OBSERVATIONS FROM MOORED CURRENT METERS IN SAN FRANCISCO BAY, 1978

Compiled and Edited by Jeffrey W. Gartner
and Ralph T. Cheng

U. S. GEOLOGICAL SURVEY

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San Francisco Bay estuary

UNITED STATES DEPARTMENT OF THE INTERIOR

James G. Watt, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

OPEN-FILE REPORT

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Menlo Park, CA 94025

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ABSTRACT

Current-meter data collected at eight stations in the San Francisco Bay estuarine system between August 1978 and December 1978 are compiled in this report. The measurements include current speed and direction, and water temperature and salinity (computed from conductivity and temperature). Data are presented in graphical format with each parameter plotted separately.

INTRODUCTION

The deployment of current meters is one segment of an extensive interdisciplinary study undertaken by the U.S. Geological Survey to better understand the interactive physical, chemical, and biological processes which affect the San Francisco Bay estuarine system. Broad goals of this study are to understand the processes and rates 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. Current meters employed permit recording of current speed, direction, temperature, and conductivity at 2 minute intervals for deployment periods of up to 30-40 days. This report presents, chronologically and station by station, all current-meter data collected during 1978. A brief summary of equipment and methods is given below. A more complete description of equipment, deployment, recovery, maintenance, and data processing procedures is given in Cheng and Gartner (1980).

METHODS

EQUIPMENT: The current meters used in the program are ENDECO-174[1/] digital-recording current meters. The ENDECO-174 is an axial-flow, ducted-impeller current meter which records data on a magnetic tape cartridge. Data can be recorded for up to 40 days when the data-recording interval is selected to be 2 minutes. Accuracy specifications for ENDECO-174 current meters provided by the manufacturer (Environmental Devices Corporation, Marion, Mass.) are as follows: speed, $\pm$3.0 percent of full scale (257 cm/s) above the threshold (2.6 cm/s); direction, $\pm 7.2^{\circ}$; temperature, $\pm 0.2^{\circ}$C; and conductivity, $\pm$0.55 mmho/cm.

POSITION: During early deployments, all station positions (Fig. 1) were determined by radar ranges and bearings or visual references. Later positions were determined by horizontal sextant fixes. Fixes were determined to the nearest second of arc ($\pm$31 m).

TIME: In this report all reference times have been converted to Pacific Standard Time and Julian days.

RECORDED PARAMETERS: 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. Salinity is computed from temperature and conductivity data based upon the modified Cox relationship (D. W. Pritchard, personal communication, 1978).

[1/] Mention of a commercial company or product in this report does not constitute an endorsement by the authors or the U.S. Geological Survey.

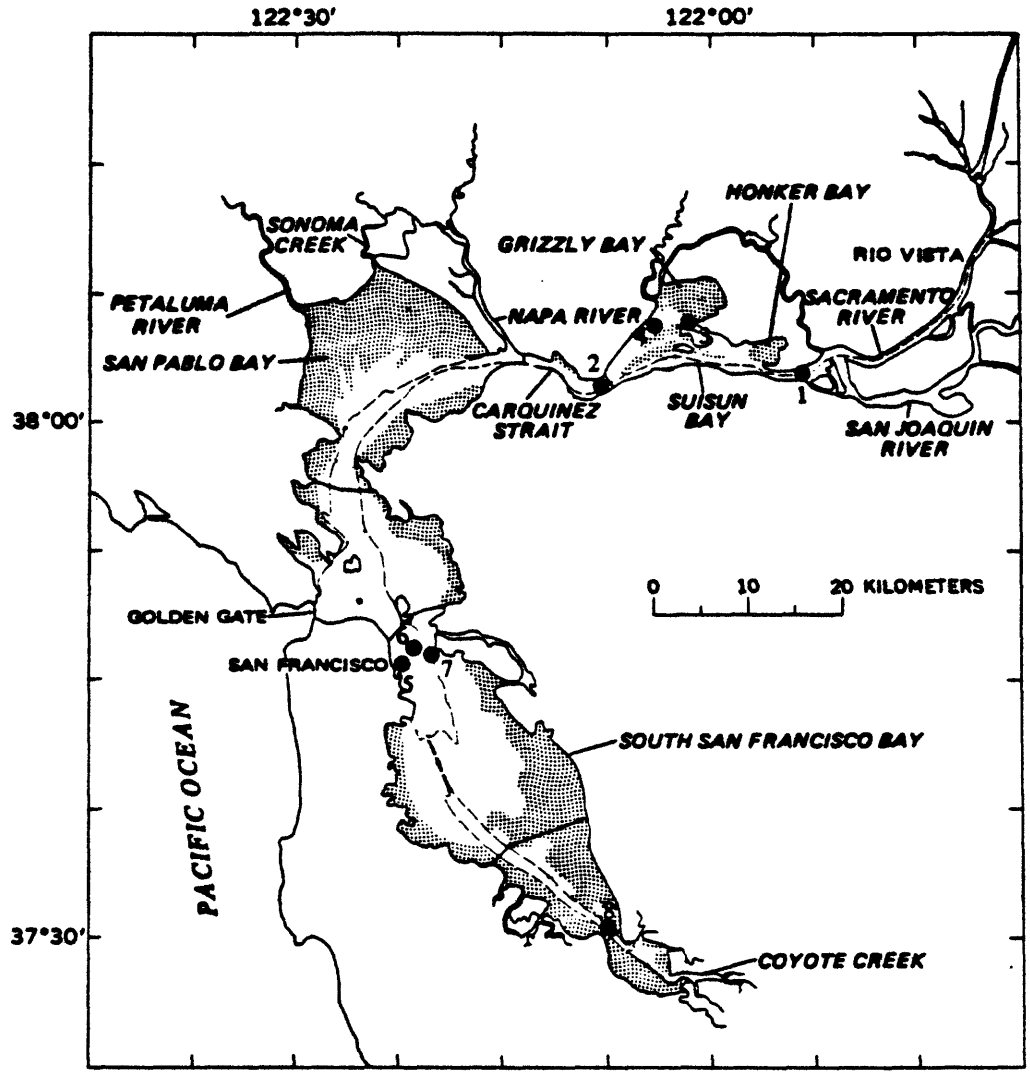


FIGURE 1. Map of study region and locations of current-meter stations (1978)

DATA

Current-meter data are presented in Appendix A with each parameter plotted against time for the entire deployment period. The temperature and salinity values in the graphs were block averaged over 30 minutes (15 samples) and speed and direction were vector averaged over the same time period. If either speed or direction data became unusable at some point in the record and the time series of these parameters are of different lengths, the arithmetic averages of the "good" data have been plotted rather than vector averages. This is the case if a compass or speed encoder failed to perform correctly. In addition to the time-series plots, histograms of speed and direction (Appendix B) are included to show the parameter distributions for the deployment period based on the original 2 minute (nonaveraged) data. Plot legends give station position, meter height, and tape number. Table 1, which summarizes station locations, deployment and recovery times for all data included in this report can be used as a cross-reference to the current-meter stations by referring to deployment tape number.

In several records the temperature data were in error due to an electronic problem in the current meters. In these cases conductivity is plotted rather than salinity because salinity could not be computed without temperature data. The minimum conductivity which can be measured by the ENDECO-174 current meter is approximately 5 mmho/cm (approximately 3 $^{o}/oo$ salinity at $20^{o}C$). Therefore, during several deployments, the minimum conductivities and salinities were below the threshold of the sensor and are not known. Accuracy of conductivity data may also be affected by two external conditions. These are the

TABLE 1. Summary of current-meter deployments, 1978

DEPLOYMENTS BETWEEN 1 78 AND 365 78

COMPLETED DEPLOYMENTS

STATION NUMBER	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPLOYMENT DATE*	RECOVERY DATE	TAPE NUMBER	MLLW DEPTH**	POSITION
GS1	38.	2.6	121.	53.9	214 78	250 78	GS001A1	50	PITTSBURG
GS1	38.	2.6	121.	53.9	214 78	250 78	GS001A2	50	PITTSBURG
GS1	38.	2.6	121.	53.9	214 78	250 78	GS001A3	50	PITTSBURG
GS1	38.	2.6	121.	53.9	255 78	286 78	GS001B2	50	PITTSBURG
GS1	38.	2.6	121.	53.9	255 78	286 78	GS001B3	50	PITTSBURG
GS2	38.	2.5	122.	7.5	214 78	249 78	GS002A1	50	BENECIA BR.
GS2	38.	2.5	122.	7.5	214 78	249 78	GS002A2	50	BENECIA BR.
GS2	38.	2.5	122.	7.5	214 78	249 78	GS002A3	50	BENECIA BR.
GS2	38.	2.5	122.	7.5	255 78	286 78	GS002B1	50	BENECIA BR.
GS2	38.	2.5	122.	7.5	255 78	286 78	GS002B2	50	BENECIA BR.
GS2	38.	2.5	122.	7.5	255 78	286 78	GS002B3	50	BENECIA BR.
GS3	38.	5.6	122.	1.1	250 78	286 78	GS003A1	25	RYER IS.
GS3	38.	5.6	122.	1.1	250 78	286 78	GS003A2	25	RYER IS.
GS4	38.	5.8	122.	4.0	250 78	286 78	GS004A1	25	RESERVE FLT.
GS4	38.	5.8	122.	4.0	250 78	286 78	GS004A2	25	RESERVW FLT.
GS5	37.	45.4	122.	21.9	319 78	345 78	GS005A1	40	POTRERO PT.
GS5	37.	45.4	122.	21.9	319 78	345 78	GS005A2	40	POTRERO PT.
GS5	37.	45.4	122.	21.9	319 78	345 78	GS005A3	40	POTRERO PT.
GS6	37.	46.2	122.	21.3	319 78	345 78	GS006A1	60	POTRERO PT.
GS6	37.	46.2	122.	21.3	319 78	345 78	GS006A2	60	POTRERO PT.
GS6	37.	46.2	122.	21.3	319 78	345 78	GS006A3	60	POTRERO PT.
GS7	37.	46.2	122.	20.0	319 78	345 78	GS007A1	30	NAS ALAMEDA
GS7	37.	46.2	122.	20.0	319 78	345 78	GS007A2	30	NAS ALAMEDA
GS8	37.	31.2	122.	8.0	319 78	345 78	GS008A1	30	DUMBARTON BR.

*Date in Julian Day

**Water column depth referenced to Mean Lower Low Water

amount of marine growth on the external sensor and the battery voltage which is a function of the deployment length and water temperature. Current-meter circuitry generates conductivity reference values applied in data reduction which greatly eliminates the latter problem; however, marine growth is not a simple problem to evaluate. As a check on data validity, current-meter records were compared to existing data from nearby water-sampling stations collected during research cruises (Alpine and others, 1981a, b) as well as other current-meter records from the same area. If data were incorrect for an entire tape (for example if the electronic circuitry had failed) no record was plotted. However, if data were correct for only a part of a deployment, the plot was terminated at the time of the last corresponding cruise sample where the data were in agreement or at the point of obvious electronic failure (see Fig. 2). If no suitable data existed in order to make this determination, yet the data appeared to be erroneous, the time series plot was terminated at the point of apparent error. This situation might exist if the conductivity value at the end of one deployment differed from that at the beginning of a subsequent deployment at the same station.

The histograms in Appendix B give the statistical distributions of speed and direction for each deployment. The histograms can also be used to identify abnormal instrument performance. For example, in a few cases an examination of the speed histograms revealed an additional problem. Discontinuities in the data occured because a few binary digits were never recorded. This was the result of a mechanical problem in the encoder which prevented certain discrete speeds from being recorded. However, this discrepency did not affect the general

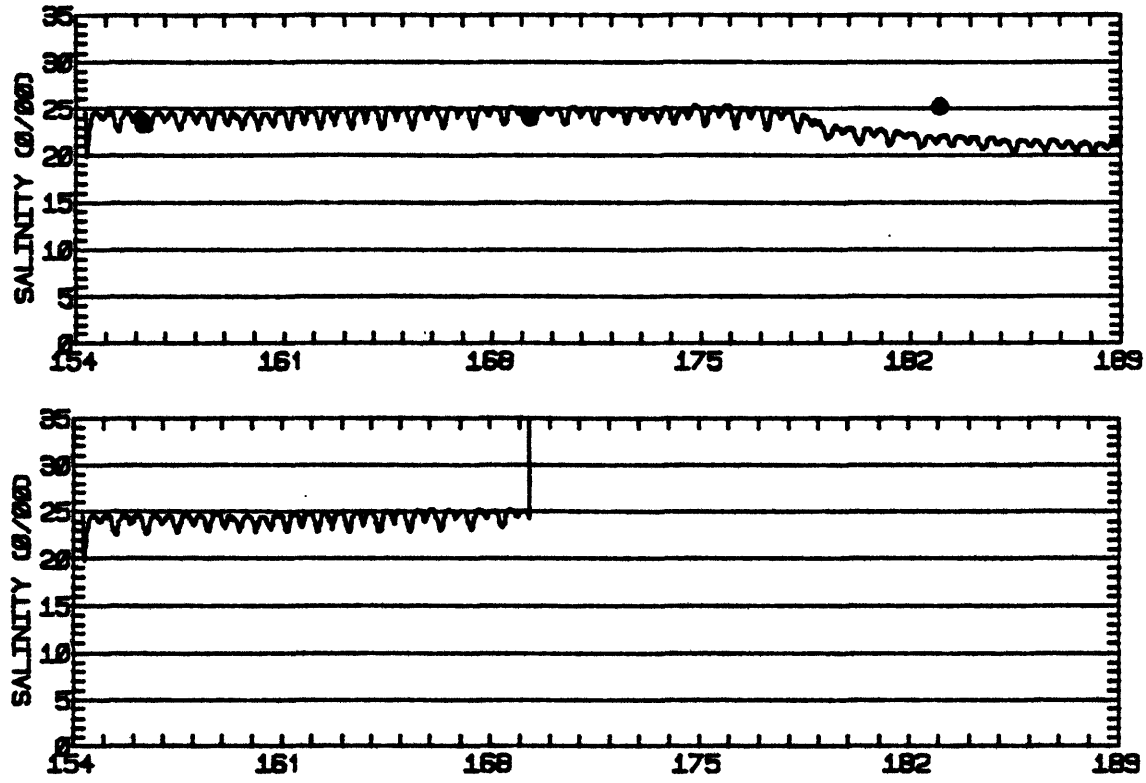


FIGURE 2. Salinity from a deployment with degraded conductivity. The dots in the top plot show the corresponding water sample obtained from a research cruise. The bottom plot is an example of that time series plot truncated at the point of the last cruise when the data were in agreement. The same data screening procedure is used for all temperature and conductivity data presented in this report.

features of the speed records when they were averaged over a 30-minute period.

Editing of speed and direction readings are much more difficult and there is no simple procedure that can be routinely applied to these series. No attempt has been made to correct erroneous speed and direction readings prior to the averaging and plotting of the records unless a parameter was obviously unreliable. The plotted data provide users with a visual record to examine for possible "glitches". It is left for users to further edit the data set if desired before the next phase of data analysis. All data files (2 minute and 30 minute) are currently stored on computer retrievable media.

Appendix C lists the status of measured parameters and any applicable notes for all deployments.

REFERENCES

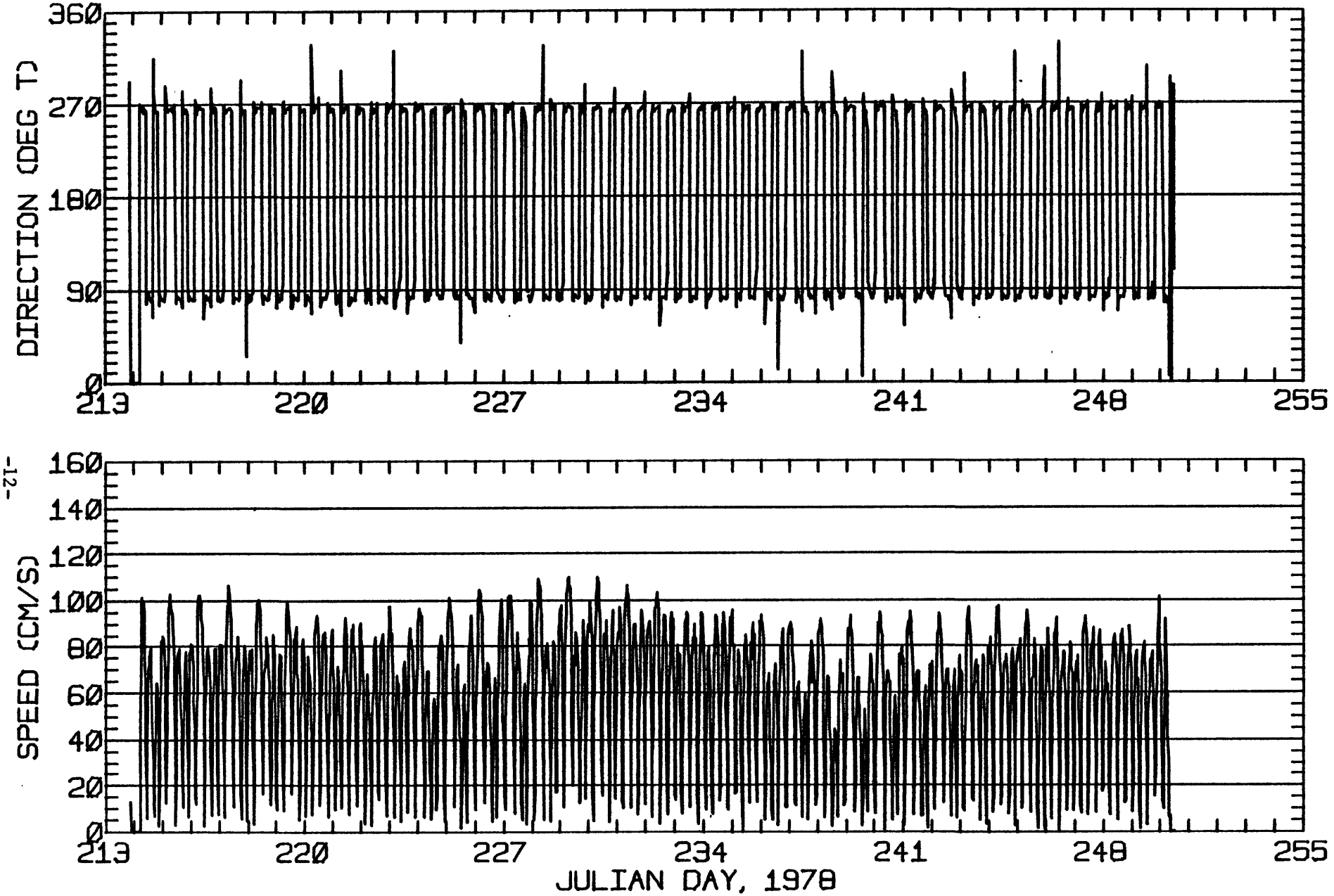
1. Alpine, A.E., Cloern, J.E., and Cole, B.E., 1981a, Plankton studies in San Francisco Bay. I. Chlorophyll distributions and hydrographic properties of the San Francisco Bay Estuary, July 1977 - December 1979: U.S. Geological Survey Open-File Report 81-213, 150 p.

2. Alpine, A.E., Cloern, J.E., and Cole, B.E., 1981b, Plankton studies in San Francisco Bay. II. Chlorophyll distributions and hydrographic properties of the San Francisco Bay Estuary, January 1980 - April 1981: U.S. Geological Survey Open-File Report, in prep.

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

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

APPENDIX A



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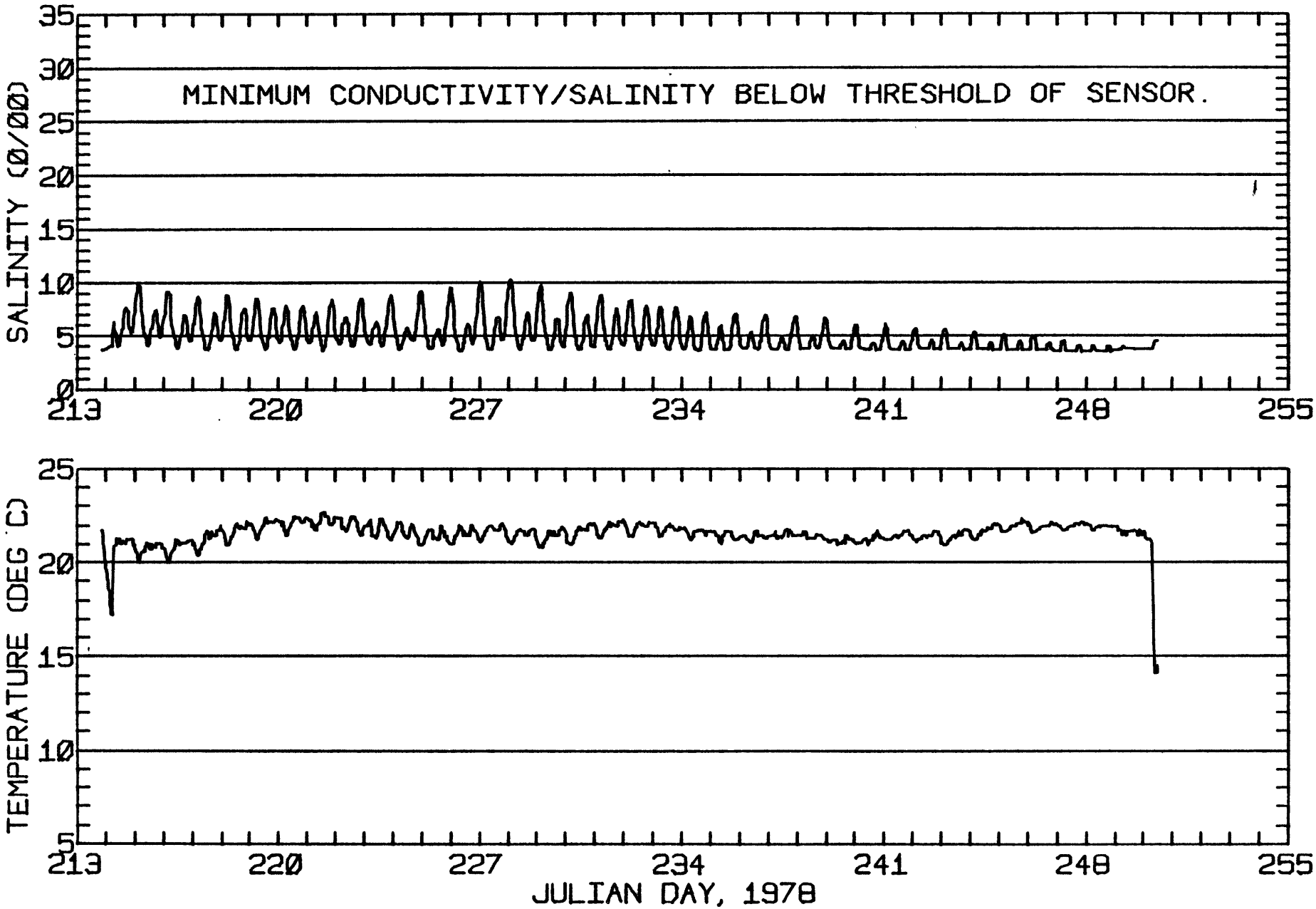
PITTSBURG 38- 2-38N 121-53-58W
METER 43 FEET ABOVE BED. TAPE NUMBER GS001A1.



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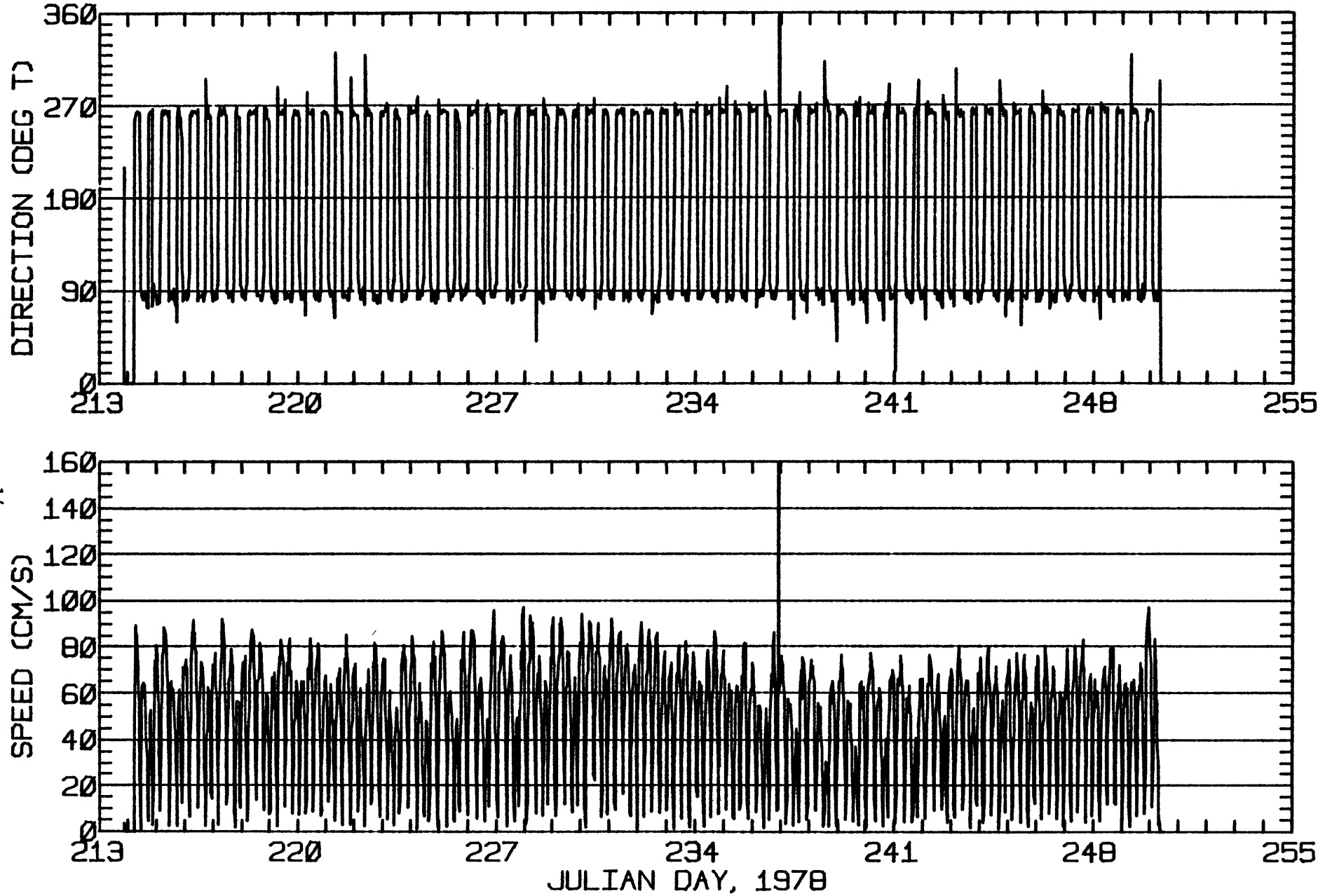

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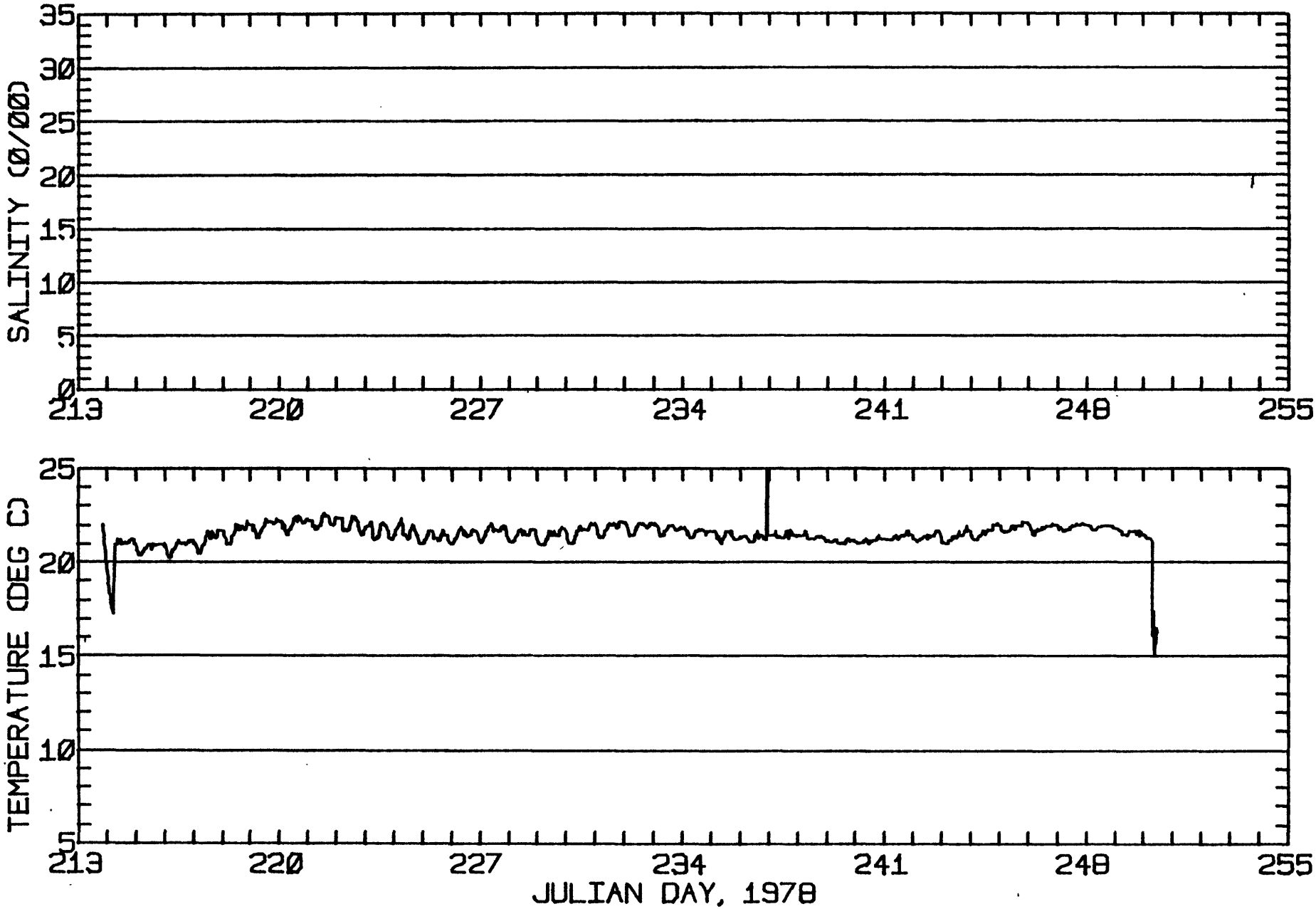

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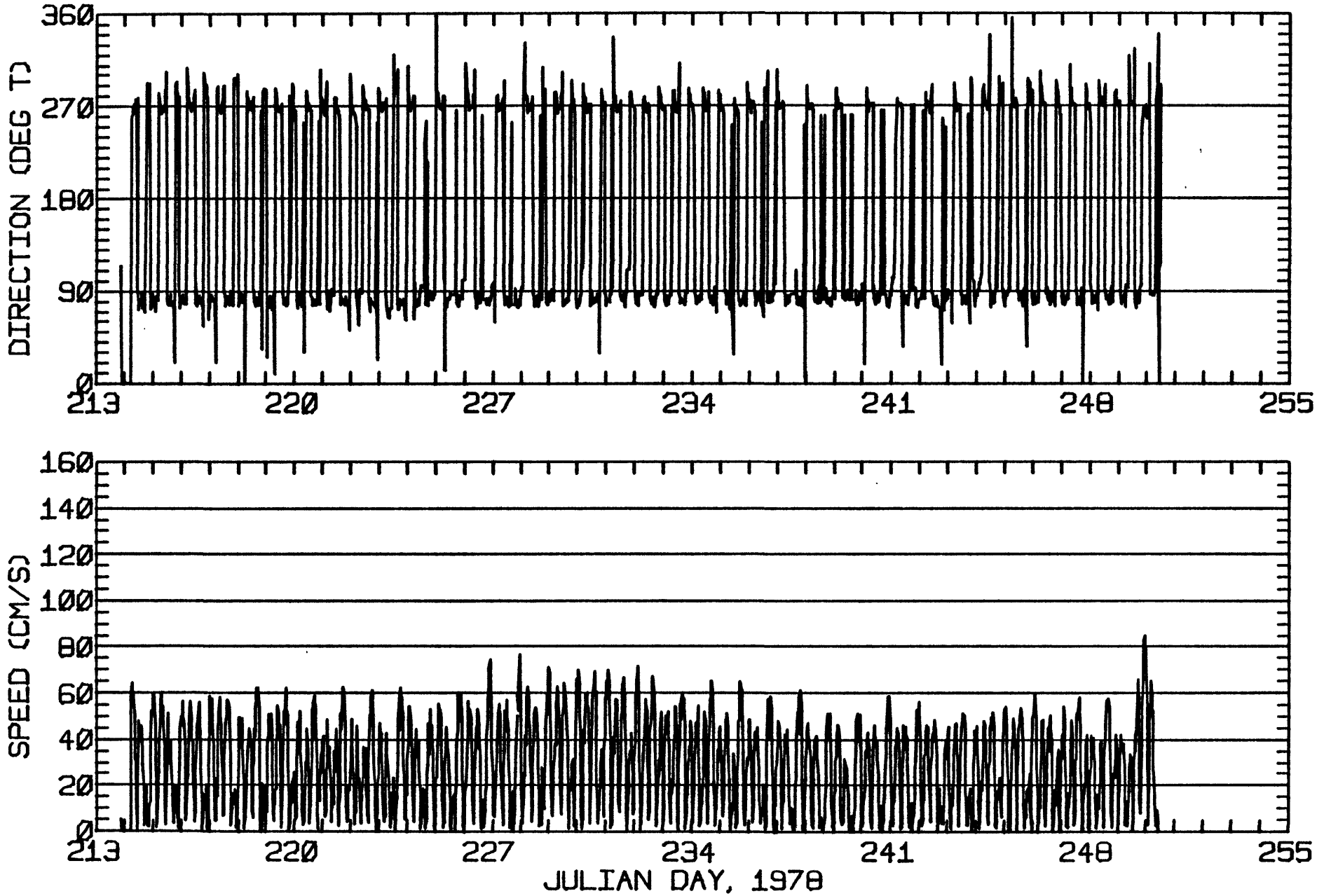

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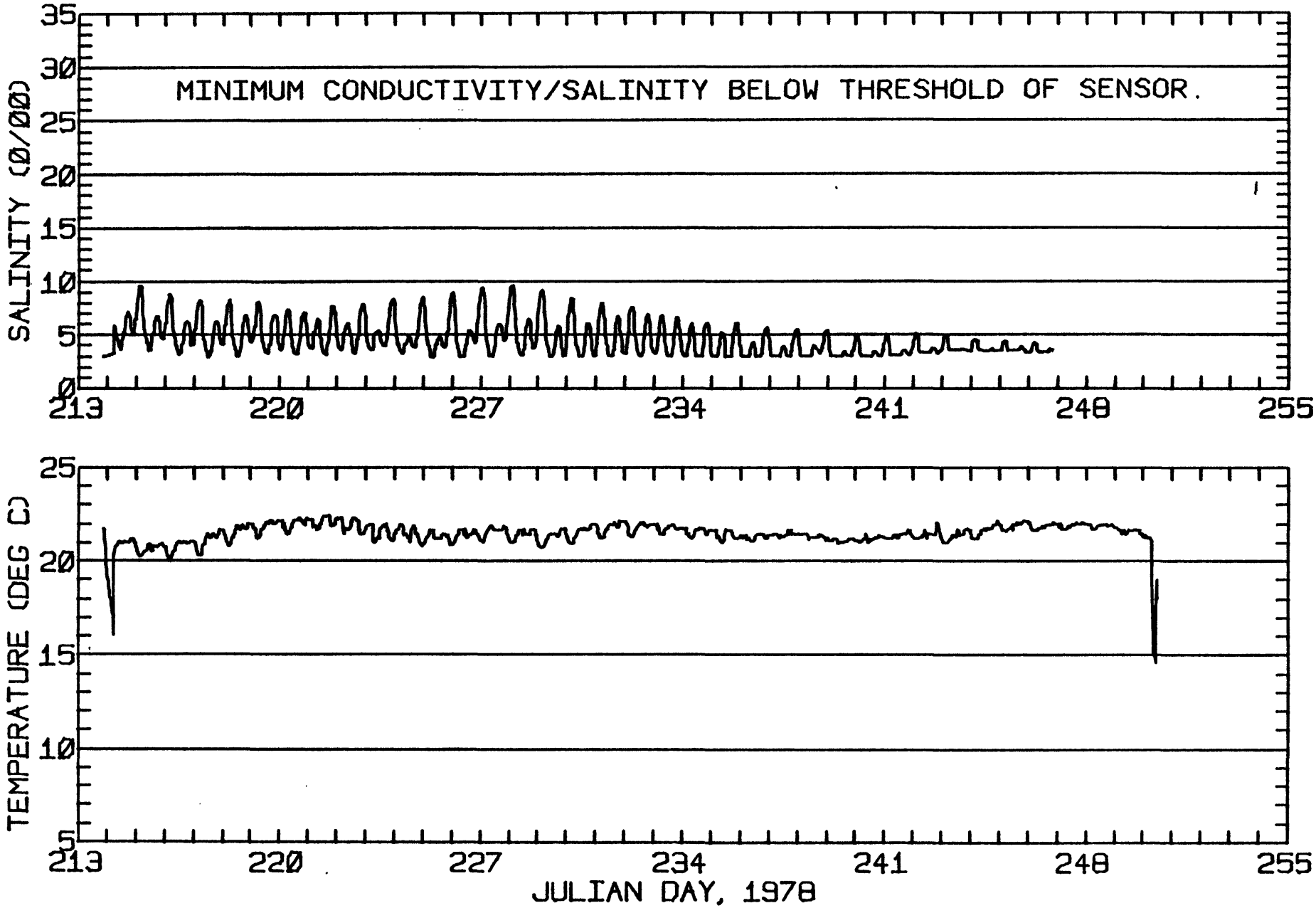

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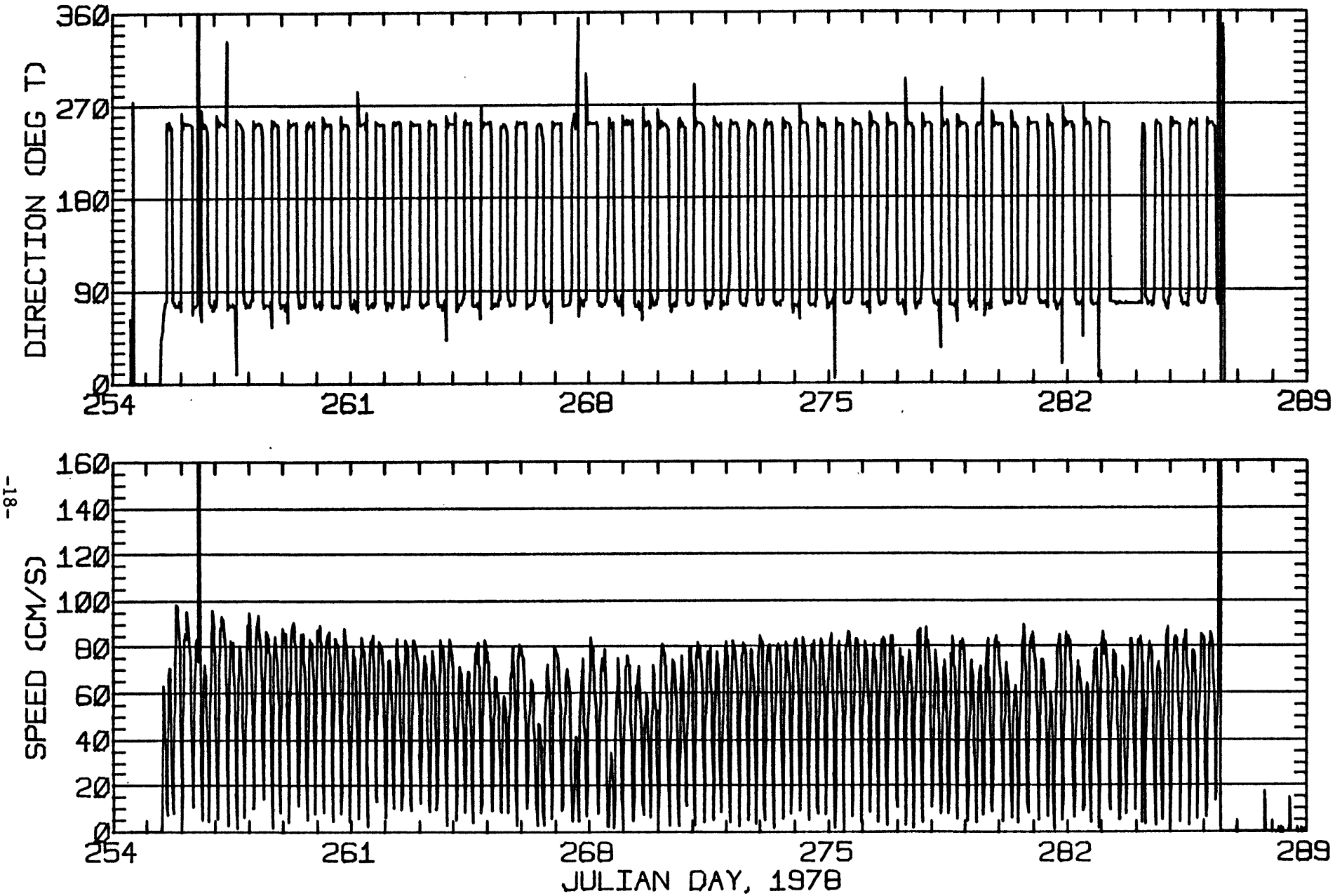

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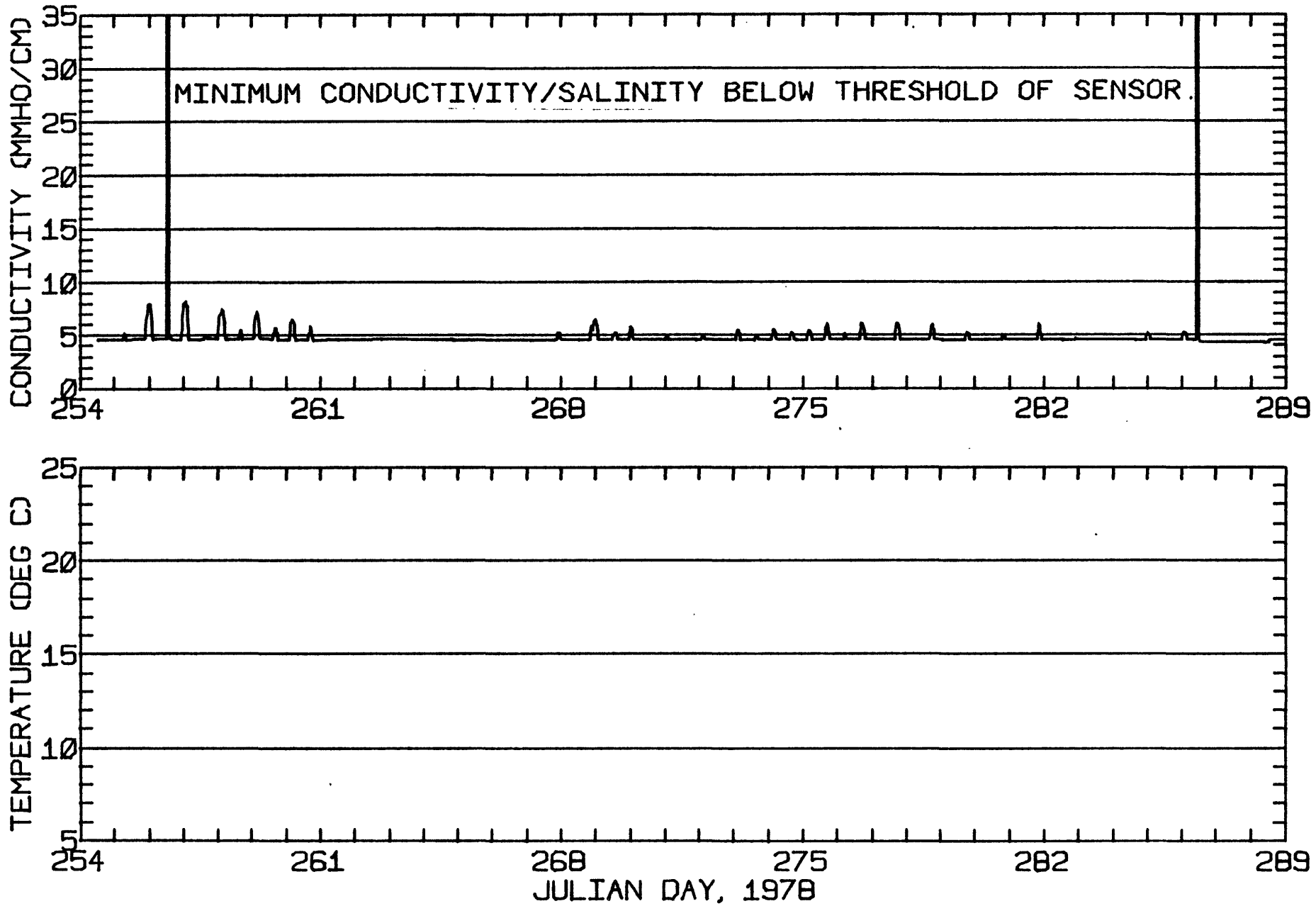

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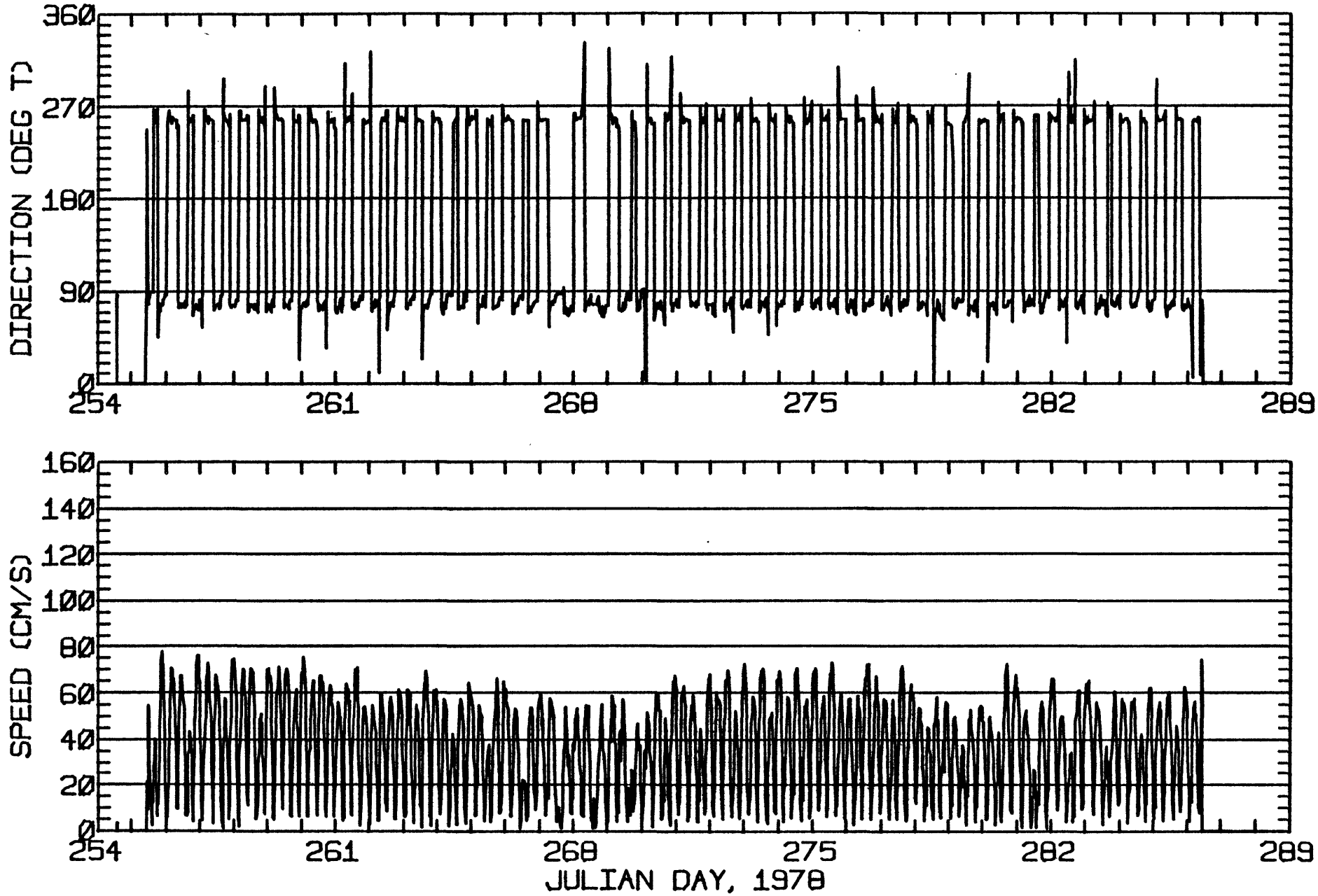

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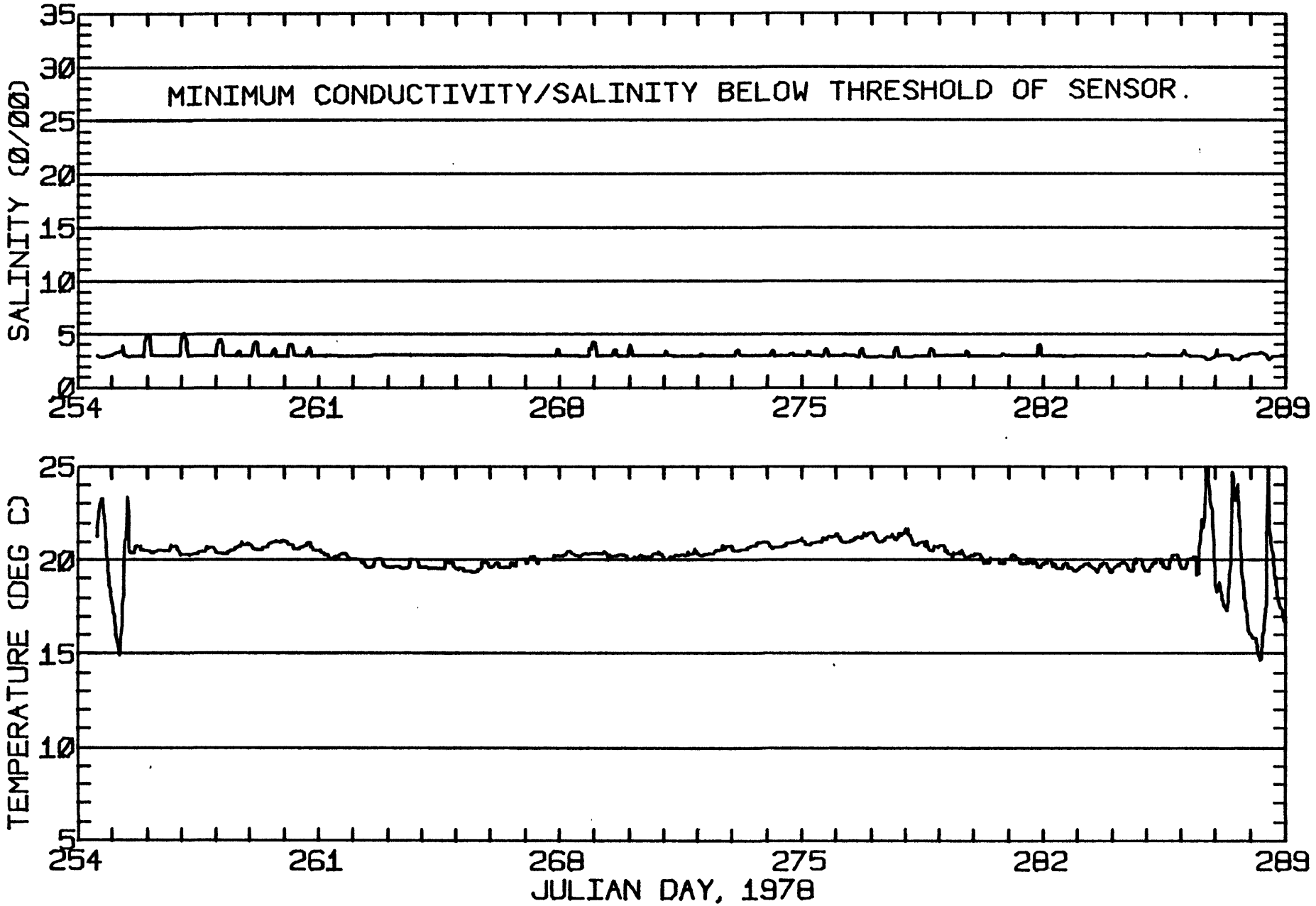

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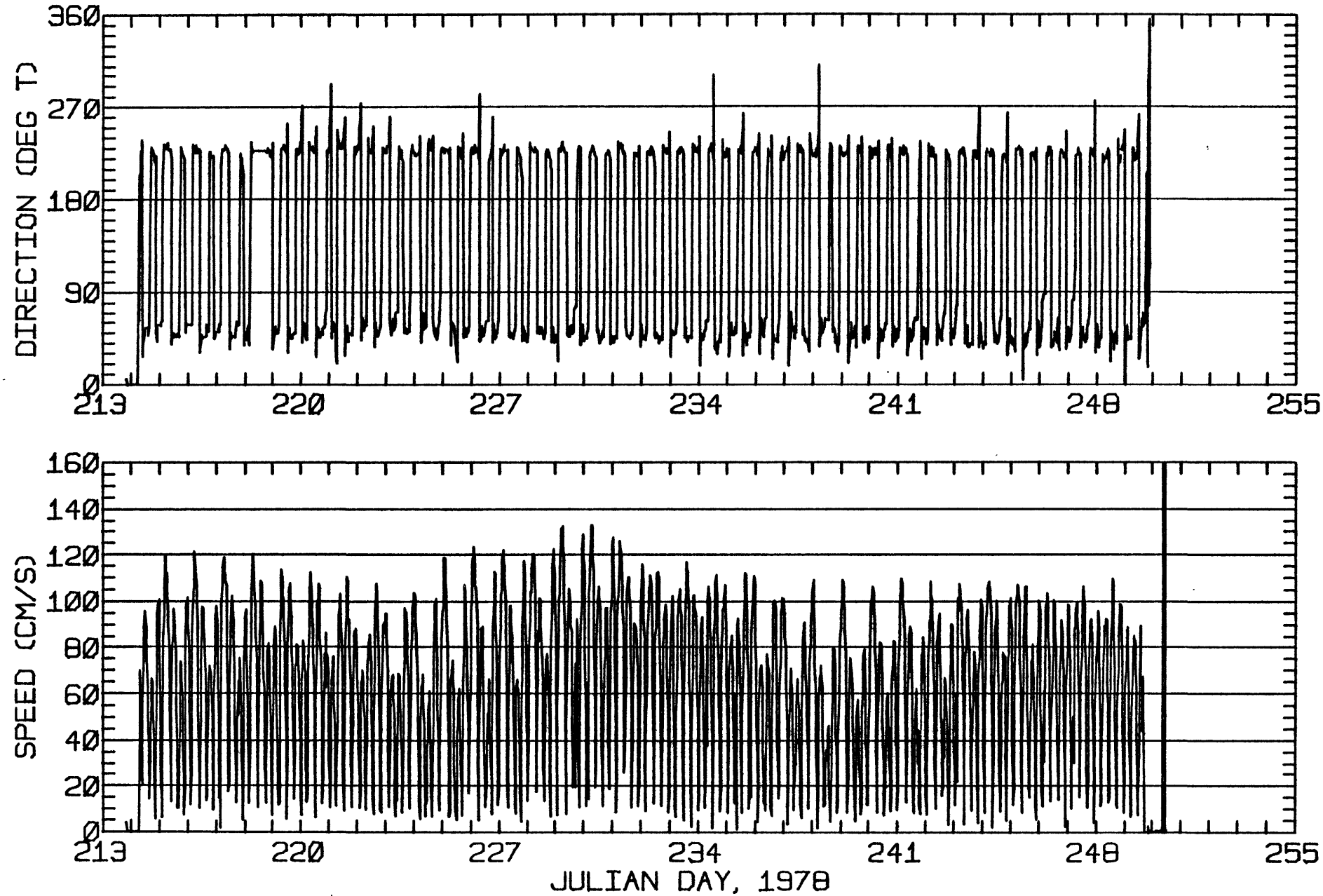

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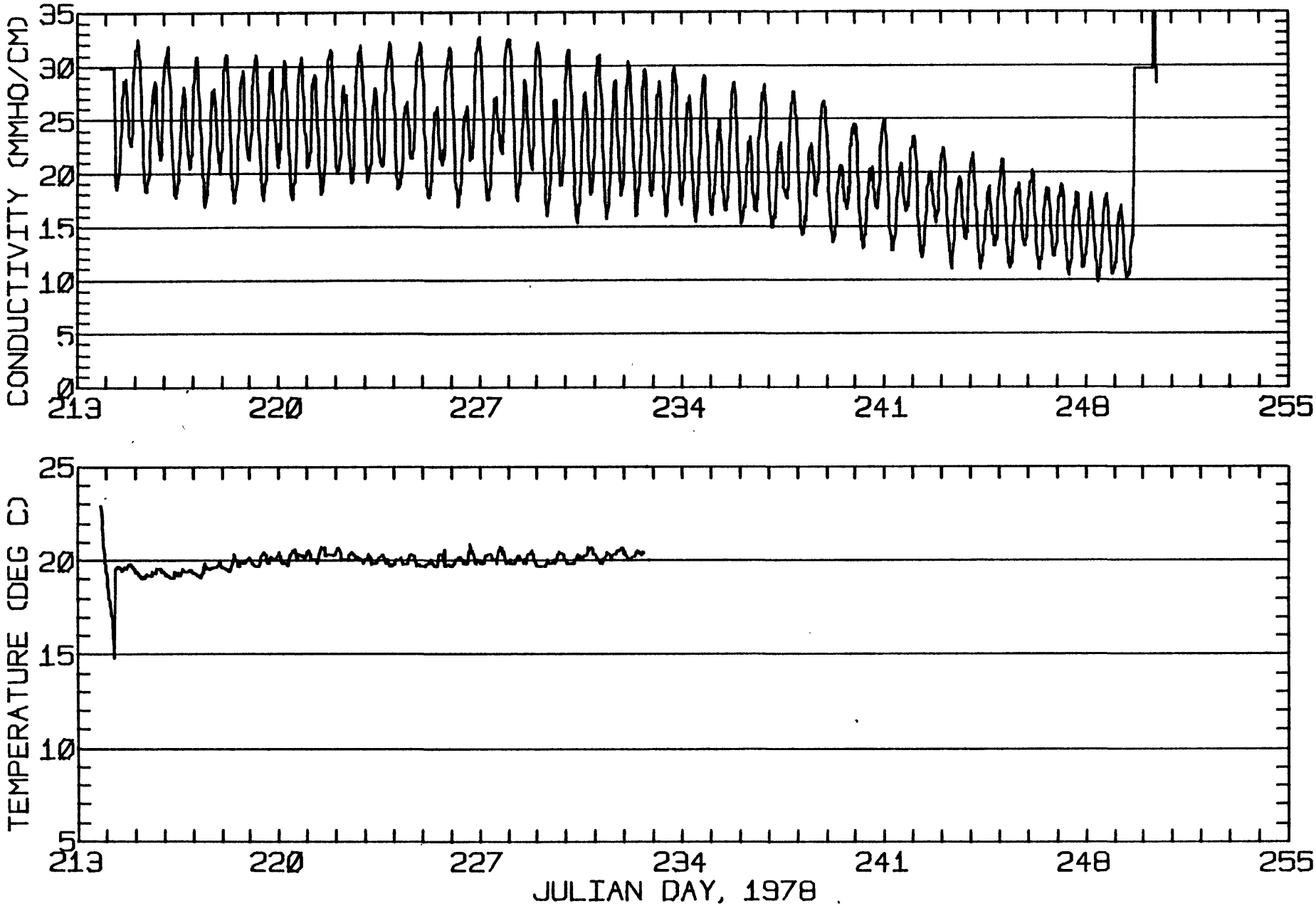

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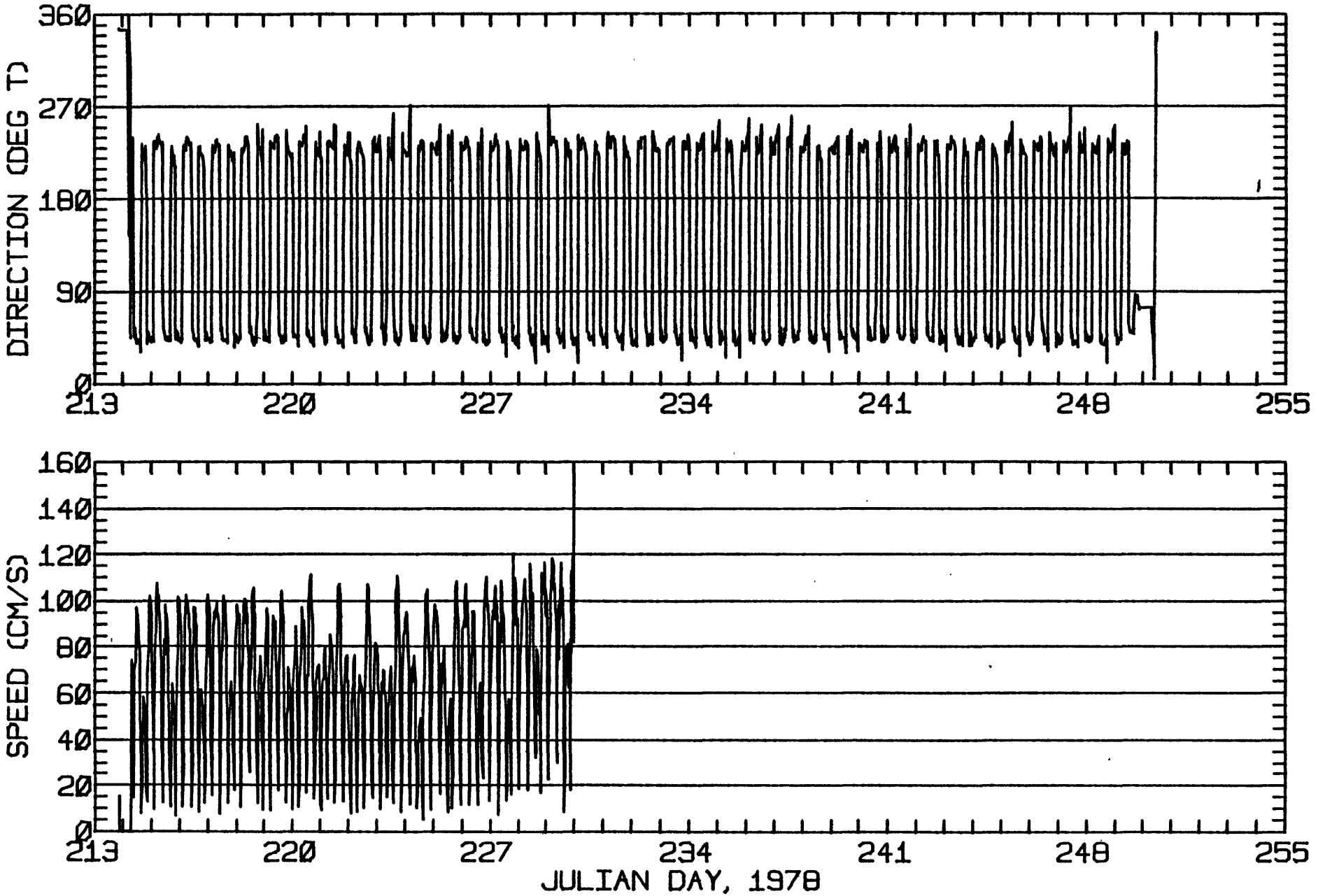

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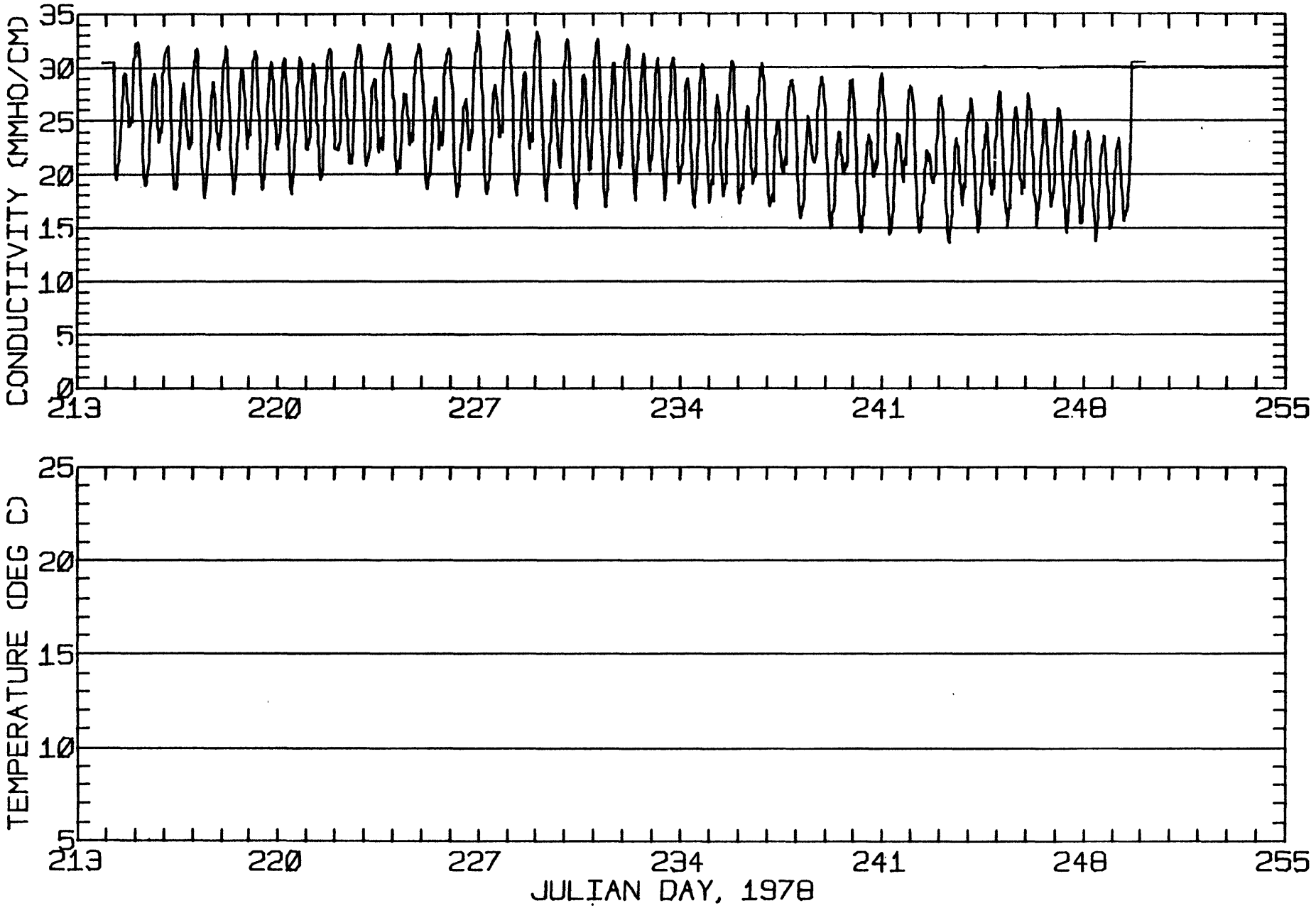

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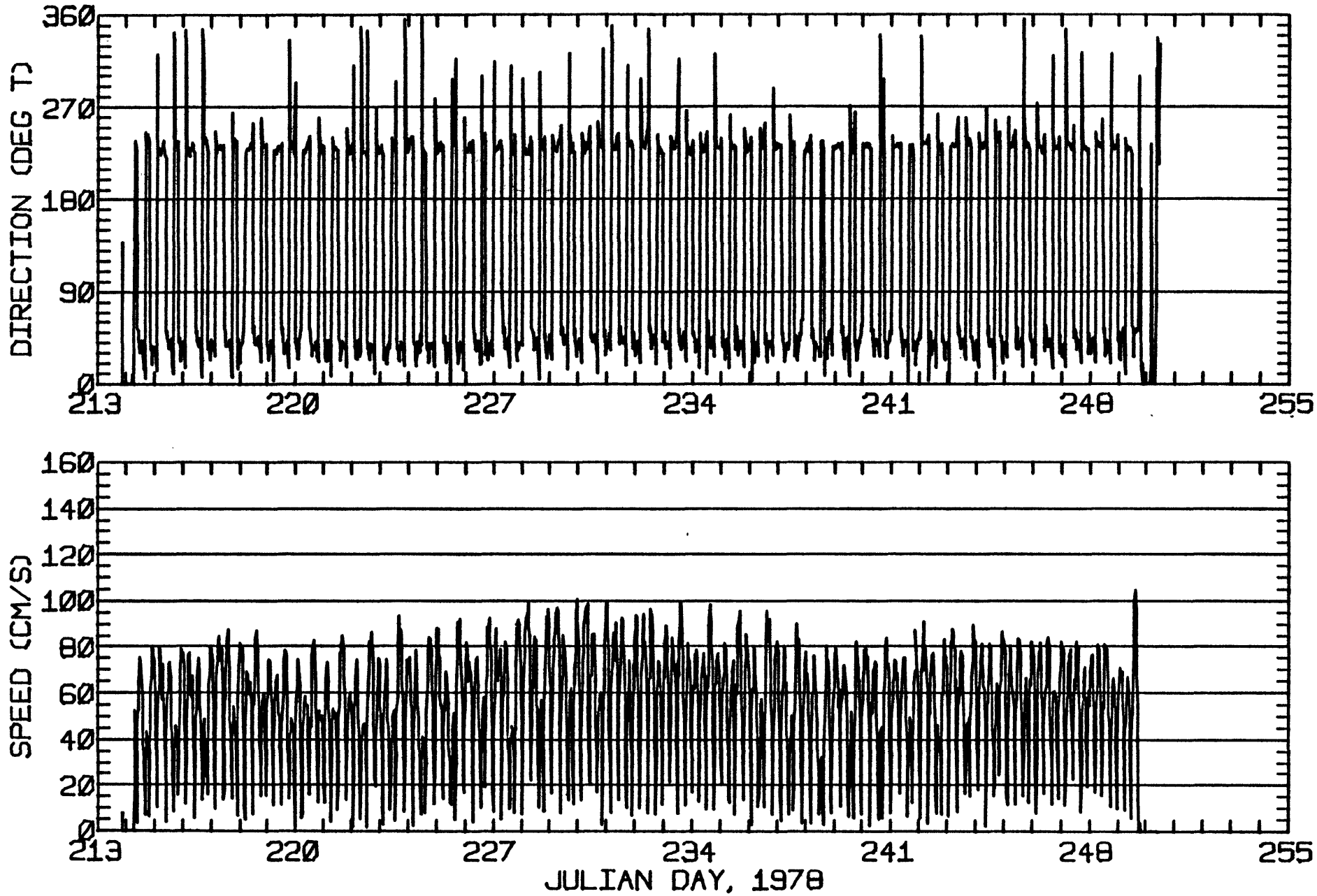

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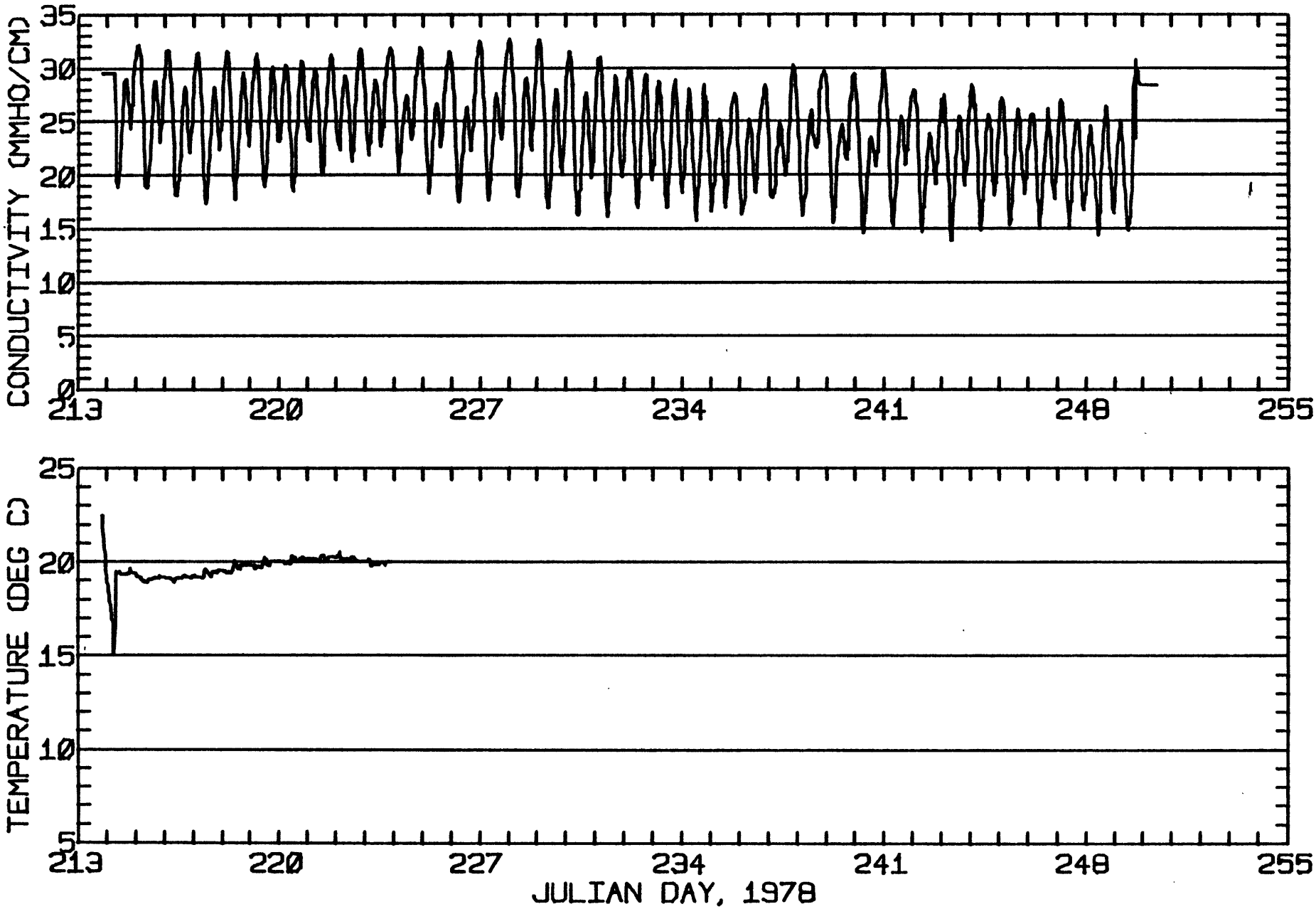

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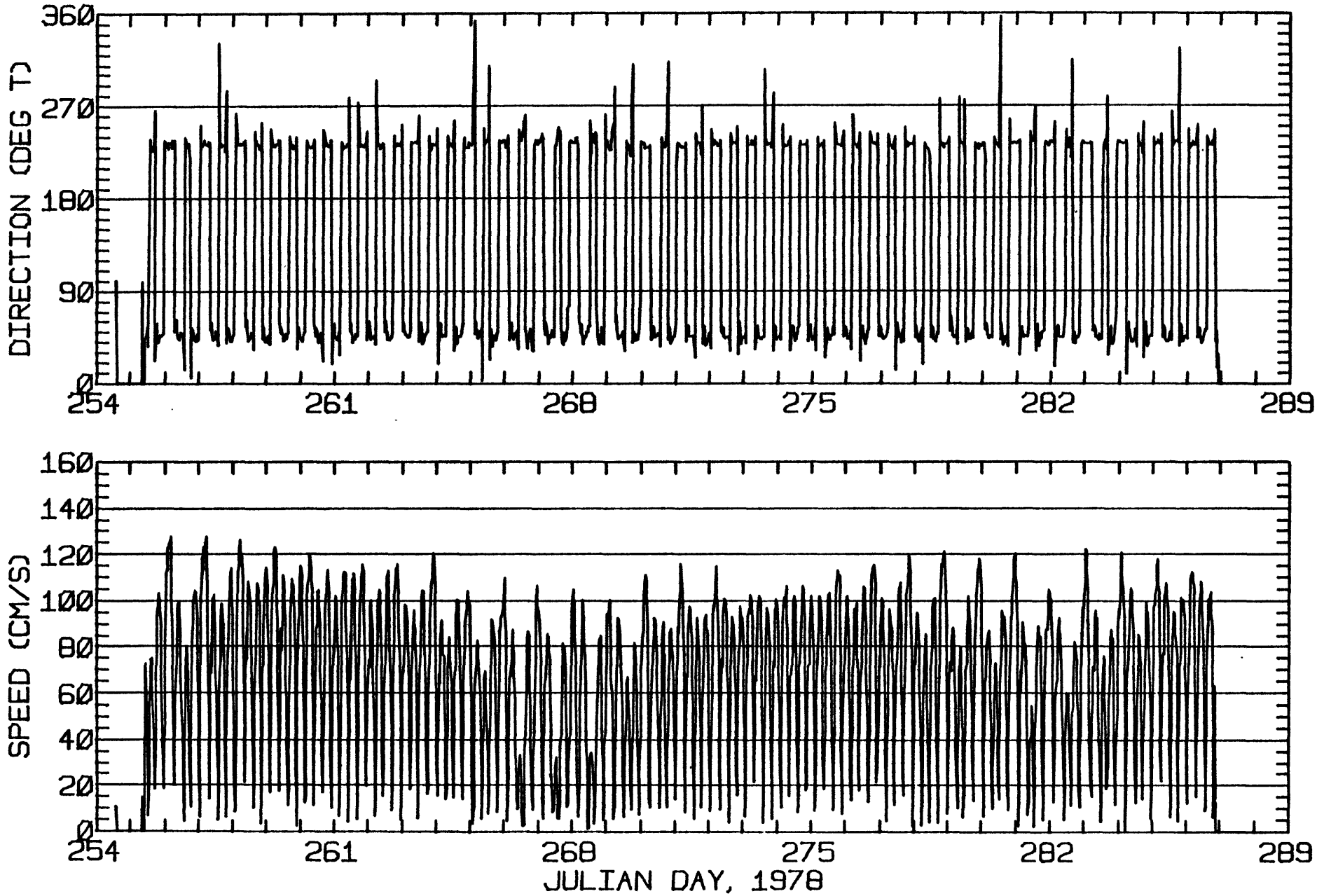

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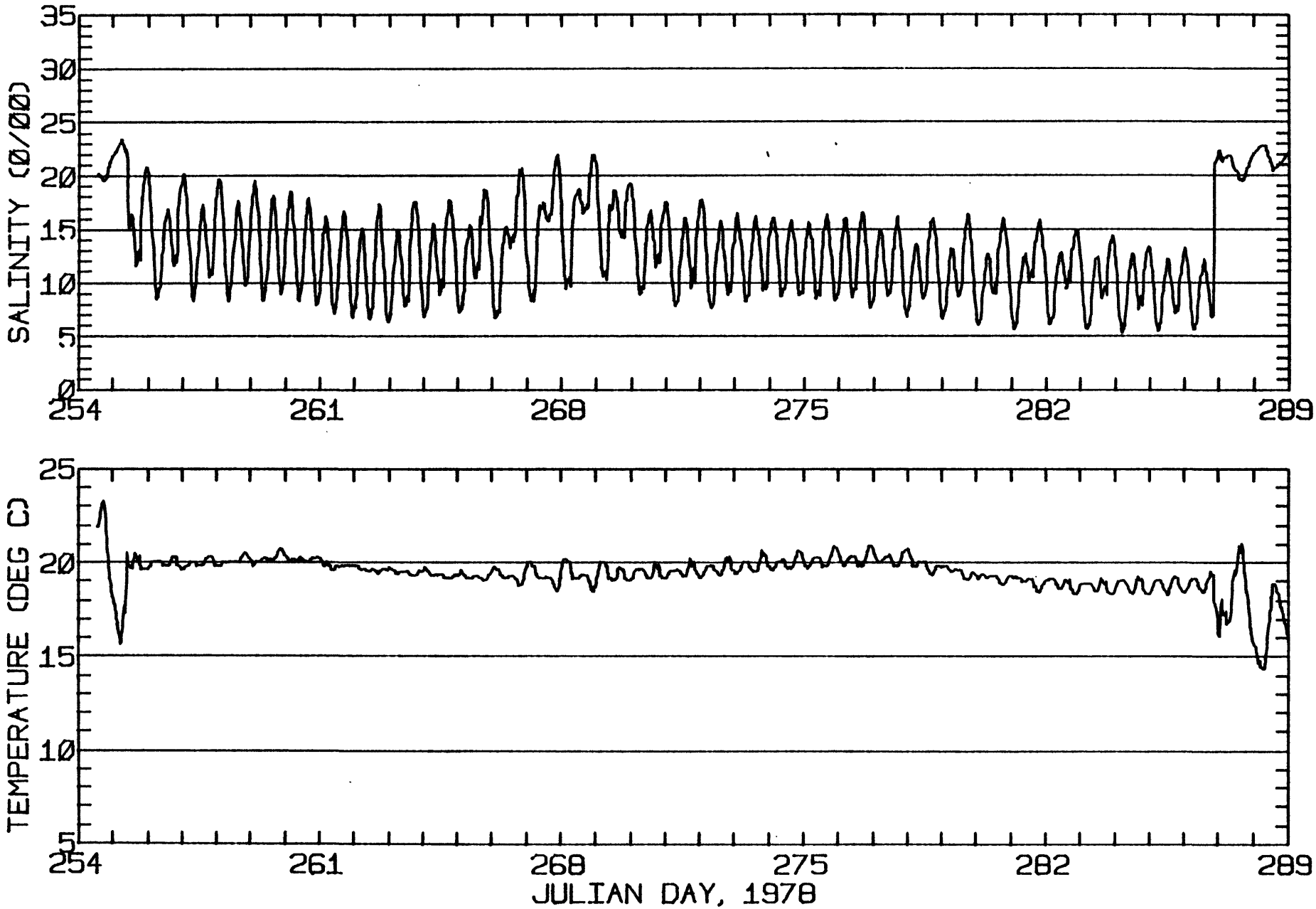

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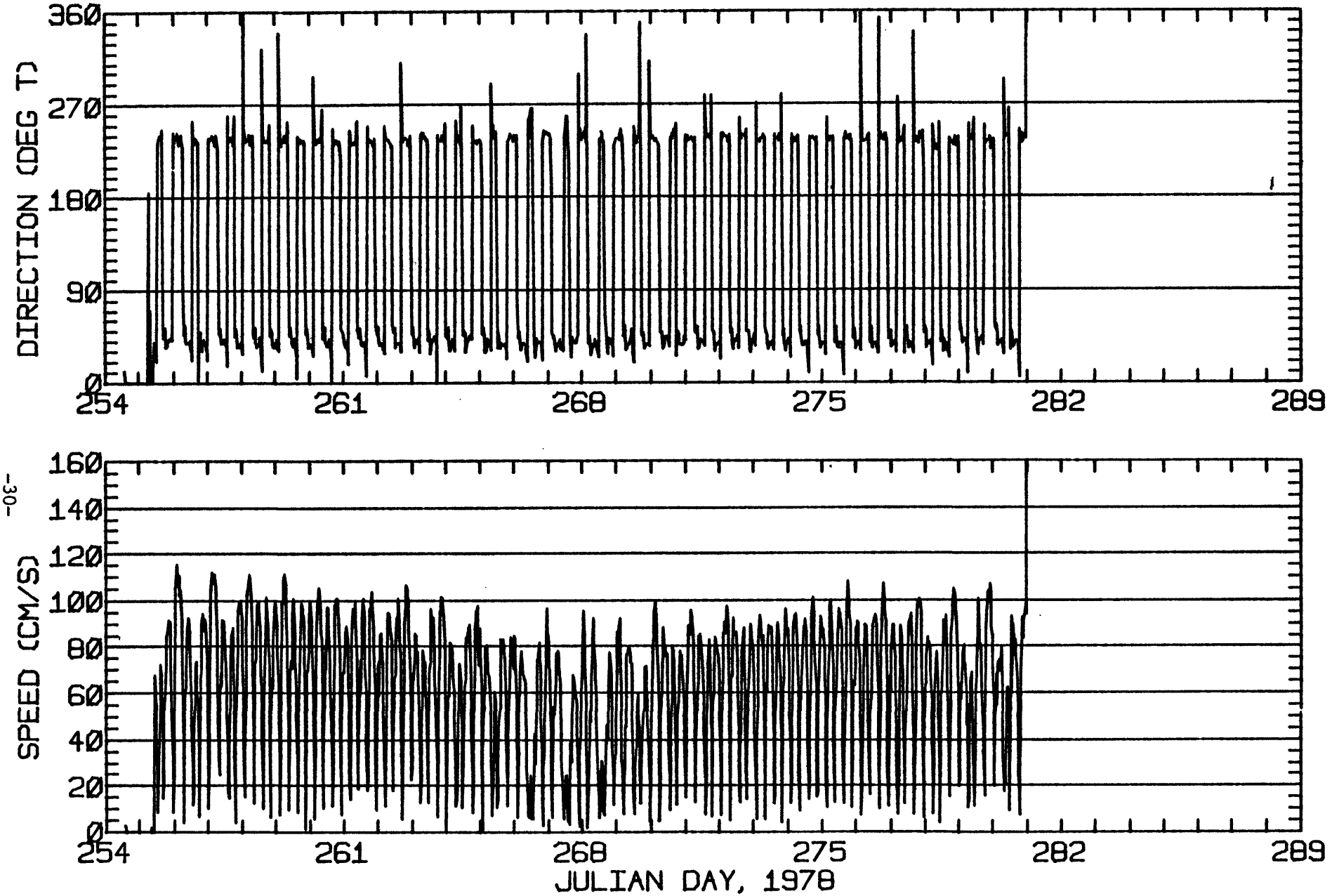

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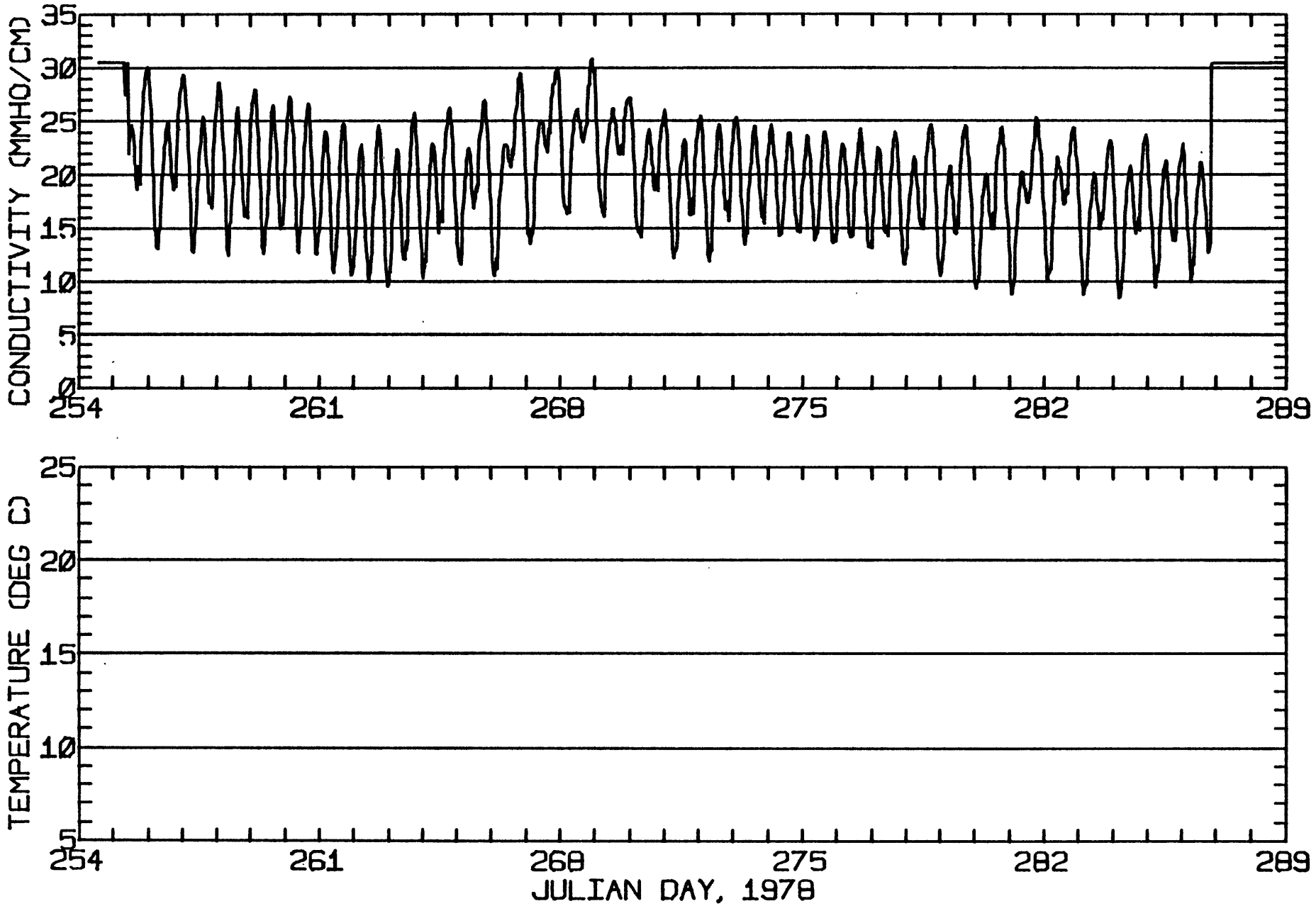

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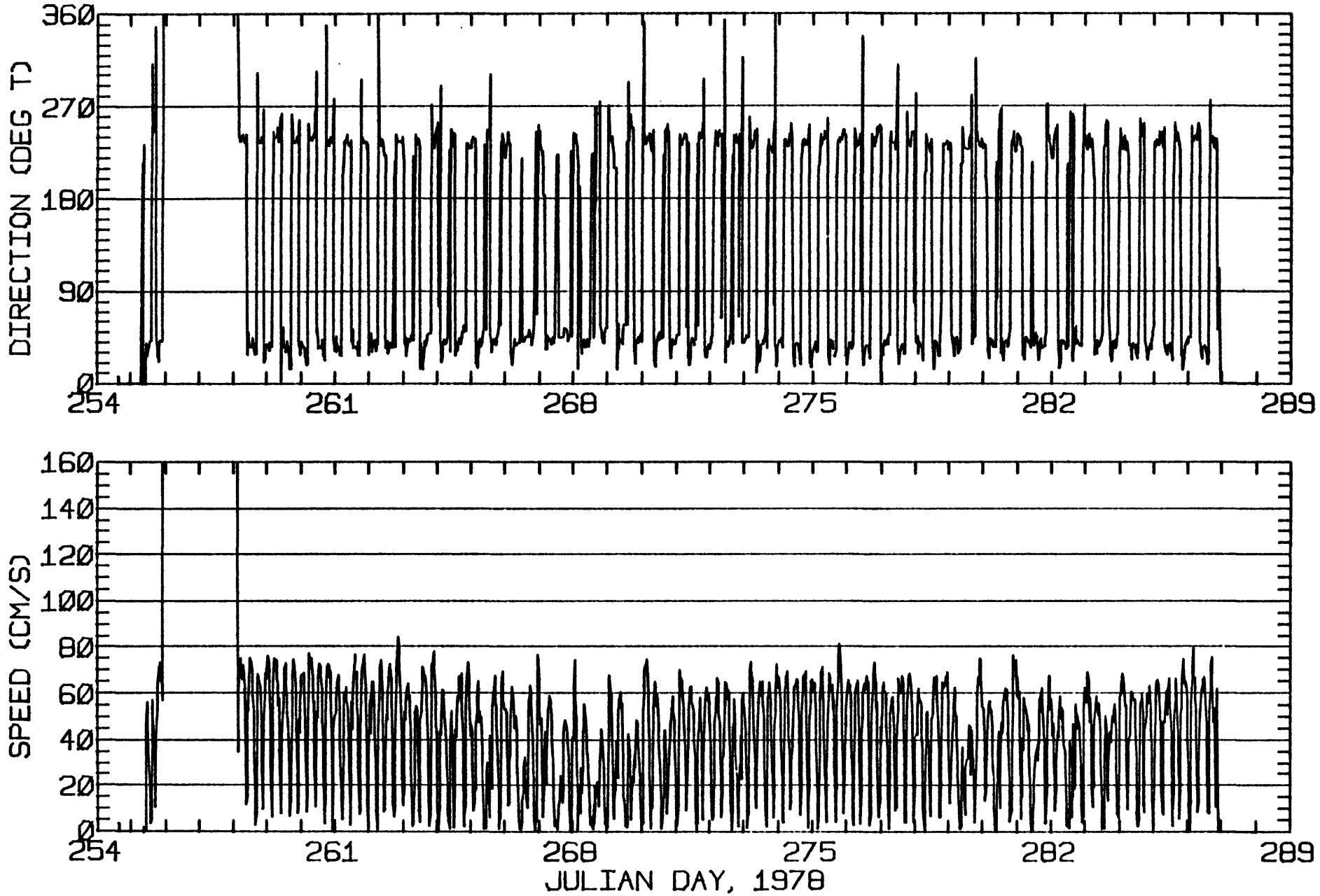

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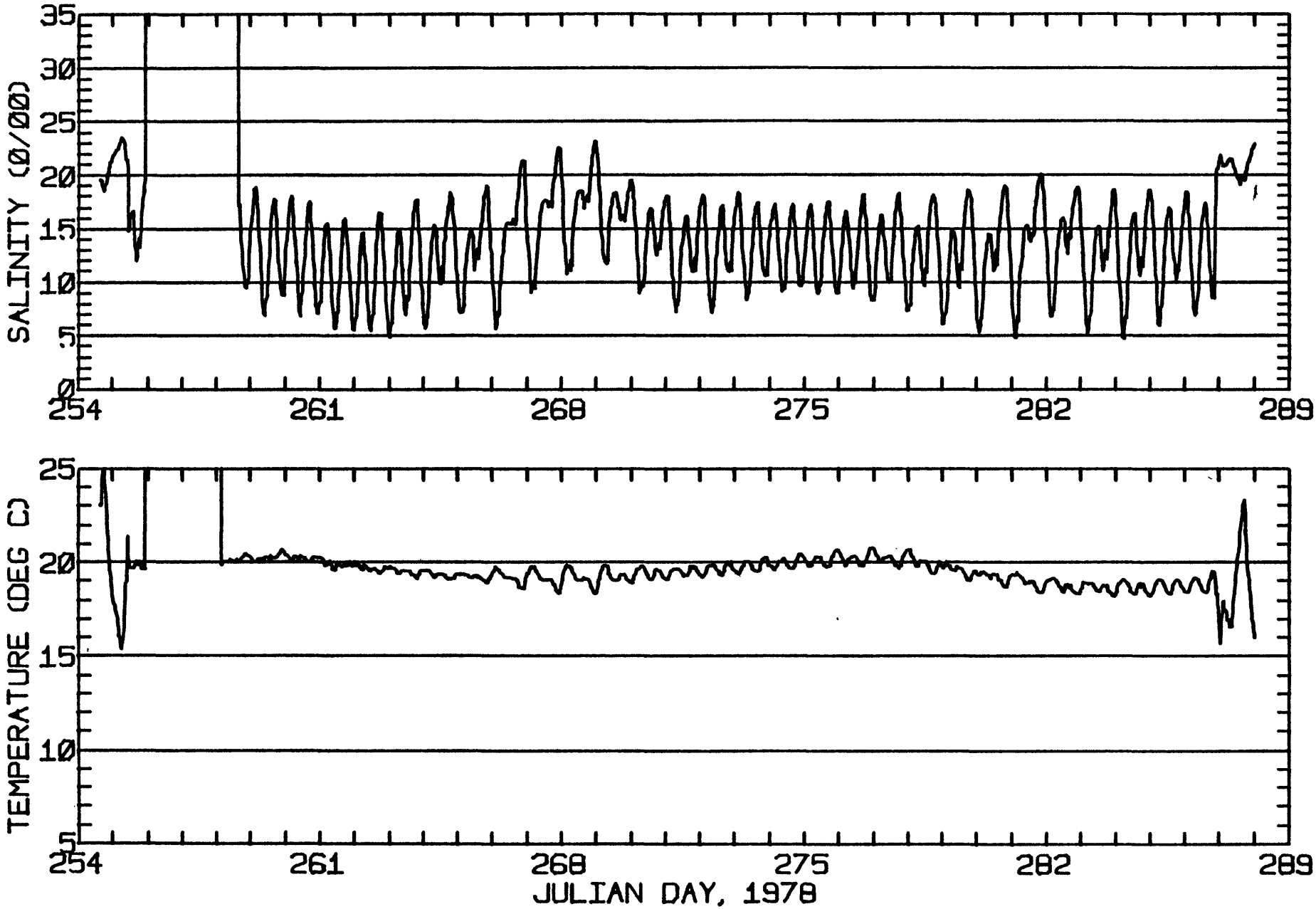

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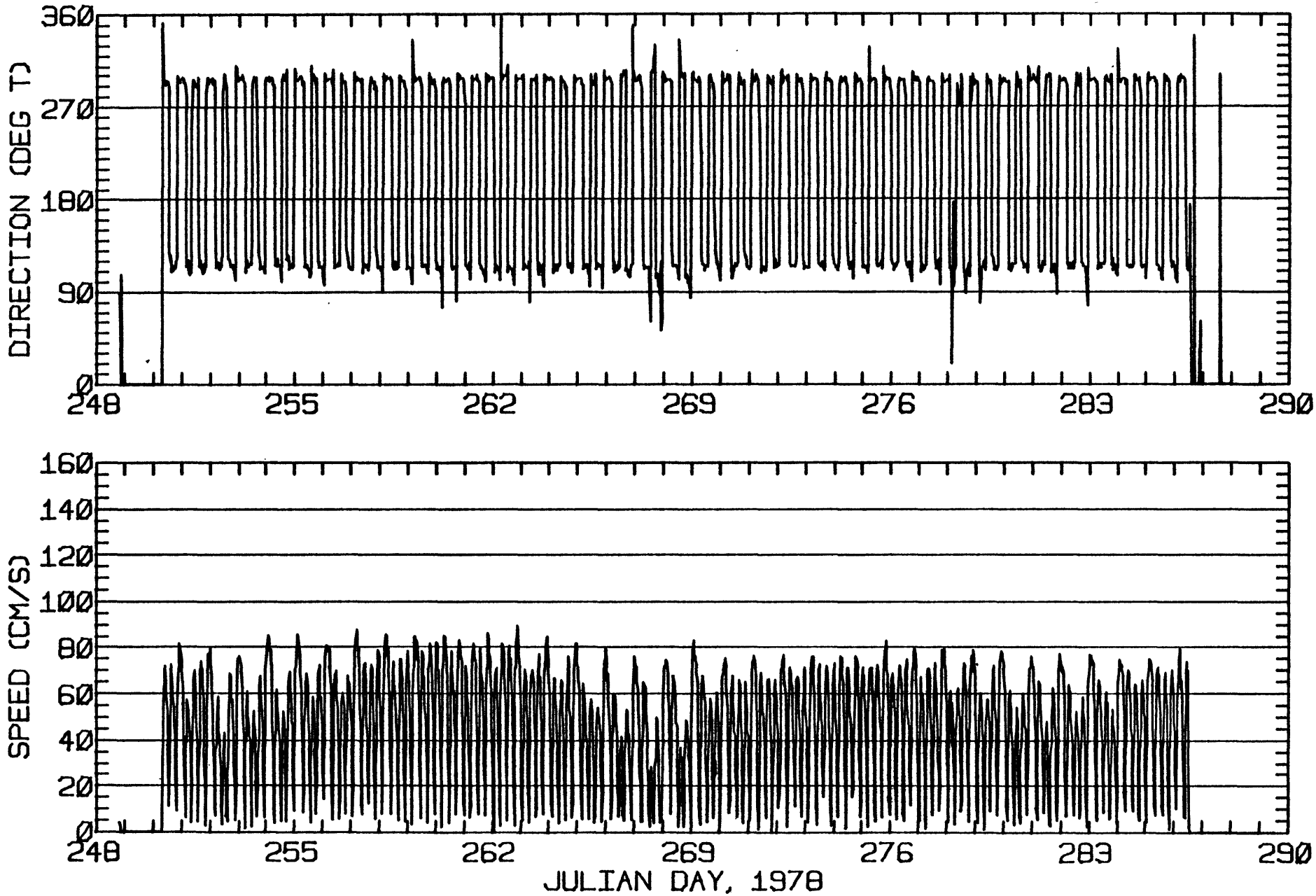

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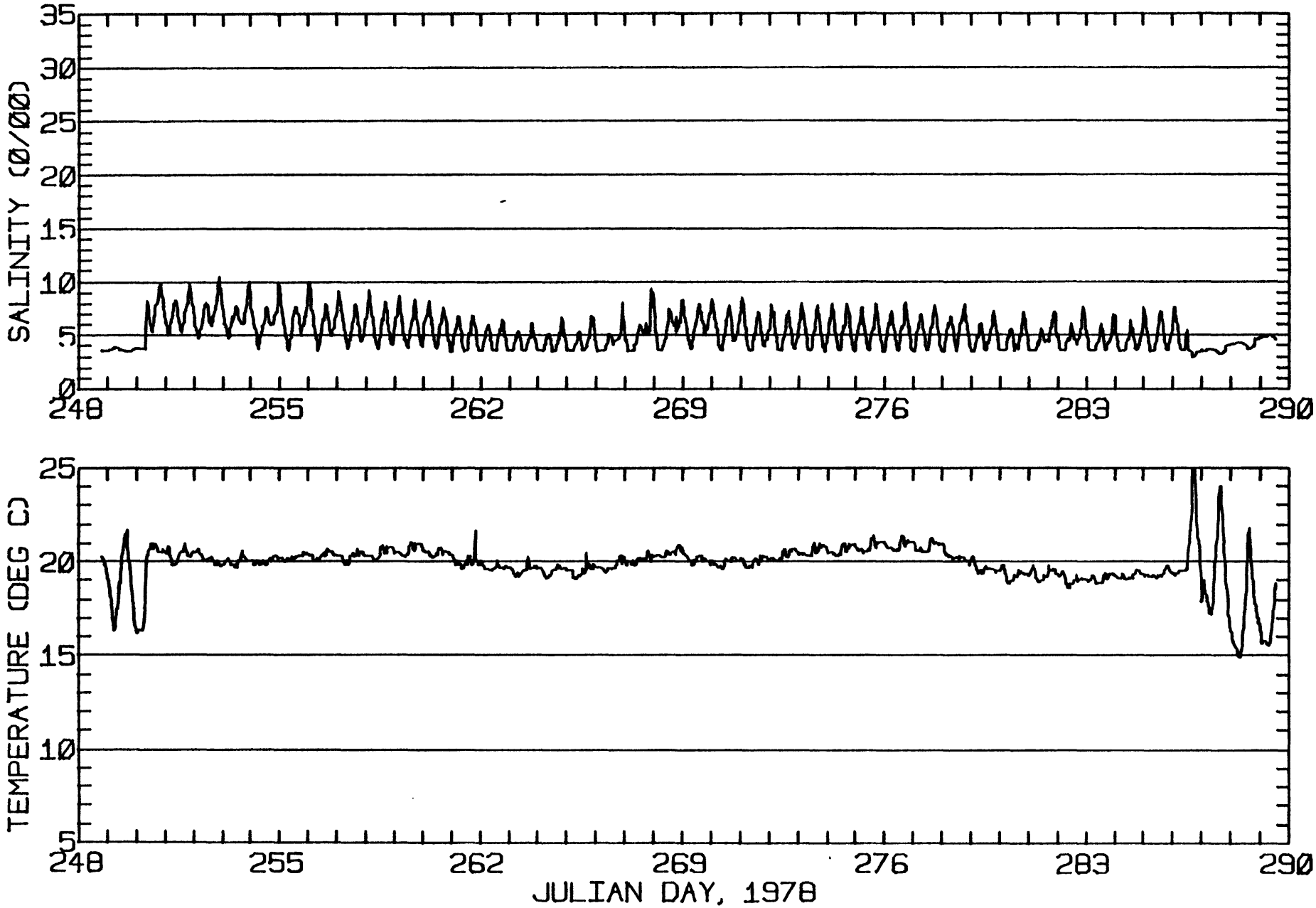

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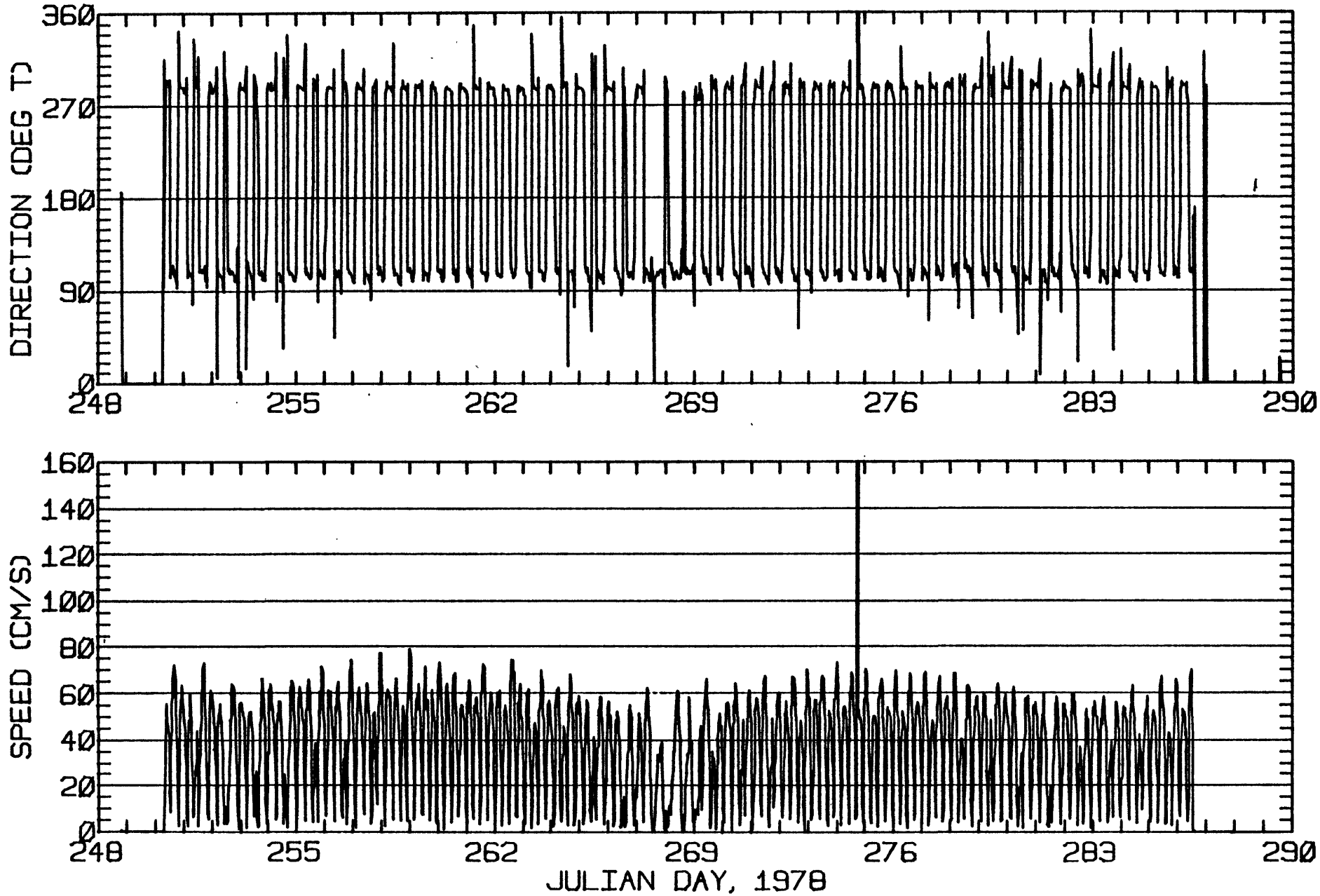

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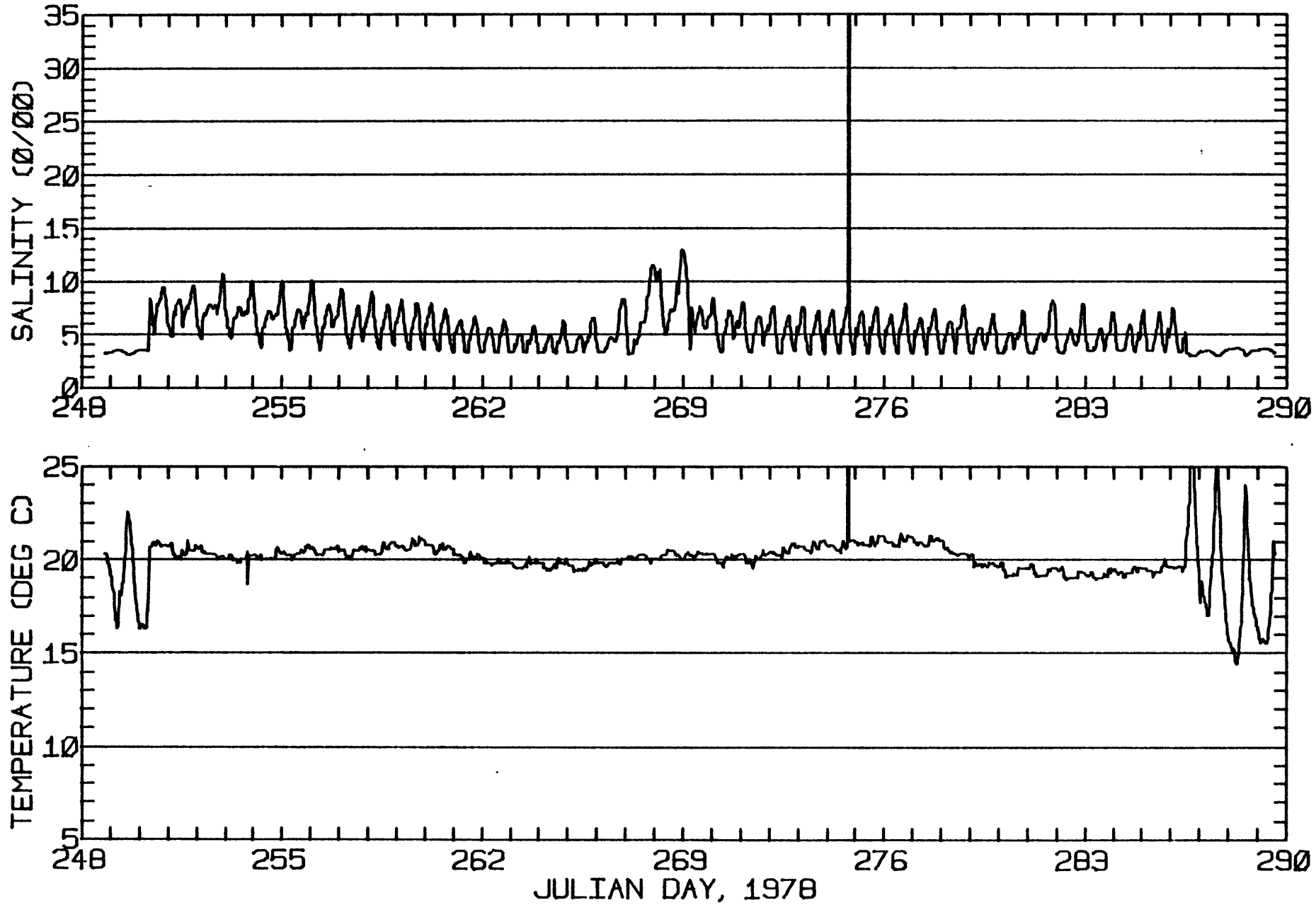
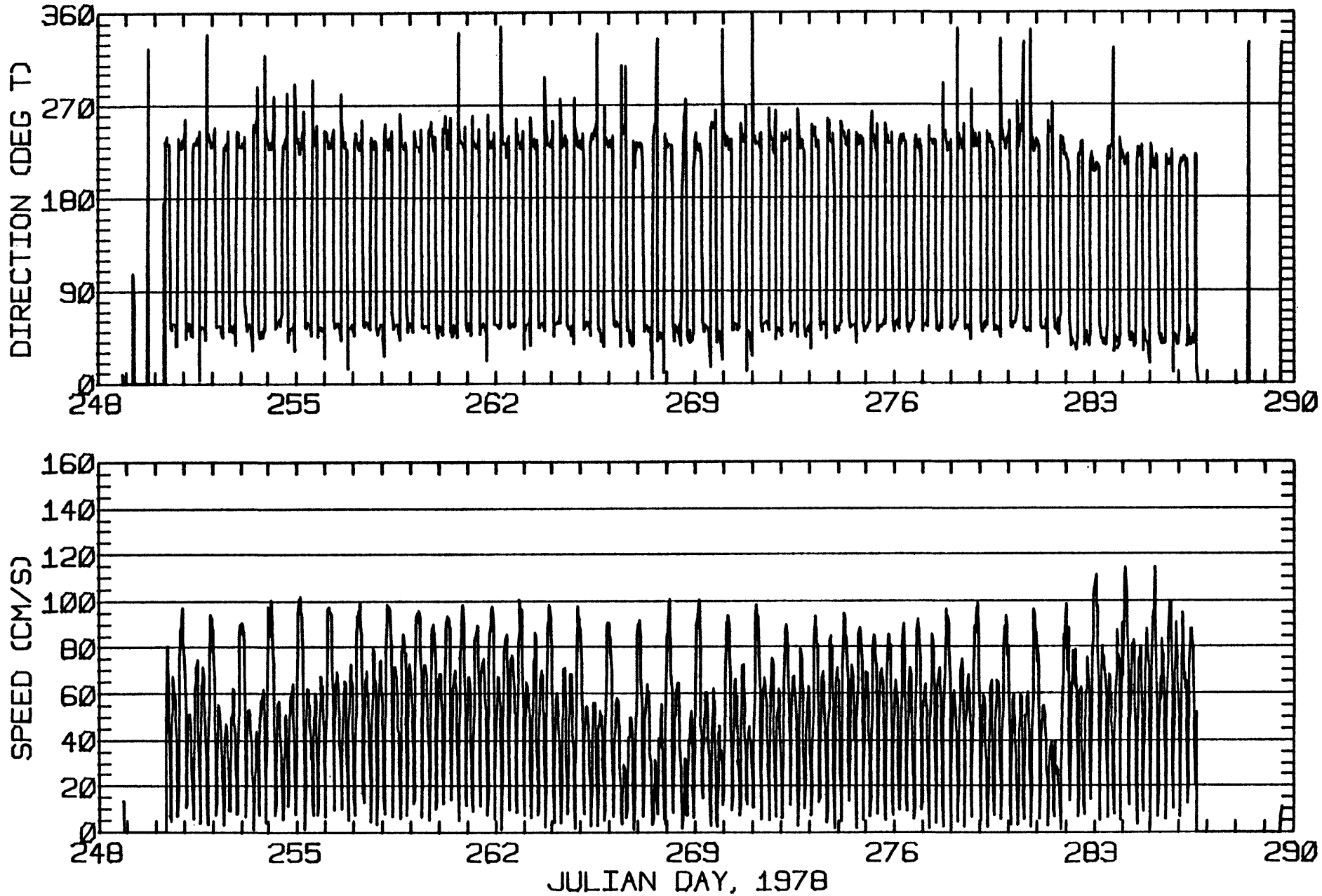
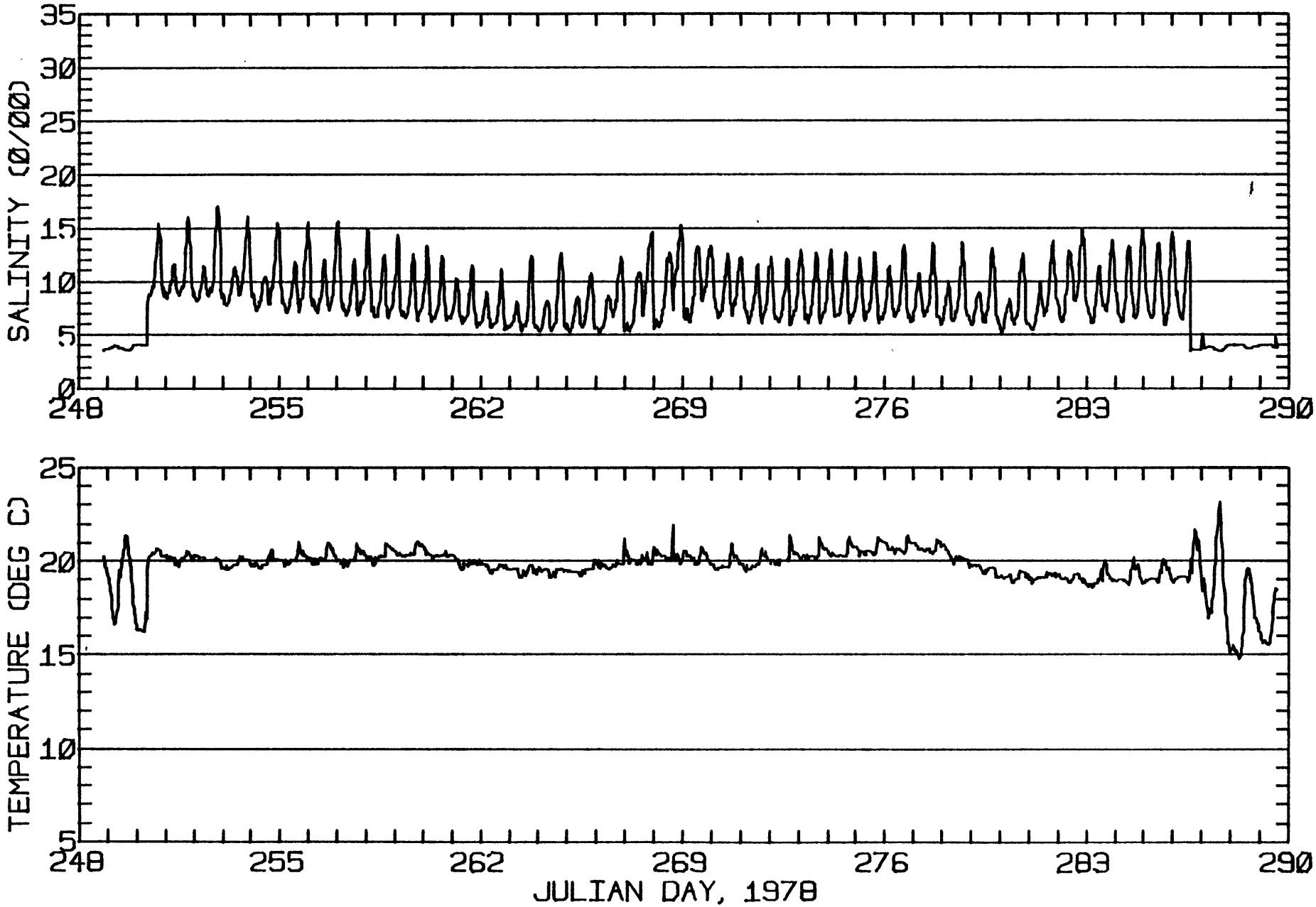
RYER ISLAND 38- 5-34N 122- 1- 5W
METER 5 FEET ABOVE BED. TAPE NUMBER GS003A2.



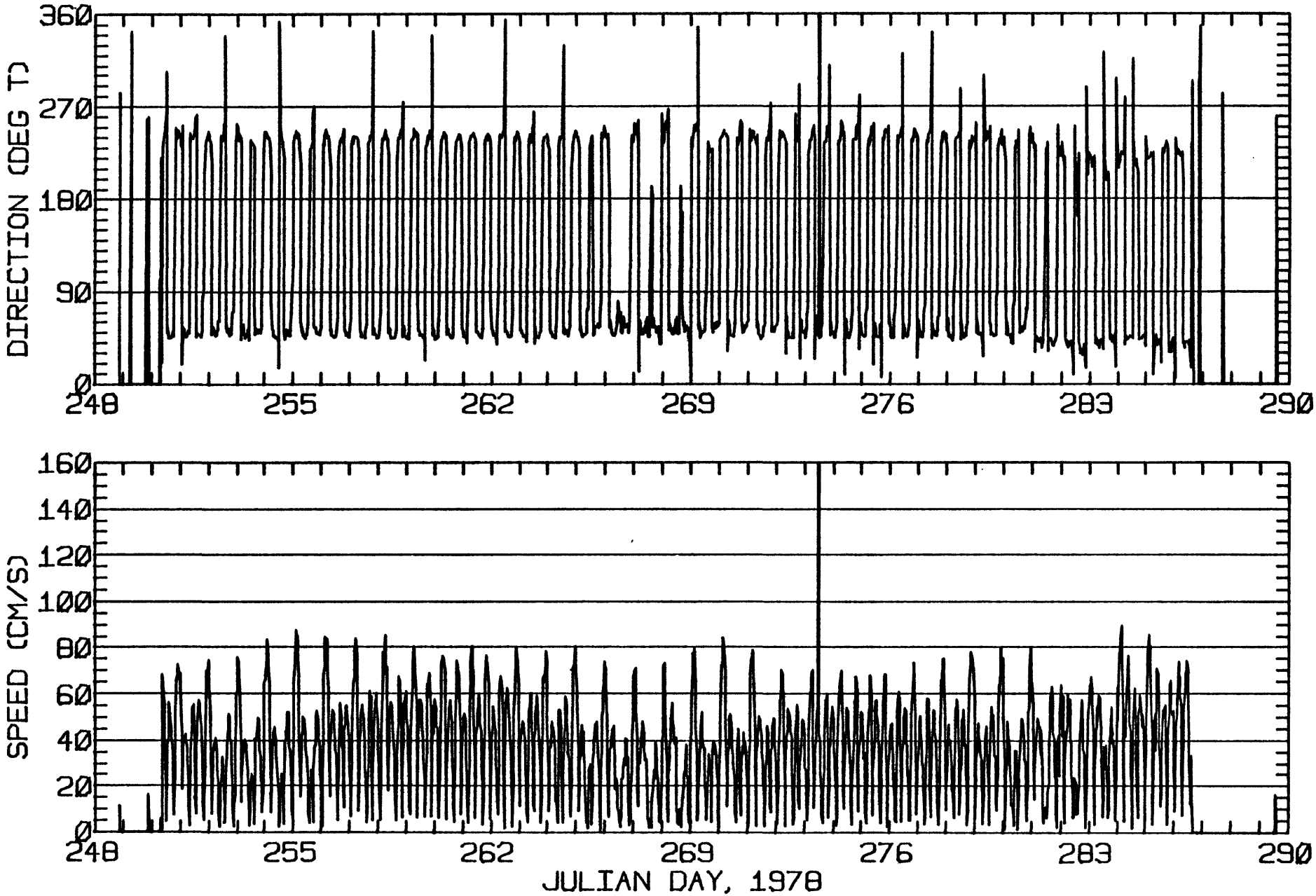
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RYER ISLAND 38- 5-34N 122- 1- 5W
METER 5 FEET ABOVE BED. TAPE NUMBER GS003A2.



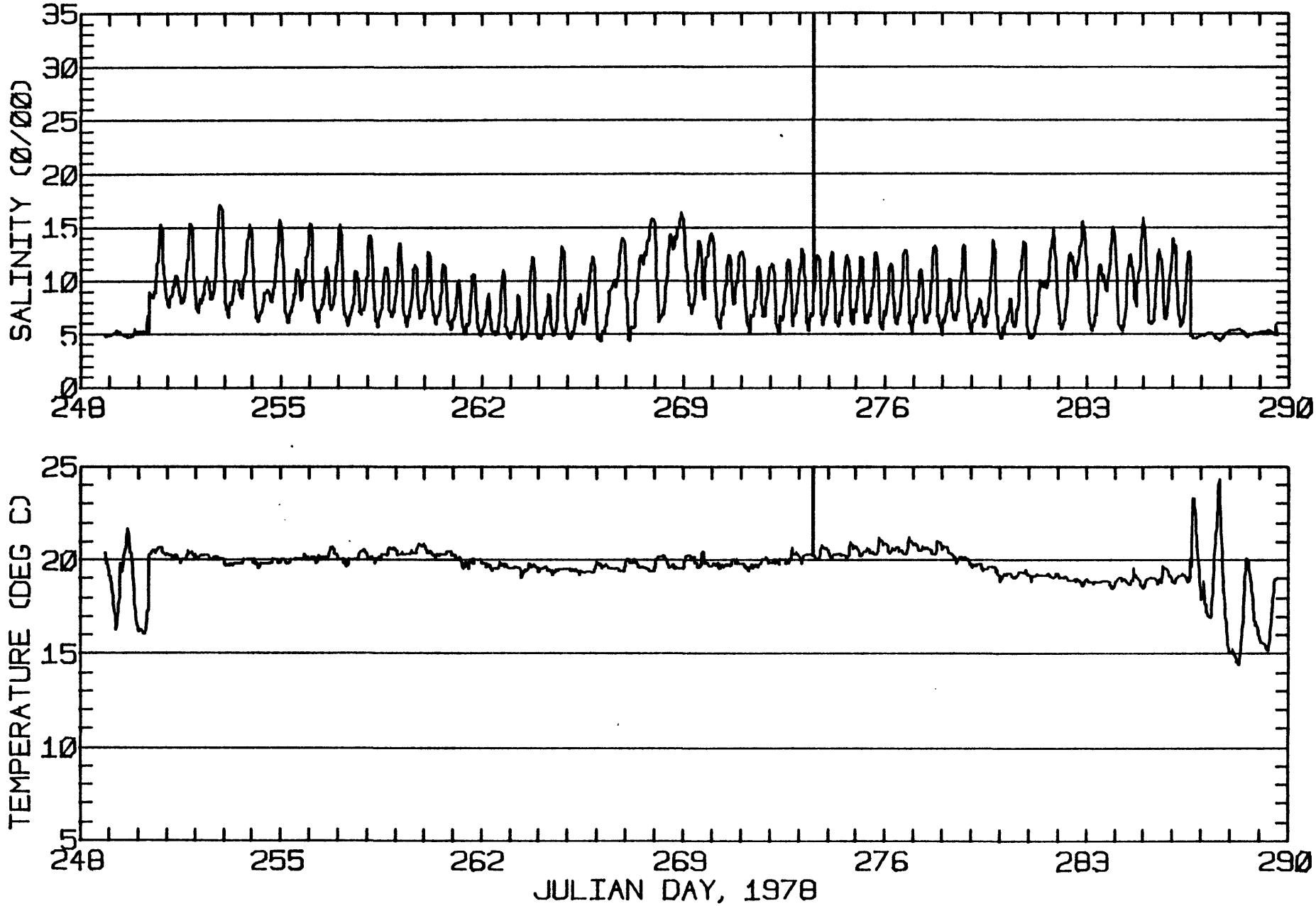
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RESERVE FLEET 38- 5-50N 122- 3-59W
METER 18 FEET ABOVE BED. TAPE NUMBER GS004A1 .



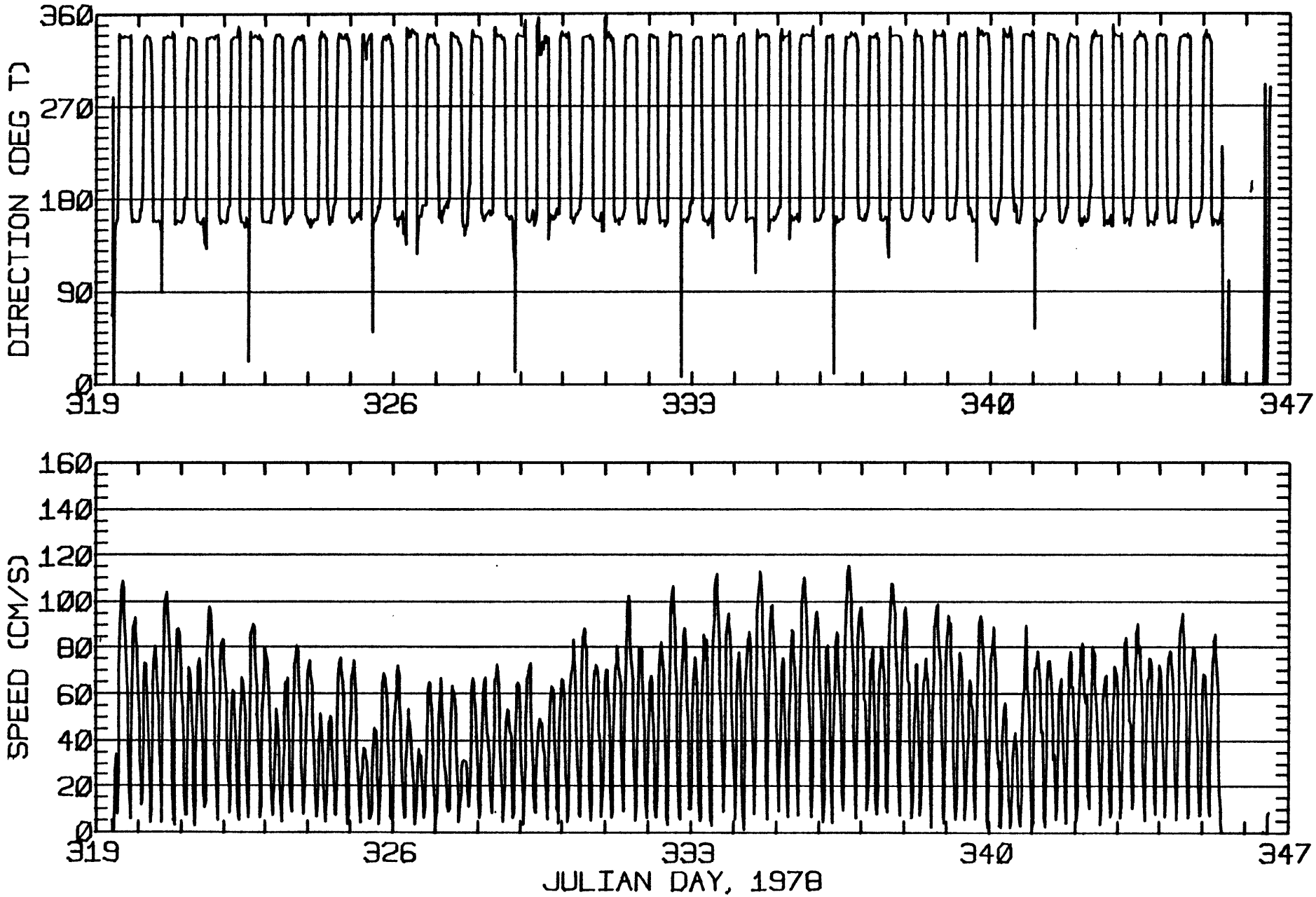
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RESERVE FLEET 38- 5-50N 122- 3-59W
METER 18 FEET ABOVE BED. TAPE NUMBER GS004A1 .



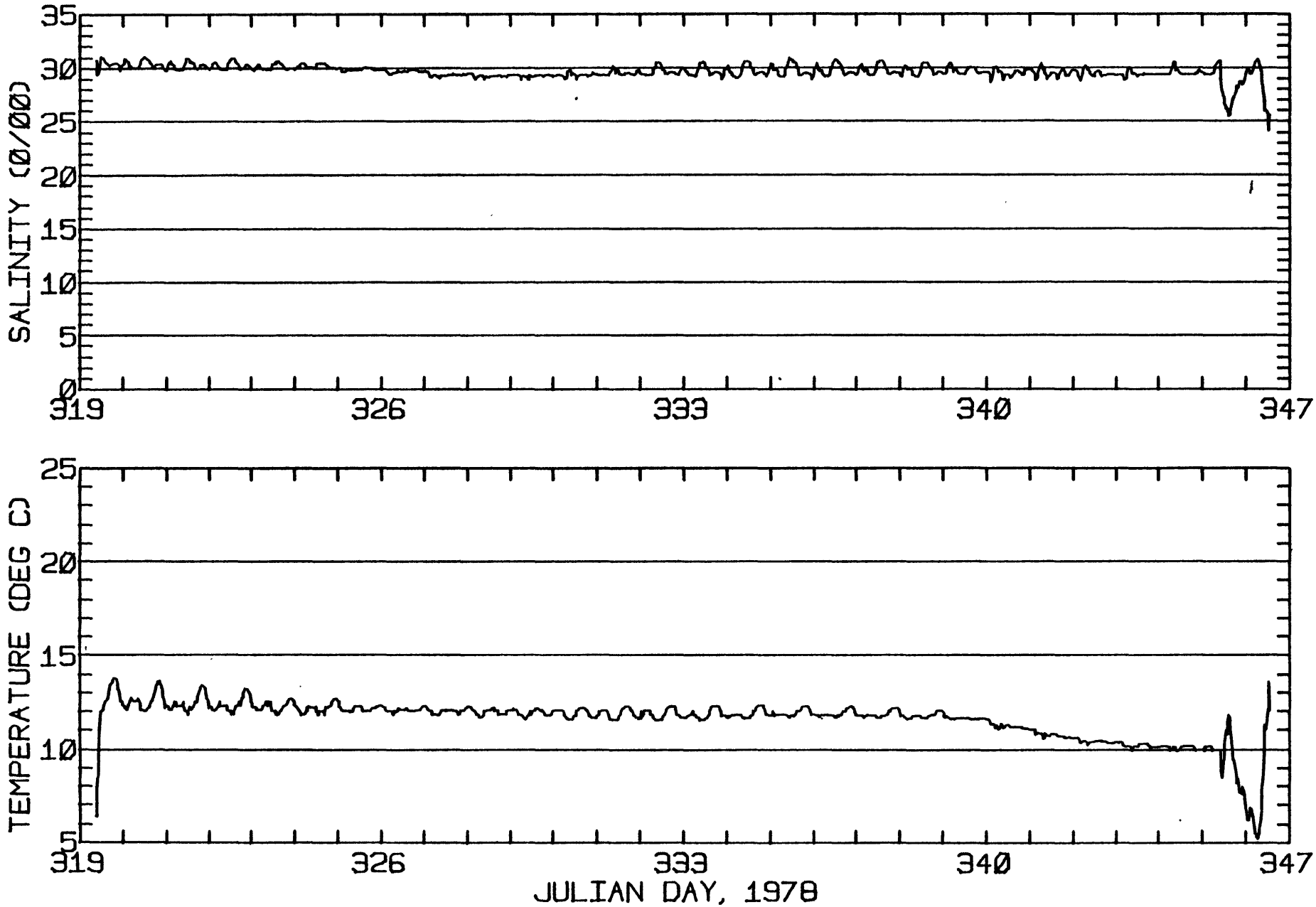
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RESERVE FLEET 38- 5-50N 122- 3-59W
METER 5 FEET ABOVE BED. TAPE NUMBER GS004A2 .



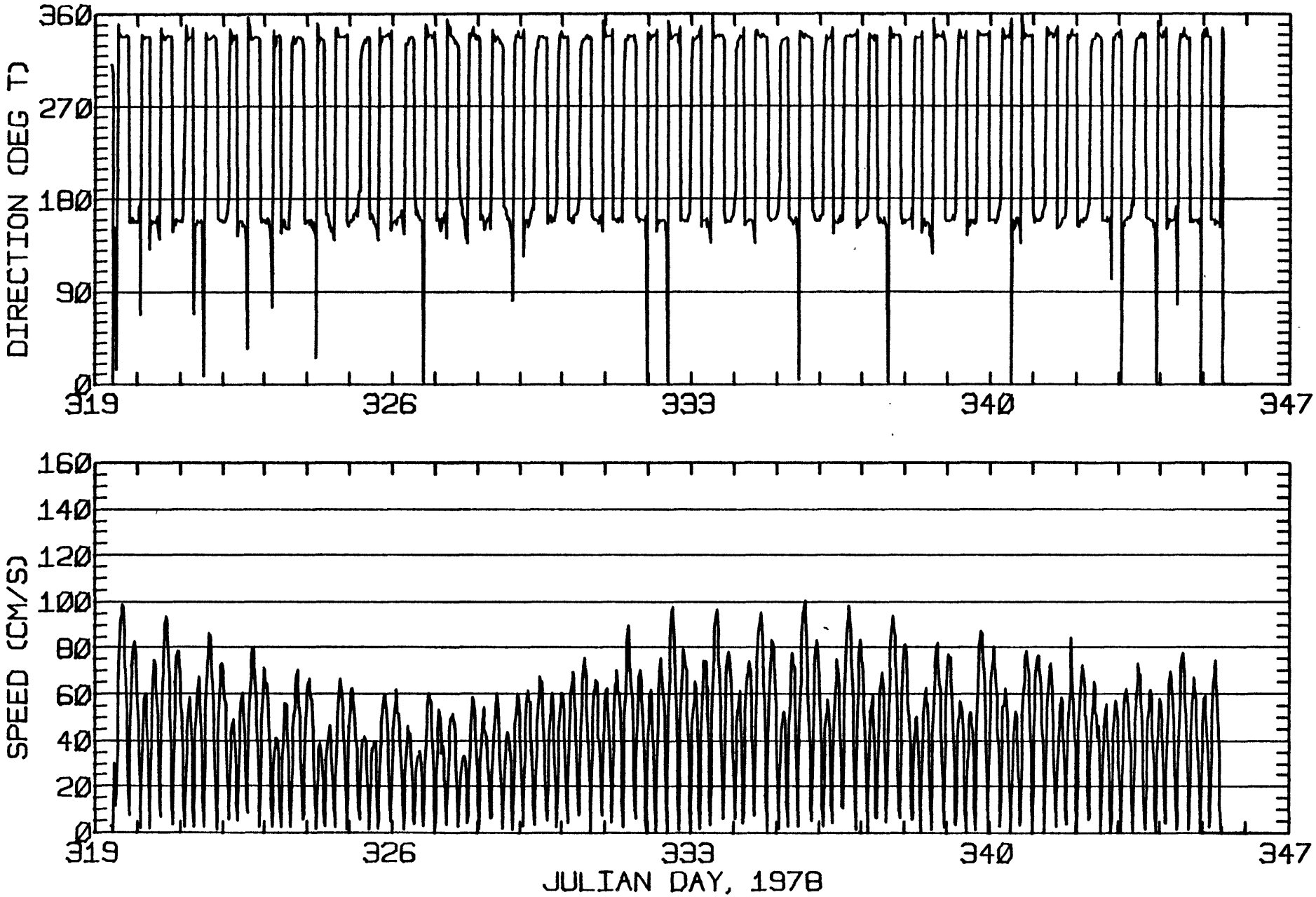
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
RESERVE FLEET 38- 5-50N 122- 3-59W
METER 5 FEET ABOVE BED. TAPE NUMBER GS004A2 .



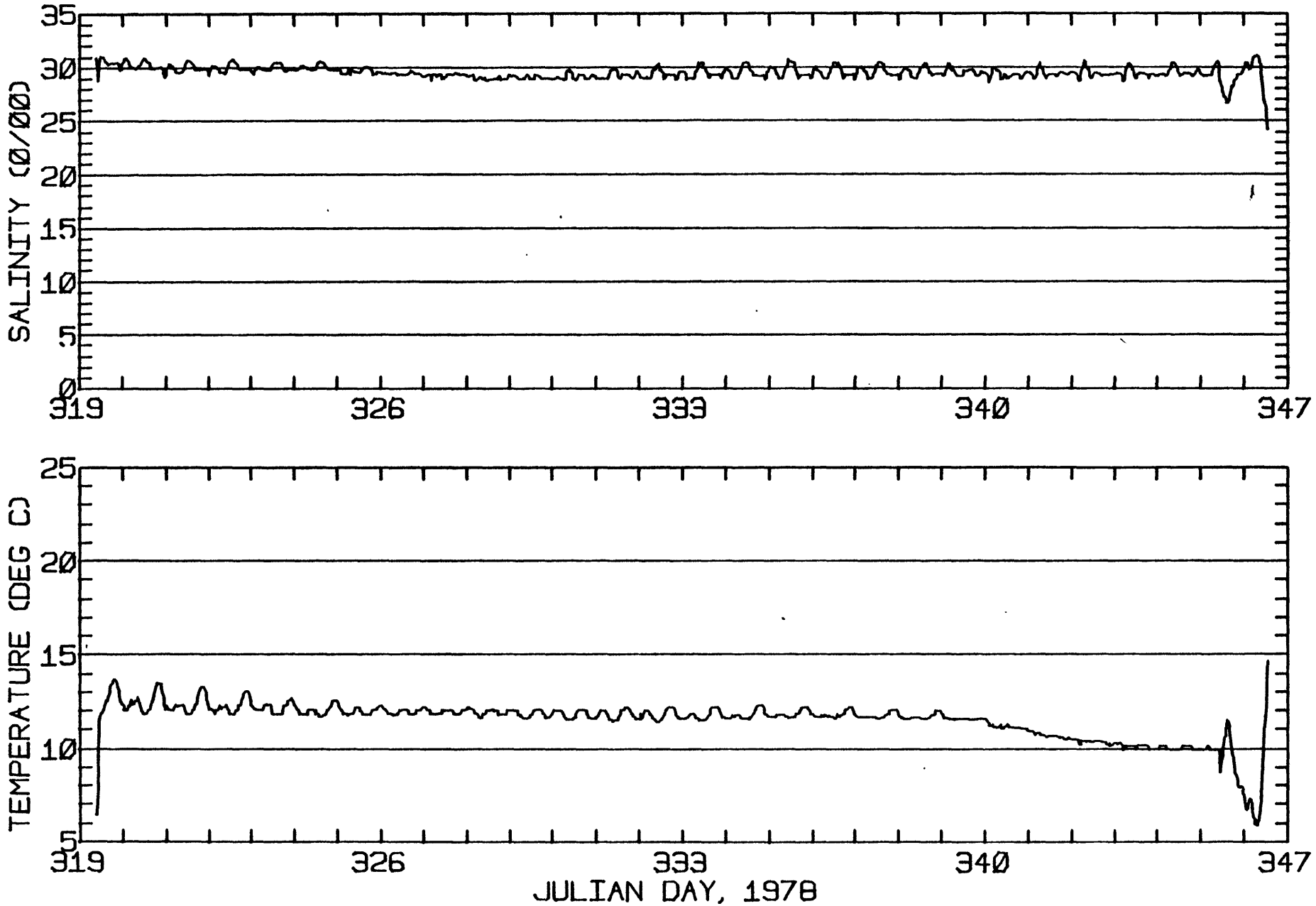
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-45-25N 122-21-55W
METER 28 FEET ABOVE BED. TAPE NUMBER GS005A1 .



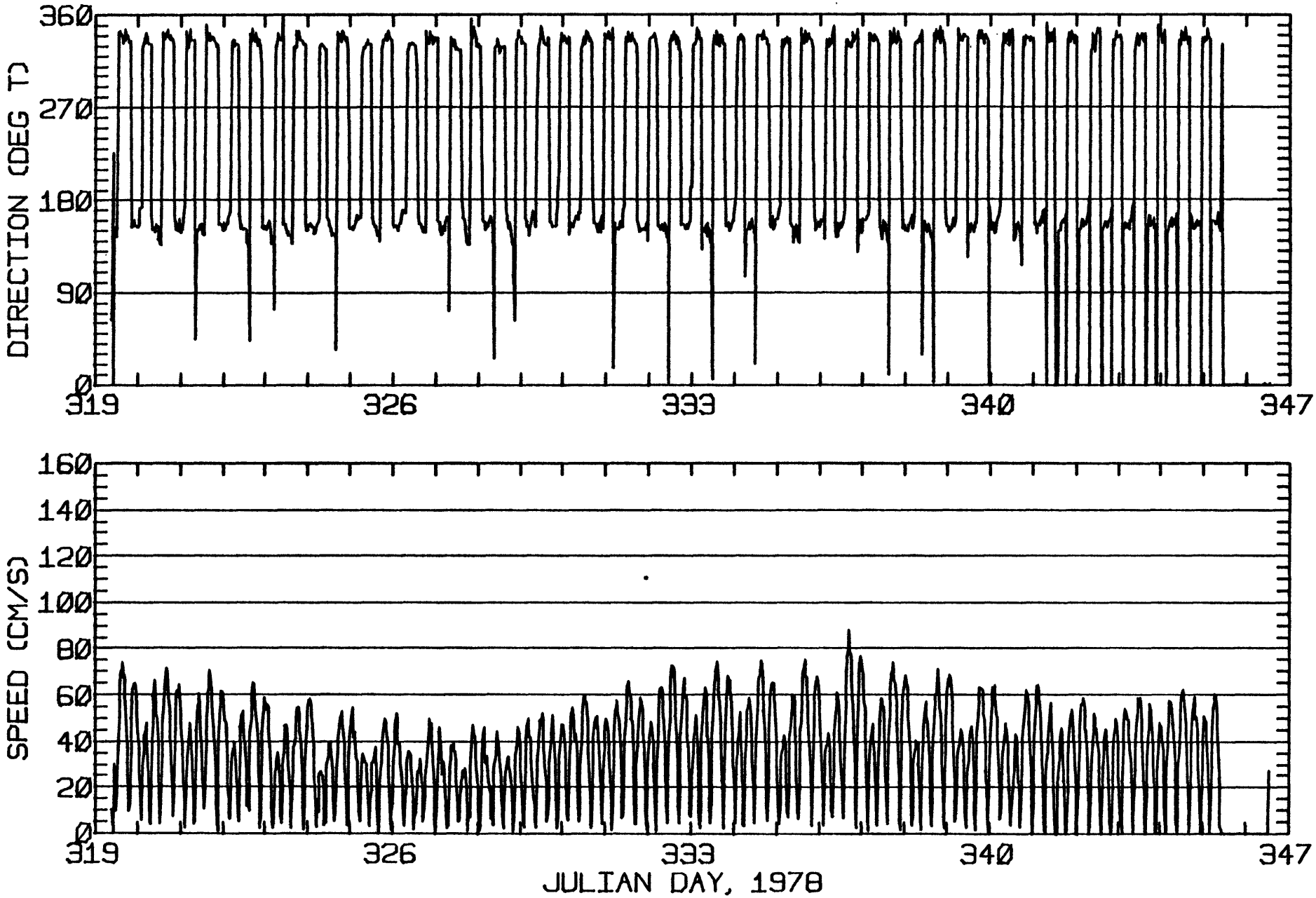
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-45-25N 122-21-55W
METER 28 FEET ABOVE BED. TAPE NUMBER GS005A1 .



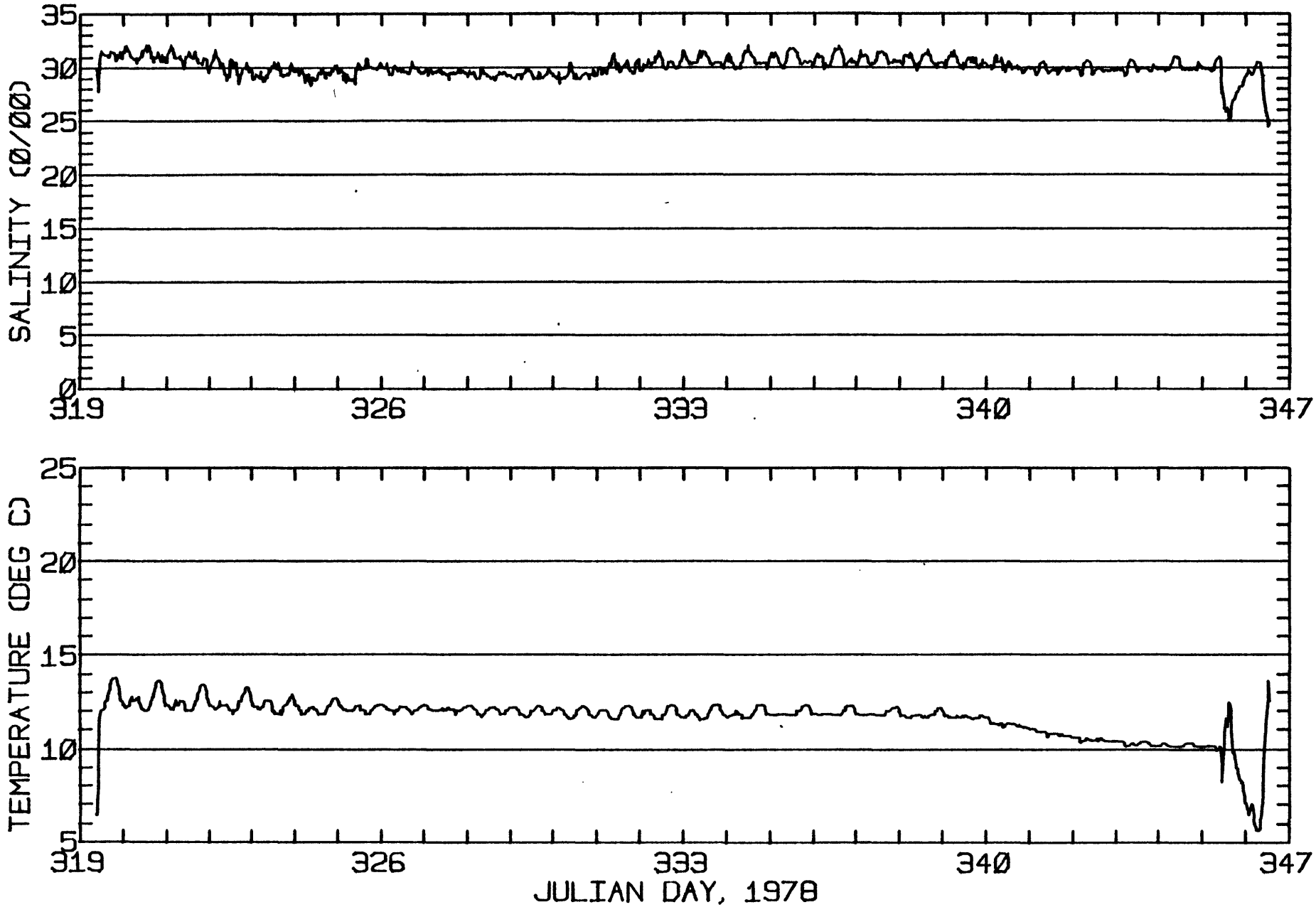
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-45-25N 122-21-55W
METER 16 FEET ABOVE BED. TAPE NUMBER GS005A2 .



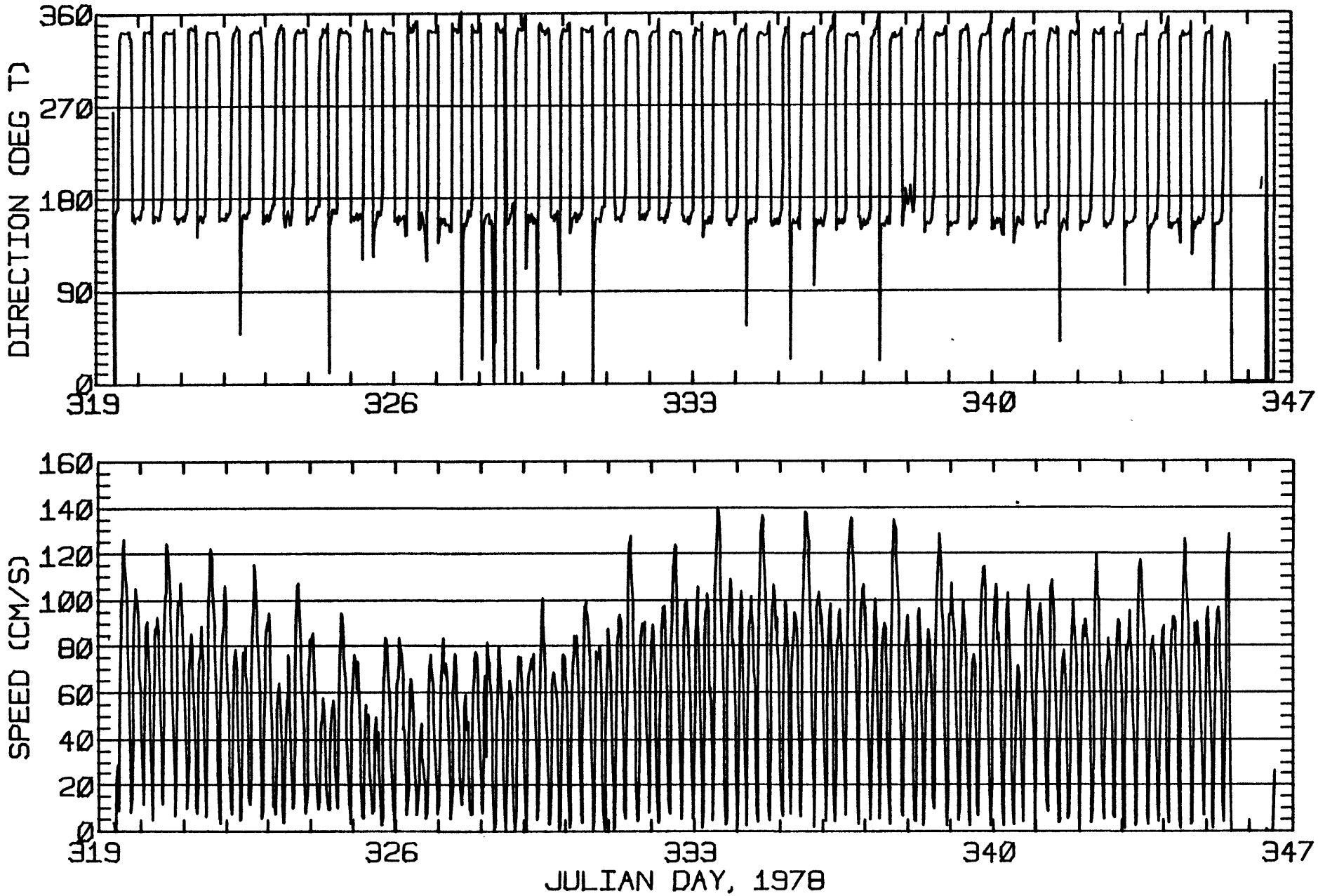
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-45-25N 122-21-55W
METER 16 FEET ABOVE BED. TAPE NUMBER GS005A2 .



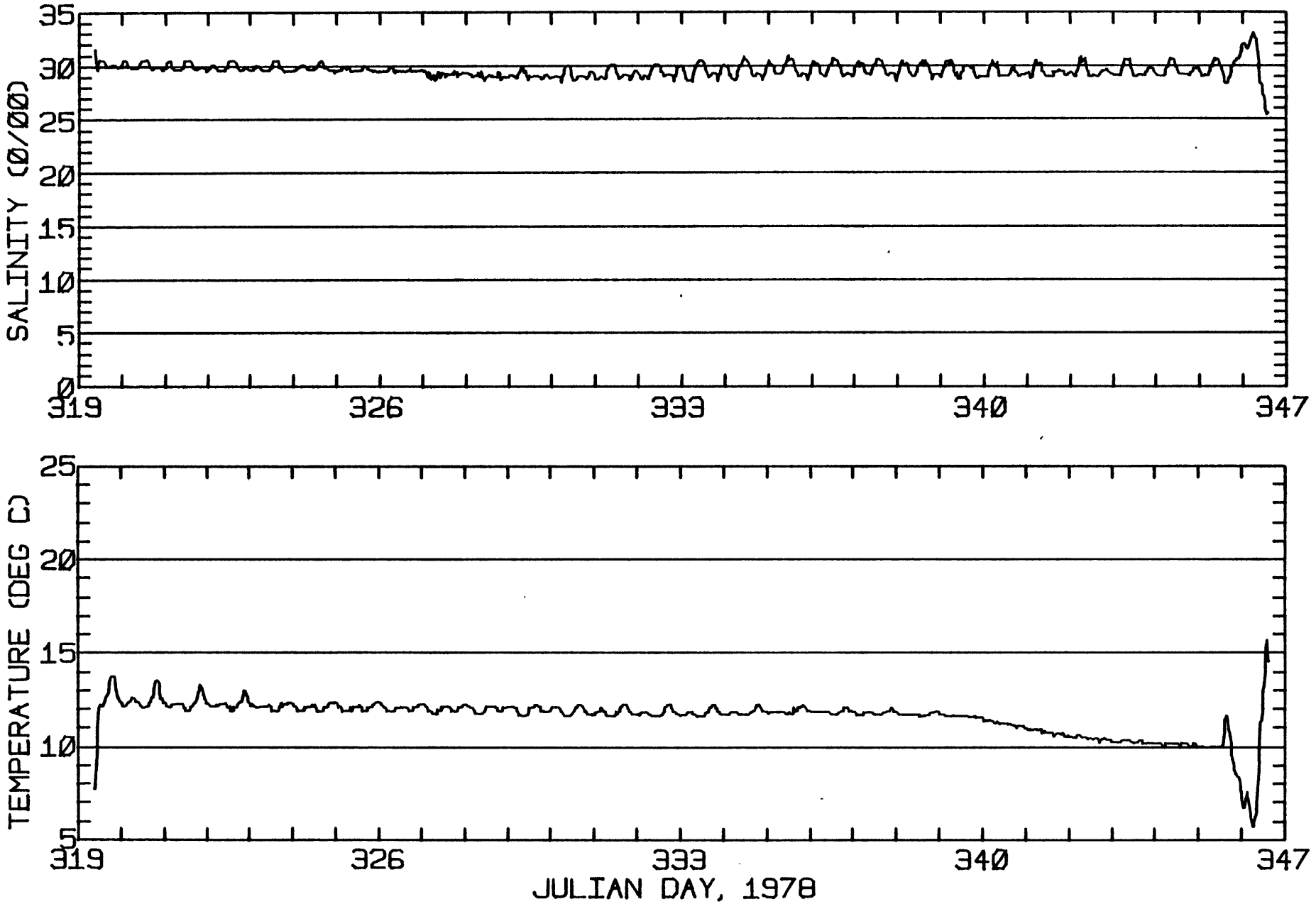
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-45-25N 122-21-55W
METER 5 FEET ABOVE BED. TAPE NUMBER GS005A3 .



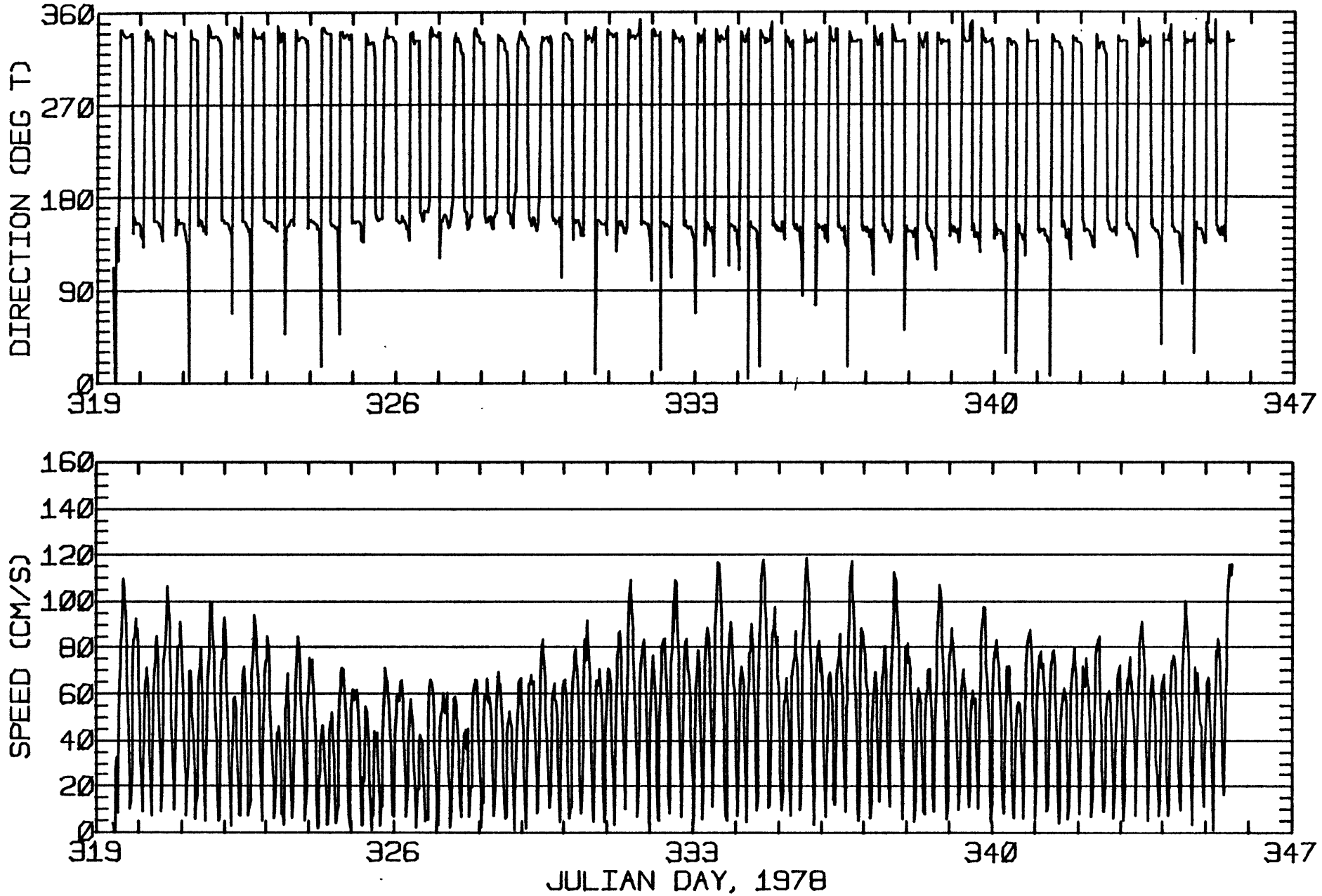
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-45-25N 122-21-55W
METER 5 FEET ABOVE BED. TAPE NUMBER GS005A3 .



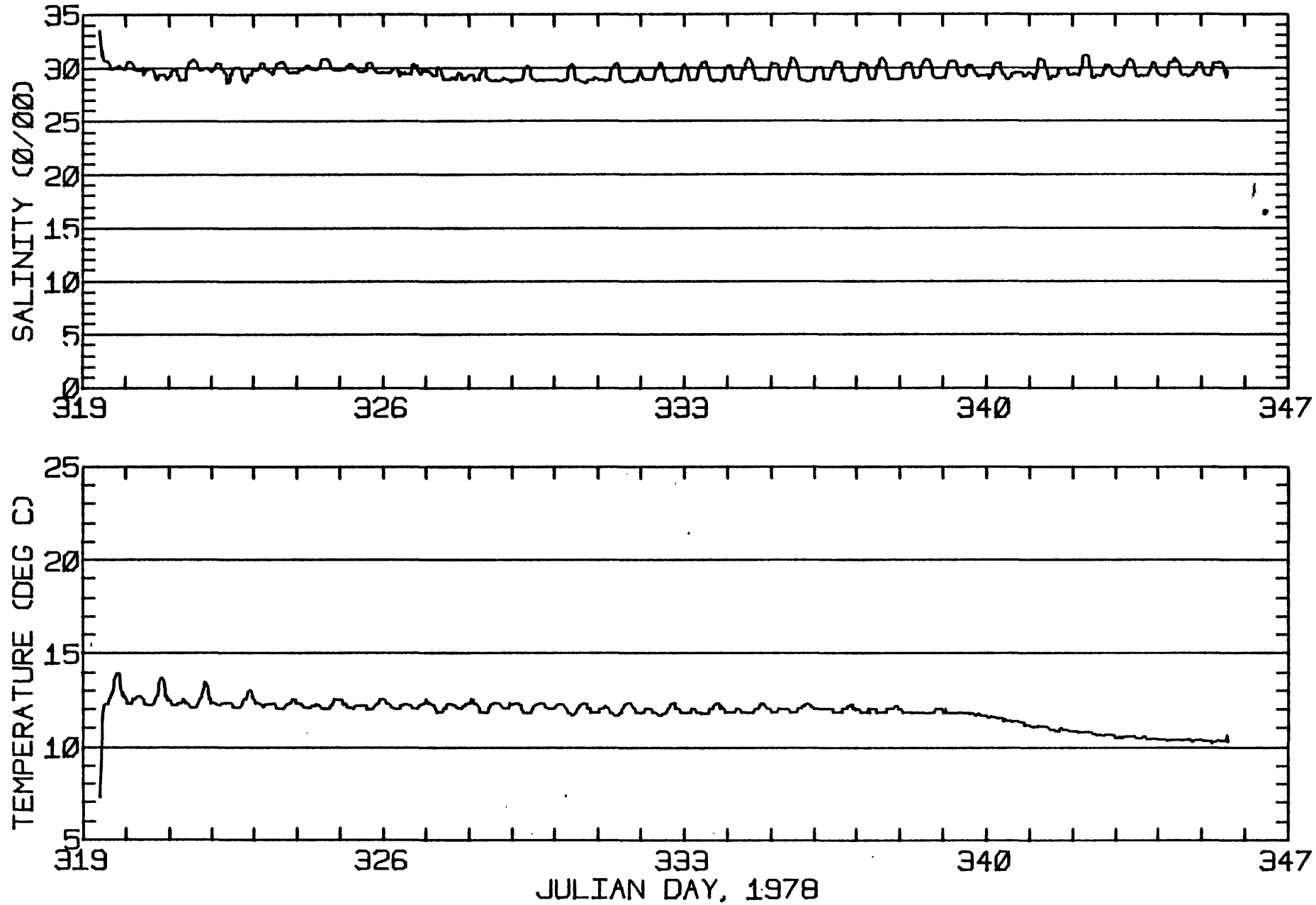
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-46-15N 122-21-20W
METER 43 FEET ABOVE BED. TAPE NUMBER GS006A1 .



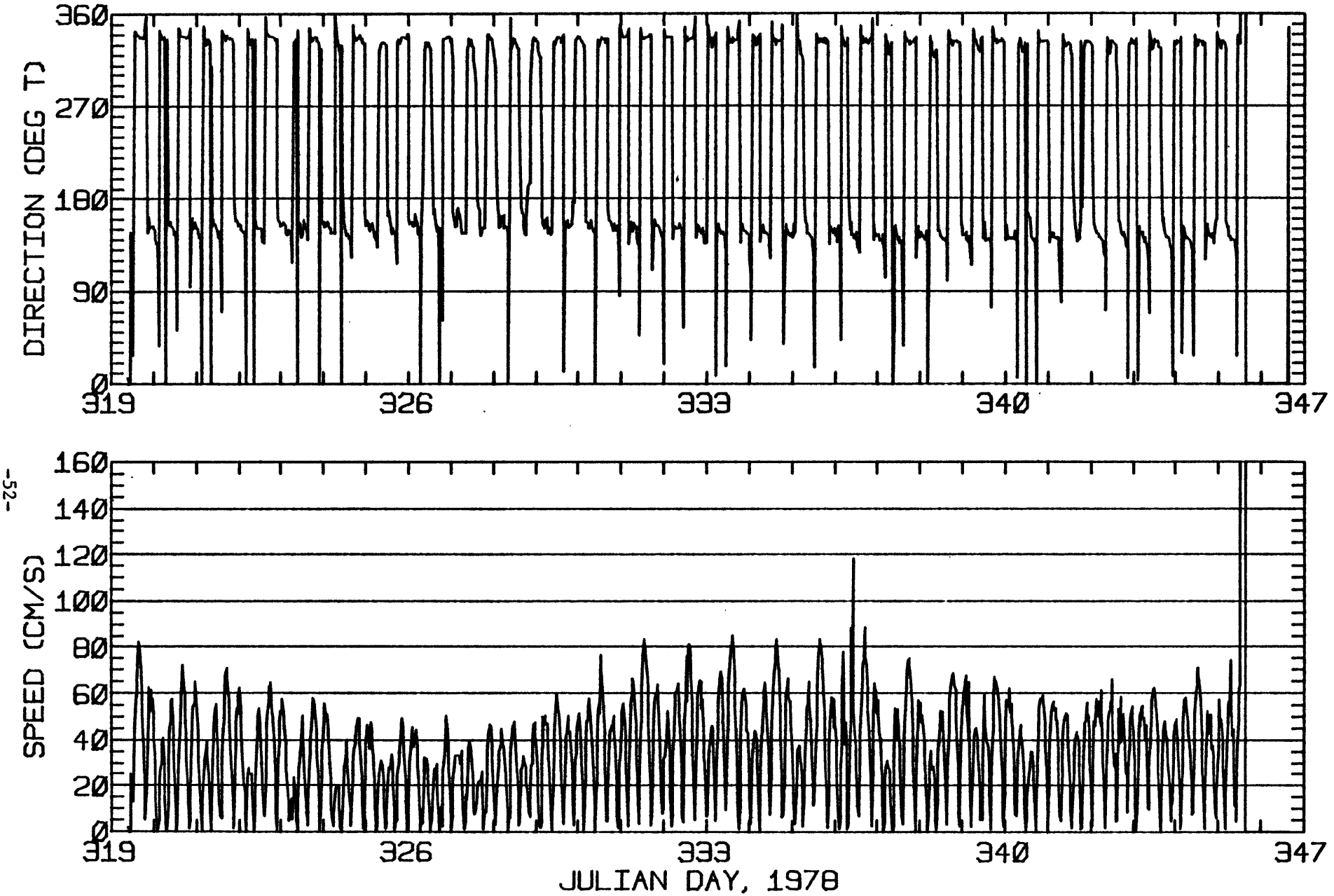
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-46-15N 122-21-20W
METER 43 FEET ABOVE BED. TAPE NUMBER GS006A1 .



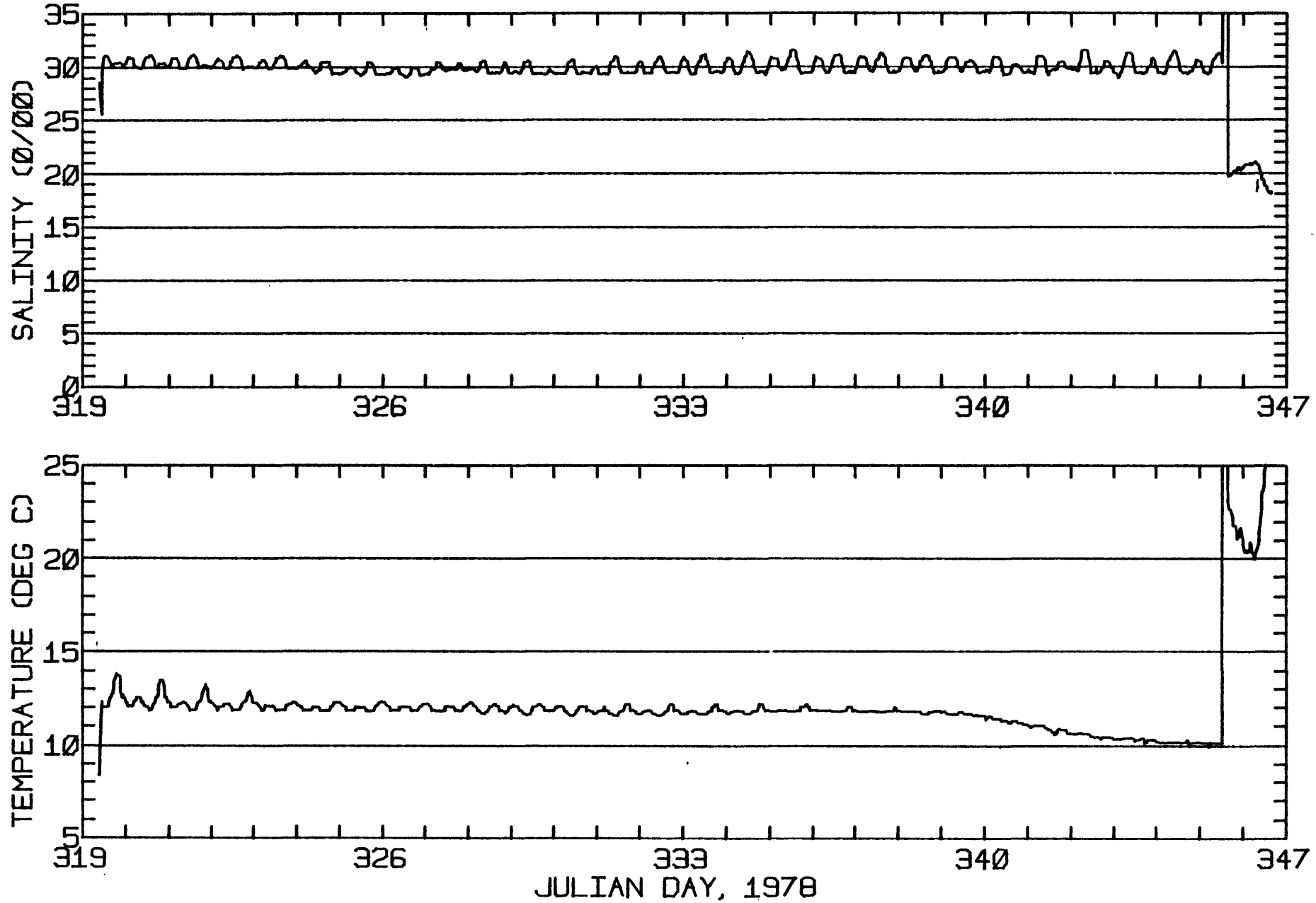
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-46-15N 122-21-20W
METER 24 FEET ABOVE BED. TAPE NUMBER GS006A2 .



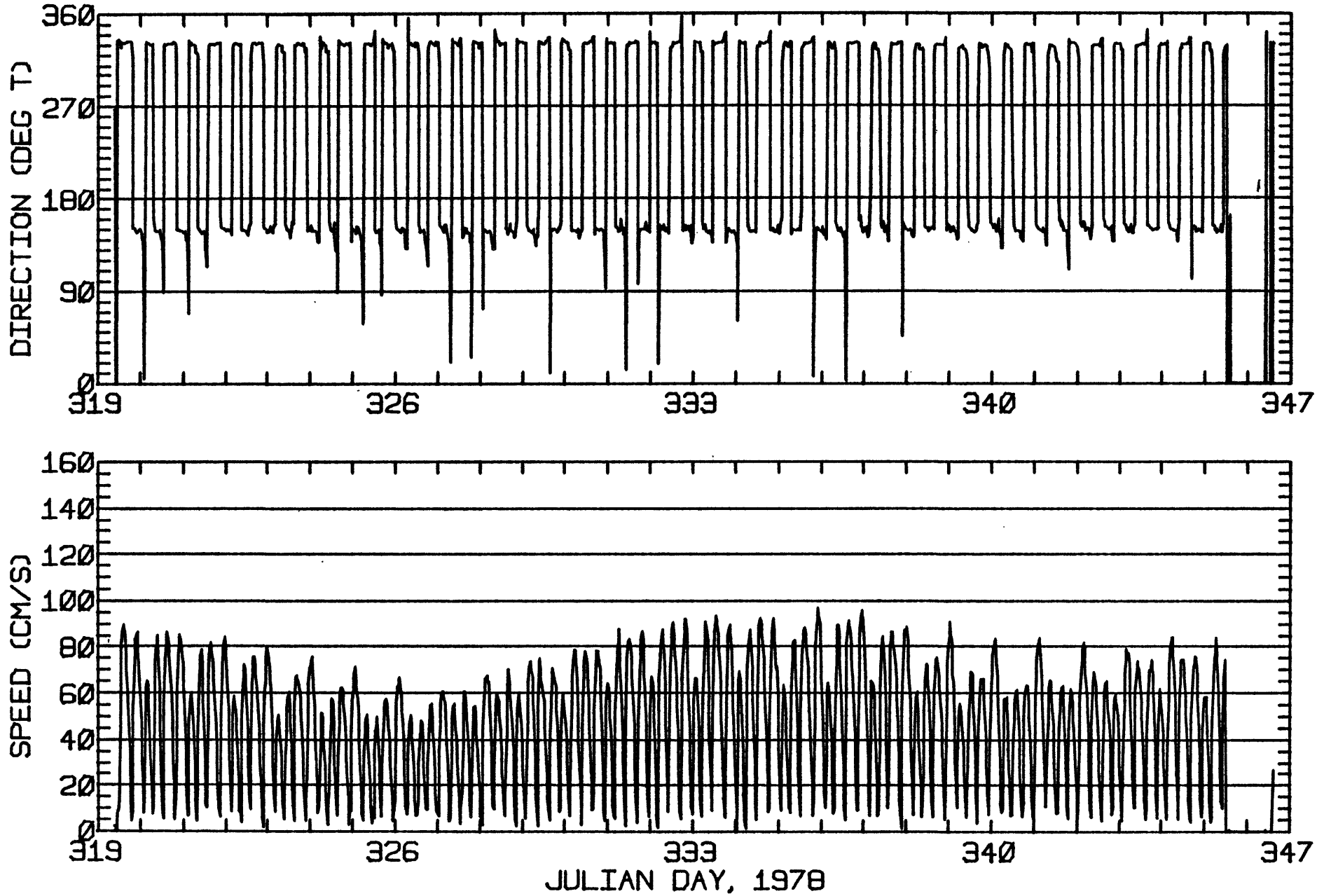
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-46-15N 122-21-20W
METER 24 FEET ABOVE BED. TAPE NUMBER GS006A2 .



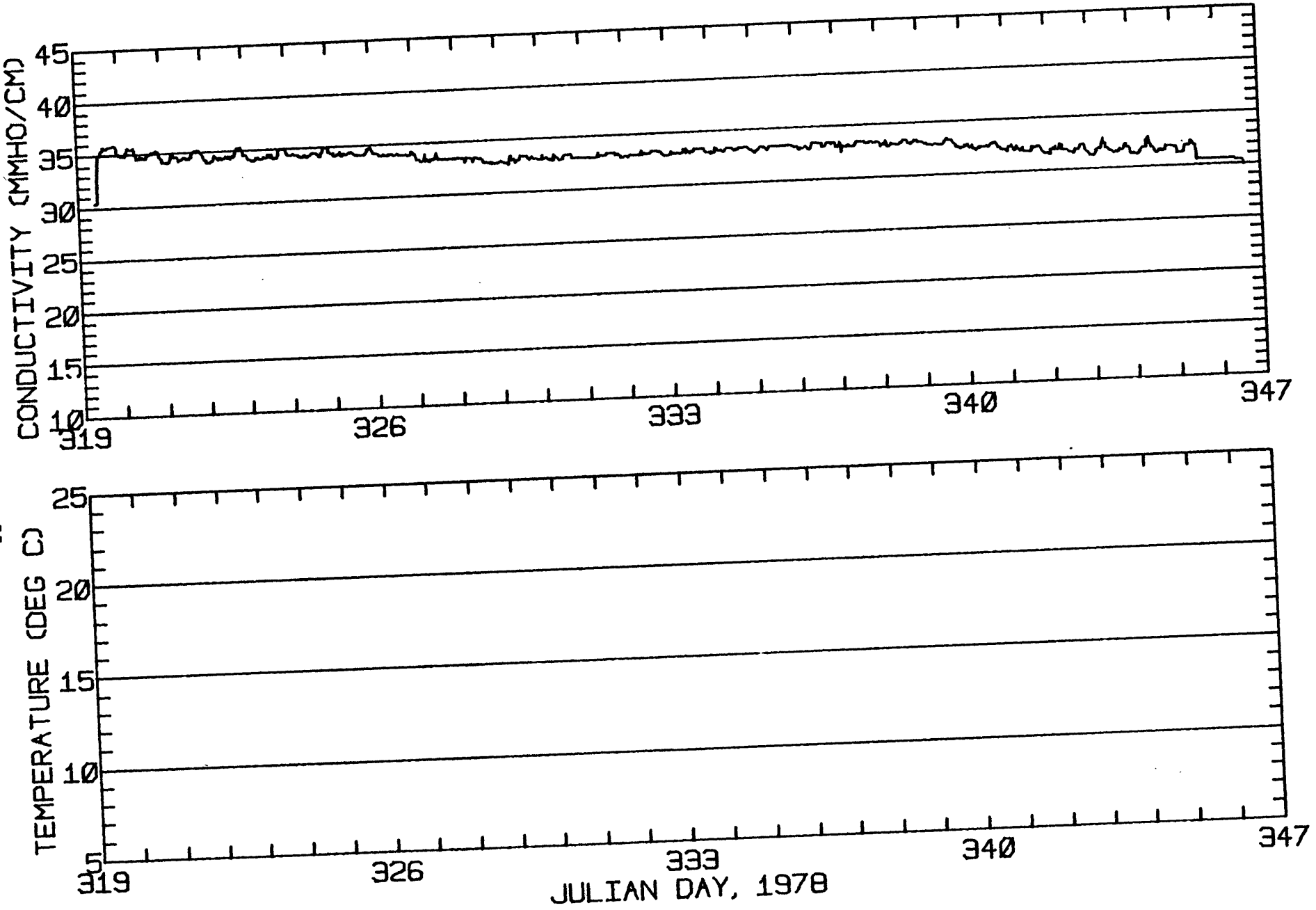
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-46-15N 122-21-20W
METER 5 FEET ABOVE BED. TAPE NUMBER GS006A3 .



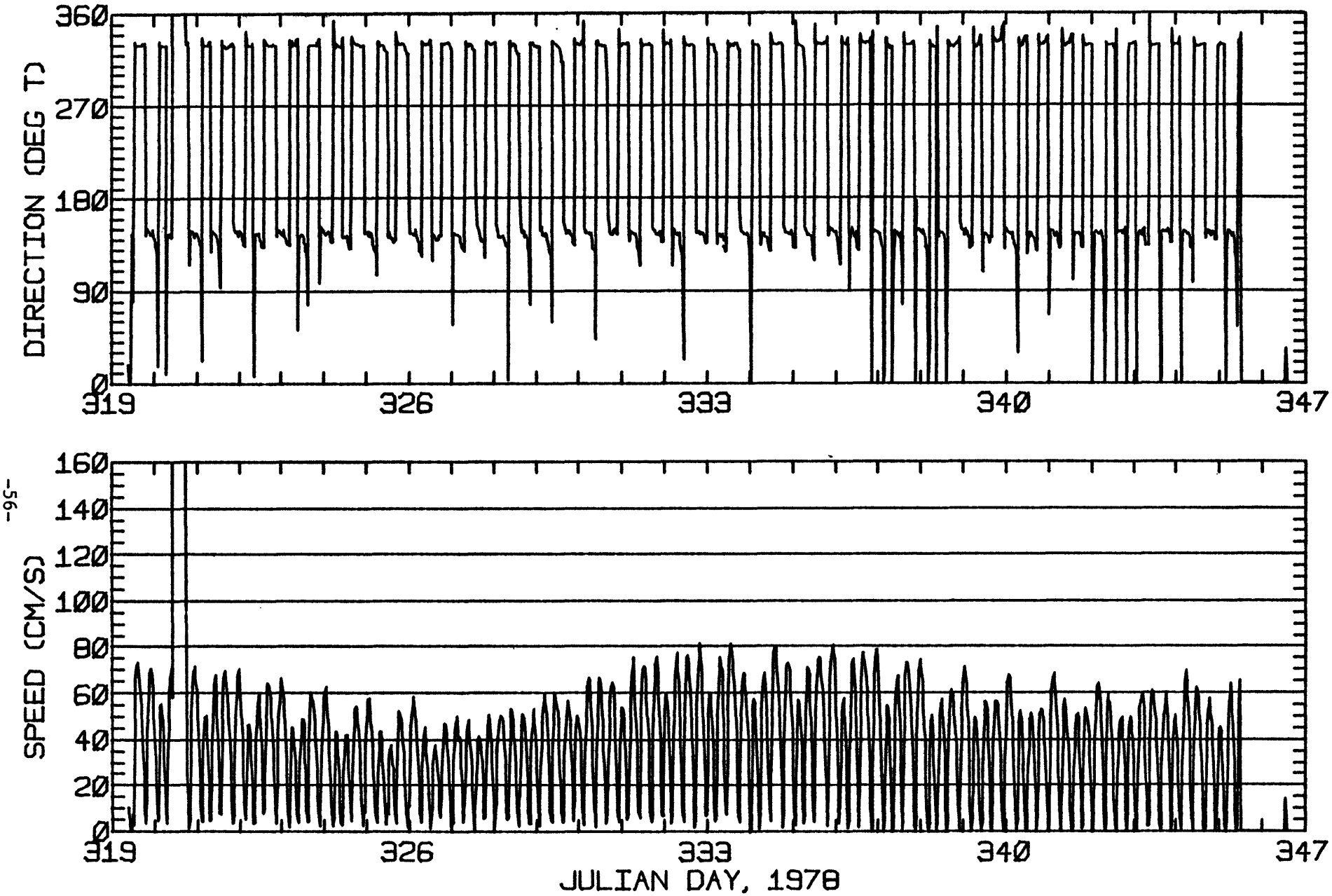
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
POTRERO POINT 37-46-15N 122-21-20W
METER 5 FEET ABOVE BED. TAPE NUMBER GS006A3 .



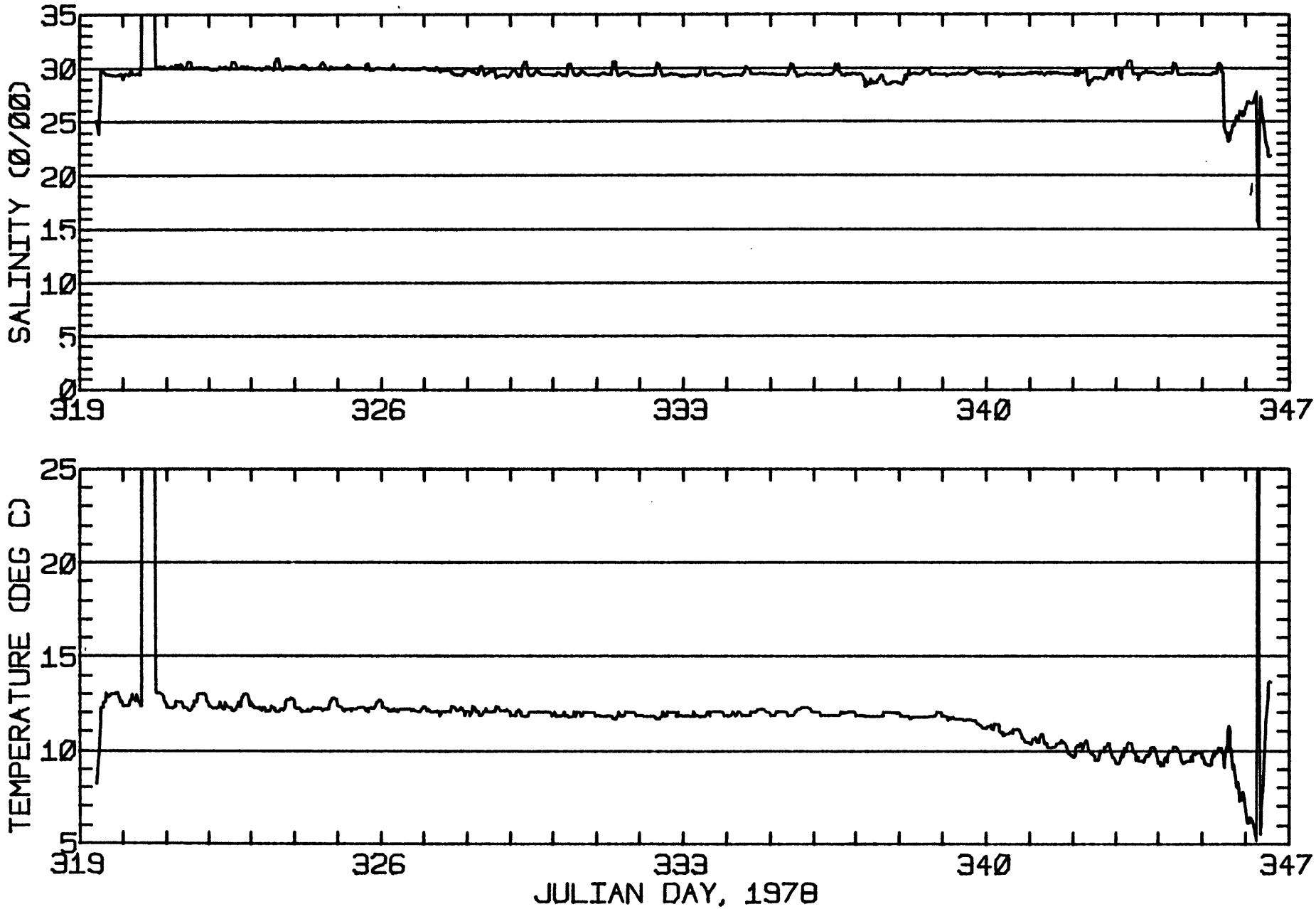
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NAS ALAMEDA 37-46-14N 122-20- 0W
METER 18 FEET ABOVE BED. TAPE NUMBER GS007A1 .



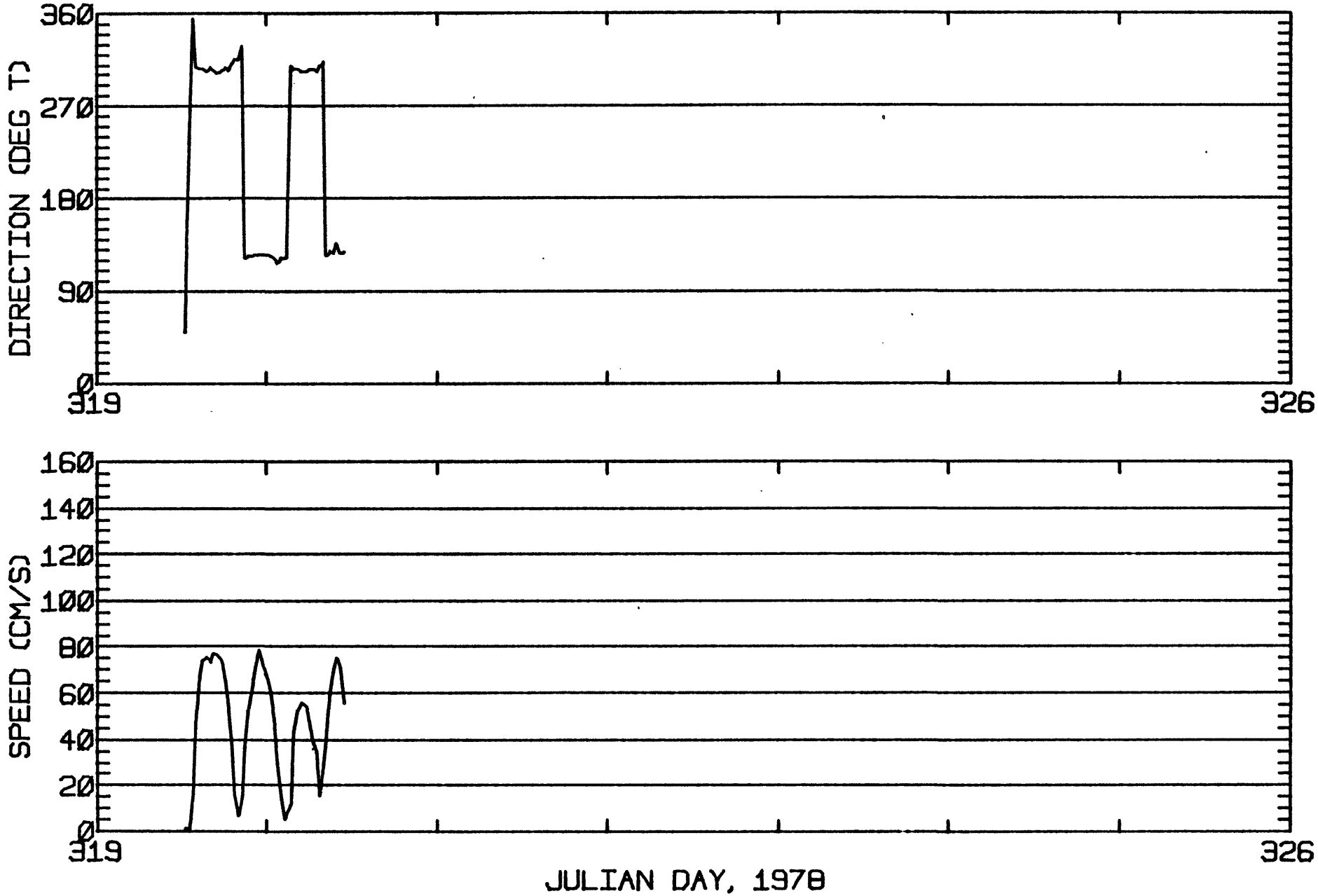
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NAS ALAMEDA 37-46-14N 122-20- 0W
METER 18 FEET ABOVE BED. TAPE NUMBER GS007A1 .



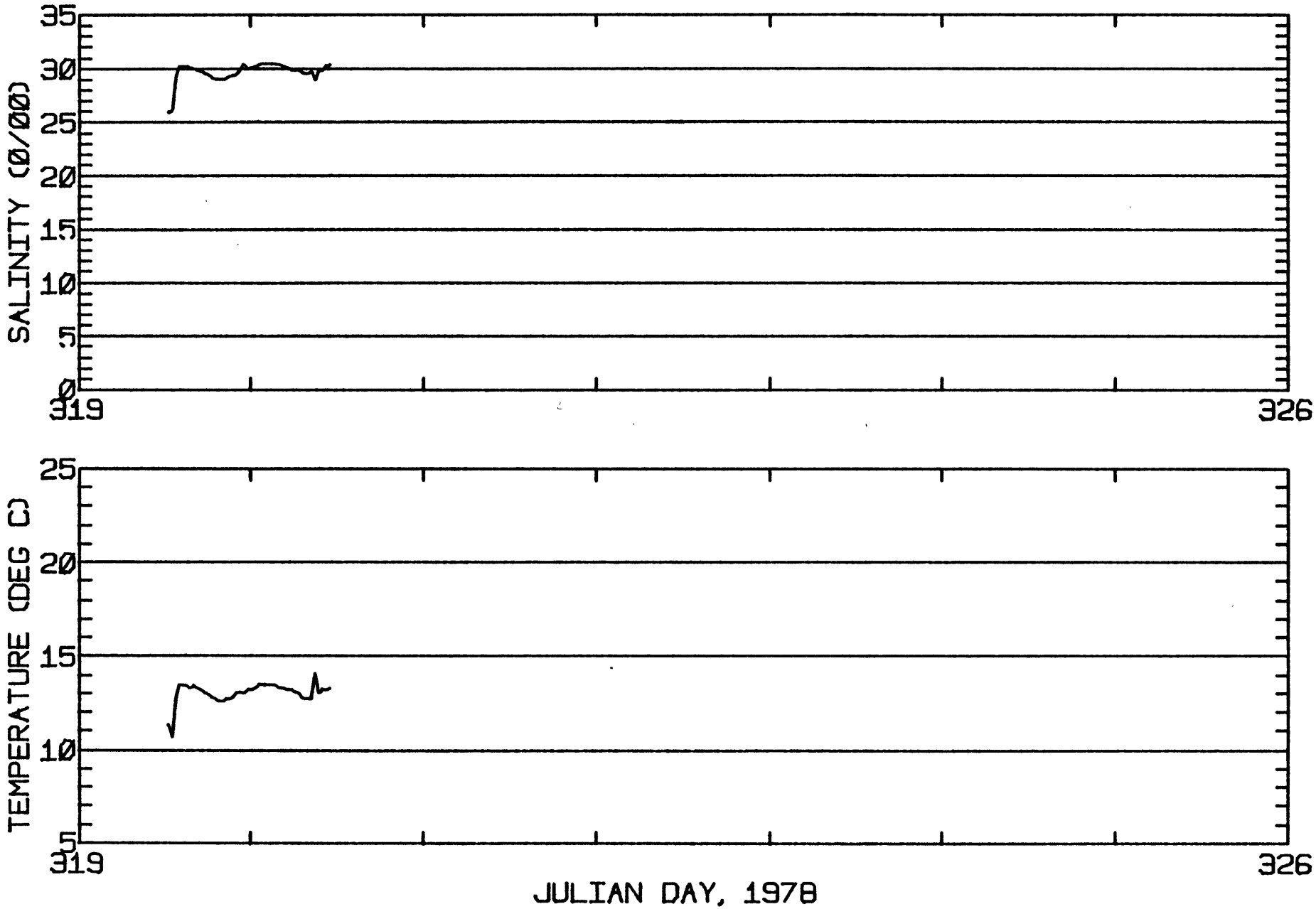
CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NAS ALAMEDA 37-46-14N 122-20- 0W
METER 5 FEET ABOVE BED. TAPE NUMBER GS007A2 .



CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
NAS ALAMEDA 37-46-14N 122-20- 0W
METER 5 FEET ABOVE BED. TAPE NUMBER GS007A2 .

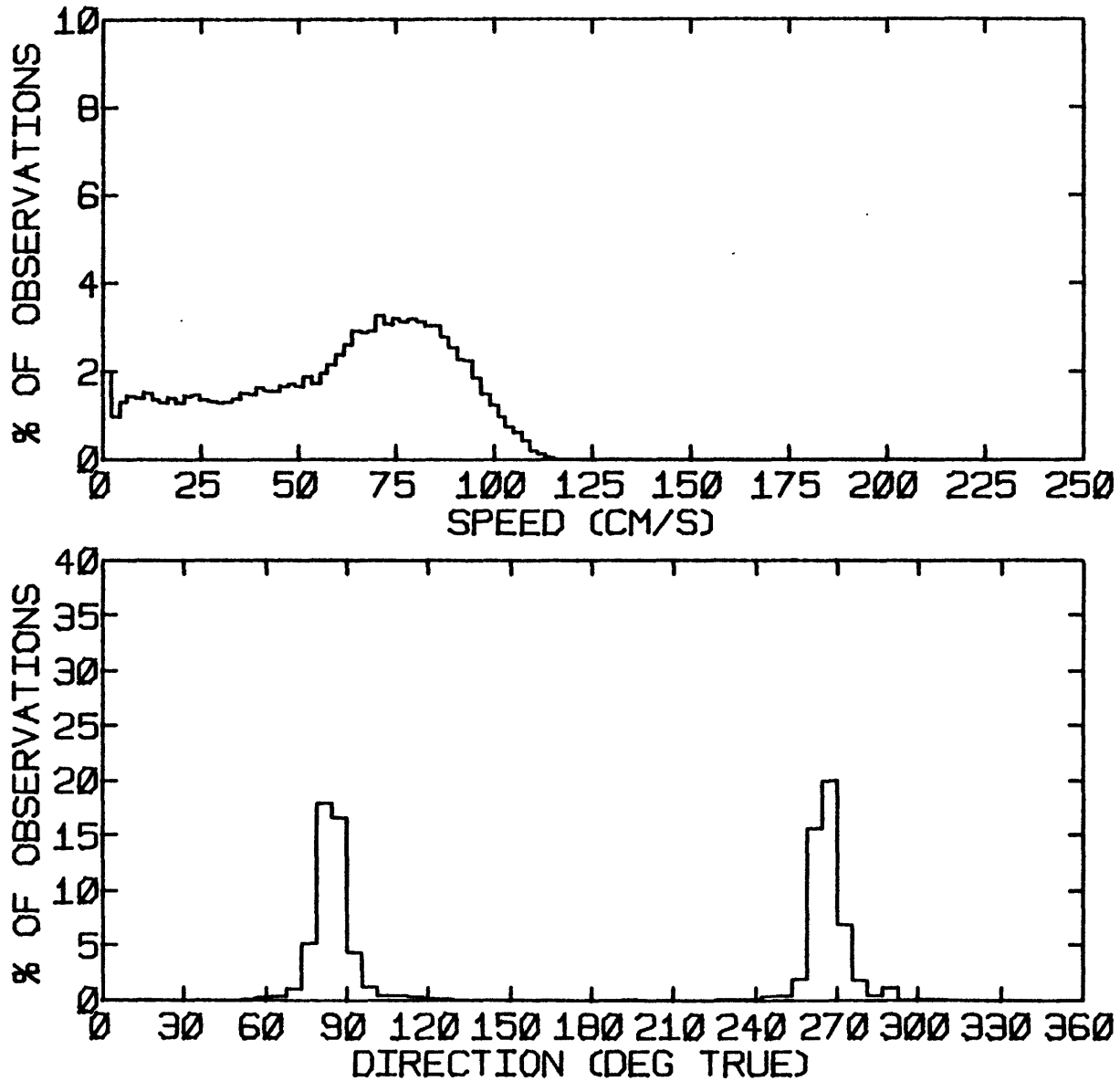


CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-31-10N 122- 7-57W
METER 18 FEET ABOVE BED. TAPE NUMBER GS008A1 .

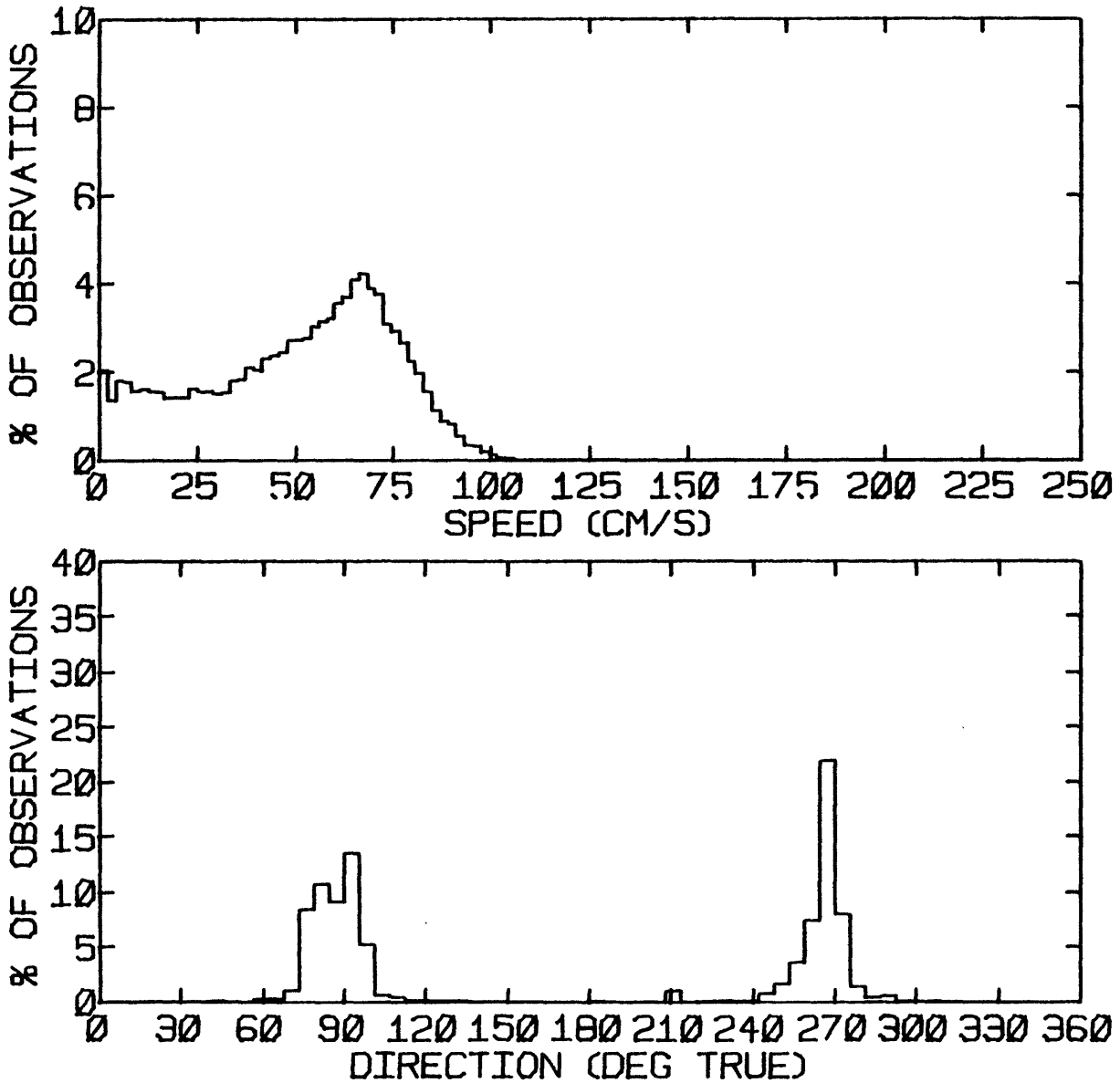


CURRENT METER OBSERVATIONS (30 MINUTE AVERAGES)
DUMBARTON BRIDGE 37-31-10N 122- 7-57W
METER 18 FEET ABOVE BED. TAPE NUMBER GS008A1 .

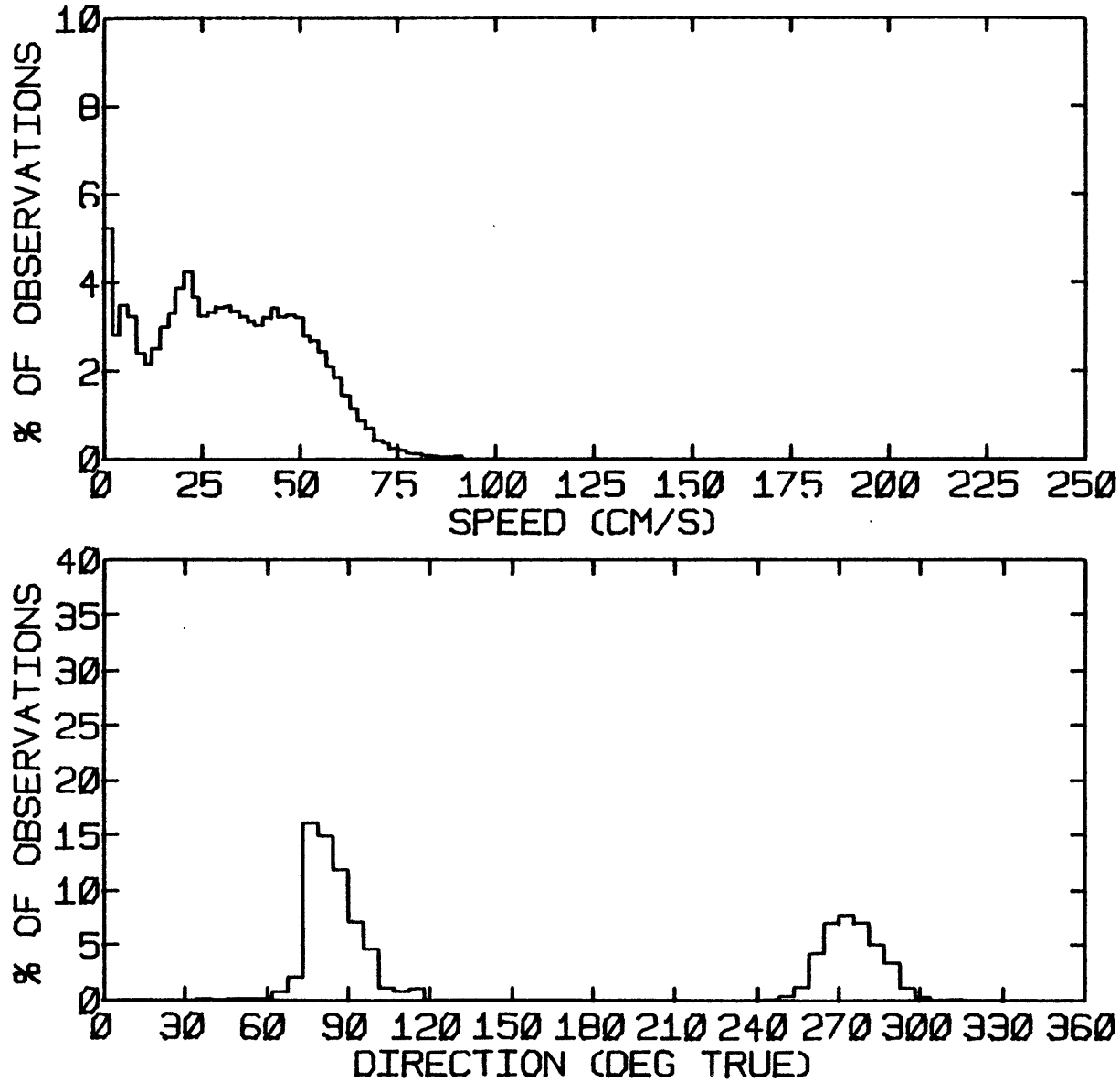
APPENDIX B



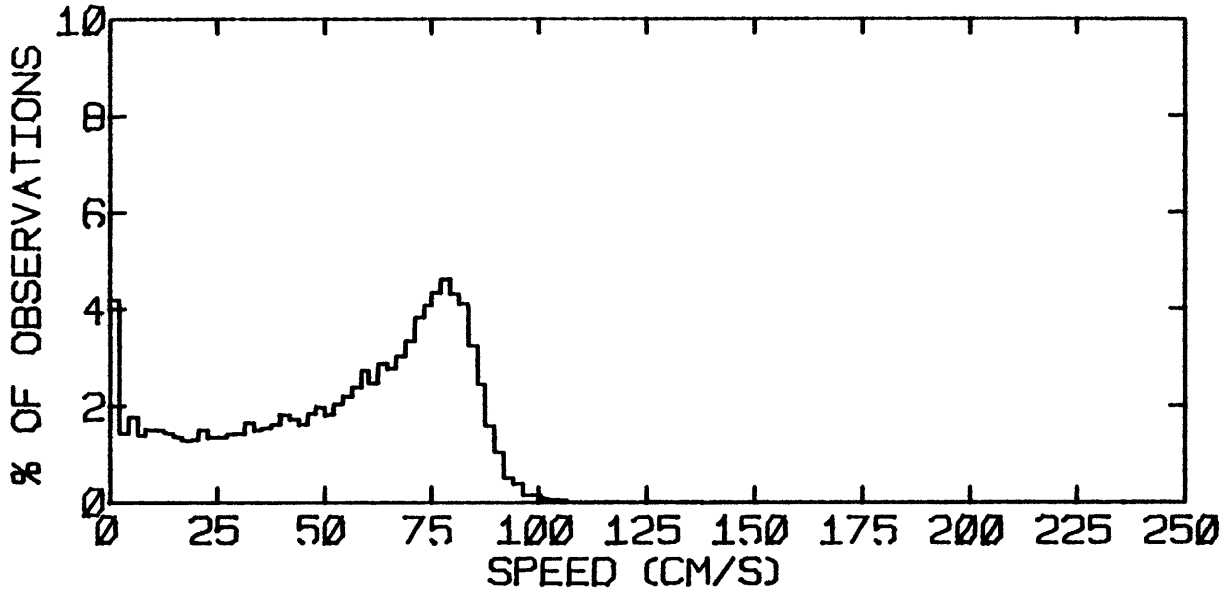
STATISTICS: SPEED & DIRECTION 8- 1-78 TO 9- 7-78
PITTSBURG 38- 2-38N 121-53-58W
METER 43 FEET ABOVE BED. TAPE NUMBER GS001A1.

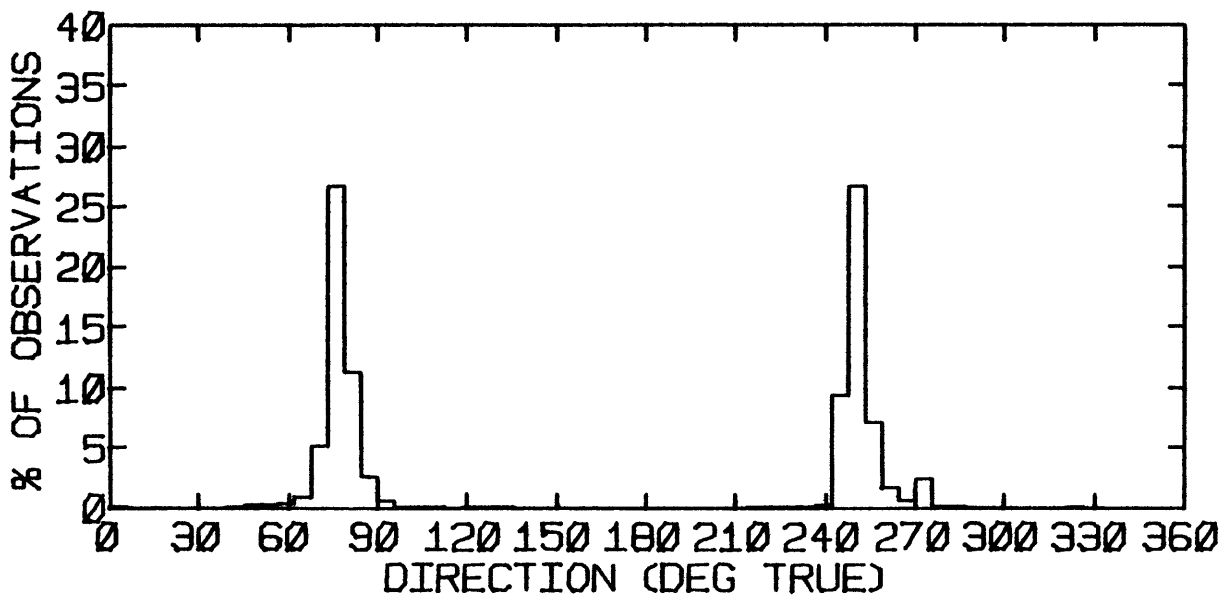


STATISTICS: SPEED & DIRECTION 8- 1-78 TO 9- 7-78
PITTSBURG 38- 2-38N 121-53-58W
METER 24 FEET ABOVE BED. TAPE NUMBER GS001A2.

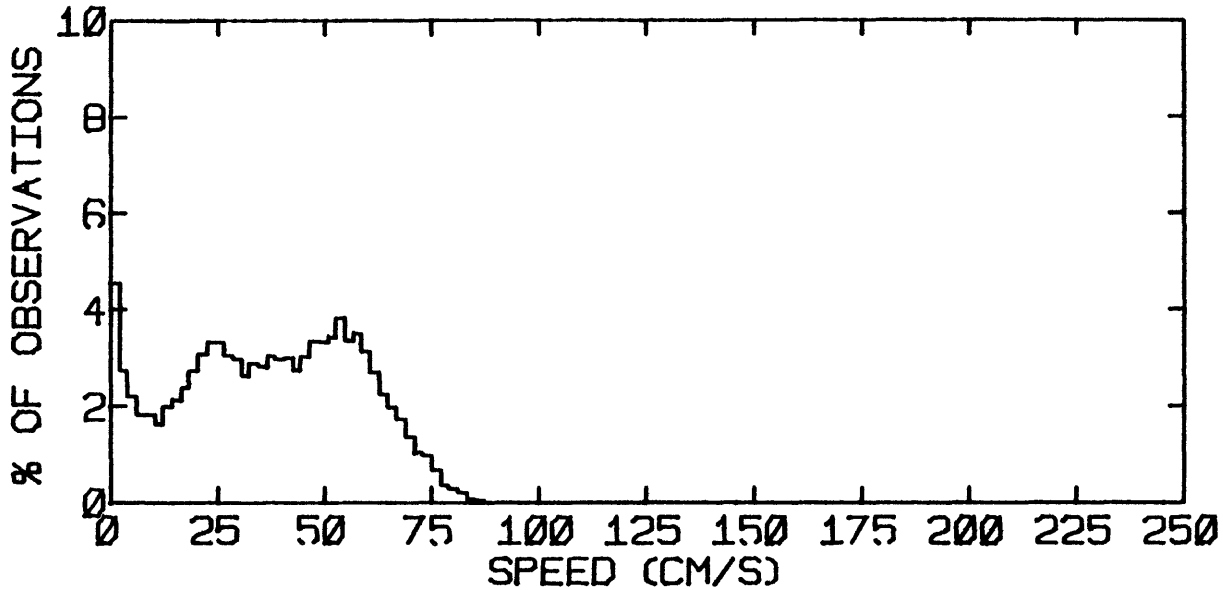


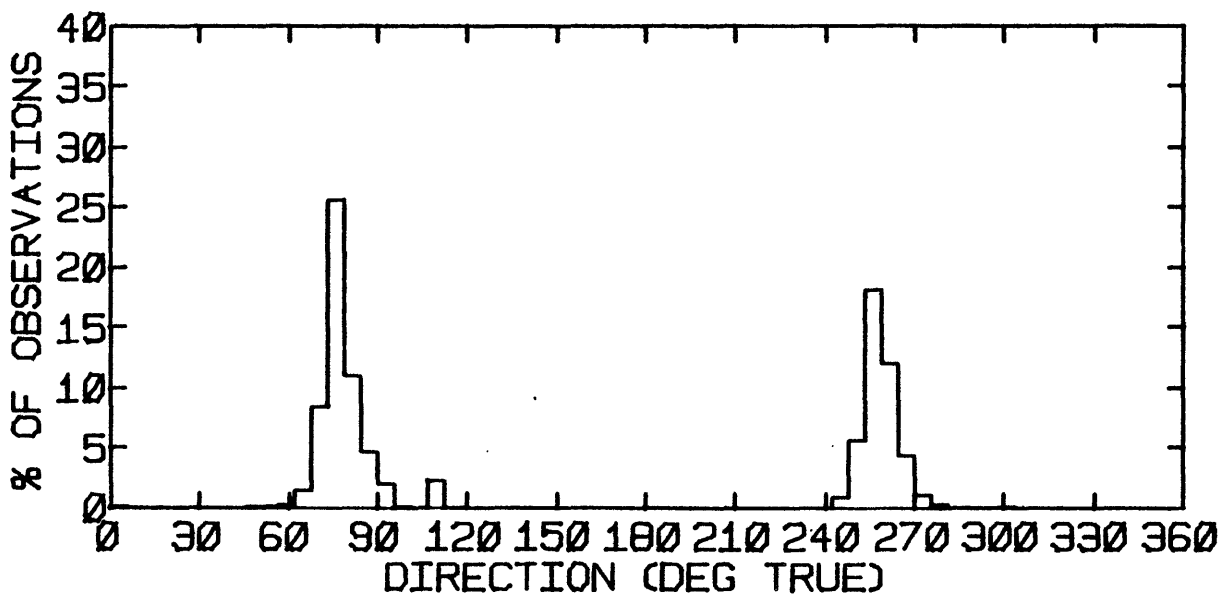
STATISTICS: SPEED & DIRECTION 8- 1-78 TO 9- 7-78
PITTSBURG 38- 2-38N 121-53-58W
METER 5 FEET ABOVE BED. TAPE NUMBER GS001A3 .



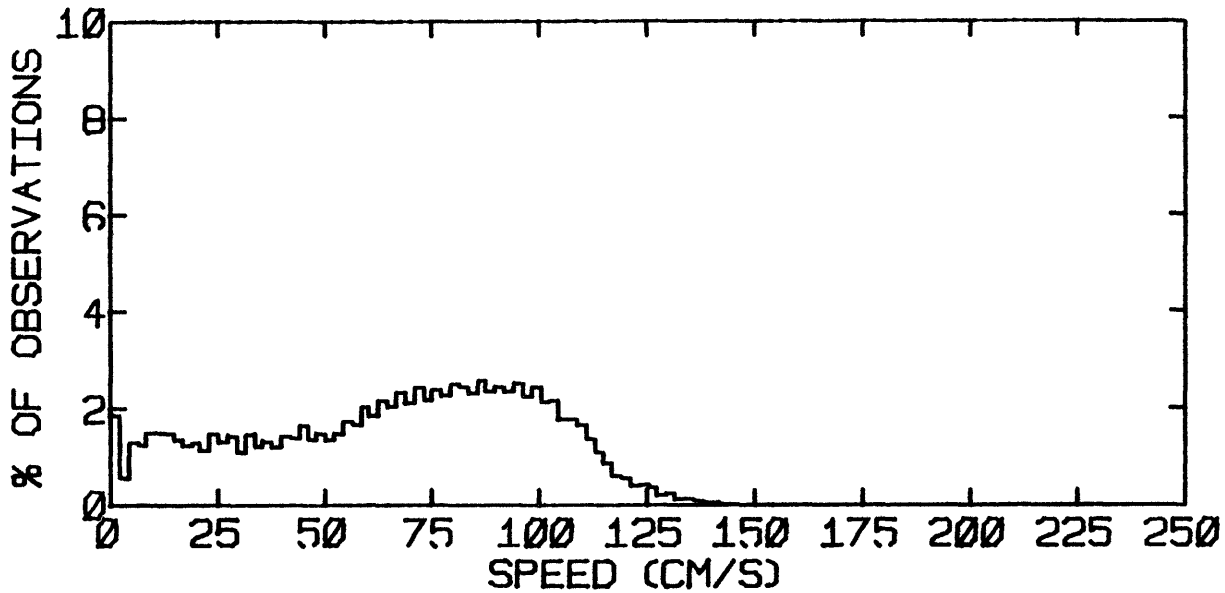


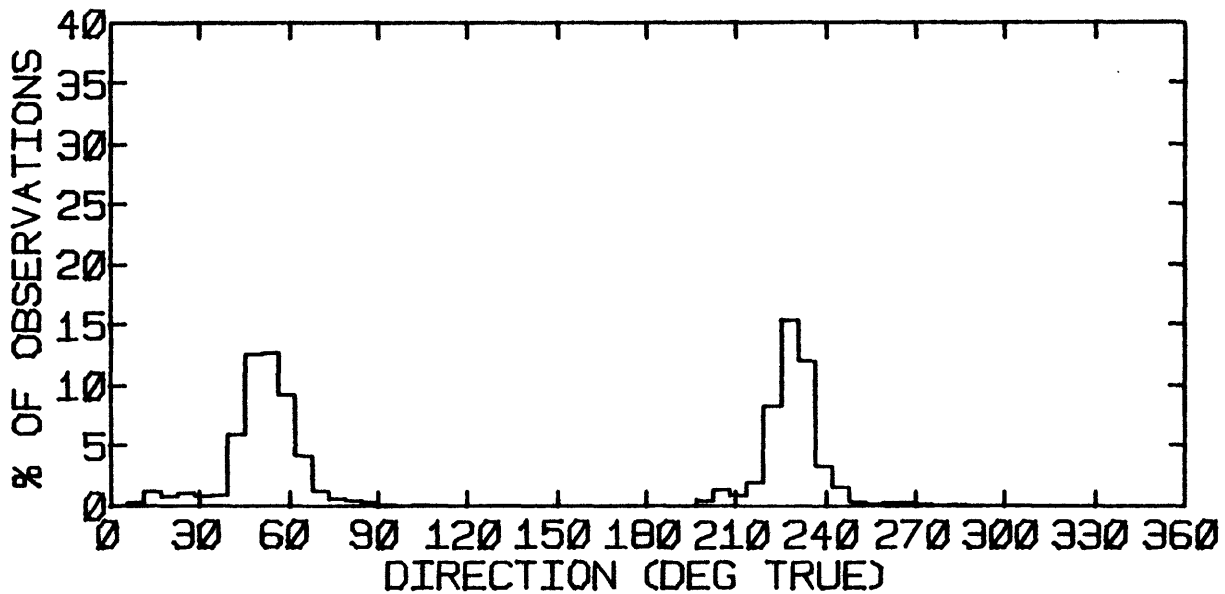
STATISTICS: SPEED & DIRECTION 9-11-78 TO 10-16-78
PITTSBURG 38- 2-38N 121-53-58W
METER 24 FEET ABOVE BED. TAPE NUMBER GS001B2 .



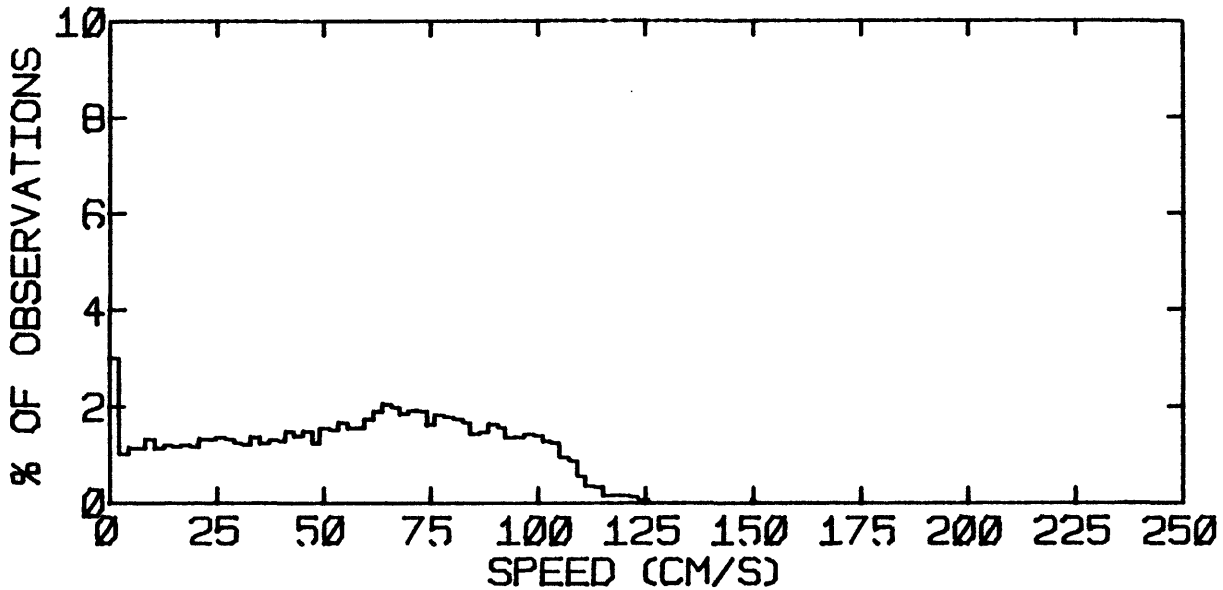


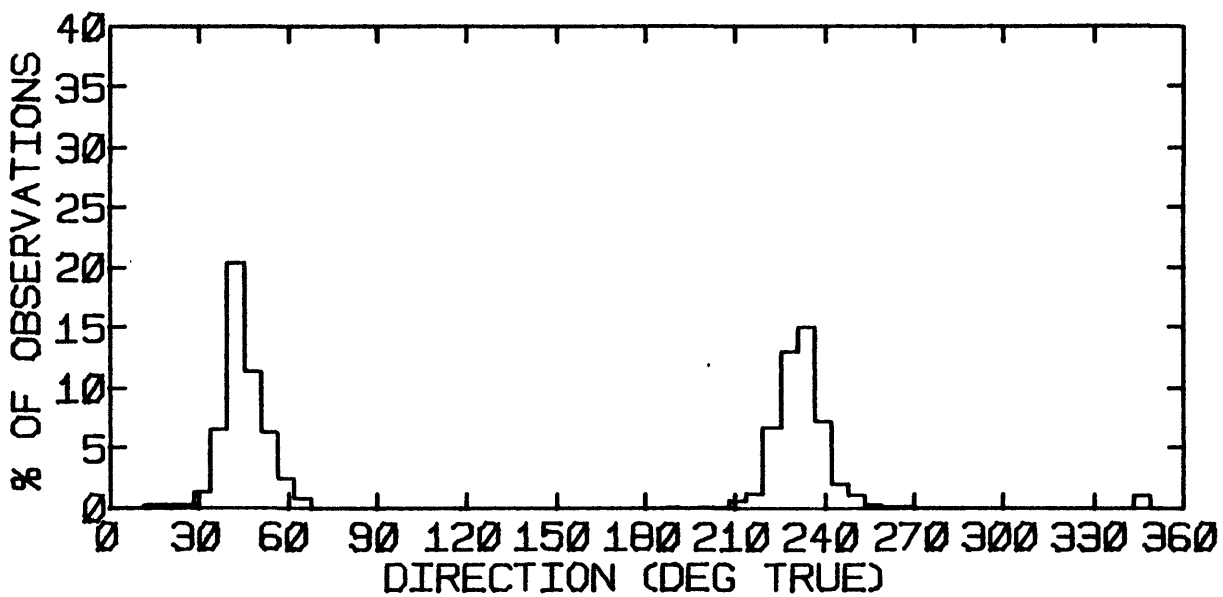
STATISTICS: SPEED & DIRECTION 9-11-78 TO 10-16-78
PITTSBURG 38- 2-38N 121-53-58W
METER 5 FEET ABOVE BED. TAPE NUMBER GS001B3 .



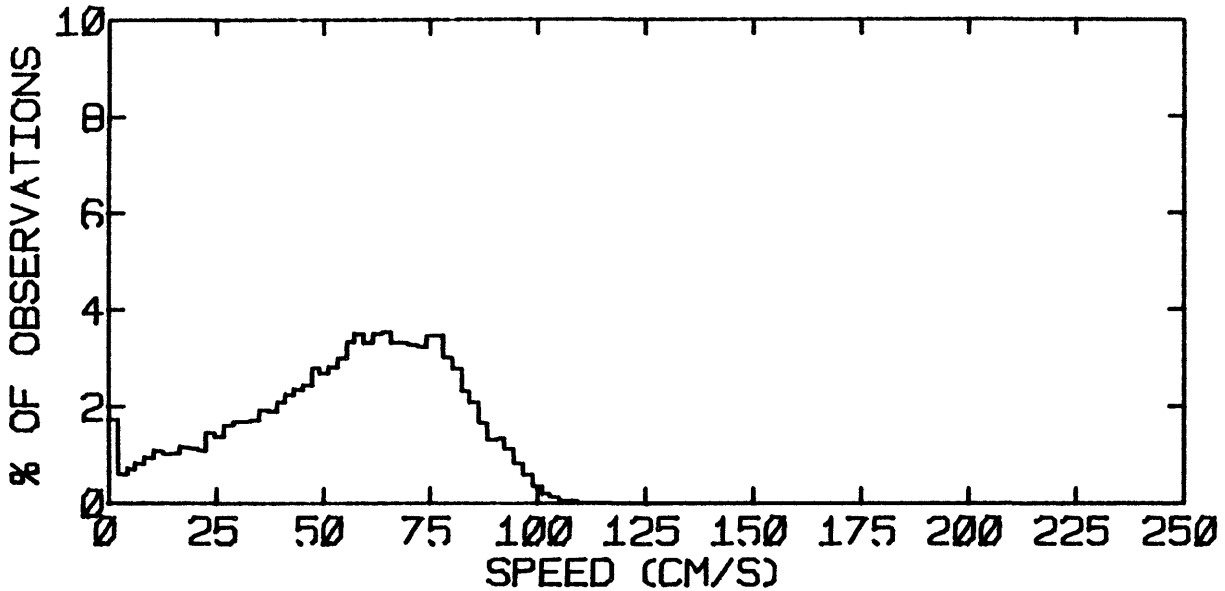


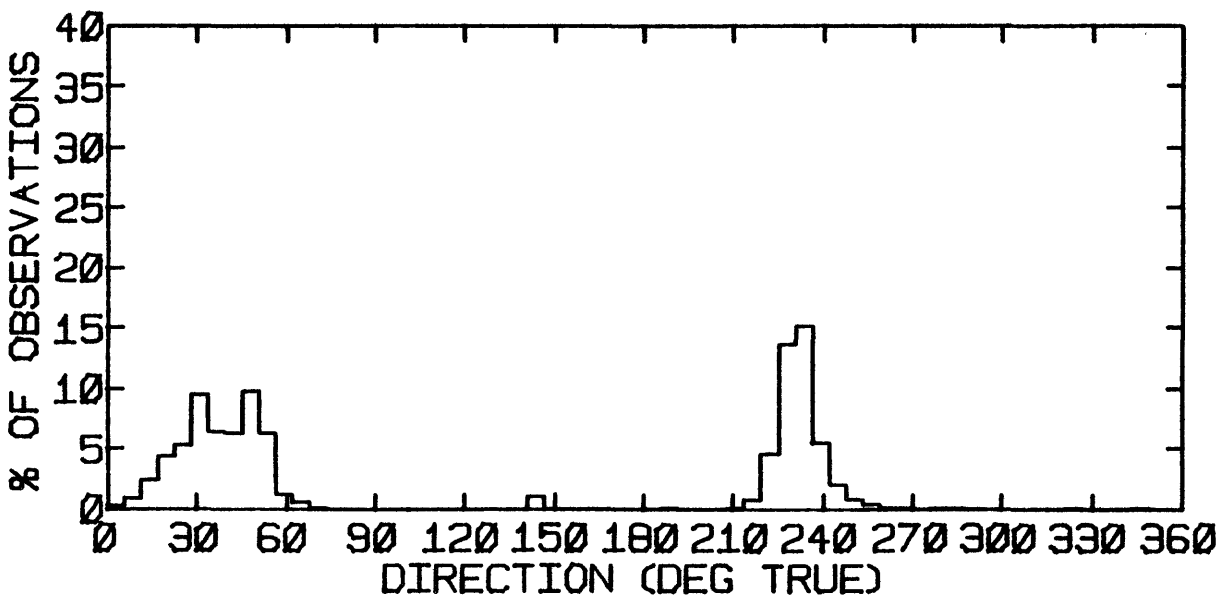
STATISTICS: SPEED & DIRECTION 8- 1-78 TO 9- 7-78
BENECIA BRIDGE 38- 2-27N 122- 7-30W
METER 43 FEET ABOVE BED. TAPE NUMBER GS002A1 .



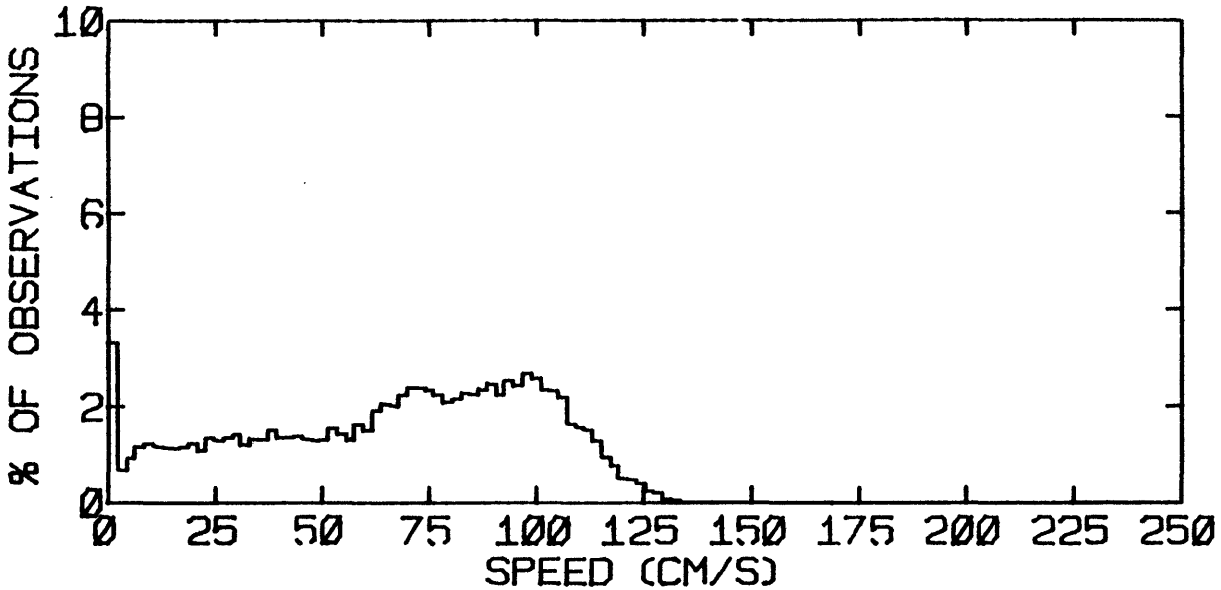


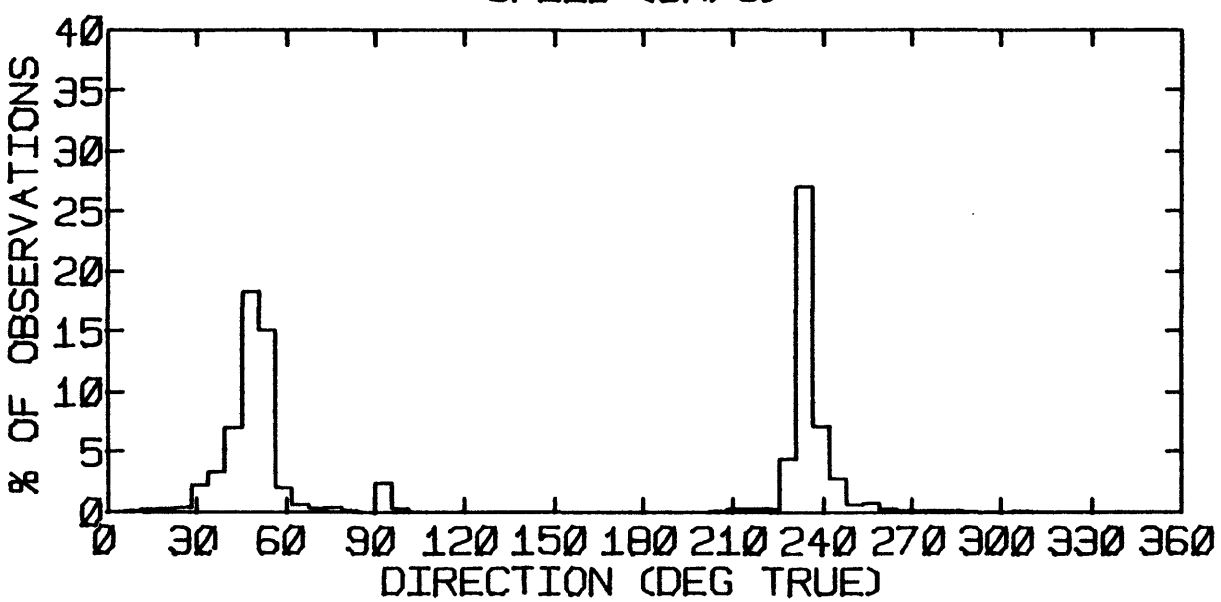
STATISTICS: SPEED & DIRECTION 8- 1-78 TO 9- 7-78
BENECIA BRIDGE 38- 2-27N 122- 7-30W
METER 24 FEET ABOVE BED. TAPE NUMBER GS002A2 .



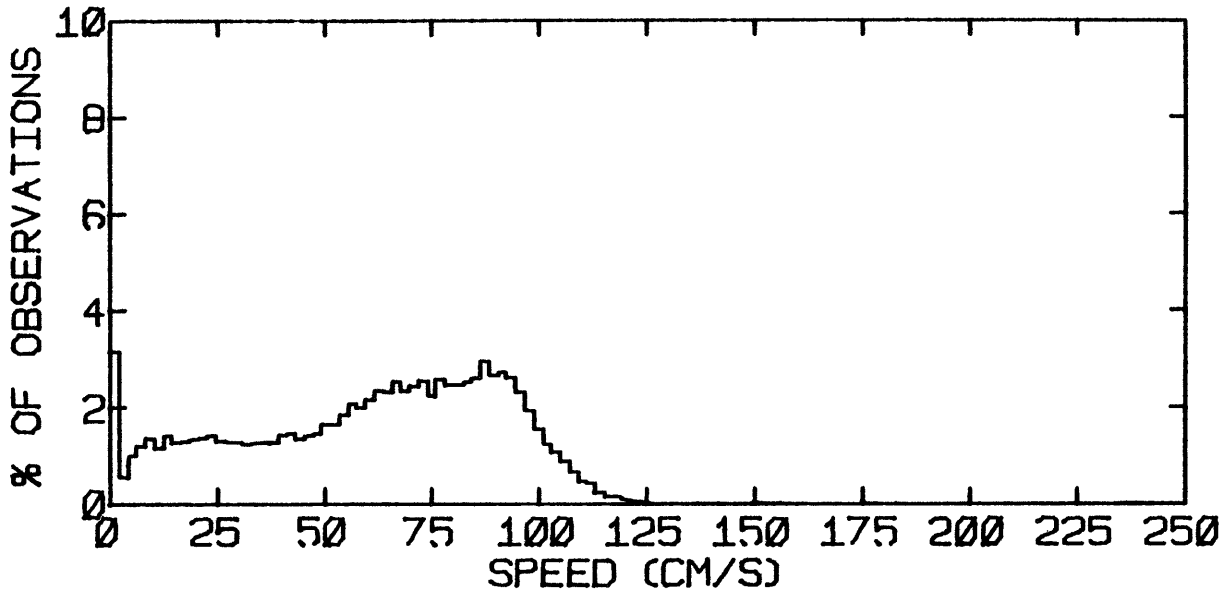


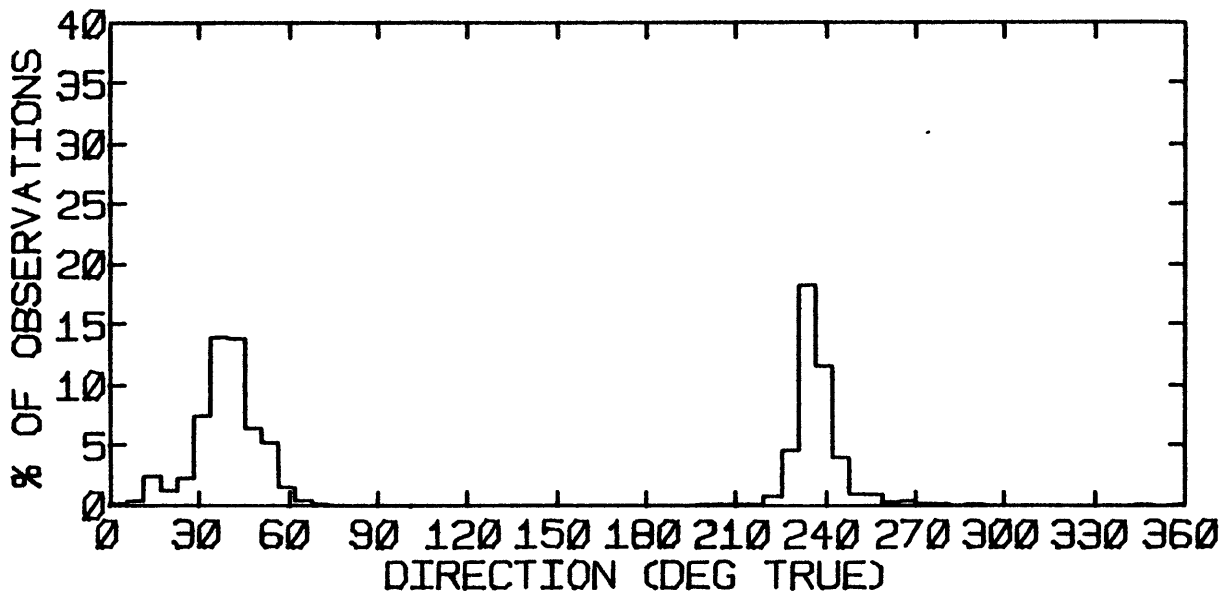
STATISTICS: SPEED & DIRECTION 8- 1-78 TO 9- 7-78
BENECIA BRIDGE 38- 2-27N 122- 7-30W
METER 5 FEET ABOVE BED. TAPE NUMBER GS002A3 .



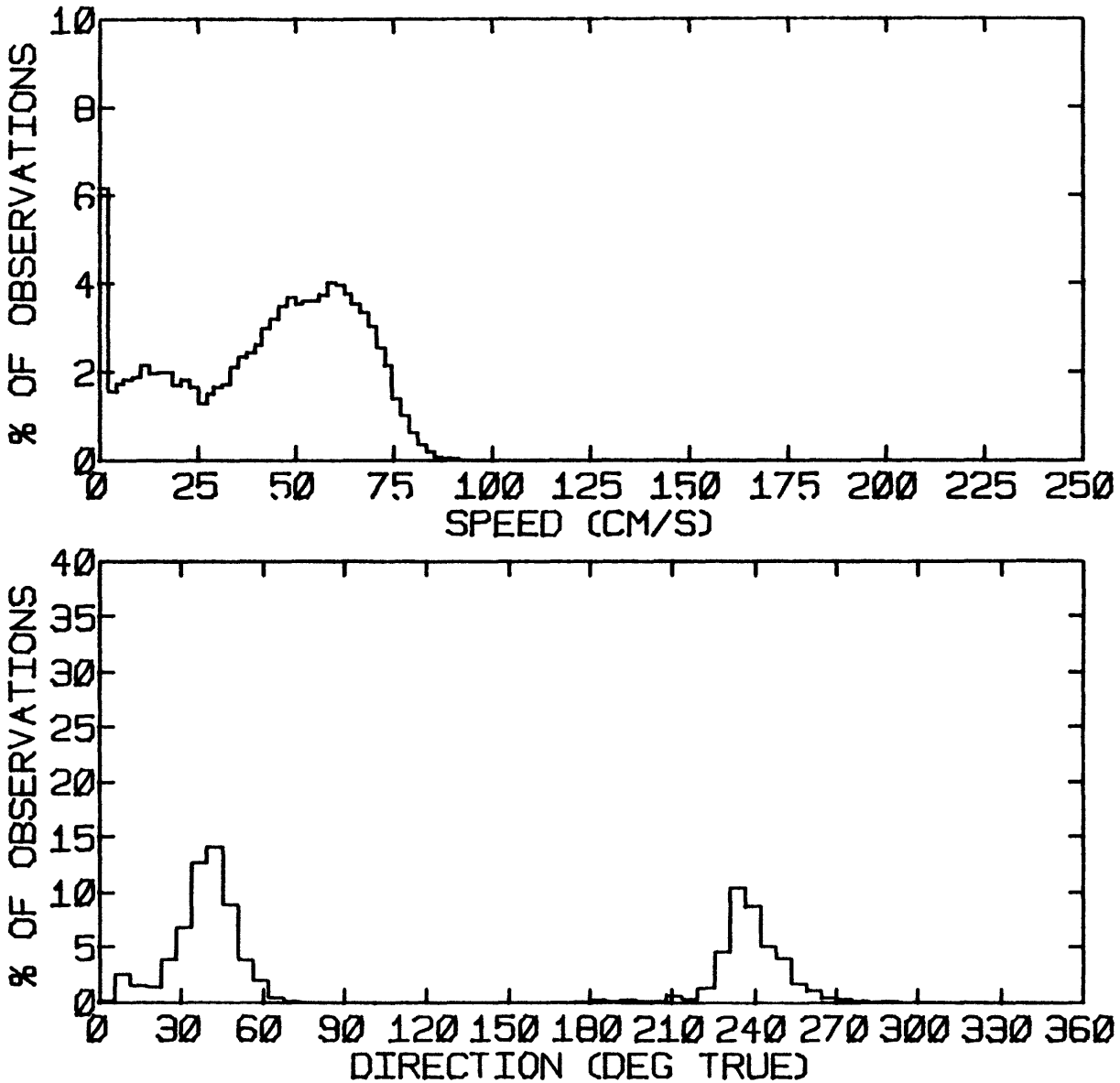


STATISTICS: SPEED & DIRECTION 9-11-78 TO 10-16-78
BENECIA BRIDGE 38- 2-27N 122- 7-30W
METER 43 FEET ABOVE BED. TAPE NUMBER GS002B1 .

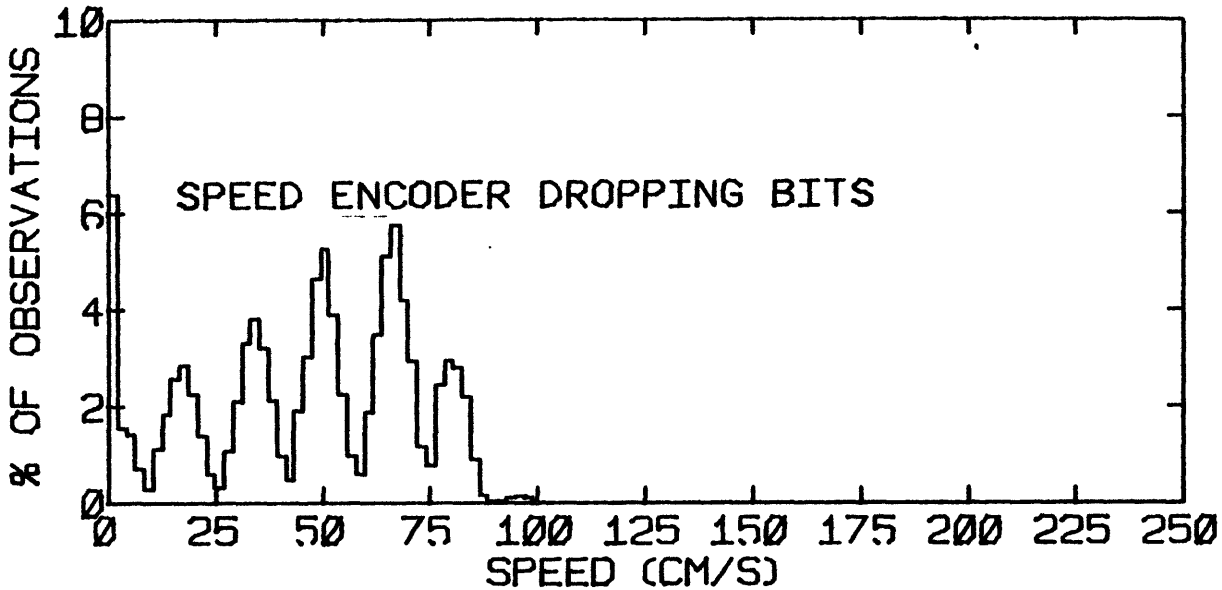


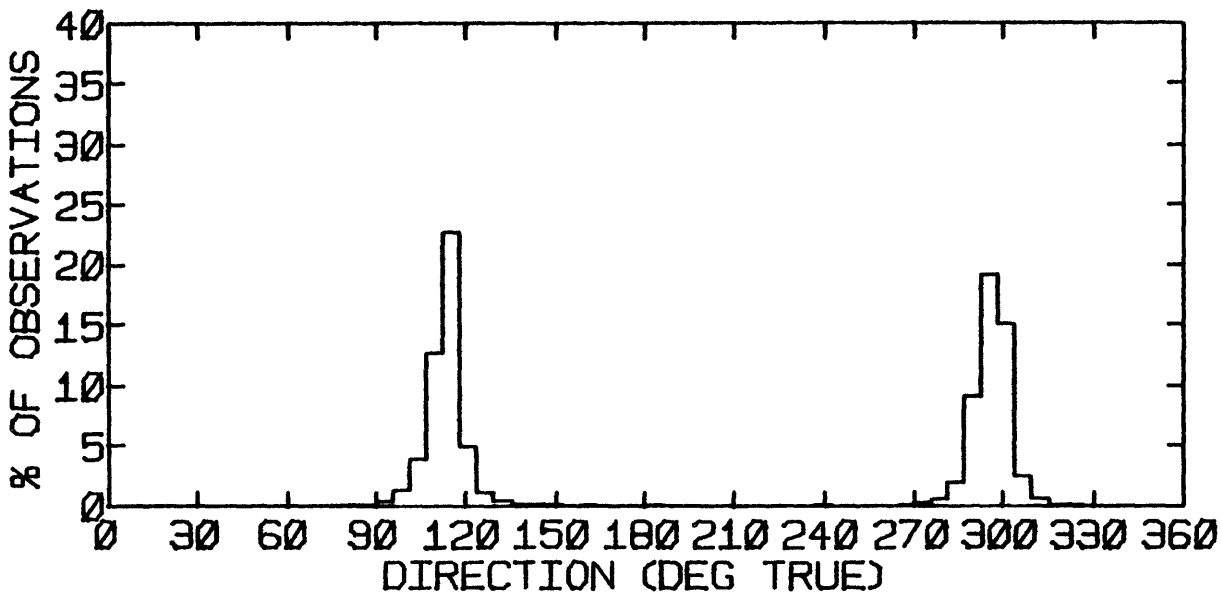


STATISTICS: SPEED & DIRECTION 9-11-78 TO 10-16-78
BENECIA BRIDGE 38- 2-27N 122- 7-30W
METER 24 FEET ABOVE BED. TAPE NUMBER GS002B2 .

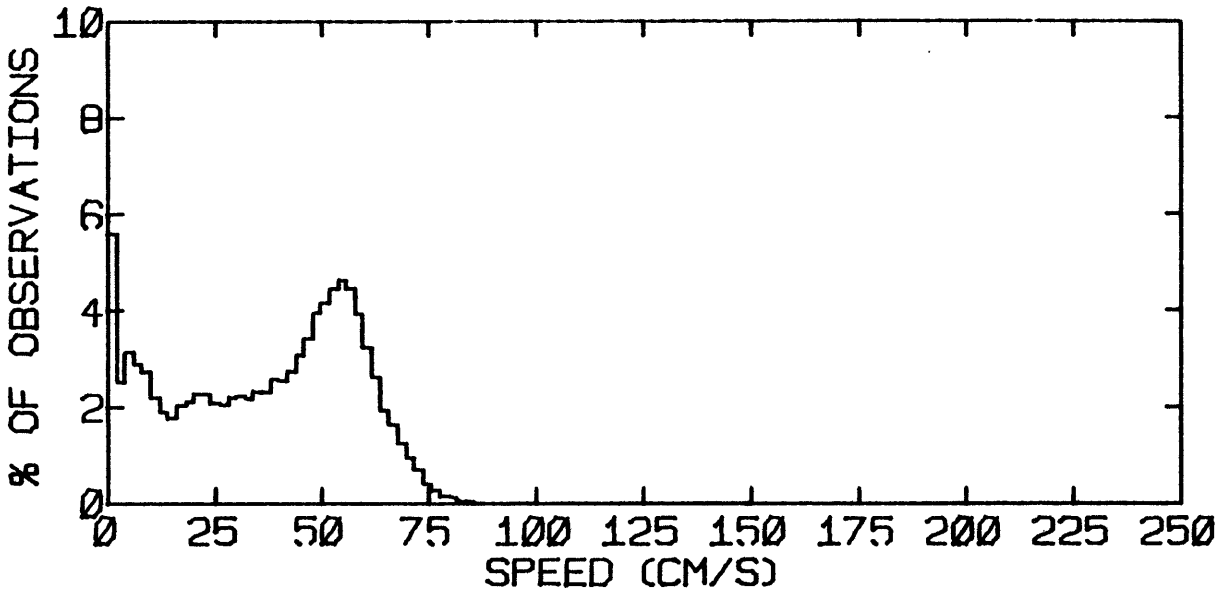


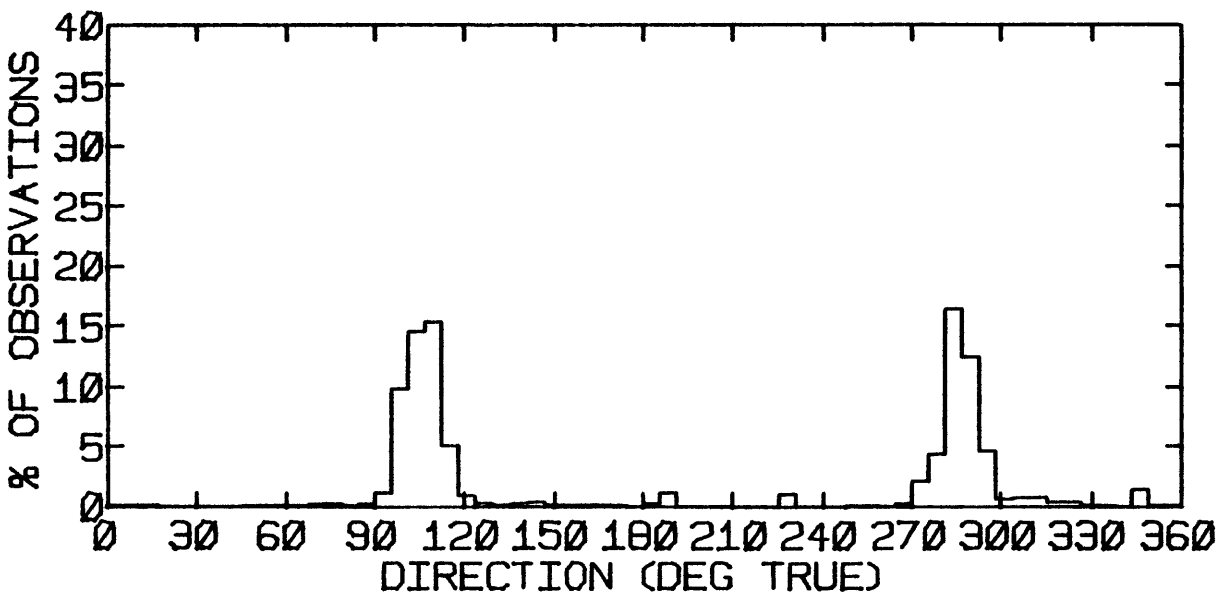
STATISTICS: SPEED & DIRECTION 9-11-78 TO 10-16-78
BENECIA BRIDGE 38- 2-27N 122- 7-30W
METER 5 FEET ABOVE BED. TAPE NUMBER GS002B3 .



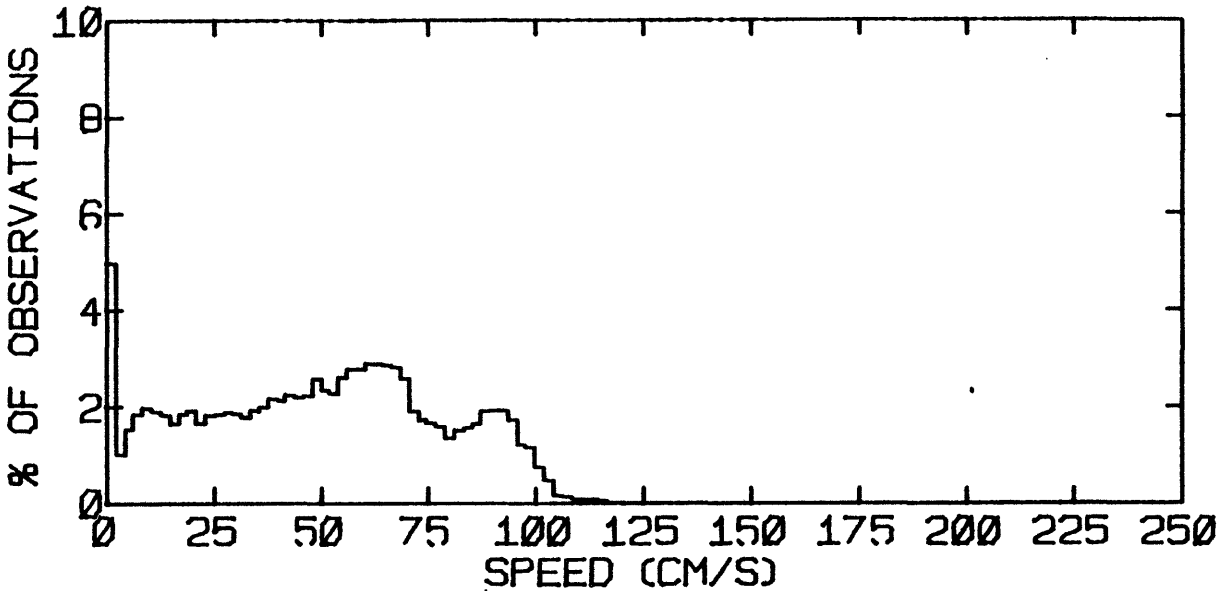


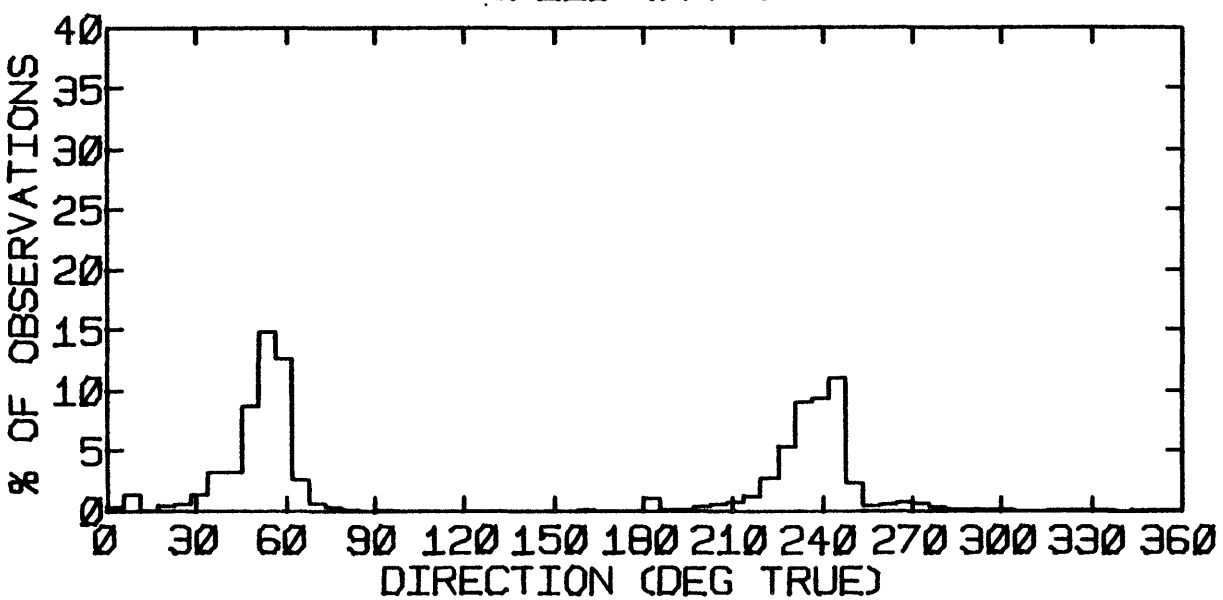
STATISTICS: SPEED & DIRECTION 9- 5-78 TO 10-16-78
RYER ISLAND 38- 5-34N 122- 1- 5W
METER 18 FEET ABOVE BED. TAPE NUMBER GS003A1.



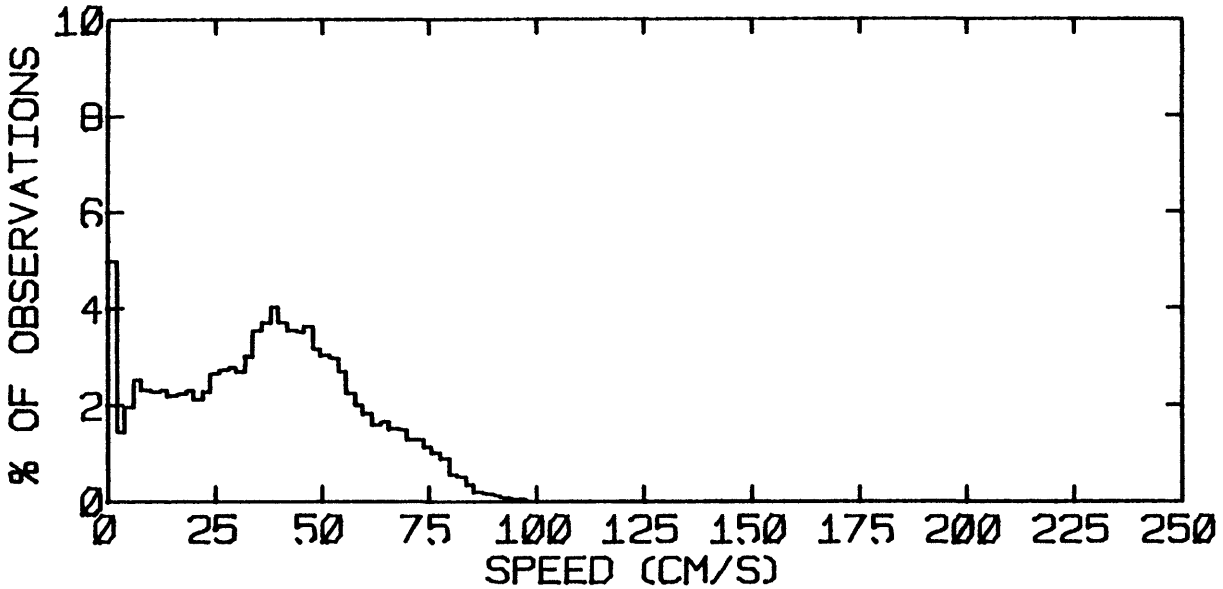


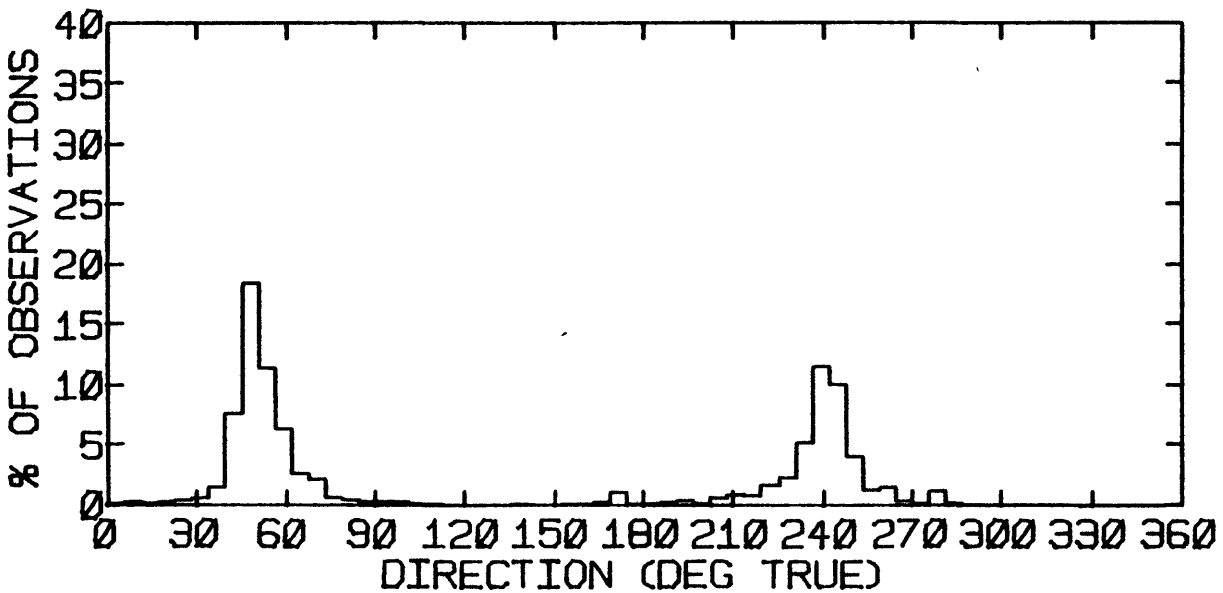
STATISTICS: SPEED & DIRECTION 9- 5-78 TO 10-16-78
RYER ISLAND 38- 5-34N 122- 1- 5W
METER 5 FEET ABOVE BED. TAPE NUMBER GS003A2.



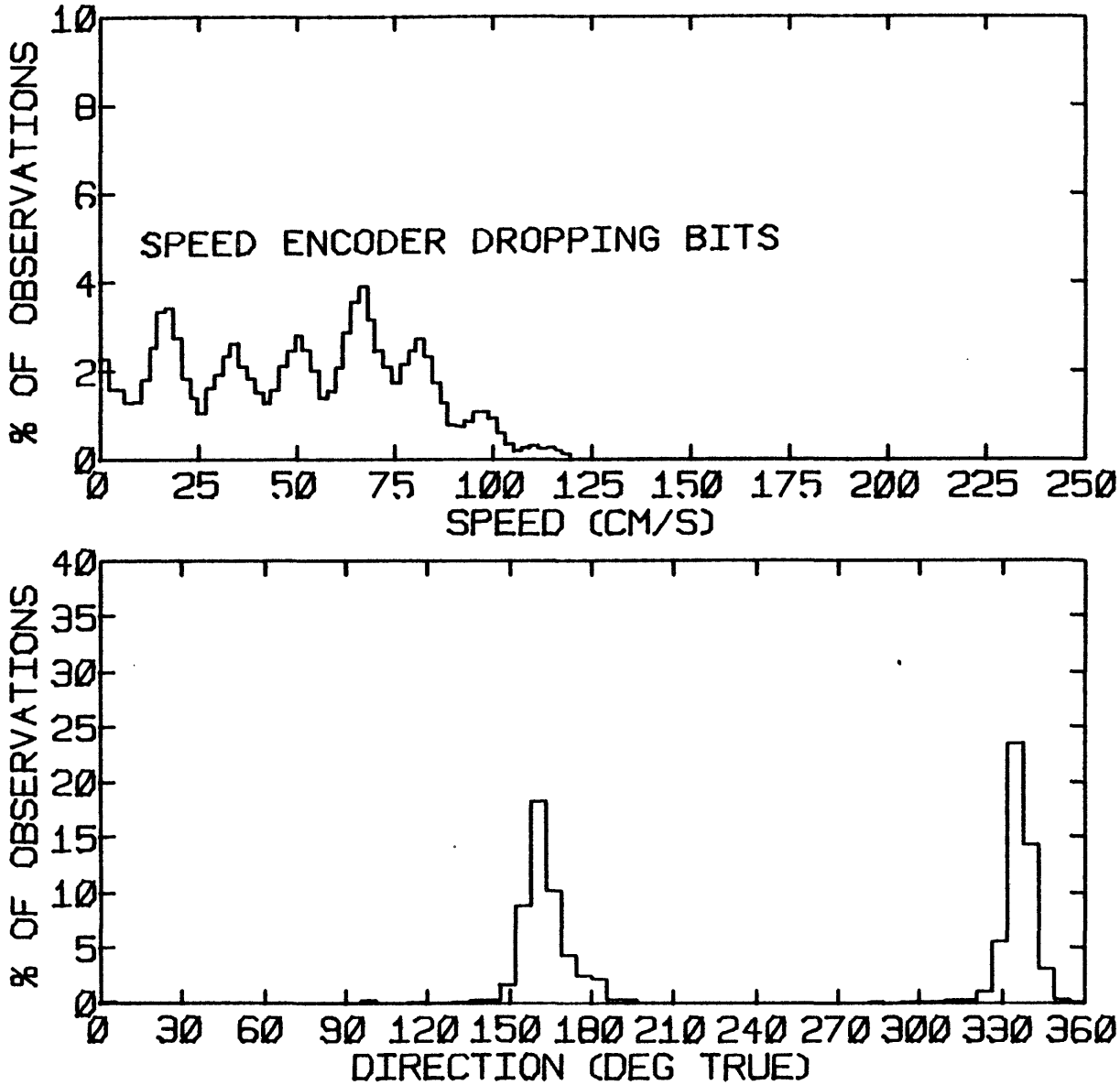


STATISTICS: SPEED & DIRECTION 9- 5-78 TO 10-16-78
RESERVE FLEET 38- 5-50N 122- 3-59W
METER 18 FEET ABOVE BED. TAPE NUMBER GS004A1, .

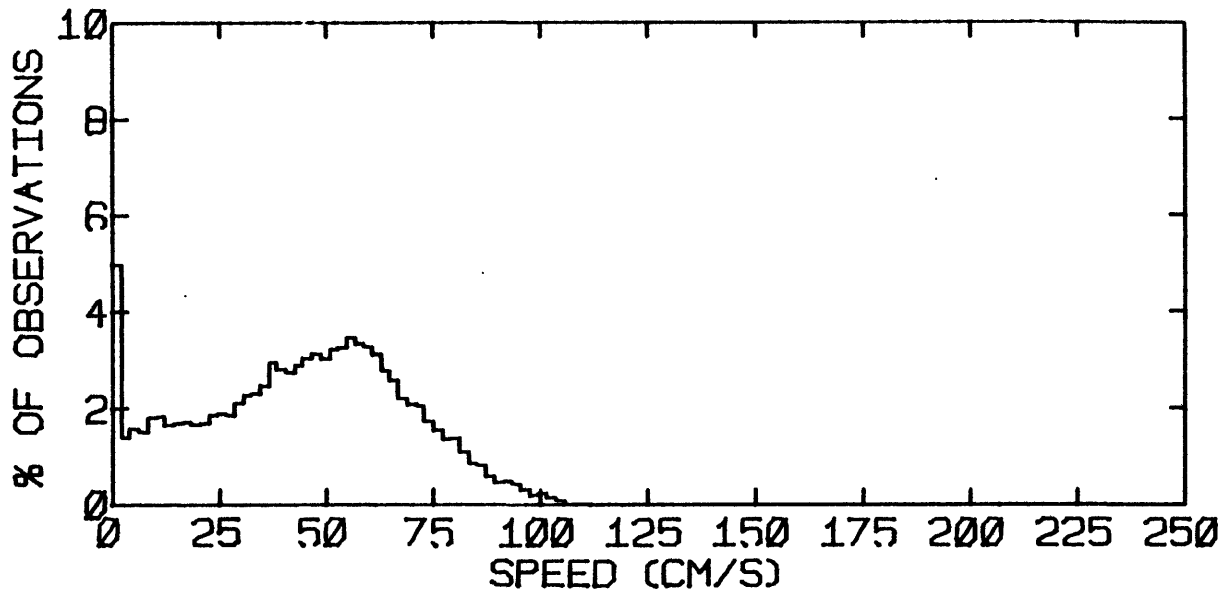


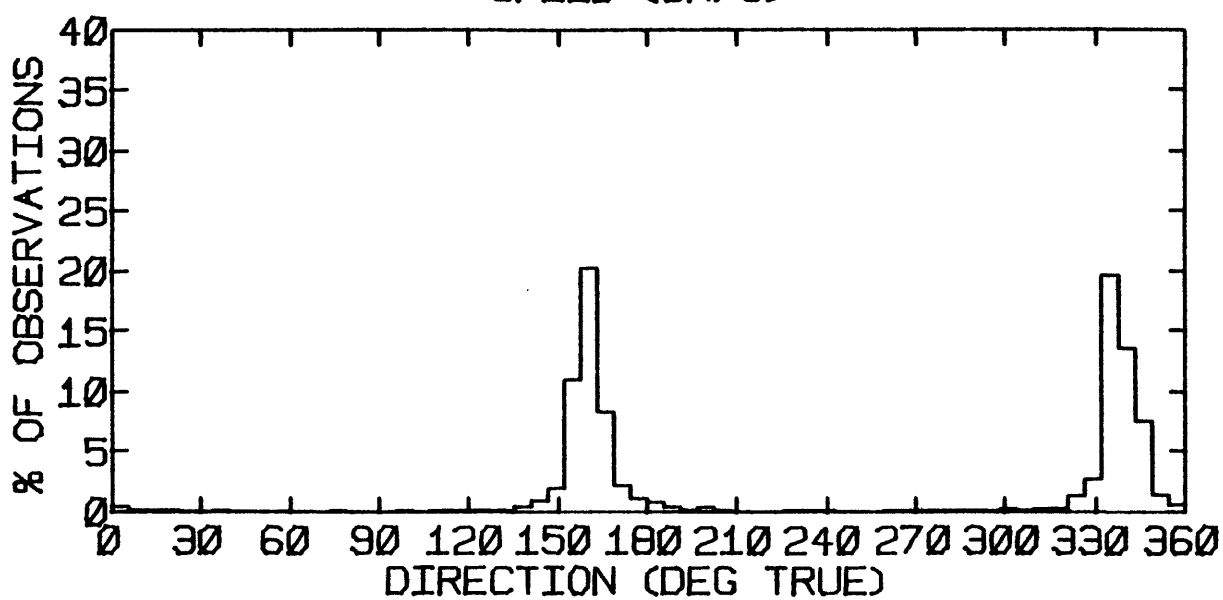


STATISTICS: SPEED & DIRECTION 9- 5-78 TO 10-16-78
RESERVE FLEET 38- 5-50N 122- 3-59W
METER 5 FEET ABOVE BED. TAPE NUMBER GS004A2 .

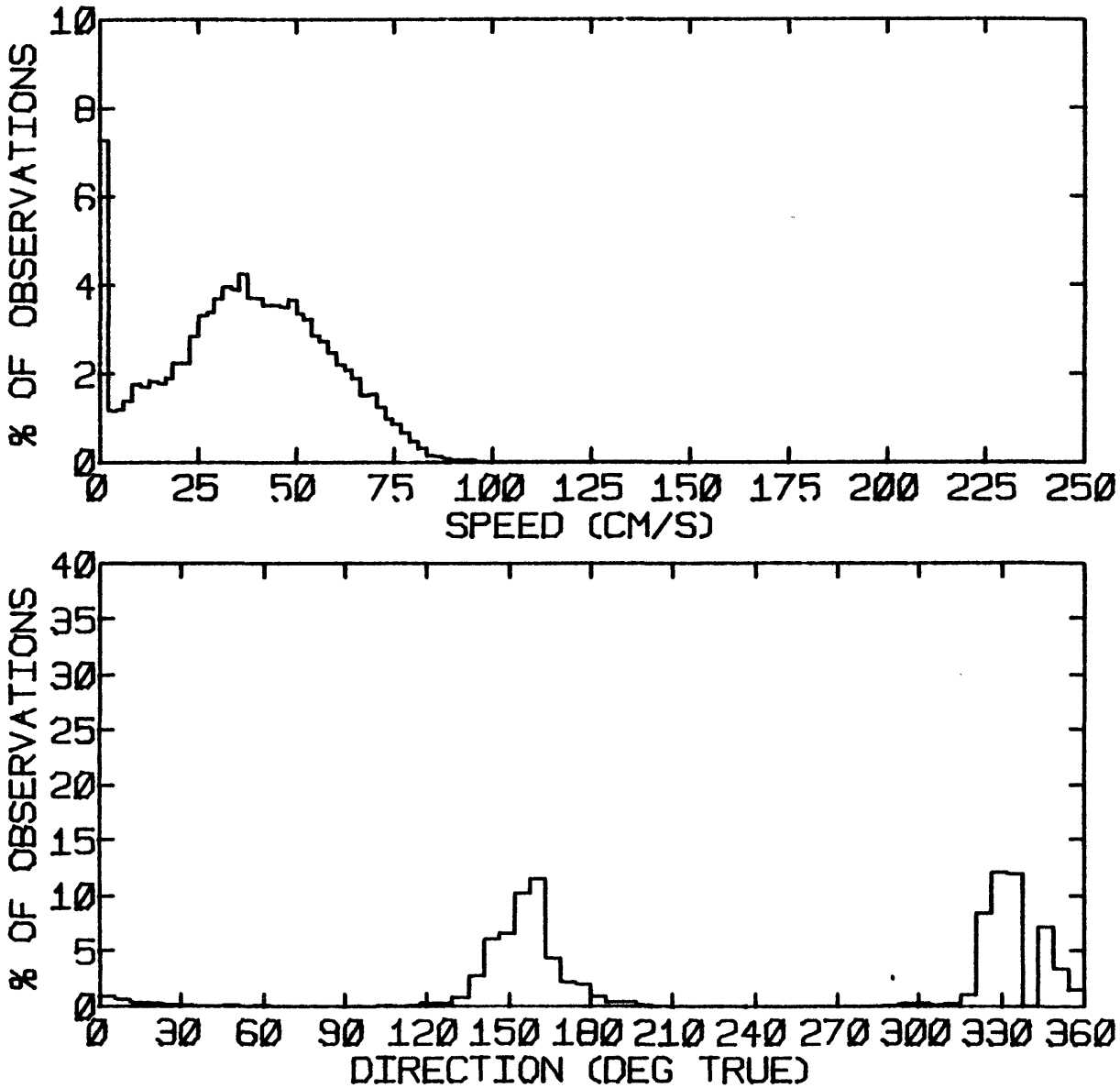


STATISTICS: SPEED & DIRECTION 11-15-78 TO 12-12-78
POTRERO POINT 37-45-25N 122-21-55W
METER 28 FEET ABOVE BED. TAPE NUMBER GS005A1 .

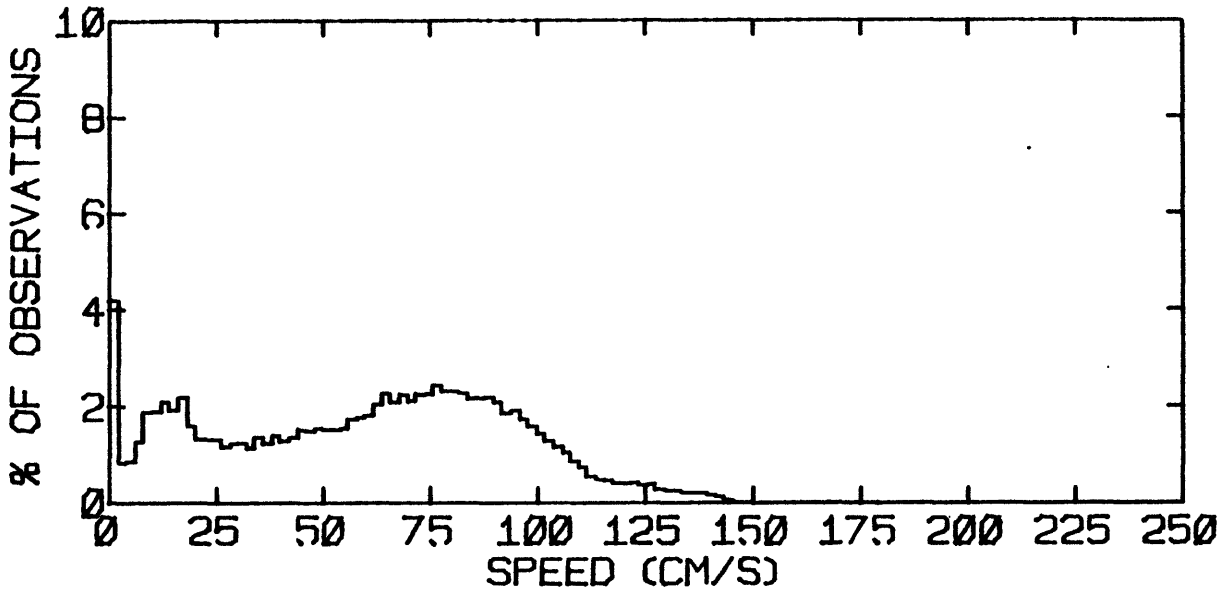


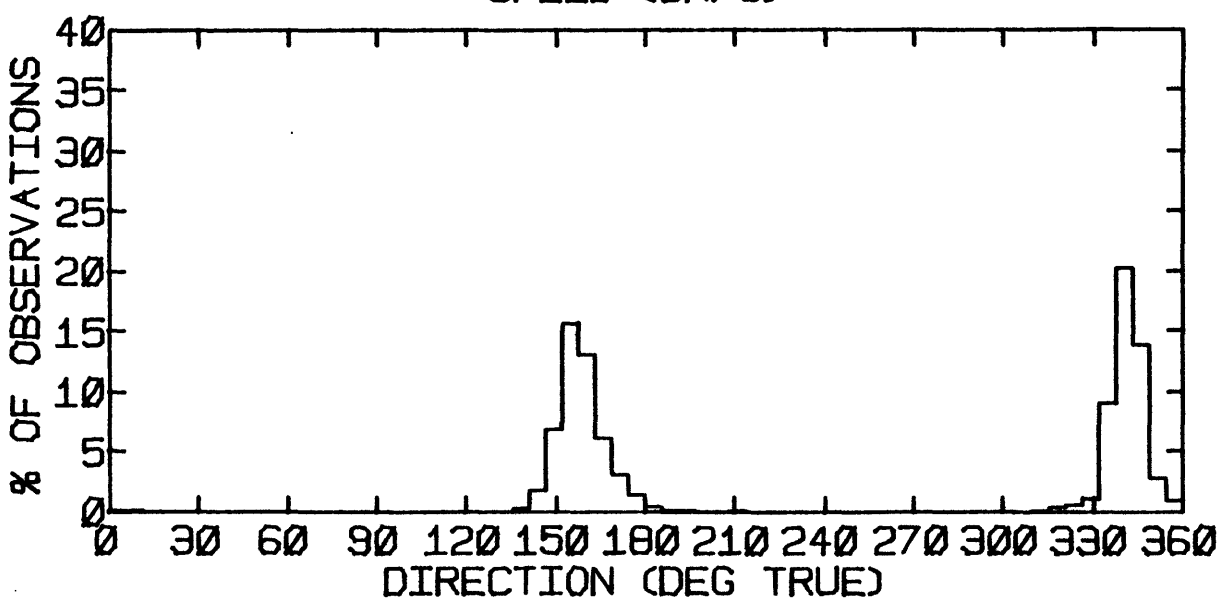


STATISTICS: SPEED & DIRECTION 11-15-78 TO 12-12-78
POTRERO POINT 37-45-25N 122-21-55W
METER 16 FEET ABOVE BED. TAPE NUMBER GS005A2 .

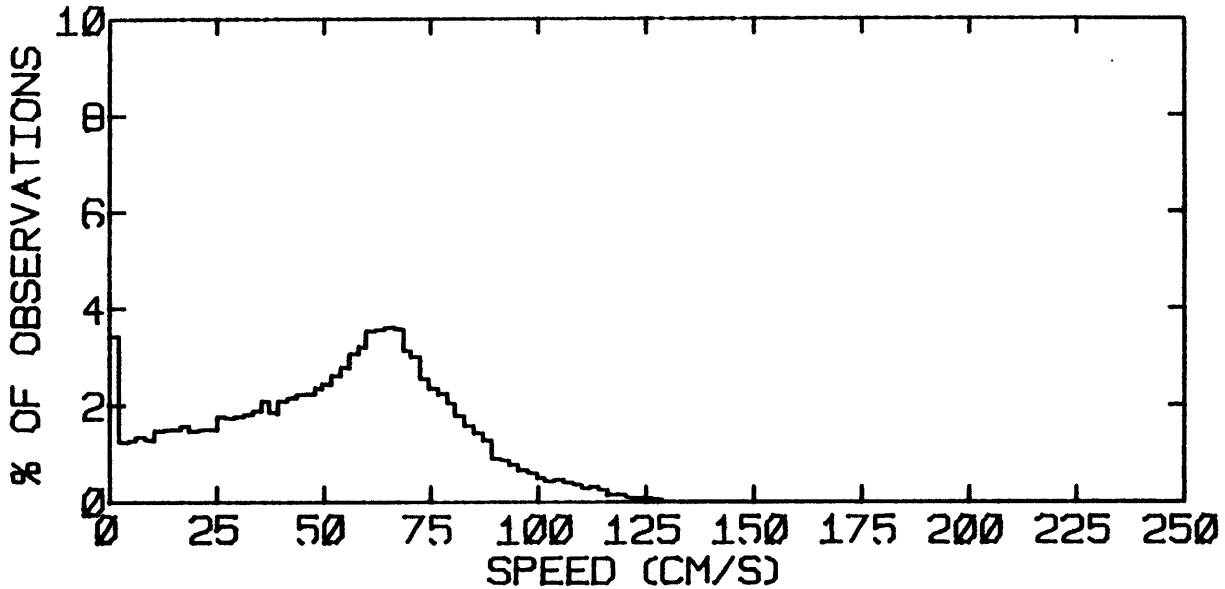


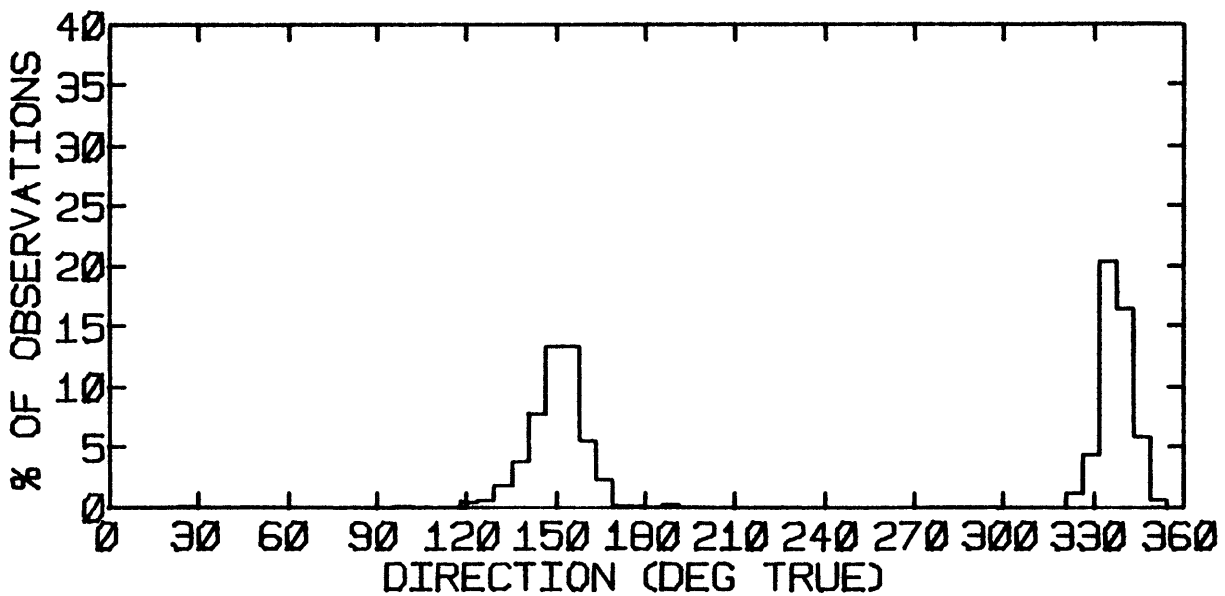
STATISTICS: SPEED & DIRECTION 11-15-78 TO 12-12-78
POTRERO POINT 37-45-25N 122-21-55W
METER 5 FEET ABOVE BED. TAPE NUMBER GS005A3 .



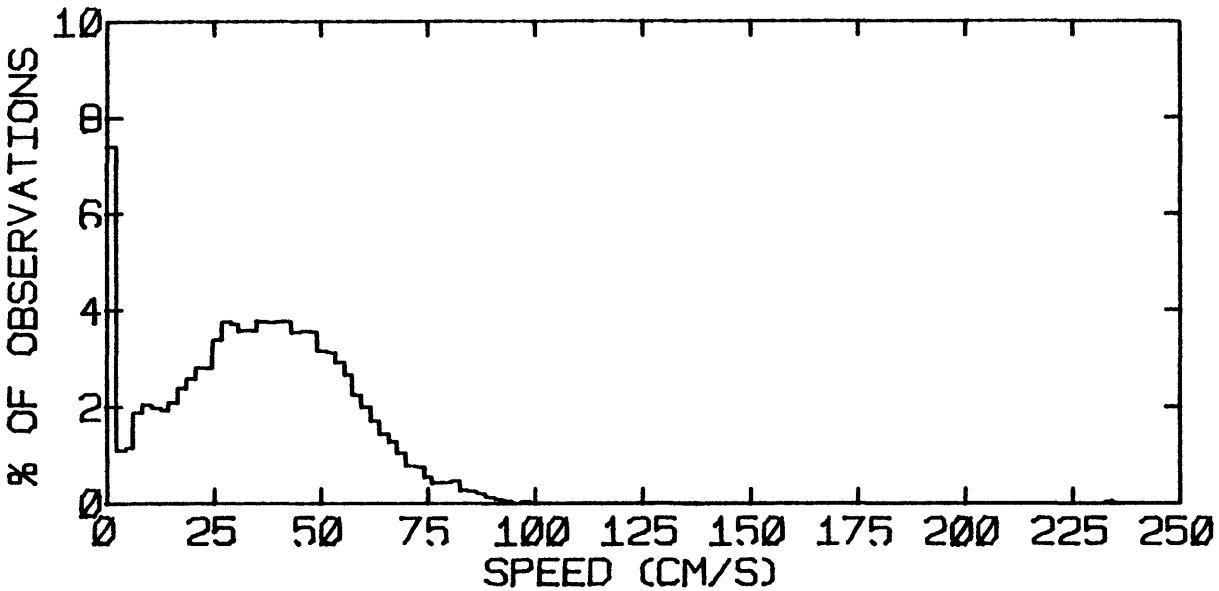


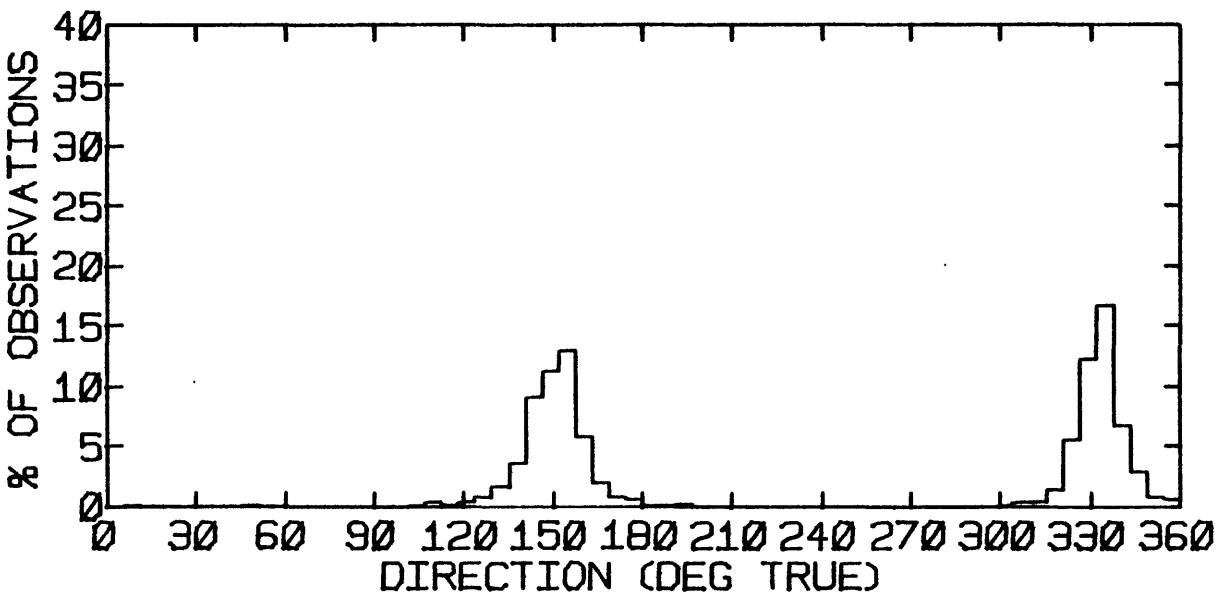
STATISTICS: SPEED & DIRECTION 11-15-78 TO 12-12-78
POTRERO POINT 37-46-15N 122-21-20W
METER 43 FEET ABOVE BED. TAPE NUMBER GS006A1 .



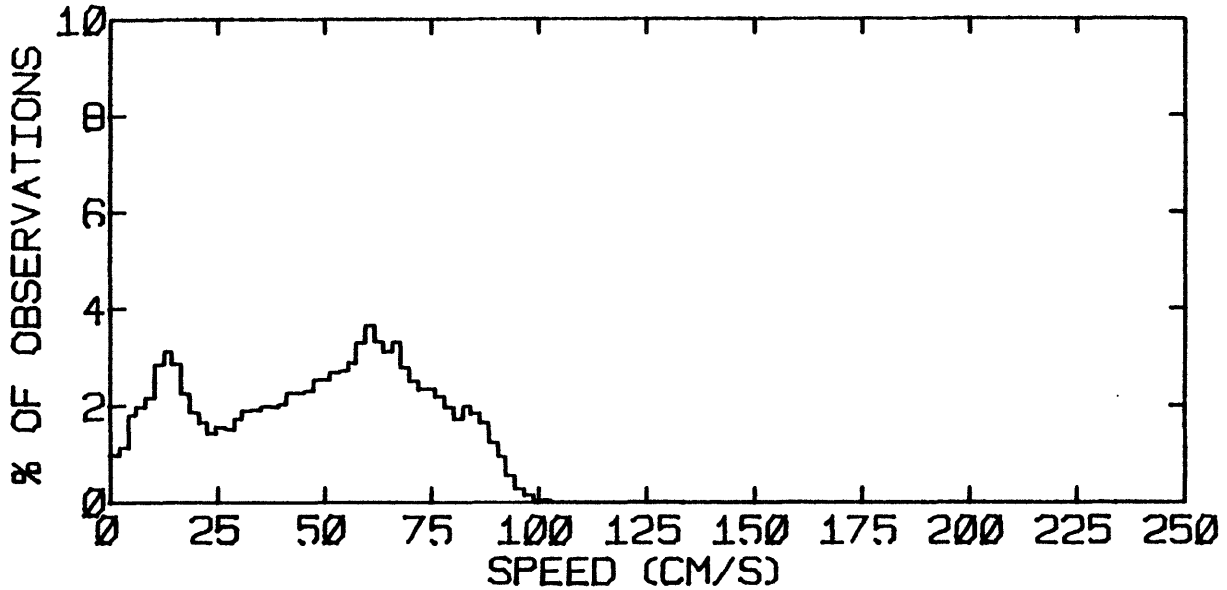


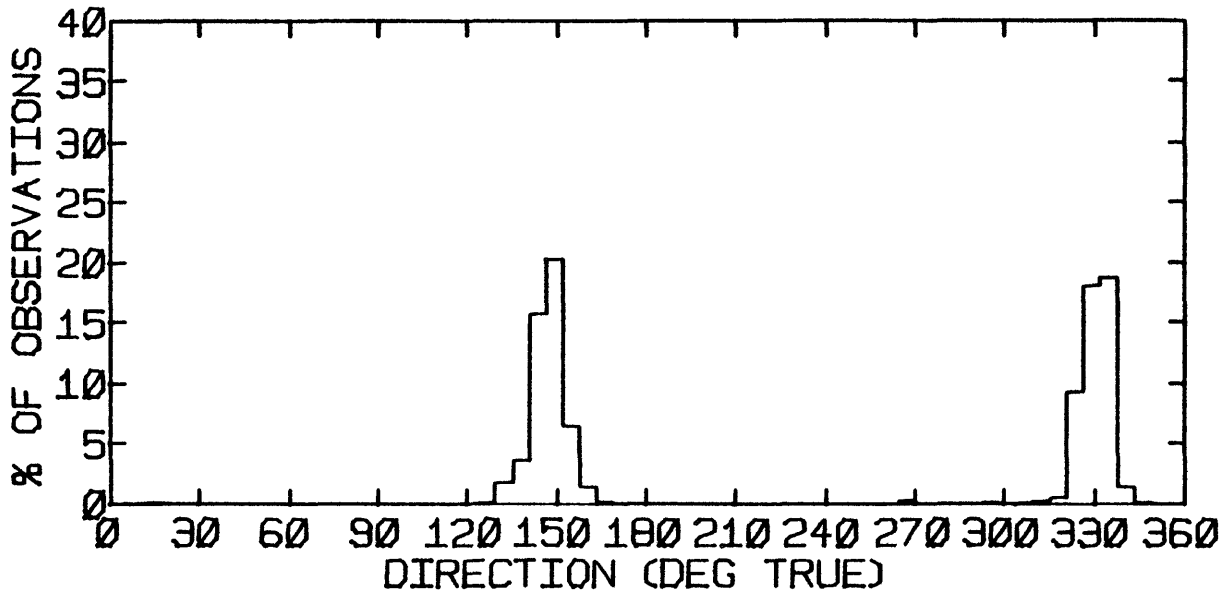
STATISTICS: SPEED & DIRECTION 11-15-78 TO 12-12-78
POTRERO POINT 37-46-15N 122-21-20W
METER 24 FEET ABOVE BED. TAPE NUMBER GS006A2 .



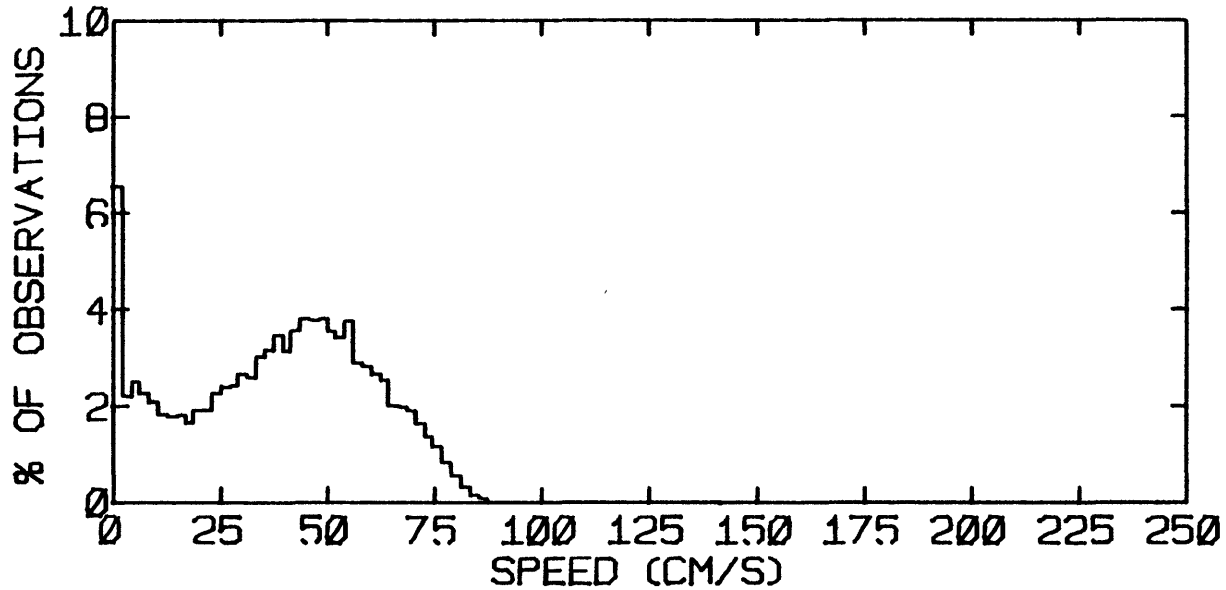


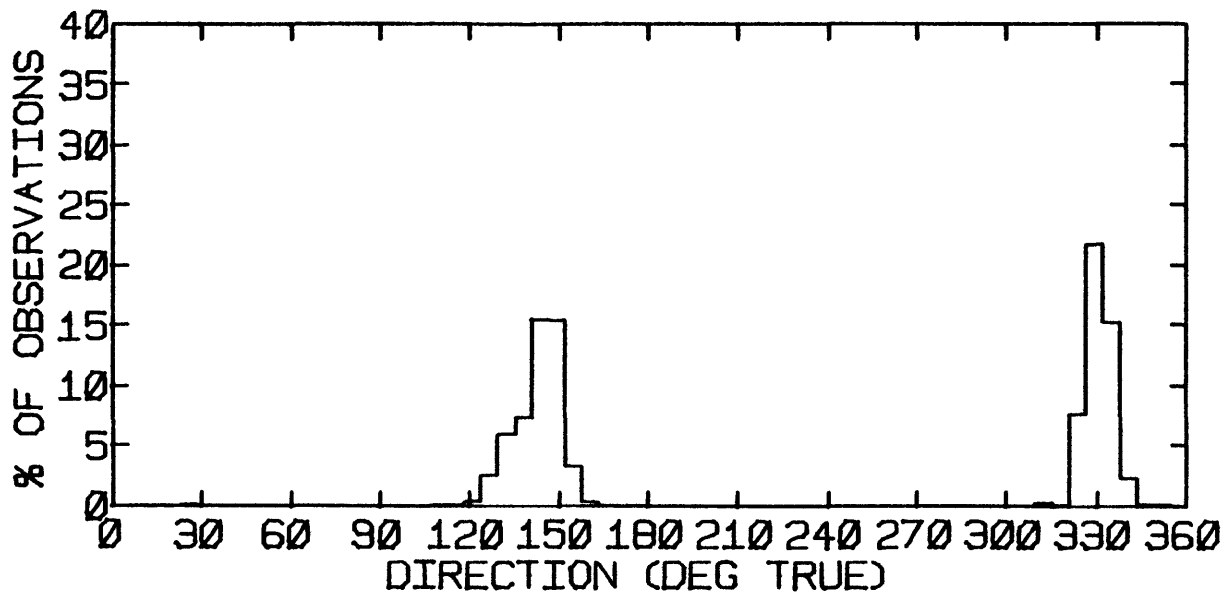
STATISTICS: SPEED & DIRECTION 11-15-78 TO 12-12-78
POTRERO POINT 37-46-15N 122-21-20W
METER 5 FEET ABOVE BED. TAPE NUMBER GS006A3 .



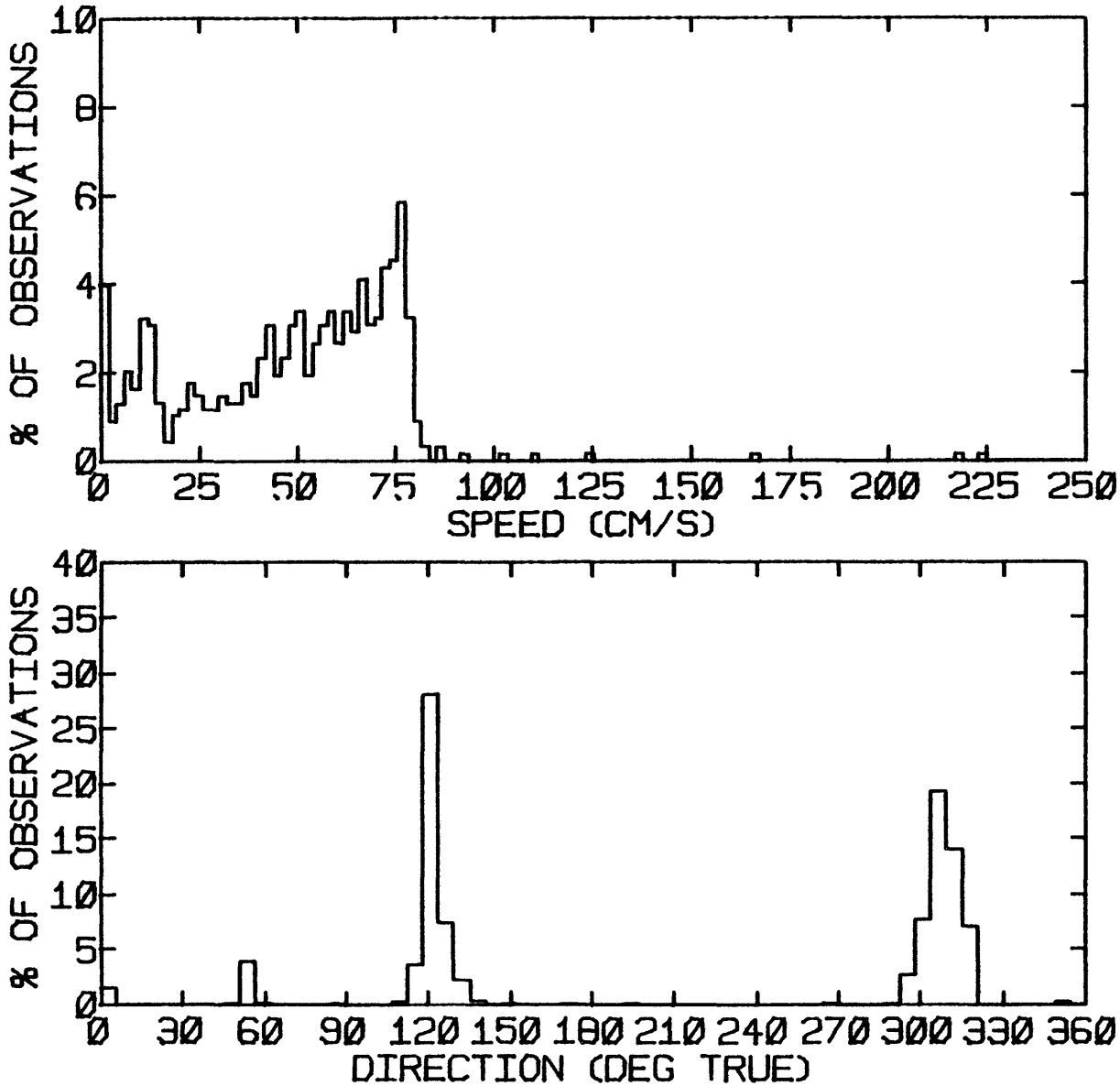


STATISTICS: SPEED & DIRECTION 11-15-78 TO 12-12-78
NAS ALAMEDA 37-46-14N 122-20- 0W
METER 18 FEET ABOVE BED. TAPE NUMBER GS007A1 .





STATISTICS: SPEED & DIRECTION 11-15-78 TO 12-12-78
NAS ALAMEDA 37-46-14N 122-20- 0W
METER 5 FEET ABOVE BED. TAPE NUMBER GS007A2 .



STATISTICS: SPEED & DIRECTION 11-15-78 TO 11-16-78
DUMBARTON BRIDGE 37-31-10N 122- 7-57W
METER 18 FEET ABOVE BED. TAPE NUMBER GS008A1 .

APPENDIX C

APPENDIX C

DEPLOYMENT TAPE STATUS

NOTES:

1. ALL UTM COORDINATES ARE IN ZONE 10.
2. MLLW DEPTH AND METER DEPTH ARE ACTUALLY A HEIGHT ABOVE THE BED.
3. METER TYPES: E=ENDECO, A=AANDERAA.
4. MOORING TYPES: T=TAUT, P=BOTTOM PLATFORM, M=MID-LEVEL PLATFORM.
5. PARAMETERS MEASURED:
   1=SPEED, 2=DIRECTION, 3=TEMPERATURE, 4=CONDUCTIVITY, 5=PRESSURE.
6. DATA PROCESSING STEPS:
   1=8-TRACK TAPE TRANSLATED
   2=DATA EDITED
   3=DATA TRANSLATED TO 2 MIN ENGINEERING UNITS
   4=DATA AVERAGED
   5=DATA PLOTTED
7. DATA QUALITY KEY:
   1=NO DATA
   2=DATA ALMOST COMPLETELY UNUSABLE
   3=SOME LONG MISSING OR UNRELIABLE SECTIONS
   4=SOME GLITCHES OR SHORT UNRELIABLE SECTIONS
   5=EXCELLENT DATA

DEPLOYMENTS BETWEEN 1 78 AND 365 78

COMPLETED DEPLOYMENTS

LAT DEG	LAT MIN	LON DEG	LON MIN	UTM NORTH	UTM EAST	STATION NUMBER	MLLW DEPTH	#METERS AT STA & TYPE	MTR DEP	TAPE NUMBER	MTR #	MOR TYP	PARAM-ETERS	DEPLMT DATE	RECVRY DATE	HRS DATA
38.	2.6	121.	53.9	211.0	596.7	GS1	50	E E E	43	GS001A1	39	T	12340	214 78	250 78	865

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:MINIMUM CONDUCTIVITY THRESHOLD TOO HIGH

LAT DEG	LAT MIN	LON DEG	LON MIN	UTM NORTH	UTM EAST	STATION NUMBER	MLLW DEPTH	#METERS AT STA & TYPE	MTR DEP	TAPE NUMBER	MTR #	MOR TYP	PARAM-ETERS	DEPLMT DATE	RECVRY DATE	HRS DATA
38.	2.6	121.	53.9	211.0	596.7	GS1	50	E E E	24	GS001A2	41	T	12340	214 78	250 78	865

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 2 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:CONDUCTIVITY CORRECTION UNSTABLE
CONDUCTIVITY BAD.

LAT DEG	LAT MIN	LON DEG	LON MIN	UTM NORTH	UTM EAST	STATION NUMBER	MLLW DEPTH	#METERS AT STA & TYPE	MTR DEP	TAPE NUMBER	MTR #	MOR TYP	PARAM-ETERS	DEPLMT DATE	RECVRY DATE	HRS DATA
38.	2.6	121.	53.9	211.0	596.7	GS1	50	E E E	5	GS001A3	42	T	12340	214 78	250 78	865

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 4 . QUALITY OF DATA FOR DIRECTION IS 4
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:COND CORR DECREASING RAPIDLY AT TAPE END
COND. DEFECTIVE BEYOND DAY 246.86
COND. BELOW THRESHOLD IN SPOTS

LAT DEG	LAT MIN	LON DEG	LON MIN	UTM NORTH	UTM EAST	STATION NUMBER	MLLW DEPTH	#METERS AT STA & TYPE	MTR DEP	TAPE NUMBER	MTR #	MOR TYP	PARAM-ETERS	DEPLMT DATE	RECVRY DATE	HRS DATA
38.	2.6	121.	53.9	211.0	596.7	GS1	50	E E E	24	GS001B2	35	T	12340	255 78	286 78	743

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 1 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 4
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:TEMPERATURE DATA ARE BAD.
COND BELOW THRESHOLD

LAT DEG	LAT MIN	LON DEG	LON MIN	UTM NORTH	UTM EAST	STATION NUMBER	MLLW DEPTH	#METERS AT STA & TYPE	MTR DEP	TAPE NUMBER	MTR #	MOR TYP	PARAM-ETERS	DEPLMT DATE	RECVRY DATE	HRS DATA
38.	2.6	121.	53.9	211.0	596.7	GS1	50	E E E	5	GS001B3	42	T	12340	255 78	286 78	743

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 4
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .

COMMENTS:COND BELOW THRESHOLD

38. 2.5 122. 7.5 210.6 576.8 GS2 50 E E E 43 GS002A1 35 T 12340 214 78 249 78 849

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 3 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 4
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:TEMPERATURE VALUES BAD BEYOND JULIAN DAY 233

38. 2.5 122. 7.5 210.6 576.8 GS2 50 E E E 24 GS002A2 38 T 12340 214 78 249 78 849

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 1 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 3 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:TEMPERATURE VALUES INCORRECT.
SPEED ENCODER DROPPING BITS LAST HALF OF TAPE.

38. 2.5 122. 7.5 210.6 576.8 GS2 50 E E E 5 GS002A3 37 T 12340 214 78 249 78 849

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 2 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:TEMPERATURE BAD BEYOND DAY 10 OF RECORD.

38. 2.5 122. 7.5 210.6 576.8 GS2 50 E E E 43 GS002B1 39 T 12340 255 78 286 78 754

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:SEVERAL HOURS OF DRAGGING TO RECOVER ARRAY

38. 2.5 122. 7.5 210.6 576.8 GS2 50 E E E 24 GS002B2 38 T 12340 255 78 286 78 754

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 1 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 4 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:SPEED ENCODER DROPPING BITS AT TAPE END.
TEMPERATURE DATA BAD

38. 2.5 122. 7.5 210.6 576.8 GS2 50 E E E 5 GS002B3 31 T 12340 255 78 286 78 754

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 4 . QUALITY OF DATA FOR CONDUCTIVITY IS 4 . QUALITY OF DATA FOR DIRECTION IS 4
QUALITY OF DATA FOR SPEED IS 4 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:51 HOURS OF DATA MISSING AFTER HOUR 32.

38. 5.6 122. 1.1 216.4 586.1 GS3 25 E E 18 GS003A1 36 T 12340 250 78 286 78 868

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:CONSIDERABLE MARINE GROWTH ALL COMPONENTS
COND. BELOW THRESHOLD IN SPOTS

38. 5.6 122. 1.1 216.4 586.1 GS3 25 E E 5 GS003A2 33 T 12340 250 78 286 78 868

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 4
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:COND BELOW THRESHOLD IN SPOTS

38. 5.8 122. 4.0 216.7 581.8 GS4 25 E E 18 GS004A1 34 T 12340 250 78 286 78 870

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:ARRAY RECOVERED 1.5MI WEST OF LOGGED DEPLOYMENT
SITE AT MK6 RATHER THAN MK8

38. 5.8 122. 4.0 216.7 581.8 GS4 25 E E 5 GS004A2 40 T 12340 250 78 286 78 870

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 4
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:

37. 45.4 122. 21.9 178.2 555.9 GS5 40 E E E 28 GS005A1 36 T 12340 319 78 345 78 624

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:POSSIBLE SPEED DEGRADATION FROM MARINE GROWTH.

37. 45.4 122. 21.9 178.2 555.9 GS5 40 E E E 16 GS005A2 42 T 12340 319 78 345 78 624

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:SOME SPEED DEGRADATION FROM MARINE GROWTH.

37. 45.4 122. 21.9 178.2 555.9 GS5 40 E E E 5 GS005A3 34 T 12340 319 78 345 78 624

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:BROKEN IMPELLER BLADE. HEAVY MARINE GROWTH EFFECTING SPEED.

37. 46.2 122. 21.3 180.3 556.8 GS6 60 E E E 43 GS006A1 40 T 12340 319 78 345 78 626

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:IMPELLER RESTRICTED DUE TO A PLASTIC SHEET IN IMPELLER.

37. 46.2 122. 21.3 180.3 556.8 GS6 60 E E E 24 GS006A2 41 T 12340 319 78 345 78 626

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS: 18 HOURS OF DATA MISSING AT TIME METER LEFT WATER. FIRST
CONDUCTIVITY CORRECTION EDITED.

37. 46.2 122. 21.3 180.3 556.8 GS6 60 E E E 5 GS006A3 38 T 12340 319 78 345 78 626

DATA HAS BEEN PROCESSED THROUGH STEP 5

QUALITY OF DATA FOR TEMPERATURE IS 5 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS: MODERATE EFFECT ON SPEED BY MARINE GROWTH.

37. 46.2 122. 20.0 180.3 558.7 GS7 30 E E 18 GS007A1 39 T 12340 319 78 345 78 624

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 1 . QUALITY OF DATA FOR CONDUCTIVITY IS 5 . QUALITY OF DATA FOR DIRECTION IS 5
QUALITY OF DATA FOR SPEED IS 5 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:TEMPERATURE DATA ARE BAD.

37. 46.2 122. 20.0 180.3 558.7 GS7 30 E E 5 GS007A2 31 T 12340 319 78 345 78 624

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 4 . QUALITY OF DATA FOR CONDUCTIVITY IS 4 . QUALITY OF DATA FOR DIRECTION IS 4
QUALITY OF DATA FOR SPEED IS 4 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:FIRST CONDUCTIVITY CORRECTION WAS EDITED. 6 HOURS OF PARTIAL
OR MISSING DATA (HOUR 26 TO 32).
POSSIBLE SMALL EFFECT FROM GROWTH

37. 31.2 122. 8.0 152.7 576.6 GS8 30 E E 18 GS008A1 33 T 12340 319 78 345 78 24

DATA HAS BEEN PROCESSED THROUGH STEP 5
QUALITY OF DATA FOR TEMPERATURE IS 2 . QUALITY OF DATA FOR CONDUCTIVITY IS 2 . QUALITY OF DATA FOR DIRECTION IS 2
QUALITY OF DATA FOR SPEED IS 2 . QUALITY OF DATA FOR PRESSURE IS 1 .
COMMENTS:DEFECTIVE TAPE-ONLY ONE DAY OF DATA