NOAA Technical Memorandum ERL AOML-50

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

PHYSICAL OCEANOGRAPHIC OBSERVATIONS IN THE EASTERN GULF OF MEXICO DURING 1979-1980 FOR A POTENTIAL OTEC SITE

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John V. Byrne,
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Environmental Research
Laboratories
George H. Ludwig
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NOTICE

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EXECUTIVE SUMMARY

Physical oceanographic data forms the basis for decisions on OTEC plant site selection in several ways: First, the thermal resource has to be evaluated to insure that the temperature difference is adequate to support economically competitive plants. Second, the flow regime in the vicinity where a thermal resource is adequate must be known in order to properly design the plant and its moorings. Third, the plant will affect the local hydrographic conditions by artificially upwelling significant volumes of water; as this upwelled water is advected away its diffusion affects interplant distances. Fourth, the local conditions relating to a plant site's biology may be altered, and the natural (pre-plant) conditions need to be documented.

The data discussed herein was collected over a two year period in the vicinity of the proposed site west of Tampa, Florida near 27.7°N and 85.5°W. Each time the current meter moorings were serviced, expendable bathythermograph (XBT) observations and some salinity-temperature-depth (STD) profiles were acquired. In addition, optical oceanography measurements were made to study the natural optical properties from ship and satellite; those data are reported separately by Bushnell and Maul (1982). Finally, three cruises designed to study the effect of infrared satellite-observed cold tongues on a plant site were conducted. The XBT and STD data are listed and plotted in Appendices 1, 2, and 3. The current meter data are plotted in Appendix 4, and the three process oriented cruises are summarized in Appendices 5, 6, and 7.

Composite XBT profile overlays were made on a cruise-by-cruise basis and they show large wintertime variability in the thermal resource depending upon where the Gulf Loop Current (part of the Gulf Stream System) was. This current so dominates the eastern Gulf's hydrography that it must be included in any thermal or dynamic analysis of a potential plant site off Tampa and southward around the Florida peninsula to Key West. This conclusion is reinforced by studying the STD profiles at the site and noting especially in the T-S correlations how clearly the current's influence is seen.

Rudimentary analysis plots of the current meter records from the Tampa site show that the shallow meters record many more transient short-term events than the deeper meters do. These events are caused by one of two forcing phenomena: Passage of wintertime cold fronts and summertime tropical cyclones, storms, or hurricanes. The other strong current events appear to be associated with the Gulf Loop Current's meandering or the interaction with a spin-off eddy. Energy in spectra computed by Molinari and Mayer (1980) show mostly diurnal (and to a lesser extent semi-diurnal) tidal energy.

Hydrographic data in the eastern Gulf clearly shows the correlation between the T-S fields and the Loop Current's presence. The cold tongues observed by satellite were observed to be rather deep features, ones that would impact OTEC plant operations by causing short term changes in the surface and subsurface thermal resource. The cold tongues appear to be associated with atmospheric events and Loop Current change suggesting some possibility of short range forecasts.

DATA FROM THE TAMPA OTEC CHARACTERIZATION STUDY IN THE GULF OF MEXICO

Introduction

The OTEC program of the Department of Energy has a requirement for physical oceanographic data. These data and other types of oceanographic data are necessary to evaluate the potential of various sites for OTEC operations. The type of physical oceanographic data required for this evaluation are given by Molinari and Festa (1978) and Molinari and Chew (1979). A suggested measurement program to obtain these data is also given in those reports, and was implemented at two sites in the Gulf of Mexico, and one in the tropical South Atlantic.

This report represents the third in a series of reports which present data collected at potential OTEC sites. The first report listed data collected in the Gulf of Mexico, south of Mobile, Alabama (Thomas et al., 1979), and the second report presented data collected at the Mobile site and west of Tampa, Florida, and in the tropical South Atlantic (Molinari et al., 1979). This report lists data collected in the Gulf of Mexico and at the Tampa site during 1979 and 1980. The objectives of these reports are to present lists and plots of the data collected.

Bimonthly site visits were initiated at Tampa and Mobile in June, 1978. The site visits were discontinued at Mobile in October, 1978 because of the lack of a suitable thermal resource. Additional site visits have been made to Tampa and supplementary data collected in the Gulf of Mexico when ships were available. Table 1 lists the data obtained included in this report.

The analysis techniques applied to each data set are described next. Listings and figures for each set are given in Appendices as noted. Some data products are also given.

Expendable Bathythermograph Data

Expendable bathermograph (XBT) profiles are digitized upon return to AOML. Those that are degraded by electronic interference or mechanical failure are discarded. Each profile is examined for its check cycle tick mark, an indicator of proper system initialization. Those lacking it are compared to surrounding profiles for consistency. Calibration of the recorder is maintained by comparison of SST's from XBT profile and bucket temperature samples.

The XBT's are read at 1°C isotherm intervals. The 1°C isotherm depth are listed in Appendix 1, while composite plots of each cruise's XBT traces are presented in Appendix 2 to provide a visualization of the intracruise variability. All XBT data have been submitted to the NODC for inclusion in their data bank.

Salinity-Temperature-Depth Data

Salinity Temperature Depth (STD) data were collected with the Plessey Environmental Systems Model 9040 STD unit. This unit telemeters its sensor data to a deck recorder where it is stored on magnetic tape. The electronic

TABLE 1: OTEC MEASUREMENTS TAKEN IN THE GULF OF MEXICO

Month	Year	Site	Vessel	XBT's	STD's	Current Meter Servicing
January	1979	Gulf of Mexico	*VIRGINIA KEY	✓	--	--
February	1979	Tampa	VIRGINIA KEY	✓	✓	✓
March	1979	Tampa	VIRGINIA KEY	✓	✓	--
April	1979	Tampa	VIRGINIA KEY	✓	✓	--
May	1979	Gulf of Mexcio	VIRGINIA KEY	✓	✓	--
May	1979	Gulf of Mexico	*MT. MITCHELL	✓	--	--
June	1979	Tampa	VIRGINIA KEY	✓	--	✓
June	1980	Tampa	VIRGINIA KEY	✓	--	✓

*Ship-of-opportunity cruises which determined position of Loop Current outputs of this unit must be calibrated by other in situ data to obtain accurate results. A Rosette Sampler with Niskin bottles and reversing thermometers were used to collect salinity and temperature data for the calibration. The salinity samples were analyzed on a Guildline Autosal 8400 and are accurate to within ± 0.005°/oo.

Calibration of the electronic data is accomplished by smoothing the temperature and salinity data which was recorded on magnetic tape to reduce noise and then comparing the resulting parameter-depth profiles with the water sample data at the various sample depths. Final temperatures are accurate to within ± 0.01°C, salinities to ± 0.01°/oo, and depths to within ± 5 m.

Current Meter Data

A mooring comprised of four Aanderaa current meters was deployed on June 13, 1978 at a site west of Tampa, Florida (27°39.8'N, 85°31.0'W). This mooring was retrieved on October 25, 1978 and has been reported on by Molinari et al. (1979). It was replaced by another four meter array on the same day at 27°39.9'N, 85°31.2'W and after several recoveries and deployments for servicing was finally secured on June 13, 1980.

All meter records which were determined to be valid were routinely transcribed, calibrated, and edited as stated in Thomas et al. (1979). In addition, a three hour low-pass filter was used to smooth the raw data, which were then resampled at hourly intervals (Appendix 4). Stick Plots (Appendix 4) represent data that have been smoothed with a 40 hour low-pass filter. Appendix 4 also gives speed and direction histograms computed on a polar coordinate grid, and time series of temperature data obtained from the current meters.

The first deployment of the series incorporated four Aanderaa RCM-5 current meters. The water depth was 1057 m, with the current meters located at depths of 157, 257, 557, and 957 m. The meter at 557 m malfunctioned and recorded no data. Data from the remaining three were recovered successfully.

Deployment #2, in water also 1057 m deep, contained four current meters at depths of 154, 254, 558, and 960 m. All meters were Aanderaa RCM-5 models. The surface meter was lost and not recovered. The speed rotor for meter 3283 (254 m depth) malfunctioned and necessitated chopping one month from the end of the series. The remaining two meters were successfully recovered.

The third deployment consisted of four Aanderaa RCM-5 current meters at depths of 100, 232, 546, and 950, in water 1050 m deep. All meters were successfully recovered. The position was 27°39.8'N, 85°31.2'W.

Deployment #4, moored at a depth of 1050 m, consisted of four current meters at depths of 150, 246, 535, and 950 m. All meters were RCM-5 models. The surface meter flooded and recorded no data. The three lower current meters were successfully recovered. The position was: 27°39.6'W, 85°31.2'W.

Deployment #5, in 1039 m of water contained four current meters at depths of 135, 239, 543, and 939 m. The top meter was an Aanderaa RCM-4 model, and the bottom three meters were Aanderaa RCM-5 models. All meters were recovered successfully. The position of deployment #5 was: 27°43.3'N, 85°31.1'W.

The Aanderaa current meter registers ten-bit binary words on 1/4-inch audio tape for each of its six parameters in the sequence of reference number, temperature, conductivity, pressure, current direction, and current speed. One scan of each of these six parameters was recorded at a twenty minute sampling interval. Digital computer compatible tapes were made from the audio tapes at the University of Miami. All meters used an electronic counter with the ratio of four motor turns to one count. With a twenty minute sampling interval, the least count speed is 0.14 cm/sec.

All current meter data were processed calibrated and edited according to the methods described by Ortman, 1982. Detailed discussions of deployments Nos. 1 and 2 is given in Molinari and Mayer (1980).

Special Plots for March, April, and May 1979

Three cruises in the spring of 1979 were conducted on the NOAA Ship VIRGINIA KEY to study cold tongues of surface water near the Tampa OTEC site. These cold water intrusions were first detected by infrared satellite measurements, analyzed by personnel under contract at the Research Triangle Institute. The cruises were staffed by RTI and AOML personnel, and the data were processed by RTI for inclusion in this report and for special studies of the cold tongues.

In addition to routine measurements of temperature and salinity versus depth, at least one optical station was occupied to measure the following variables in the upper 50 m: upwelling spectral radiance and irradiance (400 - 700 nm), downwelling spectral irradiance, in vivo volume scattering functions at four wavelengths (443 nm, 520 nm, 550 nm, and 670 nm) and at angles from 30° to 135°, in situ beam transmittance of white light, chlorophyll-a and phaeophytin, secchi disk depth, Forel and Munsell scale ocean color, infrared and thermometric measurements of sea surface temperatures and photographic records of cloud cover and water color. The optical data are reported on by Bushnell and Maul (1982) in a separate report.

Processing of the data for Appendix 5 (March 1979) Appendix 6 (April 1979) and Appendix 7 (May 1979) was by convential means as reported elsewhere herein. Each appendix starts with a map showing the trackline and the location of key stations to which the cross section plots are keyed. Each section which was observed with STD and XBTs has cross section plots of temperature vs. depth, salinity vs. depth, σ_t vs. depth, and geostrophic velocity relative to 1000 m (or the least depth of a station pair) vs. depth. If a section was observed by XBTs only, the cross section plot is of temperature vs. depth. In addition to each of the cross section plots, each appendix has a contoured areal view of the depth of the 20°C isotherm and the depth of the 22°C isotherm, both of which have been historically used extensively to infer circulation.

Acknowledgments

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Appendix 1

Listing of the depths, in m of 1°C isotherms from XBT data.

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-JAN. 79

XBT NO.	1	2	3	4	5	6	7
DATE (GMT)	1/ 3	1/ 3	1/ 3	1/ 4	1/ 4	1/ 4	1/ 4
TIME (GMT)	1820	2058	2334	156	420	643	9 6
LATITUDE	27	27	28	28	28	28	28
'	55	57	00	03	06	08	12
LONGNITUDE	84	85	85	85	86	86	86
'	44	06	28	51	14	36	59
SURF T (C)	20.8	21.5	21.6	21.2	21.1	21.5	20.8
29							
28							
27							
26							
25							
24							
23							
22							
21		67	78	74	73	73	
20	92	71	80	78	77	78	85
19	123	90	95	93	91	95	110
18	137	118	114	162	115	120	131
17	143	144	150	189	141	149	167
16	153	168	176	213	163	171	208
15	160	193	203	235	206	194	248
14	183	230	231	275	238	228	278
13		265	263	298	269	262	306
12		290	300	312	322	298	322
11		317	327	344	363	340	339
10		325	366	390	408	388	361
9			422	457	467	450	390
8			490	523	522	521	439
7				618	617	595	509
6				730	725	718	672

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-JAN. 79

XBT NO.	8	9	10	11	12	13	14
DATE (GMT)	1/ 4	1/ 4	1/ 4	1/ 4	1/ 4	1/13	1/13
TIME (GMT)	1130	1345	1556	18 3	2018	1540	18 0
LATITUDE	28	28	28	28	28	28	28
'	15	18	21	24	28	13	04
LONGNITUDE	87	87	88	88	88	89	88
'	21	44	06	29	51	13	53
SURF T (C)	21.4	21.4	21.5	21.7	21.7	21.3	21.7
29							
28							
27							
26							
25							
24							
23							
22							
21	82	81	81	89	89	97	98
20	86	88	85	99	106	104	99
19	106	105	101	112	131	114	113
18	133	136	113	139	151	130	128
17	163	158	144	161	170	151	151
16	188	191	190	185	185	172	180
15	217	215	240	220	208	212	212
14	251	249	288	252	232	232	237
13	288	287	341	285	257	260	271
12	322	330	384	332	285	313	307
11	362	372	422	363	323	369	359
10	405	426	462	410	371	410	406
9	460	534	509	466	470	464	468
8	537	584	575	534	548	537	520
7	617	648	645	610	621	626	629
6	732	770	768	730	741	738	744

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-JAN. 79

XBT NO.	15	16	17	18	19	20	21
DATE (GMT)	1/13	1/13	1/14	1/14	1/14	1/14	1/14
TIME (GMT)	1956	2213	036	3 2	520	739	944
LATITUDE	27	27	27	27	27	27	26
'	54	44	35	25	16	06	57
LONGNITUDE	88	88	87	87	87	86	86
'	33	13	53	33	14	54	34
SURF T (C)	20.8	22.5	23.2	24.1	23.8	25.5	26.2
29							
28							
27							
26							34
25						22	83
24				32		50	91
23			30	41	33	73	98
22		22	62	58	58	98	104
21		67	67	67	86	107	121
20	89	71	72	83	93	113	140
19	106	83	82	96	105	134	165
18	129	100	98	113	124	165	198
17	170	130	119	134	151	185	230
16	208	164	144	152	175	213	260
15	261	210	175	188	210	238	292
14	304	242	206	223	250	270	328
13	349	277	247	255	284	302	361
12	372	316	295	300	312	353	393
11	396	355	329	341	362	402	438
10	418	405	394	388	404	438	482
9	437	482	463	445	451	446	537
8	469	543	537	510	520	566	598
7	538	603	630	586	610	641	672
6	670		748	718	725	750	783

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-JAN. 79

XBT NO.	22	23	24	25	26	27
DATE (GMT)	1/14	1/14	1/14	1/14	1/14	1/14
TIME (GMT)	1139	1333	1519	17 6	19 7	2120
LATITUDE	26	26	26	26	26	26
'	48	38	28	19	10	00
LONGNITUDE	86	85	85	85	84	84
'	14	53	34	14	54	35
SURF T (C)	26.4	26.0	25.4	21.4	21.6	22.3
29						
28						
27						
26	90	1				
25	95	88	38			
24	108	100	43			
23	117	109	49			
22	130	127	59			41
21	144	146	83	21	72	87
20	169	156	129	102	80	96
19	191	173	137	110	102	115
18	227	196	153	134	127	137
17	268	214	186	157	152	154
16	309	245	208	185	182	189
15	334	277	241	219	210	203
14	354	308	273	254	232	217
13	379	342	315	299	269	
12	415	385	352	329	291	
11	451	431	388	365	332	
10	498	461	437	419	390	
9	559	522	494	482	459	
8	630	597	571	548	537	
7	711	689	657	627	608	
6	830	795	760	732	730	

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-FEB. 79

XBT NO.	1	2	3	4	5	6	7
DATE (GMT)	2/12	2/12	2/12	2/13	2/13	2/13	2/13
TIME (GMT)	1315	1540	1747	212	815	12 2	1613
LATITUDE	26	27	27	27	27	27	27
'	59	12	24	38	34	34	38
LONGNITUDE	84	84	85	85	85	85	85
'	39	56	14	30	30	30	31
SURF T (C)	25.1	24.7	23.6	21.9	22.3	22.6	22.6
29							
28							
27							
26							
25	33						
24	43	29					
23	52	38	15				
22	55	53	22		14	16	20
21	80	73	55	45	32	36	32
20	99	90	88	76	78	73	77
19	119	112	99	89	92	87	85
18	139	125	111	109	108	102	105
17	160	153	138	126	126	117	126
16	179	177	156	148	147	141	155
15		213	184	168	169	170	176
14		240	214	198	199	201	204
13		270	249	230	228	229	240
12		315	278	269	269	262	271
11		373	319	302	299	294	297
10			373	353	329	325	338
9			418	382	380	377	406
8			471	447	451	454	472
7			557	555		580	571
6			648	654		672	682

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-FEB. 79

XBT NO.	8	9	10	11	12	13	14
DATE (GMT)	2/13	2/14	2/14	2/14	2/14	2/14	2/14
TIME (GMT)	20 0	0 0	4 0	8 0	12 0	16 0	20 0
LATITUDE	27	27	27	27	27	27	27
'	40	38	36	37	38	40	40
LONGNITUDE	85	85	85	85	85	85	85
'	33	33	34	37	34	37	40
SURF T (C)	22.8	23.4	23.2	22.3	22.4	22.5	22.8
29							
28							
27							
26							
25							
24							
23		11	9				
22	23	15	12	18	18	19	17
21	34	48	47	36	40	58	38
20	77	79	69	69	68	75	66
19	88	87	82	83	84	91	79
18	108	102	100	100	99	108	96
17	125	124	121	118	116	122	118
16	153	153	145	136	150	143	139
15	173	180	177	168	172	170	171
14	197	200	200	192	198	198	193
13	236	222	222	217	220	220	218
12	269	269	255	251	259	259	256
11	300	311	298	290	298	302	295
10	355	344	330	325	327	344	339
9	401	401	374	371	390	403	400
8	470	460	438	438	469	470	471
7	547	555	538	558	579	582	550
6	657	688	661	788	667	678	675

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-FEB. 79

XBT NO.	15	16	17	18	19	20	21
DATE (GMT)	2/15	2/15	2/15	2/15	2/15	2/15	2/15
TIME (GMT)	0 0	0 9	413	8 0	1214	16 0	18 0
LATITUDE	27	27	27	27	27	27	27
'	34	34	35	36	35	35	38
LONGNITUDE	85	85	85	85	85	85	85
'	30	30	28	31	31	30	33
SURF T (C)	21.7	21.8	20.8	20.7	20.9	20.8	20.9
29							
28							
27							
26							
25							
24							
23							
22							
21	18	17					
20	61	59	67	69	82	68	70
19	72	72	82	80	88	88	86
18	89	88	97	94	102	99	95
17	116	113	123	111	118	114	114
16	139	136	146	135	137	137	135
15	159	166	175	166	161	164	161
14	195	191	203	194	188	188	196
13	220	216	237	222	219	221	221
12	258	252	265	261	252	258	249
11	282	275	294	286	298	298	291
10	337	329	340	334	324	336	331
9	394	385	405	387	370	388	391
8		460	464	453	443	452	472
7		539	564	557	550	559	572
6		648	705	664	669	675	682

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-FEB. 79

XBT NO.	22	23	24	25	26	27	28
DATE (GMT)	2/16	2/16	2/16	2/16	2/16	2/16	2/16
TIME (GMT)	019	1 8	156	241	335	422	515
LATITUDE	27	27	27	27	27	27	27
'	32	29	36	43	46	49	42
LONGNITUDE	85	85	85	85	85	85	85
'	27	35	39	42	34	27	23
SURF T (C)	20.7	20.7	20.7	20.7	21.2	21.3	20.7
29							
28							
27							
26							
25							
24							
23							
22							
21					7	19	
20	73	80	66	75	71	89	81
19	83	85	77	82	82	95	89
18	96	91	94	103	94	115	109
17	112	102	106	117	124	134	130
16	136	126	135	143	149	160	155
15	155	149	152	169	170	194	173
14	187	179	183	197	202	218	200
13	213	212	210	222	239	253	230
12	248	244	243	252	275	303	268
11	283	275	279	285	315	354	300
10	328	320	314	333	361	409	354
9	380	389	378	385	400	455	428
8	449	446	447	452	462	550	485
7	553	573	550	543	551		556
6	660	703	661	683	663		680

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-FEB. 79

XBT NO.	29	30	31	32	33	34	35
DATE (GMT)	2/16	2/18	2/18	2/18	2/18	2/19	2/19
TIME (GMT)	610	1150	1320	16 0	20 0	0 0	4 0
LATITUDE	27	27	27	27	27	27	27
'	35	35	34	34	34	34	34
LONGNITUDE	85	85	85	85	85	85	85
'	20	04	19	30	30	30	30
SURF T (C)	22.7	21.4	23.0	21.4	21.5	21.4	21.3
29							
28							
27							
26							
25							
24							
23							
22	16		10				
21	22	21	37	18	20	18	28
20	73	49	52	56	61	54	66
19	90	58	77	71	68	65	73
18	106	123	95	92	94	89	91
17	138	151	115	118	117	119	112
16	156	176	135	137	149	142	139
15	173	211	163	158	158	158	171
14	196	251	187	175	178	175	195
13	222	276	217	202	211	211	229
12	271	309	269	236	243	248	252
11	309	364	289	275	275	277	283
10	351	412	346	326	328	329	345
9	408	446	401	408	405	392	390
8	480		465	456	471	468	465
7	550		549	555	560	553	550
6	650		646	666	670	652	668

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-FEB. 79

XBT NO.	36	37	38	39	40	41	42
DATE (GMT)	2/19	2/19	2/19	2/19	2/19	2/19	2/19
TIME (GMT)	648	846	1122	1342	16 8	1734	1851
LATITUDE	27	27	26	26	26	26	25
'	34	13	52	33	13	00	49
LONGNITUDE	85	85	85	85	85	85	85
'	31	30	30	30	29	29	22
SURF T (C)	21.3	20.7	20.9	21.1	25.4	26.1	25.9
29							
28							
27							
26						89	
25					39	100	134
24					51	121	144
23					61	130	160
22					64	139	183
21	22			11	68	145	202
20	68	79	72	73	77	159	225
19	71	87	80	82	140	210	247
18	89	99	87	95	181	240	261
17	115	114	110	106	209	258	292
16	142	136	127	116	230	284	324
15	171	151	142	129	254	323	347
14	198	178	167	136	276	366	385
13	228	208	200	160	301	391	420
12	256	249	219	191	337	425	454
11	271	281	249	229	370	478	485
10	323	310	297	269	408	526	527
9	396	360	349	317	474	571	589
8	474	420	411	388	549	624	669
7	560	510	480	461	639	680	734
6	670	634	615	600	763	805	

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-FEB. 79

XBT NO.	43	44	45	46	47	48	49
DATE (GMT)	2/19	2/19	2/19	2/19	2/20	2/20	2/20
TIME (GMT)	1954	21 5	2218	2325	039	151	3 0
LATITUDE	25	25	25	25	25	24	24
'	40	31	22	12	03	53	43
LONGNITUDE	85	85	85	84	84	84	84
'	16	09	01	55	47	40	33
SURF T (C)	25.9	25.8	25.8	25.9	25.9	25.9	25.5
29							
28							
27							
26							
25	142	143	145	129	118	50	81
24	161	160	152	140	131	56	93
23	176	179	171	162	151	76	103
22	196	194	195	185	159	92	121
21	209	206	212	210	189	116	128
20	229	228	241	236	222	141	144
19	255	264	269	262	249	149	159
18	280	301	300	294	270	182	170
17	315	333	338	327	311	222	189
16	345	363	370	354	343	271	235
15	358	396	400	384	376	275	250
14	385	427	423	420	398	287	258
13	422	457	455	447	424	314	266
12	452	491	492	478	446	331	321
11	500	518	528	509	456	343	355
10	533	554	574	551	473	360	391
9	587	606	620	608	510	394	440
8	646	680	683	663	580	433	515
7	740	743	750	738	672	613	592
6							760

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-FEB. 79

XBT NO.	50	51	52	53
DATE (GMT)	2/20	2/20	2/20	2/20
TIME (GMT)	4 8	13 0	14 0	15 0
LATITUDE	24	23	23	23
'	34	39	44	51
LONGNITUDE	84	83	83	83
'	26	40	32	26
SURF T (C)	25.1	23.2	23.8	22.9
29				
28				
27				
26				
25	40			
24	48			
23	59	6	11	
22	68	16	27	27
21	75	24	42	45
20	81	27	69	111
19	96	65	99	128
18	119	94	141	155
17	141	107	157	172
16	165	134	174	195
15	191	157	186	216
14	199	180	208	228
13	218	230	217	251
12	257	258	259	278
11	316	300	286	305
10	350	324	319	323
9	395	356	368	359
8	523	444	432	430
7	623	520	512	519
6	743	635	620	613

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-MAR. 79

XBT NO.	1	2	3	4	5	6	7
DATE (GMT)	3/26	3/26	3/26	3/26	3/26	3/27	3/27
TIME (GMT)	815	1057	14 6	1810	2133	031	744
LATITUDE	24	24	24	24	24	24	24
'	10	10	09	10	10	10	15
LONGNITUDE	81	82	82	82	83	83	84
'	48	09	31	53	15	37	09
SURF T (C)	22.6	22.7	25.4	24.9	25.8	25.8	25.3
29							
28							
27							
26							
25			20	83	111	106	50
24			34	91	122	120	55
23			45	99	134	132	62
22	40	60	60	111	160	150	72
21	47	64	73	134	174	169	92
20	53	70	89	160	196	188	110
19	71	73	96	168	221	212	136
18	90	77	98	180	248	237	159
17	106	80	100	200	279	269	178
16	116	84	102	224	300	297	199
15	136	89	104	243	318	318	225
14	151	98	107	260	344	342	248
13	176	115	119	266	366	364	288
12	187	130	145	279	393	392	330
11	235	168	237	308	423	430	383
10	285	305	277	330	464	485	427
9	349	365	340	415	515	519	458
8	425	460	422	476	574	583	510
7	535	585	560	555	650	674	585
6	720	685	630	700	712		725

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-MAR. 79

XBT NO.	8	9	11	12	13	14	15
DATE (GMT)	3/27	3/27	3/28	3/28	3/28	3/28	3/29
TIME (GMT)	1232	1619	521	635	1233	1425	130
LATITUDE	24	24	24	24	24	24	25
'	24	33	51	55	00	57	00
LONGNITUDE	84	84	85	85	85	85	84
'	30	48	27	36	33	11	49
SURF T (C)	22.5	21.6	25.8	25.6	25.3	23.0	22.7
29							
28							
27							
26							
25			86	107	91		
24			91	118	107		
23			109	130	122		
22	20		112	144	133	40	25
21	35	26	132	178	150	79	50
20	56	52	157	201	188	92	71
19	66	73	170	219	200	107	99
18	89	90	180	238	220	115	119
17	101	98	203	263	248	132	141
16	119	110	233	301	277	162	176
15	157	130	268	338	311	193	181
14	175	154	292	382	355	215	198
13	201	165	320	410	401	230	220
12	232	218	339	439	413	254	256
11	265	240	382	471	444	276	294
10	305	261	459	507	480	311	340
9	341	319	529	574	540	360	378
8	407	388	586	628	588	520	406
7	485	440	672	705	663	591	485
6	616	554				700	650

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-MAR. 79

XBT NO.	17	18	19	20	21	22	23
DATE (GMT)	3/29	3/29	3/29	3/29	3/29	3/30	3/30
TIME (GMT)	818	10 0	1154	1552	2150	028	214
LATITUDE	24	25	25	24	25	25	25
'	60	00	00	59	05	14	24
LONGNITUDE	84	84	84	83	83	83	84
'	27	17	05	40	36	55	14
SURF T (C)	22.6	23.4	24.1	24.8	24.5	24.5	24.0
29							
28							
27							
26							
25							
24			28	69	55	47	
23		30	30		67	52	33
22		37	39		68	70	44
21		44	50			89	71
20	11	58	67			110	94
19	32	80	79				115
18	69	105	120				142
17	89	121					
16	106	141					
15	123	168					
14	132	183					
13	158	232					
12	218	279					
11	241	308					
10	280	350					
9	330						
8	399						
7	488						
6	623						

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-MAR. 79

XBT NO.	24	25	26	27	28	29	30
DATE (GMT)	3/30	3/30	3/30	3/30	3/30	3/30	3/30
TIME (GMT)	6 7	946	1417	1550	1726	1859	2031
LATITUDE	25	25	25	25	25	26	26
'	34	44	53	59	09	19	29
LONGNITUDE	84	84	85	85	85	85	85
'	32	51	10	40	19	20	19
SURF T (C)	22.7	24.0	25.7	25.2	25.0	25.3	25.5
29							
28							
27							
26							
25			117	122		50	00
24		25	129	140	125	76	68
23		40	138	152	136	83	80
22	51	69	147	163	150	98	93
21	70	88	161	190	179	117	110
20	89	101	189	219	194	133	128
19	119	131	213	242	214	152	139
18	142	150	241	274	241	190	168
17	181	185	272	311	280	220	180
16	210	210	301	342	310	247	200
15	244	234	337	372	351	280	233
14	268	280	365	408	383	316	255
13	291	313	400	449	430	351	297
12	320	350	438	483	474	392	339
11	342	399	479	530	508	430	379
10	373	430	524	570	543	480	430
9	414	470	575	635	590	540	500
8	470	536	652	703	660	590	560
7	640	640	728			678	600
6							695

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-MAR. 79

XBT NO.	31	32	33	34	35	36	37
DATE (GMT)	3/30	3/30	3/31	3/31	3/31	3/31	3/31
TIME (GMT)	22 9	2332	053	2 4	316	422	538
LATITUDE	26	25	26	27	27	27	27
'	39	49	59	08	19	29	39
LONGNITUDE	85	85	85	85	85	85	85
'	19	20	19	20	20	19	20
SURF T (C)	25.1	24.5	23.5	23.5	22.3	22.2	19.6
29							
28							
27							
26							
25	84	50					
24	95	60					
23	114	72	35	20			
22	135	93	50	38	22	17	
21	145	110	74	60	28	25	
20	156	130	90	72	61	36	
19	161	164	120	88	80	70	63
18	189	170	125	110	120	98	110
17	208	179	136	135	150	150	139
16	221	193	144	160	161	174	184
15	238	220	163	197	200	213	217
14	260	252	179	240	239	250	253
13	310	284	214	267	276	279	287
12	343	324	252	303	305	301	322
11	398	371	301	350	340	339	351
10	450	431	330	385	386	385	400
9	505	490	360	444	440	438	448
8	610	550	376	500	500	495	525
7	685	648	409	602	580	564	600
6			495	695	672	675	688

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-MAR. 79

XBT NO.	38	39	40
DATE (GMT)	3/31	3/31	3/31
TIME (GMT)	656	822	943
LATITUDE	27	27	27
'	39	39	38
LONGNITUDE	85	84	84
'	09	57	46
SURF T (C)	20.5	21.2	21.4
29			
28			
27			
26			
25			
24			
23			
22			
21			10
20	51	16	43
19	76	50	85
18	116	92	142
17	150	159	156
16	170	180	207
15	203	208	
14	250	247	
13	289	292	
12	320		
11	361		
10	417		
9	459		
8	495		
7			
6			

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-APR. 79

XBT NO.	2	3	4	5	6	7	8
DATE (GMT)	4/ 8	4/26	4/26	4/26	4/27	4/27	4/27
TIME (GMT)	9 8	11 6	15 0	22 4	140	615	1148
LATITUDE	27	26	26	25	25	25	25
'	36	20	13	50	36	36	49
LONGNITUDE	085	084	084	084	084	085	085
'	31	10	17	29	53	08	26
SURF T (C)	24.5	23.8	24.8	25.8	25.7	25.8	25.8
29							
28							
27							
26							
25				00	39	55	70
24	34		29	29	58	70	74
23	39	39	30	38	65	80	98
22	53	46	32	40	73	100	113
21	69	60	50	50	92	128	130
20	81	69	70	65	111	155	168
19	102	99	80	87	150	185	189
18	121	114	99	124	188	223	226
17	160	136	122	149	210	250	253
16	181	140	149	161	227	271	270
15	222		170	193	250	307	304
14	249		183	232	283	332	333
13	290		195	258	317	368	380
12	323			280	357	410	411
11	388			307	394	449	440
10	423			367	450	497	487
9	500			400	500	550	550
8	560			447	550	600	620
7	625			521	625	676	695
6					750		

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-APR. 79

XBT NO.	9	10	11	12	13	14	15
DATE (GMT)	4/27	4/27	4/28	4/28	4/28	4/28	4/28
TIME (GMT)	1347	2350	520	648	1117	1521	1925
LATITUDE	25	26	26	26	26	27	27
'	54	06	21	31	50	09	27
LONGNITUDE	085	085	085	085	085	085	085
'	34	52	56	53	47	41	41
SURF T (C)	25.9	26.2	26.0	24.0	23.5	24.1	23.8
29							
28							
27							
26		10					
25	76	80	46				
24	91	93	58			00	
23	98	103	70	29	18	30	33
22	119	114	81	35	24	45	39
21	132	129	89	47	40	56	49
20	163	144	100	60	56	71	53
19	189	198	147	94	69	90	62
18	226	228	180	122	100	100	133
17	259	258	210	160	118	121	161
16	283	279	233	198	142	139	174
15	318	311	270	220	160	168	200
14	342	338	297	250	184	199	220
13	378	370	318	281	213	230	251
12	409	406	352	316	250	265	300
11	445	460	400	350	274	315	350
10	490	508	447	395	330	372	388
9	557	560	510	450	389	438	433
8	623	624	565	508	443	495	492
7	710	699	616	570	515	534	590
6			744	672	640	750	705

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-APR. 79

XBT NO.	17	18	19	20	21	22	23
DATE (GMT)	4/29	4/29	4/29	4/29	4/29	4/29	4/30
TIME (GMT)	3 0	7 0	11 0	15 0	19 0	23 0	3 0
LATITUDE	27	27	27	27	27	27	27
'	38	37	39	39	40	37	37
LONGNITUDE	085	085	085	085	085	085	085
'	30	33	31	33	34	30	33
SURF T (C)	23.5	23.4	23.3	23.4	24.0	23.8	23.6
29							
28							
27							
26							
25							
24					00		
23	32	33	30?	35	38	37	38
22	35	37	38	40	40	41	41
21	41	40	42	48	48	48	48
20	51	52	55	61	55	65	66
19	92	65	78	81	80	91	92
18	131	120	114	120	134	138	136
17	175	173	162	161	170	160	170
16	199	195	183	190	197	189	196
15	230	219	211	217	225	220	230
14	251	240	241	249	249	250	250
13	284	268	279	277	277	278	278
12	321	307	315	314	310	313	307
11	359	347	350	349	349	352	350
10	408	395	393	397	400	409	407
9	453	447	440	447	439	453	450
8	508	488	496	499	510	520	517
7	601	593	580	581	584	580	600
6	760	732	720	728	712	743	740

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-APR. 79

XBT NO.	24	26	27	28	29	30	31
DATE (GMT)	4/30	4/30	4/30	4/30	4/30	4/30	4/30
TIME (GMT)	4 0	546	640	746	855	10 0	11 0
LATITUDE	27	27	27	27	27	27	27
'	34	44	39	39	39	37	39
LONGNITUDE	085	085	085	085	085	084	084
'	31	31	25	14	02	51	40
SURF T (C)	23.5	23.5	23.6	23.7	23.5	23.8	23.8
29							
28							
27							
26							
25							
24							
23	35	38	36	37	33	33	41
22	40	40	38	41	39	39	49
21	46	47	56	48	42	43	57
20	70	64	60	52	49	57	76
19	81	100	80	83	78	79	90
18	130	133	128	108	112	119	143
17	150	158	170	167	163	150	145
16	182	188	191	191	190	160	
15	211	220	217	217	214	173	
14	239	254	240	243	233	214	
13	263	291	285	284	268	241	
12	300	321	312	315	287	245	
11	342	360	350	358	305		
10	394	407	385	383	338		
9	438	450	426	430			
8	495	489	488	474			
7	584	560	562	544			
6	720	740					

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-APR. 79

XBT NO.	32
DATE (GMT)	4/30
TIME (GMT)	12 0
LATITUDE	27
'	38
LONGNITUDE	084
'	28
SURF T (C)	23.8
29	
28	
27	
26	
25	
24	
23	40
22	46
21	58
20	98
19	100
18	112
17	
16	
15	
14	
13	
12	
11	
10	
9	
8	
7	
6	

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-MAY 79

XBT NO.	1	2	3	4	5	6	7
DATE (GMT)	5/18	5/18	5/18	5/18	5/18	5/18	5/18
TIME (GMT)	753	9 8	1018	1134	1235	1348	1453
LATITUDE	28	27	28	28	28	28	28
'	00	60	00	00	00	00	00
LONGNITUDE	84	84	84	85	85	85	85
'	35	47	58	10	20	32	43
SURF T (C)	25.1	25.1	24.7	24.7	24.8	24.8	24.7
29							
28							
27							
26							
25	00	00					
24	33	39	30	30	30	27	27
23	43	46	40	40	39	35	37
22	48	50	47	47	43	39	42
21	55	52	52	55	52	47	49
20	61	68	67	70	67	60	73
19	75	84	84	90	81	89	85
18		100	100	110	105	102	115
17		126	127	130	137	140	171
16		140	151	159	170	168	187
15		160	168	169	183	194	202
14		172	189	186	204	211	212
13			217	210	238	249	232
12				240	261	280	269
11				317	312	320	310
10					370	370	360
9					448	422	421
8						468	472
7							565
6							

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-MAY 79

XBT NO.	8
DATE (GMT)	5/18
TIME (GMT)	1559
LATITUDE	28
'	00
LONGNITUDE	85
'	54
SURF T (C)	24.7
29	
28	
27	
26	
25	
24	27
23	40
22	42
21	47
20	70
19	100
18	140
17	179
16	205
15	228
14	240
13	270
12	300
11	349
10	377
9	420
8	480
7	566
6	730

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-JUNE 79

XBT NO.	1	2	3	4	5	6	7
DATE (GMT)	6/28	6/28	6/29	6/29	6/29	6/29	6/29
TIME (GMT)	18 7	22 0	2 0	6 0	10 0	14 0	1815
LATITUDE	27	27	27	27	27	27	27
'	38	39	37	34	38	37	39
LONGNITUDE	85	85	85	85	85	85	85
'	31	31	31	29	29	27	30
SURF T (C)	28.7	28.7	28.6	28.6	28.5	28.5	28.7
29							
28	20	21	23	26	23	19	24
27	28	23	28	31	28	26	30
26	33	30	32	36	33	34	37
25	37	37	39	44	39	38	42
24	43	42	45	49	48	46	51
23	51	52	56	56	54	52	60
22	59	60	65	71	61	61	69
21	73	70	71	82	82	78	77
20	80	90	88	91	104	99	95
19	98	99	118	106	111	119	118
18	133	132	128	135	137	140	139
17	162	167	162	161	164	166	170
16	197	197	199	198	194	195	193
15	223	219	228	221	218	225	220
14	252	253	255	253	250	243	250
13	282	281	284	294	282	279	286
12	316	319	321	328	314	311	328
11	357	359	368	371	357	351	383
10	409	408	422	424	404	409	429
9	467	472	481	488	462	462	495
8	540	549	549	555	538	535	559
7	619	640	640	664	631		649
6	738	760	760				

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC-JUNE 79

XBT NO.	8	9	10	11	12	13
DATE (GMT)	6/29	6/30	6/30	6/30	6/30	6/30
TIME (GMT)	22 0	2 5	6 5	10 0	14 7	18 0
LATITUDE	27	27	27	27	27	27
'	39	39	40	40	40	38
LONGNITUDE	85	85	85	85	85	85
'	30	30	31	30	28	31
SURF T (C)	28.6	28.6	28.5	28.4	28.3	28.0
29						
28	31	32	17	21	12	13
27	38	37	29	29	20	21
26	42	39	33	34	29	29
25	48	44	42	40	35	36
24	56	54	49	49	41	42
23	61	60	57	54	47	49
22	69	71	68	63	57	55
21	84	82	73	74	69	64
20	100	91	83	83	73	69
19	118	112	101	105	98	89
18	141	131	126	126	122	99
17	173	161	152	151	152	139
16	194	189	184	179	188	161
15	217	219	213	218	218	200
14	246	249	249	249	242	238
13	275	279	279	289	277	266
12	314	320	313	320	306	309
11	360	360	354	361	342	353
10	411	412	402	408	405	404
9	470	466	468	467	459	443
8	535	539	534	540	519	502
7	619	634	619	624	600	
6	742	758	748	760	740	

ISOTHERM DEPTHS (M)

SHIP RV VIRGINIA KEY CRUISE OTEC JUNE 80

XBT NO.	1	2	3	4	5	8	9
DATE (GMT)	6/14	6/15	6/15	6/15	6/15	6/15	6/15
TIME (GMT)	1731	136	250	4 4	526	649	827
LATITUDE	27	27	27	27	27	26	26
'	40	38	28	18	07	56	43
LONGNITUDE	85	85	85	85	85	85	85
'	28	30	30	30	30	29	29
SURF T (C)	27.6	27.4	27.7	27.8	27.3	27.2	27.2
29							
28							
27	12	20	20	22	25	15	15
26	15	22	27	31	28	21	19
25	19	26	32	35	32	25	21
24	21	30	38	40	42	30	25
23	30	35	45	45	50	35	28
22	41	50	50	50	55	45	40
21	62	62	61	58	60	60	50
20	72	80	70	68	70	68	60
19	90	100	83	74	78	76	90
18	108	115	100	90	88	95	110
17	126	140	125	105	102	110	133
16	146	160	150	128	115	130	158
15	177	190	173	150	140	150	190
14	203	228	195	188	160	180	213
13	242	261	222	218	190	205	245
12	290	295	245	255	220	242	280
11	330	335	295	285	255	276	320
10	385	395	349	340	310	325	365
9	433	435	400	393	365	385	415
8	505	520	502	460		445	480
7	600	610	600	560		545	580
6	735		740			690	720

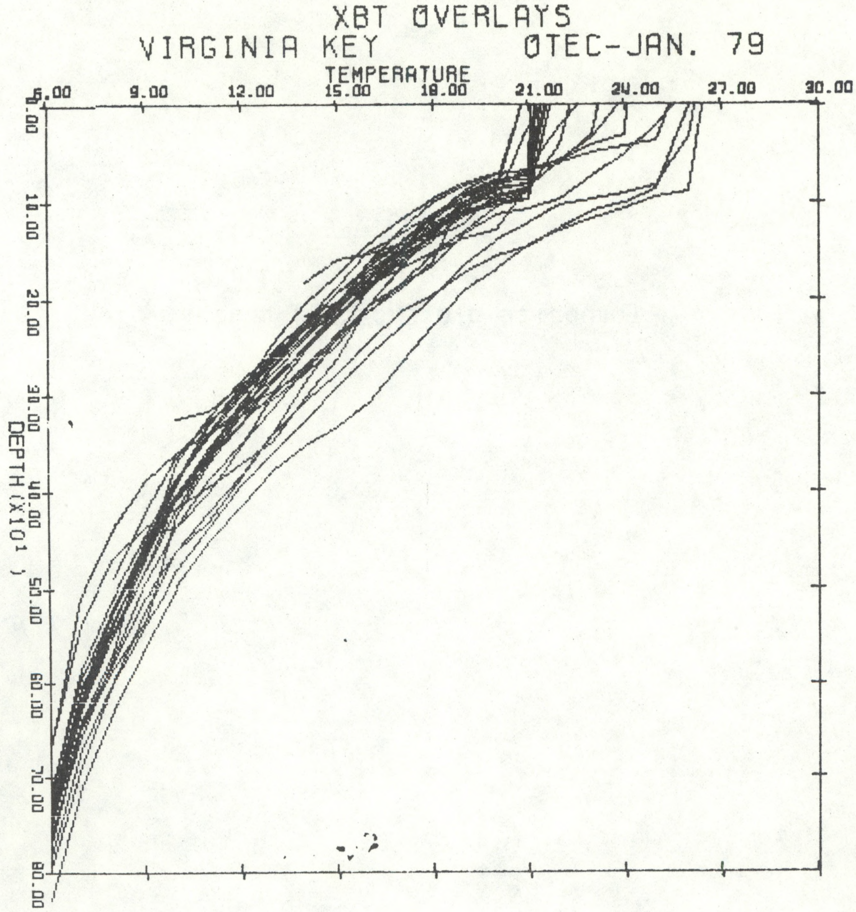
ISOTHERM DEPTHS (M)

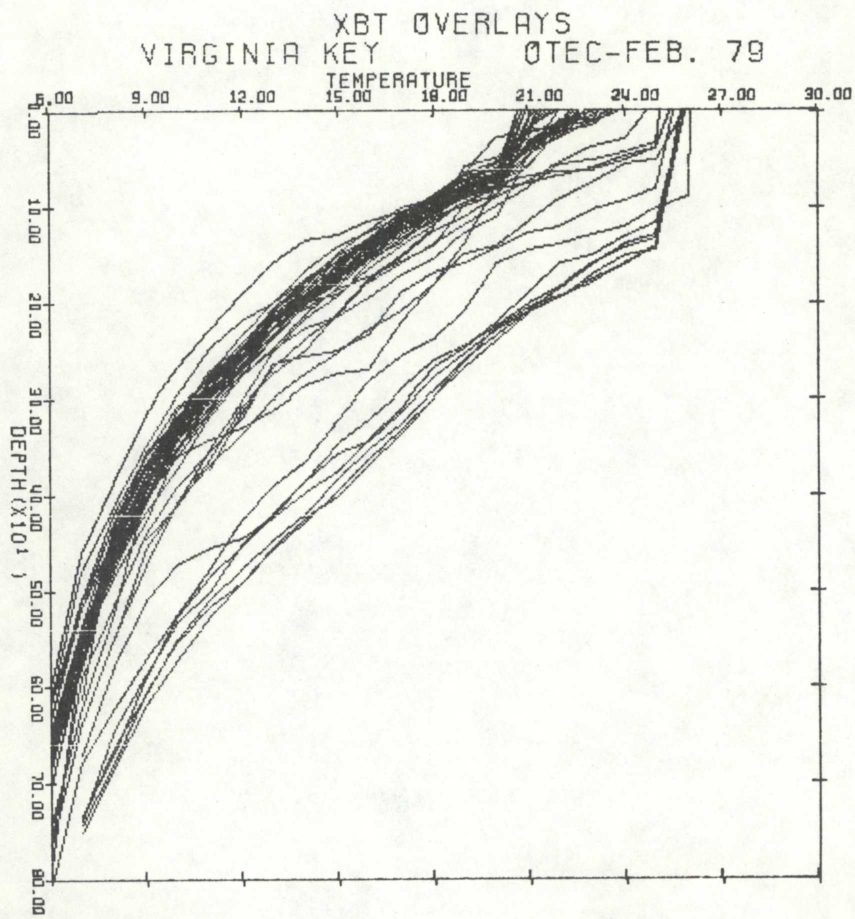
SHIP RV VIRGINIA KEY CRUISE OTEC JUNE 80

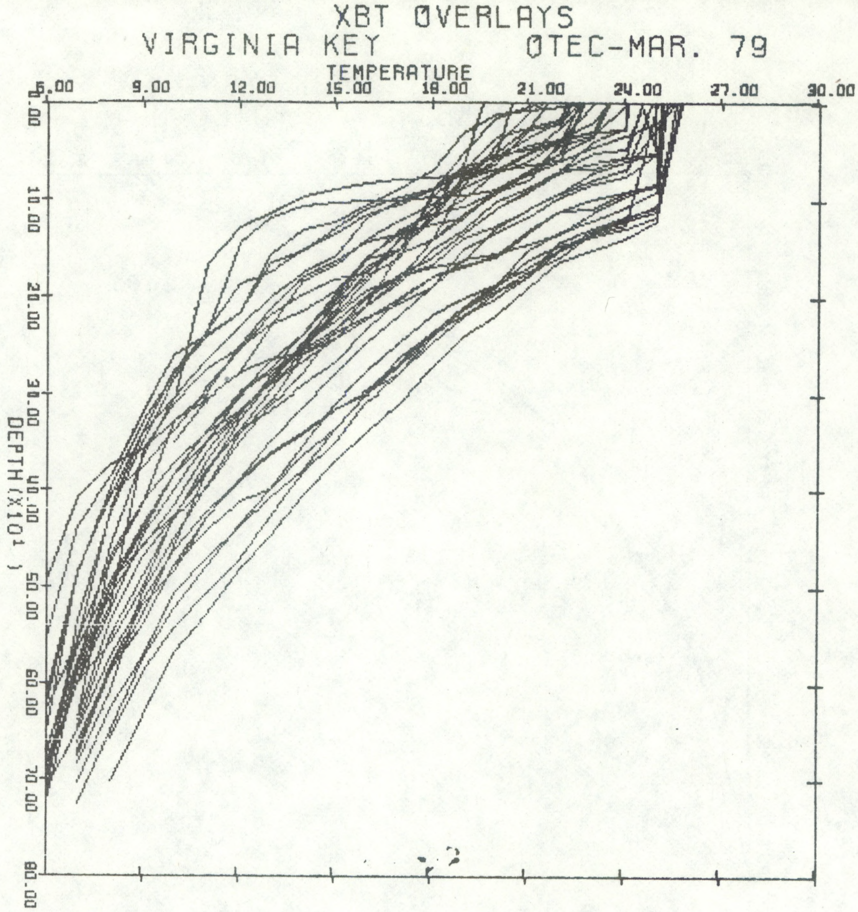
XBT NO.	10	11	12	13	14
DATE (GMT)	6/15	6/15	6/15	6/15	6/15
TIME (GMT)	1037	1420	16 1	1738	1917
LATITUDE	26	26	25	25	25
'	25	12	59	44	29
LONGNITUDE	85	85	85	85	85
'	29	30	30	30	30
SURF T (C)	27.5	27.7	27.8	28.3	28.3
29					
28				30	50
27	20	28	30	35	60
26	22	30	32	40	80
25	25	36	38	46	85
24	30	40	42	55	90
23	37	50	55	65	100
22	65	72	80	93	120
21	75	85	95	120	140
20	88	120	120	135	175
19	105	135	140	150	195
18	122	150	160	168	230
17	148	163	178	200	255
16	170	183	207	230	
15	192	208	235	260	
14	220	228	260	298	
13	290	245	285	335	
12	320	265	318	370	
11	355	305	360	410	
10	400	350	410	460	
9		408	450	520	
8		472	520	575	
7		565	600	670	
6		690	740		

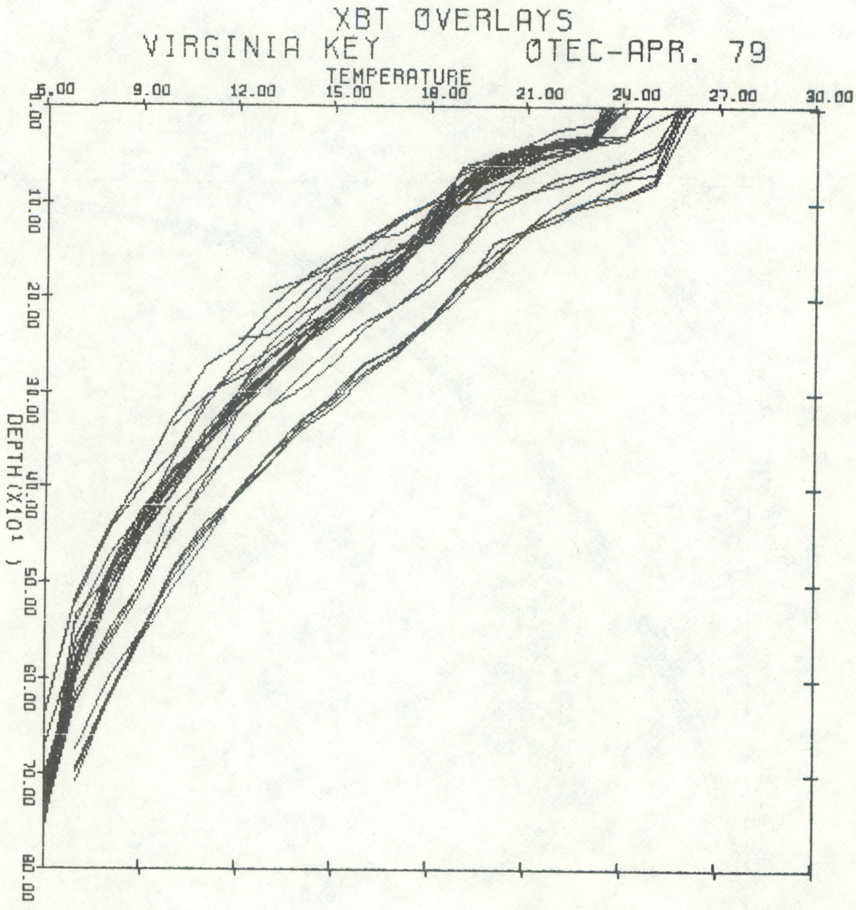
Appendix 2

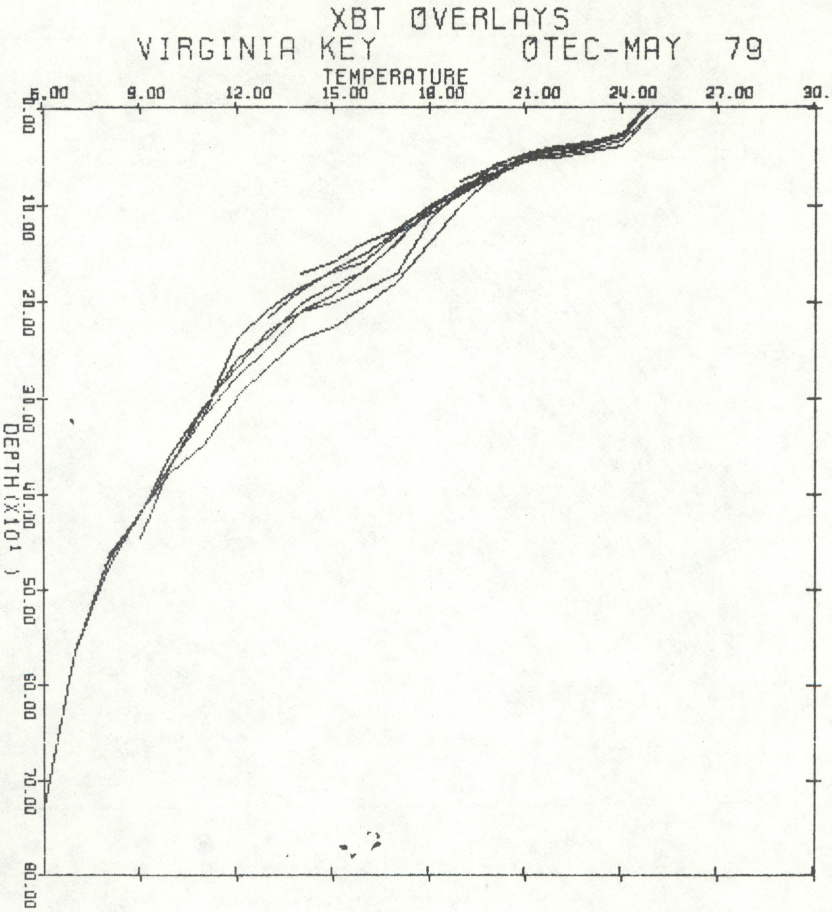
Composite plots of XBT traces.

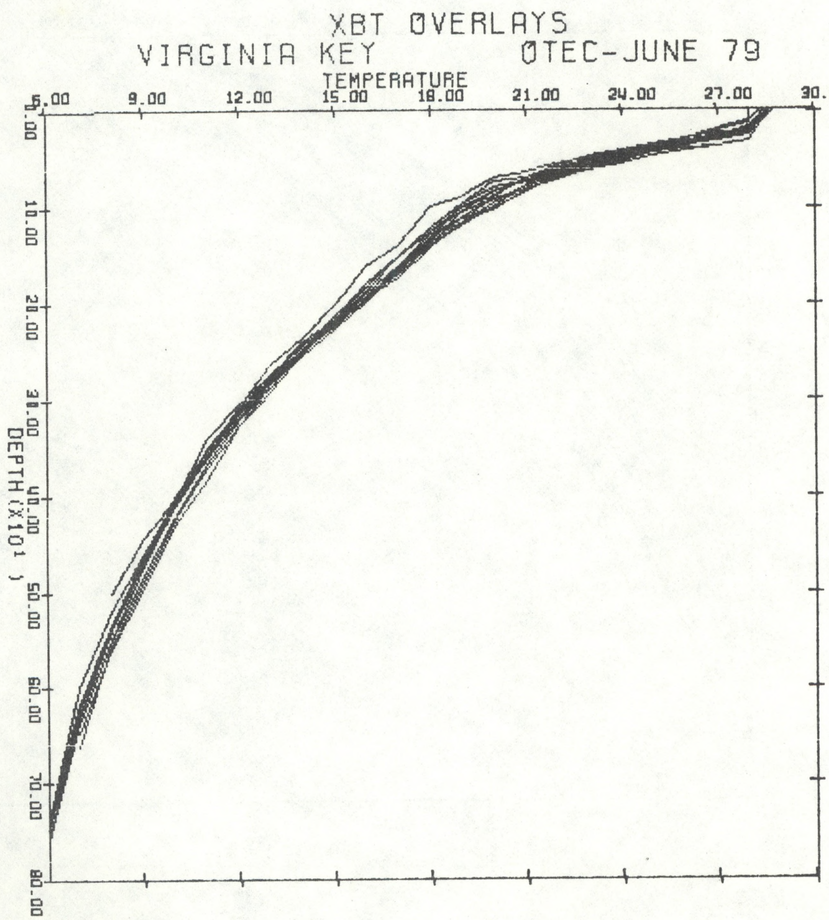

XBT OVERLAYS
VIRGINIA KEY OTEC-JAN. 79
TEMPERATURE
6.00 9.00 12.00 15.00 18.00 21.00 24.00 27.00 30.00
DEPTH (X10¹)
0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00

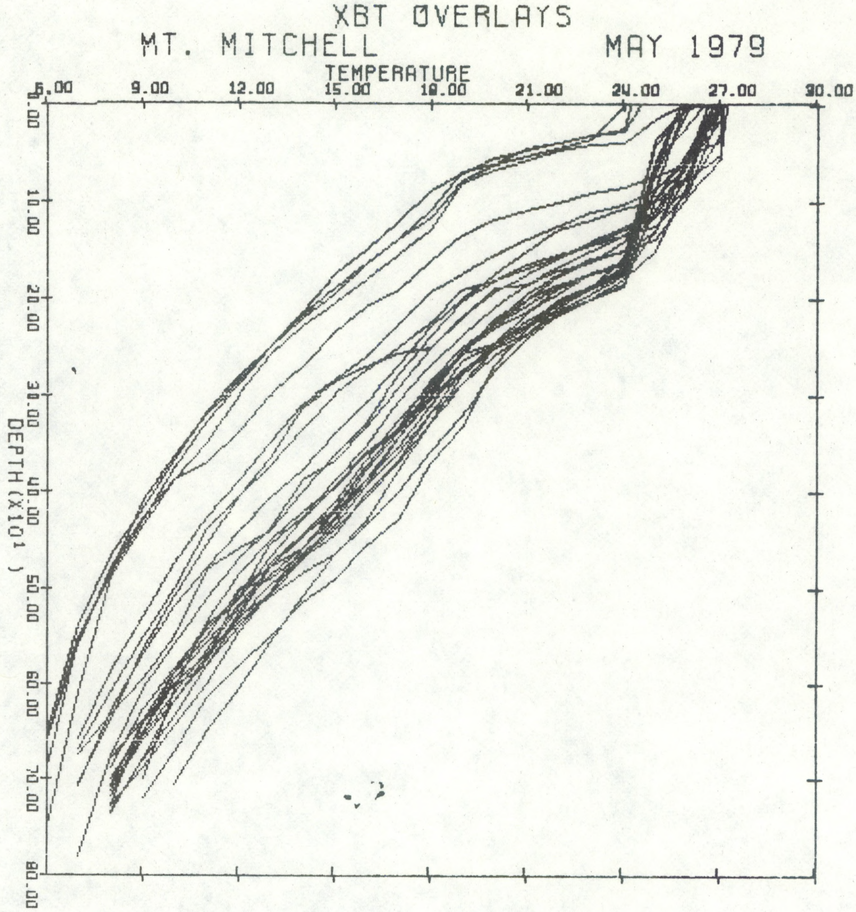

XBT OVERLAYS
VIRGINIA KEY OTEC-FEB. 79
TEMPERATURE
6.00 9.00 12.00 15.00 18.00 21.00 24.00 27.00 30.00
DEPTH (X10¹)
0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00

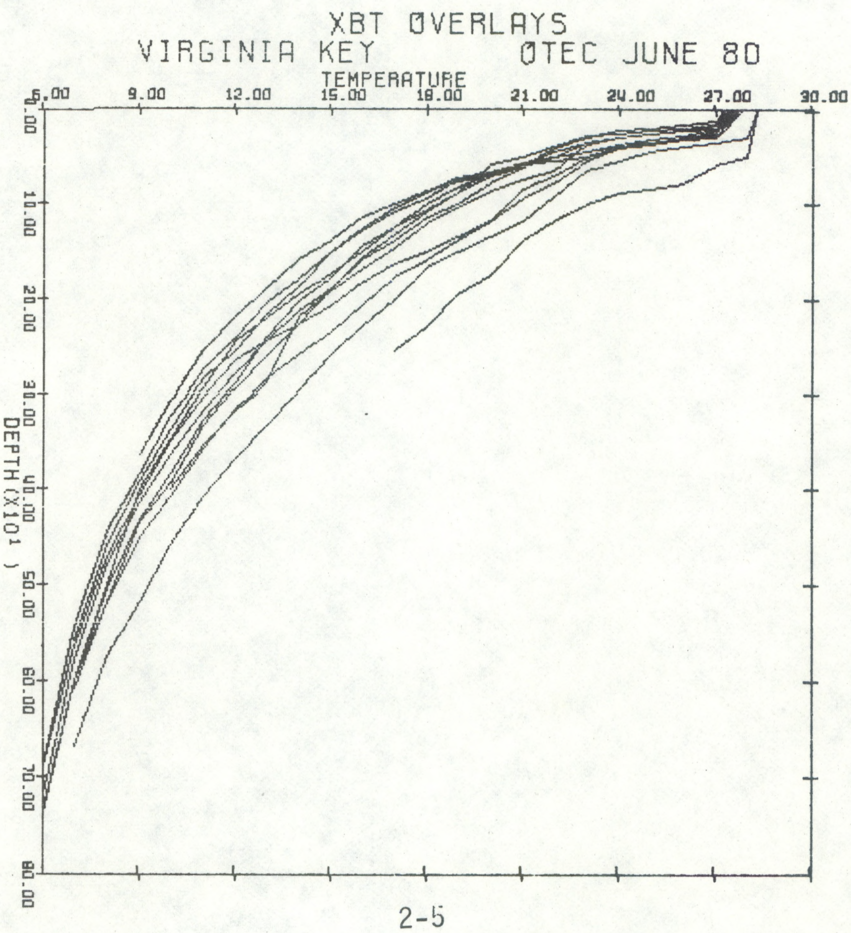

XBT OVERLAYS
VIRGINIA KEY
OTEC-MAR. 79
TEMPERATURE
6.00
9.00
12.00
15.00
18.00
21.00
24.00
27.00
30.00
DEPTH (X10¹)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00


XBT OVERLAYS
VIRGINIA KEY
OTEC-APR. 79
TEMPERATURE
6.00
9.00
12.00
15.00
18.00
21.00
24.00
27.00
30.00
DEPTH (X10¹)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00


XBT ØVERLAYS
VIRGINIA KEY ØTEC-MAY 79
TEMPERATURE
6.00
9.00
12.00
15.00
18.00
21.00
24.00
27.00
30.00
DEPTH (X10¹)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00

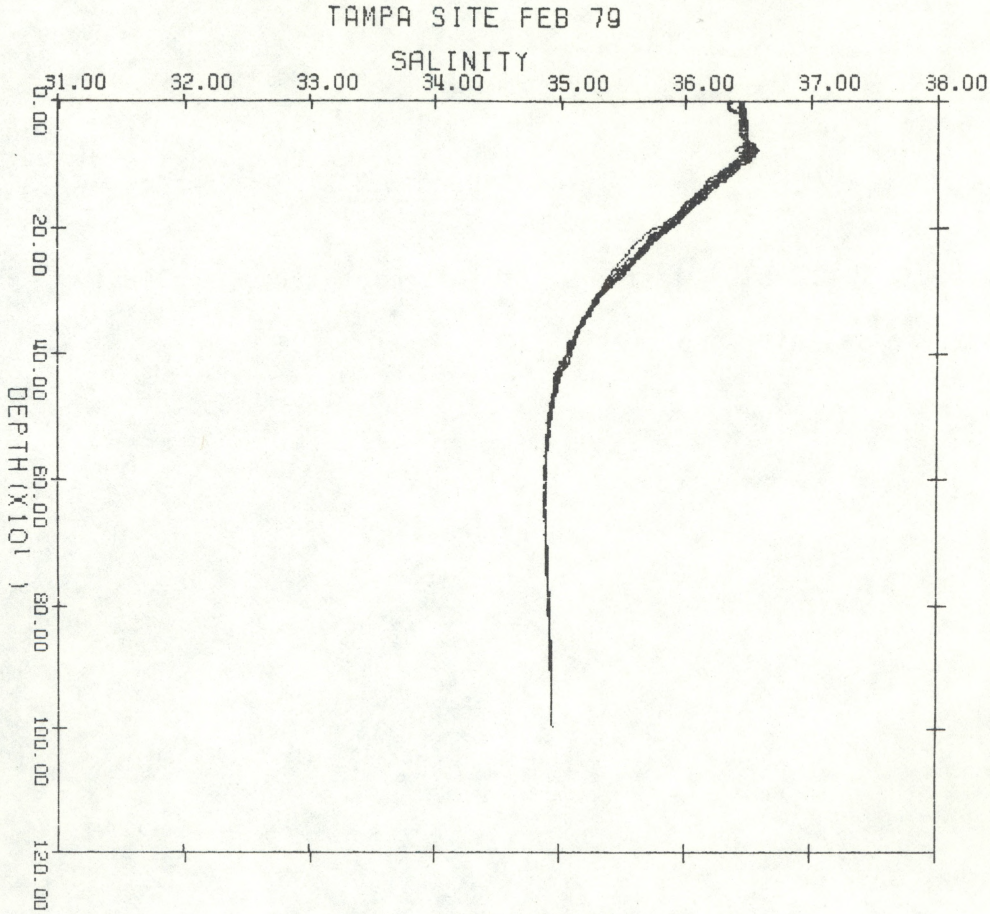

XBT ØVERLAYS
VIRGINIA KEY ØTEC-JUNE 79
TEMPERATURE
6.00
9.00
12.00
15.00
18.00
21.00
24.00
27.00
30.00
DEPTH (X10¹)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00

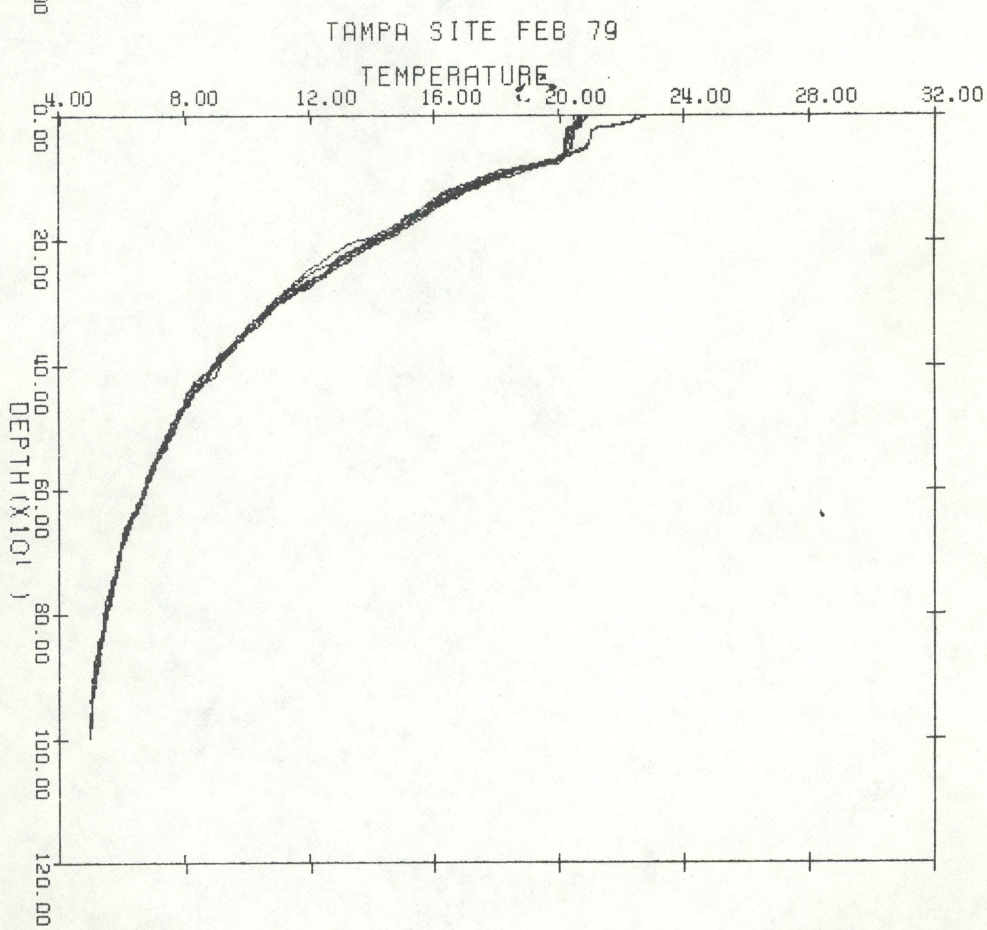

XBT OVERLAYS
MT. MITCHELL
MAY 1979
TEMPERATURE
6.00
9.00
12.00
15.00
18.00
21.00
24.00
27.00
30.00
DEPTH (X10¹)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00

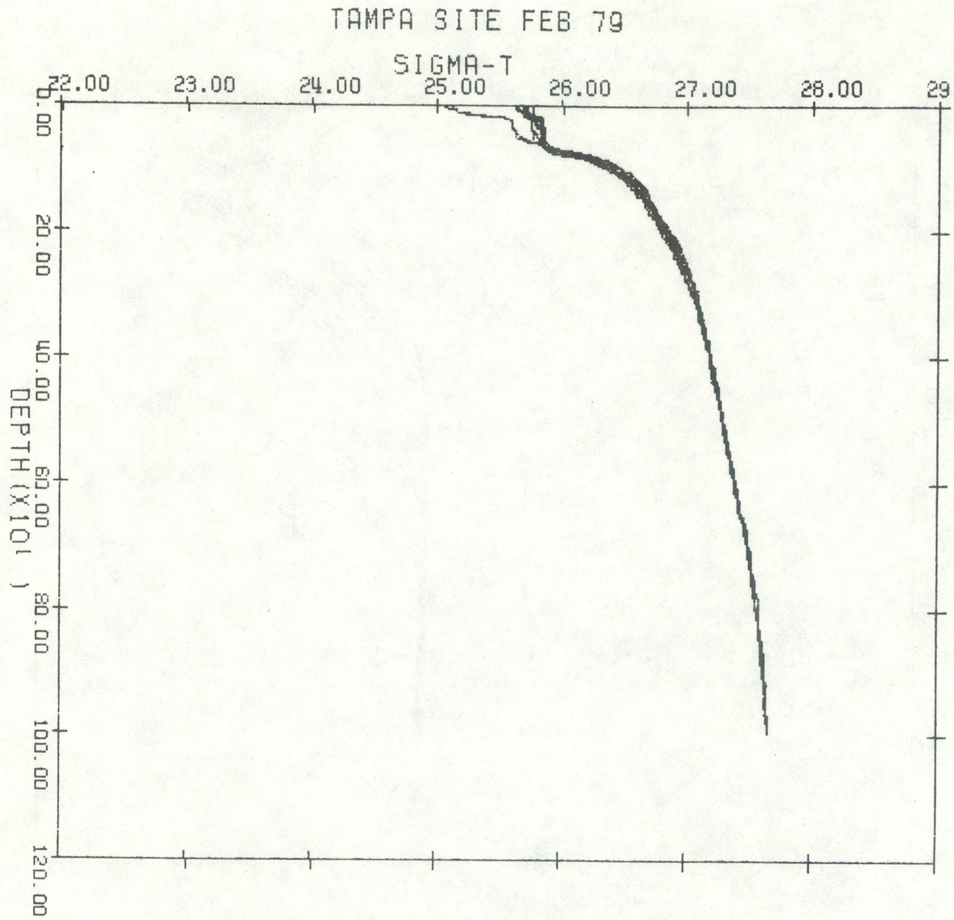

XBT OVERLAYS
VIRGINIA KEY
OTEC JUNE 80
TEMPERATURE
6.00
9.00
12.00
15.00
18.00
21.00
24.00
27.00
30.00
DEPTH (X10¹)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00

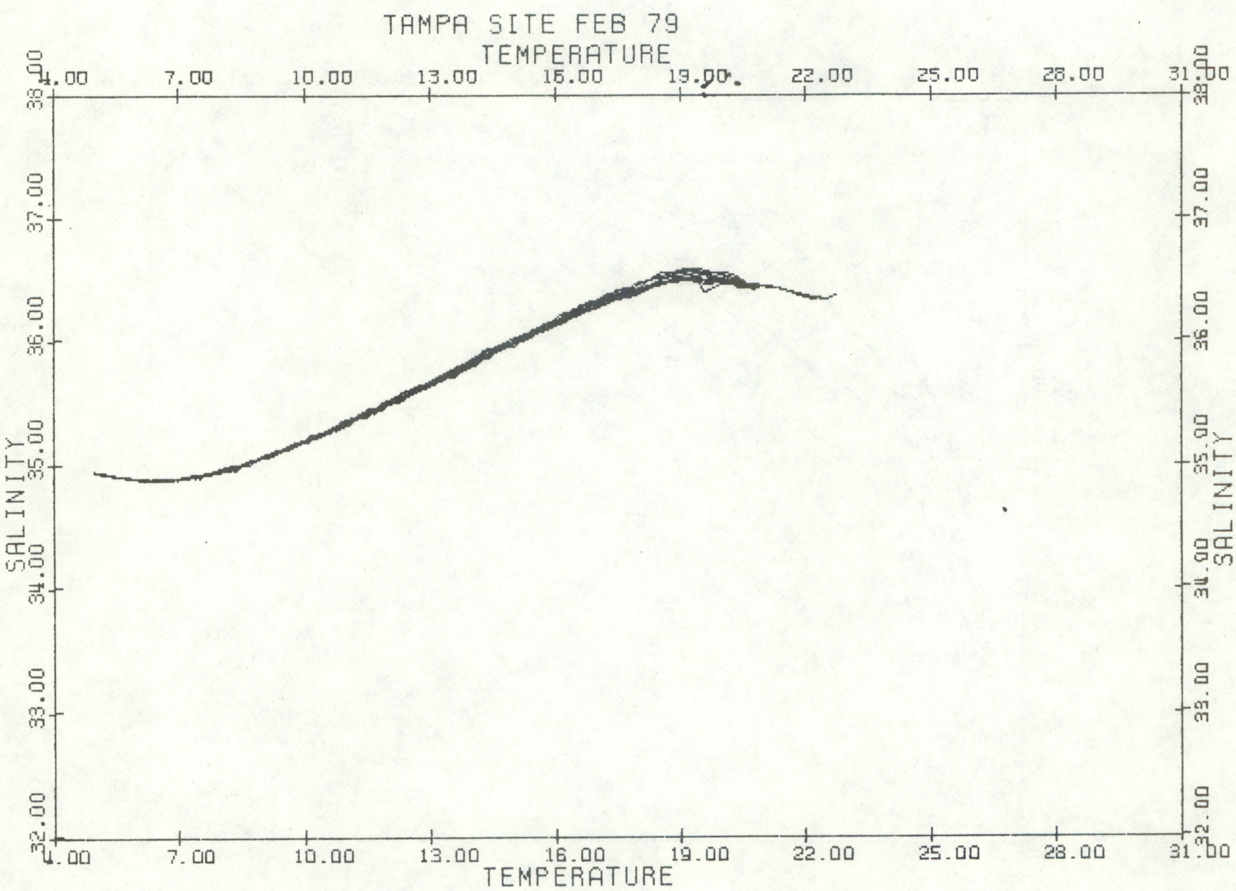
Appendix 3

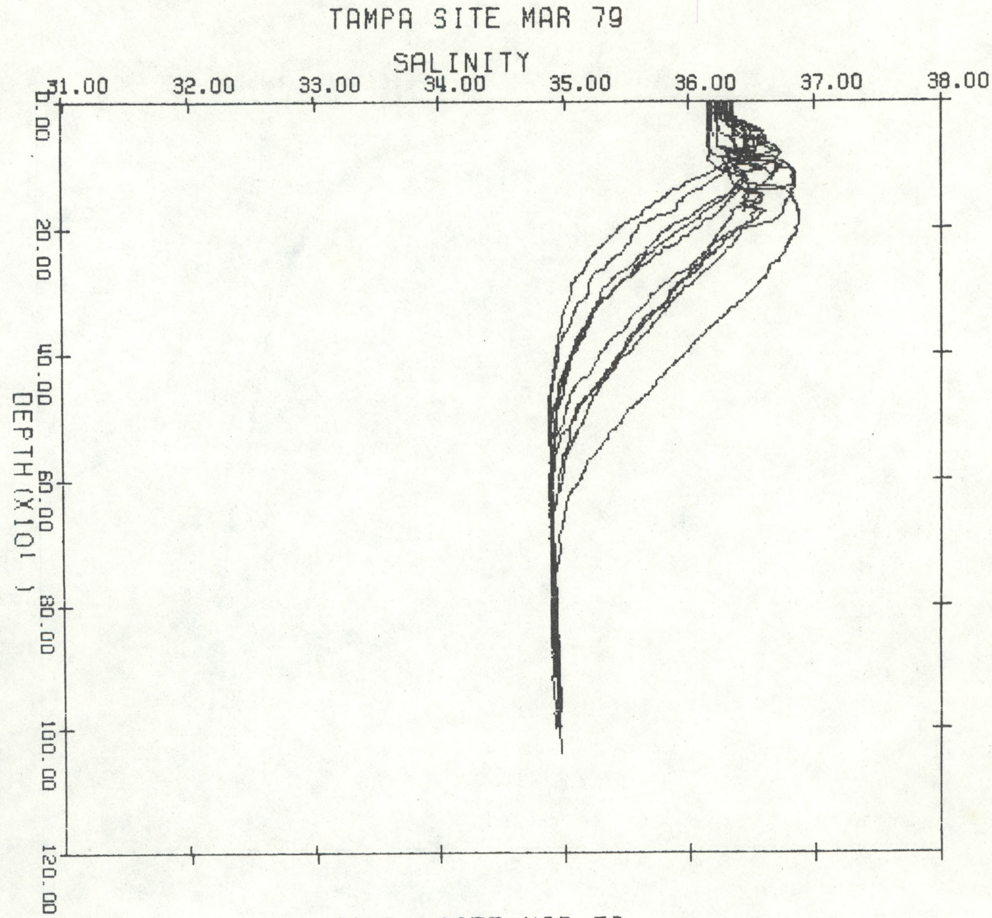
Corrected 9040 STD listings and temperature, salinity, sigma-t, and temperature-salinity profiles.

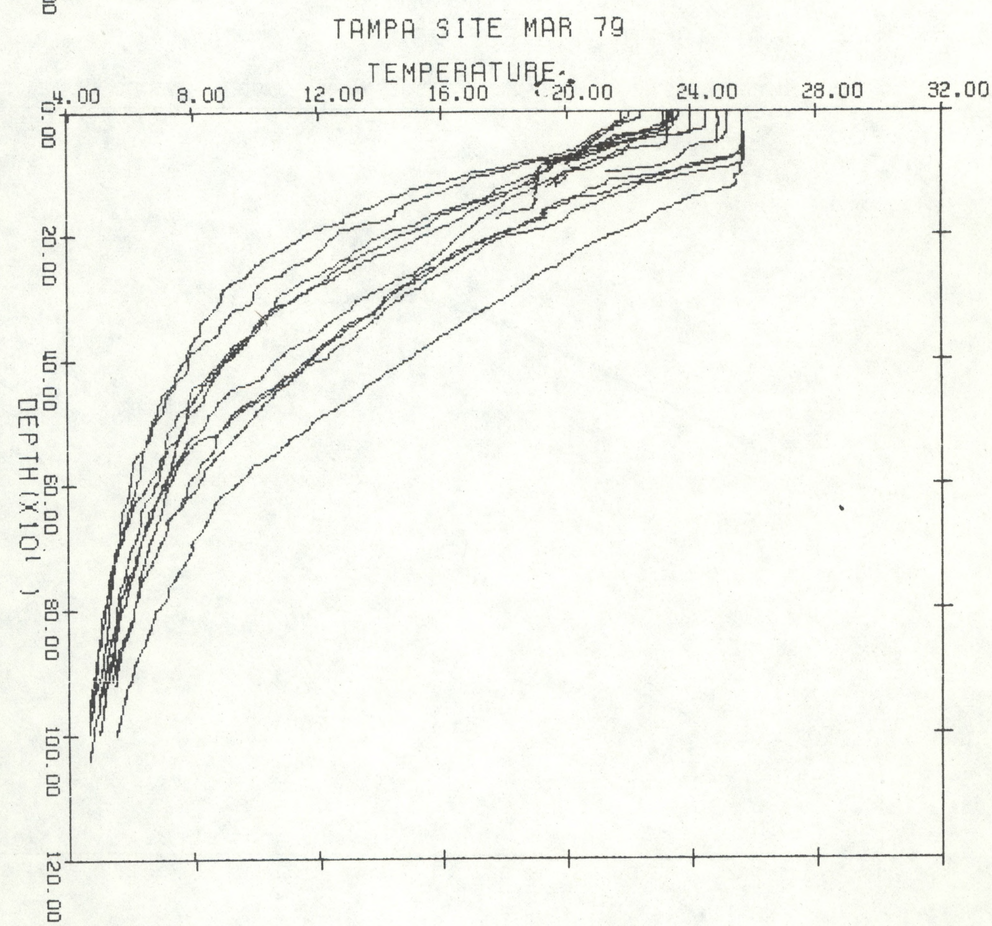

TAMPA SITE FEB 79
SALINITY
31.00
32.00
33.00
34.00
35.00
36.00
37.00
38.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
DEPTH(X10¹)

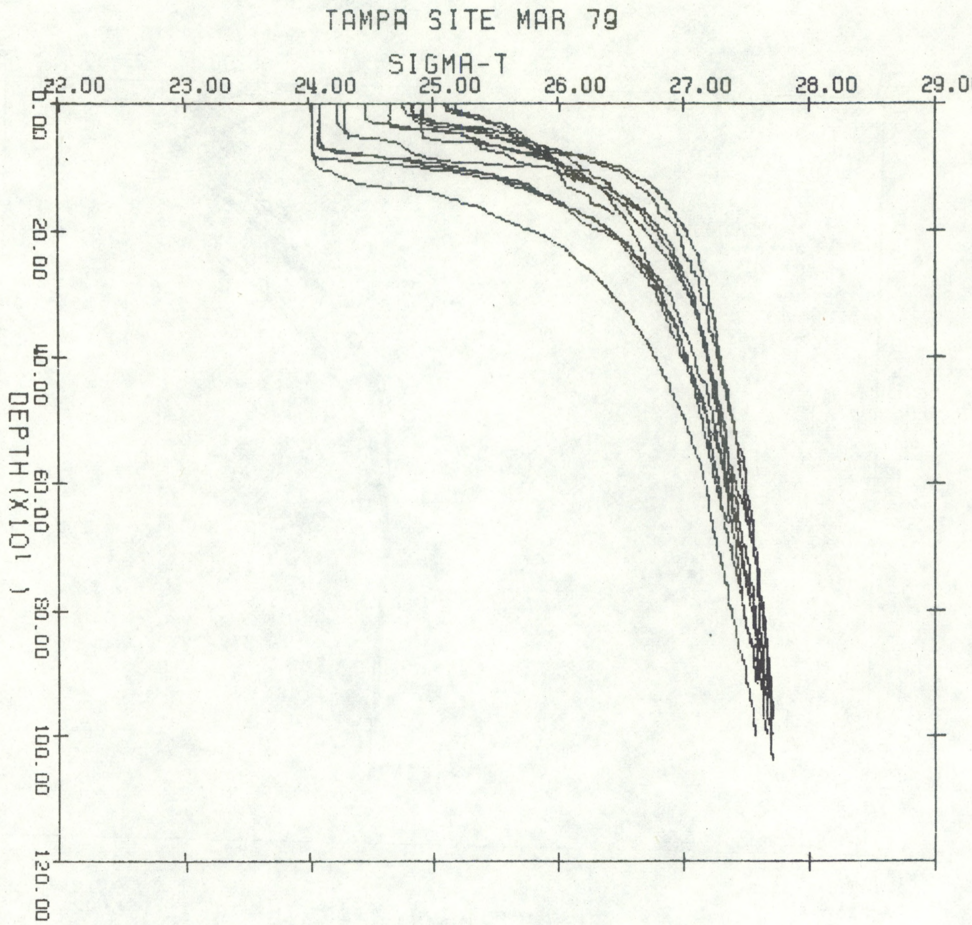

TAMPA SITE FEB 79
TEMPERATURE
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
DEPTH(X10¹)

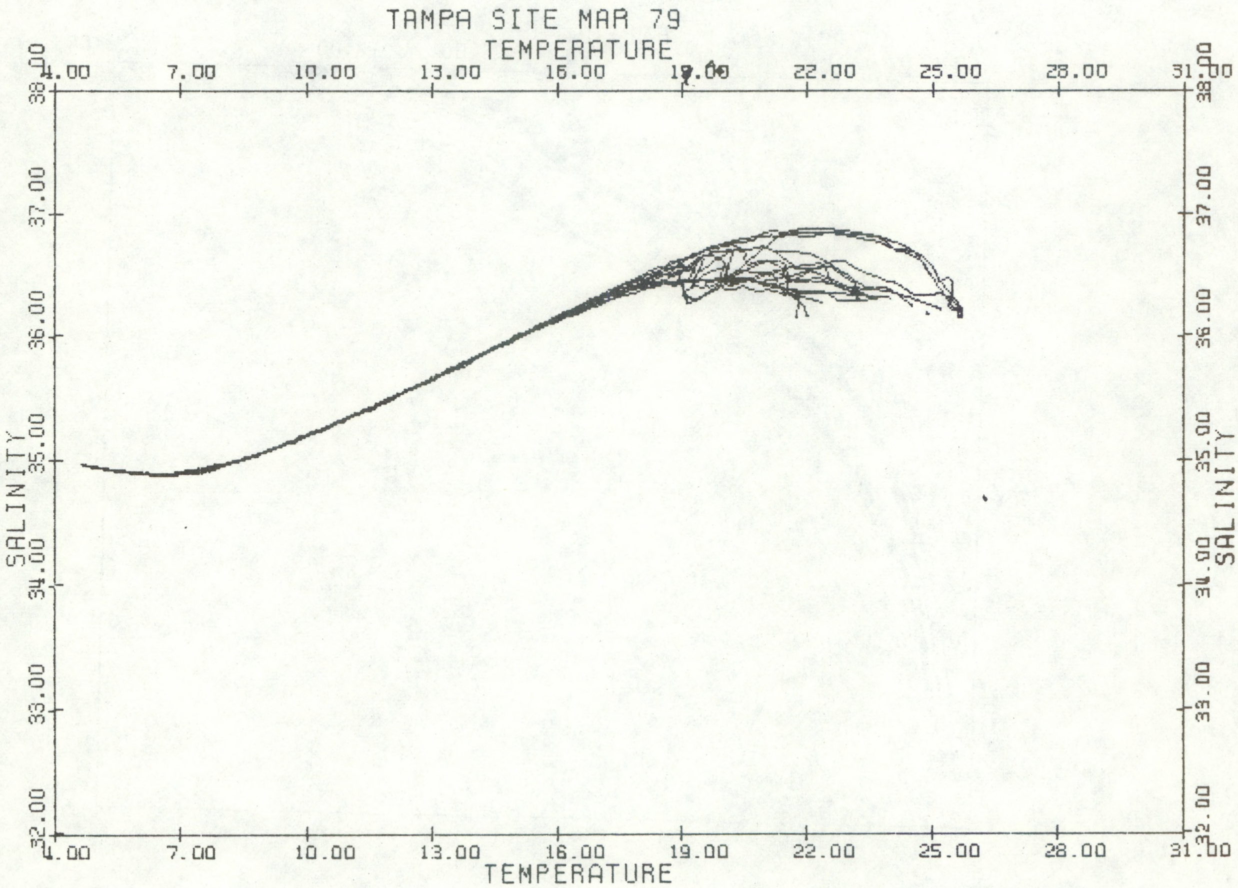

TAMPA SITE FEB 79
SIGMA-T
22.00 23.00 24.00 25.00 26.00 27.00 28.00 29.00
DEPTH (X10¹)
0.00 20.00 40.00 60.00 80.00 100.00 120.00

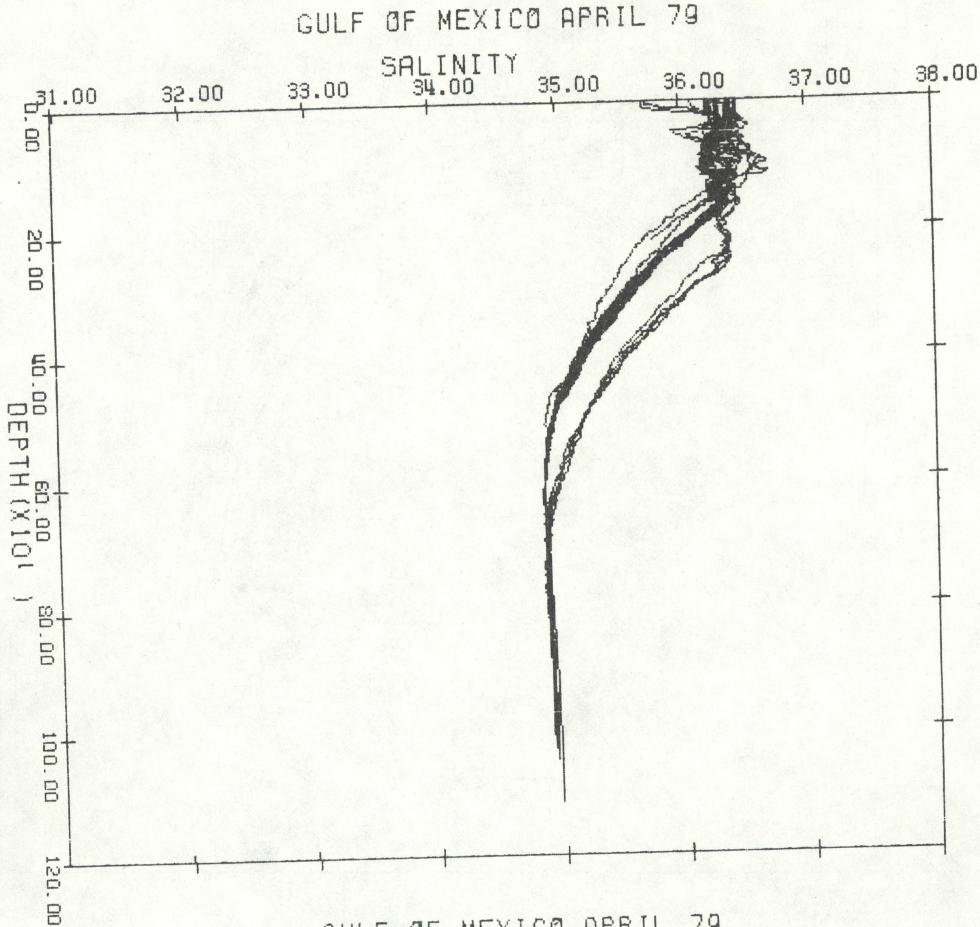

TAMPA SITE FEB 79
TEMPERATURE
4.00 7.00 10.00 13.00 16.00 19.00 22.00 25.00 28.00 31.00
SALINITY
32.00 33.00 34.00 35.00 36.00 37.00 38.00
SALINITY
TEMPERATURE

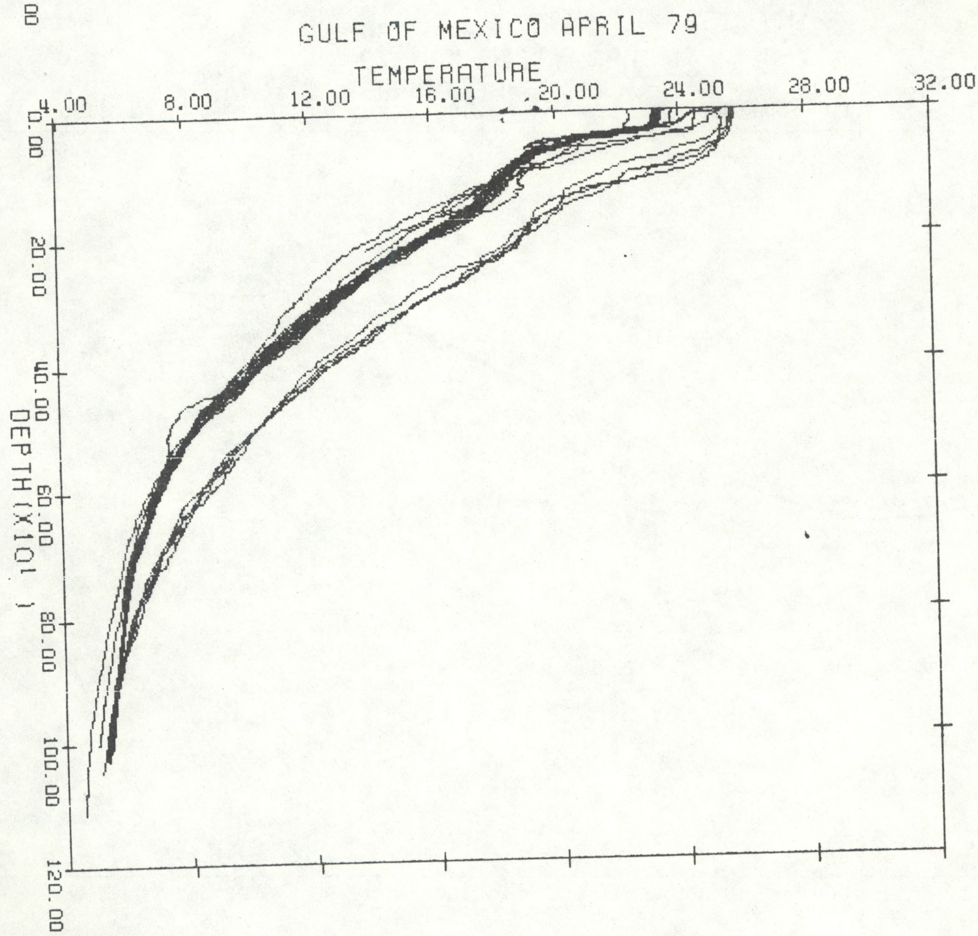

TAMPA SITE MAR 79
SALINITY
31.00
32.00
33.00
34.00
35.00
36.00
37.00
38.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
DEPTH (X10¹)

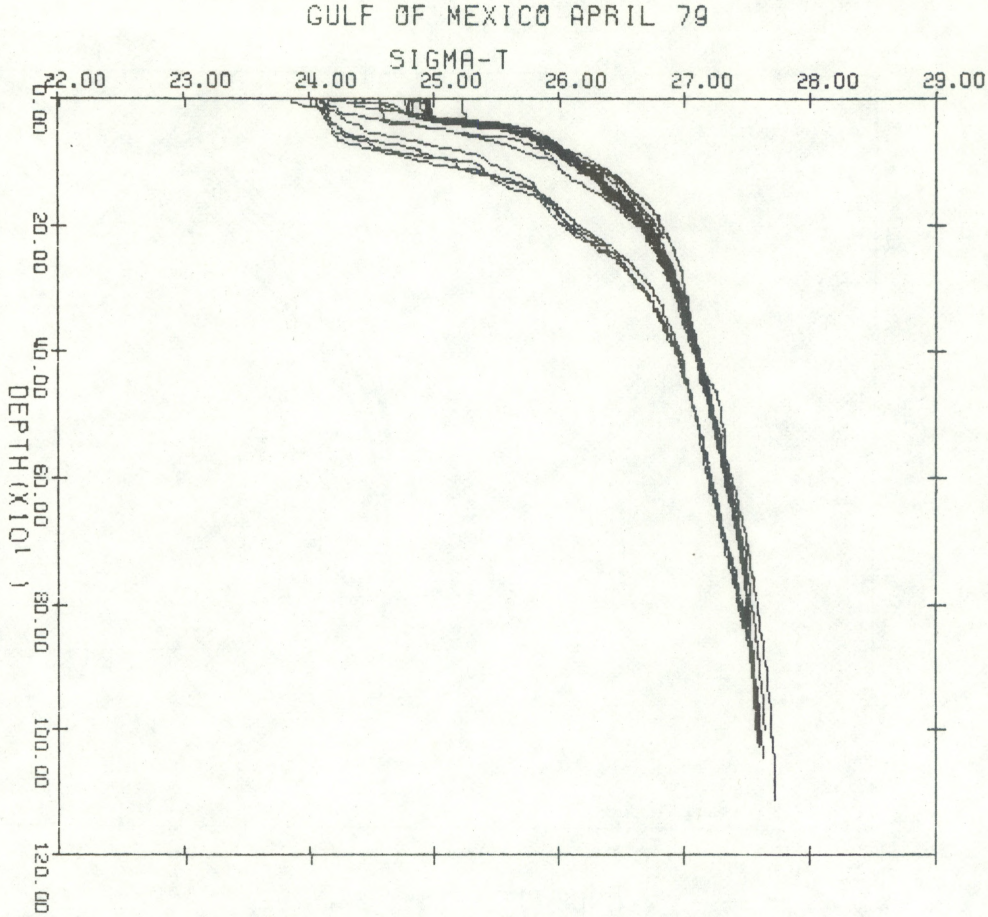

TAMPA SITE MAR 79
TEMPERATURE
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
DEPTH (X10¹)

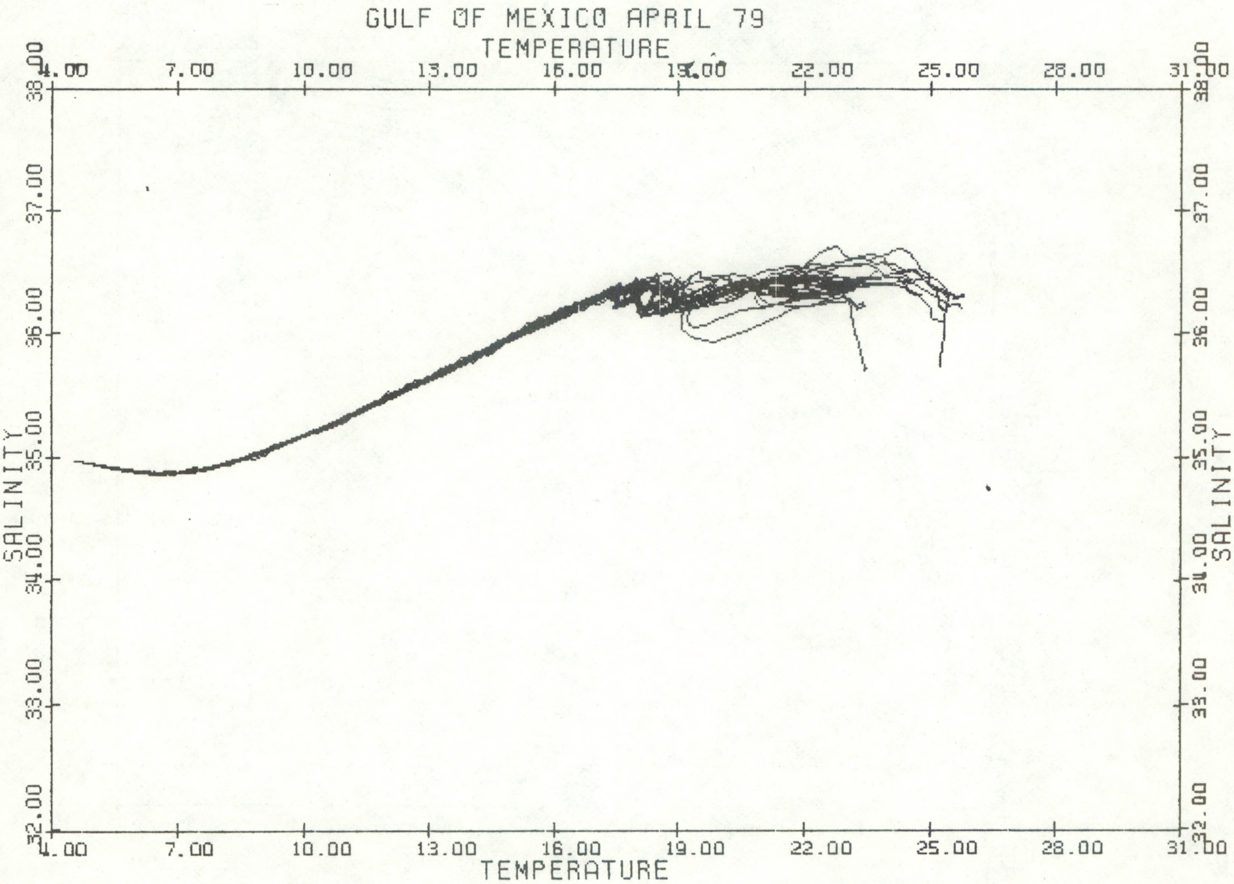

TAMPA SITE MAR 79
SIGMA-T
22.00 23.00 24.00 25.00 26.00 27.00 28.00 29.00
DEPTH(X10[1])
0.00 20.00 40.00 60.00 80.00 100.00 120.00

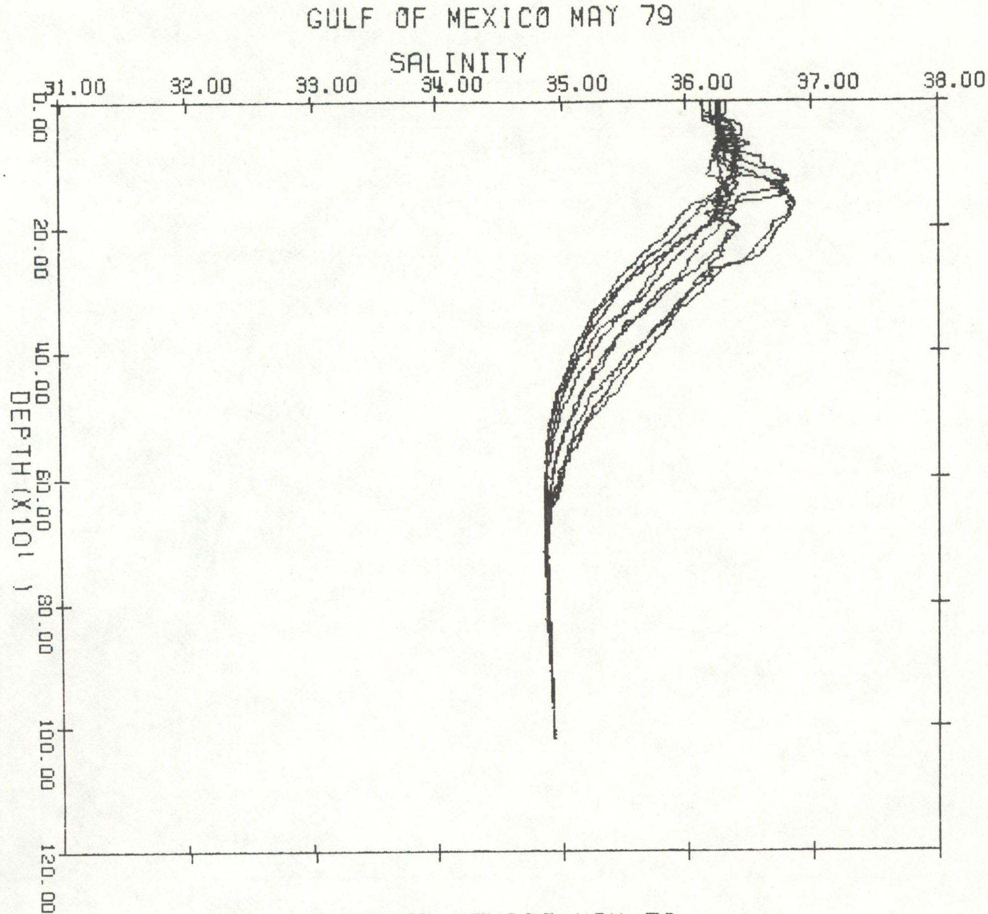

TAMPA SITE MAR 79
TEMPERATURE
4.00 7.00 10.00 13.00 16.00 19.00 22.00 25.00 28.00 31.00
SALINITY
32.00 33.00 34.00 35.00 36.00 37.00 38.00
SALINITY
TEMPERATURE


GULF OF MEXICO APRIL 79
SALINITY
31.00
32.00
33.00
34.00
35.00
36.00
37.00
38.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
DEPTH(X10¹)

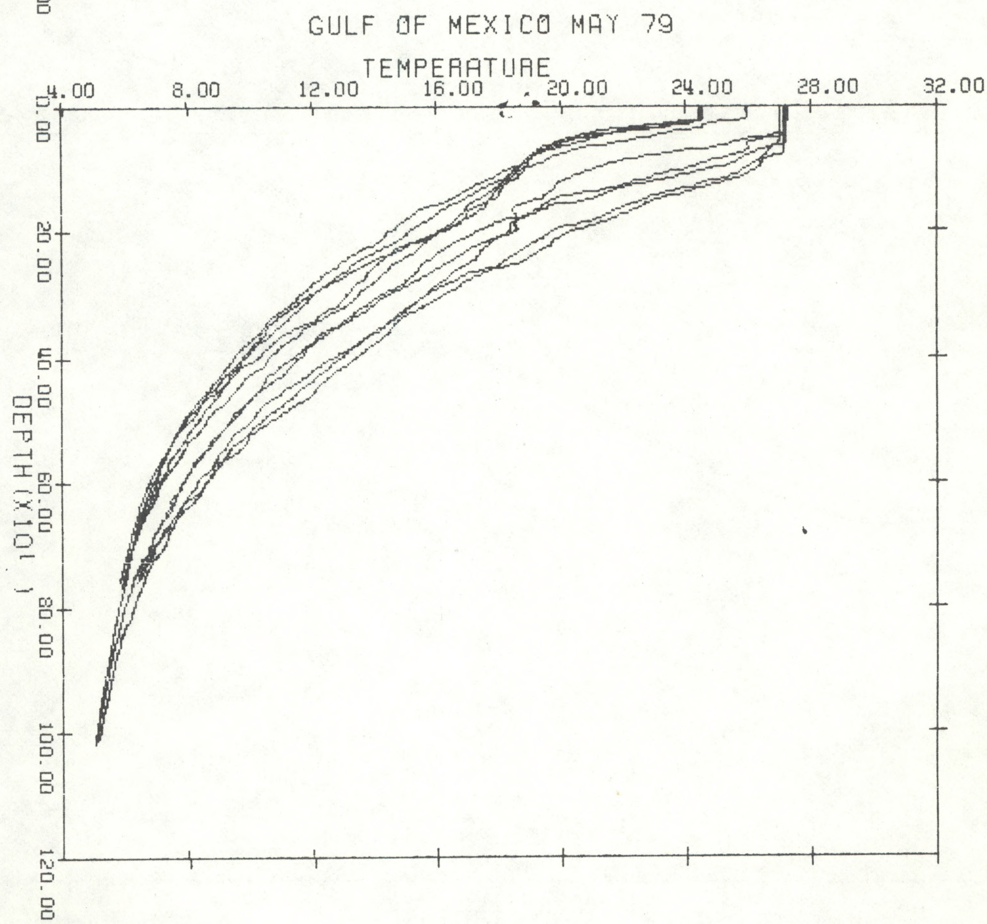

GULF OF MEXICO APRIL 79
TEMPERATURE
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
DEPTH(X10¹)


GULF OF MEXICO APRIL 79
SIGMA-T
22.00
23.00
24.00
25.00
26.00
27.00
28.00
29.00
DEPTH(X10)
0.00
20.00
40.00
60.00
80.00
100.00
120.00

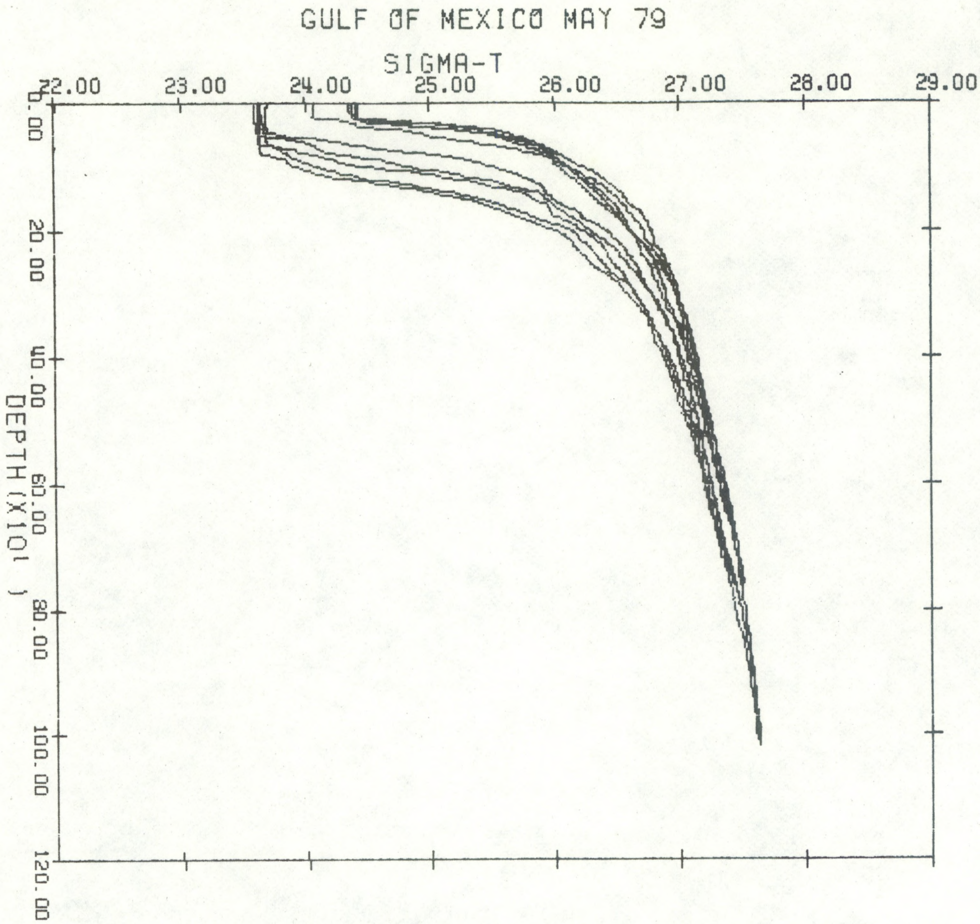

GULF OF MEXICO APRIL 79
TEMPERATURE
4.00
7.00
10.00
13.00
16.00
19.00
22.00
25.00
28.00
31.00
SALINITY
32.00
33.00
34.00
35.00
36.00
37.00
38.00
TEMPERATURE

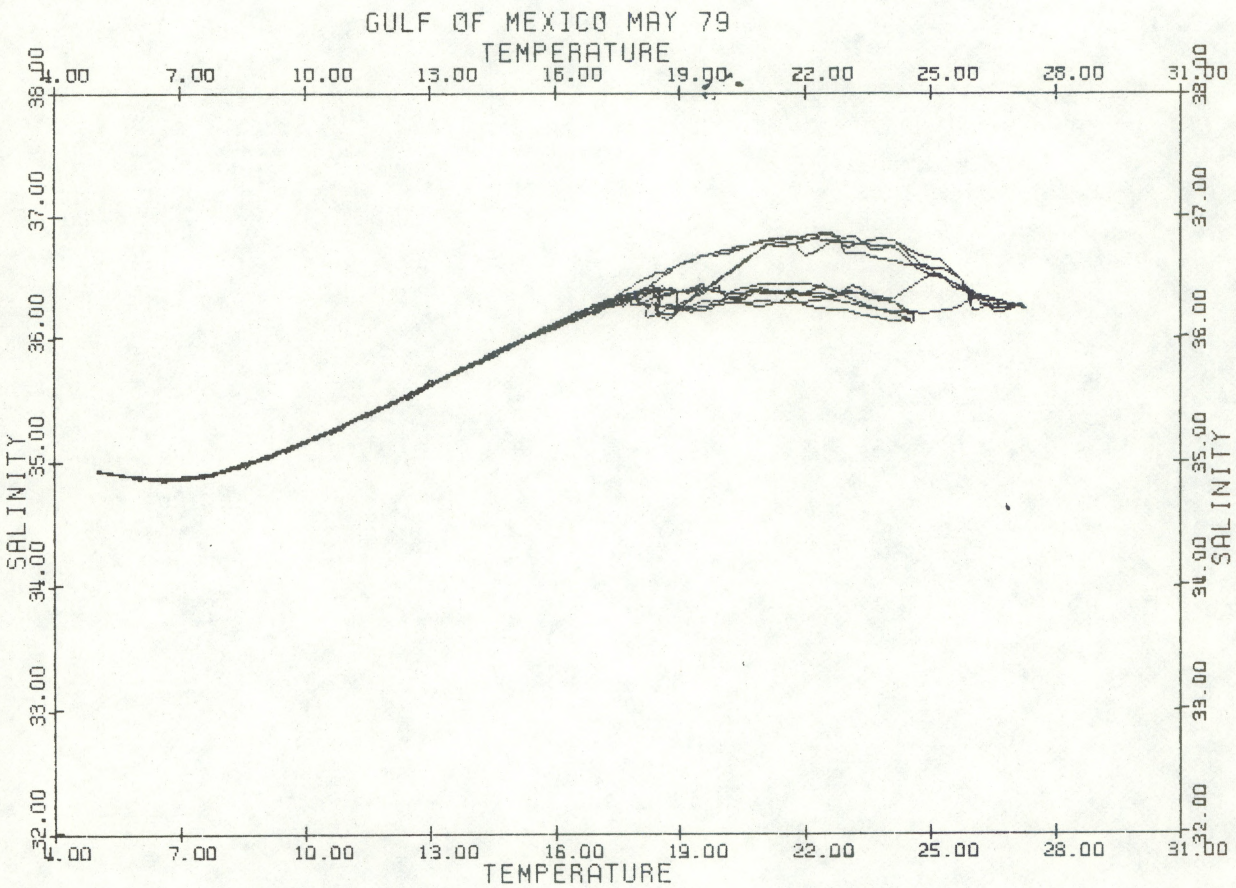


GULF OF MEXICO MAY 79
SALINITY
31.00
32.00
33.00
34.00
35.00
36.00
37.00
38.00
DEPTH (X10[1])
0.00
20.00
40.00
60.00
80.00
100.00
120.00



GULF OF MEXICO MAY 79
TEMPERATURE
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
DEPTH (X10[1])
0.00
20.00
40.00
60.00
80.00
100.00
120.00

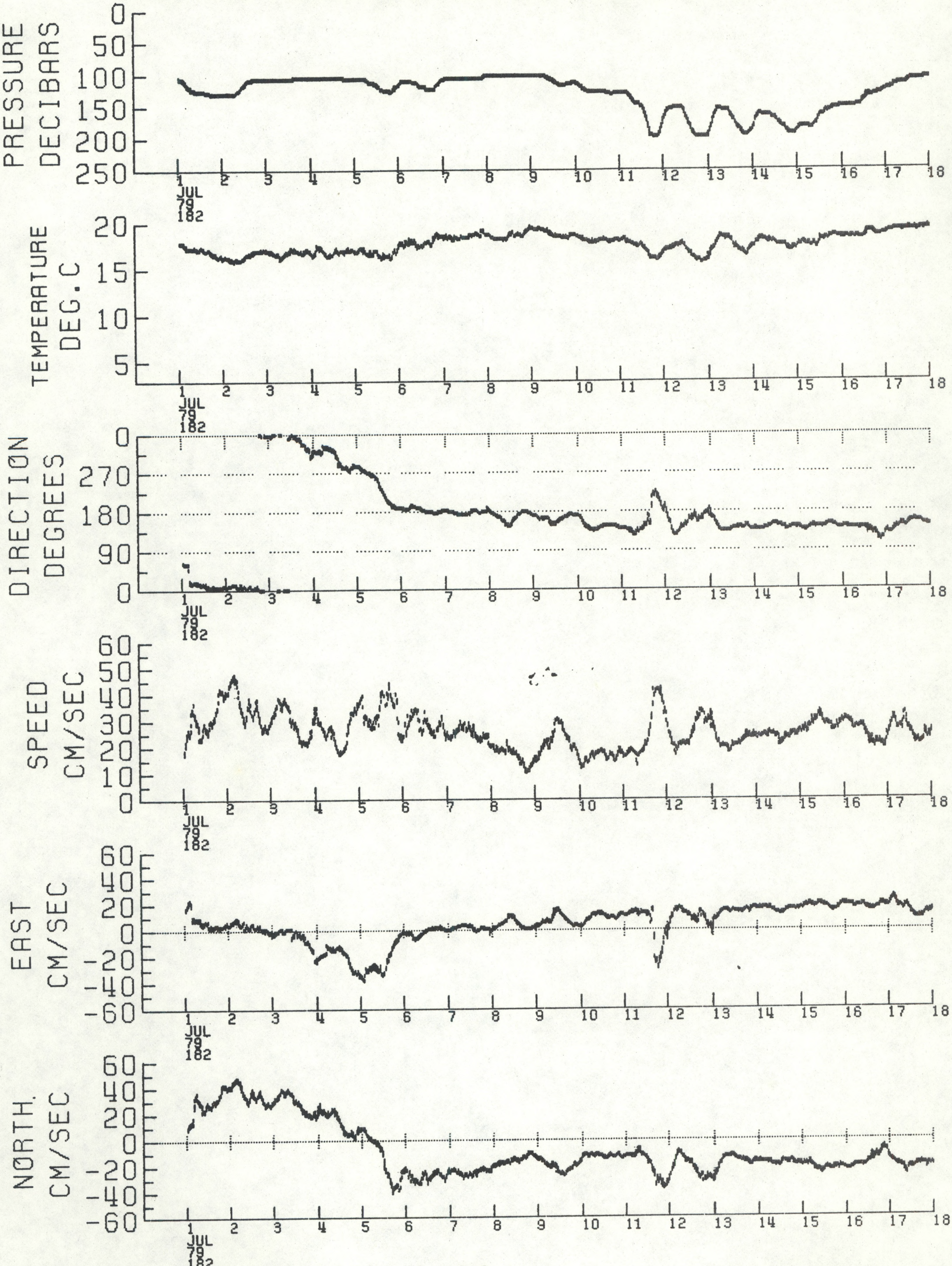

GULF OF MEXICO MAY 79
SIGMA-T
22.00
23.00
24.00
25.00
26.00
27.00
28.00
29.00
DEPTH(X10¹)
0.00
20.00
40.00
60.00
80.00
100.00
120.00


GULF OF MEXICO MAY 79
TEMPERATURE
4.00
7.00
10.00
13.00
16.00
19.00
22.00
25.00
28.00
31.00
SALINITY
32.00
33.00
34.00
35.00
36.00
37.00
38.00
TEMPERATURE
SALINITY

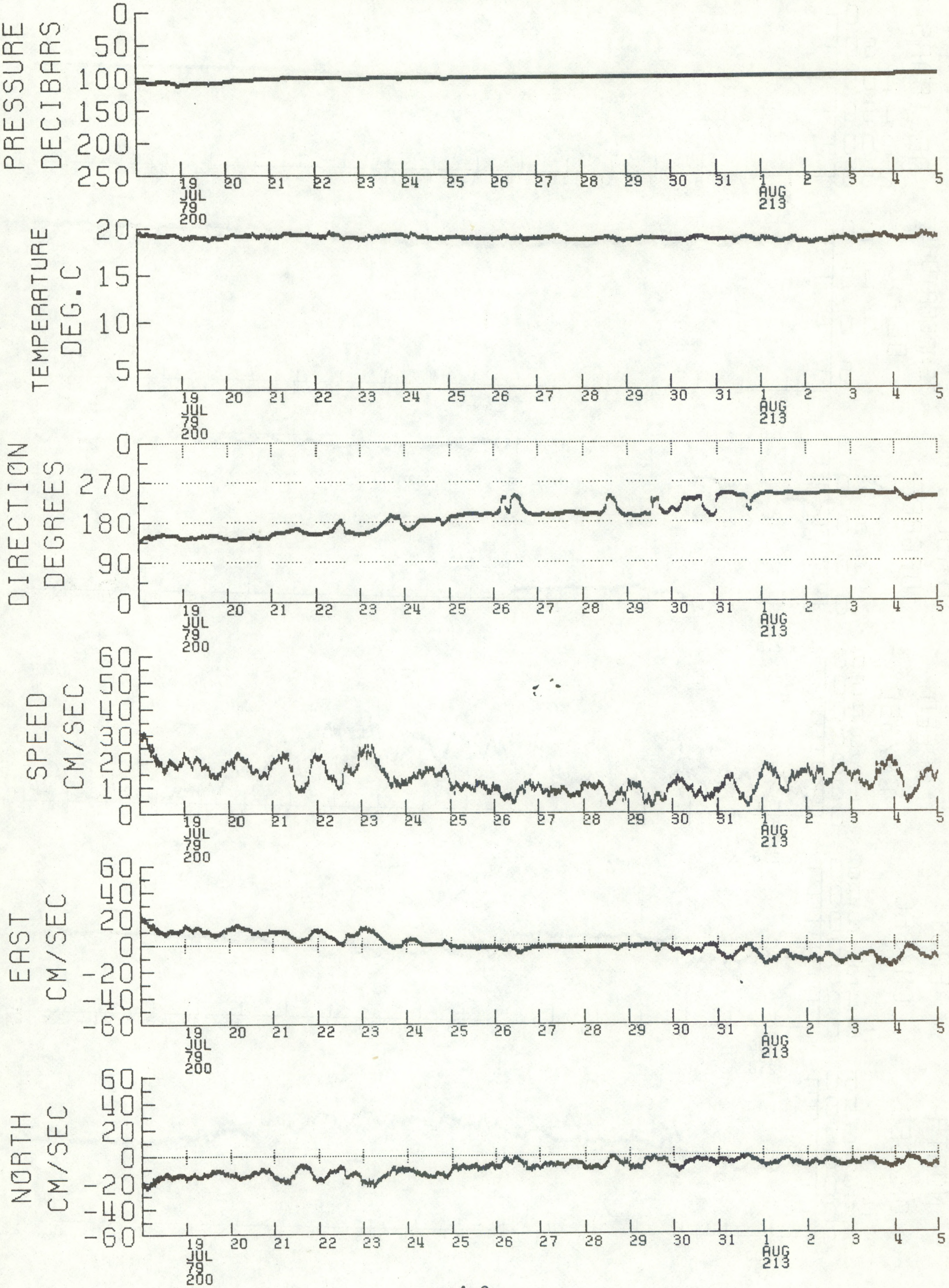
Appendix 4

Current meter data.

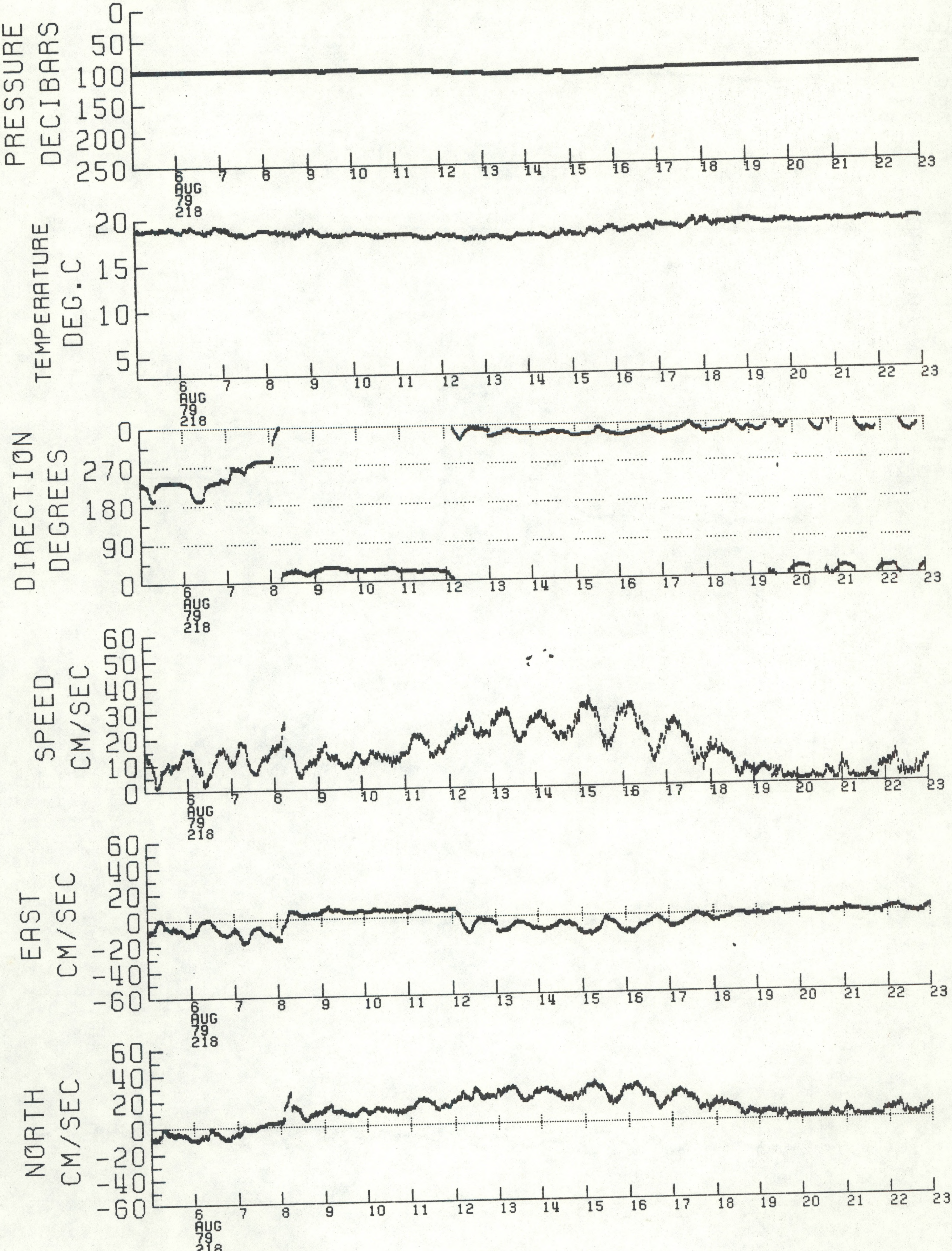
ØTEC TAMPA MOORING, METER 3285, DEPTH 100 M. IN 1050 M.



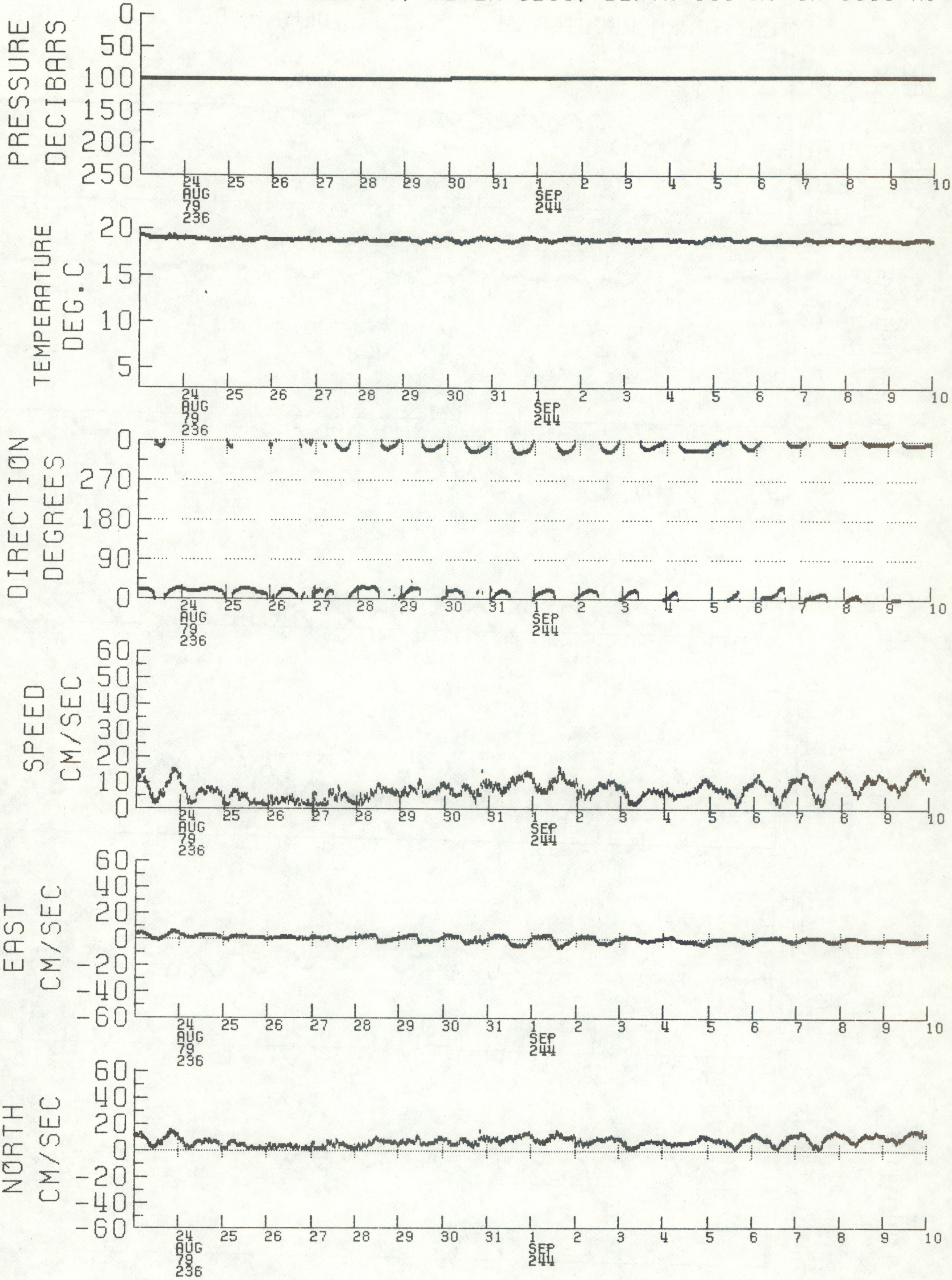
ØTEC TAMPA MOORING, METER 3285, DEPTH 100 M. IN 1050 M.



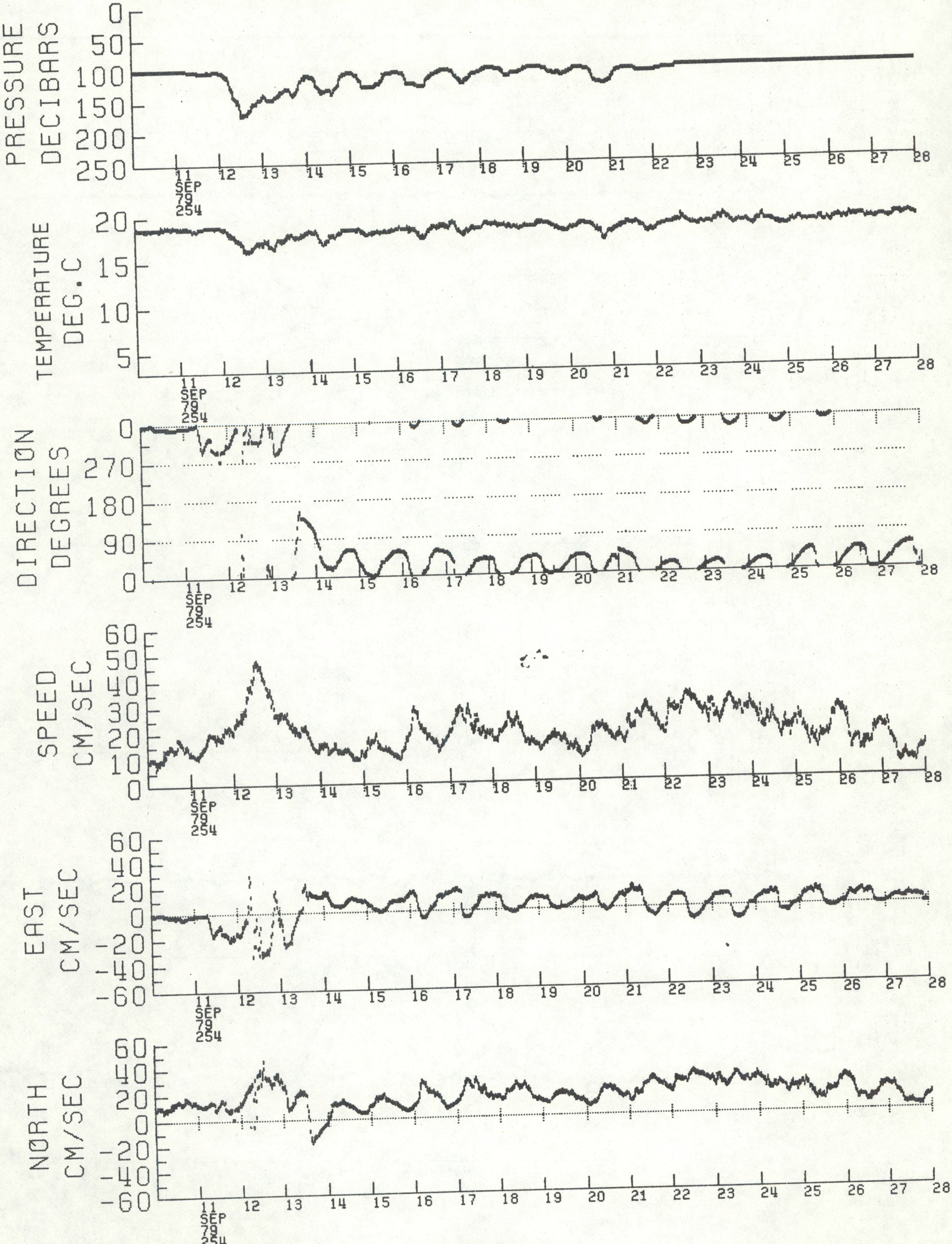
ØTEC TAMPA MOØRING, METER 3285, DEPTH 100 M. IN 1050 M.



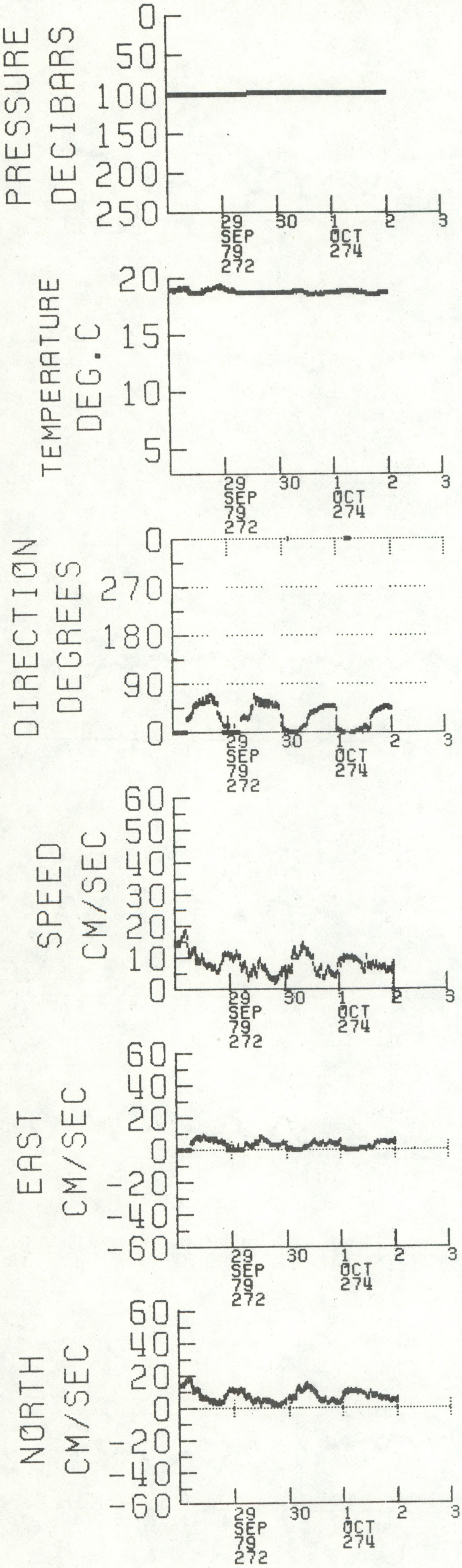
ØTEC TAMPA MOORING, METER 3285, DEPTH 100 M. IN 1050 M.

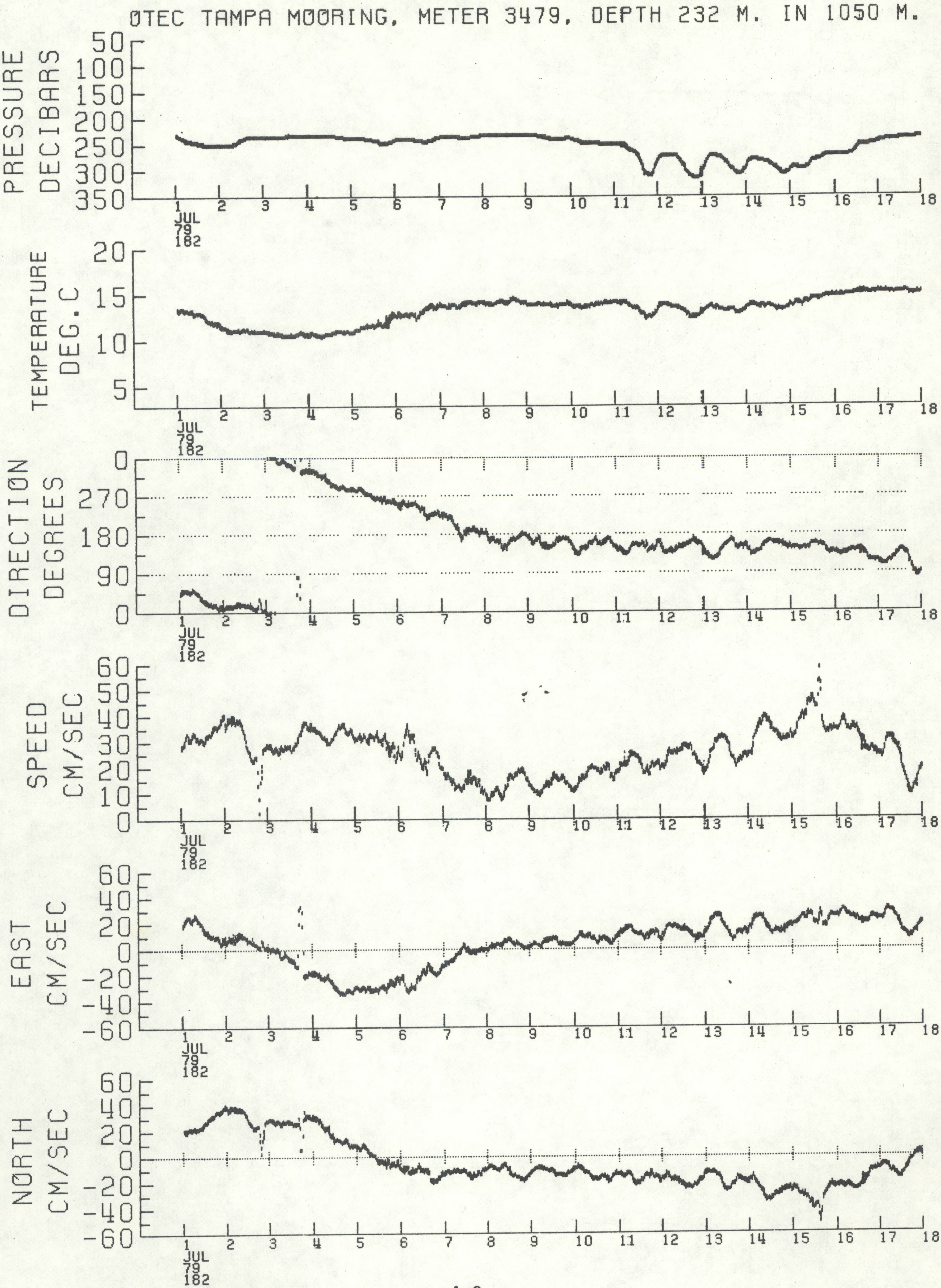


ØTEC TAMPA MOØRING, METER 3285, DEPTH 100 M. IN 1050 M.

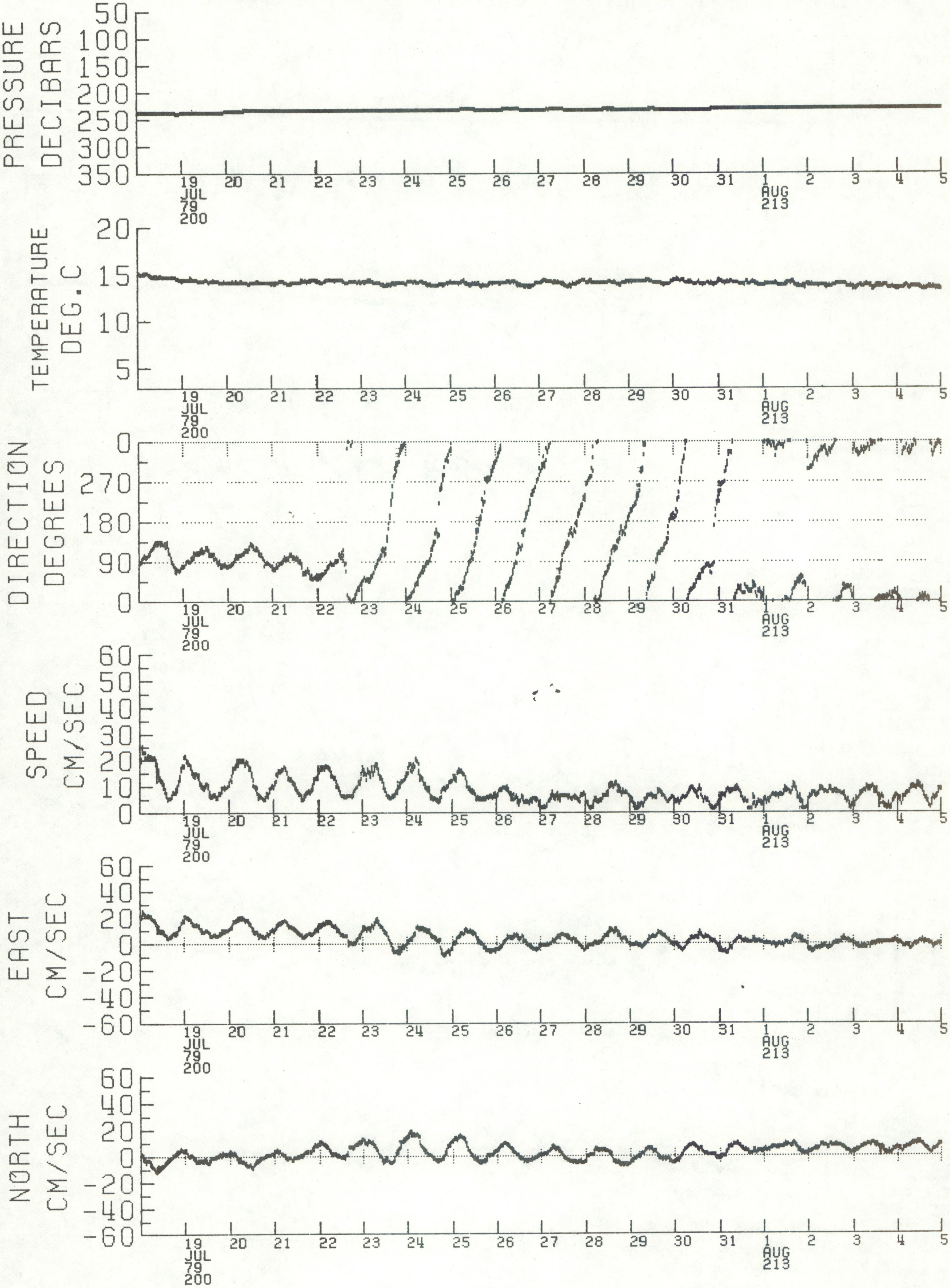


ØTEC TAMPA MOØRING, METER 3285, DEPTH 100 M. IN 1050 M.

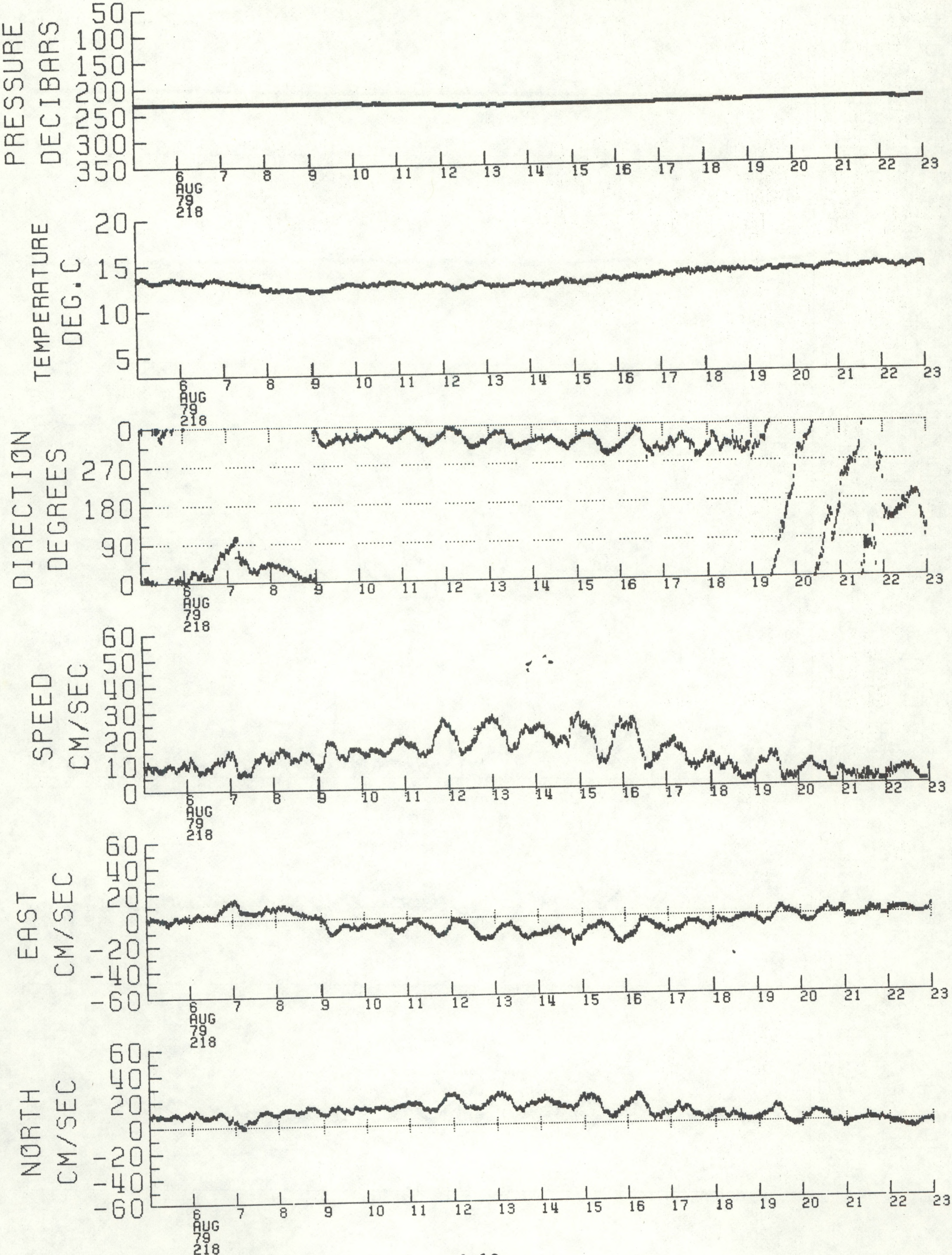



ØTEC TAMPA MOORING, METER 3479, DEPTH 232 M. IN 1050 M.
PRESSURE DECIBARS
TEMPERATURE DEG.C
DIRECTIØN DEGREES
SPEED CM/SEC
EAST CM/SEC
NØRTH CM/SEC
JUL
79
182

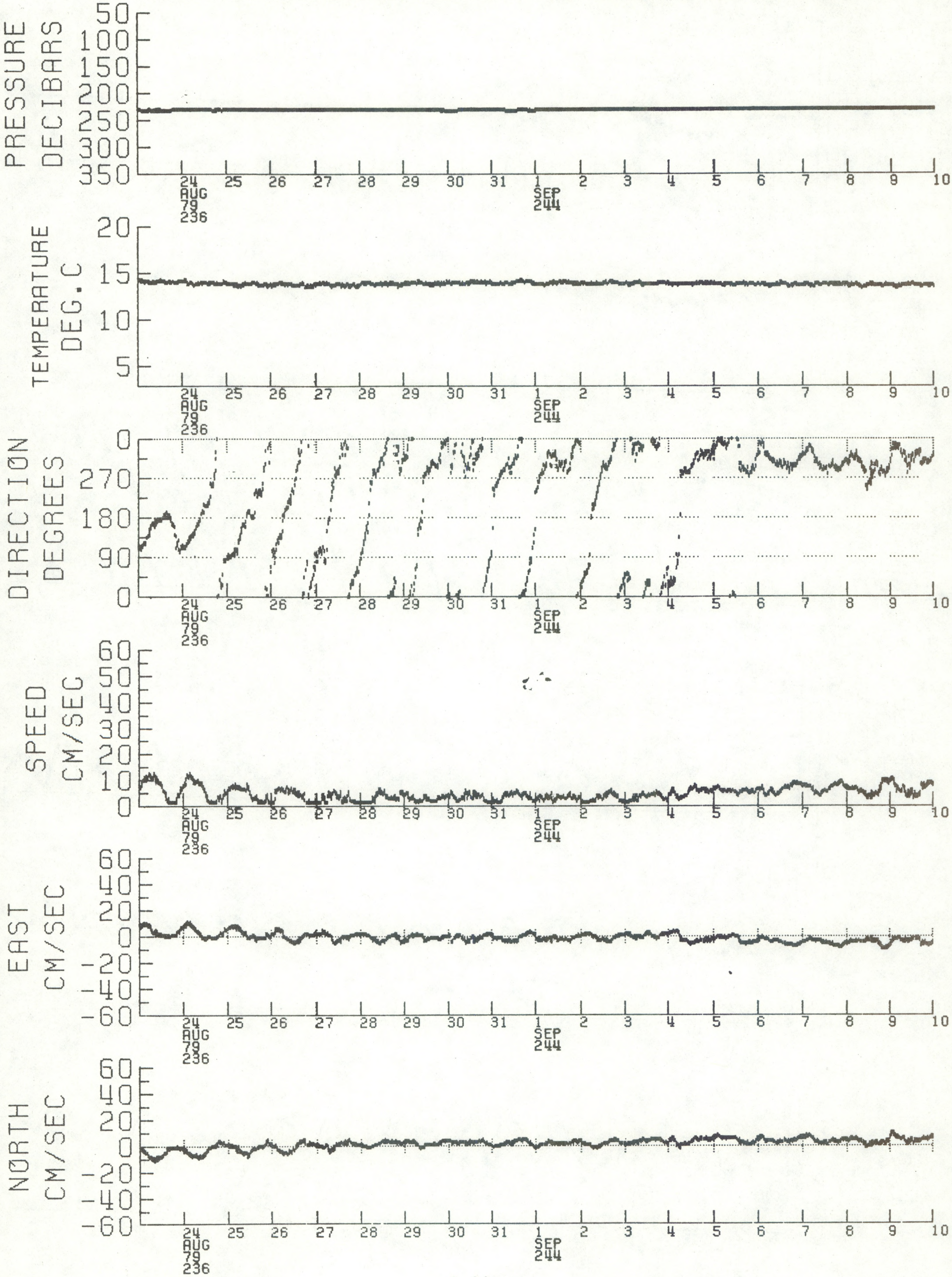
ØTEC TAMPA MOORING, METER 3479, DEPTH 232 M. IN 1050 M.



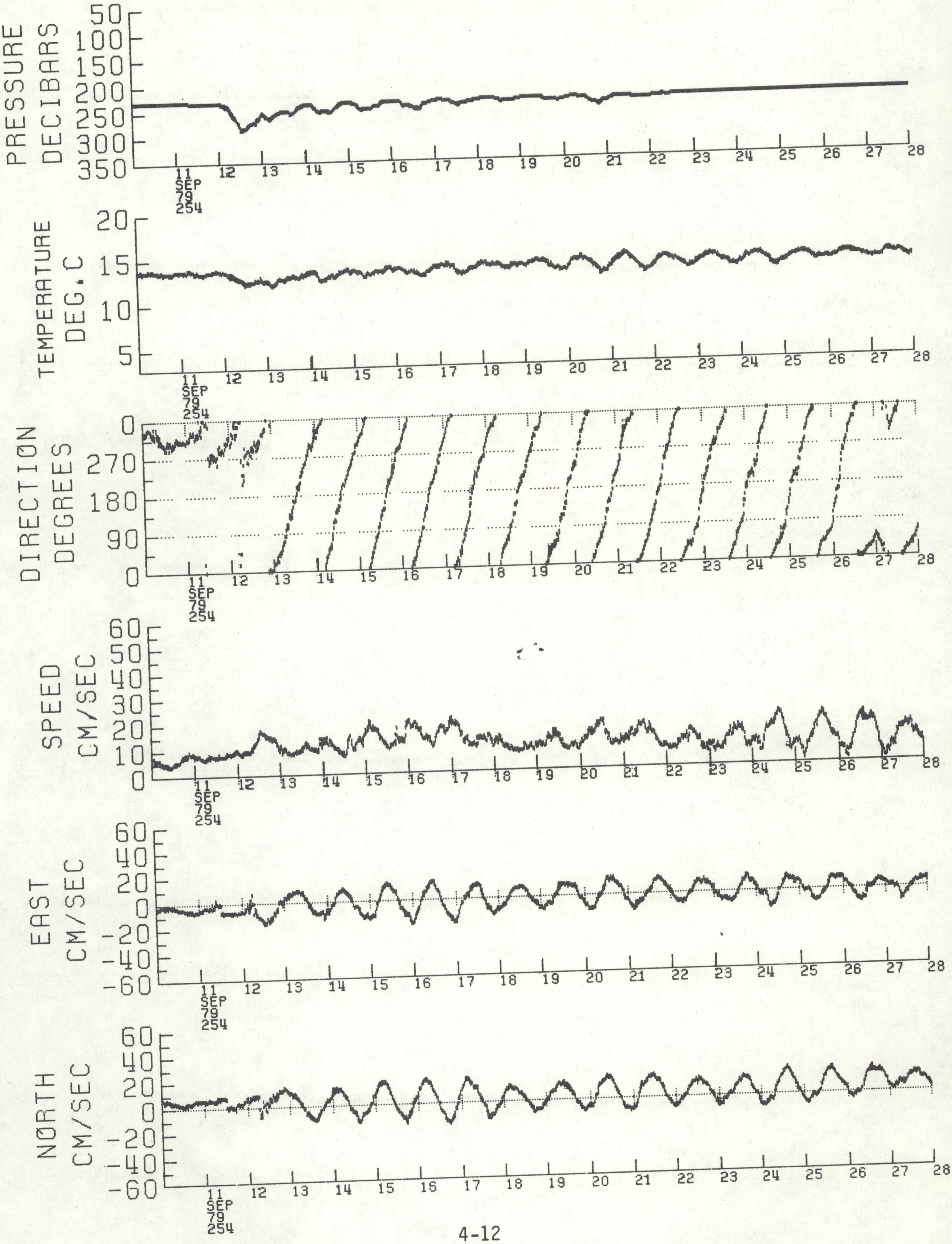
ØTEC TAMPA MOORING, METER 3479, DEPTH 232 M. IN 1050 M.



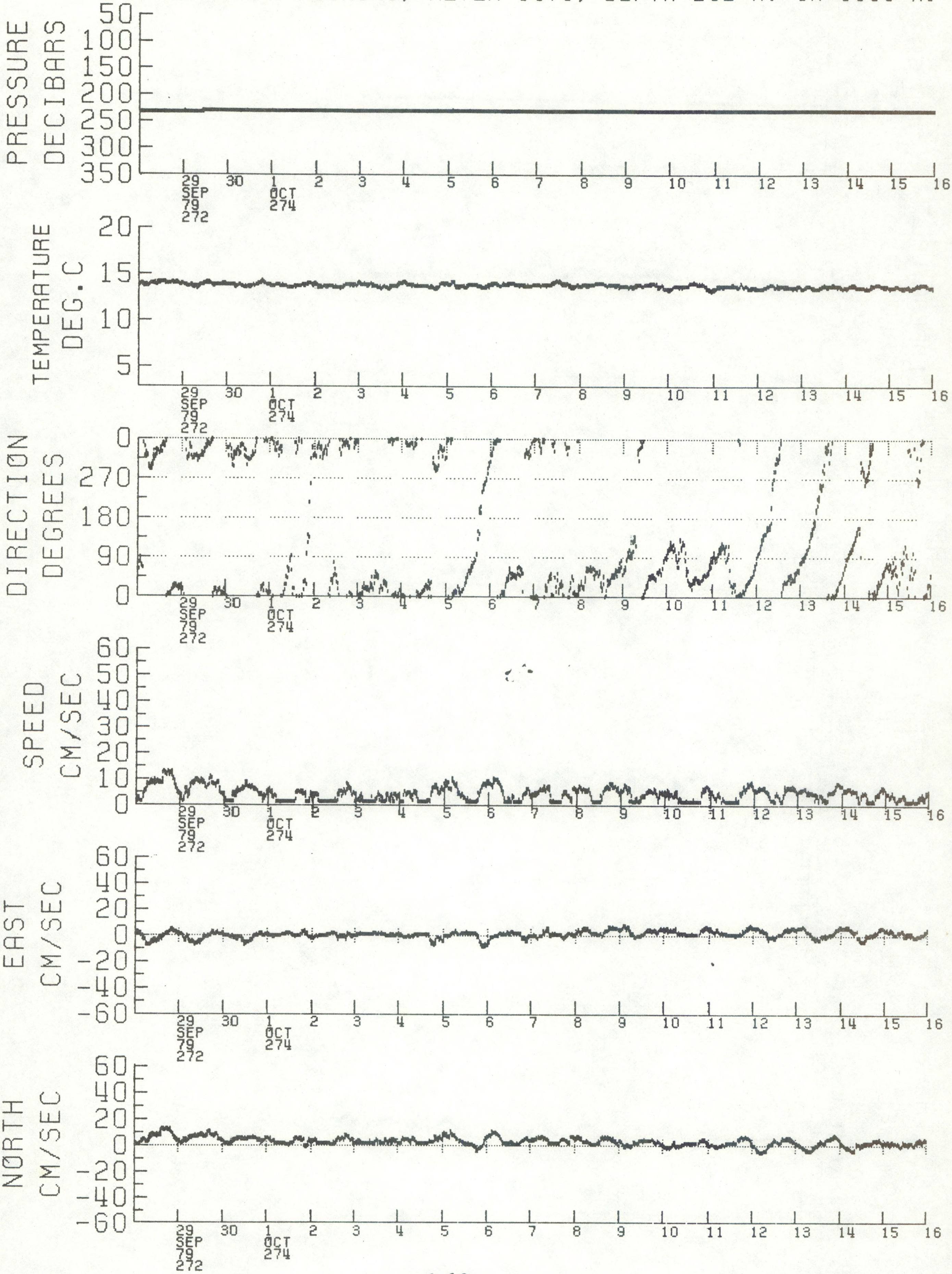
OTEC TAMPA MOORING, METER 3479, DEPTH 232 M. IN 1050 M.



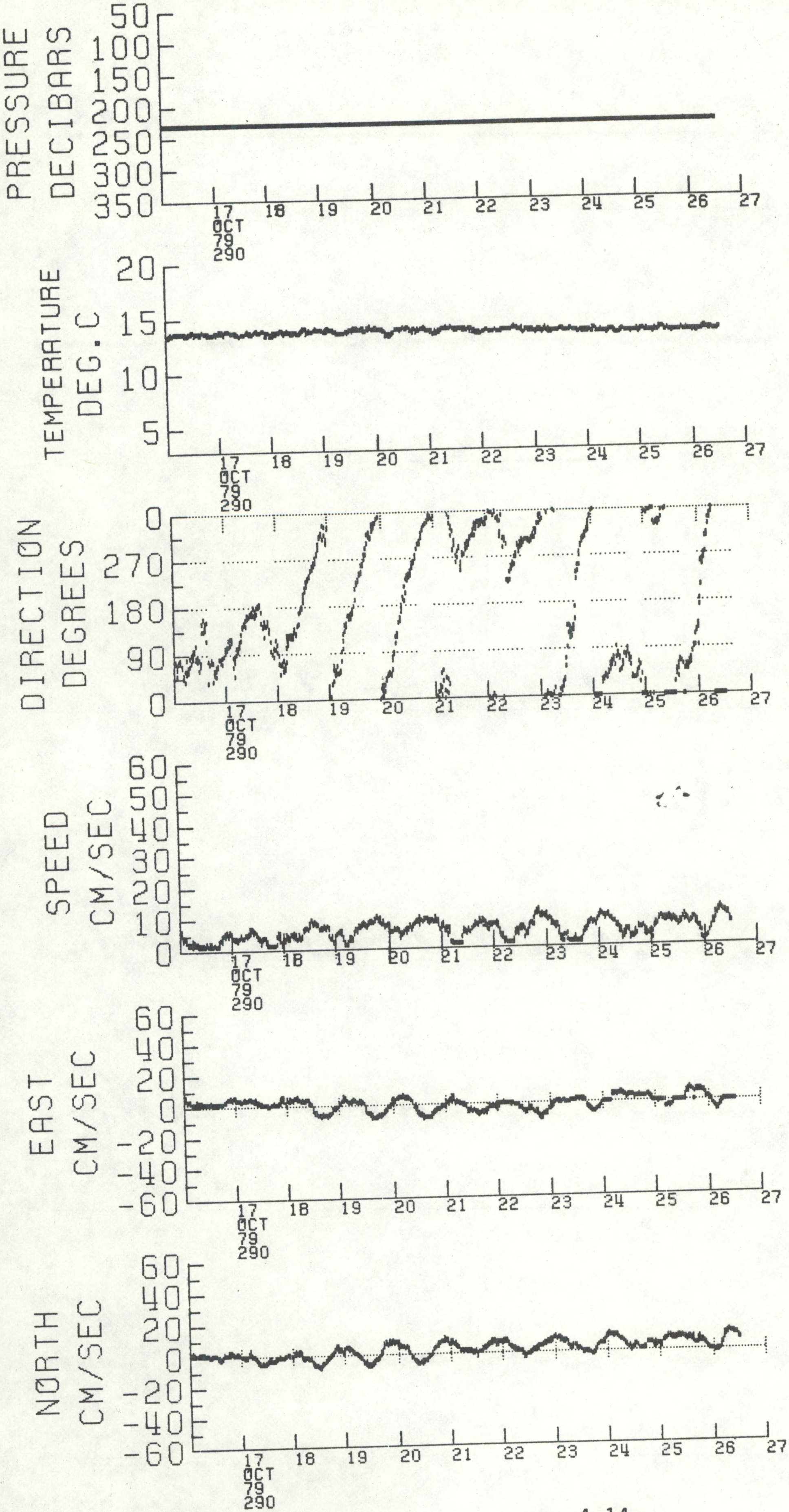
ØTEC TAMPA MOORING, METER 3479, DEPTH 232 M. IN 1050 M.

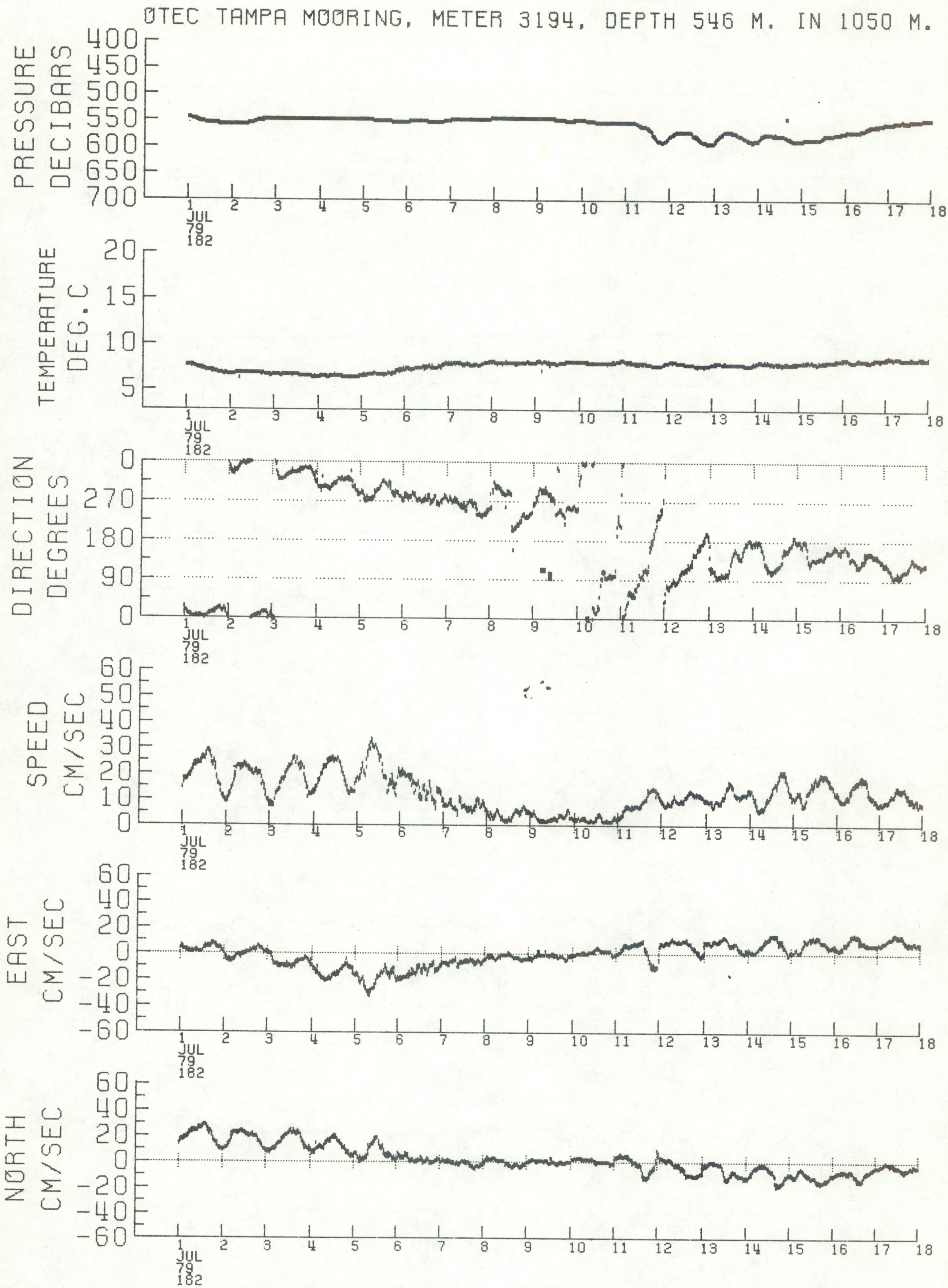


ØTEC TAMPA MOØRING, METER 3479, DEPTH 232 M. IN 1050 M.



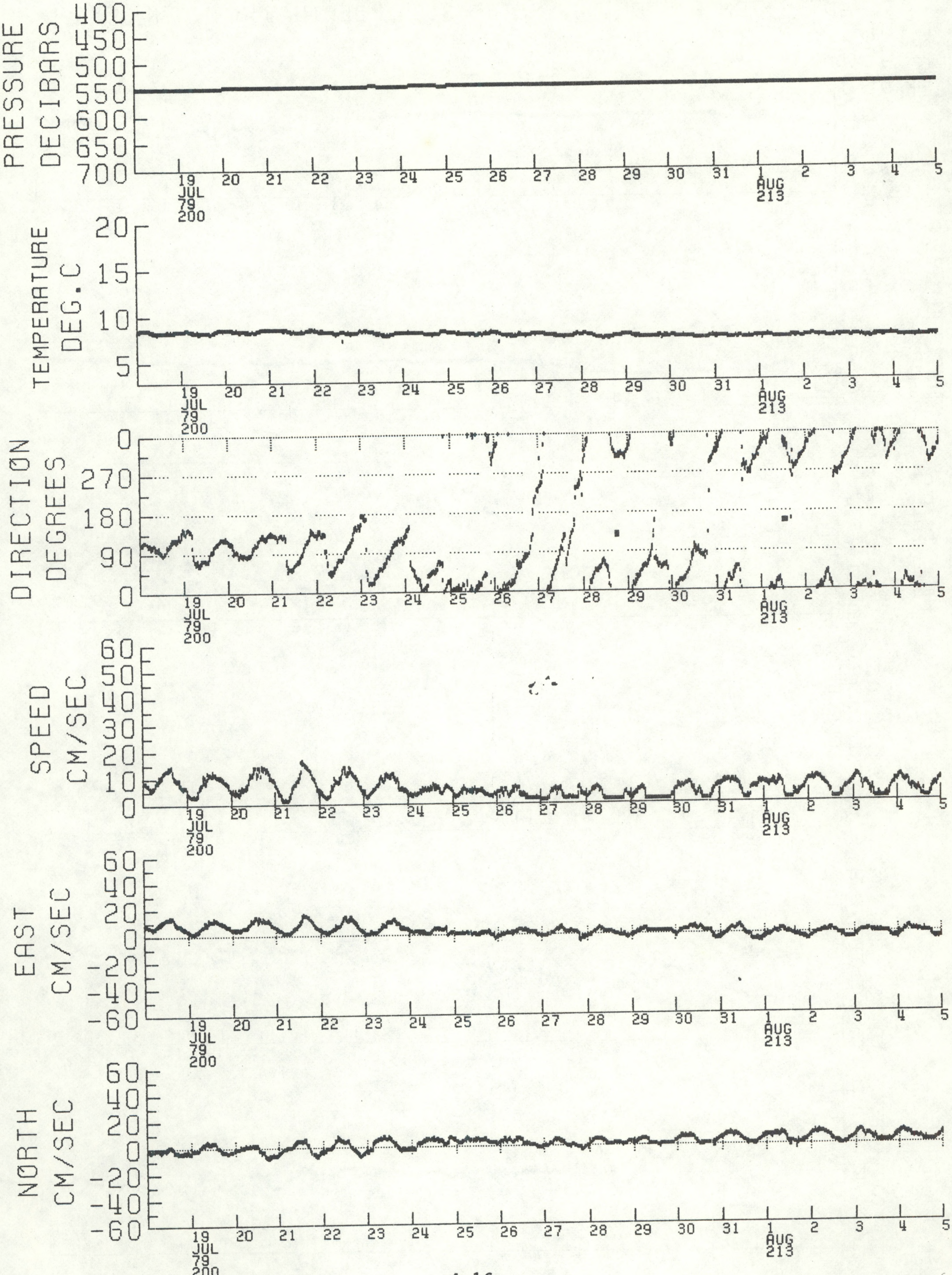
ØTEC TAMPA MOORING, METER 3479, DEPTH 232 M. IN 1050 M.





ØTEC TAMPA MOØRING, METER 3194, DEPTH 546 M. IN 1050 M.
PRESSURE DECIBARS
400 450 500 550 600 650 700
TEMPERATURE DEG.C
20 15 10 5
DIRECTIØN DEGREES
0 270 180 90 0
SPEED CM/SEC
60 50 40 30 20 10 0
EAST CM/SEC
60 40 20 0 -20 -40 -60
NØRTH CM/SEC
60 40 20 0 -20 -40 -60
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
JUL 79 182

ØTEC TAMPA MOORING, METER 3194, DEPTH 546 M. IN 1050 M.



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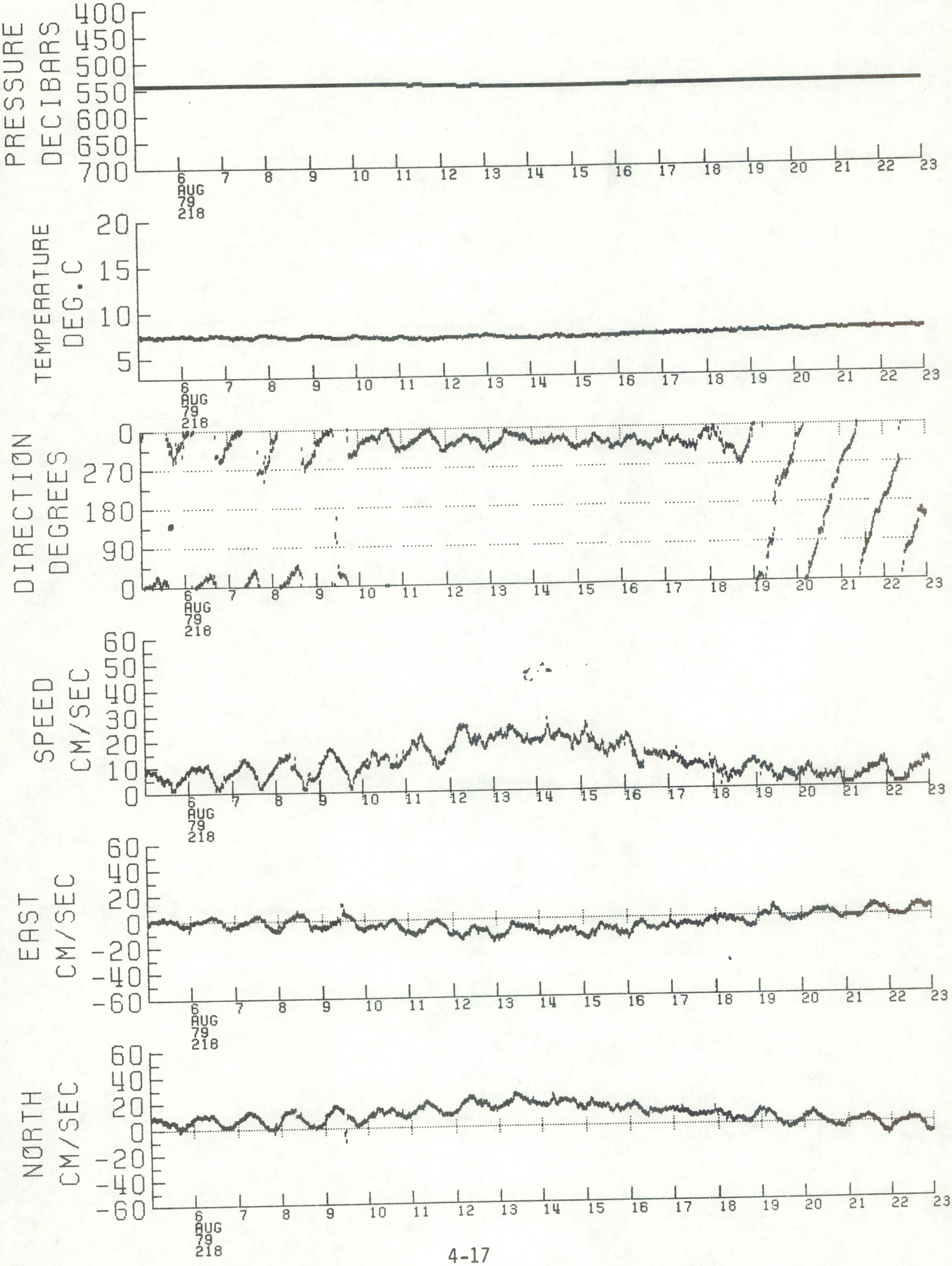

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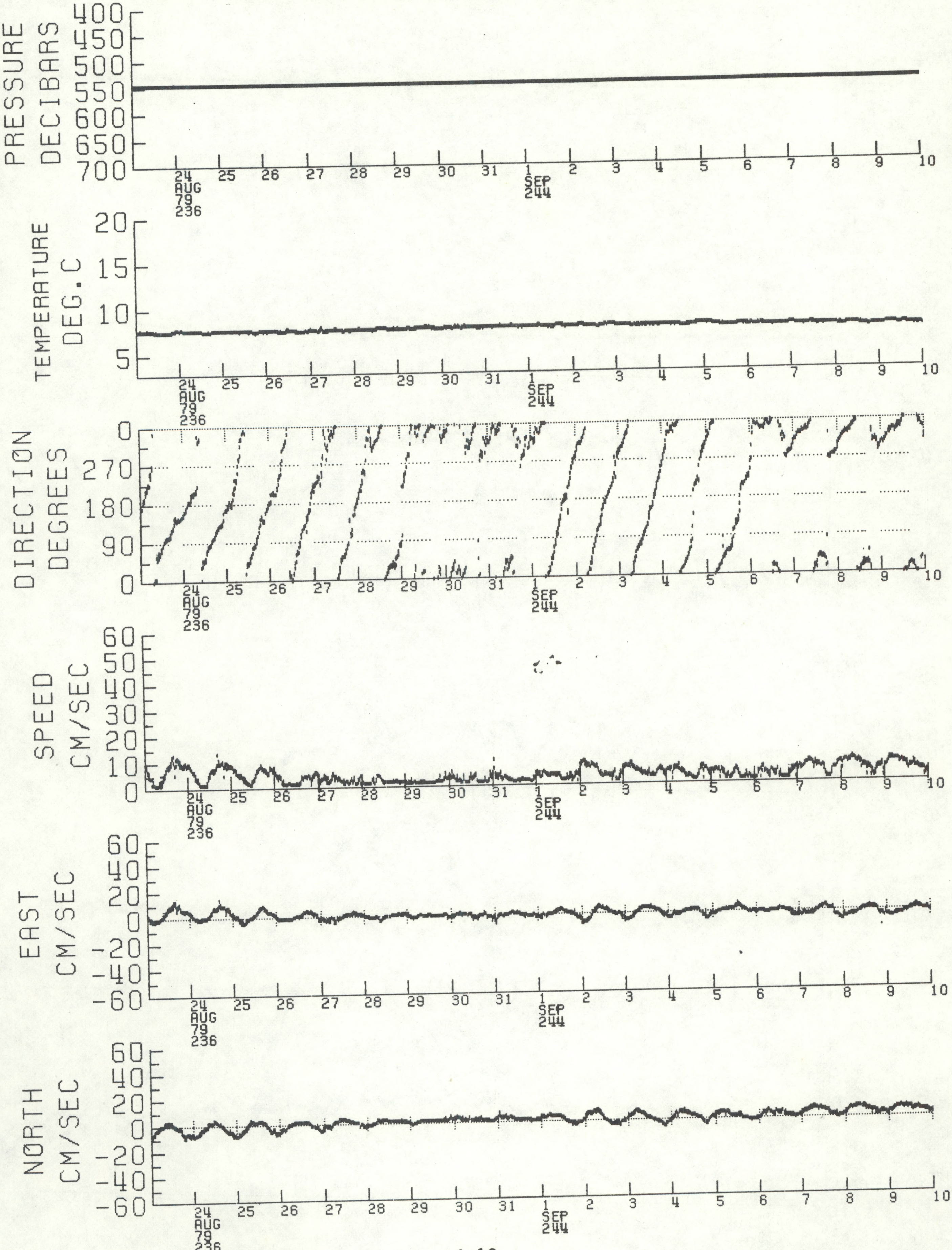
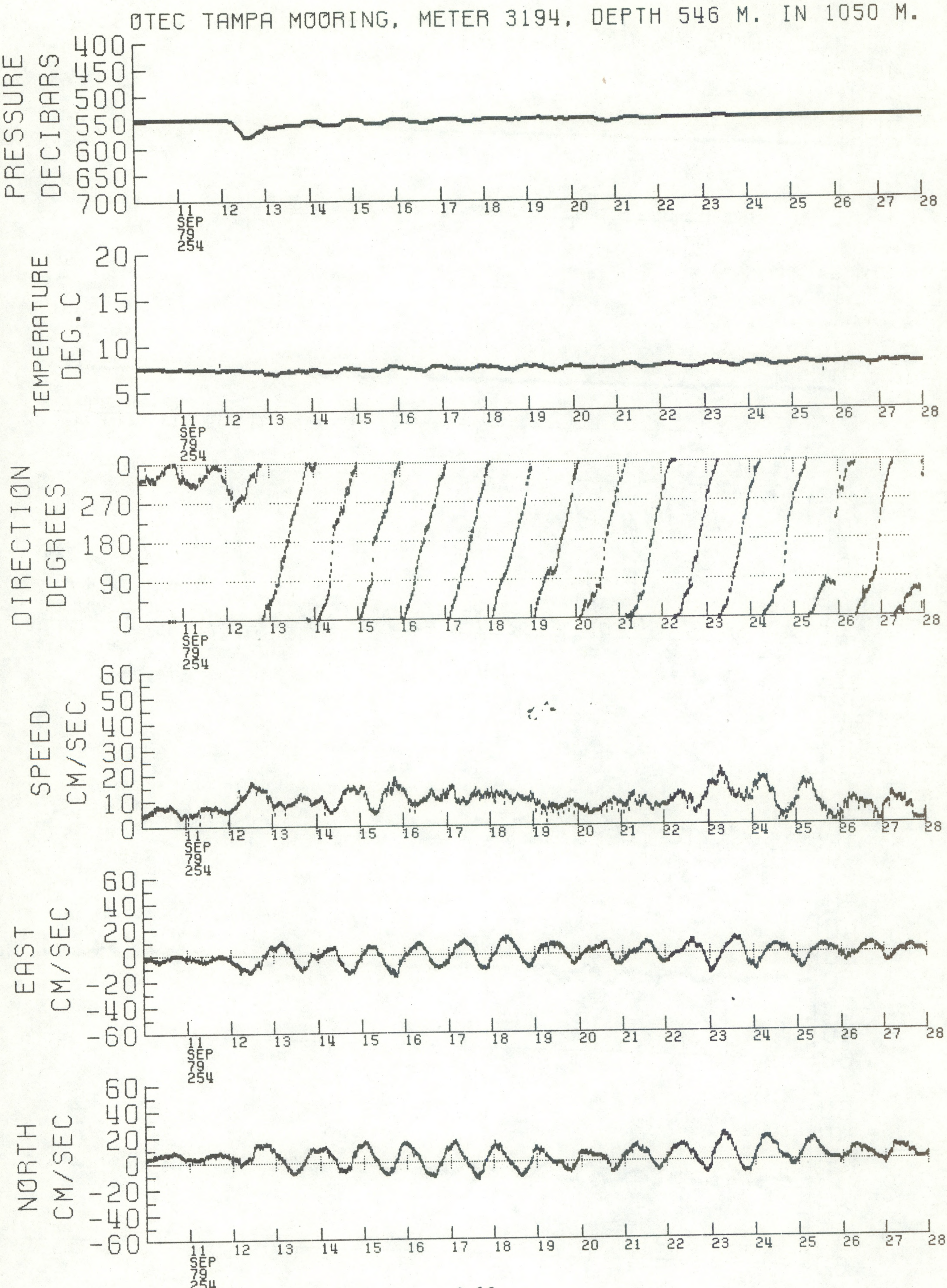
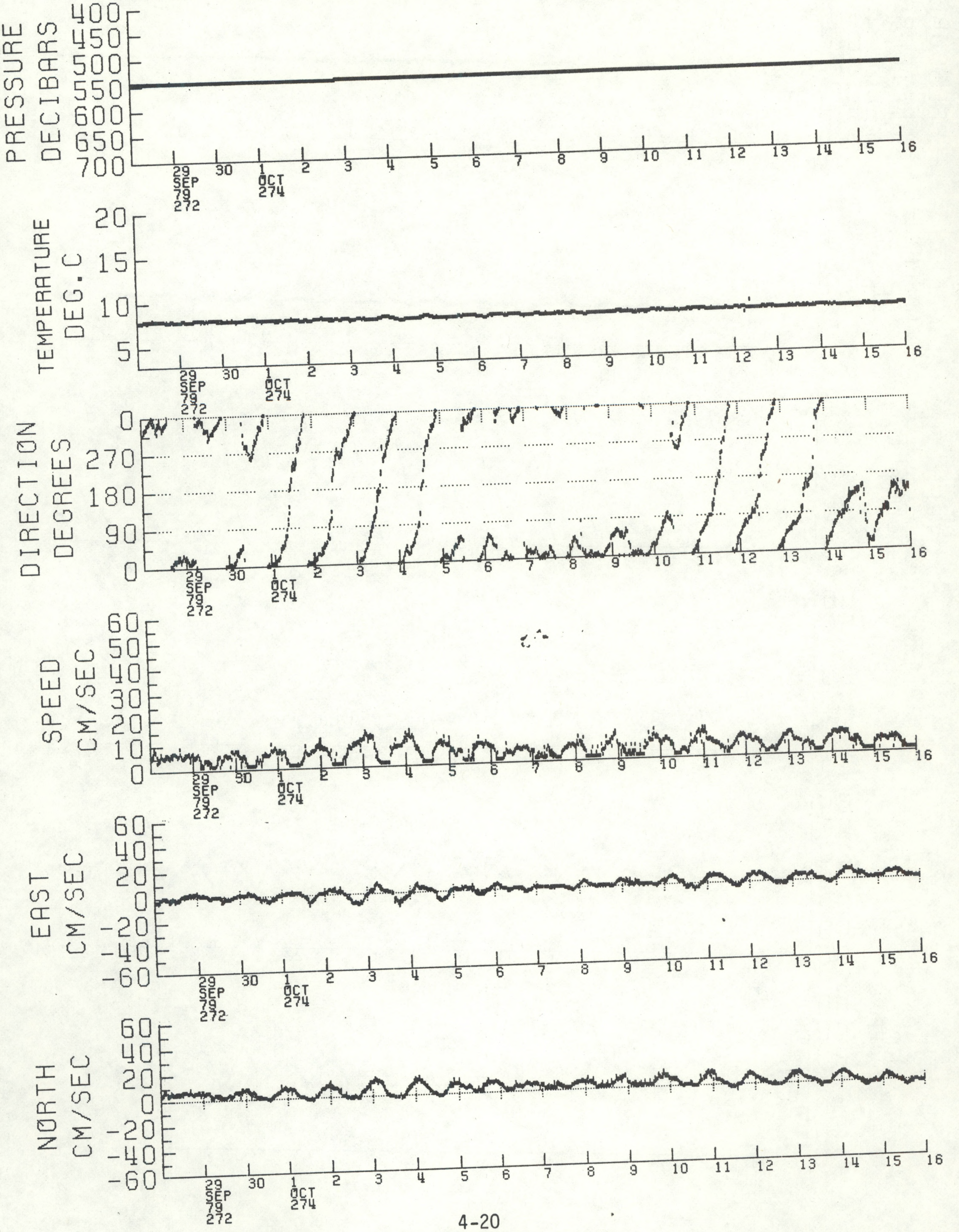
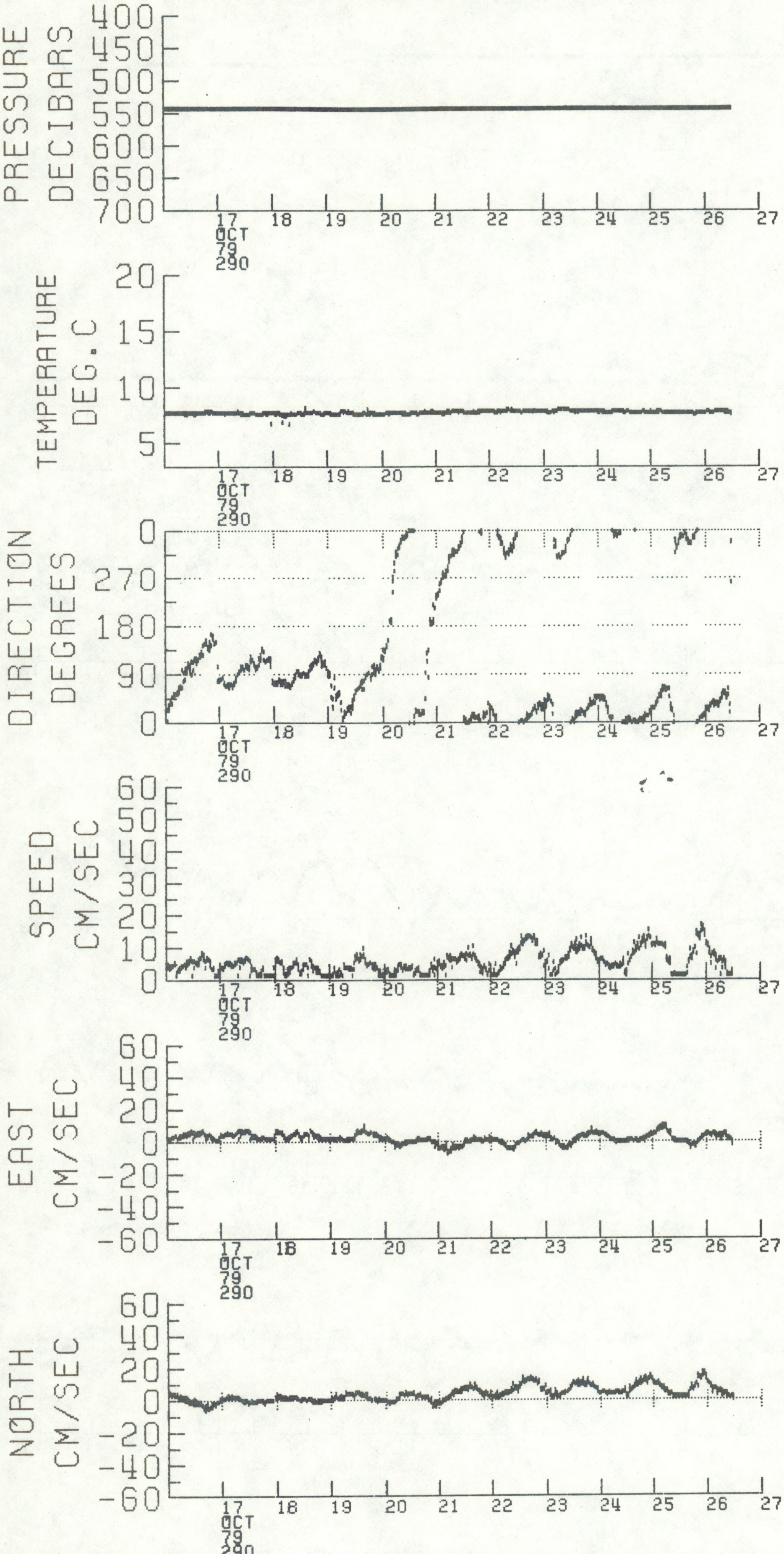



ØTEC TAMPA MOORING, METER 3194, DEPTH 546 M. IN 1050 M.
PRESSURE DECIBARS
TEMPERATURE DEG.C
DIRECTIØN DEGREES
SPEED CM/SEC
EAST CM/SEC
NØRTH CM/SEC
11 SEP 79 254

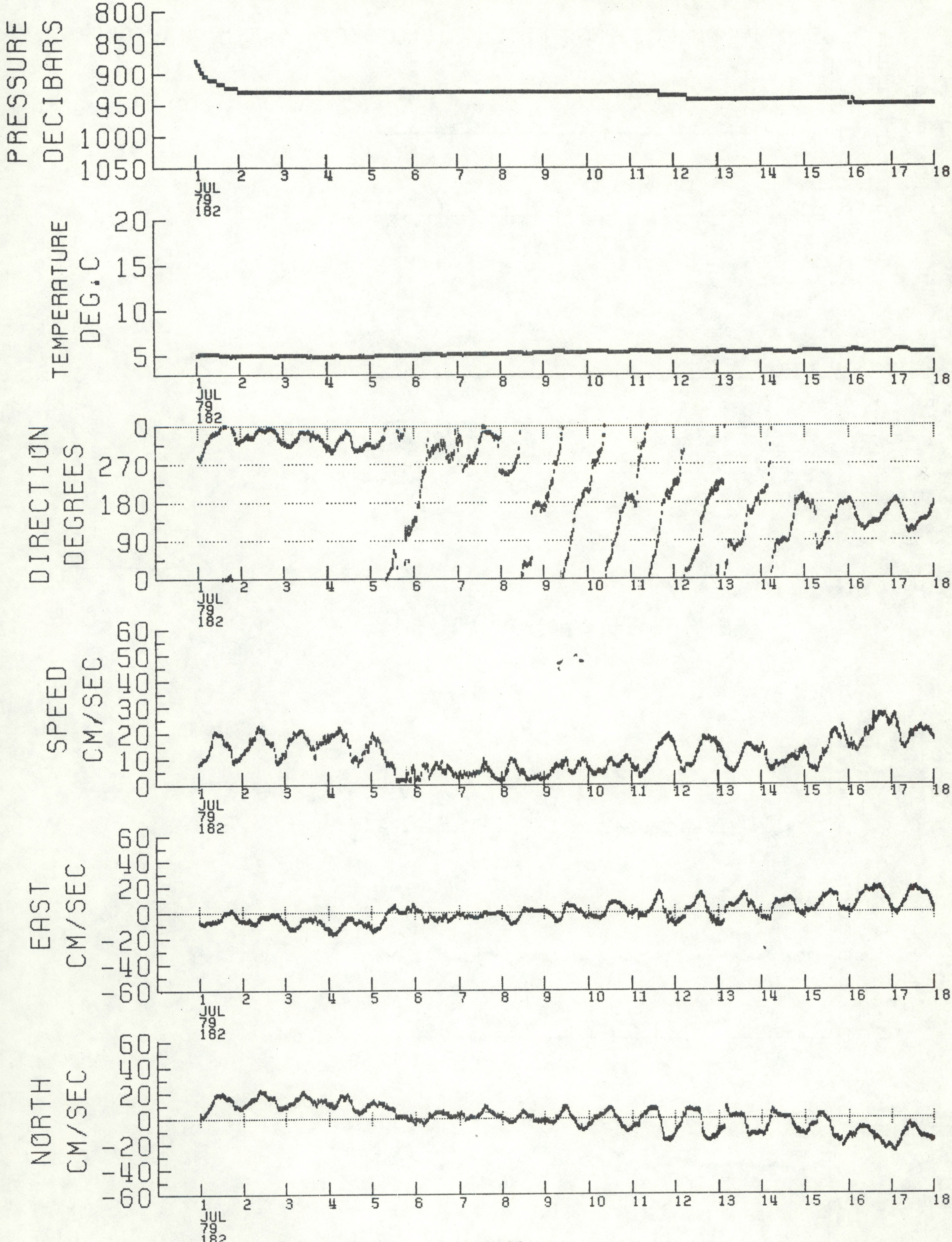
ØTEC TAMPA MOORING, METER 3194, DEPTH 546 M. IN 1050 M.

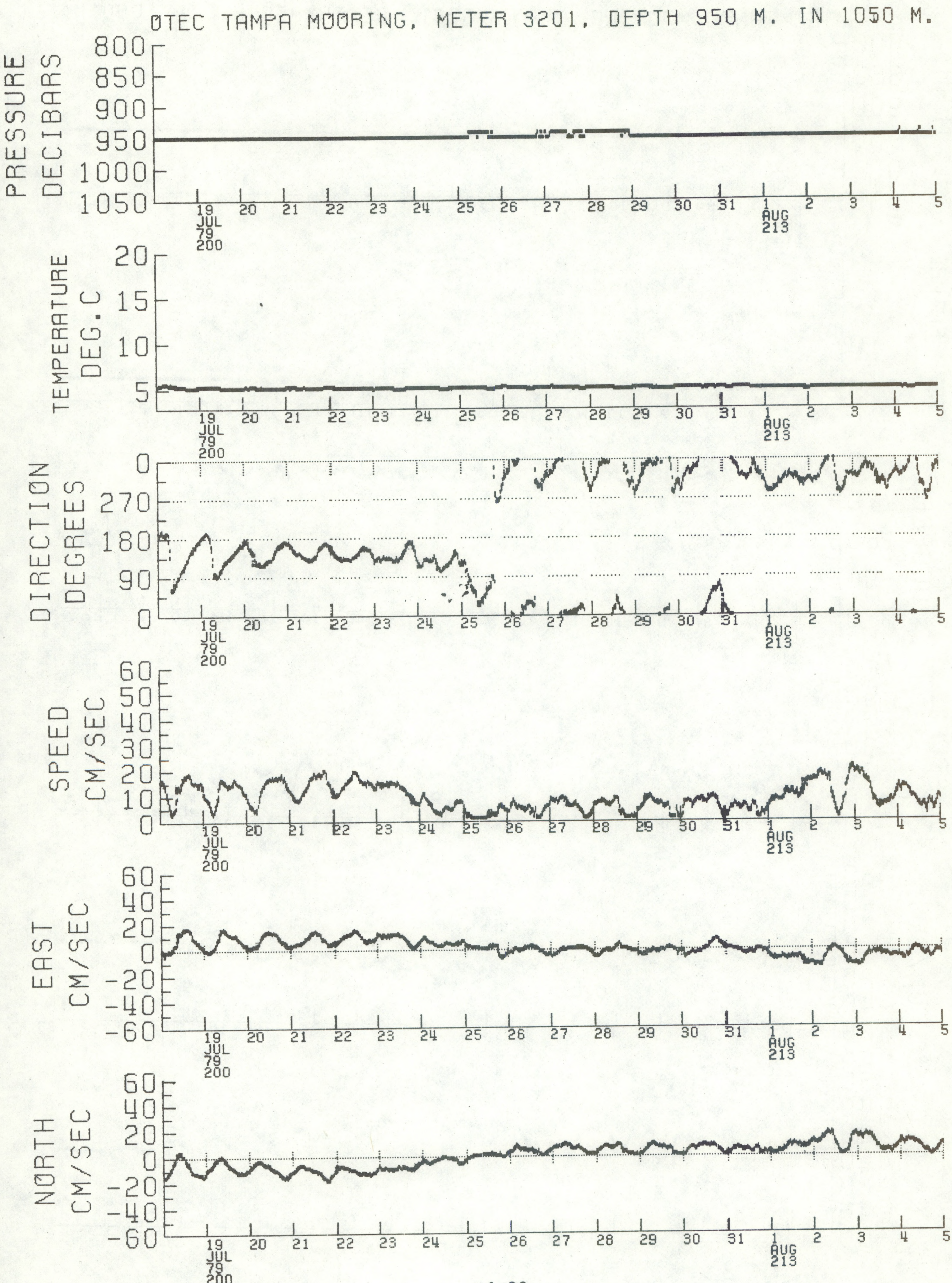


ØTEC TAMPA MOORING, METER 3194, DEPTH 546 M. IN 1050 M.



ØTEC TAMPA MOØRING, METER 3201, DEPTH 950 M. IN 1050 M.





OTEC TAMPA MOORING, METER 3201, DEPTH 950 M. IN 1050 M.
PRESSURE DECIBARS
800
850
900
950
1000
1050
TEMPERATURE DEG. C
20
15
10
5
DIRECTION DEGREES
0
270
180
90
0
SPEED CM/SEC
60
50
40
30
20
10
0
EAST CM/SEC
60
40
20
0
-20
-40
-60
NORTH CM/SEC
60
40
20
0
-20
-40
-60
19 JUL 79 200
20
21
22
23
24
25
26
27
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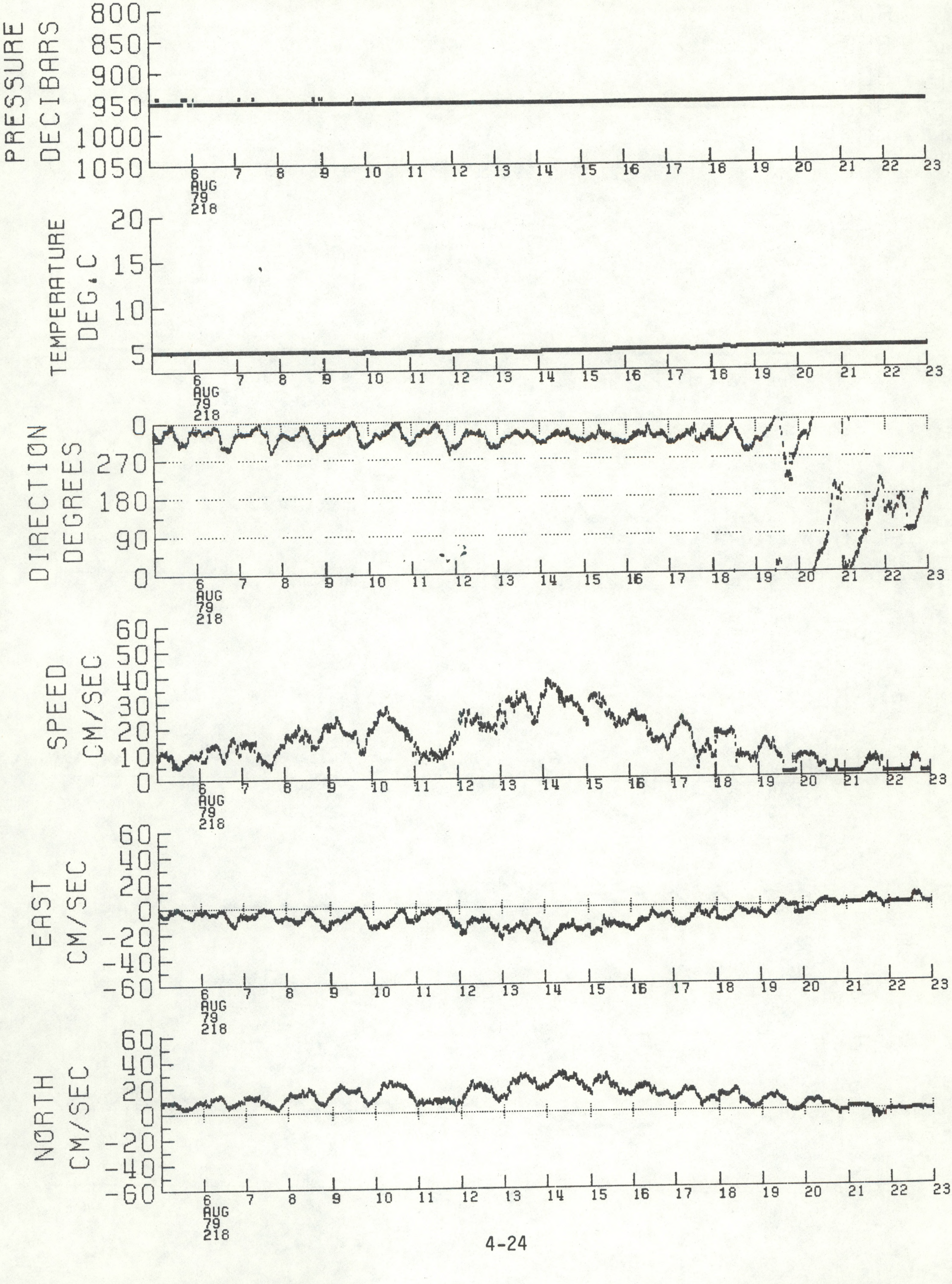
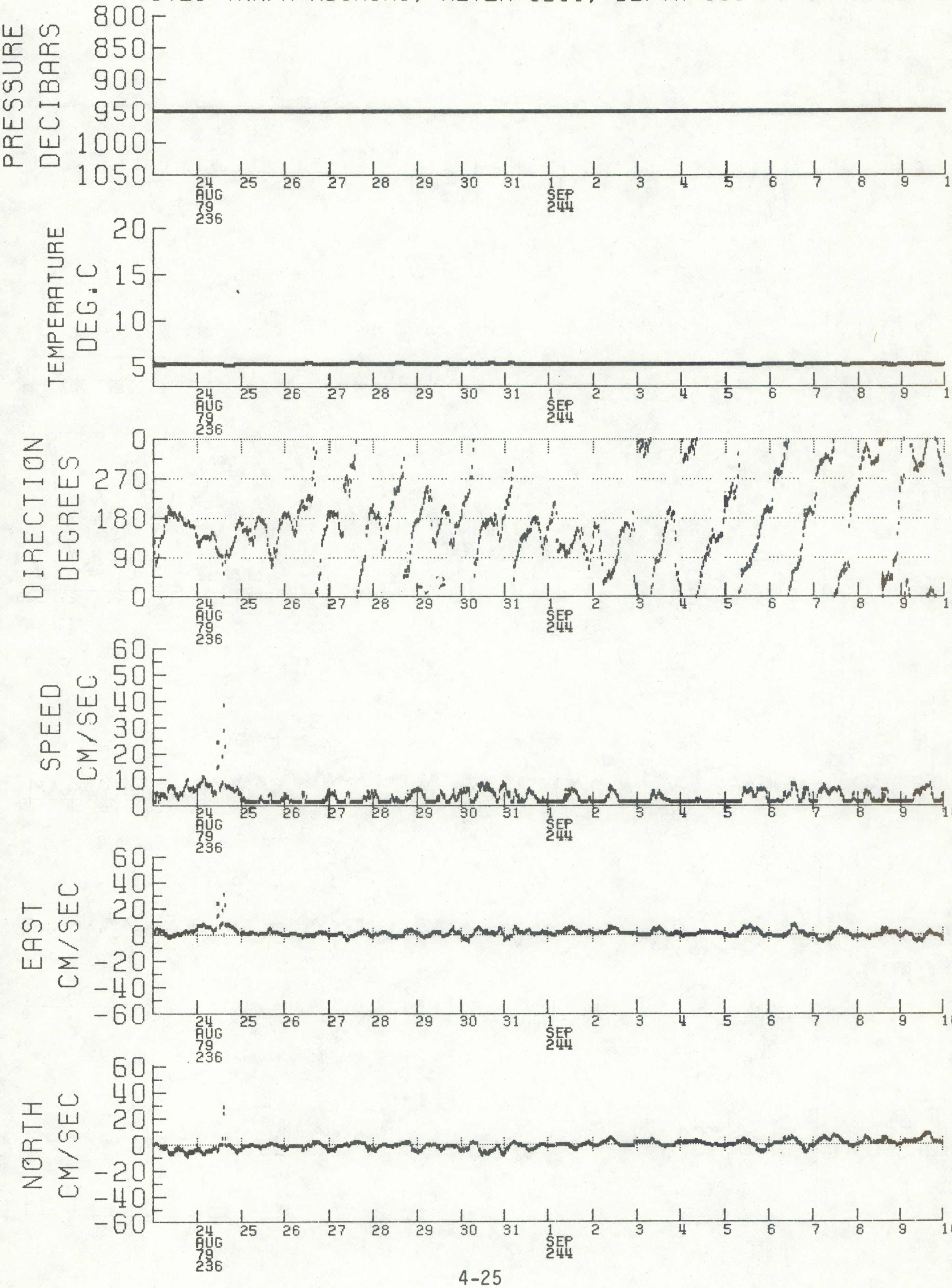
29
30
31
1 AUG 213
2
3
4
5

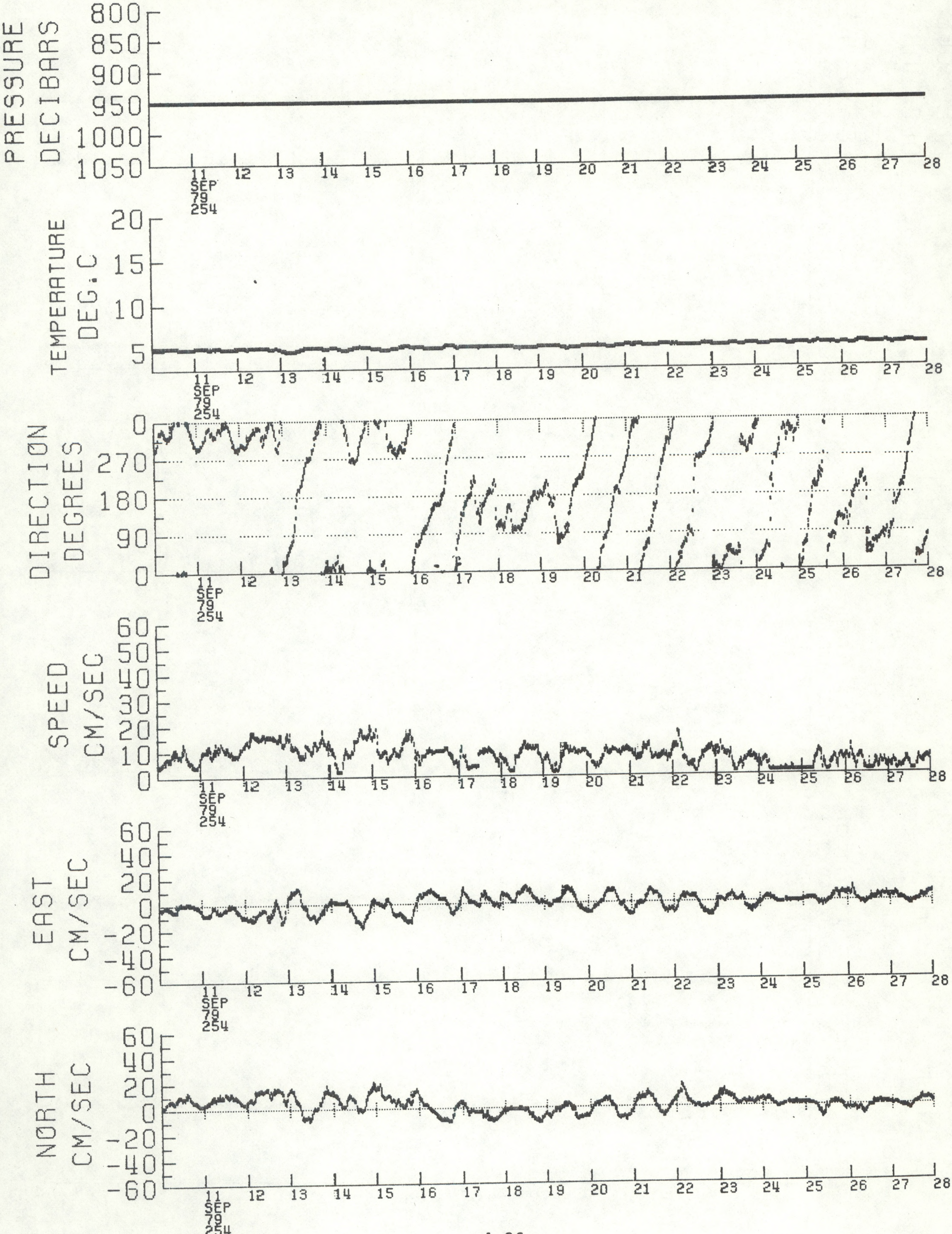
ØTEC TAMPA MØØRING, METER 3201, DEPTH 950 M. IN 1050 M.



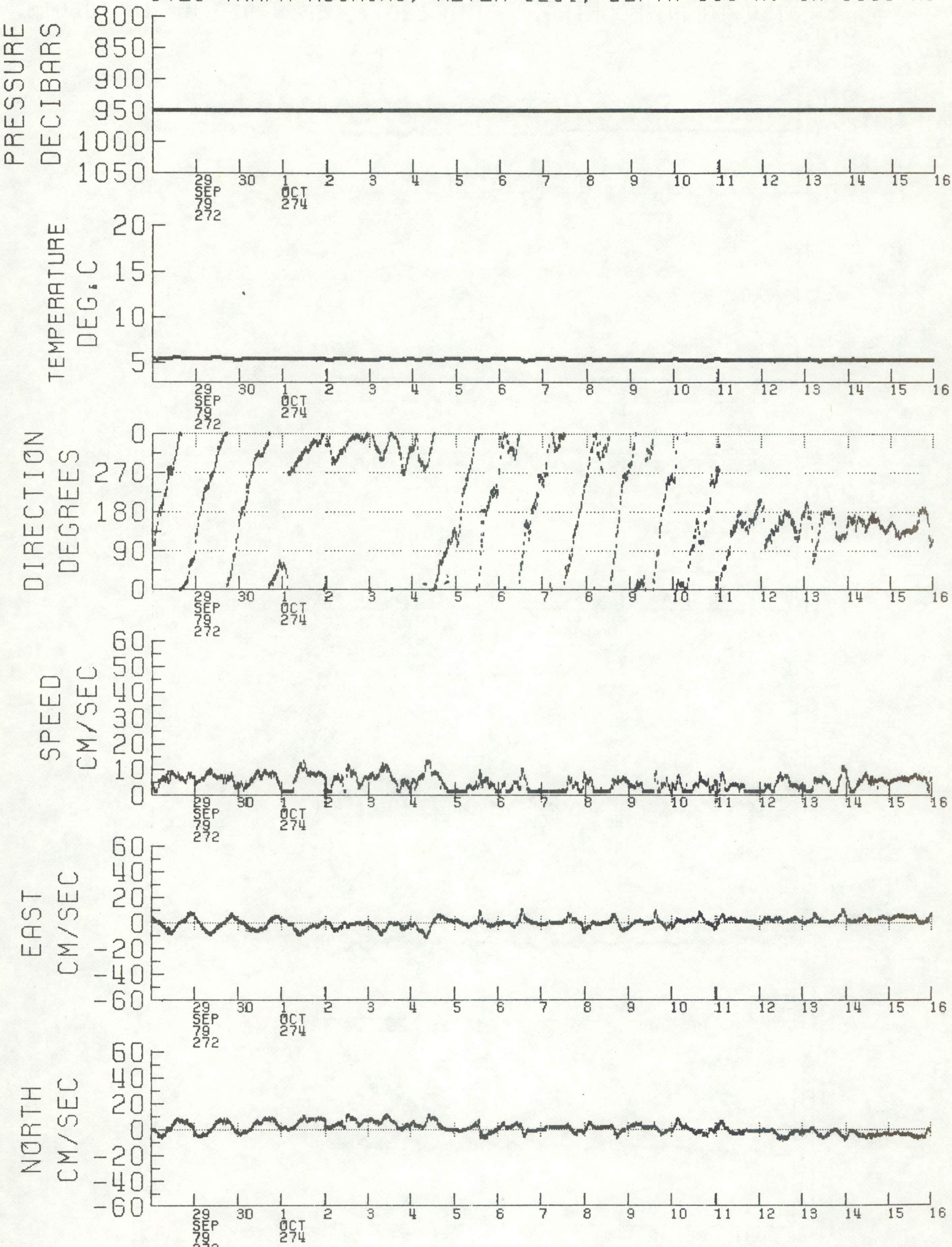
ØTEC TAMPA MØØRING, METER 3201, DEPTH 950 M. IN 1050 M.



ØTEC TAMPA MOORING, METER 3201, DEPTH 950 M. IN 1050 M.



OTEC TAMPA MOORING, METER 3201, DEPTH 950 M. IN 1050 M.



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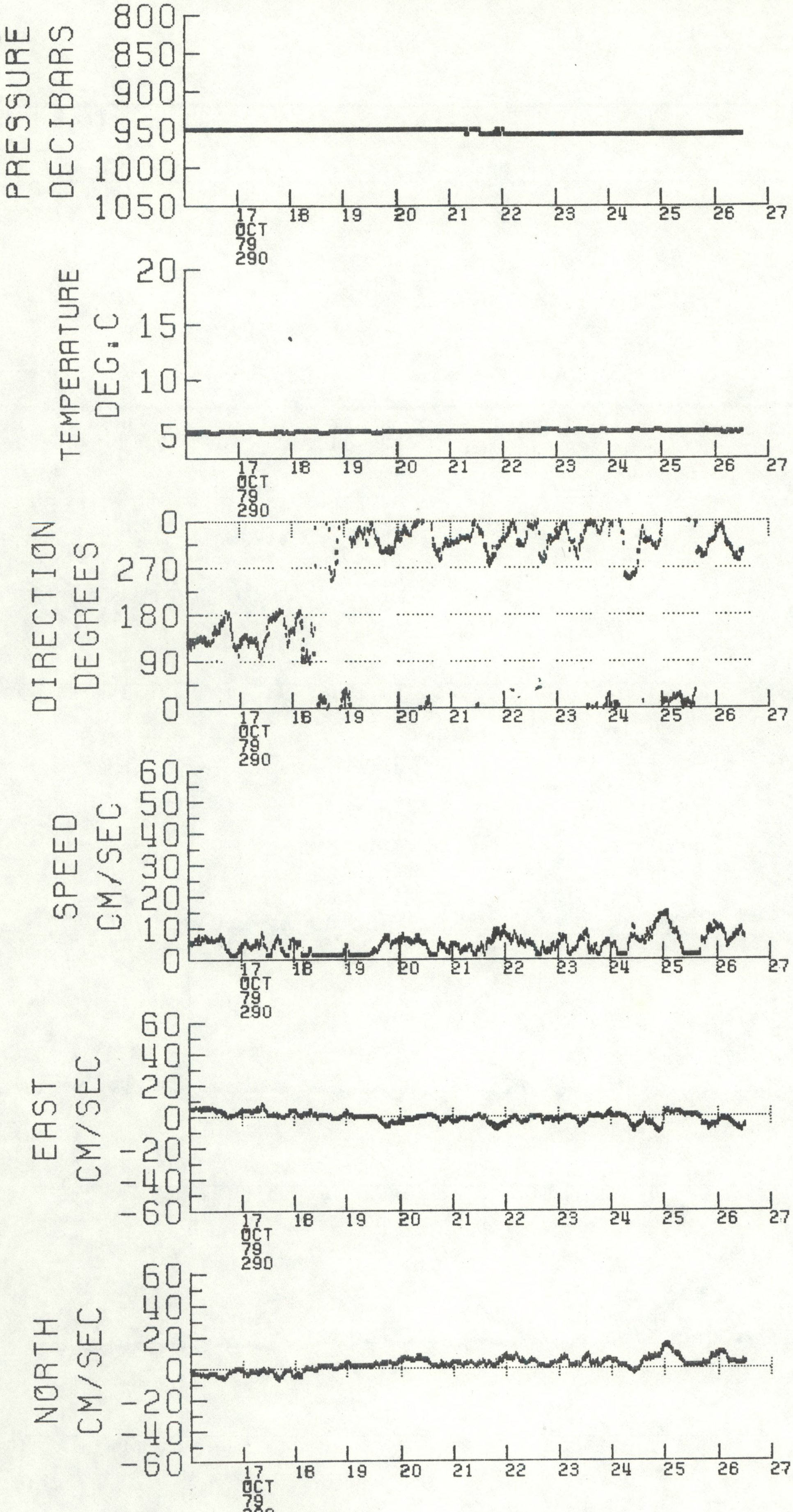
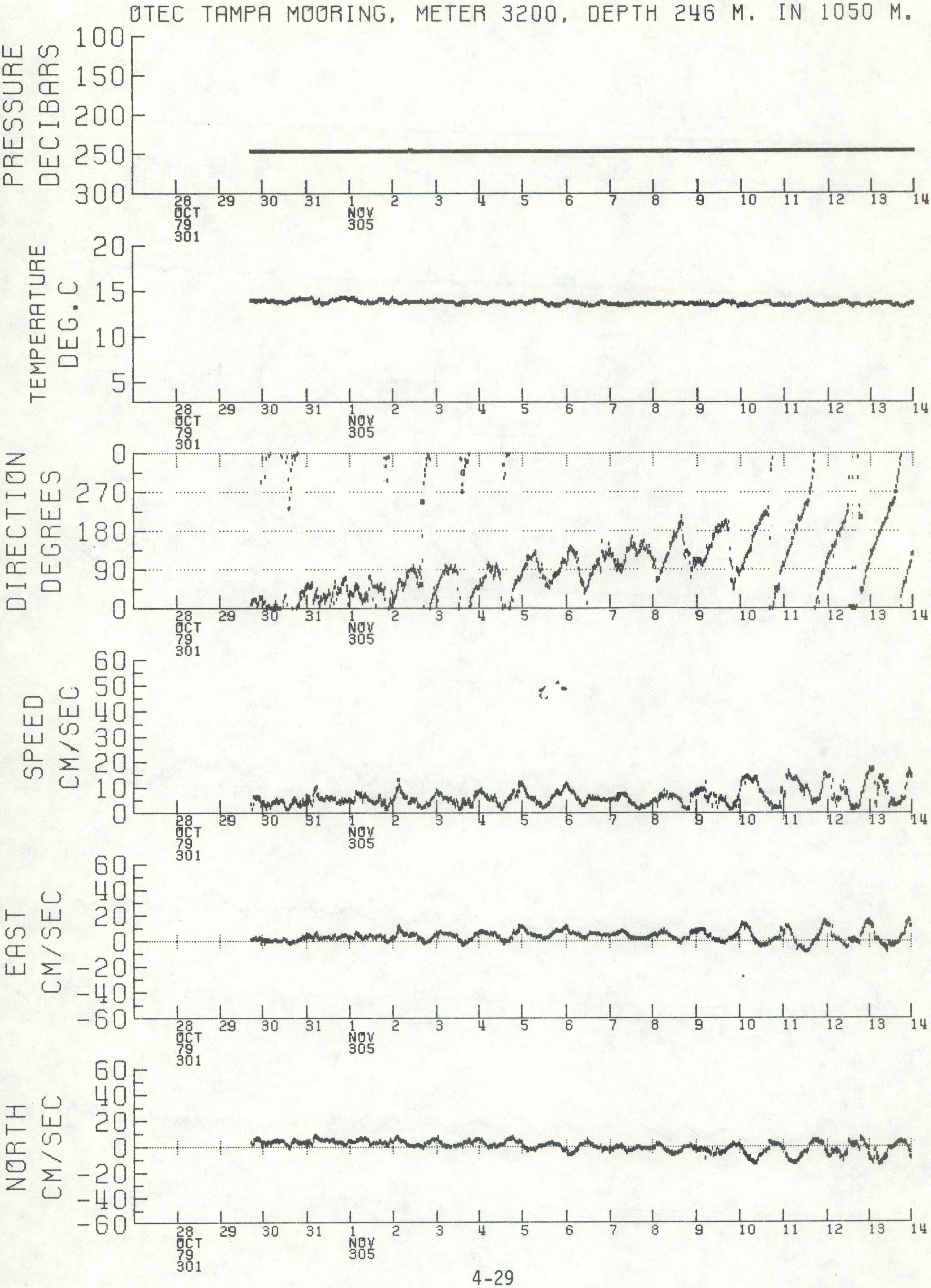
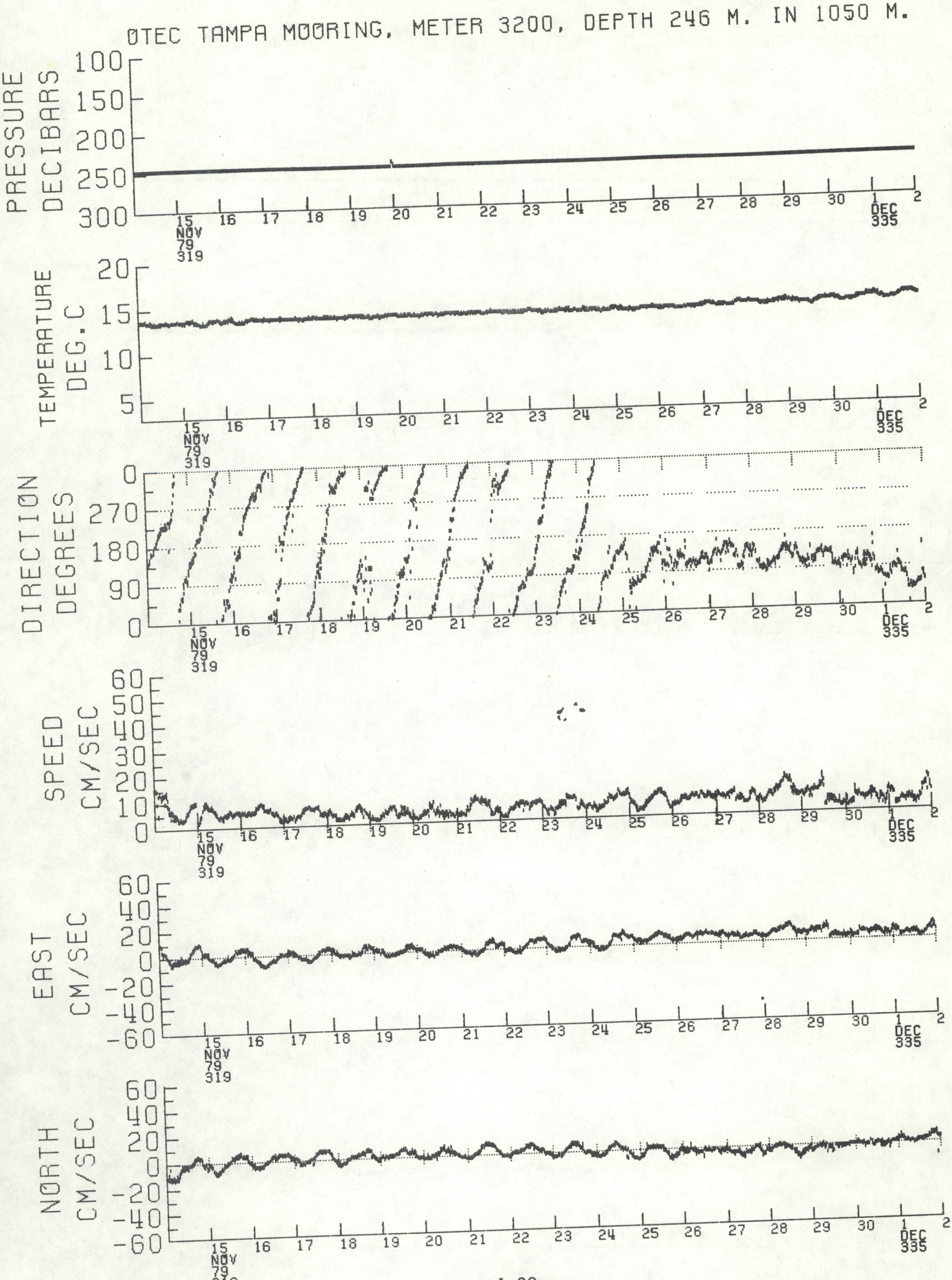
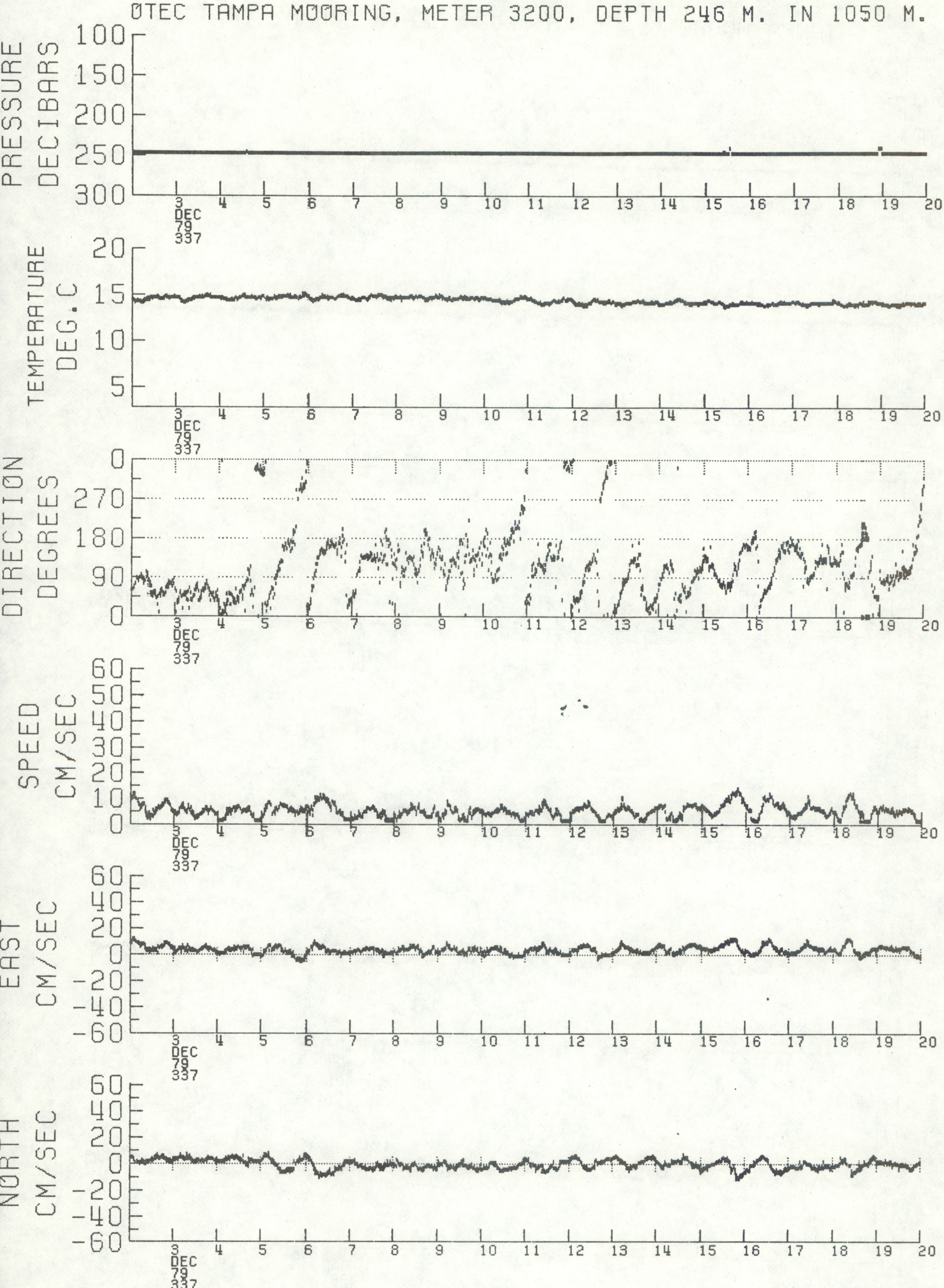



ØTEC TAMPA MOORING, METER 3200, DEPTH 246 M. IN 1050 M.
PRESSURE DECIBARS
TEMPERATURE DEG.C
DIRECTIØN DEGREES
SPEED CM/SEC
EAST CM/SEC
NØRTH CM/SEC
28 OCT 79 301
1 NOV 305



ØTEC TAMPA MOØRING, METER 3200, DEPTH 246 M. IN 1050 M.
PRESSURE DECIBARS
TEMPERATURE DEG.C
DIRECTIØN DEGREES
SPEED CM/SEC
EAST CM/SEC
NØRTH CM/SEC
15 NOV 79 319
1 DEC 335


ØTEC TAMPA MOORING, METER 3200, DEPTH 246 M. IN 1050 M.
PRESSURE DECIBARS
TEMPERATURE DEG.C
DIRECTION DEGREES
SPEED CM/SEC
EAST CM/SEC
NØRTH CM/SEC
DEC
79
337

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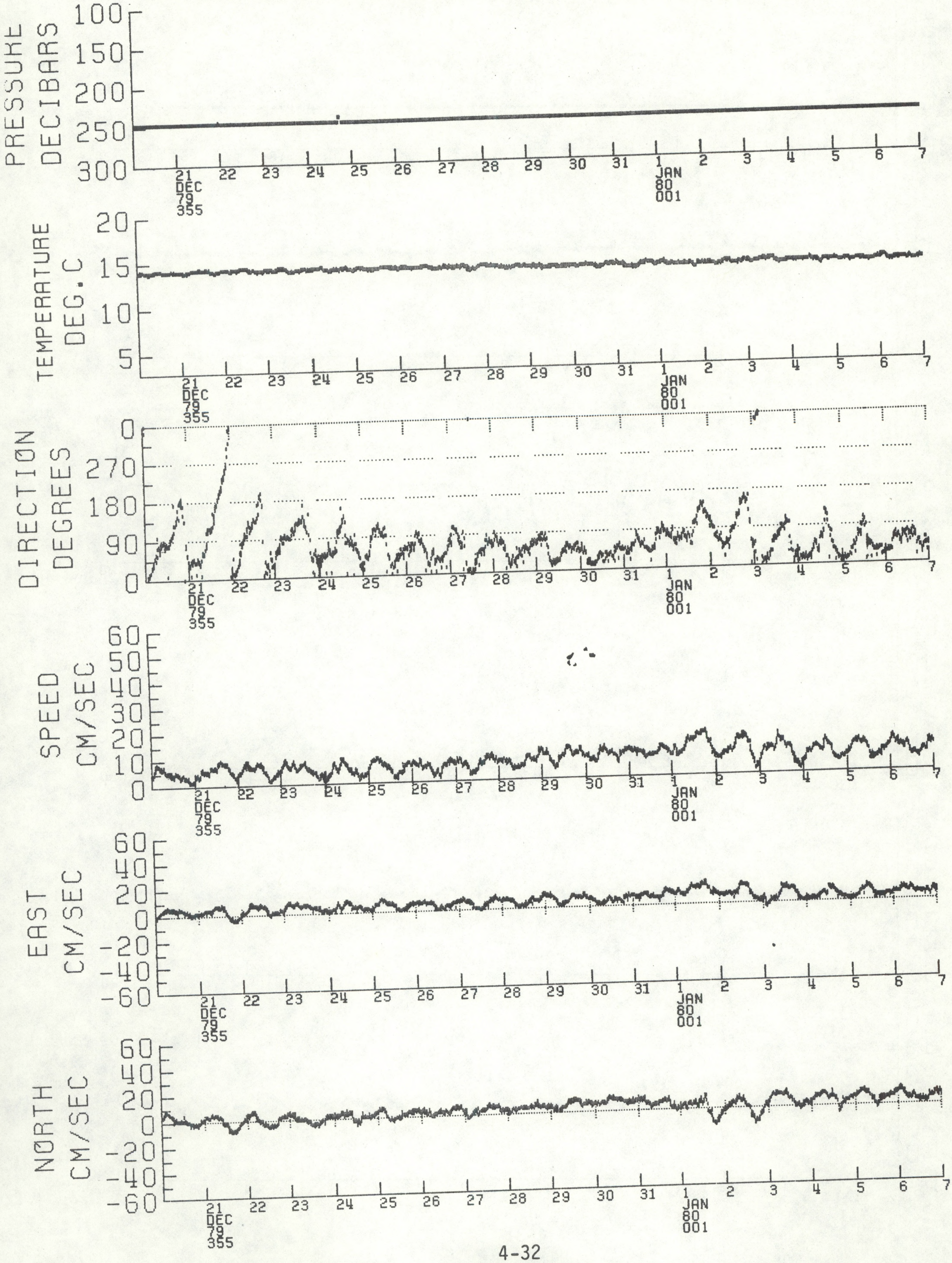
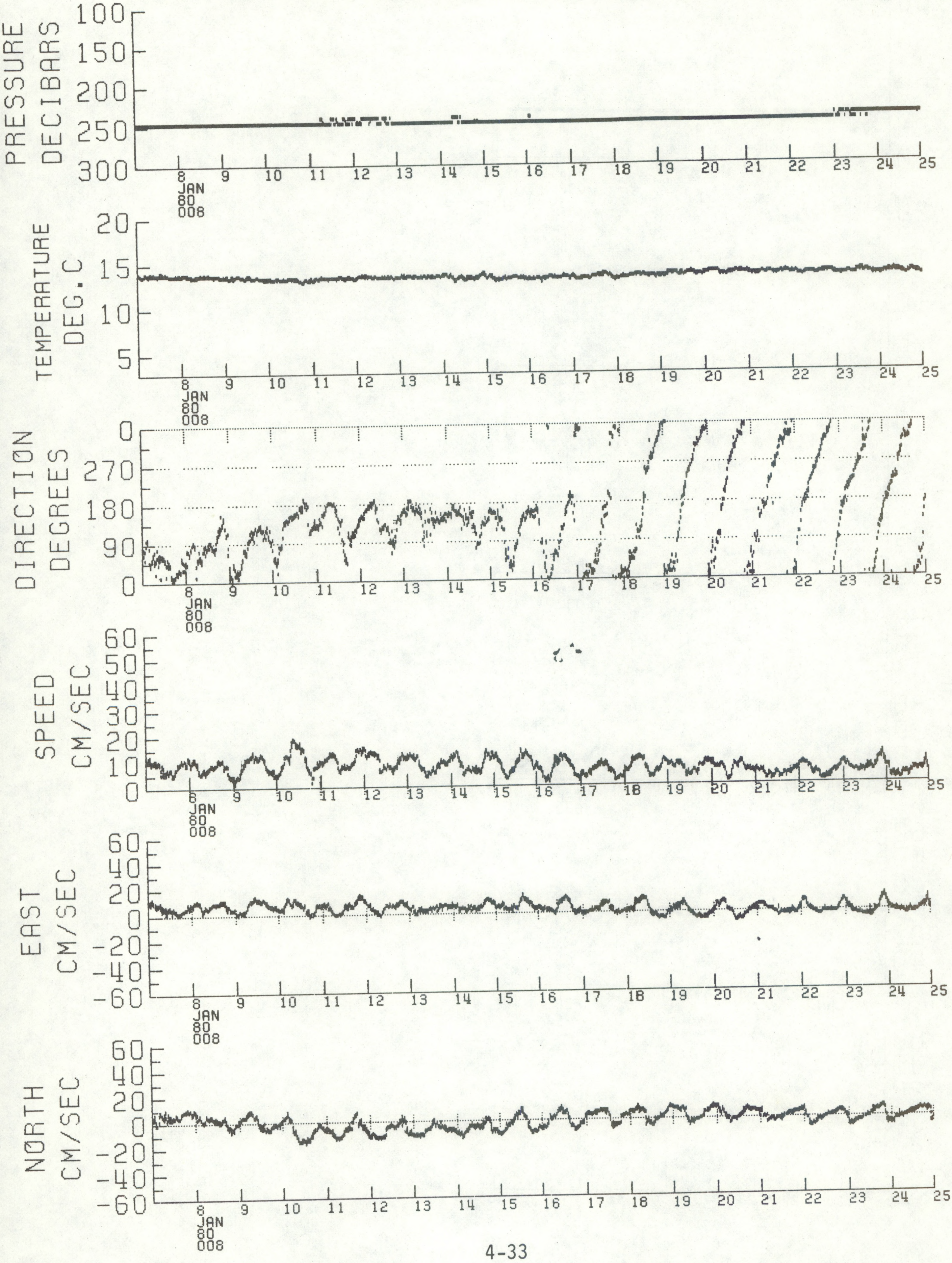


OTEC TAMPA MOORING, METER 3200, DEPTH 246 M. IN 1050 M.



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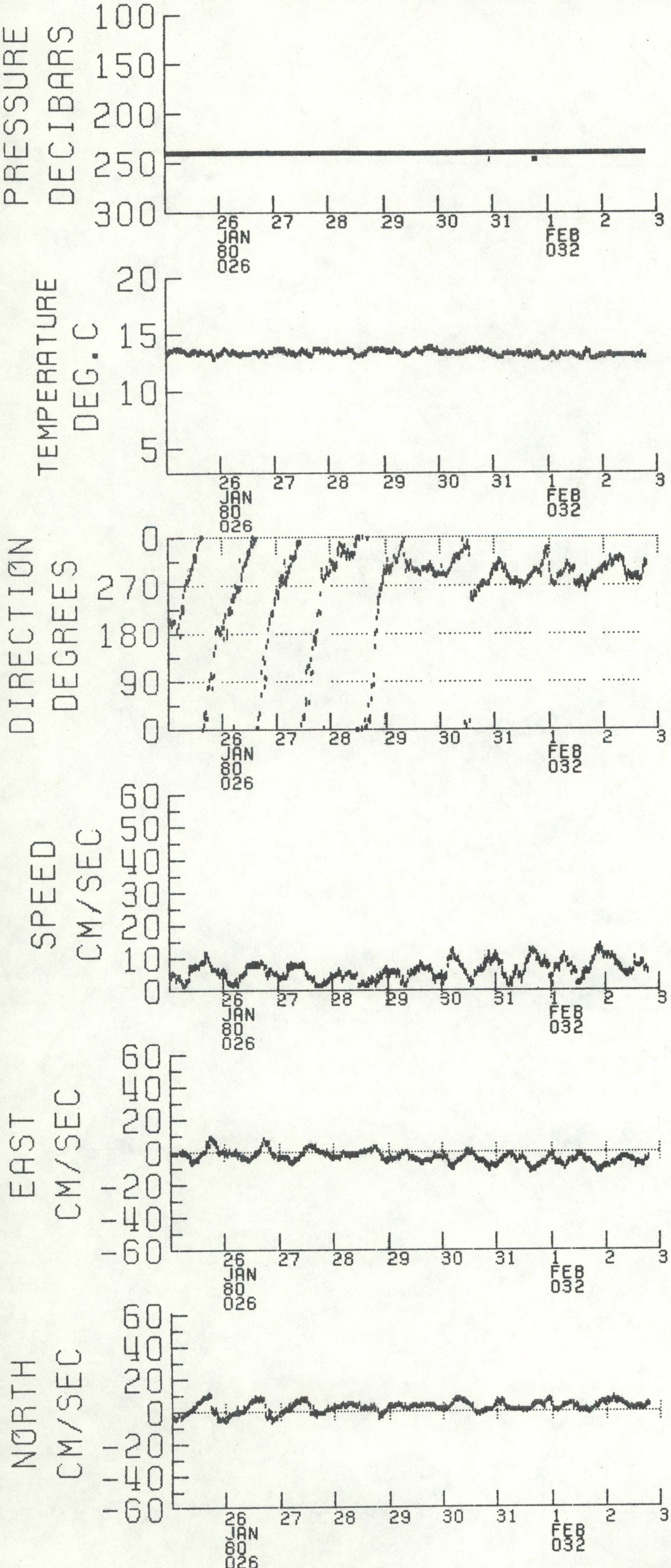
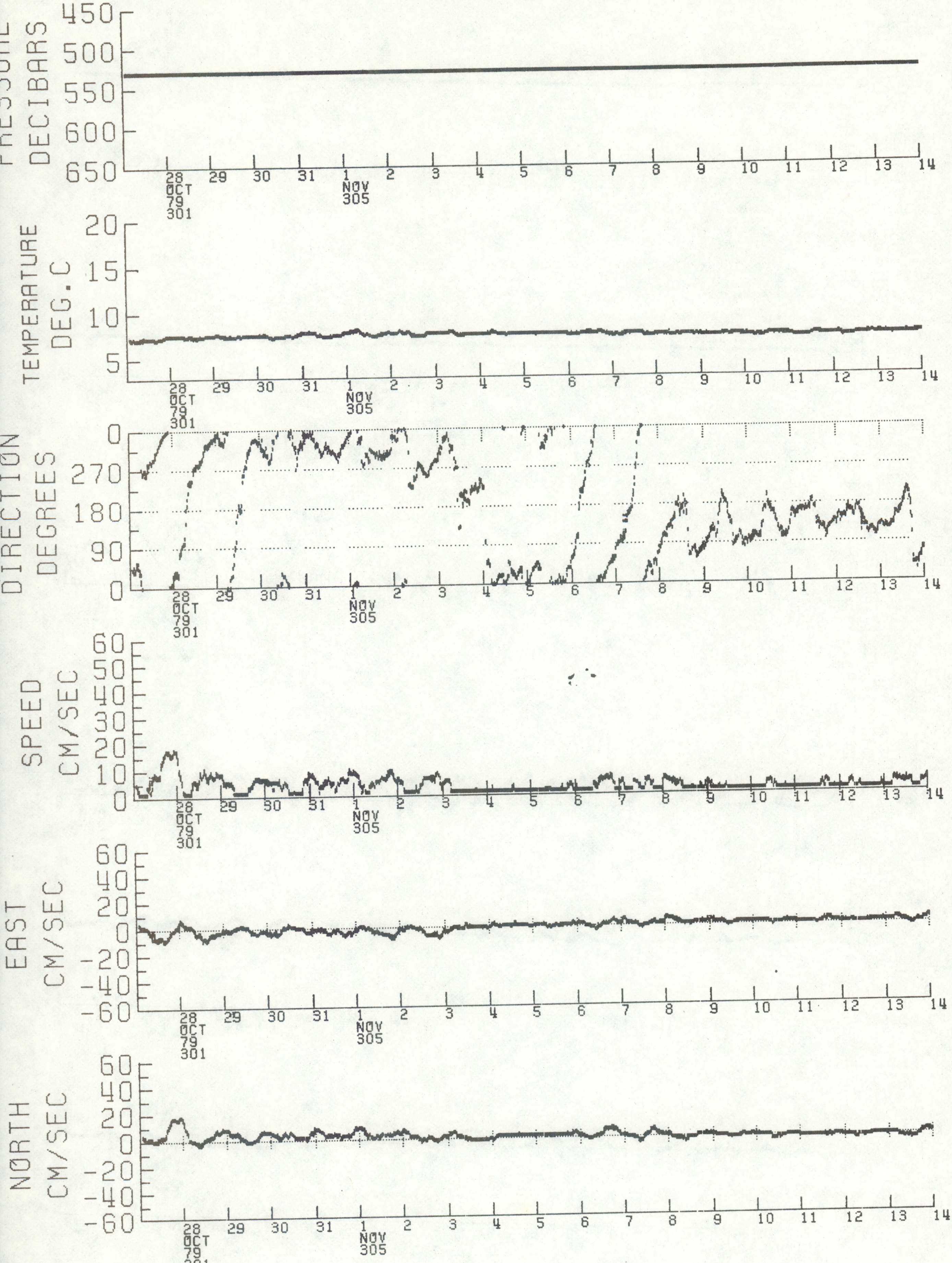


ØTEC TAMPA MOØRING, METER 3479, DEPTH 535 M. IN 1050 M.



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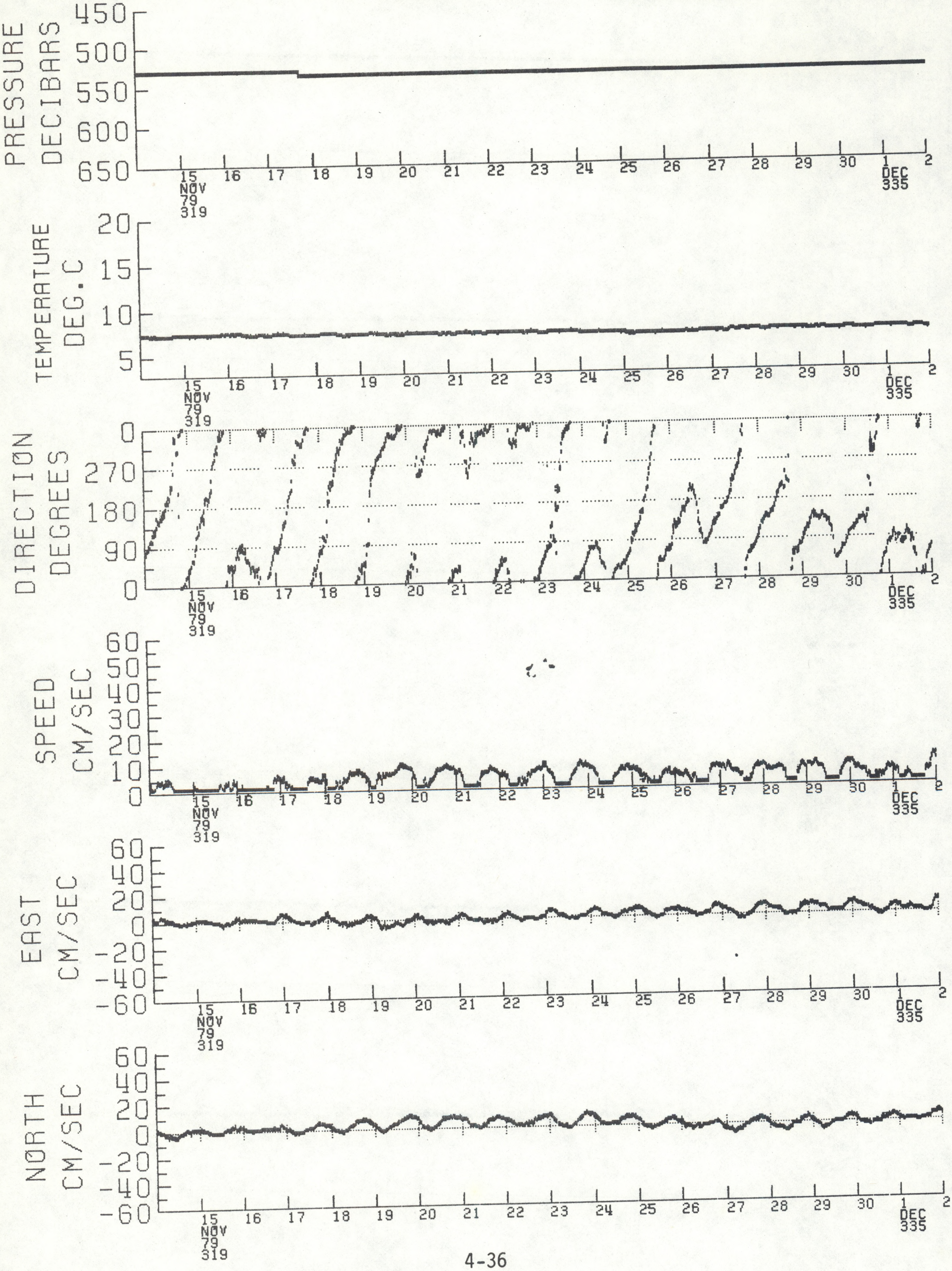

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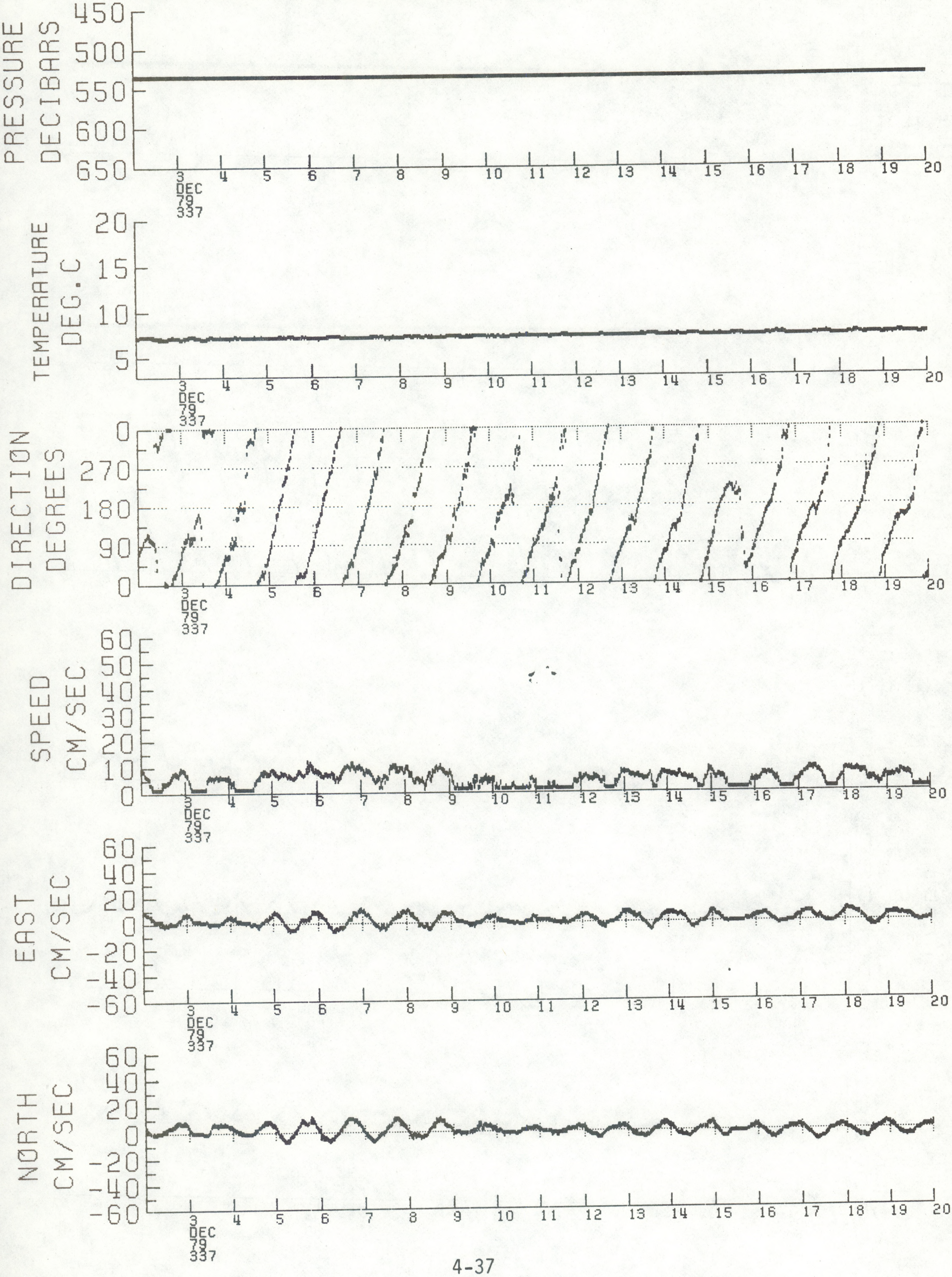

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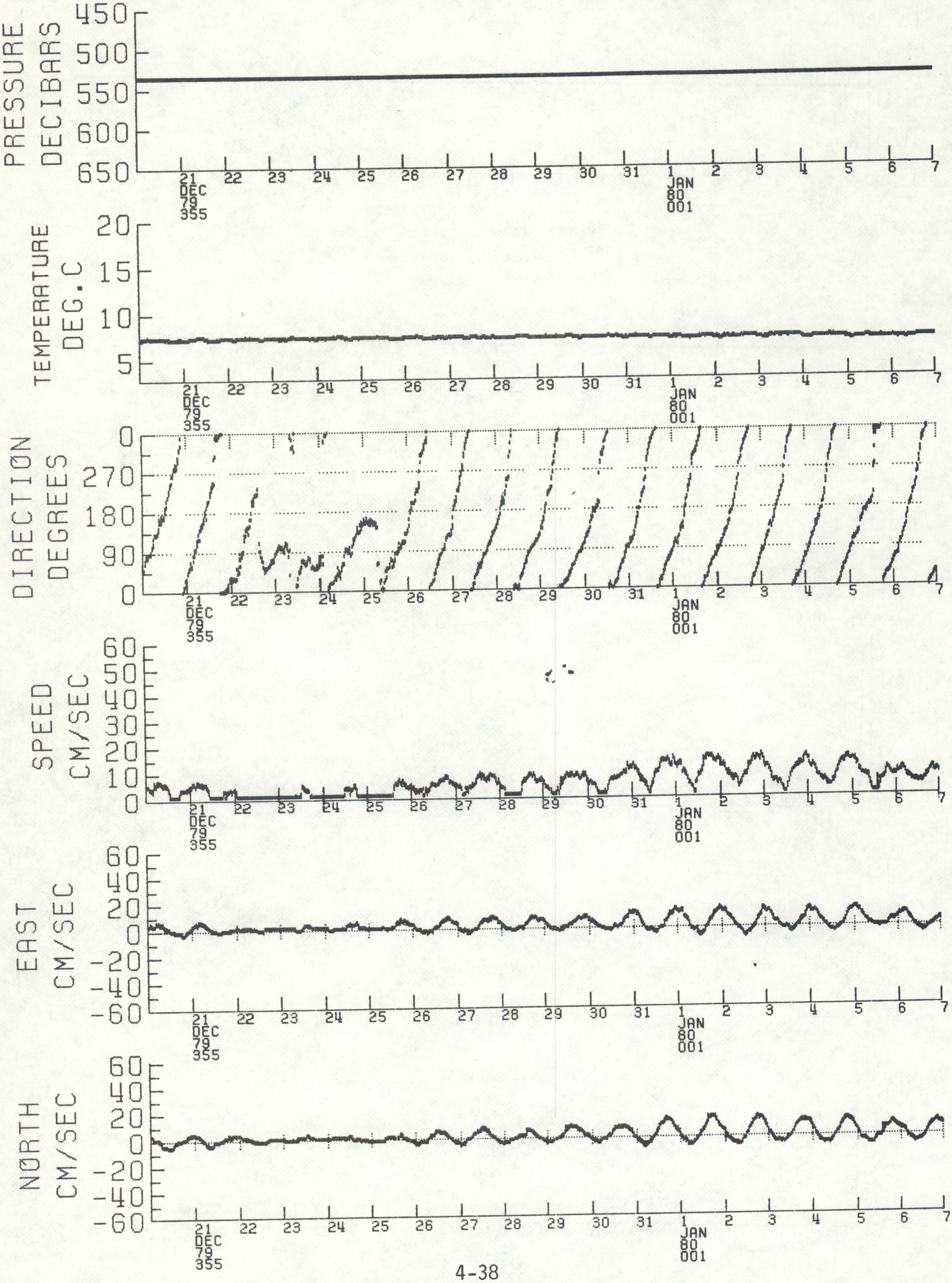
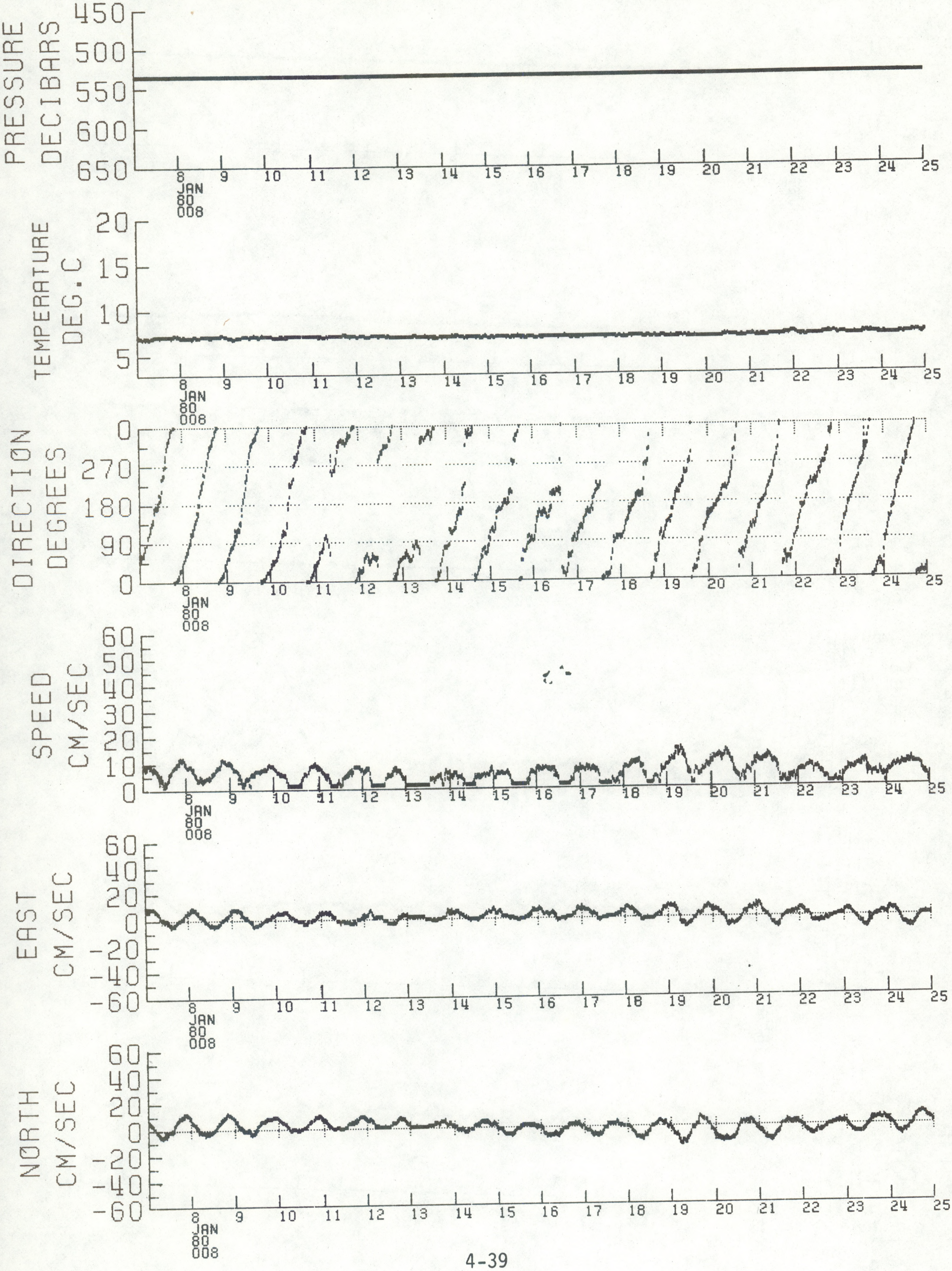
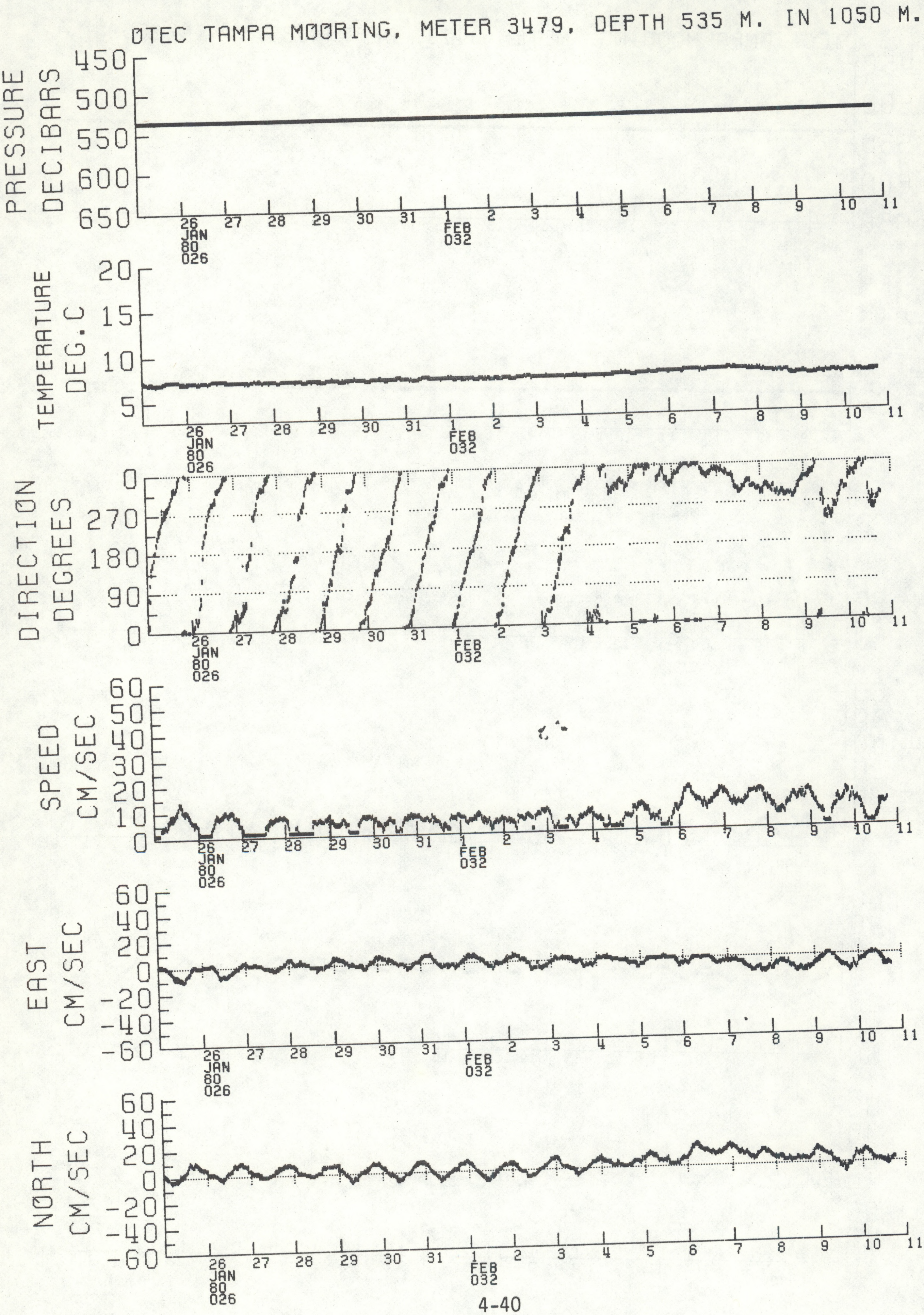


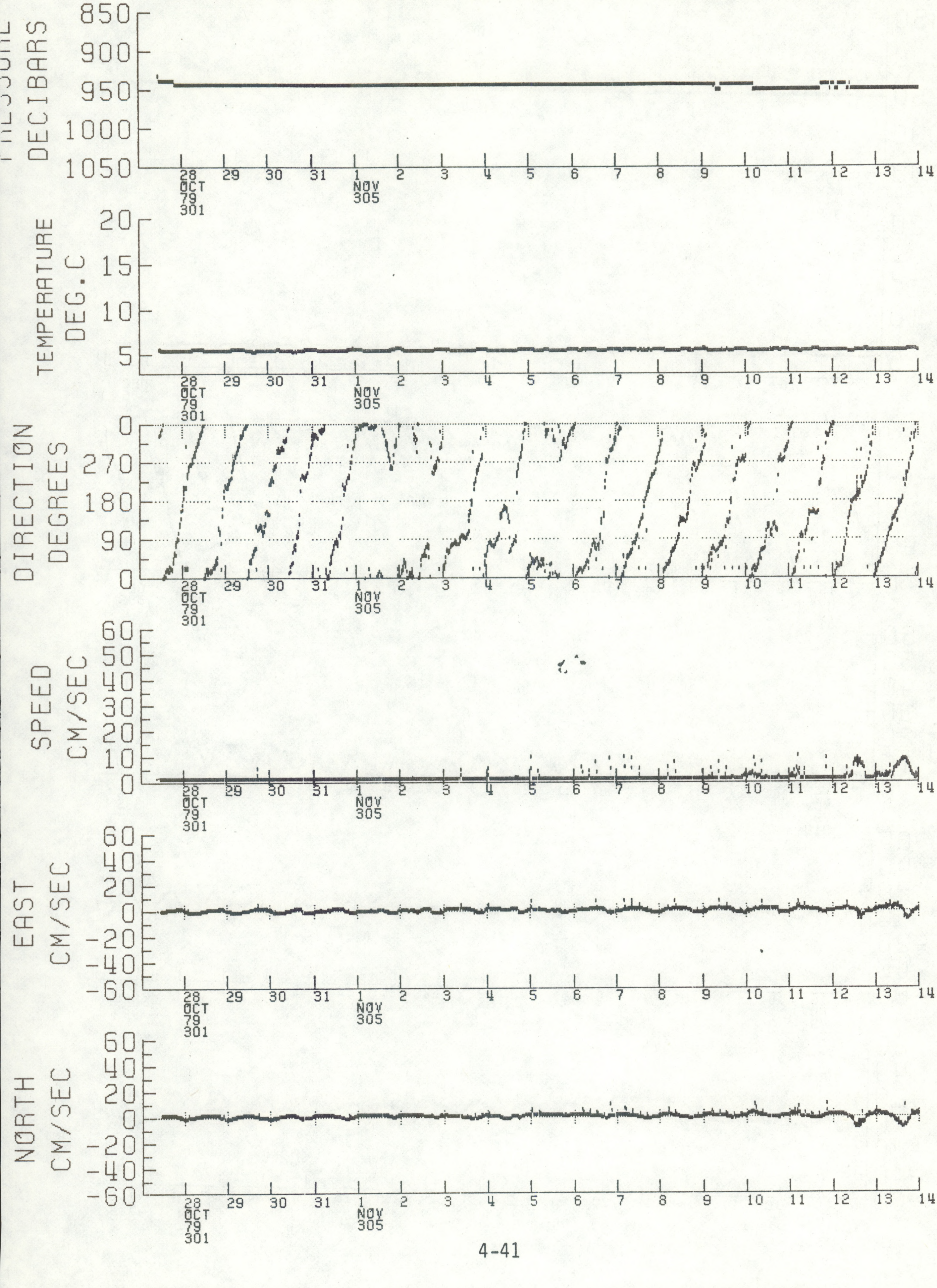
OTEC TAMPA MOORING, METER 3479, DEPTH 535 M. IN 1050 M.





OTEC TAMPA MOORING, METER 3479, DEPTH 535 M. IN 1050 M.
PRESSURE DECIBARS
TEMPERATURE DEG.C
DIRECTION DEGREES
SPEED CM/SEC
EAST CM/SEC
NORTH CM/SEC
26 JAN 80 026
FEB 032

ØTEC TAMPA MØØRING, METER 614, DEPTH 950 M. IN 1050 M.



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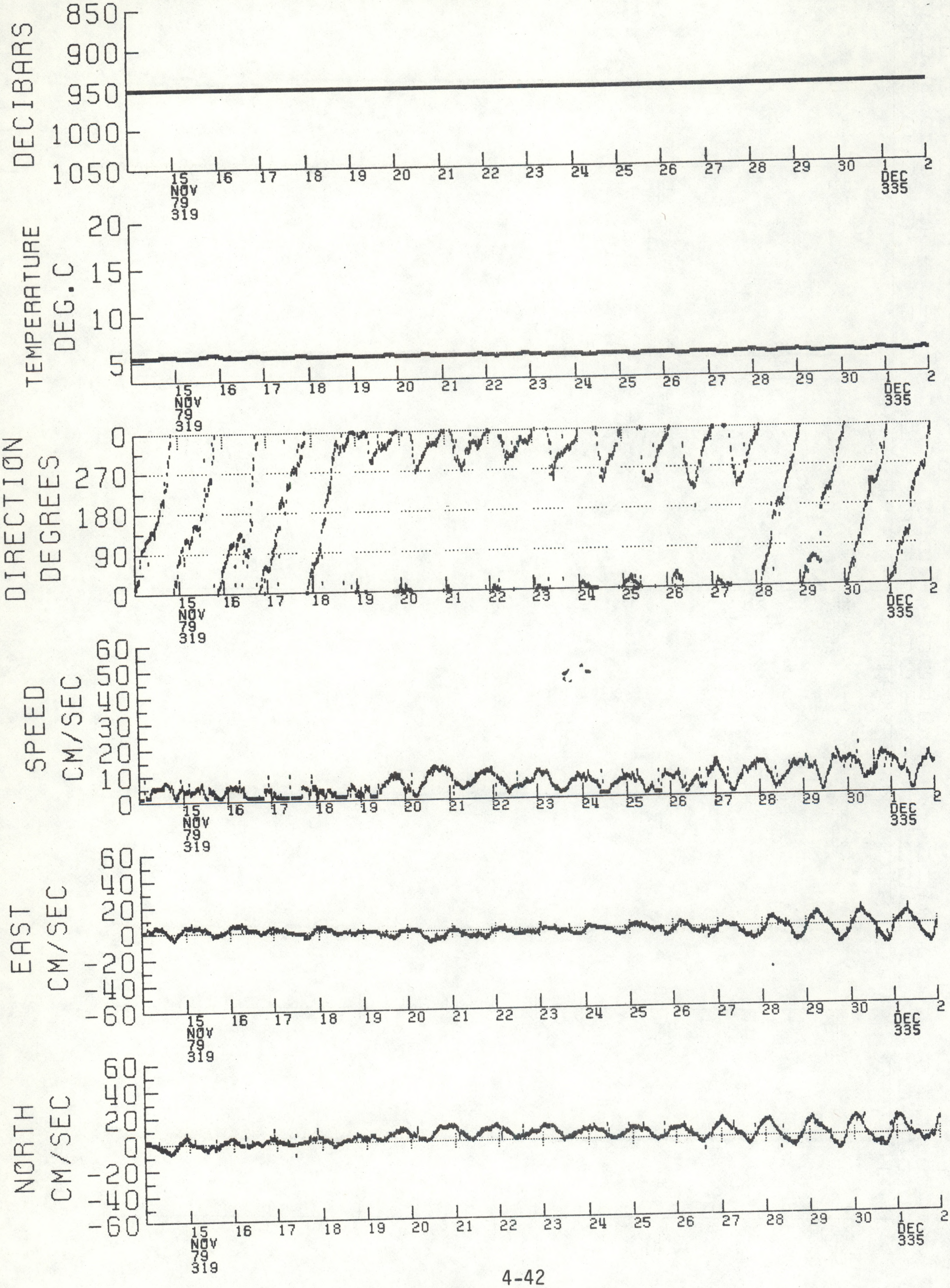
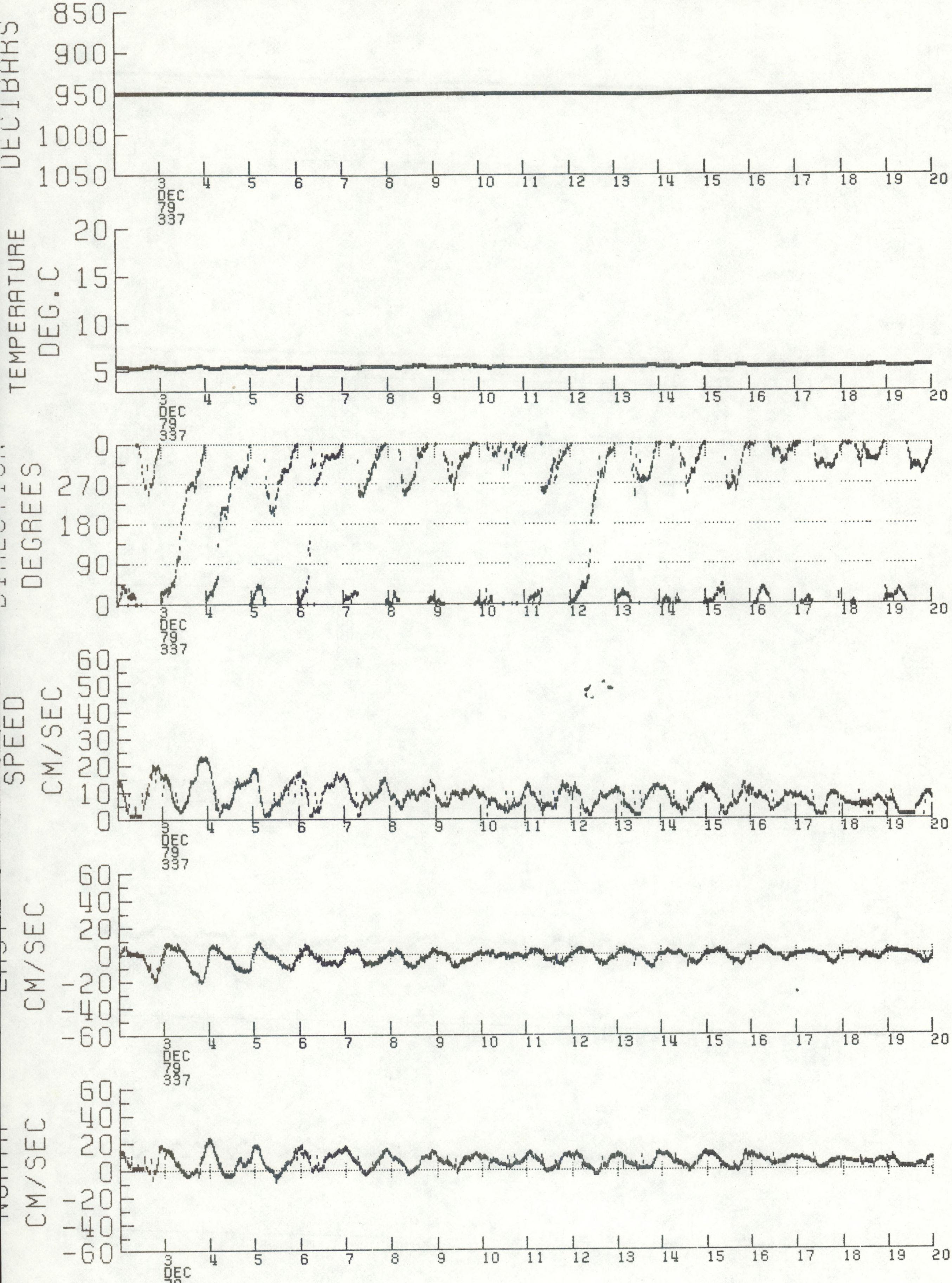


OTEC TAMPA MOORING, METER 614, DEPTH 950 M. IN 1050 M.



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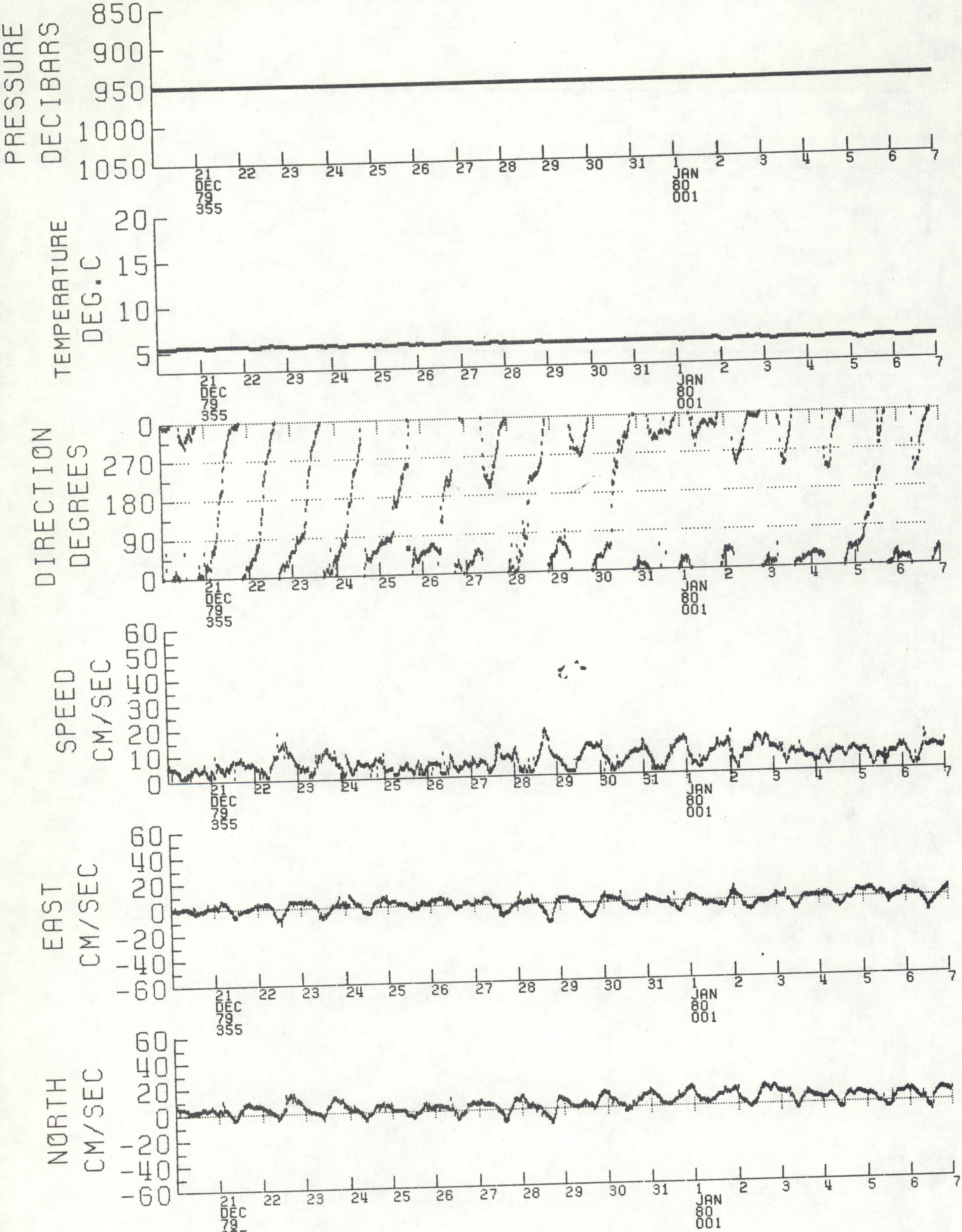

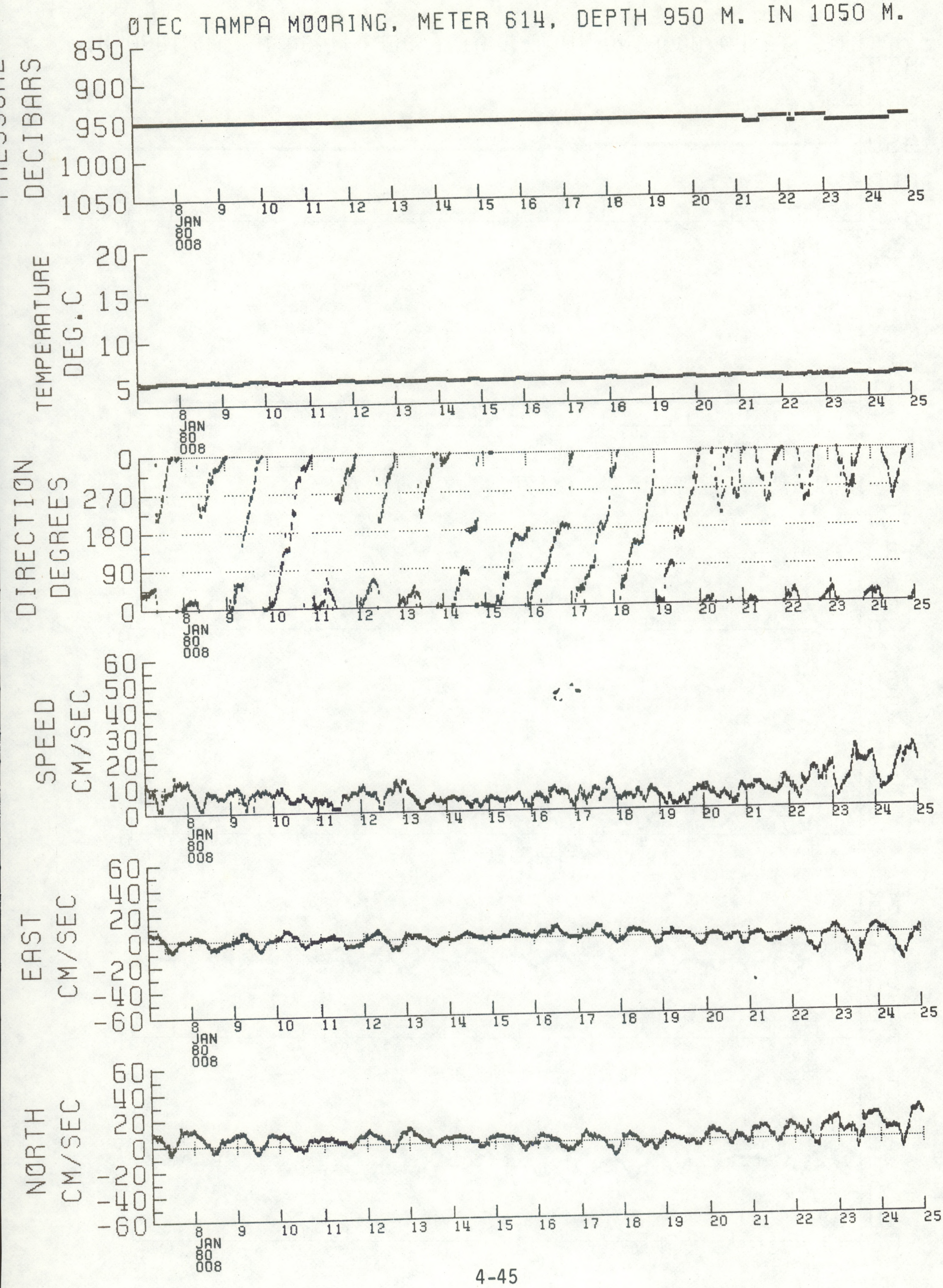

ØTEC TAMPA MØØRING, METER 614, DEPTH 950 M. IN 1050 M.
DECIBARS
850
900
950
1000
1050
TEMPERATURE
DEG.C
20
15
10
5
DIRECTIØN
DEGREES
0
270
180
90
SPEED
CM/SEC
60
50
40
30
20
10
EAST
CM/SEC
NØRTH
CM/SEC
-20
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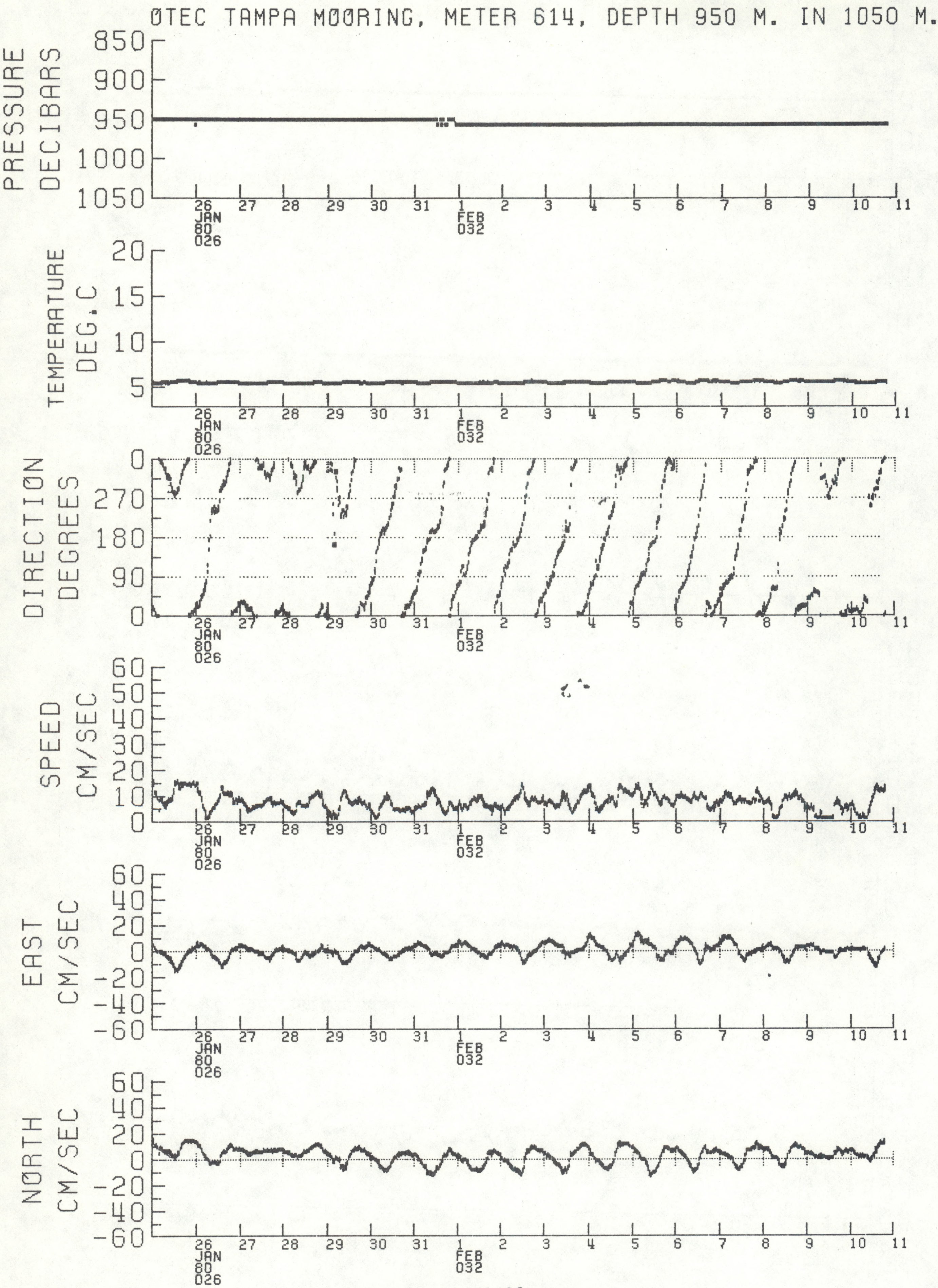
ØTEC TAMPA MØØRING, METER 614, DEPTH 950 M. IN 1050 M.
PRESSURE DECIBARS
850
900
950
1000
1050
TEMPERATURE DEG.C
20
15
10
5
DIRECTIØN DEGREES
0
270
180
90
0
SPEED CM/SEC
60
50
40
30
20
10
0
EAST CM/SEC
60
40
20
0
-20
-40
-60
NØRTH CM/SEC
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-20
-40
-60
26 JAN 80 026
27
28
29
30
31
1 FEB 032
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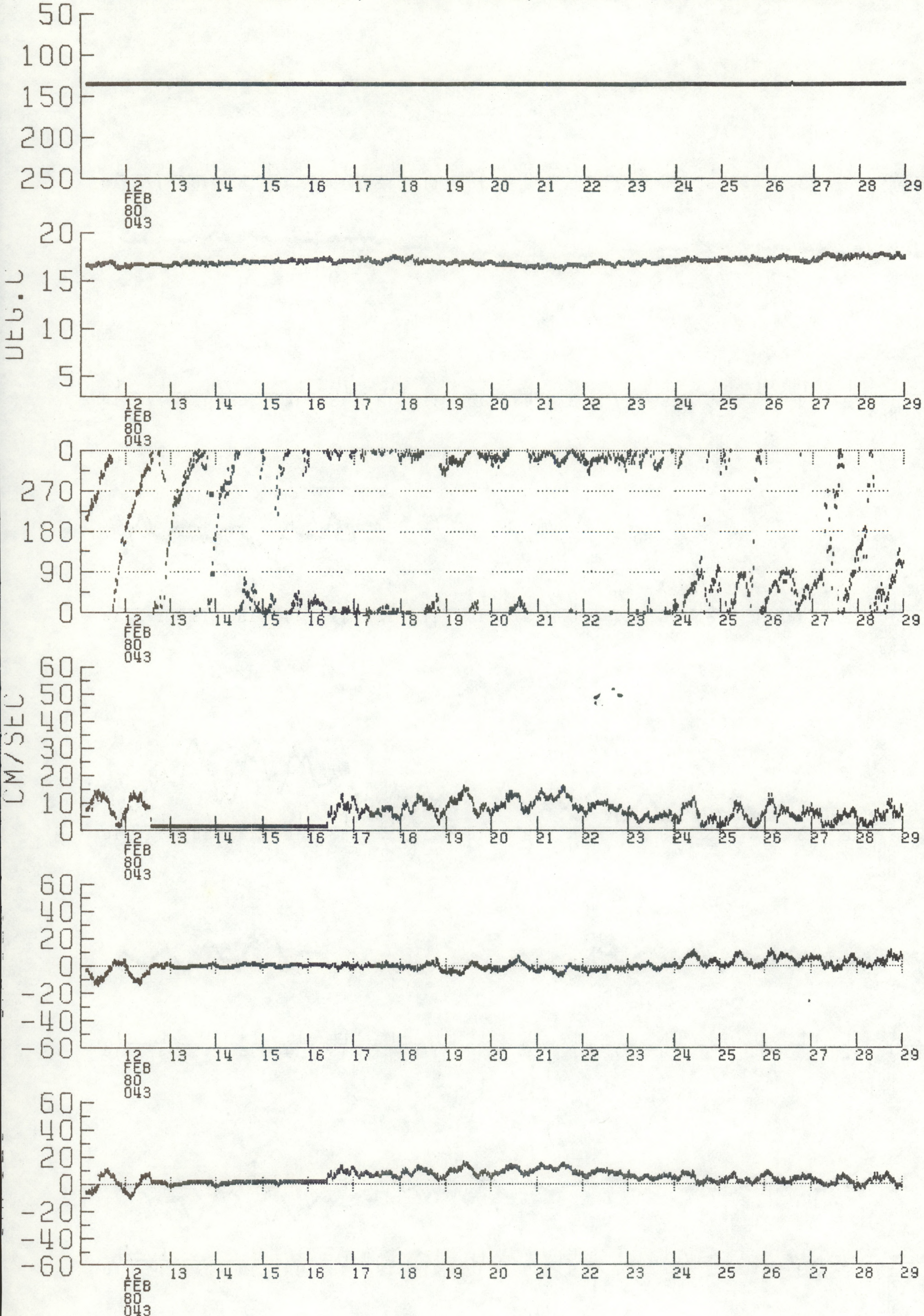
11

ØTEC TAMPA MØØRING, METER 723, DEPTH 135 M. IN 1039 M.



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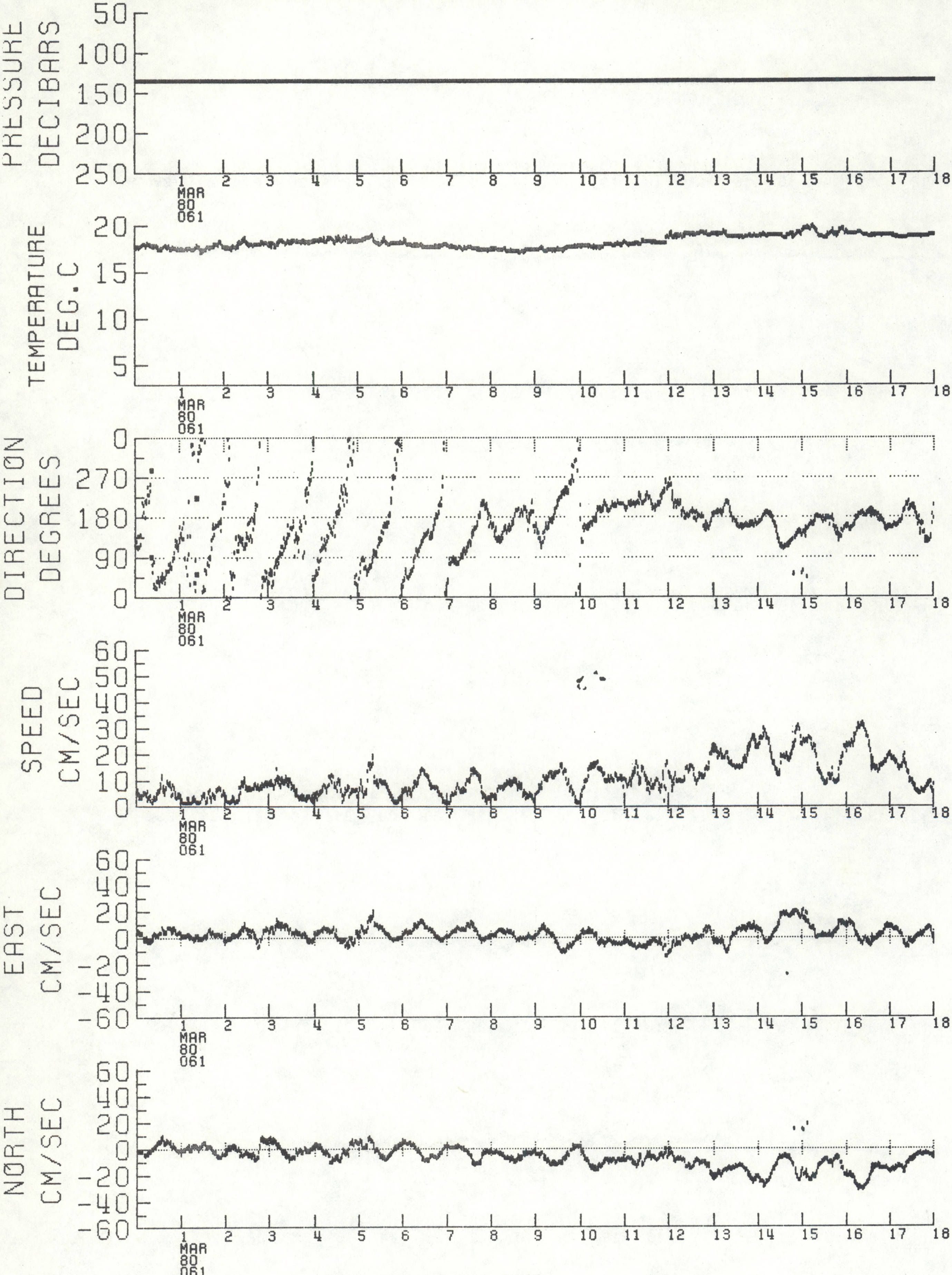

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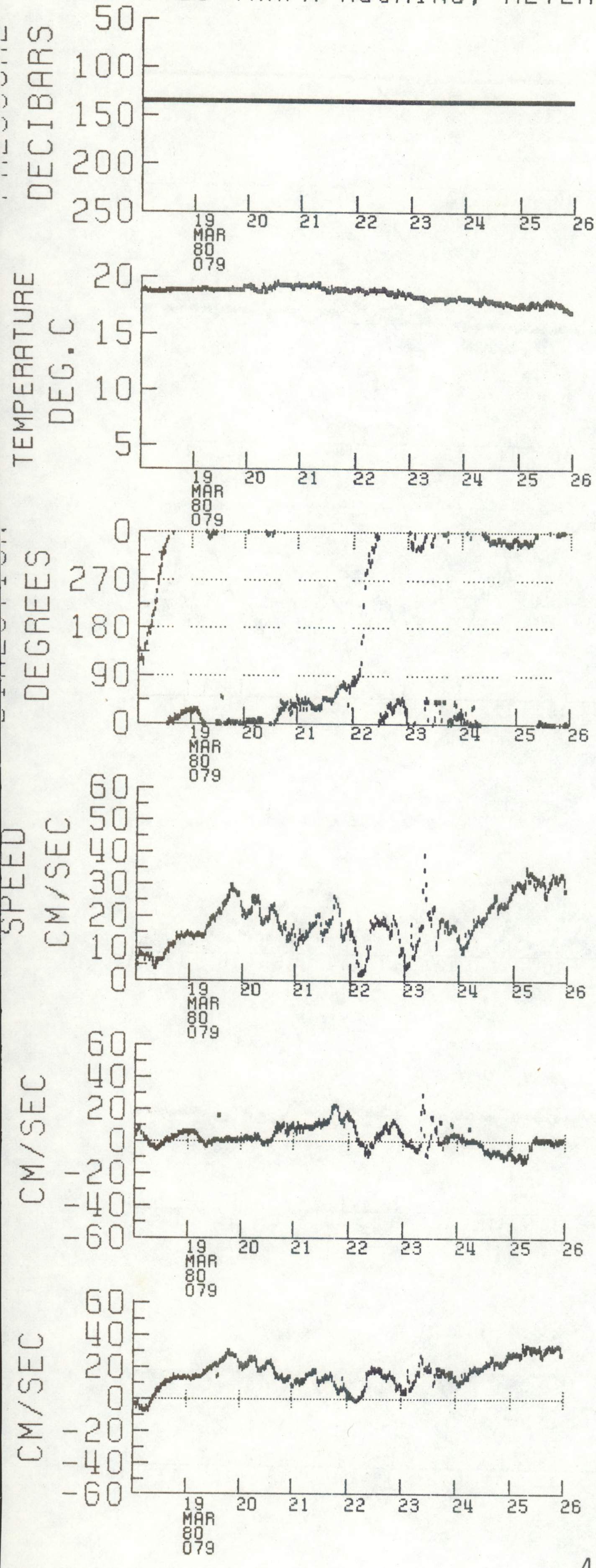
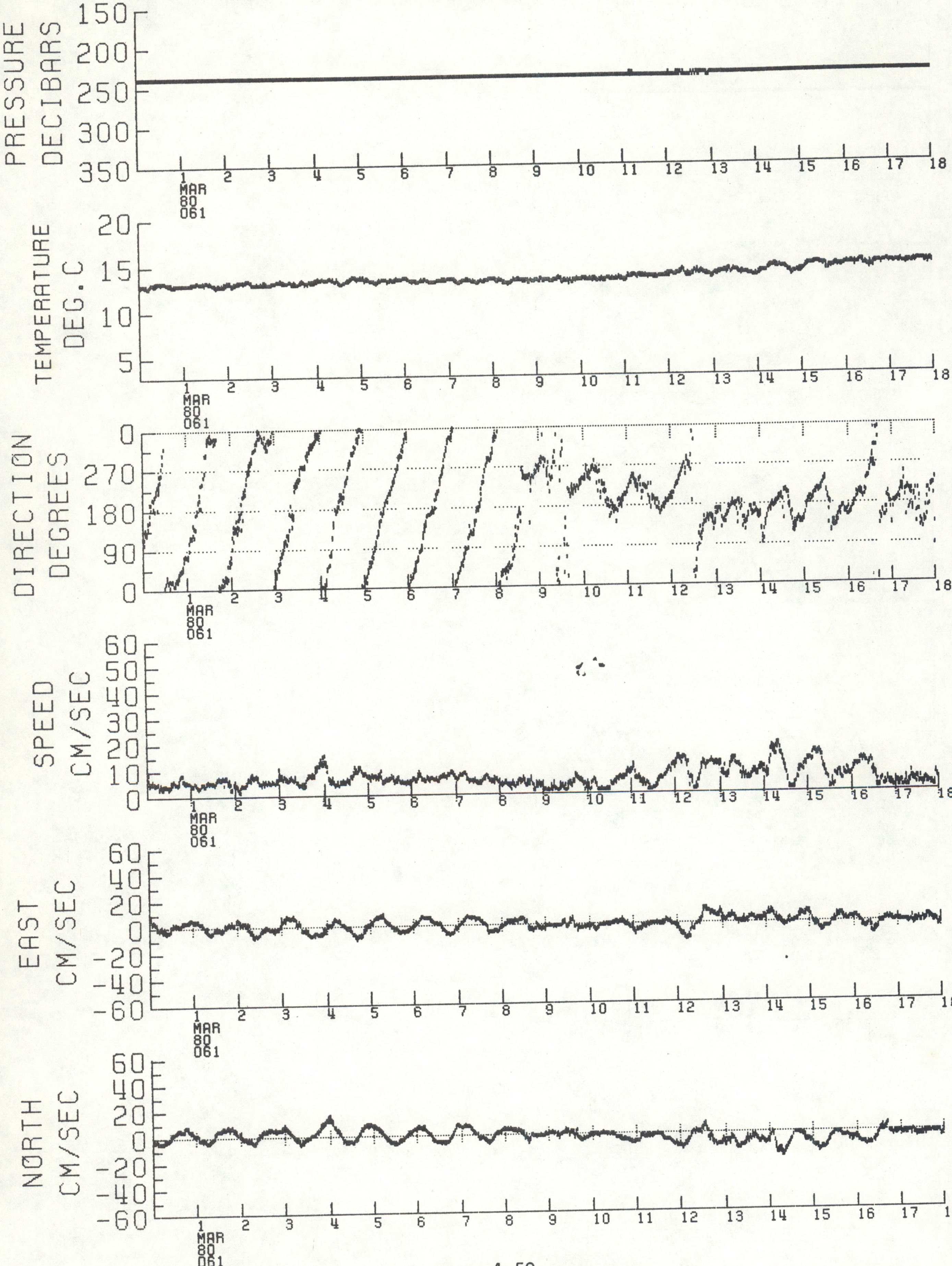


ØTEC TAMPA MØORING, METER 606, DEPTH 239 M. IN 1039 M.



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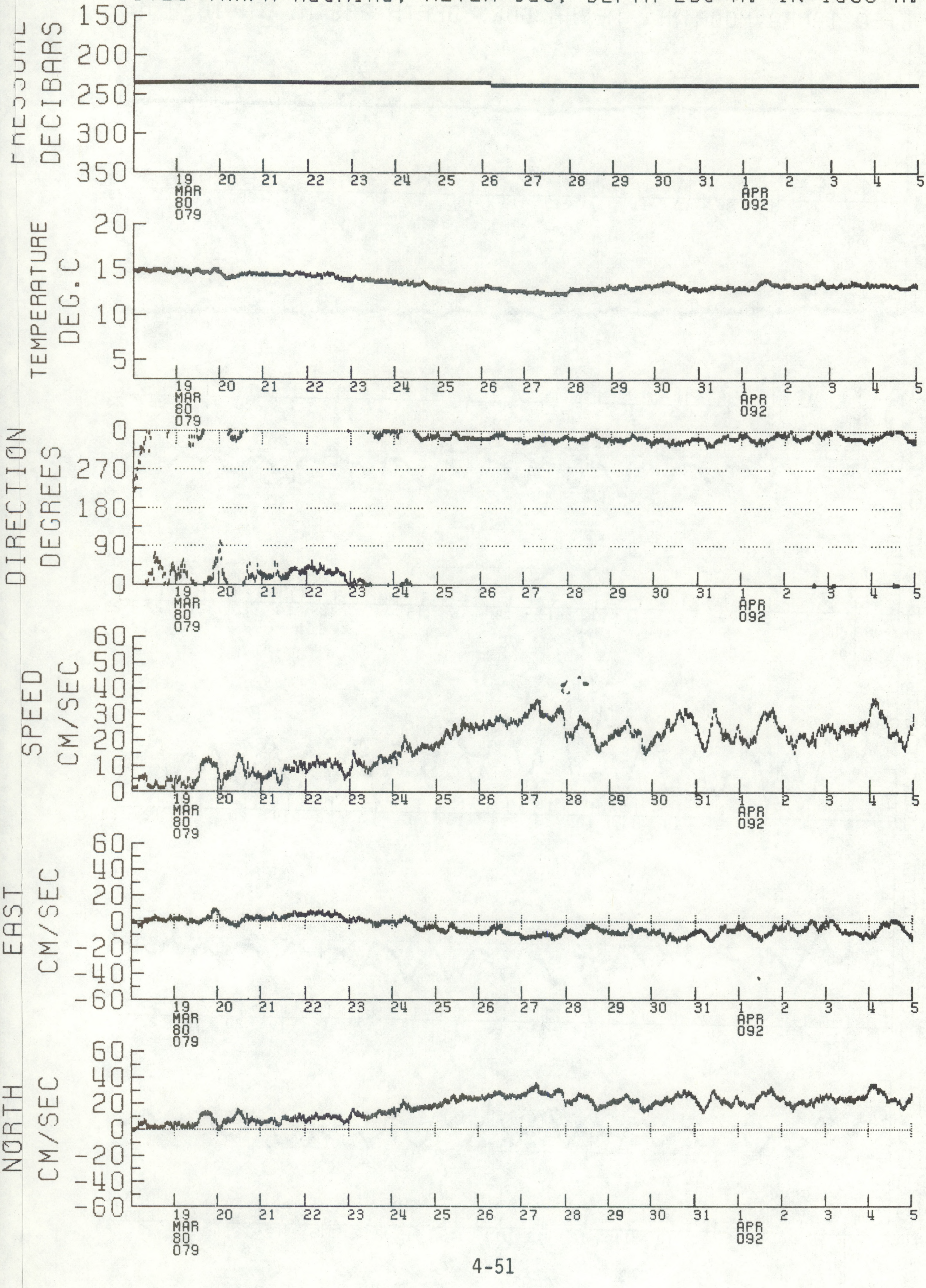

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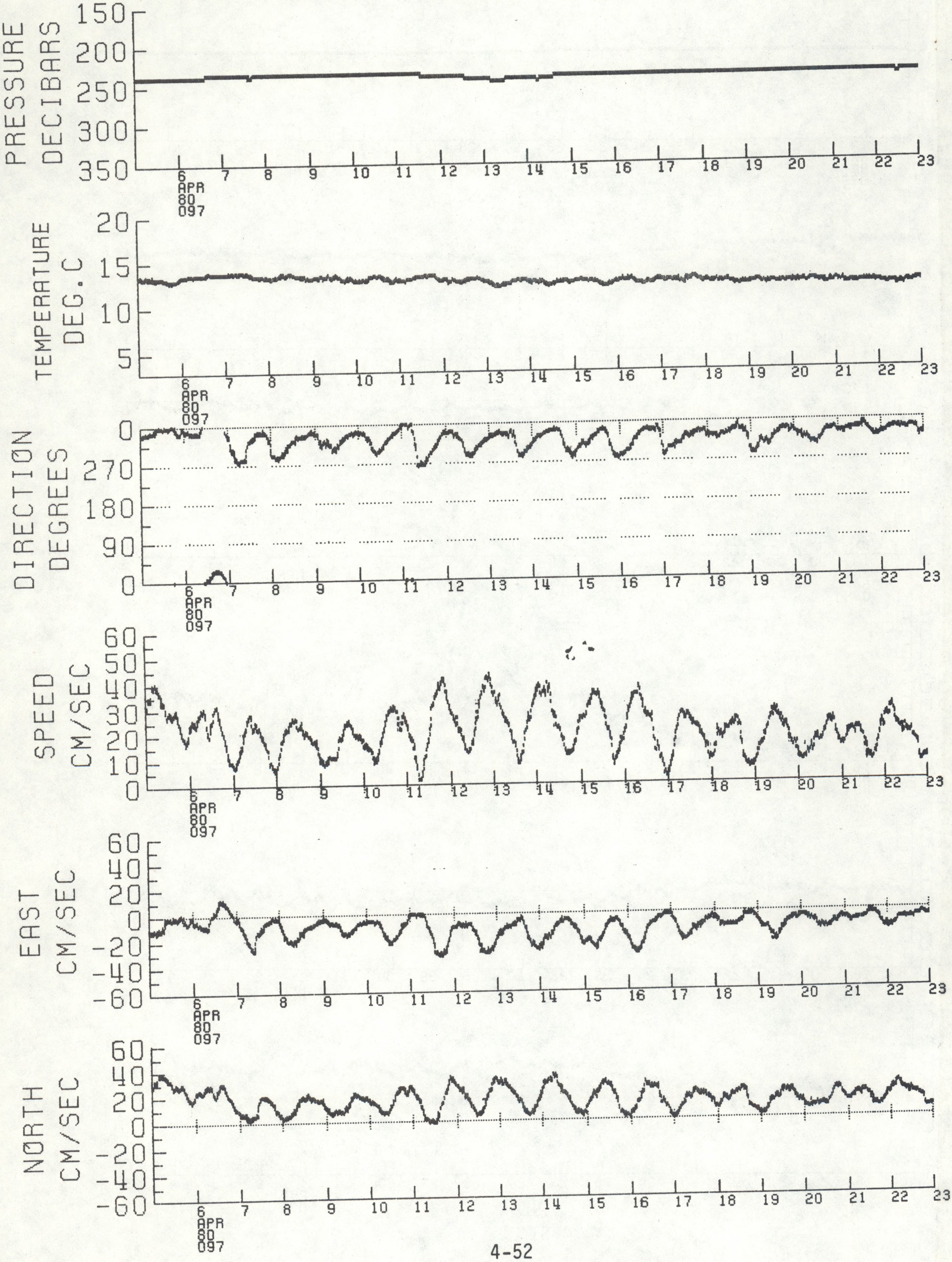
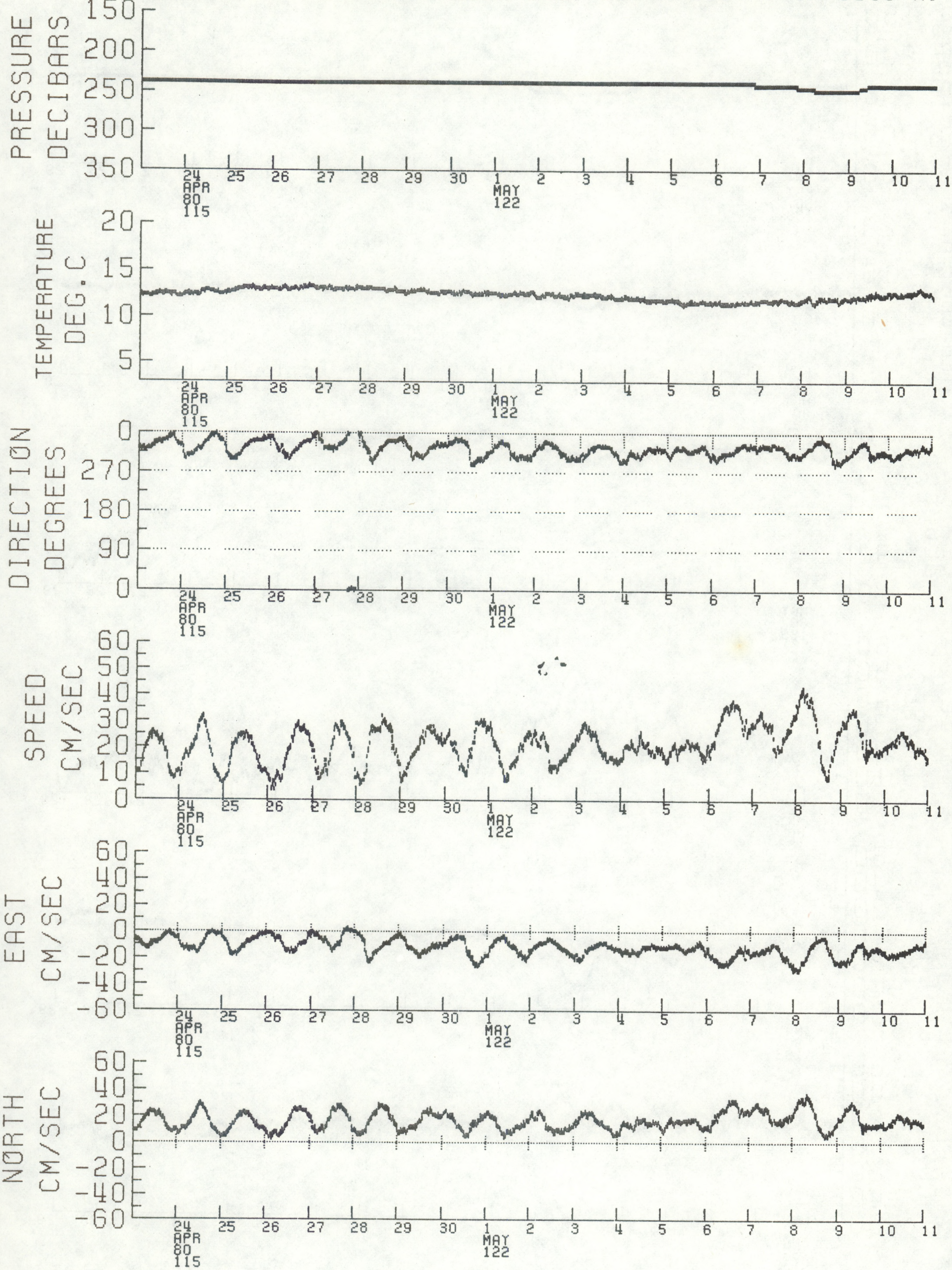
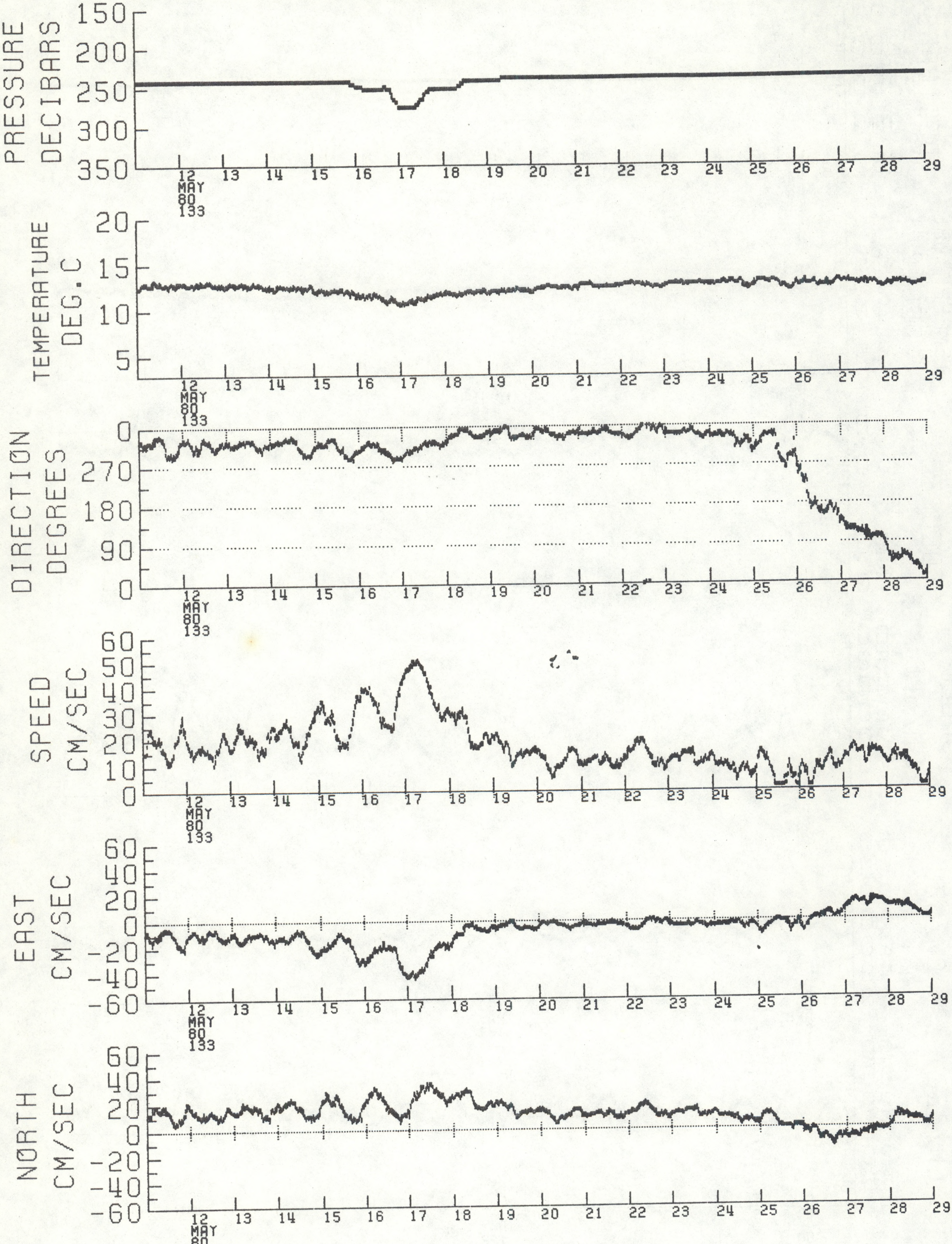


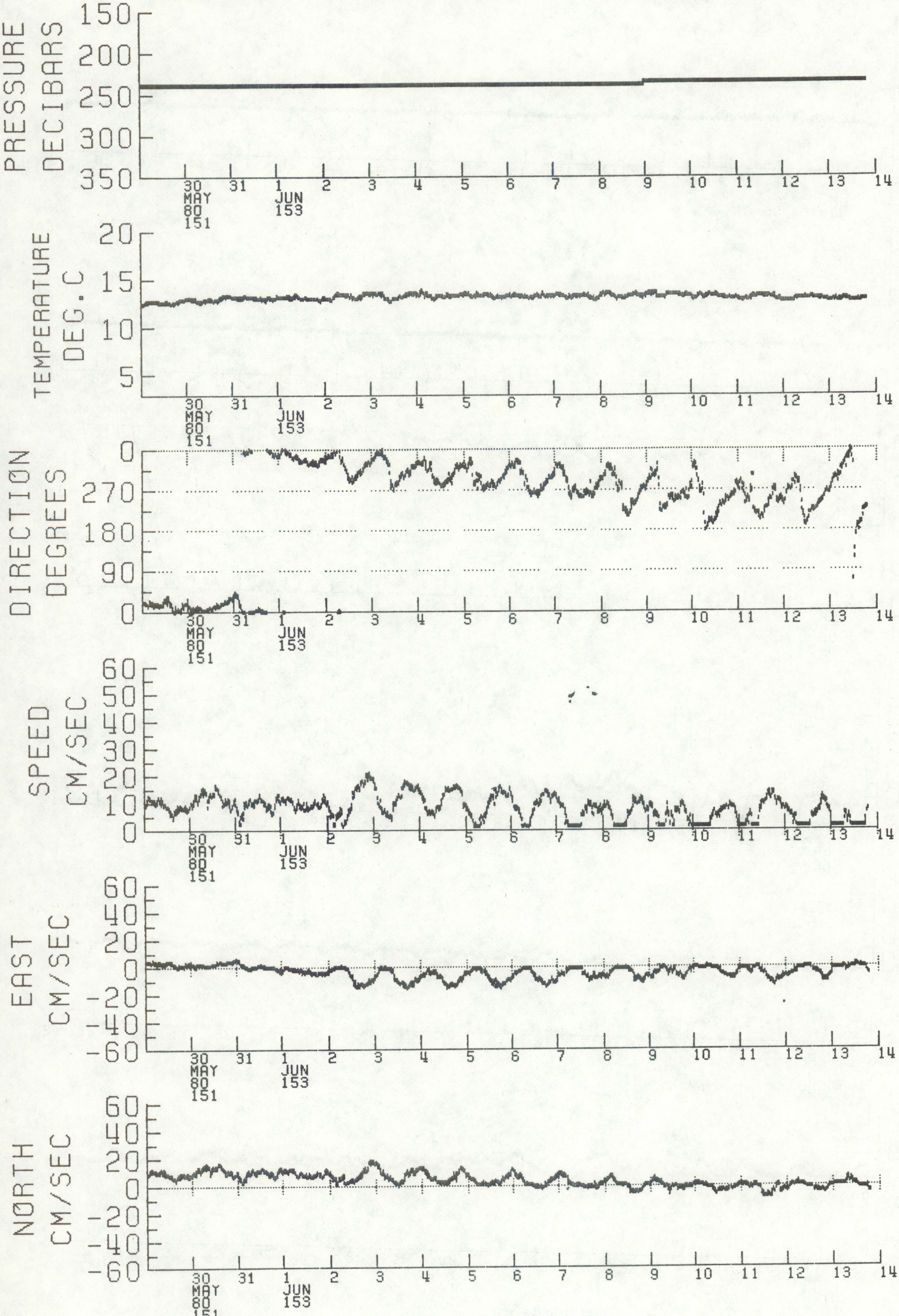
ØTEC TAMPA MØØRING, METER 606, DEPTH 239 M. IN 1039 M.



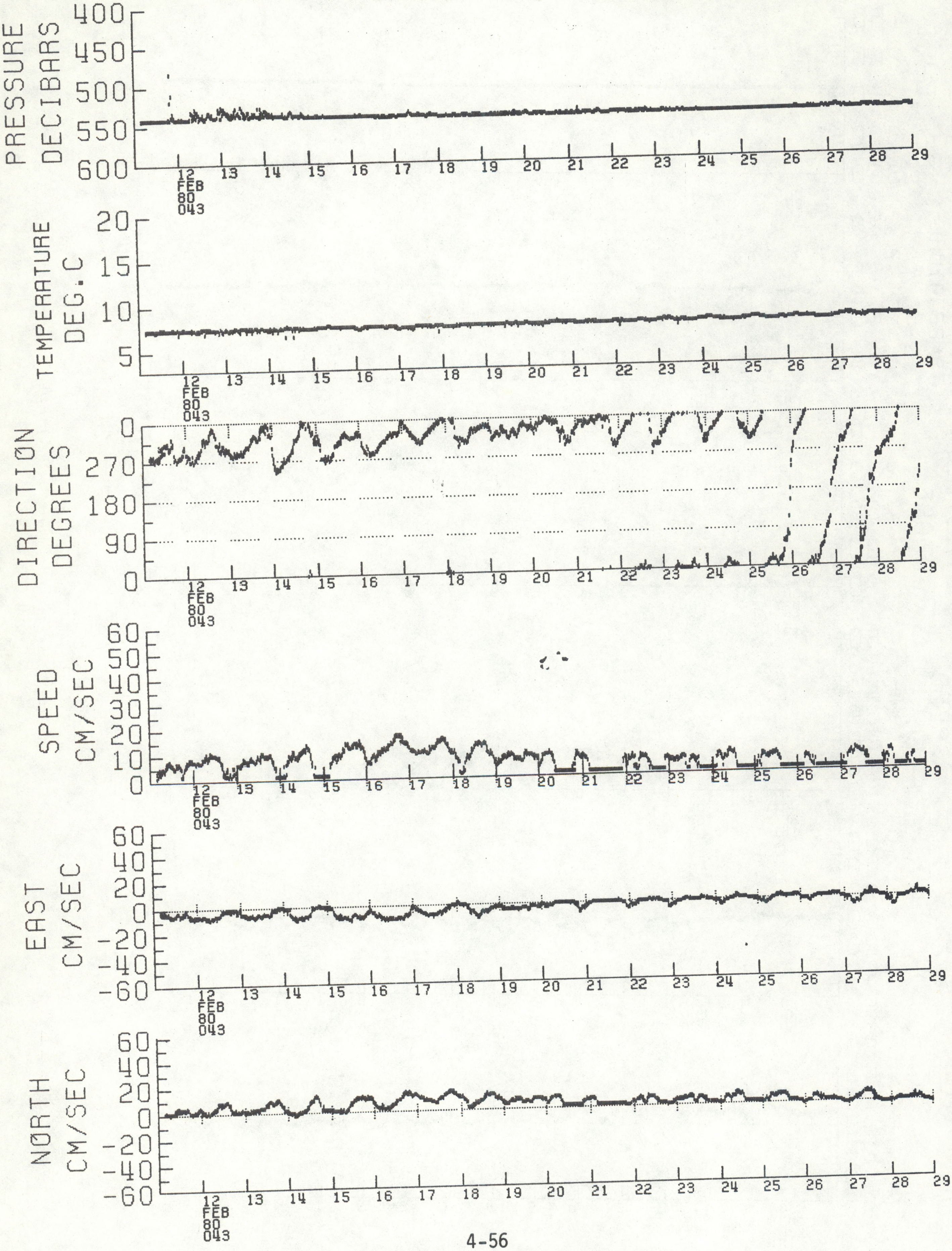
ØTEC TAMPA MØØRING, METER 606, DEPTH 239 M. IN 1039 M.



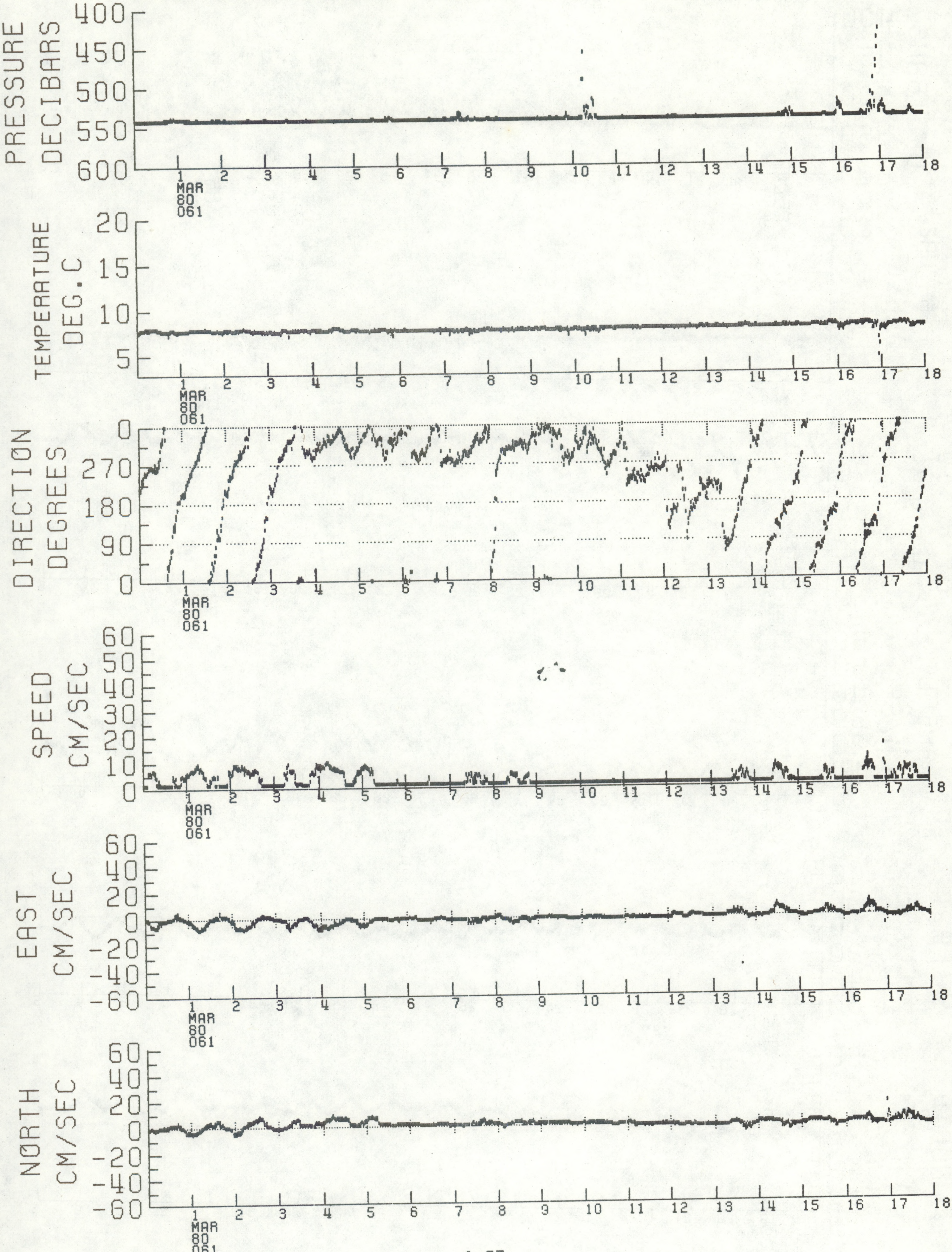
ØTEC TAMPA MØØRING, METER 606, DEPTH 239 M. IN 1039 M.



ØTEC TAMPA MOØRING, METER 3285, DEPTH 543 M. IN 1039 M.



ØTEC TAMPA MOORING, METER 3285, DEPTH 543 M. IN 1039 M.



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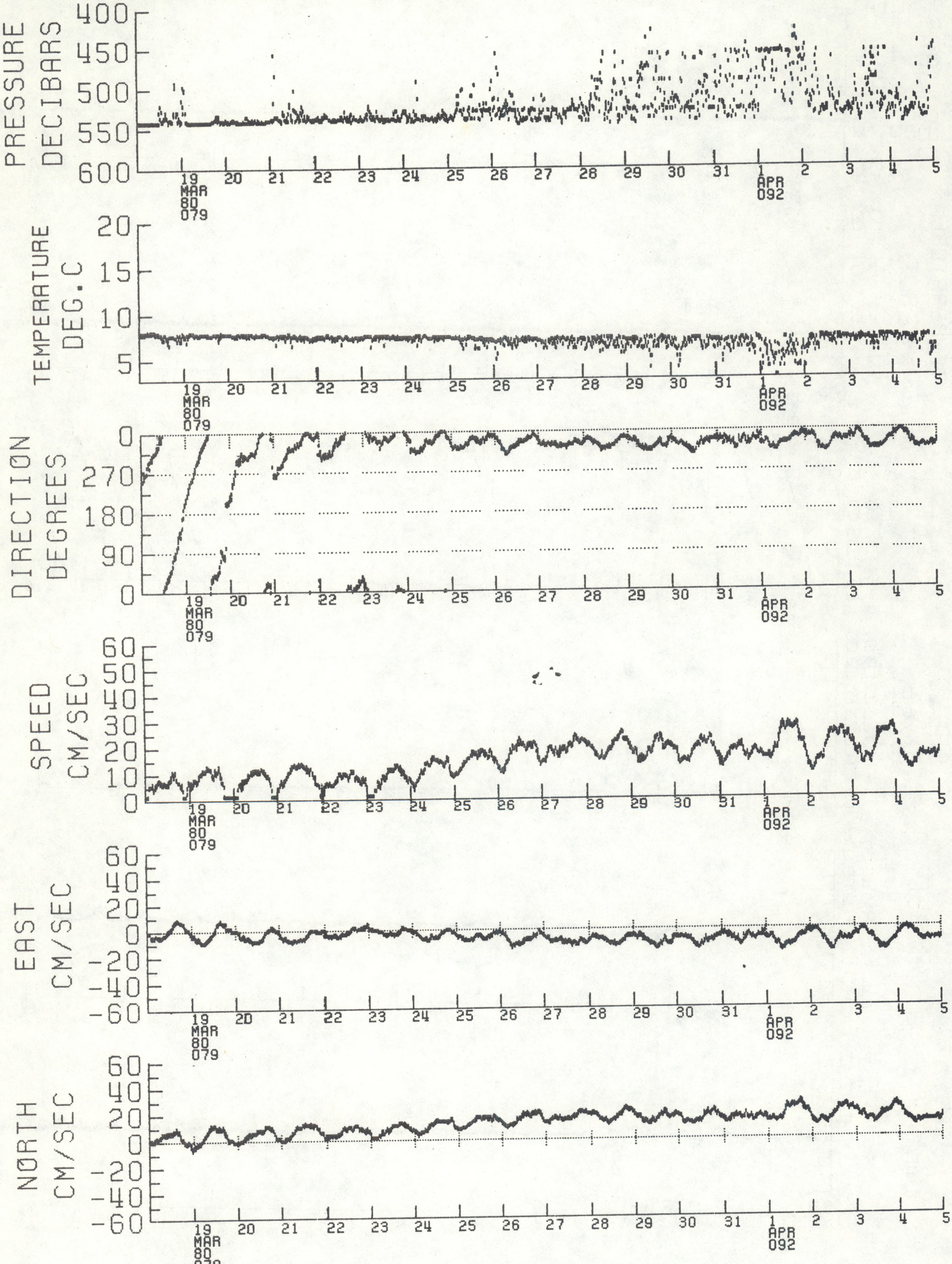
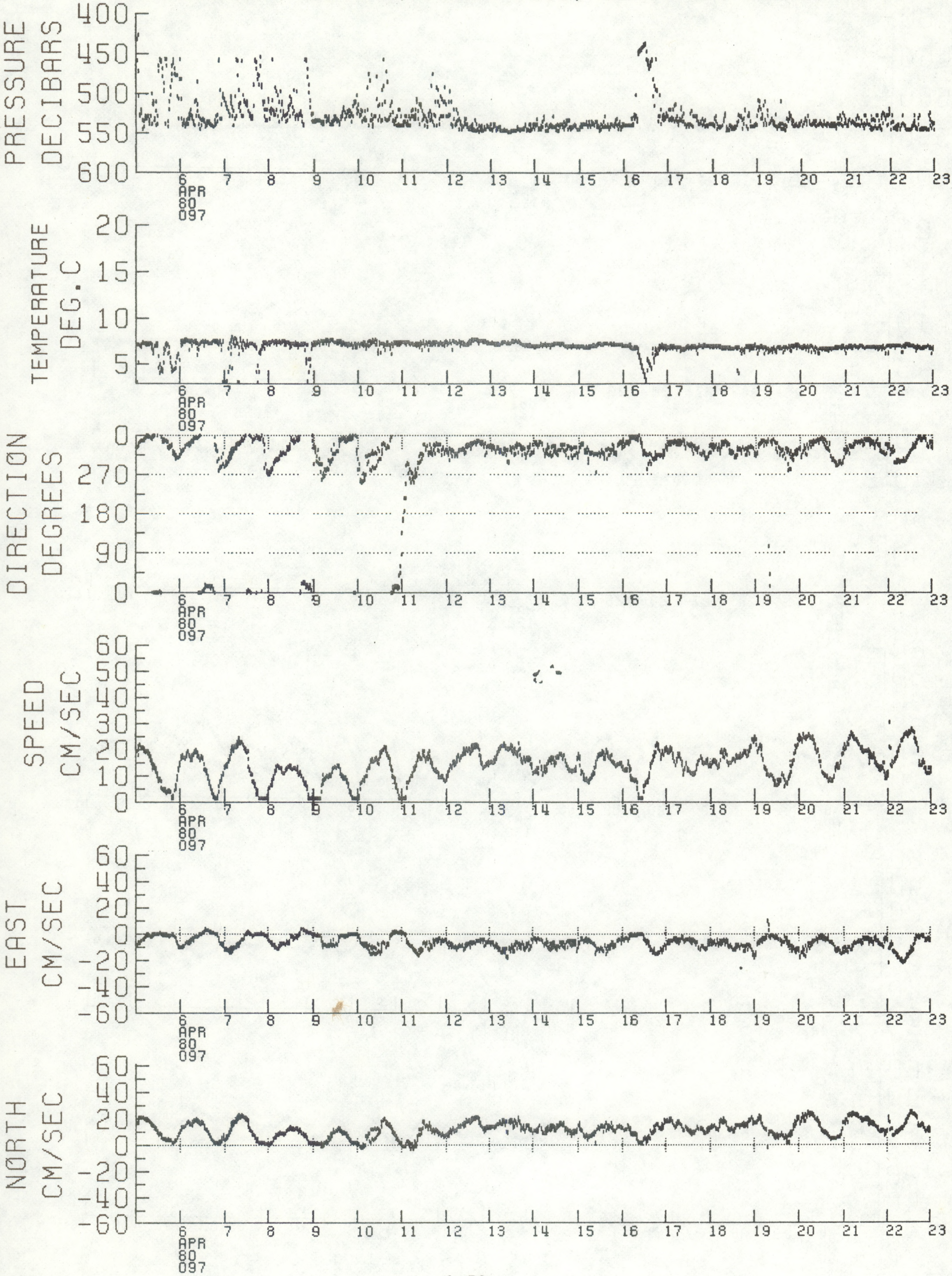
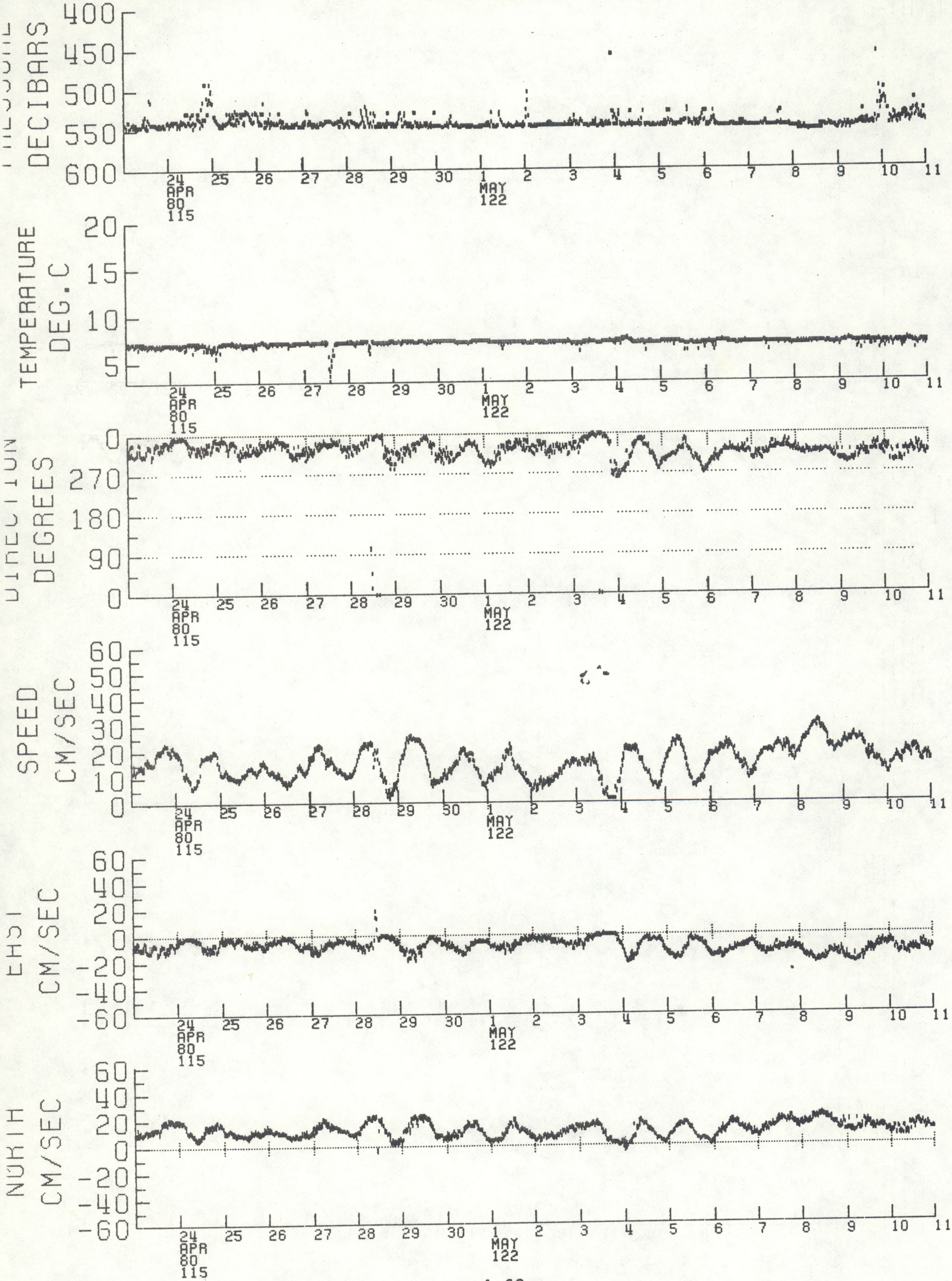


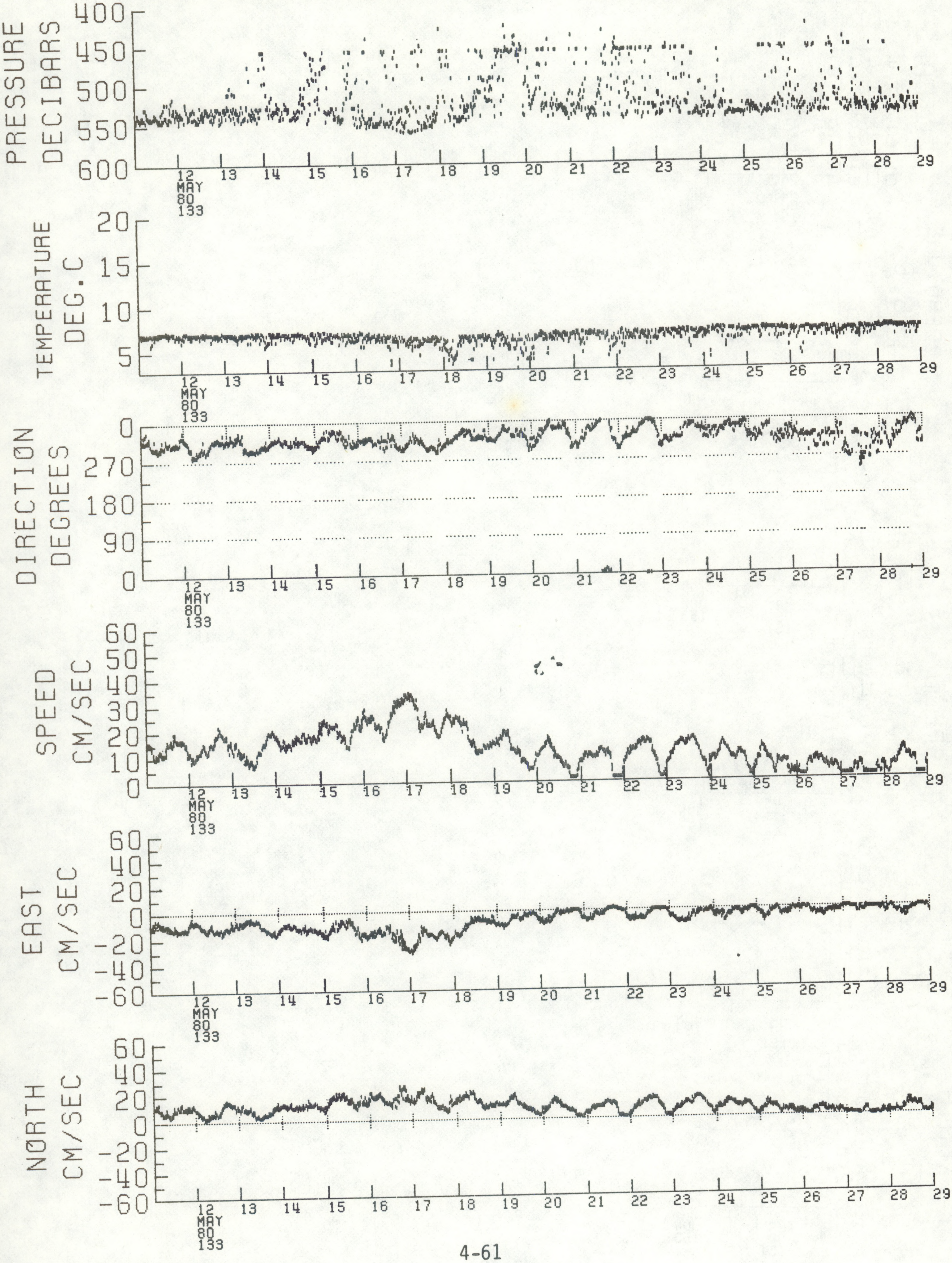
ØTEC TAMPA MOORING, METER 3285, DEPTH 543 M. IN 1039 M.



ØTEC TAMPA MOORING, METER 3285, DEPTH 543 M. IN 1039 M.



ØTEC TAMPA MOORING, METER 3285, DEPTH 543 M. IN 1039 M.



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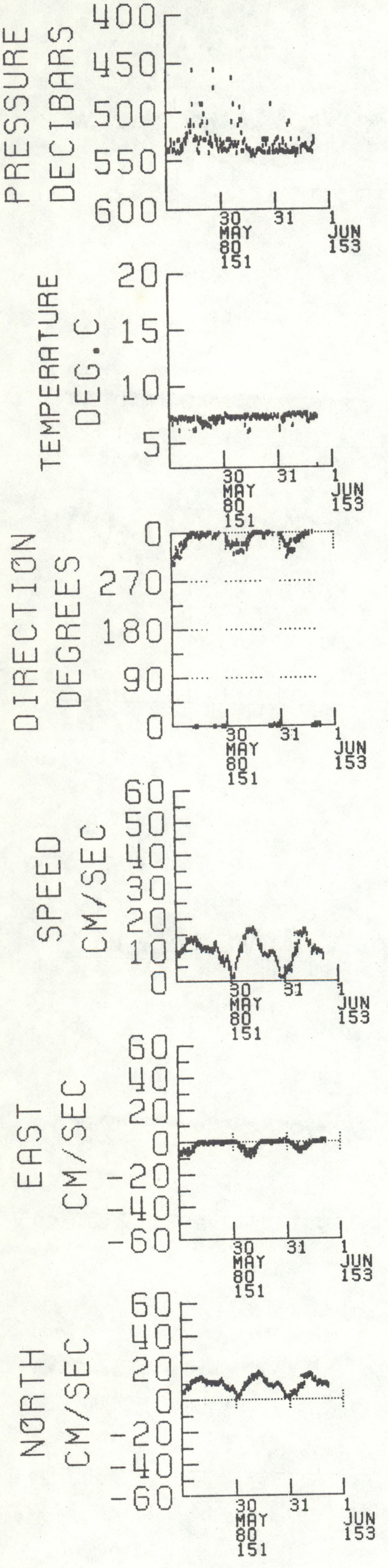

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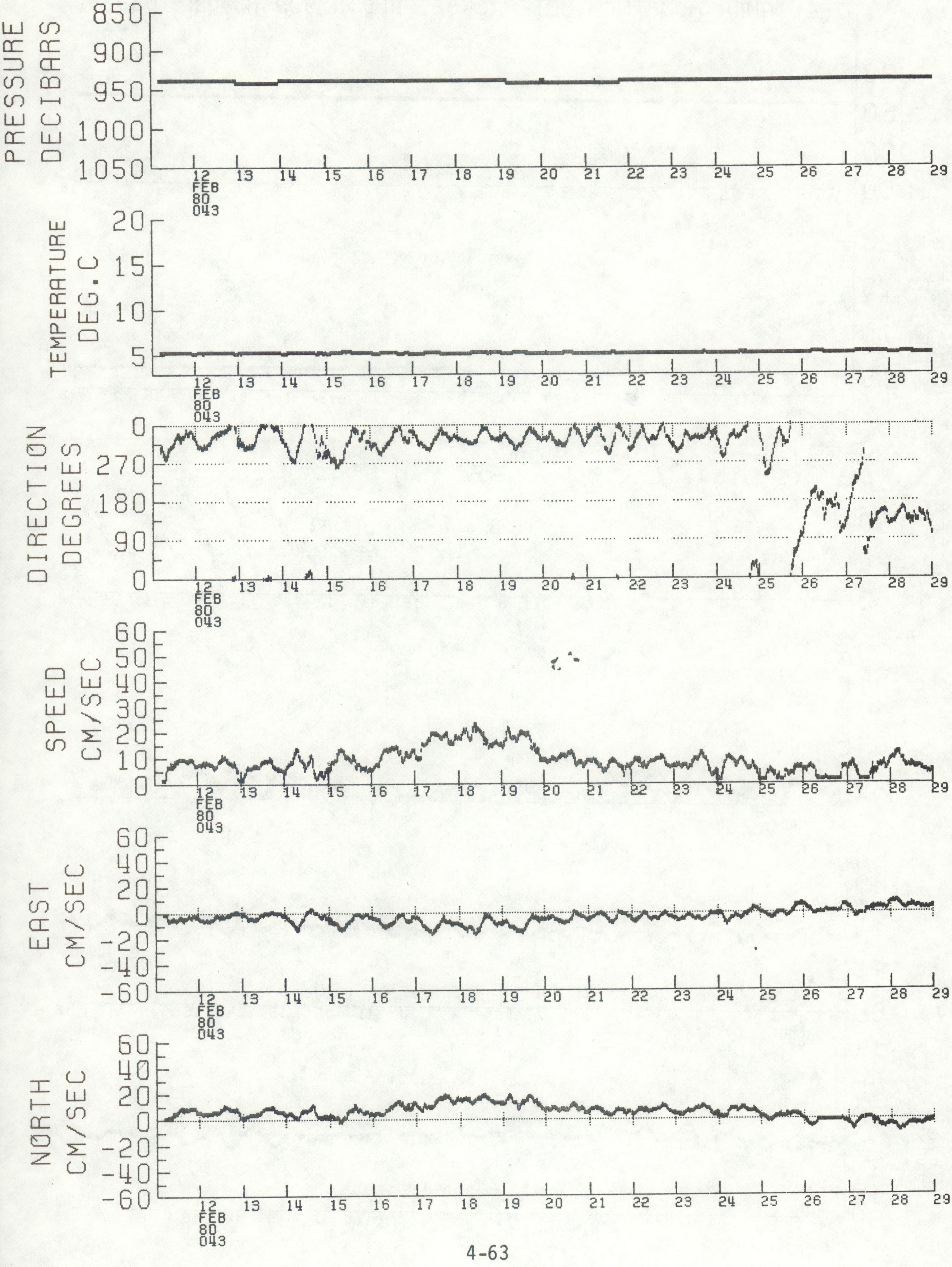

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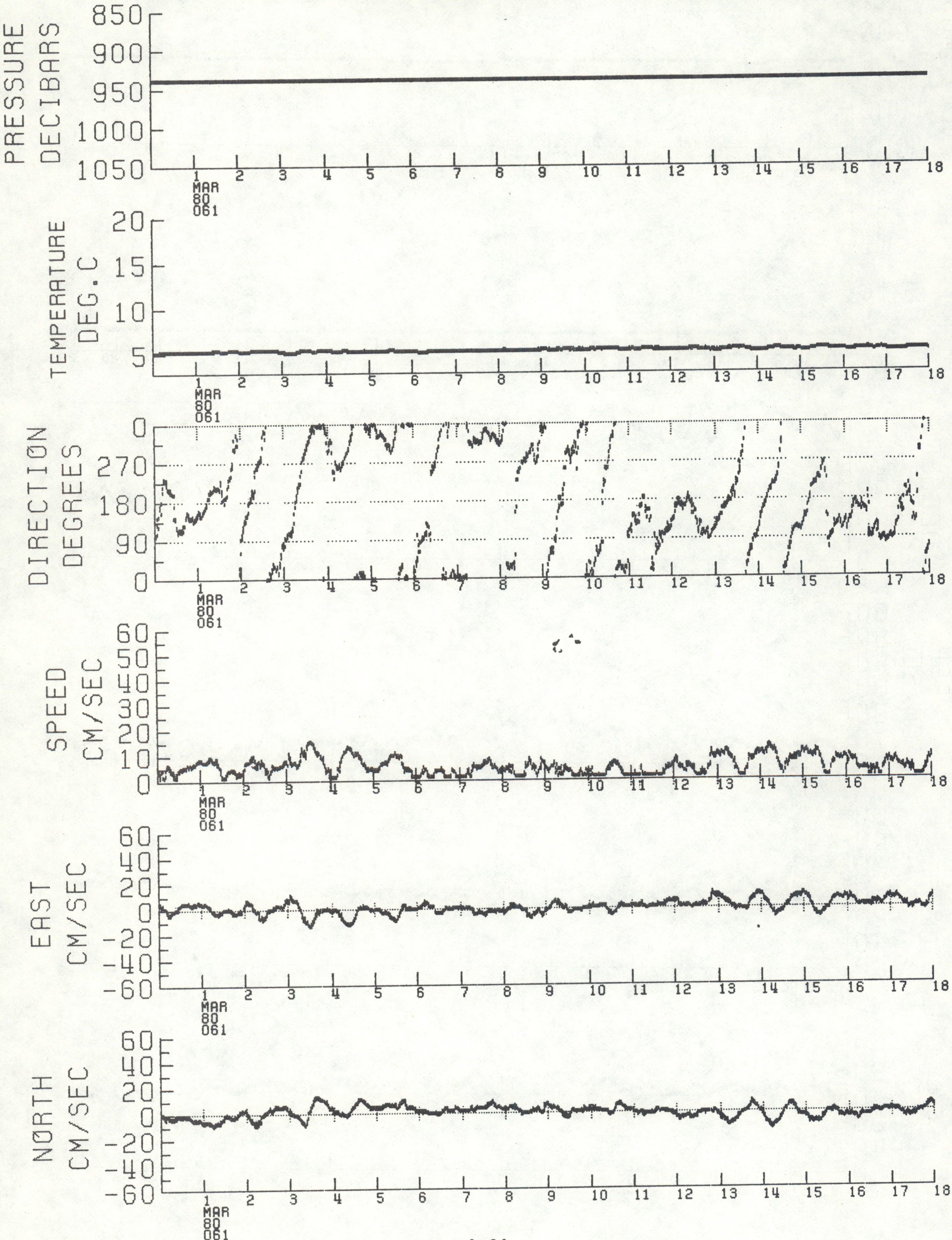

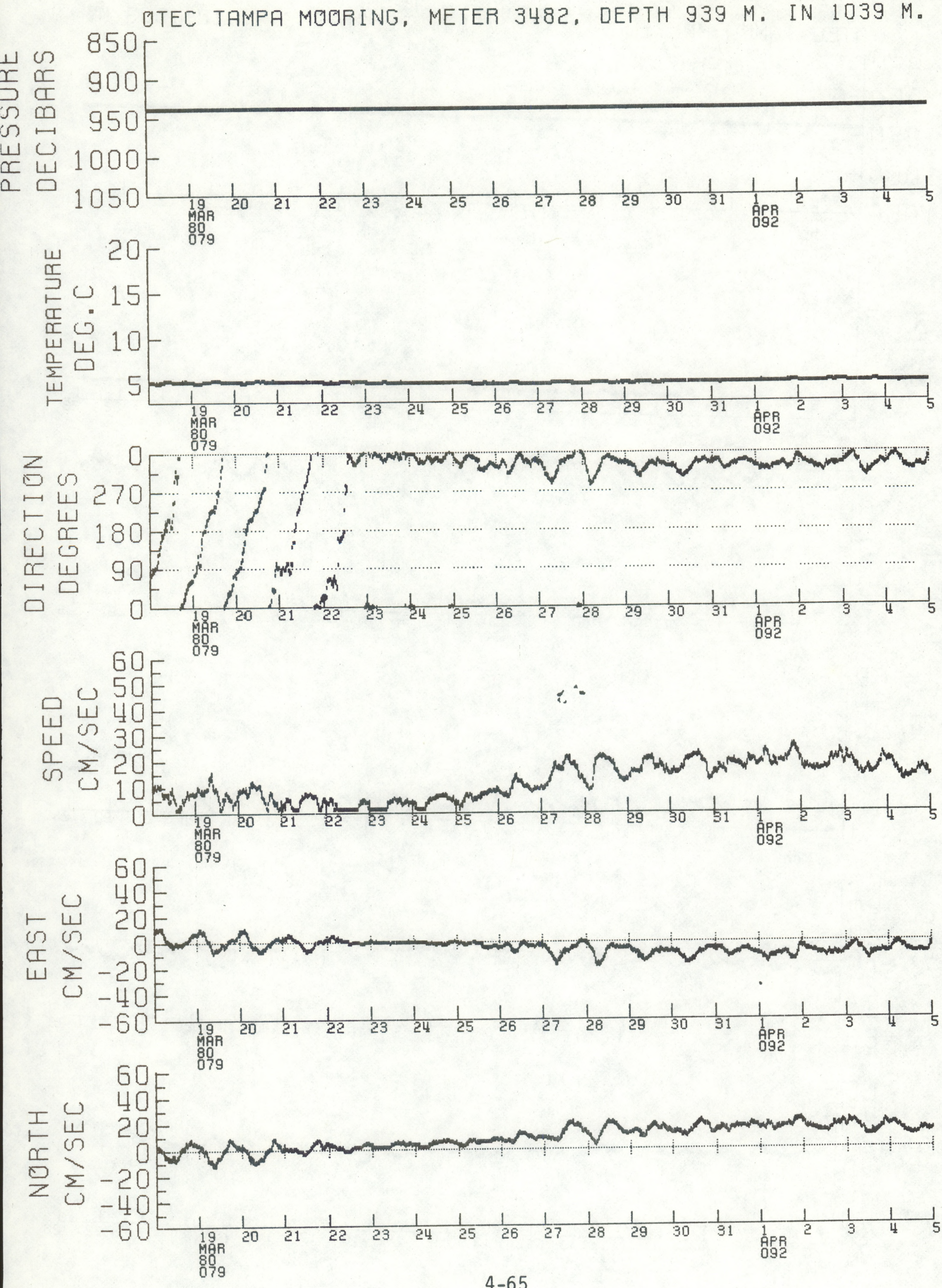
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PRESSURE DECIBARS
TEMPERATURE DEG.C
DIRECTIØN DEGREES
SPEED CM/SEC
EAST CM/SEC
NØRTH CM/SEC
19 MAR 80 079
1 APR 092

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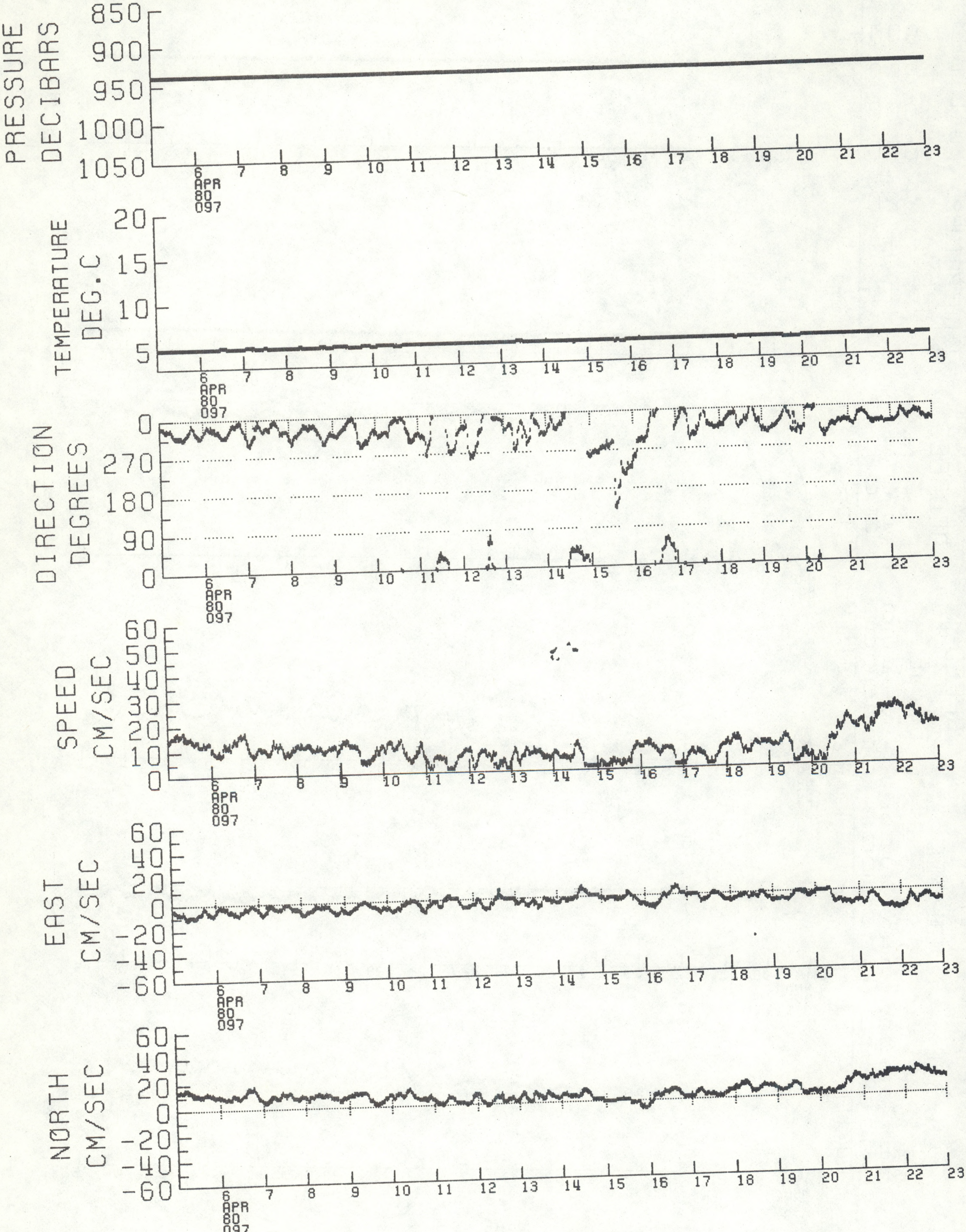

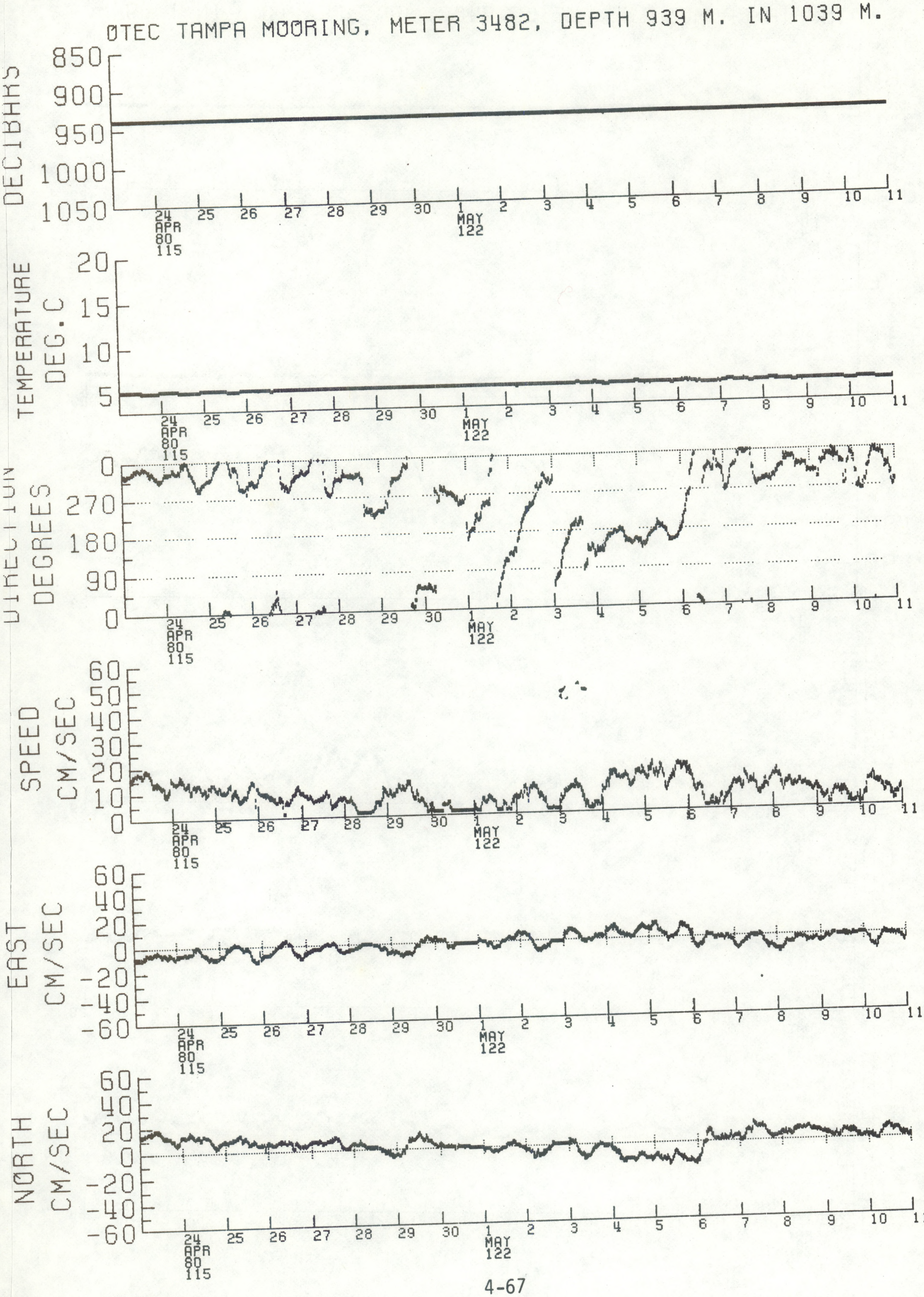
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DECIBARS
850
900
950
1000
1050
24 APR 80 115
25
26
27
28
29
30
1 MAY 122
2
3
4
5
6
7
8
9
10
11
TEMPERATURE DEG. C
20
15
10
5
DIRECTION DEGREES
0
270
180
90
0
SPEED CM/SEC
60
50
40
30
20
10
0
EAST CM/SEC
60
40
20
0
-20
-40
-60
NØRTH CM/SEC
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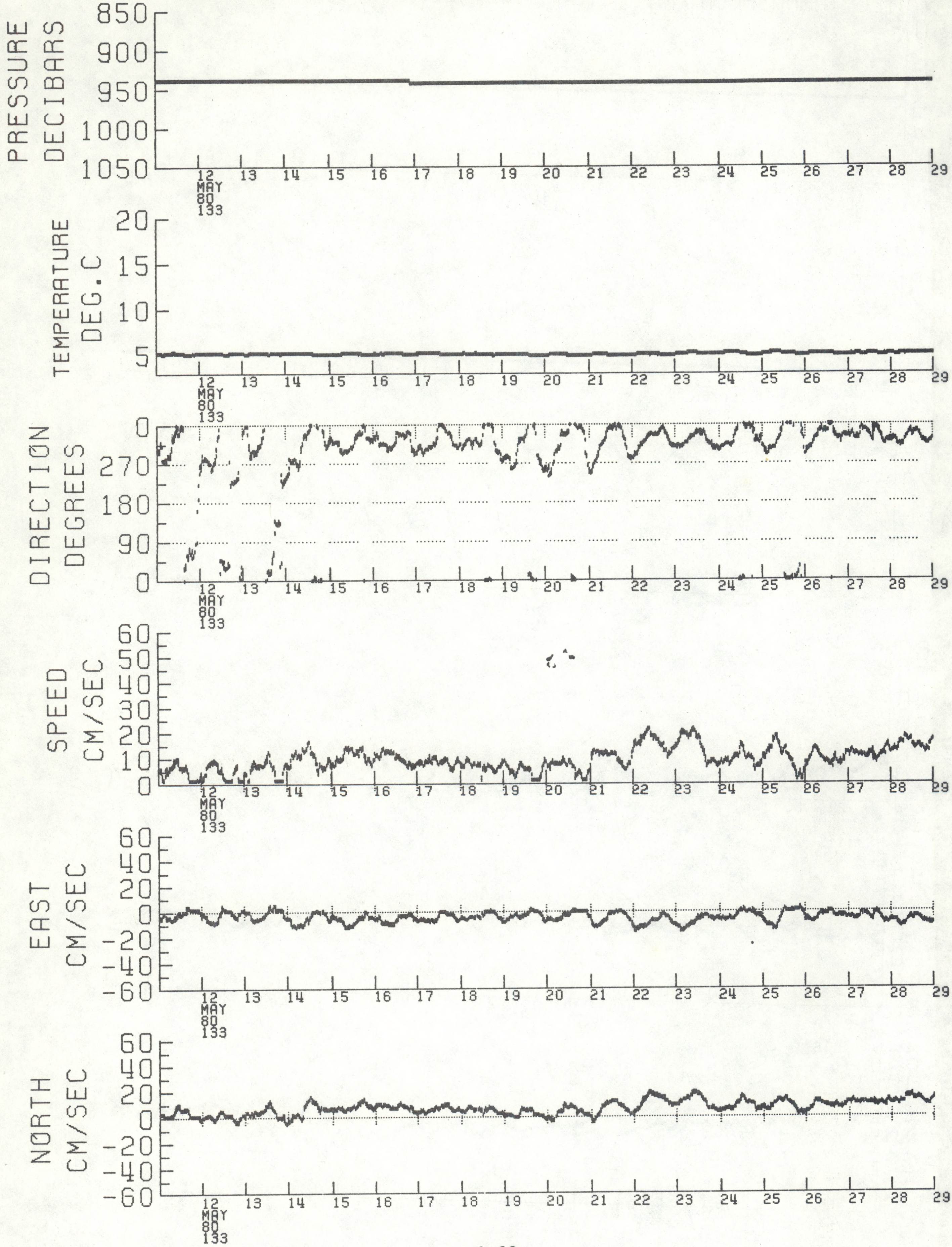
20
0
-20
-40
-60

OTEC TAMPA MOORING, METER 3482, DEPTH 939 M. IN 1039 M.



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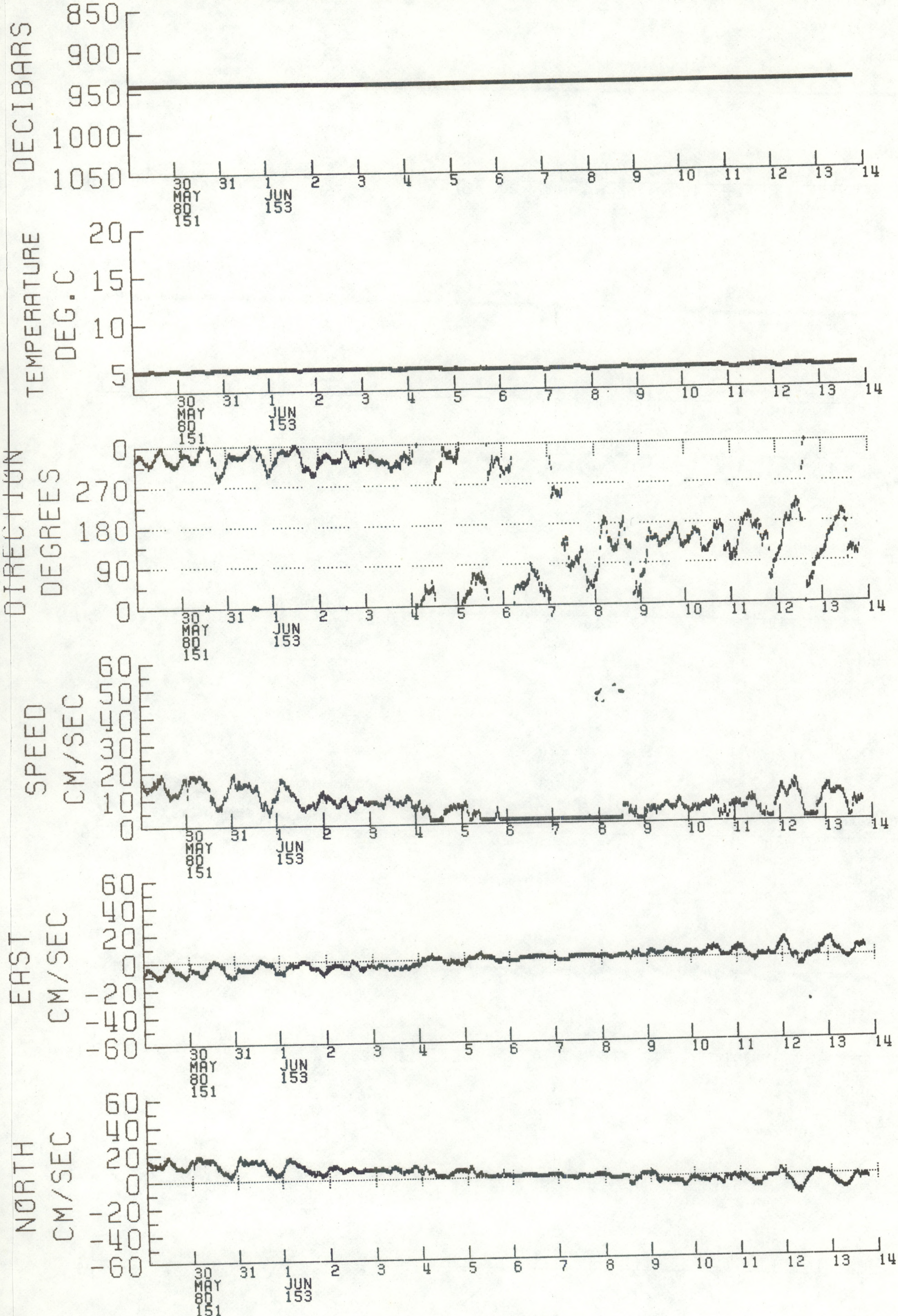

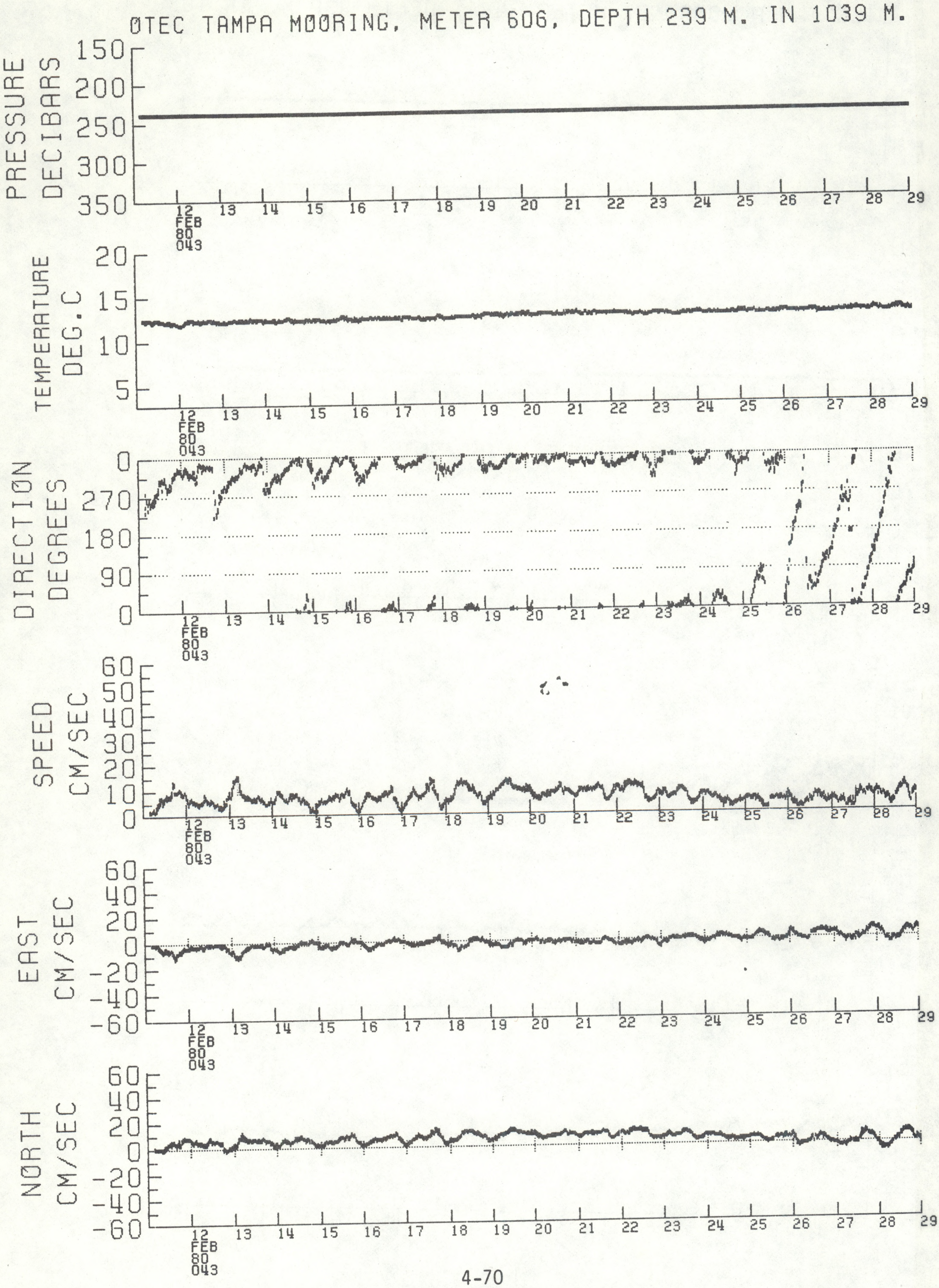
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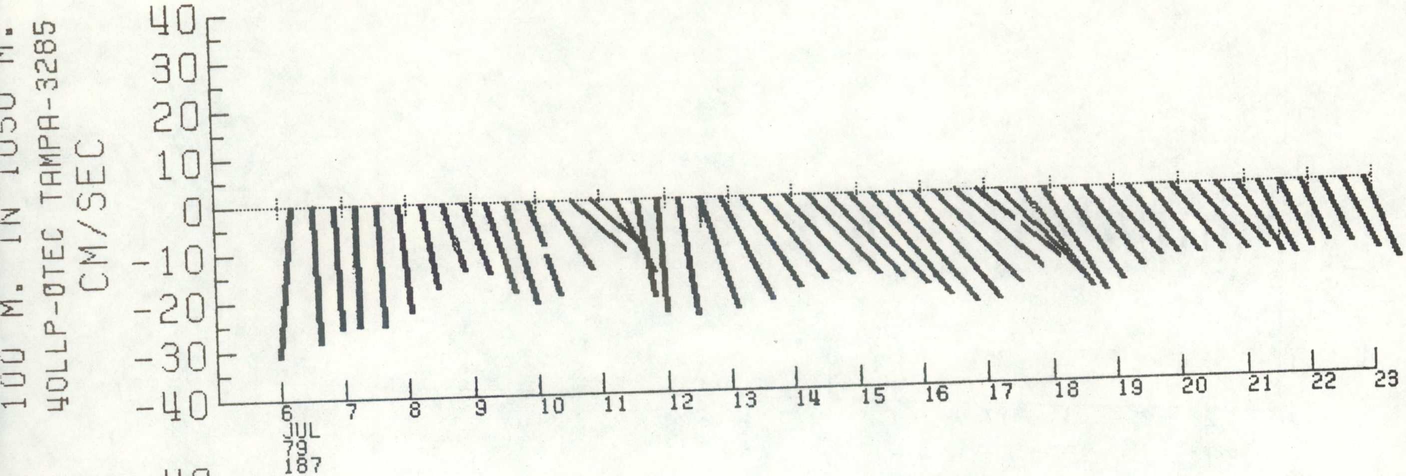
TEMPERATURE DEG.C
DIRECTIØN DEGREES
SPEED CM/SEC
EAST CM/SEC
NØRTH CM/SEC
12 FEB 80 043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CM/SEC
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-10
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JUL
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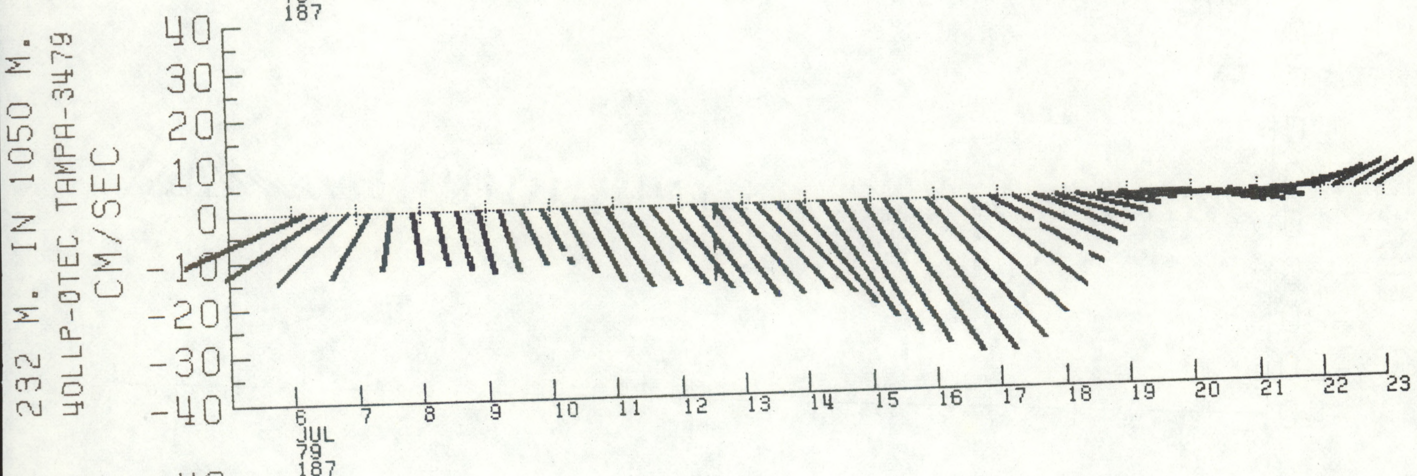
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4OLLP-ØTEC TAMPA-3479
CM/SEC
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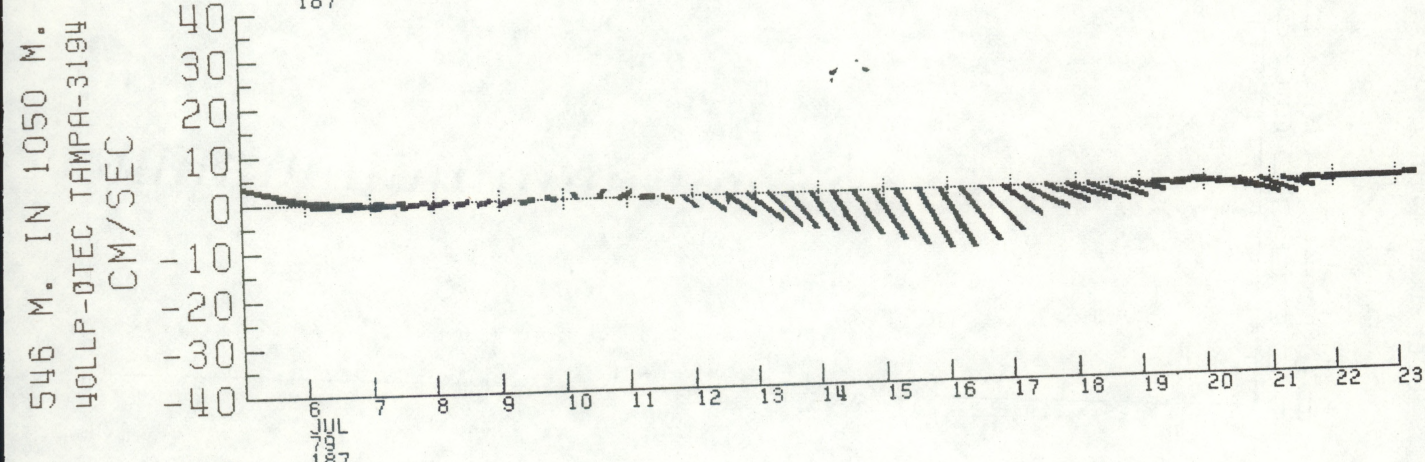
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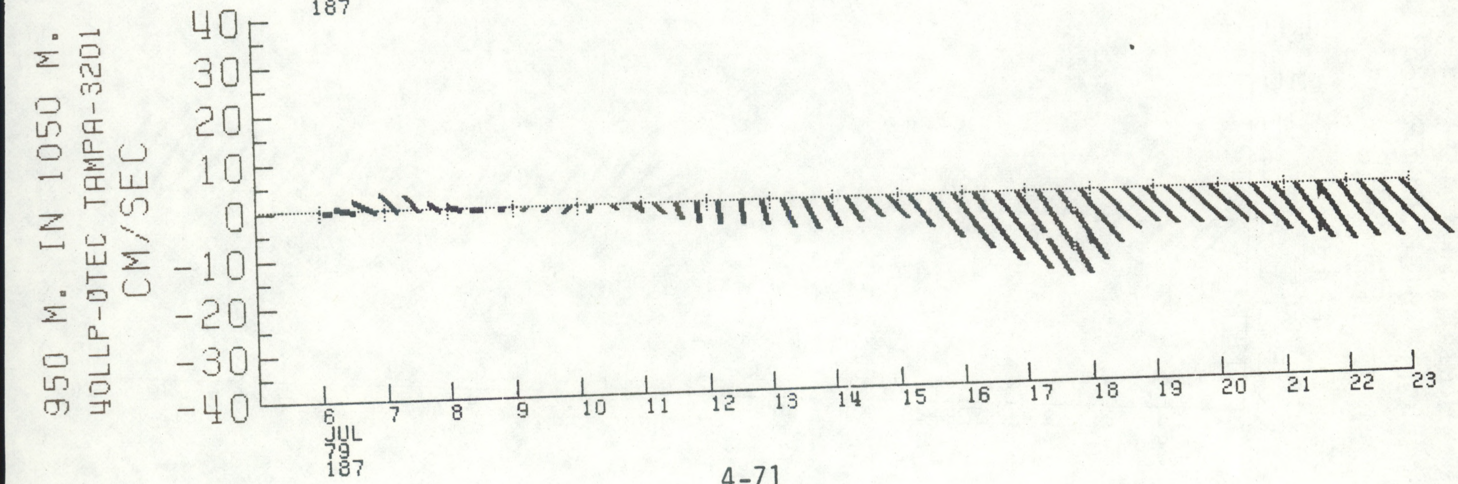
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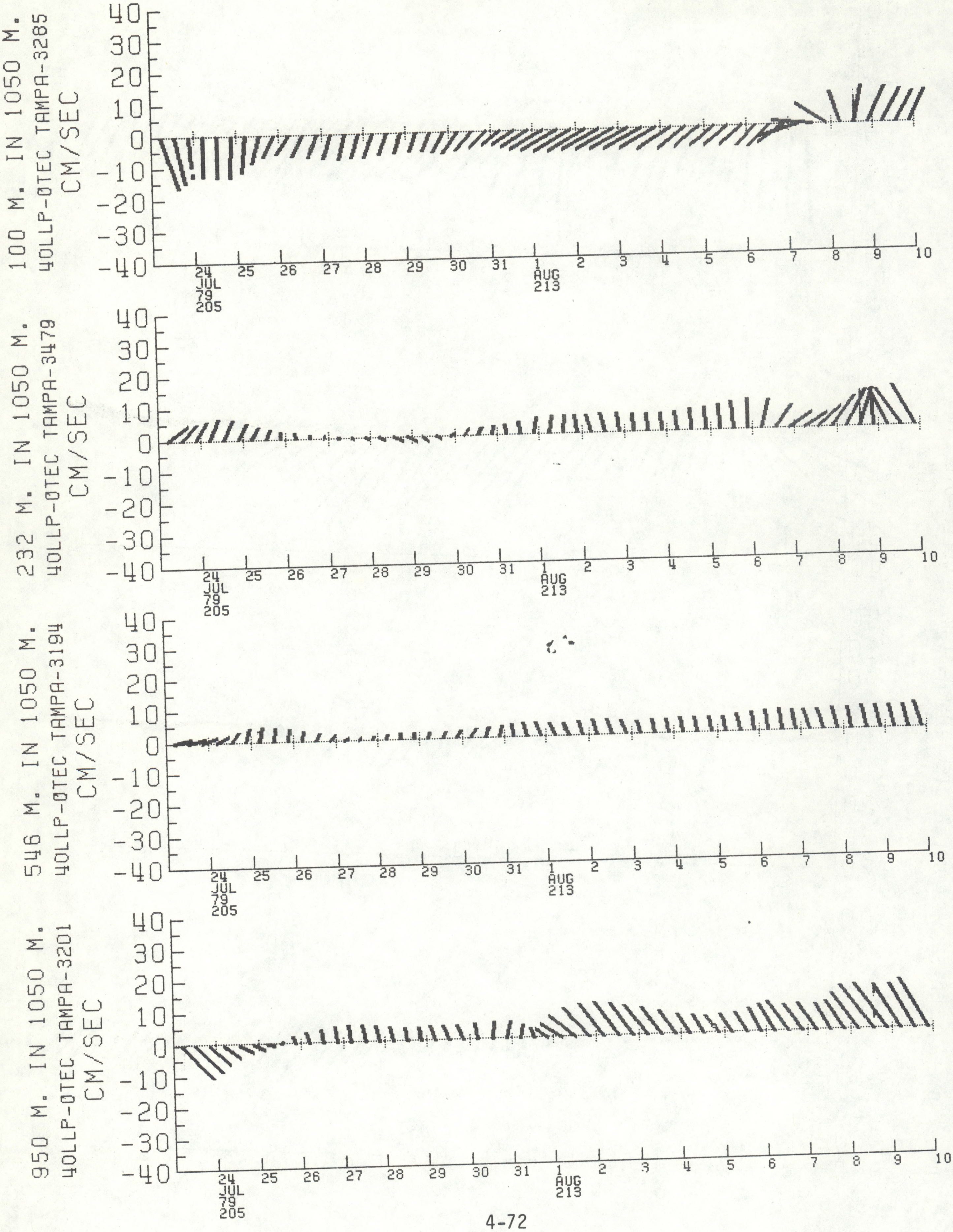
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CM/SEC
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CM/SEC
546 M. IN 1050 M.
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CM/SEC
24 JUL 79 205
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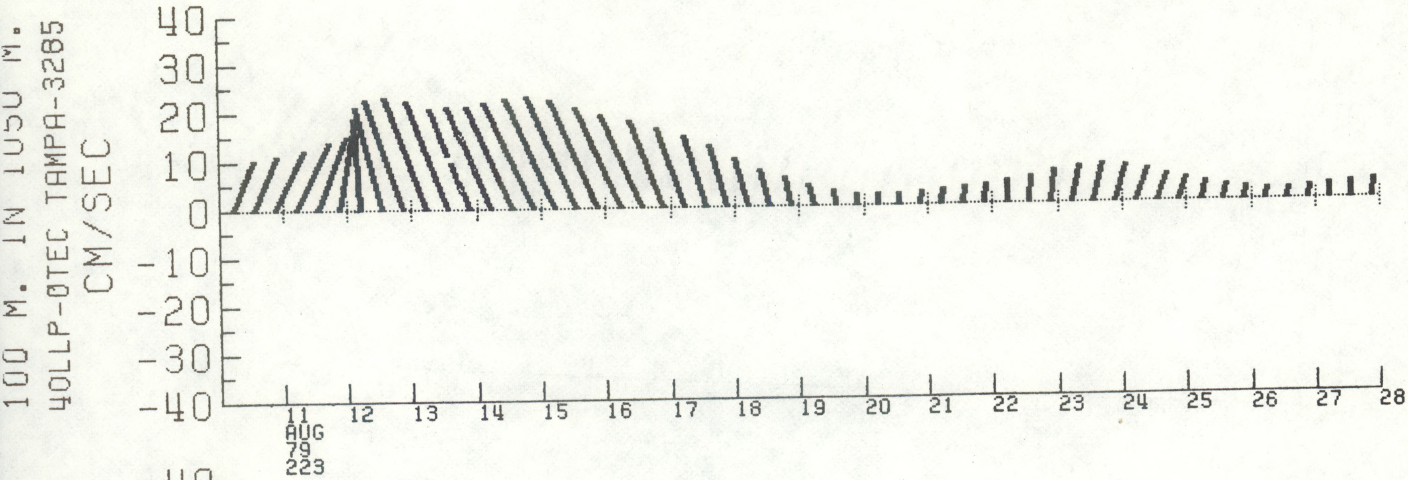
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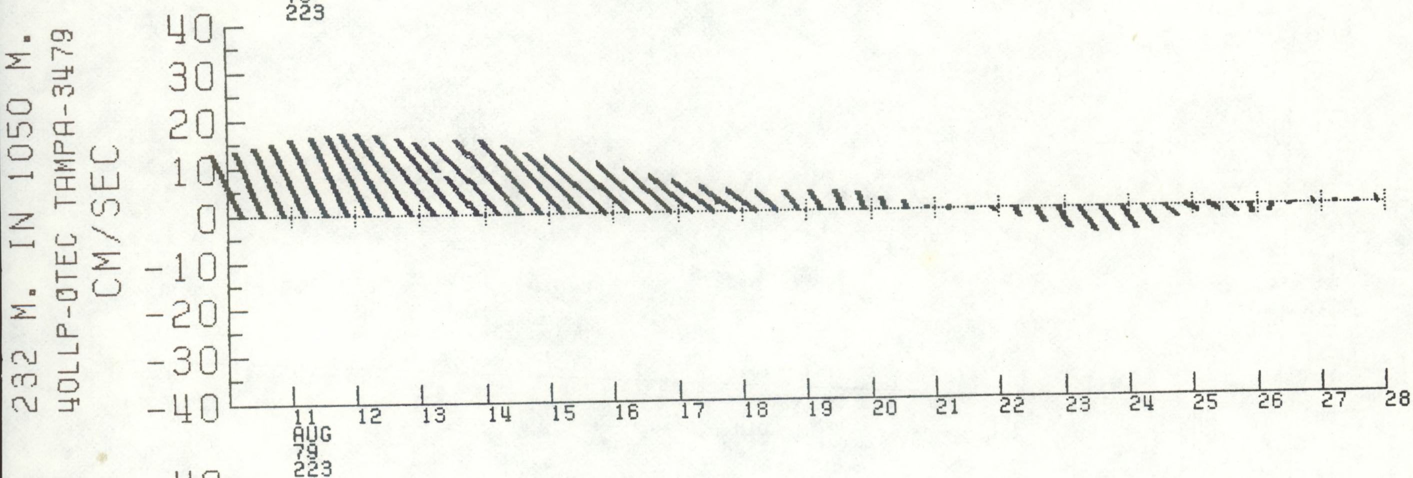
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CM/SEC
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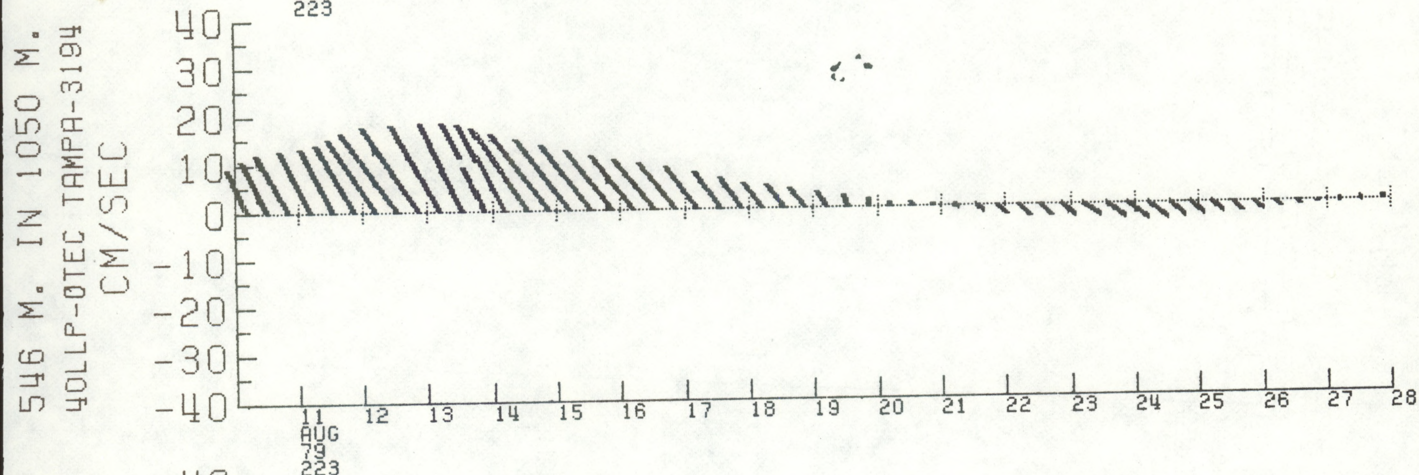
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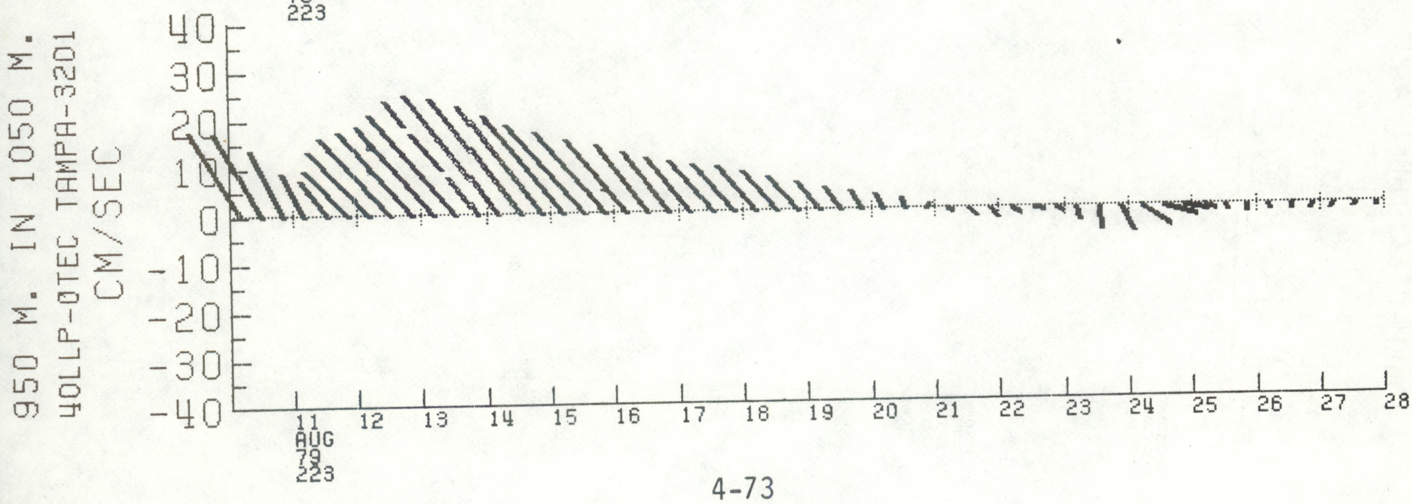
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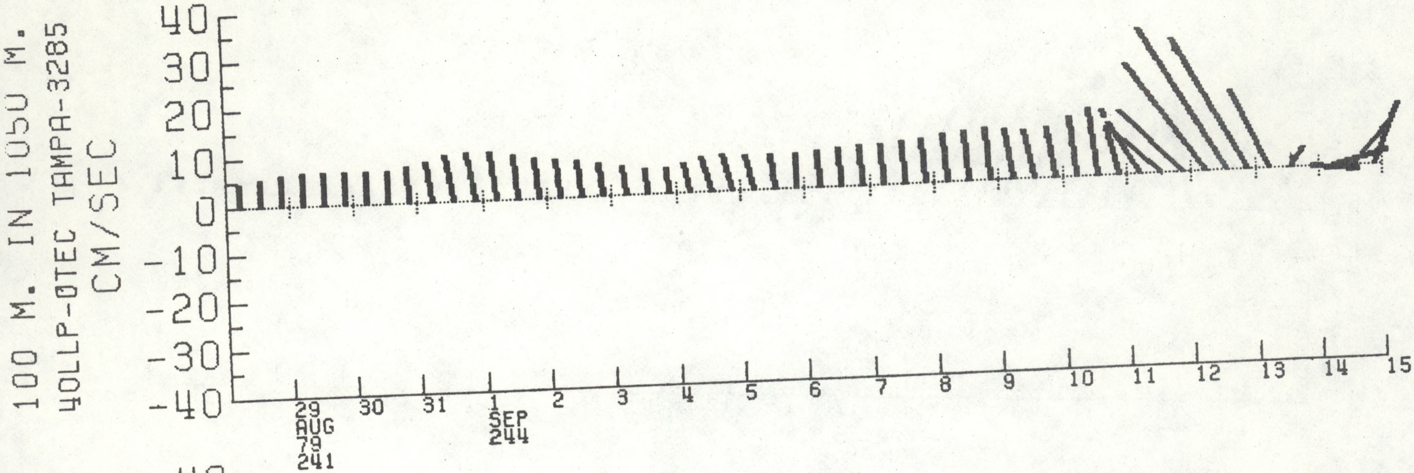
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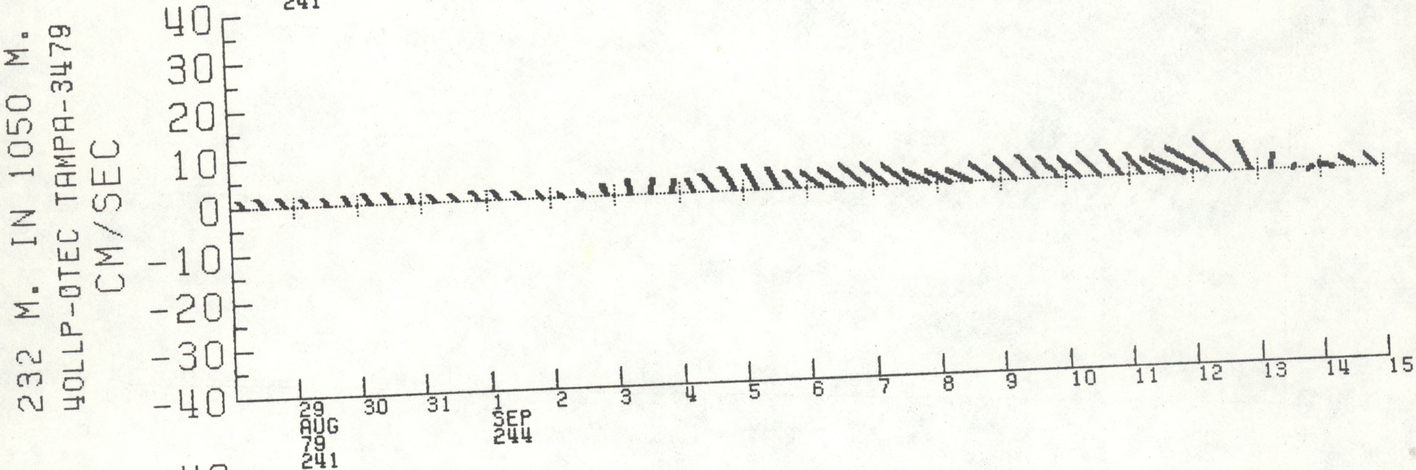
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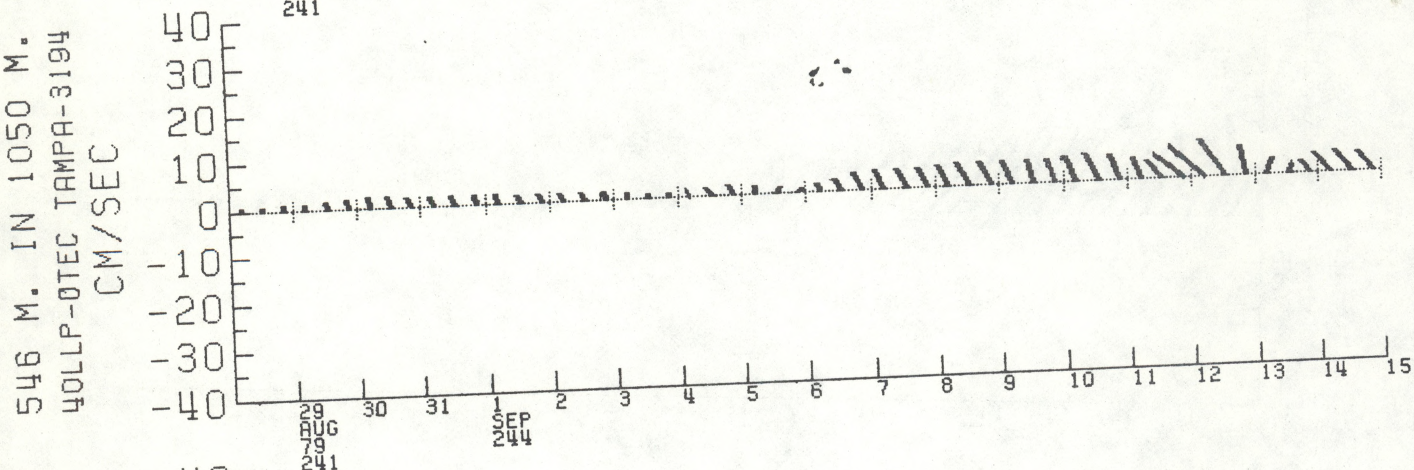
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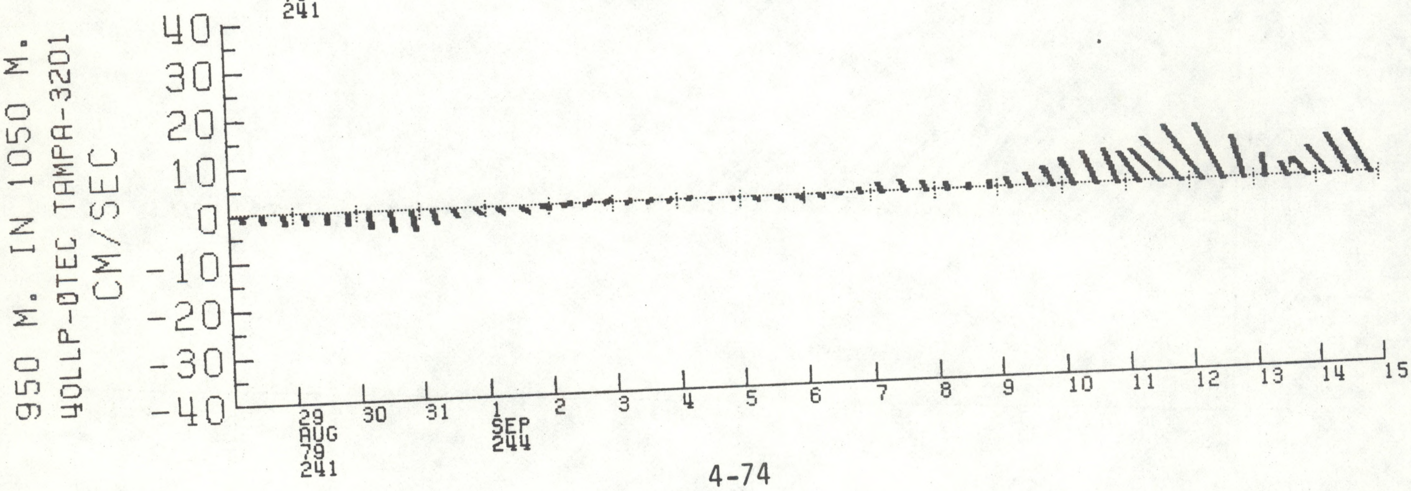
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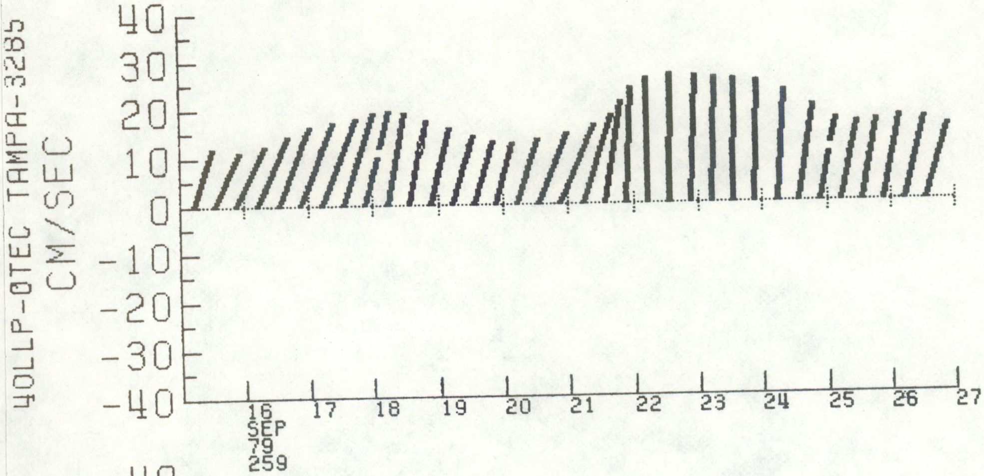
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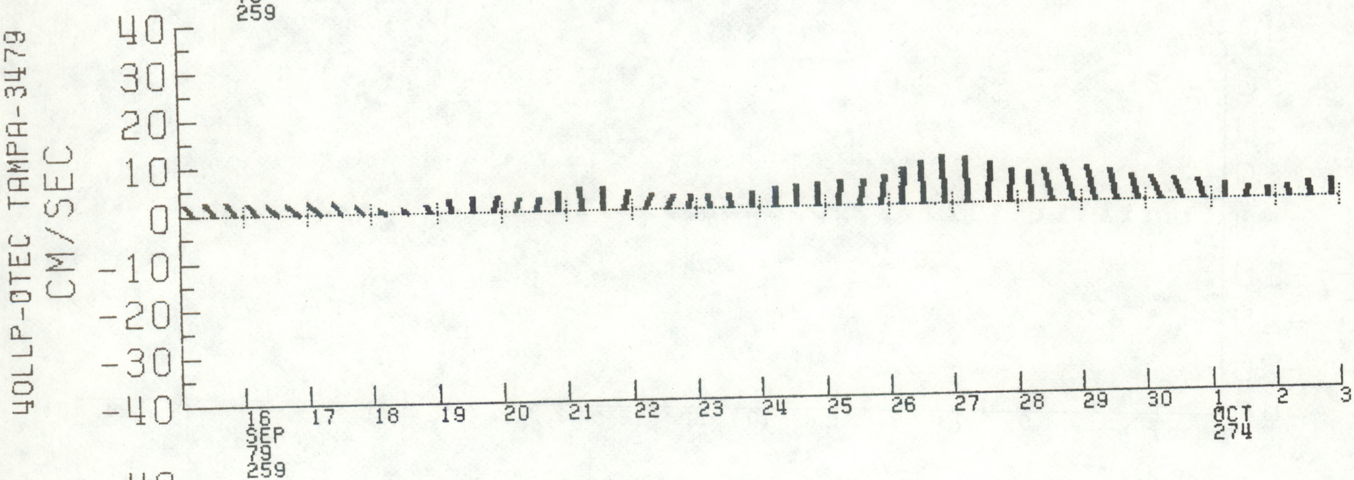
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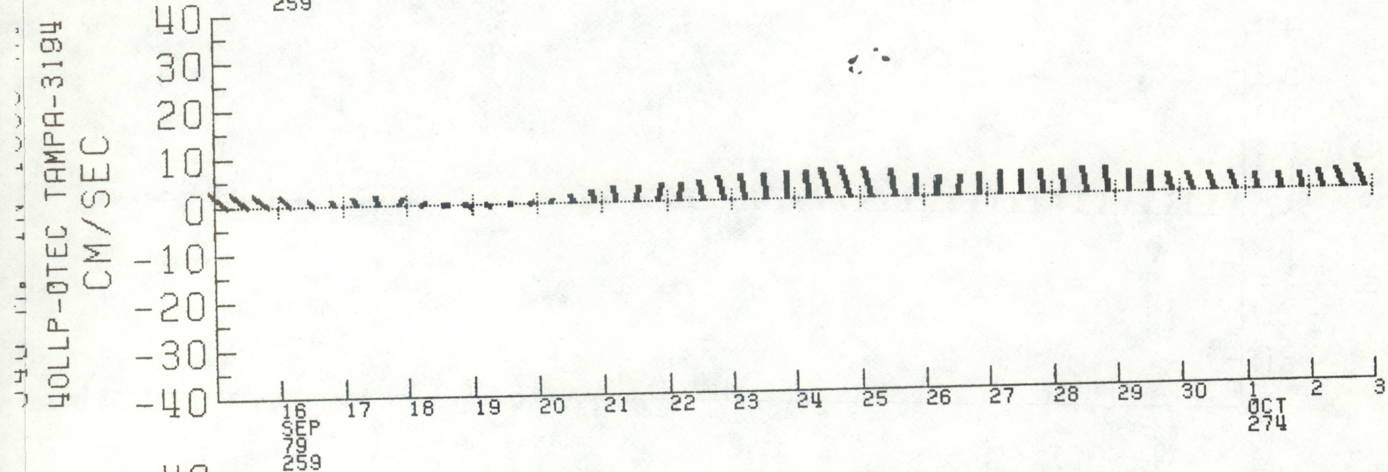
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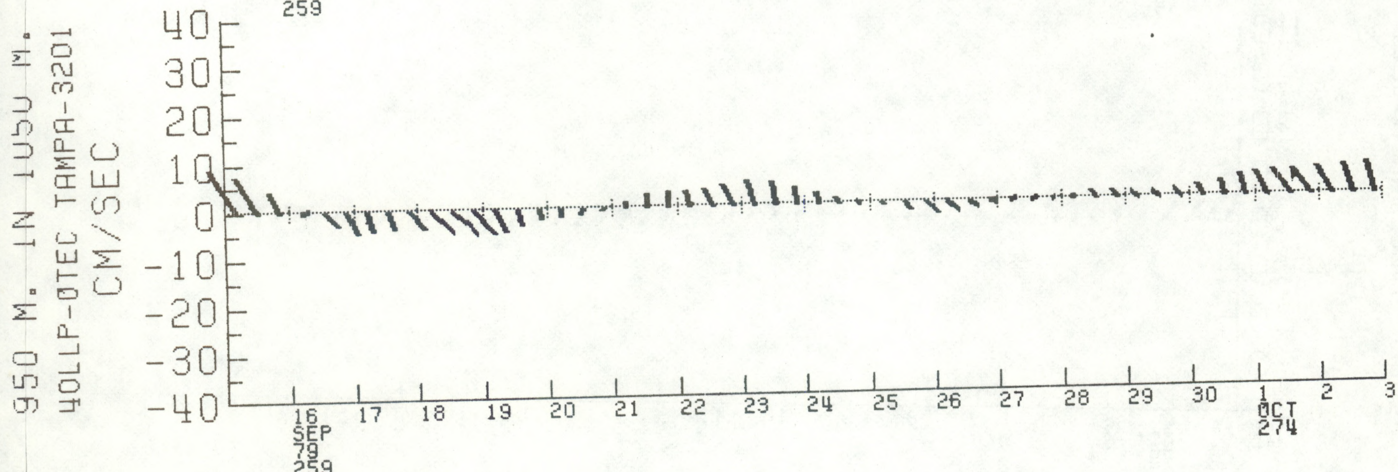
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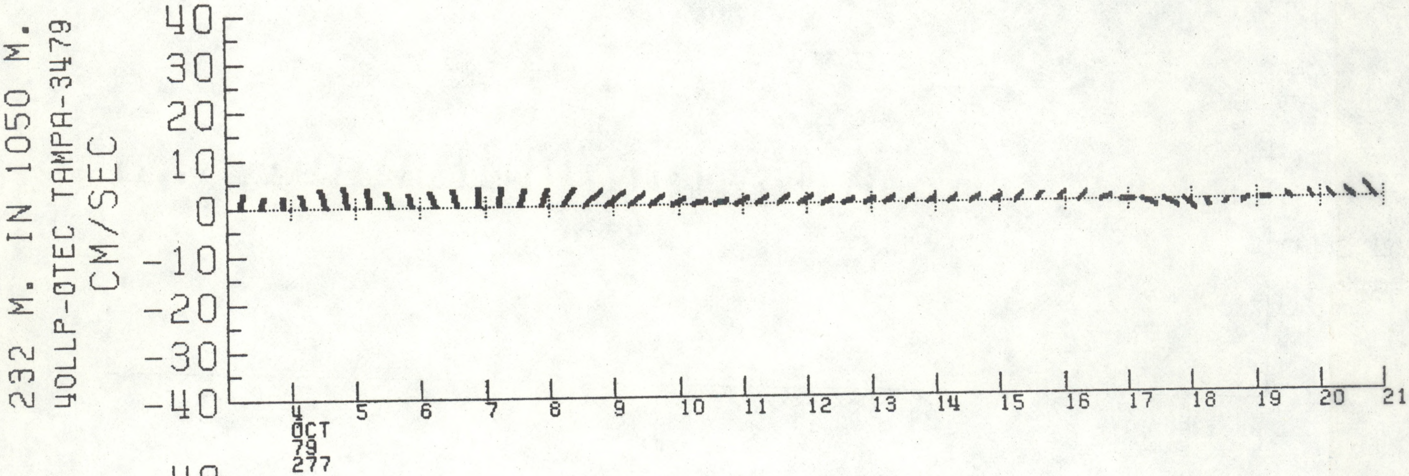
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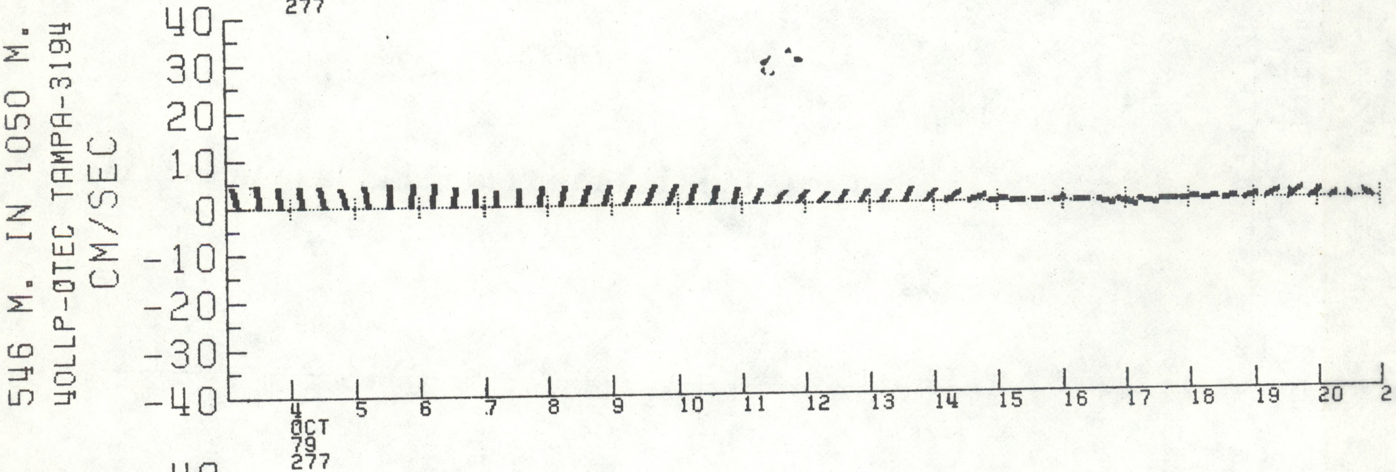
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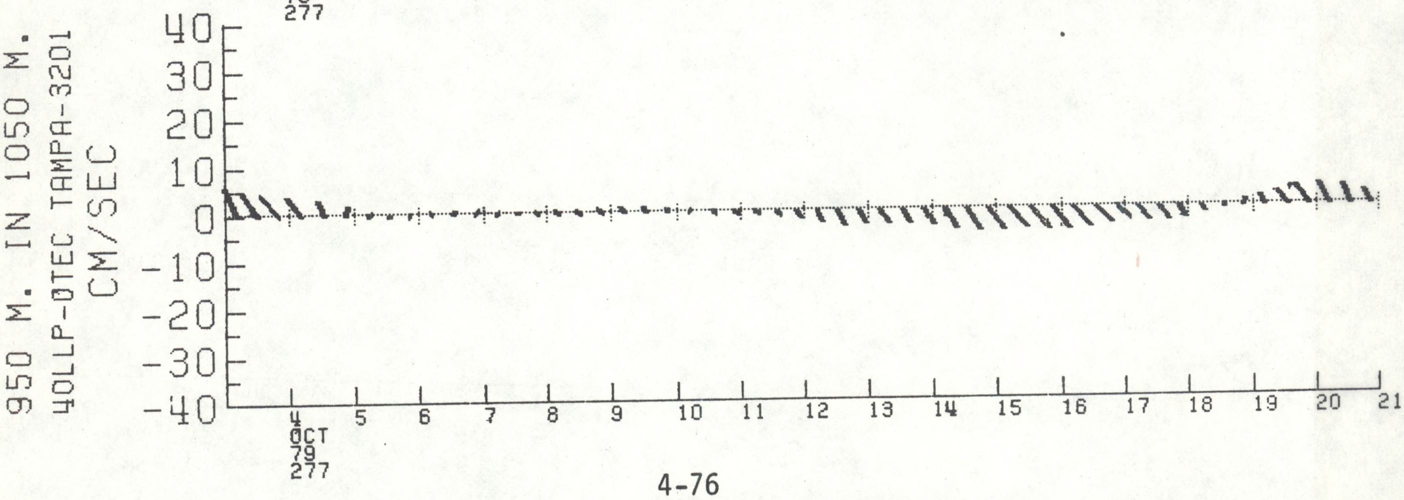
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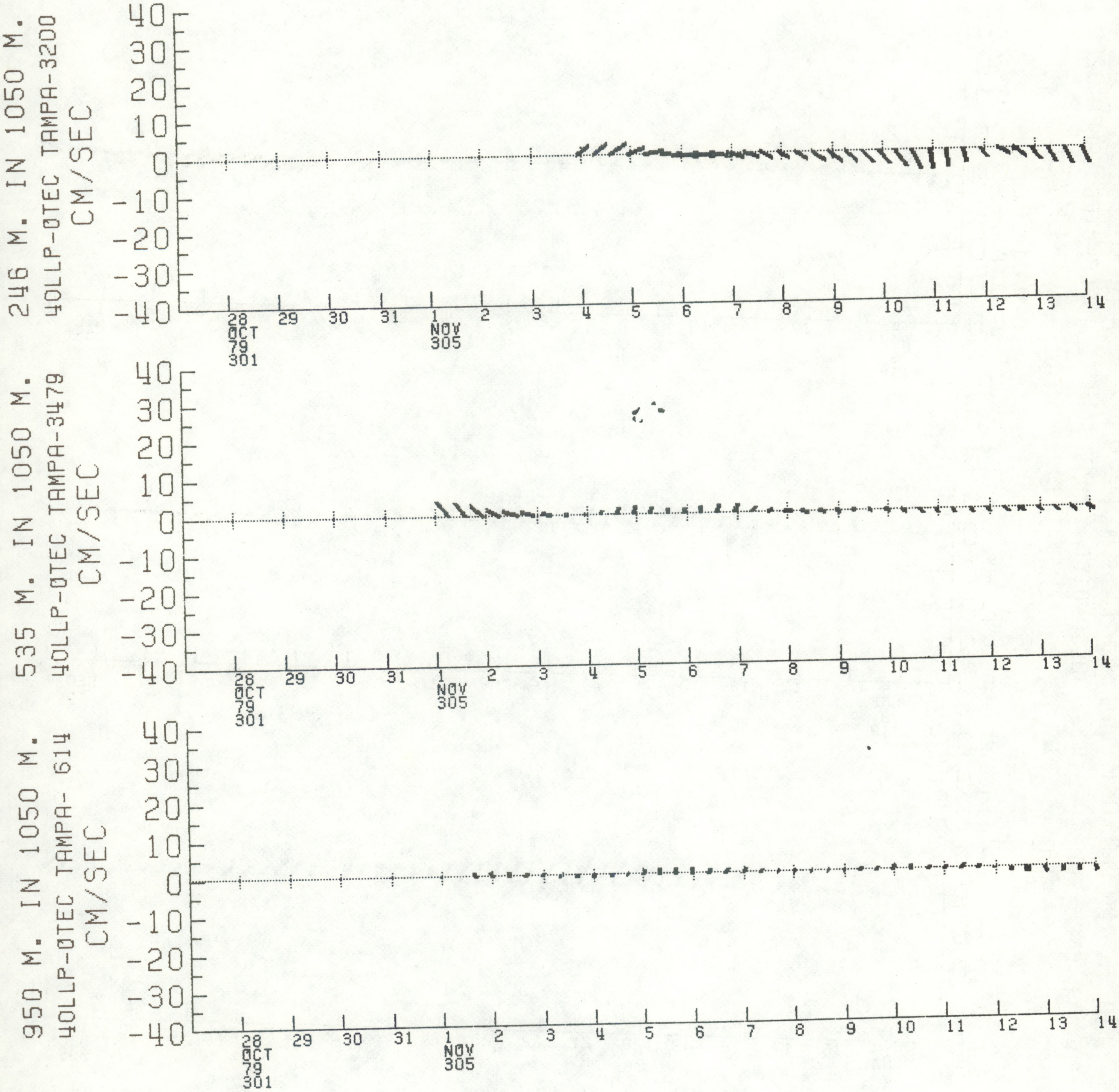
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CM/SEC
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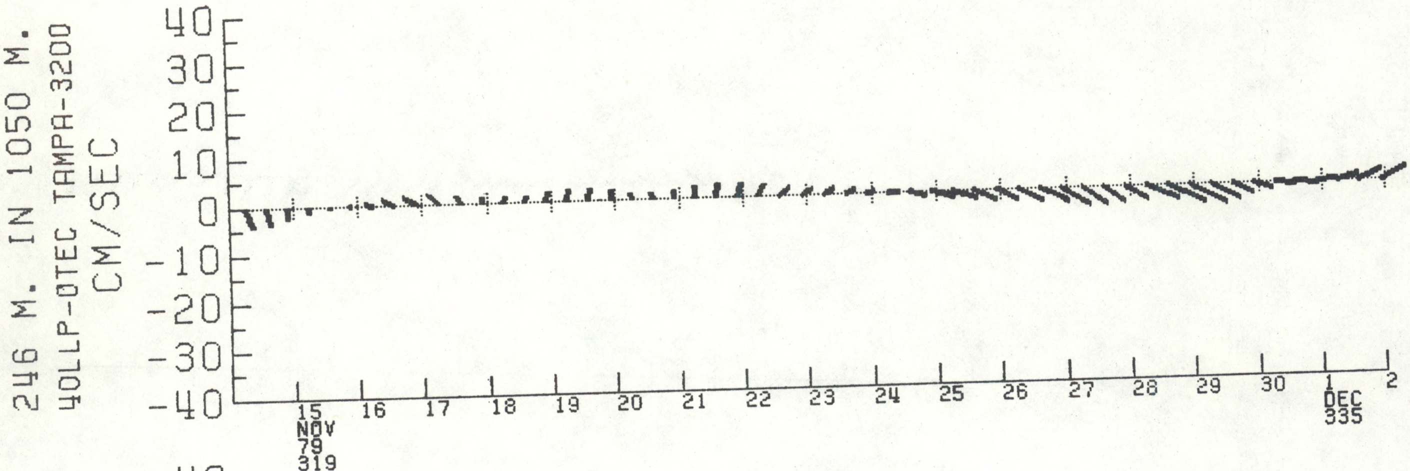
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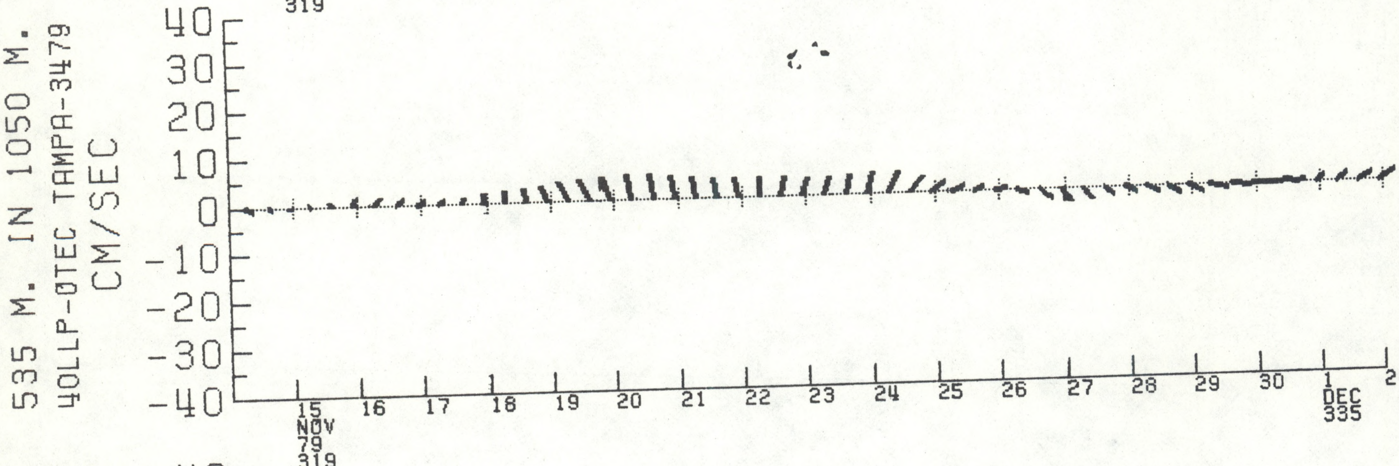
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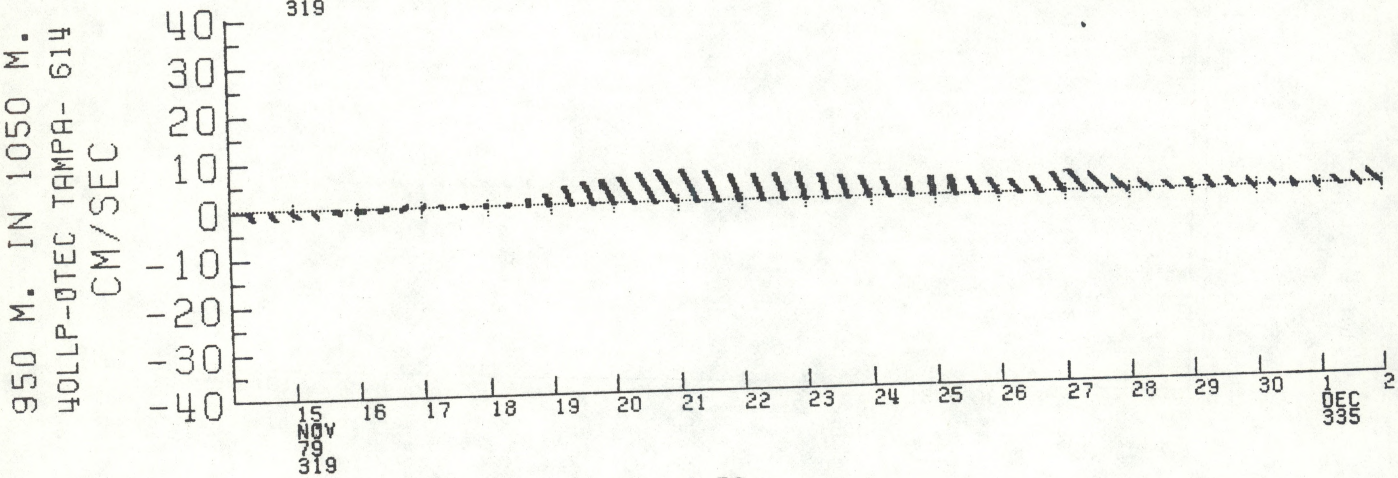
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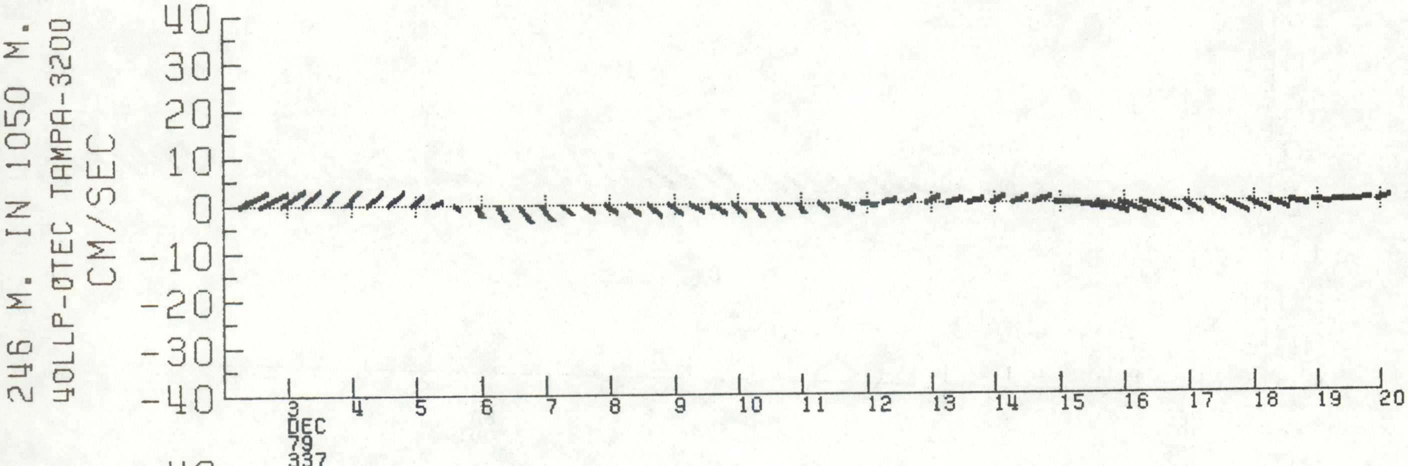
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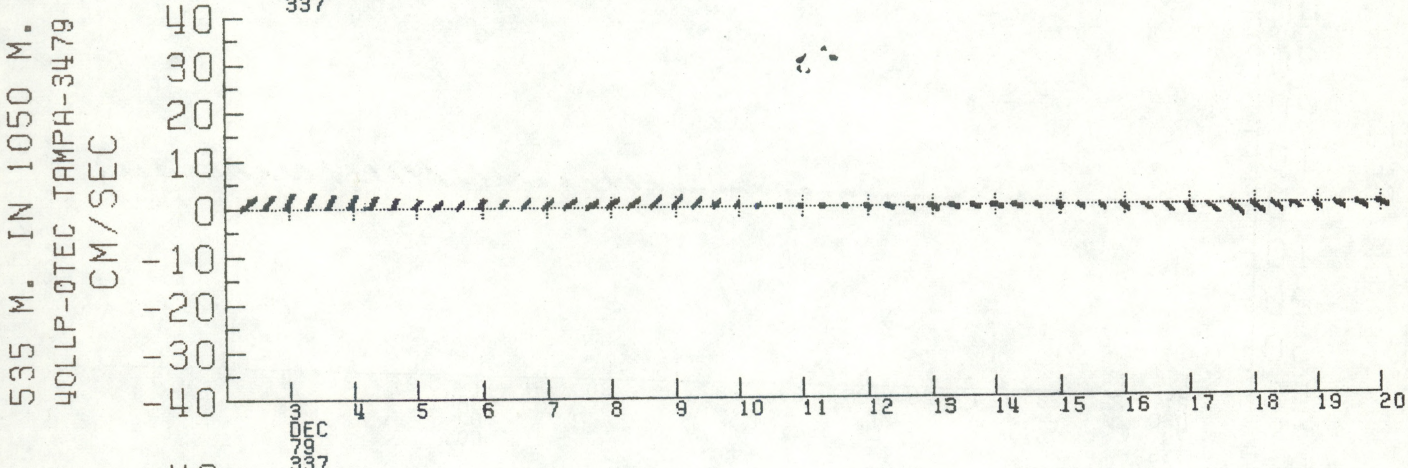
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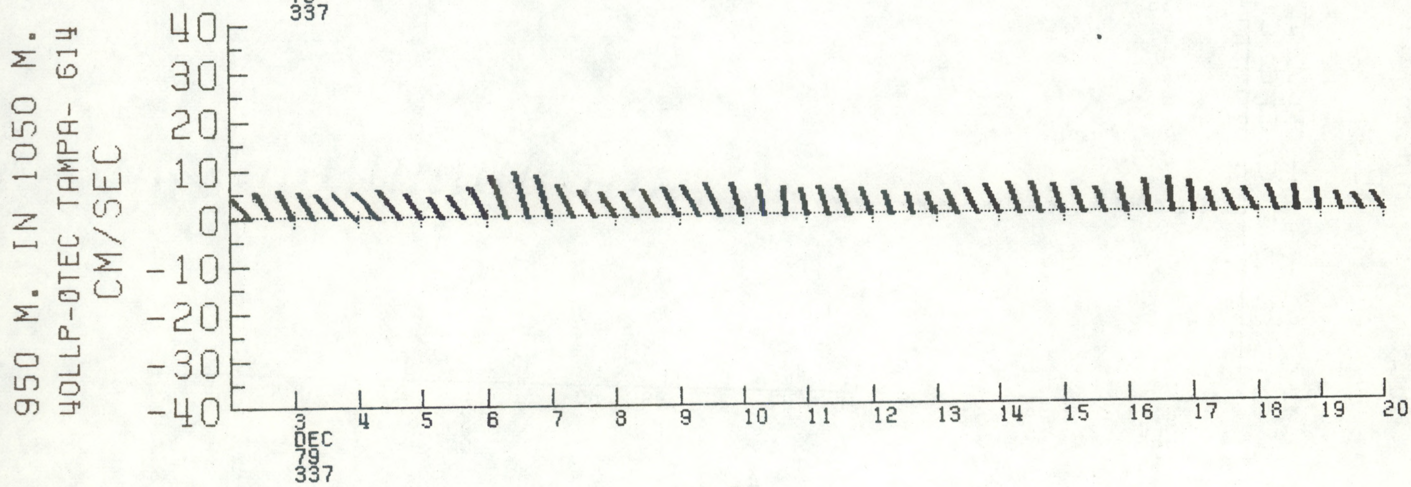
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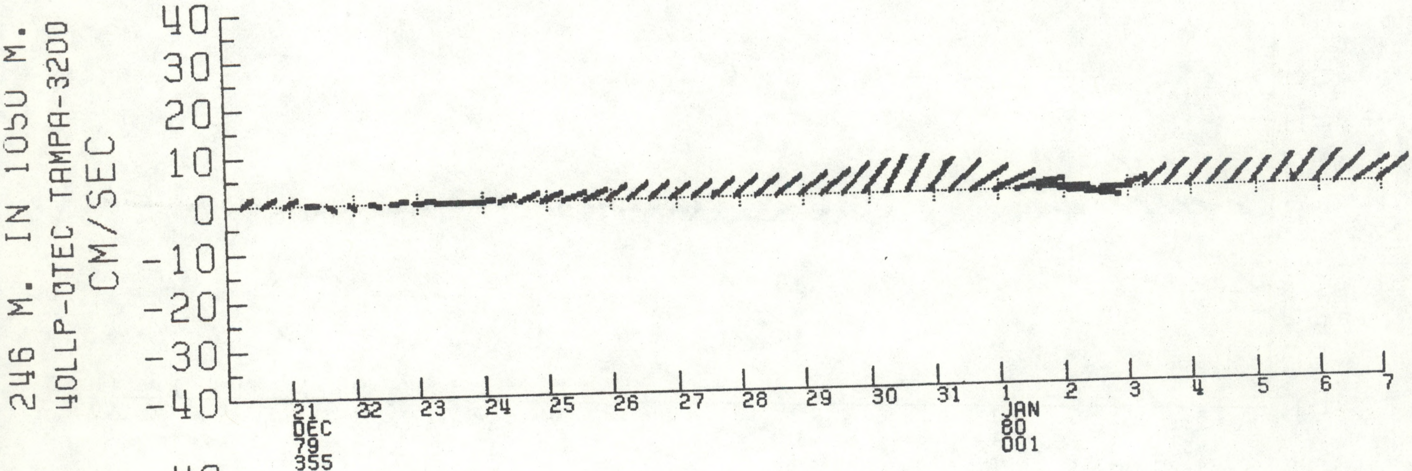
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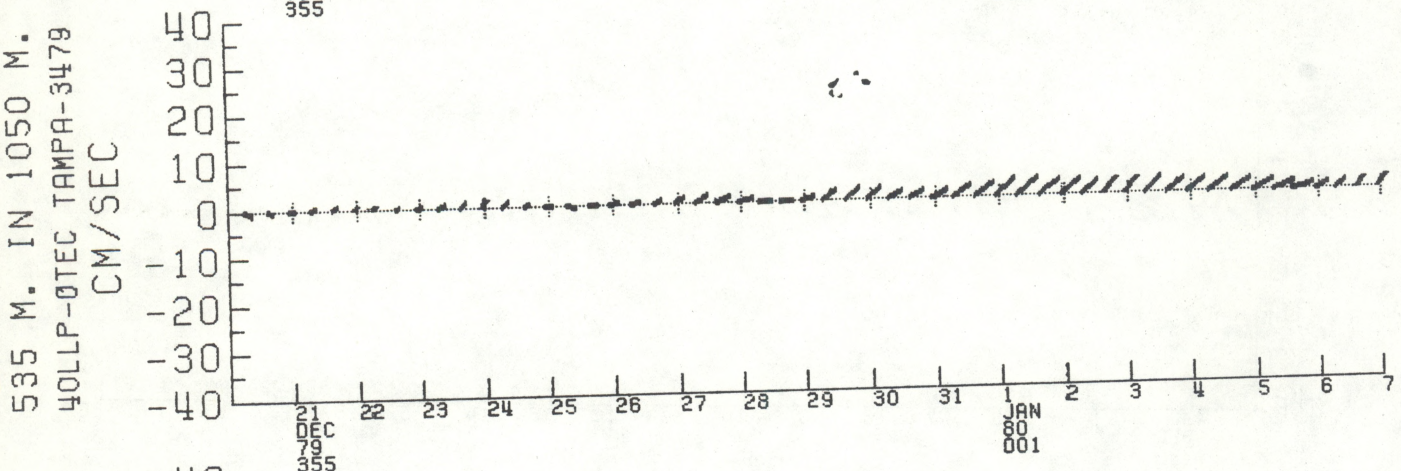
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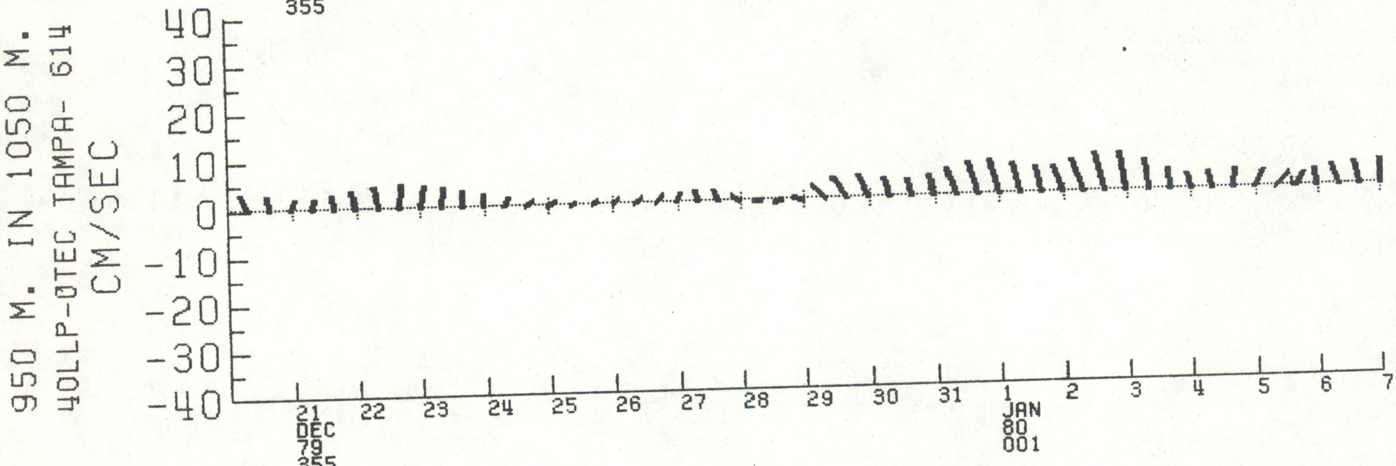
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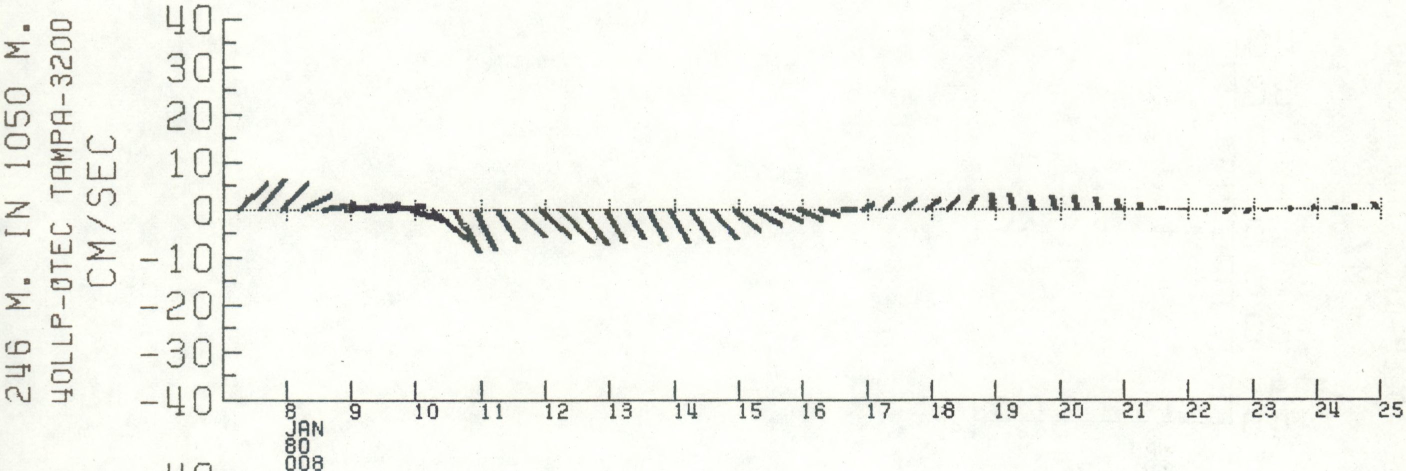
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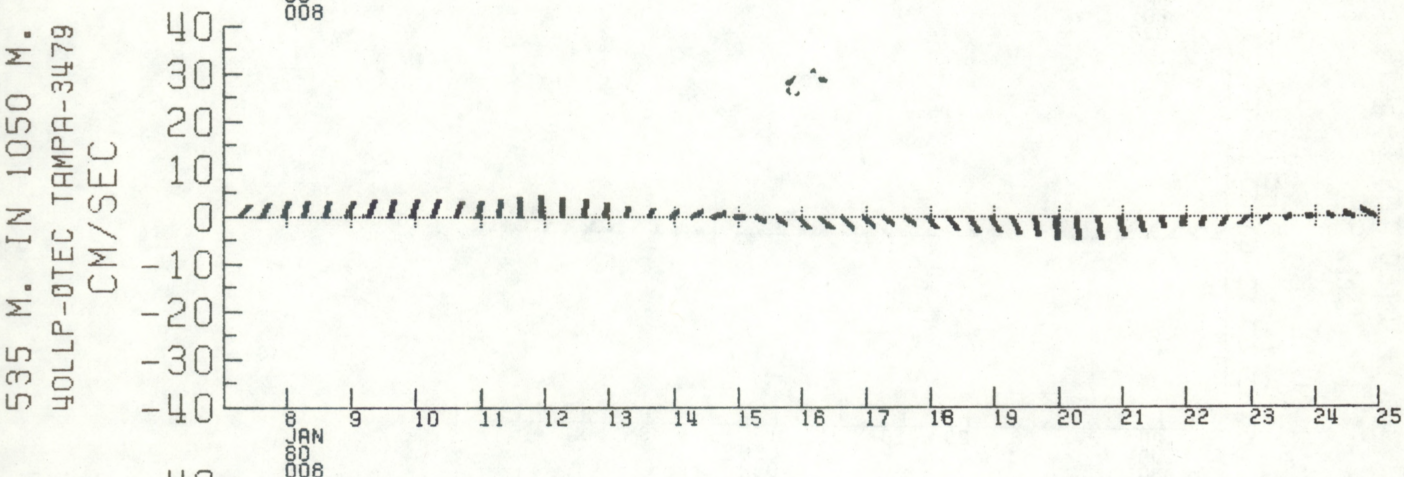
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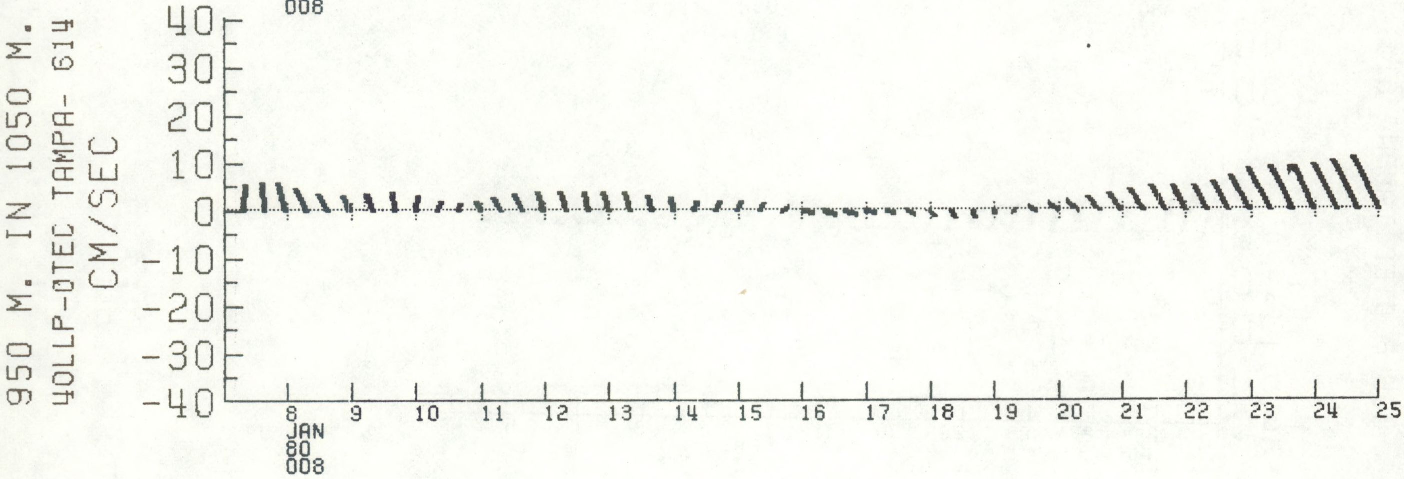
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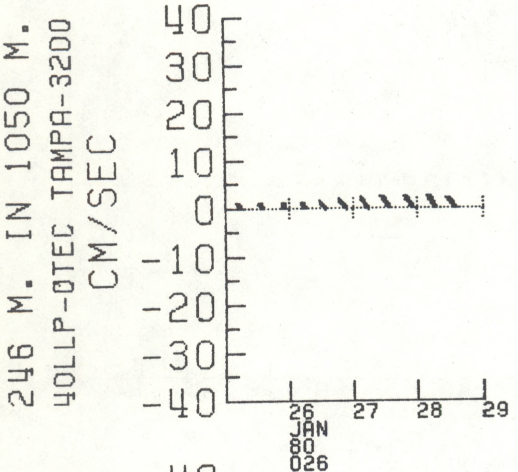
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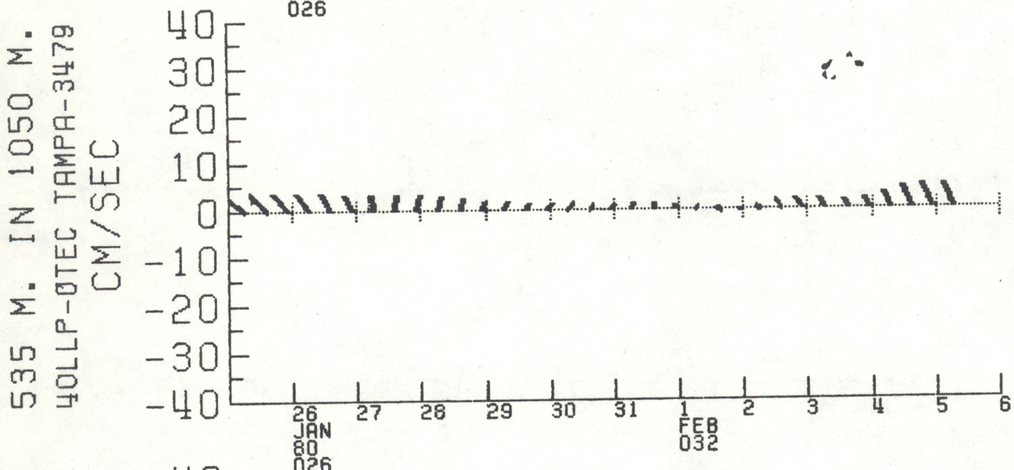
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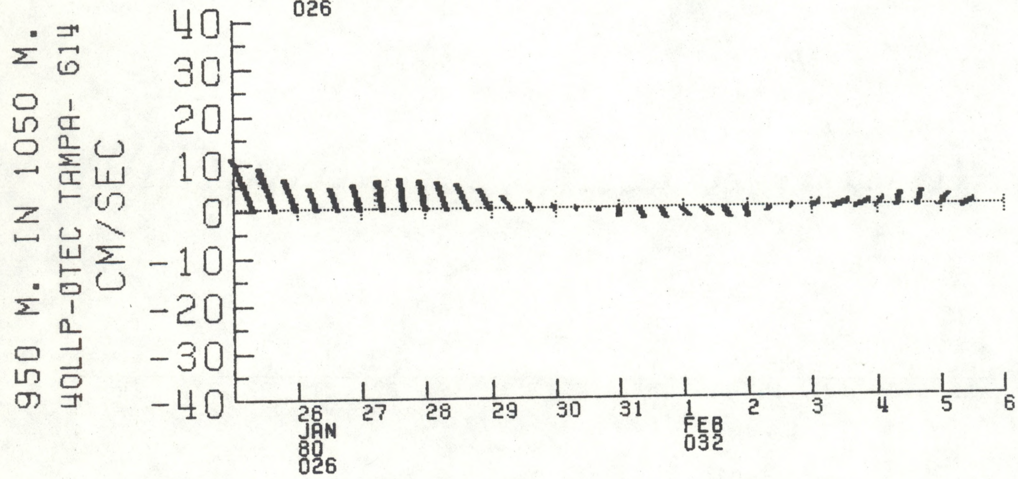
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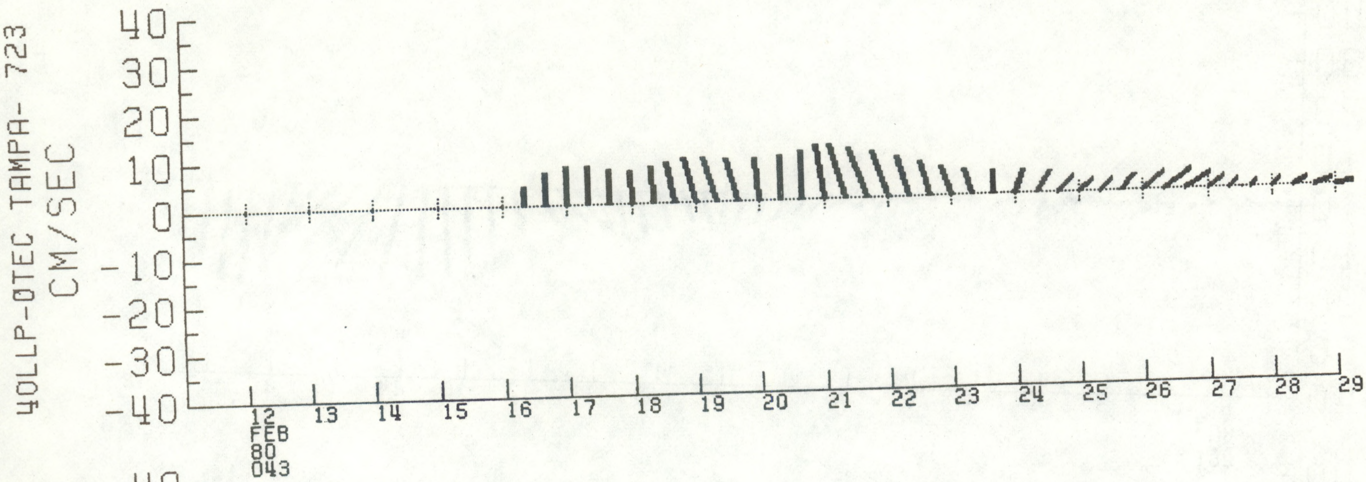
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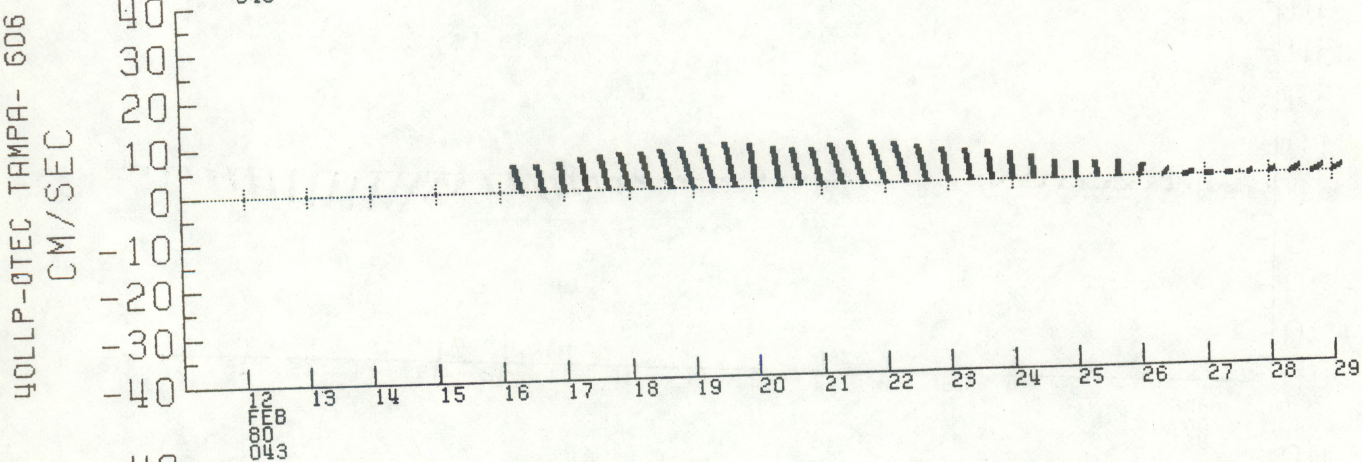
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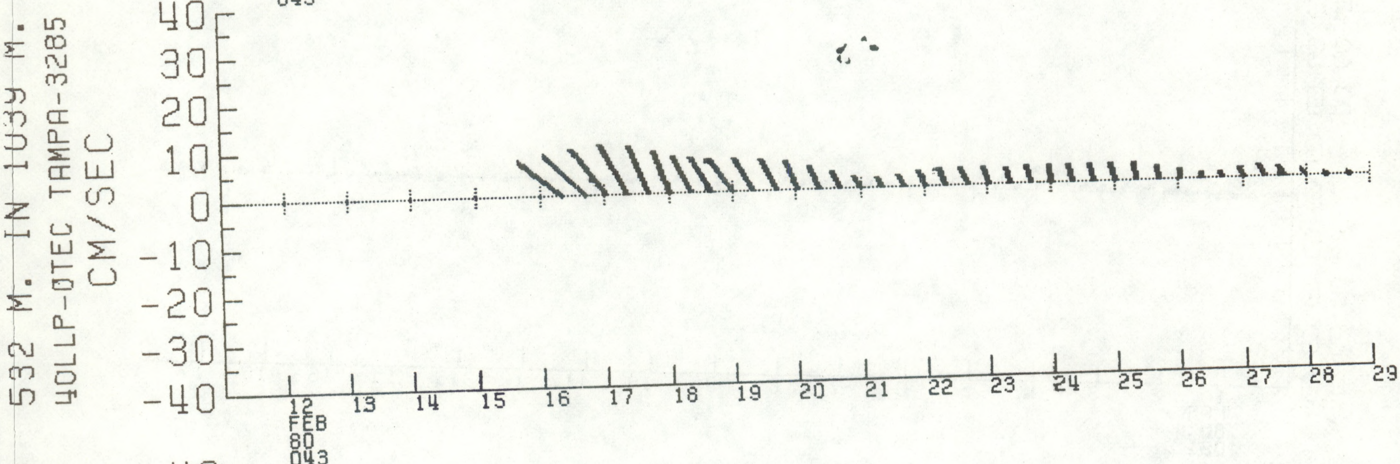
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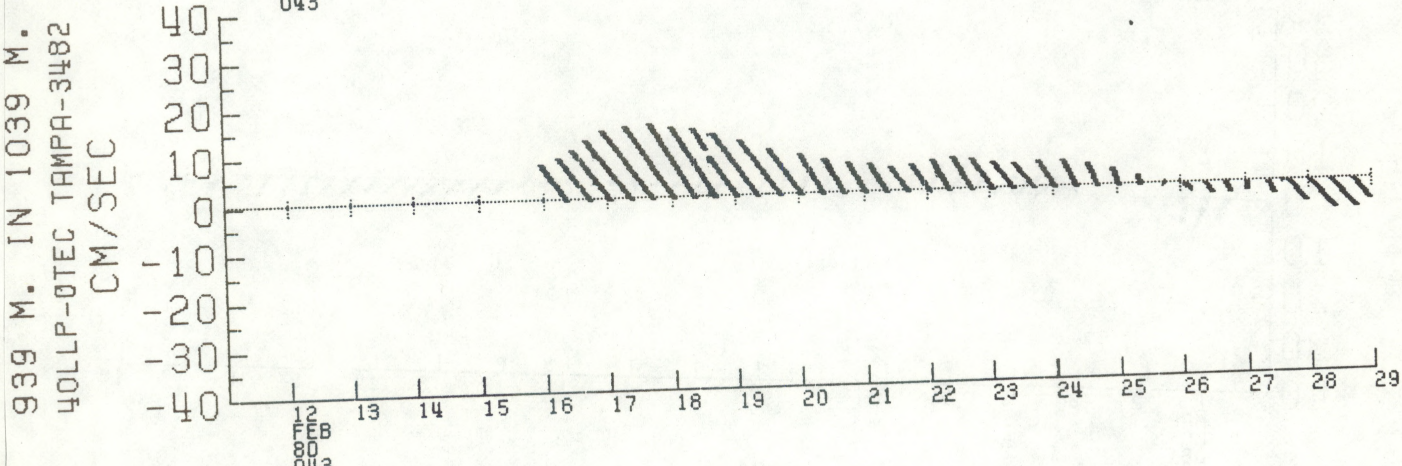
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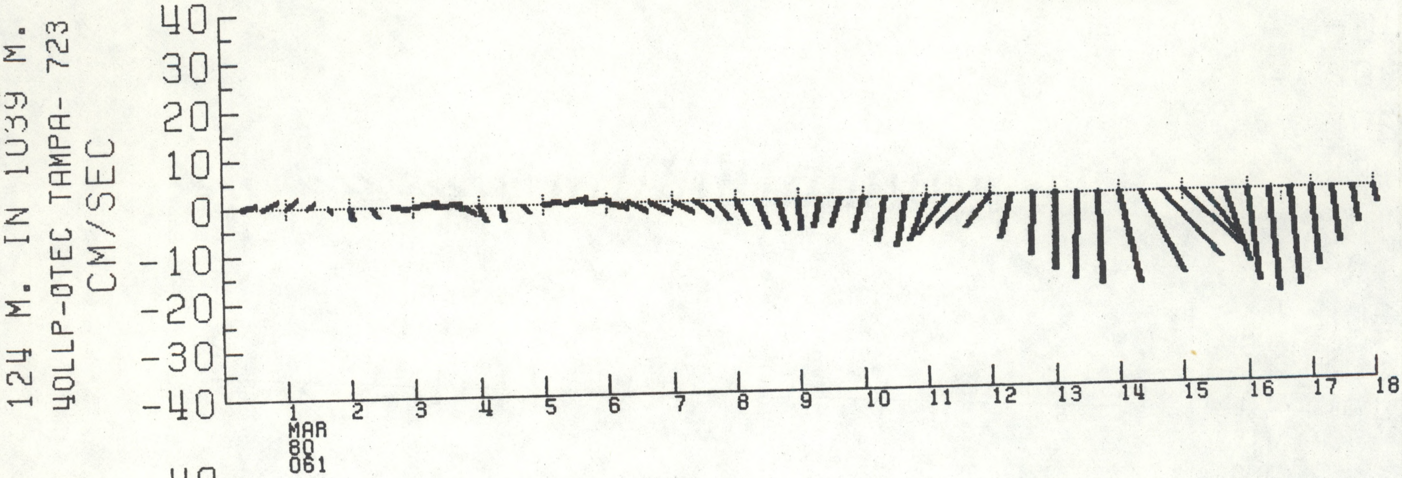
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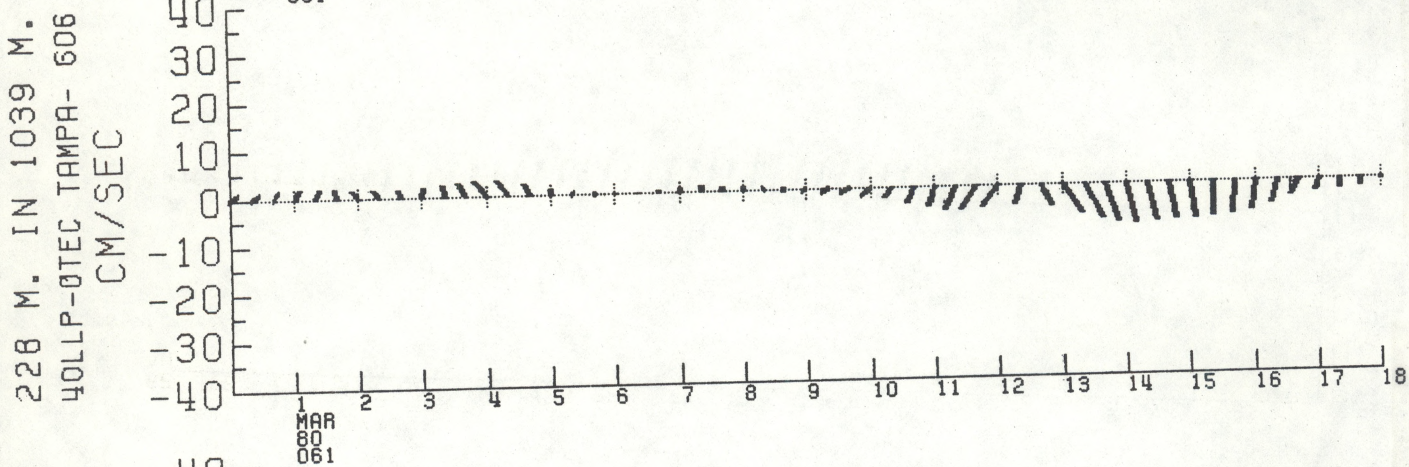
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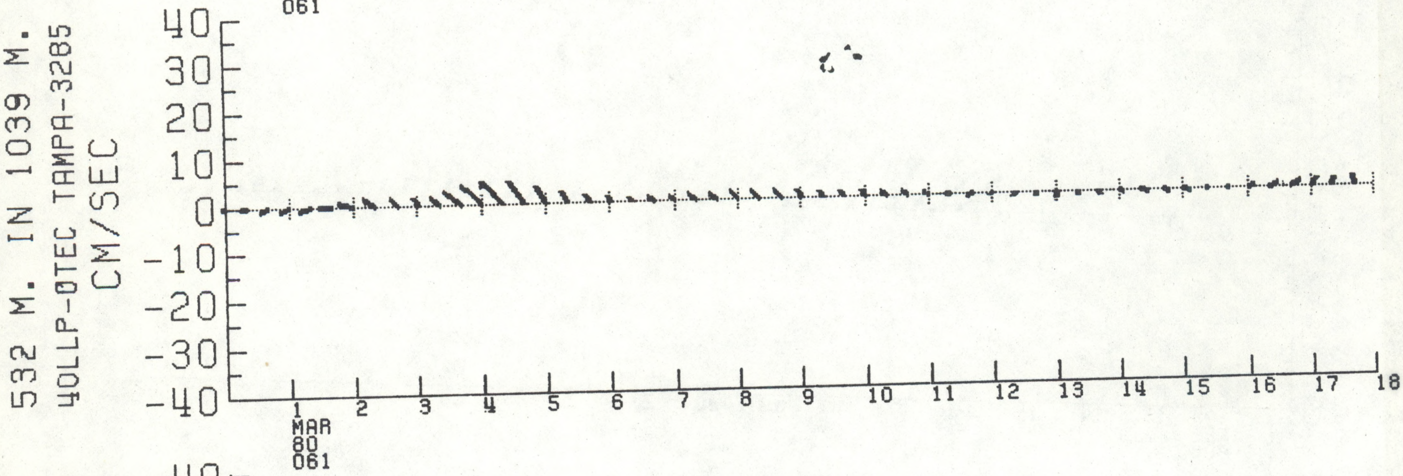
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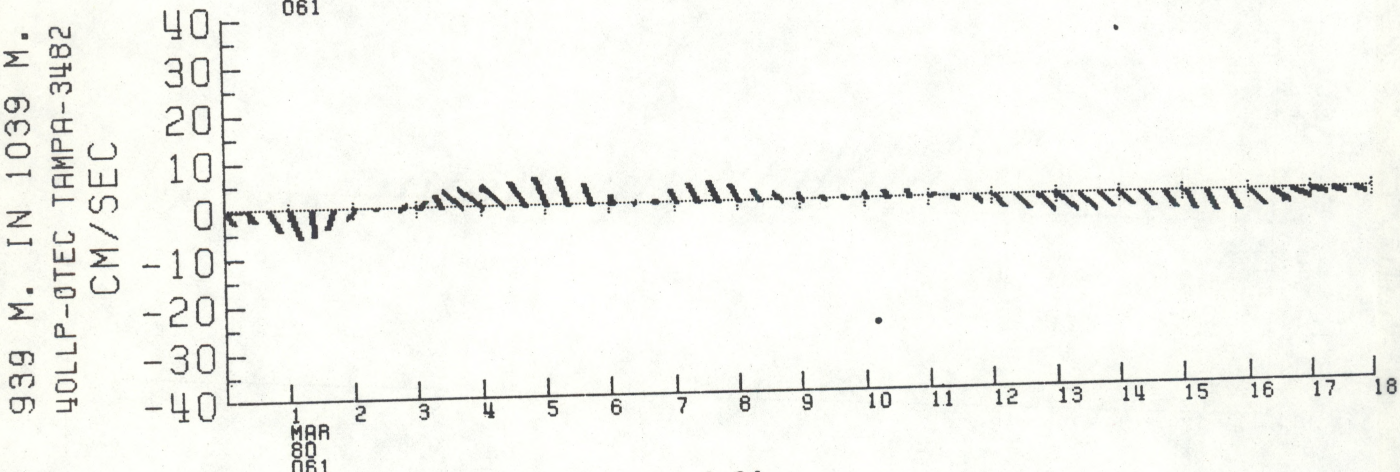
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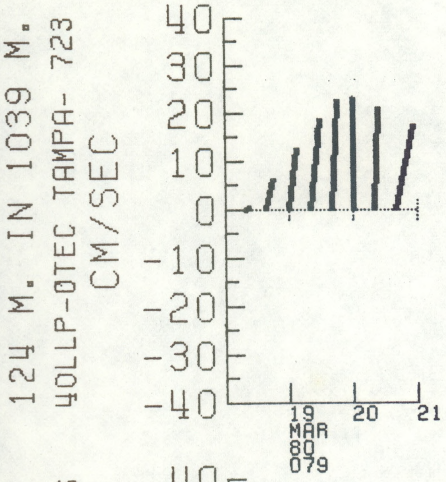
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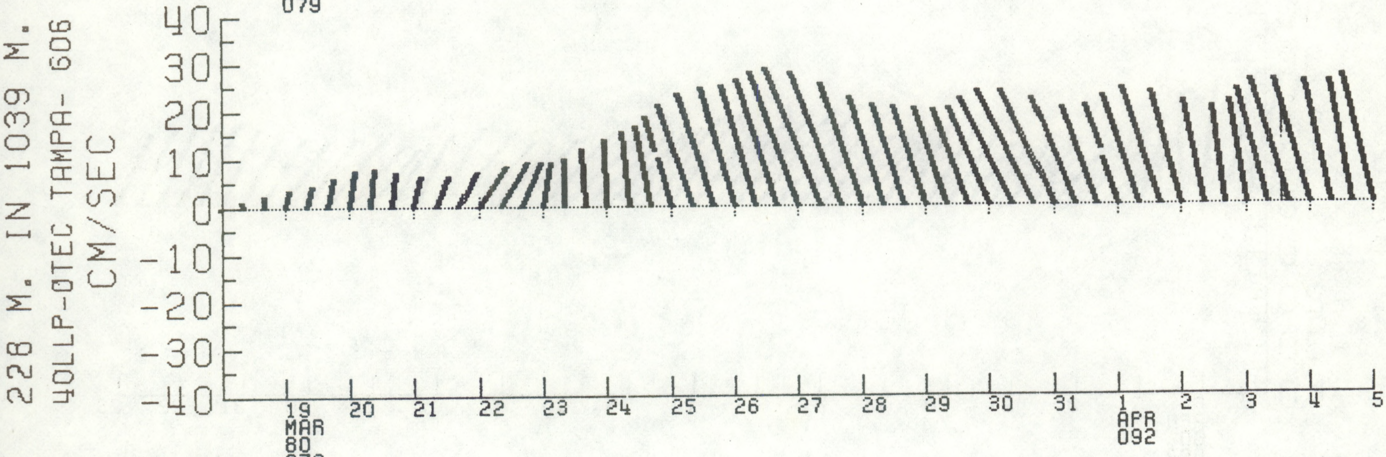
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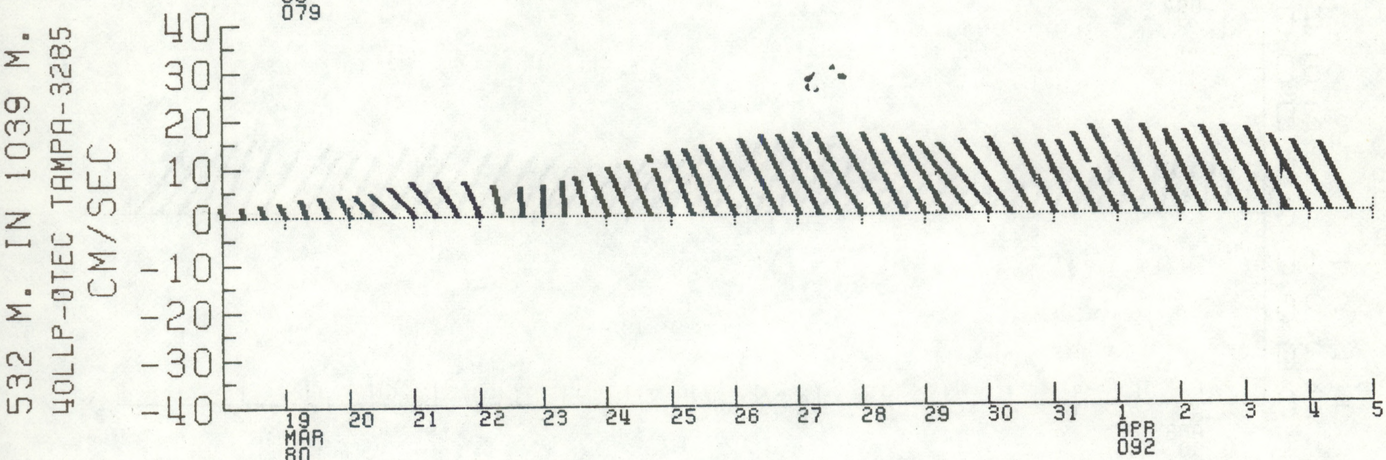
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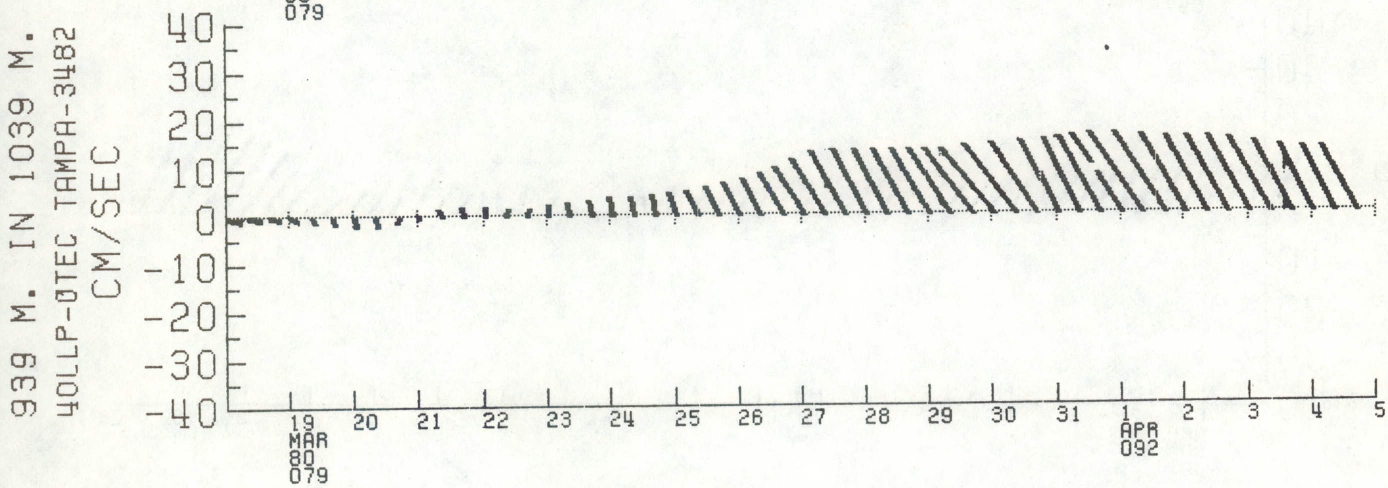
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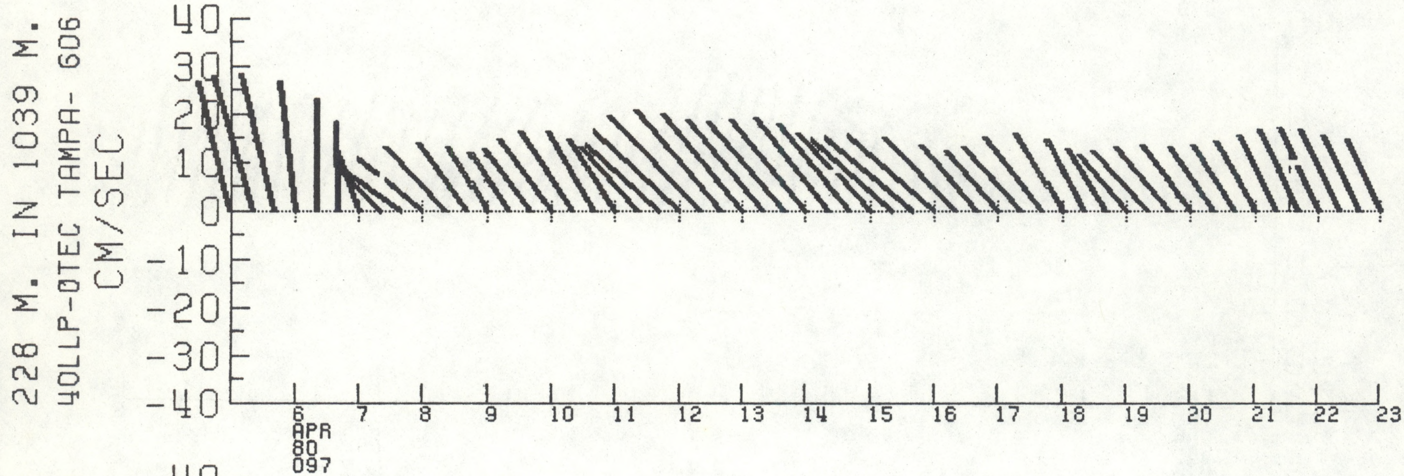
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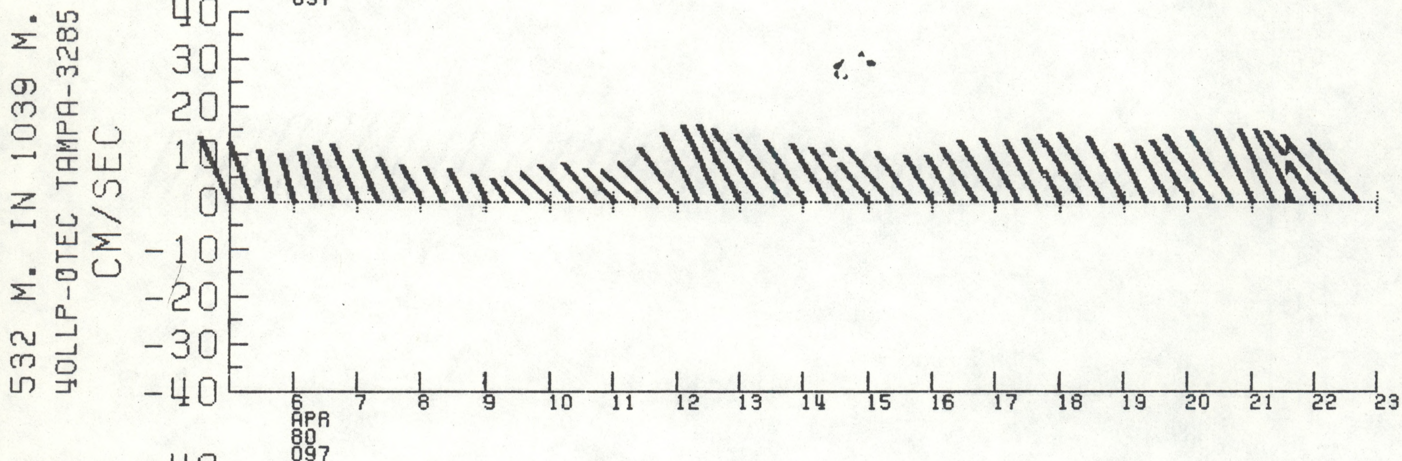
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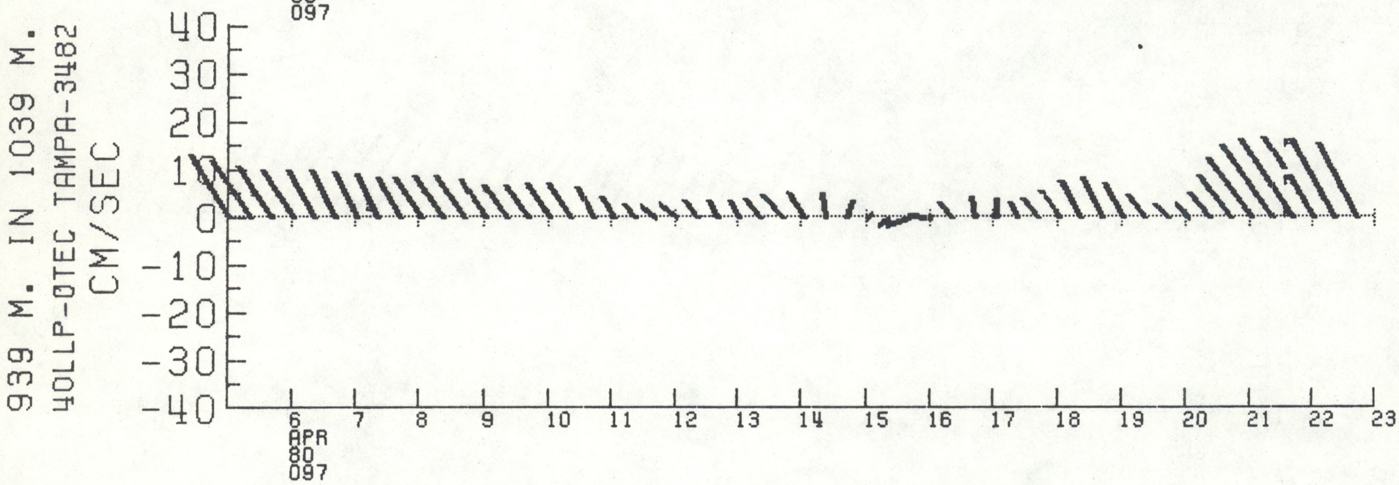
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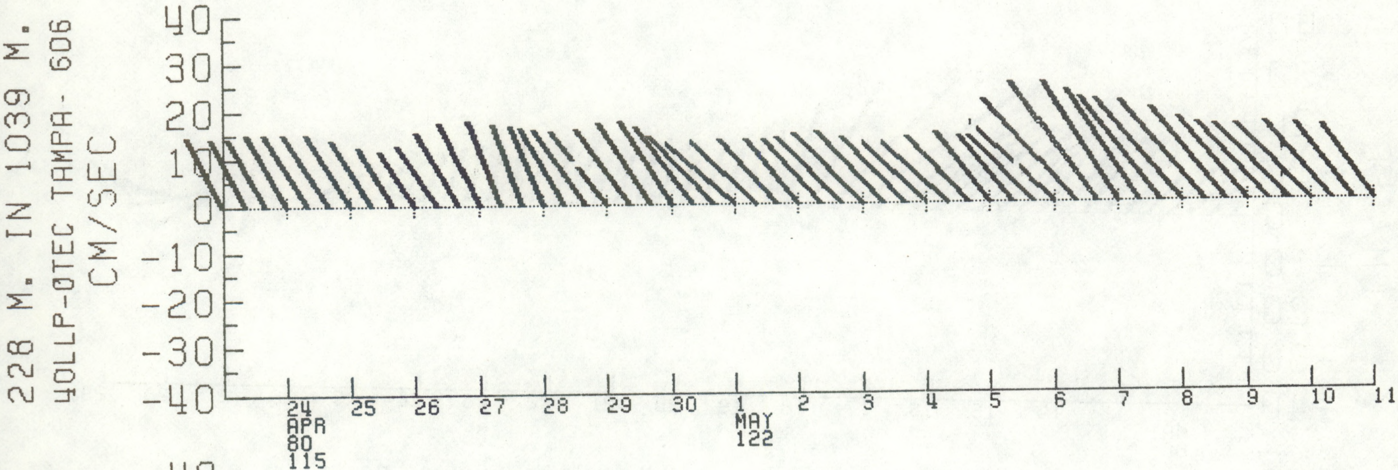

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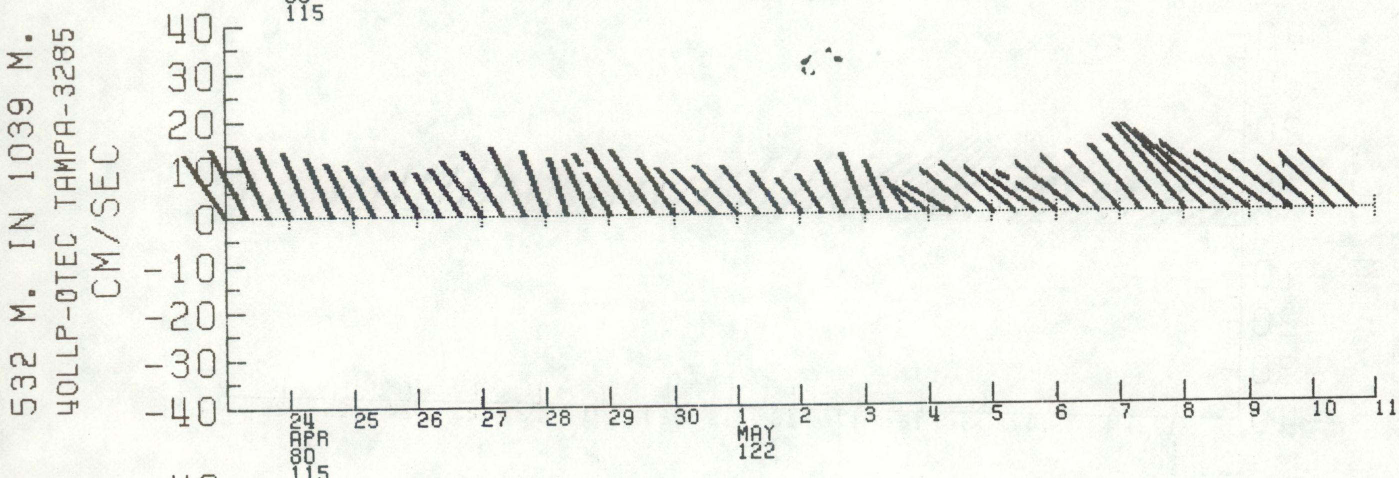

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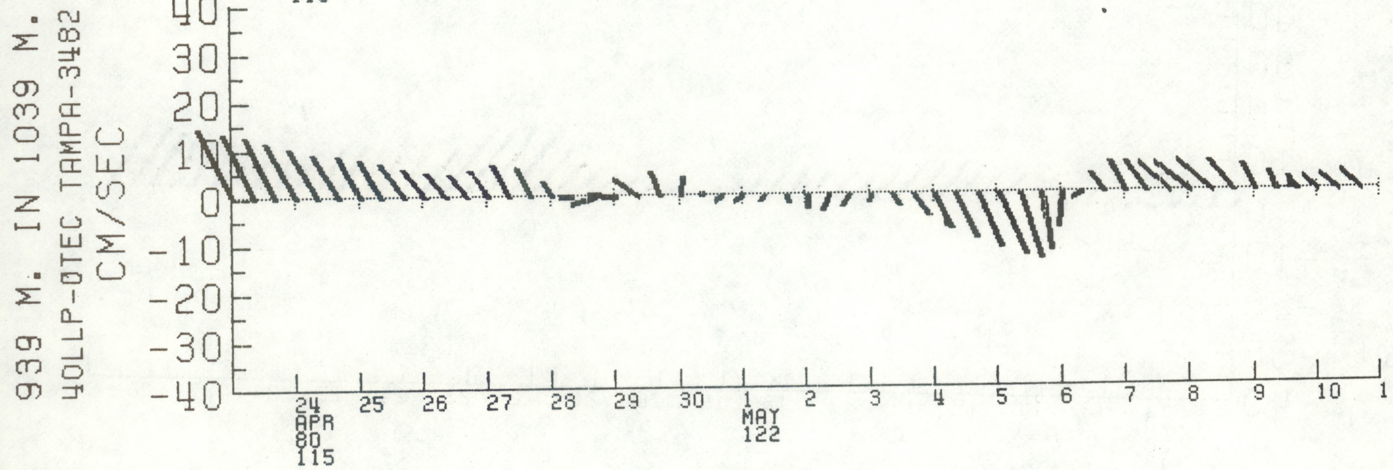

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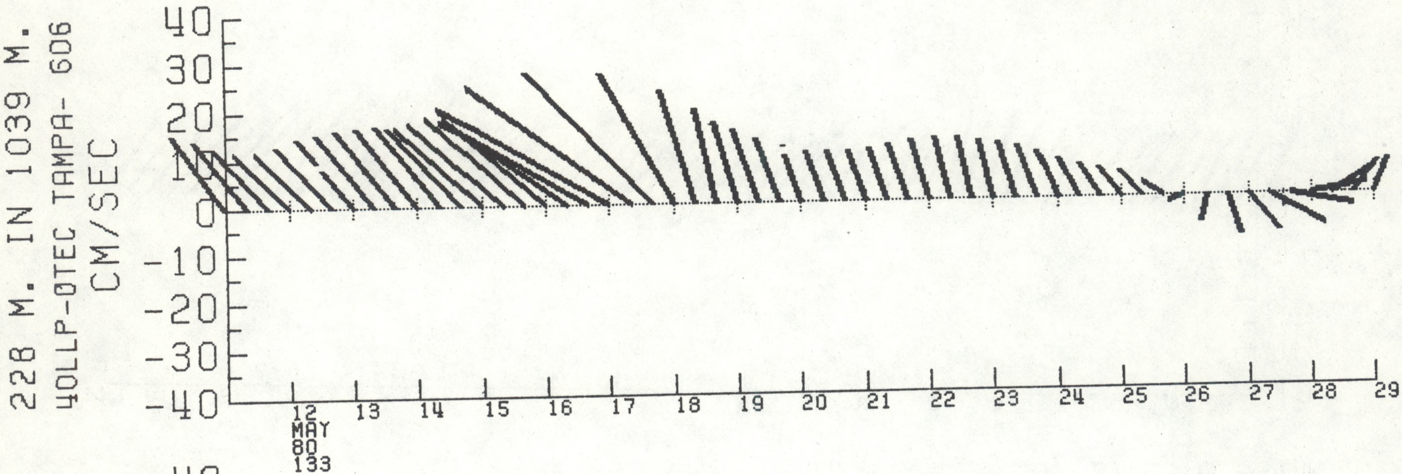
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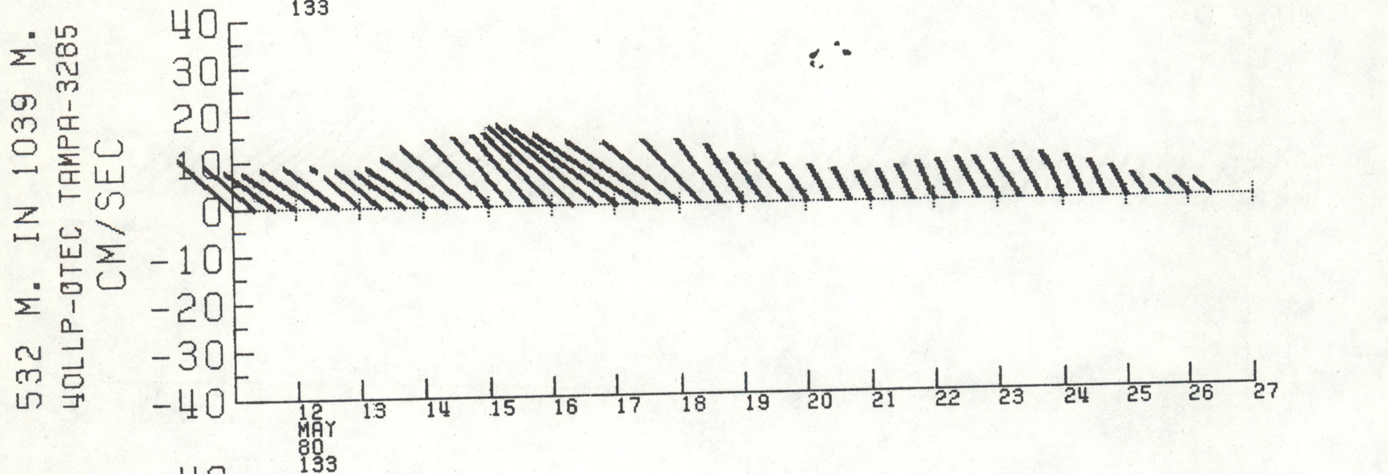
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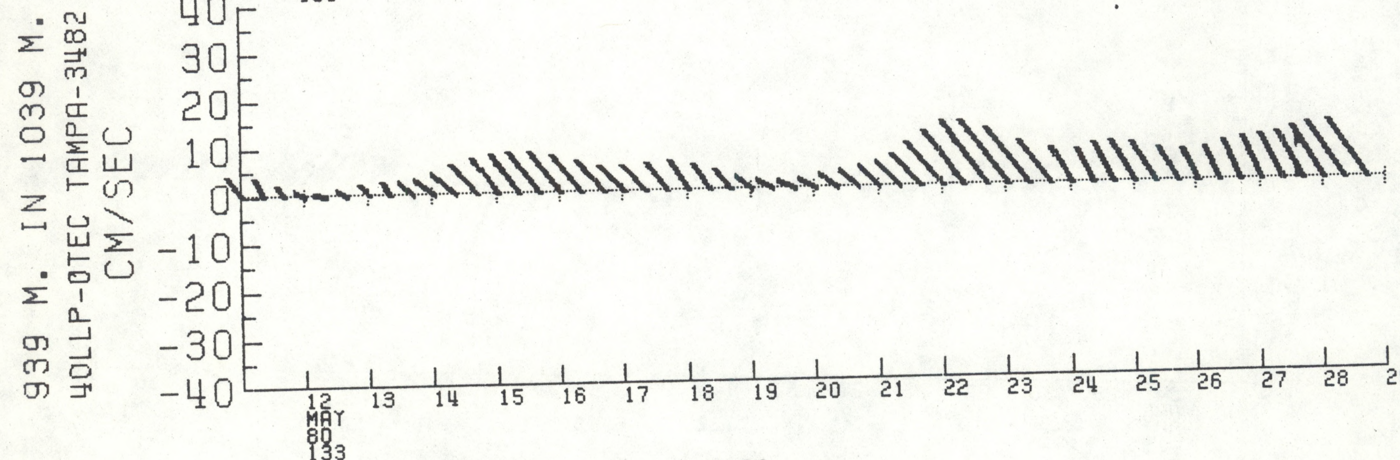
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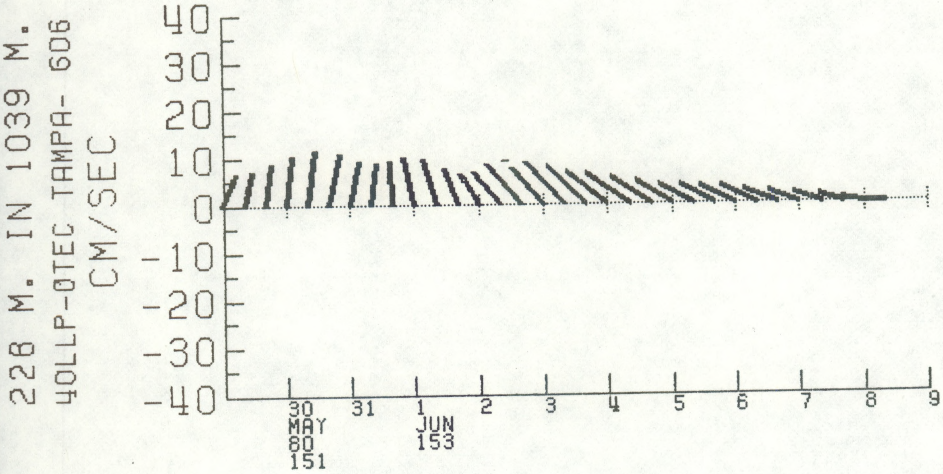
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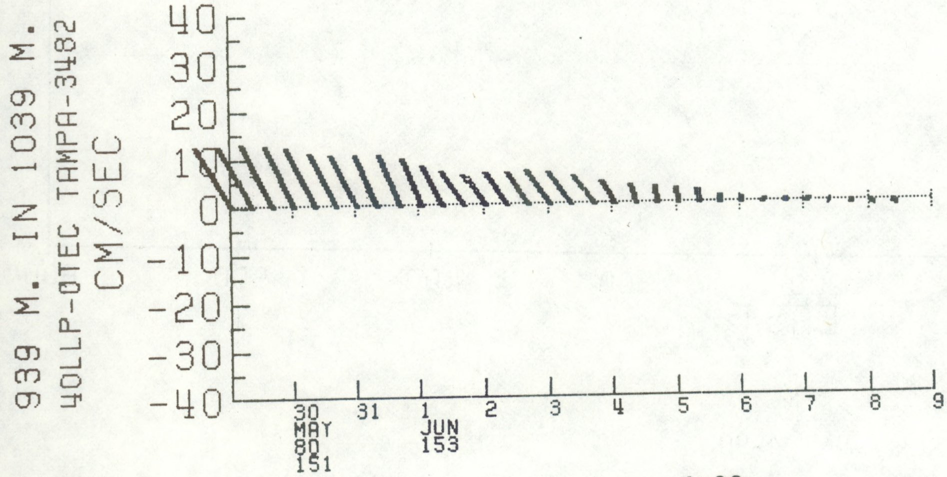
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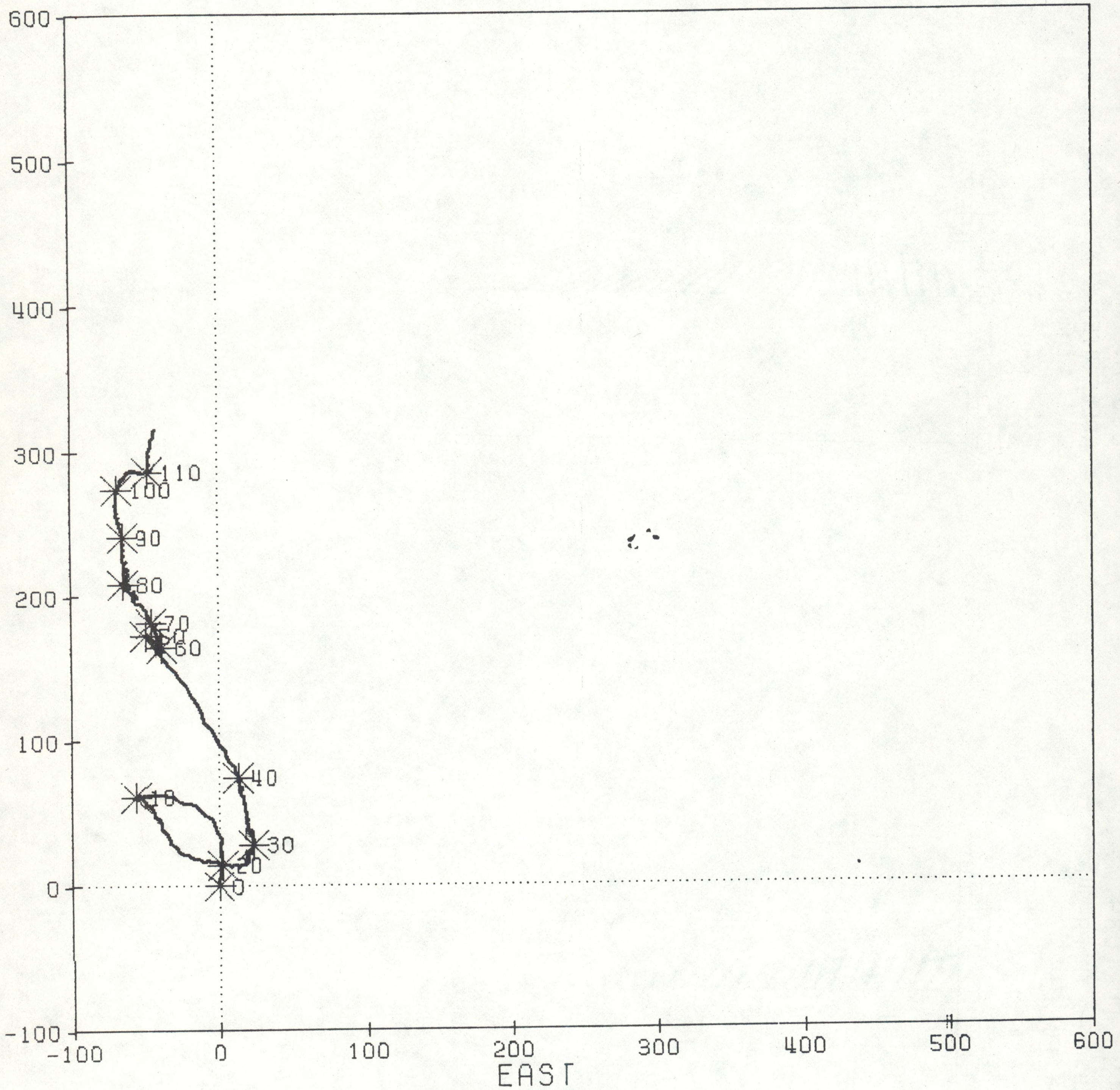
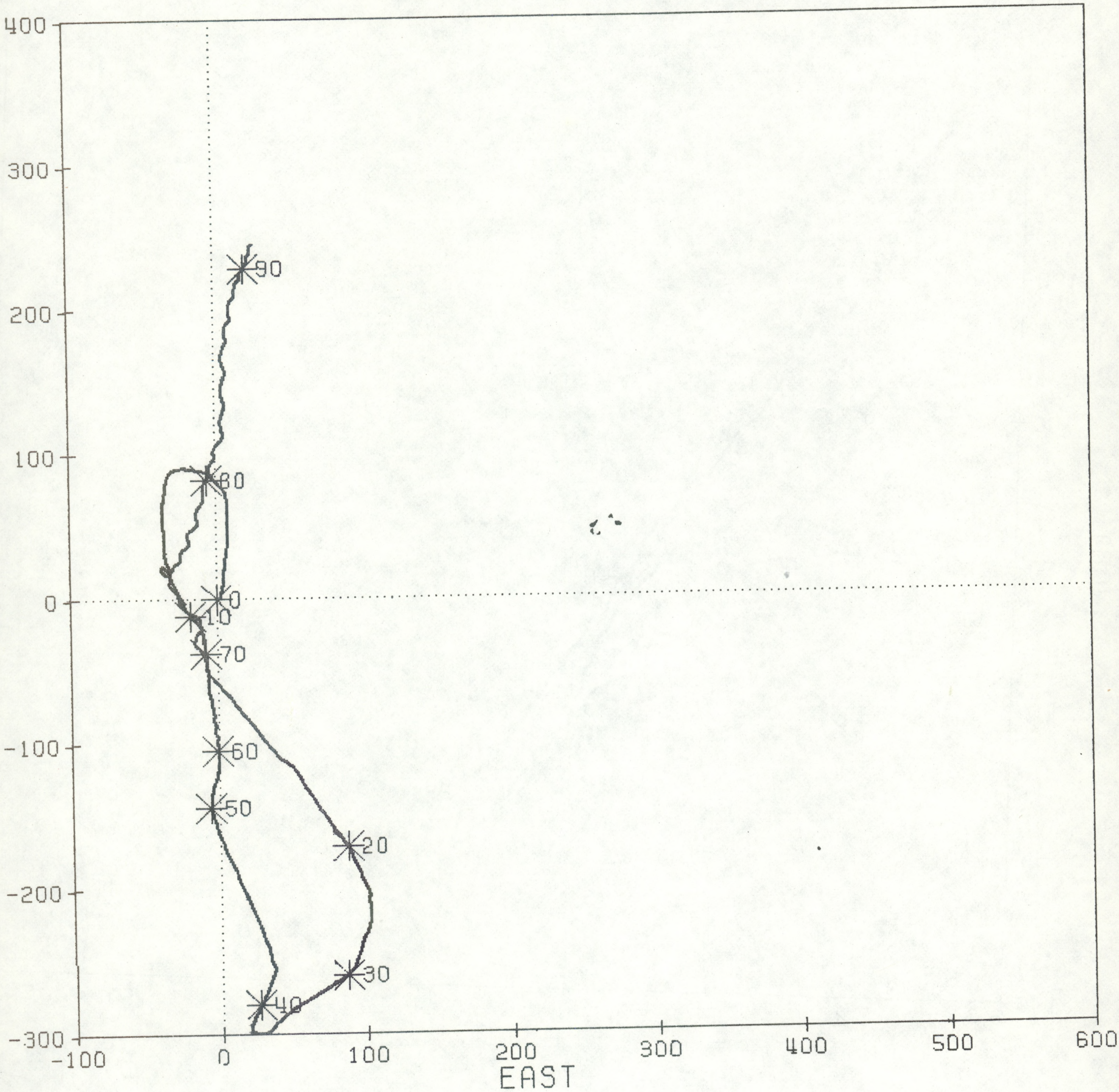
PROGRESSIVE VECTOR DIAGRAM
OTEC TAMPA-3194
546 M. IN 1050 M.
SYMBOLS EVERY 10 DAYS
BEGINNING 1979 JUL 1(182),0007Z



PROGRESSIVE VECTOR DIAGRAM
OTEC TAMPA-3285
100 M. IN 1050 M.
SYMBOLS EVERY 10 DAYS
BEGINNING 1979 JUL 1(182),0027Z



PROGRESSIVE VECTOR DIAGRAM
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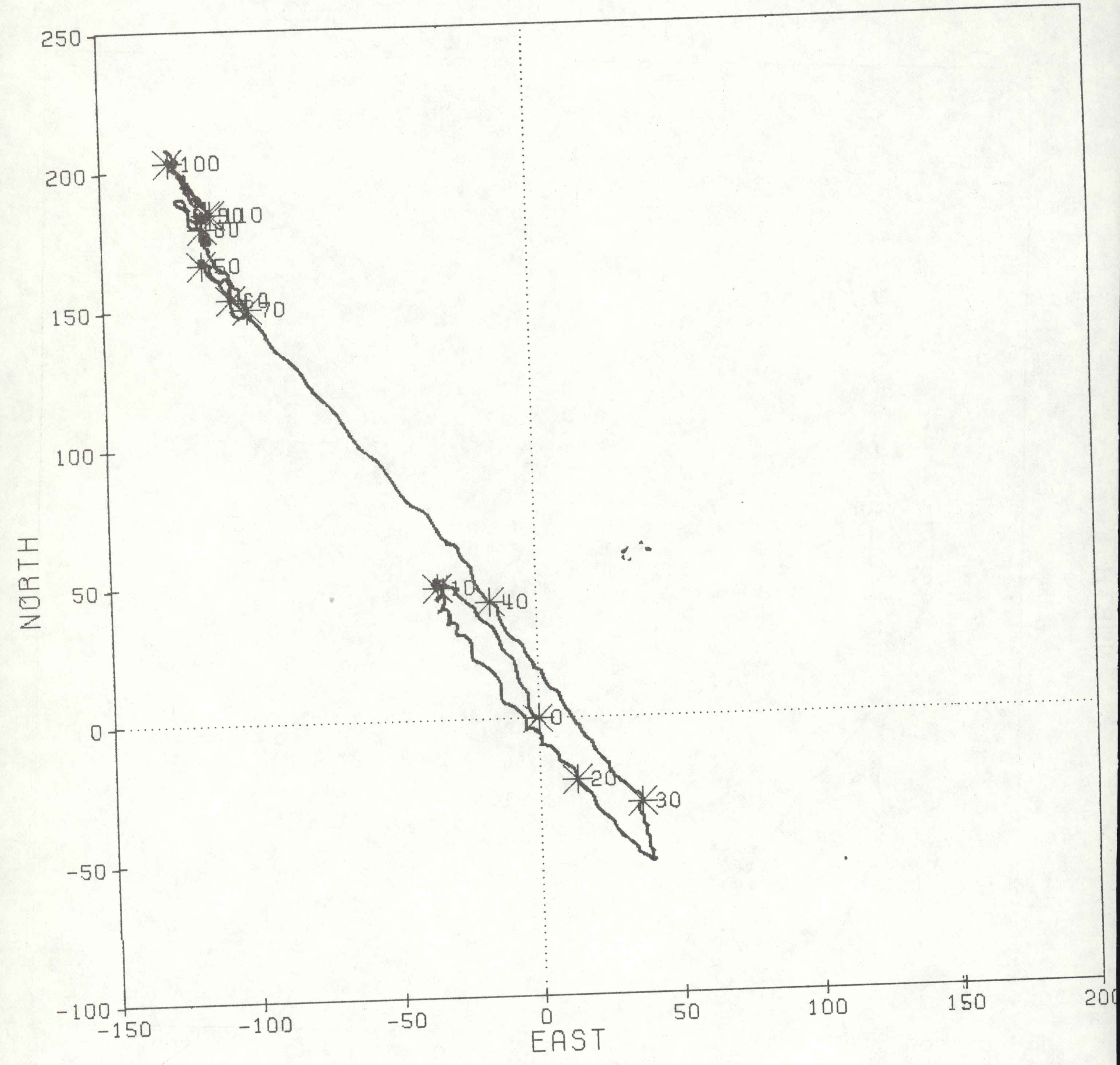
SYMBOLS EVERY 10 DAYS
BEGINNING 1979 JUL 1 (182), 0007Z



PROGRESSIVE VECTOR DIAGRAM
OTEC TAMPA-3479
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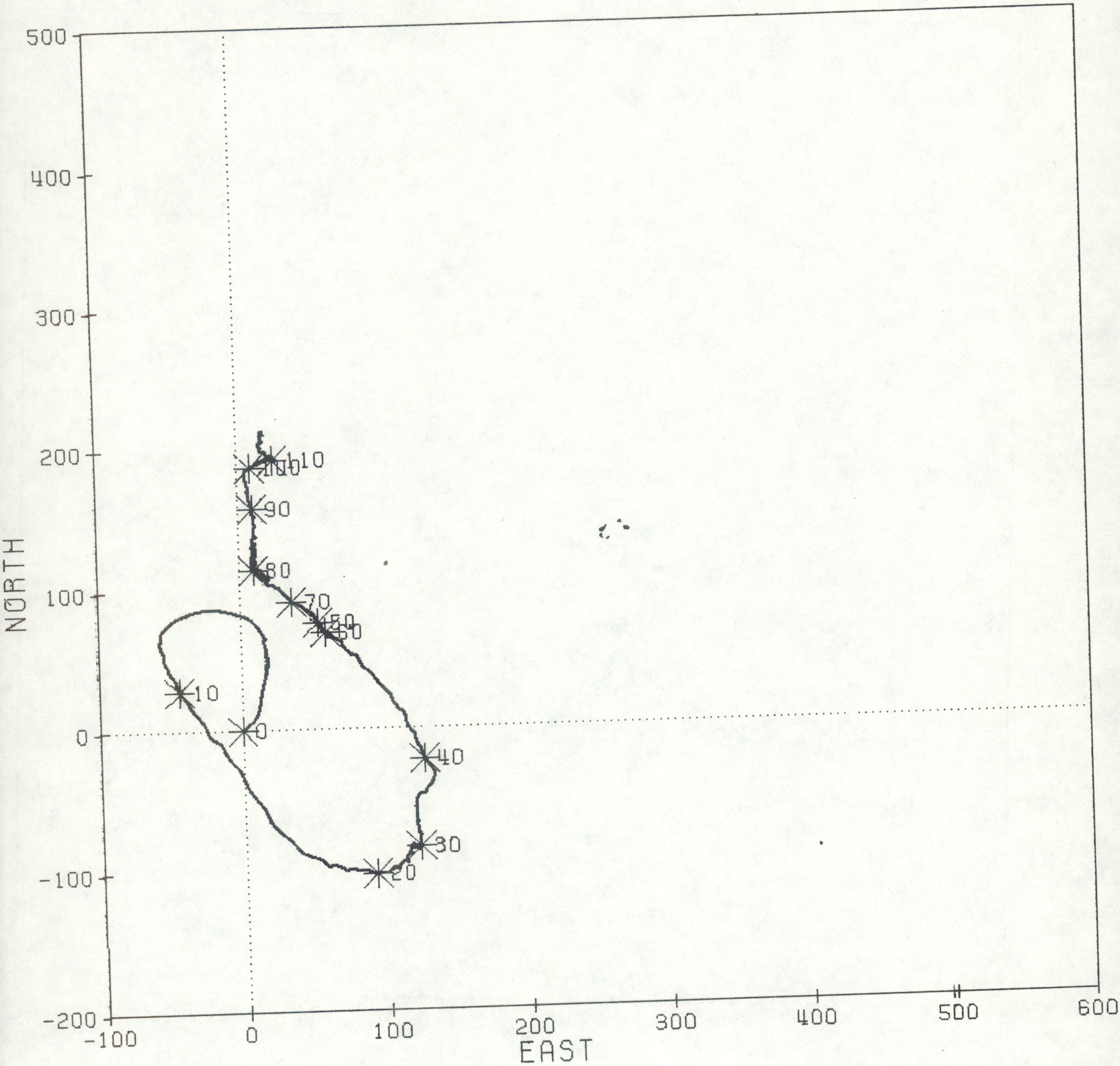
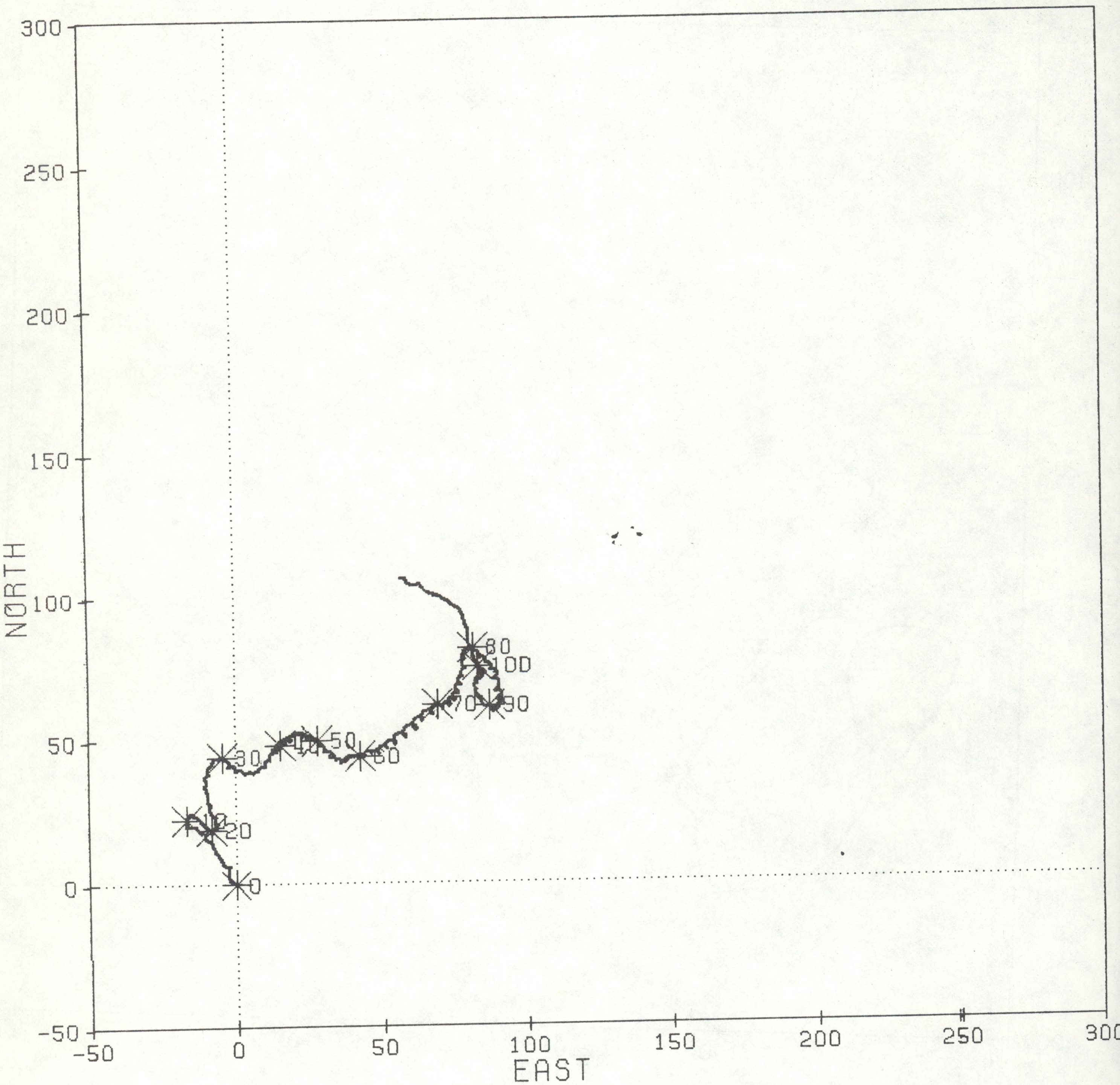
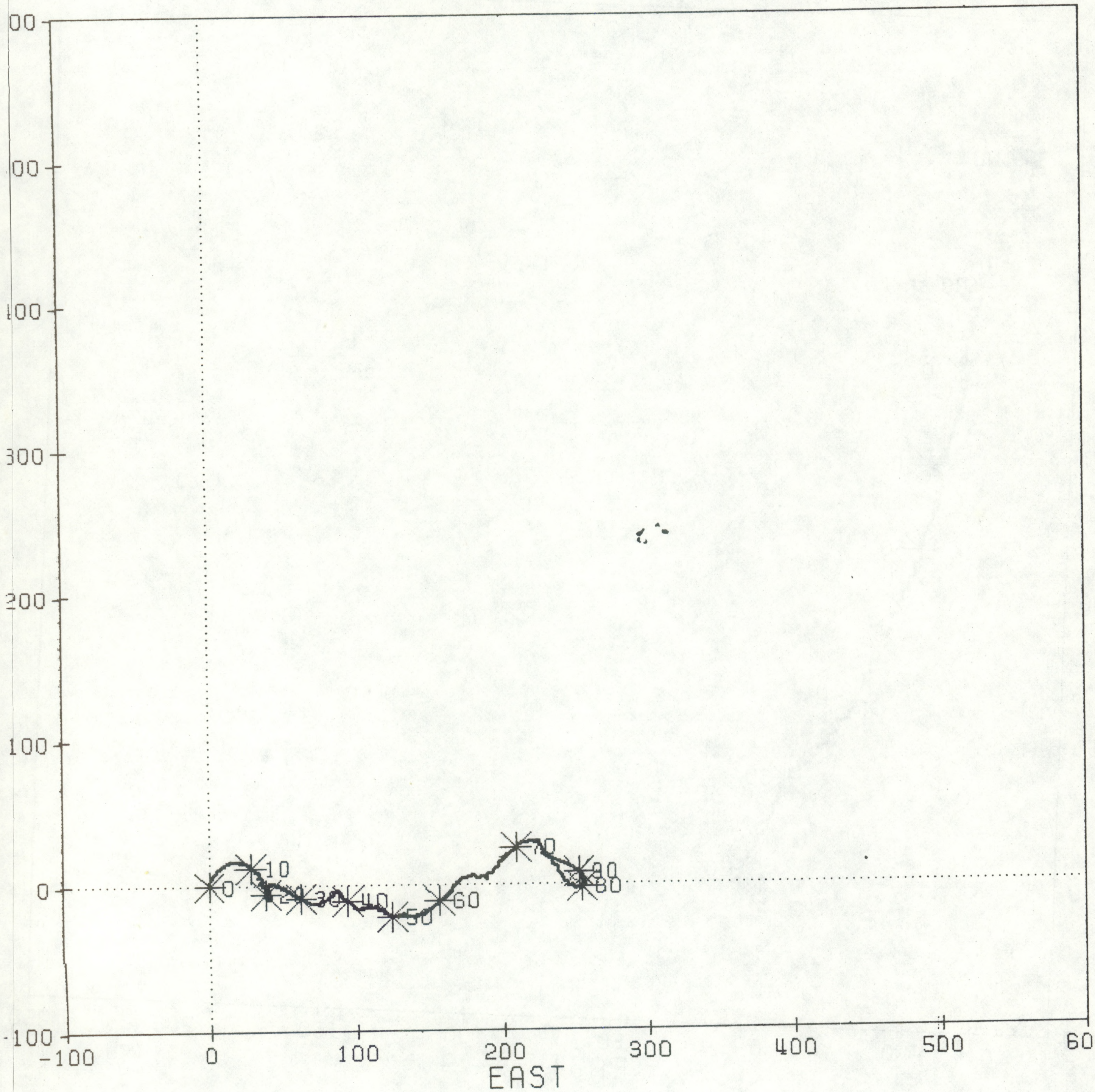
SYMBOLS EVERY 10 DAYS
BEGINNING 1979 JUL 1 (182), 0027Z



PROGRESSIVE VECTOR DIAGRAM
OTEC TAMPA-3479
535 M. IN 1050 M.
SYMBOLS EVERY 10 DAYS
BEGINNING 1979 OCT27(300),0146Z



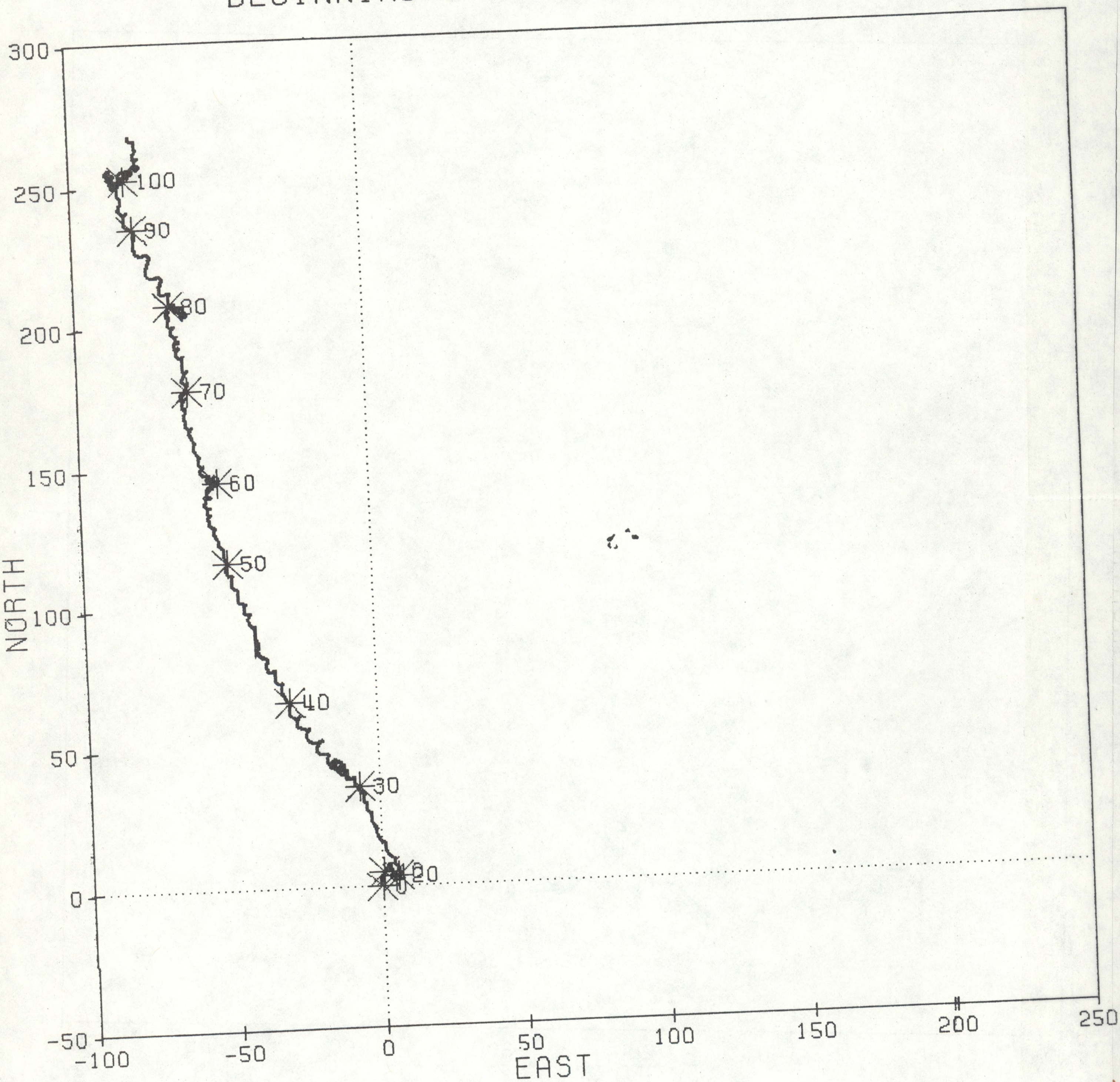
PROGRESSIVE VECTOR DIAGRAM
OTEC TAMPA-3200
246 M. IN 1050 M.
SYMBOLS EVERY 10 DAYS
BEGINNING 1979 OCT29(302),1711Z



PROGRESSIVE VECTOR DIAGRAM
OTEC TAMPA- 614
950 M. IN 1050 M.

SYMBOLS EVERY 10 DAYS

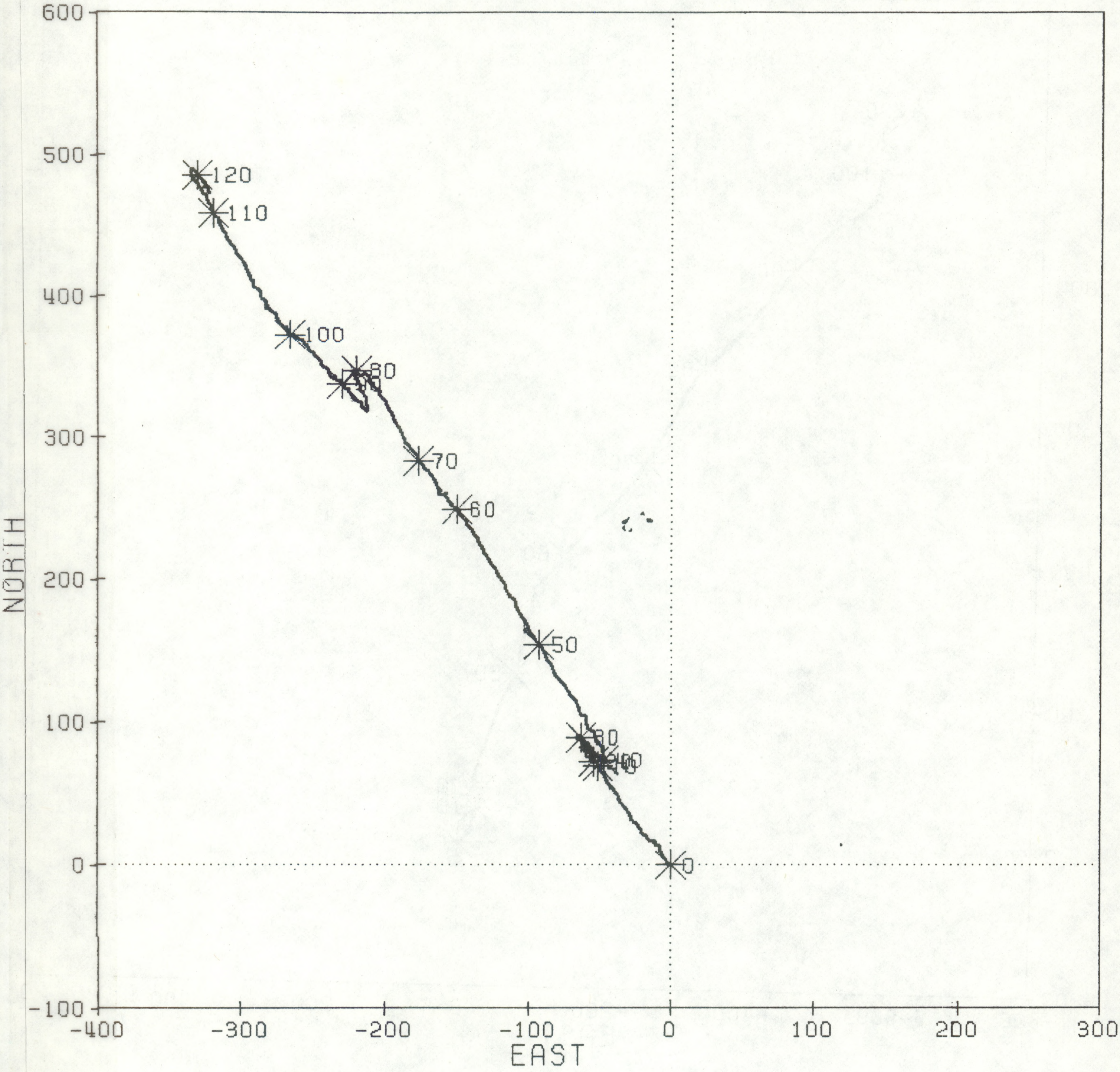
BEGINNING 1979 OCT27(300),1051Z

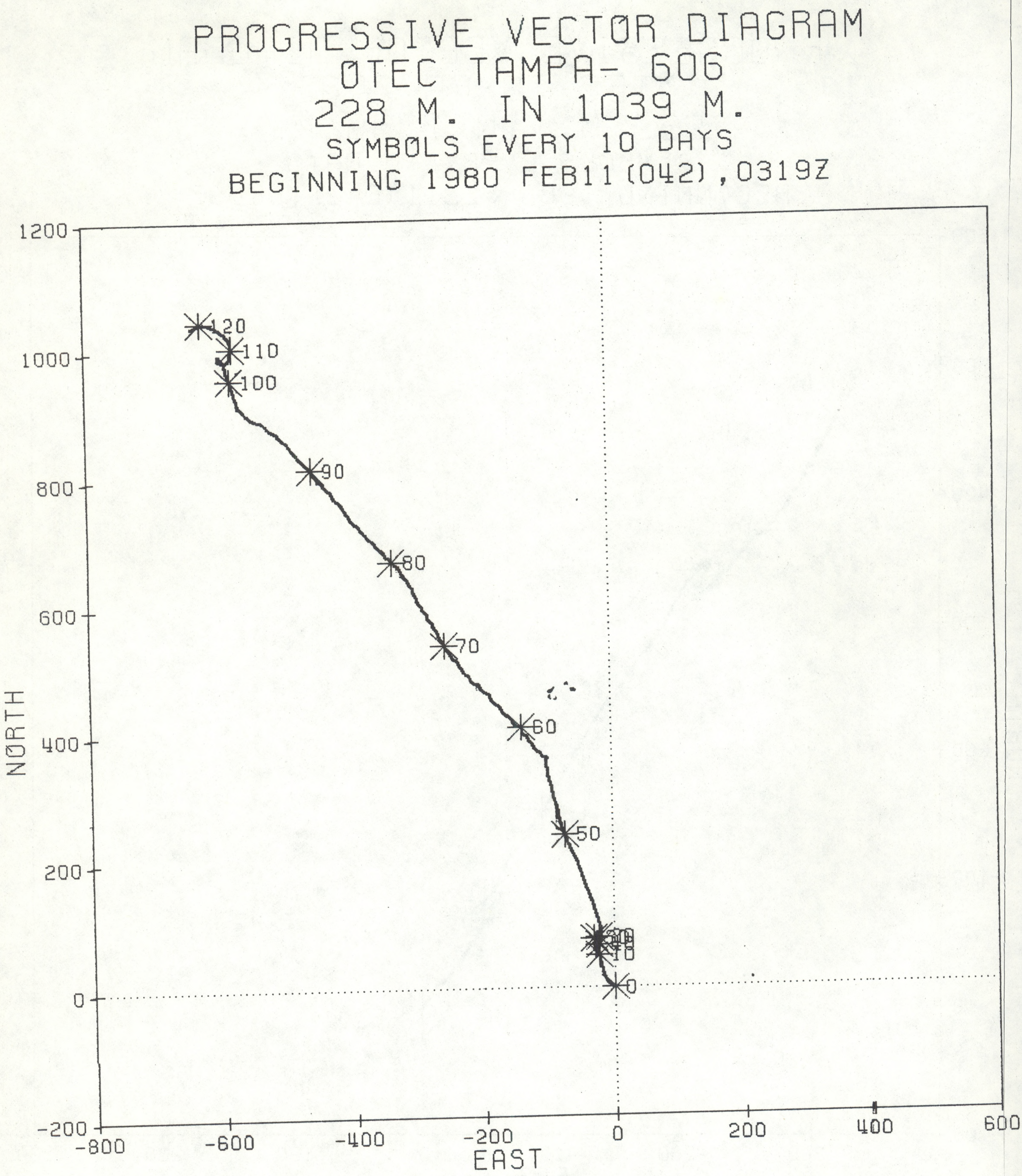


PROGRESSIVE VECTOR DIAGRAM
OTEC TAMPA-3482
939 M. IN 1039 M.

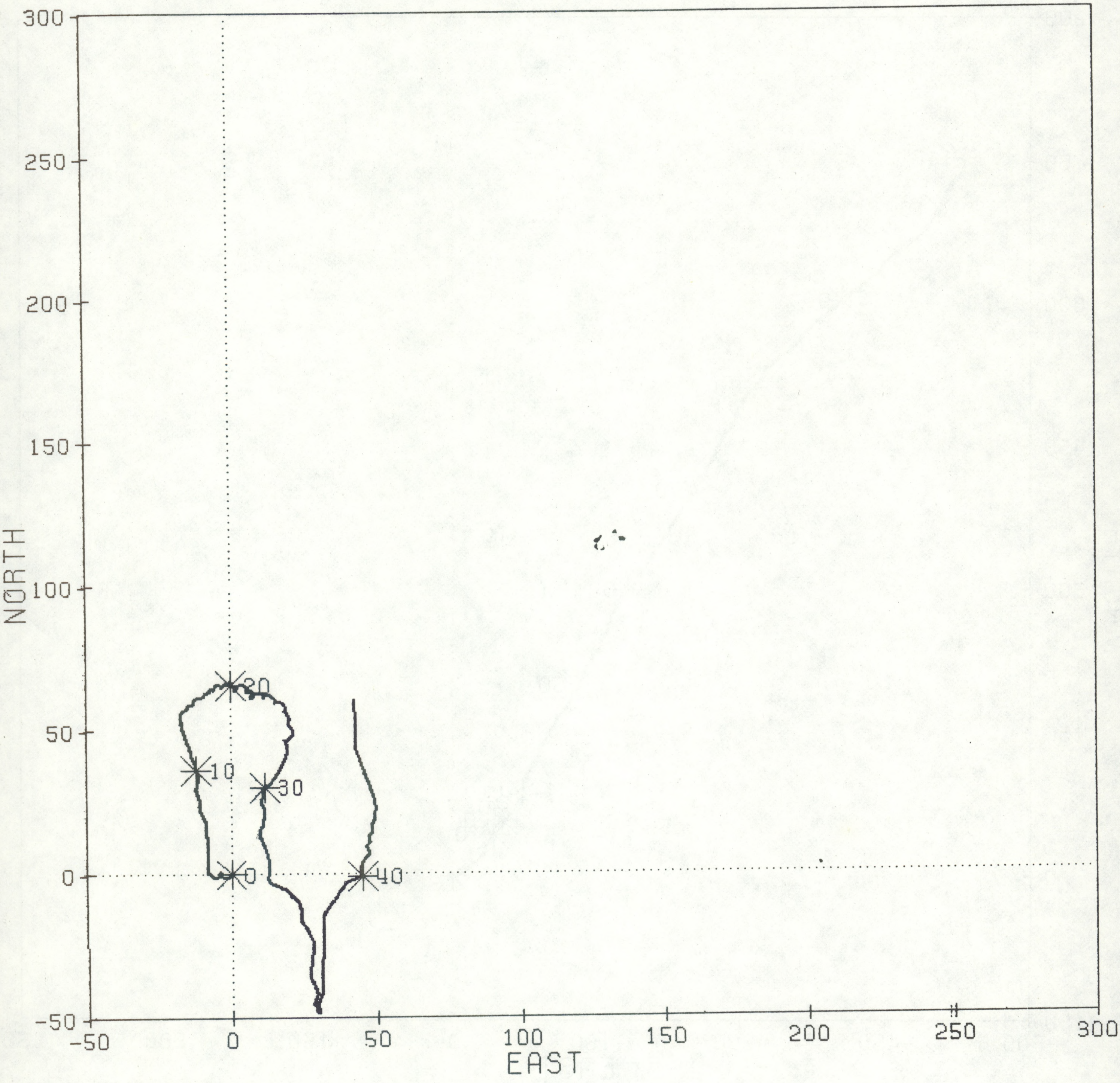
SYMBOLS EVERY 10 DAYS

BEGINNING 1980 FEB11(042),0409Z

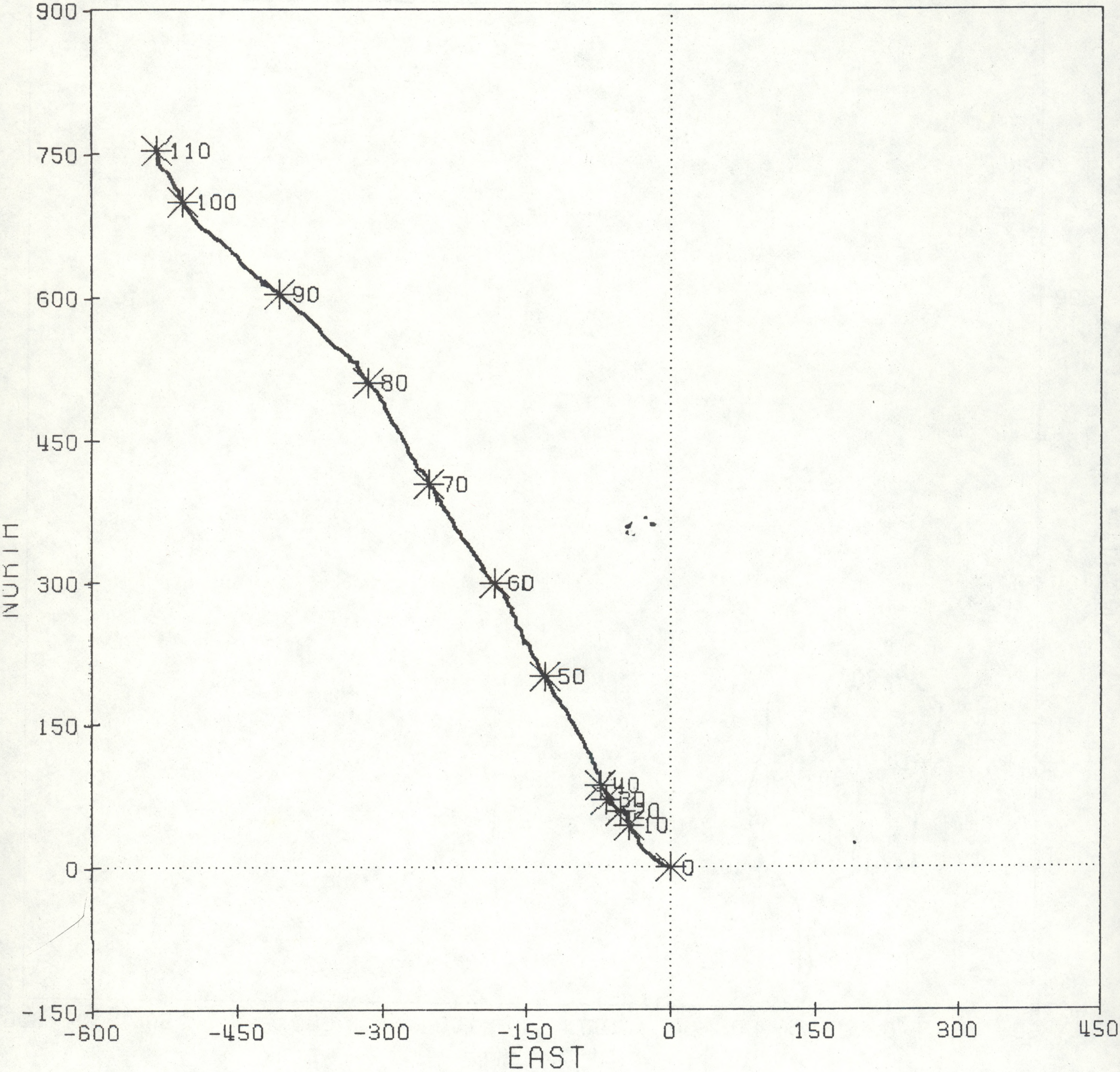



PROGRESSIVE VECTOR DIAGRAM
ØTEC TAMPA- 606
228 M. IN 1039 M.
SYMBØLS EVERY 10 DAYS
BEGINNING 1980 FEB11(042),0319Z
NØRTH
EAST
1200
1000
800
600
400
200
0
-200
-800
-600
-400
-200
0
200
400
600
0
10
50
60
70
80
90
100
110
120

PROGRESSIVE VECTOR DIAGRAM
OTEC TAMPA- 723
124 M. IN 1039 M.
SYMBOLS EVERY 10 DAYS
BEGINNING 1980 FEB11(042),0307Z



PROGRESSIVE VECTOR DIAGRAM
ØTEC TAMPA-3285
532 M. IN 1039 M.
SYMBØLS EVERY 10 DAYS
BEGINNING 1980 FEB11(042),0329Z

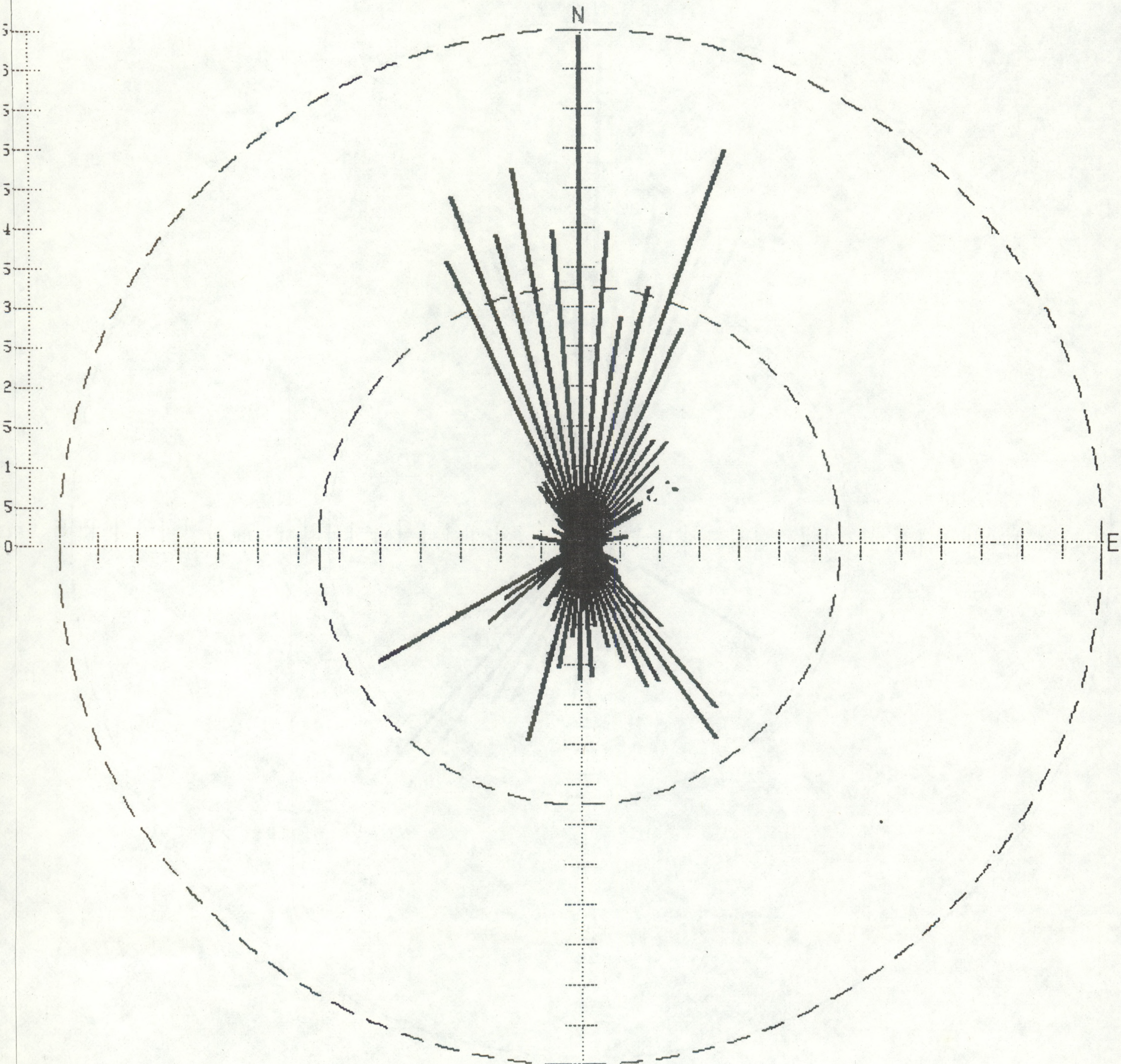


ØTEC TAMPA- 723

DEPTH 124 M.

% TIME

5 DEGREE SECTORS

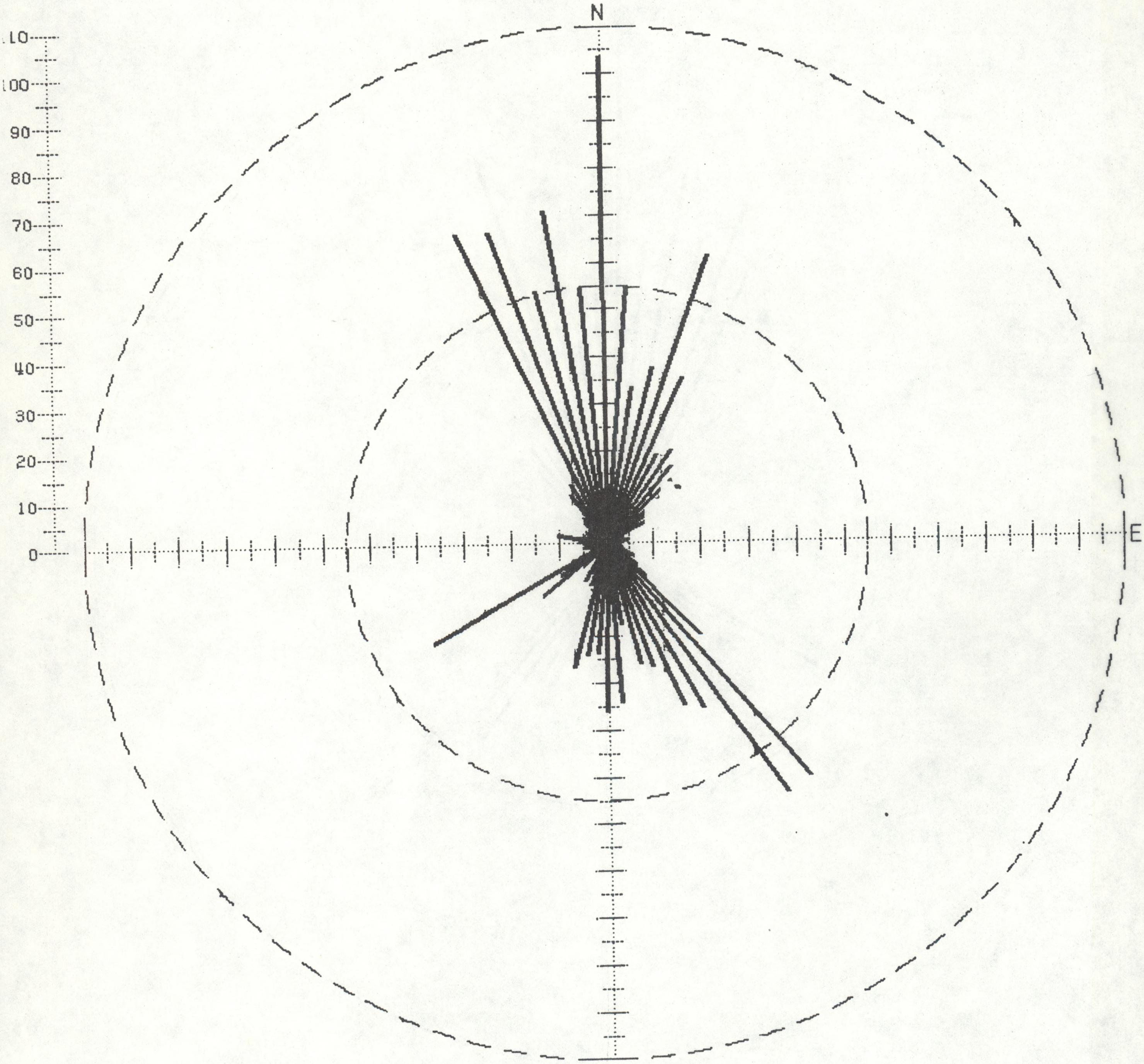


ØTEC TAMPA- 723

DEPTH 124 M.

VIRTUAL DISPLACEMENT (KM)

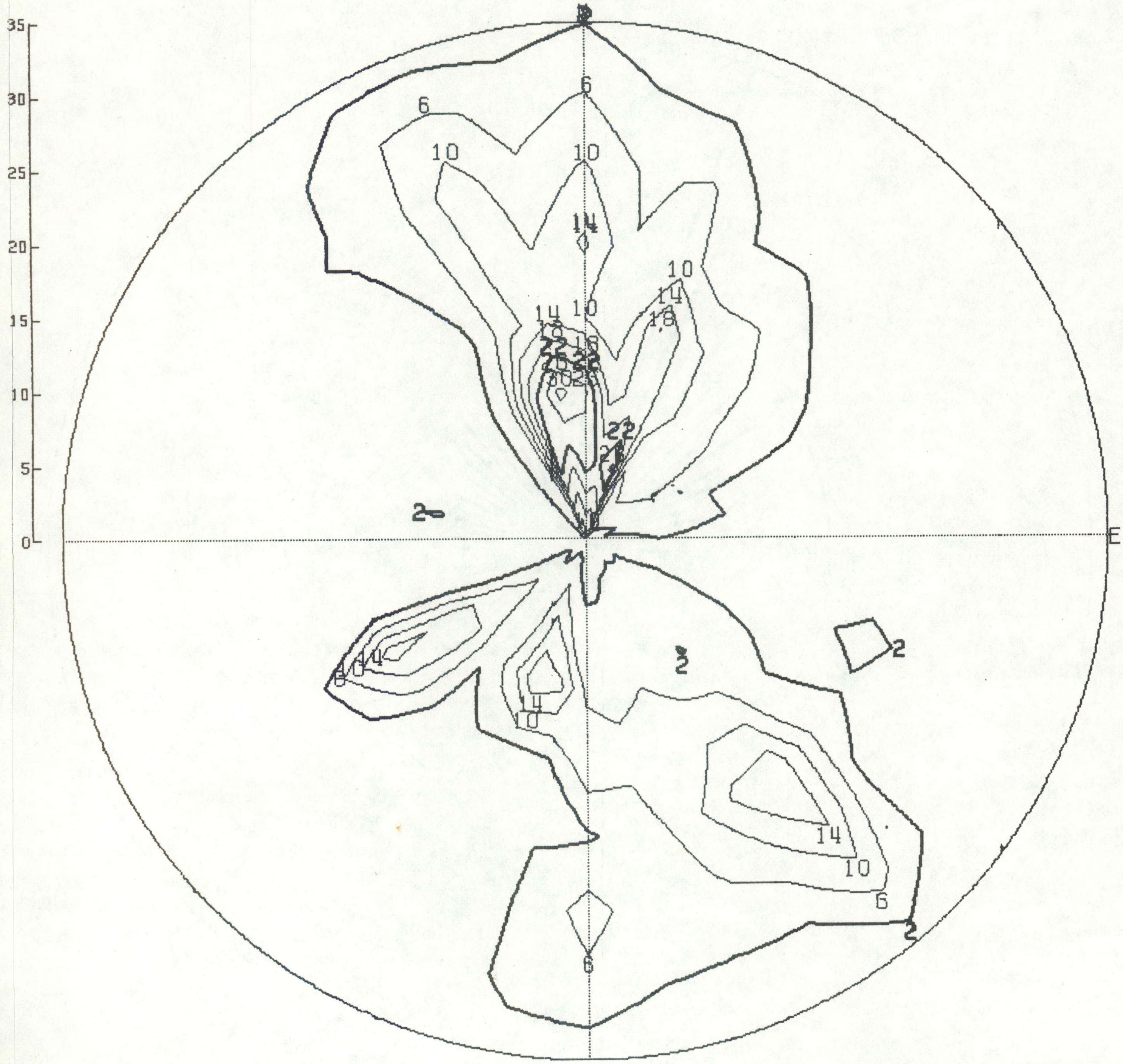
5 DEGREE SECTORS

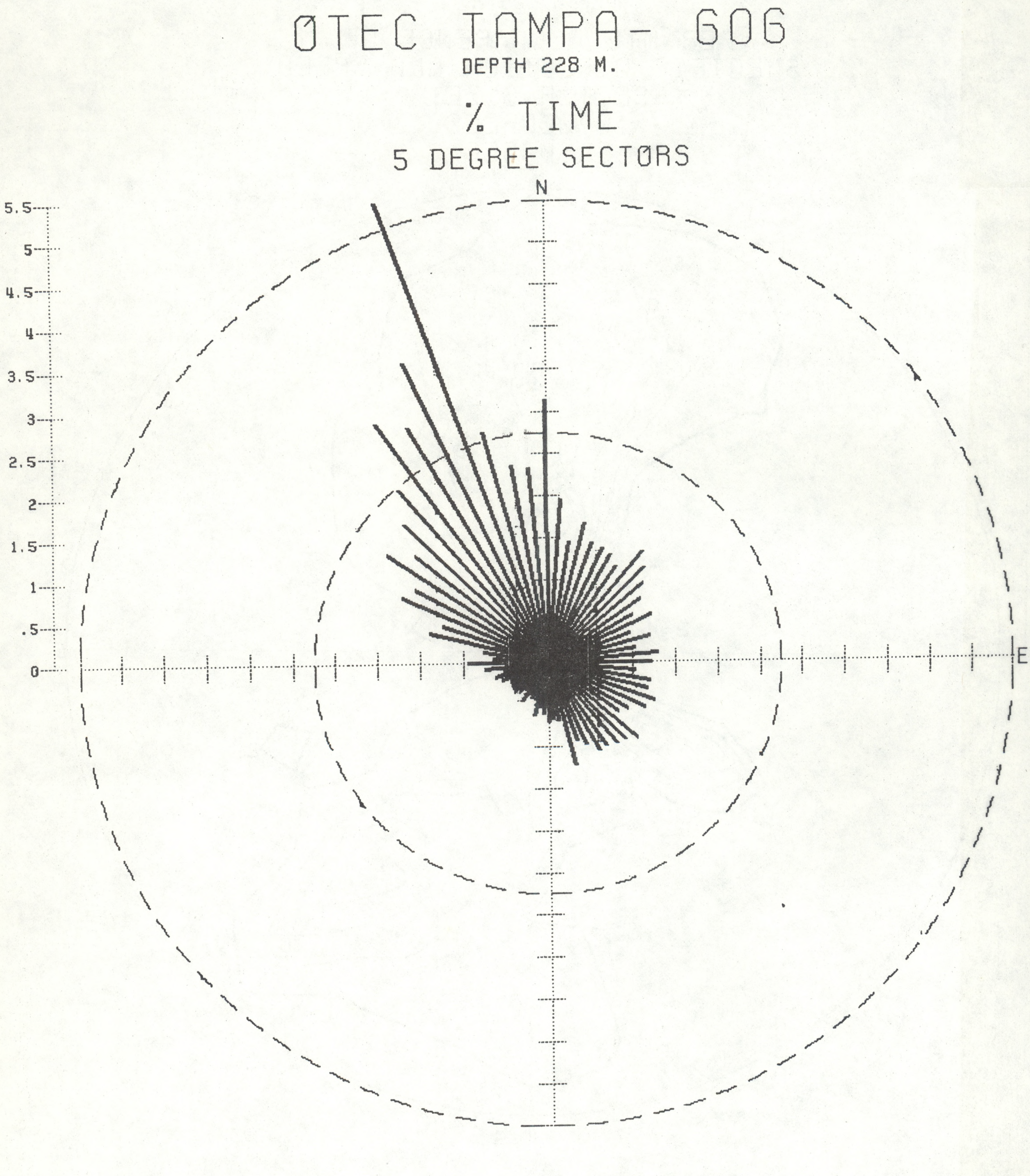


ØTEC TAMPA- 723

DEPTH 124 M.

PER MIL ØCCURRENCE ØF
SPECIFIC DIRECTIØN AND SPEED
SECTØR SIZE:
10 DEGREES
5 CM/SEC



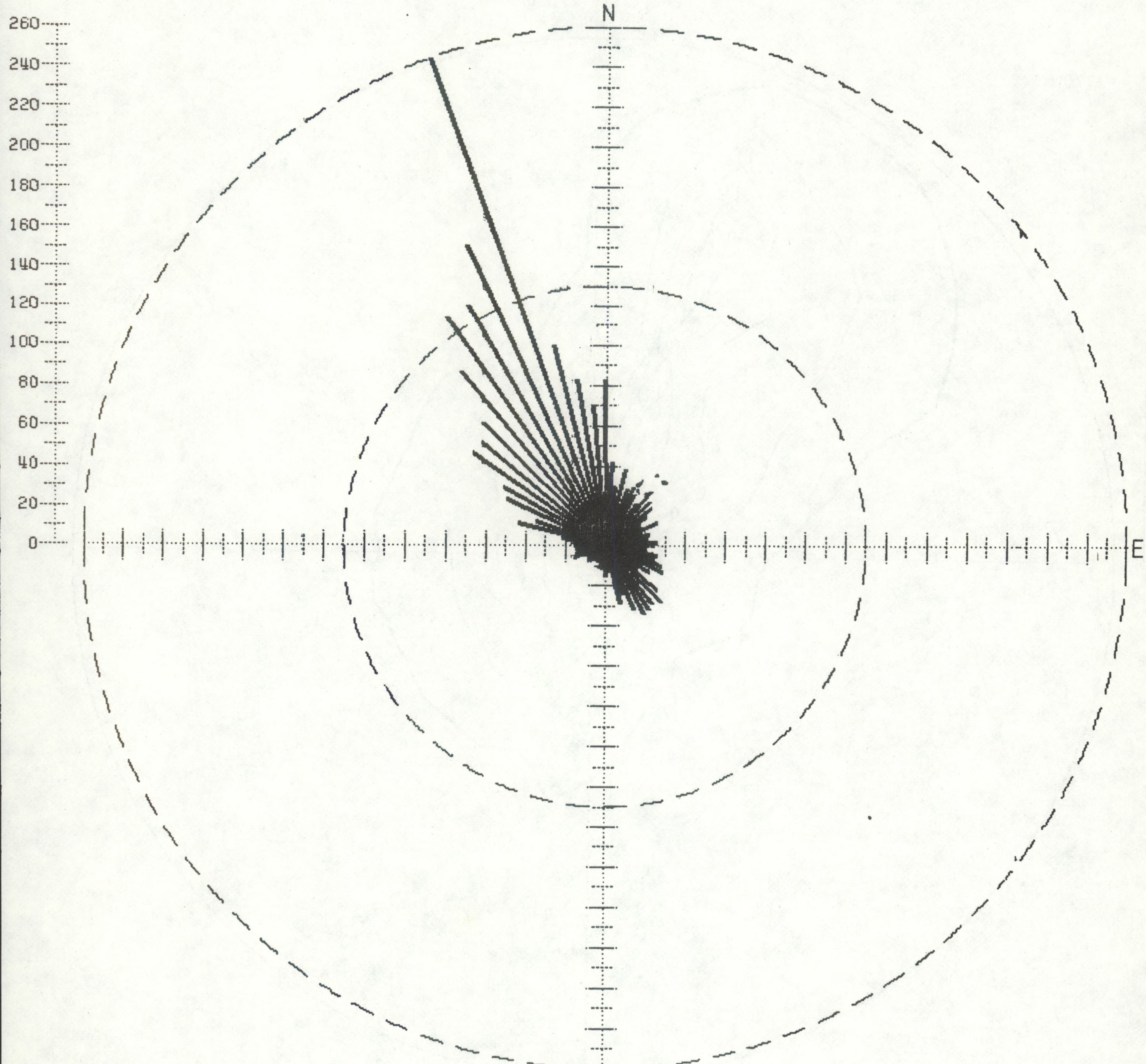

ØTEC TAMPA- 606
DEPTH 228 M.
% TIME
5 DEGREE SECTØRS
N
E
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
.5
0

ØTEC TAMPA- 606

DEPTH 228 M.

VIRTUAL DISPLACEMENT (KM)

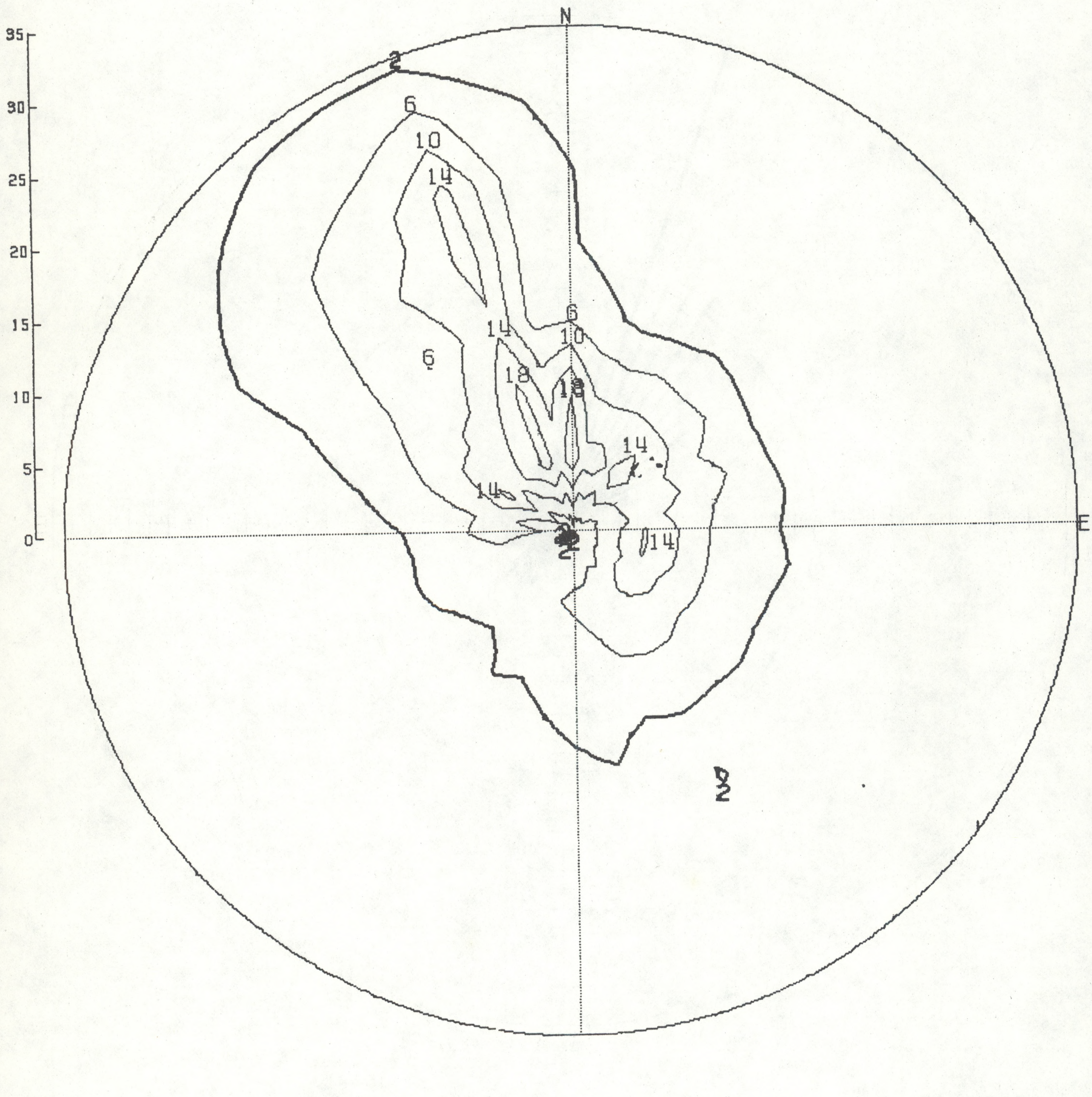
5 DEGREE SECTORS



ØTEC TAMPA- 606

DEPTH 228 M.

PER MIL ØCCURRENCE ØF
SPECIFIC DIRECTIØN AND SPEED
SECTØR SIZE:
10 DEGREES
5 CM/SEC

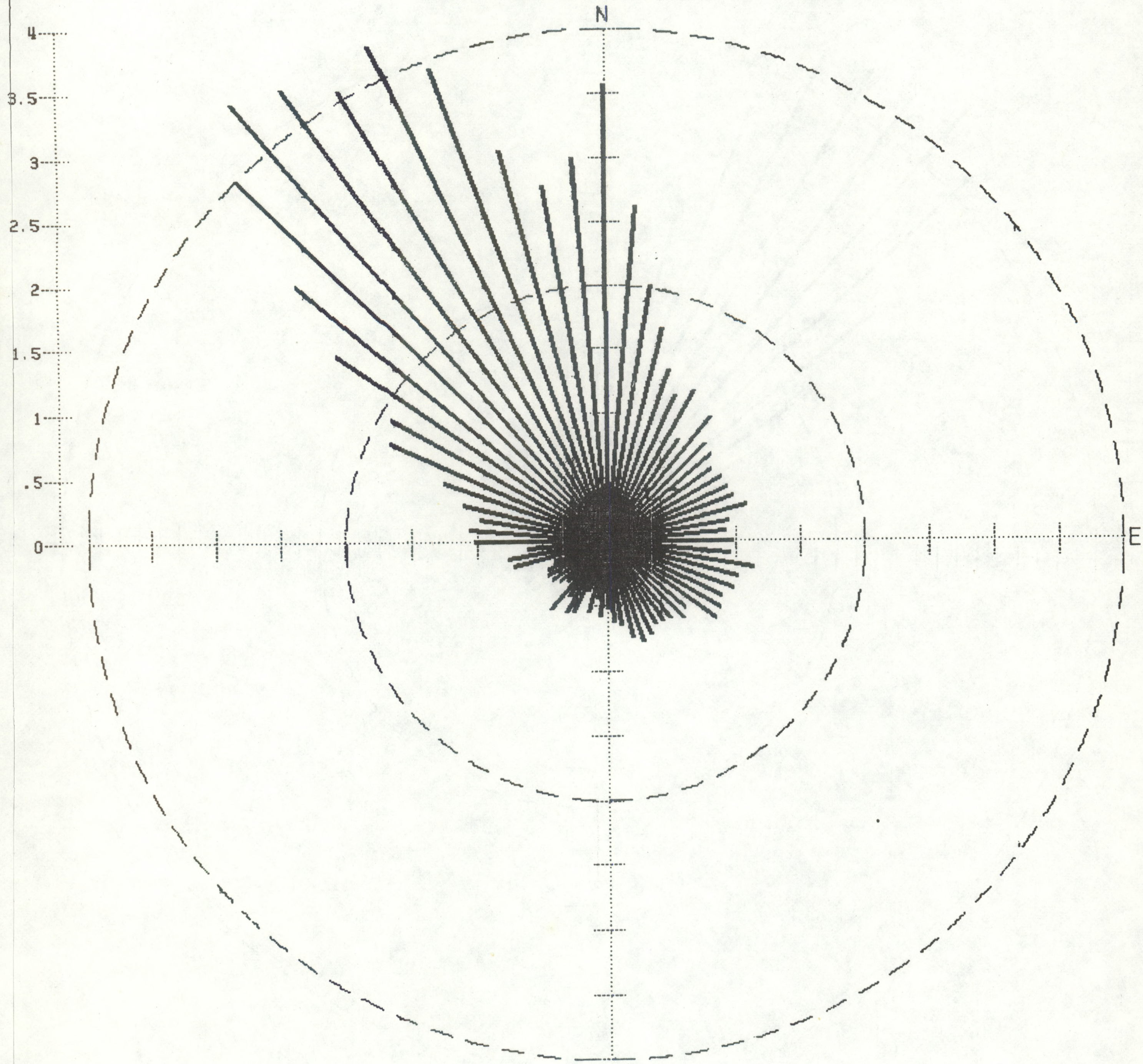


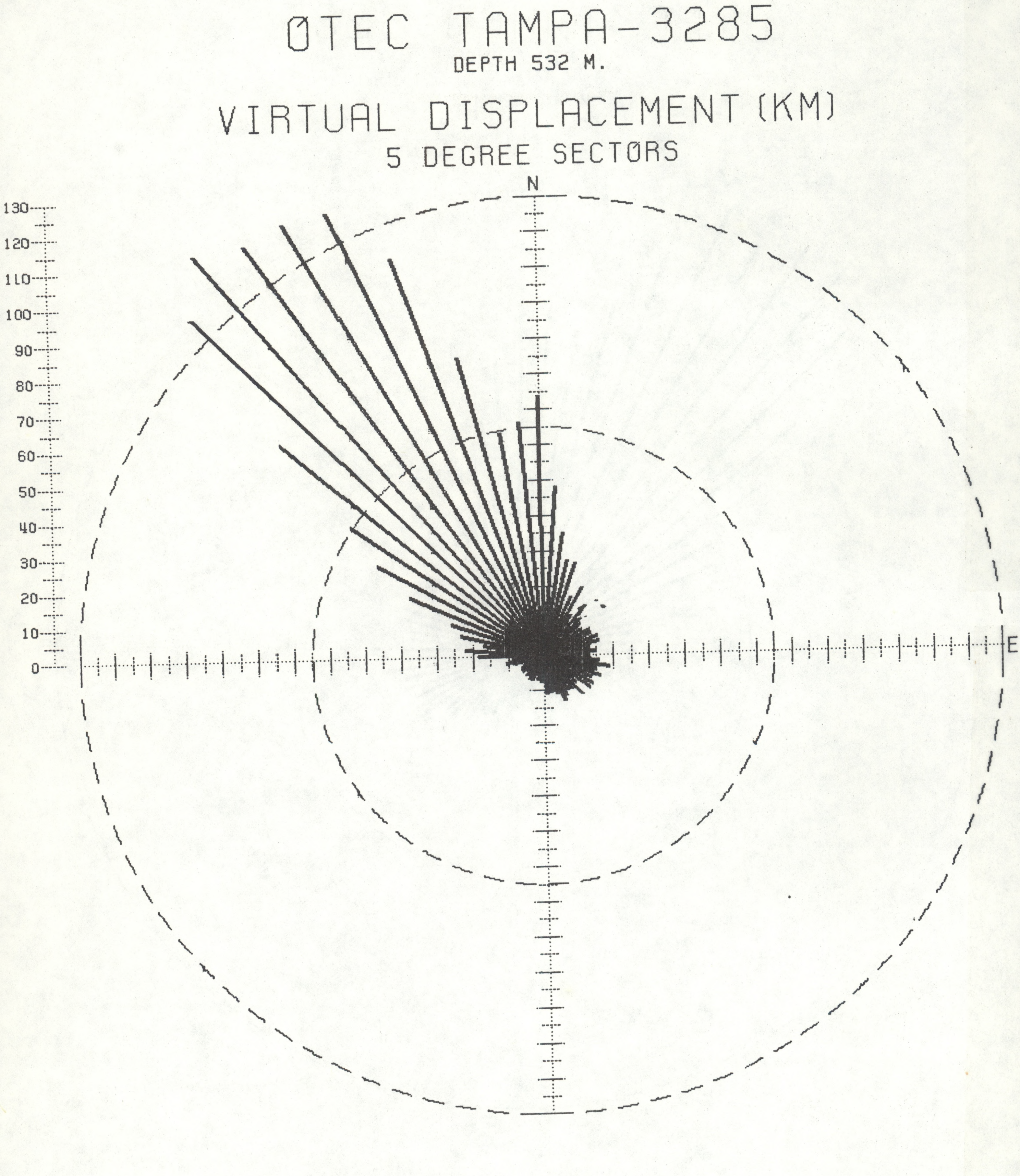
ØTEC TAMPA-3285

DEPTH 532 M.

% TIME

5 DEGREE SECTORS



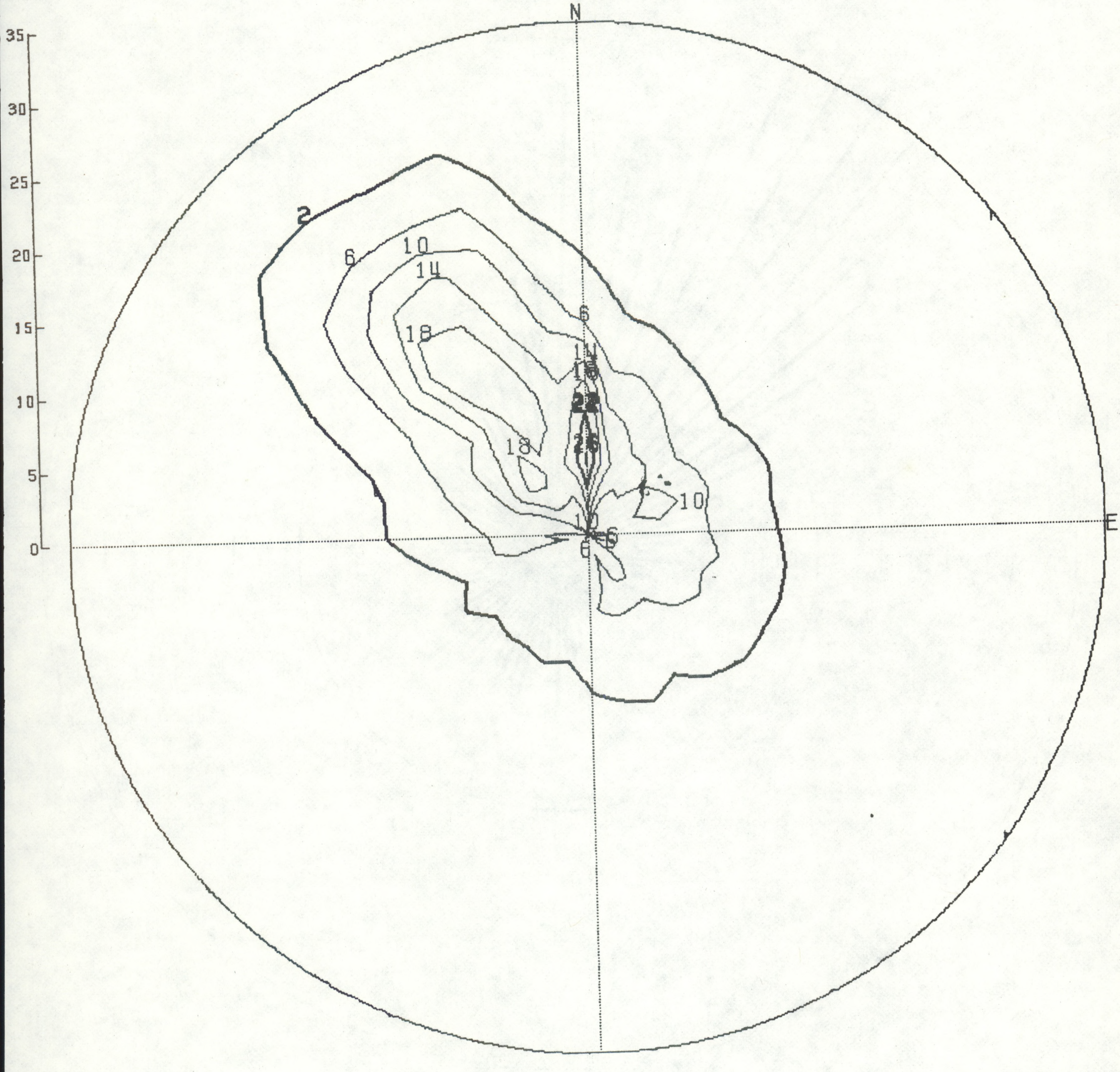


ØTEC TAMPA-3285
DEPTH 532 M.
VIRTUAL DISPLACEMENT (KM)
5 DEGREE SECTORS
N
E
130
120
110
100
90
80
70
60
50
40
30
20
10
0

ØTEC TAMPA-3285

DEPTH 532 M.

PER MIL ØCCURRENCE ØF
SPECIFIC DIRECTIØN AND SPEED
SECTØR SIZE:
10 DEGREES
5 CM/SEC

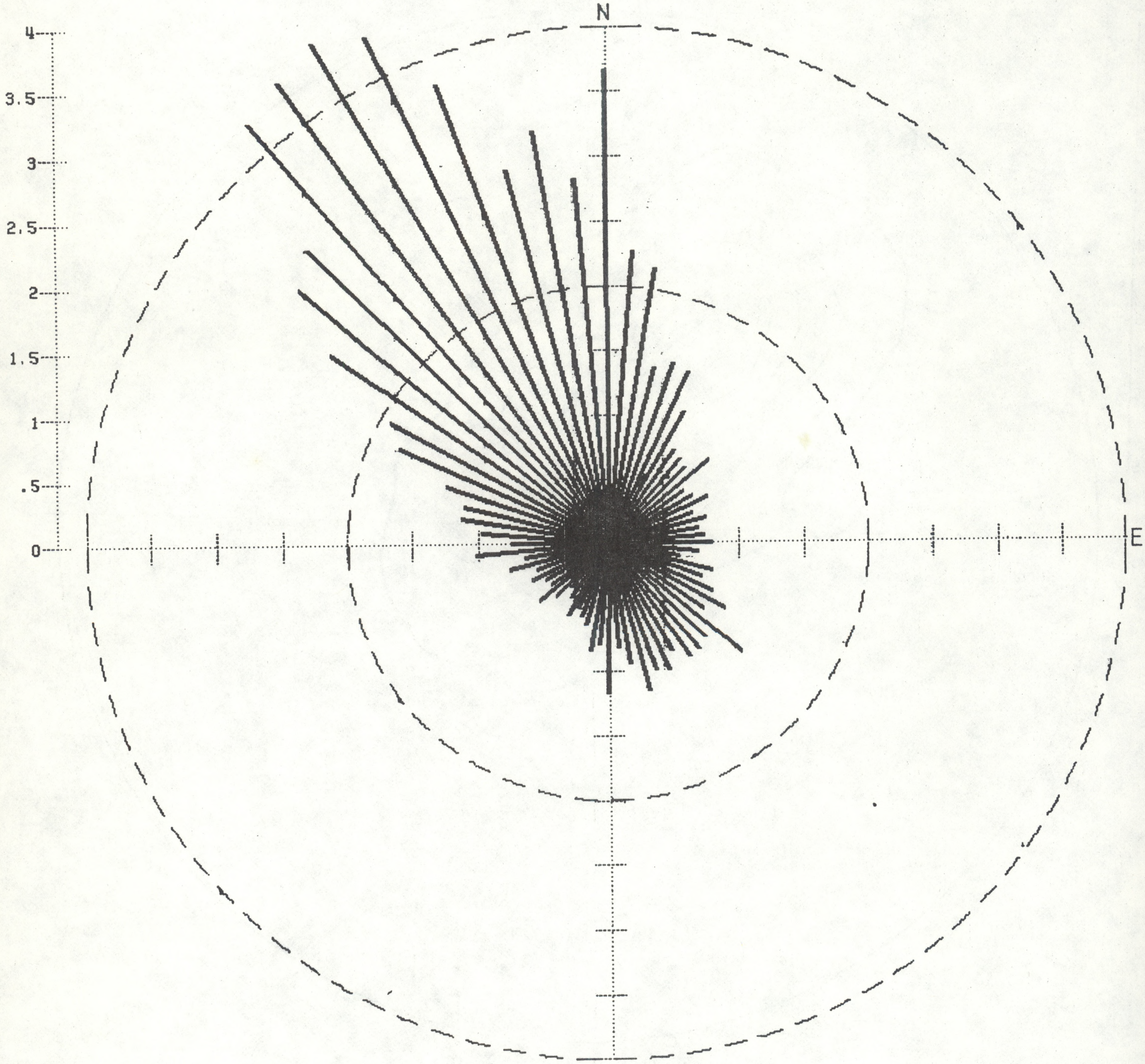


ØTEC TAMPA-3482

DEPTH 939 M.

% TIME

5 DEGREE SECTØRS

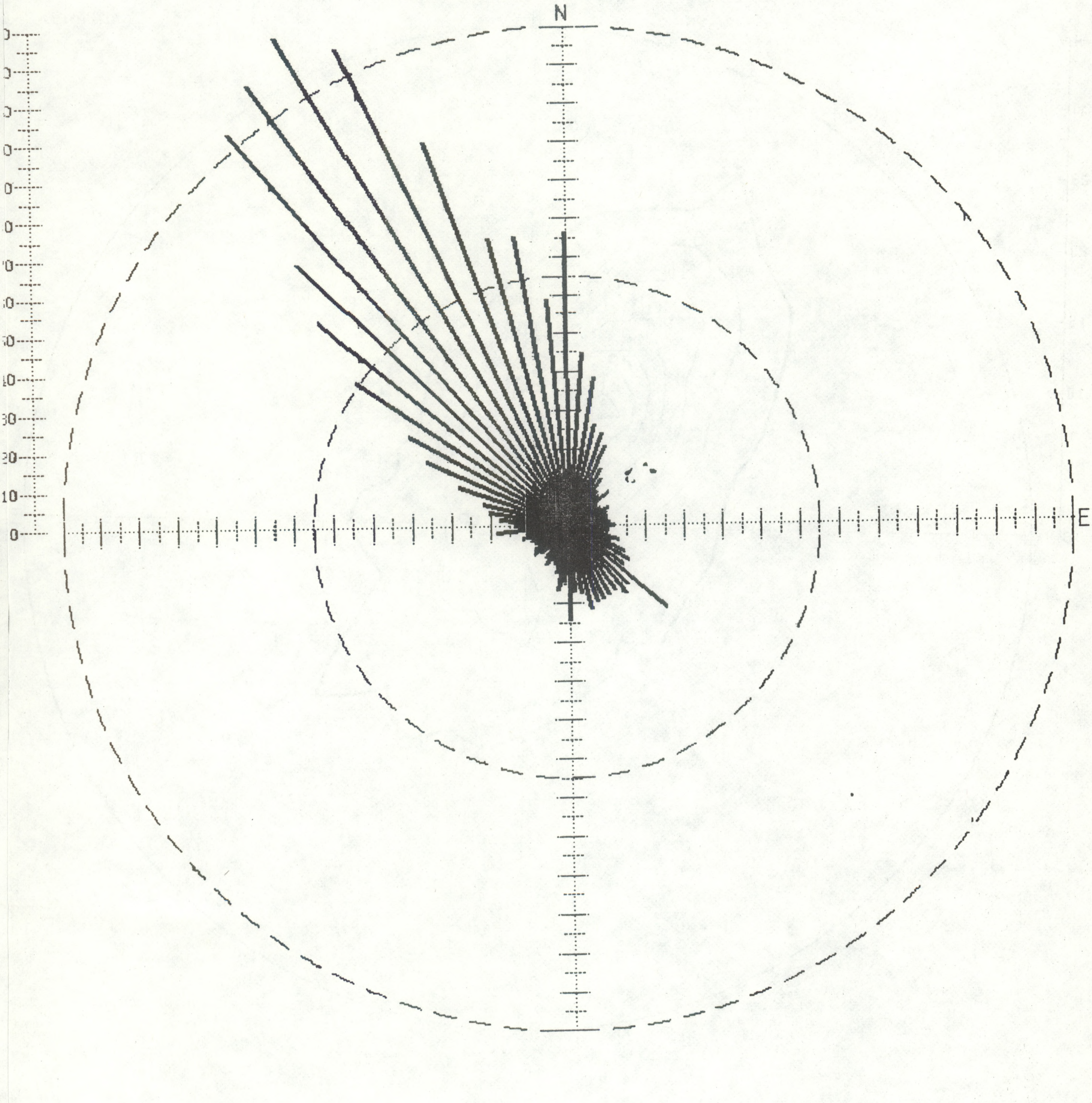


ØTEC TAMPA-3482

DEPTH 939 M.

VIRTUAL DISPLACEMENT (KM)

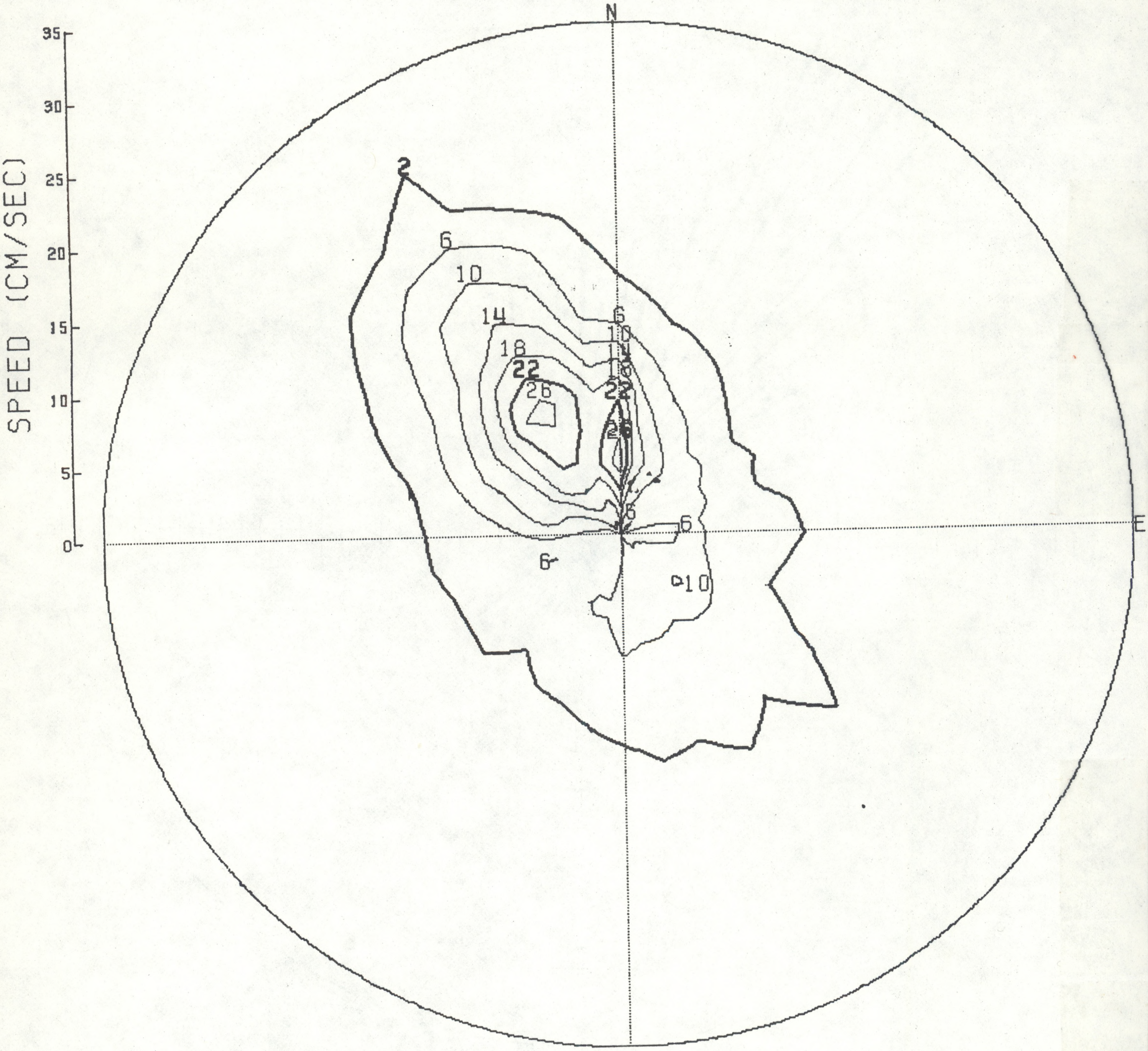
5 DEGREE SECTØRS



ØTEC TAMPA-3482

DEPTH 939 M.

PER MIL ØCCURRENCE ØF
SPECIFIC DIRECTIØN AND SPEED
SECTØR SIZE:
10 DEGREES
5 CM/SEC



Appendix 5

Hydrographic data from the NOAA Ship VIRGINIA KEY cruise #7904, 25-31 March 1979. Section 1, stations 1-17 are STD's with XBT's between for greater thermal resolution; similarly, sections 2 and 3, stations 17-29 and 29-41 respectively are composite plots. Section 4, stations 41-51 is an XBT only transect. The figures are:

Figure	Description
5.1	Station locations, 25-31 March 1979
5.2	Temperature (°C) vs. depth (m) for section 1
5.3	Salinity (°/∘∘) vs. depth (m) for section 1
5.4	σ_t (mg cm^{-3}) vs. depth (m) for section 1
5.5	Geostrophic velocity (cm sec^{-1}) vs. depth (m) for section 1
5.6	Temperature (°C) vs. depth (m) for section 2
5.7	Salinity (°/∘∘) vs. depth (m) for section 2
5.8	σ_t (mg cm^{-3}) vs. depth (m) for section 2
5.9	Geostrophic velocity (cm sec^{-1}) vs. depth (m) for section 2
5.10	Temperature (°C) vs. depth (m) for section 3
5.11	Salinity (°/∘∘) vs. depth (m) for section 3
5.12	σ_t (mg cm^{-3}) vs. depth (m) for section 3
5.13	Geostrophic velocity (cm sec^{-1}) vs. depth (m) for section 3
5.14	Temperature (°C) vs. depth (m) for section 4
5.15	Depth (m) of the 20°C isothermal surface for 25-31 March
5.16	Depth (m) of the 22°C isothermal surface for 25-31 March 1979

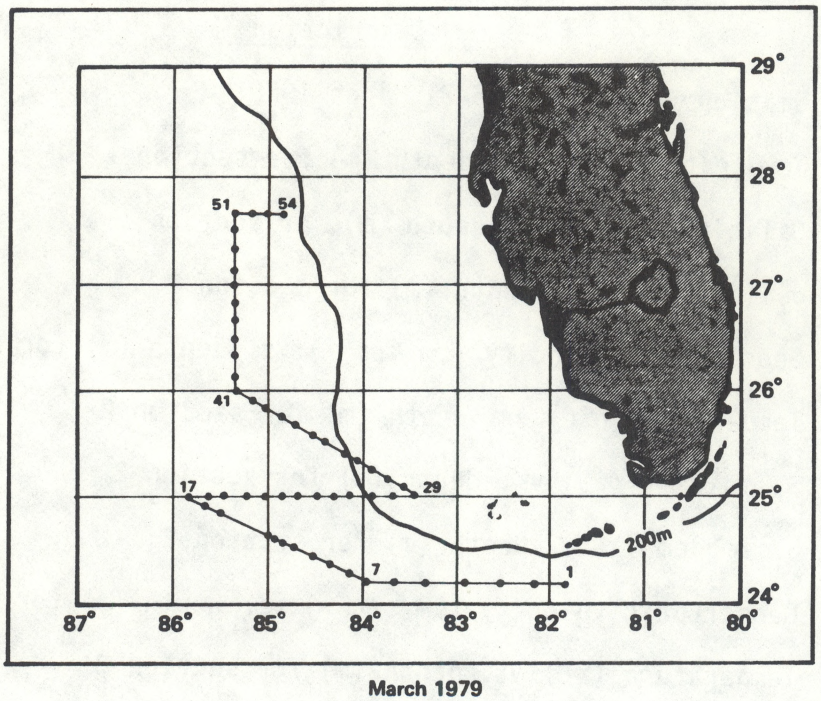
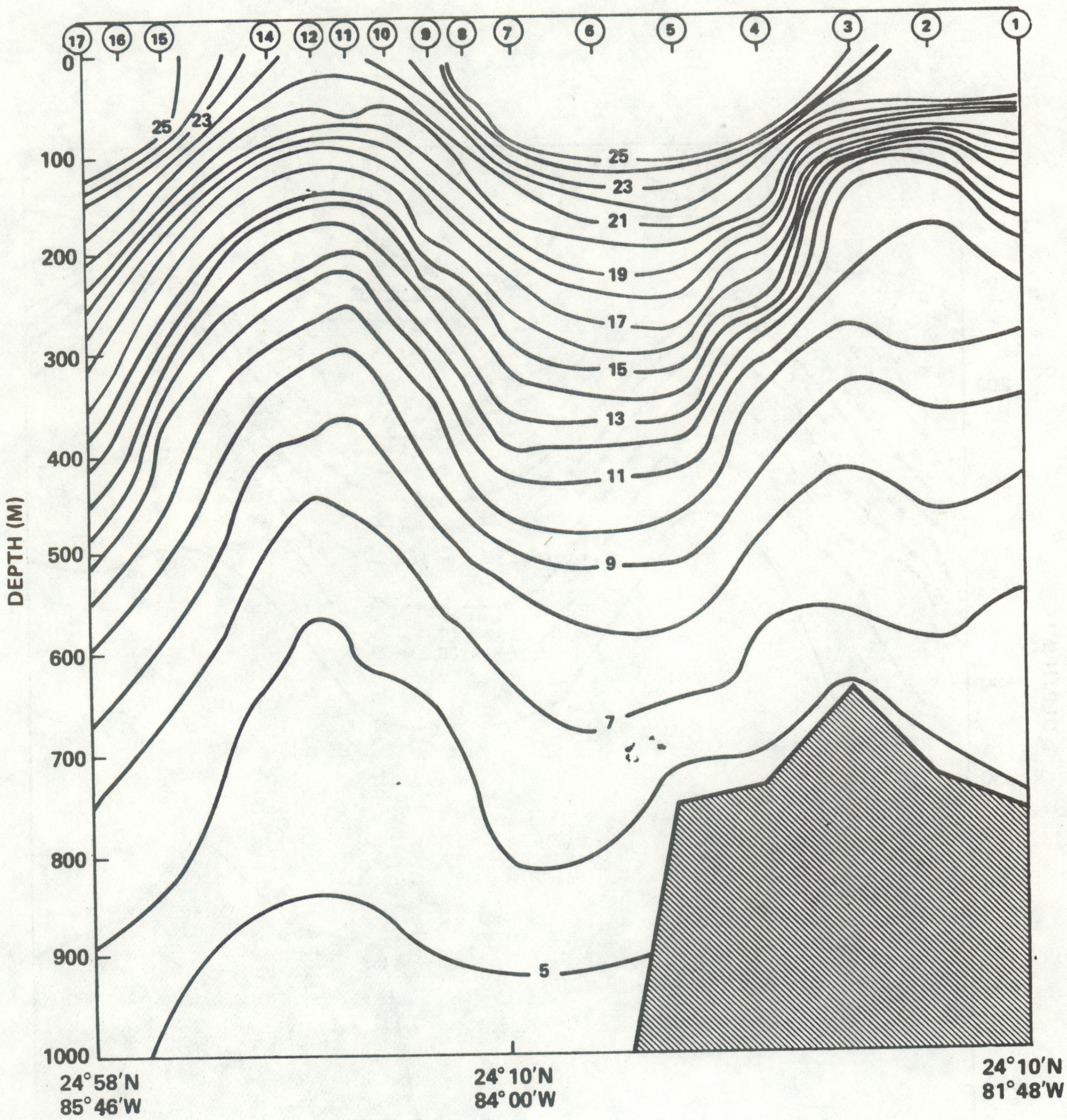

29°
28°
27°
26°
25°
24°
51
54
41
29
17
7
1
200m
87°
86°
85°
84°
83°
82°
81°
80°
March 1979

Figure 5.1



17
16
15
14
12
11
10
9
8
7
6
5
4
3
2
1
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
25
23
21
19
17
15
13
11
9
7
5
24°58'N
85°46'W
24°10'N
84°00'W
24°10'N
81°48'W

Figure 5.2

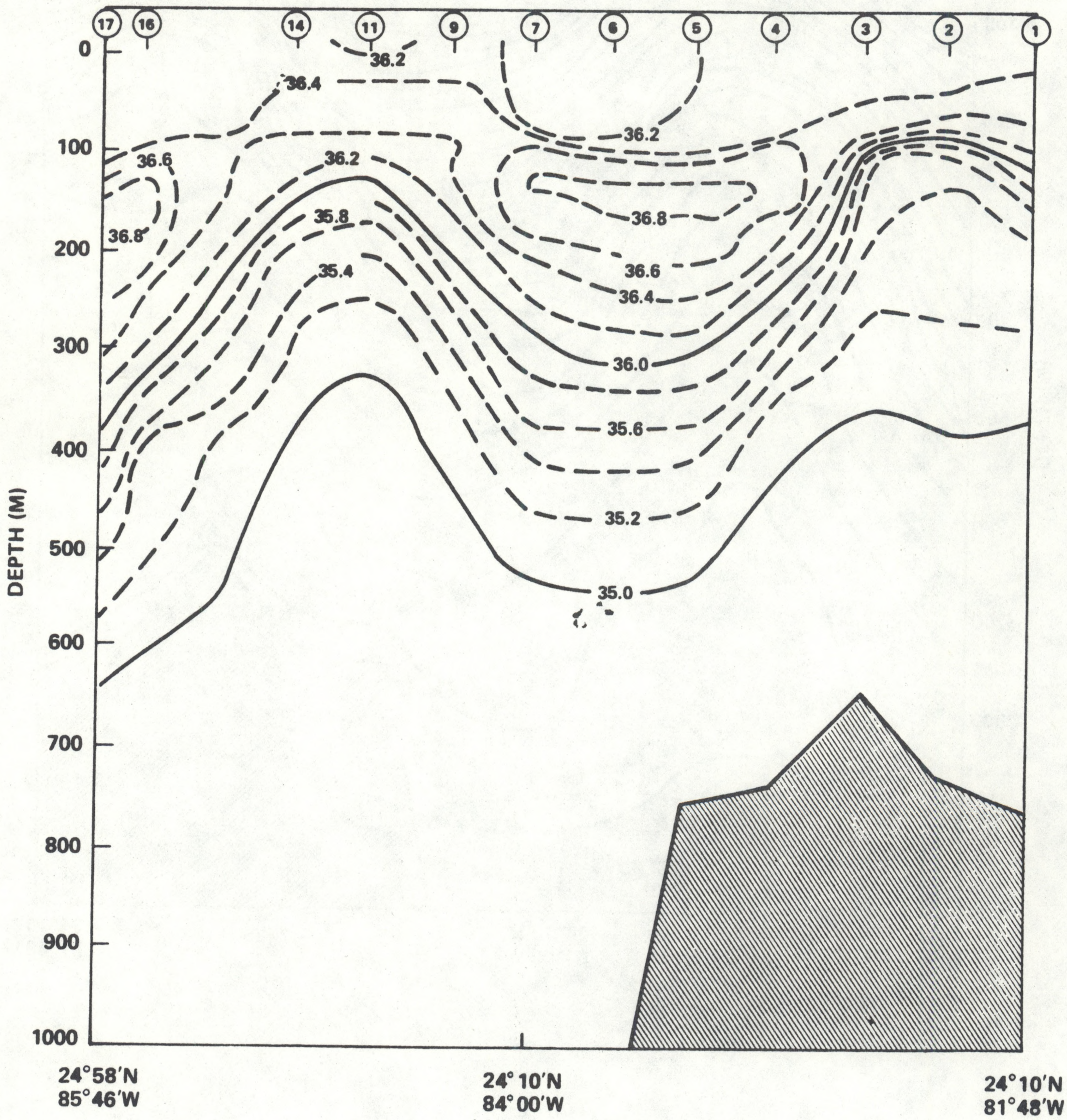

17
16
14
11
9
7
6
5
4
3
2
1
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
36.2
36.4
36.6
36.8
36.2
35.8
35.4
36.2
36.8
36.6
36.4
36.0
35.6
35.2
35.0
24°58'N
85°46'W
24° 10'N
84° 00'W
24°10'N
81°48'W

Figure 5.3

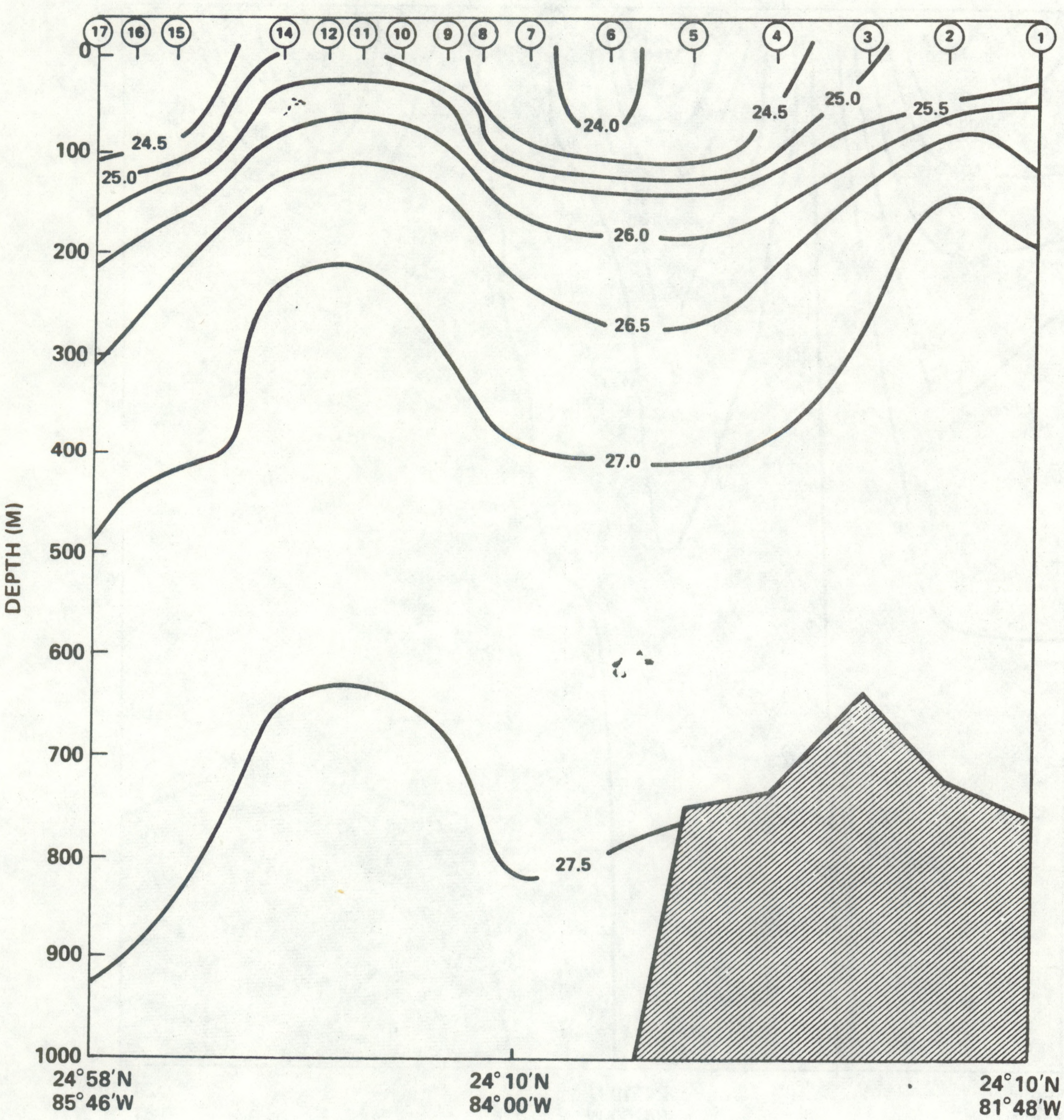

17
16
15
14
12
11
10
9
8
7
6
5
4
3
2
1
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
24°58'N
85°46'W
24°10'N
84°00'W
24°10'N
81°48'W

Figure 5.4

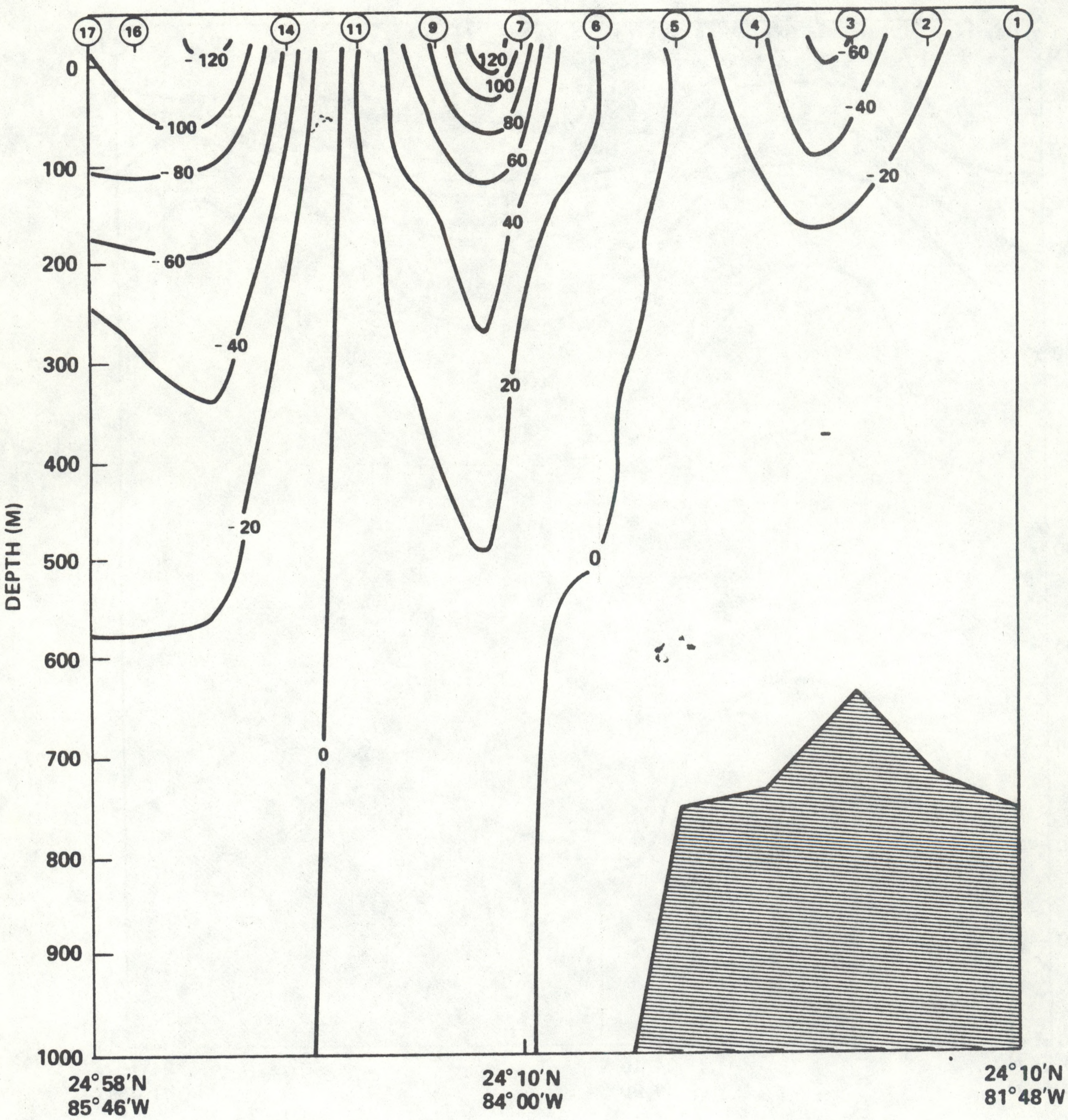

17
16
14
11
9
7
6
5
4
3
2
1
-120
120
100
80
60
40
20
0
-100
-80
-60
-40
-20
0
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
24°58'N
85°46'W
24°10'N
84°00'W
24°10'N
81°48'W

Figure 5.5

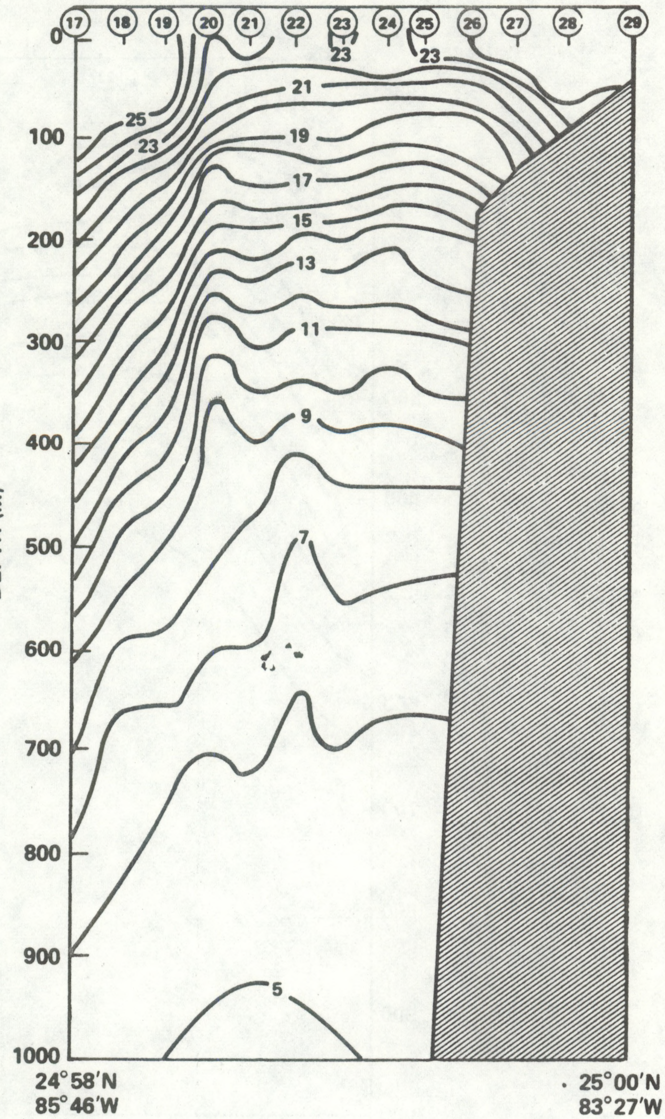

17
18
19
20
21
22
23
24
25
26
27
28
29
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
25
23
23
23
21
19
17
15
13
11
9
7
5
24°58'N
85°46'W
25°00'N
83°27'W

Figure 5.6

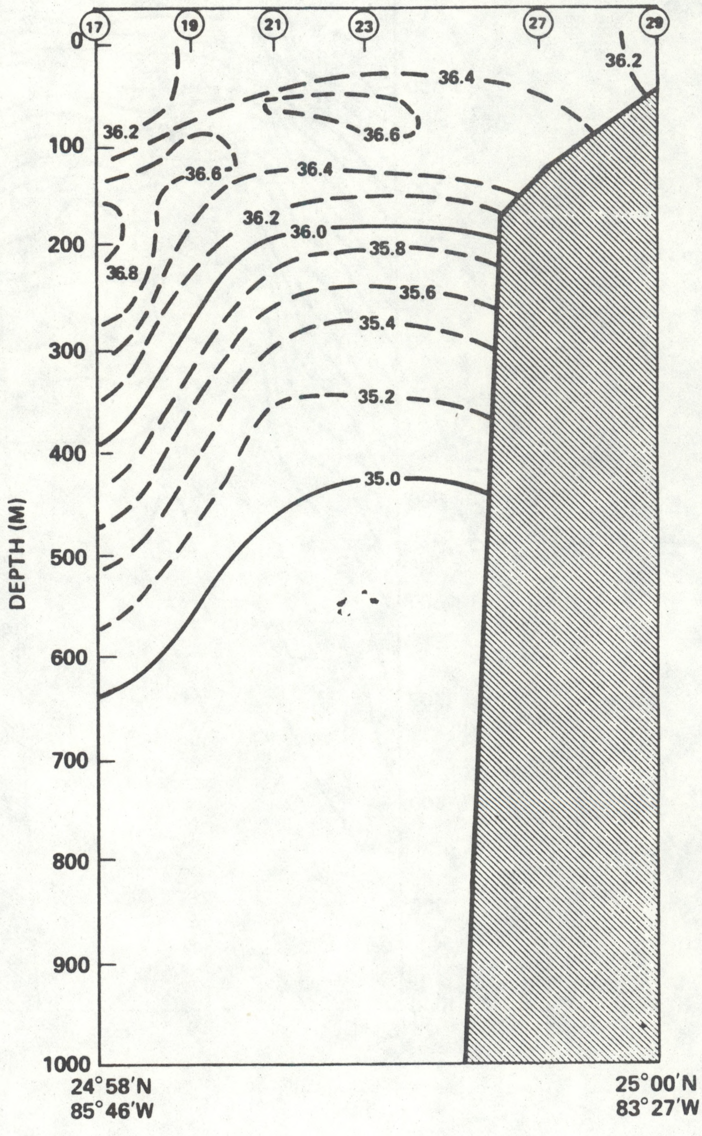

17
19
21
23
27
29
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
36.4
36.2
36.6
36.2
36.6
36.4
36.2
36.0
35.8
35.6
35.4
35.2
35.0
36.8
24°58'N
85°46'W
25°00'N
83°27'W

Figure 5.7

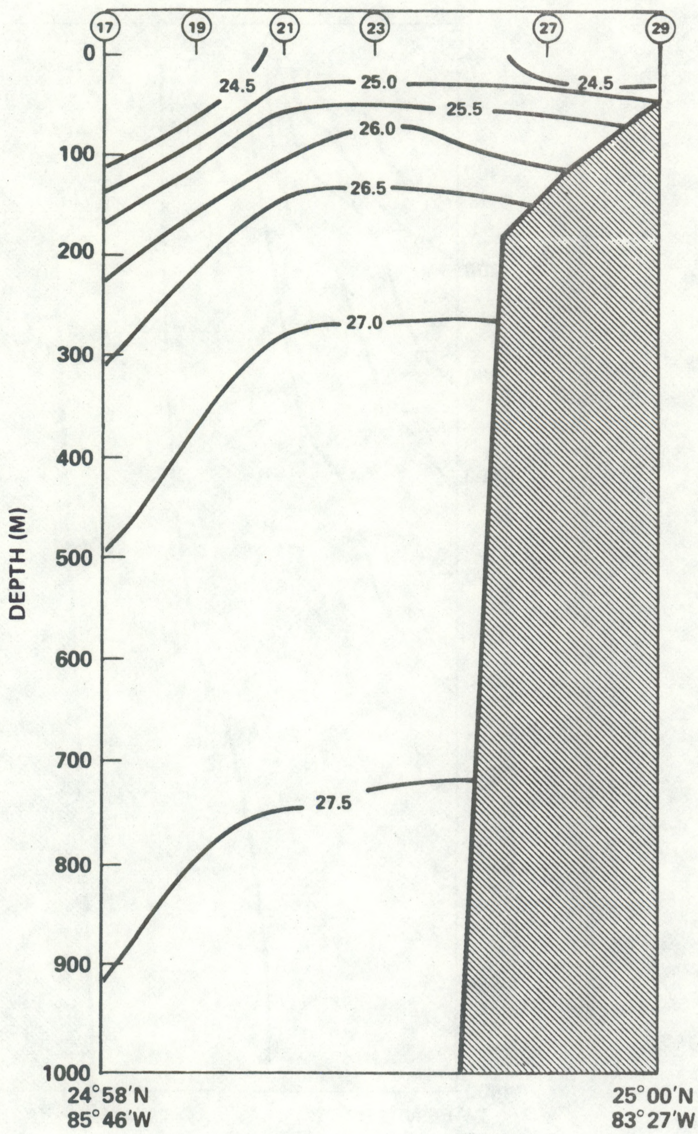

17
19
21
23
27
29
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
24.5
25.0
24.5
25.5
26.0
26.5
27.0
27.5
24°58'N
85°46'W
25°00'N
83°27'W

Figure 5.8

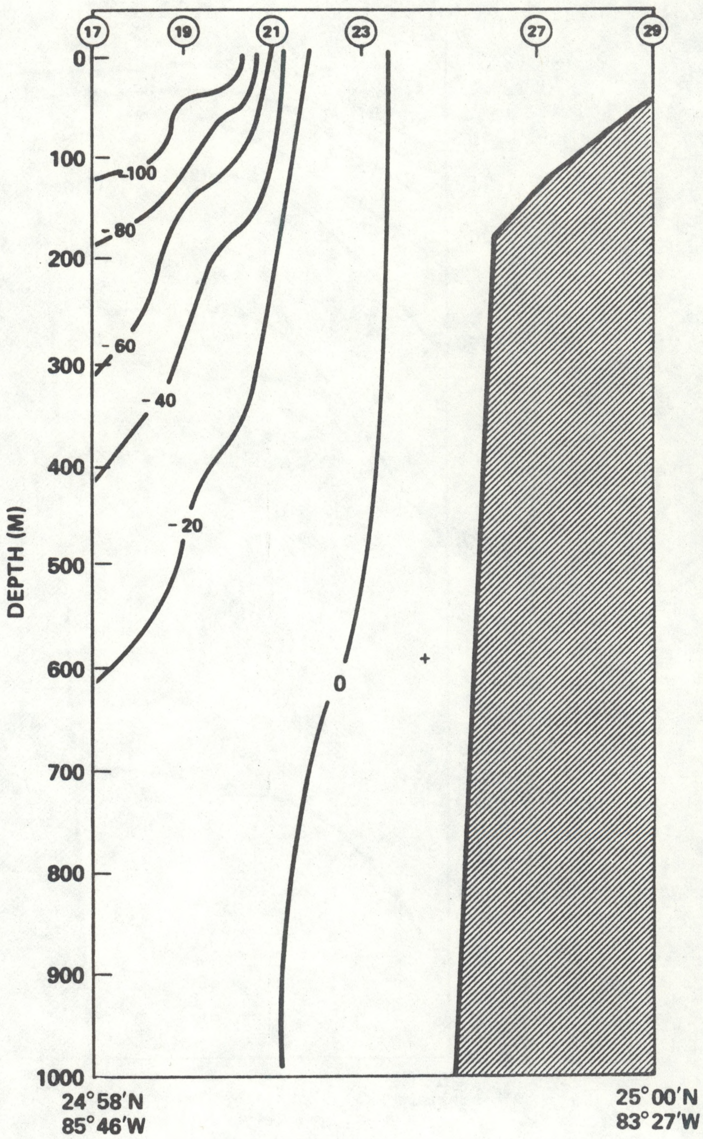

17
19
21
23
27
29
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
-100
-80
-60
-40
-20
0
24°58'N
85°46'W
25°00'N
83°27'W

Figure 5.9

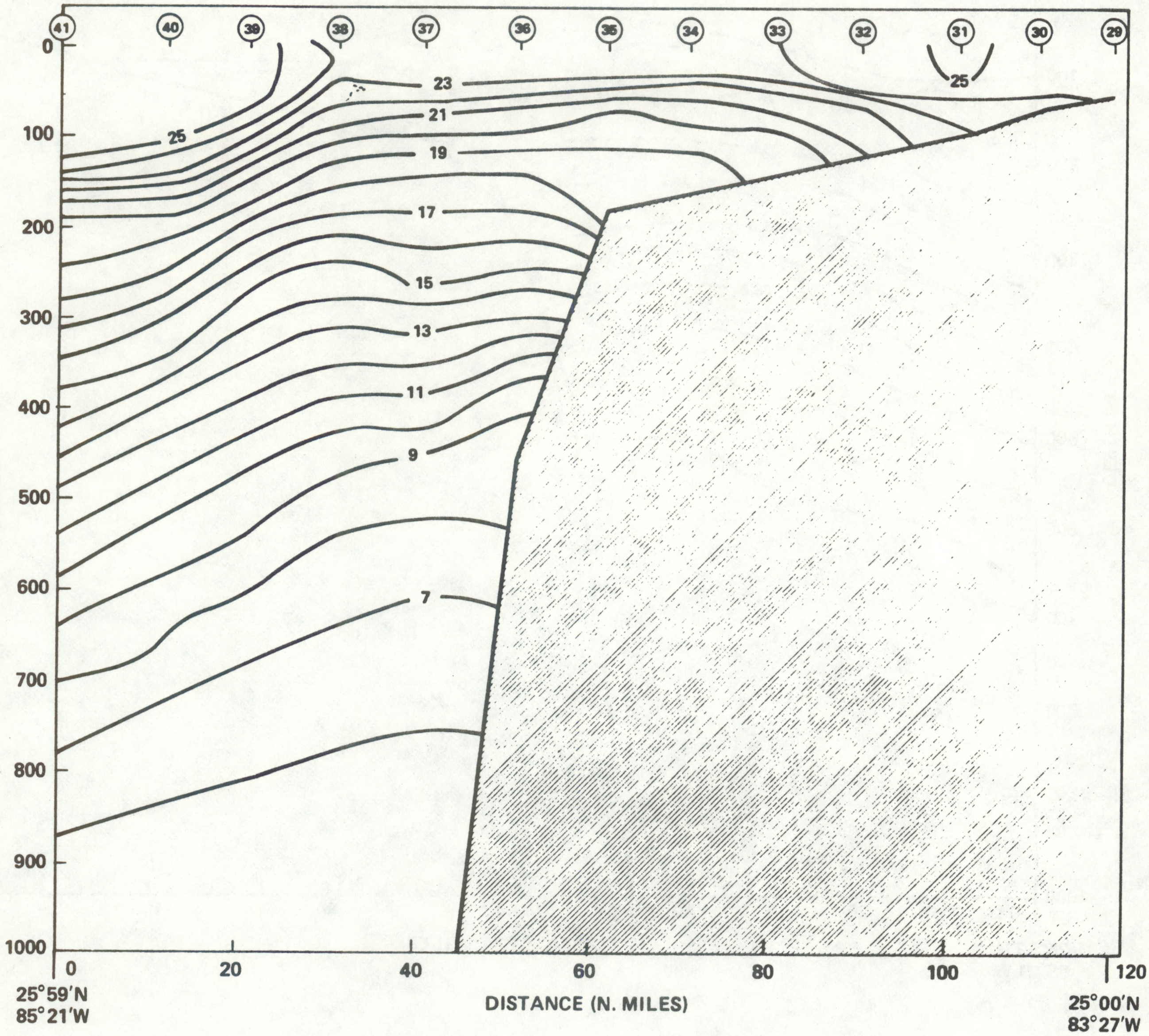

41
40
39
38
37
36
35
34
33
32
31
30
29
23
21
19
17
15
13
11
9
7
25
25
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
120
25°59'N
85°21'W
DISTANCE (N. MILES)
25°00'N
83°27'W

Figure 5.10

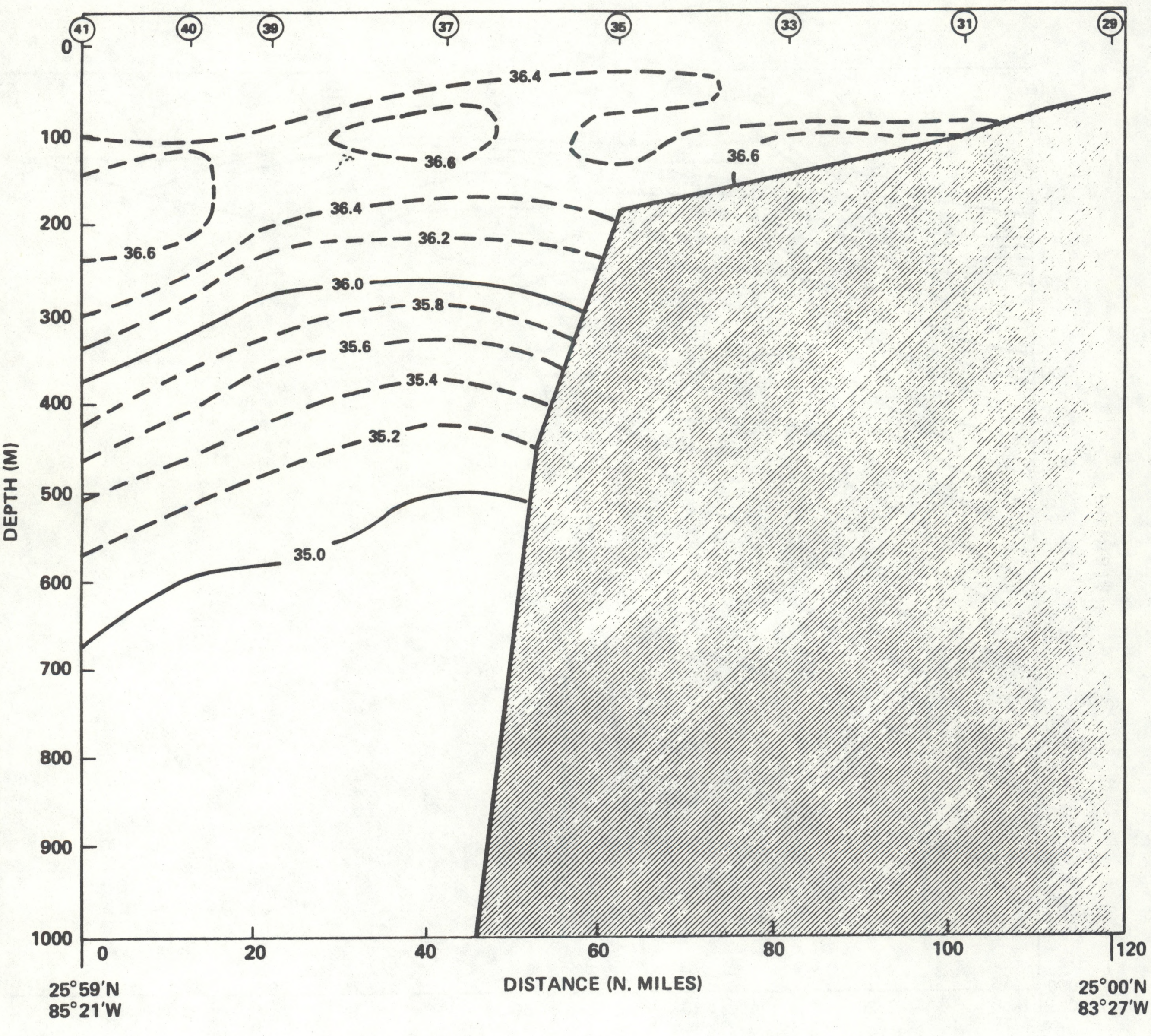

41
40
39
37
35
33
31
29
36.4
36.6
36.6
36.6
36.4
36.2
36.0
35.8
35.6
35.4
35.2
35.0
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
120
DISTANCE (N. MILES)
25°59'N
85°21'W
25°00'N
83°27'W

Figure 5.11

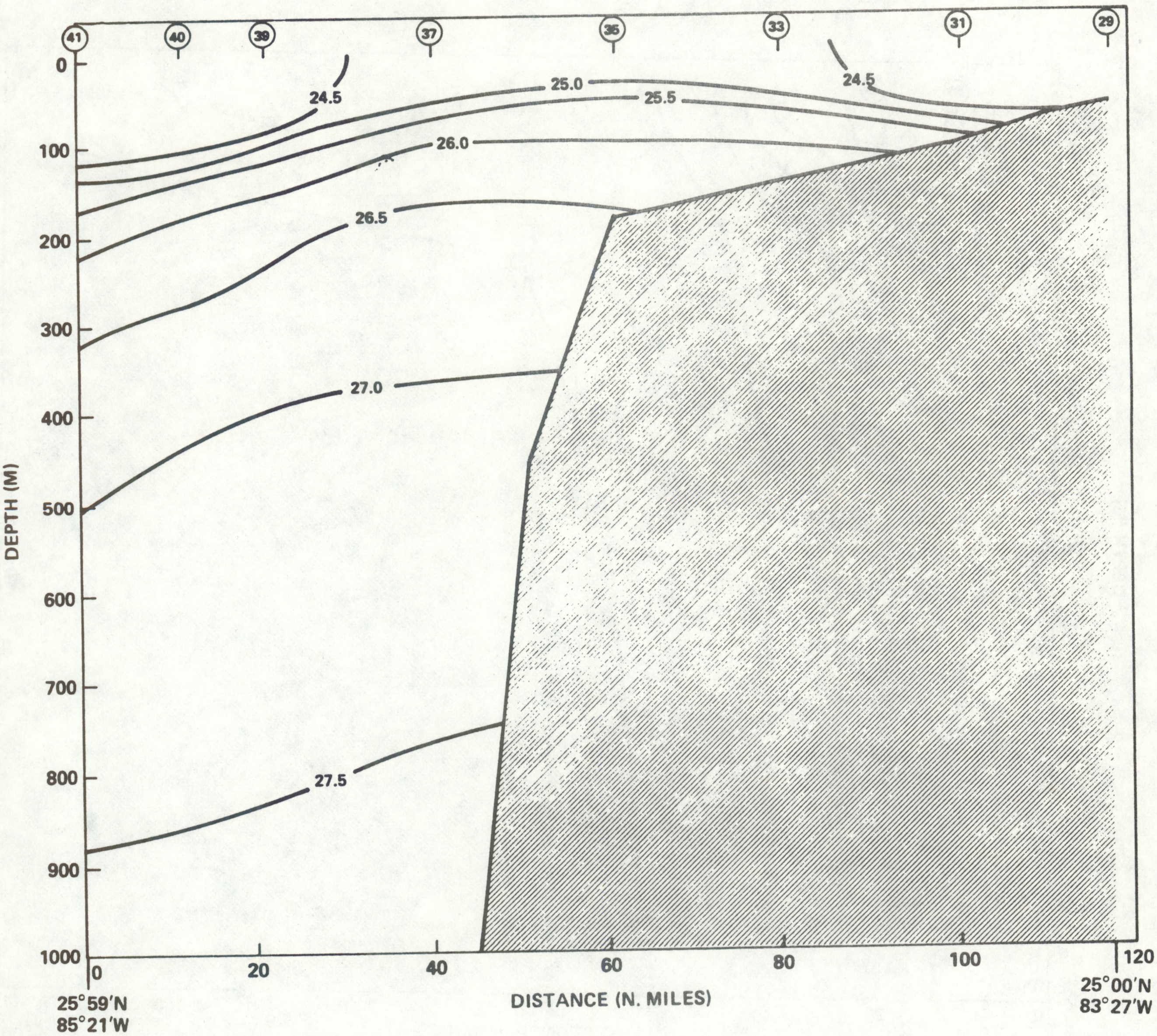
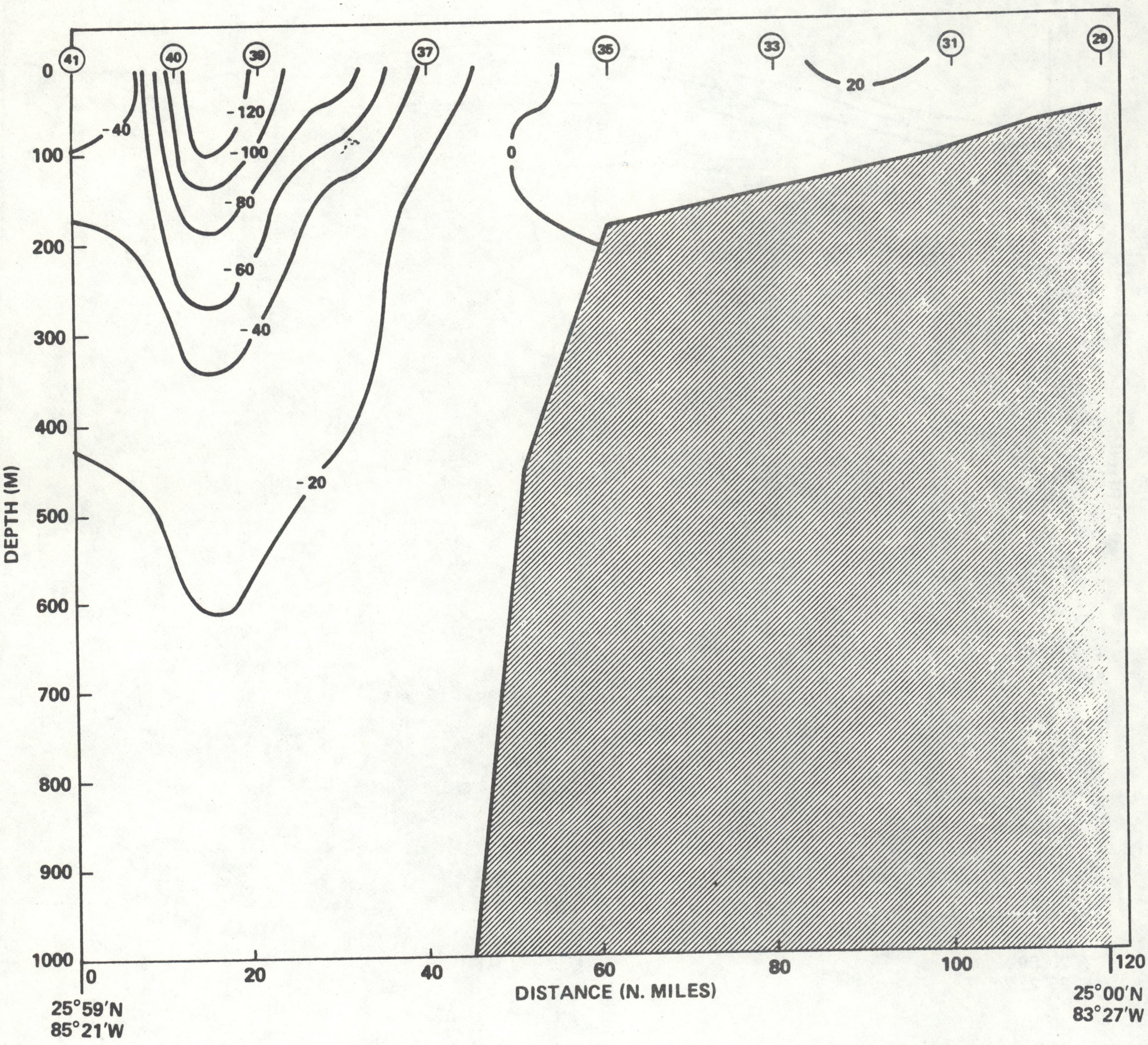

41
40
39
37
35
33
31
29
24.5
25.0
25.5
24.5
26.0
26.5
27.0
27.5
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
120
25°59'N
85°21'W
DISTANCE (N. MILES)
25°00'N
83°27'W

Figure 5.12



41
40
39
37
35
33
31
29
-120
-100
-80
-60
-40
-40
-20
0
20
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
120
DISTANCE (N. MILES)
25°59'N
85°21'W
25°00'N
83°27'W

Figure 5.13

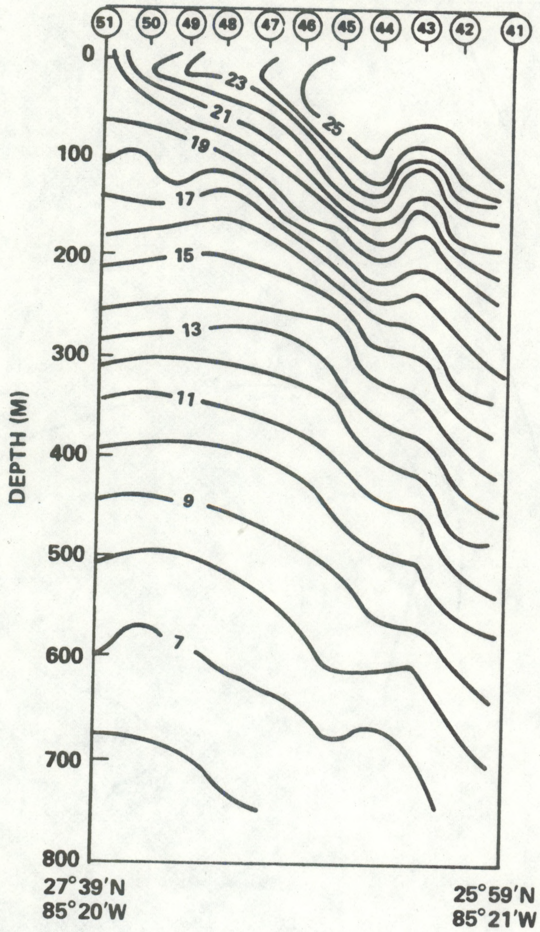

51
50
49
48
47
46
45
44
43
42
41
DEPTH (M)
0
100
200
300
400
500
600
700
800
23
25
21
19
17
15
13
11
9
7
27°39'N
85°20'W
25°59'N
85°21'W

Figure 5.14

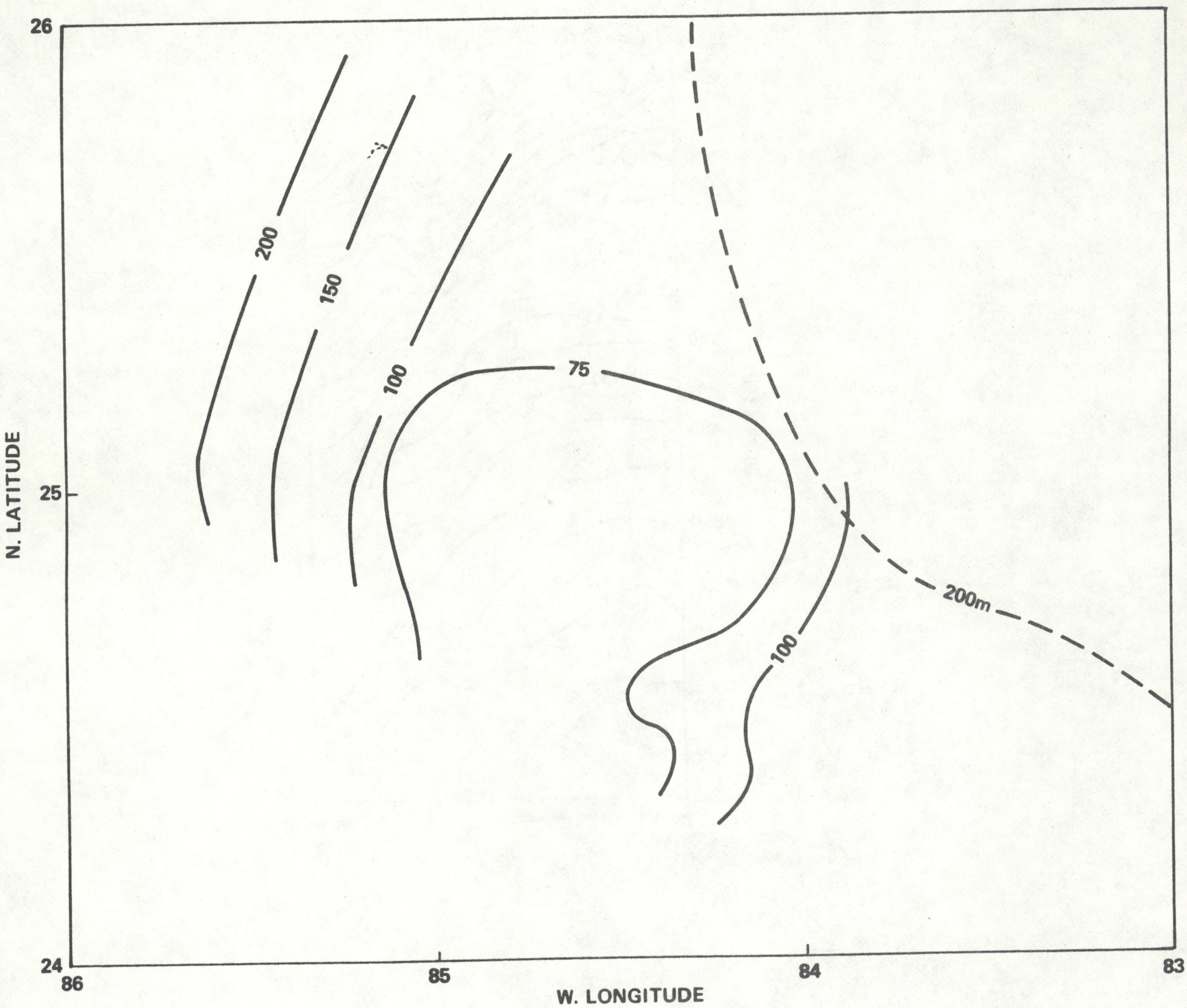

26
25
24
86
85
84
83
N. LATITUDE
W. LONGITUDE
200
150
100
75
100
200m

Figure 5.15

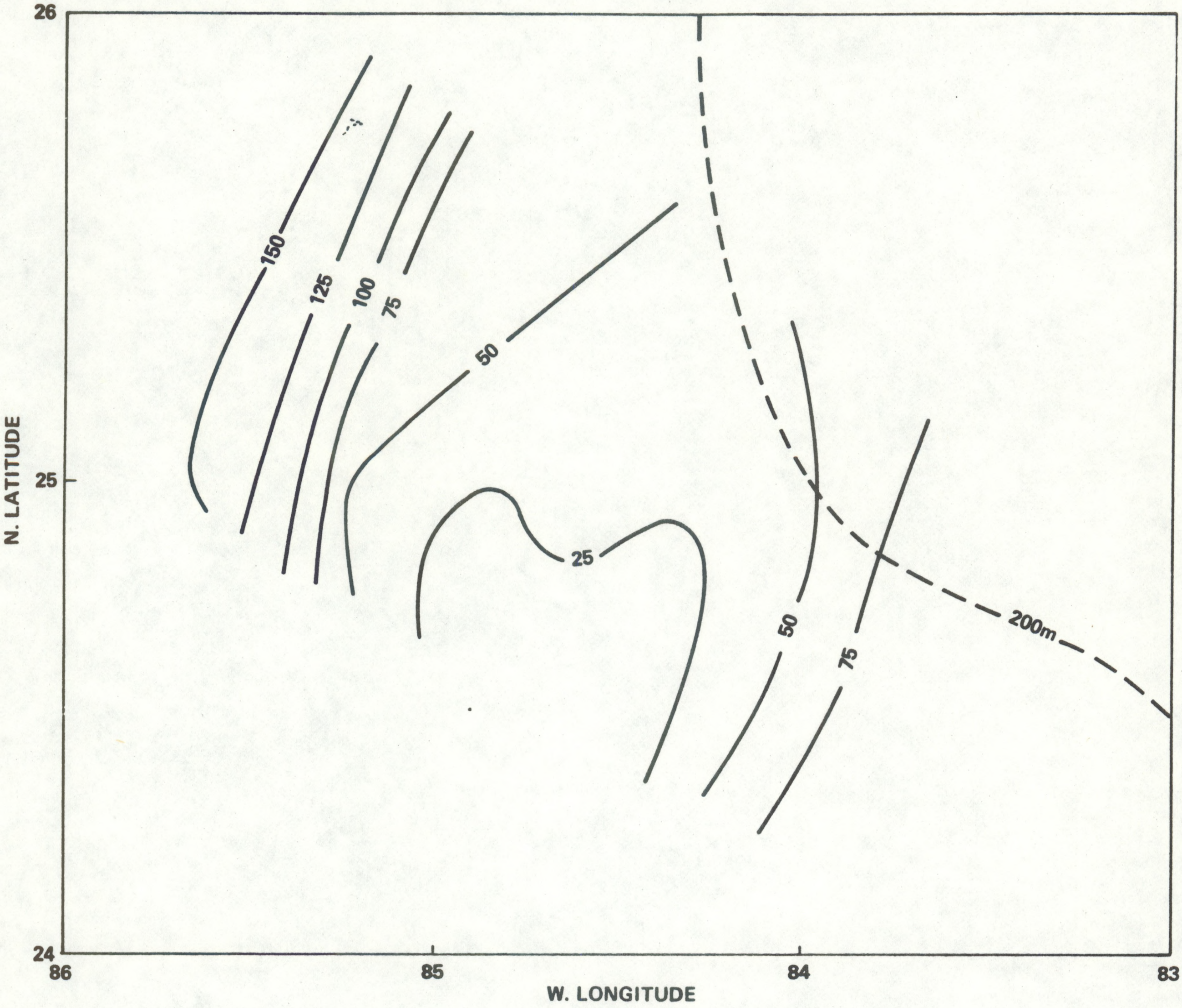

26
25
24
86
85
84
83
N. LATITUDE
W. LONGITUDE
150
125
100
75
50
25
50
75
200m

Figure 5.16

Appendix 6

Hydrographic data from the NOAA Ship VIRGINIA KEY Cruise #7906, 25-30 April 1979. Section 1 (stations 1-11), section 2 (stations 11-18), section 3 (stations 18-26), are combination of XBT and STD observation, but section 4 (stations 27-33) is XBT data only. The figures are:

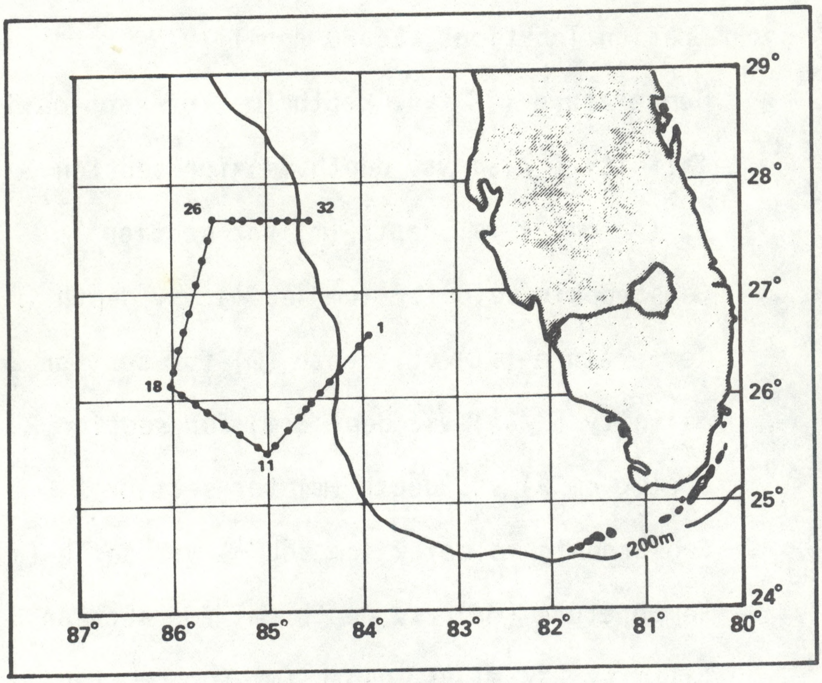
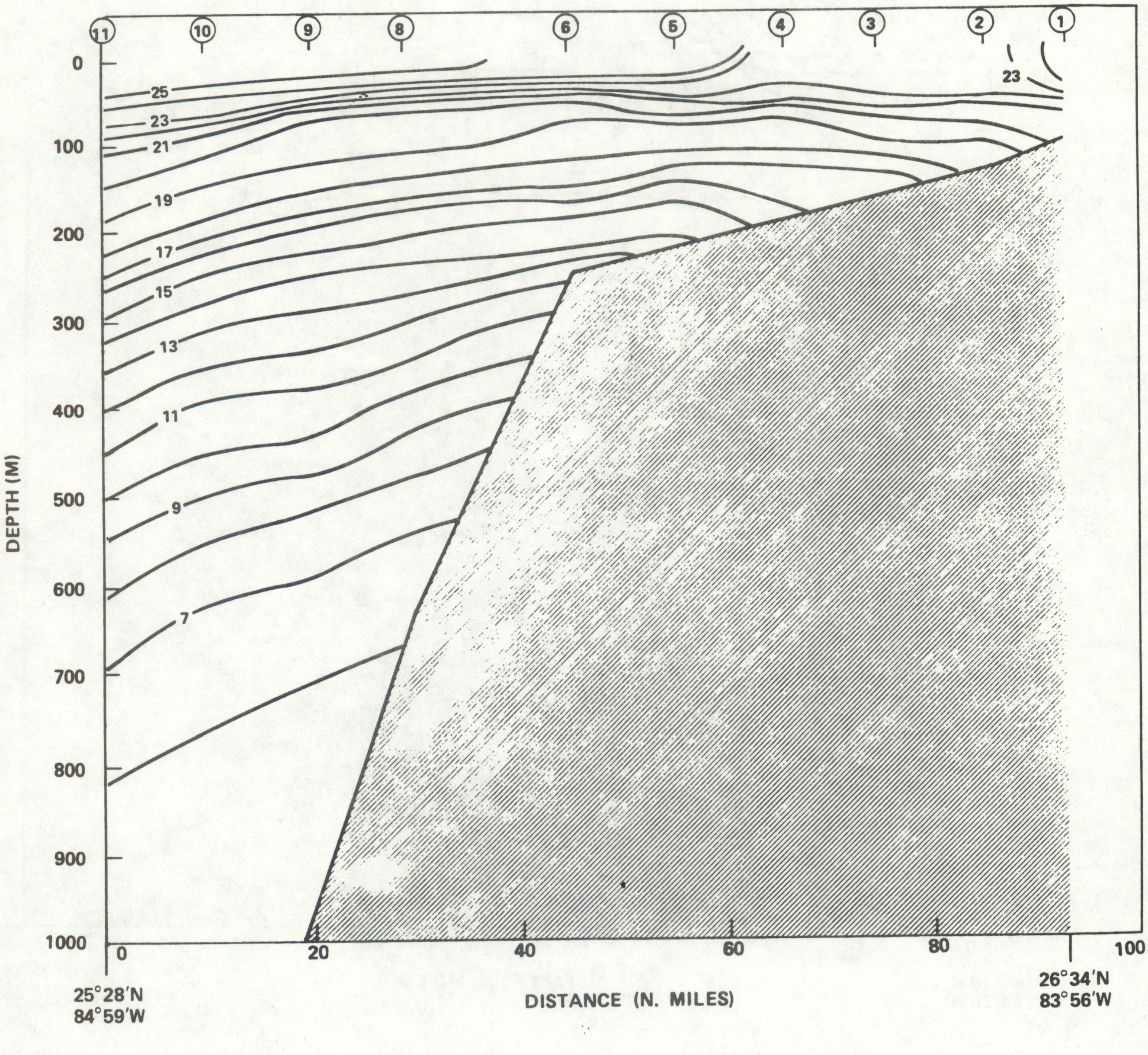
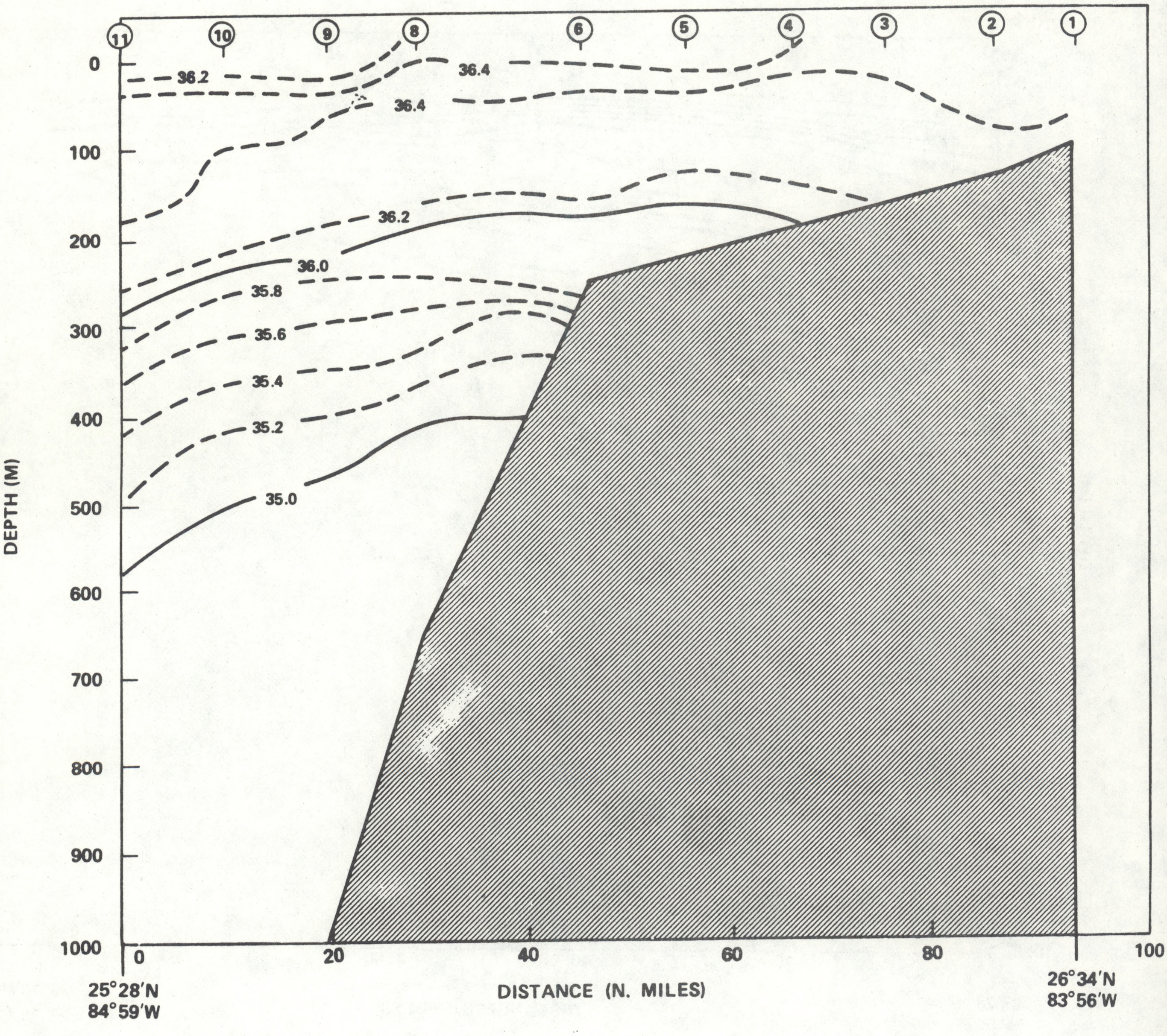

29°
28°
27°
26°
25°
24°
87°
86°
85°
84°
83°
82°
81°
80°
26
32
1
18
11
200m
April 1979

Figure 6.1



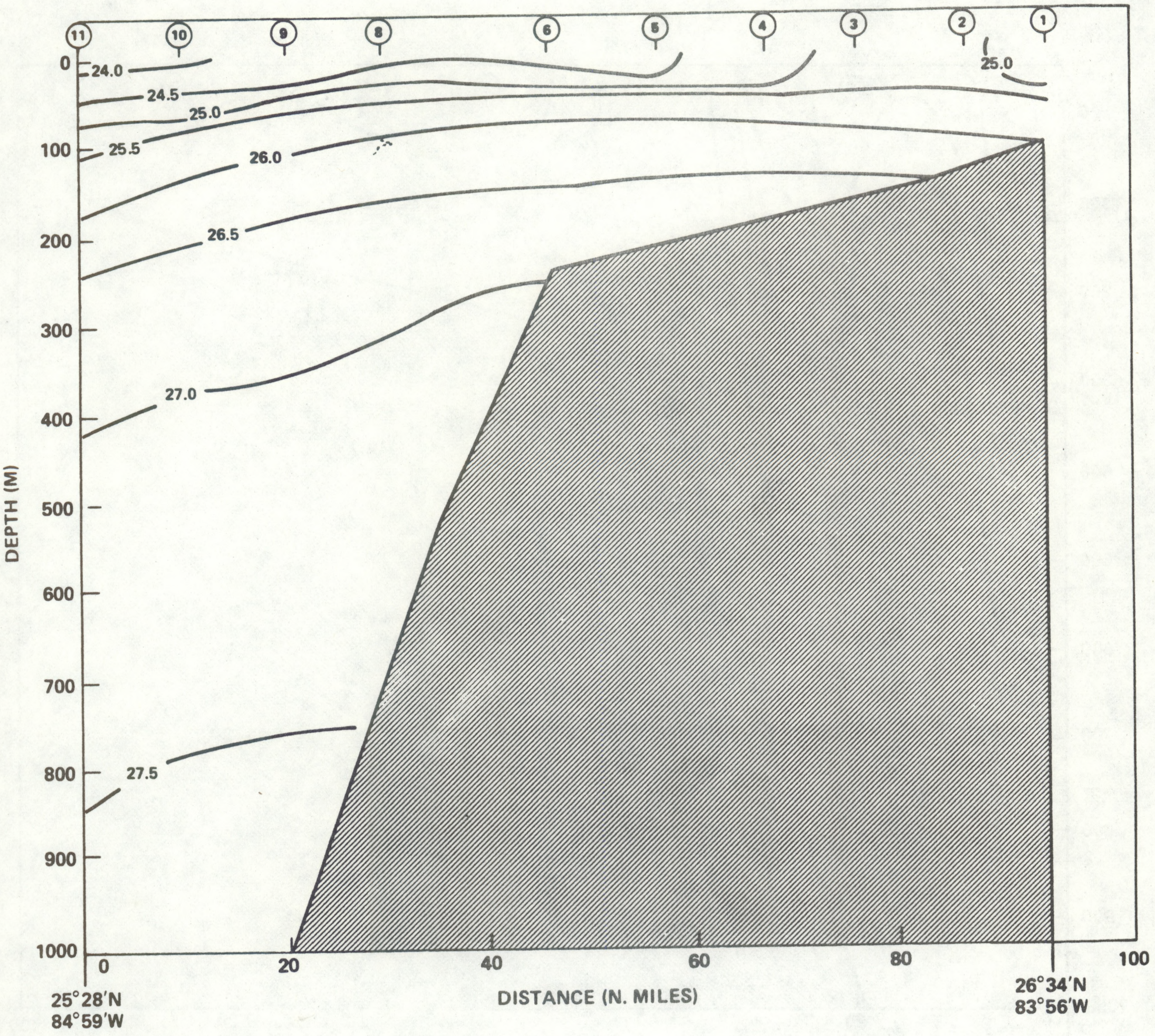
11
10
9
8
6
5
4
3
2
1
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
25
23
21
19
17
15
13
11
9
7
23
0
20
40
60
80
100
25°28'N
84°59'W
DISTANCE (N. MILES)
26°34'N
83°56'W

Figure 6.2



11
10
9
8
6
5
4
3
2
1
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
36.2
36.4
36.4
36.2
36.0
35.8
35.6
35.4
35.2
35.0
0
20
40
60
80
100
25°28′N
84°59′W
DISTANCE (N. MILES)
26°34′N
83°56′W

Figure 6.3



11
10
9
8
6
5
4
3
2
1
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
25.0
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
25°28'N
84°59'W
DISTANCE (N. MILES)
26°34'N
83°56'W

Figure 6.4

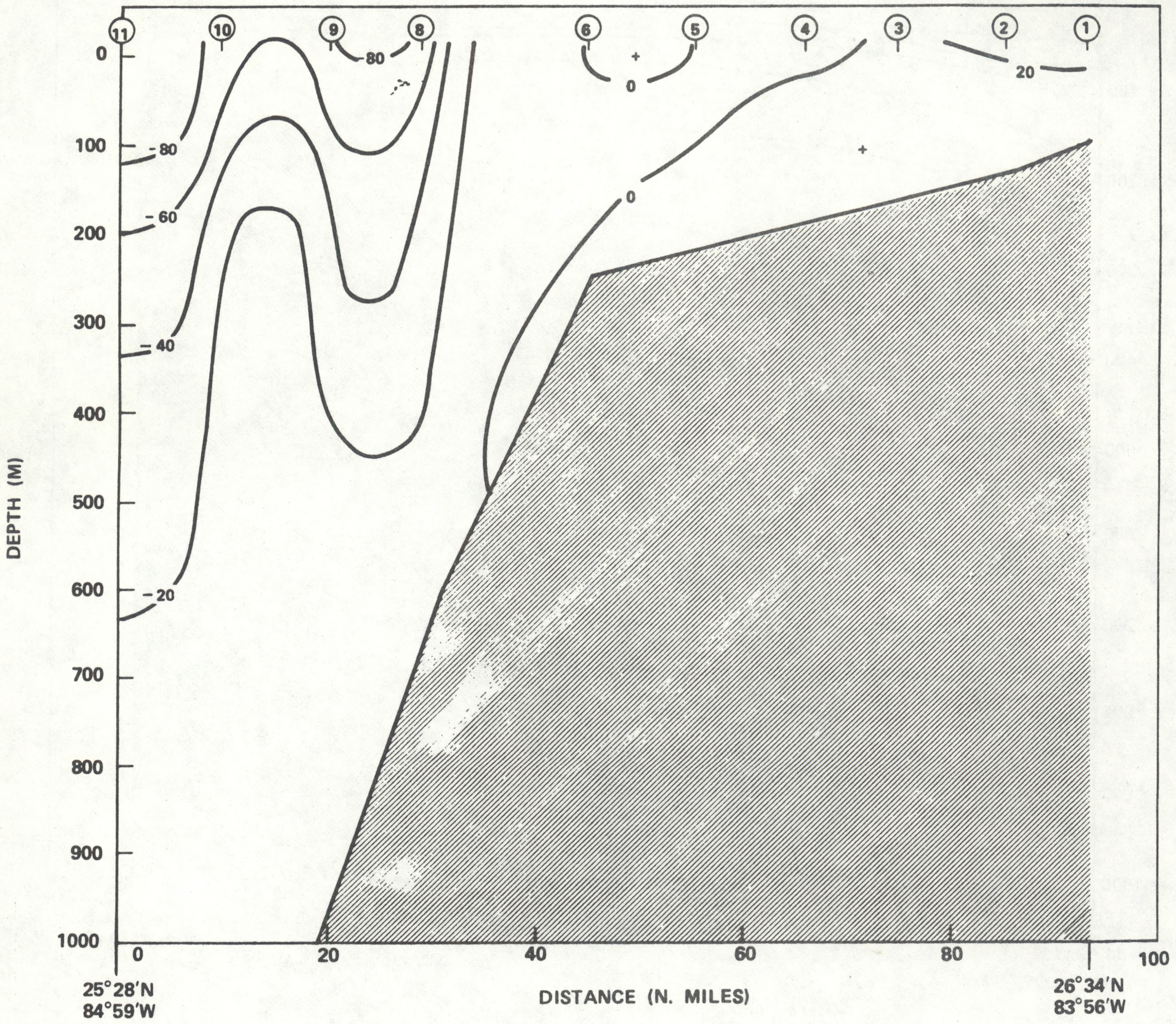

11
10
9
8
6
5
4
3
2
1
80
+
0
20
0
+
-80
-60
-40
-20
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
0
20
40
60
80
100
25°28'N
84°59'W
DISTANCE (N. MILES)
26°34'N
83°56'W

Figure 6.5

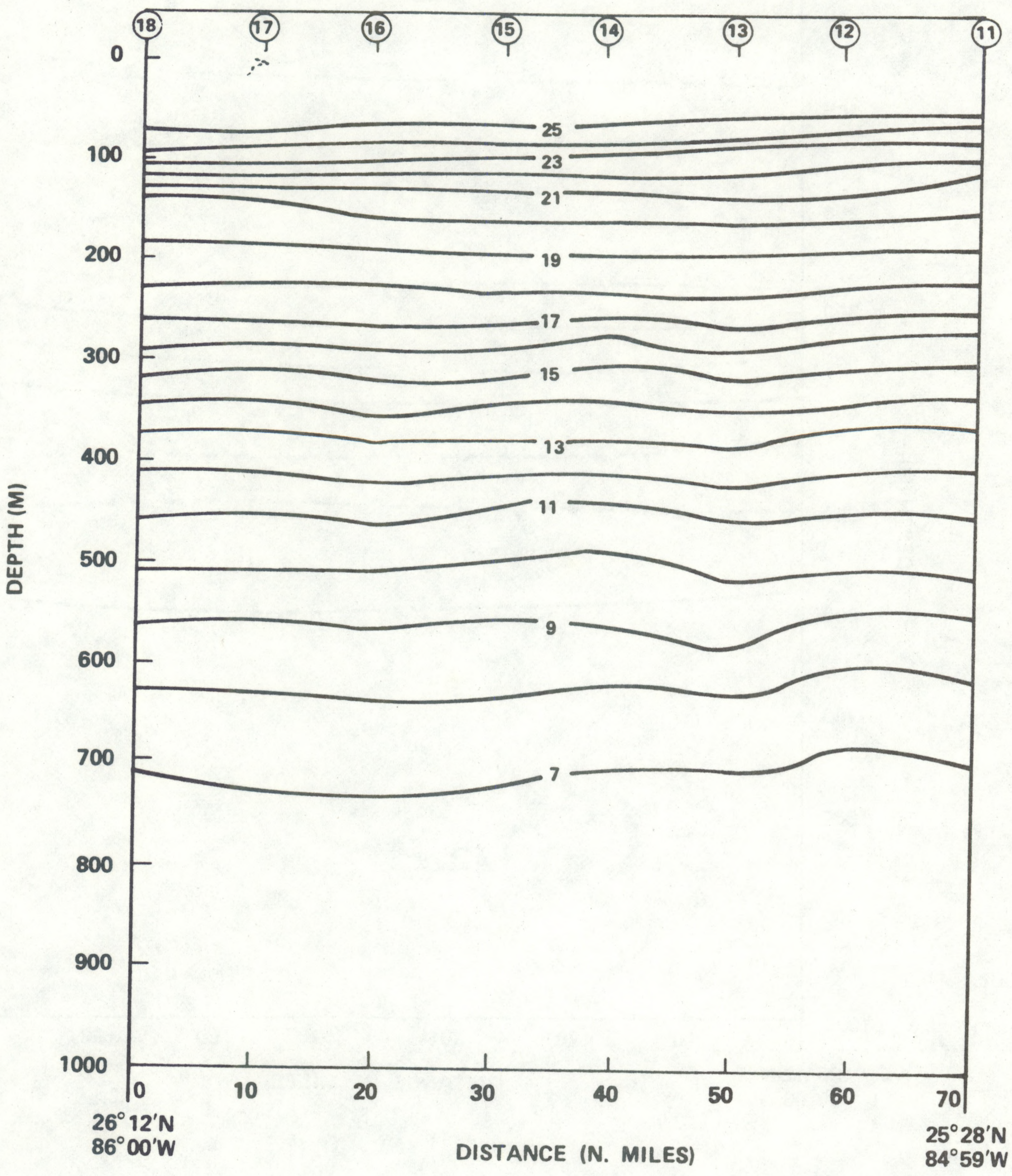
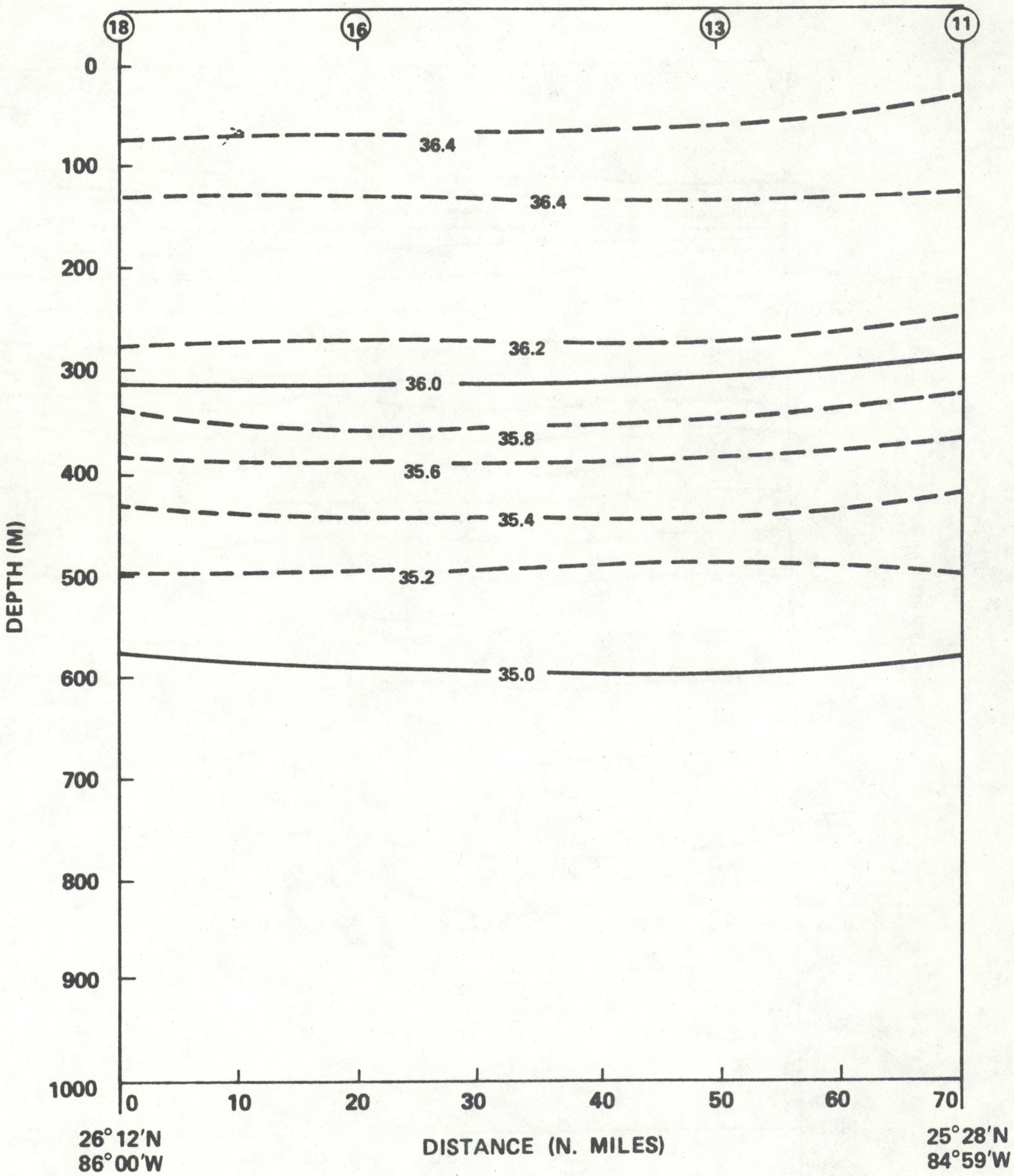

18
17
16
15
14
13
12
11
25
23
21
19
17
15
13
11
9
7
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
0
10
20
30
40
50
60
70
26° 12'N
86° 00'W
25° 28'N
84° 59'W
DISTANCE (N. MILES)

Figure 6.6



18
16
13
11
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
36.4
36.4
36.2
36.0
35.8
35.6
35.4
35.2
35.0
0
10
20
30
40
50
60
70
26°12'N
86°00'W
DISTANCE (N. MILES)
25°28'N
84°59'W

Figure 6.7

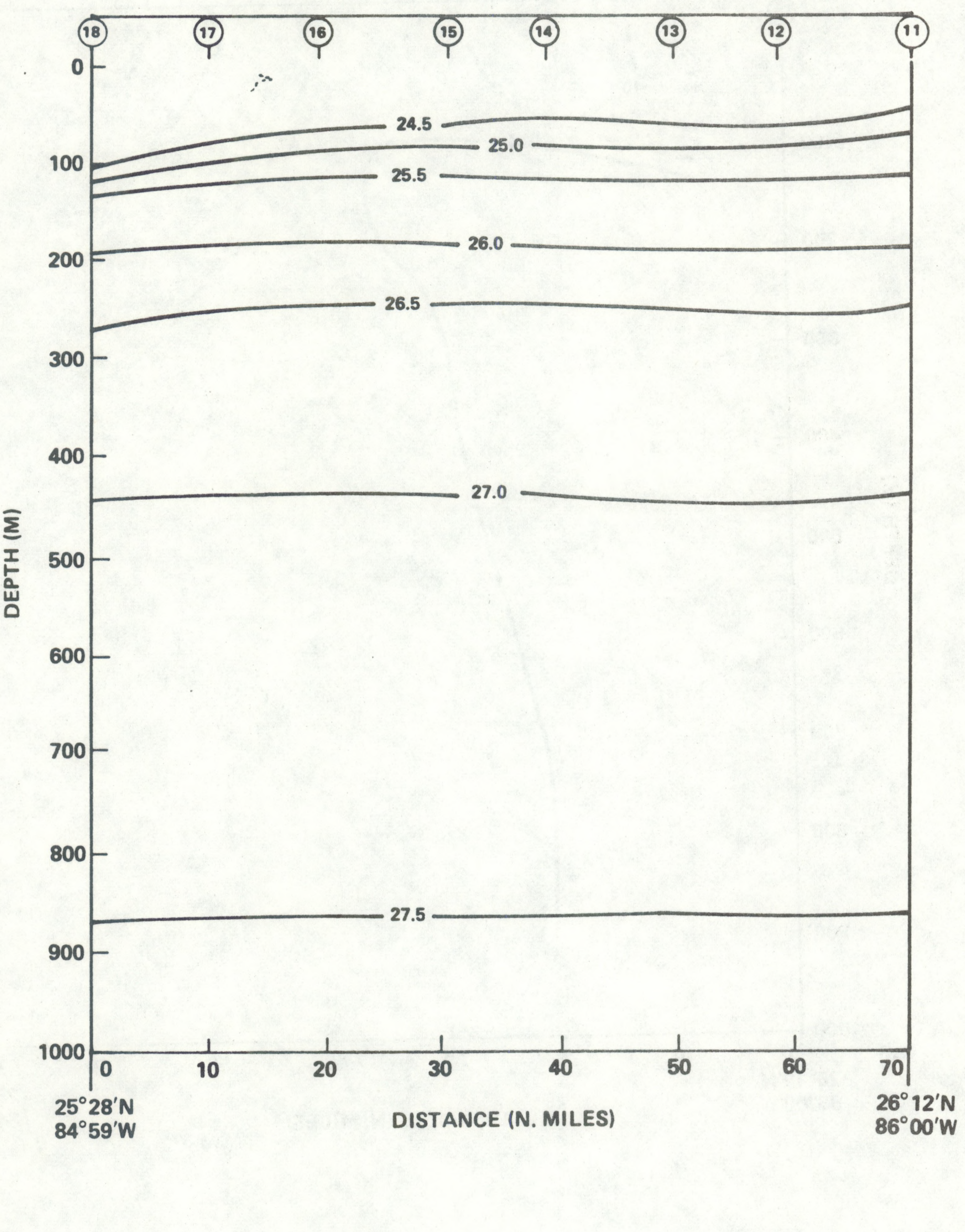
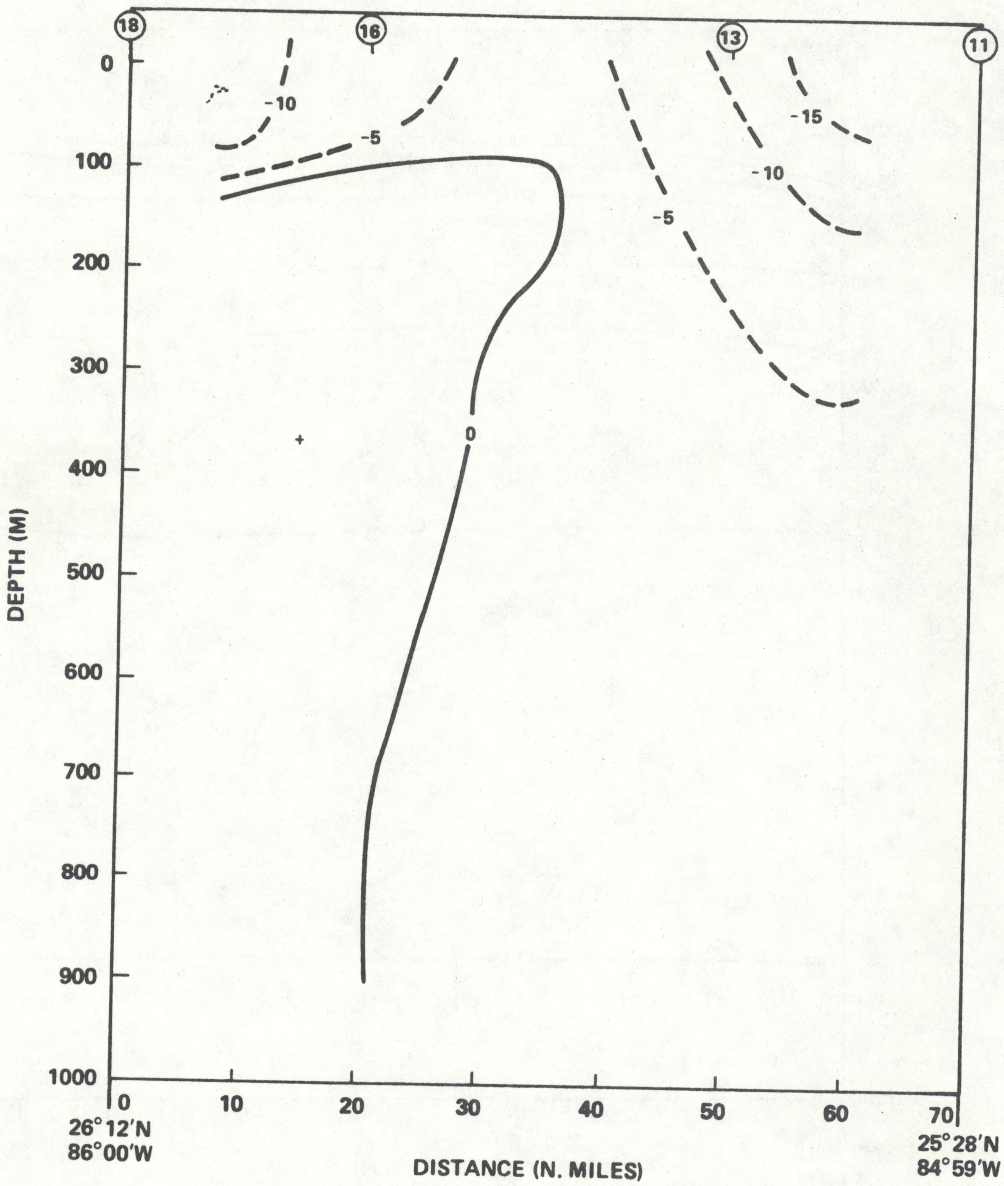
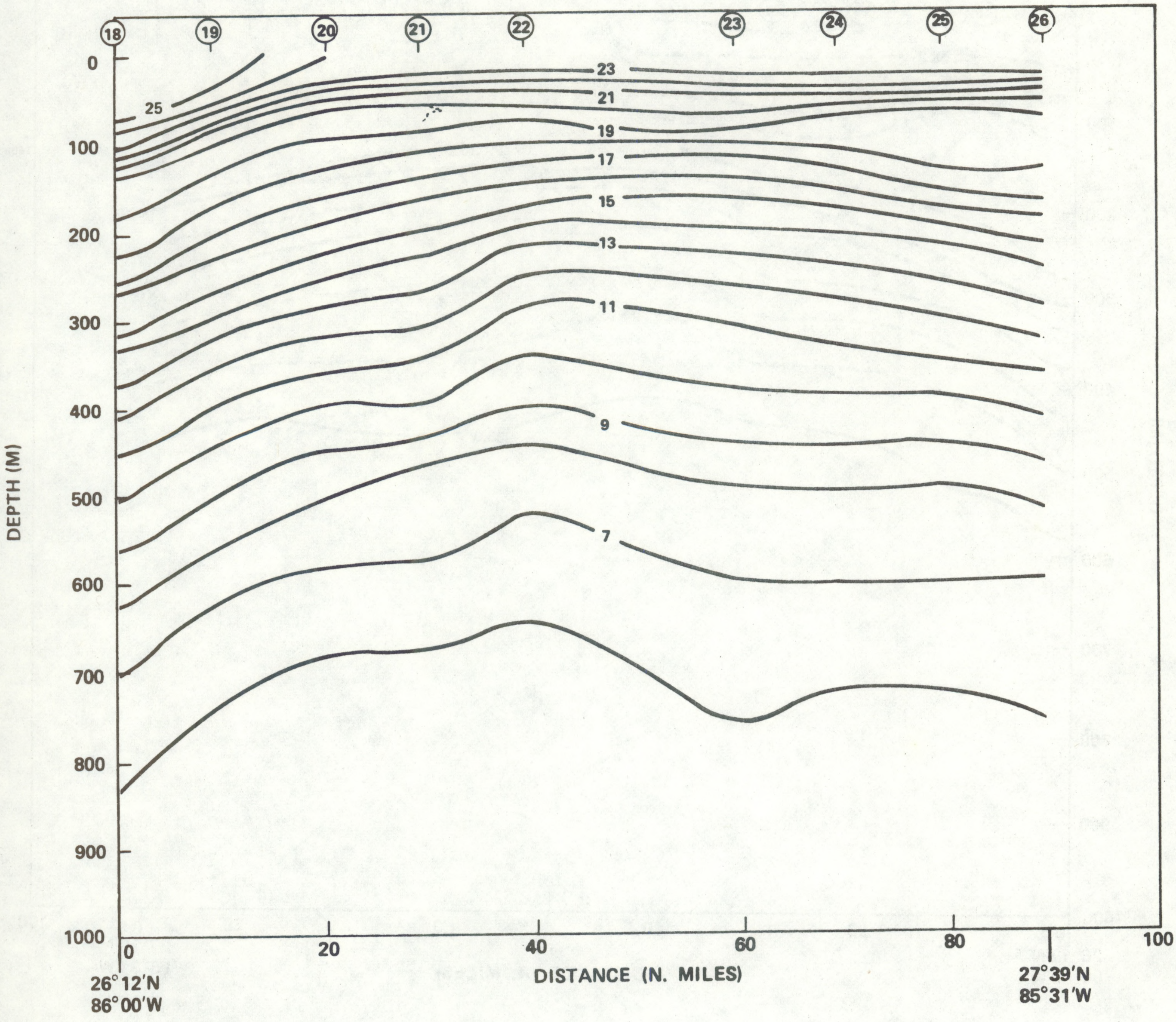

18
17
16
15
14
13
12
11
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
24.5
25.0
25.5
26.0
26.5
27.0
27.5
0
10
20
30
40
50
60
70
25°28'N
84°59'W
DISTANCE (N. MILES)
26°12'N
86°00'W

Figure 6.8



18
16
13
11
-10
-5
0
-5
-10
-15
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
10
20
30
40
50
60
70
26°12'N
86°00'W
25°28'N
84°59'W
DISTANCE (N. MILES)

Figure 6.9



18
19
20
21
22
23
24
25
26
25
23
21
19
17
15
13
11
9
7
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
DISTANCE (N. MILES)
26°12'N
86°00'W
27°39'N
85°31'W

Figure 6.10

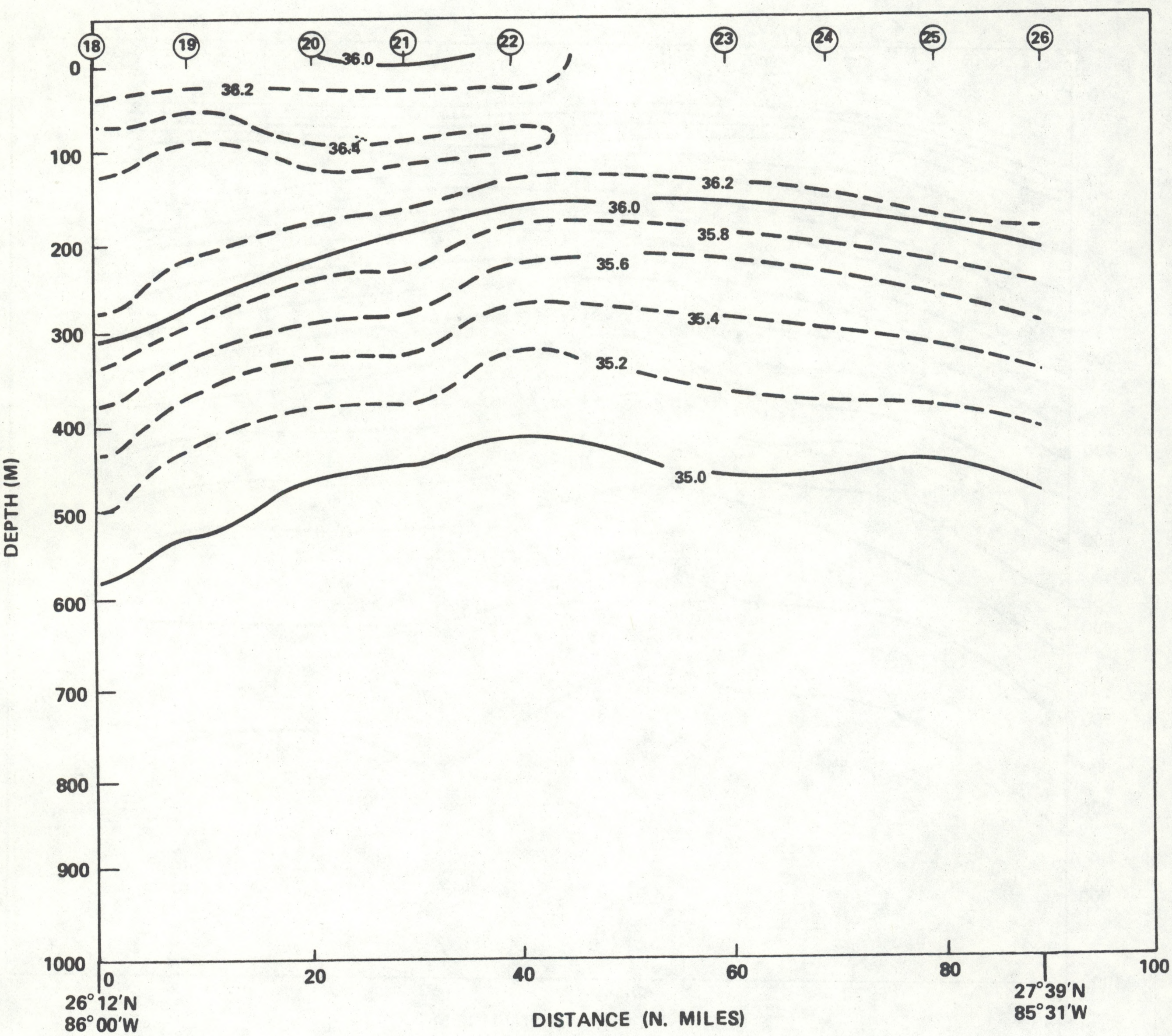

18
19
20
21
22
23
24
25
26
36.0
36.2
36.4
36.2
36.0
35.8
35.6
35.4
35.2
35.0
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
0
20
40
60
80
100
26°12'N
86°00'W
27°39'N
85°31'W
DISTANCE (N. MILES)

Figure 6.11

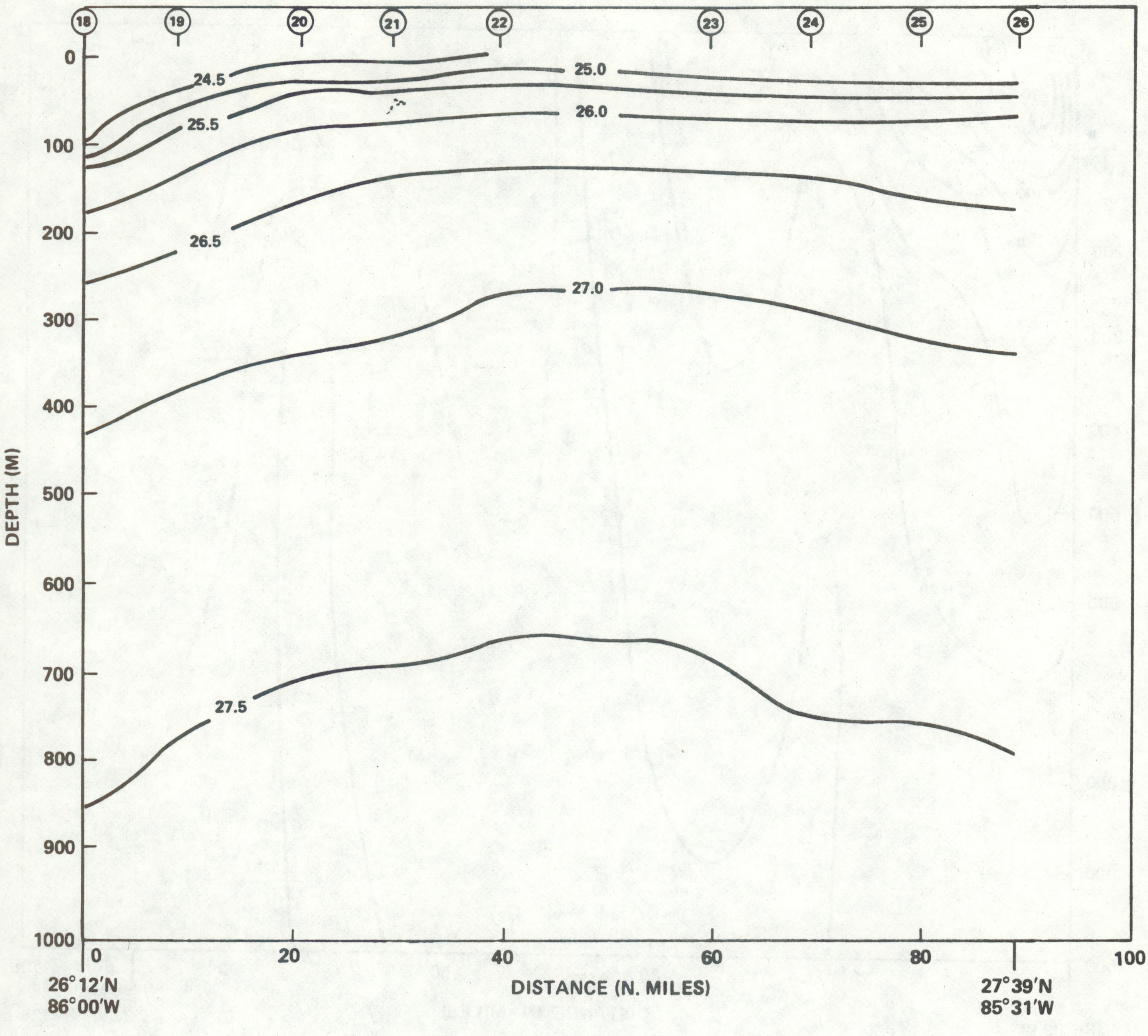

18
19
20
21
22
23
24
25
26
24.5
25.0
25.5
26.0
26.5
27.0
27.5
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
DISTANCE (N. MILES)
26° 12'N
86°00'W
27°39'N
85°31'W

Figure 6.12

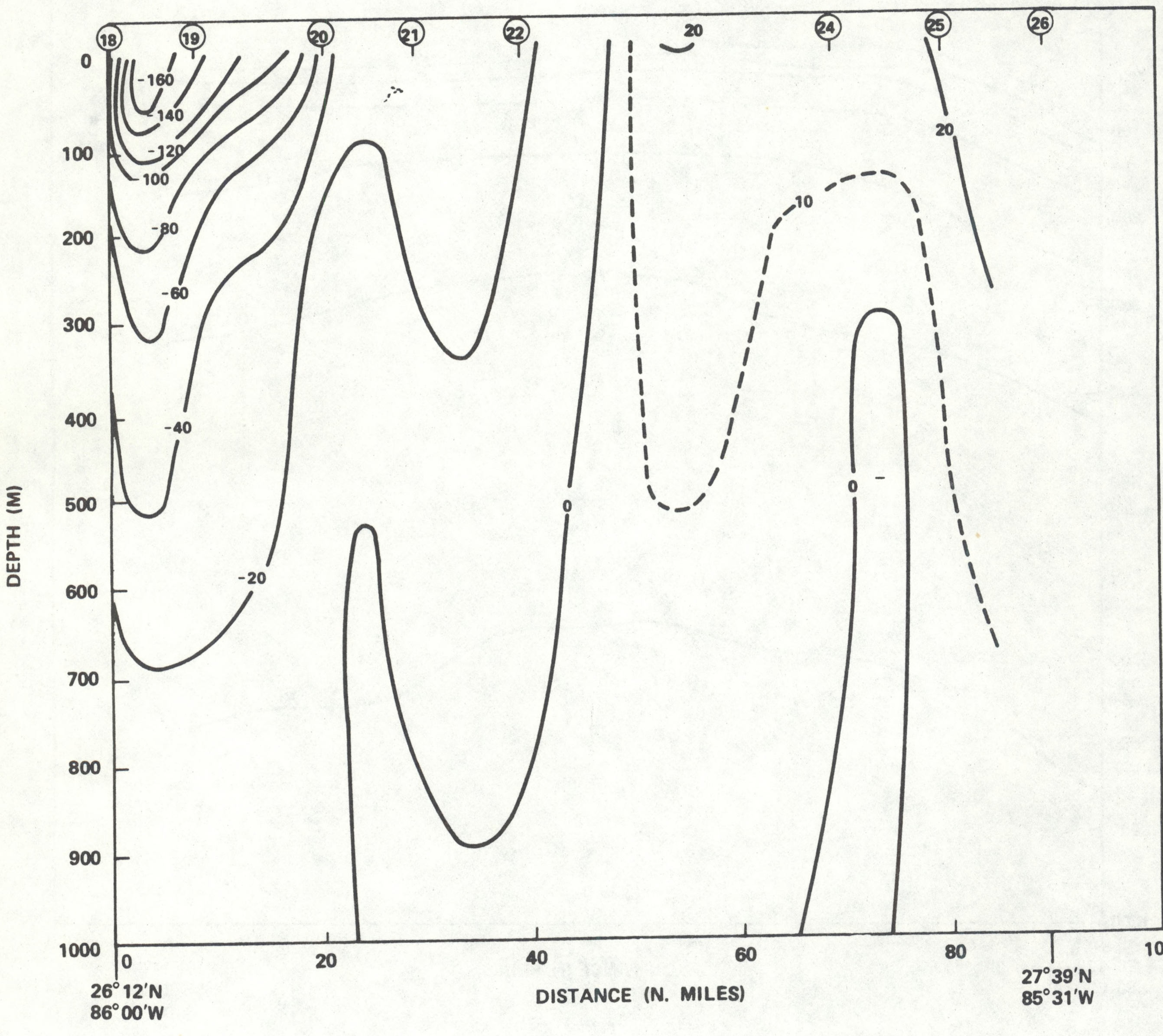

18
19
20
21
22
24
25
26
-160
-140
-120
-100
-80
-60
-40
-20
0
10
20
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
DISTANCE (N. MILES)
26°12'N
86°00'W
27°39'N
85°31'W

Figure 6.13

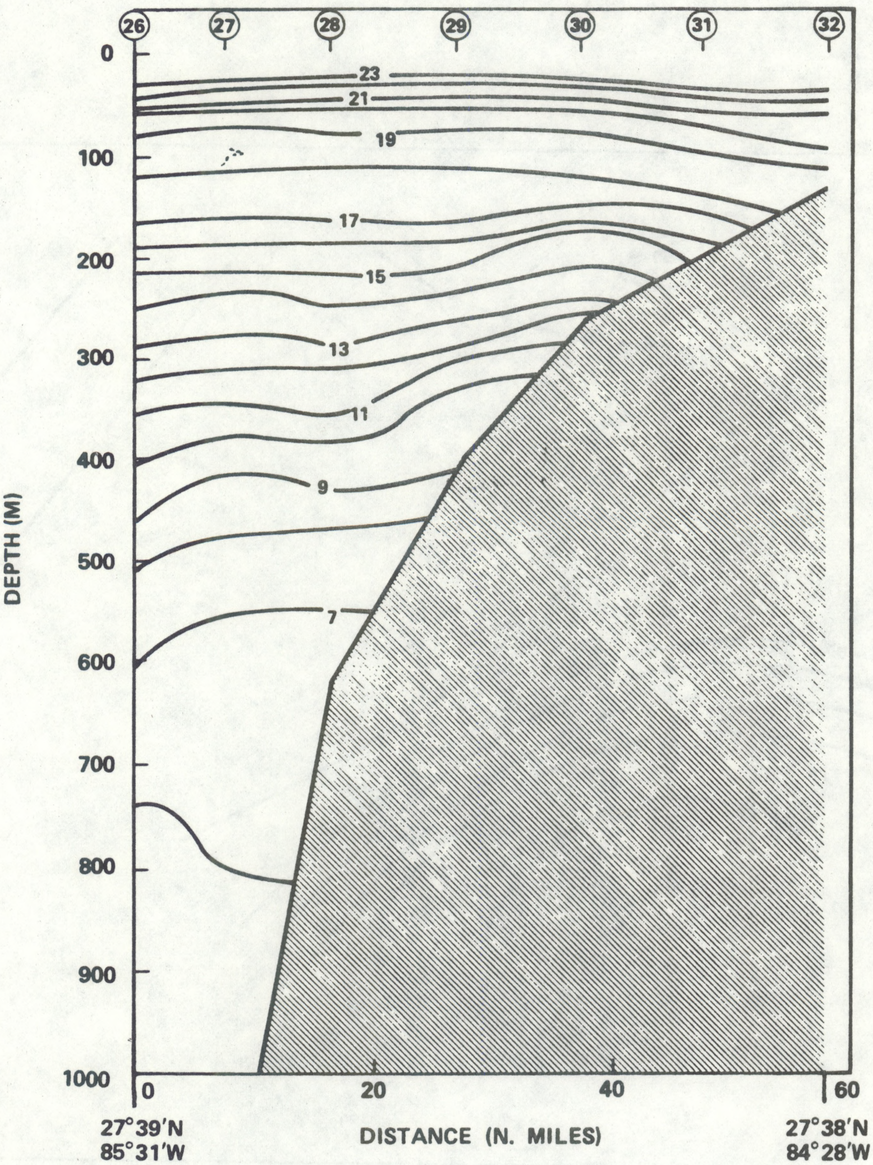

26
27
28
29
30
31
32
23
21
19
17
15
13
11
9
7
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
0
20
40
60
27°39'N
85°31'W
DISTANCE (N. MILES)
27°38'N
84°28'W

Figure 6.14

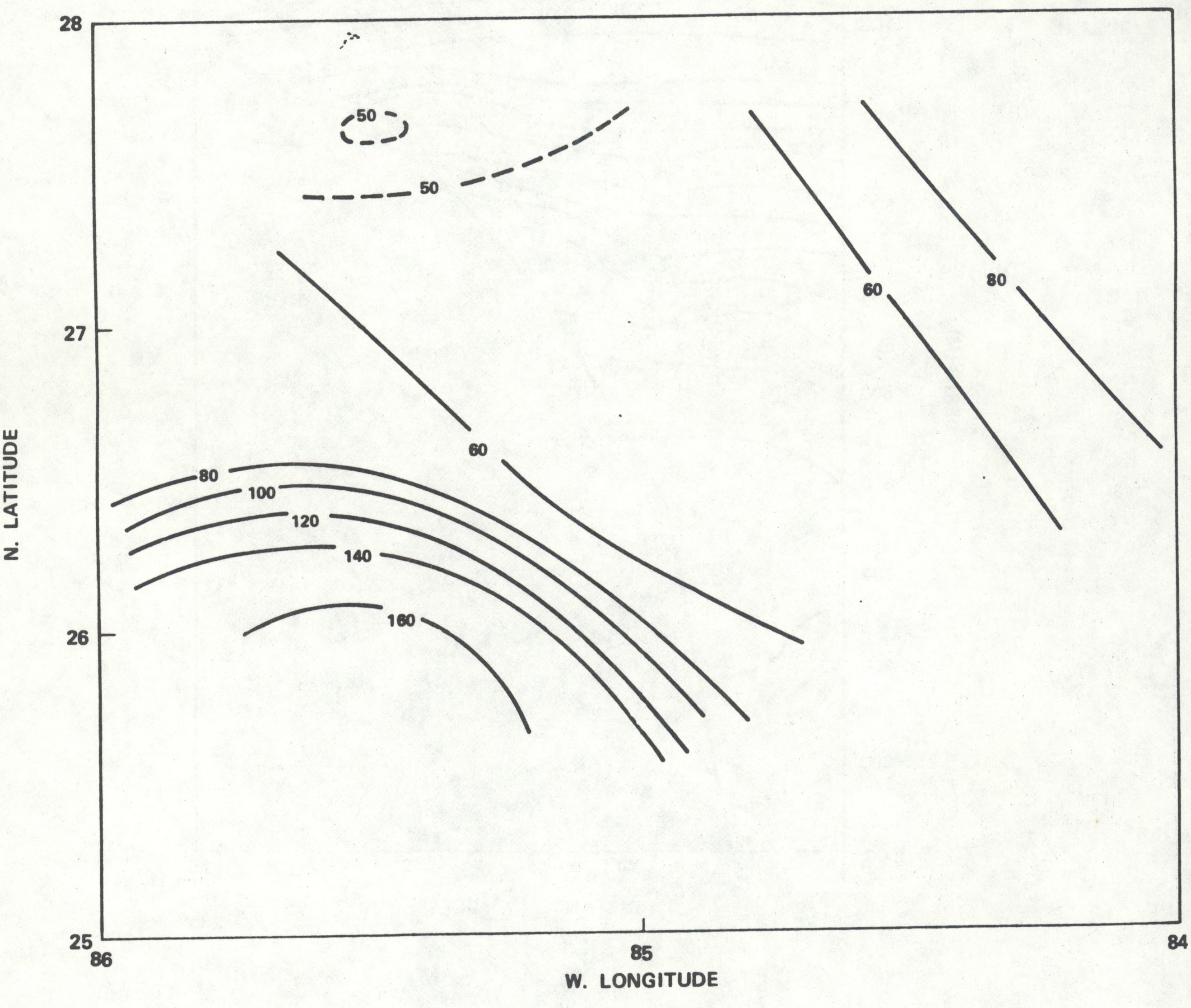

28
27
26
25
N. LATITUDE
86
85
84
W. LONGITUDE
50
50
60
60
80
80
100
120
140
160

Figure 6.15

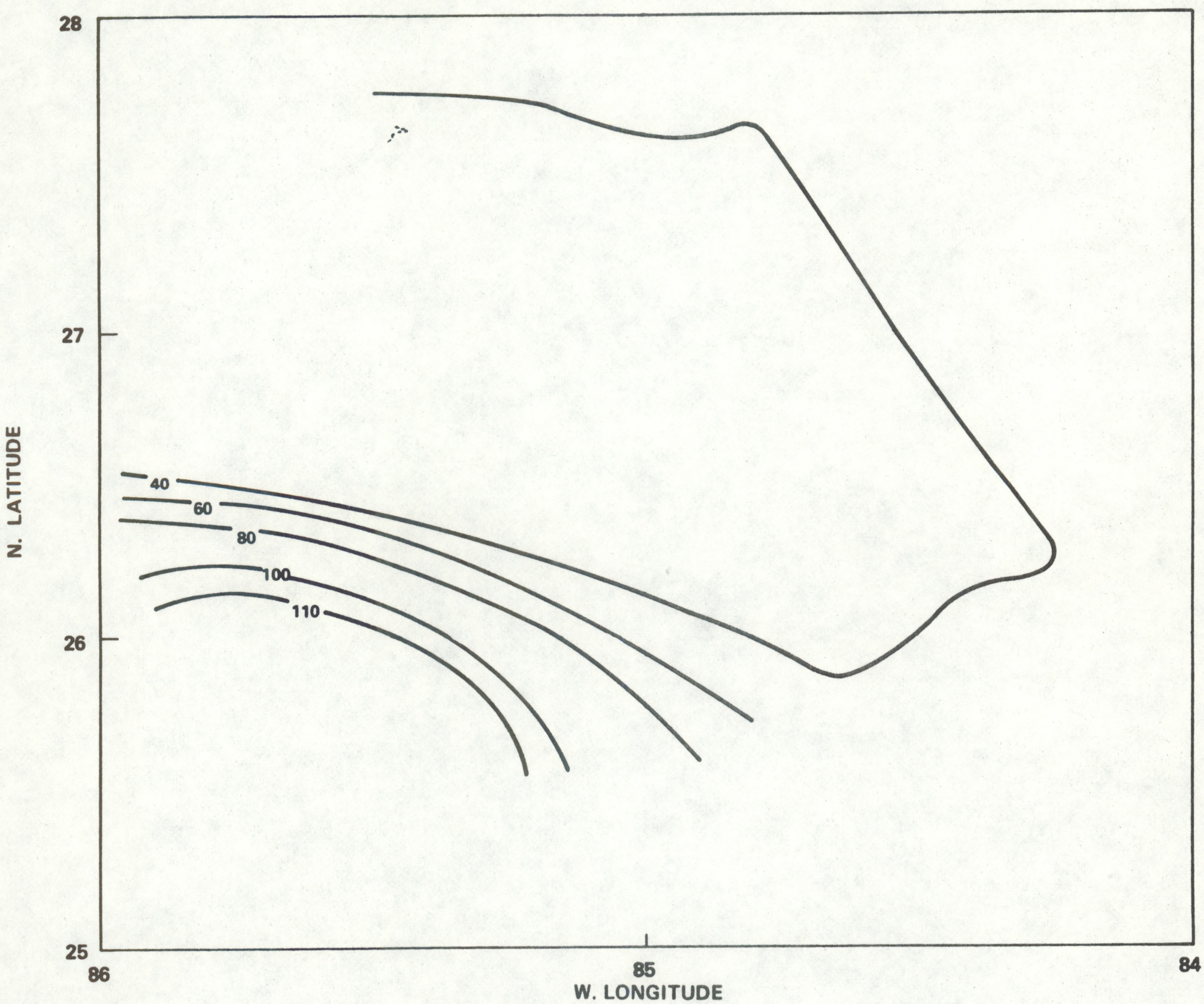


Figure 6.16

Appendix 7

Hydrographic data from the NOAA Ship VIRGINIA KEY cruise #7907, 17-22 May 1979. Section 1 (stations 1-10) and section 2 (stations 10-25) are combinations of XBT and STD data. No isothermal surface depths are plotted in areal view since only two sections were taken. The figures are:

Figure	Description
7.1	Station locations, 17-22 May 1979
7.2	Temperature (°C) vs. depth (m) for section 1
7.3	Salinity (°/oo) vs. depth (m) for section 1
7.4	σ_t (mg cm^{-3}) vs. depth (m) for section 1
7.5	Geostrophic velocity (cm sec^{-1}) vs. depth (m) for section 1
7.6	Temperature (°C) vs. depth (m) for section 2
7.7	Salinity (°/oo) vs. depth (m) for section 2
7.8	σ_t (mg cm^{-3}) vs. depth (m) for section 2
7.9	Geostrophic velocity (cm sec^{-1}) vs. depth (m) for section 2

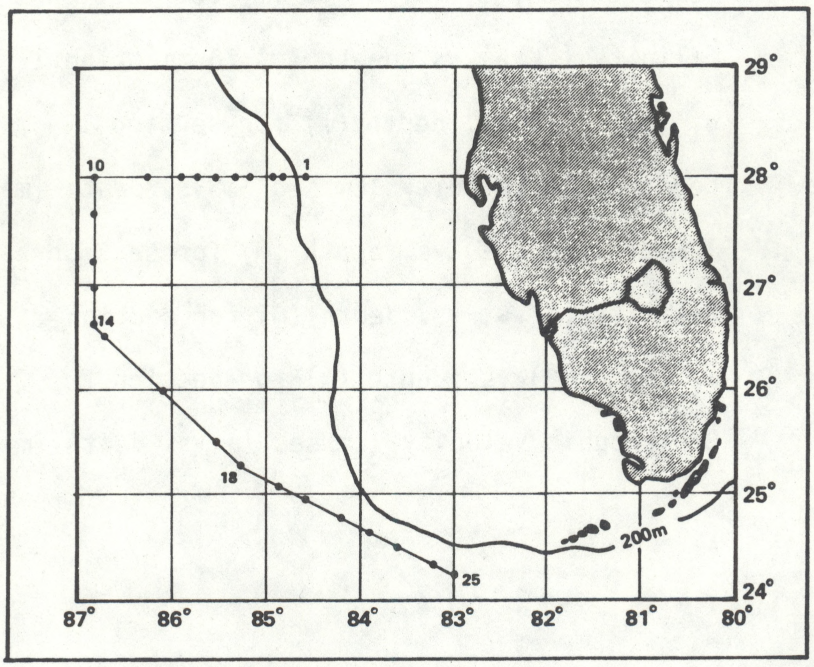
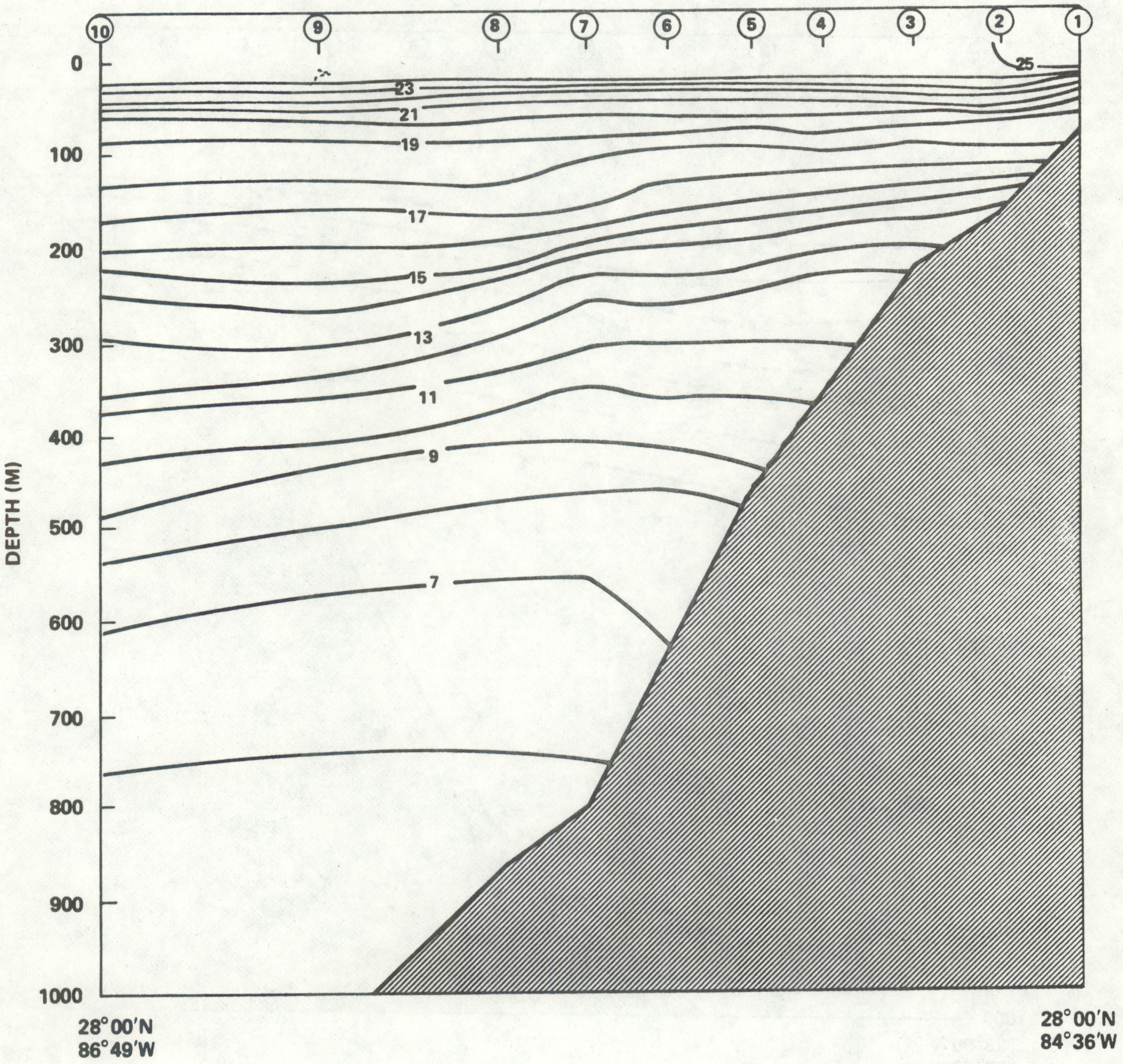
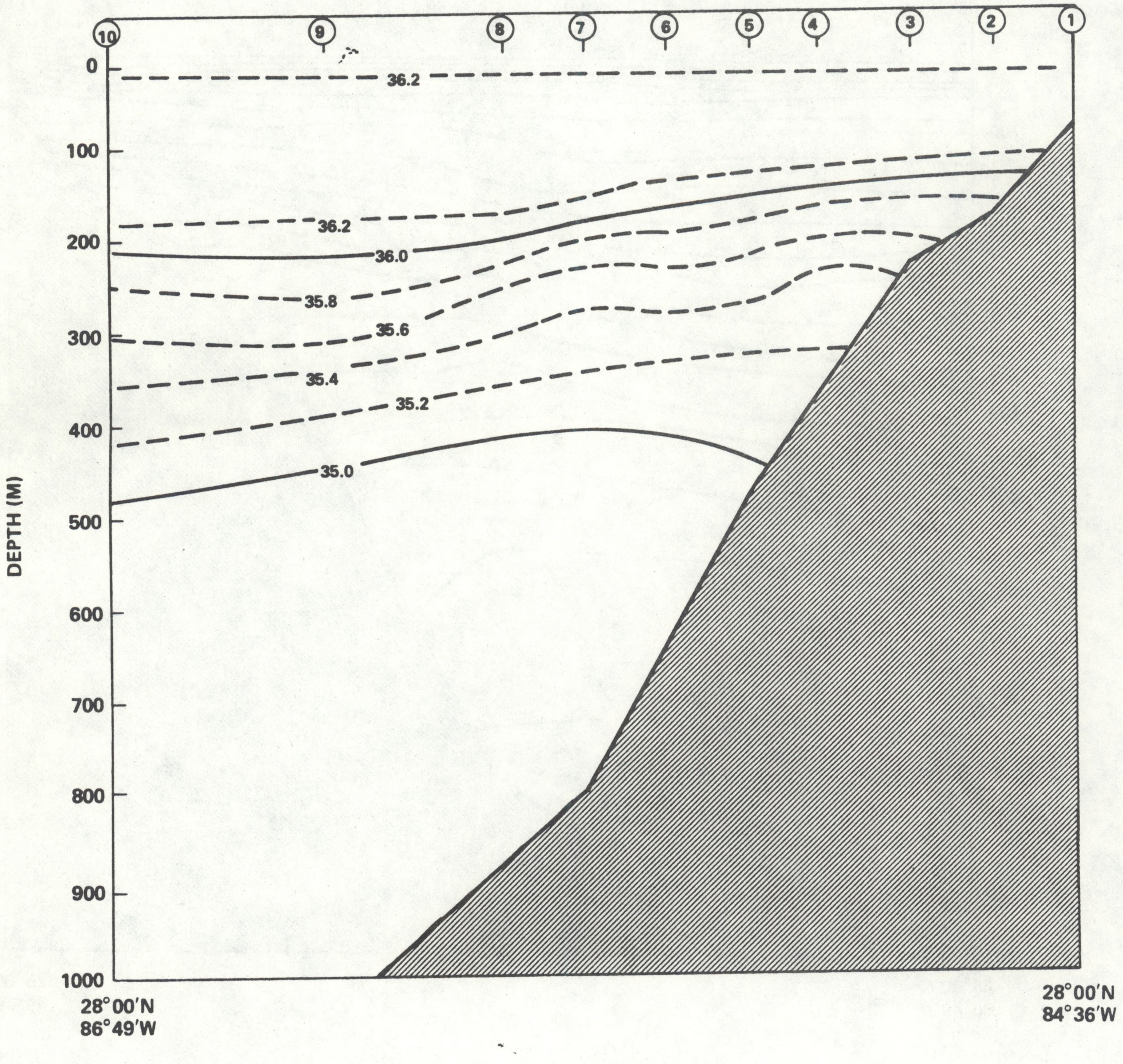


Figure 7.1



10
9
8
7
6
5
4
3
2
1
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
25
23
21
19
17
15
13
11
9
7
28°00'N
86°49'W
28°00'N
84°36'W

Figure 7.2



10
9
8
7
6
5
4
3
2
1
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
36.2
36.2
36.0
35.8
35.6
35.4
35.2
35.0
28°00'N
86°49'W
28°00'N
84°36'W

Figure 7.3

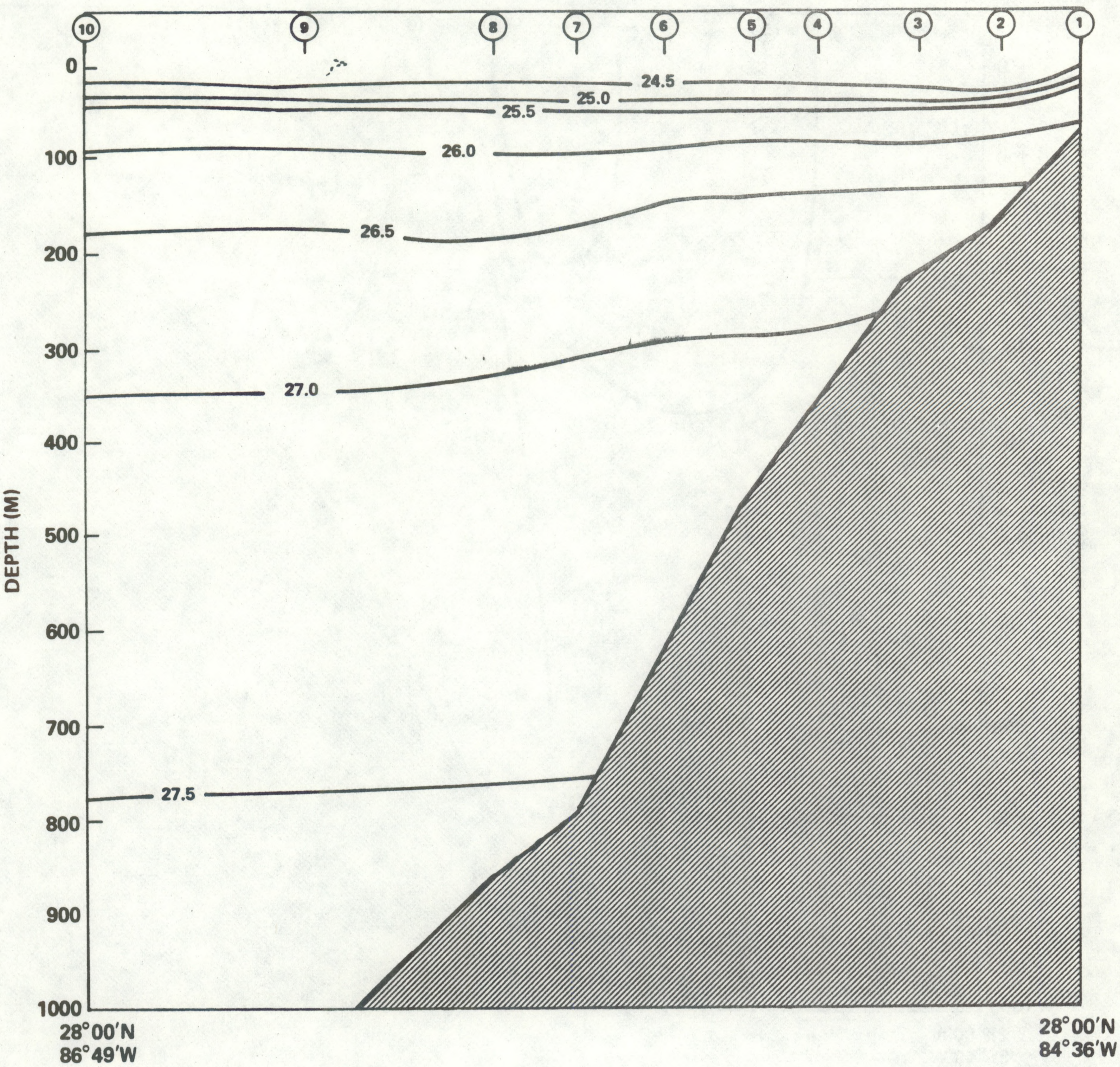

10
9
8
7
6
5
4
3
2
1
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
24.5
25.0
25.5
26.0
26.5
27.0
27.5
28°00'N
86°49'W
28°00'N
84°36'W

Figure 7.4

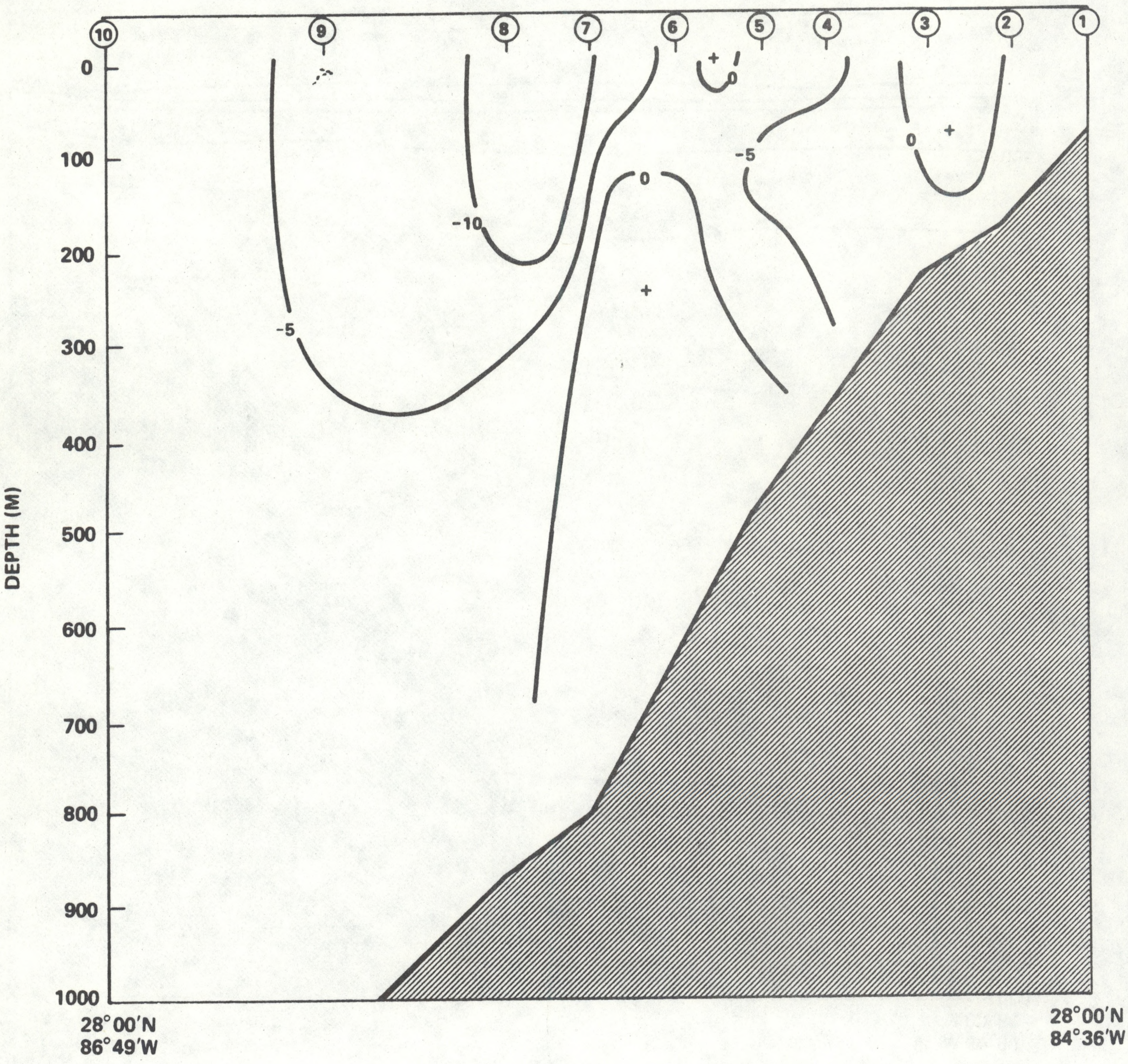

10
9
8
7
6
5
4
3
2
1
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
-10
-5
0
+
-5
0
+
0
+
+
28°00'N
86°49'W
28°00'N
84°36'W

Figure 7.5

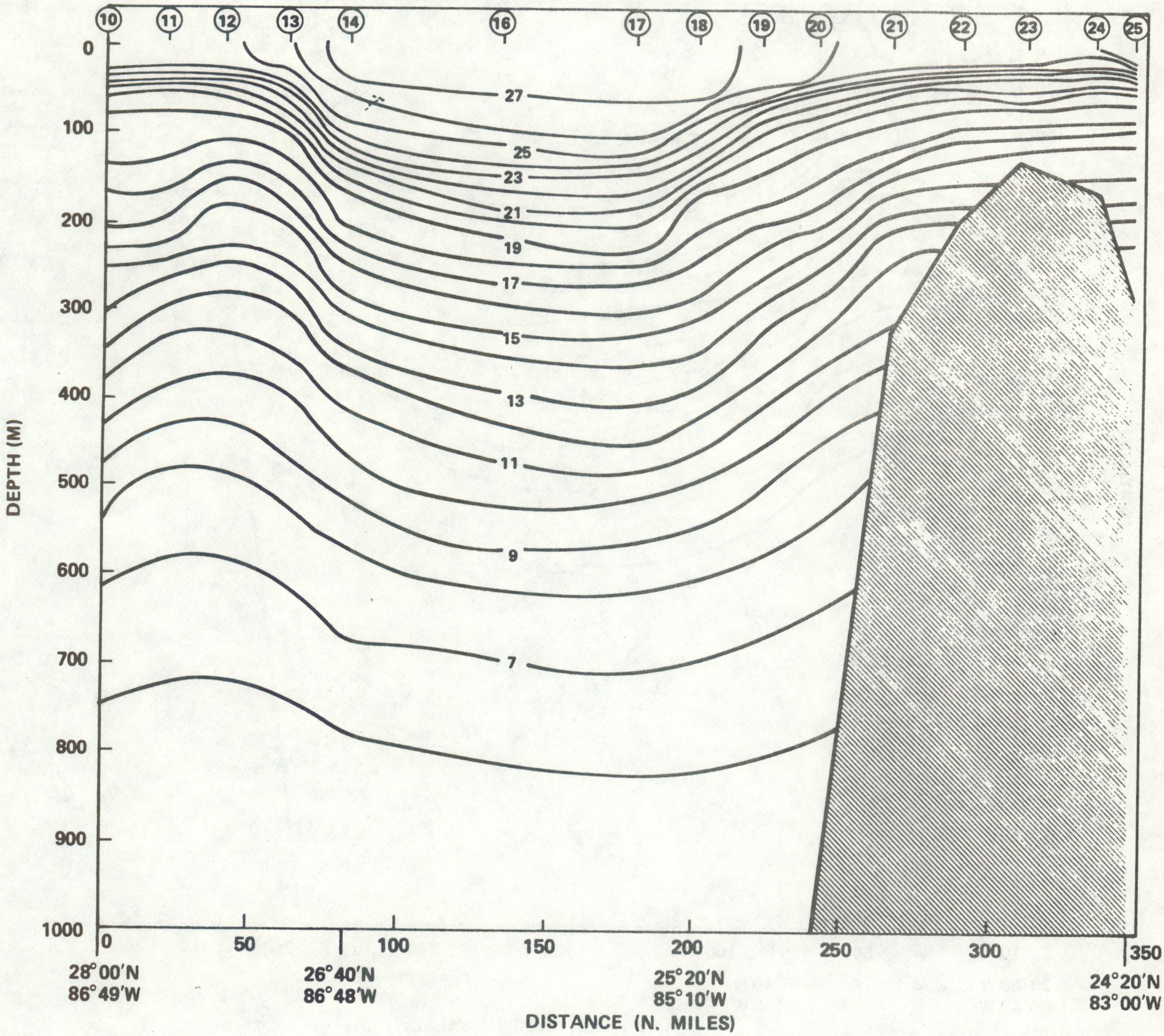
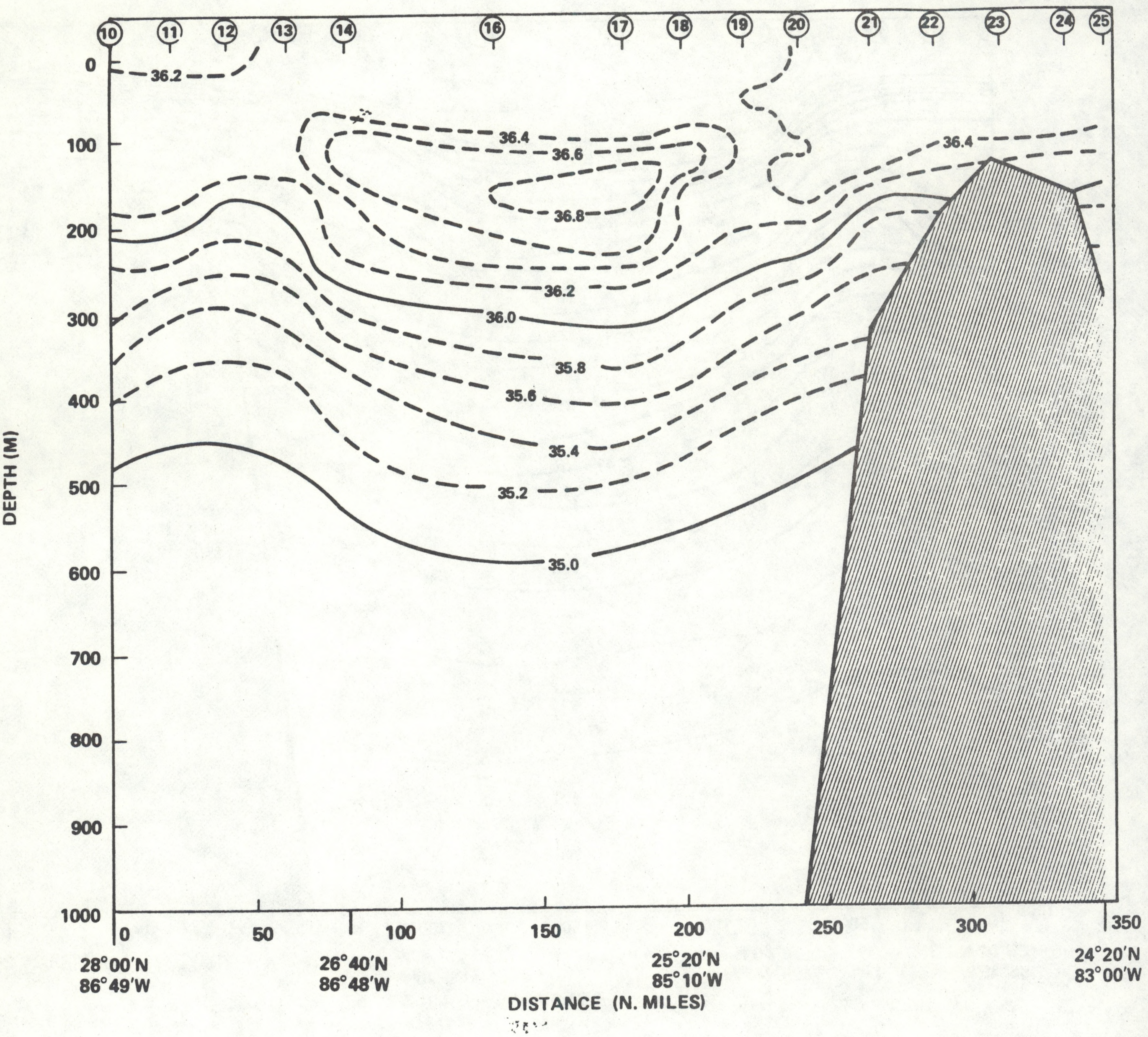

10
11
12
13
14
16
17
18
19
20
21
22
23
24
25
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
27
25
23
21
19
17
15
13
11
9
7
0
50
100
150
200
250
300
350
28°00'N
86°49'W
26°40'N
86°48'W
25°20'N
85°10'W
24°20'N
83°00'W
DISTANCE (N. MILES)

Figure 7.6



10
11
12
13
14
16
17
18
19
20
21
22
23
24
25
DEPTH (M)
0
100
200
300
400
500
600
700
800
900
1000
36.2
36.4
36.6
36.8
36.2
36.0
35.8
35.6
35.4
35.2
35.0
36.4
0
50
100
150
200
250
300
350
28°00'N
86°49'W
26°40'N
86°48'W
25°20'N
85°10'W
24°20'N
83°00'W
DISTANCE (N. MILES)

Figure 7.7

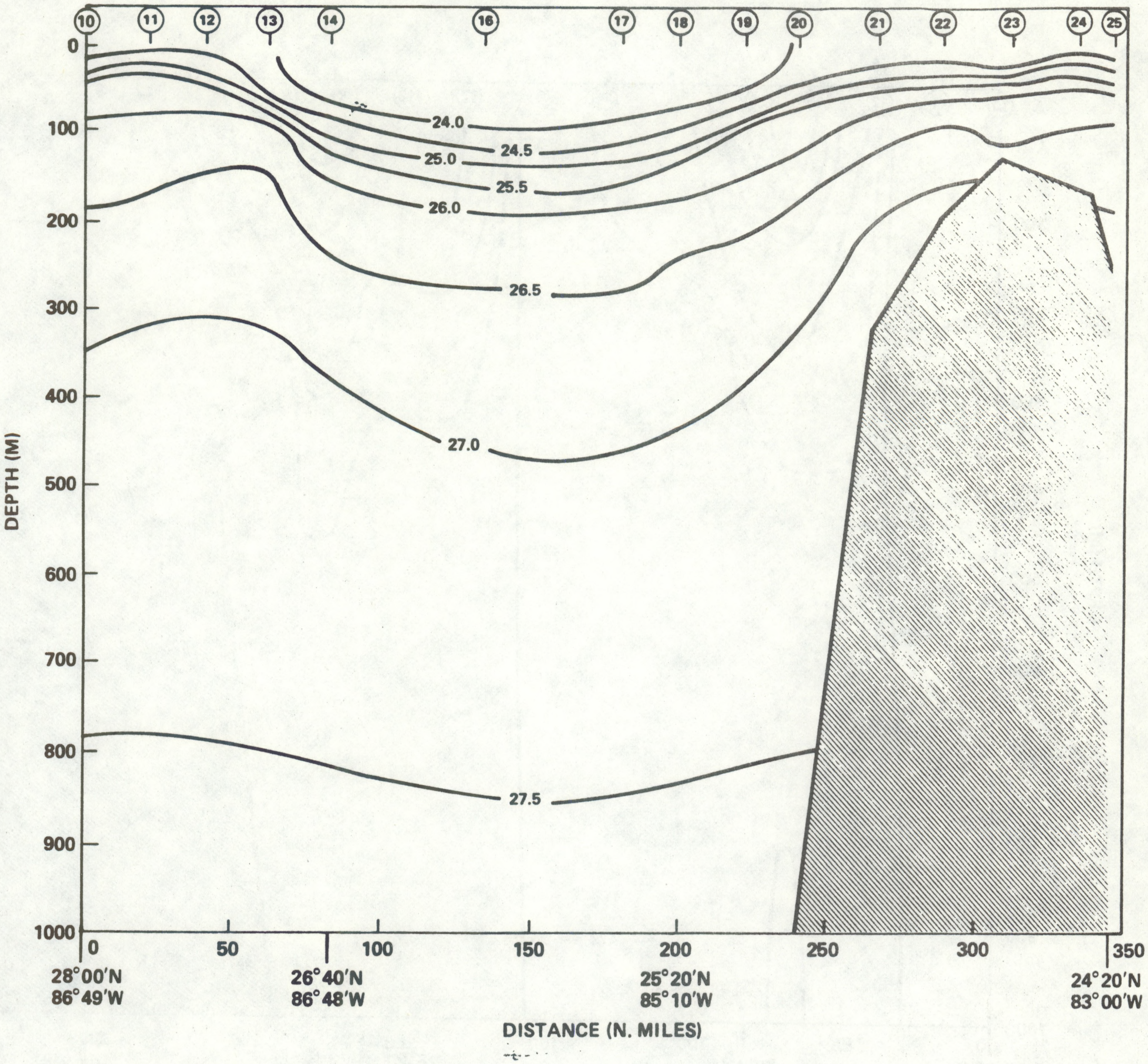

10
11
12
13
14
16
17
18
19
20
21
22
23
24
25
0
100
200
300
400
500
600
700
800
900
1000
DEPTH (M)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
0
50
100
150
200
250
300
350
28°00'N
86°49'W
26°40'N
86°48'W
25°20'N
85°10'W
24°20'N
83°00'W
DISTANCE (N. MILES)

Figure 7.8

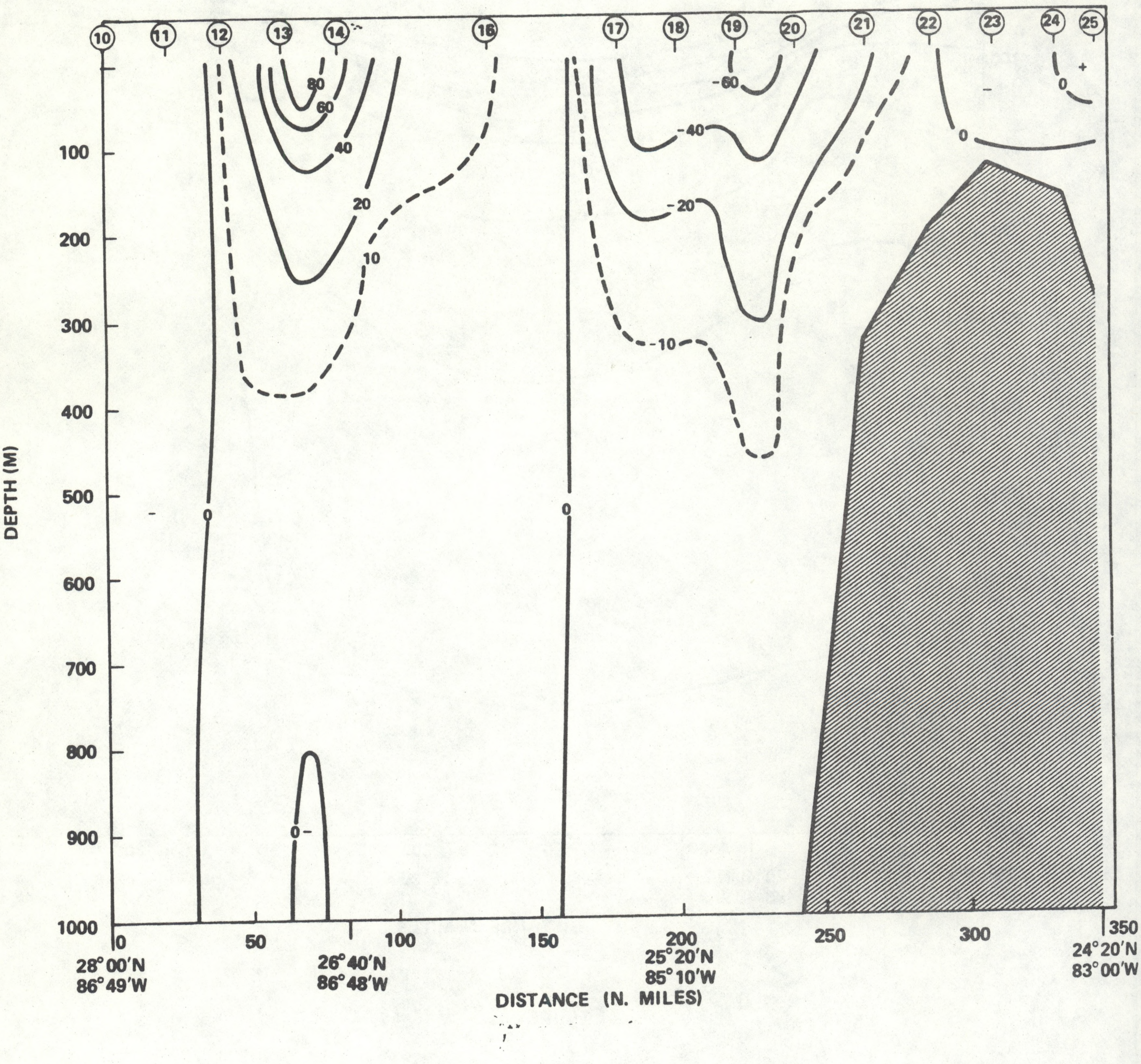

DEPTH (M)
DISTANCE (N. MILES)
28°00'N
86°49'W
26°40'N
86°48'W
25°20'N
85°10'W
24°20'N
83°00'W

Figure 7.9