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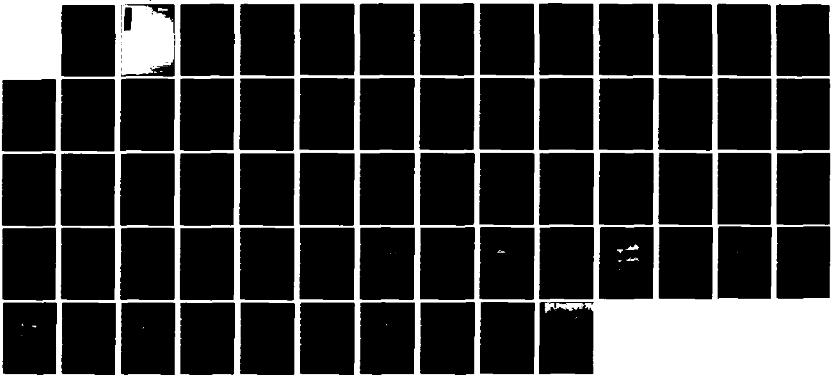

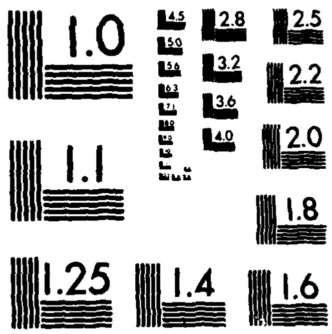

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Summaries of long-term current, temperature and pressure measurements from moored instruments in the western Pacific Ocean (along 152°E, between 28°N and 41°N) are presented. Tables, plots, and statistics are presented for filtered and unfiltered time series. There were two consecutive settings of instruments, referred to as WesPac I and II, each spanning a one year interval (nominal). The objective of the experiment was to motivate exploratory descriptions of the low frequency variability in the western North Pacific.

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A COMPILATION OF MOORED CURRENT METER DATA FROM THE WESTERN NORTH PACIFIC, VOLUME XXXI, 1980 - 1982

by

Ellen Levy and Susan A. Tarbell

WOODS HOLE OCEANOGRAPHIC INSTITUTION

Woods Hole, Massachusetts 02543

August 1983

TECHNICAL REPORT

Prepared for the Office of Naval Research under contract N00014-76-C-0197; NR 083-400.

Approved for Distribution: N. P. Fofonoff

N. P. Fofonoff, Chairman
Department of Physical Oceanography

ABSTRACT

Summaries of long-term current, temperature and pressure measurements from moored instruments in the western Pacific Ocean (along 152°E, between 28°N and 41°N) are presented. Tables, plots and statistics are presented for filtered and unfiltered time series. There were two consecutive settings of instruments, referred to as WesPac I and II, each spanning a one year interval (nominal). The objective of the experiment was to motivate exploratory descriptions of the low frequency variability in the western North Pacific.

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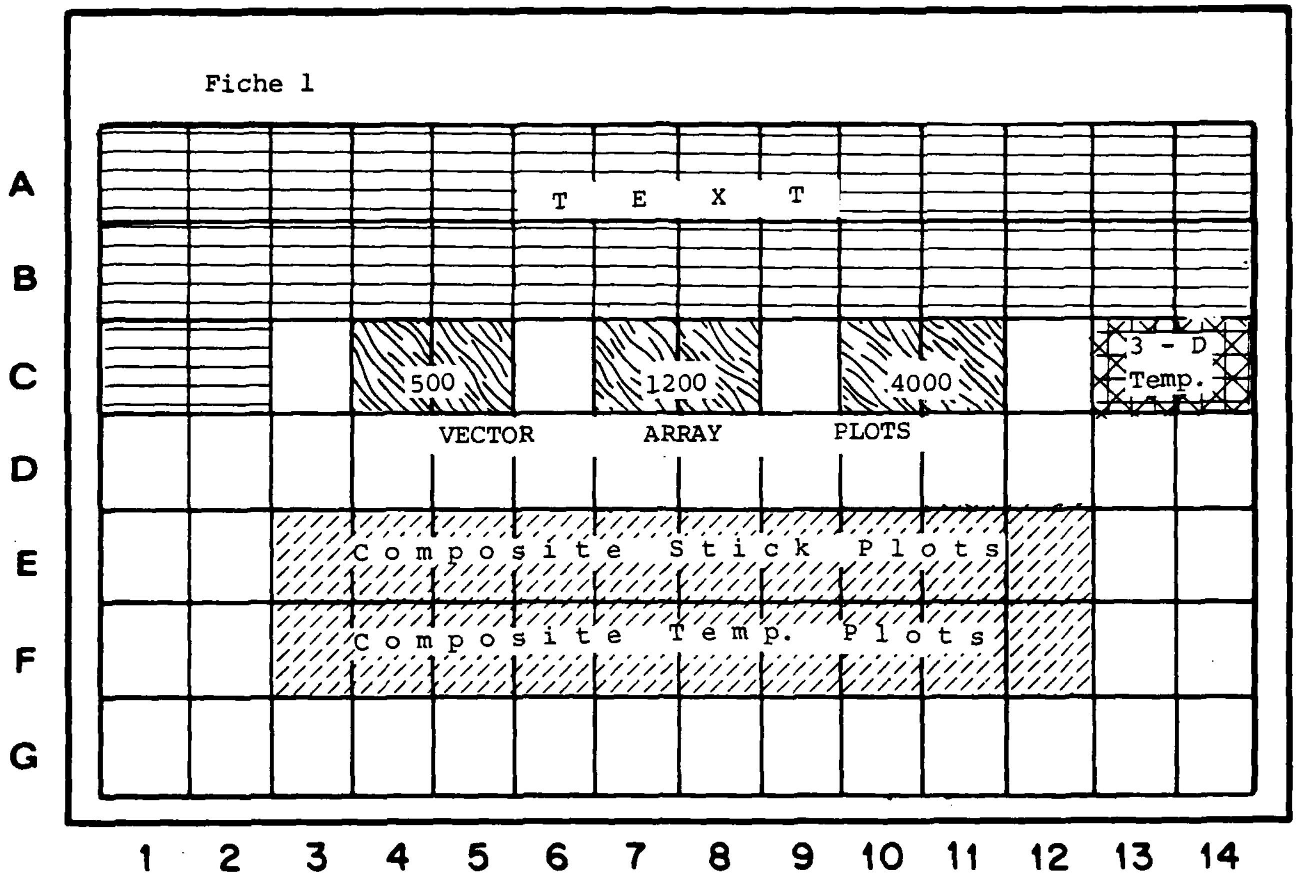
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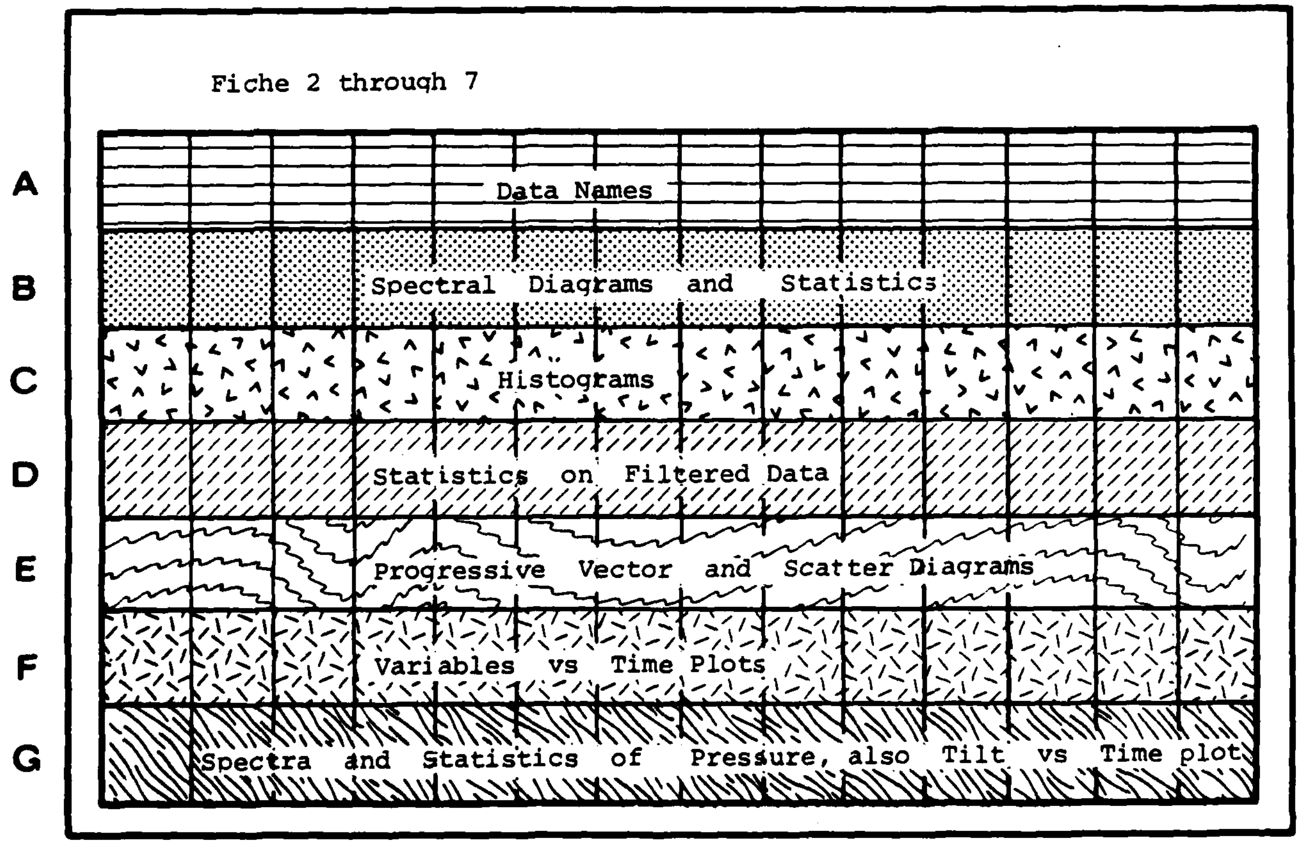
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Data Names
Spectral Diagrams and Statistics
Histograms
Statistics on Filtered Data
Progressive Vector and Scatter Diagrams
Variables vs Time Plots
Spectra and Statistics of Pressure, also Tilt vs Time plot

ACKNOWLEDGMENTS

Many people share credit for the quality of data returned during the WesPac I and II experiment. They include the people in the buoy group instrument shop and those who worked on the moorings, both hardware and design. Jerry Dean updated the text concerning instrumentation. The officers and crews of the R. V. Thomas Washington and the R. V. Thomas Thompson deserve special mention for their willing assistance in mooring deployment and recovery. The principal investigator responsible for the moored intrument array was Dr. William J. Schmitz, Jr. Cooperative experiments included CTD and XBT observations, for which Dr. P. P. Niiler (Oregon State University) was responsible.

The experiment was funded at W.H.O.I. by the Office of Naval Research Contract N00014-76-C-0197, NR 083-400.

PREFACE

This volume is the thirty-first in a series of Data Reports presenting moored current meter and associated data collected by the WHOI Buoy Group.

Volumes I-XVI present data prior to 1976 and are not listed below.

Volumes XVII through XXX present data obtained during the years 1972-1980, either by year or experiment (see notes).

A data directory and bibliography for the years 1963-1978 has been published, as WHOI Technical Report 79-88.

Volume XXXI presents data from the West Pacific Experiments, 1980-1982.

Volume No.	WHOI Ref. No.		Notes Year Experiment
XVII	78-49	Tarbell, S., A. Spencer and R. E. Payne	1975-1977 POLYMODE Array II
XVIII	79-65	Tarbell, S., M. G. Briscoe and R. A. Weller	1978 JASIN
XIX	79-34	Spencer, A., C. Mills and R. Payne	1974-1975 POLYMODE Array I
XX	79-56	Spencer, A.	1974 Rise Array
XXI	79-85	Mills, C. and P. Rhines.	1978 W.B.U.C.
XXII	79-87	Tarbell, S. and R. Payne.	1973 measurements
XXIII	80-40	Tarbell, S. and R. Payne.	1978 POLYMODE Array III
XXIV	80-41	Spencer, A. , K. O'Neill and J. R. Luyten	1976 INDEX
XXV	81-12	Spencer, A., E. D'Asaro and L. Armi	1977 B.B.L. Expt.
XXVI	81-45	Chausse, D. and R. Payne	1972 measurements
XXVII	81-68	McKee, T., E. Francis and N. Hogg	1975,78 topographic expts.
XXVIII	81-73	Mills, C., S. Tarbell, W. B. Owens and R. Payne	1978 L.D.E.
XXIX	82-16	Levy, E., A. Spencer, G. Needell, G. Hund, and J. R. Luyten	1979 INDEX
XXX	82-43	Levy, E., S. A. Tarbell, and N. P. Fofonoff	1979-1980 GSE/NSOI

PRESENTATION

The printed portion of this report contains plots, introductory text and information about the instruments and data processing procedures. Tables and figures give information on moorings, instruments, and the quality of the data. Data are shown graphically in numerous composite displays. The data series are presented in a merged form of the two settings, whenever possible.

These pages are reproduced on microfiche (fiche) one. Fiche 2 through 7 contain standard displays of data from each individual instrument. Included are spectral plots, tables of statistics, variables versus time, histograms, progressive vector diagrams and scatter plots.

A generalized layout of the microfiche is shown on page iii. Each printed page is numbered at the top, with a fiche designation at the bottom.

INTRODUCTION

WesPac I (Schmitz et al., 1982; Bradley, 1982) and II involved long-term settings of an exploratory moored array in the western North Pacific. This array is similar in goals and design to the POLYMODE Array II in the western North Atlantic (Schmitz, 1976, 1977, 1978). The emphasis was on long-term measurements, providing a more complete description of the low frequency variability in an energetic area in the western North Pacific.

An array of ten moorings including 38 current meters was deployed along 152°E longitude, between 28°N and 41°N latitude, for eleven months. The northernmost moorings were located in the vacinity of the Kuroshio Extension, more southern moorings in the Oyashio Frontal Region of recirculation and the southernmost mooring was located below the recirculation region in a "mid-ocean" area. These ten moorings were recovered and redeployed at the same locations in May 1981 for another thirteen months, and finally retrieved in May 1982. Instruments were located at standard nominal depths of 250, 500, 1200, 4000, 5000 meters. See Figure 1 and Table 1 for further details.

Cooperative investigations involving CTD and XBT observations were conducted (Niiler, 1980; Schmitz et al., 1982). The data will not be presented in this report.

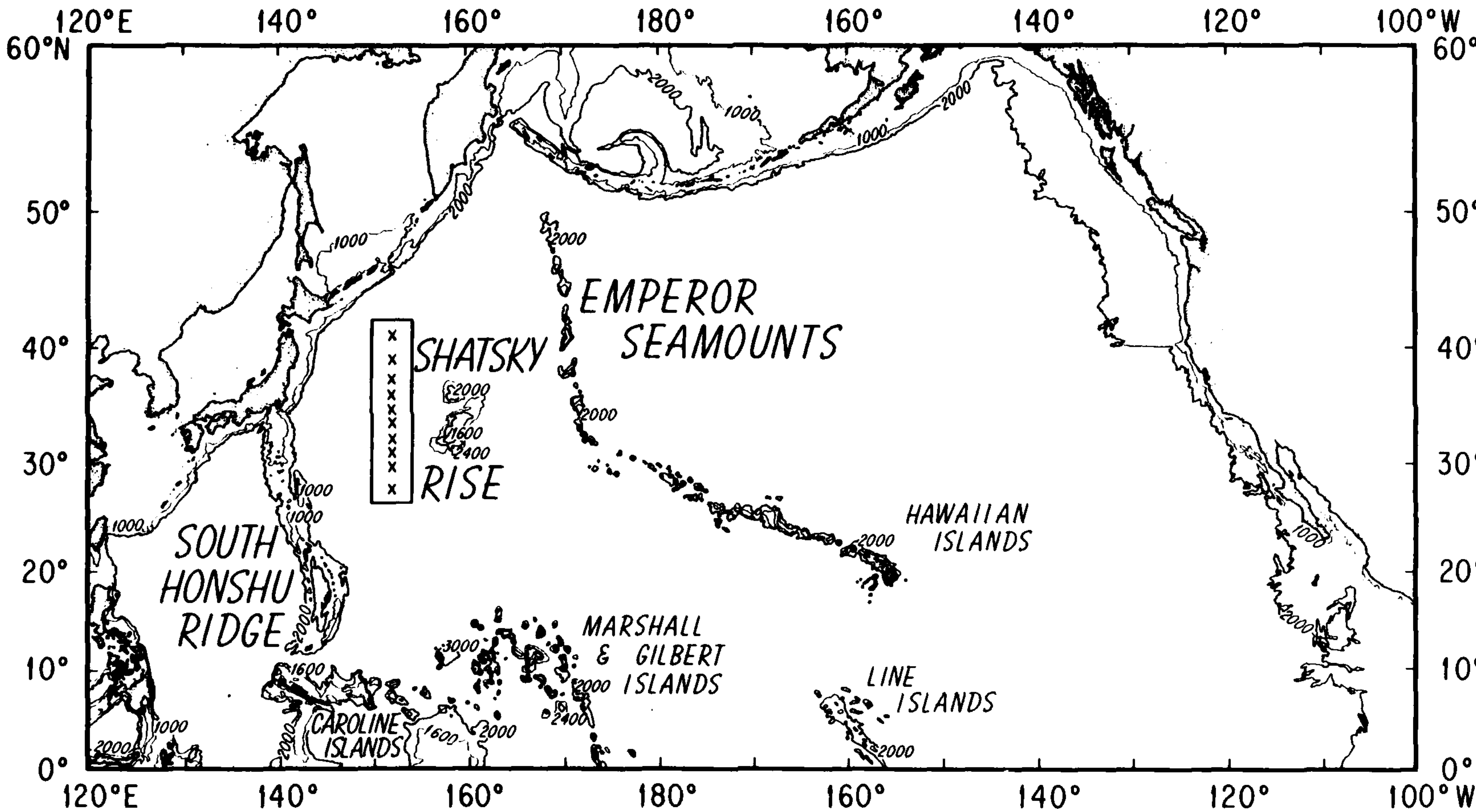

Figure 1: Array location (shown in rectangle) of the western Pacific experiment (WesPac I and II). The northernmost mooring location is WP01.

Table 1

MOORING NUMBERS AND NOMINAL LOCATIONS

MOORING LOCATION		WesPac #	WHOI DATA #	WHOI DATA #
152°E	41.00°N	WP01	6951	7281
			6952	7282
			6953	7283
			6954	7284
			6955	7285
152°E	39.00°N	WP02	6961	7271
			6962	7272
			6963	7273
152°E	37.50°N	WP03	6971	7261
			6972	7262
			6973	7263
152°E	36.25°N	WP04	6981	7251
			6982	7252
			6983	7253
152°E	35.00°N	WP05	6991	7241
			6992	7242
			6993	7243
			6994	7244
			6995	7245
152°E	33.75°N	WP06	7001	7221
			7002	7222
			7003	7223
152°E	32.50°N	WP07	7011	7211
			7012	7212
			7013	7213
			7014	7214
			7015	7215
152°E	31.25°N	WP08	7021	7201
			7022	7202
			7023	7203
152°E	30.00°N	WP09	7031	7191
			7032	7192
			7033	7193
152°E	28.00°N	WP10	7041	7181
			7042	7182
			7043	7183
			7044	7184
			7045	7185

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INSTRUMENTATION

Current Meters

The moorings in both settings of the array were instrumented with burst sampling and vector averaging current meters. These Savonious rotor and vane instruments are coupled in-line on the moorings and provide a measure of the speed and direction of the currents and, with calibrated thermistor sensors, water temperature. A crystal controlled time reference, accurate to within one second per day is synchronized with UTC (Universel Temps Coordonné) before launch and the accrued error recorded after recovery.

The Model 850 current meter, originally built by Geodyne, measures in a burst sampling mode described by Webster (1968). These early instruments were extensively modified at WHOI in the mid 1970's to take advantage of newly developed low-power integrated-circuit technology and a new sensor bearing design. The basic burst sampling technique was not changed. At a pre-determined time interval, which can be set to any binary multiple of 7.5 minutes, the instrument turns on and logs the clock count and a measure of the temperature. It then samples the 5.19 second rotor count, compass position and vane position for a preset number of "strobes", either 5, 13 or 21. These data are recorded on magnetic tape. It then turns off until the beginning of the next record. Valdes (1977) includes a more detailed discussion of the WHOI COS/MOS 850 current meter. For these arrays, the strobe rate was set to 7 and the recording interval to 1 hour.

By the early 1970s, engineers at WHOI had developed a vector averaging current meter which is now commonly known as the VACM. Built by AMF Sea-Link Systems (now EG&G Sea-Link), the VACM continuously sums vector increments of water flow sensed by the rotor and vane. At regular intervals, usually 15 minutes, it then records, on a magnetic tape cassette, the accumulated east-west and north-south velocities as a part of the data record. McCullough (1975) discusses calibration of the vector averaging current meter and its recording technique.

Some VACMs average temperature over the entire recording interval to an accuracy of about 0.01°C (Payne et. al., 1976). By 1980, a modification had been developed which permitted up to four variables in addition to current data to be recorded in a time-shared or multiplexed (MX) mode. These MX-VACMs measure pressure in addition to temperature, each averaging over about one-half of the record interval. The multiplex circuit temperature measurement is accurate to about .006°C and pressure is measured to about 0.1% or 3 decibars for a standard 3000 decibar transducer. Pressure and temperature sensors are recalibrated between deployments.

Two multiplex VACMs on Moored Station 724 measured inclination in addition to temperature and pressure, although the pressure transducer on the VACM at 4000 m. was over-range and no pressure data were obtained. The tilt sensors were electrolytic levels which produce an electronic signal proportional to tilt about a sensitive axis. Two components of tilt were thus measured in multiplex channels 3 and 4 and when combined with the instantaneous compass position give a qualitative measure of the magnitude and the direction of inclination ("tilt" and "tilt azimuth" respectively) of the instrument, thus the mooring, at that point.

MOORINGS

Figure 2 shows the depths of the instruments on the moorings and the bottom topography. Table 2 summarizes the mooring statistics.

Details of mooring configuration are shown in Table 3. Mooring items are listed with their lengths measured in meters. Depths of the individual instruments are underlined. A pinger was placed on WP10, for both settings, as an engineering experiment.

The anchors, unless otherwise stated are 3000 lb. wet-weight cylinders. The item "glass balls and chain" refers to glass flotation spheres with hard hats, each one bolted to 3/8" chain at one meter intervals. See Heinmiller (1976) for a more complete description of WHOI moorings.

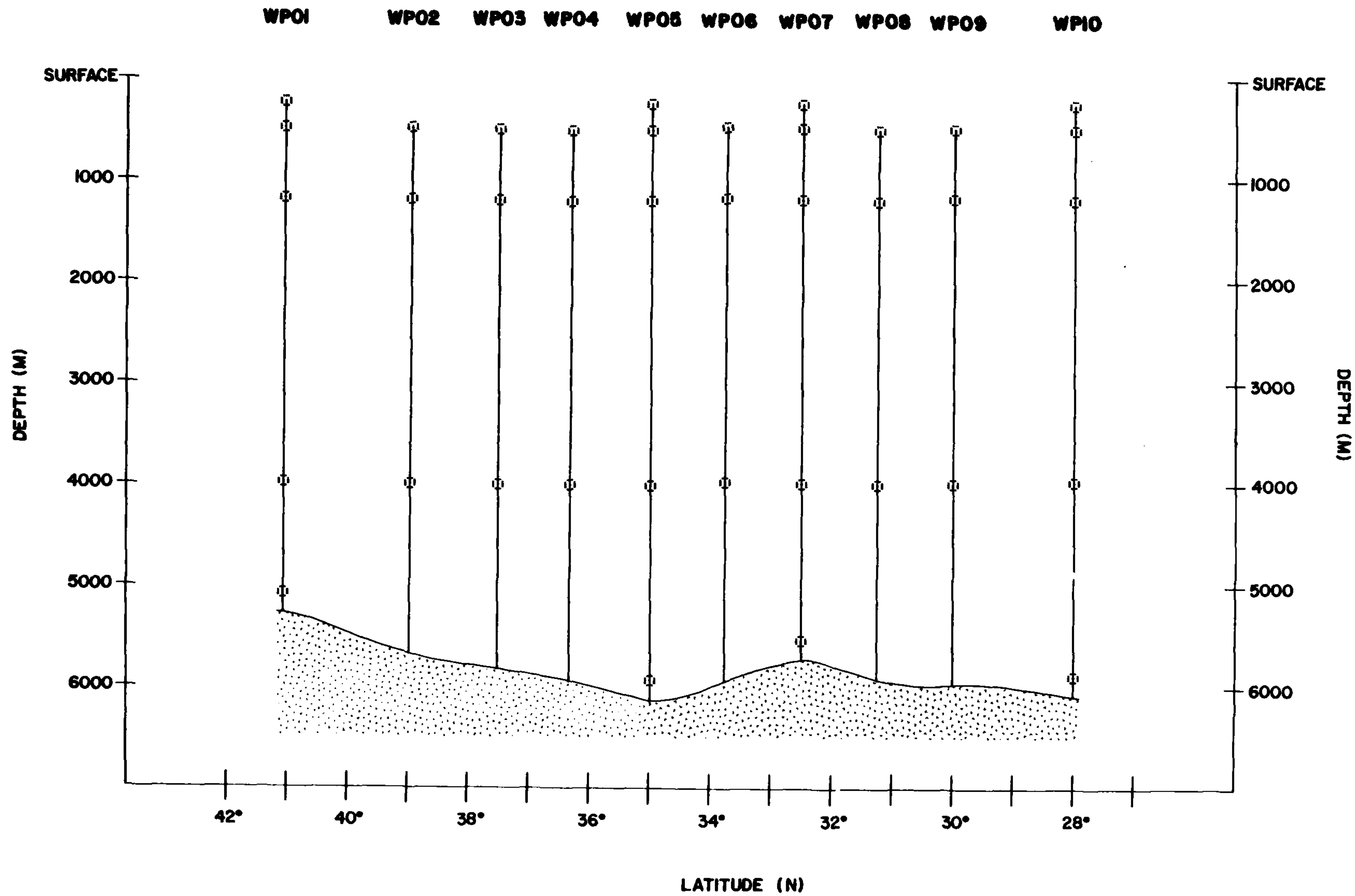

Figure 2: Mooring configuration relative to the bottom topography.

Table 2

MOORING STATISTICS

WesPac I

WesPac #	FILE	DEPTH (M)	DATE SET 1980	DATE RET. 1981	LOCATION	BOTTOM DEPTH(M)
WP01	6951	240	5 JUL	27 MAY	40 59.1 N	5278
	6952	490			152 1.1 E	
	6953	1190				
	6954	3990				
	6955	5077				
WP02	6961	495	5 JUL	25 MAY	38 58.3 N	5664
	6962	1195			152 4.0 E	
	6963	3995				
WP03	6971	501	6 JUL	24 MAY	37 30.1 N	5842
	6972	1201			152 1.8 E	
	6973	4001				
WP04	6981	507	8 JUL	23 MAY	36 17.8 N	5945
	6982	1207			152 2.5 E	
	6983	4007				
WP05	6991	261	9 JUL	21 MAY	34 58.8 N	6149
	6992	511			152 1.9 E	
	6993	1211				
	6994	4015				
	6995	5949				
WP06	7001	478	12 JUL	20 MAY	33 46.4 N	5952
	7001	1178			151 59.4 E	
	7003	3979				
WP07	7011	250	13 JUL	19 MAY	32 29.0 N	5728
	7012	500			152 10.3 E	
	7013	1200				
	7014	4000				
	7015	5540				
WP08	7021	506	14 JUL	17 MAY	31 16.0 N	5952
	7022	1206			152 4.7 E	
	7023	4006				
WP09	7031	494	15 JUL	16 MAY	30 2.1 N	5966
	7032	1194			152 0.8 E	
	7033	3994				
WP10	7041	251	17 JUL	14 MAY	27 59.6 N	6078
	7042	501			151 56.4 E	
	7043	1202				
	7044	3984				
	7045	5890				

Table 2 (continued)

MOORING STATISTICS

WesPac II

WesPac #	FILE	DEPTH (M)	DATE SET 1981	DATE RET. 1982	LOCATION	BOTTOM DEPTH (M)
WP01	7281	287	28 MAY	4JUN	41 2.33 N	5356
	7282	537			152 1.08 E	
	7283	1237				
	7284	4037				
	7285	5216				
WP02	7271	522	26 MAY	3 JUN	38 57.7 N	5680
	7272	1222			152 6.6 E	
	7273	4023				
WP03	7261	486	24 MAY	2 JUN	37 28.3 N	5828
	7262	1186			152 4.4 E	
	7263	3987				
WP04	7251	496	24 MAY	2 JUN	36 16.0 N	5938
	7252	1196			152 0.8 E	
	7253	3996				
WP05	7241	255	22 MAY	1 JUN	34 53.7 N	6158
	7242	505			152 0.7 E	
	7243	1204				
	7244	4004				
	7245	5958				
WP06	7221	498	20 MAY	31 MAY	33 49.75 N	5952
	7222	1198			151 59.37 E	
	7223	3999				
WP07	7211	265	19 MAY	30 MAY	32 28.14 N	5756
	7212	515			152 6.62 E	
	7213	1214				
	7214	4015				
	7215	5556				
WP08	7201	496	18 MAY	LOST	31 15.79 N	5931
	7202	1196			152 3.52 E	
	7203	3996				
WP09	7191	502	17 MAY	28 MAY	30 3.1 N	6005
	7192	1202			152 2.8 E	
	7193	4002				
WP10	7181	247	15 MAY	26 MAY	27 59.3 N	6057
	7182	497			151 53.6 E	
	7183	1198				
	7184	3984				
	7185	5856				

Table 3a.

MOORING CONFIGURATION

WesPac I

	695	699	701	704
Float/Radio/Light				
3/8" chain	2	10	2	2
17" glass balls	14		14	31
3/8" chain				3
3/16" wire	10		10	10
VACM-P	240	261	250	251
3/16" wire	234	233	234	233
17" glass balls	3	3	3	3
3/16" wire	10	10	10	10
VACM-P	490	511	500	501
3/16" wire	682	679	682	679
17" glass balls	3	4	3	4
3/16" wire	10	10	10	10
Pinger				1
VACM	1190	1211	1200	1202
3/16" wire	750	761	750	773
1/4" Kevlar				1082
3/16" wire	1000	1000	1000	
1/4" Kevlar				900
3/16" wire	1000	1000	1000	
17" glass balls	31	10	31	3
3/16" wire	10	10	10	10
VACM	3990	4015	4000	3984
1/4" Kevlar				500
3/16" wire	1000	1000	1000	
1/4" Kevlar				498
3/16" wire	50	294	500	
3/16" wire		500		124
3/16" wire		100		307
3/16" wire				297
3/16" wire				148
16" glass balls	26		26	19
17" glass balls		20		
3/8" chain	2		2	2
VACM	5077	5949	5540	5890
3/8" chain	2	2	2	2
Release				
1/2" chain	3	3	3	3
3/8" wire	162	162	162	162
3/4" nylon	20	20	10	10
1/2" chain	5	5	5	5
Anchor	5278	6149	5728	6078*

Table 3b.

MOORING CONFIGURATION

WesPac I (continued)

	696	697	698	700	702	703
Float/Radio/Light						
3/8" chain	2	3		2	2	2
17" glass balls	15	15	15	15	15	15
3/16" wire	10	10	10	10	10	10
VACM-P	495	501	507	478	506	494
3/16" wire	679	679	679	679	679	679
17" glass balls	6	6	6	6	6	6
3/16" wire	10	10	10	10	10	10
VACM	1195	1201	1207	1178	1206	1194
3/16" wire	752	752	752	752	752	752
3/16" wire					500	
3/16" wire	1000	1000	1000	1000	500	1000
3/16" wire	1000	1000	1000	1000	1000	1000
17" glass balls	28	28	28	28	28	28
3/16" wire	10	10	10	10	10	10
VACM	3995	4001	4007	3979	4006	3994
3/16" wire	1000	1000	1000	1000	1000	1000
3/16" wire					20	
3/16" wire					50	
3/16" wire	200	500	200	200	297	600
3/16" wire	200	50	679	500	446	100
3/16" wire		20			20	
3/16" wire					20	
3/16" wire	200	200		200	20	200
16" glass balls	23	24	24	24	23	24
17" glass balls				1	1	
Release						
1/2" chain	3	3	3	3	3	3
3/4" nylon	20	20	10	20	20	20
1/2" chain	5	5	5	5	5	5
Anchor	5664	5842	5945	5952	5952	5966

* NOTE: The anchor on mooring 704 was a Stimson with a dry weight of 4100 lb.

Table 3c.

MOORING CONFIGURATION

WesPac II

	718	721	724	728
Float/Radio/Light				
3/8" chain	2	2	10	2
17" glass balls	34	14		14
3/16" wire	10	10		10
VACM-P	247	265	255	287
3/16" wire	232	234	233	234
17" glass balls	3	3	3	3
3/16" wire	10	10	10	10
VACM-P	497	515	505#	537
3/16" wire	679	682	679	682
17" glass balls				3
16" glass balls	4	3	4	
3/16" wire	10	10	10	10
Pinger	1			
850 CM	1198	1214	1204	1237
3/16" wire	773	750	10	751
3/16" wire			750	500
3/16" wire		1000	1000	500
1/4" Kevlar	1082			
1/4" Kevlar	900			
3/16" wire		1000	1000	500
3/16" wire				500
17" glass balls	3	31	10	31
1/4" wire	10	10	10	10
VACM-P	3984			4037
VACM		4015	4004#	
1/4" Kevlar	500			
3/16" wire			500	
1/4" Kevlar	498			
3/16" wire			500	
3/16" wire	10	1000	500	
3/16" wire	100	50	200	1000
3/16" wire	297	100	148	20
3/16" wire	307	300	20	20
3/16" wire	124	50	50	100
16" glass balls		26		
17" glass balls	19		20	26
3/8" chain	2	2		
VACM	5856	5556	5958	5216
3/8" chain	2	2	2	3
Release				
1/2" chain	3	3	3	3
3/4" nylon				47
1/4" wire	161	162	162	
3/4" nylon	20	20	20	
3/4" dacron				52
1/2" chain	5	5	5	5
Anchor	6057*	5756	6158	5356**

Table 3d.

MOORING CONFIGURATION

WesPac II (continued)

	719	720	722	725	726	727
Float/Radio/Light						
3/8" chain	2	2	2	2	2	2
17" glass balls	15	15	15	15	15	15
3/16" wire	10	10	10	10	10	10
VACM-P	502	496	498	496	486	522
3/16" wire	679	679	679	679	679	679
17" glass balls	6	6	6	6	6	6
3/16" wire	10	10	10	10	10	10
850 CM	1202	1196	1198	1196	1186	1222
3/16" wire	752	752	752	752	752	752
3/16" wire	1000	1000	1000	1000	1000	1000
3/16" wire	1000	1000	1000	1000	1000	1000
17" glass balls	28	28	28	28	28	28
1/4" wire	10	10	10	10	10	10
VACM	4002	3996	3999	3996	3987	4023
3/16" wire	1000	500	1000	1000	1000	1000
3/16" wire	200	500	300	50	500	200
3/16" wire	500	446	500	100	20	200
3/16" wire	50	297	10	700	50	50
3/16" wire	50	50	20	20	200	50
3/16" wire	100	20	50			100
3/16" wire	20	50				
3/16" wire	10					
17" glass balls		1	2			
16" glass balls	24	23	23	24	24	23
Release						
1/2" chain	3	3	3	3	3	3
3/4" nylon	20	20	20	20	20	10
1/2" chain	5	5	5	5	5	5
Anchor	6005	5931	5952	5938	5828	5680

These instruments were modified to include inclinometers.

* The anchor on mooring 718 was a Stimson with a wet weight of 3000 lb.

** Mooring 728 had a modular anchor with wet weight of 2250 lb.

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DATA PROCESSING

After WesPac I was processed and before WesPac II was processed, WHOI converted to a new computer. This change demanded new programming, and produced a difference in the style of the output for the WesPac II data.

Data are identified by a mooring number, a sequential instrument position number (e.g., 6953 is the third instrument down on mooring 695), a letter to indicate the data version (e.g., 6953A is the first editing of 6953), and a number to indicate the time sampling interval for that data record (e.g., 6953A900 is the fifteen minute (900 seconds) averaged version).

As the time series from the two settings have been merged together, additional naming parameters have been used. The mooring locations for both settings were numbered 1 though 10, starting with the northernmost location and ending with the southernmost location. For example, WP01 refers to the combined time series of mooring 695 in WesPac I and mooring 728 in WesPac II.

Current meter data from cassettes (VACM) and cartridges (Model 850) were transcribed to 9-track magnetic tapes, converted to scientific units, edited to remove launch and retrieval transients and bad points, and linearly interpolated across missing or erroneous data cycles. All directional data has been processed and plotted in degrees true. Data quality was determined at this point, and is noted in Table 4.

There was a problem with directions in the data file 6992. The filtered version was heavily edited (86 out of 313 points) to make the areas where there were bad directions agree with adjacent data. The data quality of the edited filtered series is questionable. The data from the unfiltered series are considered bad and are not shown in the report.

Series 7181 had special editing. Due to a malfunction in the instrument, the vector components were unusable. East and north components were created from the last compass and vane value in each recording interval, together with the total rotor count for the interval.

Series 7185 showed a temperature off-set (as compared with the corresponding instrument for the first setting). No instrumental reason could be found, but CTD measurements in the area indicated the measurements to be too low. The data series was edited, by adding .024° to each value. The original temperature is shown on the microfiche plots and tables, and the edited temperature is used for the composite display, on page 54.

Low passed versions of data series were formed by passing the data through a Gaussian filter with a 24 hour half-width, and then subsampling the filtered series once a day. The composite plots shown for each mooring use these filtered data series.

Depth

Depths for the current meters were computed using a standard procedure. Before launch, water depth at the anticipated anchor location was read from a depth recorder at sea. The mooring components were adjusted to bring the instruments as close as possible to the nominal depths. The recorded lengths of all the mooring components became input for the program NOYFB (Moller,1976). Instrument depths for zero current were calculated.

Mooring 695 (WesPac I) presented a problem. Calculated depths differed from believed actual depths, based on the records of the two pressure sensors on the mooring. Instrument 6951 believed to be at about 250 meters was actually closer to 600 meters according to the pressure records, and instrument 6952 was closer to 800 meters than the predicted 500 meters. Since these were the only two instruments with pressure recorders it is not known whether or not the lower instruments were also deeper than was predicted.

PROGRAMS

Variables versus Time

The stick plots, displayed on Fiche 2 through 7, Row F, are plotted so that North is up, relative to the time axis. The composite stick diagrams in Figures 5 through 24 are plotted such that East is up.

Individual variables and the stick plots are plotted against time from one day Gaussian filtered series.

Tilt and tilt azimuth for 7242 and 7244 are shown in Row G of Fiche 5 and 7.

Statistics

Statistics are computed on the filtered and unfiltered time series. Mean, standard error, variance, kurtosis and extrema are computed. East and north covariance, correlation and other statistics are given for the vectors. For reference, note that a Gaussian random variable would have a kurtosis of three and a skewness of zero.

Statistical tables for the unfiltered velocity and temperature statistics are shown in Fiche 2 through 7, in Row B. Unfiltered pressure statistics are shown in Row G. Filtered statistics are found in Row D of Fiche 2 through 7 and Table 5 of the text.

See Volume XVII (POLYMODE Array II) of this series for a more detailed discussion of these parameters.

Table 4

DATA QUALITY

WesPac I

FILE	START DATE	END DATE	COMMENTS
6951	80-VII-07	81-V-26	600m depth / good
6952	80-VII-07	80-X-19	800m depth / only 4 months data
6953			1.5 months data / not processed
6954	80-VII-07	81-V-26	good
6955	80-VII-07	81-V-26	good
6961	80-VII-07	81-V-24	good
6962	80-VII-07	81-V-24	good / very low speeds 22 Aug-4 Oct.
6963	80-VII-07	81-V-24	good
6971	80-VII-08	81-V-23	good
6972	80-VII-08	81-V-23	good
6973	80-VII-08	81-V-23	good
6981	80-VII-10	81-V-21	good
6982	80-VII-10	81-V-21	good
6983	80-VII-10	81-V-21	good
6991	80-VII-11	81-V-19	good
6992	80-VII-11	81-V-19	no compass values within 45° of 180°
6993	80-XI-24	81-V-19	data after 23 Nov looks good
6994	80-VII-11	81-V-19	good / recreated time base
6995	80-VII-11	81-V-19	temp. only / lost rotor during launch.
7001	80-VII-14	81-V-18	good
7002	80-VIII-23	81-V-18	2 gaps early in record / rest good
7003	80-VII-14	81-V-18	good
7011	80-VII-15	81-V-17	good
7012	80-VII-15	81-V-17	good
7013	80-VII-15	81-V-17	good
7014	80-VII-15	81-V-17	good
7015	80-VII-15	81-I-23	Temp. not good after Jan. Speed not good after Sept.
7021	80-VII-16	81-V-16	good
7022	80-VII-16	81-V-16	good
7023	80-VII-16	81-V-16	good
7031	80-VII-17	81-V-14	good
7032			when clock reads zero,so did temp.,vane
7033	80-VII-17	81-V-14	good
7041	80-VII-19	81-V-12	good
7042	80-VII-19	81-V-12	good
7043	80-VII-19	81-V-12	good / speed seems low 29 Sep - 13 Oct
7044	80-VII-19	81-V-12	good
7045	80-VII-19	81-V-12	good

Table 4 (continued)

DATA QUALITY

WesPac II

FILE	START TIME	END TIME	COMMENTS
7281	30-V-81	19-XI-81	short, tape motor drive malfunction
7282	30-V-81	03-VI-82	good
7283	30-V-81	03-VI-82	good
7284	30-V-81	02-VI-82	good
7285	30-V-81	03-VI-82	good
7271	28-V-81		instrument lost
7272	28-V-81	02-VI-82	3 months no speeds, middle of record
7273	28-V-81	02-VI-82	temp. only, no useful rotor
7261	26-V-81	01-VI-82	good
7262	13-VI-81	01-VI-82	good, short
7263	26-V-81	01-VI-82	good
7251	25-V-81	31-V-82	good
7252	25-V-81	31-V-82	good
7253	25-V-81	31-V-82	good
7241	24-V-81	30-V-82	good
7242	24-V-81	30-V-82	good
7243	24-V-81	30-V-82	good
7244	24-V-81	30-V-82	good
7245	24-V-81	30-V-82	good
7221	22-V-81	01-IX-82	rotor dies in August. temp, pres. good
7222	22-V-81	29-V-82	good,no temp.
7223			no data
7211	21-V-81	28-V-82	good
7212	25-IX-81	28-V-82	no rotor. good temp.,press.
7213	21-V-81	28-V-82	good
7214	21-V-81	28-V-82	good
7215	21-V-81	28-V-82	good
7201			mooring lost
7202			lost
7203			lost
7191			no useful data
7192	19-V-81	26-V-82	good
7193	19-V-81	26-V-82	good
7181	17-V-81	24-V-82	pressure short, (see page 14 for component information)
7182	17-V-81	24-V-82	good
7183	17-V-81	24-V-82	good
7184	17-V-81	24-V-82	clock problem, two parts
7185	17-V-81	24-V-82	temperature offset (see page 14)

Table 5

TABLE OF STATISTICS: velocity variables

SERIES	START DATE	# IN AVG.	MEANS <U>	MEANS <V>	VARIANCES <UPRSQ>	VARIANCES <VPRSQ>	CO-VARIANCE <UPRVPR>
7261B1DG24	81- V -30	174	6.3	-9.5	71.7	54.6	-32.0
MP01.600M	80-VII-07	697	4.1	-0.7	53.7	19.2	-6.7
7263B1DG24	81- V -30	370	2.7	-1.3	10.5	6.3	-0.5
MP01.4000M	80-VII-07	696	-1.0	-1.1	10.0	6.3	-1.3
MP01.5000M	80-VII-07	697	-0.6	-1.7	13.8	7.4	-2.0
6961A1DG24	80-VII-07	322	-2.6	0.3	60.7	44.2	-19.3
MP02.1200M	80-VII-07	395	-0.1	-0.1	22.5	7.0	-3.9
6963A1DG24	80-VII-07	322	2.9	-1.4	58.2	15.3	-10.4
MP03.500M	80-VII-08	694	-0.8	0.8	61.8	93.7	-10.3
MP03.1200M	80-VII-08	693	-1.6	1.2	22.2	23.1	-6.3
MP03.4000M	80-VII-08	694	-1.9	1.5	32.1	20.3	-8.5
MP04.500M	80-VII-10	691	5.3	-6.3	211.1	190.2	-96.7
MP04.1200M	80-VII-10	691	0.2	-1.4	49.2	41.5	-23.1
MP04.4000M	80-VII-10	691	-1.7	2.3	19.1	20.9	-4.9
MP05.200M	80-VII-11	689	14.3	-17.6	647.0	954.8	-238.7
MP05.500M	80-VII-11	689	8.4	-10.1	271.1	343.2	-95.5
7243B1DG24	81- V -24	372	4.4	-4.3	52.3	93.9	-27.5
MP05.4000M	80-VII-11	689	-2.7	-0.7	40.2	49.7	-19.1
7245B1DG24	81- V -24	372	-1.3	-1.6	40.3	38.2	-19.6
MP06.500M	80-VII-14	415	-5.6	-1.8	245.1	406.0	-21.1
MP06.1200M	80-VIII-23	644	3.6	-0.5	58.3	56.2	16.7
7003A1DG24	80-VII-14	309	0.8	0.6	19.0	43.4	6.7
MP07.200M	80-VII-15	683	-2.2	-4.0	416.1	470.5	27.2
7012A1DG24	80-VII-15	307	5.2	-1.9	116.0	161.4	41.2
MP07.1200M	80-VII-15	683	-1.9	0.6	27.6	17.8	1.6
MP07.4000M	80-VII-15	683	-2.0	2.1	16.8	17.4	6.0
7215B1DG24	81- V -21	373	-3.0	3.7	32.3	39.7	11.8
7021A1DG24	80-VII-16	305	5.2	-10.0	158.6	131.3	56.0
7022A1DG24	80-VII-16	305	1.5	-1.4	20.9	11.3	6.4
7023B1DG24	80-VII-16	305	1.4	0.5	17.3	13.0	8.3
7031A1DG24	80-VII-17	302	1.0	-1.0	65.1	43.7	-18.1
7192B1DG24	81- V -19	373	-1.8	0.5	18.2	8.1	-1.5
MP09.4000M	80-VII-17	679	-1.3	-0.5	13.7	10.6	2.0
MP10.200M	80-VII-19	675	-1.8	-0.9	87.0	69.0	9.7
MP10.500M	80-VII-19	675	-1.2	-0.2	36.5	22.9	-1.0
MP10.1200M	80-VII-19	675	-0.2	0.7	5.6	3.9	-1.3
MP10.4000M	80-VII-19	527	0.1	1.2	15.4	11.2	-3.1
MP10.5000M	80-VII-19	675	-1.3	1.5	20.0	16.3	-7.0

Table 5 (continued)

TABLE OF STATISTICS: temperature and pressure

SERIES	# IN AVG.	MEAN <T>	STD.DEV. SQRT<TPRSQ>	TEMP/VEL.COVAR. <UPRTPR>	<VPRTPR>	MEAN <P>	STD.DEV SQRT<PPR>
7261B1DG24	174	4.061	0.903	-0.515	-0.344		
*P01.600M	697	3.920	0.286	0.054	0.223	591.0	23.8
7253B1DG24	370	2.531	0.074	0.034	0.065		
*P01.4000M	696	1.462	0.006	0.000	0.000		
*P01.5000M	697	1.530	0.005	0.002	0.001		
6961A1DG24	322	4.402	0.272	0.174	0.653		
*P02.1200M	395	2.582	0.054	0.029	-0.023		
6963A1DG24	322	1.475	0.006	0.002	-0.007		
*P03.500M	694	4.733	0.456	-0.102	-0.248	540.6	23.6
*P03.1200M	693	2.645	0.105	0.003	-0.014		
*P03.4000M	694	1.465	0.007	0.009	-0.014		
*P04.500M	691	4.993	0.746	3.895	-2.580	572.6	52.2
*P04.1200M	691	2.648	0.099	0.130	-0.215		
*P04.4000M	691	1.472	0.007	0.005	-0.012		
*P05.200M	689	12.258	3.591	6.582	-27.250	361.9	61.9
*P05.500M	689	7.160	2.653	-2.654	-3.397	613.8	61.6
7243B1DG24	372	2.837	0.231	0.516	-0.933		
*P05.4000M	689	1.484	0.010	0.033	-0.027		
7245B1DG24	372	1.603	0.003	0.007	-0.006		
*P06.500M	415	8.861	3.099	1.019	-17.668	566.3	68.3
*P06.1200M	644	3.382	0.426	1.460	-0.060		
7003A1DG24	309	1.473	0.009	0.004	0.028		
*P07.200M	683	13.434	2.761	-9.546	-4.165		
7012A1DG24	307	6.564	2.345	-8.226	-1.999	645.6	68.3
*P07.1200M	683	2.916	0.277	-0.570	-0.094		
*P07.4000M	683	1.458	0.010	-0.016	-0.010		
7215B1DG24	373	1.534	0.006	-0.005	-0.005		
7021A1DG24	305	10.099	2.218	-6.436	6.245	556.3	35.4
7022A1DG24	305	3.029	0.181	-0.321	0.073		
7023B1DG24	305	1.462	0.009	0.012	0.013		
7031A1DG24	302	10.444	0.649	0.058	0.734	569.9	2.4
7192B1DG24	373	3.133	0.099	0.018	-0.040		
*P09.4000M	679	1.478	0.009	-0.013	-0.004		
*P10.200M	675	16.414	0.282	-0.653	-0.214		
*P10.500M	675	11.637	0.527	-0.829	-0.542	508.3	9.6
*P10.1200M	675	3.221	0.117	-0.019	-0.012		
*P10.4000M	527	1.477	0.006	0.002	0.000		
*P10.5000M	675	1.535	0.004	-0.005	0.002		

Histograms

The variables temperature, velocity components, speed and direction are shown as frequency of occurrence versus amplitude plots. They are shown in Row C of Fiche 2 through 7. The mean for each data series is marked for WesPac I. The direction of histogram 7181 is questionable due to an instrument malfunction. See page 14 for further information.

Progressive Vector and Scatter Plots

Progressive vector plots are based on the unfiltered time series. The current vectors are placed tail-to-head so as to show the path that a perfect particle in a perfectly homogeneous flow would have travelled. Flow regimes and low frequency behavior show up well on this type of plot. The plot begins with an asterisk, the first day of each month is marked with a triangle and every month is annotated.

Every daily averaged point from the series is plotted in a scatter plot, in which east and north components are plotted as points on a polar diagram. The line drawn through the points is the principal axis. This line measures the orientation angle but does not denote the length of the major axis. It has slope theta (θ) (where theta is given by $\tan(2\theta) = (2\overline{uv}) / (u^2 - v^2)$) and it passes through the point $(\overline{u},\overline{v})$.

Progressive vectors and scatter plots are shown in Row E of Fiche 2 through 7.

Spectra

The horizontal kinetic energy (HKE) and temperature are displayed as spectra (Hunt, 1977). The HKE spectrum is half of the sum of the spectra of the east and north components. It has the advantage of not being tied to a particular coordinate system. These plots are shown in the fiche.

The HKE, temperature, and pressure spectra have units of either $(cm^2/sec^2)/cph$, $(°C)^2/cph$, and $(Decibars)^2/cph$ respectively. The spectra are all one-sided, i.e., the area under the spectrum is equal to the variance of the original record. The plots are log-log rather than "variance preserving", i.e., the contributions of various frequency bands to the total variance are not in proportion to the displayed areas. They are shown on Fiche 2 through 7 in Row B, for velocities and temperatures, and Row G for pressure.

Array Plots

Five day Gaussian filtered data series are subsampled every five days and plotted, according to their location, as velocity vectors for each depth. Plots are shown in Figure 3.

Three Dimensional Temperature Plots

These displays show temperature as a function of time and space. Each surface consists of temperature values at the depth indicated. Geographical position (latitude) is shown along the Y axis and the X axis denotes time in days. The data series have been passed through a five day half-width Gaussian filter, and a point is plotted every fifth day. These plots are shown in Figure 4.

REFERENCES

Bradley, K. F., 1982. Technical activities associated with an exploratory array in the western North Pacific. Woods Hole Oceano. Inst. Tech. Rept. WHOI-82-41.

Heinmiller, R. H., 1976, Woods Hole Buoy Project Moorings, 1960-1974. Woods Hole Oceano. Inst. Tech. Rept. WHOI-76-53.

Hunt, M., 1977, A program for spectral analysis of time series. WHOI Technical Memorandum 2-77.

McCullough, J. R. (1975). Vector Averaging Current Meter Speed Calibration and Recording Technique. Woods Hole Oceano. Inst. Tech. Rept. WHOI-75-44.

Moller, D. A., 1976, A computer program for the design and static analysis of single-point subsurface mooring systems: NOYFB. Woods Hole Oceano. Inst. Tech. Rept. WHOI-76-59.

Niiler, P. P., 1980, CTD transect of the Kuroshio Extension, 28-41° N, 152°E. Scripps Ref. 81-3 (Technical Report).

Payne, R. E., A. L. Bradshaw, J. P. Dean and K. E. Schleicher, 1976, Accuracy of temperature measurements with the V.A.C.M. Woods Hole Oceano. Inst. Tech. Rept. WHOI 76-94.

Schmitz, W. J., Jr., 1976, Eddy kinetic energy in the deep western North Atlantic, J. Geophys. Res., 81, 4981-4982.

REFERENCES (continued)

Schmitz, W. J., Jr., 1977, On the deep general circulation in the western North Atlantic., J. Mar. Res., 35, 21-28.

Schmitz, W. J., Jr., 1978, Observations of the vertical structure of low frequency fluctuations in the western North Atlantic, J. Mar. Res., 36, 295-310.

Schmitz, W. J., Jr., P. P. Niiler, R. L. Bernstein, and W. R. Holland, 1982. Recent long-term moored instrument observations in the western North Pacific. J. Geophys. Res., 87, 9425-9440.

Tarbell, S. A., A. Spencer, and R. E. Payne, 1978, A compilation of moored current meter data and associated oceanographic observations, Vol. XVII (Polymode Array II data). Woods Hole Oceano. Inst. Tech. Rept. WHOI-78-49.

Valdes, J. R. (1977). COS/MOS 850 Current Meter Report. Woods Hole Oceano. Inst. Tech. Rept. WHOI-77-30.

Webster, F. (1968). A Scheme for Sampling Deep-Sea Currents from Moored Buoys. Woods Hole Oceano. Inst. Tech. Rept. WHOI-68-2.


WESPAC 1 500M. 5-DAY CURRENT VECTORS
VII-24 VII-29 VIII-3 VIII-8 VIII-13 VIII-18 VIII-23 VIII-28 IX-2 IX-7
IX-12 IX-17 IX-22 IX-27 X-2 X-7 X-12 X-17 X-22 X-27
XI-1 XI-6 XI-11 XI-16 XI-21 XI-26 XII-1 XII-6 XII-11 XII-16
XII-21 XII-26 XII-31 I-5 I-10 I-15 I-20 I-25 I-30 II-4
II-9 II-14 II-19 II-24 III-1 III-6 III-11 III-16 III-21 III-26
III-31 IV-5 IV-10 IV-15 IV-20 IV-25 IV-30 V-5
5 CM/SEC 1 DEG OF LAT. 1 DEG OF LONG
LOWER LEFT CORNER OF FRAME: 148 W 28 N

Figure 3a

WESPAC 2 500M. 5-DAY CURRENT VECTORS

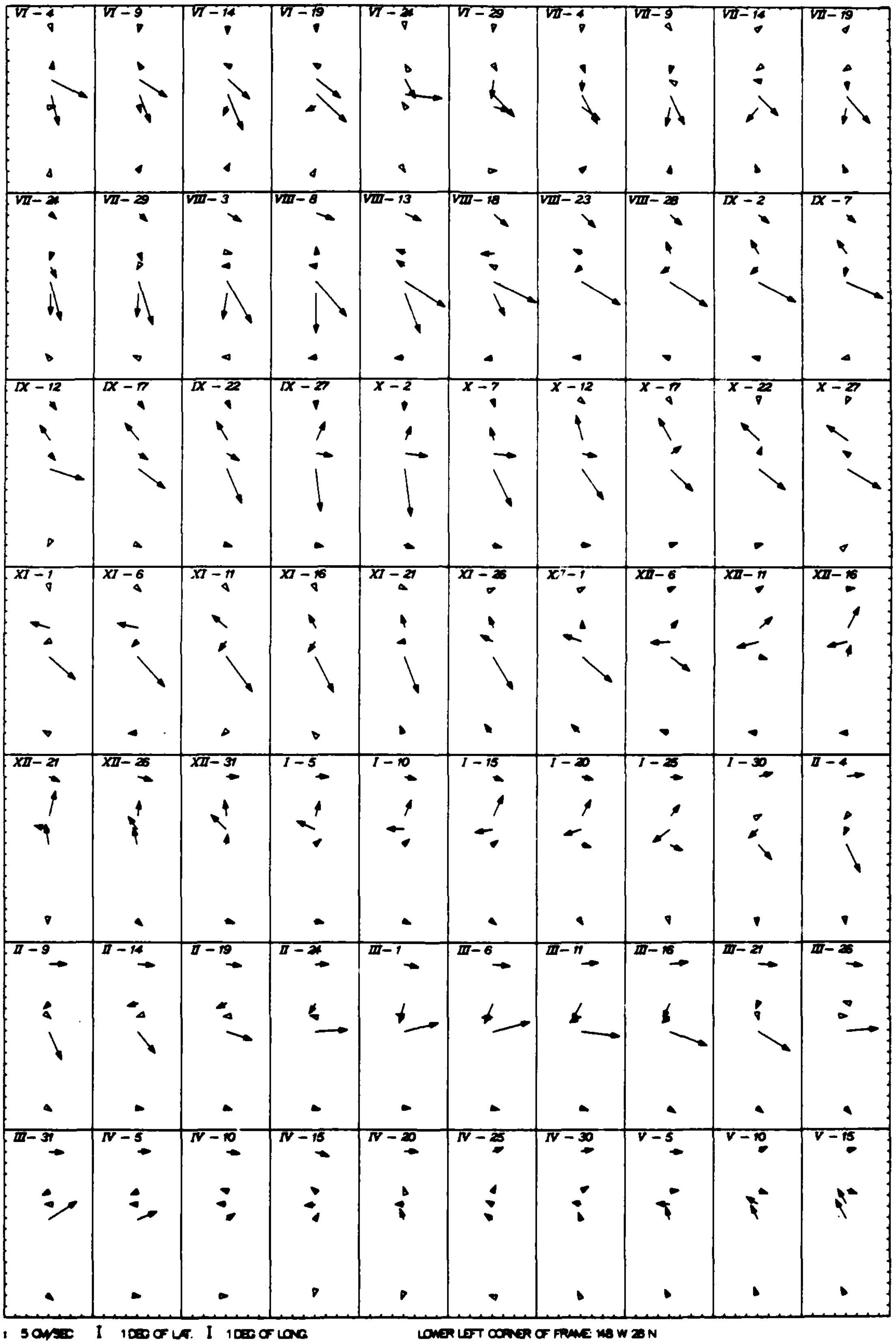
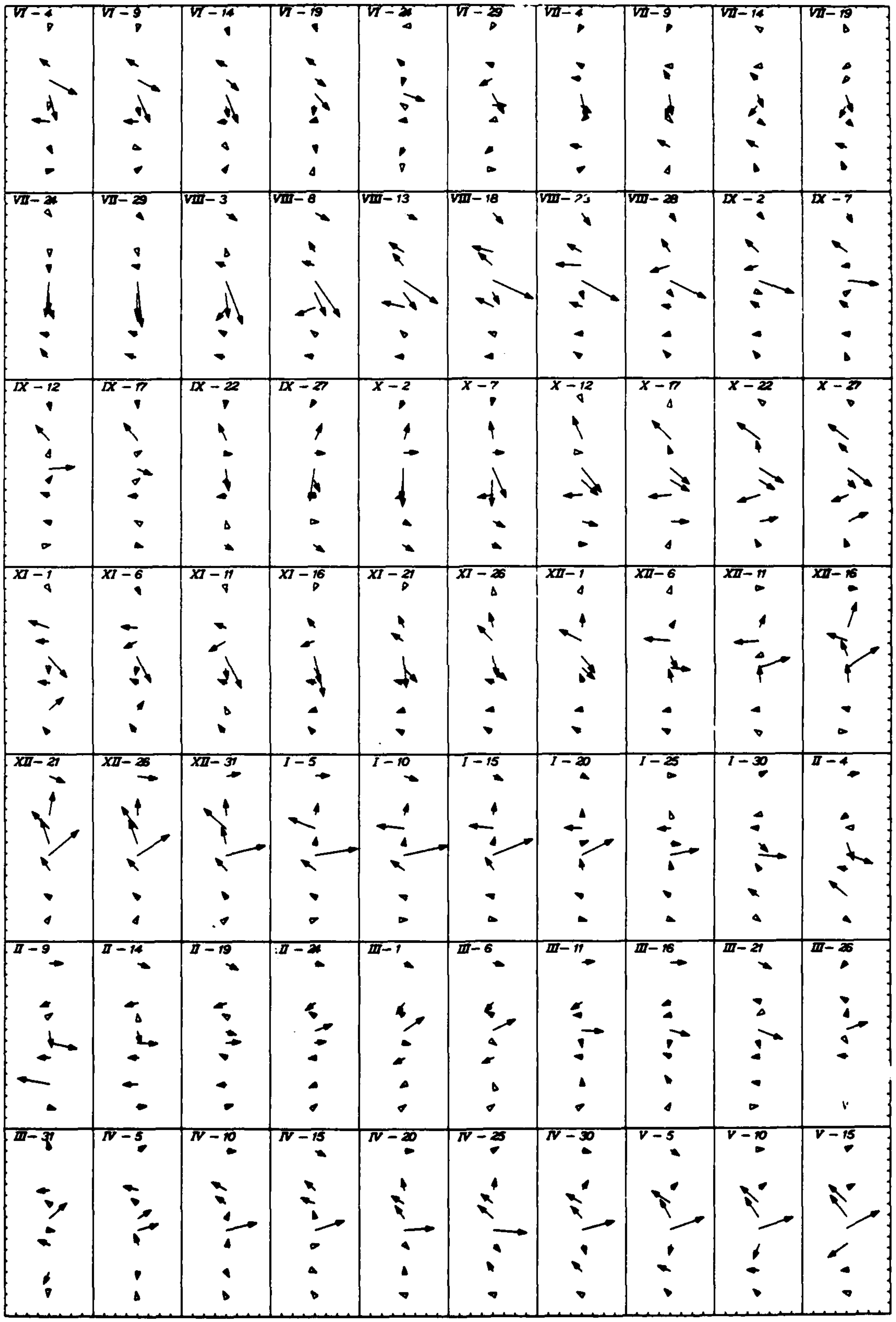


Figure 3b

WESPAC 1 1200M. 5-DAY CURRENT VECTORS

Figure 3c

WESPAC 2 1200M. 5-DAY CURRENT VECTORS



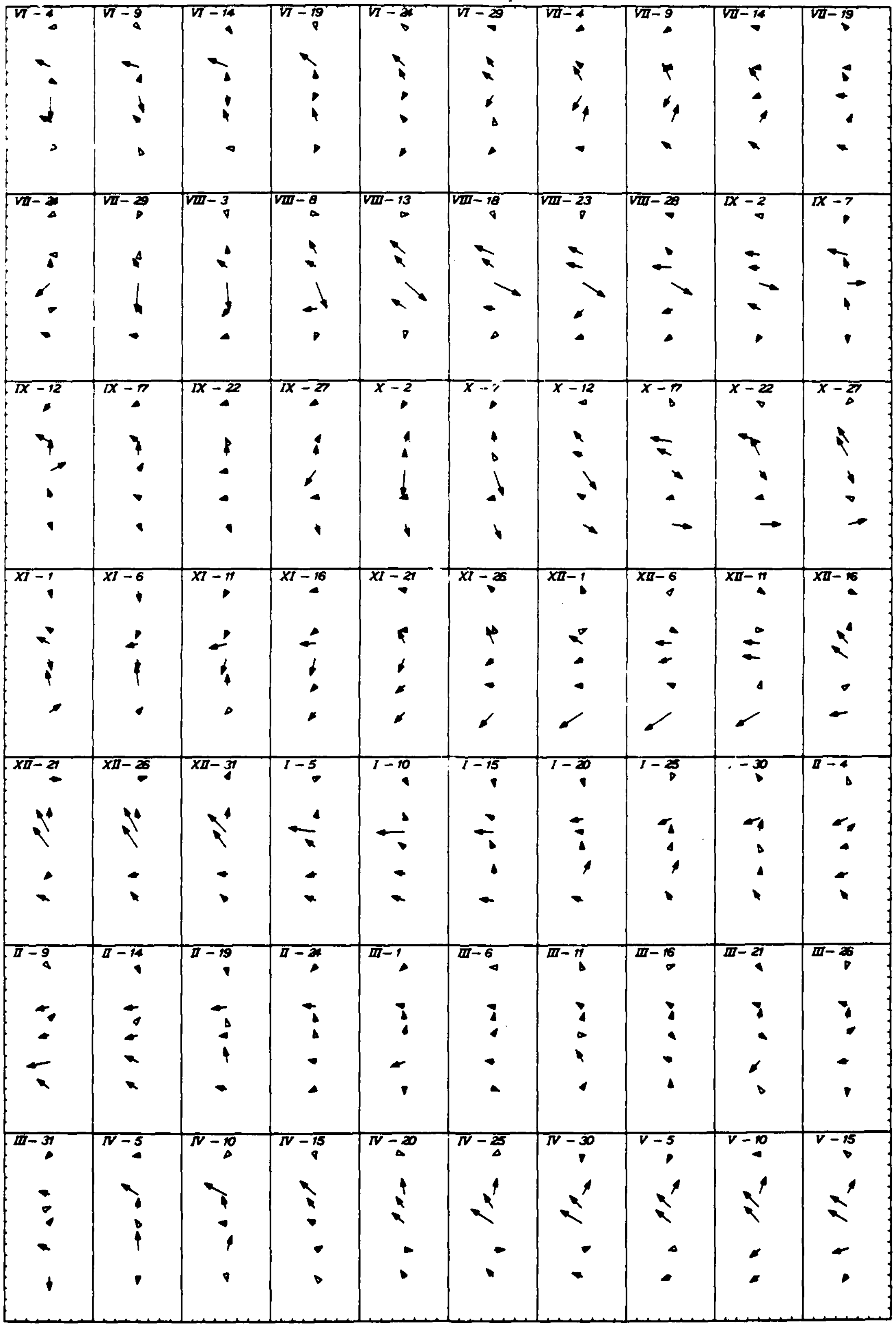
I 5 CM/SEC I 1 DEG OF LAT. I 1 DEG OF LONG LOWER LEFT CORNER OF FRAME: 148 W 28 N

Figure 3d

WESPAC 1 4000M. 5-DAY CURRENT VECTORS

Figure 3e

WESPAC 2 4000M. 5-DAY CURRENT VECTORS



I 5 CM/SEC I 1 DEG OF LAT. I 1 DEG OF LONG LOWER LEFT CORNER OF FRAME: 148 W 28 N

Figure 3f

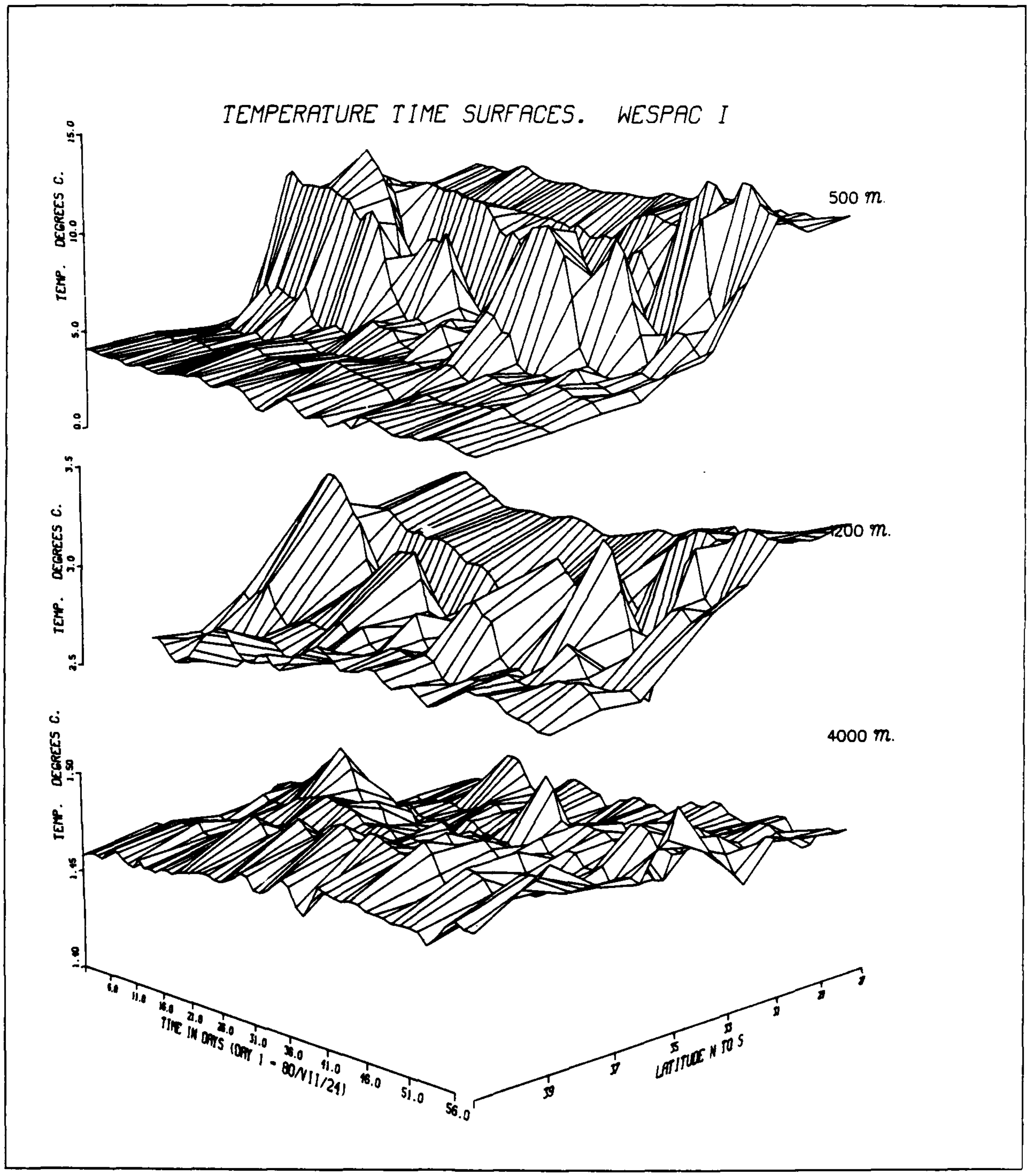

TEMPERATURE TIME SURFACES. WESPAC I
500 m.
1200 m.
4000 m.
TEMP. DEGREES C.
15.0
10.0
5.0
0.0
TEMP. DEGREES C.
3.5
3.0
2.5
TEMP. DEGREES C.
1.50
1.45
1.40
TIME IN DAYS (DAY 1 - 80/VII/24)
11.0
16.0
21.0
31.0
41.0
46.0
51.0
56.0
LATITUDE N TO S
39
37
35
33
31
29
27

Figure 4a

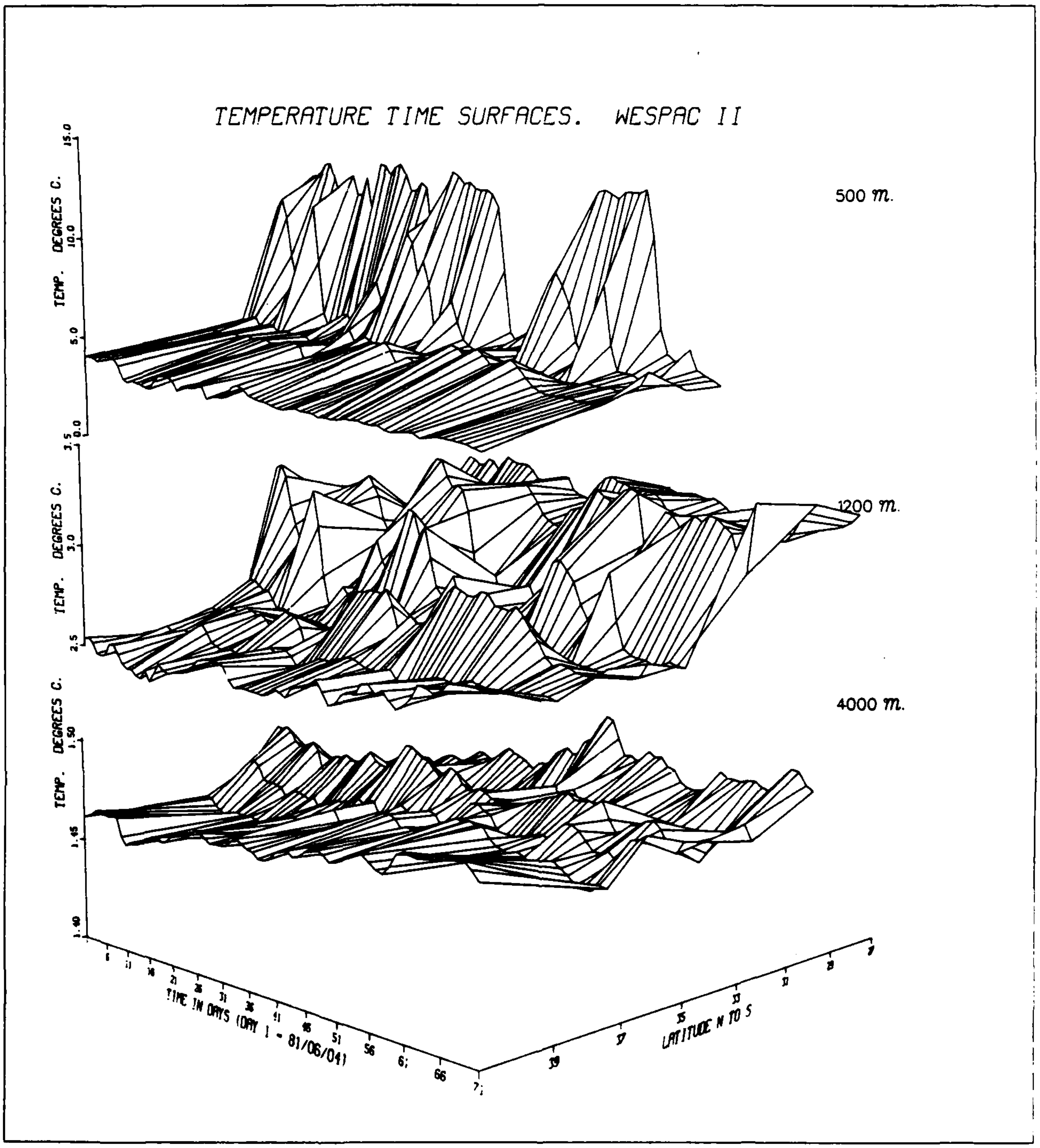

TEMPERATURE TIME SURFACES. WESPAC II
TEMP. DEGREES C.
500 m.
1200 m.
4000 m.
TIME IN DAYS (DAY 1 = 81/06/04)
LATITUDE N TO S

Figure 4b

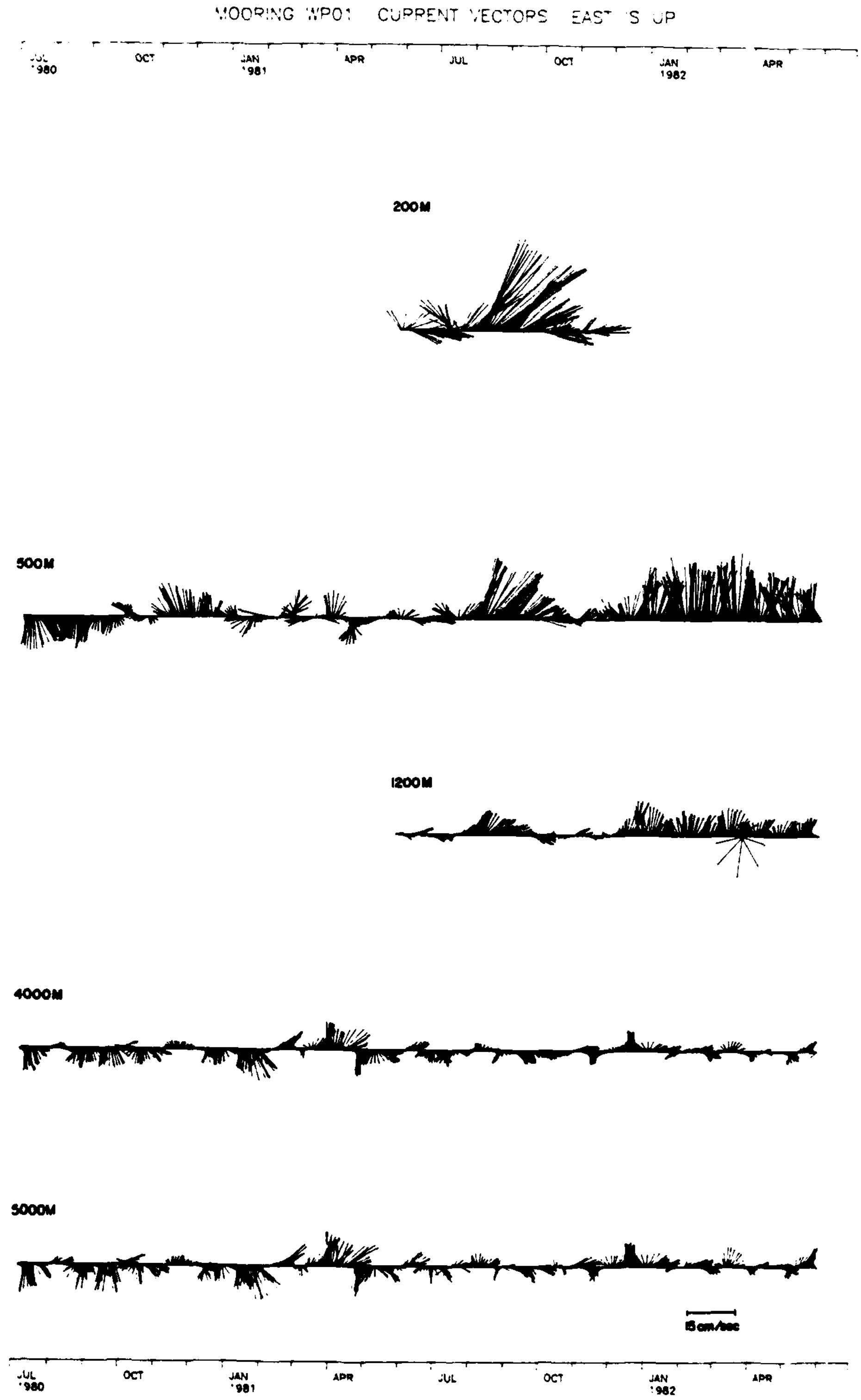
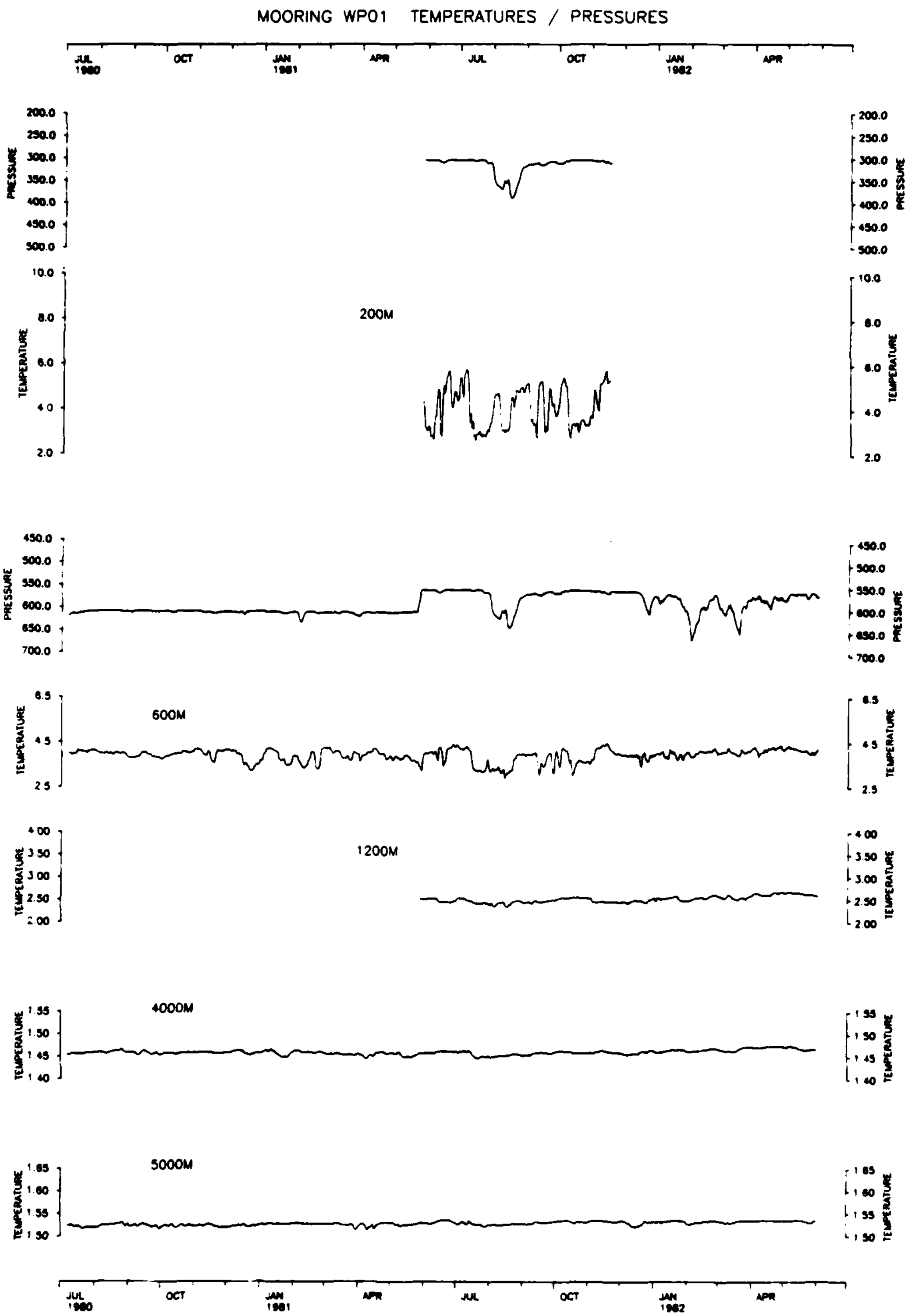

MOORING WP01 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
200M
500M
1200M
4000M
5000M
15 cm/sec

Figure 5



MOORING WP01 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
PRESSURE
TEMPERATURE
200M
600M
1200M
4000M
5000M

Figure 6

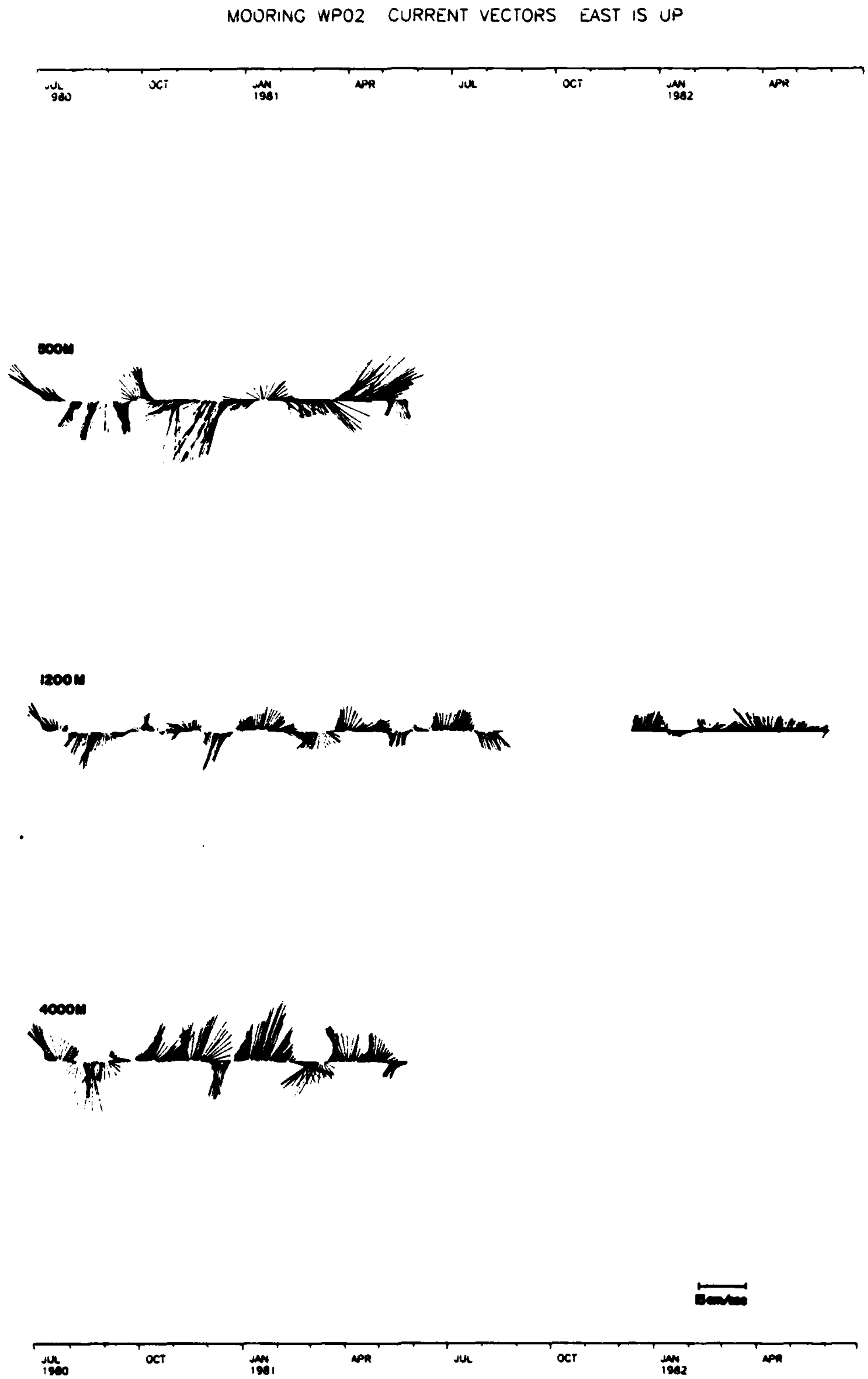

MOORING WP02 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
1200M
4000M

Figure 7

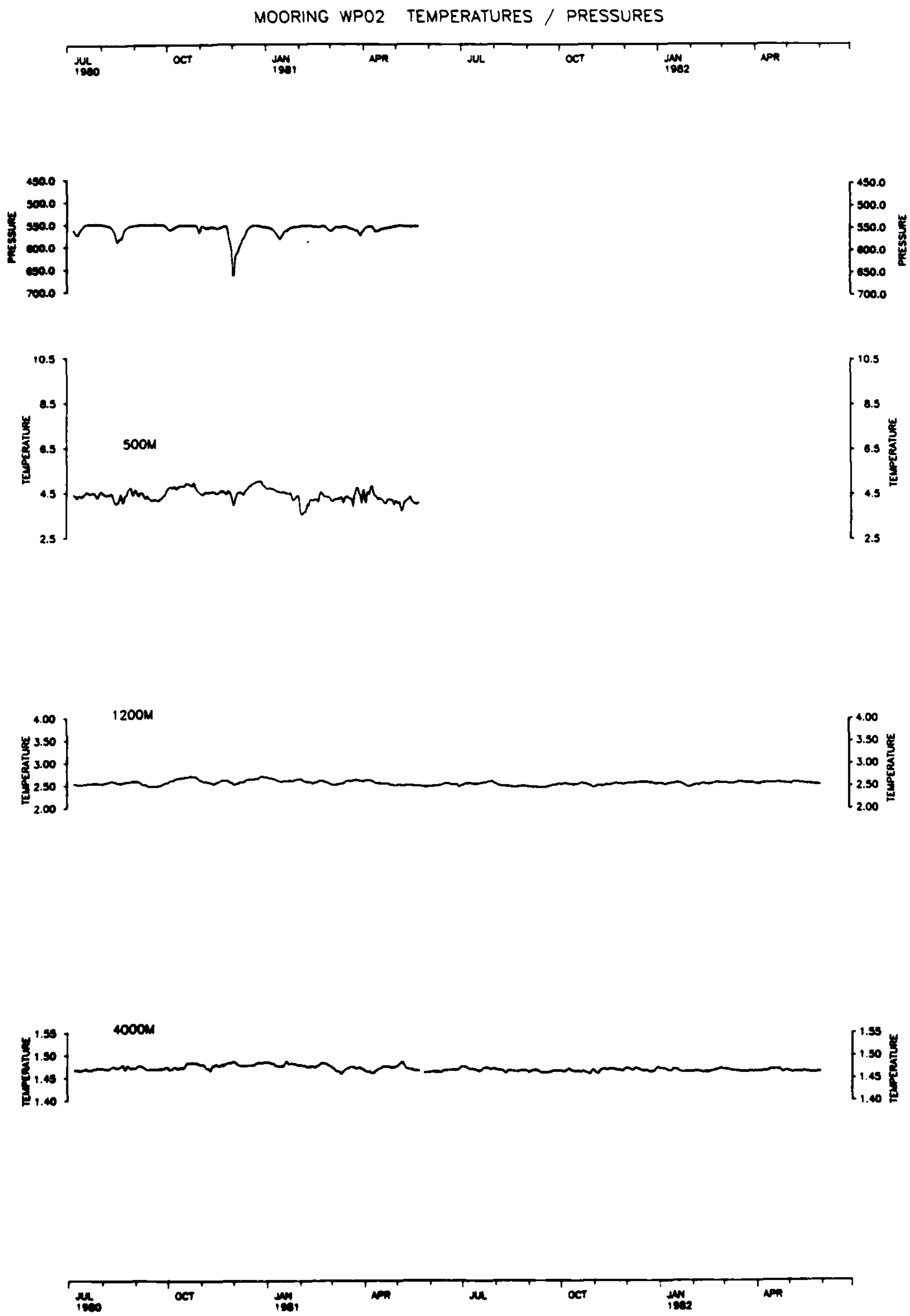

MOORING WP02 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
PRESSURE
450.0
500.0
550.0
600.0
650.0
700.0
TEMPERATURE
10.5
8.5
6.5
4.5
2.5
500M
1200M
4.00
3.50
3.00
2.50
2.00
4000M
1.55
1.50
1.45
1.40

Figure 8

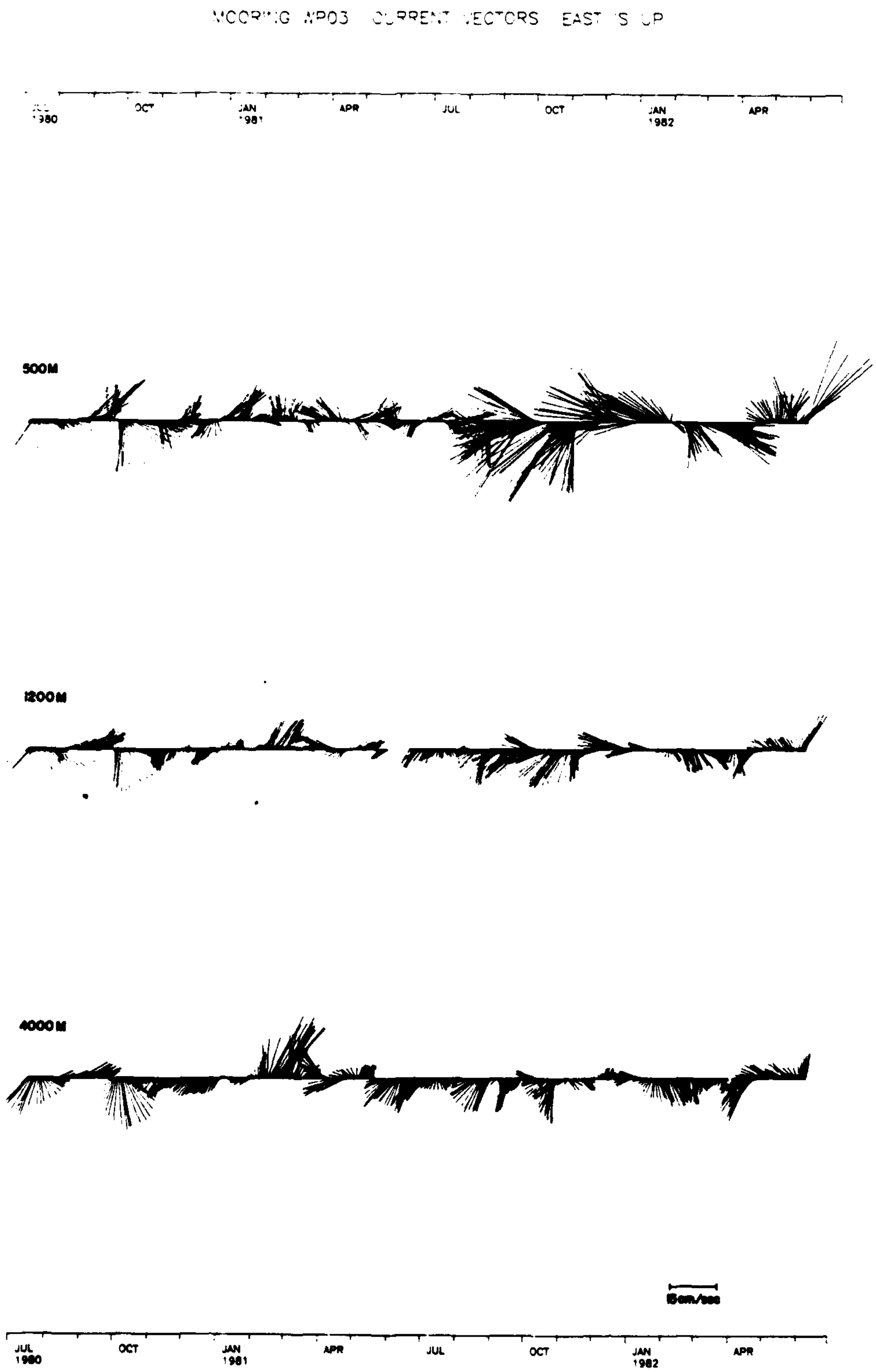

MOORING WP03 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
500M
1200M
4000M
15cm/sec

Figure 9

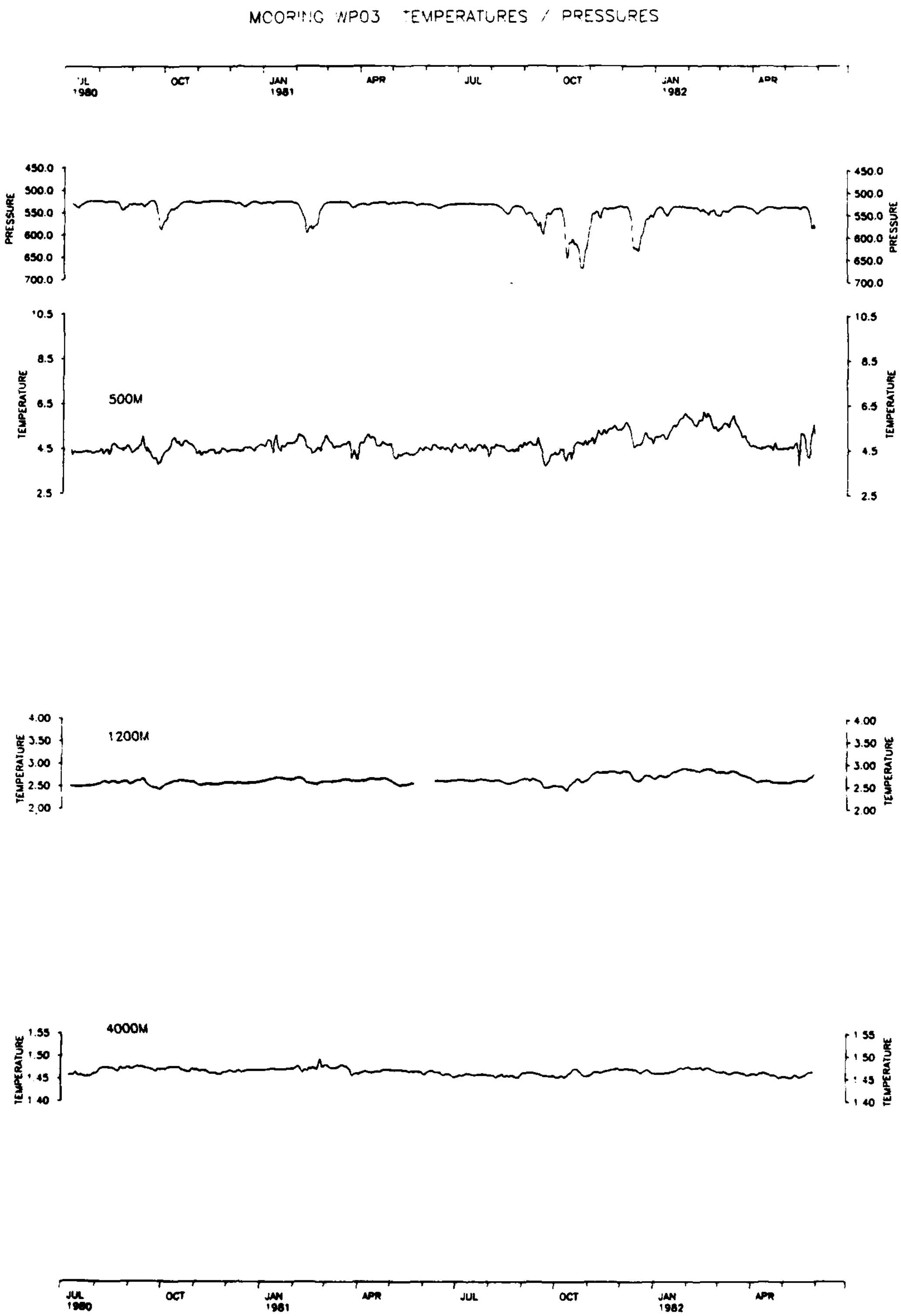

MOORING WP03 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
PRESSURE
450.0
500.0
550.0
600.0
650.0
700.0
TEMPERATURE
500M
10.5
8.5
6.5
4.5
2.5
1200M
4.00
3.50
3.00
2.50
2.00
4000M
1.55
1.50
1.45
1.40

Figure 10

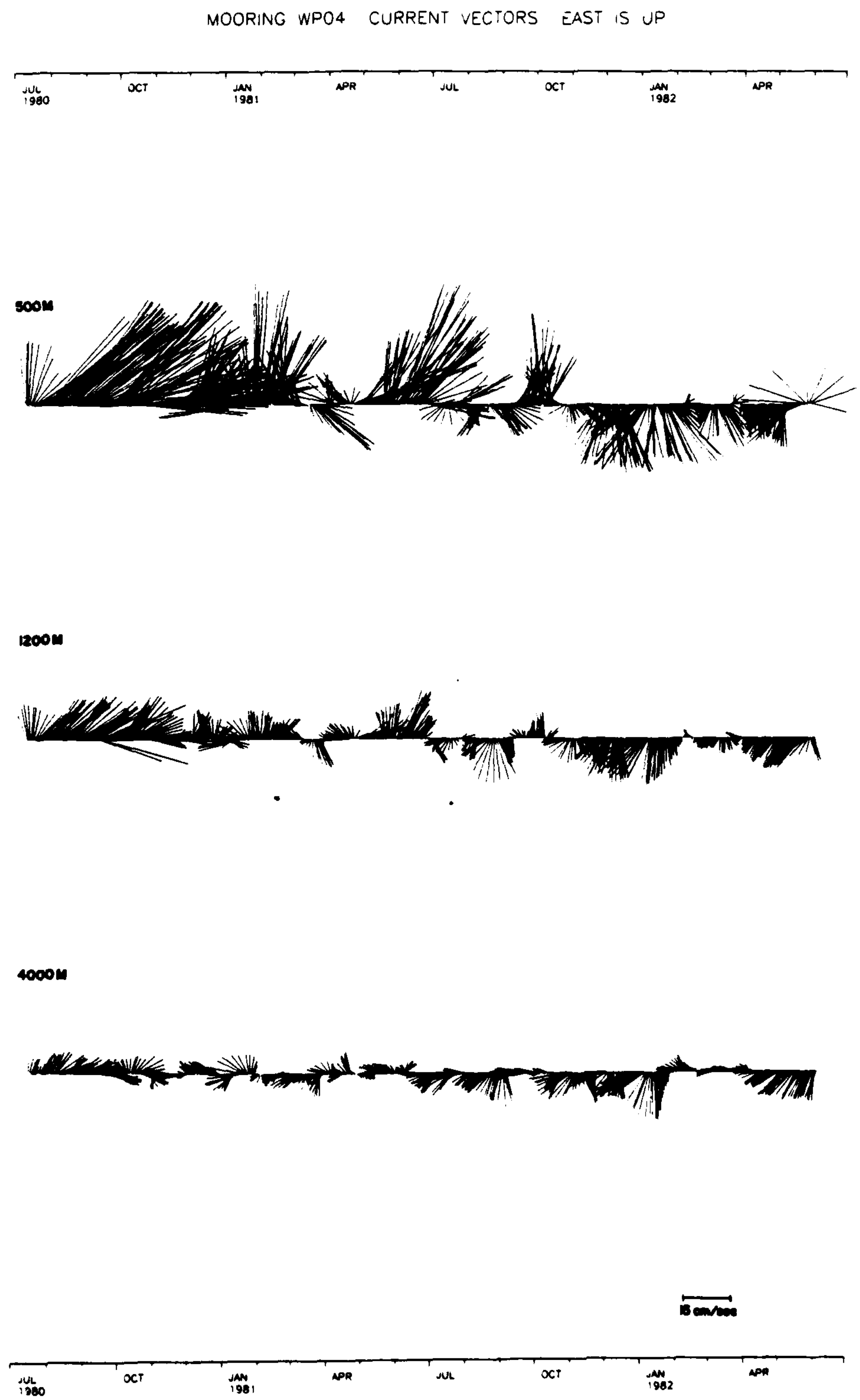

MOORING WP04 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
500M
1200M
4000M
15 cm/sec

Figure 11

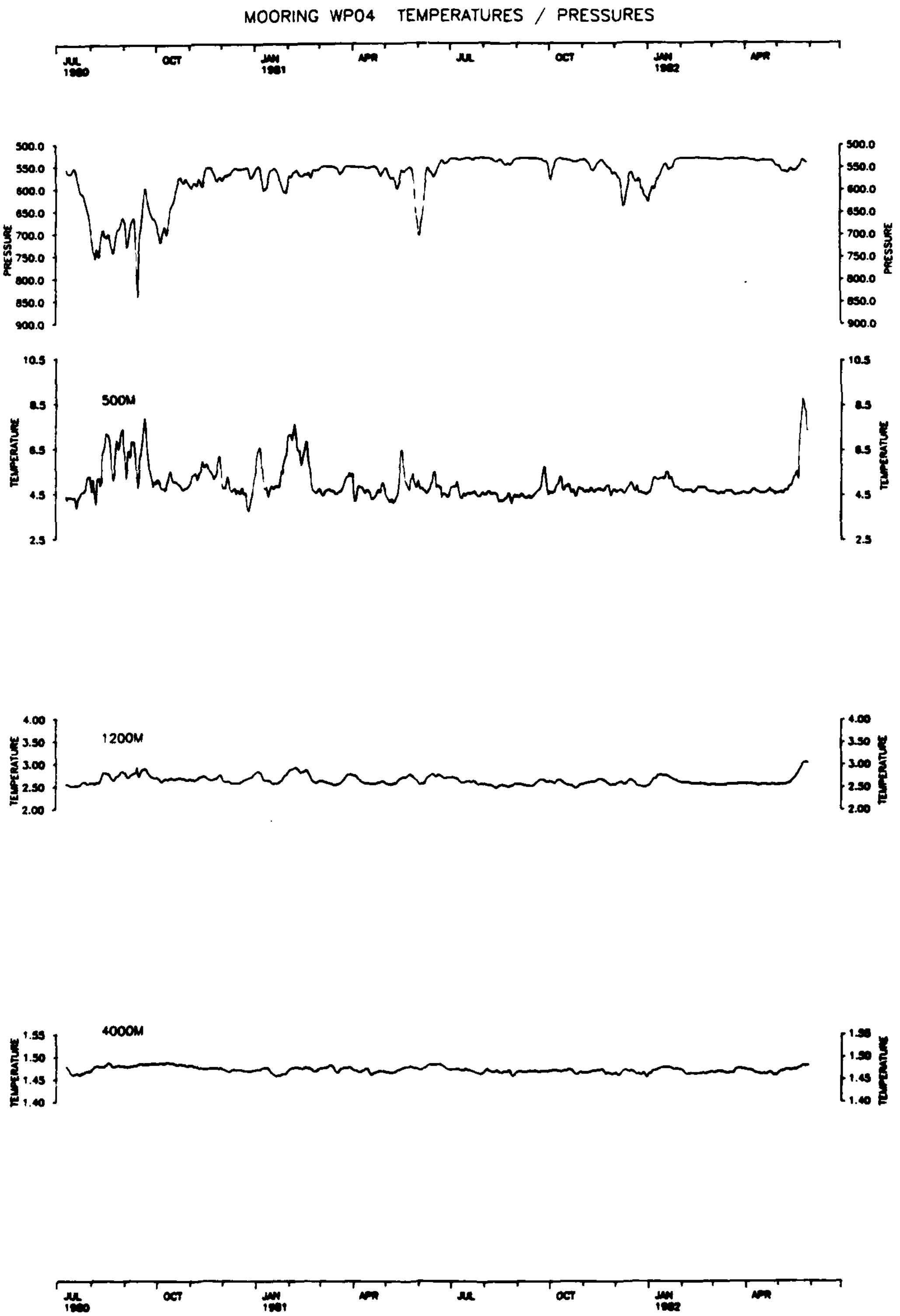
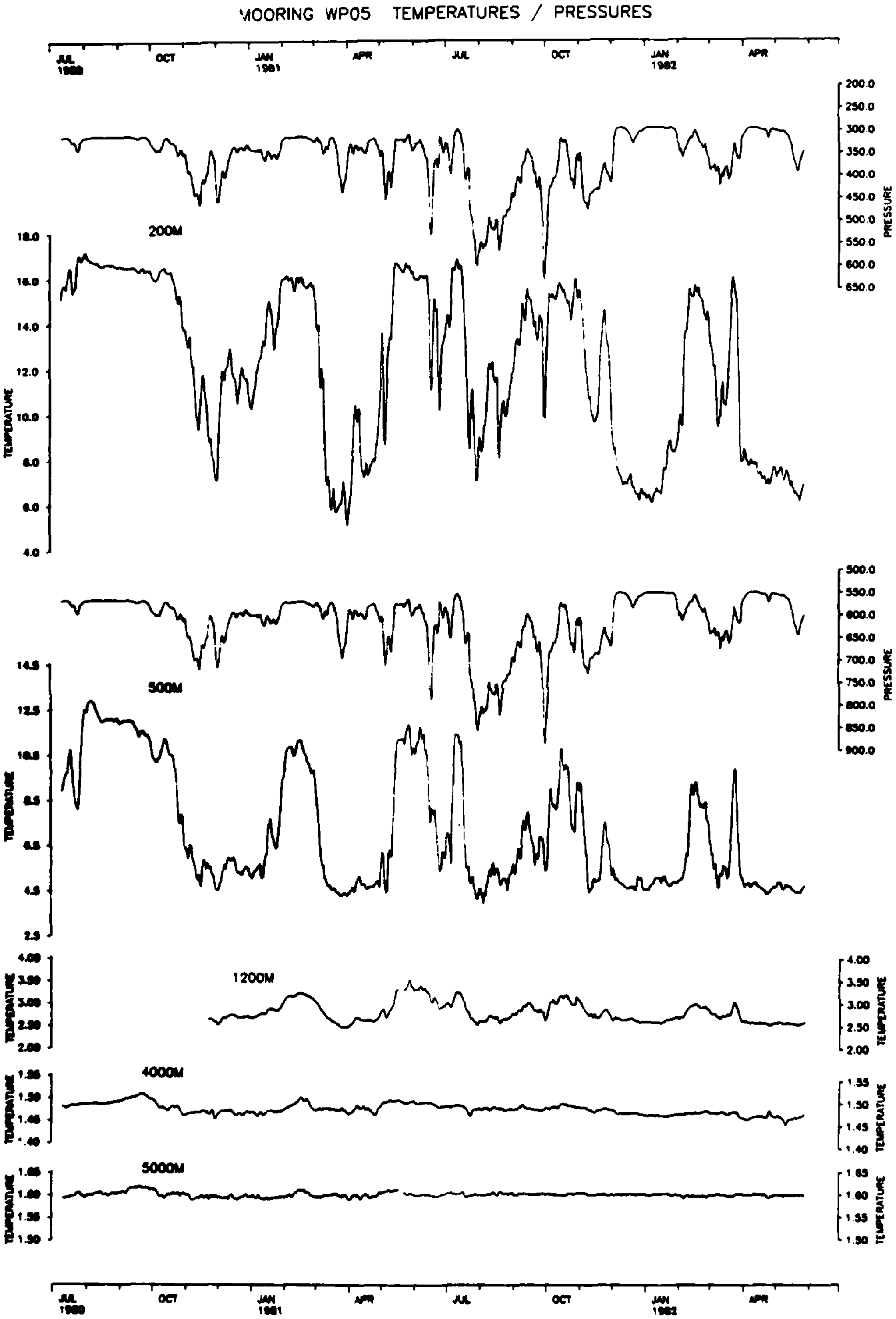

MOORING WP04 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
PRESSURE
500.0
550.0
600.0
650.0
700.0
750.0
800.0
850.0
900.0
TEMPERATURE
500M
10.5
8.5
6.5
4.5
2.5
1200M
4.00
3.50
3.00
2.50
2.00
4000M
1.55
1.50
1.45
1.40

Figure 12

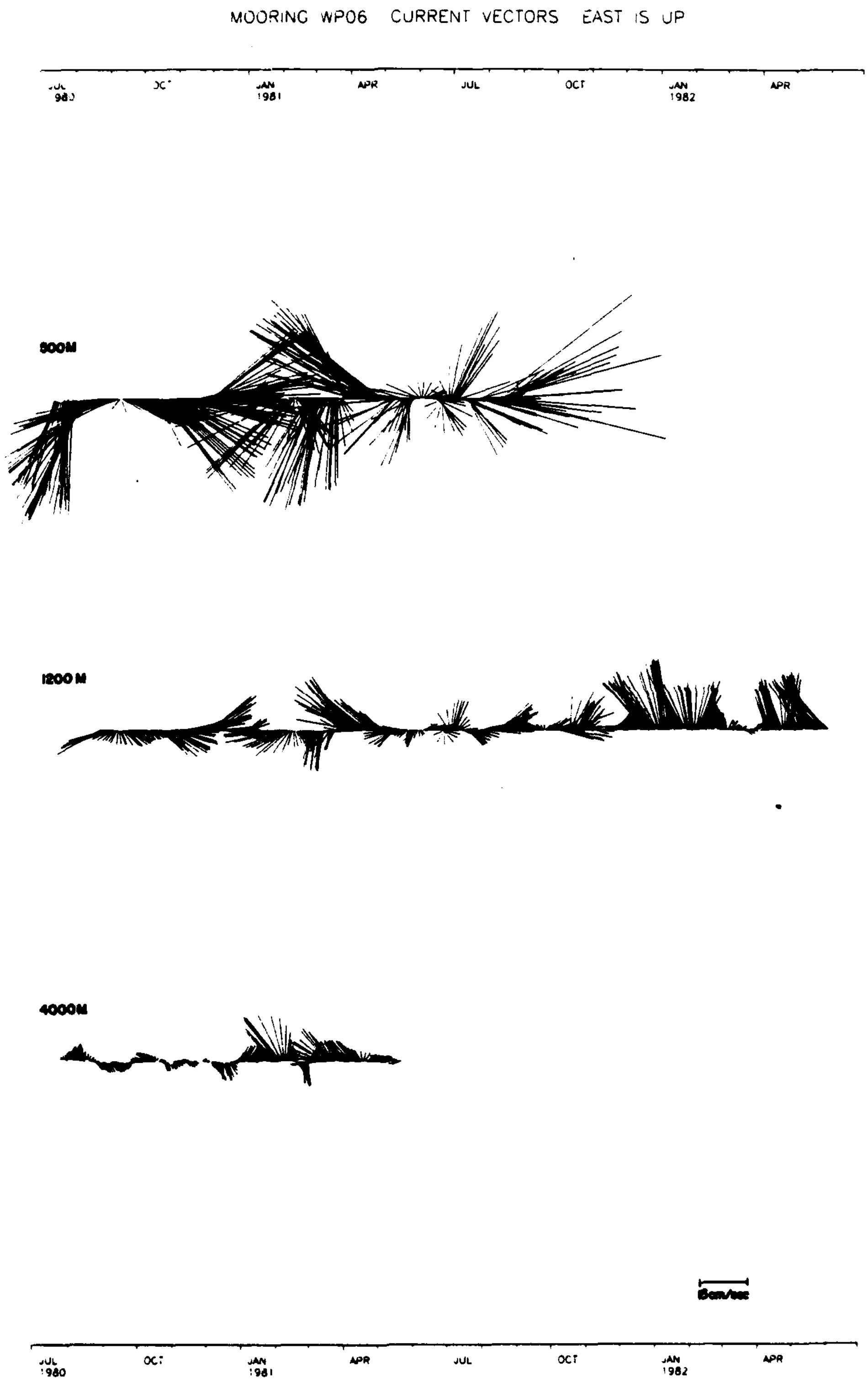

MOORING WP05 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
200M
500M
1200M
4000M
5000M
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR

Figure 13



MOORING WP05 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
200M
500M
1200M
4000M
5000M
TEMPERATURE
PRESSURE

Figure 14



MOORING WP06 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
800M
1200 M
4000M
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR

Figure 15

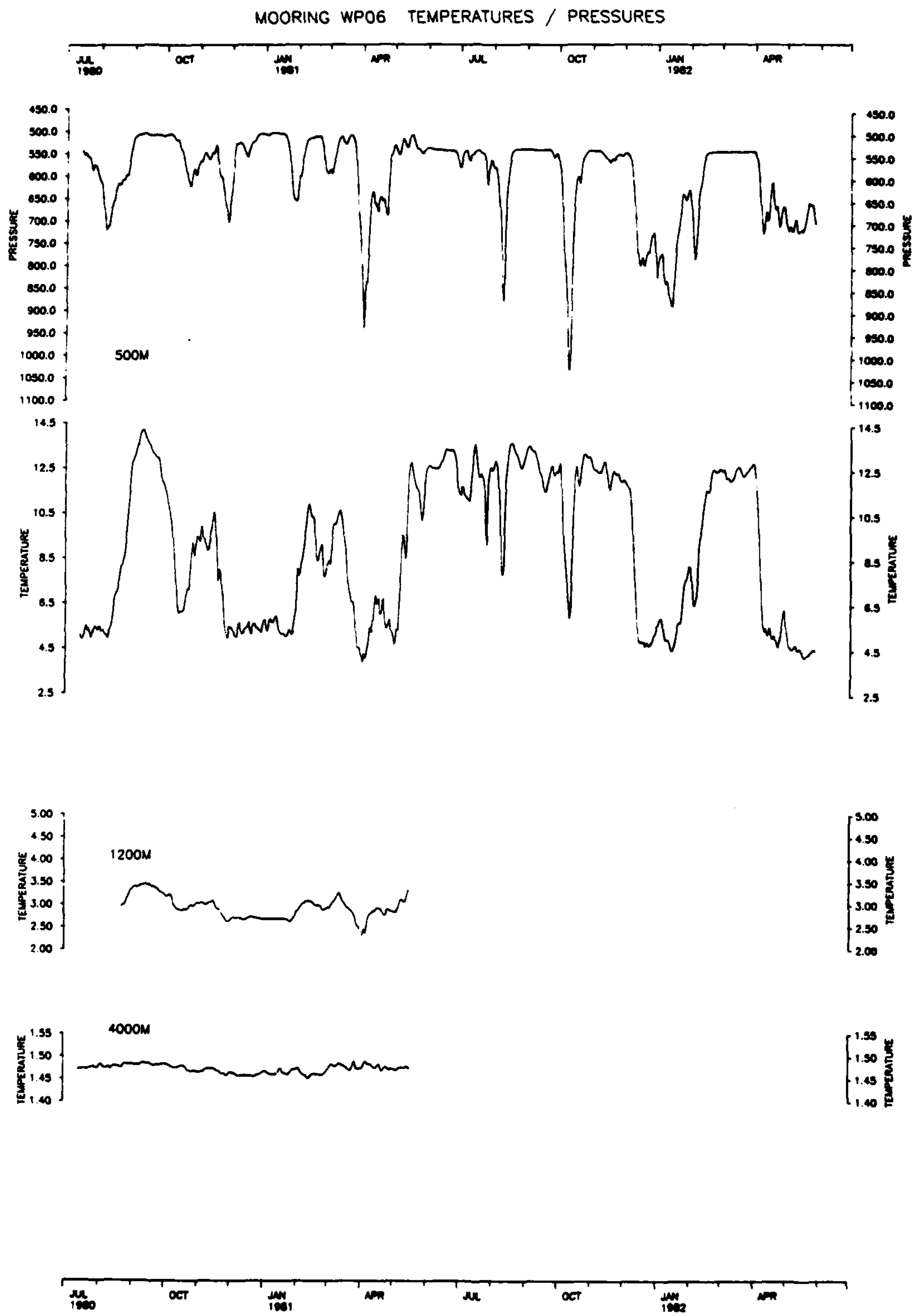

MOORING WP06 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
PRESSURE
450.0
500.0
550.0
600.0
650.0
700.0
750.0
800.0
850.0
900.0
950.0
1000.0
1050.0
1100.0
500M
TEMPERATURE
14.5
12.5
10.5
8.5
6.5
4.5
2.5
1200M
5.00
4.50
4.00
3.50
3.00
2.50
2.00
4000M
1.55
1.50
1.45
1.40

Figure 16

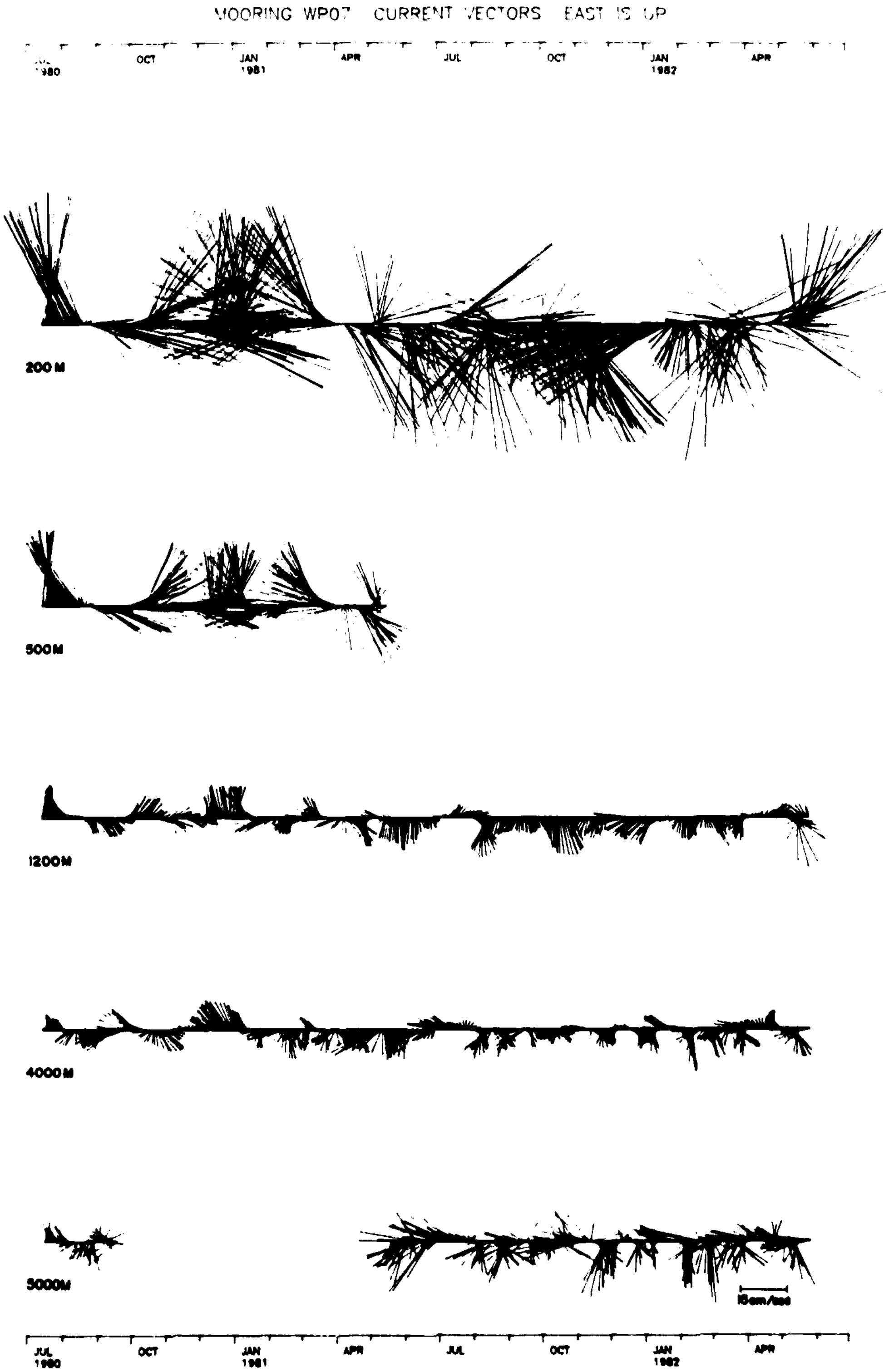

MOORING WP07 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
200 M
500M
1200M
4000M
5000M
10cm/sec

Figure 17

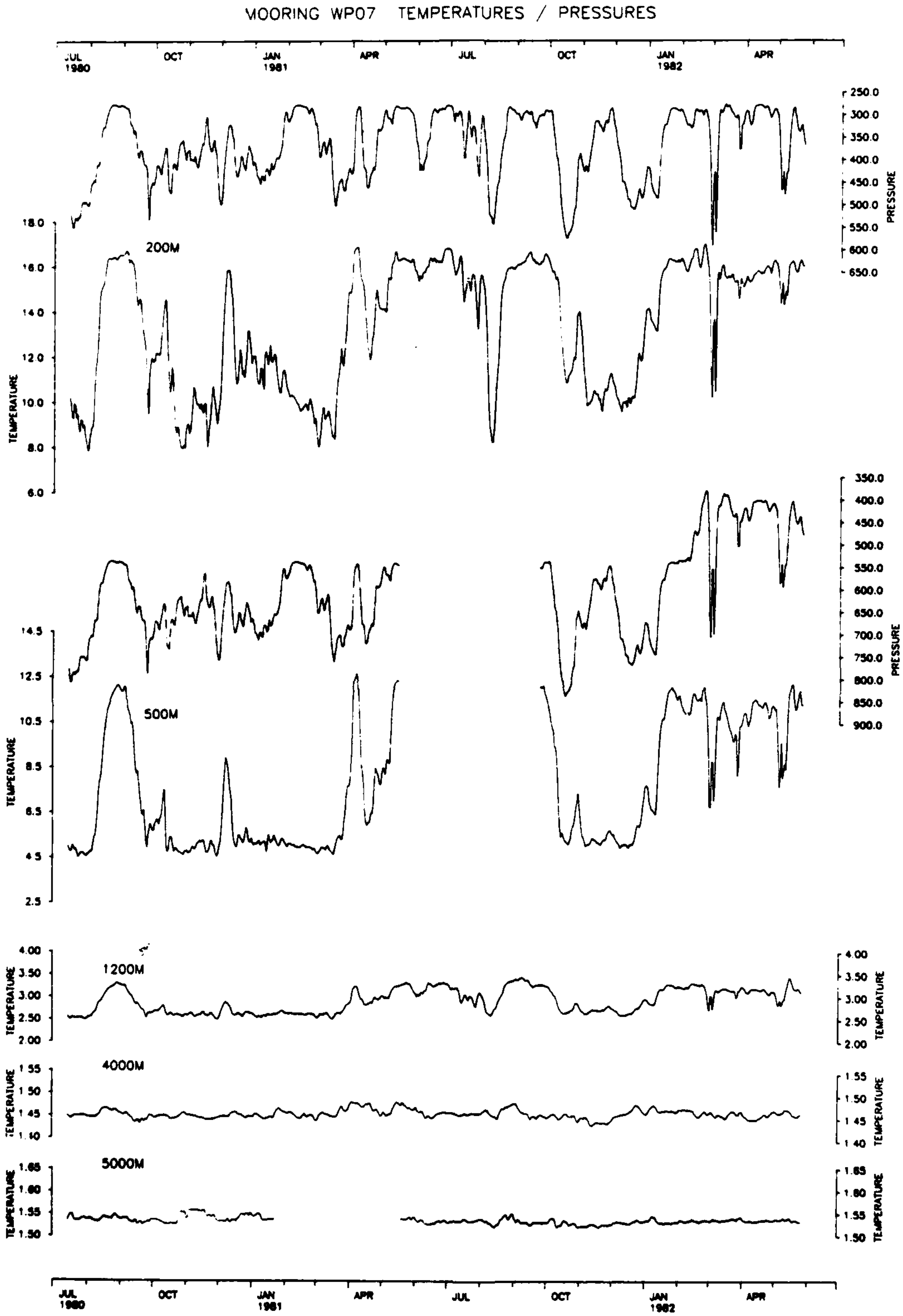

MOORING WP07 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
200M
500M
1200M
4000M
5000M
TEMPERATURE
PRESSURE

Figure 18

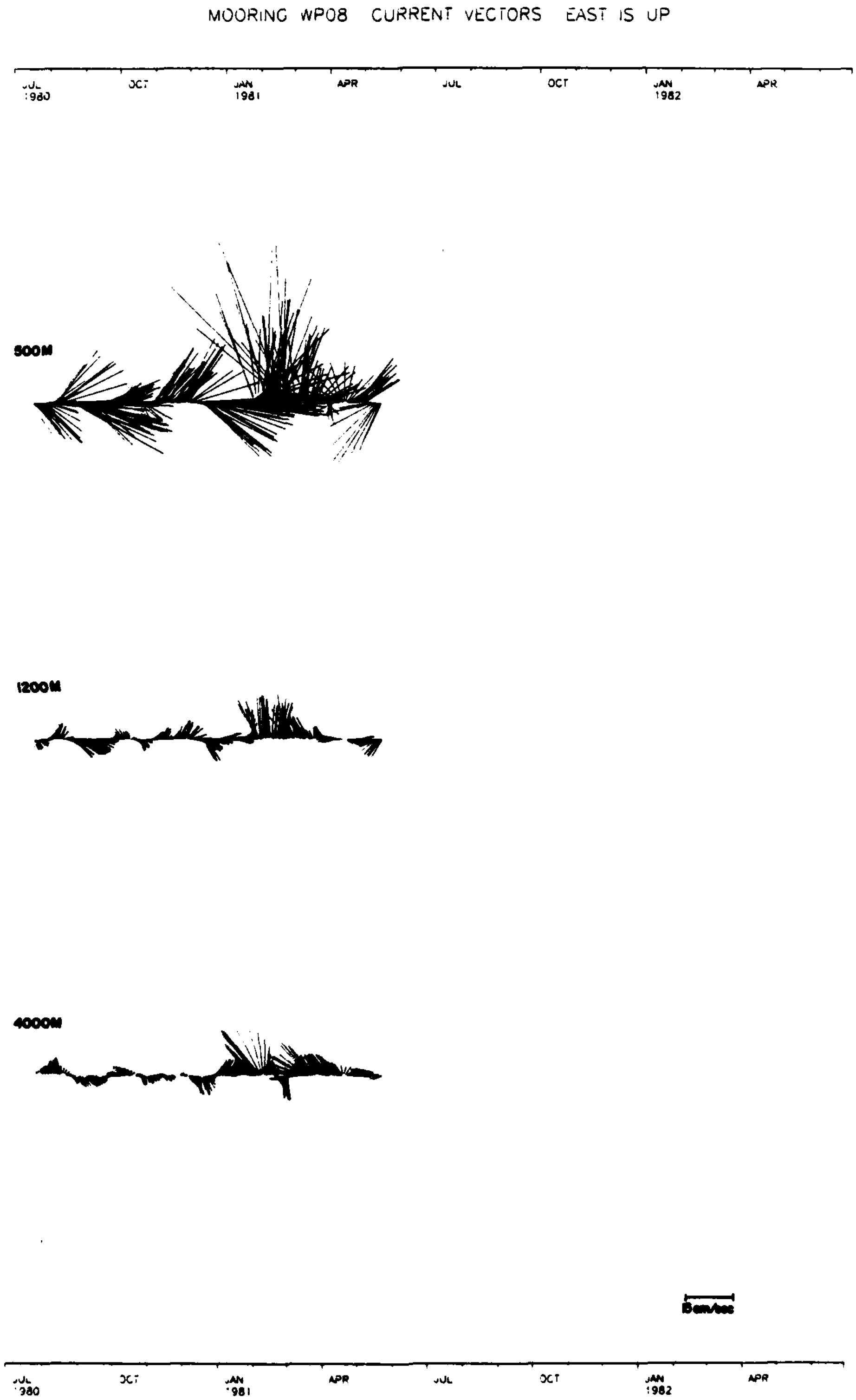

MOORING WP08 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
500M
1200M
4000M

Figure 19

MOORING WP08 TEMPERATURES / PRESSURES

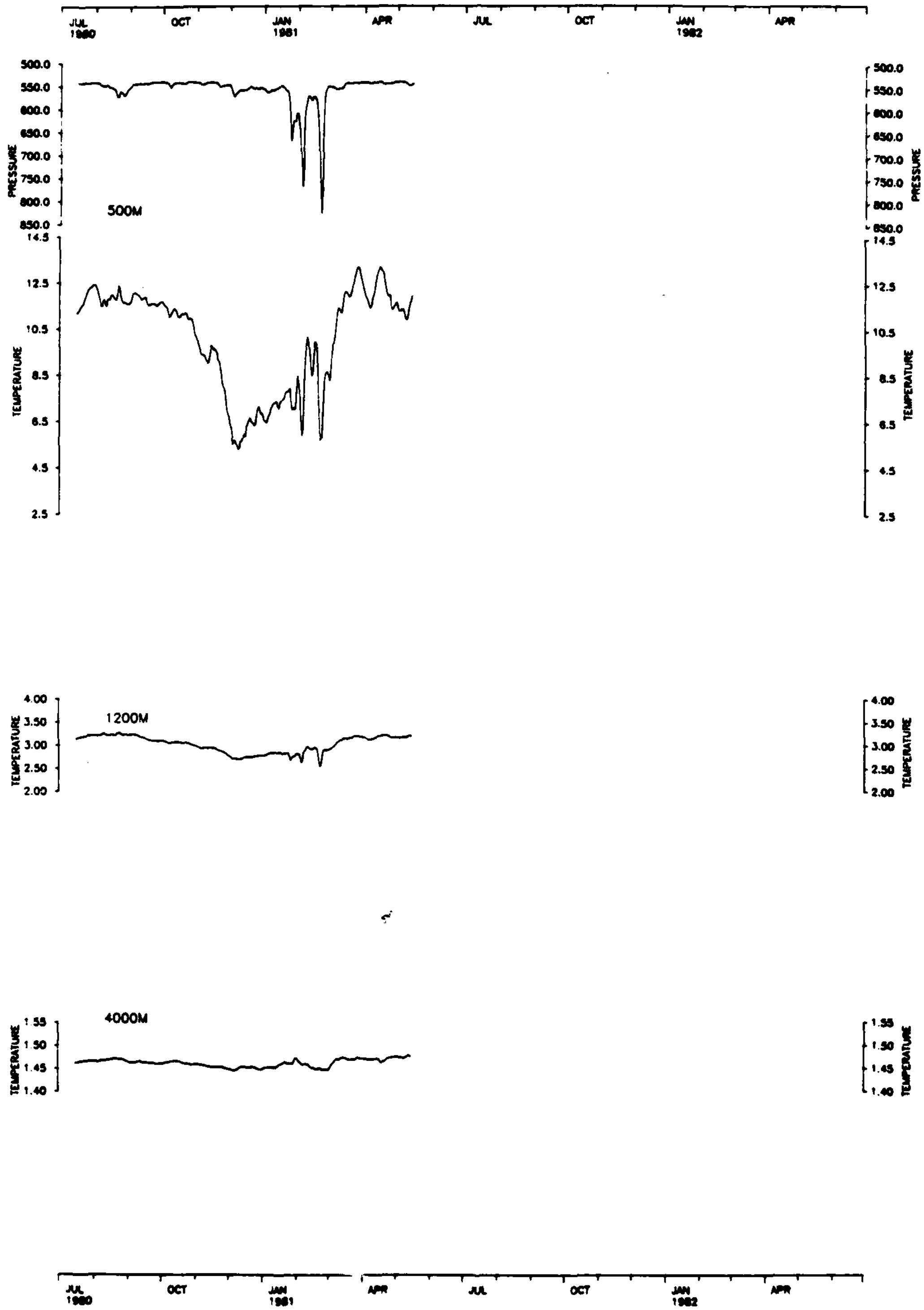


Figure 20

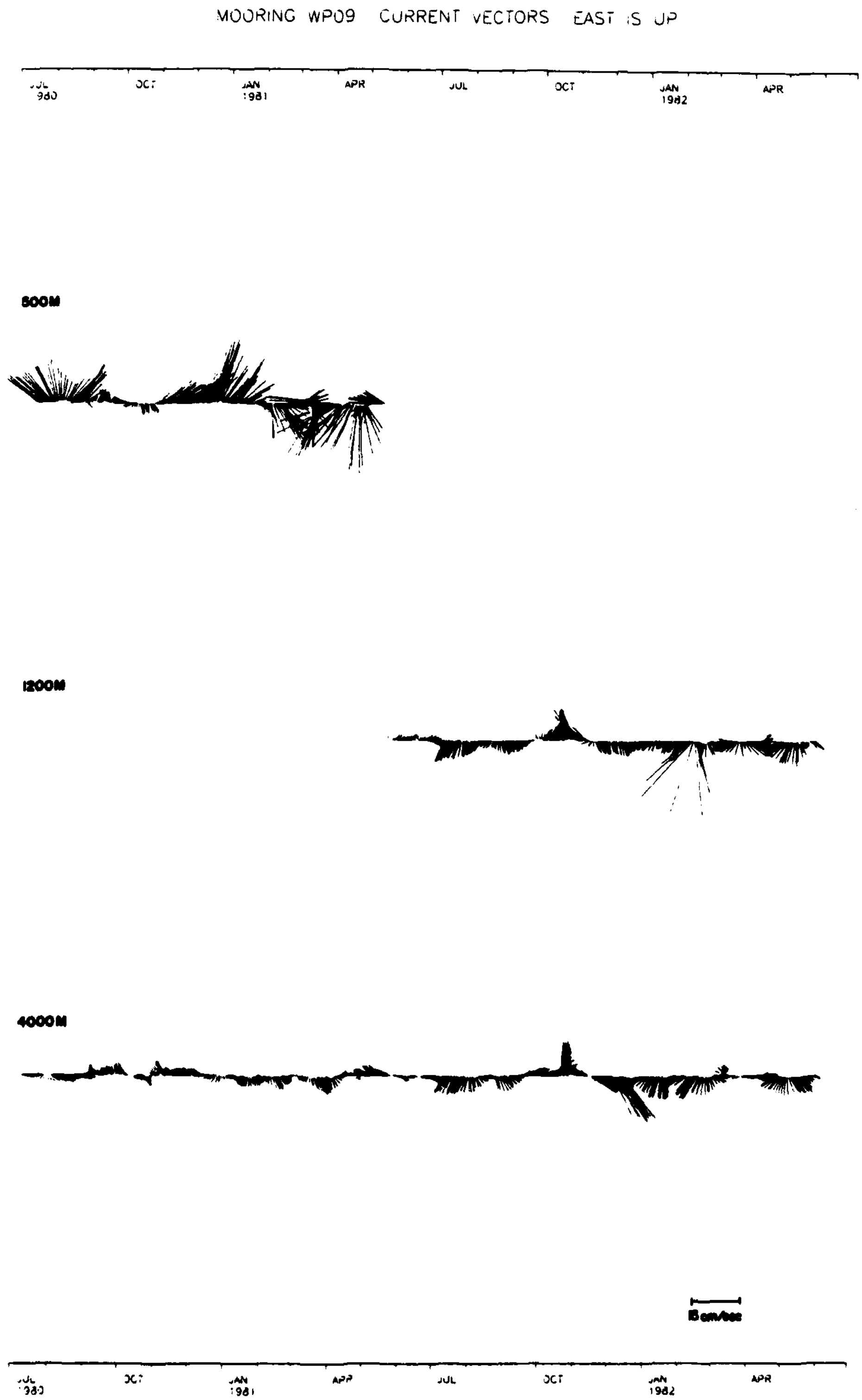

MOORING WP09 CURRENT VECTORS EAST IS UP
OCT
JAN
1981
APR
JUL
OCT
JAN
1982
APR
1200M
4000M

Figure 21

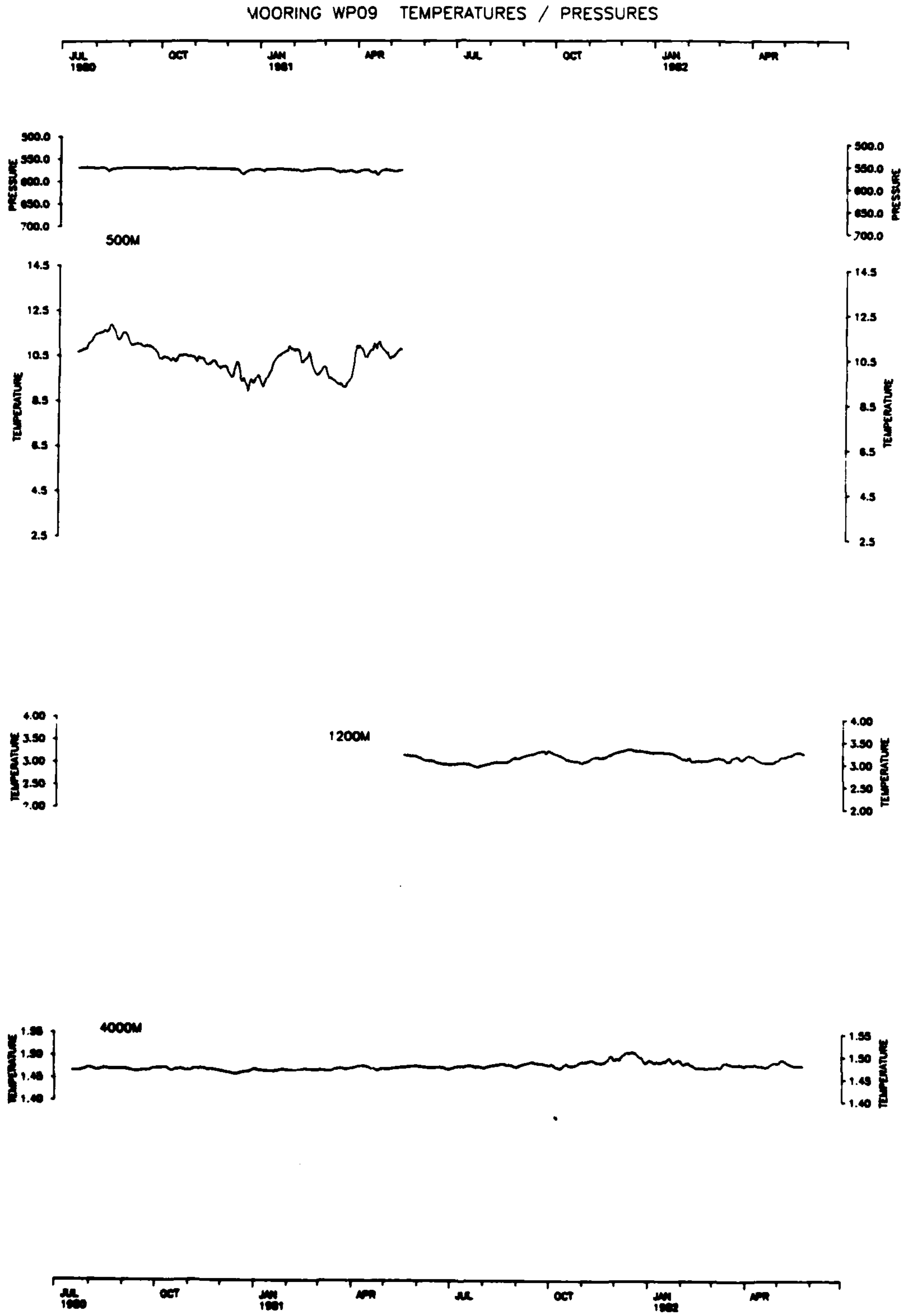

MOORING WP09 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
PRESSURE
500M
TEMPERATURE
1200M
4000M

Figure 22

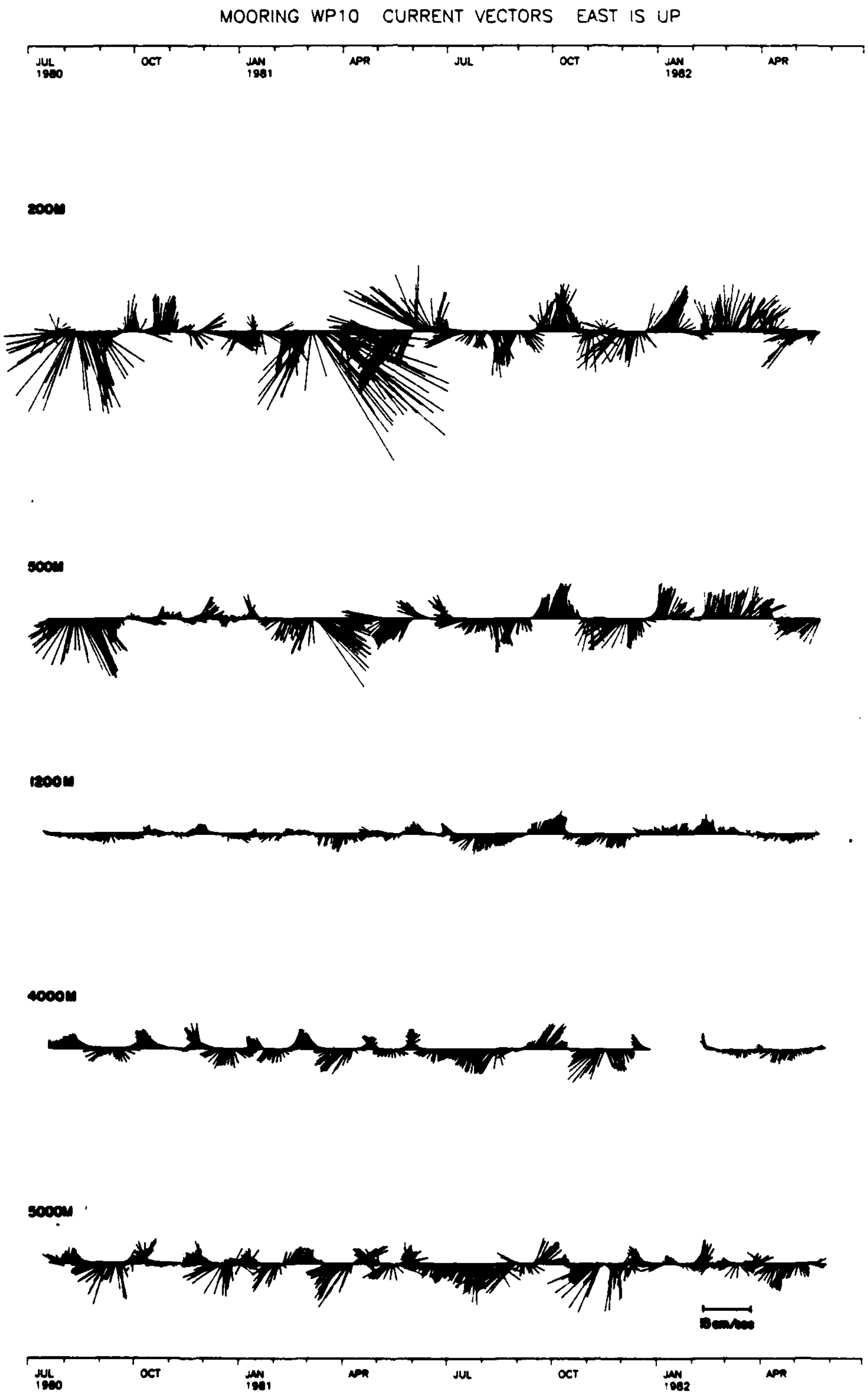

MOORING WP10 CURRENT VECTORS EAST IS UP
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
200M
500M
1200M
4000M
5000M

Figure 23

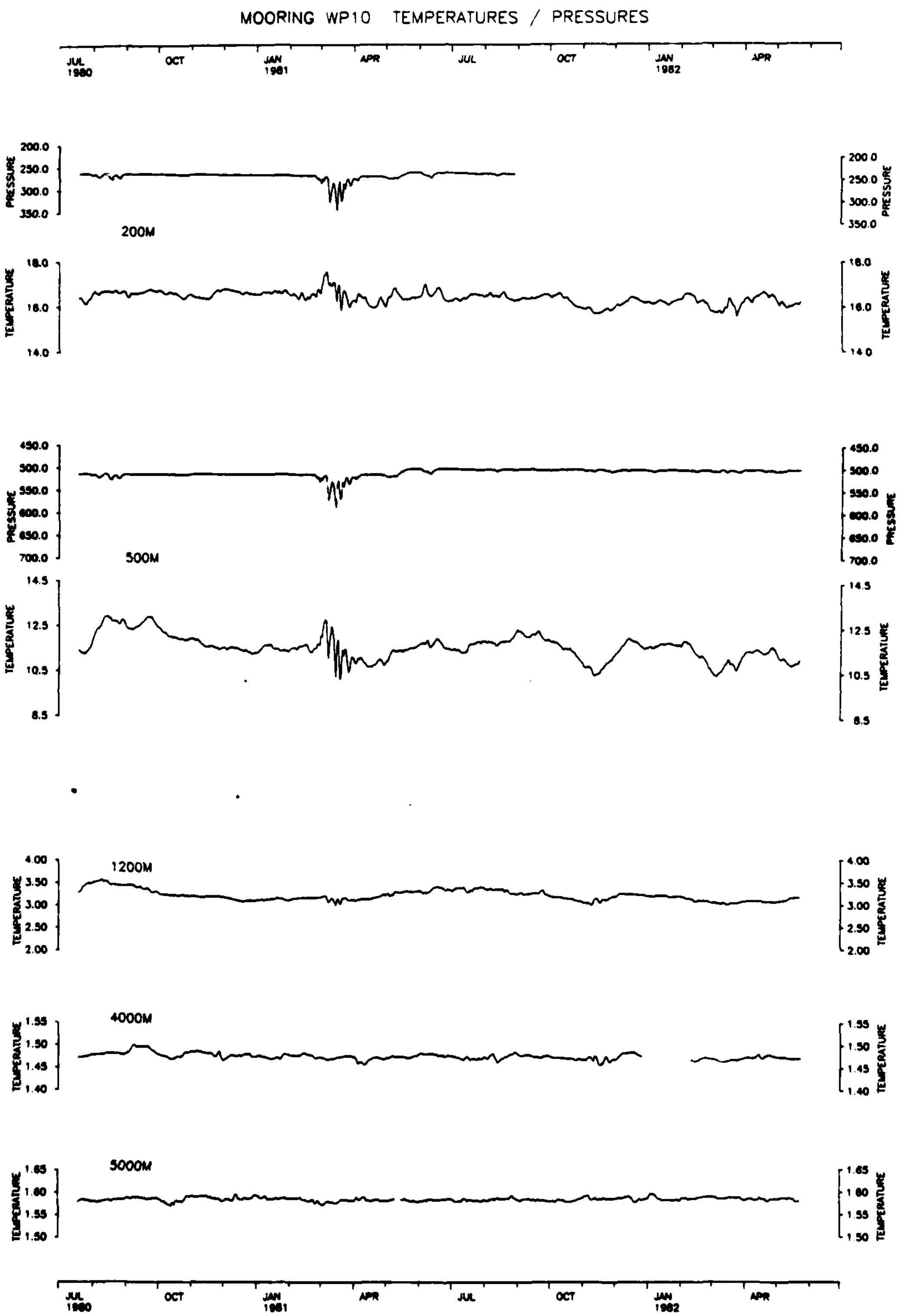

MOORING WP10 TEMPERATURES / PRESSURES
JUL 1980
OCT
JAN 1981
APR
JUL
OCT
JAN 1982
APR
PRESSURE
TEMPERATURE
200M
500M
1200M
4000M
5000M
200.0
250.0
300.0
350.0
18.0
16.0
14.0
450.0
500.0
550.0
600.0
650.0
700.0
14.5
12.5
10.5
8.5
4.00
3.50
3.00
2.50
2.00
1.55
1.50
1.45
1.40
1.65
1.60
1.55
1.50

Figure 24

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