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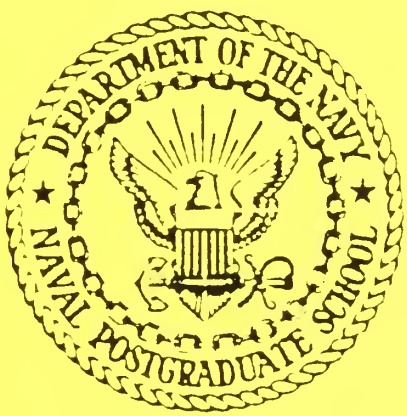

HYDROGRAPHIC DATA FROM THE OPTOMA PROGRAM
OPTOMA21
7 - 20 July 1986

by

Paul A. Wittmann
Melissa L. Ciandro
Arlene A. Bird
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A multidisciplinary cruise, OPTOMA21, was undertaken during the period 7 to 20 July 1986 off Northern California to map a cool anomaly, meandering jet and eddy system. This report presents the hydrographic data from that cruise.

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Hydrographic Data from the **OPTOMA** *Program:*

OPTOMA21

7 - 20 July, 1986

by

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Melissa L. Ciandro
Arlene A. Bird
Christopher N. K. Mooers

Chief Scientist:
Christopher N. K. Mooers

The **OPTOMA** Program is a joint program of

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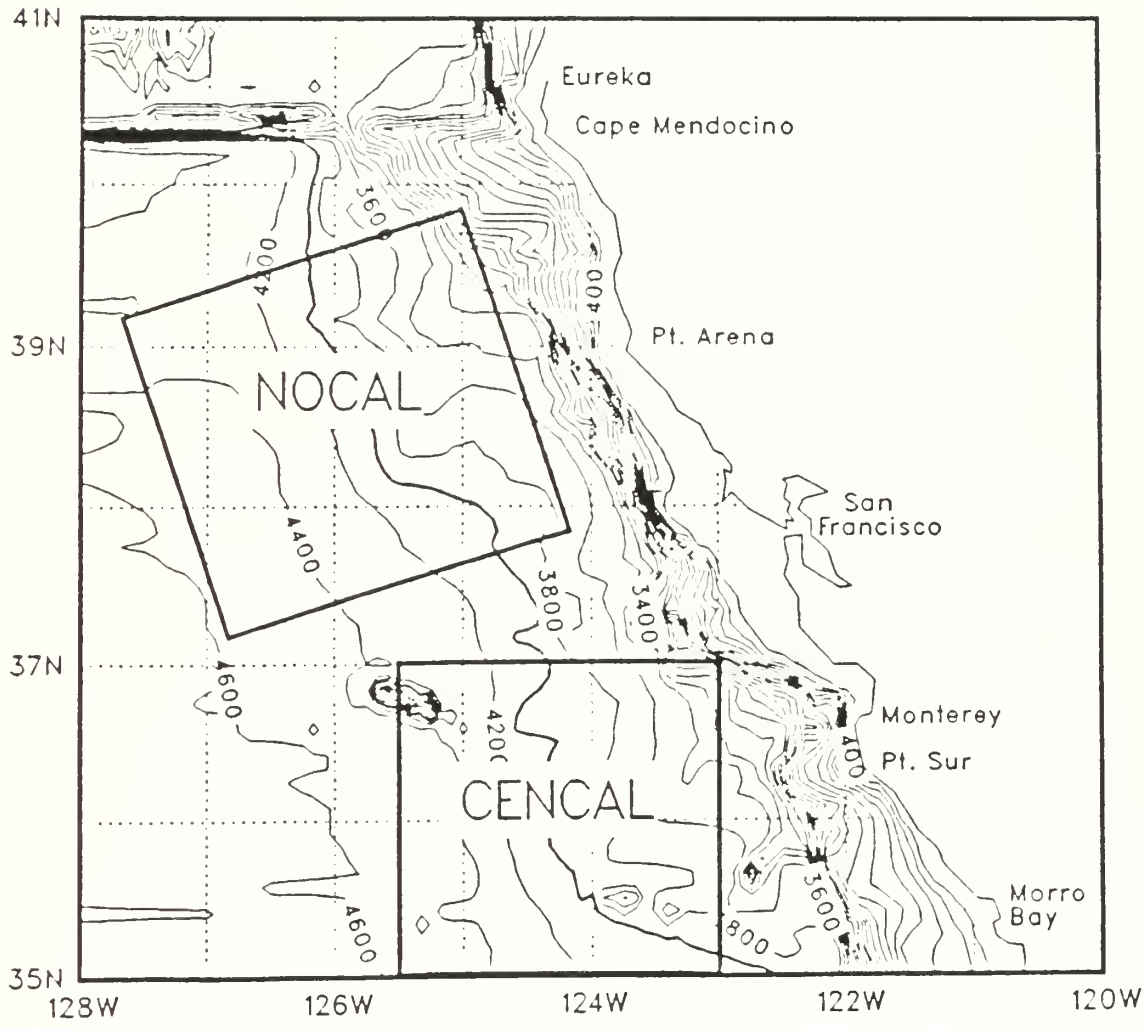


Figure 1: The NOCAL and CENCAL subdomains of the OPTOMA Program. Isobaths are shown in meters.

INTRODUCTION

The OPTOMA (Ocean Prediction Through Observation, Modeling and Analysis) Program, a joint NPS/Harvard program sponsored by ONR, seeks to understand the mesoscale (fronts, eddies, and jets) variability and dynamics of the California Current System and to determine the scientific limits to practical mesoscale ocean forecasting. To help carry out the aims of this project, a series of cruises has been planned in two subdomains, NOCAL and CENCAL, shown in Figure 1.

OPTOMA21 was a multidisciplinary study which took place from 7 to 20 July, 1986 aboard the R/V POINT SUR in the NOCAL domain (Figure 2). In addition to conducting a quasi-synoptic CTD/XBT mapping of a cool anomaly, meandering jet, and eddy system, measurements were made to determine:

- the fine scale variability of the upper ocean mass and velocity fields
- the upper ocean nutrient, optical and phytoplankton fields
- the structure of the zooplankton population.

In this report, the CTD/XBT data are presented.

DATA ACQUISITION

Data acquired during OPTOMA21 include profiles from Sippican XBTs and from a Neil Brown CTD, with accuracies as given in Table 1. The XBT data were digitized using a Sippican MK9 unit. All data were recorded, using an HP200 series computer, on data disks. Station positions were determined by LORAN C fixes and are claimed to be accurate to within about 0.1 km. Bucket surface temperatures and water samples for salinity were taken at 73 CTD stations and used for calibration purposes. The surface salinities from bottle samples were determined ashore by a Guildline Model 8400 "Autosal" salinometer, with accuracy given in Table 1.

Continuous 2m thermosalinograph measurements and continuous meteorological data, such as atmospheric pressure at a height of 2m and wind speed and direction at a height of 20m, were also acquired. These data were digitized, using an HP5328 frequency counter and a 40 channel digital voltmeter, and then averaged over two-minute intervals.

All data were transferred to the IBM 3033 mainframe computer for editing and processing.

DATA PROCESSING

Data processing, such as estimating depth profiles for the XBT temperature profiles based on the descent speed, and conversion of CTD conductivity to salinity using the algorithm given in Lewis and Perkin (1981), was carried out on the IBM 3033 at the Naval Postgraduate School. The data were then edited by removing obvious salinity spikes and eliminating cast failures that were not identified during the cruise. Approximately 99% of the casts were retained in the data set. From a comparison of the CTD salinities with the salinity samples from the bottles, it was determined that the average salinity offset was -.044 ppt. Since this offset value was small, no correction was made to the salinities. The CTD data were interpolated to 5m intervals and then up and down casts were averaged.

The data have been transferred on digital tape to the National Oceanographic Data Center in Washington, DC.

DATA PRESENTATION

The cruise track, station locations (with XBTs and CTDs identified) and station numbers are shown in Figures 2, 3, and 4, respectively. On the cruise track figure, transect extremes are identified by letter to aid in cross-referencing the data presented in subsequent figures. These figures are followed by a listing of the stations with their coordinates, the date and time when each station was occupied, and the surface information obtained at the station.

Vertical profiles of temperature from the XBT casts are shown in staggered fashion. The location of these profiles may be found by reference to the various maps of the cruise tracks. Transect extremes are identified as nearly as possible. The first profile on each plot is shown with its temperature unchanged; to each subsequent profile, an appropriate multiple of 5C has been added. Vertical profiles from the CTDs follow. Profiles of temperature are staggered by 5C and those of salinity by 4 ppt.

Isotherms for each transect are shown in the next pages, followed by isopleths of temperature, salinity and sigma-t, from the CTDs, when four or more casts were acquired along a transect. Based on instrument accuracy and the vertical temperature gradient, it is estimated that depths of isotherms in the main thermocline are uncertain to $\pm$20m. The tick marks identify station positions and, again, the transect extremes are shown on these plots.

Mean profiles of temperature from the XBTs and CTDs are given for the nearshore stations (1-61, 182-186) in Figure 9, and for the offshore stations (62-181,

187-196) in Figure 10. Salinity and sigma-t profiles from nearshore and offshore CTDs are shown in Figures 11 and 12, followed by scatter diagrams of the T-S pairs and the mean S(T) curves for the nearshore and offshore data, with the ± standard deviation envelope. The data presentation concludes with plots of the nearshore and offshore mean N^2 (Brunt-Vaisala frequency squared) profiles, with ± the standard deviations. On the sigma-t and N^2 plots, the appropriate profiles derived from the mean temperature and mean salinity profiles are also shown.

Table 1: Scientific instruments aboard the R/V POINT SUR

Instrument	Variable	Sensor	Accuracy	Resolution
Neil Brown CTD Mark IIIb	pressure temperature conductivity	strain gauge thermistor electrode cell	1.6 db 0.005 C 0.005 mmho	0.025 db 0.0005 C 0.001 mmho
Sippican XBT	temperature depth	thermistor descent speed	0.2 C greater of 4.6m and 2% of depth	
Sea-Bird Sensors	temperature conductivity at 2 meters	thermistor electrode cell	0.003 C 0.003 mmho	0.0005 C 0.0005 mmho
General Eastern Temperature Sensors	air temperature dew point temperature	thermometer condensation temp.sensor	0.01 C 0.2 C	
R.M. Young Wind Sensors	wind speed wind direction	anemometer vane	0.15 mph 2.5 degrees	
Internav LC 408 LORAN C	position	two chain LORAN receiver	100 meters	10 meters

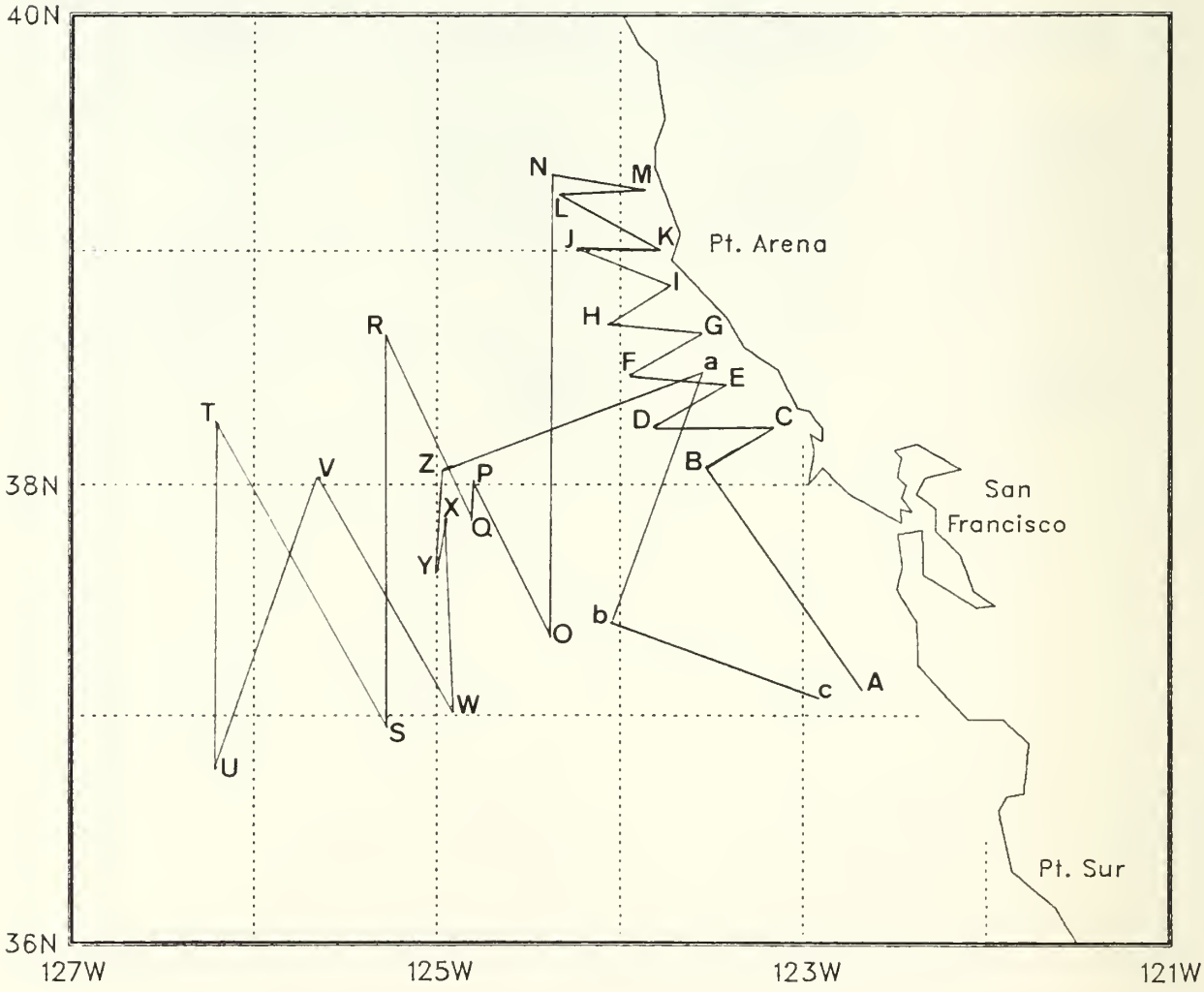


Figure 2: The cruise track for OPTOMA21.

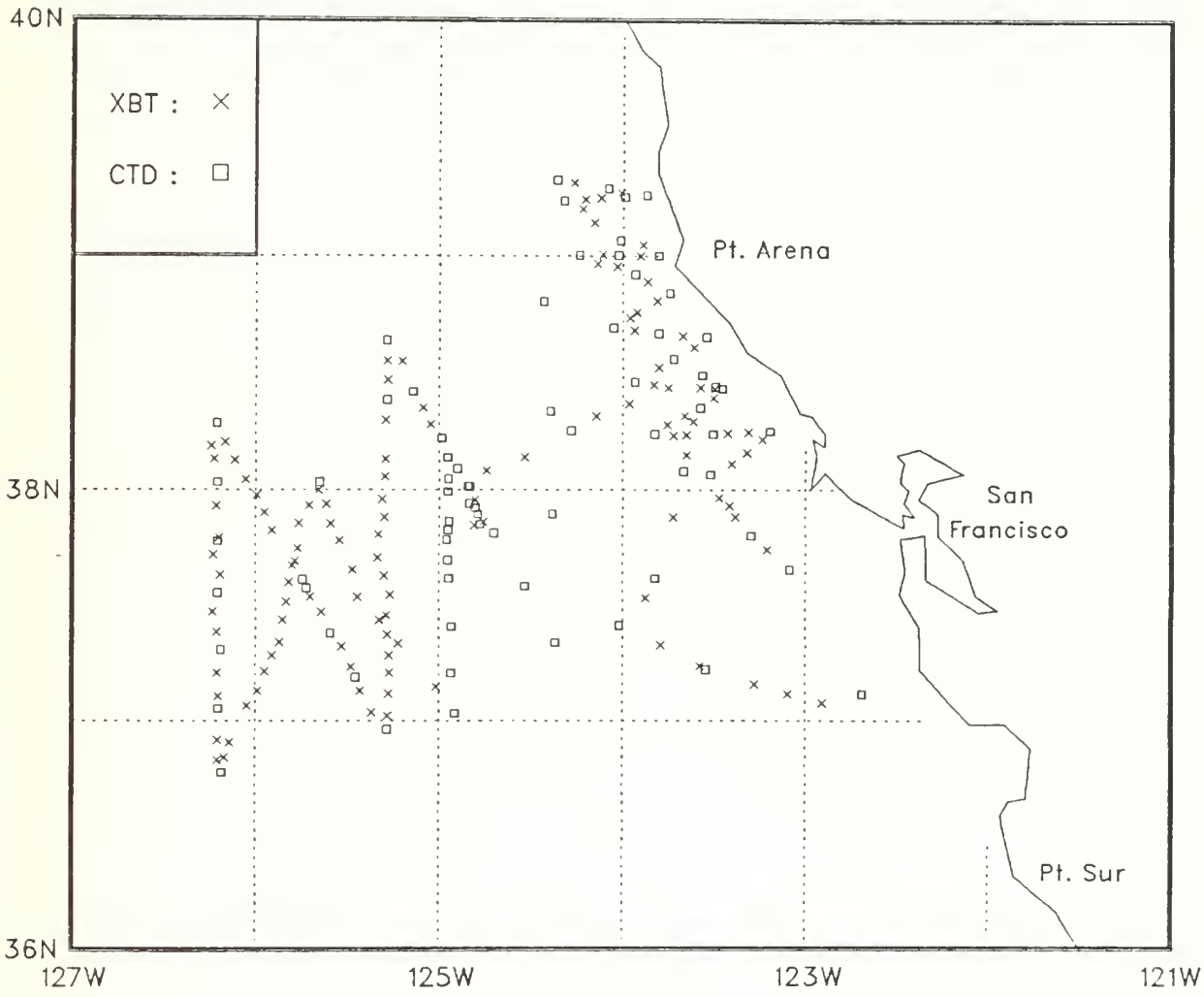


Figure 3: XBT and CTD locations for OPTOMA21.

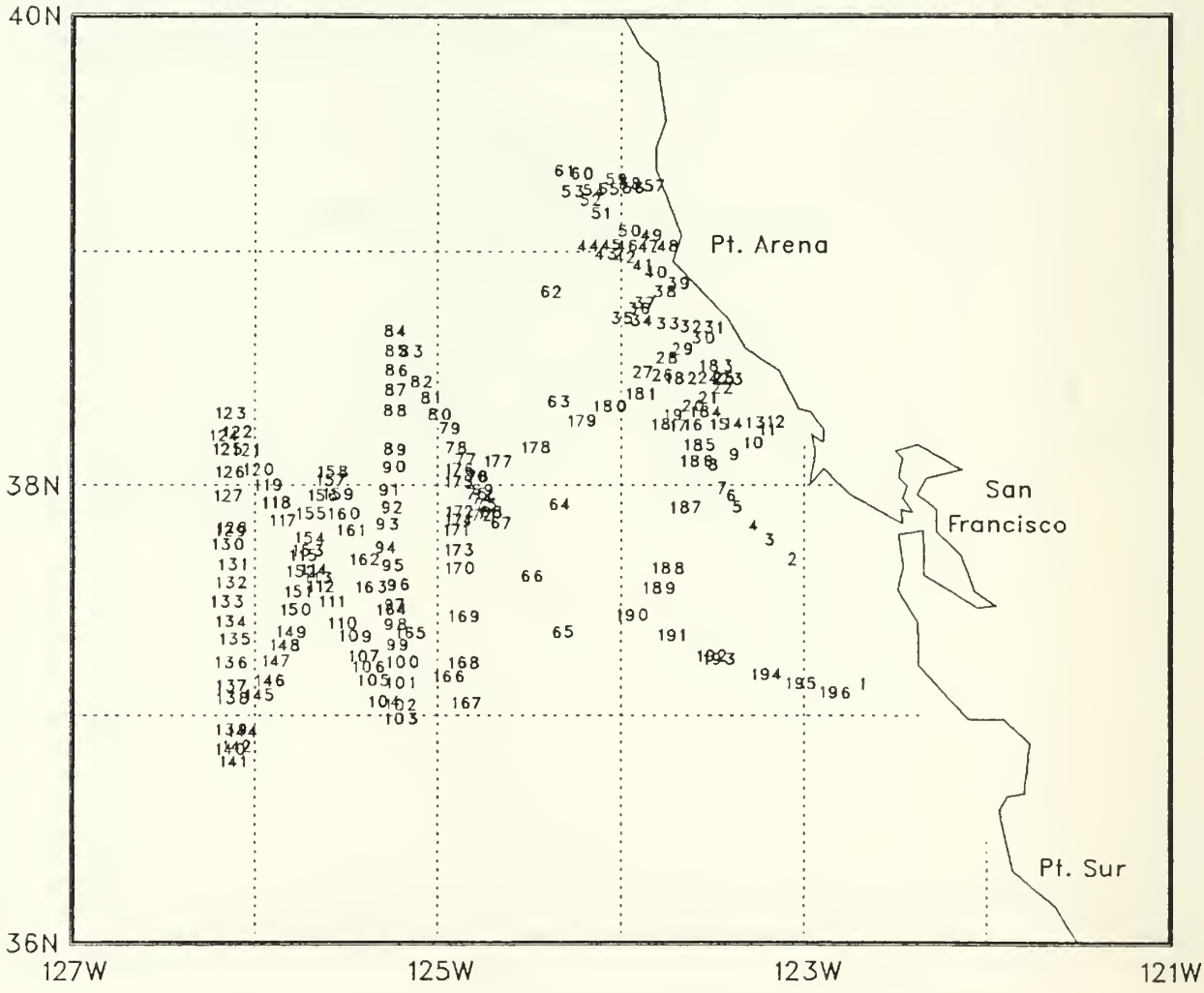


Figure 4. Station numbers for OPTOMA21.

Table 2: OPTOMA21 Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
1	CTD	86188	1607	37.07	122.41	14.3	33.52		
2	CTD	86188	2105	37.39	123.05	11.9	33.63	11.6	
3	XBT	86188	2220	37.45	123.13	11.4			
4	CTD	86188	2319	37.48	123.18	11.3	33.23		
5	XBT	86189	132	37.53	123.23	11.2			
6	XBT	86189	216	37.56	123.25	11.8			
7	XBT	86189	254	37.58	123.28	11.9			
8	CTD	86189	357	38.04	123.31	11.5	33.17		
9	XBT	86189	509	38.07	123.24	10.6			
10	XBT	86189	539	38.10	123.19	10.3			
11	XBT	86189	611	38.13	123.14	11.2			
12	CTD	86189	646	38.15	123.12	10.7	33.84		
13	XBT	86189	728	38.15	123.19	10.1			
14	XBT	86189	800	38.15	123.26	9.9			
15	CTD	86189	841	38.14	123.30	9.8	33.67	9.8	
16	XBT	86189	1030	38.14	123.39	10.9			
17	XBT	86189	1059	38.14	123.44	12.1			
18	CTD	86189	1151	38.14	123.49	12.6	33.01	12.4	
19	XBT	86189	1308	38.17	123.45	11.8			
20	XBT	86189	1343	38.19	123.40	11.0			
21	CTD	86189	1422	38.21	123.34	10.4	33.66	10.3	
22	XBT	86189	1516	38.24	123.30	10.4			
23	CTD	86189	1546	38.26	123.27	10.1	33.78	9.9	
24	XBT	86189	1636	38.26	123.35	10.3			
25	CTD	86189	1750	38.27	123.30	10.2	33.65		
25	XBT	86189	1714	38.26	123.30	10.2			
26	XBT	86189	1906	38.27	123.50	11.1			
27	CTD	86189	2003	38.28	123.56	10.8	33.55		
28	XBT	86189	2157	38.32	123.48	11.5			
29	CTD	86189	2246	38.34	123.43	10.7	33.57		33.55
30	XBT	86189	2354	38.37	123.36	9.9			
31	CTD	86190	32	38.39	123.32	10.1	33.86		
32	XBT	86190	132	38.40	123.40	10.2			
33	CTD	86190	253	38.40	123.48	11.2	33.35		
34	XBT	86190	414	38.41	123.56	12.1			
35	CTD	86190	515	38.42	124.03	11.5	33.47		
36	XBT	86190	630	38.44	123.57	12.0			
37	XBT	86190	753	38.46	123.55	11.8			
38	XBT	86190	837	38.49	123.49	11.0			
39	CTD	86190	912	38.51	123.45	9.7	33.89		
40	XBT	86190	1029	38.54	123.52	11.3			
41	CTD	86190	1110	38.55	123.56	11.5	33.32	11.8	
42	XBT	86190	1208	38.57	124.02	12.0			
43	XBT	86190	1243	38.58	124.08	11.0			
44	CTD	86190	1339	39.00	124.14	11.2	33.07	11.4	

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
45	XBT	86190	1507	39.01	124.07	11.8			
46	CTD	86190	1553	39.00	124.01	11.6	33.26	11.9	
47	XBT	86190	1712	39.00	123.54	11.6			
48	CTD	86190	1804	39.00	123.48	11.3	33.59	11.4	
49	XBT	86190	1908	39.03	123.53	11.9			
50	CTD	86190	2003	39.04	124.01	11.4	33.33	11.7	
51	XBT	86190	2130	39.09	124.09	12.0			
52	XBT	86190	2217	39.12	124.13	11.6			
53	CTD	86190	2316	39.14	124.19	11.7	33.31	12.0	
54	XBT	86191	26	39.14	124.12	12.1			
55	XBT	86191	103	39.15	124.07	11.9			
56	CTD	86191	159	39.15	123.59	11.6	33.25	11.8	
57	CTD	86191	331	39.16	123.52	10.8	33.56	11.0	
58	XBT	86191	422	39.16	124.00	11.3			
59	CTD	86191	531	39.17	124.05	11.7	33.26	11.9	
60	XBT	86191	707	39.19	124.16	12.0			
61	CTD	86191	931	39.19	124.21	11.6	33.35	11.6	
62	CTD	86191	2016	38.49	124.26	14.0	32.71	14.3	
63	CTD	86192	400	38.20	124.24	12.1	33.28	12.4	
64	CTD	86192	1315	37.54	124.23	13.5	32.87	13.8	
65	CTD	86192	2119	37.20	124.22	13.1	32.80	13.5	32.84
66	CTD	86193	330	37.35	124.32	13.9	33.22		
67	CTD	86193	922	37.49	124.42	13.9	33.12	14.3	
68	XBT	86193	1158	37.52	124.46	14.1			
69	XBT	86193	1306	37.57	124.48	11.8			
70	CTD	86193	1415	38.01	124.51	12.6	32.79	12.8	
71	CTD	86193	1724	37.51	124.47	14.1	33.13	14.3	
72	XBT	86193	1741	37.51	124.49	14.3			
73	CTD	86193	1843	37.54	124.47	13.9	33.11	14.1	
74	CTD	86193	2020	37.55	124.48	13.4	33.17	13.8	
75	CTD	86193	2131	37.56	124.50	11.2	32.88	11.6	
76	CTD	86193	2354	38.01	124.50	12.7	32.76	12.9	
77	CTD	86194	238	38.05	124.54	14.7	32.64	14.8	
78	CTD	86194	530	38.08	124.57	14.7	32.64	14.9	
79	CTD	86194	812	38.13	124.59	14.7	32.62	14.9	
80	XBT	86194	934	38.17	125.03	14.9			
81	XBT	86194	1023	38.21	125.05	15.1			
82	CTD	86194	1128	38.25	125.09	14.6	32.63	14.8	32.64
83	XBT	86194	1327	38.33	125.12	14.9			
84	CTD	86194	1452	38.39	125.17	14.5	32.68	14.8	
85	XBT	86194	1616	38.33	125.17	15.0			
86	XBT	86194	1647	38.28	125.17	15.1			
87	CTD	86194	1741	38.23	125.17	14.8	32.65	15.1	
88	XBT	86194	1843	38.18	125.18	15.2			
89	XBT	86194	2016	38.08	125.17	15.3			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
90	XBT	86194	2106	38.03	125.18	15.4			
91	XBT	86194	2224	37.58	125.19	15.3			
92	XBT	86194	2316	37.53	125.18	15.3			
93	XBT	86195	3	37.49	125.20	14.7			
94	XBT	86195	145	37.42	125.20	12.2			
95	XBT	86195	239	37.38	125.18	14.2			
96	XBT	86195	345	37.33	125.16	14.5			
97	XBT	86195	500	37.28	125.17	14.6			
98	XBT	86195	603	37.22	125.17	13.5			
99	XBT	86195	708	37.17	125.17	13.6			
100	XBT	86195	805	37.13	125.16	14.9			
101	XBT	86195	911	37.07	125.17	16.4			
102	XBT	86195	1025	37.01	125.17	16.9			
103	CTD	86195	1137	36.58	125.17	16.6	32.94	16.8	
104	XBT	86195	1332	37.02	125.22	17.0			
105	XBT	86195	1418	37.08	125.26	17.0			
106	CTD	86195	1524	37.11	125.28	16.7	32.89	16.9	
107	XBT	86195	1659	37.14	125.29	17.0			
109	XBT	86195	1835	37.20	125.32	14.4			
110	CTD	86195	1958	37.23	125.35	13.0	32.82	13.2	
111	XBT	86195	2207	37.28	125.39	14.2			
112	XBT	86195	2305	37.32	125.42	12.3			
113	CTD	86195	2355	37.35	125.43	12.4	32.88	12.6	
114	CTD	86196	205	37.37	125.45	13.7	32.69	13.9	
115	XBT	86196	348	37.41	125.48	14.8			
117	XBT	86196	718	37.50	125.55	15.2			
118	XBT	86196	857	37.54	125.57	15.3			
119	XBT	86196	1004	37.59	126.00	15.3			
120	XBT	86196	1104	38.03	126.03	15.3			
121	XBT	86196	1210	38.08	126.07	15.2			
122	XBT	86196	1322	38.12	126.10	14.9			
123	CTD	86196	1505	38.17	126.13	15.2	32.73	15.4	
124	XBT	86196	1725	38.11	126.14	14.9			
125	XBT	86196	1825	38.08	126.13	15.0			
126	CTD	86196	2017	38.02	126.13	15.0	32.71		
127	XBT	86196	2155	37.56	126.13	15.1			
128	XBT	86196	2323	37.48	126.12	14.8			
129	CTD	86197	3	37.47	126.12	14.8	32.72	15.0	
130	XBT	86197	202	37.43	126.14	15.0			
131	XBT	86197	251	37.38	126.12	14.9			
132	CTD	86197	408	37.33	126.12	14.8	32.70	15.1	
133	XBT	86197	525	37.28	126.14	16.3			
134	XBT	86197	608	37.23	126.13	16.4			
135	CTD	86197	715	37.19	126.11	16.6	32.85	16.8	

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
136	XBT	86197	848	37.13	126.13	17.0			
137	XBT	86197	931	37.06	126.12	17.1			
138	CTD	86197	1018	37.03	126.12	16.7	32.97	16.9	
139	XBT	86197	1151	36.55	126.13	16.7			
140	XBT	86197	1233	36.50	126.12	16.7			
141	CTD	86197	1328	36.47	126.11	16.4	32.81	16.7	
142	XBT	86197	1437	36.51	126.10	16.7			
143	XBT	86197	1515	36.54	126.08	16.8			
145	XBT	86197	1649	37.04	126.03	17.0			
146	XBT	86197	1731	37.08	126.00	17.3			
147	XBT	86197	1820	37.13	125.57	16.8			
148	XBT	86197	1904	37.17	125.55	16.2			
149	XBT	86197	1956	37.21	125.52	15.0			
150	XBT	86197	2038	37.26	125.51	13.6			
151	XBT	86197	2123	37.31	125.50	13.9			
152	XBT	86197	2216	37.36	125.49	14.7			
153	XBT	86197	2304	37.42	125.47	14.7			
154	XBT	86197	2349	37.45	125.46	14.9			
155	XBT	86198	44	37.51	125.46	14.9			
156	XBT	86198	136	37.56	125.42	15.3			
157	XBT	86198	233	38.00	125.39	15.3			
158	CTD	86198	309	38.02	125.39	14.9	32.70		
159	XBT	86198	456	37.56	125.37	15.8			
160	XBT	86198	612	37.51	125.36	14.8			
161	XBT	86198	727	37.47	125.33	14.5			
162	XBT	86198	904	37.39	125.29	13.7			
163	XBT	86198	1203	37.32	125.27	13.9			
164	XBT	86198	1345	37.26	125.20	14.2			
165	XBT	86198	1520	37.20	125.13	14.7			
166	XBT	86198	1809	37.09	125.01	13.8			
167	CTD	86198	2026	37.02	124.55	14.2	32.77	14.4	
168	CTD	86198	2305	37.13	124.56	14.8	33.15	15.3	
169	CTD	86199	128	37.25	124.56	14.5	33.28	14.6	
170	CTD	86199	350	37.37	124.57	14.0	33.08	14.5	
171	CTD	86199	559	37.47	124.58	13.0	33.04		
172	CTD	86199	822	37.52	124.57	12.9	33.30	13.3	
173	CTD	86199	1027	37.42	124.57	13.9	33.11	14.3	33.08
174	CTD	86199	1230	37.50	124.57	11.8	32.96		32.96
175	CTD	86199	1427	38.00	124.57	14.6	32.74		
176	CTD	86199	1611	38.03	124.57	14.6	32.80		
177	XBT	86199	1810	38.05	124.45	14.7			
178	XBT	86199	2124	38.08	124.32	13.7			
179	CTD	86200	47	38.15	124.17	13.7	33.12		
180	XBT	86200	208	38.19	124.09	13.0			
181	XBT	86200	310	38.22	123.58	12.0			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
182	XBT	86200	425	38.26	123.45	11.0			
183	CTD	86200	557	38.29	123.34	10.4	33.90		
184	XBT	86200	827	38.18	123.37	10.9			
185	XBT	86200	919	38.09	123.39	12.2			
186	CTD	86200	1006	38.05	123.40	11.8	33.00	12.3	
187	XBT	86200	1201	37.53	123.43	11.2			
188	CTD	86200	1330	37.37	123.49	13.0	32.97	13.3	
189	XBT	86200	1543	37.32	123.52	14.2			
190	CTD	86200	1703	37.25	124.01	14.3	32.81		
191	XBT	86200	1952	37.20	123.47	14.1			
192	XBT	86200	2207	37.14	123.35	14.1			
193	CTD	86200	2306	37.13	123.33	13.8	33.55		
194	XBT	86201	55	37.10	123.17	13.6			
195	XBT	86201	154	37.07	123.05	14.0			
196	XBT	86201	254	37.05	122.54	13.6			

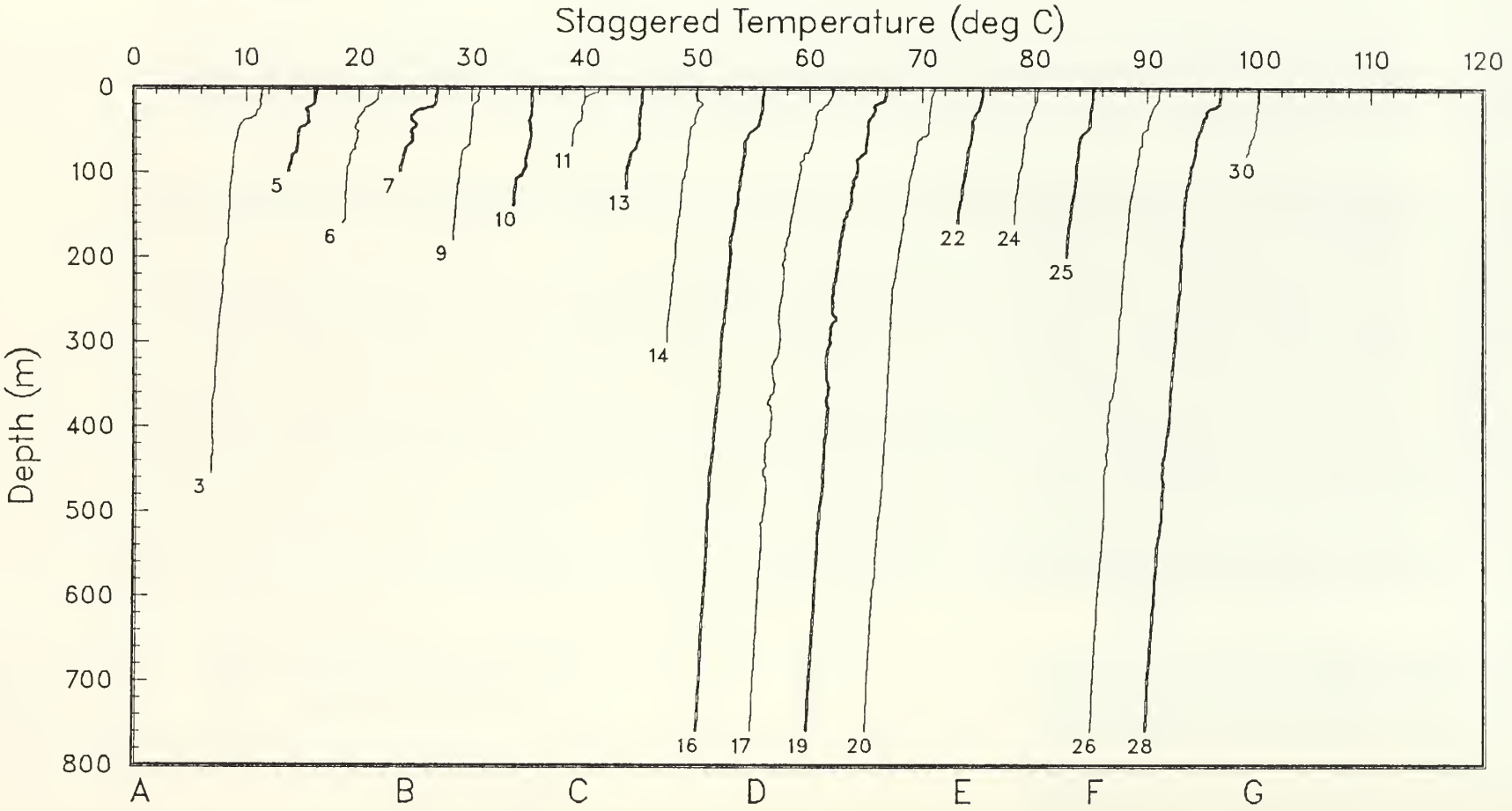


Figure 5(a): XBT temperature profiles, staggered by multiples of 5C.

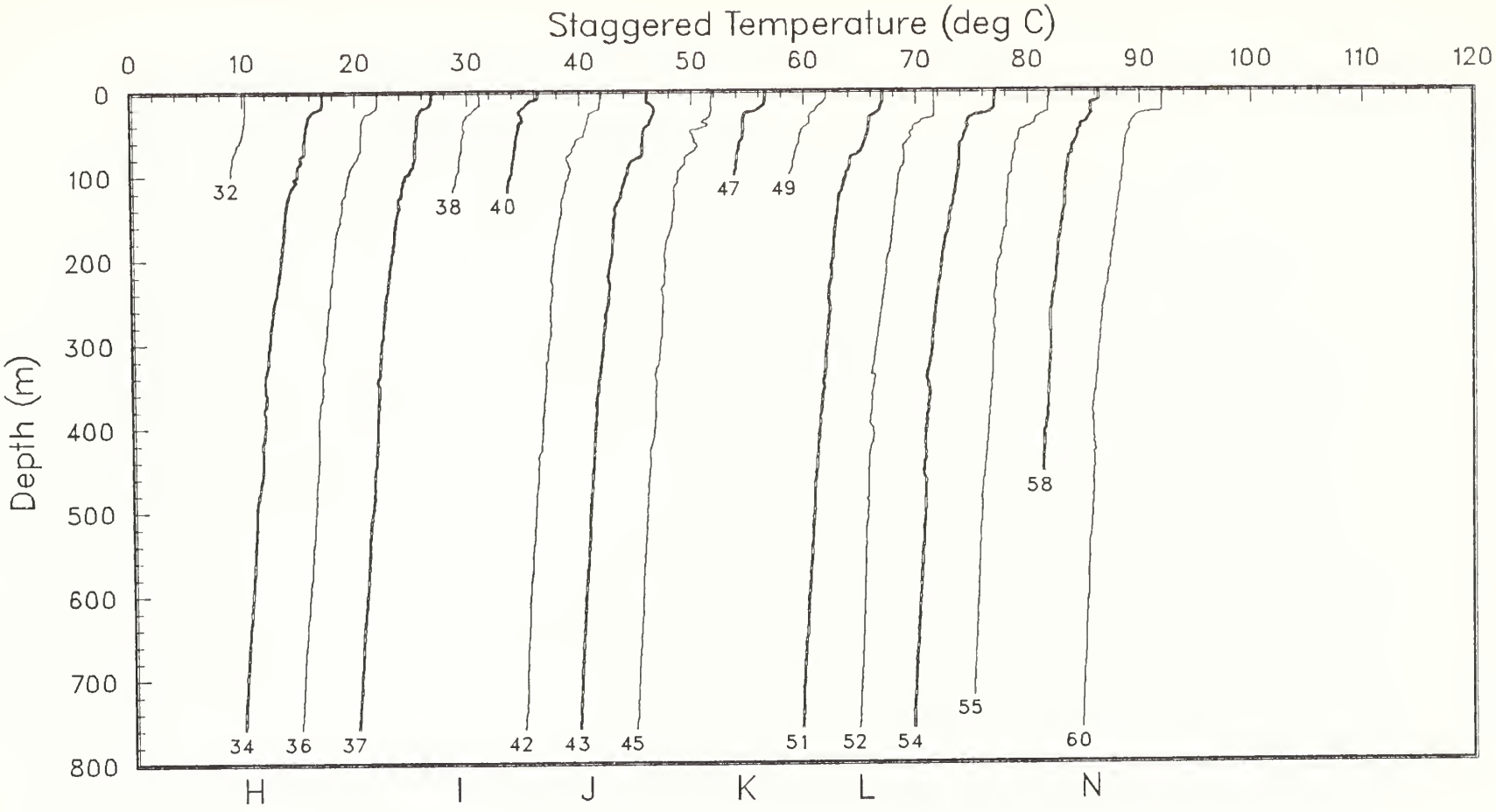

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
32
38
40
47
49
58
34
36
37
42
43
45
51
52
54
55
60
H
I
J
K
L
N

Figure 5(b)

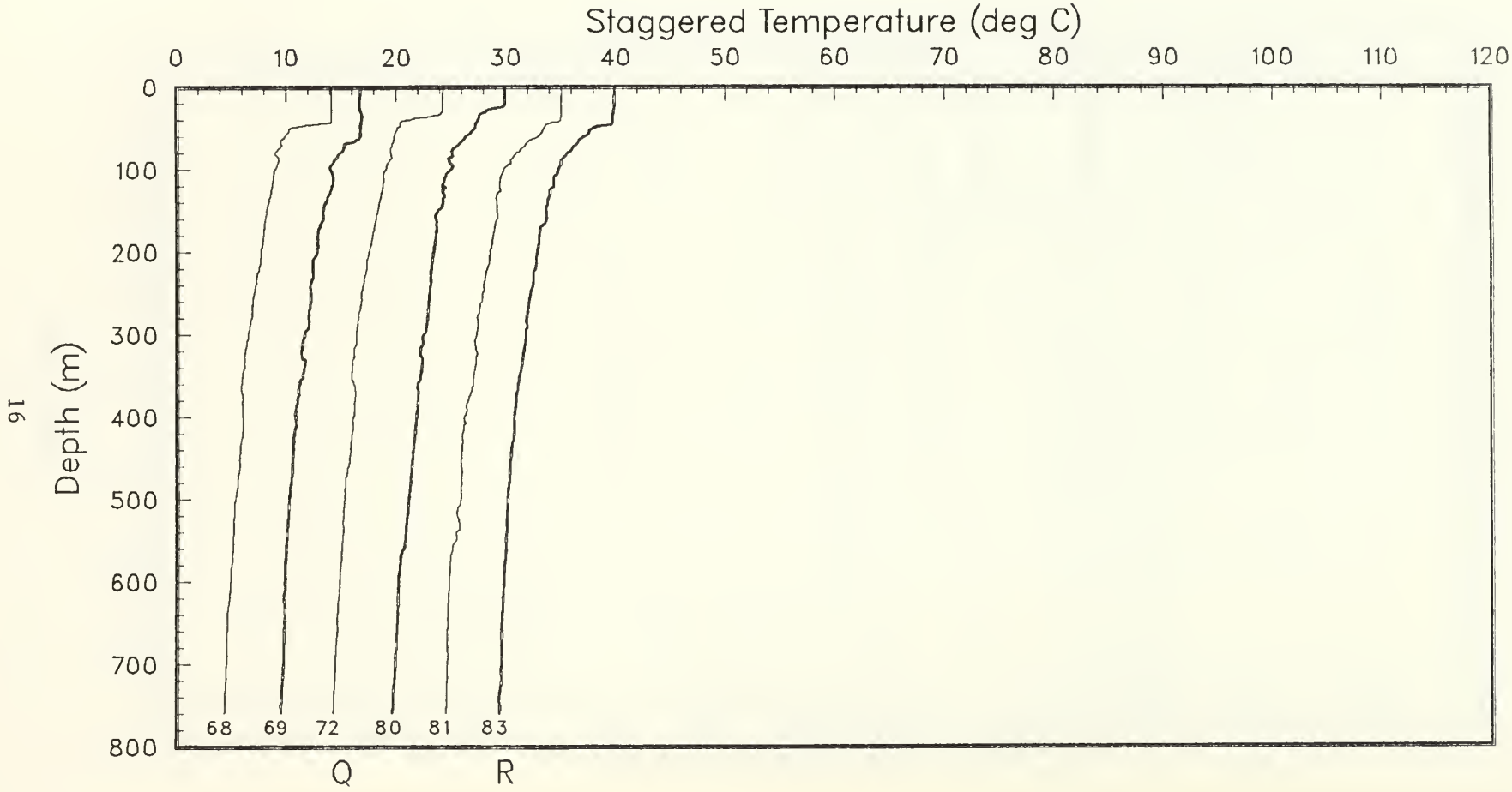

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
68
69
72
80
81
83
Q
R

Figure 5(c)

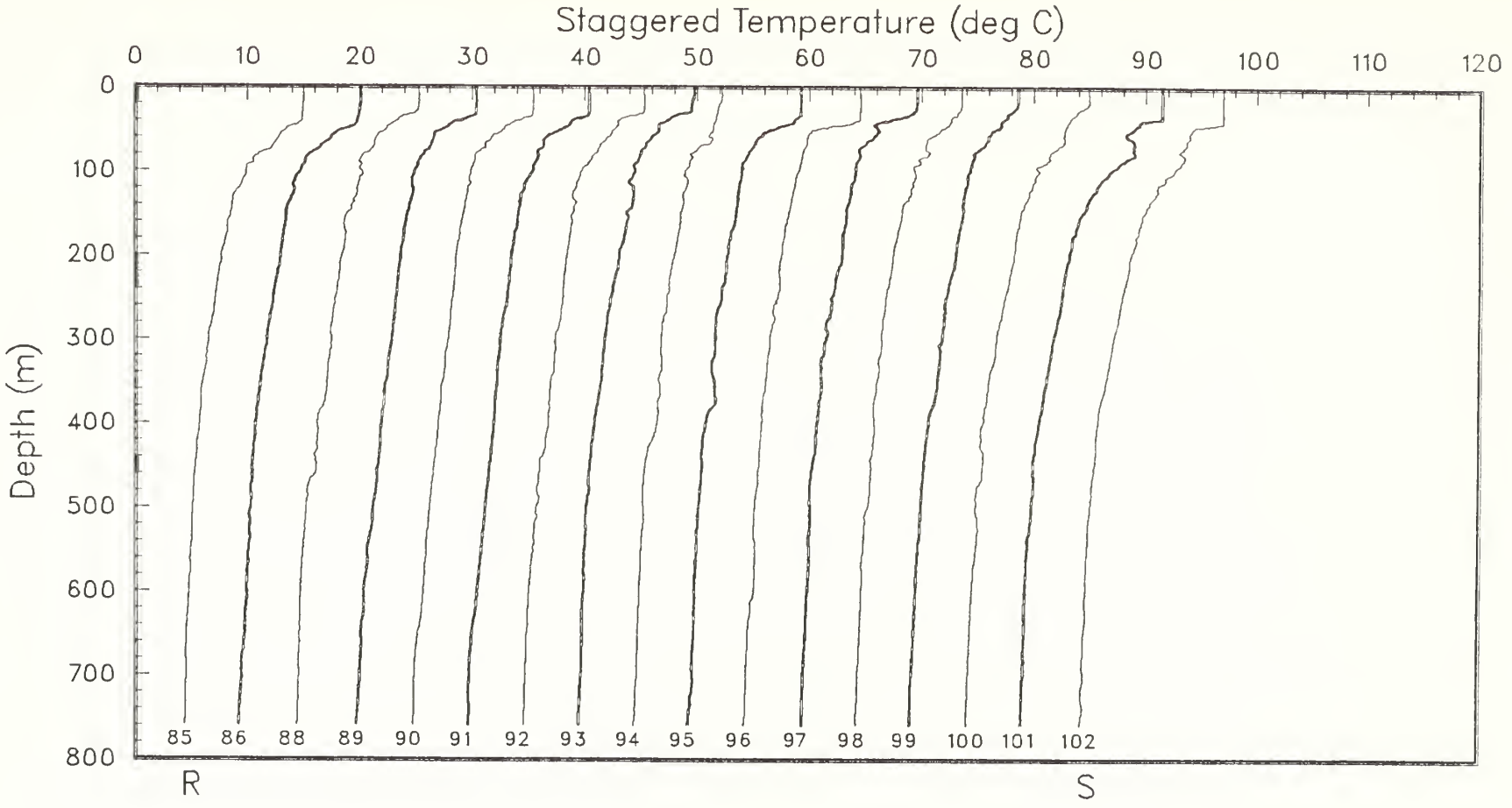

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
85
86
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
R
S

Figure 5(d)

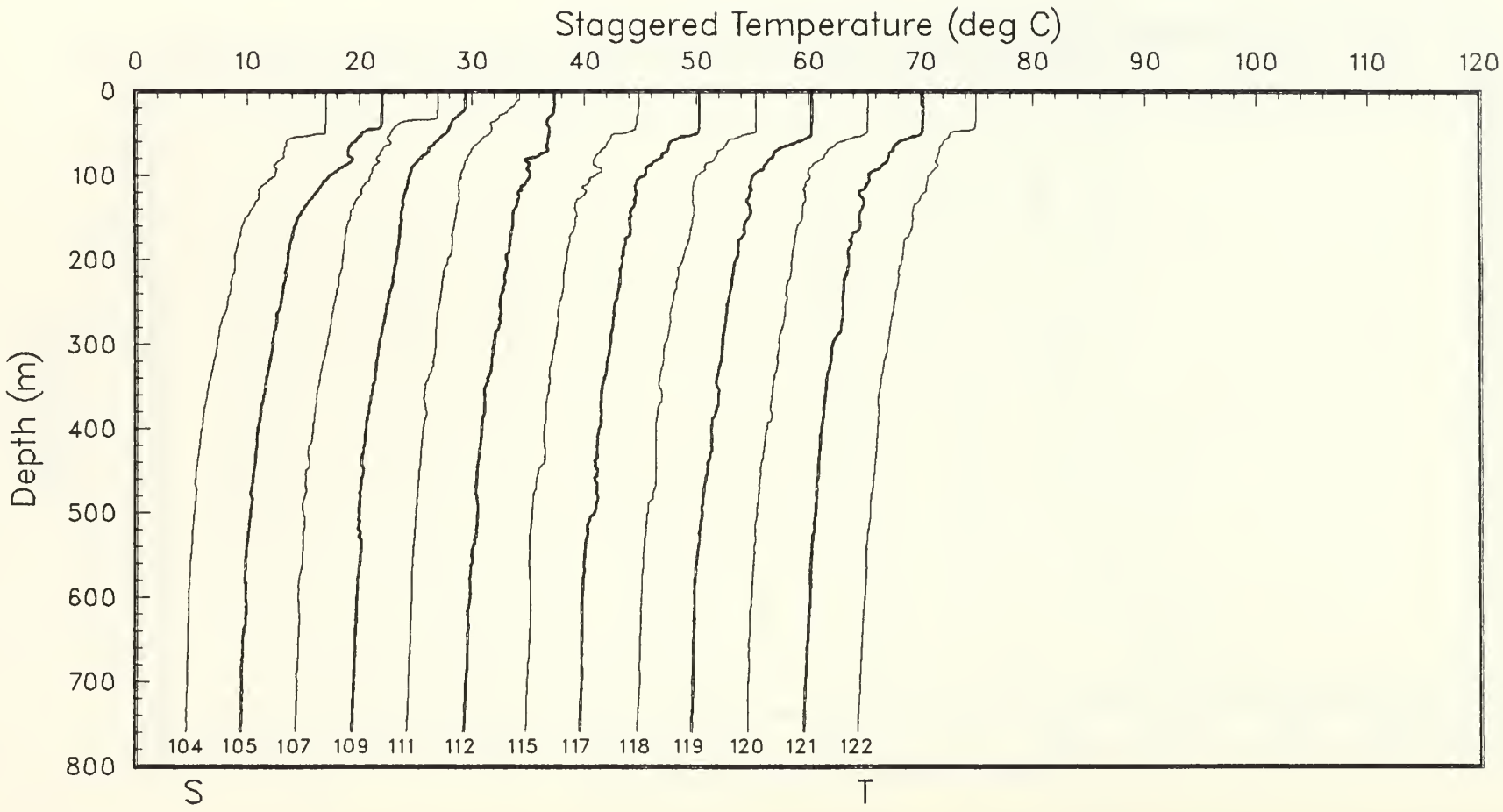

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
104
105
107
109
111
112
115
117
118
119
120
121
122
S
T

Figure 5(e)

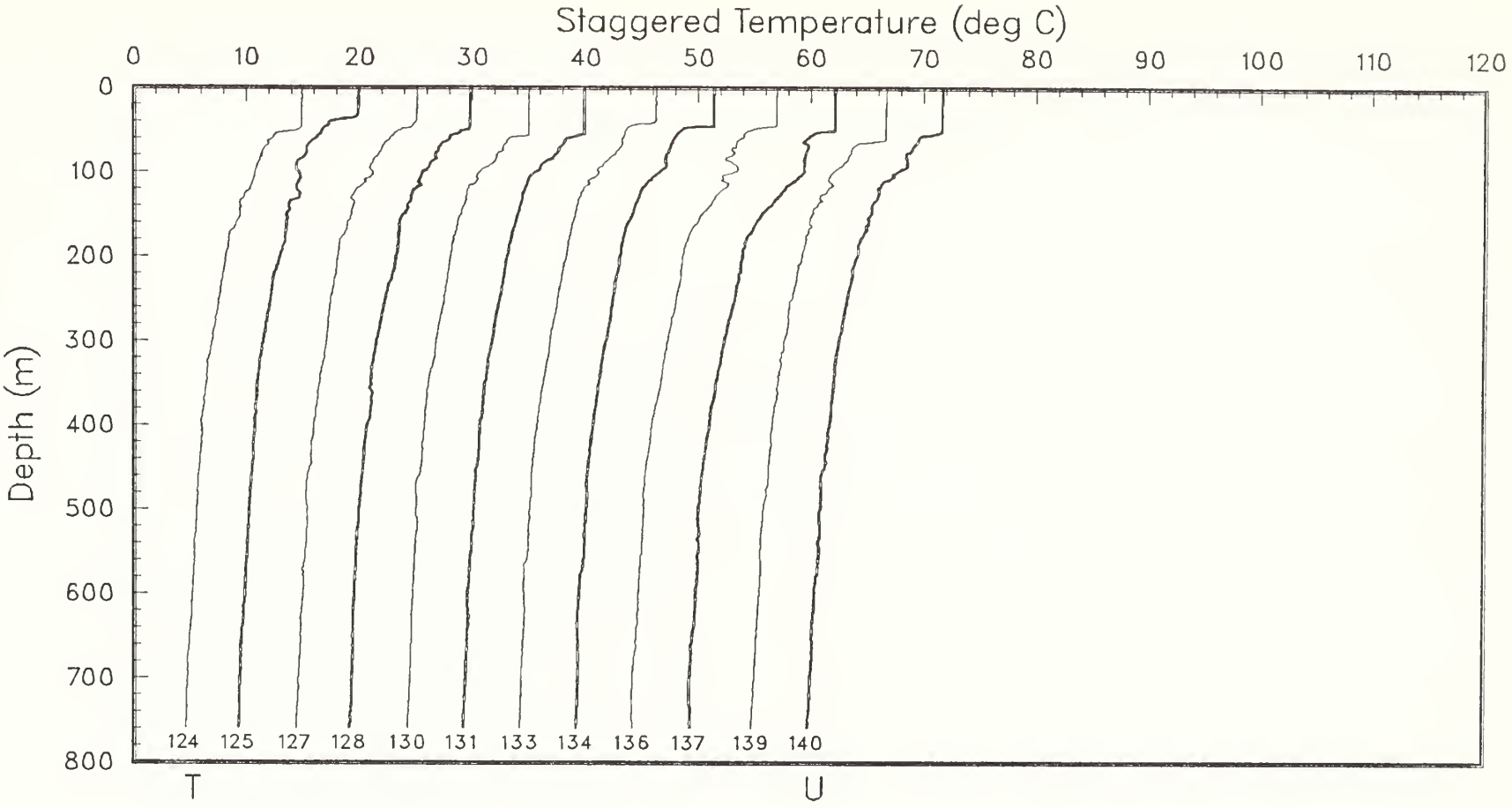

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
124
125
127
128
130
131
133
134
136
137
139
140
T
U

Figure 5(f)

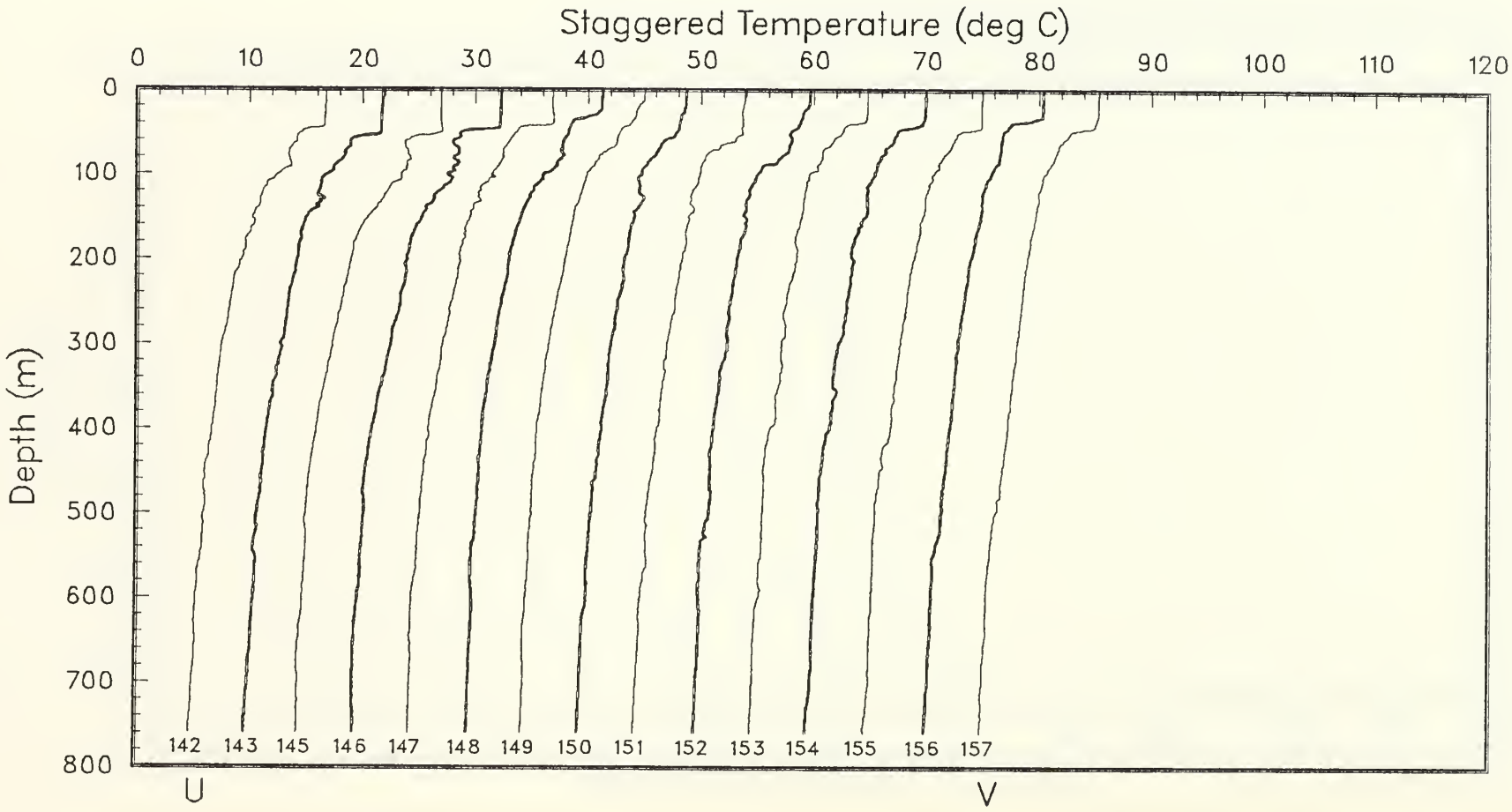

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
142
143
145
146
147
148
149
150
151
152
153
154
155
156
157
U
V

Figure 5(g)

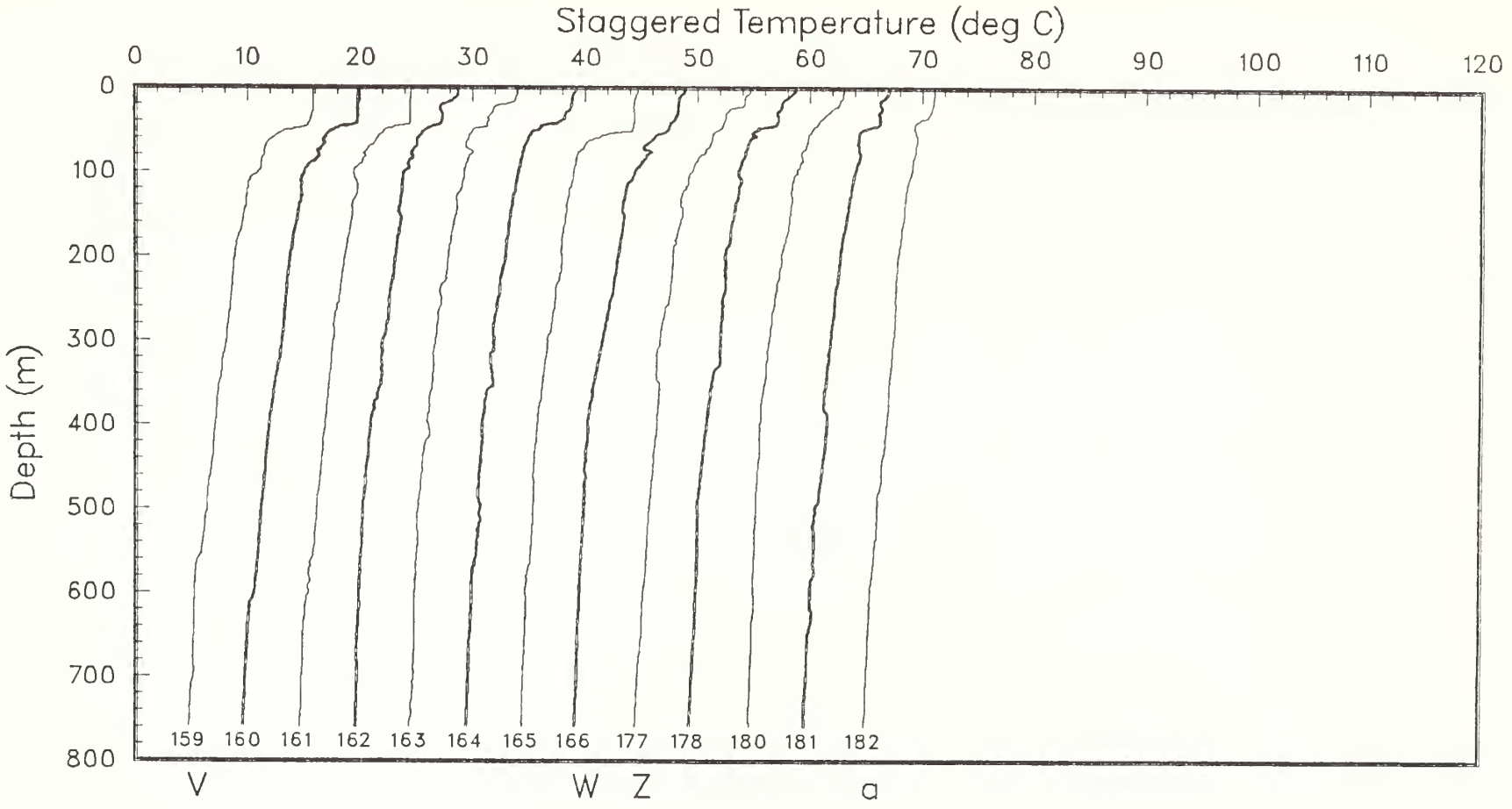

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
159
160
161
162
163
164
165
166
177
178
180
181
182
V
W
Z
a

Figure 5(h)

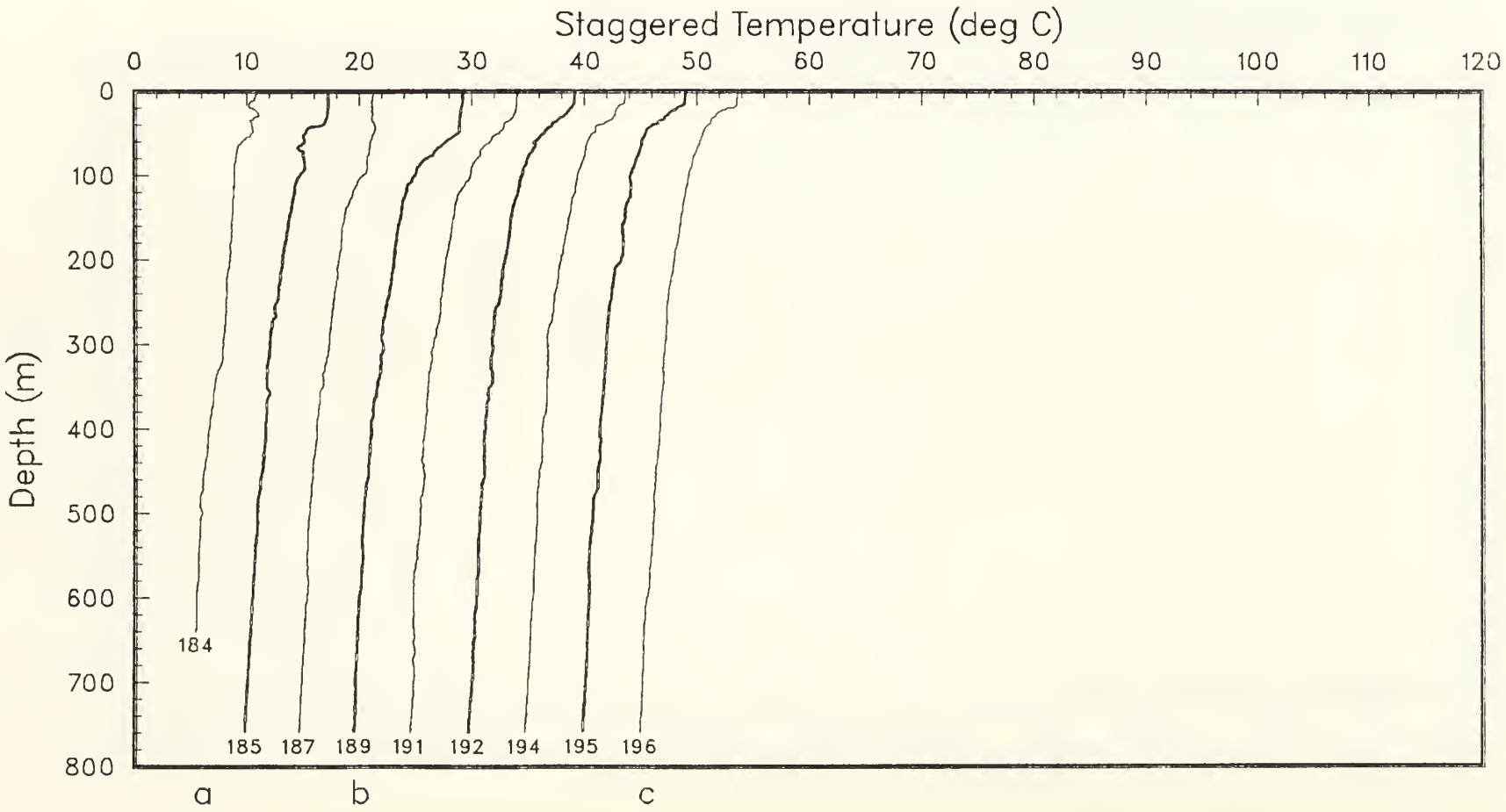

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
184
185
187
189
191
192
194
195
196
a
b
c

Figure 5(i)

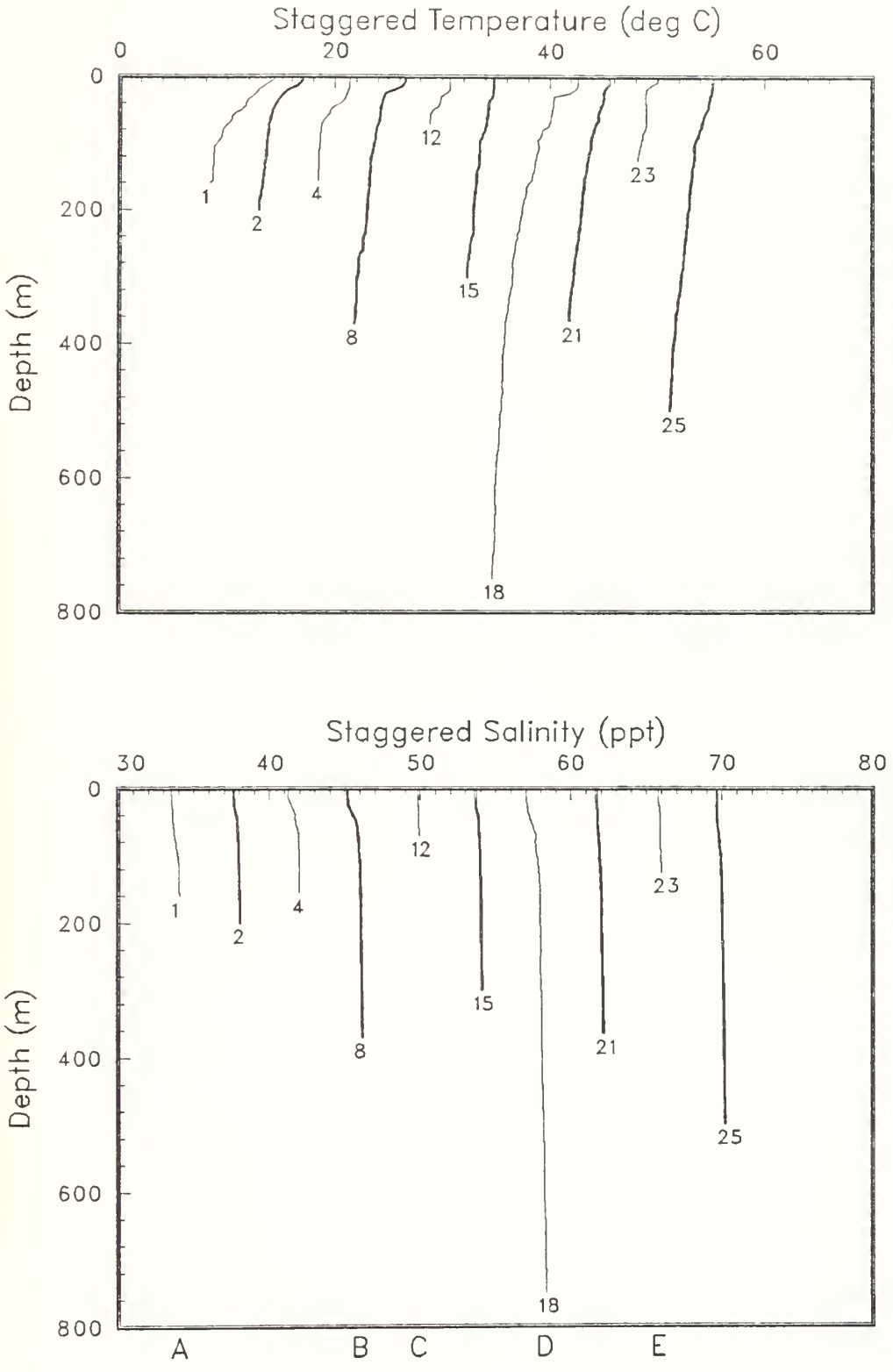


Figure 6(a): CTD temperature profiles, staggered by multiples of 5C, and salinity profiles staggered by multiples of 4 ppt.

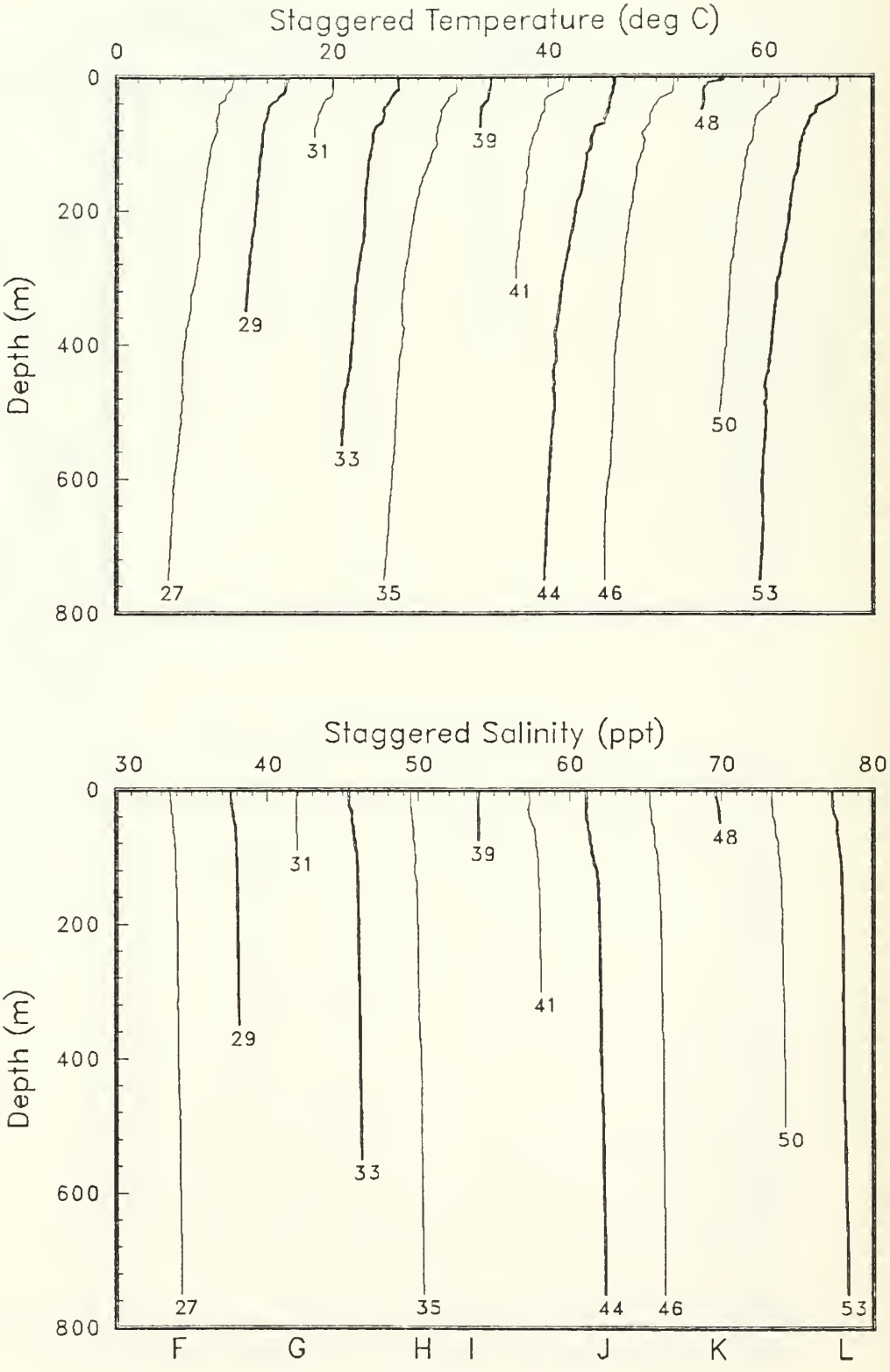

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
27
29
31
33
35
39
41
44
46
48
50
53
Staggered Salinity (ppt)
30
40
50
60
70
80
F
G
H
I
J
K
L

Figure 6(b)

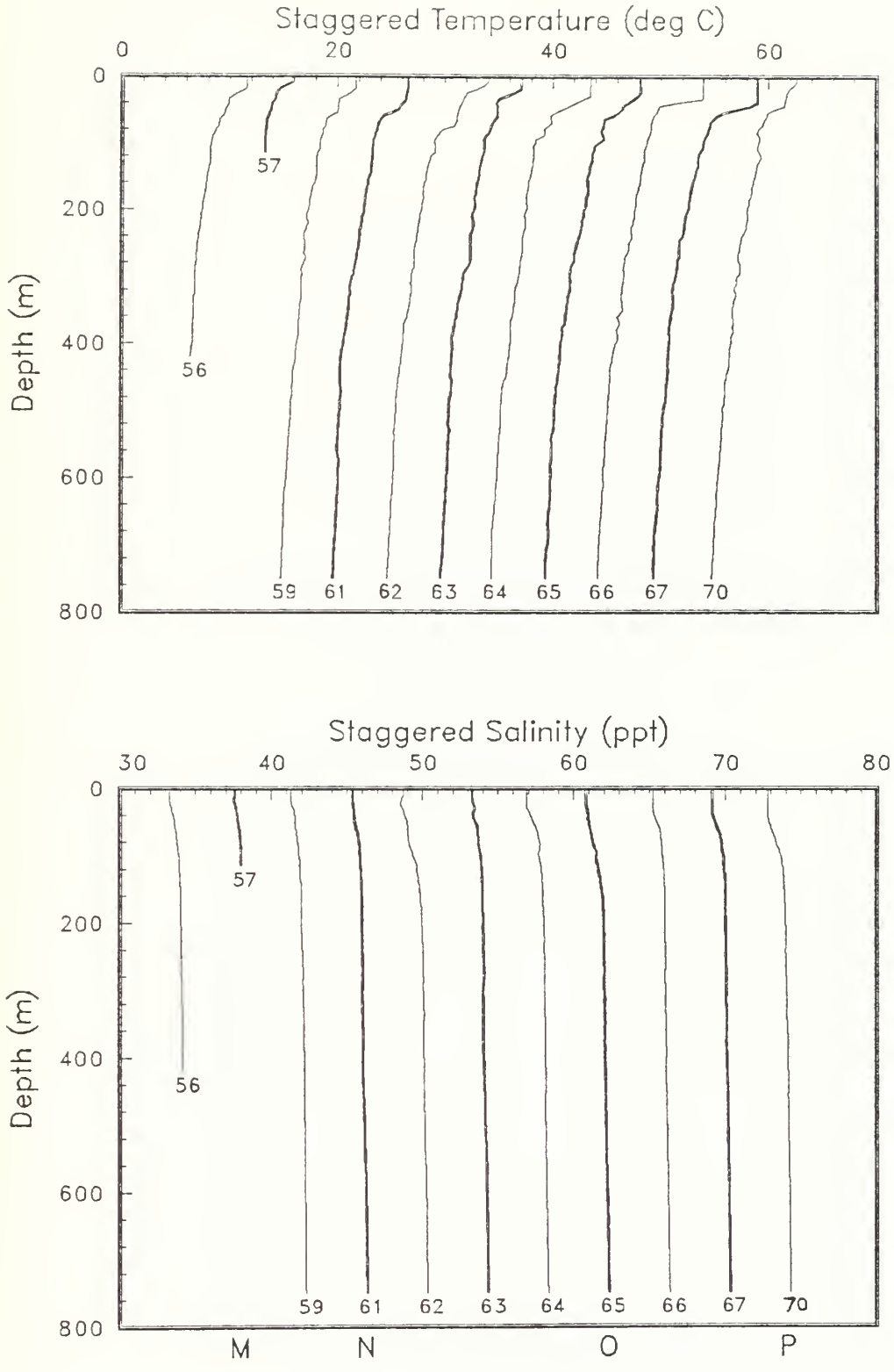

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
56
57
59
61
62
63
64
65
66
67
70
Staggered Salinity (ppt)
30
40
50
60
70
80
0
200
400
600
800
Depth (m)
56
57
59
61
62
63
64
65
66
67
70
M
N
O
P

Figure 6(c)

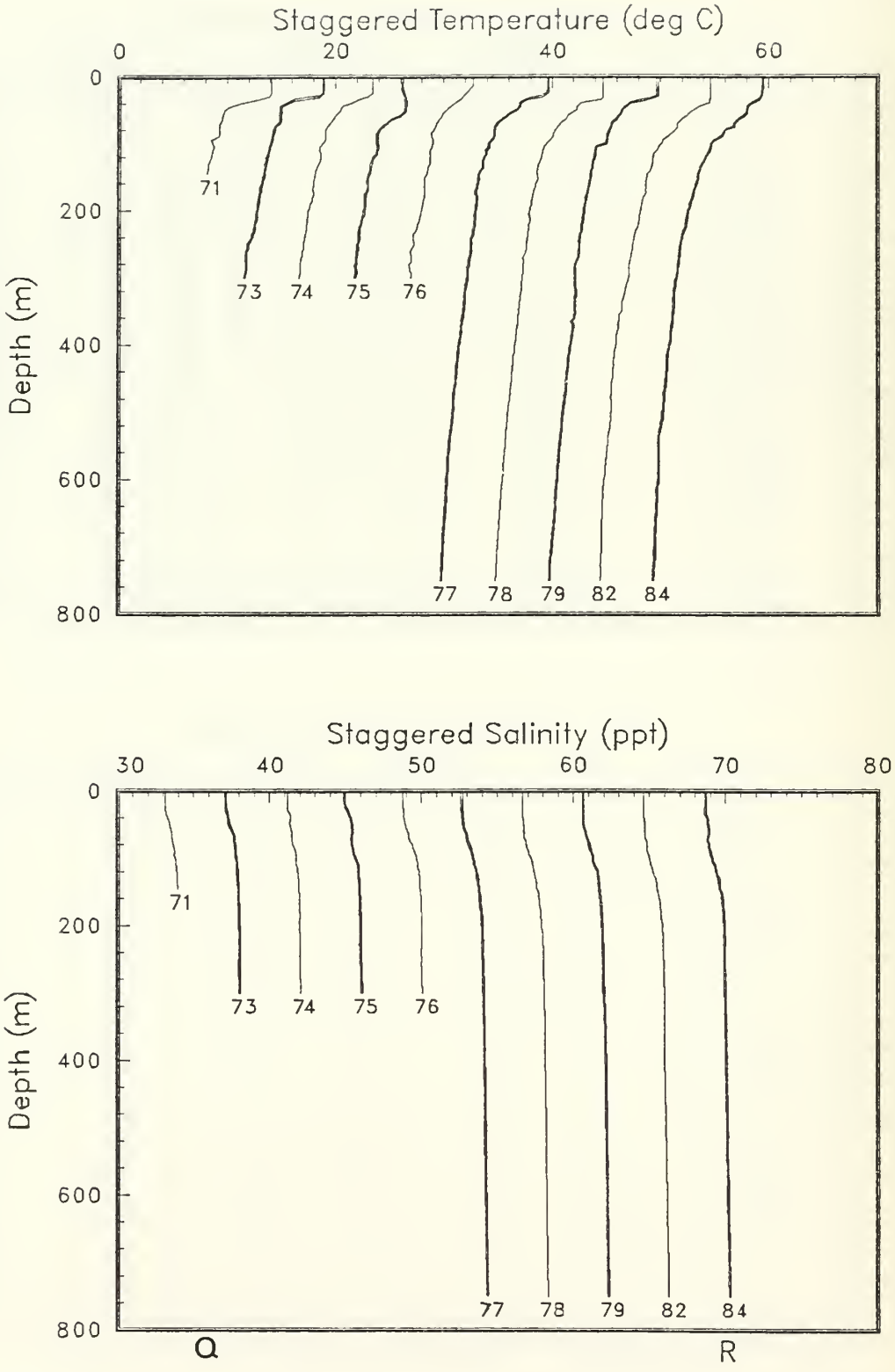

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
71
73
74
75
76
77
78
79
82
84
Staggered Salinity (ppt)
30
40
50
60
70
80
Depth (m)
0
200
400
600
800
71
73
74
75
76
77
78
79
82
84
Q
R

Figure 6(d)

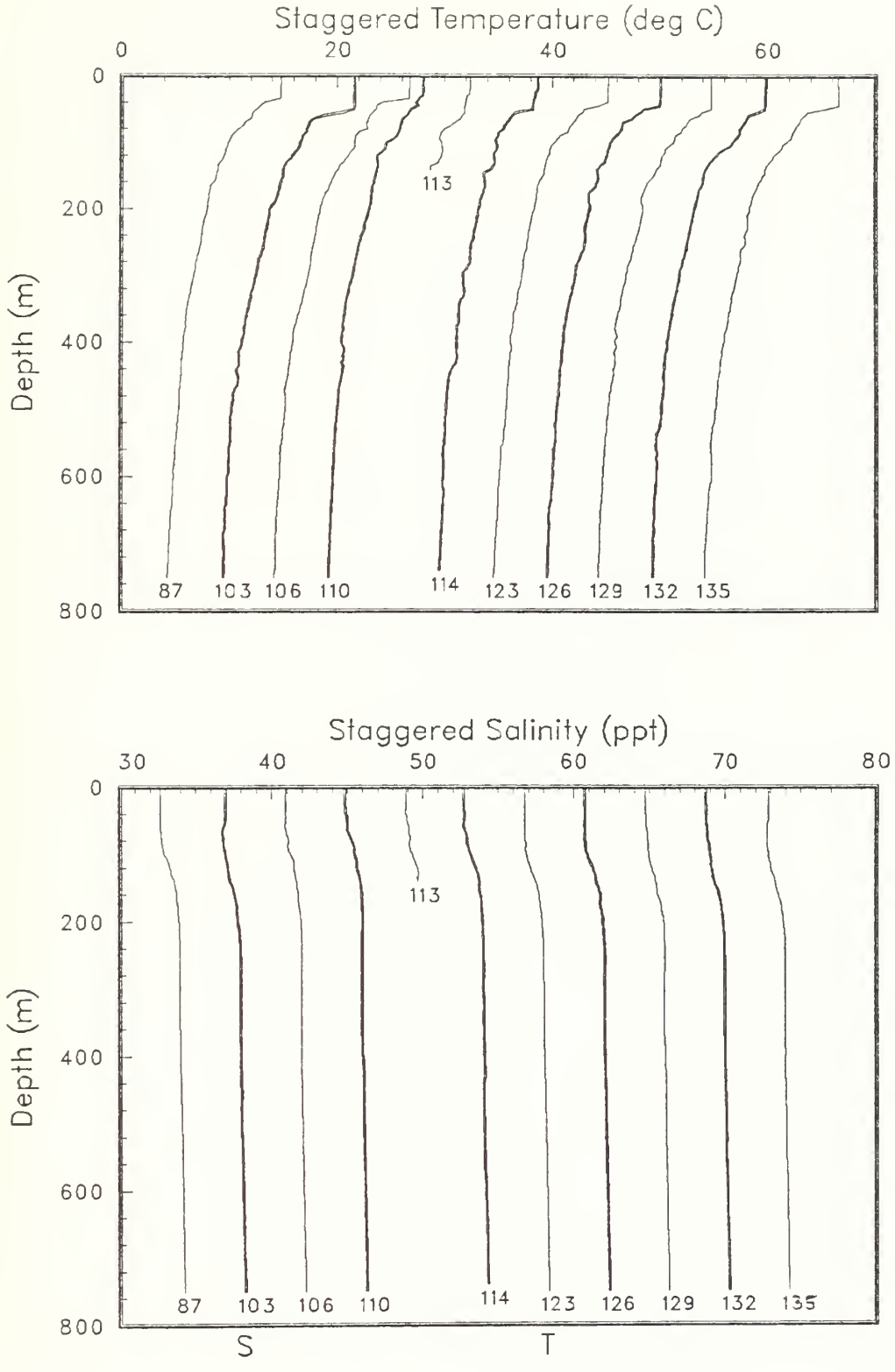

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
87
103
106
110
113
114
123
126
129
132
135
Staggered Salinity (ppt)
30
40
50
60
70
80
S
T

Figure 6(e)

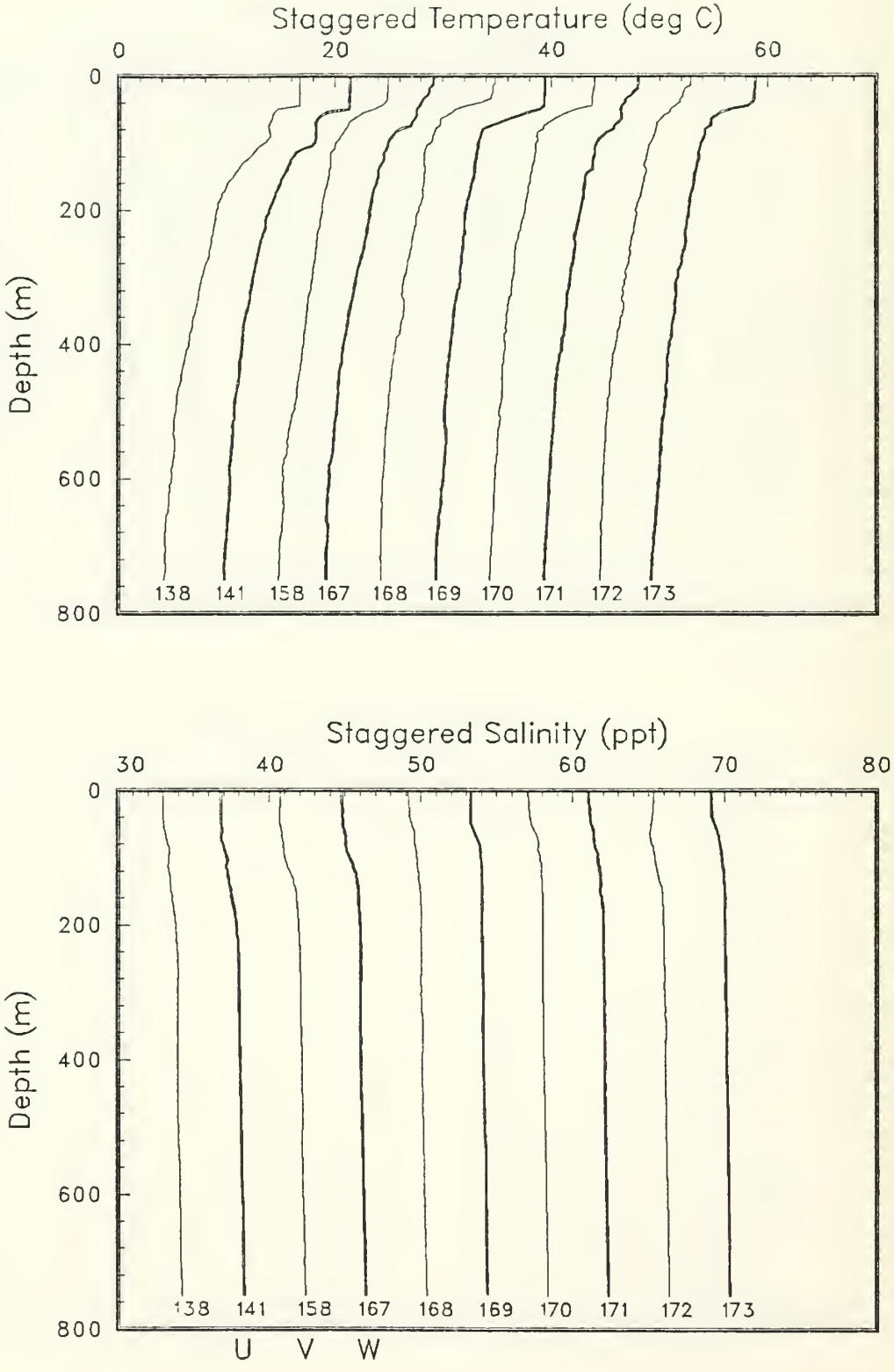

Staggered Temperature (deg C)
0
20
40
60
0
200
400
600
800
Depth (m)
138
141
158
167
168
169
170
171
172
173
Staggered Salinity (ppt)
30
40
50
60
70
80
0
200
400
600
800
Depth (m)
138
141
158
167
168
169
170
171
172
173
U
V
W

Figure 6(f)

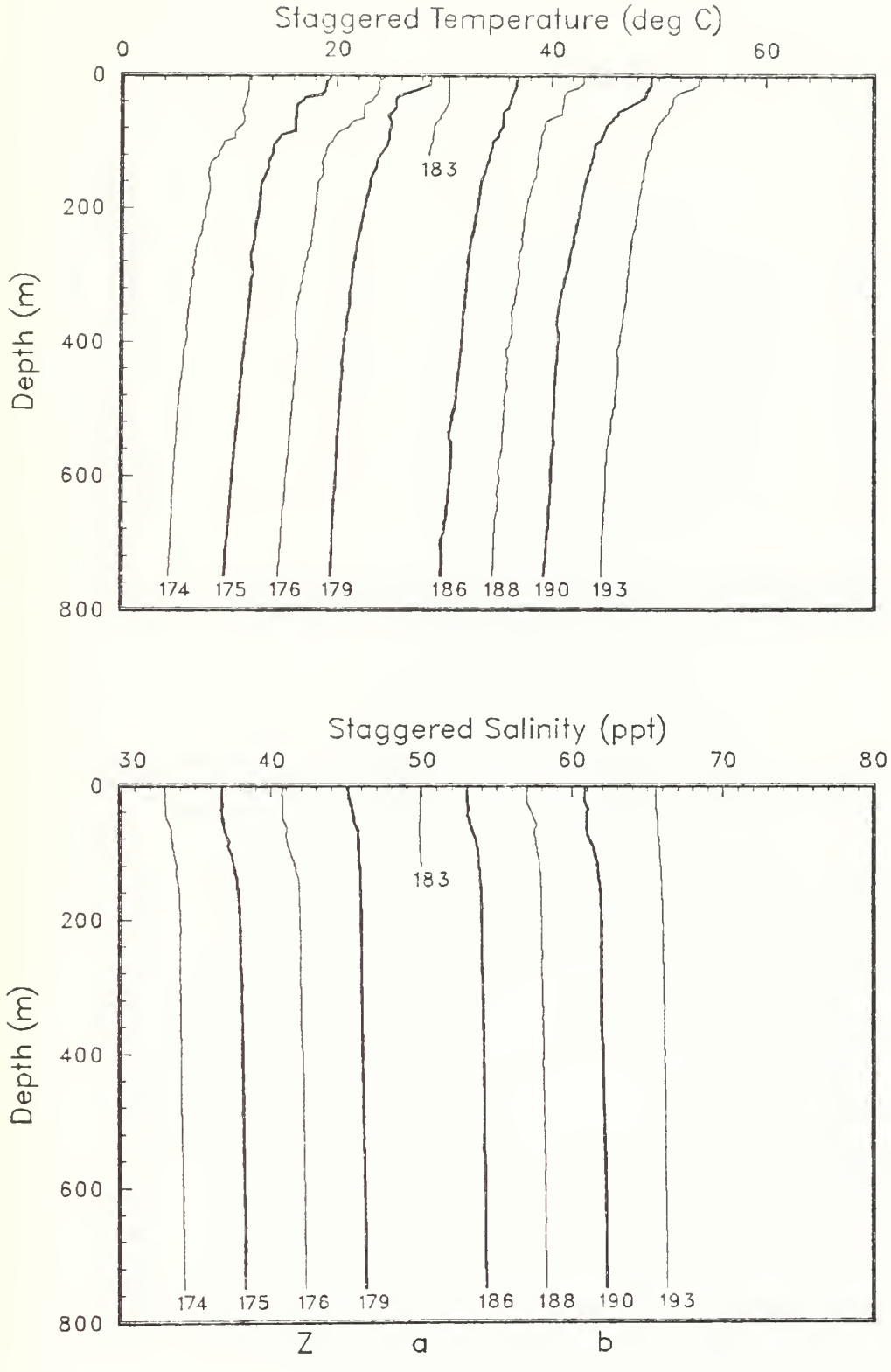

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
183
174
175
176
179
186
188
190
193
Staggered Salinity (ppt)
30
40
50
60
70
80
Depth (m)
0
200
400
600
800
183
174
175
176
179
186
188
190
193
Z
a
b

Figure 6(g)

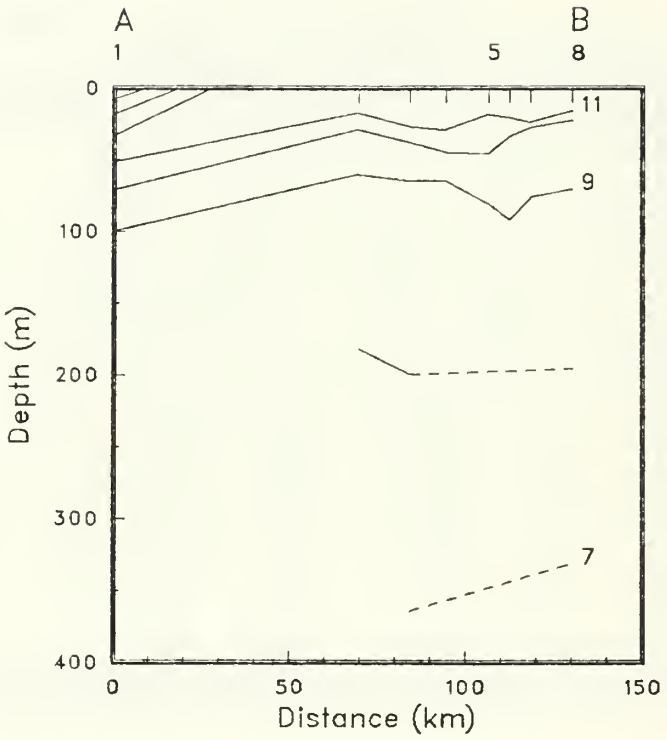


Figure 7(a): Along-track isotherms. Tick marks along the upper horizontal axis show station positions. Some station numbers are given. Dashed lines are used if the cast was too shallow.

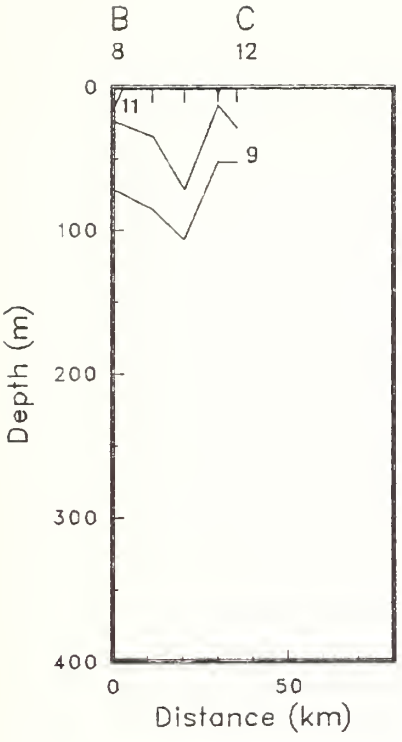


Figure 7(b)

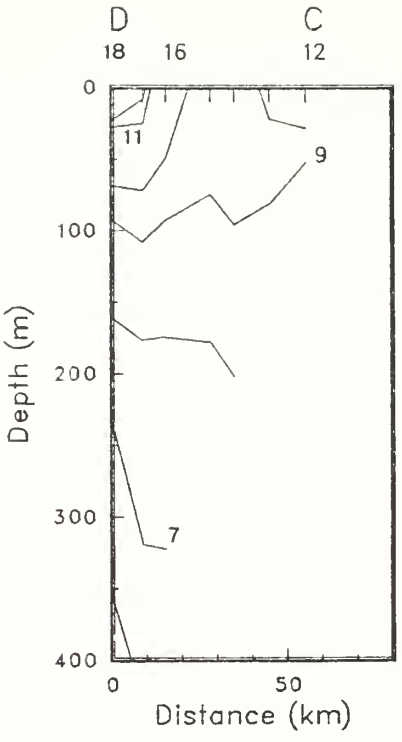


Figure 7(c)

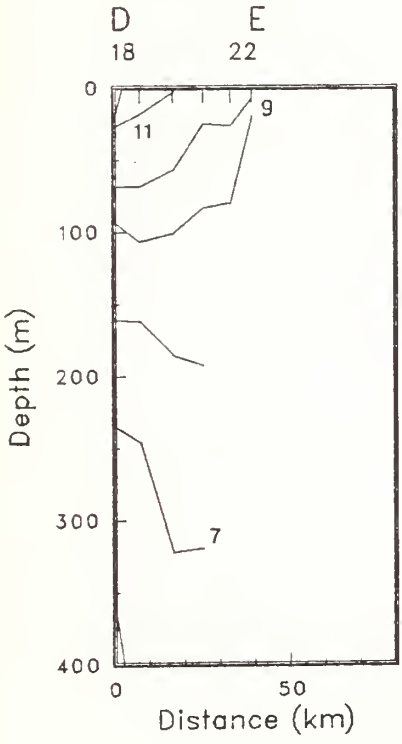


Figure 7(d)

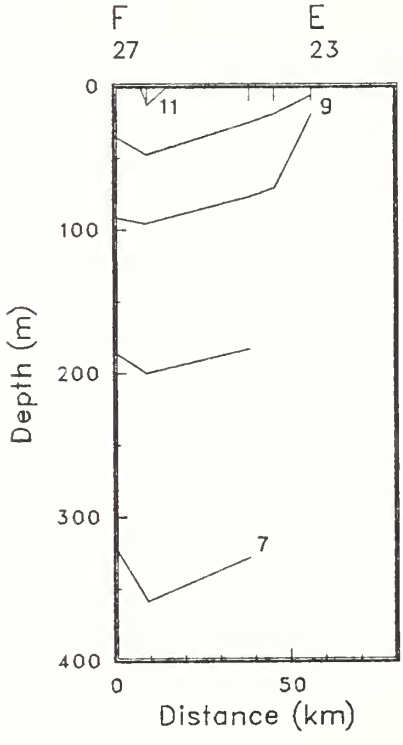


Figure 7(e)

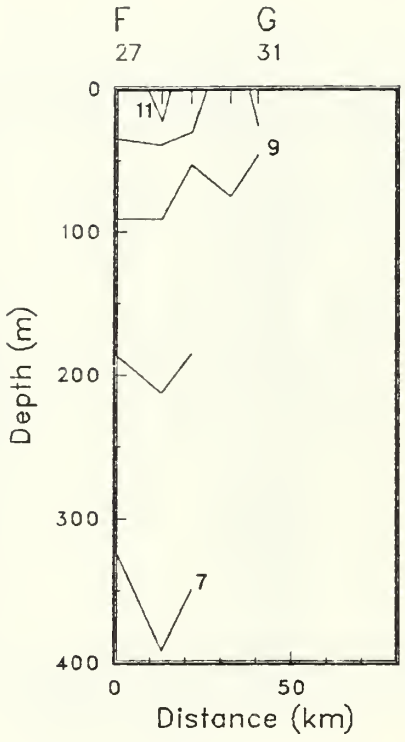


Figure 7(f)

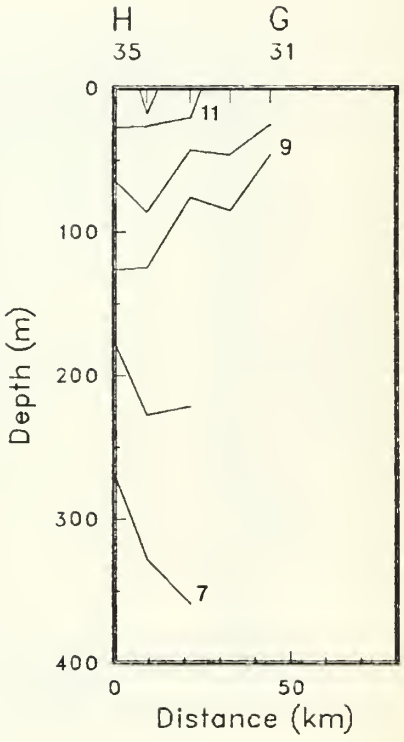


Figure 7(g)

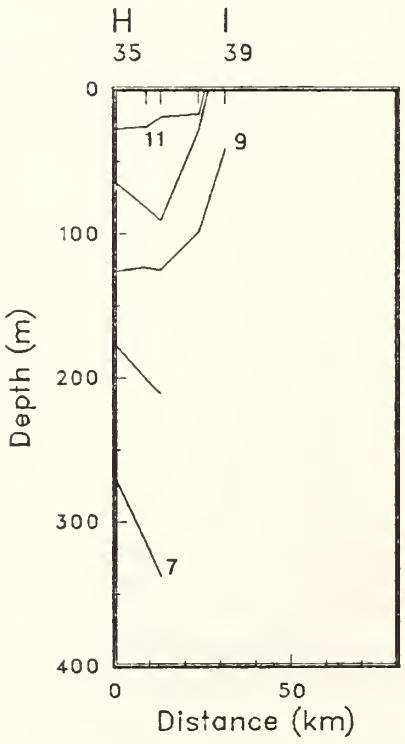


Figure 7(h)

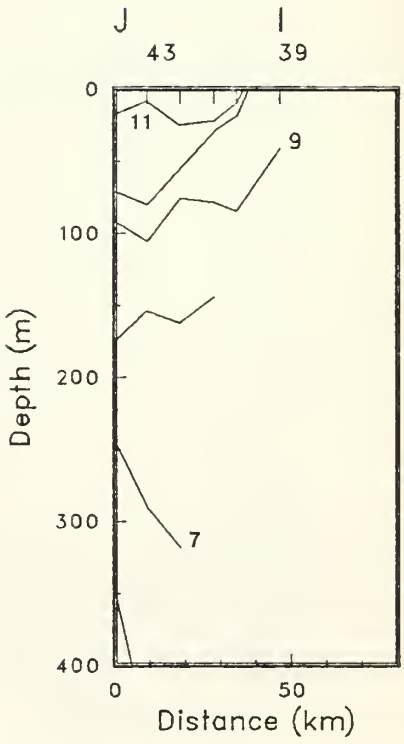


Figure 7(i)

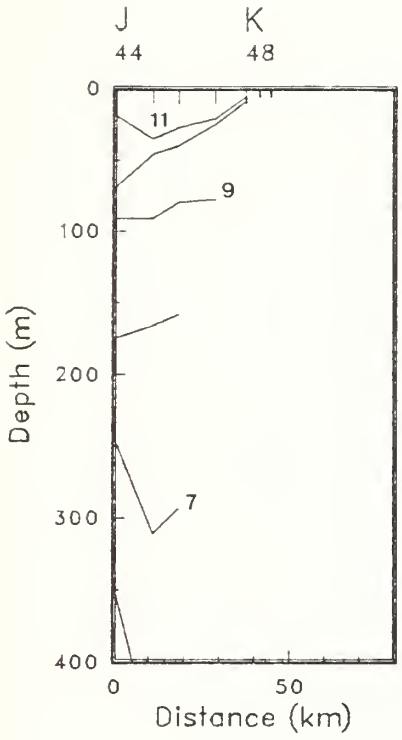


Figure 7(j)

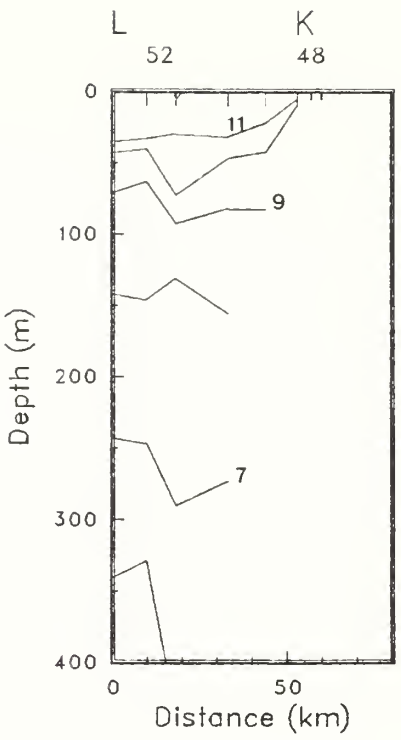


Figure 7(k)

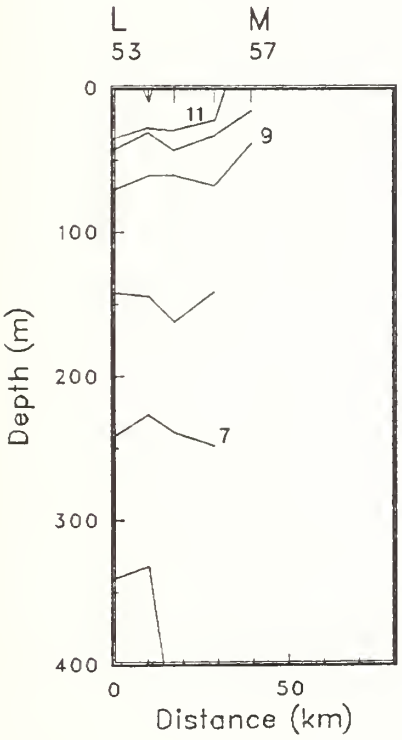


Figure 7(l)

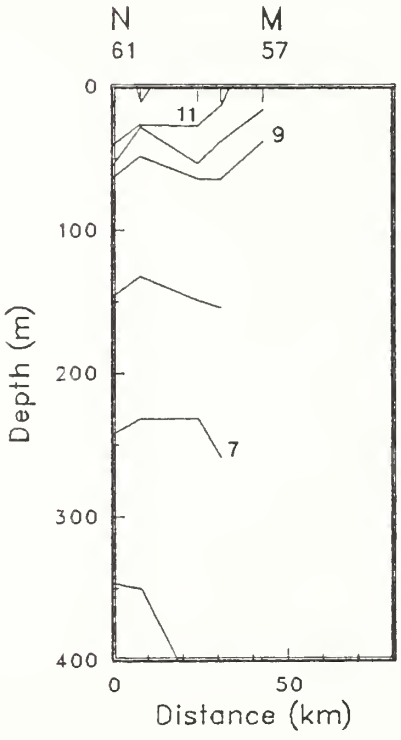


Figure 7(m)

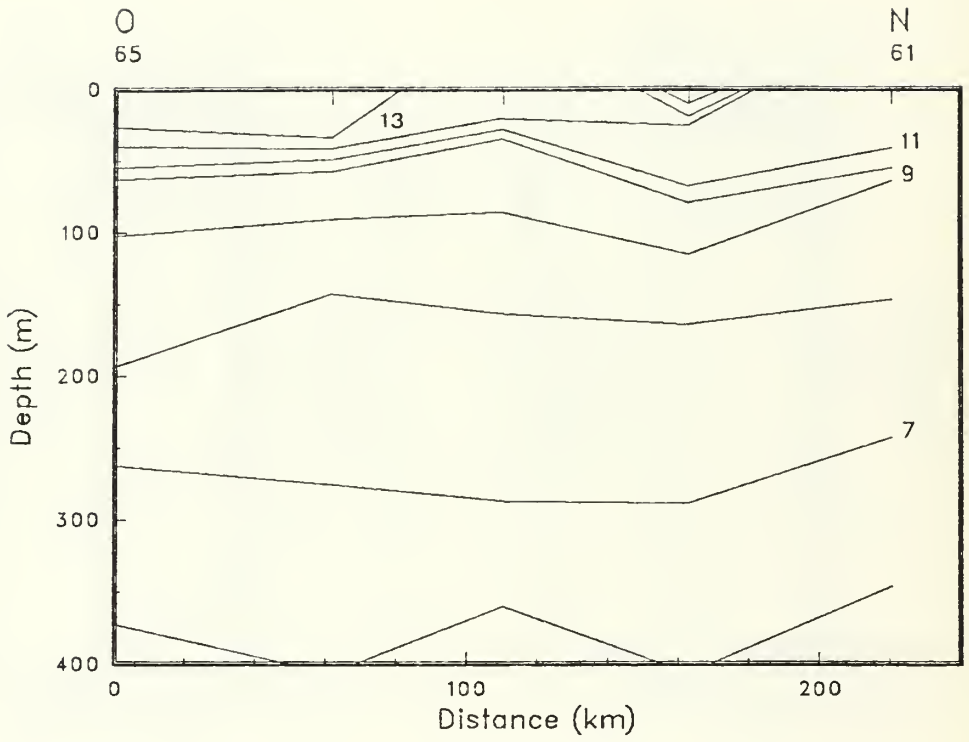


Figure 7(n)

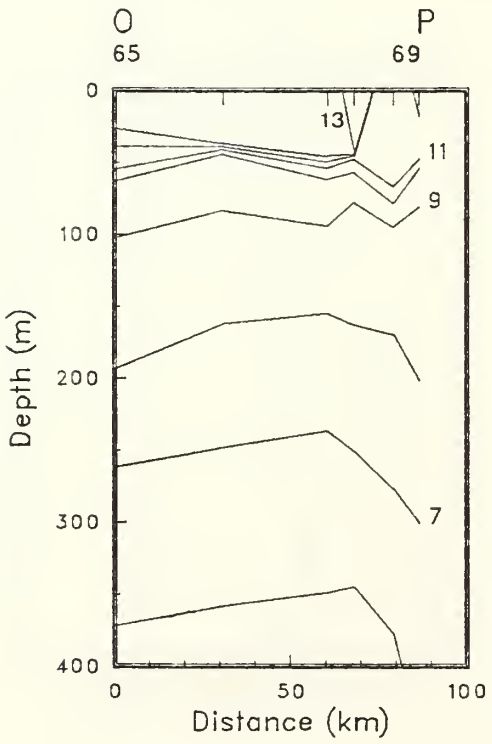


Figure 7(o)

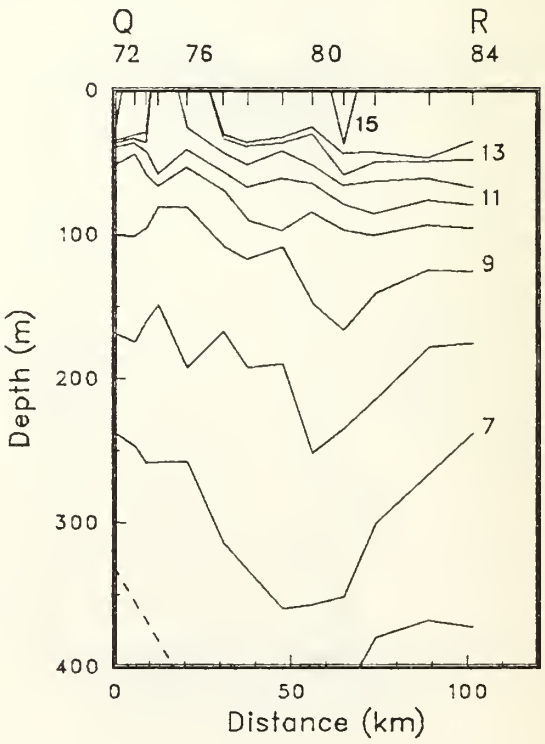


Figure 7(p)

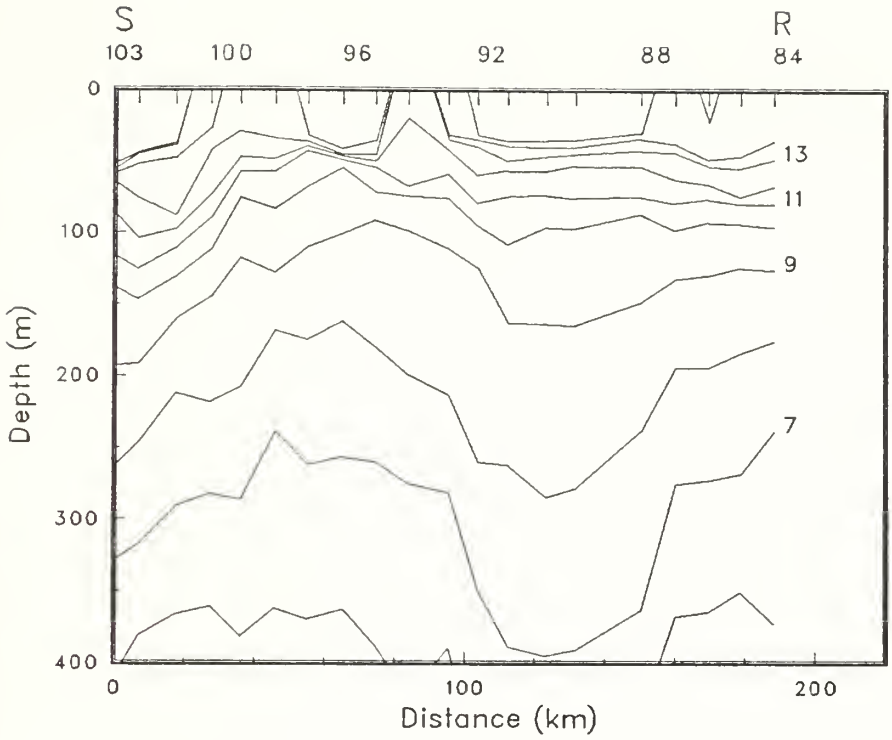


Figure 7(q)

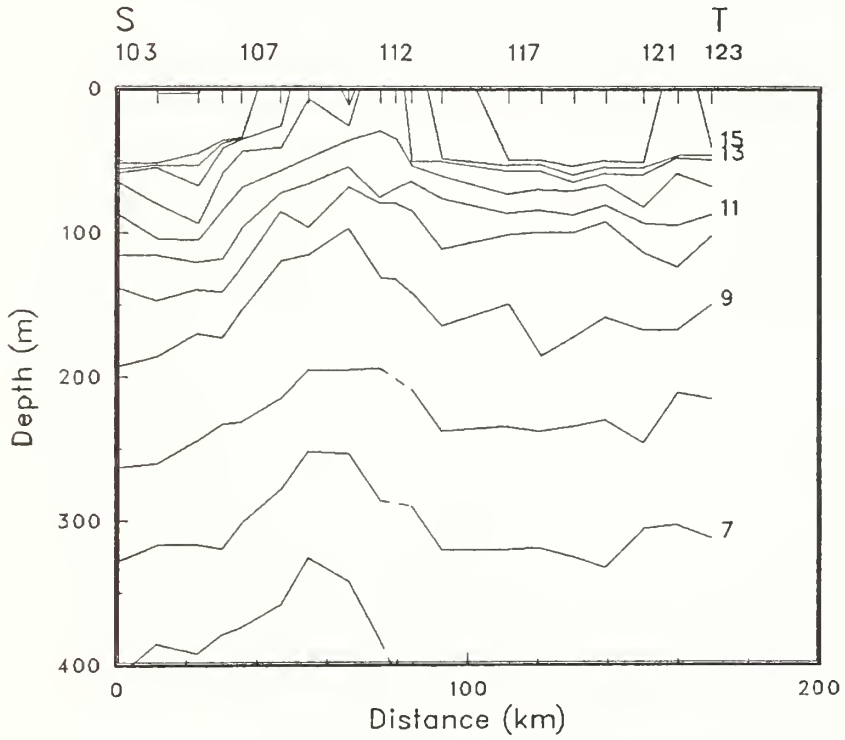


Figure 7(r)

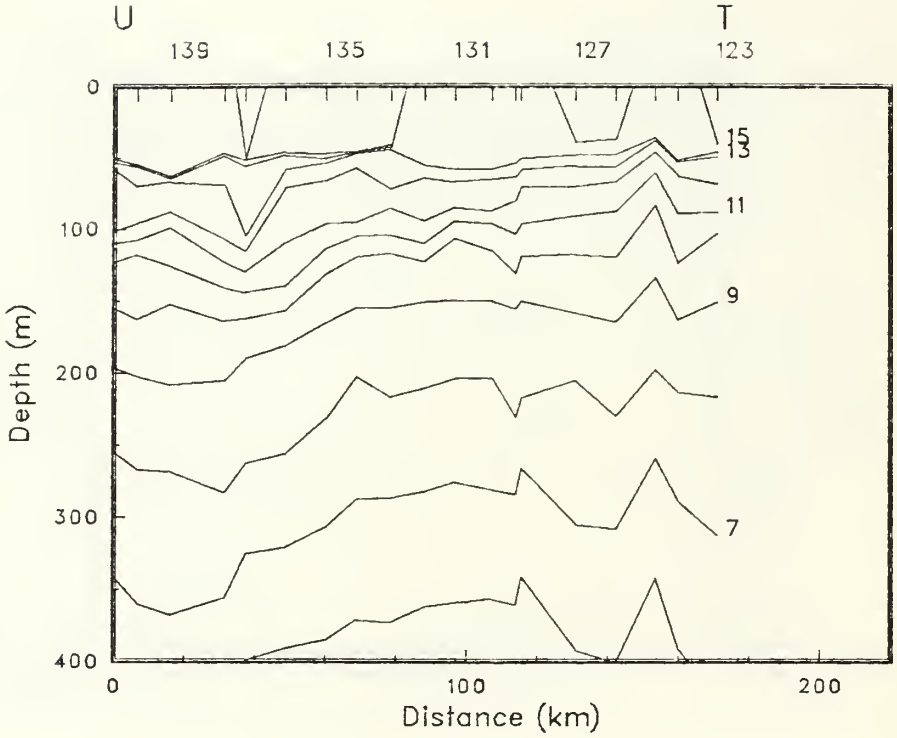


Figure 7(s)

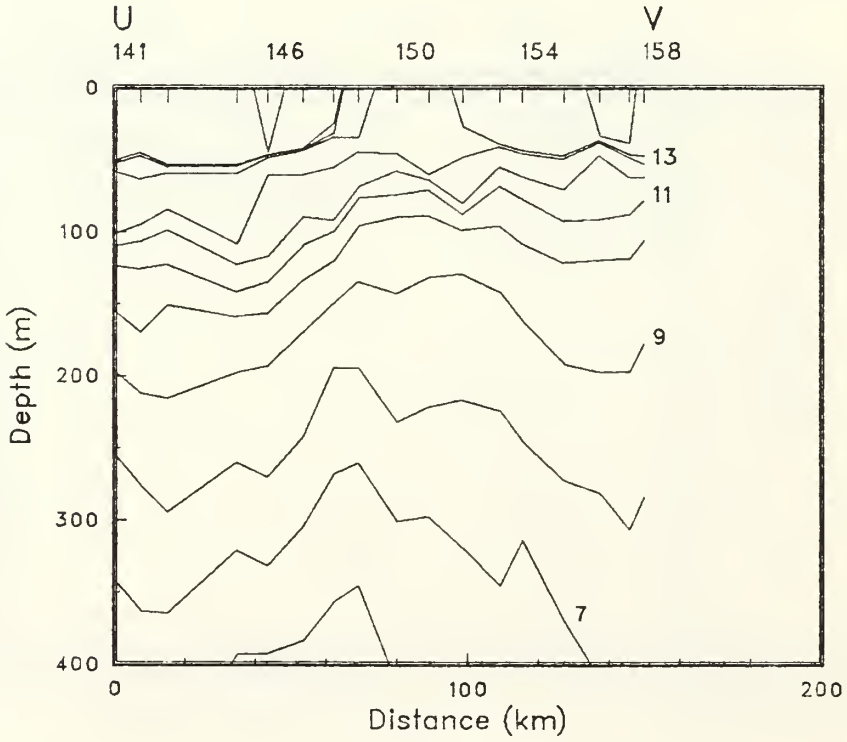


Figure 7(t)

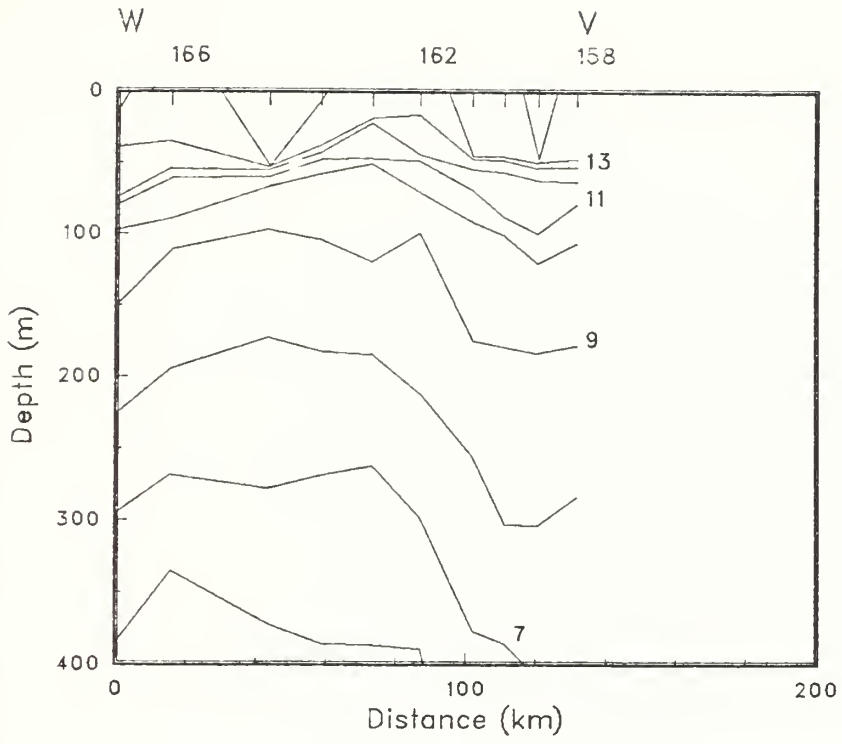


Figure 7(u)

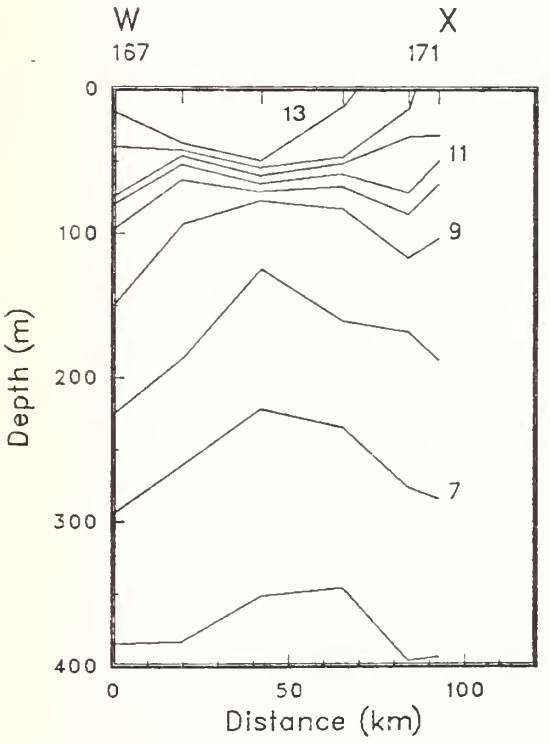


Figure 7(v)

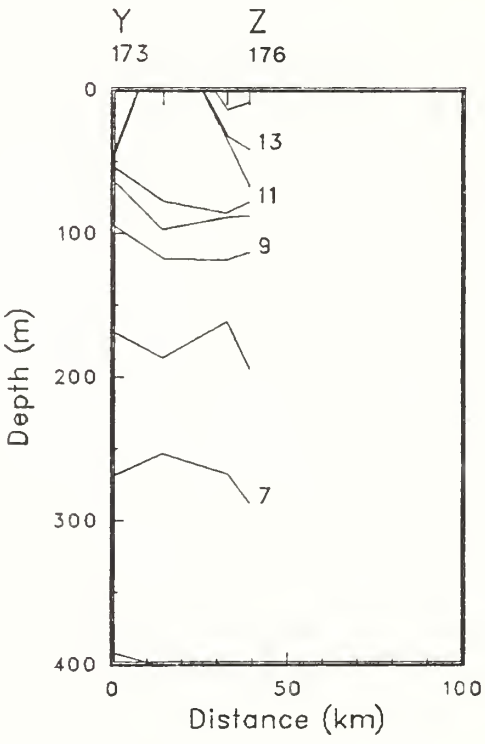


Figure 7(w)

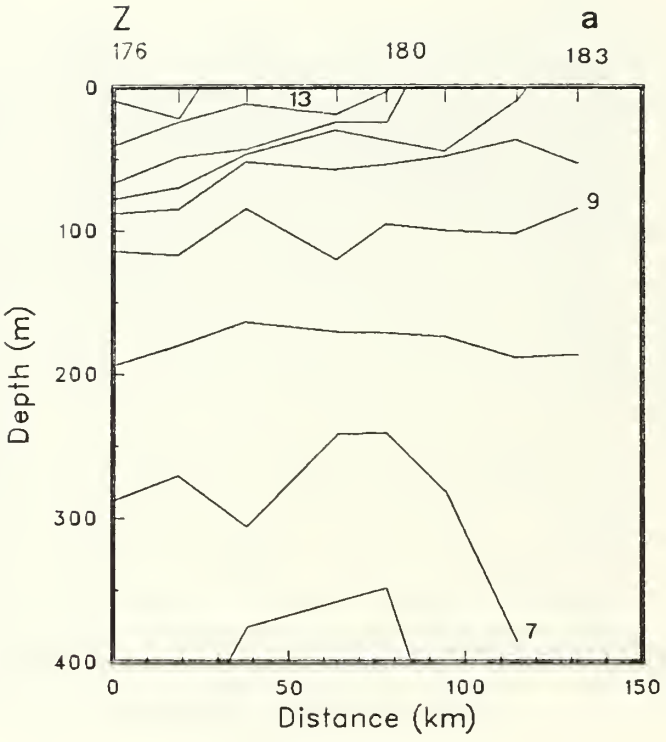


Figure 7(x)

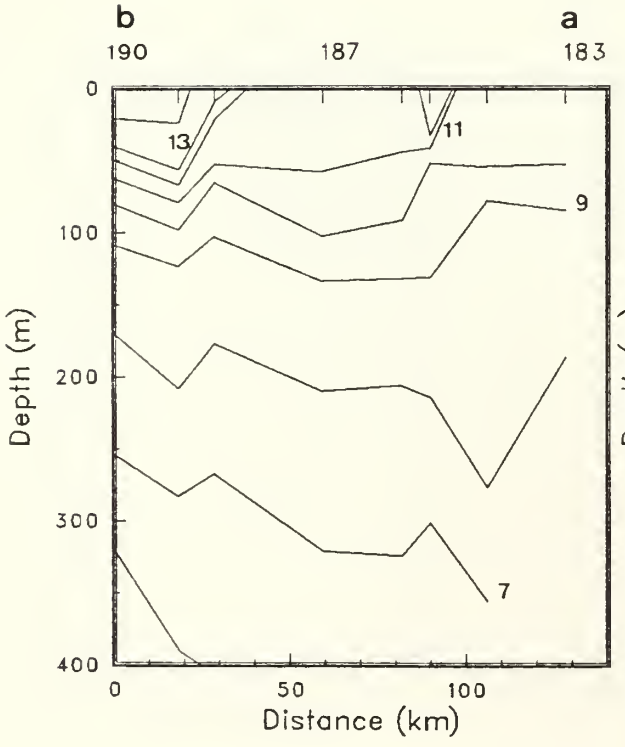


Figure 7(y)

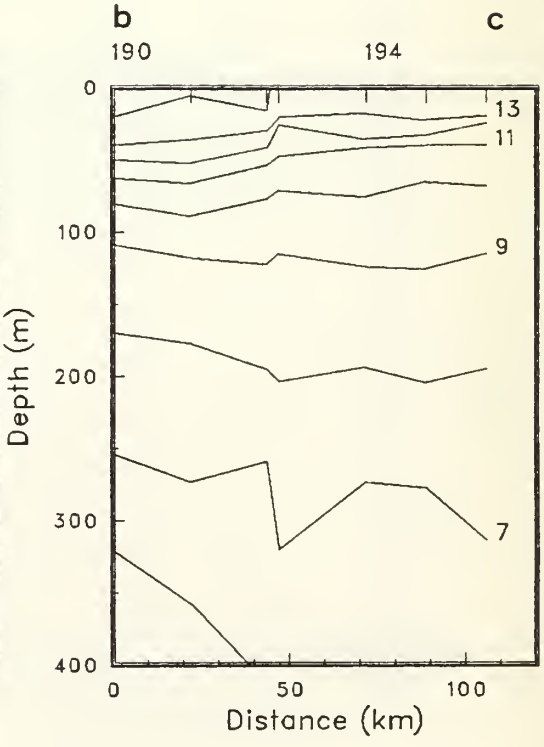


Figure 7(z)

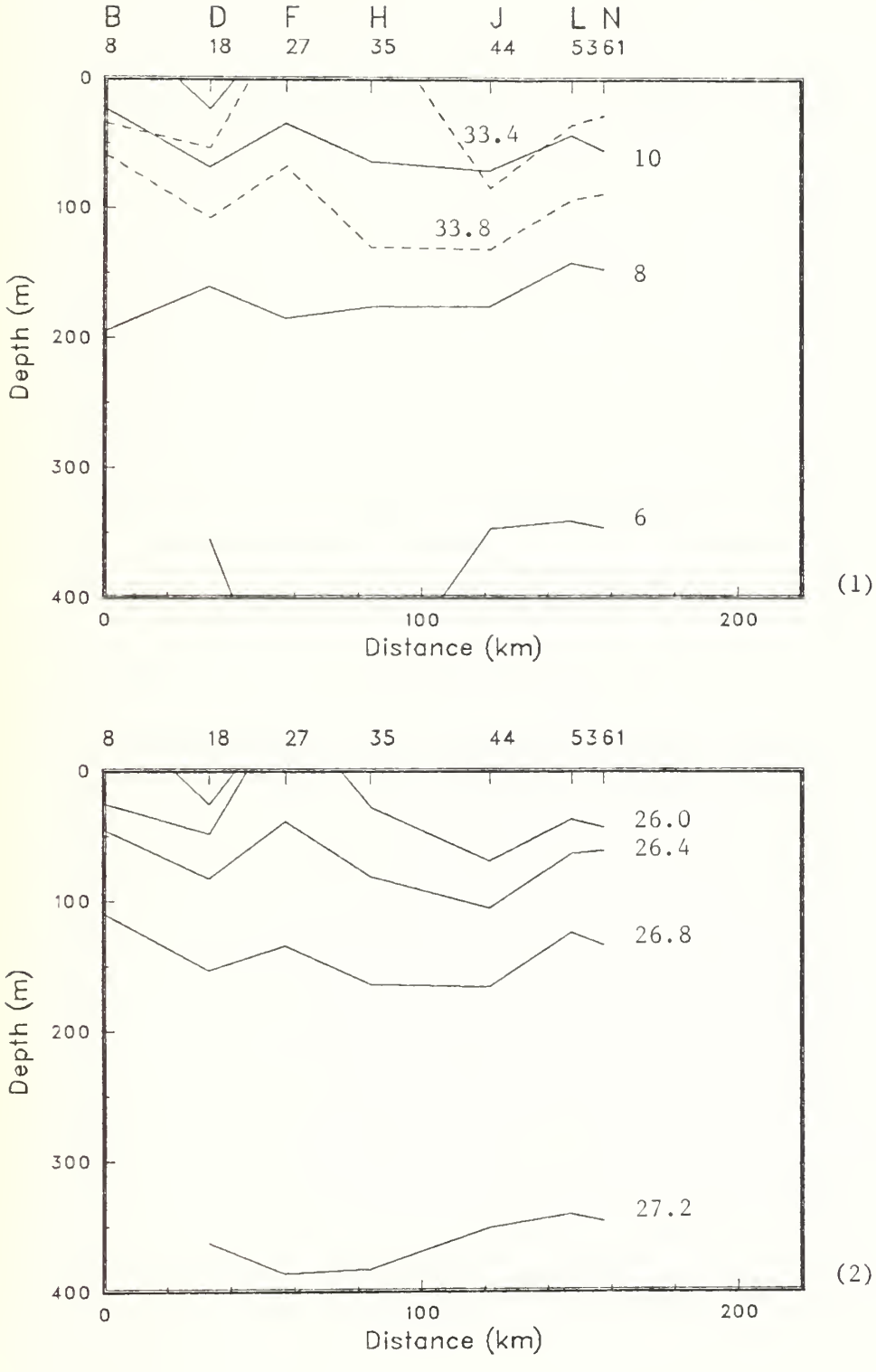
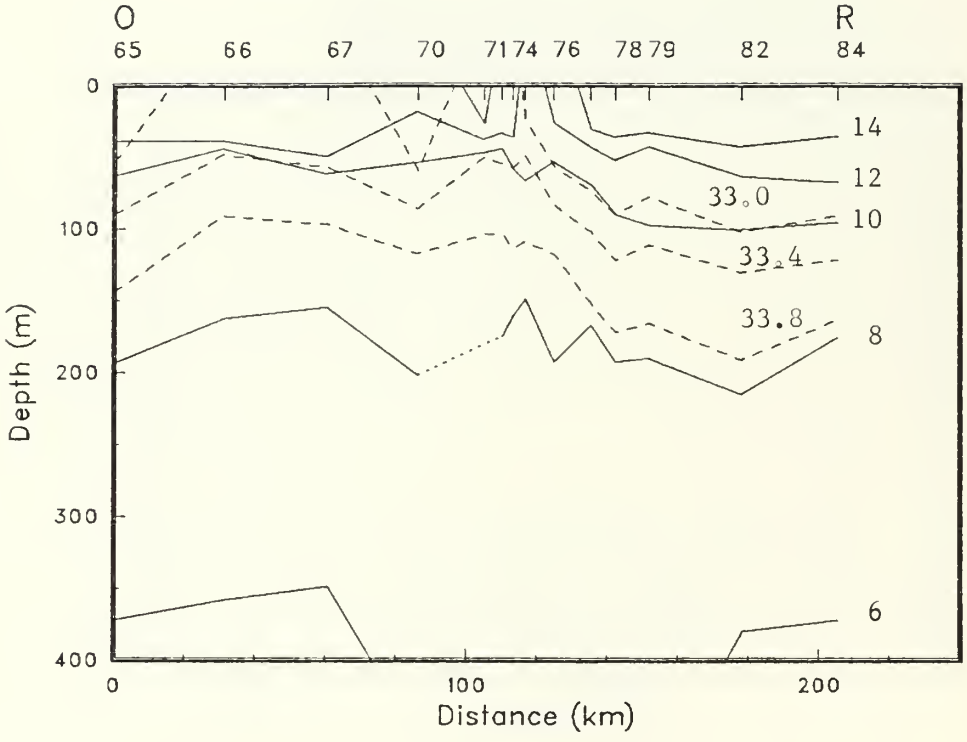
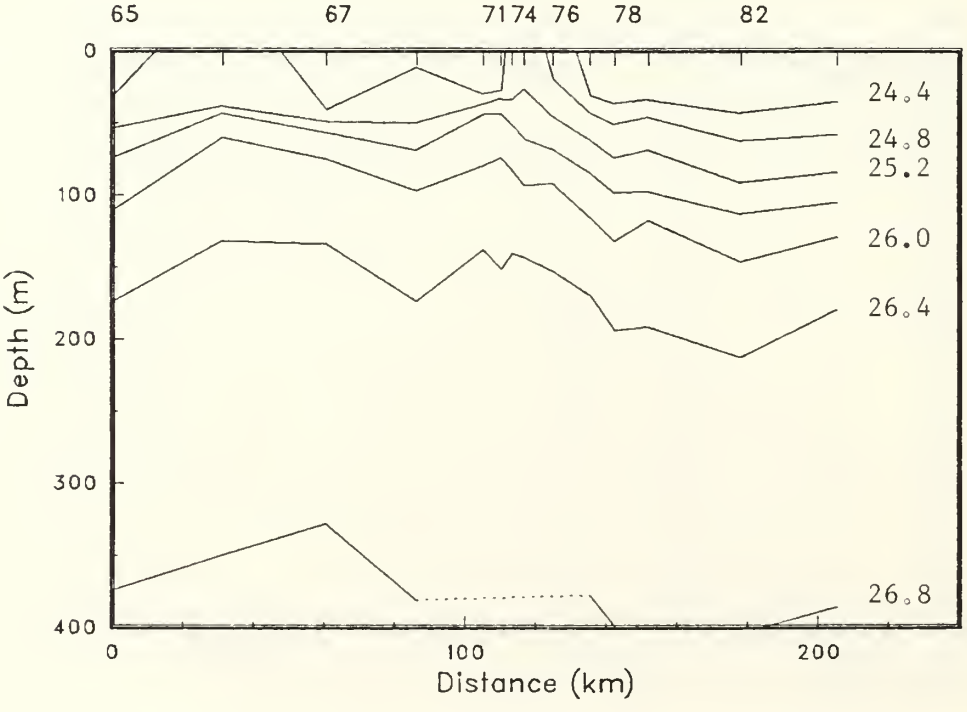


Figure 8(a): Isopleths of (1) temperature and salinity and (2) sigma-t from the CTDs.

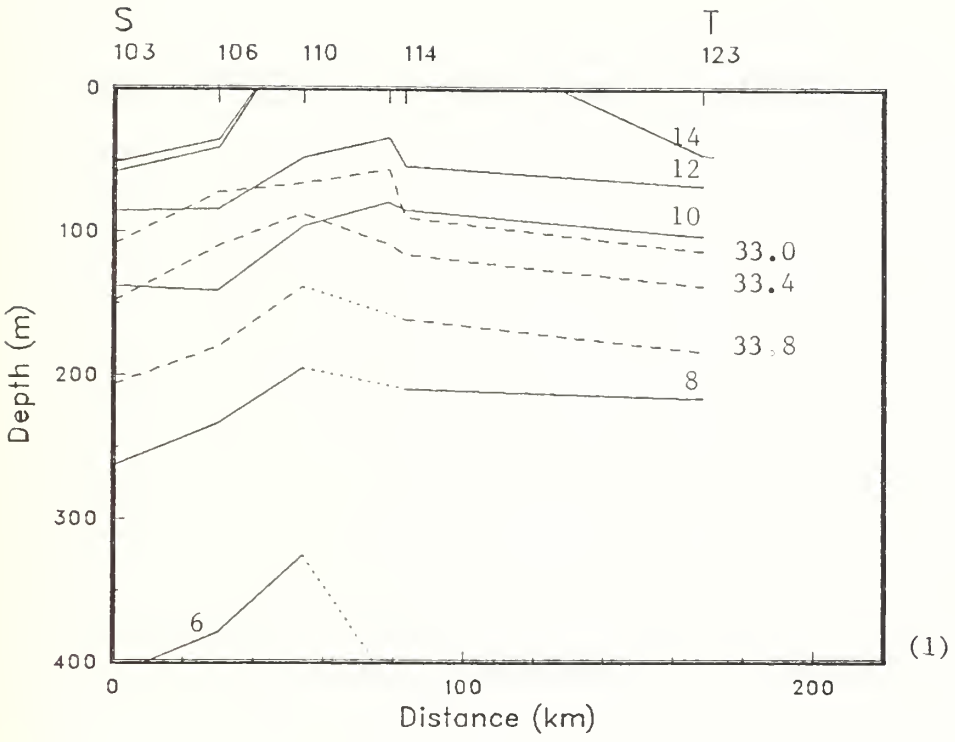

O
R
65
66
67
70
71
74
76
78
79
82
84
0
100
200
300
400
Depth (m)
14
12
33.0
10
33.4
33.8
8
6
0
100
200
Distance (km)

(1)

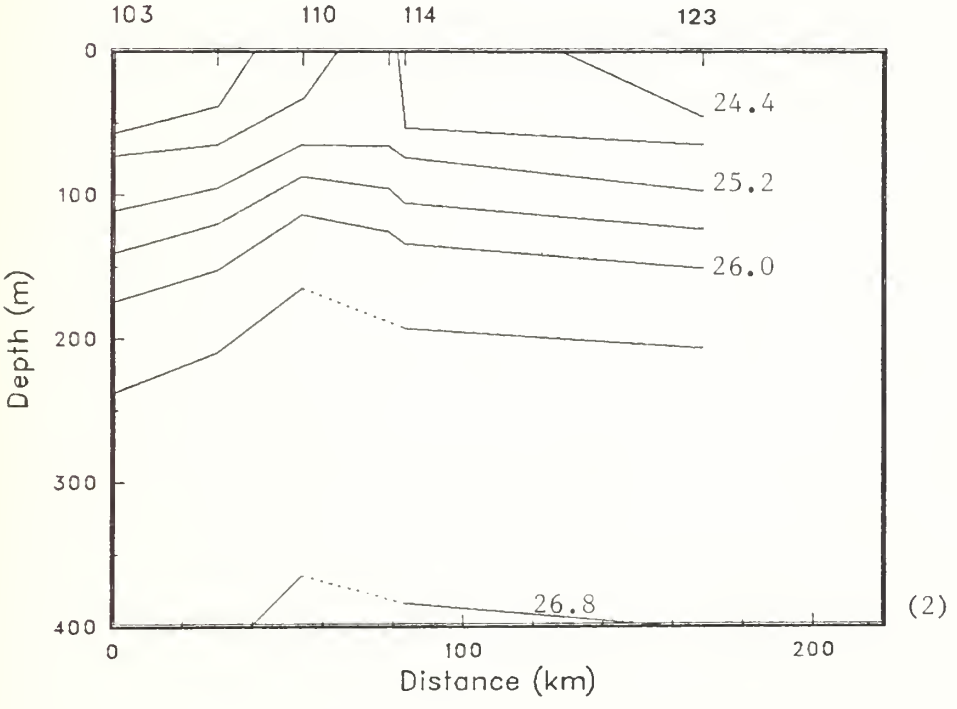

65
67
71
74
76
78
82
0
100
200
300
400
Depth (m)
24.4
24.8
25.2
26.0
26.4
26.8
0
100
200
Distance (km)

(2)

Figure 8(b)

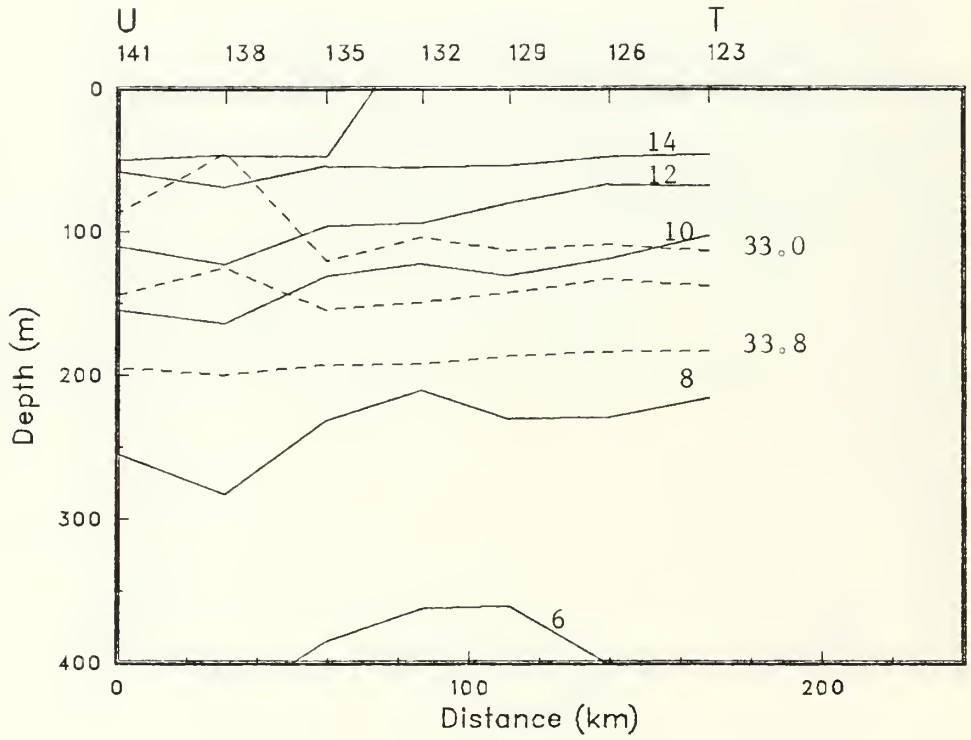

S
T
103
106
110
114
123
0
100
200
300
400
Depth (m)
14
12
10
33.0
33.4
33.8
8
6
0
100
200
Distance (km)

(1)

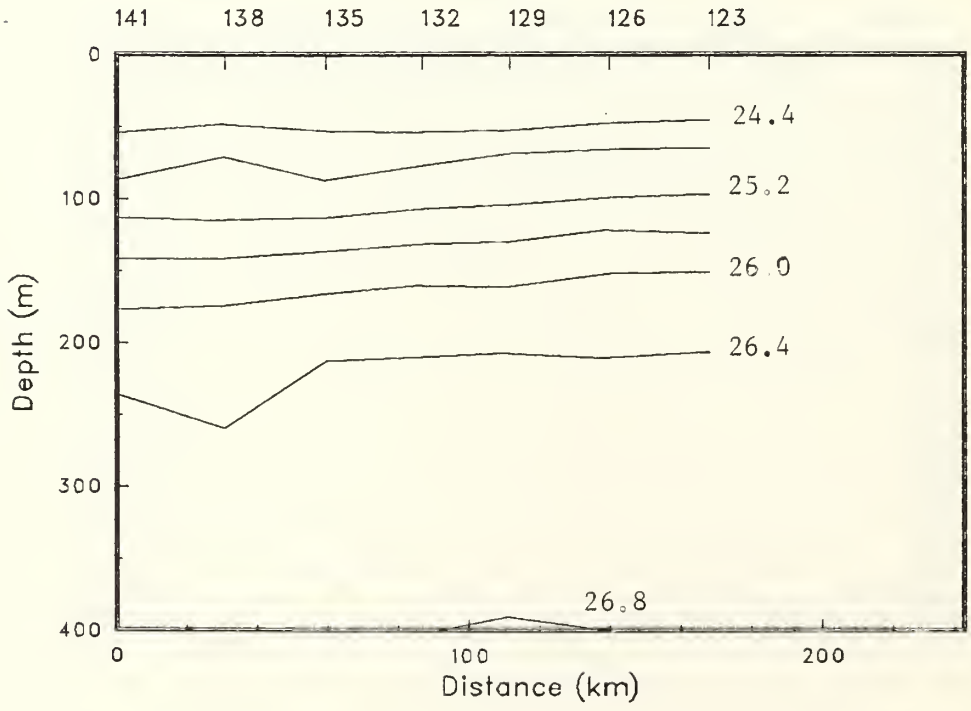

103
110
114
123
0
100
200
300
400
Depth (m)
24.4
25.2
26.0
26.8
0
100
200
Distance (km)

(2)

Figure 8(c)


U
T
141
138
135
132
129
126
123
0
100
200
300
400
Depth (m)
14
12
10
33.0
33.8
8
6
0
100
200
Distance (km)

(1)


141
138
135
132
129
126
123
0
100
200
300
400
Depth (m)
24.4
25.2
26.0
26.4
26.8
0
100
200
Distance (km)

(2)

Figure 8 (d)

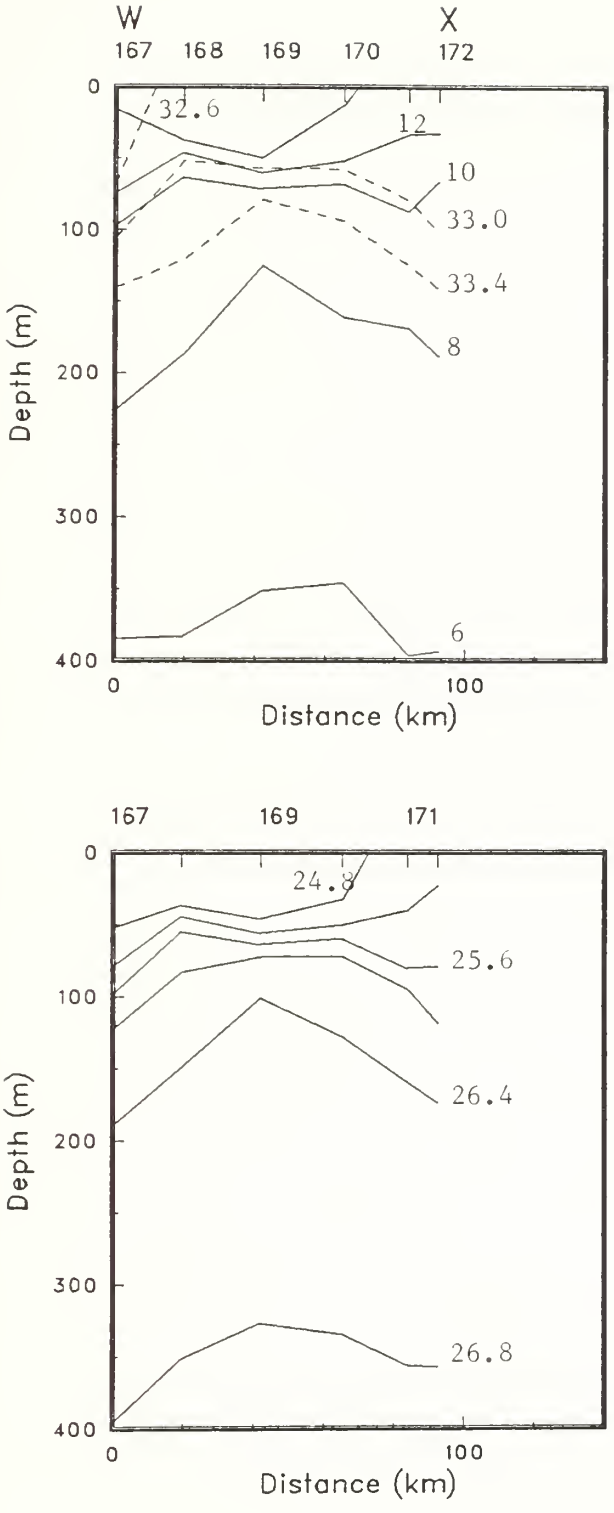

W
X
167
168
169
170
172
0
100
200
300
400
Depth (m)
32.6
12
10
33.0
33.4
8
6
0
100
Distance (km)
167
169
171
0
100
200
300
400
Depth (m)
24.8
25.6
26.4
26.8
0
100
Distance (km)

Figure 8(e)

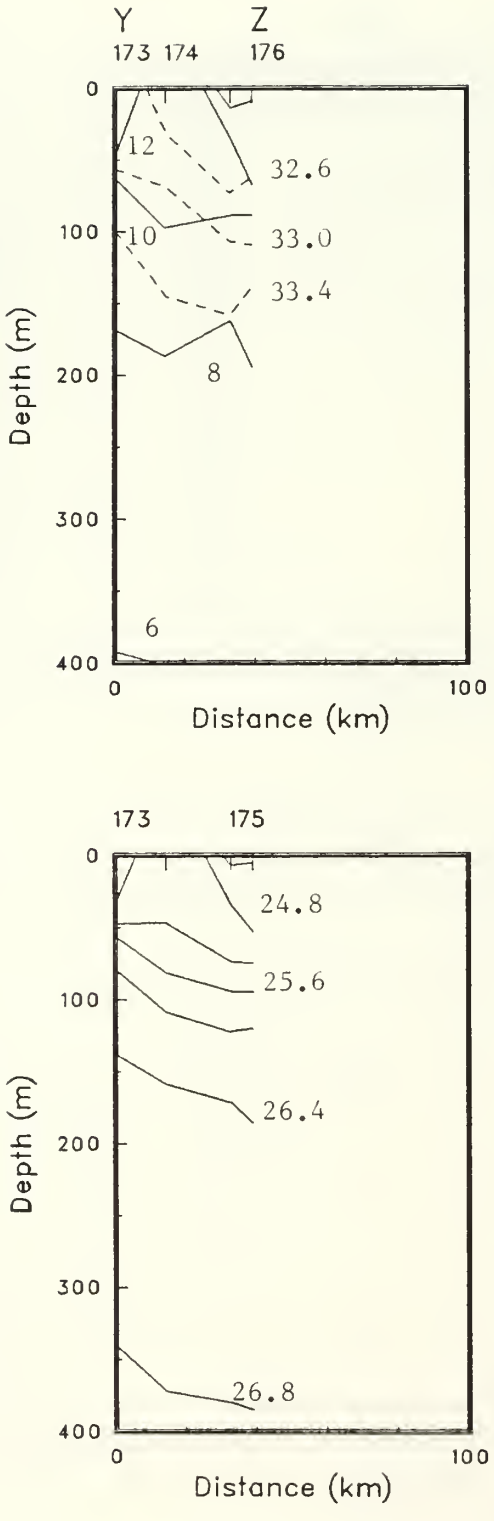

Y
Z
173 174
176
0
100
200
300
400
Depth (m)
12
10
8
6
32.6
33.0
33.4
0
100
Distance (km)
173
175
24.8
25.6
26.4
26.8

Figure 8(f)

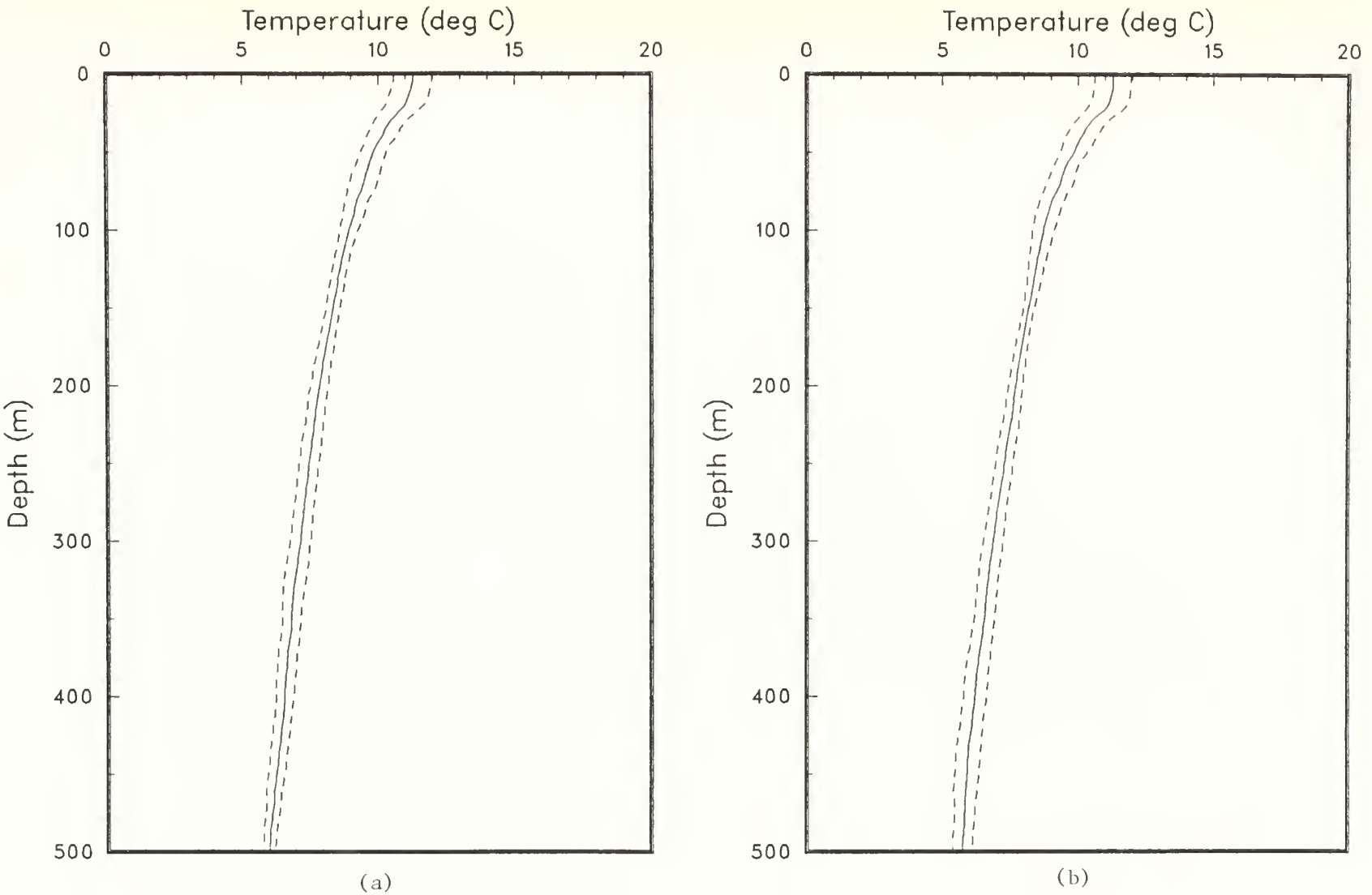


Figure 9: Mean nearshore temperature profiles from (a) XBTs and (b) CTDs, with + and - the standard deviation.

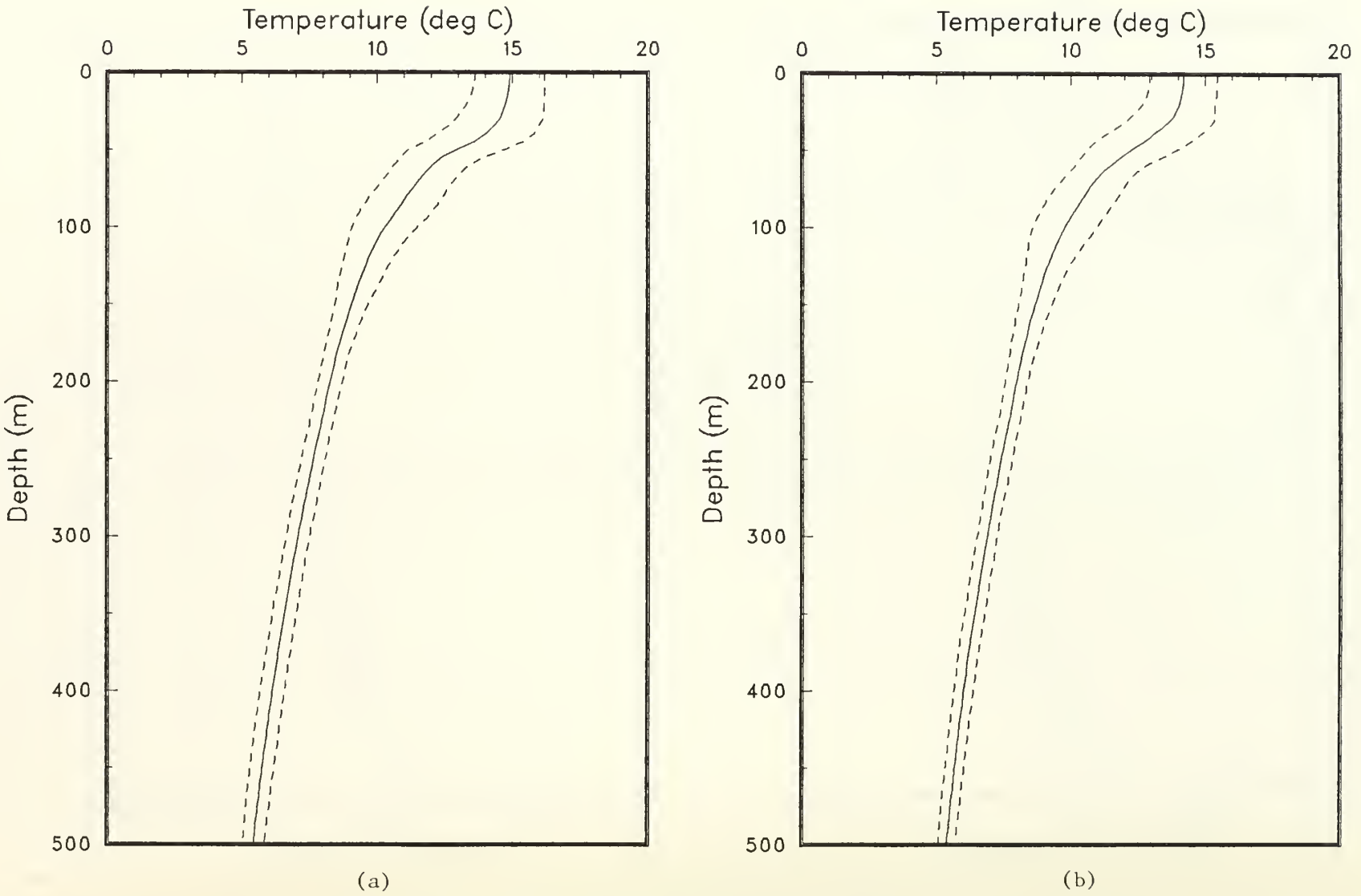


Figure 10: Same as Figure 9 but for the offshore profiles.

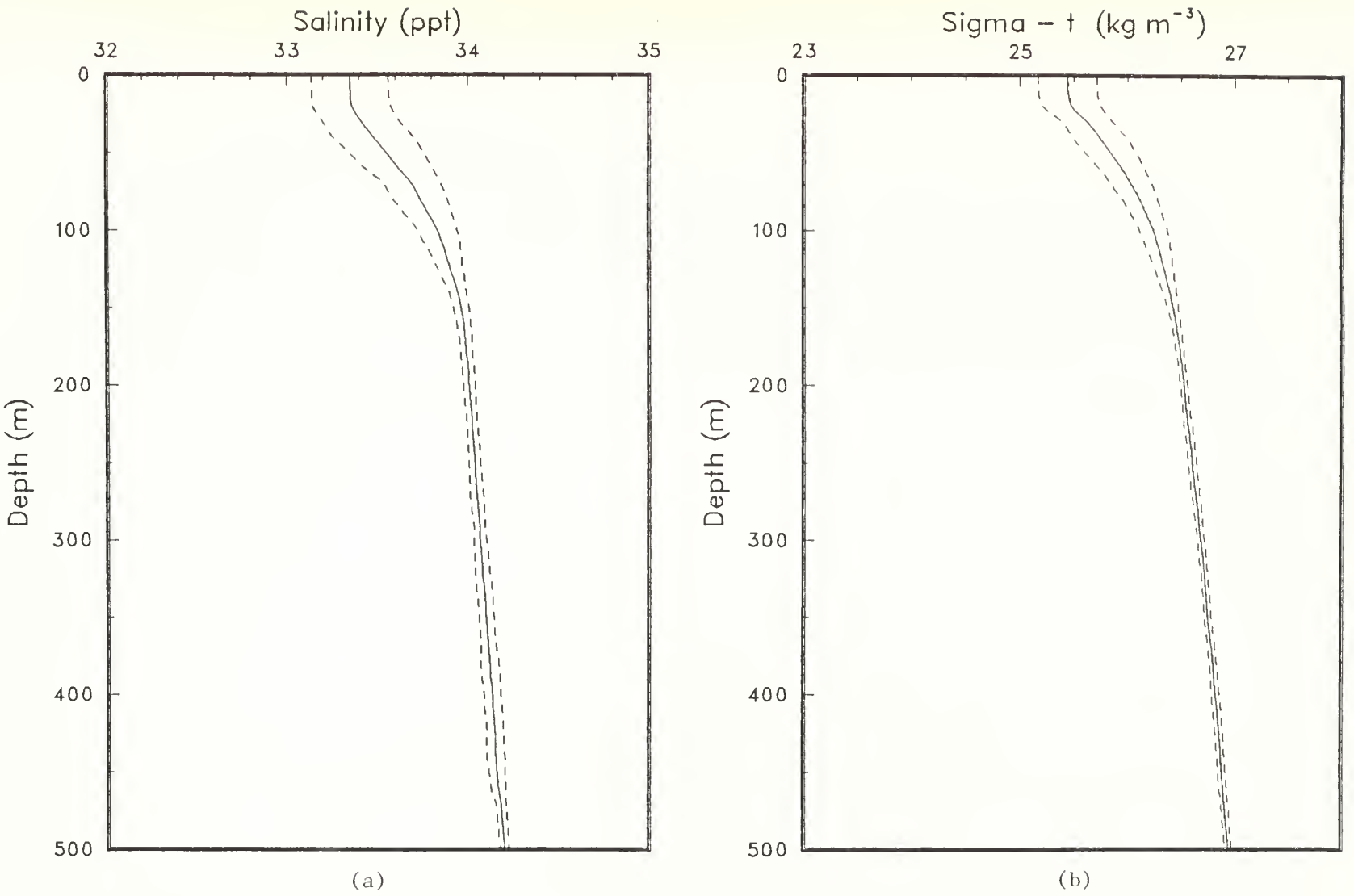


Figure 11: Mean profiles of (a) salinity and (b) sigma-t, with + and - the standard deviations, from the nearshore CTDs.

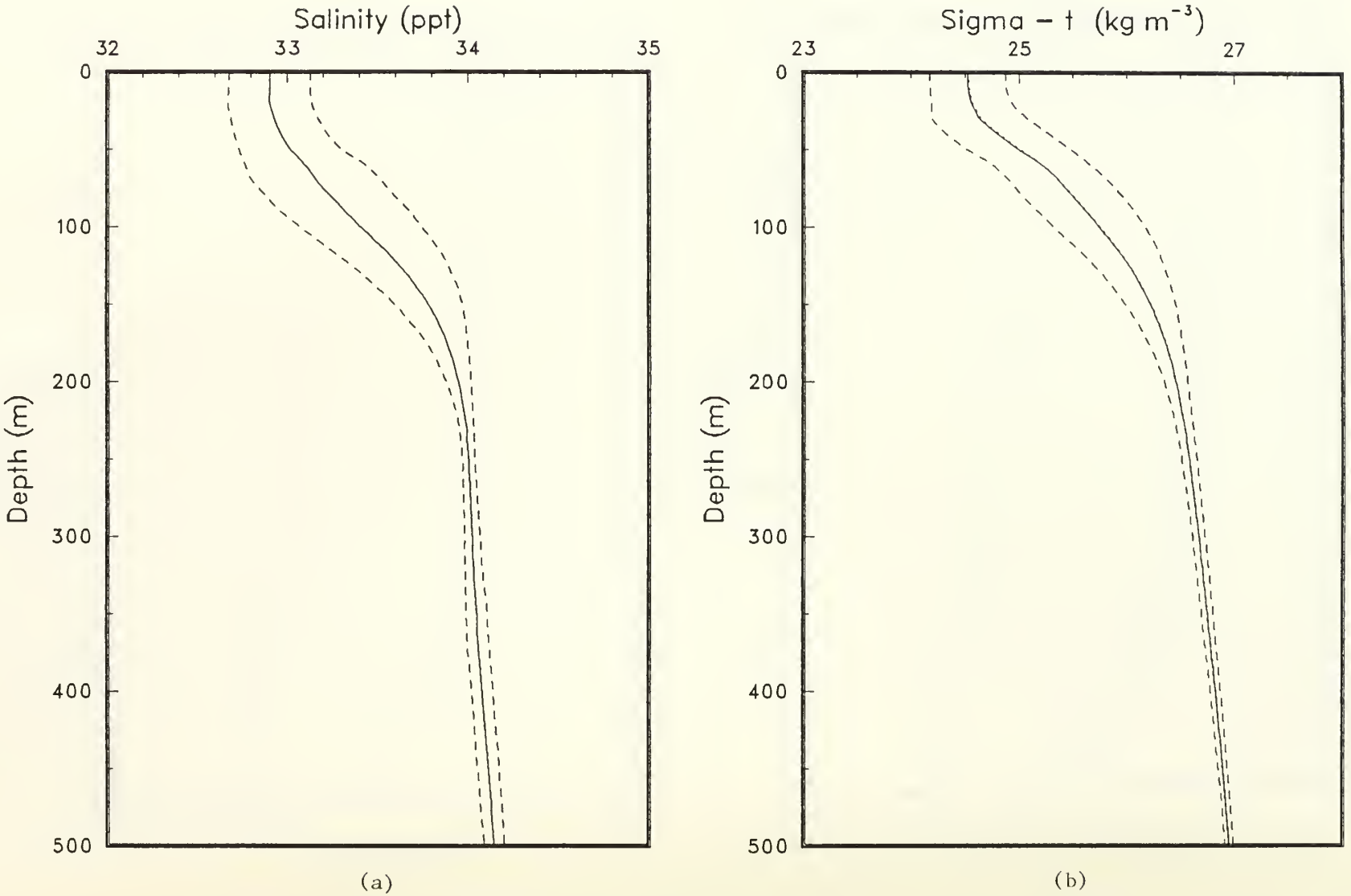


Figure 12: Same as Figure 11, but for the offshore CTDs.

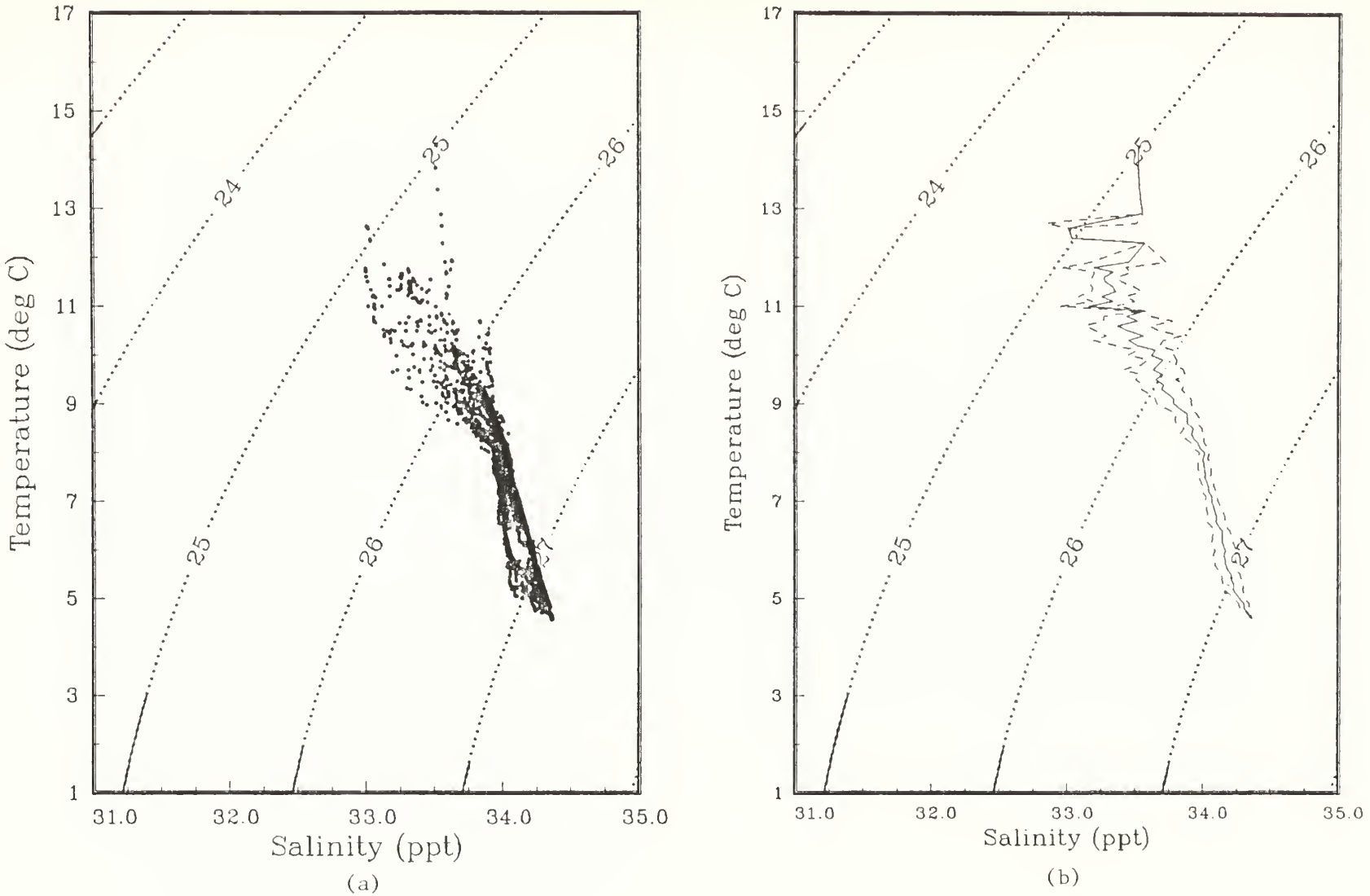


Figure 13: (a) T-S pairs and (b) mean T-S relation, with + and - the standard deviation, from the nearshore CTDs. Selected sigma-t contours are also shown.

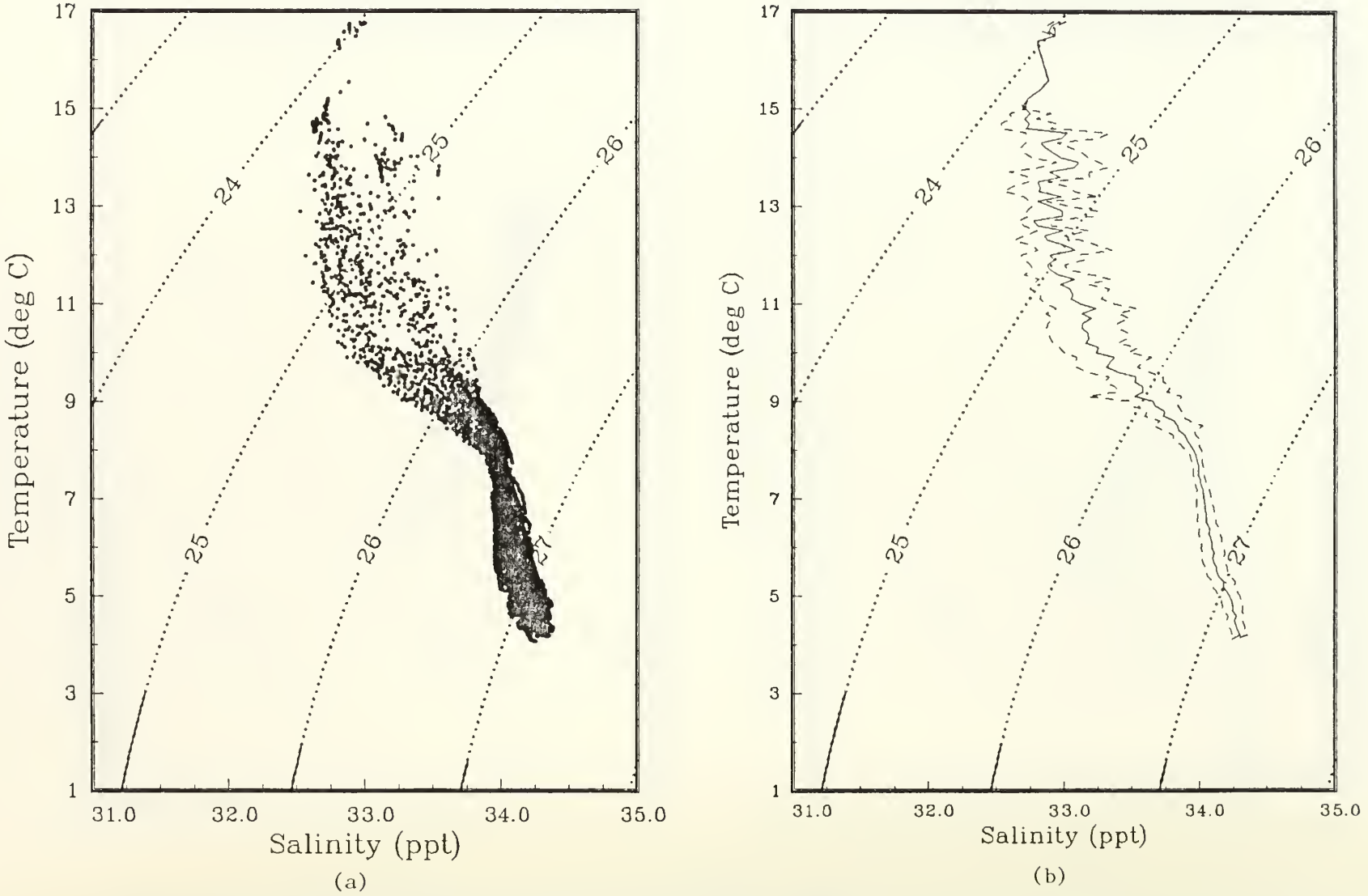


Figure 14: Same as Figure 13, but from the offshore CTDs.

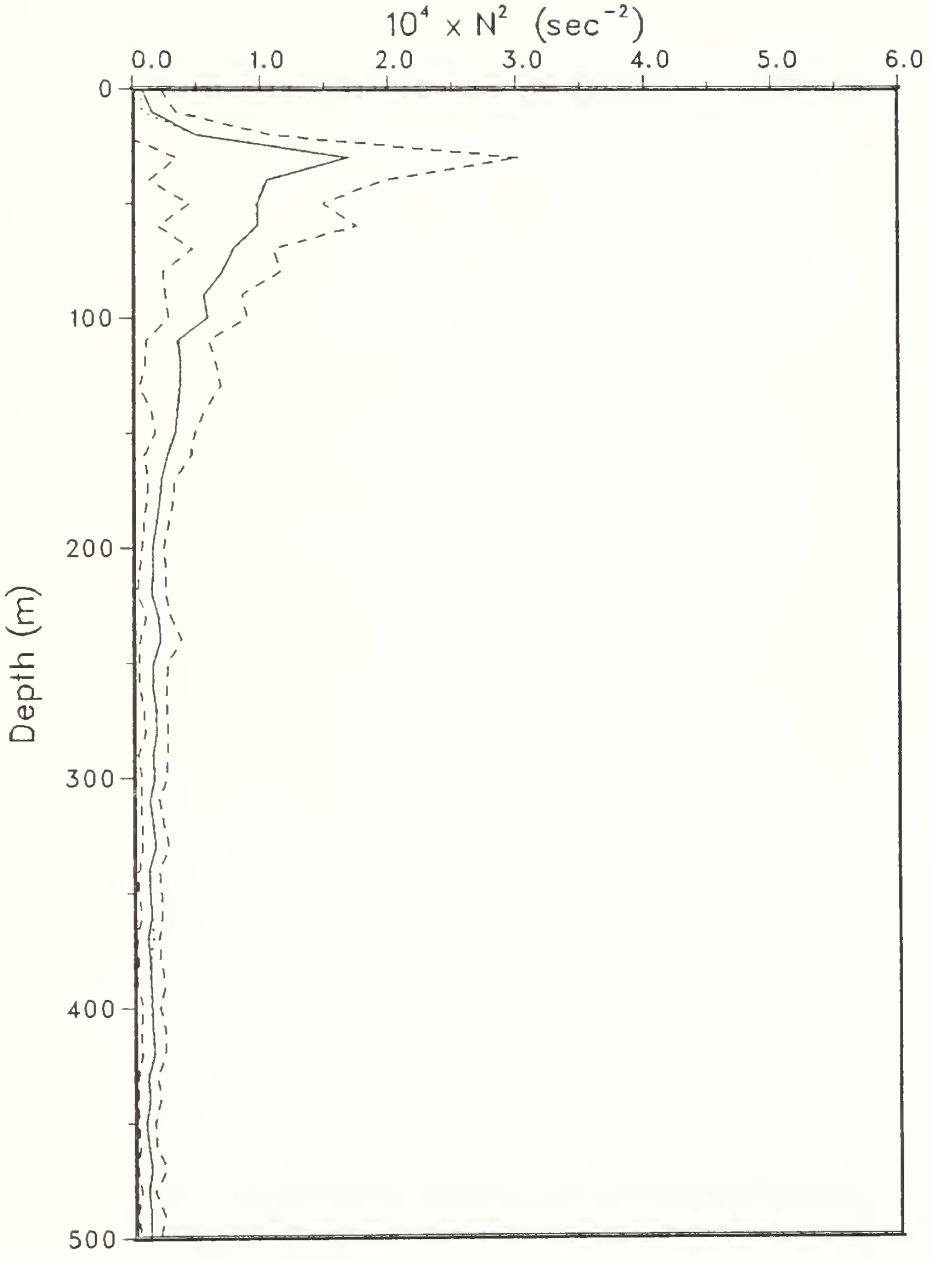


Figure 15: Mean N^2 profile (——) from the nearshore CTDs, with + and - the standard deviation (----). The N^2 profile from $\overline{T(z)}$ and $\overline{S(z)}$ is also shown (····).

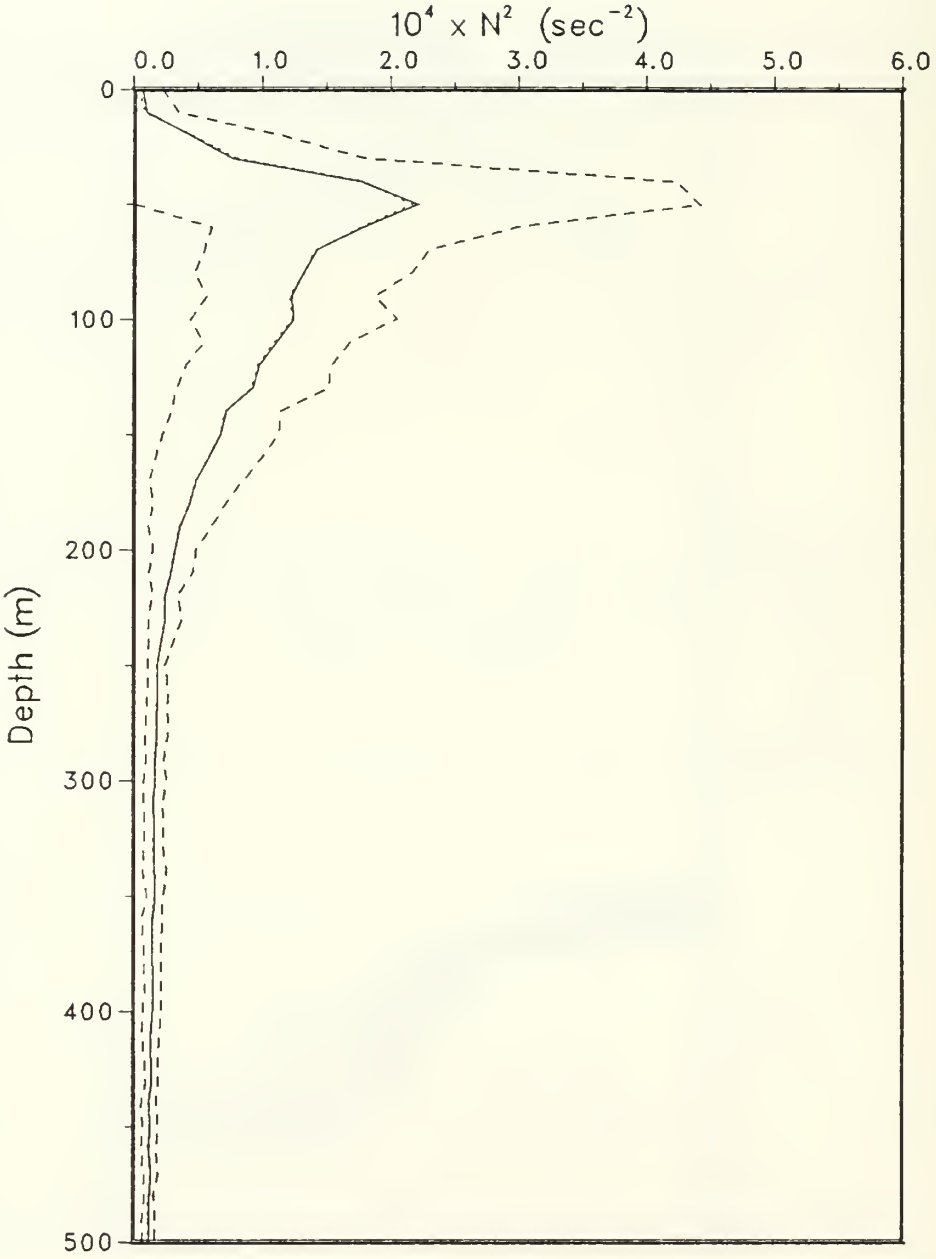


Figure 16: Same as Figure 15, but from the offshore CTDs.

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Mr. Eric Olson, USC
Mr. Terry Garrett, USC
Mr. Dennis O'Neill, USC
Dr. Ann Bucklin, SIO
Dr. Richard Bohrer, SFSU (Tiburon Center)
Dr. Russ Flegal, UCSC
Mr. Phil Mote, Harvard Univ.

REFERENCE

Lewis, E.L. and R.G. Perkin, 1981: The Practical Salinity Scale 1978: conversion of existing data. **Deep Sea Res., 28A**, 307-328.

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