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STD AND CURRENT METER OBSERVATIONS IN THE NORTH SAN JUAN ISLANDS OCTOBER 1973

Dan E. Tracy

Pacific Marine Environmental Laboratory
Seattle, Washington
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UNITED STATES
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STD AND CURRENT METER OBSERVATIONS

IN THE NORTH SAN JUAN ISLANDS

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Summaries of STD measurements and current meter data from the north San Juan Islands during October 1973 are presented as computer-generated plots and as contours of temperature, salinity, and sigma-t. Some wind data have been included to aid in data interpretation.

1. INTRODUCTION

The Pacific Marine Environmental Laboratory (PMEL) conducted salinity-temperature-depth (STD) data and tidal current measurements, commencing a 5-year survey to provide water circulation information. PMEL was responsible for collection and analysis of STD data aboard the NOAA ship McARTHUR and for some analyses of current meter data not routinely done by the National Ocean Survey (NOS). All STD and current meter data are to be forwarded to the National Oceanographic Data Center under the heading OPR-MA-509-1973. A summary of cruise dates and operations is given in figure 1, and figure 6 shows the working area. This report is intended to provide data which may be useful to others.

2. DATA MEASUREMENT

2.1 STD Sensor

A Plessey Model 9006 STD system was used to measure temperature, salinity, and depth. The STD sensors were lowered at 30 m/min to within a few meters of the bottom as determined by a pinger attached to the STD cage. Data were recorded in an analog format on an x_1-x_2-y recorder (Esterline Angus) and were also recorded in digital format at a rate of 0.5 s/scan on a Plessey Model 8114A digital data logger. Except for calibration purposes, data were recorded only during descent.

For determining STD calibrations, a Nansen bottle was placed above the STD sensors and was tripped at a depth where the analog trace indicated nearly constant values of temperature and salinity. The bottles were allowed to soak for a period of 5 minutes. The reversing thermometers used were calibrated by the National Oceanographic Instrumentation Center, and salinity was determined on a laboratory inductive salinometer (Hytech

Model 6220). Resulting corrections were -0.04°C and +0.02°/oo. These values were applied during the initial processing of the digital data. Changes in corrections during the October operations were not detected. Information pertaining to STD and current meter stations is given in figure 2.

2.2 Current Meter

Current meters used during these operations were Aanderaa meters (RCM-4) which record averages of speed and instantaneous readings of direction every 10 minutes. The current meter tapes were furnished by NOS. Location, depth (minus (-) when measured from sea surface and plus (+) when measured from sea floor), and period of operation for each current meter are given in figure 2. Aanderaa current meters were deployed at 5 m below the surface (MLLW) and 16 m above the bottom. Deep water moorings were deployed at 5 and 23 m below the surface (MLLW), with the bottom meter 16 m above the bottom (see fig. 3).

2.3 Wind

Windspeed and direction data were collected at the Cherry Point Oil Refinery, near current meter station 500, during the entire period of our survey. These data are presented in histogram form and as a progressive vector diagram (see fig. 4.1 and 4.2).

3. DATA PRESENTATION

3.1 STD Data

The STD data were translated, edited, and corrected to provide average values of temperature and salinity at 1-m intervals by PMEL programs at University of Washington facilities. Sigma-t was computed from the averaged temperature and salinity. These data were used for all subsequent work. The STD data are presented as four cross-channel transects and three time-series plots. Contour intervals are nominally 0.2°C, 0.2°/oo, and 0.2 gm/l for temperature, salinity, and sigma-t, respectively, but in some cases 0.1 contours are included as dashed lines to show details.

3.2 Current Meter Data

Sampling of temperature, pressure, conductivity, current speed, and direction were averaged and recorded at 10-min intervals by the Aanderaa current meters.

The Aanderaa magnetic tape was copied aboard the ship to a more compact form as shown in figure 5 and transcribed to a seven-track binary format by the CDC 6400 in Rockville, Md. This was corrected for calibration

and converted to engineering units; at this time, the data were edited to delete bad data and parity errors. The processing and presentation of current meter data generally follow procedures and formats developed in previous reports (Halpern et al., 1973; Halpern et al., 1974).

The following presentation of the data has been selected as being the most descriptive for a wide variety of users. For each current meter there are four pages of data presentation in Sections 14 through 25, including standard statistics, speed and direction histograms, time series of u and v components of velocity (east and north, respectively), progressive vector diagrams, and spectra of the velocity.

3.2.1 Histogram and Standard Statistics

Speeds and directions were grouped into 1.5 cm/s and 6^{o} intervals, respectively. These data are presented as the actual number of observations in each interval.

3.2.2 Time Series

Time series plots are the hourly averages of the u and v components of velocity.

3.2.3 Progressive Vector Diagrams

The progressive vector diagrams were constructed by vector addition of hourly averages of currents. The diagrams do not represent real particle trajectories, but they do give an indication of the longer period fluctuations in Eulerian motion. Because of the complexity of the diagrams, the ranges vary from 20 to 400 kilometers. Start times are given in figure 2, and the axes are north and east. There is a "0" at the beginning and a "*" at 0000 hours thereafter.

3.2.4 Spectra

The velocity spectra (see Halpern et al., 1973), plotted in log-log format, were all computed from Cooley-Tukey Fourier transforms using the perfect Daniell frequency window. Dashed vertical lines corresponding to the diurnal, inertial, and semidiurnal frequencies are marked on the diagrams. By use of a fast Fourier transform algorithm which required that none of the prime factors of the total number of points be greater than 97, raw periodograms, defined so that the sum over positive frequencies was equal to the total variance, were computed for the 10-min averaged U_{10} and V_{10} series. Because on a log-log plot periodogram ordinates are closer together as the frequency increases, averaging over more frequency bands was done for larger values of the frequency.

For each frequency, the complex-valued horizontal velocity vector can be represented in the hodograph plane by two counterrotating circular motions, each with its own amplitude and phase, namely:

$$W(\sigma) = U(\sigma) + iV(\sigma) = A\, e^{i(\alpha t + \beta)}\, B\, e^{-(\alpha t + \beta)},$$

where $W(\sigma)$ is the complex horizontal velocity vector at frequency σ, A and B are real-valued amplitudes, α and β are the phases and $e^{i\sigma t}$ and $e^{-\sigma t}$ are vectors of unit magnitude rotating in the counterclockwise (positive) direction and clockwise (negative) direction, respectively. The rotary spectrum (lower plot), defined as the sum of the spectra of the counterrotation vectors, was computed from the Fourier coefficients using the perfect Daniell window of varying widths. The total kinetic energy is equal to the integral overall frequencies of the two-sided rotary spectrum. For each frequency, the trajectory in the hodograph plane of the velocity vector is an ellipse (or, in the limiting cases, a circle or a straight line). For example, if A = 0, there is energy only in the negative component, and the tip of the vector rotates in the clockwise direction describing a circle. If A = B, then the trajectory consists of a straight line, and the motion in the complex U- and V-planes consists of rectilinear oscillations. If $A \neq B$, the shape of the curve is an ellipse, and the tip of the vector rotates with the sense associated with the larger amplitude.

3.3 Vector Mean Currents

The vector mean currents in figure 6 are presented to summarize all the data observations in one figure. They represent the vectors drawn from the start to the end of each Progressive Vector Diagram and are presented in km/day. Meter depth is labeled at the head of the vector.

Note: A small vector mean does not necessarily imply small currents.

4. ACKNOWLEDGMENTS

We appreciate the continuous and enthusiastic support of Captain Austin Yeager and the officers and crew of the NOAA ship McARTHUR.

5. REFERENCES

Halpern, D., J. R. Holbrook, and R. M. Reynolds (1973), Physical oceanographic observations made by Pacific Oceanographic Laboratories off the Oregon coast during July and August 1972, CUEA Tech. Rept. 3, Ref. M73-46, Dept. Ocean., Univ. of Washington, Seattle, pp. 1-22.

Halpern, D., J. R. Holbrook, and R. M. Reynolds (1974), A compilation of wind, current and temperature measurements: Oregon, July and August 1973, CUEA Tech. Rept. 6, Ref. M74-73, Dept. Ocean., Univ. of Washington, Seattle, pp. 1-20.

Cruise no.	Date (1973)	Operation
1	10-11 Oct.:	12 STD casts; two transects off Southern Haro Strait (ST 11-16).
2	17-18 Oct.:	23 STD casts; two transects Orcas Island-Boundary Pass, two transects North Rosario Strait (ST 17-23).
3	23-24 Oct.:	27 STD casts; 13-hr time series, S-3 Mid-Haro Strait.
4	24-31 Oct.:	88 STD casts; 13-hr time series, S-2 Southern Rosario Strait; 13-hr time series, S-1 Northern Rosario Strait; two transects off Southern Rosario Strait (ST 6-10).

Figure 1. Cruise dates and operations.

Station no.	Latitude (N)	Longitude (N)	Current meters	Duration (days)	Depth (m)	Start time
26	48°40'36"	122°42'54"	3	30	94	0034 2 Oct. 73
500	48°51'04"	122°46'28"	2	3	38	1712 2 Oct. 73
500A	48°45'44"	122°46'51"	3	13	100	2244 9 Oct. 73
37	48°45'18"	122°58'36"	3	30	121	2122 2 Oct. 73
48	48°35'18"	123°13'18"	2	30	276	0114 3 Oct. 73

Figure 2. Current meter stations.

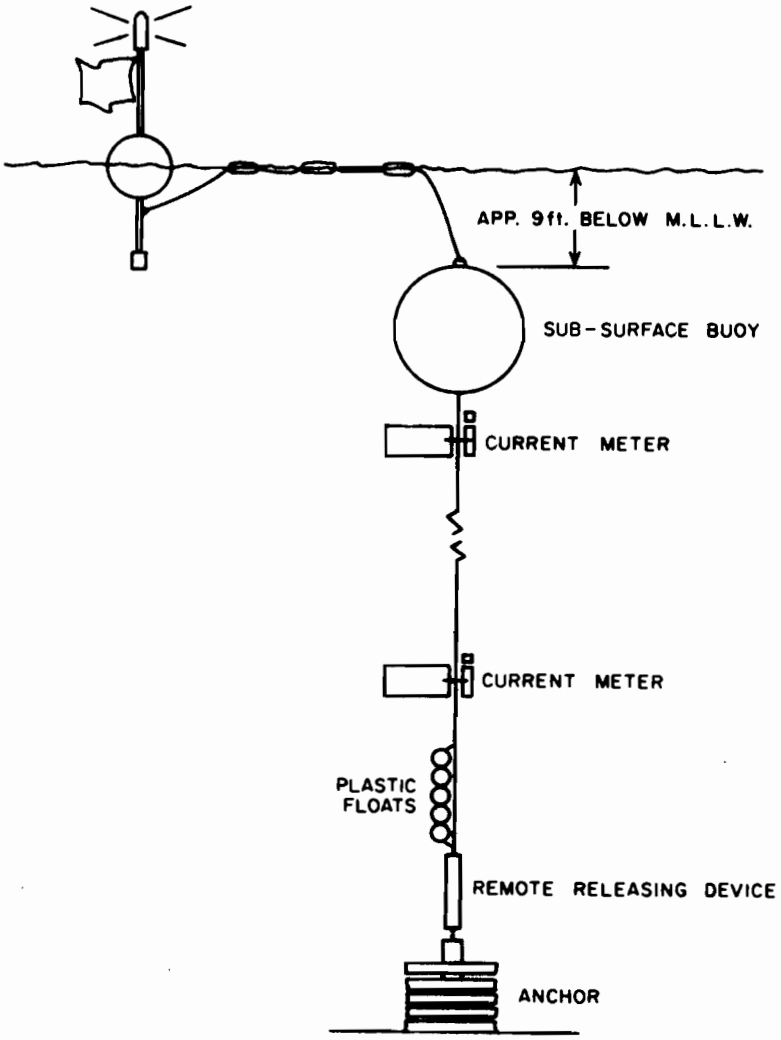


Figure 3. Current meter array.

STATISTICS OF 73 CHERRY POINT LAT 48 52.00N LONG 122 45.00W
0.0 METERS NUMBER OF OBSERVATIONS = 705
OBSERVATION PERIOD 29.4 DAYS FROM 0000 GMT 1 OCT 73

	MEAN (M/SEC)	VARIANCE (M/SEC) 2	ST-DEV (M/SEC)	SKEW	KURT	MAX (M/SEC)	MIN (M/SEC)
S	3.66	5.22	2.28	.633	3.18	11.17	0.00
U	2.16	8.39	2.90	.462	3.11	11.01	-5.41
V	.01	5.54	2.35	.125	3.46	8.40	-7.93

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

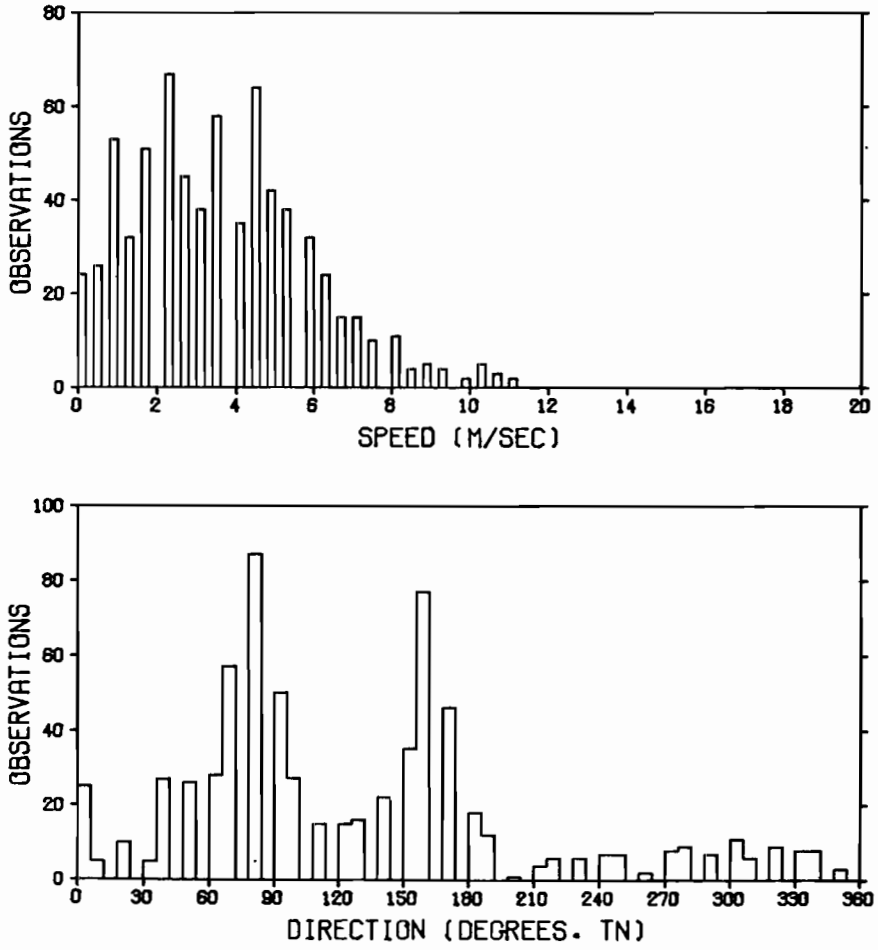


Figure 4.1. Wind--Cherry Point: Standard statistics and histograms.

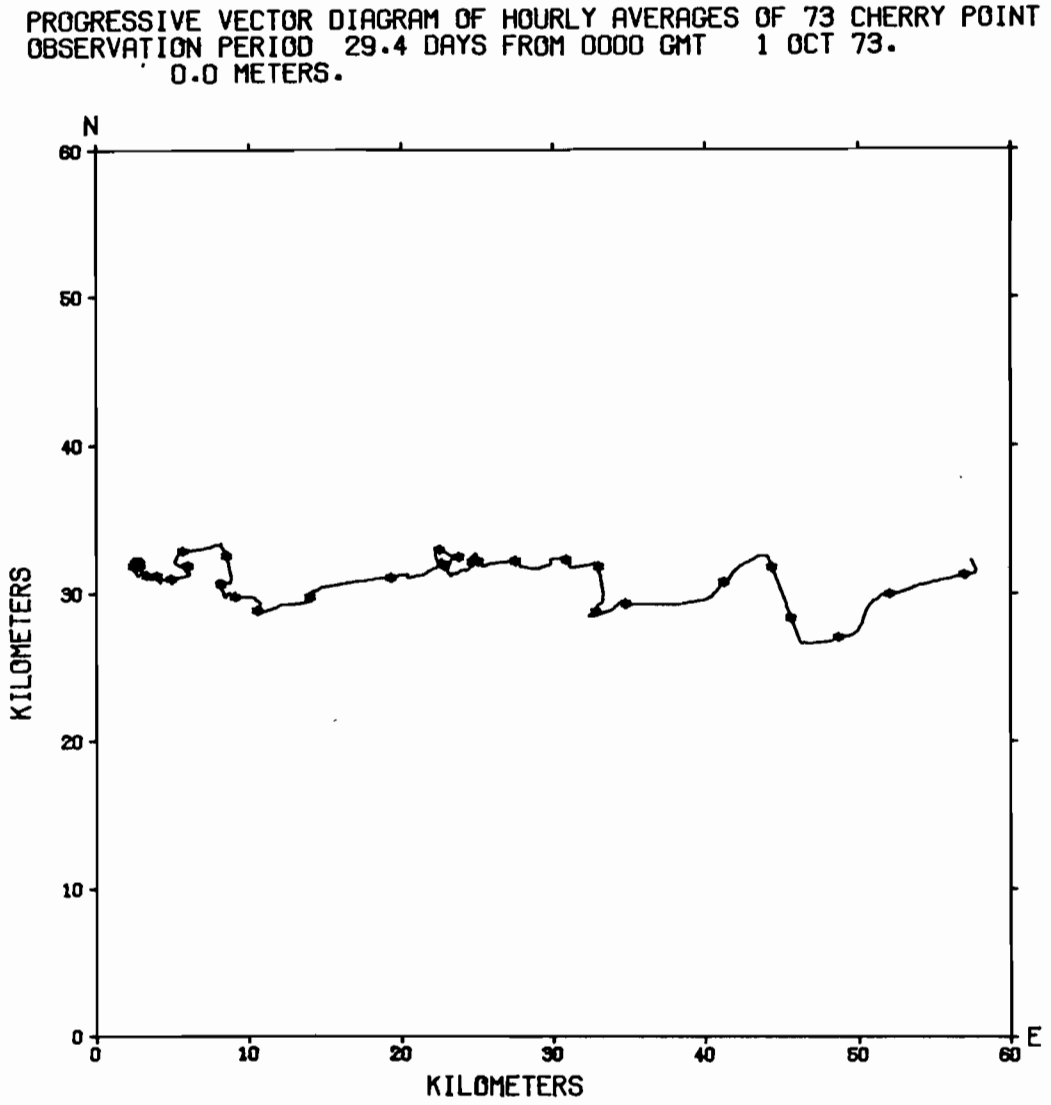


Figure 4.2. Wind--Cherry Point: Progressive Vector Diagram (PVD).

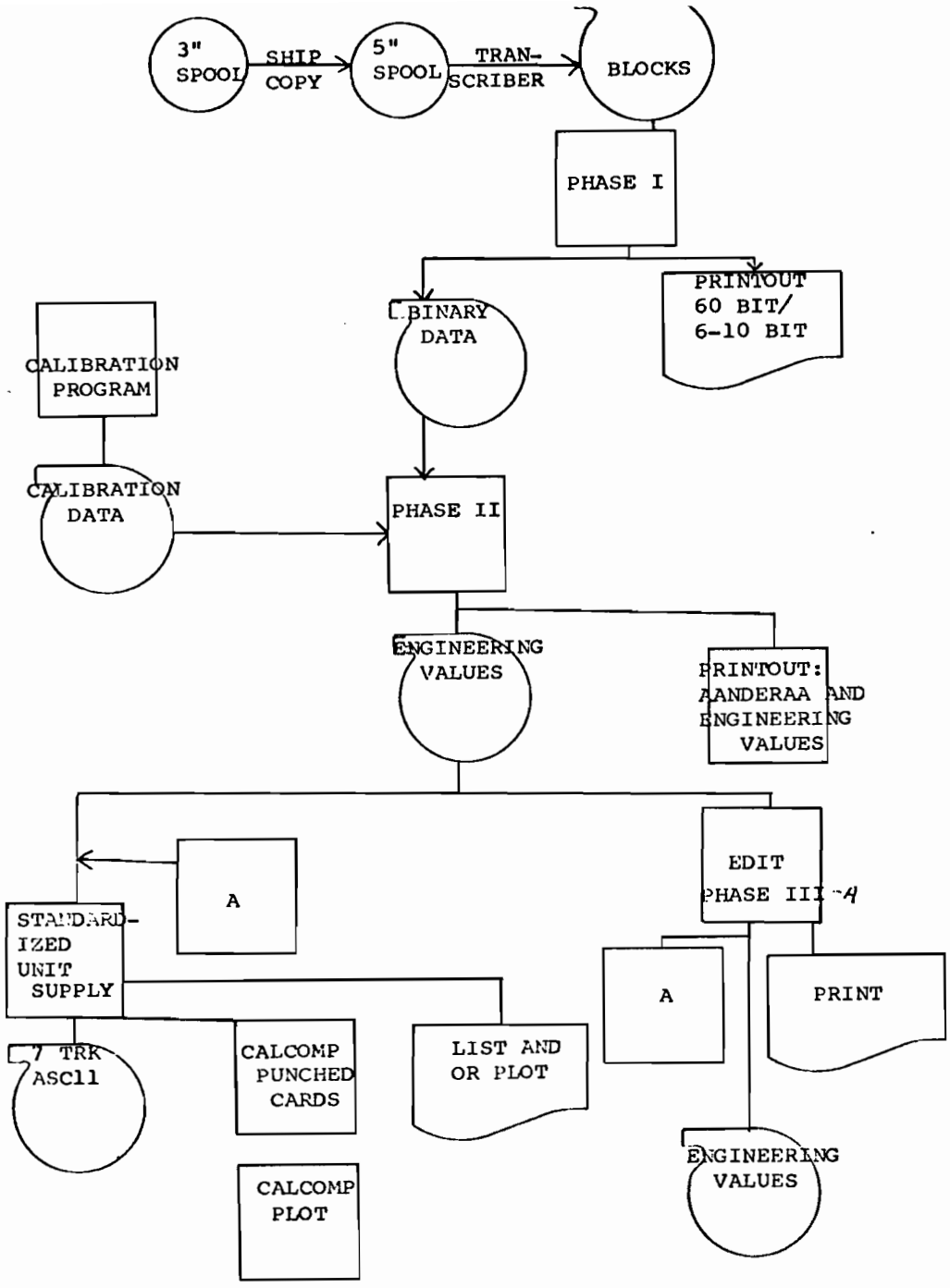


Figure 5. Data flow.

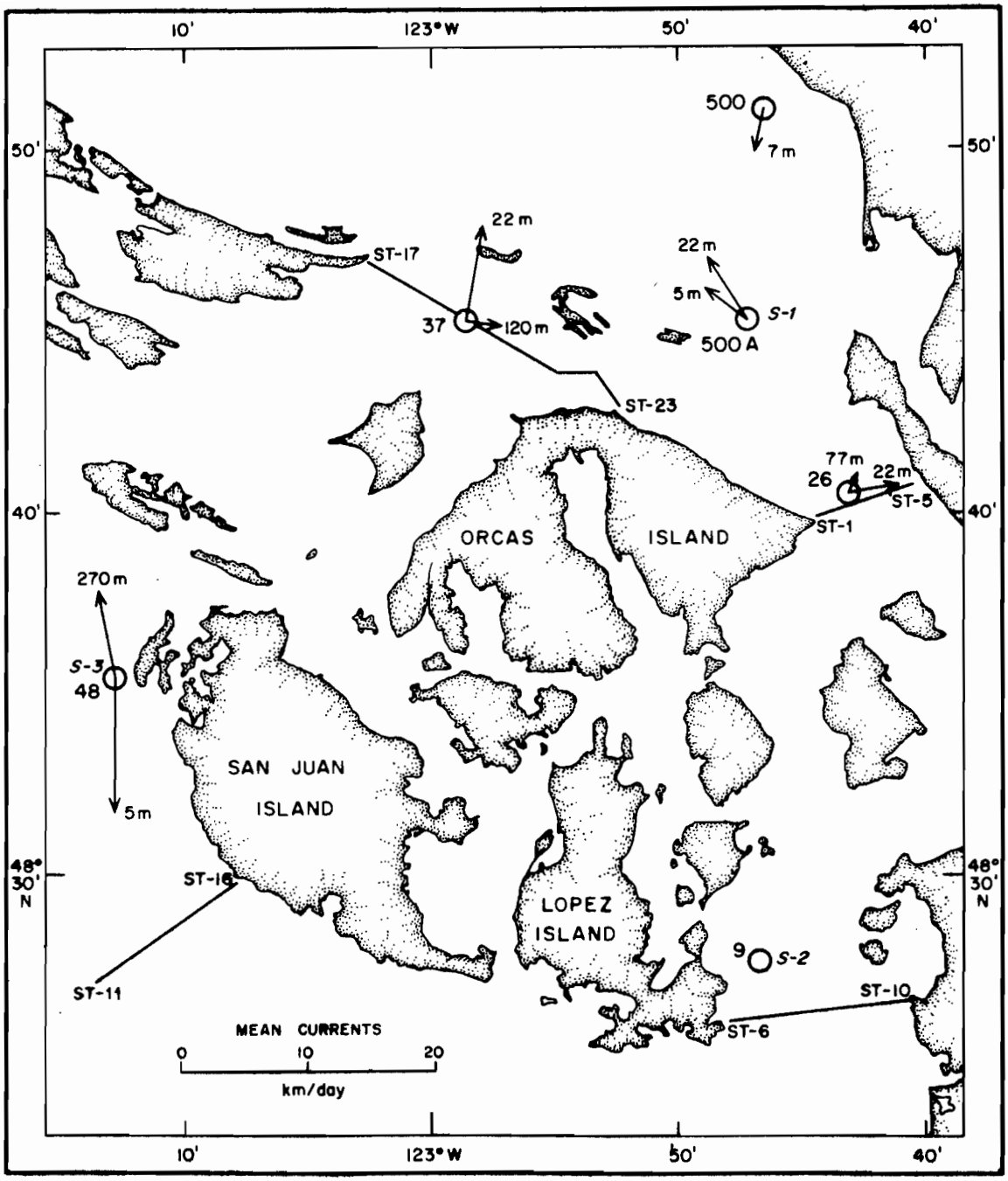


Figure 6. Chart of working area: Meter locations, time series locations, transect locations, and mean current display.

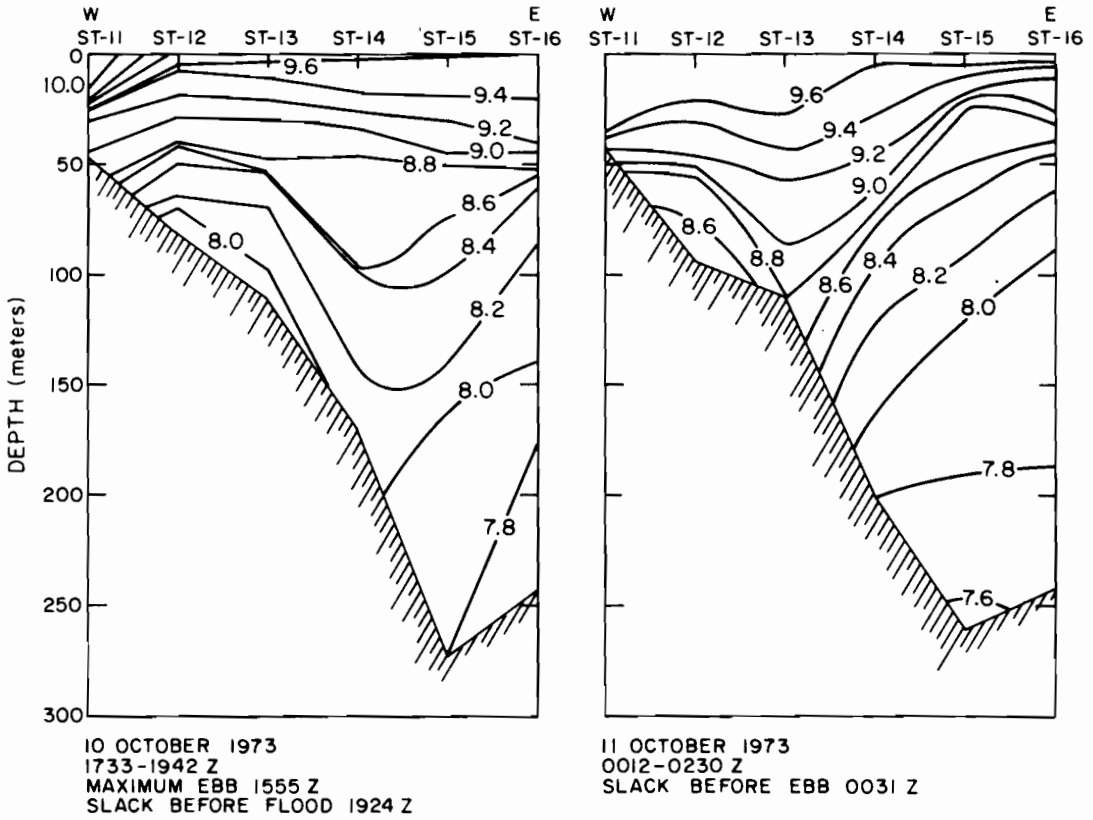


Figure 7.1. Transect #1, South Haro Strait, 10-11 October 1973 (ST11--ST16)--Temperature.

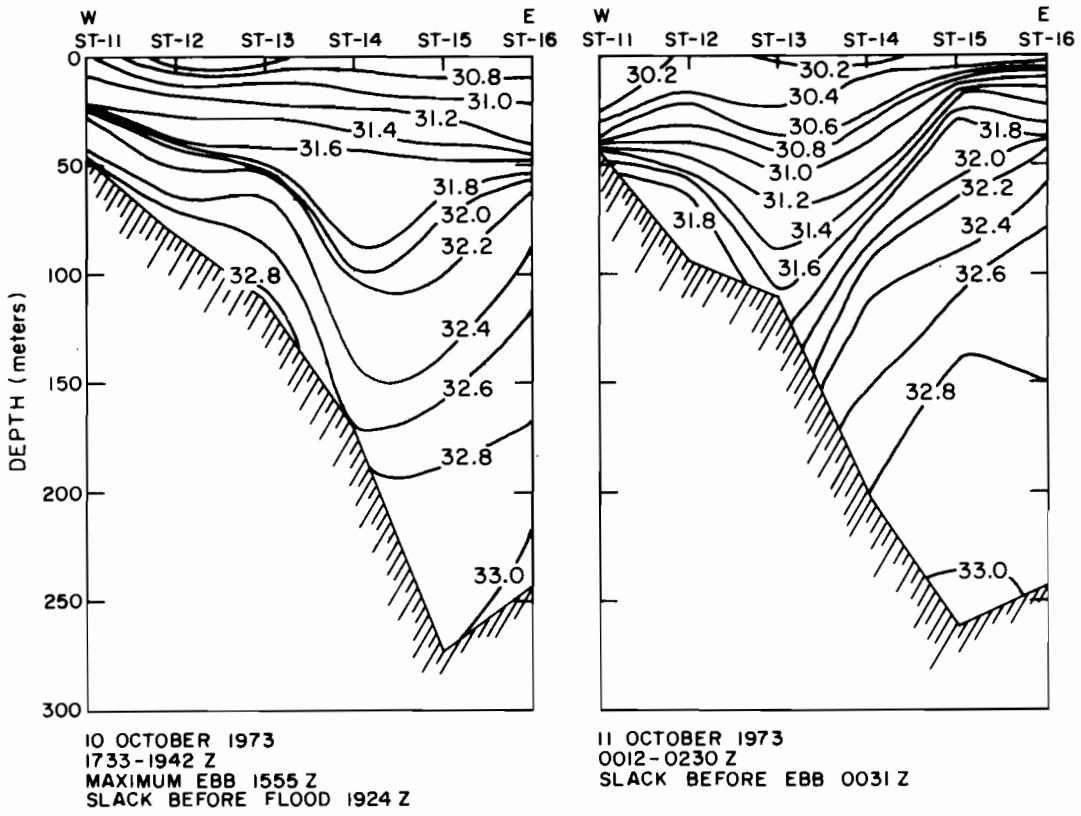


Figure 7.2. Transect #1, South Haro Strait, 10-11 October 1973 (ST11--ST16)--Salinity.

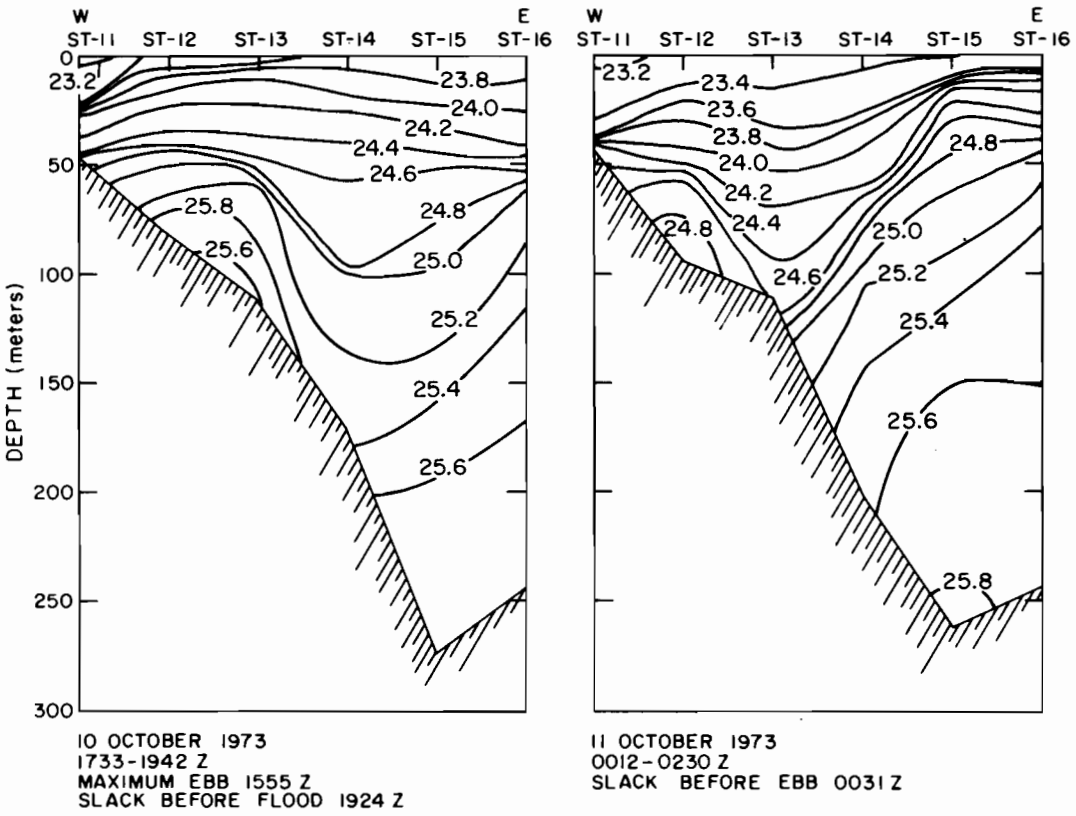


Figure 7.3. Transect #1, South Haro Strait, 10-11 October 1973 (ST11--ST16)--Sigma-t.

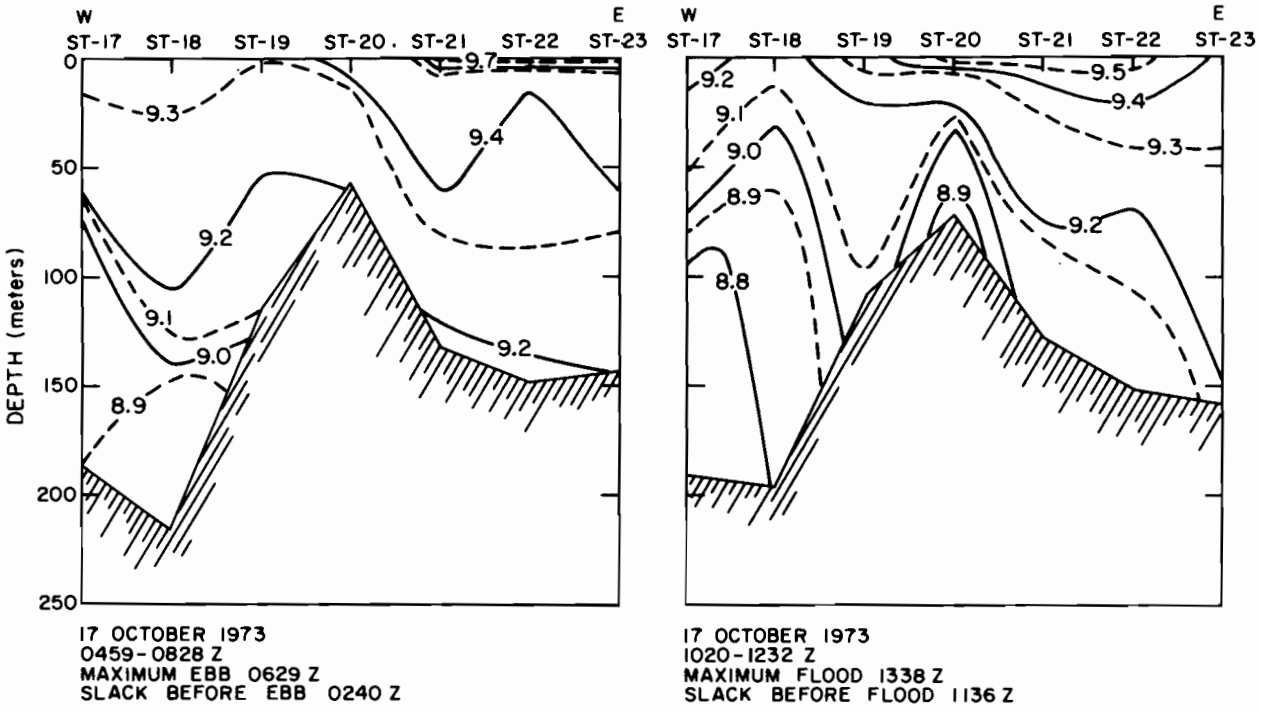


Figure 8.1. Transect #2, North Haro Strait, 17 October 1973 (ST17--ST23)--Temperature.

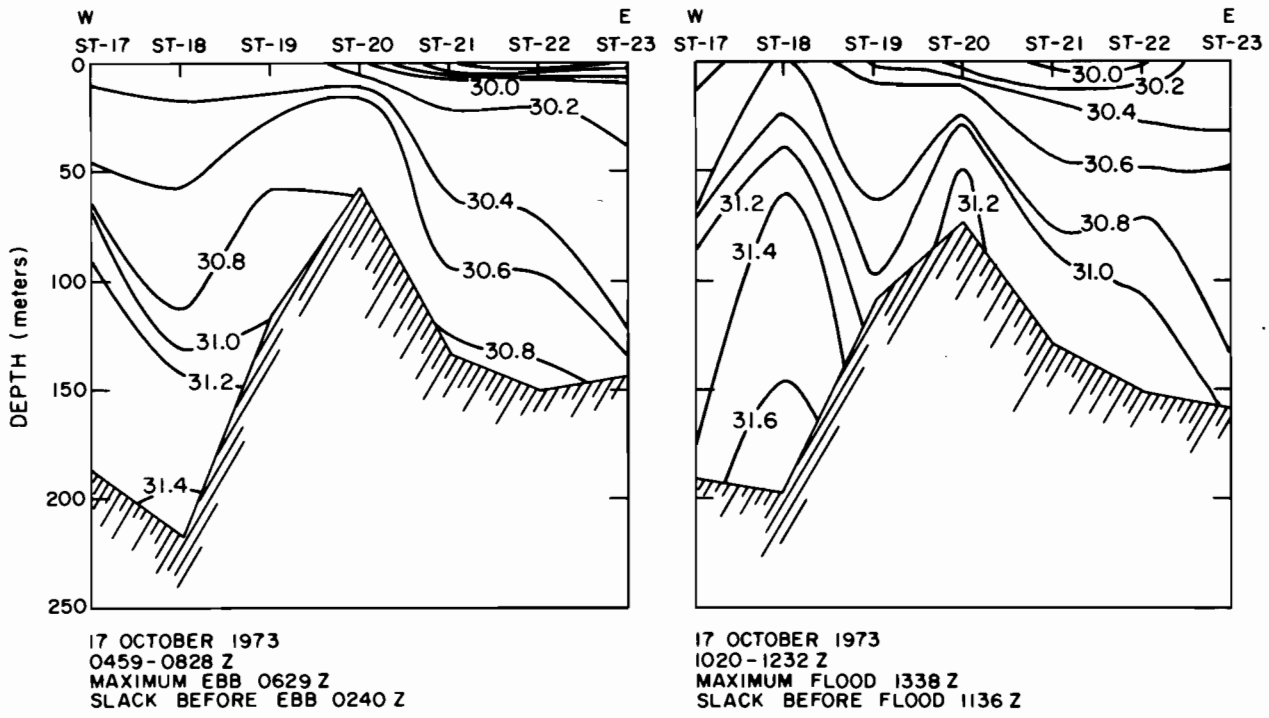


Figure 8.2. Transect #2, North Haro Strait, 17 October 1973 (ST17--ST23)--Salinity.

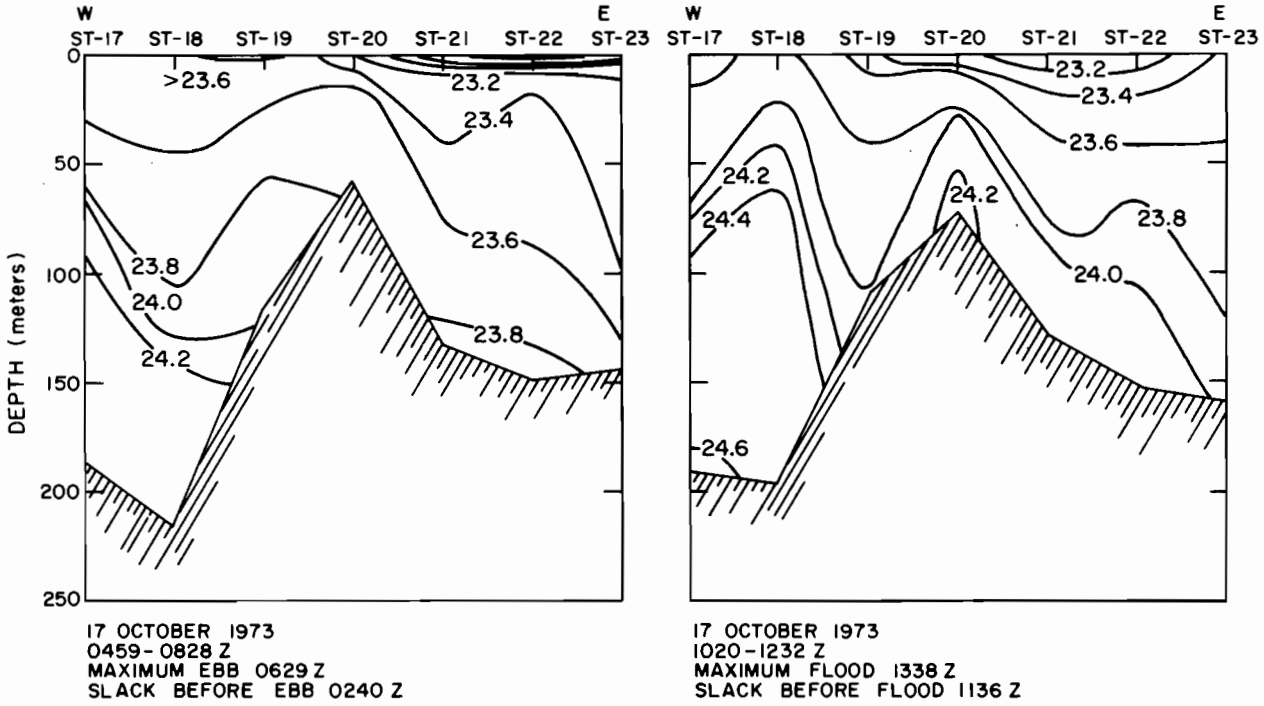


Figure 8.3. Transect #2, North Haro Strait, 17 October 1973 (ST17--ST23)--Sigma-t.

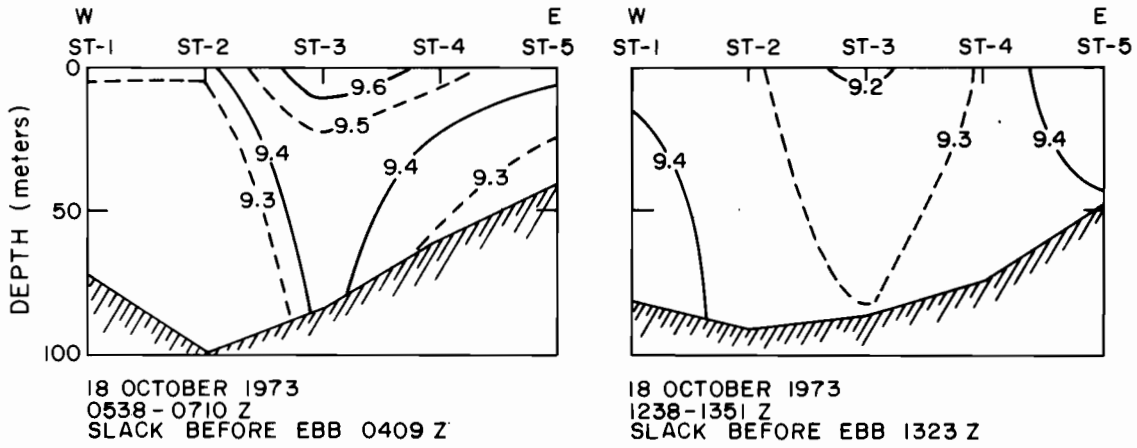


Figure 9.1. Transect #3, North Rosario Strait, 18 October 1973 (ST1--ST5)--Temperature.

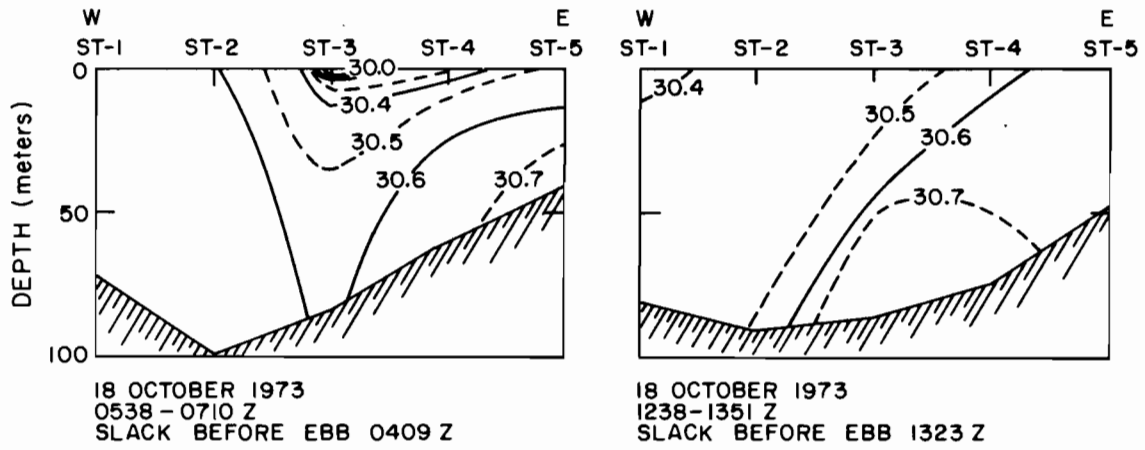


Figure 9.2. Transect #3, North Rosario Strait, 18 October 1973 (ST1--ST5)--Salinity.

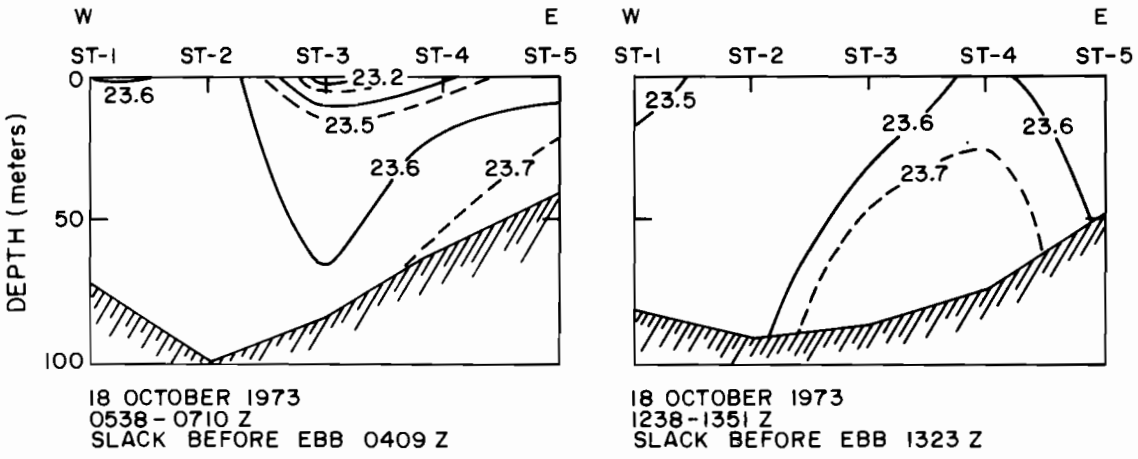


Figure 9.3. Transect #3, North Rosario Strait, 18 October 1973 (ST1--ST5)--Sigma-t.

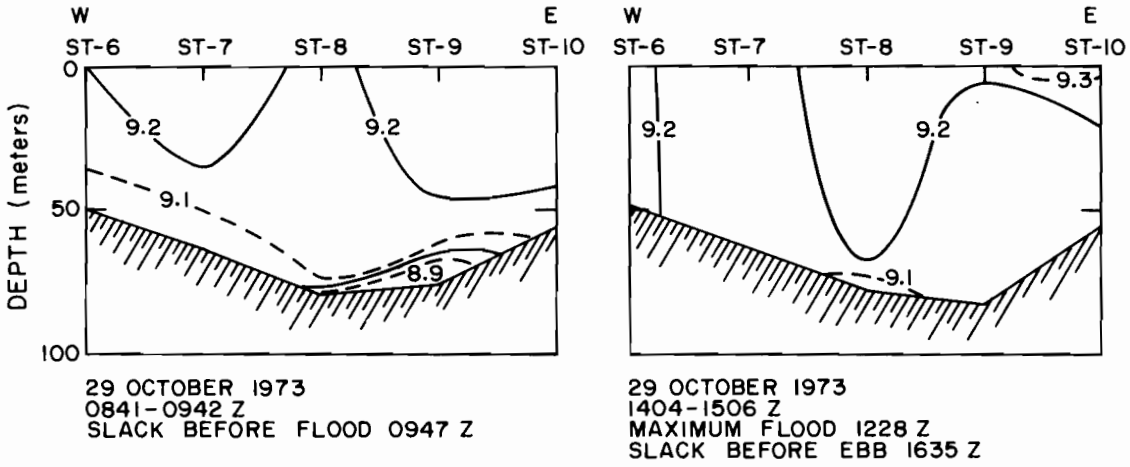


Figure 10.1. Transect #4, South Rosario Strait, 29 October 1973 (ST6--ST10)--Temperature.

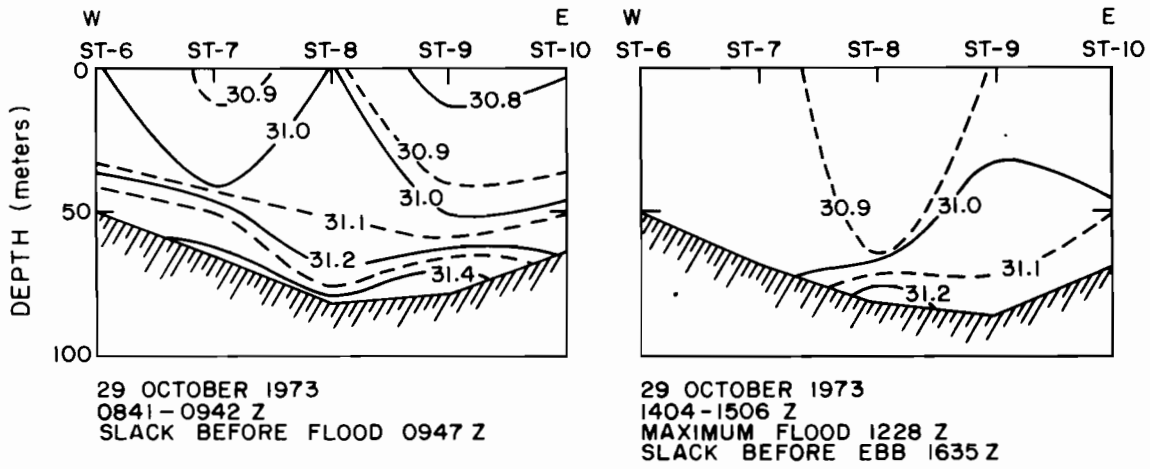


Figure 10.2. Transect #4, South Rosario Strait, 29 October 1973 (ST6--ST10)--Salinity.

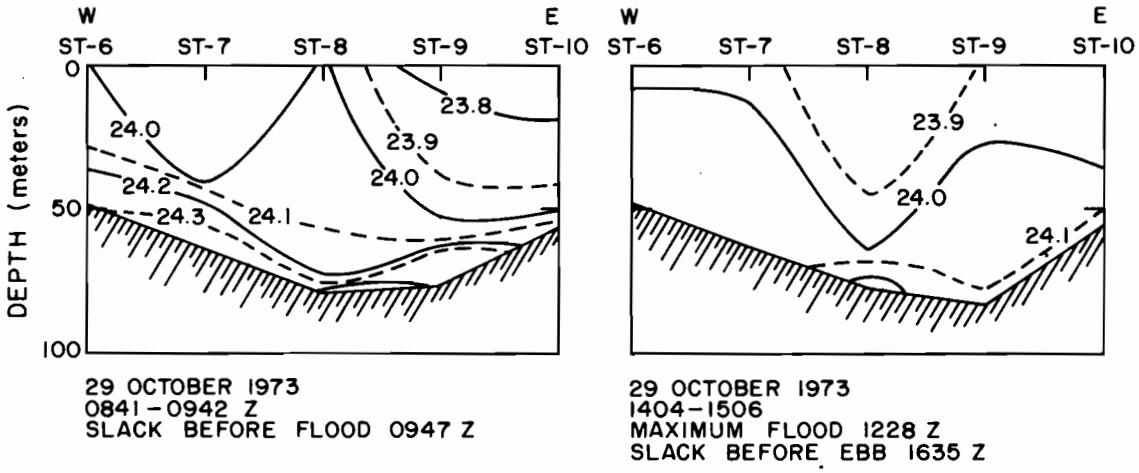


Figure 10.3. Transect #4, South Rosario Strait, 29 October 1973 (ST6--ST10)--Sigma-t.

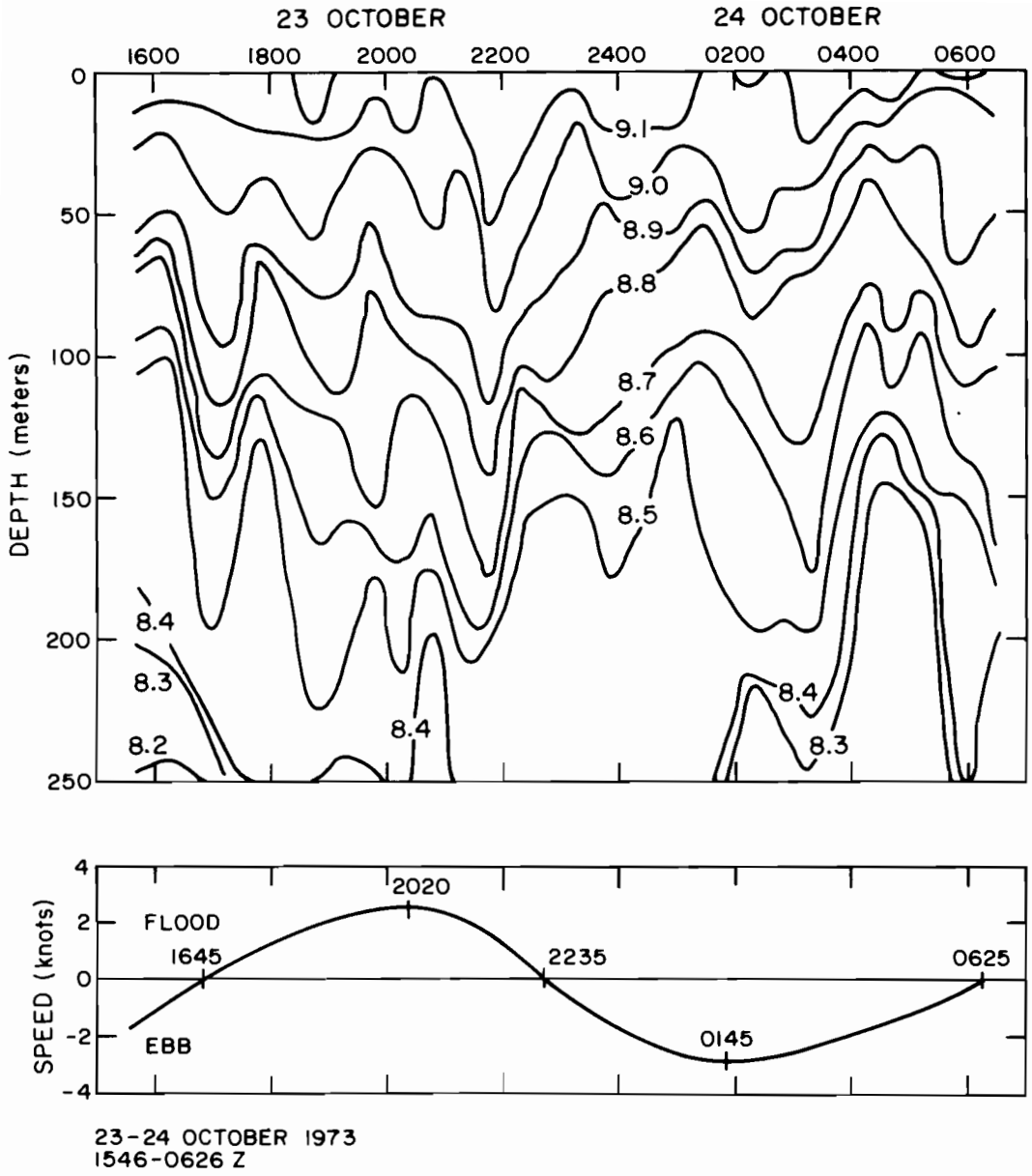


Figure 11.1. Time Series #1, Haro Strait, 23-24 October 1973 (S-3)--Temperature.

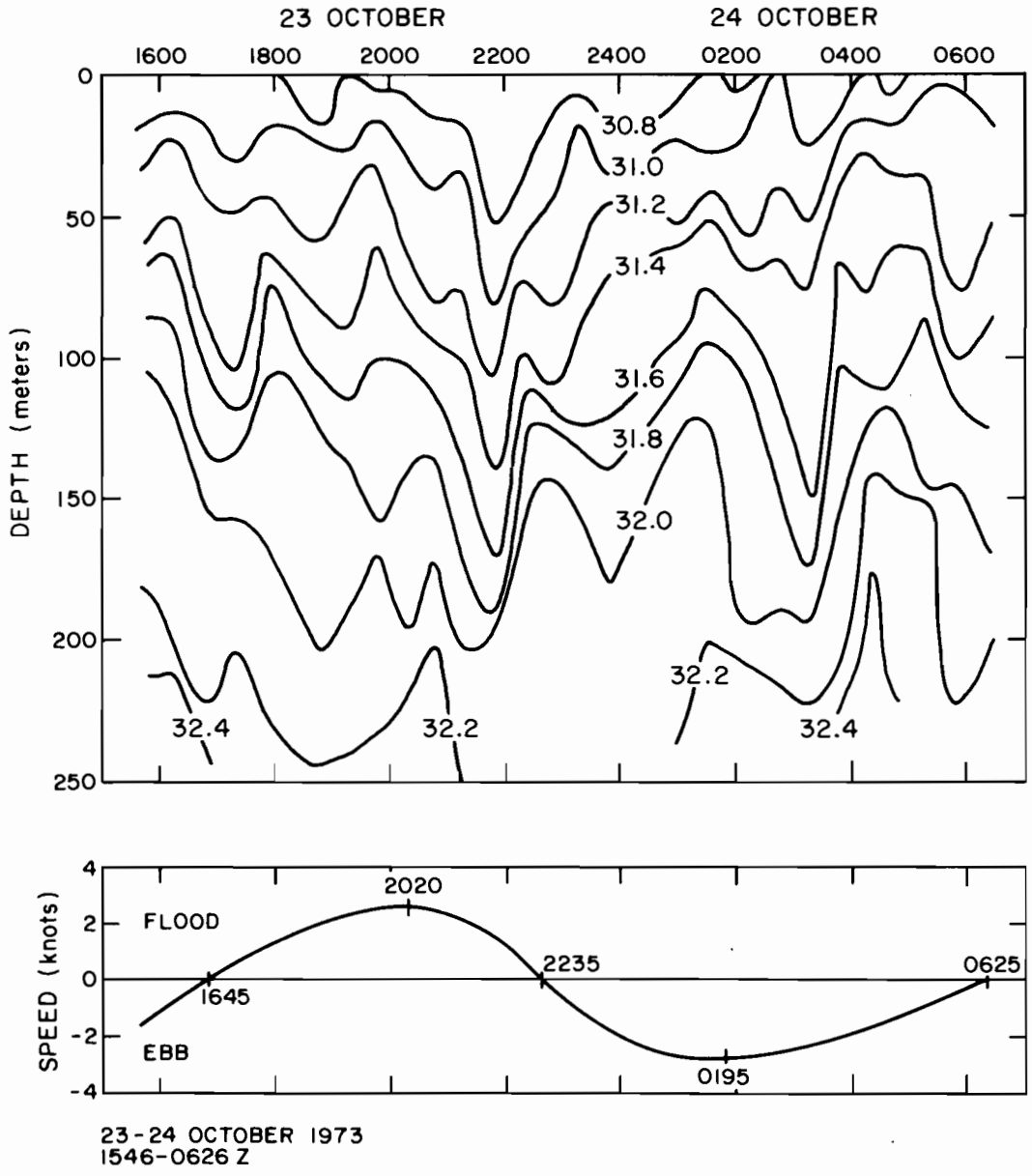


Figure 11.2. Time Series #1, Haro Strait, 23-24 October 1973 (S-3)--Salinity.

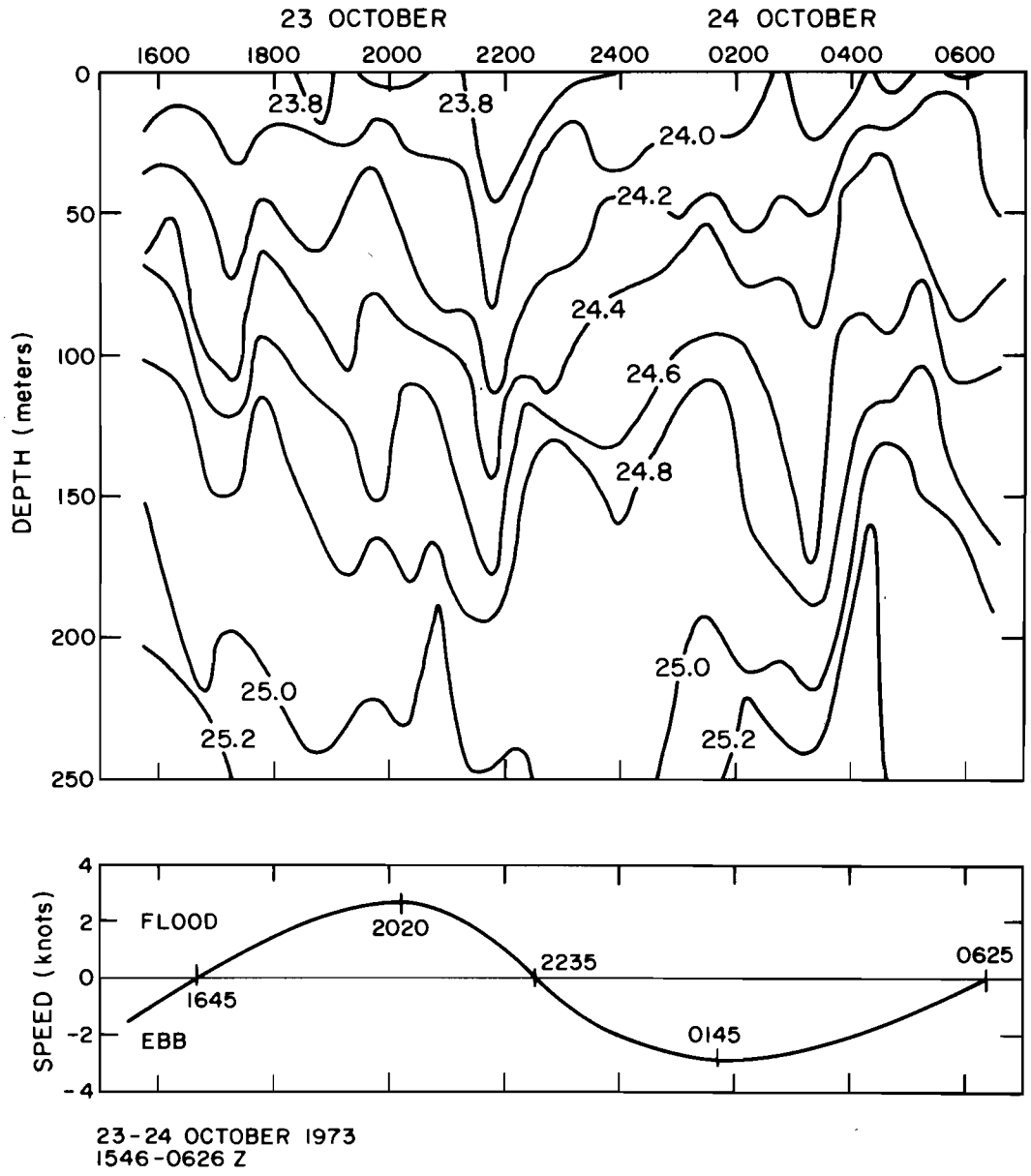


Figure 11.3. Time Series #1, Haro Strait, 23-24 October 1973 (S-3)--Sigma-t.

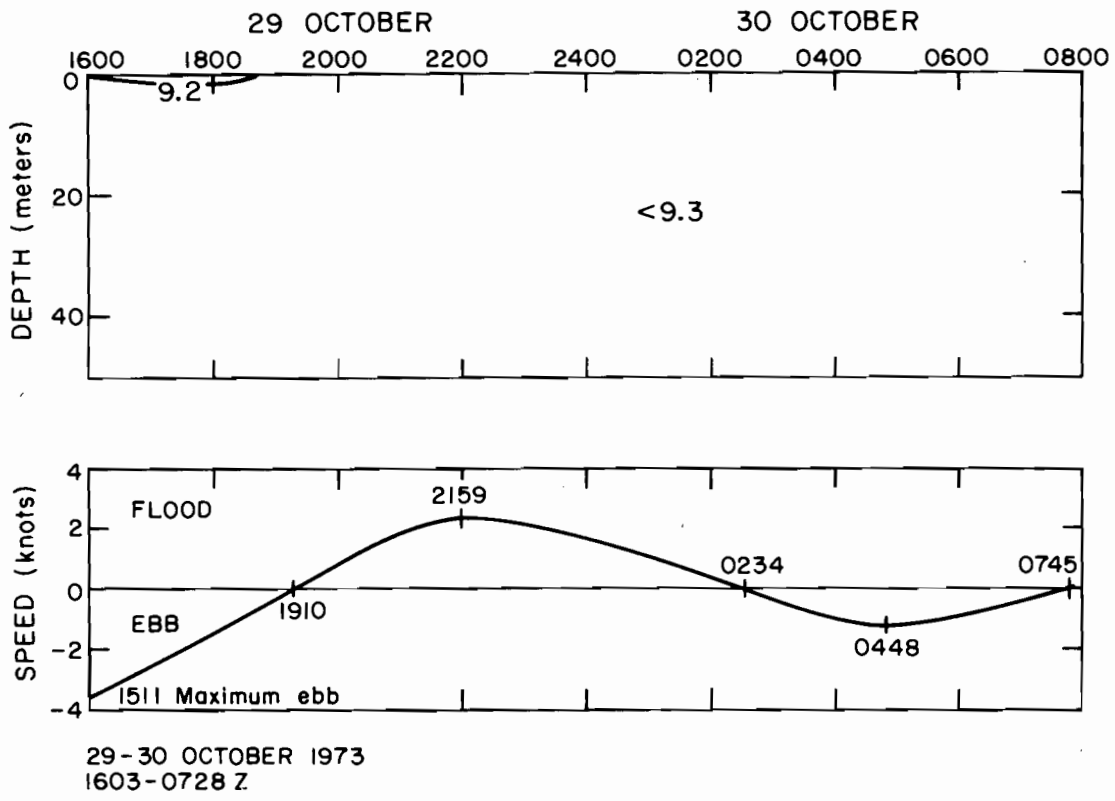


Figure 12.1. Time Series #2, South Rosario Strait, 29-30 October 1973 (S-2)--Temperature.

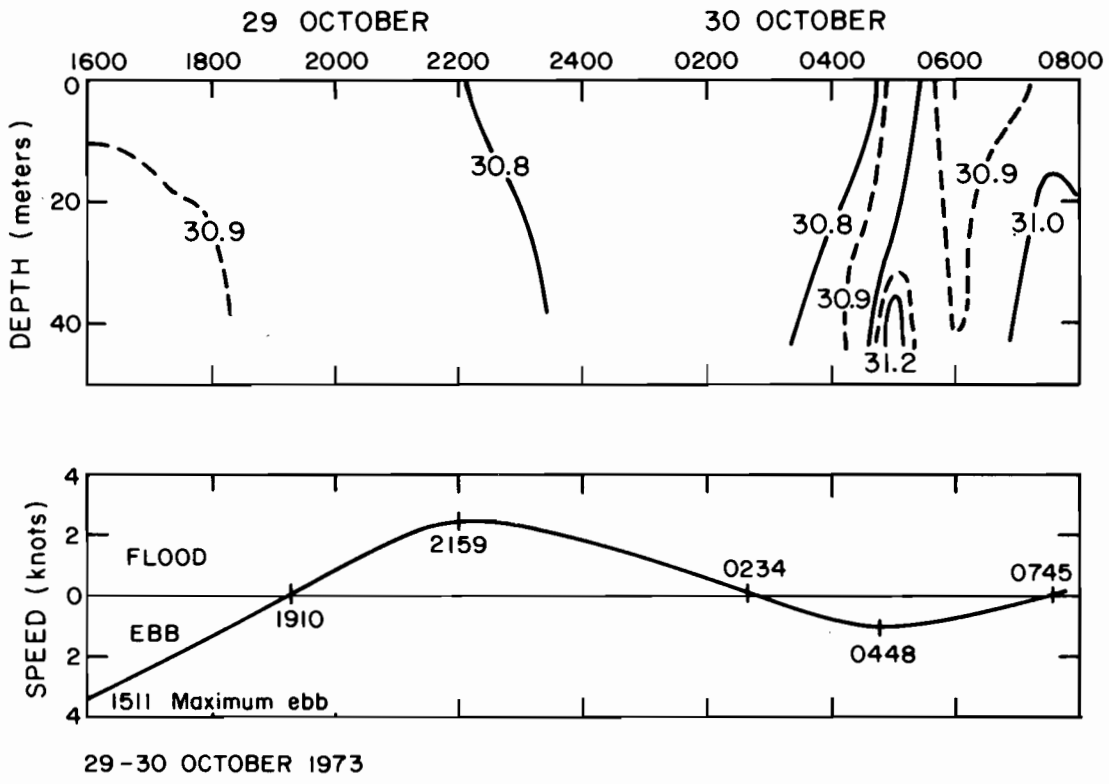


Figure 12.2. Time Series #2, South Rosario Strait, 29-30 October 1973 (S-2)--Salinity.

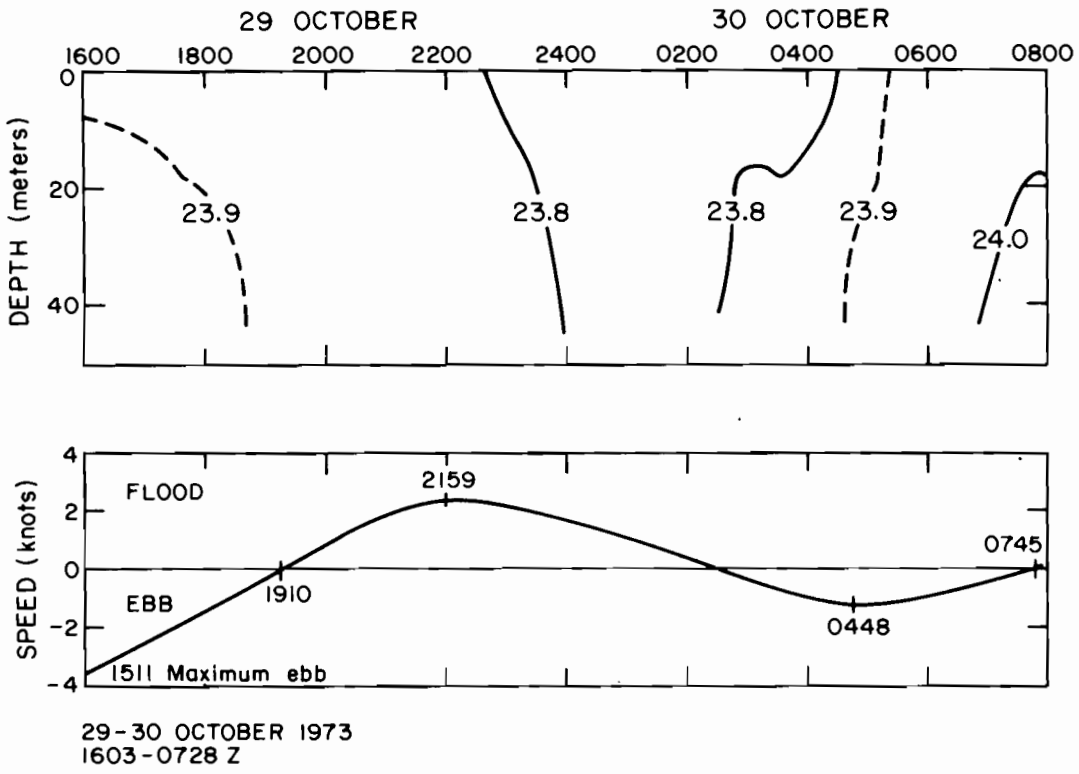


Figure 12.3. Time Series #2, South Rosario Strait, 29-30 October 1973 (S-2)--Sigma-t.

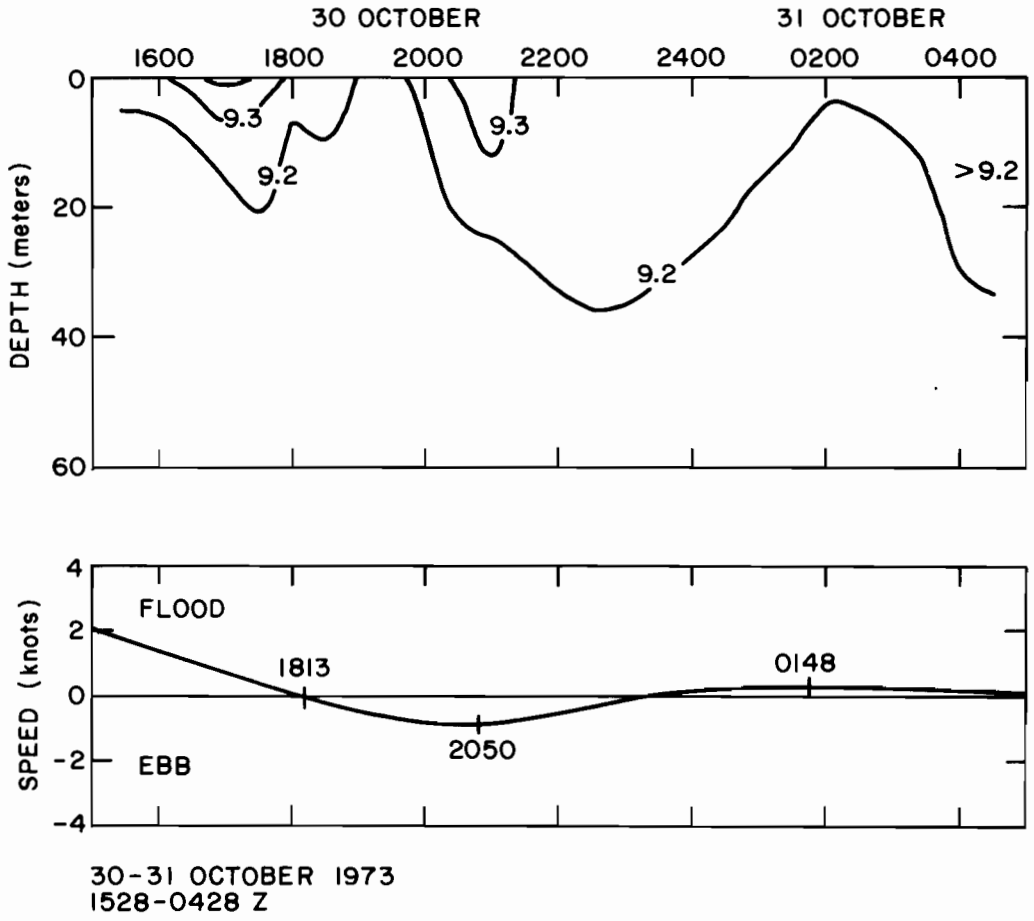


Figure 13.1. Time Series #3, North Rosario Strait, 30-31 October 1973 (S-1)--Temperature.

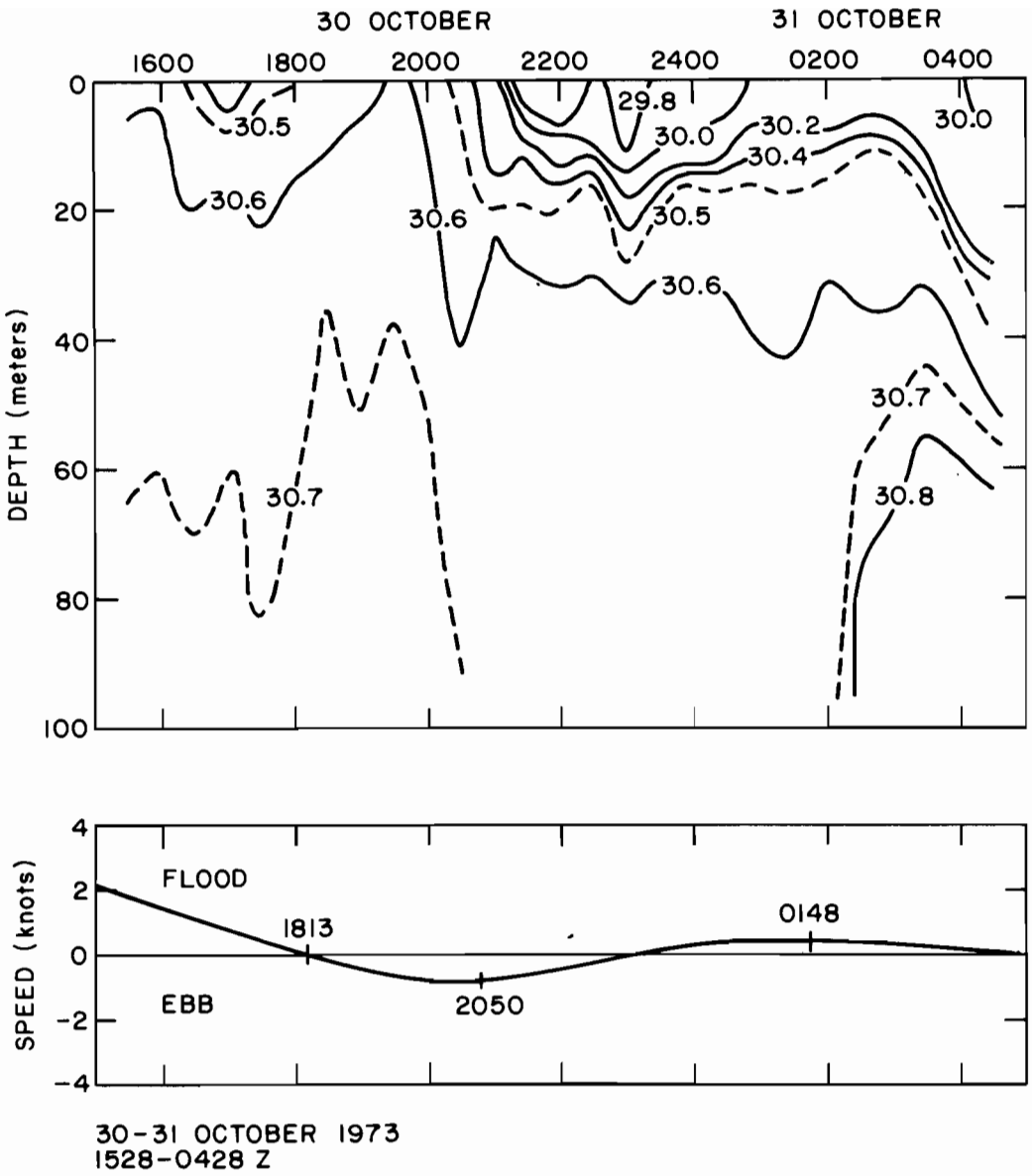


Figure 13.2. Time Series #3, North Rosario Strait, 30-31 October 1973 (S-1)--Salinity.

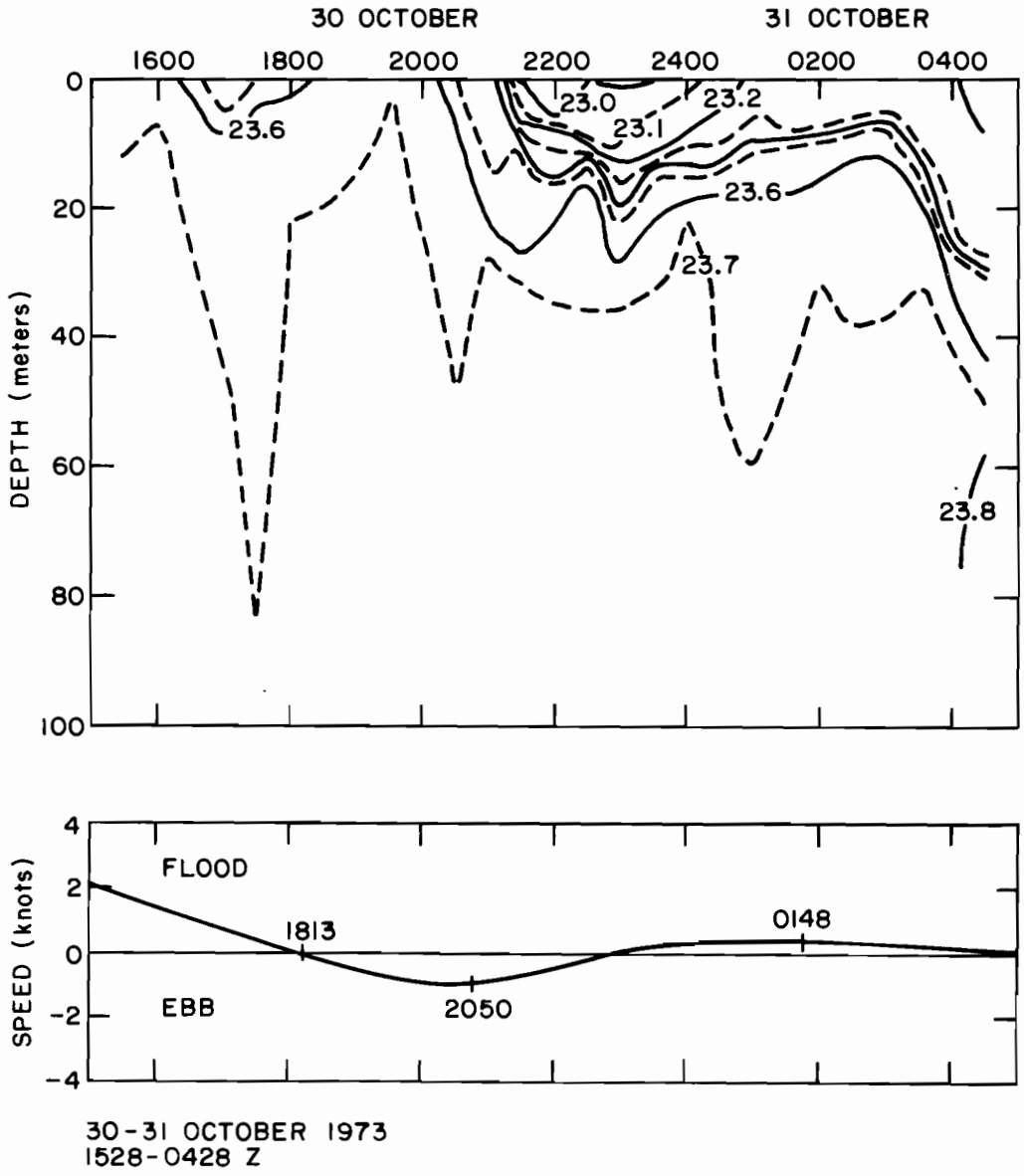


Figure 13.3. Time Series #3, North Rosario Strait, 30-31 October 1973 (S-1)--Sigma-t.

STATISTICS OF 73 SAN JUAN 500 LAT 48 51.04N LONG 122 46.28W
DEPTH 7.0 METERS NUMBER OF OBSERVATIONS = 470
OBSERVATION PERIOD 3.3 DAYS FROM 1712 GMT 2 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	12.73	97.26	9.86	.903	3.34	49.00	0.00
U	-1.21	96.20	9.81	.472	4.34	33.44	-24.72
V	-4.73	139.33	11.80	.850	5.74	46.03	-31.51

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY. EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY. NORTH = POSITIVE V

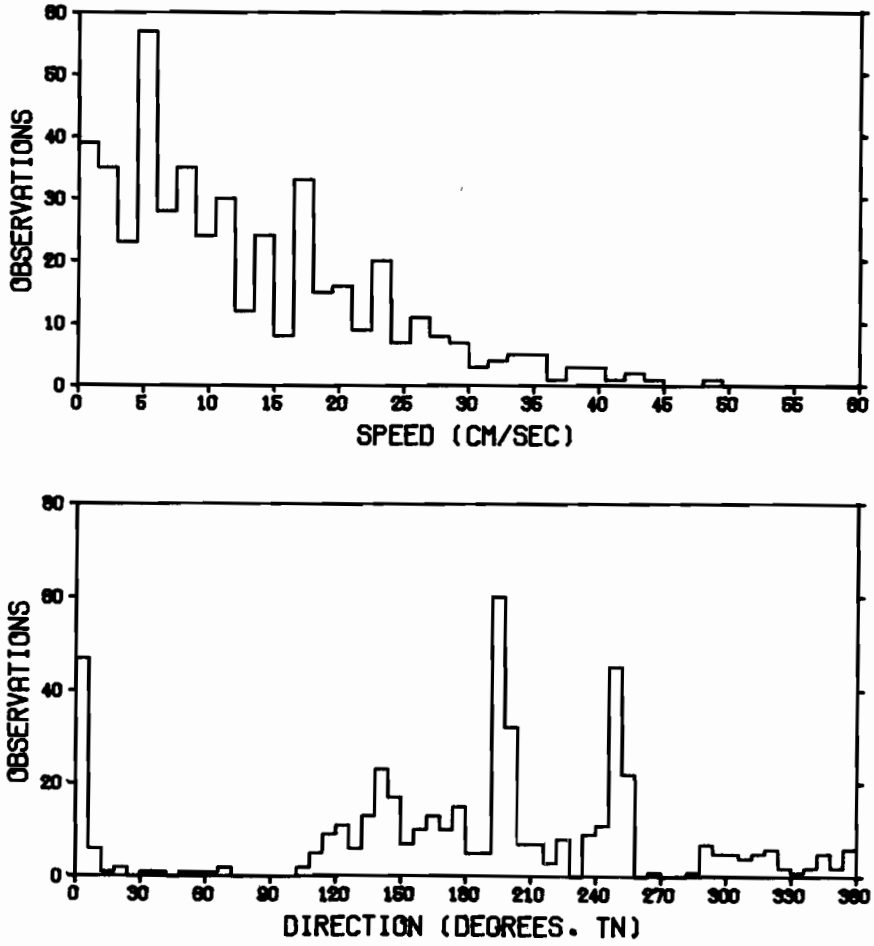


Figure 14.1. Current Meter Station 500 (-7m): Standard statistics and histograms.

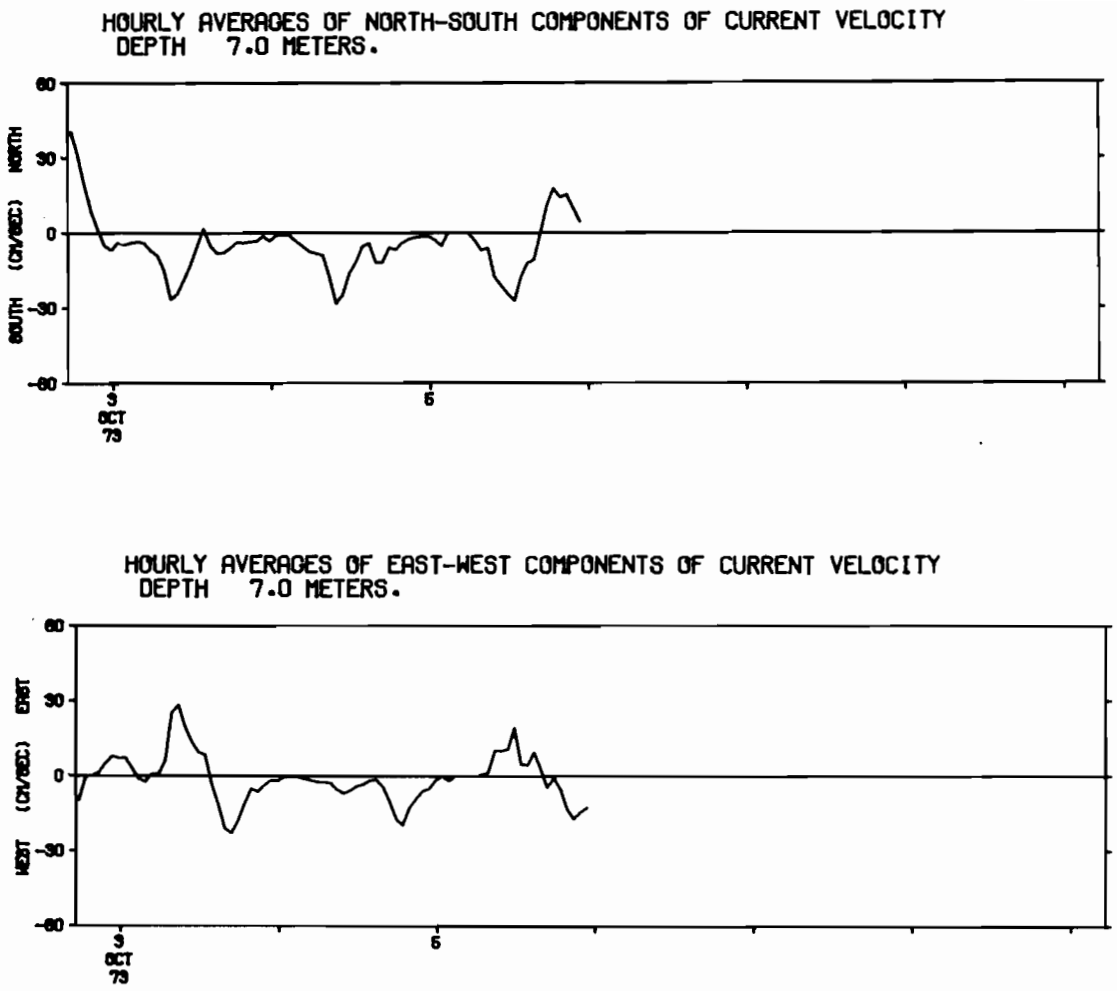


Figure 14.2. Current Meter Station 500 (-7m): Time series.

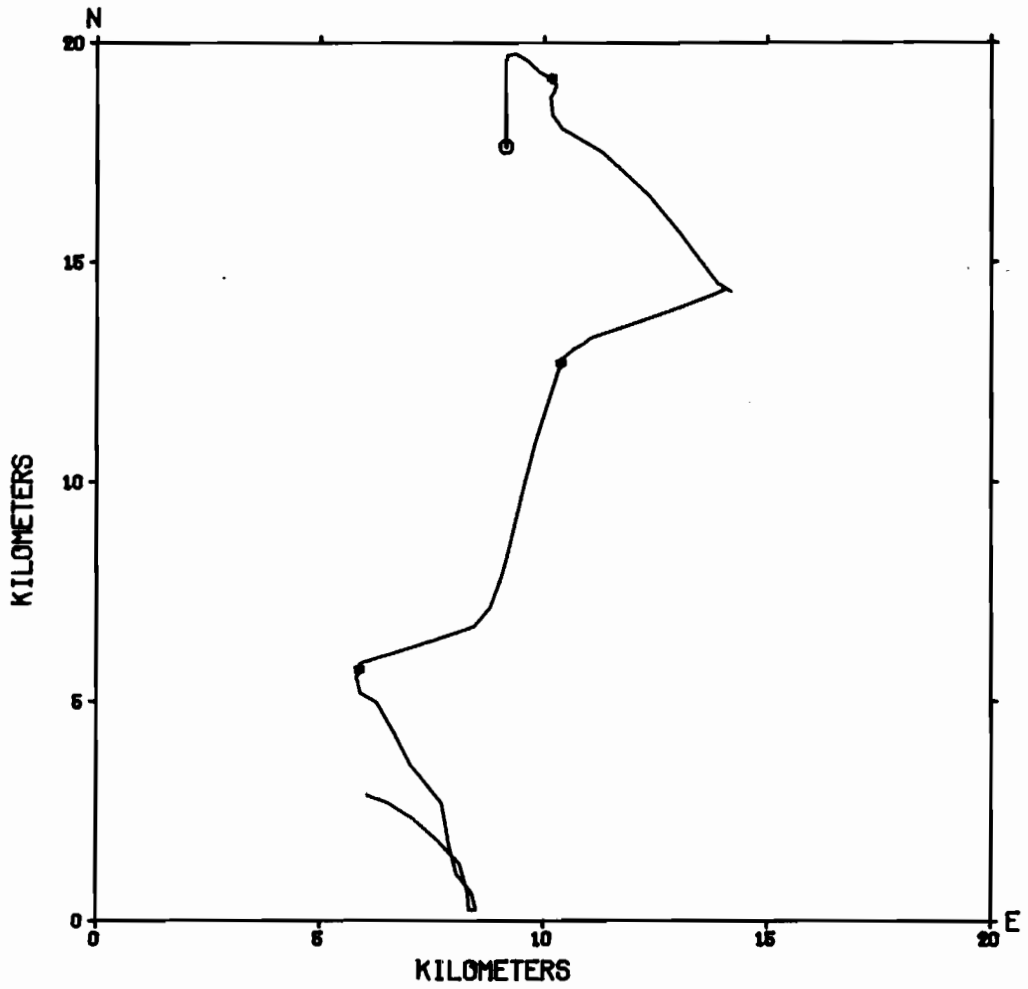


Figure 14.3. Current Meter Station 500 (-7m): Progressive Vector Diagram (PVD).

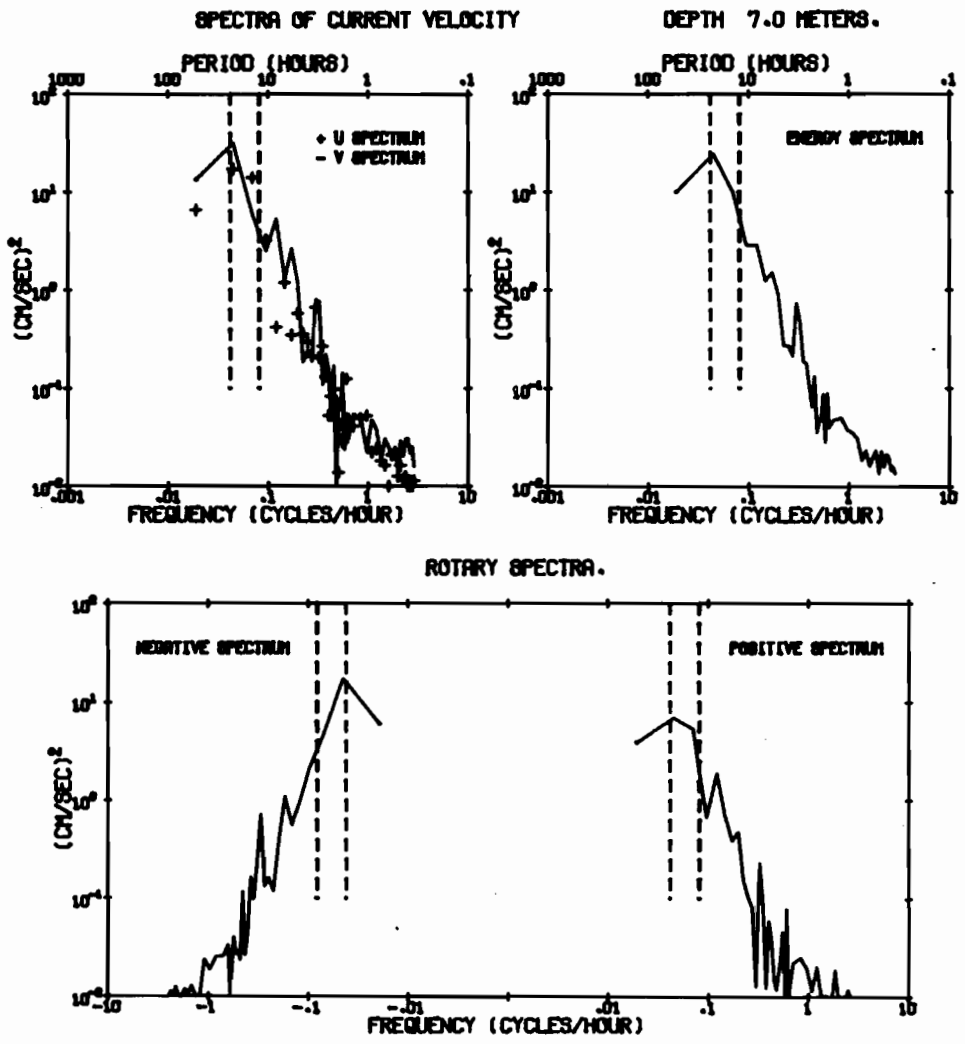


Figure 14.4. Current Meter Station 500 (-7m): Spectra.

STATISTICS OF 73 SAN JUAN 500 LAT 48 51.04N LONG 122 46.28W
DEPTH 20.0 METERS NUMBER OF OBSERVATIONS = 470
OBSERVATION PERIOD 3.3 DAYS FROM 1730 GMT 2 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	15.28	107.15	10.35	.581	2.52	43.00	0.00
U	6.28	16.40	4.05	.328	2.05	16.11	-.27
V	13.71	96.87	9.84	.488	2.85	39.87	-17.00

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY. EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY. NORTH = POSITIVE V

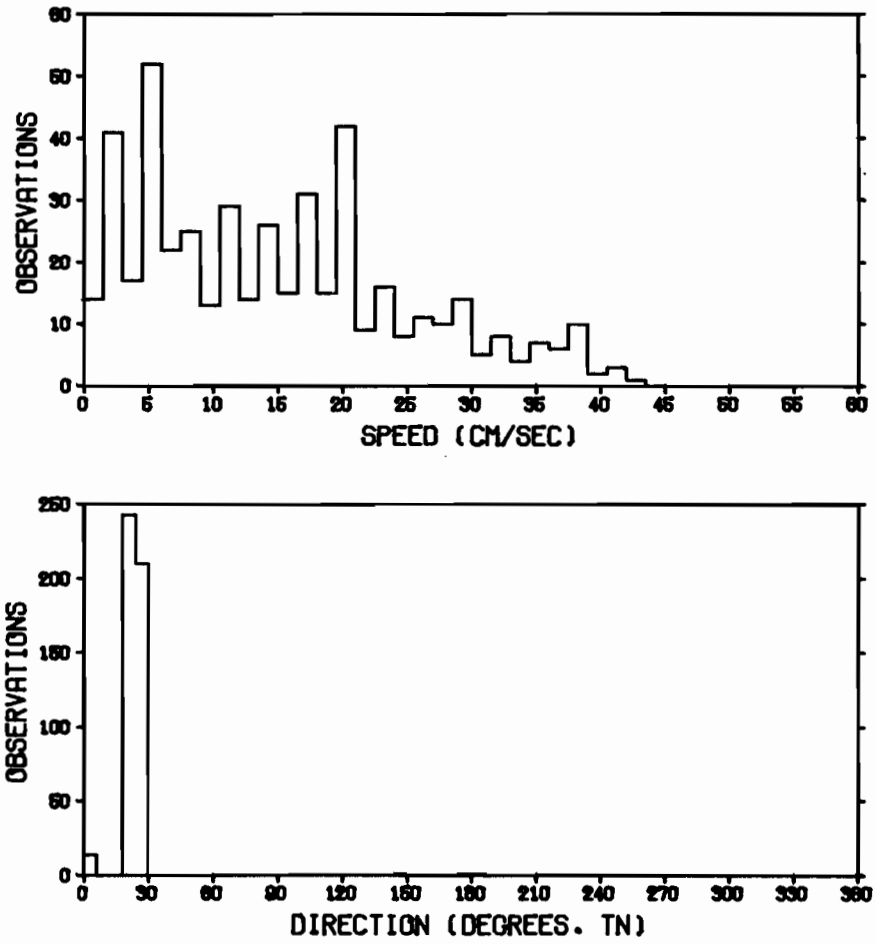


Figure 15.1. Current Meter Station 500 (-20m): Standard statistics and histograms.

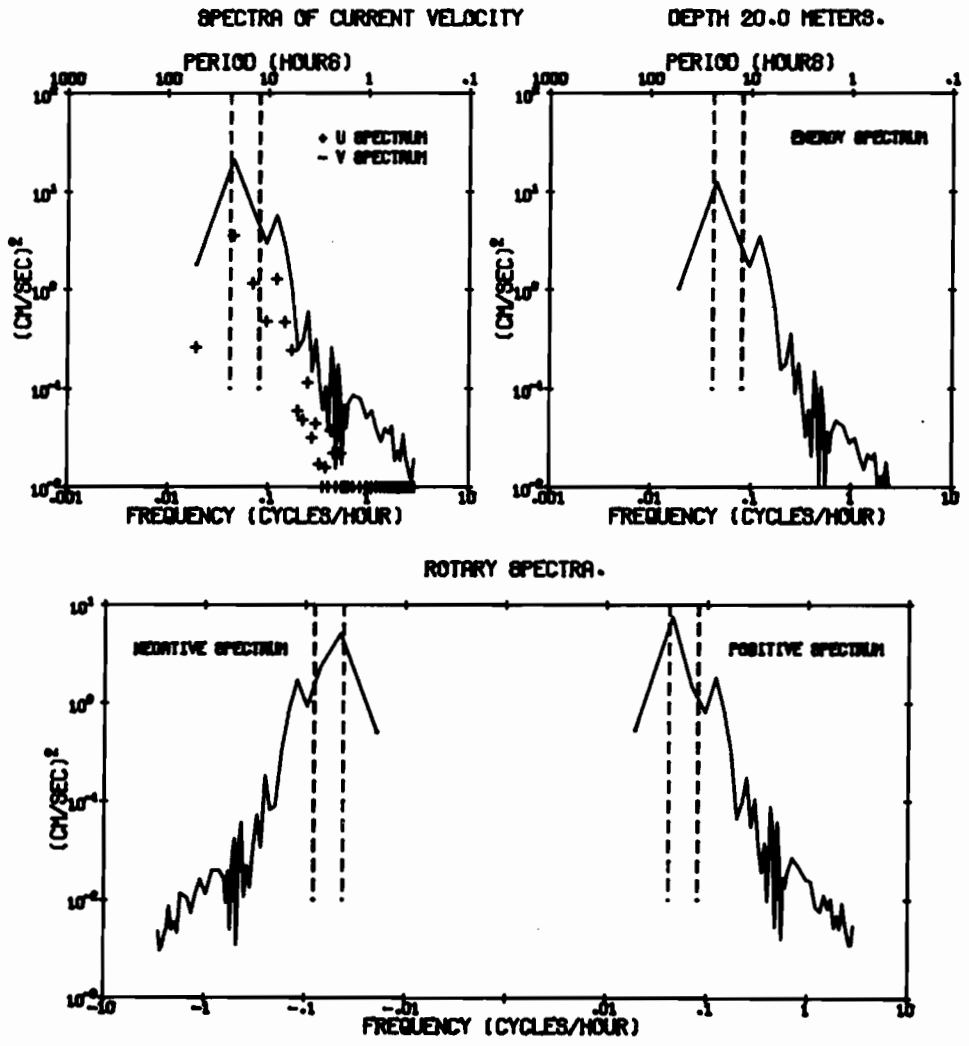
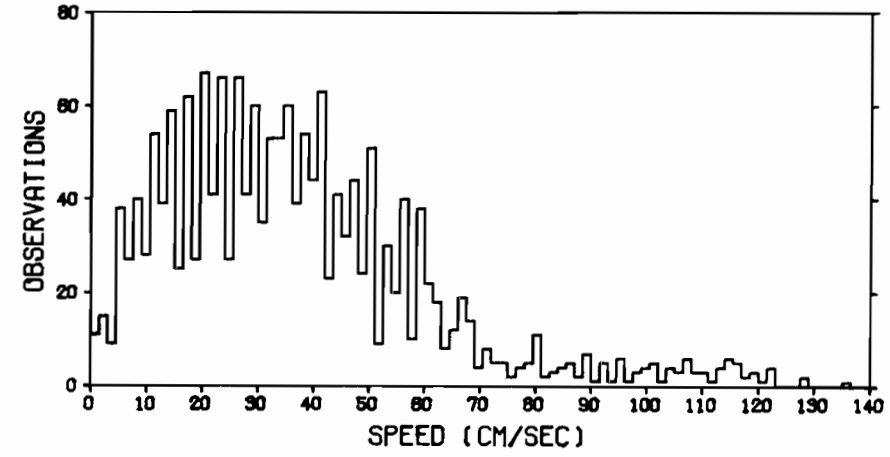


Figure 15.2. Current Meter Station 500 (-20m): Spectra.

STATISTICS OF 73 SAN JUAN 500A LAT 48 45.44N LONG 122 46.51W
DEPTH 5.0 METERS NUMBER OF OBSERVATIONS = 1800
OBSERVATION PERIOD 12.5 DAYS FROM 2244 GMT 9 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	36.97	560.73	23.68	1.195	4.77	135.00	0.00
U	-7.94	374.15	19.34	-.191	3.47	55.84	-80.32
V	6.66	1446.28	38.03	.174	2.84	118.00	-85.16

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V



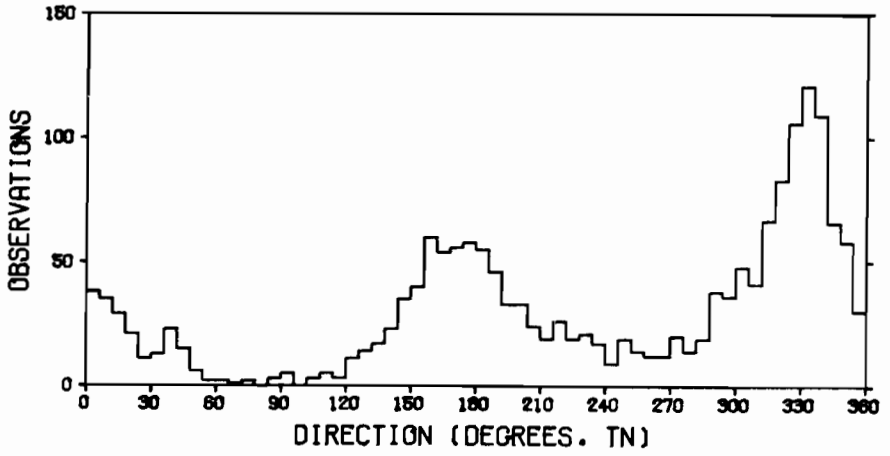


Figure 16.1. Current Meter Station 500A (-5m): Standard statistics and histograms.

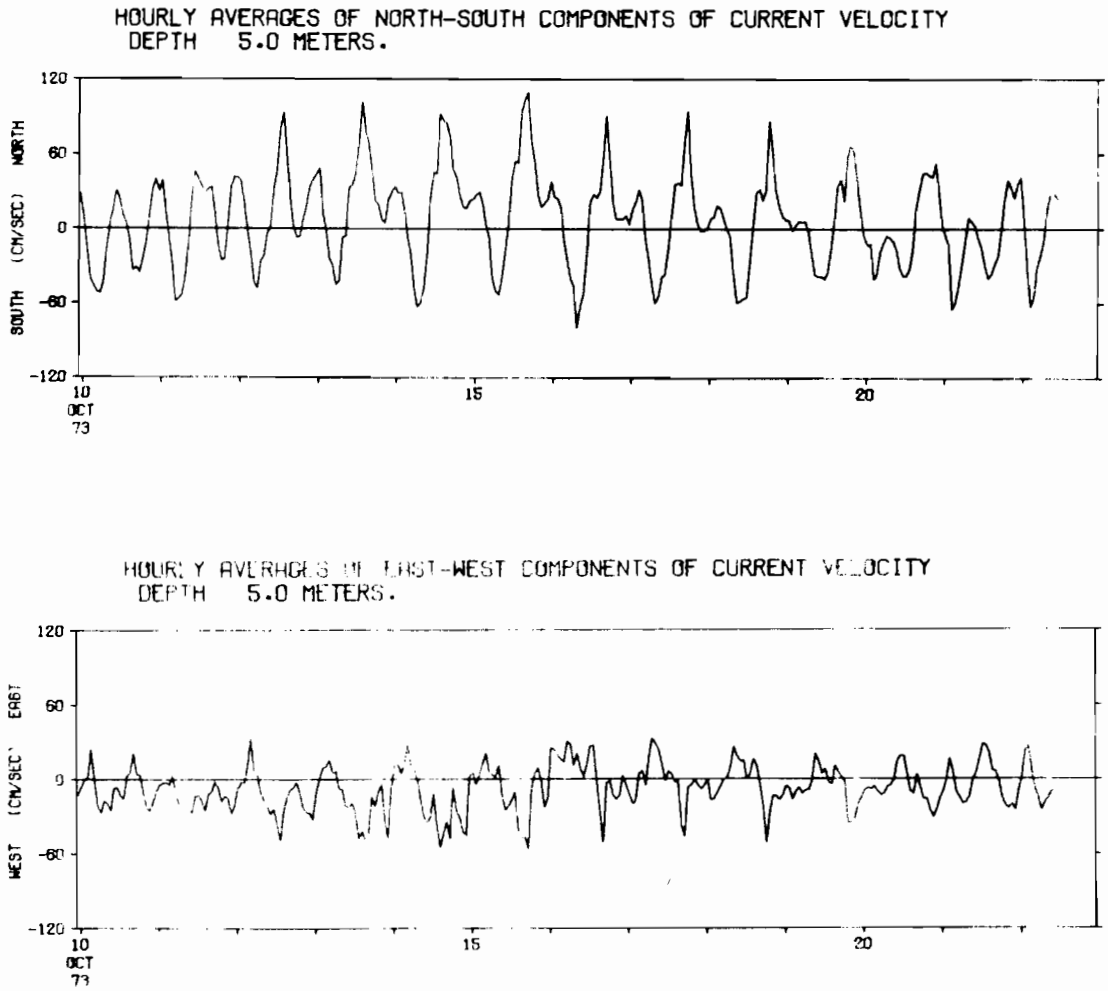


Figure 16.2. Current Meter Station 500A (-5m): Time series.

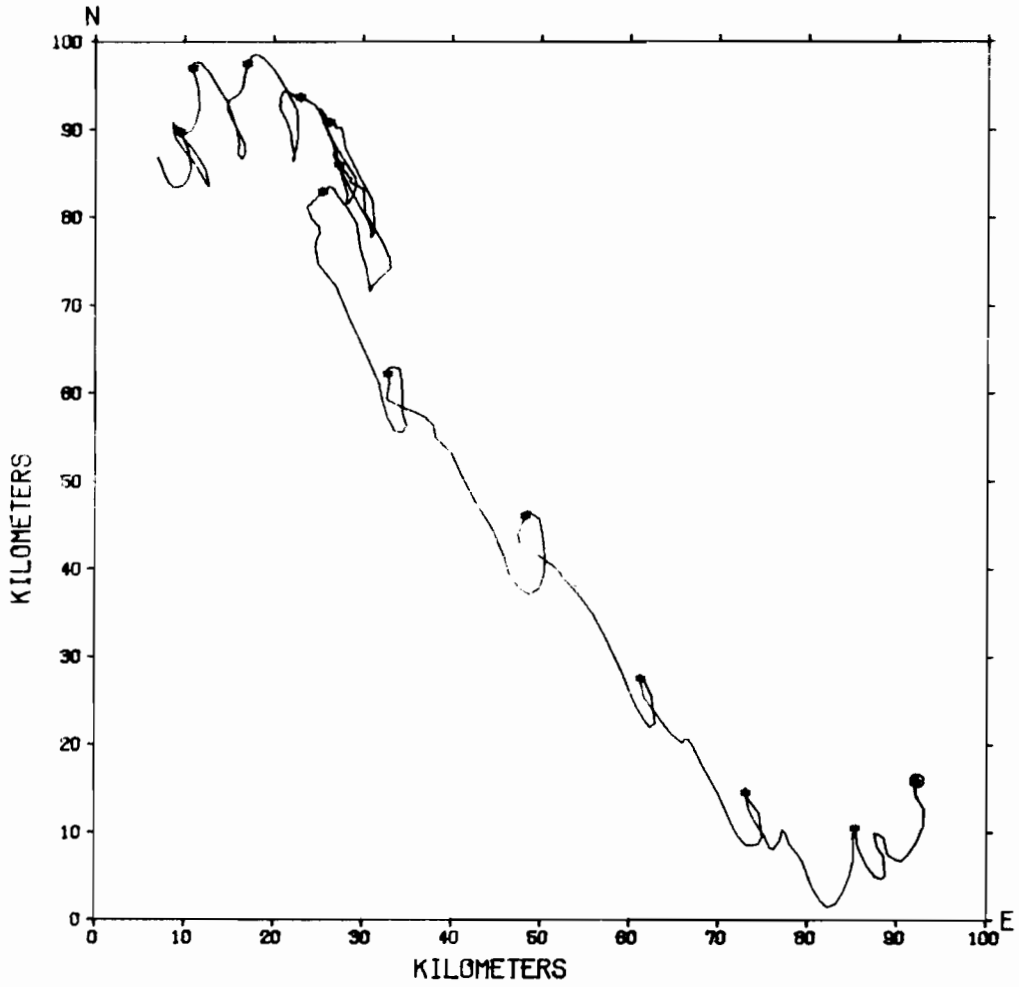


Figure 16.3. Current Meter Station 500A (-5m): Progressive Vector Diagram (PVD).

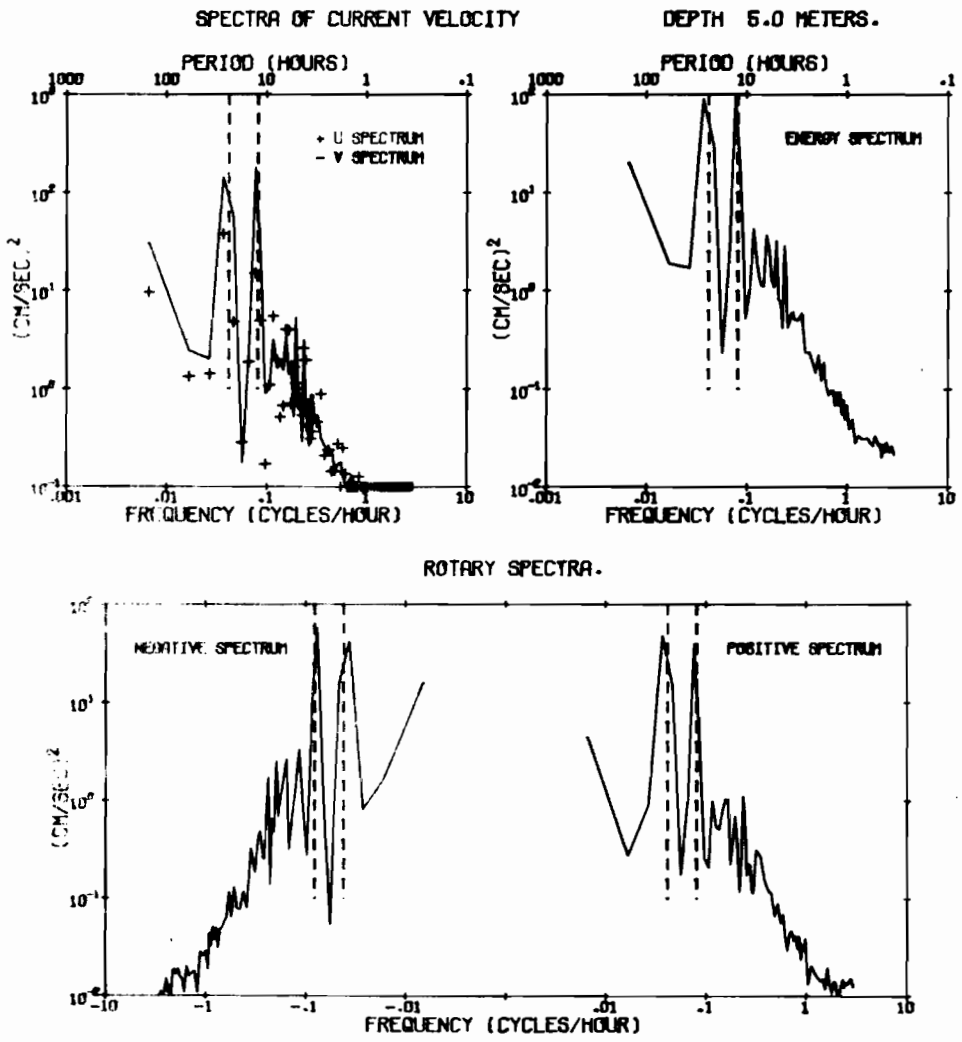


Figure 16.4. Current Meter Station 500A (-5m): Spectra.

STATISTICS OF 73 SAN JUAN 500A LAT 48 45.44N LONG 122 46.[illegible]W
DEPTH 22.0 METERS NUMBER OF OBSERVATIONS = 1800
OBSERVATION PERIOD 12.5 DAYS FROM 2242 GMT 9 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	35.06	519.52	22.79	1.103	4.00	119.00	2.[illegible]
U	-7.75	337.23	18.36	-.285	3.31	40.97	-75.[illegible]
V	12.05	1206.47	34.73	.225	2.41	105.07	-80.[illegible]

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

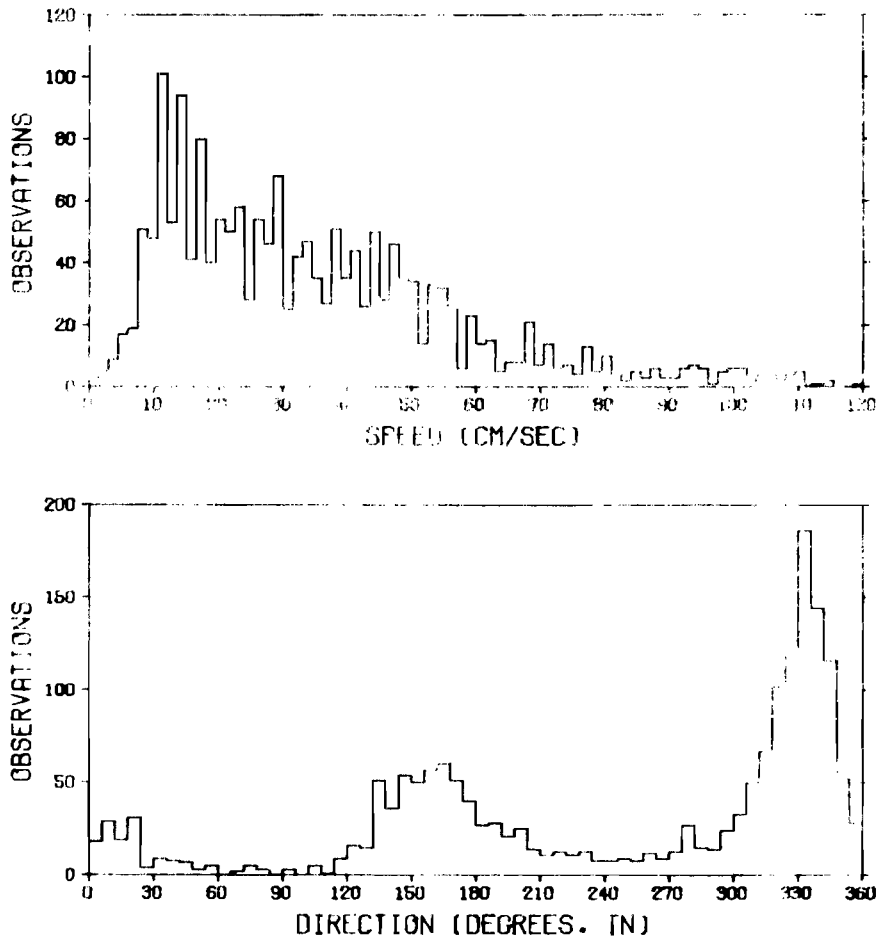
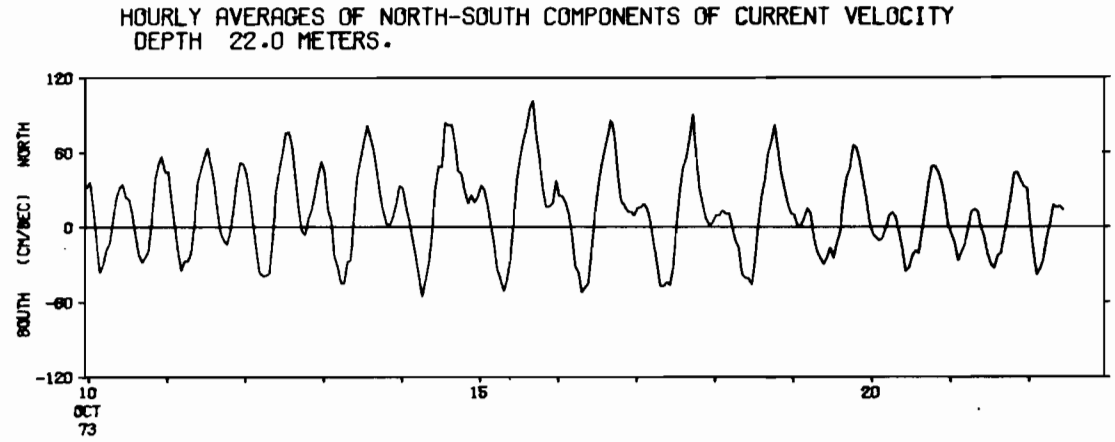


Figure 17.1. Current Meter Station 500A (-22m): Standard statistics and histograms.



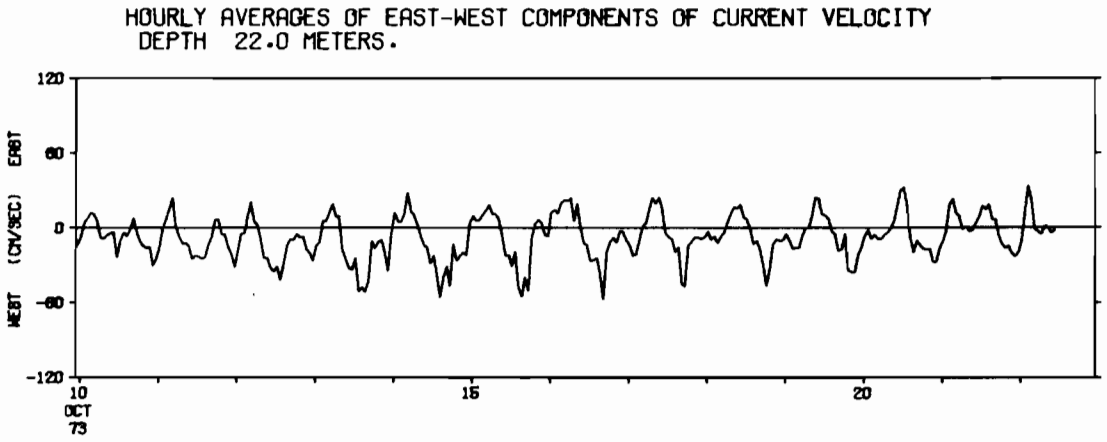


Figure 17.2. Current Meter Station 500A (-22m): Time series.

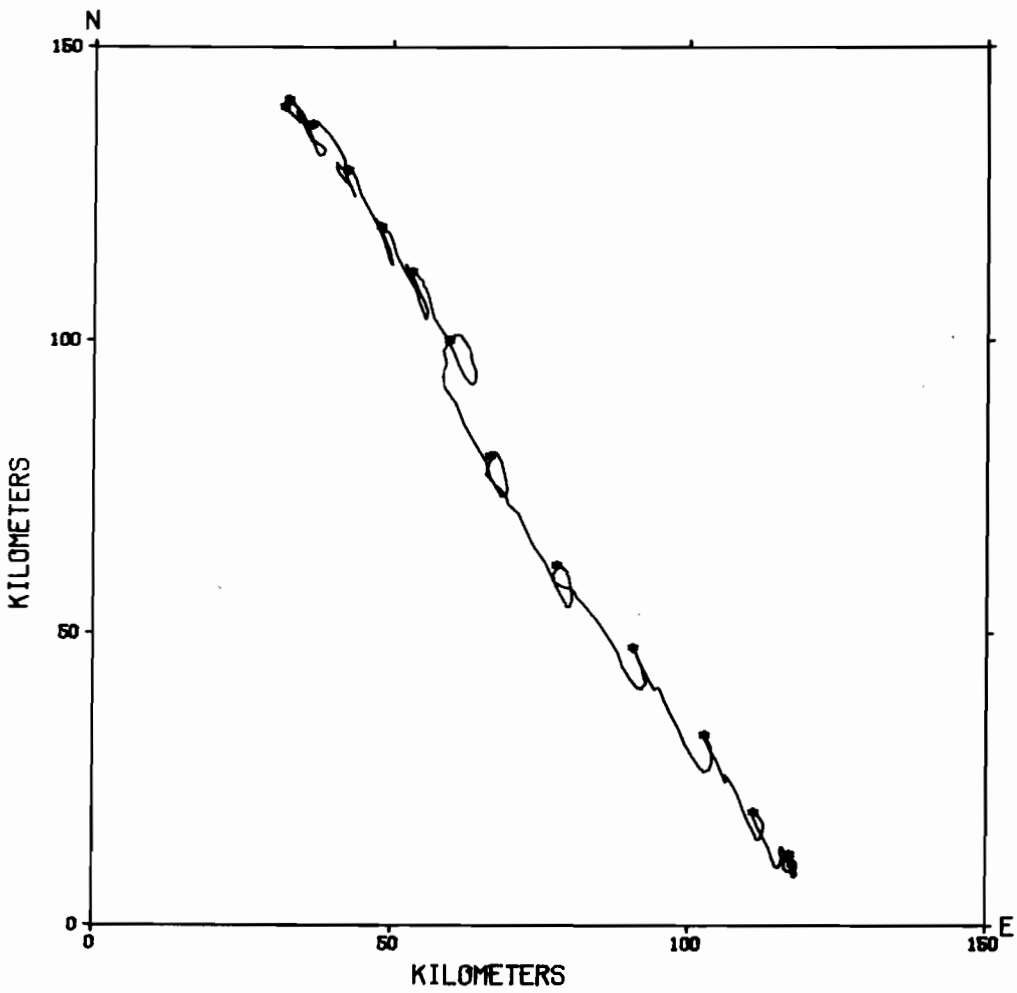


Figure 17.3. Current Meter Station 500A (-22m): Progressive Vector Diagram (PVD).

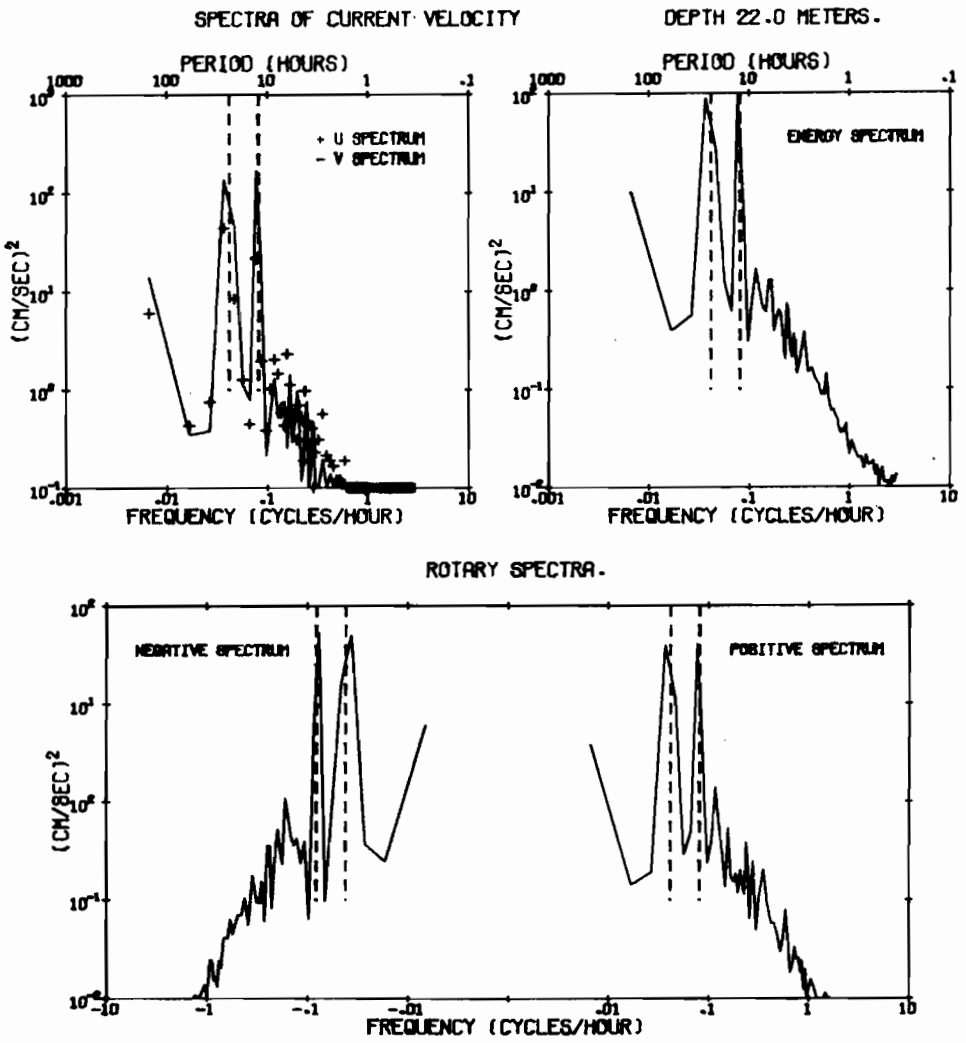


Figure 17.4. Current Meter Station 500A (-22m): Spectra.

STATISTICS OF 73 SAN JUAN 500A LAT 48 45.44N LONG 122 46.51W
DEPTH 83.0 METERS NUMBER OF OBSERVATIONS = 1800
OBSERVATION PERIOD 12.5 DAYS FROM 2240 GMT 9 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	29.60	387.09	19.67	1.089	3.68	98.00	2.00
U	11.86	64.34	8.02	.428	6.97	37.89	-62.62
V	26.65	347.54	18.64	.888	4.33	90.87	-67.99

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

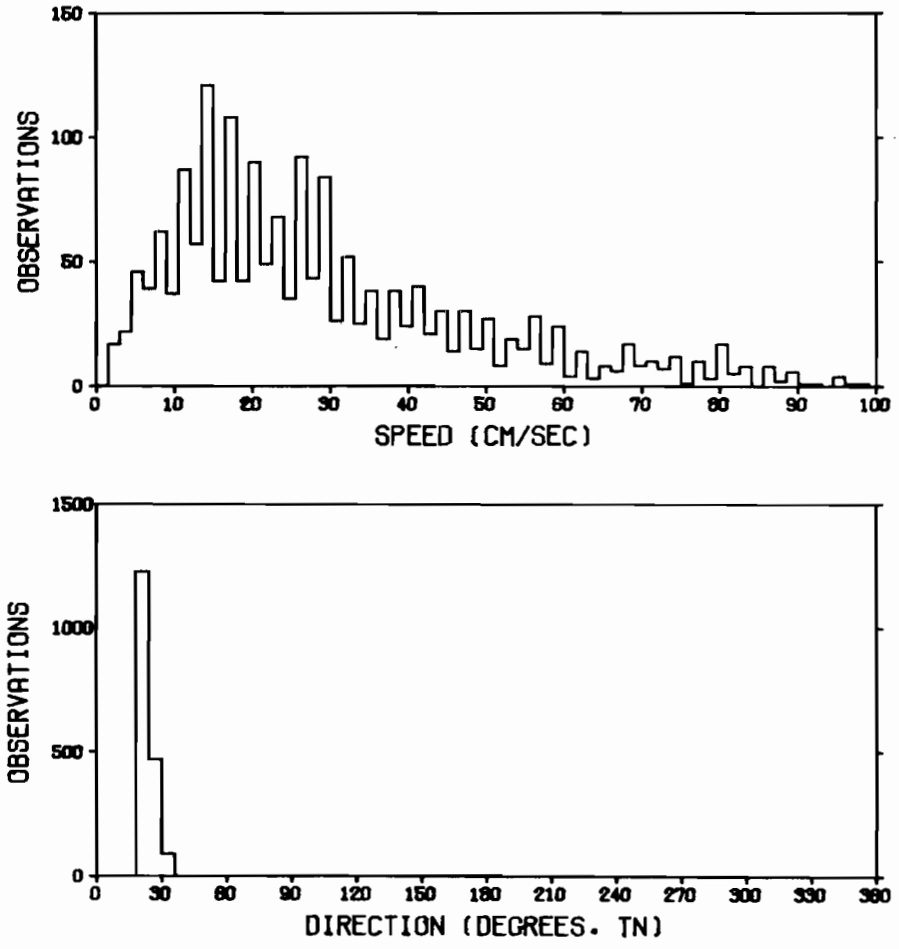


Figure 18.1. Current Meter Station 500A (-83m): Standard statistics and histograms.

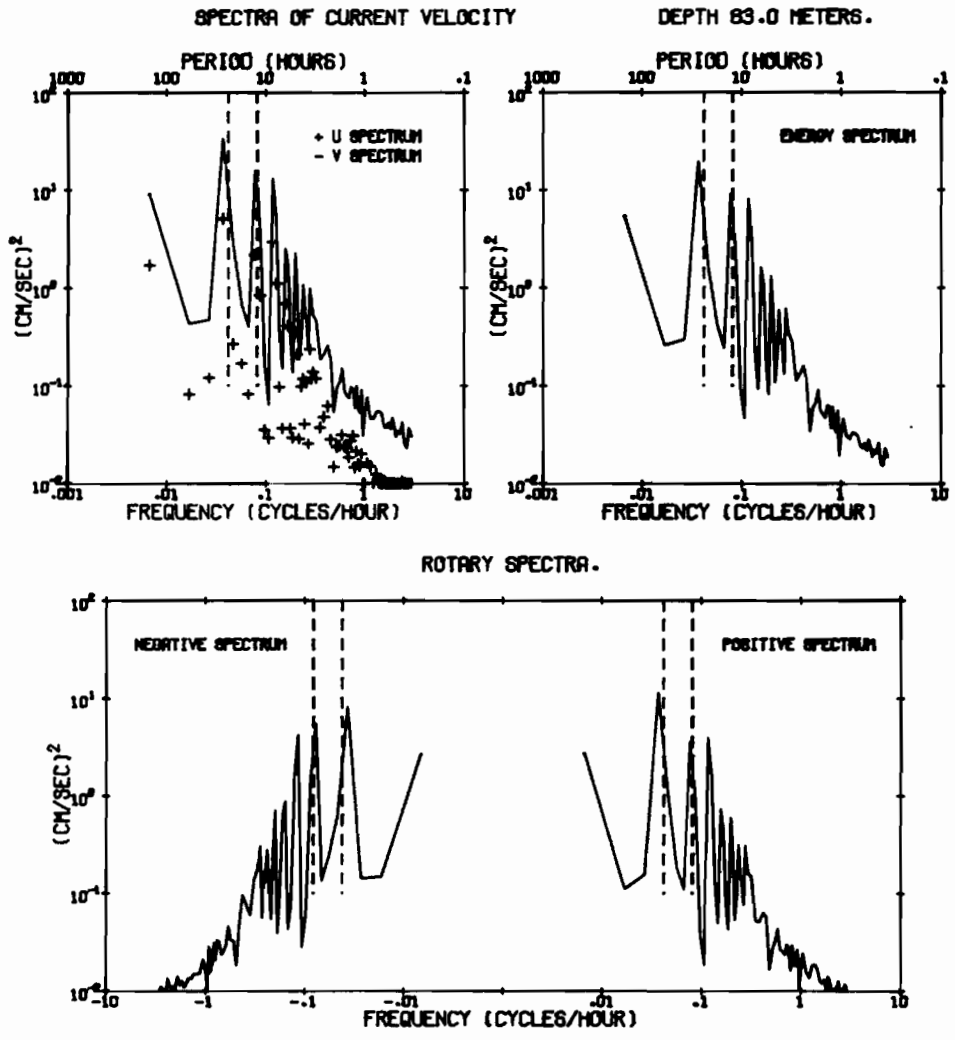


Figure 18.2. Current Meter Station 500A (-83m): Spectra.

STATISTICS OF 73 SAN JUAN 48 LAT 48 35.21N LONG 122 13.28W
DEPTH 5.0 METERS NUMBER OF OBSERVATIONS = 2400
OBSERVATION PERIOD 16.7 DAYS FROM 0114 GMT 3 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	64.02	1464.09	38.26	.700	2.92	184.00	0.00
U	-1.66	414.30	20.35	-.293	4.39	90.33	-83.16
V	-25.55	4493.32	67.03	.402	2.85	170.69	-183.31

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

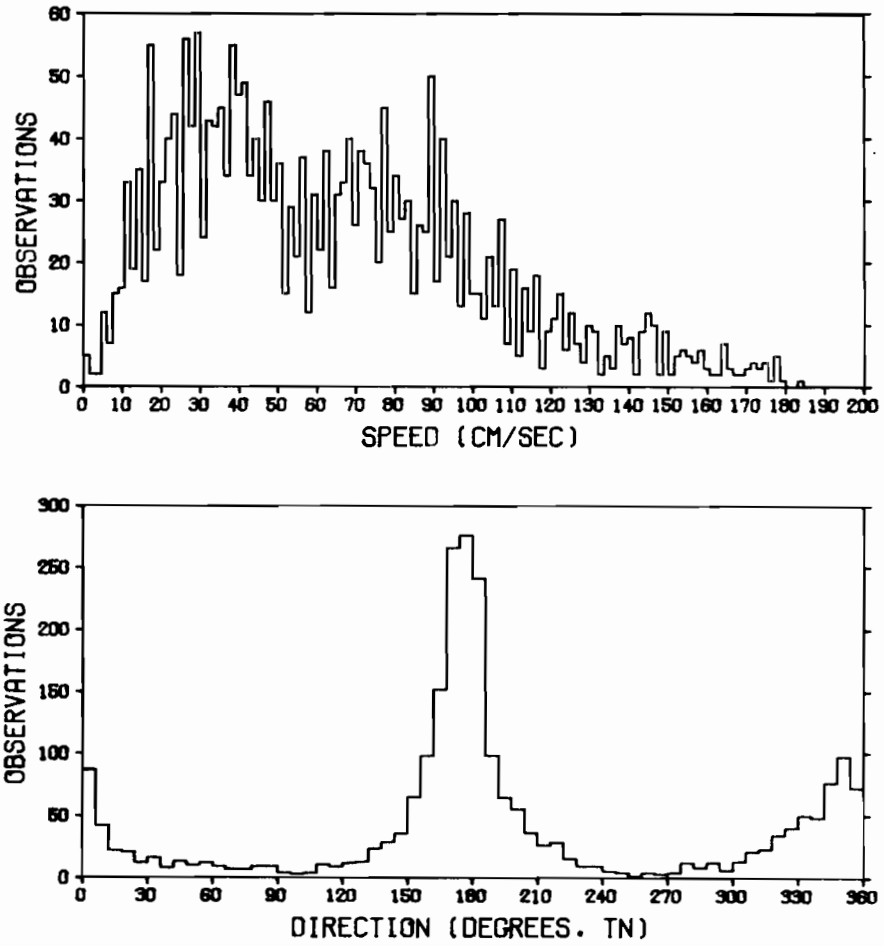


Figure 19.1. Current Meter Station 48 (-5m): Standard statistics and histograms.

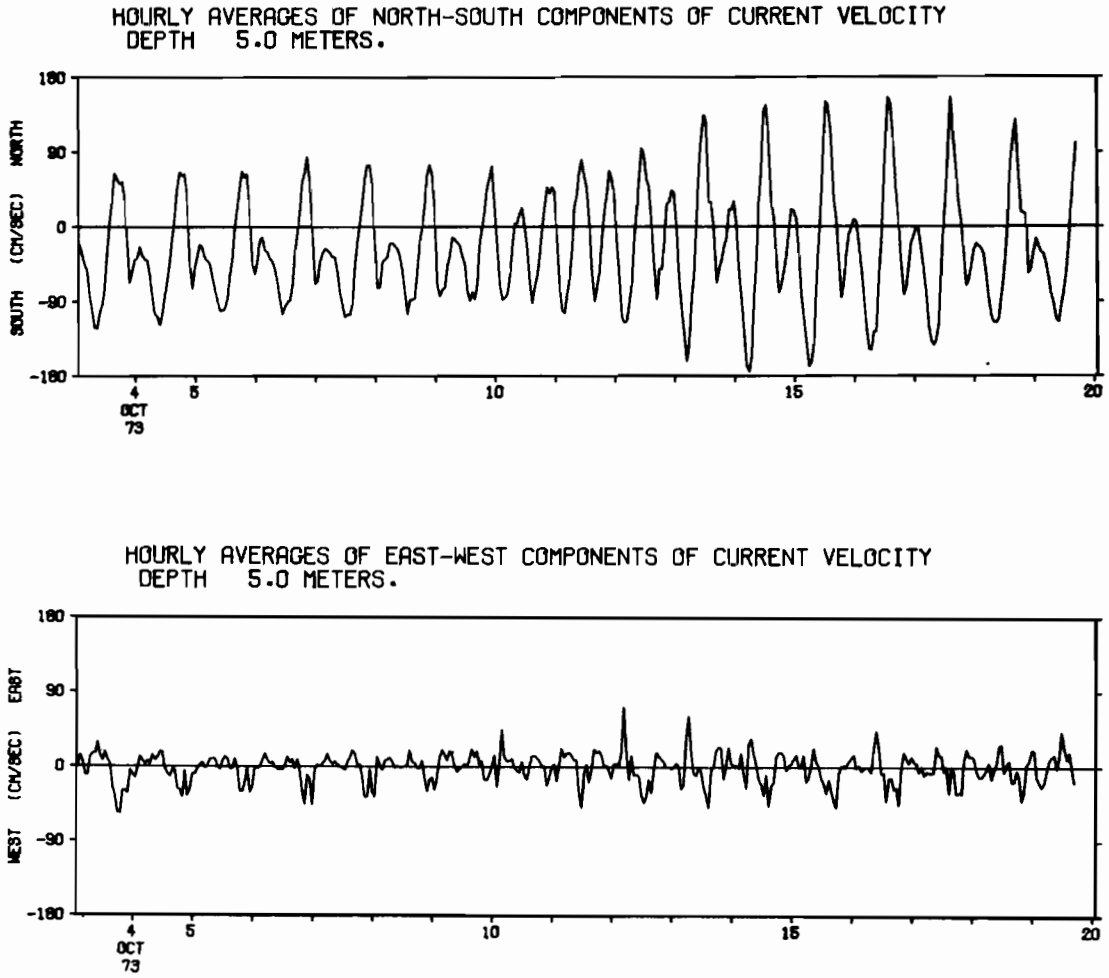


Figure 19.2. Current Meter Station 48 (-5m): Time series.

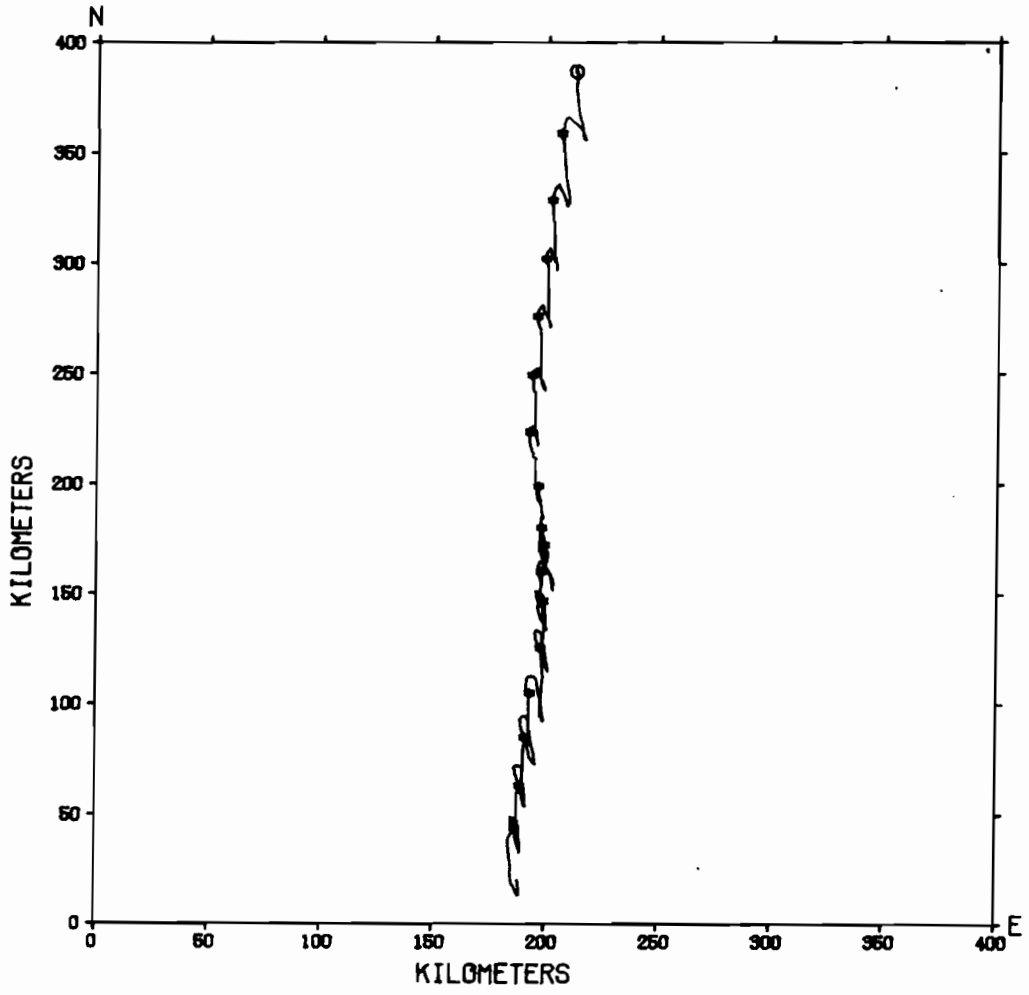


Figure 19.3. Current Meter Station 48 (-5m): Progressive Vector Diagram (PVD).

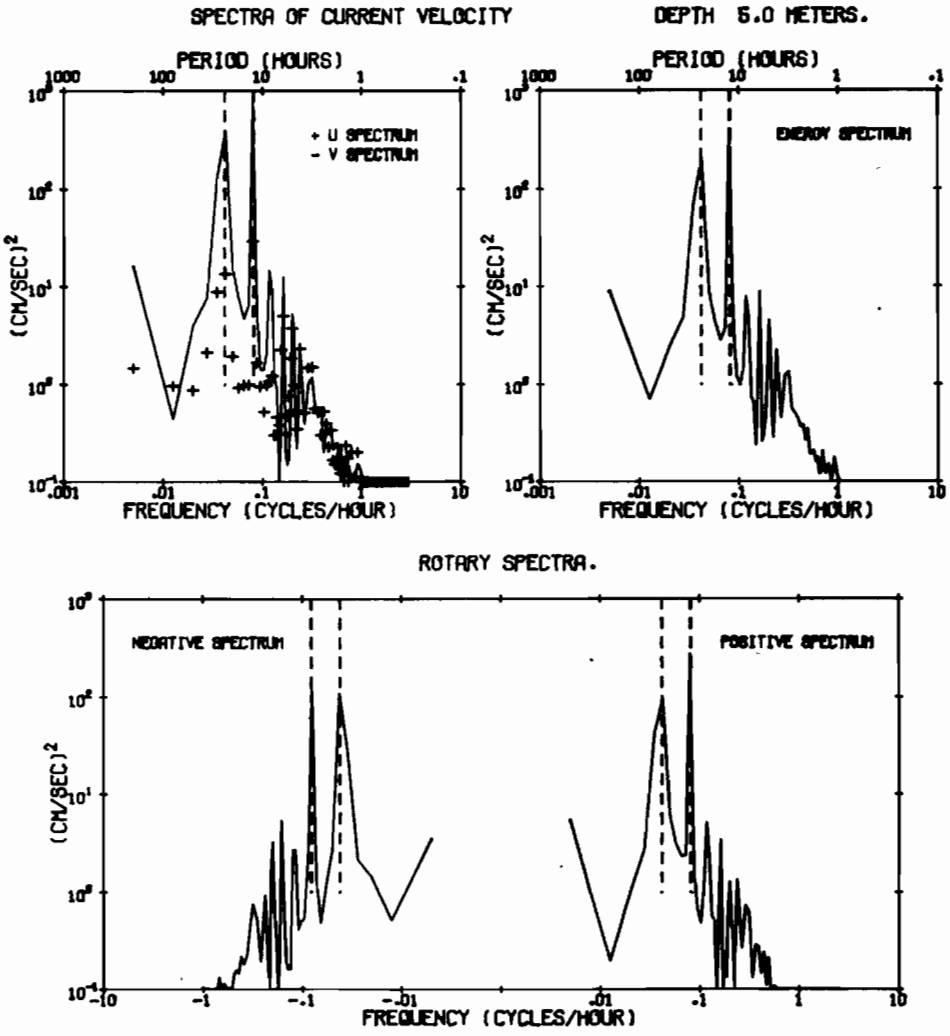


Figure 19.4. Current Meter Station 48 (-5m): Spectra.

STATISTICS OF 73 SAN JUAN 48 LAT 48 35.21N LONG 122 13.28W
DEPTH 270.0 METERS NUMBER OF OBSERVATIONS = 2400
OBSERVATION PERIOD 16.7 DAYS FROM 0120 GMT 3 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	52.80	1457.08	38.17	.812	2.95	178.00	0.00
U	-7.43	1010.24	31.78	-1.380	7.37	115.04	-175.05
V	18.02	2855.10	53.43	.047	2.42	177.74	-146.20

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

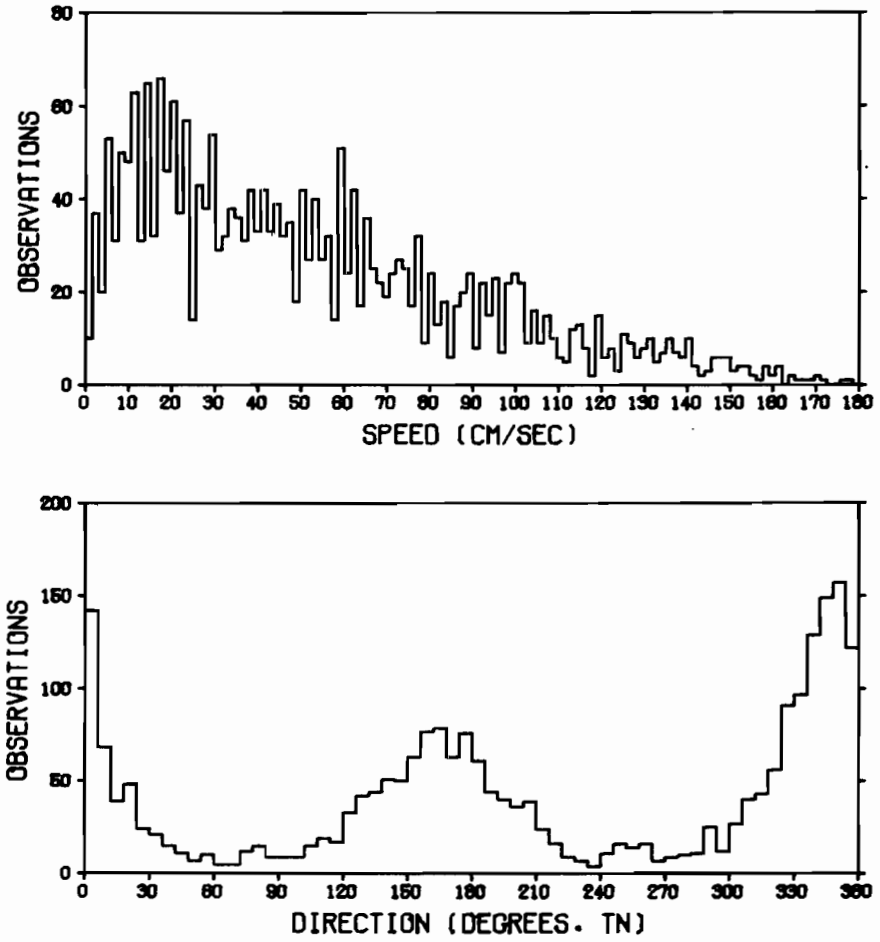


Figure 20.1. Current Meter Station 48 (-270m): Standard statistics and histograms.

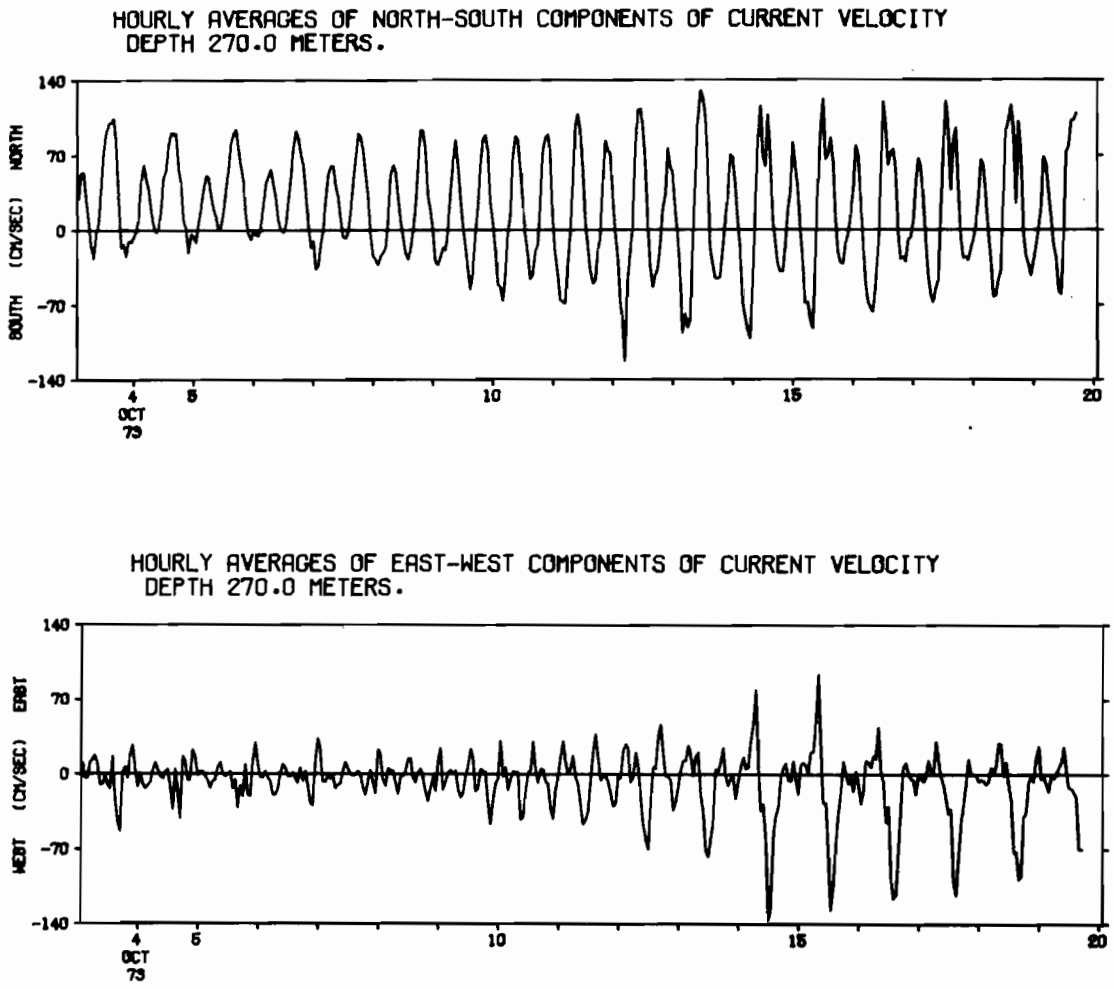


Figure 20.2. Current Meter Station 48 (-270m): Time series.

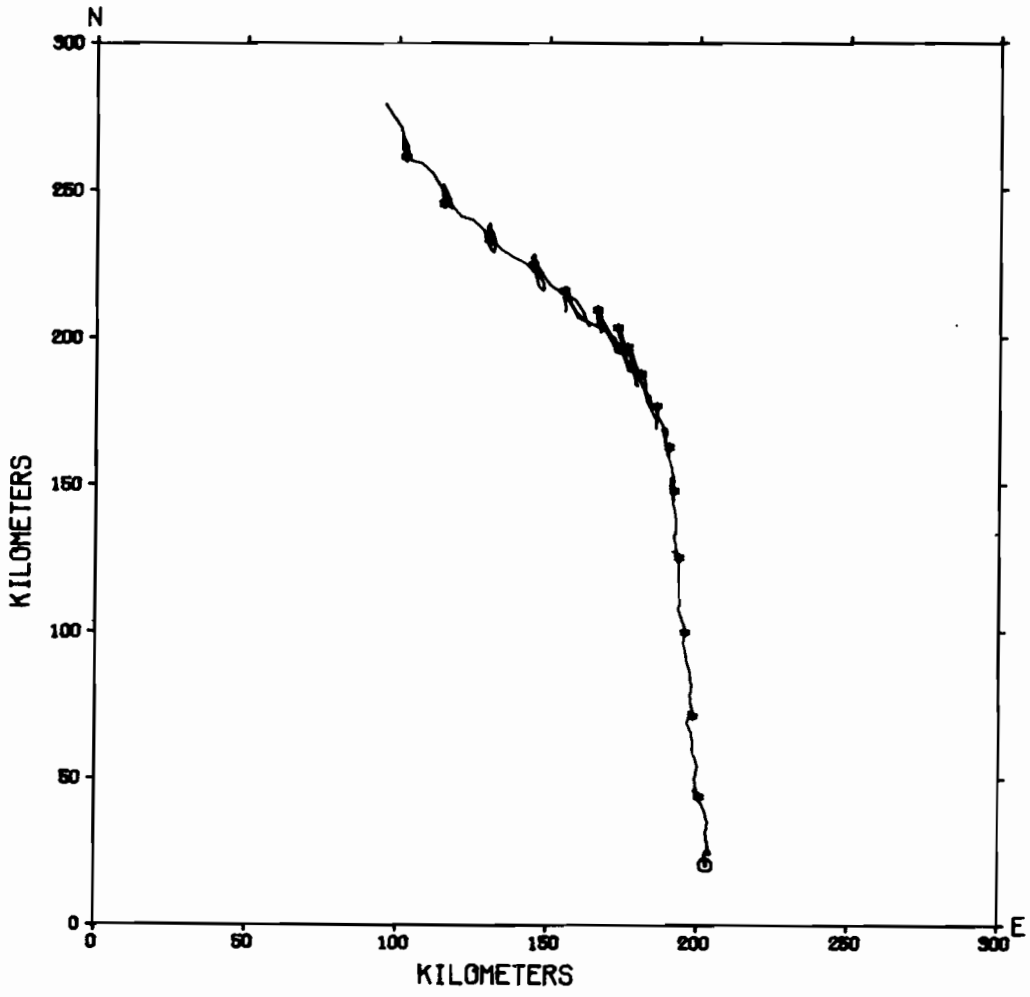


Figure 20.3. Current Meter Station 48 (-270m): Progressive Vector Diagram (PVD).

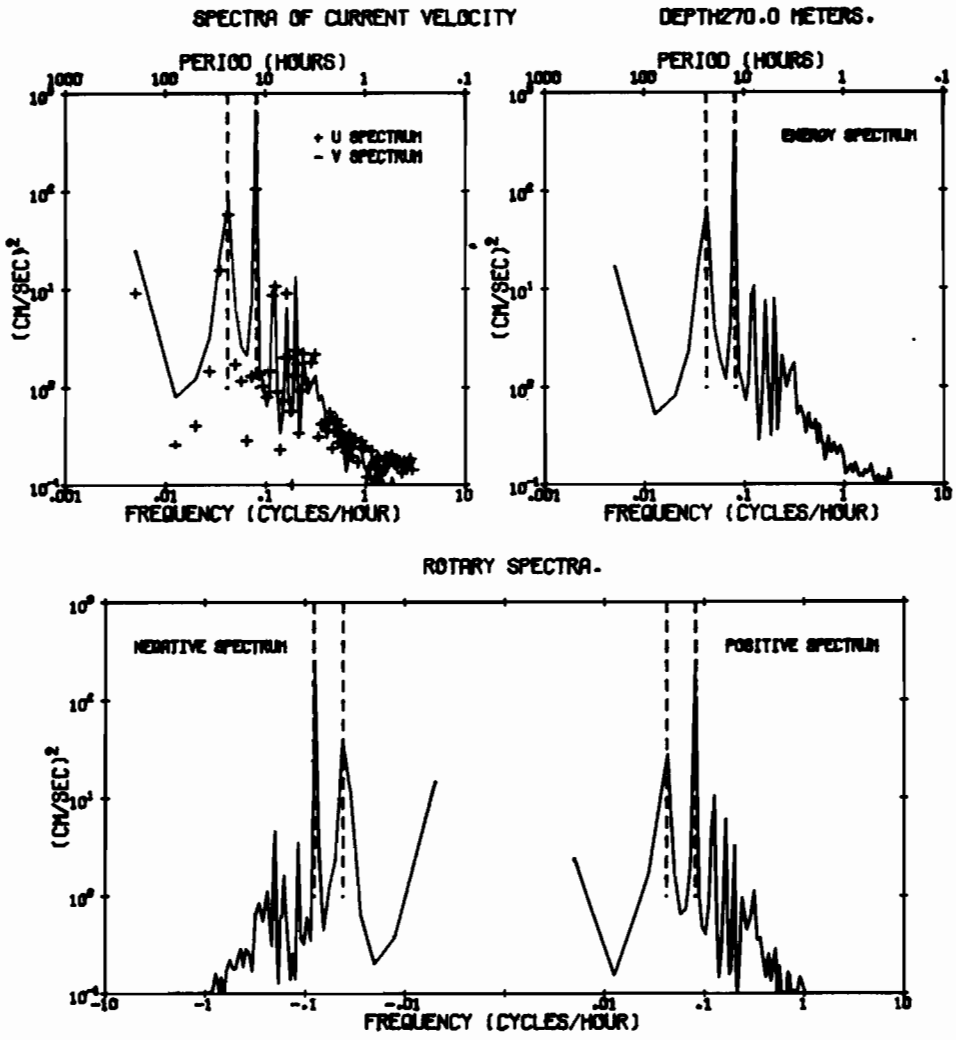


Figure 20.4. Current Meter Station 48 (-270m): Spectra.

STATISTICS OF 73 SAN JUAN 37 LAT 48 45.14N LONG 122 58.34W
DEPTH 22.0 METERS NUMBER OF OBSERVATIONS = 2400
OBSERVATION PERIOD 16.7 DAYS FROM 2122 GMT 2 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	47.76	762.62	27.62	.904	3.52	161.00	2.00
U	7.93	908.67	30.14	-.110	2.73	109.47	-78.82
V	12.80	1907.91	43.68	.384	2.55	154.77	-87.66

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

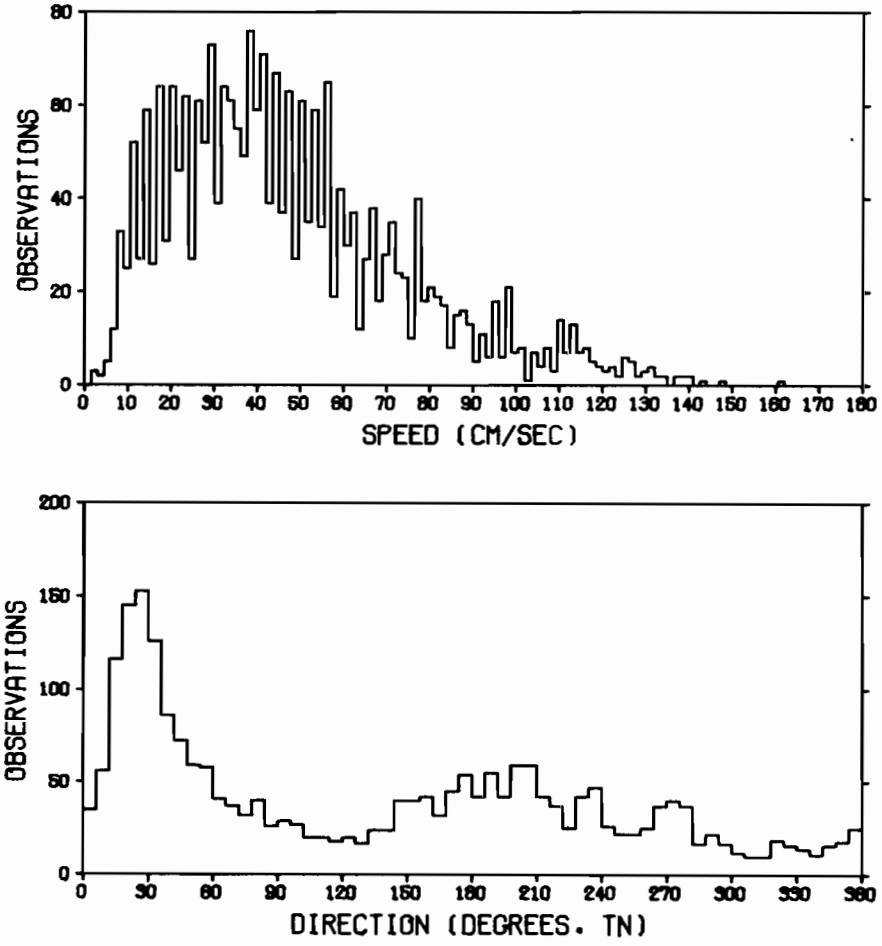


Figure 21.1. Current Meter Station 37 (-22m): Standard statistics and histograms.

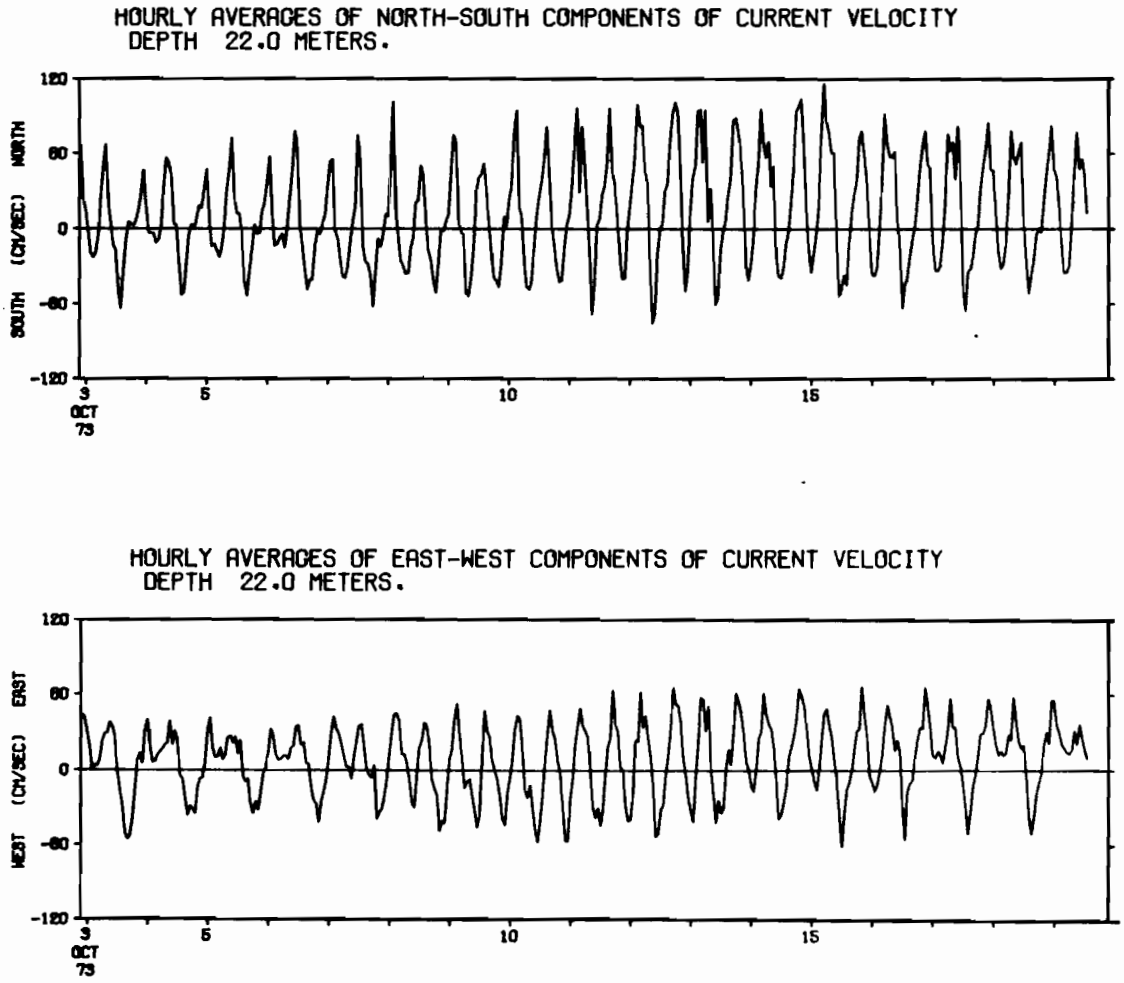


Figure 21.2. Current Meter Station 37 (-22m): Time series.

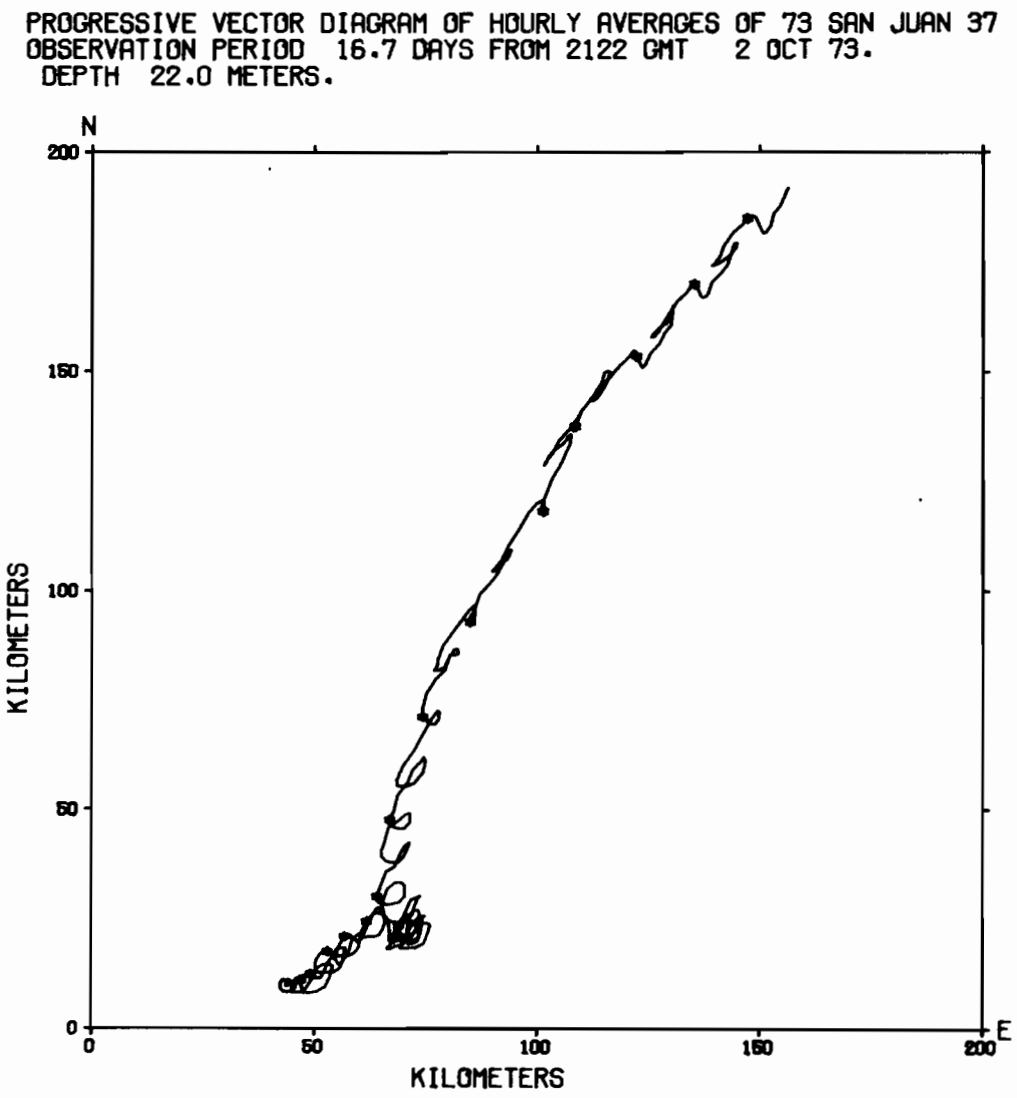


Figure 21.3. Current Meter Station 37 (-22m): Progressive Vector Diagram (PVD).

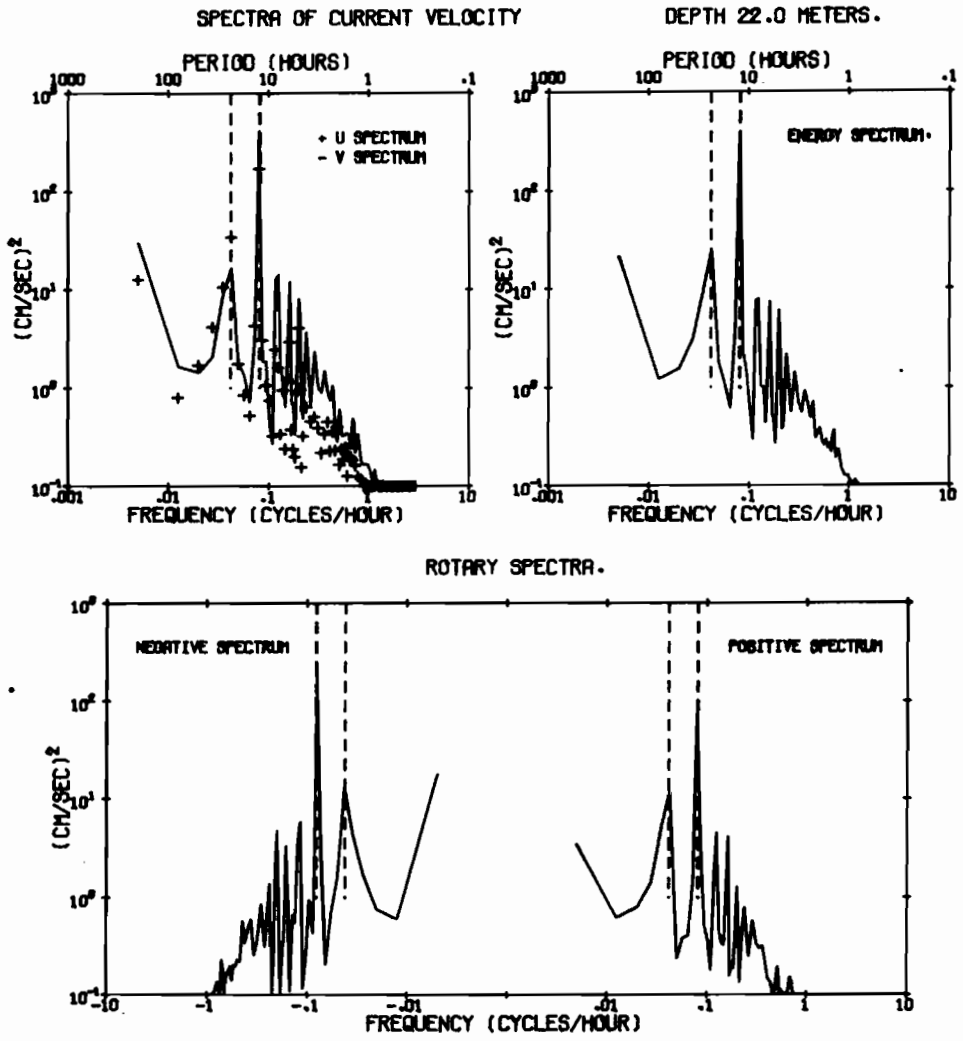


Figure 21.4. Current Meter Station 37 (-22m): Spectra.

STATISTICS OF 73 SAN JUAN 37 LAT 48 45.14N LONG 122 58.34W
DEPTH 120.0 METERS NUMBER OF OBSERVATIONS = 2400
OBSERVATION PERIOD 16.7 DAYS FROM 2130 GMT 2 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	32.36	578.41	24.05	.936	3.70	183.00	0.00
U	6.71	354.26	18.82	-.233	4.51	95.38	-85.15
V	-1.19	1224.57	34.99	.462	3.59	104.86	-169.72

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

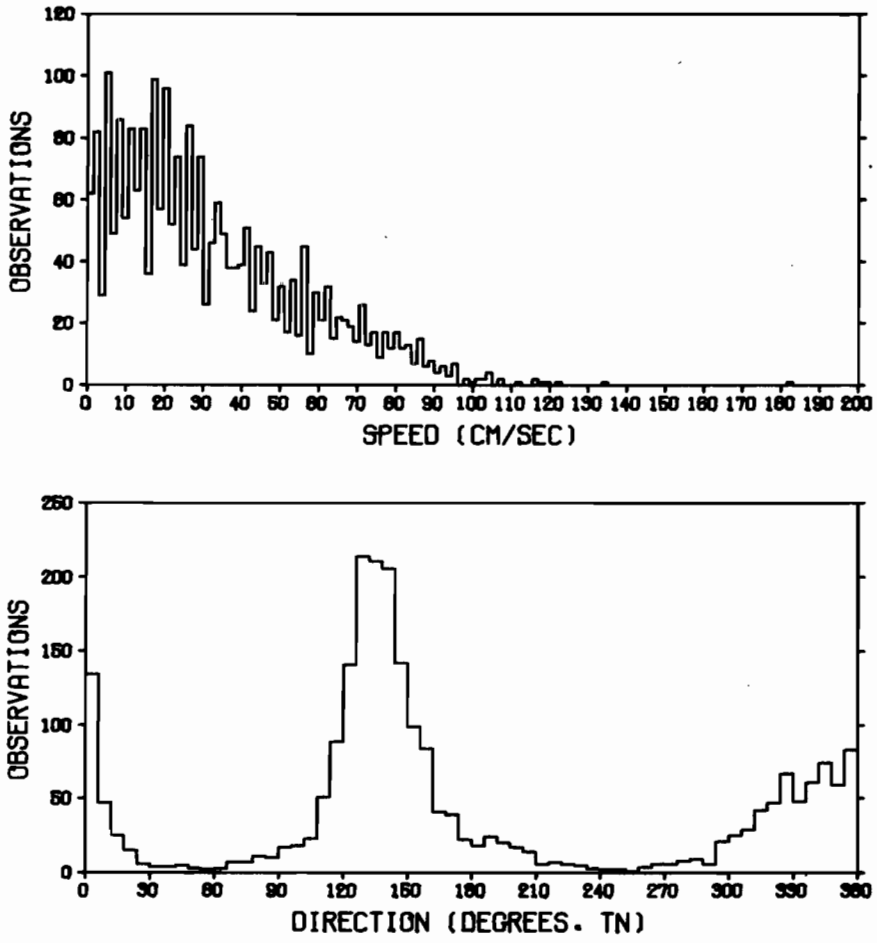


Figure 22.1. Current Meter Station 37 (-120m): Standard statistics and histograms.

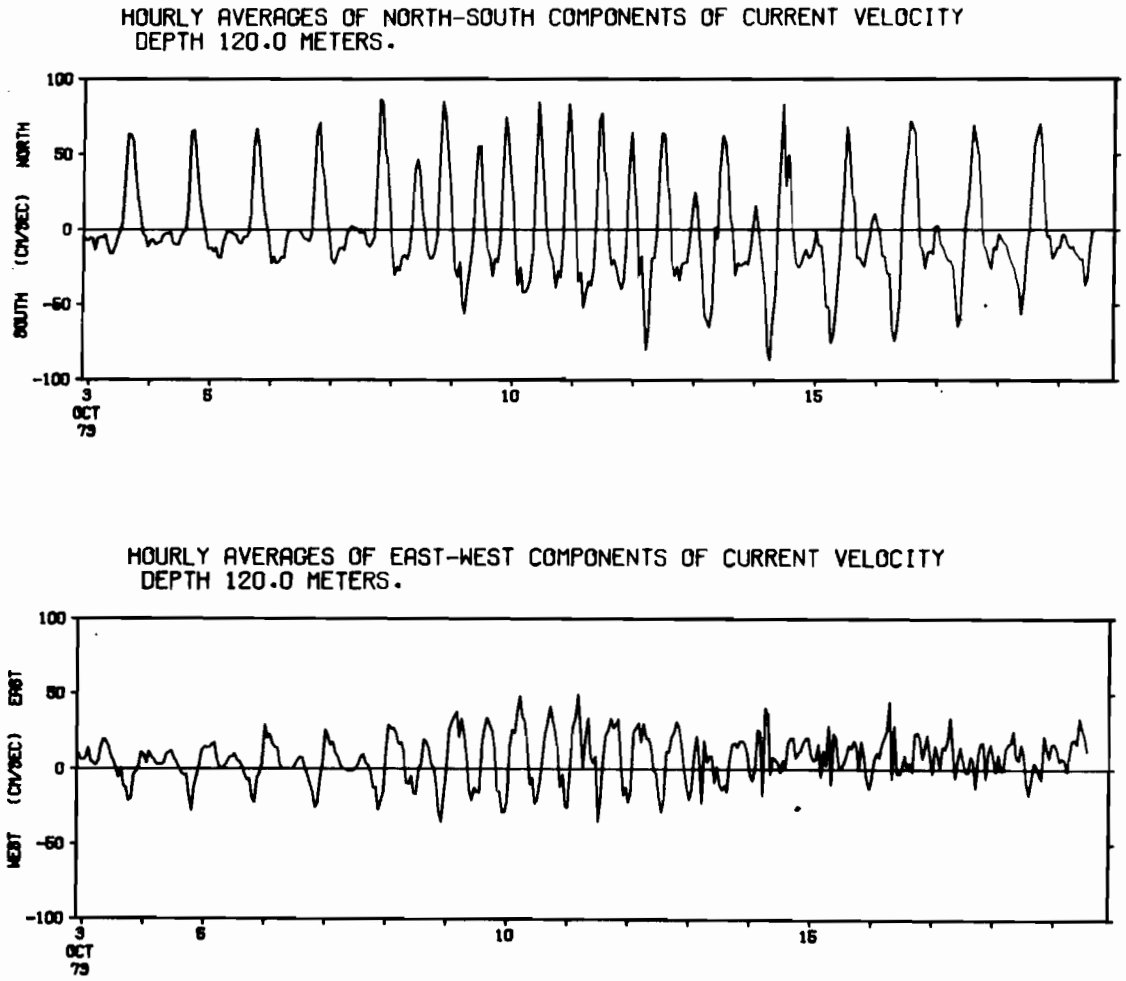


Figure 22.2. Current Meter Station 37 (-120m): Time series.

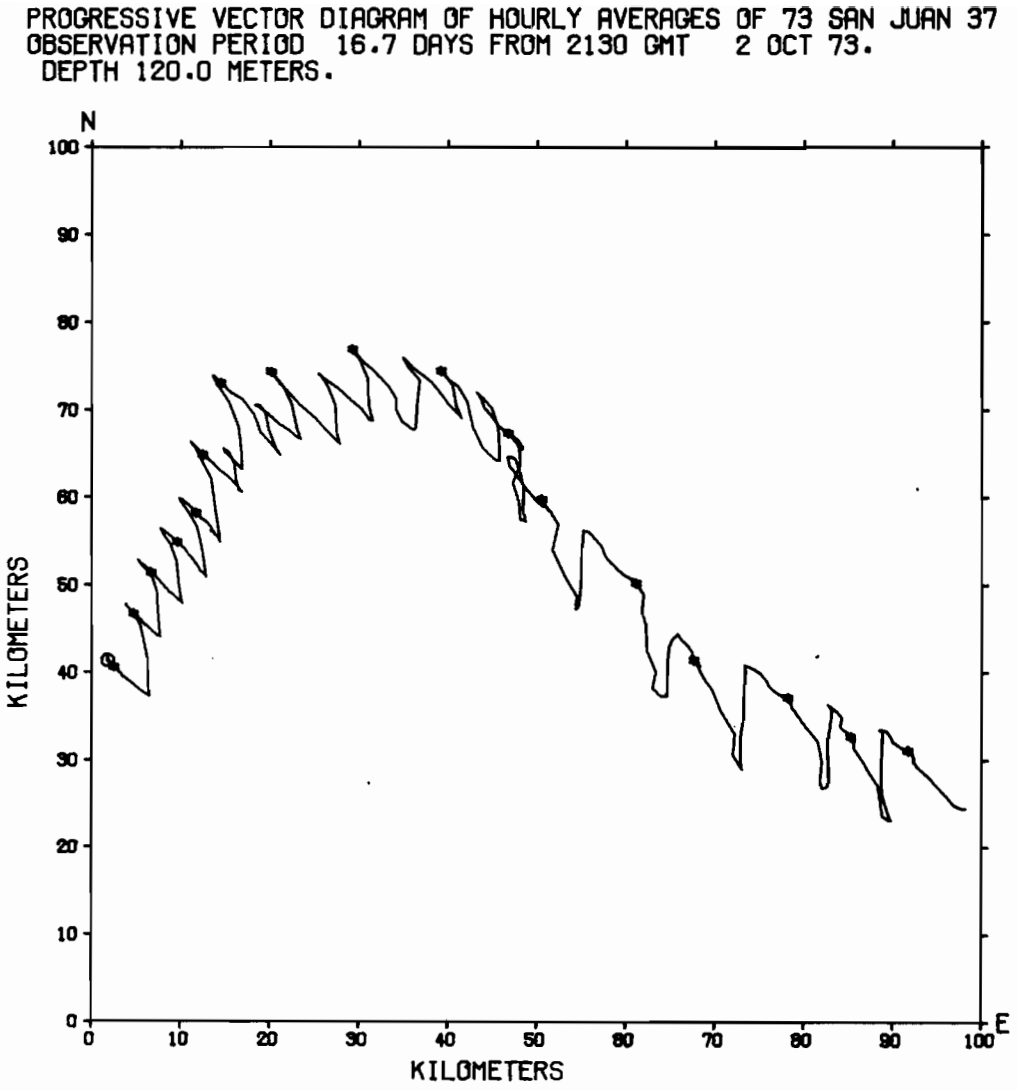


Figure 22.3. Current Meter Station 37 (-120m): Progressive Vector Diagram (PVD).

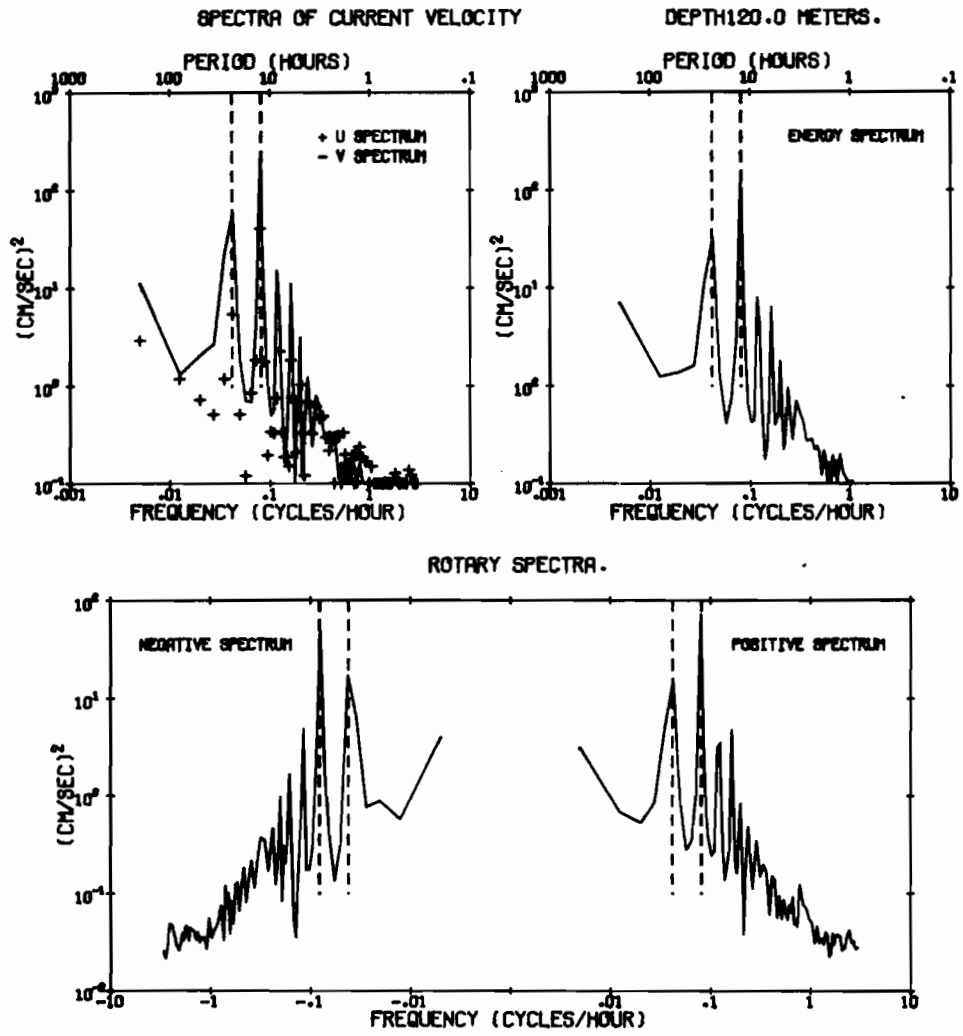


Figure 22.4. Current Meter Station 37 (-120m): Spectra.

STATISTICS OF 73 SAN JUAN 26 LAT 48 40.51N LONG 122 42.52W
DEPTH 5.0 METERS NUMBER OF OBSERVATIONS = 2400
OBSERVATION PERIOD 16.7 DAYS FROM 0054 GMT 2 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	50.83	1081.50	32.89	1.029	4.01	187.00	0.00
U	10.35	642.36	25.34	-.413	3.53	79.80	-123.14
V	-3.37	2904.00	53.89	.629	3.41	186.54	-134.97

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

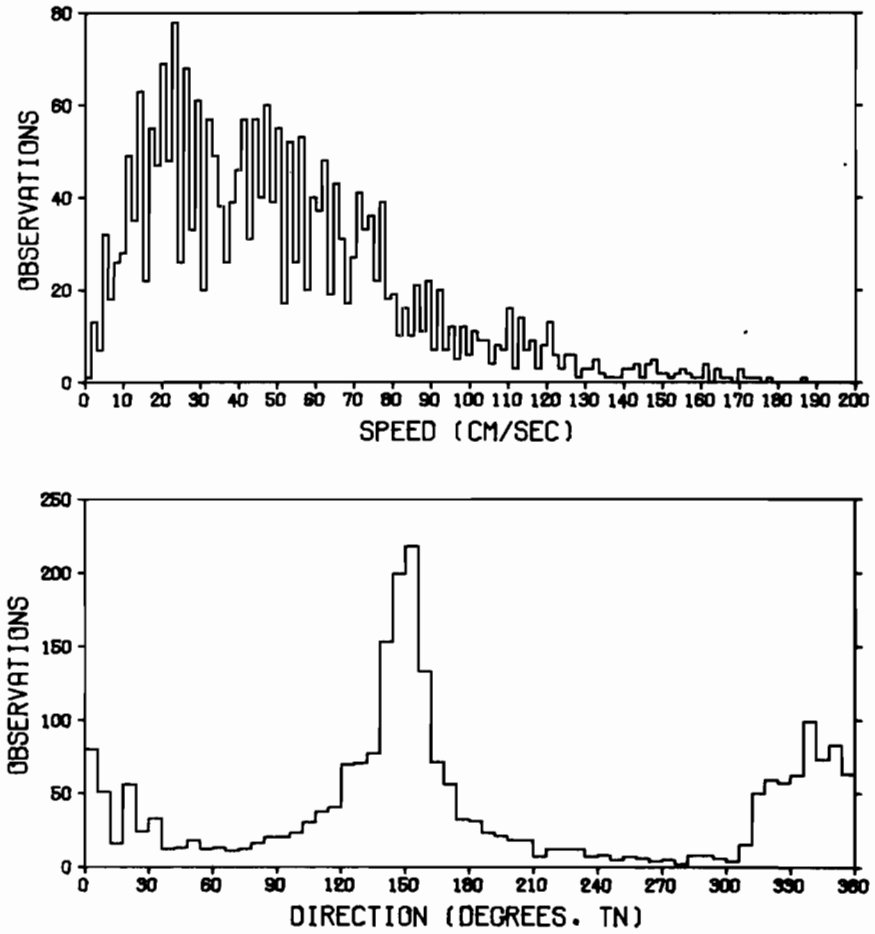


Figure 23.1. Current Meter Station 26 (-5m): Standard statistics and histograms.

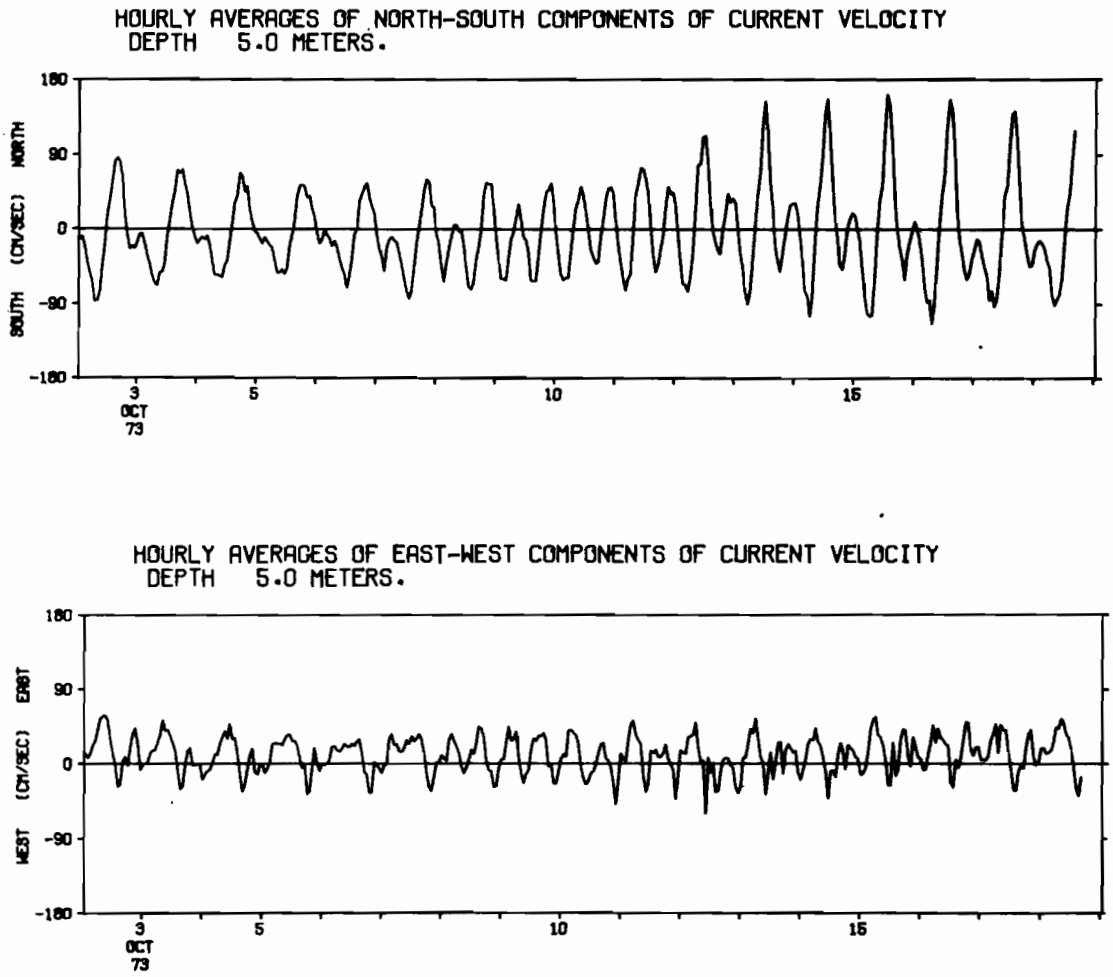


Figure 23.2. Current Meter Station 26 (-5m): Time series.

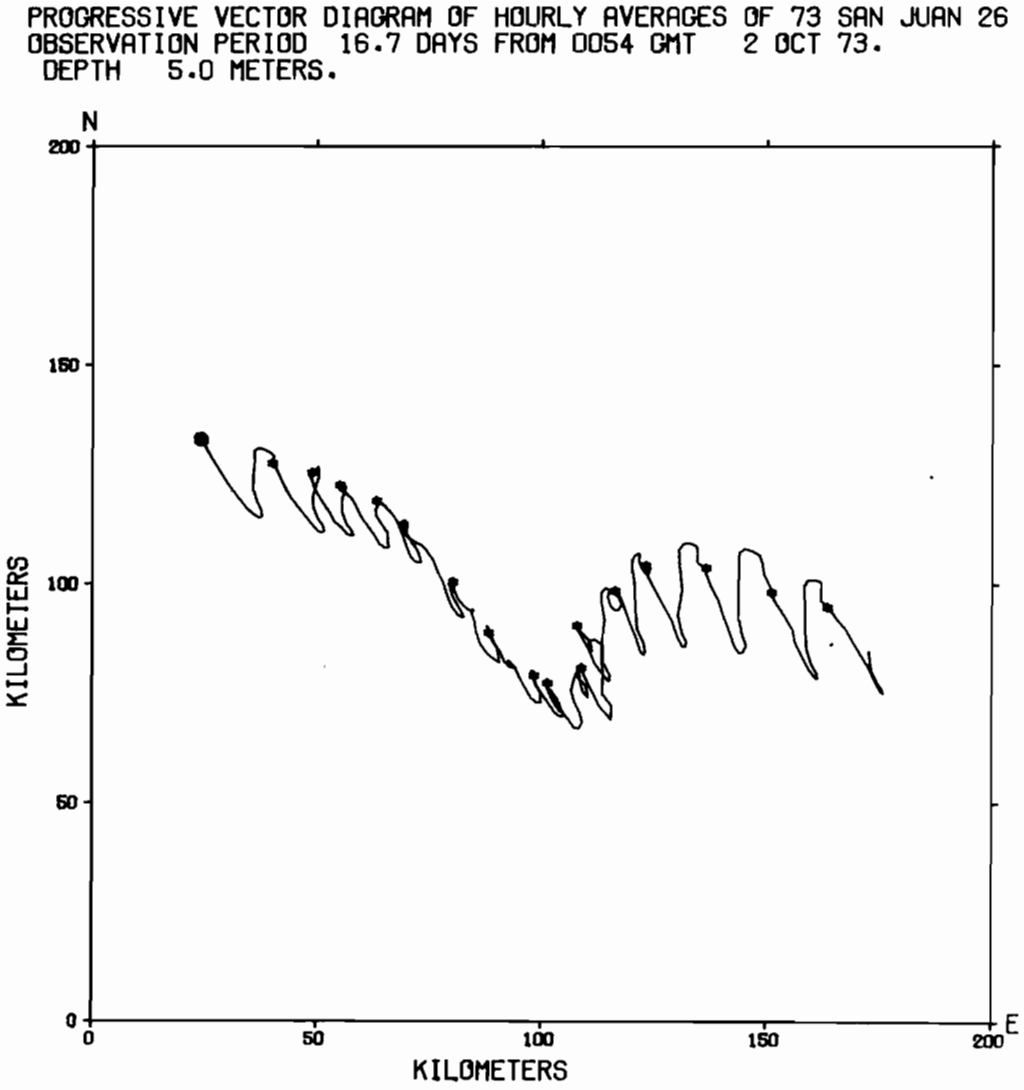


Figure 23.3. Current Meter Station 26 (-5m): Progressive Vector Diagram (PVD).

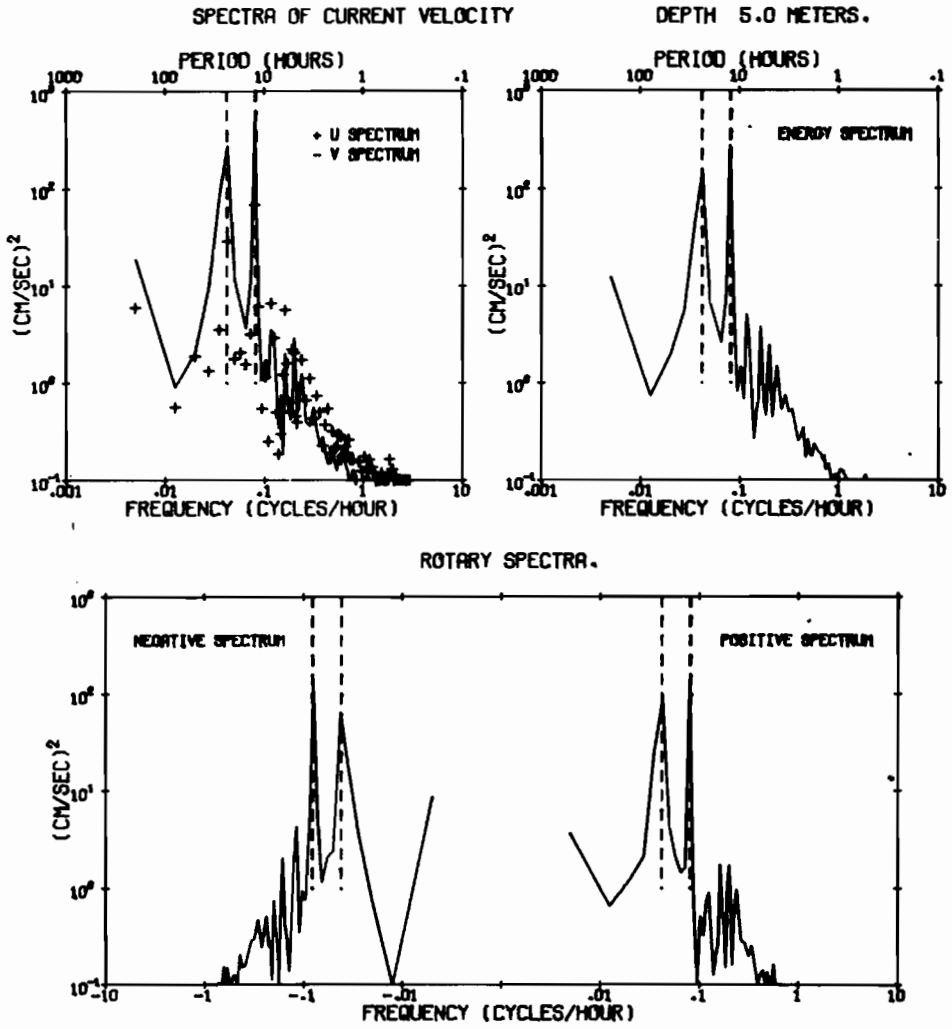


Figure 23.4. Current Meter Station 26 (-5m): Spectra.

STATISTICS OF 73 SAN JUAN 26 LAT 48 40.51N LONG 122 42.52W
DEPTH 22.0 METERS NUMBER OF OBSERVATIONS = 2400
OBSERVATION PERIOD 16.7 DAYS FROM 0052 GMT 2 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	47.34	1027.22	32.05	1.047	3.92	175.00	0.00
U	10.02	485.09	22.02	-.064	2.93	86.87	-68.10
V	1.28	2680.90	51.78	.528	3.18	173.75	-114.17

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V

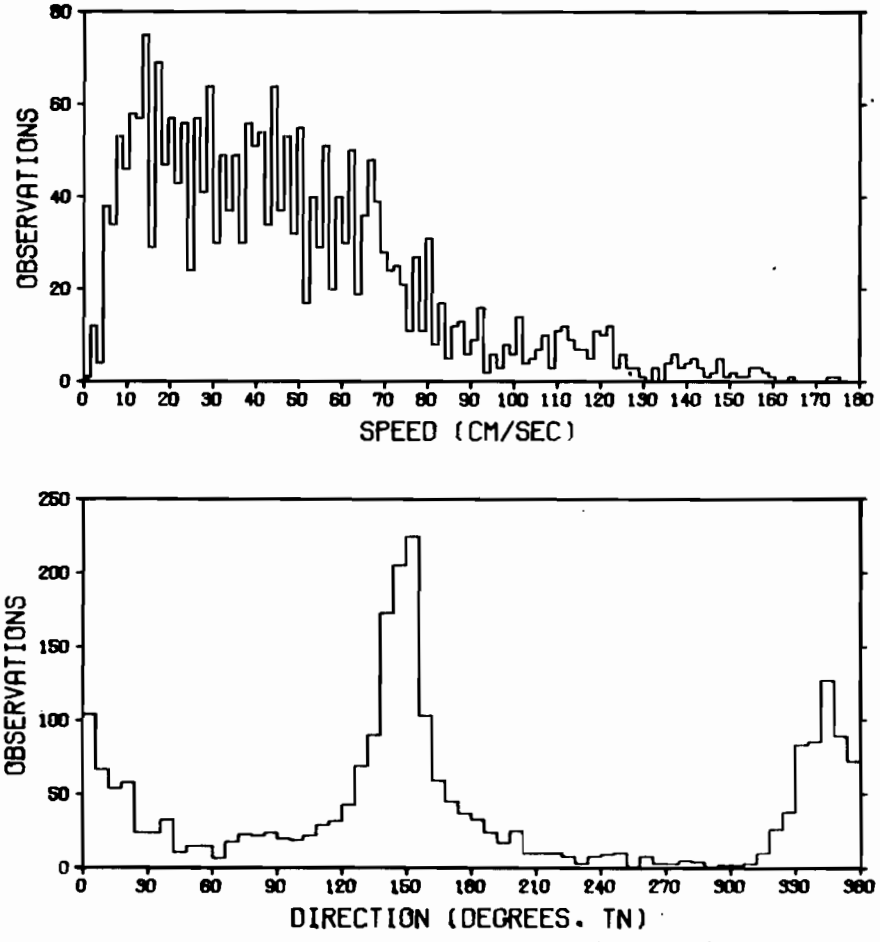


Figure 24.1. Current Meter Station 26 (-22m): Standard statistics and histograms.

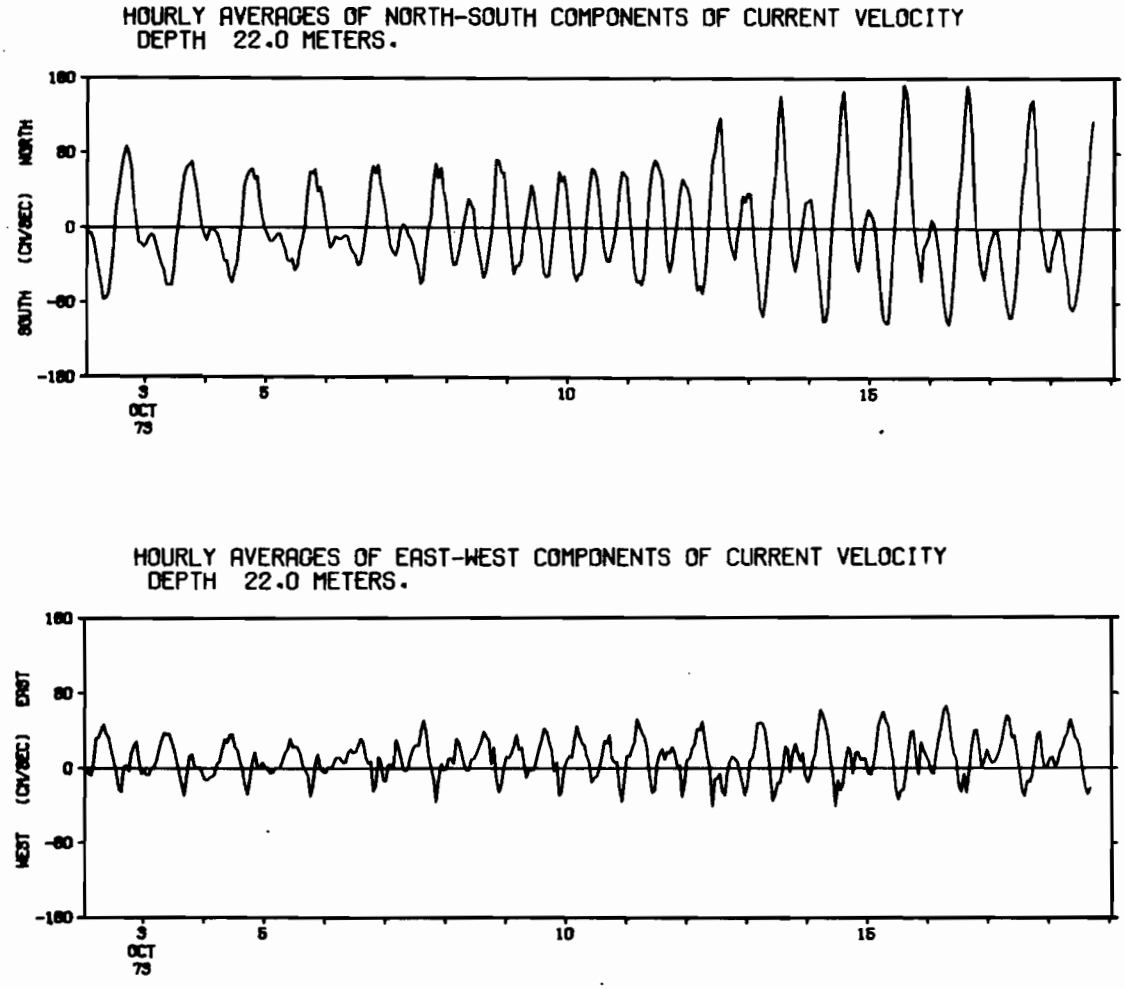


Figure 24.2. Current Meter Station 26 (-22m): Time series.

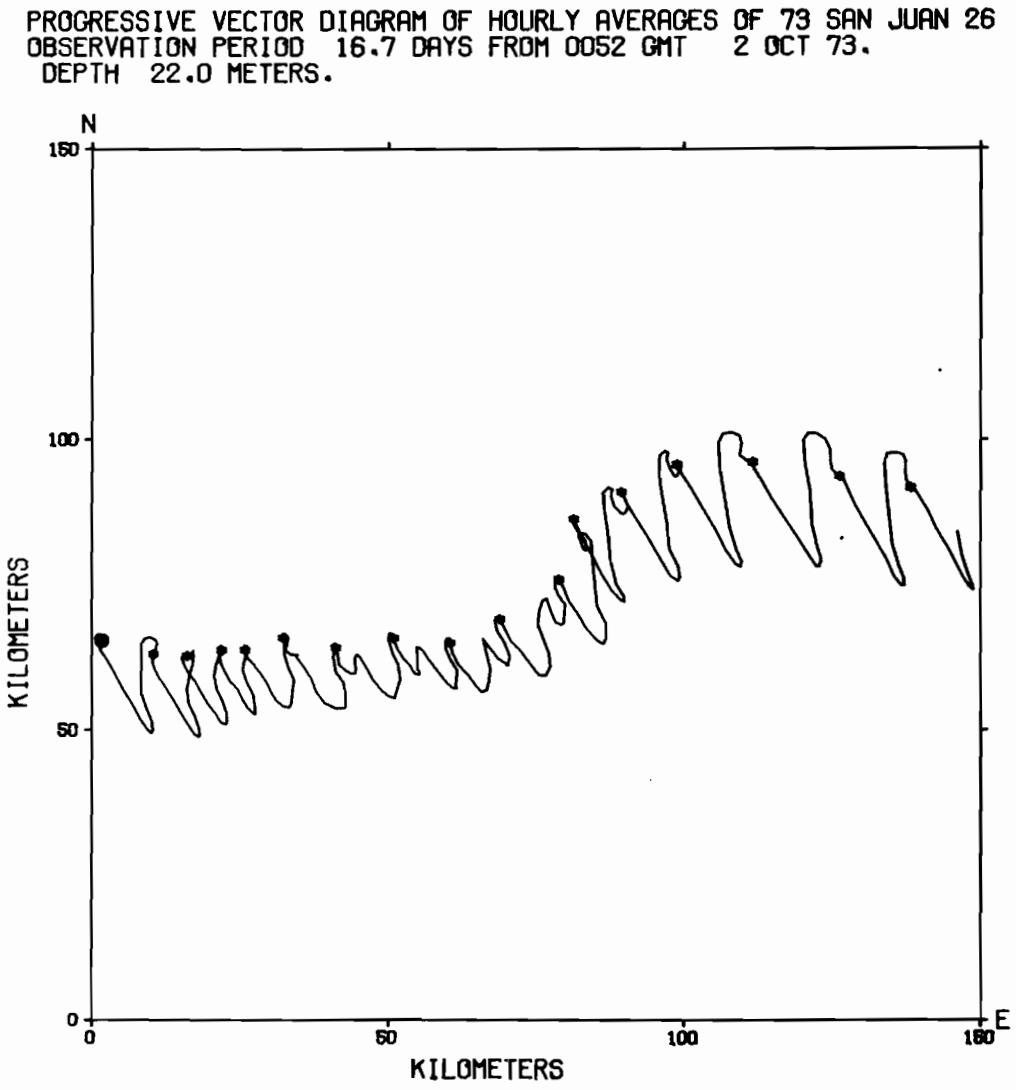


Figure 24.3. Current Meter Station 26 (-22m): Progressive Vector Diagram (PVD).

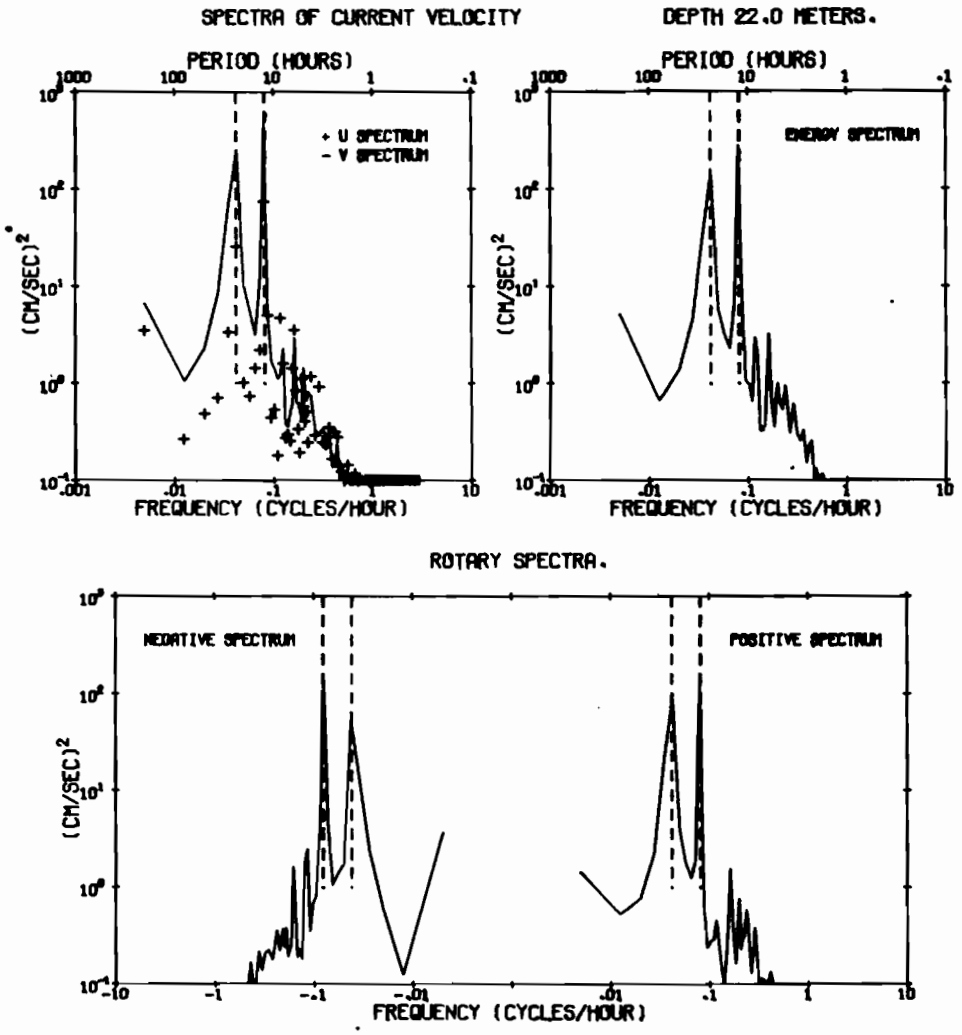
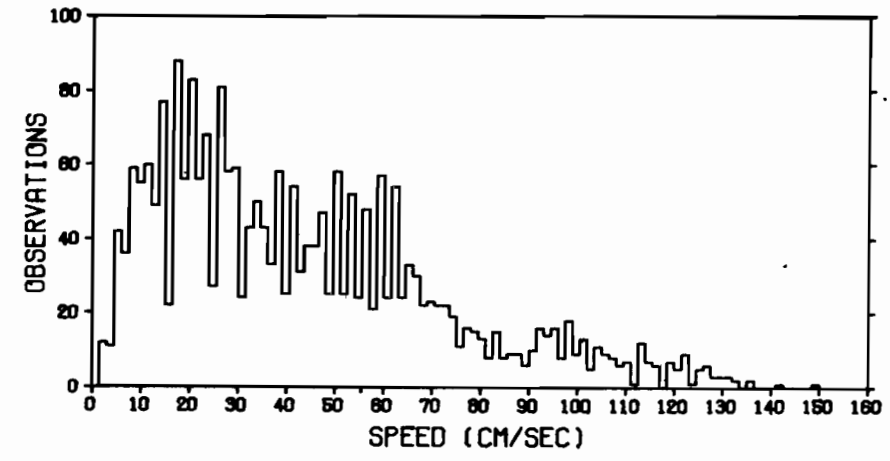


Figure 24.4. Current Meter Station 26 (-22m): Spectra.

STATISTICS OF 73 SAN JUAN 26 LAT 48 40.51N LONG 122 42.52W
DEPTH 77.0 METERS NUMBER OF OBSERVATIONS = 2400
OBSERVATION PERIOD 16.7 DAYS FROM 0050 GMT 2 OCT 73

	MEAN (CM/SEC)	VARIANCE (CM/SEC)2	ST-DEV (CM/SEC)	SKEW	KURT	MAX (CM/SEC)	MIN (CM/SEC)
S	43.62	846.05	29.09	.880	3.22	150.00	2.00
U	2.74	1556.75	39.46	-.146	3.00	108.98	-122.18
V	3.36	1172.81	34.25	.578	3.89	132.00	-103.04

S = SPEED
U = EAST-WEST COMPONENT OF VELOCITY, EAST = POSITIVE U
V = NORTH-SOUTH COMPONENT OF VELOCITY, NORTH = POSITIVE V



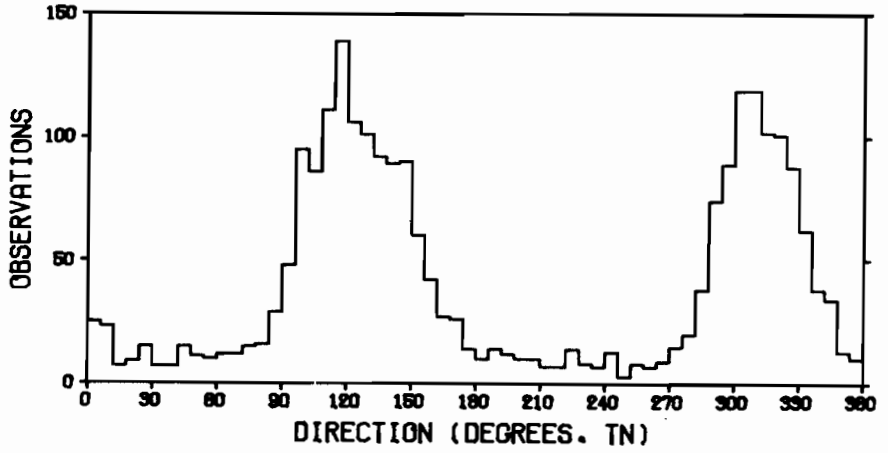


Figure 25.1. Current Meter Station 26 (-77m): Standard statistics and histograms.

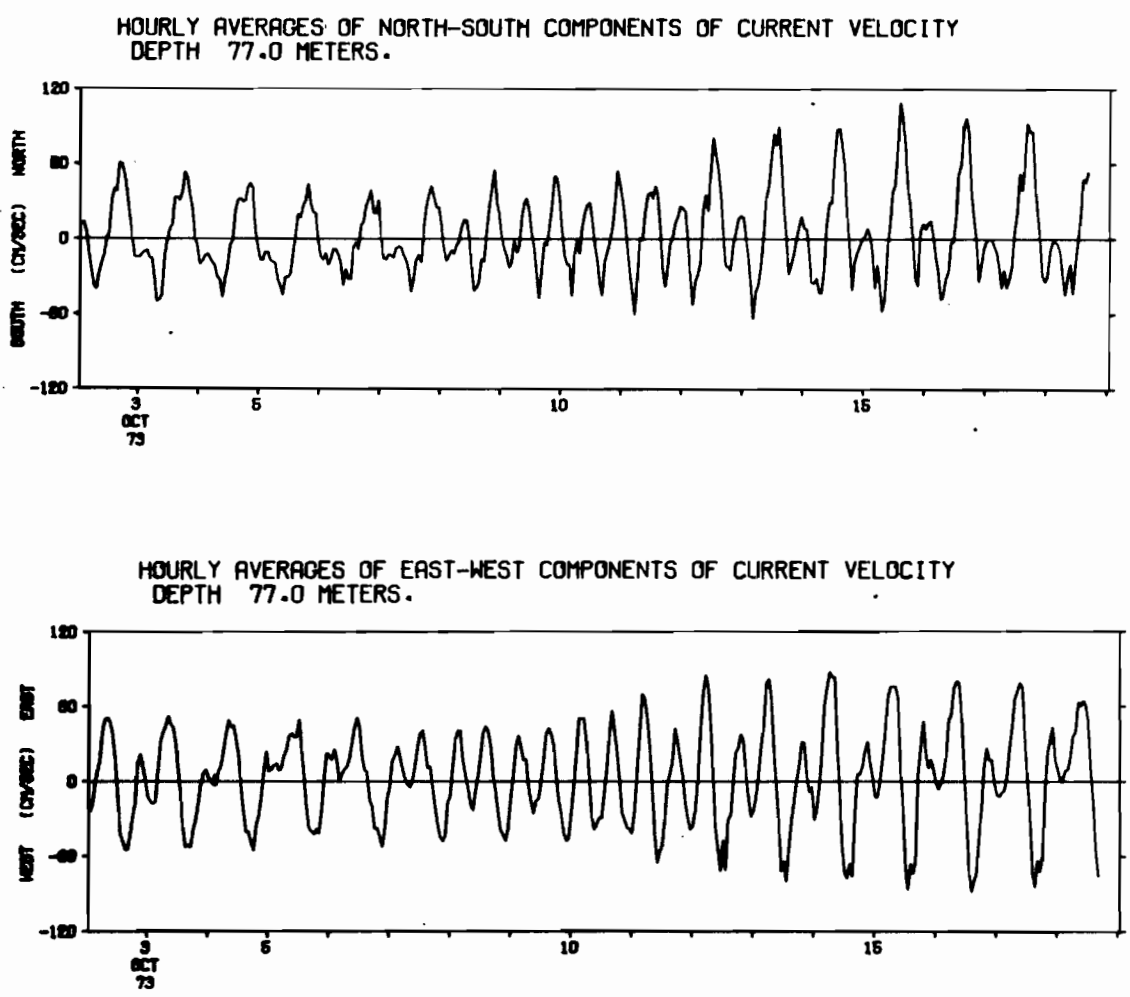


Figure 25.2. Current Meter Station 26 (-77m): Time series.

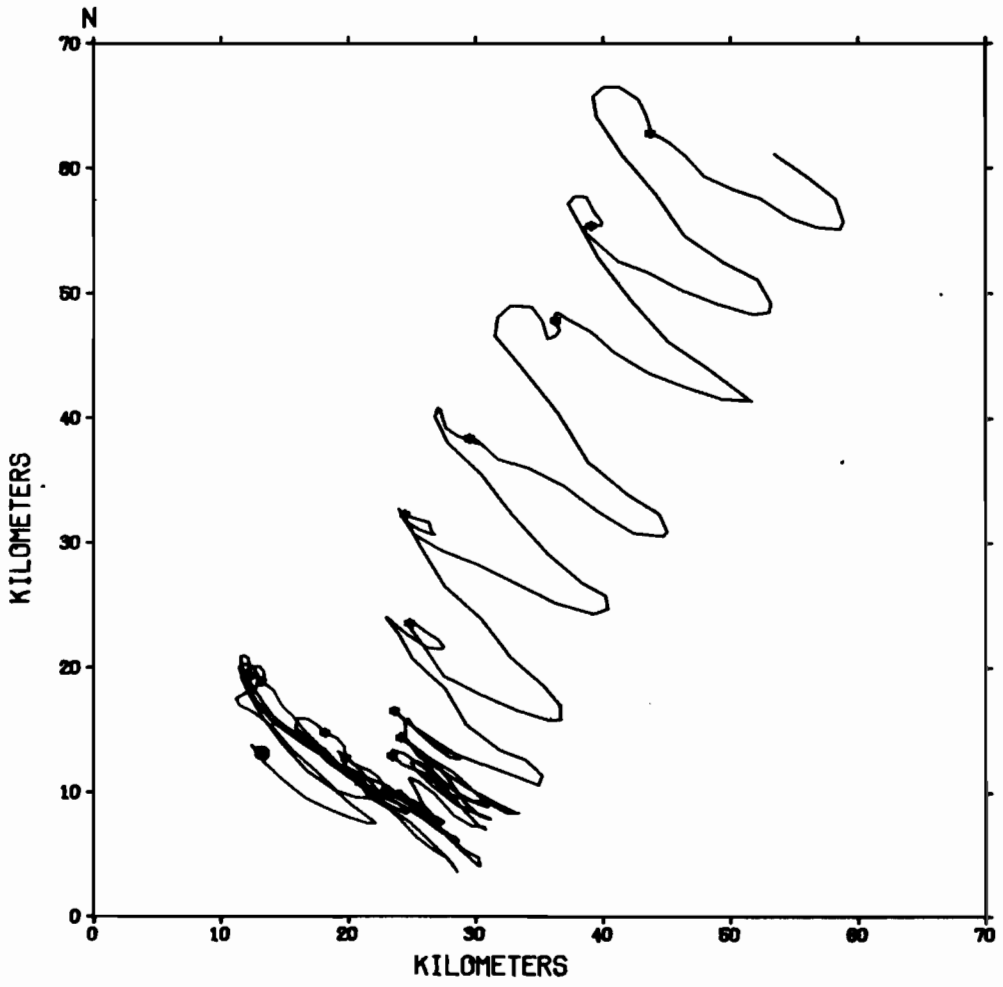


Figure 25.3. Current Meter Station 26 (-77m): Progressive Vector Diagram (PVD).

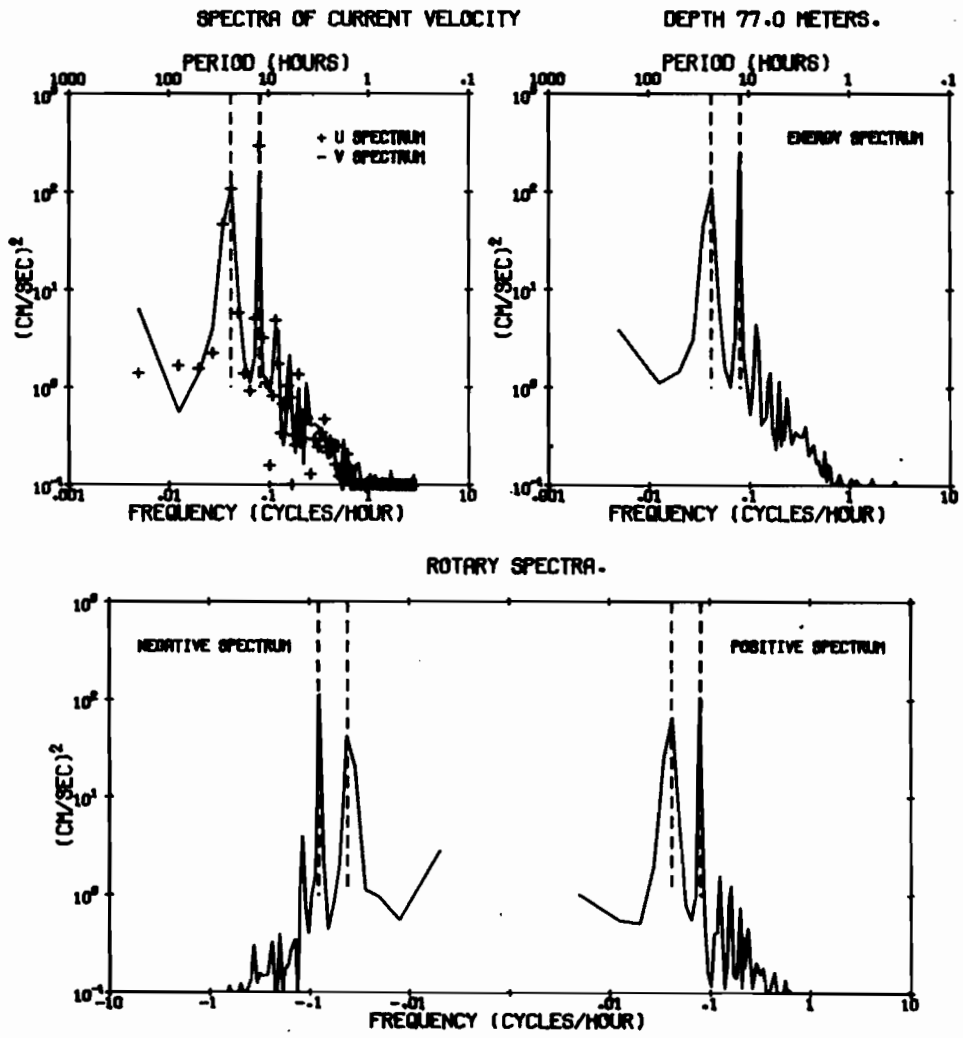


Figure 25.4. Current Meter Station 26 (-77m): Spectra.