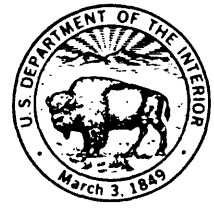
TIDAL AND RESIDUAL CURRENTS IN SOUTH SAN FRANCISCO BAY, CALIFORNIA

RESULTS OF MEASUREMENTS, 1981-83

By Jeffrey W. Gartner and Roy A. Walters

U.S. Geological Survey

Water-Resources Investigations Report 86-4024



FEBRUARY 1986

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CONVERSION FACTORS

Conversion factors for terms used in this report are listed below:

Multiply	By	To obtain
centimeter (cm)	0.3937	inch (in)
centimeter per second (cm/s)	0.3937	inch per second (in/s)
kilometer (km)	0.6214	mile (mi)
meter (m)	3.281	foot (ft)
cubic meters per second (cms)	35.31	cubic feet per second (cfs)
square kilometers (km^2)	0.3861	square miles (mi^2)
cubic kilometers per year (km^3/yr)	0.2399	cubic miles per year (mi^3/yr)

Temperature in degrees Celsius (^oC) can be converted to degrees Fahrenheit (^oF) as follows:

$$^oF = 1.8 \times {}^oC + 32$$

Tidal and Residual Currents in South San Francisco Bay, California, Results of Measurements, 1981-83

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Jeffrey W. Gartner and Roy A. Walters

ABSTRACT

Current-meter data collected at seven stations in South San Francisco Bay, California from 1981 to 1983 are compiled in this report. Measurements include current speed and direction, and water temperature and salinity (computed from temperature and conductivity). For each of the forty-two deployments, data are presented in two forms: (1) results of harmonic analysis; and (2) plots of tidal current speed and direction versus time and plots of temperature and salinity versus time. Spatial distribution of the properties of tidal currents are given in graphic form. In addition, Eulerian residual currents have been compiled using a vector-averaging technique.

Results of harmonic analysis indicate that the tidal currents are generally bi-directional and the principal direction depends on basin bathymetry. Current speed shows a spring/neap variation of about a factor of two and the tide is mixed but closer to semidiurnal than to diurnal. Eulerian residual flows indicate the presence of a clockwise gyre in the center part of South Bay and a counterclockwise gyre in the southern part of the bay during the late winter period.

INTRODUCTION

The deployment of current meters and subsequent processing and analysis of current-meter data are a part of an extensive interdisciplinary study undertaken by the U.S. Geological Survey to better understand the physical, chemical, and biological processes that affect the San Francisco Bay estuarine system (fig. 1). Broad goals of this study are to understand the processes by which water, solutes, sediments, and organisms interact; to quantify effects of river inflow, winds, and tides; and to develop and verify various numerical and conceptual models of these relations (Cheng and Conomos, 1980).

To examine hydrographic properties of San Francisco Bay, in-situ recording current-meter stations have been established throughout the Bay system. The current meters record current speed and direction, and water temperature and conductivity at 2-minute intervals for deployment periods of as much as to 30 to 40 days. Previous reports document current-meter data collected from 1978 through 1980 (Gartner and Cheng, 1982; and Cheng and Gartner, 1984).

The purpose of this report is to present all current-meter data collected from 1981 to 1983 in a form useful to users. Data are displayed graphically in the form of time-series plots and the spatial distribution of major properties of tidal currents are shown. Speed and direction data have been harmonically analyzed to determine the amplitude and phase of the primary tidal constituents (harmonic constants). The harmonic constants are

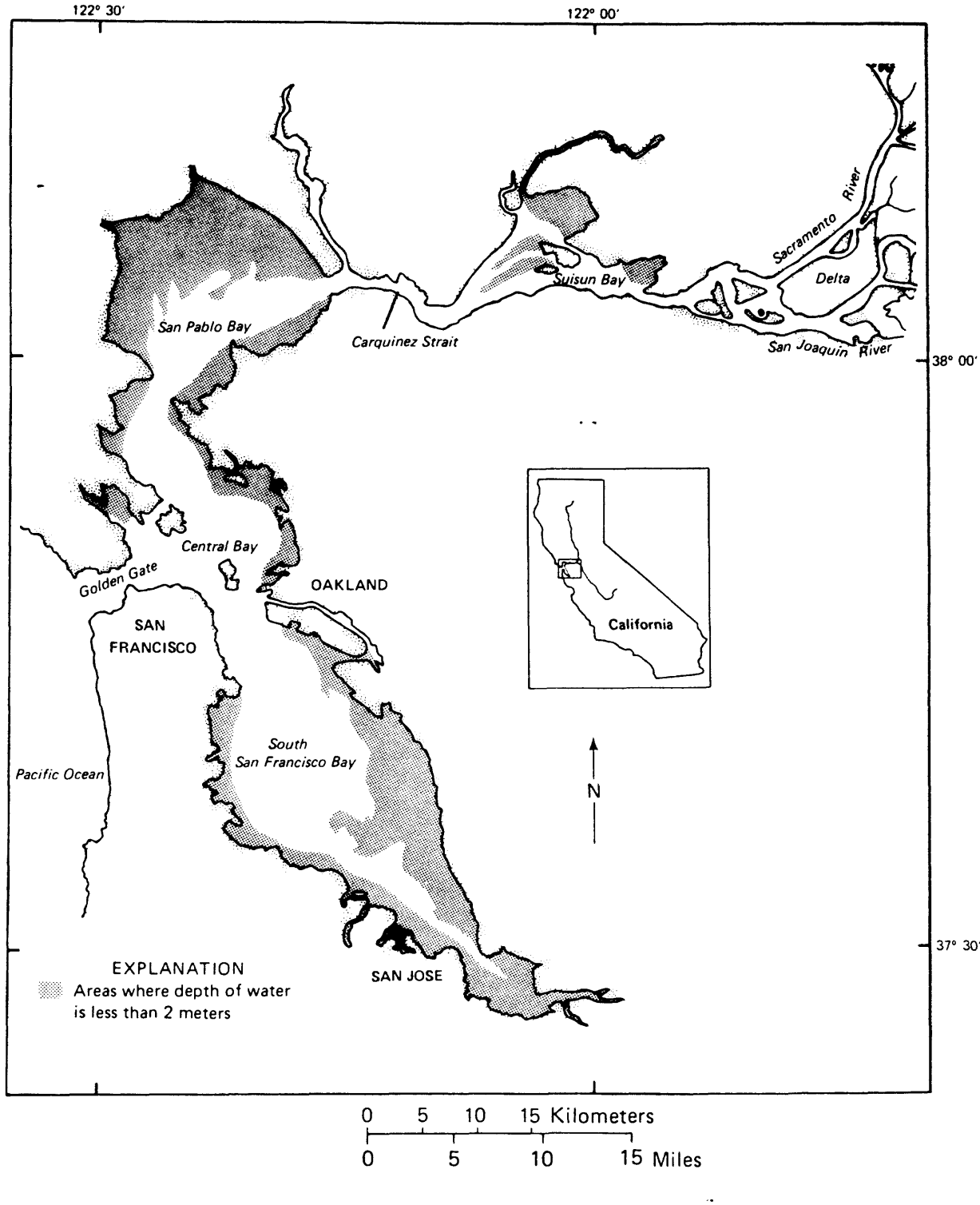

Figure 1. Map of San Francisco Bay estuarine system.

used to qualitatively define the tide and may be used for tidal predictions. Eulerian residual currents have been determined by vector averaging the time series. All data collected during this period were in South San Francisco Bay. A brief summary of the field program and data processing procedures is given below. More complete descriptions of equipment and deployment, recovery, maintenance, and data processing procedures are given by Cheng and Gartner (1980, 1984).

FIELD PROGRAM

South San Francisco Bay

All current-meter data collected from 1981 to 1983 were from stations in South San Francisco Bay (South Bay) (fig. 1). South Bay has a surface area of approximately 554 sq km and a mean depth of 3.4 m referenced to mean lower low water (MLLW). South Bay is characterized by a deep basin in the northern 1/3 of the embayment, a deep main channel (>10 m), and an expansive shoal to the east of the channel for the remainder of the Bay (fig. 2).

Water properties vary seasonally and are controlled in part by water exchange with the northern reach (Suisun and San Pablo Bays) and seasonal meteorological variations within the region. There are no major tributaries in South Bay and the area receives more than 75 percent (1.3 km^3/yr) of the total waste water discharged into the Bay system. During summer months sewage inflows exceed natural stream inflows. Salinity of South Bay is nearly isohaline and the typical salinity range is 25 to 30^{o}/oo. However, significant stratification may exist in winter and early spring when maximum flows of freshwater enter South Bay via the Delta and northern reach. 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).

Measurements of tidal currents

Tidal currents in San Francisco Bay consist of the sum of numerous partial tidal constituents. Of these, half a dozen semidiurnal and diurnal partial tides and one overtide or harmonic are the most important. Because the frequencies of the partial tides are different, resulting tides in San Francisco Bay vary constantly as the partial tides move in phase (reinforcing each other) and out of phase (canceling each other) in a fortnightly cycle. The net effect of these phase differences gives rise to the spring and neap variations of tides and tidal currents. Long term variations also occur because long time variations in the motions of the moon and earth relative to the sun cause long term variations in the tide producing forces. One of the principal objectives of the present field program is to measure the tidal currents and define the partial tides from these data. Clearly, the longer the time-series of field data, the better each frequency can be separated and the more accurately each partial tide can be computed. Therefore, only self-recording current meters which are capable of recording tidal-currents for a minimum of 15 days were used.

Equipment

Current meters used in the study are Endeco-174[1] digital

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

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 up to about 40 days when the data-recording interval is selected to be 2 minutes. Accuracy specifications for Endeco-174 current meters provided by the manufacturer (Endeco Inc., Marion, Mass.) (Endeco 1978) are as follows: speed, $\pm$3.0 percent of full scale (223 cm/s) above the threshold (2.6 cm/s); direction, $\pm$7.2°; temperature, $\pm$0.2 °C; and conductivity, $\pm$0.55 mS/cm.

Current speed is determined by measuring the displacement of an encoder-disc driven by an impeller through a magnetic coupler and a 500:1 reduction gear. Current direction (current meter heading) is determined from the output of a damped magnetic compass. Temperature is determined by a thermilinear thermistor and conductivity by an induction type electrodeless-conductivity probe. Current speed is the average speed over the sampling interval (2 minutes) while current direction and water temperature and conductivity are instantaneous values at the time of sampling.

Current-meter stations

Seven (7) current meter stations were deployed in the South Bay region by the U.S. Geological Survey during 1981 to 1983. A total of 42 current-meter records were collected; equipment were redeployed at the same location and multiple current meters were deployed at several stations. The minimum length of current-meter deployment was 14 days, and the maximum deployment was 43

days with the average deployment about 33 days. Figure 2 shows the approximate geographic location of the current-meter stations. The precise latitude and longitude and the water depth for each current-meter station at MLLW are compiled in table 1. The positions of current-meter stations were determined by horizontal sextant fixes determined to the nearest second of arc ($\pm$31 m). Additionally, the sextant readings were routinely backed up with radar and visual fixes. The latitude and longitude of each station location were determined from published navigation charts. Also included in table 1 are the depths at which the current meters were deployed, and the deployment and recovery dates for all data included in this report. All reference times have been converted to Pacific Standard Time and Julian date. Figure 3 is a chronological bargraph which indicates the period of time during which current-meter data were collected during 1981 to 1983. The solid bars on the bargraph indicate current-meter stations where multiple current meters were used for the indicated period of time. Table 1, figure 2, and figure 3 define the complete spatial and temporal distributions of the current-meter data.

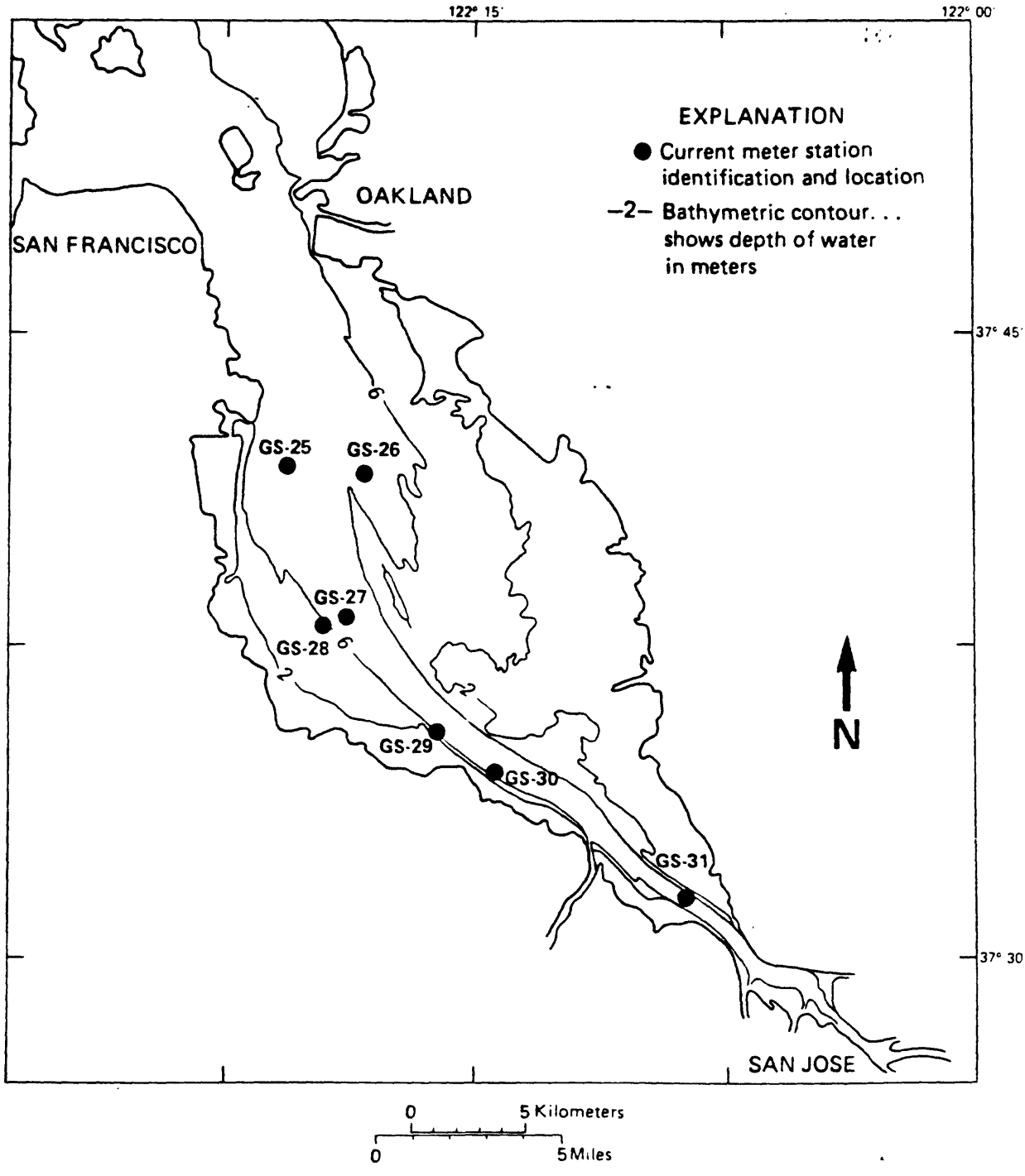

Figure 2. Map of South San Francisco Bay region and the location of current-meter moorings.

Table 1.- Current-meter deployments in South San Francisco Bay, California, 1981 - 1983.

STATION NUMBER	LATITUDE	LONGITUDE	DATE OF DEPLOYMENT	DATE OF RECOVERY	TAPE NUMBER	WATER DEPTH (MLLW)	METER DEPTH BELOW MLLW
GS25	37° 41'50"N	122° 20'12"W	35 81	67 81	GS25A1	9.7 m	3.6 m
GS25	37° 41'49"N	122° 20'10"W	75 81	97 81	GS25B1	9.4 m	3.3 m
GS25	37° 41'49"N	122° 20'10"W	75 81	97 81	GS25B2	9.4 m	6.7 m
GS26	37° 41'26"N	122° 18'19"W	35 81	70 81	GS26A1	9.7 m	3.6 m
GS26	37° 41'26"N	122° 18'19"W	35 81	70 81	GS26A2	9.7 m	7.0 m
GS26	37° 41'26"N	122° 18'19"W	70 81	106 81	GS26B1	9.7 m	3.6 m
GS26	37° 41'26"N	122° 18'19"W	105 81	138 81	GS26C1	9.7 m	3.6 m
GS26	37° 41'26"N	122° 18'19"W	105 81	138 81	GS26C2	9.7 m	7.0 m
GS27	37° 38'28"N	122° 18'40"W	35 81	70 81	GS27A1	9.4 m	3.3 m
GS27	37° 38'28"N	122° 18'40"W	35 81	70 81	GS27A2	9.4 m	6.7 m
GS27	37° 38'28"N	122° 18'40"W	70 81	105 81	GS27B1	9.7 m	3.6 m
GS27	37° 38'28"N	122° 18'40"W	70 81	105 81	GS27B2	9.7 m	7.0 m
GS27	37° 38'36"N	122° 18'32"W	27 82	54 82	GS27C1	8.2 m	2.1 m
GS27	37° 38'36"N	122° 18'32"W	27 82	54 82	GS27C2	8.2 m	5.4 m
GS27	37° 38'35"N	122° 18'41"W	53 82	93 82	GS27D1	7.9 m	1.8 m
GS28	37° 38'07"N	122° 19'00"W	27 82	53 82	GS28A1	9.1 m	3.0 m
GS28	37° 38'07"N	122° 19'00"W	27 82	53 82	GS28A2	9.1 m	6.4 m
GS28	37° 38'04"N	122° 19'00"W	88 82	102 82	GS28B1	9.4 m	3.3 m
GS28	37° 38'04"N	122° 19'00"W	88 82	102 82	GS28B2	9.4 m	6.7 m
GS28	37° 38'18"N	122° 19'13"W	104 82	133 82	GS28C1	9.1 m	3.0 m
GS28	37° 38'18"N	122° 19'13"W	104 82	133 82	GS28C2	9.1 m	6.4 m
GS28	37° 38'20"N	122° 19'10"W	133 82	160 82	GS28D1	8.5 m	2.4 m
GS28	37° 38'20"N	122° 19'10"W	133 82	160 82	GS28D2	8.5 m	5.7 m
GS28	37° 38'07"N	122° 19'17"W	111 83	152 83	GS28E1	8.8 m	2.7 m
GS28	37° 38'07"N	122° 19'17"W	111 83	152 83	GS28E2	8.8 m	6.4 m
GS29	37° 35'26"N	122° 16'05"W	27 82	53 82	GS29A1	13.1 m	7.0 m
GS29	37° 35'26"N	122° 16'05"W	27 82	53 82	GS29A2	13.1 m	10.3 m
GS29	37° 35'24"N	122° 16'00"W	53 82	88 82	GS29B1	13.1 m	7.0 m
GS29	37° 35'24"N	122° 16'00"W	53 82	88 82	GS29B2	13.1 m	10.3 m
GS29	37° 35'24"N	122° 16'00"W	88 82	126 82	GS29C1	12.8 m	3.3 m
GS29	37° 35'24"N	122° 16'00"W	88 82	126 82	GS29C2	12.8 m	6.7 m
GS30	37° 34'18"N	122° 14'02"W	75 83	111 83	GS30A1	12.1 m	4.2 m
GS30	37° 34'18"N	122° 14'02"W	75 83	111 83	GS30A2	12.1 m	6.7 m
GS30	37° 34'18"N	122° 14'02"W	75 83	111 83	GS30A3	12.1 m	9.4 m
GS30	37° 34'25"N	122° 14'10"W	111 83	152 83	GS30B1	11.8 m	3.9 m
GS30	37° 34'25"N	122° 14'10"W	111 83	152 83	GS30B2	11.8 m	6.4 m
GS30	37° 34'25"N	122° 14'10"W	111 83	152 83	GS30B3	11.8 m	9.1 m
GS31	37° 31'31"N	122° 08'35"W	75 83	111 83	GS31A1	12.1 m	4.5 m
GS31	37° 31'31"N	122° 08'35"W	75 83	111 83	GS31A2	12.1 m	7.0 m
GS31	37° 31'31"N	122° 08'35"W	75 83	111 83	GS31A3	12.1 m	9.4 m
GS31	37° 31'34"N	122° 08'40"W	111 83	154 83	GS31B1	11.8 m	4.2 m
GS31	37° 31'34"N	122° 08'40"W	111 83	154 83	GS31B3	11.8 m	9.1 m

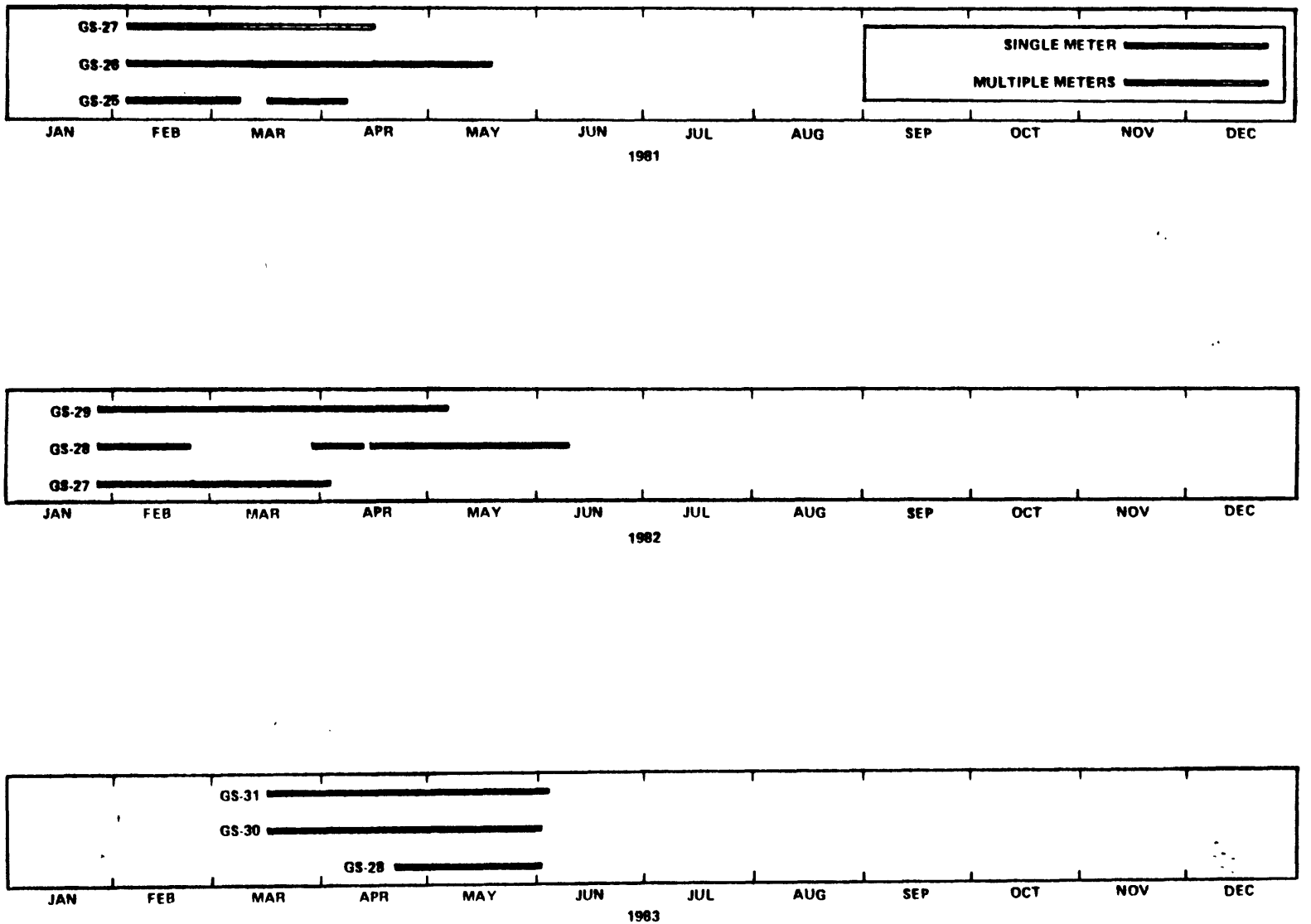

Figure 3. Bar graph of periods when current-meter arrays were deployed in South San Francisco Bay in 1981 to 1983.

DATA PROCESSING PROCEDURES

Data translation

The raw data tapes from Endeco-174 current meters were read and translated into computer readable codes utilizing a special tape reader (Cheng and Gartner, 1979). The 2-minute interval data were examined for possible record gaps, and individual sensor calibration constants were applied to convert the data to engineering units. Salinity was not directly measured; it was computed from temperature and conductivity values based upon the modified Cox relationship (D. Pritchard, unpublished notes, 1978). All computer programs used in the processing of these data have been documented in Cheng and Gartner (1980).

Current speeds and directions (2-minute interval) were vector-averaged to produce a new time series of 30-minute averaged data. Similar time series of 30-minute averaged 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 harmonic analyses and time-series plots.

Time-series plot

A time-series plot of data is one of the most useful ways for displaying current-meter data in a clear and concise manner. Time-series plots of all data records are given in the Appendix. The tidal-current velocity is plotted in the form of speed and

direction (relative to true north) versus time. Time-series plots are used to provide a visual display of temporal variations of tidal currents and their associated properties. Current speed and direction data were not edited. Portions of the data may be invalid due to marine fouling, malfunction of instrument, or for other unknown reasons. Data compiled here are close to their original form. Where questionable or unreliable data are apparent on the time-series plots in the Appendix, those sections are noted. Only valid data (our own best judgement) were used in the harmonic analyses. Whereas the time-series plots cover the entire deployment, in the case of harmonic analysis the start time and the length of the record analyzed are noted on the harmonic analysis summary sheets.

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.

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, conductivity (salinity) records were compared with data from nearby water-sampling stations collected during research cruises. If data were correct for only 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. Additionally, spurious temperature and conductivity

readings in the records were corrected when identified.

The plotted data provide users with a visual record to examine. For future reference and for special applications, all data in 2-minute files and 30-minute files are currently stored on computer retrievable media.

Harmonic analysis

The method of harmonic analysis for tidal current data is well documented in Schureman (1940) and Cheng and Gartner (1984). In all cases the data sets are truncated to an even number of M_2 cycles (56 cycles maximum). The M_2 cycle (12.42 hours) is used for this purpose because it is by far the most dominant tidal constituent (partial tide) in San Francisco Bay. The angular frequencies of the tidal constituents included in the analysis are given in table 2.

Six harmonic constituents (O_1, K_1, N_2, M_2, S_2, M_4) were computed for east-west and north-south tidal velocity components. Results of harmonic analysis of current-meter records collected during the study are included in the Appendix. The tidal constituents determined may be used for prediction of tidal currents at the same location (Cheng and Gartner, 1984). In addition to pertinent notes concerning the current-meter deployment and recovery and the harmonic constituents, the summary sheets include some general properties of tidal currents computed by the harmonic analysis program such as the root-mean-squared (RMS) current speed, spring and neap tidal current maxima, principal tidal current direction, tidal current form number, and Eulerian residual

Table 2.--Principal astronomical partial tidal constituents

Symbol	Period (solar hours)	Angular frequency (degrees per hour)	Species
K_1	23.93	15.0411	Luni-solar diurnal
O_1	25.82	13.9430	Principal lunar 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
M_4	6.21	57.9682	Lunar quarter diurnal

current (time averaged velocity) (Cheng and Gartner, 1984). Depending upon the usable length of the record, the time average velocities 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.

SUMMARY AND CONCLUSIONS

Tidal current in South San Francisco Bay

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. Form numbers less than 0.25 indicate a semidiurnal tide while form numbers greater than 3.0 indicate a diurnal tide. Form numbers between 0.25 and 3.0 indicate a mixed tide. As the form numbers (0.13 to 0.52) 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 semidiurnal than diurnal.

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. 4) 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.

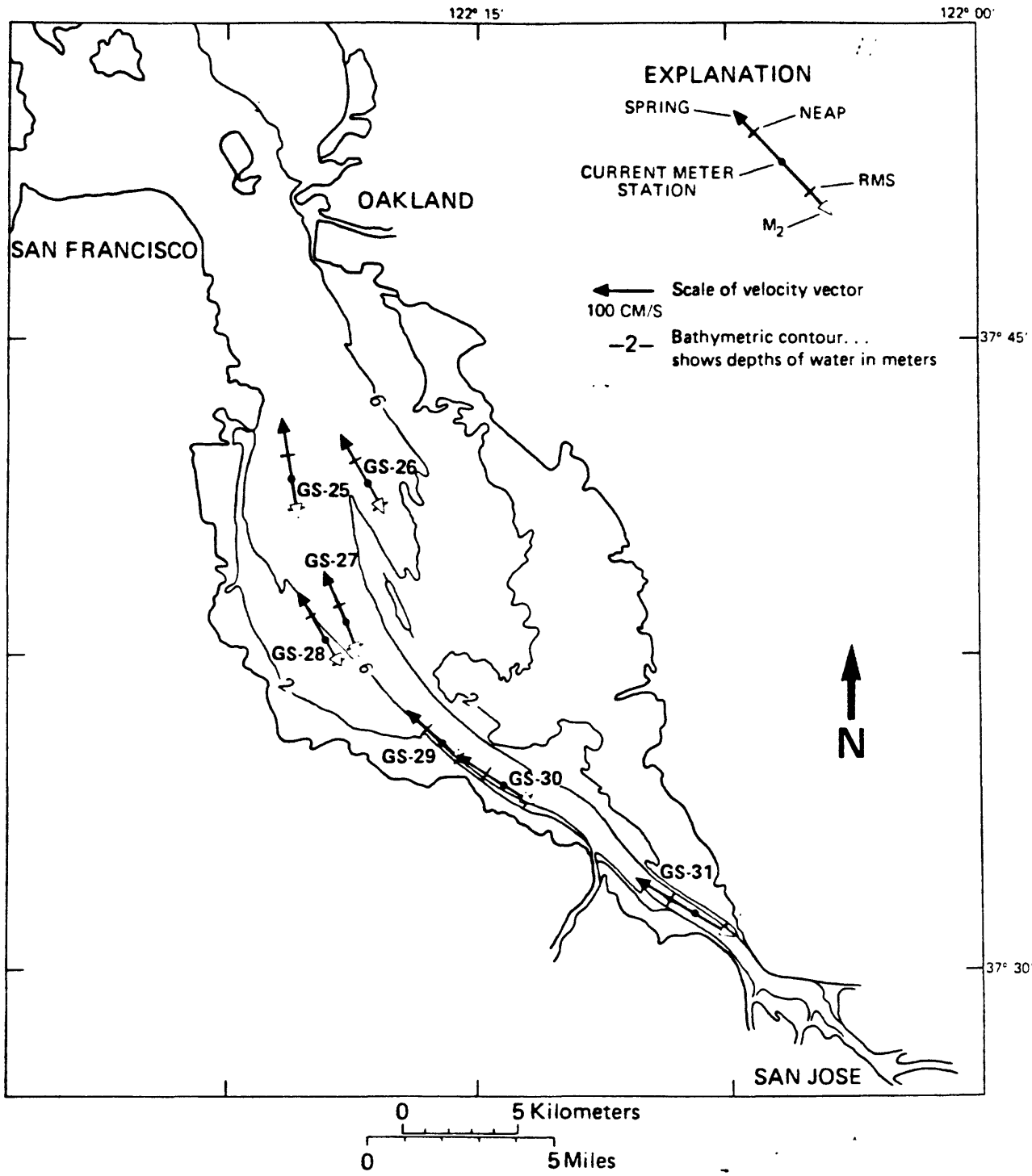

Figure 4. Spatial distribution of tidal current properties in South San Francisco Bay. The legend and scale of the velocity vectors are defined in the upper right hand corner of the figure.

Eulerian residual current in South San Francisco Bay

The Eulerian residual current is defined as the vectorial average of the current-meter data made over several (even) M_2 tidal cycles. This serves to average out the tidal signal; what remains is the Eulerian residual. The Eulerian residual current is generally a factor of ten smaller than the tidal current. As the speed accuracy of the current meter is about 7 cm/s and the current-meter record represents speed only at a single point in the water column (and the water depth varies over a tidal cycle), one must be careful in drawing conclusions from the Eulerian residual currents. The computed Eulerian residual currents are given in the summary for each current-meter data file in the format of north/south (north = +) and east/west (east = +) components. The factors that 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 (see Walters, 1982; Walters and Gartner, 1985; and Cheng and Gartner, 1985). 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 during the current-meter deployments have been computed from Dayflow summary (California Department of Water Resources, 1984) and are given in the summary sheets.

The Eulerian residual currents (Appendix A and figure 5) are in general agreement with expected values for winter conditions (low and variable winds) in South Bay (see Cheng and Gartner, 1985). The Eulerian residual current vectors displayed in figure 5 are from current-meter records collected primarily in February 1981 and 1982. Stations GS-30 and GS-31 display vectors from records collected from mid March to mid April 1983; the earliest records available from those stations but still representative of winter conditions. All records used in figure 5 are from current meters deployed between 45 percent and 67 percent of the total water depth (relative to MLLW). The vectors indicate the presence of a clockwise gyre in the central part of South Bay and a counterclockwise gyre in the southern part of South Bay in the winter.

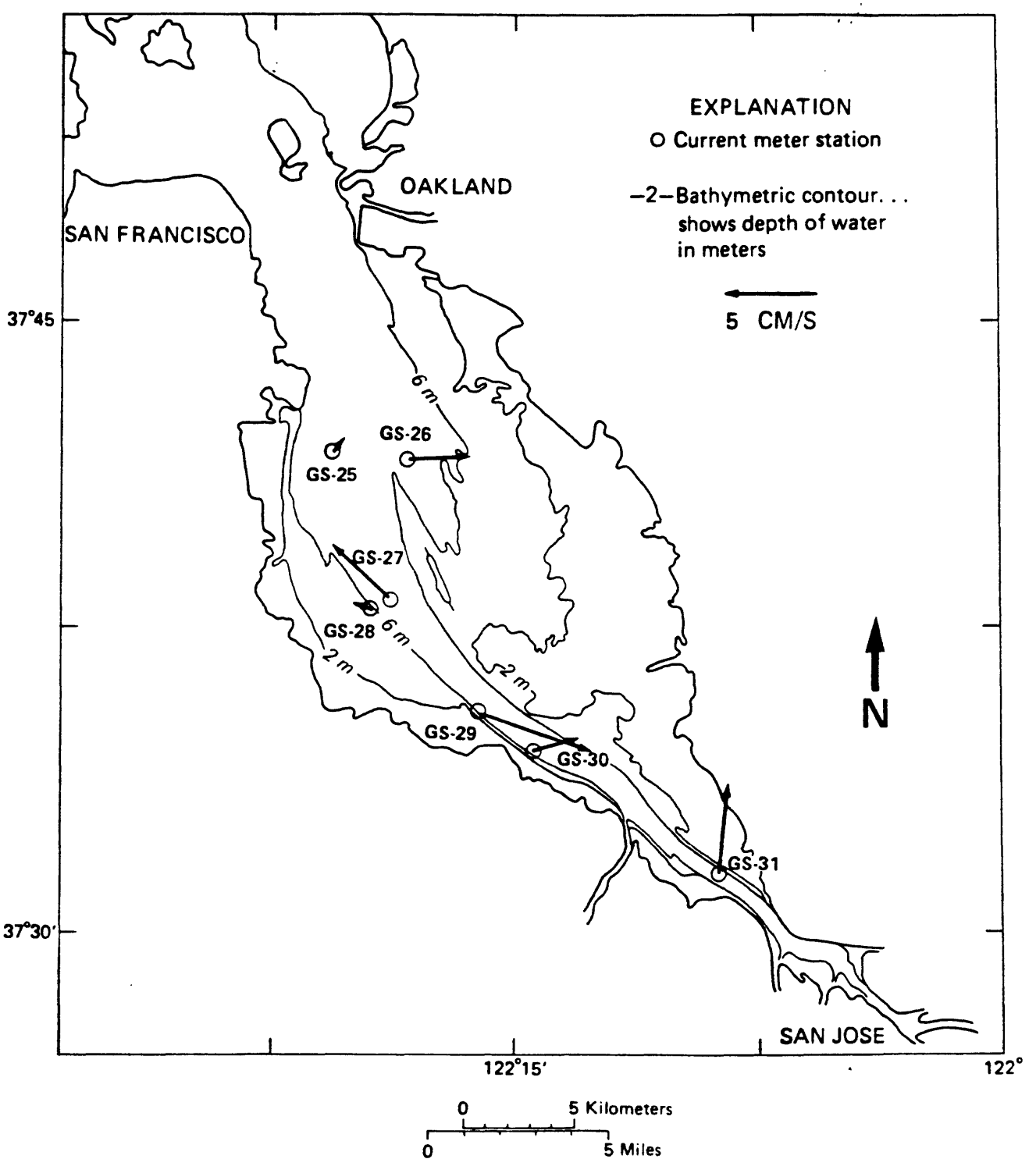

Figure 5. Eulerian residual currents (winter conditions).

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APPENDIX

The current-meter data are presented chronologically and station-by-station in Appendix A. 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 1.

The following abbreviations are used in the appendix:

MLLW	Mean lower low water (a tidal reference datum).
PST	Pacific standard time.
CM/S	Centimeters per second
DEG T	Degrees true (angular measurement from true north).
RMS	Root mean square.
CMS	Cubic meters per second

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* SUMMARY OF HARMONIC ANALYSIS *
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CURRENT METER STATION: GS025A1
POSITION: 37 41'50"N 122 20'12"W
METER TYPE: ENDECO
WATER DEPTH: 9.7 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 2/ 4/81 1248 PST JULIAN DAY= 35
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

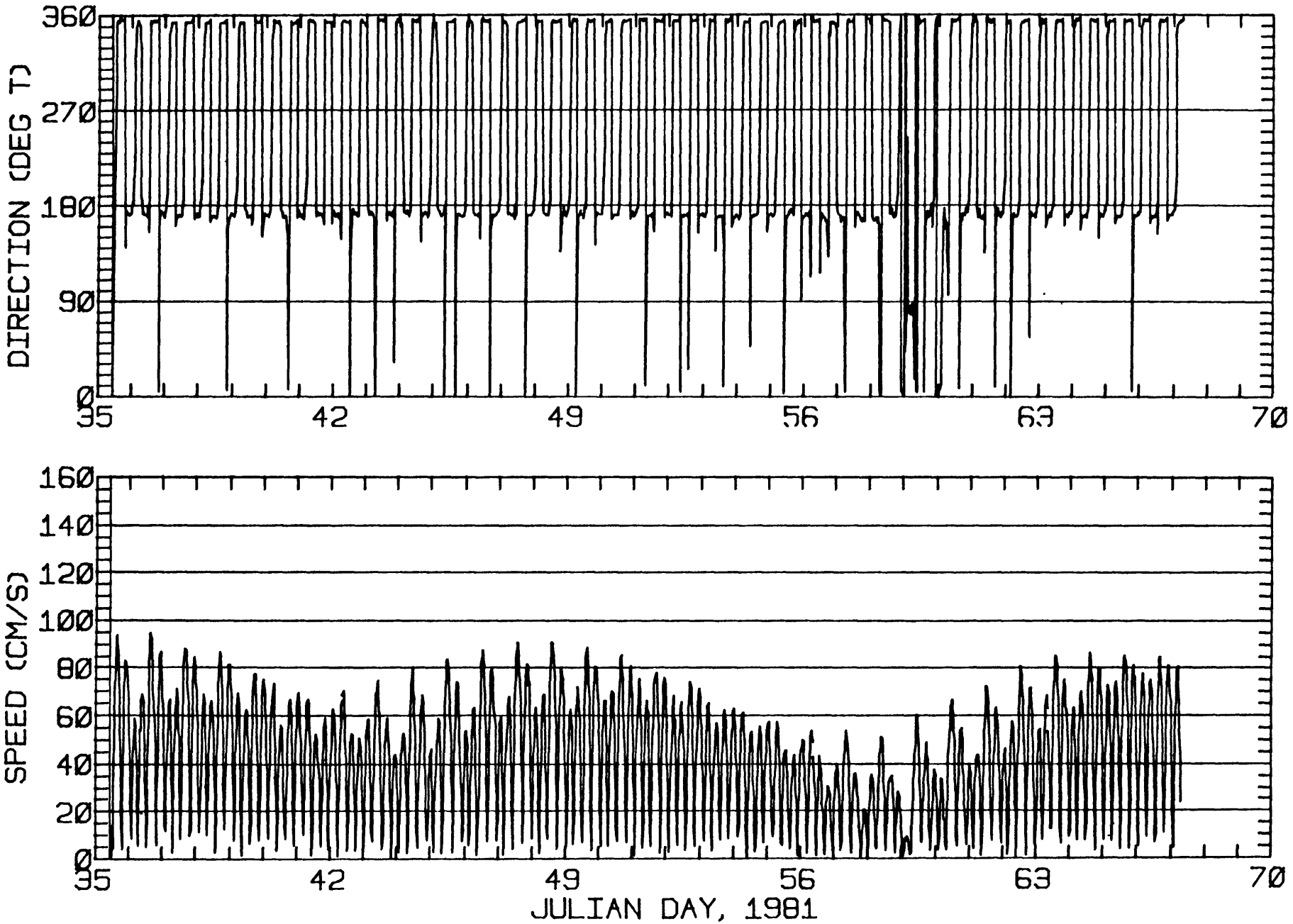
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.61	0.40	176.2	14.1	ANTI-CLOCKWISE
K1	14.87	0.08	175.7	50.6	CLOCKWISE
N2	11.58	0.06	172.2	273.6	ANTI-CLOCKWISE
M2	59.63	0.92	172.4	282.5	CLOCKWISE
S2	17.87	0.46	172.7	305.6	CLOCKWISE
M4	1.48	0.26	205.9	51.7	ANTI-CLOCKWISE

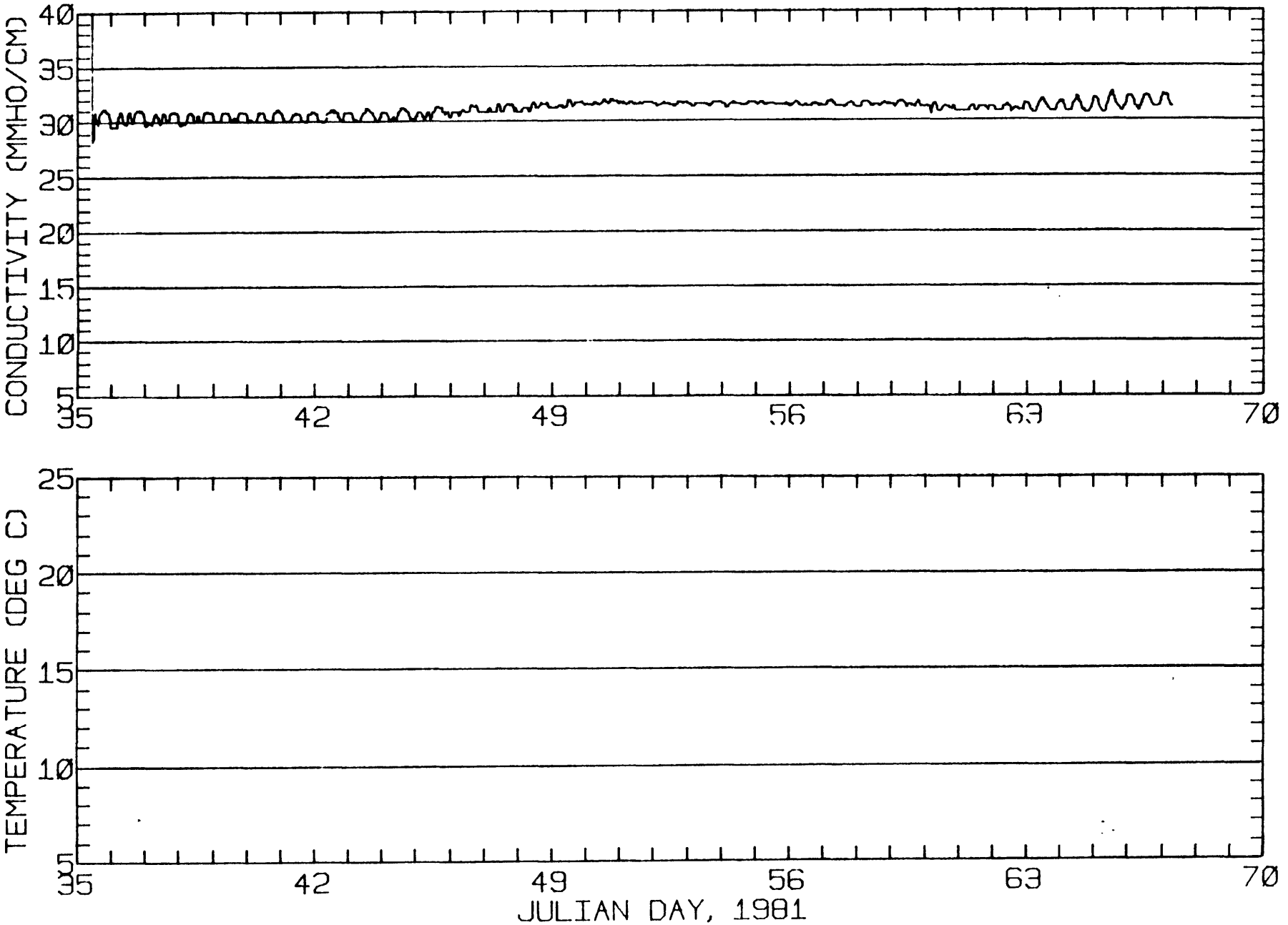
RMS SPEED: 47.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 173.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 1.99 CM/SEC
STANDARD DEVIATION V SERIES: 6.29 CM/SEC

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	0.2	0.7	588.
2	12	0.6	0.6	364.
3	12	0.7	0.1	623.
4.	12	1.0	1.8	422.
5	8	0.6	0.1	388.
ALL	56	0.6	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-41-50N 122-20-12W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS025A1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37--41-50N 122--20-12W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS025A1

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

CURRENT METER STATION: GS025B1
POSITION: 37 41'49"N 122 20'10"W
METER TYPE: ENDECO
WATER DEPTH: 9.4 M (MLLW)
METER DEPTH: 3.3 M (BELOW MLLW)
START TIME OF SERIES: 3/16/81 1529 PST JULIAN DAY= 75
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

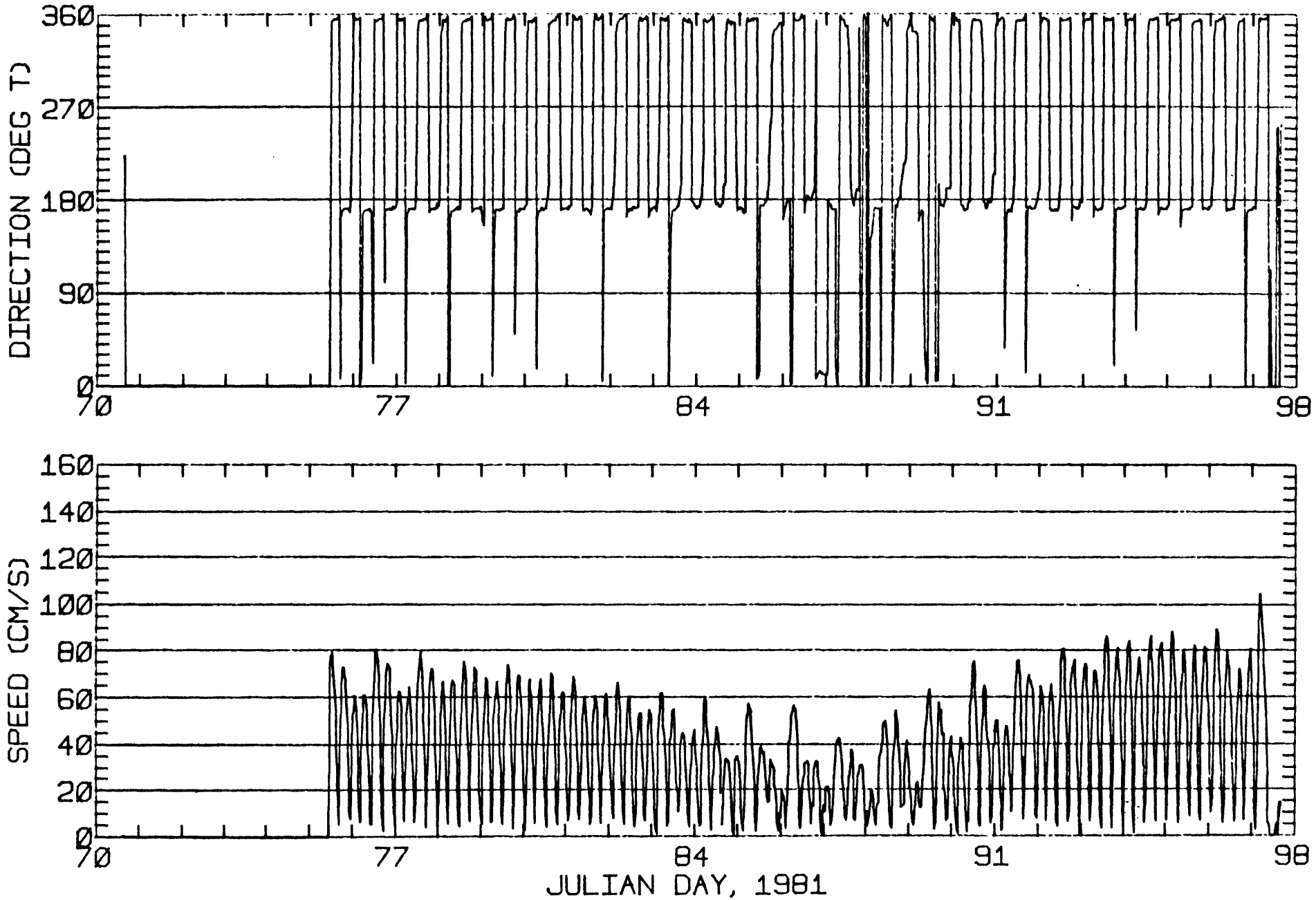
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.16	0.55	180.5	6.8	ANTI-CLOCKWISE
K1	9.26	0.59	179.7	25.9	ANTI-CLOCKWISE
N2	12.78	0.50	172.7	270.5	CLOCKWISE
M2	56.26	1.02	173.2	280.5	CLOCKWISE
S2	18.91	0.38	171.4	290.4	CLOCKWISE
M4	1.25	0.45	182.0	80.7	ANTI-CLOCKWISE

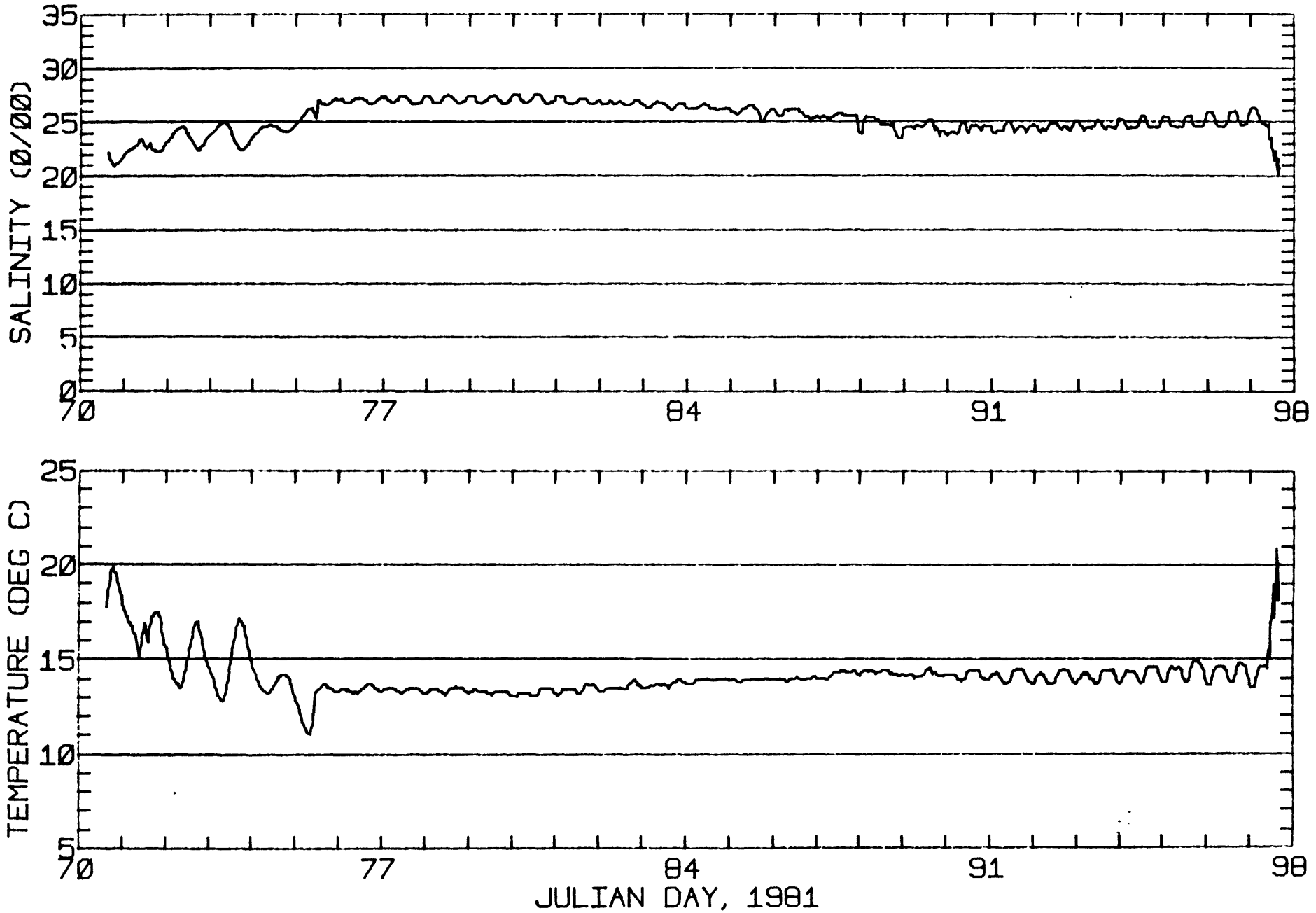
RMS SPEED: 45.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 92.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 36.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 158.3 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 2.61 CM/SEC
STANDARD DEVIATION V SERIES: 7.20 CM/SEC

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	1.4	-0.5	753.
2	12	-0.4	3.1	1187.
3	12	-0.4	3.2	962.
4	4	0.8	0.7	693.
ALL	40	0.3	1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-41-49N 122-20-10W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS025B1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-41-49N 122-20-10W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS025B1 .

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

CURRENT METER STATION: GS025B2
POSITION: 37 41'49"N 122 20'10"W
METER TYPE: ENDECO
WATER DEPTH: 9.4 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 3/16/81 1427 PST JULIAN DAY= 75
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

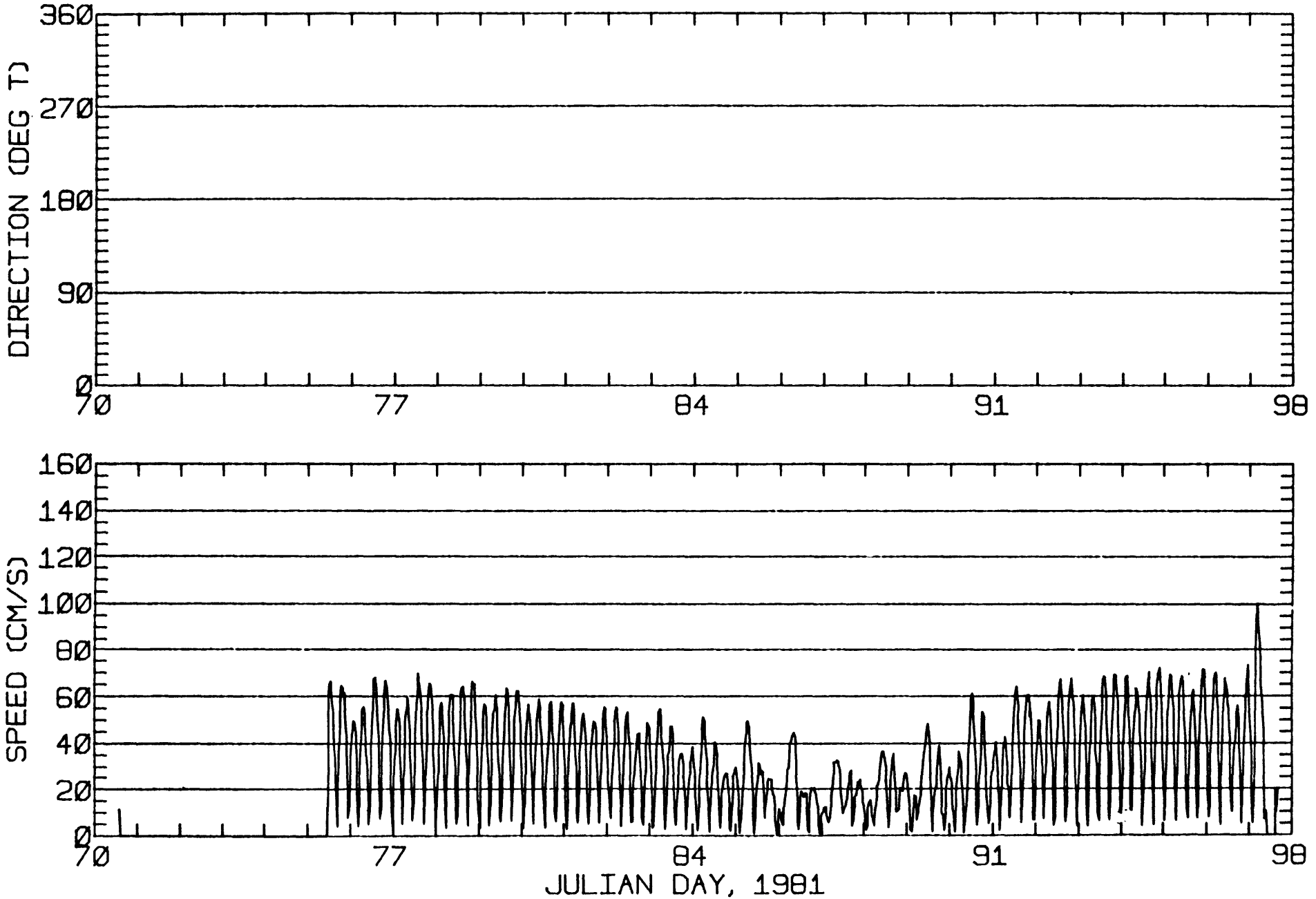
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

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

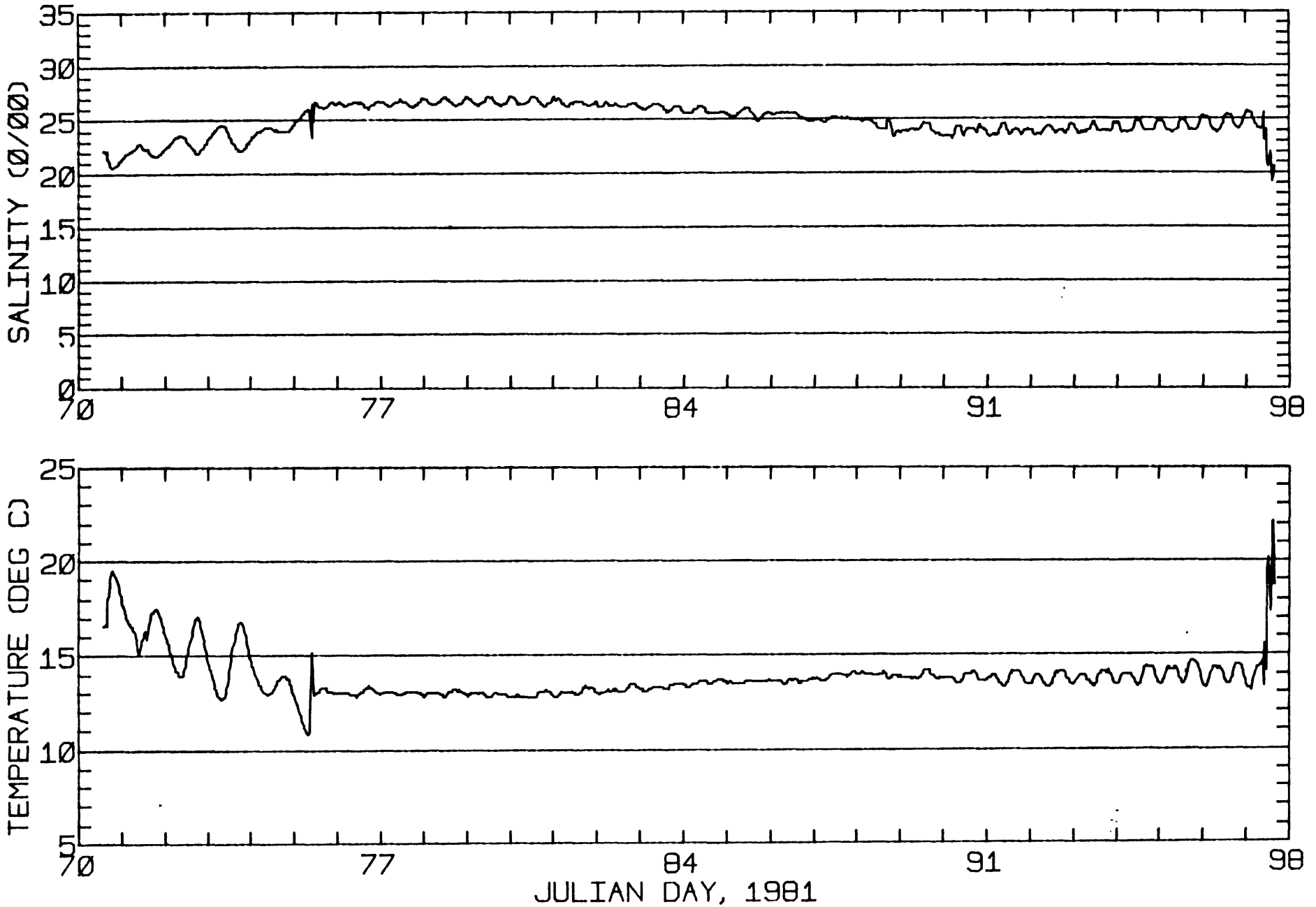
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

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				
2				
3				
4				
ALL				



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-41-49N 122-20-10W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS025B2 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
HUNTERS POINT 37-41-49N 122-20-10W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS025B2 .

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

CURRENT METER STATION: GS026A1
POSITION: 37 41'26"N 122 18'19"W
METER TYPE: ENDECO
WATER DEPTH: 9.7 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 2/ 4/81 1348 PST JULIAN DAY= 35
APPROXIMATE RECORD LENGTH IS 48 M2-CYCLES

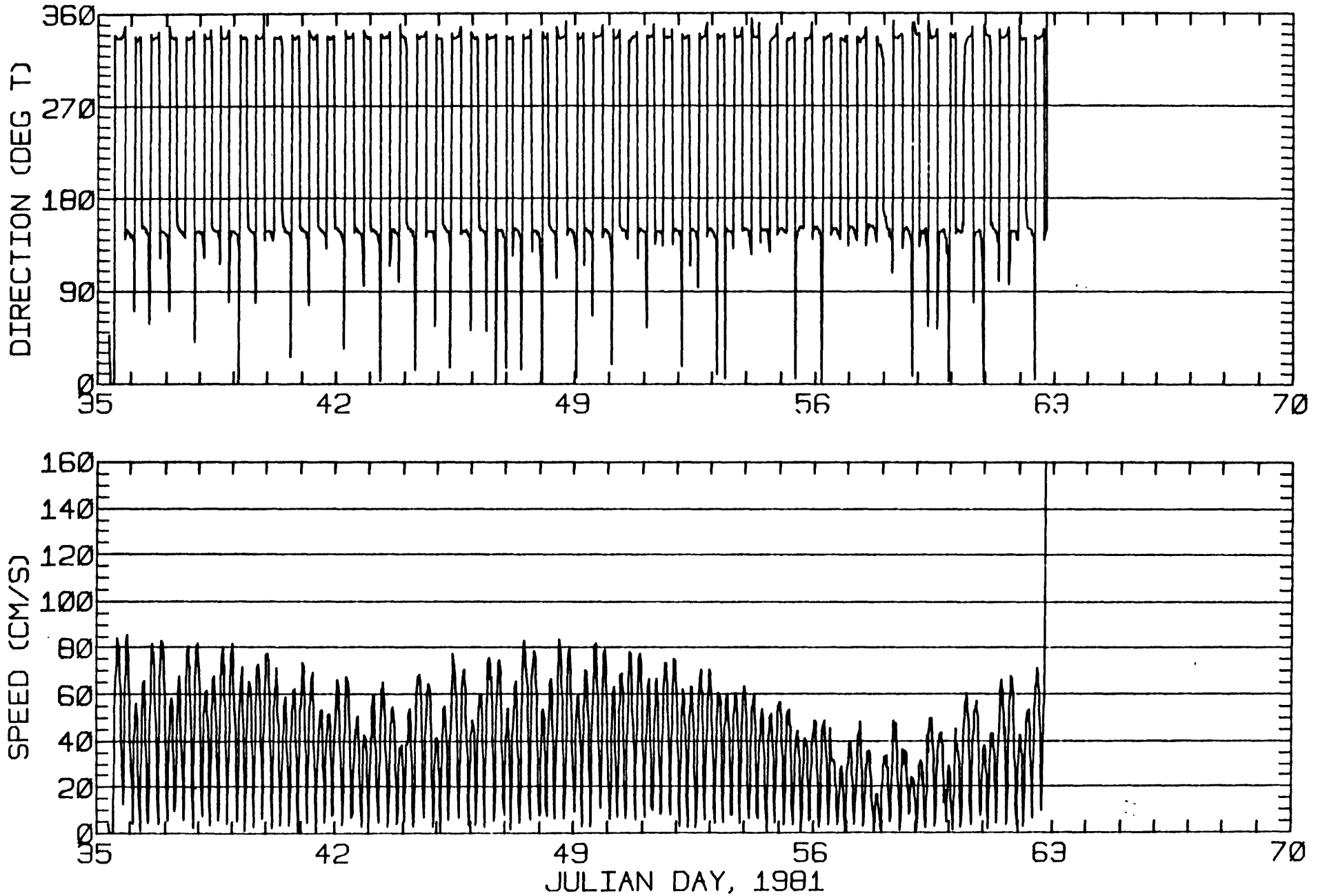
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.09	0.83	155.1	20.3	CLOCKWISE
K1	14.12	0.41	152.0	49.3	CLOCKWISE
N2	10.09	0.36	151.7	273.6	ANTI-CLOCKWISE
M2	57.08	0.71	152.6	281.8	ANTI-CLOCKWISE
S2	16.75	0.05	152.1	304.7	ANTI-CLOCKWISE
M4	1.23	0.20	196.3	69.5	ANTI-CLOCKWISE

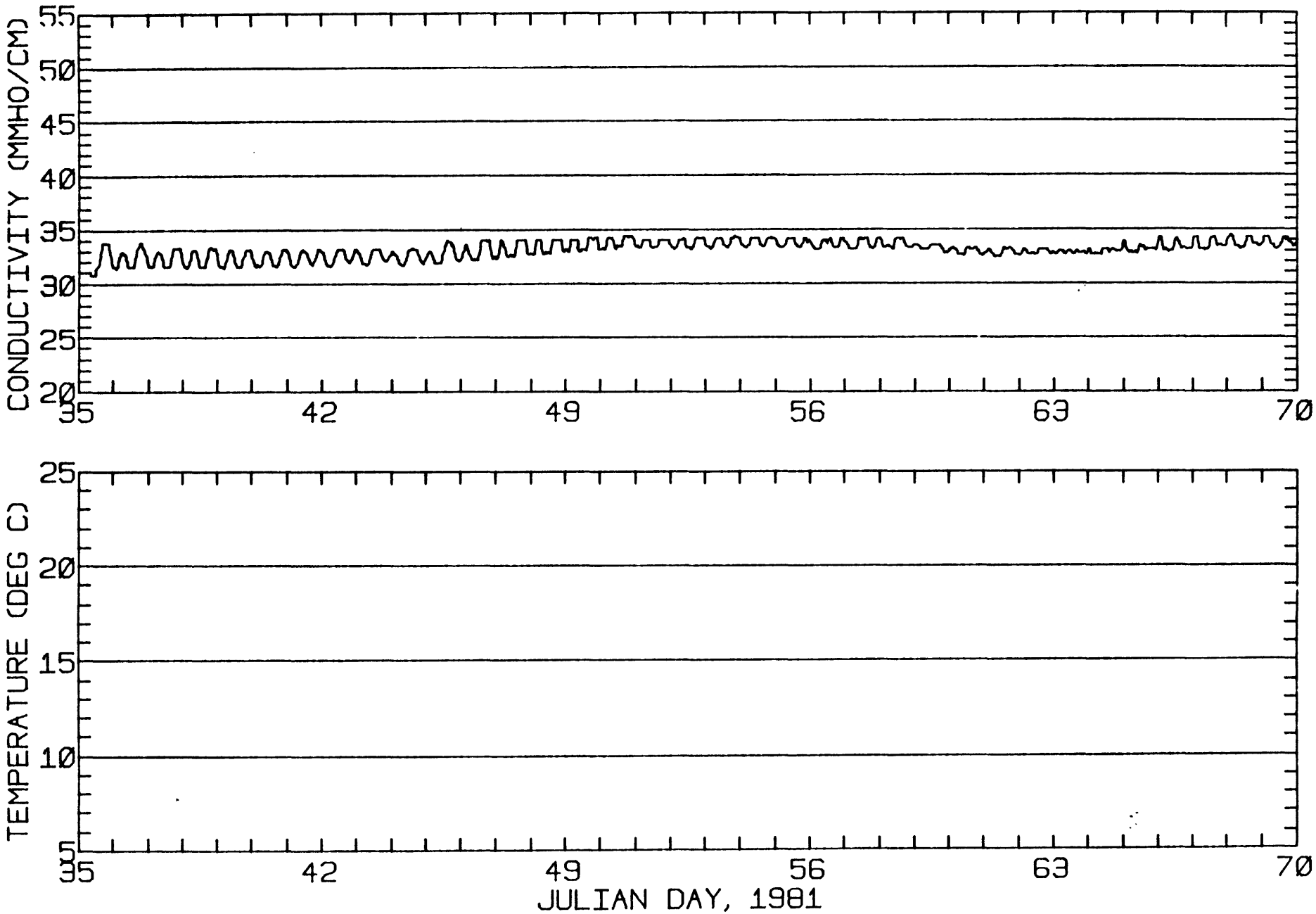
RMS SPEED: 45.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 96.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 152.6 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 2.80 CM/SEC
STANDARD DEVIATION V SERIES: 4.74 CM/SEC

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	4.1	0.5	588.
2	12	3.7	0.2	364.
3	12	3.9	0.4	623.
4	12	2.3	-0.5	422.
ALL	48	3.5	0.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS026A1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS026A1 .

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

CURRENT METER STATION: GS026A2
POSITION: 37 41'26"N 122 18'19"W
METER TYPE: ENDECO
WATER DEPTH: 9.7 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 2/ 4/81 1348 PST JULIAN DAY= 35
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

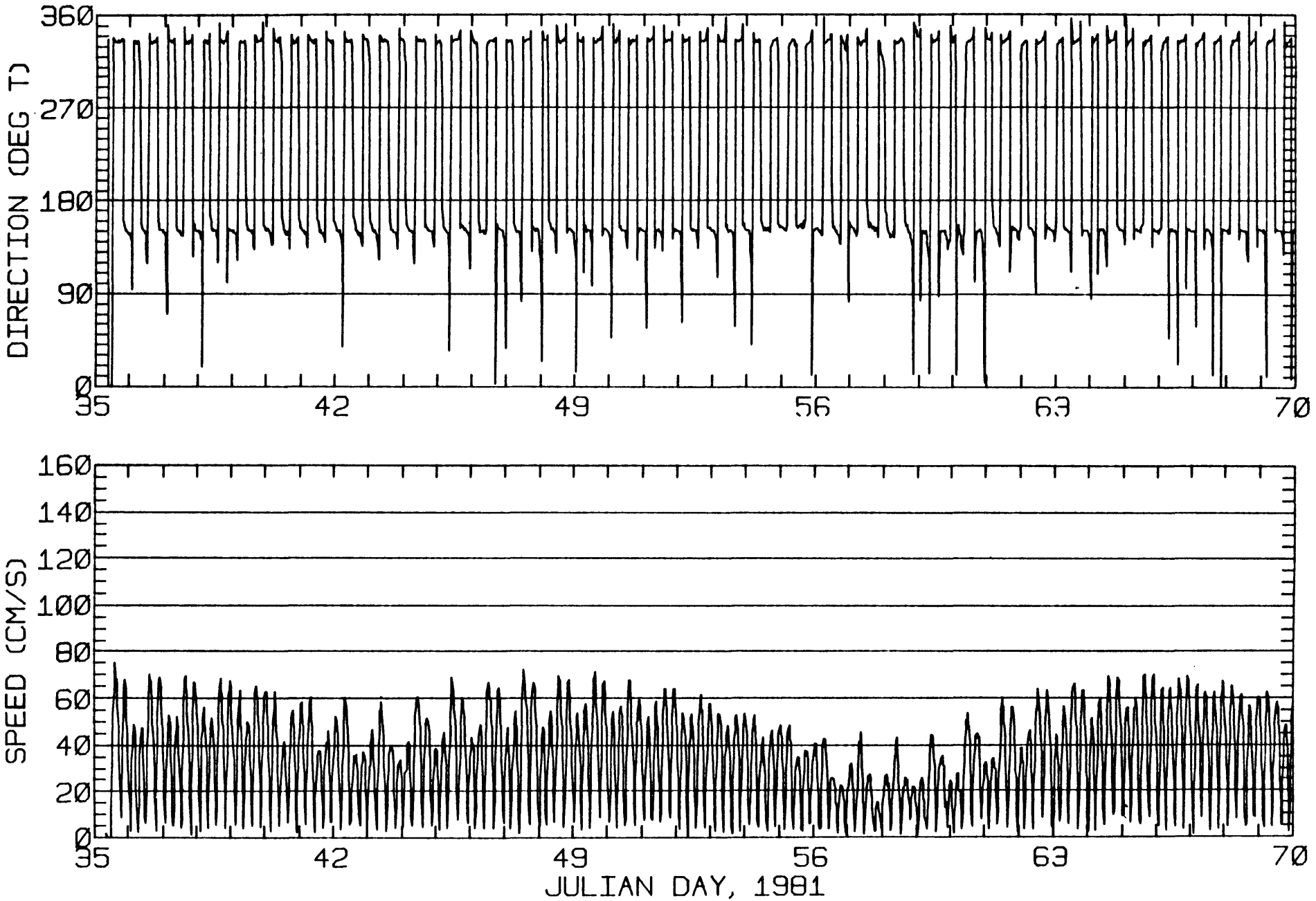
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.41	0.37	153.8	14.9	CLOCKWISE
K1	11.97	0.11	152.2	48.3	CLOCKWISE
N2	8.37	0.47	152.6	274.5	ANTI-CLOCKWISE
M2	47.85	1.05	153.0	282.5	ANTI-CLOCKWISE
S2	13.78	0.14	153.1	304.3	ANTI-CLOCKWISE
M4	1.46	0.45	172.1	58.0	CLOCKWISE

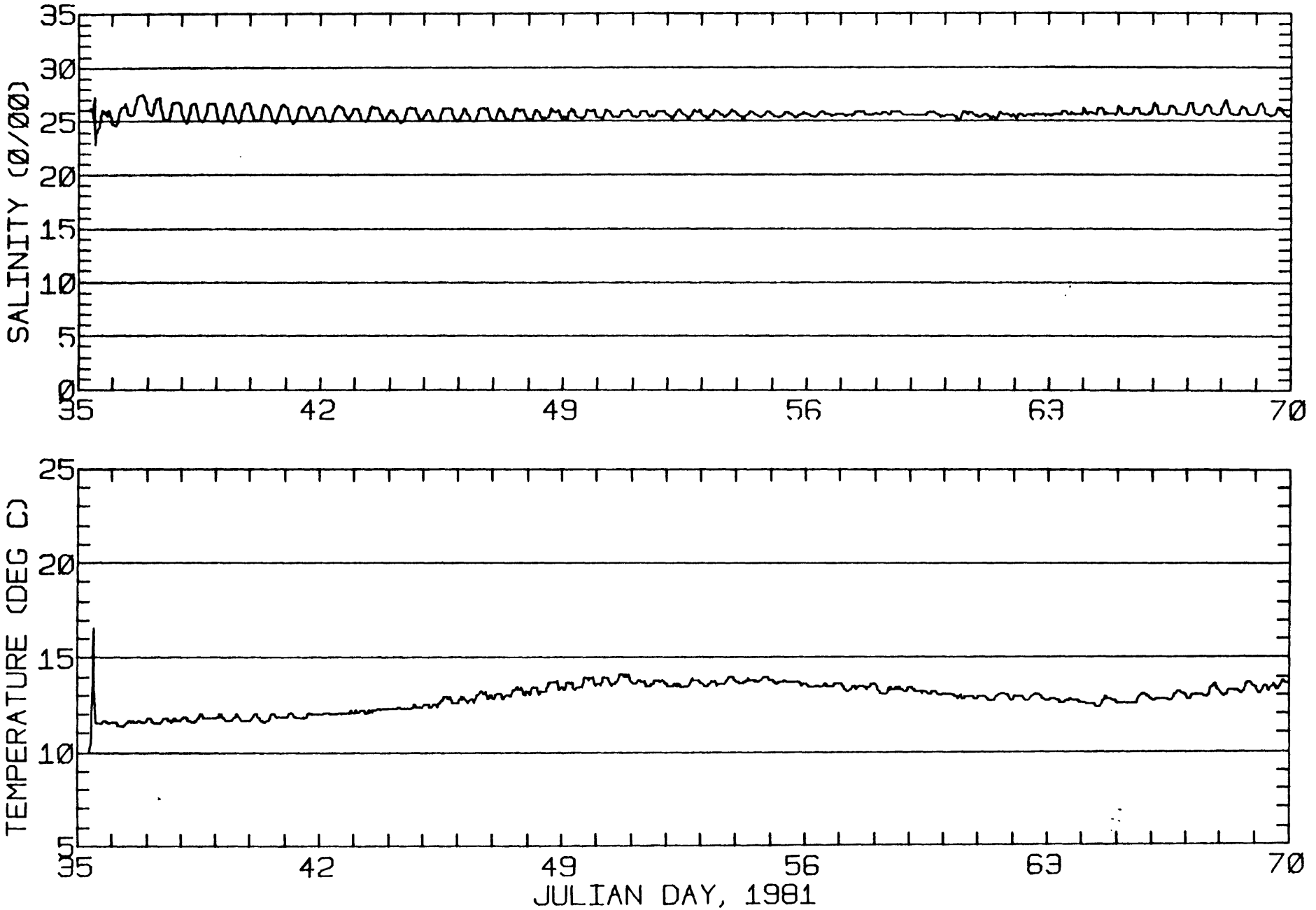
RMS SPEED: 37.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 80.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 153.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.30
STANDARD DEVIATION U-SERIES: 2.61 CM/SEC
STANDARD DEVIATION V SERIES: 4.41 CM/SEC

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	0.9	1.2	588.
2	12	0.9	0.7	364.
3	12	1.8	0.3	623.
4	12	0.6	0.2	422.
5	8	2.0	-0.9	388.
ALL	56	1.1	0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS026A2 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS026A2 .

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

CURRENT METER STATION: GS026B1
POSITION: 37 41'26"N 122 18'19"W
METER TYPE: ENDECO
WATER DEPTH: 9.7 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 3/11/81 1256 PST JULIAN DAY= 70
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

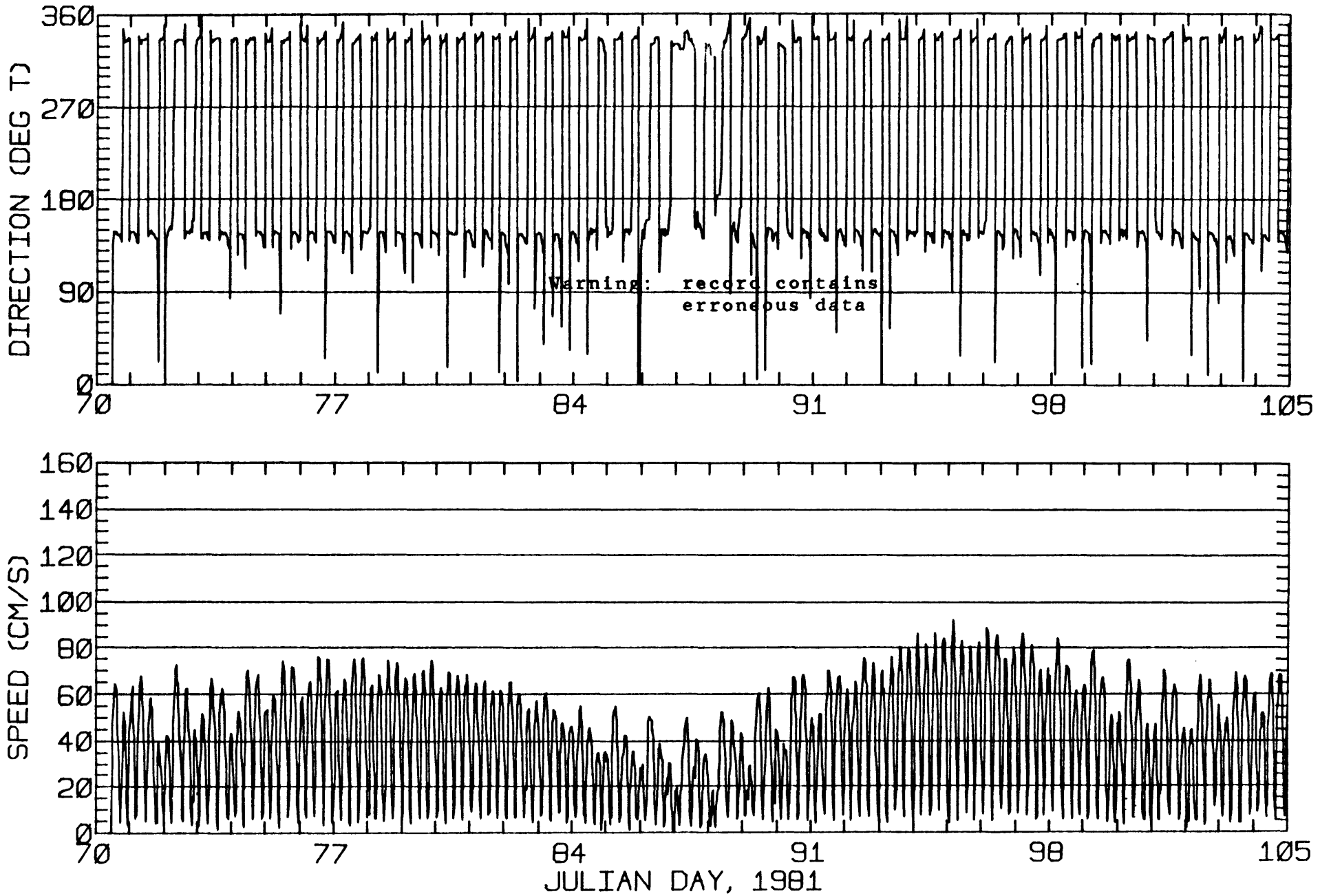
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.82	0.44	151.2	13.3	CLOCKWISE
K1	10.31	0.44	151.6	23.0	CLOCKWISE
N2	12.32	0.19	151.8	270.0	CLOCKWISE
M2	56.03	0.04	151.5	283.7	CLOCKWISE
S2	18.09	0.17	150.6	289.6	ANTI-CLOCKWISE
M4	2.21	0.40	171.6	60.6	CLOCKWISE

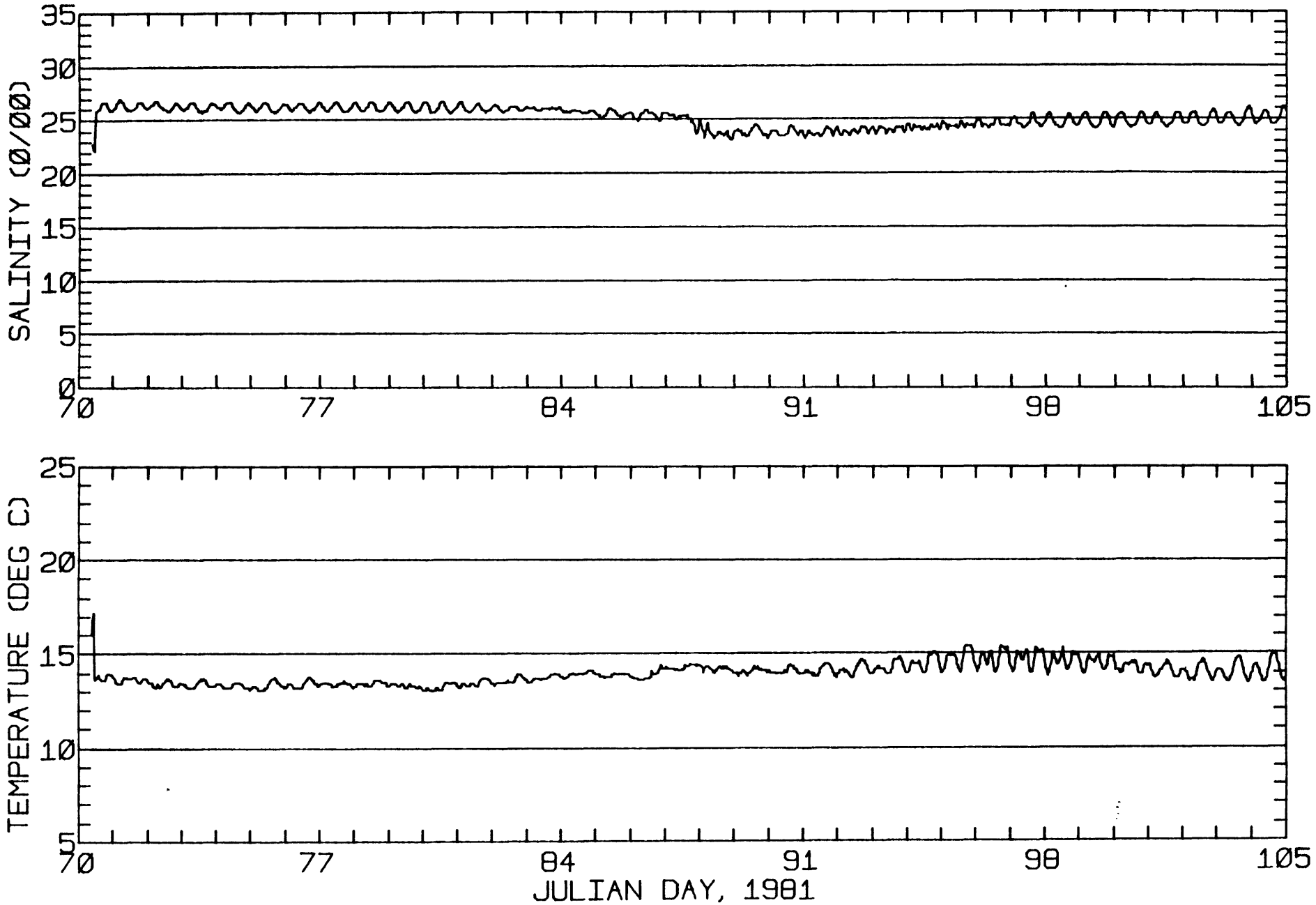
RMS SPEED:	46.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	93.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	36.5 CM/SEC
PRINCIPAL CURRENT DIRECTION:	151.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.26
STANDARD DEVIATION U-SERIES:	5.42 CM/SEC
STANDARD DEVIATION V SERIES:	8.31 CM/SEC

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	3.1	0.9	381.
2	12	5.3	-1.9	870.
3	12	-0.1	3.0	1195.
4	12	3.6	0.6	962.
5	8	4.0	1.1	596.
ALL	56	3.1	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS026B1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS026B1 .

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

CURRENT METER STATION: GS026C1
POSITION: 37 41'26"N 122 18'19"W
METER TYPE: ENDECO
WATER DEPTH: 9.7 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 4/15/81 1310 PST JULIAN DAY=105
APPROXIMATE RECORD LENGTH IS 4 M2-CYCLES

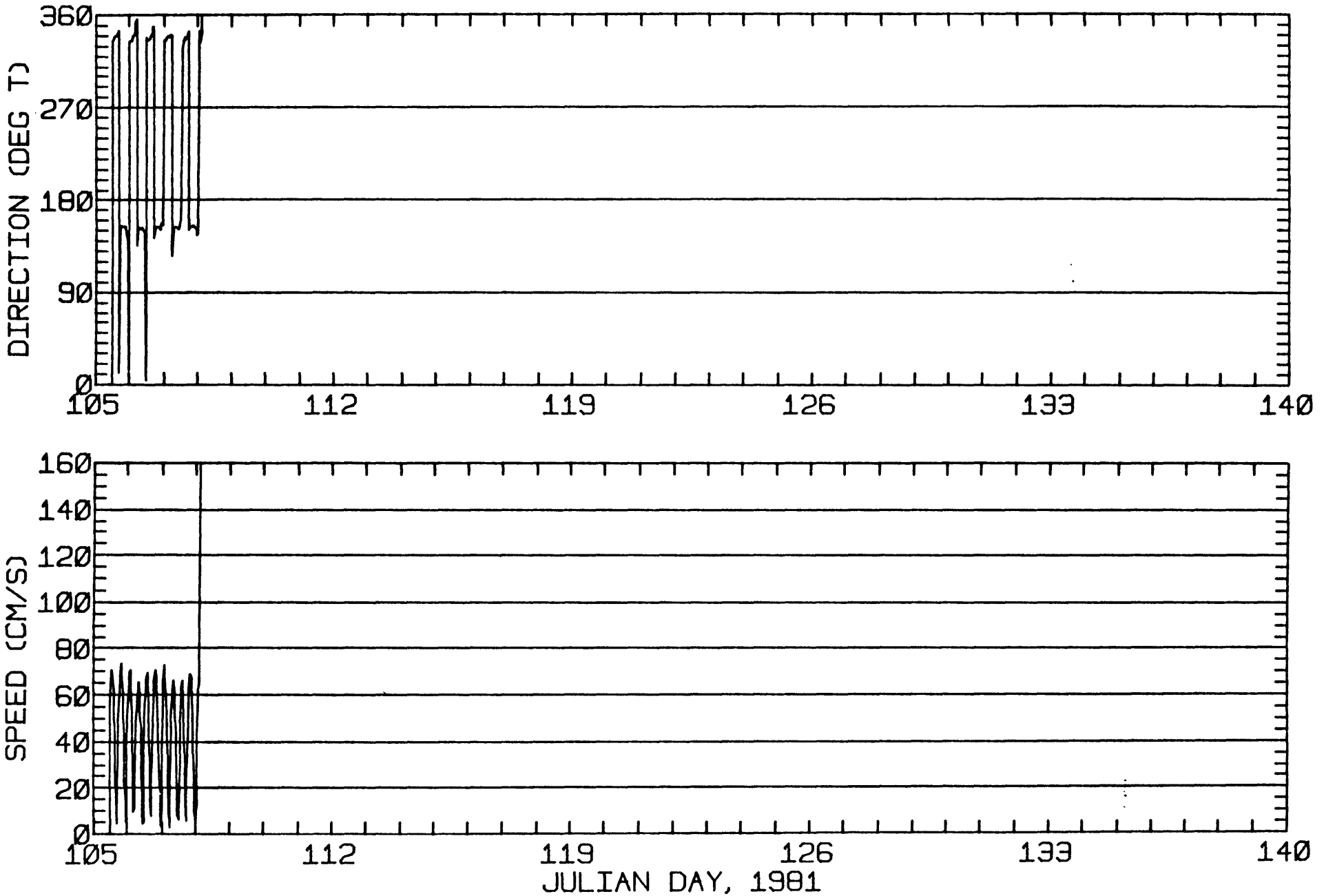
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

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

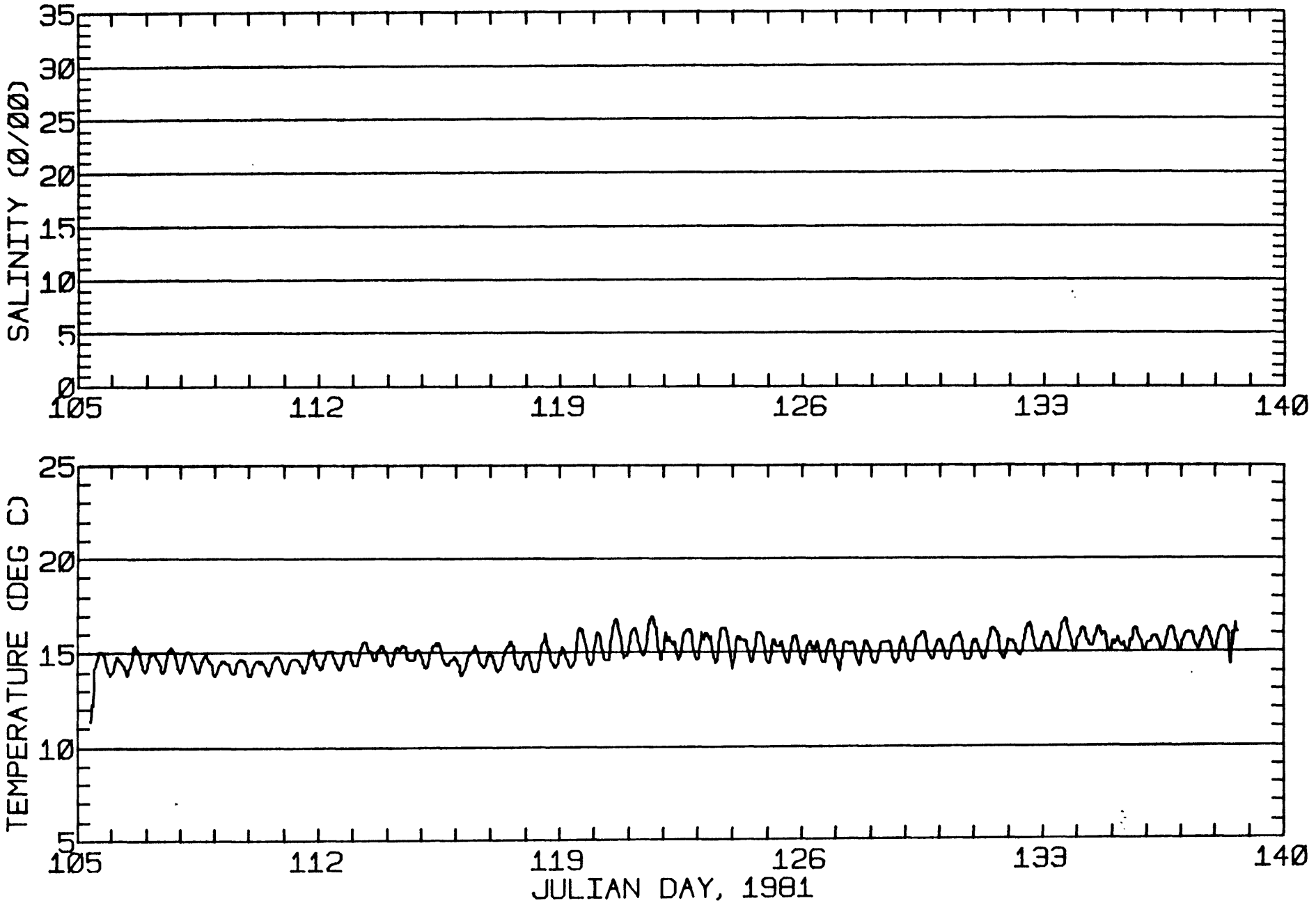
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

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				



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS026C1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS026C1 .

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

CURRENT METER STATION: GS026C2
POSITION: 37 41'26"N 122 18'19"W
METER TYPE: ENDECO
WATER DEPTH: 9.7 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 4/15/81 1542 PST JULIAN DAY=105
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

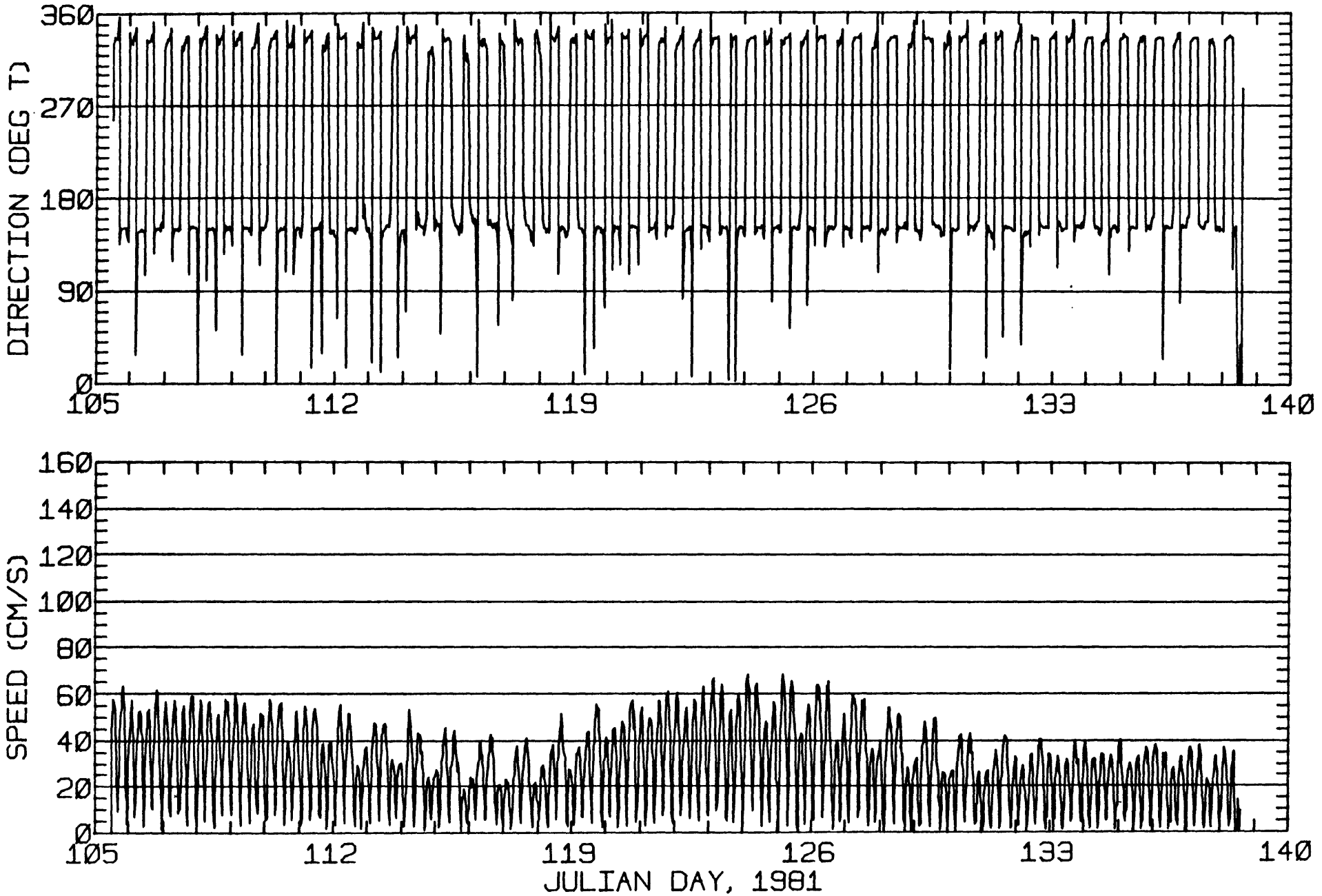
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.56	0.20	156.9	14.9	CLOCKWISE
K1	11.07	0.23	156.7	9.6	CLOCKWISE
N2	9.96	0.10	155.9	274.7	ANTI-CLOCKWISE
M2	42.66	0.32	152.0	280.8	CLOCKWISE
S2	12.51	0.49	152.8	281.6	CLOCKWISE
M4	1.66	0.47	167.7	81.4	CLOCKWISE

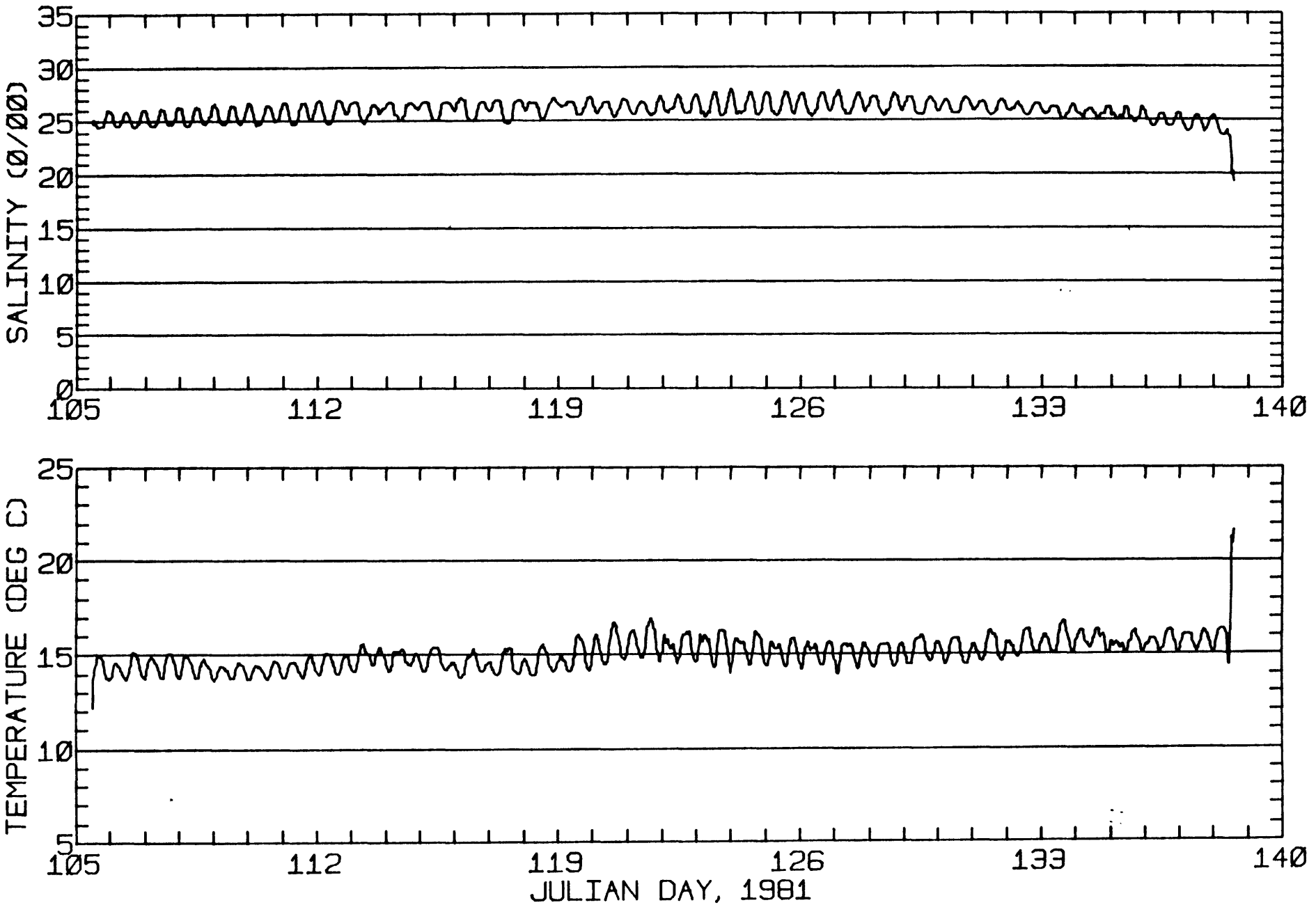
RMS SPEED:	34.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	72.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	25.6 CM/SEC
PRINCIPAL CURRENT DIRECTION:	153.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.32
STANDARD DEVIATION U-SERIES:	3.44 CM/SEC
STANDARD DEVIATION V SERIES:	5.69 CM/SEC

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	3.2	-2.7	162.
2	12	1.7	-2.4	95.
3	12	2.0	-1.2	283.
4	12	1.9	-1.4	282.
5	8	2.2	-2.7	374.
ALL	56	2.2	-2.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS26C2



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-41-26N 122-18-19W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS26C2 .

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

CURRENT METER STATION: GS027A1
POSITION: 37 38'28"N 122 18'40"W
METER TYPE: ENDECO
WATER DEPTH: 9.4 M (MLLW)
METER DEPTH: 3.3 M (BELOW MLLW)
START TIME OF SERIES: 2/ 4/81 1348 PST JULIAN DAY= 35
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

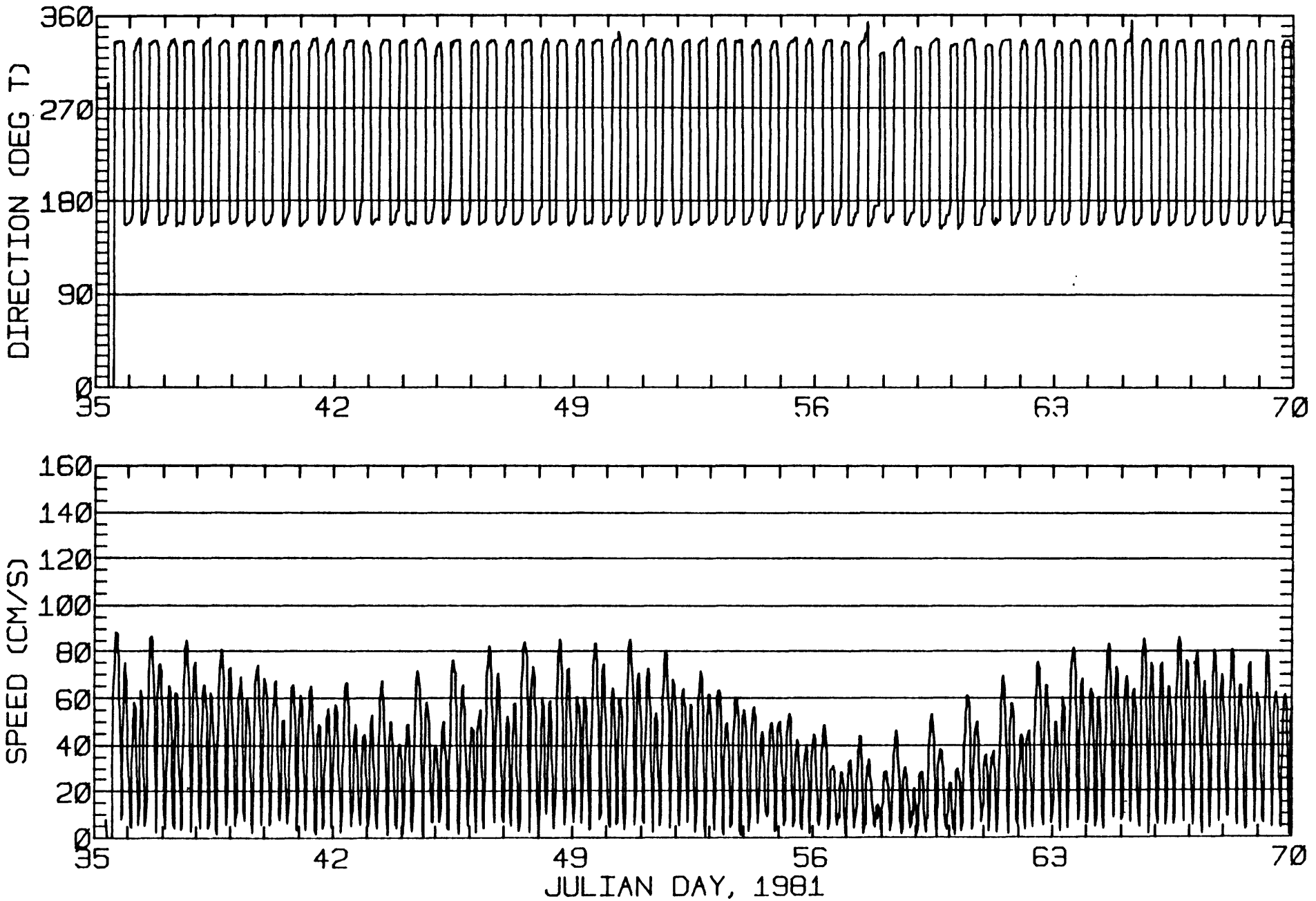
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.67	0.08	157.6	26.3	CLOCKWISE
K1	14.29	0.02	158.0	56.1	ANTI-CLOCKWISE
N2	10.30	0.01	156.3	276.0	CLOCKWISE
M2	53.48	1.29	156.2	292.4	CLOCKWISE
S2	16.60	0.15	156.4	310.5	CLOCKWISE
M4	4.12	0.22	160.7	131.5	CLOCKWISE

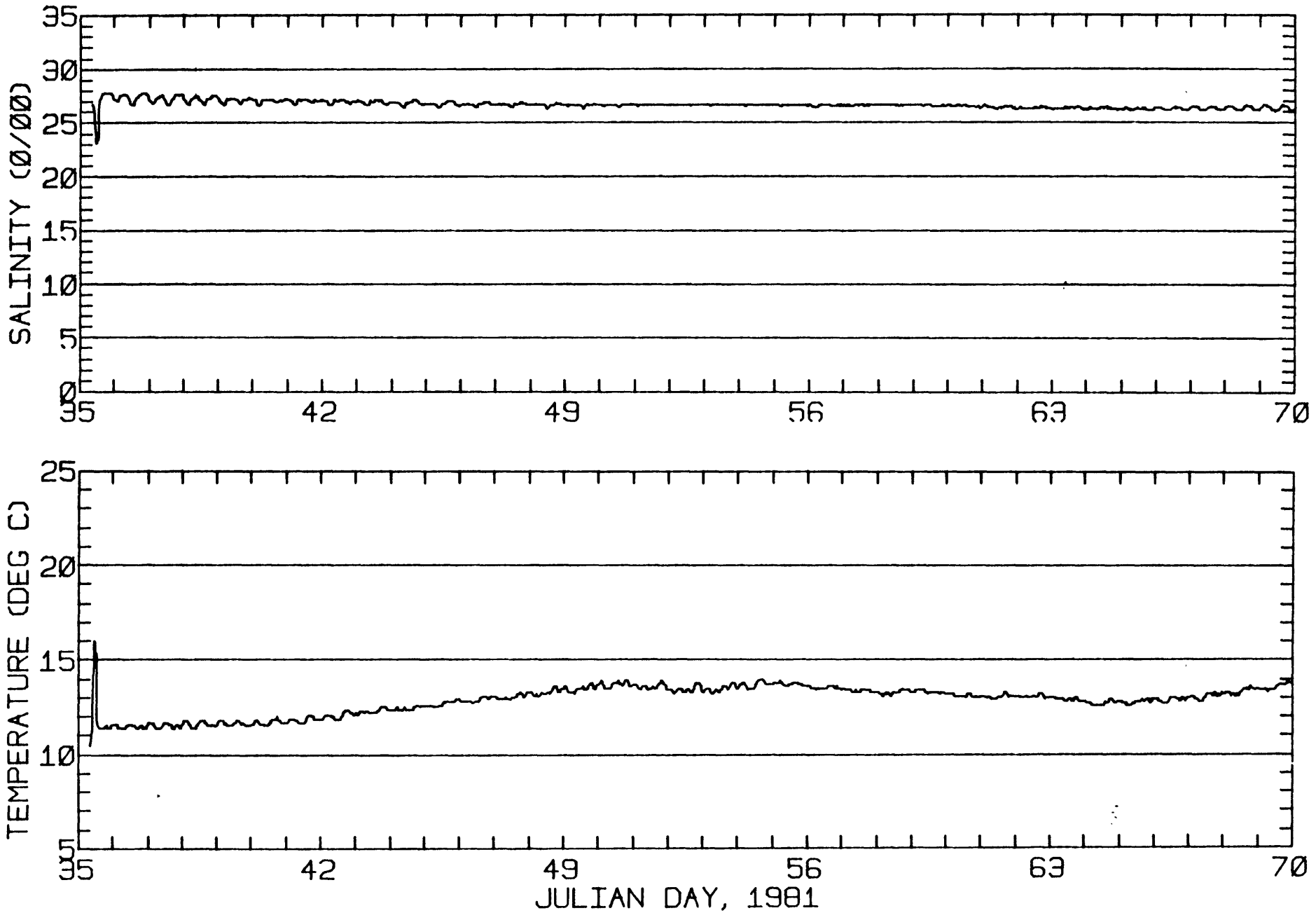
RMS SPEED: 43.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 93.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.3 CM/SEC
PRINCIPAL CURRENT DIRECTION: 156.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 3.29 CM/SEC
STANDARD DEVIATION V SERIES: 6.69 CM/SEC

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	-4.1	4.5	588.
2	12	-3.2	2.5	364.
3	12	-3.7	4.2	623.
4	12	-1.8	-0.1	422.
5	8	-3.4	2.9	388.
ALL	56	-3.2	2.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-18W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS027A1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-18W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS027A1 .

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

CURRENT METER STATION: GS027A2
POSITION: 37 38'28"N 122 18'40"W
METER TYPE: ENDECO
WATER DEPTH: 9.4 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 2/ 4/81 1348 PST JULIAN DAY= 35
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

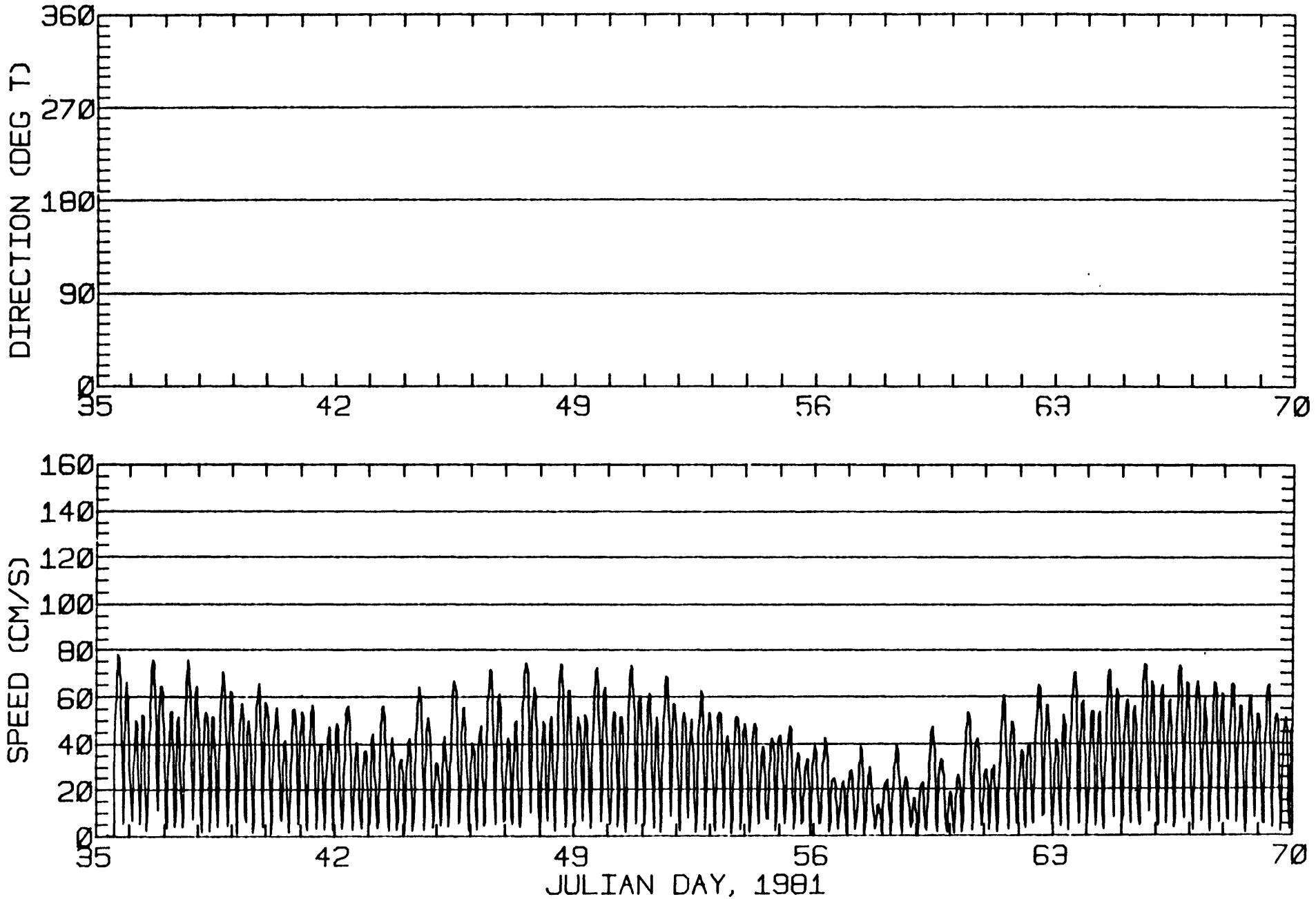
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

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

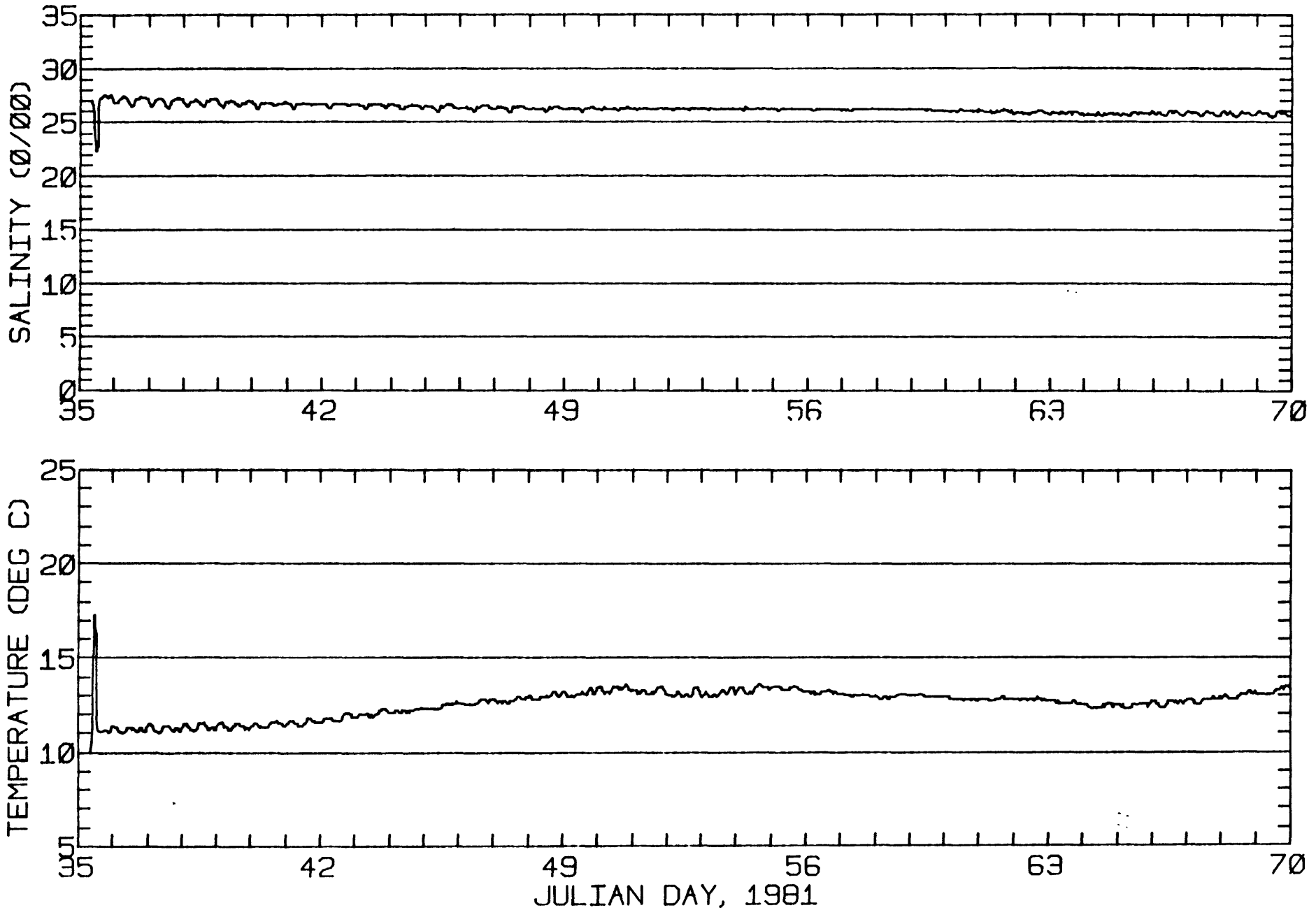
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

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				
2				
3				
4				
5				
ALL				



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-18W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS027A2 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-18W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS027A2 .

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

CURRENT METER STATION: GS027B1
POSITION: 37 38'28"N 122 18'40"W
METER TYPE: ENDECO
WATER DEPTH: 9.7 M (MLLW)
METER DEPTH: 3.6 M (BELOW MLLW)
START TIME OF SERIES: 3/11/81 1710 PST JULIAN DAY= 70
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

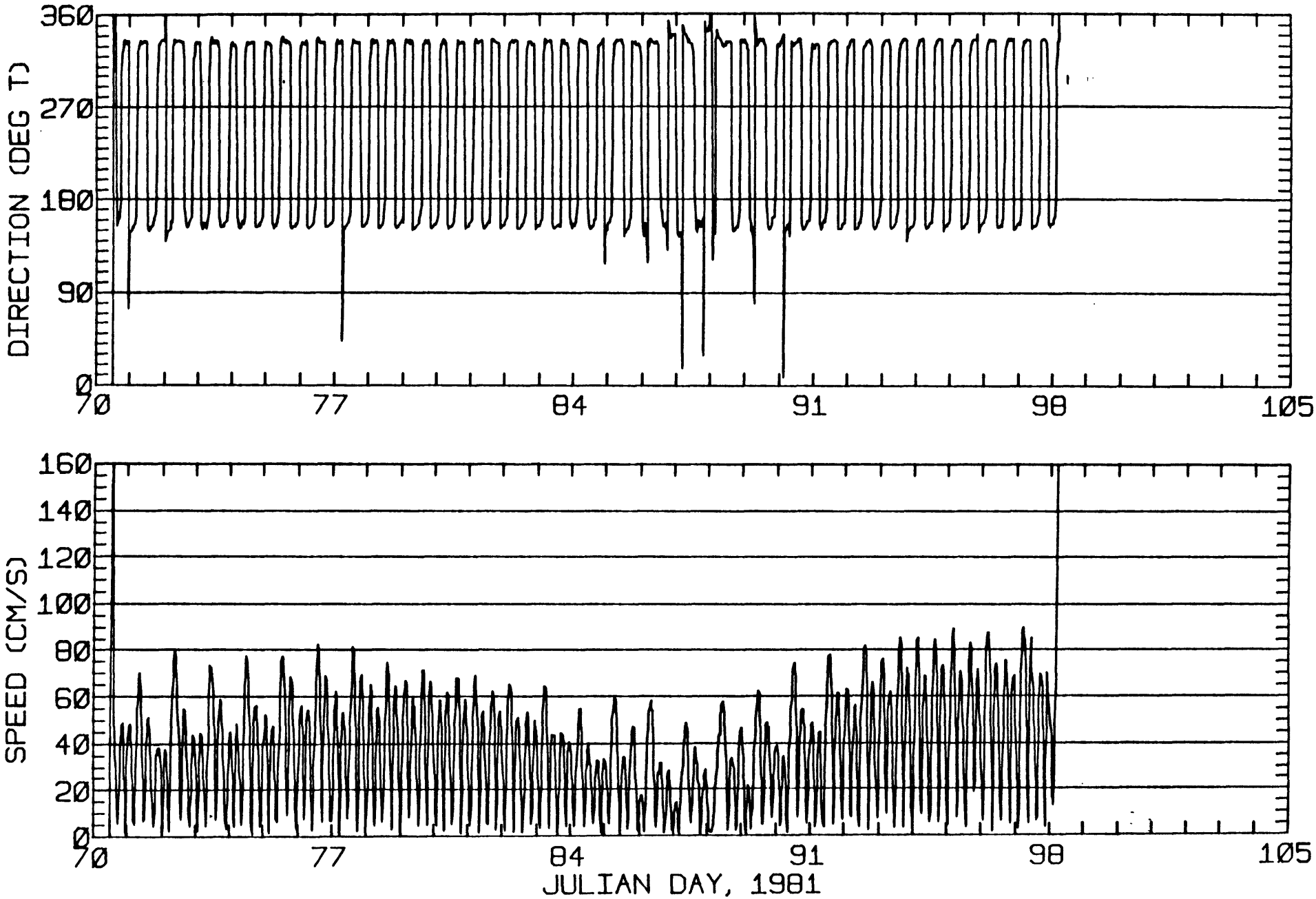
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.17	0.09	155.0	20.6	ANTI-CLOCKWISE
K1	9.81	0.10	155.1	34.4	ANTI-CLOCKWISE
N2	13.00	0.35	154.3	280.2	CLOCKWISE
M2	53.08	1.09	153.9	288.8	CLOCKWISE
S2	16.74	0.69	154.6	295.3	CLOCKWISE
M4	4.04	0.55	149.9	130.3	ANTI-CLOCKWISE

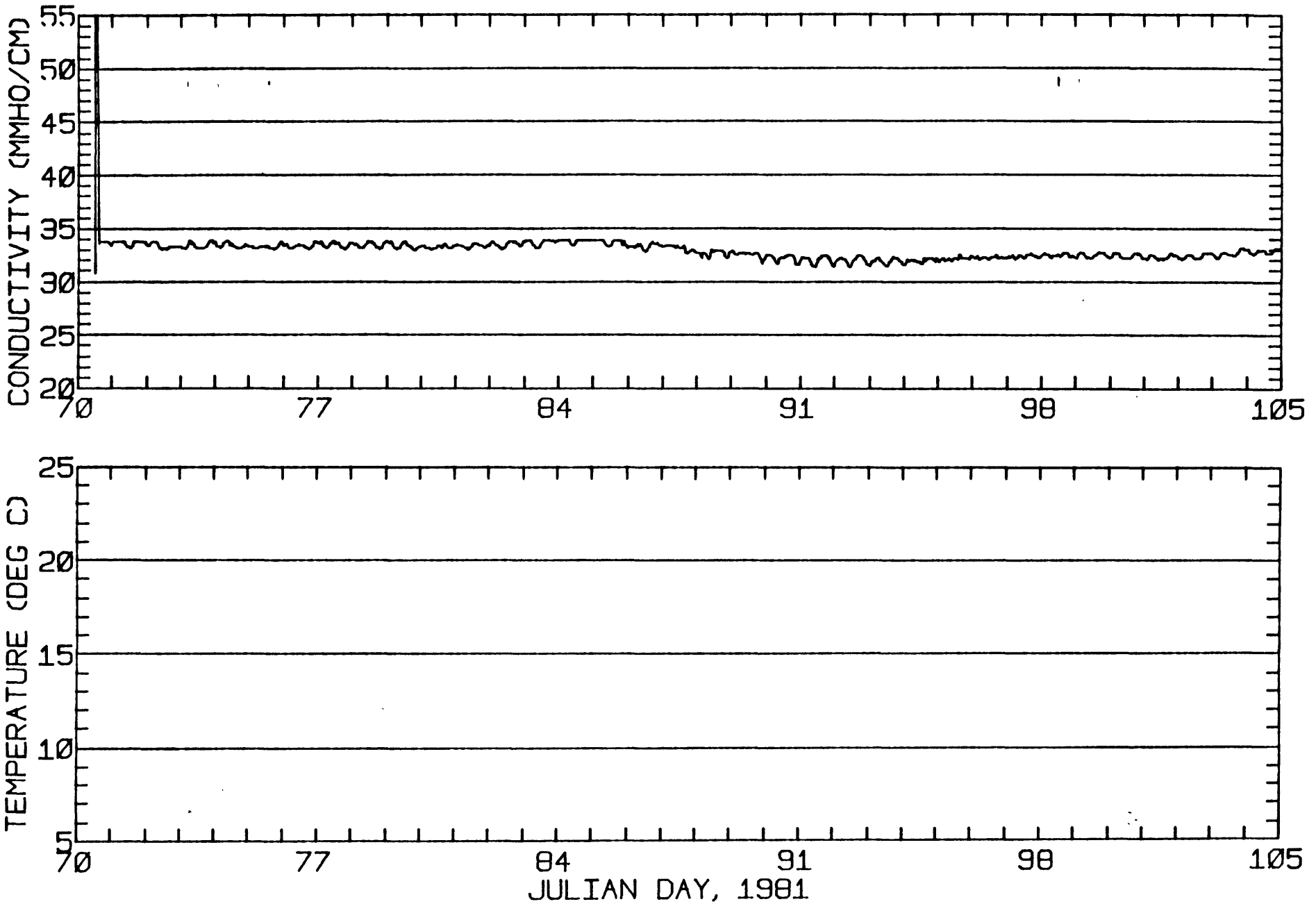
RMS SPEED:	42.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	88.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	35.7 CM/SEC
PRINCIPAL CURRENT DIRECTION:	154.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.27
STANDARD DEVIATION U-SERIES:	3.32 CM/SEC
STANDARD DEVIATION V SERIES:	6.04 CM/SEC

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	-3.0	4.7	381.
2	12	-2.0	2.3	870.
3	12	-4.1	7.6	1176.
4	12	-4.0	5.9	400.
5	2	-3.6	6.1	644.
ALL	50	-3.3	5.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-18W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS027B1 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-18W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS027B1 .

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

CURRENT METER STATION: GS027B2
POSITION: 37 38'28"N 122 18'40"W
METER TYPE: ENDECO
WATER DEPTH: 9.7 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 3/11/81 1518 PST JULIAN DAY= 70
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

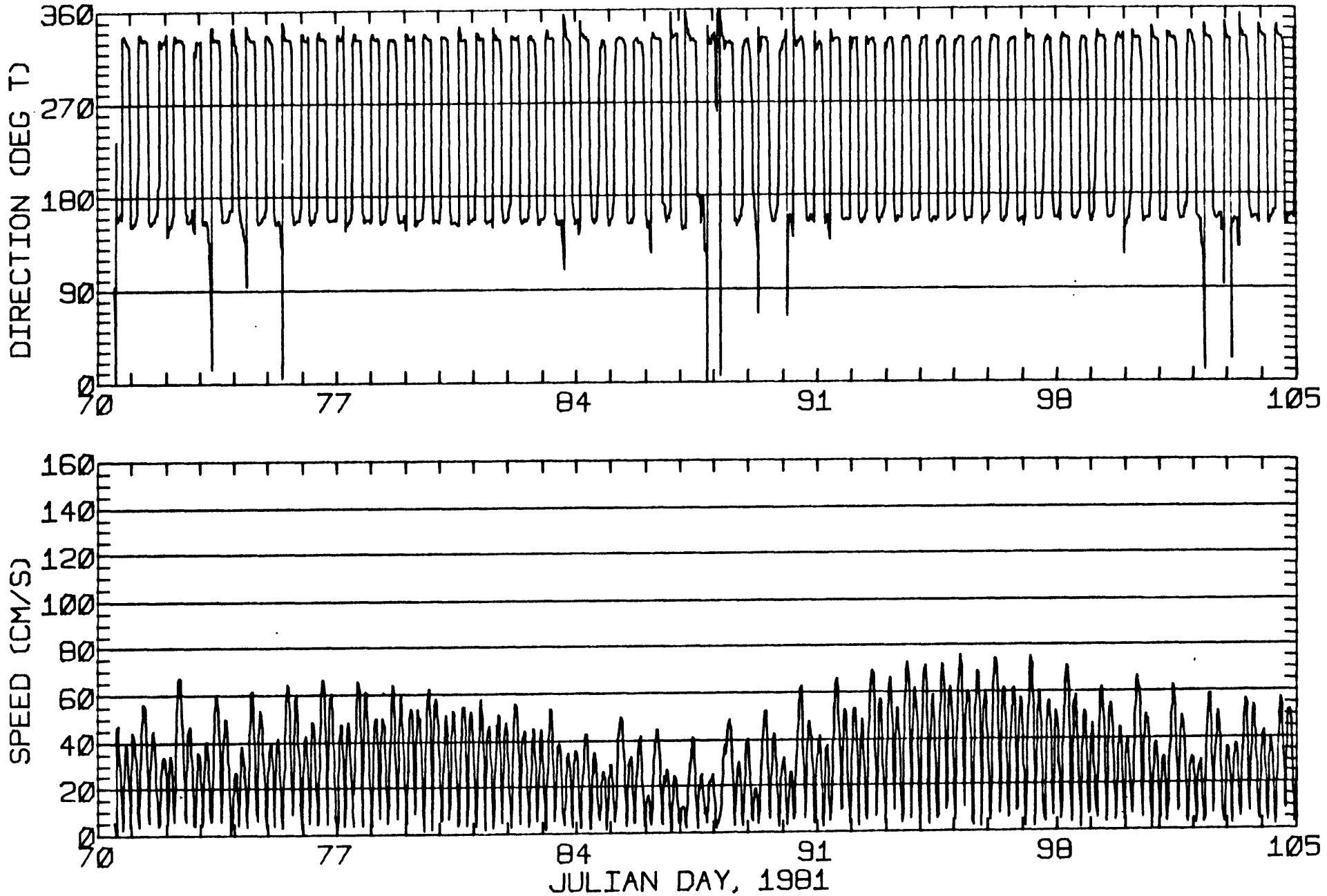
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.53	0.36	155.3	20.5	ANTI-CLOCKWISE
K1	8.23	0.35	157.6	32.9	ANTI-CLOCKWISE
N2	11.31	0.26	153.6	283.3	ANTI-CLOCKWISE
M2	44.21	0.15	153.7	289.4	ANTI-CLOCKWISE
S2	13.92	0.48	154.3	296.6	CLOCKWISE
M4	4.11	0.12	152.5	127.2	CLOCKWISE

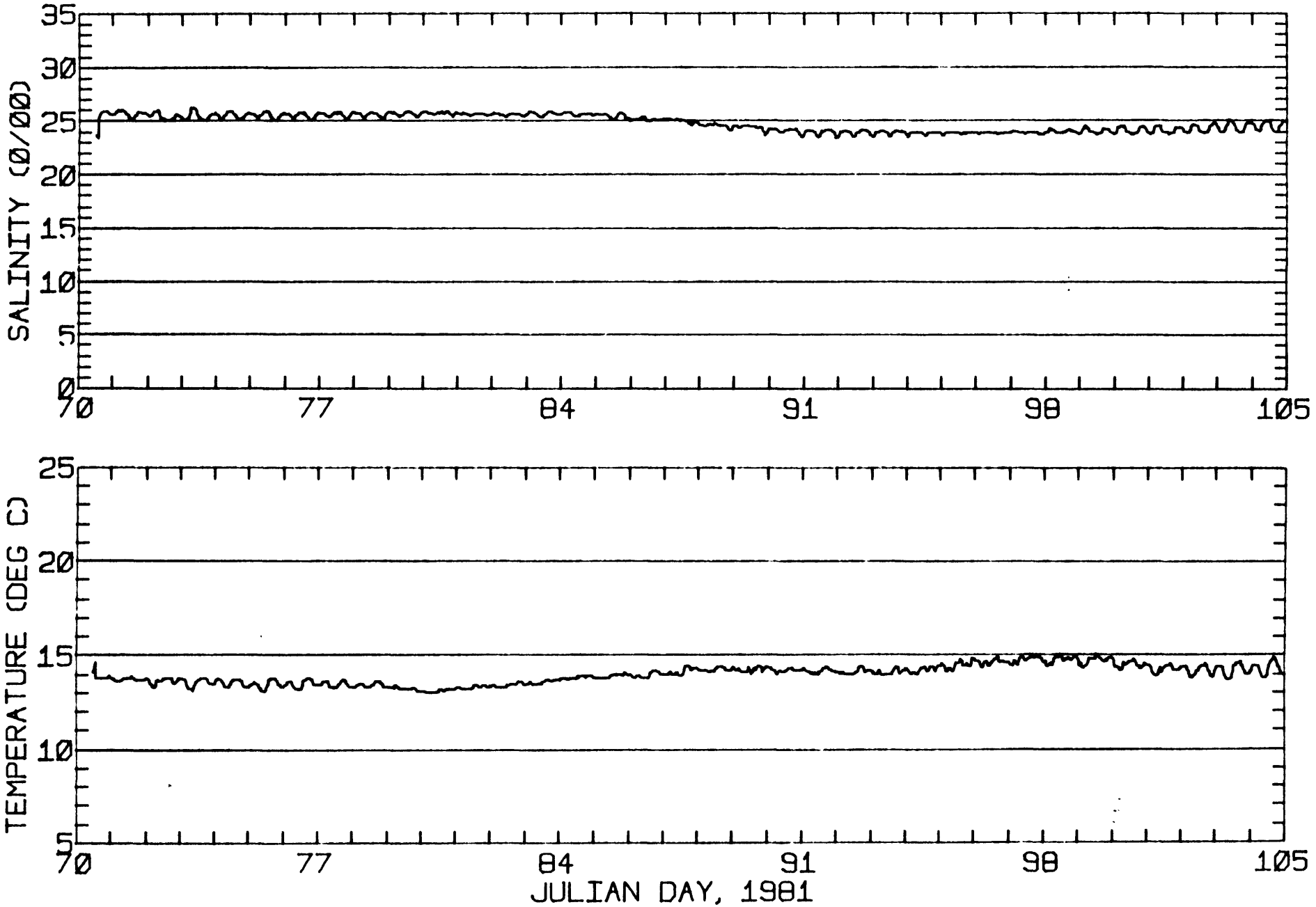
RMS SPEED: 36.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 73.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 154.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 3.63 CM/SEC
STANDARD DEVIATION V SERIES: 5.81 CM/SEC

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	-1.8	1.9	381.
2	12	-1.2	-0.3	870.
3	12	-4.2	5.6	1176.
4	12	-4.7	4.5	900.
5	8	-4.4	3.8	502.
ALL	56	-3.2	3.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-18W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS027B2 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-18W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS027B2 .

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

CURRENT METER STATION: GS027C1
POSITION: 37 38'36"N 122 18'32"W
METER TYPE: ENDECO
WATER DEPTH: 8.2 M (MLLW)
METER DEPTH: 2.1 M (BELOW MLLW)
START TIME OF SERIES: 1/27/82 1256 PST JULIAN DAY= 27
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

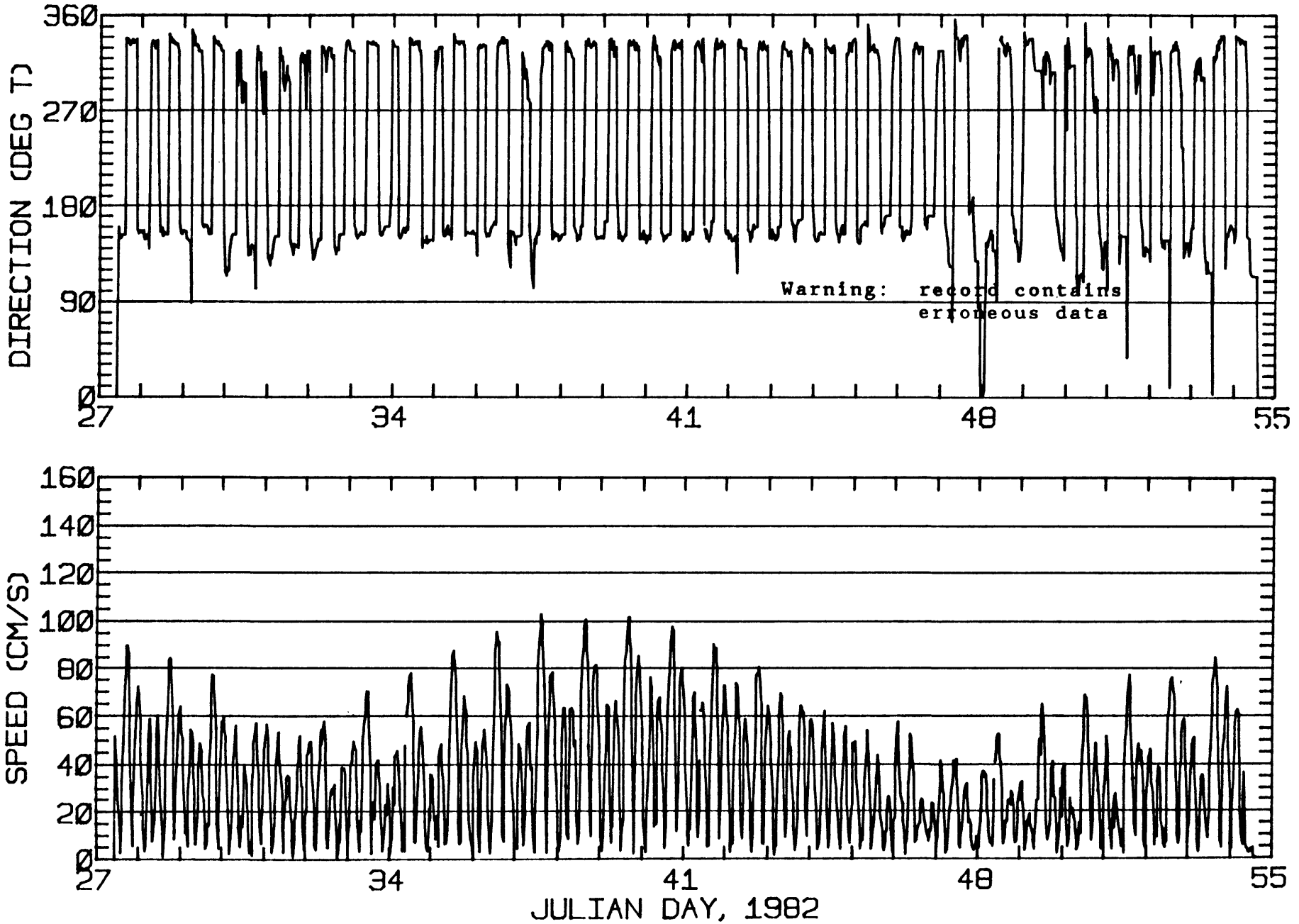
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.51	0.70	162.2	30.4	CLOCKWISE
K1	18.30	0.74	151.5	57.7	CLOCKWISE
N2	12.26	1.43	148.3	261.4	ANTI-CLOCKWISE
M2	49.21	0.10	150.0	300.2	CLOCKWISE
S2	16.09	1.07	155.6	318.8	ANTI-CLOCKWISE
M4	5.47	0.74	148.5	126.4	ANTI-CLOCKWISE

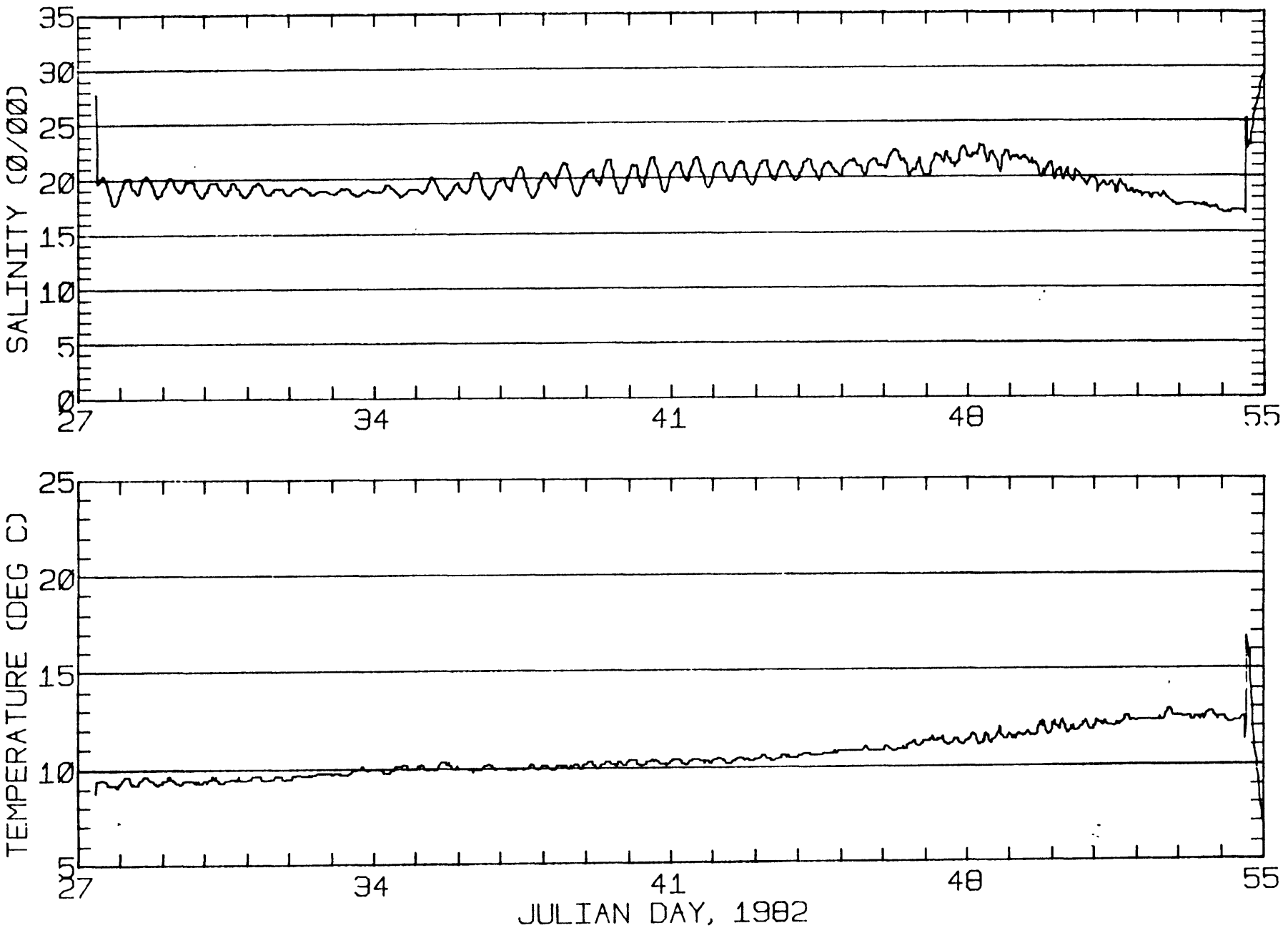
RMS SPEED:	44.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	94.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	25.3 CM/SEC
PRINCIPAL CURRENT DIRECTION:	152.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.44
STANDARD DEVIATION U-SERIES:	7.32 CM/SEC
STANDARD DEVIATION V SERIES:	10.87 CM/SEC

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	-2.3	3.0	1758.
2	12	-1.4	2.2	1304.
3	12	-2.1	0.3	851.
4	2	-3.5	-0.7	4464.
ALL	38	-2.0	1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-36N 122-18-32W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS027C1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-32W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS027C1

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

CURRENT METER STATION: GS027C2
POSITION: 37 38'36"N 122 18'32"W
METER TYPE: ENDECO
WATER DEPTH: 8.2 M (MLLW)
METER DEPTH: 5.4 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/82 948 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

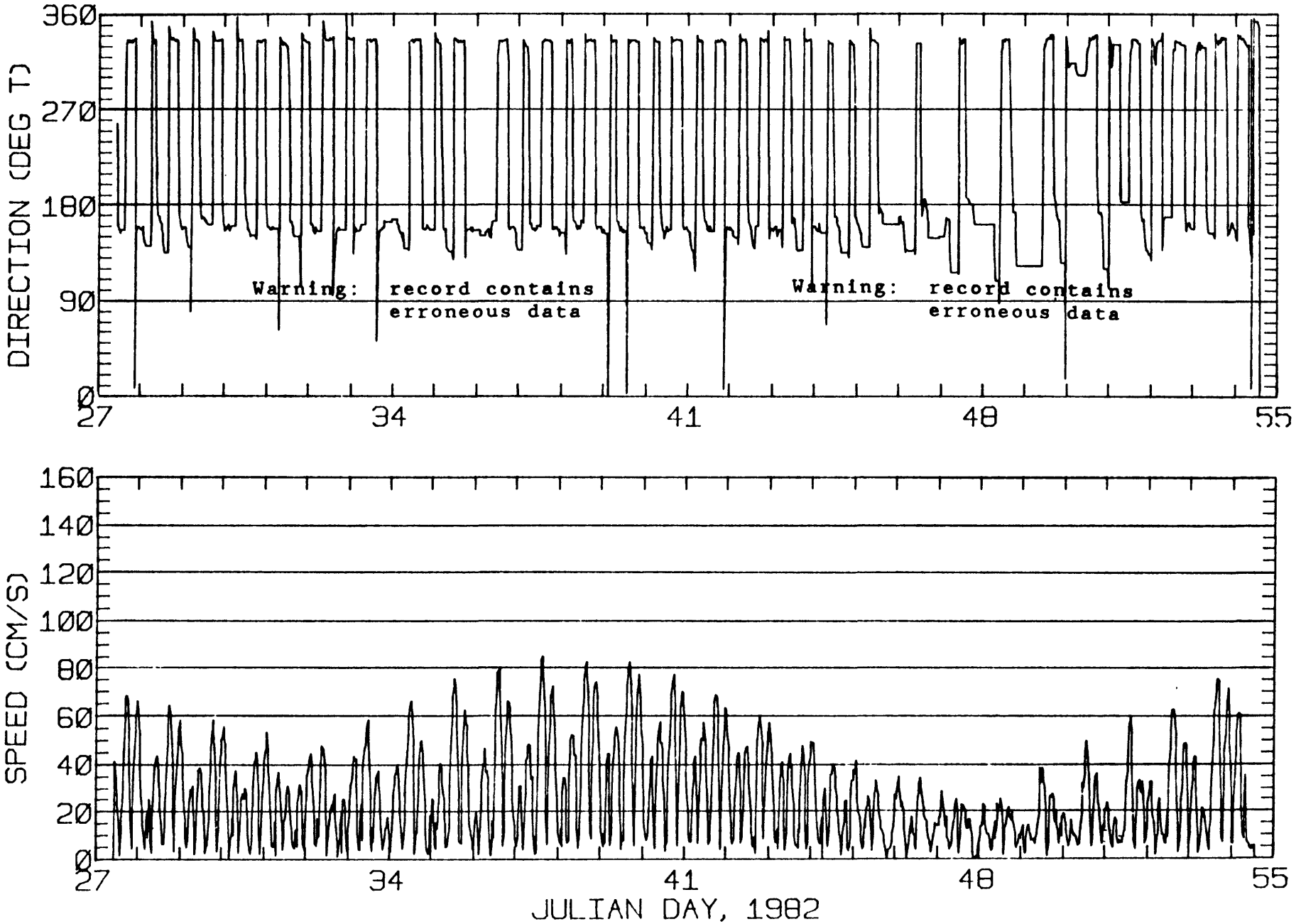
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.20	0.03	153.3	40.0	CLOCKWISE
K1	14.92	0.98	154.2	66.2	CLOCKWISE
N2	12.46	0.85	157.2	277.4	CLOCKWISE
M2	37.29	2.44	158.0	290.7	ANTI-CLOCKWISE
S2	13.03	0.23	155.8	322.3	ANTI-CLOCKWISE
M4	10.45	0.02	161.3	136.1	CLOCKWISE

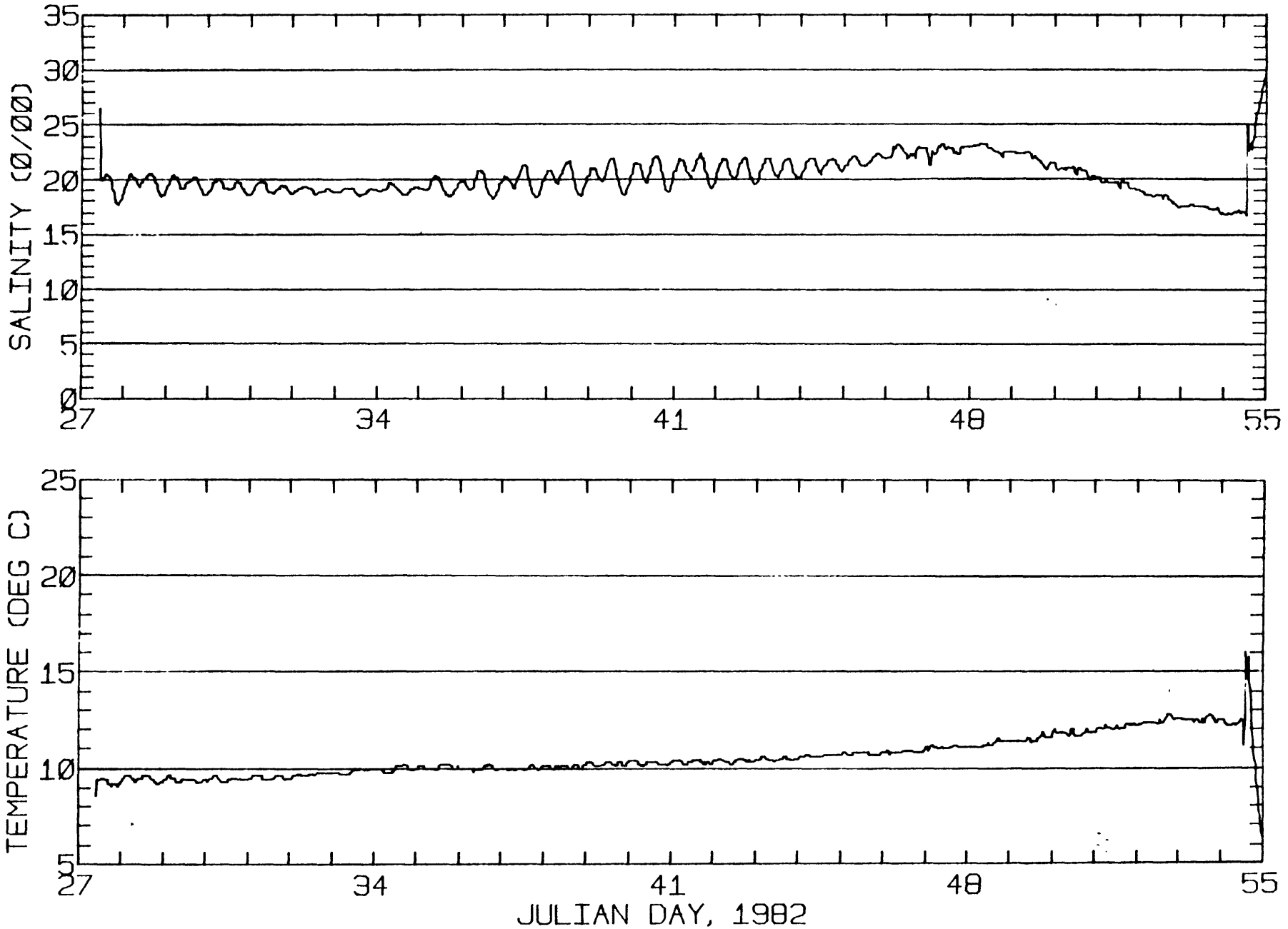
RMS SPEED: 41.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 76.4 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 20.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 156.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.52
STANDARD DEVIATION U-SERIES: 4.29 CM/SEC
STANDARD DEVIATION V SERIES: 8.06 CM/SEC

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	0.4	-3.6	1039.
2	4	2.2	-6.5	823.
ALL	16	0.9	-4.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-32W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS027C2 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-27N 122-18-32W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS027C2

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

CURRENT METER STATION: GS027D1
POSITION: 37 38'35"N 122 18'41"W
METER TYPE: ENDECO
WATER DEPTH: 7.9 M (MLLW)
METER DEPTH: 1.8 M (BELOW MLLW)
START TIME OF SERIES: 2/22/82 1606 PST JULIAN DAY= 53
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

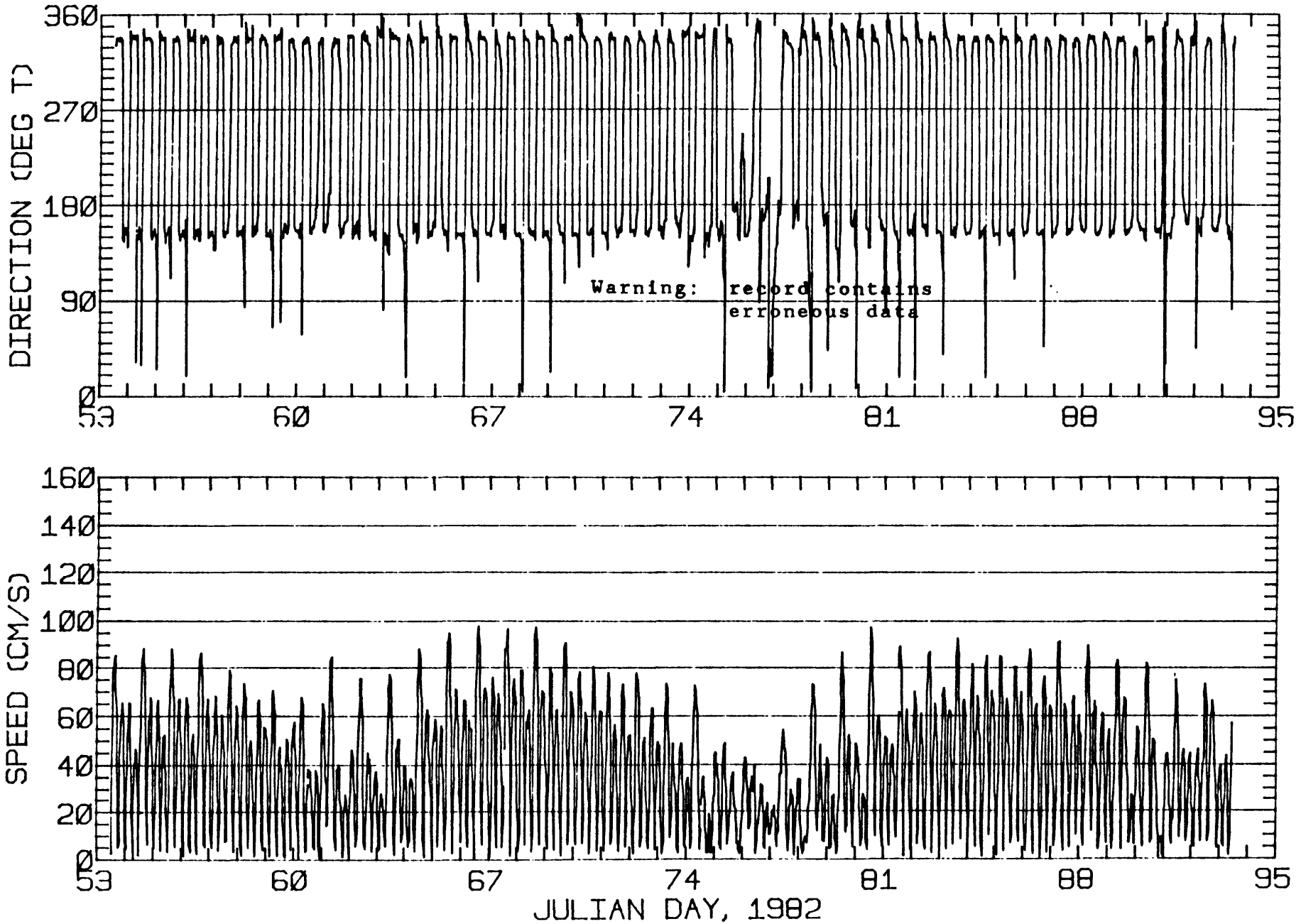
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.51	0.63	156.1	29.5	CLOCKWISE
K1	13.49	0.26	153.2	49.2	CLOCKWISE
N2	12.05	0.03	152.6	263.6	CLOCKWISE
M2	52.44	0.42	156.6	292.9	ANTI-CLOCKWISE
S2	18.60	0.40	153.0	308.7	ANTI-CLOCKWISE
M4	4.70	0.76	156.8	94.3	ANTI-CLOCKWISE

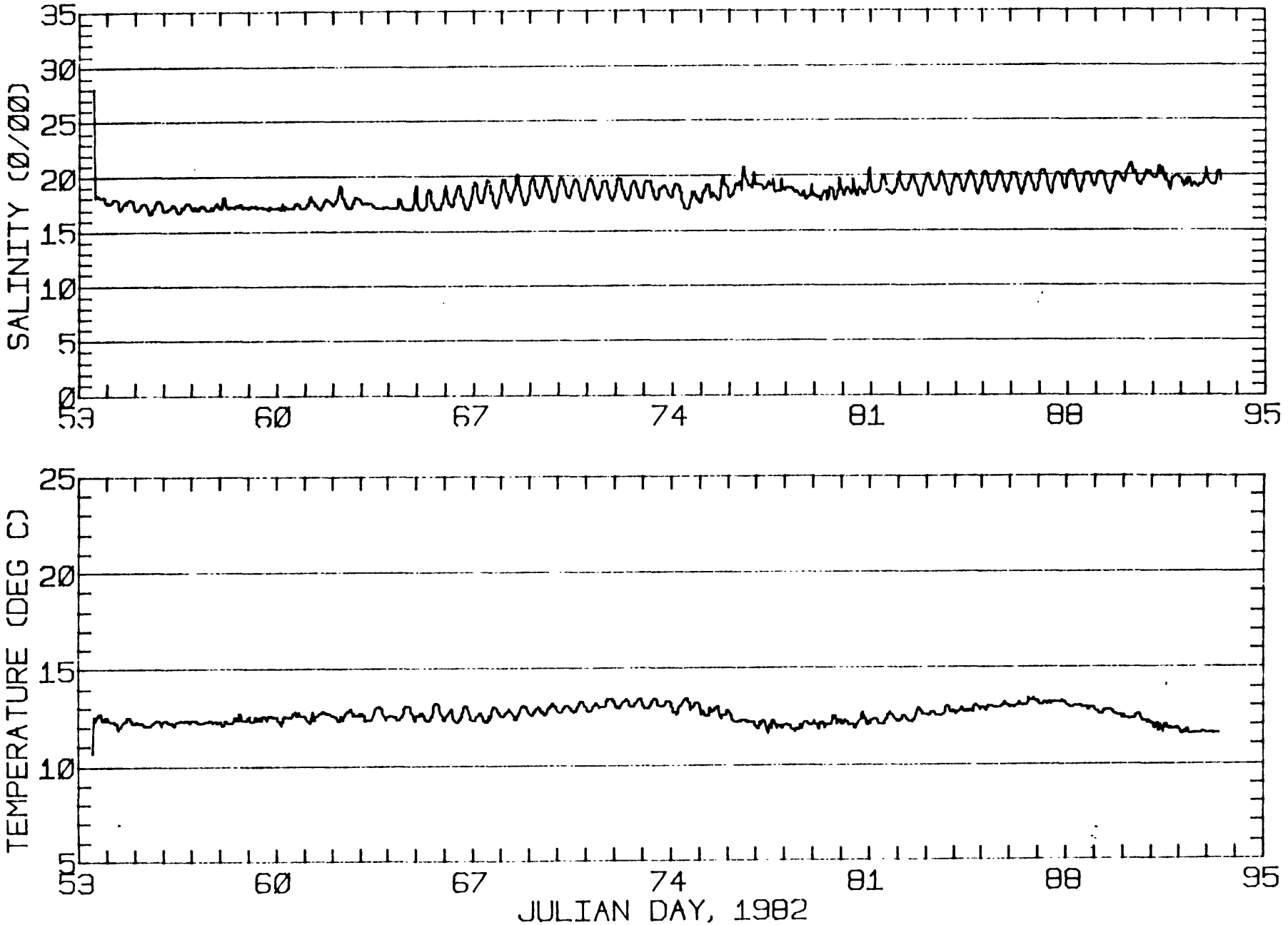
RMS SPEED:	46.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	94.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	29.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	155.4 DEGREES TRUE
TIDAL FORM NUMBER:	0.32
STANDARD DEVIATION U-SERIES:	3.76 CM/SEC
STANDARD DEVIATION V SERIES:	6.75 CM/SEC

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	6.0	3549.
2	12	-0.6	2.7	2653.
3	12	-1.2	5.7	2153.
4	4	-3.3	7.9	2278.
ALL	40	-1.2	5.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-35N 122-18-41W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS027D1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-35N 122-18-41W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS027D1

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

CURRENT METER STATION: GS028A1
POSITION: 37 38' 7"N 122 19' 0"W
METER TYPE: ENDECO
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 1/27/82 1256 PST JULIAN DAY= 27
APPROXIMATE RECORD LENGTH IS 34 M2-CYCLES

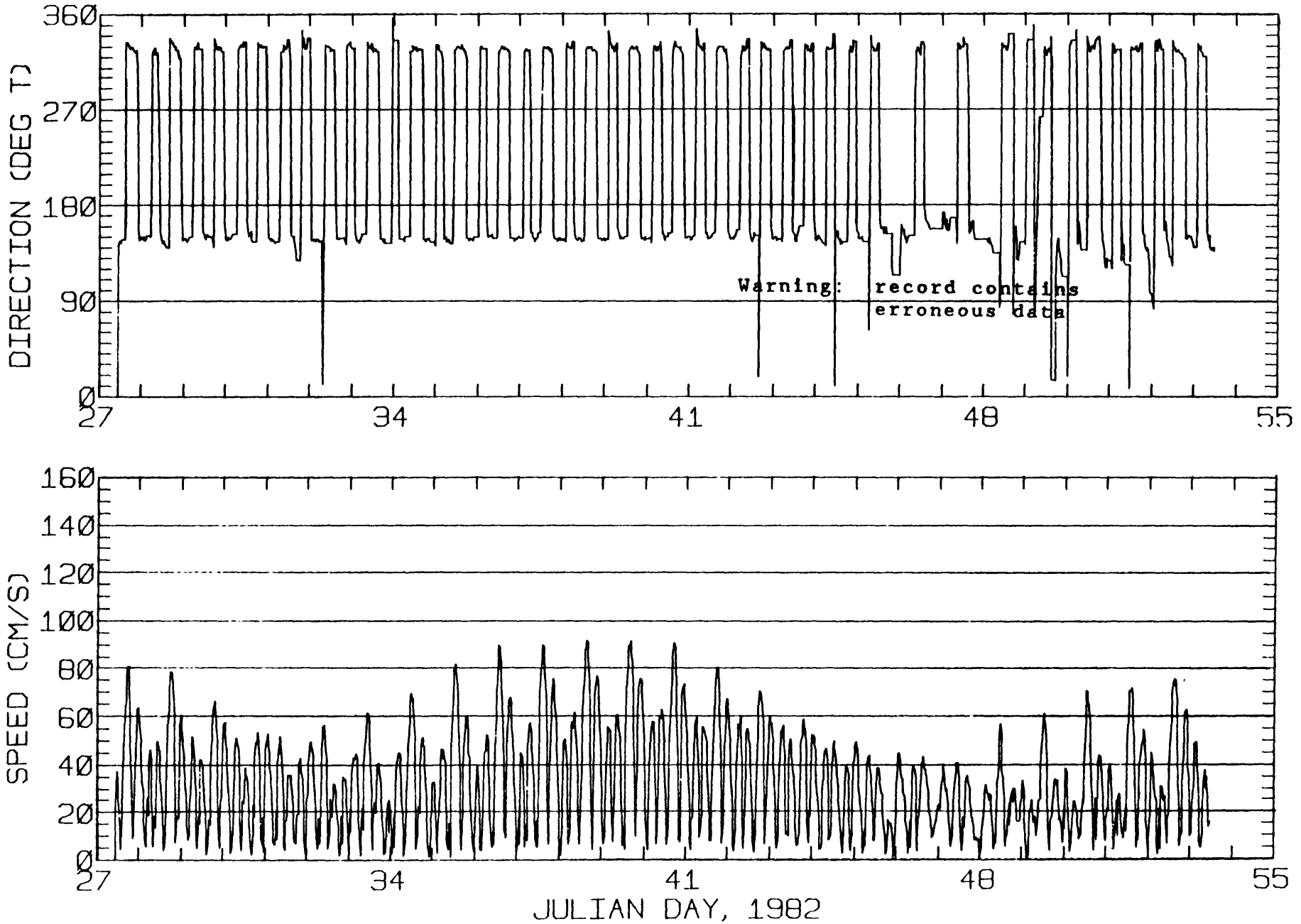
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.78	0.14	146.9	41.2	ANTI-CLOCKWISE
K1	17.30	0.32	147.9	64.6	CLOCKWISE
N2	8.66	0.01	150.8	262.1	ANTI-CLOCKWISE
M2	46.89	0.95	148.1	301.7	ANTI-CLOCKWISE
S2	13.86	0.06	148.6	323.2	ANTI-CLOCKWISE
M4	6.22	0.34	151.7	116.5	ANTI-CLOCKWISE

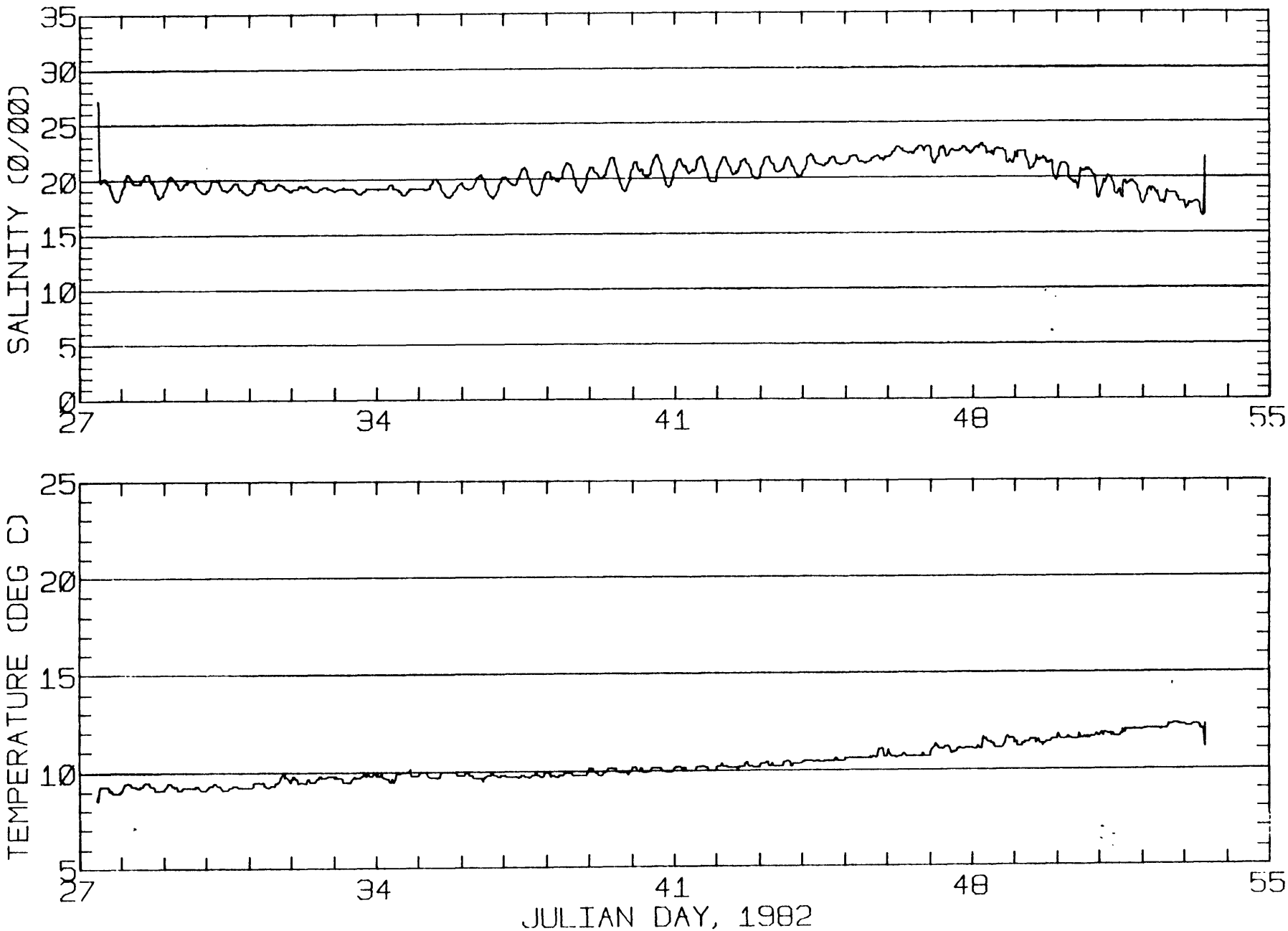
RMS SPEED: 42.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 88.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 26.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 148.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.46
STANDARD DEVIATION U-SERIES: 6.45 CM/SEC
STANDARD DEVIATION V SERIES: 10.18 CM/SEC

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	1.4	1758.
2	12	-0.8	0.1	1304.
3	10	-0.3	-1.0	869.
ALL	34	-0.7	0.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-15N 122-19-17W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS028A1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-15N 122-19-17W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS028A1

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

CURRENT METER STATION: GS028A2
POSITION: 37 38' 7"N 122 19' 0"W
METER TYPE: ENDECO
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 1/27/82 1256 PST JULIAN DAY= 27
APPROXIMATE RECORD LENGTH IS 36 M2-CYCLES

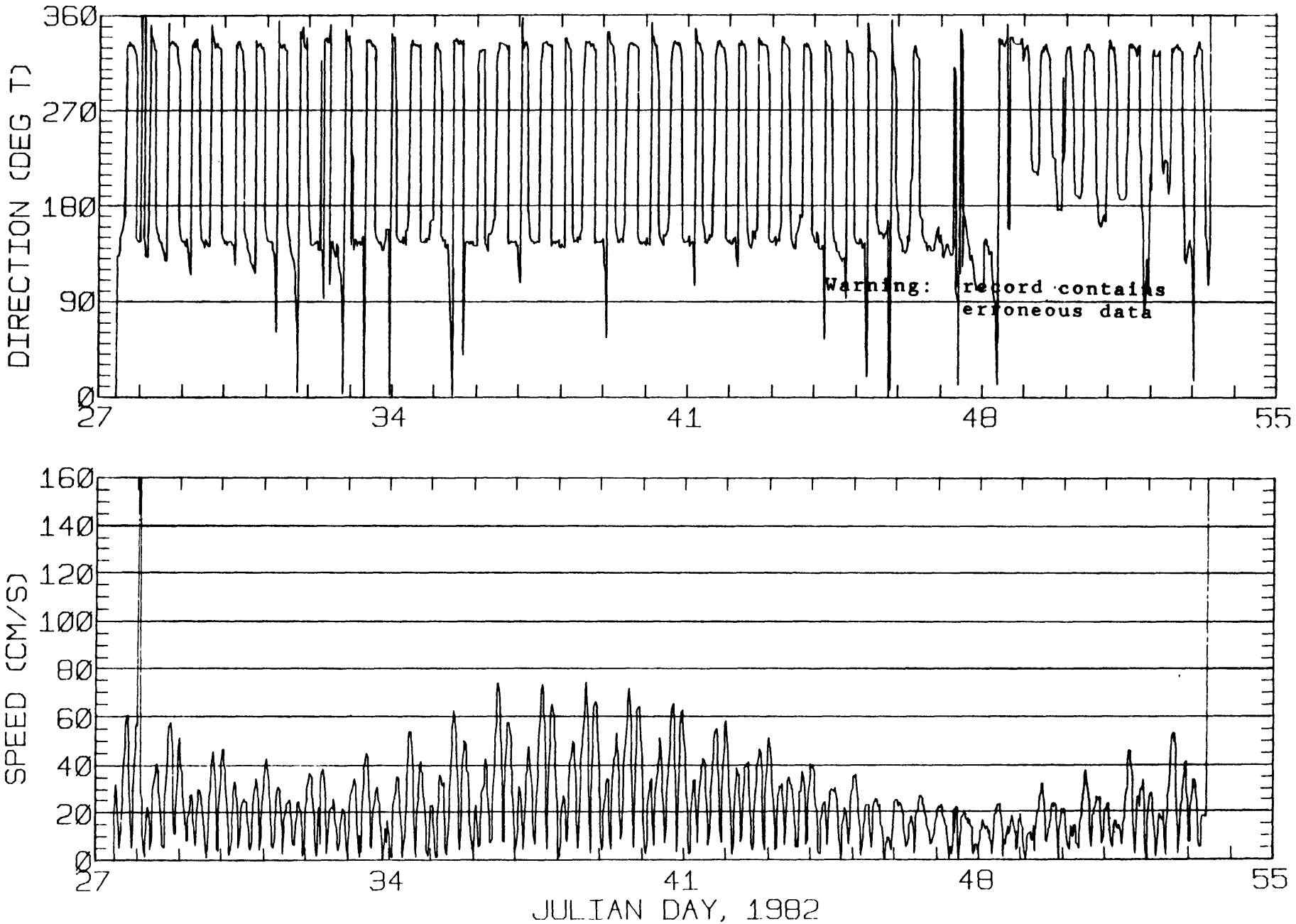
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.37	1.25	149.8	37.4	CLOCKWISE
K1	14.02	0.70	149.8	65.9	CLOCKWISE
N2	7.93	0.03	154.0	268.8	CLOCKWISE
M2	34.06	0.75	147.8	293.4	ANTI-CLOCKWISE
S2	12.22	0.02	153.2	315.6	CLOCKWISE
M4	4.09	1.90	154.7	104.2	ANTI-CLOCKWISE

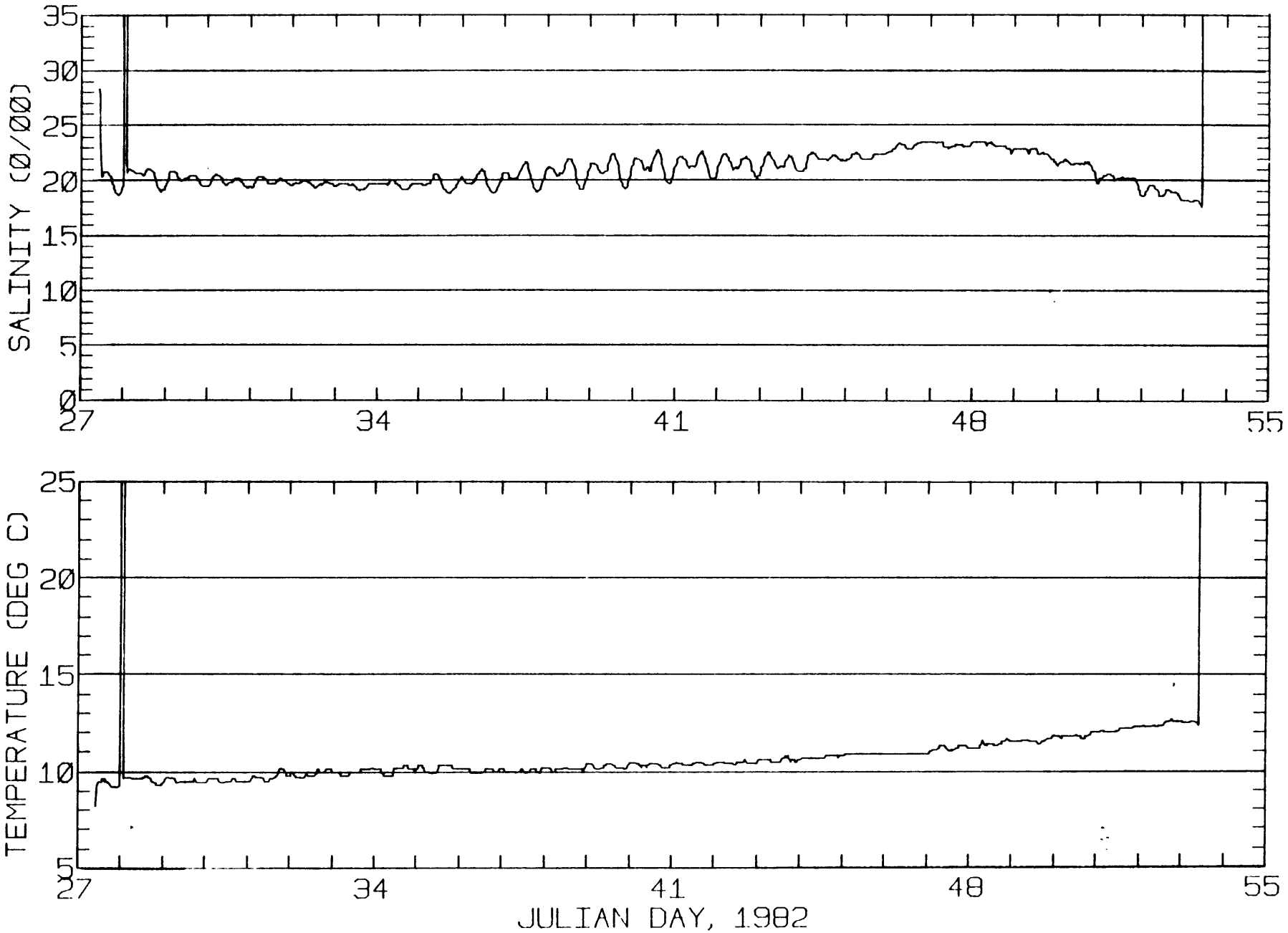
RMS SPEED: 31.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 69.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 17.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 149.4 DEGREES TRUE
TIDAL FORM NUMBER: 0.51
STANDARD DEVIATION U-SERIES: 3.40 CM/SEC
STANDARD DEVIATION V SERIES: 5.90 CM/SEC

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	2.4	-0.7	1758.
2	12	2.3	-1.3	1304.
3	12	3.0	-4.2	851.
ALL	36	2.6	-2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-15N 122-19-17W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS028A2



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-15N 122-19-17W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS028A2

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

CURRENT METER STATION: GS028B1
POSITION: 37 38' 4"N 122 19' 0"W
METER TYPE: ENDECO
WATER DEPTH: 9.4 M (MLLW)
METER DEPTH: 3.3 M (BELOW MLLW)
START TIME OF SERIES: 3/29/82 1438 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

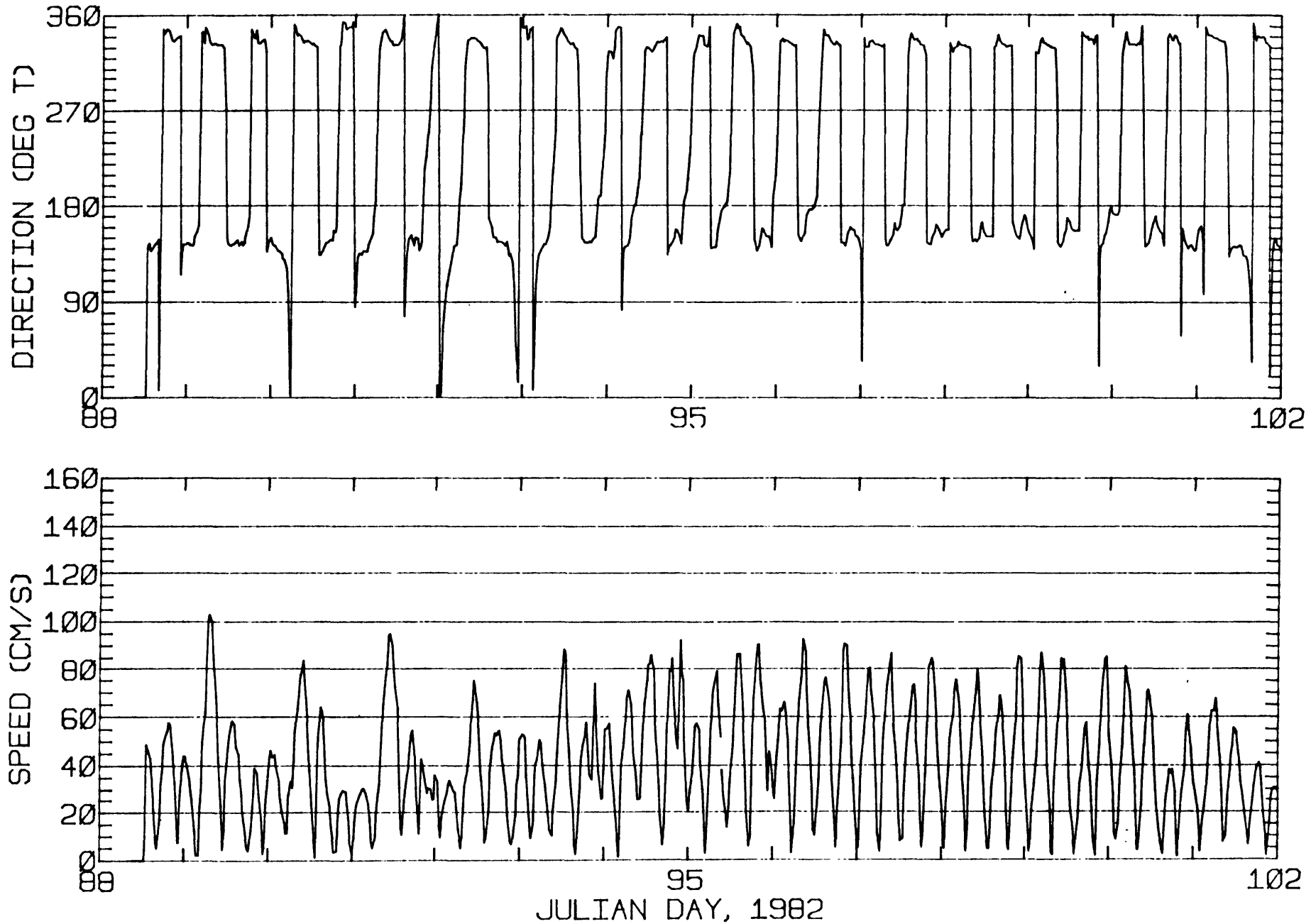
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	11.35	0.89	155.3	48.7	ANTI-CLOCKWISE
K1	12.22	0.36	151.7	37.6	CLOCKWISE
N2	12.44	0.40	161.0	290.5	CLOCKWISE
M2	53.51	2.30	152.6	294.3	CLOCKWISE
S2	20.18	0.44	166.1	294.0	CLOCKWISE
M4	4.95	1.58	126.7	150.2	ANTI-CLOCKWISE

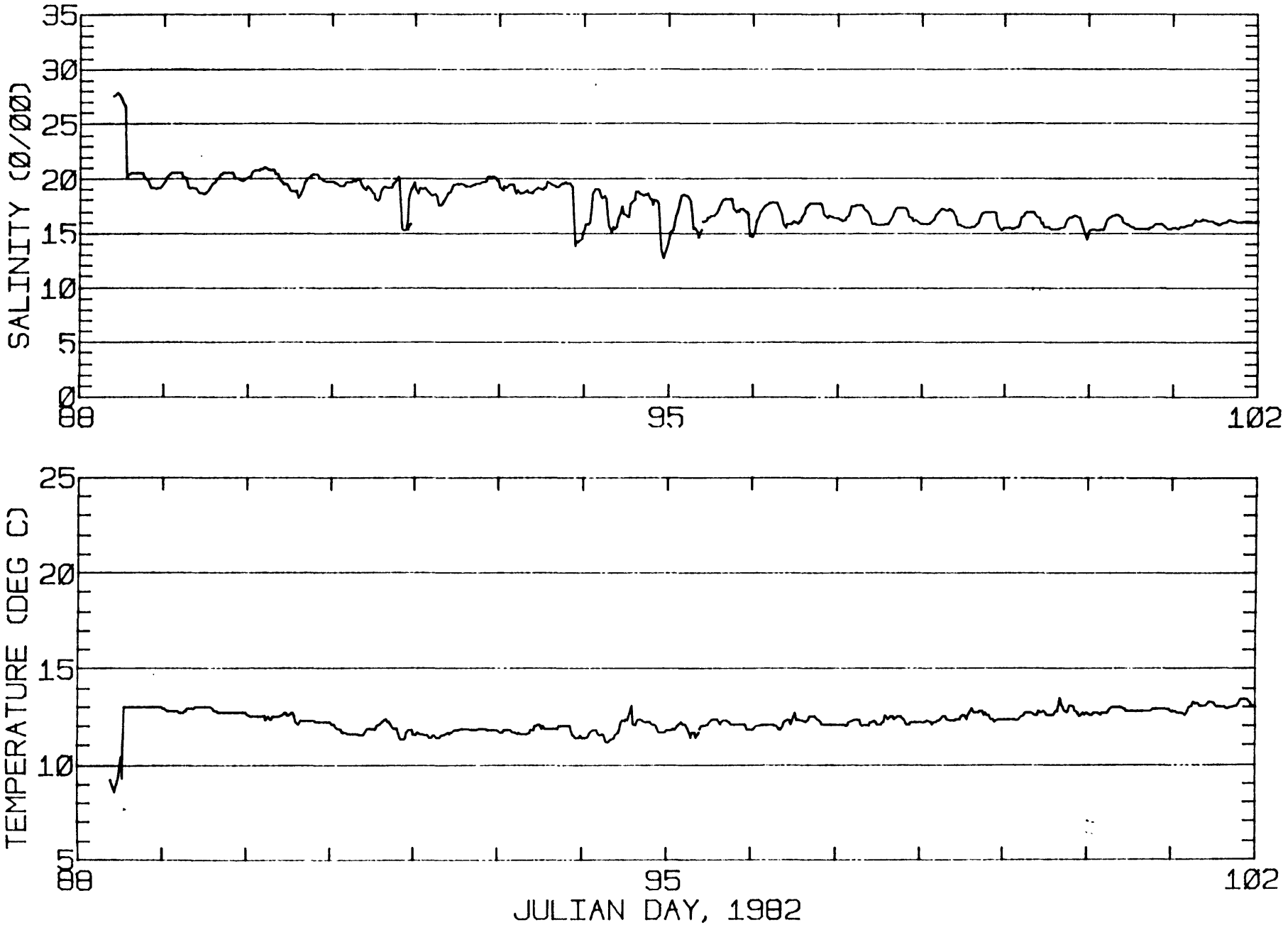
RMS SPEED:	46.8 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	97.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	32.5 CM/SEC
PRINCIPAL CURRENT DIRECTION:	155.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.32
STANDARD DEVIATION U-SERIES:	7.45 CM/SEC
STANDARD DEVIATION V SERIES:	11.07 CM/SEC

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	-0.6	5.5	3236.
2	12	0.2	-5.0	4023.
3	2	2.5	4.7	3749.
ALL	26	0.0	0.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38- 4N 122-19- 0W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS028B1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38- 4N 122-19- 0W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS028B1

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

CURRENT METER STATION: GS028B2
POSITION: 37 38' 4"N 122 19' 0"W
METER TYPE: ENDECO
WATER DEPTH: 9.4 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 3/29/82 1438 PST JULIAN DAY= 88
APPROXIMATE RECORD LENGTH IS 26 M2-CYCLES

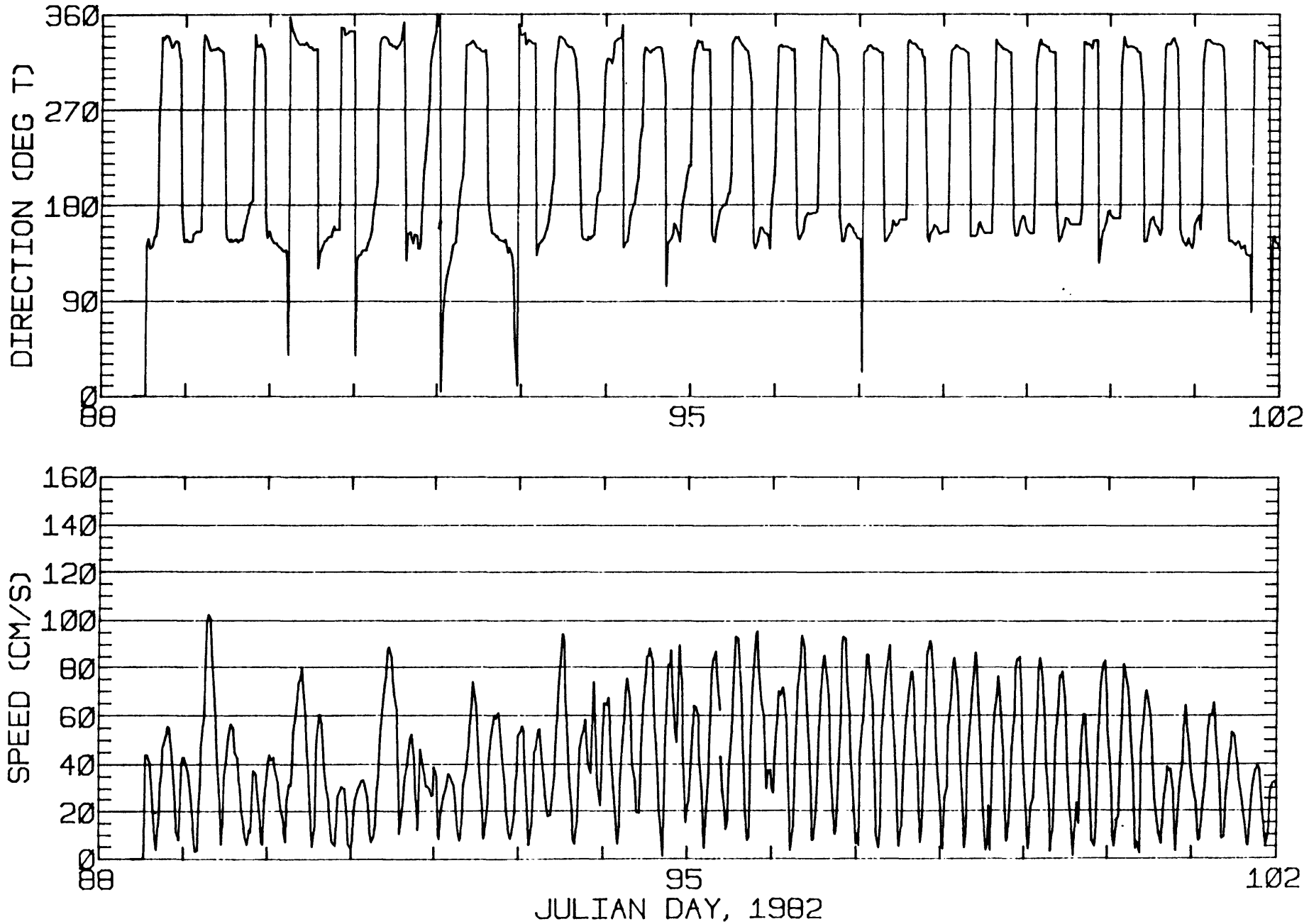
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.59	1.09	152.0	50.8	ANTI-CLOCKWISE
K1	12.07	0.15	149.2	36.6	CLOCKWISE
N2	13.59	0.07	154.0	284.7	ANTI-CLOCKWISE
M2	53.00	2.67	151.3	297.9	CLOCKWISE
S2	20.58	0.03	162.9	291.9	CLOCKWISE
M4	5.55	0.94	132.3	140.7	ANTI-CLOCKWISE

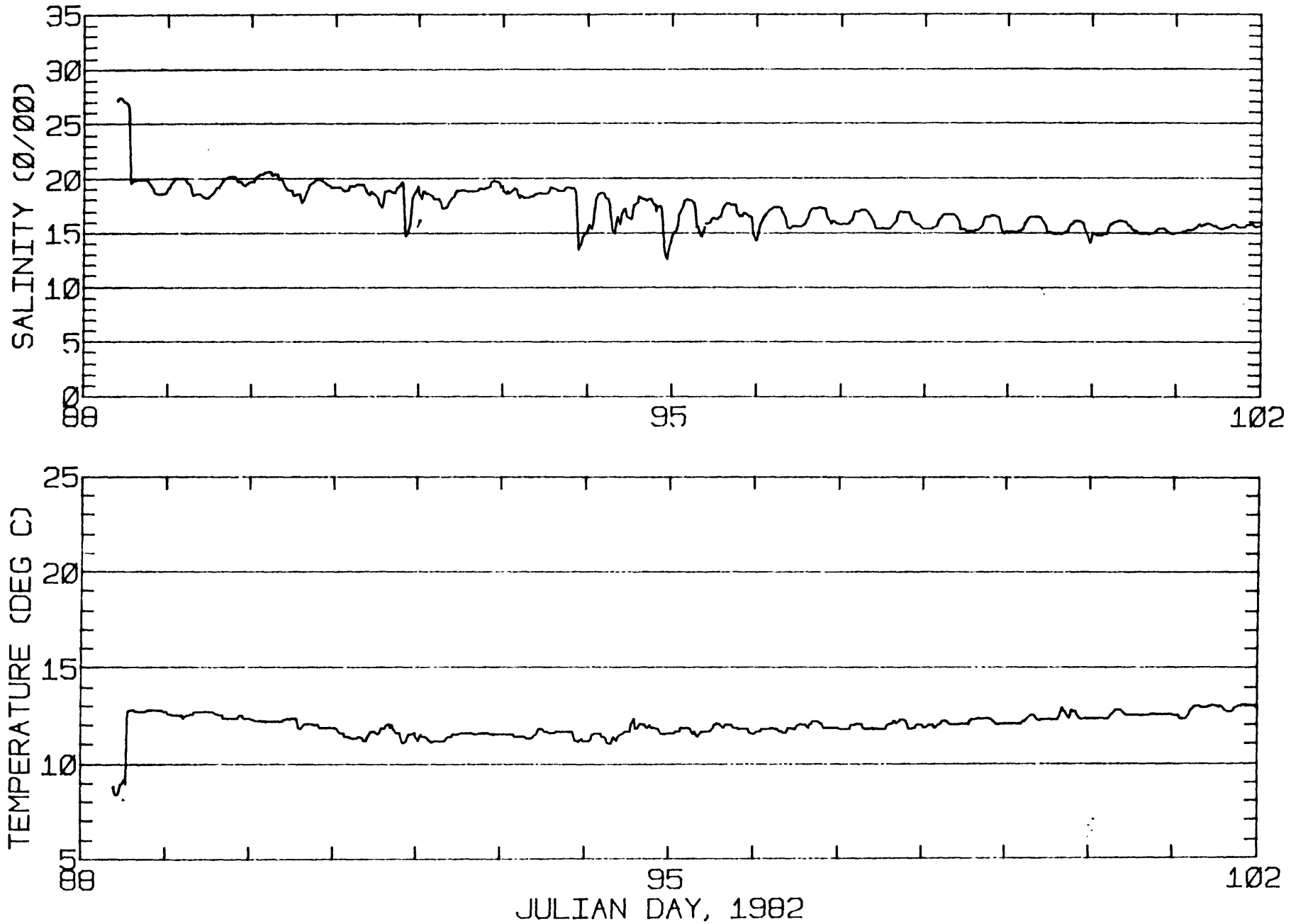
RMS SPEED:	48.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	96.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	30.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	153.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.31
STANDARD DEVIATION U-SERIES:	8.09 CM/SEC
STANDARD DEVIATION V SERIES:	12.55 CM/SEC

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	-3.0	3.8	3236.
2	12	-1.8	-6.7	4023.
3	2	0.5	2.7	3749.
ALL	26	-2.2	-1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38- 4N 122-19- 0W
METER 2.7 METERS ABOVE BED. TAPE NUMBER GS028B2



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38- 4N 122-19- ØW
METER 2.7 METERS ABOVE BED. TAPE NUMBER GSØ28B2

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

CURRENT METER STATION: GS028C1
POSITION: 37 38'18"N 122 19'13"W
METER TYPE: ENDECO
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 3.0 M (BELOW MLLW)
START TIME OF SERIES: 4/18/82 1122 PST JULIAN DAY=108
APPROXIMATE RECORD LENGTH IS 46 M2-CYCLES

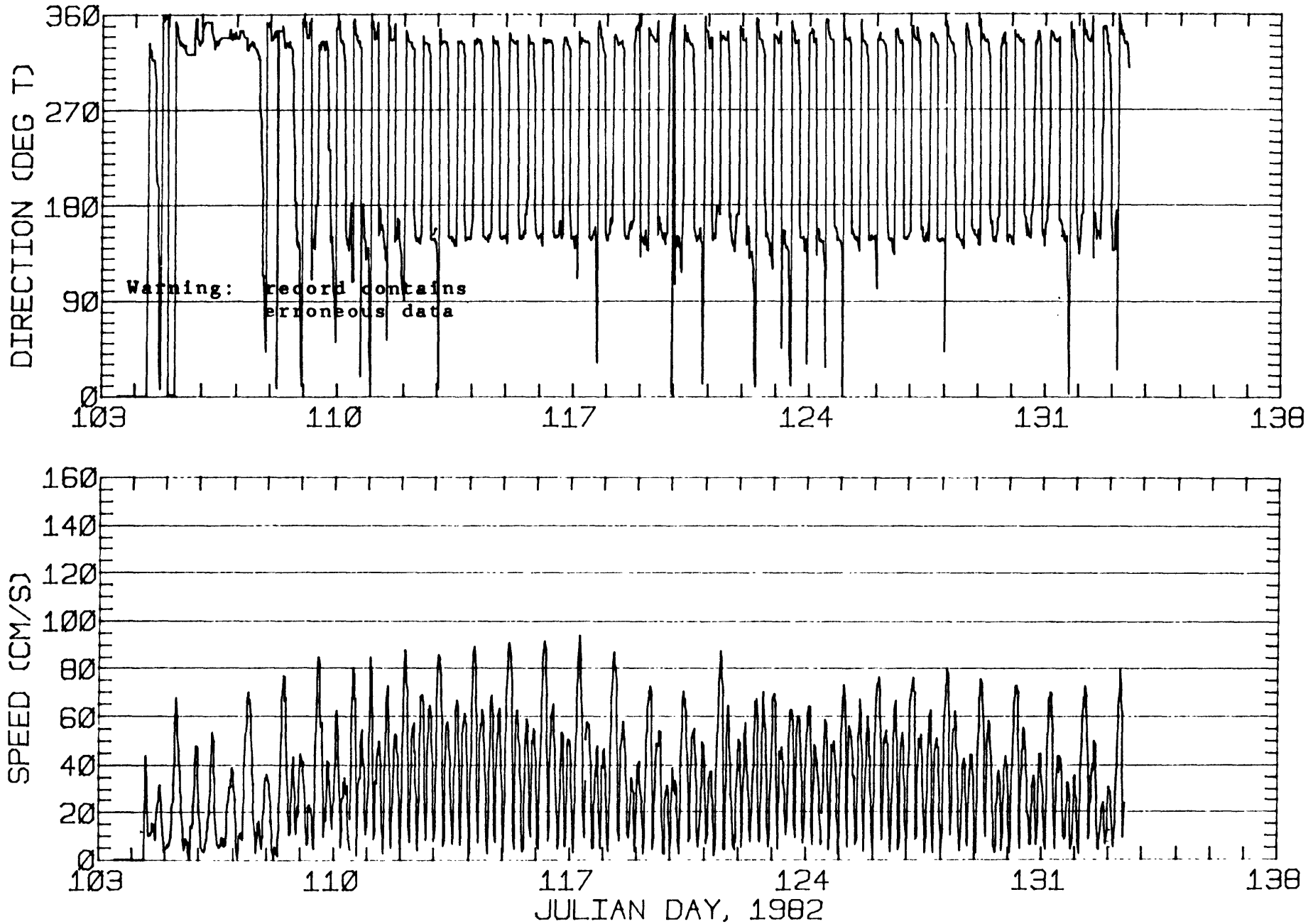
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	10.45	0.19	152.0	46.7	ANTI-CLOCKWISE
K1	12.87	1.20	154.7	27.4	ANTI-CLOCKWISE
N2	9.64	0.16	150.8	276.6	CLOCKWISE
M2	50.24	2.14	154.6	297.3	ANTI-CLOCKWISE
S2	13.98	0.77	148.1	283.3	ANTI-CLOCKWISE
M4	5.89	1.10	160.8	111.0	ANTI-CLOCKWISE

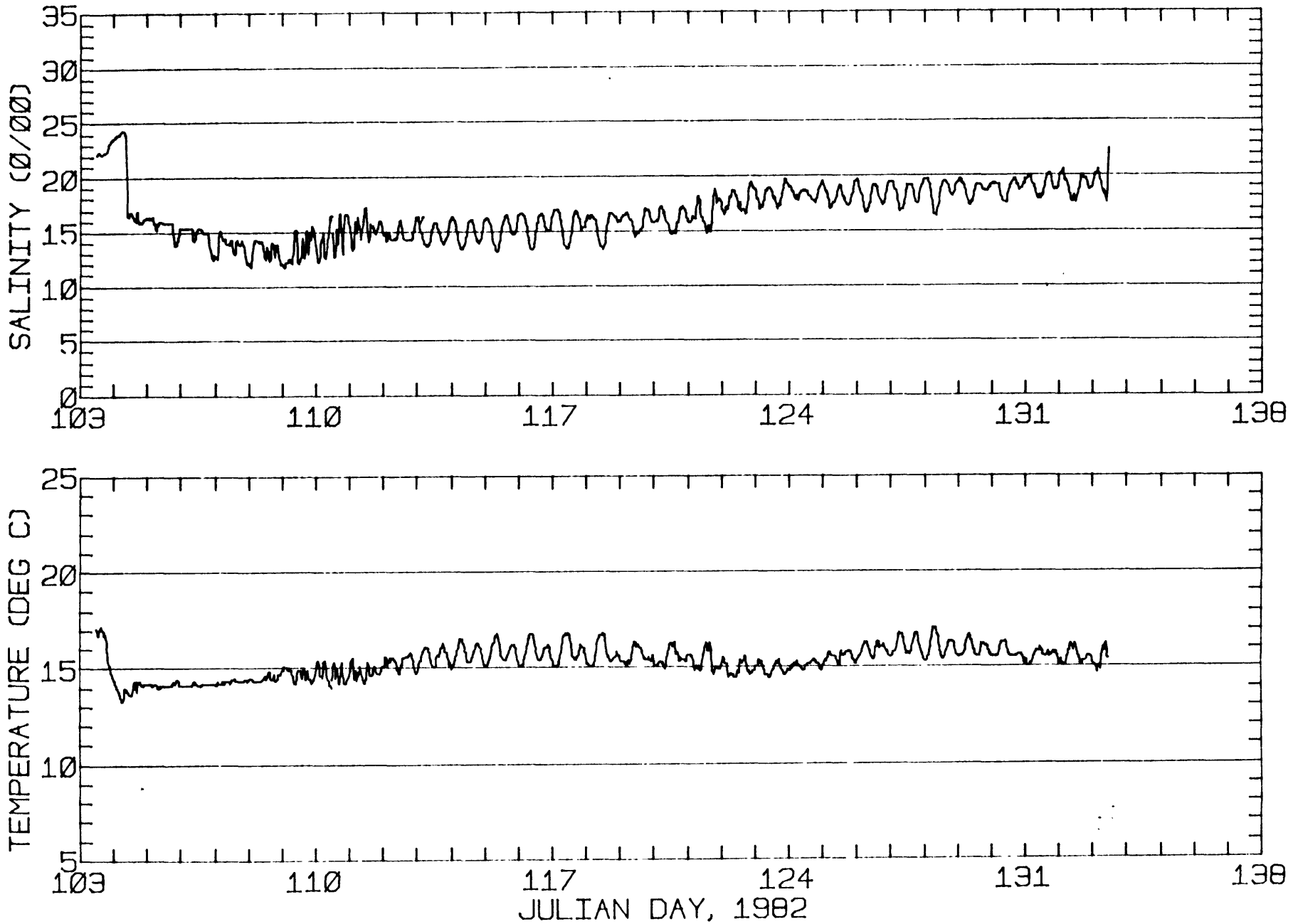
RMS SPEED:	43.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	87.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	33.8 CM/SEC
PRINCIPAL CURRENT DIRECTION:	153.3 DEGREES TRUE
TIDAL FORM NUMBER:	0.36
STANDARD DEVIATION U-SERIES:	5.59 CM/SEC
STANDARD DEVIATION V SERIES:	7.46 CM/SEC

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	-1.6	8.1	4026.
2	12	-0.4	4.3	2517.
3	12	1.0	4.7	2309.
4	10	-0.6	4.1	1967.
ALL	46	-0.4	5.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-18N 122-19-13W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS028C1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-18N 122-19-13W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS028C1

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

CURRENT METER STATION: GS028C2
POSITION: 37 38'18"N 122 19'13"W
METER TYPE: ENDECO
WATER DEPTH: 9.1 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 4/20/82 1122 PST JULIAN DAY=110
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

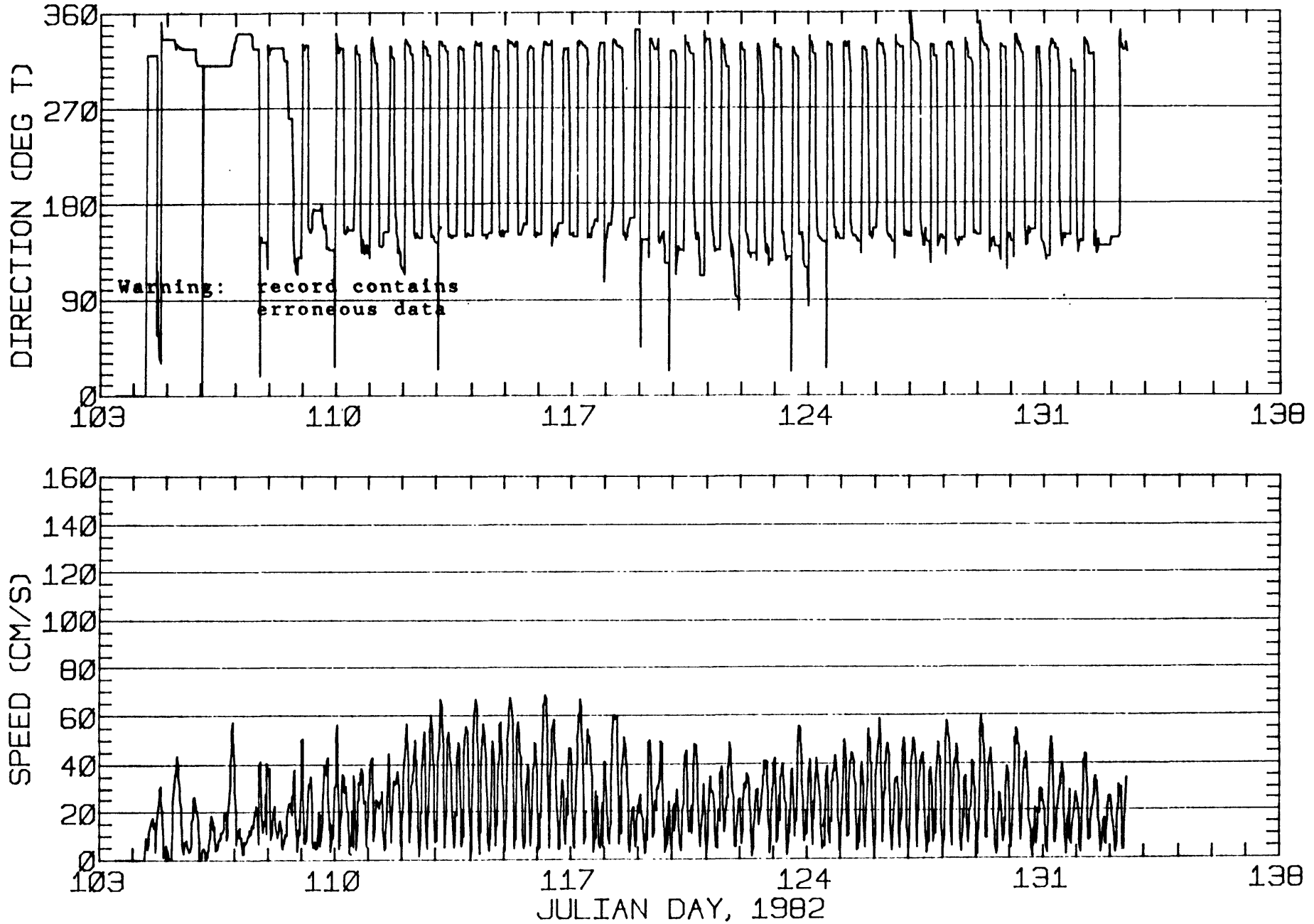
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.71	0.39	150.9	57.9	CLOCKWISE
K1	10.04	0.73	153.0	13.6	ANTI-CLOCKWISE
N2	6.88	0.05	148.2	294.7	ANTI-CLOCKWISE
M2	32.65	2.42	149.4	305.2	ANTI-CLOCKWISE
S2	9.81	0.12	142.3	295.7	CLOCKWISE
M4	4.41	1.02	148.3	163.8	ANTI-CLOCKWISE

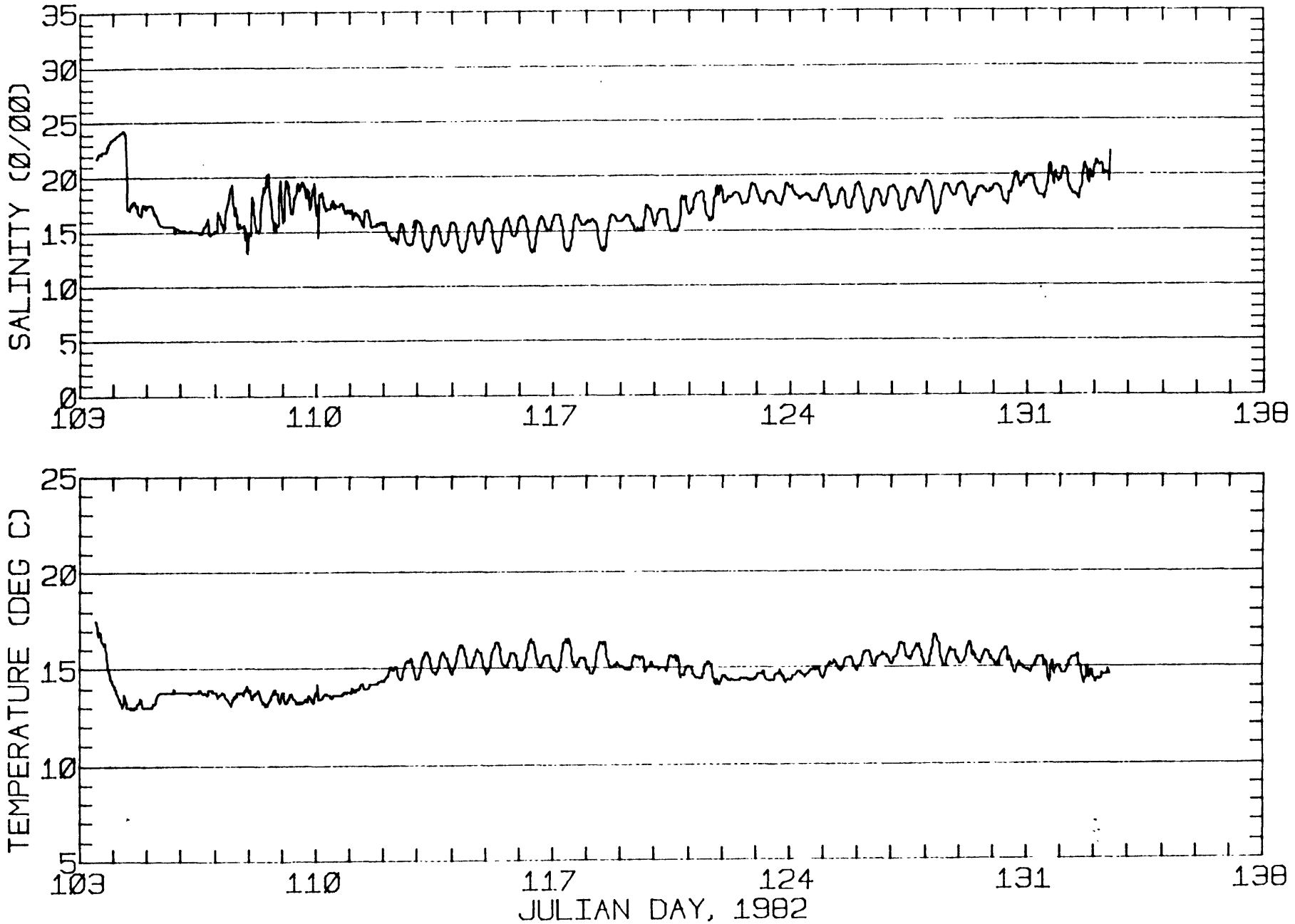
RMS SPEED: 31.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 59.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 19.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 149.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.39
STANDARD DEVIATION U-SERIES: 7.46 CM/SEC
STANDARD DEVIATION V SERIES: 11.01 CM/SEC

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	-0.1	-1.5	3329.
2	12	1.4	-1.4	2414.
3	12	1.5	-2.8	2224.
4	6	0.9	-1.2	1899.
ALL	42	0.9	-1.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-18N 122-19-13W
METER 2.7 METERS ABOVE BED. TAPE NUMBER GS028C2



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-18N 122-19-13W
METER 2.7 METERS ABOVE BED. TAPE NUMBER GS028C2

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

CURRENT METER STATION: GS028D1
POSITION: 37 38'20"N 122 19'10"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 2.4 M (BELOW MLLW)
START TIME OF SERIES: 5/13/82 1438 PST JULIAN DAY=133
APPROXIMATE RECORD LENGTH IS 50 M2-CYCLES

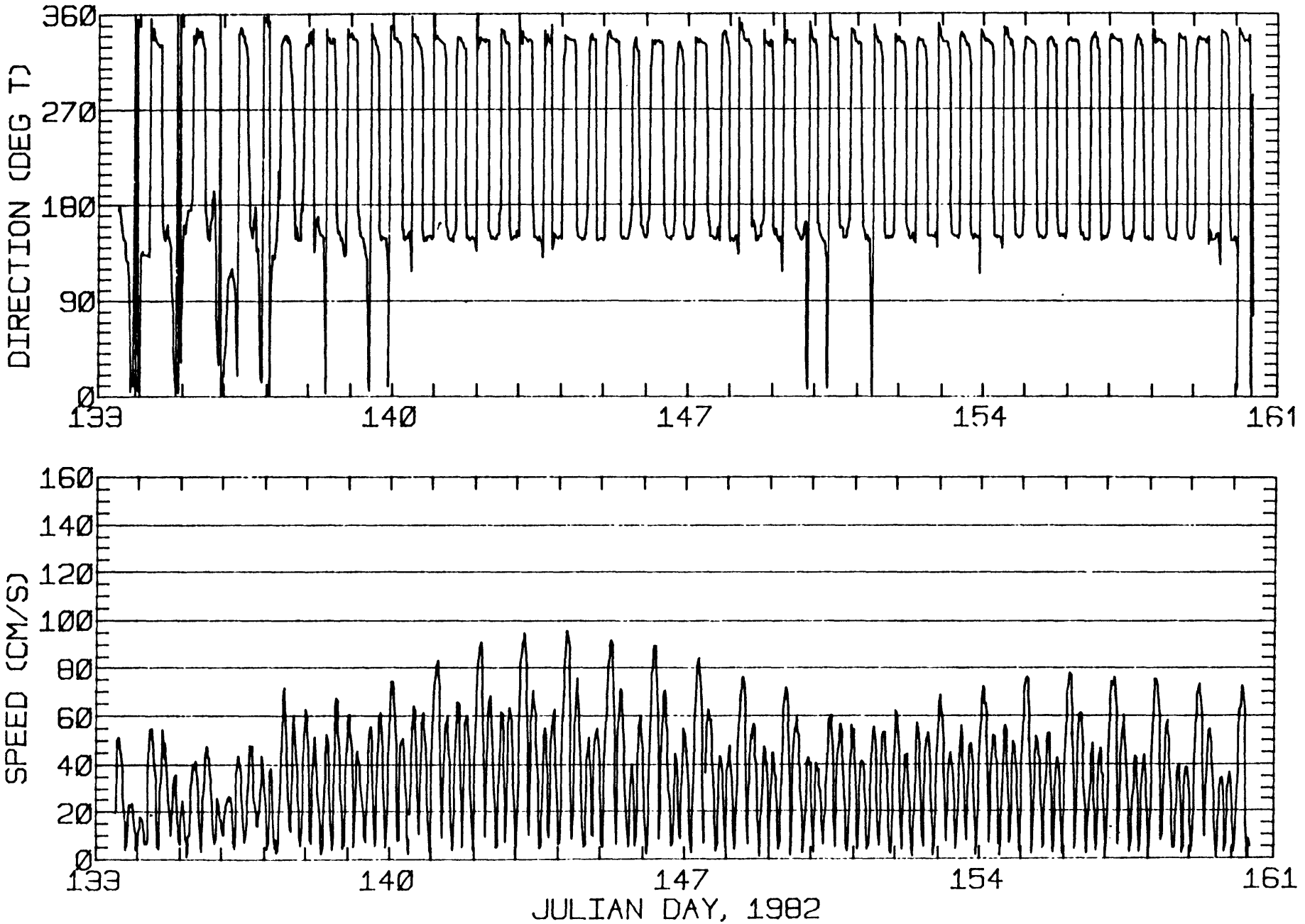
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	9.55	0.14	148.6	43.1	ANTI-CLOCKWISE
K1	16.15	0.64	155.1	29.1	ANTI-CLOCKWISE
N2	12.38	0.22	150.6	279.7	CLOCKWISE
M2	51.13	1.39	153.8	294.8	ANTI-CLOCKWISE
S2	9.82	0.09	147.7	281.6	ANTI-CLOCKWISE
M4	5.63	1.75	152.9	126.3	ANTI-CLOCKWISE

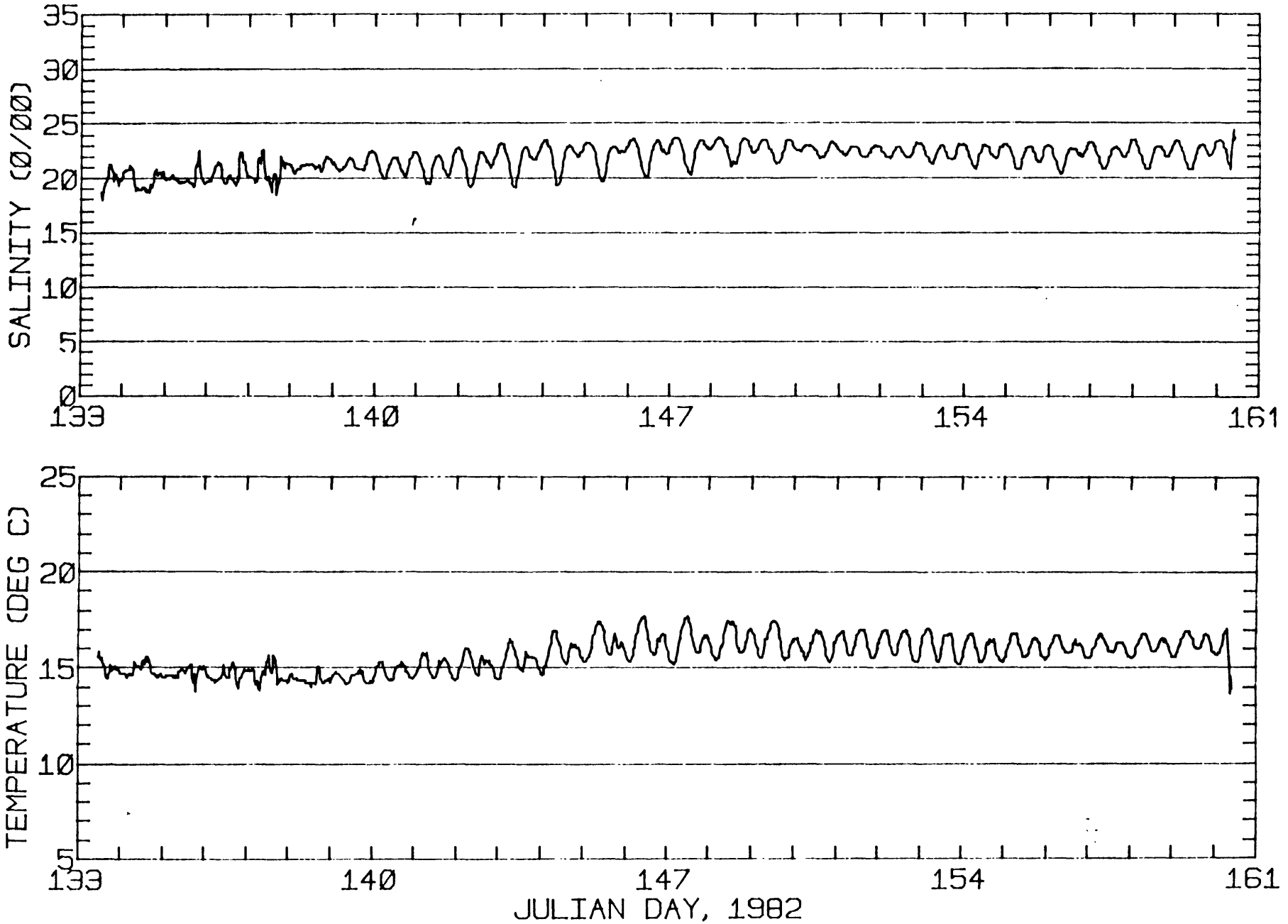
RMS SPEED: 42.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 86.6 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 34.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 152.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.42
STANDARD DEVIATION U-SERIES: 4.53 CM/SEC
STANDARD DEVIATION V SERIES: 6.20 CM/SEC

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	2.3	2.1	1529.
2	12	-0.2	5.0	1293.
3	12	-0.7	3.5	1249.
4	12	-1.7	5.7	1045.
5	2	0.3	3.5	882.
ALL	50	-0.0	4.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-20N 122-19-10W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS028D1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-20N 122-19-10W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS028D1

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

CURRENT METER STATION: GS028D2
POSITION: 37 38'20"N 122 19'10"W
METER TYPE: ENDECO
WATER DEPTH: 8.5 M (MLLW)
METER DEPTH: 5.7 M (BELOW MLLW)
START TIME OF SERIES: 5/18/82 1230 PST JULIAN DAY=138
APPROXIMATE RECORD LENGTH IS 40 M2-CYCLES

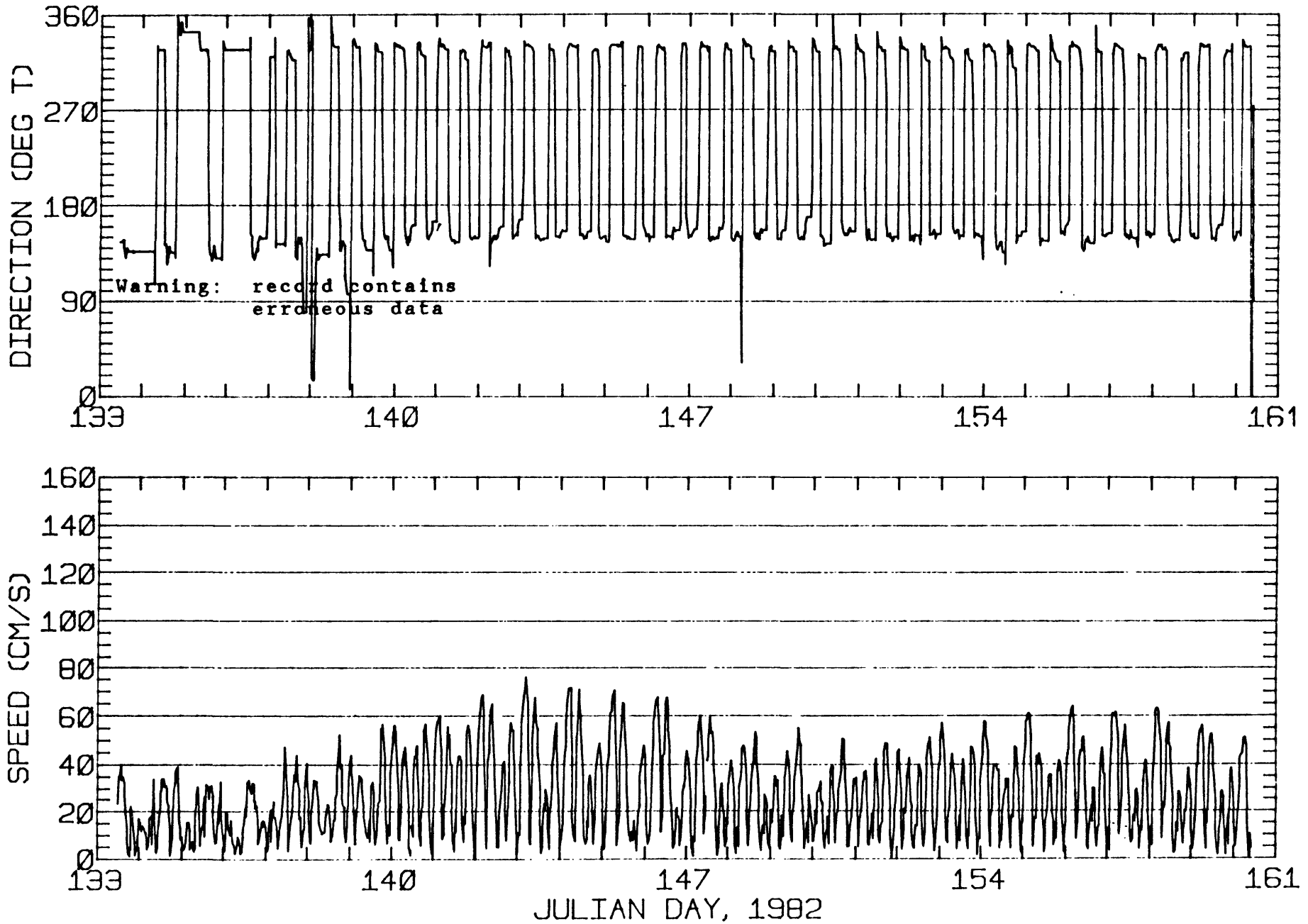
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.05	0.44	148.5	61.8	CLOCKWISE
K1	14.39	0.41	152.0	44.0	CLOCKWISE
N2	10.07	0.13	150.4	307.1	CLOCKWISE
M2	35.56	1.47	150.1	331.8	ANTI-CLOCKWISE
S2	9.82	0.10	145.9	317.6	ANTI-CLOCKWISE
M4	5.44	0.91	151.5	211.6	ANTI-CLOCKWISE

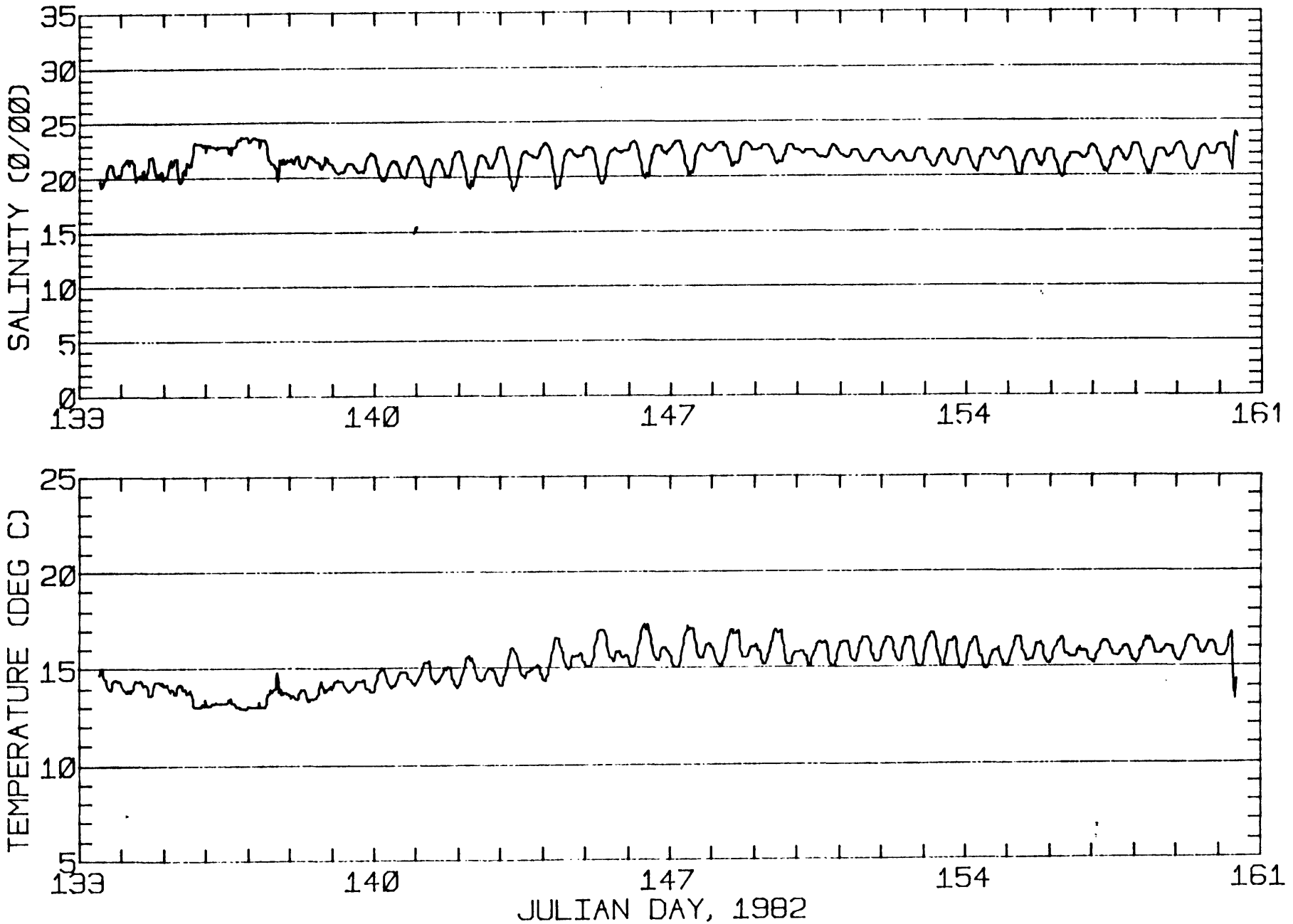
RMS SPEED: 34.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 67.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 19.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 149.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.49
STANDARD DEVIATION U-SERIES: 6.51 CM/SEC
STANDARD DEVIATION V SERIES: 9.56 CM/SEC

TIME AVERAGED 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	-2.3	1324.
2	12	1.3	-4.9	1253.
3	12	-1.1	-0.1	1133.
4	4	-1.6	-0.4	880.
ALL	40	0.2	-2.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-20N 122-19-10W
METER 2.7 METERS ABOVE BED. TAPE NUMBER GS028D2



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
SAN BRUNO SHOAL 37-38-20N 122-19-10W
METER 2.7 METERS ABOVE BED. TAPE NUMBER GS028D2

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

CURRENT METER STATION: GS028E1
POSITION: 37 38' 7"N 122 19'17"W
METER TYPE: ENDECO
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 2.7 M (BELOW MLLW)
START TIME OF SERIES: 4/21/83 1330 PST JULIAN DAY=111
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

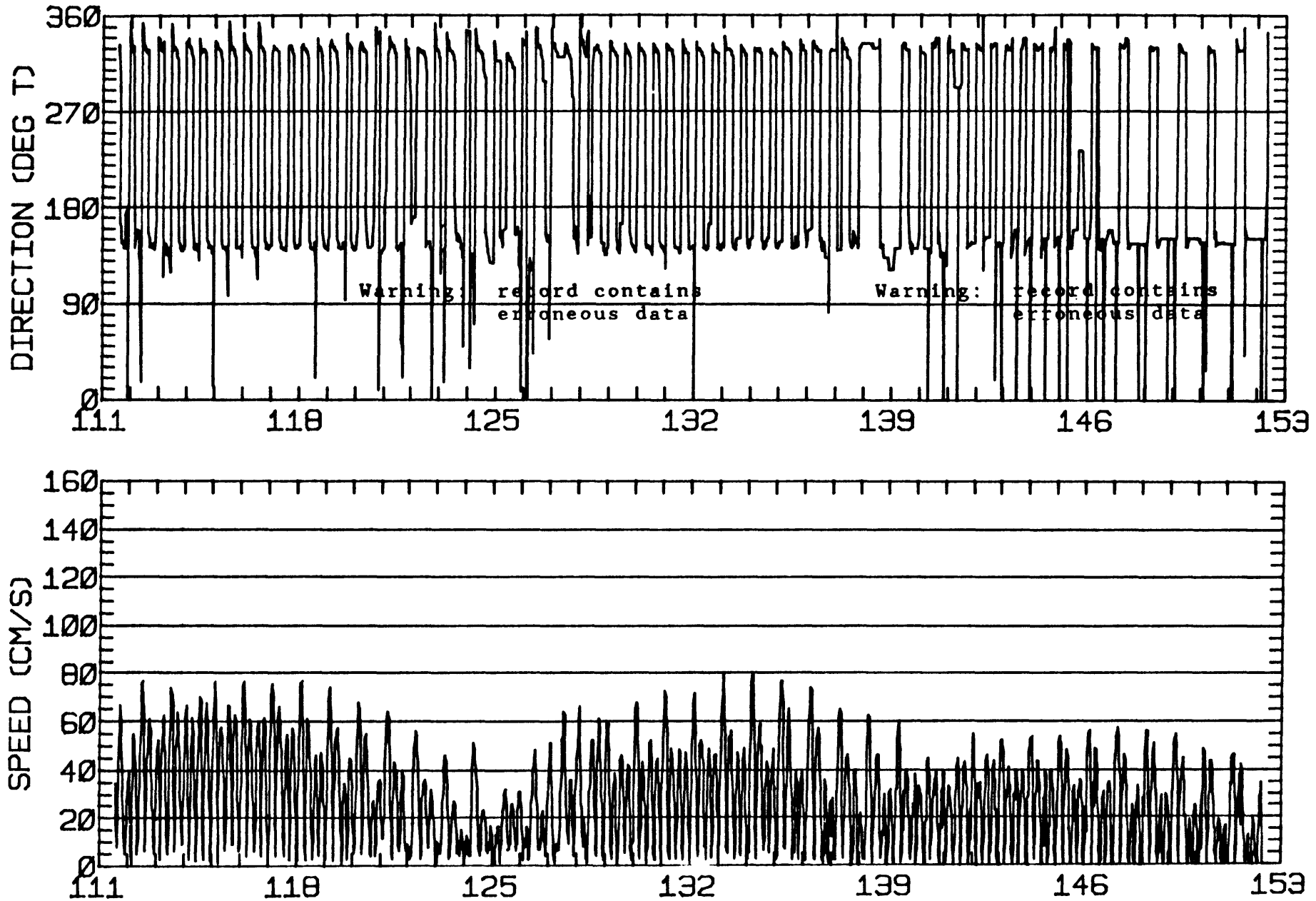
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.83	0.27	142.7	41.5	ANTI-CLOCKWISE
K1	10.83	0.04	148.1	18.7	CLOCKWISE
N2	8.99	0.75	145.6	279.8	CLOCKWISE
M2	46.51	1.20	148.1	293.6	ANTI-CLOCKWISE
S2	15.85	0.18	144.5	281.4	ANTI-CLOCKWISE
M4	3.98	1.08	139.5	143.1	ANTI-CLOCKWISE

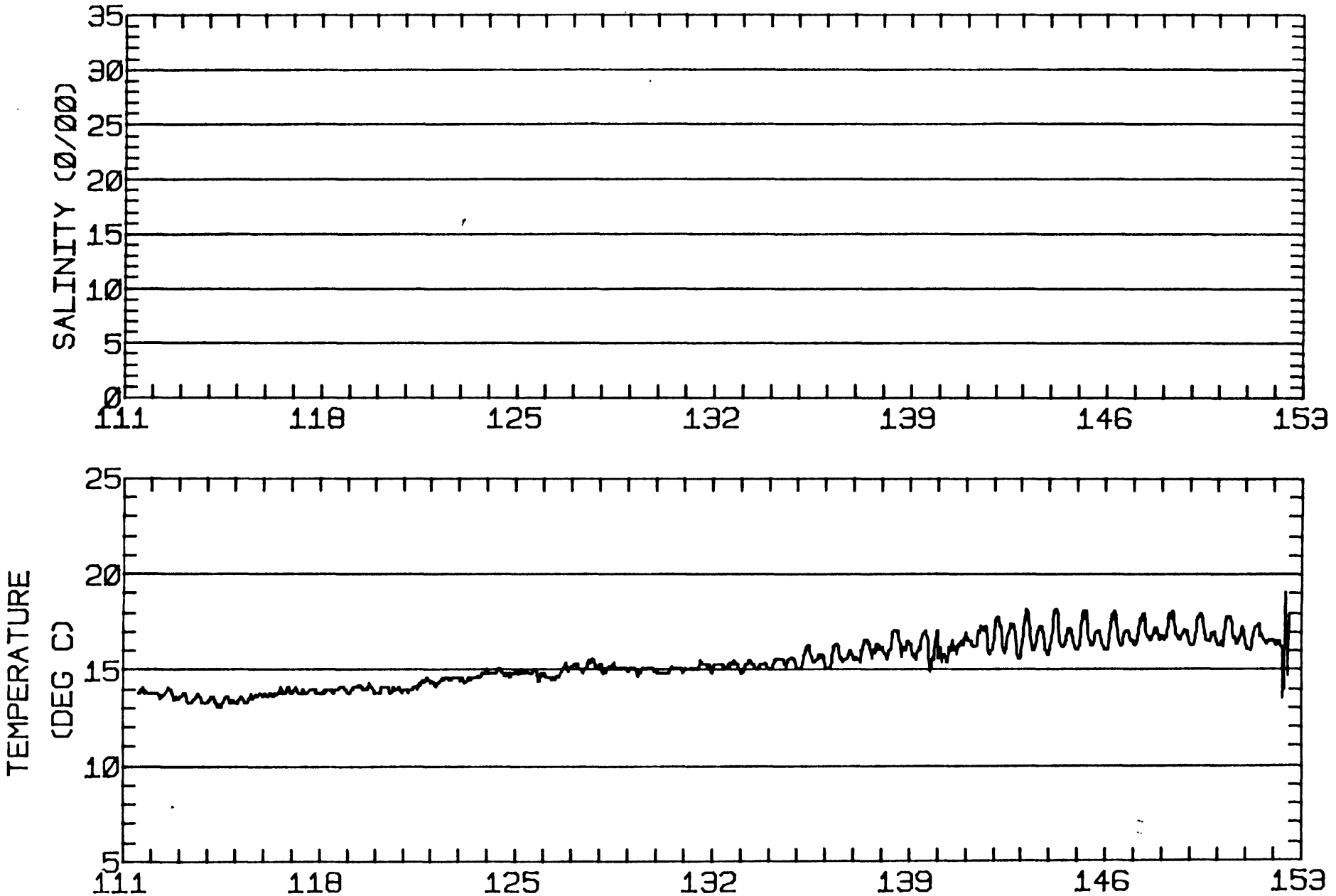
RMS SPEED: 38.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 82.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 146.8 DEGREES TRUE
TIDAL FORM NUMBER: 0.32
STANDARD DEVIATION U-SERIES: 5.13 CM/SEC
STANDARD DEVIATION V SERIES: 6.72 CM/SEC

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	1.1	1.8	2698.
2	12	-0.4	3.0	3358.
3	4	-3.3	4.9	3377.
ALL	28	-0.2	2.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 28E1 37-38- 7N 122-19-17W
METER 006.1 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 28E1 37-38- 7N 122-19-17W
METER 006.1 METERS ABOVE BED. WATER DEPTH 008.8 METERS.

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

CURRENT METER STATION: GS028E2
POSITION: 37 38' 7"N 122 19'17"W
METER TYPE: ENDECO
WATER DEPTH: 8.8 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 4/21/83 1330 PST JULIAN DAY=111
APPROXIMATE RECORD LENGTH IS 24 M2-CYCLES

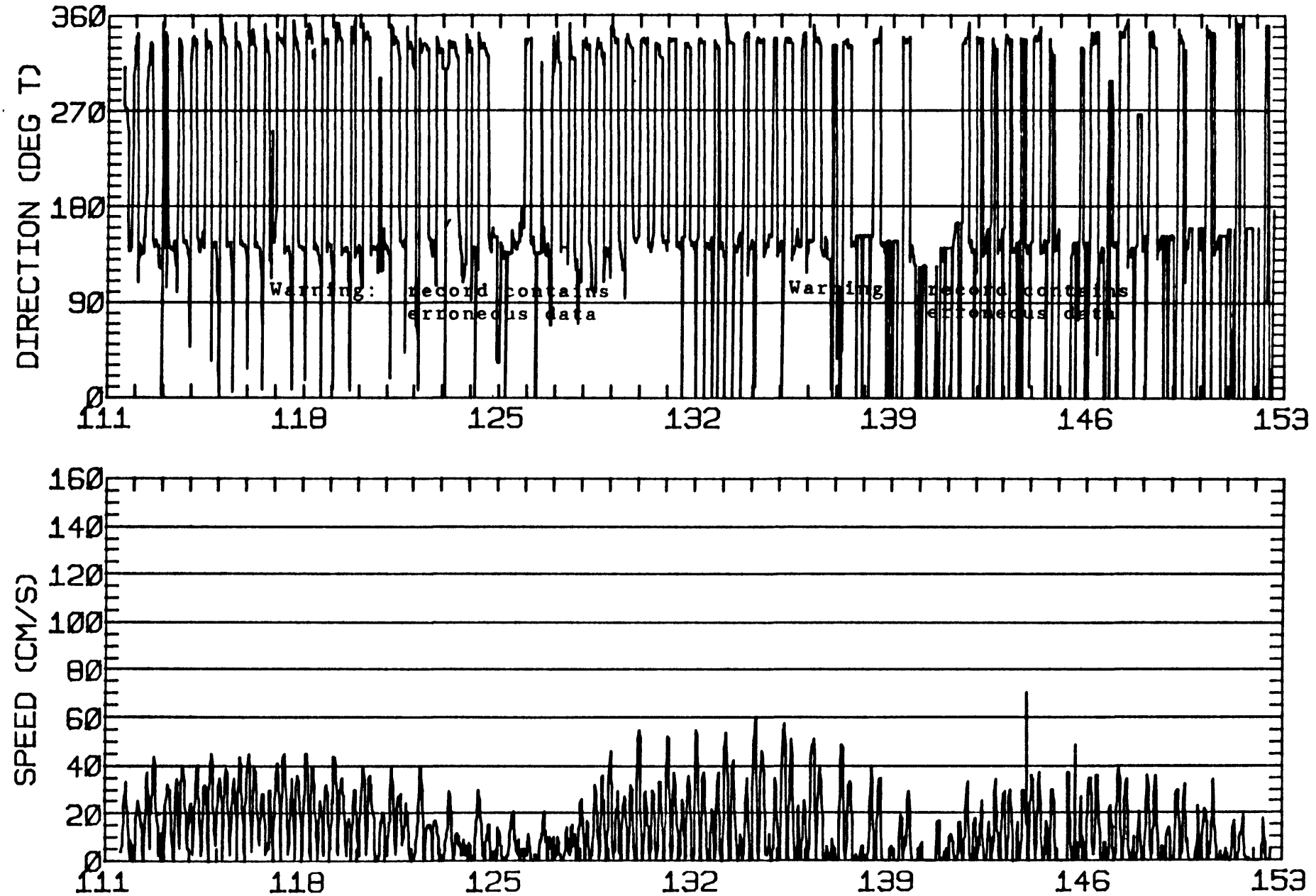
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.31	0.39	144.3	43.4	CLOCKWISE
K1	5.30	0.10	162.4	17.9	ANTI-CLOCKWISE
N2	4.98	0.49	159.0	247.2	ANTI-CLOCKWISE
M2	23.37	1.60	149.2	288.6	ANTI-CLOCKWISE
S2	9.25	0.06	152.3	286.9	CLOCKWISE
M4	2.15	0.48	165.0	106.2	ANTI-CLOCKWISE

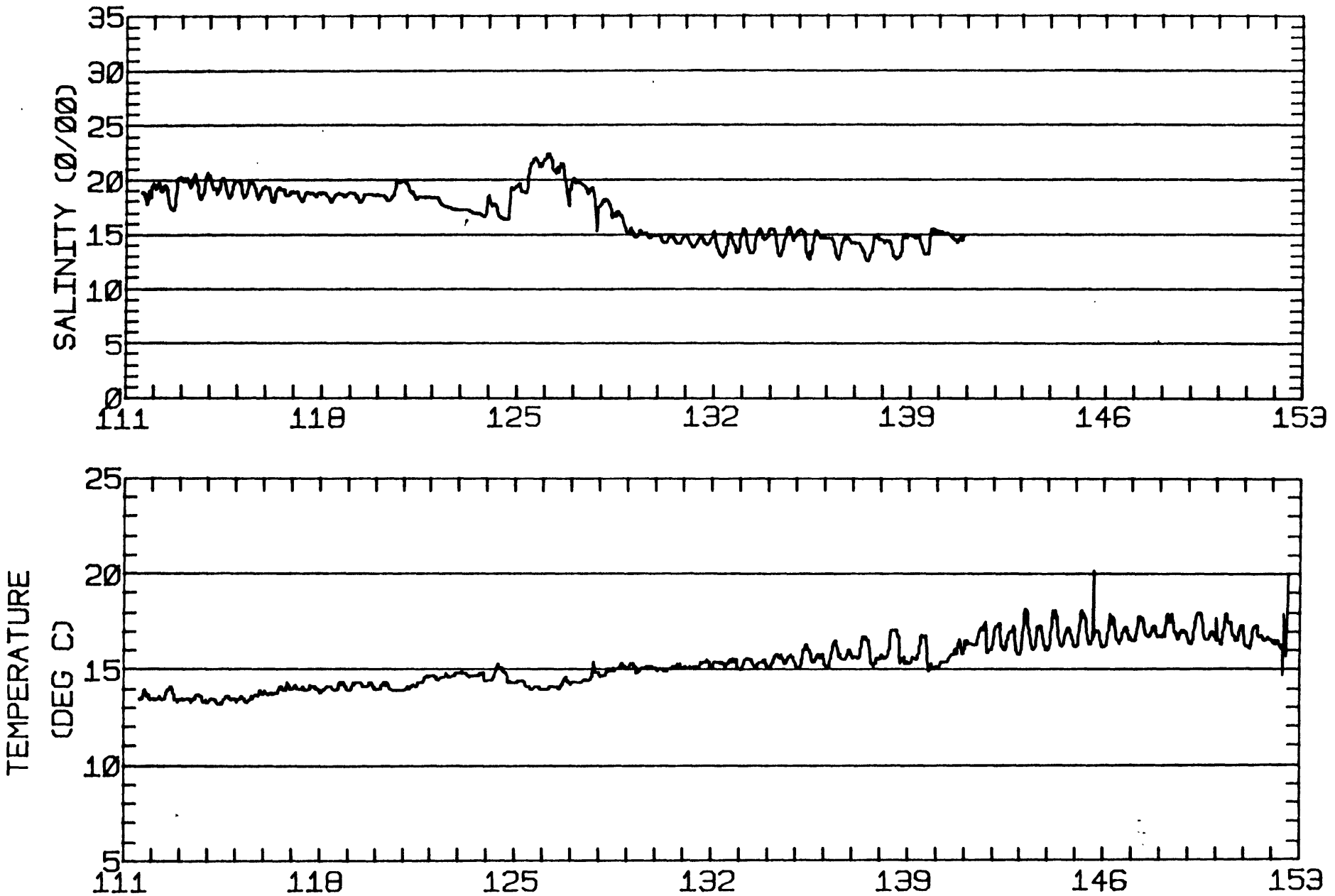
RMS SPEED:	22.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	44.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	15.1 CM/SEC
PRINCIPAL CURRENT DIRECTION:	150.7 DEGREES TRUE
TIDAL FORM NUMBER:	0.36
STANDARD DEVIATION U-SERIES:	5.61 CM/SEC
STANDARD DEVIATION V SERIES:	6.30 CM/SEC

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	3.3	-1.3	2698.
2	12	1.9	1.9	3358.
ALL	24	2.6	0.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 28E2 37-38- 7N 122-19-17W
METER 002.4 METERS ABOVE BED. WATER DEPTH 008.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 28E2 37-38- 7N 122-19-17W
METER 002.4 METERS ABOVE BED. WATER DEPTH 008.8 METERS.

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

CURRENT METER STATION: GS029A1
POSITION: 37 35'26"N 122 16' 5"W
METER TYPE: ENDECO
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 1/27/82 1256 PST JULIAN DAY= 27
APPROXIMATE RECORD LENGTH IS 48 M2-CYCLES

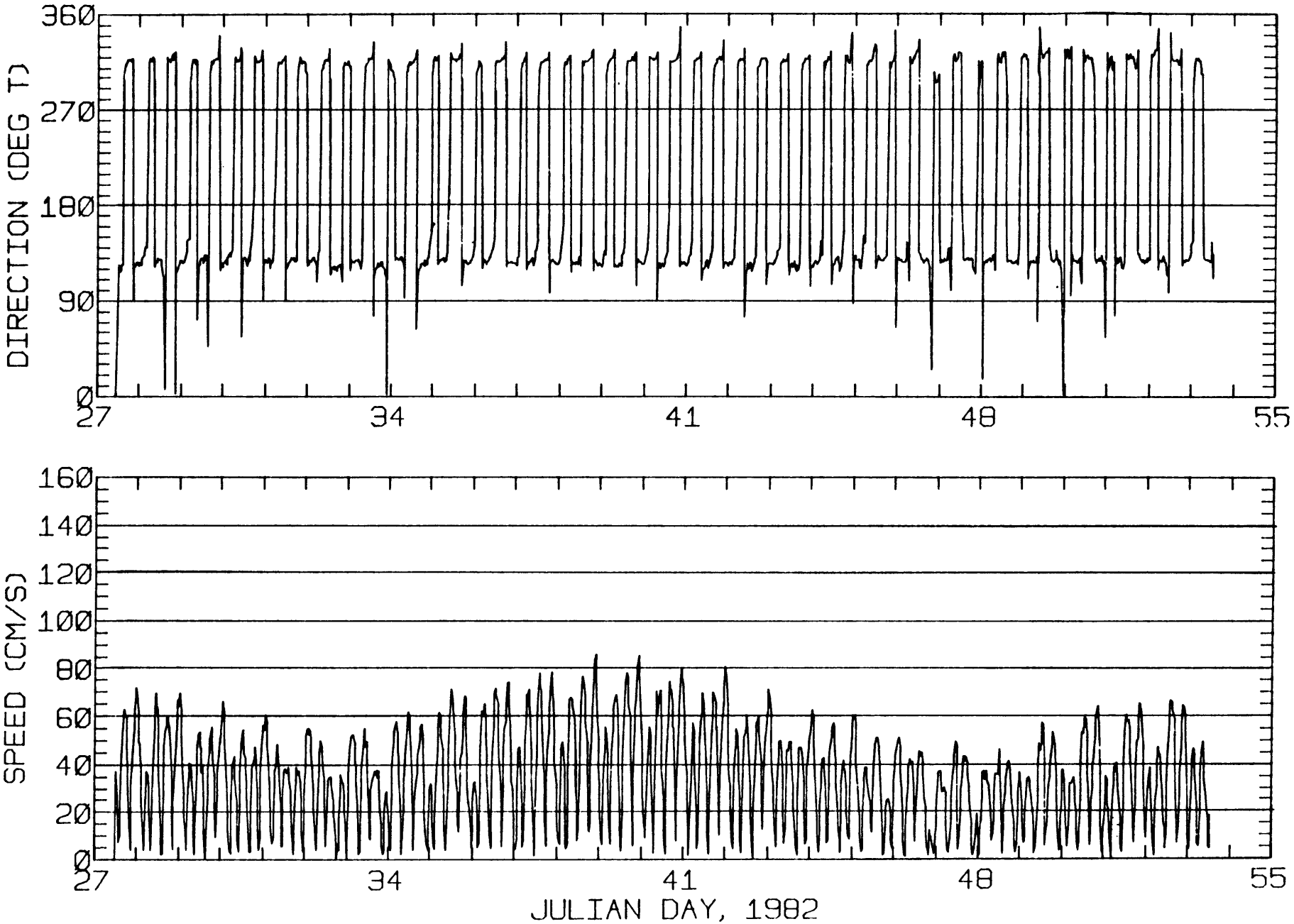
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.43	0.47	134.3	26.1	CLOCKWISE
K1	13.77	0.65	134.0	58.3	CLOCKWISE
N2	8.23	0.51	127.0	262.8	CLOCKWISE
M2	50.63	1.31	130.7	288.8	CLOCKWISE
S2	12.89	0.25	127.8	320.8	CLOCKWISE
M4	4.38	0.77	146.8	87.7	ANTI-CLOCKWISE

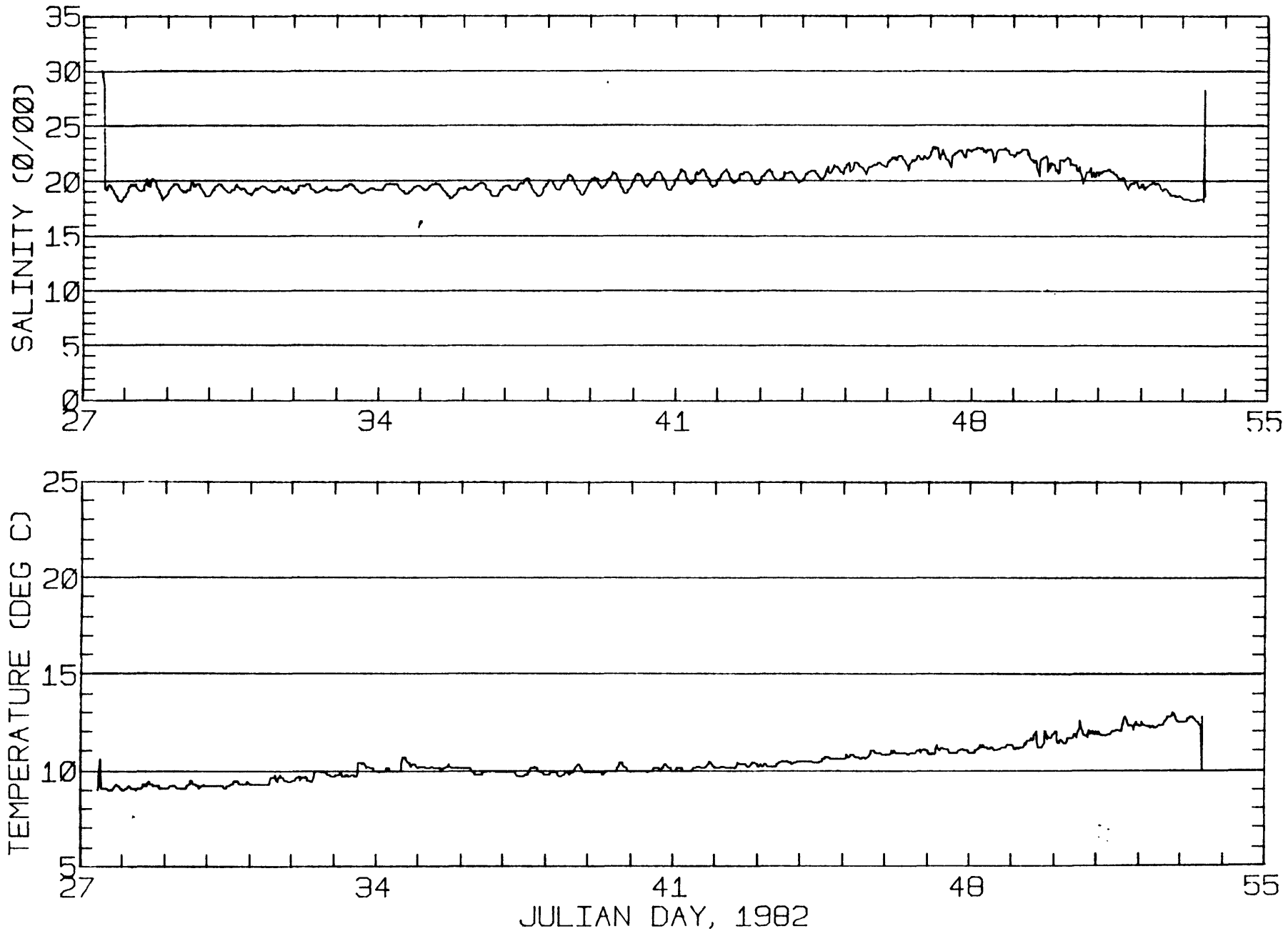
RMS SPEED: 40.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 84.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 131.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.33
STANDARD DEVIATION U-SERIES: 5.64 CM/SEC
STANDARD DEVIATION V SERIES: 5.81 CM/SEC

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	6.4	-1.8	1758.
2	12	7.1	-1.7	1304.
3	12	9.0	-3.1	851.
4	12	5.7	-1.6	4464.
ALL	48	7.1	-2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-26N 122-16- 5W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS029A1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-26N 122-16- 5W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS029A1

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

CURRENT METER STATION: GS029A2
POSITION: 37 35'26"N 122 16' 5"W
METER TYPE: ENDECO
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 10.3 M (BELOW MLLW)
START TIME OF SERIES: 2/ 5/82 948 PST JULIAN DAY= 36
APPROXIMATE RECORD LENGTH IS 16 M2-CYCLES

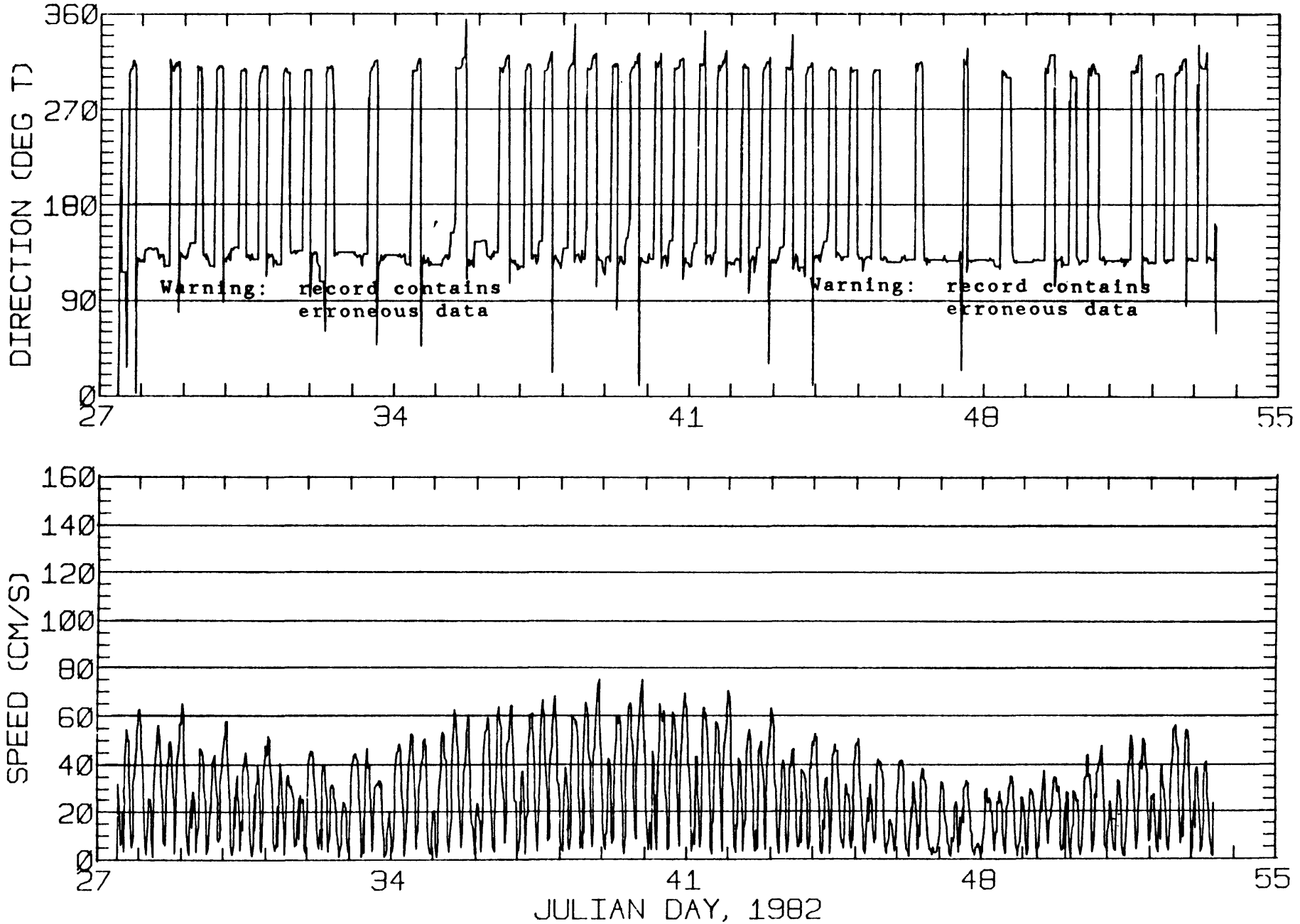
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.30	0.80	125.6	41.3	CLOCKWISE
K1	12.57	1.57	127.8	64.2	CLOCKWISE
N2	10.28	1.18	135.9	282.5	CLOCKWISE
M2	39.28	0.62	129.4	288.1	ANTI-CLOCKWISE
S2	10.18	1.25	127.9	332.3	CLOCKWISE
M4	8.04	0.36	137.5	139.2	CLOCKWISE

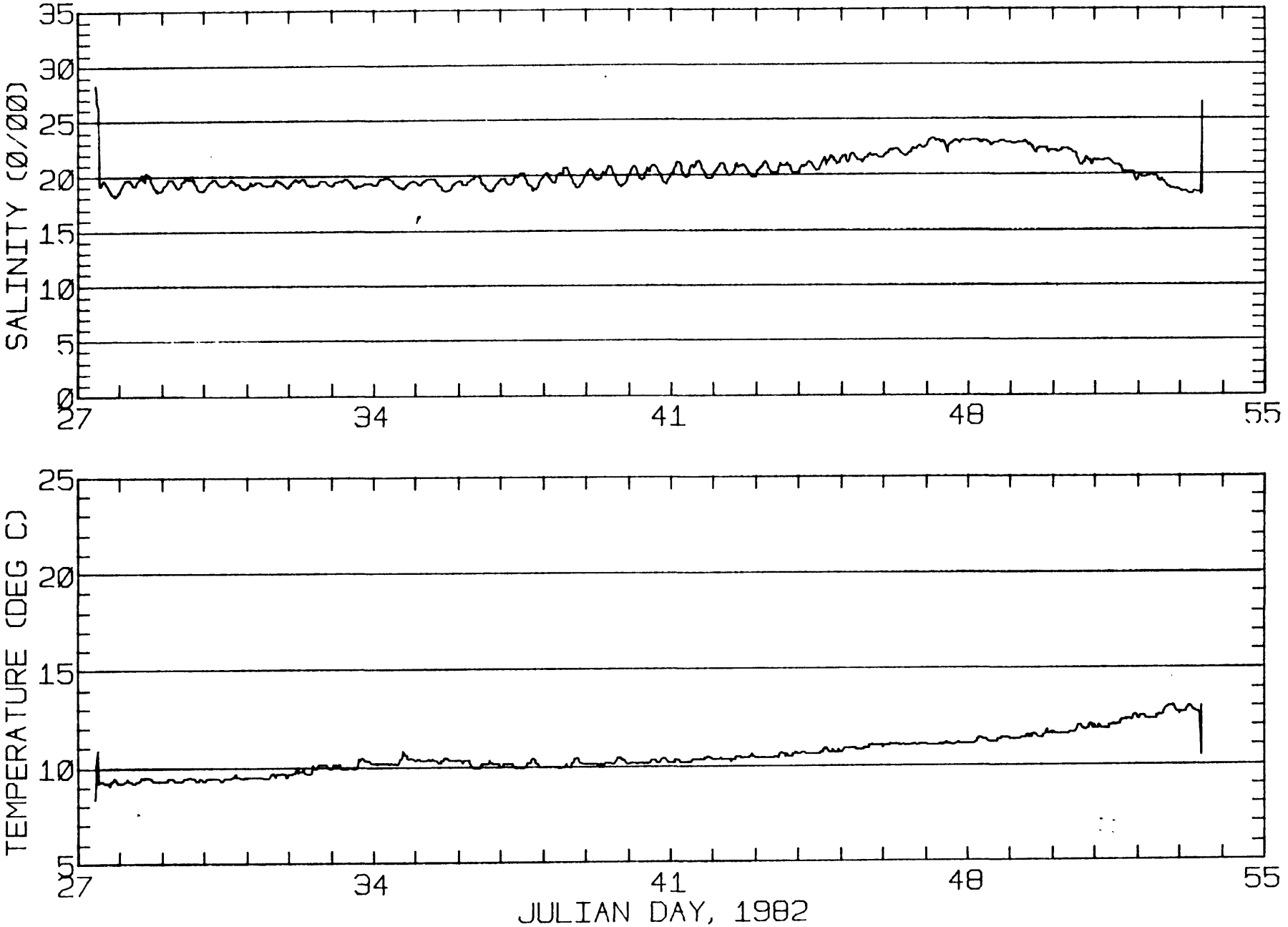
RMS SPEED: 40.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 69.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 23.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 128.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.40
STANDARD DEVIATION U-SERIES: 7.92 CM/SEC
STANDARD DEVIATION V SERIES: 6.49 CM/SEC

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	8.0	-5.3	1039.
2	4	7.7	-6.5	823.
ALL	16	7.9	-5.6	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-26N 122-16- 5W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS029A2



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-26N 122-16- 5W
METER 2.7 METERS ABOVE BED TAPE NUMBER GS029A2

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

CURRENT METER STATION: GS029B1
POSITION: 37 35'24"N 122 16' 0"W
METER TYPE: ENDECO
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 2/22/82 1452 PST JULIAN DAY= 53
APPROXIMATE RECORD LENGTH IS 42 M2-CYCLES

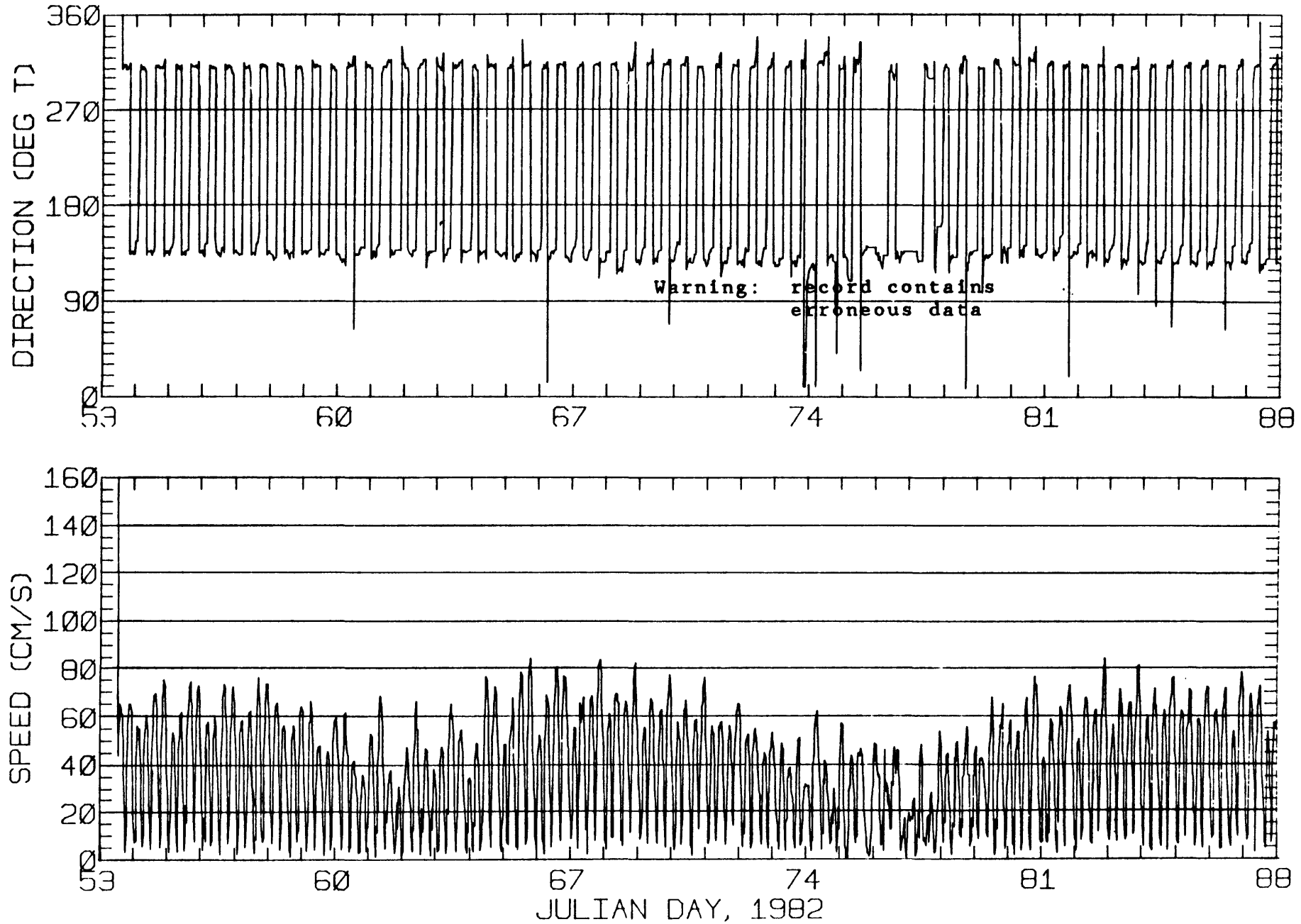
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.95	0.33	132.6	29.2	ANTI-CLOCKWISE
K1	11.78	0.29	132.8	51.4	ANTI-CLOCKWISE
N2	8.55	1.27	139.0	282.3	CLOCKWISE
M2	48.71	0.22	130.8	295.6	CLOCKWISE
S2	16.60	0.55	129.2	307.0	CLOCKWISE
M4	5.23	0.29	132.4	113.2	ANTI-CLOCKWISE

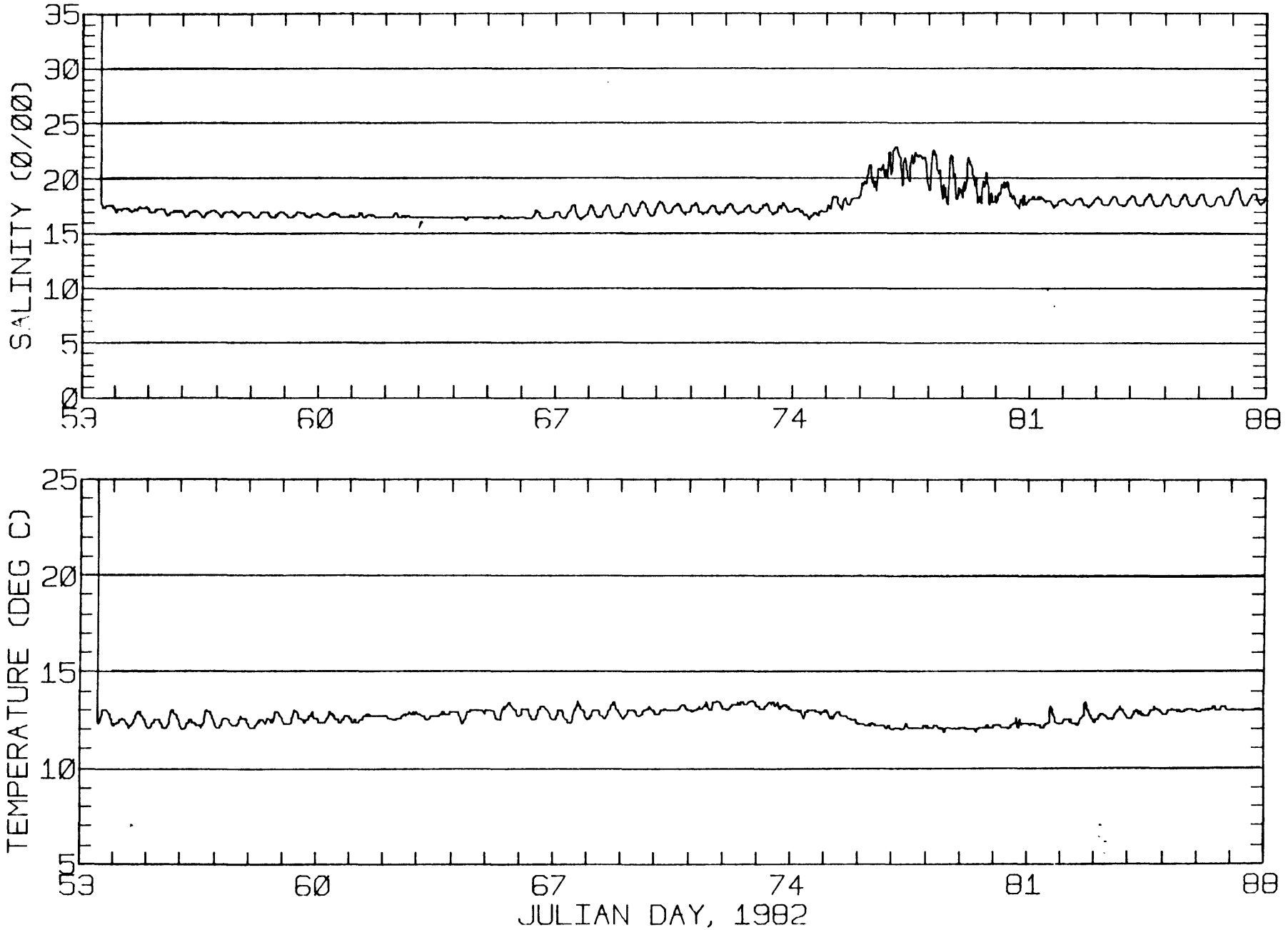
RMS SPEED:	42.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	84.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	27.3 CM/SEC
PRINCIPAL CURRENT DIRECTION:	130.9 DEGREES TRUE
TIDAL FORM NUMBER:	0.29
STANDARD DEVIATION U-SERIES:	9.06 CM/SEC
STANDARD DEVIATION V SERIES:	8.14 CM/SEC

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	-0.2	-2.0	3549.
2	12	2.2	-3.0	2653.
3	12	6.9	-4.5	2153.
4	6	3.5	-0.0	2304.
ALL	42	3.0	-2.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-24N 122-16- 0W
METER 6.1 METERS ABOVE BED TAPE NUMBER GS029B1



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-24N 122-16- 0W
METER **6.1 METERS ABOVE BED** TAPE NUMBER GS029B1

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

CURRENT METER STATION: GS029B2
POSITION: 37 35'24"N 122 16' 0"W
METER TYPE: ENDECO
WATER DEPTH: 13.1 M (MLLW)
METER DEPTH: 10.3 M (BELOW MLLW)
START TIME OF SERIES: 2/22/82 1452 PST JULIAN DAY= 53
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

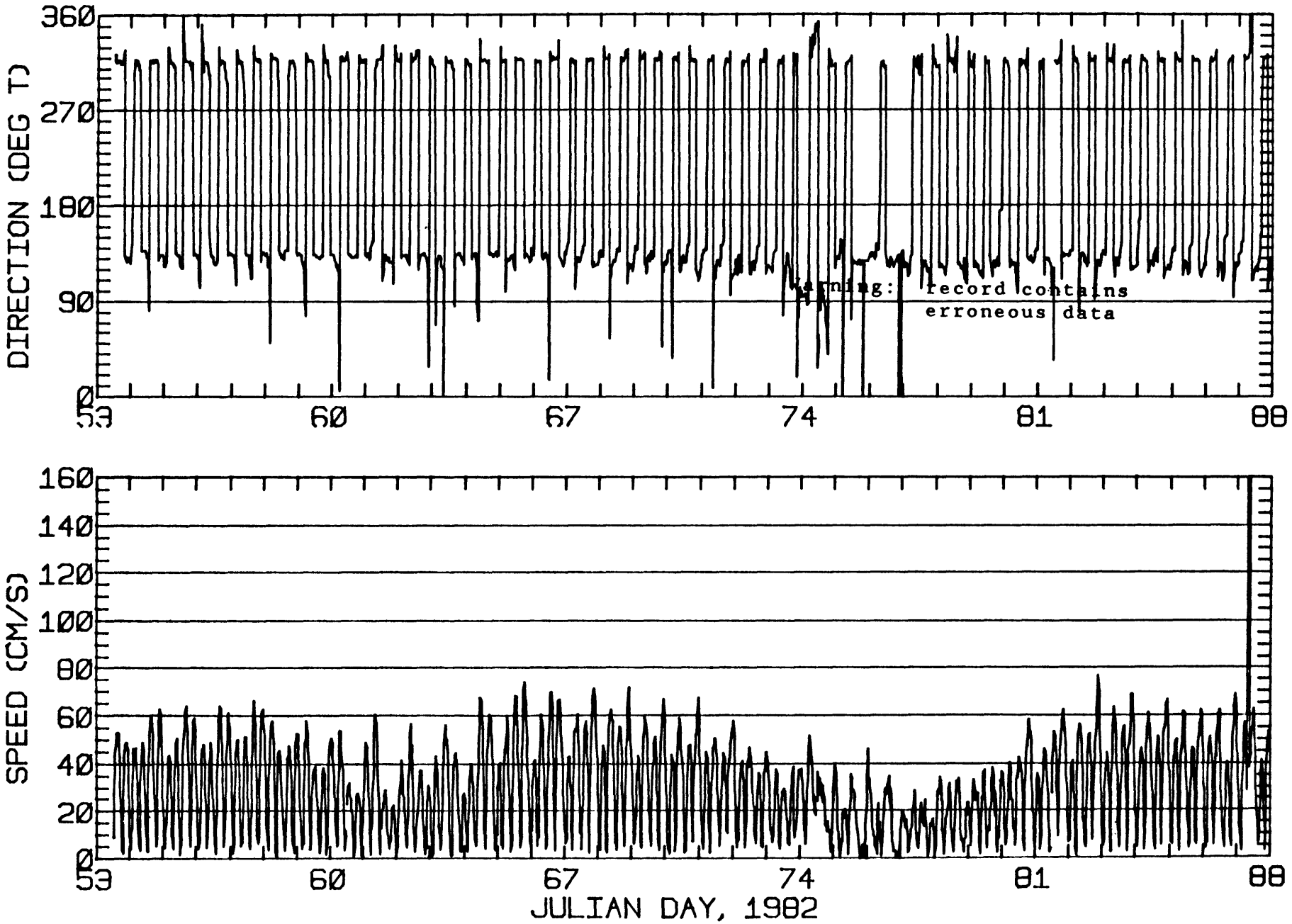
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.47	0.21	141.2	28.8	CLOCKWISE
K1	9.80	0.09	134.6	54.7	CLOCKWISE
N2	8.44	1.10	148.0	278.3	CLOCKWISE
M2	40.15	0.13	131.5	292.0	ANTI-CLOCKWISE
S2	13.54	0.46	131.0	304.1	CLOCKWISE
M4	4.15	1.10	133.3	108.5	ANTI-CLOCKWISE

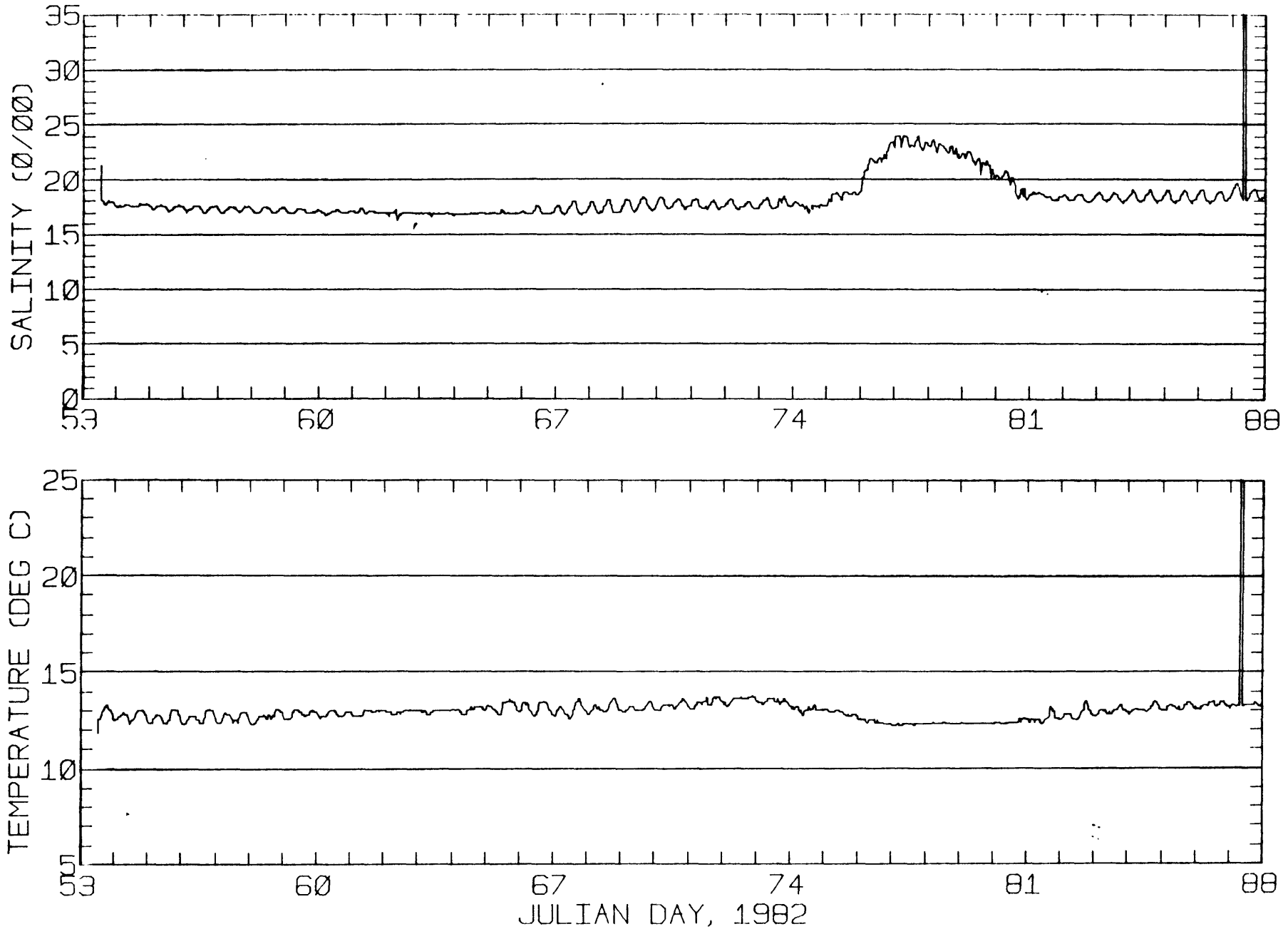
RMS SPEED:	36.5 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	69.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	22.3 CM/SEC
PRINCIPAL CURRENT DIRECTION:	132.6 DEGREES TRUE
TIDAL FORM NUMBER:	0.28
STANDARD DEVIATION U-SERIES:	6.86 CM/SEC
STANDARD DEVIATION V SERIES:	6.08 CM/SEC

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	0.0	1.3	3549.
2	12	2.8	-0.8	2653.
3	12	8.7	-3.2	2153.
4	2	8.1	-3.2	2274.
ALL	38	4.0	-1.0	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-24N 122-16- 0W
METER 2.7 METERS ABOVE BED. TAPE NUMBER GS029B2



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-24N 122-16- ØW
METER **2.7 METERS ABOVE BED** TAPE NUMBER GS029B2

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

CURRENT METER STATION: GS029C1
POSITION: 37 35'24"N 122 16' 0"W
METER TYPE: ENDECO
WATER DEPTH: 12.8 M (MLLW)
METER DEPTH: 3.3 M (BELOW MLLW)
START TIME OF SERIES: 4/18/82 758 PST JULIAN DAY=108
APPROXIMATE RECORD LENGTH IS 18 M2-CYCLES

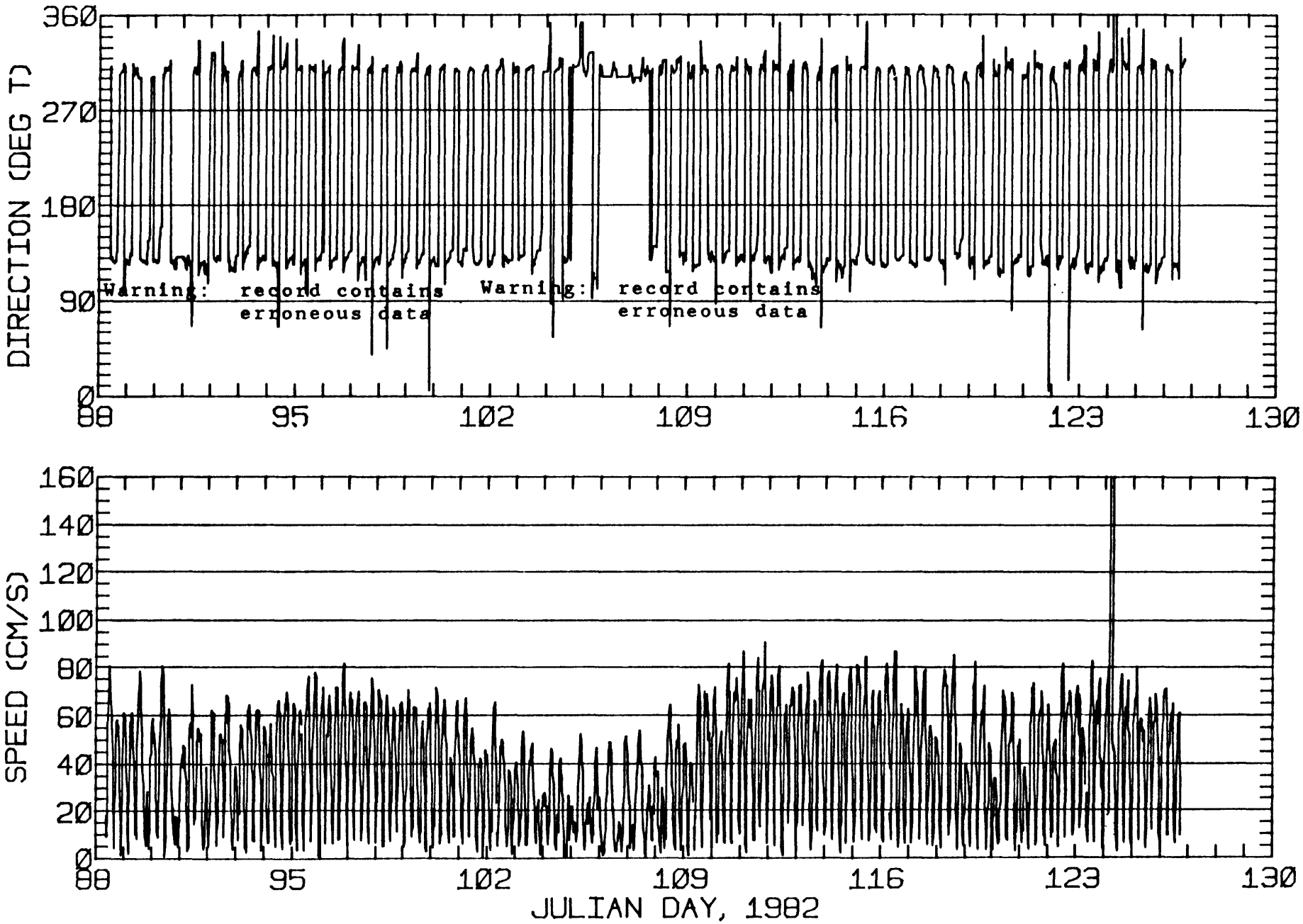
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.34	0.34	130.3	9.4	ANTI-CLOCKWISE
K1	13.58	0.57	130.5	22.3	ANTI-CLOCKWISE
N2	19.05	1.61	121.7	245.5	ANTI-CLOCKWISE
M2	59.34	1.79	129.3	292.3	ANTI-CLOCKWISE
S2	18.44	0.02	126.5	247.1	CLOCKWISE
M4	6.03	0.81	128.7	55.9	ANTI-CLOCKWISE

RMS SPEED:	51.3 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	99.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	35.7 CM/SEC
PRINCIPAL CURRENT DIRECTION:	129.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.28
STANDARD DEVIATION U-SERIES:	9.90 CM/SEC
STANDARD DEVIATION V SERIES:	8.40 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	3.0	-1.9	4026.
2	6	1.3	-0.4	2625.
ALL	18	2.4	-1.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-24N 122-16- 0W
METER 9.4 METERS ABOVE BED. TAPE NUMBER GS029C1

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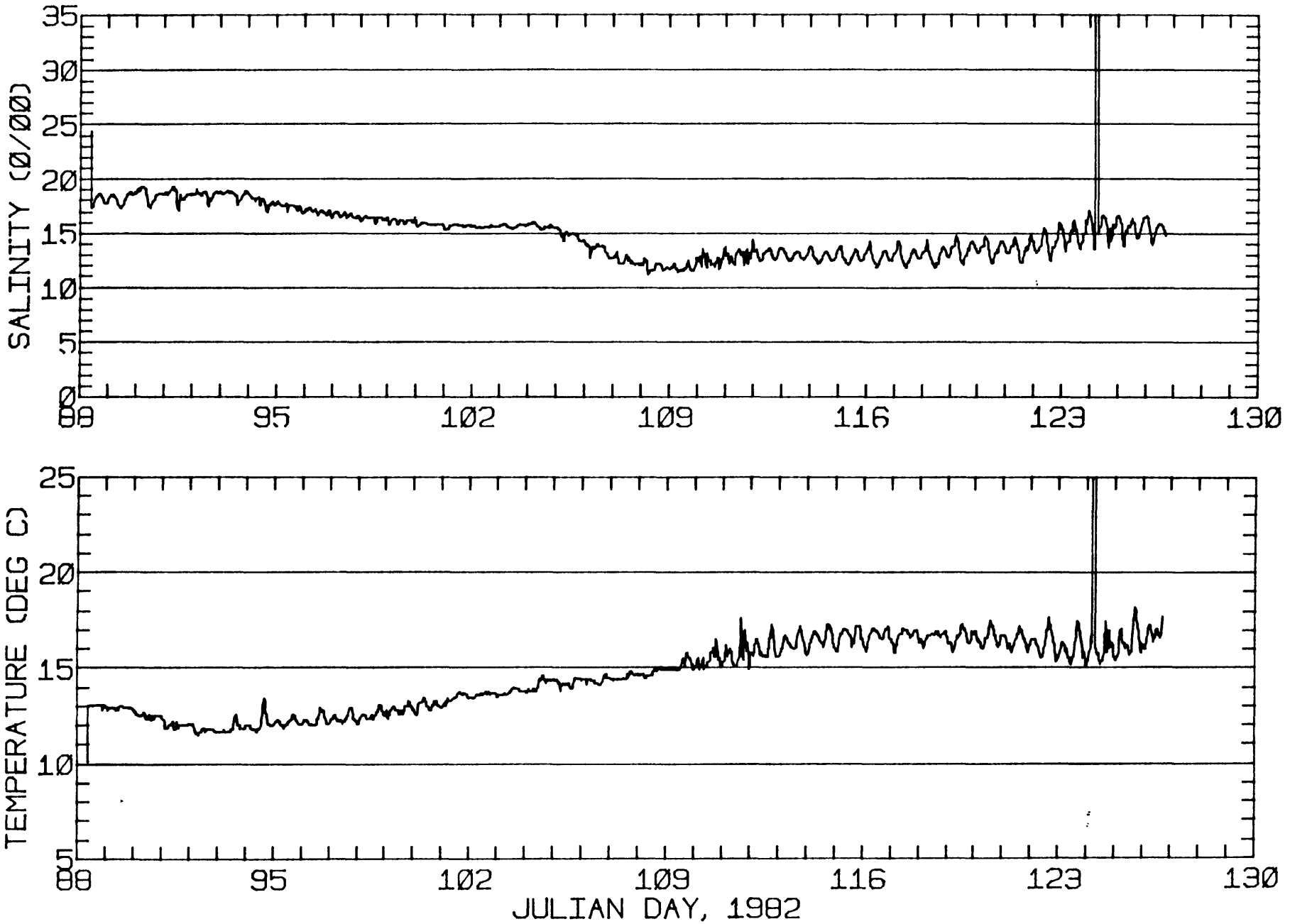


CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-24N 122-16- ØW
METER 9.4 METERS ABOVE BED. TAPE NUMBER GS029C1

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

CURRENT METER STATION: GS029C2
POSITION: 37 35'24"N 122 16' 0"W
METER TYPE: ENDECO
WATER DEPTH: 12.8 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 4/ 2/82 158 PST JULIAN DAY= 92
APPROXIMATE RECORD LENGTH IS 20 M2-CYCLES

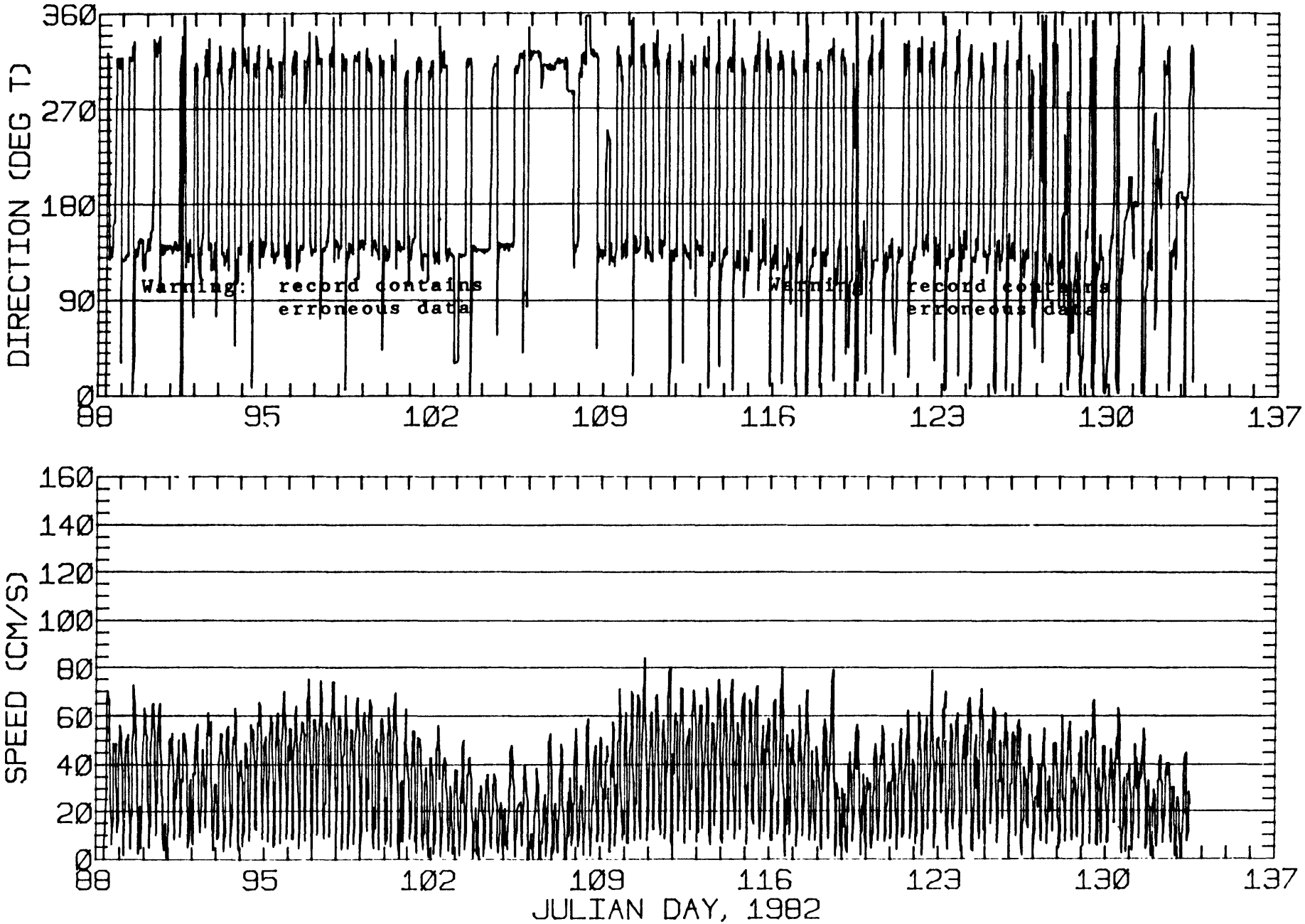
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.34	0.44	127.8	36.8	CLOCKWISE
K1	8.09	0.46	135.7	17.1	ANTI-CLOCKWISE
N2	10.08	2.87	133.7	272.7	ANTI-CLOCKWISE
M2	46.23	0.67	128.8	289.9	CLOCKWISE
S2	12.86	0.52	143.7	291.2	CLOCKWISE
M4	5.42	0.66	129.7	125.8	CLOCKWISE

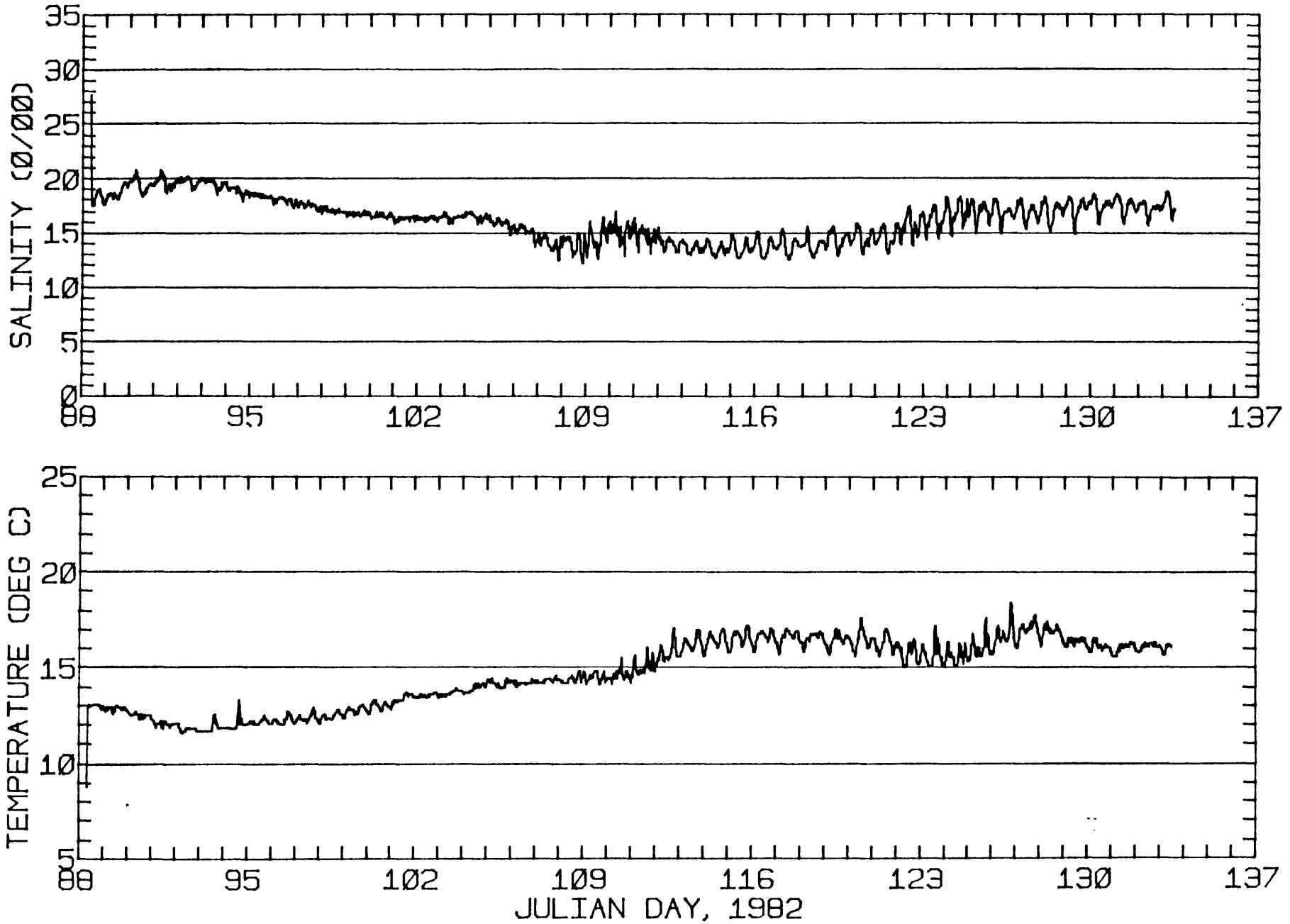
RMS SPEED: 41.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 72.5 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 30.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 132.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 8.94 CM/SEC
STANDARD DEVIATION V SERIES: 9.84 CM/SEC

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	3.6	-3.6	4462.
2	8	4.1	-5.4	3267.
ALL	20	3.8	-4.3	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-24N 122-16- 0W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS029C2



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
COYOTE POINT 37-35-24N 122-16- 0W
METER 6.1 METERS ABOVE BED. TAPE NUMBER GS029C2

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

CURRENT METER STATION: GS030A1
POSITION: 37 34'18"N 122 14' 2"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 4.2 M (BELOW MLLW)
START TIME OF SERIES: 4/ 7/83 716 PST JULIAN DAY= 97
APPROXIMATE RECORD LENGTH IS 14 M2-CYCLES

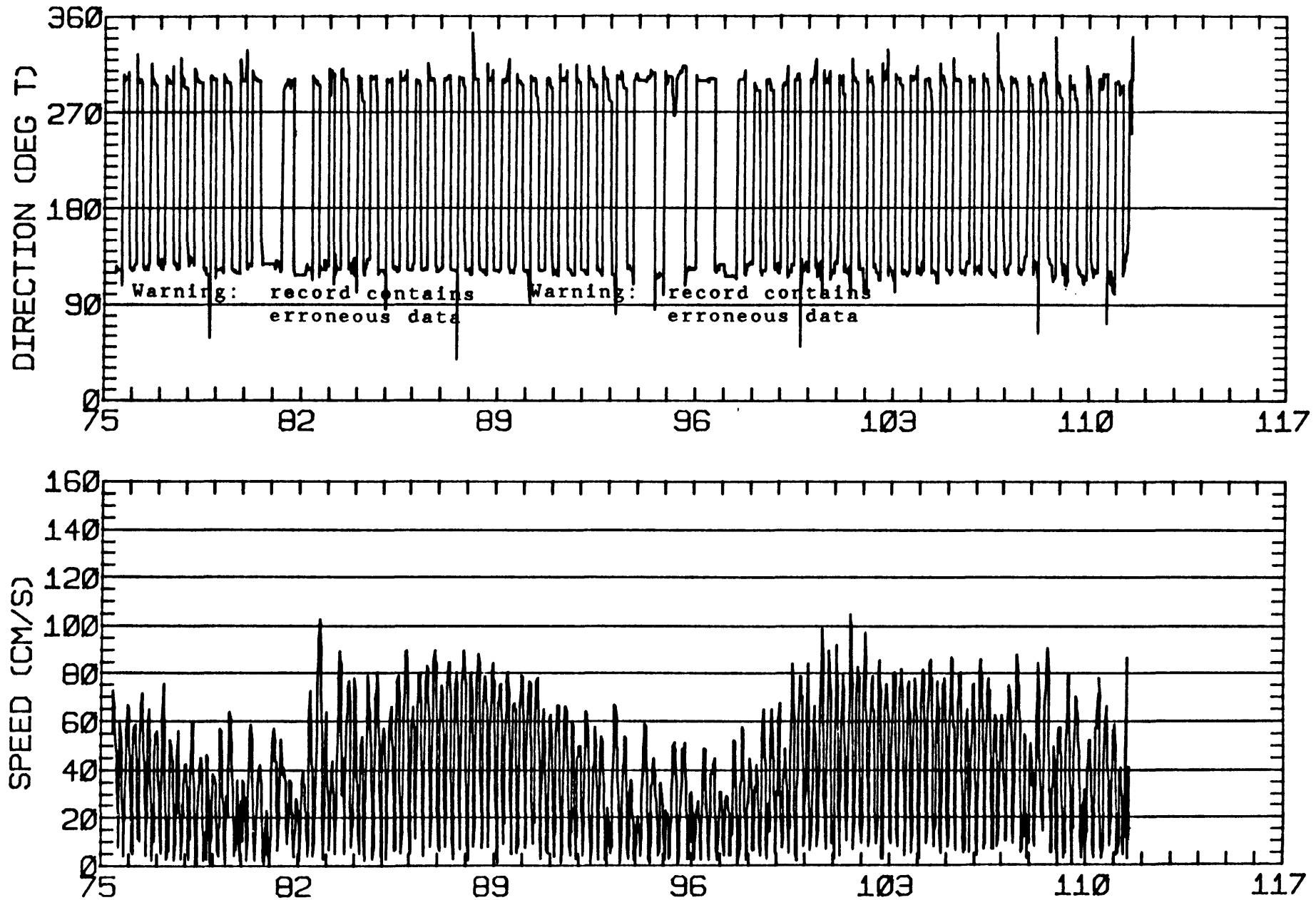
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

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

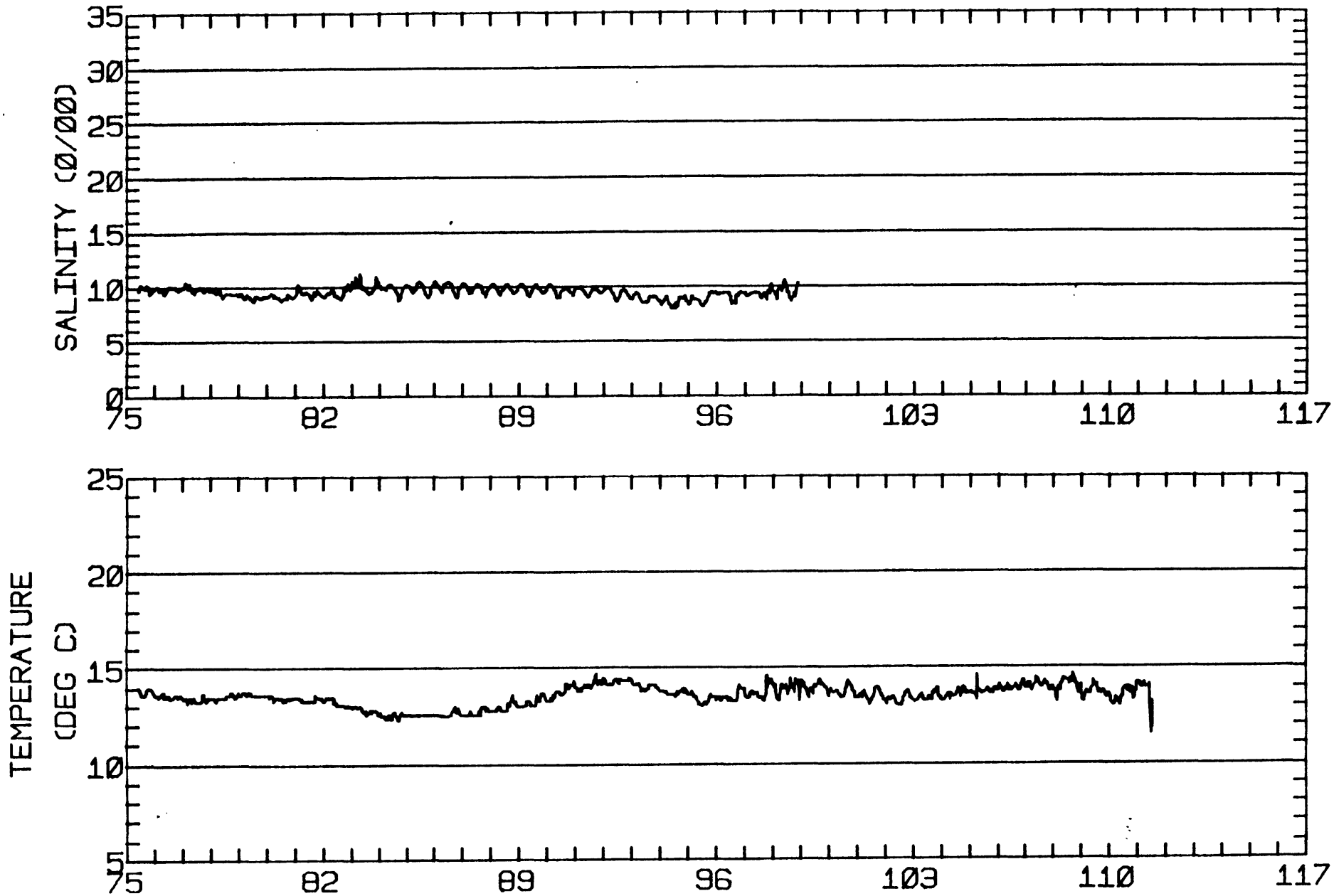
RMS SPEED:
SPRING TIDAL CURRENT MAXIMUM:
NEAP TIDAL CURRENT MAXIMUM:
PRINCIPAL CURRENT DIRECTION:
TIDAL FORM NUMBER:
STANDARD DEVIATION U-SERIES:
STANDARD DEVIATION V SERIES:

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				
2				
ALL				



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30A1 37-34-18N 122-14- 2W
METER 007.9 METERS ABOVE BED. WATER DEPTH 012.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30A1 37-34-18N 122-14- 2W
METER 007.9 METERS ABOVE BED. WATER DEPTH 012.1 METERS.

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

CURRENT METER STATION: GS030A2
POSITION: 37 34'18"N 122 14' 2"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 6.7 M (BELOW MLLW)
START TIME OF SERIES: 3/16/83 1000 PST JULIAN DAY= 75
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

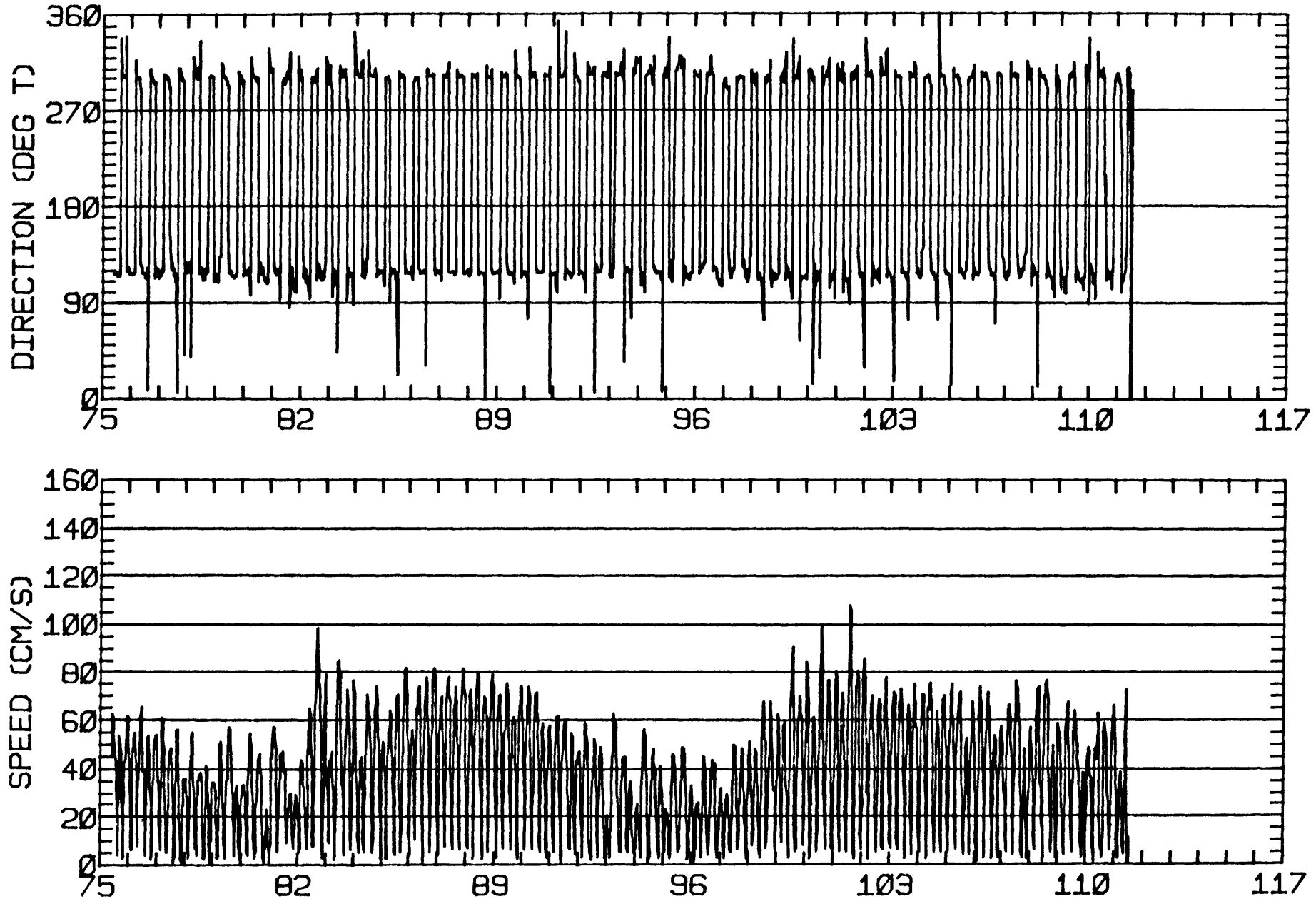
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.96	0.27	121.2	7.8	CLOCKWISE
K1	7.91	0.11	119.0	27.4	CLOCKWISE
N2	7.39	0.48	123.2	263.1	ANTI-CLOCKWISE
M2	54.88	0.88	120.1	292.6	ANTI-CLOCKWISE
S2	20.06	0.22	119.4	287.0	CLOCKWISE
M4	2.25	0.25	132.1	42.1	CLOCKWISE

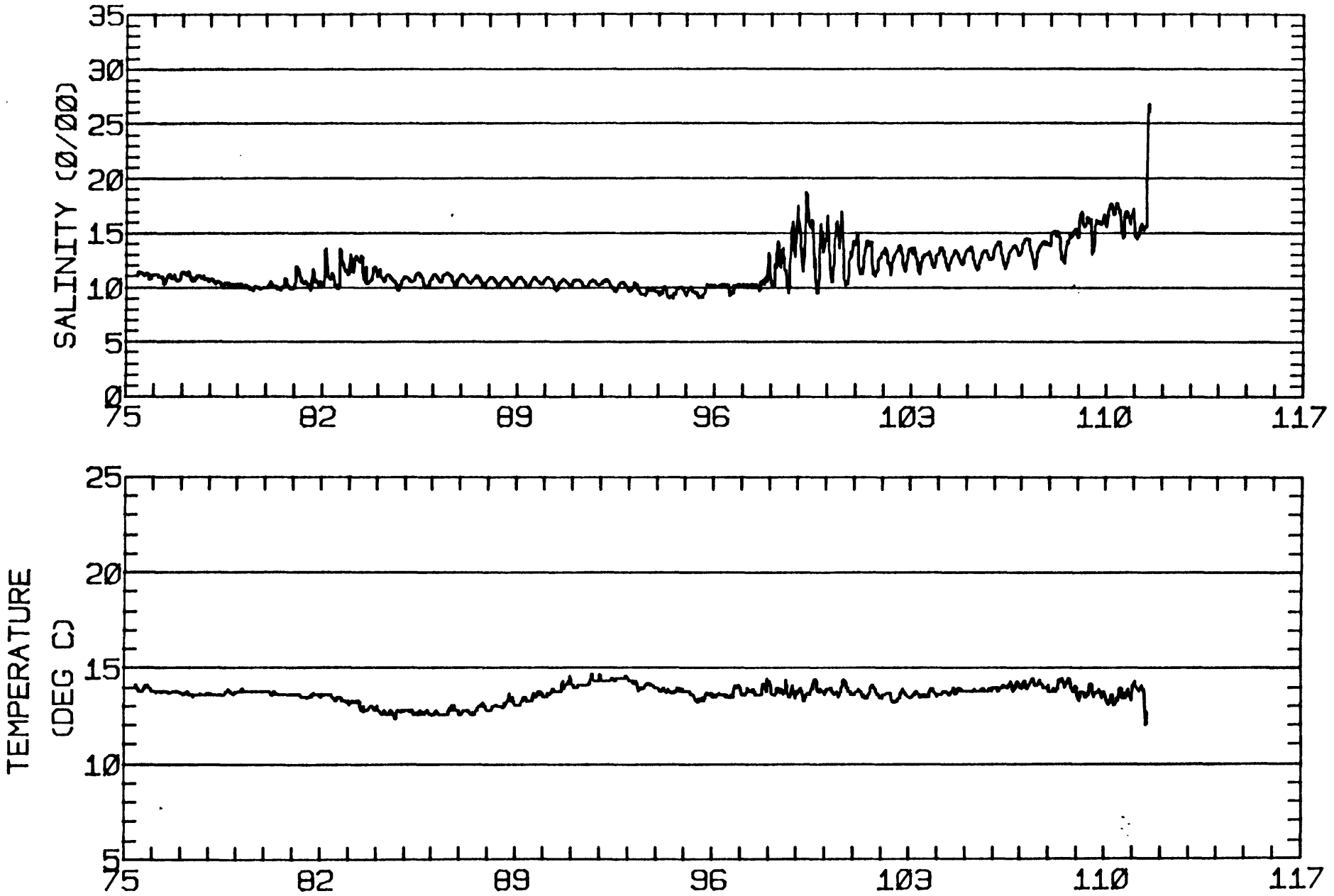
RMS SPEED:	43.9 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	90.8 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	34.9 CM/SEC
PRINCIPAL CURRENT DIRECTION:	120.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.21
STANDARD DEVIATION U-SERIES:	10.25 CM/SEC
STANDARD DEVIATION V SERIES:	6.69 CM/SEC

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	-1.2	7756.
2	12	3.6	0.3	5926.
3	12	3.4	0.6	5001.
4	12	0.4	1.9	4204.
5	8	1.1	2.6	3256.
ALL	56	2.7	0.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30A2 37-34-18N 122-14- 2W
METER 005.4 METERS ABOVE BED. WATER DEPTH 012.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30A2 37-34-18N 122-14- 2W
METER Ø05.4 METERS ABOVE BED. WATER DEPTH Ø12.1 METERS.

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

CURRENT METER STATION: GS030A3
POSITION: 37 34'18"N 122 14' 2"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 9.4 M (BELOW MLLW)
START TIME OF SERIES: 3/16/83 1000 PST JULIAN DAY= 75
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

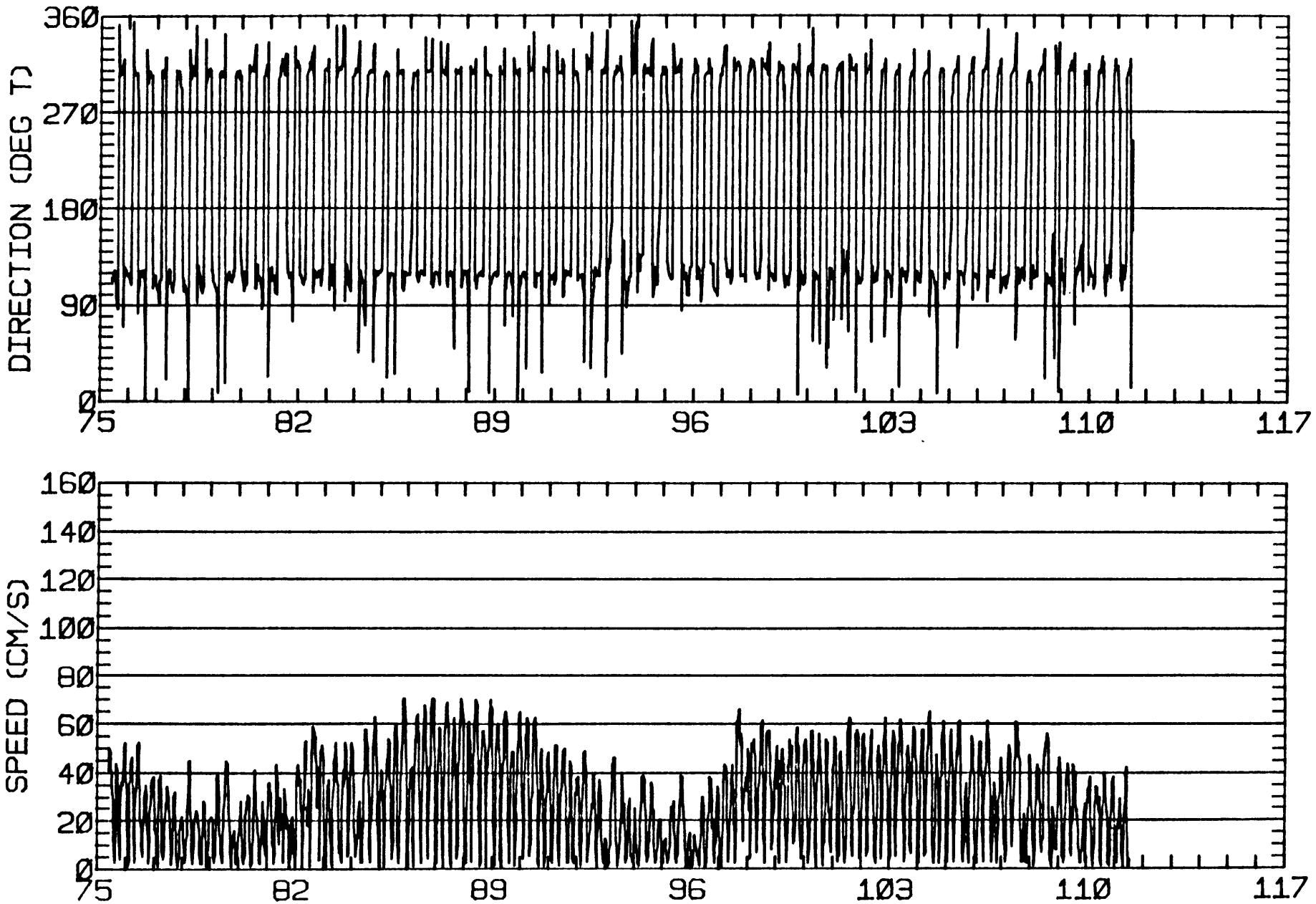
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.99	0.60	123.4	1.4	CLOCKWISE
K1	5.49	0.28	123.9	11.1	CLOCKWISE
N2	6.13	0.12	119.7	267.3	CLOCKWISE
M2	41.83	0.45	123.2	278.2	CLOCKWISE
S2	11.74	0.24	122.7	279.5	CLOCKWISE
M4	2.45	0.06	149.1	26.4	CLOCKWISE

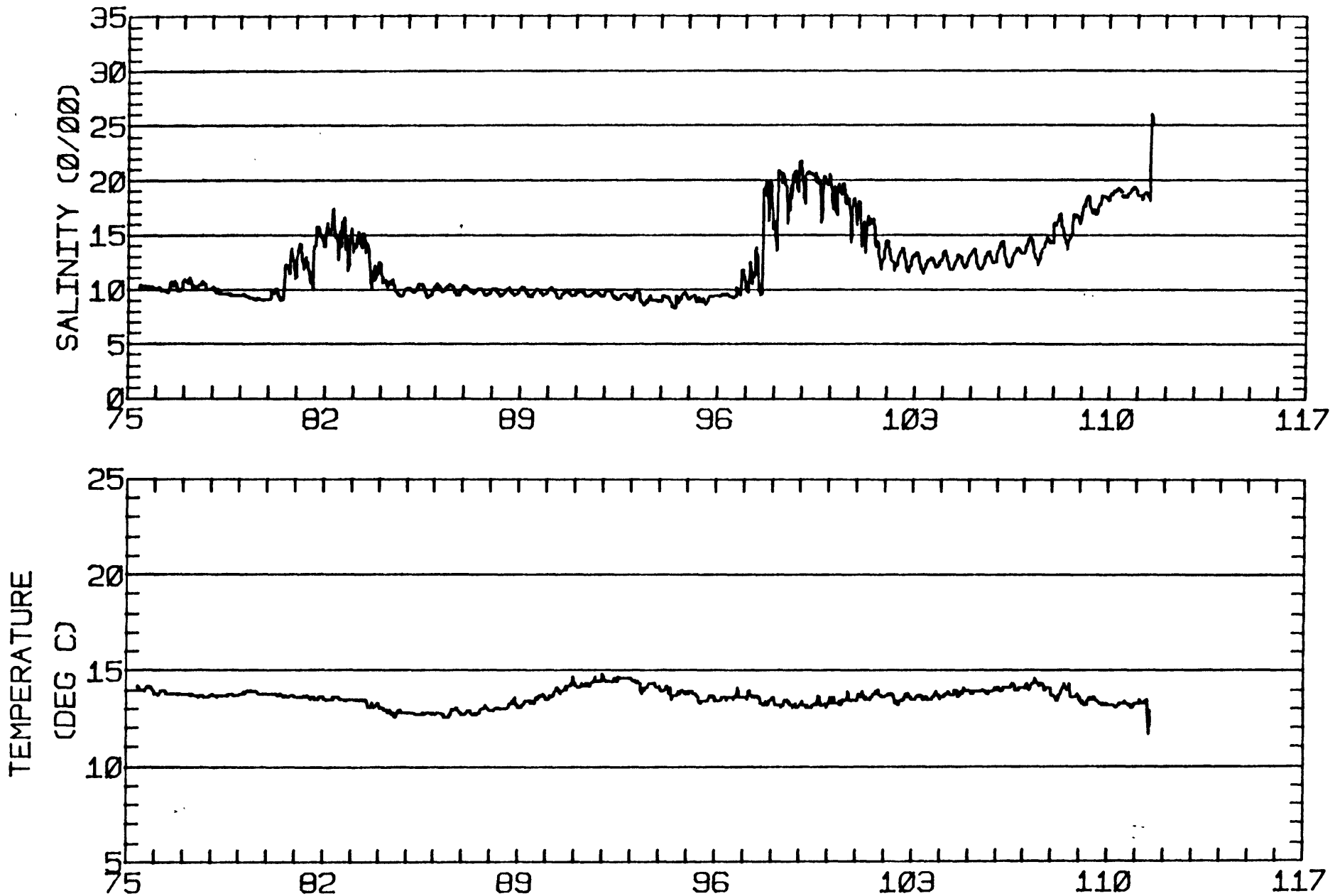
RMS SPEED: 34.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 64.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 29.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 123.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.20
STANDARD DEVIATION U-SERIES: 10.06 CM/SEC
STANDARD DEVIATION V SERIES: 7.26 CM/SEC

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	4.3	0.6	7756.
2	12	5.2	0.7	5926.
3	12	5.5	0.5	5001.
4	12	2.3	2.1	4204.
5	8	4.4	1.6	3256.
ALL	56	4.4	1.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30A3 37-34-18N 122-14- 2W
METER 002.7 METERS ABOVE BED. WATER DEPTH 012.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30A3 37-34-18N 122-14- 2W
METER 002.7 METERS ABOVE BED. WATER DEPTH 012.1 METERS.

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

CURRENT METER STATION: GS030B1
POSITION: 37 34'25"N 122 14'10"W
METER TYPE: ENDECO
WATER DEPTH: 11.8 M (MLLW)
METER DEPTH: 3.9 M (BELOW MLLW)
START TIME OF SERIES: 4/21/83 1200 PST JULIAN DAY=111
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

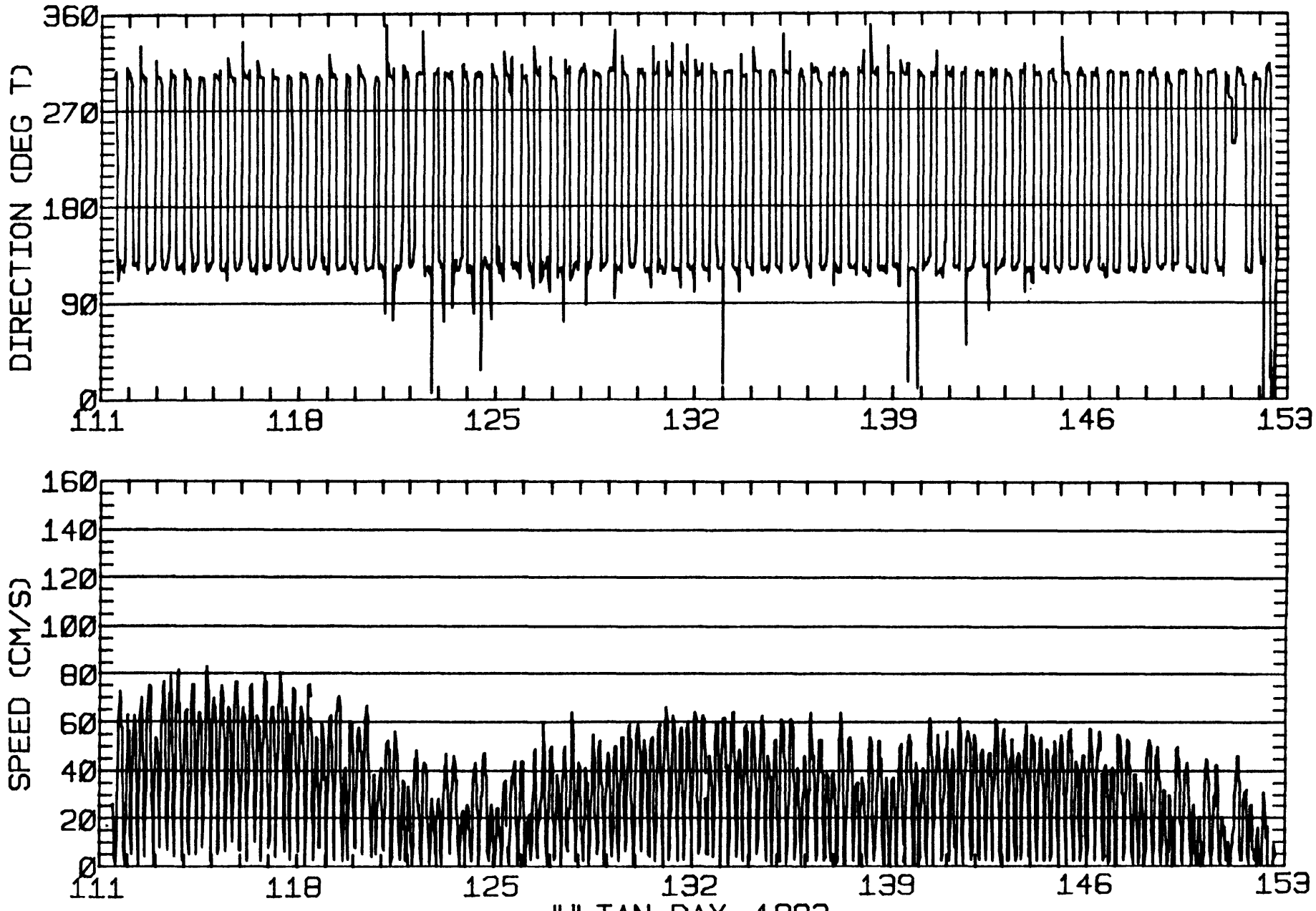
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	6.33	0.19	123.9	11.3	CLOCKWISE
K1	10.97	0.24	125.2	9.7	CLOCKWISE
N2	8.49	0.17	121.7	266.4	CLOCKWISE
M2	50.69	0.73	123.2	288.3	ANTI-CLOCKWISE
S2	14.35	0.36	123.2	271.6	ANTI-CLOCKWISE
M4	1.17	0.29	147.8	31.8	ANTI-CLOCKWISE

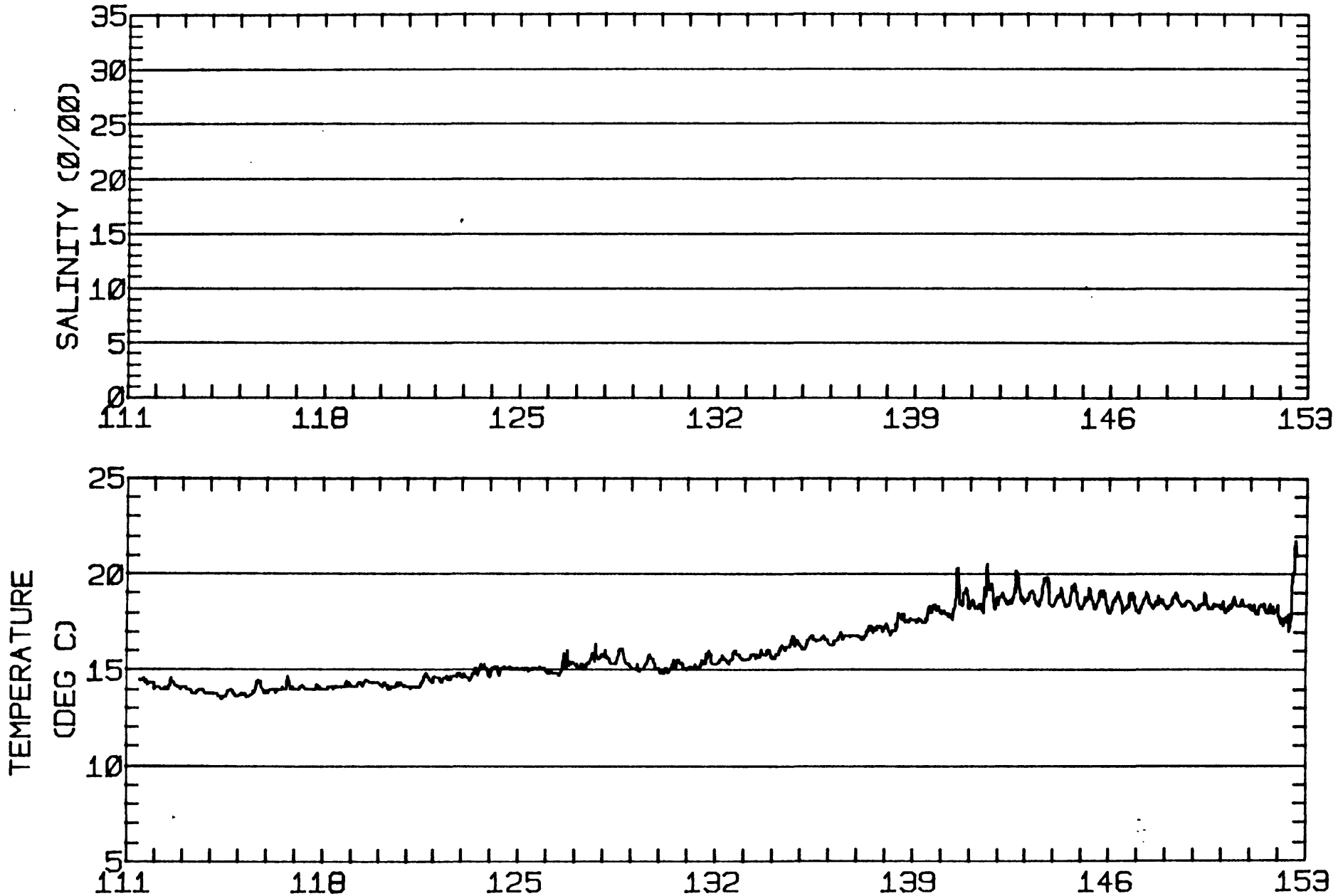
RMS SPEED: 40.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 82.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 31.7 CM/SEC
PRINCIPAL CURRENT DIRECTION: 123.5 DEGREES TRUE
TIDAL FORM NUMBER: 0.27
STANDARD DEVIATION U-SERIES: 7.22 CM/SEC
STANDARD DEVIATION V SERIES: 4.83 CM/SEC

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	5.5	-4.3	2698.
2	12	4.1	-2.6	3358.
3	12	0.6	-0.2	3294.
4	12	2.0	-0.1	3041.
5	8	1.9	-0.7	2686.
ALL	56	2.9	-1.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30B1 37-34-25N 122-14-10W
METER 007.9 METERS ABOVE BED. WATER DEPTH 011.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30B1 37-34-25N 122-14-10W
METER Ø07.9 METERS ABOVE BED. WATER DEPTH Ø11.8 METERS.

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* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS030B2
POSITION: 37 34'25"N 122 14'10"W
METER TYPE: ENDECO
WATER DEPTH: 11.8 M (MLLW)
METER DEPTH: 6.4 M (BELOW MLLW)
START TIME OF SERIES: 4/21/83 1200 PST JULIAN DAY=111
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

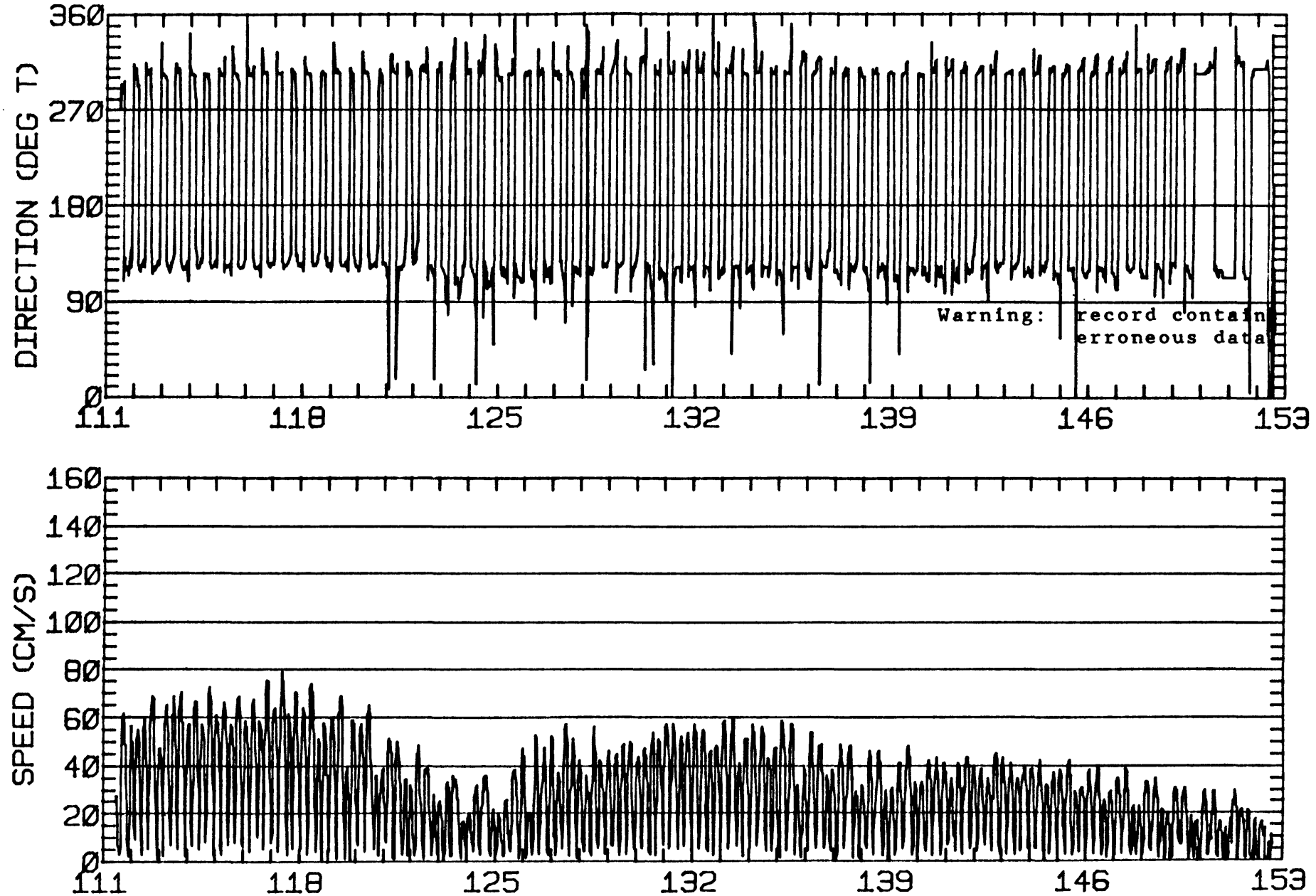
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	5.89	0.51	126.0	9.0	CLOCKWISE
K1	9.66	0.09	125.2	5.9	CLOCKWISE
N2	7.65	0.03	121.5	267.4	ANTI-CLOCKWISE
M2	46.21	0.42	123.5	287.7	ANTI-CLOCKWISE
S2	13.93	0.23	125.2	272.3	CLOCKWISE
M4	2.23	0.15	137.5	59.0	ANTI-CLOCKWISE

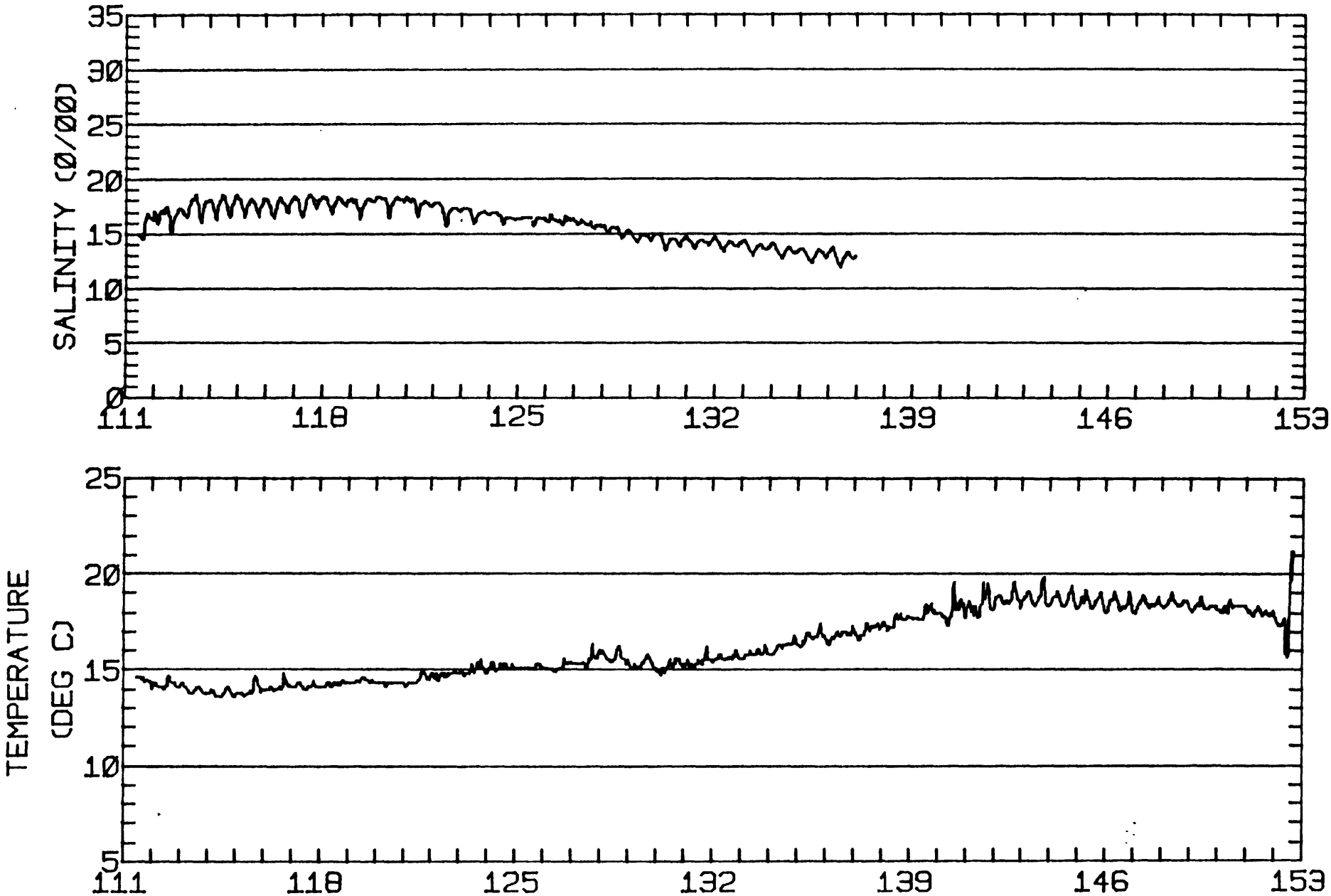
RMS SPEED: 37.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 75.7 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 28.5 CM/SEC
PRINCIPAL CURRENT DIRECTION: 124.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.26
STANDARD DEVIATION U-SERIES: 7.33 CM/SEC
STANDARD DEVIATION V SERIES: 5.47 CM/SEC

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	5.8	-3.3	2698.
2	12	5.1	-2.1	3358.
3	12	1.4	1.4	3294.
4	12	3.4	0.9	3041.
5	8	4.2	-0.7	2686.
ALL	56	4.0	-0.8	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30B2 37-34-25N 122-14-10W
METER 005.4 METERS ABOVE BED. WATER DEPTH 011.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30B2 37-34-25N 122-14-10W
METER 005.4 METERS ABOVE BED. WATER DEPTH 011.8 METERS.

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

CURRENT METER STATION: GS030B3
POSITION: 37 34'25"N 122 14'10"W
METER TYPE: ENDECO
WATER DEPTH: 11.8 M (MLLW)
METER DEPTH: 9.1 M (BELOW MLLW)
START TIME OF SERIES: 4/21/83 1200 PST JULIAN DAY=111
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

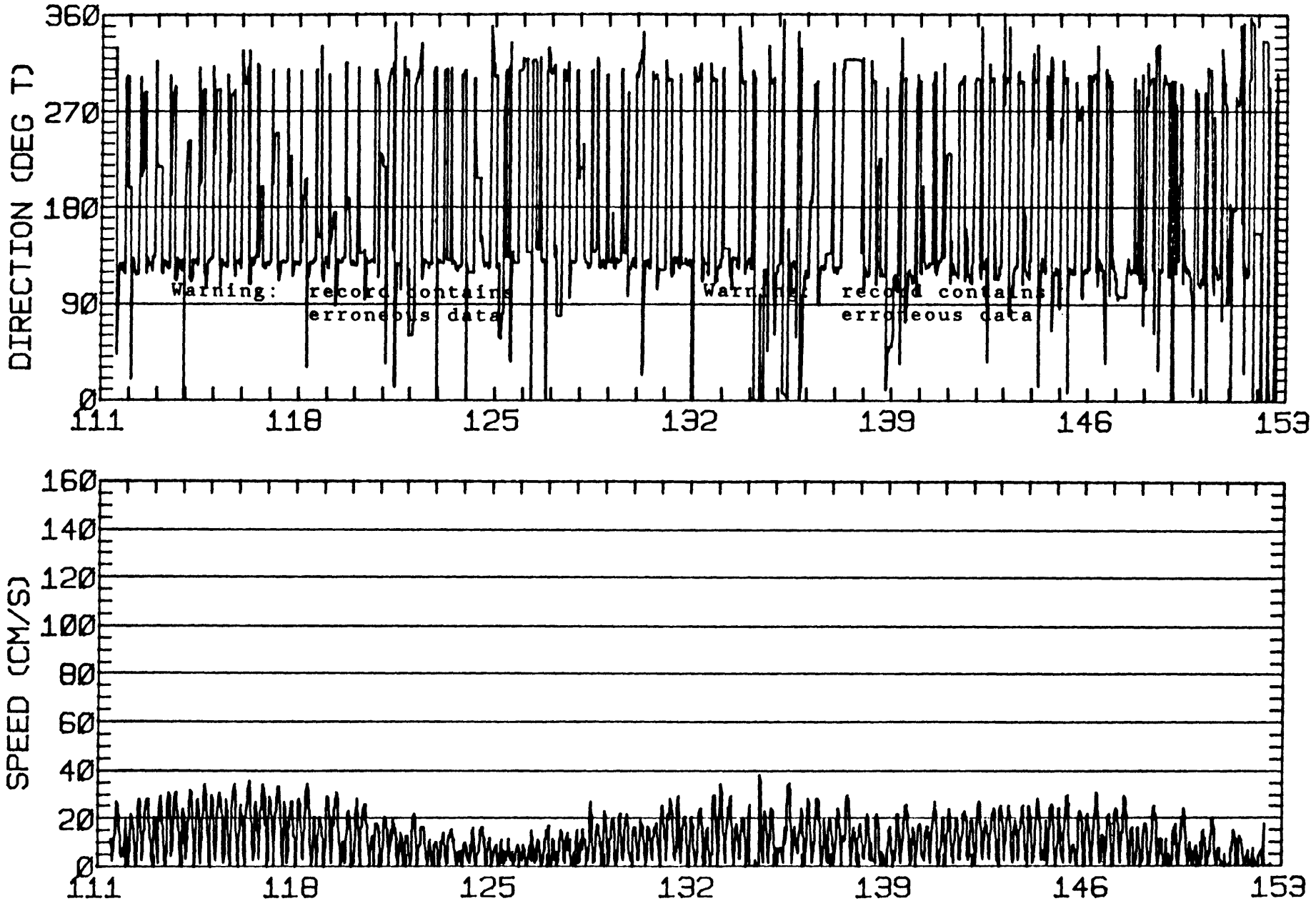
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	1.39	0.12	106.2	17.2	ANTI-CLOCKWISE
K1	2.00	0.35	109.5	340.6	ANTI-CLOCKWISE
N2	4.34	0.91	112.3	270.8	CLOCKWISE
M2	11.04	0.27	113.4	288.9	CLOCKWISE
S2	3.86	0.38	107.5	265.1	CLOCKWISE
M4	2.88	1.16	154.3	188.7	CLOCKWISE

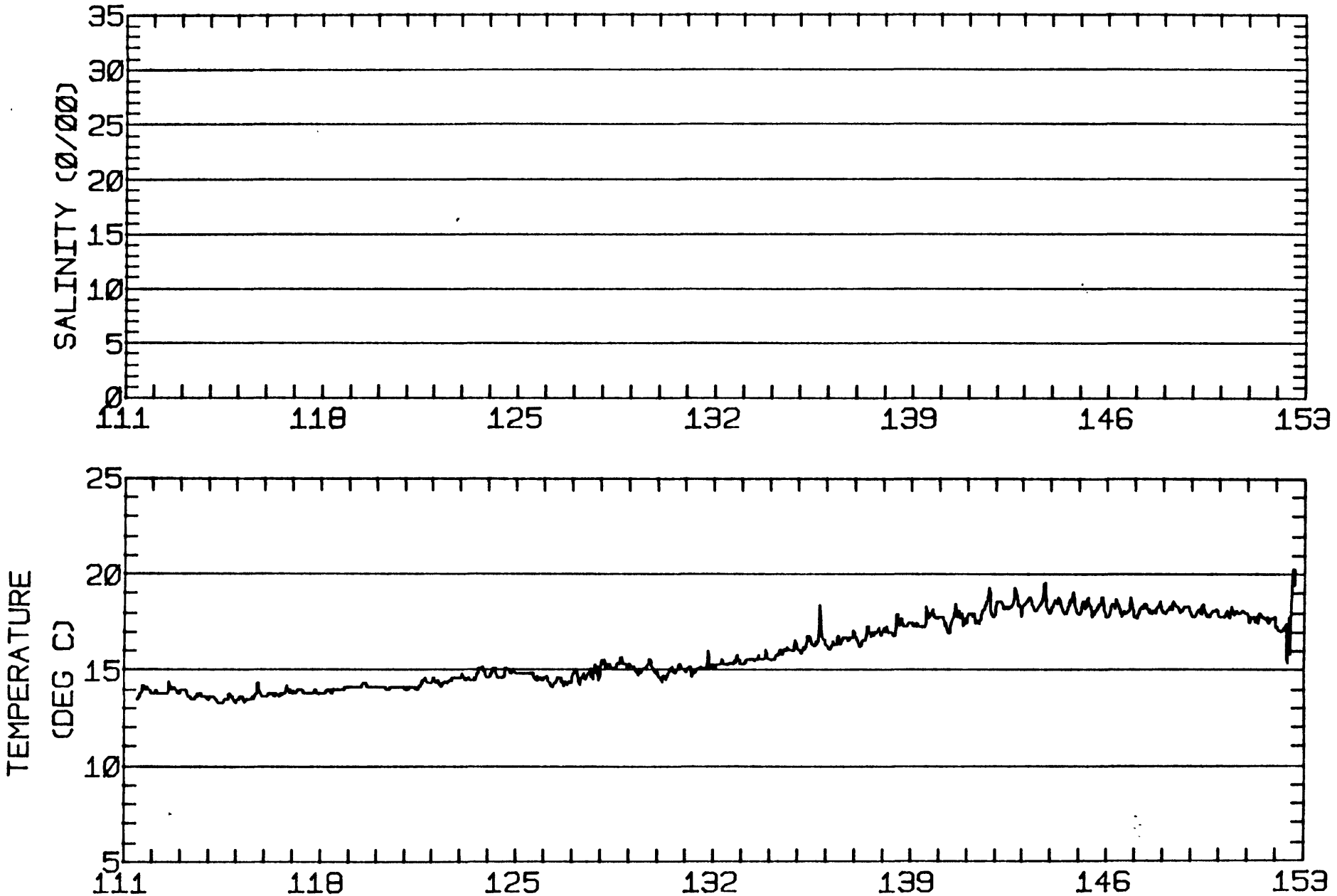
RMS SPEED: 15.7 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 18.3 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 6.6 CM/SEC
PRINCIPAL CURRENT DIRECTION: 111.2 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 7.76 CM/SEC
STANDARD DEVIATION V SERIES: 7.49 CM/SEC

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	4.8	-8.1	2698.
2	12	5.6	-6.1	3358.
3	12	3.6	-3.3	3294.
4	12	4.4	-3.8	3041.
5	8	2.5	-0.7	2686.
ALL	56	4.3	-4.7	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 3083 37-34-25N 122-14-10W
METER 002.6 METERS ABOVE BED. WATER DEPTH 011.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 30B3 37-34-25N 122-14-10W
METER ØØ2.6 METERS ABOVE BED. WATER DEPTH Ø11.8 METERS.

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* SUMMARY OF HARMONIC ANALYSIS *
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CURRENT METER STATION: GS031A1
POSITION: 37 31'31"N 122 8'35"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 4.5 M (BELOW MLLW)
START TIME OF SERIES: 3/16/83 900 PST JULIAN DAY= 75
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

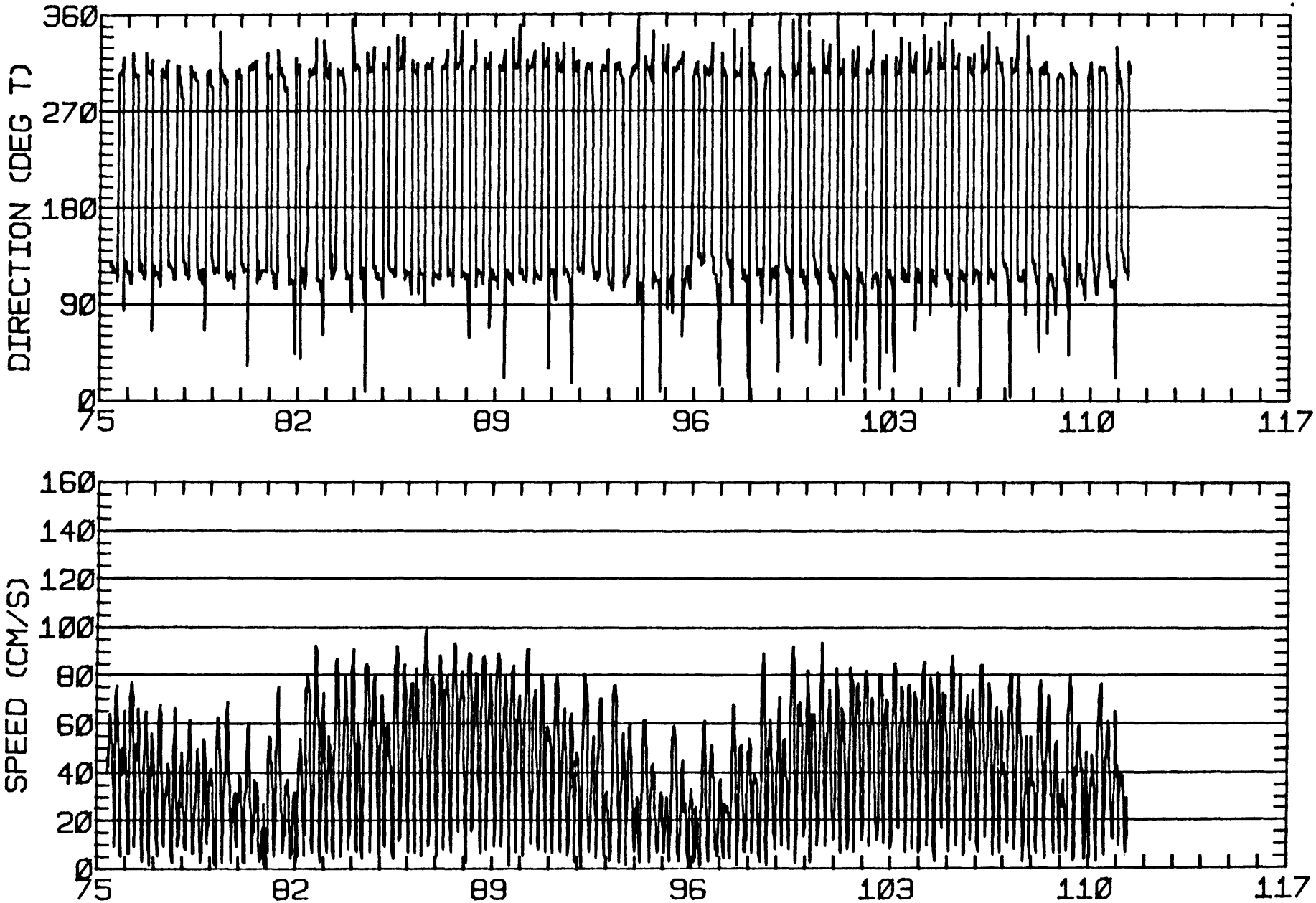
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.25	0.72	123.8	21.7	CLOCKWISE
K1	8.95	0.42	118.3	37.2	CLOCKWISE
N2	7.67	0.54	128.7	267.5	ANTI-CLOCKWISE
M2	62.18	0.99	124.1	295.3	ANTI-CLOCKWISE
S2	20.50	0.71	124.0	294.4	CLOCKWISE
M4	5.27	0.19	137.8	88.7	CLOCKWISE

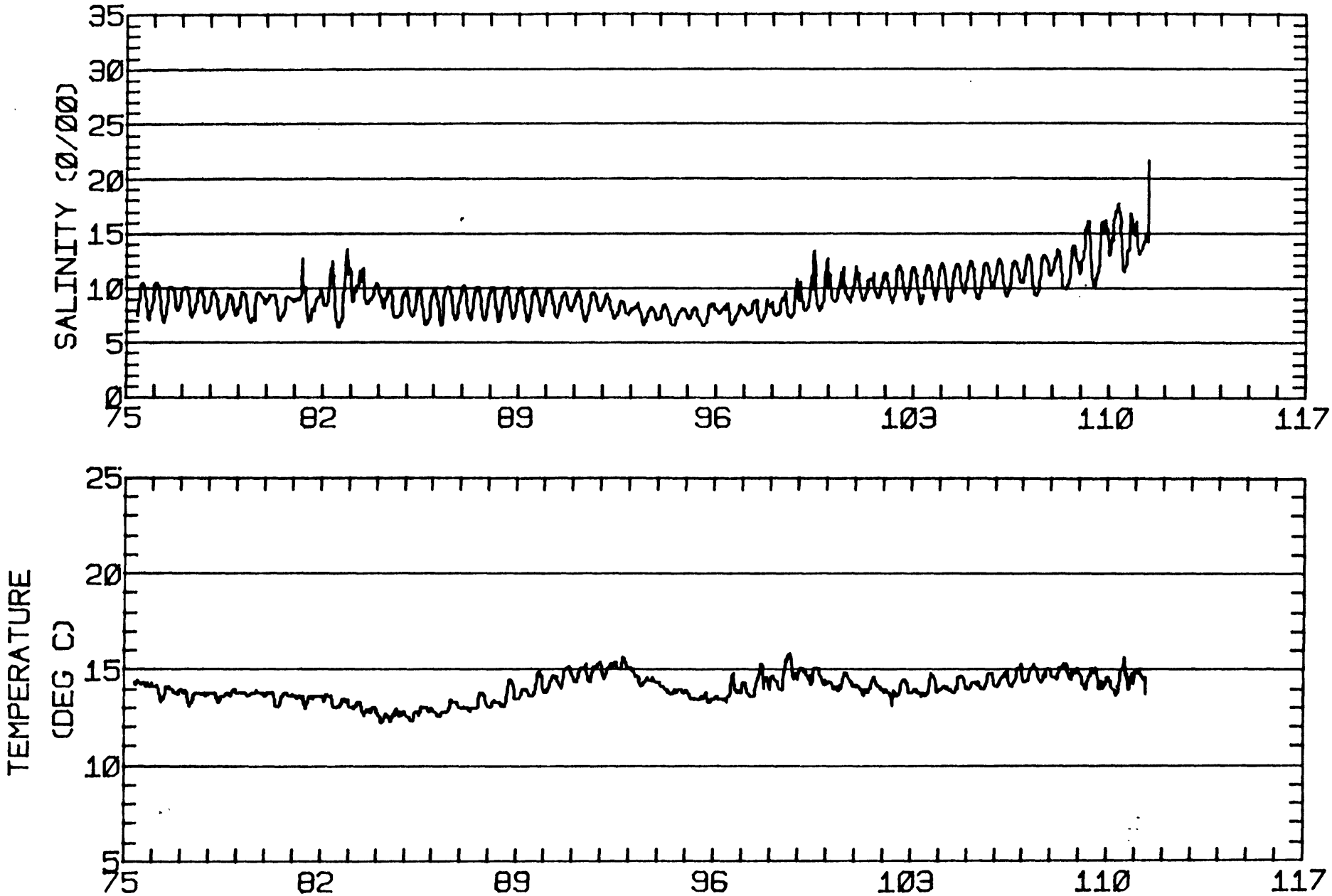
RMS SPEED:	49.1 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	99.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	41.0 CM/SEC
PRINCIPAL CURRENT DIRECTION:	123.5 DEGREES TRUE
TIDAL FORM NUMBER:	0.21
STANDARD DEVIATION U-SERIES:	9.82 CM/SEC
STANDARD DEVIATION V SERIES:	7.63 CM/SEC

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	1.5	0.9	7756.
2	12	1.1	6.0	5926.
3	12	-0.5	7.8	5001.
4	12	-2.4	5.4	4204.
5	8	2.6	6.1	3256.
ALL	56	0.3	5.2	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31A1 37-31-31N 122- 8-35W
METER 007.6 METERS ABOVE BED. WATER DEPTH 012.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31A1 37-31-31N 122- 8-35W
METER 007.6 METERS ABOVE BED. WATER DEPTH 012.1 METERS.

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* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS031A2
POSITION: 37 31'31"N 122 8'35"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 7.0 M (BELOW MLLW)
START TIME OF SERIES: 3/21/83 1916 PST JULIAN DAY= 80
APPROXIMATE RECORD LENGTH IS 28 M2-CYCLES

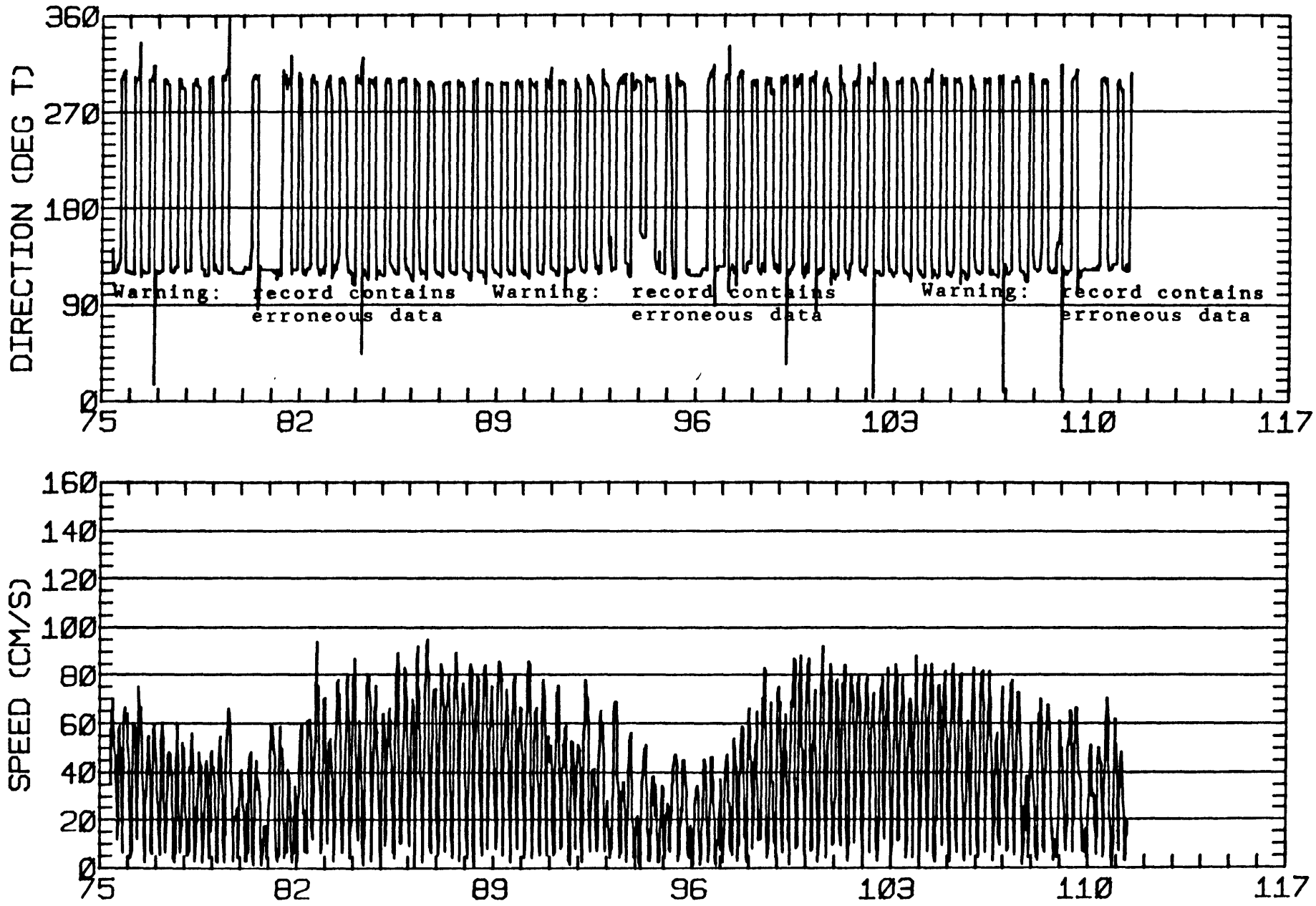
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	7.57	0.35	116.7	27.6	CLOCKWISE
K1	7.82	0.09	120.5	49.9	ANTI-CLOCKWISE
N2	10.85	0.34	113.1	261.2	CLOCKWISE
M2	53.86	1.17	120.2	297.5	ANTI-CLOCKWISE
S2	20.82	0.48	116.6	304.3	ANTI-CLOCKWISE
M4	6.81	0.50	118.0	101.9	CLOCKWISE

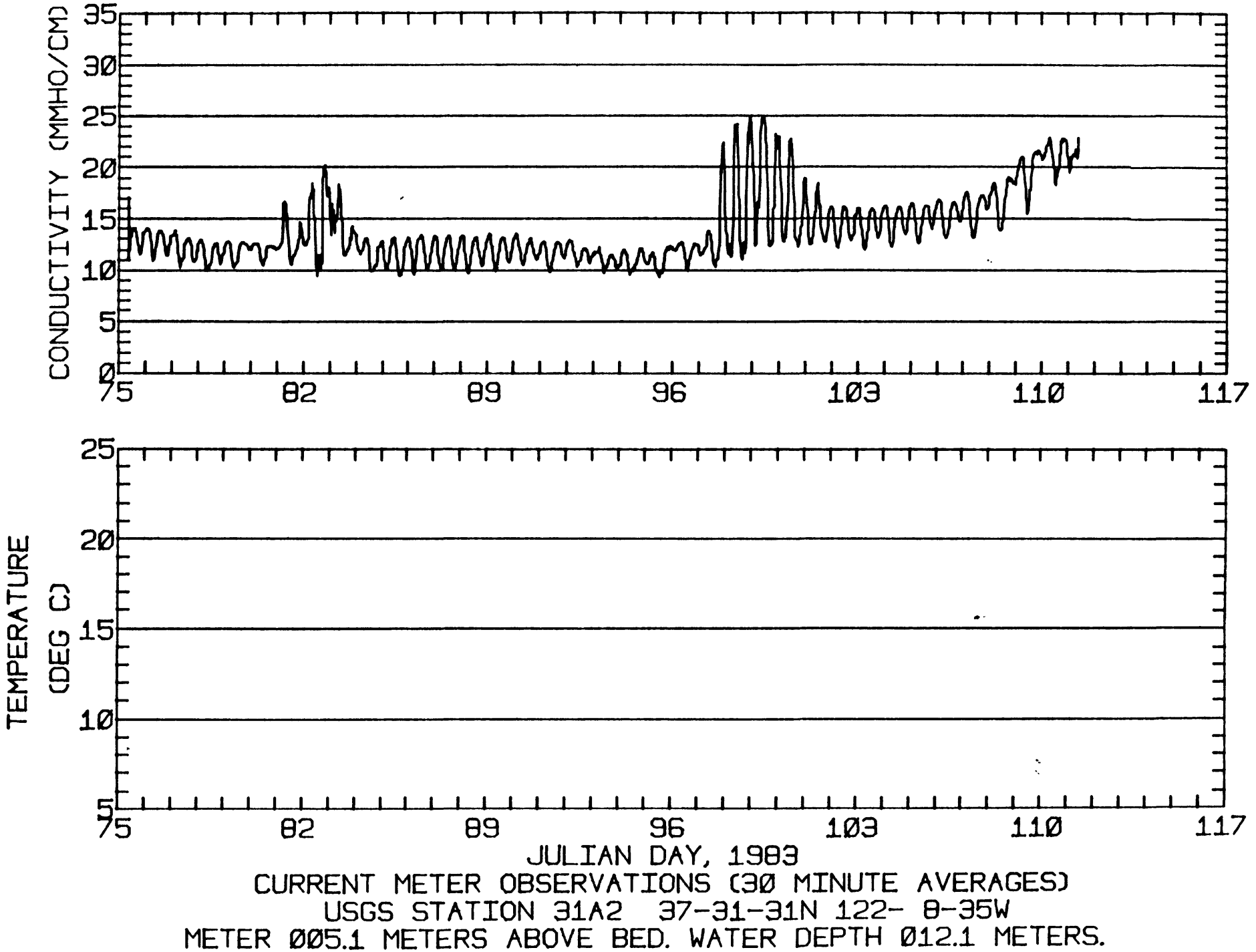
RMS SPEED: 48.6 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 90.1 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 32.8 CM/SEC
PRINCIPAL CURRENT DIRECTION: 119.1 DEGREES TRUE
TIDAL FORM NUMBER: 0.21
STANDARD DEVIATION U-SERIES: 14.48 CM/SEC
STANDARD DEVIATION V SERIES: 8.27 CM/SEC

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	3.2	-2.8	5982.
2	12	-3.3	-0.2	5001.
3	4	-9.5	2.6	4619.
ALL	28	-1.4	-0.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31A2 37-31-31N 122- 8-35W
METER 005.1 METERS ABOVE BED. WATER DEPTH 012.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31A2 37-31-31N 122- 8-35W
METER 005.1 METERS ABOVE BED. WATER DEPTH 012.1 METERS.

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* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS031A3
POSITION: 37 31'31"N 122 8'35"W
METER TYPE: ENDECO
WATER DEPTH: 12.1 M (MLLW)
METER DEPTH: 9.4 M (BELOW MLLW)
START TIME OF SERIES: 3/16/83 900 PST JULIAN DAY= 75
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

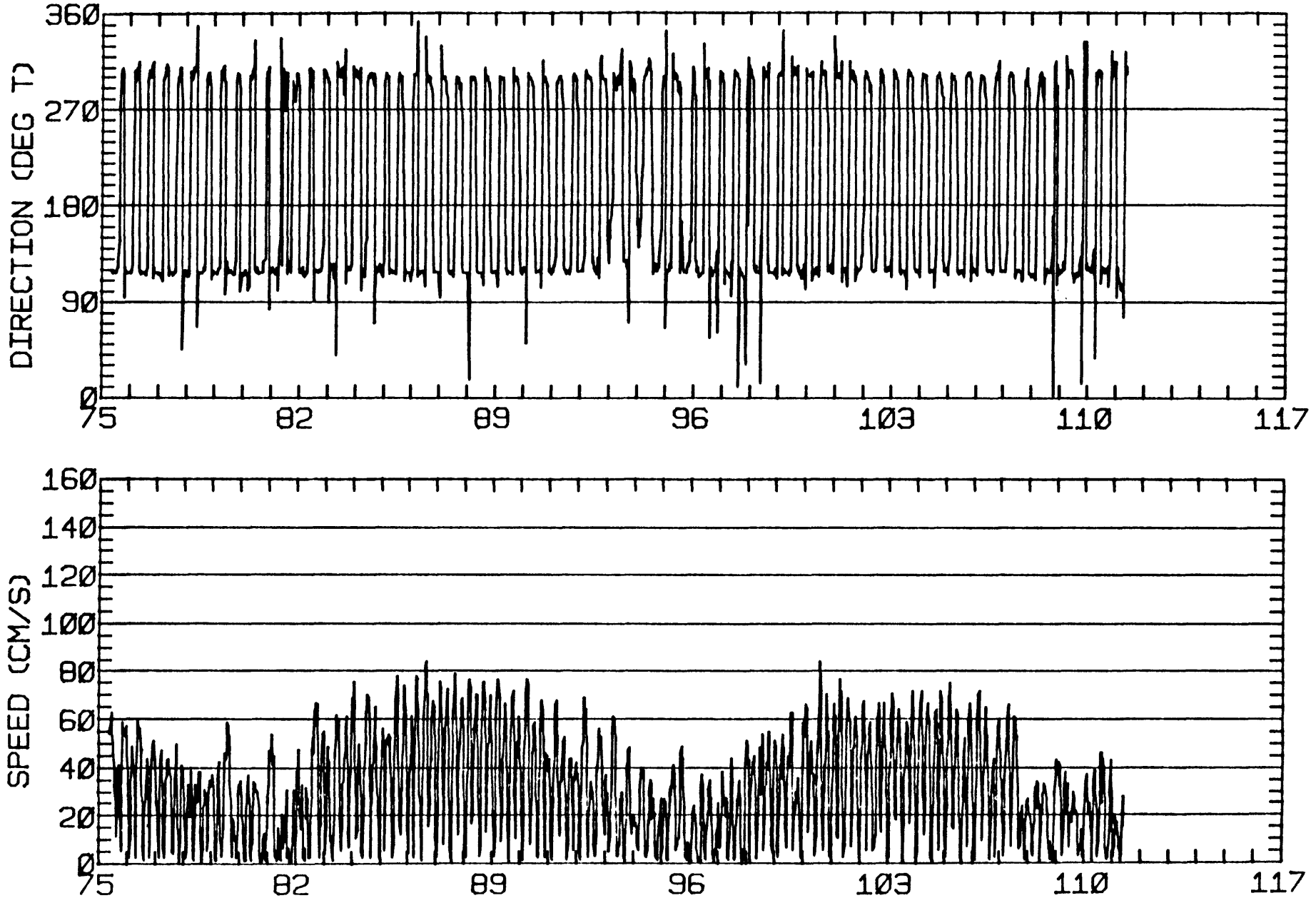
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	4.68	0.24	118.1	22.9	CLOCKWISE
K1	3.79	0.20	127.0	30.2	CLOCKWISE
N2	8.03	0.19	112.4	255.6	ANTI-CLOCKWISE
M2	47.66	1.38	119.9	284.2	ANTI-CLOCKWISE
S2	17.87	0.70	119.2	296.6	ANTI-CLOCKWISE
M4	4.67	1.51	123.7	81.0	ANTI-CLOCKWISE

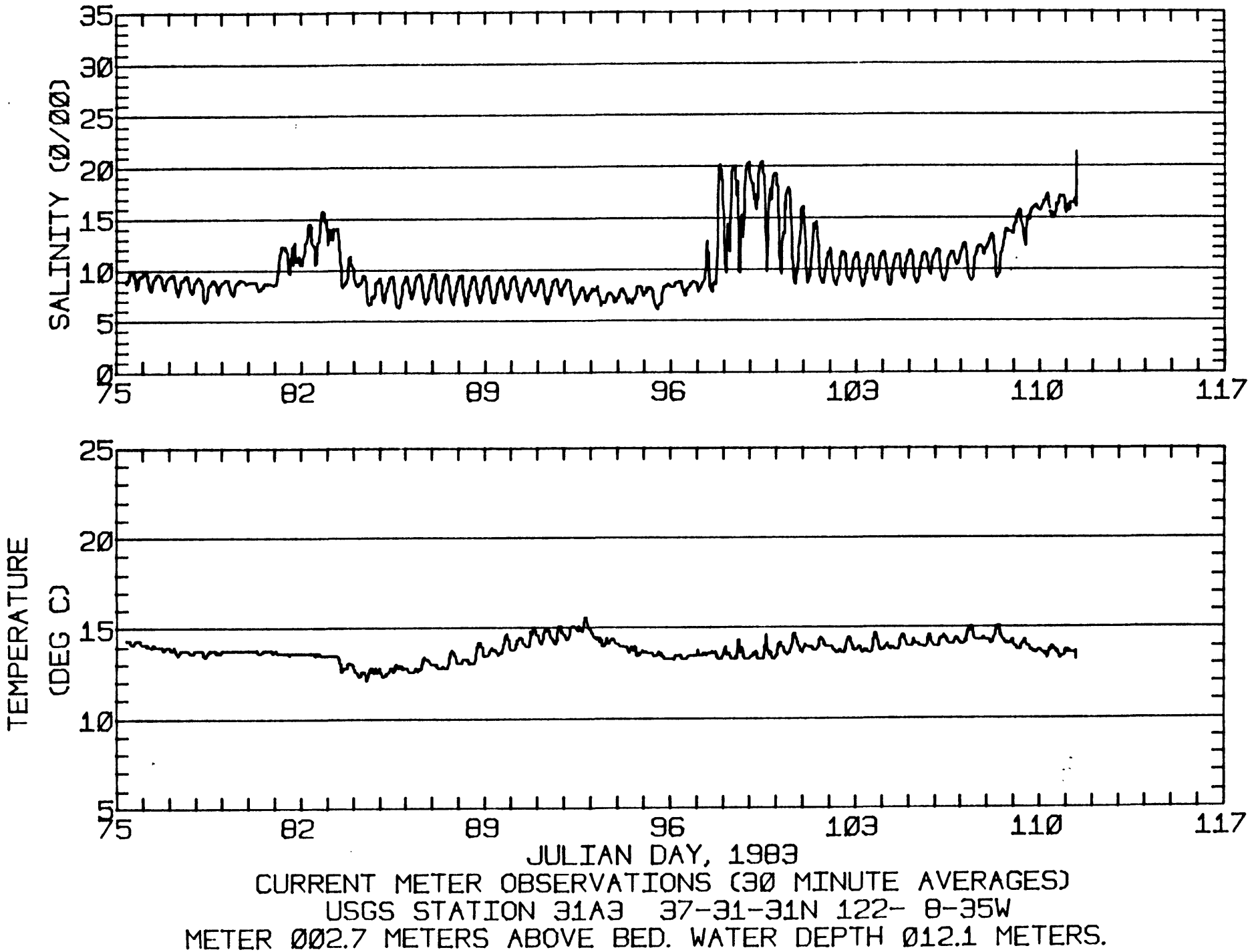
RMS SPEED:	39.2 CM/SEC
SPRING TIDAL CURRENT MAXIMUM:	74.0 CM/SEC
NEAP TIDAL CURRENT MAXIMUM:	30.7 CM/SEC
PRINCIPAL CURRENT DIRECTION:	120.0 DEGREES TRUE
TIDAL FORM NUMBER:	0.13
STANDARD DEVIATION U-SERIES:	12.53 CM/SEC
STANDARD DEVIATION V SERIES:	6.94 CM/SEC

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	9.8	-4.4	7756.
2	12	1.0	-0.5	5926.
3	12	-4.7	0.4	5001.
4	12	-0.1	0.3	4204.
5	8	-1.3	-0.3	3256.
ALL	56	1.1	-0.9	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31A3 37-31-31N 122- 8-35W
METER 002.7 METERS ABOVE BED. WATER DEPTH 012.1 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31A3 37-31-31N 122- 8-35W
METER 002.7 METERS ABOVE BED. WATER DEPTH 012.1 METERS.

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* SUMMARY OF HARMONIC ANALYSIS *
****

CURRENT METER STATION: GS031B1
POSITION: 37 31'34"N 122 8'40"W
METER TYPE: ENDECO
WATER DEPTH: 11.8 M (MLLW)
METER DEPTH: 4.2 M (BELOW MLLW)
START TIME OF SERIES: 4/21/83 1001 PST JULIAN DAY=111
APPROXIMATE RECORD LENGTH IS 56 M2-CYCLES

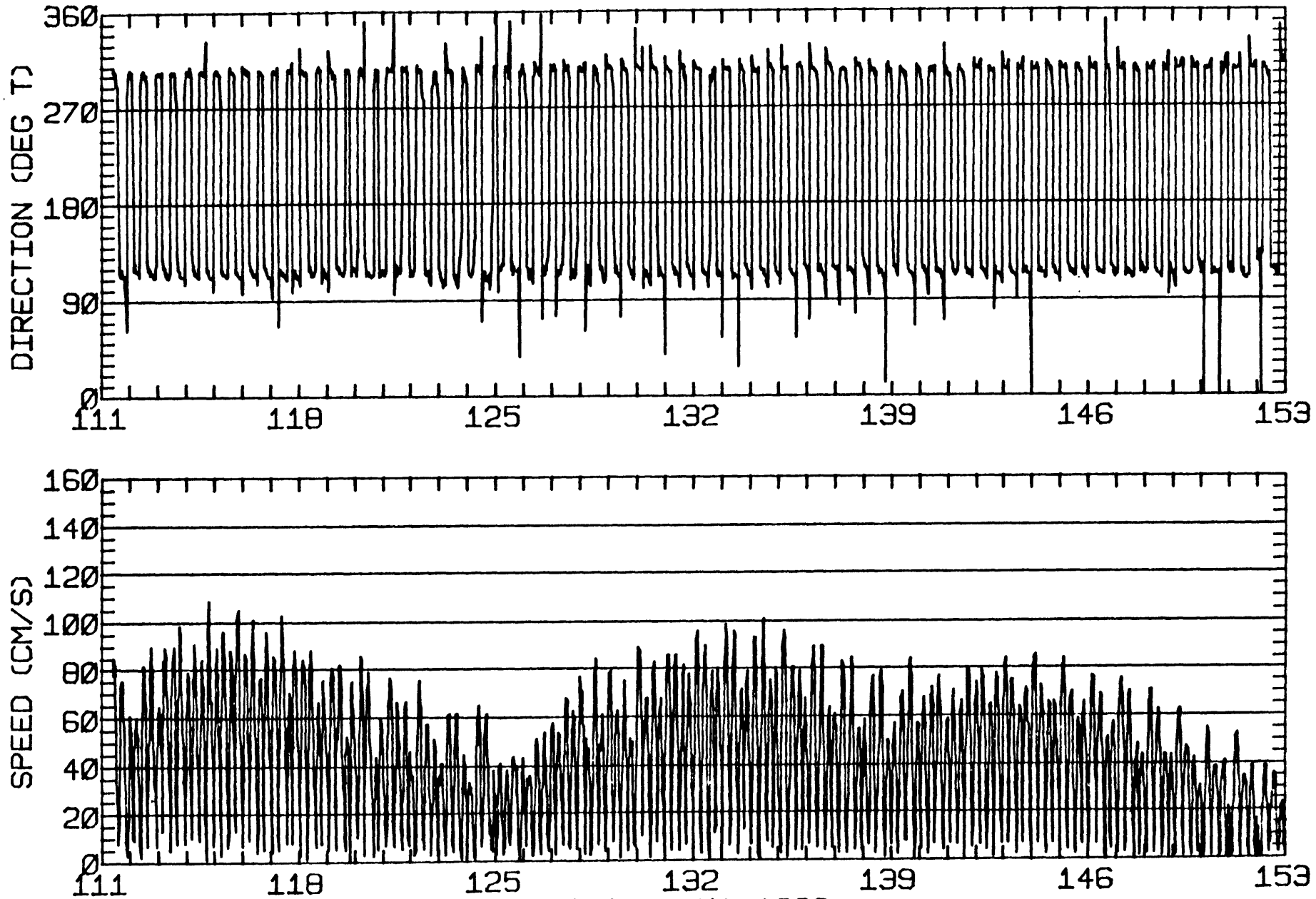
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	8.10	0.87	120.2	31.9	CLOCKWISE
K1	10.83	0.13	118.7	8.1	CLOCKWISE
N2	11.36	0.62	121.0	283.3	ANTI-CLOCKWISE
M2	66.21	1.48	120.1	292.9	ANTI-CLOCKWISE
S2	17.11	0.34	120.6	285.0	ANTI-CLOCKWISE
M4	5.89	1.87	142.7	96.1	ANTI-CLOCKWISE

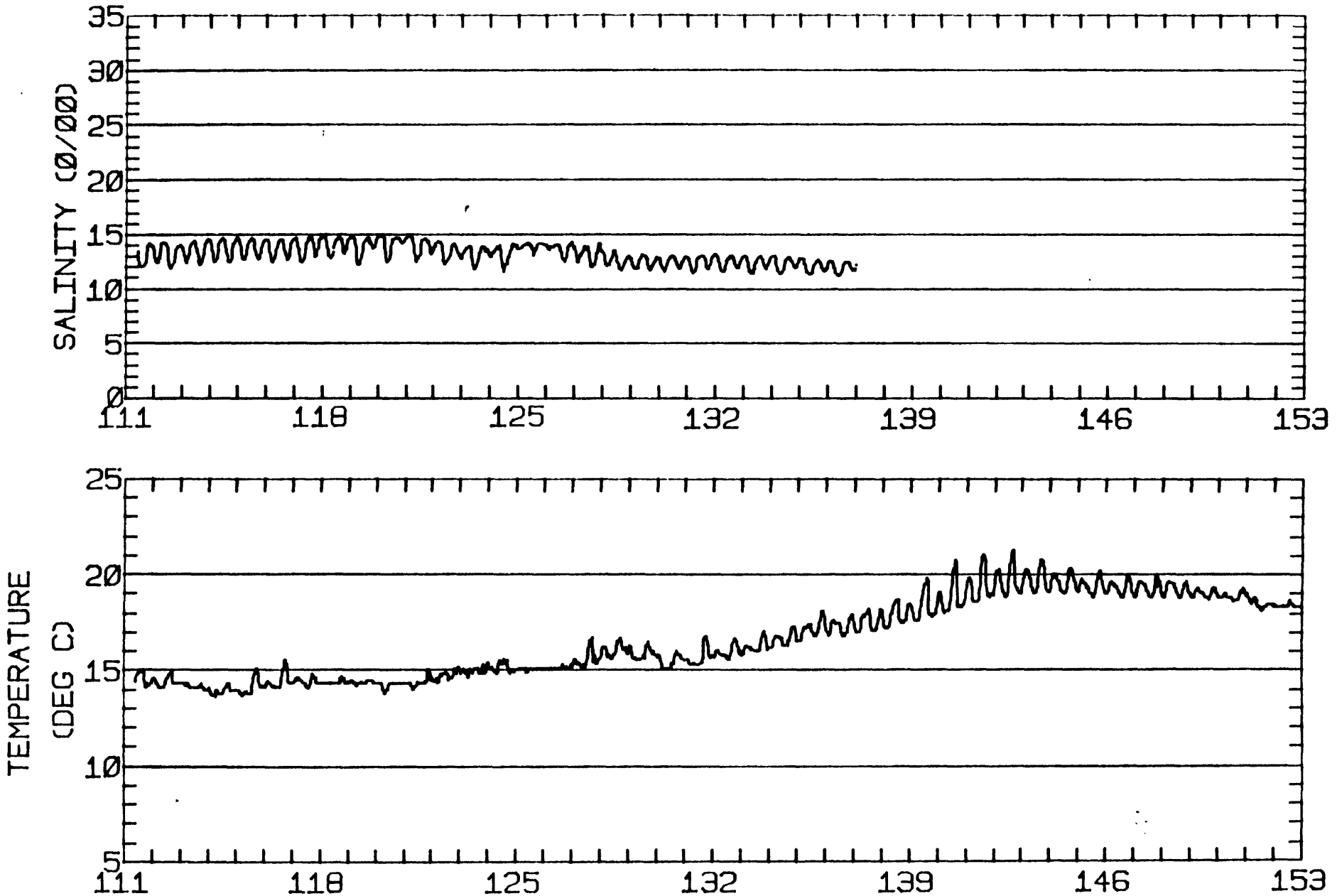
RMS SPEED: 52.0 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 102.2 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 46.4 CM/SEC
PRINCIPAL CURRENT DIRECTION: 120.0 DEGREES TRUE
TIDAL FORM NUMBER: 0.23
STANDARD DEVIATION U-SERIES: 9.39 CM/SEC
STANDARD DEVIATION V SERIES: 6.65 CM/SEC

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	8.1	-0.2	2698.
2	12	4.3	1.1	3358.
3	12	0.1	3.4	3294.
4	12	1.7	4.6	3041.
5	8	4.4	1.0	2686.
ALL	56	3.7	2.1	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31B1 37-31-34N 122- 8-40W
METER 007.6 METERS ABOVE BED. WATER DEPTH 011.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31B1 37-31-34N 122- 8-40W
METER Ø07.6 METERS ABOVE BED. WATER DEPTH Ø11.8 METERS.

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

CURRENT METER STATION: GS031B3
POSITION: 37 31'34"N 122 8'40"W
METER TYPE: ENDECO
WATER DEPTH: 11.8 M (MLLW)
METER DEPTH: 9.1 M (BELOW MLLW)
START TIME OF SERIES: 5/ 1/83 731 PST JULIAN DAY=121
APPROXIMATE RECORD LENGTH IS 38 M2-CYCLES

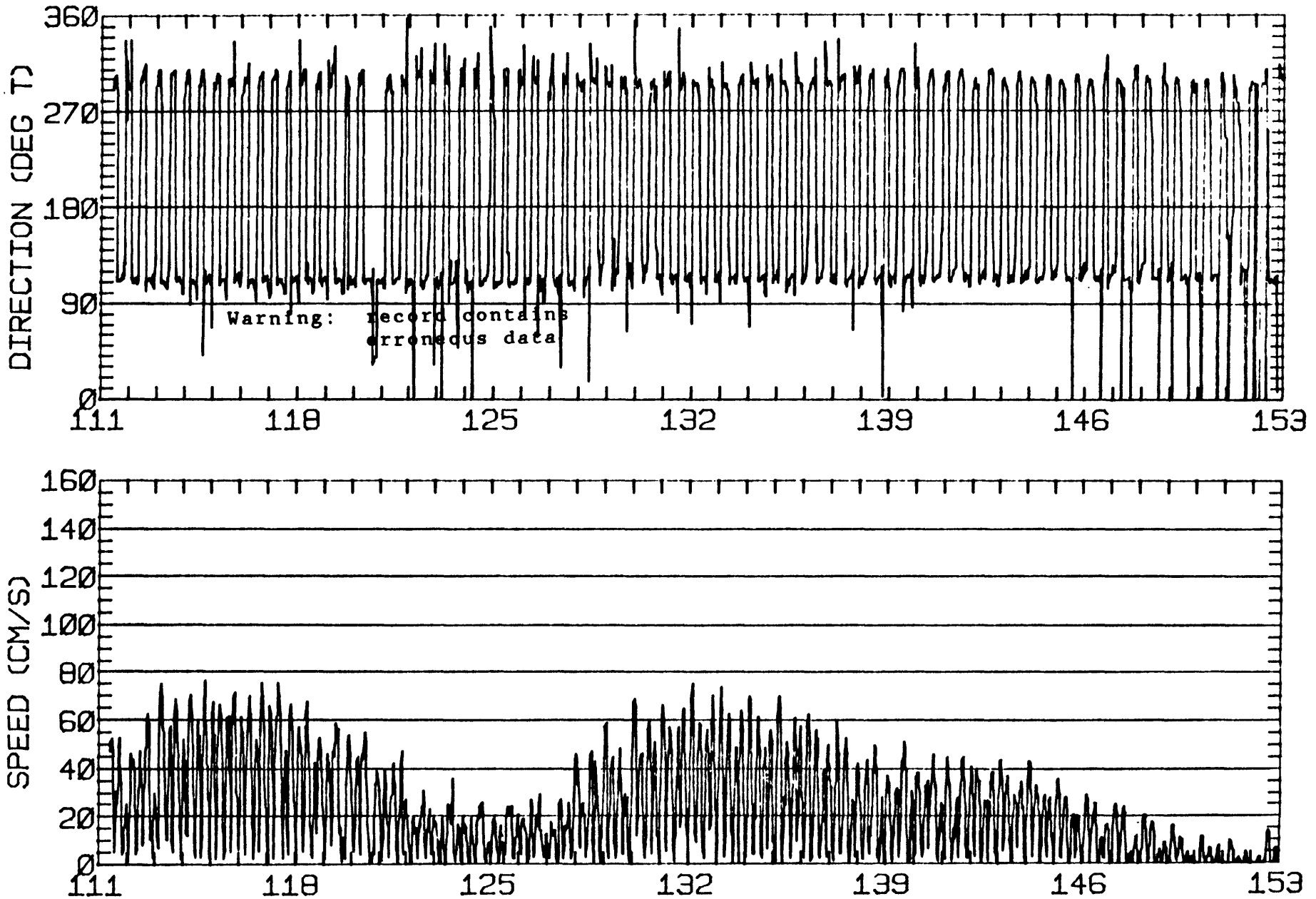
TIDAL ELLIPSES OF SIX MAJOR CONSTITUENTS:

CONSTITUENT	MAJOR (CM/SEC)	MINOR (CM/SEC)	DIR (DEG T)	PHASE (DEG)	ROTATION
O1	3.73	0.10	118.4	38.9	ANTI-CLOCKWISE
K1	6.82	0.10	116.1	353.5	CLOCKWISE
N2	8.98	0.17	119.1	296.9	ANTI-CLOCKWISE
M2	38.31	0.21	115.7	281.6	CLOCKWISE
S2	13.03	0.46	114.8	287.5	ANTI-CLOCKWISE
M4	4.39	0.90	118.4	66.6	ANTI-CLOCKWISE

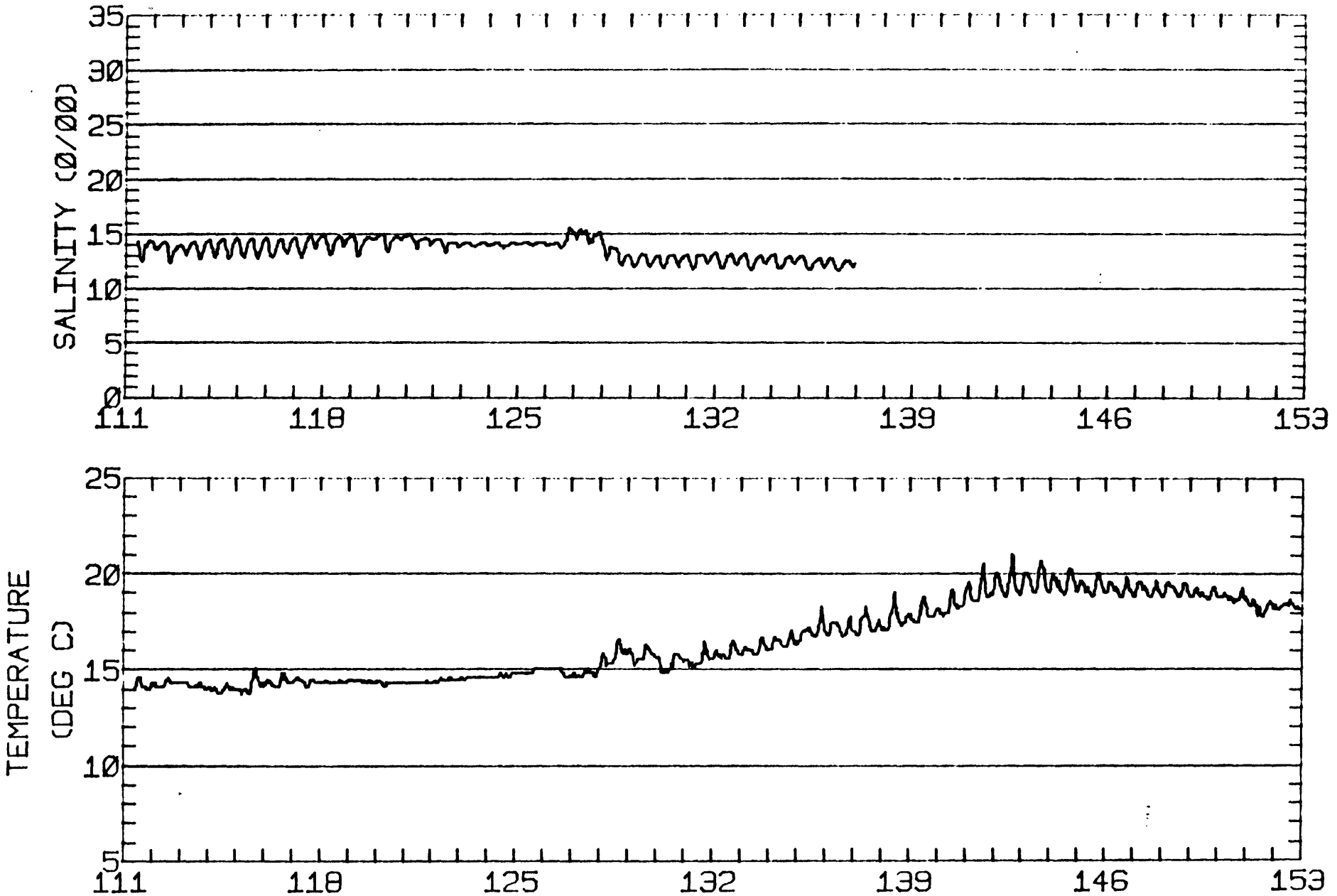
RMS SPEED: 30.4 CM/SEC
SPRING TIDAL CURRENT MAXIMUM: 61.9 CM/SEC
NEAP TIDAL CURRENT MAXIMUM: 22.2 CM/SEC
PRINCIPAL CURRENT DIRECTION: 115.7 DEGREES TRUE
TIDAL FORM NUMBER: 0.21
STANDARD DEVIATION U-SERIES: 8.27 CM/SEC
STANDARD DEVIATION V SERIES: 4.41 CM/SEC

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	4.5	-1.0	3430.
2	12	-1.8	0.8	3170.
3	12	3.5	-0.6	2863.
4	2	7.6	-2.6	2439.
ALL	38	2.3	-0.4	



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 31B3 37-31-34N 122- 8-40W
METER 002.6 METERS ABOVE BED. WATER DEPTH 011.8 METERS.



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
USGS STATION 3183 37-31-34N 122- 8-40W
METER 002.6 METERS ABOVE BED. WATER DEPTH 011.8 METERS.