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CURRENT METER MOORINGS IN THE REGION OF PRYDZ BAY, ANTARCTICA, 1987

by

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ABSTRACT

Five moorings of current meters were deployed during 1987. Information on water speed, direction, temperature, and in some cases, depth and conductivity was collected at different depths.

These moorings were divided into two deployment periods. A full year deployment, March 1987 to February 1988, hereafter referred to as the 'winter' deployment, and a 'summer' deployment lasting almost four months, released in October 1987.

The winter deployment consisted of three moorings, one with three meters, one with four meters and one with two meters. The summer deployment was of two moorings, both with four current meters.

The reduced data and notes on the data acquisition methods and locations are presented. Some initial comments on the characteristics of the data are given and some speculation on the implication of the data is included.

Data are available in other forms at the cost of reproduction from the Assistant Director of Science, Antarctic Division, Kingston, Tasmania, Australia.

1. INTRODUCTION

These data have been collected as part of a program between the Victorian Institute of Marine Sciences and the Antarctic Division. The data deriving from this work are relevant to much of the marine scientific work being undertaken in Antarctica, and to the understanding of the geophysical fluid dynamics in the area.

The objectives of the data acquisition were to characterise the physical oceanography of the area, and to provide a database of sufficient integrity for use in the development of a two and three dimensional numerical model of the circulation in Prydz Bay. This is the third in a phased collection program to be sustained over several years. The data from the previous deployments are available in the *ANARE Research Notes* series (Hodgkinson et al. 1988, Hodgkinson et al. 1991).

The data in this report are from March 1987 to February 1988.

Five moorings with two, three or four current meters were deployed, with each meter monitoring water temperature, speed and direction, and for some meters, depth and conductivity.

2. PRYDZ BAY AND MOORING LOCATIONS

The study region is bordered by the 60° E and 85° E meridians, the 60° S parallel, and by the antarctic continent to the south. The region is almost 700 km along the northern boundary, and 200 km from north to south. Water depths vary from 150 m to almost 1300 m. Figure 1 shows the bay, its bathymetry, the location of the current meters and relevant features of the region.

Mooring 1 was located to the east of Prydz Bay in shallow water of 228 m. This was the deepest spot that could be found in the vicinity. It was surrounded by many large icebergs and pack ice. This mooring was not recovered.

Mooring 2 was deployed in the south-west part of Prydz Bay. The seabed is relatively flat in this area, with the bottom at 565 m depth. This was successfully recovered 21 February 1988.

Mooring 3 was deployed off the continental shelf to the north-east, in 3000 m of water. An attempt was made to recover this in 1988. The release responded and fired, but the mooring stayed in position. It was still there at the end of February 1988.

Mooring 4 was located on comparatively flat bottom at the edge of the continental shelf to the north of Prydz Bay in 539 m of water. This mooring was not recovered.

Mooring 5 was deployed in the south-east of Prydz Bay in 710 m of water. The seabed slopes southward from the mooring site to a depth of almost 1300 m. This was successfully recovered February 22, 1988.

Tables 1, 2, 3 and 4 list the locations and periods of measurement of the current meters.

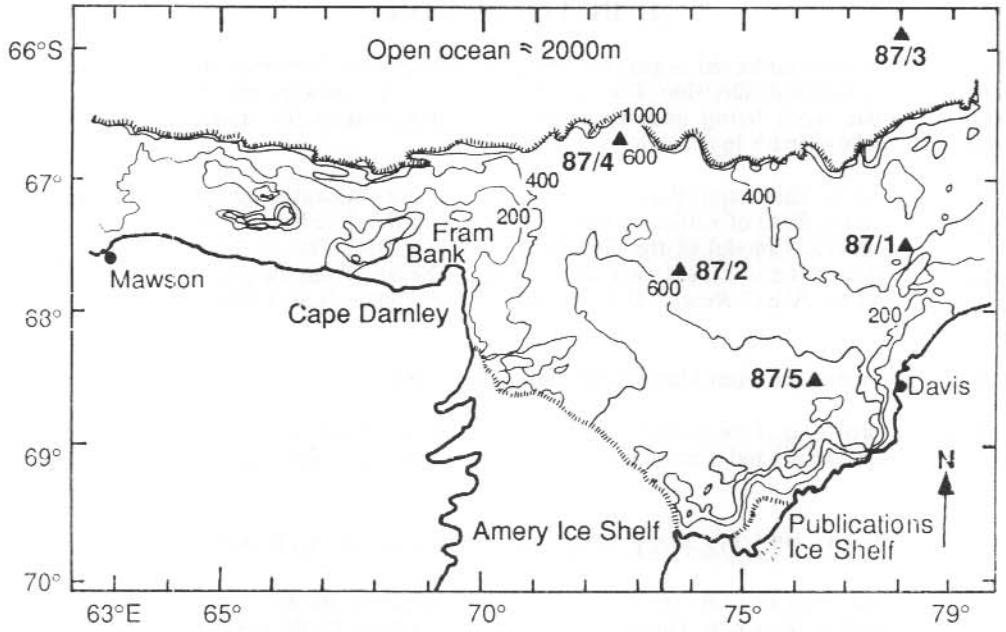

Figure 1. Prydz Bay showing bathymetry and location of current meters.

3. MOORING CONFIGURATIONS

Mooring 1 was a shallow deployment of a single meter with a target depth of 100 - 200 m depending on water depth and terrain found.

Mooring 2 consisted of two Aanderaa current meters with current meter deployment depths of 223 and 425 m, and an S4 current vector-averaging meter at 123 m from the surface.

Mooring 3 was designed to be deployed off the continental shelf as a 3000 m string. Two Aanderaa current meters were used, at target depths of 300 and 1500 m.

Mooring 4 consisted of four Aanderaa current meters with current meter deployment depths of 182, 328, 430 and 512 m.

Mooring 5 also consisted of four Aanderaa current meters with current meter deployment depths of 273, 419, 567 and 670 m.

Buoyancy for these strings was provided by Ferranti or Benthos 17 inch glass buoys.

Of the 12 current meters deployed 6 were recovered. All meters produced good data except one which had corrupted data due to a recording fault.

Tables 3 and 4 summarise the recording periods and parameters recorded for the recovered current meters.

Table 1. Location, depths and periods of current meters, Prydz Bay, Antarctica, winter 1987.

Meter Num	Tape Num	Instr Depth (m)	Ocean Depth (m)	Latitude (deg. S)	Longitude (deg. E)	Number Recs.	Inter (Min.)	Period From	To
S4	1	123	565	67 45.9'	73 51.4'	5380	60	1/03/87 -	11/10/87
78264	1	425	565	67 45.9'	73 51.4'	6767	60	1/03/87 -	8/12/87

Table 2. Location, depths and periods of current meters, Prydz Bay, Antarctica, summer 1987-88.

Meter Num	Tape Num	Instr Depth (m)	Ocean Depth (m)	Latitude (deg. S)	Longitude (deg. E)	Number Recs.	Inter (Min.)	Period From	To
8666	1	273	710	68 35.1'	76 38.6'	5549	30	28/10/87 -	21/02/88
8667	1	419	710	68 35.1'	76 38.6'	4165	30	28/10/87 -	25/01/88
8670	1	567	710	68 35.1'	76 38.6'	5550	30	28/10/87 -	21/02/88
8671	1	670	710	68 35.1'	76 38.6'	5549	30	28/10/87 -	21/02/88

Table 3. Summary of data collected by each current meter - winter 1987.

Instr. Number	Tape Number	Recording Interval	Temp	Sensors Enabled				NRECS
				Speed	Press	Cond	Direction	
S4	1	5:00 1/03/87 - 19:00 11/10/87	Yes	Yes	No	Yes	Yes	5380
7826	1	5:21 1/03/87 - 4:21 8/12/87	Yes	Yes	No	No	Yes	6767

Table 4. Summary of data collected by each current meter - summer 1987-88.

Instr. Number	Tape Number	Recording Interval	Temp	Sensors Enabled				NRECS
				Speed	Press	Cond	Direction	
8666	1	9:30 28/10/87 - 1:30 21/2/88	Yes	Yes	Yes	No	Yes	5549
8667	1	9:30 28/10/87 - 12:00 25/1/88	Yes	Yes	Yes	No	Yes	4275
8670	1	9:30 28/10/87 - 2:00 21/2/88	Yes	Yes	No	No	Yes	5550
8671	1	9:30 28/10/87 - 1:30 21/2/88	Yes	Yes	No	No	Yes	5549

4. REDUCTION OF DATA

The data were read from the Aanderaa tapes and the S4 solid state memory, and processed to produce a calibrated data file suitable for archiving. All data flagged as faulty were removed from the files before processing was attempted. 'Scatter', vector-sum, temperature/time and vector/time ('stick') plots were produced. Time series of all data columns from the current meters have been produced, and for the S4 time series of the standard deviation of the U (east) and V (north) velocities. Tidal current analyses have been performed for the currents from each meter.

The period of good data for each meter is listed in Figure 2.

These calibrated files consist of five lines of header information, giving details of start times, number of records, locations, etc. followed by the data in 14 column format. A listing of the first 30 lines of CM61483C.DAT (a sample file) and a full explanation of the header information is included in Appendix 1.

This report includes 'scatter' plots of U and V velocity, progressive-vector plots, 'stick' plots, tidal current analyses, and time series of all the recorded data.

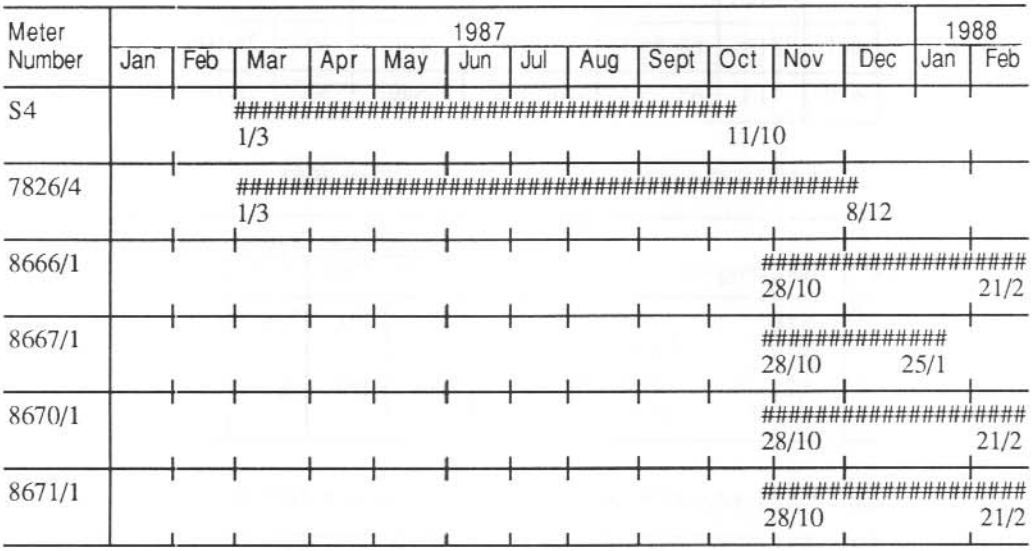

Figure 2. Periods of good data for each current meter.

5. PLOTS

5.1 SCATTER PLOTS (Appendix 2)

On all scatter diagrams, true north is to the top of the page.

5.2 PROGRESS-VECTOR PLOTS (Appendix 3)

These plot the progressive displacement of a particle starting at time zero and the location of the mooring and subject to the currents recorded by the current meter during the time period indicated. Care must be taken not to confuse this type of plot with an actual track plot taken by a 'parcel of water' in this area; the current at the indicated location in space is not necessarily the same as that at the location of the current meter at this later time. On all of these diagrams true north is to the top of the page and east is to the right.

5.3 TIMES SERIES (Appendix 4)

These are direct plots of speed, direction, U (east) velocity, V (north) velocity, and temperature against time using unfiltered data, so that diurnal fluctuations are evident as well as seasonal trends. Where applicable, depth, conductivity and velocity standard deviations are also presented.

5.4 STICK PLOTS (Appendix 5)

These plots illustrate the way in which current vectors change with time; vectors at two hourly intervals are plotted. The length of the stick represents the speed of the current, while the orientation of the stick indicates the direction of the currents with true north at the top.

5.5 TIDAL ANALYSES (Appendix 6)

Tidal current analyses were obtained by separate analysis of the U (due east) and V (due north) columns, which are then combined to produce ellipse parameters for each constituent. The output consists of a table listing the identity of the constituent, its period (hours), major axis of the ellipse, minor axis of the ellipse, inclination of the ellipse, the phase of the constituent at 0:00 1 January 1976 and the direction of rotation.

6. NOTES ON THE INDIVIDUAL DATA RECORDS

The magnetic declination for True North varies by at least 5° between the locations of the five moorings. Because of this variability, the magnetic declination recorded at Mawson does not apply to all the strings.

Magnetic variation data for the area are scarce and the latest survey to cover the area of the moorings was taken by the Bureau of Mineral Resources in 1975. These data have been extrapolated to 1985, by applying the rate of variation of declination measured at Mawson (R. Huntingdon, Bureau of Mineral Resources, pers. com.). Because the rate of variation changes with location, the values of declination can be regarded as accurate only to within half a degree. This is well within the accuracy, $\pm$ 5° of the current meter compass (Aanderaa Instruments 1981).

However, further complicating the correction for magnetic declination is the diurnal variation in position of the south magnetic pole. The diameter of the path traced out daily by each of the poles ranges from as little as 15 km on magnetically quiet days to many hundreds of kilometres on days when the magnetic field is highly disturbed by the sun (Barton and Quilty 1986).

Because of the proximity of Prydz Bay to the south magnetic pole, this can translate to an error of up to $\pm$ 5° in the direction measurement.

No detailed data are available on the diurnal movements of the pole, so no provision can be made for the inaccuracies this produces. The values of declination applied to the data are listed in Table 1.

7. SUMMARY OF DATA

Only two of the moorings were successfully retrieved, one from both the 'summer' and 'winter' deployment programs. Because of this, summary descriptions of the results are given for each mooring separately.

Mooring 1 was not recovered.

Mooring 2 was situated in the middle of Prydz Bay over a smooth bottom. This string was characterised by low currents and low water temperatures interspersed with occasional warmer water for the first half of the year. The weak currents meandered in an easterly direction for the first four months of the record, before turning north to north-westerly at the beginning of July. Both meters recorded flows of similar strength, reaching a maximum of 25 cm/s, but staying in the range 0-15 cm/s for most of the year.

Both of the scatter plots showed ellipses, although the lower meter (7826), had a slightly flattened ellipse. Weak tidal activity was present throughout the record, although this was overshadowed by predominating currents for days at a time. Because the currents were so low, the vector-sum diagrams show considerable meander, and the net excursion for the year for both current meters was less than 80 km.

Temperature records for the Aanderaa (lower) meter were about -1.7°C for most of the year, with instances of temperature jumps of 1.0° to 1.5° occurring occasionally. These jumps were sometimes of several days duration, but are confined almost exclusively to the pre-June period. The S4 meter recorded less erratic temperatures than the Aanderaas, with jumps up to -1.3°C, from a base temperature of -2.4°C. This is below the freezing point of salt water for this depth. It can only be surmised that the factory calibration for this meter is approximately 0.5° too low, and that the true base temperature should be -1.8 to -1.9°C.

Major characteristics of the current record at this meter are cold slow moving waters, occasionally replaced with warmer waters from the North.

Mooring 3 was not recovered.

Mooring 4 was not recovered.

Mooring 5 meters on this string recorded the lowest currents and the coldest water of the 1987 deployments. These weak flows meandered in a westerly direction until the end of January, before turning south for the rest of the period. There is very little diurnal variation in these currents. Not far from this mooring, and to the south-east, is the deepest part of Prydz Bay (Figure 1). This depression drops more than 300 m from the surrounding seabed and net water movement is towards this area. The strongest flows were recorded at the lowest two meters (8670, 8671), reaching 25 cm/s. The rest of the time currents at all meters were in the range 0-15 cm/s. Currents were slow to alter direction, regularly staying constant in direction for seven days.

The scatter plot of the top meter (8666), is confined to a narrow wedge in direction, and to exceptionally low speeds, rarely lifting above the threshold speed of the meter (1.1 cm/s). This may be by ice forming around the meter as the temperatures are very close to freezing point at these meters. The other meters showed normal scatter in their velocities. The bottom meter recorded a similar scatter pattern to the meters above, tending to indicate that the currents recorded in this area by meter 7623 in the 1985 and 1986 deployments, were due to either an instrument error or freezing and not due to hypersaline density currents. Because the currents at this meter were so low, the vector-sum diagrams show considerable meander, almost all the net transport occurring in the last four weeks. This and the fact that the top meter showed the intrusion of warmer water in the last two weeks, could be an indication of the break-up of surface ice.

Temperatures at this string were very cold and very stable throughout the year, with little seasonal variation. The temperatures of these three meters are very similar to the upper two at -1.8° C and meter 7623 at -1.9°C. The lowest meter showed sustained temperature increases of up to 0.2°C over the other meters, at periods through its deployment, and the top meter and bottom two meters showed some temperature disturbance in the last two weeks of their measurement.

Conductivity showed a slightly decreasing trend during the recording period, dropping 0.1 mmho during the deployment. The lowest meter had conductivities that were more variable than the other meters.

Major characteristics of the current record at this mooring are topographically influenced cold, slow moving waters, with general motion towards the deep pool nearer the coast.

ACKNOWLEDGMENTS

The authors would like to acknowledge the cooperation of Dr K.P. Black and Dr L.S. Hammond of the Victorian Institute of Marine Sciences, Rod Hutchinson of the Bureau of Mineral Resources, and the personnel of the Antarctic Division Computer Section in the realisation of this report. The assistance of the Captain and crew of the Nella Dan, particularly Arne Sorenson, Benny Neilsen and Peter Granholm is greatly appreciated.

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Hodgkinson, R.P., Colman, R.S., Kerry, K.R. *and* Robb, M.S. (1991). Water currents in Prydz Bay, Antarctica during 1986. *ANARE Research Notes Number 81*. Pp. 130.

APPENDIX I. EXAMPLE OF A CALIBRATED DATA FILE

Mooring 3 - Prydz Bay, Antarctica

6148 6148 3 66 44.20 63 17.00 580.0 275.0 277.9 345 60 8255

GMT 1 0 27 2 1985
GMT 23 0 5 2 1986

DAYS	SPEED	DIRN	U.VEL	V.VEL	TEMP	PRESS	COND	SALIN	HR	MN	DY	MO	YR
.0000	11.2	289.8	-10.5	3.8	-1.57 2	85.94	27.51	34.56	1	0	27	2	85
.0417	16.6	290.5	-15.6	5.8	-1.57 2	85.94	27.51	34.56	2	90	27	2	85
.0833	10.8	272.0	-10.8	.4	-1.57 2	85.94	27.51	34.56	3	0	27	2	85
.1250	18.5	294.7	-16.8	7.7	-1.57	285.94	27.51	34.56	4	0	27	2	85
.1667	11.8	293.6	-10.8	4.7	-1.57	285.94	27.51	34.56	5	0	27	2	85
.2083	25.2	294.7	-22.9	10.5	-1.57	286.33	27.51	34.56	6	0	27	2	85
.2500	27.4	292.2	-25.4	10.4	-1.57	286.71	27.51	34.56	7	0	27	2	85
.2917	34.4	295.0	-31.1	14.5	-1.57	287.48	27.51	34.56	8	0	27	2	85
.3333	27.8	290.1	-26.1	9.6	-1.57	290.17	27.51	34.56	9	0	27	2	85
.3750	41.8	295.0	-37.9	17.7	-1.57	293.24	27.51	34.56	10	0	27	2	85
.4167	42.8	295.0	-38.7	18.1	-1.57	294.01	27.51	34.55	11	0	27	2	85
.4583	44.1	295.0	-39.9	18.6	-1.57	294.01	27.51	34.55	12	0	27	2	85
.5000	38.1	294.0	-34.8	15.5	-1.57	294.01	27.51	34.55	13	0	27	2	85
.5417	54.7	295.0	-49.6	23.1	-1.57	295.17	27.51	34.55	14	0	27	2	85
.5833	41.4	295.0	-37.6	17.5	-1.59	293.63	27.43	34.48	15	0	27	2	85
.6250	57.7	299.4	-50.3	28.3	-1.59	293.63	27.51	34.58	16	0	27	2	85
.6667	66.5	299.4	-57.9	32.6	-1.59	295.55	27.43	34.47	17	0	27	2	85
.7083	73.4	316.1	-50.8	52.9	-1.59	294.78	27.51	34.58	18	0	27	2	85
.7500	52.8	309.5	-40.8	33.6	-1.59	295.17	27.51	34.58	19	0	27	2	85

Header Information:

Line 1: Station name and relevant details. (Format: a80)

Line 2: Station number, meter number, tape number, degrees of latitude, minutes of latitude, degrees of longitude, minutes of longitude, ocean depth, instrument depth, average pressure, number of days of data, interval between readings (minutes), number of records.
(Format: 2(1x, A4), 2I5, F6.2, I5, F6.2, 3F6.1, 2I5, I10)

Line 3: Time zone, time of first record (hours, minutes, day, month, year)
(Format: 1x, a4, 5I5)

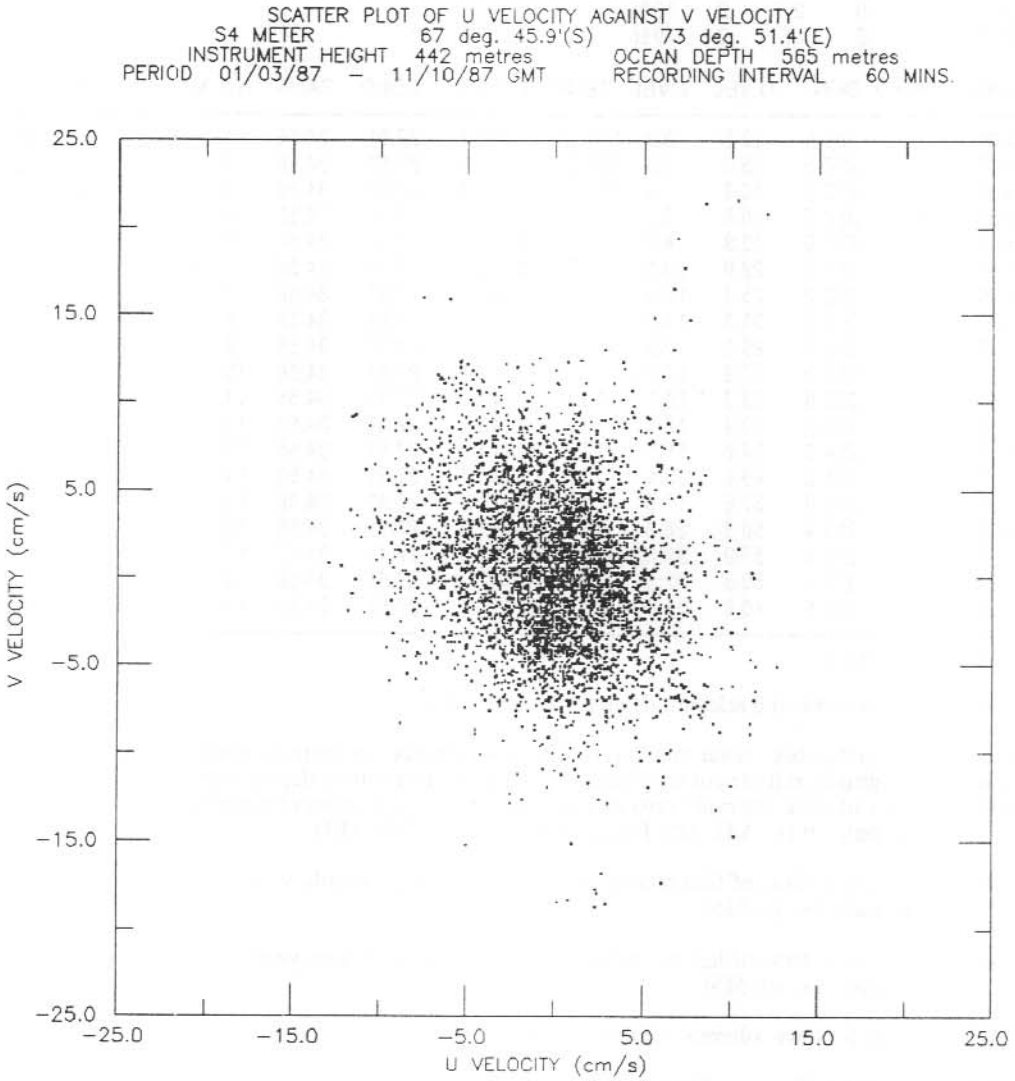
Line 4: Time zone, time of last record (hours, minutes, day, month, year)
(Format: 1x, a4, 5I5)

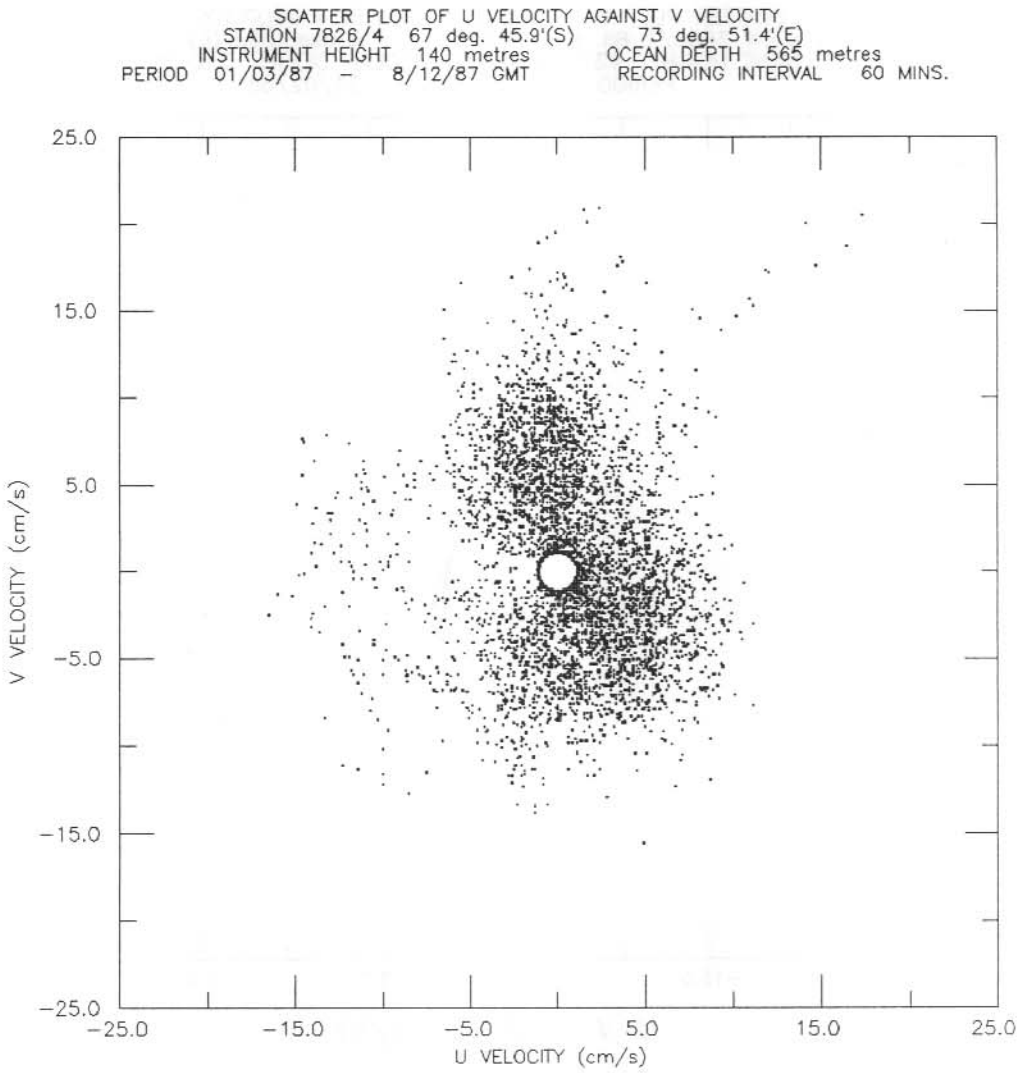
Line 5: Labels for data columns (Format: A80)

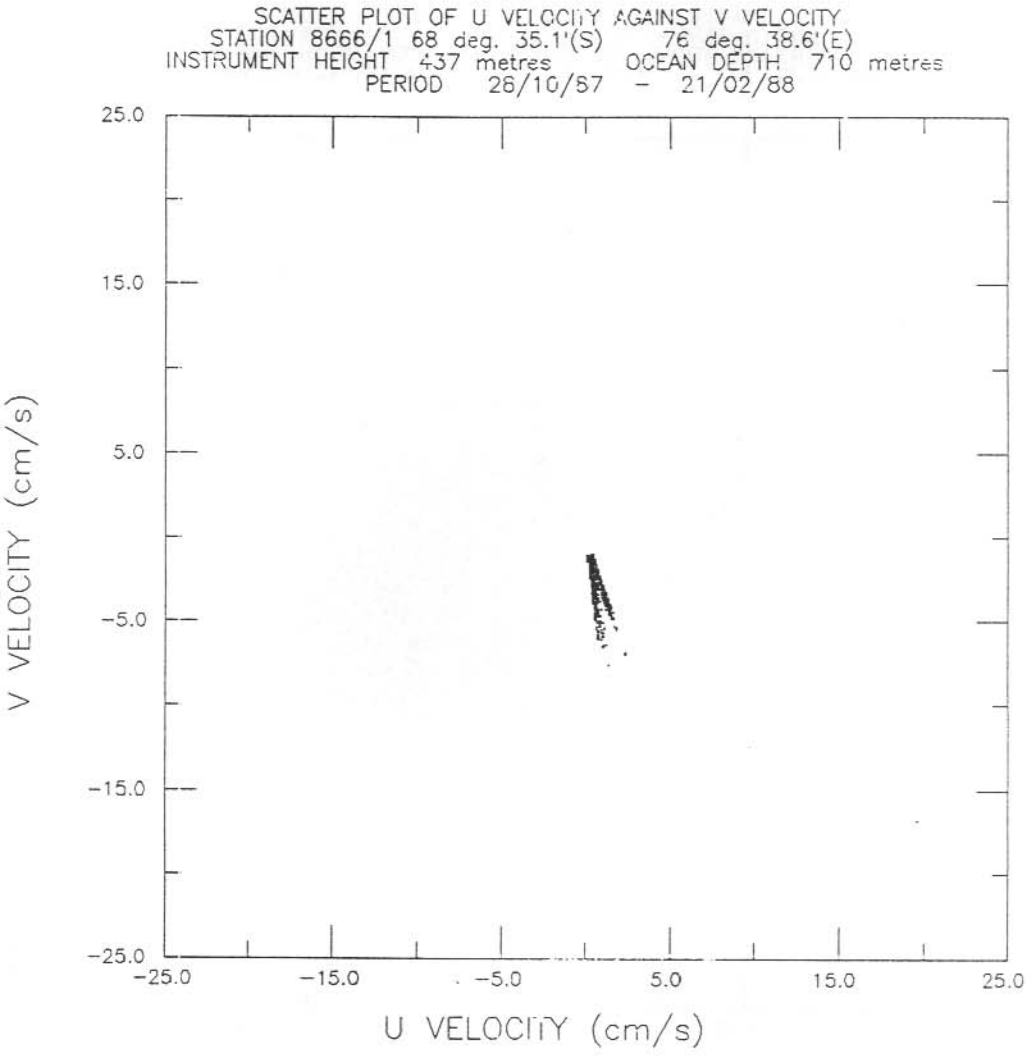
Line 6: To end of file ..... Data.
Time elapsed (hours), speed (cm/s), direction (degrees), U velocity (cm/s), V velocity (cm/s), temperature (degrees C), pressure (metres of water), conductivity (mmho), salinity (parts per 1000), date (hours, minutes, day, date, year)
(Format: F8.4, F7.1, F6.1, 2F7.1, 4F7.2, 5(1X, I2))

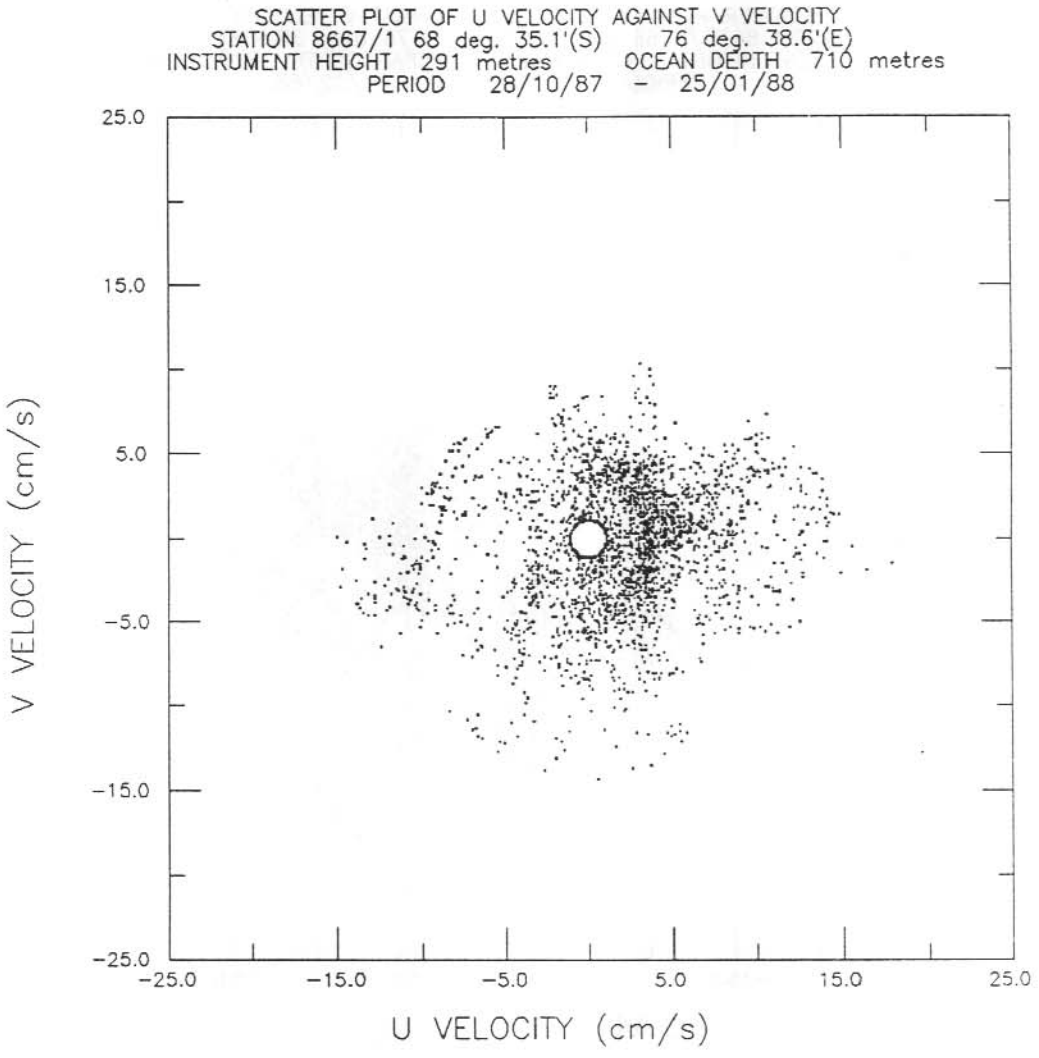
APPENDIX II. SCATTER PLOTS FOR THE CURRENT METER DATA

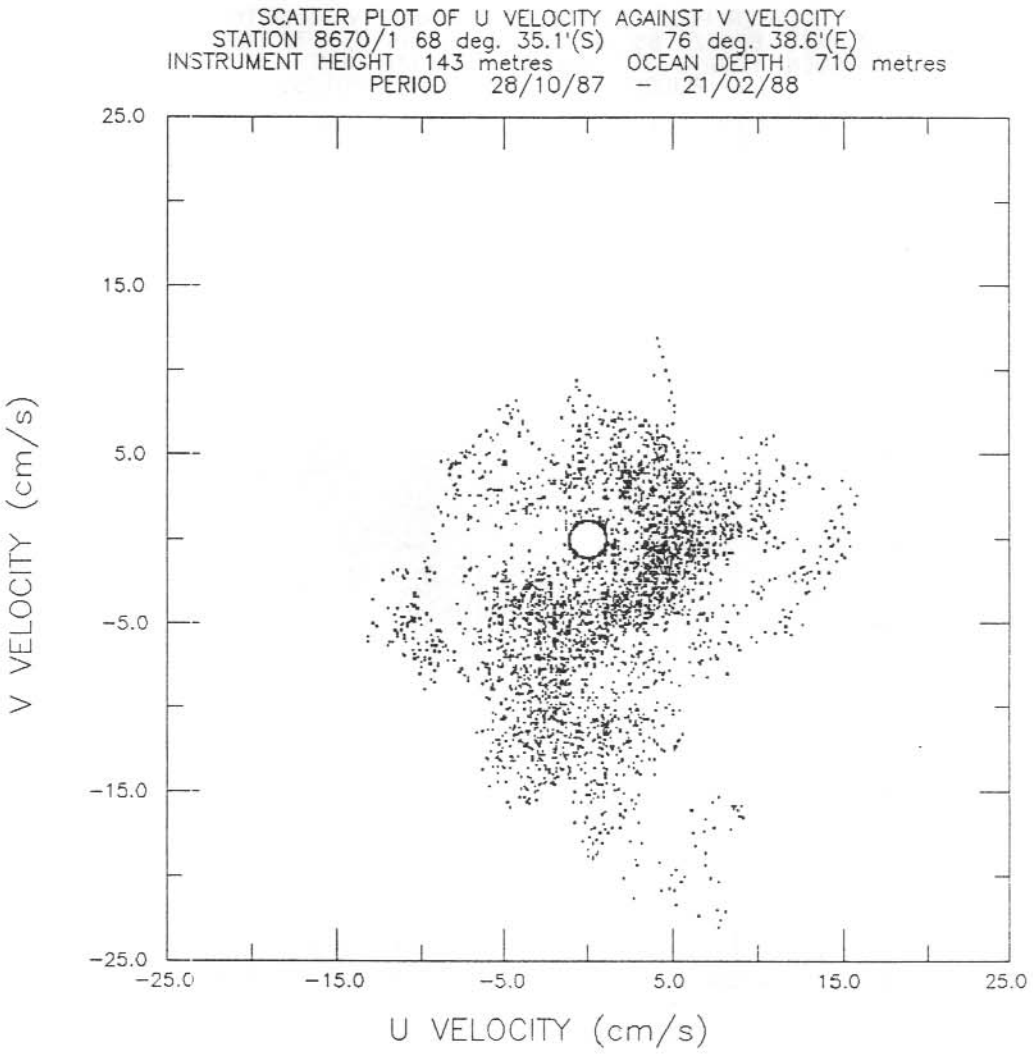
Plots are arranged in the order of moorings (2, 5) and within these sections from the shallowest to the deepest current meter.

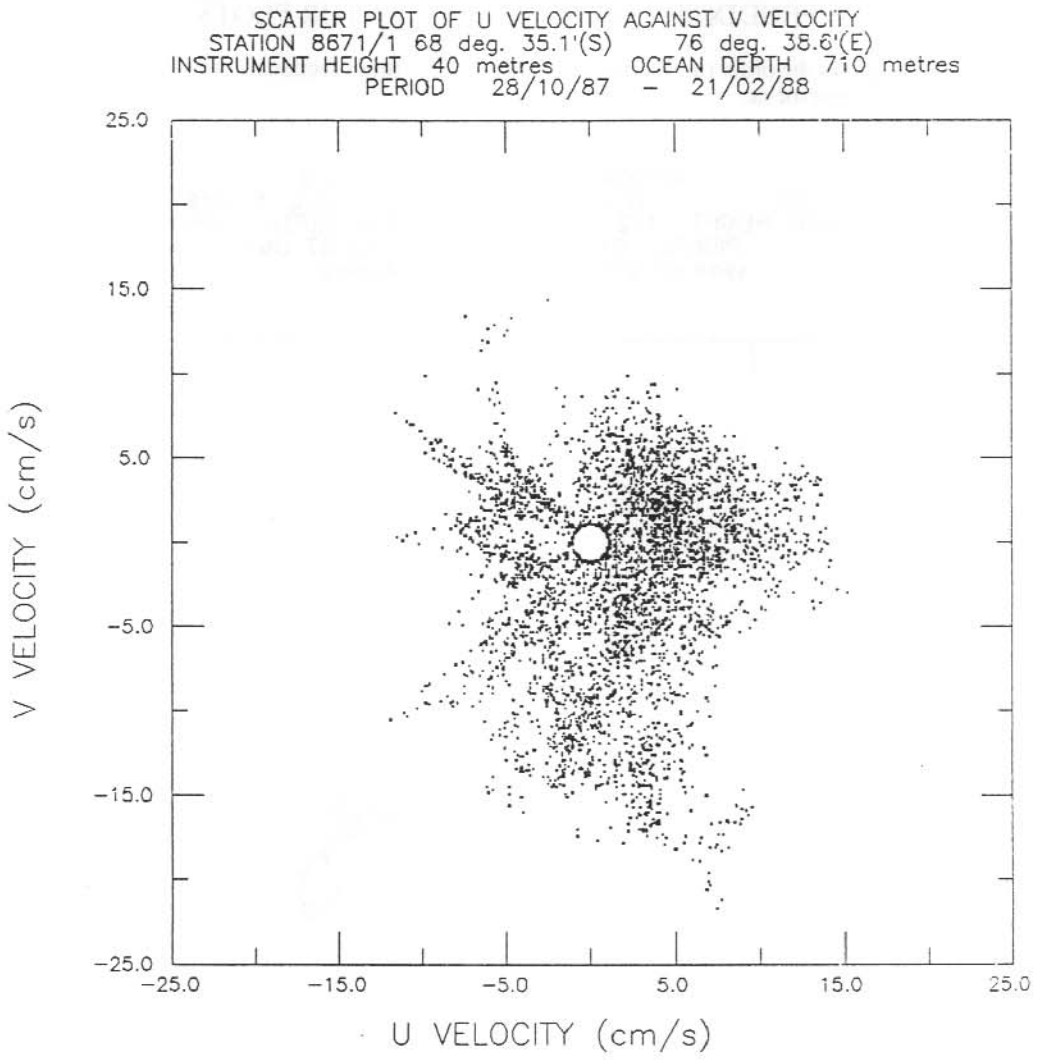



SCATTER PLOT OF U VELOCITY AGAINST V VELOCITY
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 01/03/87 - 8/12/87 GMT RECORDING INTERVAL 60 MINS.
25.0
15.0
5.0
-5.0
-15.0
-25.0
V VELOCITY (cm/s)
-25.0
-15.0
-5.0
5.0
15.0
25.0
U VELOCITY (cm/s)


SCATTER PLOT OF U VELOCITY AGAINST V VELOCITY
STATION 8666/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 437 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88
25.0
15.0
5.0
-5.0
-15.0
-25.0
V VELOCITY (cm/s)
-25.0
-15.0
-5.0
5.0
15.0
25.0
U VELOCITY (cm/s)

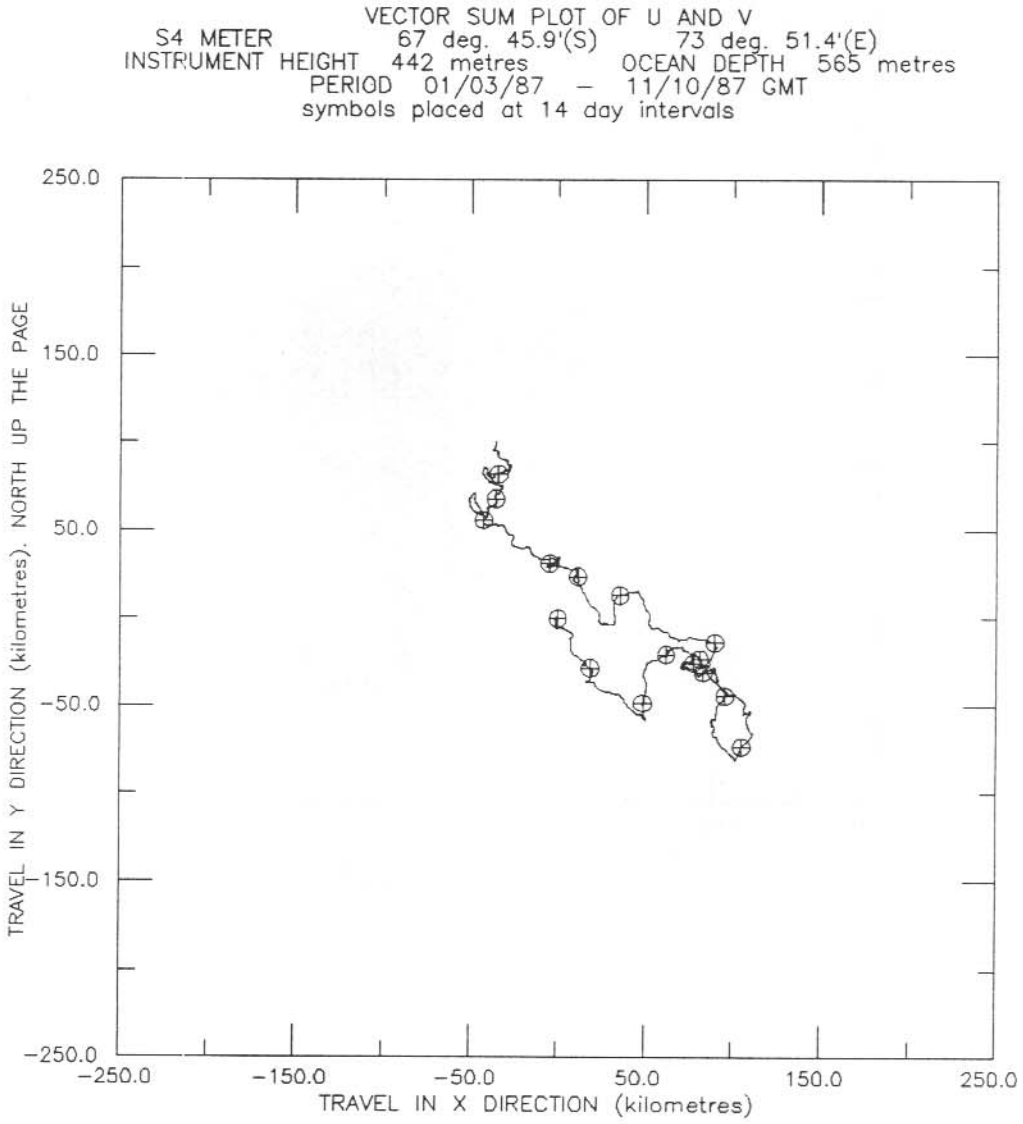

SCATTER PLOT OF U VELOCITY AGAINST V VELOCITY
STATION 8667/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 291 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 25/01/88
25.0
15.0
5.0
-5.0
-15.0
-25.0
V VELOCITY (cm/s)
-25.0
-15.0
-5.0
5.0
15.0
25.0
U VELOCITY (cm/s)


SCATTER PLOT OF U VELOCITY AGAINST V VELOCITY
STATION 8670/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 143 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88
25.0
15.0
5.0
-5.0
-15.0
-25.0
V VELOCITY (cm/s)
-25.0
-15.0
-5.0
5.0
15.0
25.0
U VELOCITY (cm/s)

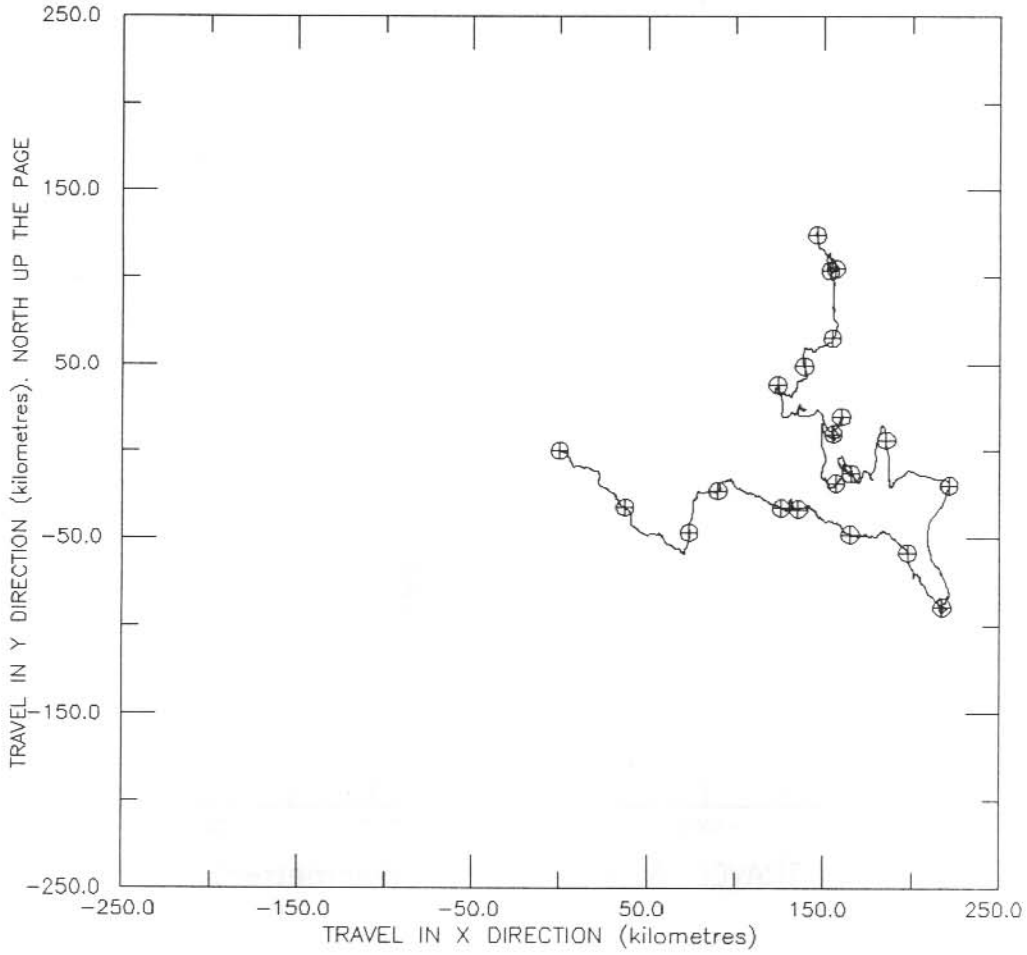

SCATTER PLOT OF U VELOCITY AGAINST V VELOCITY
STATION 8671/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 40 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88
25.0
15.0
5.0
-5.0
-15.0
-25.0
V VELOCITY (cm/s)
-25.0
-15.0
-5.0
5.0
15.0
25.0
U VELOCITY (cm/s)

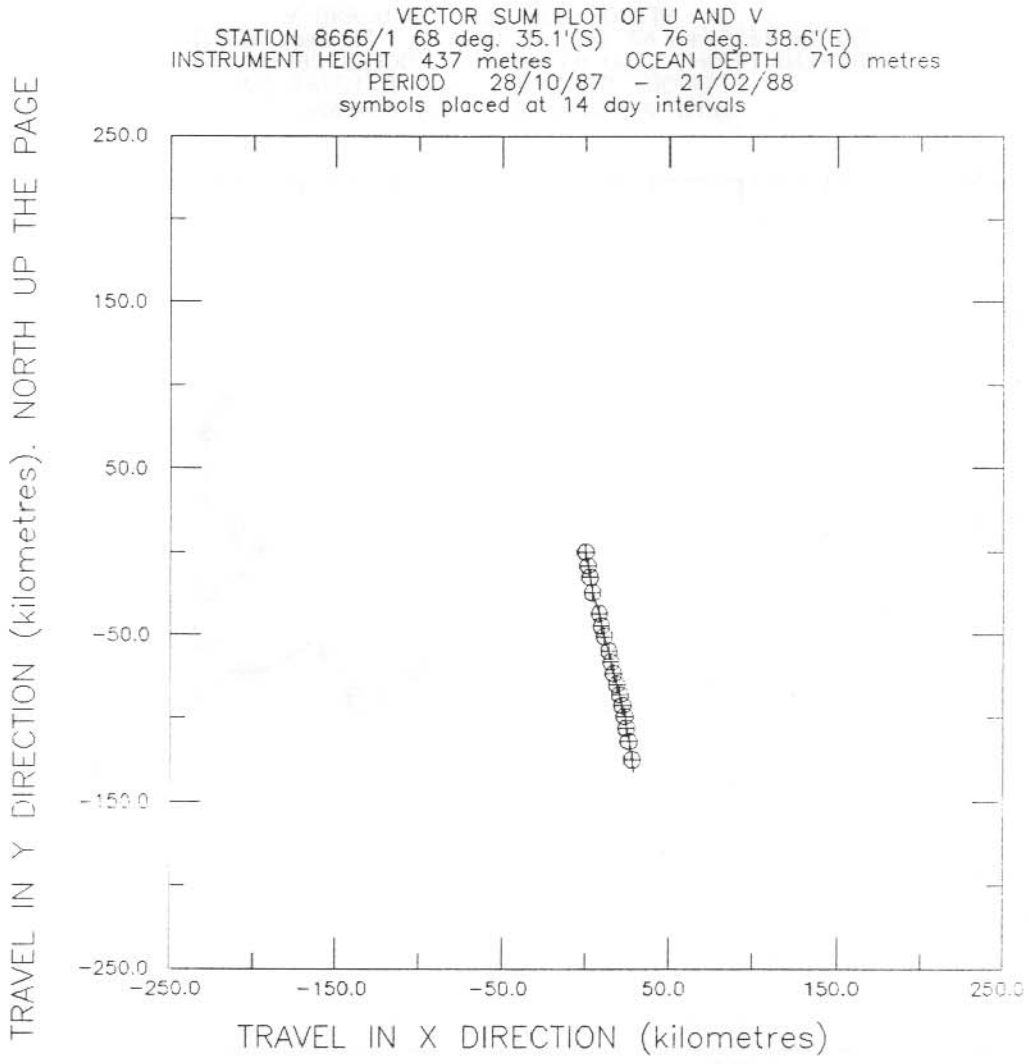
APPENDIX III. PROGRESSIVE VECTOR PLOTS

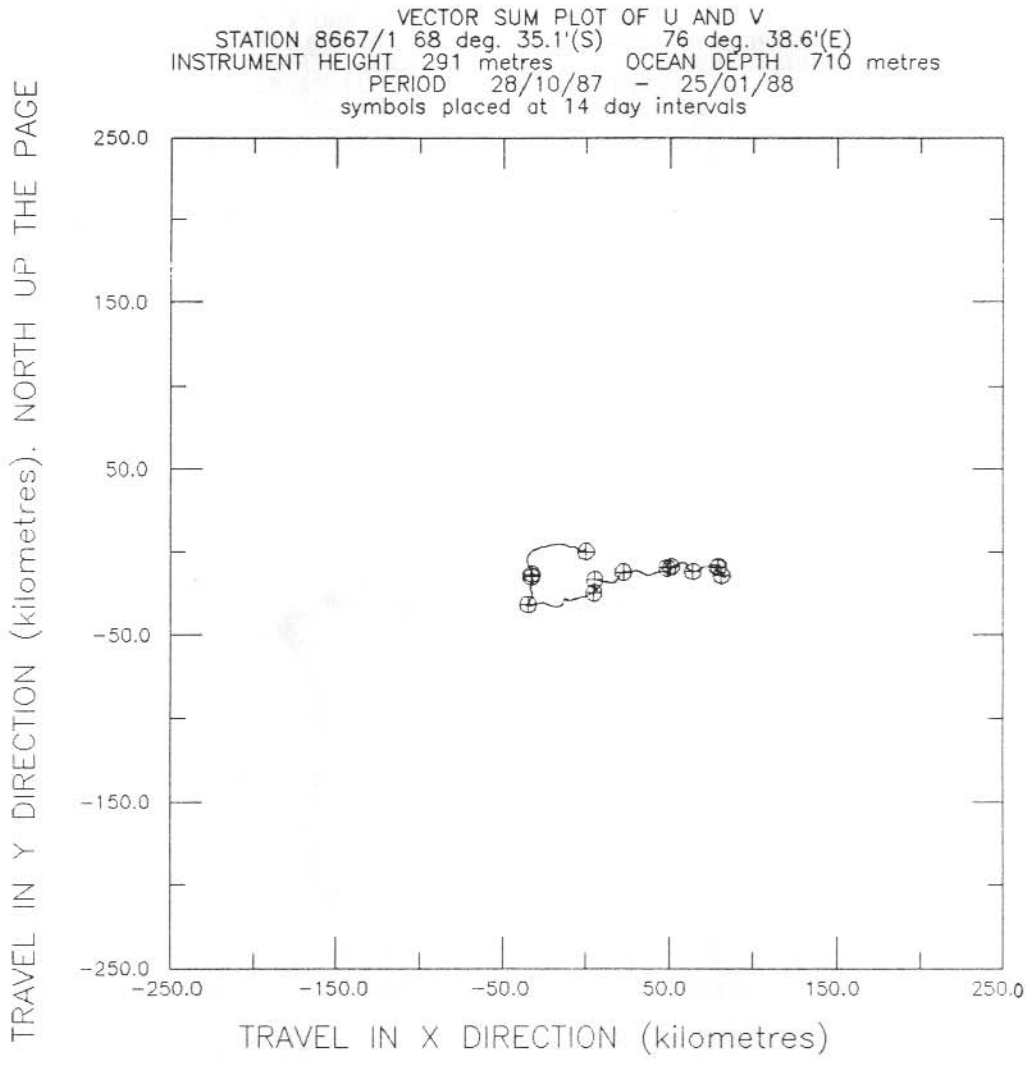
Plots are arranged in the order of moorings (2, 5) and within these sections from the shallowest to the deepest current meter.

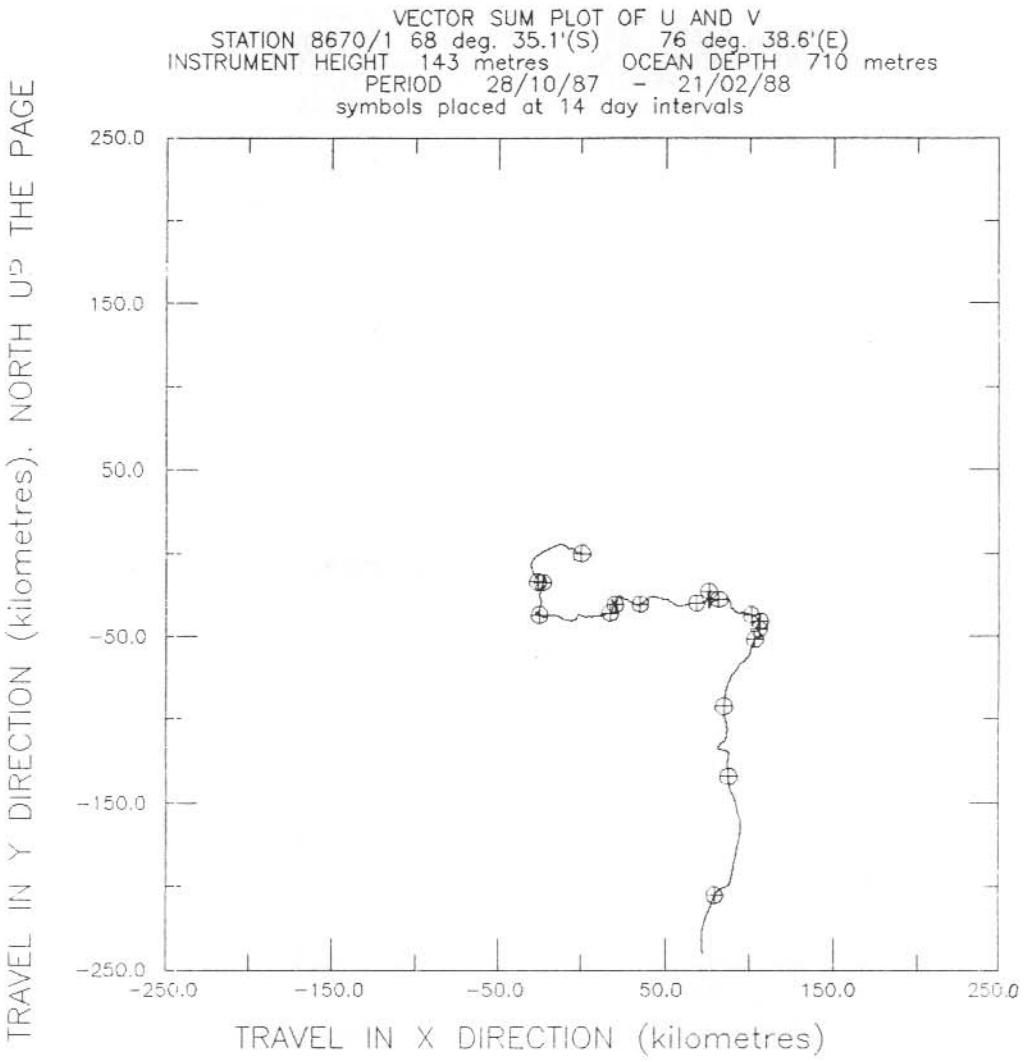


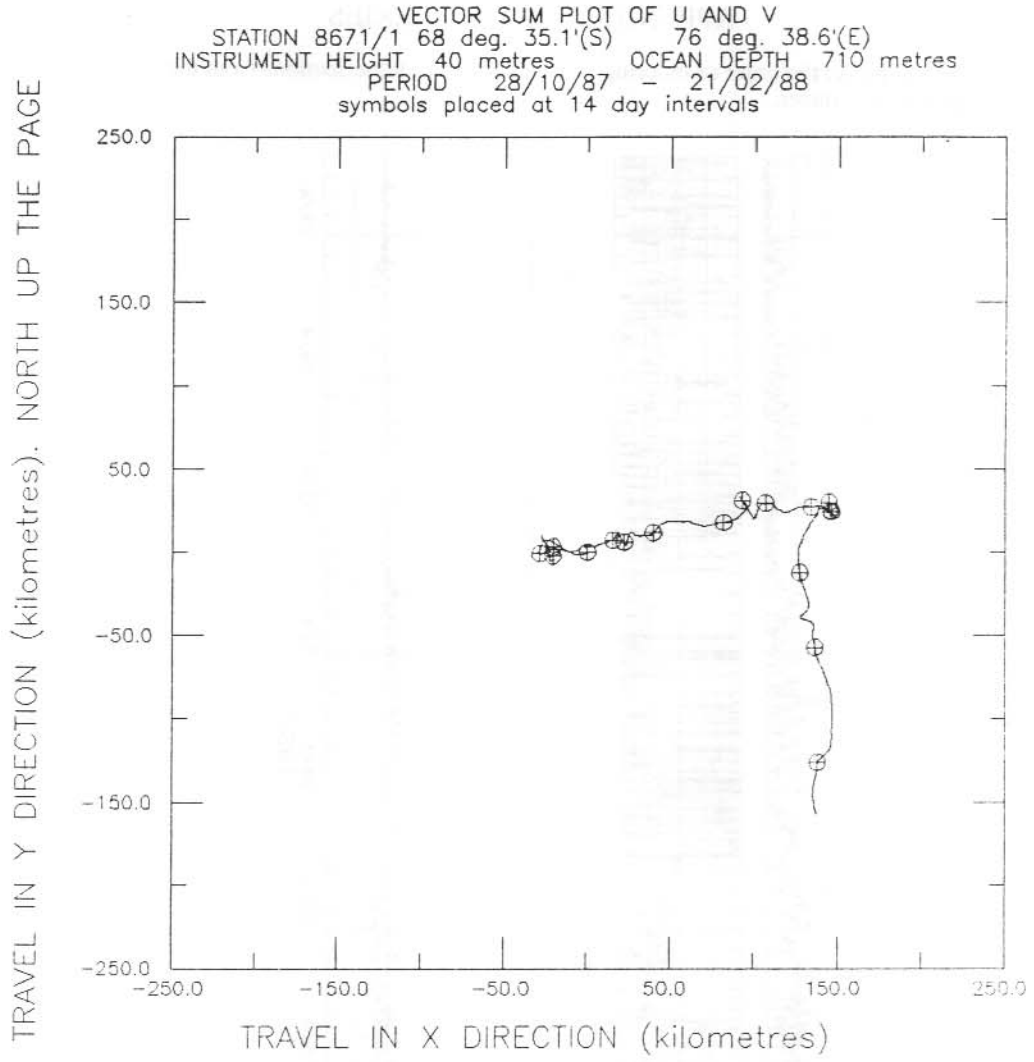
VECTOR SUM PLOT OF U AND V
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 01/03/87 – 8/12/87 GMT
symbols placed at 14 day intervals




VECTOR SUM PLOT OF U AND V
STATION 8666/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 437 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88
symbols placed at 14 day intervals
TRAVEL IN Y DIRECTION (kilometres). NORTH UP THE PAGE
250.0
150.0
50.0
-50.0
-150.0
-250.0
-250.0
-150.0
-50.0
50.0
150.0
250.0
TRAVEL IN X DIRECTION (kilometres)

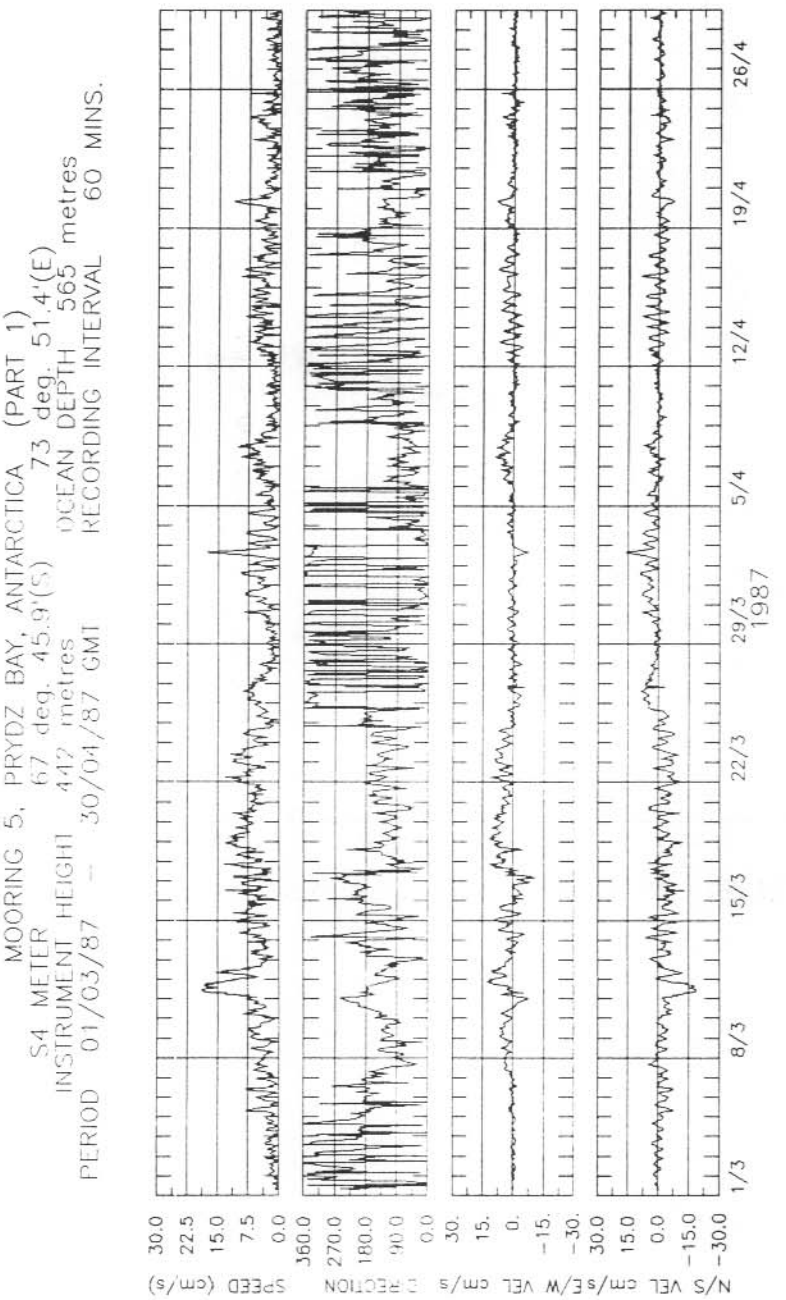

VECTOR SUM PLOT OF U AND V
STATION 8667/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 291 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 25/01/88
symbols placed at 14 day intervals
TRAVEL IN Y DIRECTION (kilometres). NORTH UP THE PAGE
250.0
150.0
50.0
-50.0
-150.0
-250.0
-250.0
-150.0
-50.0
50.0
150.0
250.0
TRAVEL IN X DIRECTION (kilometres)


VECTOR SUM PLOT OF U AND V
STATION 8670/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 143 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88
symbols placed at 14 day intervals
TRAVEL IN Y DIRECTION (kilometres). NORTH UP THE PAGE
250.0
150.0
50.0
-50.0
-150.0
-250.0
-250.0
-150.0
-50.0
50.0
150.0
250.0
TRAVEL IN X DIRECTION (kilometres)

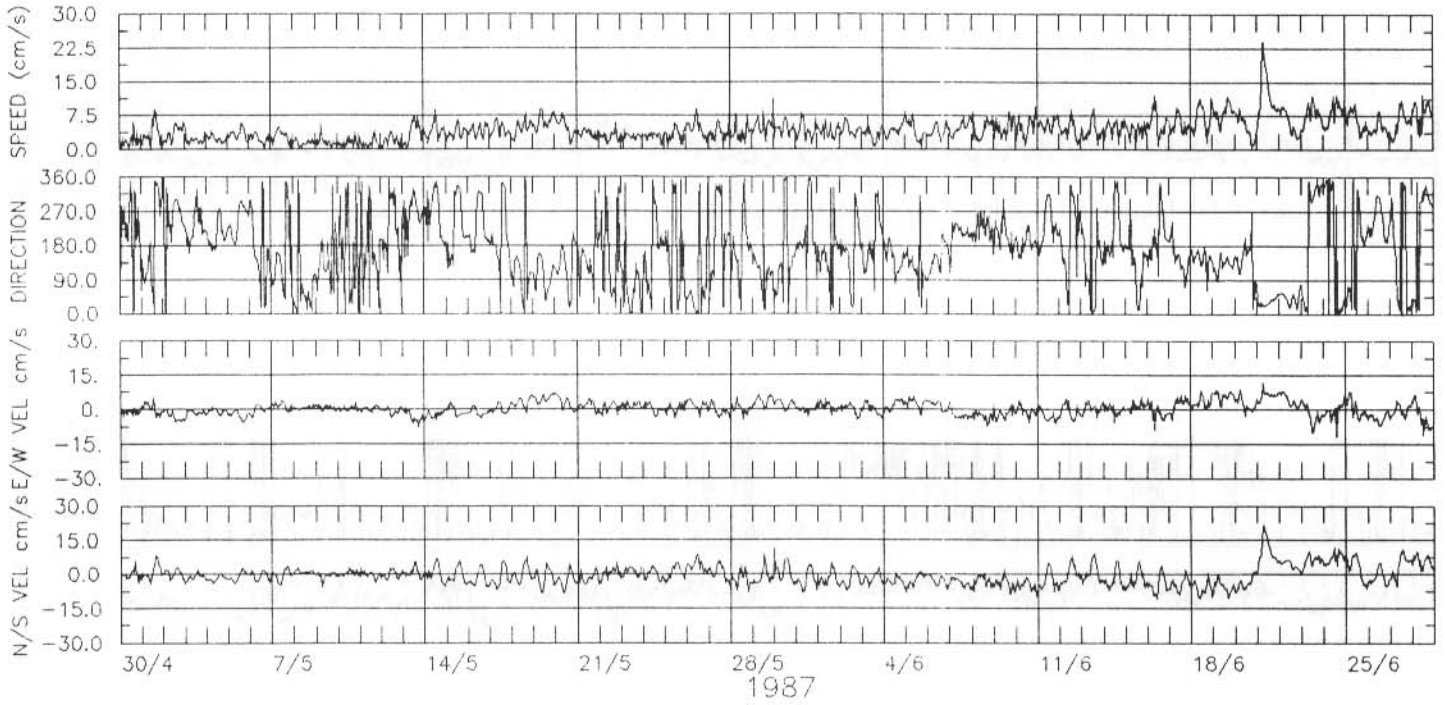

VECTOR SUM PLOT OF U AND V
STATION 8671/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 40 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88
symbols placed at 14 day intervals
TRAVEL IN Y DIRECTION (kilometres). NORTH UP THE PAGE
250.0
150.0
50.0
-50.0
-150.0
-250.0
-250.0
-150.0
-50.0
50.0
150.0
250.0
TRAVEL IN X DIRECTION (kilometres)

APPENDIX IV. TIME SERIES

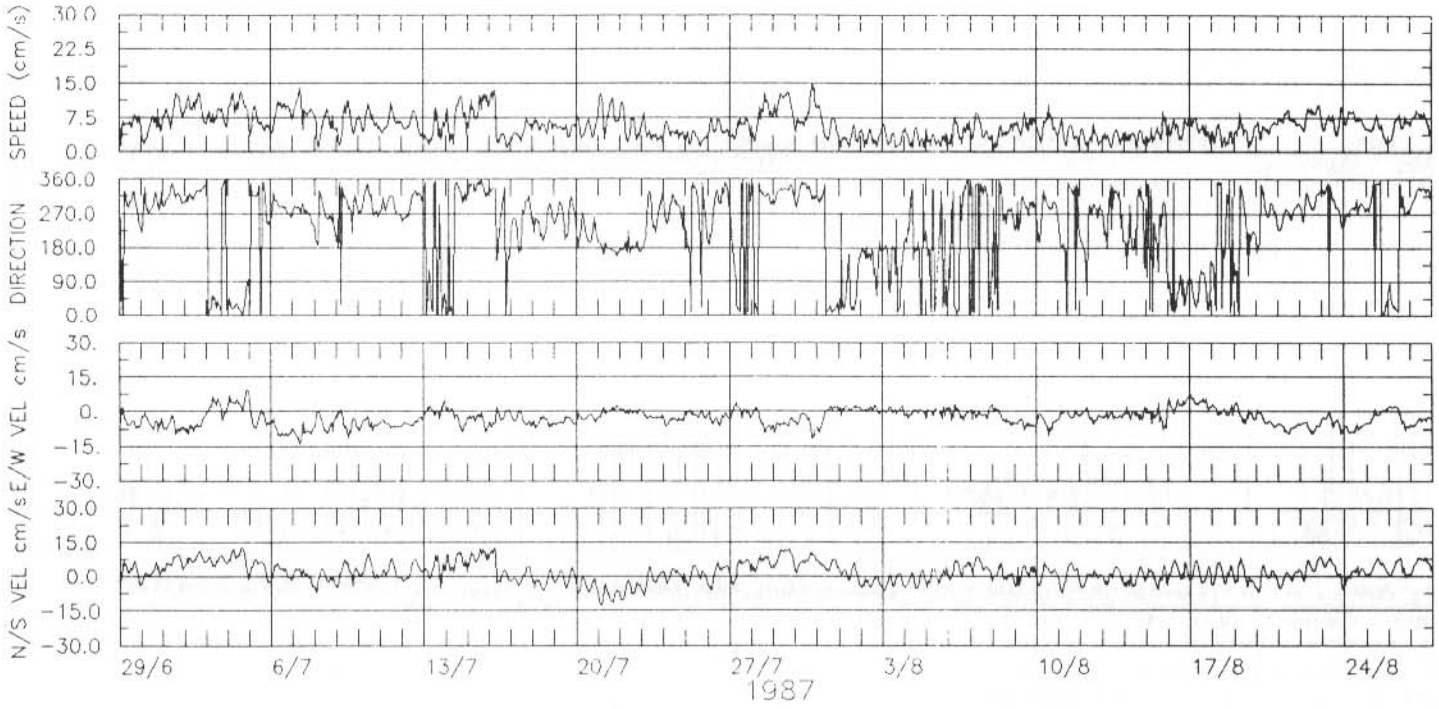
Plots are arranged in the order of moorings (2, 5) and within these sections from the shallowest to the deepest current meter.



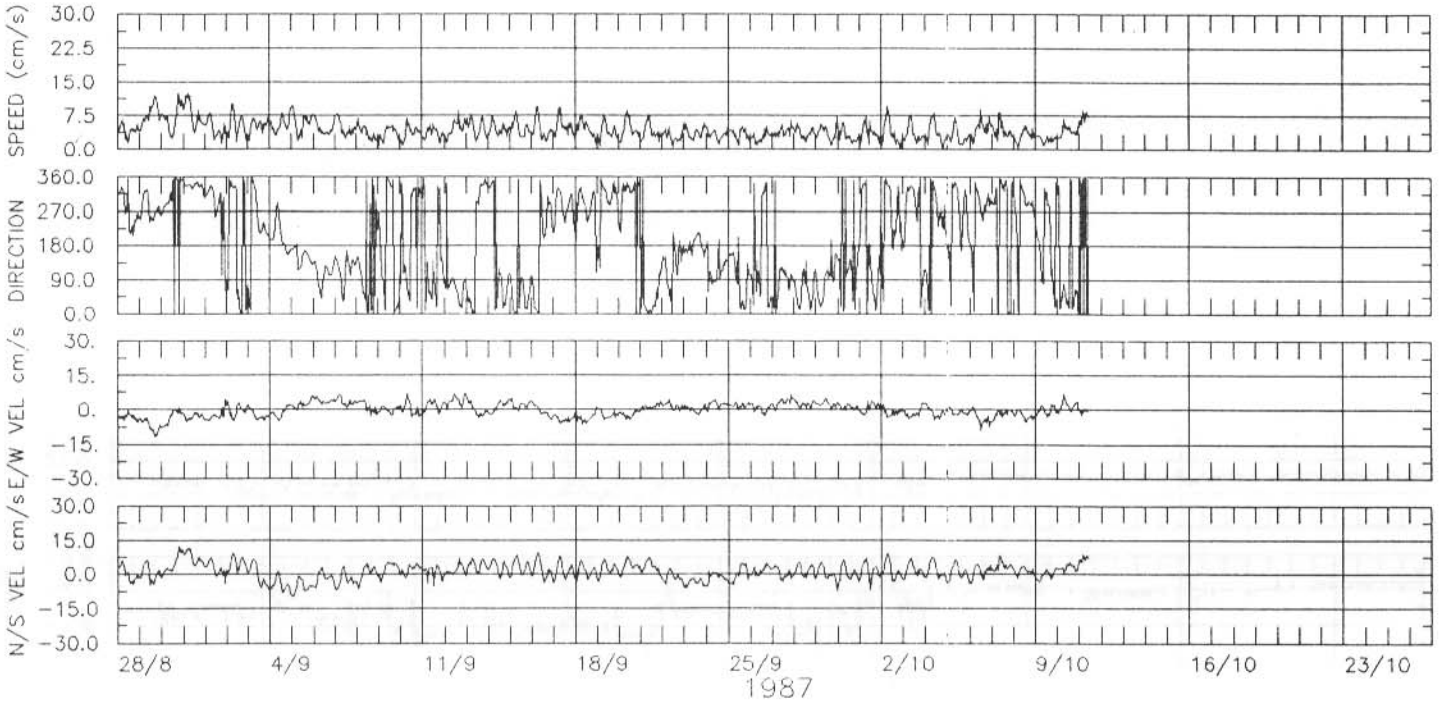
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 30/04/87 - 29/06/87 GMT RECORDING INTERVAL 60 MINS.



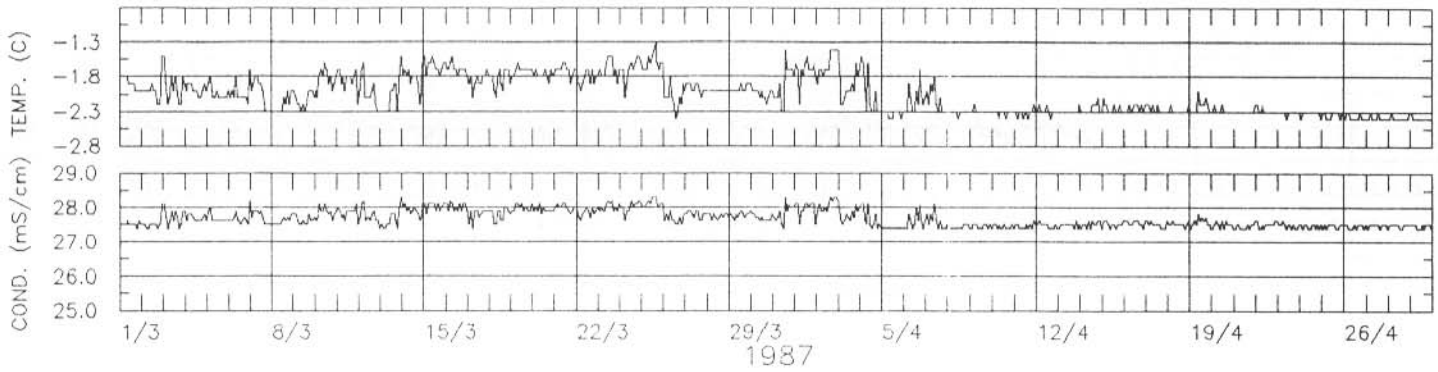
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 3)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 29/06/87 – 28/08/87 GMT RECORDING INTERVAL 60 MINS.



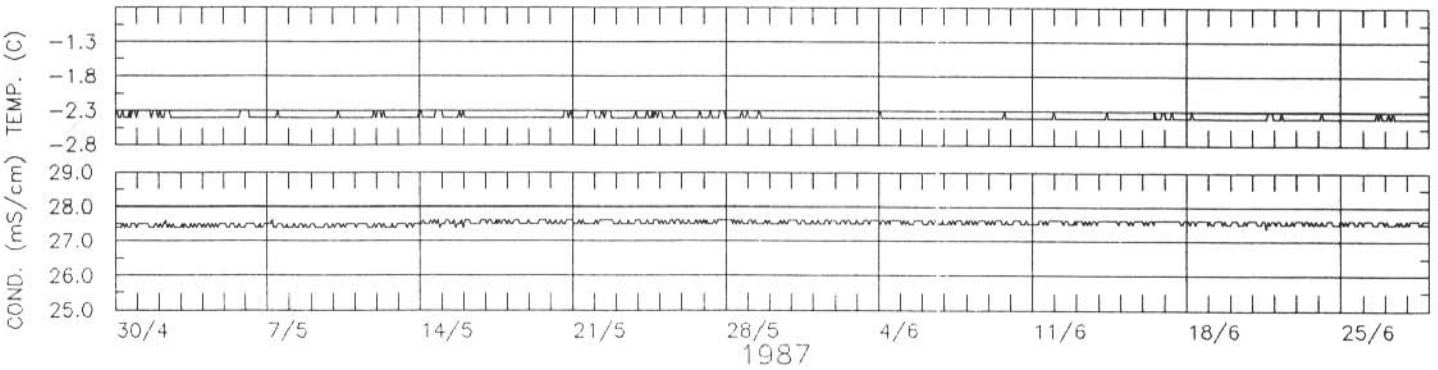
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 4)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 28/08/87 - 11/10/87 GMT RECORDING INTERVAL 60 MINS.



MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 01/03/87 - 30/04/87 GMT 120 MINS.



MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 30/04/87 – 29/06/87 GMT RECORDING INTERVAL 120 MINS.

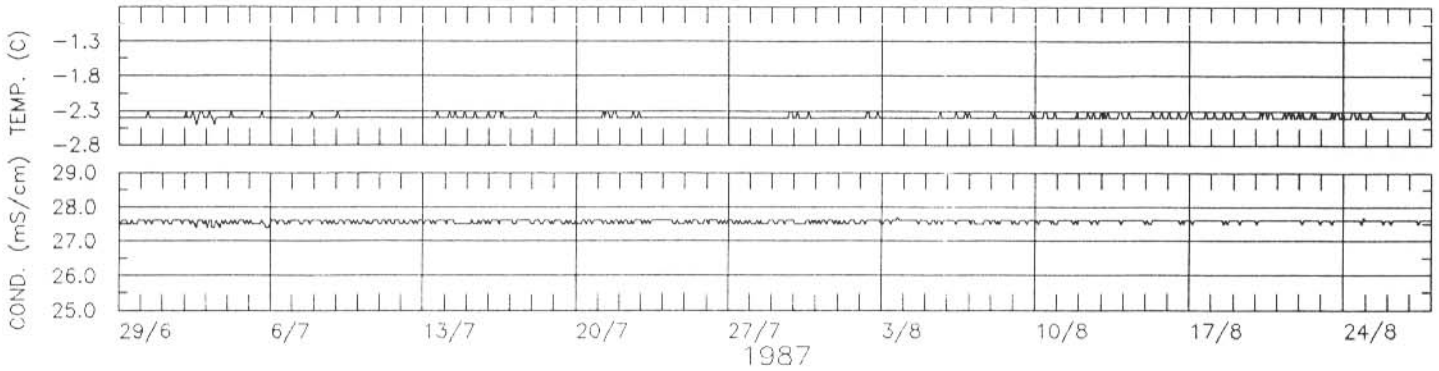


MOORING 5, PRYDZ BAY, ANTARCTICA (PART 3)

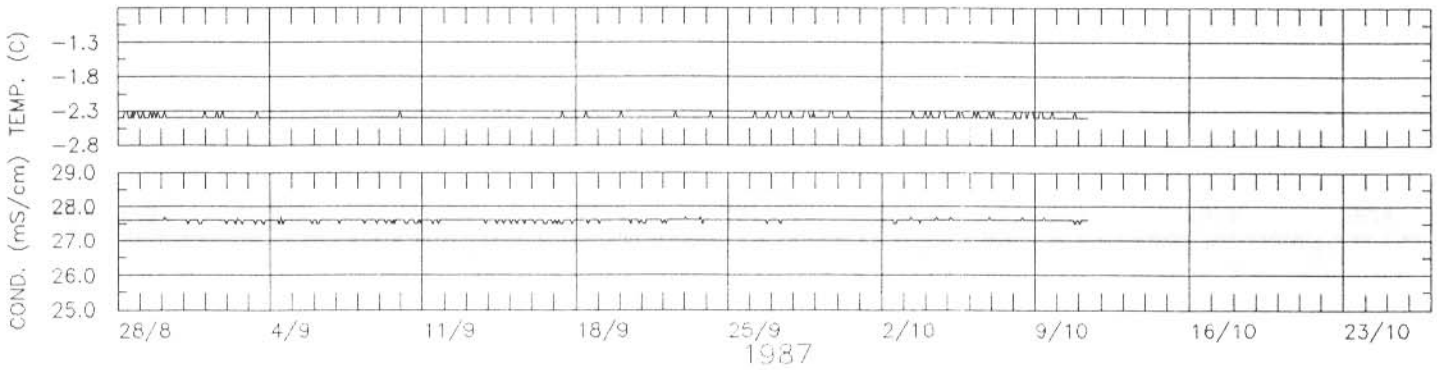
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)

INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres

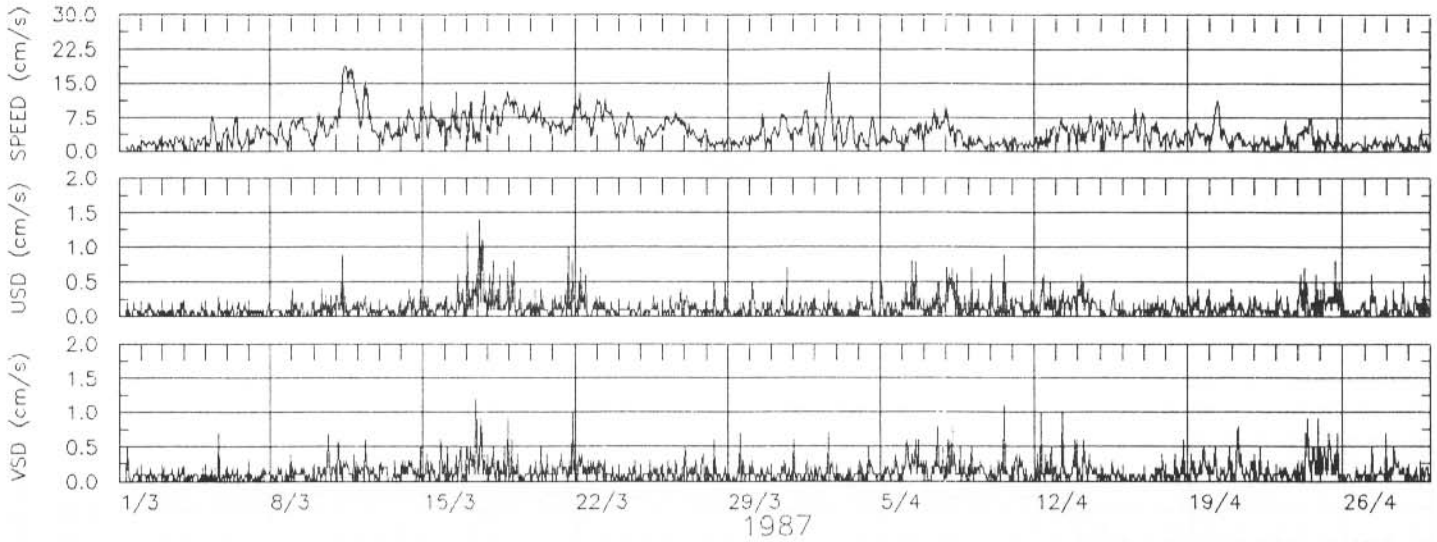
PERIOD 29/06/87 - 28/08/87 GMT RECORDING INTERVAL 120 MINS.



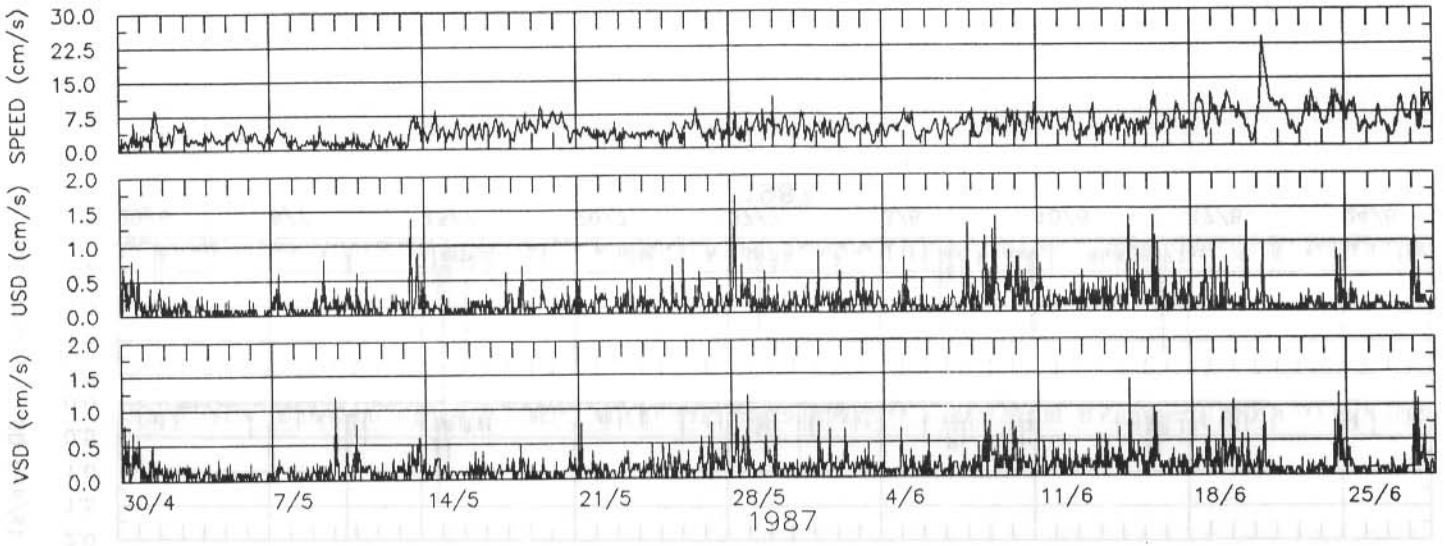
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 4)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 28/08/87 - 11/10/87 GMT RECORDING INTERVAL 120 MINS.



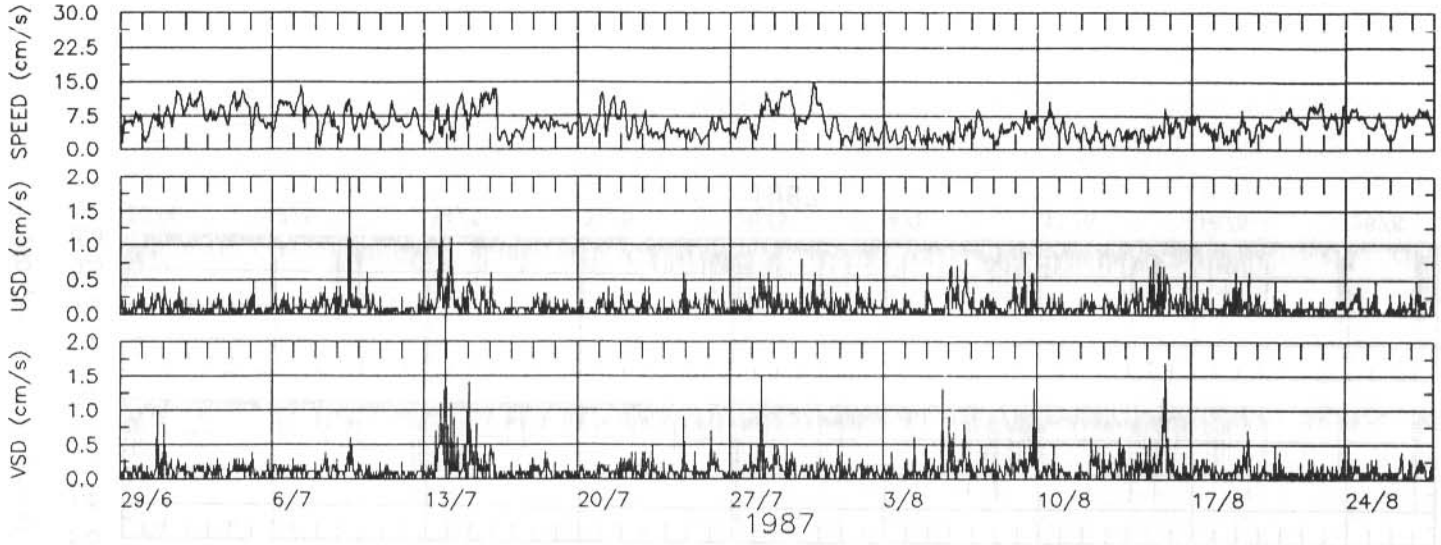
U (USD) AND V (VSD) STANDARD DEVIATIONS (PART 1)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 01/03/87 - 30/04/87 GMT RECORDING INTERVAL 60 MINS.



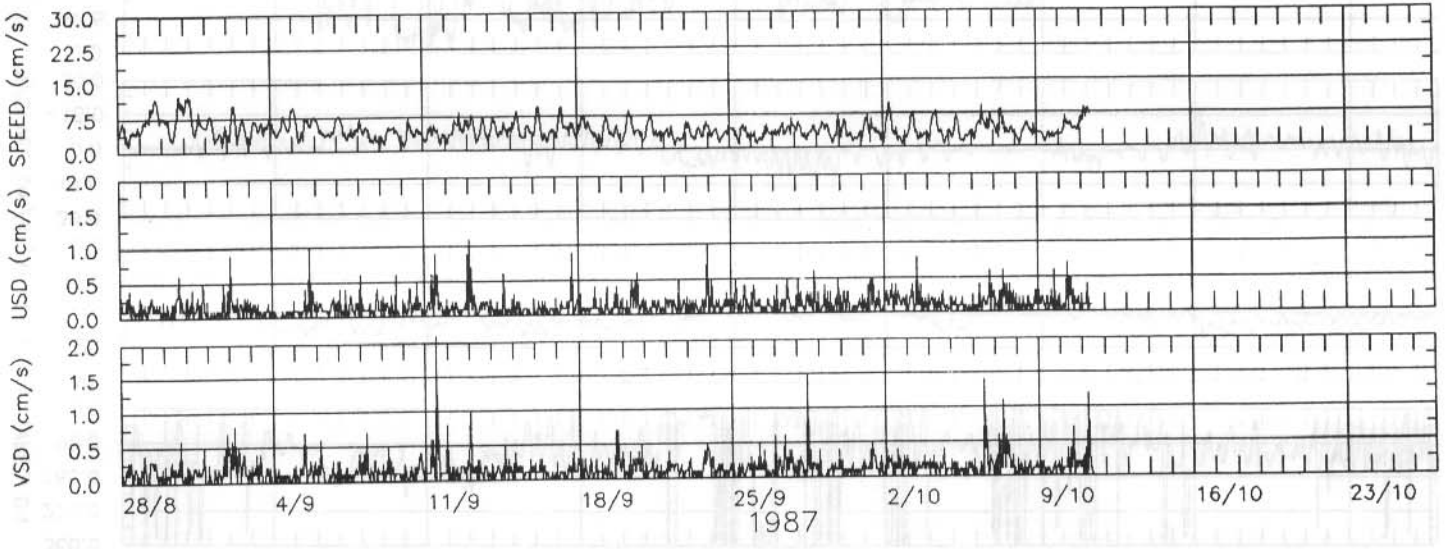
U (USD) AND V (VSD) STANDARD DEVIATIONS (PART 2)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 30/04/87 - 29/06/87 GMT RECORDING INTERVAL 60 MINS.



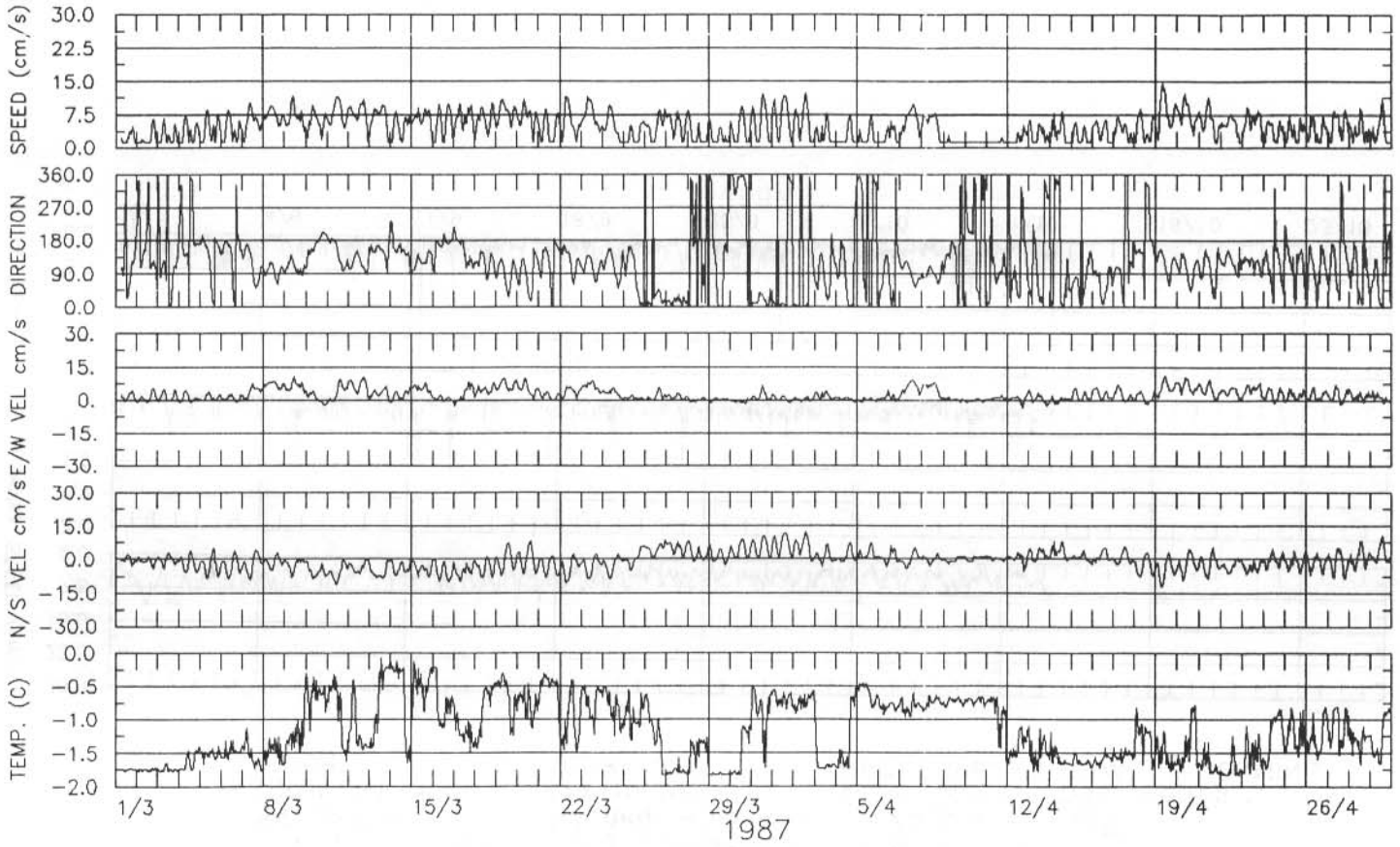
U (USD) AND V (VSD) STANDARD DEVIATIONS (PART 3)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 29/06/87 – 28/08/87 GMT RECORDING INTERVAL 60 MINS.



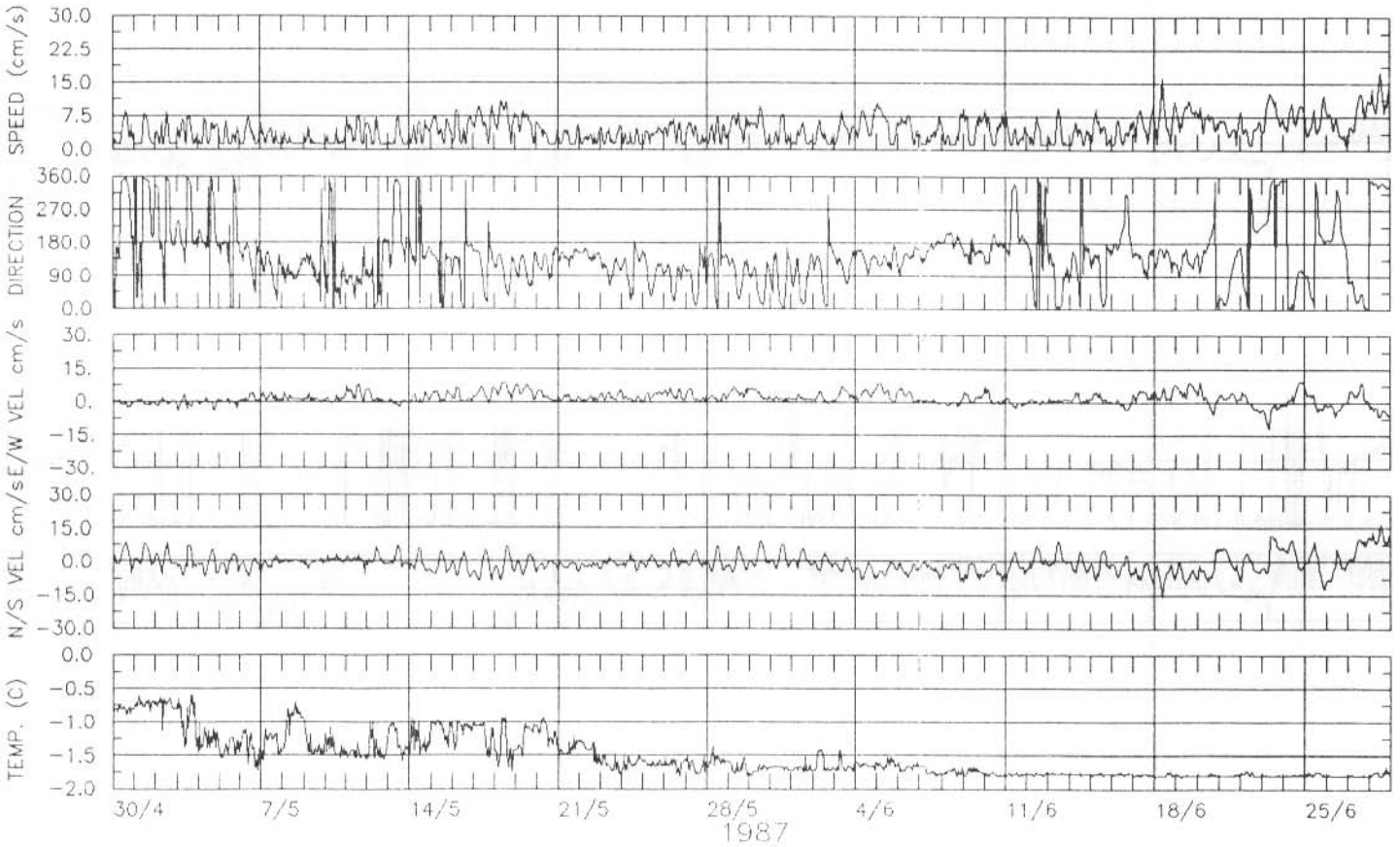
U (USD) AND V (VSD) STANDARD DEVIATIONS (PART 4)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 28/08/87 - 11/10/87 GMT RECORDING INTERVAL 60 MINS.



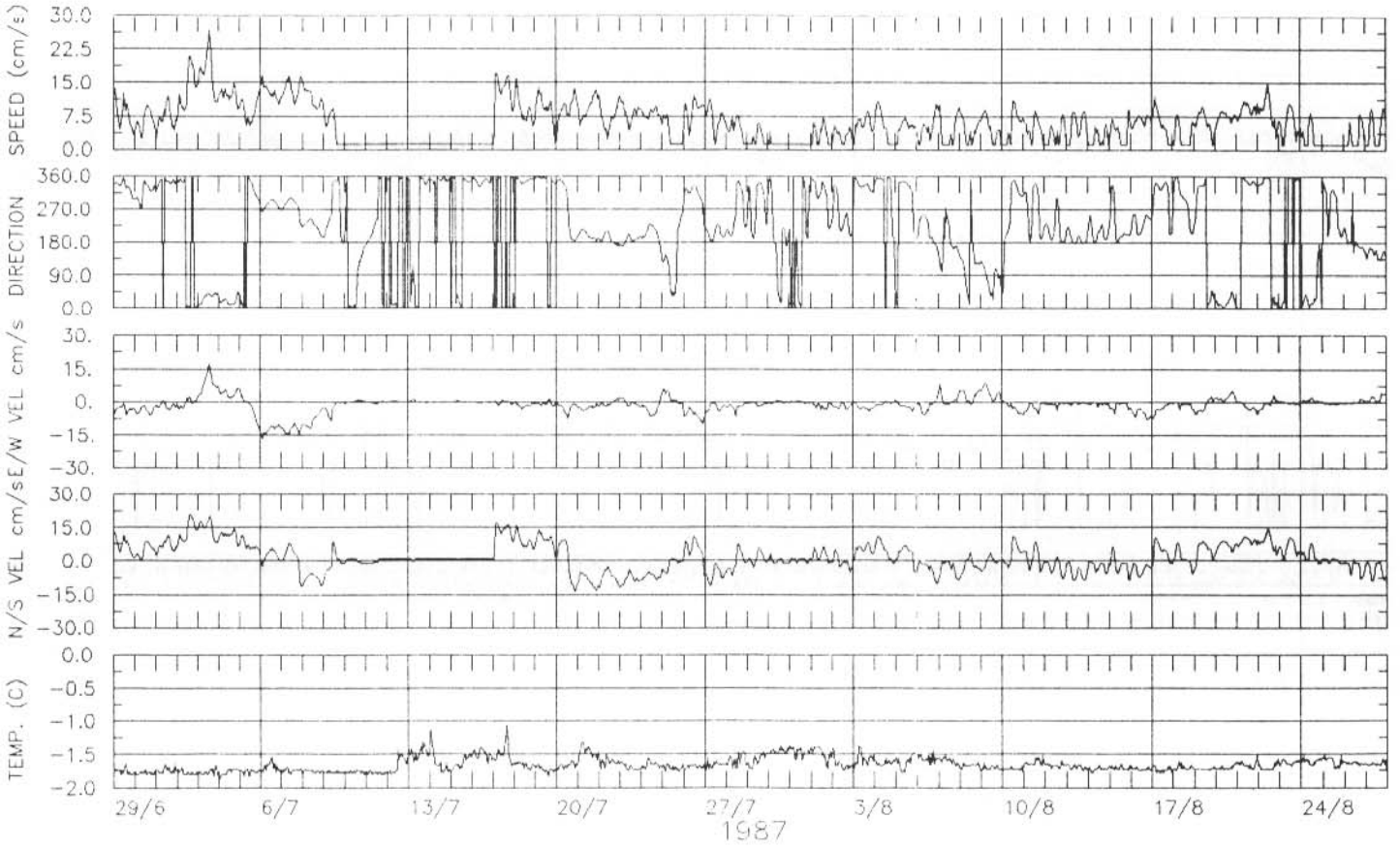
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 01/03/87 – 30/04/87 GMT RECORDING INTERVAL 60 MINS.



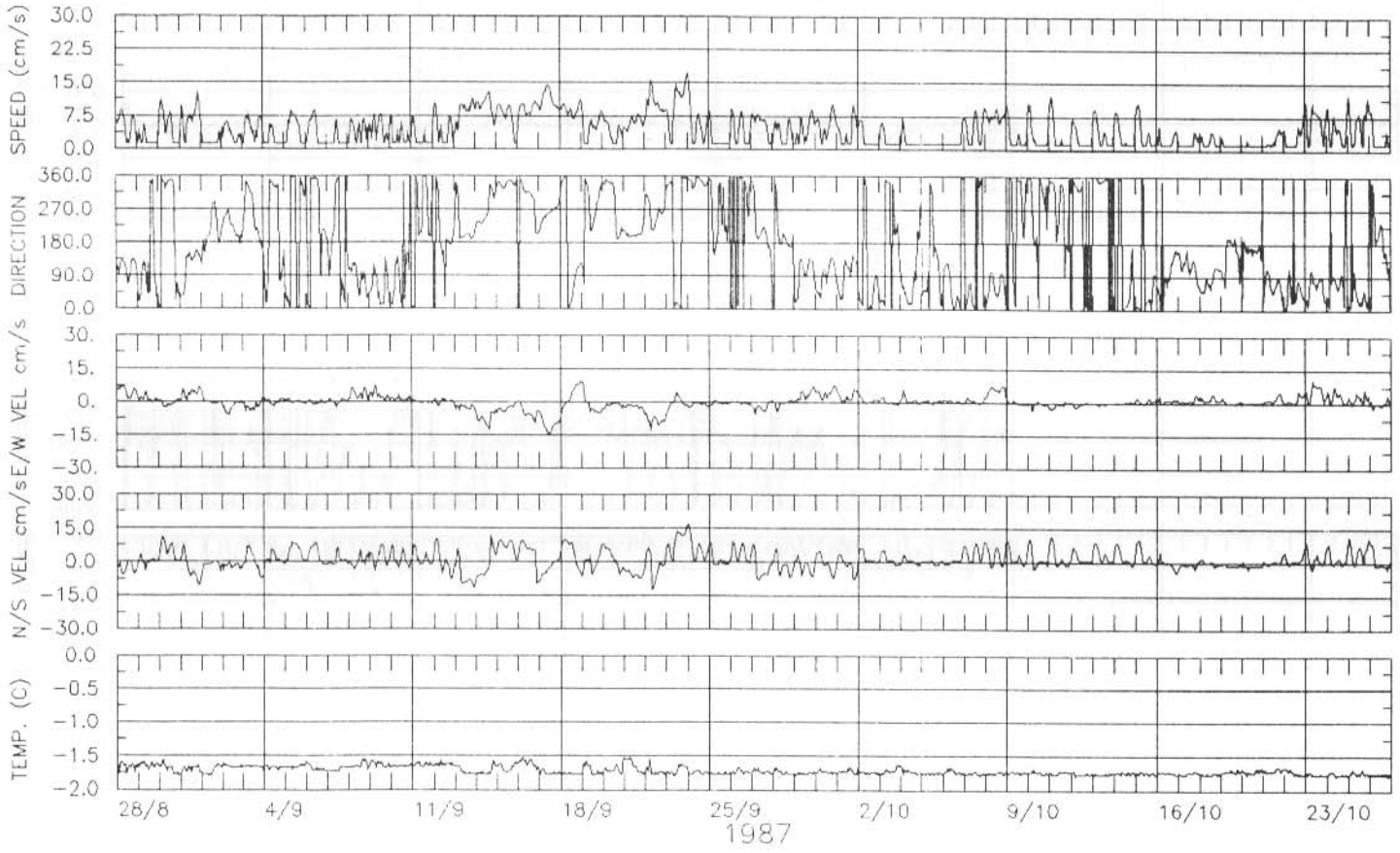
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 30/04/87 - 29/06/87 GMT RECORDING INTERVAL 60 MINS.



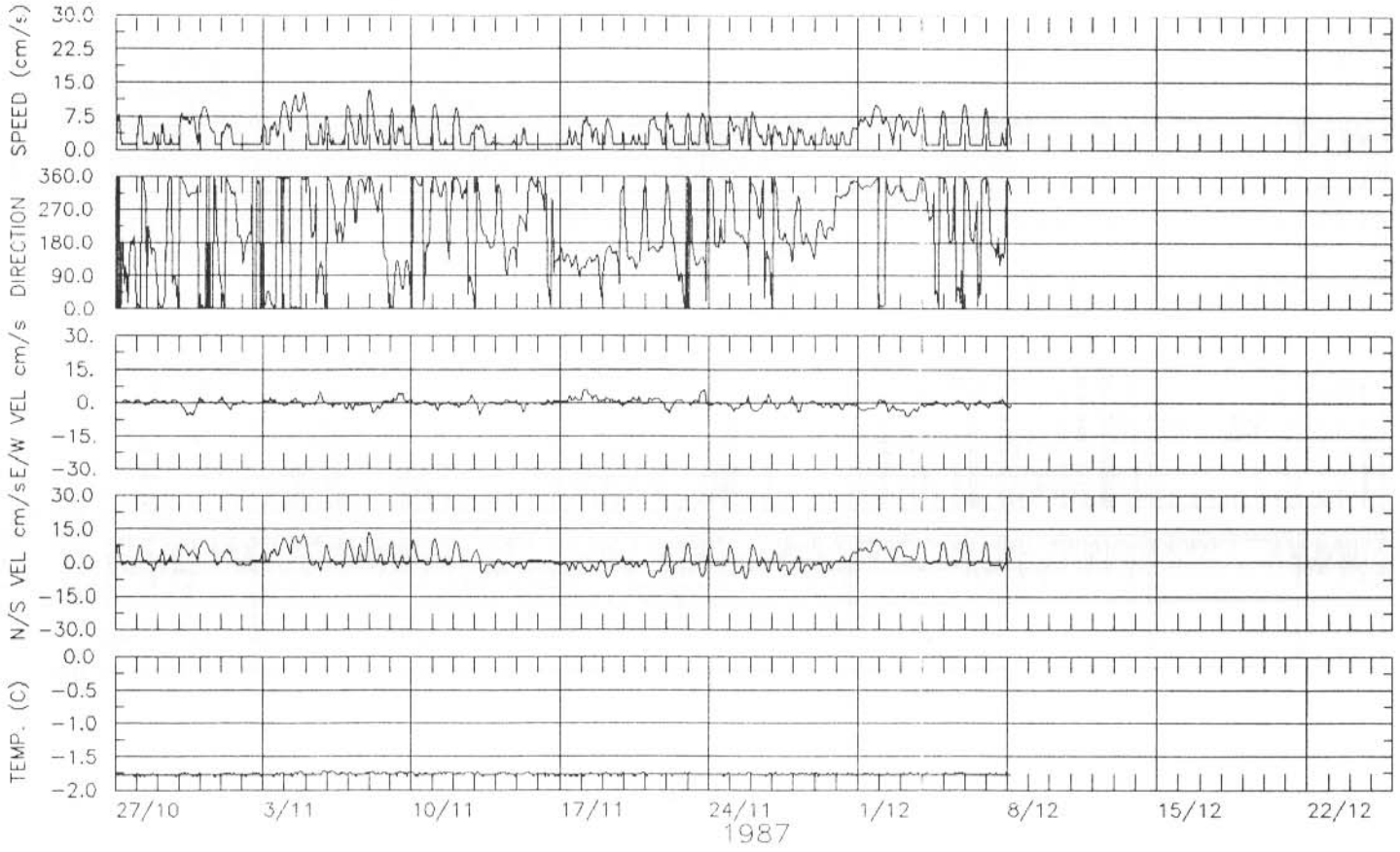
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 3)
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 29/06/87 – 28/08/87 GMT RECORDING INTERVAL 60 MINS.



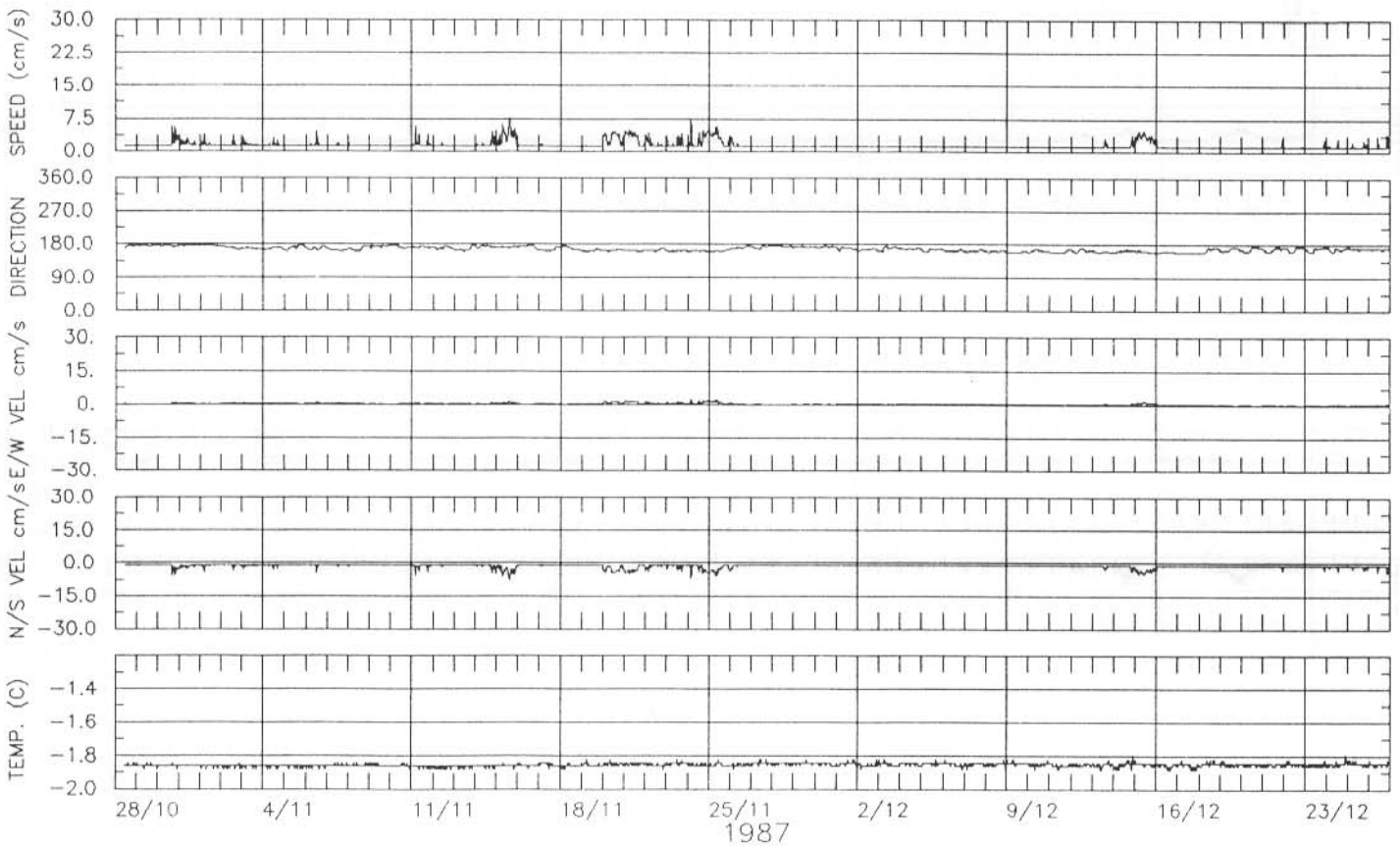
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 4)
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 28/08/87 – 27/10/87 GMT RECORDING INTERVAL 60 MINS.



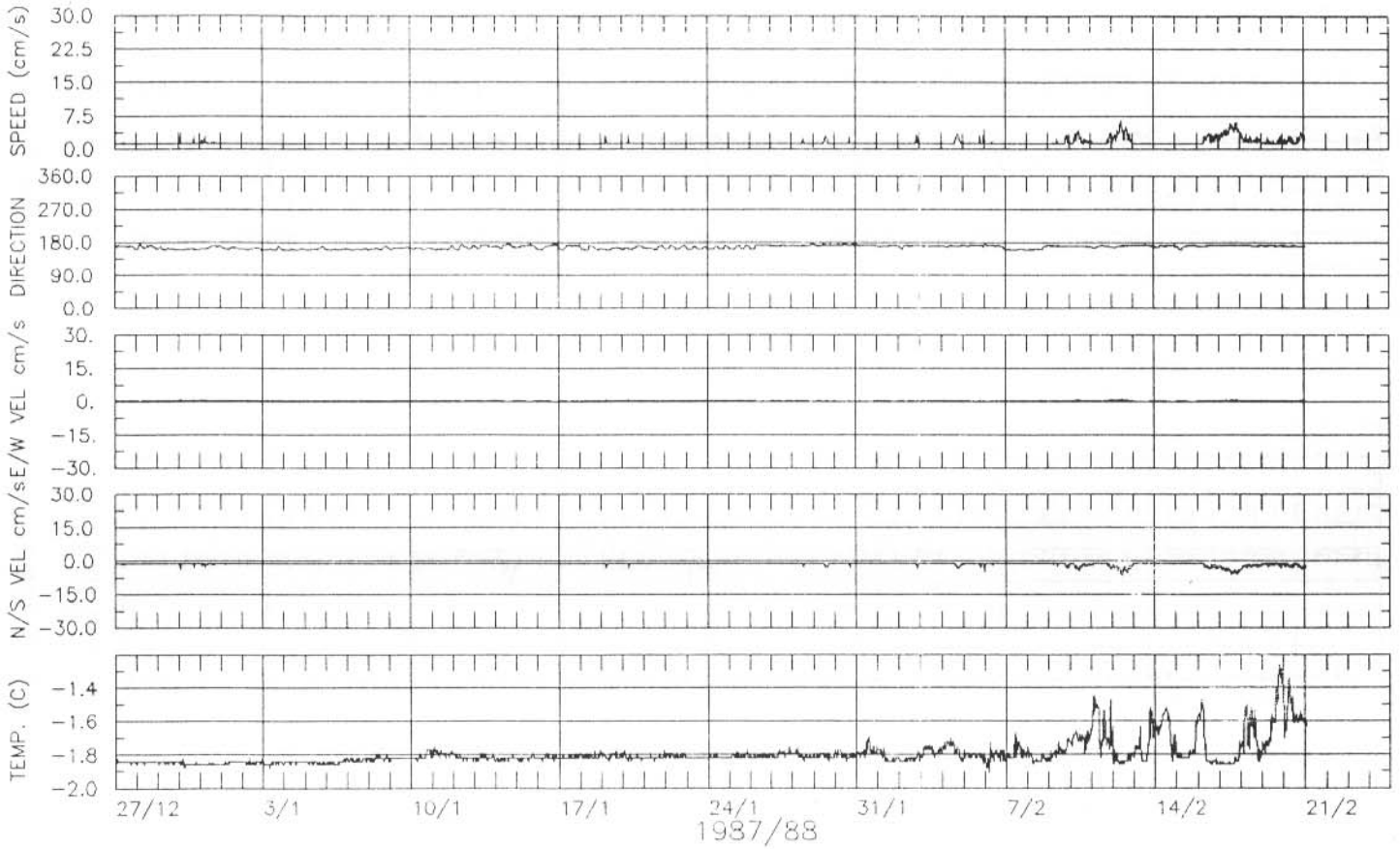
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 5)
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 27/10/87 – 8/12/87 GMT RECORDING INTERVAL 60 MINS.



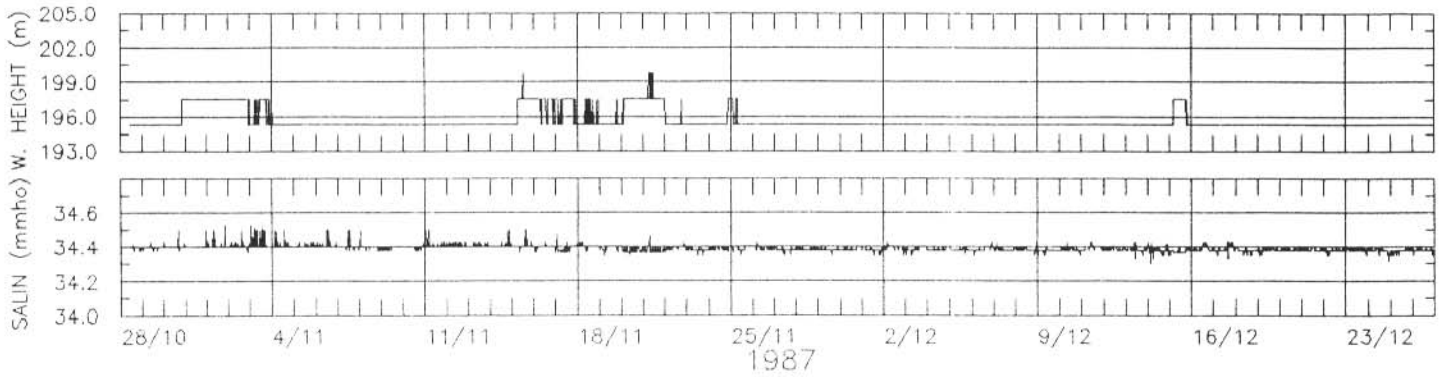
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 8666/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 437 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 – 27/12/87 EST RECORDING INTERVAL 30 MINS.



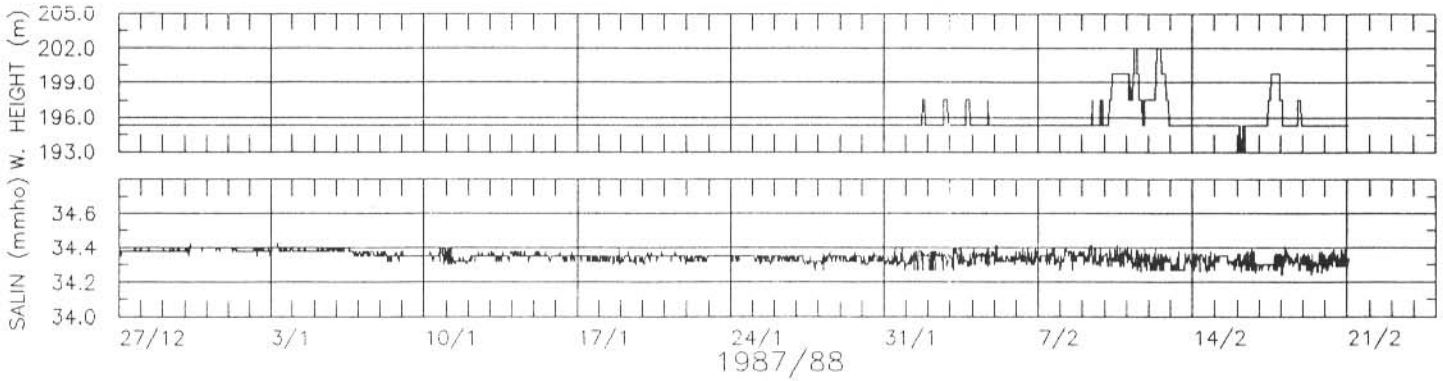
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 8666/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 437 metres OCEAN DEPTH 710 metres
PERIOD 27/12/87 - 21/02/88 EST RECORDING INTERVAL 30 MINS.



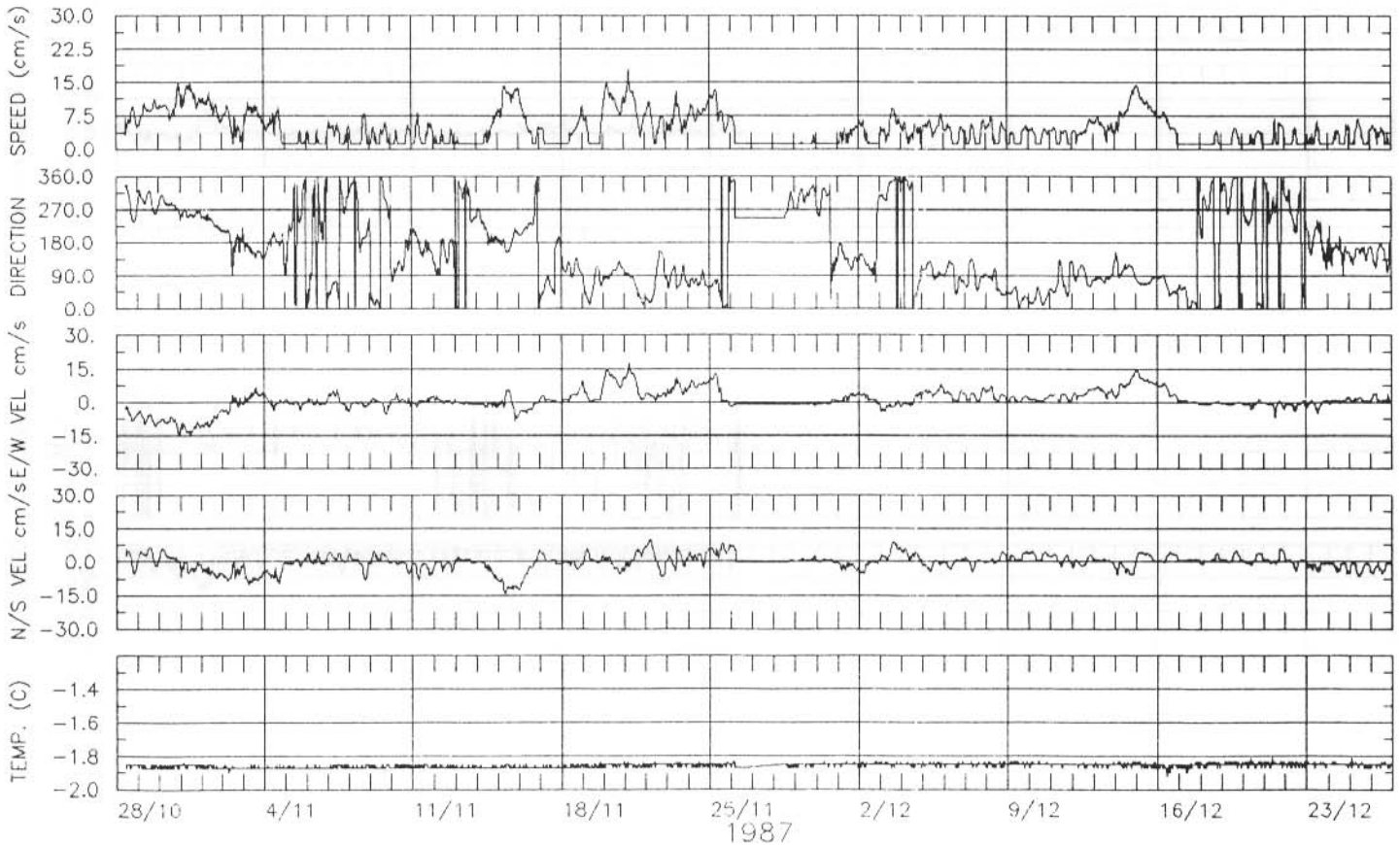
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 8666/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 437 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 – 27/12/87 EST RECORDING INTERVAL 30 MINS.



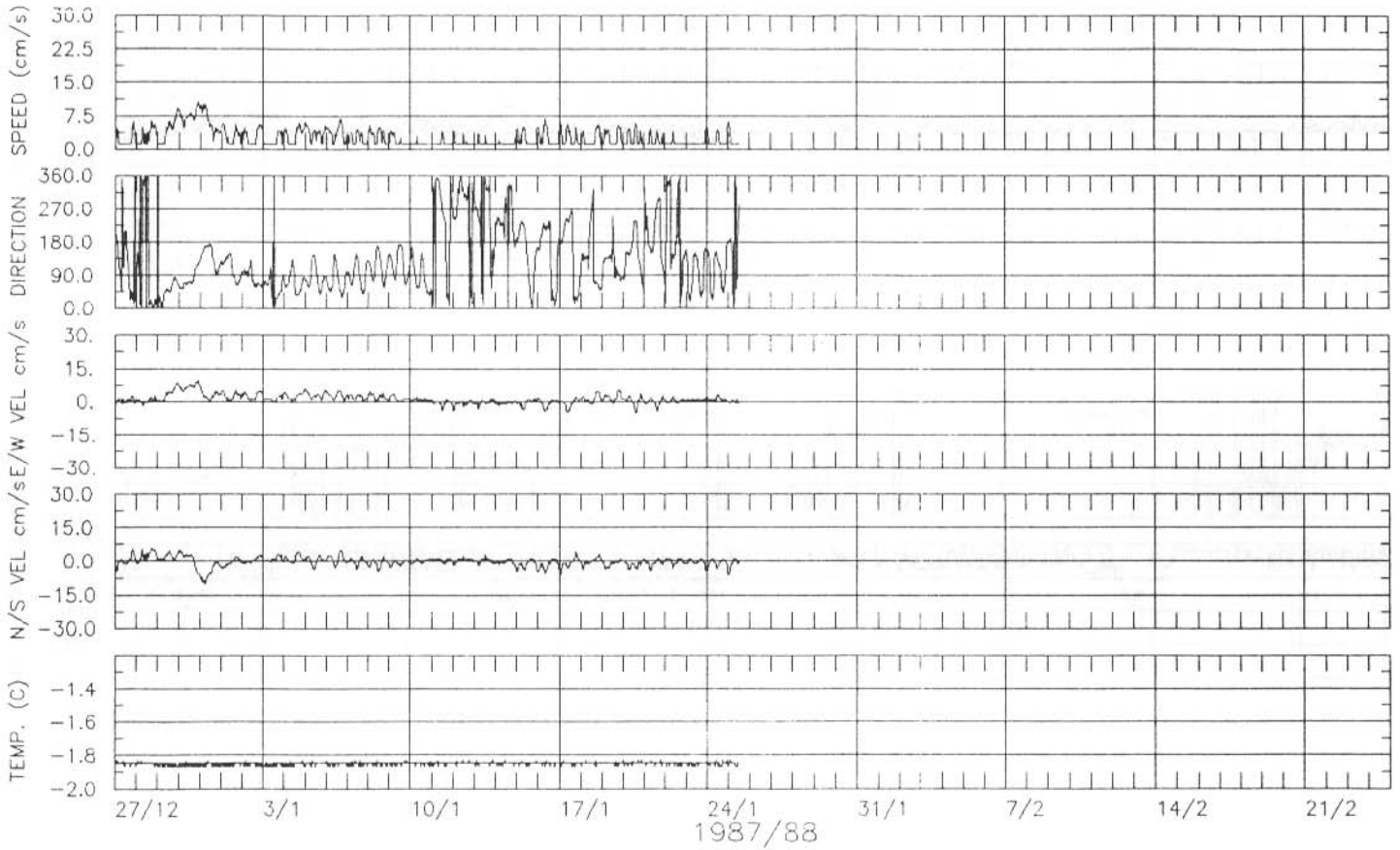
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 8666/1 68 deg. 35.1'(S) - 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 437 metres OCEAN DEPTH 710 metres
PERIOD 27/12/87 - 21/02/88 EST RECORDING INTERVAL 30 MINS.



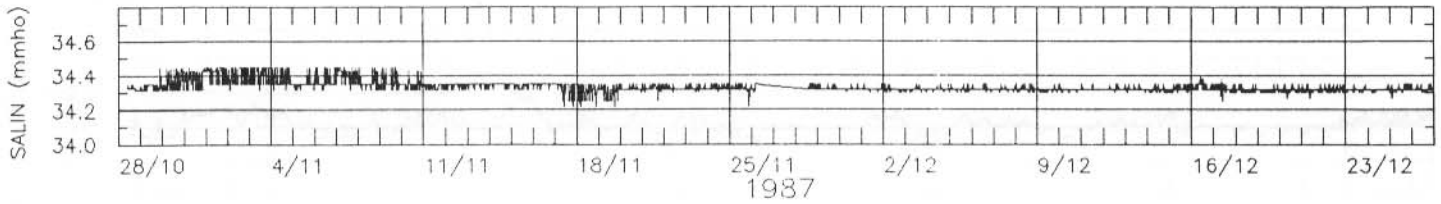
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 8667/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 291 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 – 27/12/87 EST RECORDING INTERVAL 30 MINS.



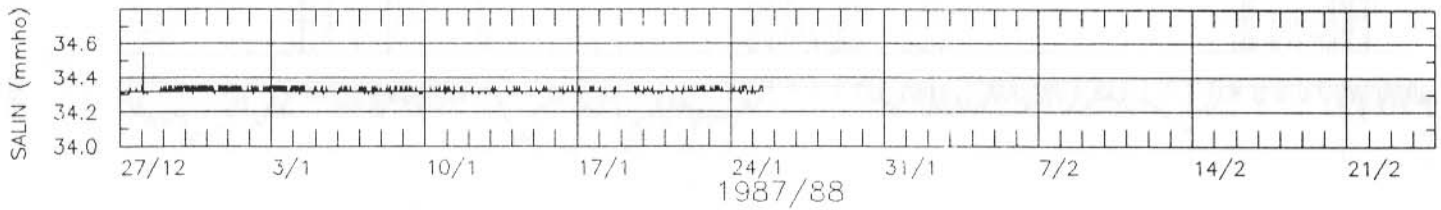
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 8667/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 291 metres OCEAN DEPTH 710 metres
PERIOD 27/12/87 – 25/01/88 EST RECORDING INTERVAL 30 MINS.



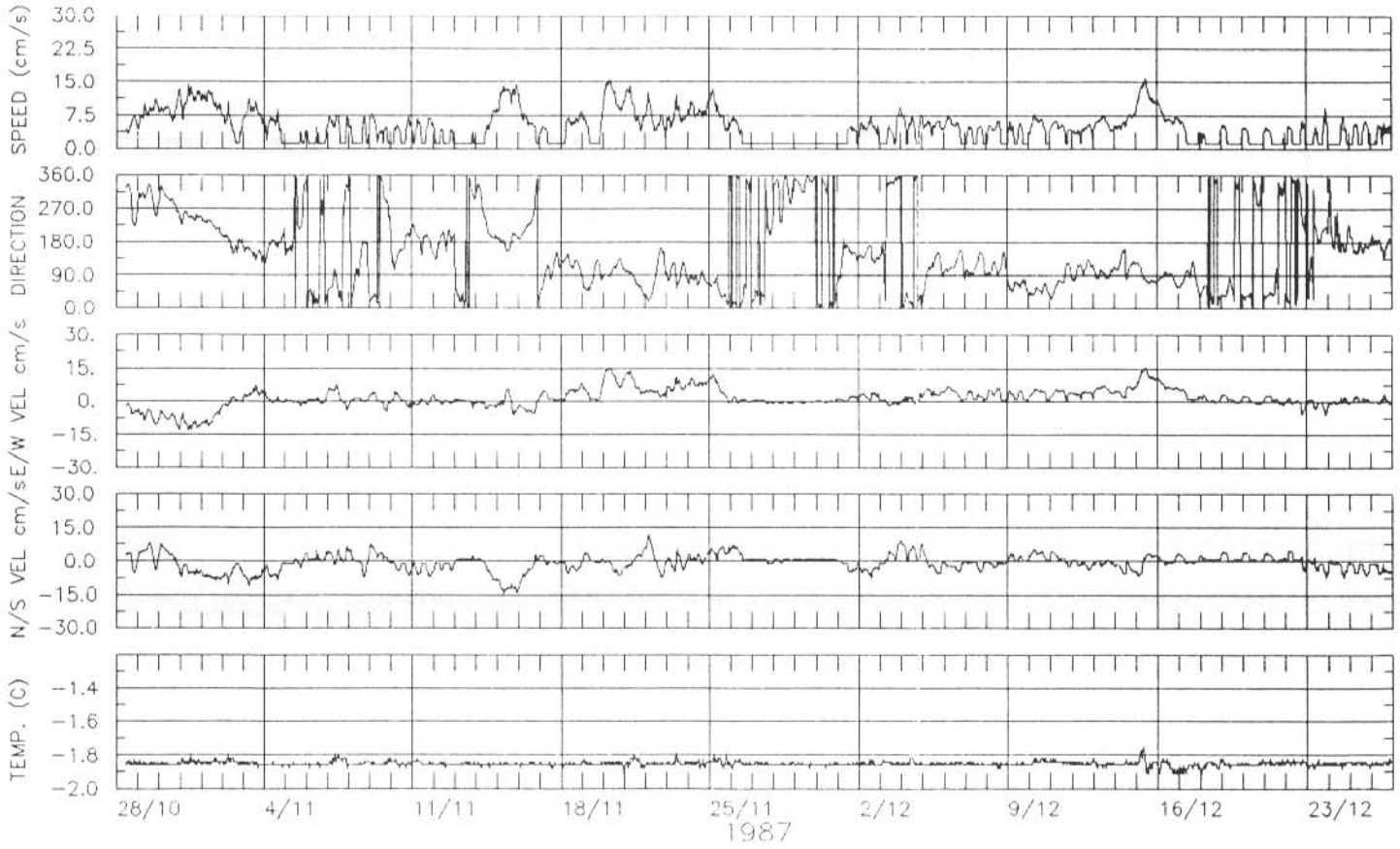
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 8667/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 291 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 27/12/87 EST RECORDING INTERVAL 30 MINS.



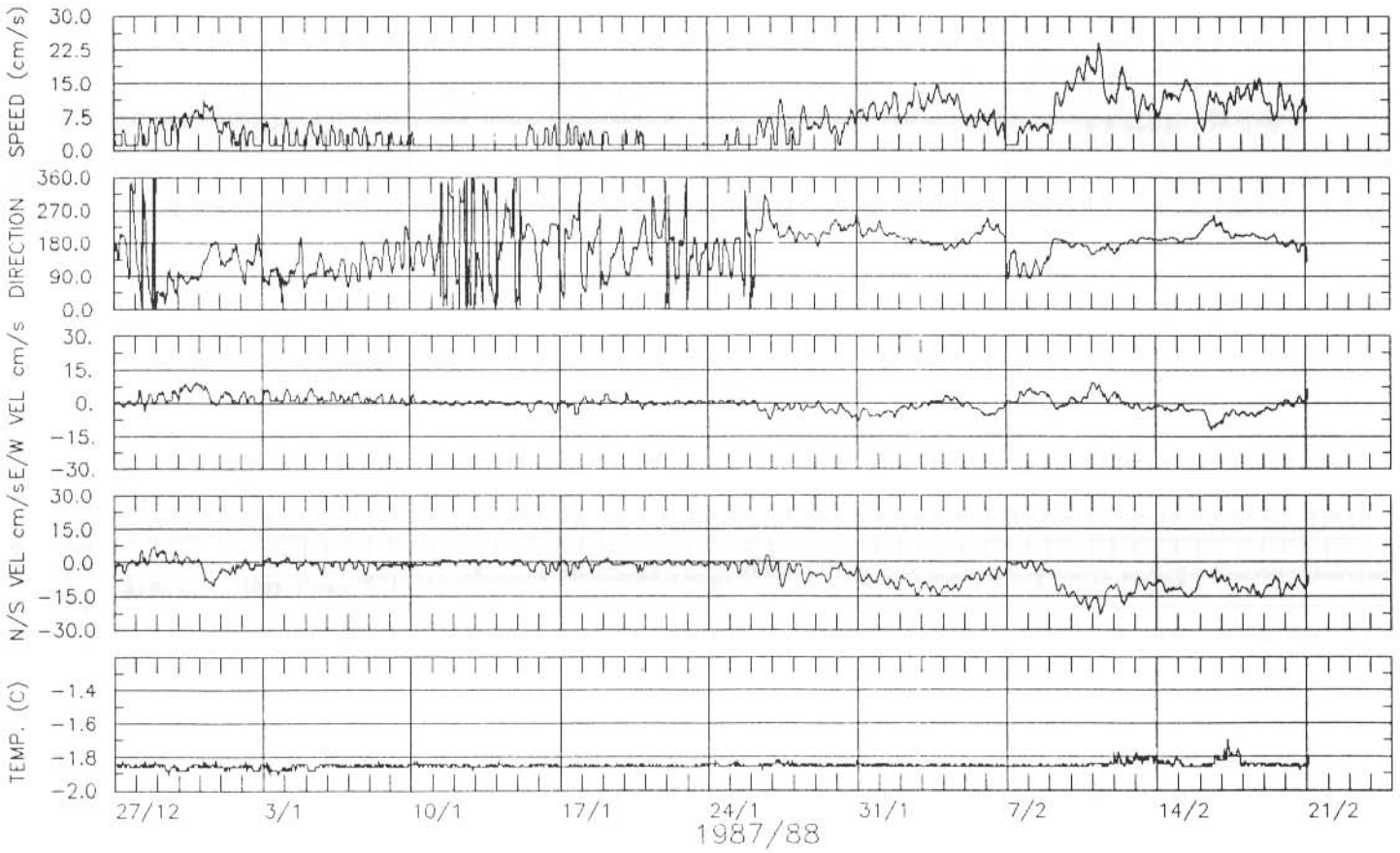
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 8667/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 291 metres OCEAN DEPTH 710 metres
PERIOD 27/12/87 - 25/01/88 EST RECORDING INTERVAL 30 MINS.



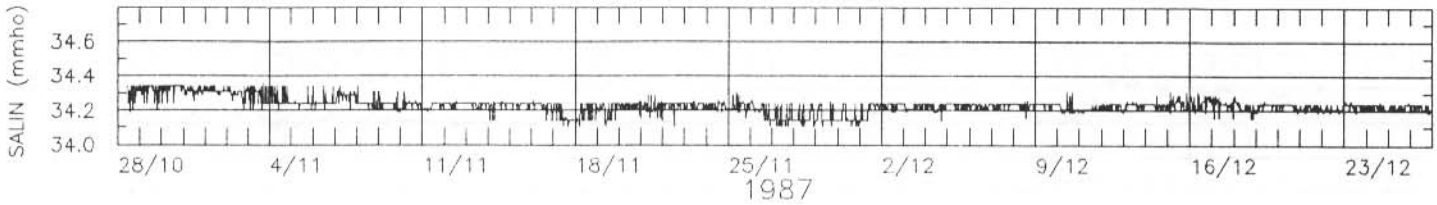
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 8670/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 143 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 27/12/87 EST RECORDING INTERVAL 30 MINS.



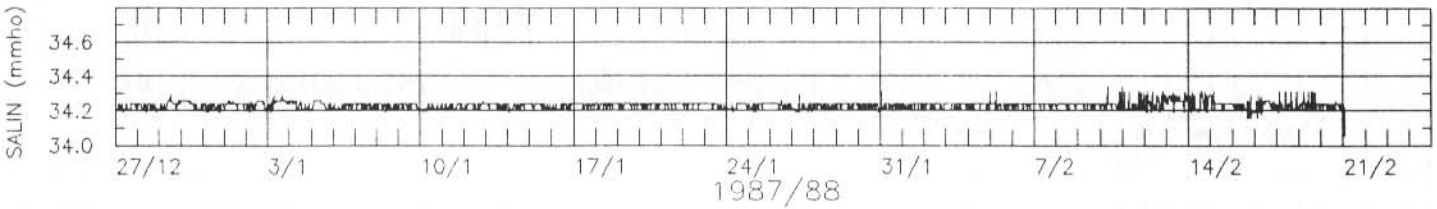
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 8670/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 143 metres OCEAN DEPTH 710 metres
PERIOD 27/12/87 – 21/02/88 EST RECORDING INTERVAL 30 MINS.



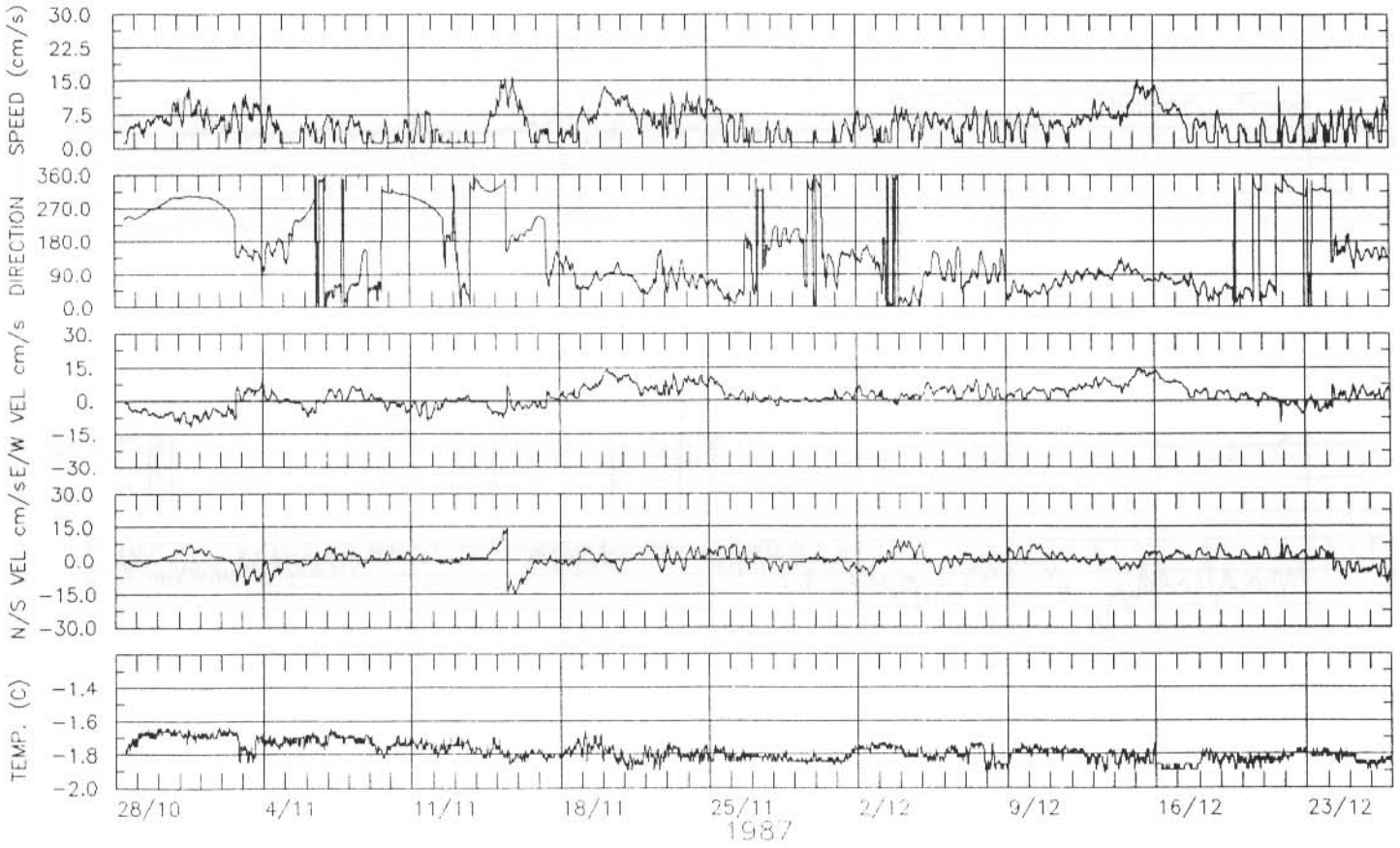
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 8670/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 143 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 27/12/87 EST RECORDING INTERVAL 30 MINS.



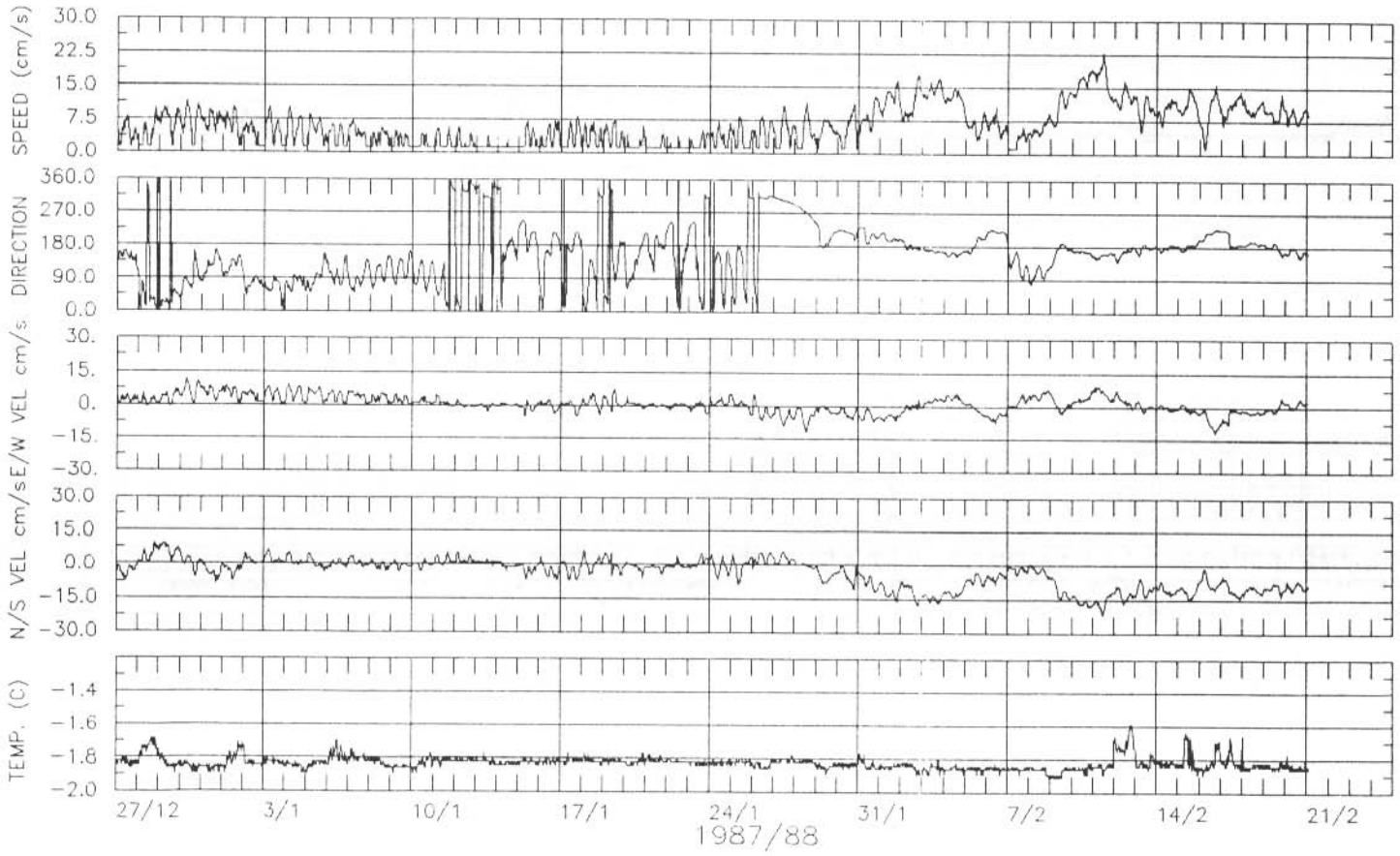
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 8670/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 143 metres OCEAN DEPTH 710 metres
PERIOD 27/12/87 - 21/02/88 EST RECORDING INTERVAL 30 MINS.



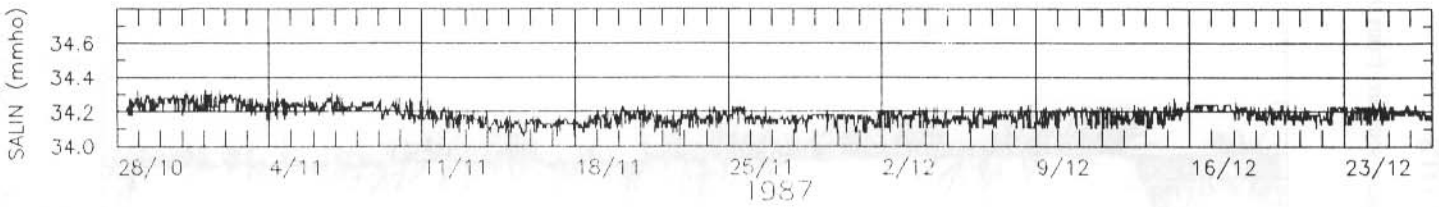
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 8671/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 40 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 27/12/87 EST RECORDING INTERVAL 30 MINS.



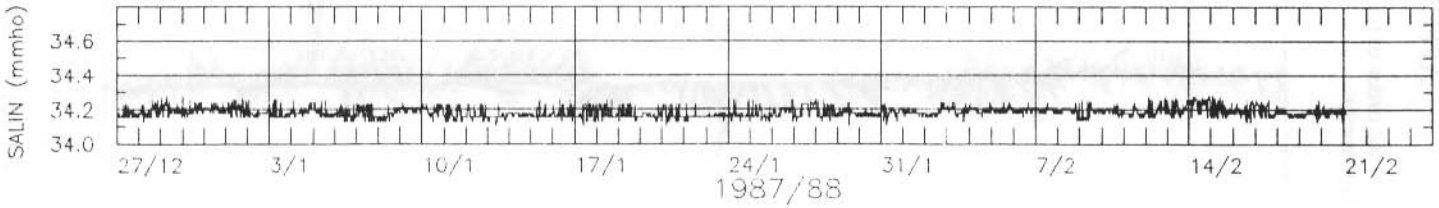
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 8671/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 40 metres OCEAN DEPTH 710 metres
PERIOD 27/12/87 - 21/02/88 EST RECORDING INTERVAL 30 MINS.



MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 8671/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 40 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 – 27/12/87 EST RECORDING INTERVAL 30 MINS.

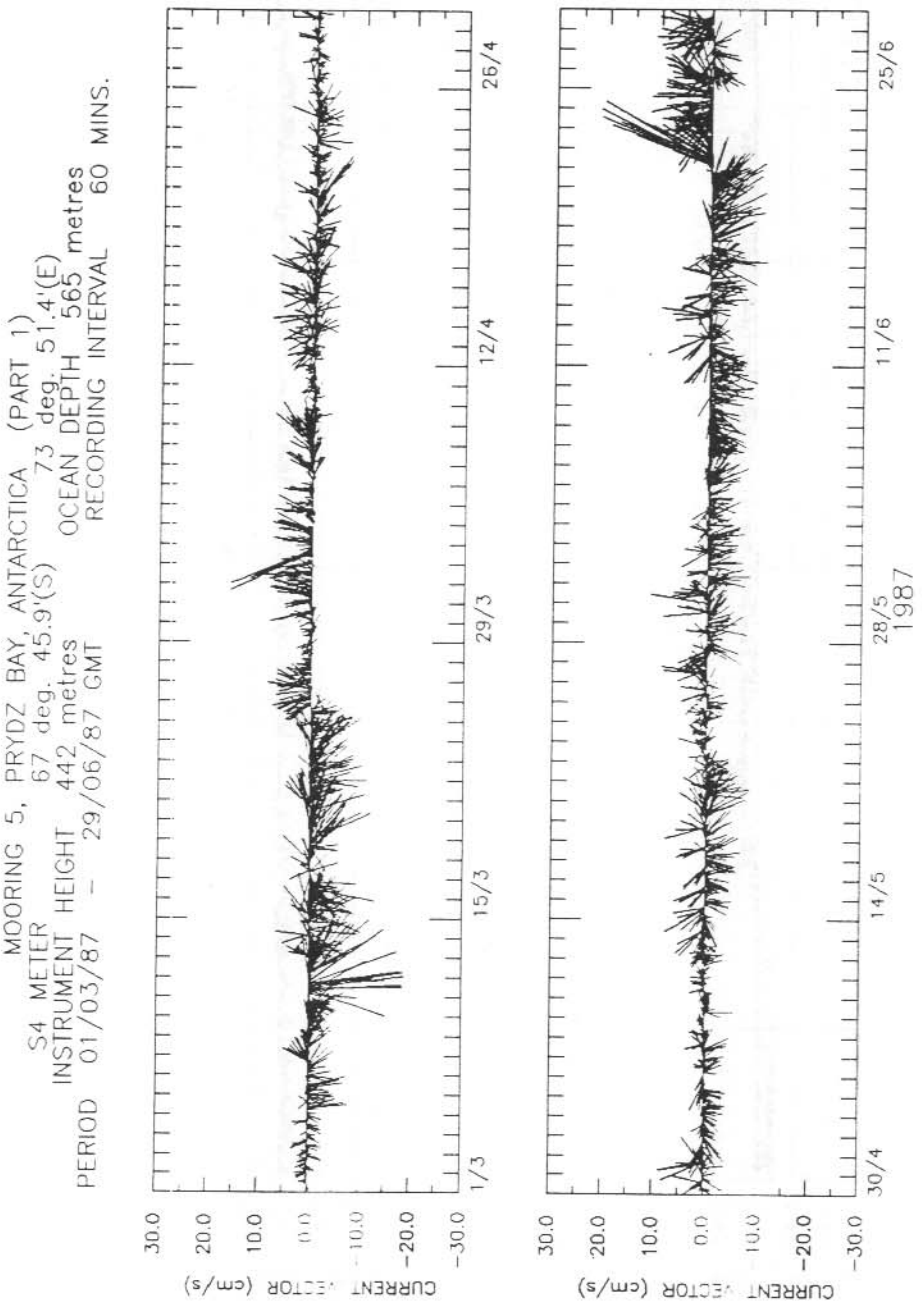


MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 8671/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 40 metres OCEAN DEPTH 710 metres
PERIOD 27/12/87 – 21/02/88 EST RECORDING INTERVAL 30 MINS.

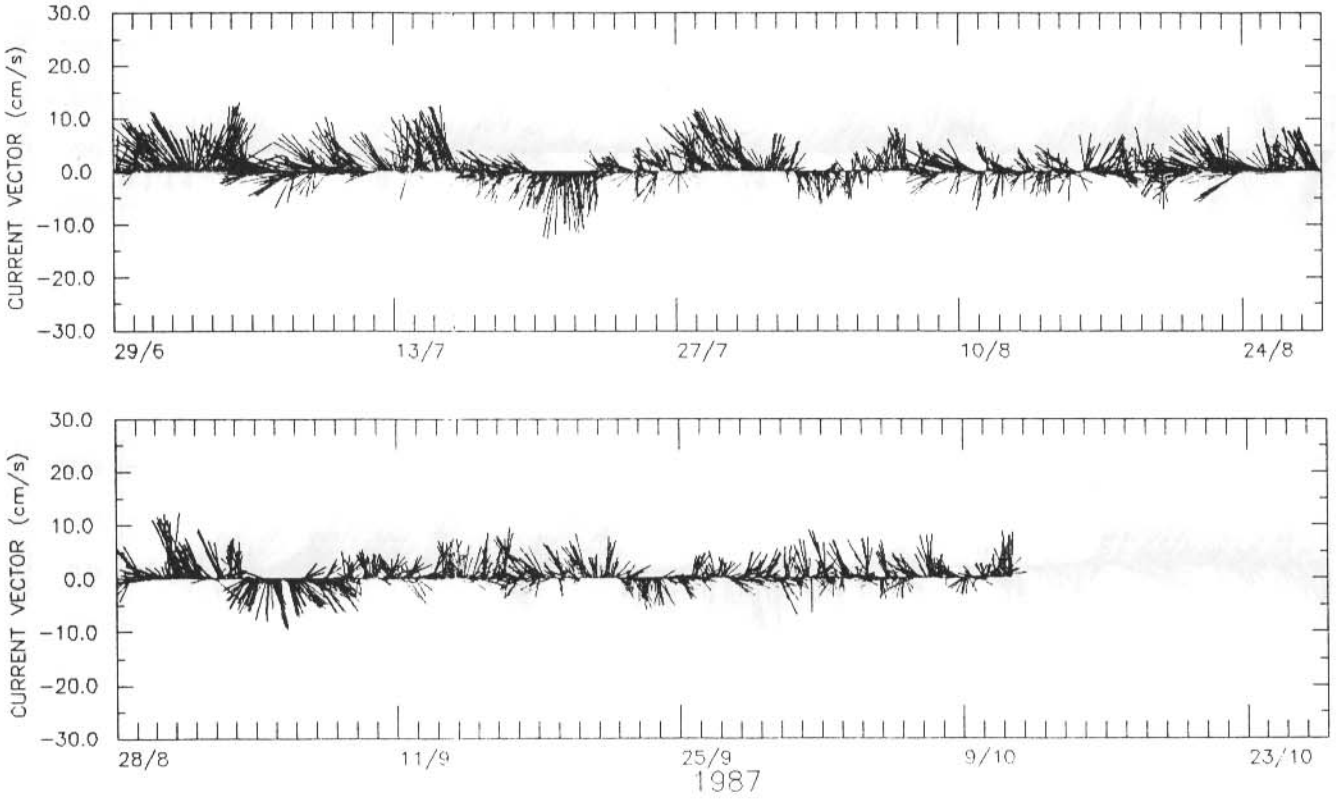


APPENDIX V. 'STICK' PLOTS

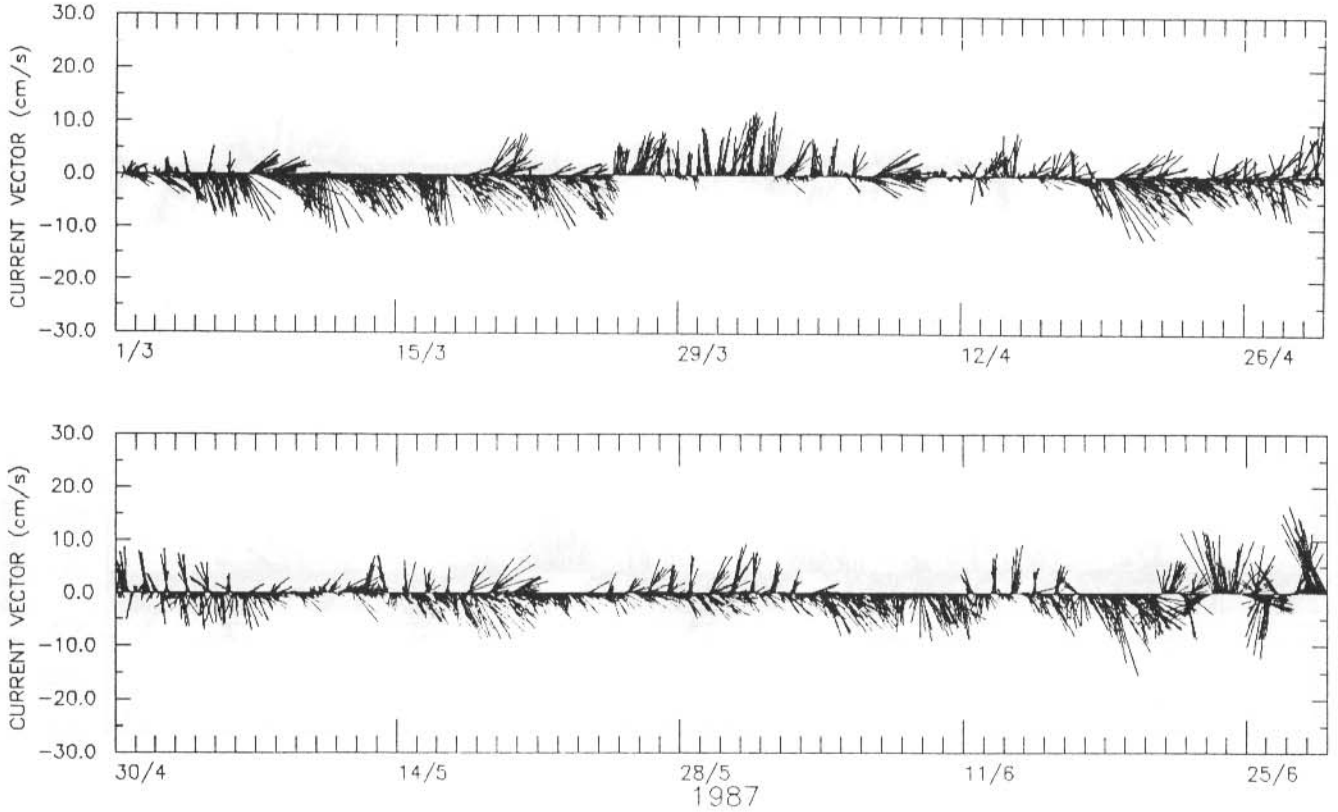
Plots are arranged in the order of moorings (2, 5) and within these sections from the shallowest to the deepest current meter.



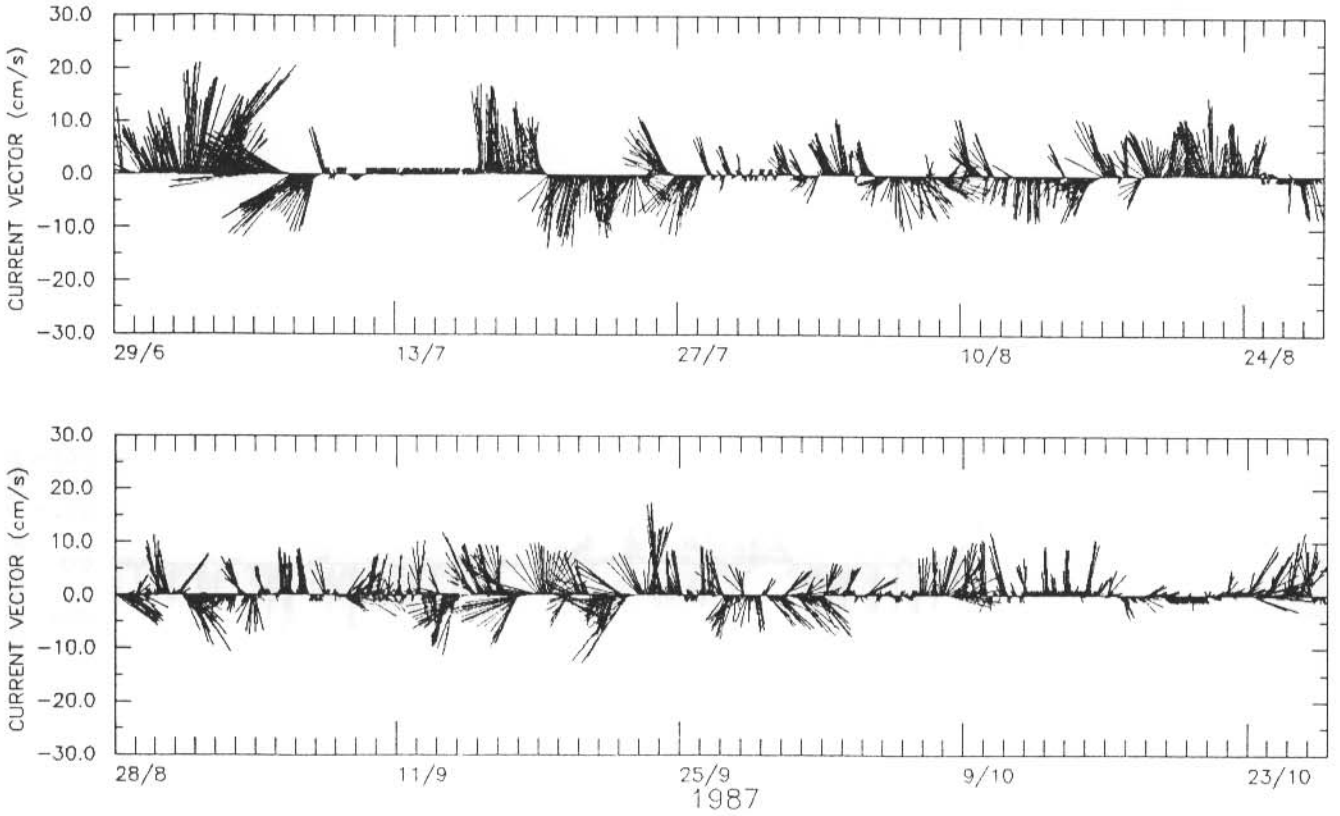
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
S4 METER 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 442 metres OCEAN DEPTH 565 metres
PERIOD 29/06/87 - 11/10/87 GMT RECORDING INTERVAL 60 MINS.



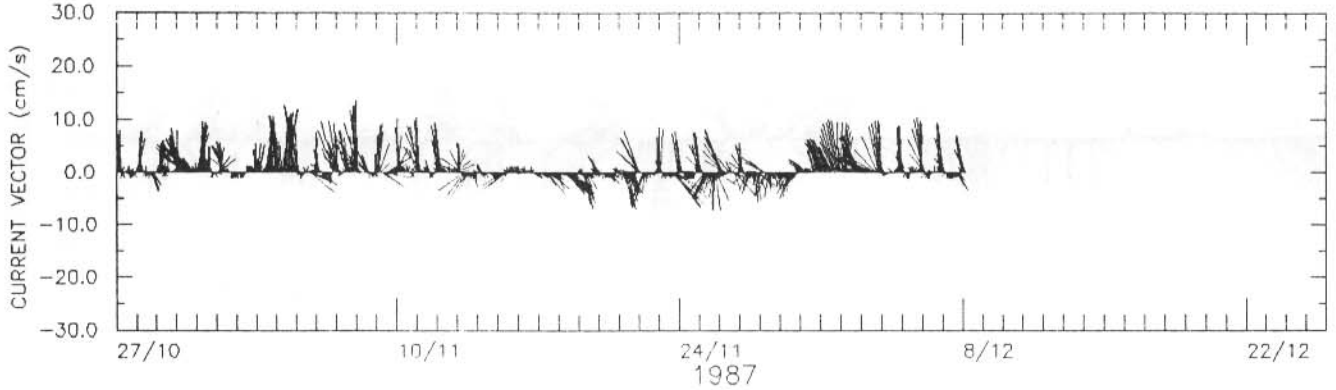
MOORING 5, PRYDZ BAY, ANTARCTICA (PART 1)
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 01/03/87 - 29/06/87 GMT RECORDING INTERVAL 60 MINS.

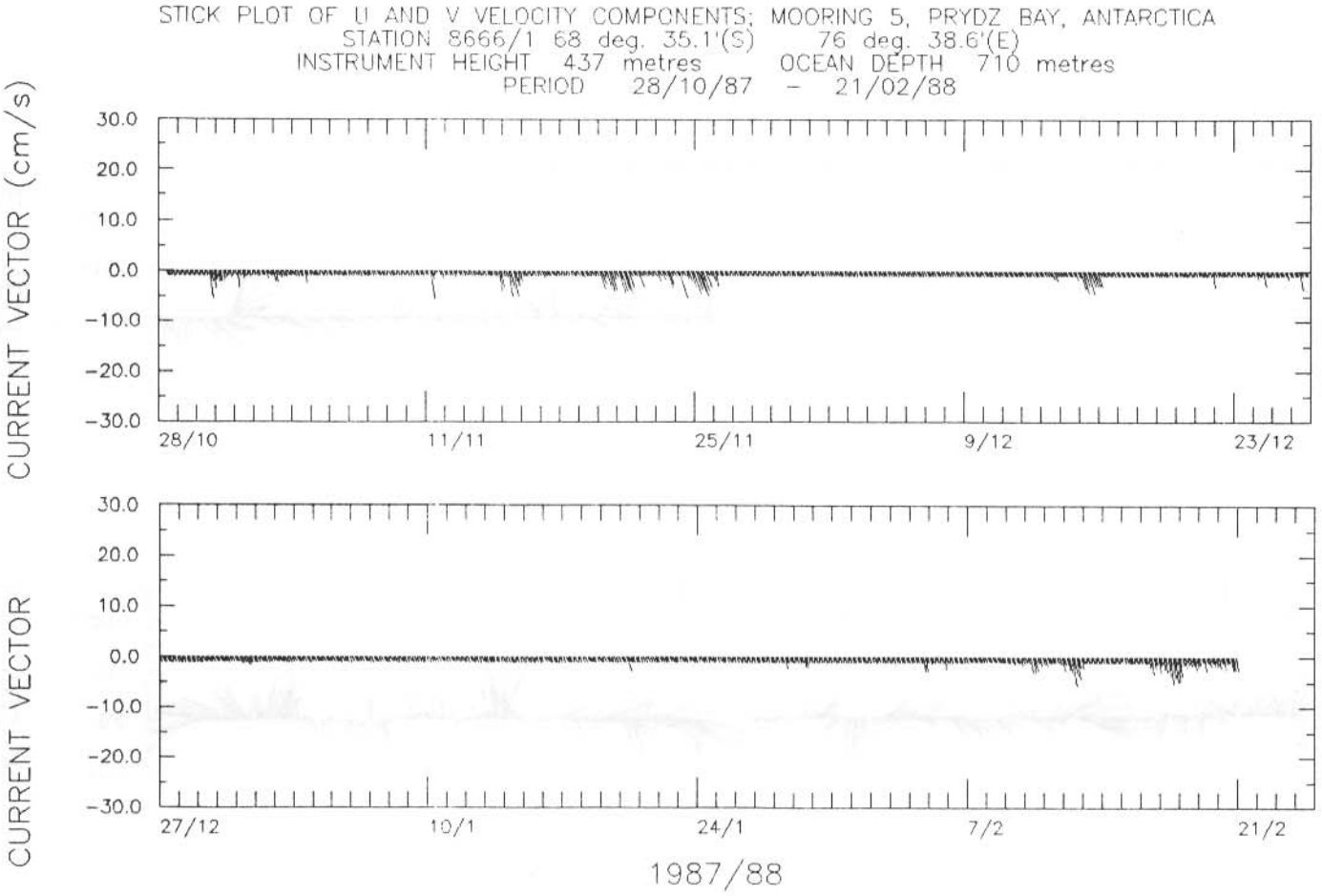


MOORING 5, PRYDZ BAY, ANTARCTICA (PART 2)
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 29/06/87 - 27/10/87 GMT RECORDING INTERVAL 60 MINS.

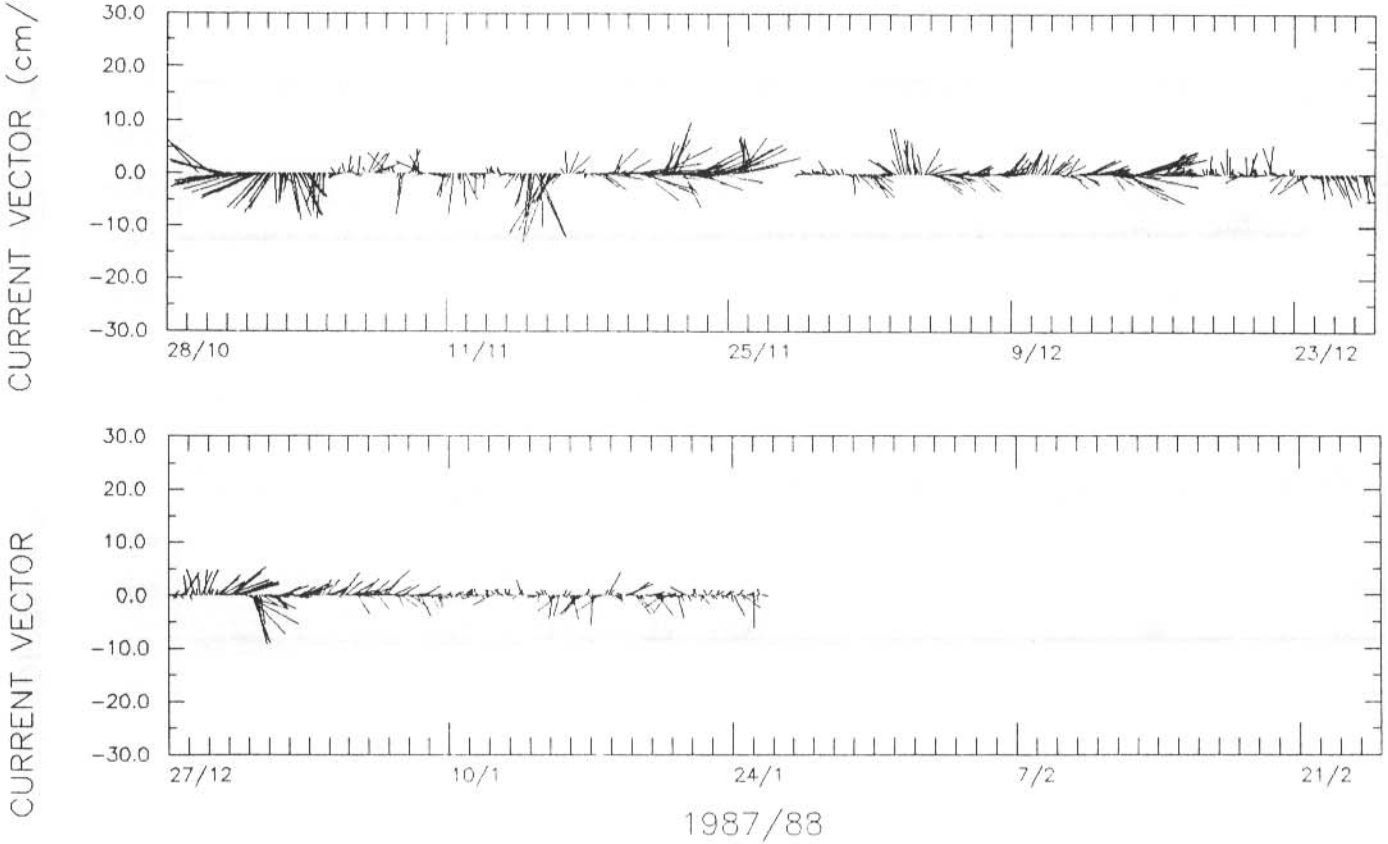


MOORING 5, PRYDZ BAY, ANTARCTICA (PART 3)
STATION 7826/4 67 deg. 45.9'(S) 73 deg. 51.4'(E)
INSTRUMENT HEIGHT 140 metres OCEAN DEPTH 565 metres
PERIOD 27/10/87 - 8/12/87 GMT RECORDING INTERVAL 60 MINS.

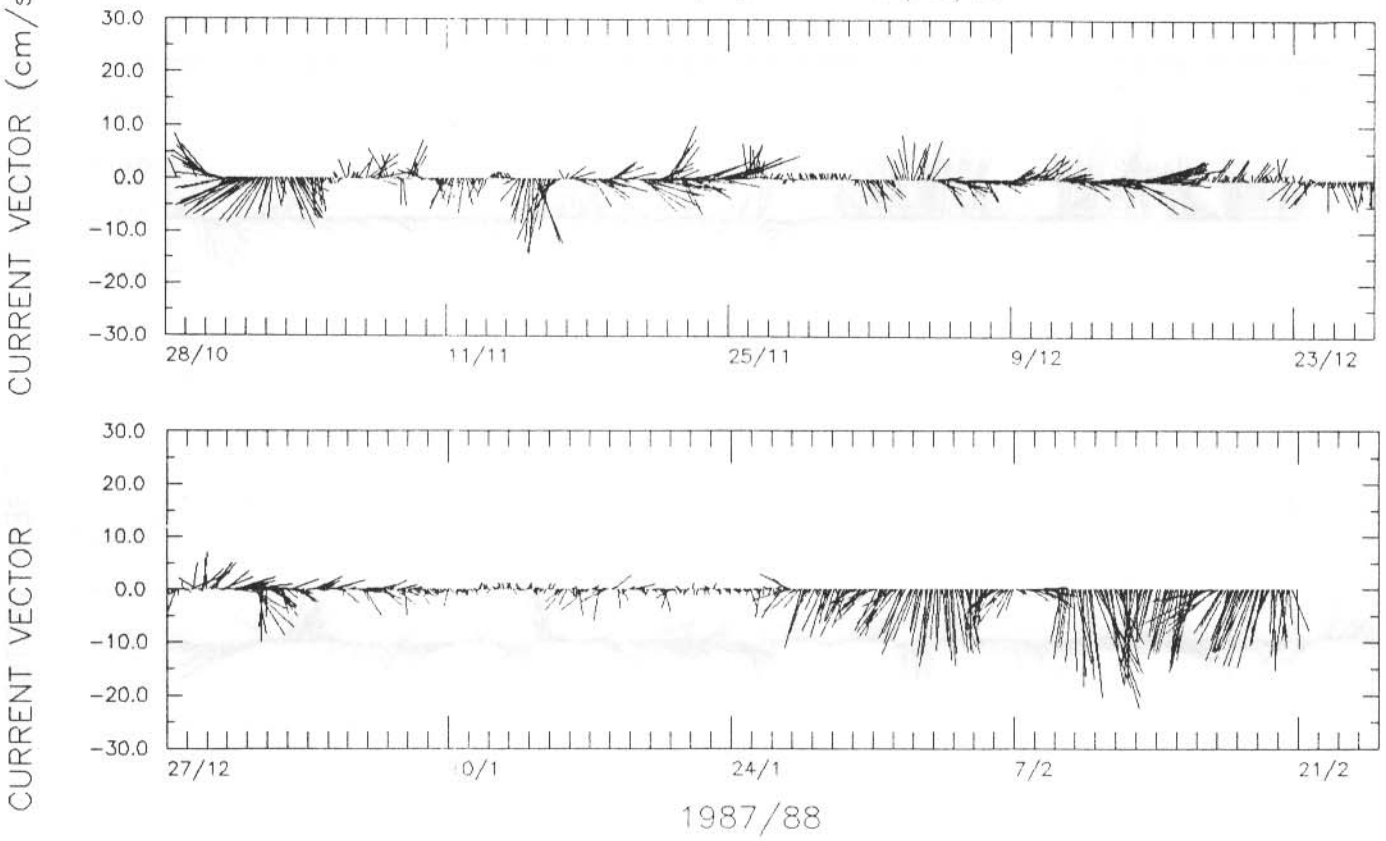



STICK PLOT OF U AND V VELOCITY COMPONENTS; MOORING 5, PRYDZ BAY, ANTARCTICA
STATION 8666/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 437 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88
CURRENT VECTOR (cm/s)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
28/10
11/11
25/11
9/12
23/12
CURRENT VECTOR
27/12
10/1
24/1
7/2
21/2
1987/88

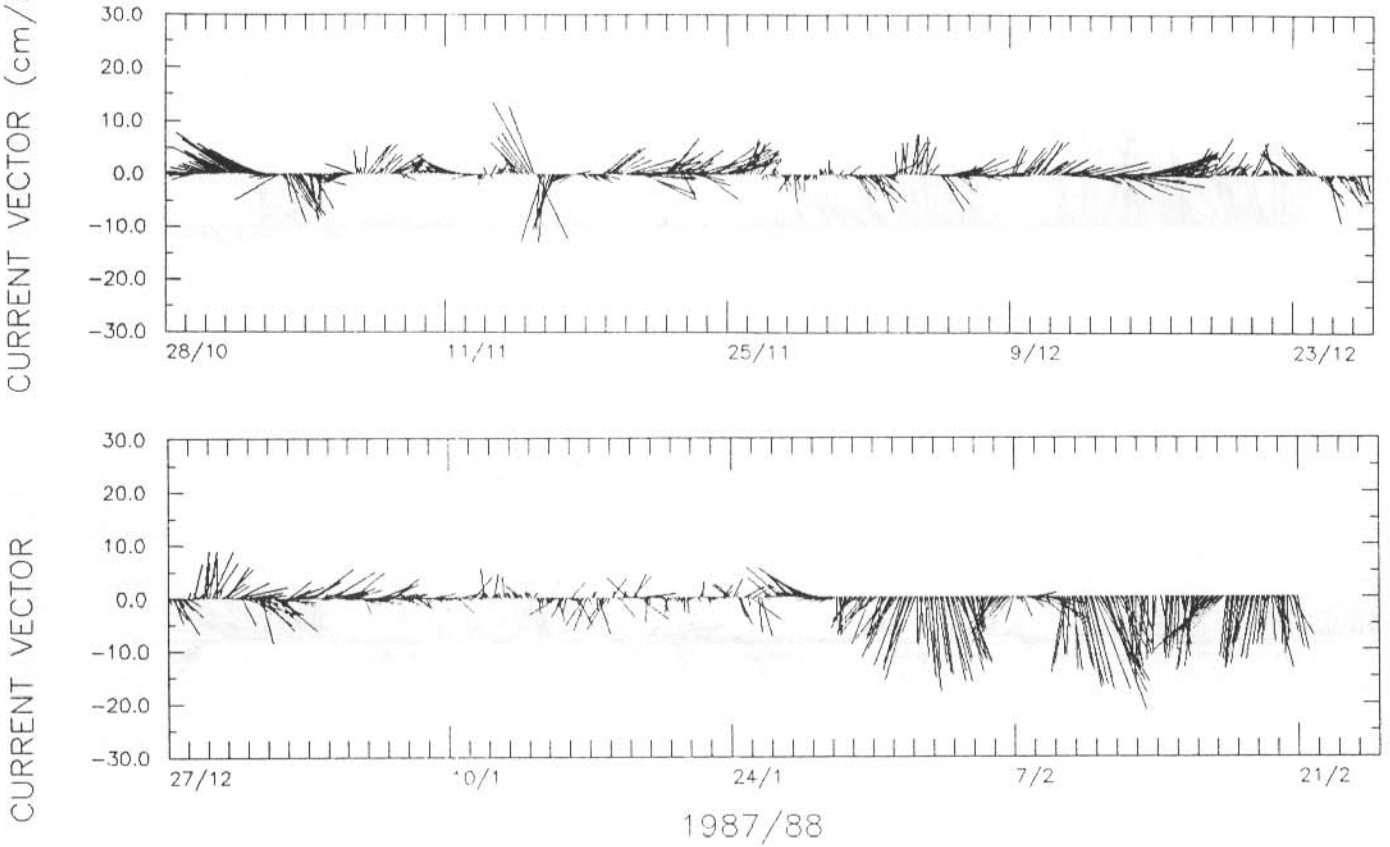
STICK PLOT OF U AND V VELOCITY COMPONENTS; MOORING 5, PRYDZ BAY, ANTARCTICA
STATION 8667/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 291 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 25/01/88



STICK PLOT OF U AND V VELOCITY COMPONENTS; MOORING 5, PRYDZ BAY, ANTARCTICA
STATION 8670/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 143 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88



STICK PLOT OF U AND V VELOCITY COMPONENTS; MOORING 5, PRYDZ BAY, ANTARCTICA
STATION 8671/1 68 deg. 35.1'(S) 76 deg. 38.6'(E)
INSTRUMENT HEIGHT 40 metres OCEAN DEPTH 710 metres
PERIOD 28/10/87 - 21/02/88



APPENDIX VI. TIDAL CURRENT ANALYSES

Tables are arranged in the order of moorings (2, 5) and within these sections from the shallowest to the deepest current meter.

TIDAL CURRENT ANALYSIS USING ROTARY VECTORS FOR; S4 METER AT PRYDZ BAY
GMT 1 0 2 3 1987
GMT 24 0 10 10 1987
Analysis using rotary vectors.
All angles measured anticlockwise from 90 deg.

constit	period	major axis	minor axis	inclin.	phase	dir
SSA	4382.91	2.003	0.292	153.8	-119.1	c
M2	12.42	1.526	0.265	108.1	-45.0	a
MSM	763.49	1.252	0.442	117.8	-88.6	a
K1	23.93	1.233	0.383	106.1	11.2	a
O1	25.82	1.225	0.350	114.4	-26.1	a
MSF	354.37	1.072	0.583	155.6	15.3	c
MM	661.31	0.636	0.420	123.5	-166.6	a
K2	11.97	0.625	0.024	95.2	125.7	c
P1	24.07	0.519	0.212	120.2	13.1	a
S2	12.00	0.474	0.064	86.6	112.6	c
MF	327.86	0.446	0.302	60.6	36.2	c
N2	12.66	0.412	0.213	101.6	-102.8	a
TAU1	25.67	0.354	0.281	100.5	16.8	a
NU2	12.63	0.297	0.117	109.3	-101.7	a
PHI1	23.80	0.295	0.146	110.0	78.8	a
Q1	26.87	0.287	0.056	79.4	-65.3	a
RHO1	26.72	0.206	0.020	72.0	-76.9	a
M3	8.28	0.203	0.035	77.6	-167.5	c
2N2	12.91	0.198	0.159	52.3	8.9	a
LDA2	12.22	0.192	0.047	105.5	-36.0	a
L2	12.19	0.159	0.066	71.9	149.3	a
MU2	12.87	0.156	0.035	97.7	-124.6	a
BET1	24.97	0.146	0.016	64.2	-115.9	a
MSN2	11.79	0.145	0.094	151.0	2.4	a
OQ2	13.16	0.143	0.075	127.5	160.0	a
SIG1	27.85	0.142	0.024	107.0	-155.7	c
SK3	7.99	0.127	0.046	93.5	-62.8	a
CHI1	24.71	0.111	0.007	133.8	90.5	c
OO1	22.31	0.104	0.027	32.9	-7.4	a
J1	23.10	0.101	0.054	81.6	-63.7	c
ETA2	11.75	0.087	0.039	103.3	-140.4	a
MK3	8.18	0.086	0.002	75.3	-100.1	a
EPS2	13.13	0.082	0.023	84.6	108.9	c
2MN6	4.17	0.072	0.046	91.9	118.1	c
2Q1	28.01	0.068	0.056	135.5	-112.3	c
MO3	8.39	0.066	0.019	57.5	-61.7	c
M4	6.21	0.065	0.060	70.9	16.9	a
THE1	23.21	0.065	0.003	48.7	-97.1	a
SK4	5.99	0.065	0.028	154.7	-124.2	a
ALP1	29.07	0.063	0.019	74.8	-139.8	a
MN4	6.27	0.060	0.035	155.8	7.9	a
SO3	8.19	0.057	0.000	32.6	-128.2	c
MSK6	4.04	0.056	0.020	72.4	75.6	a
3MK7	3.53	0.055	0.020	109.4	-83.3	a
MS4	6.10	0.053	0.034	122.9	139.4	a
2SK5	4.80	0.053	0.026	20.4	-178.8	c
NO1	24.83	0.051	0.020	85.3	106.7	c
SO1	22.42	0.051	0.027	12.9	166.1	c
S4	6.00	0.049	0.020	134.6	94.0	a
M6	4.14	0.049	0.009	125.1	-80.8	a
2MK6	4.09	0.049	0.010	144.3	71.5	c
UPS1	21.58	0.048	0.009	121.2	-108.3	a
MKS2	12.39	0.046	0.044	172.6	80.2	c
SN4	6.16	0.046	0.018	4.6	48.8	a
2MS6	4.09	0.039	0.012	28.7	83.5	c
2SM6	4.05	0.034	0.001	156.1	15.1	c
MK4	6.09	0.033	0.009	83.7	-76.1	a
2MK5	4.93	0.025	0.006	64.2	72.4	a

TIDAL CURRENT ANALYSIS USING ROTARY VECTORS FOR; CM78264C.DAT

GMT 1 0 2 3 1987

GMT 24 0 7 12 1987

Analysis using rotary vectors.

All angles measured anticlockwise from 90 deg.

constit	period	major axis	minor axis	inclin.	phase	dir
M2	12.42	1.633	0.177	106.0	-28.9	a
K1	23.93	1.489	0.346	98.1	2.4	a
S2	12.00	1.403	0.066	89.8	66.3	a
O1	25.82	1.389	0.253	108.6	0.8	a
SSA	4382.91	1.265	0.120	173.4	-122.1	a
MSM	763.49	1.226	0.381	98.5	-94.5	a
MM	661.31	0.760	0.000	119.3	159.8	a
MF	327.86	0.506	0.383	55.2	3.2	a
MSF	354.37	0.499	0.182	51.9	92.4	c
K2	11.97	0.492	0.028	92.9	77.9	c
P1	24.07	0.487	0.032	87.8	15.4	a
N2	12.66	0.403	0.195	95.1	-84.7	a
L2	12.19	0.288	0.110	84.3	-14.6	a
Q1	26.87	0.274	0.126	103.2	-32.0	a
M3	8.28	0.251	0.038	90.6	-136.4	a
NO1	24.83	0.196	0.035	66.6	-157.9	c
2N2	12.91	0.196	0.151	80.0	-127.4	a
CHI1	24.71	0.193	0.084	75.9	143.4	a
TAU1	25.67	0.191	0.127	66.9	179.7	a
PHI1	23.80	0.186	0.086	60.5	-2.1	a
SK3	7.99	0.183	0.032	76.3	-5.1	c
SO1	22.42	0.176	0.005	137.7	-83.7	c
MO3	8.39	0.161	0.030	60.4	-13.2	a
MU2	12.87	0.153	0.072	143.7	-170.6	a
2Q1	28.01	0.142	0.003	12.9	-131.6	c
THE1	23.21	0.113	0.076	64.7	-71.9	a
BET1	24.97	0.108	0.031	90.7	-25.1	a
NU2	12.63	0.105	0.017	77.1	176.3	a
J1	23.10	0.097	0.017	112.7	46.1	a
M4	6.21	0.094	0.047	60.1	-7.6	a
MK3	8.18	0.094	0.007	64.0	-30.6	c
OQ2	13.16	0.090	0.020	23.9	-156.0	a
MSN2	11.79	0.084	0.013	173.6	147.6	a
MKS2	12.39	0.079	0.010	65.5	28.3	a
SIG1	27.85	0.076	0.044	17.4	-115.9	c
MS4	6.10	0.075	0.017	15.2	52.8	a
EPS2	13.13	0.069	0.042	83.7	-151.6	a
MN4	6.27	0.069	0.037	60.1	11.0	a
LDA2	12.22	0.068	0.035	122.2	69.5	a
SO3	8.19	0.068	0.018	28.3	57.7	c
ALP1	29.07	0.050	0.018	33.1	71.8	c
OO1	22.31	0.046	0.015	135.8	111.4	c
RHO1	26.72	0.040	0.019	3.5	155.5	c
ETA2	11.75	0.035	0.025	145.7	74.8	c
2MN6	4.17	0.033	0.026	56.8	153.7	a
SK4	5.99	0.033	0.020	103.1	-116.9	a
S4	6.00	0.032	0.005	131.4	-21.2	c
MK4	6.09	0.030	0.014	57.7	77.6	c
2MK5	4.93	0.030	0.020	6.9	-81.9	a
2SM6	4.05	0.029	0.001	176.9	47.0	c
UPS1	21.58	0.029	0.006	84.7	147.0	c
2MS6	4.09	0.026	0.008	81.3	-4.6	a
SN4	6.16	0.024	0.005	101.6	123.8	a
MSK6	4.04	0.021	0.005	58.5	98.4	a
M8	3.11	0.021	0.004	94.2	22.5	a
3MK7	3.53	0.020	0.014	45.0	22.3	a
2SK5	4.80	0.018	0.003	105.9	-178.8	a
2MK6	4.09	0.015	0.005	141.6	177.6	c

TIDAL CURRENT ANALYSIS USING ROTARY VECTORS FOR; cm86661c.dat

GMT 2 0 29 10 1987

GMT 23 0 20 2 1988

Analysis using rotary vectors.

All angles measured anticlockwise from 90 deg.

constit	period	major axis	minor axis	inclin.	phase	dir
MM	661.31	0.248	0.043	103.0	129.9	c
N2	12.66	0.049	0.002	98.5	-44.1	a
MSF	354.37	0.047	0.026	139.5	-168.2	a
L2	12.19	0.038	0.003	98.1	-16.5	c
M2	12.42	0.035	0.008	106.7	-88.8	c
K1	23.93	0.031	0.007	44.6	101.1	a
ALP1	29.07	0.030	0.003	103.5	52.3	a
O1	25.82	0.030	0.016	78.8	48.4	c
SN4	6.16	0.027	0.000	101.0	-106.0	c
ETA2	11.75	0.026	0.003	102.4	-25.7	c
Q1	26.87	0.026	0.011	98.8	20.9	c
MN4	6.27	0.026	0.000	103.5	46.1	a
MS4	6.10	0.020	0.000	102.4	179.6	c
S2	12.00	0.020	0.004	46.5	103.8	a
OO1	22.31	0.020	0.001	108.8	49.1	a
2MN6	4.17	0.019	0.000	99.9	43.6	a
2MS6	4.09	0.017	0.001	106.1	52.1	a
MO3	8.39	0.017	0.000	98.1	12.3	c
2MK5	4.93	0.016	0.001	107.9	-56.4	c
J1	23.10	0.015	0.001	120.8	-139.2	a
MU2	12.87	0.014	0.003	94.2	-140.2	a
NO1	24.83	0.014	0.001	76.5	164.1	c
2Q1	28.01	0.014	0.004	95.4	-171.5	c
M3	8.28	0.013	0.006	92.2	175.6	c
M4	6.21	0.012	0.001	99.2	-84.1	c
EPS2	13.13	0.012	0.004	66.6	-59.4	a
UPS1	21.58	0.011	0.001	103.7	-57.9	a
S4	6.00	0.011	0.002	101.3	-46.7	c
3MK7	3.53	0.011	0.001	102.9	-152.5	c
2SM6	4.05	0.011	0.003	109.7	155.6	a
2SK5	4.80	0.011	0.000	98.2	84.4	c
MK3	8.18	0.007	0.000	88.8	-102.0	a
M6	4.14	0.006	0.003	102.8	-19.3	a
M8	3.11	0.005	0.001	102.3	-85.2	c
SK3	7.99	0.004	0.001	149.7	163.0	c

TIDAL CURRENT ANALYSIS USING ROTARY VECTORS FOR; cm86671c.dat
GMT 2 0 29 10 1987
GMT 23 0 24 1 1988
Analysis using rotary vectors.
All angles measured anticlockwise from 90 deg.

constit	period	major axis	minor axis	inclin.	phase	dir
MM	661.31	1.488	0.355	6.2	-145.2	a
MSF	354.37	1.485	0.562	31.9	34.1	a
K1	23.93	0.540	0.298	49.1	-21.6	c
N2	12.66	0.367	0.202	118.7	-40.9	a
S2	12.00	0.323	0.068	77.9	119.7	c
M2	12.42	0.320	0.102	92.7	45.5	c
O1	25.82	0.310	0.290	29.7	-1.0	c
Q1	26.87	0.213	0.049	66.4	-36.8	a
MU2	12.87	0.209	0.173	76.3	-97.8	a
J1	23.10	0.178	0.037	71.0	-23.2	c
EPS2	13.13	0.170	0.082	133.3	-90.9	a
NO1	24.83	0.167	0.023	25.6	-148.3	c
SK3	7.99	0.159	0.034	66.4	-149.4	a
ALP1	29.07	0.155	0.004	17.4	-122.2	c
2Q1	28.01	0.147	0.076	175.7	94.8	a
M3	8.28	0.144	0.025	63.8	168.1	a
L2	12.19	0.139	0.029	55.2	29.1	c
OO1	22.31	0.124	0.046	28.9	-170.2	a
ETA2	11.75	0.123	0.018	51.2	125.4	a
MO3	8.39	0.076	0.024	94.6	-105.1	a
UPS1	21.58	0.076	0.037	27.8	-2.9	a
MK3	8.18	0.071	0.056	35.9	-171.2	a
S4	6.00	0.065	0.006	108.8	-81.4	a
MN4	6.27	0.061	0.014	123.2	-110.7	a
SN4	6.16	0.059	0.004	103.9	-9.7	a
2SK5	4.80	0.047	0.008	116.2	-153.1	a
2MN6	4.17	0.044	0.019	10.6	-17.6	a
2SM6	4.05	0.036	0.002	142.3	113.8	c
MS4	6.10	0.036	0.002	152.8	92.9	c
3MK7	3.53	0.033	0.000	0.9	157.8	c
2MK5	4.93	0.032	0.024	14.6	-16.0	a
2MS6	4.09	0.030	0.015	82.0	81.7	c
M8	3.11	0.030	0.002	18.0	-123.5	c
M4	6.21	0.026	0.006	30.0	137.9	c
M6	4.14	0.022	0.009	3.3	-170.2	c

TIDAL CURRENT ANALYSIS USING ROTARY VECTORS FOR; cm86701c.dat
GMT 2 0 29 10 1987
GMT 23 0 20 2 1988
Analysis using rotary vectors.
All angles measured anticlockwise from 90 deg.

constit	period	major axis	minor axis	inclin.	phase	dir
MM	661.31	1.550	0.224	160.3	52.9	c
MSF	354.37	1.281	0.525	69.7	95.1	a
K1	23.93	0.943	0.302	44.8	72.6	c
O1	25.82	0.853	0.363	57.0	69.8	c
S2	12.00	0.773	0.200	54.4	85.3	c
M2	12.42	0.613	0.026	76.5	-17.2	c
N2	12.66	0.370	0.067	80.9	-106.1	a
MU2	12.87	0.321	0.189	76.0	166.7	a
L2	12.19	0.261	0.103	86.1	-52.2	a
M3	8.28	0.148	0.023	61.7	-170.9	c
EPS2	13.13	0.147	0.074	149.6	145.6	a
J1	23.10	0.128	0.118	61.7	28.9	a
2Q1	28.01	0.121	0.005	51.6	-108.9	a
ALP1	29.07	0.113	0.010	76.6	-144.9	a
UPS1	21.58	0.104	0.043	132.5	-172.0	c
ETA2	11.75	0.102	0.007	58.3	154.7	a
Q1	26.87	0.095	0.038	88.7	58.4	c
MS4	6.10	0.088	0.015	93.2	-53.4	c
SN4	6.16	0.070	0.033	74.1	-81.1	a
OO1	22.31	0.063	0.006	25.3	-125.1	c
SK3	7.99	0.060	0.005	26.3	-90.4	a
MO3	8.39	0.058	0.001	85.9	-56.7	c
MN4	6.27	0.055	0.000	89.6	-120.7	a
M4	6.21	0.052	0.020	105.5	-132.1	c
NO1	24.83	0.050	0.033	173.3	-68.2	a
2MS6	4.09	0.050	0.020	62.8	147.5	a
MK3	8.18	0.044	0.036	112.3	148.5	c
M6	4.14	0.042	0.019	167.9	78.8	a
S4	6.00	0.036	0.006	126.7	34.8	c
2MK5	4.93	0.035	0.001	96.3	169.7	a
M8	3.11	0.031	0.005	86.5	-18.2	c
2SM6	4.05	0.025	0.006	101.3	149.4	c
2MN6	4.17	0.020	0.011	125.2	-93.4	c
3MK7	3.53	0.019	0.006	131.8	100.4	a
2SK5	4.80	0.015	0.006	2.3	145.1	a

TIDAL CURRENT ANALYSIS USING ROTARY VECTORS FOR; cm86711c.dat

GMT 2 0 29 10 1987

GMT 23 0 20 2 1988

Analysis using rotary vectors.

All angles measured anticlockwise from 90 deg.

constit	period	major axis	minor axis	inclin.	phase	dir
MM	661.31	1.718	0.507	154.9	67.1	c
MSF	354.37	1.140	0.709	101.4	139.3	a
K1	23.93	0.857	0.343	54.2	74.6	c
O1	25.82	0.797	0.315	43.1	85.6	c
S2	12.00	0.742	0.108	58.4	69.0	c
M2	12.42	0.587	0.045	45.5	0.6	c
EPS2	13.13	0.295	0.097	151.0	-171.6	a
MU2	12.87	0.275	0.203	67.3	152.5	a
L2	12.19	0.180	0.043	96.6	72.6	a
Q1	26.87	0.176	0.041	72.5	77.1	c
N2	12.66	0.165	0.094	43.0	-98.0	a
SN4	6.16	0.149	0.030	113.0	-174.8	a
2Q1	28.01	0.135	0.031	129.6	149.1	c
J1	23.10	0.126	0.001	52.6	-18.5	c
ETA2	11.75	0.109	0.080	49.6	105.0	a
SK3	7.99	0.109	0.047	68.6	-42.5	a
MO3	8.39	0.109	0.013	95.9	17.6	a
M3	8.28	0.102	0.001	54.4	177.5	c
UPS1	21.58	0.091	0.026	139.3	-176.9	c
2MK5	4.93	0.089	0.047	127.8	-59.1	a
M4	6.21	0.087	0.010	148.3	144.5	a
MS4	6.10	0.083	0.025	58.4	32.9	c
MK3	8.18	0.075	0.028	161.5	81.6	c
NO1	24.83	0.070	0.007	149.1	-172.8	c
OO1	22.31	0.060	0.017	151.0	45.0	c
M6	4.14	0.047	0.044	101.1	-57.7	c
ALP1	29.07	0.043	0.012	156.4	-78.6	a
MN4	6.27	0.035	0.008	153.1	168.2	c
2MS6	4.09	0.034	0.007	137.0	-88.5	a
2MN6	4.17	0.032	0.005	122.6	83.2	a
2SK5	4.80	0.030	0.011	145.2	32.8	a
S4	6.00	0.024	0.005	106.6	-102.4	a
2SM6	4.05	0.024	0.001	107.8	72.2	a
M8	3.11	0.021	0.000	172.1	18.5	c
3MK7	3.53	0.013	0.012	52.5	13.8	a