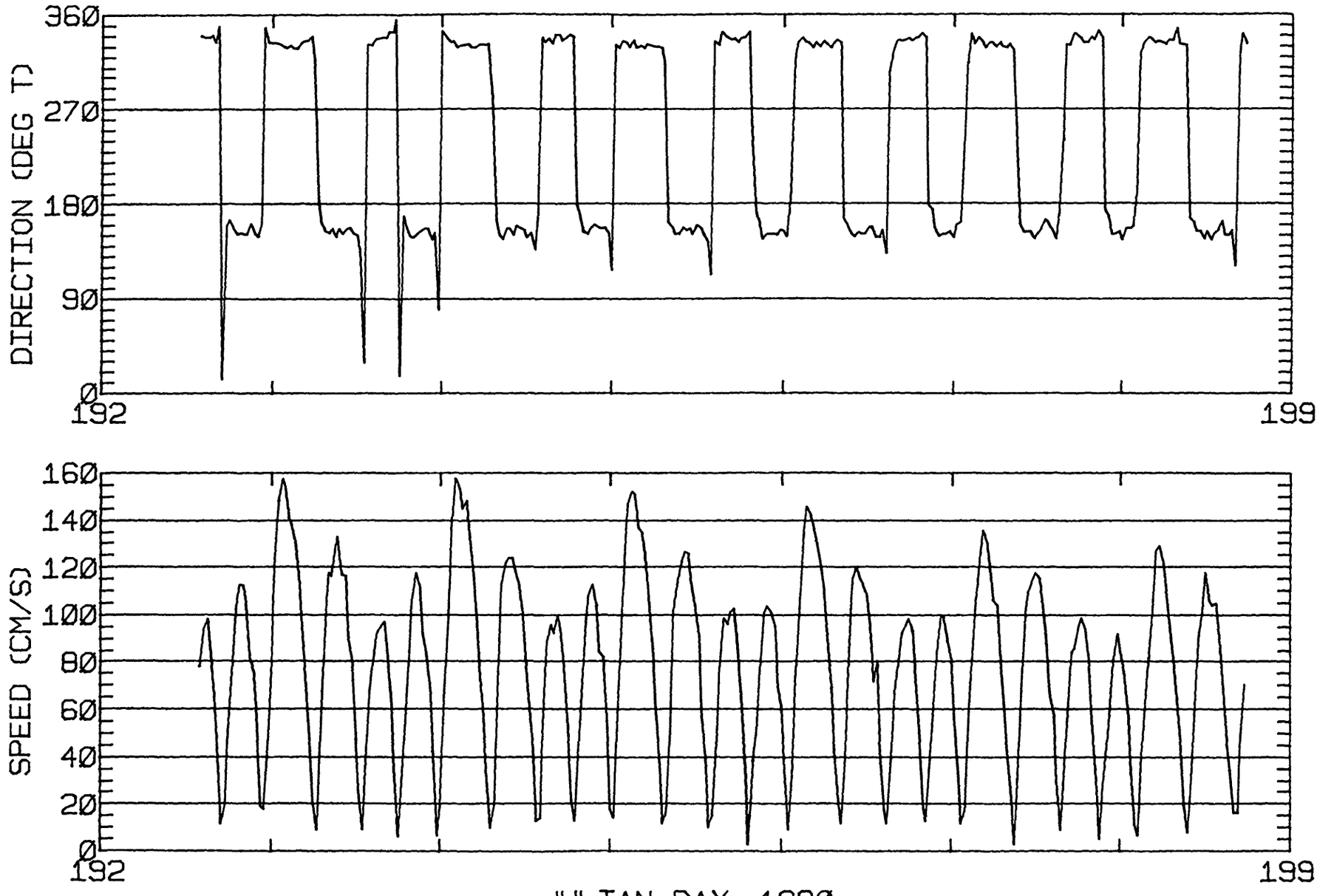
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.08	2.28	147.3	33.8	ANTI-CLOCKWISE
K1	31.77	0.82	149.4	38.4	ANTI-CLOCKWISE
N2	18.28	1.55	137.4	280.1	CLOCKWISE
M2	101.94	7.72	155.1	282.4	CLOCKWISE
S2	18.46	2.77	148.7	309.5	ANTI-CLOCKWISE
M4	2.67	0.16	160.3	217.5	CLOCKWISE

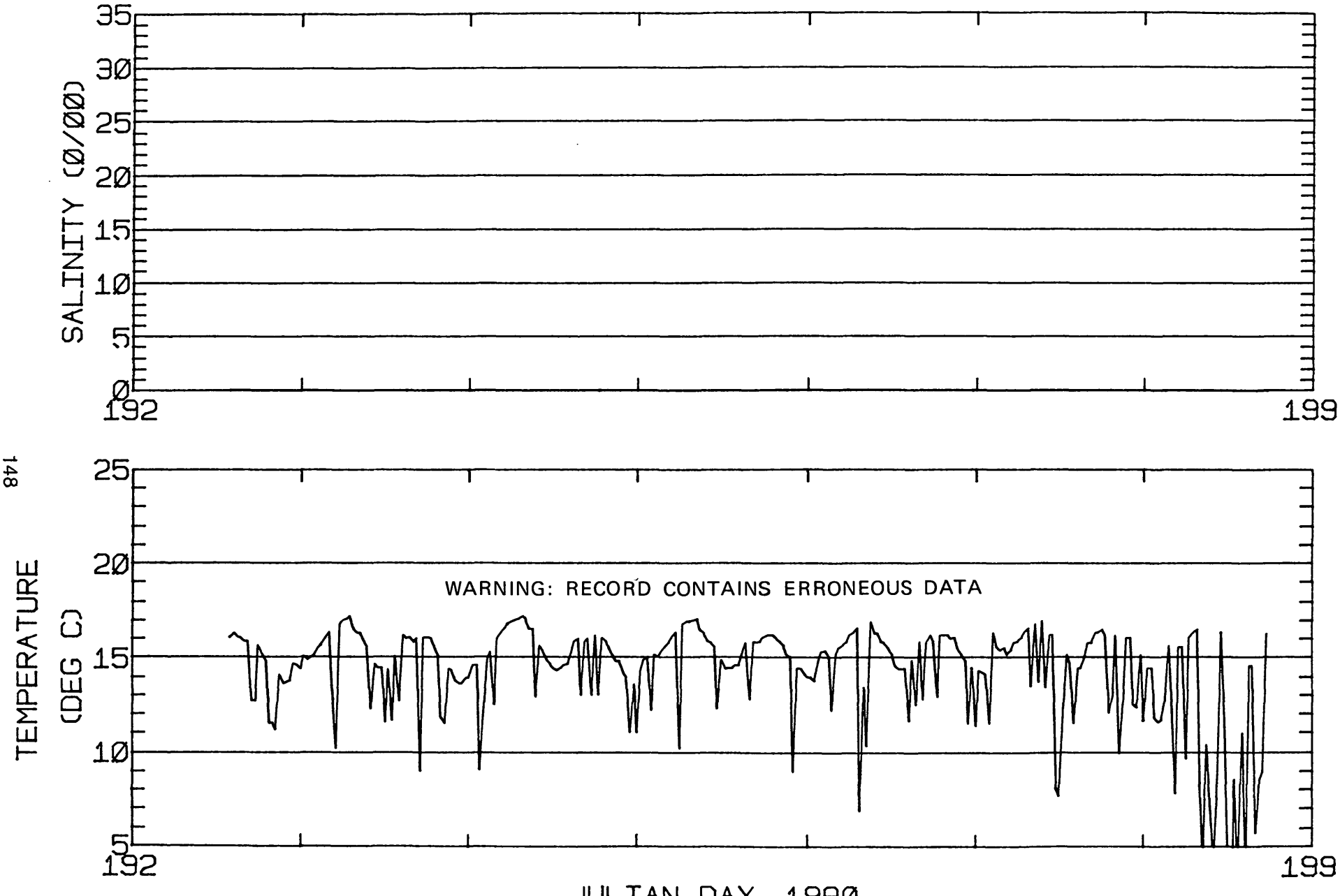
RMS SPEED: 88.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 166.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 65.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 152.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 7.24 CM/SEC
STANDARD DEVIATION V SERIES: 12.09 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	-2.6	4.8	274.
ALL	10	-2.6	4.8	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-30N 122-22-23W
METER 013.6 METERS ABOVE BED. WATER DEPTH 019.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-30N 122-22-23W
METER Ø13.6 METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'30"N 122 22'23"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 7/10/80 1532 PST JULIAN DAY=192
APPROXIMATE RECORD LENGTH IS 8 M2-CYCLES

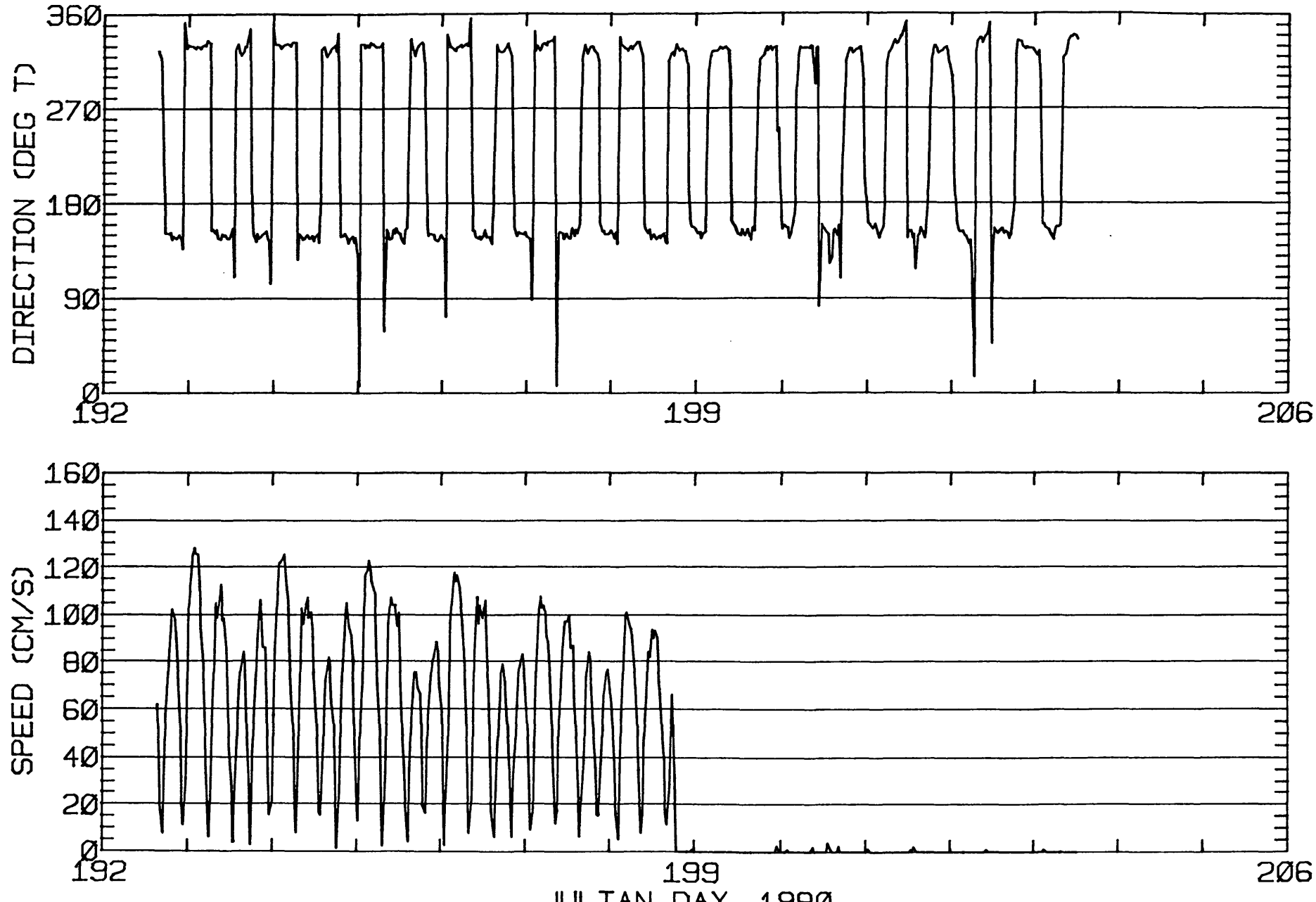
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.03	0.47	150.0	37.1	ANTI-CLOCKWISE
K1	28.21	0.44	154.0	42.0	CLOCKWISE
N2	23.68	7.04	154.5	288.5	ANTI-CLOCKWISE
M2	95.50	6.81	144.6	275.8	ANTI-CLOCKWISE
S2	16.17	0.21	159.9	325.6	ANTI-CLOCKWISE
M4	2.18	0.58	177.9	156.8	CLOCKWISE

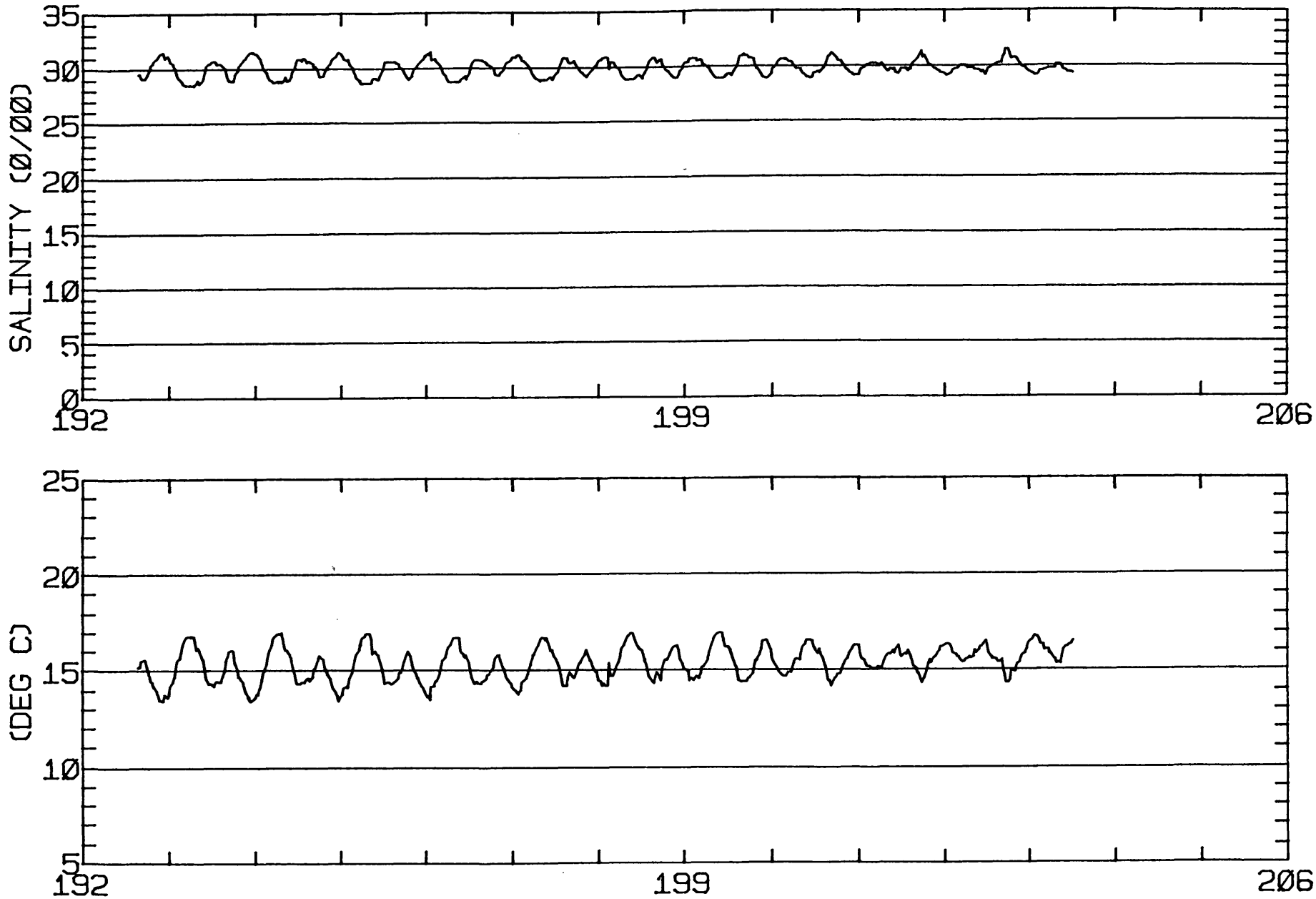
RMS SPEED: 78.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 152.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 64.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 148.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 6.65 CM/SEC
STANDARD DEVIATION V SERIES: 8.92 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	8	0.9	-1.0	281.
ALL	8	0.9	-1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-30N 122-22-23W
METER 007.5 METERS ABOVE BED. WATER DEPTH 019.8 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 6 37-47-3ØN 122-22-23W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'24"N 122 22'23"W
METER TYPE: AANDERAA
WATER DEPTH: 18.9 M (MLLW)
METER DEPTH: 5.2 M (BELOW MLLW)
START TIME OF SERIES: 7/24/80 1050 PST JULIAN DAY=206
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

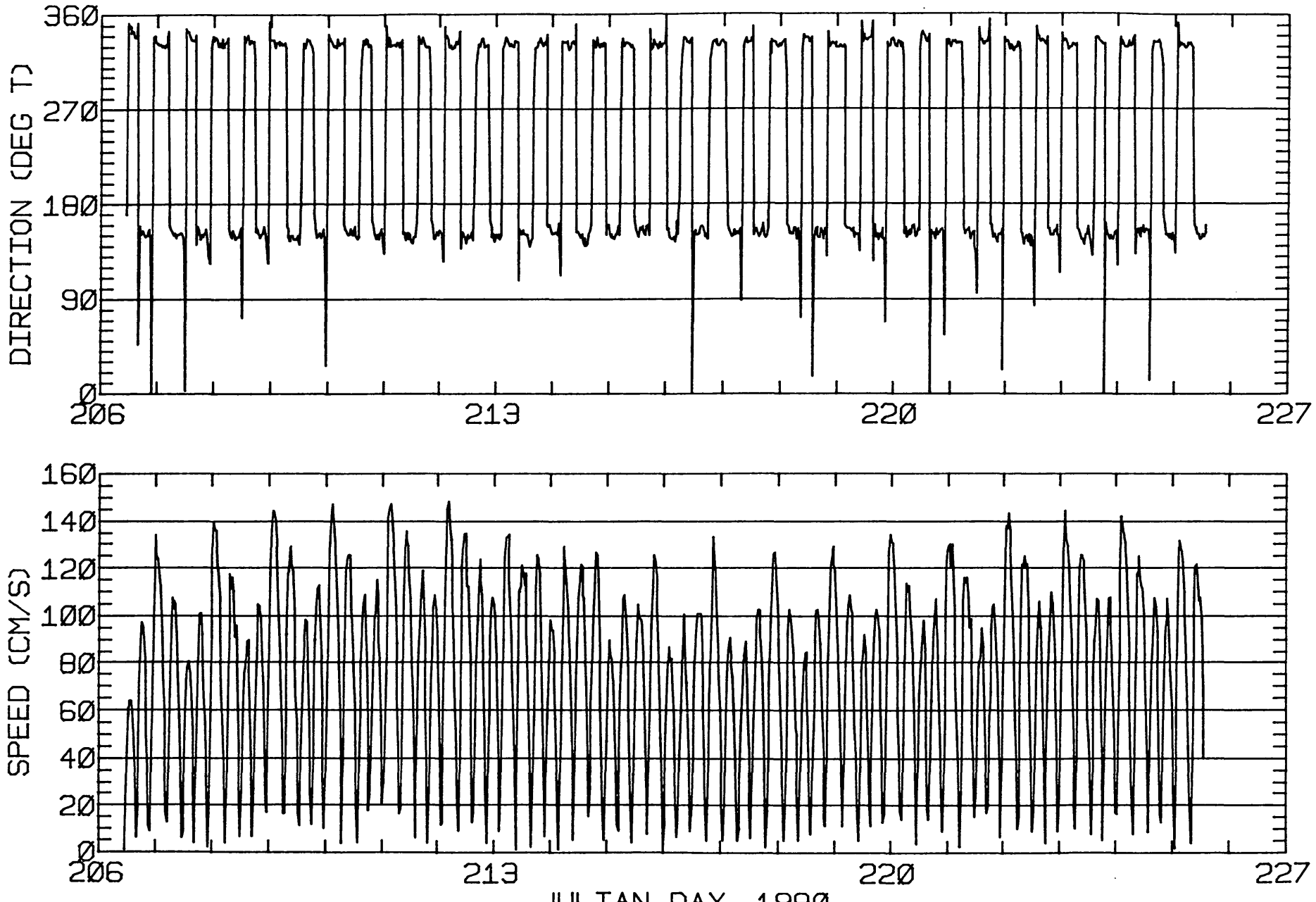
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.48	0.78	150.8	29.5	ANTI-CLOCKWISE
K1	29.46	0.24	149.8	45.9	ANTI-CLOCKWISE
N2	21.03	0.31	152.7	265.9	ANTI-CLOCKWISE
M2	94.07	0.58	152.4	283.8	ANTI-CLOCKWISE
S2	22.14	1.53	150.5	297.0	ANTI-CLOCKWISE
M4	0.86	0.26	91.3	182.5	ANTI-CLOCKWISE

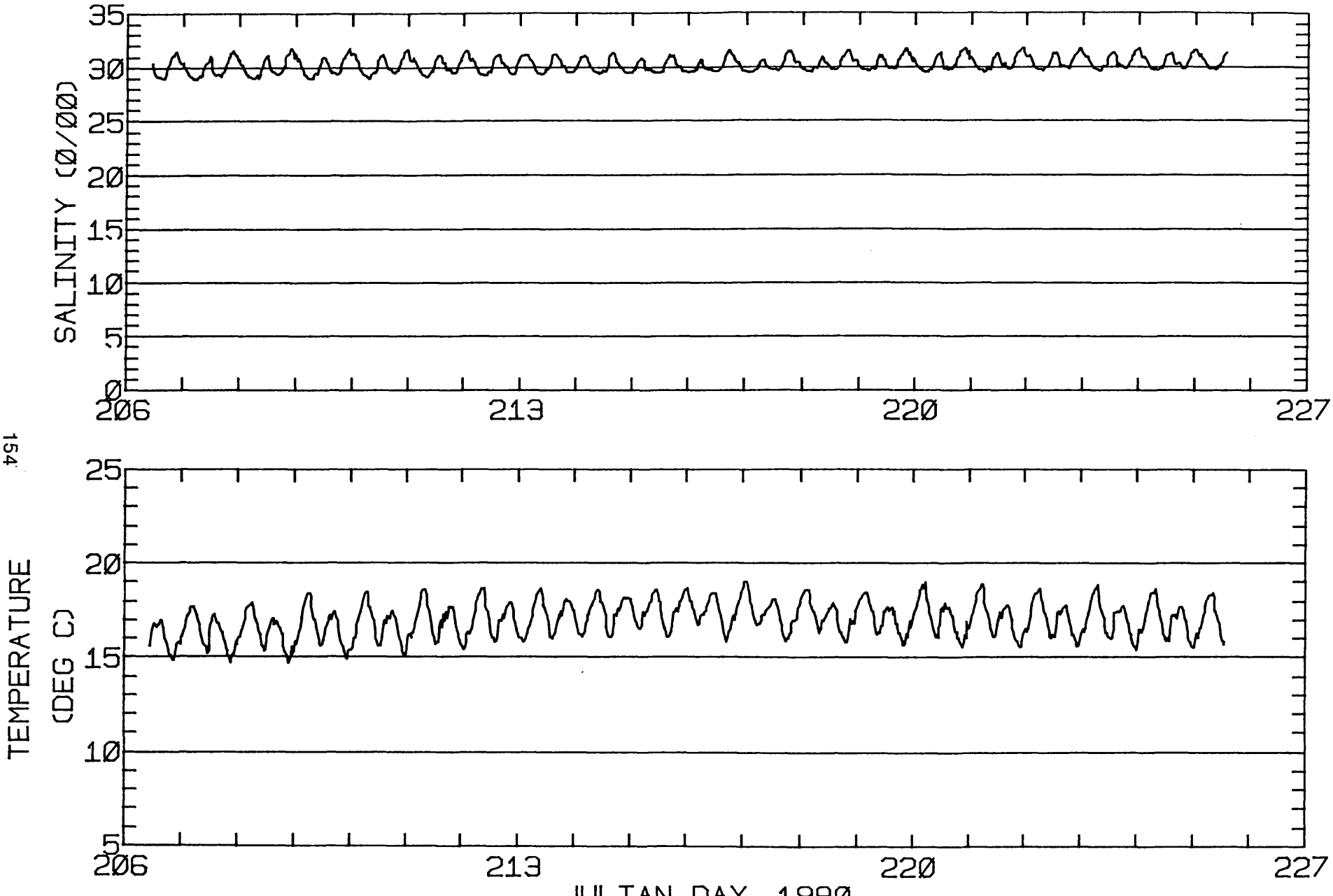
RMS SPEED: 83.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 159.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 55.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 151.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 6.55 CM/SEC
STANDARD DEVIATION V SERIES: 10.73 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.5	3.8	308.
2	12	-0.8	2.6	207.
3	12	-0.2	3.0	145.
ALL	36	-0.1	3.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-24N 122-22-23W
METER 013.7 METERS ABOVE BED. WATER DEPTH 018.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-24N 122-22-23W
METER Ø13.7 METERS ABOVE BED. WATER DEPTH Ø18.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'24"N 122 22'23"W
METER TYPE: AANDERAA
WATER DEPTH: 18.9 M (MLLW)
METER DEPTH: 11.3 M (BELOW MLLW)
START TIME OF SERIES: 7/24/80 1042 PST JULIAN DAY=206
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

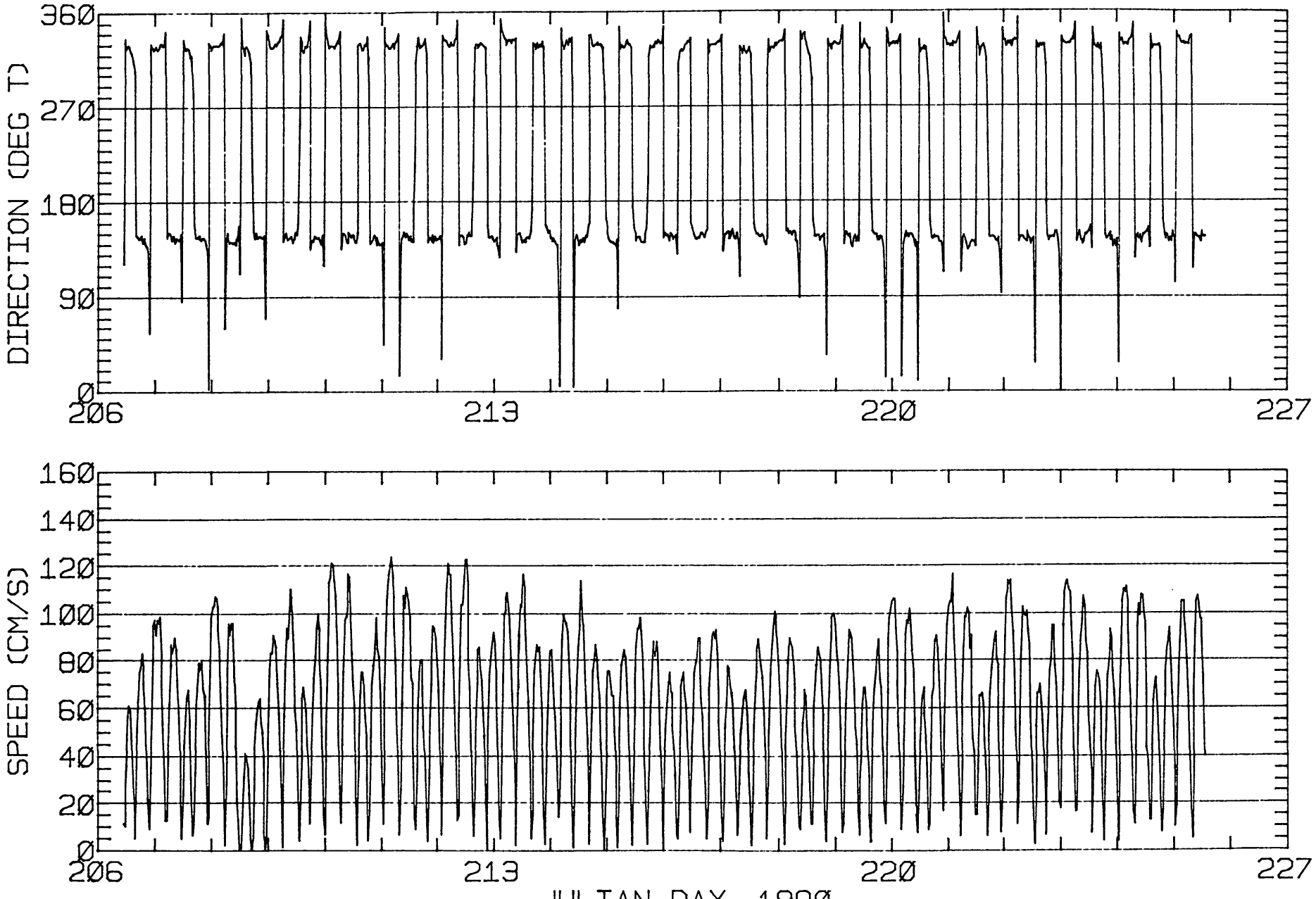
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.62	0.26	151.7	23.5	ANTI-CLOCKWISE
K1	25.81	1.22	151.6	50.9	CLOCKWISE
N2	18.37	0.10	147.0	260.4	ANTI-CLOCKWISE
M2	77.51	0.94	147.7	282.8	ANTI-CLOCKWISE
S2	17.06	0.33	145.3	294.3	CLOCKWISE
M4	0.85	0.29	38.8	273.2	ANTI-CLOCKWISE

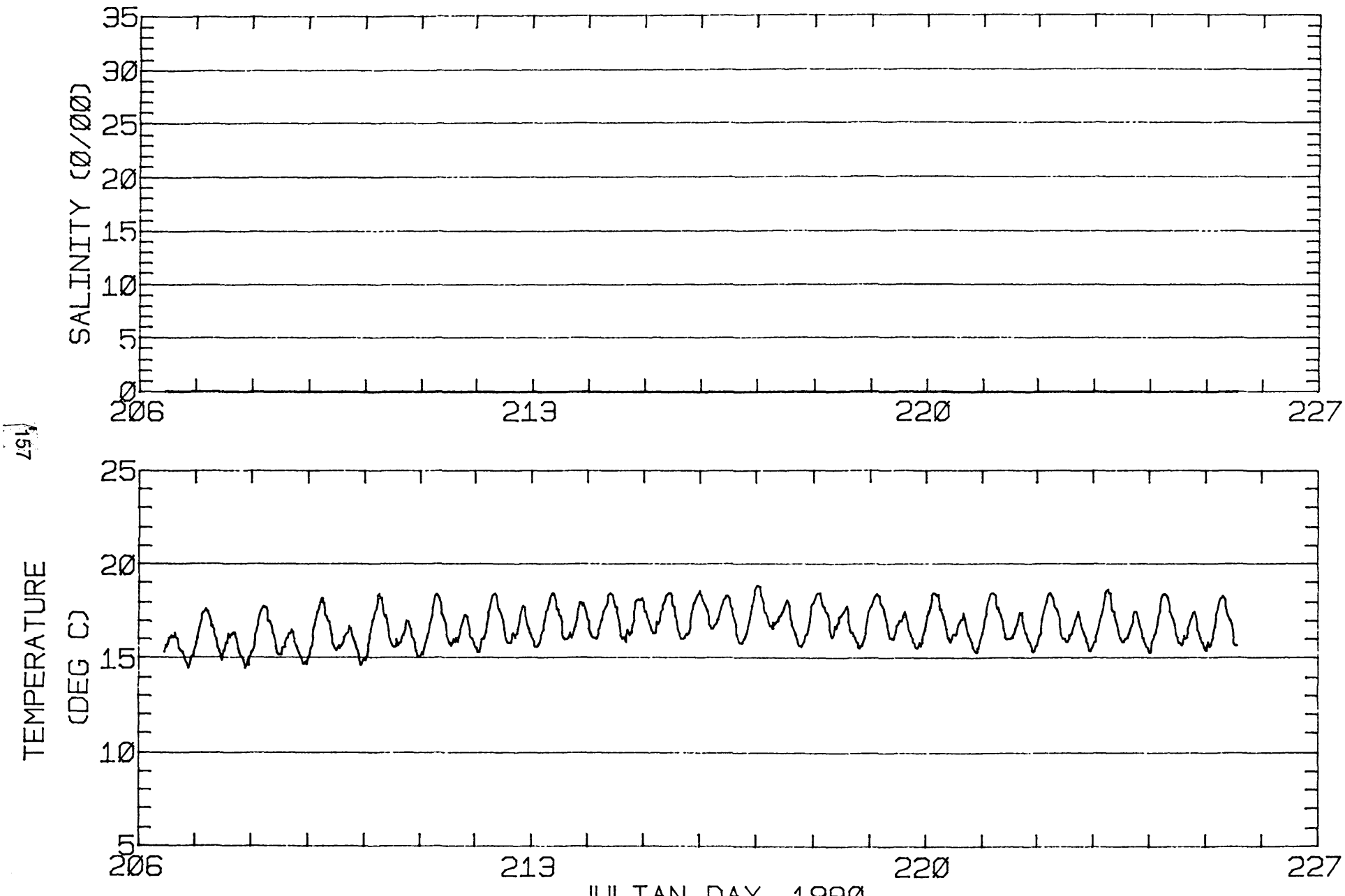
RMS SPEED: 69.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 133.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 47.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 148.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.41
STANDARD DEVIATION U-SERIES: 5.92 CM/SEC
STANDARD DEVIATION V SERIES: 8.02 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.3	-1.9	308.
2	12	2.4	-0.7	207.
3	12	3.5	-1.1	145.
ALL	36	3.0	-1.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-24N 122-22-23W
METER 007.5 METERS ABOVE BED. WATER DEPTH 018.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-24N 122-22-23W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø18.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'27"N 122 22'25"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 8/12/80 1550 PST JULIAN DAY=225
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

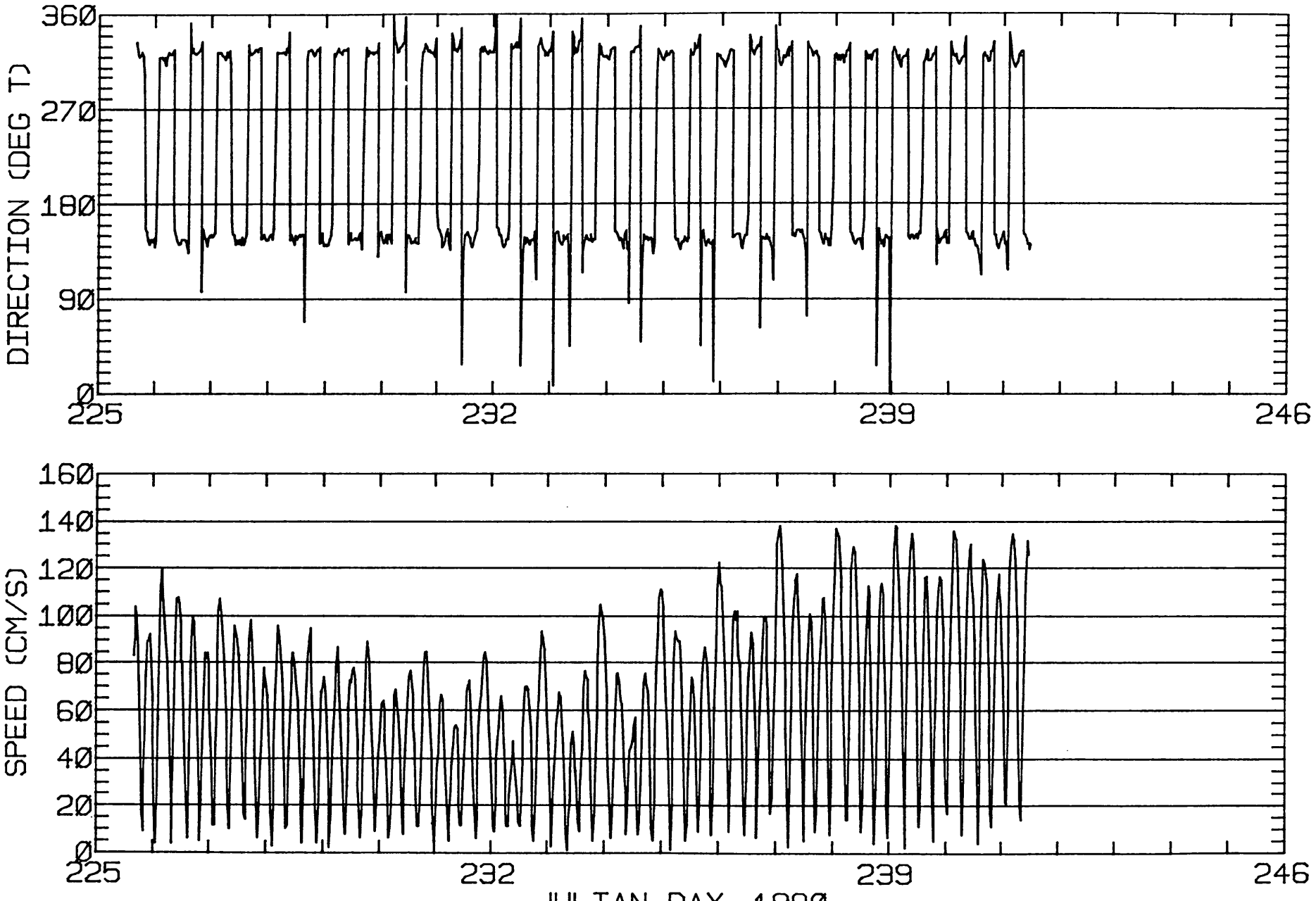
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	13.79	0.76	135.7	21.6	ANTI-CLOCKWISE
K1	22.99	1.16	140.4	49.5	ANTI-CLOCKWISE
N2	14.41	0.13	137.4	273.0	CLOCKWISE
M2	92.26	0.84	144.4	277.5	ANTI-CLOCKWISE
S2	21.53	0.18	142.0	298.5	CLOCKWISE
M4	2.53	0.45	64.1	355.8	ANTI-CLOCKWISE

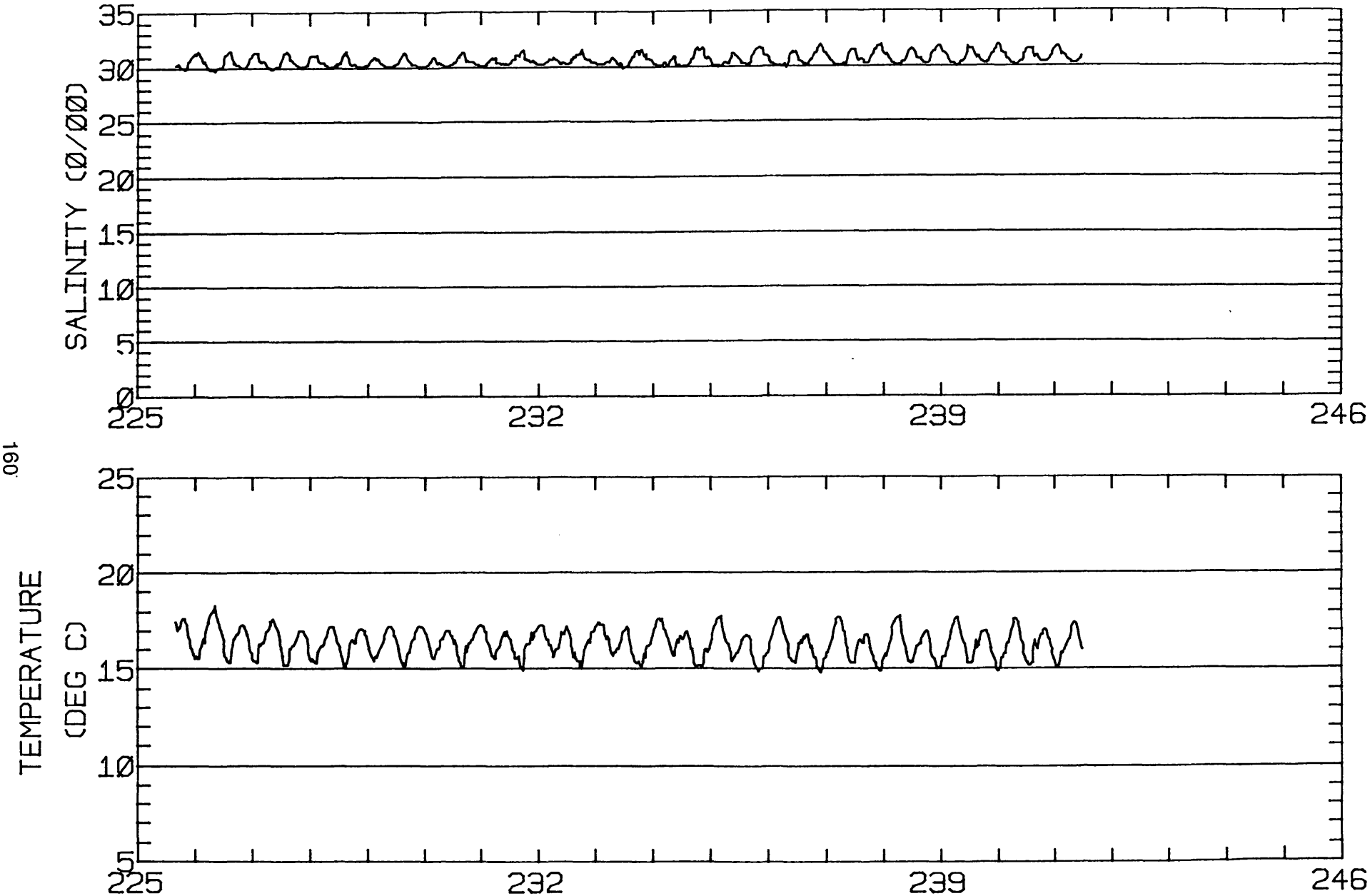
RMS SPEED: 70.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 150.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 61.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 142.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 6.46 CM/SEC
STANDARD DEVIATION V SERIES: 7.62 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.3	1.5	91.
2	12	-2.4	0.4	97.
3	6	-5.2	-1.3	103.
ALL	30	-2.9	0.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-27N 122-22-25W
METER 013.6 METERS ABOVE BED. WATER DEPTH 019.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-27N 122-22-25W
METER Ø13.6 METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 6
POSITION: 37 47'27"N 122 22'26"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 8/12/80 1542 PST JULIAN DAY=225
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

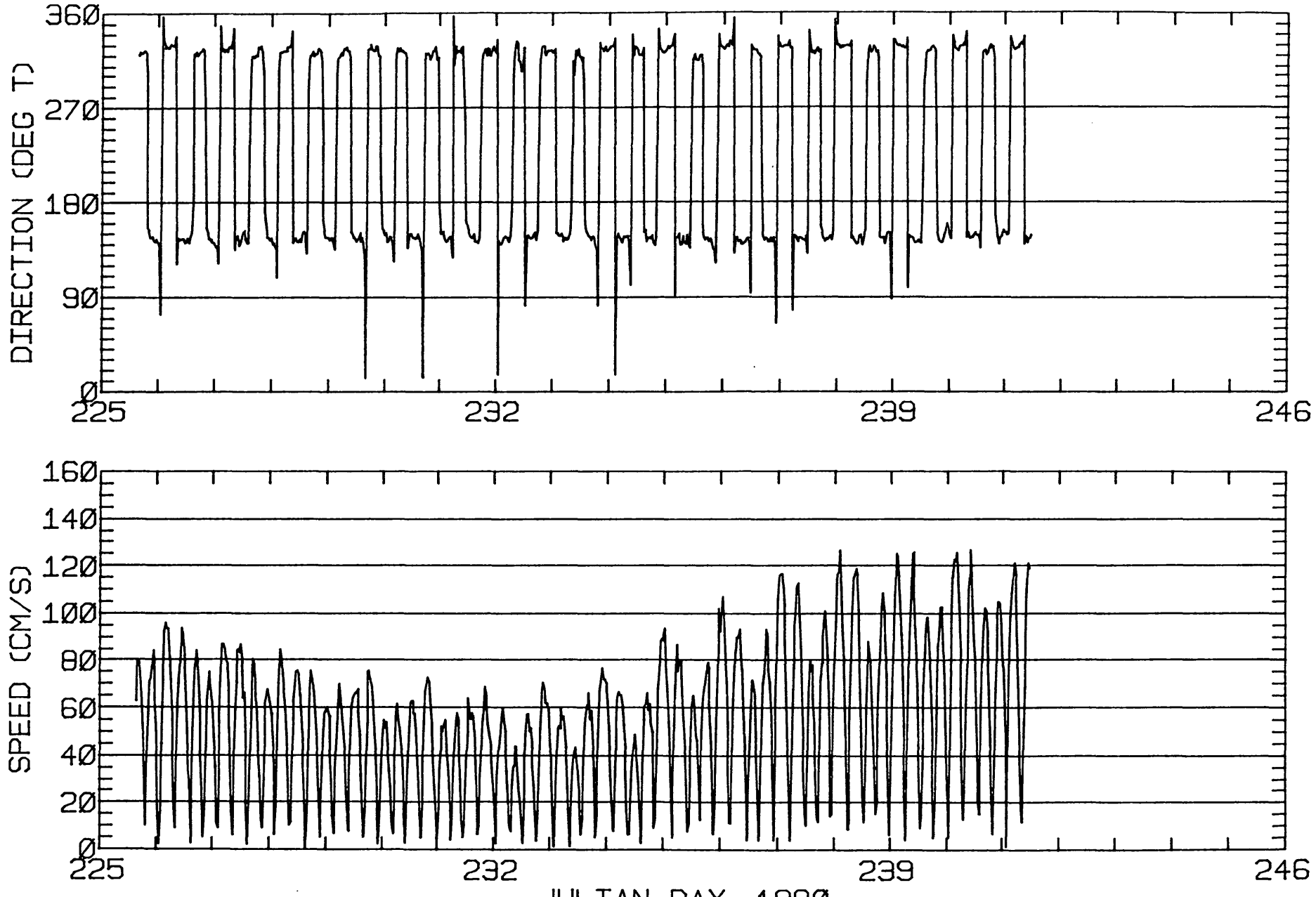
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.53	0.14	153.8	14.4	CLOCKWISE
K1	20.07	1.47	149.5	51.3	CLOCKWISE
N2	13.77	0.04	150.6	278.2	ANTI-CLOCKWISE
M2	81.40	0.25	145.9	276.5	CLOCKWISE
S2	19.91	0.47	147.0	300.0	CLOCKWISE
M4	0.69	0.12	96.3	292.2	ANTI-CLOCKWISE

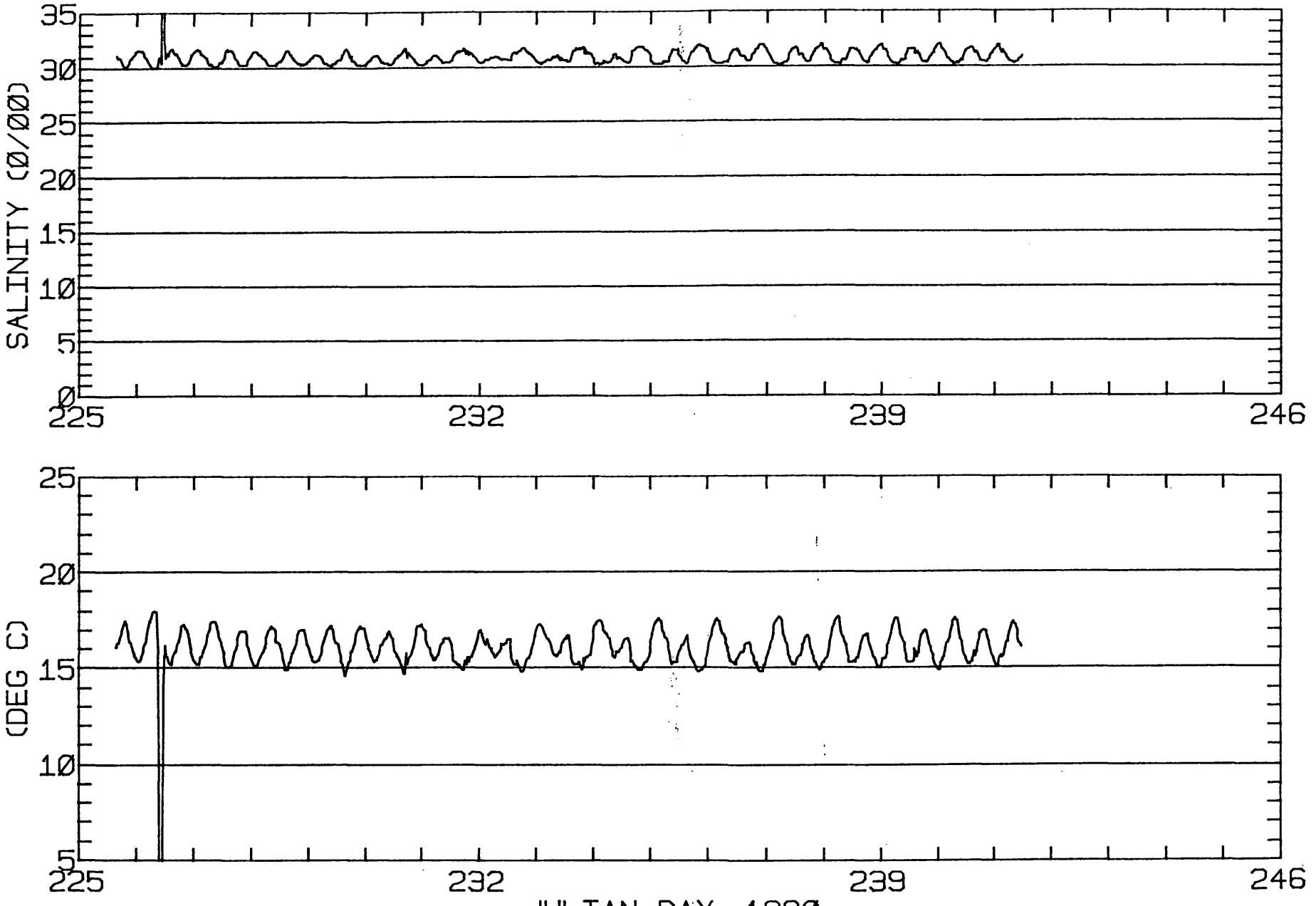
RMS SPEED: 62.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 133.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 53.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 147.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 5.29 CM/SEC
STANDARD DEVIATION V SERIES: 6.26 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.8	0.4	91.
2	12	1.0	-1.2	97.
3	6	0.4	-0.2	103.
ALL	30	0.1	-0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-27N 122-22-26W
METER 007.5 METERS ABOVE BED. WATER DEPTH 019.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 6 37-47-27N 122-22-26W
METER ØØ7.5 METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 7
POSITION: 37 43'18"N 122 19'29"W
METER TYPE: AANDERAA
WATER DEPTH: 12.2 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 3/ 8/79 1950 PST JULIAN DAY= 67
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

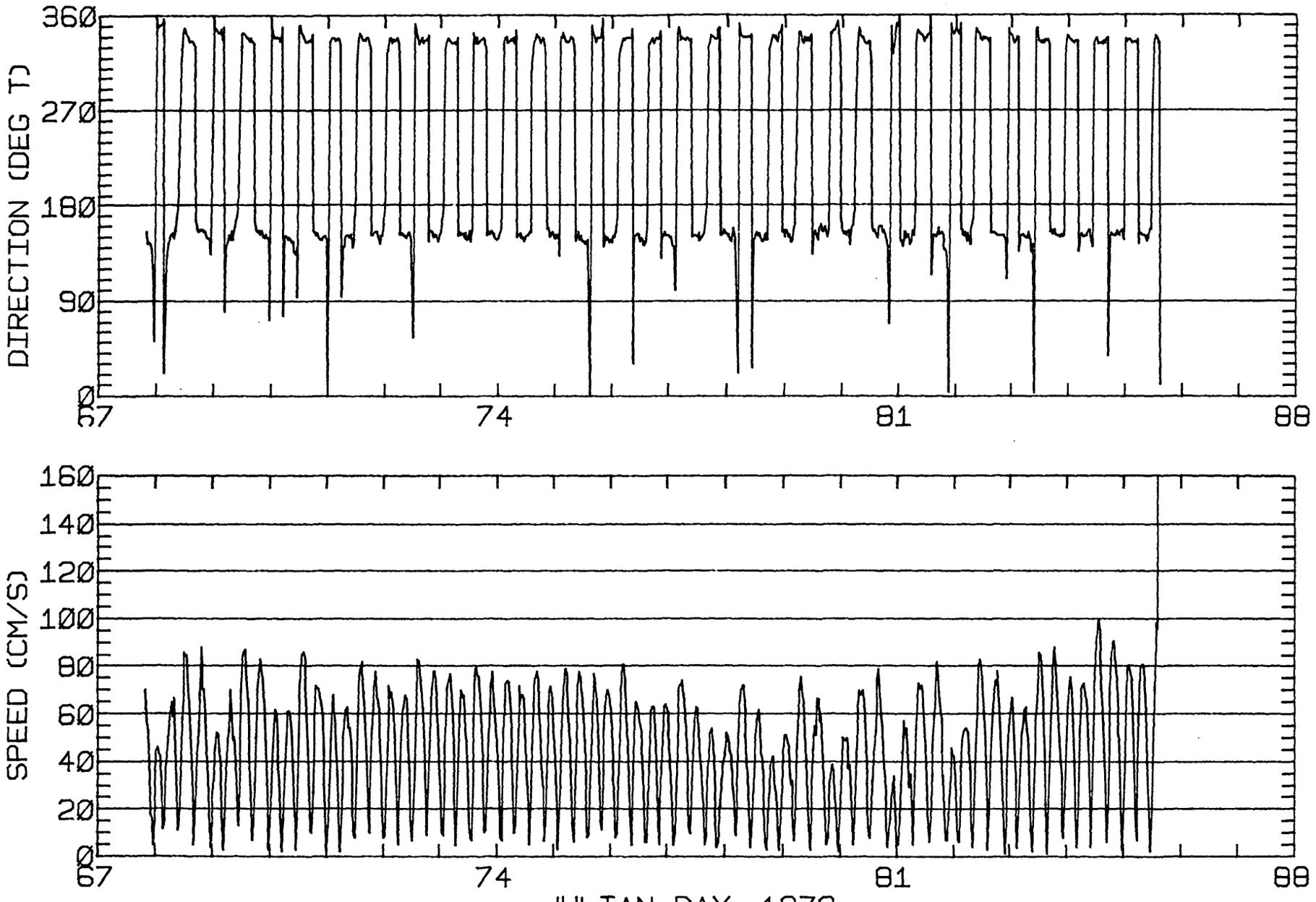
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

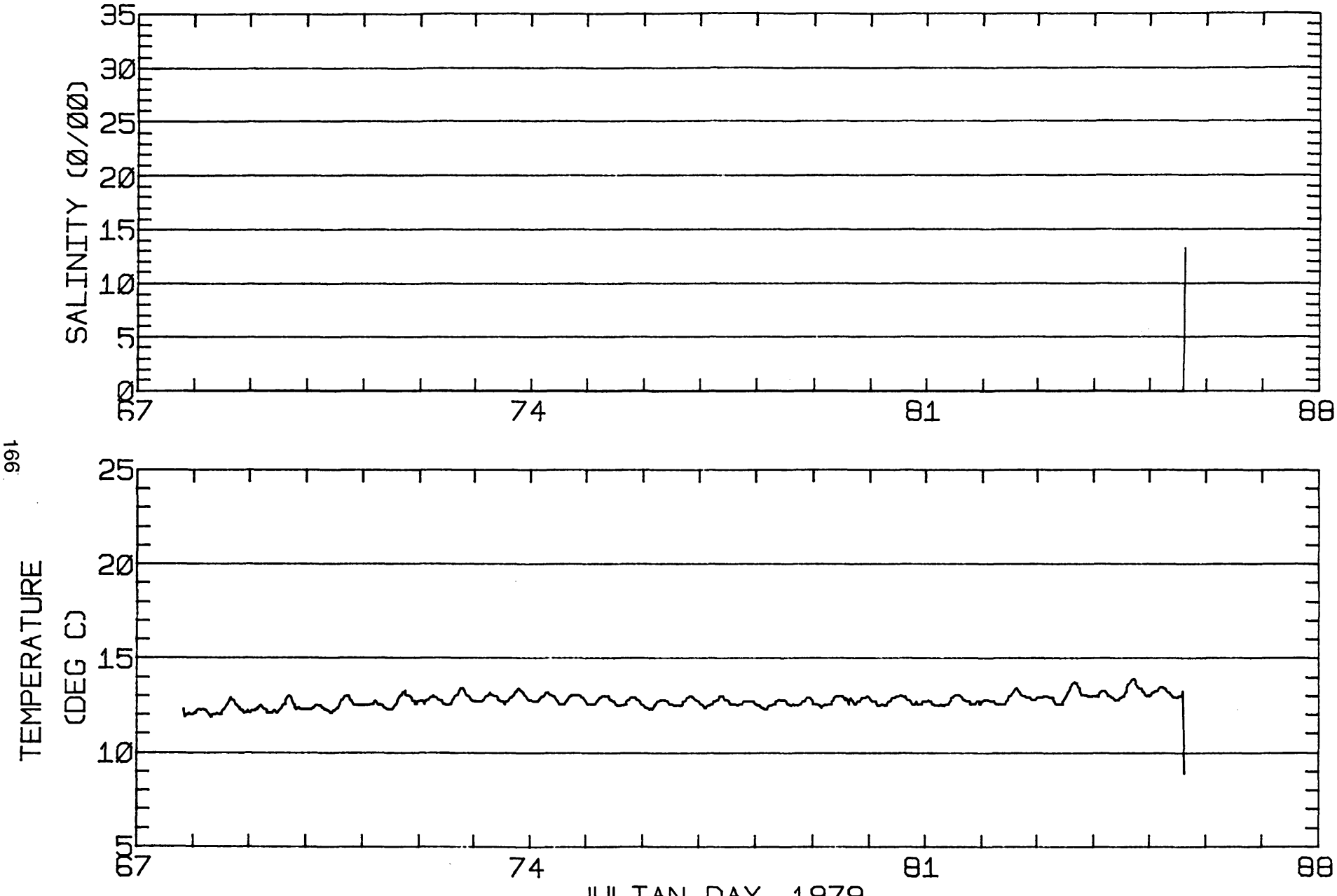
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.53	0.90	154.4	12.1	ANTI-CLOCKWISE
K1	11.72	0.44	155.7	36.9	ANTI-CLOCKWISE
N2	15.02	0.49	158.0	248.4	ANTI-CLOCKWISE
M2	66.66	0.03	155.7	282.7	CLOCKWISE
S2	21.83	0.48	153.4	293.2	ANTI-CLOCKWISE
M4	2.15	0.63	182.0	33.9	ANTI-CLOCKWISE

RMS SPEED: 51.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 111.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 44.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 155.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 3.86 CM/SEC
STANDARD DEVIATION V SERIES: 6.60 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	3.5	-1.0	938.
2	12	2.4	0.6	924.
3	10	2.9	-0.8	681.
ALL	34	3.0	-0.4	


DIRECTION (DEG T)
360
270
180
90
0
67
74
81
88
SPEED (CM/S)
160
140
120
100
80
60
40
20
0
67
74
81
88
JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 7 37-43-18N 122-19-29W
METER 006.1 METERS ABOVE BED. WATER DEPTH 012.2 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 7 37-43-18N 122-19-29W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø12.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 7
POSITION: 37 43'23"N 122 19'26"W
METER TYPE: AANDERAA
WATER DEPTH: 12.5 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 7/10/80 1250 PST JULIAN DAY=192
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

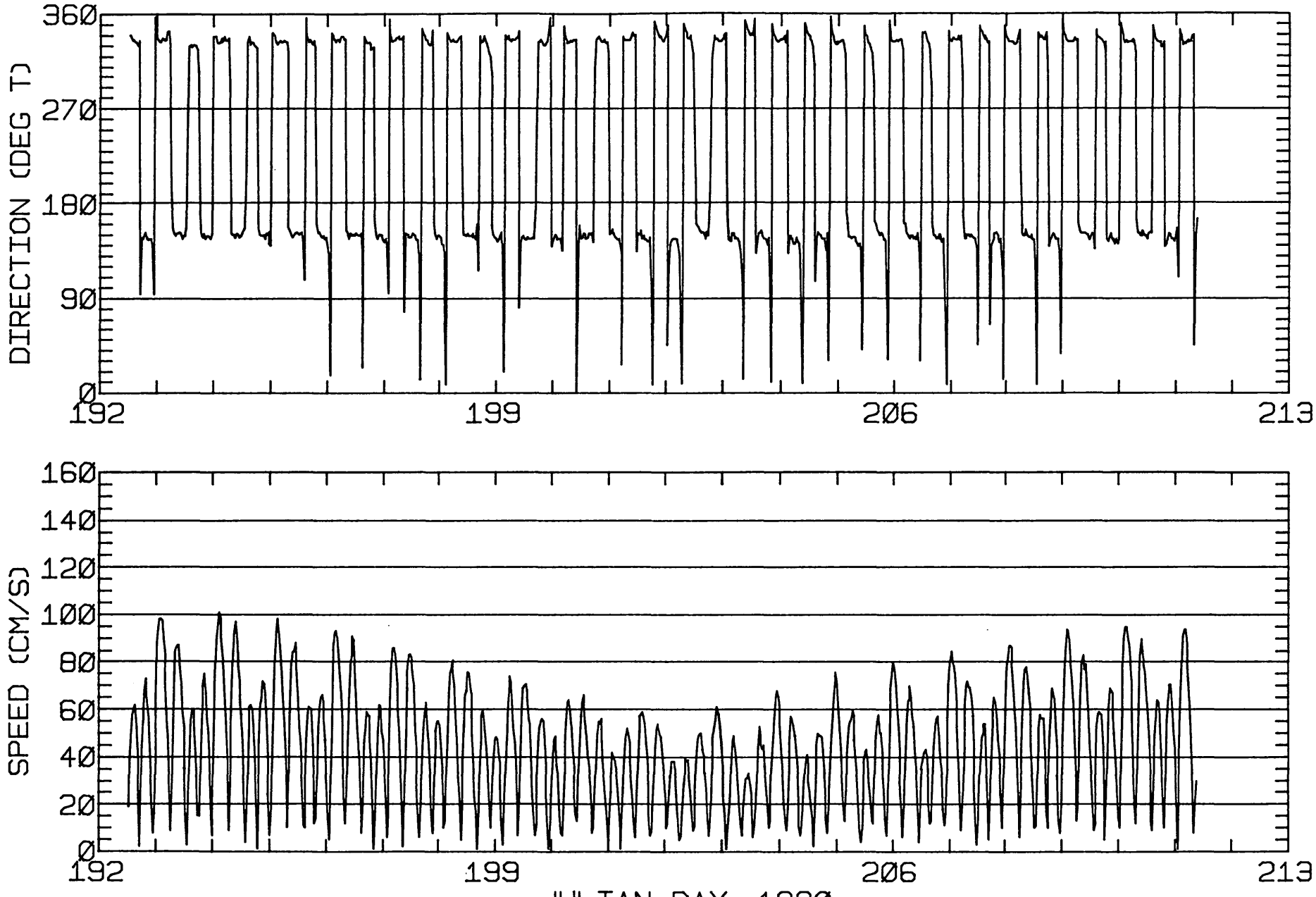
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.41	0.30	155.1	14.5	ANTI-CLOCKWISE
K1	21.51	0.39	154.6	39.3	CLOCKWISE
N2	10.33	0.02	155.3	274.8	CLOCKWISE
M2	66.52	1.59	152.5	284.4	ANTI-CLOCKWISE
S2	11.81	0.13	149.6	315.4	CLOCKWISE
M4	2.21	0.75	154.3	118.6	ANTI-CLOCKWISE

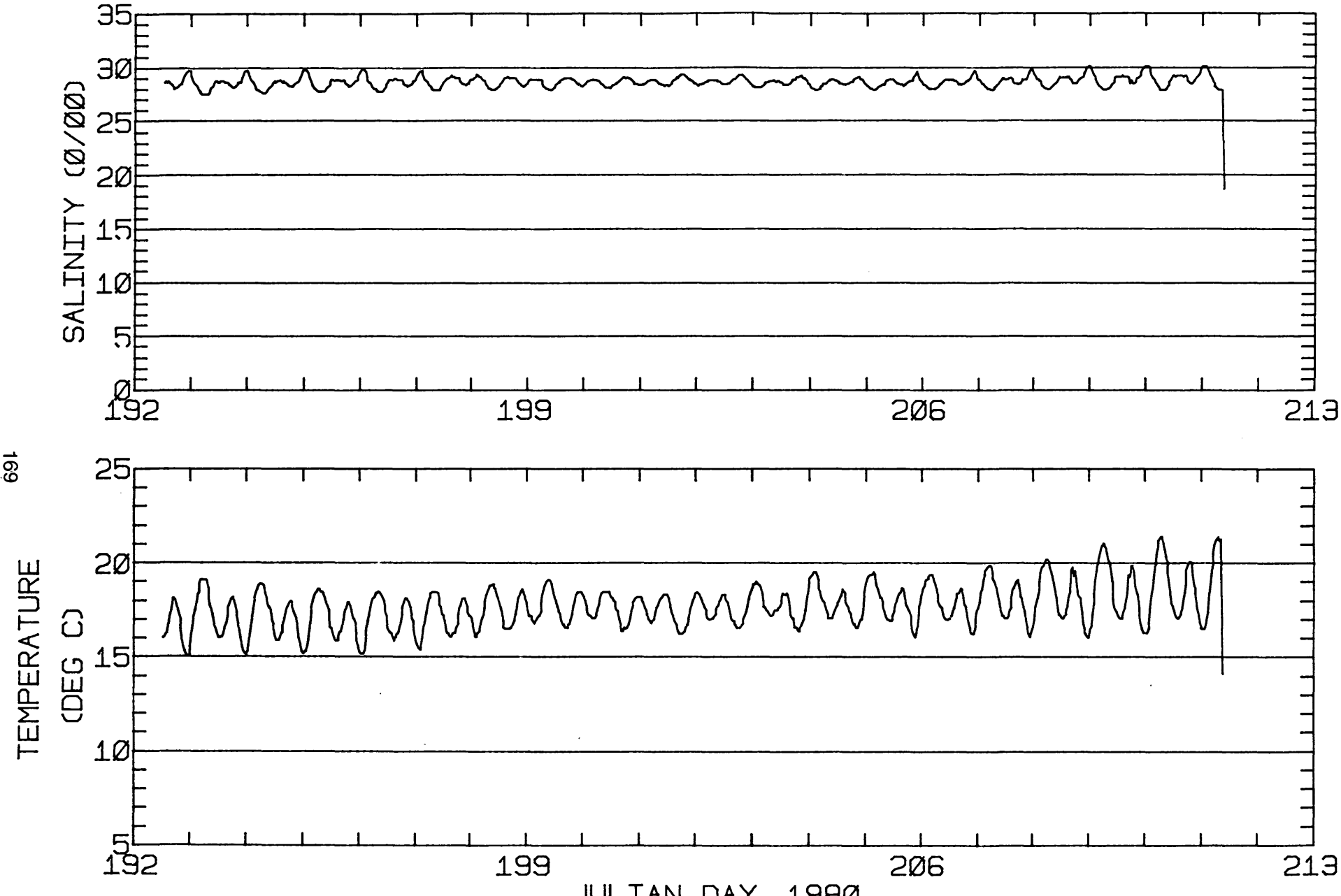
RMS SPEED: 50.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 109.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 42.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 152.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 4.05 CM/SEC
STANDARD DEVIATION V SERIES: 5.97 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.2	1.5	277.
2	12	2.1	2.0	293.
3	12	2.2	1.7	308.
ALL	36	2.2	1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 7 37-43-23N 122-19-26W
METER 006.1 METERS ABOVE BED. WATER DEPTH 012.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 7 37-43-23N 122-19-26W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø12.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 7
POSITION: 37 43'23"N 122 19'26"W
METER TYPE: AANDERAA
WATER DEPTH: 12.5 M (MLLW)
METER DEPTH: 11.0 M (BELOW MLLW)
START TIME OF SERIES: 7/10/80 1252 PST JULIAN DAY=192
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

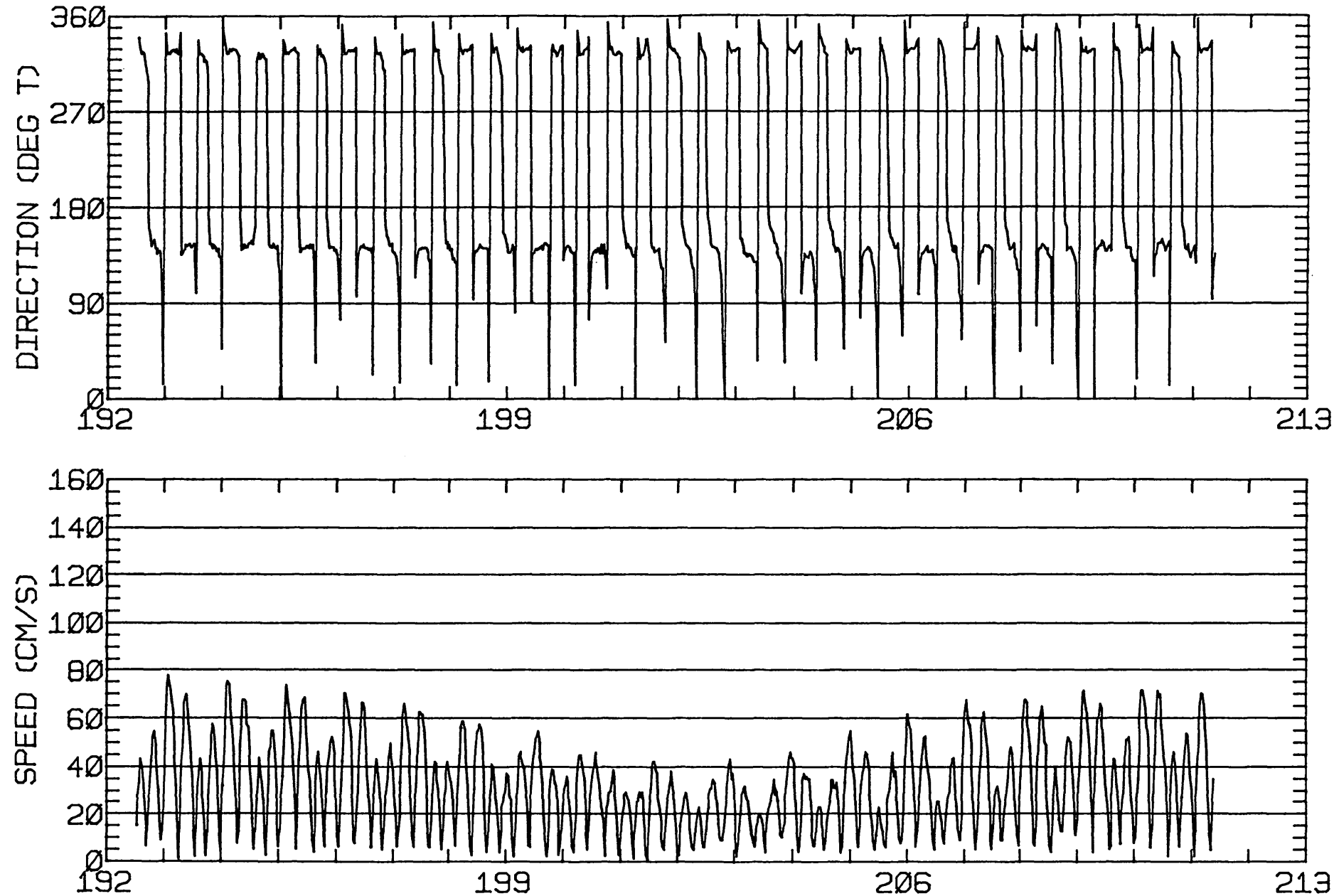
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.46	0.61	154.1	29.0	CLOCKWISE
K1	16.23	0.90	148.6	42.6	CLOCKWISE
N2	8.27	0.01	149.1	274.3	ANTI-CLOCKWISE
M2	47.25	2.28	145.2	283.4	ANTI-CLOCKWISE
S2	9.61	0.26	143.7	315.8	CLOCKWISE
M4	1.40	0.44	156.3	57.1	ANTI-CLOCKWISE

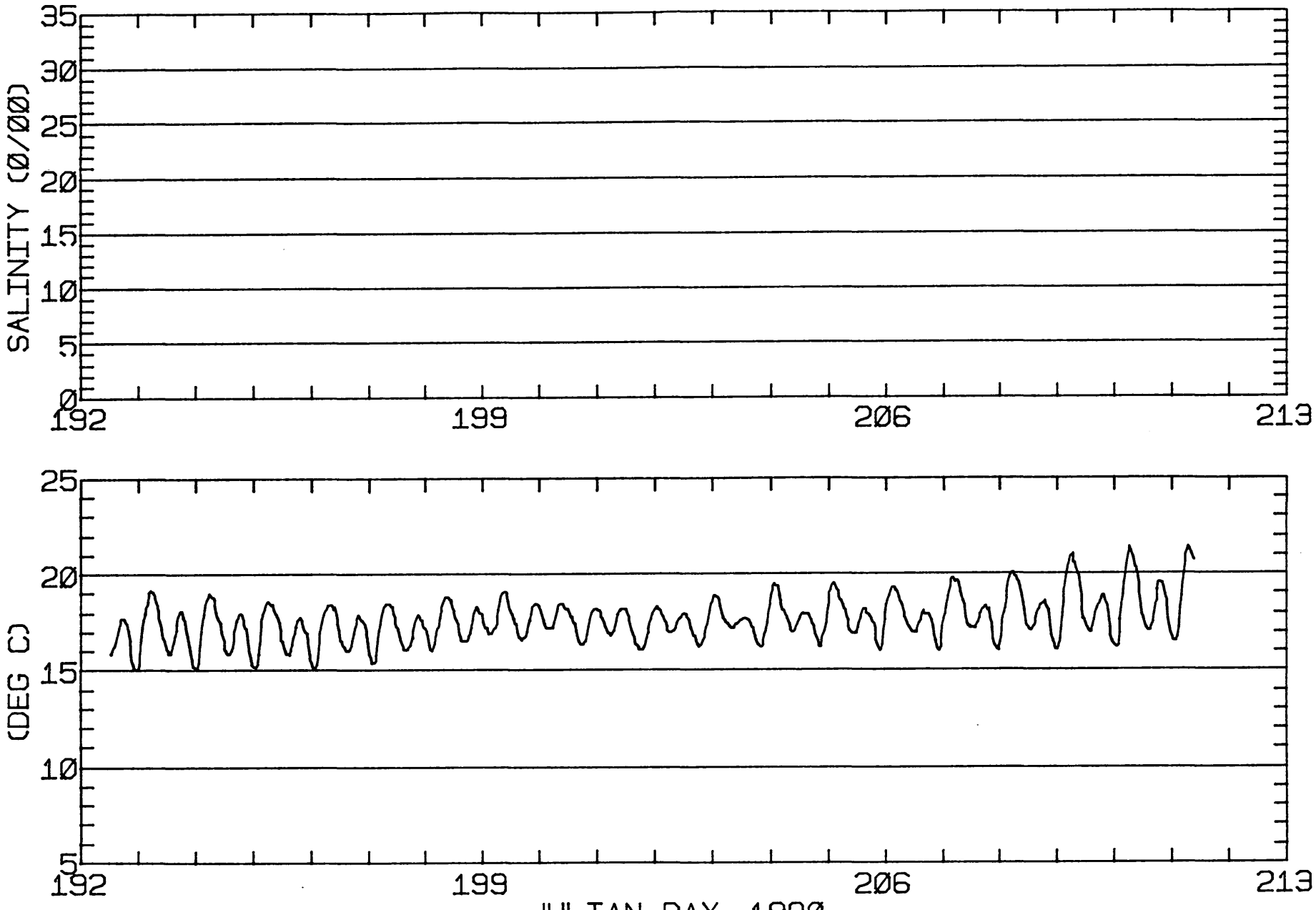
RMS SPEED: 36.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 81.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 146.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 3.29 CM/SEC
STANDARD DEVIATION V SERIES: 4.13 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.4	-0.5	277.
2	12	2.7	-0.1	293.
3	12	3.6	-0.9	308.
ALL	36	2.9	-0.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 7 37-43-23N 122-19-26W
METER 001.5 METERS ABOVE BED. WATER DEPTH 012.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 7 37-43-23N 122-19-26W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø12.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 7
POSITION: 37 43'22"N 122 19'26"W
METER TYPE: AANDERAA
WATER DEPTH: 12.5 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 7/29/80 1100 PST JULIAN DAY=211
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

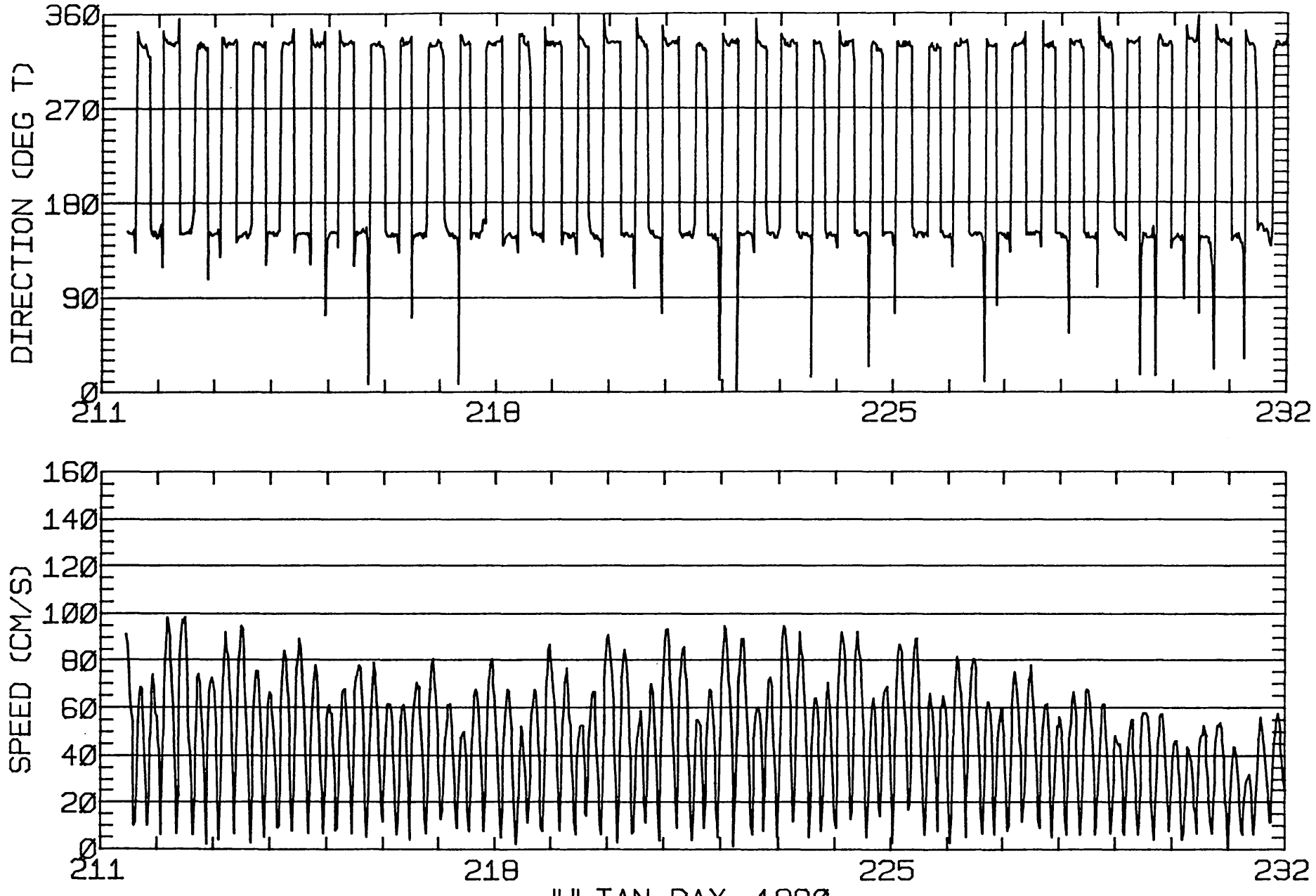
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.68	0.06	153.9	23.2	ANTI-CLOCKWISE
K1	20.34	0.79	152.1	47.9	CLOCKWISE
N2	12.75	0.24	153.0	283.6	CLOCKWISE
M2	66.27	0.89	151.3	286.0	ANTI-CLOCKWISE
S2	17.97	0.11	149.4	305.5	ANTI-CLOCKWISE
M4	1.38	0.07	150.3	117.8	ANTI-CLOCKWISE

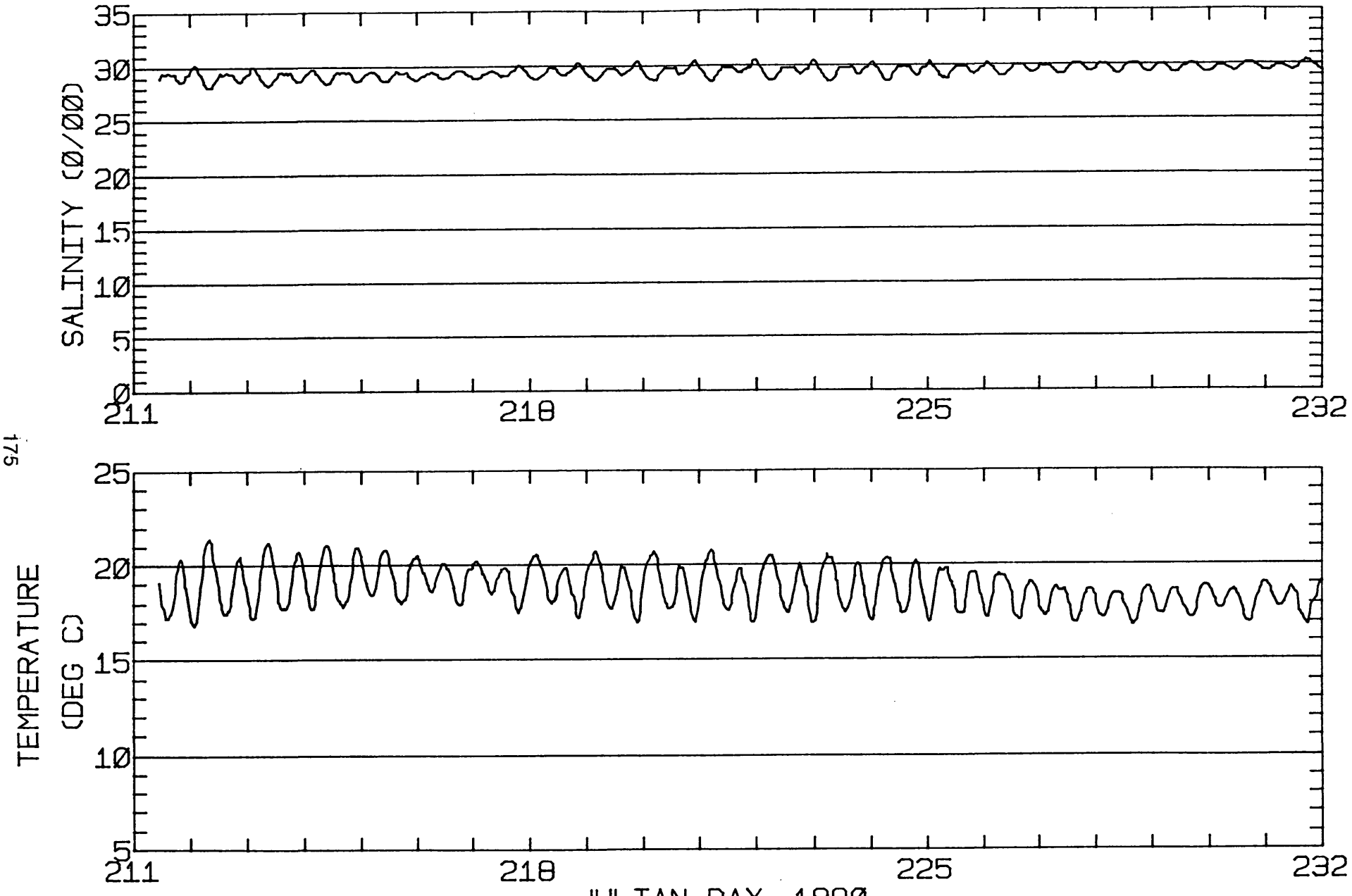
RMS SPEED: 52.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 114.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 37.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 151.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 3.92 CM/SEC
STANDARD DEVIATION V SERIES: 5.74 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.1	-1.2	227.
2	12	1.0	0.8	154.
3	12	1.0	-0.2	107.
4	4	1.1	1.0	66.
ALL	40	1.1	-0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 7 37-43-22N 122-19-26W
METER 006.1 METERS ABOVE BED. WATER DEPTH 012.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 7 37-43-22N 122-19-26W
METER ØØ6.1 METERS ABOVE BED. WATER DEPTH Ø12.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 8
POSITION: 37 44'44"N 122 16'59"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 7/13/80 840 PST JULIAN DAY=195
APPROXIMATE RECORD LENGTH IS 22 M2-CYCLES

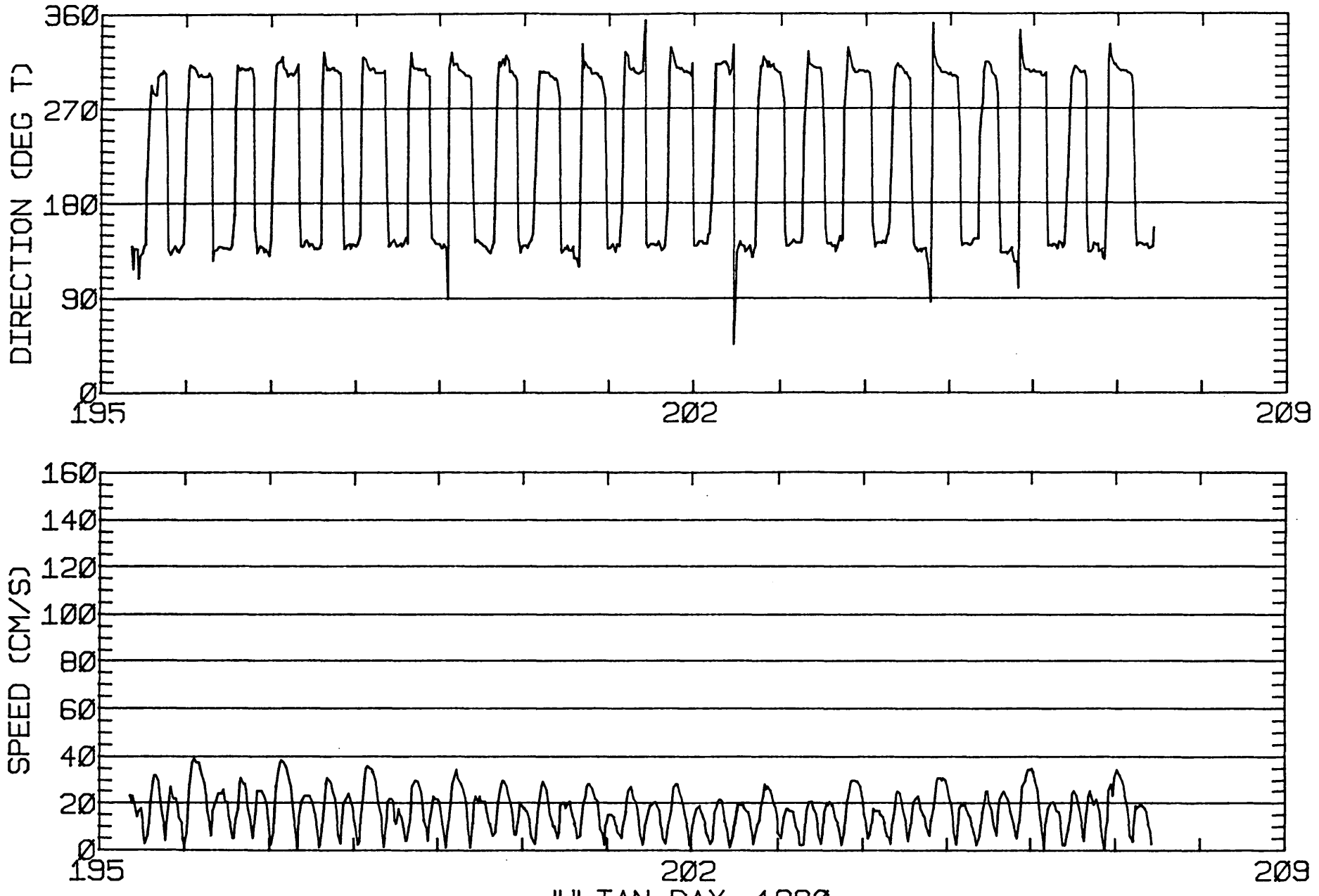
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.79	0.41	134.8	36.7	ANTI-CLOCKWISE
K1	7.13	0.57	131.3	33.1	ANTI-CLOCKWISE
N2	4.31	0.76	122.7	280.4	CLOCKWISE
M2	28.35	0.58	130.2	255.7	ANTI-CLOCKWISE
S2	4.73	0.71	127.7	291.8	CLOCKWISE
M4	1.54	0.44	112.3	22.9	CLOCKWISE

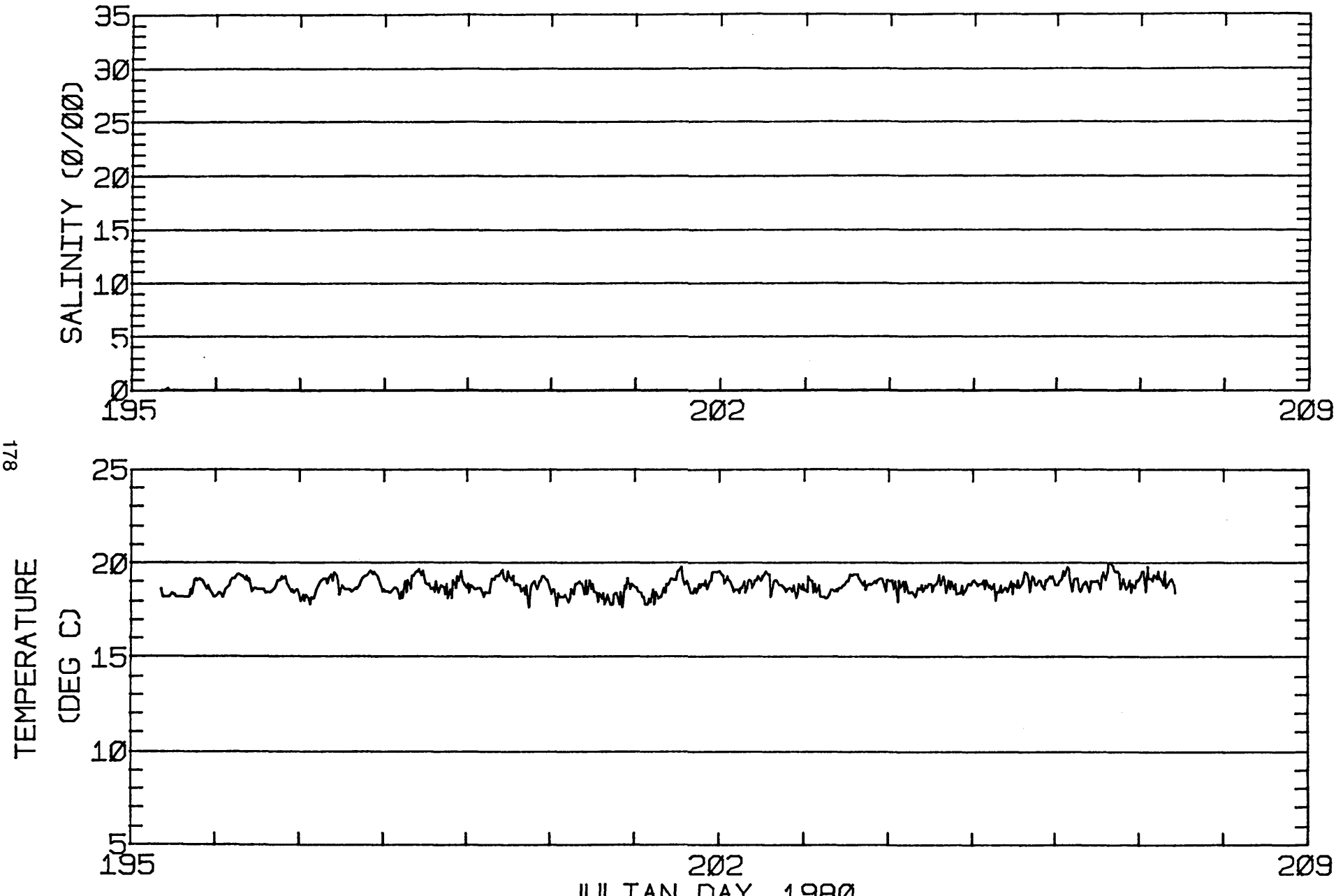
RMS SPEED: 19.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 44.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 20.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 130.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 2.74 CM/SEC
STANDARD DEVIATION V SERIES: 3.03 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.9	0.7	278.
2	10	-3.2	0.6	299.
ALL	22	-3.6	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 8 37-44-44N 122-16-59W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 8 37-44-44N 122-16-59W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 8
POSITION: 37 44'44"N 122 16'59"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 7/25/80 1040 PST JULIAN DAY=207
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

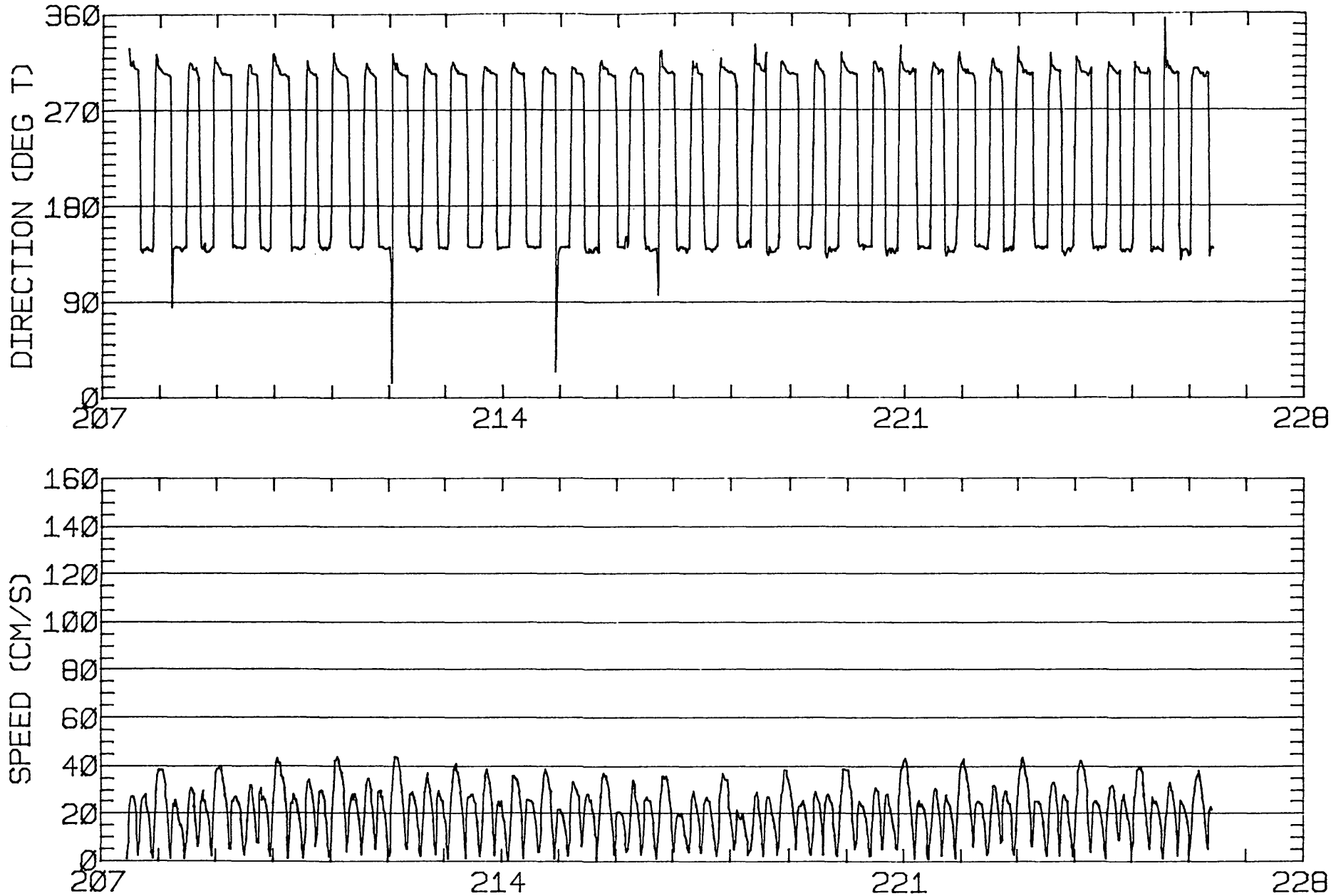
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.06	0.36	127.9	42.7	ANTI-CLOCKWISE
K1	7.57	0.40	131.4	44.3	ANTI-CLOCKWISE
N2	5.68	0.06	135.1	236.6	ANTI-CLOCKWISE
M2	27.29	0.92	133.0	257.2	ANTI-CLOCKWISE
S2	5.80	0.38	132.3	271.6	ANTI-CLOCKWISE
M4	1.94	0.47	104.3	32.9	CLOCKWISE

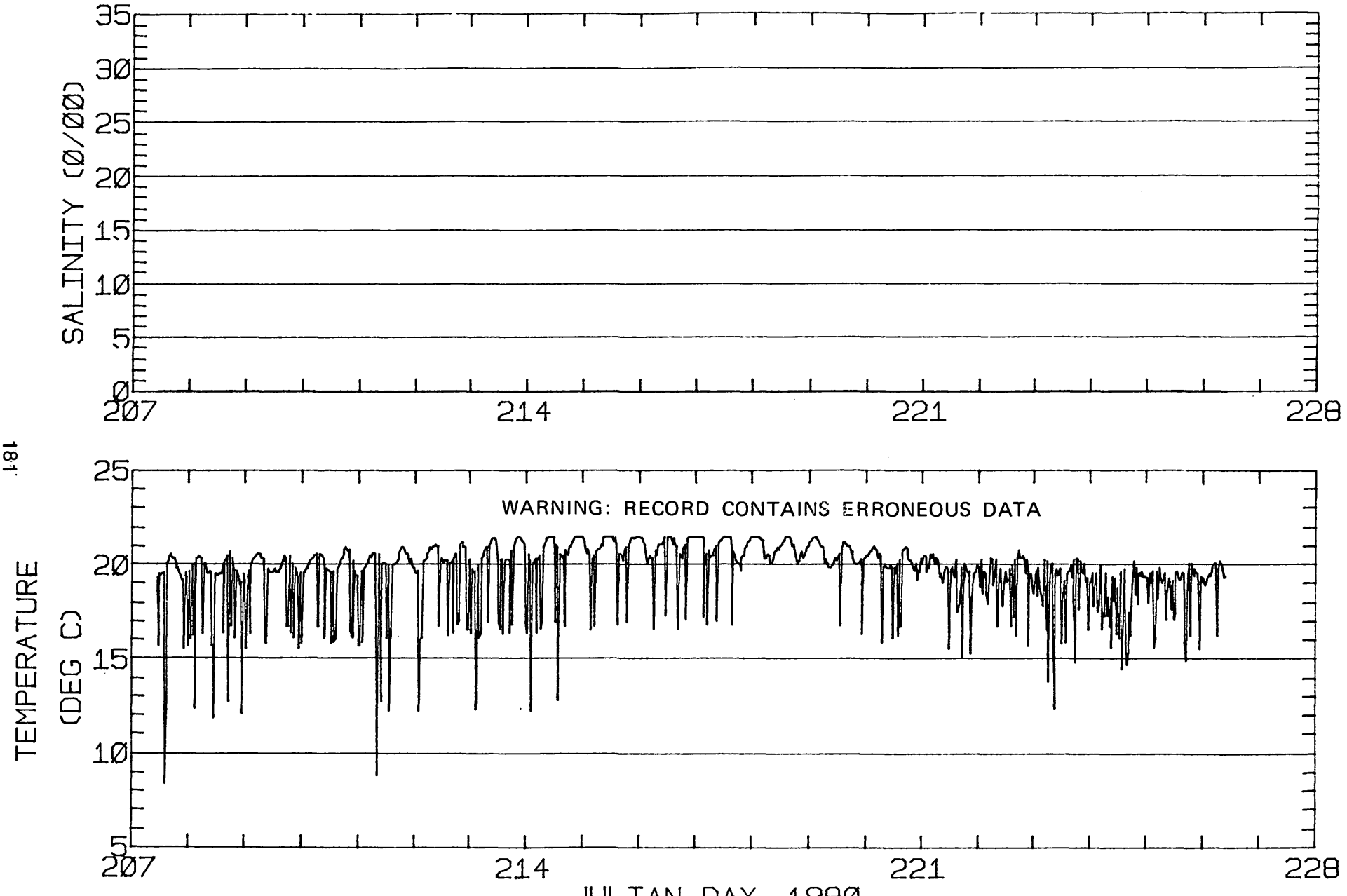
RMS SPEED: 24.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 44.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 132.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 2.96 CM/SEC
STANDARD DEVIATION V SERIES: 3.32 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.7	0.7	307.
2	12	-4.2	0.6	183.
3	12	-5.0	1.6	142.
ALL	36	-4.6	1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 8 37-44-44N 122-16-59W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 8 37-44-44N 122-16-59W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 9
POSITION: 37 39'56"N 122 19'18"W
METER TYPE: AANDERAA
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 3/ 8/79 1500 PST JULIAN DAY= 67
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

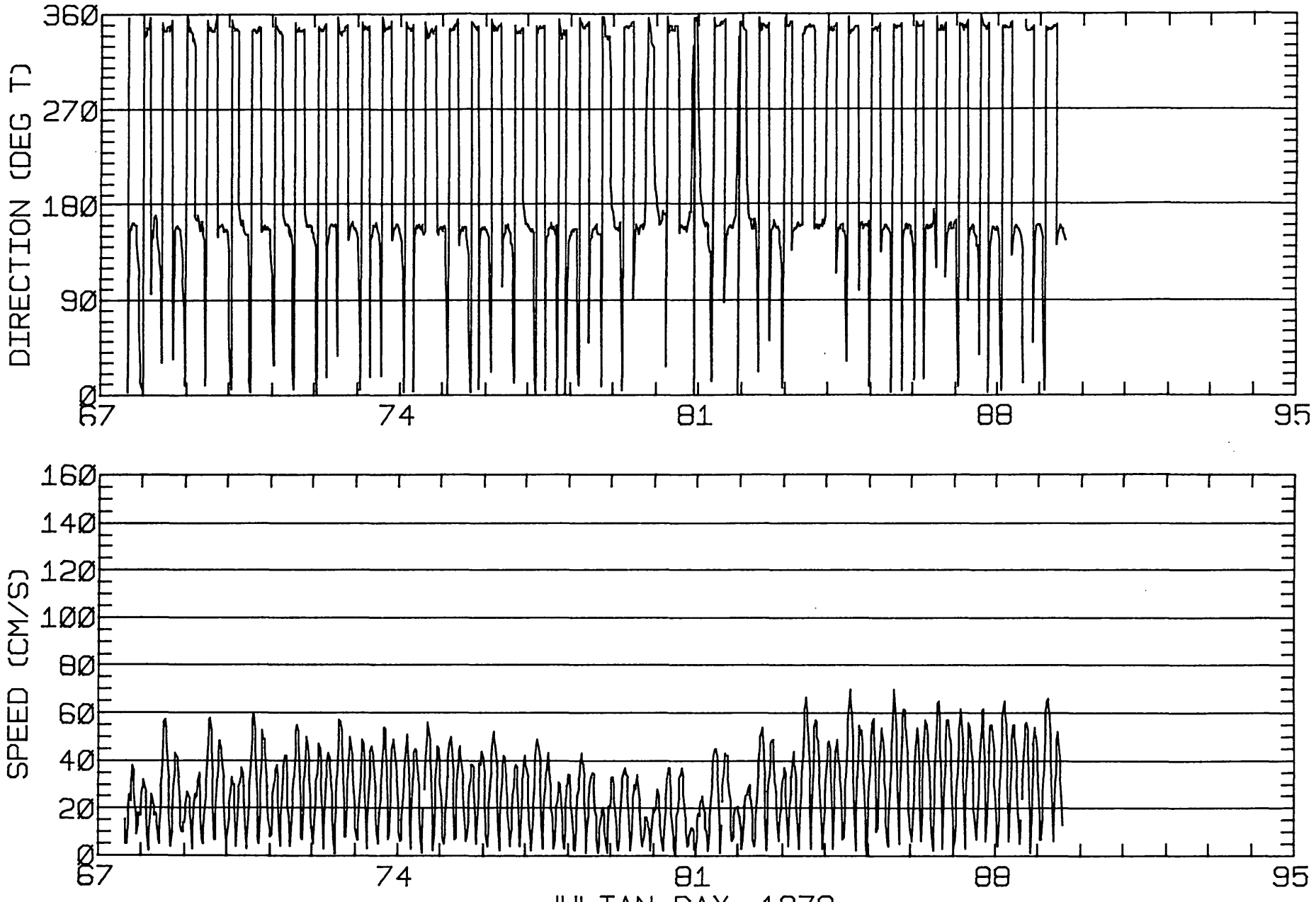
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.09	1.20	165.1	21.4	CLOCKWISE
K1	7.20	0.21	167.8	43.9	CLOCKWISE
N2	7.88	0.30	162.2	256.0	CLOCKWISE
M2	39.13	0.54	162.8	286.3	ANTI-CLOCKWISE
S2	13.15	0.30	161.9	302.5	ANTI-CLOCKWISE
M4	4.11	0.06	162.7	116.6	CLOCKWISE

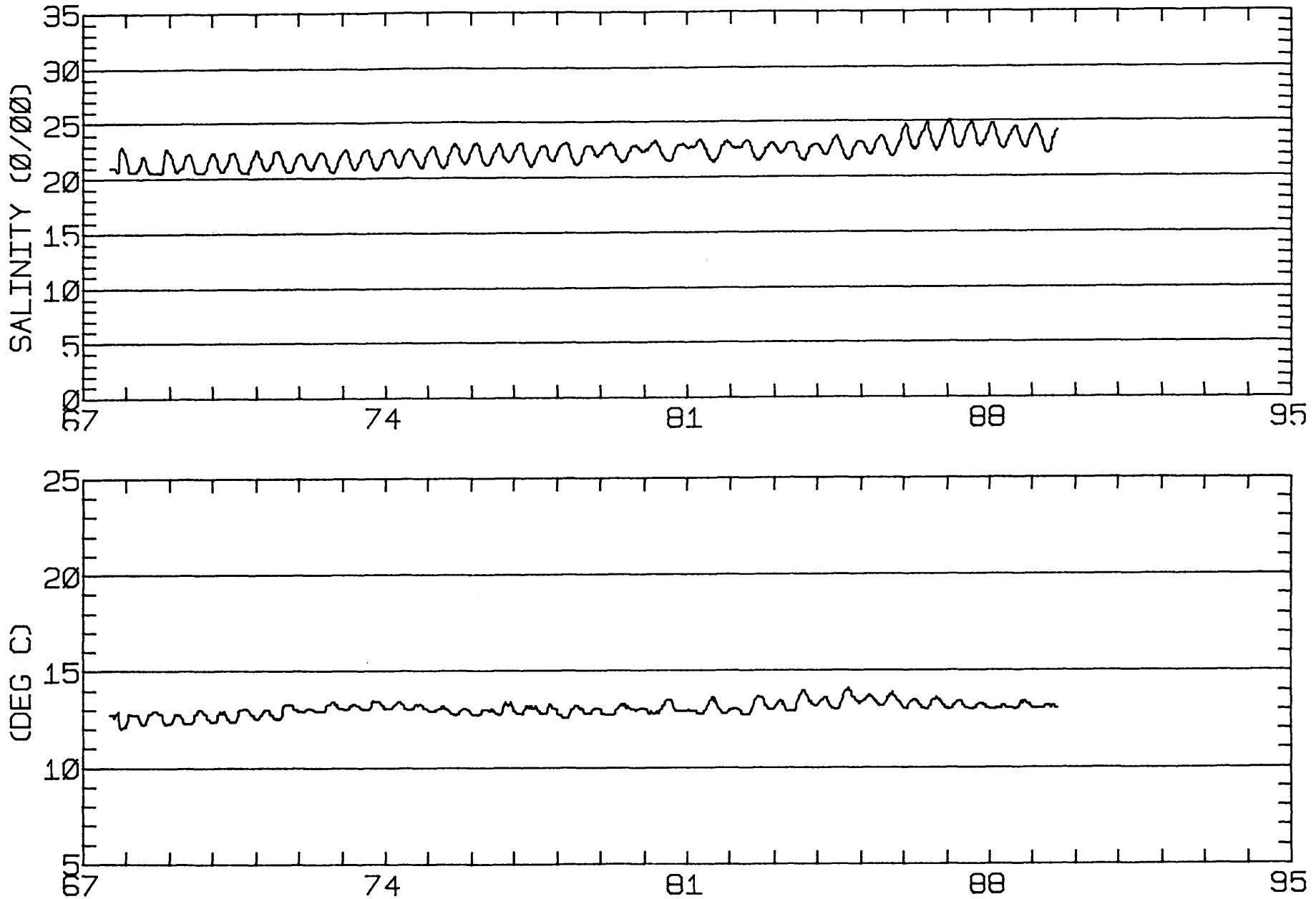
RMS SPEED: 33.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 66.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 163.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 2.57 CM/SEC
STANDARD DEVIATION V SERIES: 5.50 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.3	2.3	938.
2	12	2.4	-0.1	814.
3	12	2.0	0.9	754.
4	6	2.9	3.0	931.
ALL	42	2.3	1.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-39-56N 122-19-18W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.6 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 9 37-39-56N 122-19-18W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ7.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 9
POSITION: 37 40'20"N 122 19' 2"W
METER TYPE: AANDERAA
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:12/18/79 1030 PST JULIAN DAY=352
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

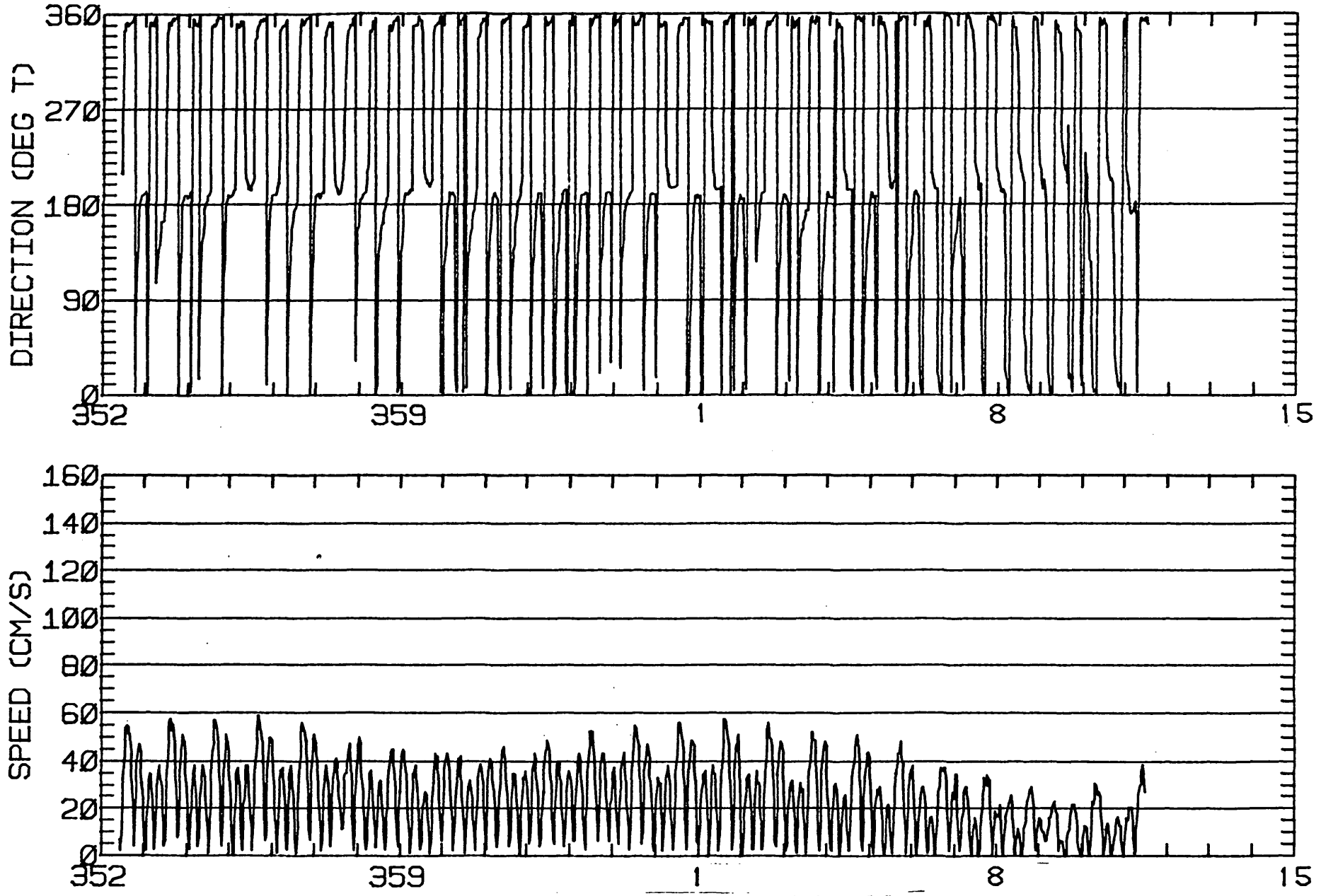
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.72	0.05	179.2	27.6	ANTI-CLOCKWISE
K1	13.00	0.93	178.9	35.5	CLOCKWISE
N2	7.05	0.79	173.1	270.6	CLOCKWISE
M2	35.00	3.19	177.5	282.3	CLOCKWISE
S2	6.96	0.26	180.5	288.7	CLOCKWISE
M4	3.07	1.31	96.4	75.7	CLOCKWISE

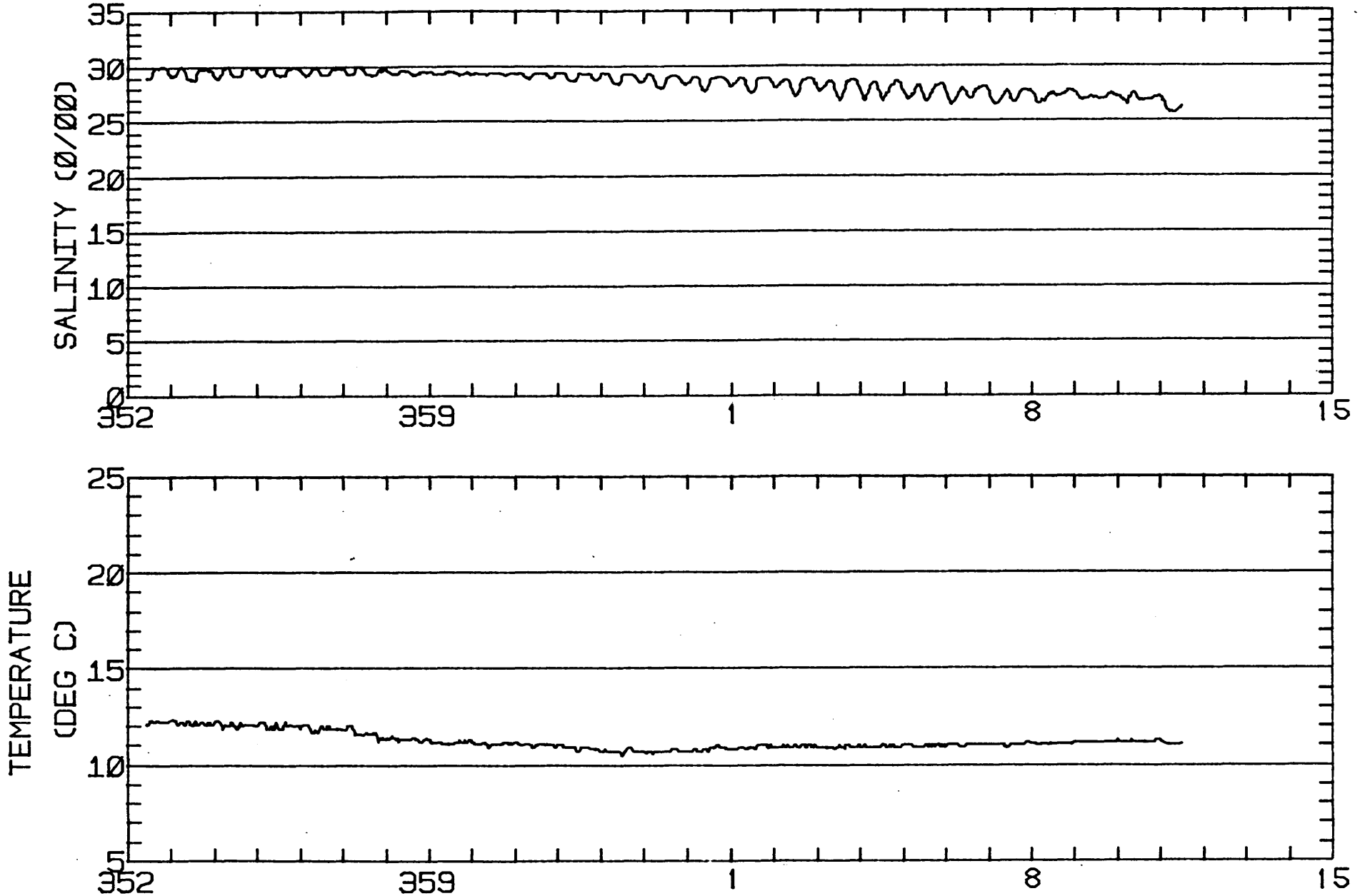
RMS SPEED: 31.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 60.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 20.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 178.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.45
STANDARD DEVIATION U-SERIES: 5.08 CM/SEC
STANDARD DEVIATION V SERIES: 4.29 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.0	2.4	329.
2	12	-0.5	3.4	1329.
3	12	-1.8	4.2	1202.
ALL	36	-1.4	3.3	



JULIAN DAY, 1979/1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-20N 122-19- 2W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-20N 122-19- 2W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 9
POSITION: 37 40'40"N 122 18'58"W
METER TYPE: AANDERAA
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 1/11/80 1400 PST JULIAN DAY= 11
APPROXIMATE RECORD LENGTH IS 22 M2-CYCLES

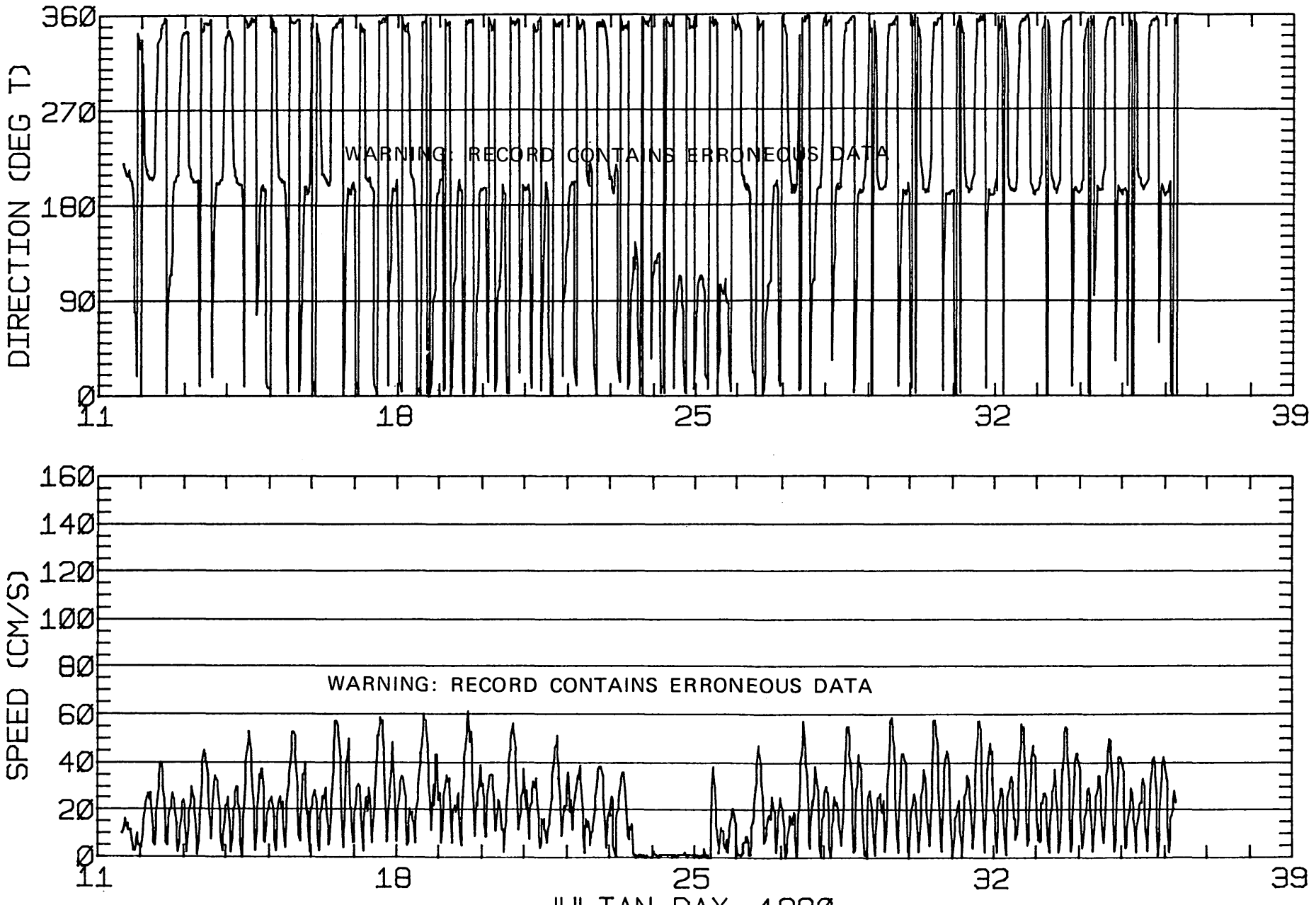
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.49	0.97	169.5	14.2	CLOCKWISE
K1	12.93	1.27	187.7	45.2	CLOCKWISE
N2	2.49	2.13	137.2	247.8	CLOCKWISE
M2	28.61	0.36	177.5	269.7	CLOCKWISE
S2	6.22	0.49	178.5	272.8	ANTI-CLOCKWISE
M4	3.69	0.64	92.6	29.4	CLOCKWISE

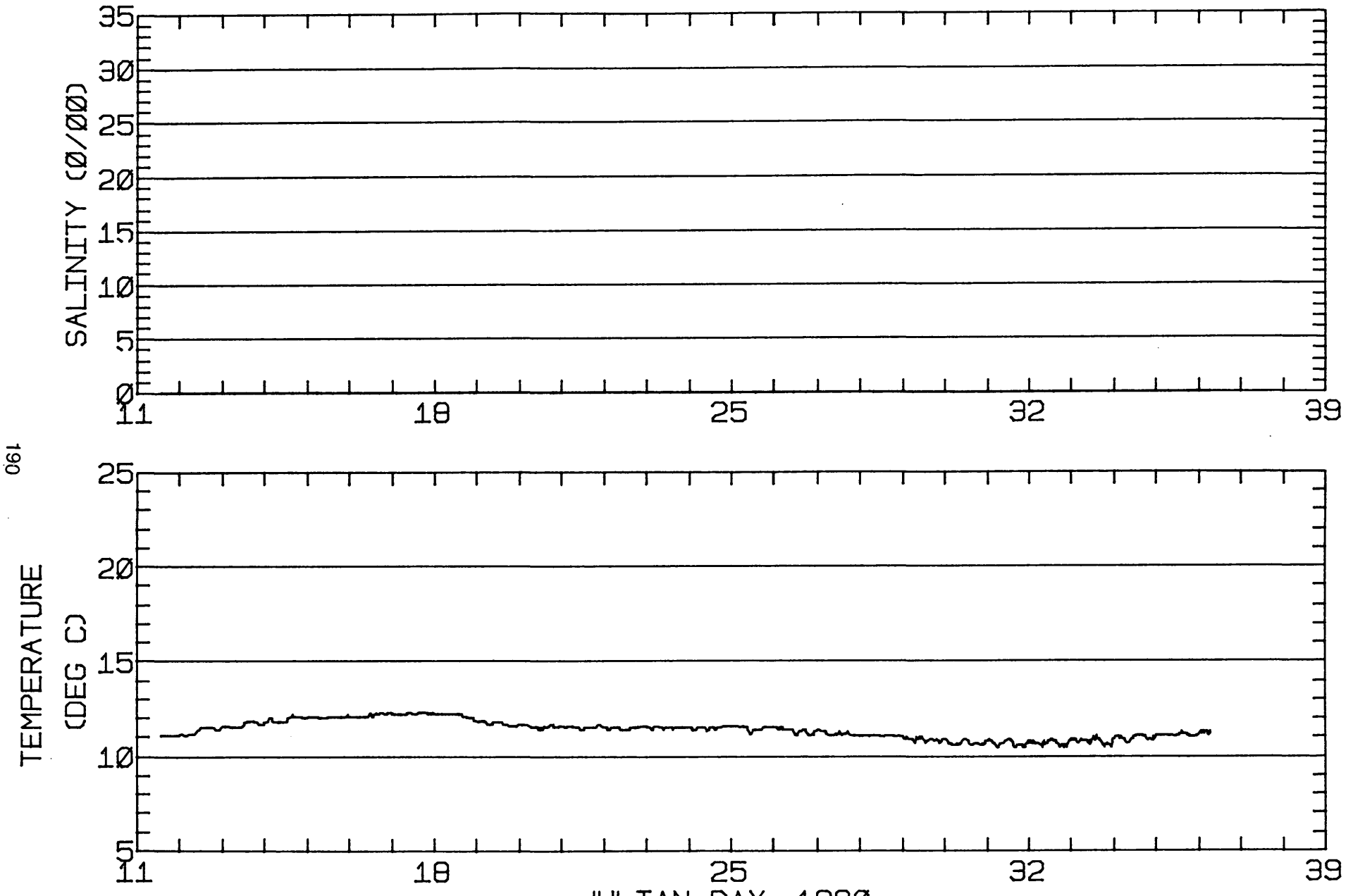
RMS SPEED: 28.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 54.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 16.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 179.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.56
STANDARD DEVIATION U-SERIES: 6.20 CM/SEC
STANDARD DEVIATION V SERIES: 6.65 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-4.1	5.0	4749.
2	10	-0.8	10.5	6910.
ALL	22	-2.6	7.5	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-40N 122-18-58W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.5 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 9 37-4Ø-4ØN 122-18-58W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 9
POSITION: 37 40'42"N 122 19' 3"W
METER TYPE: AANDERAA
WATER DEPTH: 8.2 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 3/13/80 1330 PST JULIAN DAY= 73
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

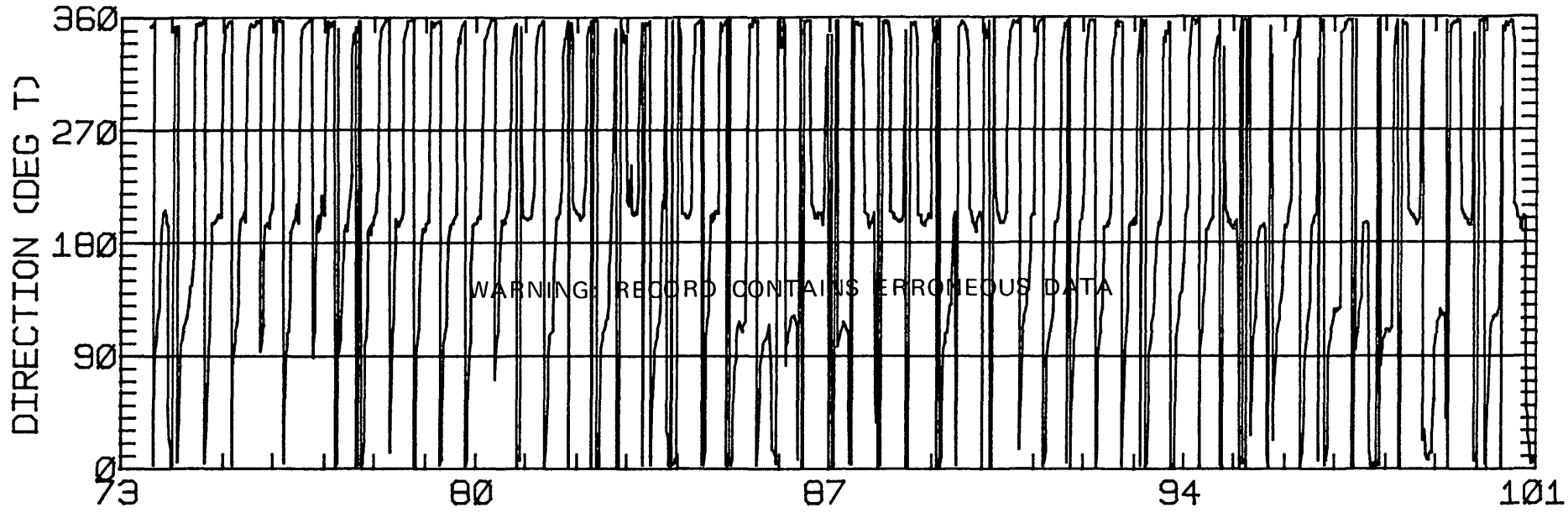
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

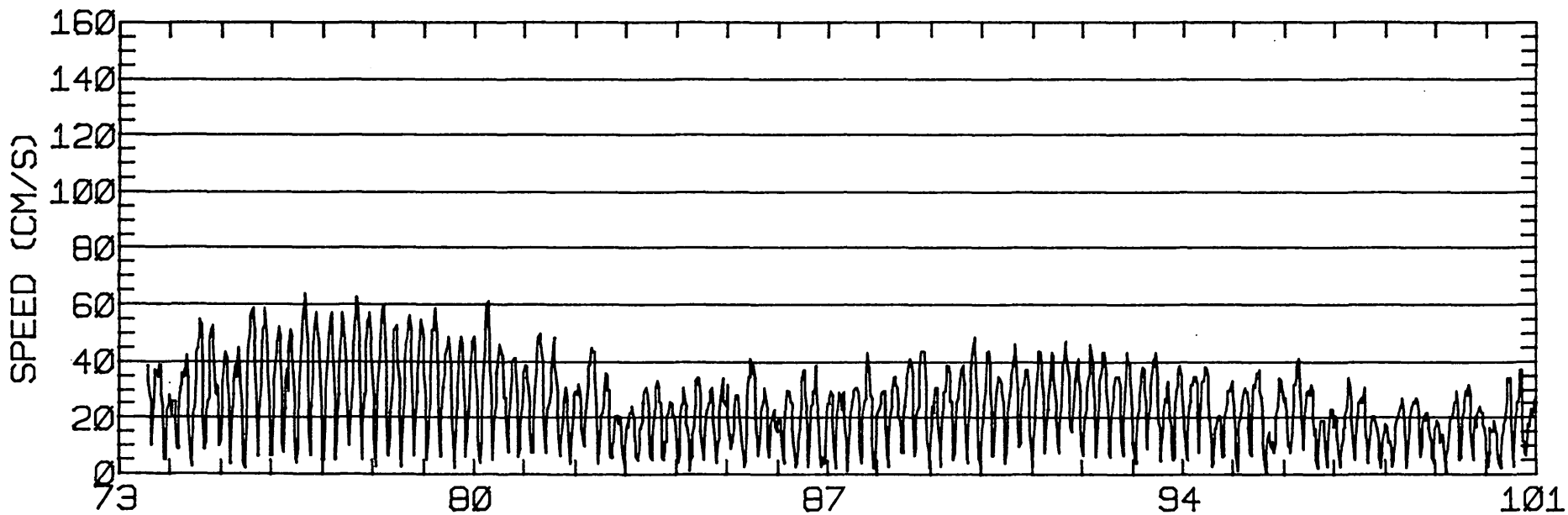
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.56	1.33	137.6	35.2	ANTI-CLOCKWISE
K1	4.96	0.18	212.3	21.2	ANTI-CLOCKWISE
N2	8.29	0.64	172.4	257.9	CLOCKWISE
M2	31.21	5.57	176.5	280.9	CLOCKWISE
S2	10.67	3.55	176.3	300.1	CLOCKWISE
M4	3.66	0.01	91.6	76.1	CLOCKWISE

RMS SPEED: 28.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 50.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 19.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 177.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.20
STANDARD DEVIATION U-SERIES: 9.45 CM/SEC
STANDARD DEVIATION V SERIES: 7.28 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	3.1	2648.
2	12	0.2	3.7	2018.
3	12	0.3	2.3	1490.
4	12	2.9	0.8	1048.
5	4	1.2	2.1	1150.
ALL	52	0.9	2.5	



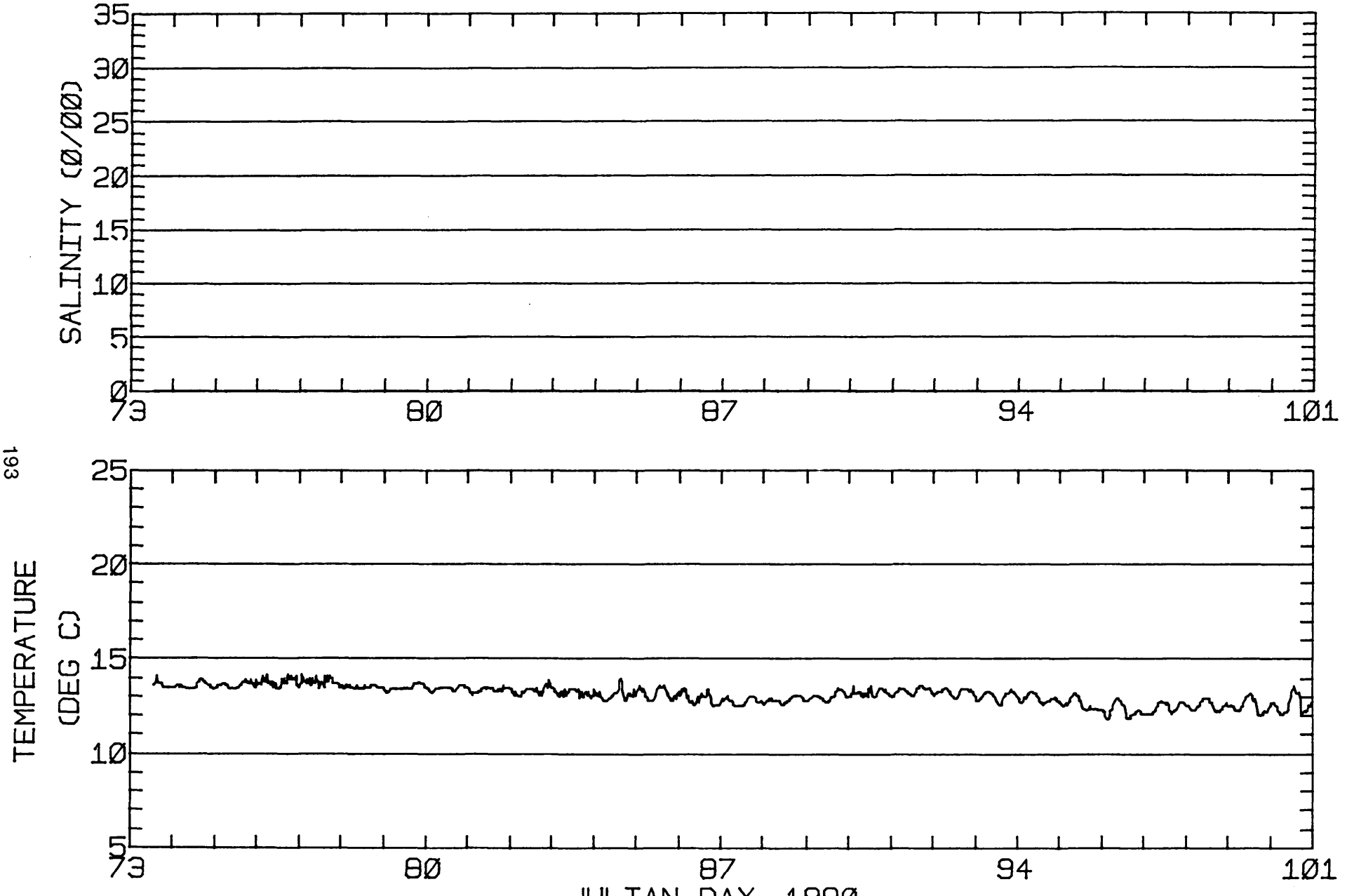


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 9 37-40-42N 122-19- 3W

METER 001.5 METERS ABOVE BED. WATER DEPTH 008.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-42N 122-19- 3W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 9
POSITION: 37 40'41"N 122 19' 3"W
METER TYPE: AANDERAA
WATER DEPTH: 7.0 M (MLLW)
METER DEPTH: 5.5 M (BELOW MLLW)
START TIME OF SERIES: 4/10/80 1540 PST JULIAN DAY=101
APPROXIMATE RECORD LENGTH IS 58 M2-CYCLES

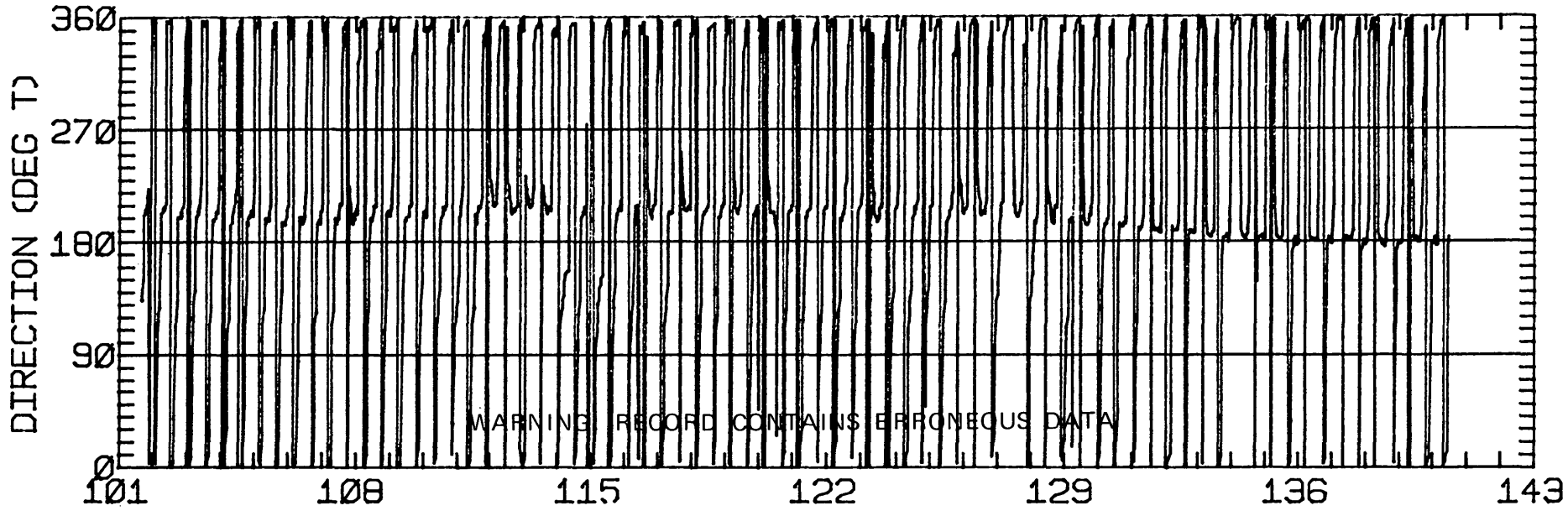
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

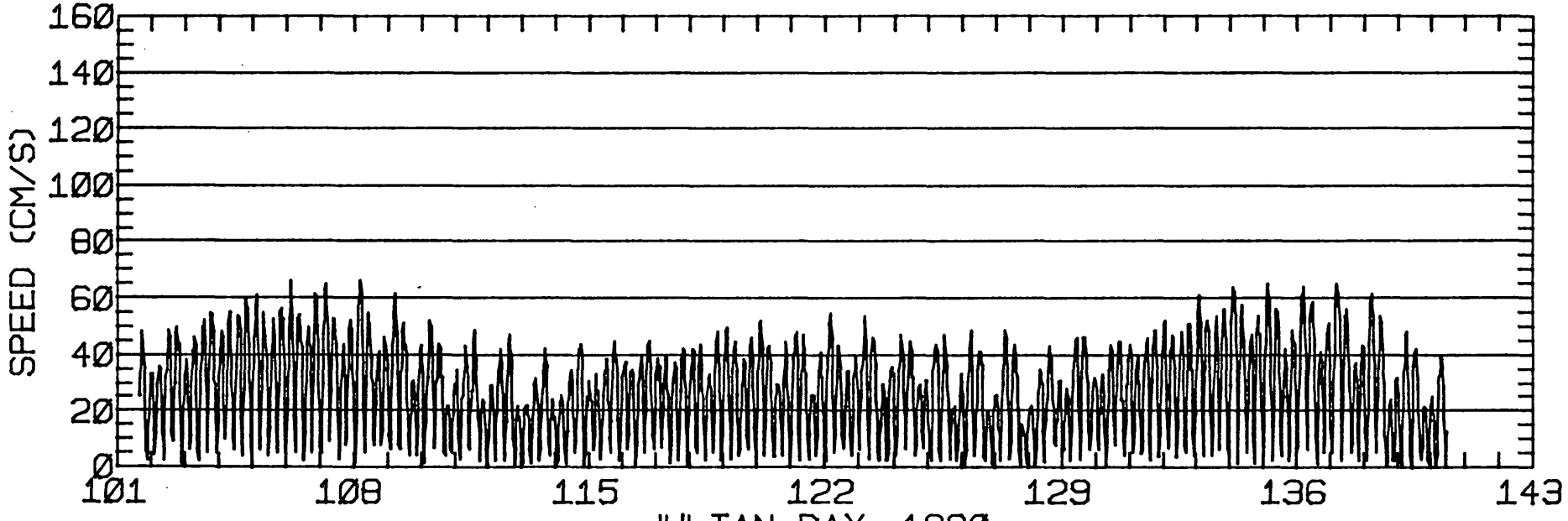
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.62	2.25	187.3	13.3	ANTI-CLOCKWISE
K1	9.69	0.79	196.6	9.6	ANTI-CLOCKWISE
N2	7.93	1.06	184.3	254.7	CLOCKWISE
M2	36.19	5.19	185.4	283.6	CLOCKWISE
S2	9.39	1.62	185.7	281.9	CLOCKWISE
M4	4.02	1.58	100.9	56.3	CLOCKWISE

RMS SPEED: 30.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 60.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 187.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 6.79 CM/SEC
STANDARD DEVIATION V SERIES: 4.27 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.3	0.1	790.
2	12	-4.3	0.2	693.
3	12	-2.4	1.9	651.
4	12	-3.4	0.9	579.
5	10	-3.6	0.1	532.
ALL	58	-3.4	0.7	



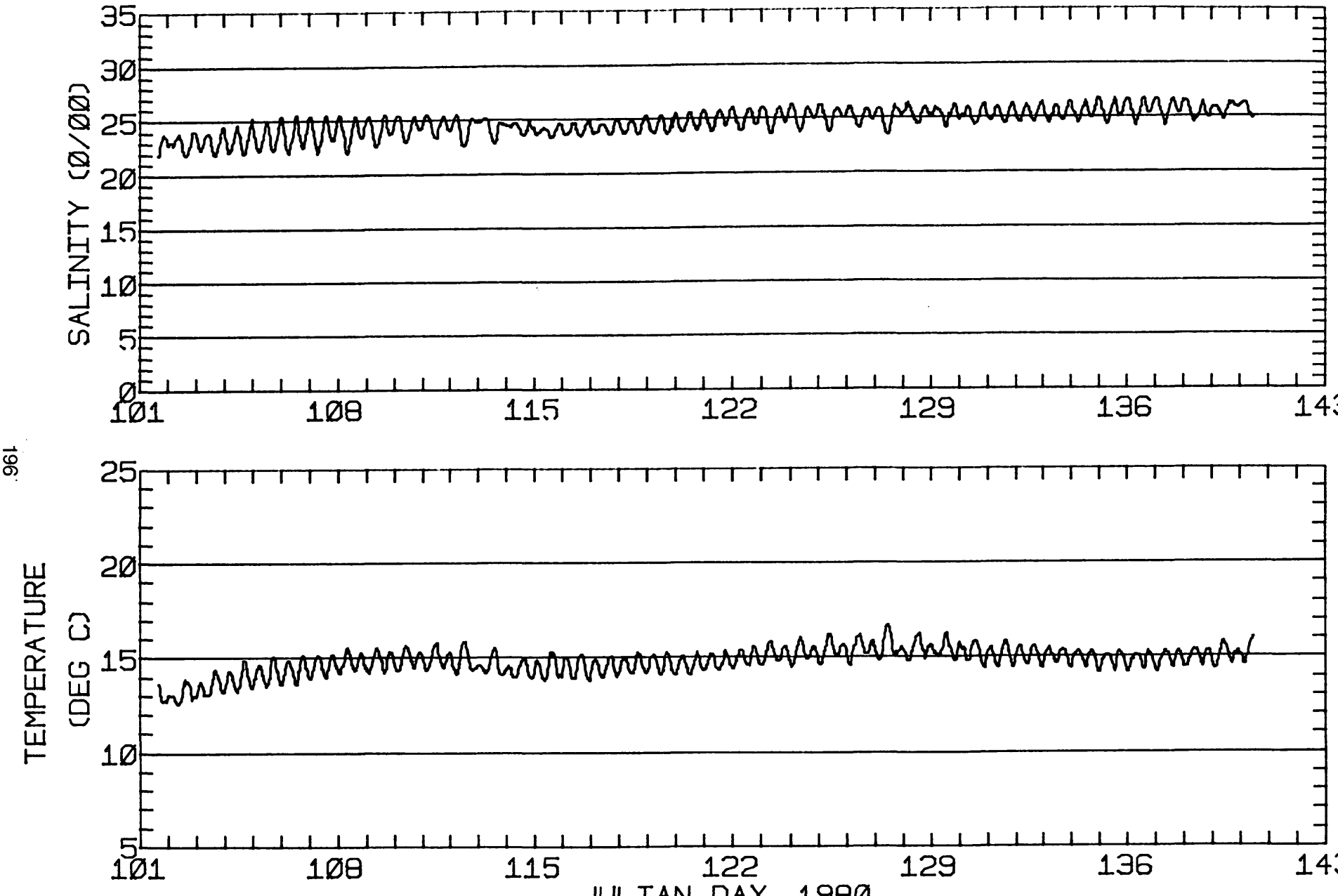


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 9 37-40-41N 122-19- 3W

METER 001.5 METERS ABOVE BED. WATER DEPTH 007.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-41N 122-19- 3W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ7.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 9
POSITION: 37 40'43"N 122 19' 0"W
METER TYPE: AANDERAA
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 6/20/80 1015 PST JULIAN DAY=172
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

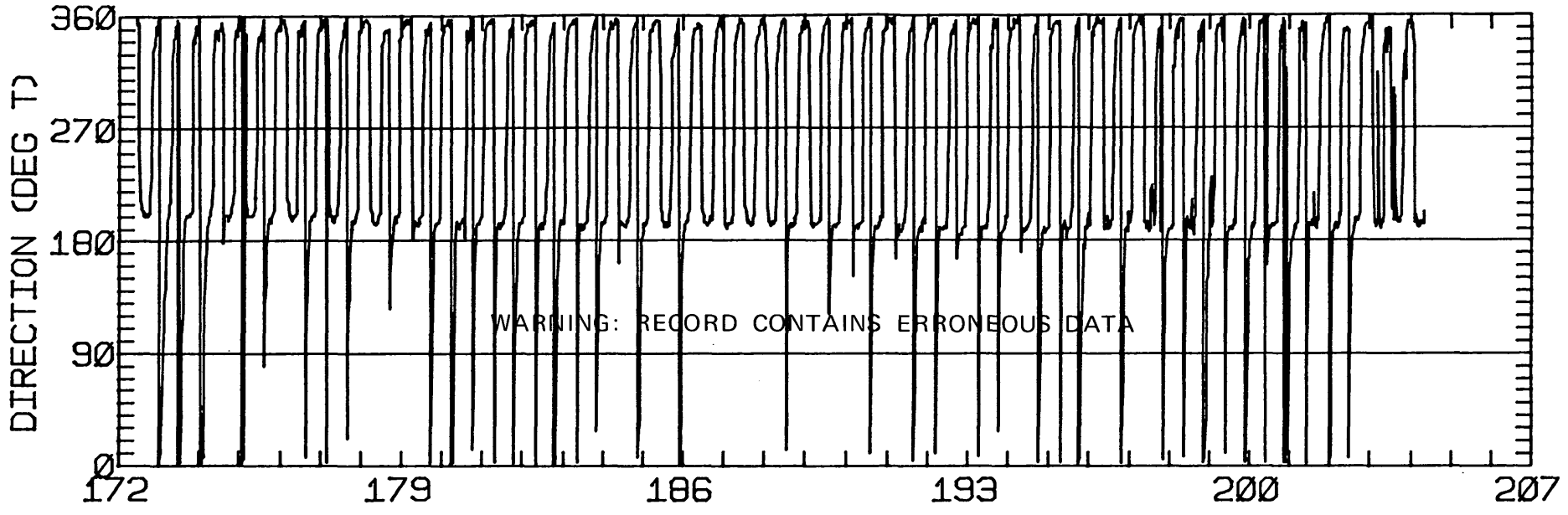
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

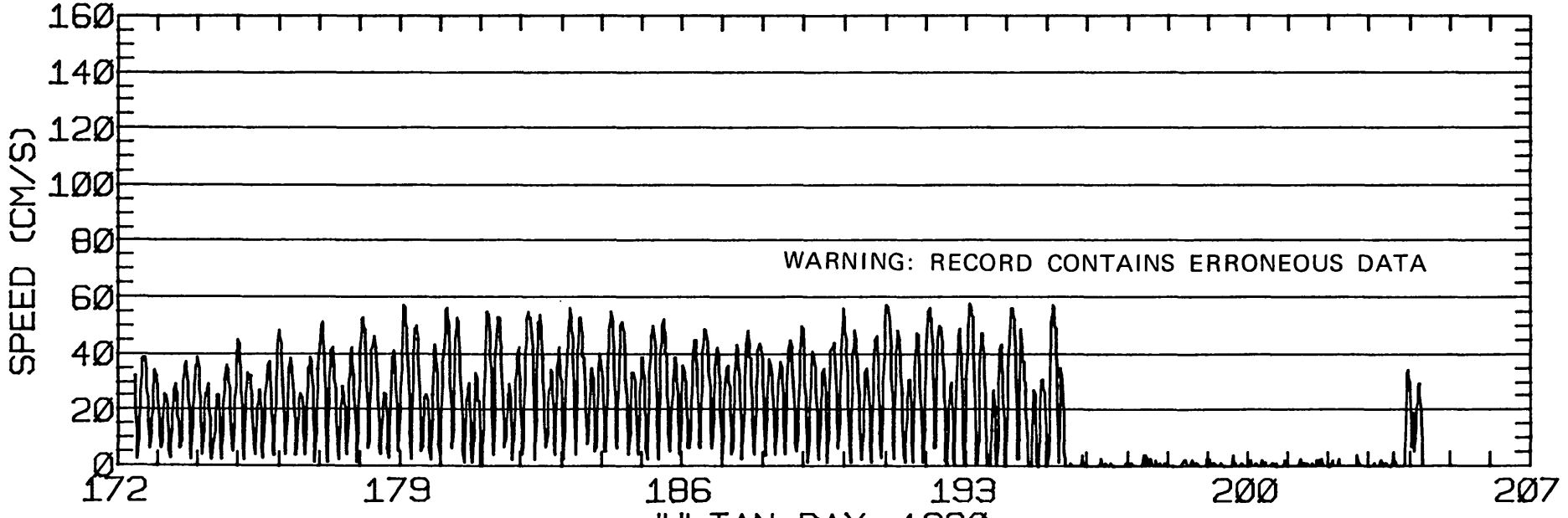
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.24	1.69	177.8	17.0	ANTI-CLOCKWISE
K1	14.15	0.94	185.4	31.9	ANTI-CLOCKWISE
N2	5.82	0.27	180.7	246.4	ANTI-CLOCKWISE
M2	39.62	2.43	183.7	283.7	CLOCKWISE
S2	6.24	0.15	182.6	290.9	CLOCKWISE
M4	2.67	2.07	255.3	179.9	CLOCKWISE

RMS SPEED: 30.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 66.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 183.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 2.95 CM/SEC
STANDARD DEVIATION V SERIES: 3.16 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

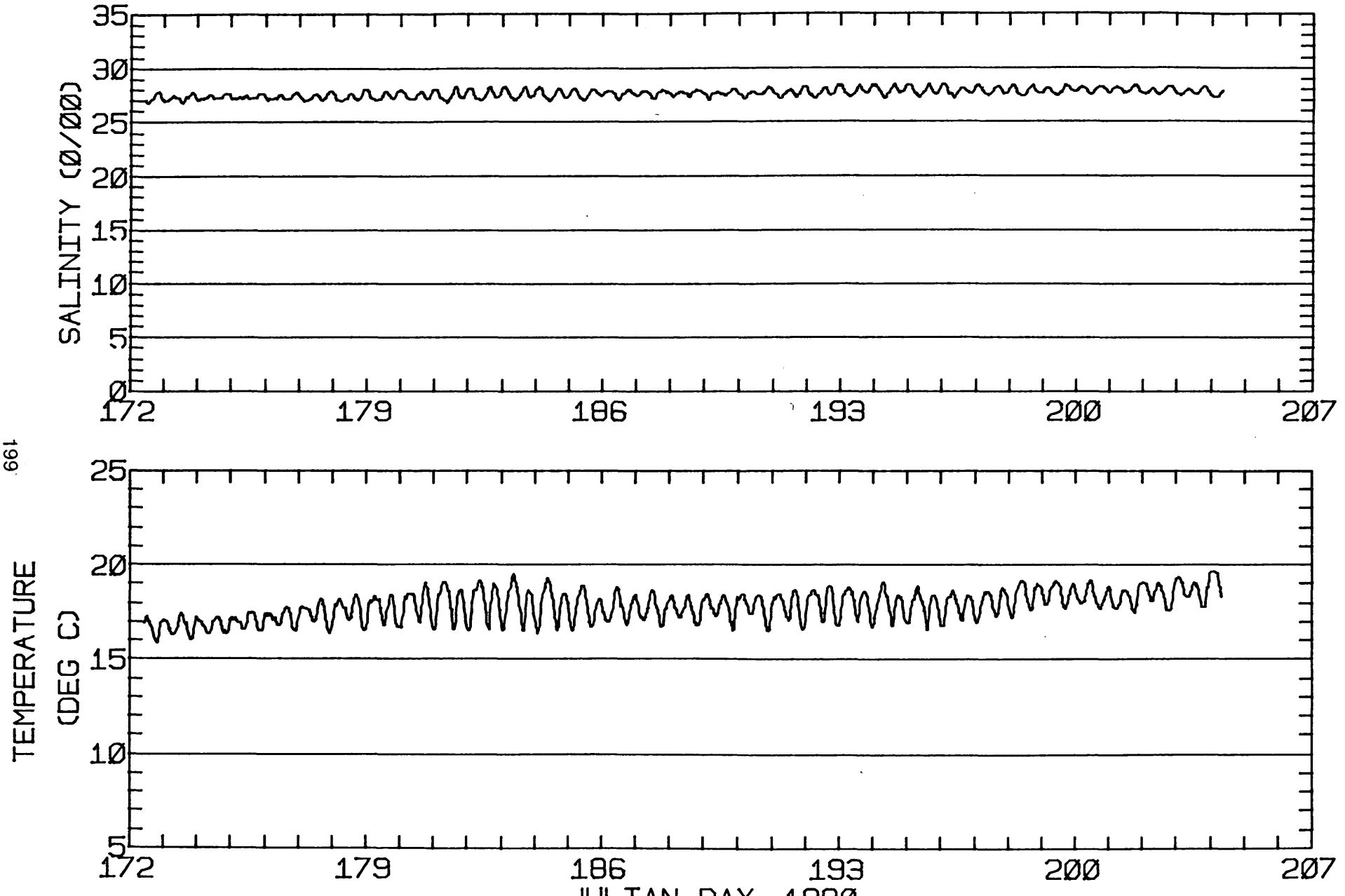
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.0	0.1	447.
2	12	-5.1	0.0	419.
3	12	-5.5	-0.4	408.
ALL	36	-5.2	-0.1	





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-43N 122-19- 0W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-43N 122-19- ØW
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ7.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 9
POSITION: 37 40'47"N 122 19' 0"W
METER TYPE: AANDERAA
WATER DEPTH: 7.6 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 8/22/80 1025 PST JULIAN DAY=235
APPROXIMATE RECORD LENGTH IS 12 M2-CYCLES

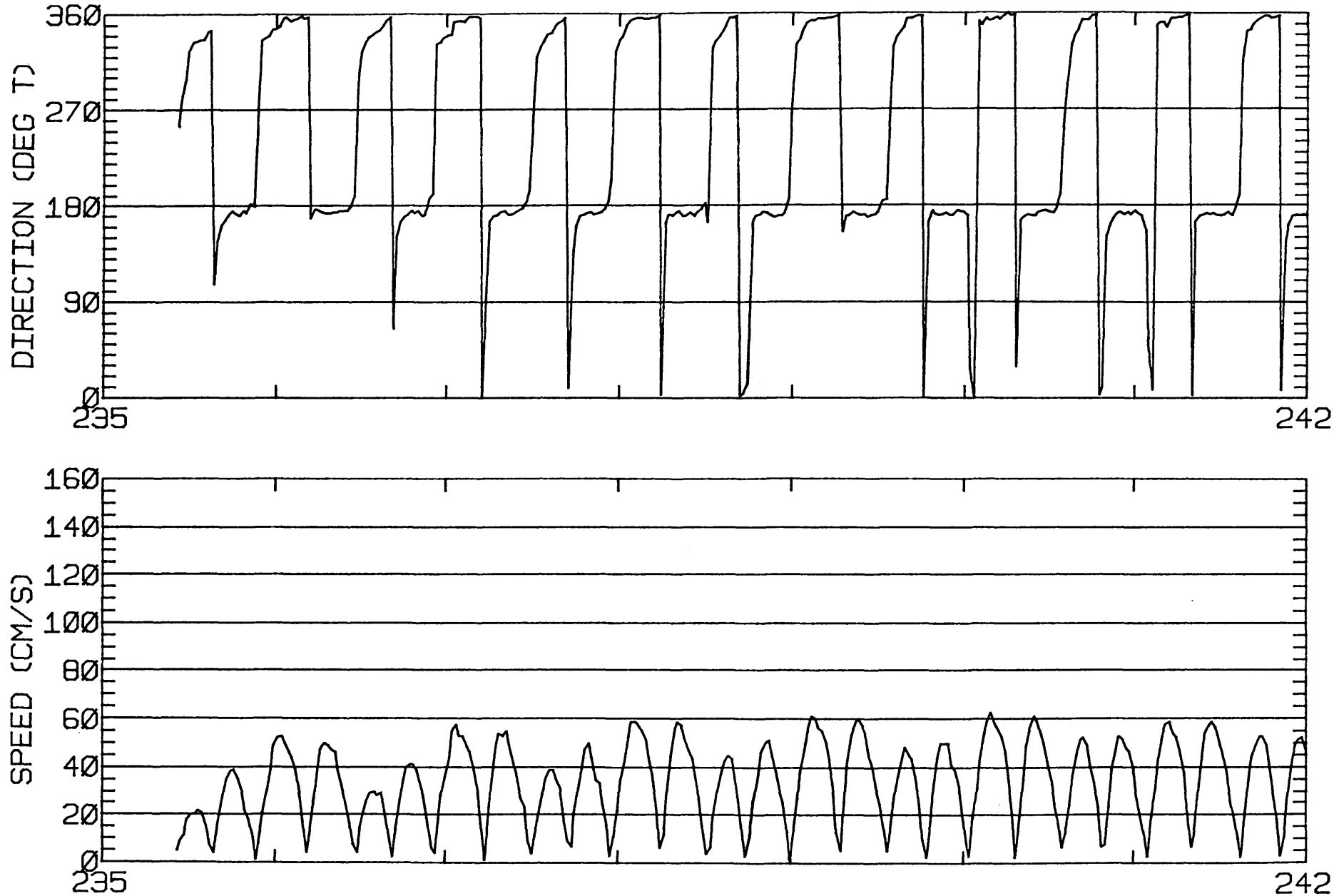
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.85	0.17	174.2	14.8	ANTI-CLOCKWISE
K1	10.27	0.90	178.3	55.7	CLOCKWISE
N2	8.62	0.95	183.6	283.1	CLOCKWISE
M2	38.40	2.79	167.9	284.2	CLOCKWISE
S2	9.32	0.08	184.1	297.8	ANTI-CLOCKWISE
M4	3.90	0.05	194.6	113.6	ANTI-CLOCKWISE

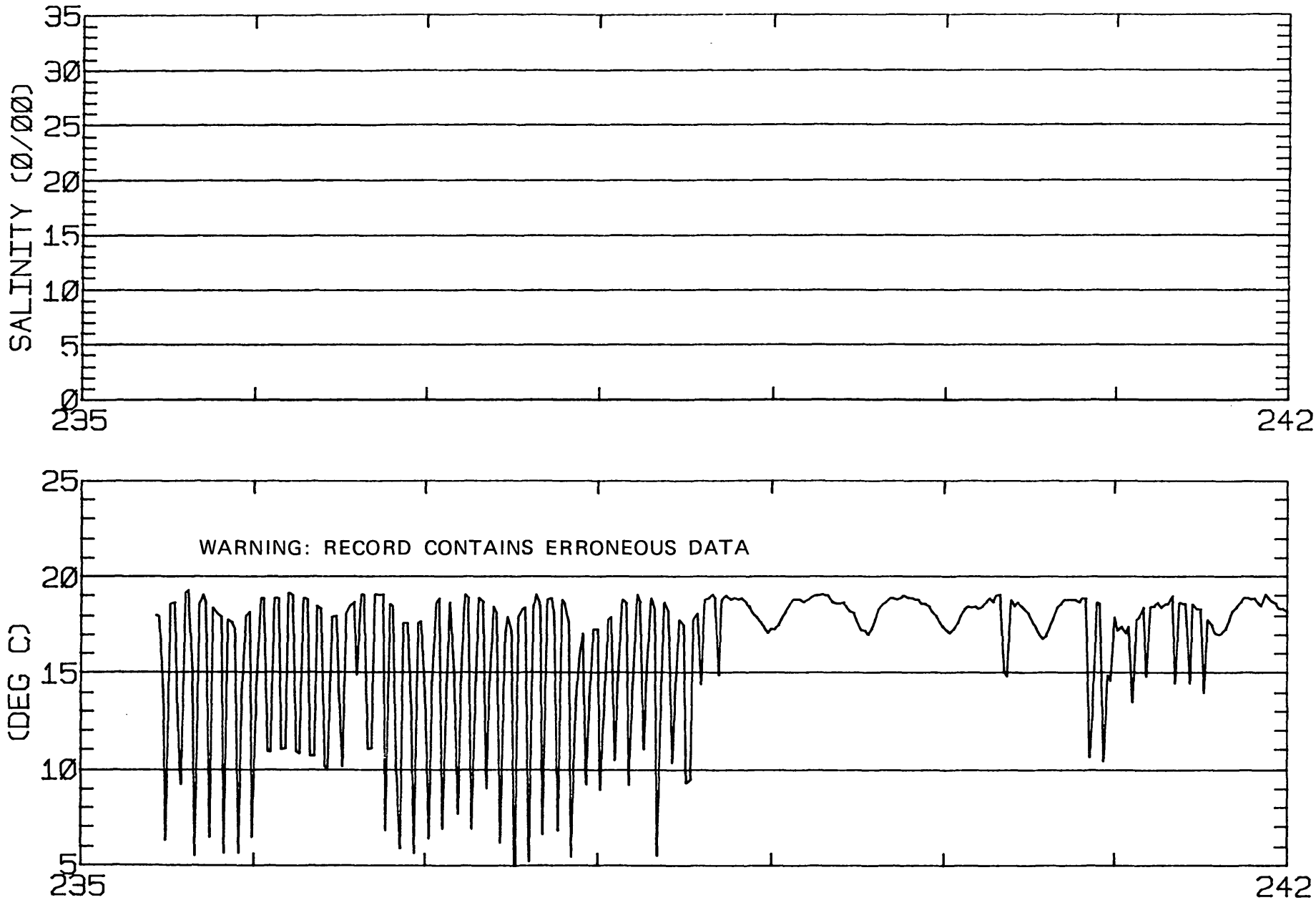
RMS SPEED: 37.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 64.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 172.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 2.31 CM/SEC
STANDARD DEVIATION V SERIES: 3.00 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.5	-1.0	106.
ALL	12	-0.5	-1.0	



JULIAN DAY, 1980
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-47N 122-19- 0W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 9 37-40-47N 122-19- ØW
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ7.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 10
POSITION: 37 41'24"N 122 14' 8"W
METER TYPE: AANDERAA
WATER DEPTH: 2.4 M (MLLW)
METER DEPTH: 1.5 M (BELOW MLLW)
START TIME OF SERIES: 2/23/79 1420 PST JULIAN DAY= 54
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

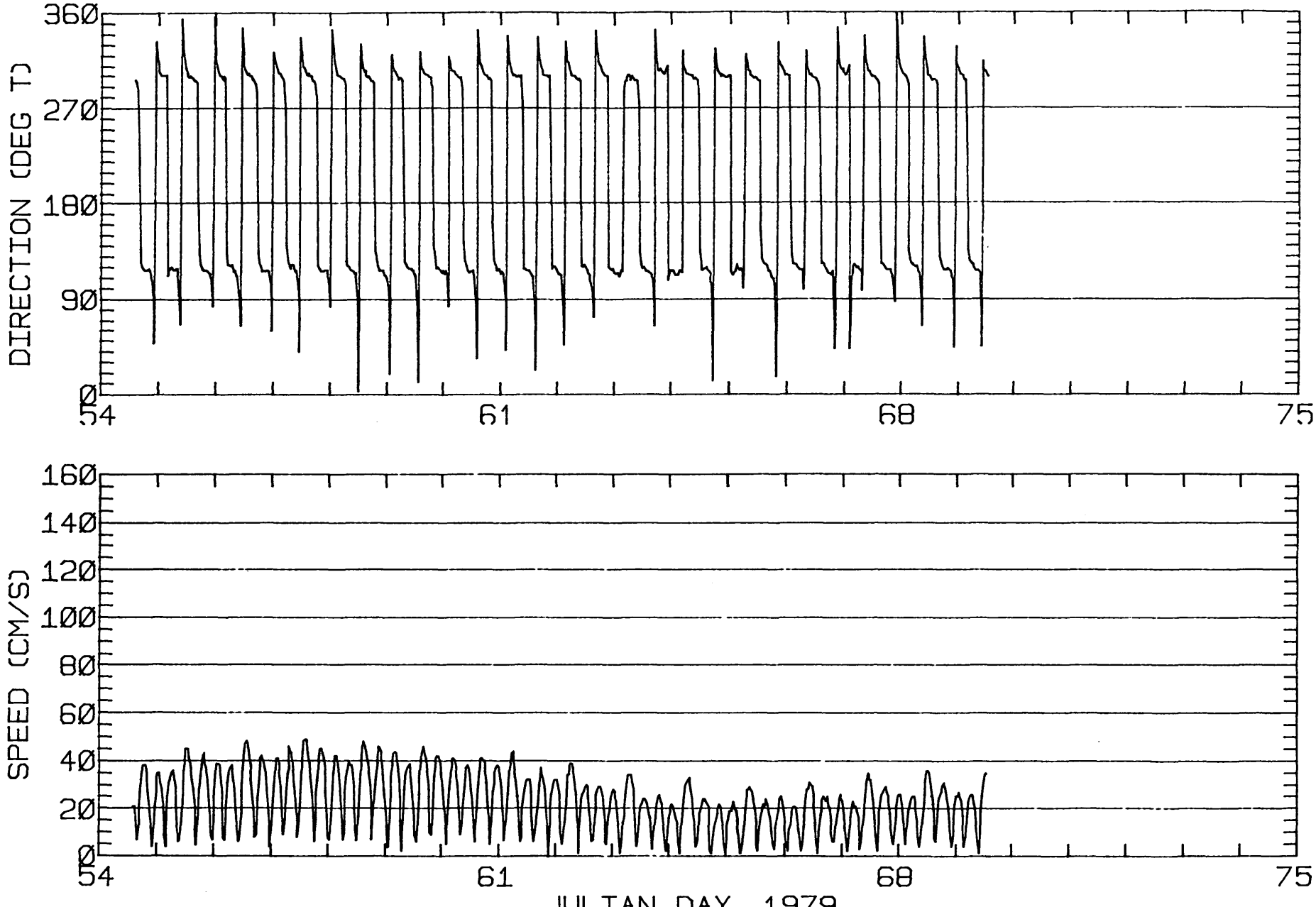
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.15	0.78	113.3	6.2	ANTI-CLOCKWISE
K1	5.26	0.02	116.2	39.1	CLOCKWISE
N2	4.45	0.40	122.5	237.9	ANTI-CLOCKWISE
M2	32.35	2.51	120.6	266.6	ANTI-CLOCKWISE
S2	8.31	1.03	120.4	281.4	ANTI-CLOCKWISE
M4	1.62	0.19	104.3	69.9	ANTI-CLOCKWISE

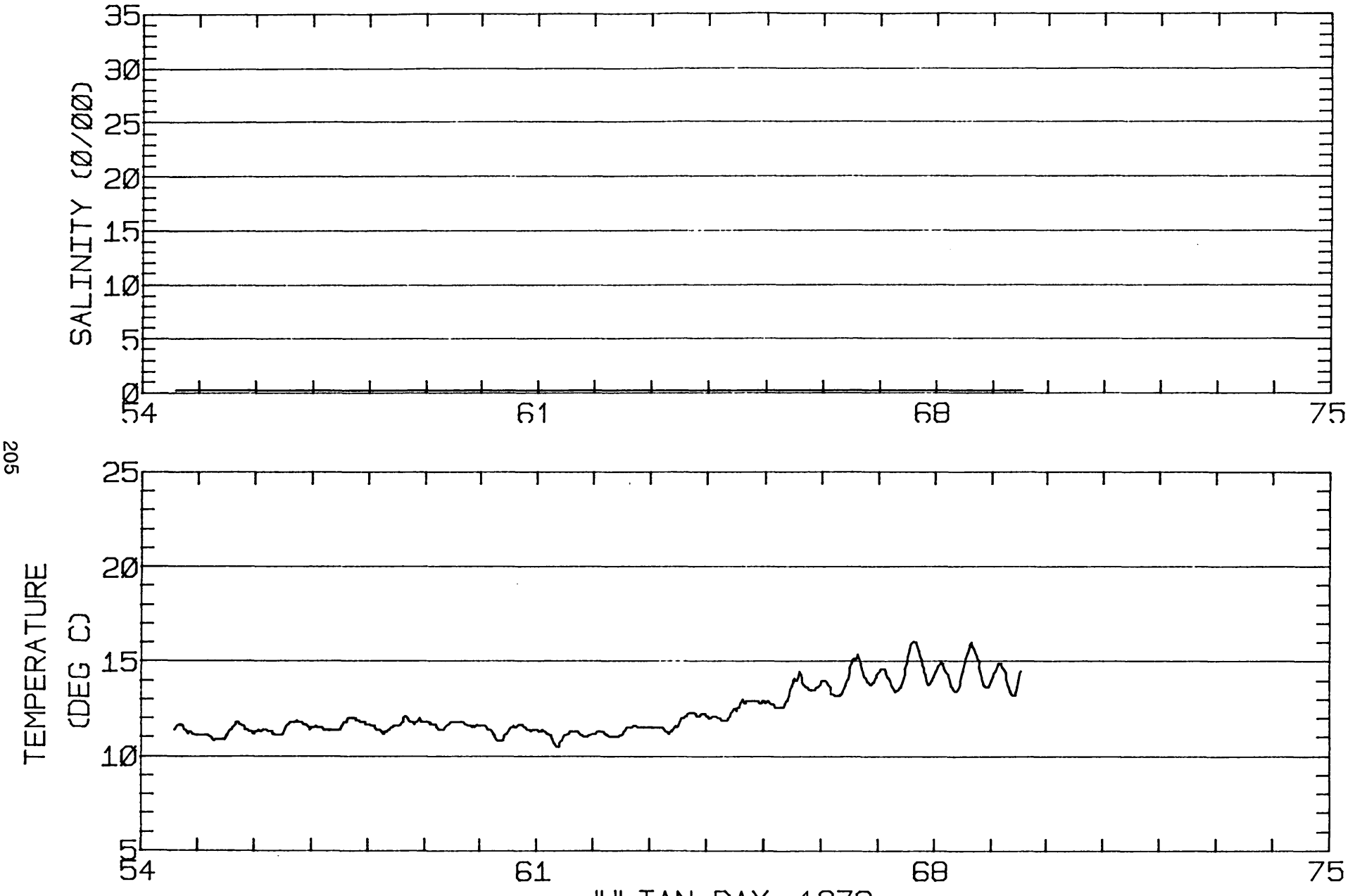
RMS SPEED: 26.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 50.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 119.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 2.83 CM/SEC
STANDARD DEVIATION V SERIES: 2.20 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.2	1.9	2733.
2	12	-0.5	1.7	1813.
3	4	0.2	0.9	1078.
ALL	28	-0.3	1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 10 37-41-24N 122-14- 8W
METER 000.9 METERS ABOVE BED. WATER DEPTH 002.4 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 1Ø 37-41-24N 122-14- 8W
METER ØØØ.9 METERS ABOVE BED. WATER DEPTH ØØ2.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 10
POSITION: 37 40'56"N 122 13'51"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: .6 M (BELOW MLLW)
START TIME OF SERIES: 8/18/80 1150 PST JULIAN DAY=231
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

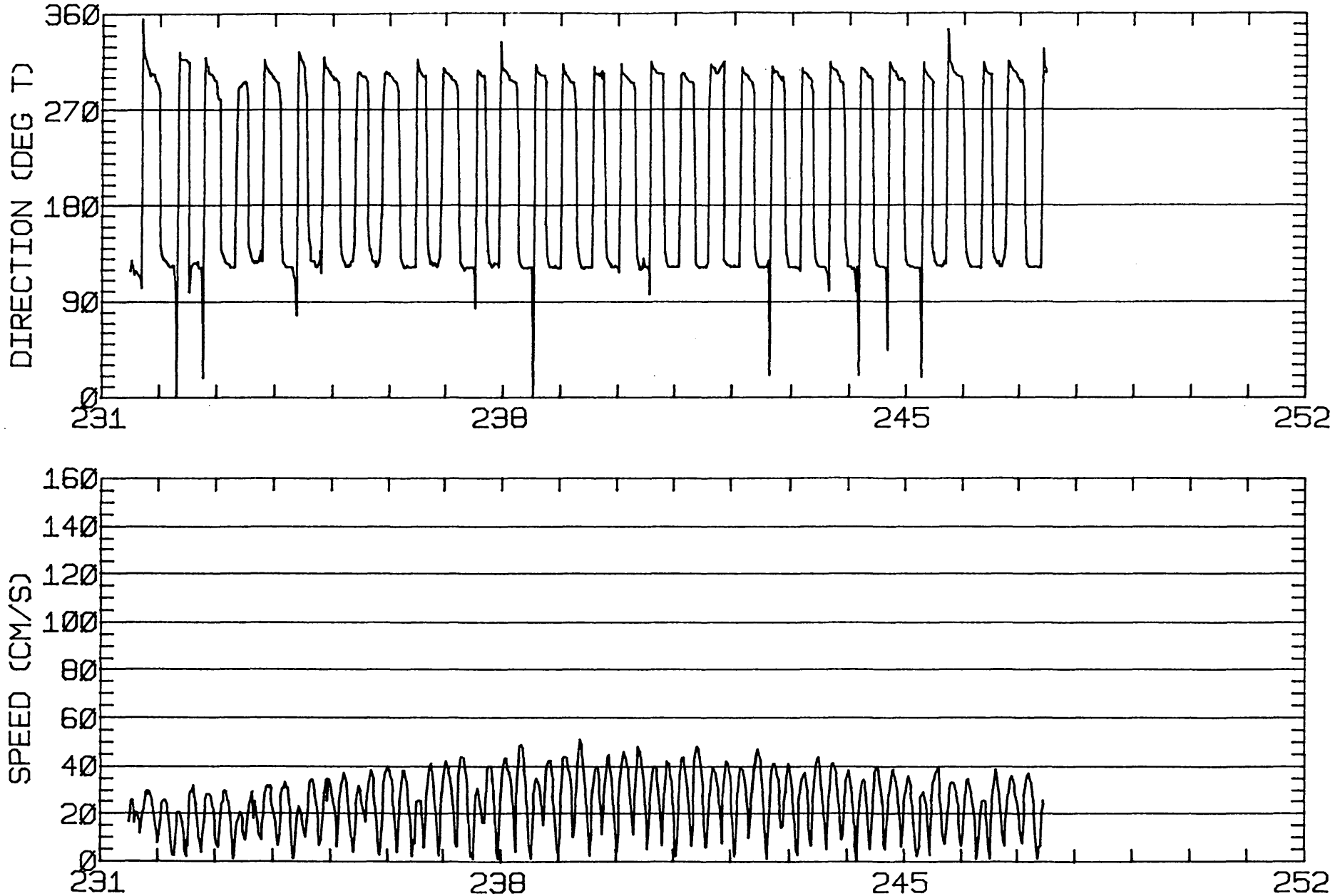
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.03	0.27	121.5	20.6	CLOCKWISE
K1	7.43	0.56	120.0	44.9	ANTI-CLOCKWISE
N2	5.47	0.12	121.0	271.9	ANTI-CLOCKWISE
M2	34.16	2.33	124.2	268.2	ANTI-CLOCKWISE
S2	6.48	0.15	119.5	291.8	ANTI-CLOCKWISE
M4	2.69	0.67	113.5	104.3	ANTI-CLOCKWISE

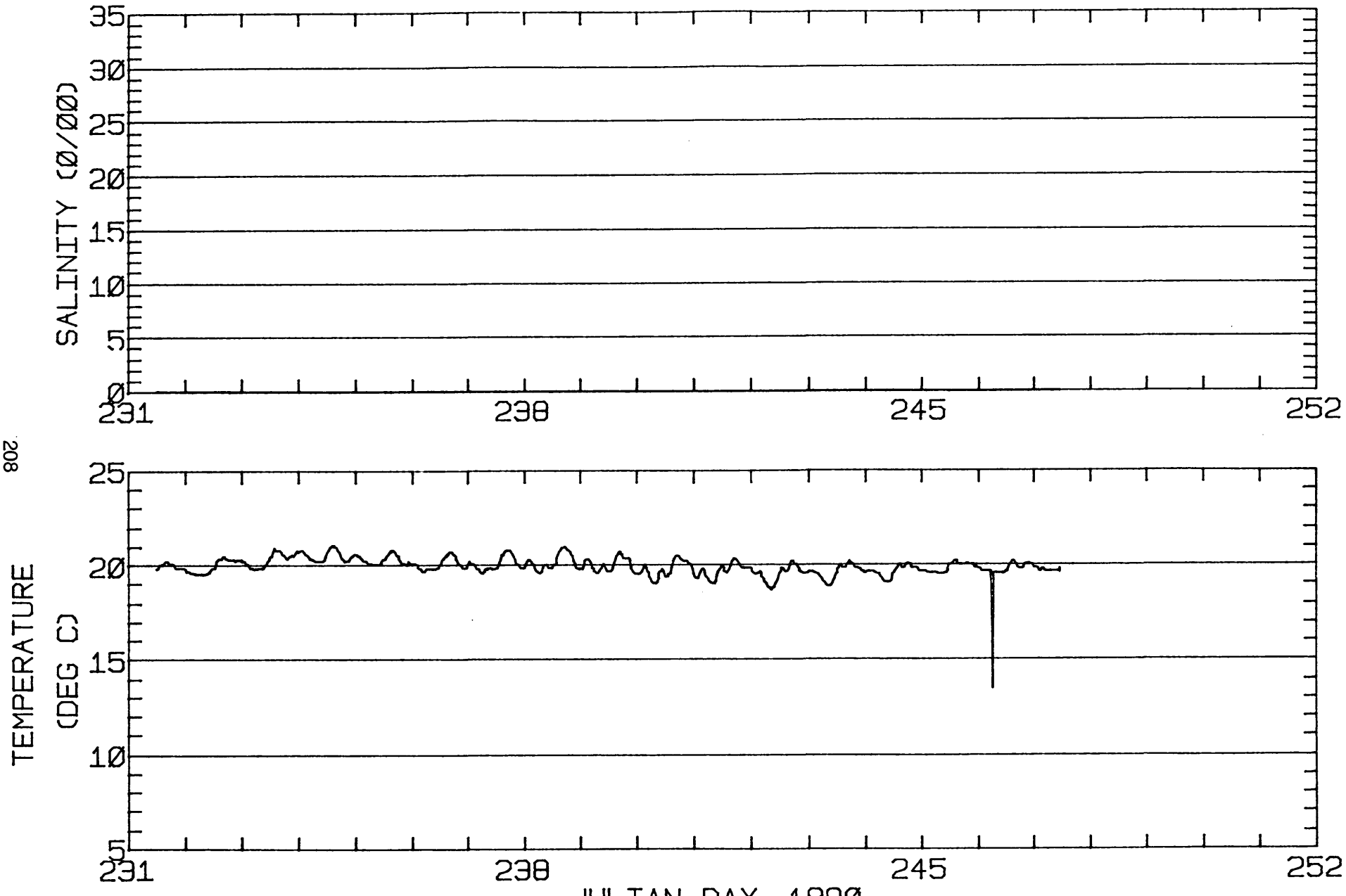
RMS SPEED: 28.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 53.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 25.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 122.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 3.97 CM/SEC
STANDARD DEVIATION V SERIES: 3.70 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	-1.2	97.
2	12	-0.0	-1.1	110.
3	6	1.1	-1.0	143.
ALL	30	0.4	-1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 10 37-40-56N 122-13-51W
METER 001.4 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 10 37-40-56N 122-13-51W
METER ØØ1.4 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 11
POSITION: 37 37'26"N 122 13'53"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 2/23/79 1300 PST JULIAN DAY= 54
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

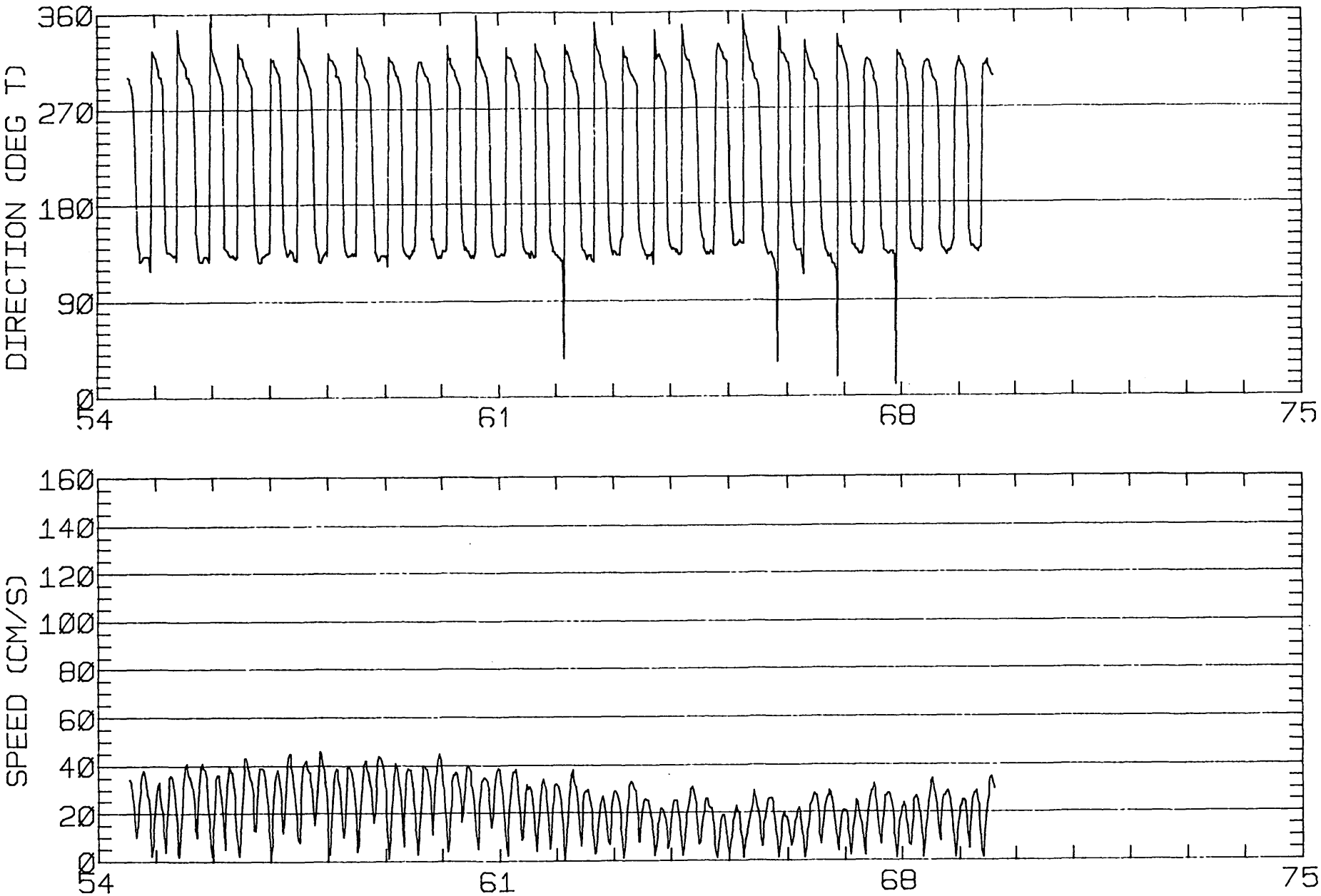
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

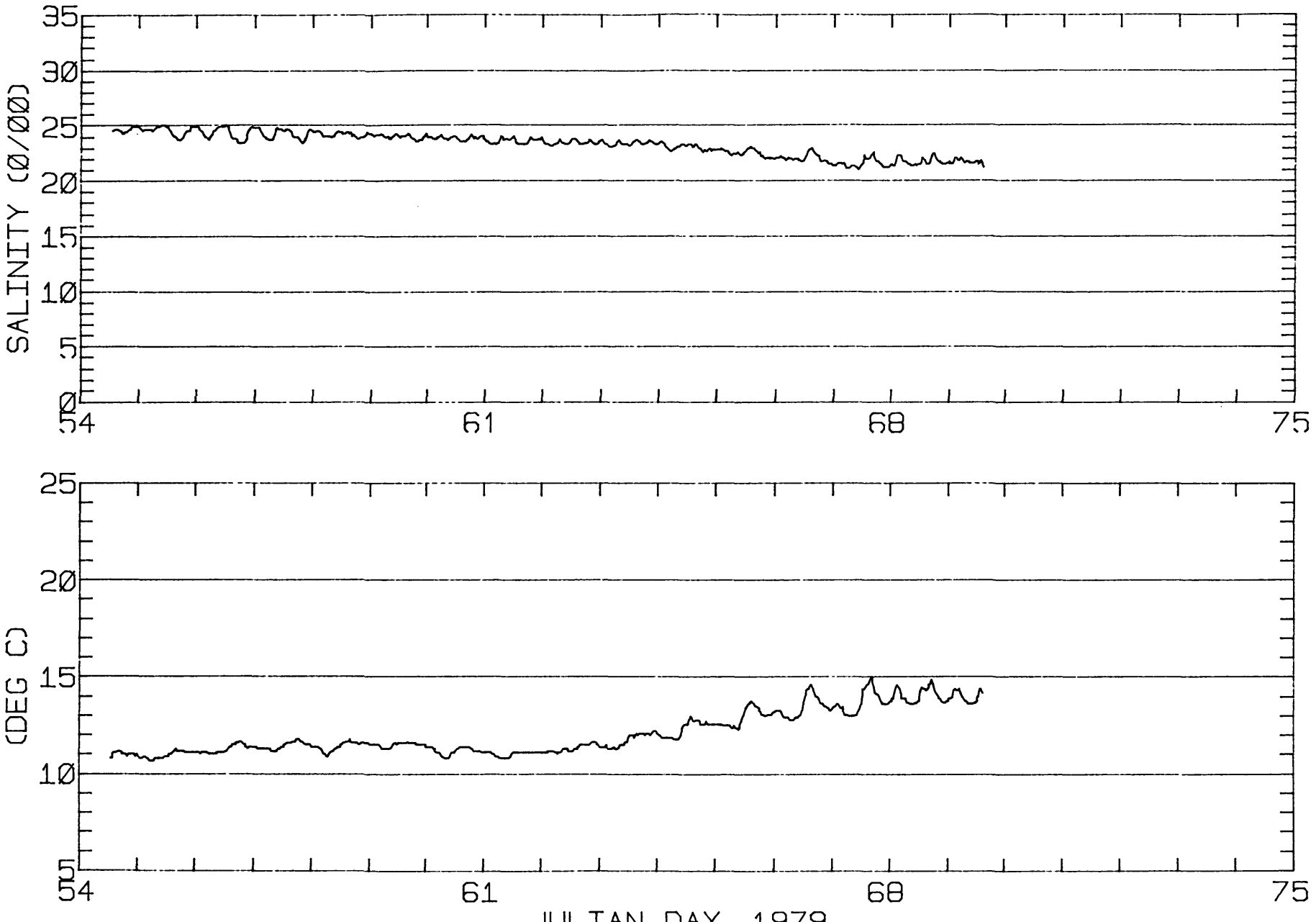
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.15	0.91	119.8	16.7	ANTI-CLOCKWISE
K1	4.90	0.78	122.4	36.6	ANTI-CLOCKWISE
N2	4.82	1.23	127.8	240.8	ANTI-CLOCKWISE
M2	30.46	3.00	132.0	273.3	ANTI-CLOCKWISE
S2	7.63	0.56	129.6	286.6	ANTI-CLOCKWISE
M4	2.35	1.09	98.2	107.0	ANTI-CLOCKWISE

RMS SPEED: 25.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 47.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 129.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 2.62 CM/SEC
STANDARD DEVIATION V SERIES: 2.78 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.0	-2.3	2733.
2	12	-0.6	-1.4	1813.
3	4	-1.1	-1.7	1184.
ALL	28	-0.8	-1.9	


DIRECTION (DEG T)
360
270
180
90
0
54
61
68
75
SPEED (CM/S)
160
140
120
100
80
60
40
20
0
54
61
68
75
JULIAN DAY, 1979
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 11 37-37-26N 122-13-53W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 11 37-37-26N 122-13-53W
METER ØØØ.8 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 12
POSITION: 37 33'16"N 122 11'51"W
METER TYPE: AANDERAA
WATER DEPTH: 11.0 M (MLLW)
METER DEPTH: 10.1 M (BELOW MLLW)
START TIME OF SERIES: 2/ 6/79 1530 PST JULIAN DAY= 37
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

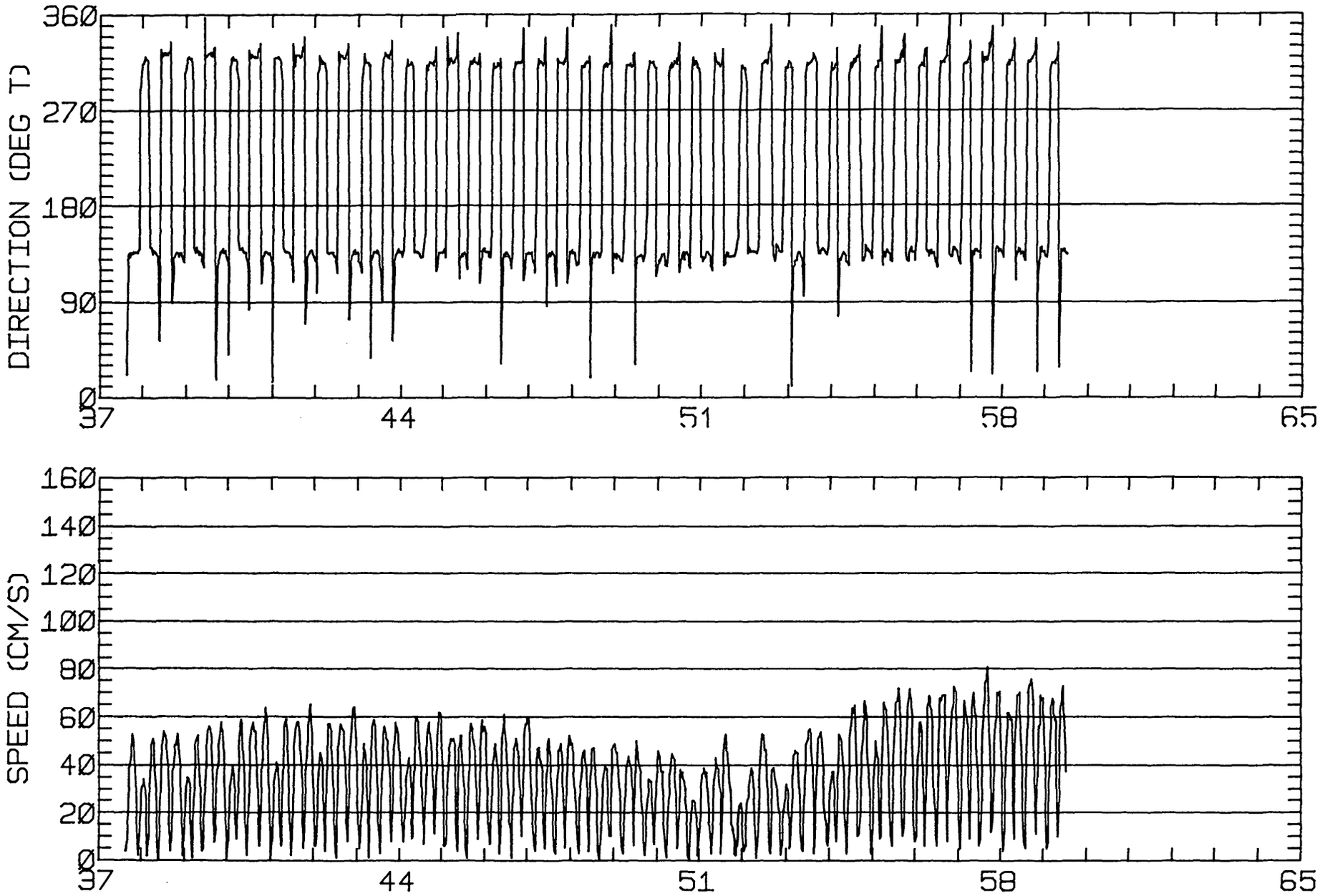
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.61	0.14	145.3	25.6	CLOCKWISE
K1	10.38	0.76	141.4	59.3	CLOCKWISE
N2	11.71	0.12	135.9	263.1	ANTI-CLOCKWISE
M2	49.64	1.72	136.6	286.6	CLOCKWISE
S2	16.39	0.32	137.7	316.9	ANTI-CLOCKWISE
M4	3.27	1.11	143.2	106.5	CLOCKWISE

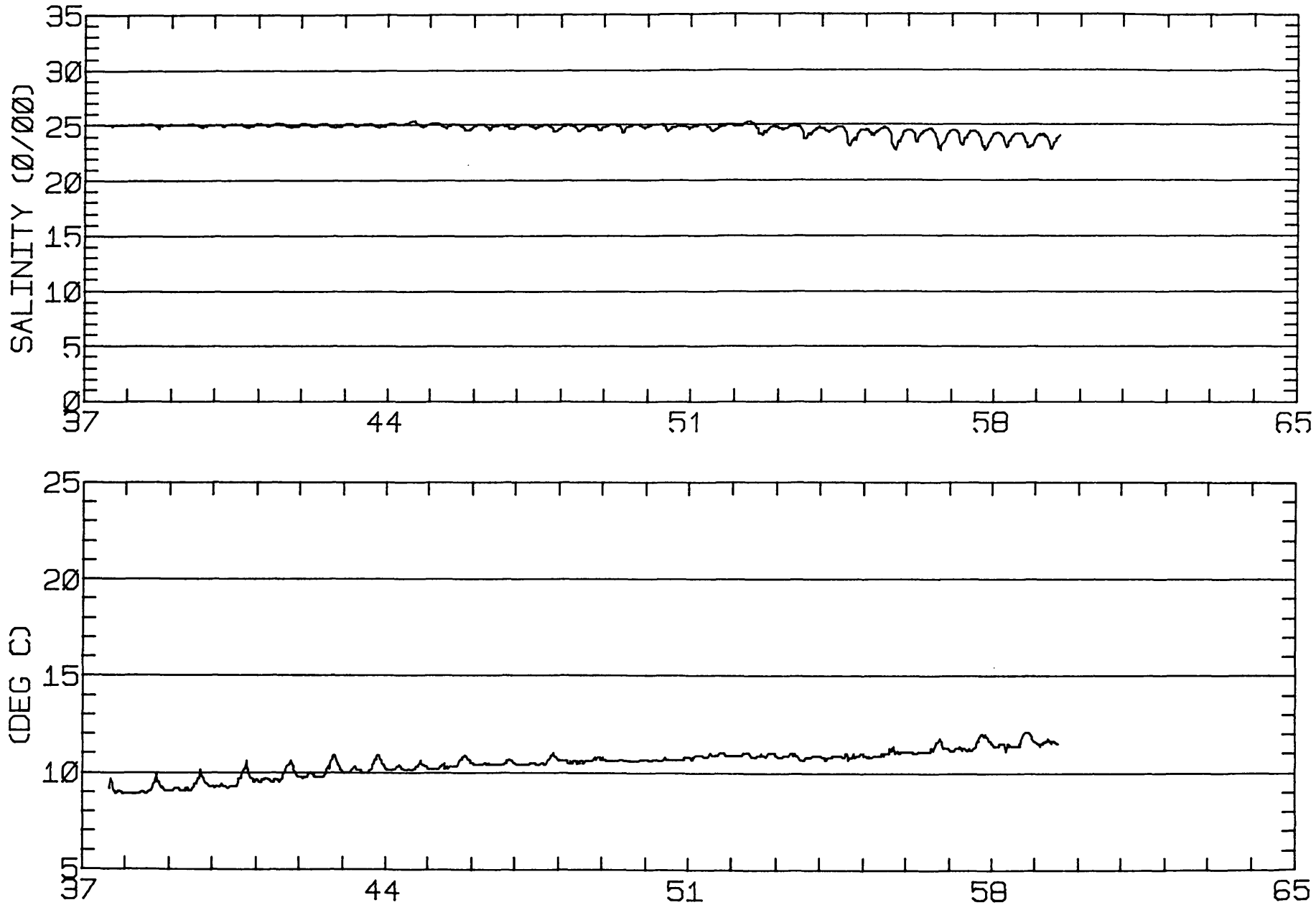
RMS SPEED: 40.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 83.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 138.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 5.03 CM/SEC
STANDARD DEVIATION V SERIES: 5.68 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.9	-0.7	399.
2	12	3.0	-2.6	925.
3	12	1.9	-1.8	2444.
4	6	1.0	1.5	2728.
ALL	42	2.4	-1.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 12 37-33-16N 122-11-51W
METER 000.8 METERS ABOVE BED. WATER DEPTH 011.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 12 37-33-16N 122-11-51W
METER ØØØ.8 METERS ABOVE BED. WATER DEPTH Ø11.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 12
POSITION: 37 33'29"N 122 11'56"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 5/20/80 910 PST JULIAN DAY=141
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

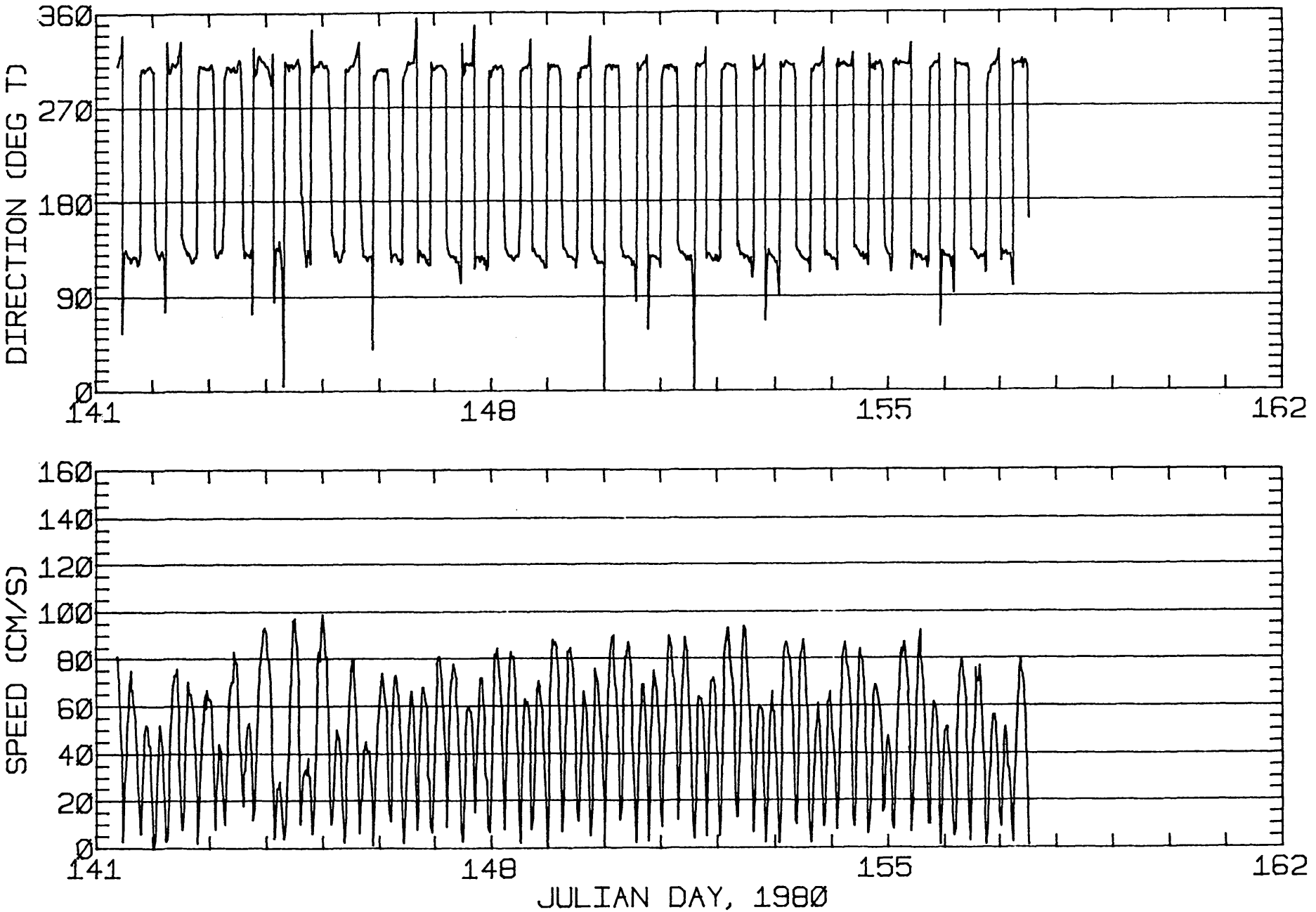
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.73	0.40	131.6	25.6	ANTI-CLOCKWISE
K1	18.14	0.36	127.2	7.8	ANTI-CLOCKWISE
N2	12.00	0.83	132.4	244.6	ANTI-CLOCKWISE
M2	73.89	1.56	129.3	294.6	ANTI-CLOCKWISE
S2	15.98	0.35	125.7	290.1	ANTI-CLOCKWISE
M4	3.55	0.86	152.9	145.9	ANTI-CLOCKWISE

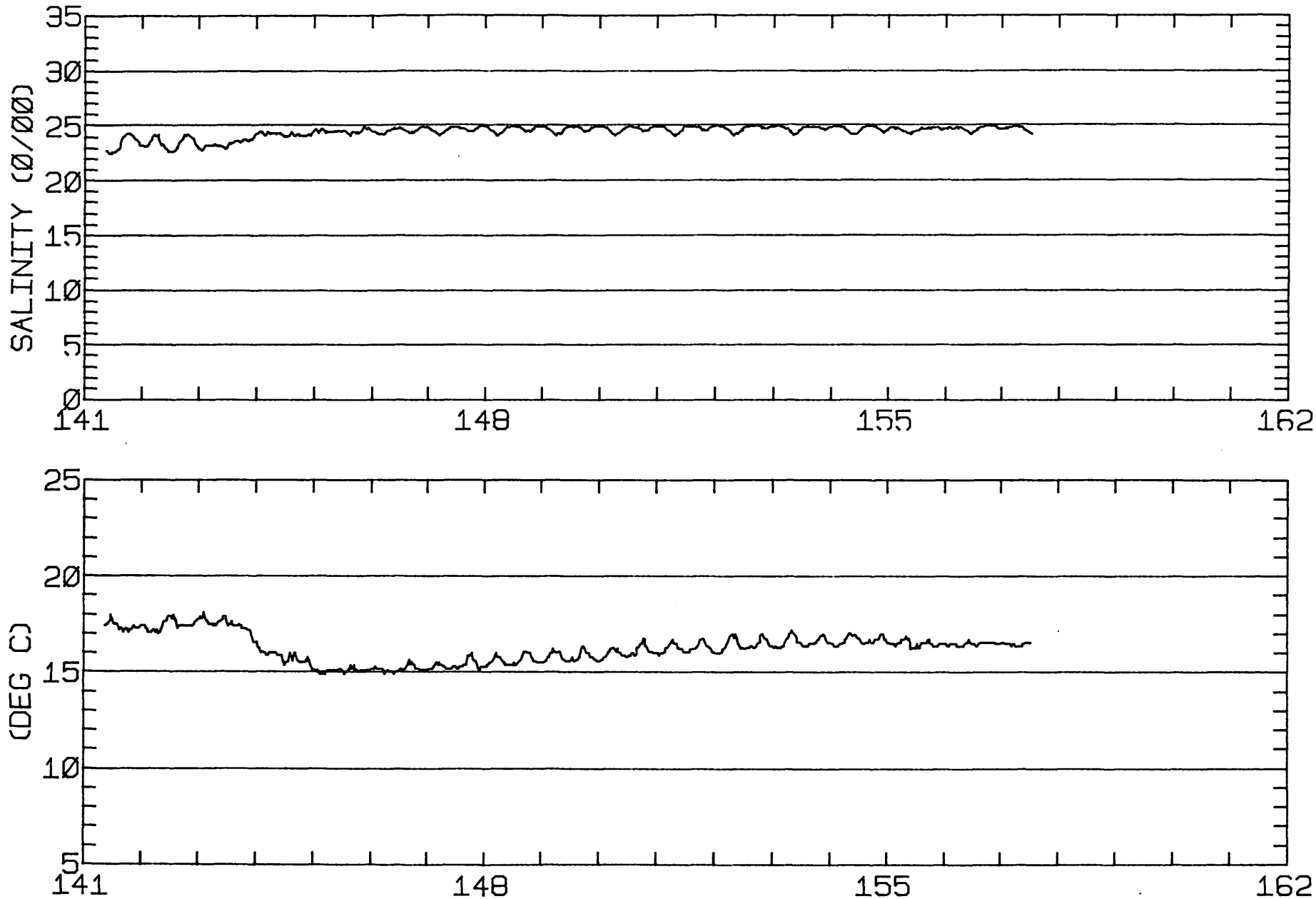
RMS SPEED: 54.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 117.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 128.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 10.07 CM/SEC
STANDARD DEVIATION V SERIES: 8.29 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.6	7.2	583.
2	12	0.9	0.6	469.
3	6	-2.4	3.0	408.
ALL	30	-3.6	3.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 12 37-33-29N 122-11-56W
METER 008.5 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 12 37-33-29N 122-11-56W
METER 008.5 METERS ABOVE BED. WATER DEPTH 014.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 12
POSITION: 37 33'29"N 122 11'56"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES: 5/20/80 1022 PST JULIAN DAY=141
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

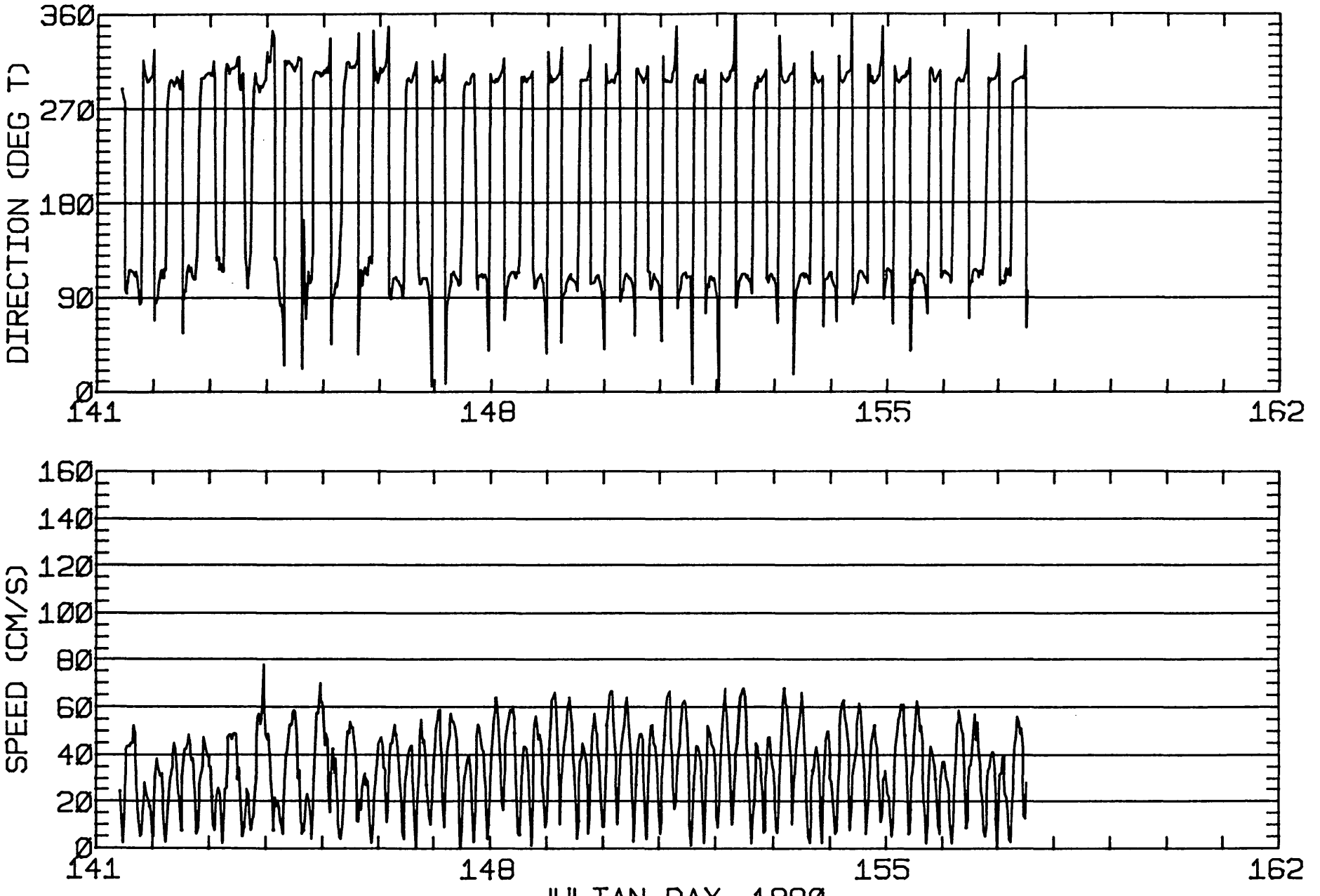
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.78	0.44	115.3	17.1	CLOCKWISE
K1	11.82	1.74	119.1	0.5	CLOCKWISE
N2	6.67	0.68	126.7	247.9	ANTI-CLOCKWISE
M2	51.07	1.92	116.1	288.7	CLOCKWISE
S2	12.11	0.20	109.9	287.1	ANTI-CLOCKWISE
M4	1.94	0.96	110.1	102.5	CLOCKWISE

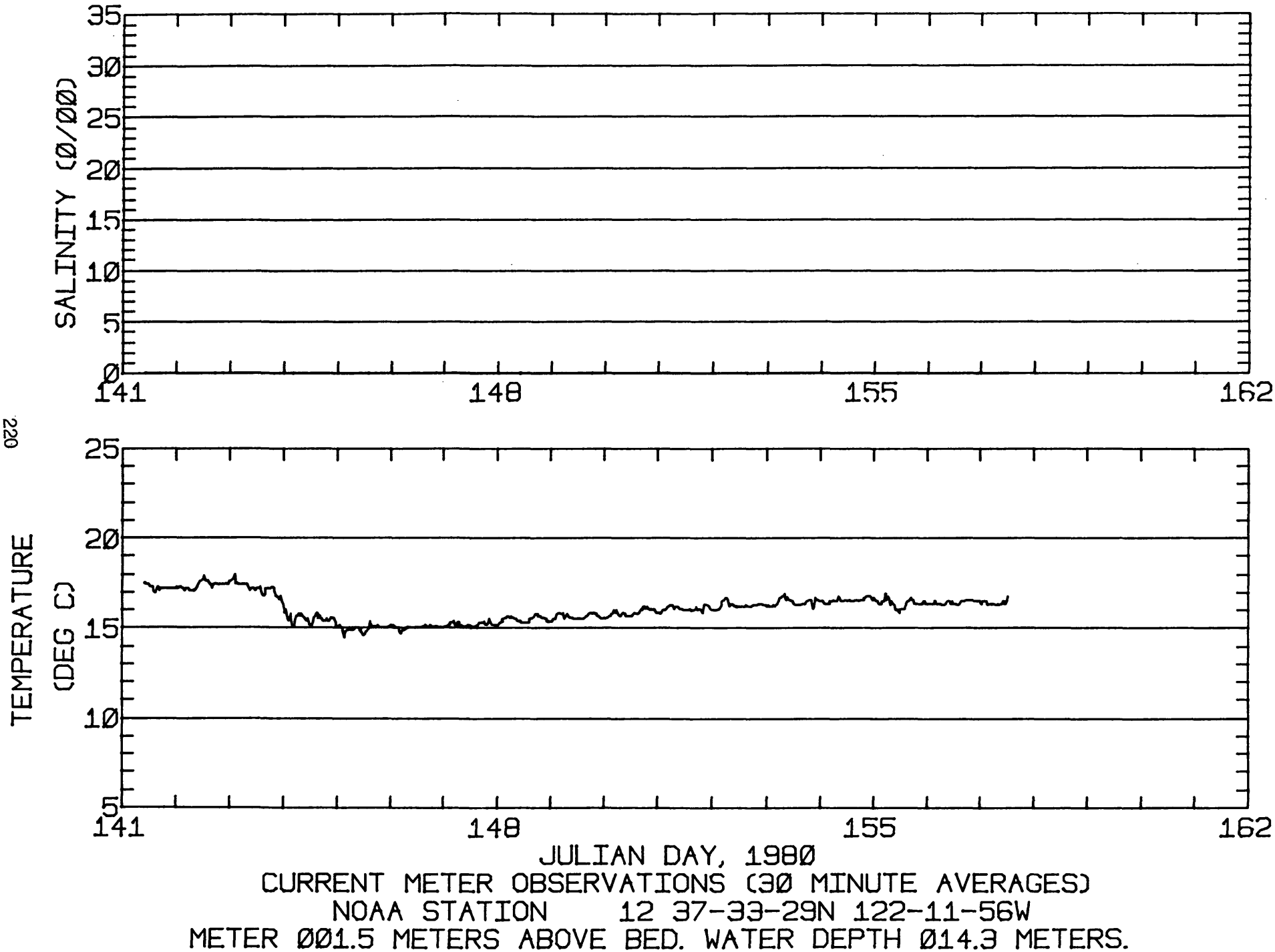
RMS SPEED:	39.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	82.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	34.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	115.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.31
STANDARD DEVIATION U-SERIES:	9.91 CM/SEC
STANDARD DEVIATION V SERIES:	5.88 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.9	7.3	583.
2	12	4.0	3.4	469.
3	6	0.5	3.5	408.
ALL	30	0.2	5.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 12 37-33-29N 122-11-56W
METER 001.5 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 12 37-33-29N 122-11-56W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30' 5"N 122 6'56"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 7.6 M (BELOW MLLW)
START TIME OF SERIES: 2/ 6/79 1440 PST JULIAN DAY= 37
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

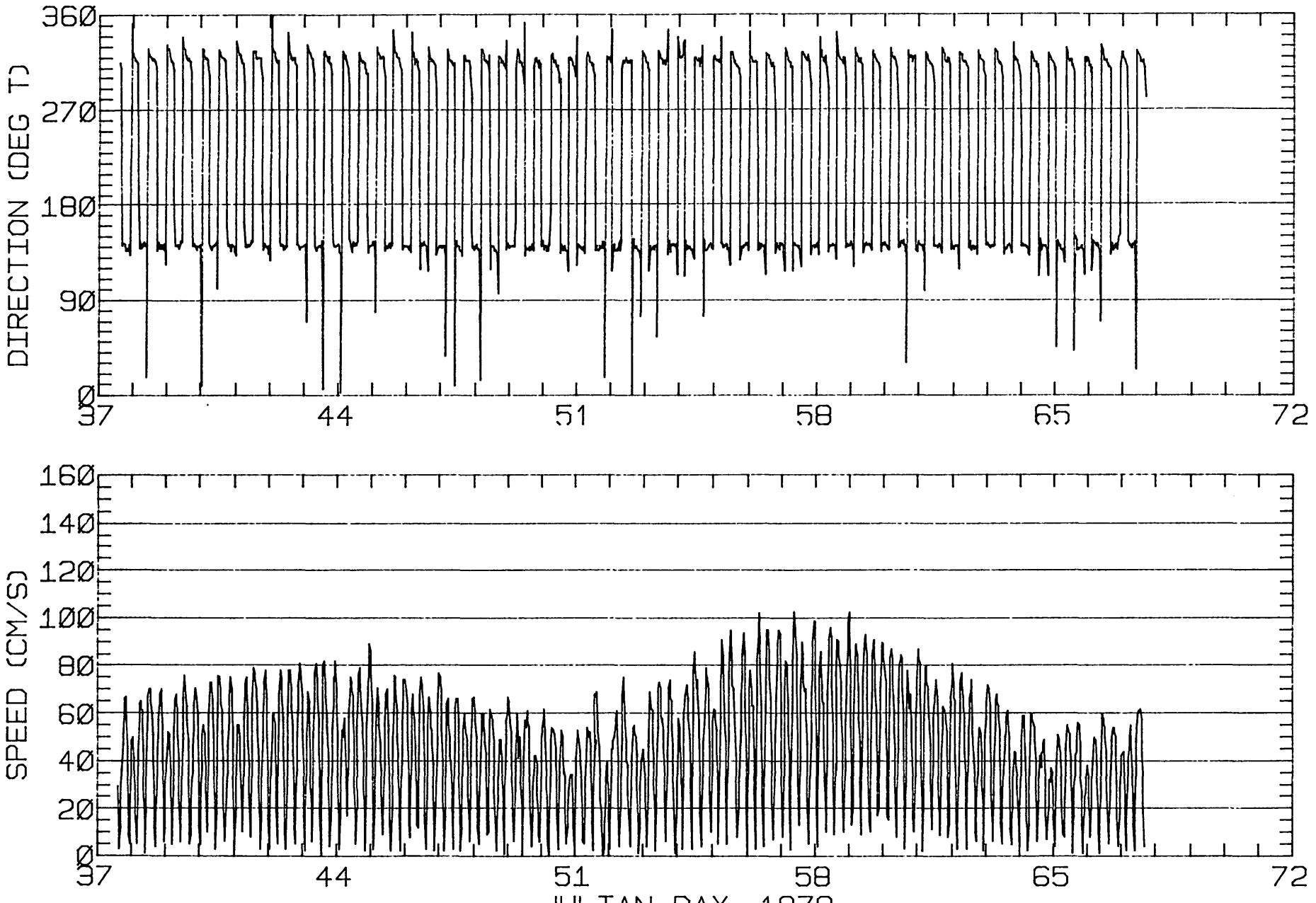
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.42	0.15	138.2	37.2	ANTI-CLOCKWISE
K1	11.71	0.05	137.9	59.5	ANTI-CLOCKWISE
N2	15.37	0.57	137.6	269.7	ANTI-CLOCKWISE
M2	63.72	1.47	139.6	290.6	ANTI-CLOCKWISE
S2	18.88	0.87	141.9	317.1	ANTI-CLOCKWISE
M4	1.35	0.28	206.6	283.2	ANTI-CLOCKWISE

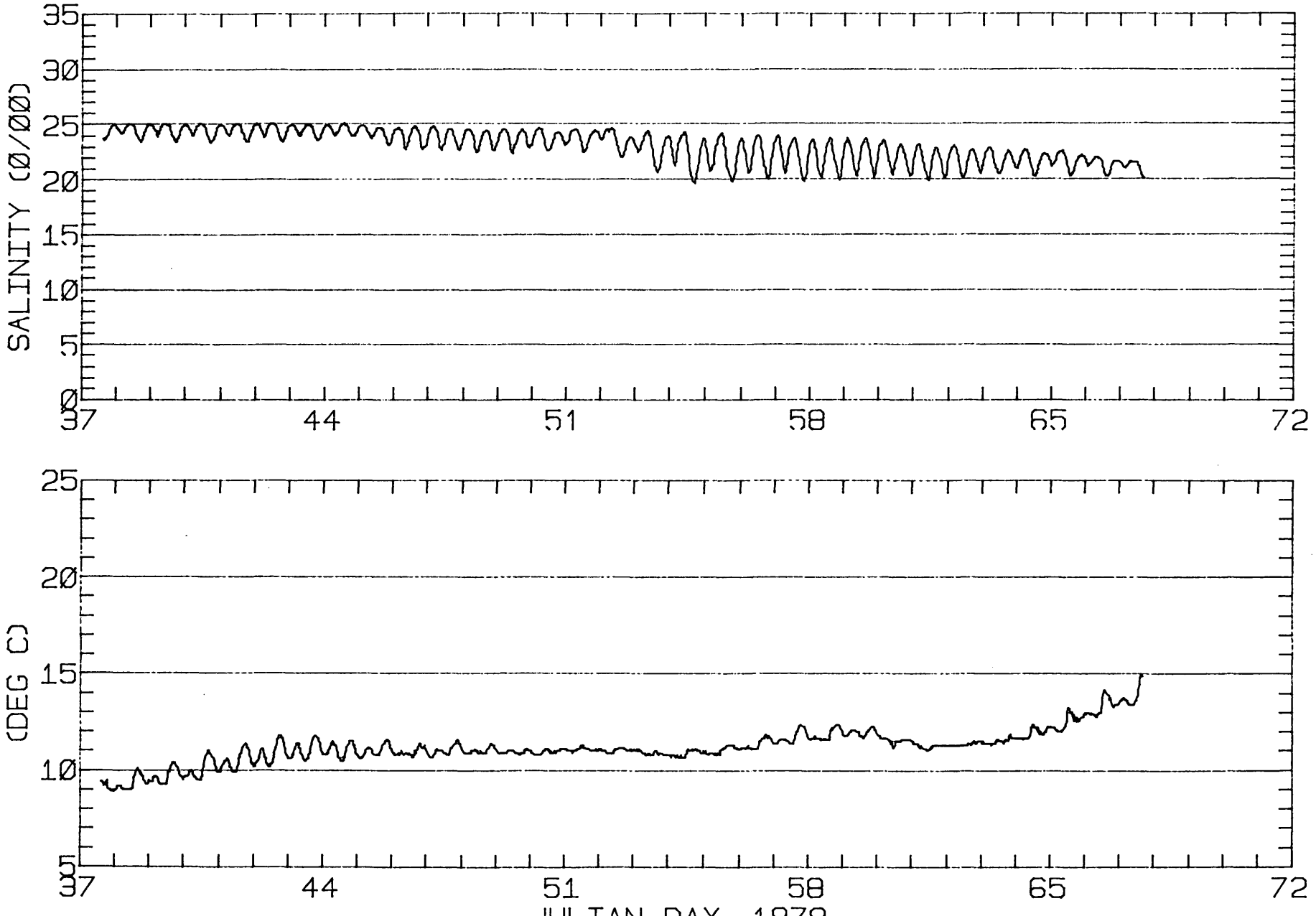
RMS SPEED: 51.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 41.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 139.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.24
STANDARD DEVIATION U-SERIES: 6.07 CM/SEC
STANDARD DEVIATION V SERIES: 7.64 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.8	-1.9	399.
2	12	1.7	-4.2	925.
3	12	0.7	-2.6	2444.
4	12	-0.3	-2.7	2364.
5	8	0.9	-3.4	1699.
ALL	56	0.7	-2.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 5N 122- 6-56W
METER 006.7 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 5N 122- 6-56W
METER ØØ6.7 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30' 5"N 122 6'56"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES: 2/ 6/79 1442 PST JULIAN DAY= 37
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

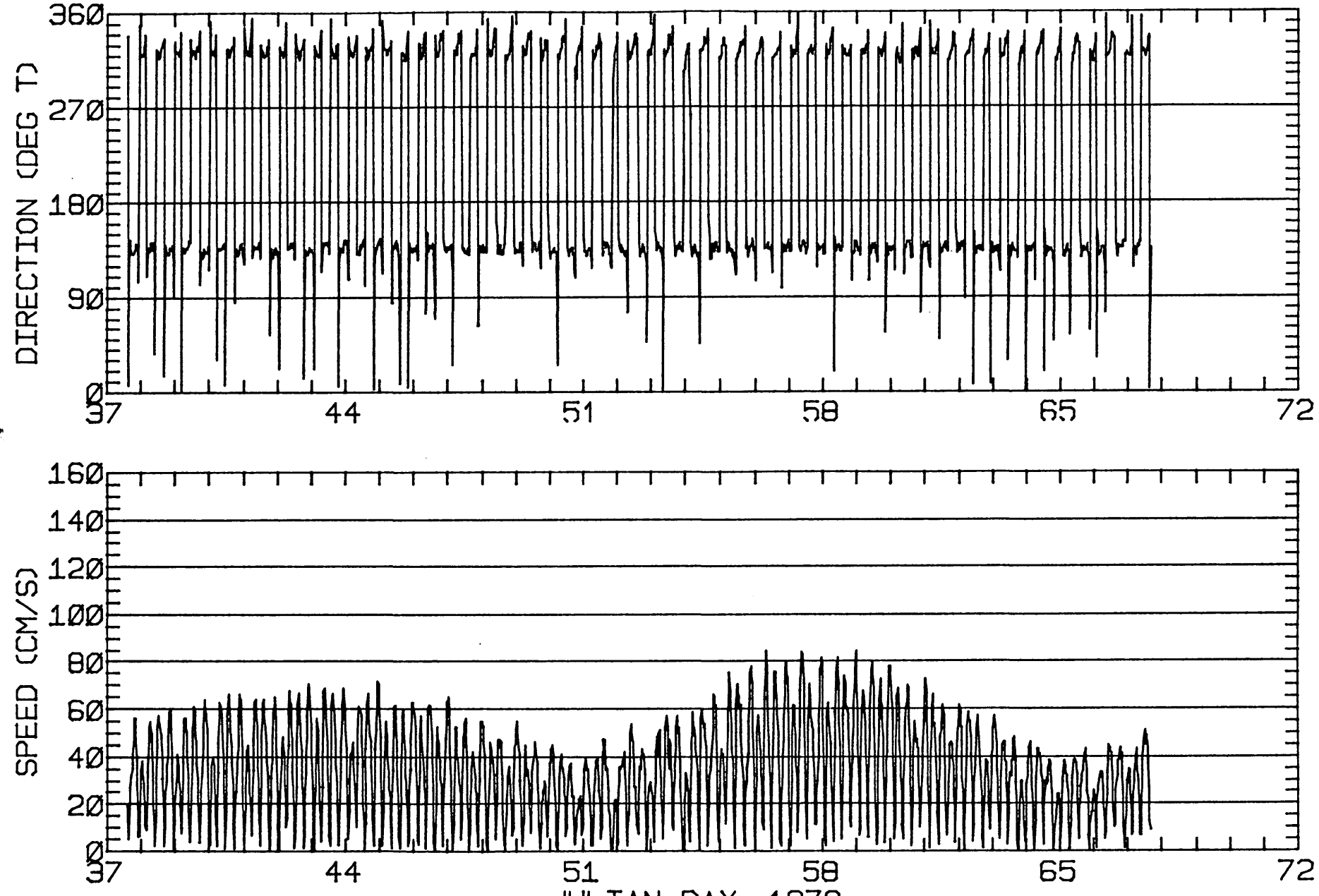
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.23	0.65	144.0	34.6	CLOCKWISE
K1	9.86	0.06	142.0	57.5	CLOCKWISE
N2	11.45	0.49	140.3	264.2	CLOCKWISE
M2	49.06	1.20	140.3	287.7	CLOCKWISE
S2	15.86	0.12	139.5	313.2	CLOCKWISE
M4	0.95	0.75	161.0	31.3	CLOCKWISE

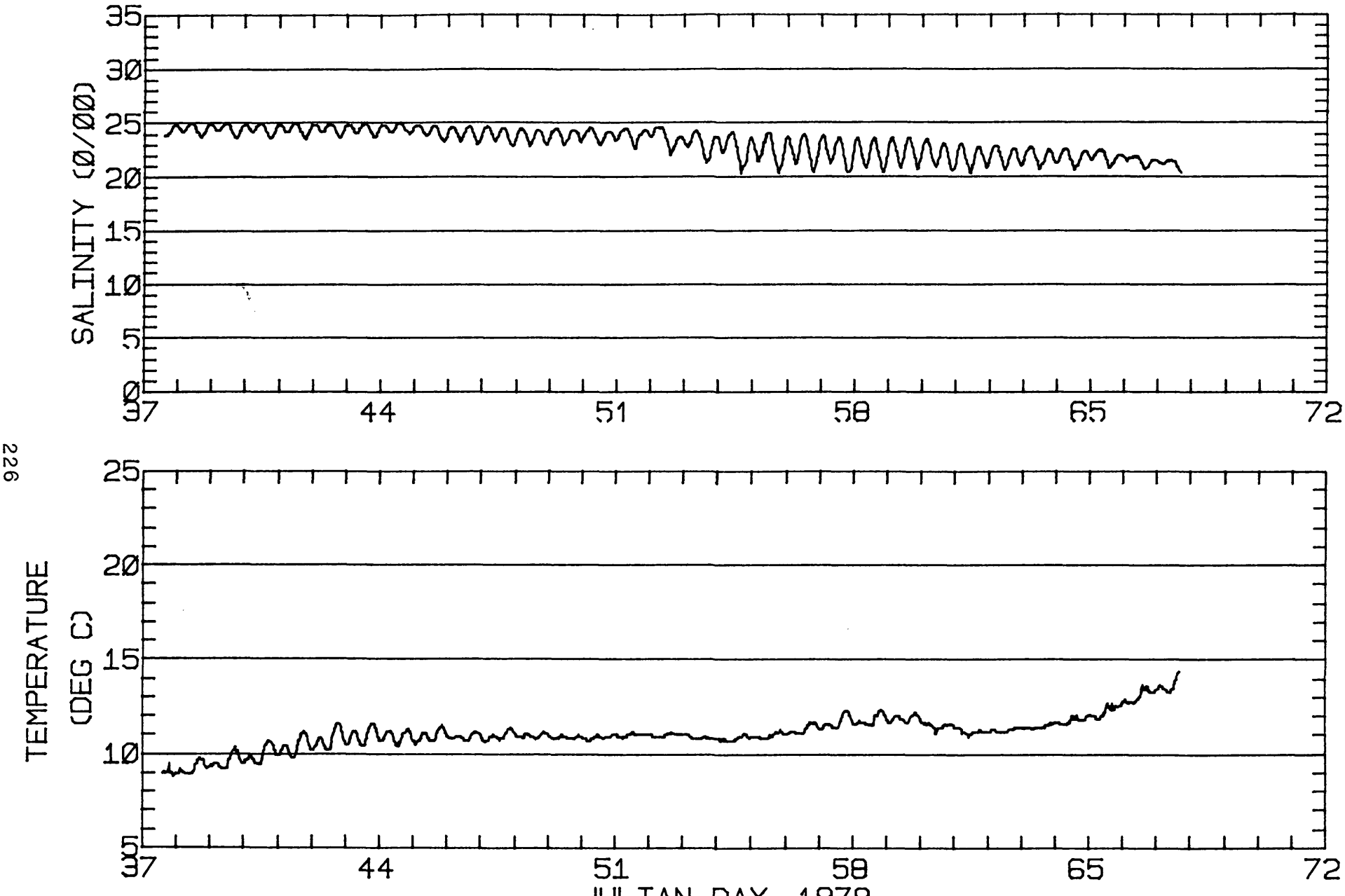
RMS SPEED: 40.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 82.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 140.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 5.36 CM/SEC
STANDARD DEVIATION V SERIES: 6.19 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.3	-1.3	399.
2	12	5.5	-3.0	925.
3	12	5.4	-1.6	2444.
4	12	4.9	-1.6	2364.
5	8	5.2	-1.7	1699.
ALL	56	5.0	-1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 5N 122- 6-56W
METER 001.5 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 5N 122- 6-56W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30'15"N 122 6'50"W
METER TYPE: AANDERAA
WATER DEPTH: 12.5 M (MLLW)
METER DEPTH: 11.0 M (BELOW MLLW)
START TIME OF SERIES:12/18/79 1454 PST JULIAN DAY=352
APPROXIMATE RECORD LENGTH IS 52 M2-CYCLES

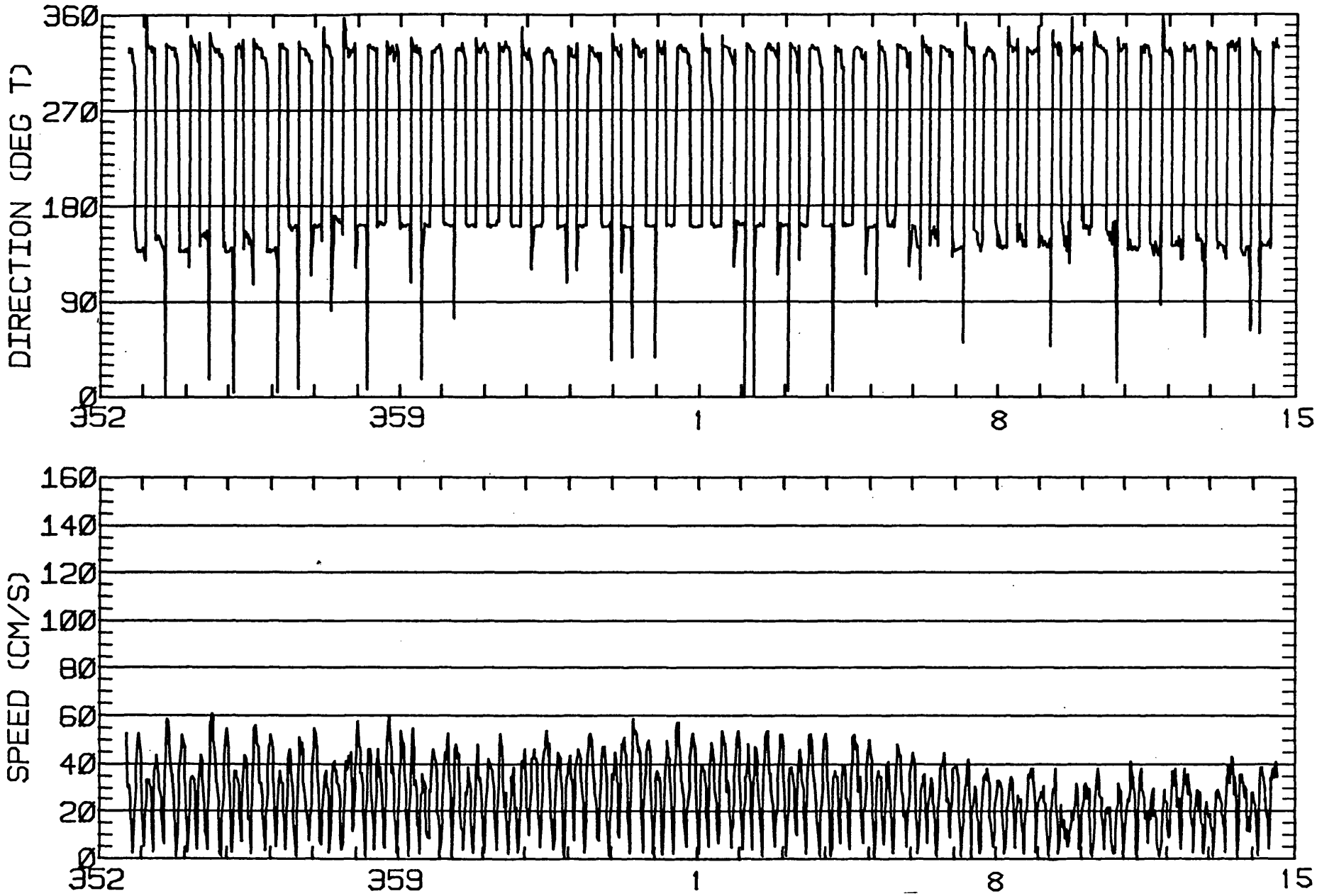
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.82	0.69	149.0	22.5	CLOCKWISE
K1	12.36	0.35	148.8	45.5	CLOCKWISE
N2	8.00	1.44	159.8	282.1	ANTI-CLOCKWISE
M2	38.11	0.57	151.1	285.9	ANTI-CLOCKWISE
S2	6.96	0.33	150.9	309.5	ANTI-CLOCKWISE
M4	0.86	0.43	215.6	277.8	ANTI-CLOCKWISE

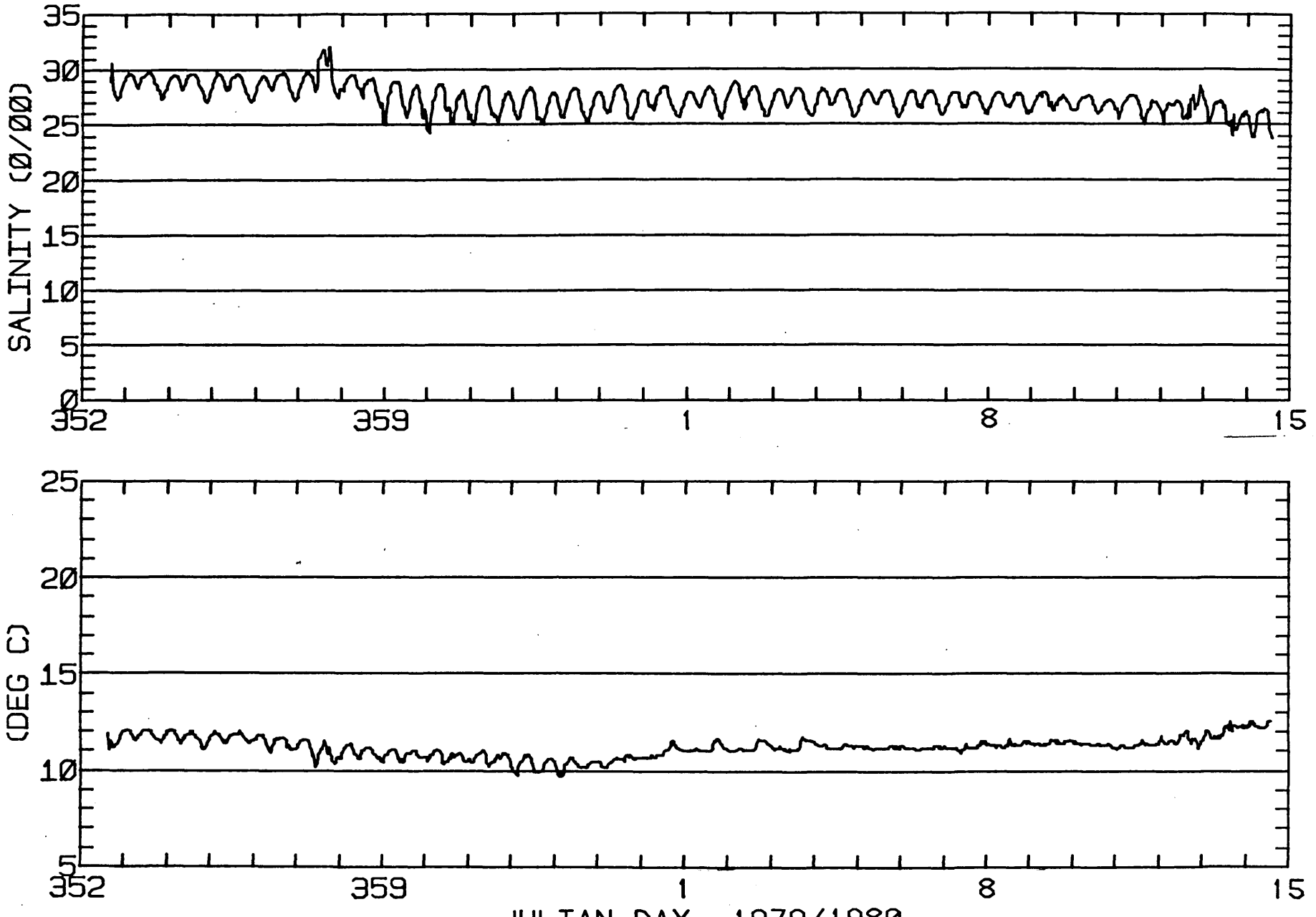
RMS SPEED: 31.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 62.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 150.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 5.20 CM/SEC
STANDARD DEVIATION V SERIES: 7.63 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.0	0.2	329.
2	12	-4.1	-0.5	1329.
3	12	-3.7	-0.5	1212.
4	12	-0.7	1.3	1017.
5	4	1.3	1.2	2470.
ALL	52	-2.1	0.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30-15N 122- 6-50W
METER 001.5 METERS ABOVE BED. WATER DEPTH 012.5 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30-15N 122- 6-50W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø12.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30' 7"N 122 6'44"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES: 1/18/80 1025 PST JULIAN DAY= 18
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

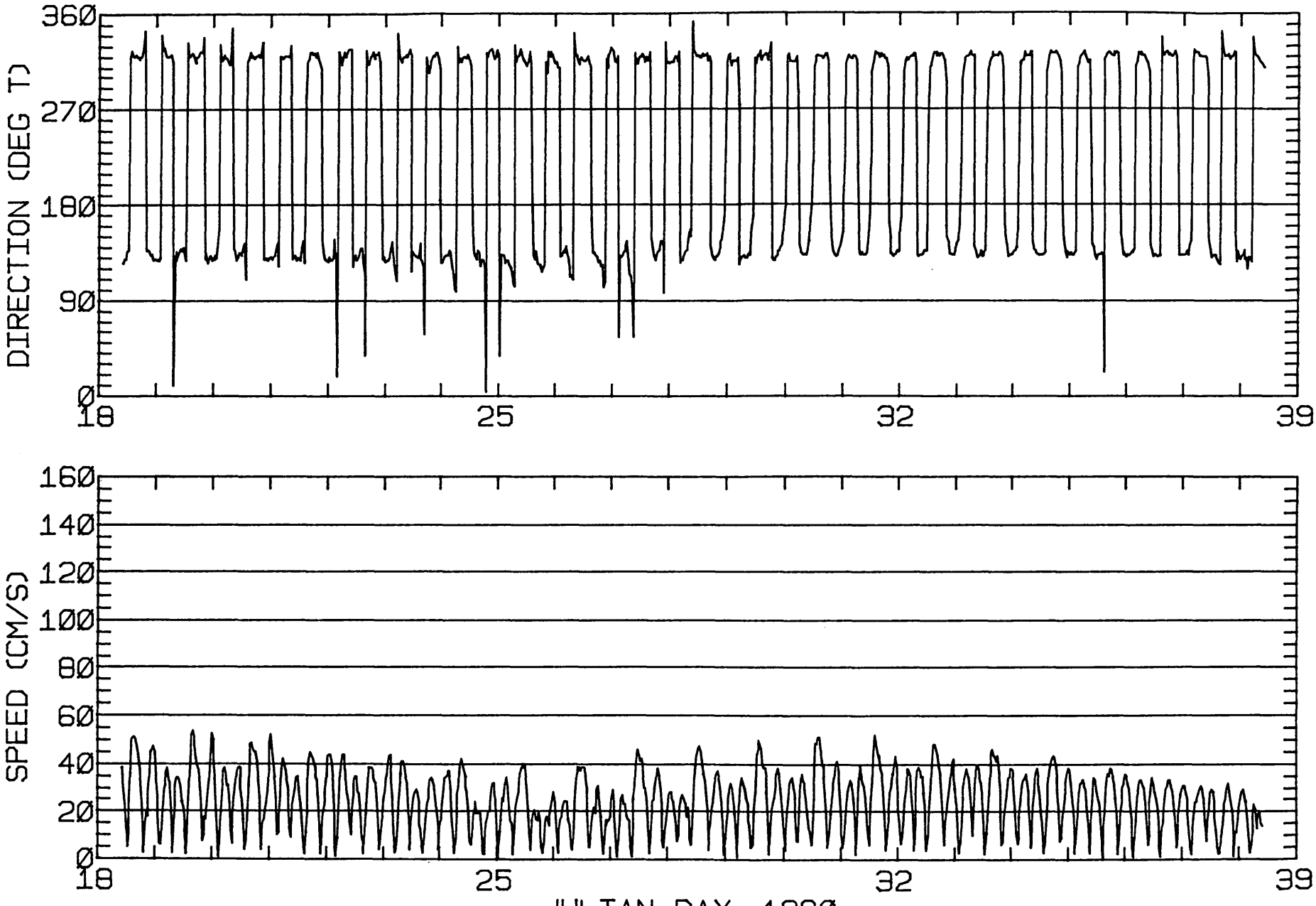
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.99	0.10	144.5	37.6	ANTI-CLOCKWISE
K1	10.07	0.04	139.3	54.7	ANTI-CLOCKWISE
N2	5.61	0.17	136.2	278.2	ANTI-CLOCKWISE
M2	33.21	0.38	136.6	288.9	CLOCKWISE
S2	10.18	0.41	140.7	310.9	CLOCKWISE
M4	1.17	0.91	220.0	45.1	ANTI-CLOCKWISE

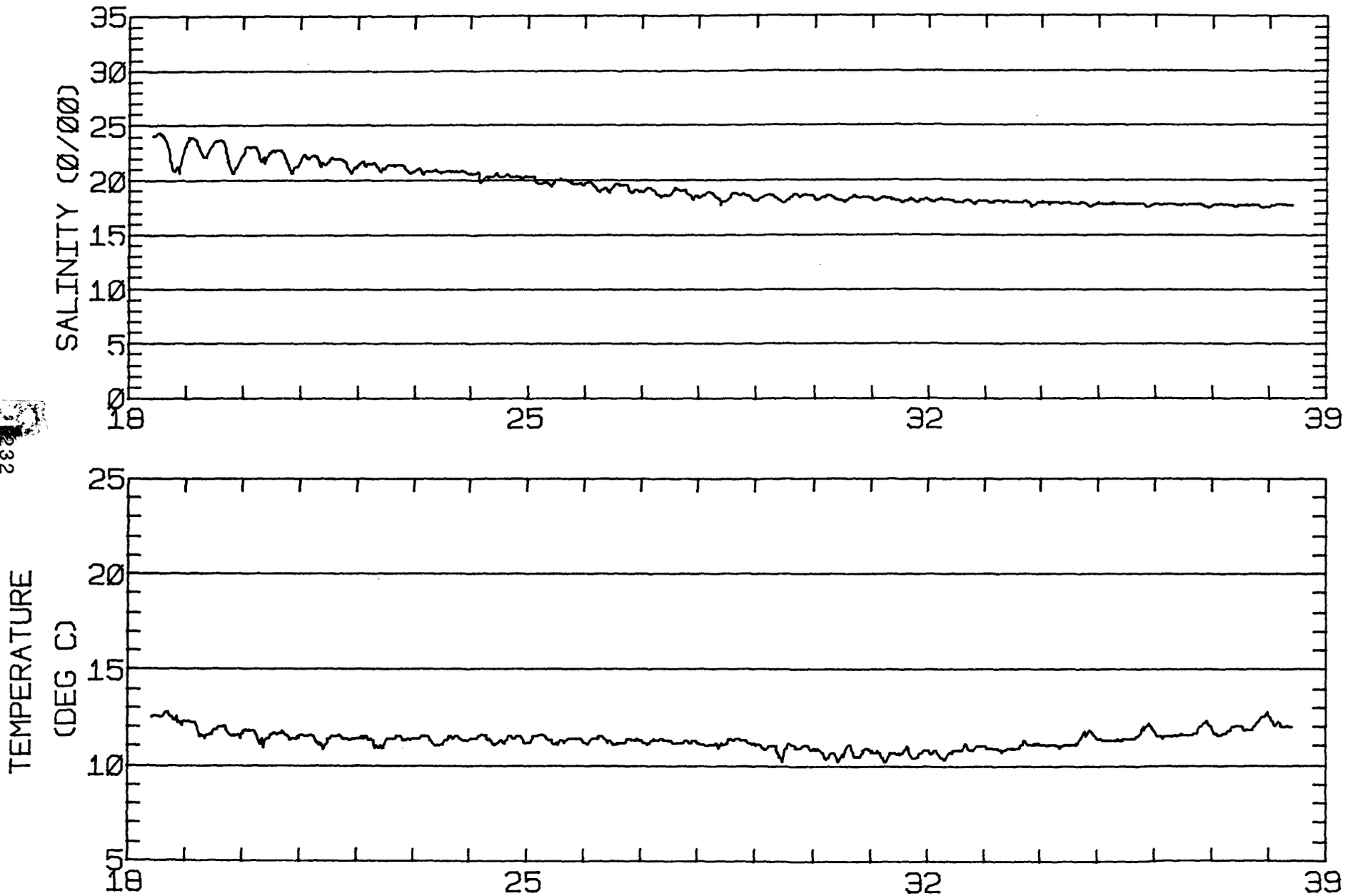
RMS SPEED: 28.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 58.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 138.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 4.06 CM/SEC
STANDARD DEVIATION V SERIES: 4.31 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.1	3.1	5646.
2	12	-2.4	3.7	2935.
3	12	-0.7	1.8	1816.
4	2	-0.5	2.1	1336.
ALL	38	-1.1	2.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 7N 122- 6-44W
METER 001.5 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 7N 122- 6-44W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30' 7"N 122 6'46"W
METER TYPE: AANDERAA
WATER DEPTH: 15.2 M (MLLW)
METER DEPTH: 13.7 M (BELOW MLLW)
START TIME OF SERIES: 3/13/80 1100 PST JULIAN DAY= 73
APPROXIMATE RECORD LENGTH IS 54 M2-CYCLES

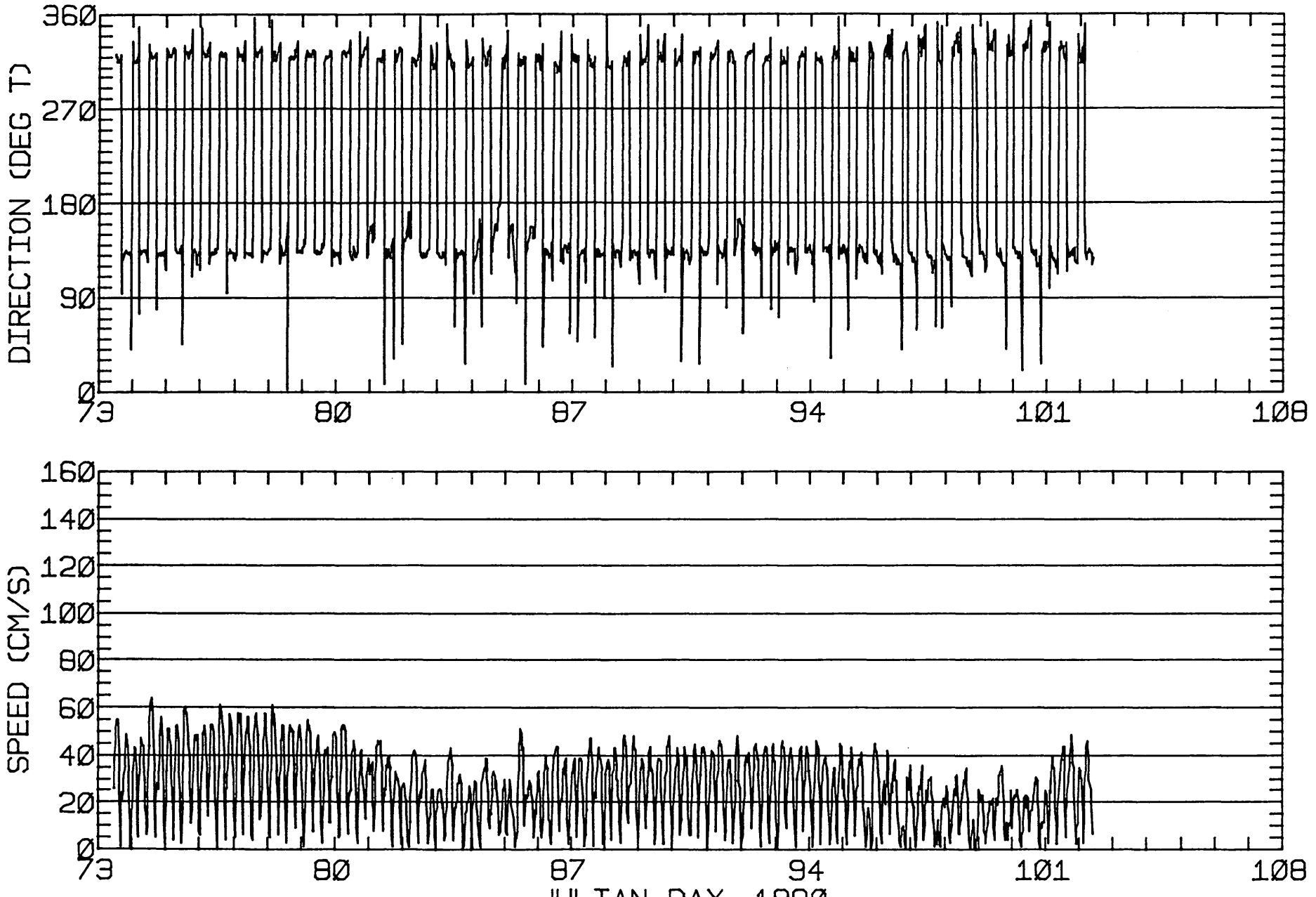
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.50	0.05	135.7	31.6	ANTI-CLOCKWISE
K1	5.24	0.41	144.0	30.5	CLOCKWISE
N2	9.24	0.14	139.9	257.9	CLOCKWISE
M2	36.56	0.18	137.4	283.2	CLOCKWISE
S2	13.24	0.34	137.9	293.8	CLOCKWISE
M4	2.54	0.21	138.1	78.2	ANTI-CLOCKWISE

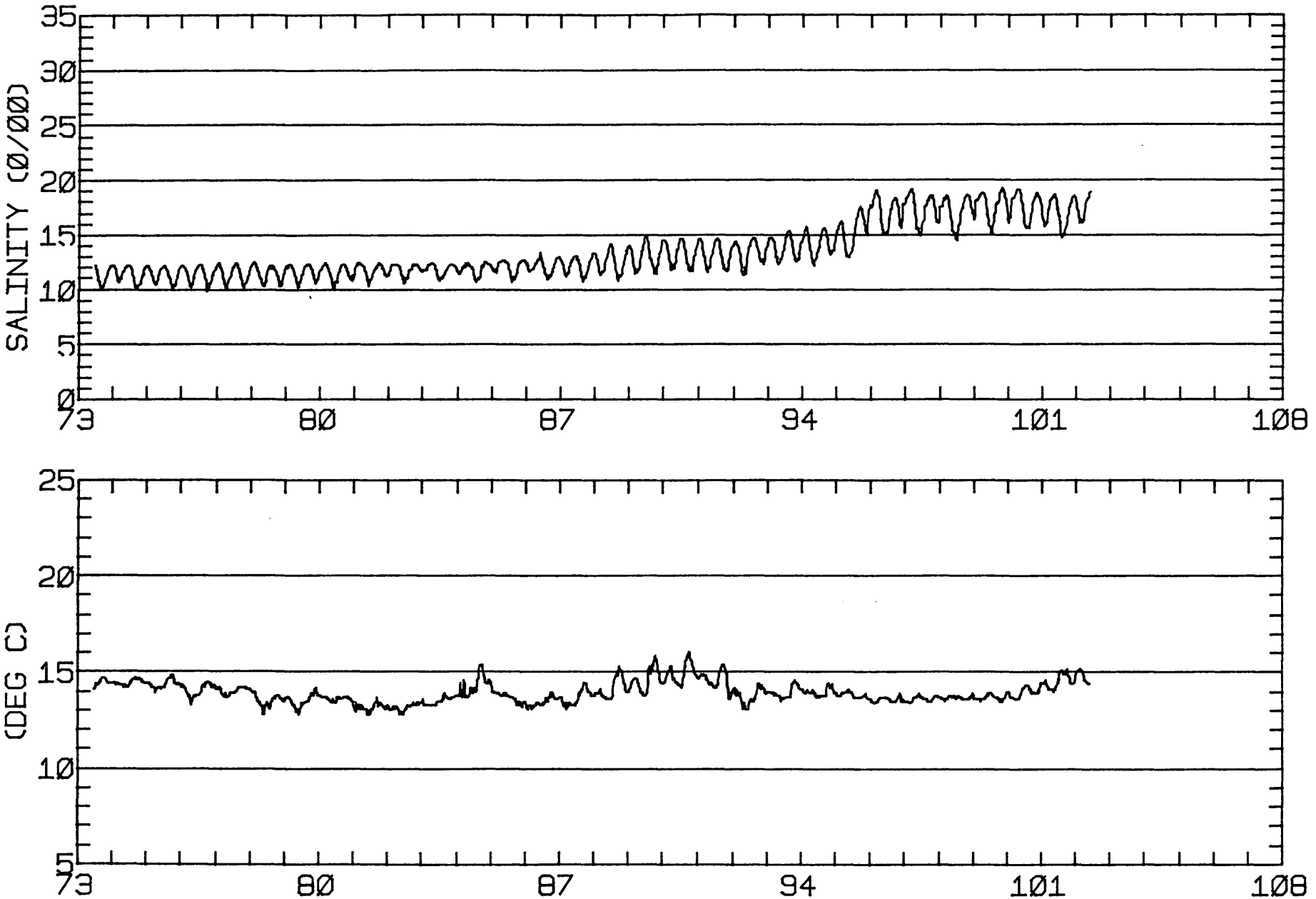
RMS SPEED: 30.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 60.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 137.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.22
STANDARD DEVIATION U-SERIES: 5.79 CM/SEC
STANDARD DEVIATION V SERIES: 5.67 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.4	2.7	2648.
2	12	-0.6	0.8	2018.
3	12	2.1	-0.7	1490.
4	12	4.2	-1.6	1048.
5	6	6.3	-1.9	1136.
ALL	54	2.3	0.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 7N 122- 6-46W
METER 001.5 METERS ABOVE BED. WATER DEPTH 015.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 7N 122- 6-46W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø15.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30' 8"N 122 6'51"W
METER TYPE: AANDERAA
WATER DEPTH: 14.6 M (MLLW)
METER DEPTH: 13.1 M (BELOW MLLW)
START TIME OF SERIES: 5/ 6/80 1700 PST JULIAN DAY=127
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

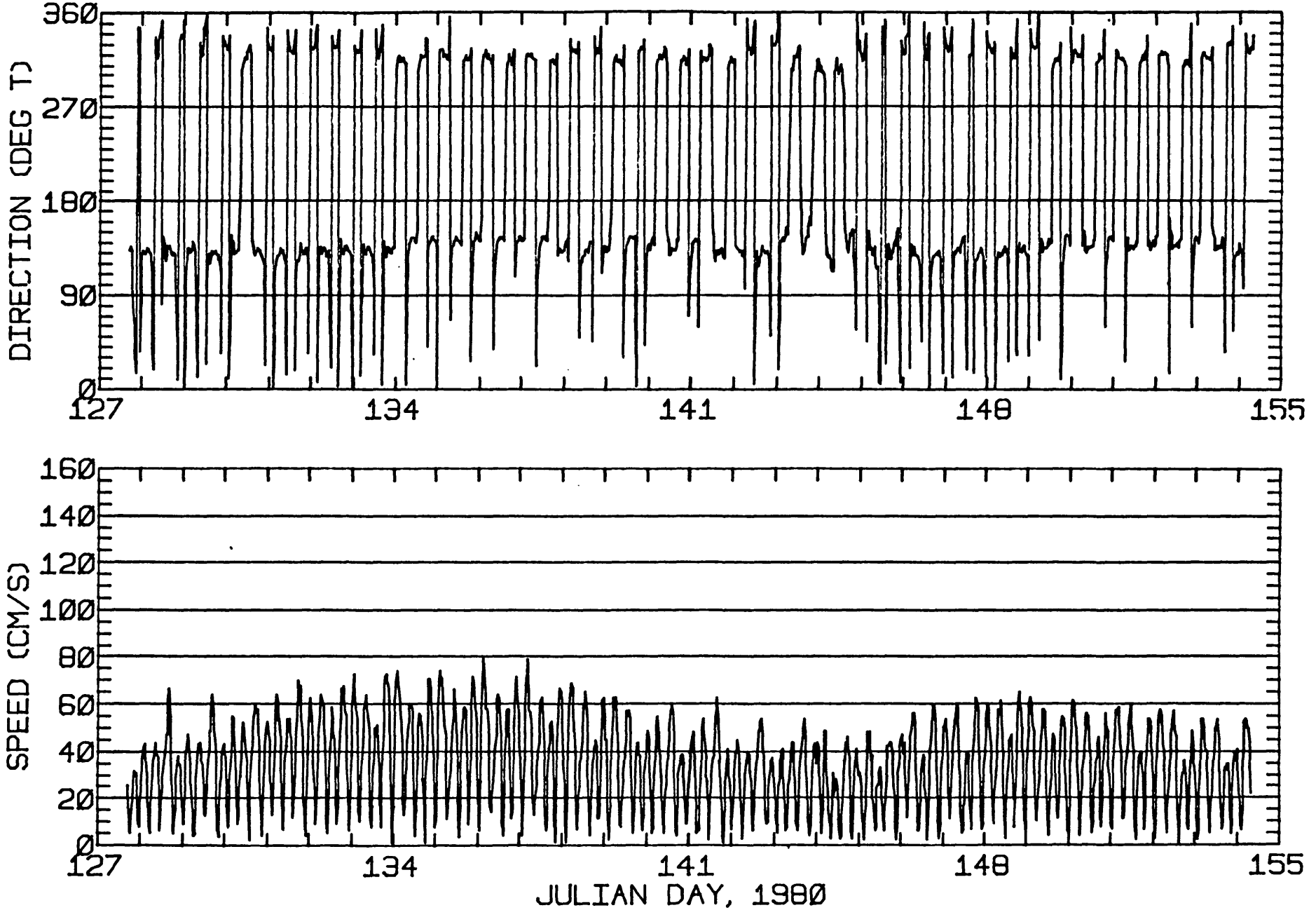
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.77	0.46	136.8	36.5	CLOCKWISE
K1	12.28	0.38	139.9	14.9	ANTI-CLOCKWISE
N2	8.17	0.66	142.6	262.8	CLOCKWISE
M2	49.43	1.13	139.5	289.5	CLOCKWISE
S2	7.39	0.25	135.0	292.8	CLOCKWISE
M4	1.50	0.44	93.2	76.3	ANTI-CLOCKWISE

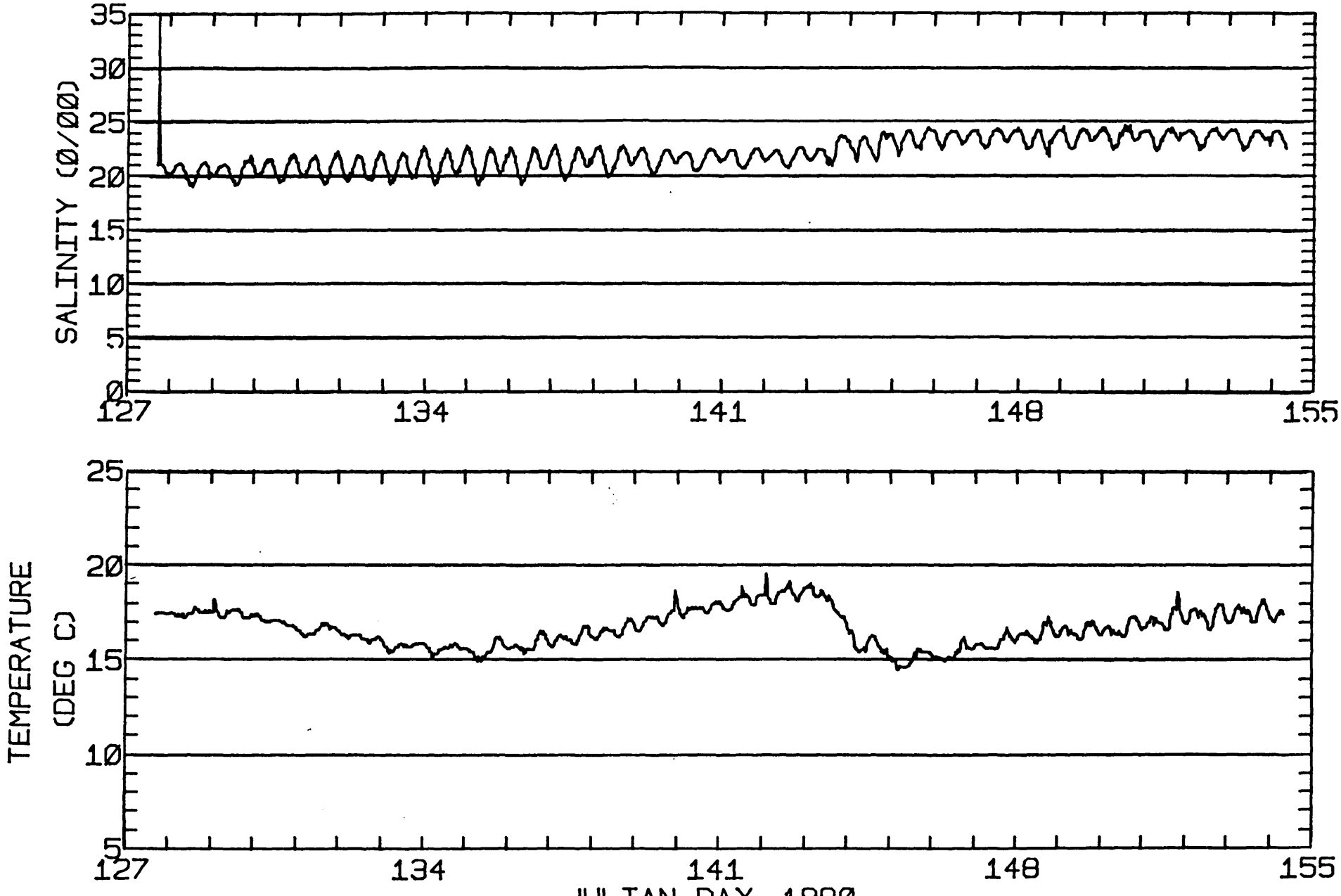
RMS SPEED: 39.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 73.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 138.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 7.73 CM/SEC
STANDARD DEVIATION V SERIES: 6.80 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	9.6	-0.6	586.
2	12	0.8	-0.4	736.
3	12	3.5	-1.4	604.
4	12	4.9	-0.5	484.
5	2	1.8	-1.5	440.
ALL	50	4.6	-0.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 8N 122- 6-51W
METER 001.5 METERS ABOVE BED. WATER DEPTH 014.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 8N 122- 6-51W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø14.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30' 8"N 122 6'50"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 12.8 M (BELOW MLLW)
START TIME OF SERIES: 6/ 2/80 935 PST JULIAN DAY=154
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

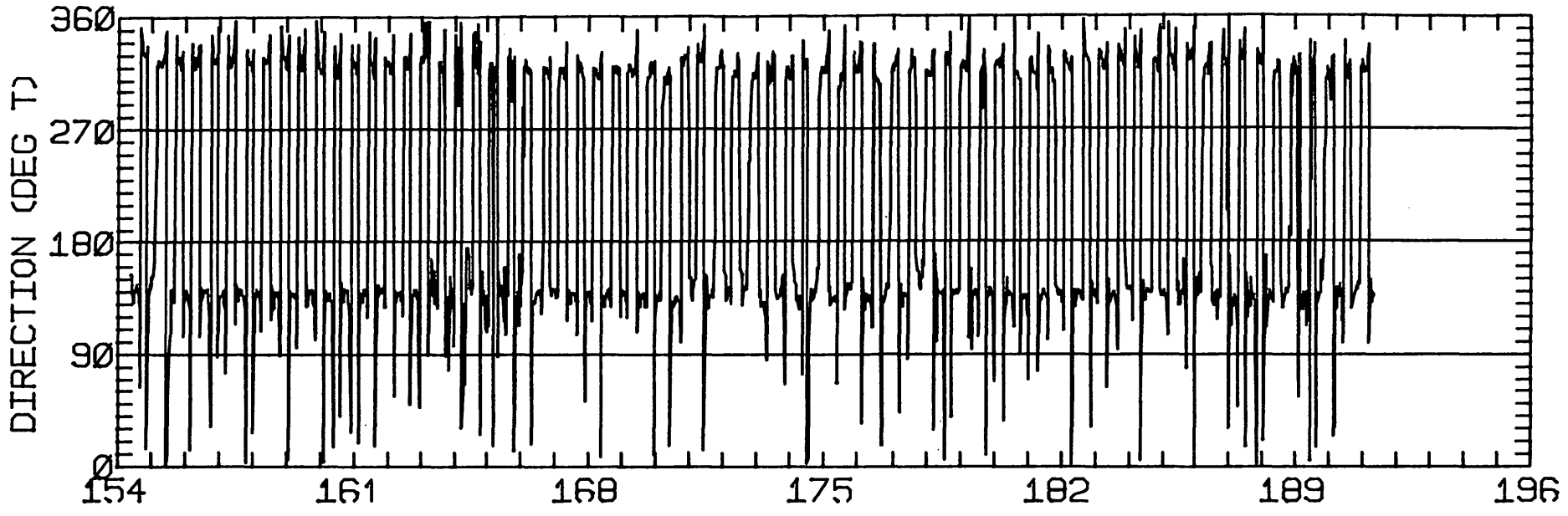
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

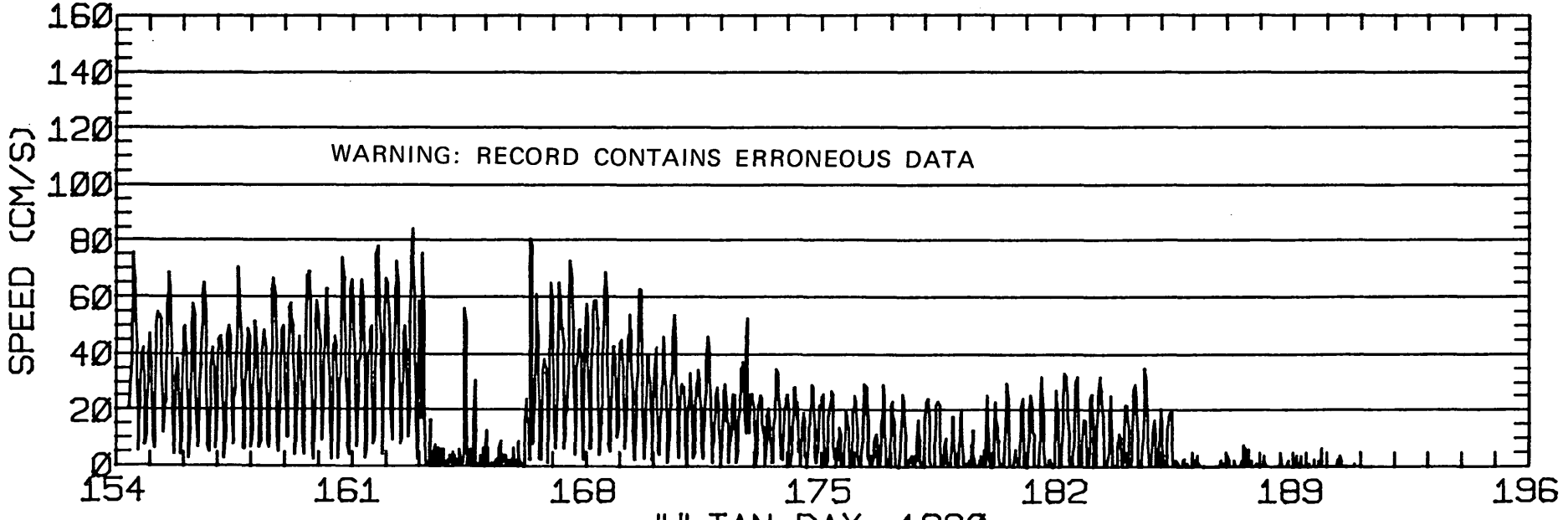
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.80	2.17	139.2	40.3	CLOCKWISE
K1	15.70	1.91	140.1	28.4	CLOCKWISE
N2	17.96	0.65	133.6	242.1	ANTI-CLOCKWISE
M2	49.33	1.75	142.8	299.1	ANTI-CLOCKWISE
S2	8.34	0.20	141.1	314.2	ANTI-CLOCKWISE
M4	1.93	0.05	177.3	262.4	ANTI-CLOCKWISE

RMS SPEED: 39.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 80.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 141.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 4.88 CM/SEC
STANDARD DEVIATION V SERIES: 8.24 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

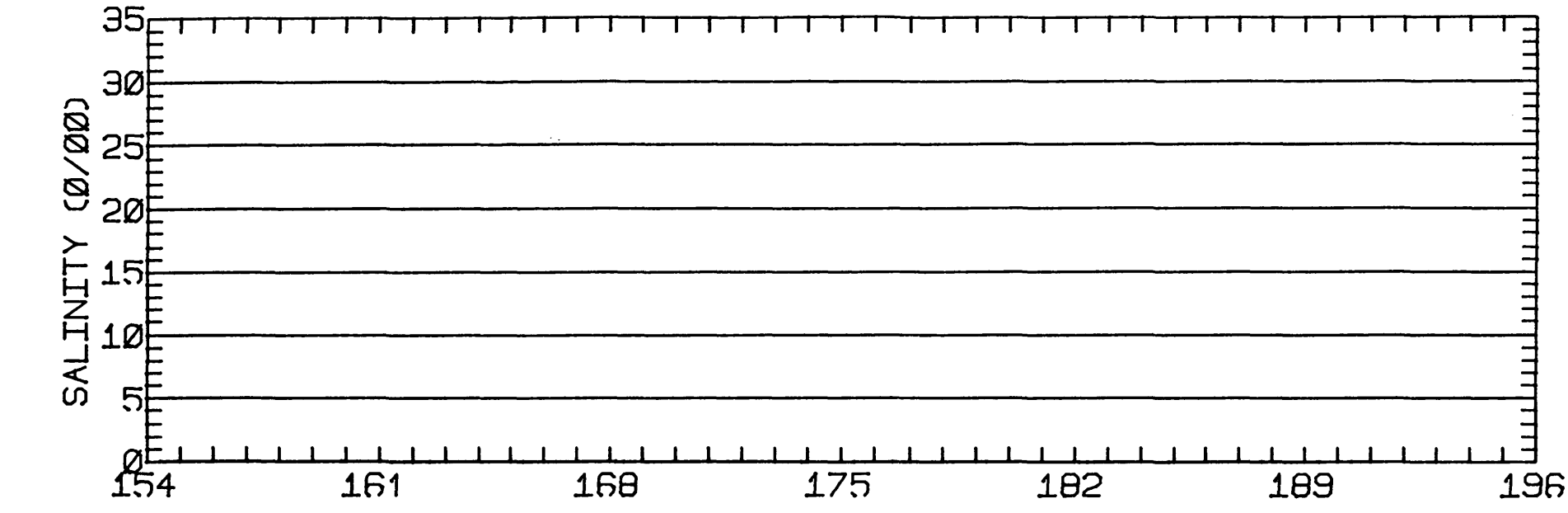
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.9	-0.9	403.
2	2	4.7	-2.5	386.
ALL	14	4.9	-1.2	

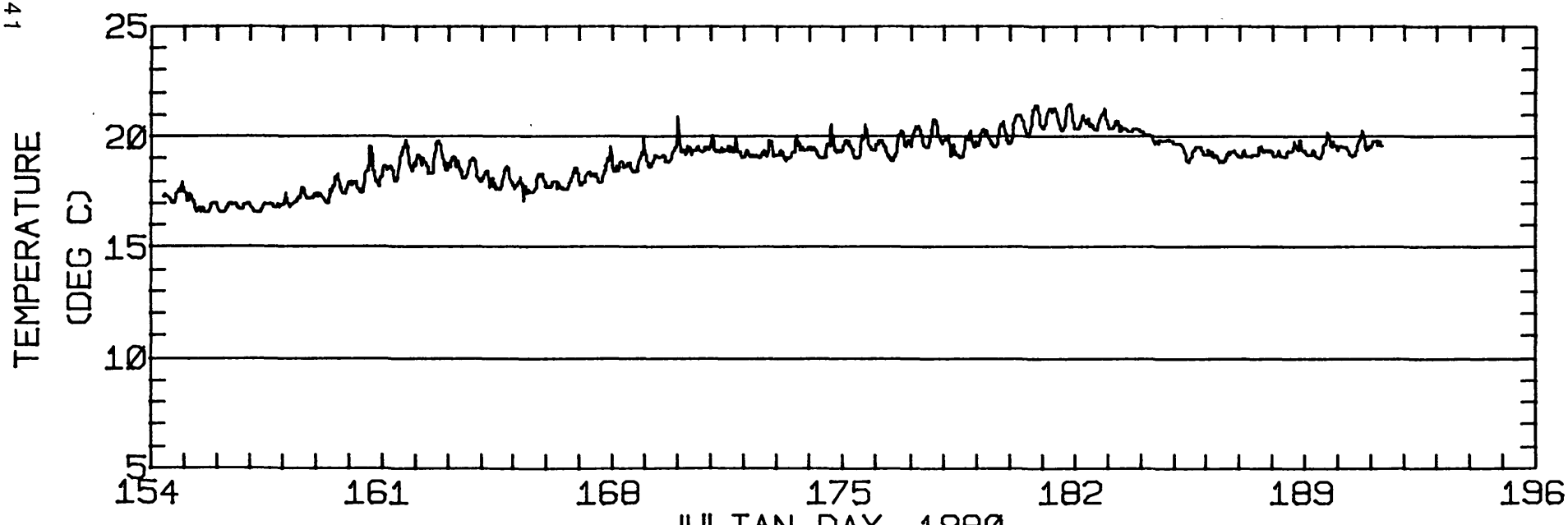




JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 8N 122- 6-50W
METER 001.6 METERS ABOVE BED. WATER DEPTH 028.1 METERS.





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 8N 122- 6-50W
METER ØØ1.6 METERS ABOVE BED. WATER DEPTH Ø28.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30' 5"N 122 6'47"W
METER TYPE: AANDERAA
WATER DEPTH: 13.7 M (MLLW)
METER DEPTH: 12.2 M (BELOW MLLW)
START TIME OF SERIES: 7/ 9/80 1050 PST JULIAN DAY=191
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

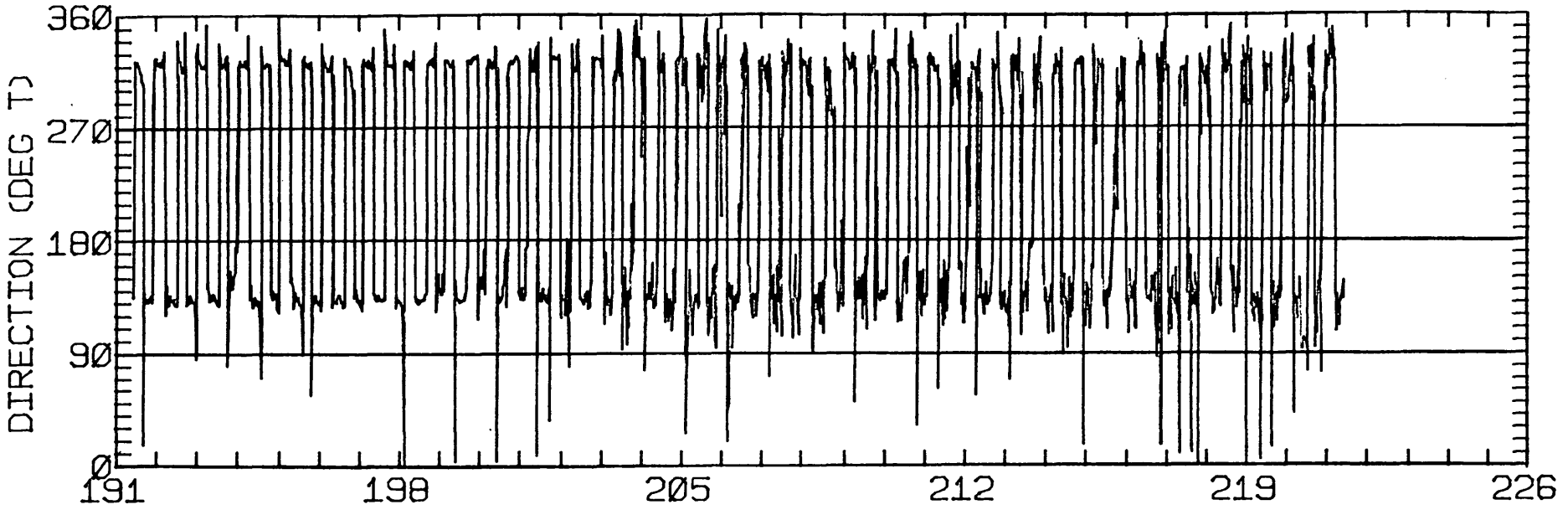
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

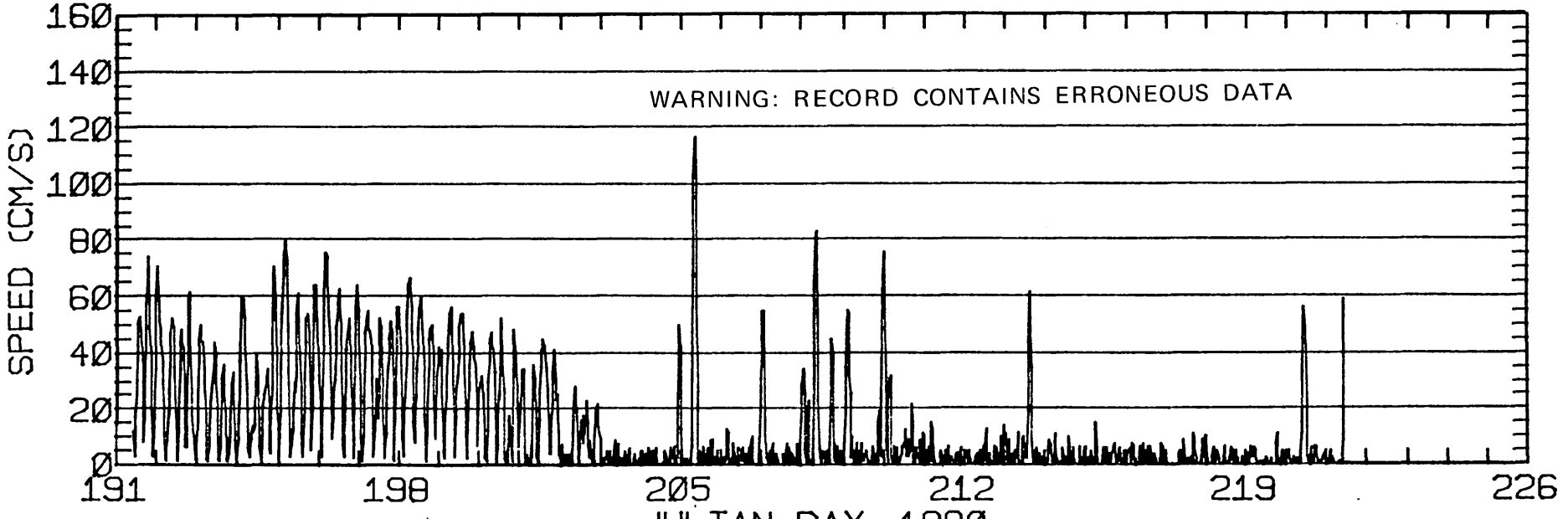
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.25	0.03	140.7	39.3	CLOCKWISE
K1	9.91	0.31	140.4	59.1	CLOCKWISE
N2	16.13	0.34	125.9	359.5	ANTI-CLOCKWISE
M2	62.83	0.22	133.9	291.1	ANTI-CLOCKWISE
S2	8.86	1.78	128.2	53.6	ANTI-CLOCKWISE
M4	2.73	0.64	144.5	92.3	ANTI-CLOCKWISE

RMS SPEED: 38.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 86.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 134.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.21
STANDARD DEVIATION U-SERIES: 8.58 CM/SEC
STANDARD DEVIATION V SERIES: 8.62 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

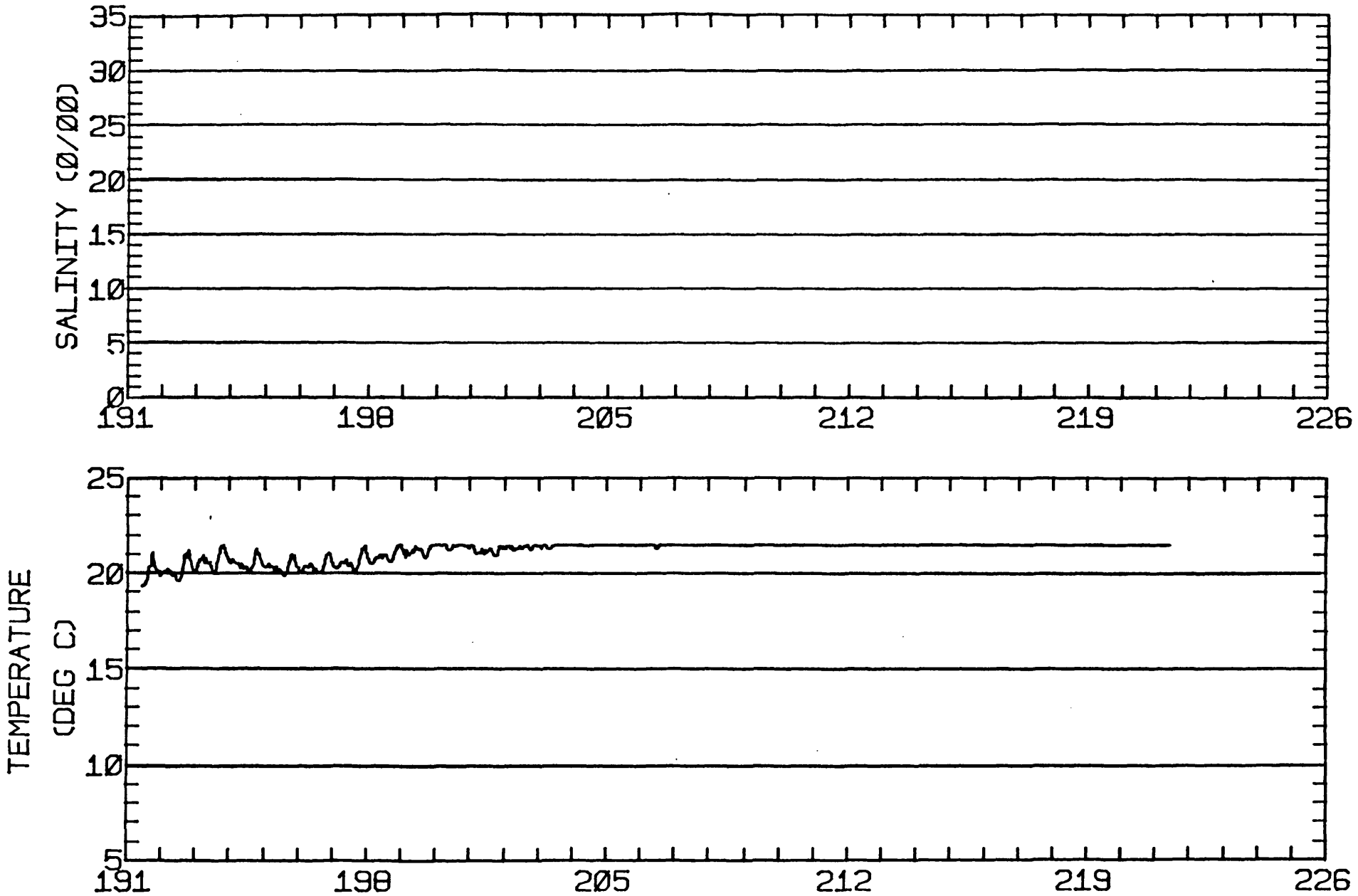
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	2.6	279.
2	2	2.3	2.6	288.
ALL	14	0.6	2.6	





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 5N 122- 6-47W
METER 001.5 METERS ABOVE BED. WATER DEPTH 013.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 5N 122- 6-47W
.METER 001.5 METERS ABOVE BED. WATER DEPTH 013.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 13
POSITION: 37 30' 9"N 122 6'47"W
METER TYPE: AANDERAA
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 12.5 M (BELOW MLLW)
START TIME OF SERIES:11/12/80 1000 PST JULIAN DAY=317
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

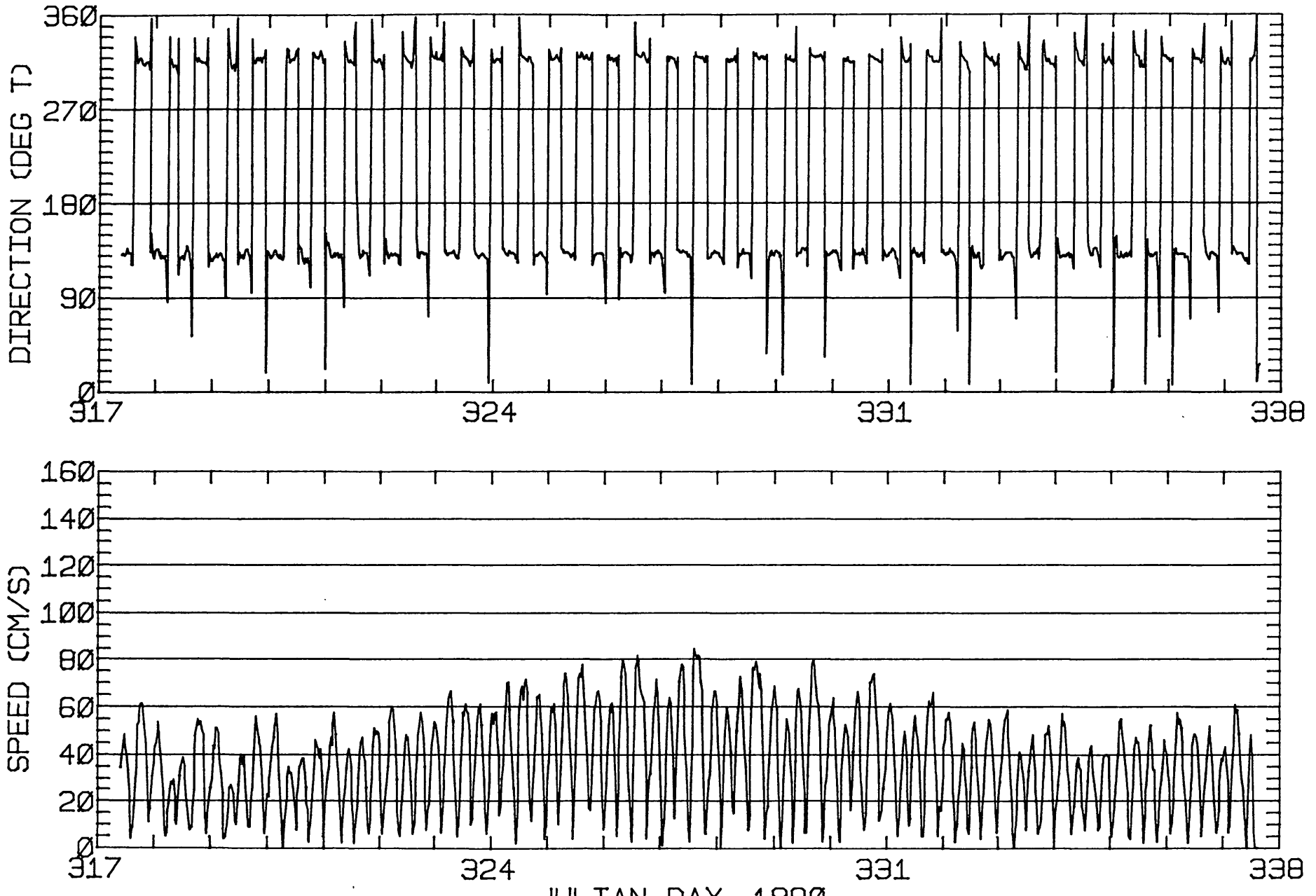
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.18	0.46	137.7	47.0	CLOCKWISE
K1	15.52	0.04	137.1	31.2	ANTI-CLOCKWISE
N2	12.48	0.17	136.5	266.7	ANTI-CLOCKWISE
M2	49.74	0.57	135.2	292.2	ANTI-CLOCKWISE
S2	9.93	0.15	138.7	296.8	ANTI-CLOCKWISE
M4	1.97	0.14	133.0	87.6	ANTI-CLOCKWISE

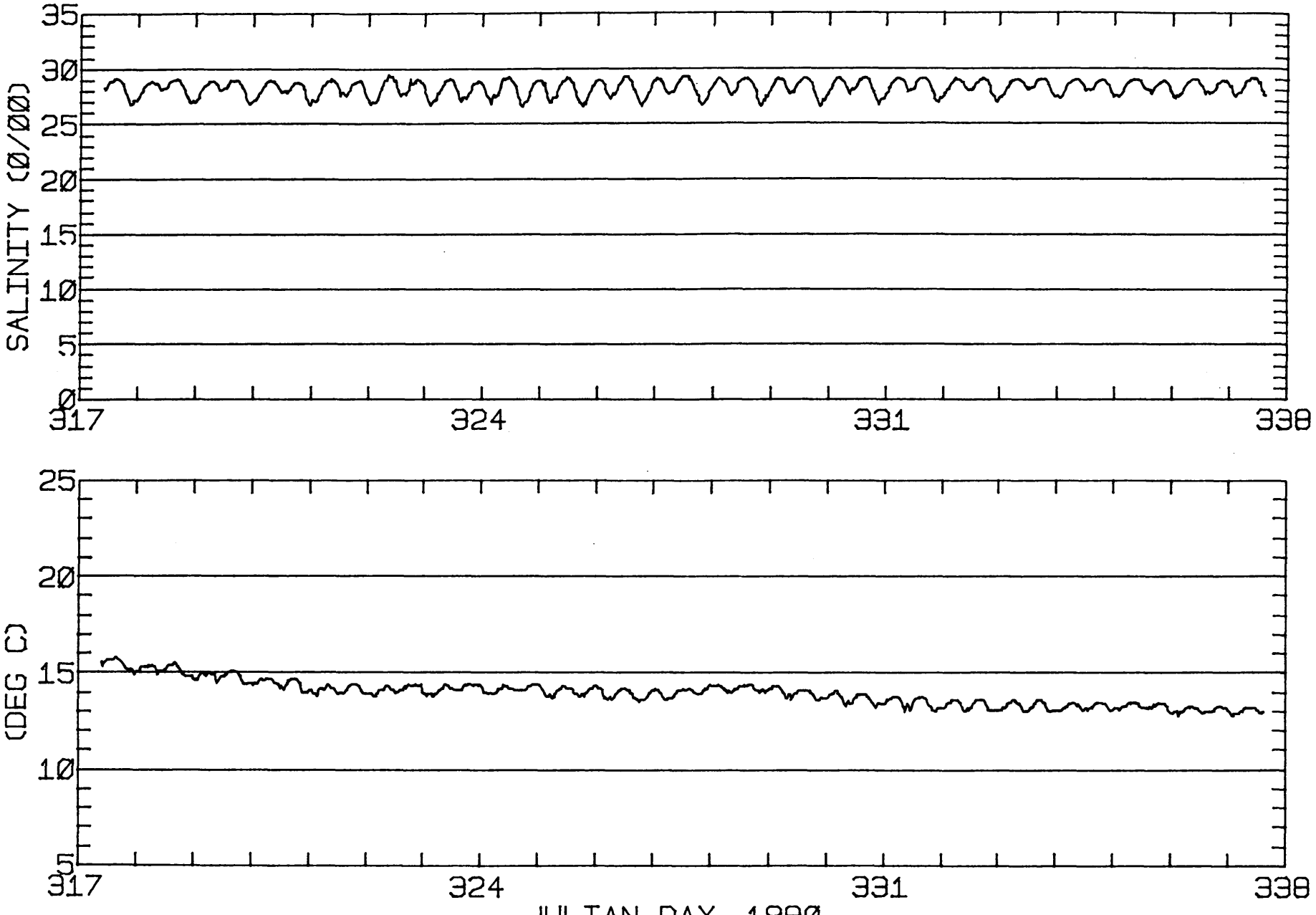
RMS SPEED: 42.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 82.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 136.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 6.15 CM/SEC
STANDARD DEVIATION V SERIES: 6.08 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.9	-0.1	197.
2	12	1.4	3.0	170.
3	12	3.2	-0.5	211.
4	2	5.0	-2.0	219.
ALL	38	2.6	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 9N 122- 6-47W
METER 001.5 METERS ABOVE BED. WATER DEPTH 014.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 13 37-30- 9N 122- 6-47W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø14.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 14
POSITION: 37 29'15"N 122 4'53"W
METER TYPE: AANDERAA
WATER DEPTH: 6.4 M (MLLW)
METER DEPTH: 4.9 M (BELOW MLLW)
START TIME OF SERIES: 5/27/80 1320 PST JULIAN DAY=148
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

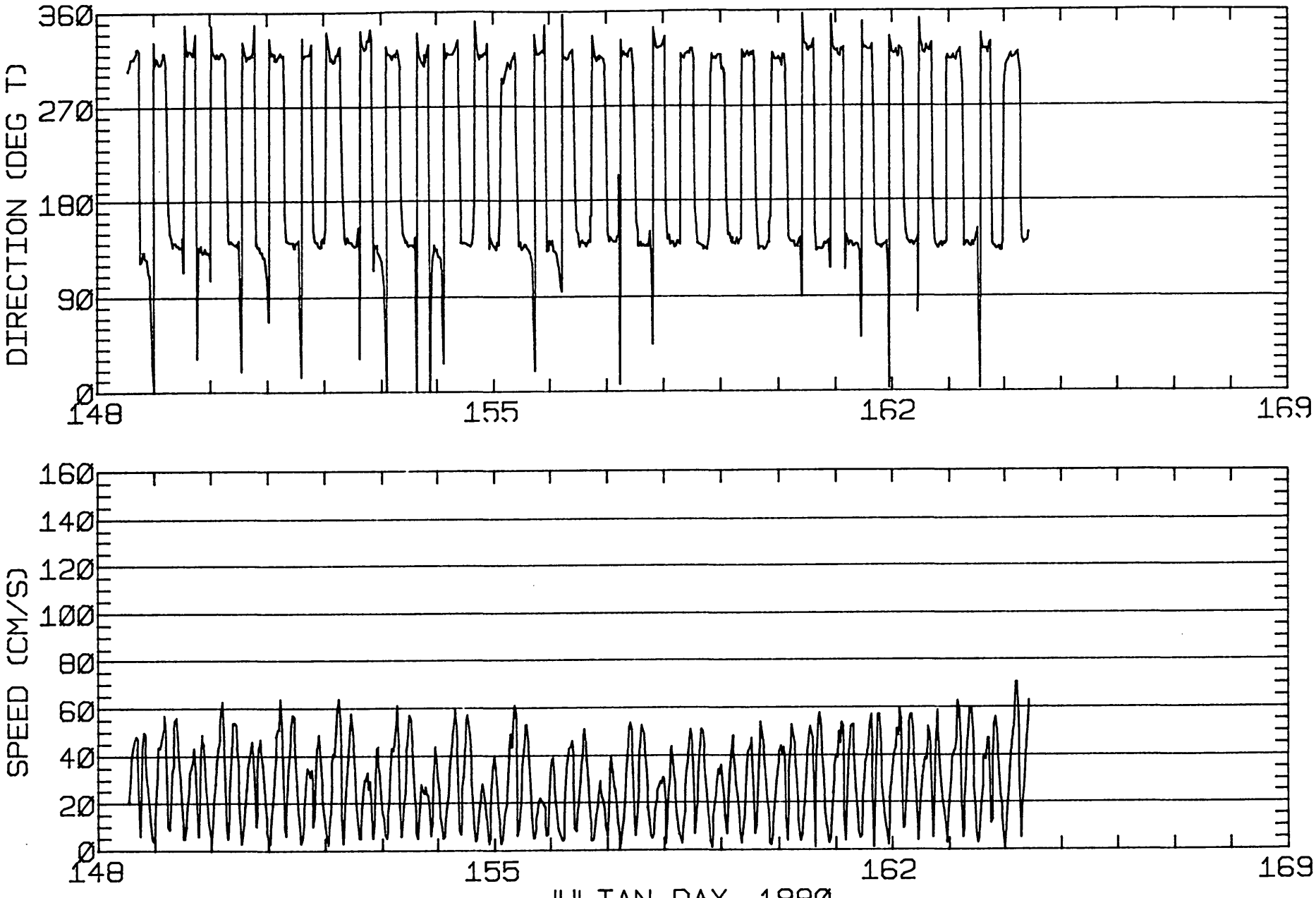
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.37	0.95	145.3	11.4	ANTI-CLOCKWISE
K1	8.92	1.20	132.6	26.1	ANTI-CLOCKWISE
N2	7.01	0.27	146.6	266.1	ANTI-CLOCKWISE
M2	39.85	0.17	139.6	296.4	ANTI-CLOCKWISE
S2	9.71	0.07	138.8	303.8	ANTI-CLOCKWISE
M4	8.19	0.33	143.0	139.5	ANTI-CLOCKWISE

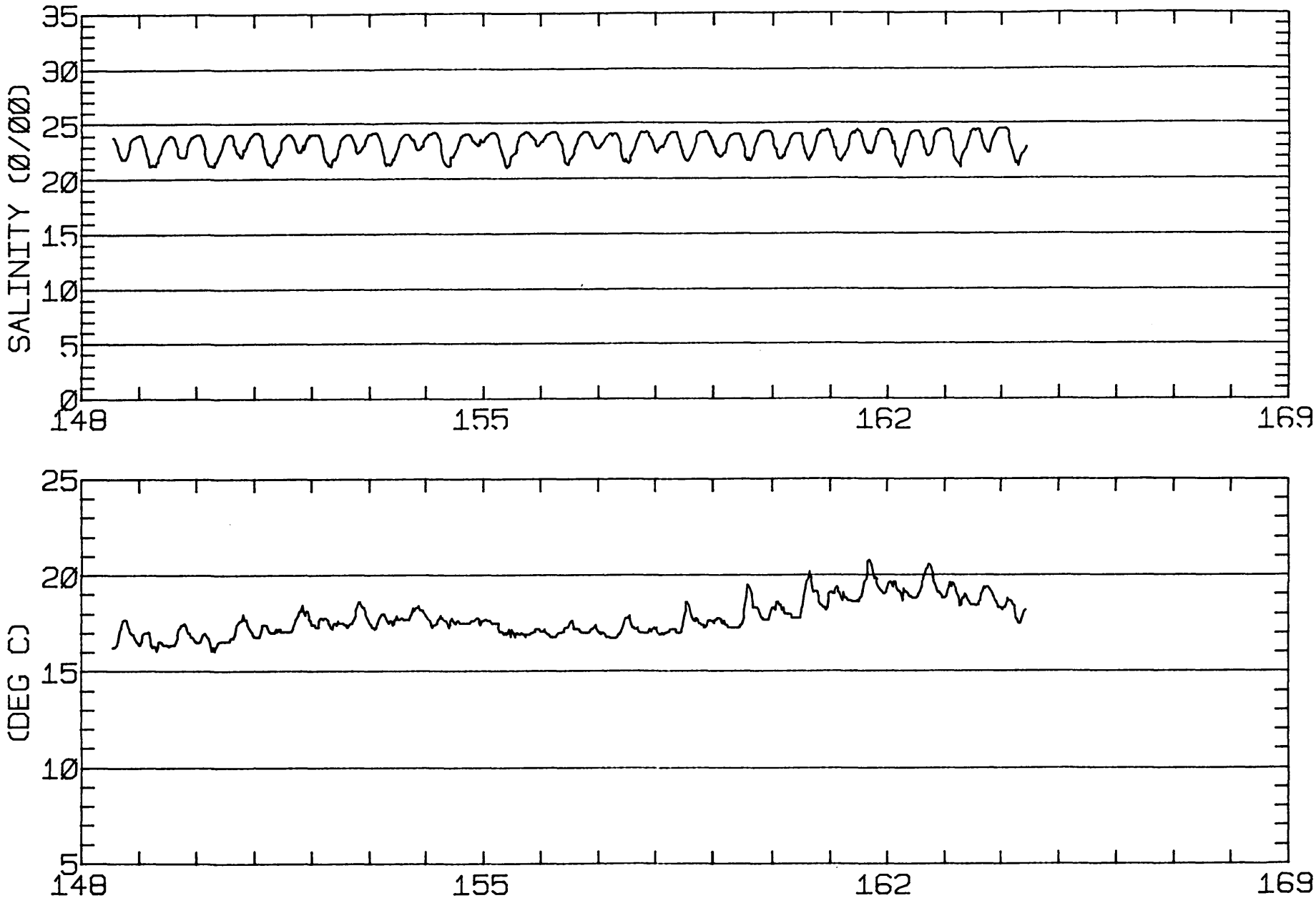
RMS SPEED: 33.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 64.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 139.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 4.95 CM/SEC
STANDARD DEVIATION V SERIES: 6.35 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.0	1.1	453.
2	12	0.7	-1.1	403.
3	6	-0.0	1.8	402.
ALL	30	0.3	0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 14 37-29-15N 122- 4-53W
METER 001.5 METERS ABOVE BED. WATER DEPTH 006.4 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 14 37-29-15N 122- 4-53W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ6.4 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 225
POSITION: 37 47'28"N 122 22'25"W
METER TYPE: AANDERAA
WATER DEPTH: 19.8 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 9/25/79 1100 PST JULIAN DAY=268
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

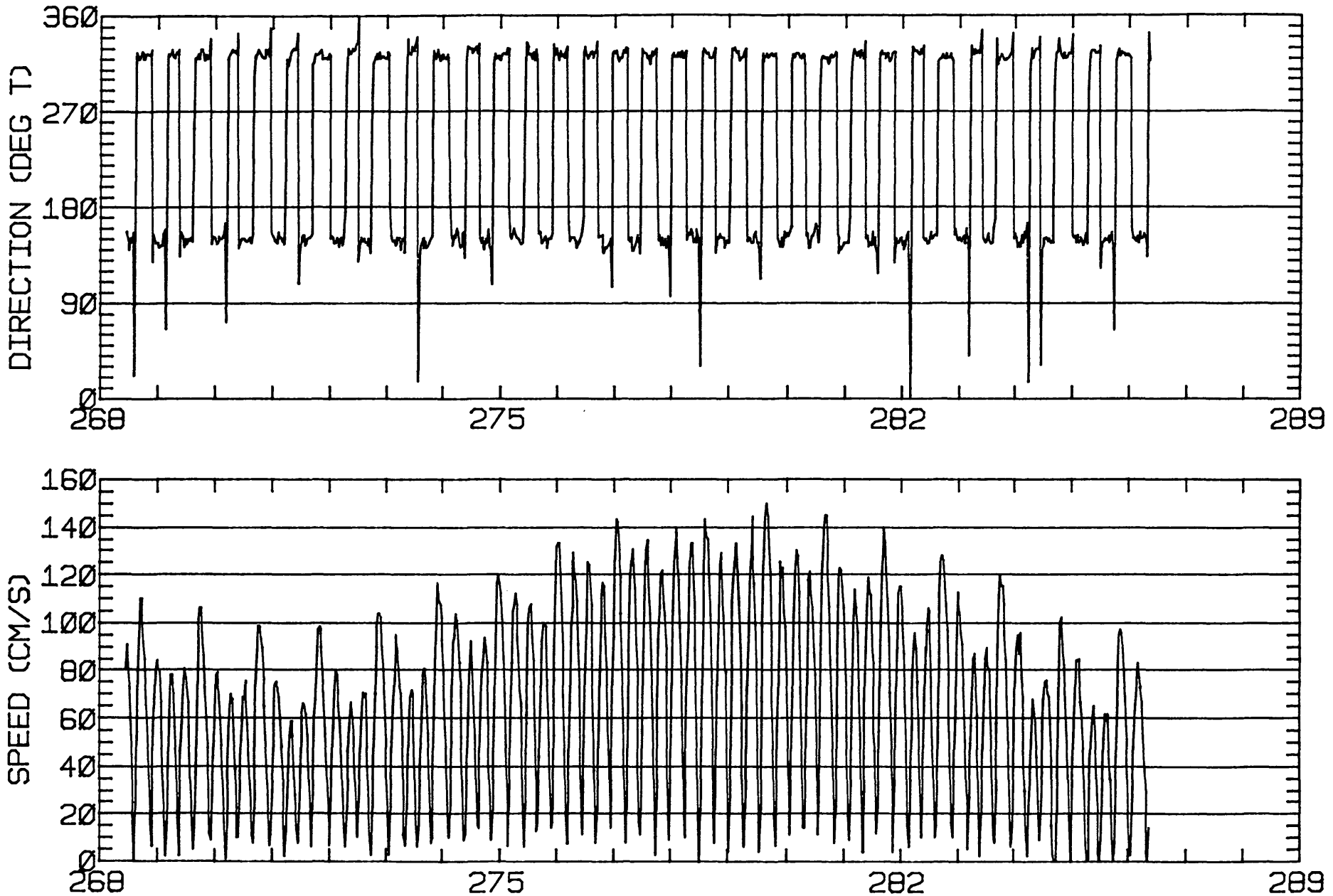
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.71	1.55	137.6	27.9	ANTI-CLOCKWISE
K1	18.98	0.15	145.2	26.9	ANTI-CLOCKWISE
N2	25.05	0.08	146.1	264.8	CLOCKWISE
M2	85.27	0.10	146.5	279.8	ANTI-CLOCKWISE
S2	24.15	0.13	144.4	286.4	ANTI-CLOCKWISE
M4	2.02	0.93	80.7	6.4	ANTI-CLOCKWISE

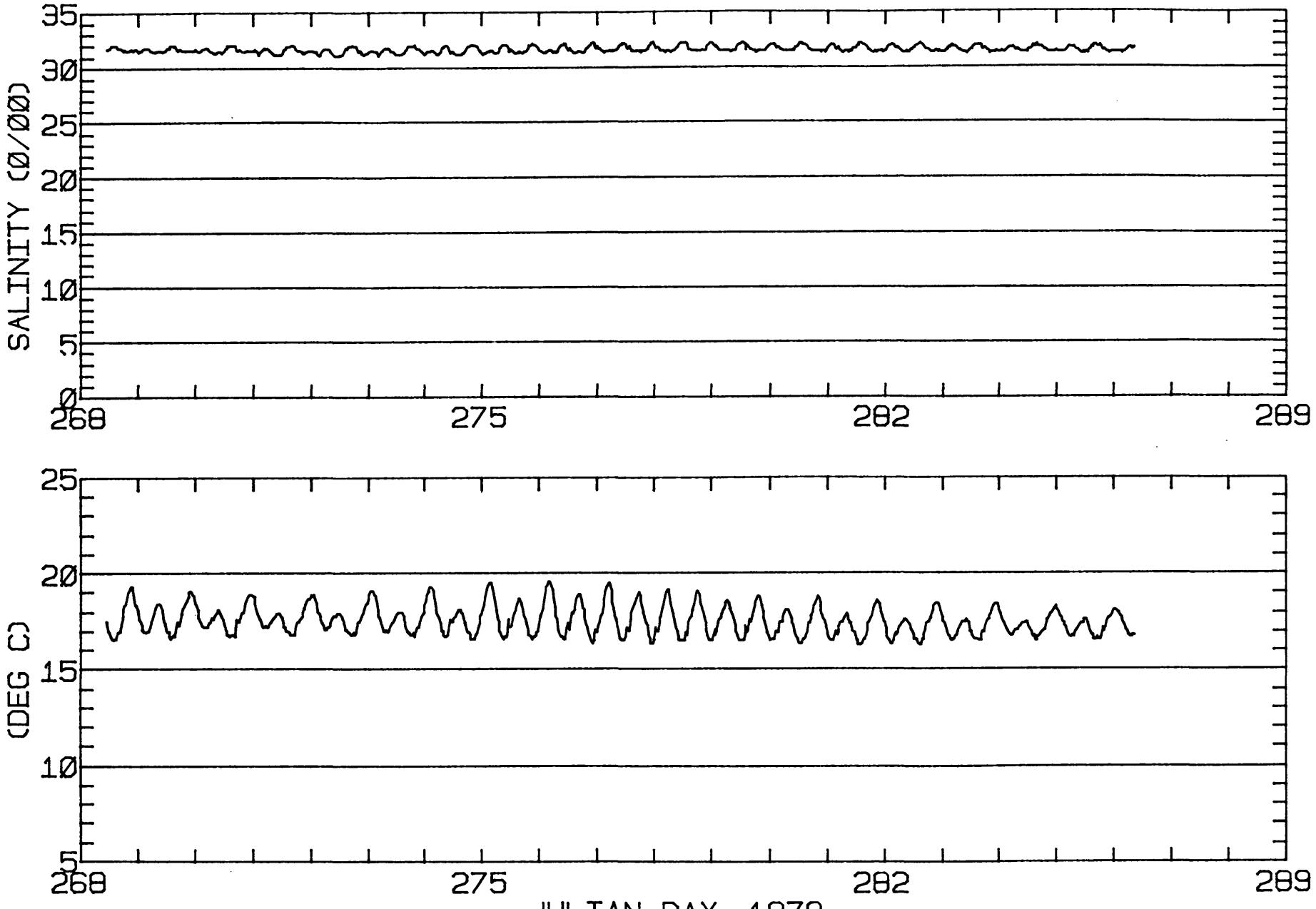
RMS SPEED: 78.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 143.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 56.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 145.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.31
STANDARD DEVIATION U-SERIES: 6.42 CM/SEC
STANDARD DEVIATION V SERIES: 7.40 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.9	2.0	135.
2	12	-6.8	1.7	153.
3	6	-3.5	-0.5	157.
ALL	30	-5.0	1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 225 37-47-28N 122-22-25W
METER 013.1 METERS ABOVE BED. WATER DEPTH 019.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 225 37-47-28N 122-22-25W
METER Ø13.1 METERS ABOVE BED. WATER DEPTH Ø19.8 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 225
POSITION: 37 47'23"N 122 22'20"W
METER TYPE: AANDERAA
WATER DEPTH: 19.2 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES:10/17/79 1410 PST JULIAN DAY=290
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

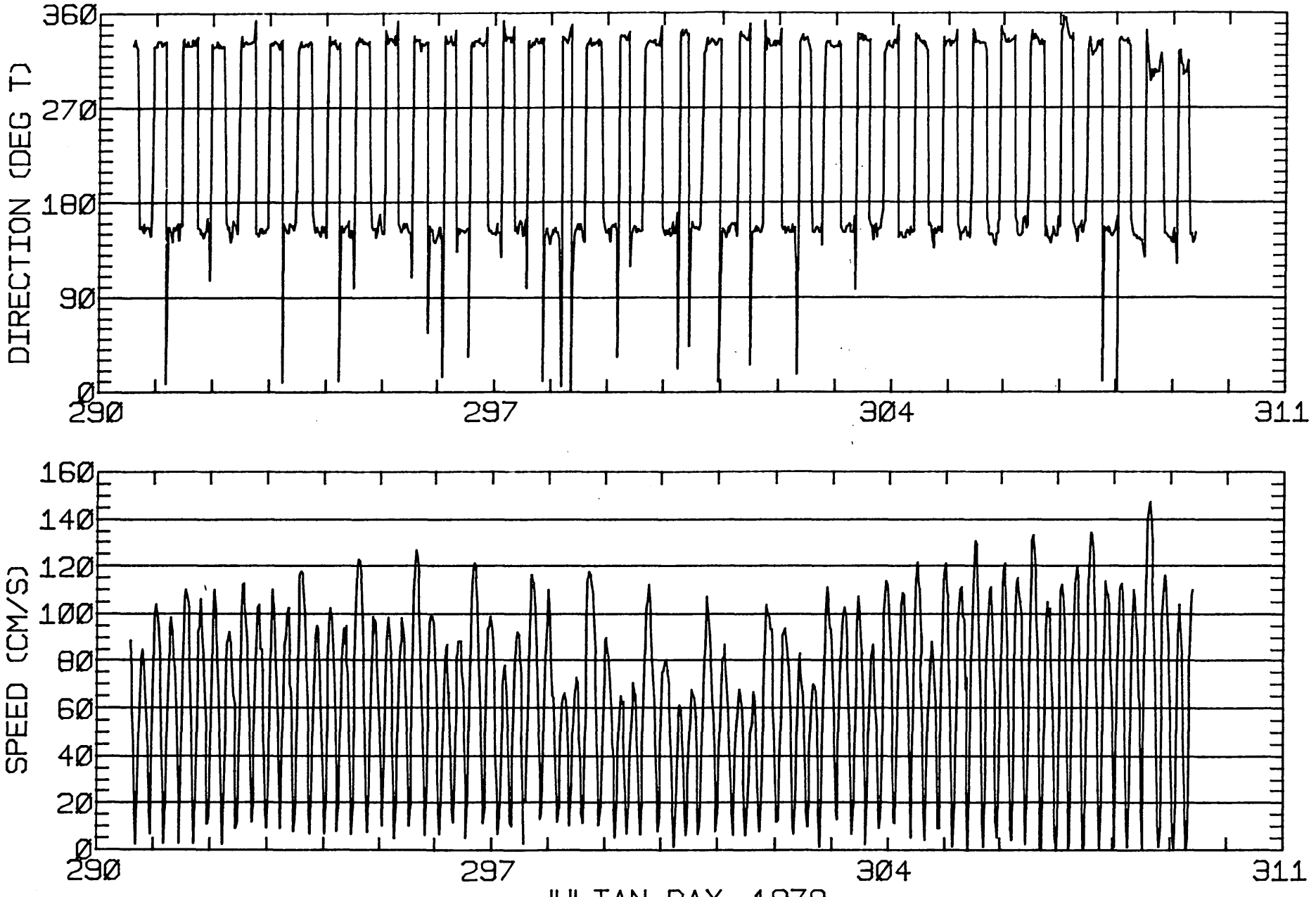
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	14.74	1.42	145.5	16.6	ANTI-CLOCKWISE
K1	23.23	0.23	147.6	16.5	CLOCKWISE
N2	14.16	1.92	148.8	257.8	CLOCKWISE
M2	86.89	0.66	152.3	279.9	ANTI-CLOCKWISE
S2	23.82	0.28	149.5	279.8	ANTI-CLOCKWISE
M4	1.97	0.55	141.5	30.1	ANTI-CLOCKWISE

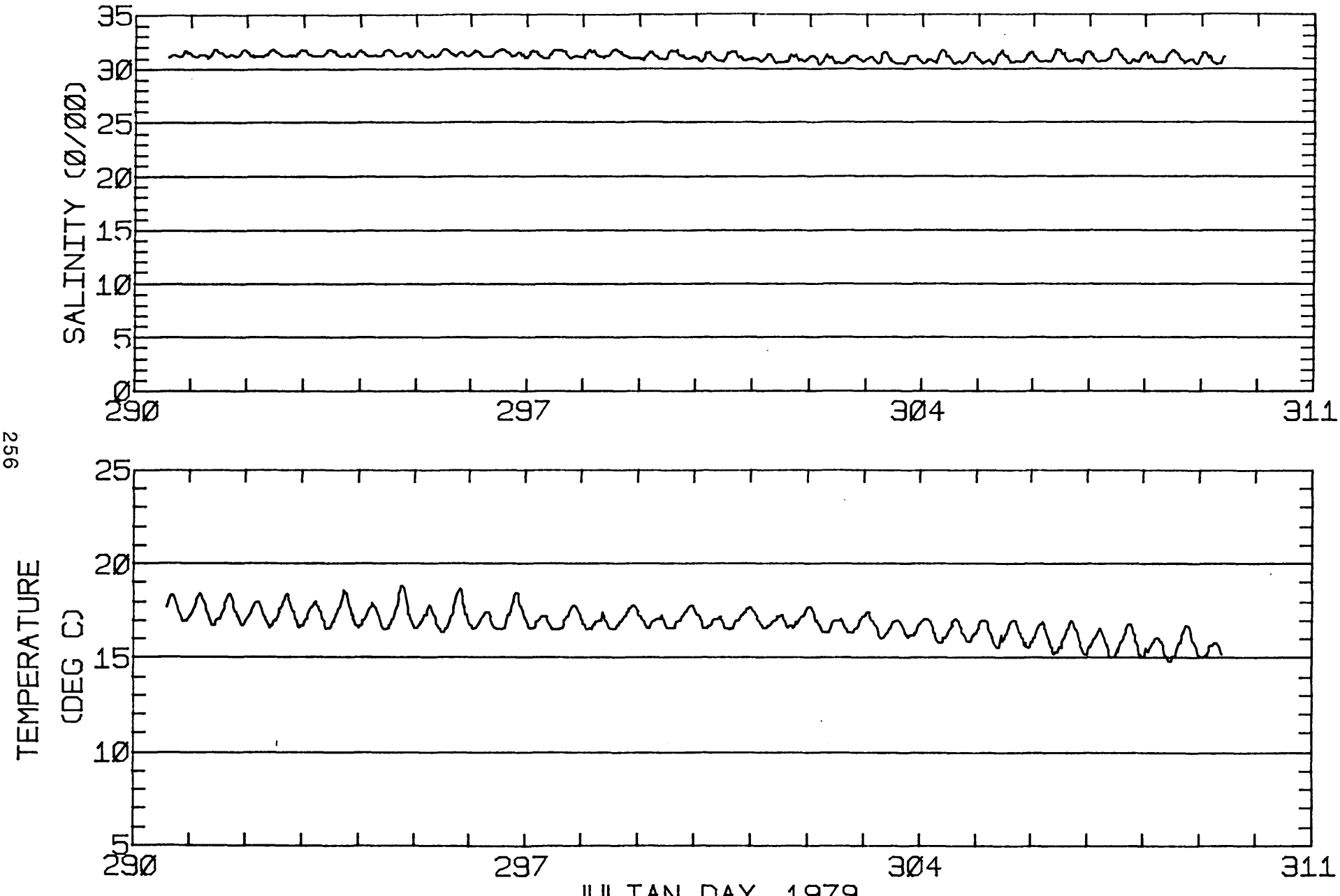
RMS SPEED: 72.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 148.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 54.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 150.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 8.41 CM/SEC
STANDARD DEVIATION V SERIES: 10.26 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.3	4.1	208.
2	12	-1.2	2.5	304.
3	12	-2.1	1.5	227.
ALL	36	-2.2	2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 225 37-47-23N 122-22-20W
METER 013.1 METERS ABOVE BED. WATER DEPTH 019.2 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 225 37-47-23N 122-22-20W
METER Ø13.1 METERS ABOVE BED. WATER DEPTH Ø19.2 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 226
POSITION: 37 48'15"N 122 21'26"W
METER TYPE: AANDERAA
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES:10/ 2/79 820 PST JULIAN DAY=275
APPROXIMATE RECORD LENGTH IS 10 M2-CYCLES

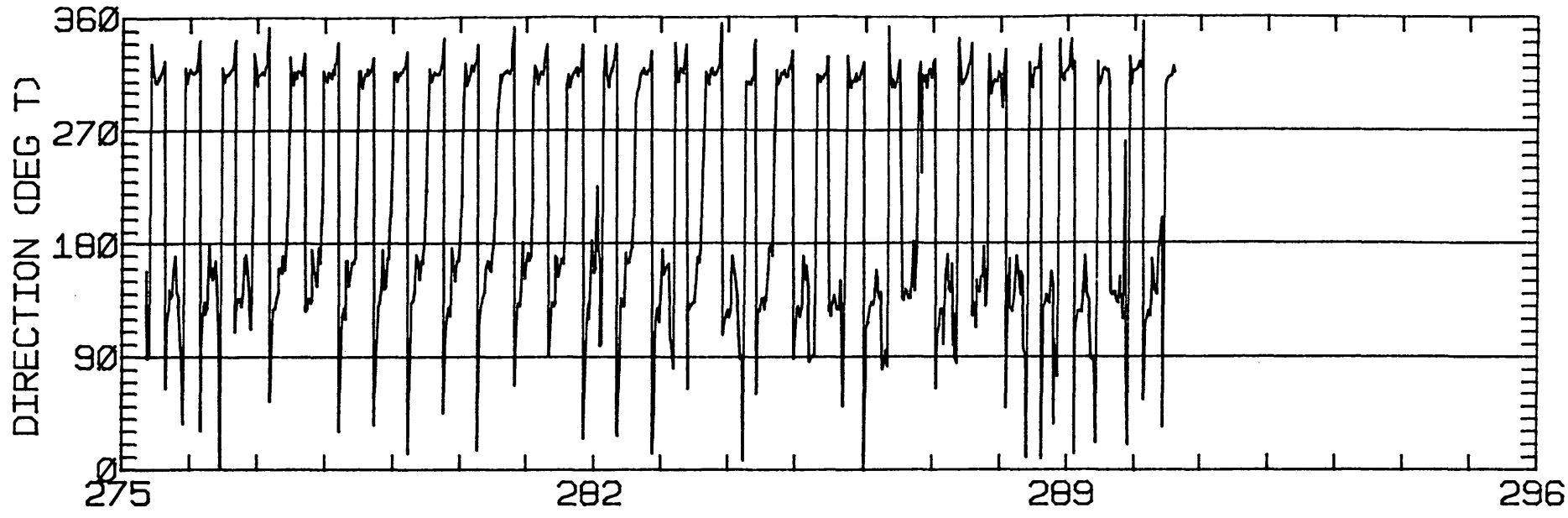
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

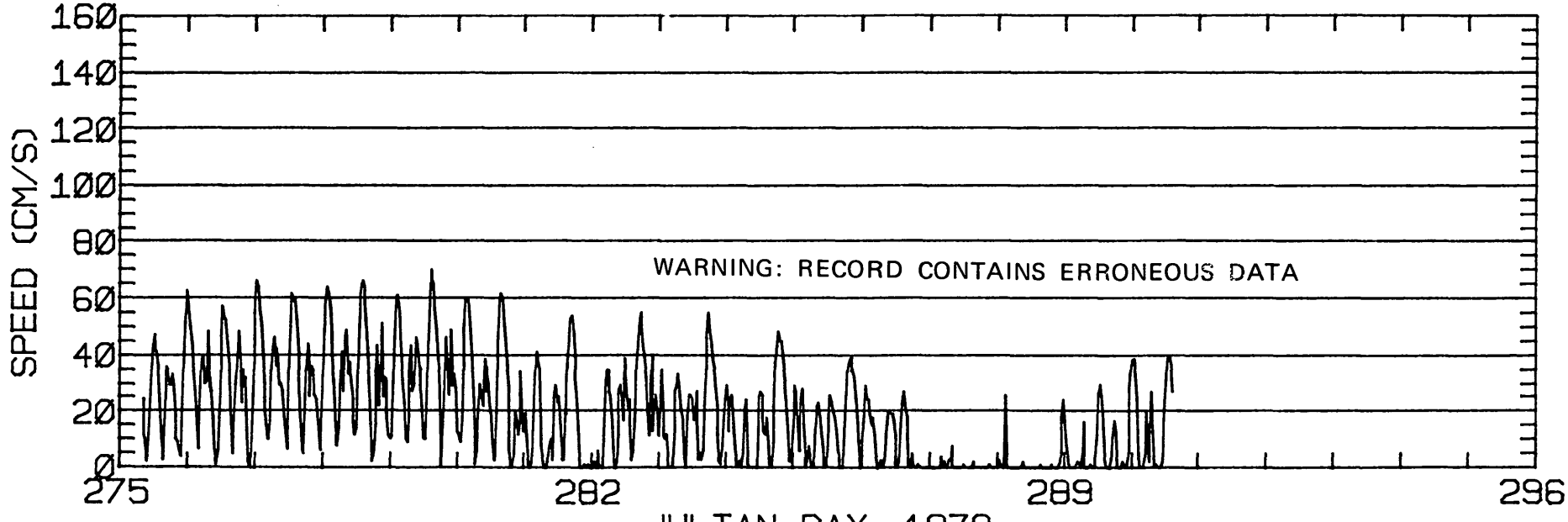
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.05	0.18	143.9	32.9	CLOCKWISE
K1	8.16	1.37	146.0	34.6	CLOCKWISE
N2	13.34	6.24	125.7	219.0	CLOCKWISE
M2	30.74	5.82	141.9	287.9	ANTI-CLOCKWISE
S2	9.01	5.31	110.6	221.8	CLOCKWISE
M4	8.22	1.46	107.8	29.9	ANTI-CLOCKWISE

RMS SPEED: 36.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 55.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 20.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 137.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 5.69 CM/SEC
STANDARD DEVIATION V SERIES: 4.35 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

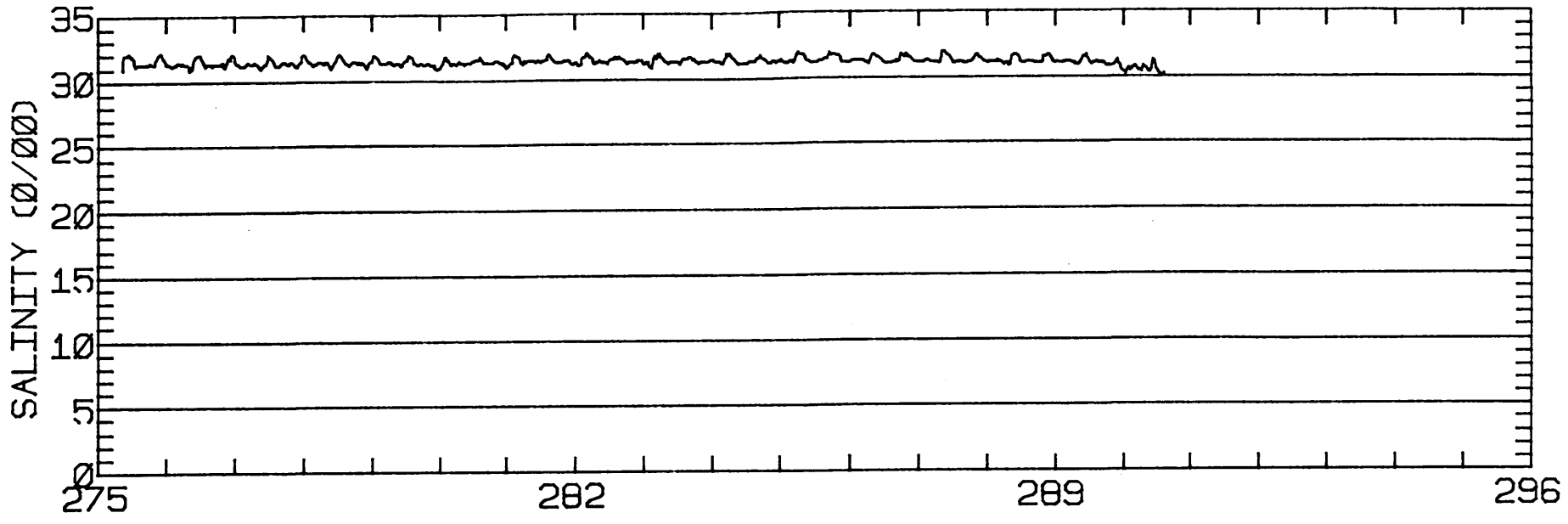
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	10	-5.6	2.1	156.
ALL	10	-5.6	2.1	

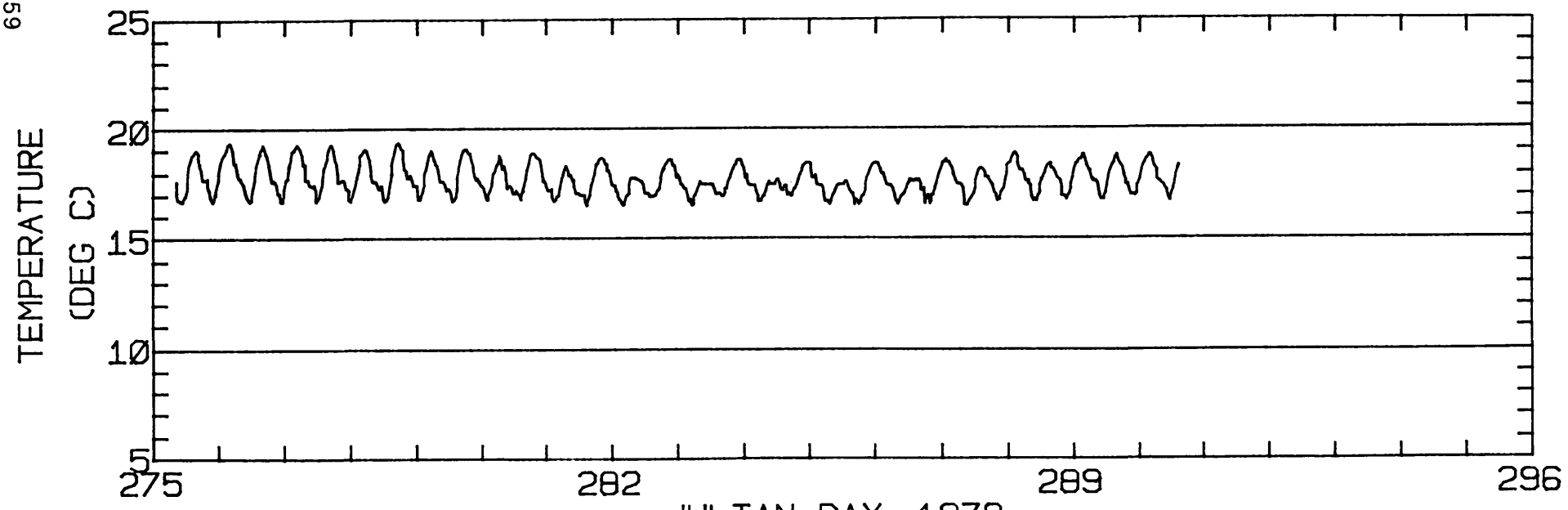




JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 226 37-48-15N 122-21-26W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.5 METERS.





JULIAN DAY, 1979

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 226 37-48-15N 122-21-26W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 226
POSITION: 37 48'16"N 122 21'30"W
METER TYPE: AANDERAA
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES:11/14/80 1010 PST JULIAN DAY=319
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

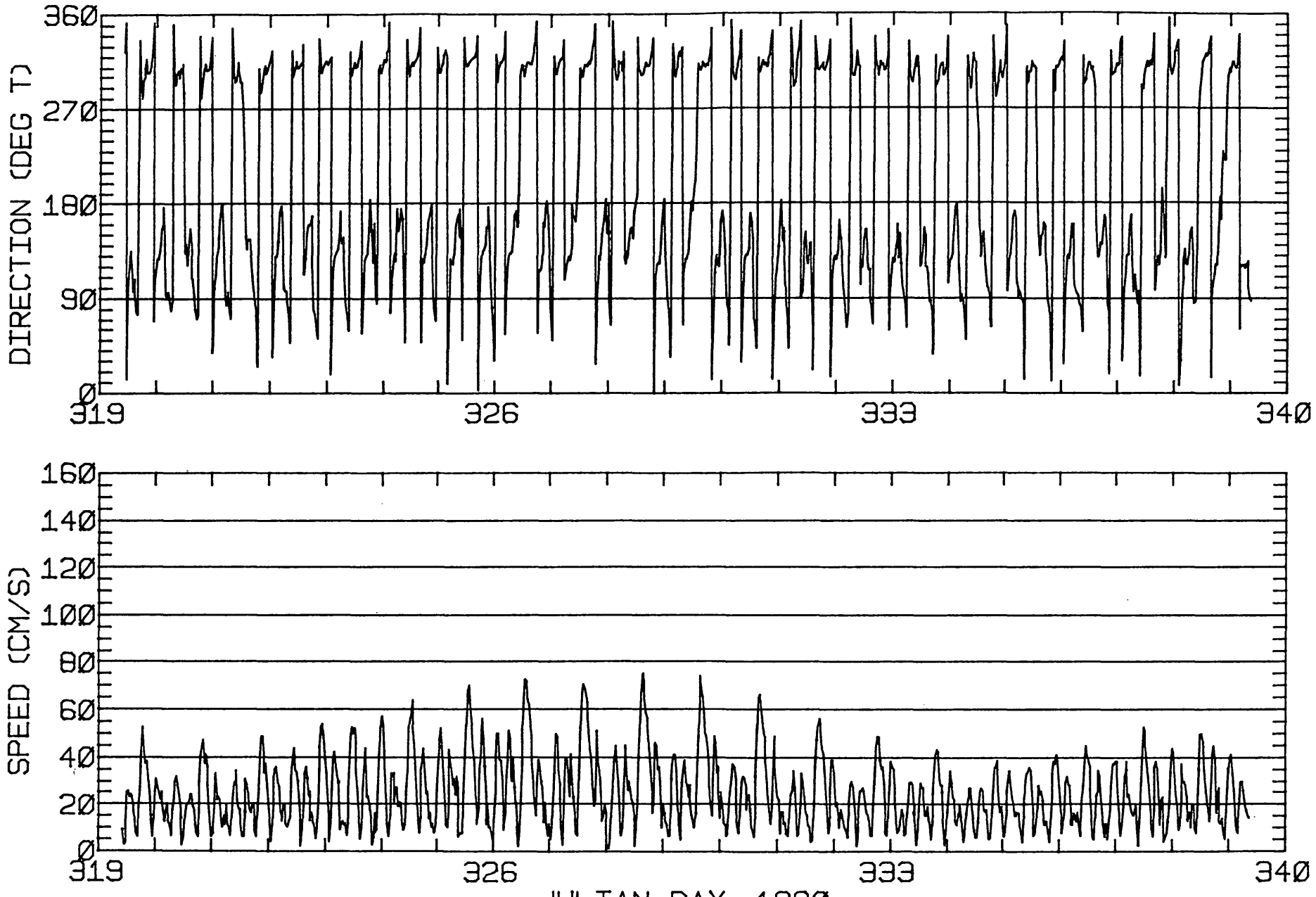
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.79	1.64	131.6	42.5	CLOCKWISE
K1	10.46	0.85	132.1	27.5	CLOCKWISE
N2	6.14	1.13	138.0	237.6	CLOCKWISE
M2	33.13	1.30	135.5	268.7	CLOCKWISE
S2	6.46	2.28	141.8	255.4	CLOCKWISE
M4	7.98	3.59	103.8	46.9	CLOCKWISE

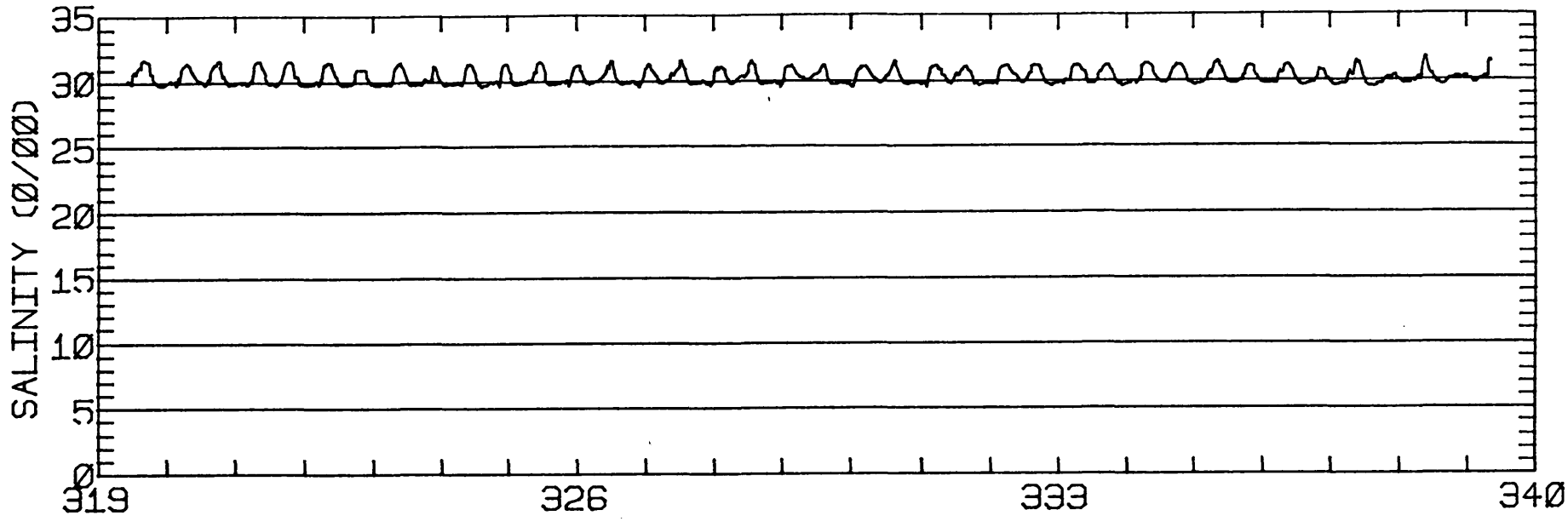
RMS SPEED: 29.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 56.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 135.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.44
STANDARD DEVIATION U-SERIES: 7.94 CM/SEC
STANDARD DEVIATION V SERIES: 5.84 CM/SEC

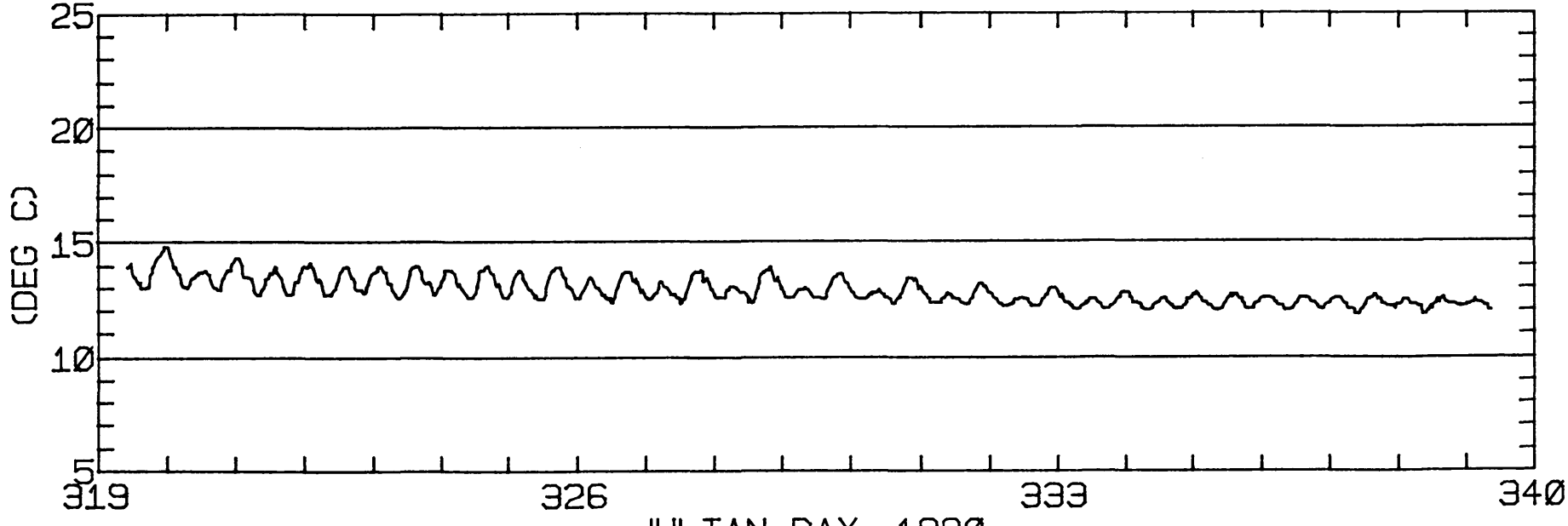
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.1	3.4	192.
2	12	-5.0	4.9	181.
3	12	-1.1	1.6	210.
4	2	-0.7	3.3	203.
ALL	38	-2.9	3.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 226 37-48-16N 122-21-30W
METER 001.5 METERS ABOVE BED. WATER DEPTH 008.5 METERS.





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 226 37-48-16N 122-21-3ØW
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ8.5 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 302
POSITION: 37 47'40"N 122 20'39"W
METER TYPE: AANDERAA
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 7/22/80 950 PST JULIAN DAY=204
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

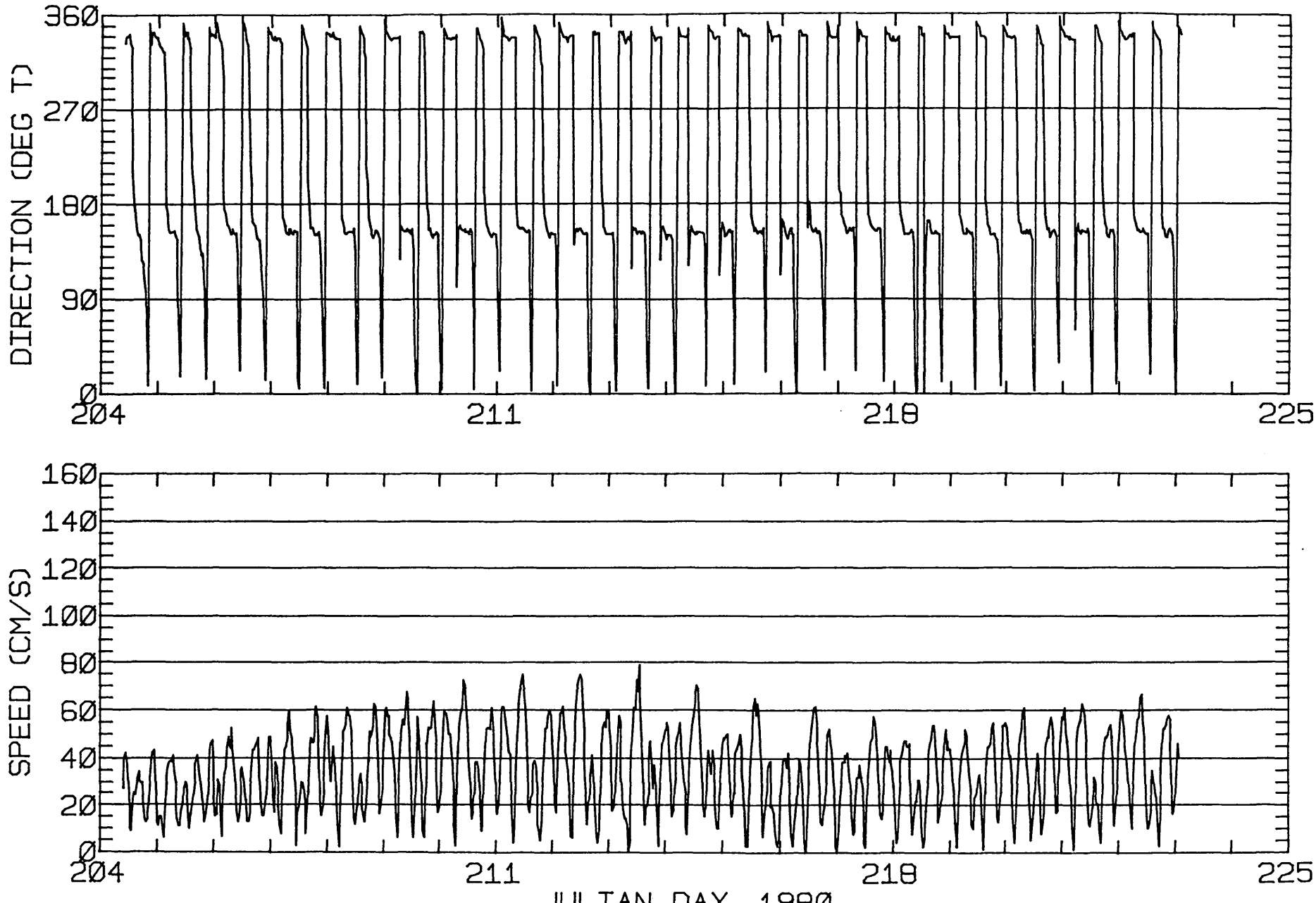
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.07	0.47	164.4	1.9	ANTI-CLOCKWISE
K1	14.46	0.73	158.6	53.4	ANTI-CLOCKWISE
N2	10.56	0.33	162.3	261.8	ANTI-CLOCKWISE
M2	42.83	4.08	156.0	268.9	ANTI-CLOCKWISE
S2	9.42	0.46	152.8	288.1	ANTI-CLOCKWISE
M4	1.89	0.42	162.2	252.7	CLOCKWISE

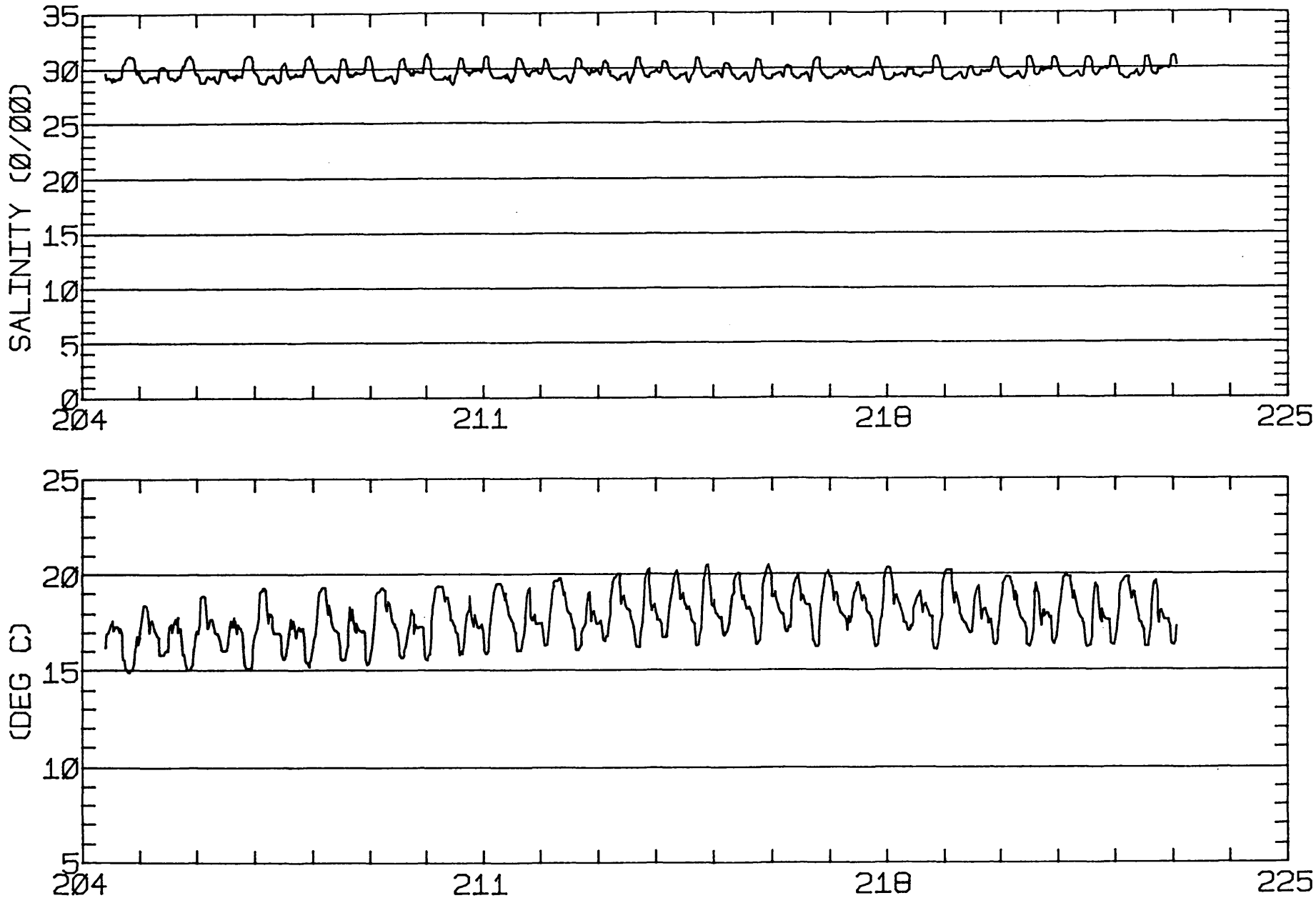
RMS SPEED: 38.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 74.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 157.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.43
STANDARD DEVIATION U-SERIES: 3.75 CM/SEC
STANDARD DEVIATION V SERIES: 8.44 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	4.6	-4.1	308.
2	12	6.2	-7.1	250.
3	10	4.3	-4.5	169.
ALL	34	5.1	-5.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 302 37-47-40N 122-20-39W
METER 001.5 METERS ABOVE BED. WATER DEPTH 007.9 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 302 37-47-40N 122-20-39W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ7.9 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 303
POSITION: 37 47'40"N 122 17' 9"W
METER TYPE: AANDERAA
WATER DEPTH: 11.6 M (MLLW)
METER DEPTH: 10.1 M (BELOW MLLW)
START TIME OF SERIES: 7/22/80 1330 PST JULIAN DAY=204
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

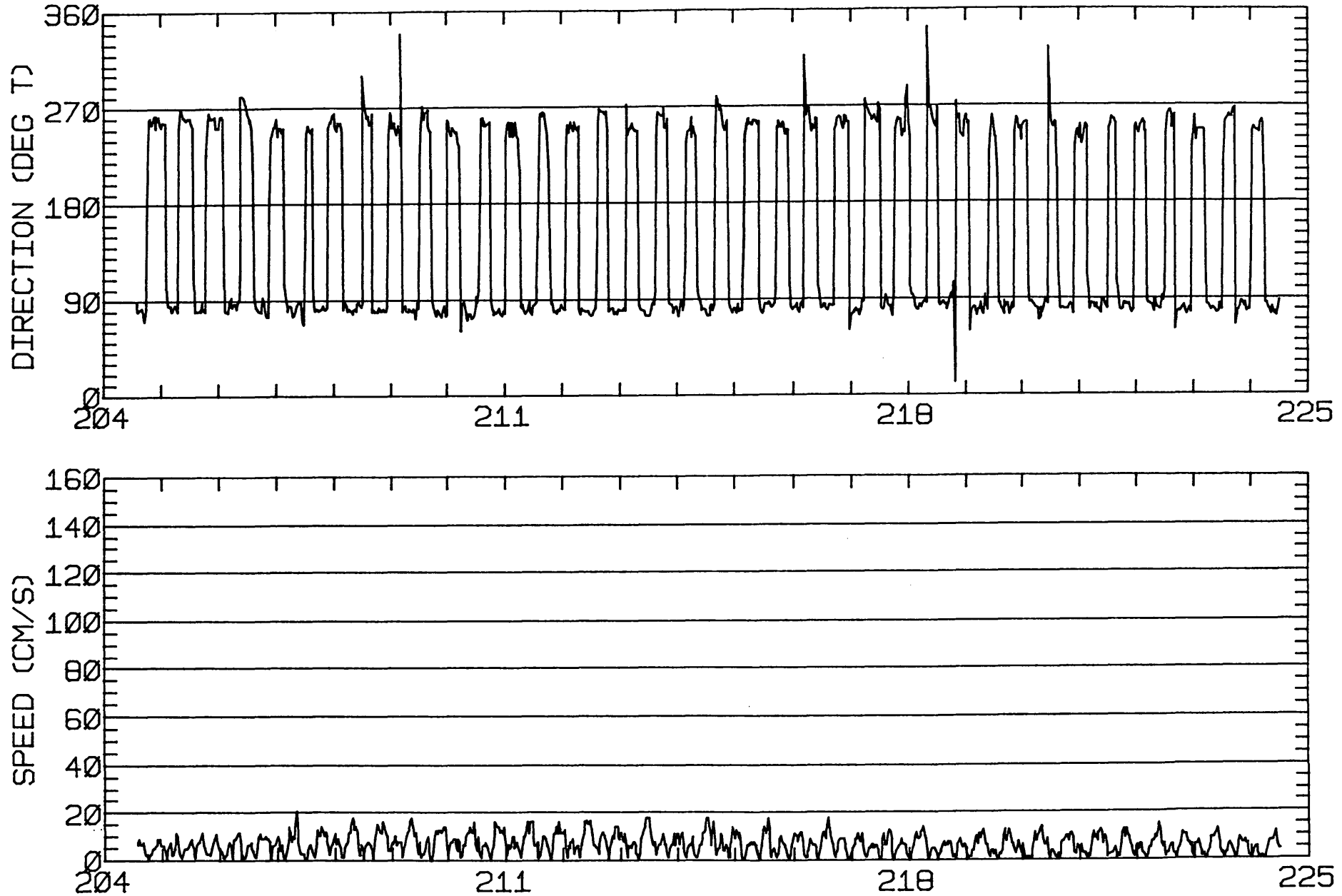
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	0.76	0.08	65.8	19.3	CLOCKWISE
K1	1.73	0.19	78.1	6.2	ANTI-CLOCKWISE
N2	2.47	0.00	79.2	269.0	ANTI-CLOCKWISE
M2	8.78	0.00	79.3	246.2	ANTI-CLOCKWISE
S2	2.22	0.03	76.1	287.3	CLOCKWISE
M4	0.46	0.06	85.5	310.2	ANTI-CLOCKWISE

RMS SPEED: 8.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 13.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 5.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 77.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 2.81 CM/SEC
STANDARD DEVIATION V SERIES: 0.84 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	2.5	0.1	308.
2	12	3.2	0.2	250.
3	12	2.9	0.1	165.
4	2	2.4	0.2	124.
ALL	38	2.8	0.2	

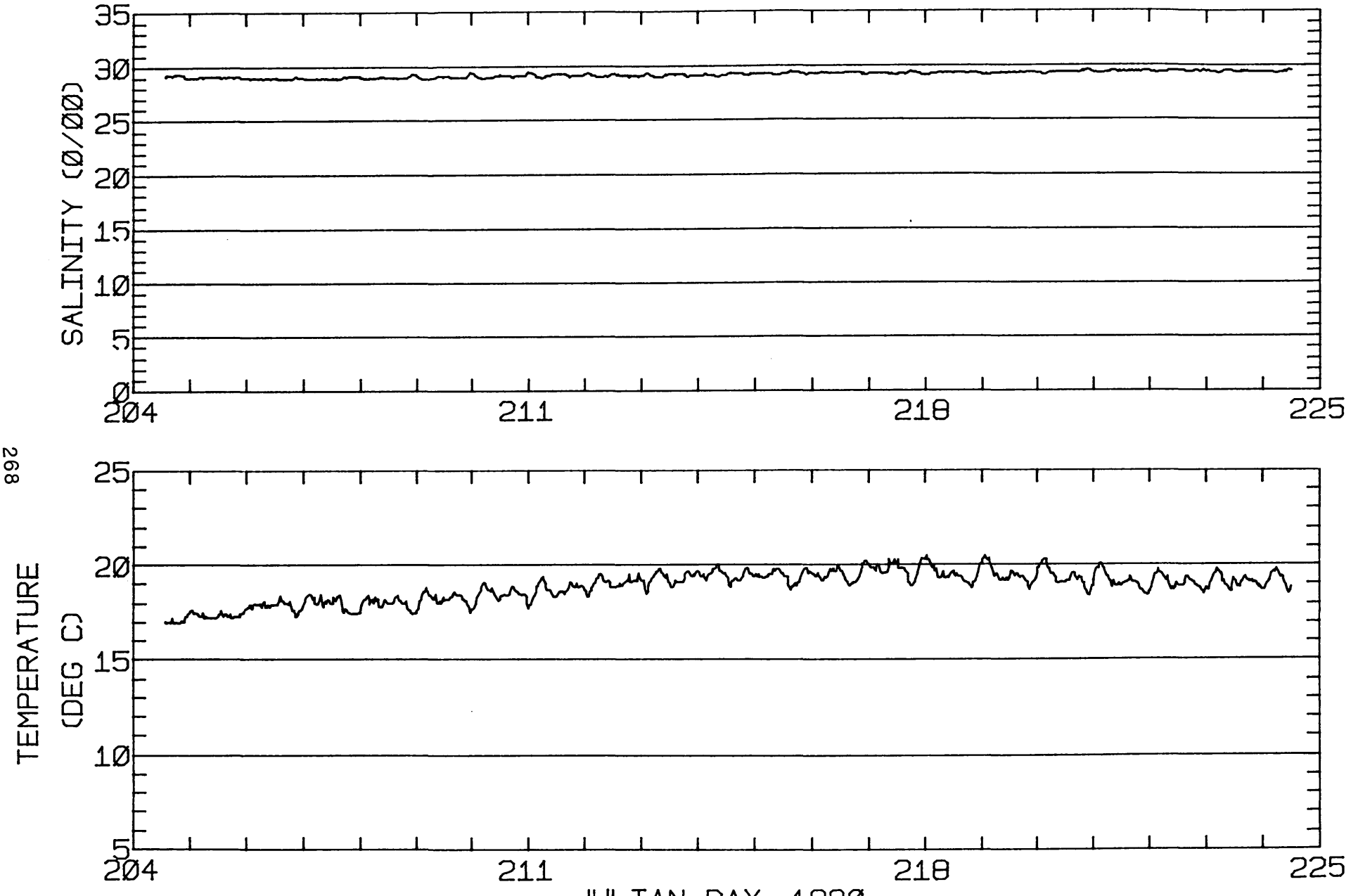


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 303 37-47-40N 122-17- 9W

METER 001.5 METERS ABOVE BED. WATER DEPTH 011.6 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 303 37-47-40N 122-17- 9W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø11.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 304
POSITION: 37 45'27"N 122 21'28"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 7/13/80 1910 PST JULIAN DAY=195
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

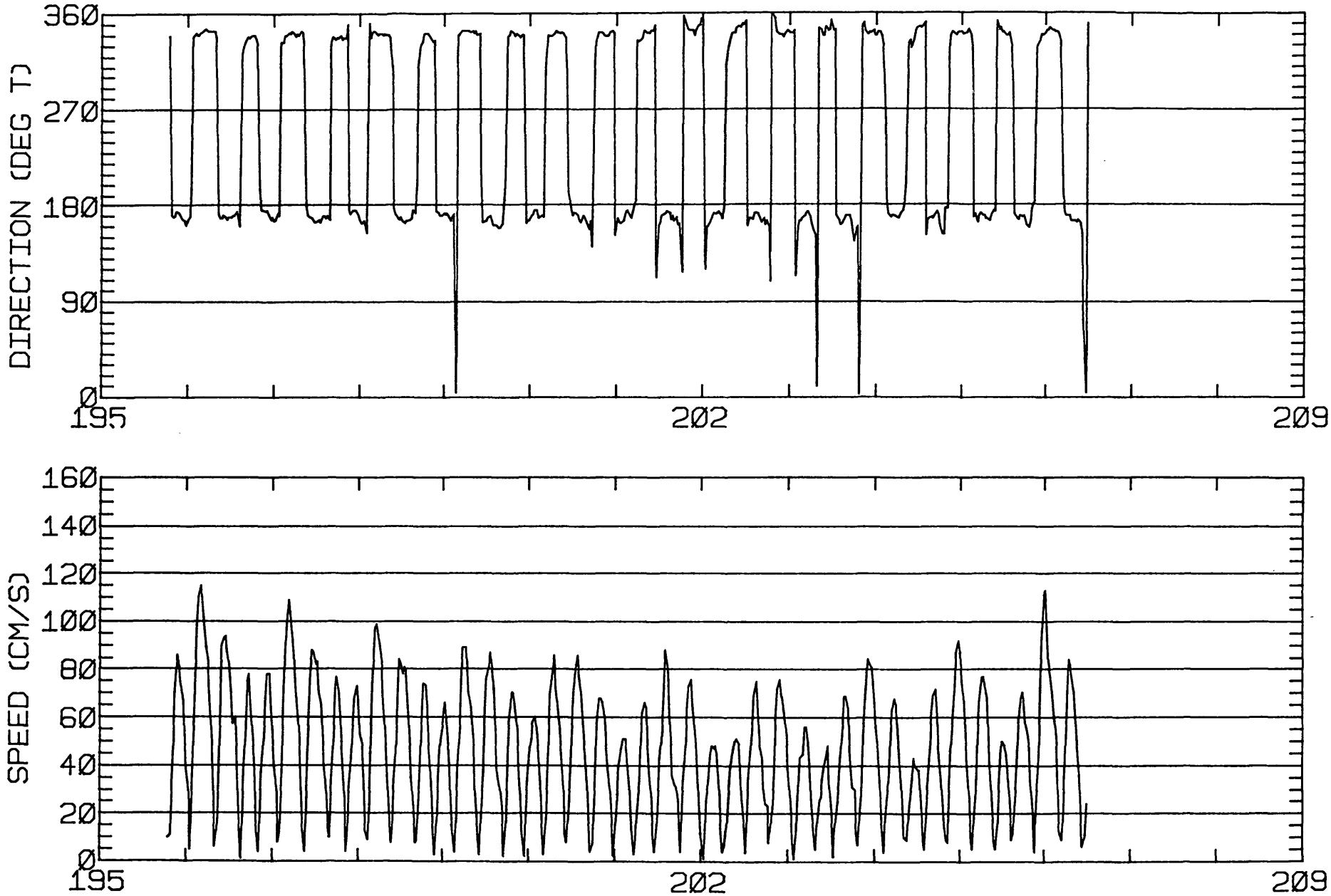
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	12.69	0.04	168.5	25.2	CLOCKWISE
K1	24.47	0.05	164.5	45.8	CLOCKWISE
N2	10.82	0.71	164.2	296.0	CLOCKWISE
M2	78.44	0.21	165.0	285.1	CLOCKWISE
S2	13.79	0.11	165.1	313.6	CLOCKWISE
M4	2.09	0.99	110.6	1.6	CLOCKWISE

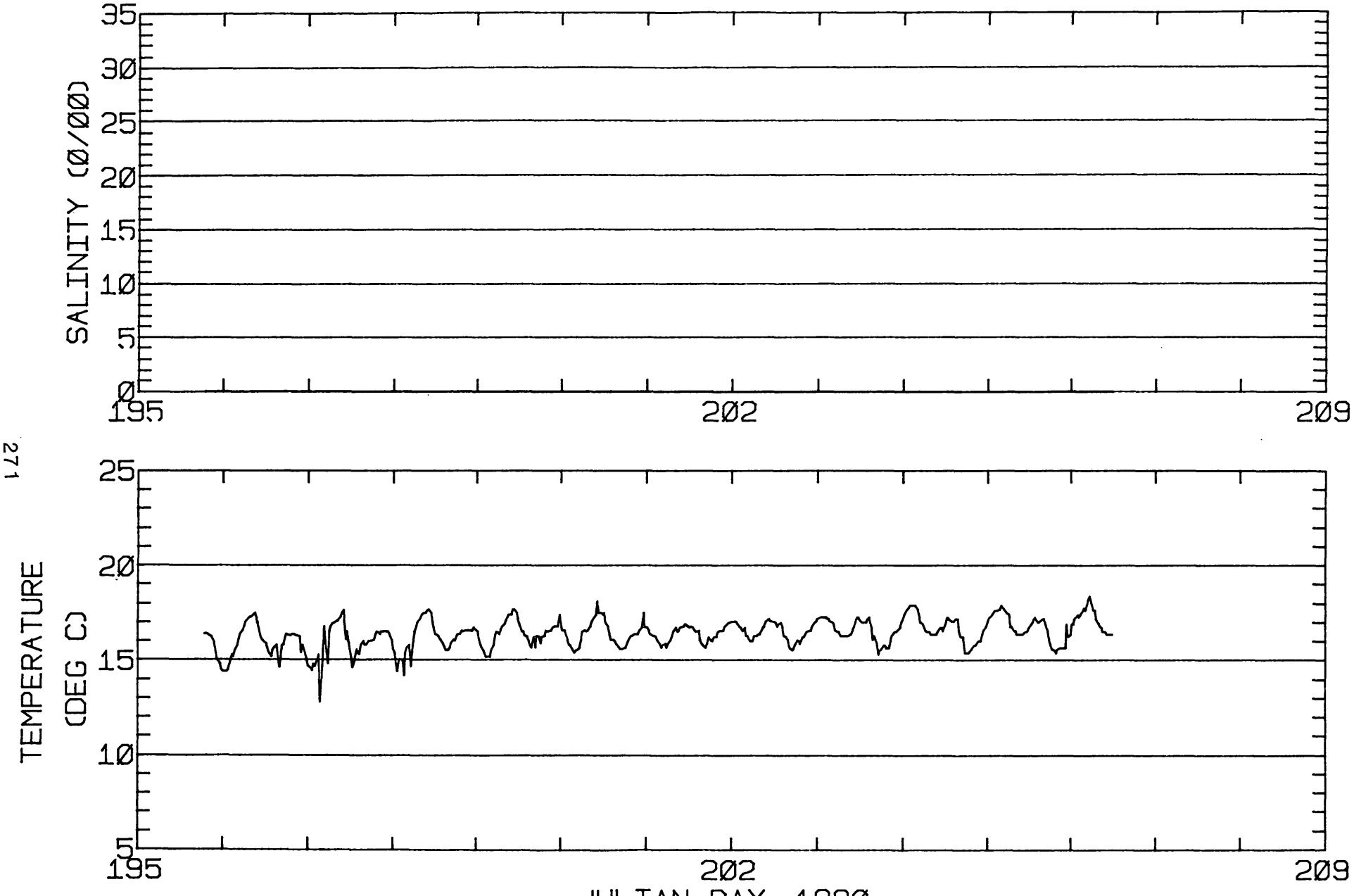
RMS SPEED: 53.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 129.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 52.9 CM/SEC
PRINCIPAL CURRENT DIRECTION: 165.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 3.34 CM/SEC
STANDARD DEVIATION V SERIES: 7.33 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-3.6	-0.2	278.
2	8	-2.6	0.4	298.
ALL	20	-3.2	0.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 304 37-45-27N 122-21-28W
METER 011.0 METERS ABOVE BED. WATER DEPTH 017.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 3Ø4 37-45-27N 122-21-28W
METER Ø11.Ø METERS ABOVE BED. WATER DEPTH Ø17.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 304
POSITION: 37 45'27"N 122 21'28"W
METER TYPE: AANDERAA
WATER DEPTH: 17.1 M (MLLW)
METER DEPTH: 14.9 M (BELOW MLLW)
START TIME OF SERIES: 7/ 8/80 944 PST JULIAN DAY=190
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

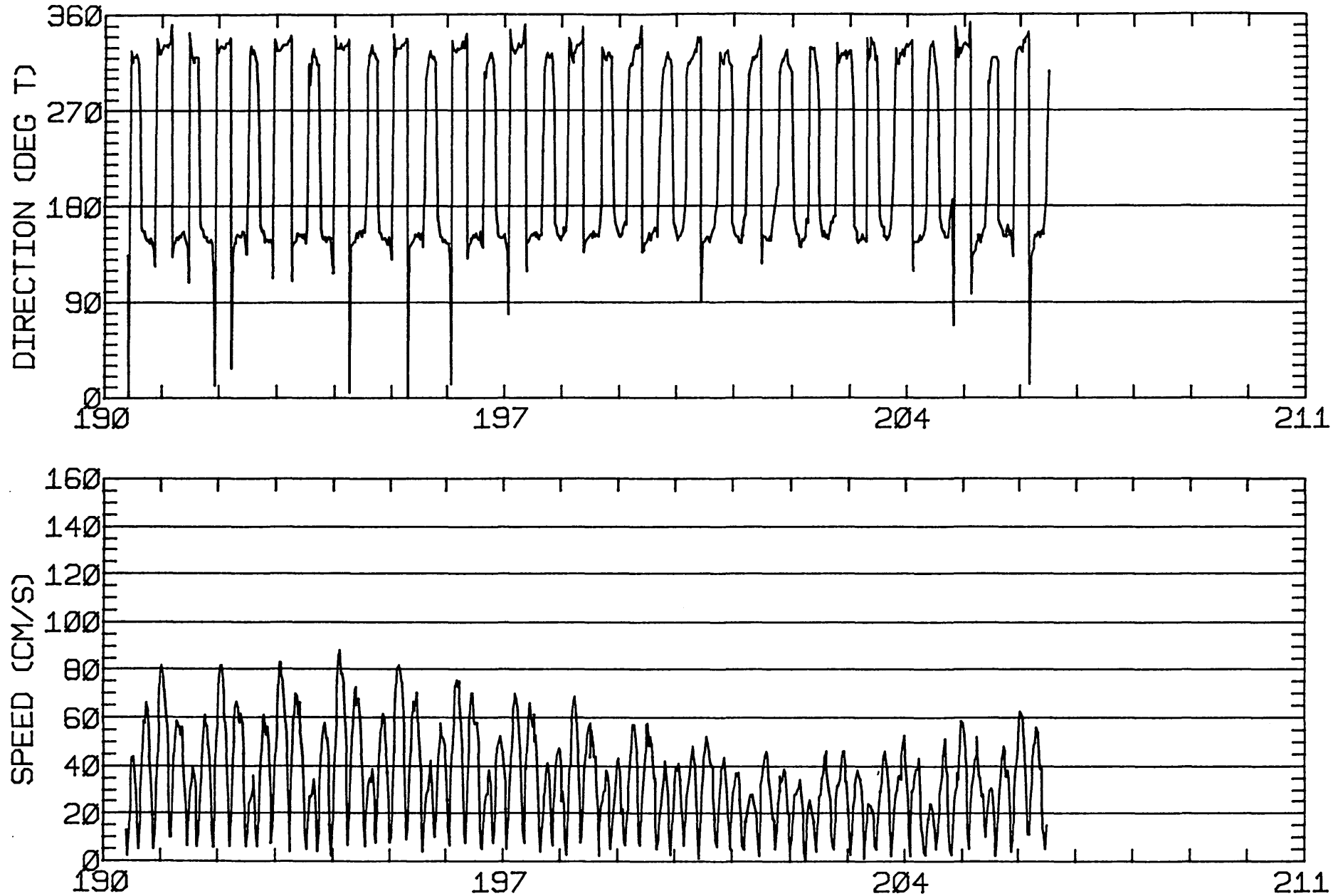
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.93	0.14	159.7	33.6	CLOCKWISE
K1	19.28	1.93	155.4	45.0	CLOCKWISE
N2	11.79	0.63	148.2	285.4	ANTI-CLOCKWISE
M2	54.04	0.54	148.8	278.7	CLOCKWISE
S2	10.51	0.17	147.8	316.4	CLOCKWISE
M4	2.46	0.09	145.3	92.8	CLOCKWISE

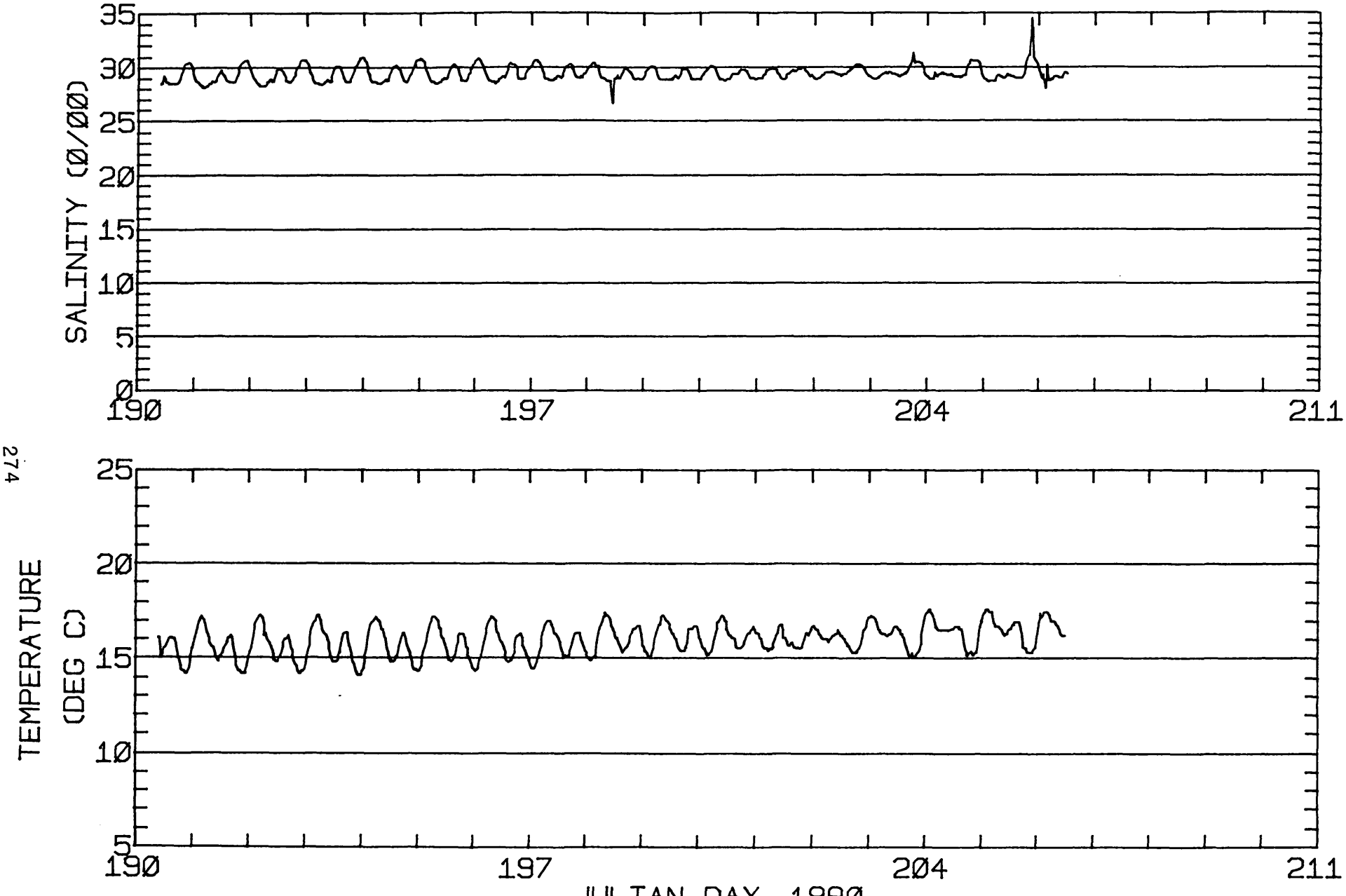
RMS SPEED: 39.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 94.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 35.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 151.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 3.90 CM/SEC
STANDARD DEVIATION V SERIES: 4.75 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.7	-2.9	286.
2	12	-1.0	-4.4	286.
3	6	-0.9	-2.5	295.
ALL	30	-0.3	-3.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 304 37-45-27N 122-21-28W
METER 002.2 METERS ABOVE BED. WATER DEPTH 017.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 304 37-45-27N 122-21-28W
METER 002.2 METERS ABOVE BED. WATER DEPTH 017.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 306
POSITION: 37 42'28"N 122 20'58"W
METER TYPE: AANDERAA
WATER DEPTH: 11.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 7/14/80 1520 PST JULIAN DAY=196
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

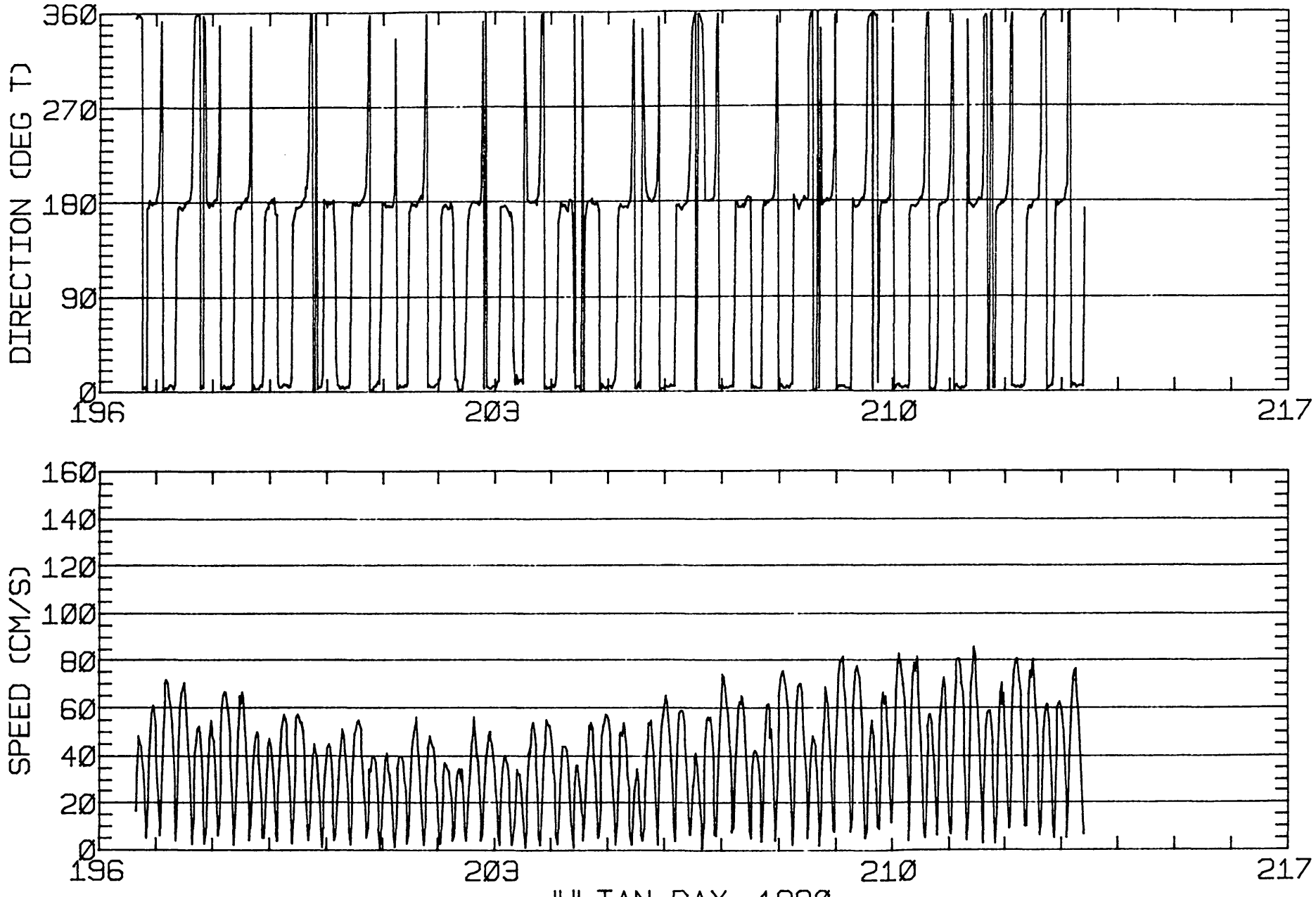
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.51	0.55	183.9	24.7	CLOCKWISE
K1	17.50	1.85	184.1	43.6	CLOCKWISE
N2	7.80	0.57	181.9	265.2	CLOCKWISE
M2	58.54	1.54	181.1	277.4	CLOCKWISE
S2	10.42	0.62	177.9	300.8	CLOCKWISE
M4	2.17	0.15	138.9	163.8	ANTI-CLOCKWISE

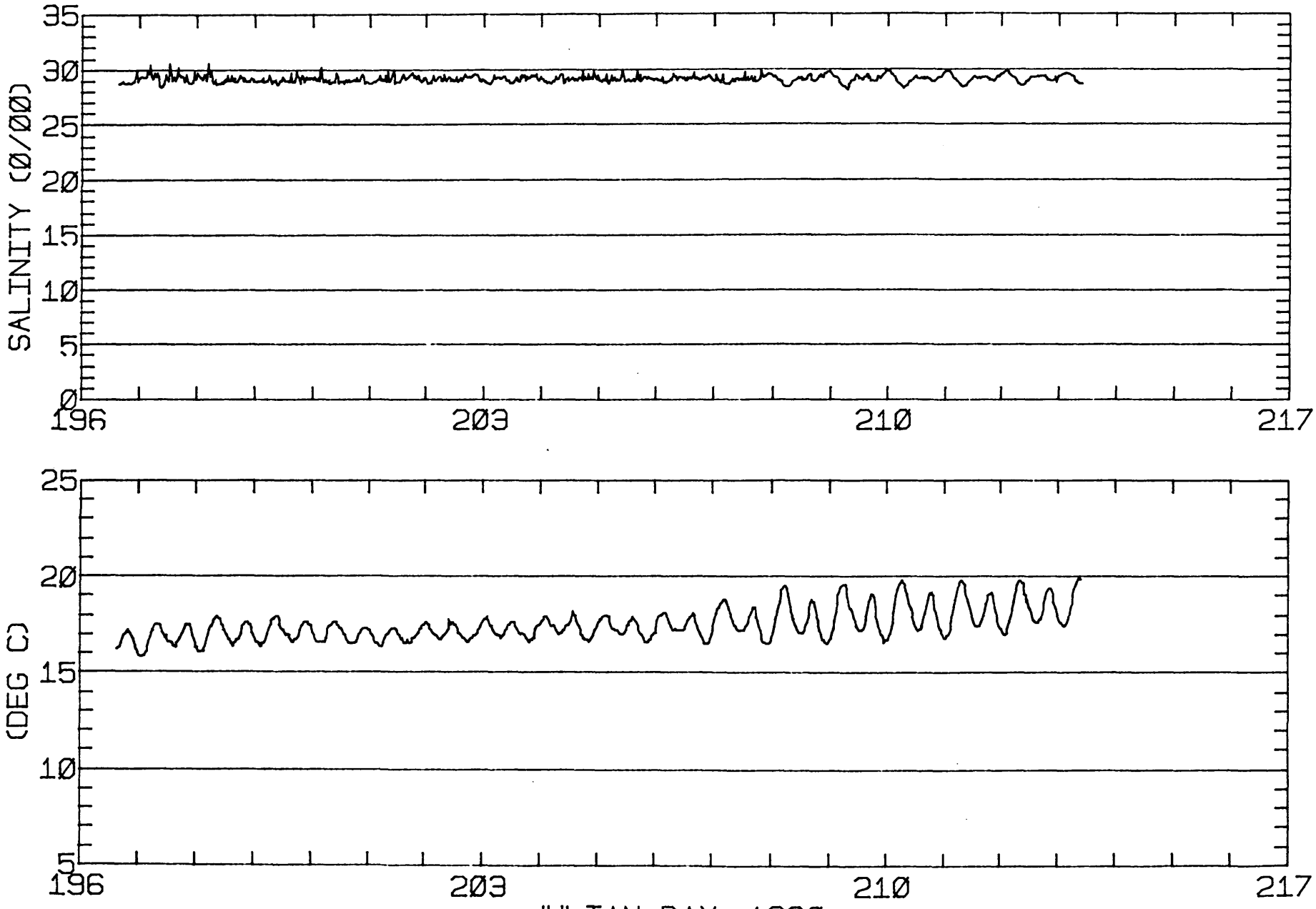
RMS SPEED: 43.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 95.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 39.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 1.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.38
STANDARD DEVIATION U-SERIES: 2.18 CM/SEC
STANDARD DEVIATION V SERIES: 4.91 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.2	-1.0	286.
2	12	1.3	-0.8	301.
3	8	1.2	0.4	306.
ALL	32	1.2	-0.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 306 37-42-28N 122-20-58W
METER 005.2 METERS ABOVE BED. WATER DEPTH 011.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 306 37-42-28N 122-20-58W
METER 005.2 METERS ABOVE BED. WATER DEPTH 011.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 306
POSITION: 37 42'28"N 122 20'58"W
METER TYPE: AANDERAA
WATER DEPTH: 11.3 M (MLLW)
METER DEPTH: 9.8 M (BELOW MLLW)
START TIME OF SERIES: 7/14/80 1522 PST JULIAN DAY=196
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

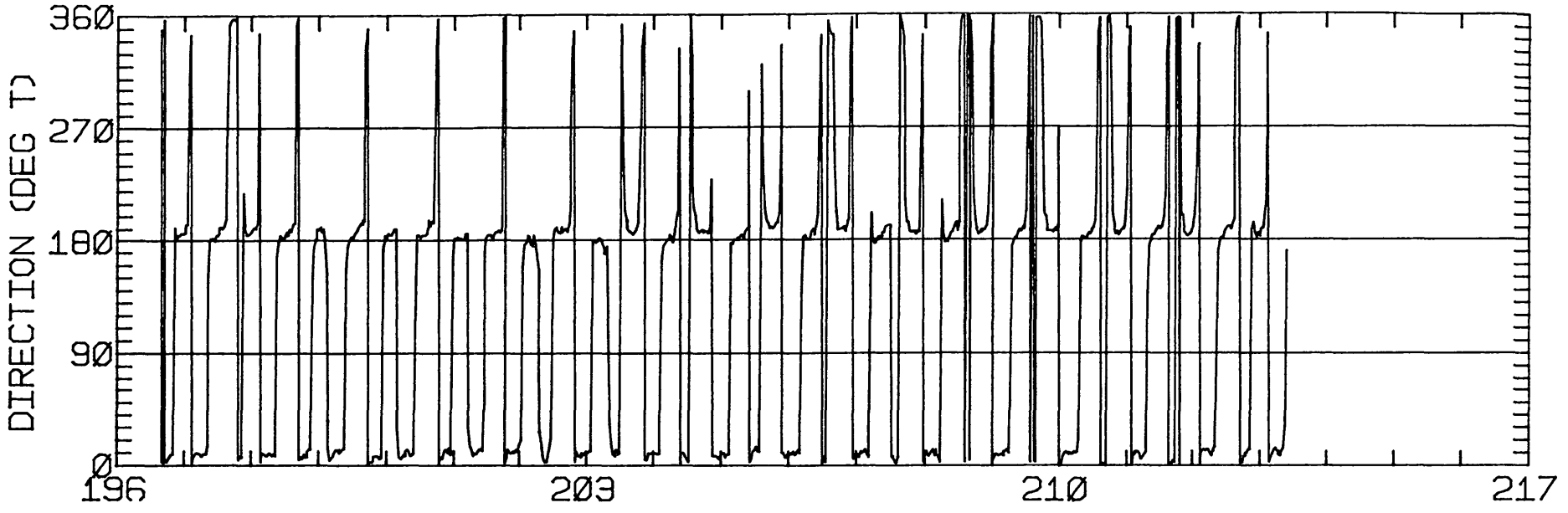
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

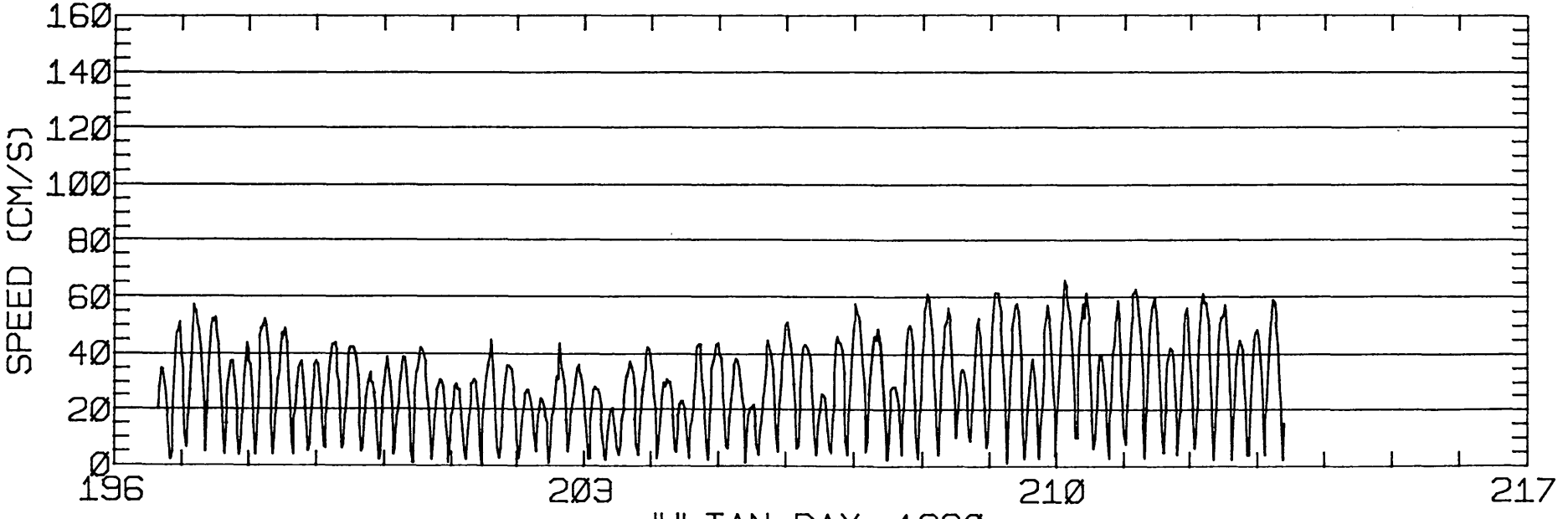
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.77	0.64	192.1	35.4	CLOCKWISE
K1	13.42	2.19	193.9	47.6	CLOCKWISE
N2	5.73	0.59	191.7	262.6	CLOCKWISE
M2	44.12	1.42	186.9	276.3	CLOCKWISE
S2	7.83	0.53	182.7	301.0	CLOCKWISE
M4	1.27	0.24	127.2	166.7	CLOCKWISE

RMS SPEED: 33.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 72.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 8.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 1.93 CM/SEC
STANDARD DEVIATION V SERIES: 3.53 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

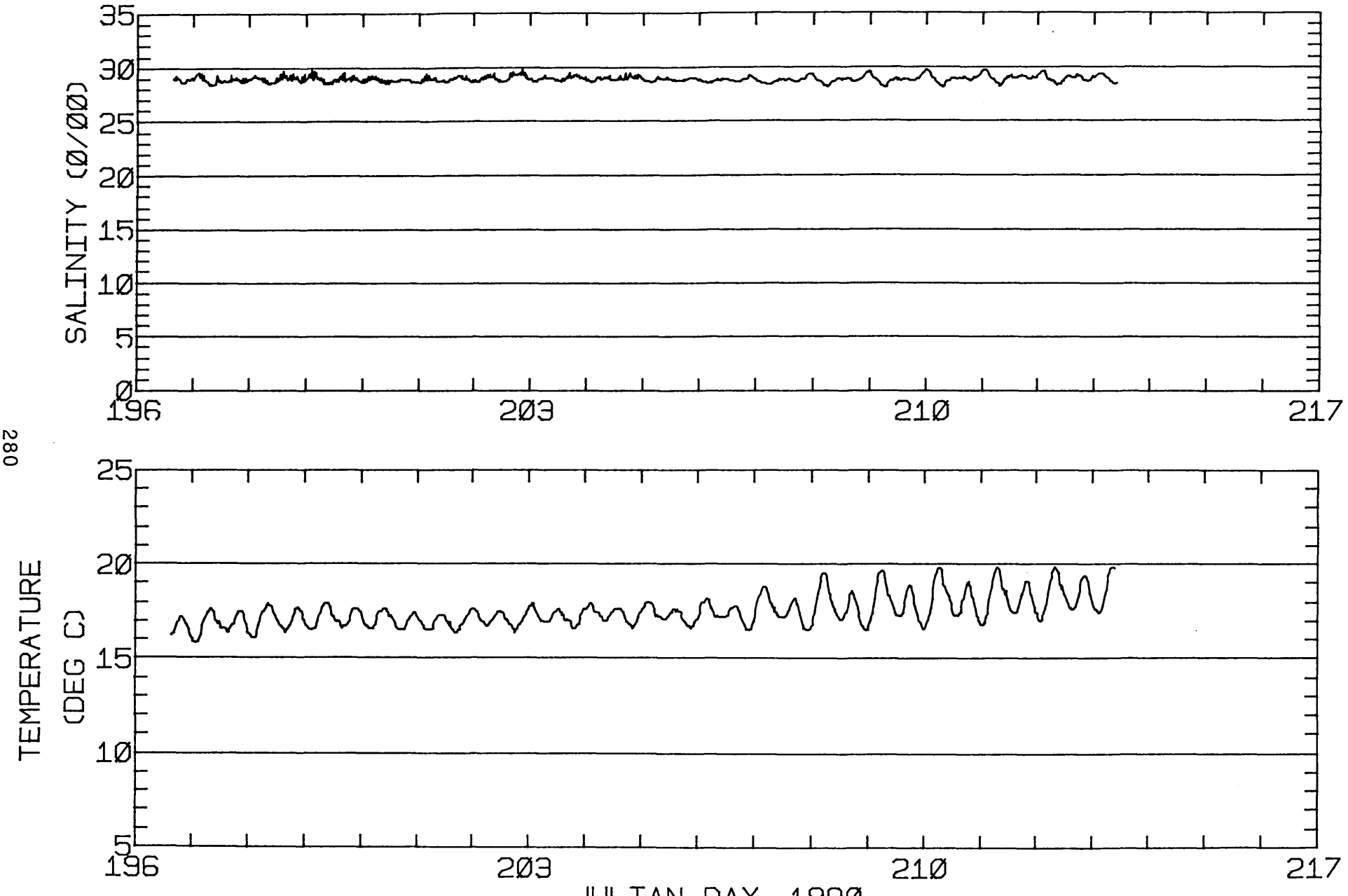
INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.1	-1.1	286.
2	12	-0.4	-1.5	301.
3	8	-0.6	-0.5	306.
ALL	32	-0.3	-1.1	





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 306 37-42-28N 122-20-58W
METER 001.5 METERS ABOVE BED. WATER DEPTH 011.3 METERS.



CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 3Ø6 37-42-28N 122-2Ø-58W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø11.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 306
POSITION: 37 42'28"N 122 20'58"W
METER TYPE: AANDERAA
WATER DEPTH: 11.3 M (MLLW)
METER DEPTH: 9.8 M (BELOW MLLW)
START TIME OF SERIES: 7/31/80 1002 PST JULIAN DAY=213
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

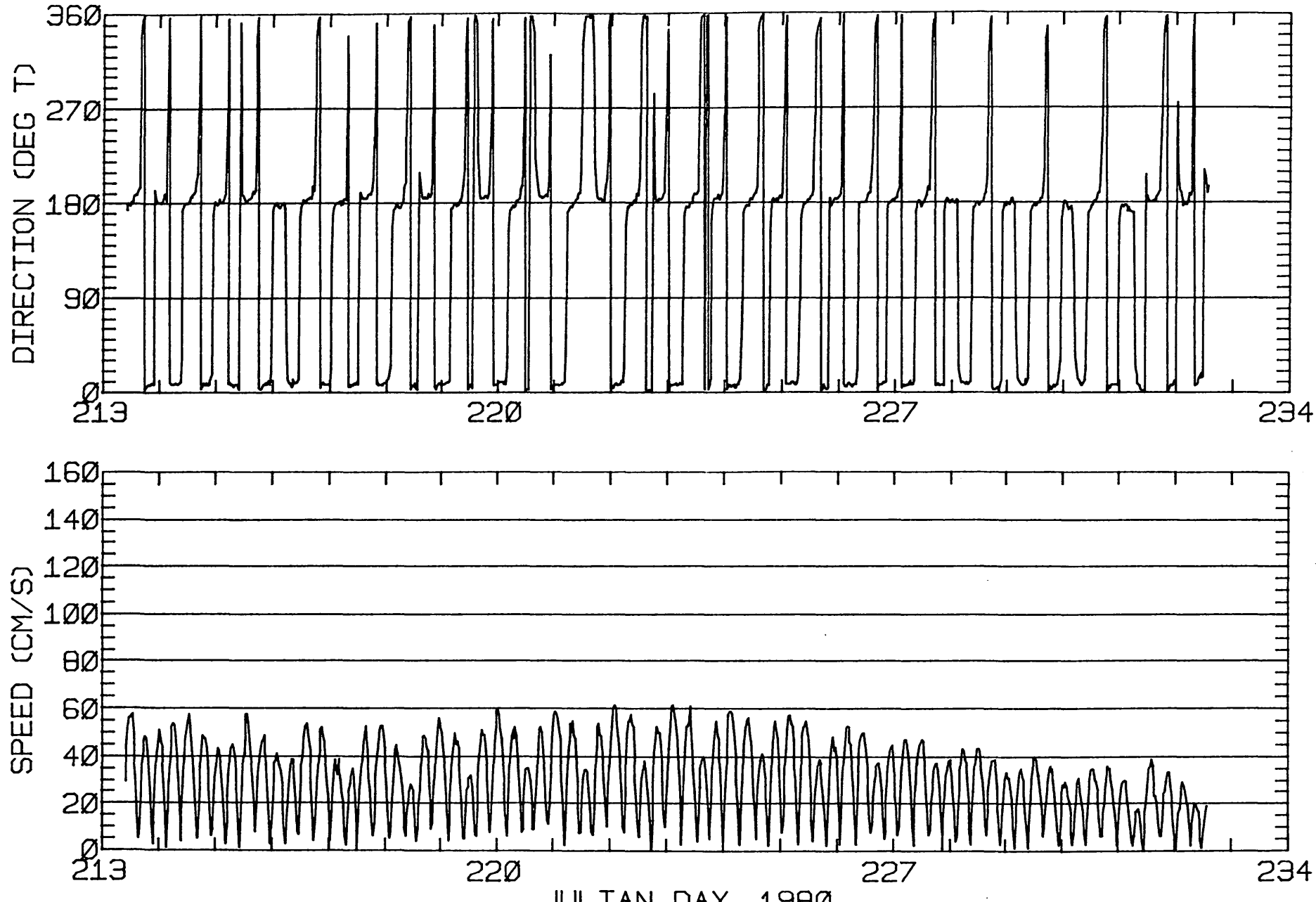
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.67	0.75	189.0	44.4	CLOCKWISE
K1	12.03	2.37	192.5	58.6	CLOCKWISE
N2	9.34	0.06	187.4	278.4	CLOCKWISE
M2	45.30	1.66	184.3	279.7	CLOCKWISE
S2	12.11	0.69	182.9	298.1	CLOCKWISE
M4	1.27	0.02	100.7	189.3	ANTI-CLOCKWISE

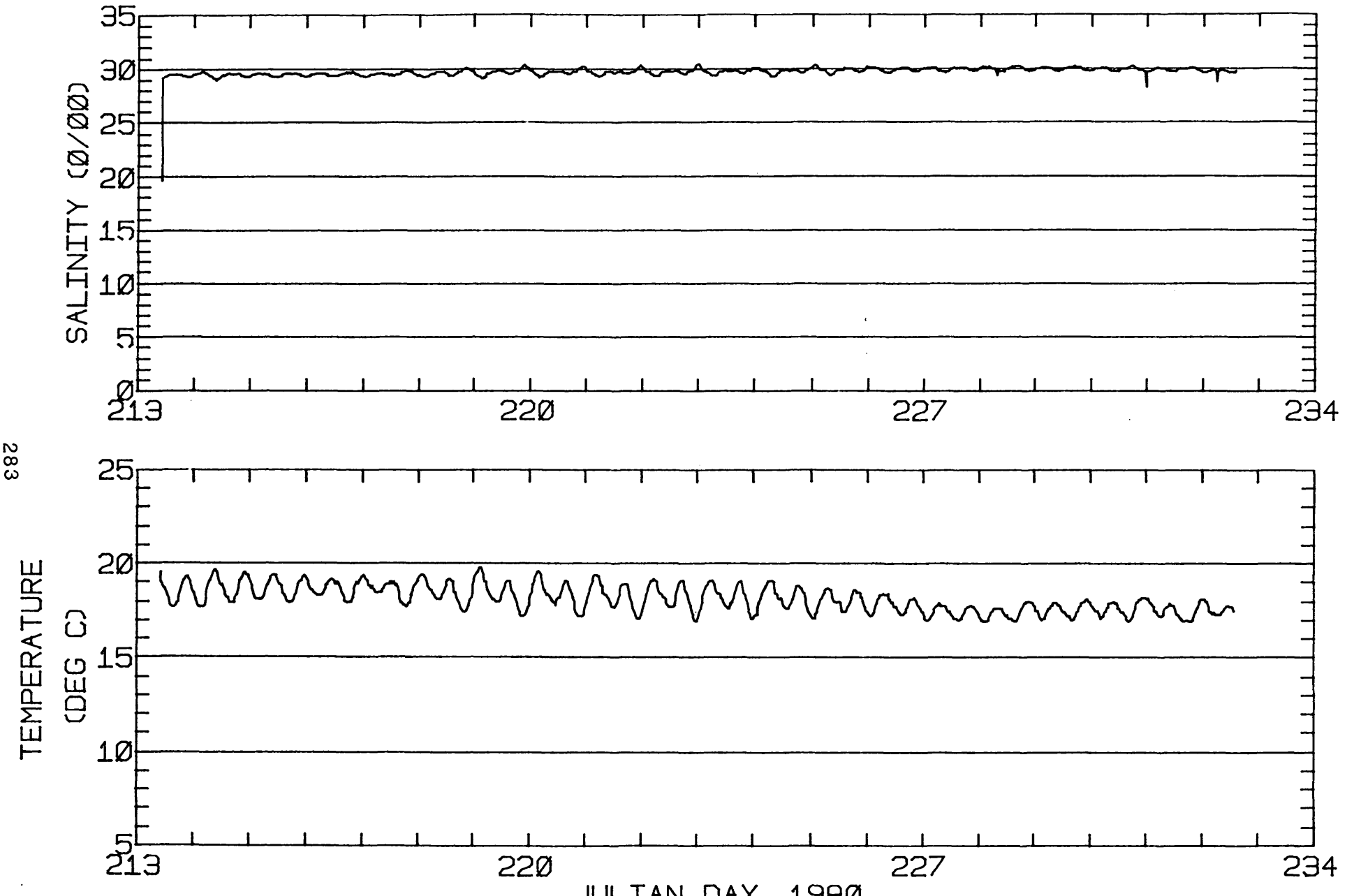
RMS SPEED: 34.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 76.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 5.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 1.95 CM/SEC
STANDARD DEVIATION V SERIES: 3.44 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.5	-2.3	183.
2	12	-0.2	-1.2	142.
3	12	0.7	-1.7	91.
ALL	36	0.3	-1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 306 37-42-28N 122-20-58W
METER 001.5 METERS ABOVE BED. WATER DEPTH 011.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 306 37-42-28N 122-20-58W
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH Ø11.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 307
POSITION: 37 39'15"N 122 21'50"W
METER TYPE: AANDERAA
WATER DEPTH: 4.6 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 8/ 5/80 1230 PST JULIAN DAY=218
APPROXIMATE RECORD LENGTH IS 32 M2-CYCLES

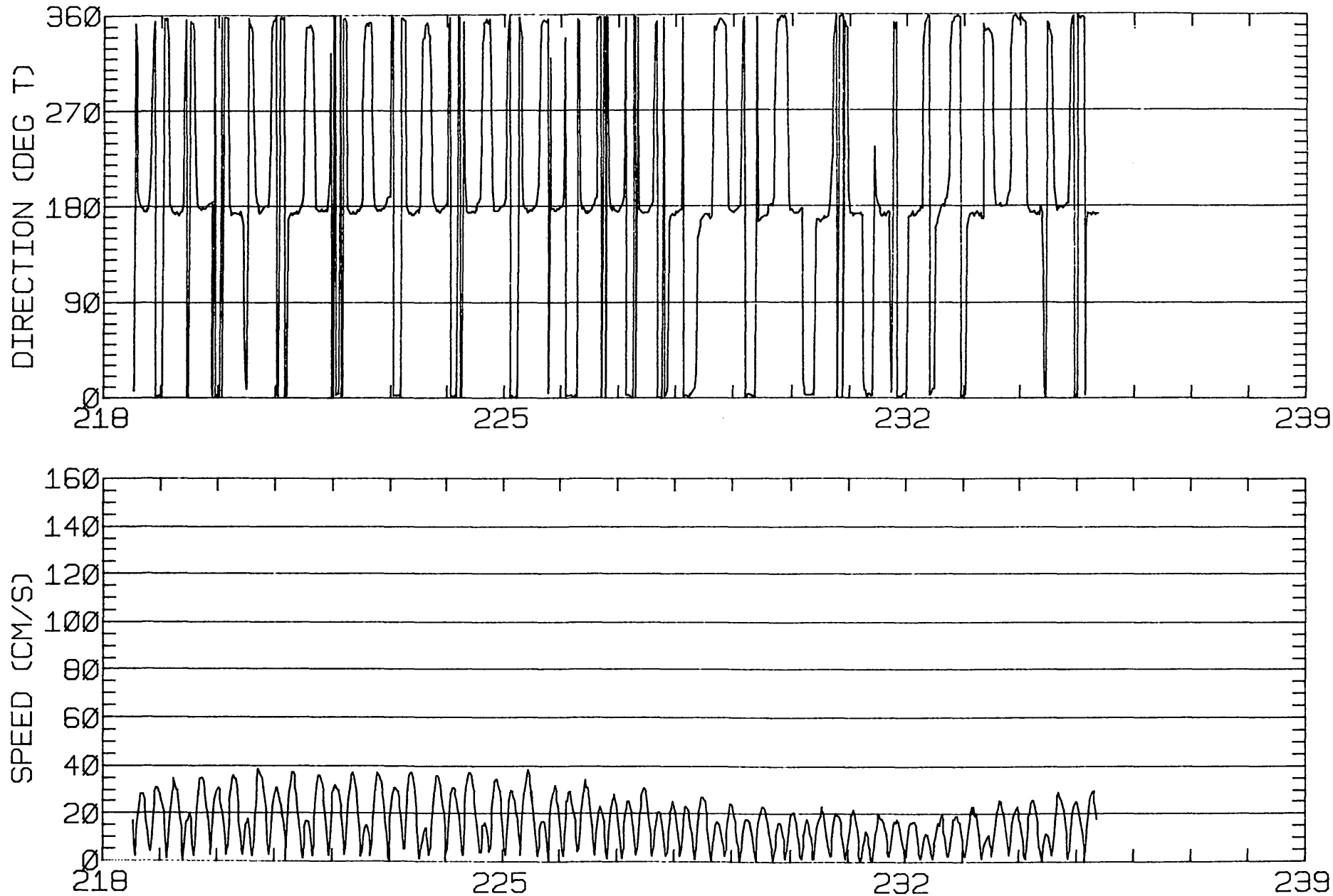
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.03	0.15	181.9	31.7	CLOCKWISE
K1	6.81	0.97	182.3	68.2	CLOCKWISE
N2	6.23	0.24	177.5	274.2	ANTI-CLOCKWISE
M2	27.05	0.10	177.0	272.1	CLOCKWISE
S2	6.76	0.04	175.2	290.1	CLOCKWISE
M4	0.74	0.20	118.2	158.6	ANTI-CLOCKWISE

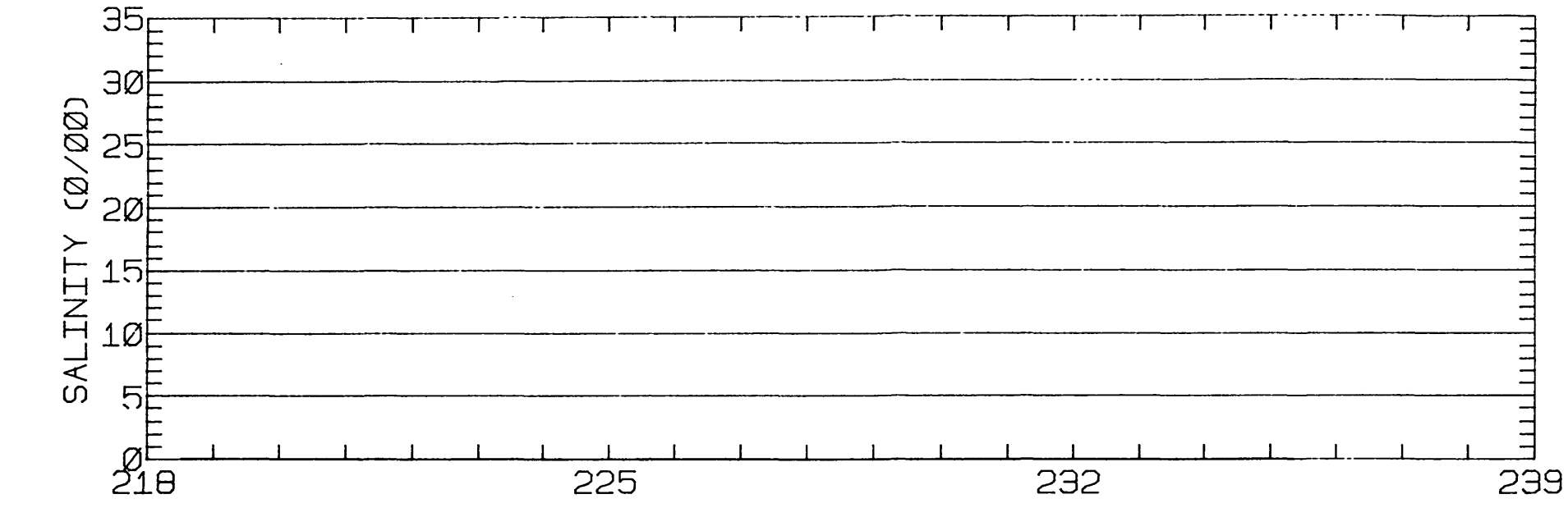
RMS SPEED: 20.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 45.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 18.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 178.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 1.23 CM/SEC
STANDARD DEVIATION V SERIES: 3.40 CM/SEC

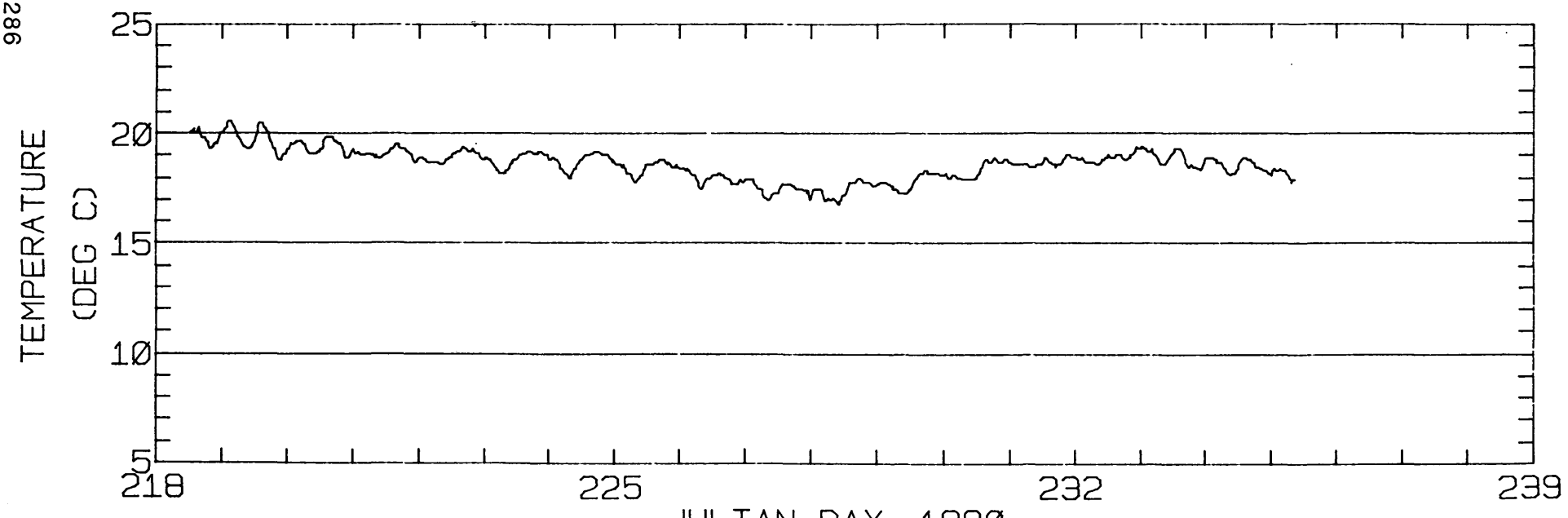
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	0.3	-5.2	145.
2	12	0.5	-3.0	101.
3	8	0.1	-2.9	82.
ALL	32	0.3	-3.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 307 37-39-15N 122-21-50W
METER 001.5 METERS ABOVE BED. WATER DEPTH 004.6 METERS.





JULIAN DAY, 198Ø

CURRENT METER OBSERVATIONS (3Ø MINUTE AVERAGES)
NOAA STATION 3Ø7 37-39-15N 122-21-5ØW
METER ØØ1.5 METERS ABOVE BED. WATER DEPTH ØØ4.6 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 310
POSITION: 37 39' 2"N 122 13'38"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 6/11/80 1100 PST JULIAN DAY=163
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

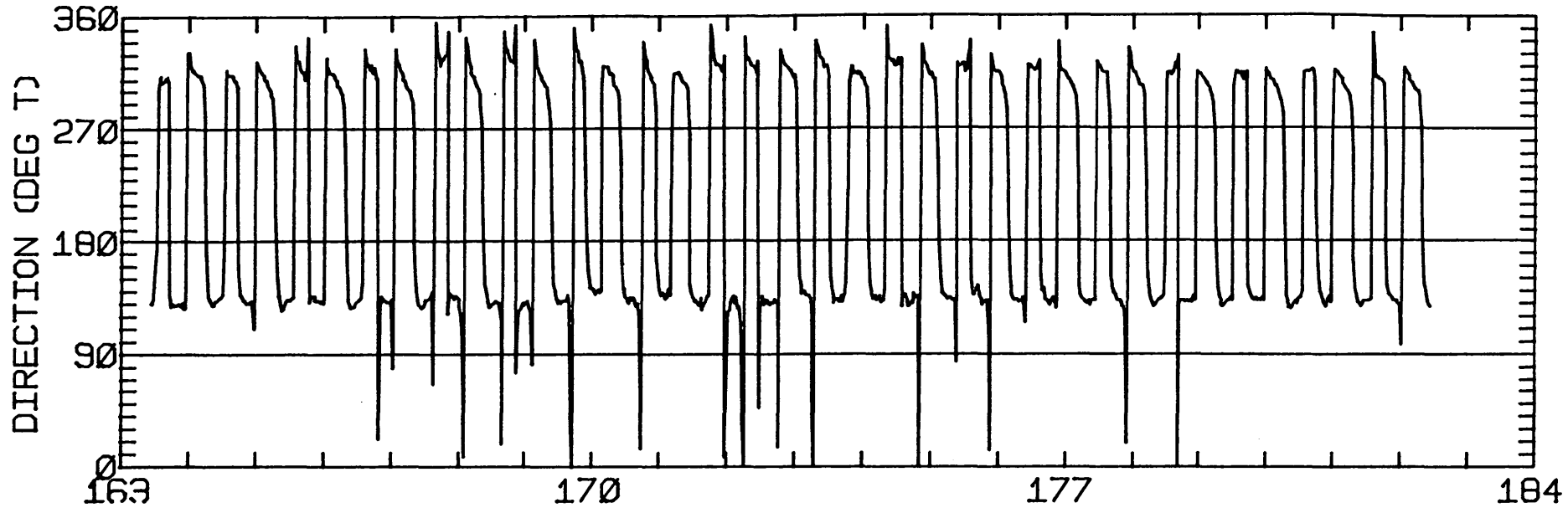
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

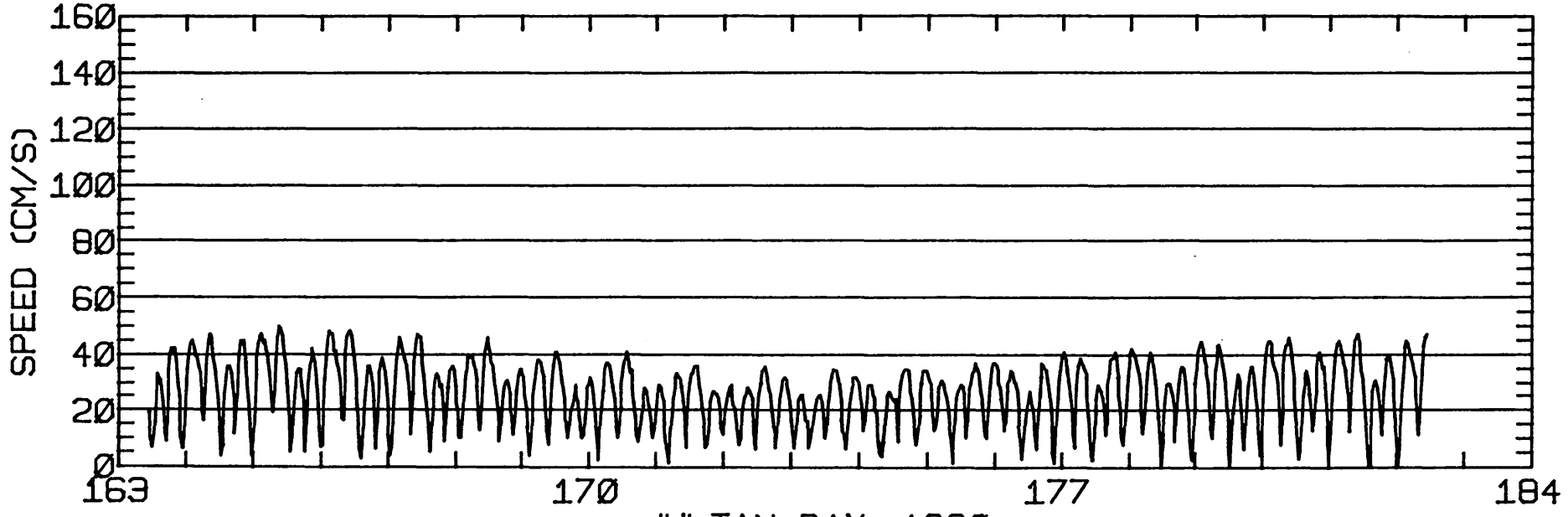
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.97	0.87	122.7	25.5	ANTI-CLOCKWISE
K1	11.03	1.52	126.2	25.6	ANTI-CLOCKWISE
N2	4.64	0.66	123.2	269.6	ANTI-CLOCKWISE
M2	37.93	2.92	133.5	271.0	ANTI-CLOCKWISE
S2	3.67	0.07	120.4	289.3	ANTI-CLOCKWISE
M4	3.18	1.18	122.7	97.0	ANTI-CLOCKWISE

RMS SPEED: 28.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 56.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 27.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 130.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 4.07 CM/SEC
STANDARD DEVIATION V SERIES: 4.54 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.0	-0.9	403.
2	12	1.5	-0.8	445.
3	12	0.1	-1.7	447.
ALL	36	0.9	-1.1	



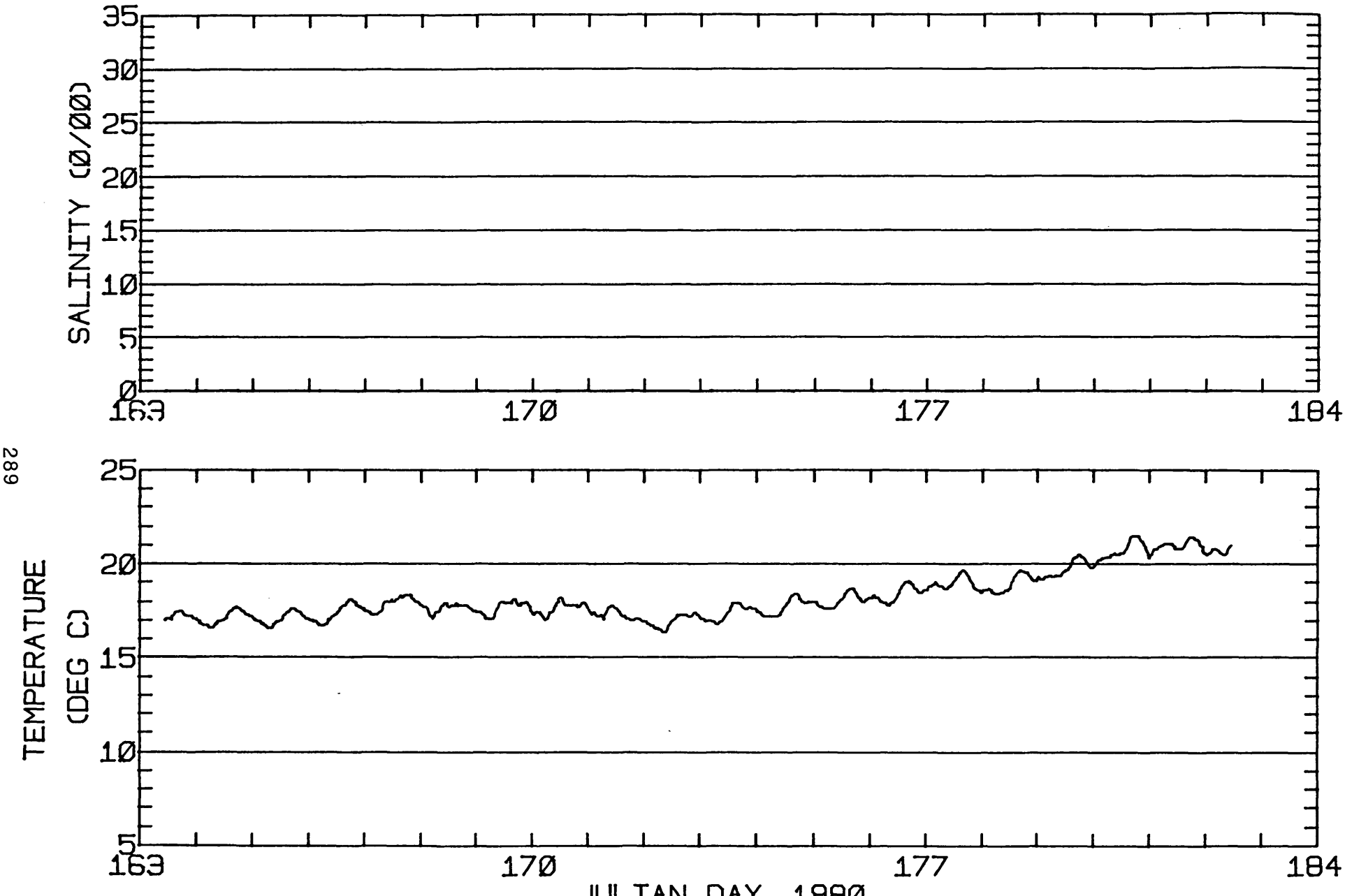


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 310 37-39- 2N 122-13-38W

METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 310 37-39- 2N 122-13-38W
METER ØØØ.8 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 310
POSITION: 37 39' 6"N 122 13'40"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 6/30/80 1210 PST JULIAN DAY=182
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

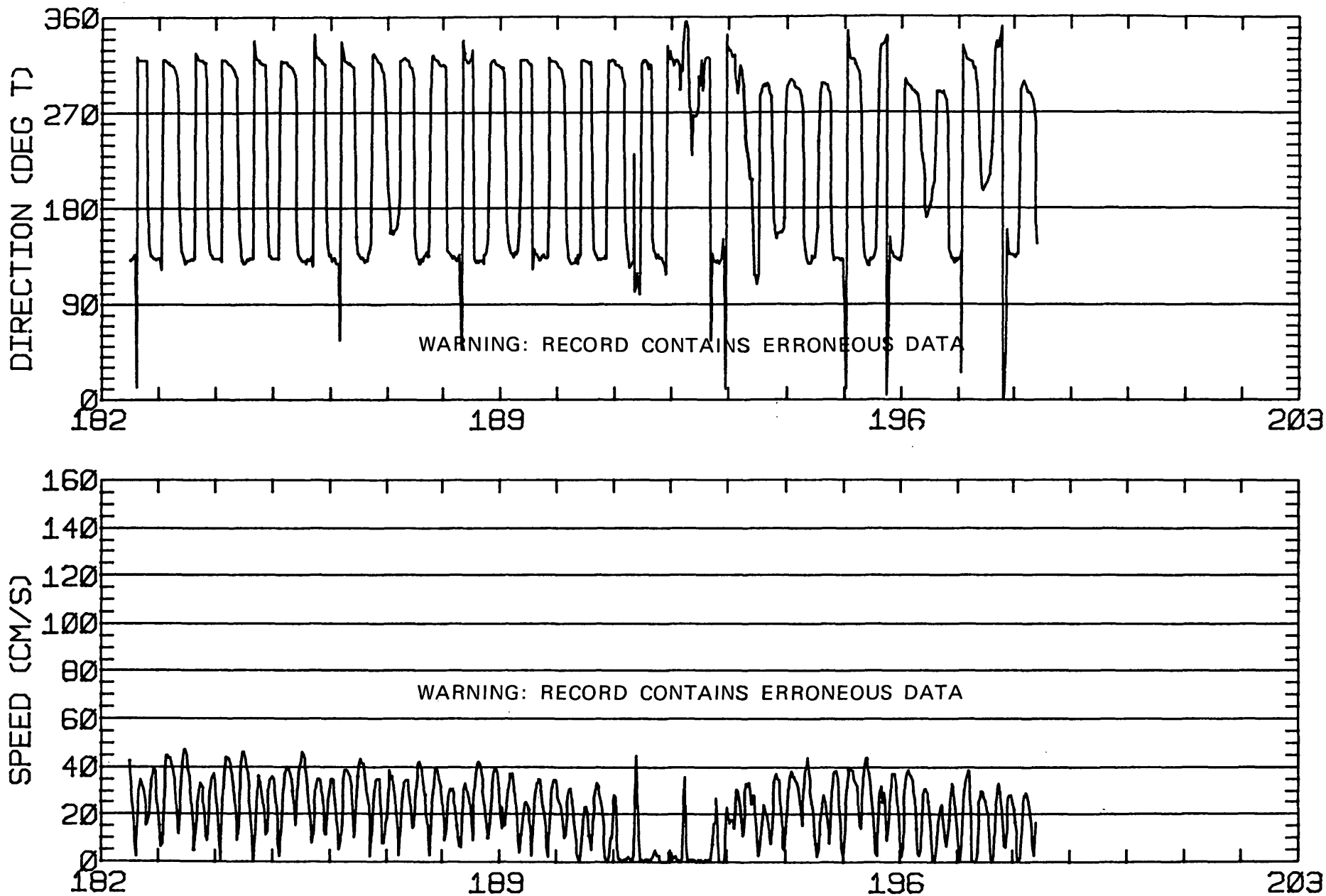
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.79	1.22	138.5	20.9	ANTI-CLOCKWISE
K1	13.04	1.31	126.9	32.8	ANTI-CLOCKWISE
N2	9.79	1.25	153.9	243.9	ANTI-CLOCKWISE
M2	33.34	0.78	133.2	273.0	CLOCKWISE
S2	6.78	0.35	135.1	303.1	CLOCKWISE
M4	2.52	1.81	135.6	53.5	ANTI-CLOCKWISE

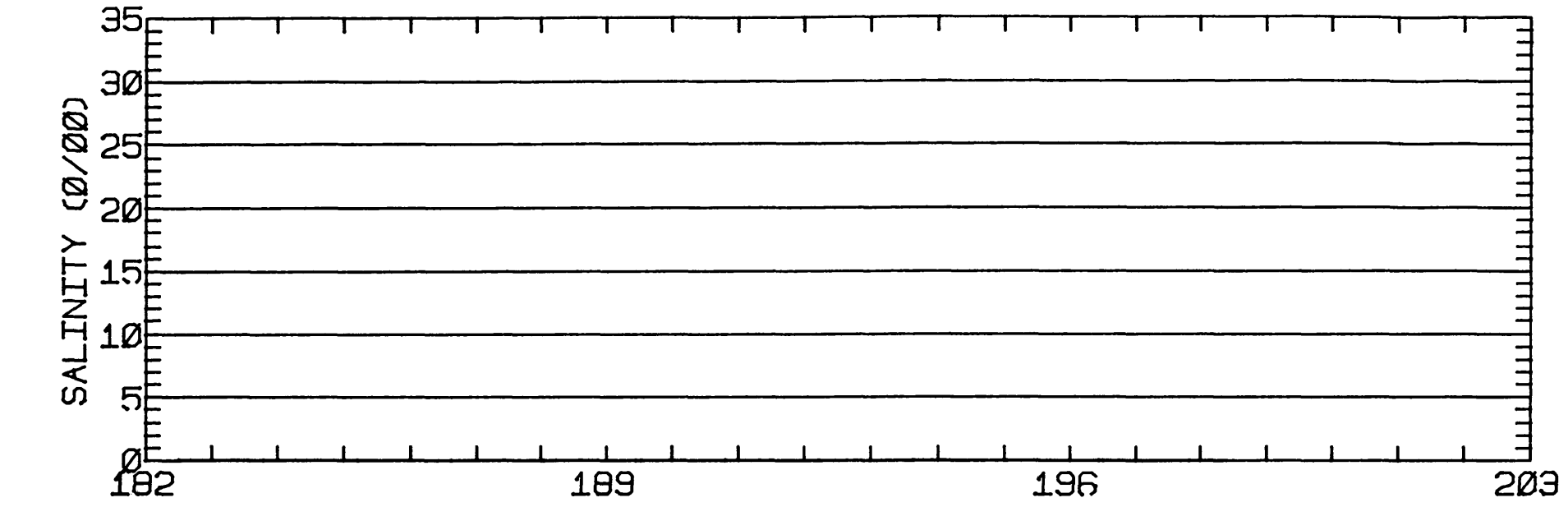
RMS SPEED: 29.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 59.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 19.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 132.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.47
STANDARD DEVIATION U-SERIES: 3.95 CM/SEC
STANDARD DEVIATION V SERIES: 4.25 CM/SEC

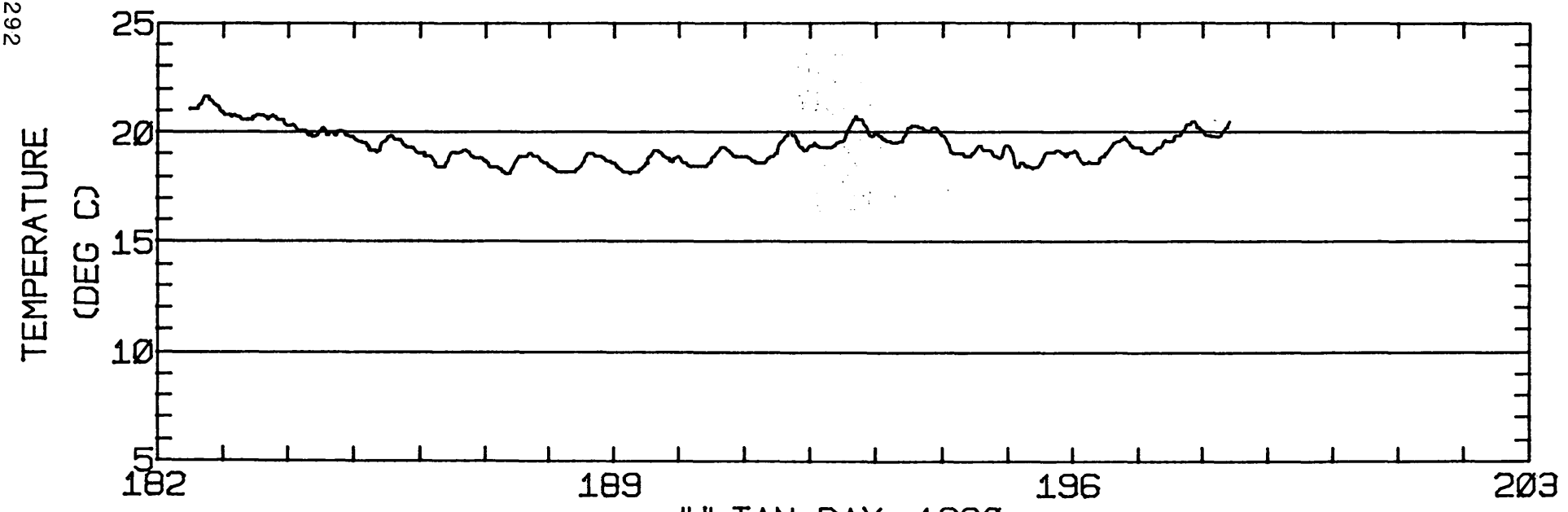
TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	1.0	-0.9	405.
2	2	0.1	-1.8	411.
ALL	14	0.9	-1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 310 37-39- 6N 122-13-40W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 310 37-39- 6N 122-13-40W

METER ØØØ.8 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 312
POSITION: 37 35'25"N 122 14'55"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 5/20/80 1040 PST JULIAN DAY=141
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

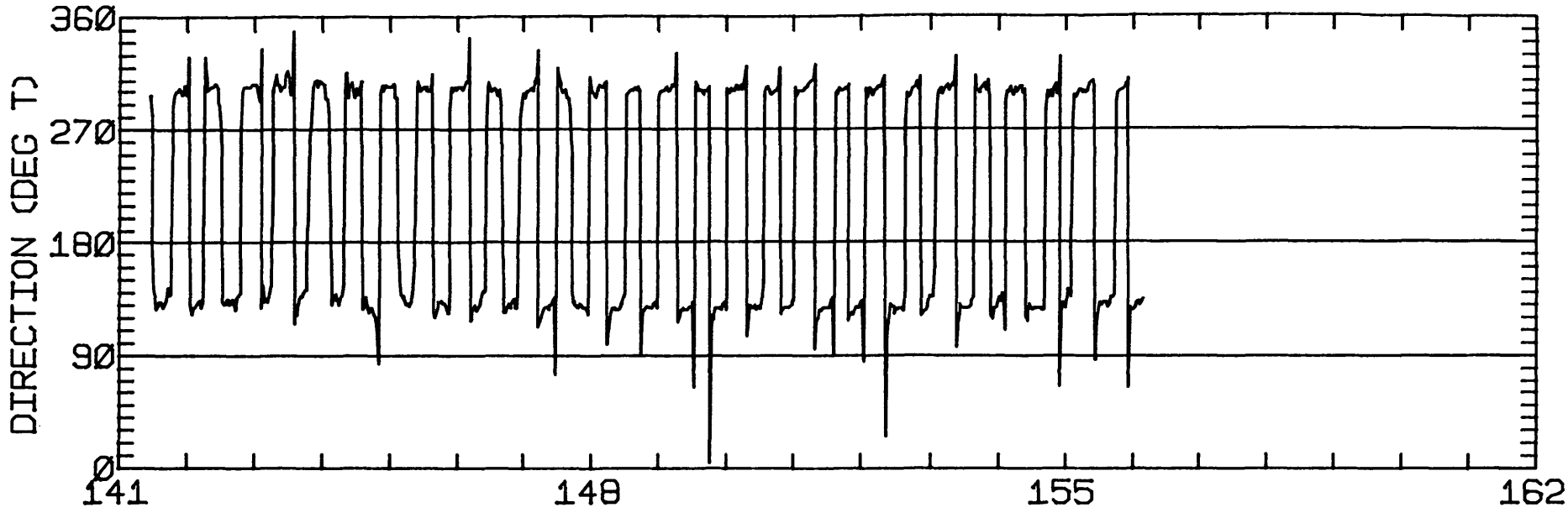
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

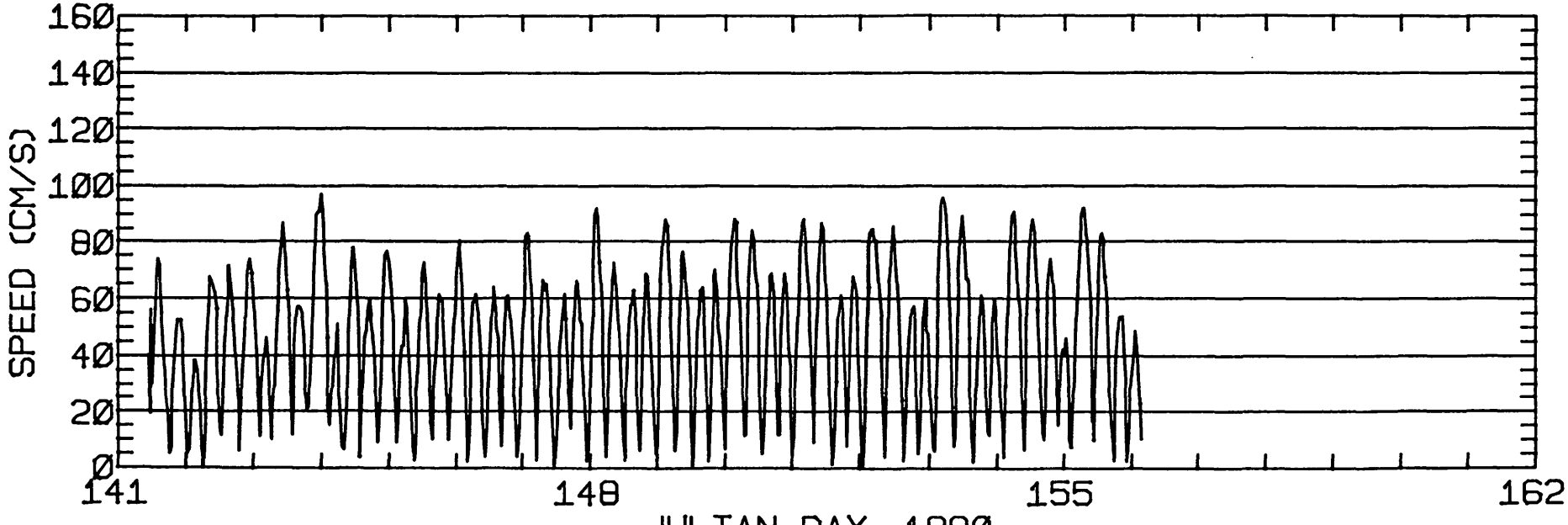
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.87	0.11	122.1	14.5	ANTI-CLOCKWISE
K1	19.09	0.45	126.0	7.0	CLOCKWISE
N2	11.42	0.75	126.5	244.6	ANTI-CLOCKWISE
M2	71.52	0.70	126.2	292.2	CLOCKWISE
S2	11.57	0.50	118.2	285.8	CLOCKWISE
M4	4.48	1.00	128.4	137.2	CLOCKWISE

RMS SPEED: 52.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 111.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 125.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.34
STANDARD DEVIATION U-SERIES: 7.98 CM/SEC
STANDARD DEVIATION V SERIES: 6.16 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.7	1.6	583.
2	12	-2.9	-0.6	469.
3	4	-6.1	0.4	411.
ALL	28	-5.4	0.5	



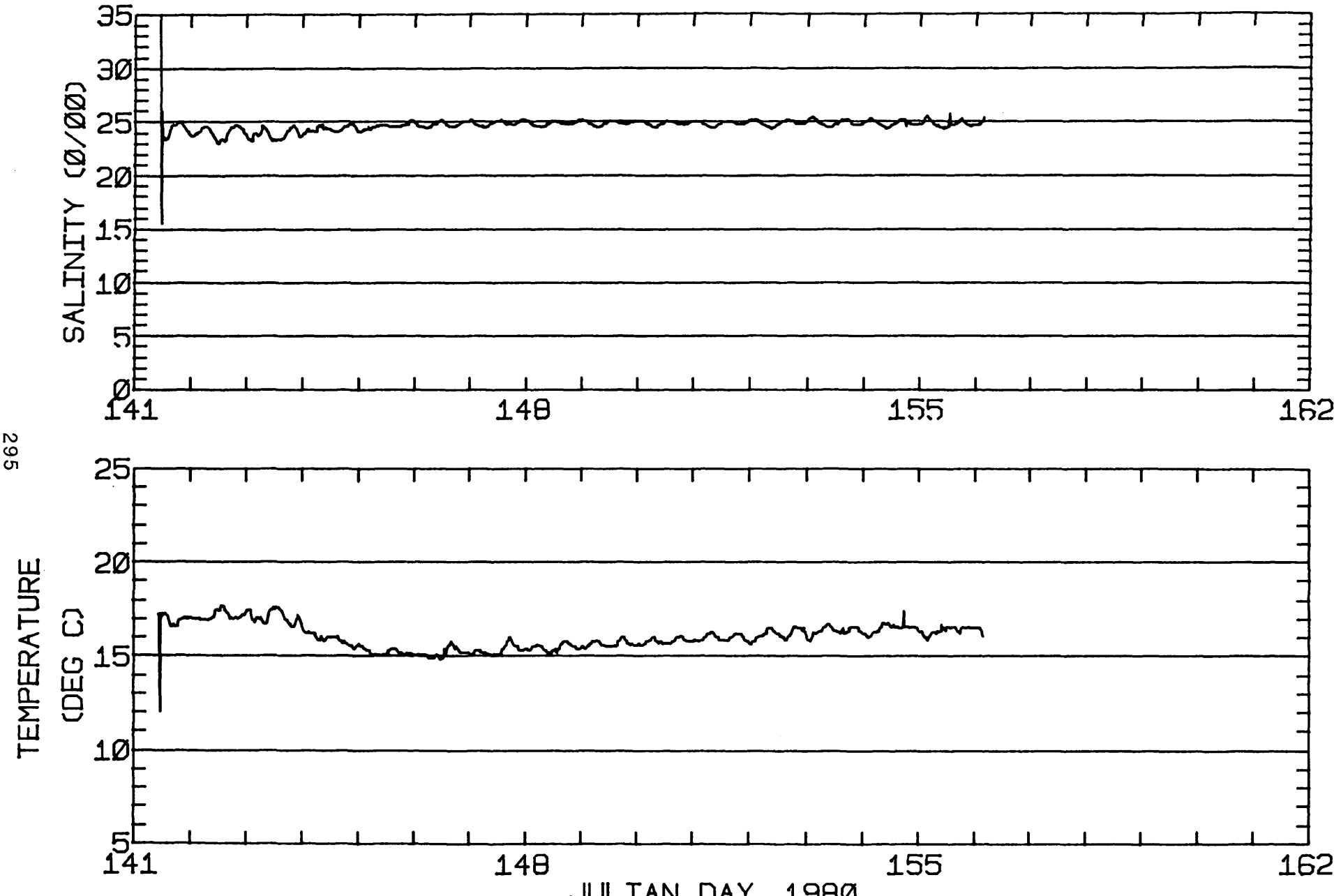


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 312 37-35-25N 122-14-55W

METER 011.3 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-55W
METER Ø11.3 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 312
POSITION: 37 35'25"N 122 14'55"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 5/20/80 1222 PST JULIAN DAY=141
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

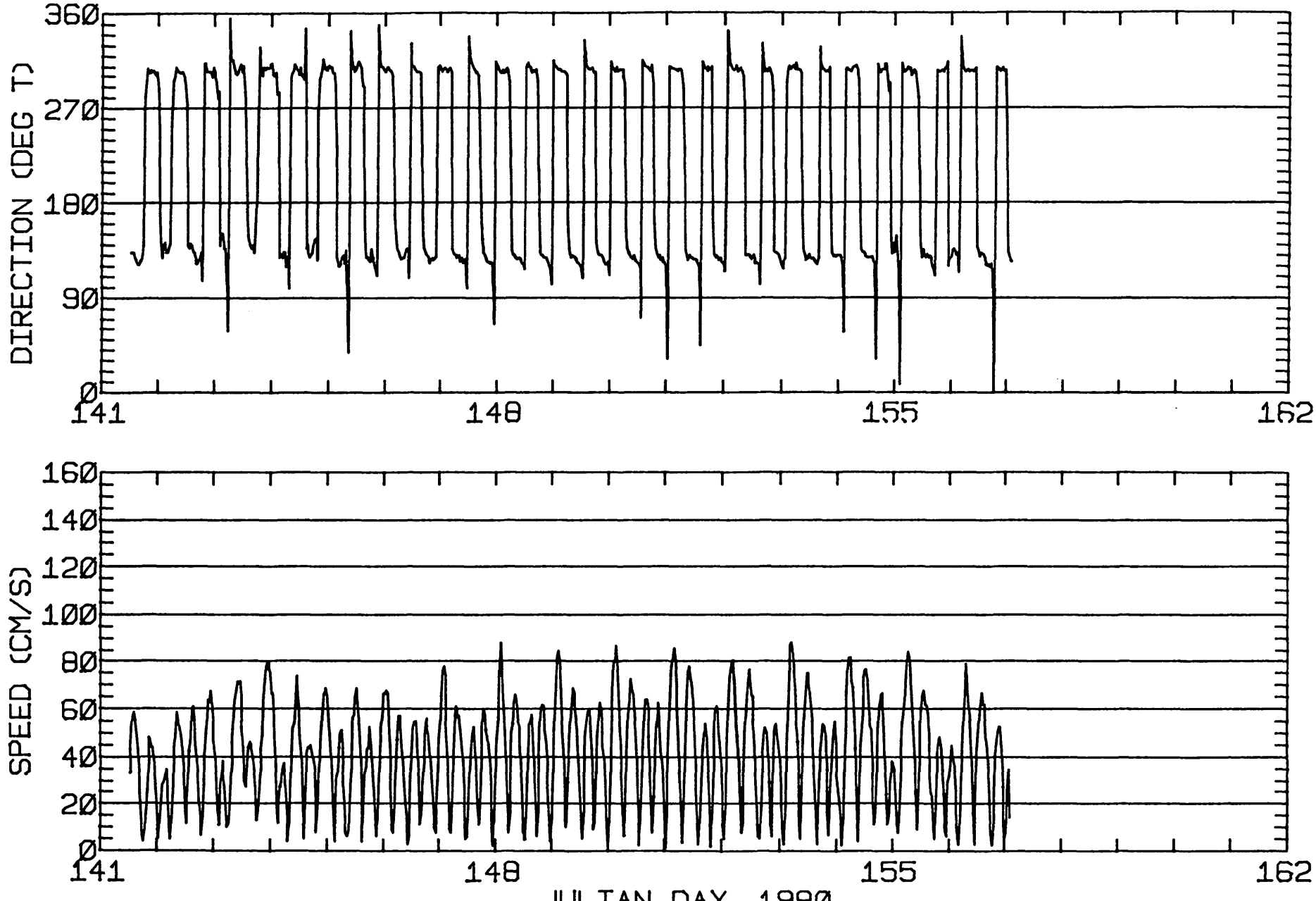
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.54	0.36	123.9	22.1	ANTI-CLOCKWISE
K1	17.27	0.06	128.4	4.8	ANTI-CLOCKWISE
N2	7.76	0.77	129.6	238.7	ANTI-CLOCKWISE
M2	62.53	3.16	128.4	290.2	ANTI-CLOCKWISE
S2	11.65	0.20	125.2	288.4	ANTI-CLOCKWISE
M4	3.81	0.27	138.2	114.5	ANTI-CLOCKWISE

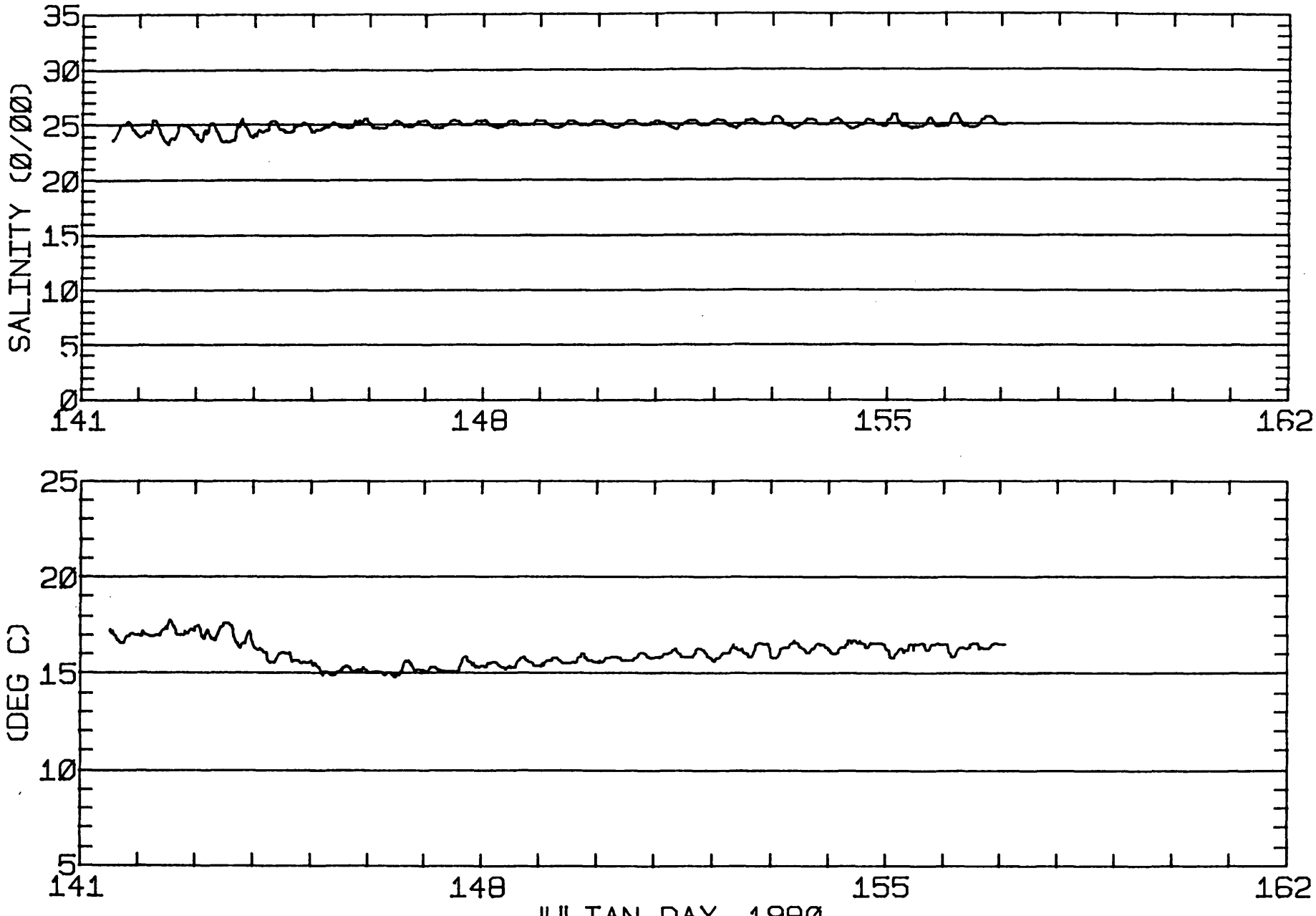
RMS SPEED: 46.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 100.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 42.1 CM/SEC
PRINCIPAL CURRENT DIRECTION: 127.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.35
STANDARD DEVIATION U-SERIES: 8.61 CM/SEC
STANDARD DEVIATION V SERIES: 6.20 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-7.8	3.7	583.
2	12	-0.2	-0.5	469.
3	4	-4.5	2.0	408.
ALL	28	-4.0	1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-55W
METER 008.2 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-55W
METER ØØ8.2 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 312
POSITION: 37 35'25"N 122 14'55"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 11.9 M (BELOW MLLW)
START TIME OF SERIES: 5/20/80 1104 PST JULIAN DAY=141
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

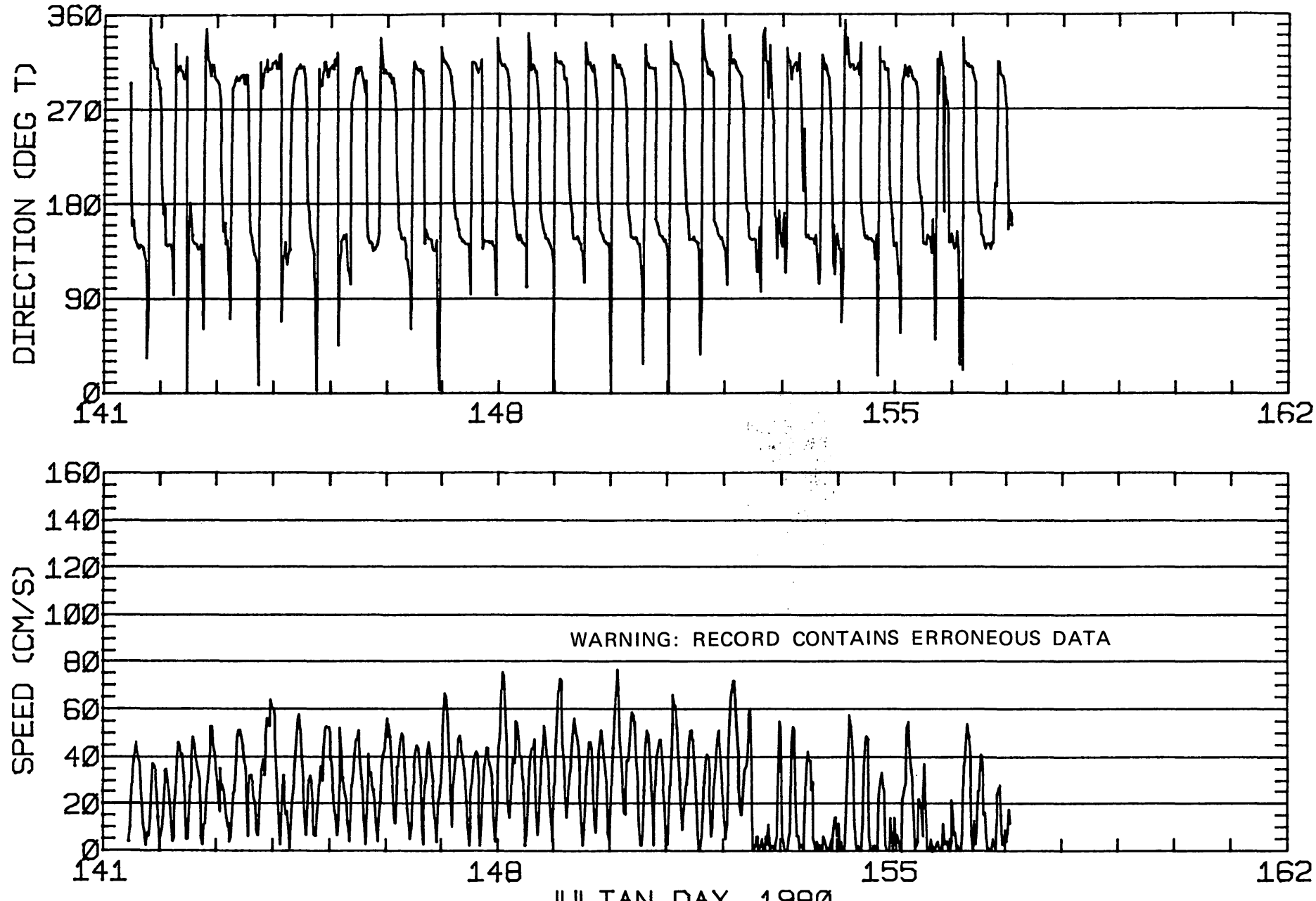
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.47	1.30	135.1	49.0	ANTI-CLOCKWISE
K1	11.12	2.51	136.9	349.6	ANTI-CLOCKWISE
N2	3.21	0.89	174.4	271.7	CLOCKWISE
M2	46.28	5.58	139.2	289.8	ANTI-CLOCKWISE
S2	9.18	0.44	151.3	287.7	ANTI-CLOCKWISE
M4	4.04	0.84	144.5	126.5	CLOCKWISE

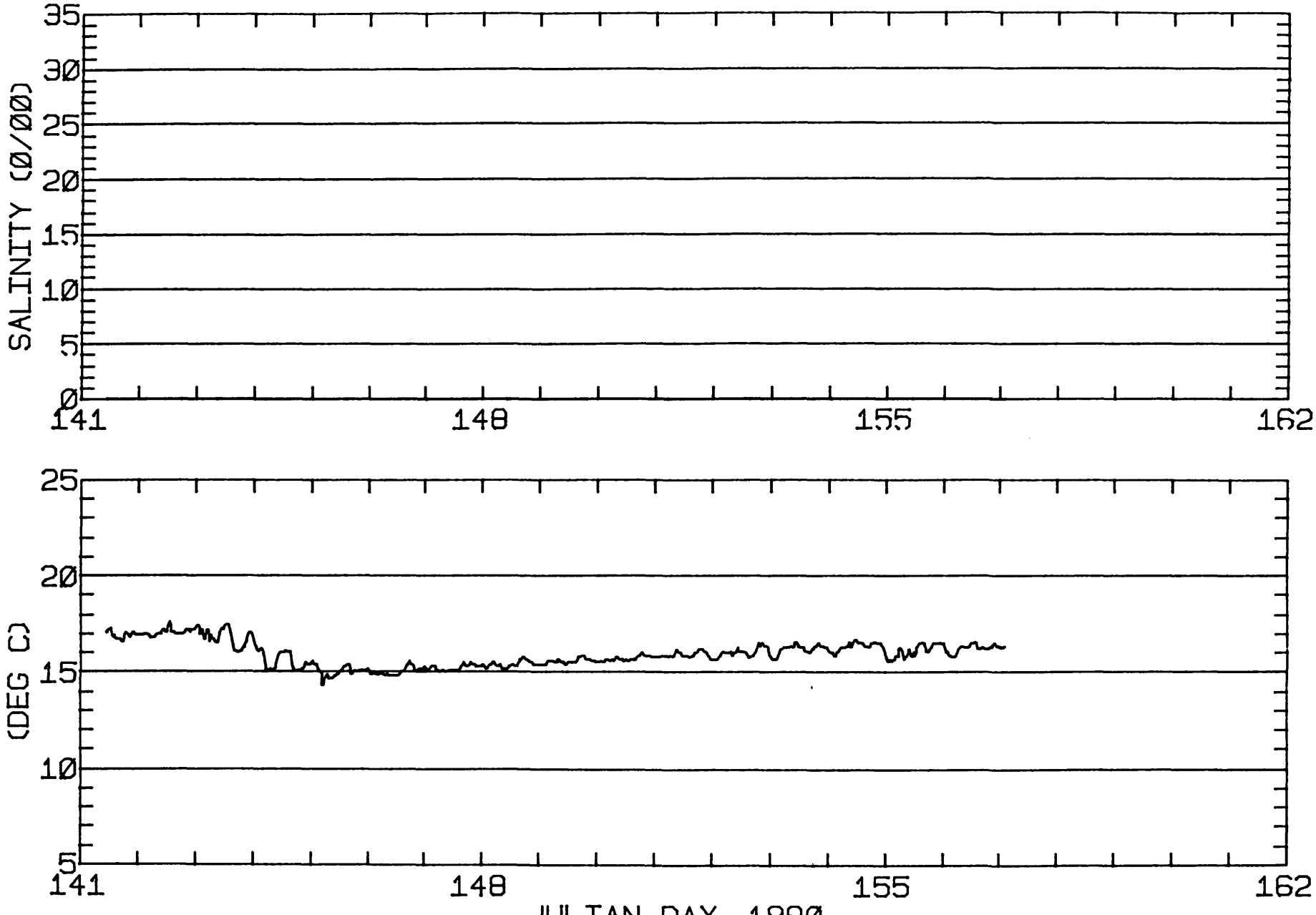
RMS SPEED: 35.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 72.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 140.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 7.28 CM/SEC
STANDARD DEVIATION V SERIES: 7.63 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-8.0	1.7	583.
2	6	-4.7	-4.2	492.
ALL	18	-6.9	-0.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-55W
METER 002.4 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-55W
METER ØØ2.4 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 312
POSITION: 37 35'25"N 122 14'57"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 6/ 5/80 1100 PST JULIAN DAY=157
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

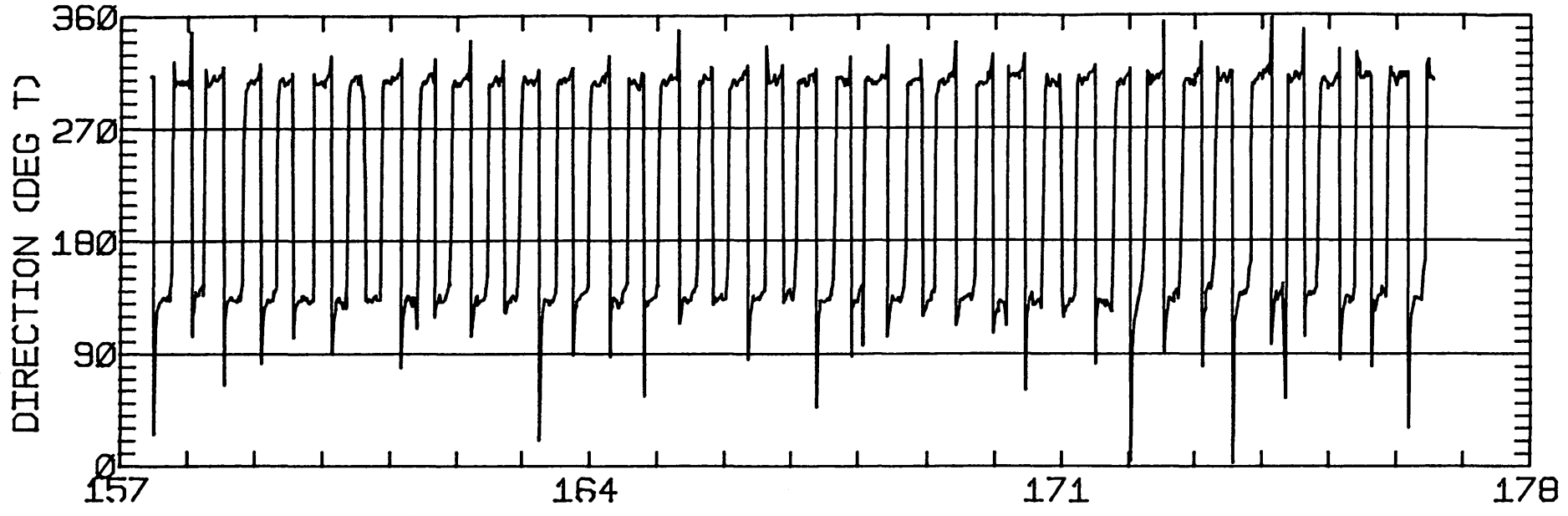
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

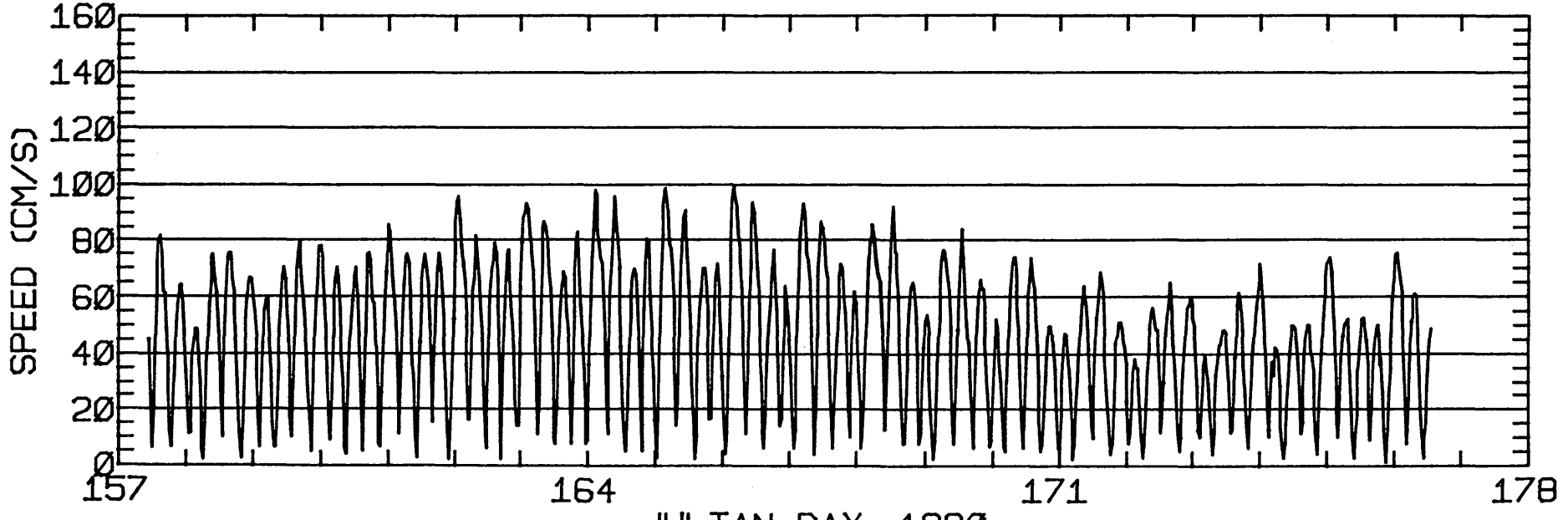
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.62	0.28	128.6	12.8	ANTI-CLOCKWISE
K1	19.49	1.22	131.0	22.6	CLOCKWISE
N2	9.48	0.04	129.3	273.8	ANTI-CLOCKWISE
M2	66.46	2.62	131.0	295.2	CLOCKWISE
S2	9.14	0.25	129.0	319.6	CLOCKWISE
M4	5.40	2.07	135.0	168.7	CLOCKWISE

RMS SPEED: 51.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 45.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 130.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.36
STANDARD DEVIATION U-SERIES: 5.69 CM/SEC
STANDARD DEVIATION V SERIES: 5.15 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-2.8	0.8	398.
2	12	-5.1	2.1	403.
3	12	-5.0	3.5	445.
ALL	36	-4.3	2.2	



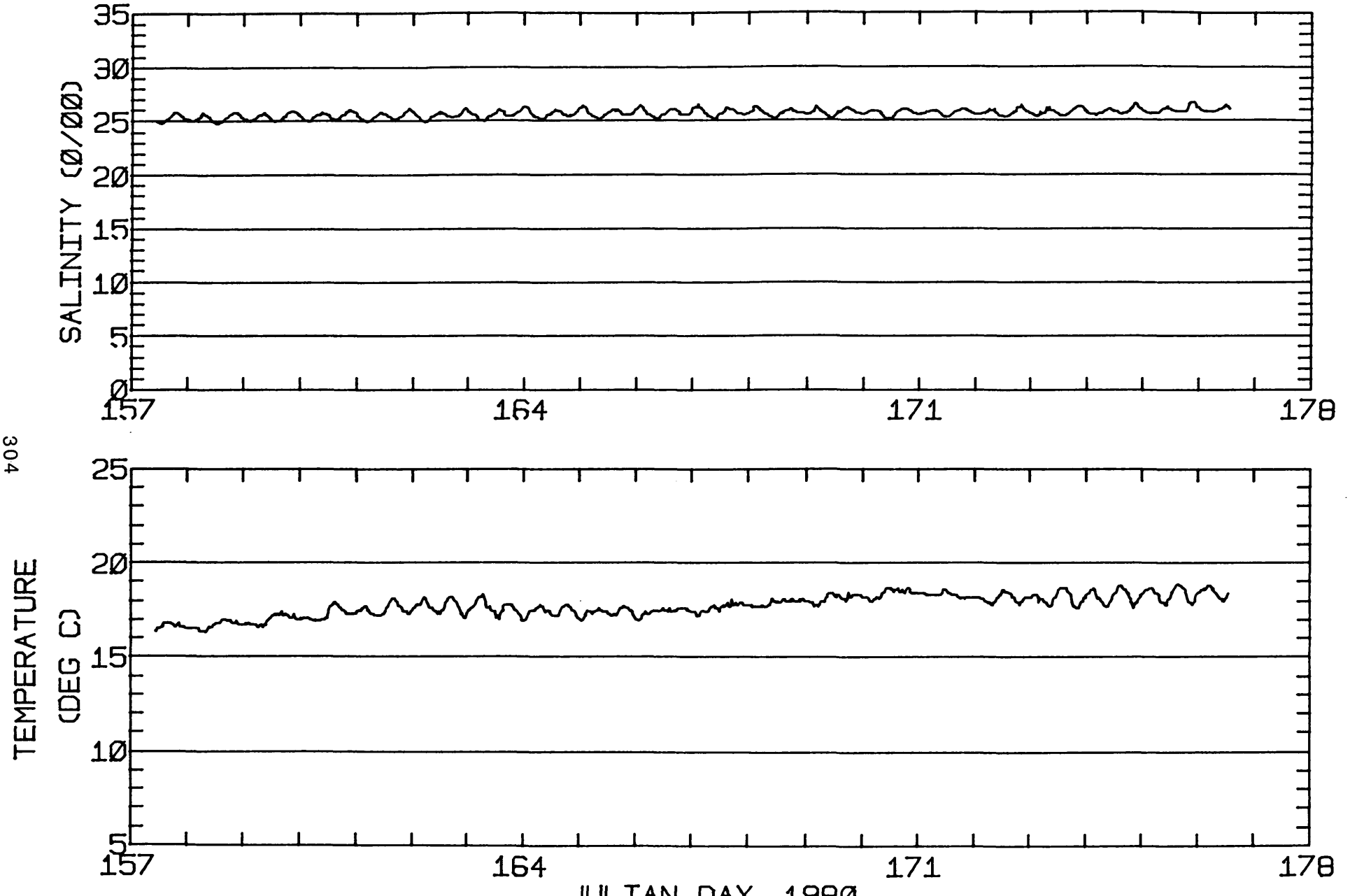


JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)

NOAA STATION 312 37-35-25N 122-14-57W

METER 011.3 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-57W
METER Ø11.3 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 312
POSITION: 37 35'25"N 122 14'57"W
METER TYPE: AANDERAA
WATER DEPTH: 14.3 M (MLLW)
METER DEPTH: 6.1 M (BELOW MLLW)
START TIME OF SERIES: 6/ 5/80 1112 PST JULIAN DAY=157
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

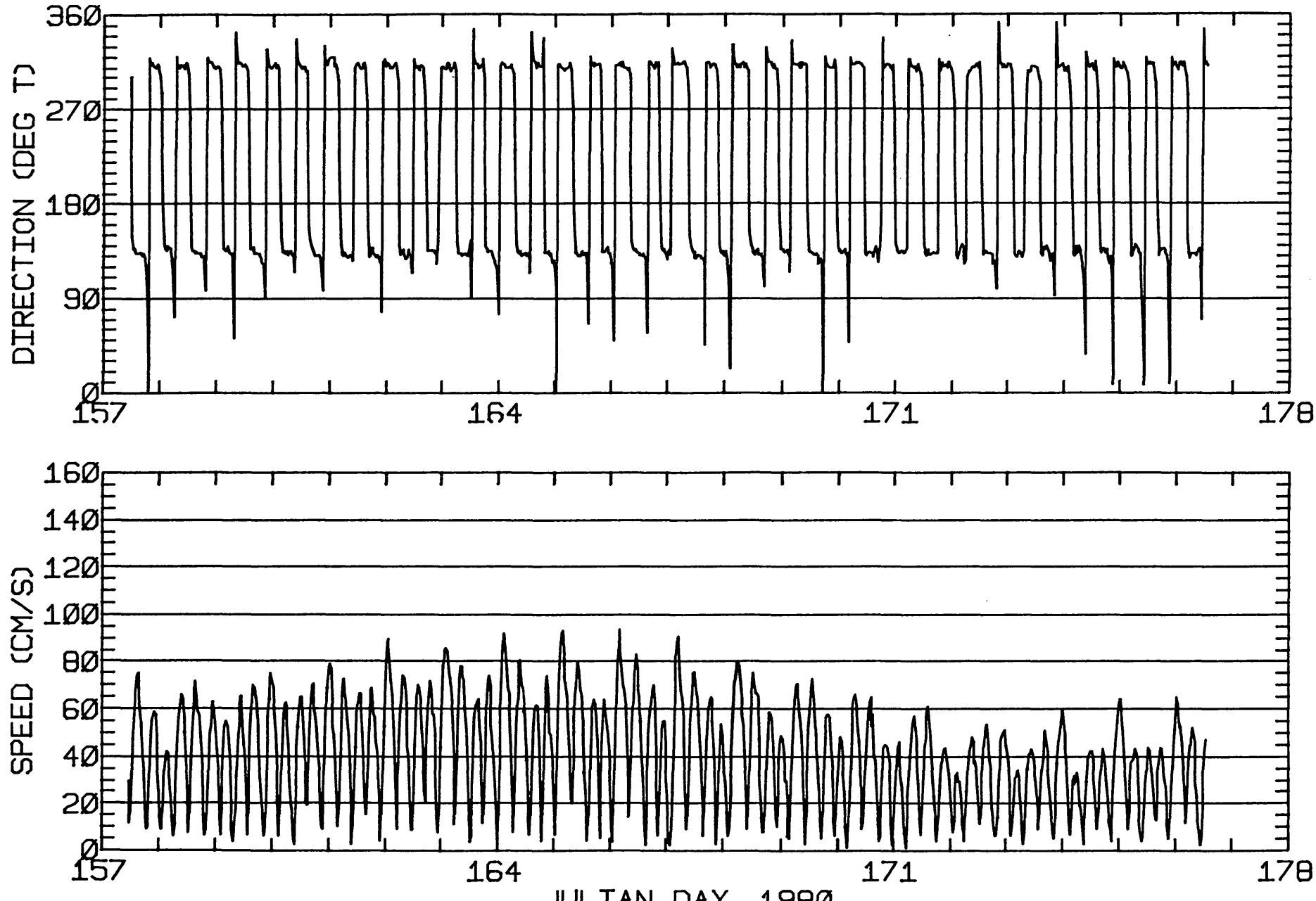
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.43	0.19	130.6	11.6	CLOCKWISE
K1	17.99	0.47	132.0	22.5	ANTI-CLOCKWISE
N2	10.00	0.36	134.2	272.9	ANTI-CLOCKWISE
M2	59.74	2.49	132.5	294.1	ANTI-CLOCKWISE
S2	8.63	0.02	130.2	319.6	CLOCKWISE
M4	4.34	0.24	138.9	137.1	ANTI-CLOCKWISE

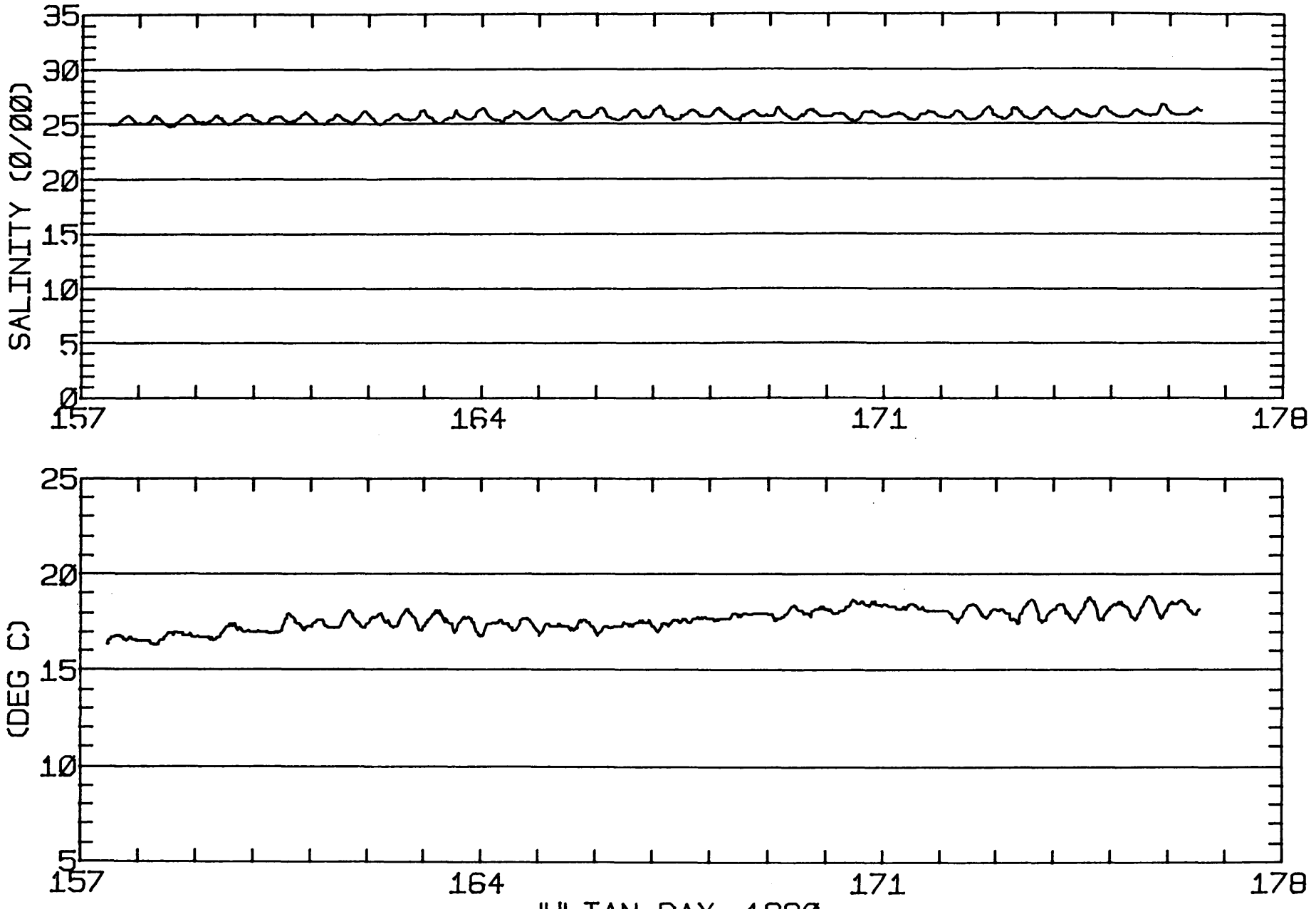
RMS SPEED: 46.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 93.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 40.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 132.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 5.40 CM/SEC
STANDARD DEVIATION V SERIES: 4.62 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.1	-0.3	398.
2	12	-2.3	1.7	403.
3	12	-3.7	2.0	445.
ALL	36	-2.4	1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-57W
METER 008.2 METERS ABOVE BED. WATER DEPTH 014.3 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-57W
METER ØØ8.2 METERS ABOVE BED. WATER DEPTH Ø14.3 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 312
POSITION: 37 35'25"N 122 14'58"W
METER TYPE: AANDERAA
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 2.7 M (BELOW MLLW)
START TIME OF SERIES: 6/24/80 1500 PST JULIAN DAY=176
APPROXIMATE RECORD LENGTH IS 30 M2-CYCLES

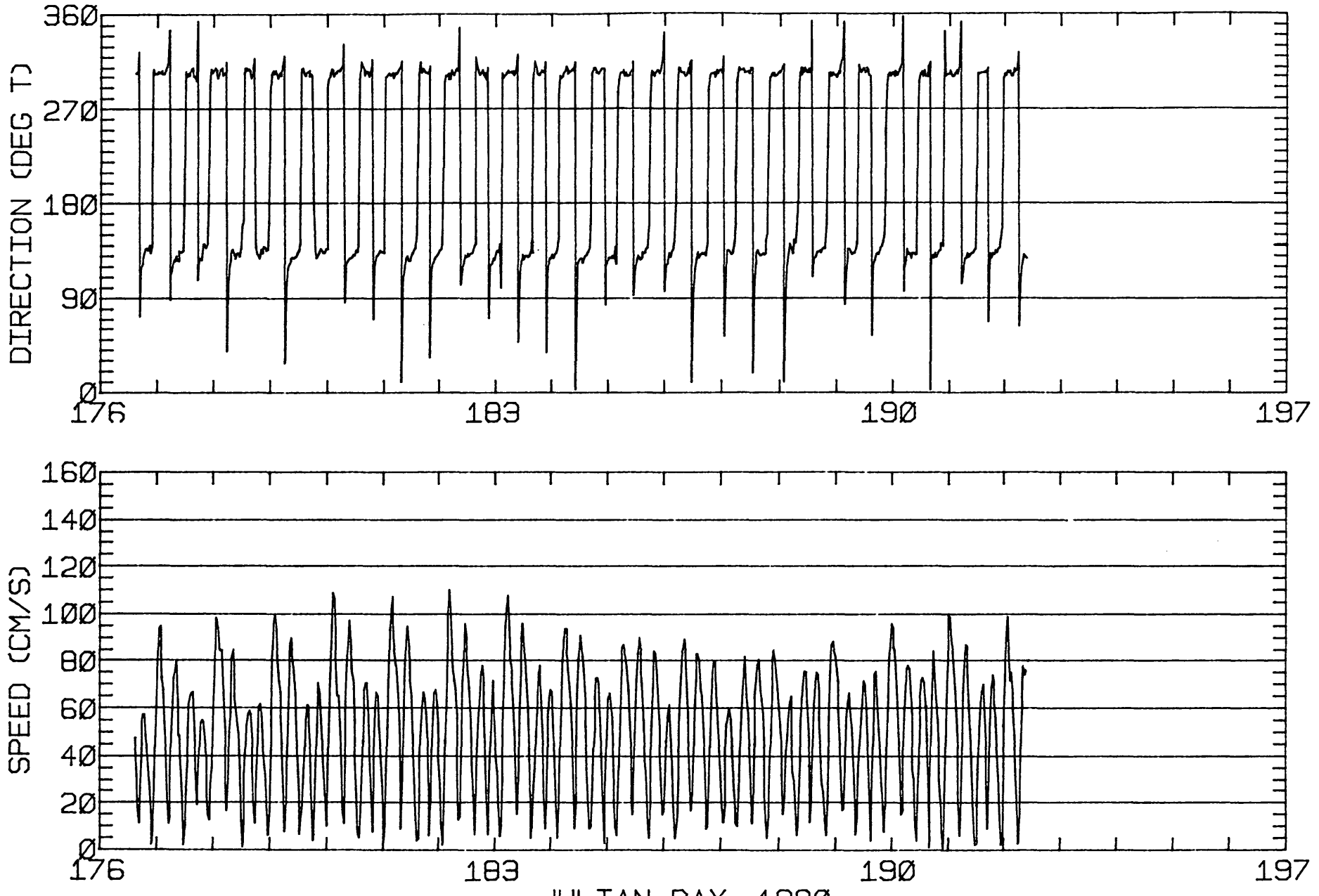
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.52	0.10	122.0	6.0	CLOCKWISE
K1	21.05	1.21	126.5	32.0	CLOCKWISE
N2	11.57	0.28	127.6	271.1	CLOCKWISE
M2	68.77	3.03	127.8	295.5	CLOCKWISE
S2	13.54	0.00	125.7	314.4	ANTI-CLOCKWISE
M4	5.59	2.75	117.6	141.0	CLOCKWISE

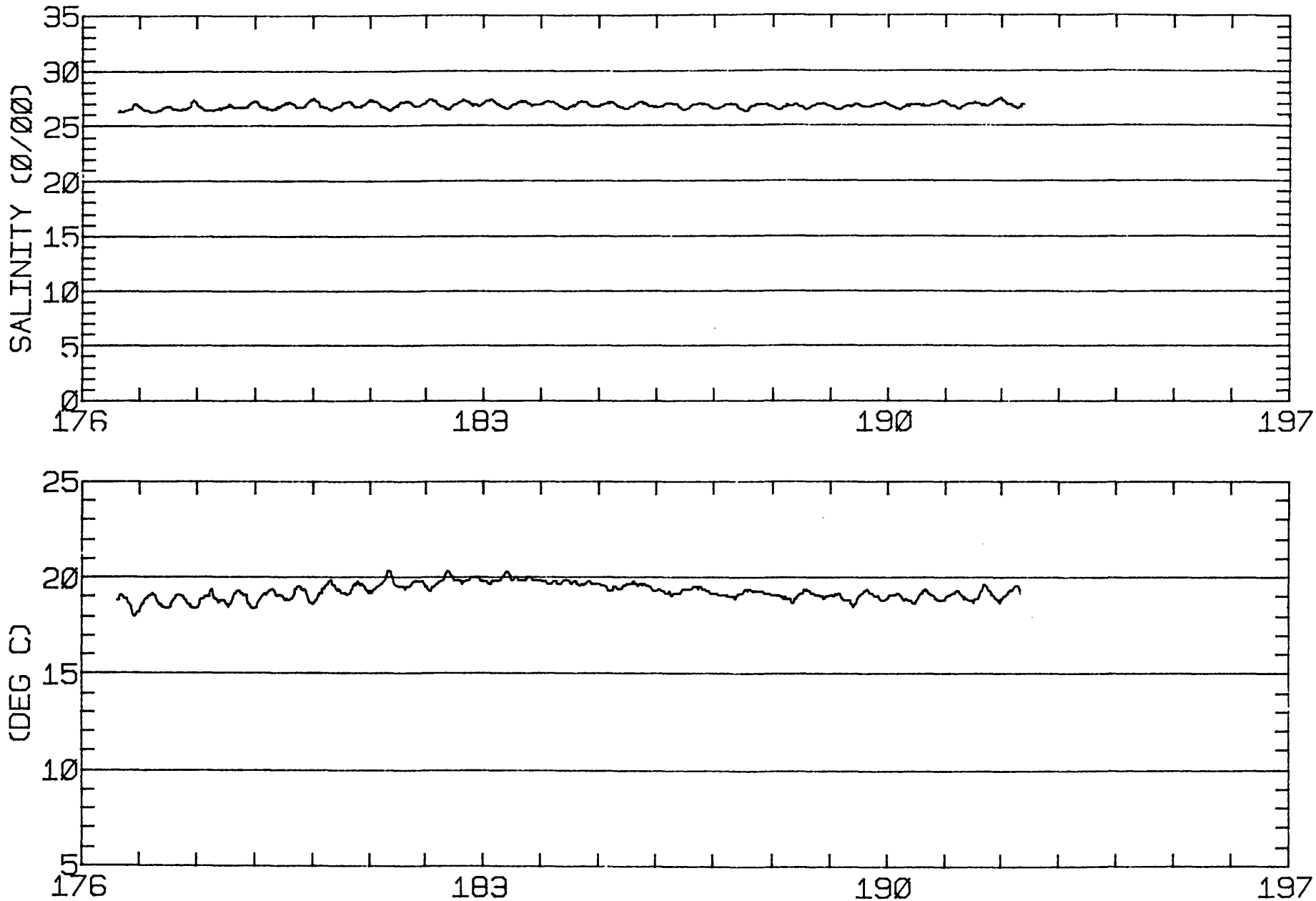
RMS SPEED: 57.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 112.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 43.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 126.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.37
STANDARD DEVIATION U-SERIES: 6.73 CM/SEC
STANDARD DEVIATION V SERIES: 6.06 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-5.0	1.3	445.
2	12	-5.9	2.1	405.
3	6	-5.9	1.3	311.
ALL	30	-5.6	1.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-58W
METER 011.3 METERS ABOVE BED. WATER DEPTH 014.0 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-58W
METER 011.3 METERS ABOVE BED. WATER DEPTH 014.0 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 312
POSITION: 37 35'25"N 122 14'58"W
METER TYPE: AANDERAA
WATER DEPTH: 14.0 M (MLLW)
METER DEPTH: 5.8 M (BELOW MLLW)
START TIME OF SERIES: 6/24/80 1522 PST JULIAN DAY=176
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

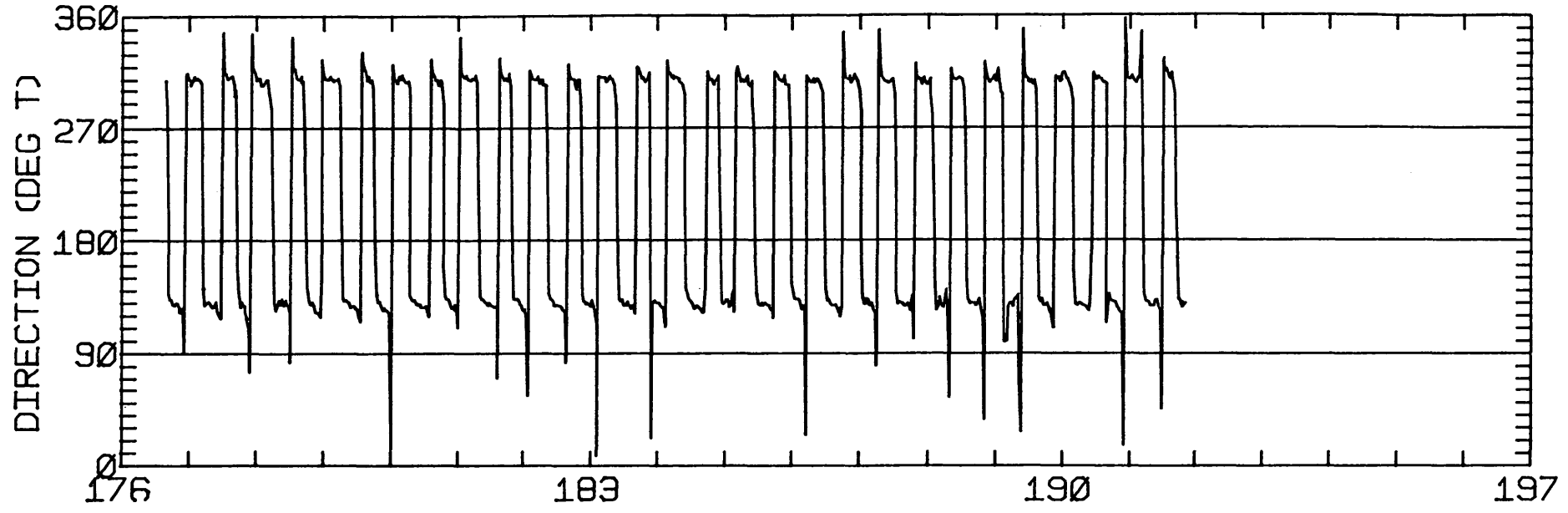
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

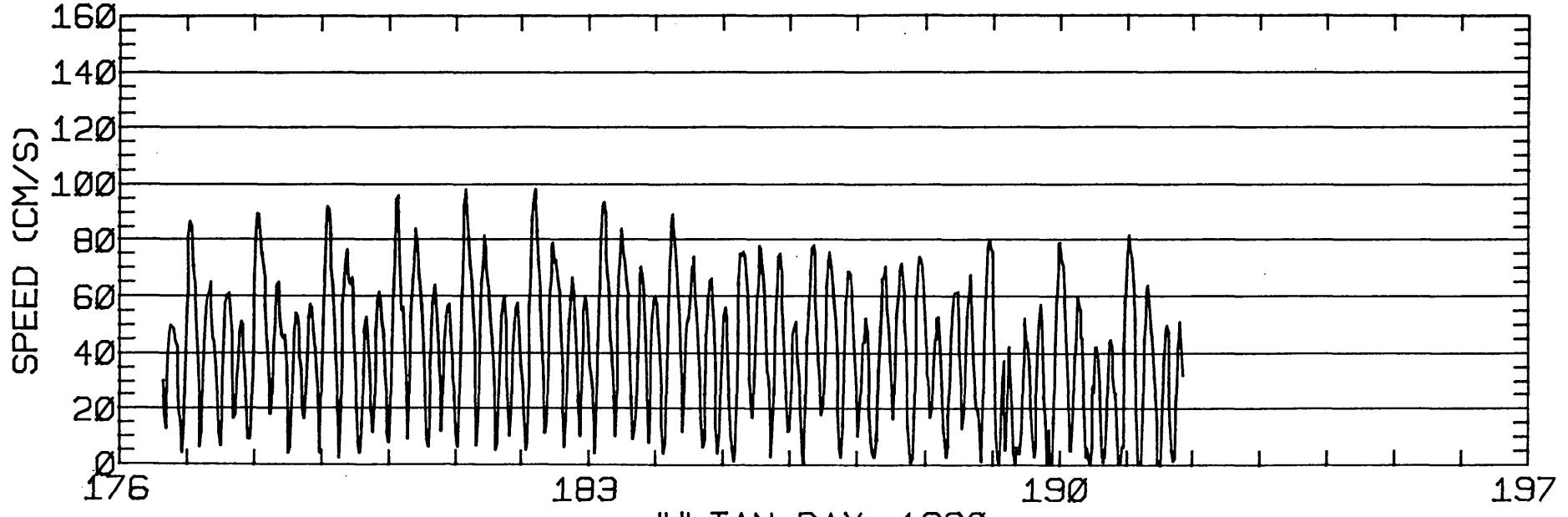
CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.36	0.16	127.9	4.2	CLOCKWISE
K1	19.32	0.63	130.3	32.9	ANTI-CLOCKWISE
N2	7.75	0.00	124.1	217.8	ANTI-CLOCKWISE
M2	66.87	3.07	128.8	289.9	ANTI-CLOCKWISE
S2	8.17	0.18	131.0	318.3	ANTI-CLOCKWISE
M4	4.92	0.52	139.1	88.6	ANTI-CLOCKWISE

RMS SPEED: 51.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 104.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 49.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 129.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 6.11 CM/SEC
STANDARD DEVIATION V SERIES: 4.75 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.3	1.3	445.
2	8	-2.7	1.6	393.
ALL	20	-1.9	1.4	

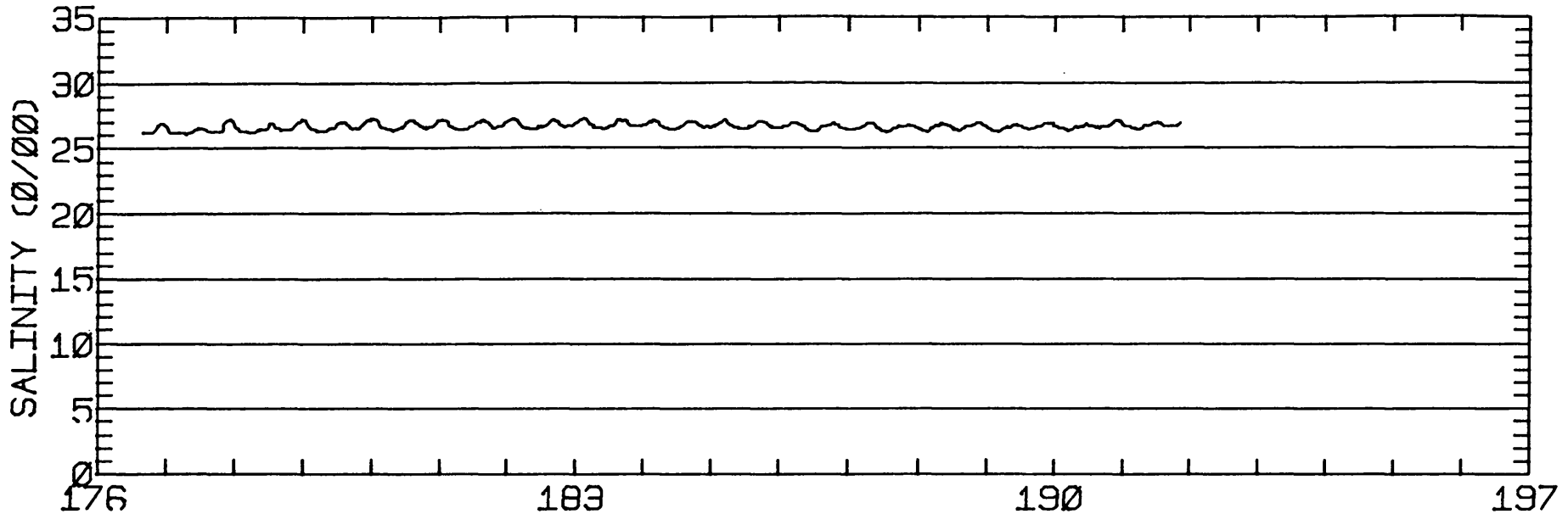


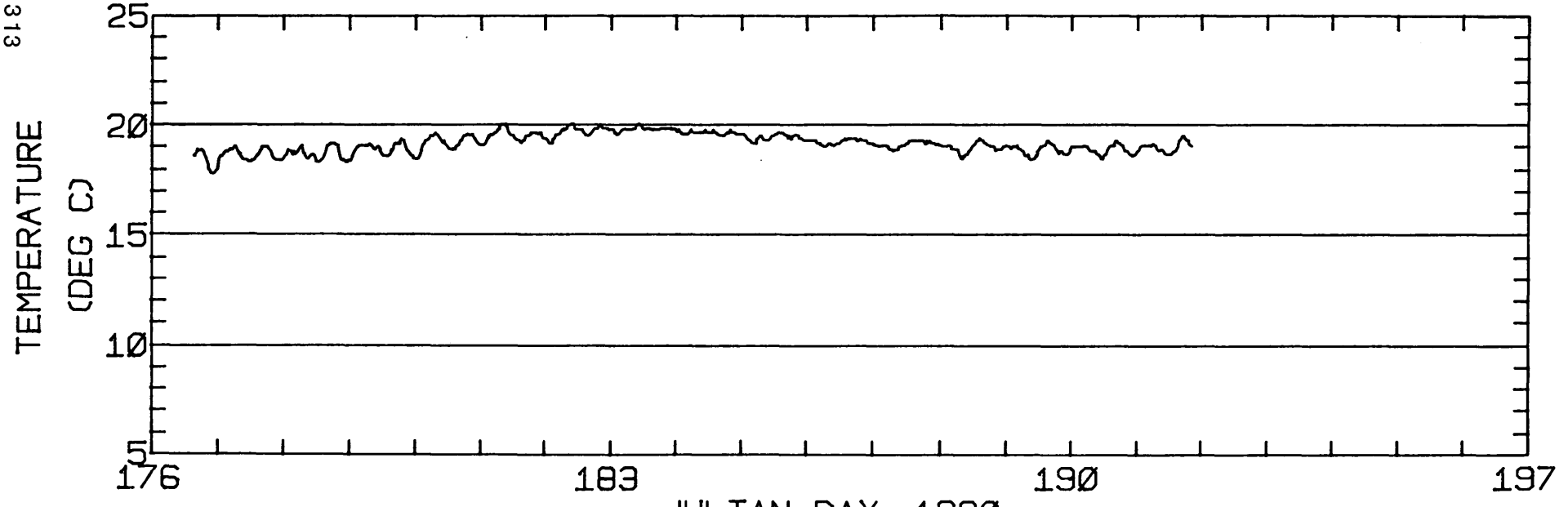


312

JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-58W
METER 008.2 METERS ABOVE BED. WATER DEPTH 014.0 METERS.





JULIAN DAY, 1980

CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-25N 122-14-58W
METER ØØ8.2 METERS ABOVE BED. WATER DEPTH Ø14.Ø METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 312
POSITION: 37 35'26"N 122 15' 5"W
METER TYPE: AANDERAA
WATER DEPTH: 13.7 M (MLLW)
METER DEPTH: 11.3 M (BELOW MLLW)
START TIME OF SERIES:11/ 6/80 1424 PST JULIAN DAY=311
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

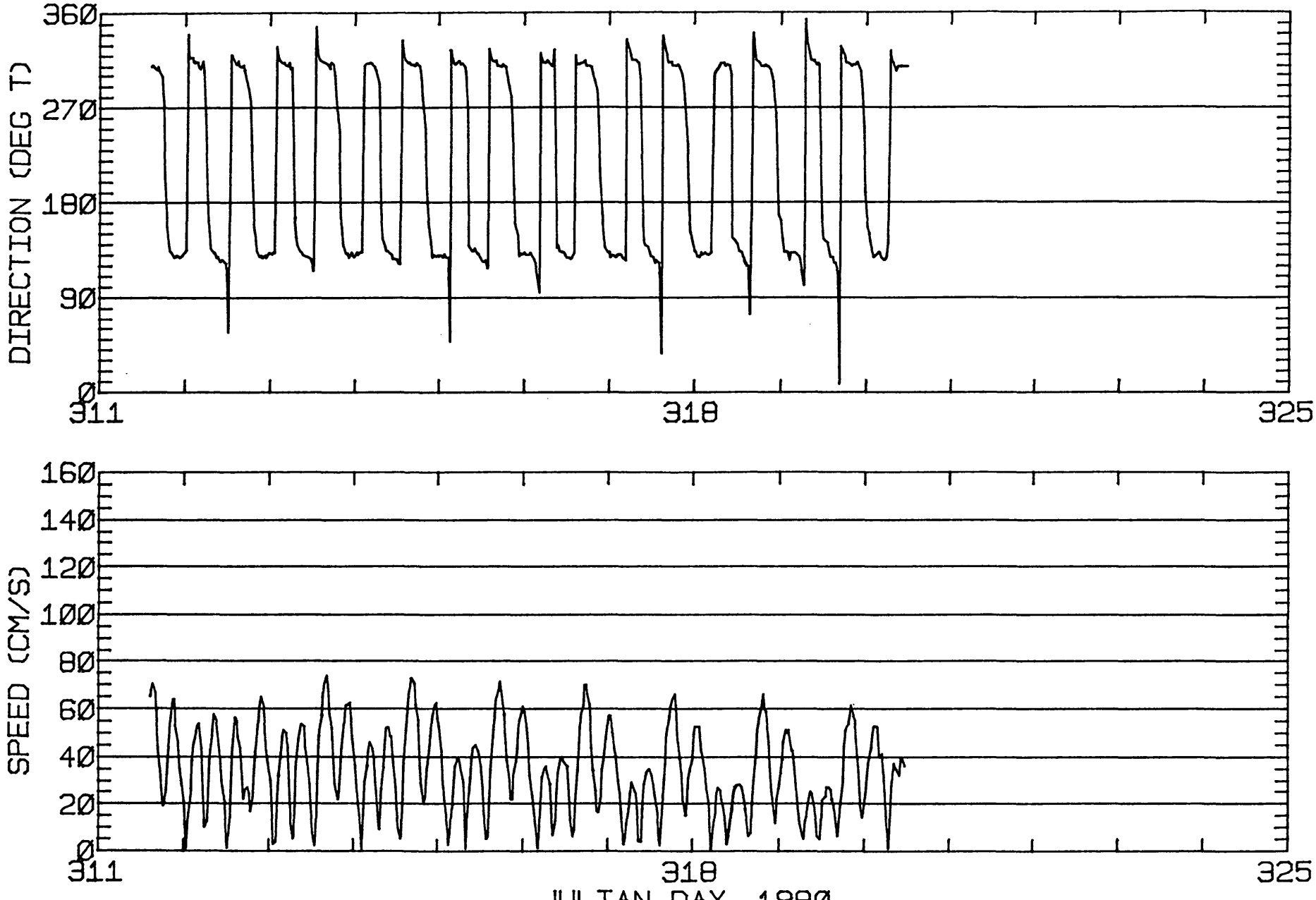
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.77	1.65	131.7	357.1	ANTI-CLOCKWISE
K1	15.62	2.22	129.4	28.1	ANTI-CLOCKWISE
N2	9.53	1.17	132.5	245.8	ANTI-CLOCKWISE
M2	51.68	5.34	131.2	287.4	ANTI-CLOCKWISE
S2	13.82	0.73	130.6	295.0	ANTI-CLOCKWISE
M4	3.26	1.62	169.5	61.8	ANTI-CLOCKWISE

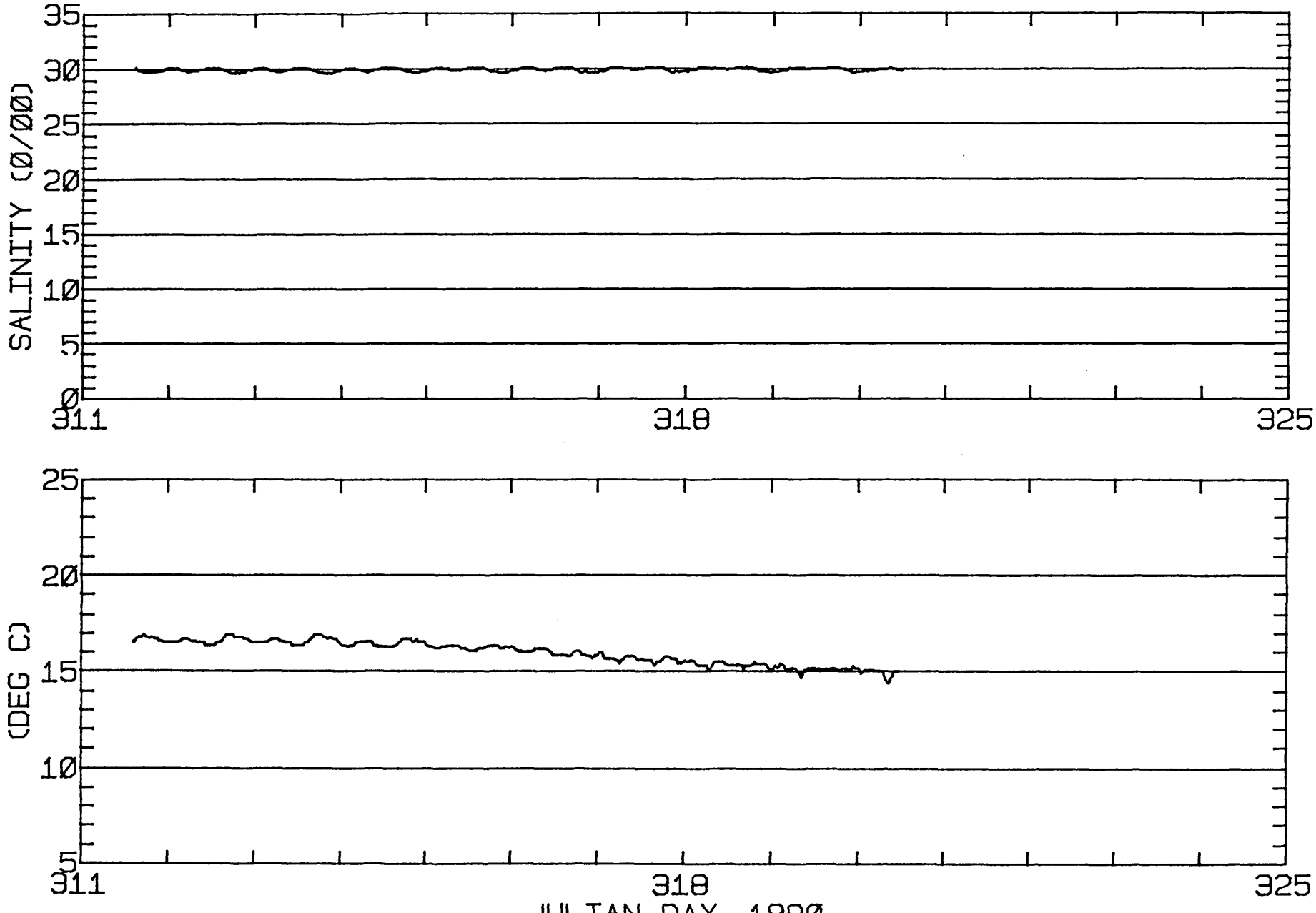
RMS SPEED: 39.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 91.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 33.0 CM/SEC
PRINCIPAL CURRENT DIRECTION: 130.9 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 4.10 CM/SEC
STANDARD DEVIATION V SERIES: 3.94 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-0.9	-0.8	194.
2	4	-0.9	-0.9	197.
ALL	16	-0.9	-0.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-26N 122-15- 5W
METER 002.3 METERS ABOVE BED. WATER DEPTH 013.7 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 312 37-35-26N 122-15- 5W
METER ØØ2.3 METERS ABOVE BED. WATER DEPTH Ø13.7 METERS.

****
* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: 313
POSITION: 37 35'53"N 122 12'20"W
METER TYPE: AANDERAA
WATER DEPTH: 2.1 M (MLLW)
METER DEPTH: 1.2 M (BELOW MLLW)
START TIME OF SERIES: 6/25/80 1100 PST JULIAN DAY=177
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

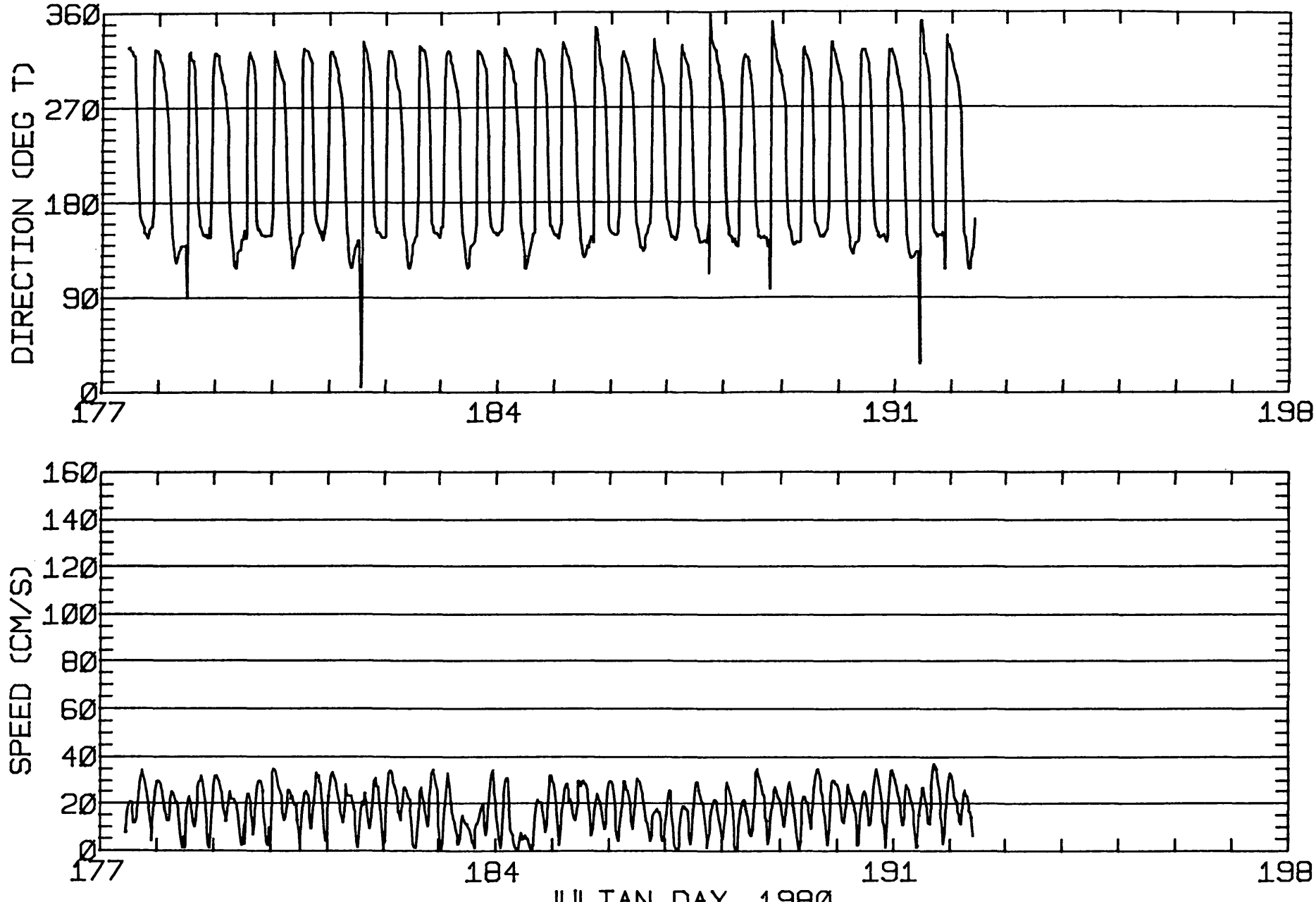
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	2.98	1.34	134.5	51.2	CLOCKWISE
K1	6.10	1.15	124.7	41.0	CLOCKWISE
N2	4.32	0.60	138.6	208.8	ANTI-CLOCKWISE
M2	24.84	4.25	139.8	256.1	ANTI-CLOCKWISE
S2	5.19	1.30	134.1	251.1	ANTI-CLOCKWISE
M4	2.27	1.78	112.1	57.5	ANTI-CLOCKWISE

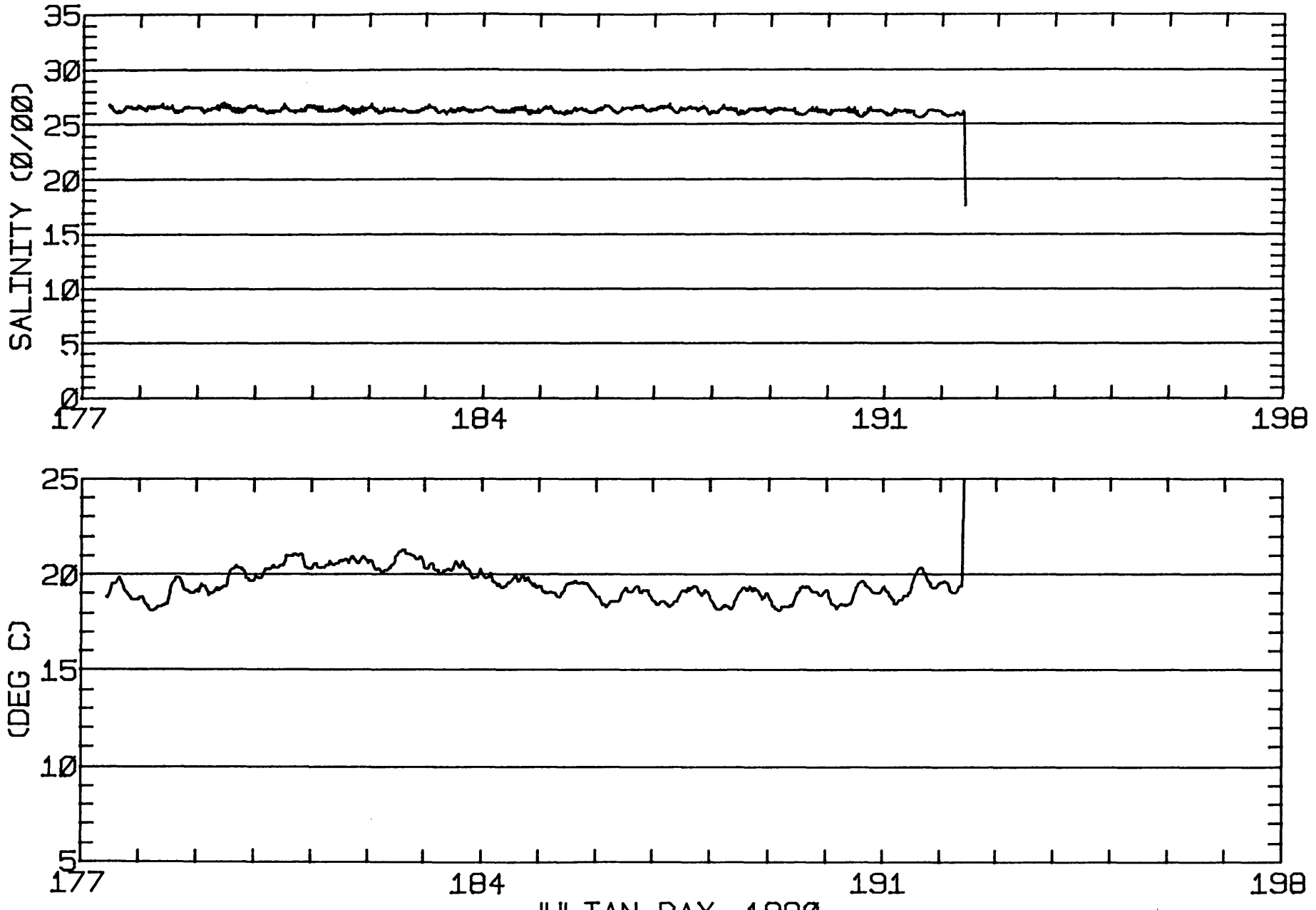
RMS SPEED: 20.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 39.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 16.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 136.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 3.33 CM/SEC
STANDARD DEVIATION V SERIES: 4.98 CM/SEC

TIME AVERAGED VELOCITY AND MEAN DELTA OUTFLOW:

INTERVAL	NO OF M2 CYCLES	EAST-WEST (CM/SEC)	NORTH-SOUTH (CM/SEC)	OUTFLOW CHIPPS IS. (CMS)
1	12	-1.8	-2.5	439.
2	12	-0.8	-3.8	407.
3	4	-1.7	-2.9	317.
ALL	28	-1.4	-3.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 313 37-35-53N 122-12-20W
METER 000.8 METERS ABOVE BED. WATER DEPTH 002.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NOAA STATION 313 37-35-53N 122-12-20W
METER ØØØ.8 METERS ABOVE BED. WATER DEPTH ØØ2.1 METERS.