

I.O.S.

**A COMPILATION OF CURRENT AND TEMPERATURE DATA
FROM MOORED INSTRUMENTS DURING INDEX 1979,
RRS DISCOVERY**

D.R. QUADFASEL

DATA REPORT 19

1980

**NATURAL ENVIRONMENT
INSTITUTE OF
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As part of the Global Weather Experiment (FGGE) a multiship oceanographic survey of the western Indian Ocean was carried out between March and September 1979. The general aim of this experiment and some preliminary results have been described by Swallow (1980). The British contribution to INDEX was a two month cruise of RRS Discovery between 10 May and 6 July 1979 (I.O.S. cruise report, No. 83, 1979).

Besides the ship-board measurements an array of four current meter systems was moored off the Somali coast in water depths between 3300 and 4500 m for just over one month. The self-recording instruments were deployed at nominal depths of 200, 500, 700 and 2000 m which were chosen in relation to the levels of the westward equatorial jets (Luyten and Swallow, 1976). The observed mean depths of instruments were however some 100-200 m greater than intended. In this report oceanographic data obtained with the moored instruments are presented in a graphical form. Basic statistics are also given. Some preliminary results on the kinematics of the Somali Current system based on these observations have been published by Schott and Quadfasel (1980).

The four moorings (272-275 in Fig. 1) contained four Aanderaa RCM-4 current meters each, except for 275 (only 3 c.m.). The moorings were taut wire systems with a steel sphere 10 m above the top instrument as the only buoyancy. Only 275 had additional back-up buoyancy above the acoustic release system.

The accuracy of the Aanderaa current meters as specified by the manufacturer are $\pm 2\%$ for the speed value, ± 2 degrees for direction, $\pm 0.1^{\circ}\text{C}$ for temperature and ± 2 dbar for pressure.

Most of the instruments deployed had a 100% data return, the amount of spiky values which had to be replaced by linear interpolation between neighbouring values was less than 1%. Only on three current meters severe problems occurred reducing the quality of data substantially:

(a) Mooring 273 (417 m):

The rotor was lost after 11 days of recording on 2 June. For the analysis and plots of this record an artificial constant speed of 15 cm/s was used during the second half of the record to show at least the directional signal.

(b) Mooring 273 (2198 m):

The compass of this instrument was cut short for altogether 25% of the recording time. Single gaps were up to 6 hours long and occurred more frequently at the end of the recording time. These gaps were linearly interpolated between neighbouring values. For analysis of high frequency fluctuations (e.g. tides) this record should not be

used, however, in the long periodic fluctuations (>2d) the errors are negligible.

(c) Mooring 275 (2142 m):

The magnetic tape was not decodable due to a slipping capstan in the recording unit. The record is completely lost.

No attempt has been made to correct the recorded current speeds and directions for horizontal mooring motion. Some statistical information about the records is given in Table 1, the data are also presented graphically in different ways, using the following abbreviations:

U - East component of current, cm/s

V - North " " " cm/s

T - Temperature °C

P - Pressure dbar

1. U,V,T,P as time series.

All time series are based on 1 hourly mean values. They are presented as deviations from the overall mean which is indicated on the left of the zero-line in each case.

2. U,V combined to progressive vector diagrams.

The plots are based on 1 hourly mean values, tickmarks are every day.

3. U,V combined for stickplots.

The time series of 1 hourly mean values was low pass filtered and every sixth value is presented. Filter type: Lanczos taper, half power frequency 30 h, No. of weights: 30, Amplitude reduction at 24.8 h: 0.26, at 12.4 h: 0.01.

4. The statistics given in Table 1 are based on 1 hourly mean values.

ACKNOWLEDGEMENTS

The help of Mr I. Waddington and captain and crew of RRS Discovery during deployment and retrieval of the moorings is highly appreciated.

REFERENCES

- I.O.S. Cruise Report No. 83, 1979. Physical oceanographic studies in the western equatorial Indian Ocean: a contribution to the FGGE oceanographic programme.
- Luyten, J.R. and J.C. Swallow, 1976. Equatorial undercurrents. Deep-Sea Res. 23, 999-1001.
- Schott, F. and D.R. Quadfasel, 1980. Development of the subsurface currents of the northern Somali Current gyre from March to July 1979, Science, in press.

Swallow, J.C., 1980. Response of the western Equatorial Indian Ocean to the monsoon winds: observations during the Global Weather Experiment, Science, in press.

Table 1a

MOORING NO.: 272 BOTTOM DEPTH: 4215 m

POSITION: $\phi = 2^{\circ}00.2'N$ $\lambda = 48^{\circ}02.7'E$ START: 17.05.1979, 16.00 GMT STOP: 19.06.1979, 07.00 GMT $\Delta t = 10$ min

DEPTH (m)	PAR	MEAN	VARIANCE	STD DEV.	MIN	MAX	VECTOR MEAN	DIR MEAN	INSTR
305	U	.89	26.69	5.17	-14.75	11.93	2.22	156.3	A-VTP
	V	-2.04	25.96	5.09	-14.26	12.04			
	T	11.77	.02	.14	11.43	12.23			
	P	305.1	9.6	3.1	300.1	314.3			
607	U	9.26	64.85	8.05	-17.23	30.50	12.65	47.0	A-VT
	V	8.62	32.05	5.66	-2.65	24.41			
	T	8.89	.02	.13	8.66	9.50			
859	U	-.39	15.90	3.99	-13.95	10.07	1.95	348.4	A-VT
	V	1.91	31.94	5.65	-9.27	17.87			
	T	7.59	.02	.12	7.24	8.10			
2166	U	-2.81	17.67	4.20	-12.15	7.47	3.77	228.3	A-VT
	V	-2.51	12.47	3.53	-10.74	9.22			
	T	2.53	.002	.05	2.38	2.72			

Table 1b.

MOORING NO.: 273 BOTTOM DEPTH: 3851 m

POSITION: $\phi = 3^{\circ}57.2'N$ $\lambda = 50^{\circ}03.3E$ START: 21.05.1979, 13.00 GMT STOP: 22.06.1979, 12.00 GMT $\Delta t = 10$ min

REMARKS: TOP INSTR. ROTOR LOST ON 2 JUNE

DEEP INSTR. PARTLY COMPASS SHORT CUT

DEPTH (m)	PAR	MEAN	VARIANCE	STD DEV.	MIN	MAX	VECTOR MEAN	DIR MEAN	INSTR
416	U	2.16	128.91	11.35	-18.96	14.99	2.60	123.9	A-VTP
	V	-1.45	38.73	6.22	-14.96	12.87			
	T	10.52	.18	.43	9.65	11.82			
	P	416.0	2535.5	50.4	376.2	566.9	7.91	267.0	
	U*	-7.89	12.91	3.59	-18.96	.75			
	V*	-.41	19.78	4.45	-12.59	12.85			
657	U	2.83	103.78	10.19	-16.49	23.54	3.69	50.1	A-VT
	V	2.37	30.93	5.56	-12.61	17.02			
	T	9.39	.05	.21	8.54	9.81			
901	U	2.55	102.53	10.13	-17.27	23.35	4.59	33.7	A-VT
	V	3.83	47.72	6.91	-11.75	26.82			
	T	8.20	.25	.49	6.61	9.09			
2198	U	5.46	8.73	2.95	-4.21	13.59	10.69	30.7	A-VT
	V	9.19	39.67	6.30	-7.20	21.97			
	T	2.22	.004	.06	2.07	2.32			

* only 21 May - 2 June 1979.

Table 1c.

MOORING NO.: 274 BOTTOM DEPTH: 4542 m

POSITION: $\phi = 5^{\circ}40.7'N$ $\lambda = 50^{\circ}23.8'E$

START: 25.05.1979 04.00 GMT STOP: 25.06.1979 09.00 GMT $\Delta t = 10$ min

DEPTH (m)	PAR	MEAN	VARIANCE	STD DEV.	MIN	MAX	VECTOR MEAN	DIR MEAN	INSTR
357	U	1.18	58.05	7.62	-13.52	21.25	1.29	66.3	A-VTP
	V	.52	354.58	18.83	-25.09	41.85			
	T	11.57	.49	.70	9.87	12.99			
	P	356.6	1822.3	42.7	300.9	468.8			
651	U	6.00	169.55	13.02	-18.45	32.92	7.45	126.2	A-VT
	V	-4.40	448.24	21.17	-33.01	40.13			
	T	9.75	.24	.49	8.50	10.95			
909	U	-2.32	172.45	13.13	-26.68	28.77	2.34	278.2	A-VT
	V	.33	192.99	13.89	-32.91	30.26			
	T	8.04	.42	.65	6.55	9.45			
2204	U	-4.32	32.80	5.73	-13.88	7.86	4.46	255.4	A-VT
	V	-1.12	27.02	5.20	-12.53	10.44			
	T	2.44	.004	.06	2.28	2.61			

Table 1d.

MOORING NO.: 275 BOTTOM DEPTH 3335 m

POSITION: $\phi = 7^{\circ}17.8'N$ $\lambda = 50^{\circ}39.22'E$

START: 28.05.1979, 06.00 GMT STOP: 28.06.1978 13.00 GMT $\Delta t = 10$ min

REMARKS: TAPE OF DEEP INSTR. NOT DECODABLE

DEPTH (m)	PAR	MEAN	VARIANCE	STD DEV.	MIN	MAX	VECTOR MEAN	DIR MEAN	INSTR
267	U	-1.06	79.80	8.93	-21.82	20.33	5.79	349.5	A-VTP
	V	5.69	208.89	14.45	-16.49	50.52			
	T	13.29	.57	.75	11.23	15.05			
	P	267.4	1495.6	38.7	241.6	409.5			
820	U	-4.67	230.37	15.18	-35.00	46.01	4.67	268.5	A-VT
	V	-.12	85.90	9.27	-24.79	18.45			
	T	9.17	.22	.47	7.66	10.13			

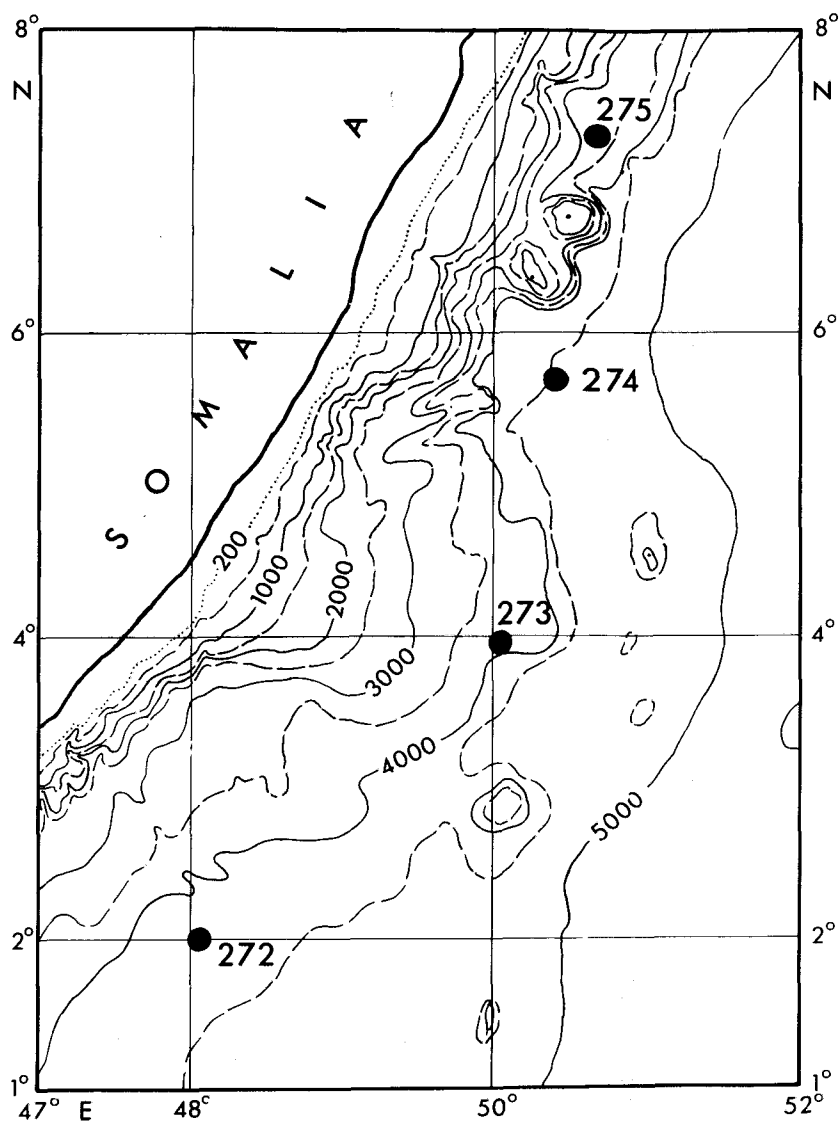


Fig. 1 Mooring positions (272-275) and bathymetry of experimental site. Depth contours in metres.

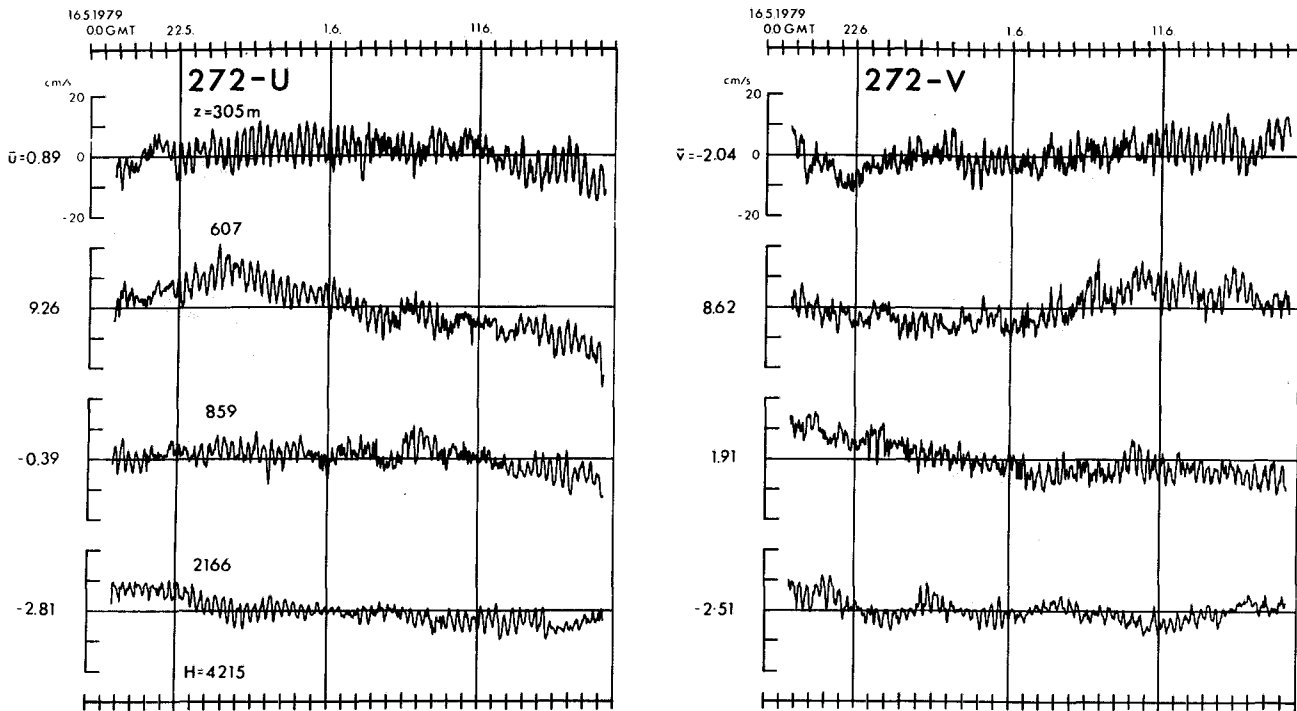


Fig. 2 Variation of east - (u) and north - (v) component of current from their mean value at position 272 (see Fig. 1). H = bottom depth, z = instrument depth, $\bar{u}$, $\bar{v}$ = mean values u , v .

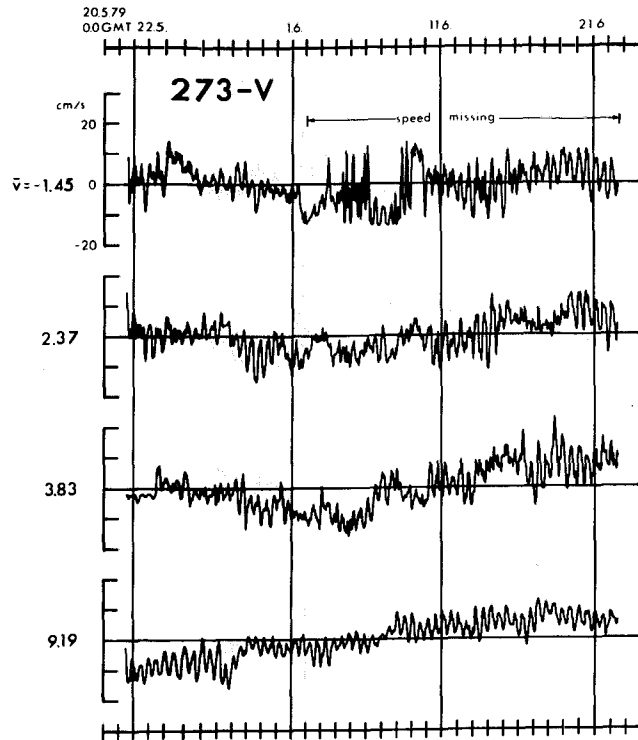
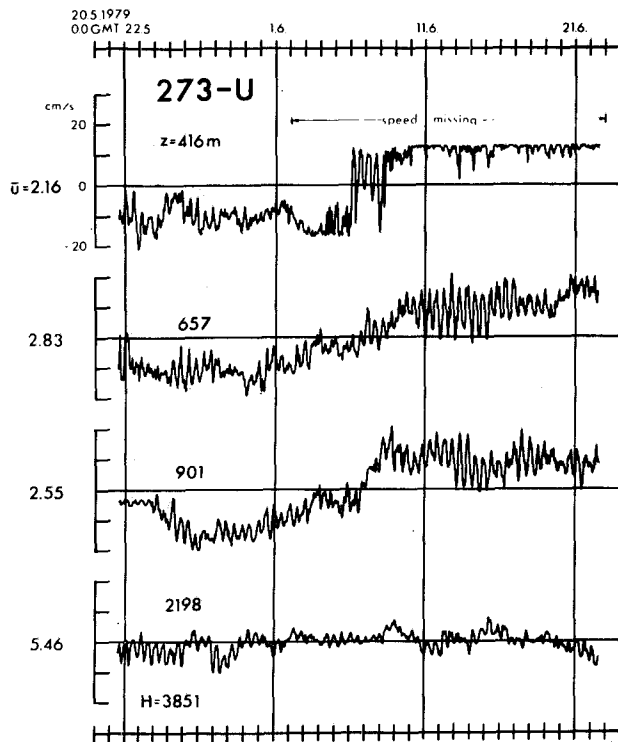


Fig. 3 Variation of current components at position 273 (see Figs. 1, 2).

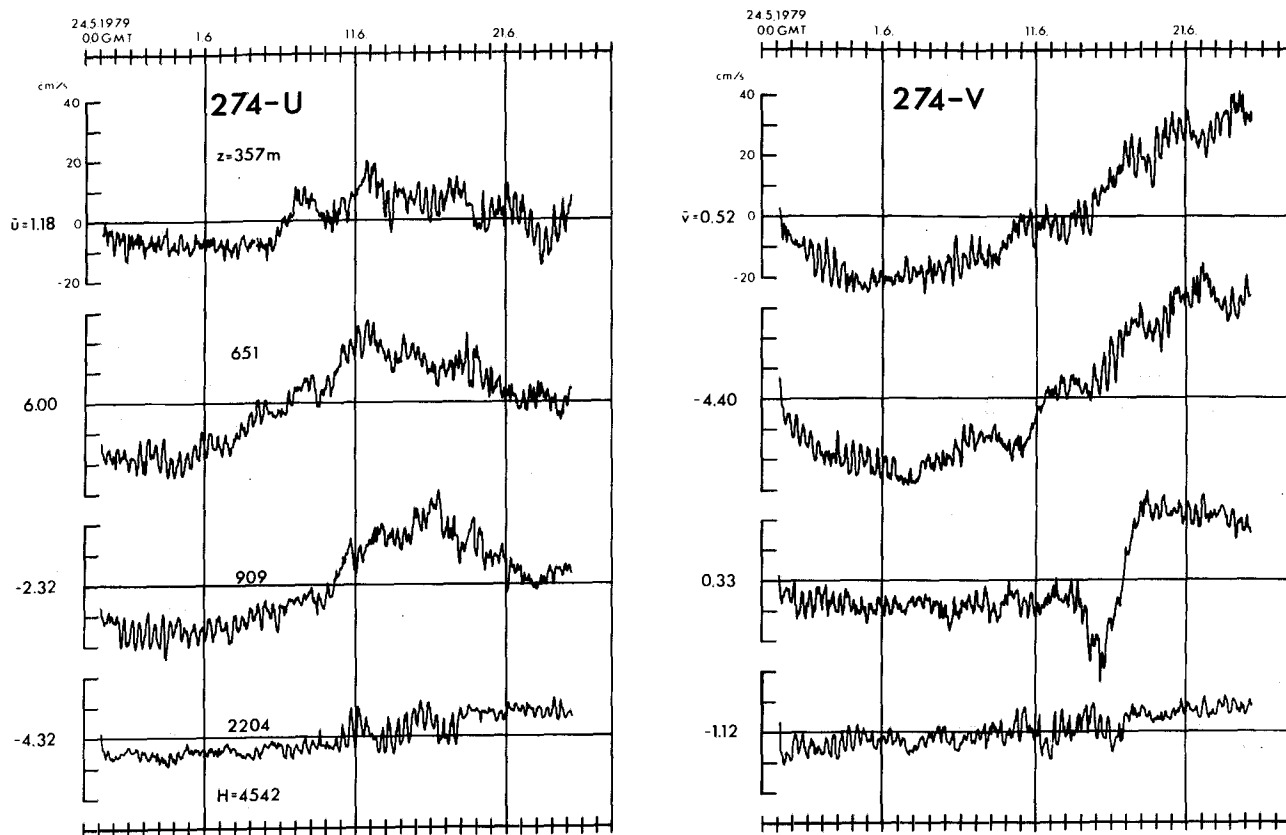


Fig. 4 Variation of current components at position 274 (see Figs. 1,2).

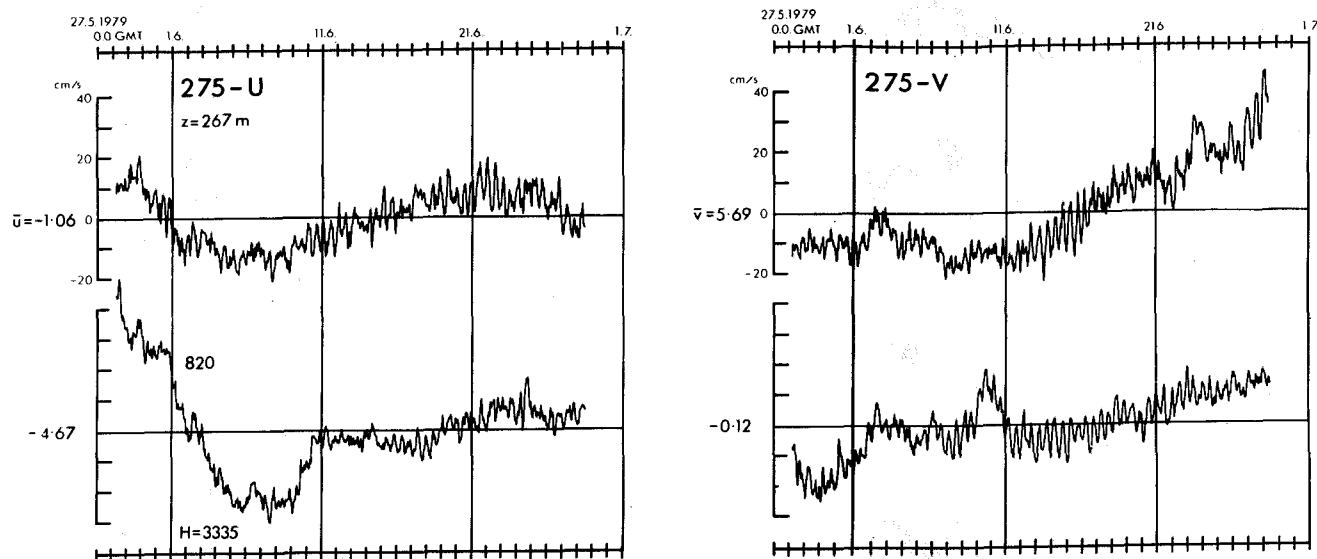


Fig. 5 Variation of current components at position 275 (see Figs. 1,2).

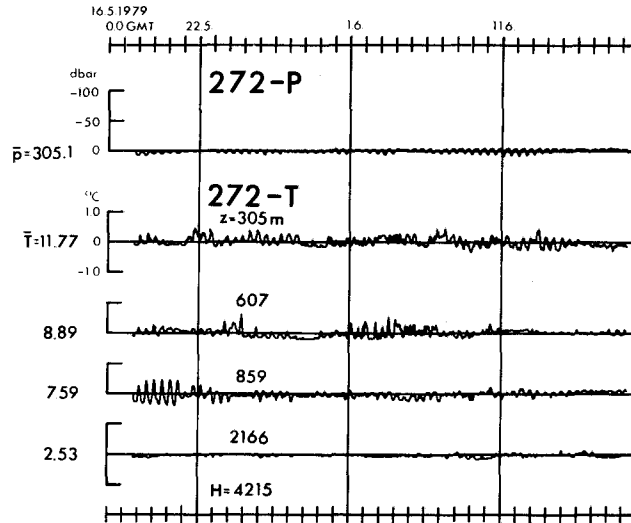


Fig. 6 Variation of pressure (p) and temperature (T) from their mean value at position 272 (see Fig. 1). H = bottom depth, z = instrument depth, $\bar{p}$ = mean value of p , $\bar{T}$ = mean value of T .

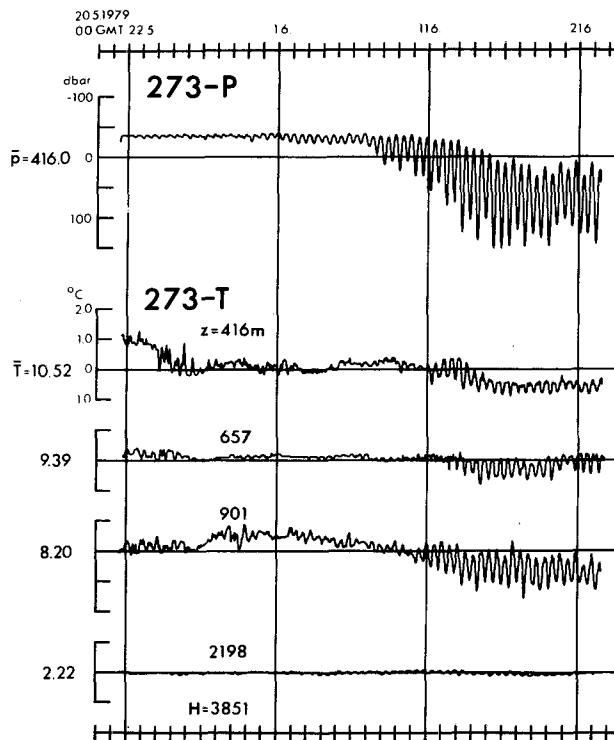


Fig. 7 Variation of pressure and temperature at position 273 (see Figs. 1,6).

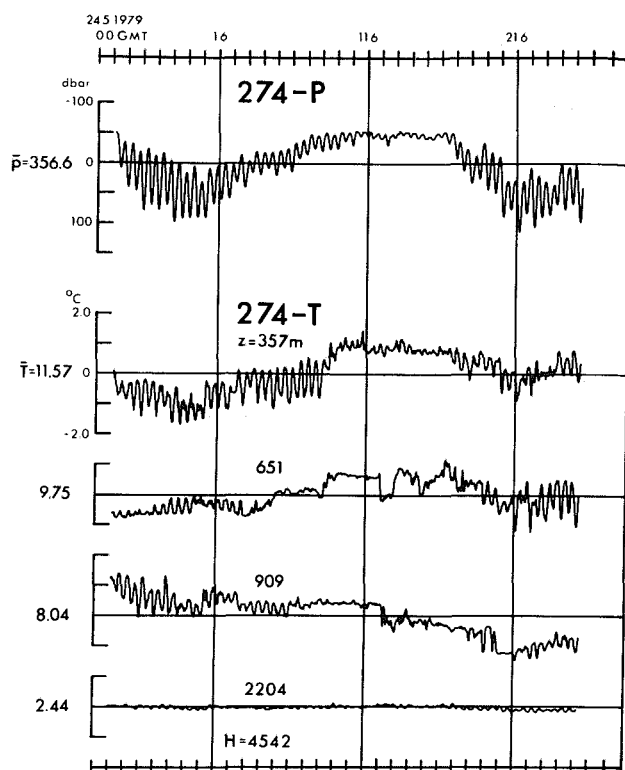


Fig. 8 Variation of pressure and temperature at position 274 (see Figs. 1,6).

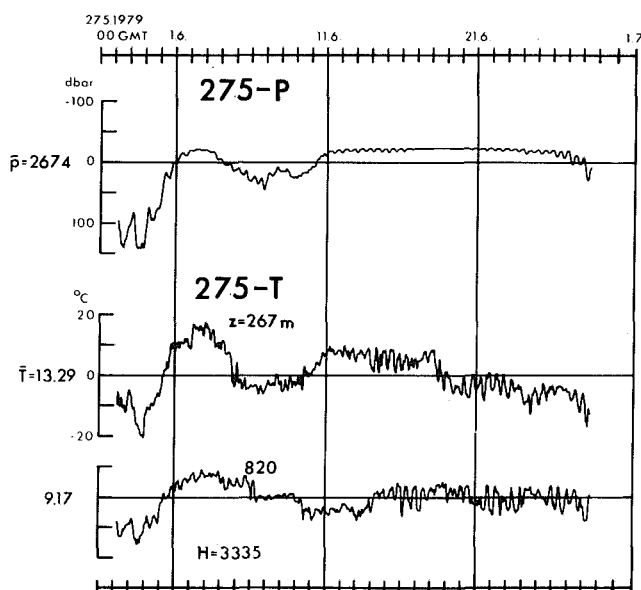


Fig. 9 Variation of pressure and temperature at position 275 (see Figs. 1,6).

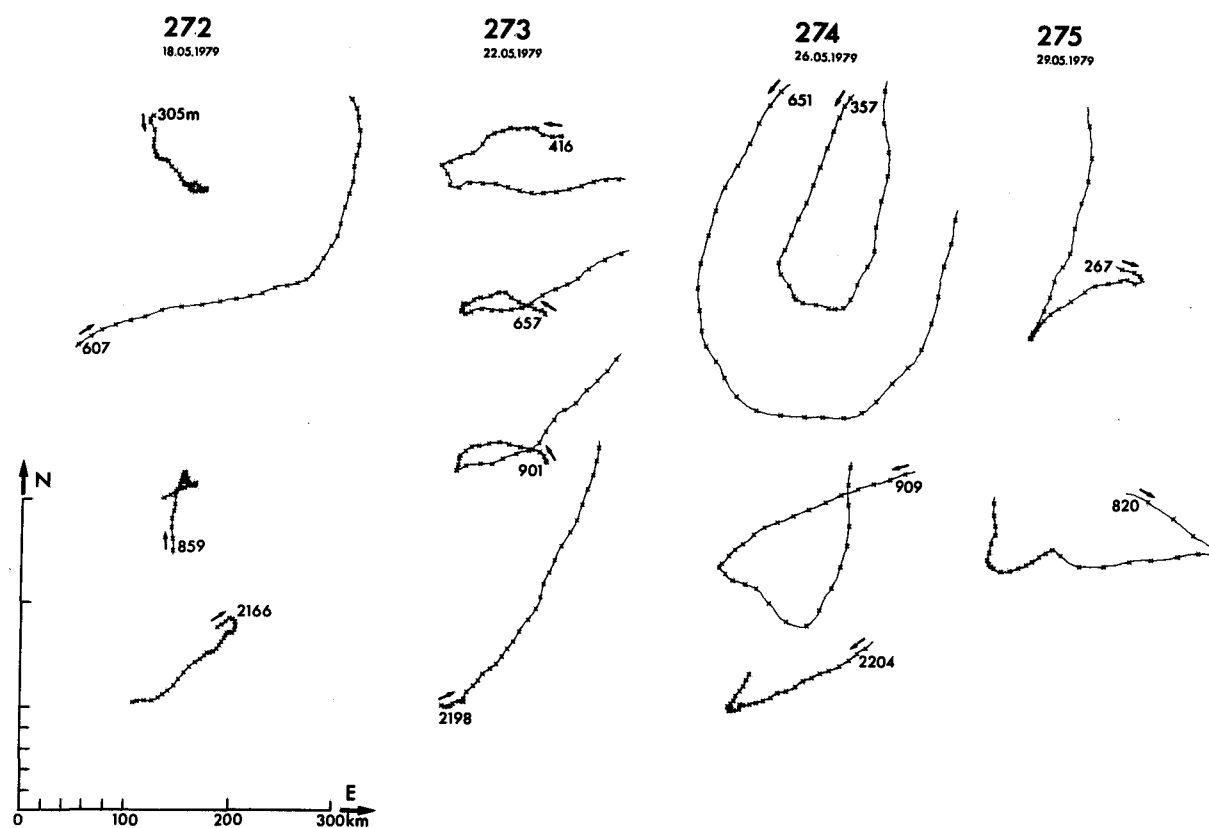


Fig. 10 Progressive Vector diagrams for positions 272, 273, 274 and 275 (see Fig. 1). Tickmarks are every day 0000 GMT. Station No. and date of first tickmark are given on top of each column. Instrument depth in metres is indicated at start of each diagram.

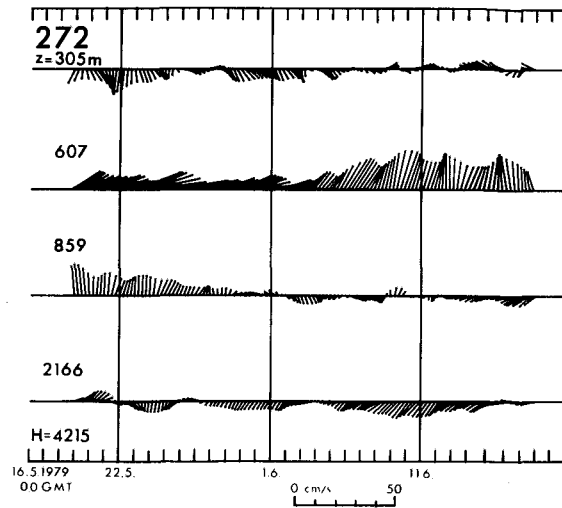


Fig. 11 Stickplots of low pass filtered currents at position 272. Half power frequency : 30 hours, H = bottom depth, z = instrument depth. North is upwards.

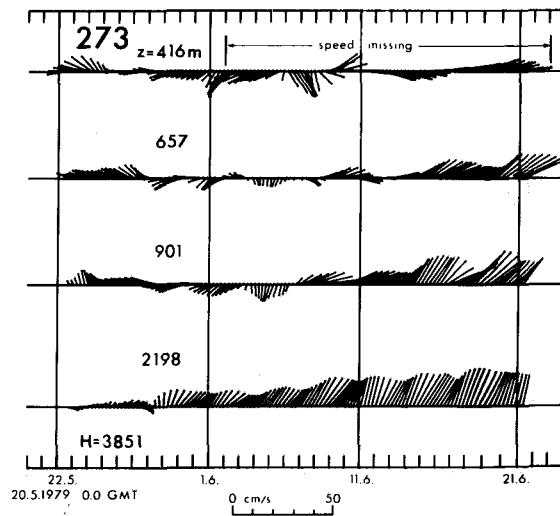


Fig. 12 Stickplots of currents at position 273 (see Figs. 1,11).

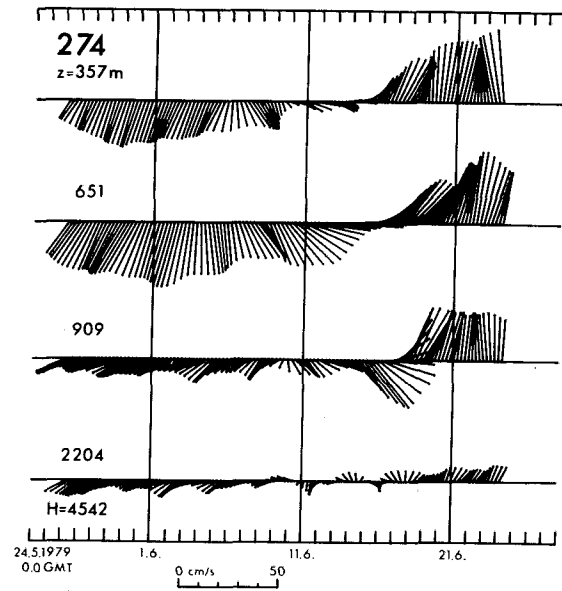


Fig. 13 Stickplots of currents at position 274 (see Figs. 1,11).

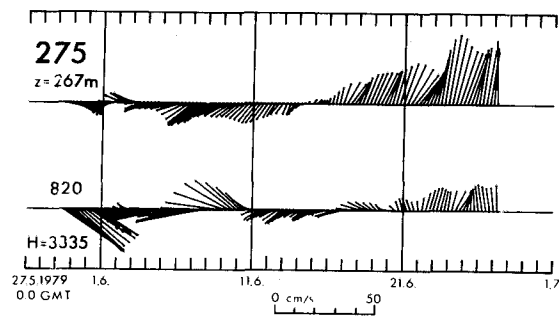


Fig. 14 Stickplots of currents at position 275 (see Figs. 1,11).



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