MOSS LANDING MARINE LABORATORIES

OCEANOGRAPHIC RESULTS FROM THE VERTEX 3
PARTICLE INTERCEPTOR TRAP EXPERIMENT OFF CENTRAL MEXICO

October-December,1982

Moss Landing Marine Laboratories Technical Publication 83-1

William W. Broenkow
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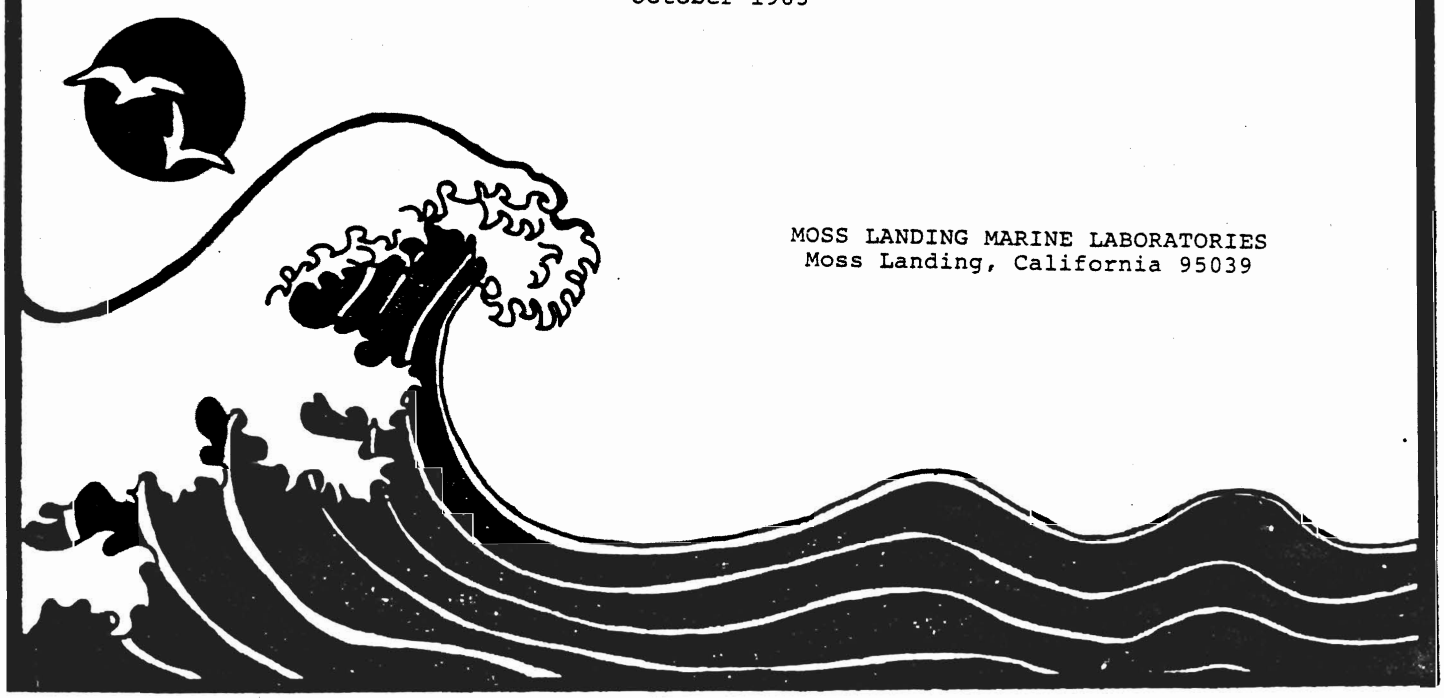

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INTRODUCTION

In this report, we present oceanographic results from VERTEX 3 Particle Interceptor Trap (PIT) experiment conducted off the western coast of Mexico during October to November 1982. The oceanographic data presented here were obtained during three cruise legs by Moss Landing Marine Laboratory scientists aboard R/V Cayuse while the detailed chemical studies were done by other scientists aboard R/V Wecoma. Only the oceanographic data will be presented in this report.

Sampling logistics were complicated during this investigation by several circumstances. First, the expedition did not receive permission to operate in the Mexican fisheries zone (within 200 nautical miles of the Mexican coast and the Revillagigedo Islands) until Leg 3 was underway. This caused us to change the PIT deployment site and the hydrographic station positions. The resulting station grid is not ideally suited toward mapping mesoscale variability in the study area. Secondly, on the last station of the first leg (from San Diego to Puerto Vallarta), the temperature sensor on the CTD failed completely. A replacement temperature board was received in time for Leg 3. During the Leg 2 work, 5 hydrographic stations were completed using a combination of continuous data from the C-OD profiler, rosette samples, and Niskin bottle samples. This improvised scheme resulted in continuous profiles for conductivity, dissolved oxygen, *in situ* fluorescence, and beam attenuation and discrete data at 16 depths for reversing thermometer temperatures and salinity determined by shipboard salinometer.

Five stations were completed on Leg 1 to provide data on the spatial variability of the secondary and tertiary fluorescence features first observed during VERTEX 2 (Broenkow *et al*. 1982). The 5 C-OD/bottle cast stations completed during Leg 2 were intended to provide water column structure information prior to the launching of the particle traps and to estimate the probable drift of the particle trap moorings using the geostrophic approximation. The 20 CTD stations completed on Leg 3 were intended to complete the long north-south section begun on Leg 1, to determine the mesoscale variability near the trap site, and to provide a vertical section normal to the coastline across the oxygen minimum. Permission to operate in Mexican waters was received during the Leg 3 operations, but a sudden storm prevented completion of the final section near the Mexican coast.

SCIENTIFIC PERSONNEL

William Broenkow	Chief Scientist
Donald Eliason	Graduate Assistant
Jose Luis Granados	Visiting Scientist
Katherine Hauschildt	Graduate Assistant
Robert Krenz	Oceanographic Technician
Alan Lewitus	Party Chief (Leg 1)
Richard Reaves	Computer Technician
Barbara Scudder	Graduate Assistant
Mark Yarbrough	Graduate Assistant

ACKNOWLEDGEMENTS

This research is supported by the National Science Foundation, Ocean Sciences Division, Grant No. OCE 79-26797. We also appreciate additional data acquisition equipment acquired under National Science Foundation Grant No. PRM-82-067393.

METHODS

CTD Sampling and Calibration

The CTD system consists of a Plessey 9400 underwater unit having conductivity, temperature and pressure transducers and a Plessey 9040 Deck Unit. The original system, acquired in 1975, was pressure rated to only 600 m. In 1980, 2000 m pressure housings were installed, and a Grundy 5475 oxygen sensor (that uses a Beckman pressure-compensated oxygen electrode) and a 5th channel voltage controlled oscillator (VCO) were added along with additional discriminators in the deck unit. The VCO is time-shared by three optical sensors mounted on the underwater sensor cage: 1) a Variosens *in situ* fluorometer; 2) a Martek beam transmissometer; and 3) a bioluminescence sensor designed and built at Moss Landing Marine Laboratories. The Variosens fluorometer excites chlorophyll fluorescence using a Xenon strobe through a Corning 5-60 (420 nm peak) filter. Fluorescence is detected by a silicon diode behind a Corning 2-64 (750 nm half power) emission filter. The Martek beam transmissometer and power supply have been rebuilt into a deep pressure case capable of 2000 m depths. A Wratten 61 (520 nm) filter is used in front of the silicon diode detector. The MLML bioluminescence sensor consists of a Hamamatsu R282 photomultiplier and a Hamamatsu C956-04 power supply that detects light emitted in a free-flowing light baffle. Bioluminescence is stimulated in front of the photomultiplier window by a motor-driven impeller. The baffle completely excludes ambient light, even at the surface under a tropical noon sun. The output from the photomultiplier is passed through a 3-decade log amplifier. The signals from these optical sensors are routed through the VCO by magnetic switches actuated by lanyards on the General Oceanics Rosette. Typically, we would use the transmissometer or the bioluminescence sensor on the down-cast, and trigger the rosette to switch to the Variosens fluorometer on the up-cast.

The data acquisition equipment as changed significantly since our previous VERTEX work. Data from the CTD is telemetered over the sea cable as 5 FM bands (from about 1.5 to 16 kHz). The mixed signal is separated into 5 signals and converted to 0 to 10 mv DC levels by the Plessey 9040 discriminators (Figs. 1 and 2). The DC signals drive XYY' recorders for real-time display of the cast results and for zeroth order backup. During the cast the frequency signals are output to the HP-3497 Data Acquisition system (Fig. 3). Under HP-9825 Computer control, the signals are routed by a scanner through the period averaging counter for analog to digital conversion. The computer stores data at discrete depths: at 1-m intervals from the surface to 100 m; at 2-m intervals between 100 and 500 m; and at 5-m intervals thereafter. Each stored value for depth, temperature, conductivity, and dissolved oxygen consists of 5 center-weighted values obtained over about a 0.5 m depth interval at nominal winch speeds of 20 m/min. The temperature data are corrected for mismatch between the conductivity and temperature transducer time responses using the linear least-squares time-rate-of-change determined from the 5 replicates. The fifth-channel optical data were sampled differently because of the large variation of particulate material in the water column. Optical data were digitized as rapidly as possible, and sample mean, number of replicates per mean, and standard deviation were stored for each depth interval. Typical sample sizes are 6 for the 1-m intervals, 16 for the 2-m intervals, and 60 for the 5-m intervals.

Following completion of the down-cast, the digitized data are recorded on disk and printed. A rosette lanyard is tripped to throw a magnetic switch which changes the optical signal output to the VCO from the transmissometer (or bioluminescence sensor) to the fluorometer. During the up-cast, the winch is stopped at 6 depths to obtain 1.7 liter calibration samples for dissolved oxygen, salinity, and chlorophyll analyses. Reversing thermometers on each rosette bottle are used to field calibrate the CTD temperatures. Because large volume samples are necessary for the chlorophyll/fluorescence calibrations, several rosette bottles are tripped at a single depth for this purpose.

Salinity calibration samples were analysed using a Guildline Autosal 8400 salinometer aboard ship. To avoid atmospheric contamination dissolved oxygen calibration samples were analysed by withdrawing seawater from septums on the rosette bottles by 30 ml syringes. The dissolved oxygen was determined colorimetrically by the method of (Broenkow and Cline 1969) using a Varian 634 spectrophotometer. The bioluminescence sensor was not calibrated, and the transmissometer was calibrated in air to a value of 85.5% (R. W. Austin, Scripps Visibility Laboratory, unpublished).

Calibration data obtained from Leg 3 of the VERTEX 3 cruise are shown in Figures 4 through 6. Calibration corrections were applied to the observed CTD data using the following relations (note that primed symbols indicate uncorrected values digitized directly from the CTD and unprimed symbols denote the corrected values):

$$T = a + bT'$$

$$Z = a + bZ'$$

$$S' = f(C',T,P)$$

$$S = S' + a + bT + cTT$$

$$O = a + bO$$

$$P = a + bF$$

In the above conversion algorithms note the following: The first approximation to depth (Z') is computed from uncorrected pressure using the equations of Saunders (1981), and additional correction coefficients based on thermometric depths are then applied. The first approximation to salinity (S') is computed from corrected temperature and pressure and uncorrected conductivity (C') using the procedure recommended by SCOR-UNESCO (1981). Additional corrections to salinity are made by an empirical correction based on temperature (as in this report) or pressure (as has been done previously). The temperature (T), dissolved oxygen (O), and pigment (P) corrections are linear models based upon the calibration data.

During the VERTEX 3 cruise the failure of the temperature board resulted in the use of uncalibrated electronics. This caused a large offset and slope (Table 1), but the precision (0.03 C) was essentially that observed previously. Statistics on the salinity calibration (0.03 S) are also similar to previous data. However, we feel that the conductivity sensor has seriously degraded during the past year. Note on the T-S diagrams and vertical profiles (Figs. 15 and 19) the large amplitude (0.1 S) oscillations in the deeper waters. The oxygen calibrations have been divided into two groups in Table 1: the total range and those below 1 ml/liter. Use of the colorimetric method for calibration allowed us to determine the oxygen electrode precision in the oxygen depleted waters. Note that the overall calibration precision of the electrode is 0.25 ml/l while in the waters of less than 1 ml/l, the precision is 0.06 ml/l. The reason for this may be that the oxygen electrode error is proportional to concentration or that sampling variability in the pycnocline increases errors in the higher concentration waters. The Variosens fluorometer measures fluorescence from an unknown array of organic materials that fluoresce at wavelengths above 650 nm. Rather than present fluorometer results in fluoresence units, we have attempted to correlate fluorescence with extracted fluorescent materials measured by the method of Yentsch and Menzel (1963) and Holm-Hansen, et al. (1965). We term the resulting quantity "Pigments", though the method is supposed to be specific for chlorophyll a and its degradation products. The pigment calibration results were exceptionally good (compared with our previous results) and produce results quite similar to those found on VERTEX 2 (Broenkow and Krenz 1982).

Table 1.

VERTEX 3 CTOD Calibration Coefficients

	n	a	b	c	Sy	r
Depth	231	3.15	0.9943		4.6	0.999
Temperature	89	0.222	0.9614		0.030	0.999
Salinity	96	-0.314	0.0057	-0.0019	0.026	0.443
Oxygen (all)	175	-0.007	0.876		0.25	0.990
Oxygen (low)	103	-0.030	0.873		0.06	0.951
Pigments	15	0.02	0.015		0.07	0.919

n = number of calibration samples

a = offset

b = first order regression coefficient (slope)

c = second order regression coefficient

Sy = standard error of estimate (1 SD)

r = product-moment correlation coefficient

Currents

Two neutrally-buoyant ENDECO Model 741 current meters were placed on the MLML particle trap mooring at 60 and 600 m. Current speed, direction and temperature were recorded at 2-minute intervals. Digital precision of the thermistor is 0.1 C and the stall speed of the ducted propeller is 2 to 3 cm/sec. Manufacturer's speed and direction calibrations have been applied, and the data were subsequently vector averaged to 30-minute intervals for presentation here.

RESULTS

The VERTEX 3 results were obtained in essentially the same area as studied the previous year during VERTEX 2 (Broenkow and Krenz 1982), thus we will not repeat here a general description of the area which has been described previously by EASTROPAC Expedition (1956), Wyrtki (1967) and Cline and Richards (1972) among others.

Central to our interest in the eastern tropical Pacific off the coast of Mexico is the extensive oxygen minimum zone. During VERTEX 2 we reported that minimum oxygen concentrations in the oxygen minimum were found near the top of the minimum. During VERTEX 3 we wished to more accurately determine oxygen concentrations in the minimum and extensively calibrated the electrode in this region. For oxygen concentrations less than 1 ml/liter (45 uM/kg) the standard error of estimate between the electrode and the colorimetric calibration data was +/-0.06 ml/liter. Minimum concentrations of oxygen, determined from corrected electrode data, varied only slightly near the center of the study area (by about 0.02 ml/liter or 1 uM/kg). Thus it is not possible through use of the electrode data to determine if statistically significant between-station differences exist. However at this level of precision, we can see reproducible structural features in the oxygen profiles, such as the minimum oxygen concentrations occurring near the top of the oxygen minimum zone between 95 and 140 m (Figs. 24 and 25). During VERTEX 3 we obtained profiles south of the study area and found an intrusive feature in the oxygen minimum (Fig 24, Stations 25 and 26) which is apparently related to the spreading of Subtropical Subsurface water (Wyrtki 1967) from the south.

During the previous cruise, VERTEX 2, we were not satisfied with the operation of the oxygen electrode near the surface where highly erratic results were obtained. During VERTEX 3 we soaked the CTOD near the surface for 15 minutes to condition the electrode before starting the cast. This procedure did not always work, and we have edited apparently erratic electrode results in this report. The oxygen calibration procedure was complicated by the operation of the rosette sampler. As the rosette is tripped, power to the CTOD is turned off, and a stable signal from the oxygen sensor is not regained for 10 or more minutes. (Recently we have found that soaking the electrode in a commercial wetting solution, Kodak Photo-Flo, eliminates the initially erratic results. Also by operating the rosette on a separate conductor eliminates the oxygen calibration problem during the up-cast.)

The Variosens fluorometer, MLML bioluminescence profiler, and the Martek transmissometer were successfully used during VERTEX 3 (Figs 17,18 and 26 to 29). The VERTEX 3 results confirm the persistent presence of 3 fluorescent features first observed by us during VERTEX 2: the primary maximum near 60 m, a secondary maximum coincident with the depth of the oxygen minimum, and a broad tertiary maximum centered near 300 m. These latest data indicate that the secondary fluorescence maximum is a unique characteristic of the eastern tropical north Pacific oxygen minimum zone. During VERTEX 3 the secondary maximum was observed at 22 of the 23 stations obtained between 14 and 19 N latitude (on VERTEX 2 it was found in only 12 of 20 such stations). Secondly, the north-south transect (Fig. 26) shows that the secondary maximum is not found north or south of these latitudes and thus is associated with only the most oxygen impoverished waters (< 10 uM/kg). The mean depth of the oxygen minimum was 121 m, while the mean depth of the secondary fluorescence maximum was 123 m, a correlation that appears to be more than coincidental.

Geostrophic currents (Figs. 11 to 14) in the study area were not as well defined during VERTEX 3 as during VERTEX 2, and pycnocline topography was not as variable (Fig. 8). This may be due to a combination of weaker currents, accelerations in the current field during the observations and a less than ideal survey. The shoal mixed layer at 16 N 107 W (Fig. 8) suggests cyclonic surface currents, and indeed the particle trap moorings began drifting in a counterclockwise sense (Figs. 10, 11 and 39). The dynamic height anomalies (Figs. 11 to 14) do not provide as clear evidence of a cyclonic eddy. Data from the mixed layer and the center of the pycnocline (Figs 11 and 12) suggest a shear zone in the center of the study area with cyclonic and anti-cyclonic eddies in the northwest and southeast sections. Circulation cannot be definitively described by geostrophy, because it was apparent that the currents were unsteady. At station 11 (made during Leg 2) the surface dynamic height anomaly was 1.902 dyn m, while 8 days later at station 15 (during Leg 3) the dynamic height anomaly was 2.015. That temporal difference is very nearly equal to the maximum spatial difference observed across the center of the study area (Fig. 11). The dynamic height data have been contoured using only Leg 3 data, but still local accelerations may be large and the resulting geostrophic current estimations could differ significantly from the true currents.

Current meter data (Figs. 36 to 38) show the same sort of periodicity as observed during VERTEX 2: both inertial (44 hr) and tidal (12 hr) periodicities were observed. Maximum 30-min averaged speeds were about 35 cm/sec at 60 m and 20 cm/sec at 600 m, and modal speeds at these depths were 11 and 7 cm/sec respectively (Fig. 38). While the current data do not clearly show an acceleration during the experiment, the temperature time series do. Note, for example, the strong increase in temperature between Julian days 318 and 321 (15 and 18 November). During that time the trap moorings accelerated from daily mean speeds of about 4 to 7 cm/sec (Table 6) and the relative currents past the moorings at 60 m increased from 3-6 cm/sec to more than 10 cm/sec. This observation helps to explain the large variation in geopotential anomaly that occurred between legs 2 and 3. It also explains the failure of our prediction for southeasterly mooring drift based on the leg 2 geostrophic currents.

The MLML and UCSC moorings drifted along essentially the same paths (Fig. 39, Tables 4 and 5). Because the UCSC mooring was 1500 m long and the MLML mooring was 2000 m long, this indicates that current shear was negligible in the deeper waters. The daily mean mooring drift rate did not correlate with the daily mean relative currents at either 60 or 600 m, but the total mooring drift over the 21 day deployment was at about the same speed and direction as the relative currents past the mooring at 60 m. By vector addition of the daily mean mooring velocity with the relative daily mean current, an estimate of absolute currents at 60 and 600 m is obtained (Fig. 40). The adjusted absolute mean current speeds at 600 m were about 1/5 those at 60 m (about 2 cm/sec) and were northerly. This contrasts sharply with similar observations made during VERTEX 2, when current speeds at 600 m were about 5 cm/sec and directed offshore around a well-developed cyclonic eddy. Whether or not either observation pertains to the long-term spreading rate of Intermediate Water in the area is questionable. The three week observation period is insufficient for that purpose.

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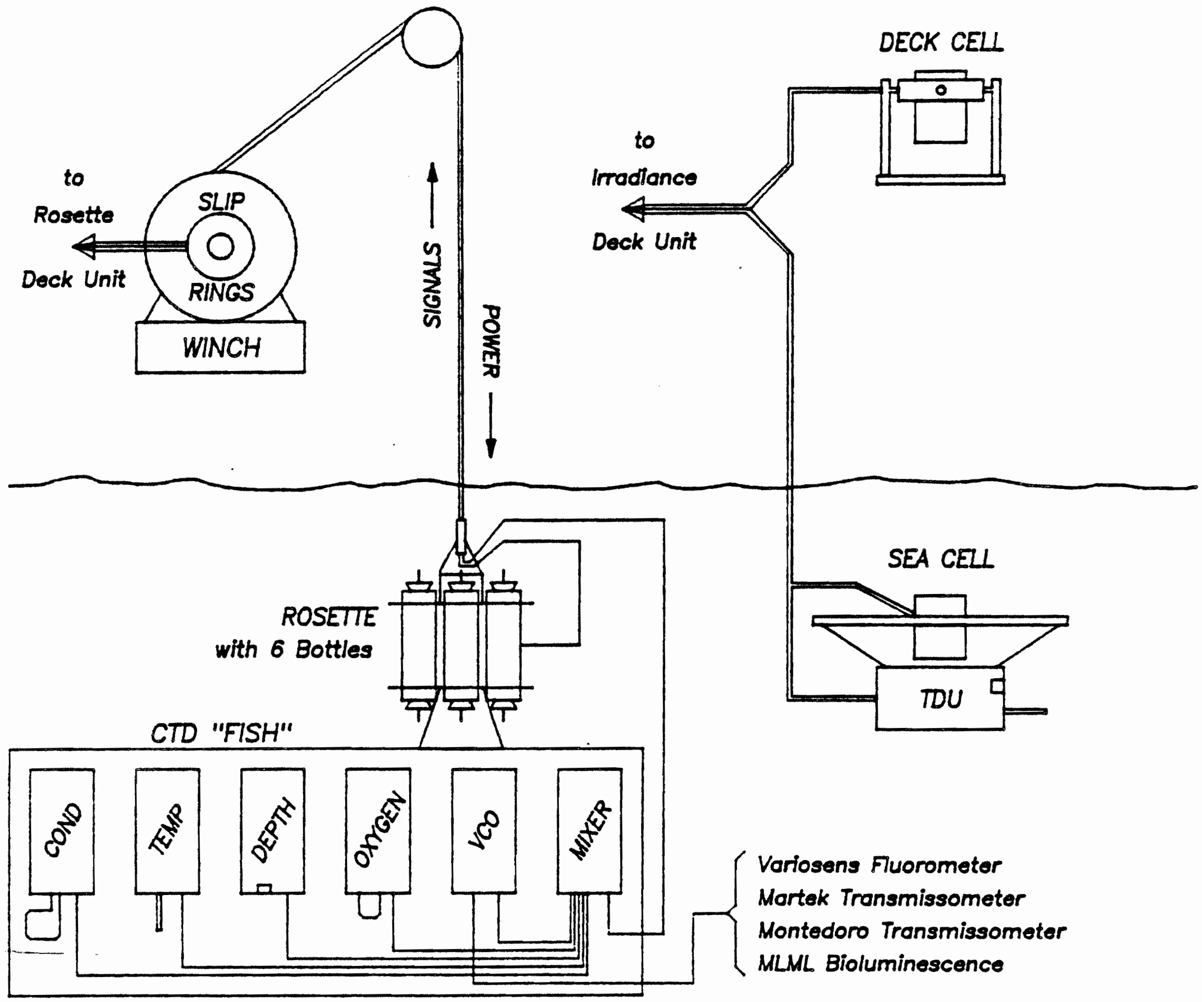

Fig. 1 Oceanographic instrumentation used during VERTEX 3.

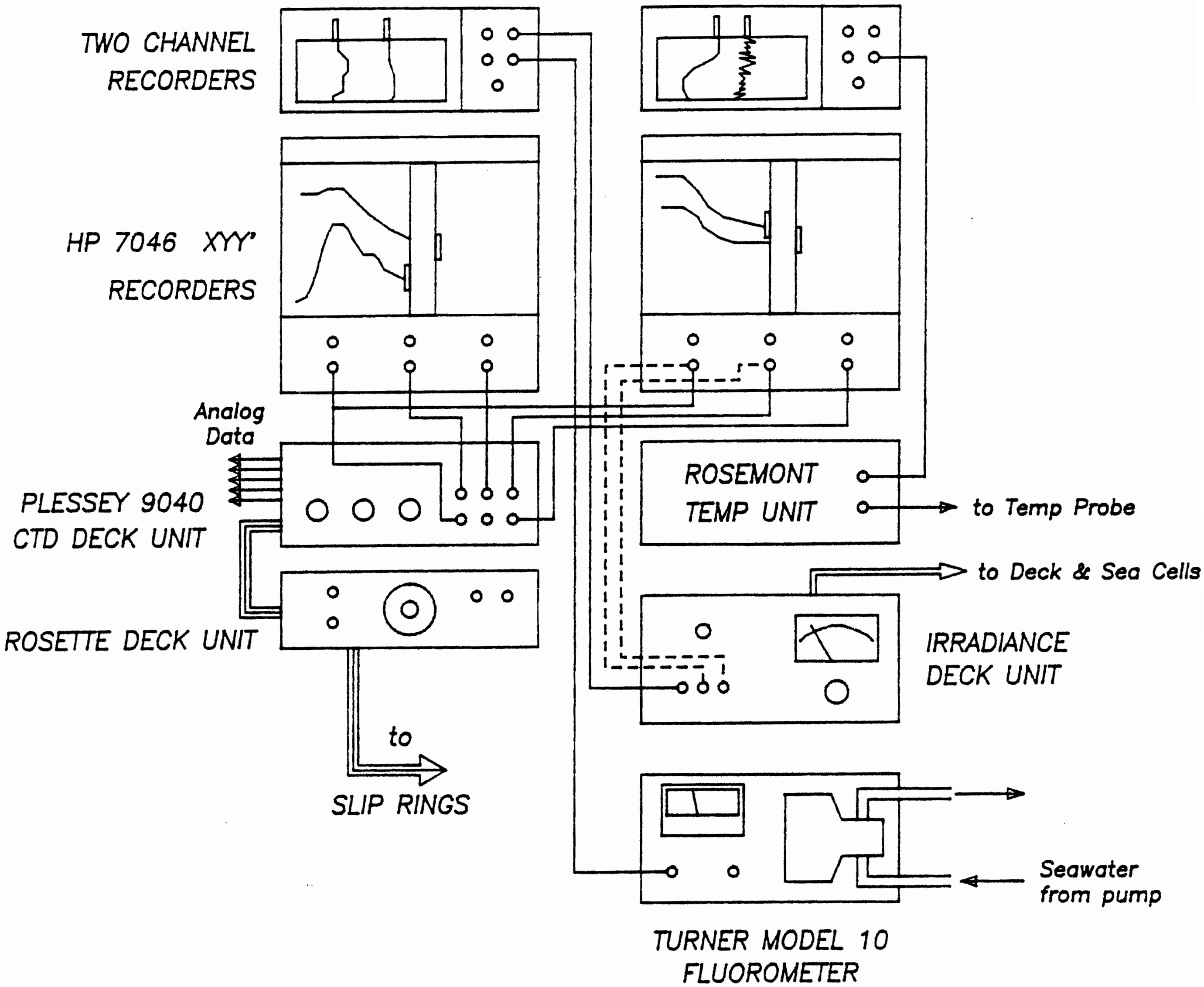

Fig. 2 Deckboard signal processors and recorders used during VERTEX 3.

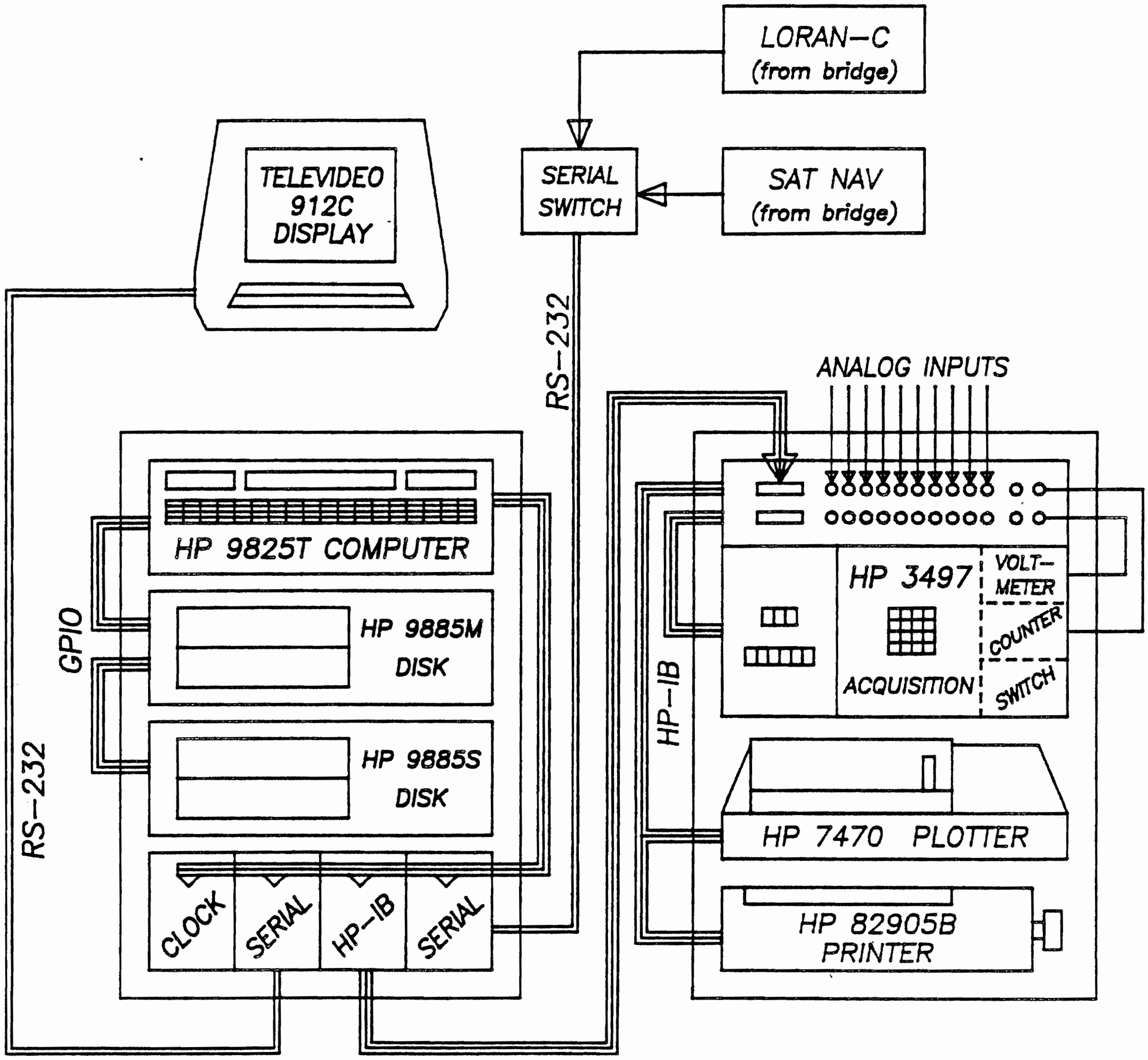

Fig. 3 Data acquisition equipment used during VERTEX 3.

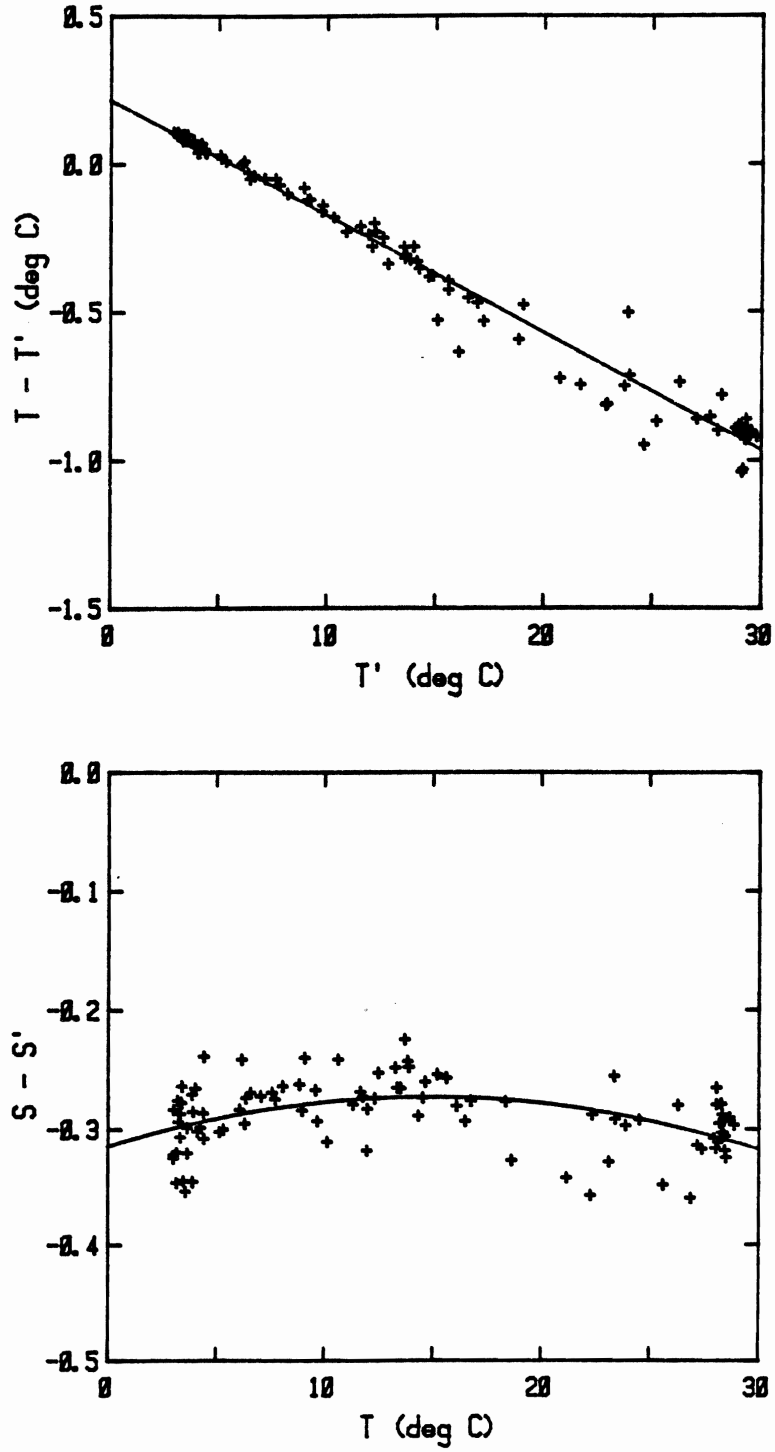

Fig. 4 Temperature (top) and salinity (bottom) calibration data from VERTEX 3.

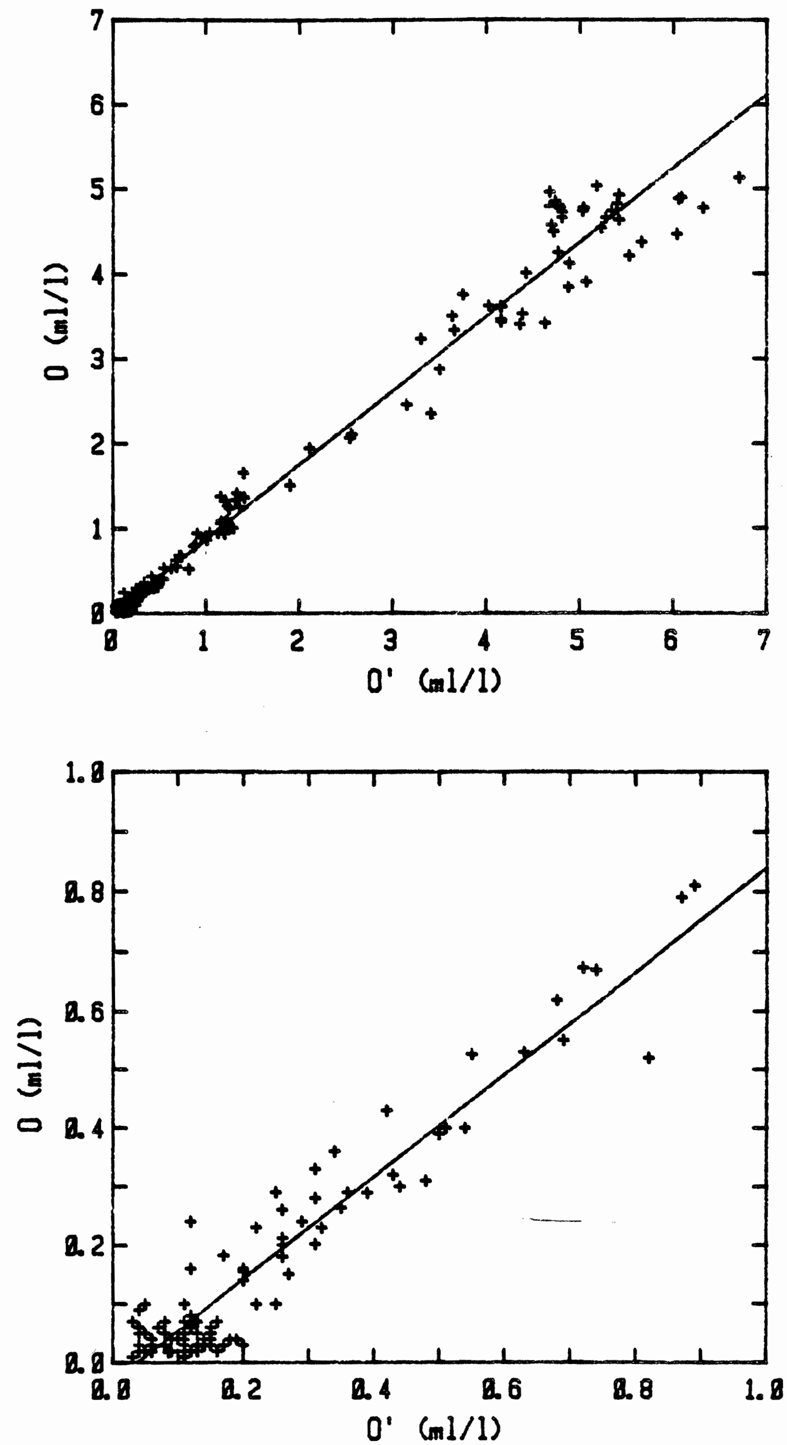

Fig. 5 Oxygen calibration from VERTEX 3. Upper panel shows agreement between colorimetric oxygen concentrations from calibration samples and raw CTOD values for all data. Lower panel shows correlation for data less than 1 ml/liter.

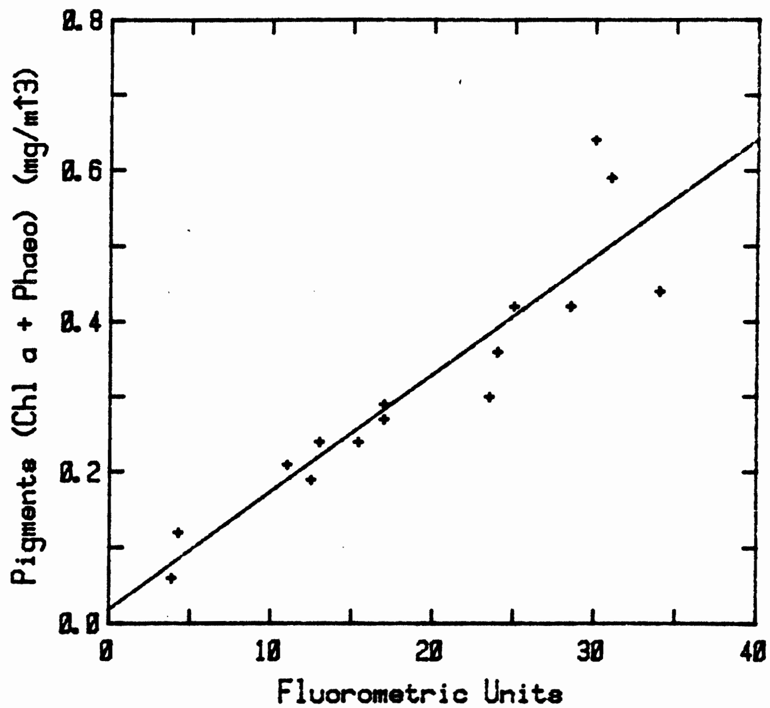

Fig. 6 In situ fluorescence vs extracted pigment concentrations (chlorophyll a plus phaeophytin) for VERTEX 3.

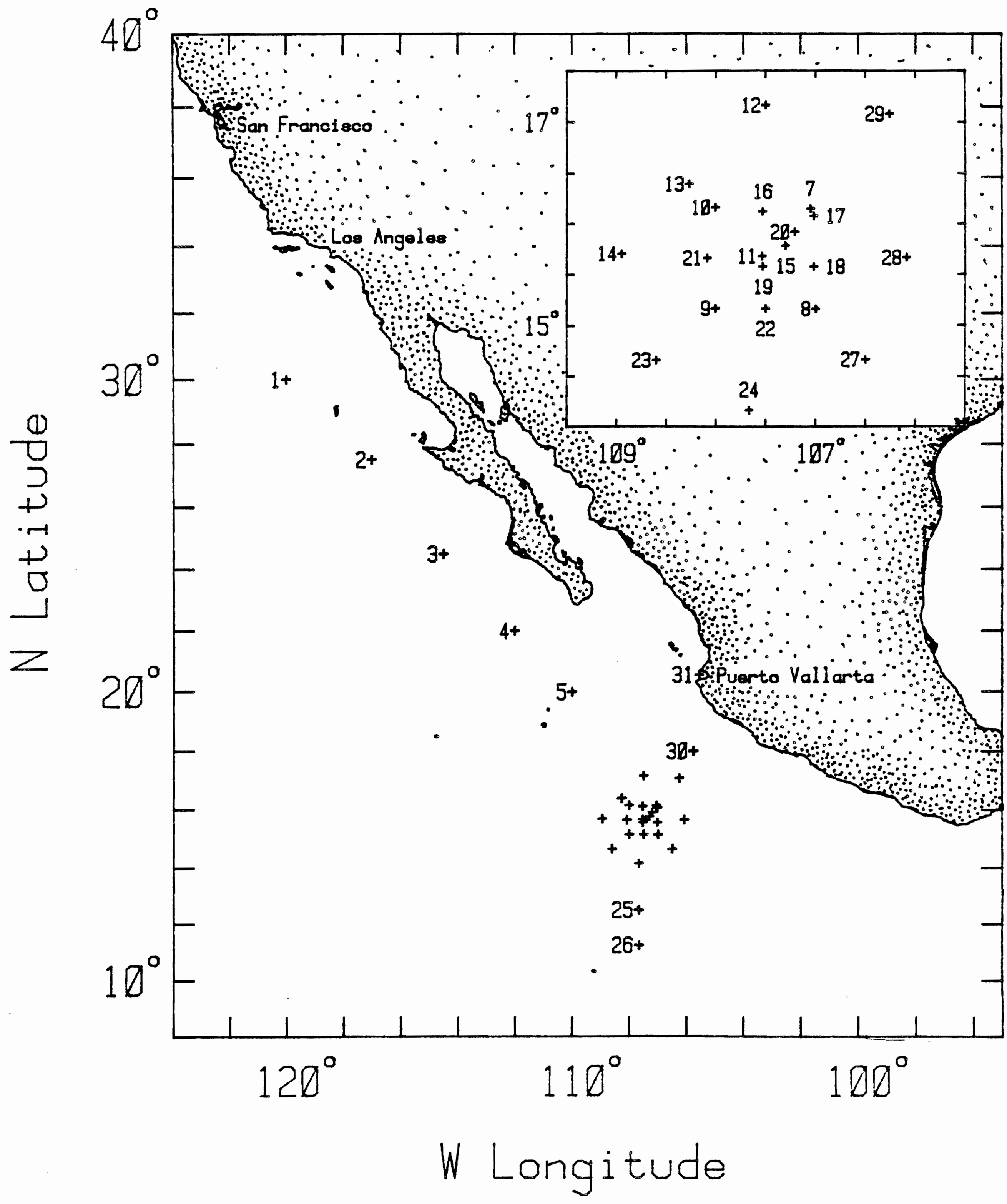

Fig. 7 Station positions, VERTEX 3; 28 October to 2 November 1982.

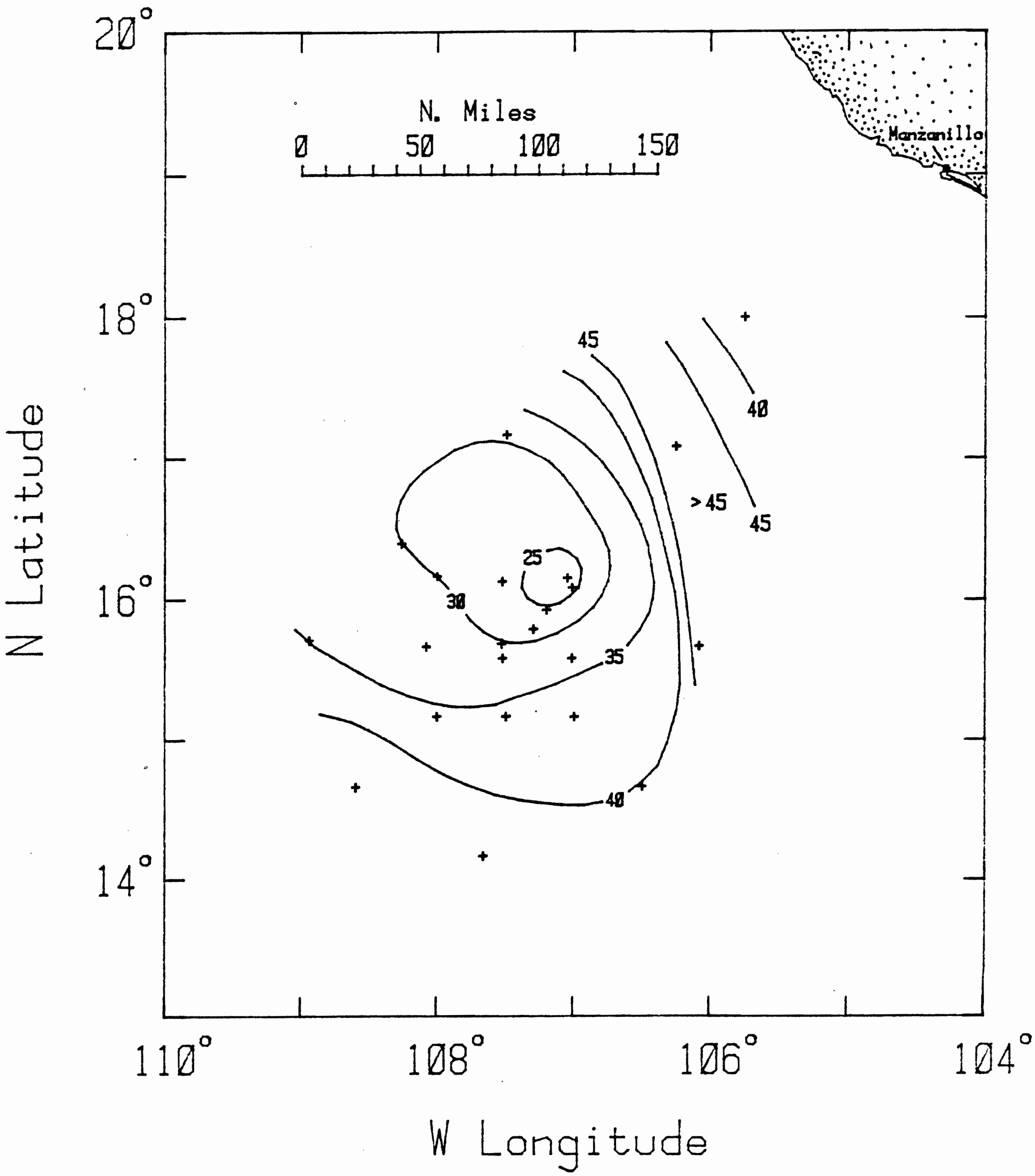

Fig. 8 Mixed layer depth (meters) during Legs 2 and 3, VERTEX 3; 6 through 27 November 1982.

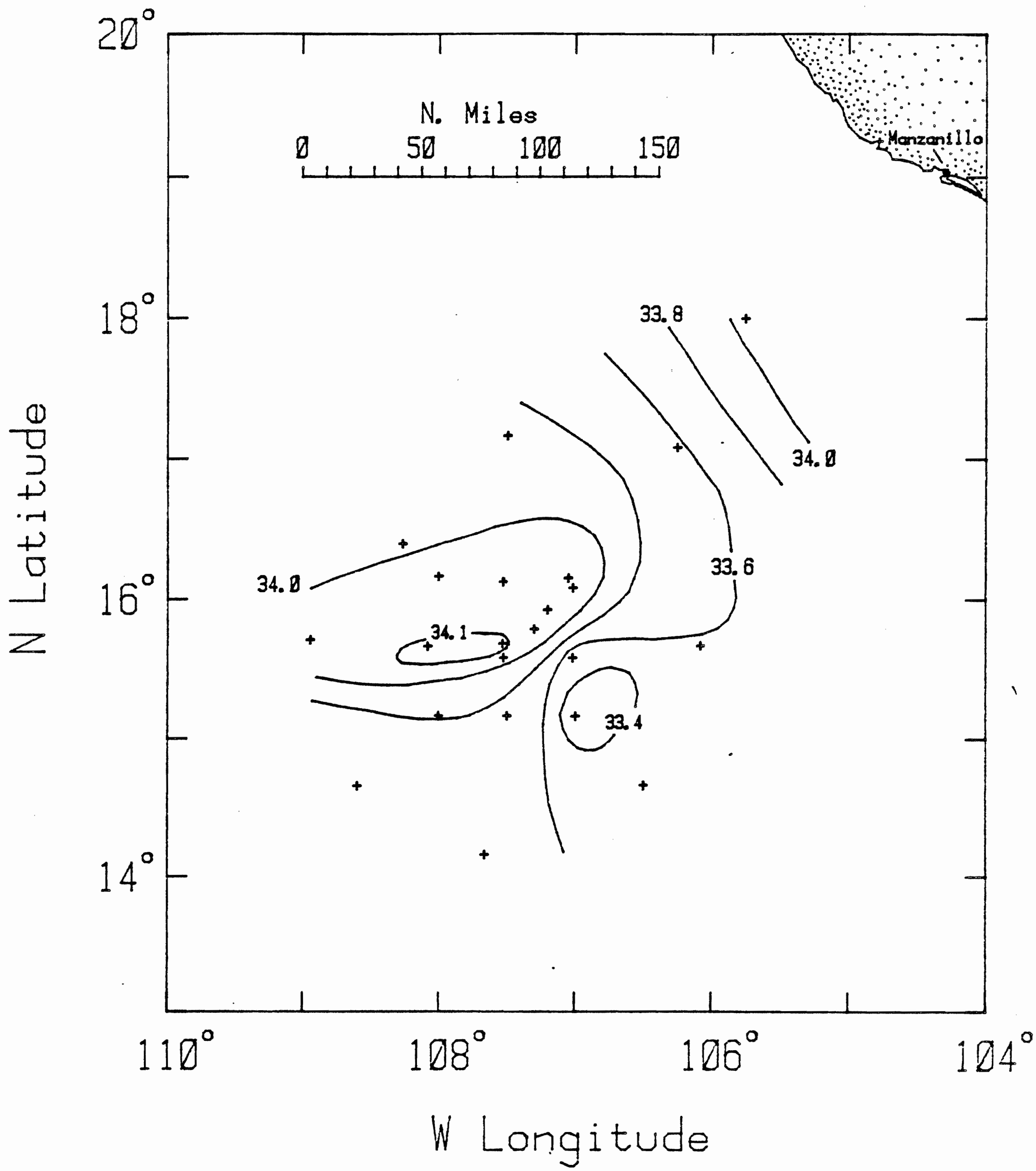

Fig. 9 Surface salinity during Legs 2 and 3, VERTEX 3; 6 to 27 November 1982.

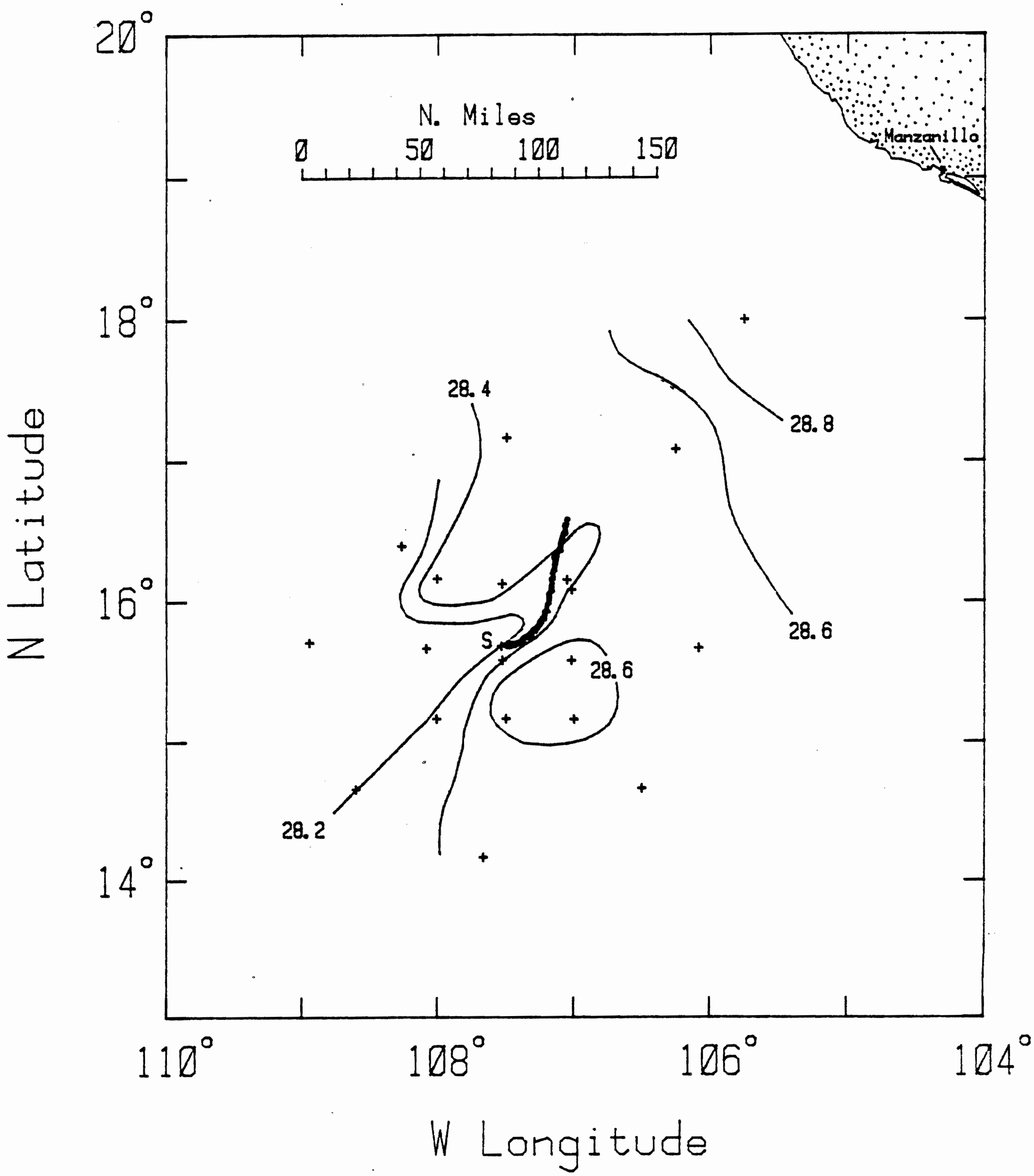

Fig. 10 Surface temperature during Legs 2 and 3, VERTEX 3; 6 to 27 November 1982. MLML and UCSC particle trap mooring tracklines; "S" identifies starting position.

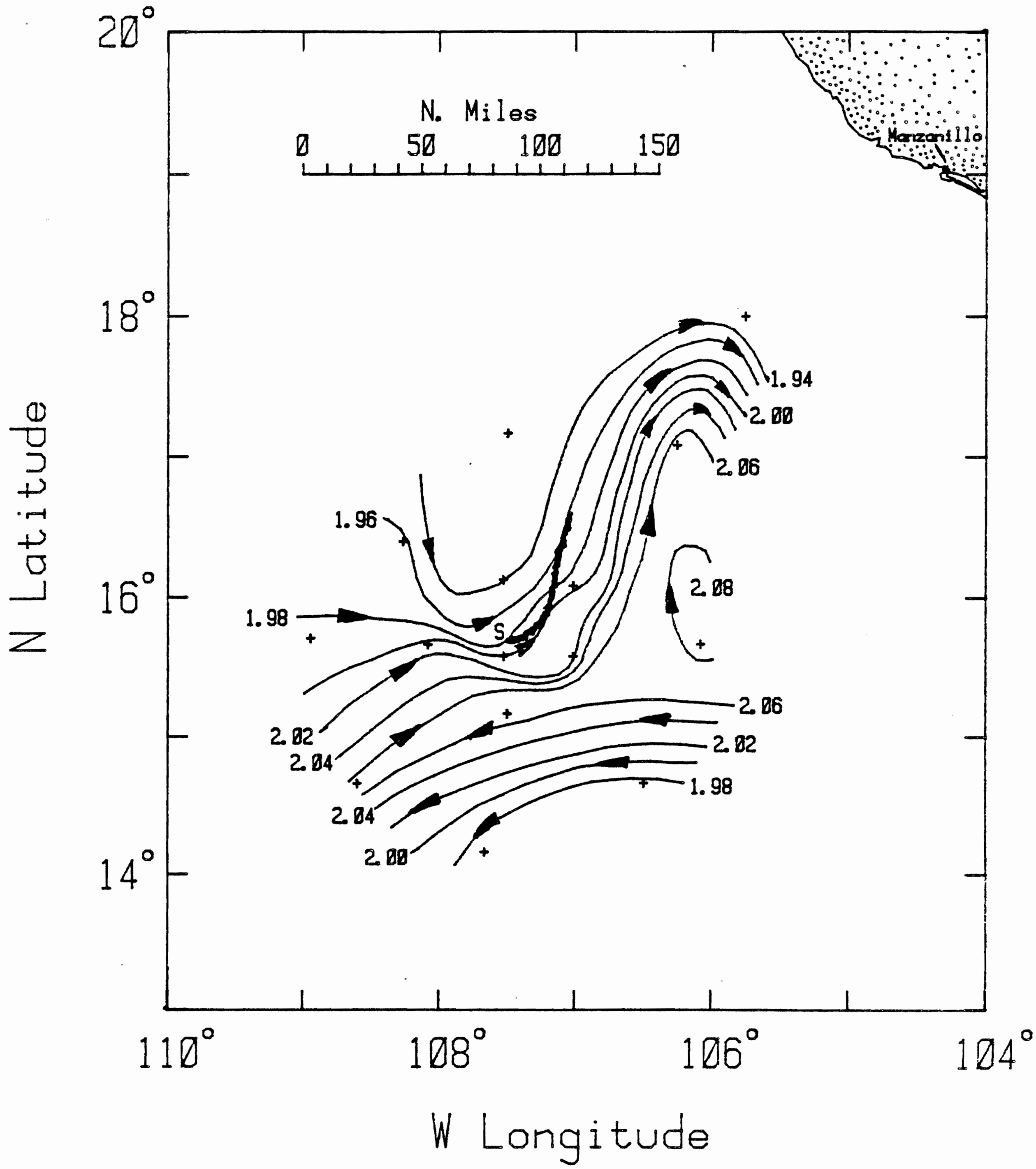

Fig. 11 Geopotential anomaly (dyn m) of the surface relative to 1500 db (0/1500). VERTEX 3, November 1982. Mooring tracklines are shown as in Fig. 10.

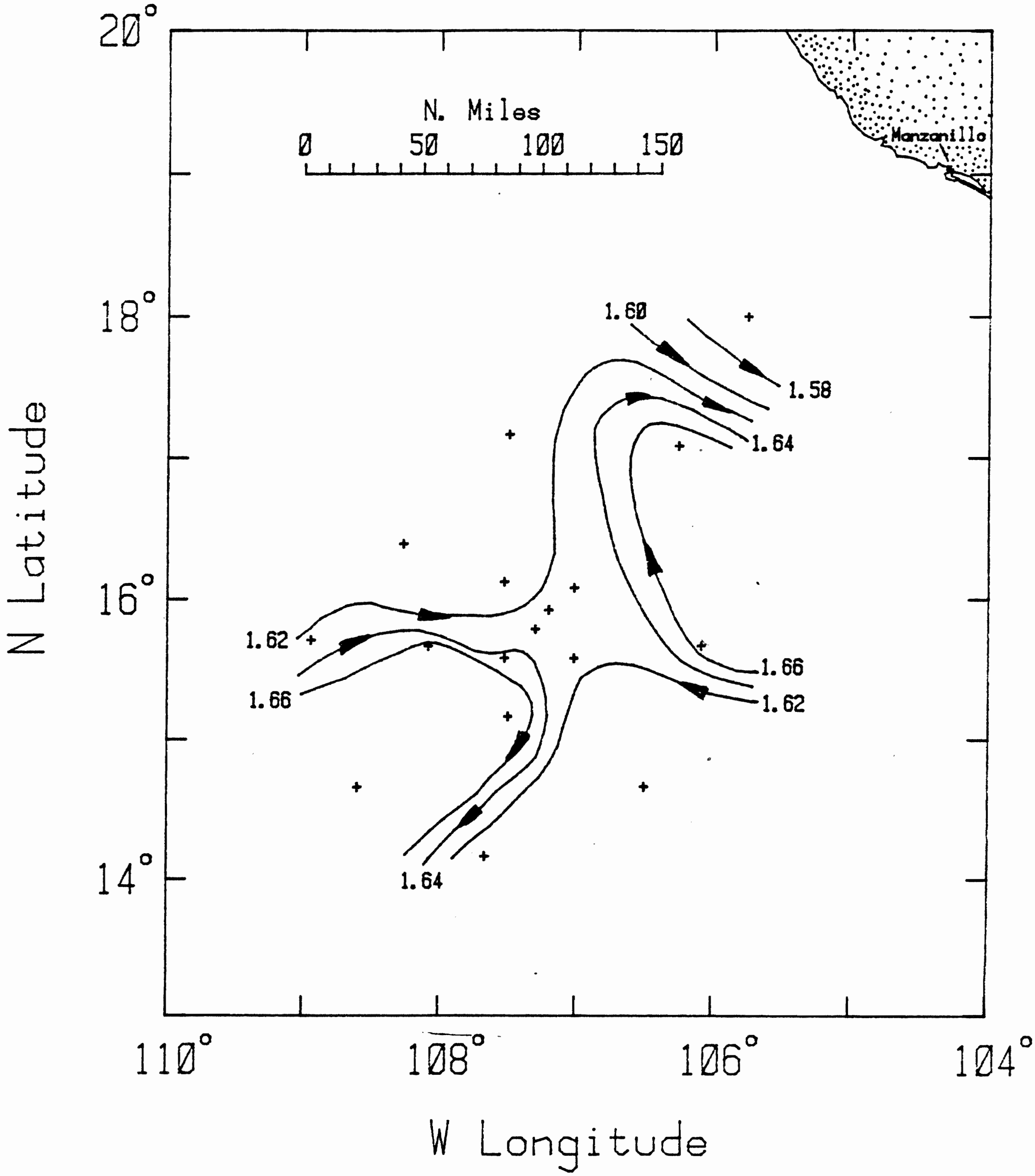

Fig. 12 Geopotential anomaly (dyn m) 60/1500 db. VERTEX 3, November 1982.

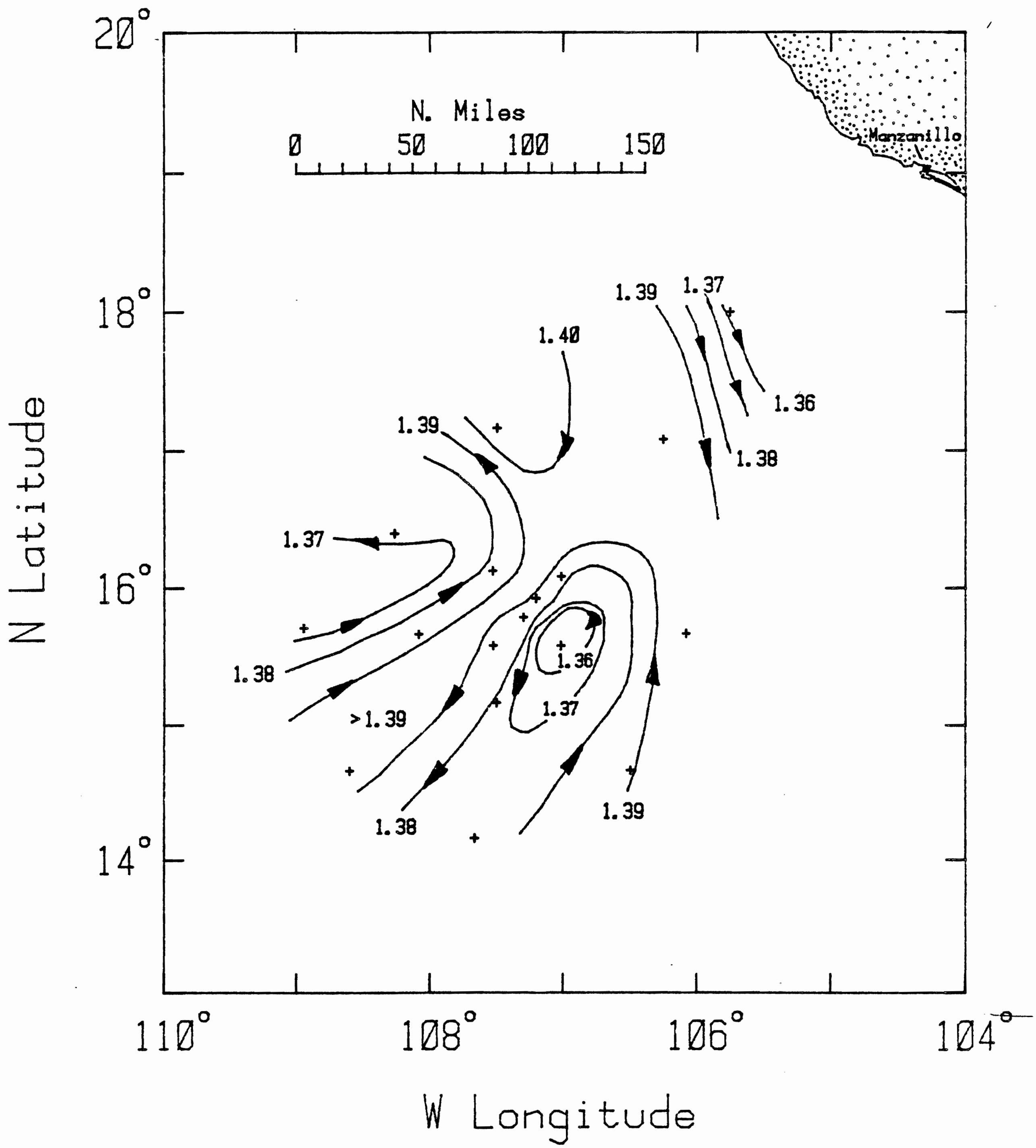

Fig. 13 Geopotential anomaly (dyn m) 150/1500 db. VERTEX 3, November 1982.

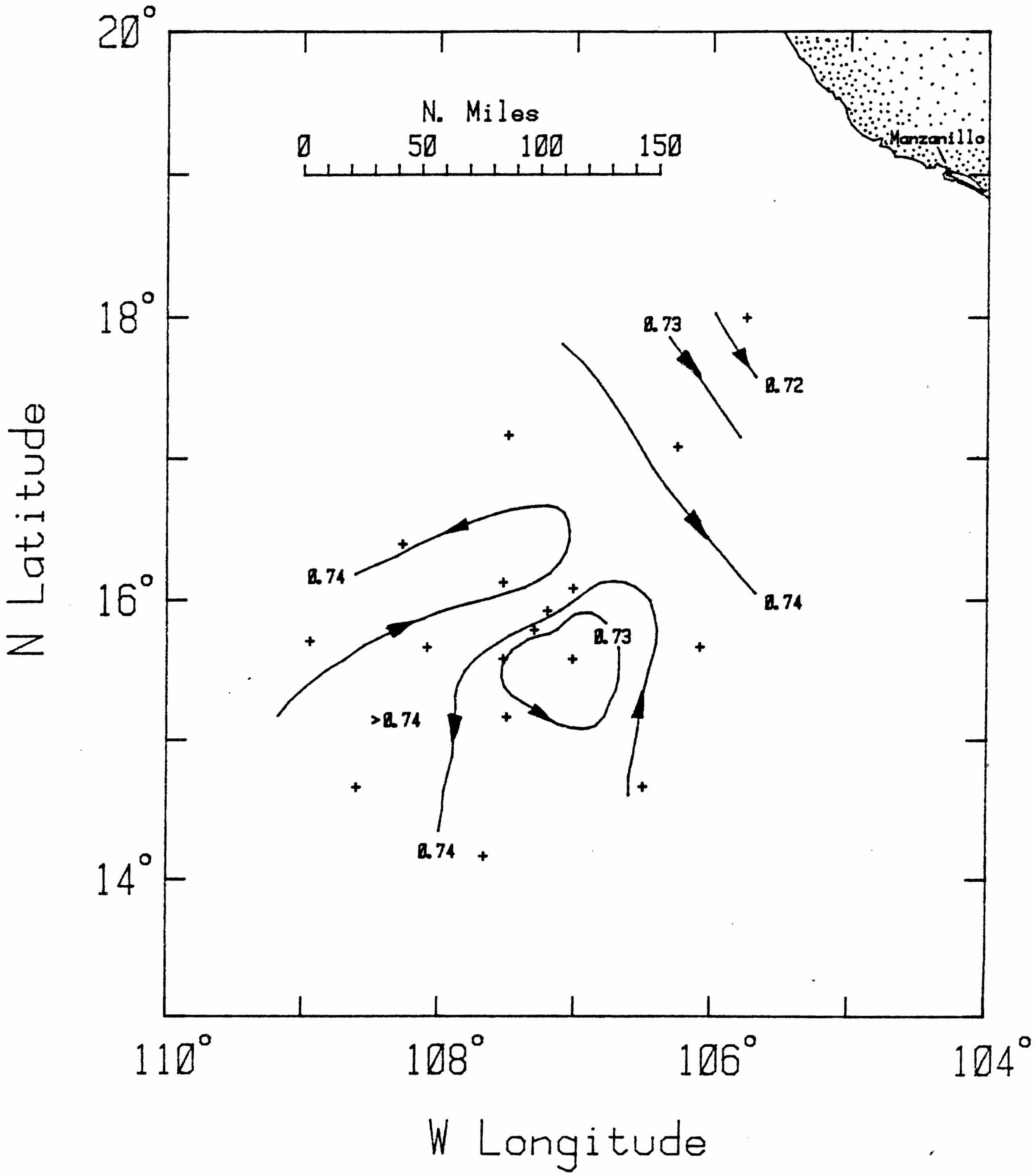

Fig. 14 Geopotential anomaly (dyn m) 600/1500 db. VERTEX 3, November 1982.

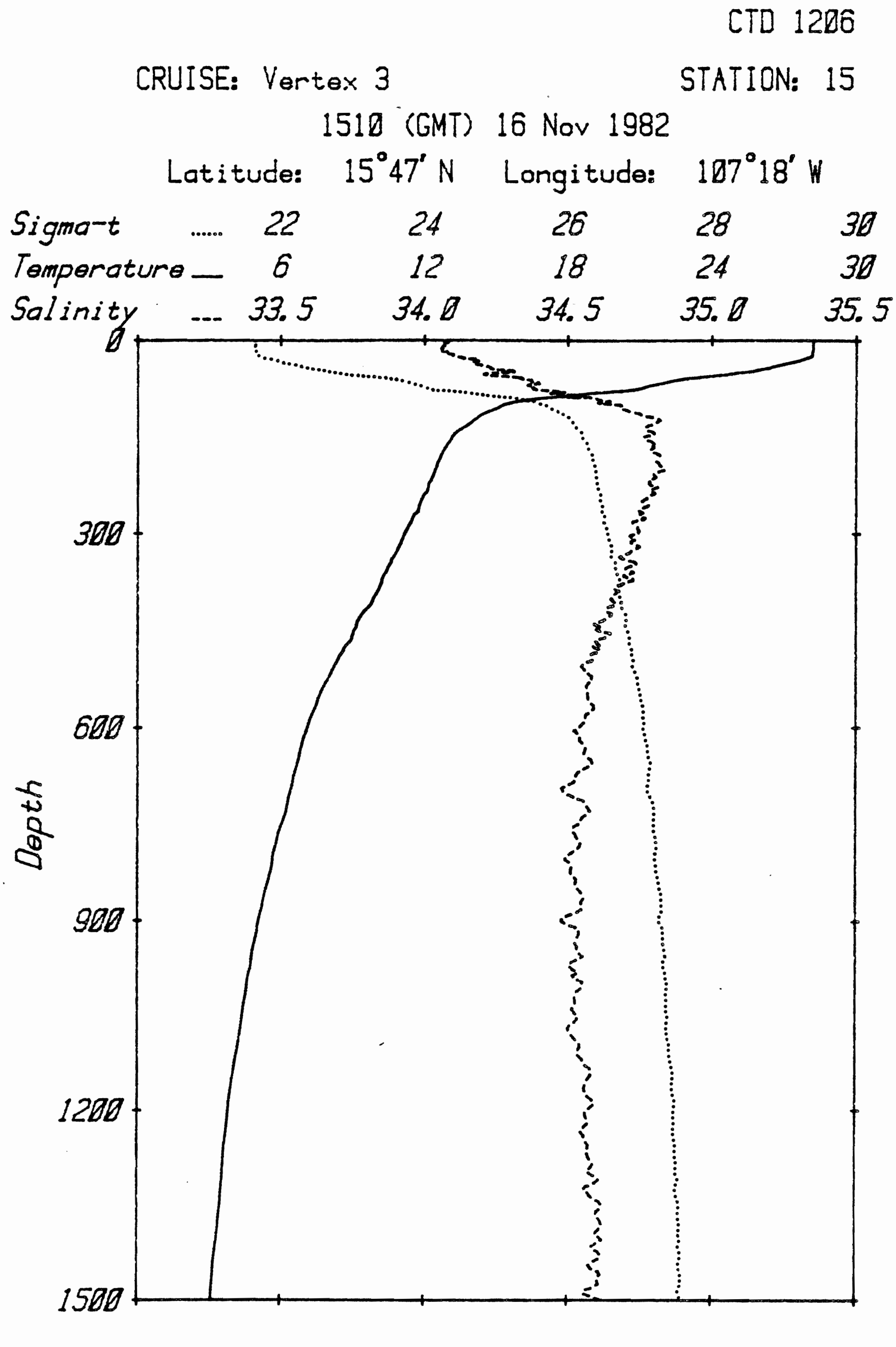

Fig. 15 Salinity, temperature (C) and sigma-t profiles representative of the PIT launch site. VERTEX 3, Station 15, 16 November 1982.

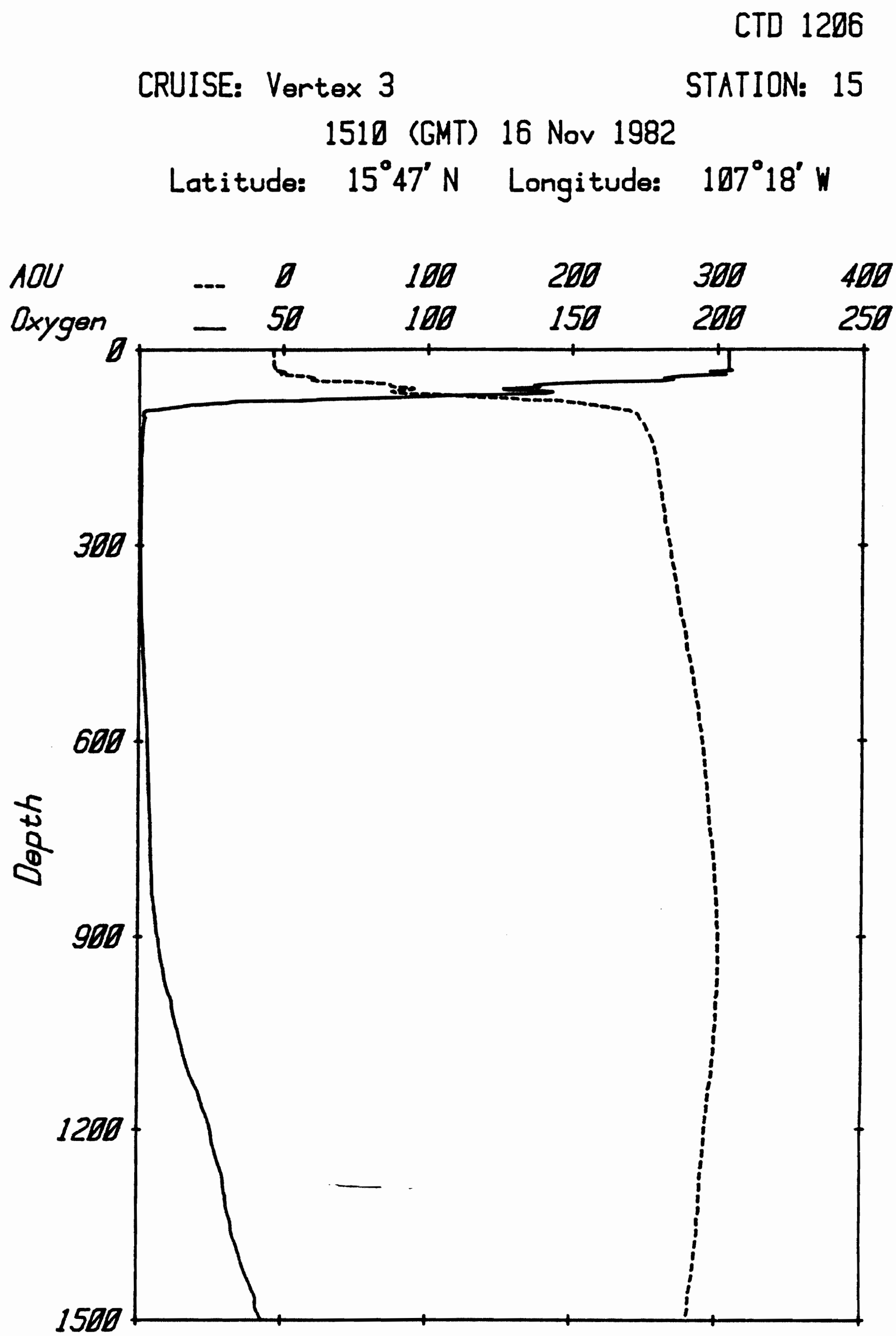

Fig. 16 Dissolved oxygen (uM/kg), and Apparent Oxygen Utilization (ug-atoms/kg) typical of the PIT site. VERTEX 3, Station 15, 16 November 1982.

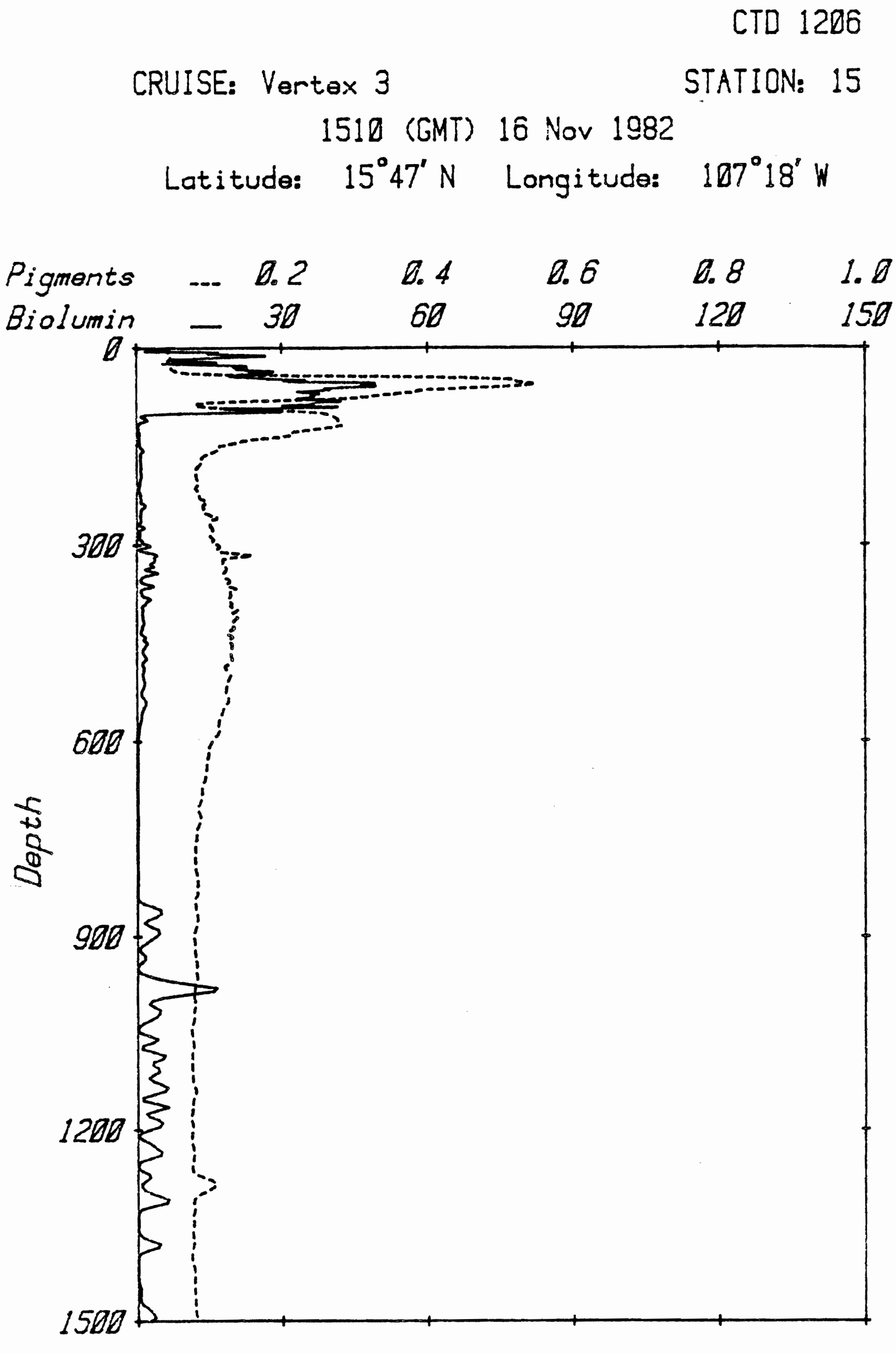

Fig. 17 Relative concentrations of fluorescent pigments (ug/liter) and bioluminescence at the PIT site, VERTEX 3, Station 15, 16 November 1982.

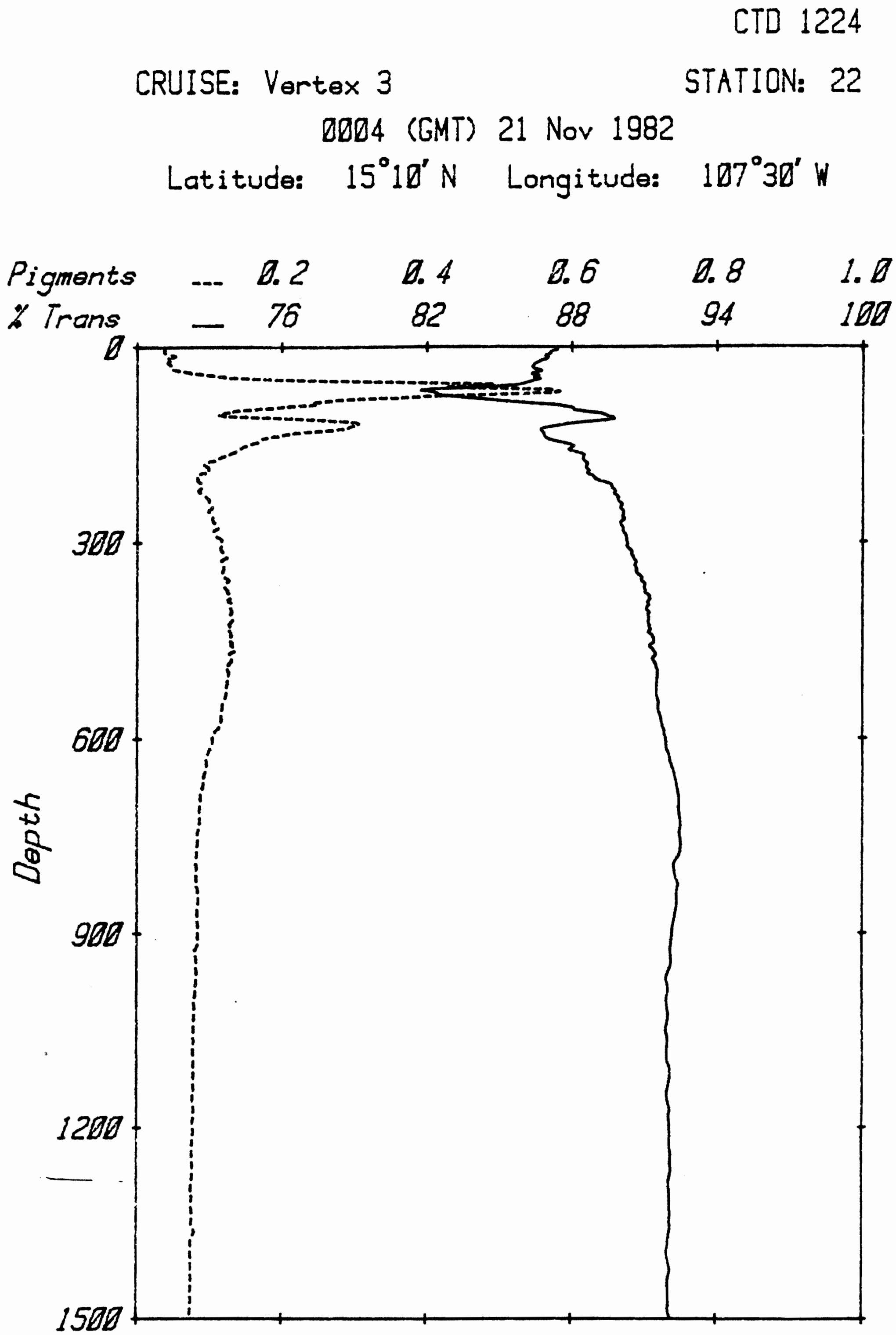

Fig. 18 Relative concentrations of fluorescent pigments (ug/liter) and beam transmittance (%/m), VERTEX 3, Station 22, 21 November 1982.

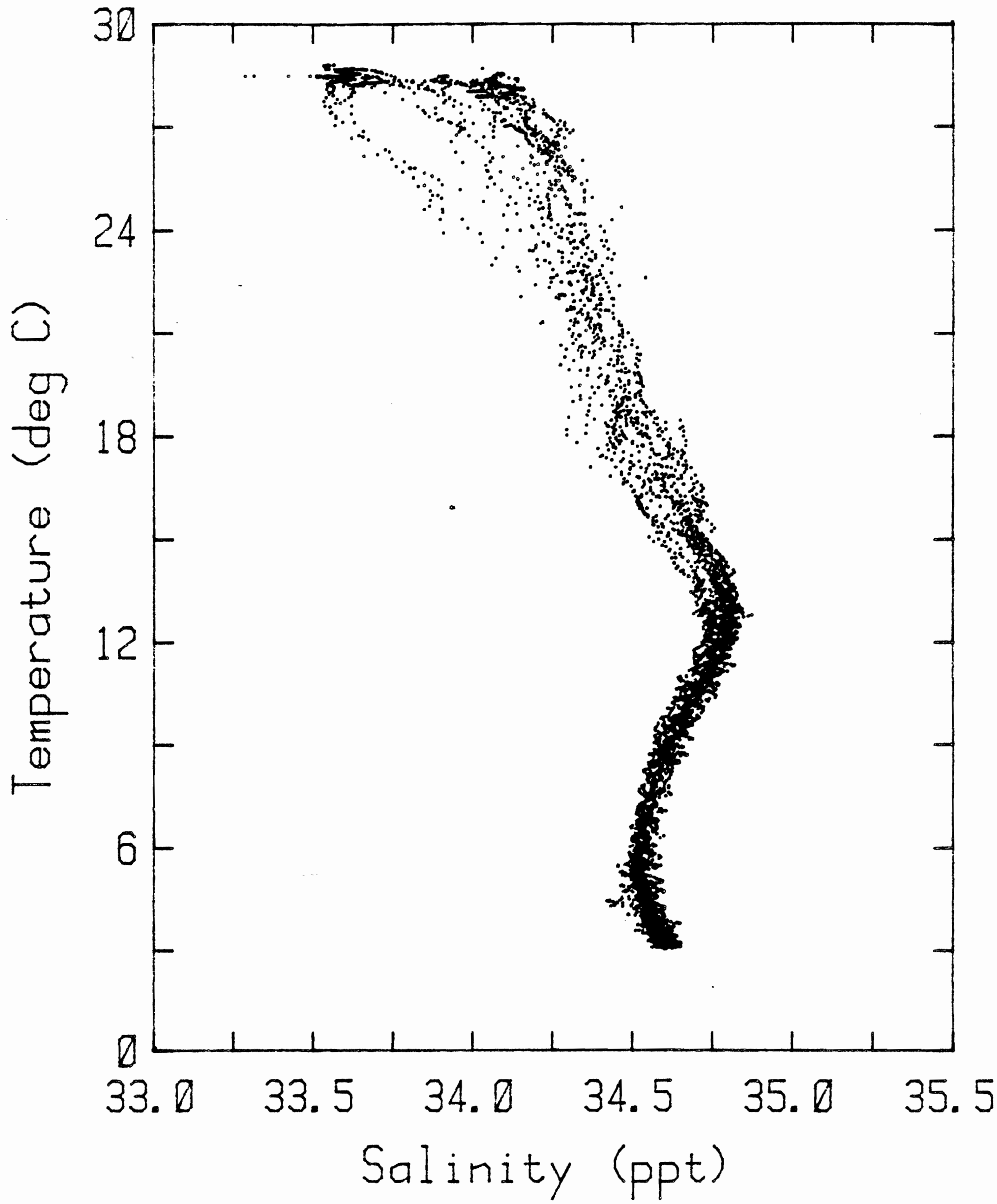

Fig. 19 Temperature-Salinity relationships for VERTEX 3, Leg 3 stations (Stations 12 through 31).

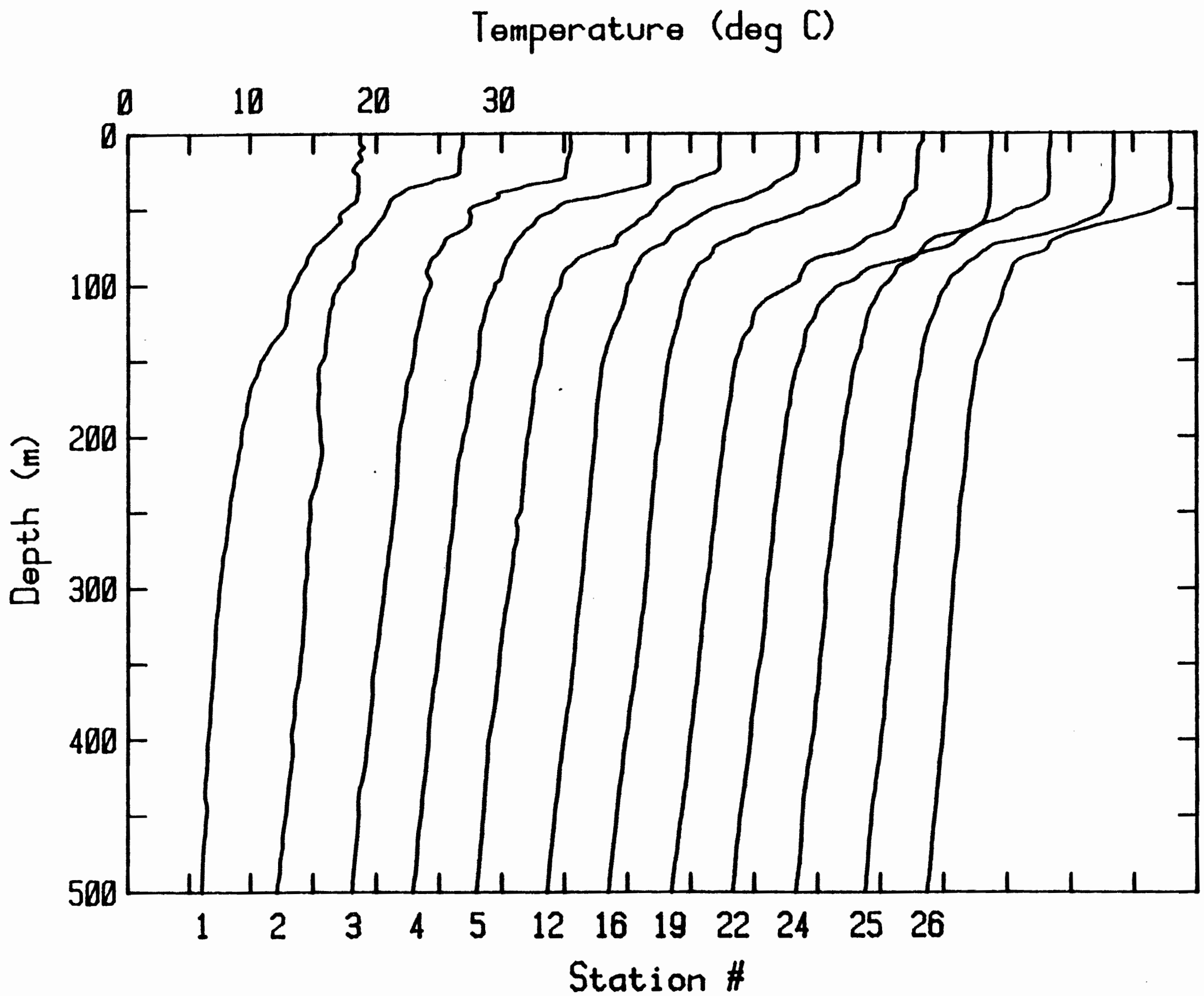

Fig. 20 North-south section of temperature (C) profiles, VERTEX 3. See Fig. 7 for station locations.

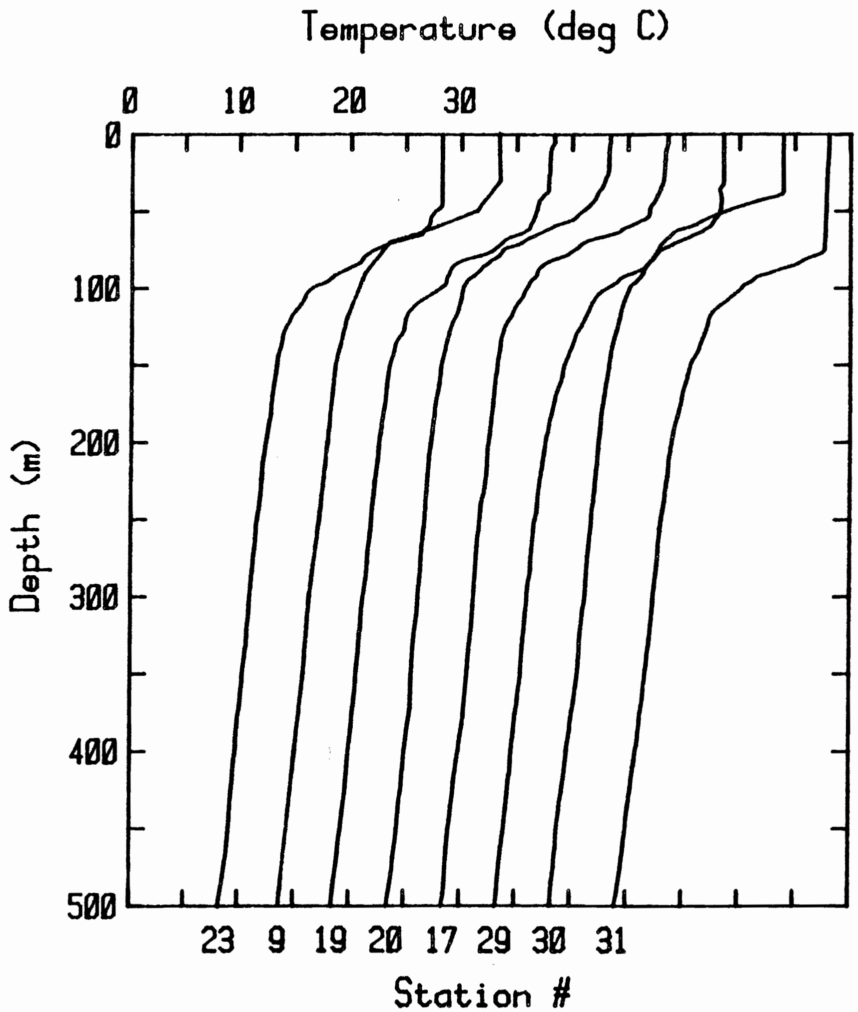

Fig. 21 West-east section of temperature (C) profiles, VERTEX 3. Station positions are shown in Fig. 7.

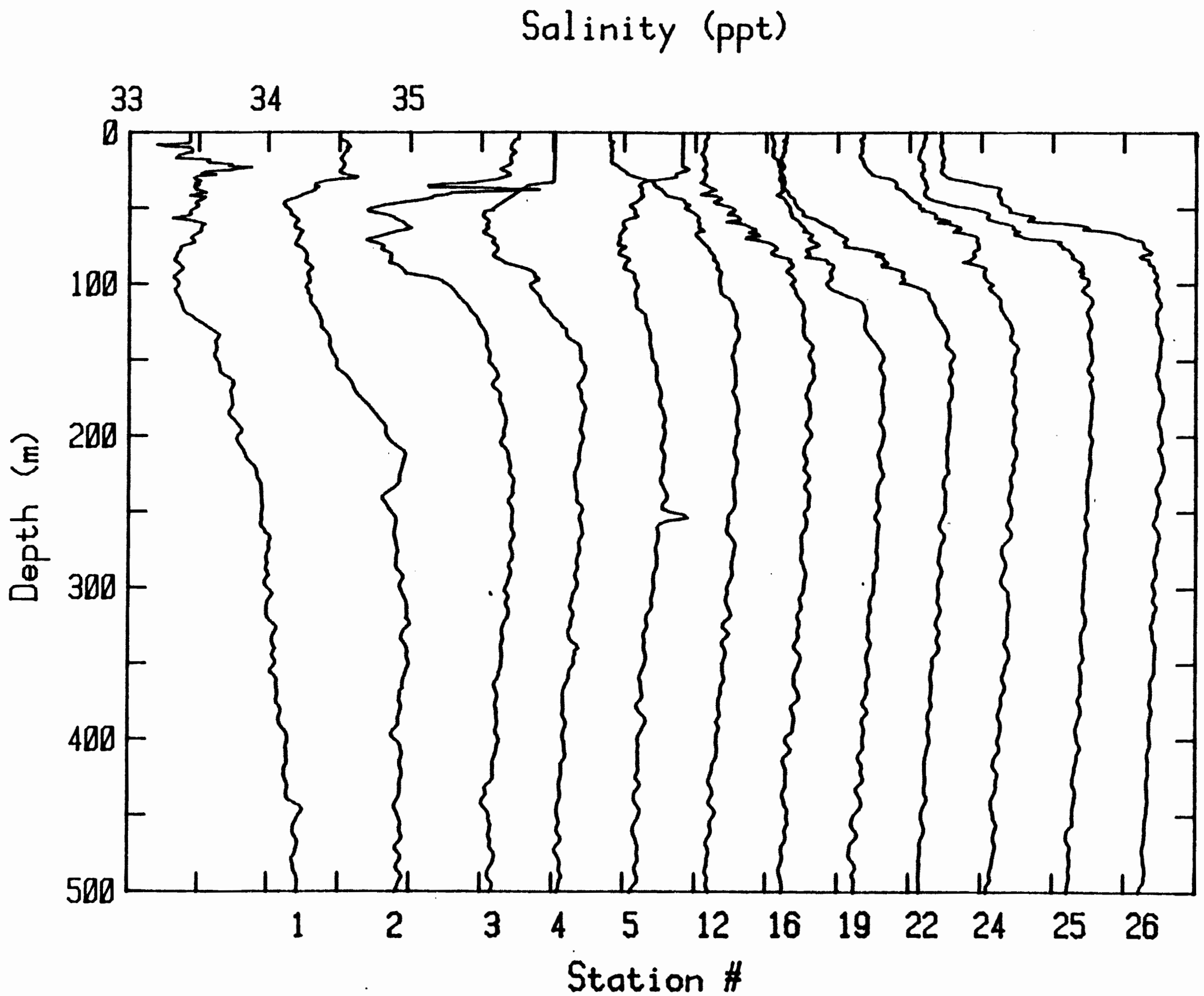

Fig. 22 North-south section of salinity profiles, VERTEX 3. Station locations are shown in Fig 7.

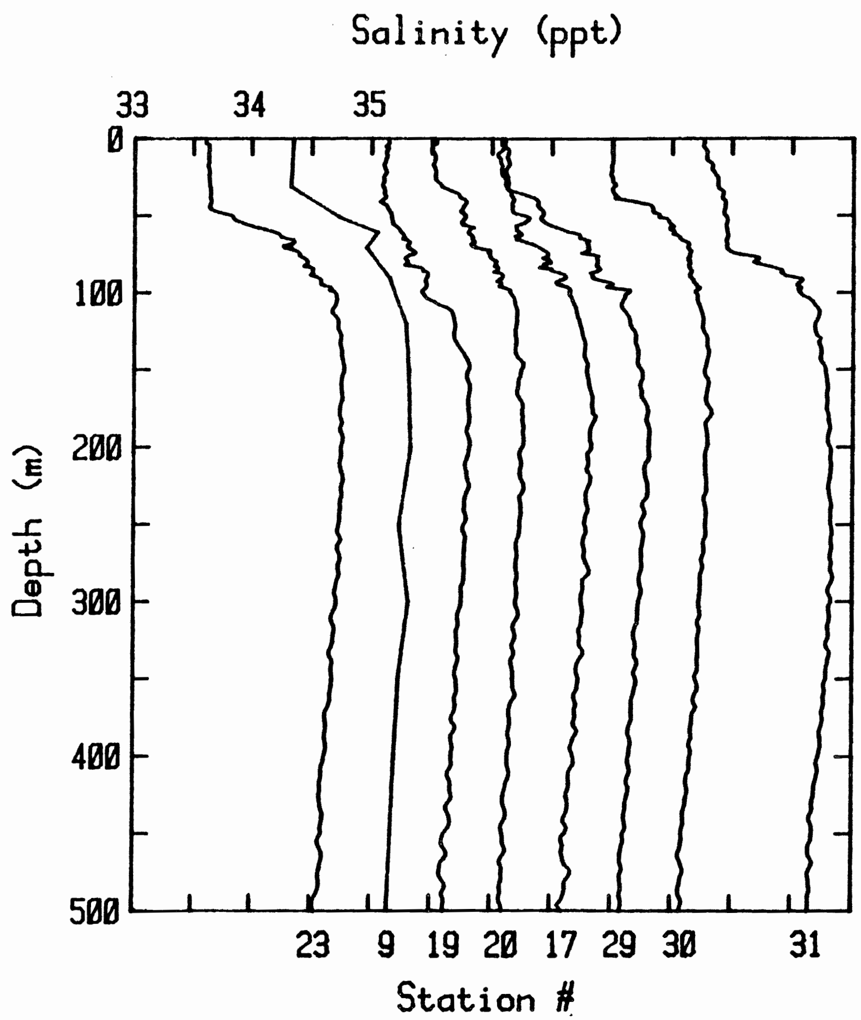

Fig. 23 West-east section of saliniity profiles, VERTEX 3. Station positions are shown in Fig. 7.

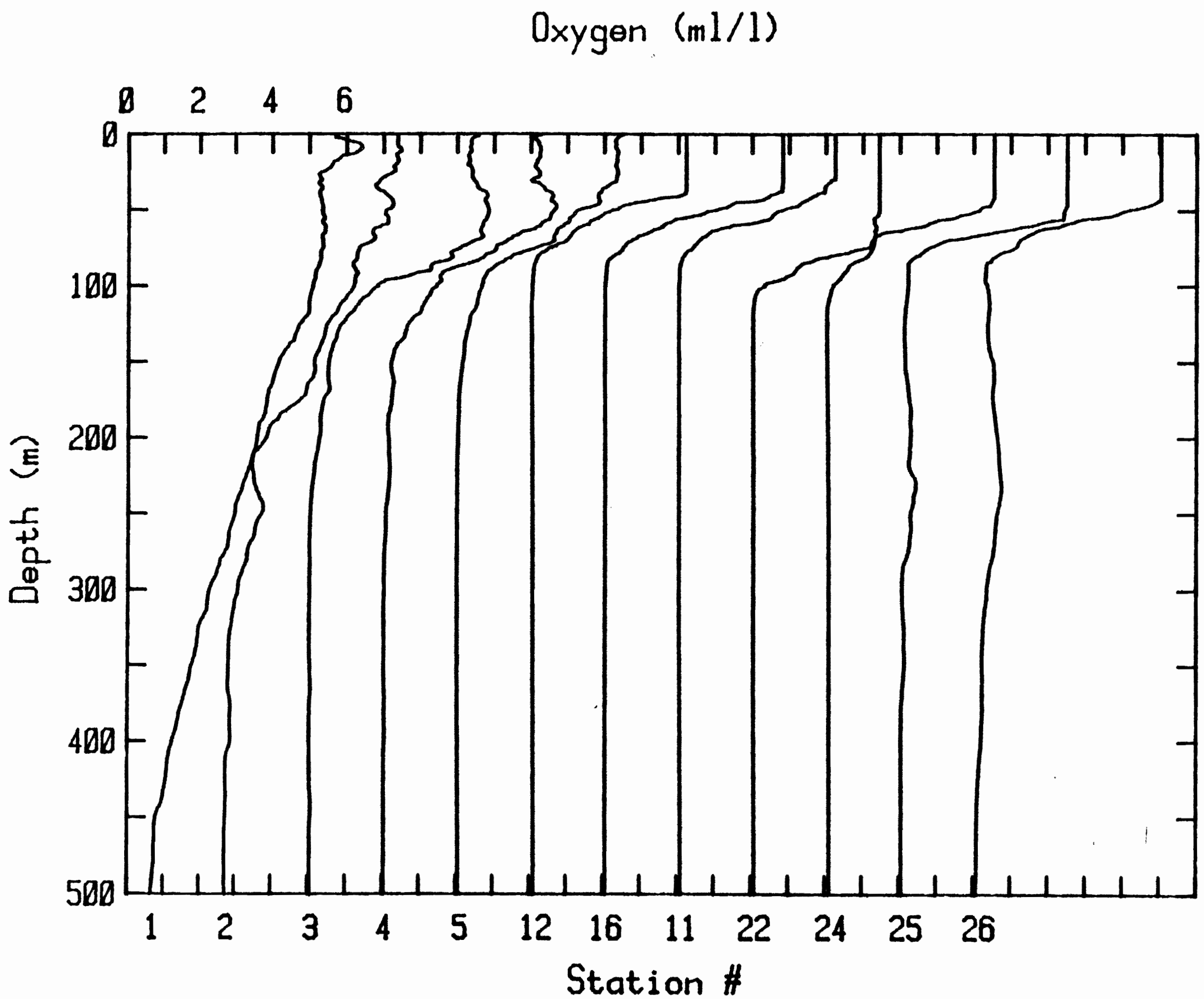

Fig. 24 North-south section of dissolved oxygen (ml/liter) profiles, VERTEX 3. Station positions are shown in Fig. 7.

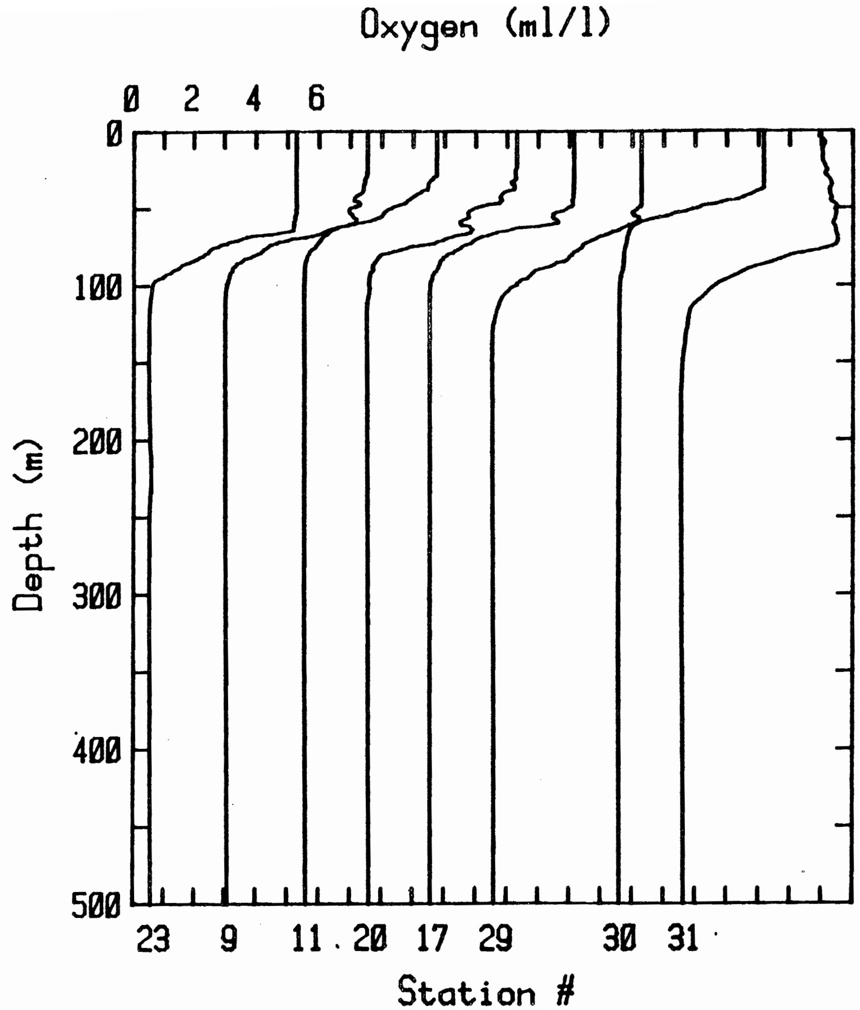

Fig. 25 West-east section of dissolved oxygen (ml/liter) profiles. Station positions are shown in Fig. 7.

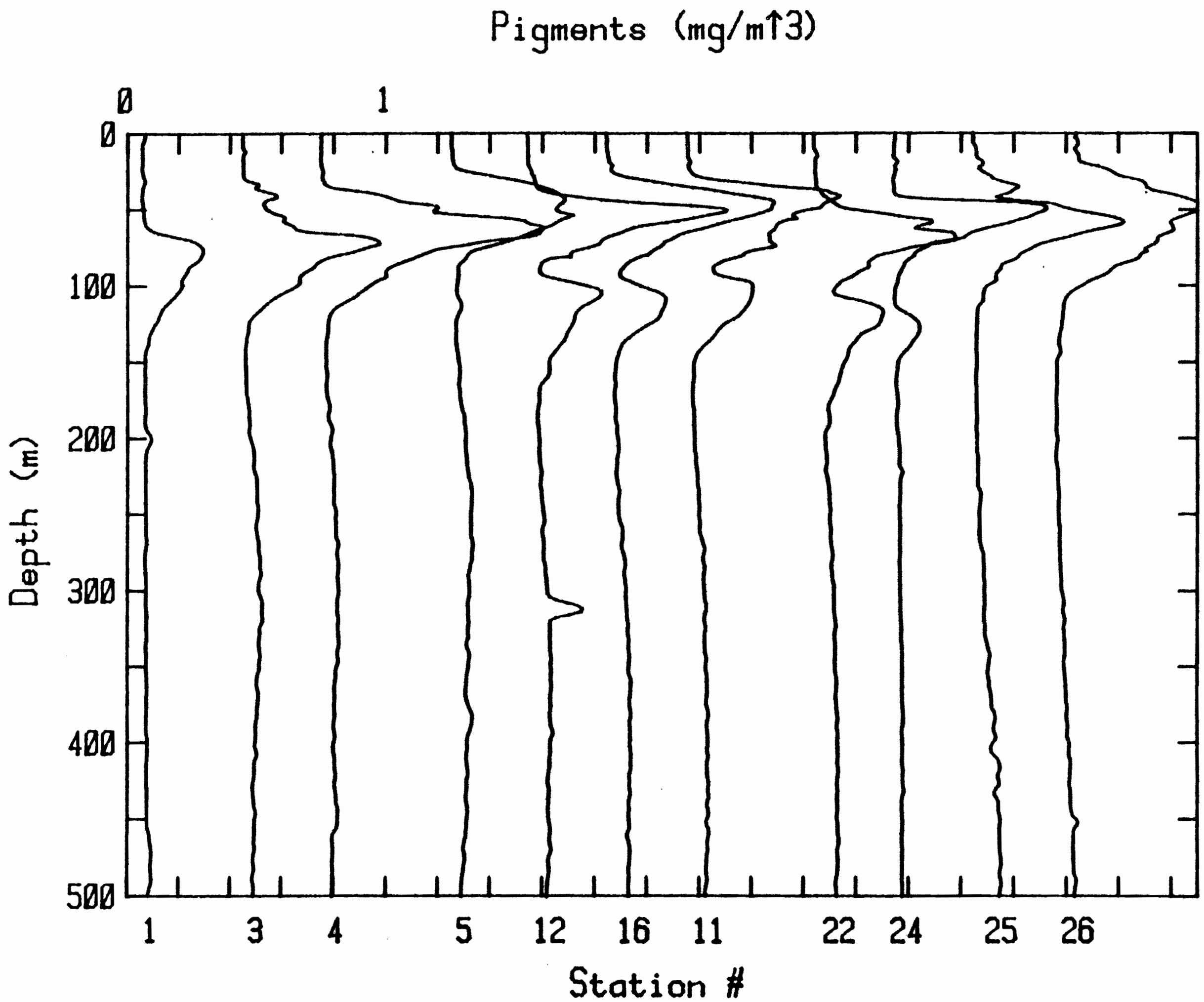

Fig. 26 North-south section of pigment (ug/liter) profiles, VERTEX 3. Station positions are shown in Fig. 7.

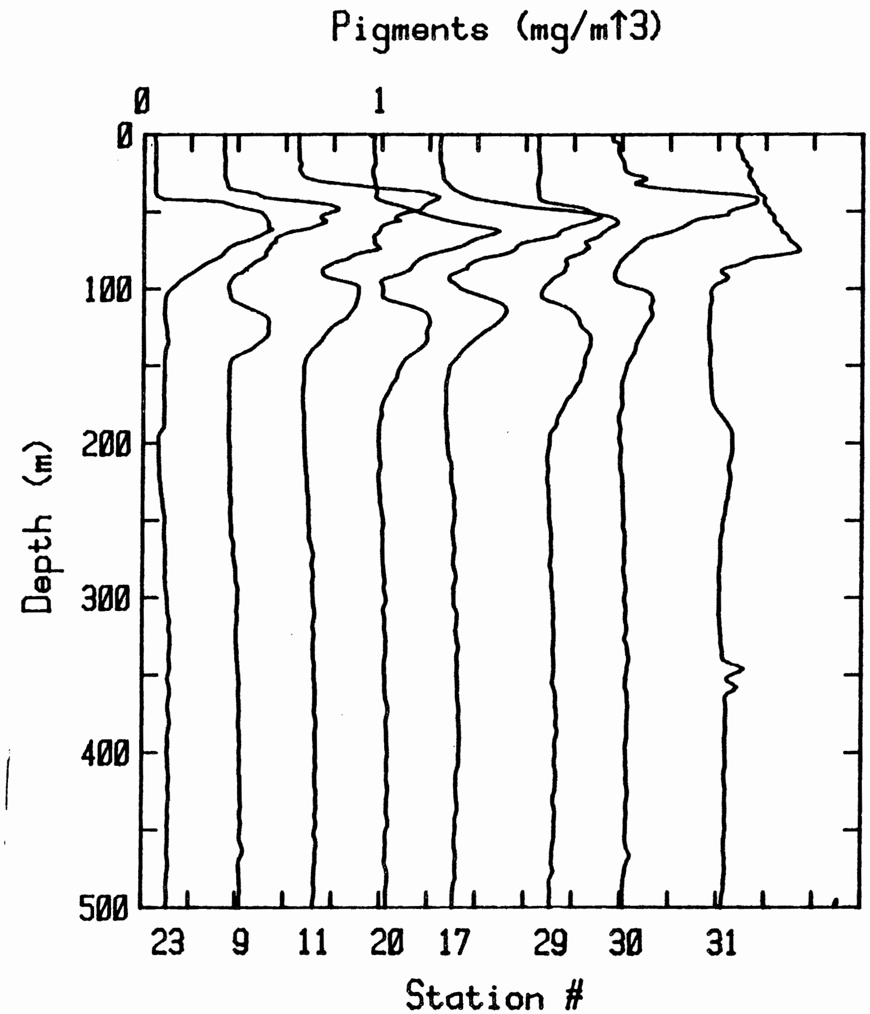

Fig. 27 West-east section of pigment (ug/liter) profiles, VERTEX 3. Station positions are shown in Fig. 7.

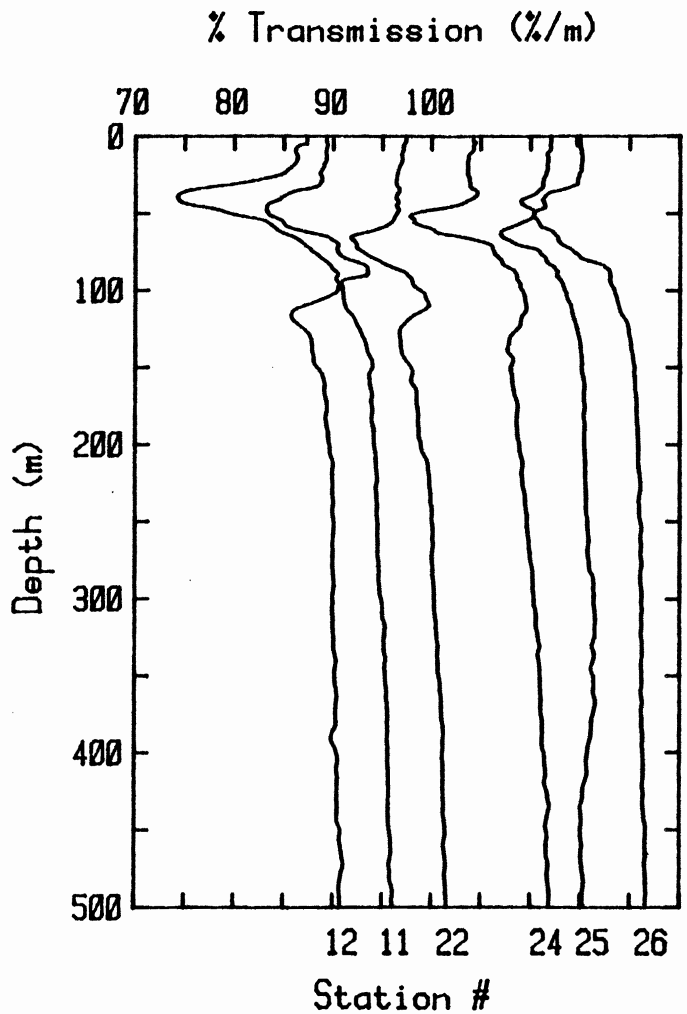

Fig. 28 North-south section of beam transmission (%/m) profiles, VERTEX 3. Station positions are shown in Fig. 7.

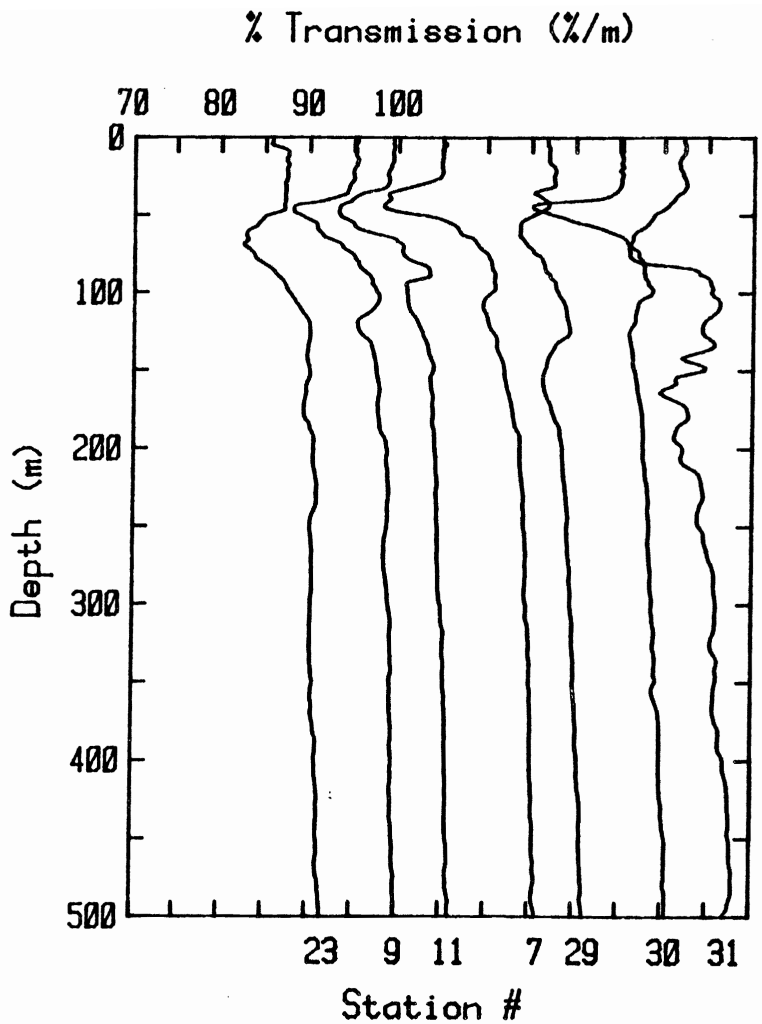

Fig. 29 West-east section of beam transmission (%/m) profiles, VERTEX 3. Station positions are shown in Fig. 7.

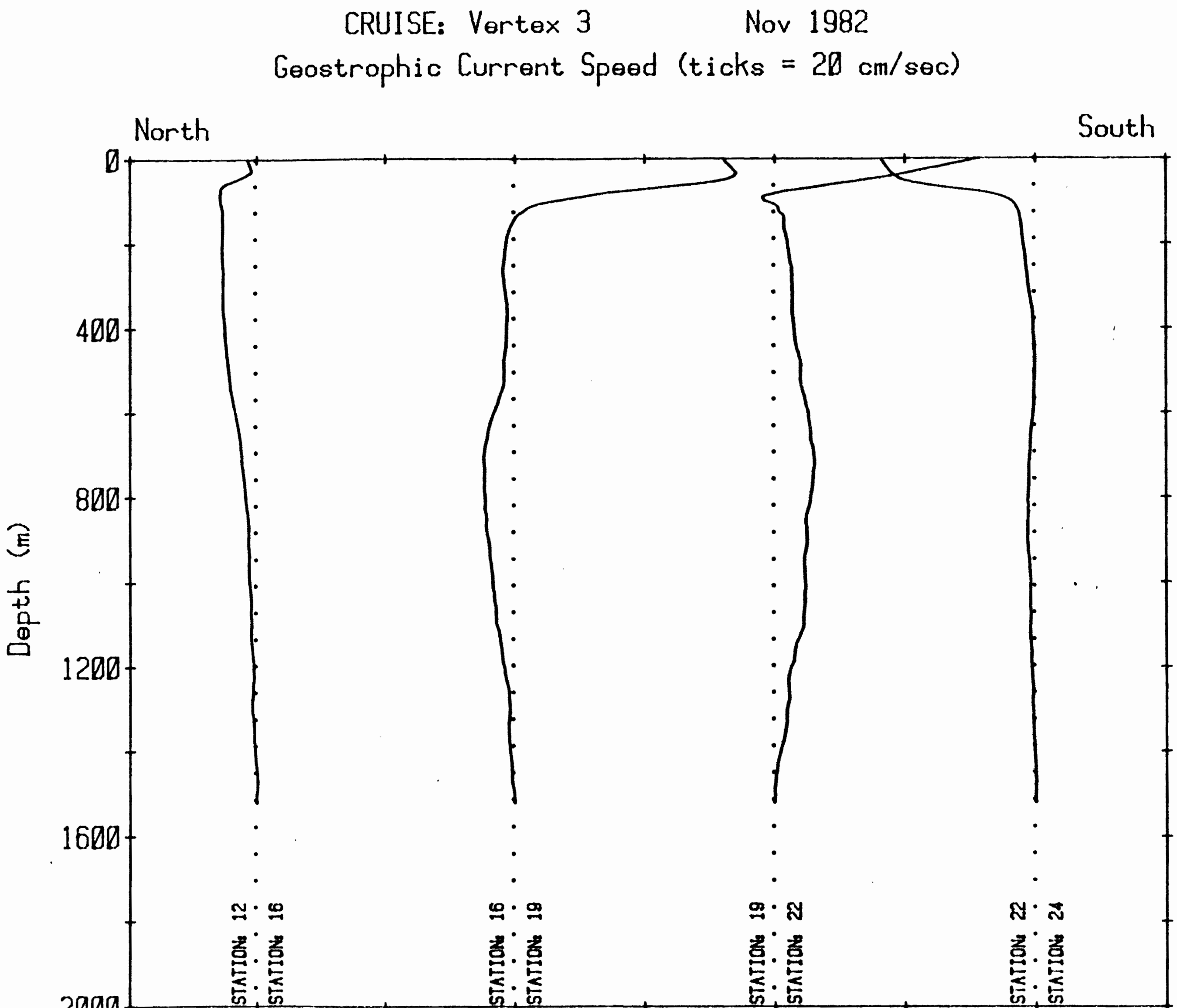

Fig. 30 Geostrophic currents relative to 1500 db along a north-south section, VERTEX 3. Station positions are shown in Fig. 7.

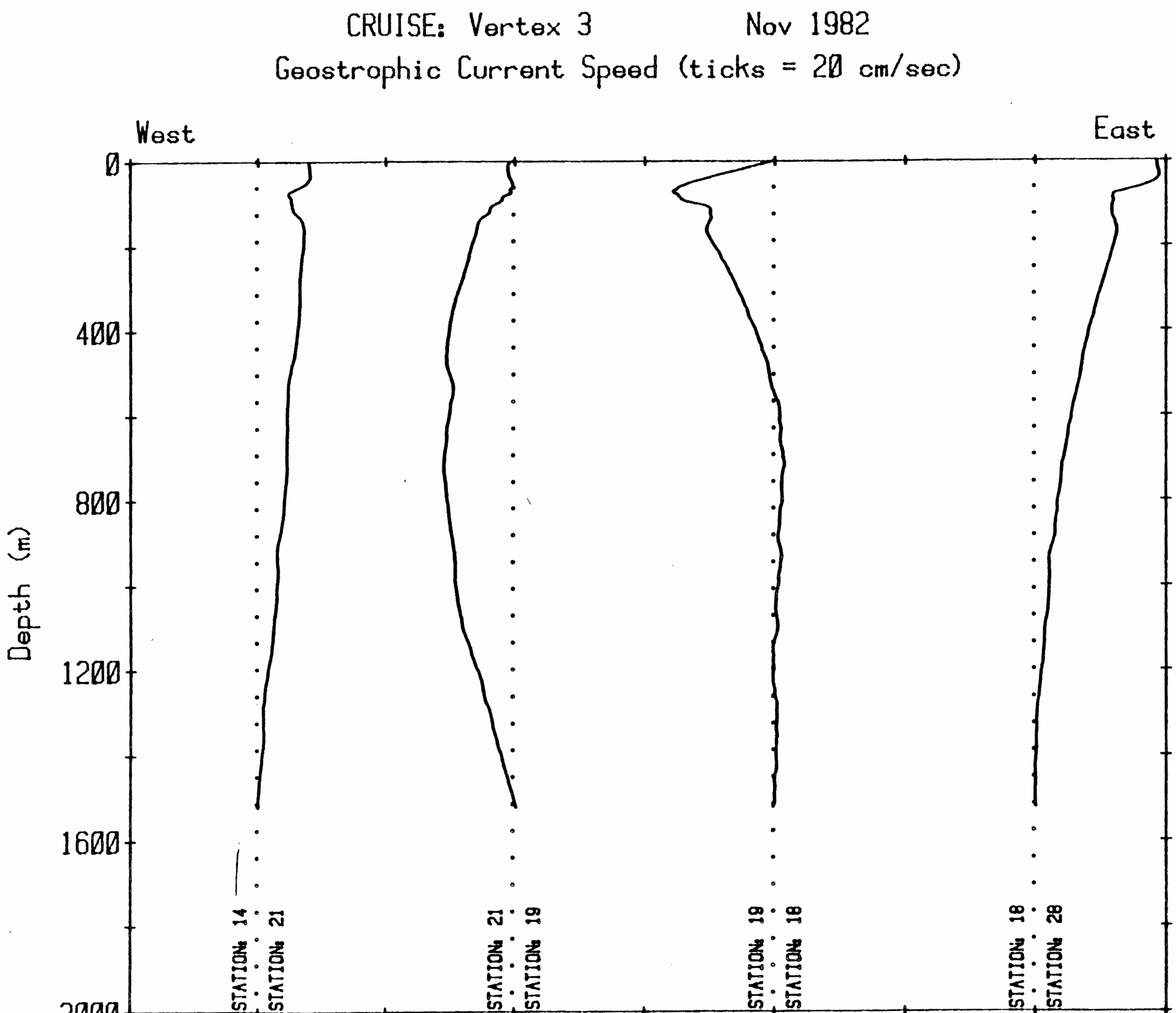

Fig. 31 Geostrophic currents relative to 1500 db along a west-east section, VERTEX 3. Station positions are shown in Fig. 7.

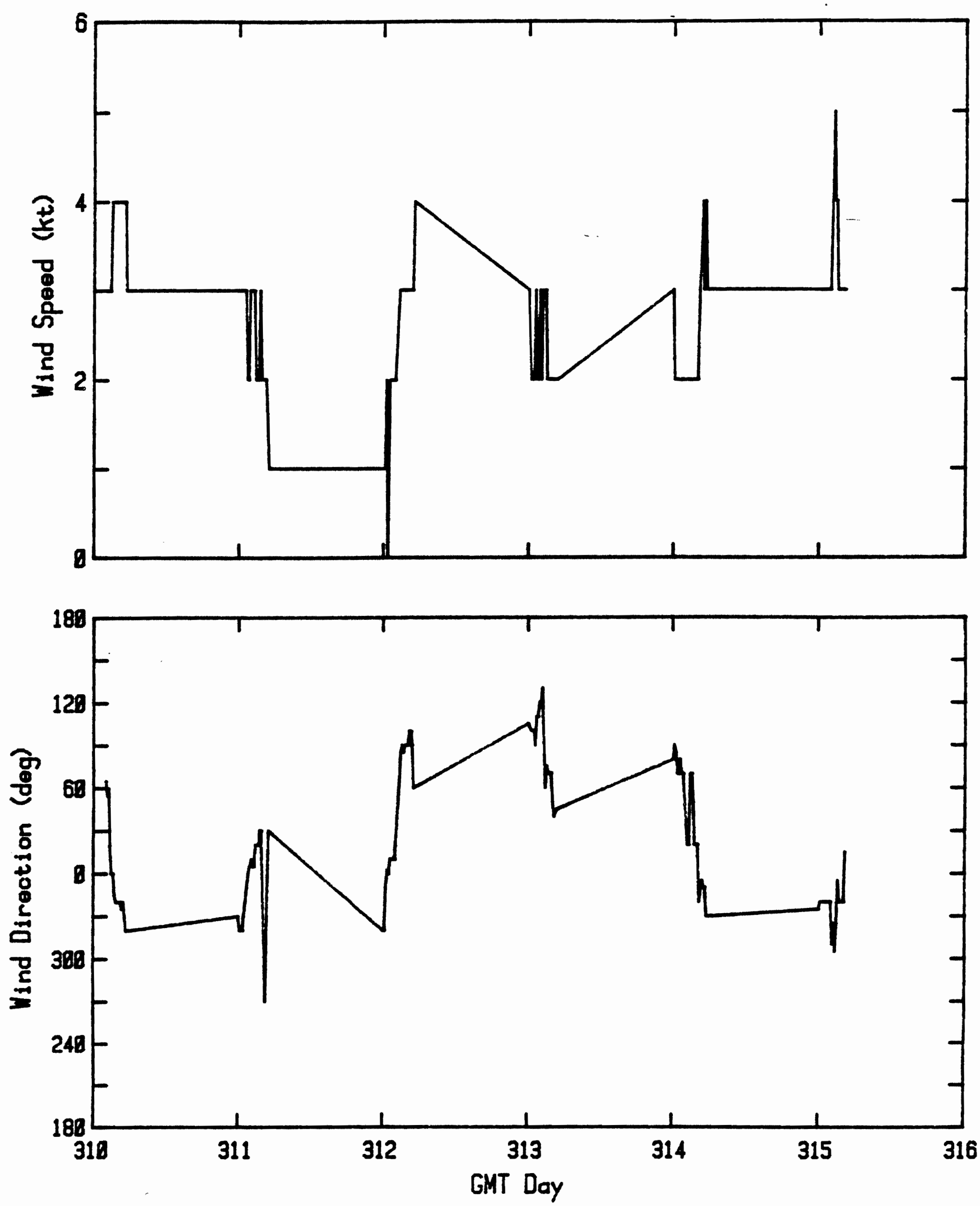

Fig. 32 Wind speed (knots) and direction (degrees true) during Leg 2, VERTEX 3, 7 to 12 November 1982.

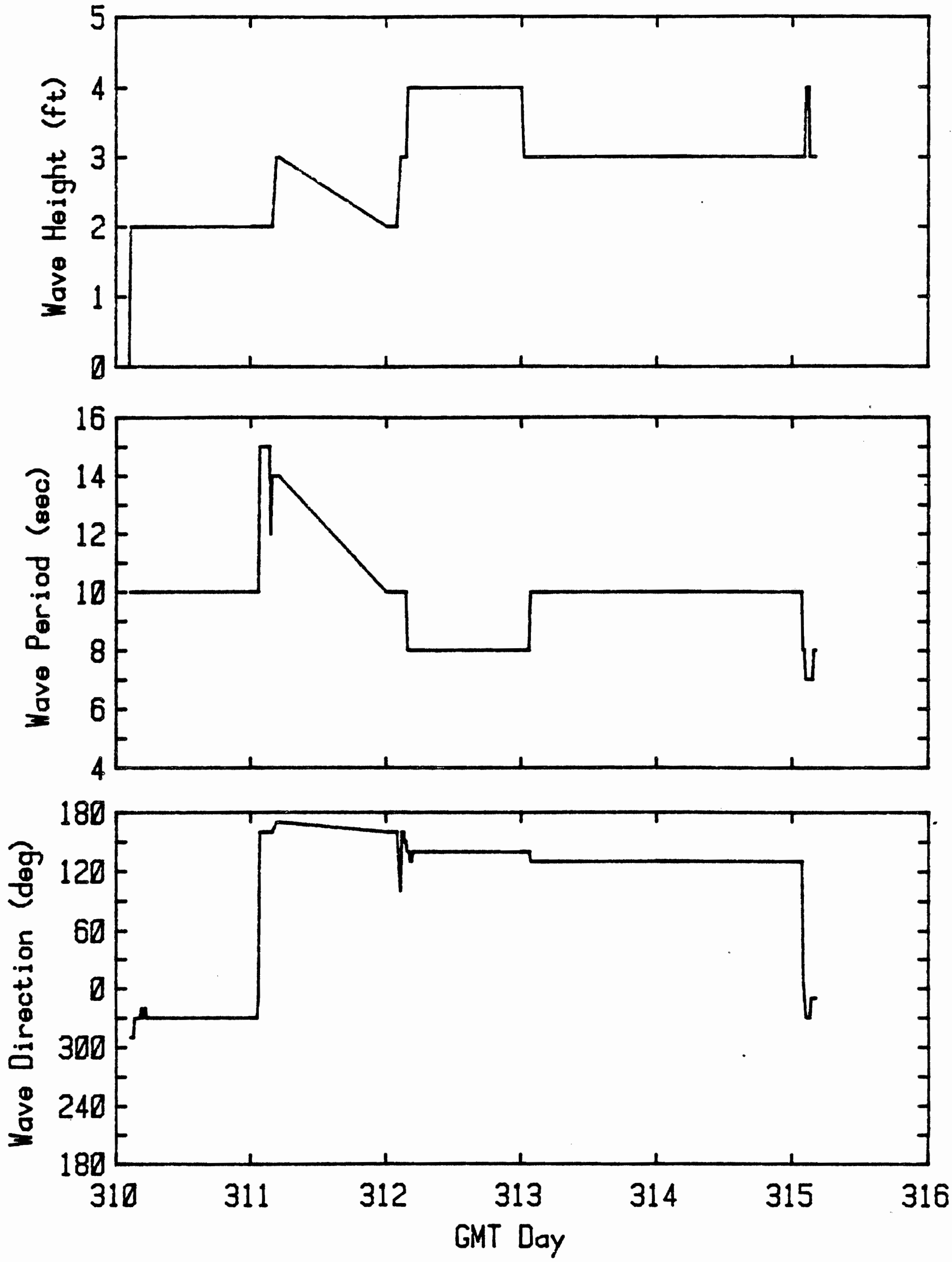

Fig. 33 Wave Height (ft), period (sec), and direction (degrees true), VERTEX 3, 7 to 12 November 1982.

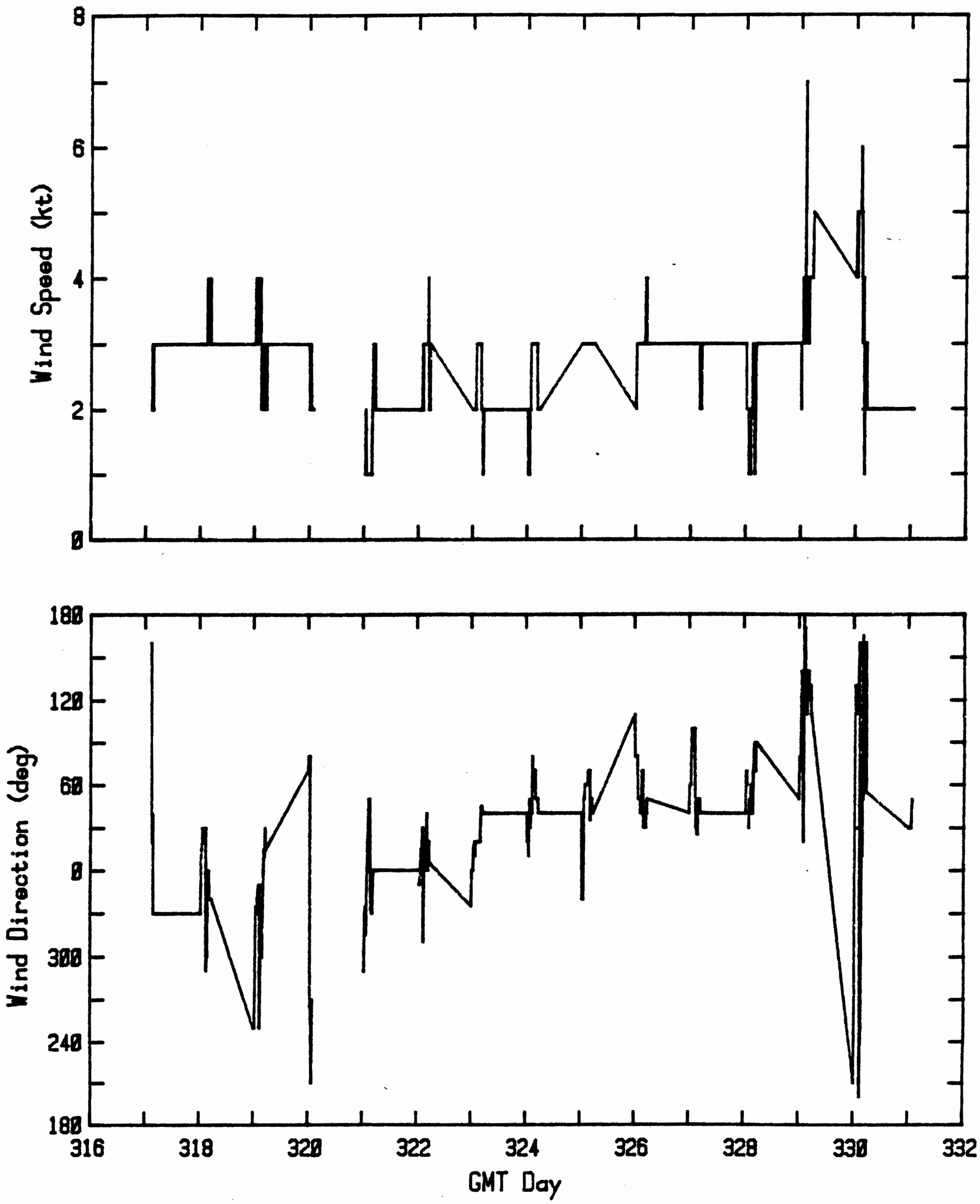

Fig. 34 Wind speed (knots) and direction (degrees true) during Leg 2, VERTEX 3, 13 to 27 November 1982.

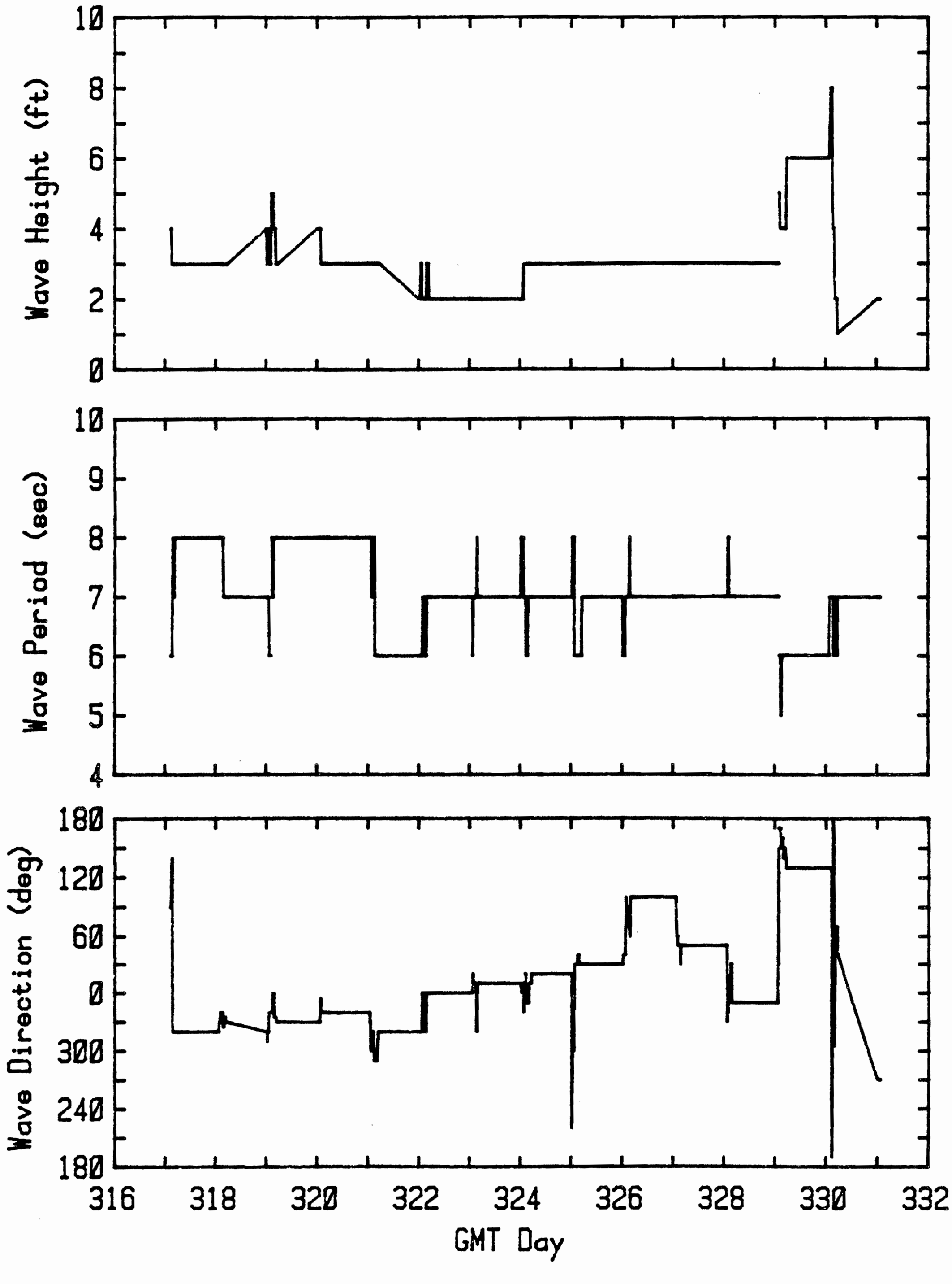

Fig. 35 Wave Height (ft), period (sec), and direction (degrees true), VERTEX 3, 13 to 27 November 1982.

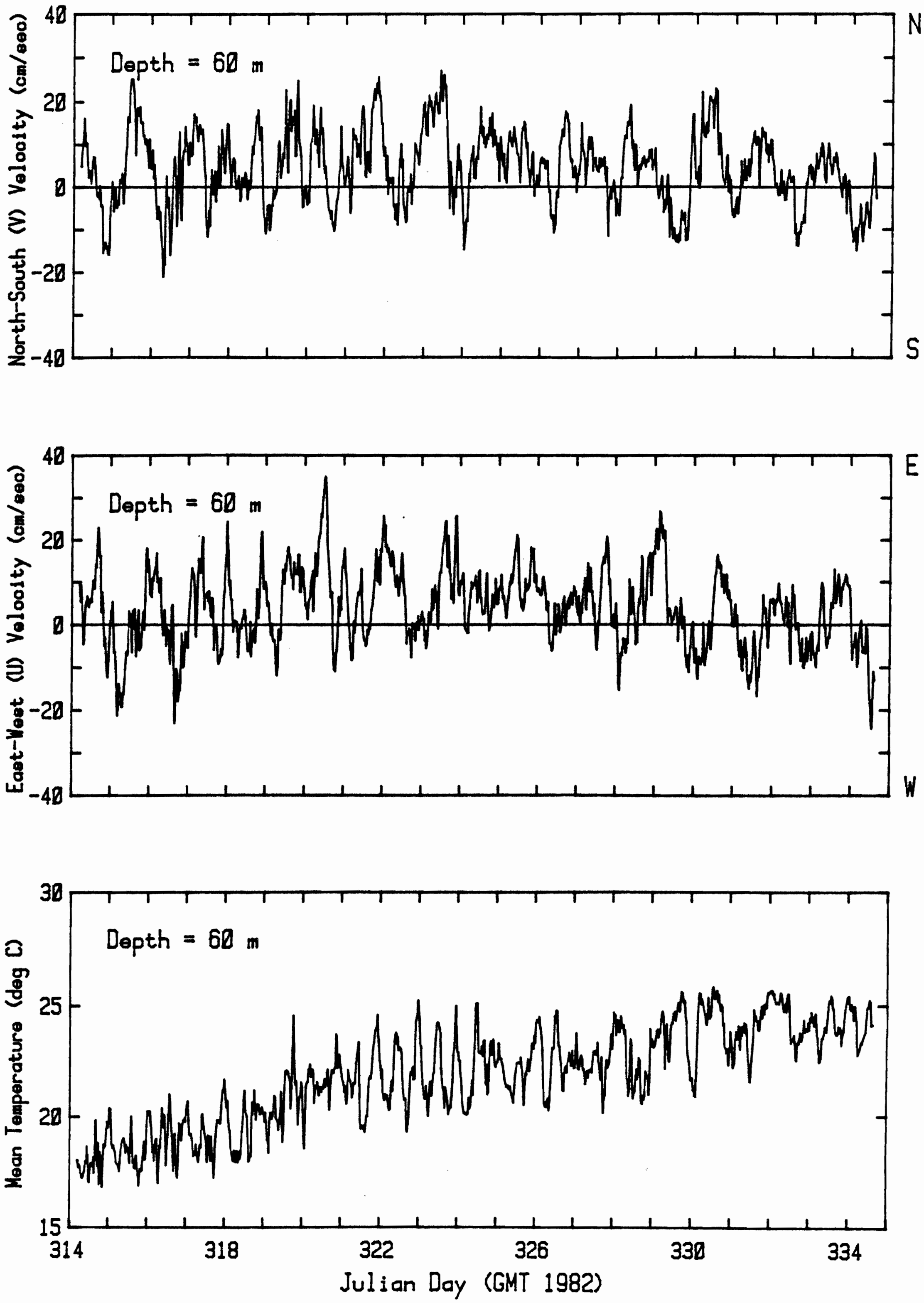

Fig. 36. Relative current speed vectors and temperature (30-min average values) on the MLML particle trap mooring at 60 m, VERTEX 3, 11 November to 1 December 1982.

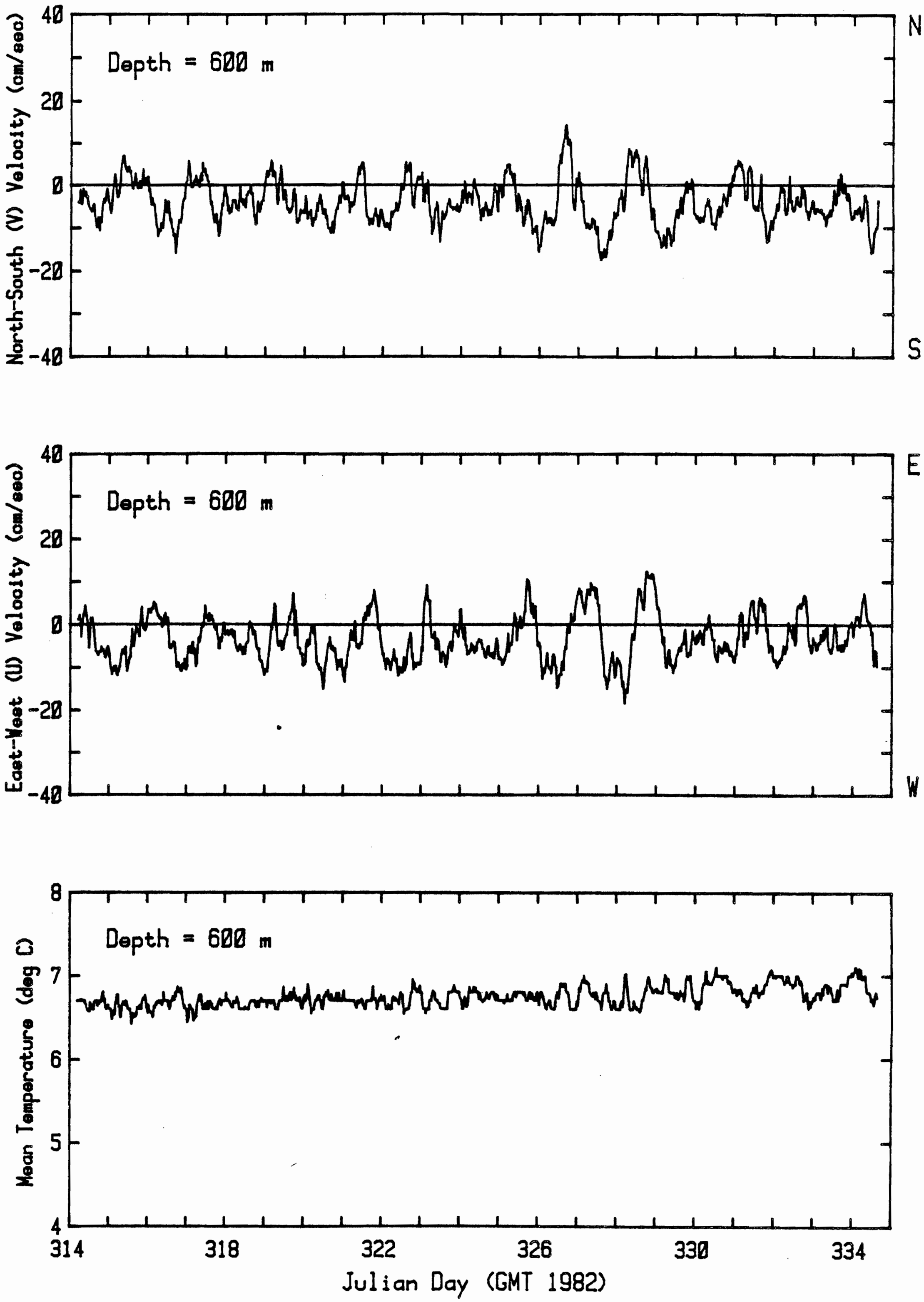

Fig. 37 Relative current speed vectors and temperature (30-min average values) on the MLML particle trap mooring at 600 m, VERTEX 3, 11 November to 1 December 1982.

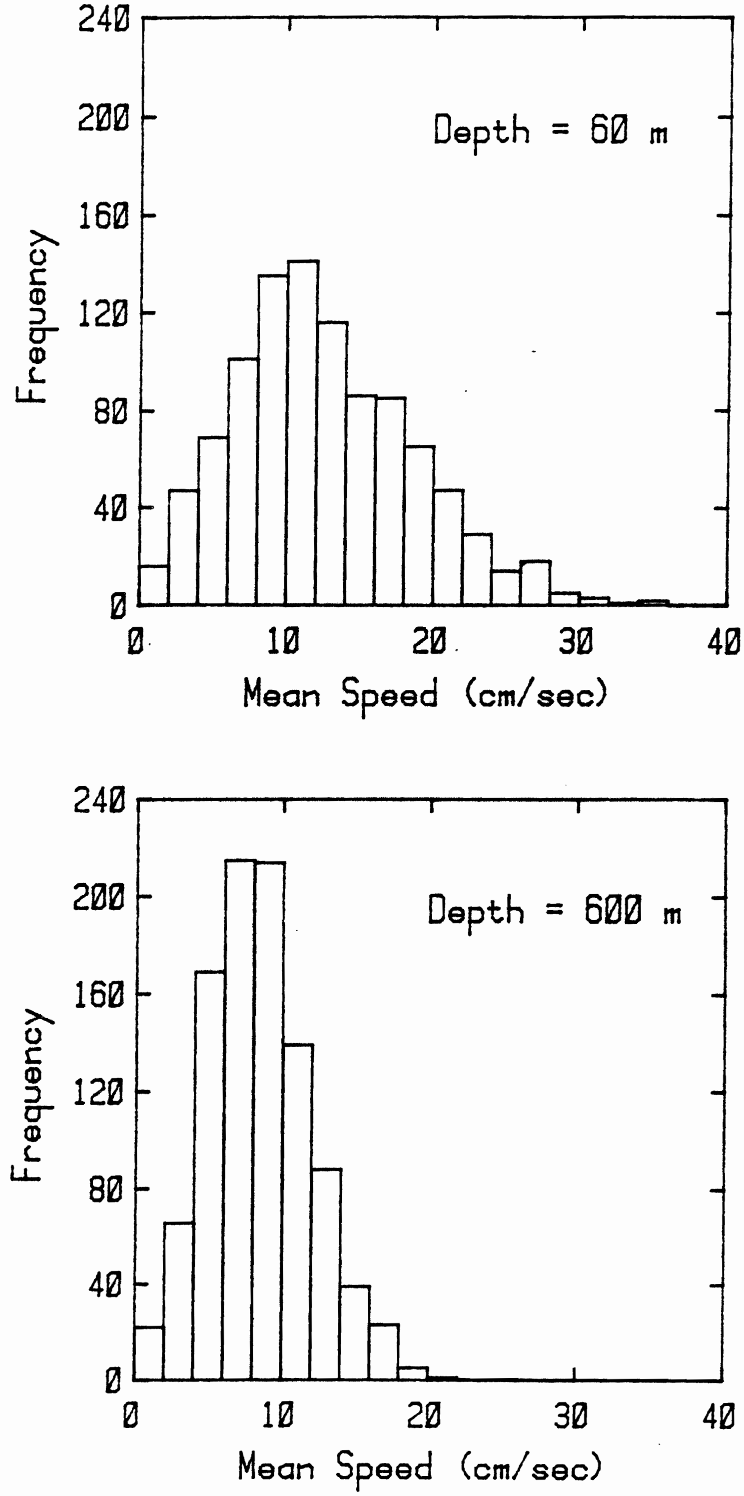

Fig. 38 Histograms of relative current speeds (30-min averages) on the MLML particle trap moorings at 60 and 600 m, VERTEX 3, 11 November to 1 December 1982.

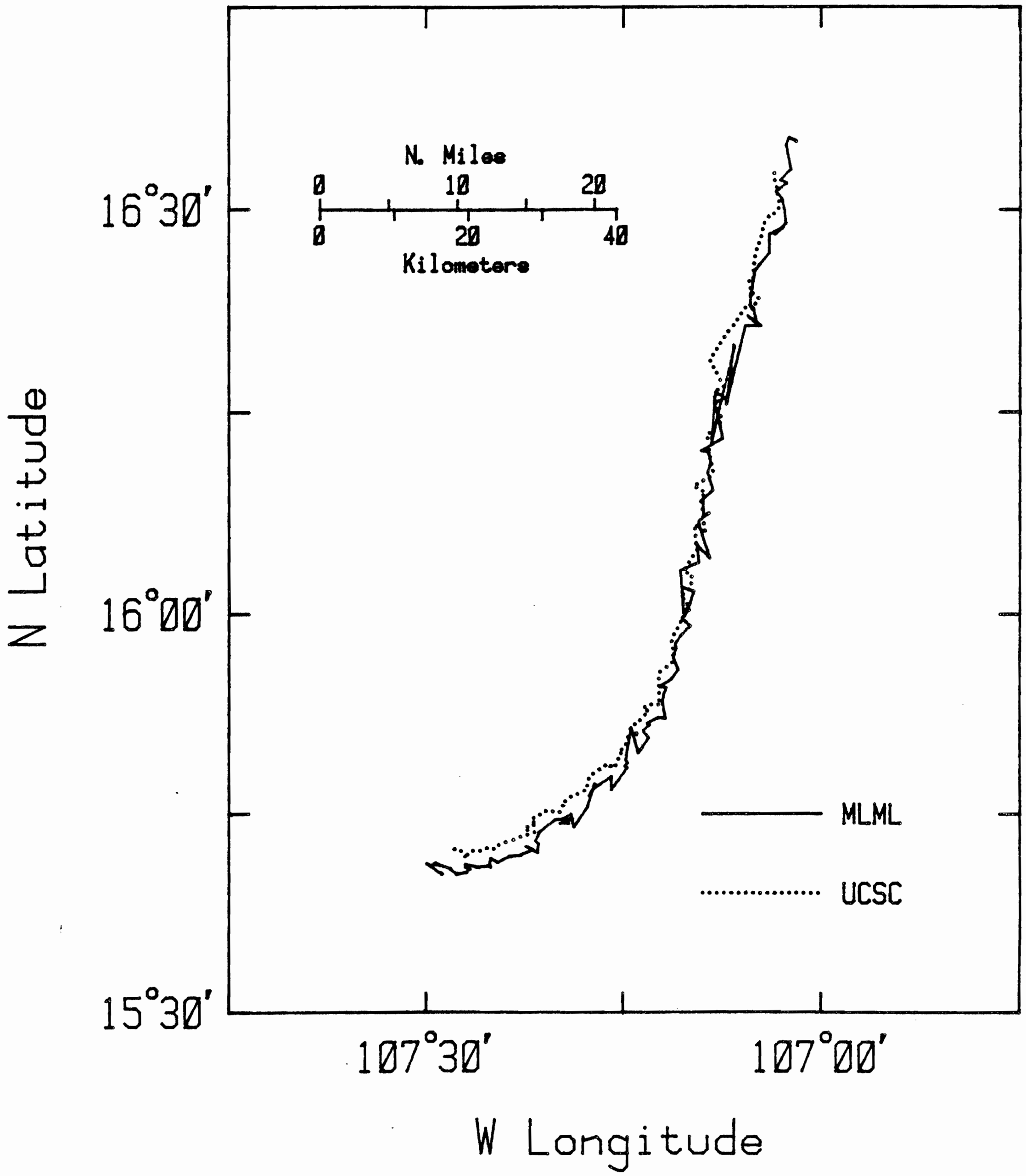

Fig. 39 ARGOS satellite positions of the Moss Landing Marine Laboratories (MLML) and University of California, Santa Cruz (UCSC) particle trap moorings, VERTEX 3, 11 November to 1 December 1982.

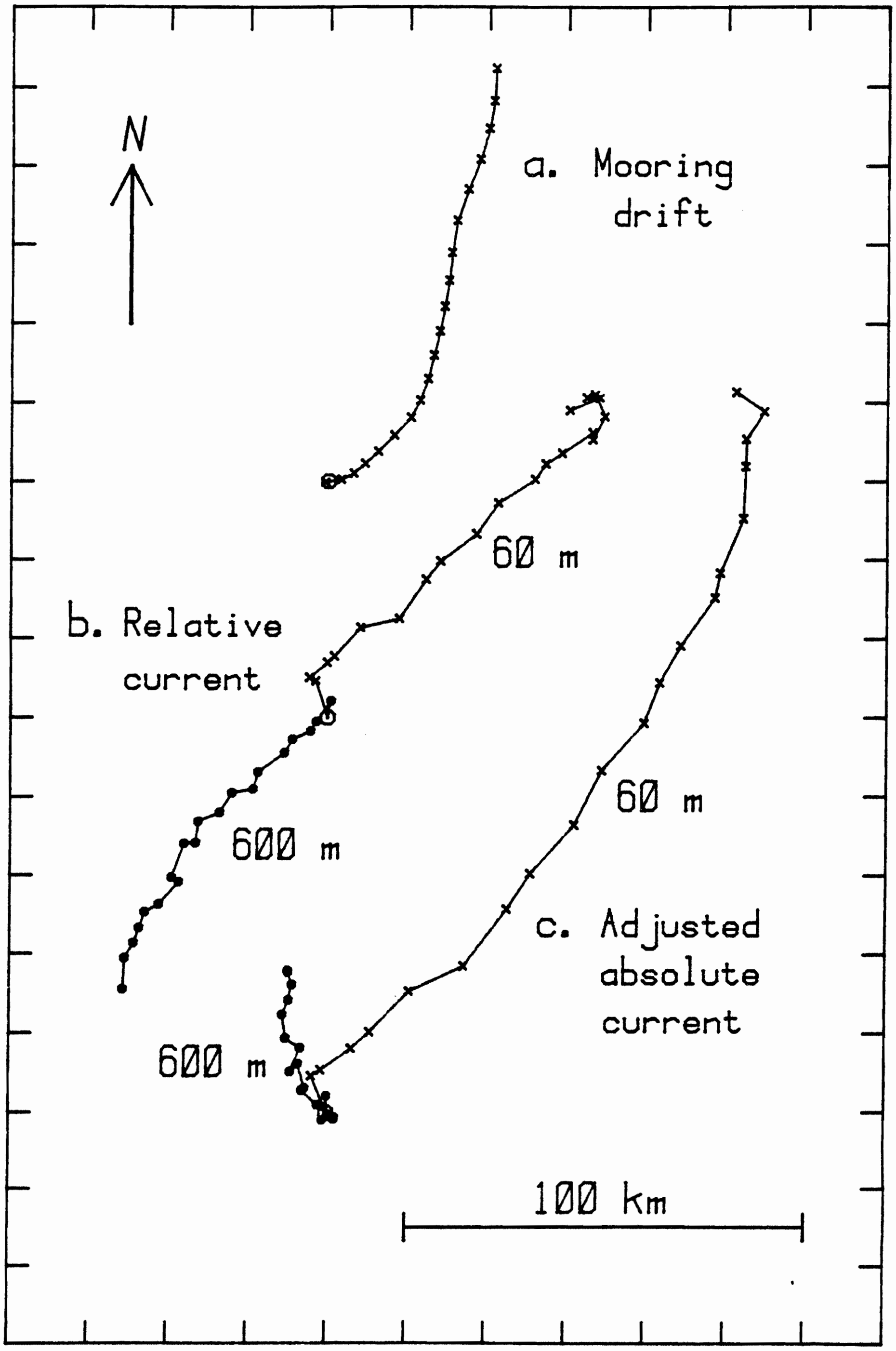

Fig. 40 Progressive vector plots of daily mean currents on the MLML trap mooring, VERTEX 3, 11 November to 1 December 1982. Mooring drift was determined from smoothed ARGOS positions; adjusted absolute current is the vector sum of the interpolated mooring drift and the daily mean relative currents.

OCEANOGRAPHIC DATA REPORT

Vertex III Positional Data

Vertex III, Legs 1, 2 and 3
28 October to 27 November 1982

Station	CTD#	GMT (hhmm)	Date (1982)	Lat ° ′	Long ° ′	Max Depth (m)	Aux Sensor down	Aux Sensor up
1	1170	2112	28 Oct	29 60	119 60	1520	% Trans	Fluoro
2	1172	2359	30 Oct	27 30	117 00	980	% Trans	
3	1174	0220	31 Oct	24 30	114 30	1520	% Trans	Fluoro
4	1176	0324	01 Nov	22 00	111 60	1520	% Trans	
5	1178	0119	02 Nov	19 59	109 59	1520	% Trans	Fluoro
7	1180	2316	07 Nov	16 09	107 03	1520	% Trans	Fluoro
	1182	0336	08 Nov	16 11	107 04	200	% Trans	
8	1184	1509	08 Nov	15 10	106 60	1520	% Trans	Fluoro
	1186	1931	08 Nov	15 11	107 00	208	% Trans	Fluoro
9	1188	0351	09 Nov	15 10	108 00	1520	% Trans	Fluoro
	1190	0827	09 Nov	15 11	108 02	498	% Trans	Fluoro
10	1192	1657	09 Nov	16 10	108 00	1520	% Trans	Fluoro
	1194	2052	09 Nov	16 09	107 59	198	% Trans	Fluoro
11	1196	0248	10 Nov	15 41	107 32	1520	% Trans	Fluoro
	1198	0632	10 Nov	15 39	107 31	204	% Trans	Fluoro
12	1200	0001	15 Nov	17 10	107 30	1520	% Trans	Fluoro
13	1202	1215	15 Nov	16 24	108 16	1520	% Trans	Fluoro
14	1204	0017	16 Nov	15 42	108 57	1520	% Trans	Fluoro
15	1206	1510	16 Nov	15 47	107 18	1520	Biolum	Fluoro
16	1210	1806	17 Nov	16 08	107 32	1520	Biolum	Fluoro
17	1212	0049	18 Nov	16 05	107 01	1520	Biolum	Fluoro
18	1214	1229	18 Nov	15 35	107 01	1520	Biolum	Fluoro
19	1216	1954	18 Nov	15 35	107 32	1520	Biolum	Fluoro
20	1219	1818	19 Nov	15 55	107 12	1520	Biolum	Fluoro
21	1222	1227	20 Nov	15 40	108 05	1520	% Trans	Fluoro
22	1224	0004	21 Nov	15 10	107 30	1520	% Trans	Fluoro
23	1226	1203	21 Nov	14 40	108 36	1520	% Trans	Fluoro
24	1228	0010	22 Nov	14 10	107 40	1520	% Trans	Fluoro
25	1230	1604	22 Nov	12 30	107 40	1520	% Trans	Fluoro
	1232	1913	22 Nov	12 29	107 43	505	Biolum	
26	1233	0415	23 Nov	11 15	107 40	1520	% Trans	Fluoro
	1235	0733	23 Nov	11 15	107 47	500	Biolum	
27	1236	1206	24 Nov	14 40	106 30	1520	% Trans	Fluoro
	1238	1526	24 Nov	14 40	106 30	505	Biolum	
28	1239	2356	24 Nov	15 40	106 05	1520	% Trans	Fluoro
	1241	0240	25 Nov	15 41	106 06	505	Biolum	
29	1242	1235	25 Nov	17 05	106 15	1520	% Trans	Fluoro
30	1244	2303	25 Nov	18 00	105 45	1520	% Trans	Fluoro
31	1246	0032	27 Nov	20 33	105 33	510	% Trans	
	1247	0142	27 Nov	20 33	105 32	510	Biolum	
	1248	0221	27 Nov	20 33	105 32	515	Fluoro	

Vertex III MLML PIT Positions
(by ARGOS Satellite Navigation)
10 November to 30 November 1982

Julian Day	GMT (hhmm)	N Lat °	N Lat '	W Long °	W Long '
314	0341	15	40.5	107	28.8
314	0944	15	41.3	107	29.9
314	1130	15	41.0	107	29.5
314	1437	15	41.3	107	29.2
314	1609	15	41.3	107	29.3
314	2237	15	40.9	107	28.1
315	0323	15	40.4	107	27.7
315	0932	15	40.6	107	26.9
315	1118	15	40.9	107	26.6
315	1407	15	41.0	107	27.0
315	1552	15	41.2	107	27.0
315	2225	15	41.0	107	26.1
316	0253	15	41.1	107	25.2
316	0920	15	41.0	107	25.1
316	1107	15	41.1	107	25.1
316	1349	15	41.6	107	25.1
316	1523	15	41.3	107	24.5
316	2213	15	41.8	107	23.6
317	0914	15	41.9	107	22.7
317	1049	15	41.9	107	22.9
317	2201	15	42.3	107	21.8
318	0205	15	42.5	107	22.4
318	0351	15	42.1	107	21.5
318	0902	15	42.7	107	21.4
318	1037	15	43.0	107	21.7
318	1436	15	43.4	107	21.4
318	1620	15	43.6	107	21.4
319	0142	15	44.6	107	20.2
319	0323	15	44.6	107	18.8
319	0849	15	44.3	107	19.8
319	1025	15	44.3	107	19.1
319	1412	15	44.6	107	19.6
319	1558	15	45.0	107	19.0
319	2135	15	45.0	107	19.0
319	2322	15	44.0	107	18.7
320	0259	15	45.5	107	17.7
320	1152	15	47.3	107	17.2
320	1355	15	46.4	107	17.6
320	1529	15	47.0	107	17.2
320	2123	15	47.9	107	15.9
320	2311	15	46.9	107	15.9

Vertex III MLML PIT Positions
(by ARGOS Satellite Navigation)
10 November to 30 November 1982

Julian Day	GMT (hhmm)	N Lat °	N Lat '	W Long °	W Long '
321	1000	15	48.6	107	14.7
321	1145	15	48.7	107	14.9
321	1330	15	49.0	107	14.7
321	1505	15	49.1	107	14.8
321	2111	15	51.6	107	14.4
321	2254	15	49.7	107	13.9
322	0352	15	50.8	107	13.1
322	0949	15	51.2	107	13.4
322	1134	15	51.4	107	13.5
322	1442	15	51.8	107	13.0
322	1625	15	51.9	107	13.2
322	2241	15	52.3	107	12.4
323	0329	15	52.3	107	11.8
323	0937	15	53.5	107	12.1
323	1418	15	54.5	107	11.8
323	1603	15	54.6	107	12.2
323	2229	15	55.2	107	11.3
324	0305	15	55.9	107	10.9
324	0924	15	56.8	107	11.2
324	1111	15	57.0	107	11.2
324	1355	15	57.4	107	11.0
324	1541	15	57.7	107	11.1
324	2217	15	58.3	107	10.7
325	0242	15	59.1	107	10.0
325	0919	15	59.7	107	10.6
325	1052	16	00.1	107	10.2
325	1335	16	00.4	107	10.2
325	1511	16	00.7	107	10.0
325	2205	16	01.7	107	09.7
326	0217	16	02.0	107	10.6
326	0402	16	00.1	107	10.4
326	0906	16	03.2	107	10.7
326	1041	16	03.8	107	09.3
326	1626	16	05.2	107	09.4
327	0153	16	05.2	107	09.5
327	0340	16	04.1	107	08.5
327	0852	16	06.7	107	09.3
327	1028	16	06.9	107	09.3
327	1424	16	07.5	107	08.5
327	1609	16	07.3	107	08.9
327	2139	16	08.5	107	09.0

Vertex III MLML PIT Positions
(by ARGOS Satellite Navigation)
10 November to 30 November 1982

Julian Day	GMT (hhmm)	N Lat o	'	W Long o	'
327	2327	16	08.3	107	09.2
328	0311	16	09.2	107	08.2
328	0836	16	10.5	107	08.6
328	1400	16	11.0	107	08.5
328	1546	16	11.2	107	08.4
328	2128	16	12.0	107	08.6
328	2315	16	12.1	107	09.1
329	0248	16	13.0	107	07.5
329	1005	16	14.8	107	07.9
329	1149	16	15.7	107	08.2
329	1342	16	15.7	107	08.0
329	1516	16	16.0	107	07.3
329	2116	16	16.4	107	08.0
329	2258	16	16.1	107	08.1
330	0404	16	12.7	107	08.3
330	0953	16	19.8	107	06.6
330	1138	16	20.0	107	06.7
330	1632	16	15.5	107	07.2
330	2104	16	21.4	107	05.8
330	2252	16	21.4	107	04.6
331	0201	16	22.1	107	05.6
331	0340	16	21.5	107	04.9
331	0941	16	22.7	107	05.2
331	1126	16	22.9	107	05.4
331	1436	16	23.8	107	05.4
331	1609	16	23.6	107	05.3
331	2233	16	25.5	107	05.0
332	0322	16	26.8	107	04.0
332	0929	16	27.7	107	04.0
332	1115	16	28.2	107	04.0
332	1405	16	28.7	107	02.9
332	1551	16	28.2	107	03.5
332	2222	16	29.0	107	02.7
333	0252	16	30.0	107	02.8
333	0923	16	30.8	107	03.0
333	1057	16	31.4	107	03.5
333	1347	16	32.0	107	02.6
333	1522	16	32.2	107	03.1
333	2210	16	33.0	107	02.3
334	0409	16	34.8	107	02.7
334	0910	16	35.3	107	02.5
334	1045	16	35.0	107	01.9

Vertex III UCSC PIT Positions
(by ARGOS Satellite Navigation)
10 November to 29 November 1982

Julian Day	GMT (hhmm)	N Lat °	N Lat '	W Long °	W Long '
314	1609	15	42.4	107	27.8
314	2242	15	42.2	107	27.3
315	0322	15	41.6	107	26.8
315	0933	15	42.1	107	26.8
315	1118	15	42.2	107	26.6
315	1407	15	42.3	107	26.3
315	1552	15	42.2	107	25.9
315	2225	15	42.4	107	25.4
316	0254	15	42.4	107	24.9
316	0921	15	42.4	107	24.9
316	1106	15	42.4	107	24.7
316	1347	15	42.6	107	24.7
316	1523	15	42.8	107	24.2
316	2212	15	43.0	107	23.6
317	0913	15	43.1	107	23.2
317	1049	15	43.2	107	23.1
317	2200	15	43.6	107	21.7
318	0205	15	43.9	107	22.5
318	0350	15	44.4	107	21.8
318	0900	15	44.0	107	21.8
318	1037	15	44.2	107	21.8
318	1436	15	44.7	107	21.8
319	0142	15	45.3	107	20.8
319	0322	15	45.1	107	19.8
319	1024	15	45.4	107	19.6
319	1413	15	46.0	107	19.6
319	1557	15	46.0	107	19.1
319	2135	15	46.3	107	19.0
320	0304	15	46.9	107	17.8
320	1355	15	48.0	107	17.5
320	1528	15	48.2	107	17.2
320	2123	15	48.9	107	16.2
320	2311	15	48.5	107	15.7

Vertex 111 UCSC PIT Positions
(by ARGOS Satellite Navigation)
10 November to 29 November 1982

Julian Day	GMT (hhmm)	N Lat °	'	W Long °	'
321	1001	15	49.7	107	15.1
321	1144	15	49.7	107	15.4
321	1506	15	50.2	107	14.8
321	2112	15	51.1	107	14.6
321	2259	15	51.1	107	13.9
322	0213	15	51.5	107	14.5
322	0948	15	52.4	107	13.4
322	1134	15	52.8	107	13.1
322	1441	15	53.1	107	13.5
322	2241	15	53.5	107	12.5
323	0328	15	53.2	107	12.2
323	0937	15	55.1	107	12.3
323	1418	15	55.8	107	12.2
323	1602	15	55.9	107	11.9
323	2230	15	56.5	107	11.3
324	0304	15	57.1	107	11.2
324	0925	15	58.0	107	11.3
324	1111	15	58.3	107	11.2
324	1355	15	58.7	107	11.1
324	1539	15	58.9	107	10.9
324	2217	15	59.6	107	10.5
325	0241	16	00.4	107	09.9
325	0916	16	01.4	107	10.6
325	1052	16	01.5	107	10.3
325	1510	16	02.0	107	09.8
325	2204	16	02.9	107	09.8
326	0217	16	03.2	107	10.4
326	1041	16	04.7	107	09.4
327	0154	16	06.7	107	09.6
327	0339	16	05.9	107	08.8
327	1029	16	08.0	107	09.1
327	1424	16	08.6	107	09.1

Vertex III UCSC PIT Positions
(by ARGOS Satellite Navigation)
10 November to 29 November 1982

Julian Day	GMT (hhmm)	N Lat °	'	W Long °	'
327	1607	16	08.9	107	08.8
327	2141	16	09.5	107	09.7
328	0311	16	10.3	107	08.2
328	1401	16	12.2	107	08.5
328	1545	16	12.4	107	08.2
328	2128	16	13.2	107	08.7
329	0248	16	14.3	107	07.5
329	1006	16	16.0	107	08.1
329	1341	16	16.7	107	07.8
329	1517	16	16.9	107	07.4
329	2113	16	17.6	107	07.8
330	0224	16	18.8	107	08.5
330	0954	16	20.9	107	07.1
330	1138	16	21.3	107	06.7
330	2104	16	22.8	107	05.7
330	2250	16	22.6	107	05.2
331	0341	16	23.5	107	04.7
331	0940	16	24.0	107	05.4
331	1125	16	24.1	107	05.3
331	1435	16	25.0	107	05.5
331	1609	16	25.0	107	05.2
331	2233	16	26.8	107	05.0
332	0322	16	27.9	107	04.6
332	0929	16	29.0	107	04.3
332	1115	16	29.2	107	04.1
332	1406	16	29.7	107	03.9
332	1551	16	29.7	107	03.6
332	2222	16	30.2	107	03.1
333	0252	16	31.0	107	03.3
333	0922	16	31.9	107	03.4
333	1057	16	32.2	107	03.5
333	1348	16	32.8	107	03.6

Daily Mean PIT Mooring Velocities
Relative and Absolute Current Velocities at 60 and 600 meters

Vertex III
10 November to 30 November 1982

GMT DAY	MOORING Speed cm/s	MOORING Dir deg	RELATIVE @ 60 m Speed cm/s	RELATIVE @ 60 m Dir deg	ABSOLUTE @ 60 m Speed cm/s	ABSOLUTE @ 60 m Dir deg	RELATIVE @ 600 m Speed cm/s	RELATIVE @ 600 m Dir deg	ABSOLUTE @ 600 m Speed cm/s	ABSOLUTE @ 600 m Dir deg
314.7	5.6	82	3.1	109	8.6	92	5.8	223	3.8	155
315.7	4.7	82	9.9	357	11.3	22	3.1	284	2.2	52
316.7	4.7	80	2.1	297	3.2	57	7.4	215	5.3	177
317.7	4.1	63	6.7	50	10.8	55	3.3	210	2.2	115
318.7	4.4	49	2.8	47	7.2	48	5.8	245	2.0	283
319.7	5.2	47	11.3	42	16.5	44	4.6	211	1.5	105
320.7	6.6	44	11.5	77	17.5	65	9.5	233	3.2	252
321.7	7.1	43	13.8	34	20.9	37	5.2	196	3.4	85
322.7	5.6	28	6.8	37	12.4	33	6.3	259	5.3	317
323.7	6.6	20	13.3	52	19.2	42	6.8	212	1.4	291
324.7	7.0	13	11.1	35	17.9	26	6.7	247	6.2	313
325.7	7.2	13	12.6	57	18.5	42	6.3	187	1.1	49
326.7	7.4	11	5.5	34	12.7	21	3.4	266	7.4	345
327.7	7.7	10	5.7	57	12.3	30	10.5	200	3.2	224
328.7	8.3	6	10.7	56	17.2	34	2.4	123	7.5	23
329.7	9.6	9	2.1	180	7.5	12	8.8	222	5.2	304
330.7	9.7	19	7.7	27	17.4	22	4.7	240	6.9	352
331.7	9.5	21	7.1	336	15.4	2	4.9	200	4.6	23
332.7	9.3	16	2.6	249	8.1	1	4.7	199	4.7	12
333.7	8.3	10	3.7	90	9.6	32	5.1	210	3.9	343
334.7	9.5	3	9.3	247	10.0	305	9.1	184	0.4	342

Table 6. Selected CTD profiling data from VERTEX 3, Leg 3. Data from other stations are available upon request.

Depth	=	sampling depth, in meters
Temp	=	*in situ* temperature, Celsius
Theta	=	potential temperature, Celsius
Salin	=	salinity, practical salinity units
Sigma-t	=	potential density anomaly, g/liter
Geop Anom	=	geopotential anomaly, dynamic meters
Oxygen	=	dissolved oxygen concentration, umoles/kg
Sat	=	percentage oxygen saturation from solubility relations of Postman, *et al*.
Trans	=	beam transmittance at 520 nm, %/m
Pigments	=	approximate pigment concentration from *in situ* fluorescence, ug/liter
Biolum	=	relative stimulated bioluminescence, data are logarithmically scaled

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MOSS LANDING MARINE LABORATORIES

Vertical Profiling Data

CRUISE: Vertex 3
1510 (GMT) 16 Nov 1982
Latitude 15*47' N

STATION: 15
Wind 2 kts; Wave 2 ft
Longitude 107*18' W

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	Biolum	Pigments mg/m^3
0	28.22	28.22	34.08	21.65	0.000	204	104	5	0.04
5	28.22	28.22	34.06	21.64	0.031	204	103	2	0.04
10	28.21	28.21	34.06	21.64	0.062	204	103	19	0.04
15	28.20	28.20	34.05	21.64	0.093	204	103	15	0.05
20	28.17	28.16	34.08	21.67	0.123	204	103	10	0.04
25	28.10	28.09	34.12	21.73	0.154	204	103	8	0.05
30	27.68	27.68	34.19	21.91	0.184	204	103	20	0.05
35	27.12	27.11	34.17	22.08	0.214	202	101	28	0.05
40	26.55	26.54	34.22	22.30	0.242	188	93	25	0.10
45	25.95	25.94	34.29	22.53	0.269	185	91	23	0.43
50	24.96	24.95	34.23	22.80	0.295	149	72	30	0.52
55	23.77	23.76	34.28	23.18	0.320	138	65	48	0.55
60	22.59	22.58	34.36	23.58	0.343	126	58	42	0.48
65	21.99	21.97	34.40	23.78	0.364	142	65	36	0.39
70	21.33	21.32	34.37	23.94	0.384	106	48	37	0.34
75	20.87	20.86	34.38	24.08	0.404	63	28	35	0.30
80	19.49	19.48	34.49	24.52	0.422	31	14	42	0.18
85	18.27	18.26	34.55	24.88	0.439	17	7	36	0.09
90	16.80	16.78	34.60	25.27	0.453	10	4	40	0.09
95	15.85	15.83	34.64	25.53	0.466	2	1	24	0.20
100	15.29	15.27	34.68	25.68	0.479	1	1	9	0.26
110	14.68	14.66	34.72	25.84	0.502	2	1	2	0.28
120	14.19	14.17	34.80	26.01	0.523	1	0	0	0.27
130	13.84	13.82	34.79	26.08	0.543	1	0	1	0.21
140	13.39	13.37	34.78	26.16	0.562	1	0	1	0.16
150	13.13	13.11	34.76	26.20	0.581	1	0	1	0.11
160	12.96	12.93	34.80	26.26	0.599	1	0	1	0.10
170	12.79	12.77	34.79	26.29	0.617	1	0	1	0.09
180	12.66	12.64	34.82	26.34	0.635	1	0	1	0.09
190	12.54	12.51	34.81	26.36	0.652	1	0	1	0.08
200	12.45	12.42	34.84	26.39	0.669	1	0	1	0.08
210	12.34	12.31	34.80	26.39	0.686	1	0	1	0.08
220	12.20	12.17	34.78	26.40	0.703	1	0	1	0.09
230	12.13	12.10	34.80	26.43	0.720	1	0	1	0.09
240	11.95	11.92	34.79	26.45	0.737	1	0	2	0.09
250	11.83	11.80	34.76	26.45	0.753	1	0	1	0.09
260	11.75	11.71	34.76	26.47	0.770	1	0	1	0.11

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	BioLum	Pigments mg/m^3
260	11.75	11.71	34.76	26.47	0.770	1	0	1	0.11
270	11.56	11.52	34.75	26.50	0.786	1	0	1	0.10
280	11.45	11.41	34.74	26.51	0.802	1	0	1	0.11
290	11.29	11.25	34.74	26.54	0.818	1	0	1	0.10
300	11.15	11.11	34.73	26.56	0.833	0	0	2	0.11
310	11.05	11.00	34.73	26.57	0.849	0	0	1	0.11
320	10.93	10.89	34.75	26.61	0.864	1	0	4	0.13
330	10.79	10.75	34.71	26.61	0.879	1	0	3	0.12
340	10.62	10.58	34.70	26.63	0.895	1	0	2	0.12
350	10.48	10.43	34.72	26.67	0.909	1	0	1	0.12
360	10.36	10.31	34.73	26.70	0.924	1	0	2	0.13
370	10.22	10.18	34.73	26.72	0.938	1	0	1	0.13
380	10.13	10.08	34.68	26.70	0.953	1	0	1	0.13
390	10.01	9.96	34.67	26.71	0.967	1	0	2	0.13
400	9.86	9.81	34.65	26.72	0.981	1	0	1	0.14
410	9.73	9.68	34.66	26.75	0.995	1	0	1	0.14
420	9.46	9.41	34.63	26.78	1.009	1	0	1	0.13
430	9.27	9.22	34.64	26.81	1.022	1	0	1	0.13
440	9.15	9.10	34.59	26.79	1.036	1	0	1	0.13
450	9.03	8.98	34.61	26.83	1.049	1	1	2	0.13
460	8.96	8.90	34.63	26.86	1.062	2	1	1	0.13
470	8.77	8.72	34.60	26.86	1.075	2	1	2	0.13
480	8.61	8.55	34.61	26.90	1.088	2	1	1	0.13
490	8.44	8.38	34.59	26.90	1.101	2	1	2	0.12
500	8.30	8.25	34.55	26.90	1.113	2	1	1	0.13
550	7.61	7.56	34.57	27.01	1.173	3	1	2	0.12
600	7.12	7.06	34.54	27.06	1.229	3	1	0	0.10
650	6.75	6.69	34.58	27.14	1.282	4	1	0	0.10
700	6.41	6.34	34.49	27.12	1.335	4	1	0	0.09
750	6.05	5.97	34.54	27.20	1.385	4	1	0	0.08
800	5.69	5.62	34.49	27.21	1.433	5	2	0	0.08
850	5.40	5.33	34.54	27.28	1.480	5	2	1	0.08
900	5.09	5.01	34.48	27.27	1.525	7	2	4	0.08
950	4.83	4.75	34.54	27.35	1.568	9	3	0	0.08
1000	4.61	4.51	34.56	27.39	1.610	12	4	3	0.08
1050	4.42	4.32	34.53	27.39	1.651	14	5	1	0.08
1100	4.23	4.13	34.54	27.42	1.691	17	5	3	0.08
1150	3.99	3.89	34.57	27.47	1.728	22	7	1	0.08
1200	3.82	3.72	34.57	27.48	1.765	25	8	3	0.08
1250	3.68	3.57	34.57	27.50	1.800	28	9	1	0.08
1300	3.58	3.47	34.58	27.52	1.835	30	10	3	0.09
1350	3.48	3.37	34.62	27.56	1.869	33	10	0	0.08
1400	3.34	3.23	34.61	27.56	1.901	36	11	0	0.07
1450	3.19	3.08	34.58	27.56	1.934	40	12	1	0.08
1500	3.10	2.98	34.62	27.59	1.966	43	13	3	0.08

(1)# 1212/1

MOSS LANDING MARINE LABORATORIES

Vertical Profiling Data

CRUISE: Vertex 3 | STATIC 17
0049 (GMT) 18 Nov 1982 | Wind 2s; Wave 2 ft
Latitude 16*05' N | Longit 107*01' W

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	sat %	Biolum	Pigments mg/m^3
0	28.55	28.55	34.08	21.54	0.000	202	13	70	0.05
5	28.55	28.55	34.09	21.55	0.031	202	03	85	0.04
10	28.35	28.35	34.04	21.58	0.063	202	13	84	0.04
15	28.30	28.29	34.07	21.62	0.094	202	13	82	0.04
20	28.25	28.24	34.07	21.64	0.125	202	13	79	0.05
25	28.21	28.20	34.10	21.67	0.155	202	03	76	0.05
30	28.12	28.11	34.11	21.71	0.186	202	13	74	0.06
35	27.88	27.87	34.15	21.82	0.217	202	02	93	0.09
40	27.57	27.56	34.18	21.94	0.246	202	01	78	0.15
45	27.16	27.15	34.17	22.06	0.276	199	00	89	0.34
50	26.91	26.89	34.25	22.20	0.304	195	97	99	0.58
55	26.47	26.45	34.27	22.36	0.332	174	86	119	0.70
60	24.97	24.96	34.20	22.77	0.359	180	87	118	0.59
65	23.65	23.63	34.22	23.18	0.384	109	51	119	0.53
70	21.22	21.21	34.36	23.97	0.405	67	30	124	0.40
75	20.30	20.28	34.47	24.30	0.424	45	20	123	0.35
80	19.09	19.08	34.49	24.63	0.442	25	11	123	0.23
85	17.42	17.40	34.50	25.05	0.458	15	6	93	0.16
90	16.83	16.81	34.62	25.28	0.472	10	4	85	0.11
95	16.33	16.32	34.54	25.34	0.485	4	1	98	0.09
100	15.89	15.87	34.65	25.52	0.498	1	1	105	0.13
110	15.06	15.04	34.70	25.75	0.522	0	0	5	0.30
120	14.33	14.31	34.73	25.93	0.544	0	0	1	0.30
130	13.69	13.67	34.77	26.09	0.565	0	0	1	0.21
140	13.47	13.45	34.77	26.14	0.584	0	0	1	0.14
150	13.26	13.24	34.79	26.20	0.603	1	0	1	0.09
160	13.06	13.04	34.81	26.25	0.621	1	0	3	0.07
170	12.94	12.91	34.84	26.30	0.639	1	0	2	0.07
180	12.79	12.76	34.87	26.35	0.657	1	0	5	0.07
190	12.66	12.63	34.82	26.34	0.674	1	0	3	0.07
200	12.48	12.45	34.84	26.39	0.692	1	0	1	0.08
210	12.37	12.34	34.81	26.39	0.709	1	1	4	0.09
220	12.28	12.25	34.83	26.42	0.726	1	1	1	0.09
230	12.11	12.08	34.78	26.42	0.742	1	1	2	0.10
240	11.80	11.76	34.81	26.50	0.759	2	1	1	0.11
250	11.68	11.64	34.78	26.50	0.775	2	1	1	0.11
260	11.52	11.48	34.76	26.51	0.791	2	1	1	0.10

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	Biolum	Pigments mg/m^3
260	11.52	11.48	34.76	26.51	0.791	2	1	1	0.10
270	11.41	11.37	34.77	26.54	0.807	2	1	2	0.11
280	11.33	11.29	34.82	26.60	0.822	2	1	1	0.11
290	11.24	11.20	34.77	26.57	0.837	2	1	6	0.11
300	11.15	11.11	34.75	26.57	0.853	2	1	1	0.11
310	11.05	11.01	34.75	26.59	0.868	2	1	2	0.12
320	10.98	10.94	34.73	26.59	0.884	2	1	1	0.11
330	10.79	10.74	34.75	26.64	0.899	2	1	1	0.12
340	10.67	10.63	34.72	26.63	0.913	2	1	1	0.12
350	10.58	10.54	34.73	26.66	0.928	2	1	2	0.12
360	10.46	10.41	34.69	26.65	0.943	2	1	1	0.12
370	10.32	10.27	34.69	26.68	0.958	2	1	9	0.13
380	10.21	10.16	34.69	26.69	0.972	2	1	1	0.13
390	9.97	9.92	34.68	26.73	0.986	2	1	6	0.13
400	9.79	9.74	34.69	26.76	1.000	2	1	2	0.13
410	9.58	9.53	34.65	26.77	1.014	2	1	4	0.12
420	9.40	9.34	34.65	26.80	1.028	2	1	1	0.12
430	9.28	9.23	34.64	26.81	1.041	2	1	1	0.12
440	9.14	9.09	34.61	26.81	1.054	3	1	2	0.12
450	8.96	8.90	34.62	26.85	1.067	3	1	1	0.12
460	8.82	8.76	34.60	26.85	1.080	3	1	1	0.11
470	8.73	8.68	34.63	26.89	1.093	3	1	1	0.12
480	8.65	8.60	34.63	26.91	1.106	3	1	1	0.12
490	8.57	8.52	34.61	26.90	1.118	3	1	1	0.11
500	8.37	8.31	34.60	26.92	1.131	4	1	1	0.11
550	7.81	7.75	34.56	26.98	1.191	4	1	1	0.10
600	7.37	7.30	34.57	27.05	1.249	5	2	1	0.09
650	6.90	6.84	34.55	27.10	1.303	5	2	1	0.09
700	6.50	6.43	34.57	27.17	1.356	5	2	1	0.09
750	6.07	6.00	34.57	27.23	1.406	6	2	1	0.08
800	5.79	5.71	34.56	27.25	1.454	6	2	1	0.08
850	5.52	5.44	34.57	27.30	1.500	7	2	1	0.09
900	5.23	5.15	34.54	27.30	1.545	8	2	1	0.08
950	4.96	4.88	34.51	27.31	1.590	9	3	1	0.08
1000	4.77	4.67	34.59	27.40	1.632	11	3	7	0.09
1050	4.50	4.40	34.56	27.41	1.672	14	4	1	0.08
1100	4.26	4.16	34.57	27.44	1.712	17	5	8	0.08
1150	4.07	3.97	34.53	27.43	1.749	20	6	1	0.08
1200	3.86	3.76	34.56	27.48	1.786	24	8	4	0.08
1250	3.73	3.62	34.54	27.47	1.823	28	9	3	0.08
1300	3.61	3.50	34.55	27.49	1.859	31	10	3	0.08
1350	3.48	3.37	34.62	27.56	1.893	33	10	2	0.08
1400	3.35	3.23	34.58	27.54	1.926	36	11	2	0.08
1450	3.24	3.13	34.63	27.59	1.958	40	12	2	0.08
1500	3.11	2.99	34.57	27.56	1.989	43	13	3	0.08

MOSS LANDING MARINE LABORATORIES

Vertical Profiling Data

CRUISE: Vertex 3
0004 (GMT) 21 Nov 1982
Latitude 15*10' N

STATION: 22
Wind 2 kts; Wave 1 ft
Longitude 107*30' W

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	Trans %/m	Pigments mg/m^3
0	28.78	28.78	33.54	21.06	0.000	150	77	87	0.04
5	28.80	28.80	33.55	21.07	0.034	150	77	87	0.04
10	28.75	28.75	33.54	21.07	0.067	150	77	87	0.04
15	28.68	28.67	33.54	21.10	0.101	150	77	87	0.05
20	28.67	28.66	33.58	21.13	0.134	150	77	87	0.04
25	28.68	28.67	33.59	21.14	0.168	150	77	86	0.04
30	28.70	28.69	33.62	21.15	0.201	150	77	86	0.05
35	28.67	28.66	33.62	21.16	0.234	150	77	87	0.05
40	28.67	28.66	33.65	21.18	0.267	150	77	86	0.07
45	28.61	28.60	33.70	21.24	0.300	150	77	86	0.11
50	28.52	28.51	33.73	21.29	0.333	149	76	86	0.19
55	28.34	28.32	33.77	21.38	0.366	143	73	86	0.40
60	27.90	27.89	33.89	21.62	0.397	147	74	85	0.45
65	26.93	26.92	33.97	21.99	0.428	146	72	82	0.57
70	26.08	26.06	34.06	22.33	0.456	141	69	82	0.58
75	25.24	25.22	34.05	22.57	0.483	131	63	83	0.40
80	22.93	22.91	34.32	23.46	0.508	92	43	84	0.28
85	20.92	20.90	34.34	24.03	0.529	60	27	86	0.24
90	18.87	18.85	34.40	24.62	0.547	50	22	88	0.22
95	18.16	18.14	34.45	24.83	0.563	37	16	88	0.17
100	16.88	16.87	34.49	25.17	0.578	15	6	89	0.13
110	15.46	15.44	34.64	25.61	0.604	2	1	90	0.21
120	14.80	14.78	34.69	25.79	0.627	1	0	87	0.30
130	14.08	14.06	34.76	26.00	0.649	1	0	87	0.24
140	13.91	13.89	34.75	26.03	0.669	1	0	87	0.18
150	13.51	13.48	34.79	26.15	0.689	1	0	88	0.15
160	13.14	13.11	34.79	26.22	0.707	1	1	88	0.14
170	12.88	12.85	34.80	26.28	0.726	1	1	88	0.11
180	12.75	12.72	34.77	26.29	0.744	1	1	89	0.09
190	12.49	12.46	34.78	26.34	0.761	2	1	89	0.10
200	12.35	12.32	34.76	26.36	0.779	2	1	89	0.08
210	12.17	12.14	34.76	26.39	0.796	2	1	90	0.09
220	12.04	12.00	34.76	26.42	0.813	2	1	90	0.08
230	11.89	11.85	34.74	26.43	0.829	2	1	90	0.10
240	11.74	11.71	34.75	26.46	0.846	2	1	90	0.10
250	11.57	11.53	34.75	26.49	0.862	2	1	90	0.10
260	11.48	11.44	34.71	26.48	0.878	2	1	90	0.11

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	Trans %/m	Pigments mg/m^3
260	11.48	11.44	34.71	26.48	0.878	2	1	90	0.11
270	11.38	11.34	34.73	26.51	0.894	2	1	90	0.11
280	11.25	11.21	34.70	26.52	0.910	2	1	90	0.11
290	11.08	11.04	34.73	26.57	0.926	2	1	90	0.11
300	10.97	10.93	34.70	26.57	0.941	2	1	90	0.12
310	10.88	10.84	34.70	26.58	0.957	2	1	90	0.12
320	10.82	10.78	34.69	26.59	0.972	2	1	91	0.12
330	10.73	10.68	34.71	26.62	0.987	2	1	91	0.12
340	10.59	10.54	34.71	26.64	1.002	2	1	91	0.12
350	10.38	10.33	34.66	26.64	1.017	2	1	91	0.12
360	10.16	10.12	34.65	26.67	1.032	2	1	91	0.13
370	10.02	9.98	34.65	26.69	1.046	2	1	91	0.12
380	9.88	9.83	34.65	26.72	1.061	3	1	91	0.13
390	9.72	9.67	34.64	26.74	1.075	3	1	91	0.13
400	9.63	9.58	34.64	26.76	1.089	3	1	91	0.13
410	9.52	9.47	34.62	26.75	1.102	3	1	91	0.13
420	9.35	9.30	34.61	26.78	1.116	3	1	91	0.13
430	9.19	9.14	34.61	26.80	1.130	3	1	91	0.13
440	8.98	8.93	34.62	26.85	1.143	3	1	91	0.13
450	8.82	8.77	34.58	26.84	1.156	3	1	91	0.13
460	8.73	8.68	34.61	26.87	1.169	4	1	91	0.13
470	8.56	8.50	34.58	26.88	1.182	4	1	91	0.13
480	8.47	8.41	34.57	26.89	1.195	4	1	91	0.13
490	8.37	8.31	34.57	26.90	1.207	4	1	92	0.12
500	8.21	8.16	34.57	26.93	1.220	4	1	92	0.13
550	7.59	7.53	34.55	27.00	1.279	5	2	92	0.12
600	7.03	6.97	34.53	27.06	1.335	5	2	92	0.10
650	6.54	6.48	34.52	27.12	1.389	6	2	92	0.09
700	6.17	6.10	34.52	27.17	1.440	6	2	92	0.09
750	5.84	5.77	34.51	27.21	1.490	6	2	92	0.08
800	5.48	5.40	34.52	27.26	1.537	7	2	92	0.08
850	5.30	5.22	34.53	27.29	1.584	8	3	92	0.09
900	5.08	5.00	34.53	27.32	1.628	9	3	92	0.08
950	4.84	4.76	34.53	27.34	1.671	11	4	92	0.08
1000	4.59	4.49	34.58	27.41	1.713	14	4	92	0.08
1050	4.40	4.30	34.54	27.40	1.753	17	5	92	0.08
1100	4.20	4.10	34.55	27.43	1.792	20	6	92	0.08
1150	4.06	3.96	34.53	27.43	1.831	23	7	92	0.08
1200	3.93	3.83	34.55	27.46	1.868	26	8	92	0.08
1250	3.73	3.62	34.58	27.50	1.905	29	9	92	0.08
1300	3.66	3.55	34.58	27.51	1.940	32	10	92	0.08
1350	3.52	3.41	34.58	27.53	1.974	37	11	92	0.08
1400	3.38	3.26	34.59	27.54	2.008	40	13	92	0.07
1450	3.24	3.12	34.61	27.57	2.040	45	14	92	0.08
1500	3.08	2.96	34.62	27.60	2.072	52	16	92	0.07

MOSS LANDING MARINE LABORATORIES

Vertical Profiling Data

CRUISE: Vertex 3
1203 (GMT) 21 Nov 1982
Latitude 14*40' N

STATION: 23
Wind 2 kts; Wave 2 ft
Longitude 108*36' W

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	Trans %/m	Pigments mg/m^3
0	28.21	28.21	33.61	21.31	0.000	209	106	86	0.05
5	28.21	28.21	33.64	21.33	0.032	208	106	86	0.05
10	28.21	28.21	33.63	21.32	0.065	209	106	88	0.05
15	28.22	28.21	33.64	21.32	0.097	209	106	87	0.05
20	28.22	28.21	33.64	21.33	0.130	208	106	87	0.05
25	28.21	28.21	33.64	21.32	0.162	209	106	87	0.05
30	28.22	28.21	33.65	21.33	0.195	208	106	87	0.05
35	28.21	28.20	33.66	21.34	0.227	208	106	87	0.05
40	28.21	28.20	33.66	21.34	0.259	208	106	87	0.06
45	28.21	28.20	33.64	21.33	0.292	208	106	87	0.35
50	27.58	27.57	33.83	21.67	0.324	209	105	85	0.48
55	27.13	27.12	33.93	21.89	0.354	206	103	84	0.52
60	26.88	26.87	34.16	22.14	0.383	205	102	83	0.53
65	26.40	26.39	34.29	22.40	0.411	199	98	83	0.50
70	23.91	23.89	34.26	23.13	0.437	133	63	83	0.42
75	22.11	22.10	34.40	23.75	0.459	100	46	84	0.35
80	21.08	21.06	34.47	24.09	0.479	81	36	84	0.32
85	20.37	20.35	34.51	24.32	0.498	59	26	86	0.25
90	18.94	18.92	34.53	24.70	0.515	36	16	87	0.20
95	17.98	17.97	34.58	24.97	0.531	20	8	87	0.16
100	16.49	16.47	34.69	25.42	0.545	6	2	88	0.12
110	15.53	15.51	34.69	25.63	0.570	3	1	89	0.09
120	14.53	14.51	34.73	25.88	0.593	1	0	90	0.09
130	13.86	13.84	34.75	26.04	0.613	1	0	90	0.10
140	13.58	13.56	34.76	26.11	0.633	1	0	90	0.09
150	13.33	13.31	34.78	26.17	0.652	1	0	90	0.09
160	13.11	13.09	34.75	26.20	0.671	1	0	90	0.09
170	12.92	12.90	34.76	26.24	0.690	1	0	89	0.09
180	12.81	12.78	34.74	26.25	0.708	1	0	90	0.09
190	12.57	12.54	34.75	26.30	0.726	2	1	90	0.09
200	12.35	12.33	34.75	26.34	0.744	3	1	91	0.07
210	12.15	12.12	34.74	26.38	0.761	4	1	91	0.07
220	12.03	12.00	34.77	26.42	0.778	4	2	91	0.07
230	11.93	11.90	34.76	26.44	0.795	4	2	91	0.08
240	11.80	11.77	34.74	26.45	0.811	2	1	91	0.09
250	11.59	11.56	34.73	26.48	0.828	2	1	90	0.09
260	11.47	11.44	34.75	26.52	0.844	2	1	90	0.09

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	Trans %/m	Pigments mg/m^3
260	11.47	11.44	34.75	26.52	0.844	2	1	90	0.09
270	11.35	11.31	34.74	26.53	0.860	2	1	90	0.10
280	11.22	11.18	34.73	26.55	0.875	2	1	90	0.10
290	11.08	11.04	34.71	26.55	0.891	2	1	91	0.10
300	10.96	10.92	34.72	26.58	0.907	2	1	90	0.11
310	10.88	10.84	34.67	26.56	0.922	2	1	90	0.11
320	10.74	10.70	34.70	26.61	0.937	2	1	90	0.11
330	10.69	10.64	34.67	26.59	0.953	2	1	90	0.12
340	10.50	10.45	34.68	26.64	0.968	2	1	90	0.11
350	10.35	10.30	34.68	26.66	0.982	2	1	91	0.11
360	10.22	10.17	34.66	26.67	0.997	2	1	90	0.12
370	10.10	10.05	34.63	26.67	1.012	2	1	90	0.11
380	9.89	9.84	34.63	26.70	1.026	2	1	91	0.12
390	9.78	9.74	34.63	26.72	1.040	2	1	91	0.11
400	9.71	9.66	34.62	26.72	1.055	2	1	91	0.11
410	9.54	9.49	34.59	26.73	1.069	3	1	91	0.11
420	9.46	9.41	34.59	26.74	1.083	3	1	91	0.11
430	9.32	9.27	34.59	26.76	1.097	3	1	91	0.11
440	9.23	9.18	34.60	26.79	1.110	3	1	91	0.11
450	9.13	9.08	34.59	26.80	1.124	3	1	91	0.11
460	9.03	8.98	34.59	26.81	1.138	3	1	91	0.11
470	8.86	8.81	34.58	26.84	1.151	3	1	91	0.11
480	8.67	8.62	34.58	26.86	1.164	3	1	91	0.11
490	8.46	8.40	34.54	26.87	1.177	3	1	92	0.11
500	8.26	8.20	34.54	26.89	1.189	4	1	92	0.10
550	7.66	7.60	34.54	26.99	1.251	4	1	92	0.10
600	7.28	7.22	34.52	27.02	1.309	5	2	92	0.09
650	6.77	6.71	34.51	27.09	1.365	5	2	92	0.09
700	6.40	6.33	34.53	27.15	1.418	6	2	92	0.09
750	6.06	5.99	34.51	27.18	1.470	6	2	92	0.09
800	5.84	5.76	34.53	27.22	1.519	7	2	92	0.09
850	5.50	5.42	34.51	27.25	1.566	8	3	92	0.08
900	5.28	5.19	34.54	27.30	1.612	9	3	92	0.08
950	5.00	4.92	34.54	27.33	1.656	11	4	92	0.08
1000	4.72	4.62	34.52	27.35	1.699	14	4	92	0.10
1050	4.50	4.40	34.54	27.39	1.741	18	6	92	0.08
1100	4.33	4.22	34.56	27.42	1.781	21	7	92	0.08
1150	4.18	4.07	34.53	27.41	1.820	23	7	92	0.10
1200	3.99	3.89	34.56	27.46	1.858	27	9	92	0.11
1250	3.84	3.73	34.56	27.47	1.895	31	10	92	0.08
1300	3.68	3.57	34.57	27.50	1.931	36	11	92	0.09
1350	3.52	3.41	34.58	27.52	1.966	40	12	92	0.12
1400	3.40	3.29	34.60	27.55	1.999	44	14	92	0.09
1450	3.28	3.17	34.60	27.56	2.032	47	15	92	0.08
1500	3.17	3.05	34.60	27.57	2.064	52	16	92	0.08

MOSS LANDING MARINE LABORATORIES

Vertical Profiling Data

CRUISE: Vertex 3
1235 (GMT) 25 Nov 1982
Latitude 17*05' N

STATION: 29
Wind 1 kts; Wave 1 ft
Longitude 106*15' W

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	Trans %/m	Pigments mg/m^3
0	28.53	28.53	33.61	21.20	0.000	209	106	87	0.06
5	28.53	28.53	33.61	21.20	0.033	209	106	87	0.05
10	28.54	28.53	33.63	21.22	0.066	209	106	87	0.05
15	28.53	28.53	33.64	21.22	0.099	209	106	87	0.05
20	28.54	28.54	33.61	21.20	0.132	209	106	88	0.06
25	28.54	28.53	33.63	21.21	0.165	209	106	87	0.06
30	28.54	28.53	33.63	21.21	0.198	209	106	88	0.05
35	28.20	28.19	33.69	21.37	0.231	209	106	85	0.05
40	28.35	28.34	33.87	21.45	0.263	209	106	86	0.05
45	28.33	28.32	33.89	21.47	0.294	209	106	87	0.11
50	28.18	28.17	33.92	21.55	0.326	204	104	85	0.26
55	27.75	27.73	33.94	21.71	0.357	199	100	84	0.37
60	27.20	27.18	34.10	22.00	0.387	197	99	84	0.36
65	25.98	25.97	34.23	22.48	0.415	176	86	84	0.31
70	24.40	24.38	34.30	23.02	0.441	146	70	85	0.25
75	23.04	23.02	34.24	23.37	0.465	126	59	85	0.25
80	22.33	22.31	34.38	23.68	0.486	113	52	86	0.18
85	21.66	21.64	34.40	23.88	0.507	101	46	87	0.17
90	20.57	20.55	34.33	24.12	0.527	66	30	87	0.15
95	19.17	19.15	34.51	24.62	0.545	51	22	88	0.10
100	18.20	18.18	34.65	24.97	0.561	35	15	88	0.07
110	16.75	16.74	34.58	25.27	0.590	12	5	89	0.13
120	16.12	16.10	34.65	25.47	0.616	5	2	89	0.22
130	15.35	15.33	34.70	25.68	0.641	1	0	89	0.27
140	14.84	14.82	34.72	25.81	0.664	1	0	87	0.26
150	14.29	14.26	34.75	25.95	0.686	1	0	86	0.24
160	14.01	13.98	34.73	26.00	0.707	1	0	86	0.22
170	13.52	13.50	34.77	26.13	0.727	1	0	87	0.18
180	13.22	13.20	34.79	26.21	0.746	1	0	88	0.15
190	12.91	12.88	34.82	26.29	0.764	1	0	88	0.12
200	12.63	12.60	34.81	26.34	0.782	1	0	89	0.10
210	12.41	12.38	34.79	26.36	0.799	1	1	89	0.09
220	12.22	12.19	34.79	26.40	0.816	1	1	89	0.09
230	12.03	12.00	34.80	26.45	0.833	2	1	89	0.10
240	11.89	11.86	34.77	26.45	0.849	2	1	89	0.10
250	11.65	11.62	34.74	26.47	0.866	2	1	89	0.10
260	11.51	11.48	34.76	26.52	0.882	2	1	89	0.11

Depth m	Temp C	Theta C	Salin ppt	Sigma-t g/l	Geop Anom m^2/s^2	Oxygen uM/kg	Sat %	Trans %/m	Pigments mg/m^3
260	11.51	11.48	34.76	26.52	0.882	2	1	89	0.11
270	11.38	11.34	34.75	26.53	0.898	2	1	89	0.11
280	11.31	11.27	34.74	26.54	0.913	2	1	90	0.11
290	11.10	11.06	34.74	26.58	0.929	3	1	90	0.11
300	10.98	10.94	34.73	26.59	0.944	3	1	90	0.12
310	10.86	10.81	34.72	26.60	0.960	3	1	90	0.12
320	10.76	10.72	34.69	26.59	0.975	3	1	90	0.12
330	10.60	10.55	34.70	26.64	0.990	3	1	90	0.12
340	10.52	10.47	34.72	26.66	1.005	3	1	90	0.12
350	10.43	10.39	34.71	26.67	1.019	3	1	90	0.12
360	10.26	10.21	34.68	26.68	1.034	3	1	90	0.13
370	10.10	10.05	34.67	26.70	1.048	3	1	90	0.13
380	9.90	9.86	34.65	26.72	1.063	4	1	90	0.13
390	9.76	9.71	34.67	26.75	1.077	4	1	90	0.13
400	9.61	9.56	34.64	26.76	1.090	4	1	90	0.13
410	9.53	9.48	34.66	26.78	1.104	4	1	90	0.13
420	9.37	9.32	34.65	26.80	1.118	4	1	91	0.13
430	9.25	9.20	34.62	26.80	1.131	4	1	91	0.12
440	9.10	9.05	34.61	26.82	1.145	4	1	91	0.13
450	8.97	8.91	34.60	26.83	1.158	4	1	91	0.12
460	8.78	8.73	34.58	26.85	1.171	4	1	91	0.12
470	8.62	8.57	34.59	26.88	1.184	4	1	91	0.11
480	8.49	8.44	34.58	26.89	1.196	4	1	91	0.11
490	8.39	8.34	34.58	26.90	1.209	4	1	91	0.11
500	8.23	8.17	34.57	26.93	1.221	4	2	91	0.11
550	7.62	7.56	34.56	27.01	1.281	5	2	91	0.10
600	7.23	7.17	34.53	27.04	1.338	5	2	92	0.10
650	6.81	6.74	34.53	27.10	1.392	6	2	92	0.09
700	6.37	6.30	34.50	27.13	1.445	6	2	92	0.09
750	5.98	5.91	34.51	27.19	1.496	6	2	92	0.08
800	5.61	5.54	34.51	27.24	1.544	6	2	92	0.08
850	5.35	5.27	34.53	27.28	1.590	7	2	92	0.08
900	5.11	5.03	34.53	27.31	1.635	9	3	92	0.08
950	4.88	4.79	34.54	27.35	1.678	10	3	92	0.08
1000	4.62	4.53	34.53	27.37	1.719	13	4	92	0.08
1050	4.41	4.31	34.54	27.40	1.760	17	5	92	0.08
1100	4.19	4.09	34.56	27.44	1.799	21	7	92	0.08
1150	4.01	3.91	34.58	27.47	1.837	25	8	92	0.08
1200	3.84	3.74	34.58	27.49	1.873	29	9	92	0.08
1250	3.74	3.64	34.56	27.49	1.909	32	10	92	0.08
1300	3.62	3.51	34.60	27.53	1.943	35	11	92	0.08
1350	3.46	3.35	34.60	27.54	1.977	40	12	92	0.08
1400	3.35	3.23	34.61	27.56	2.009	44	14	92	0.07
1450	3.24	3.13	34.63	27.59	2.041	47	15	92	0.08
1500	3.13	3.01	34.61	27.59	2.072	51	16	92	0.07