

Berichte
aus dem
Institut für Meereskunde
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ESACAN - Data report

por

C. Brockmann, E. Fahrbach y W. Urquizo

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Summary

From March to May 1977 the joint German-Peruvian investigation of the northern Peruvian upwelling area ESACAN ("Estudio del Sistema de Afloramiento Costero en el Area Norte") took place. Three current meter moorings were laid on a section along 5°S at depths of 104 m, 1360 m and 3820 m. On board the Peruvian research vessel "BAP Unanue" hydrographic casts, STD-measurements and current profiling measurements were carried out. Meteorological data were collected from five land stations and two buoys. Data are available from two further land stations; at one the sea-level was recorded; at the other the sea-surface temperature. The data obtained are presented in this paper.

Zusammenfassung

Von März bis Mai 1977 fand das deutsch-peruanische Gemeinschaftsprojekt ESACAN ("Estudio del Sistema de Afloramiento Costero en el Area Norte") zur Untersuchung der nördlichen Auftriebsregion vor der peruanischen Küste statt. Drei Strommesser-Verankerungen werden auf einem Schnitt entlang 5°S in 104 m, 1360 m und 3820 m Tiefe ausgelegt. An Bord des peruanischen Forschungsschiffes "BAP Unanue" wurde eine hydrographische Serienausrüstung, eine STD-Sonde und ein profilierender Strömungsmesser eingesetzt. Meteorologische Daten werden an 5 Landstationen und 2 Bojen gewonnen. Die Wasserstandsaufzeichnungen und Oberflächentemperaturmessungen von je einer Landstation stehen zur Verfügung. Das gesammelte Datenmaterial wird in diesem Band vorgelegt.

1. Introduction

One of the most important upwelling areas is situated off the Peruvian coast. Four regions are especially prominent. They are situated at $4^{\circ} - 6^{\circ} \text{ S}$, $7^{\circ} - 8^{\circ} \text{ S}$, $11^{\circ} - 12^{\circ} \text{ S}$ and $14^{\circ} - 15^{\circ} \text{ S}$. The most intense upwelling is encountered in the last area. In addition to the spatial change, there is a time variation with a pronounced annual period. The maximum upwelling is found in the southern hemispheric winter.

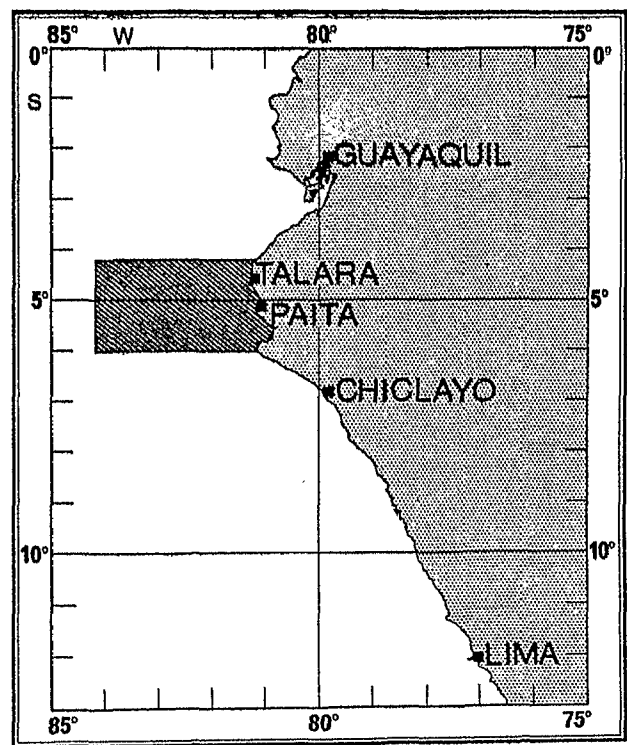


Figure 1

The location of ESACAN area

Between March and May 1977 two programmes for the investigation of these phenomena were undertaken: The US-investigation Joint II MAM 77 within the scope of the "Coastal Upwelling Ecosystem Analysis" (CUEA) programme in the southern area and the Westgerman-Peruvian "Estudio del Sistema de Afloramiento Costero en el Area Norte" (ESACAN) in the north. The location of the ESACAN area is depicted in Figure 1.

The northern upwelling area is of special interest because there coastal upwelling may interact with features typical of the equatorial region, for example the equatorial front and the equatorial undercurrent. Special conditions may be generated by the fact that the Peru current leaves the coast in this region. A dramatic change in the whole system occurs when the "El Nino" phenomenon takes place. The equatorial front advances far to the south and coastal upwelling is suppressed.

2. Measurements

In the period from March 27 to May 22 1977 stratification measurements were made from the Peruvian research vessel "BAP Unanue" in the northern upwelling area. These measurements were supplemented by current meter measurements from a moored array.

2.1. Navigation and bathymetry

On board "BAP Unanue" terrestrial and astronomical navigation were practised. The terrestrial navigation was carried out by radar and gave reasonable results (accuracy ± 1 nm) within a distance of 15 nm of the coast. Astronomical navigation could only yield very crude results, because of the restricted visibility. Further than 15 nm from the coast the position error may be as large as ± 5 nm; the accuracy depends mainly on the number of stations made without terrestrial navigation. However, the mooring positions, even those for which no radar fix was possible are exact to within 1 nm. Only the gross features of the bottom topography of the area under investigation are known (Fig. 2). A more detailed two-dimensional bathymetric survey did not seem justified during this cruise because of the limited navigational accuracy. However, to get some additional information to that given by existing charts, three bathymetric sections were carried out along $4^{\circ} 15' S$, $5^{\circ} 00' S$ and $6^{\circ} 00' S$

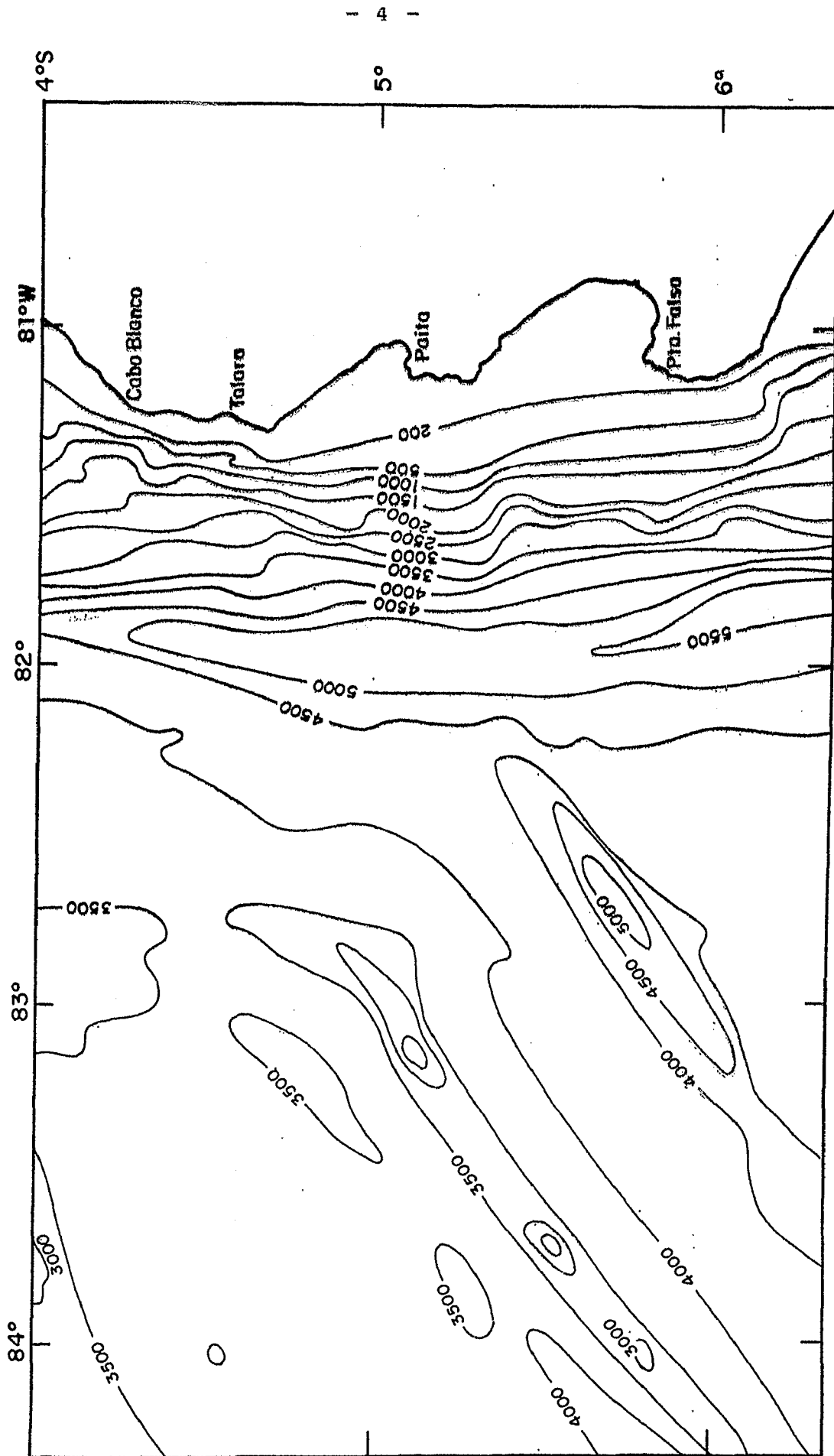
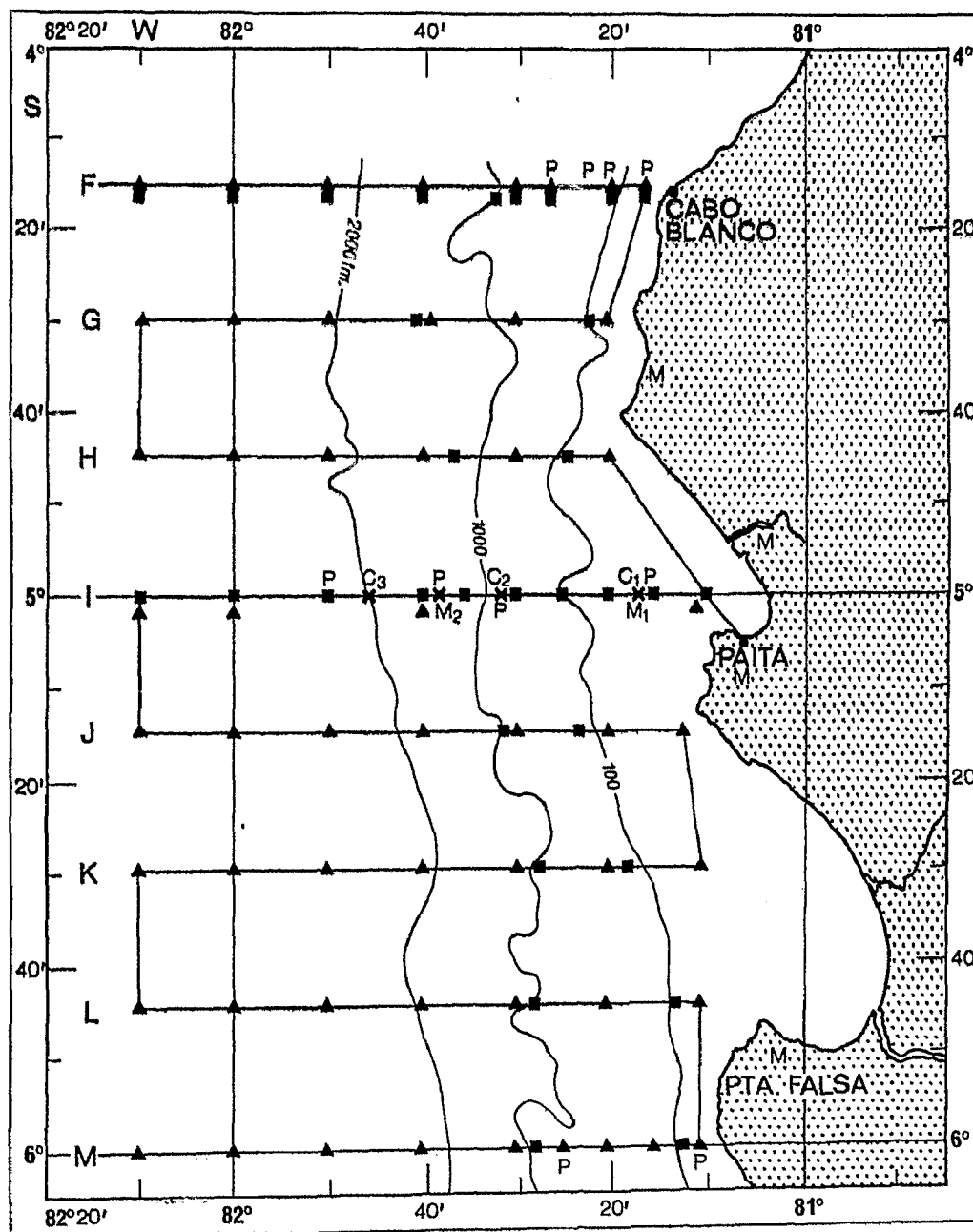


Figure 2. Bathymetric chart from Scripps Institution of Oceanography (depth in meters).



ESACAN AREA

- | | | |
|--------------------------|------------------------|---------------------------------|
| M Meteorological station | C Currentmeter mooring | P Currentmeter profiler station |
| ■ Hydrographic station | ▲ STD station | |

Figure 3. Location of measurements in the ESACAN area.

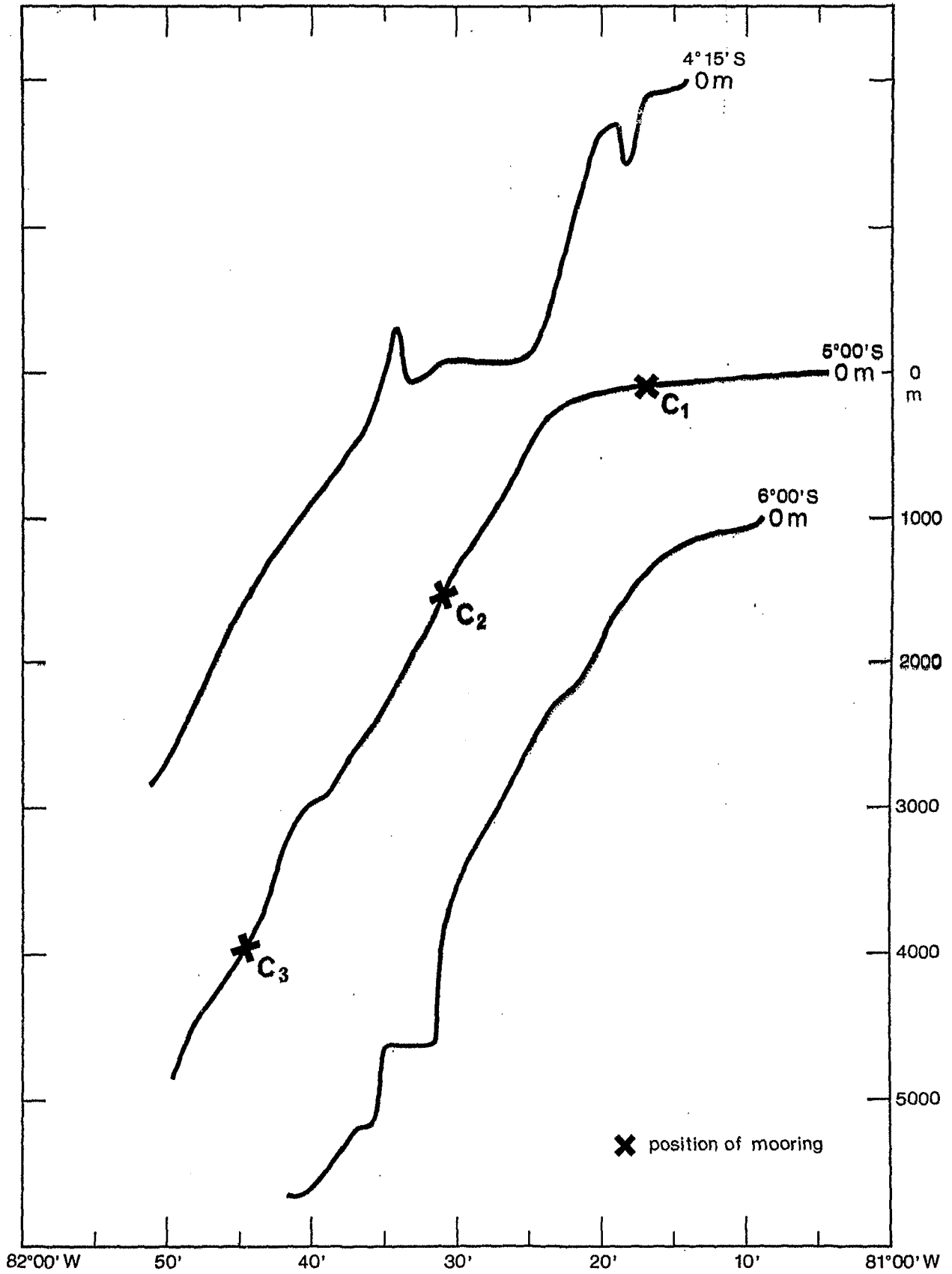


Figure 4. Bathymetric sections along 4°15'S, 5°00'S and 6°00'S.

(Fig. 4).

The measurements of the echosounder were corrected to agree with the depth values obtained from the readings of the pressure gauges in the moorings combined with the known cable length. Sound velocity corrections have not been applied because they are much smaller than the errors caused by instrumental problems.

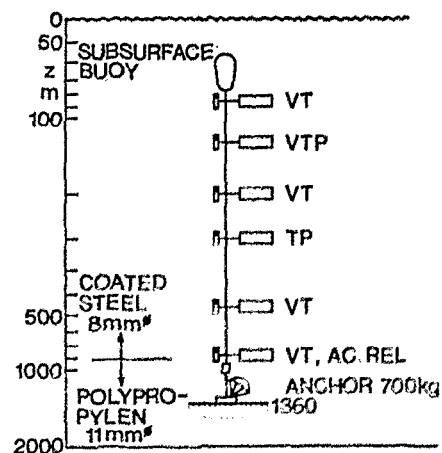
2.2. Moored instrument measurements

Three subsurface moorings with 16 Aanderaa RCM-4 current meters were located at the positions given in Figure 3 and 4. The moorings were maintained for about 50 days. The sampling interval was 10 minutes for all instruments. As an example a schematic representation of the mooring C2 is given in Figure 5.

Figure 5

Schematic representation of mooring C2

V = velocity sensor
T = temperature sensor
P = pressure sensor
AC.REL = acoustic release

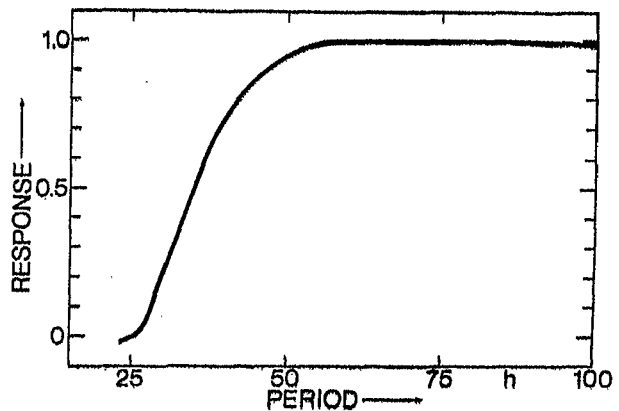


Unfortunately not all of the instruments worked without problems. The time series obtained are summarized in Table 1.

Because the aim of the experiment was to study upwelling phenomena with low frequency variations the time series of the hourly

means have been filtered by a Lanczos low pass filter with a half power point of 35 hours and 60 weights (Fig. 6).

Figure 6
Response of the applied
Lanczos low pass filter
(60 weights).



The results of the current measurements are presented in Figures 7 - 10. Current measurements are presented in two ways: as progressive vector diagrams (Fig. 7 and 8) and stick-plot diagrams (Fig. 9 and 10). The progressive vector diagrams consist of hourly values. The overall mean currents are presented in Figure 11. The instrumental accuracy of the Aanderaa current meters is given as $\pm 2\%$ of the measured speed and as ± 5 degrees for the direction. In Figure 12 the pressure traces are shown. Quite strong movements of the moorings are indicated in the records. The velocity generated by the movement of the mooring has been calculated for the deepening of C2 on April 30 as 0.16 cm s^{-1} , which is negligible in comparison with the recorded velocities of 15 cm s^{-1} . The high velocities shown in the record of mooring C2 in 560 m depth seem rather doubtful. But even the most painstaking inquiry did not reveal an instrumental or data processing error which could explain the surprising feature.

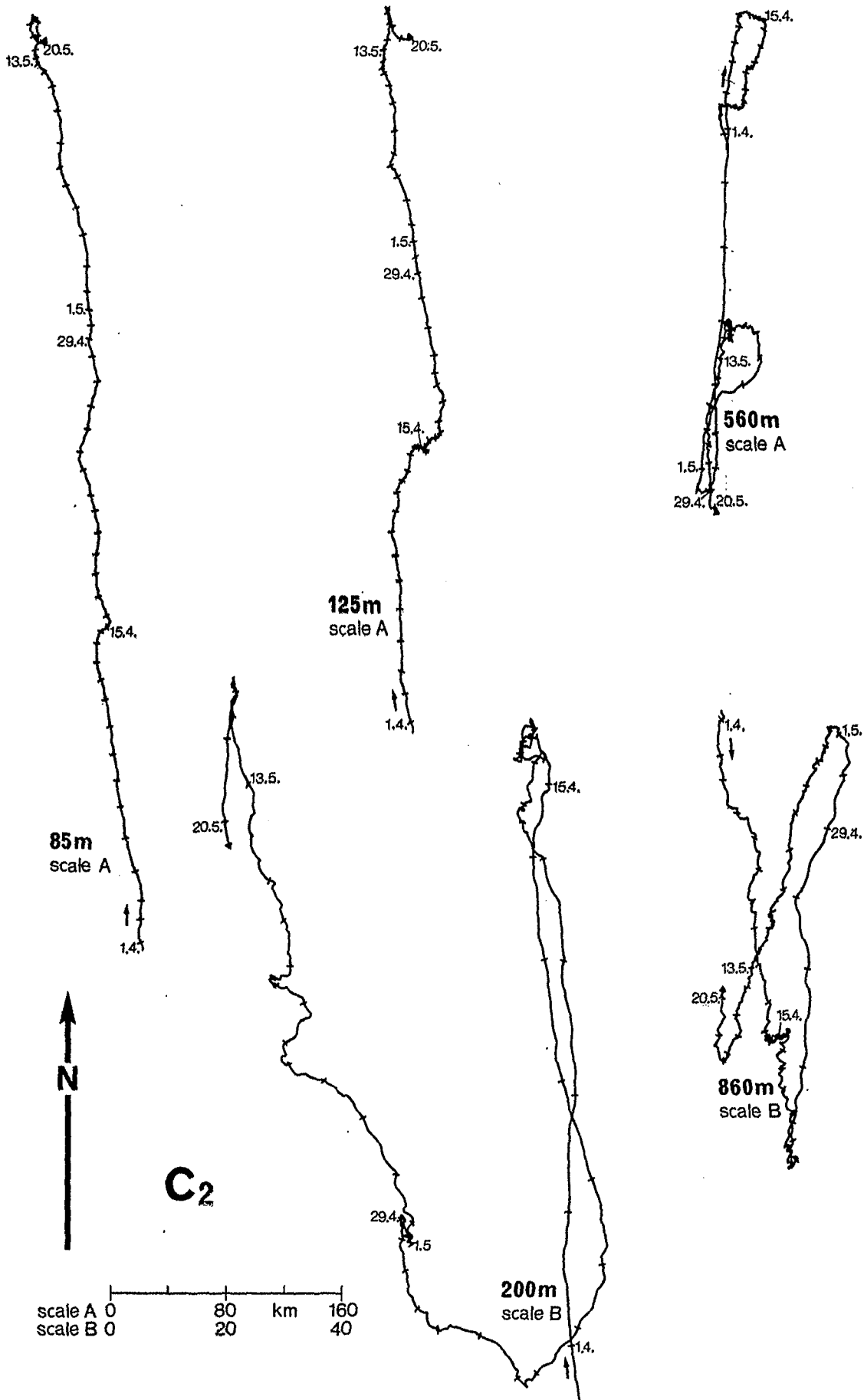


Figure 8. Progressive vector diagrams derived from the current meter time series at mooring C₂ (hourly mean values).

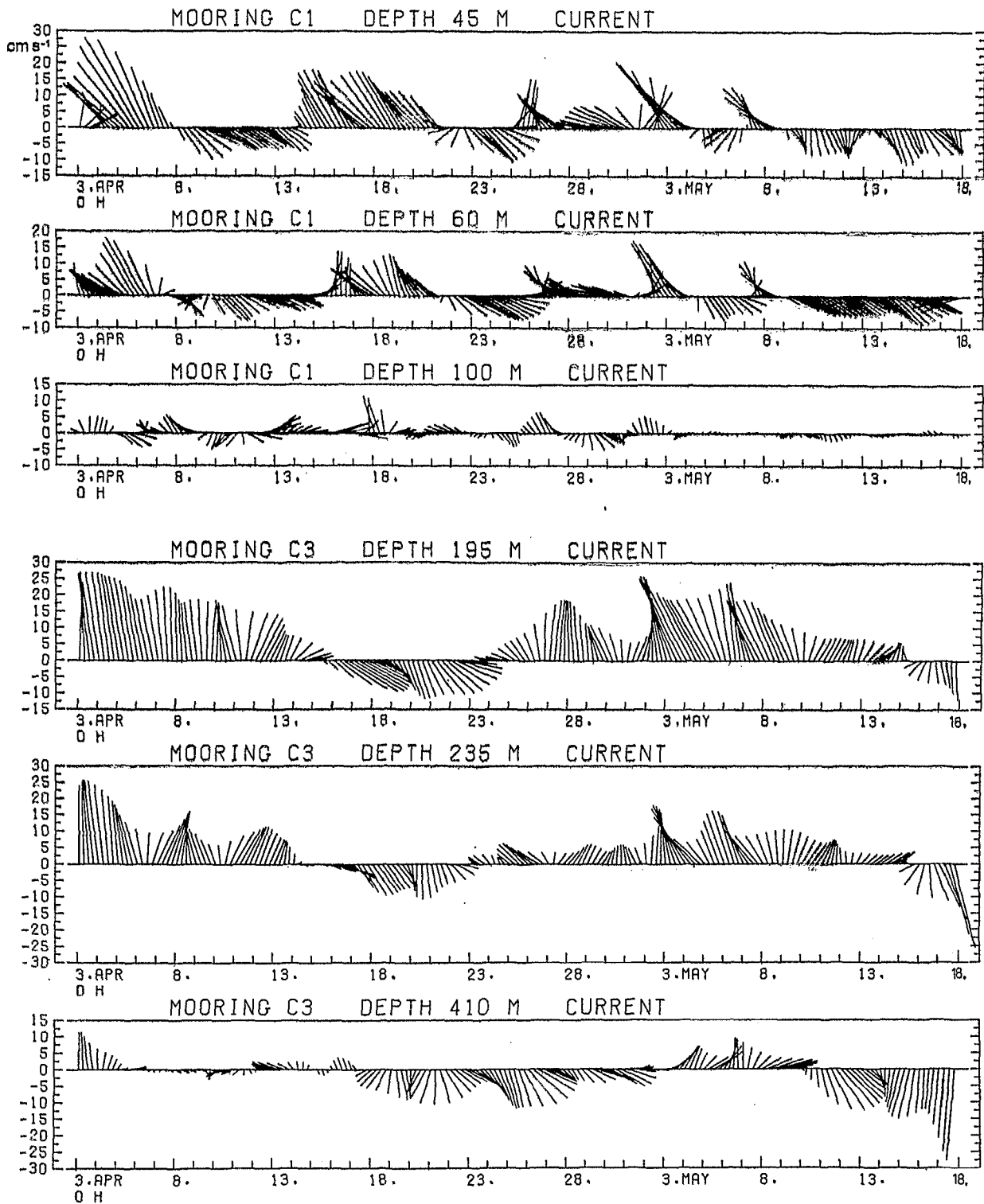


Figure 9. Stick-plot diagrams derived from the current meter time series at moorings C_1 and C_3 . For the deepest current meter of C_1 see caption of Figure 7 (low passed values at 6 hour interval). North is upwards.

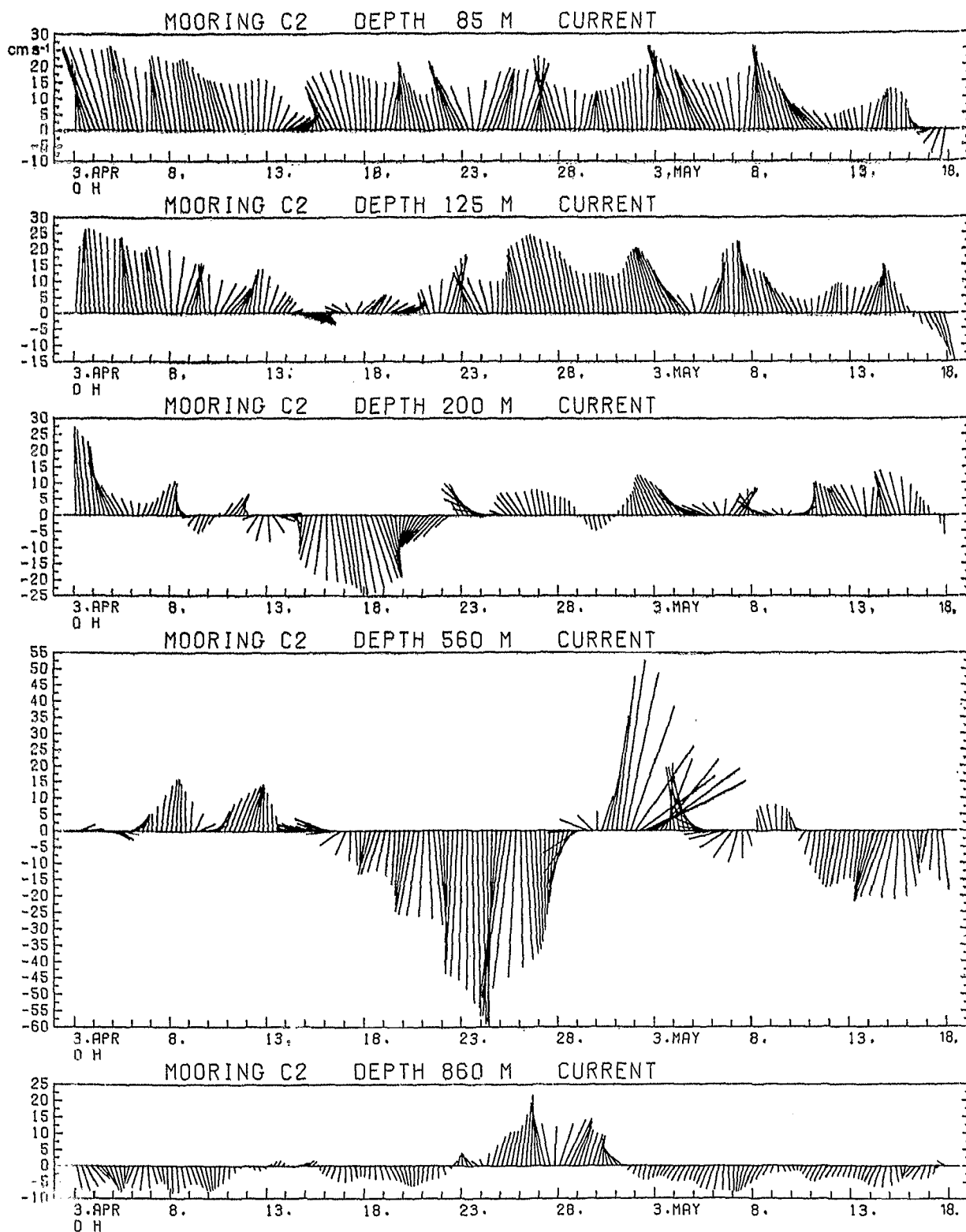


Figure 10. Stick-plot diagrams derived from the current meter time series at mooring C₂ (low passed values at 6 hour intervals). North is upwards.

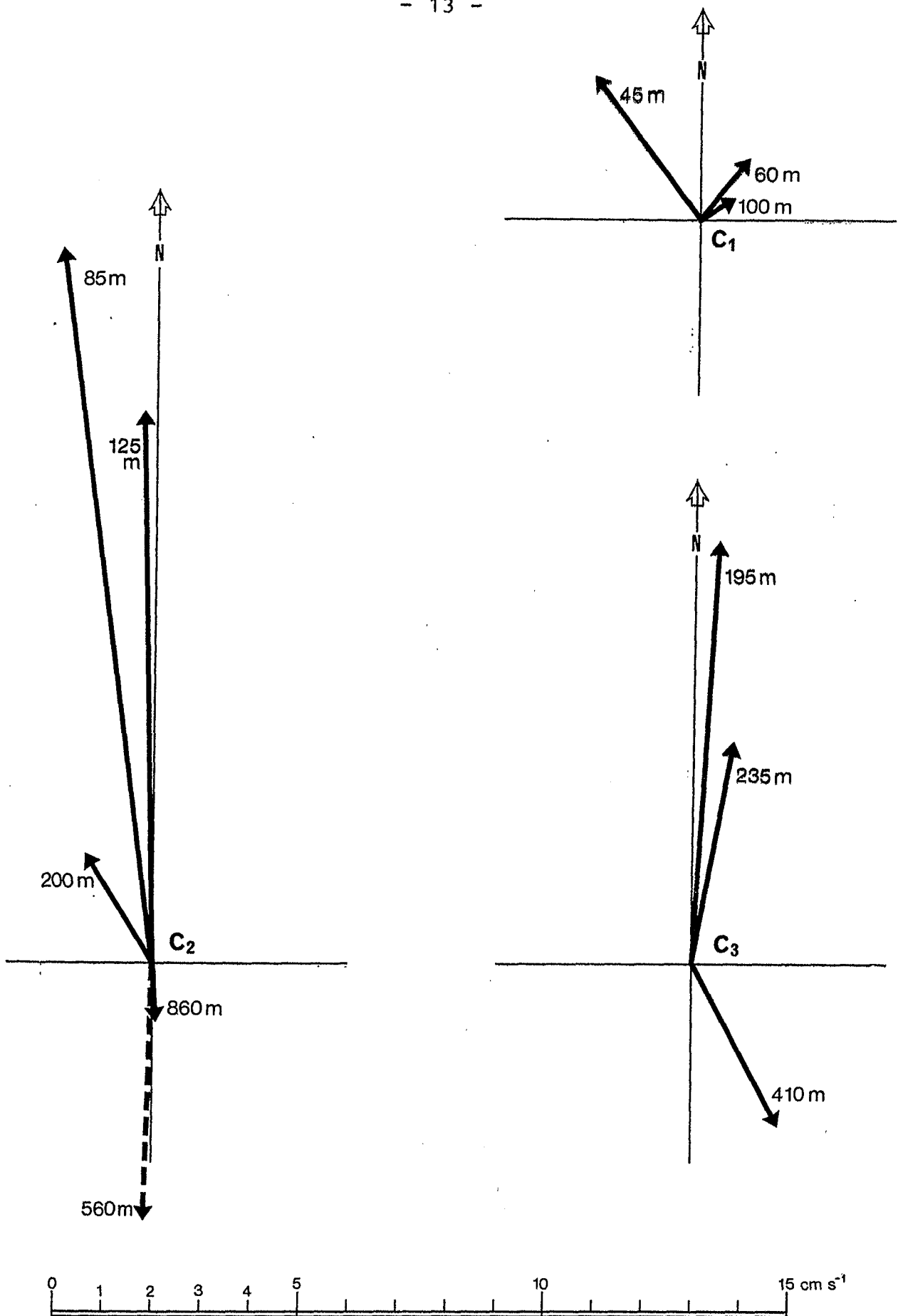


Figure 11. Mean current over the whole observation period (51 days). The record of the instrument at 560 m on C₂ seems doubtful, however, no instrumental or processing error could be found. For the deepest instrument of C₁ see caption of Figure 7.

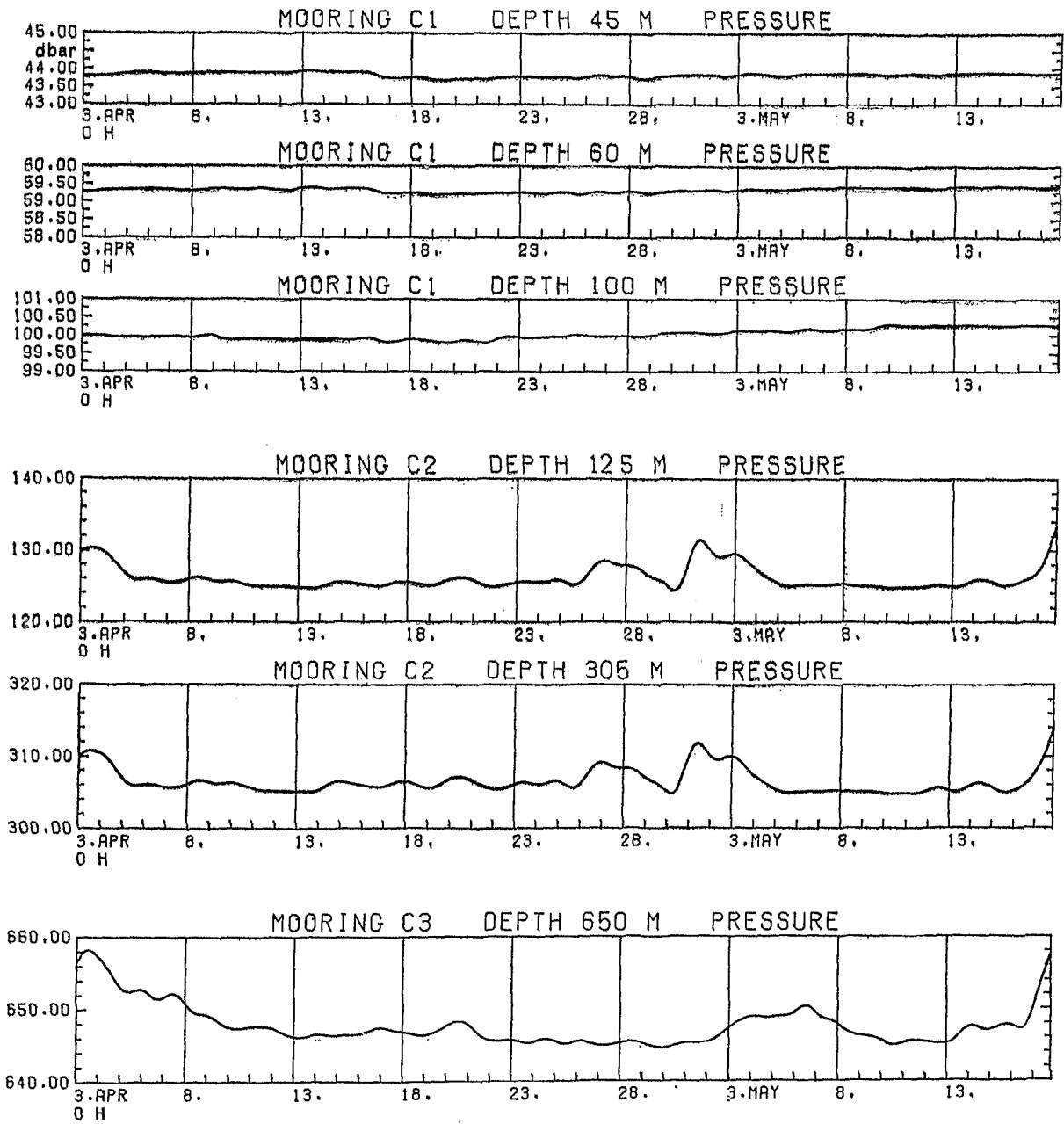


Figure 12. Pressure gauge records
(low passed values at 1 hour intervals).

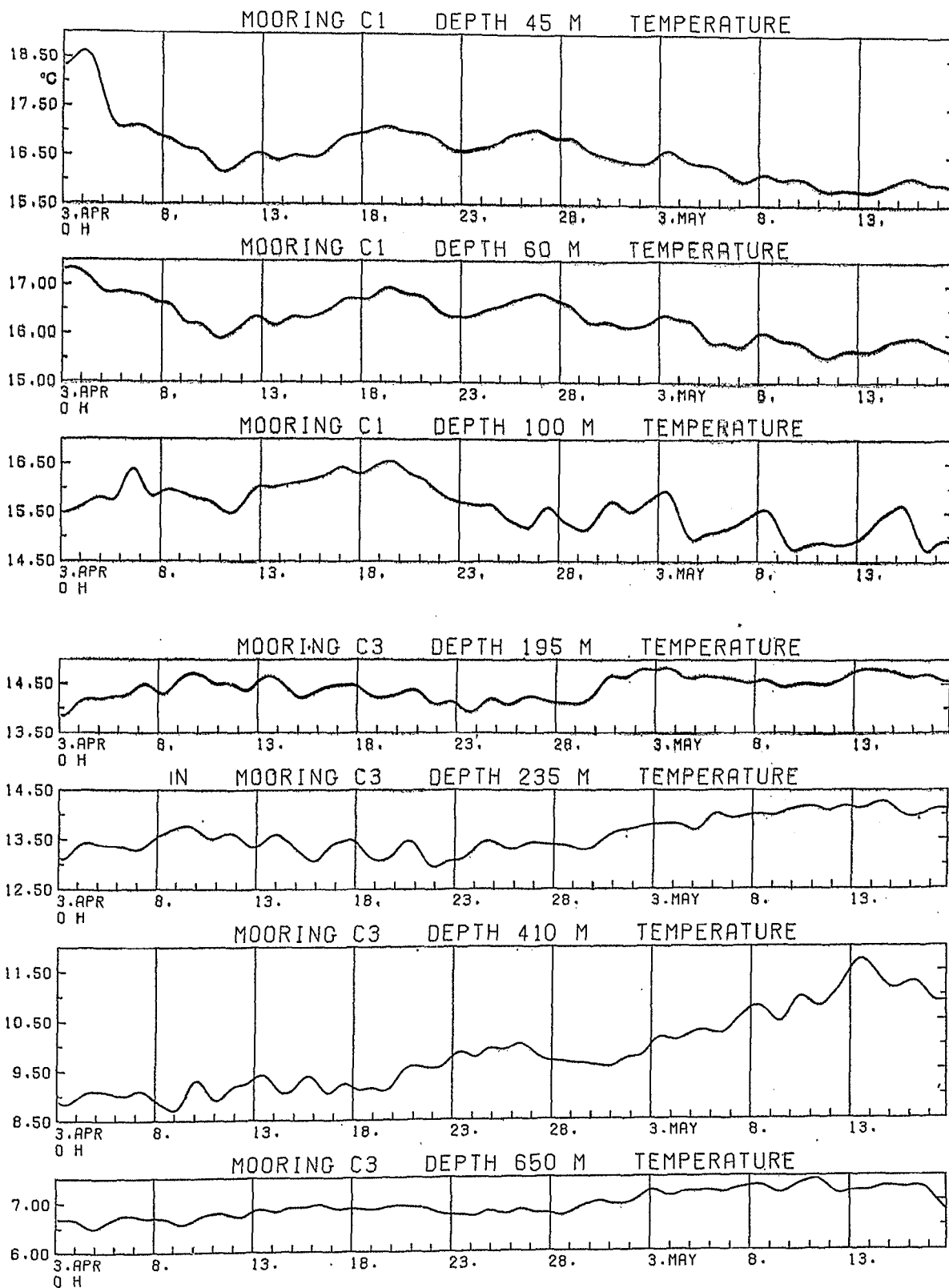


Figure 13. Temperature records derived from moorings C₁ and C₃ (low passed values at 1 hour intervals).

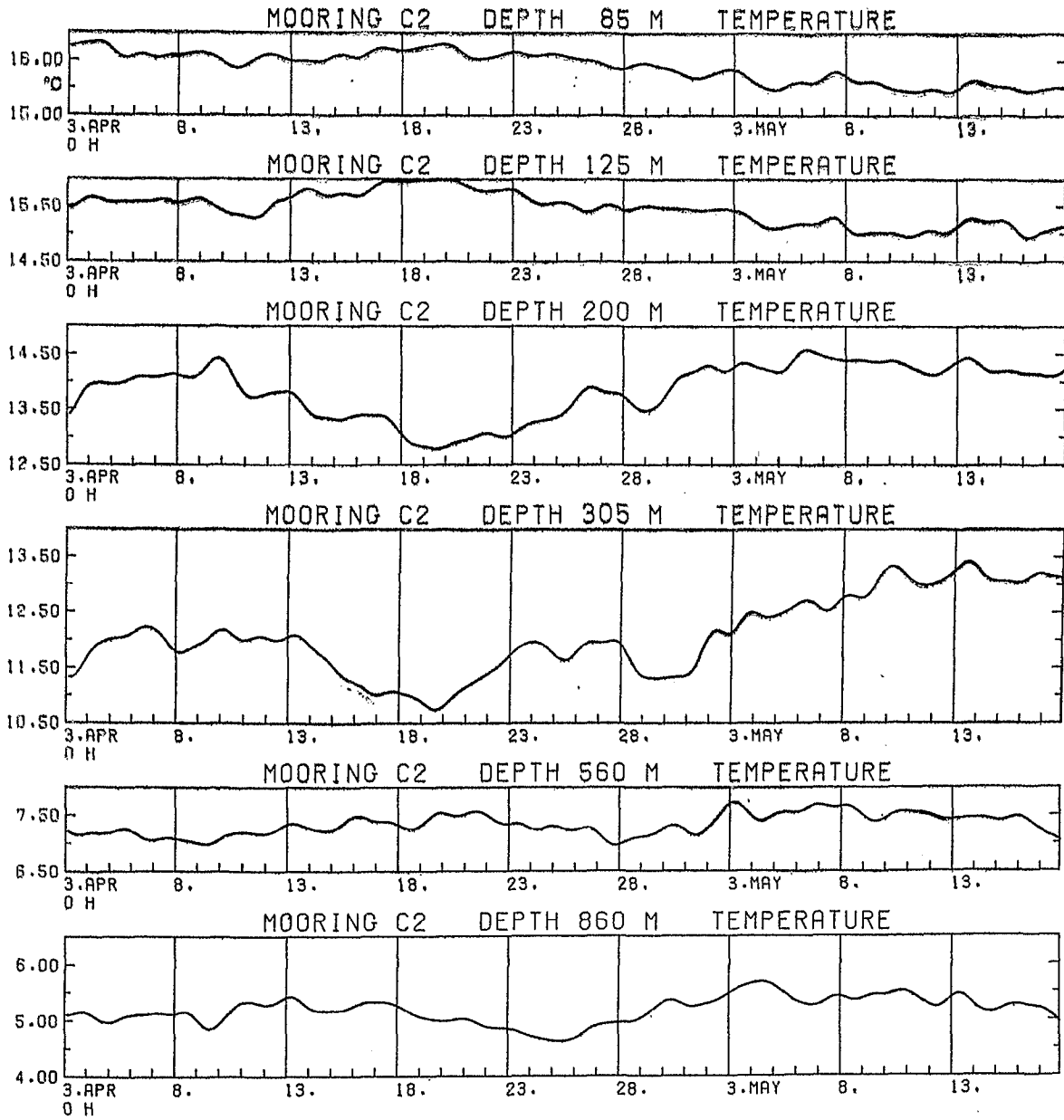


Figure 14. Temperature records derived from mooring C₂ (low passed values at 1 hour intervals).

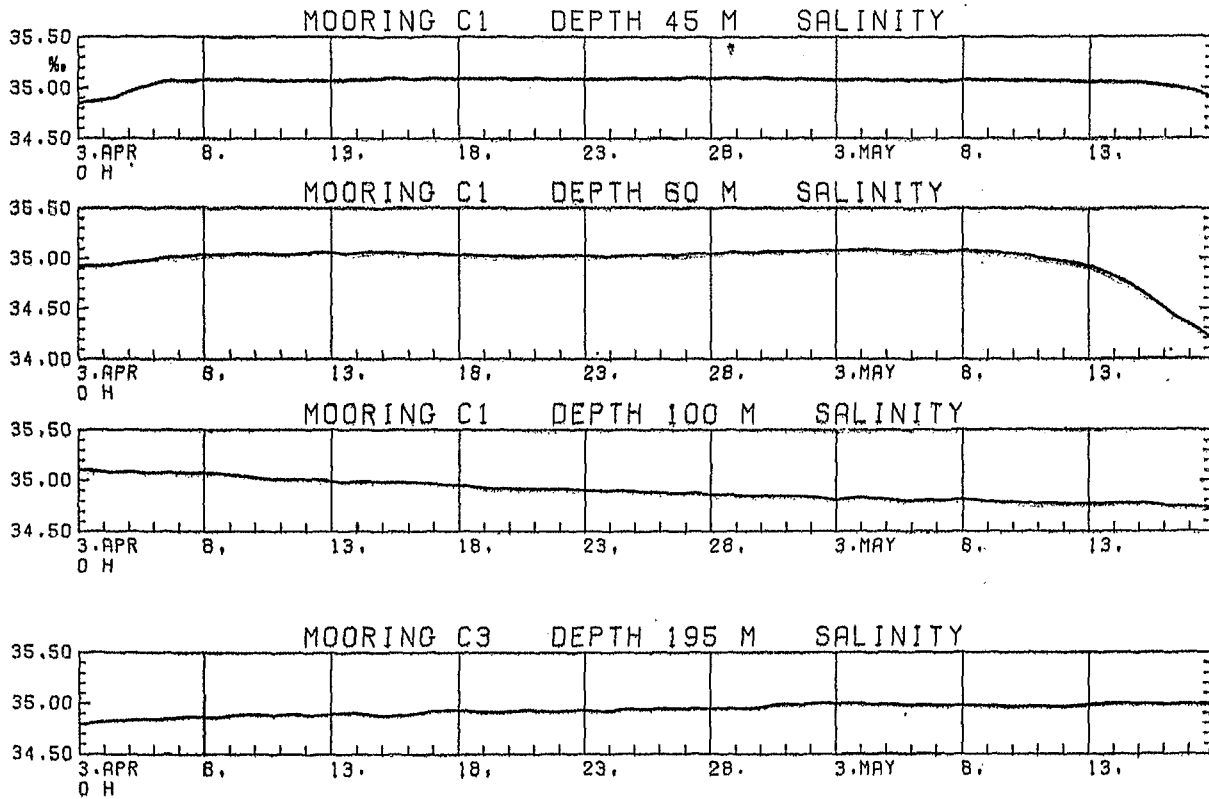


Figure 15. Salinity records
(low passed values at 1 hour intervals).

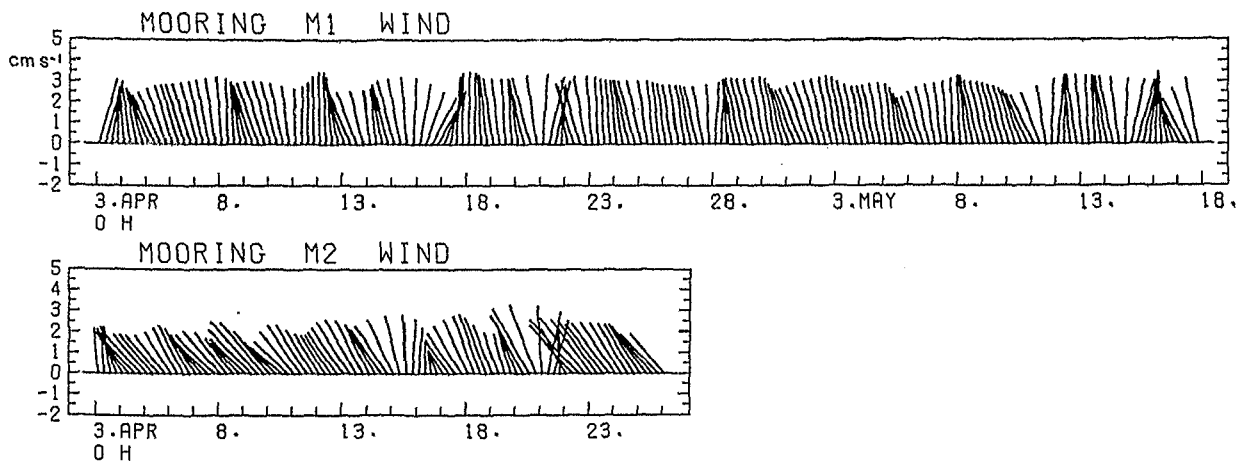


Figure 16. Stick-plot diagrams derived from the wind records
at M_1 and M_2
(low passed values at 6 hour intervals).
For M_1 a constant speed of 3.5 m s^{-1} is assumed.
For M_2 a constant speed of 3.5 m s^{-1} is assumed
starting at April 20, 22.30 h.

Figures 13 - 15 show the filtered temperature and salinity records. The errors in the temperature measurements amount to $\pm 0.1^{\circ}\text{C}$. The salinity time series has been adjusted to agree with the hydrographic casts, taking in account the well known problems with Aanderaa conductivity cells (H. Peters, personal communication). The striking decrease of salinity at C1 is due to strong overgrowth of the conductivity cells.

The wind speed sensors only functioned for a part of the observation period. To use as much of the data as possible, the time series of M_2 was completed with the mean speed obtained from the intact record of 22 days. The speed sensor on M_1 worked only for 3 days. The mean speed was calculated from this record and used for the whole time series. The filtered wind records are shown as stick-plot diagrams in Figure 16.

2.3. Shipborne measurements

During the whole experiment the Peruvian research vessel "BAP Unanue" was in the area. Hydrographic casts, STD- and profiling current measurements were carried out. A quasi-synoptic survey from April 30 to May 3 was used to produce surface maps.

2.3.1. Hydrographic casts

Hydrographic casts were carried out with 13 Niskin bottles. Two reversing thermometers were mounted on each bottle. The hydrographic winch was equipped with 1000 m of wire.

Unfortunately the salinometer broke down two weeks before the end of the cruise. It may be possible that even a part of the salinities determined earlier are affected by a slowly increasing error, although there is no evidence of this. For this reason no estimate can be given of the salinity error.

The reversing thermometers appear to be less accurate than may be generally expected because there was no possibility in Peru to recalibrate them. By intercomparison the best ones were selected for near-surface use (accuracy $\pm 0.03^{\circ}\text{C}$) and the poor ones for greater depth (accuracy $\pm 0.1^{\circ}\text{C}$). The results are presented in temperature and salinity sections (Fig. 17 - 24). The location of the sections is given in Figure 3.

2.3.2. STD-Sonde

A Plessey STD with a 1500 m depth range was on board. As the instrument did not work reliably only one STD section has been processed (Fig. 25). The accuracy of the STD- measurements is $\pm 0.1^{\circ}\text{C}$ in temperature and ± 0.05 ‰ in salinity. At each STD-station three Niskin bottles were deployed on the same wire as the STD. The temperature measurements of the STD were

corrected to agree with values measured by the reversing thermometers. The salinity of these samples was determined by L. Codispoti on board the US research vessel "Melville". The corrected salinity measurements of the STD agree well with the salinities determined earlier on board the "BAP Ununue".

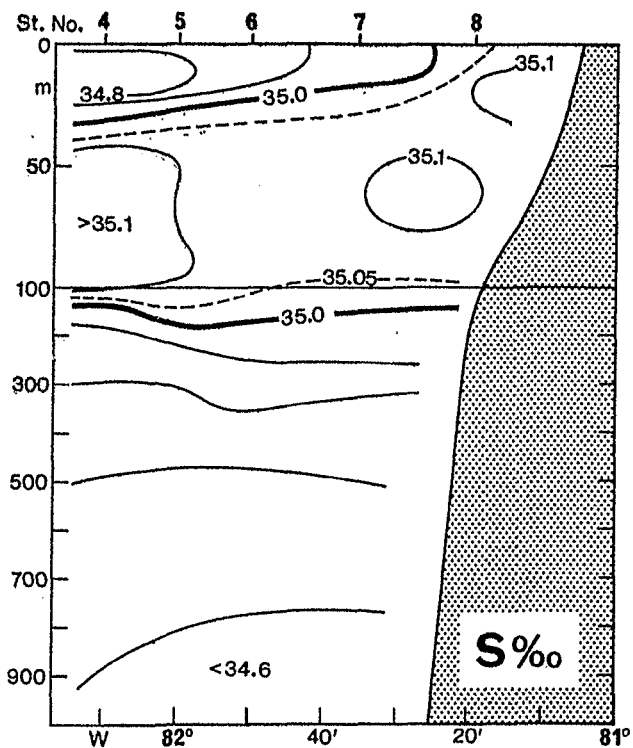
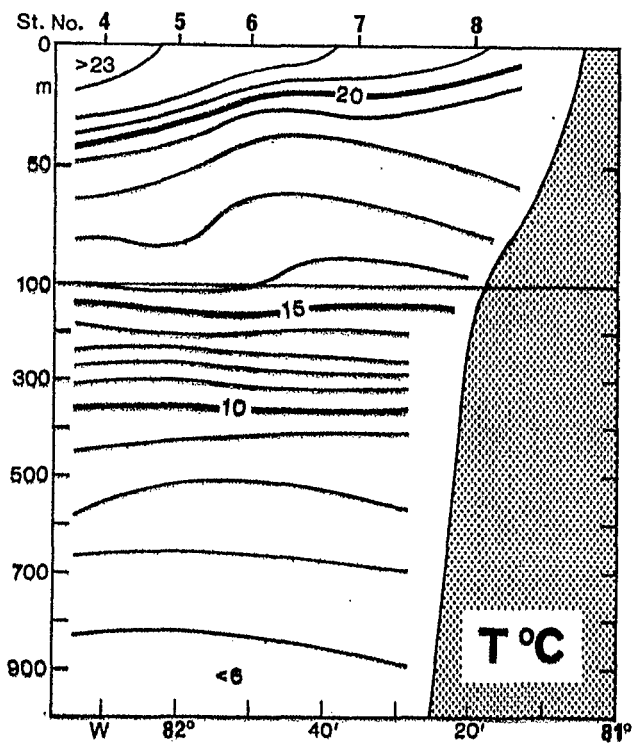


Figure 17. Temperature and salinity sections along $5^{\circ}00'S$ from hydrographic casts carried out from March 30 to 31 1977

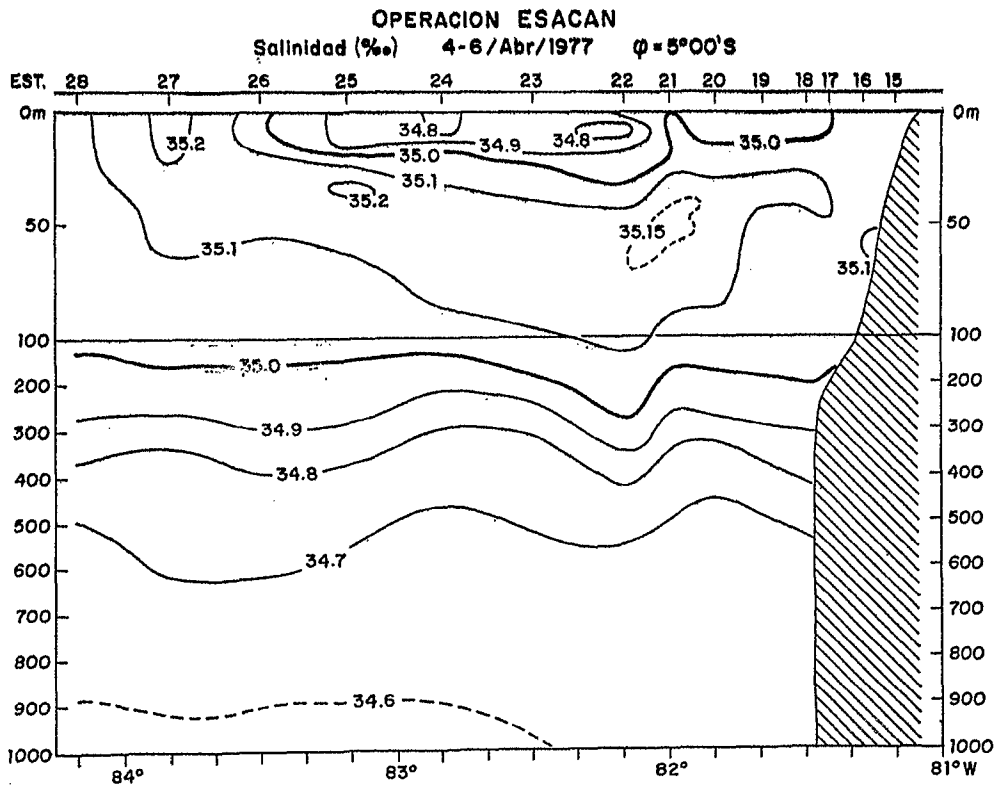
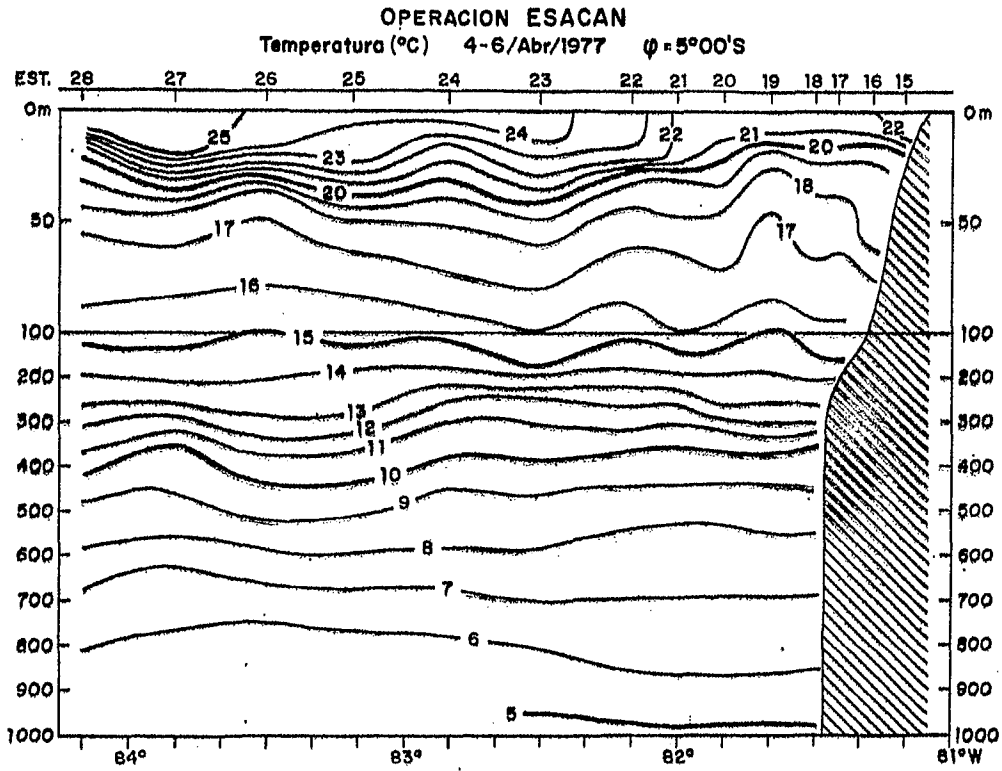


Figure 18. Temperature and salinity sections from hydrographic casts.

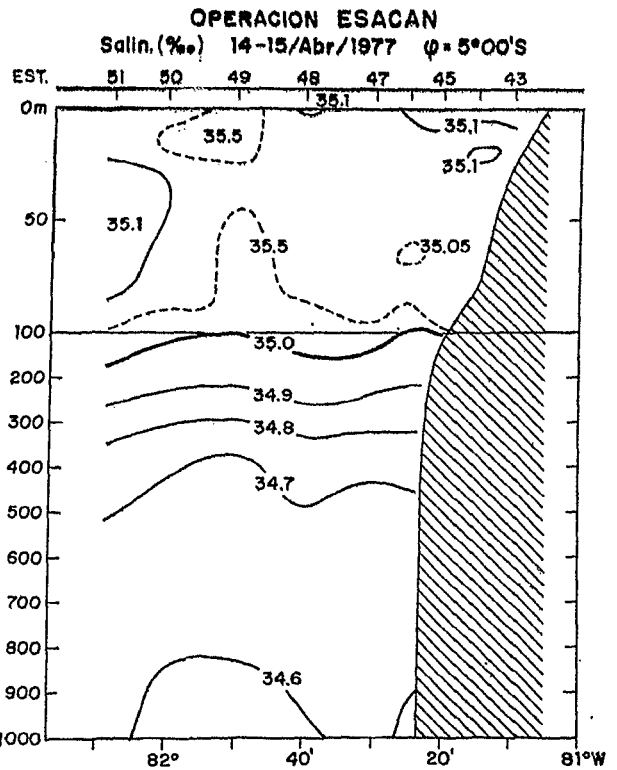
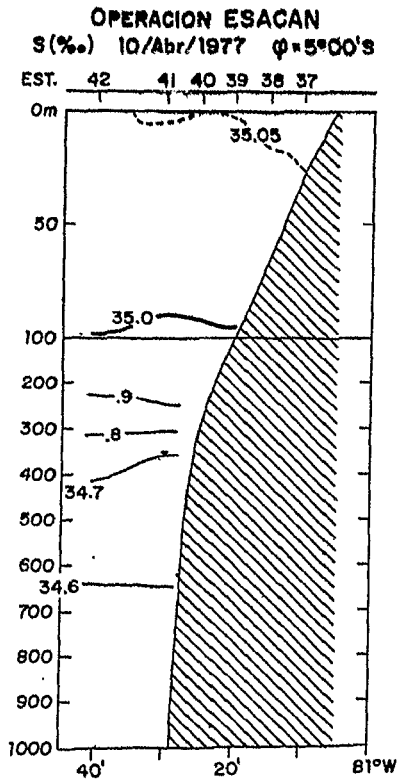
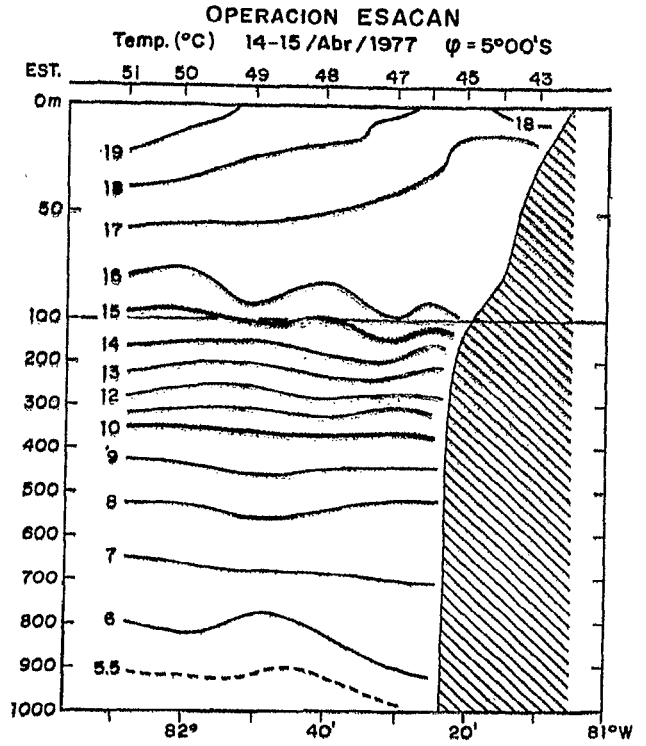
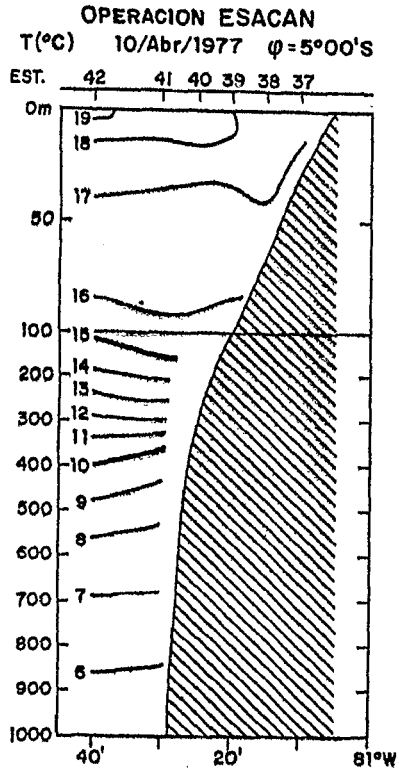


Figure 19. Temperature and salinity sections from hydrographic casts.

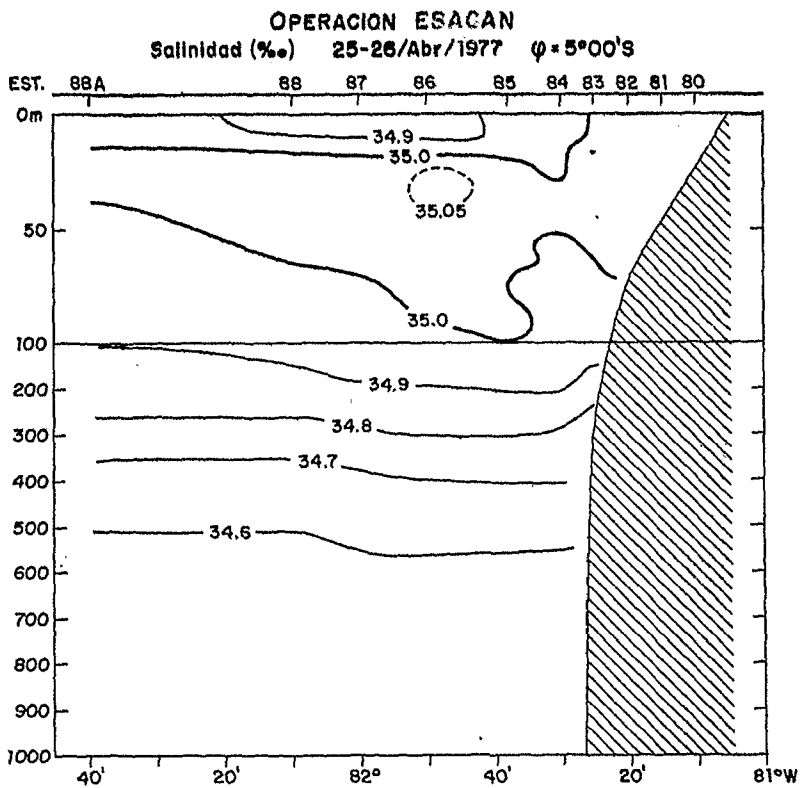
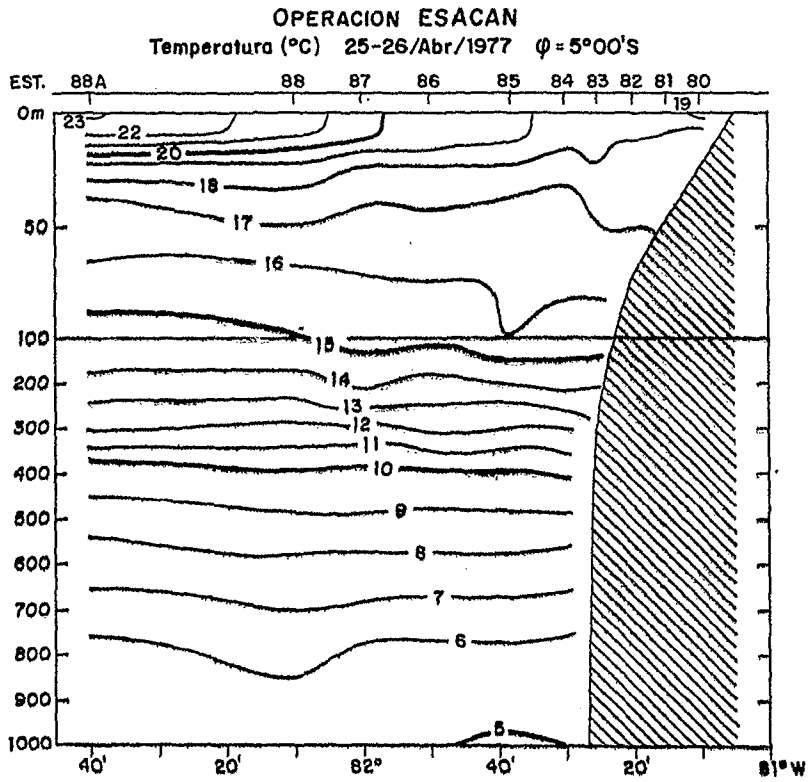


Figure 20. Temperature and salinity sections from hydrographic casts.

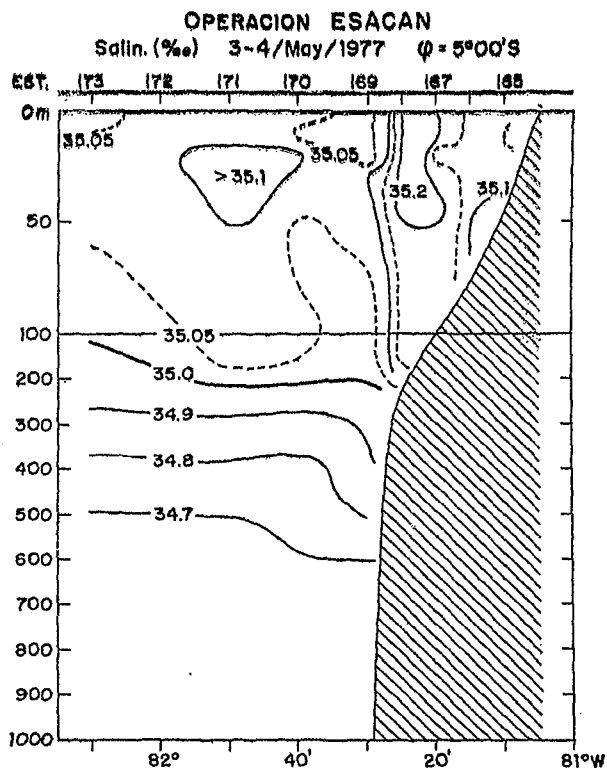
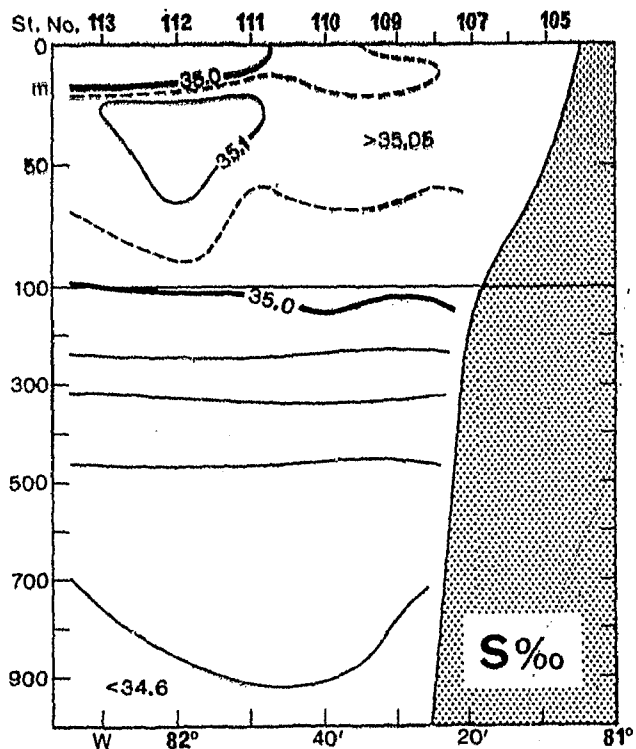
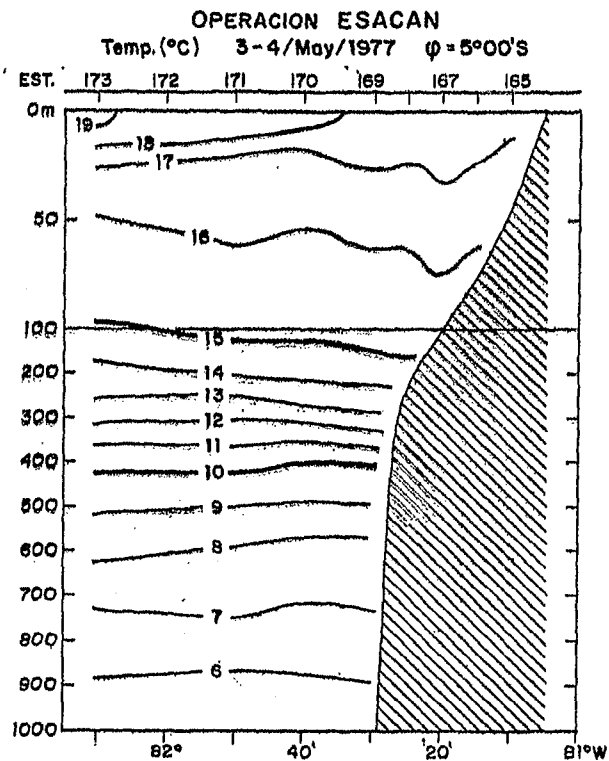
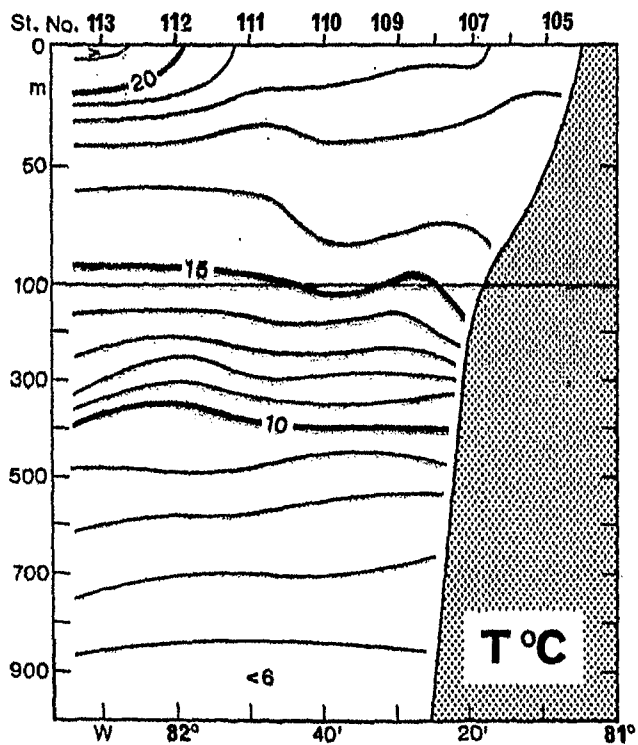


Figure 21. Temperature and salinity sections from hydrographic casts along 5°00'S carried out at April 29 and from May 3 to 4 1977.

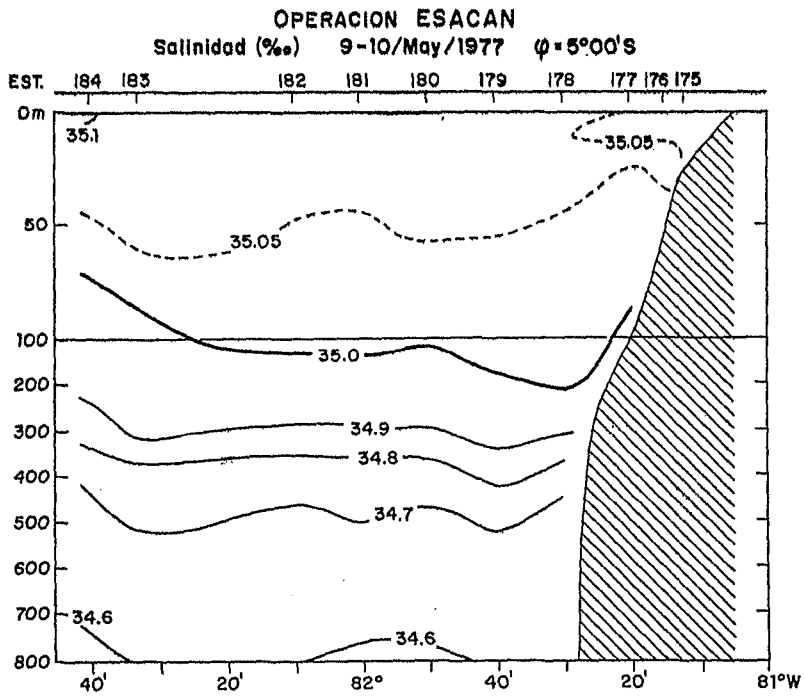
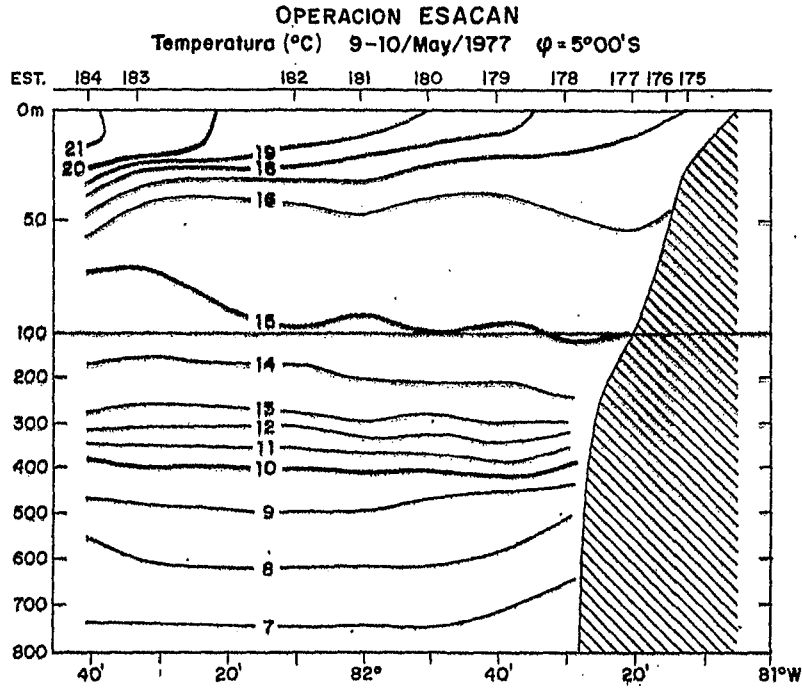


Figure 22. Temperature and salinity sections from hydrographic casts.

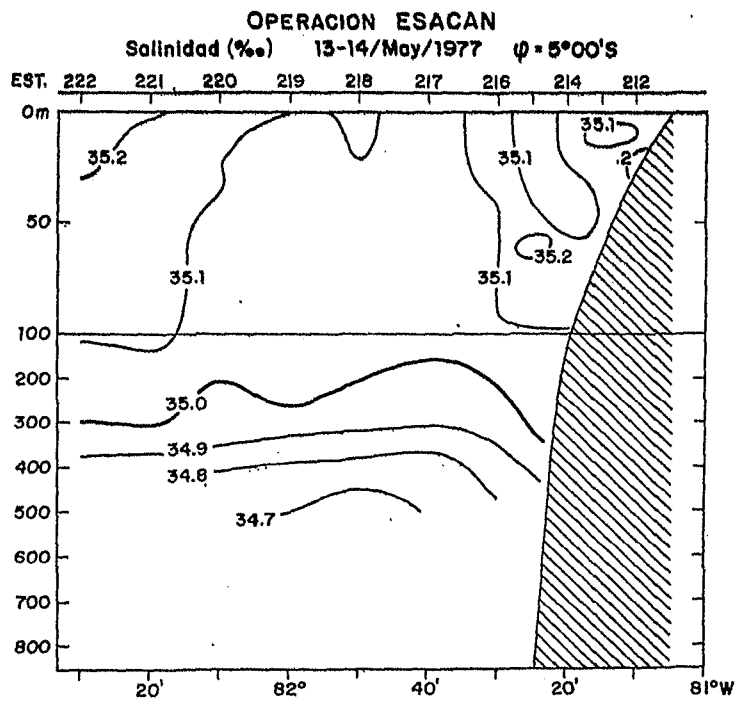
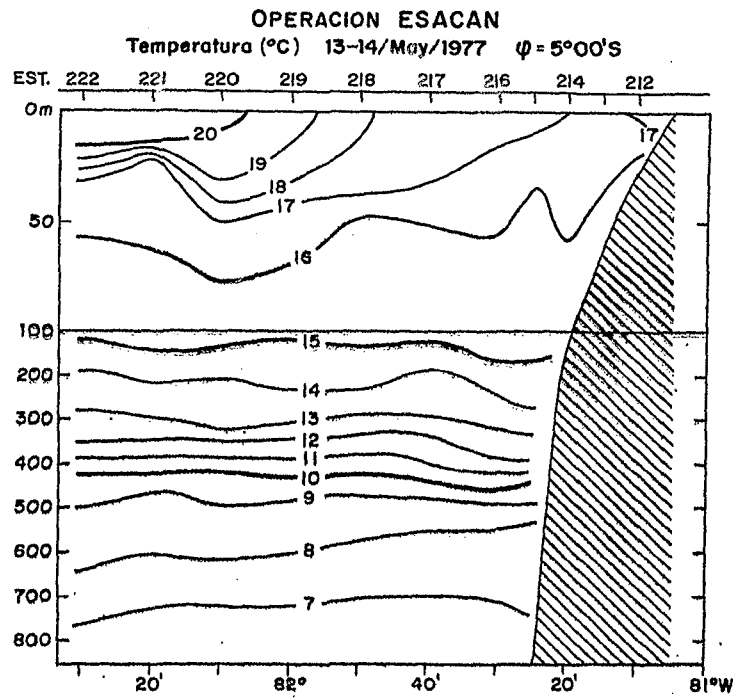


Figure 23. Temperature and salinity sections from hydrographic casts.

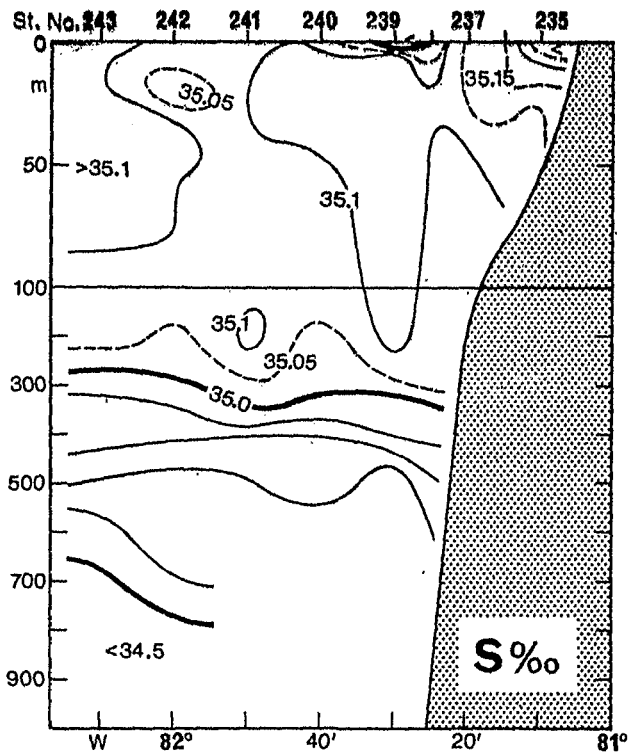
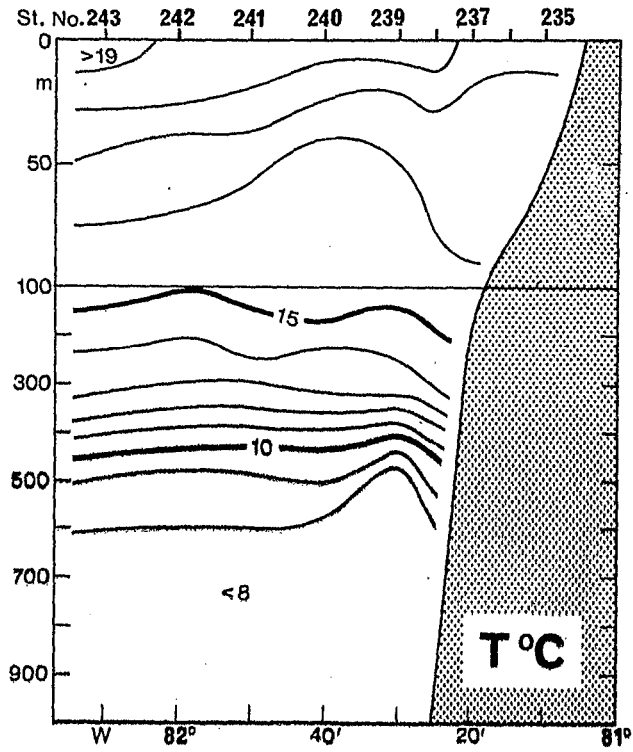


Figure 24. Temperature and salinity sections along 5°00'S vom hydrographic casts carried out from May 21 to 22 1977.

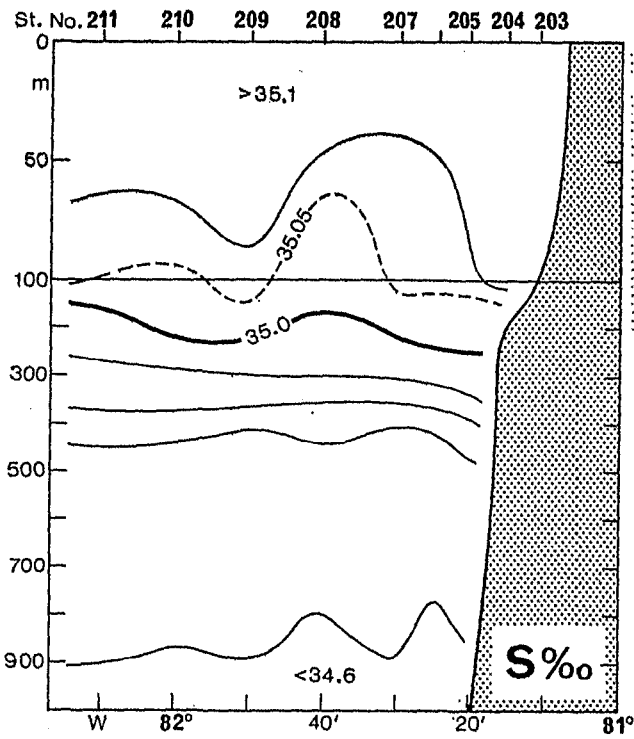
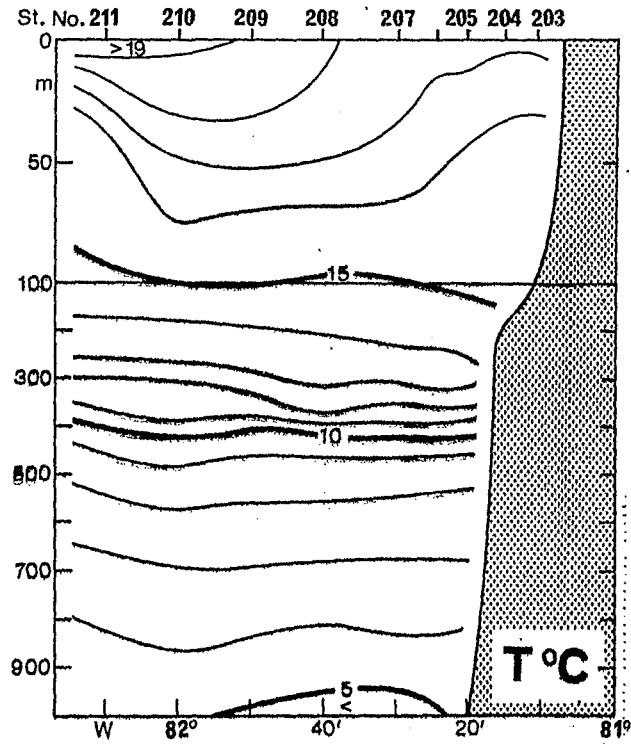


Figure 25. Temperature and salinity sections along 6°00'S from STD measurements carried out from May 12 - 13 1977.

2.3.3. Profiling current meter measurements

At 14 locations profiling current measurements were carried out with a RCM-4 Aanderaa current meter. At some locations the profiles were repeated several times. For detailed information see table 2. The locations of the measurements are shown in Figure 3.

The current meter sank along the hydrographic wire from a freely drifting ship (Fig. 26).

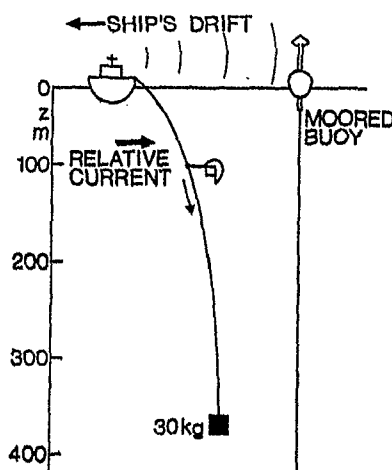


Figure 26

Schematic representation of a profiling current measurement. The ship's drift is determined relative to a moored buoy.

The drift of the ship was determined every 5 minutes with reference to a specially laid buoy, a meteorological buoy or an oil rig. From the instantaneous drift fixes during each profile a mean drift was determined which was added to the velocity measured by the instrument. The mean drift at each location during several profiles is presented in Figure 27. Table 3 gives the statistics of the values presented. Because in general the drift velocity was significantly higher (in the order of 50 cm s^{-1}) than the corrected current velocities (in the order of 20 cm s^{-1}) the accuracy is very limited. Assuming an error in the drift

of $\pm 10 \text{ cm s}^{-1}$ in speed and $\pm 5^\circ$ in direction, one obtains an error in the velocity components in the order of $\pm 10 \text{ cm s}^{-1}$. Taking into account this error which is of the same order as the observed currents, the current profiles agree with the measurements of moored current meter. However, if there is only the relative current needed, as far calculations of current shear the accuracy amounts to that one, normally given by Aanderaa. On the current meter there was a temperature and salinity sensor. The salinity records are adjusted to agree with the hydrographic casts.

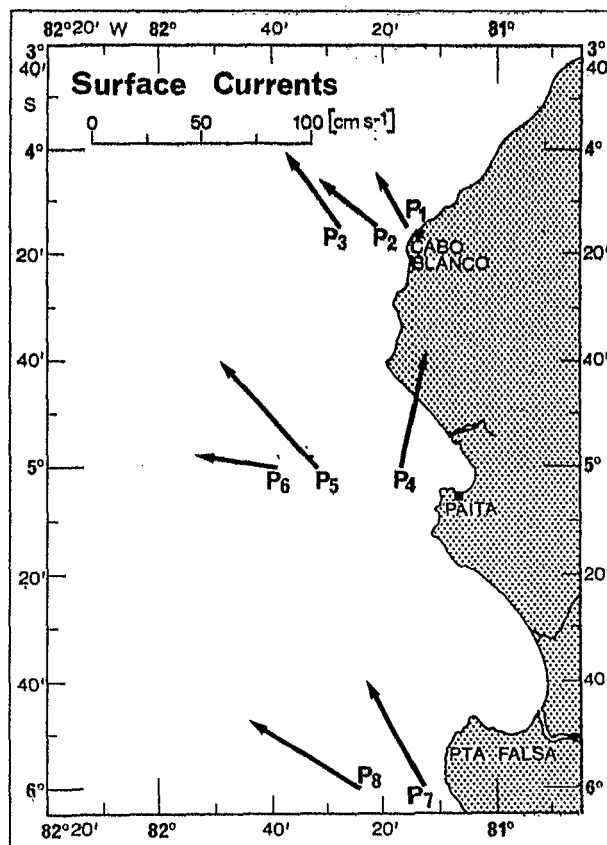


Figure 27

Surface currents determined from ship's drift measurements. For more detailed information on time and location see Table 3 and station list.

The results of the two components, temperature and salinity are shown in figures 28 - 31.

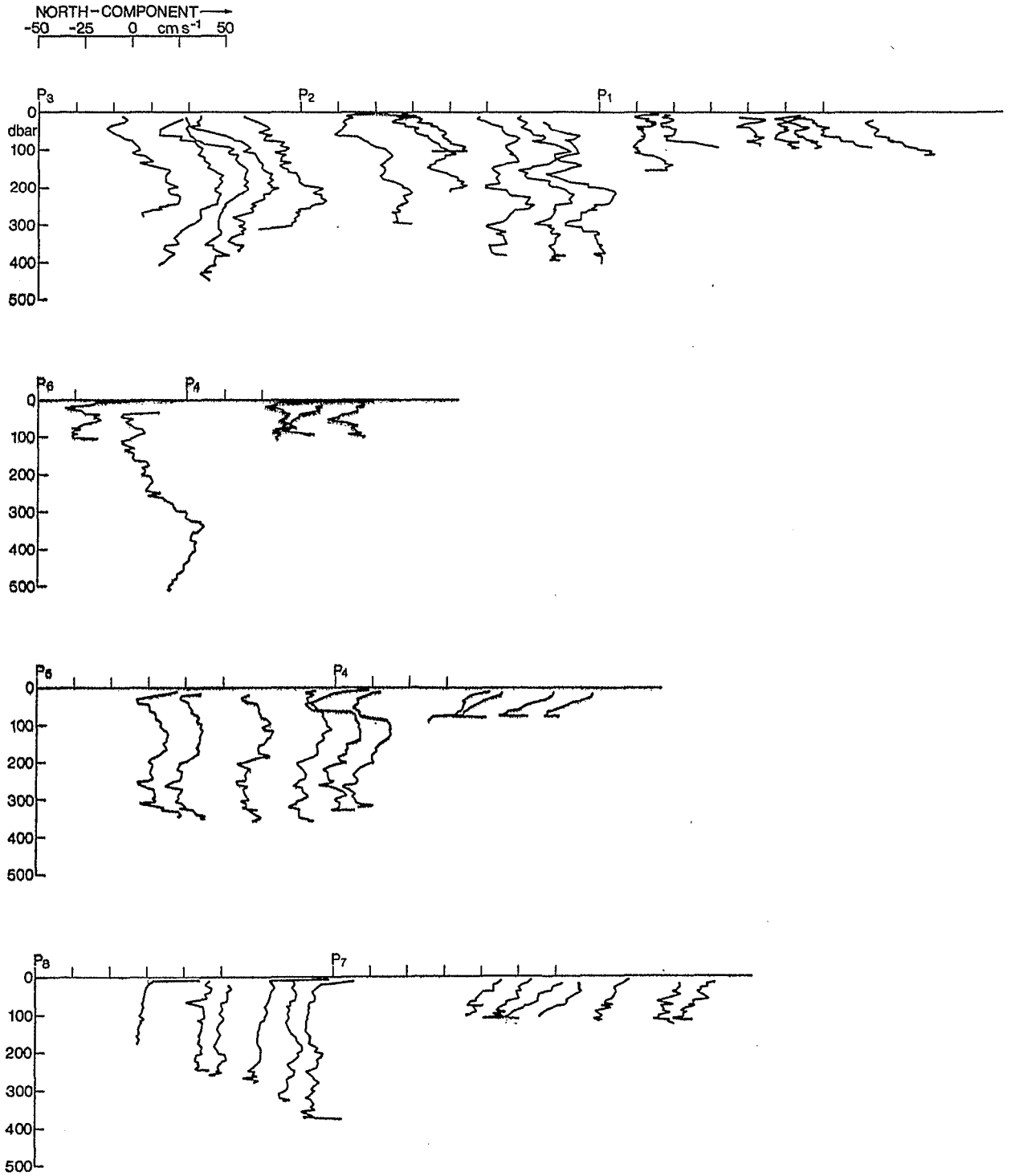


Figure 28. V (northward) velocity component derived from the profiling current measurements at positions shown on Figure 27.

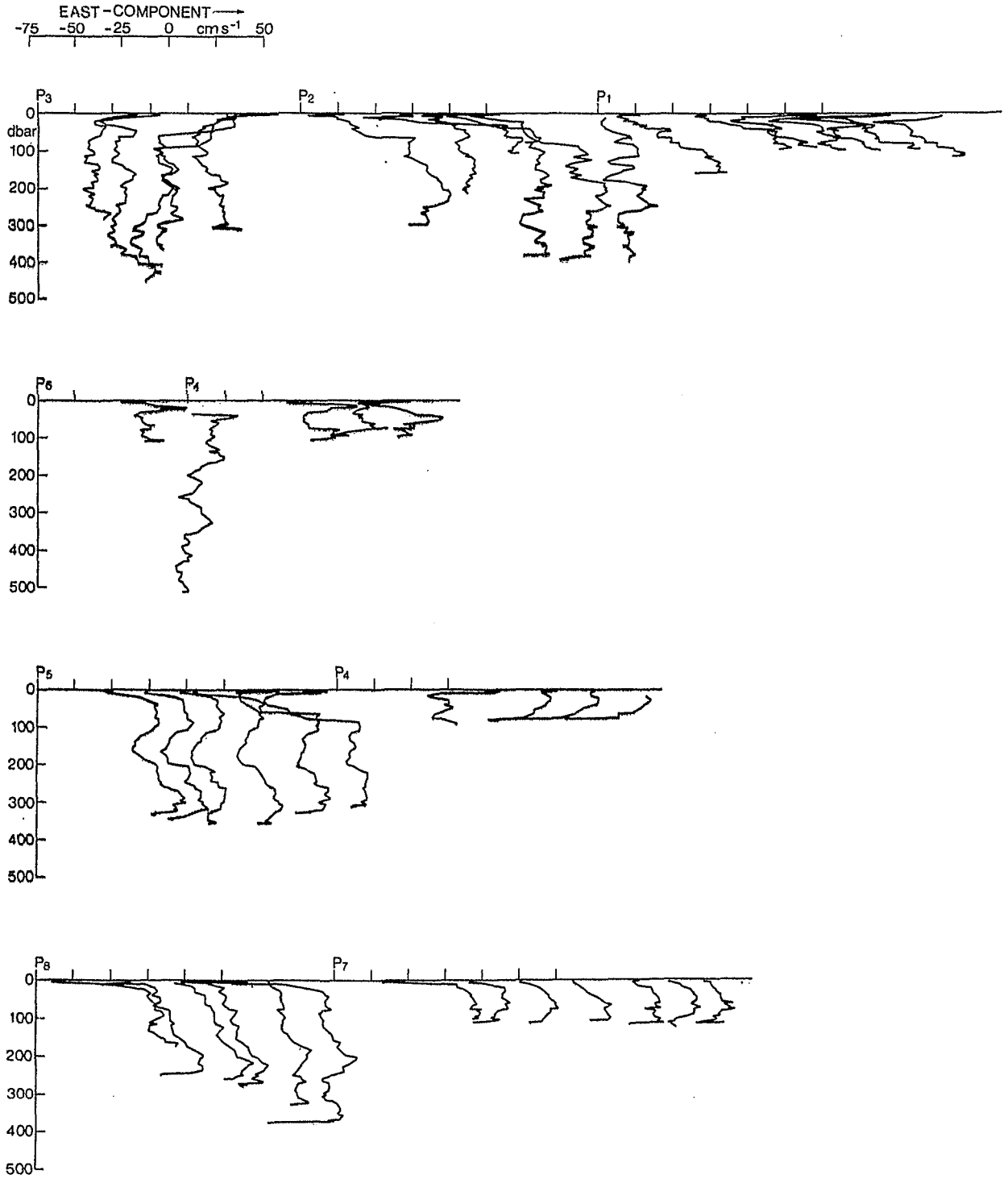


Figure 29. U (eastward) velocity component derived from the profiling current measurements at positions shown on Figure 27.

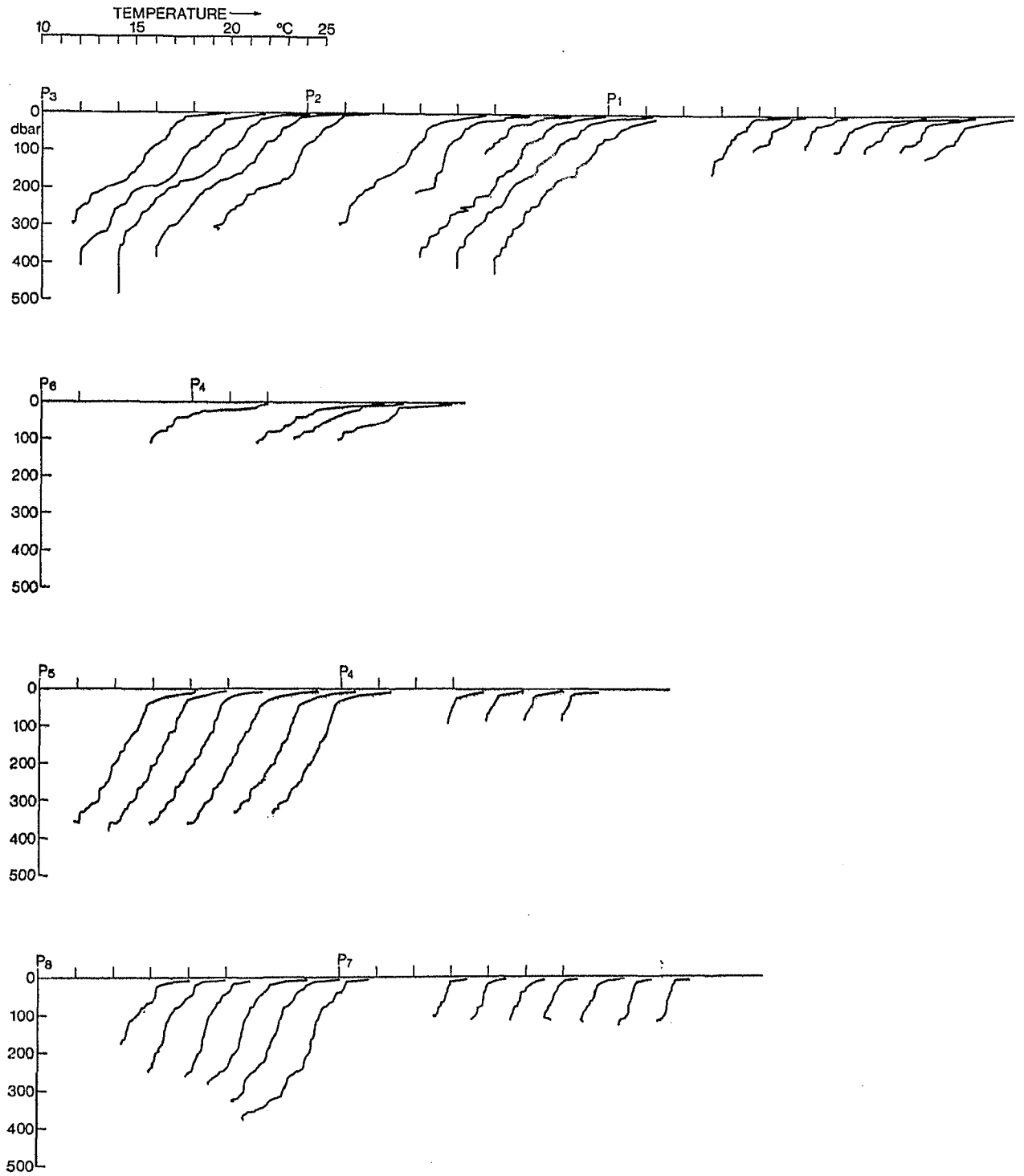


Figure 30. Temperature profiles at positions shown on Figure 27.

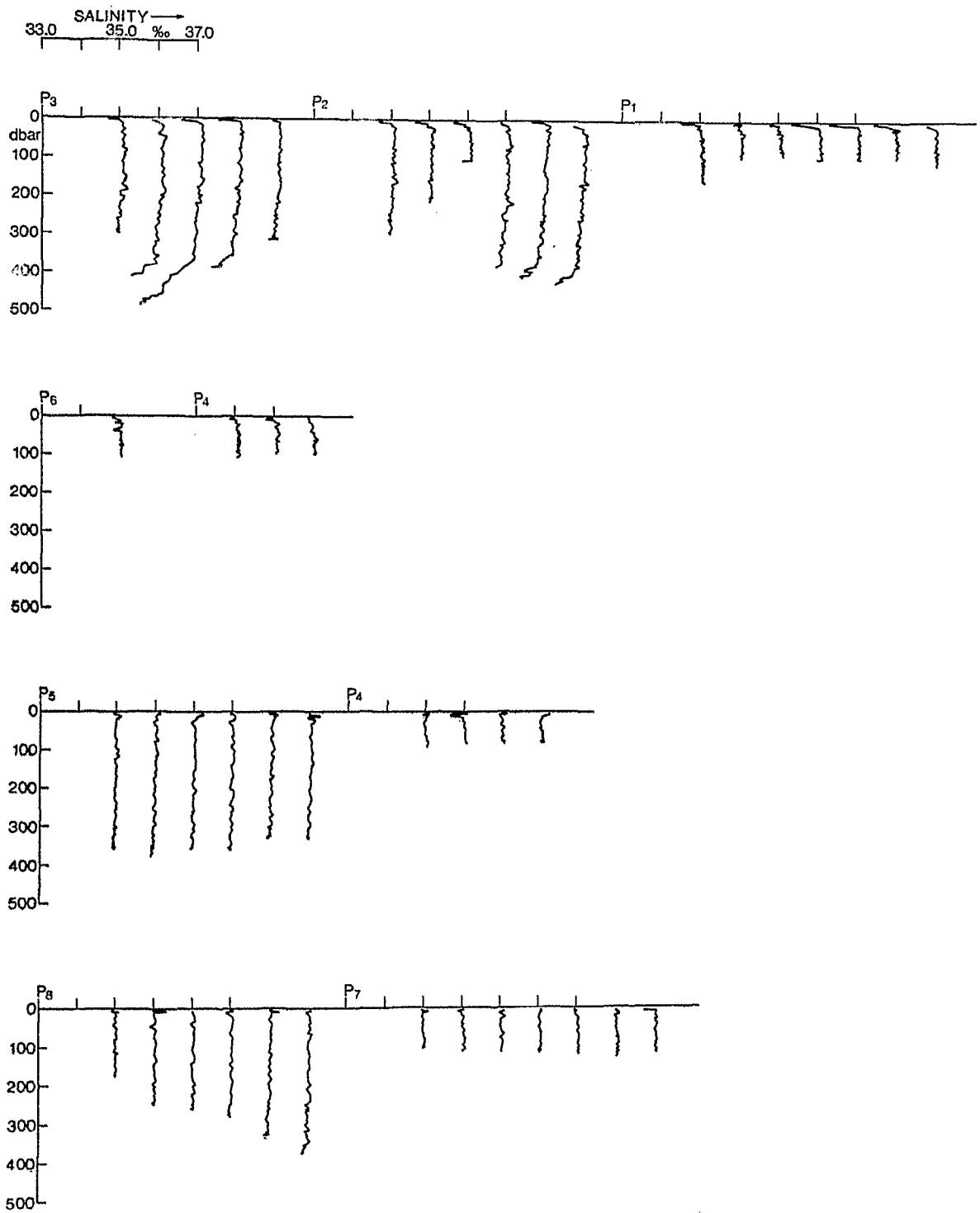


Figure 31. Salinity profiles at position shown on Figure 27.

2.3.4. Surface mapping

From April 30 to May 3 1977 sequential surface measurements were carried out over the whole area at the positions shown in Figure 3. The results are presented as pseudo-synoptic maps of the sea-surface temperature, salinity and wind at 5 m above the sea-surface (Fig. 32).

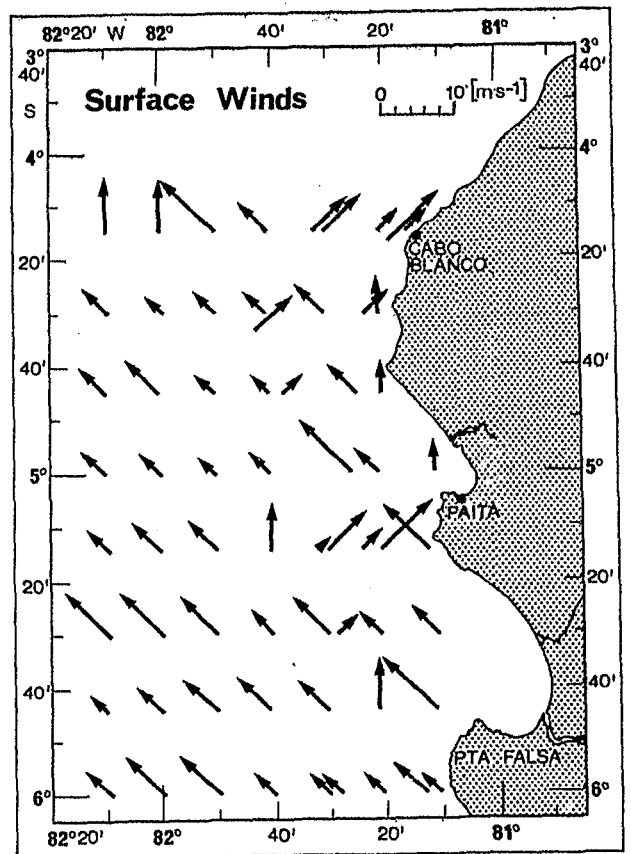
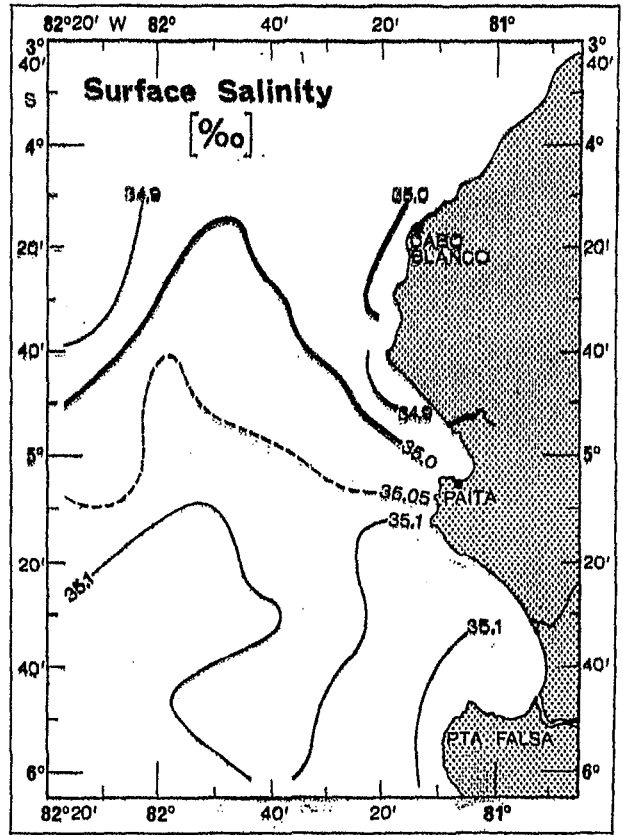
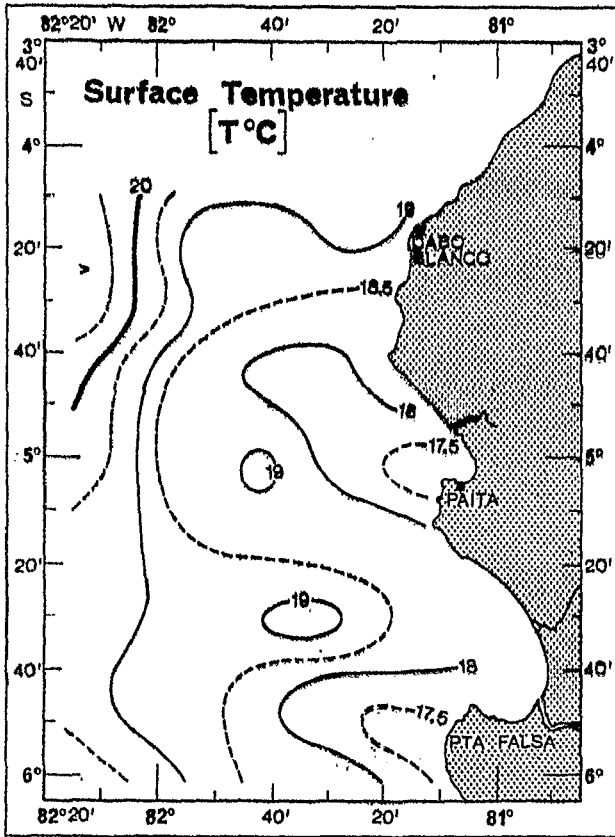


Figure 32

Sea-surface temperature, salinity and winds at 5 m above the sea-surface during the survey from April 30 to May 3 1977.

3. Data from land stations

To facilitate a complete analysis all available informations from surrounding land stations were collected. A list of time series collected is given in Table 4. The quality of the data from various stations was not uniform. There are stations at which the wind direction was given as an angle and at others as a point of the compass. At some stations there were no observation at night. To provide complete time series the data were interpolated which may be acceptable for low frequency studies. The atmospheric pressure of all stations is reduced to the pressure on sea-level. The pressure records from Paita show a evident systematical deviation of about 50 mb which may be explained as instrumental error. Therefor they are corrected to agree with values interpolated from those at Talara and Chiclayo. The corrected and interpolated time series were filtered in the same way as the moored instruments records. The results are presented in Figures 33 and 34. Data were obtained from two further land stations. The tide gauge at Talara provided hourly sea-level records. The values are given relative to the tide gauge zero which is 1.43 m below the mean sea-level. The thermograph records at Paita is digitized at hourly intervals. Both records were treated like the moored instruments time series (Fig. 35 and 36).

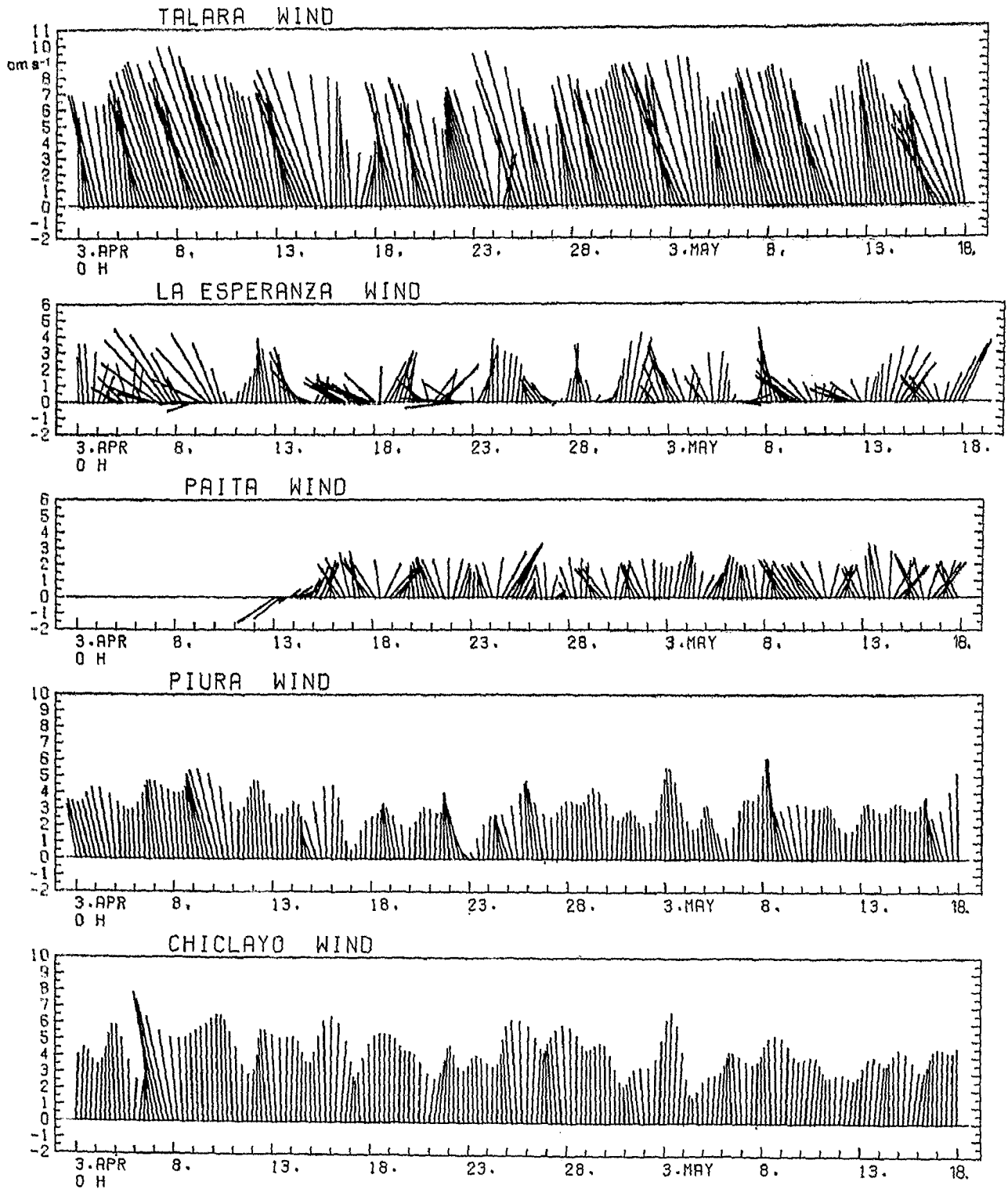


Figure 33. Wind at the airport stations of Talara, Piura and Chiclayo (at Piura the night time values are interpolated), and at Paita and La Esperanza (at both stations the night time wind values are interpolated), low passed values at 6 hour intervals.

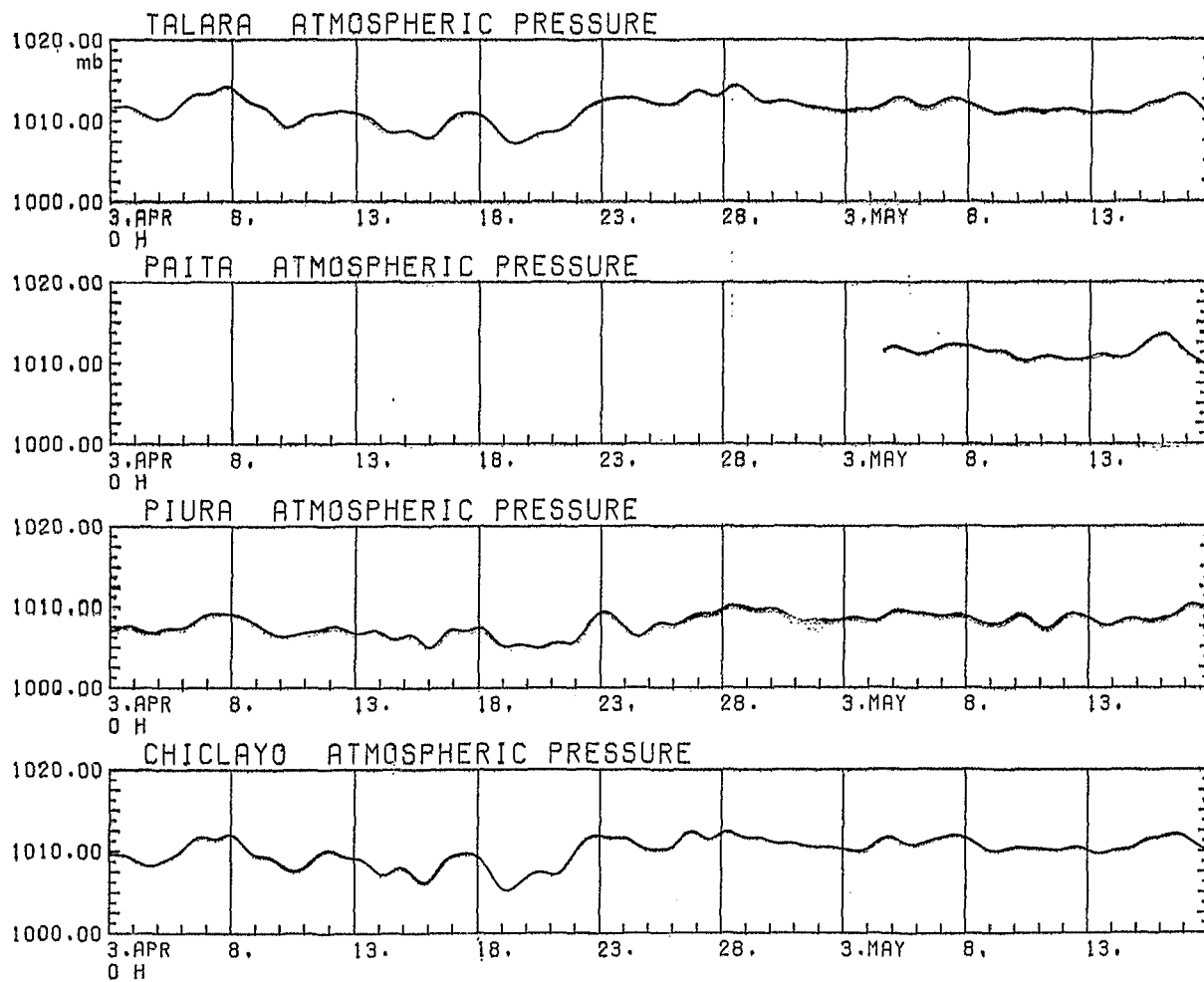


Figure 34. Atmospheric pressure at the airport stations of Talara, Piura and Chiclayo (at Piura the night time values are interpolated) and at Paita, low passed values at 6 hour intervals.

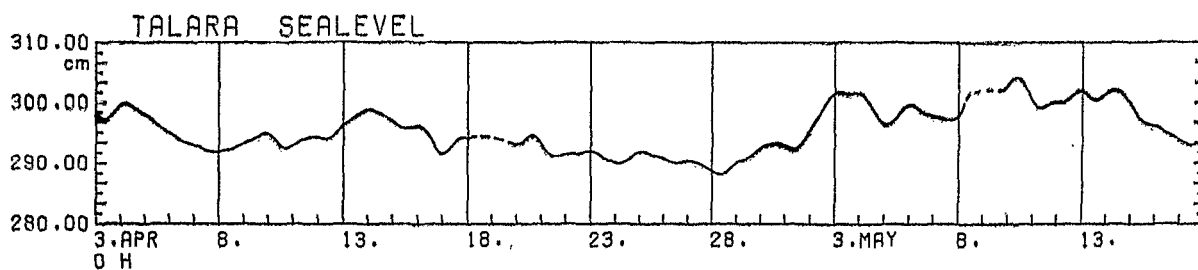


Figure 35. Sea-level record from Talara. During periods in which no data is available the curve is completed by a dashed straight line (low passed values at 6 hour intervals).

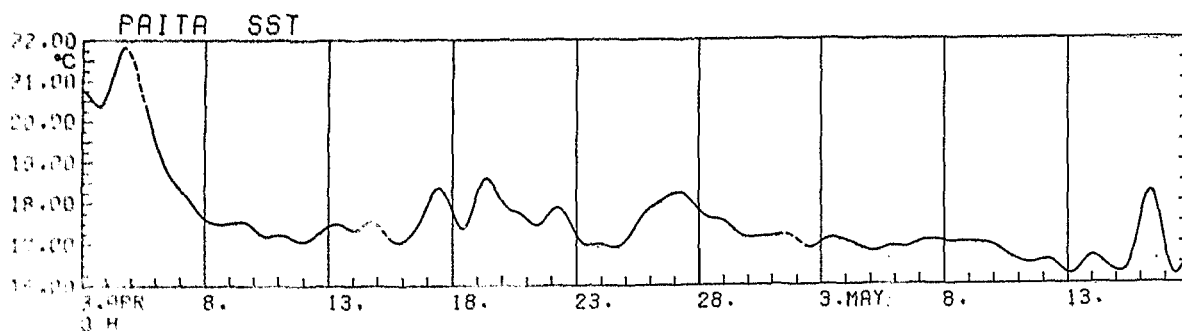


Figure 36. Sea-surface temperature at Paita. During periods in which no data is available the curve is completed by a dashed straight line (low passed values at 6 hour intervals).

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Name	IFM Code	Position	Water depth (m)	Sensor depth (m)	Sensors	Observation period
C ₁	187101			45	VTPC	
	102	5°01.3'S 81°17.0'W	104	60	VTPC	
	104			100	VTPC	
C ₂	186101			85	VT	
	102			125	VTP	
	103	5°01.3'S 81°31.0'W	1360	200	VT	
	104			305	TP	31.3.77 1440 h -
	105			560	VT	20.5.77 0730 h
	106			860	VT	
C ₃	185101			195	VTC	
	102	5°00.5'S 81°44.5'W	3820	235	VT	GMT + 5
	104			410	VT	
	105			650	TP	
M ₁	188	5°01.3'S 81°17.0'W	104	0	WD	
M ₂	196	5°01.5'S 81°39.5'W	2580	0	WSD	31.3.77 1440 h -
						28.4.77 1810 h

Sensors: V current speed and direction, T Temperature, P Pressure, C Conductivity
WSD meteorological buoy (wind speed and direction)
WD meteorological buoy (wind direction)

Table 1: Moored instruments

Position	Date	Water depth (m)	Number of Profiles	Observation period	Wire length (m)
5°00.0'S 81°49.0'W	01.04.77	3910	1	2 h	100
5°01.0'S 81°39.5'W	01.04.77	2580	1	1 h	100
5°03.0'S 81°27.2'W	01.04.77	930	1	1 h	100
5°01.5'S 81°17.0'W	01.04.77	97	1	1 h	100
5°01.1'S 81°17.0'W	04.04.77	94	1	1 h	100
5°01.5'S 81°39.5'W	07.04.77	2580	1	3 h	500
4°15.0'S 81°16.0'W	18.04.77	90	7	12 h	100
4°15.5'S 81°19.5'W	20.04.77	240	4	4 h	200
4°15.0'S 81°22.0'W	20.04.77	1170	3	6 h	400
4°15.0'S 81°28.0'W	19.04.77	1870	5	10 h	400
5°59.0'S 81°13.0'W	11.05.77	135	7	11 h	100
6°02.0'S 81°24.5'W	12.05.77	1475	6	11 h	400
5°01.0'S 81°17.0'W	15.05.77	90	4	3 h	90
5°01.0'S 81°33.0'W	17.05.77	1960	6	11 h	400

Table 2: Profiling current measurements

No	Mean position (S)	Mean position (W)	Number of samples	time
P ₁	4°15'	81°16'	7	18.4.77
P ₂	4°15'	81°21'	6	20.4.77
P ₃	4°15'	81°27'	5	19.4.77
P ₄	5°01'	81°17'	6	1.4./4.4./15.5.77
P ₅	5°01'	81°33'	6	17.5.77
P ₆	5°01'	81°39'	2	1.4./7.4.77
P ₇	5°59'	81°13'	7	11.5.77
P ₈	6°02'	81°24'	6	12.5.77

All measurements were carried out within a distance of 2nm of the given position

Table 3: Statistics of the surface current measurements at profiler stations

Name	Position	Data	Sampling interval (h)	Interpolated values	Providing source
Talara	04° 34.0'S 81° 15.0'W	Sea-level Wind (A) Atmospheric pressure	1 1 1	- - -	HIDRONAV CORPAC CORPAC
La Esperanza	04° 55.0'S 81° 03.5'W	Wind (P)	6	1 per day	DEPECP
Paita	05° 05.0'S 81° 07.0'W	Wind (P) Atmospheric pressure Sea-surface temperature	6 1 1	1 per day - -	SENAMHI SENAMHI IMARPE
Piura	05° 11.0'S 80° 36.0'W	Wind (A) Atmospheric pressure	1 1	8 per day 8 per day	CORPAC CORPAC
Chiclayo	06° 47.0'S 79° 50.0'W	Wind (A) Atmospheric pressure	1 1	- -	CORPAC CORPAC
HIDRONAV	Direccion de Hidrografia y Navegacion de la Marina				
CORPAC	Corporacion Peruana de Aerolineas Comerciales				
DEPECP	Direccion Ejecutiva del Proyecto Especial CHIRA-PIURA				
SENAMHI	Servicio Nacional de Meteorologia y Hidrologia				
IMARPE	Instituto del Mar del Peru				
Wind (A)	Wind direction measured as angle				
Wind (P)	Wind direction measured as point of the compass				

Table 4: Available data from land stations

List of stations

H Hydrographic cast (H3 cast with 3 bottles only)
BT Bathythermograph
STD Salinity, Temperature, Depth-Sonde
Prof Profiling current meter
MB Microbiological samples
PP Phytoplankton samples
ZP Zooplankton samples
OM Organic matter samples
() Instrument failed

The depth values are uncorrected.

Station N ^o .	Time	ϕ (S)	λ (W)	Depth (m)	Operations performed
1	28-III 09 ⁰⁰ -16 ⁰⁰	05 ^o 01.5'	81 ^o 39.5'	2580	mooring M2 laid
2	29-III 09 ²⁰ -13 ¹⁵	05 ^o 01.3'	81 ^o 31.0'	1300	mooring C2 laid
3	30-III 08 ⁴⁰ -13 ³⁰	05 ^o 00.5'	81 ^o 44.5'	3660	mooring C3 laid
4	15 ⁵⁵ -22 ³⁰	05 ^o 00.0'	82 ^o 10.0'	5500	H, BT, ZP
5	23 ⁴⁰ -31-III 03 ⁰⁰	05 ^o 00.0'	82 ^o 00.0'	4370	H
6	31-III 03 ⁵⁸ -05 ⁵³	05 ^o 00.0'	81 ^o 50.0'	4200	H
7	08 ¹⁰ -10 ¹⁰	05.01.0'	81 ^o 35.5'	1950	H
8	11 ⁴⁵ -12 ⁴⁵	05 ^o 03.0'	81 ^o 19.7'	140	H
9	13 ⁴⁵ -15 ¹⁵	05 ^o 01.3'	81 ^o 17.0'	97	mooring C1 M1 laid
10	01-IV 07 ³⁰ -09 ⁰⁵	05 ^o 00.0'	81 ^o 49.0'	4200	Prof, (STD)
11	10 ²⁰ -11 ⁴⁵	05 ^o 01.0'	81 ^o 39.5'	2580	Prof, (STD)
12	12 ⁴⁰ -12 ⁵⁰	05 ^o 01.0'	81 ^o 31.0'	1300	mooring C2 checked
13	13 ³⁵ -15 ¹⁰	05 ^o 03.0'	81 ^o 28.2'	1000	Prof, (STD)
14	16 ⁴⁰ -17 ³⁰	05 ^o 01.5'	81 ^o 17.0'	100	Prof, STD
<hr/>					
15	04-IV 13 ¹⁵ -13 ³⁵	05 ^o 00.0'	81 ^o 10.0'	25	H
16	14 ⁵⁰ -17 ⁵⁰	05 ^o 01.1'	81 ^o 17.0'	96	H, Prof, (STD), BT
17	18 ⁴⁰ -19 ⁵⁵	05 ^o 01.0'	81 ^o 24.6'	196	H, STD
18	20 ²⁷ -22 ²⁵	05 ^o 00.0'	81 ^o 30.0'	1500	H
19	23 ⁵⁵ -05-IV 01 ²⁵	05 ^o 01.5'	81 ^o 39.5'	2700	H
20	05-IV 02 ¹³ -03 ⁵⁵	05 ^o 00.0'	81 ^o 50.0'	4950	H
21	04 ⁵⁵ -07 ⁴⁰	05 ^o 00.0'	82 ^o 00.0'	-	H
22	08 ⁵⁵ -10 ⁴⁵	05 ^o 00.0'	82 ^o 10.0'	-	H, ZP
23	12 ³⁰ -14 ²⁰	05 ^o 00.0'	82 ^o 30.0'	-	H
24	16 ⁰³ -18 ¹⁵	05 ^o 03.0'	82 ^o 50.0'	-	H, ZP
25	20 ²⁰ -22 ⁴⁰	05 ^o 00.0'	83 ^o 11.0'	-	H
26	06-IV 00 ³⁰ -02 ⁴⁰	05 ^o 00.0'	83 ^o 30.0'	-	H, ZP
27	04 ³¹ -06 ²⁵	05 ^o 00.0'	83 ^o 50.0'	-	H
28	08 ³⁰ -11 ⁰⁵	05 ^o 00.0'	84 ^o 10.0'	-	H, ZP
29	21 ²⁵ -22 ⁰⁰	05 ^o 05.0'	82 ^o 40.0'	4220	BT
30	23 ⁰⁰ -23 ¹⁷	05 ^o 05.0'	82 ^o 30.0'	-	BT
31	07-IV 00 ¹³ -00 ⁴⁰	05 ^o 05.0'	82 ^o 23.0'	4600	BT
32	01 ¹² -01 ³⁰	05 ^o 05.0'	82 ^o 20.0'	4600	BT
33	02 ⁰³ -02 ²⁵	05 ^o 05.0'	82 ^o 17.0'	-	BT
34	02 ⁵⁷ -03 ¹⁸	05 ^o 05.0'	82 ^o 14.0'	-	BT
35	03 ⁵² -04 ¹³	05 ^o 05.0'	82 ^o 05.0'	-	BT
36	08 ⁴⁰ -14 ³⁵	05 ^o 01.5'	81 ^o 39.5'	2580	BT, STD, H, ZP, Prof

Station N ^o .	Time	ϕ (S)	λ (W)	Depth (m)	Operations performed
37	10-IV 09 ⁰⁹ -09 ³⁵	05 ⁰⁰ .0'	81 ¹⁰ .0'	25	H
38	09 ⁵⁶ -10 ³⁸	05 ⁰⁰ .0'	81 ¹⁵ .0'	-	H
39	10 ⁵⁶ -11 ³²	05 ⁰⁰ .0'	81 ²⁰ .0'	105	H
40	12 ⁰⁰ -12 ⁴⁰	05 ⁰⁰ .0'	81 ²⁵ .0'	-	H
41	13 ⁰⁹ -15 ¹⁵	05 ⁰⁰ .0'	81 ³⁰ .0'	1500	H
42	17 ⁰⁵ -19 ²⁰	05 ⁰⁰ .0'	81 ⁴⁰ .0'	2800	H
43	14-IV 07 ¹¹ -07 ⁴⁷	05 ⁰⁰ .0'	81 ¹⁰ .0'	25	H, MB
44	08 ⁰⁶ -09 ⁰⁴	05 ⁰⁰ .0'	81 ¹⁵ .0'	-	H, PP, ZP
45	09 ³⁷ -10 ⁴³	05 ⁰⁰ .0'	81 ²⁰ .0'	105	H, PP, ZP, MB
46	10 ⁵⁶ -12 ³⁷	05 ⁰⁰ .0'	81 ²⁵ .0'	1200	H
47	13 ⁰⁴ -14 ⁵⁵	05 ⁰⁰ .0'	81 ³⁰ .0'	1900	H, PP, ZP, MB
48	16 ⁰⁰ -18 ¹⁴	05 ⁰⁰ .0'	81 ⁴⁰ .0'	2900	H
49	20 ³⁰ -22 ³⁵	05 ⁰⁰ .0'	81 ⁵⁰ .0'	-	H, PP, ZP, MB
50	14-IV 23 ¹⁵ -15-IV 01 ⁰⁸	05 ⁰⁰ .0'	82 ⁰⁰ .0'	-	H
51	02 ⁰⁸ -04 ²²	05 ⁰⁰ .0'	82 ⁰⁸ .0'	4800	H, PP, ZP, MB
=====					
52	18-IV 06 ³⁰ -08 ³⁰	04 ¹³ .0'	81 ^{17.5} '	150	Prof
53	09 ⁰⁰ -10 ⁵⁰	04 ¹³ .0'	81 ¹⁵ .0'	110	Prof, H, PP, ZP
54	11 ⁰⁵ -12 ³⁵	04 ¹⁵ .0'	81 ¹⁶ .0'	90	Prof, H, STD
55	12 ⁵² -14 ³¹	04 ¹⁵ .0'	81 ¹⁶ .0'	90	Prof, H, STD
56	14 ⁴⁰ -16 ²³	04 ¹⁵ .0'	81 ¹⁶ .0'	90	Prof, H, STD
57	16 ⁴⁰ -18 ²⁰	04 ¹⁵ .0'	81 ¹⁶ .0'	90	Prof, H, STD, PP
58	18 ³⁰ -20 ⁴²	04 ¹⁵ .0'	81 ¹⁶ .0'	90	Prof, H, ZP
59	19-IV 02 ²⁷ -09 ¹⁵	04 ¹⁵ .0'	81 ²⁸ .0'	2050	H, Prof, STD, ZP, PP
60	09 ²⁵ -11 ²⁵	04 ¹⁵ .0'	81 ²⁷ .0'	2000	Prof
61	11 ⁴⁰ -13 ⁴⁵	04 ¹⁵ .0'	81 ²⁷ .0'	2000	Prof
62	13 ⁵⁸ -15 ³⁰	04 ¹⁵ .0'	81 ²⁷ .0'	2000	Prof
63	17 ¹⁵ -18 ¹⁵	04 ¹⁴ .0'	81 ²⁸ .0'	1950	Prof
64	19 ⁰⁰ -23 ⁰⁵	04 ¹⁵ .0'	81 ²⁸ .0'	2100	H, STD, ZP, PP
65	20-IV 05 ¹⁵ -07 ²⁵	04 ¹⁵ .0'	81 ^{18.5} '	650	H, STD
66	07 ⁴⁸ -09 ¹⁵	04 ^{15.2} '	81 ¹⁹ .0'	320	Prof
67	09 ³⁰ -10 ³⁴	04 ^{15.2} '	81 ^{19.8} '	208	Prof
68	10 ⁵⁰ -11 ⁴¹	04 ^{15.7} '	81 ^{19.2} '	262	Prof
69	12 ⁰⁰ -14 ¹⁰	04 ^{14.8} '	81 ^{21.7} '	1200	Prof
70	14 ³⁰ -16 ²⁴	04 ^{14.8} '	81 ^{21.7} '	1200	Prof

Station N ^o .	Time	ϕ (S)	λ (W)	Depth (m)	Operations performed
71		16 ⁴⁰ -18 ¹⁸	04 ^o 15.0'	81 ^o 23.0'	1300 Prof
72		19 ⁰⁵ -20 ²²	04 ^o 15.0'	81 ^o 16.0'	115 H, STD, PP, ZP, MB
73		20 ⁴⁰ -23 ²⁷	04 ^o 15.0'	81 ^o 20.0'	720 H, STD, PP, ZP, MB
74		23 ⁴⁰ -03 ⁰⁵	04 ^o 14.0'	81 ^o 25.5'	1840 H, (STD)
75	21-IV	03 ²⁵ -06 ⁵⁰	04 ^o 15.0'	81 ^o 30.0'	2640 H, (STD), PP, ZP, MB
76		07 ³⁵ -09 ⁴⁵	04 ^o 15.0'	81 ^o 40.0'	3300 H, (STD)
77		10 ³⁴ -13 ⁴⁵	04 ^o 15.2'	81 ^o 50.0'	5000 H, STD, PP, ZP, MB
78		14 ³⁵ -17 ¹⁰	04 ^o 15.0'	82 ^o 00.0'	5600 H, STD
79		18 ⁰⁰ -22 ⁰⁰	04 ^o 15.0'	82 ^o 10.0'	- H, STD, PP, ZP, MB
=====					
80	25-IV	16 ²¹ -16 ⁵⁰	05 ^o 00.0'	82 ^o 10.0'	25 H, MB
81		17 ¹⁵ -17 ⁵⁰	05 ^o 00.0'	81 ^o 15.0'	46 H, ZP
82		18 ⁰⁰ -18 ⁵⁸	05 ^o 00.0'	81 ^o 20.0'	75 H, MB
83		19 ³⁰ -20 ⁴²	05 ^o 00.0'	81 ^o 25.0'	300 H
84		21 ¹⁴ -23 ¹²	05 ^o 00.0'	81 ^o 30.0'	1400 H, MB
85	26-IV	00 ¹⁰ -02 ¹⁰	05 ^o 00.0'	81 ^o 38.0'	2000 H
86		03 ¹⁰ -05 ³⁶	05 ^o 00.0'	81 ^o 50.0'	2400 H, MB
87		06 ³⁰ -08 ⁴⁰	05 ^o 00.0'	82 ^o 00.0'	- H
88		09 ³⁵ -11 ³⁵	05 ^o 00.0'	82 ^o 10.0'	4900 H, MB
88A		14 ⁰⁵ -15 ⁵⁰	05 ^o 00.0'	81 ^o 39.8'	- H, MB
89	27-IV	00 ⁴⁵ -02 ¹³	04 ^o 17.0'	81 ^o 17.0'	192 H, MB
90		03 ⁵⁰ -05 ⁰⁴	04 ^o 30.0'	81 ^o 22.0'	180 H, MB
91		06 ³⁵ -07 ³⁵	04 ^o 45.0'	81 ^o 25.0'	170 H, MB
92		08 ⁵⁸ -10 ⁰⁵	05 ^o 00.0'	81 ^o 28.0'	230 H, MB
93		11 ²⁵ -12 ²⁶	05 ^o 15.0'	81 ^o 25.0'	400 H, MB
94		14 ²⁵ -15 ⁰¹	05 ^o 30.0'	81 ^o 20.0'	200 H, MB
95		17 ²⁰ -18 ³⁹	05 ^o 45.0'	81 ^o 14.0'	180 H, MB
96		19 ⁴⁰ -20 ³⁰	06 ^o 00.0'	81 ^o 13.0'	175 H, MB
97		21 ⁵⁰ -23 ⁴⁷	06 ^o 00.0'	81 ^o 28.0'	2750 H, MB
98	28-IV	01 ⁰² -02 ⁵⁵	05 ^o 45.0'	81 ^o 29.0'	1800 H, MB
99		03 ⁵⁵ -05 ⁵⁰	05 ^o 30.0'	81 ^o 29.0'	2000 H, MB
100		07 ⁰² -08 ⁴²	05 ^o 15.0'	81 ^o 32.0'	1900 H, MB
101		09 ⁵⁵ -11 ³⁵	05 ^o 00.0'	81 ^o 38.0'	- H, MB
102		12 ⁵⁵ -14 ²⁰	04 ^o 45.0'	81 ^o 38.0'	2000 H, MB
103		16 ⁰⁰ -18 ¹⁰	04 ^o 34.0'	81 ^o 42.0'	2500 H, MB
104		19 ³⁷ -21 ⁰⁰	04 ^o 15.0'	81 ^o 32.0'	2100 H, MB

Station N ^o .	Time	ϕ (S)	λ (W)	Depth (m)	Operations performed
105	29-IV 01 ¹⁰ -01 ⁴⁰	05 ⁰⁰ .0'	81 ¹⁰ .0'	60	H, MB
106	02 ¹² -02 ⁴⁵	05 ⁰⁰ .0'	81 ¹⁵ .0'	70	H, MB, OM
107	03 ¹² -04 ¹⁰	05 ⁰⁰ .0'	81 ²⁰ .0'	230	H, MB, OM
108	04 ³⁷ -06 ¹⁰	05 ⁰⁰ .0'	81 ²⁵ .0'	750	H, MB
109	06 ²⁵ -08 ¹⁰	05 ⁰⁰ .0'	81 ³⁰ .0'	3290	H, MB, OM
110	09 ⁰⁰ -10 ²⁸	05 ⁰⁰ .0'	81 ⁴⁰ .0'	3600	H, MB
111	11 ¹⁵ -12 ⁴⁷	05 ⁰⁰ .0'	81 ⁵⁰ .0'	4570	H, MB, OM
112	13 ³⁷ -15 ¹⁵	05 ⁰⁰ .0'	82 ⁰⁰ .0'	4500	H, MB
113	16 ⁰⁵ -17 ⁵⁰	05 ⁰⁰ .0'	82 ¹⁰ .0'	4500	H, MB, OM
114	30-IV 01 ¹⁵ -01 ³⁰	04 ¹⁵ .0'	81 ¹⁵ .0'	74	STD, OM
115	01 ⁵⁰ -02 ¹⁵	04 ¹⁵ .0'	81 ²⁰ .0'	450	STD
116	03 ¹⁰ -03 ⁵²	04 ¹⁵ .0'	81 ³⁰ .0'	2000	STD, OM
117	04 ⁴⁵ -06 ¹³	04 ¹⁵ .0'	81 ⁴⁰ .0'	3200	STD
118	07 ⁰⁰ -07 ⁵⁵	04 ¹⁵ .0'	81 ⁵⁰ .0'	-	STD, OM
119	08 ⁴⁰ -09 ²⁵	04 ¹⁵ .0'	82 ⁰⁰ .0'	4400	STD
120	10 ²⁰ -11 ⁰¹	04 ¹⁵ .0'	82 ¹⁰ .0'	4000	STD, OM
121	12 ³⁰ -13 ¹¹	04 ³⁰ .0'	82 ¹⁰ .0'	-	STD, OM
122	14 ¹⁵ -14 ⁴⁸	04 ³⁰ .0'	82 ⁰⁰ .0'	3600	STD
123	15 ⁵⁰ -16 ⁴¹	04 ³⁰ .0'	81 ⁵⁰ .0'	-	STD, OM
124	17 ⁵⁰ -18 ⁴⁵	04 ³⁰ .0'	81 ⁴⁰ .0'	-	STD
125	19 ³⁰ -20 ¹³	04 ³⁰ .0'	81 ³⁰ .0'	2800	STD, OM
126	21 ³⁰ -21 ⁴⁵	04 ³⁰ .0'	81 ²⁰ .0'	120	STD, MB, OM
127	23 ⁰⁶ -23 ¹⁸	04 ⁴⁵ .0'	81 ²⁰ .0'	30	OM
128	01-V 00 ⁰⁵ -00 ⁴⁶	04 ⁴⁵ .0'	81 ³⁰ .0'	1000	STD
129	01 ³⁶ -02 ¹⁵	04 ⁴⁵ .0'	81 ⁴⁰ .0'	3600	STD, OM
130	02 ⁵⁸ -03 ⁴⁸	04 ⁴⁵ .0'	81 ⁵⁰ .0'	4400	STD
131	04 ³⁷ -05 ³⁷	04 ⁴⁵ .0'	82 ⁰⁰ .0'	5200	STD, OM
132	06 ¹⁷ -07 ⁰¹	04 ⁴⁵ .0'	82 ¹⁰ .0'	3000	STD, OM
133	08 ²⁵ -09 ⁵⁰	05 ⁰⁰ .0'	82 ¹⁰ .0'	5100	STD, OM
134	11 ³⁵ -12 ⁰⁵	05 ⁰⁰ .0'	82 ⁰⁰ .0'	-	STD, MB, OM
135	13 ³⁸ -14 ²⁰	05 ⁰⁰ .0'	81 ⁴⁰ .0'	2400	STD, MB, OM
136	16 ⁵⁰ -16 ⁵⁵	05 ⁰⁰ .0'	81 ²⁵ .0'	45	OM
137	19 ⁴² -20 ⁰²	05 ¹⁵ .0'	81 ¹² .0'	50	STD, OM
138	20 ⁴⁰ -20 ⁵⁵	05 ¹⁵ .0'	81 ²⁰ .0'	160	STD
139	21 ⁴⁶ -22 ³⁵	05 ¹⁵ .0'	81 ³⁰ .0'	1500	STD, OM

Station N ^o .	Time	ϕ (S)	λ (W)	Depth (m)	Operations performed
140		23 ³⁰ -00 ¹⁰	05 ⁰ 15.0'	81 ⁰ 40.0'	3100 STD
141	02-V	01 ⁰⁶ -01 ³⁷	05 ⁰ 15.0'	81 ⁰ 50.0'	3700 STD
142		02 ²⁰ -03 ⁰⁰	05 ⁰ 15.0'	82 ⁰ 00.0'	5600 STD
143		03 ⁴² -04 ³⁸	05 ⁰ 15.0'	82 ⁰ 10.0'	- STD
144		05 ⁵⁵ -06 ⁵⁵	05 ⁰ 30.0'	82 ⁰ 10.0'	- STD, OM
145		07 ⁴⁰ -08 ³⁰	05 ⁰ 30.0'	82 ⁰ 00.0'	- STD
146		09 ¹⁵ -10 ⁰⁰	05 ⁰ 30.0'	81 ⁰ 50.0'	- STD, OM
147		10 ⁴⁵ -11 ⁴⁰	05 ⁰ 30.0'	81 ⁰ 40.0'	5000 STD
148		12 ²⁵ -13 ¹⁴	05 ⁰ 30.0'	81 ⁰ 30.0'	4300 STD, OM
149		14 ⁰⁸ -14 ⁴⁵	05 ⁰ 30.0'	81 ⁰ 20.0'	2200 STD
150		16 ¹⁵ -16 ⁵⁰	05 ⁰ 30.0'	81 ⁰ 10.0'	250 STD, OM
151		17 ⁴⁰ -18 ⁰⁵	05 ⁰ 45.0'	81 ⁰ 10.0'	80 STD, OM
152		18 ⁴⁰ -19 ¹⁵	05 ⁰ 45.0'	81 ⁰ 20.0'	600 STD
153		19 ⁴⁰ -20 ⁵⁰	05 ⁰ 45.0'	81 ⁰ 30.0'	2400 STD, OM
154		21 ³⁰ -22 ²⁵	05 ⁰ 45.0'	81 ⁰ 40.0'	4700 STD
155		23 ¹⁰ -00 ⁰⁵	05 ⁰ 45.0'	81 ⁰ 50.0'	4800 STD
156	03-V	00 ⁵⁰ -01 ³⁰	05 ⁰ 45.0'	82 ⁰ 00.0'	- STD
157		02 ⁰⁷ -02 ⁴⁶	05 ⁰ 45.0'	82 ⁰ 10.0'	- STD
158		03 ⁵⁰ -04 ⁵⁸	06 ⁰ 00.0'	82 ⁰ 10.0'	- STD, OM
159		05 ⁴⁵ -06 ⁵⁴	06 ⁰ 00.0'	82 ⁰ 00.0'	- STD
160		07 ³⁵ -08 ²⁰	06 ⁰ 00.0'	81 ⁰ 50.0'	- STD, OM
161		09 ¹⁰ -09 ⁵⁵	06 ⁰ 00.0'	81 ⁰ 40.0'	- STD
162		10 ⁵⁰ -11 ³⁷	06 ⁰ 00.0'	81 ⁰ 30.0'	- STD, OM
163		12 ³⁵ -13 ¹⁵	06 ⁰ 00.0'	81 ⁰ 20.0'	2100 STD
164		14 ¹⁵ -14 ³⁰	06 ⁰ 00.0'	81 ⁰ 10.0'	250 STD, MB
165		19 ⁰⁵ -19 ⁴³	05 ⁰ 00.0'	81 ⁰ 10.0'	45 H
166		19 ⁵⁰ -20 ¹⁸	05 ⁰ 00.0'	81 ⁰ 15.0'	75 H
167		20 ³⁵ -21 ²⁰	05 ⁰ 00.0'	81 ⁰ 20.0'	120 H
168		21 ⁴⁰ -22 ²²	05 ⁰ 00.0'	81 ⁰ 25.0'	220 H
169		22 ⁴⁴ -01 ⁰⁶	05 ⁰ 00.0'	81 ⁰ 30.0'	1200 H, MB
170	04-V	01 ³⁵ -03 ²⁵	05 ⁰ 00.0'	81 ⁰ 40.0'	2500 H
171		04 ⁰⁷ -07 ⁰⁰	05 ⁰ 00.0'	81 ⁰ 50.0'	4050 H, MB
172		07 ⁵⁶ -08 ⁰⁵	05 ⁰ 00.0'	82 ⁰ 00.0'	- (H)
173		09 ⁰⁰ -10 ²⁰	05 ⁰ 00.0'	82 ⁰ 10.0'	- H, MB
174		14 ⁵⁰ -14 ⁵⁵	05 ⁰ 01.3'	81 ⁰ 17.0'	85 MB

Line	Time	Lat	Long	Depth (m)	Operations performed
100	02-00	02°00.0'	01°20.0'	3100	STD
101		02°01.0'	01°20.0'	3700	STD
102		02°02.0'	01°20.0'	5100	STD
103		02°03.0'	01°20.0'	-	STD
104		02°04.0'	01°20.0'	-	STD, CM
105		02°05.0'	01°20.0'	-	STD
106		02°06.0'	01°20.0'	-	STD, CM
107		02°07.0'	01°20.0'	5300	STD
108		02°08.0'	01°20.0'	4700	STD, CM
109		02°09.0'	01°20.0'	2300	STD
110		02°10.0'	01°20.0'	280	STD, CM
111		02°11.0'	01°20.0'	80	STD, CM
112		02°12.0'	01°20.0'	600	STD
113		02°13.0'	01°20.0'	3600	STD, CM
114		02°14.0'	01°20.0'	4700	STD
115		02°15.0'	01°20.0'	4300	STD
116	03-00	02°16.0'	01°20.0'	-	STD
117		02°17.0'	01°20.0'	-	STD
118		02°18.0'	01°20.0'	-	STD, CM
119		02°19.0'	01°20.0'	-	STD
120		02°20.0'	01°20.0'	-	STD, CM
121		02°21.0'	01°20.0'	-	STD
122		02°22.0'	01°20.0'	-	STD, CM
123		02°23.0'	01°20.0'	2100	STD
124		02°24.0'	01°20.0'	280	STD, MB
125		02°25.0'	01°20.0'	65	H
126		02°26.0'	01°20.0'	75	H
127		02°27.0'	01°20.0'	170	H
128		02°28.0'	01°20.0'	220	H
129		02°29.0'	01°20.0'	1200	H, MB
130	04-00	02°30.0'	01°20.0'	2500	H
131		02°31.0'	01°20.0'	4050	H, MB
132		02°32.0'	01°20.0'	-	(H)
133		02°33.0'	01°20.0'	-	H, MB
134		02°34.0'	01°20.0'	85	MB

Station N ^o .	Time	ϕ (S)	λ (W)	Depth (m)	Operations performed
140		23 ³⁰ -00 ¹⁰	05 ⁰ 15.0'	81 ⁰ 40.0'	3100 STD
141	02-V	01 ⁰⁶ -01 ³⁷	05 ⁰ 15.0'	81 ⁰ 50.0'	3700 STD
142		02 ²⁰ -03 ⁰⁰	05 ⁰ 15.0'	82 ⁰ 00.0'	5600 STD
143		03 ⁴² -04 ³⁸	05 ⁰ 15.0'	82 ⁰ 10.0'	- STD
144		05 ⁵⁵ -06 ⁵⁵	05 ⁰ 30.0'	82 ⁰ 10.0'	- STD, OM
145		07 ⁴⁰ -08 ³⁰	05 ⁰ 30.0'	82 ⁰ 00.0'	- STD
146		09 ¹⁵ -10 ⁰⁰	05 ⁰ 30.0'	81 ⁰ 50.0'	- STD, OM
147		10 ⁴⁵ -11 ⁴⁰	05 ⁰ 30.0'	81 ⁰ 40.0'	5000 STD
148		12 ²⁵ -13 ¹⁴	05 ⁰ 30.0'	81 ⁰ 30.0'	4300 STD, OM
149		14 ⁰⁸ -14 ⁴⁵	05 ⁰ 30.0'	81 ⁰ 20.0'	2200 STD
150		16 ¹⁵ -16 ⁵⁰	05 ⁰ 30.0'	81 ⁰ 10.0'	250 STD, OM
151		17 ⁴⁰ -18 ⁰⁵	05 ⁰ 45.0'	81 ⁰ 10.0'	80 STD, OM
152		18 ⁴⁰ -19 ¹⁵	05 ⁰ 45.0'	81 ⁰ 20.0'	600 STD
153		19 ⁴⁰ -20 ⁵⁰	05 ⁰ 45.0'	81 ⁰ 30.0'	2400 STD, OM
154		21 ³⁰ -22 ²⁵	05 ⁰ 45.0'	81 ⁰ 40.0'	4700 STD
155		23 ¹⁰ -00 ⁰⁵	05 ⁰ 45.0'	81 ⁰ 50.0'	4800 STD
156	03-V	00 ⁵⁰ -01 ³⁰	05 ⁰ 45.0'	82 ⁰ 00.0'	- STD
157		02 ⁰⁷ -02 ⁴⁶	05 ⁰ 45.0'	82 ⁰ 10.0'	- STD
158		03 ⁵⁰ -04 ⁵⁸	06 ⁰ 00.0'	82 ⁰ 10.0'	- STD, OM
159		05 ⁴⁵ -06 ⁵⁴	06 ⁰ 00.0'	82 ⁰ 00.0'	- STD
160		07 ³⁵ -08 ²⁰	06 ⁰ 00.0'	81 ⁰ 50.0'	- STD, OM
161		09 ¹⁰ -09 ⁵⁵	06 ⁰ 00.0'	81 ⁰ 40.0'	- STD
162		10 ⁵⁰ -11 ³⁷	06 ⁰ 00.0'	81 ⁰ 30.0'	- STD, OM
163		12 ³⁵ -13 ¹⁵	06 ⁰ 00.0'	81 ⁰ 20.0'	2100 STD
164		14 ¹⁵ -14 ³⁰	06 ⁰ 00.0'	81 ⁰ 10.0'	250 STD, MB
165		19 ⁰⁵ -19 ⁴³	05 ⁰ 00.0'	81 ⁰ 10.0'	45 H
166		19 ⁵⁰ -20 ¹⁸	05 ⁰ 00.0'	81 ⁰ 15.0'	75 H
167		20 ³⁵ -21 ²⁰	05 ⁰ 00.0'	81 ⁰ 20.0'	120 H
168		21 ⁴⁰ -22 ²²	05 ⁰ 00.0'	81 ⁰ 25.0'	220 H
169		22 ⁴⁴ -01 ⁰⁶	05 ⁰ 00.0'	81 ⁰ 30.0'	1200 H, MB
170	04-V	01 ³⁵ -03 ²⁵	05 ⁰ 00.0'	81 ⁰ 40.0'	2500 H
171		04 ⁰⁷ -07 ⁰⁰	05 ⁰ 00.0'	81 ⁰ 50.0'	4050 H, MB
172		07 ⁵⁶ -08 ⁰⁵	05 ⁰ 00.0'	82 ⁰ 00.0'	- (H)
173		09 ⁰⁰ -10 ²⁰	05 ⁰ 00.0'	82 ⁰ 10.0'	- H, MB
174		14 ⁵⁰ -14 ⁵⁵	05 ⁰ 01.3'	81 ⁰ 17.0'	85 MB

Station N ^o .	Time		ϕ (S)	λ (W)	Depth (m)	Operations performed
175	09-V	15 ⁵³ -16 ²⁰	05°00.0'	81°12.0'	25	H
176		17 ⁰⁵ -17 ³⁶	05°00.0'	81°15.0'	55	H
177		18 ⁰⁰ -18 ⁴⁶	05°00.0'	81°20.0'	110	H
178		19 ⁴⁰ -21 ⁵³	05°00.0'	81°30.0'	1600	H
179		22 ⁴⁵ -00 ⁵²	05°00.0'	81°40.0'	3800	H
180	10-V	01 ⁴³ -03 ³¹	05°00.0'	81°50.0'	3950	H
181		04 ²⁴ -06 ³³	05°00.0'	82°00.0'	-	H
182		07 ¹⁷ -09 ¹⁸	05°00.0'	82°10.0'	-	H
183		10 ¹² -12 ⁰³	05°00.0'	82°33.0'	-	H
184		13 ⁴² -15 ⁰²	05°00.0'	82°40.0'	-	H
185	11-V	02 ⁰⁰ -02 ⁴⁵	06°00.0'	81°12.0'	110	H
186		04 ⁰⁰ -04 ⁴⁵	06°00.0'	81°12.0'	110	H
187		06 ²⁰ -07 ⁵⁰	05°59.0'	81°12.0'	110	Prof, H
188		08 ⁰⁰ -09 ³⁴	05°59.0'	81°13.0'	150	Prof, H
189		09 ⁴⁵ -11 ¹⁰	05°59.0'	81°13.0'	146	Prof, H
190		11 ⁵⁷ -13 ³⁸	05°59.0'	81°13.0'	110	Prof, H
191		14 ⁰⁰ -15 ³⁸	05°59.0'	81°13.0'	152	Prof, H
192		15 ⁵⁰ -17 ⁰⁵	06°00.0'	81°13.0'	115	Prof, H
193		17 ¹⁸ -19 ⁴⁵	05°59.0'	81°12.0'	115	Prof, H
194		20 ⁰⁰ -21 ⁴⁰	06°00.0'	81°13.0'	140	H
195		22 ⁰⁰ -23 ⁴⁰	05°59.0'	81°14.0'	190	H
196	12-V	00 ³⁵ -01 ²⁰	06°00.0'	81°13.0'	116	H
197		06 ³⁰ -07 ⁵⁵	06°02.0'	81°24.5'	1580	Prof
198		08 ¹⁵ -09 ³⁵	06°02.0'	81°24.5'	1580	Prof
199		09 ⁵⁰ -11 ³⁵	06°02.0'	81°24.5'	1540	Prof
200		11 ⁵⁵ -13 ³⁵	06°00.0'	81°25.0'	1560	Prof
201		14 ⁰⁰ -15 ³⁵	06°00.0'	81°25.0'	1600	Prof
202		15 ⁵⁰ -17 ²⁵	06°02.0'	81°24.0'	1540	Prof
203		19 ⁰⁰ -19 ⁴⁵	06°00.0'	81°11.0'	120	STD, H3
204		20 ⁰⁵ -21 ⁰³	06°00.0'	81°15.0'	200	STD, H3
205		21 ³⁰ -22 ⁰⁵	06°00.0'	81°20.0'	1100	STD, H3
206		23 ³⁰ -00 ⁵⁶	06°00.0'	81°25.0'	2140	STD, H3
207	13-V	01 ³⁵ -02 ³⁶	06°00.0'	81°30.0'	2400	STD, H3
208		03 ²⁷ -04 ⁴⁸	06°00.0'	81°40.0'	-	STD, H3
209		05 ⁴⁵ -07 ¹⁵	06°00.0'	81°50.0'	-	STD, H3
210		08 ⁰⁸ -10 ⁰⁸	06°00.0'	82°00.0'	-	STD, H3
211		10 ⁵⁰ -12 ²⁵	06°00.0'	82°10.0'	-	STD, H3
212		20 ²³ -21 ⁰⁰	05°00.0'	81°10.0'	25	H

Station N ^o .	Time	ϕ (S)	λ (W)	Depth (m)	Operations performed
213	21 ²⁵ -22 ⁰⁶	05°00.0'	81°15.0'	65	H
214	22 ³⁰ -23 ¹⁸	05°00.0'	81°20.0'	130	H
215	23 ⁴³ -01 ¹⁴	05°00.0'	81°25.0'	950	H
216	14-v 01 ³⁵ -02 ⁵¹	05°00.0'	81°30.0'	1440	H
217	03 ²⁸ -05 ⁰³	05°00.0'	81°40.0'	2900	H
218	05 ⁴⁸ -07 ⁴⁵	05°00.0'	81°50.0'	4200	H
219	08 ²⁸ -10 ²⁵	05°00.0'	82°00.0'	-	H
220	11 ¹⁰ -12 ⁵⁷	05°00.0'	82°10.0'	-	H
221	13 ²⁶ -14 ⁵⁸	05°00.0'	82°20.0'	-	H
222	15 ³⁷ -17 ⁰⁵	05°00.0'	82°30.0'	-	H
223	15-v 07 ⁰⁰ -11 ⁰⁰	05°01.5'	81°39.5'	2580	mooring M2 recovered
223A	13 ⁴⁰ -14 ¹¹	05°01.35'	81°17.0'	91	Prof
224	14 ²⁸ -14 ⁵⁸	05°01.35'	81°17.0'	90	Prof
225	15 ¹⁰ -15 ⁵⁷	05°01.35'	81°17.0'	90	Prof
226	15 ⁵⁰ -16 ⁴⁰	05°01.35'	81°17.0'	90	Prof
227	17-v 07 ⁰⁷ -08 ³⁸	05°01.0'	81°32.8'	2100	Prof
228	08 ⁵⁹ -10 ³⁹	05°01.0'	81°32.8'	2100	Prof
229	10 ⁵⁷ -12 ³⁸	05°01.0'	81°32.8'	2100	Prof
230	12 ⁴⁶ -14 ²⁵	05°01.0'	81°32.8'	2100	Prof
231	14 ⁴⁶ -16 ²³	05°01.0'	81°32.8'	2100	Prof
232	16 ⁵² -18 ³⁰	05°01.0'	81°32.8'	2100	Prof
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233	20-v 08 ⁰⁵ -11 ¹⁶	05°00.5'	81°44.5'	3660	mooring C3 recovered
234	12 ³⁰ -16 ²⁰	05°01.3'	81°31.0'	1300	mooring C2 recovered
235	21-v 09 ³⁵ -10 ⁰⁵	05°00.0'	81°10.0'	55	H
236	10 ³⁰ -11 ⁰²	05°00.0'	81°15.0'	82	H
237	11 ²⁷ -12 ¹⁰	05°00.0'	81°20.0'	170	H
238	12 ³⁶ -14 ¹⁶	05°00.0'	81°25.0'	1000	H
239	14 ⁴⁰ -16 ²⁹	05°00.0'	81°30.0'	1500	H
240	17 ¹⁵ -18 ⁴⁵	05°00.0'	81°40.0'	3400	H
241	19 ²⁵ -21 ⁰¹	05°00.0'	81°50.0'	-	H
242	21 ⁴⁵ -23 ⁴²	05°00.0'	82°00.0'	-	H
243	22-v 00 ²⁰ -02 ⁰⁴	05°00.0'	82°10.0'	-	H
244	07 ⁵⁰ -13 ³⁰	05°01.3'	81°17.0'	97	mooring C1 M1 recovered