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Current-meter Data from the Leeuwin Current Interdisciplinary Experiment

The LUCIE Group

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Abstract

This report presents current-meter data acquired along the west coast of Australia between 22° and 35°S during an interdisciplinary study of the Leeuwin Current from September 1986 to August 1987. Current-meter moorings were deployed in two offshore sections at 29.5°S and 34°S, and a section along the shelf break. The data were low-pass filtered to eliminate tidal and other high-frequency signals. This report includes tables of simple statistics and time-series plots of velocity vectors, temperature, and the onshore and alongshore velocity components for each mooring area.

Introduction

Between September 1986 and August 1987, the Leeuwin Current Interdisciplinary Experiment (LUCIE) was conducted off the west coast of Australia; a general description of the experiment has been given by Church et al. (1988). Current-meter moorings were deployed from FRV *Soela* and RV *Franklin* to determine the structure and variability of the Leeuwin Current, and to shed light on its dynamics.

Current meter moorings were in place at 11 sites (sections along the shelf break and offshore from Dongara at 29.5°S) through most of the experiment; between February and August 1987, four moorings in the 34° S section were added.

This data report summarises the analysis of data from these current-meter moorings. Results from other LUCIE endeavours, including CTD surveys, bottom pressure-gauges, and meteorological and tide-gauge measurements, will be presented elsewhere.

Instrument Deployment and Data Processsing

Current-meter moorings were deployed in three arrays: an alongshore array of 6 moorings along the shelf break, an offshore section of 5 moorings off Dongara at 29.5°S, and a second offshore section of 4 moorings off Cape Mentelle at 34°S (Figure 1, Table 1). Moorings were deployed in two installations: Period 1 from September 1986 to February 1987, and Period 2 from February to August 1987 (Figure 2, Table 1). Some moorings in the alongshore array were in place continuously from September 1986 to August 1987; this is referred to as Period J (the joined periods 1 and 2).

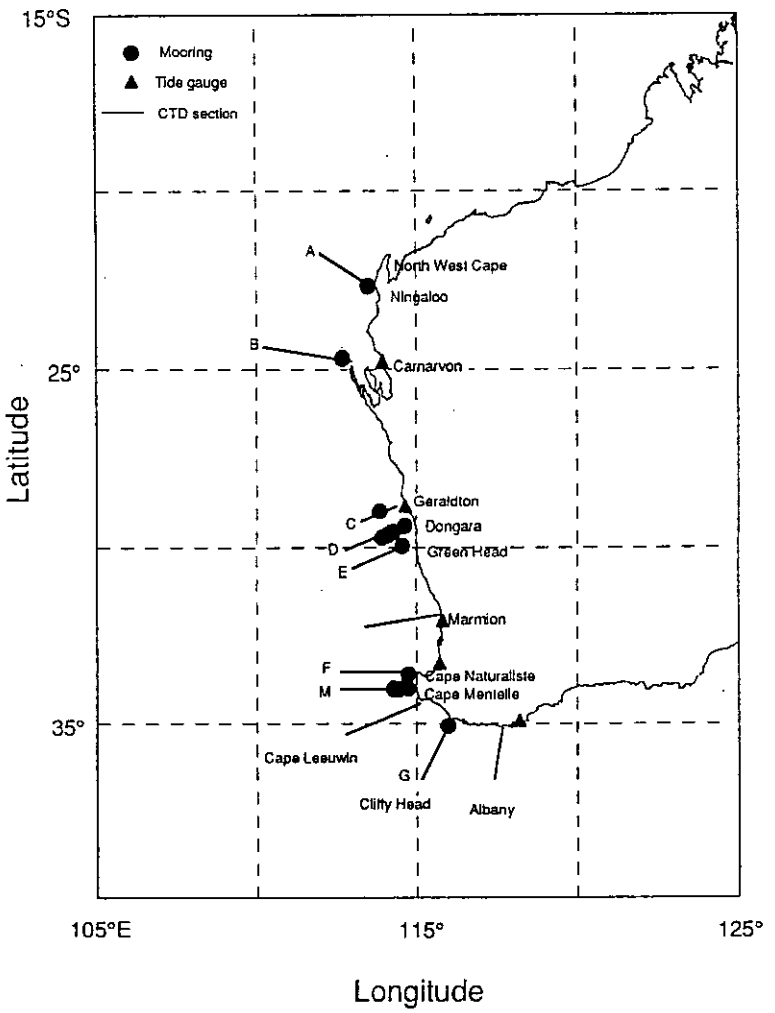

Figure 1. Location diagram. Solid dots: locations of moorings A to G and M. Triangles: tide gauges. Lines: locations of repeated CTD sections.

Table 1 *Current meter moorings deployed during the Leeuwin Current Interdisciplinary Experiment (LUCIE), showing mooring names, period of deployment (Period 1: Sept 1986 to Feb 1987; Period 2: Feb to Aug 1987; Period J: Sept 1986 to August 1987), position, local alongshore direction, bottom depth, and current meter depths, for each of the three arrays. Unless otherwise indicated by a footnote, all instruments were Aanderaa current meters.*

Mooring Name	Period	Latitude	Longitude	Alongshore Direction	Bottom Depth(m)	Instrument Depths(m)
			Alongshore Array			
A2	J	22°43.1'S	113°31.5'E	020°	118	103,113≠
B2	J	24°46.7'S	112°45.2'E	000°	80	65,75
C2	J	29°00.5'S	113°52.5'E	320°	61	46
E2	1	29°59.5'S	114°32.3'E	340°	85	70
	2	30°00.5'S	114°32.5'E	"	85	70
F2	1	33°38.0'S	114°43.6'E	000°	77	62
	2	33°37.1'S	114°43.5'E	"	73	58
G2	J	35°04.7'S	115°59.6'E	300°	76	61,71
			Dongara Array			
D1	1	29°23.0'S	114°37.0'E	330∞T	53	28†,43
	2	29°22.6'S	114°36.7'E	"	53	(28†),43
DM	1	29°31.1'S	114°16.0'E	"	85	8†,13†,23†
	2	29°31.8'S	114°15.1'E	"	85	8†,13†,(23†)
D2	1	29°32.9'S	114°16.3'E	"	108	48,73,93,103
	2	29°34.3'S	114°17.5'E	"	107	47,72,92,102
D3	1	29°32.7'S	114°09.9'E	"	300	45*),75,125,250
	2	29°35.9'S	114°13.0'E	"	308	(53*),83,133,258
D4	1	29°39.3'S	114°05.3'E	"	704	79†,129,254,454
	2	29°39.0'S	114°02.9'E	"	696	71†,121,246,446
			34°S Array			
M2	2	33°59.8'S	114∞42.8'E	000°	116	76
MM	2	34°00.3'S	114∞28.6'E	"	198	8†,43#
M3	2	33°58.9'S	114∞28.7'E	"	186	(121),171
M4	2	33°59.1'S	114∞24.9'E	"	720	90,160,230,320

≠ Only temperature data recovered
† Neil Brown acoustic current meter
* EG&G vector-averaging current meter
# General Oceanics S4 electromagnetic current meter
( ) No useful data recovered

Most of the current meters deployed were Anderaa current meters, which recorded average speed, instantaneous direction and temperature at intervals of 30 minutes (for Periods 1, 2) or 60 minutes (for Period J). Several additional current meters of a different design were deployed to give information near the surface. One EG&G vector-averaging current meter was deployed in both Periods 1 and 2, but we have not as yet been able to read the data tape. Five Neil Brown acoustic current meters were deployed; these measure orthogonal components of the current and case direction continuously, and record ten 5-minute vector averages of current and a single instantaneous temperature and case orientation at intervals of 50 minutes. One General Oceanics S4 electromagnetic current meter was deployed in Period 2; every 30 minutes, it measures orthogonal currents and case orientation continuously for 3 minutes and records the resulting vector average. From the entire LUCIE moored array, one current meter was lost, and four other records provided no usable data; a total of 59 useful current-meter records was obtained.

Figure 2 *The time-line of the current-meter observations, showing the length of hourly records. Solid lines: both velocity and temperature were measured successfully. Dotted lines: temperature data only. Dashed lines: absence of speed data for at least a day. Dash-dotted lines: acoustic current-meter data of doubtful quality.*

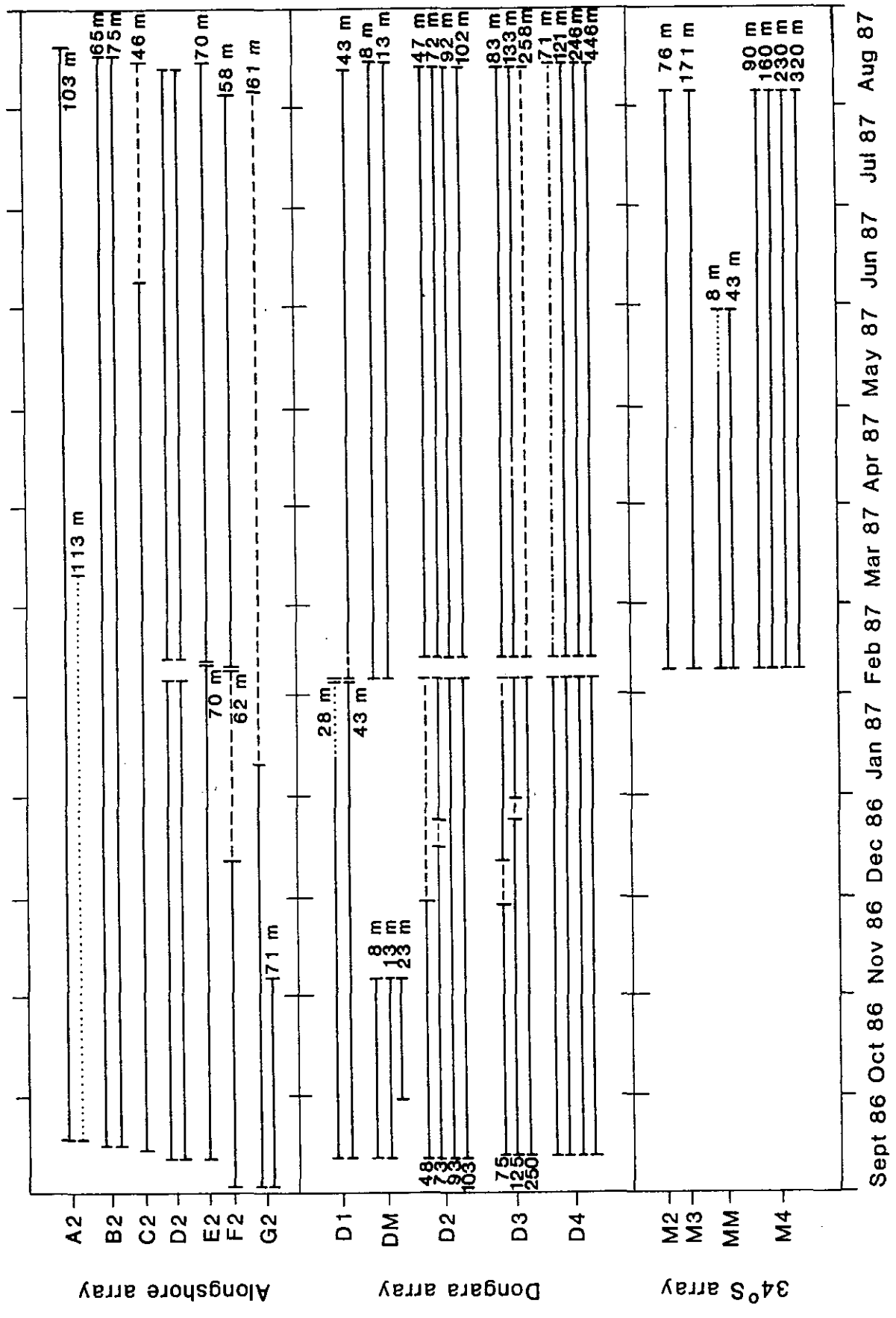

Table 2 *Simple statistics of the current (cm/sec) and temperature (degrees C) data from the alongshore array. For each mooring, period, and instrument depth, the table shows the current meter and tape number (cm/t); the number (N) of 12-hourly values; the means and standard deviations of temperature and of the onshore and alongshore components of the current; and the direction of the vector mean (qm) and the orientation of the principal axis (qpa) of the current in degrees true; the start and stop times (hour, date UTC) of the low-passed data record.. Data from bottom presssure gauges (PG) and from the shelf mooring of the Dongara array are included for comparison.*

		Depth	cm/t		Means			Std. Devs.			θ_m	θ_{pa}	Record of Length	
				N	T	u	v	T	u	v			Start	Stop
A2	J	103[1]	7156/6	652	22.08	-0.5	-15.4	1.43	2.6	12.7	202	203	12, 23 Sep	00, 15 Aug
		"	"	562	21.90	-0.6	-17.3	1.45	2.4	12.5	202	204	12, 23 Sep	00, 1 July
		113[2]	1276/6	339	20.83			0.65					12, 23 Sep	12, 11 Mar
		PG	—	652	21.73			1.31					12, 23 Sep	00, 15 Aug
B2	J	65[3]	1733/10	651	22.30	0.2	-5.5	1.42	6.1	8.6	178	173	00, 21 Sep	00, 12 Aug
		"	"	606	22.29	0.2	-5.7	1.47	6.3	8.9	178	172	00, 21 Sep	12, 20 Jul
		75[4]	7154/9	651	21.90	-2.2	-2.8	1.32	4.1	5.0	218	196	00, 21 Sep	00, 12 Aug
		PG[5]	—	651	21.40			0.78					00, 21 Sep	00, 12 Aug
C2	J	46[6]	1731/20	650	21.07	0.7	-11.4	1.29	3.2	12.6	136	135	12, 19 Sep	00, 10 Aug
		"	"	524	20.86	1.1	-12.7	1.32	3.1	13.4	135	136	12, 19 Sep	00, 8 June
E2	1	70	7662/1	286	19.23	-1.4	-15.1	0.58	4.6	13.8	166	167	00, 17 Sep	12, 6 Feb
	2	70	7837/2	347	21.37	-10.6	-12.7	0.90	11.6	12.0	200	203	00, 17 Feb	00, 9 Aug
	J	70[7]	—	653	20.37	-6.3	-13.7	1.32	10.1	12.9	185	188	00, 17 Sep	00, 9 Aug
F2	1	62[8]	586/26	299	18.43	0.8	-4.6	0.65	4.8	10.8	170	187	00, 7 Sep	00, 3 Feb
		"	"	192	18.11	0.2	-7.1	0.41	5.3	11.6	178	188	00, 7 Sep	12, 11 Dec
	2	58	7838/2	335	20.10	-3.6	-9.5	0.98	7.2	11.9	201	202	12, 13 Feb	12, 30 Jul
	J	60[9]	—	654	19.28	-1.4	-7.0	1.18	6.5	11.6	191	198	00, 7 Sep	12, 30 Jul
		PG	—	655	18.87			1.21					00, 7 Sep	00, 31 Jul
G2	J	61[10]	7664/1	656	18.68	-1.8	-5.6	1.18	2.6	7.5	138	128	12, 7 Sep	00, 1 Aug
		"	"	254	17.60	-2.0	-6.5	0.39	3.0	9.2	137	129	12, 7 Sep	00, 12 Jan
		71[11]	6560/6	116	17.33	2.0	-16.4	0.27	5.8	11.6	113	98	12, 7 Sep	00, 4 Nov
		PG	—	470	17.79			1.22					12, 7 Sep	00, 30 Apr
D2	J	92[12]	—	650	20.50	-3.5	-14.1	1.28	7.0	11.0	164	166	12, 17 Sep	00, 8 Aug
		102[13]	—	650	20.35	-6.2	-7.8	1.20	9.6	6.6	189	222	12, 17 Sep	00, 8 Aug

[1]Speeds may be too low (fouled?) from 0700, 1 July

[2]Direction bad throughout

[3]Two 13-h speed gaps bridged; speeds look too low (fouled?) from 0300h 21 July

[4]Five 1–2 day gaps bridged, 17 short gaps interpolated; entire record has very low speeds

[5]Temperature calibration uncertain: a constant of 6.57° C has been added to the original data

[6]Speed fails at 1800h, 8 June; set to 10 cm/sec for remainder of this record

[7]Period 1 and 2 hourly files joined (8 hour gap) to make J

[8]Doubtful speeds: decrease from beginning; set to 10 cm/sec from 0200h, 12 Dec to 0100h, 8 Feb

[9]Period 1 and 2 hourly files joined (7 hour gap) to make J

[10]Speed fouled; all zero speeds replaced by 10 cm/sec beginning 0800h, 12 Jan

[11]Direction becomes bad 4 Nov; temperature becomes bad at 2100h, 7 Nov.

[12]Period 1 and 2 hourly files joined (172 hour gap) to make J

[13]Period 1 and 2 hourly files joined (173 hour gap) to make J

Table 3 *Simple statistics of the current and temperature data from the Dongara array during Period 1. Parameters shown are the same as those in Table 2.*

	Depth	cm/t		Means			Std. Devs.			θ_m	θ_{pa}	Record of Length	
			N	T	u	v	T	u	v			Start	Stop
D1	28[1]	1257/4	270	19.74			0.91					12,17 Sep - 00, 30 Jan	
		1257/4	236	19.56	2.4	4.7	0.82	4.0	10.8	358	347	12,17 Sep - 00, 13 Jan	
	43	7659/1	270	19.63	0.6	2.1	0.89	2.4	5.8	347	348	12,17 Sep - 00, 30 Jan	
DM[2]	8[3]	1196/4	93	19.62	4.1	3.3	0.28	7.1	15.0	21	328	12,17 Sep - 12, 2 Nov	
	13	1260/4	93	19.50	5.1	2.5	0.28	7.1	15.6	32	323	12,17 Sep - 12, 2 Nov	
	23	1251/3	62	19.34	6.1	-1.0	0.30	5.0	15.4	70	324	00, 3 Oct - 12, 2 Nov	
D2	48[4]	7830/1	272	19.74	2.1	-5.5	0.59	3.5	12.7	135	146	12,17 Sep - 00, 31 Jan	
	73[5]	7838/1	272	19.46	0.0	-10.7	0.50	3.9	15.5	150	156	12,17 Sep - 00, 31 Jan	
	93	7837/1	272	19.33	-1.0	-9.0	0.48	5.3	10.4	156	151	12,17 Sep - 00, 31 Jan	
	103	7663/1	272	19.28	-3.8	-7.1	0.47	6.4	7.6	178	180	12,17 Sep - 00, 31 Jan	
D3	75[6]	7839/1	271	19.45	-0.8	-16.8	0.62	8.4	27.9	153	156	00,18 Sep - 00, 31 Jan	
	125[7]	571/25	271	18.78	0.2	-12.4	0.63	6.3	21.9	149	151	00,18 Sep - 00, 31 Jan	
	250	7155/5	271	15.23	-2.2	2.3	0.92	4.0	12.6	286	314	00,18 Sep - 00, 31 Jan	
D4	79	1120/5	271	19.35	0.4	-6.4	0.93	13.4	21.4	147	165	00,18 Sep - 00, 31 Jan	
	129	7157/4	271	18.19	0.4	-1.9	0.91	11.5	17.6	141	166	00,18 Sep - 00, 31 Jan	
	254	6166/5	271	14.92	-3.3	12.0	0.86	9.5	11.8	315	299	00,18 Sep - 00, 31 Jan	
	454[8]	7199/5	271	9.41	-4.3	14.5	0.26	9.2	14.6	313	306	00,18 Sep - 00, 31 Jan	

[1]The current data from this ACM record failed on 13 January

[2]This mooring broke loose: data changed character at 0626h, 3 November; did not move substantially until 6 Nov

[3]Rotor severely fouled; speed set to 10 cm/sec beginning 0000h, 30 Nov; remainder also doubtful

[4]Rotor apparently fouled for a week; speeds set same as those at 7837/1 from 2200h, 17 Dec through 1400h, 24 Dec

[5]Rotor apparently fouled twice; zero speeds from 0500h, 31 Jan through 1600h, 2 Feb bridged; very low speeds from 0830, 30 Nov through 1800h, 11 Dec replaced with those at 571/25; many spikes removed by doubling speeds

[6]Three speed gaps bridged: 0330-1330h, 20 Nov; 0000-0830h, 27 Nov; 0230h, 25 Dec through 2100h,30 Dec

[7]Speed gap bridged: 0530h, 29 Dec through 0500h, 30 Dec

[8]One pair of sensors underestimated the currents by about 20%

Table 4 *Simple statistics of the current and temperature data from the Dongara Array during Period 2. Parameters shown are the same as those in Table 2.*

	Depth	cm/t		Means			Std. Devs			θ_m	θ_{pa}	Record Length
			N	T	u	v	T	u	v			Start Stop
D1	43[1]	7773/3	360	20.97	-4.2	-6.2	0.96	7.3	12.2	185	176	12, 9 Feb - 00, 8 Aug
	"	"	344	20.97	-4.6	-6.3	0.98	7.1	12.2	186	175	12, 17 Feb - 00, 8 Aug
DM	8[2]	1196/5	364	22.51	2.2	-17.0	0.79	10.0	21.0	143	145	12, 9 Feb - 00, 10 Aug
	13	1251/4	364	22.28	4.0	-16.2	0.78	8.4	18.9	136	140	12, 9 Feb - 00, 10 Aug
D2	47[3]	7839/2	344	21.97	1.4	-19.3	0.70	5.8	16.2	146	151	12, 17 Feb - 00, 8 Aug
	72	7830/2	344	21.75	-0.9	-17.9	0.81	5.4	12.8	153	150	12, 17 Feb - 00, 8 Aug
	92	7663/2	344	21.51	-5.8	-17.9	0.86	7.8	10.3	168	171	12, 17 Feb - 00, 8 Aug
	102	7155/6	344	21.27	-8.7	-8.1	0.84	11.4	6.1	197	227	12, 17 Feb - 00, 8 Aug
D3	83[4]	571/26	344	21.15	-3.6	-38.5	0.94	8.1	27.9	156	150	12, 17 Feb - 00, 8 Aug
	133[5]	6166/6	344	20.09	-2.6	-29.8	1.18	5.9	22.8	155	151	12, 17 Feb - 00, 8 Aug
	258[6]	7199/6	344	15.09	-0.8	-0.9	1.16	1.6	6.8	177	139	12, 17 Feb - 00, 8 Aug
D4	71[7]	1257/5	346	20.92	-15.4	-30.3	0.93	28.7	34.6	177	184	12, 17 Feb - 00, 9 Aug
	121	7662/2	346	19.36	-5.5	-24.3	1.50	14.3	20.7	163	167	12, 17 Feb - 00, 9 Aug
	246	586/27	346	14.40	-2.4	0.2	0.94	7.7	11.1	243	132	12, 17 Feb - 00, 9 Aug
	446	7157/5	346	9.39	-1.1	5.9	0.22	5.3	11.2	319	324	12, 17 Feb - 00, 9 Aug

[1] Speed gap at beginning (1030h, 4 Feb through 2200h, 12 Feb) has been filled with speed of 10 cm/sec

[2] One pair of sensors underestimated the currents by about 20%

[3] Eleven speed spikes removed

[4] Offscale speeds (wrap arounds) corrected; 4.5 hour gap interpolated

[5] Speed gap bridged: 1330h, 10 Apr through 0600h, 13 April; temperature offscale (>21.51∞C) briefly on 24 and 26 April, on 3 and 8 July, and during most of the period from 1200h, 30 May through 1800h, 23 June

[6] No speed data in this record; speed set to 10 cm/sec throughout

[7] Status bit indicates one pair of current sensors failed, and some sudden jumps in the hourly current data are noticeable; however, the low-passed data look reasonable

Table 5 *Simple statistics of current and temperature from the low-passed joined data records for the Dongara array, obtained by joining hourly records from Periods 1 and 2. Parameters shown are the same as those in Table 2, except that the column for current meter and tape number has been replaced with a column for GL to show the length of the gap (in hours) between subsequent hourly data records from the same nominal location. For reservations about data quality at each location.*

	Depth	GL	N	Means T	u	v	Std. Devs. T	u	v	θ_m	θ_{pa}	Record Length
D1	43	7	650	20.41	-2.0	-2.4	1.13	6.3	10.8	190	176	12,17 Sep - 00, 8 Aug
D2	48	172	650	20.96	1.6	-13.7	1.26	4.9	16.3	143	151	12,17 Sep - 00, 8 Aug
	72	172	650	20.69	-0.4	-15.1	1.31	4.8	14.3	152	153	12,17 Sep - 00, 8 Aug
	92	172	650	20.50	-3.5	-14.2	1.28	7.1	11.0	164	166	12,17 Sep - 00, 8 Aug
	102	173	650	20.35	-6.3	-7.8	1.20	9.6	6.6	189	222	12,17 Sep - 00, 8 Aug
D3	79	171	649	20.33	-2.4	-29.9	1.20	8.1	29.8	154	154	00,18 Sep - 00, 8 Aug
	129	171	649	19.41	-1.5	-23.0	1.24	6.2	24.0	154	153	00,18 Sep - 00, 8 Aug
D4	75	166	651	20.16	-8.1	-19.1	1.22	24.2	31.4	173	181	00,18 Sep - 00, 9 Aug
	125	168	651	18.73	-2.6	-14.1	1.45	13.3	21.9	160	166	00,18 Sep - 00, 9 Aug
	250	168	651	14.56	-2.5	4.8	0.98	8.6	12.8	302	310	00,18 Sep - 00, 9 Aug
	450	168	651	9.37	-2.4	9.2	0.28	7.5	13.4	316	312	00,18 Sep - 00, 9 Aug

The raw data from all of the current meters were processed and examined for errors or defects. Any significant editing and any other reservations about data quality are noted in footnotes to the table of statistics presented for each array (Tables 2-5). The most common problem was the loss or obvious degradation of speed data from Aanderaa meters, presumably due to fouling of the rotor. In some cases, the gap in speed data was temporary, while in others the speed sensor failed for the remainder of the installation. The basic processed files (designated E files, with the original sampling intervals) were edited to provide as long a useful time-series as possible: short speed gaps of a few hours or less were linearly interpolated; longer speed gaps were bridged using a predictive filter described below, or, in two cases, the speed data from a vertically adjacent (and highly correlated) record were substituted. In several cases of total speed sensor failure but good direction data, an artificial constant speed was inserted in the E files in order to retain directional information.

The basic edited E files were reformatted into hourly (H) files, using a simple filter if the data were recorded at 30 minute intervals, and these files were low-pass filtered using a filter with 120 weights. The filter, which uses the least-squares method outlined by Thompson (1983), completely suppresses signals at the dominant tidal frequencies and the local inertial frequency at the main Dongara array (1.015 cycles per day). The filter's amplitude response is within 0.3% of 1.0 at periods longer than 2.5 days, about 0.5 at 1.7 days, and less than 0.01 at periods shorter than 1.3 days. The low-passed records have a data interval of 12 hours, with values at 0000 and 1200 UTC.

Where current meter moorings were replaced during the experiment, it was desirable to join the two records to provide a long, continuous record. The scalar variables (velocity components, temperature, etc.) in the hourly data records (H files) were 'joined' by means of the same predictive filter technique used in bridging speed gaps in the E files. The technique uses the spectral characteristics of the data on either side of the data gap, computed by the maximum entropy method, to determine a predictive filter. The technique is described in Ulrych et al. (1973) and Smylie et al. (1973), and the calculation of the filter coefficients elucidated in Andersen (1974). In general, we used data intervals of about twice the gap length to determine a prediction filter, which was used to predict both forwards and backwards across three-quarters of the gap. (The "predictions" were averaged to obtain the data in the center half of the gap). The bridged or joined records were then treated in the same manner as original records to provide continuous low-passed time-series. All gaps so treated were less than 239 hours, the span of the low-pass filter used on the hourly data.

For each mooring or array, we determined the local alongshore direction (shown in Table 1) by examining the orientation of the appropriate isobaths on available bathymetric charts; in general, the chosen angle agrees well with the principal axis orientation of the measured currents. The current records were then rotated to obtain onshore and alongshore components perpendicular and parallel to this direction. Tables of simple statistics and time-series of current vectors, temperature and onshore and alongshore components of the current are shown for the appropriate period(s) for each array. The data plots for each of the arrays are shown at the end of this data report. Throughout this data report, time-series of the current vectors are oriented so that the positive alongshore direction (specified in Table 1) is toward the top of each figure. On each page, records from separate moorings are in separate panels; records from the same mooring are shown in the same panel, simply offsetting the origin of the y-axis if necessary for clarity. Each record is labelled with the mooring name and instrument depth separated by a slash. Uniform scales are used throughout.

The Alongshore Array

The alongshore array (Table 2) consisted of six moorings (designated A2, B2, C2, E2, F2, and G2, in order from north to south) along the shelf-break from 22.7° S to 35.1° S. The number 2 indicates the shelf-break mooring. Each of these moorings had an Aanderaa current meter 15 m above the bottom. Three moorings (A2, B2, G2) had a second Aanderaa current meter 5 m from the bottom, intended to be within the bottom Ekman layer. Four moorings (A2, B2, F2, G2) included a bottom pressure-gauge with a temperature sensor less than 2 m from the bottom. The temperature data from these instruments are included in the table and the time-series plots for this array.

Three of the moorings in this array (C2, F2 and G2) experienced heavy rotor fouling (Table 2). One current meter (5 m above the bottom at A2) had no direction data, and another current meter (at G2) failed completely six weeks after deployment.

All six moorings were intended to record data for the entire experiment, but two moorings (E2, F2) were recovered and reinstalled in February. The short data gaps between the successive hourly records were filled with artificial data by means of the predictive filtering technique. The joined hourly records were low-pass filtered in the same way as the original records to provide continuous low-passed time-series at these sites for comparison with data from the other moorings in this array. Statistics are shown for both the original and the joined records in Table 2; time-series plots are presented for the joined records only.

The shelf-break mooring (D2) at 29.5°S on the Dongara Line, which makes a seventh element in the alongshore array, was also recovered and reinstalled in February. For comparison with the data from the other shelf-break moorings, the low-passed joined records from the instruments 5 and 15 m above the bottom at this site have been included in the table and plots for this array.

The Dongara Array (29.5° S)

At 29.5°S, an array of five moorings was deployed over the continental shelf and upper slope off Dongara (Figure 3). The entire array was installed in September 1986, recovered and replaced in February 1987 and finally recovered in August 1987, so the data for the two installation periods (Periods 1 and 2) are presented separately (Tables 3, 4). The Period 1 and Period 2 arrays were intended to be identical, and in fact most of the moorings and instruments were at very nearly the same depth during the two periods (Table 1). During both periods, there were four subsurface moorings (Figure 3): D1 over the mid-shelf, D2 at the shelf-break, and D3 and D4 over the upper slope near the 300 and 700 m isobaths, respectively (Figure 3). Most of the instruments on these subsurface moorings were Aanderaa current meters (Table 1). A fifth mooring, DM, with surface flotation and meteorological sensors, was installed during both periods to measure the upper-layer currents near the shelf-break with three Neil Brown acoustic current meters (Table 1). This mooring was equipped with a satellite transmitter so that its position could be monitored with the ARGOS buoy tracking system. These data showed that the DM mooring began to move significantly on 6 November 1986 (Table 3); its anchor chain had parted, but it was recovered intact.

During Period 1, data losses on the Dongara array (Table 3) were due chiefly to the anchor-chain break at DM, to rotor fouling of Aanderaa current meters (particularly at D2), and to the failure of the vector-averaging current meter at the top of D3. In addition, two acoustic current meters malfunctioned, resulting in partial records at 28 m on mooring D1 and 23 m on DM.

During the February cruise of the RV *Franklin*, all the Dongara moorings were to be replaced immediately after recovery. However, after the moorings were recovered and D1 and DM replaced, the weather off Dongara was too rough to replace the remaining moorings. *Franklin* therefore moved farther south where the weather was better, and returned to complete the Dongara Period 2 array a week later (Table 4).

During Period 2, there was comparatively little rotor fouling (Table 4), and the main data losses were due to the complete failure of two acoustic current meters on D1 and DM and the vector-averaging current meter at D3 (Table 1). The acoustic current meter at D4 produced data of doubtful quality: a status bit indicated the failure of one pair of sensors. However, there were only a few noticeable jumps in the hourly current data and the low-passed current was significantly correlated with data from other current meters on the D4 mooring. These data have, therefore, been included in Table 4 and the time-series plots.

Time-series plots for the Dongara array are shown separately for the two mooring periods. In both cases, the current data have been rotated so that the alongshore direction is toward 330°T for all moorings. In the vector time series, 330°T is toward the top of the page. For the current components, positive alongshore is toward 330°T and positive onshore is toward 60°T.

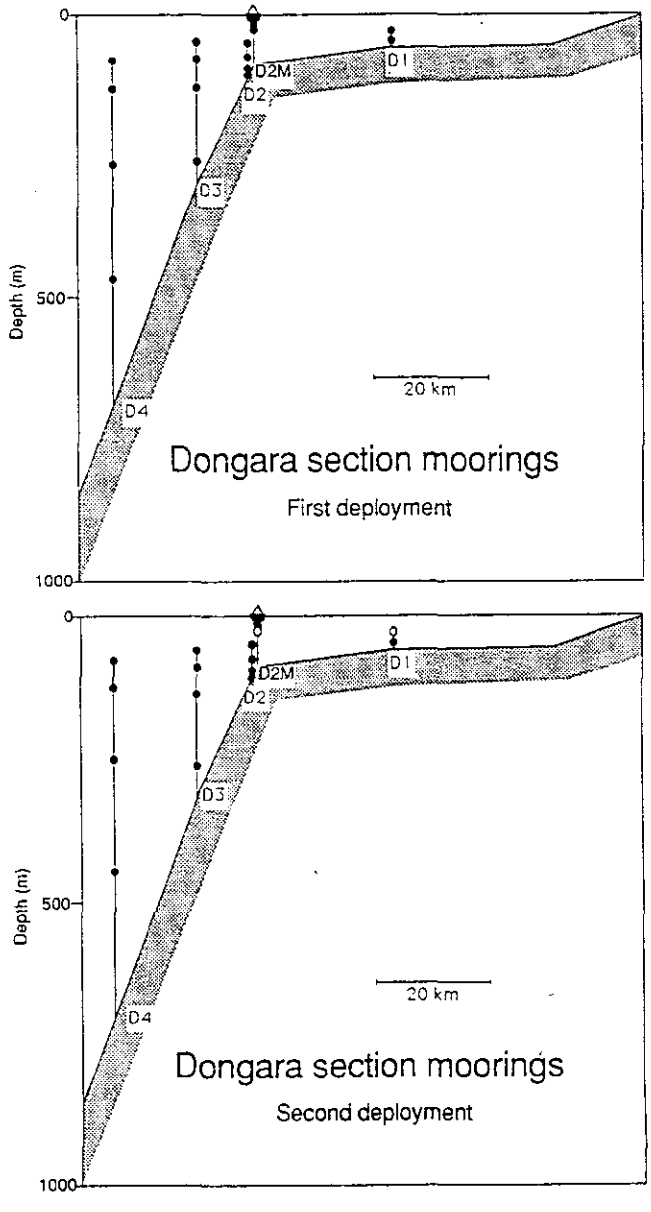

Figure 3. Schematics of the Dongara array at 29.5° S during Periods 1 and 2, showing mooring names and instrument locations. Instruments that were lost or failed completely are shown as open circles.

Where good-quality data were obtained from the same nominal location of the Dongara array during both Period 1 and Period 2, the two-hourly records were joined by filling the gap using the predictive filter technique described above. These joined hourly records were low-pass filtered in the same way as the original records for each period; the temperature and current statistics of these low-passed joined Dongara records are shown in Table 5. Note that there are no joined records from the DM site, and only one from D1 and two from D3 (Table 5). The time-series plots of the joined Dongara records are shown at the end of this data report.

The 34°S Array (Cape Mentelle)

At 34°S off Cape Mentelle, an array of four moorings was deployed across the shelf and upper slope during Period 2, February–August 1987 (Figure 4). There were three subsurface moorings: M2 over the outer shelf, M3 just seaward of the shelf-break and M4 over the 700 m isobath; and one surface mooring with a meteorological buoy equipped with an ARGOS transmitter and two upper-layer current meters. Like the DM mooring during Period 1, this meteorological buoy broke its anchor chain and began to drift between 24 and 27 May 1987, but was retrieved. The top instrument of the M3 mooring (Table 1) was somehow destroyed – only half of the gimbal-rod was still there when the mooring was recovered. Apart from these losses, data quality from the 34°S array was generally good (Table 6).

At 34°S, all of the isobaths were directed approximately north–south, so no coordinate rotation was necessary. Thus, the alongshore component is directed due North and the onshore component is directed due East. In the plot of the vector time-series, due North (000°T) is toward the top of the page.

Table 6 *Simple statistics of the current and temperature data from the 34° S array, installed only during Period 2. Parameters shown are the same as those in Table 2.*

				Means			Std. Devs.					
	Depth	cm/t	N	T	u	v	T	u	v	θ_m	θ_{pa}	Record Length
M2	76	7659/2	338	19.95	2.3	-13.7	1.07	4.6	15.6	171	170	12, 12 Feb - 00, 31 Jul
M3	171[1]	7772/3	337	17.67	-7.5	-16.2	1.76	6.5	14.1	205	186	00, 13 Feb - 00, 31 Jul
MM[2]	8[3]	1120/6	214	21.05			0.89					12, 12 Feb - 00, 30 May
	"	"	178	21.20	-4.0	-22.8	0.88	9.2	20.4	190	179	12, 12 Feb - 00, 12 May
	43	4590/2	214	20.53	0.2	-28.8	0.96	12.0	22.6	180	181	12, 12 Feb - 00, 30 May
M4	90	7777/3	337	24.64	0.0	-23.8	2.58	12.7	24.0	180	182	00, 13 Feb - 00, 31 Jul
	160	6167/8	337	16.88	-0.0	-13.4	2.05	9.3	20.0	180	172	00, 13 Feb - 00, 31 Jul
	230	7776/3	336	14.41	-1.0	-3.2	1.96	6.9	20.3	197	176	12, 13 Feb - 00, 31 Jul
	320	7778/3	336	12.14	0.1	3.8	0.94	5.6	22.2	001	358	12, 13 Feb - 00, 31 Jul

[1]Speed gap bridged: 0730h, 11 Feb through 0230h, 12 Feb

[2]Buoy adrift at 2055h,27 May; still in position at 2124h, 24 May

[3]Instrument direction failed after 1933h,12 May

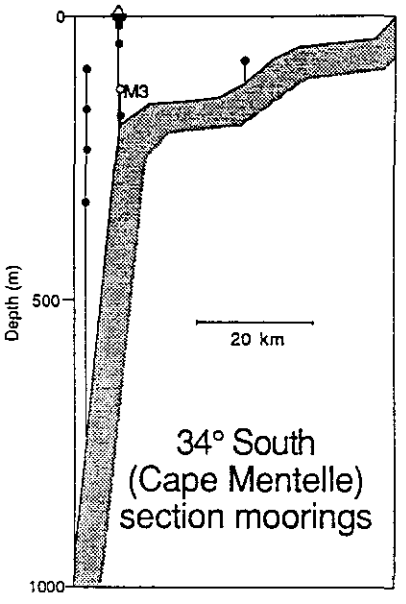

Figure 4. Schematic of the 34° S array off Cape Mentelle during period 2. The instrument that was lost is shown as an open circle.

Acknowledgements

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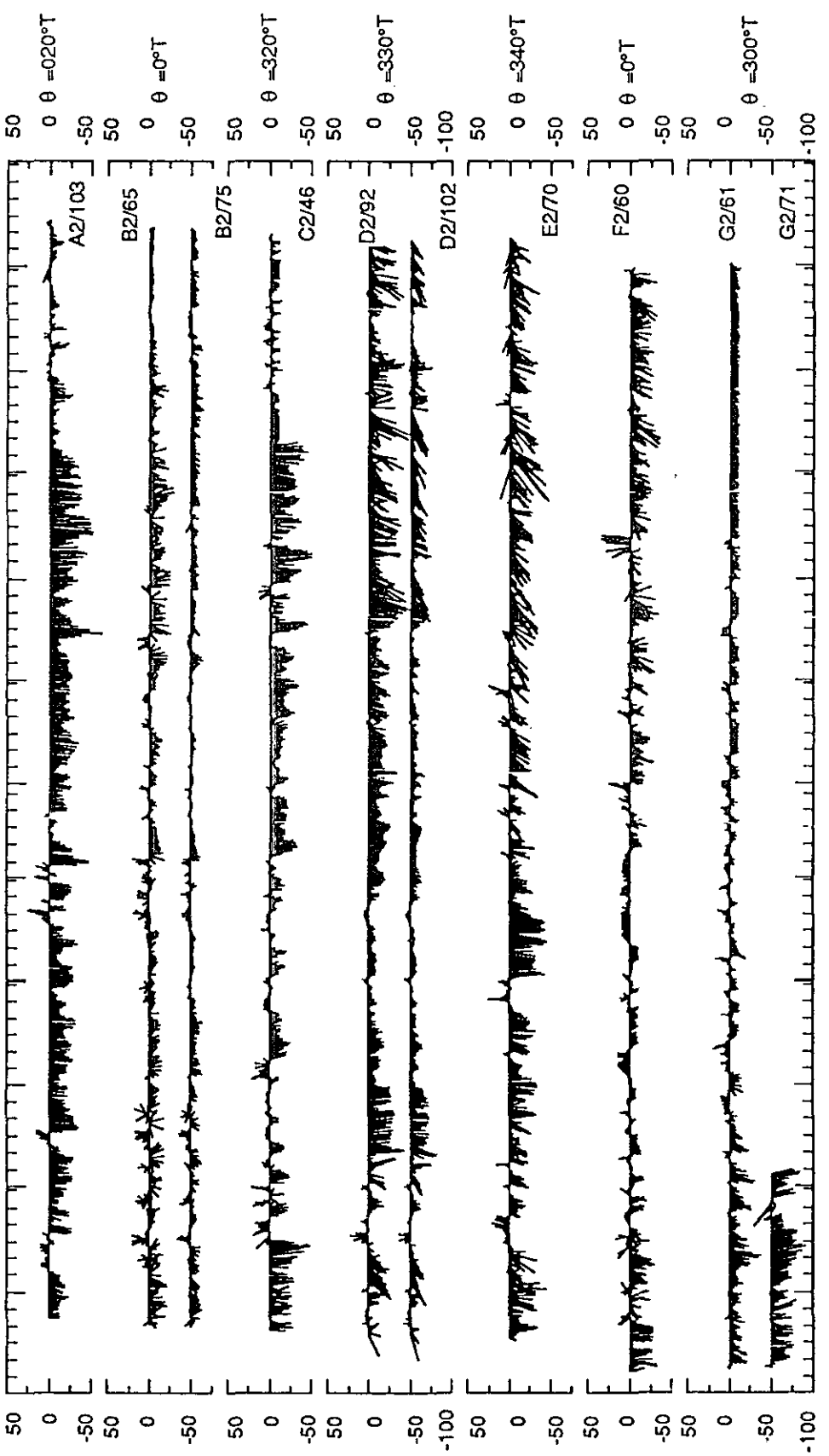
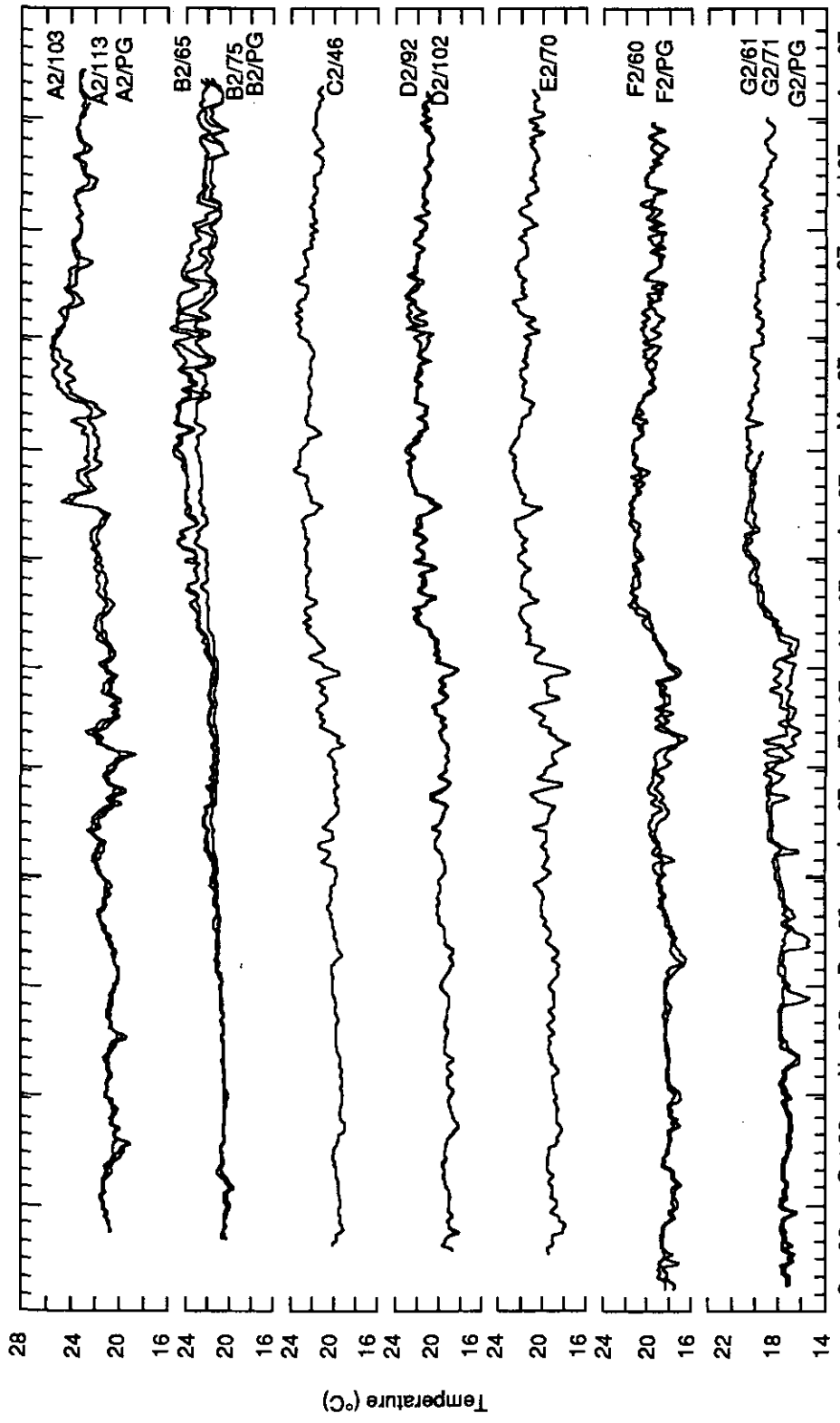
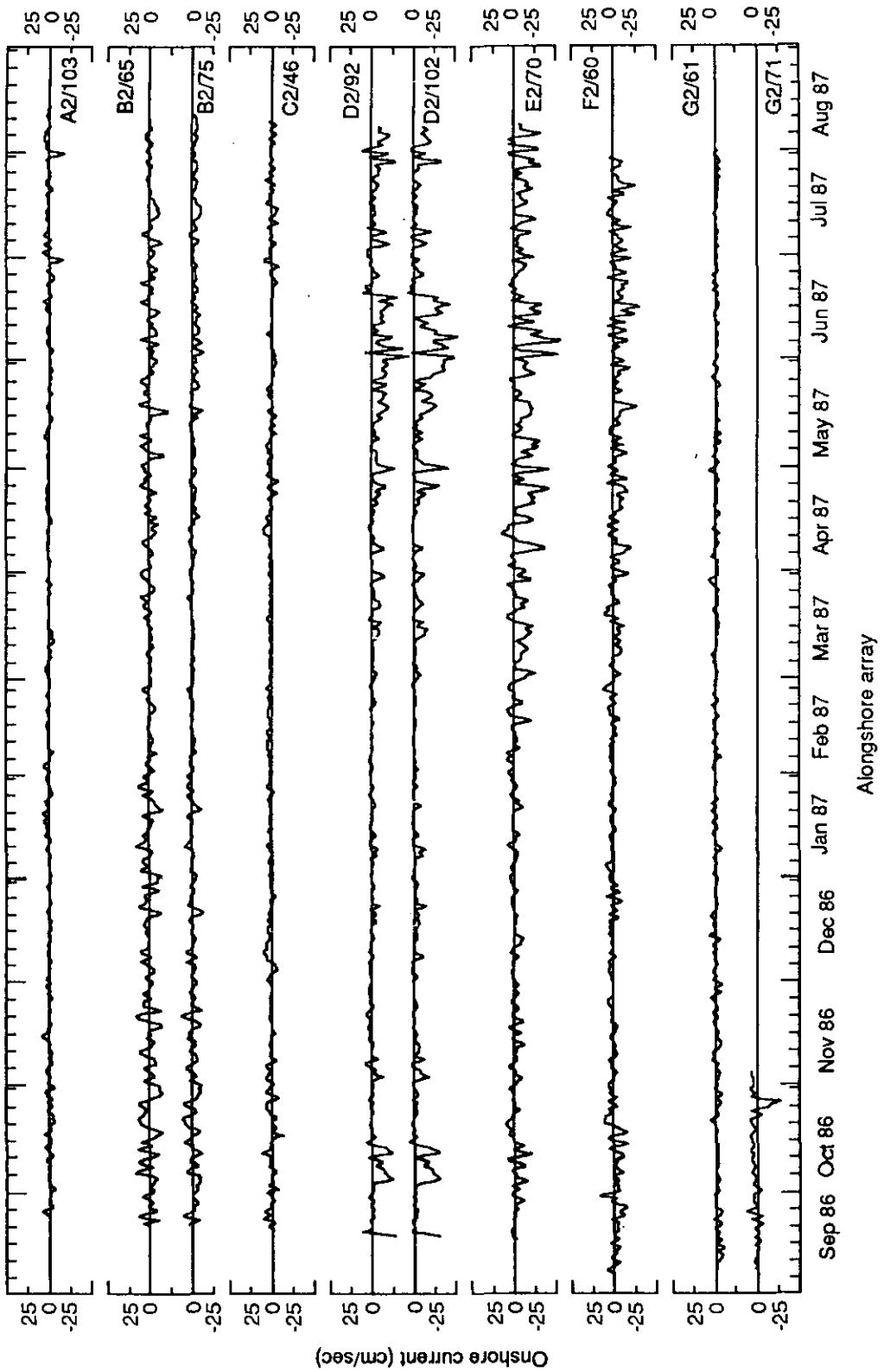
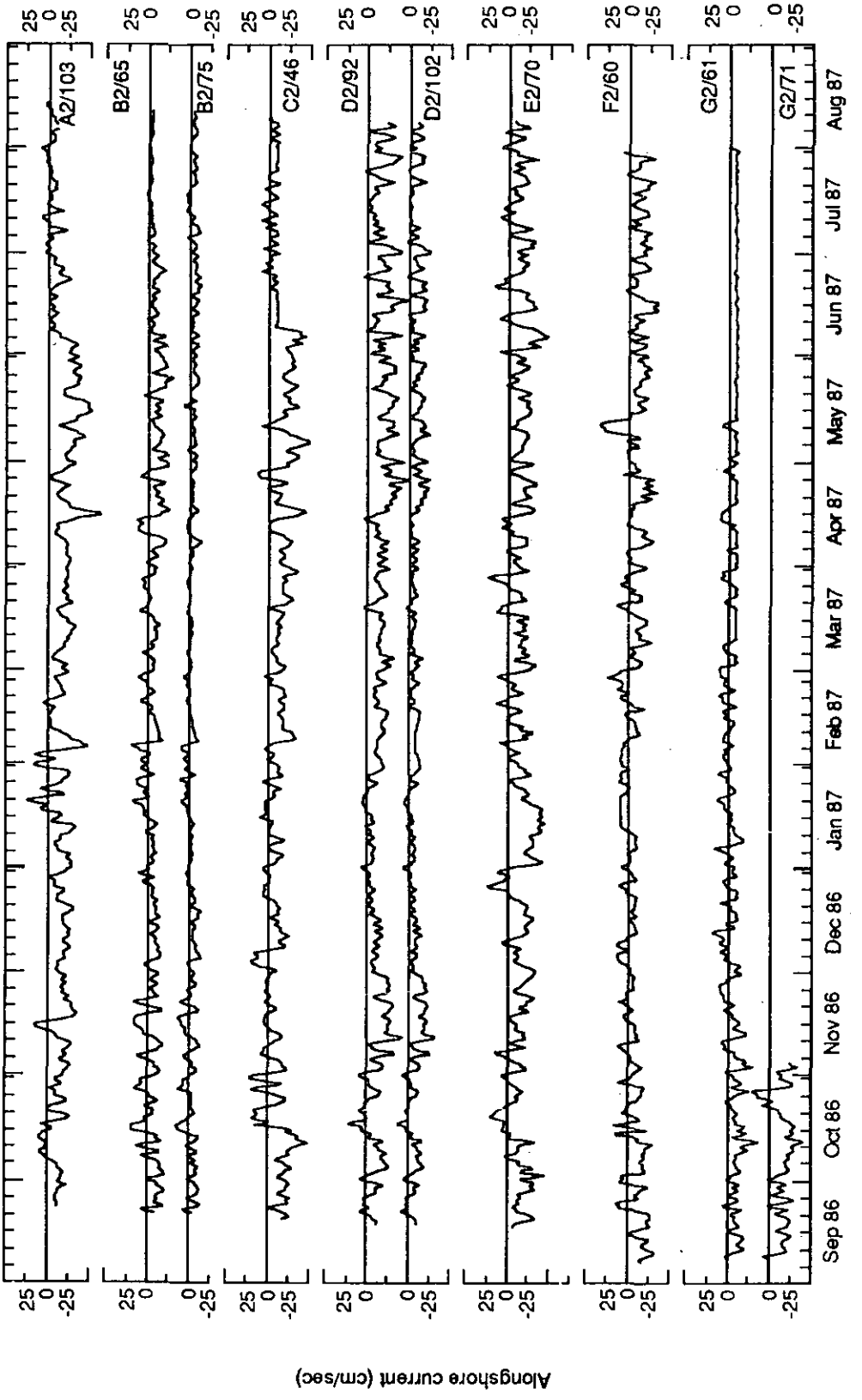
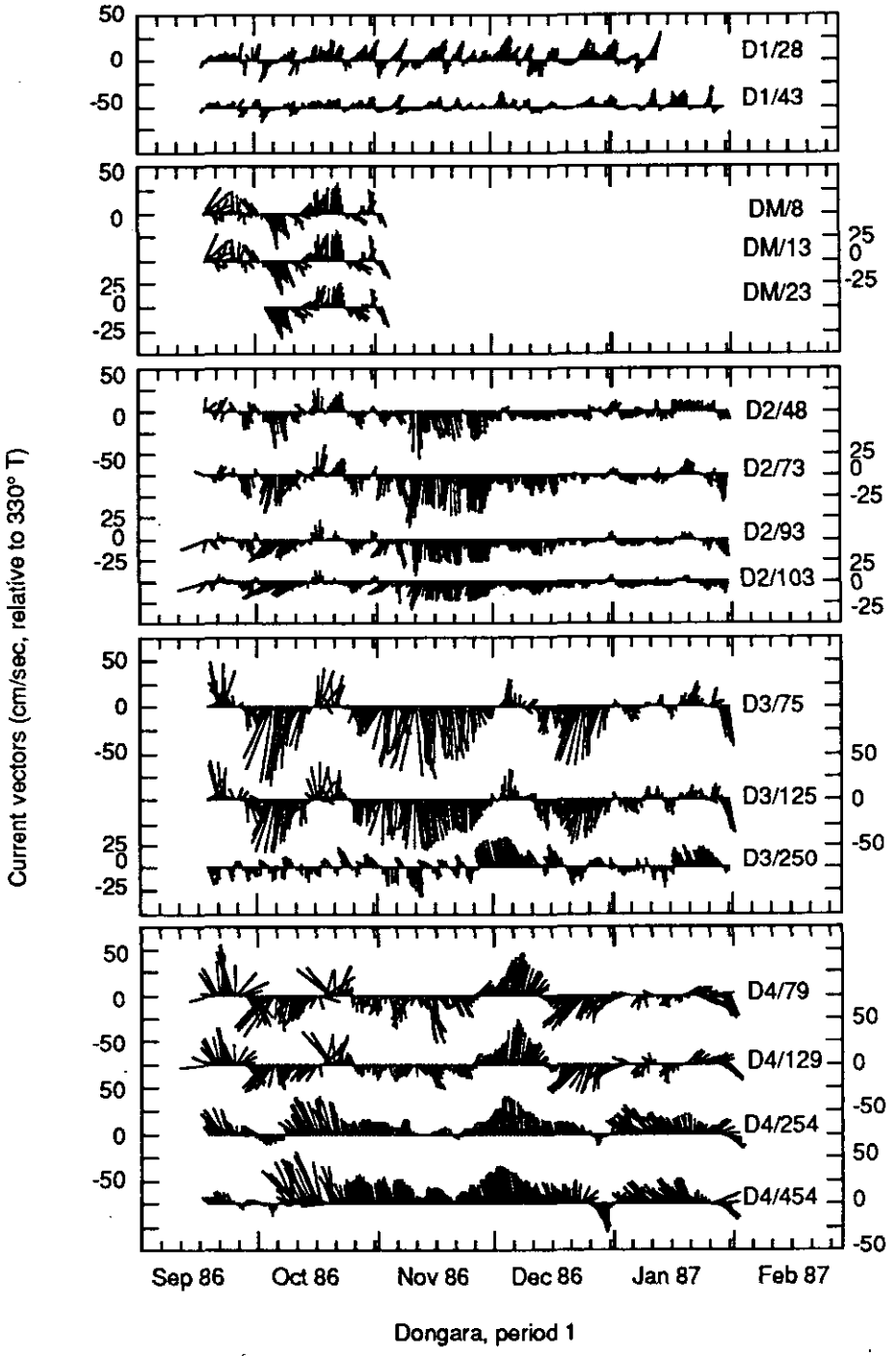
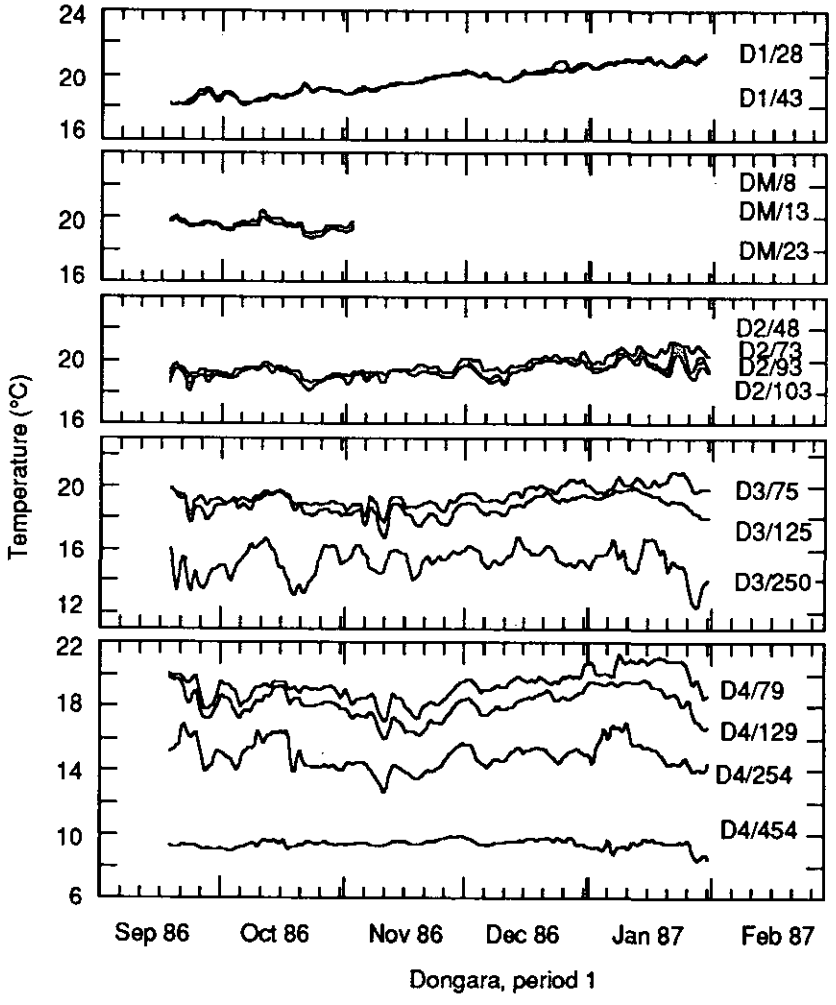

A2/103
θ =020°T
B2/65
θ =0°T
B2/75
θ =320°T
C2/46
D2/92
θ =330°T
D2/102
E2/70
θ =340°T
F2/60
θ =0°T
G2/61
θ =300°T
G2/71
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Alongshore array
Current vectors (cm/sec, relative to θ)

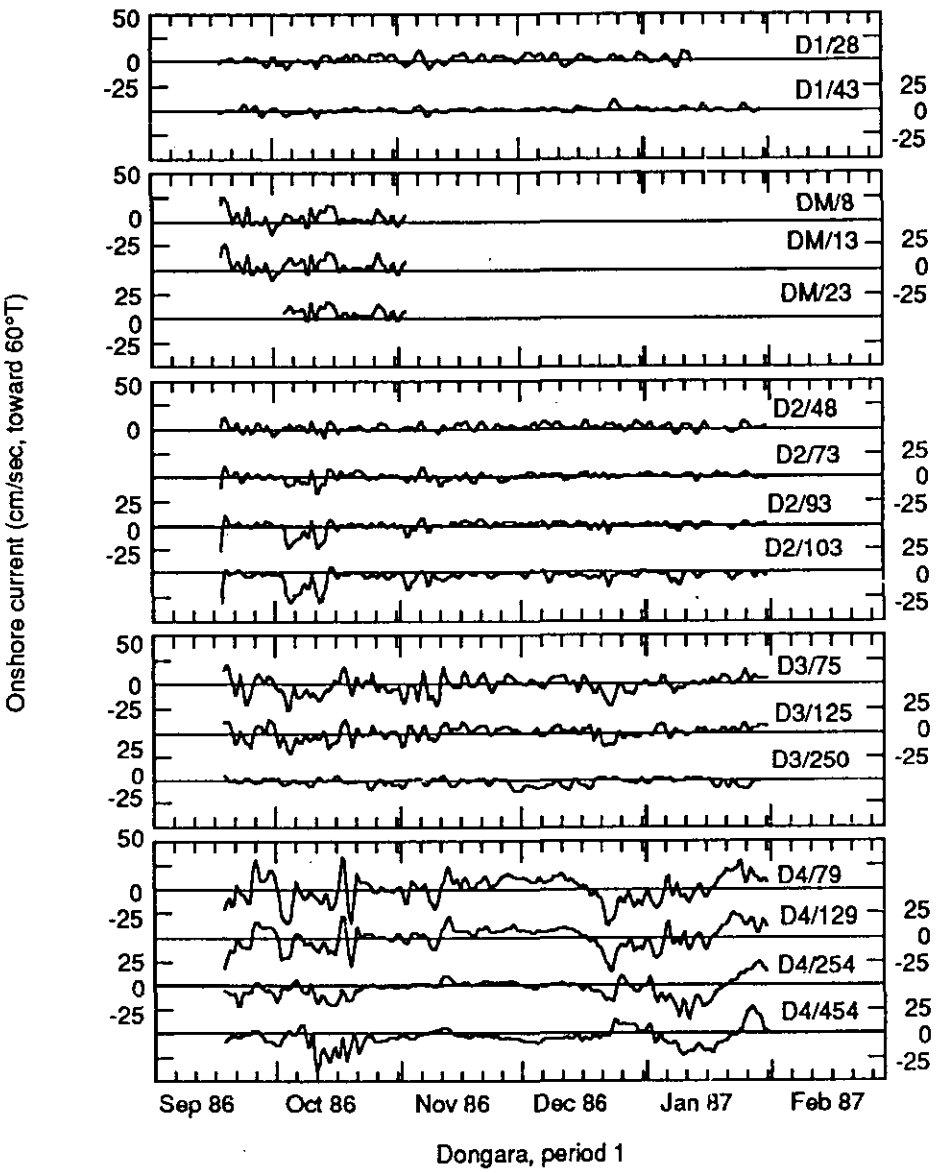

A2/103
A2/113
A2/PG
B2/65
B2/75
B2/PG
C2/46
D2/92
D2/102
E2/70
F2/60
F2/PG
G2/61
G2/71
G2/PG
28
24
20
16
24
20
16
24
20
16
24
20
16
24
20
16
22
18
14
Temperature (°C)
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Alongshore array

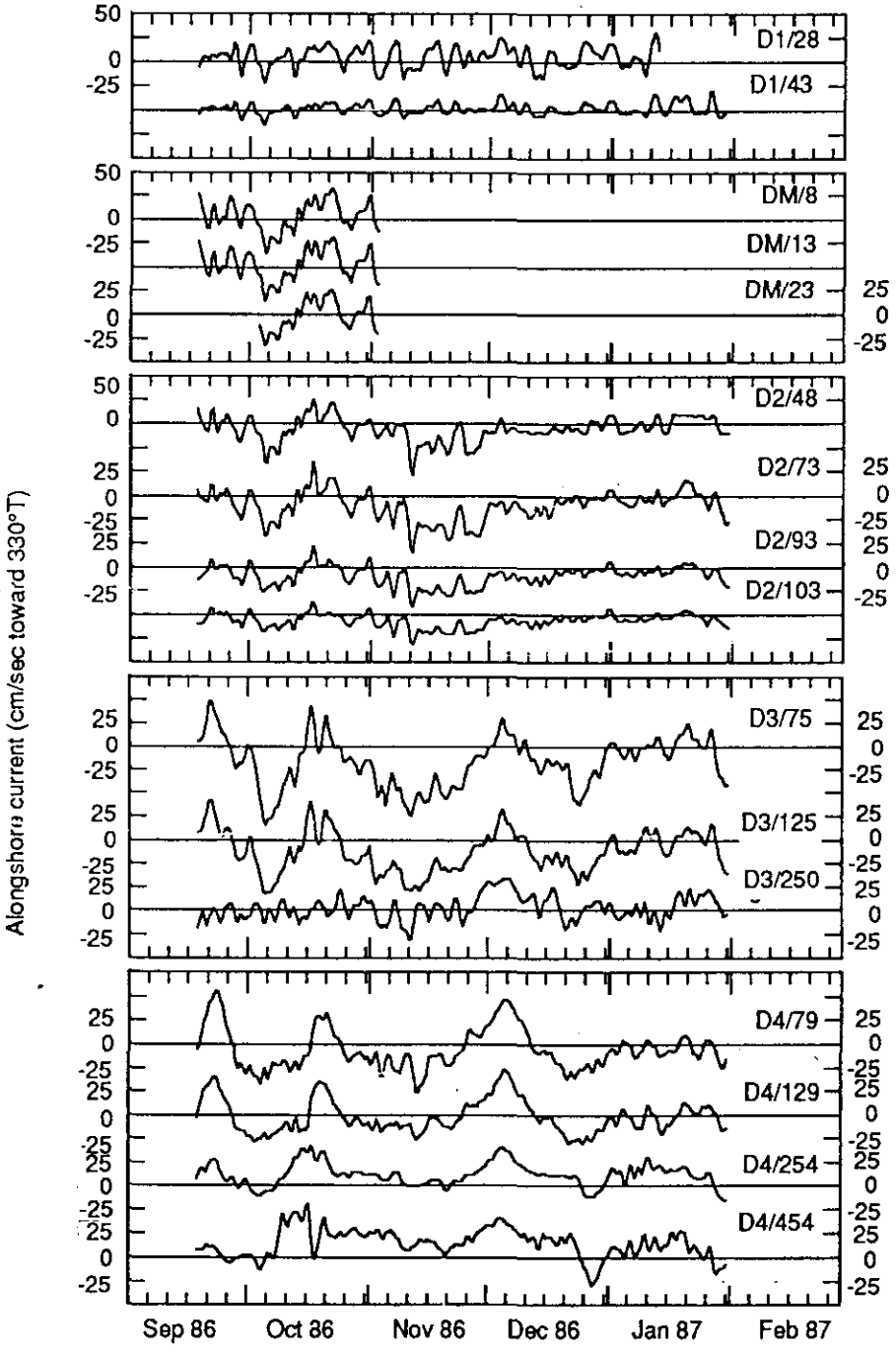

A2/103
B2/65
B2/75
C2/46
D2/92
D2/102
E2/70
F2/60
G2/61
G2/71
25
0
-25
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Alongshore array
Onshore current (cm/sec)


A2/103
B2/65
B2/75
C2/46
D2/92
D2/102
E2/70
F2/60
G2/61
G2/71
25
0
-25
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Alongshore array
Alongshore current (cm/sec)

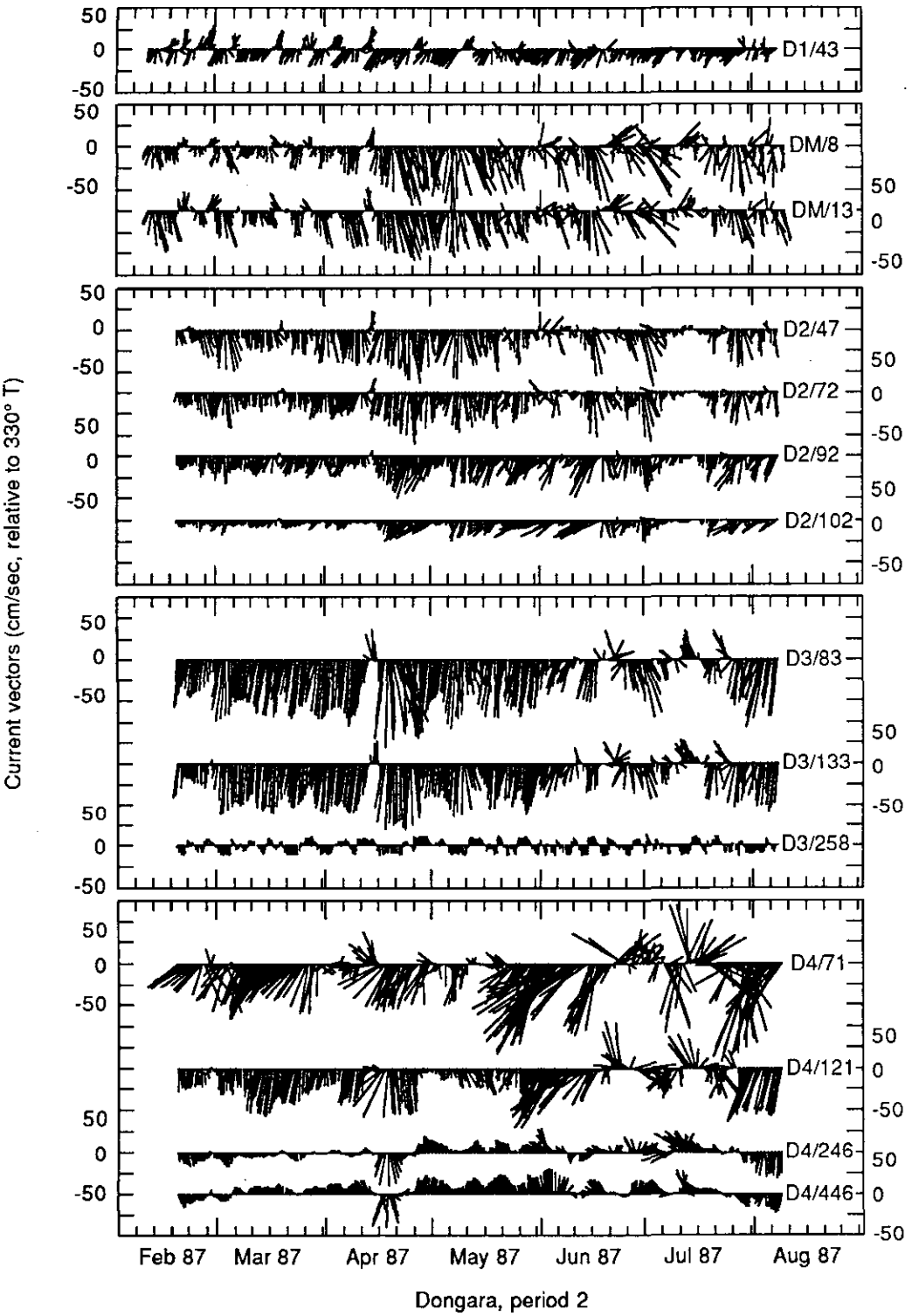

Current vectors (cm/sec, relative to 330° T)
D1/28
D1/43
DM/8
DM/13
DM/23
D2/48
D2/73
D2/93
D2/103
D3/75
D3/125
D3/250
D4/79
D4/129
D4/254
D4/454
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Dongara, period 1

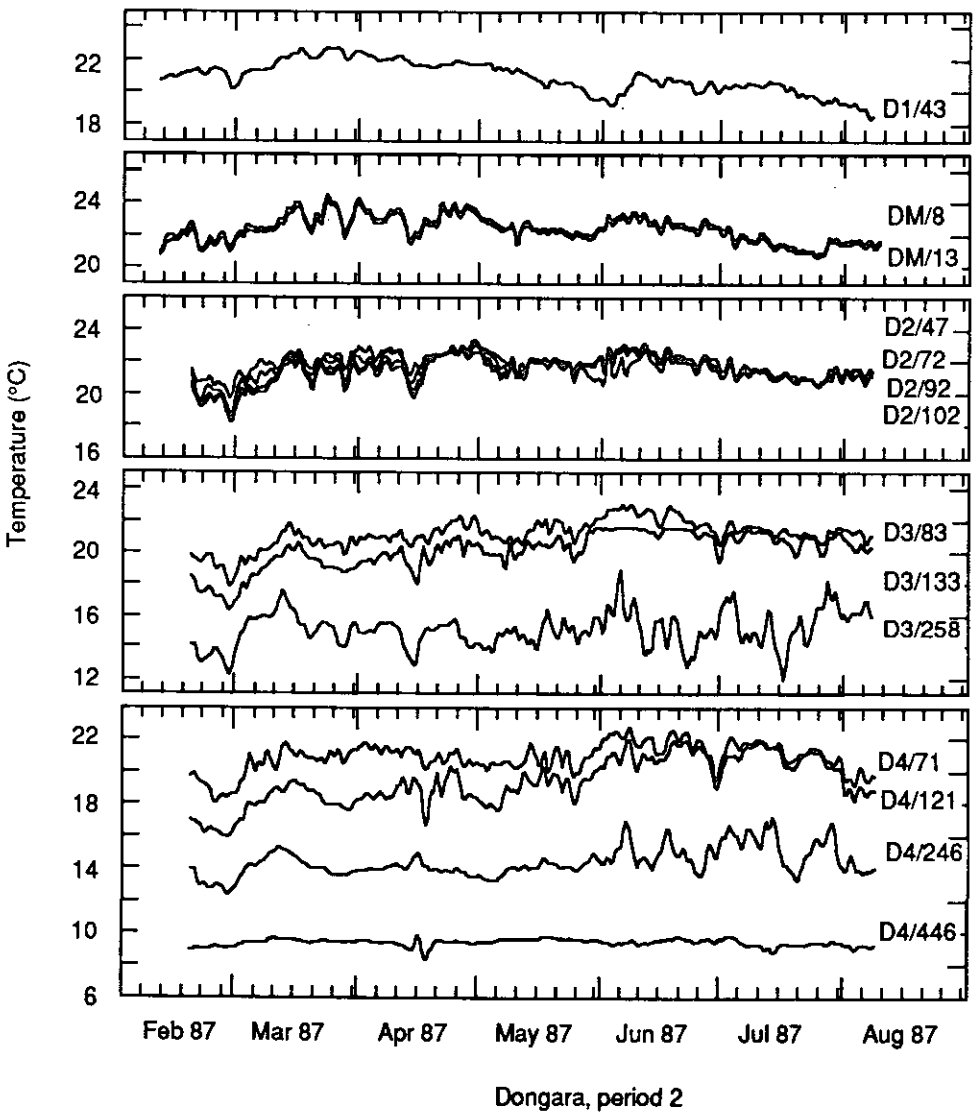

Temperature (°C)
24
20
16
D1/28
D1/43
DM/8
DM/13
DM/23
D2/48
D2/73
D2/93
D2/103
D3/75
D3/125
D3/250
12
22
18
14
10
6
D4/79
D4/129
D4/254
D4/454
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Dongara, period 1

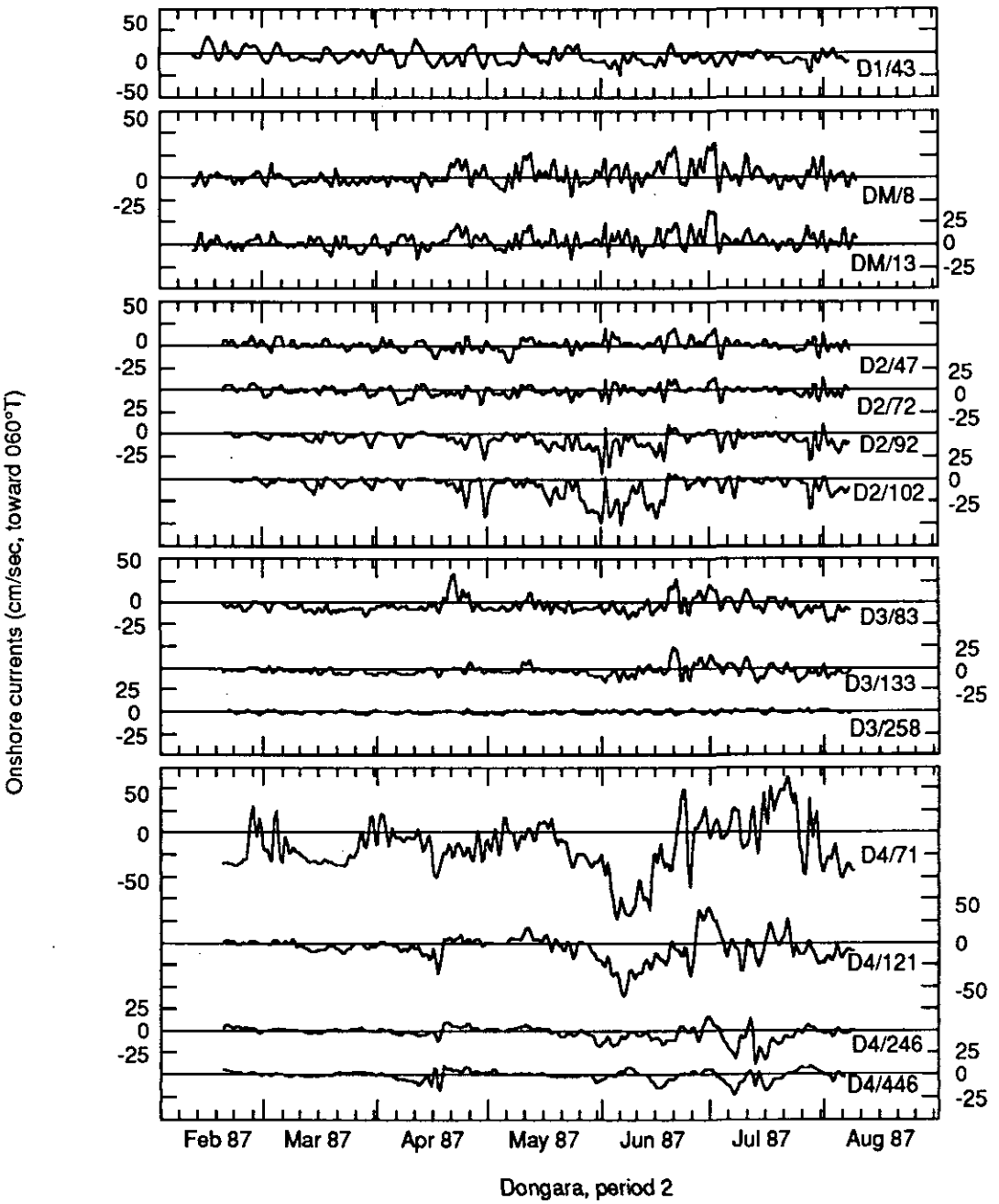

Onshore current (cm/sec, toward 60°T)
D1/28
D1/43
DM/8
DM/13
DM/23
D2/48
D2/73
D2/93
D2/103
D3/75
D3/125
D3/250
D4/79
D4/129
D4/254
D4/454
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Dongara, period 1

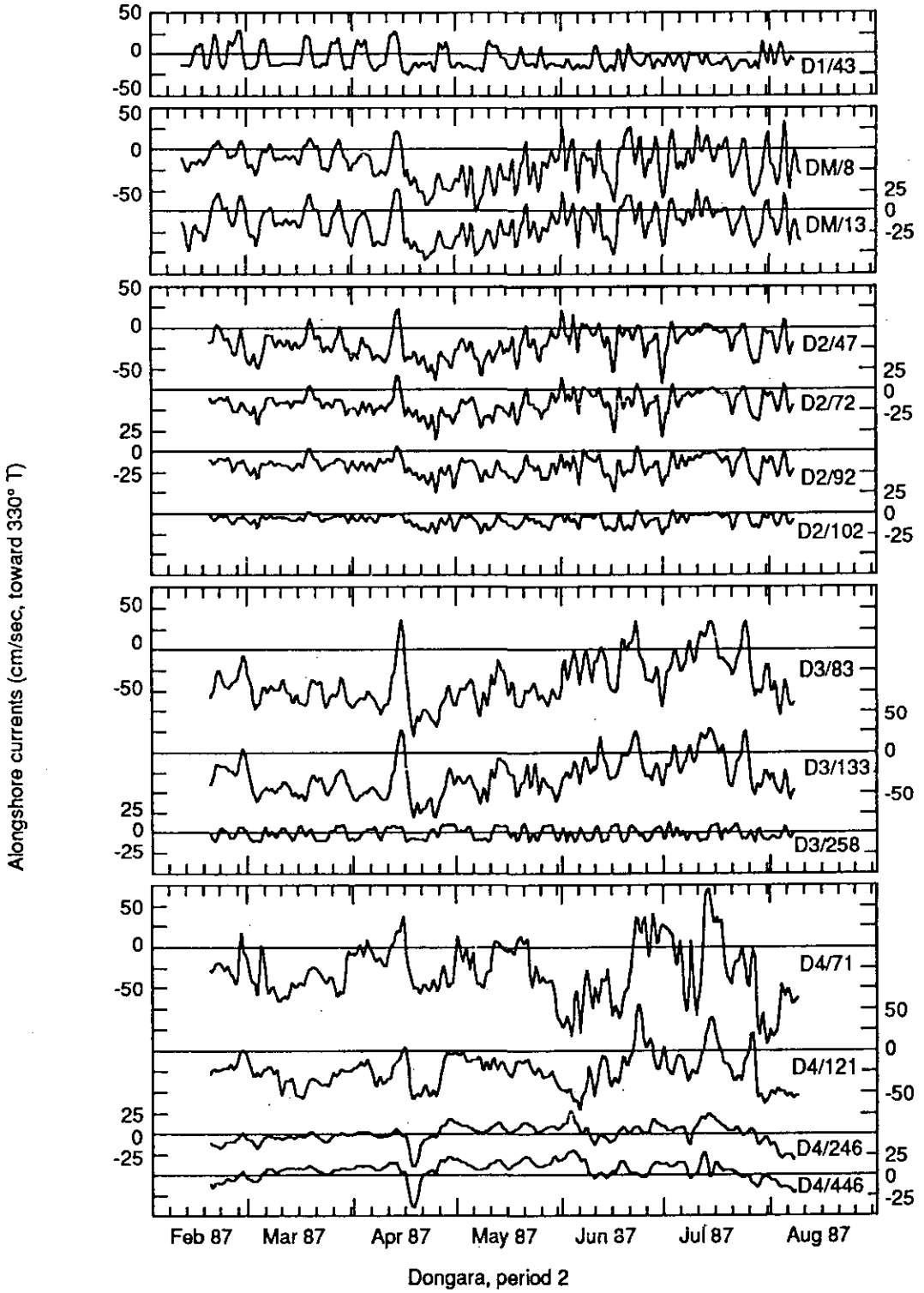


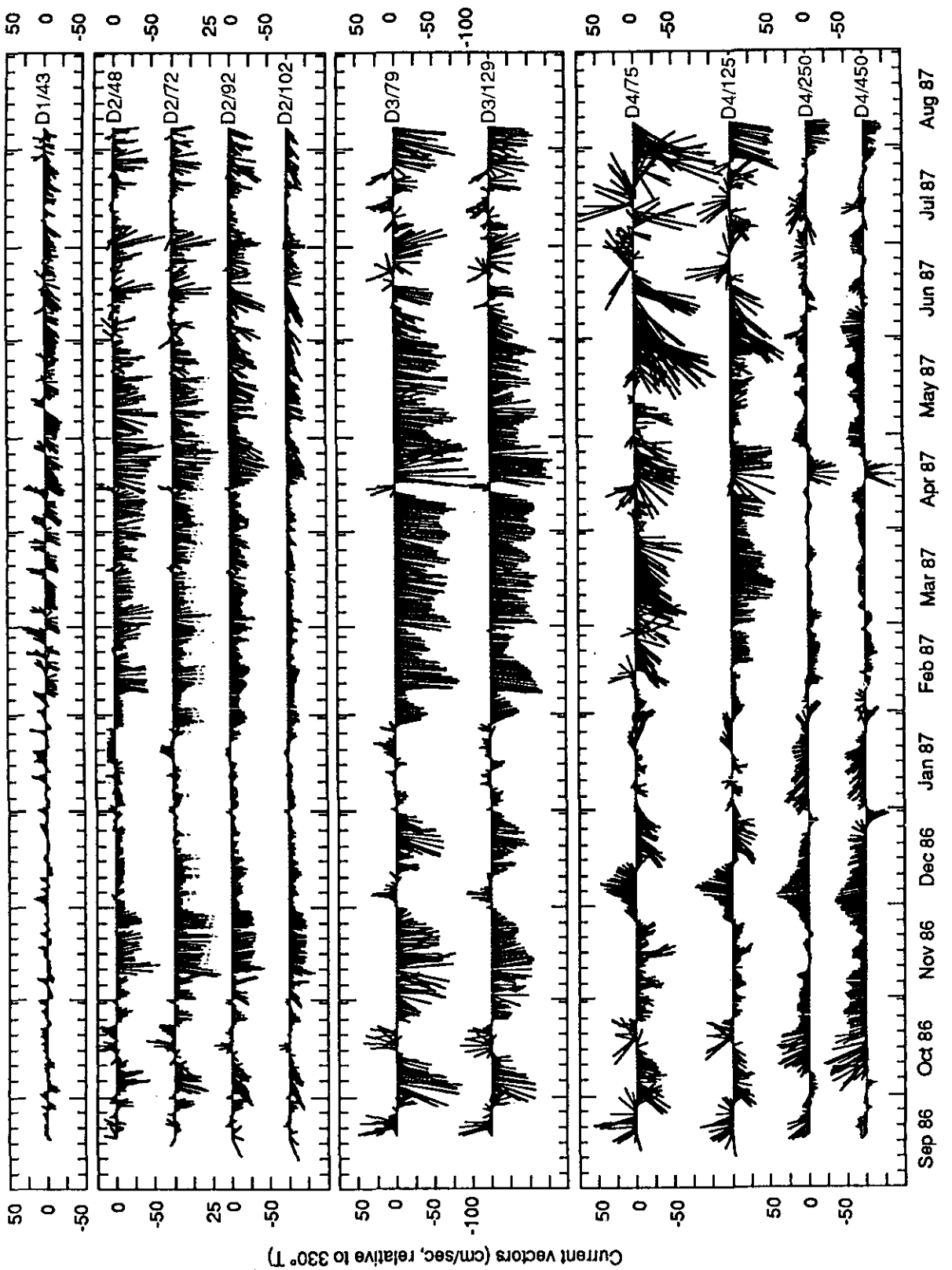
Dongara, period 1

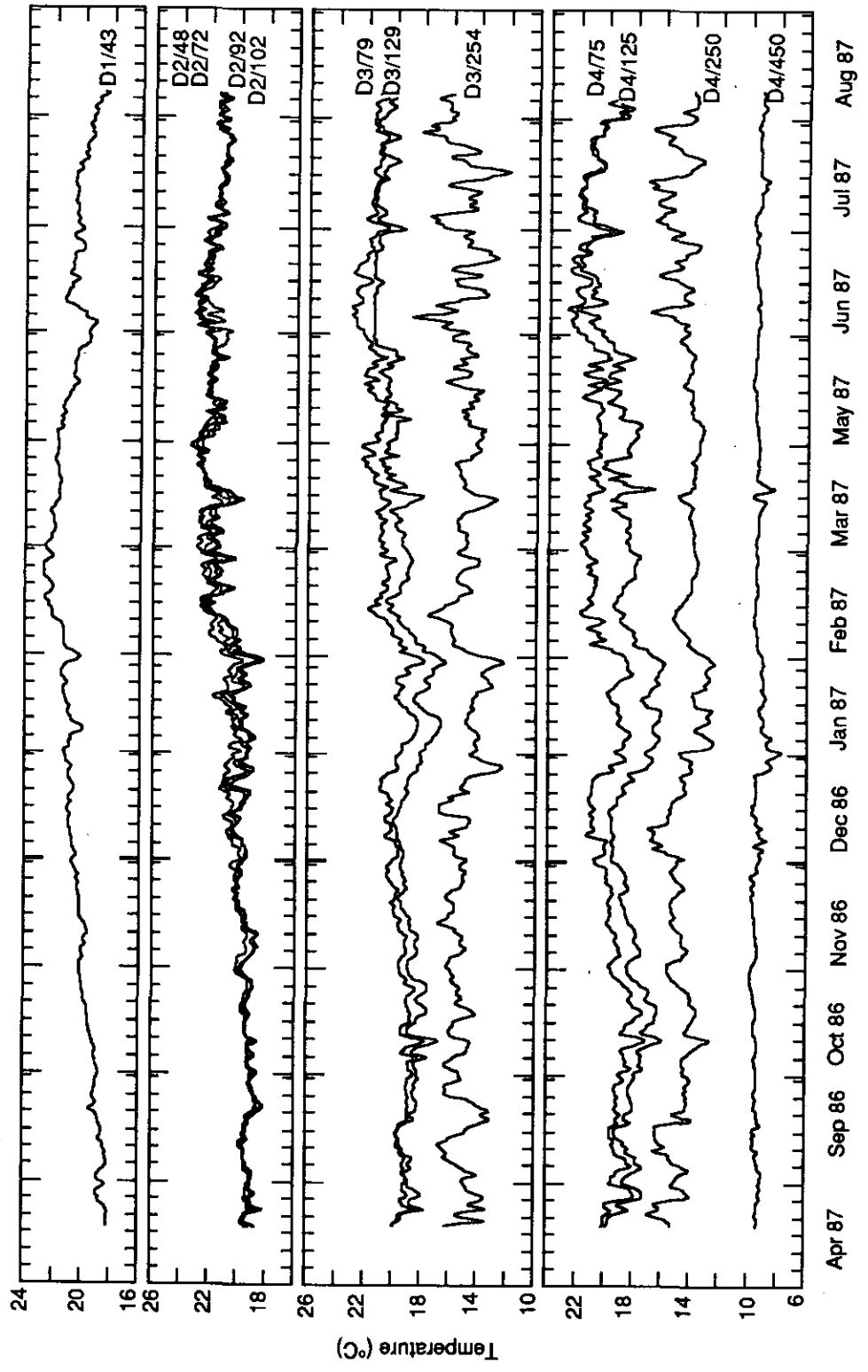

Current vectors (cm/sec, relative to 330° T)
D1/43
DM/8
DM/13
D2/47
D2/72
D2/92
D2/102
D3/83
D3/133
D3/258
D4/71
D4/121
D4/246
D4/446
50
0
-50
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Dongara, period 2

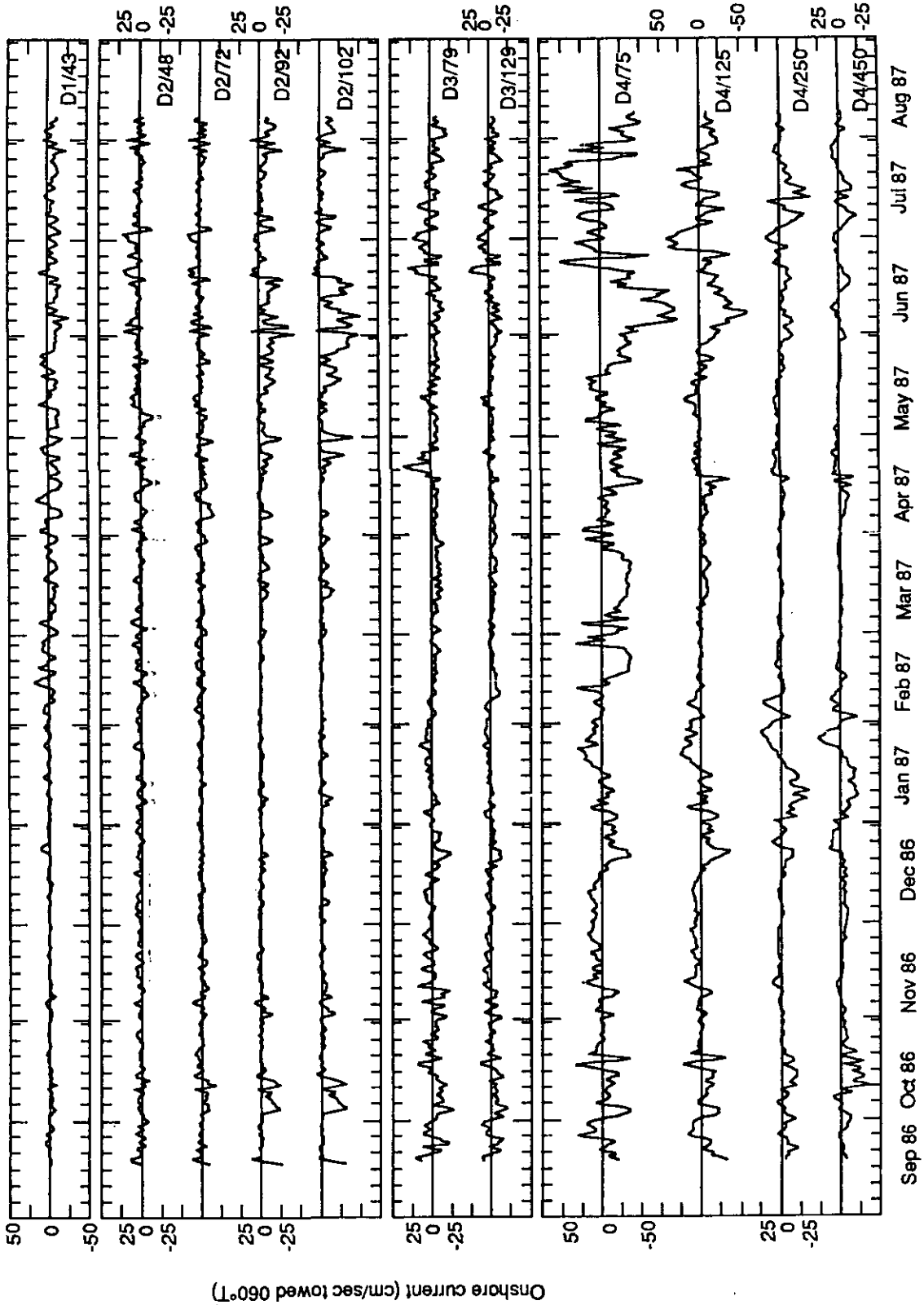

Temperature (°C)
22
18
D1/43
24
20
DM/8
DM/13
24
20
16
D2/47
D2/72
D2/92
D2/102
24
20
16
12
D3/83
D3/133
D3/258
22
18
14
10
6
D4/71
D4/121
D4/246
D4/446
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Dongara, period 2

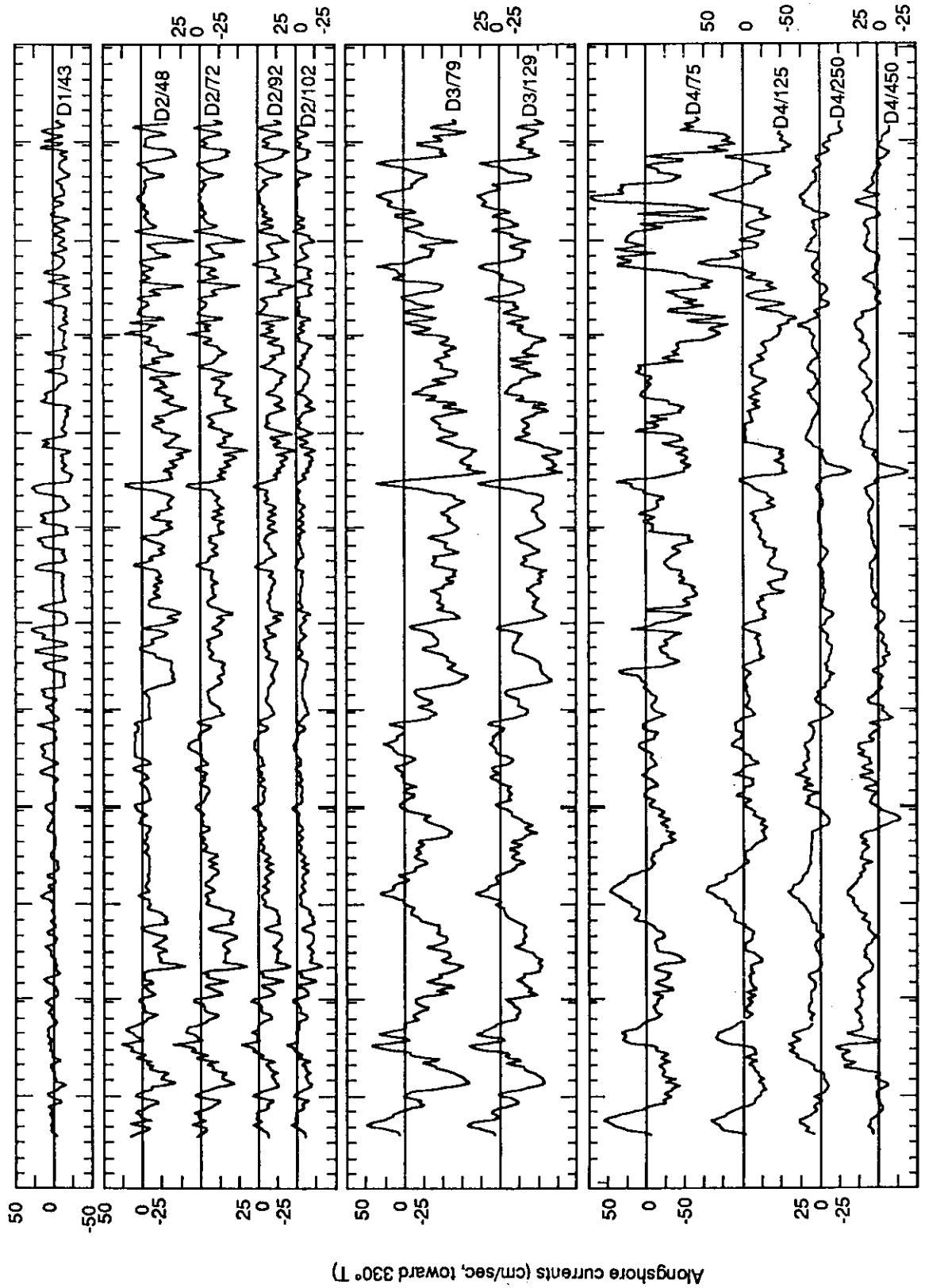

Onshore currents (cm/sec, toward 060°T)
D1/43
DM/8
DM/13
D2/47
D2/72
D2/92
D2/102
D3/83
D3/133
D3/258
D4/71
D4/121
D4/246
D4/446
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Dongara, period 2

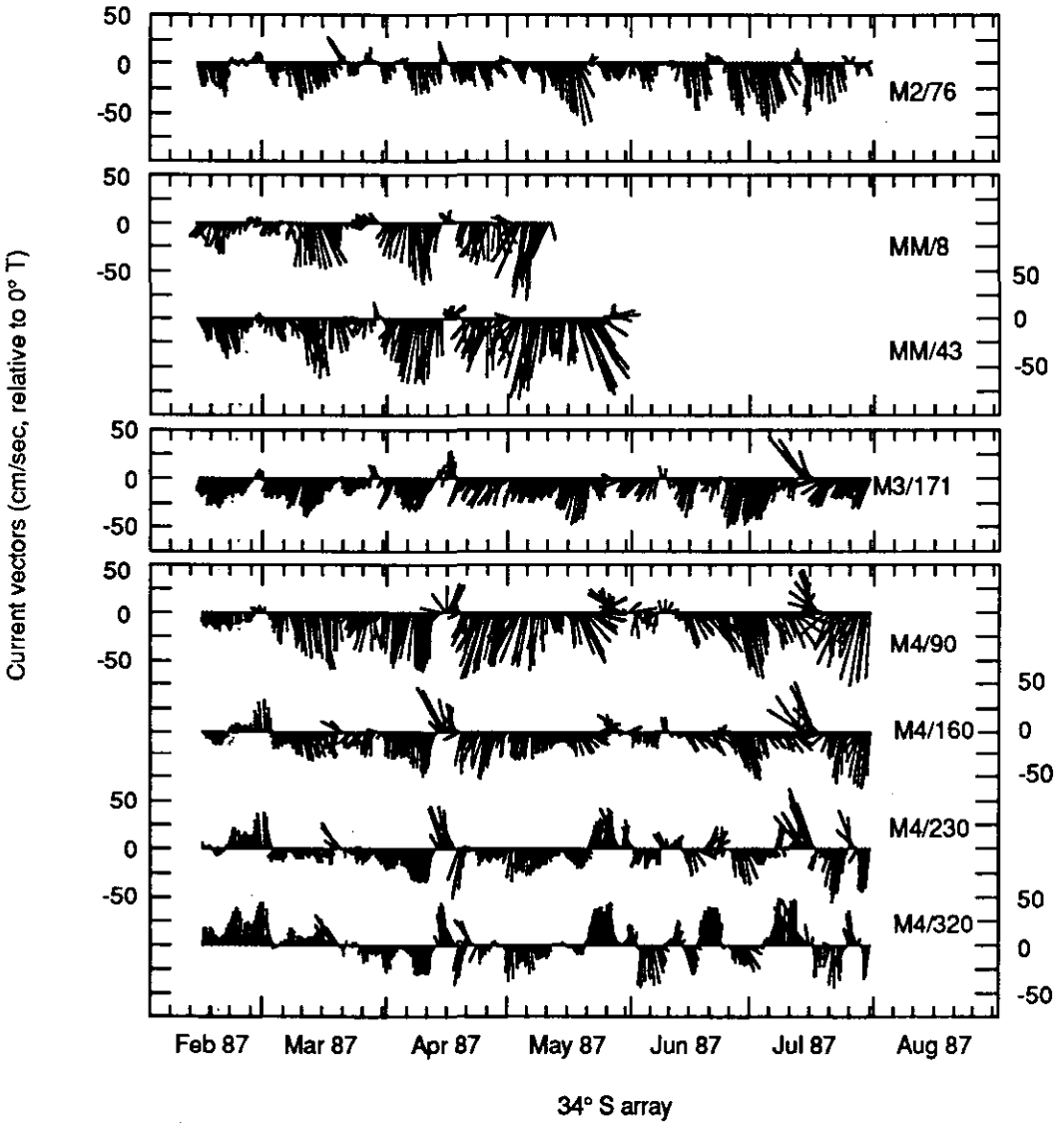

Alongshore currents (cm/sec, toward 330° T)
D1/43
DM/8
DM/13
D2/47
D2/72
D2/92
D2/102
D3/83
D3/133
D3/258
D4/71
D4/121
D4/246
D4/446
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Dongara, period 2

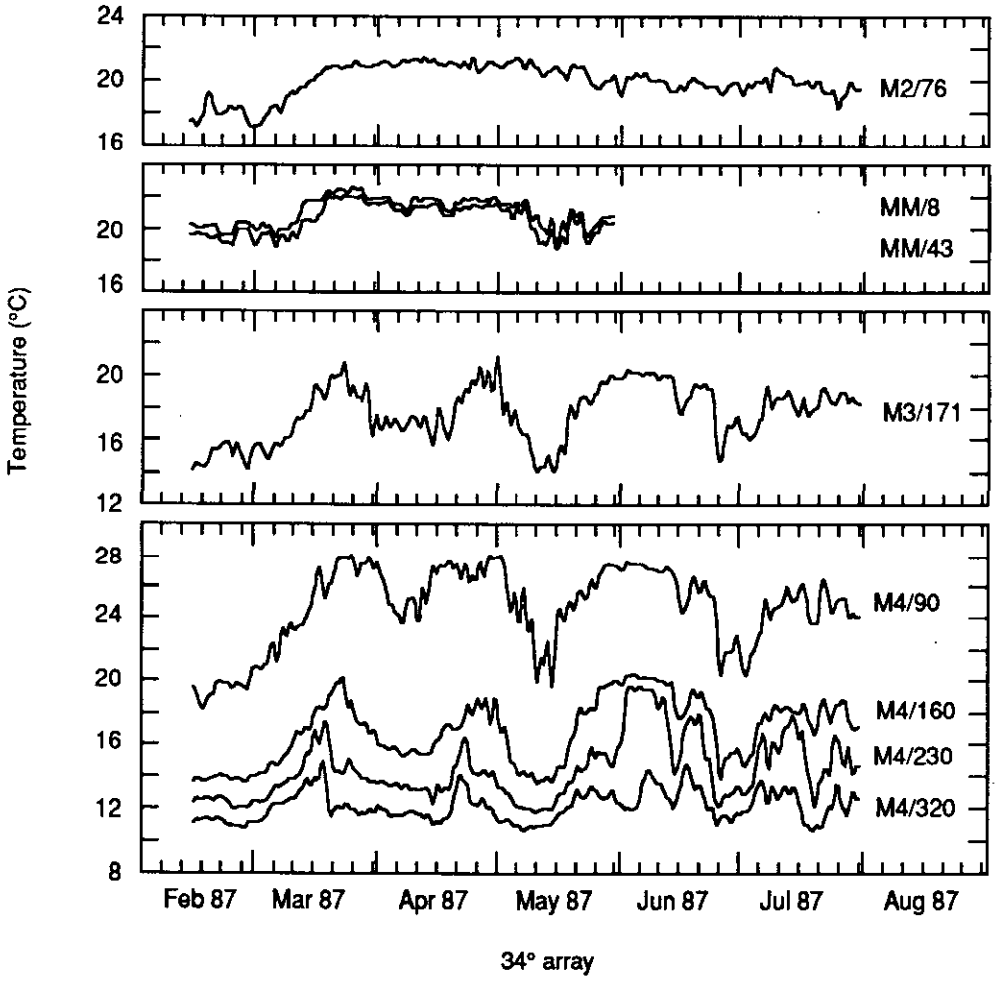

D1/43
D2/48
D2/72
D2/92
D2/102
D3/79
D3/129
D4/75
D4/125
D4/250
D4/450
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Joined Dongara
Current vectors (cm/sec, relative to 330° T)

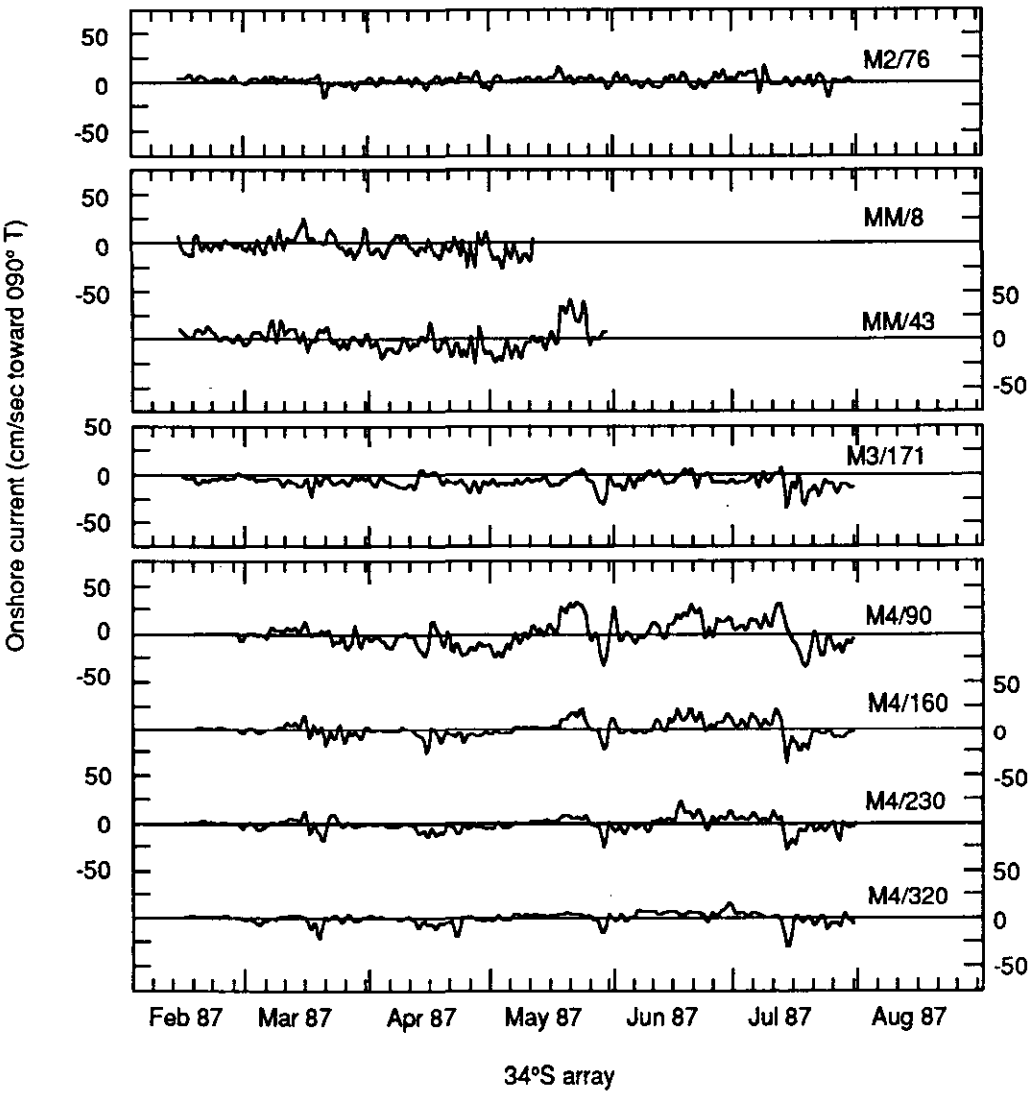

D1/43
D2/48
D2/72
D2/92
D2/102
D3/79
D3/129
D3/254
D4/75
D4/125
D4/250
D4/450
Temperature (°C)
Apr 87
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Mar 87
May 87
Jun 87
Jul 87
Aug 87
Joined Dongara

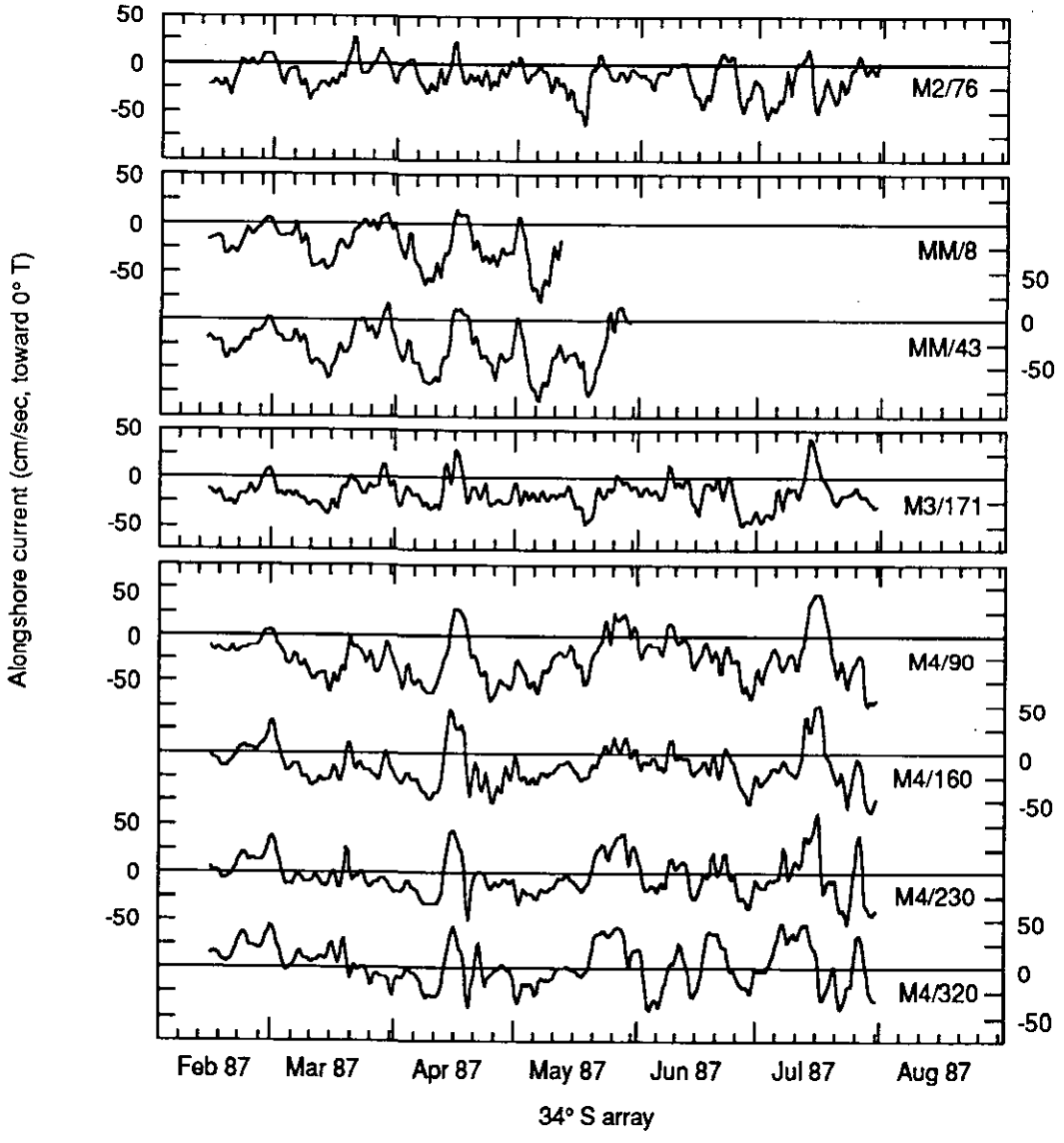

D1/43
D2/48
D2/72
D2/92
D2/102
D3/79
D3/129
D4/75
D4/125
D4/250
D4/450
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
Onshore current (cm/sec toward 060°T)


D1/43
D2/48
D2/72
D2/92
D2/102
D3/79
D3/129
D4/75
D4/125
D4/250
D4/450
Apr 87
Sep 86
Oct 86
Nov 86
Dec 86
Jan 87
Feb 87
Mar 87
May 87
Jun 87
Jul 87
Aug 87
Alongshore currents (cm/sec, toward 330° T)


Current vectors (cm/sec, relative to 0° T)
50
0
-50
M2/76
MM/8
MM/43
M3/171
M4/90
M4/160
M4/230
M4/320
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
34° S array


Temperature (°C)
24
20
16
M2/76
20
16
MM/8
MM/43
20
16
12
M3/171
28
24
20
16
12
8
M4/90
M4/160
M4/230
M4/320
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
34° array


Onshore current (cm/sec toward 090° T)
50
0
-50
M2/76
MM/8
MM/43
M3/171
M4/90
M4/160
M4/230
M4/320
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
34°S array


Alongshore current (cm/sec, toward 0° T)
50
0
-50
M2/76
MM/8
MM/43
M3/171
M4/90
M4/160
M4/230
M4/320
Feb 87
Mar 87
Apr 87
May 87
Jun 87
Jul 87
Aug 87
34° S array

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