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Hydrographic data from the Wolftrap section, 1982-1983

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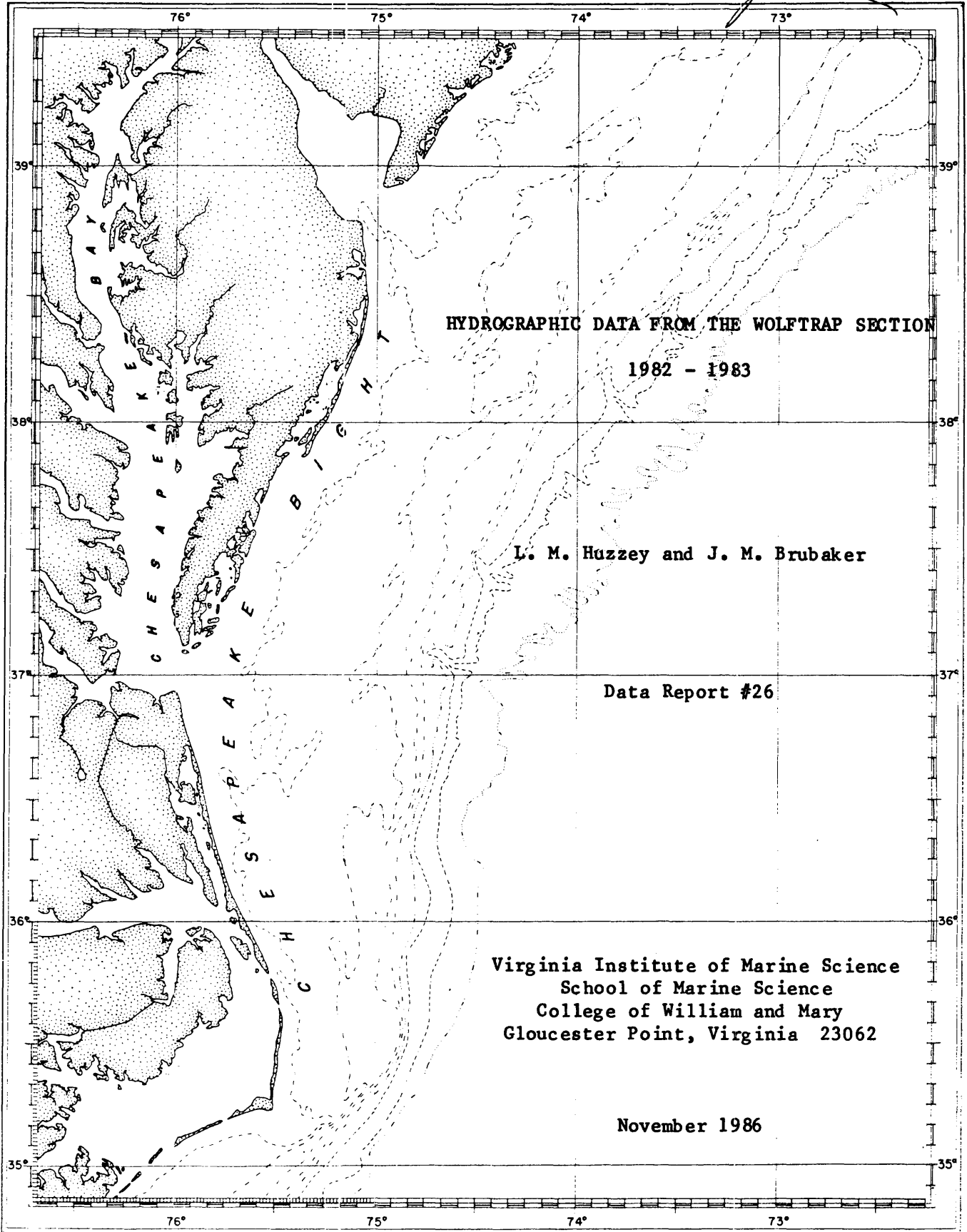
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Byrne



**HYDROGRAPHIC DATA FROM THE WOLFTRAP SECTION
1982 - 1983**

L. M. Huzzey and J. M. Brubaker

Data Report #26

**Virginia Institute of Marine Science
School of Marine Science
College of William and Mary
Gloucester Point, Virginia 23062**

November 1986

Bob,
A report at last!
over my compliments
Linda A.

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I. INTRODUCTION

Commencing in the summer of 1981 the National Ocean Survey (NOS) branch of the National Oceanic and Atmospheric Administration (NOAA) conducted a three year circulatory survey of the Chesapeake Bay. The survey was designed to update tide and tidal current prediction data, provide circulatory and navigational information and to define tidal datums used for shoreline boundary determinations (Browne and Fisher, 1986). The study was executed in three one-year phases in different sections of the bay. In order to provide continuity between this segmented data set, it was planned to maintain three long-term current meter stations throughout the duration of the study. One of these was in the upper bay near the Patuxent River (C36), one at the Chesapeake Bay entrance (C40) and one in the vicinity of Wolftrap Lighthouse (C65). To assist NOAA/NOS in maintaining these long-term stations, an arrangement was made whereby the Virginia Institute of Marine Science (VIMS) undertook the servicing of the current meters at station C65 for a portion of the deployment. This work involved visits to the station every two weeks and changing the current meters once a month. During these cruises data was collected on a hydrographic transect across the Chesapeake Bay from Mathews County on the western shore to Northampton County on the Eastern Shore. In this way, simultaneous information on currents and density was gathered across a section of the bay which is relatively distant from the mouths of any of the major tributary rivers.

Five additional current meter stations were located across this transect by NOAA/NOS for the month of April, 1982, and a two week period in July/August 1982. Tide gages were established by NOAA/NOS at Horn Harbor, near New Point Comfort, on the western end of the transect, and at Mattawoman Creek on the Eastern Shore, during March 1982. These were maintained by NOAA/NOS until December 1982 at which time VIMS assumed the responsibility. Tidal data at these locations was collected throughout 1983.

The data set collected across this section of the Chesapeake Bay is comprehensive and somewhat unusual, providing detailed information in both the vertical and lateral dimensions over several seasonal cycles. The current meter data (Browne and Fisher, 1986) is available from NOAA through the National Oceanographic Data Center; this report is concerned primarily with the hydrographic data set obtained by VIMS.

II. METHODS

The hydrographic section sampled by VIMS during this project contained 15 stations located along an east-west transect at latitude $37^{\circ}24.7'N$. The locations and water depths of these stations are listed in Table I and illustrated in Figures 1 and 2. One of the hydrographic stations, Station 07, coincided with the site of current meter station C65. Several of the other stations were very close to the short-term current meter stations of April and July 1982.

The surveys were conducted every two weeks during the time period December 1981 until June 1982, and February 1983 until December 1983. In the intervening period the surveys were conducted monthly. The stations were sampled sequentially, starting at either the eastern or western end of the transect, depending on the other tasks undertaken on each particular cruise (such as current meter or tide gage servicing). On the occasions when the cruise included a dive to exchange current meters at station C65, then a CTD cast was done at this station before, and sometimes after, the dive as well as during the transect. These extra stations are referred to as 7A, 7B etc. and occurred on cruise #'s 02, 03, 05, 06, 17, 27, 30, 32, 33, 36 and 39. A complete listing of the dates and sampling times of each cruise is given in Table II. The sampling was intended to be centered around the time of predicted slack water, either slack-before-ebb or slack-before-flood (U. S. Dept. of Commerce, 1982/83). On average the transect took two and one half hours

to complete. Figure 3 shows the actual sampling period for each cruise in relation to the (predicted) tidal phase.

On all cruises, except #19, the CTD used was a Neil-Brown Instrument Systems Mark III CTD; the data were recorded on audio magnetic tape. The instrument was calibrated periodically by VIMS Department of Physical Oceanography lab personnel. In addition, at each station, a Secchi-depth was noted and surface and bottom water samples collected for subsequent salinity and dissolved oxygen analysis. On cruise #19 a hand-held Interocean CTD was used and values of conductivity and temperature obtained from a digital readout at one meter increments from the surface to the bed. The station positions were determined using Loran-C.

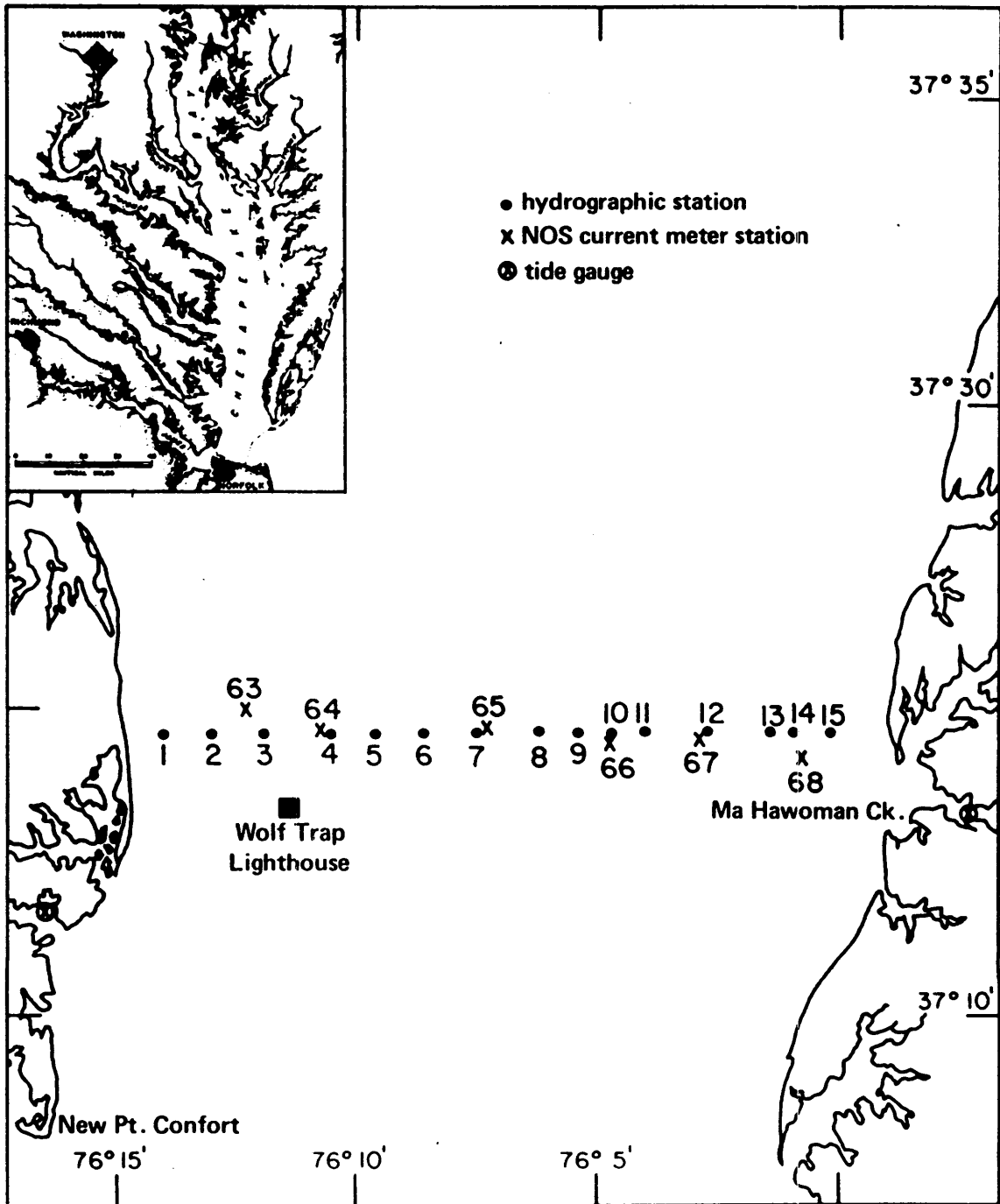


FIG. 1 Location of hydrographic and current meter stations, and tide gages across the Wolftrap section.

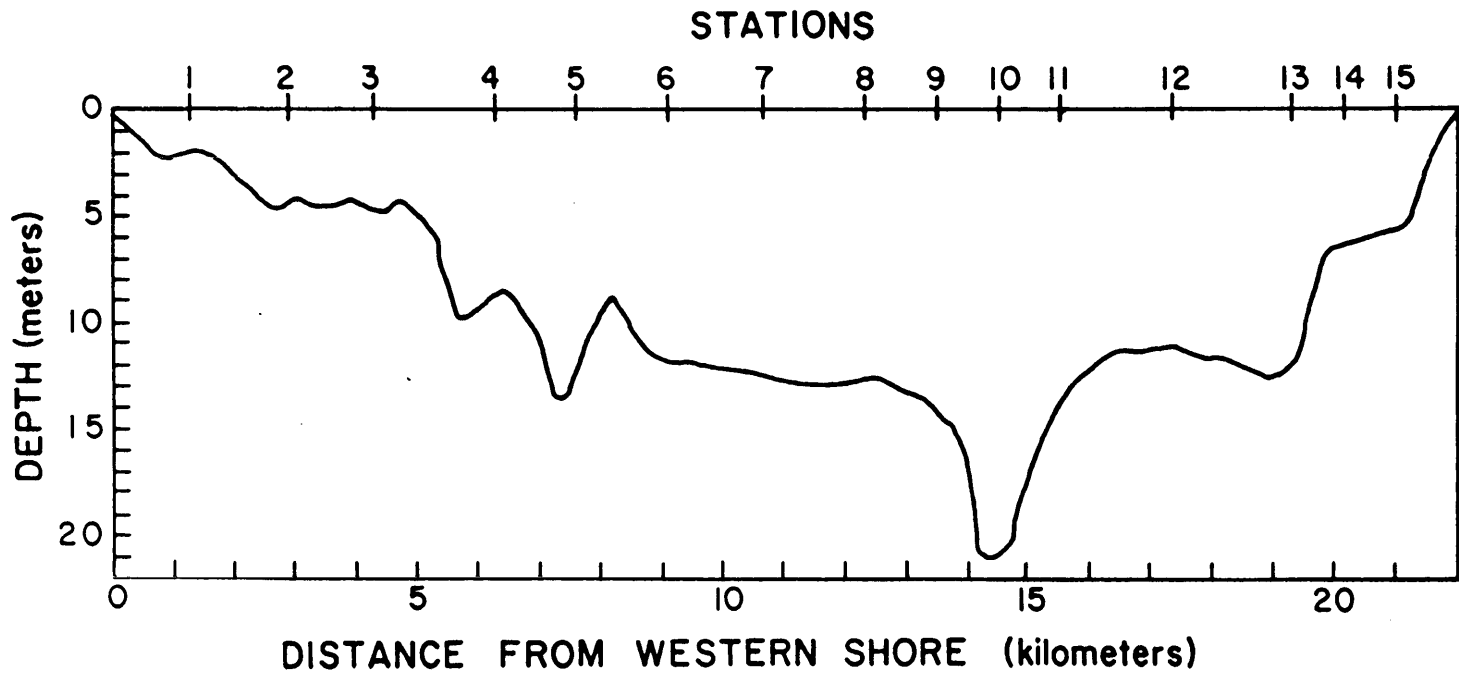


FIG.2 Location of hydrographic stations across the section (looking up-estuary).

TABLE I

STATION	LONGITUDE	WATER DEPTH (m)
01	76° 14.00' W	2
02	76° 12.95' W	3
03	76° 11.91' W	4
04	76° 10.52' W	7
05	76° 09.60' W	12
06	76° 08.64' W	12
07	76° 07.51' W	12
08	76° 06.26' W	12
09	76° 05.53' W	13
10	76° 04.80' W	21
11	76° 04.10' W	11
12	76° 02.82' W	11
13	76° 01.50' W	13
14	76° 00.97' W	5
15	76° 00.32' W	4

All stations located along latitude 37°24.68' N

TABLE II

CRUISE No.	DATE	STATIONS SAMPLED	TIME (EST)
<u>1982</u>			
2	20 Jan	1 - 15	1113 - 1328
		7A	1005
3	5 Feb	1 - 15	1214 - 1407
		7A	1105
5	10 Mar	1 - 8	1235 - 1341
		7A,8A,9 - 15	1509 - 1706
6	24 Mar	1 - 15	1322 - 1517
		4,7,10,13	1527 - 1632
7	8 Apr	1 - 15	0920 - 1308
8	21 Apr	1 - 15	1109 - 1253
9	5 May	1 - 15	0950 - 1143
10	19 May	1,3 - 15	0938 - 1126
11	3 Jun	2 - 15	1023 - 1237
12	18 Jun	1,2,4 - 15	0905 - 1114
13	30 Jun	1 - 15	0822 - 1012
14	5 Aug	1,2,3,5 - 15	1116 - 1348
16	16 Nov	1 - 11	1325 - 1520
17	15 Dec	1 - 15	1325 - 1522
		7A	1425

TABLE II (Cont'd)

CRUISE No.	DATE	STATIONS SAMPLED	TIME (EST)
<u>1983</u>			
18	6 Jan	2 - 15	1117 - 1253
20	3 Feb	1 - 15	0930 - 1151
21	16 Feb	1 - 14	0954 - 1312
22	9 Mar	1 - 15	1030 - 1249
23	22 Mar	1 - 15	0846 - 1111
24	27 Apr	1 - 15	1138 - 1405
25	11 May	1 - 15	0750 - 1012
26	25 May	1 - 15	1056 - 1427
27	9 Jun	1 - 15	0744 - 1015
		7A	1056
		7B	1205
28	22 Jun	1 - 15	1015 - 1239
29	13 Jul	1 - 15	1354 - 1619
30	27 Jul	1 - 15	0908 - 1150
		7A	1525
32	23 Aug	1 - 15	0717 - 859
		7A	0952
33	6 Sep	1 - 14	0847 - 1107
		7A	1151
		7B	1250
34	20 Sep	1 - 15	0734 - 1058

TABLE II (Cont'd)

CRUISE No.	DATE	STATIONS SAMPLED	TIME (EST)
35	3 Oct	1 - 15	1058 - 1313
		7A	1010
36	18 Oct	1 - 15	0917 - 1151
		7A	1359
37	1 Nov	1 - 15	1205 - 1423
		7A	1122
38	18 Nov	1 - 15	1121 - 1319
39	5 Dec	1 - 15	1317 - 1506
		7A	1205

Note: Cruise # 1 - no CTD data collected

Cruise #'s 4, 15, 31 - data lost due to instrument

malfunction

Cruise # 19 - abandoned due to adverse weather conditions.

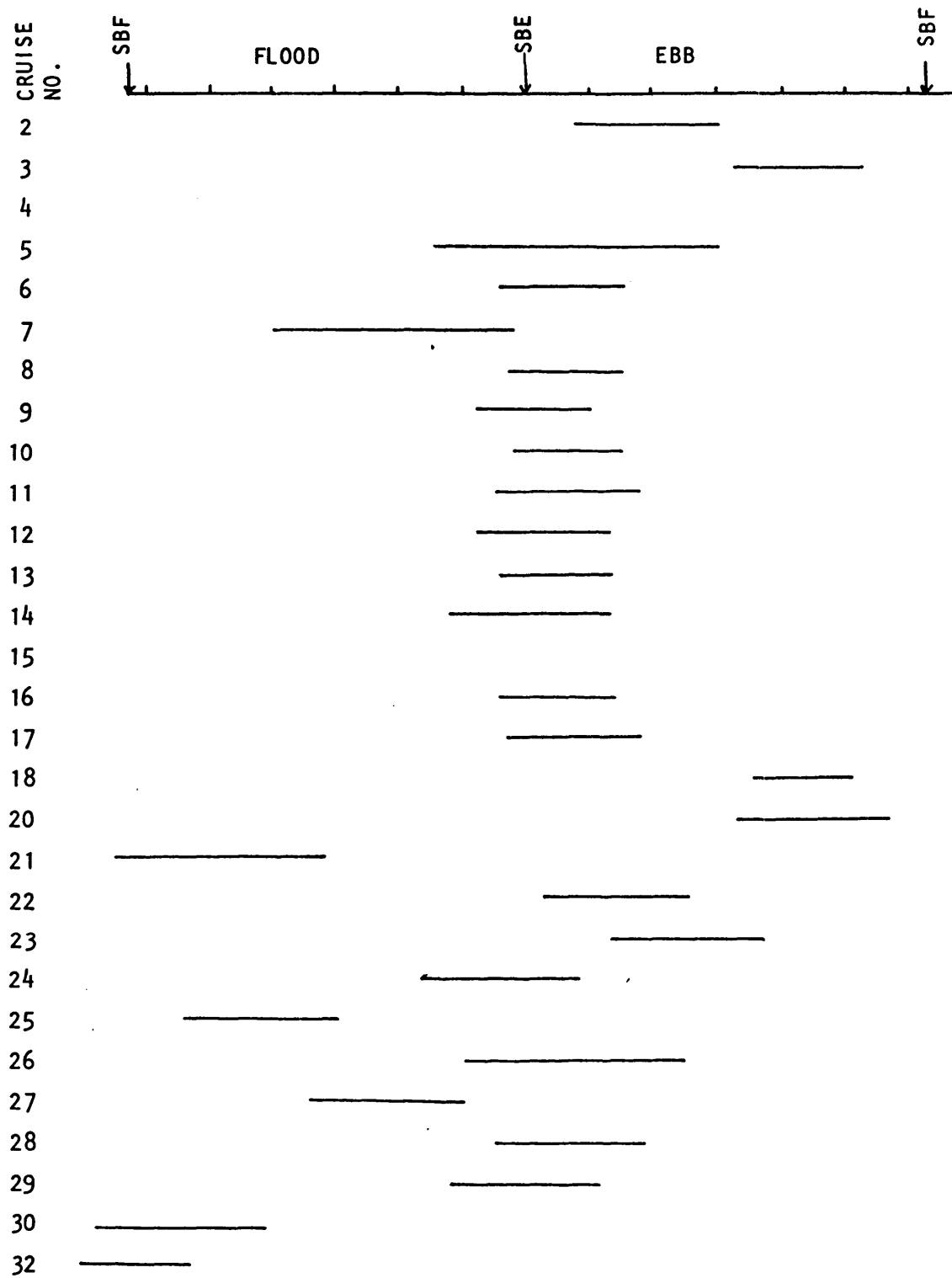
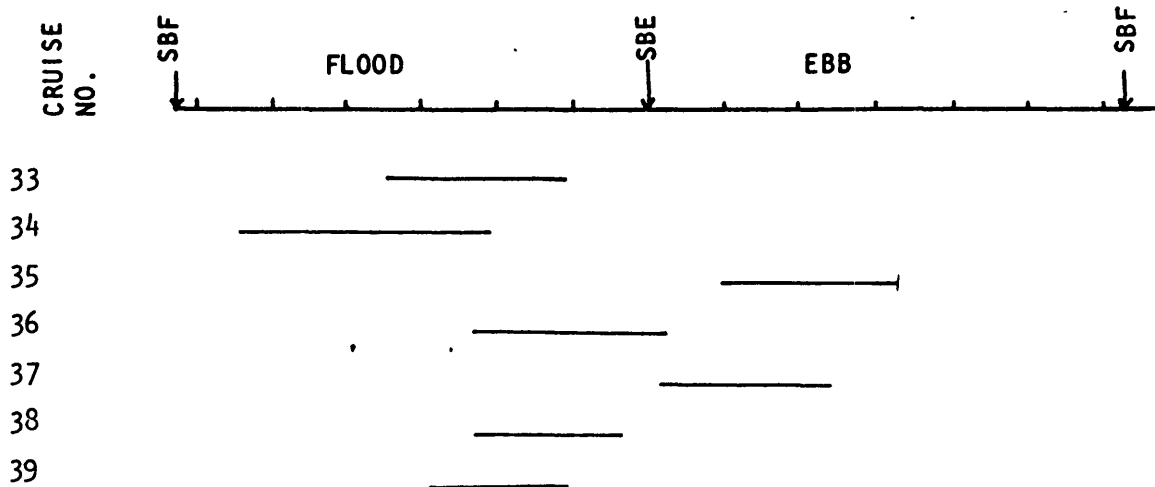


FIG.3 Time of sampling along the transect in relation to the predicted tidal cycle.



III. DATA ANALYSIS

Values of conductivity, temperature and pressure were recorded in the field on audio magnetic tape. Upon returning to VIMS, this data was translated to digital format, via a dedicated microprocessor, and then transferred to the Institute's Prime computer as a binary file. These binary data files are stored in the VIMS "Hydrofile" data base.

Subsequent processing utilized a program ("CTDPRO") to edit and smooth the data, and calculate values of salinity and sigma-t using the UNESCO Practical Salinity Scale (Fofonoff and Millard, 1983). Interpolated values of temperature, conductivity, salinity and sigma-t were obtained at 0.25 meter increments for each station. For the purposes of this report, the values for all stations for each cruise were combined and cross-sectional contours drawn using the software package, SURFACE-II. These are contained in Appendix A. A contour interval of 0.5°C was used for temperature, 1 for salinity and 1 kg/m^3 for sigma-t. The '+' symbol indicates the location of data points used in contouring.

For those cruises where a station was occupied more than once, vertical profiles of salinity, temperature, sigma-t and the Brunt-Vaisala frequency have been drawn to show the time variation of these properties at a given location. These are contained in Appendix B.

Values for dissolved oxygen were determined from the surface and bottom water samples using the Winkler titration method. These are tabulated in Appendix C.

IV. RESULTS

A. CROSS-SECTIONAL ISOLINES

In general, this section of the Chesapeake Bay shows a seasonal variation in the degree of stratification, the summer months exhibiting markedly more stratification than the winter. This is especially apparent in 1982 where low levels of stratification persisted until late April. Two weeks later, on the 5 May (Cruise # 9) a strong pycnocline had developed and remained throughout May and early June. It was observed again in August of that year. Unusually destratified conditions occurred in June 1982, as was also noted by Goodrich (1985). A similar sequence was seen in 1983. The summer pycnocline was established by late May (Cruise # 26) and persisted throughout the summer and early fall, at least until 20 September (Cruise # 34). A decrease in stratification was observed in October and on November 1 (Cruise # 37) almost completely destratified conditions prevailed.

Throughout 1982 and 1983 a marked lateral variability in both the salinity, temperature and density can be seen. The shallower areas near the shore exhibit less vertical stratification at all times. Additionally, the freshest and least dense water is generally located on the western side of the bay. The tilt of the isopycnals, if it occurs, is in accordance with that expected due to the influence of the coriolis force. At times, the water over the western shoal is bounded by a

region of strong salinity gradient and almost vertical isopycnals - see especially Cruise #'s 16 and 17 (December 1982) and 38 (November 1983). More generally the isopycnals slope gradually downward from east to west, the pycnocline intersecting the bed near station 4 in 5 to 10 meters of water, and breaking the surface in the vicinity of stations 13, 14 and 15 (eg. Cruise #'s 6, 9, 30, 32). Frequently, a lens of fresher water occupies the surface layer to the western side of the main channel.

B. VERTICAL PROFILES

The temporal variation in vertical structure at Station 7, plus on one occasion that at Stations 4, 8, 10 and 13, is illustrated in Appendix B. The stations were sampled between 1 and 3 hours apart. At times a marked change in the vertical density profile was observed (see, for example, Cruise #'s 37 and 39), although more usually conditions remained relatively constant. Consideration of the time of sampling in relation to the tidal cycle on that day is needed for further interpretation of these plots.

C. SURFACE AND BOTTOM DISSOLVED OXYGEN

Surface and bottom water samples were collected on 30 of the cruises. The values show both a seasonal and spatial (laterally across the bay) variability.

V. REFERENCES

Browne, D. and C. Fisher, 1986, Chesapeake Bay Circulatory Survey Report 1981-1983, N.O.S. Ocean Circulation Survey Report #8, National Oceanic and Atmospheric Administration, 70pp.

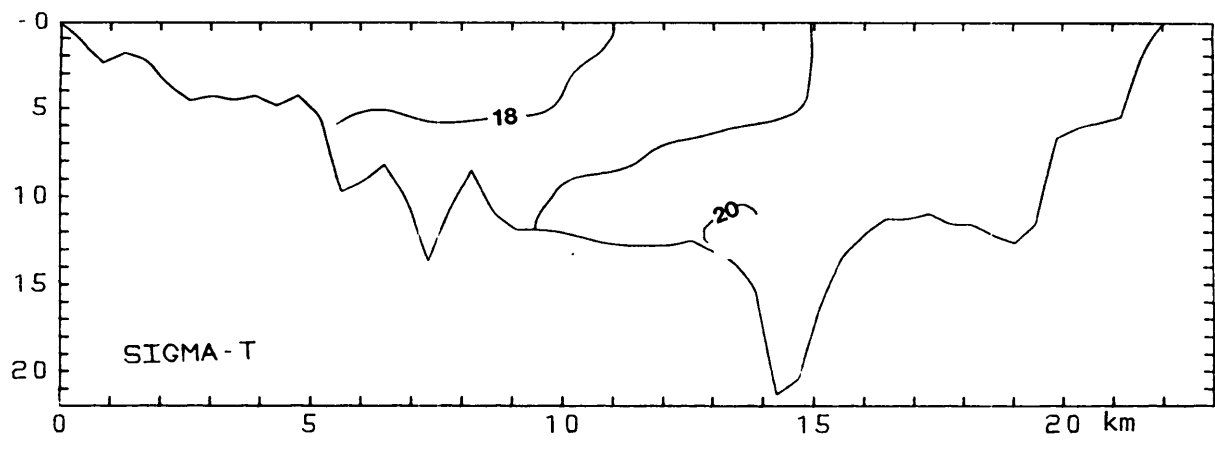
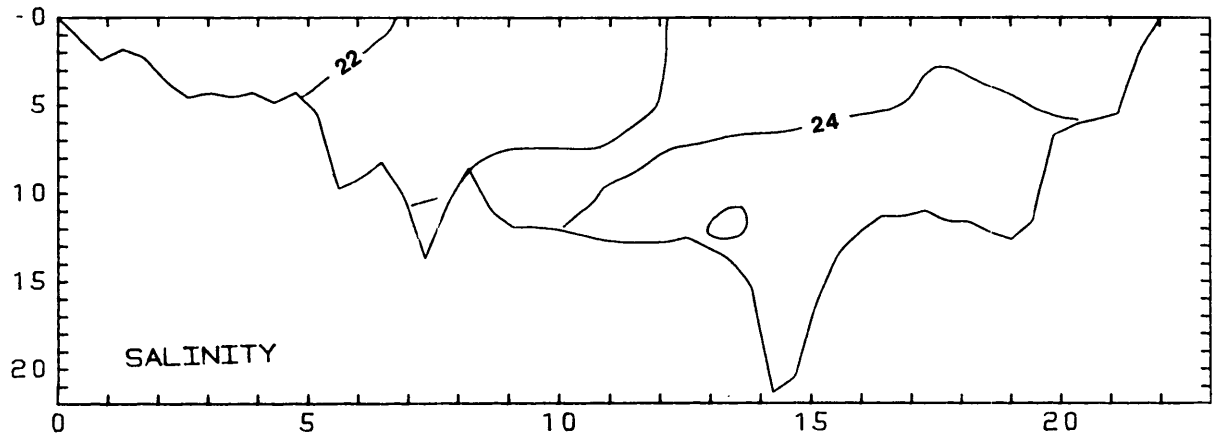
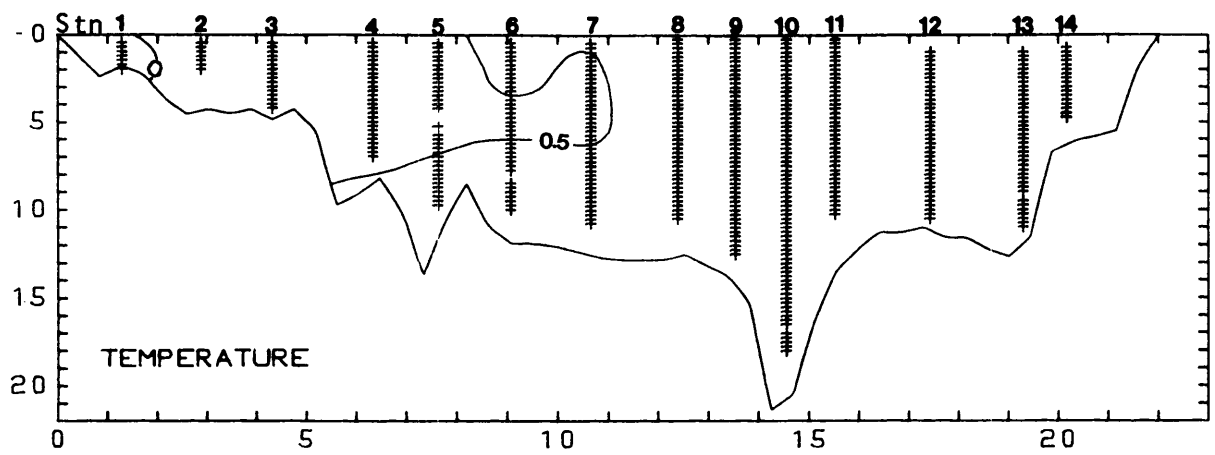
Fofonoff, N. P. and R. C. Millard, Jr., 1983, Algorithms for computation of fundamental properties of seawater, UNESCO Technical Papers in Marine Science, # 44.

Goodrich, D. M., 1985, On stratification and wind-induced mixing in the Chesapeake Bay, PhD dissertation, State University of New York.

U. S. Dept of Commerce, 1982/83, Tidal Current Tables, Atlantic Coast of North America, National Ocean Service, Rockville, Maryland.

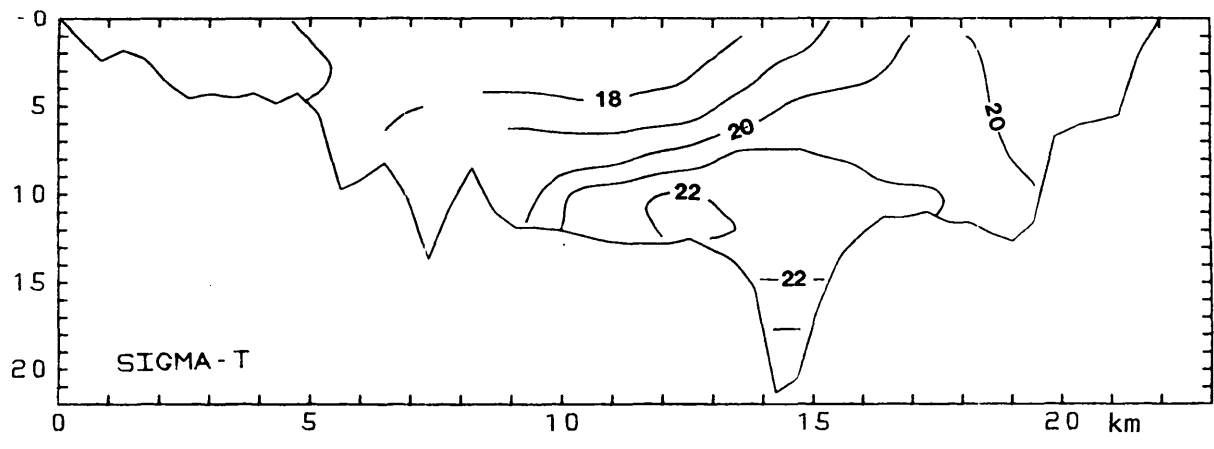
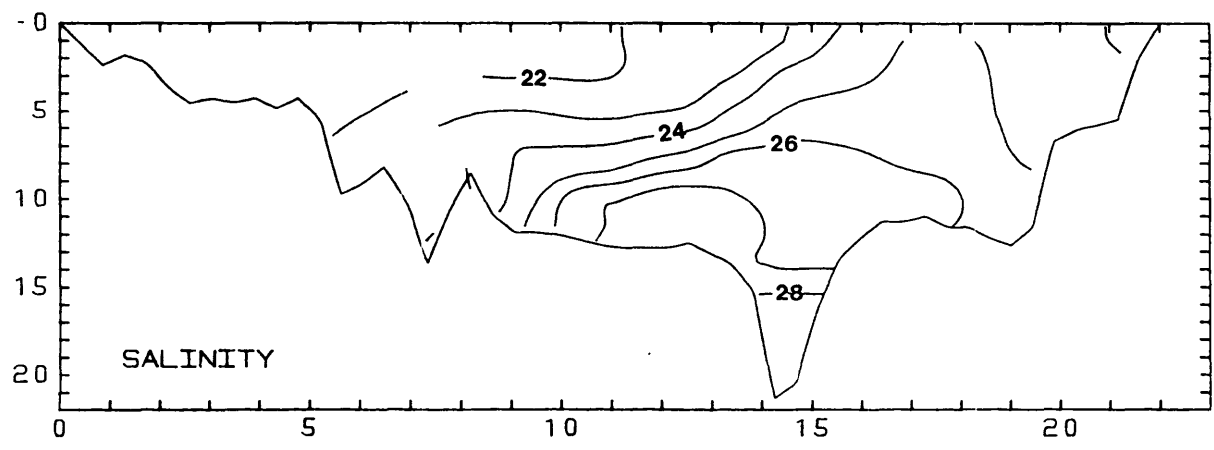
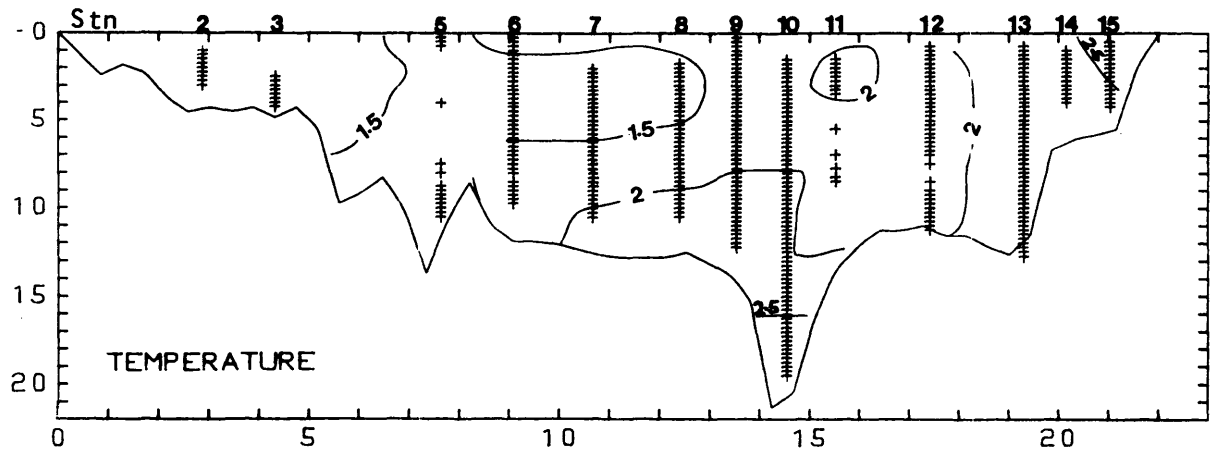
APPENDIX A

Cross-sectional isolines



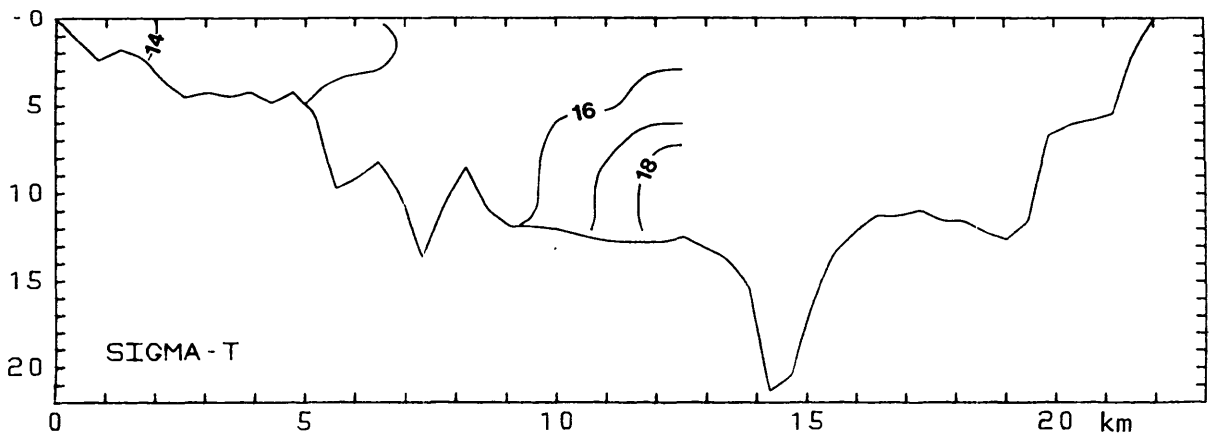
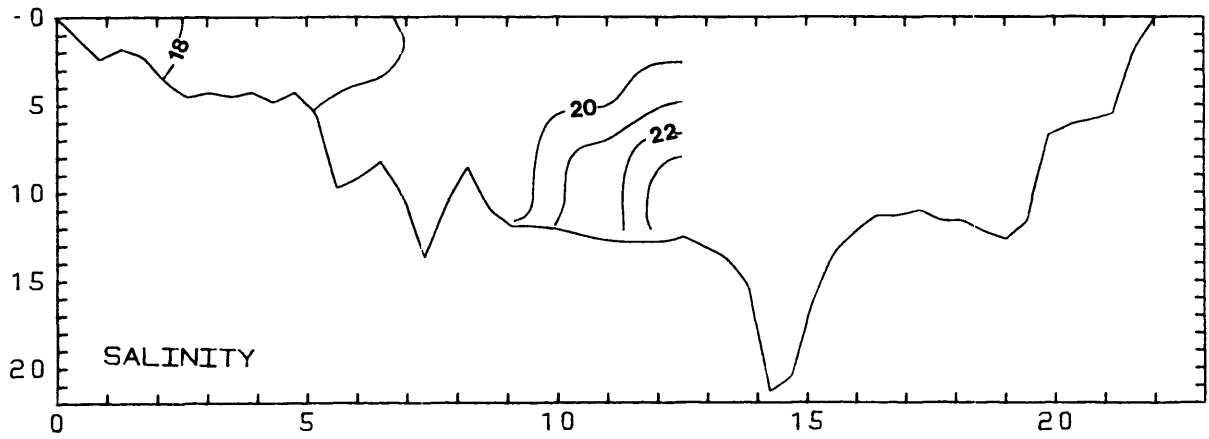
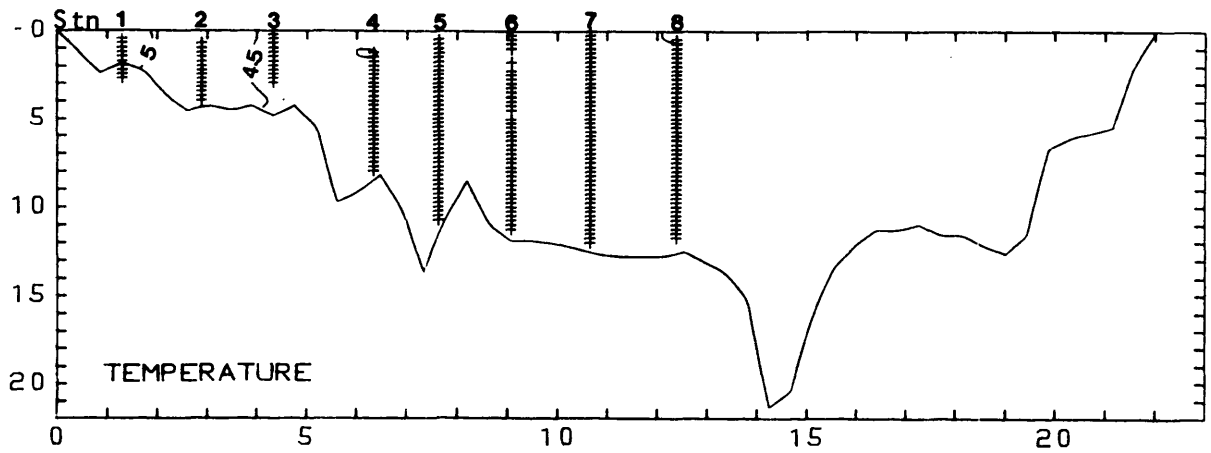
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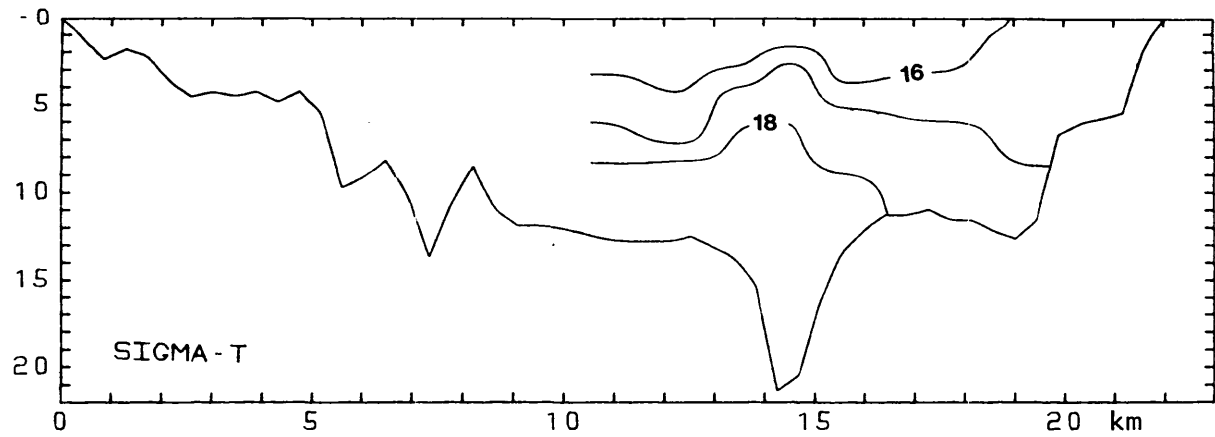
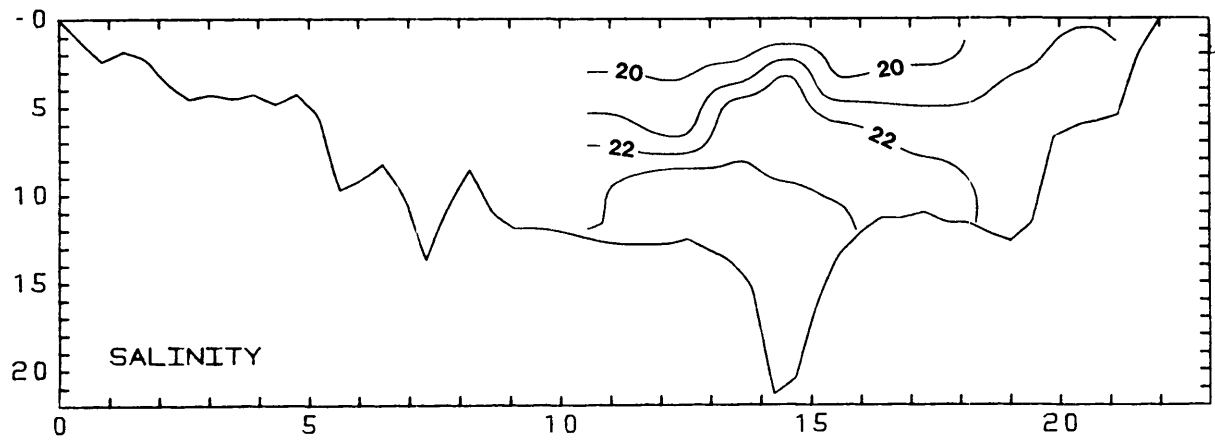
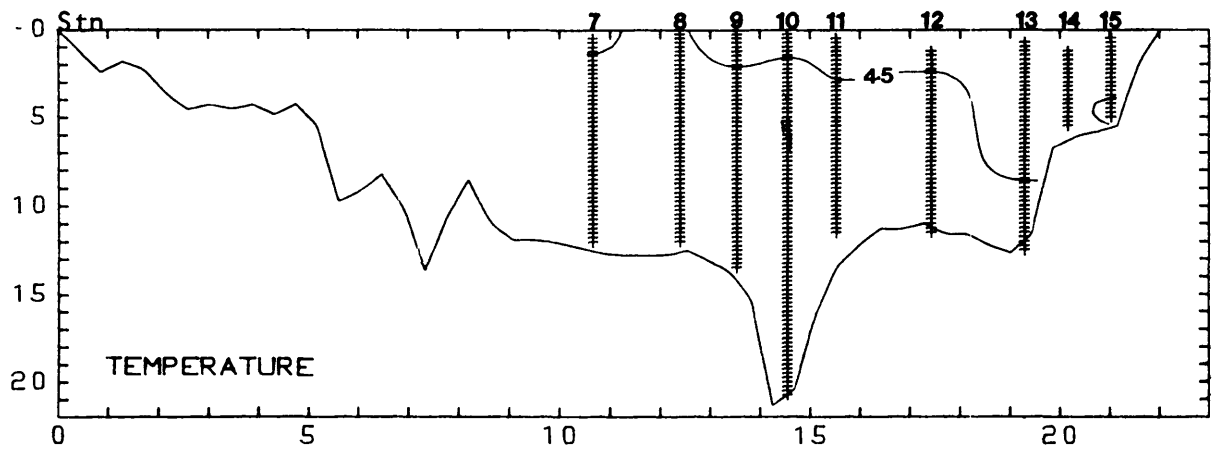
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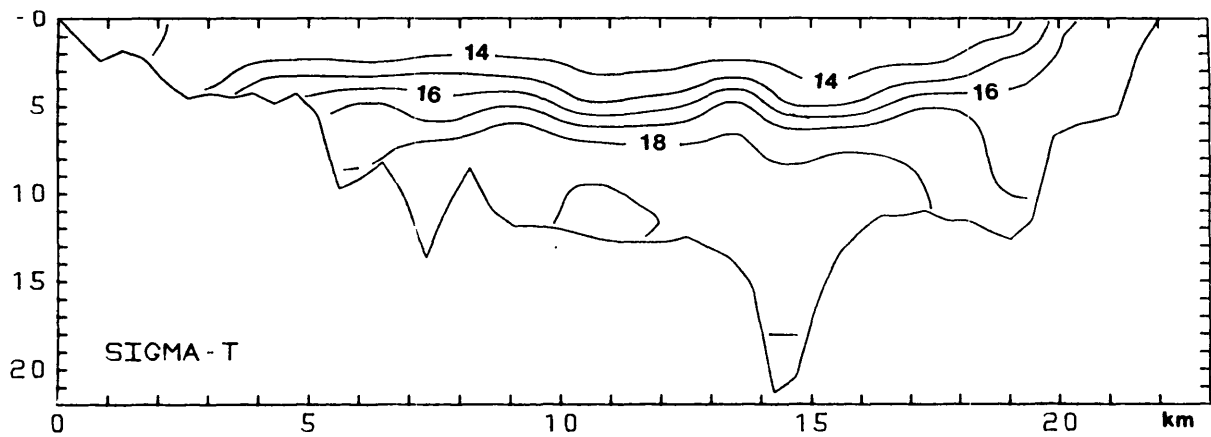
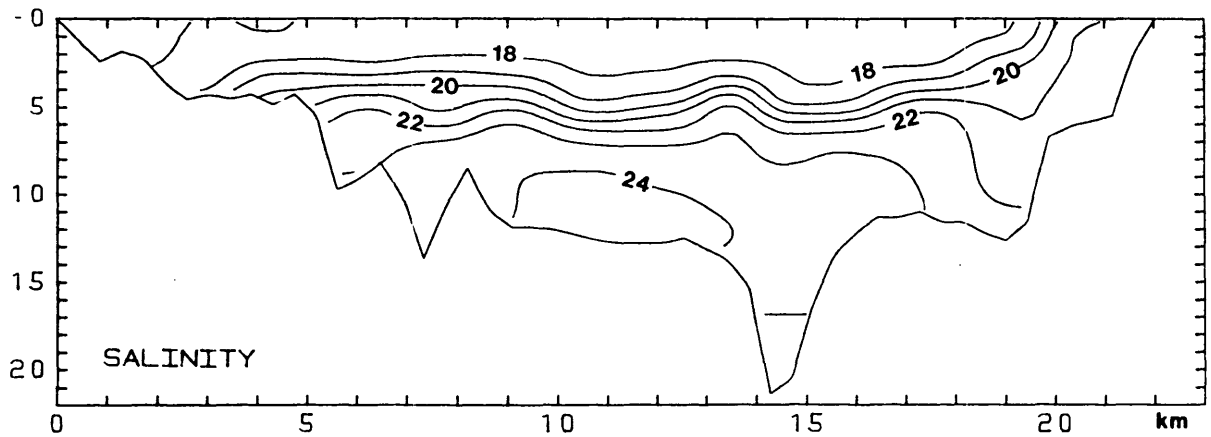
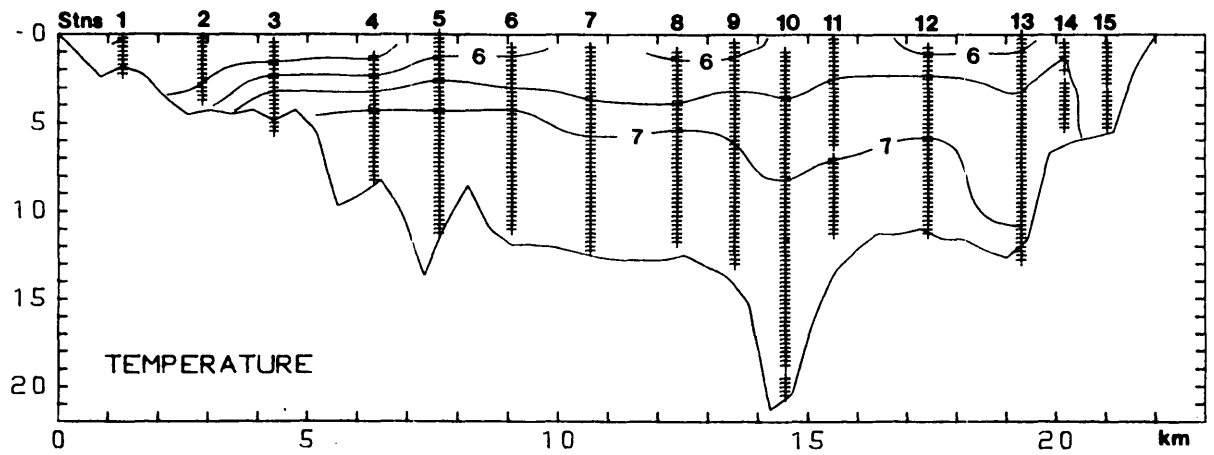
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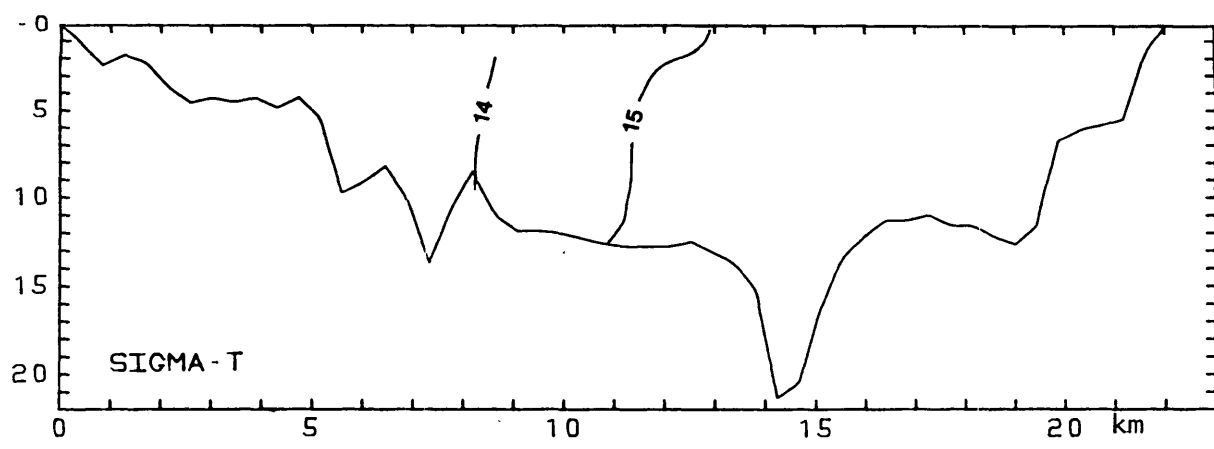
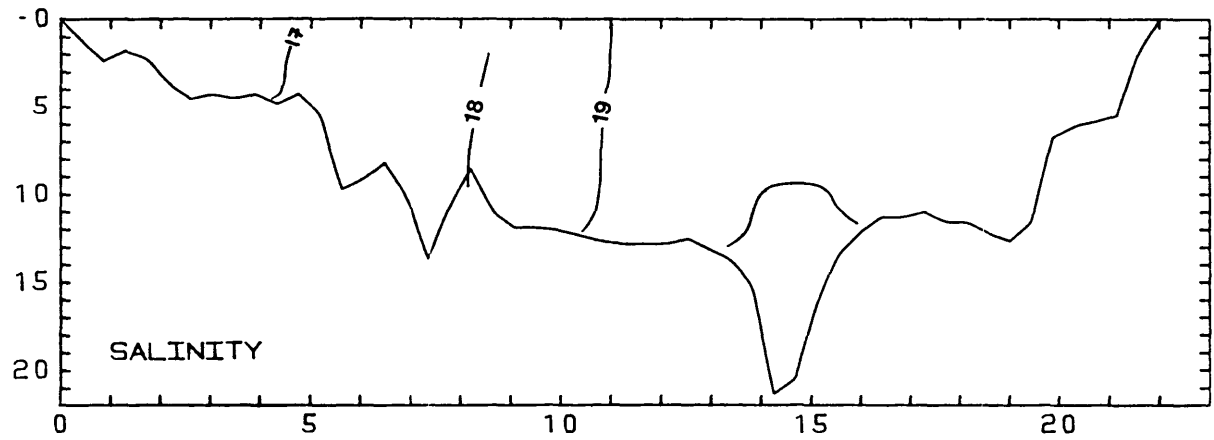
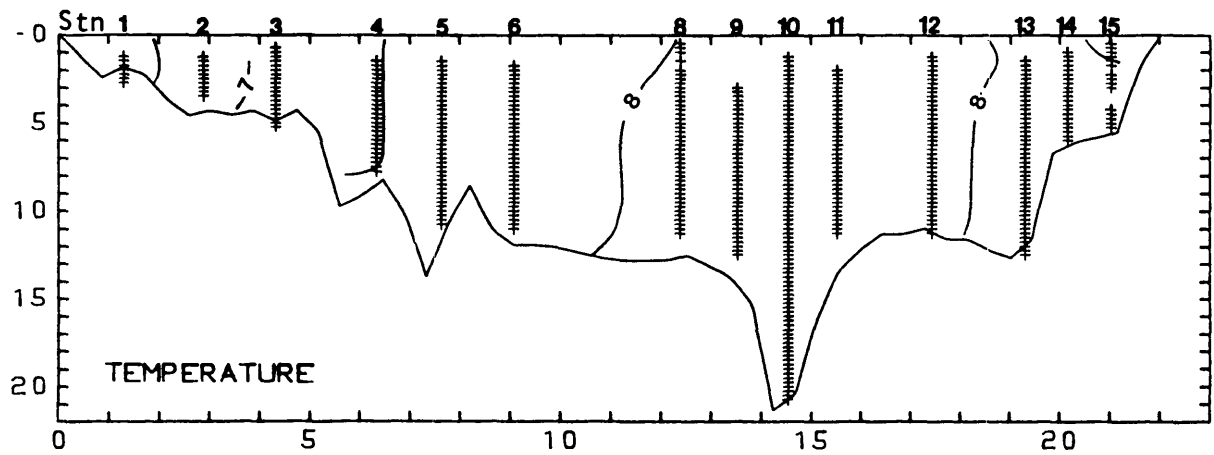
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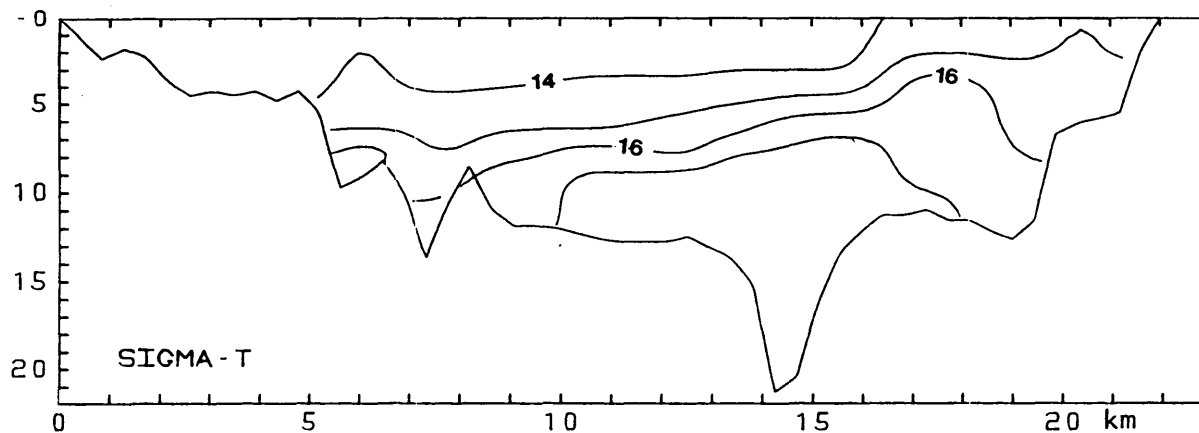
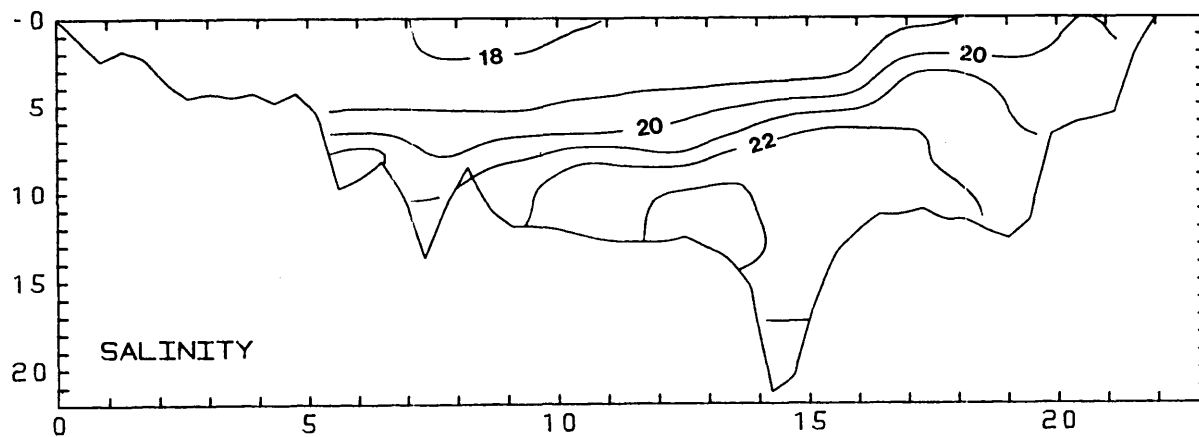
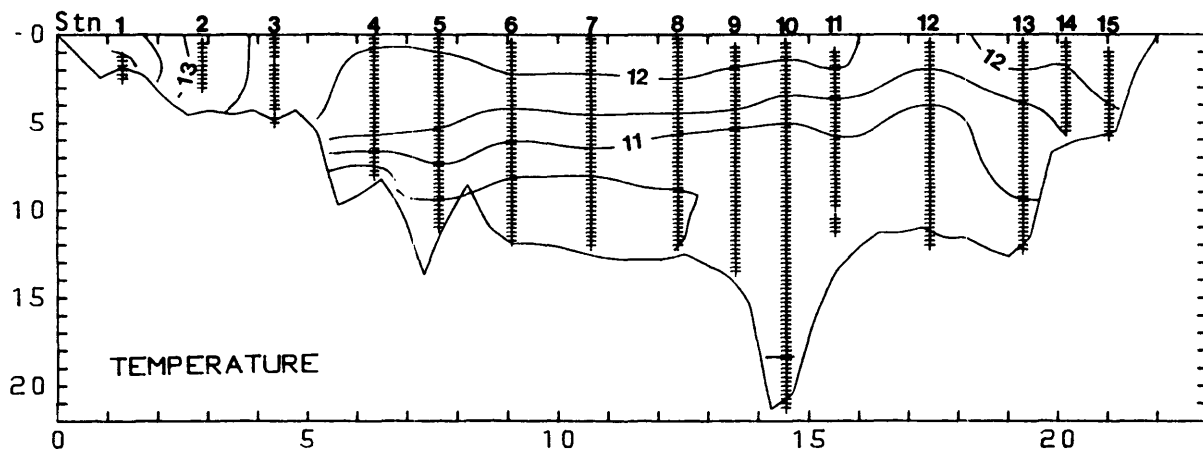
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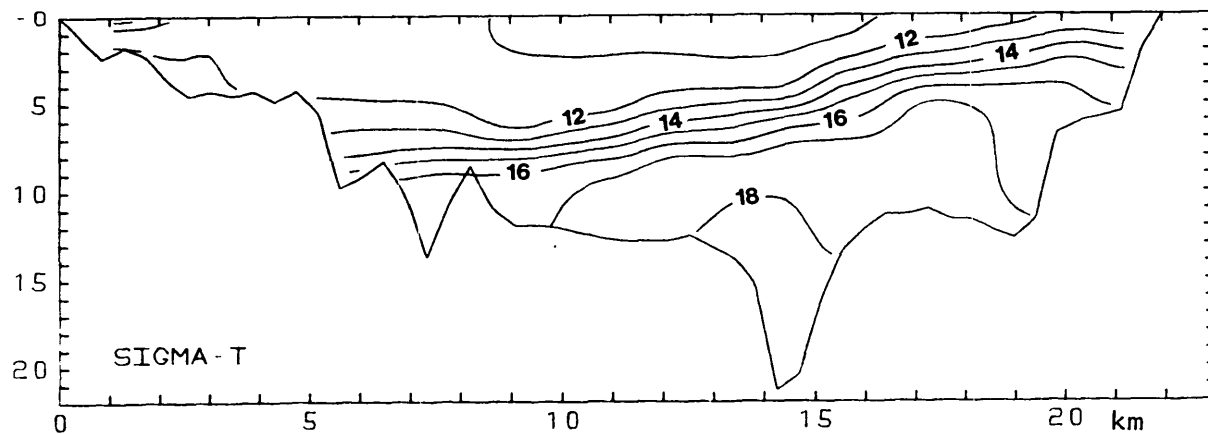
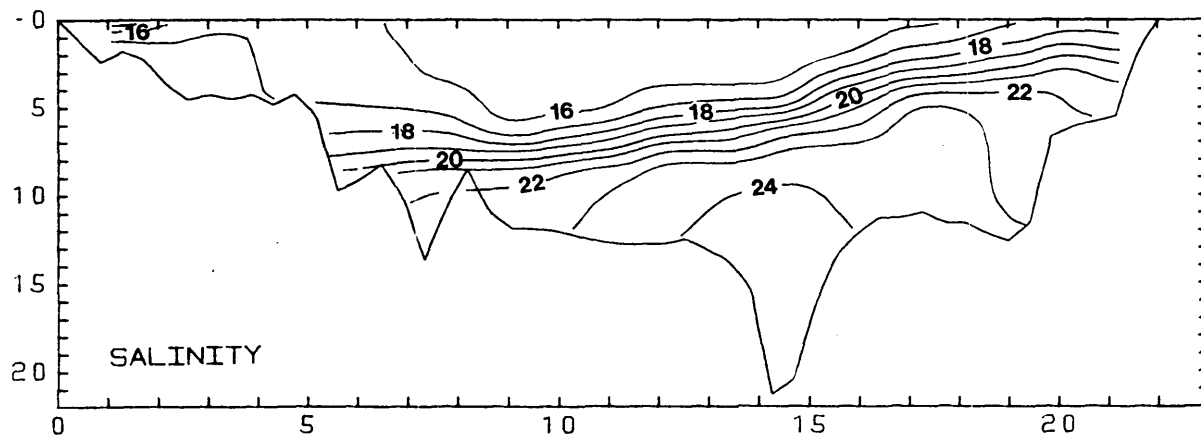
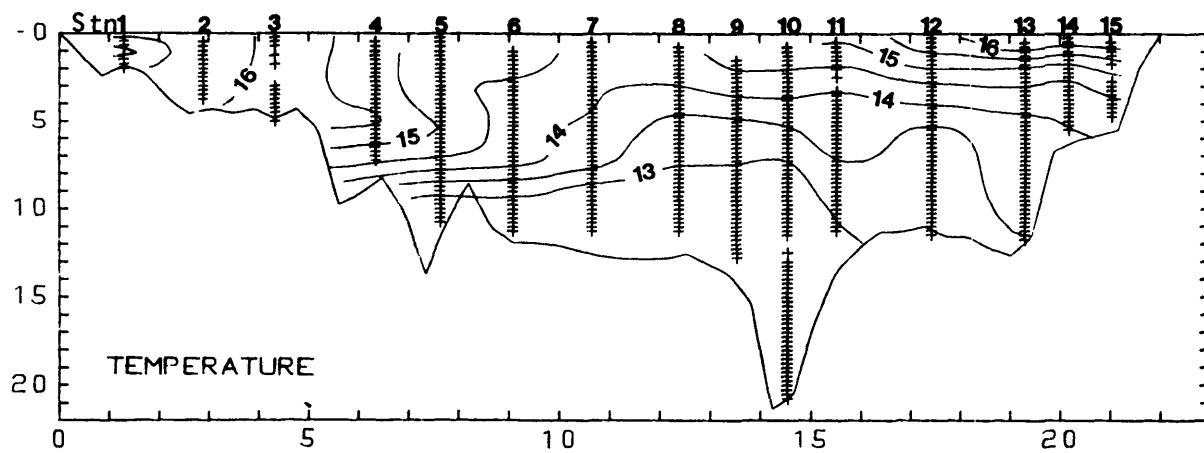
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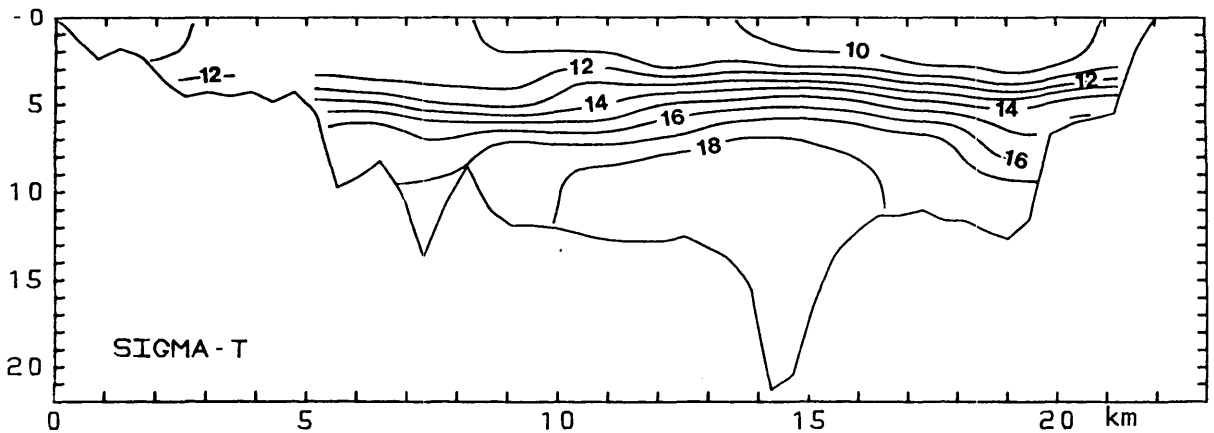
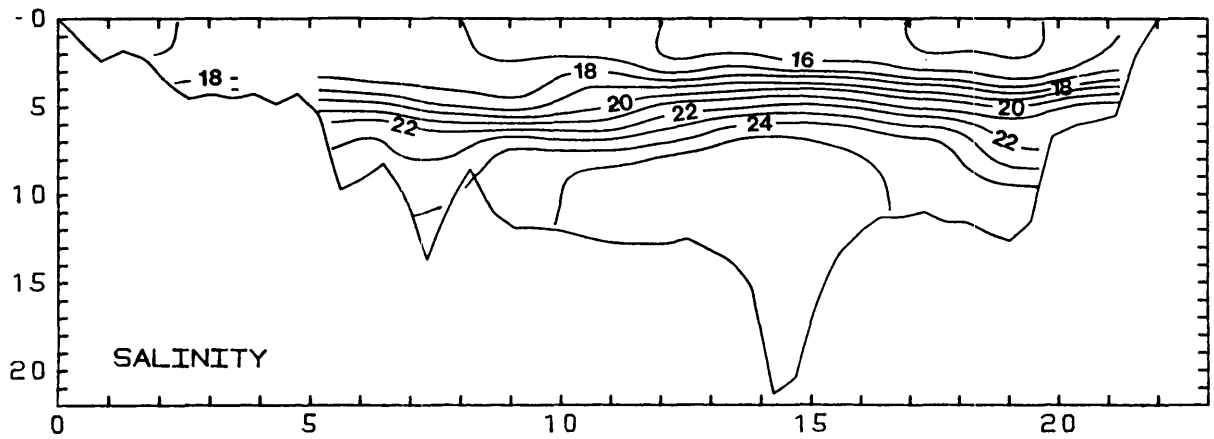
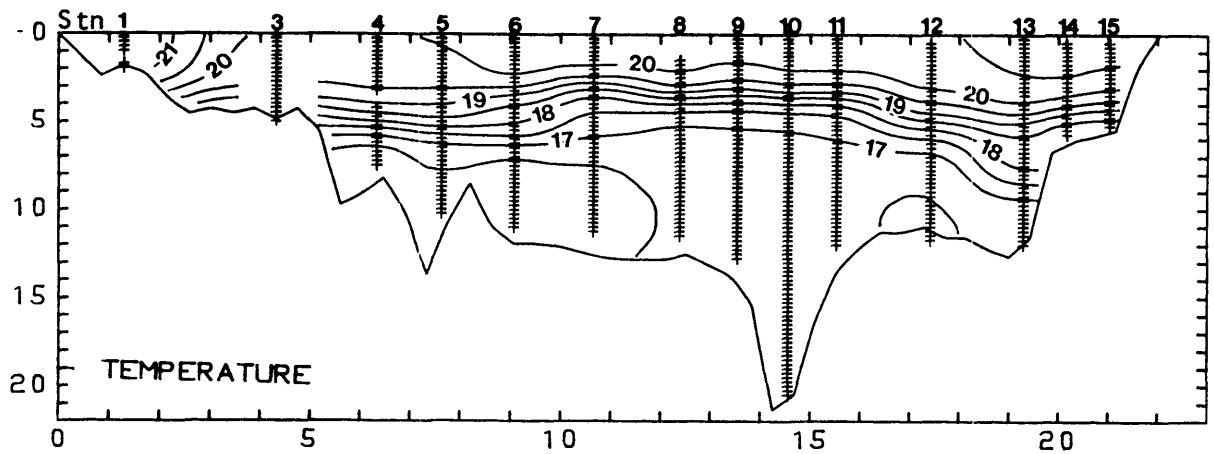
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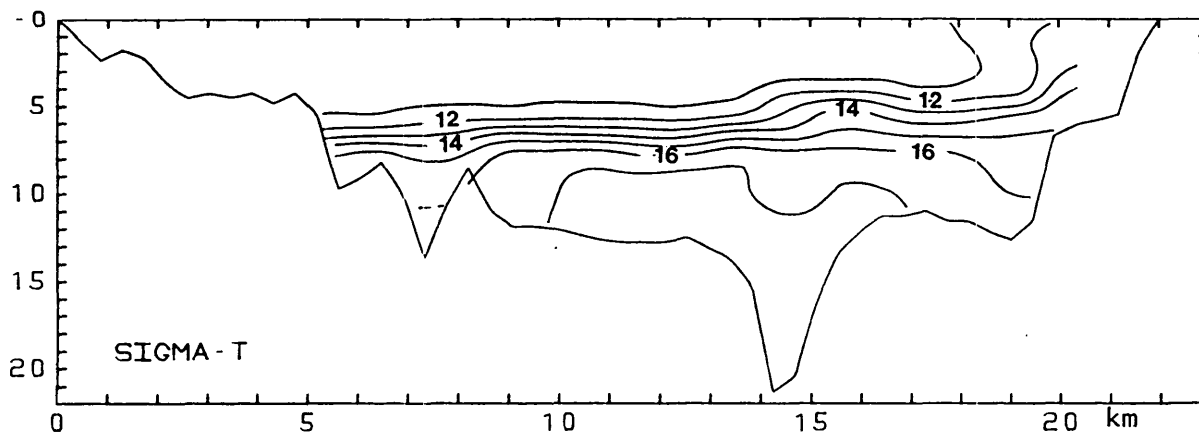
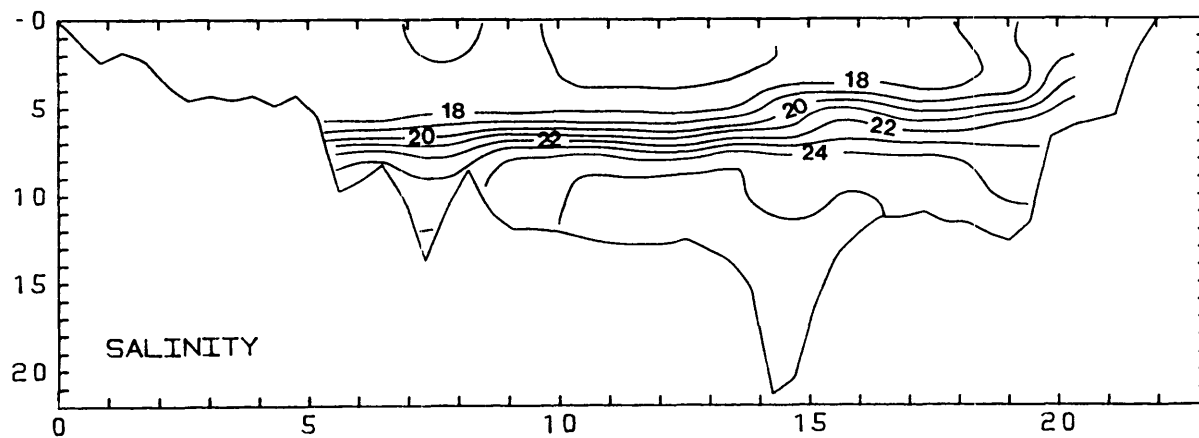
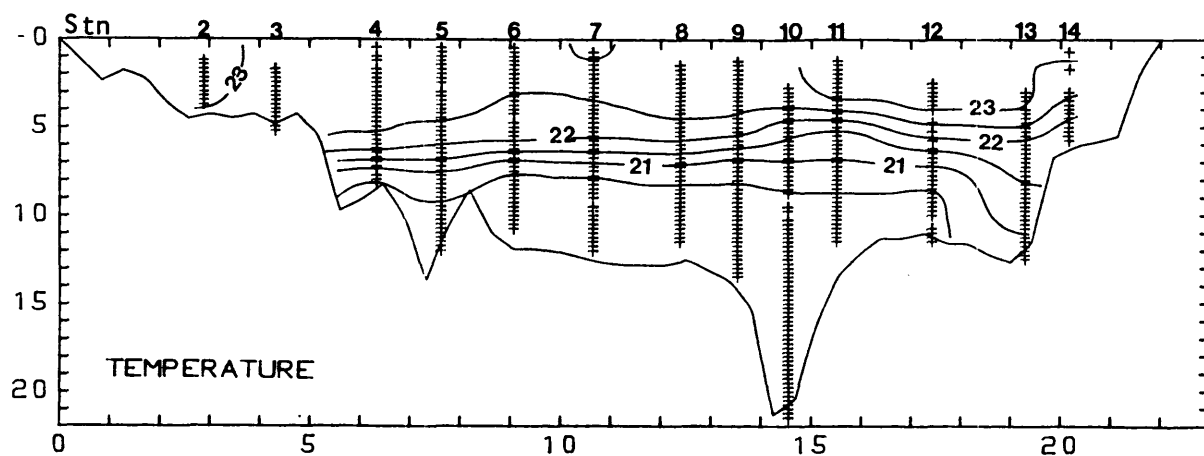
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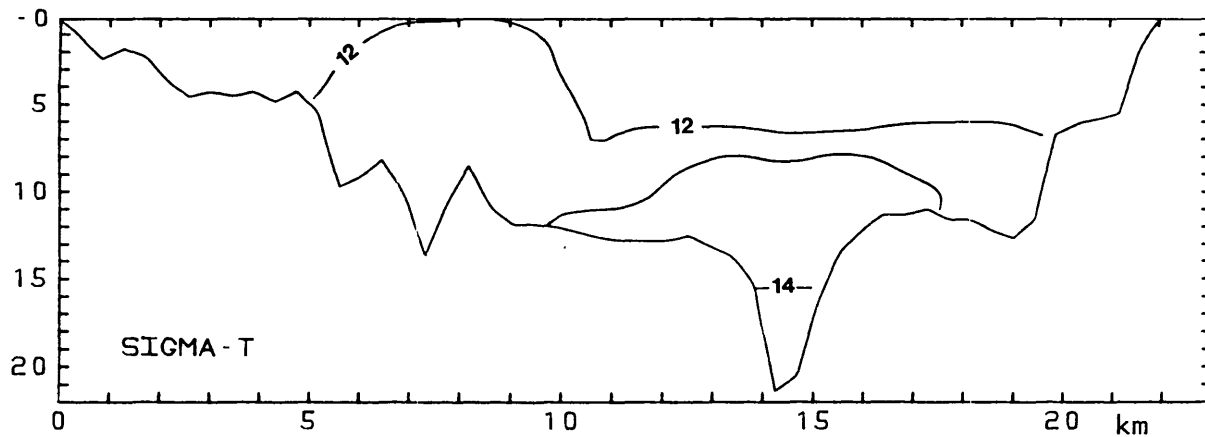
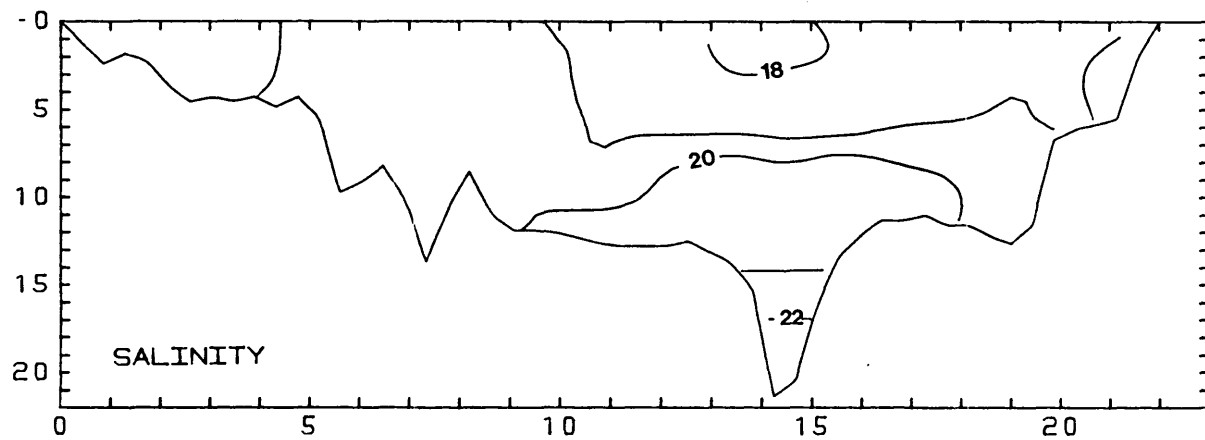
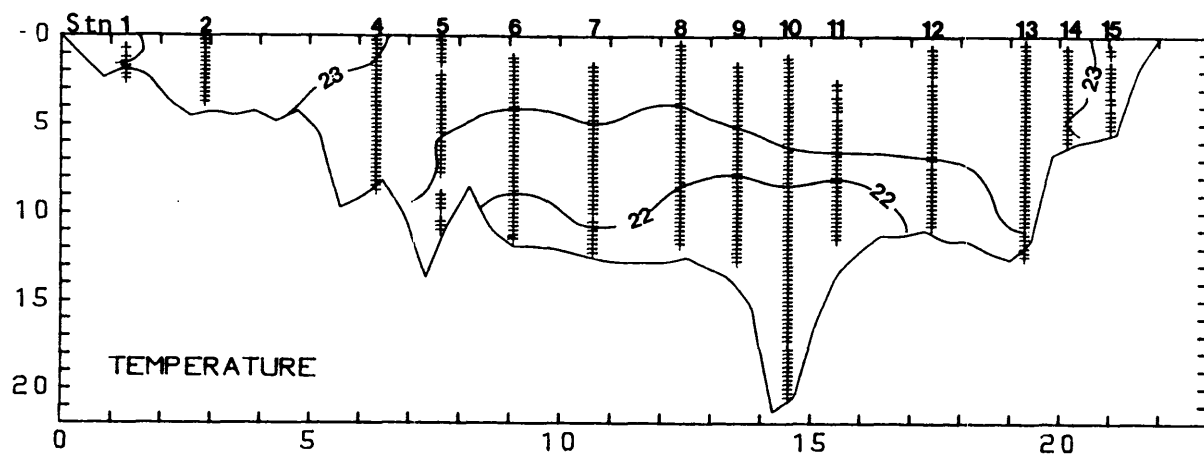
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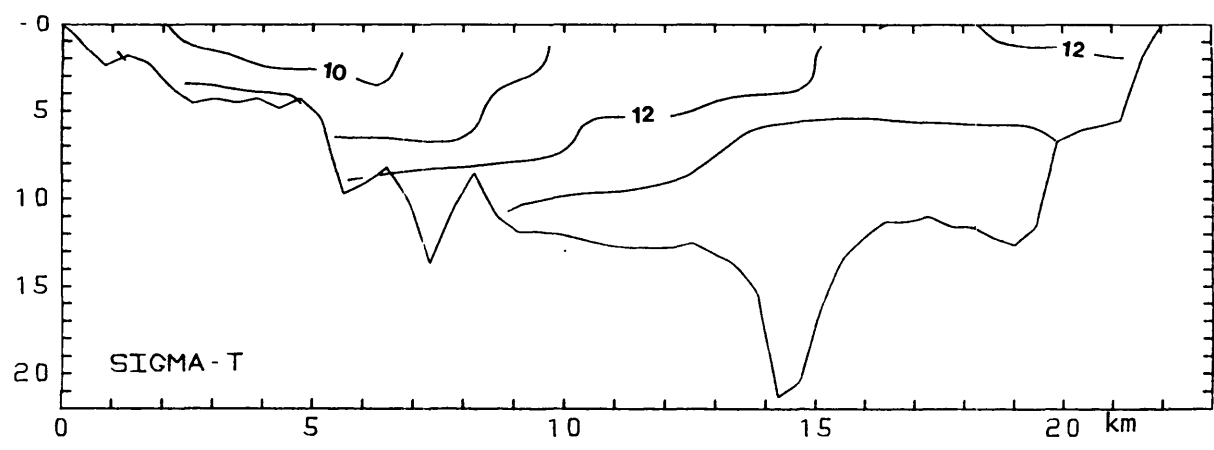
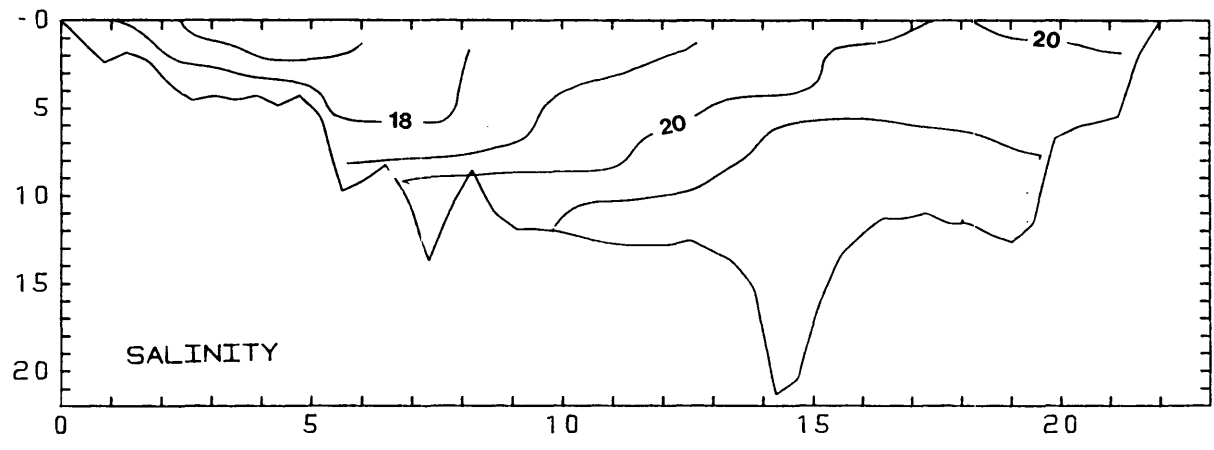
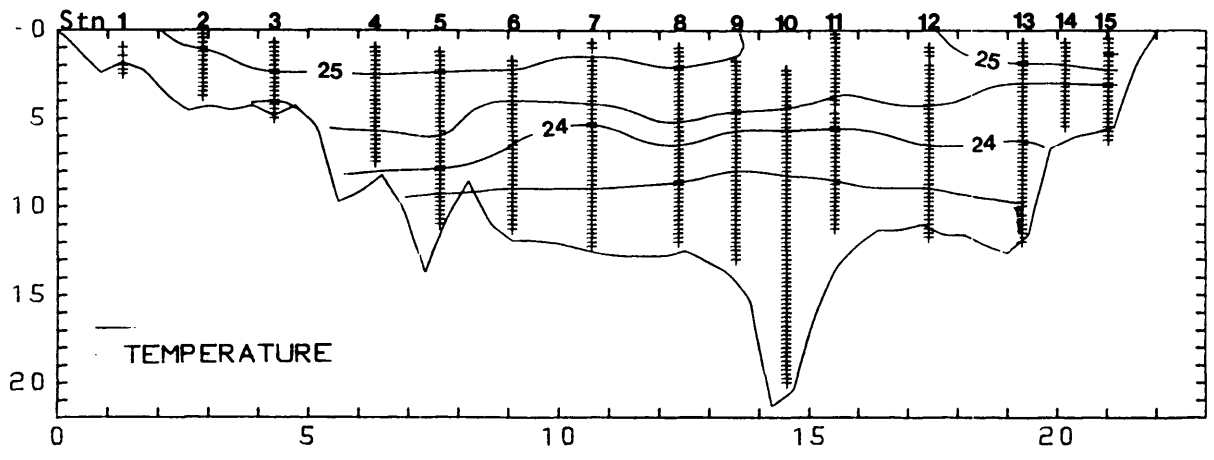
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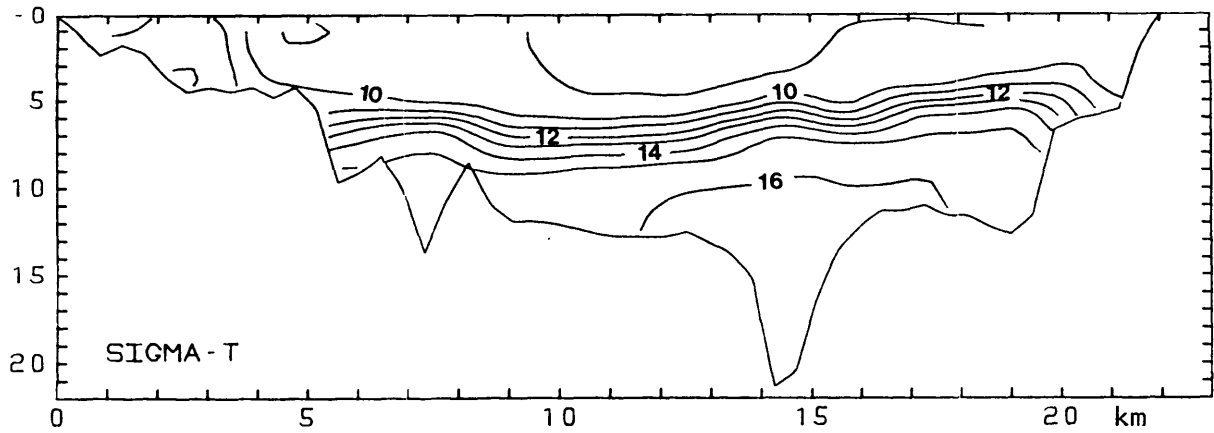
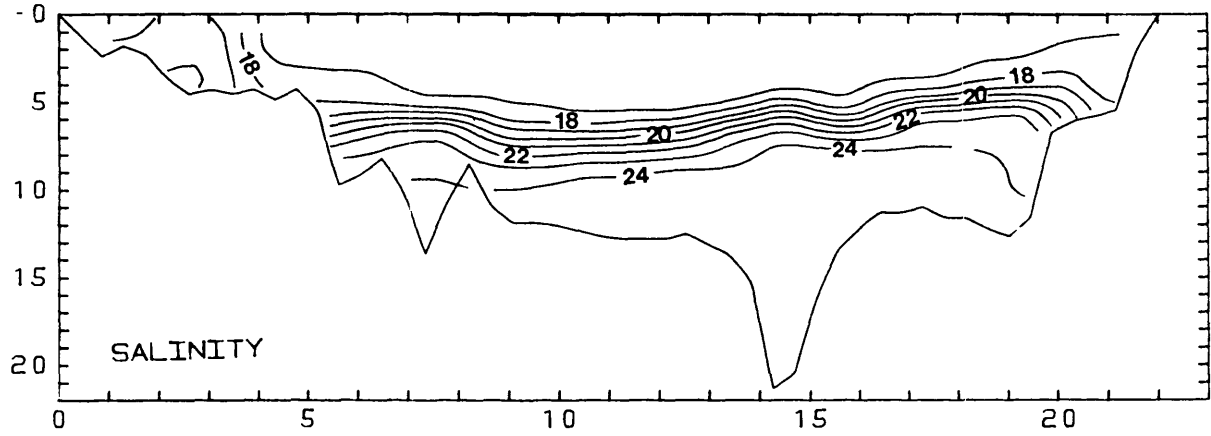
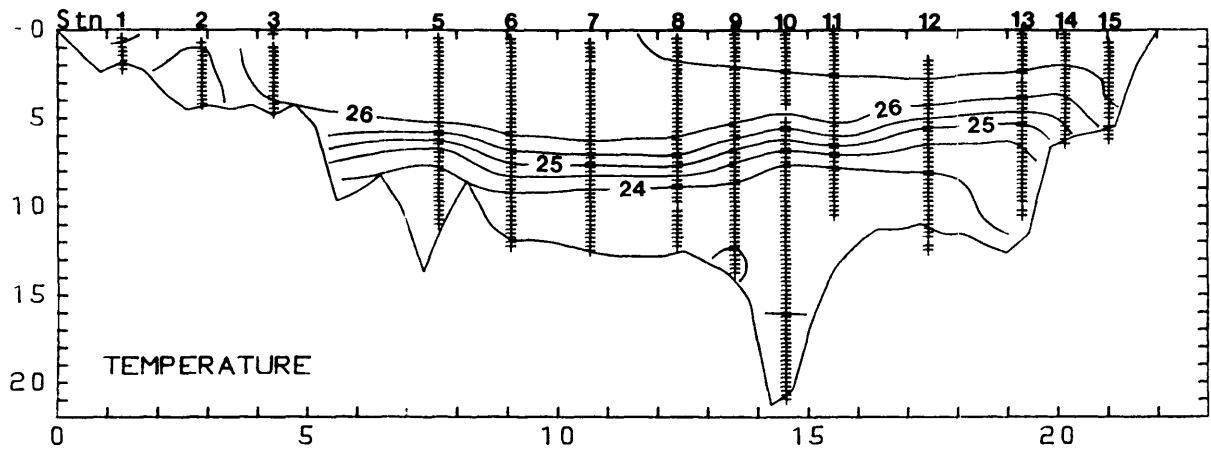


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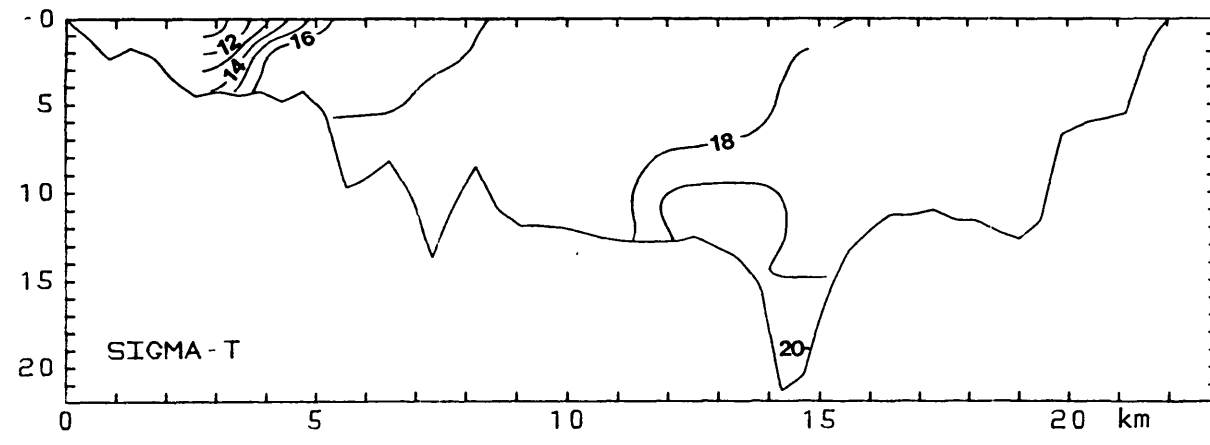
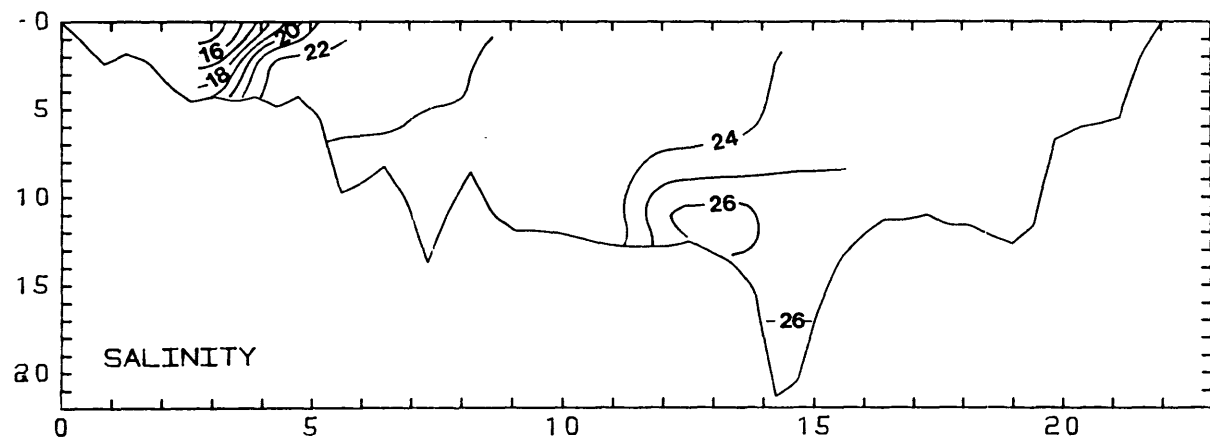
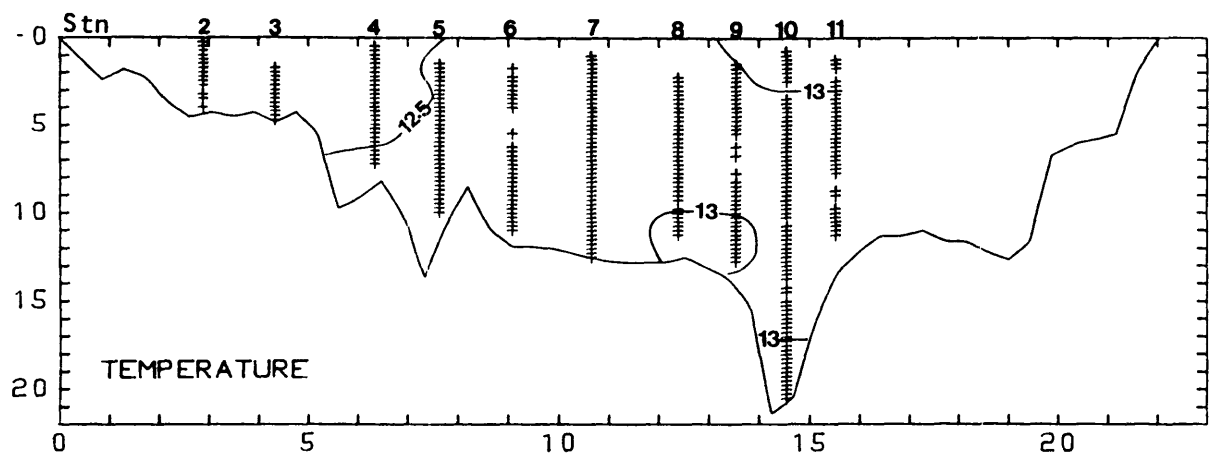


CRUISE #: 13 DATE: 30 JUNE 1982



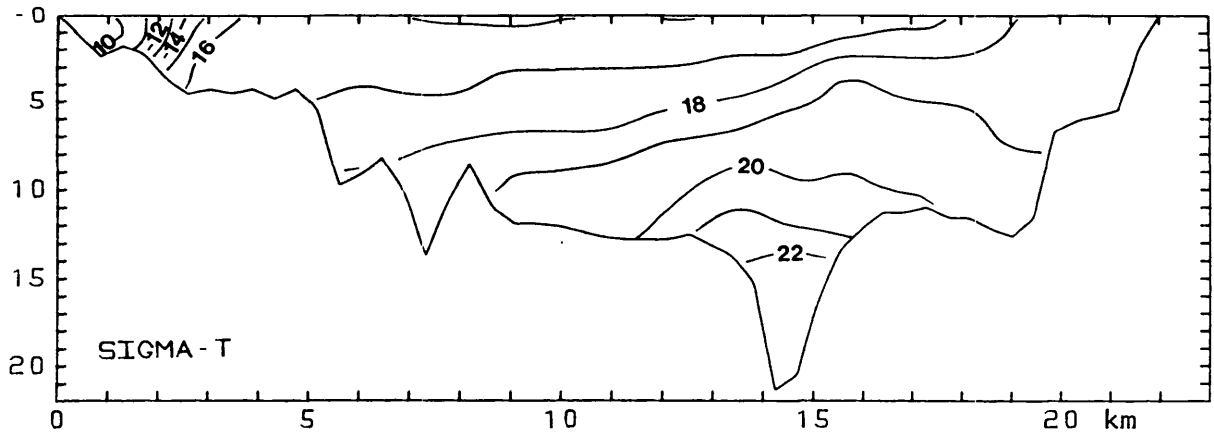
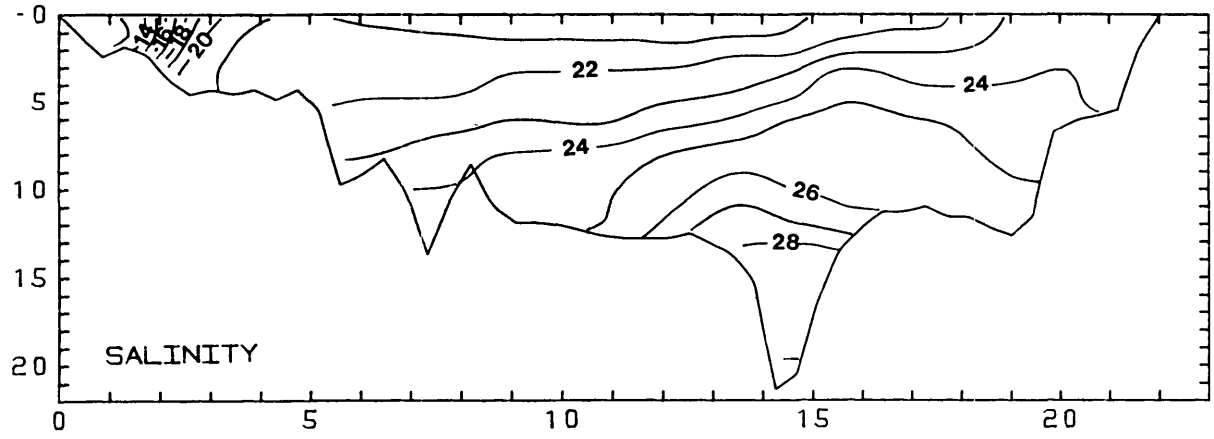
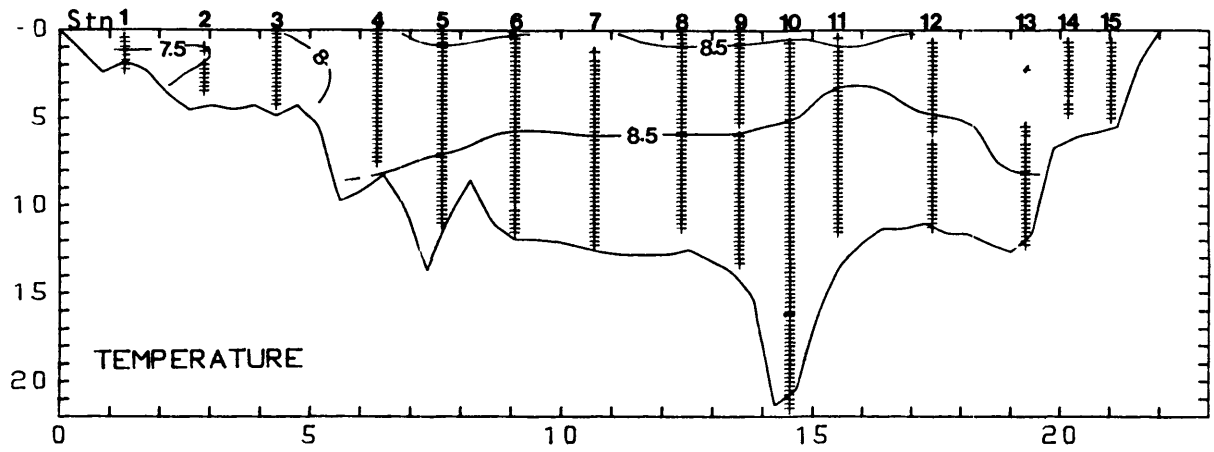
CRUISE #: 14

DATE: 5 AUGUST 1982



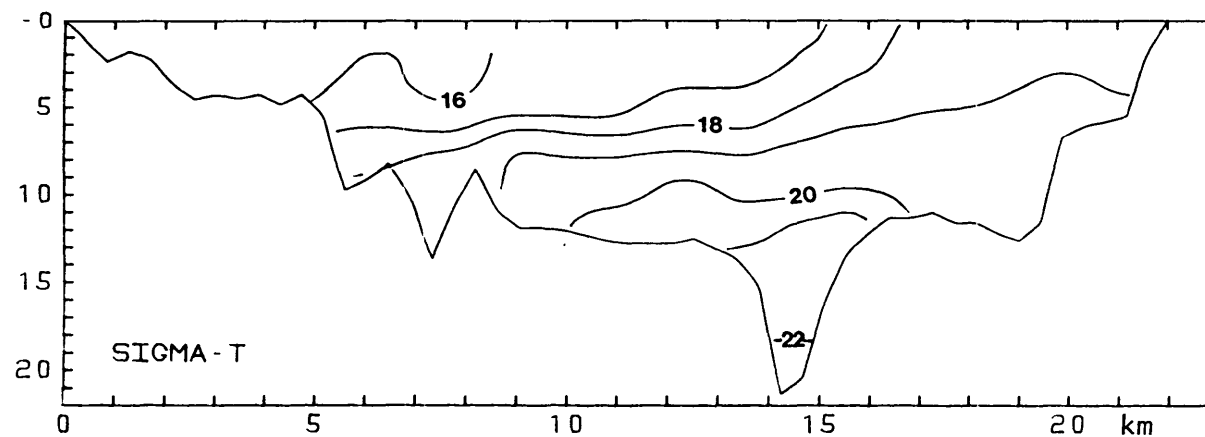
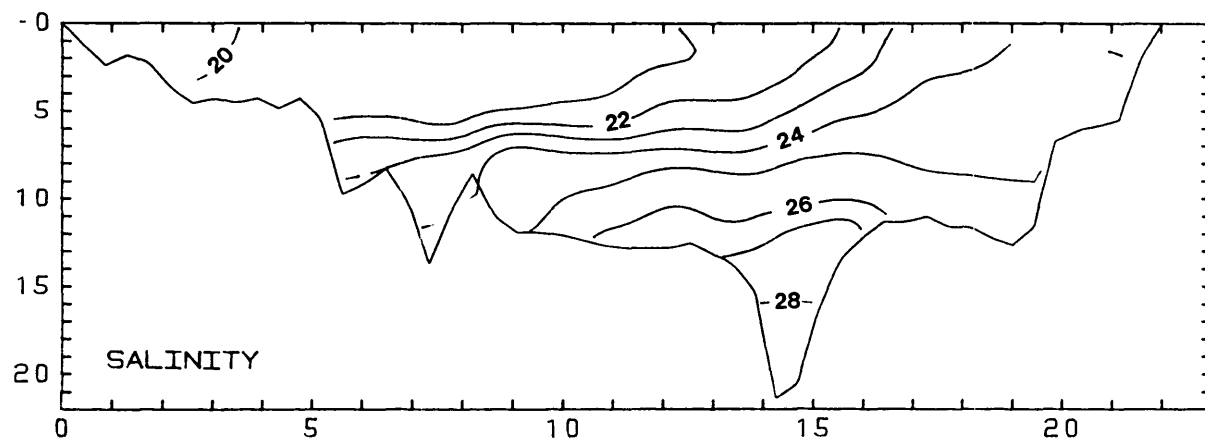
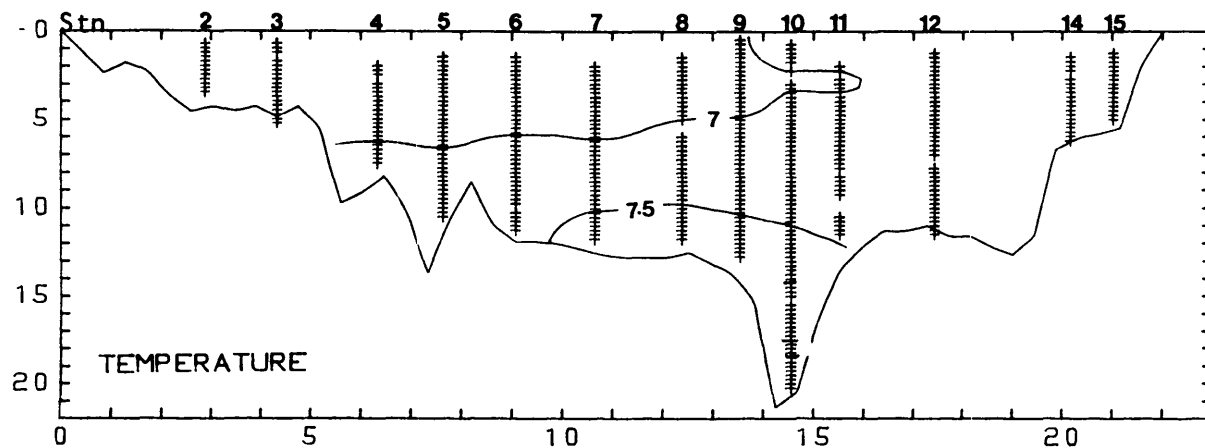
CRUISE #: 16

DATE: 16 NOVEMBER 1982



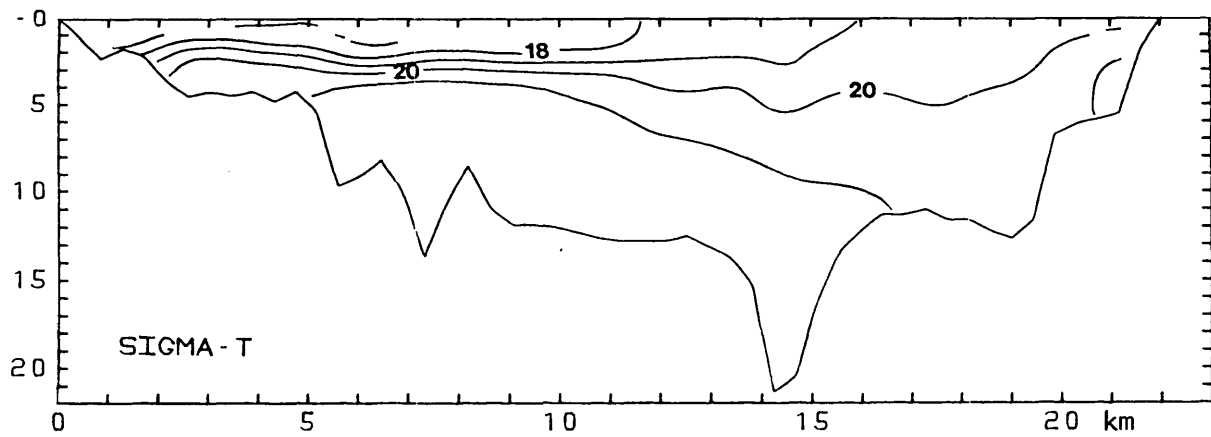
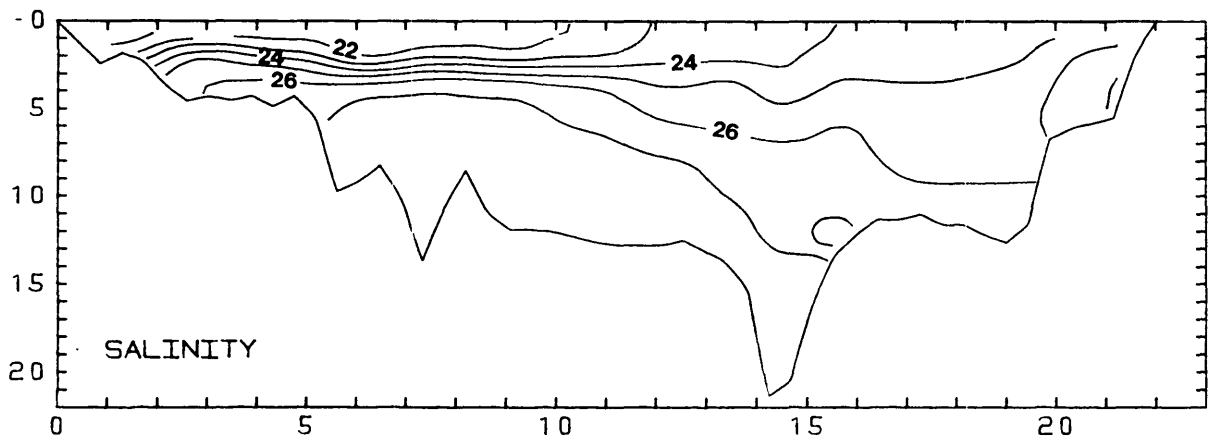
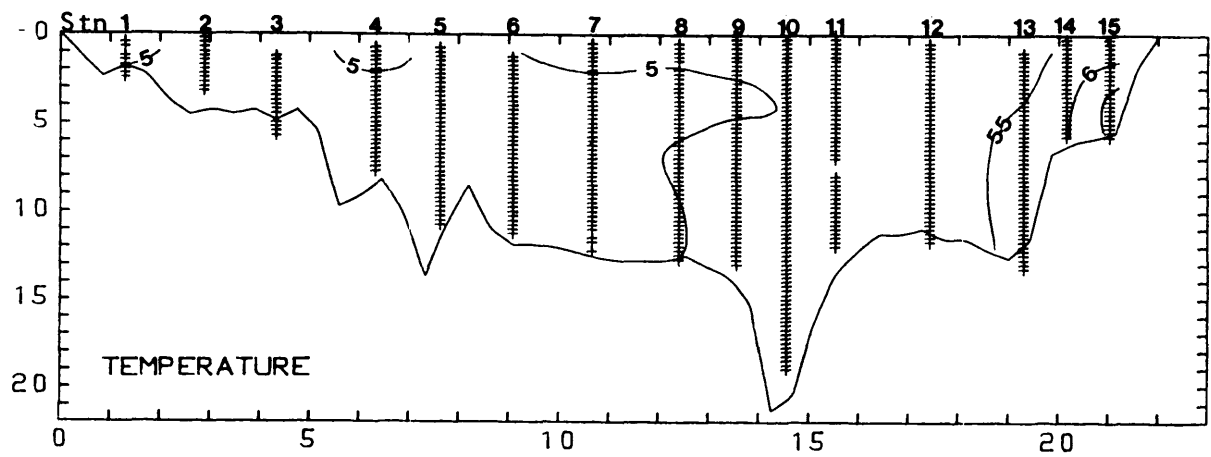
CRUISE #: 17

DATE: 15 DECEMBER 1982



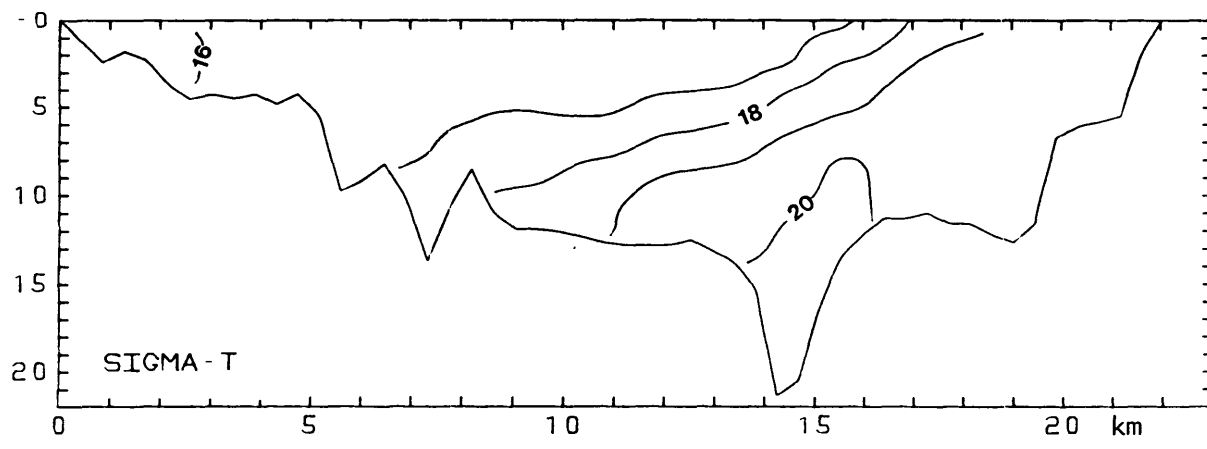
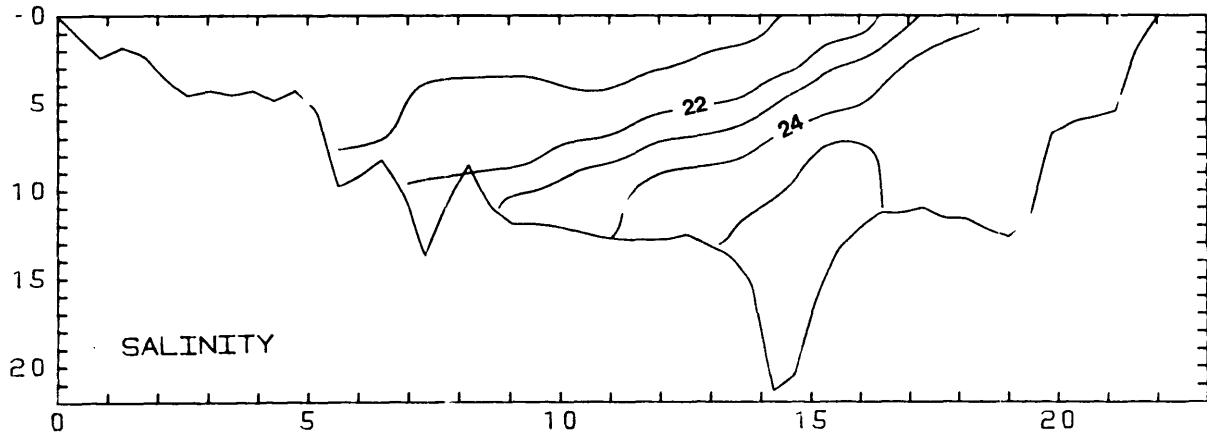
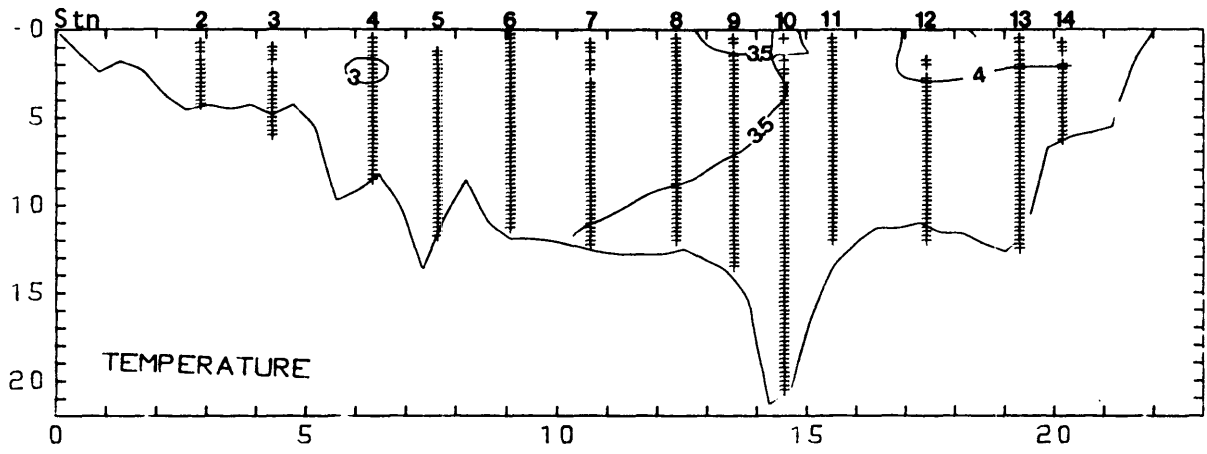
CRUISE #: 18

DATE: 6 JANUARY 1983



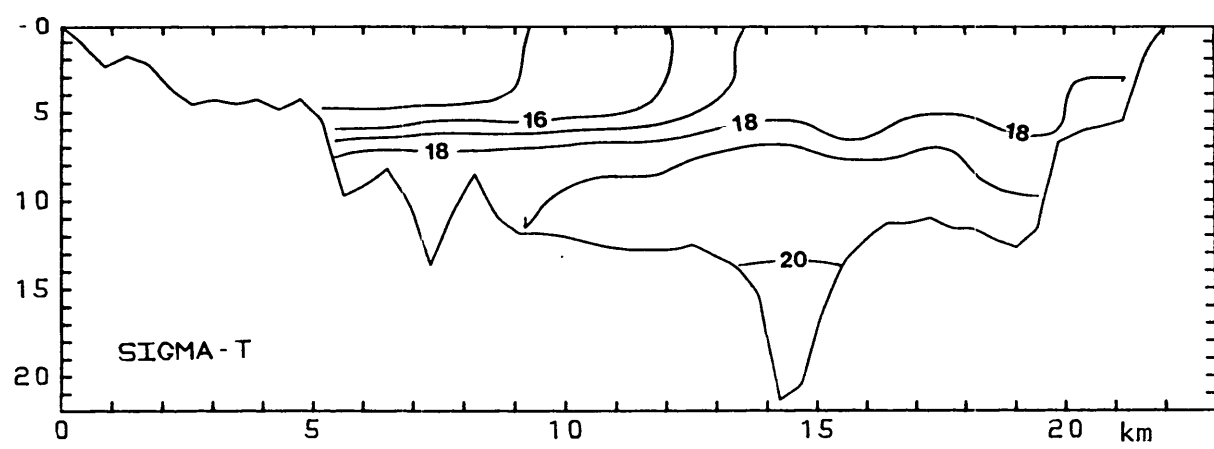
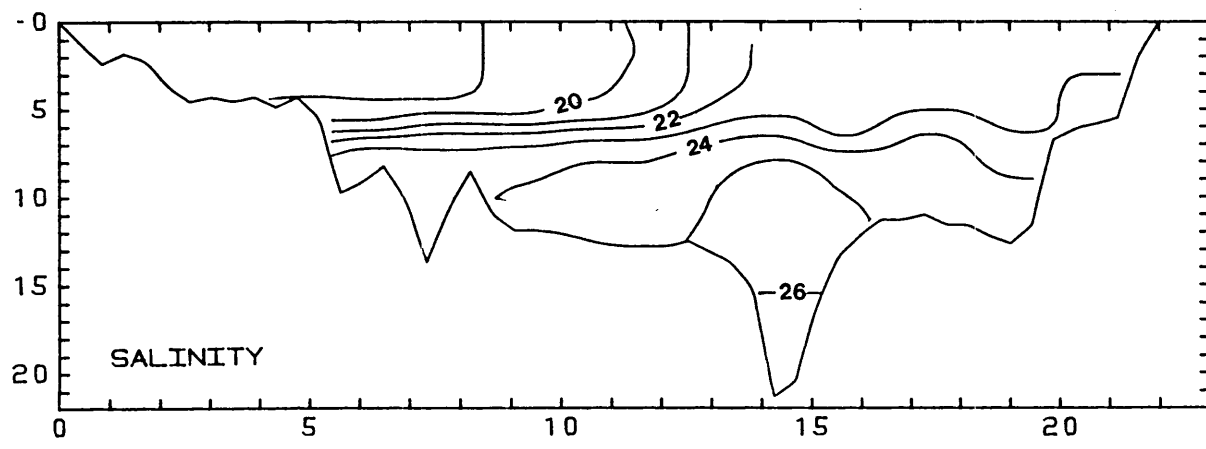
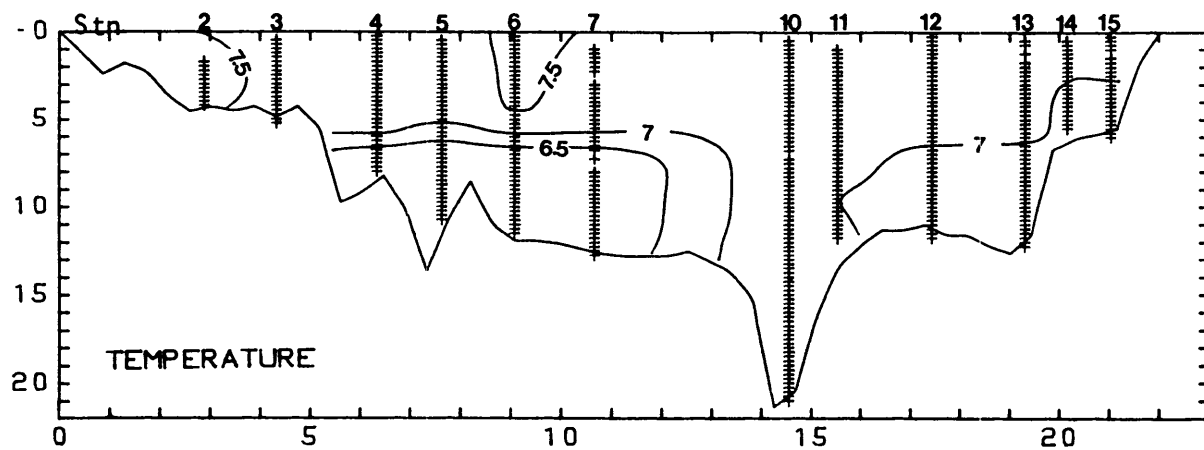
CRUISE #: 20

DATE: 3 FEBRUARY 1983



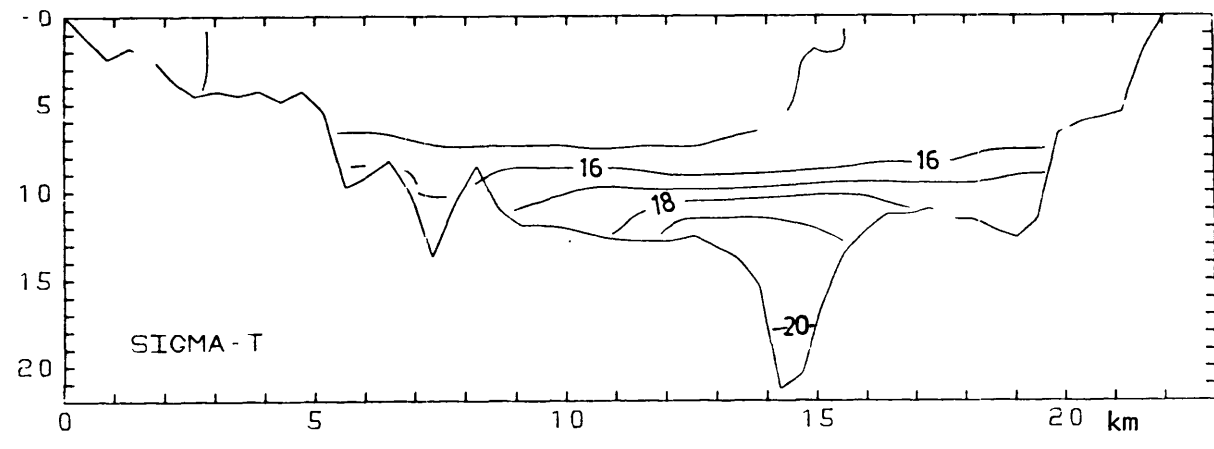
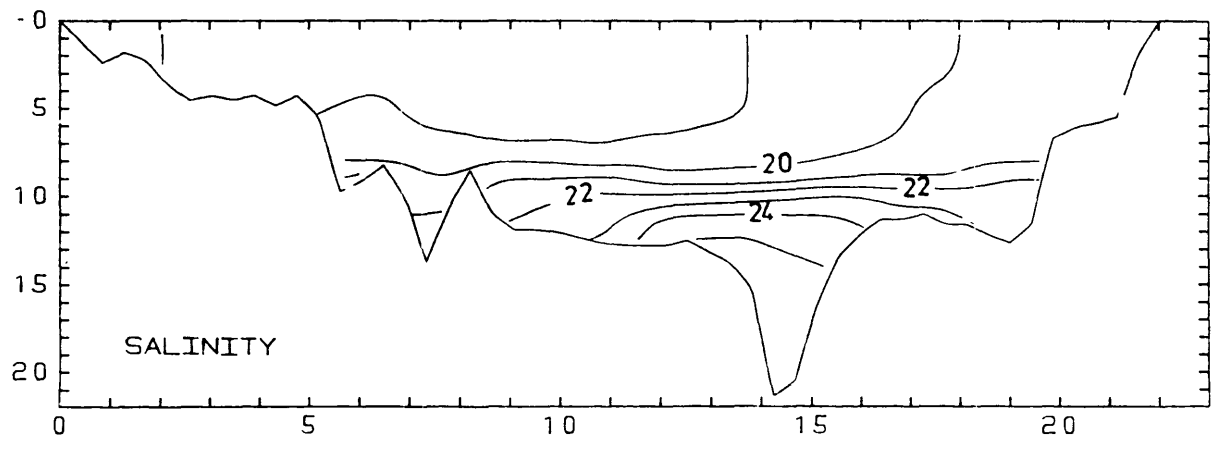
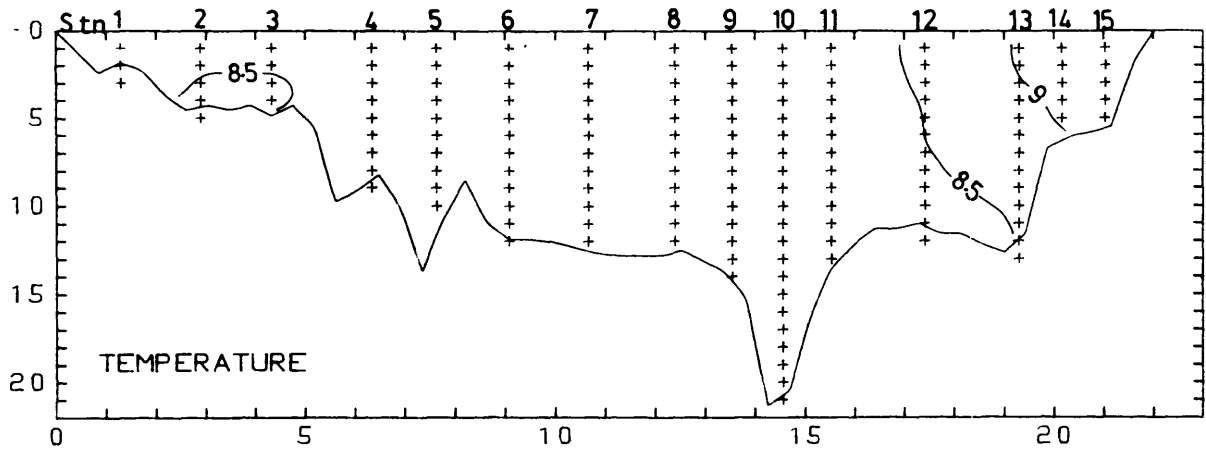
CRUISE #: 21

DATE: 16 FEBRUARY 1983



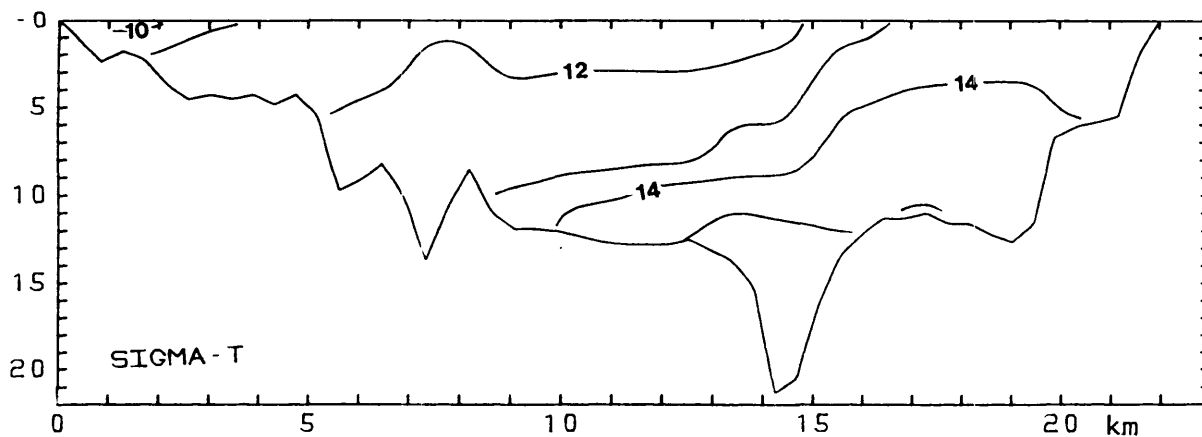
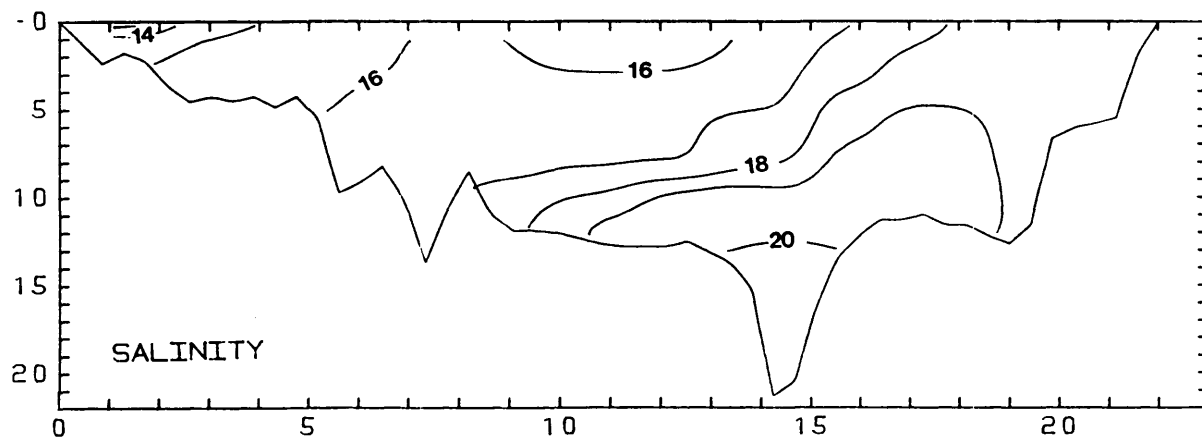
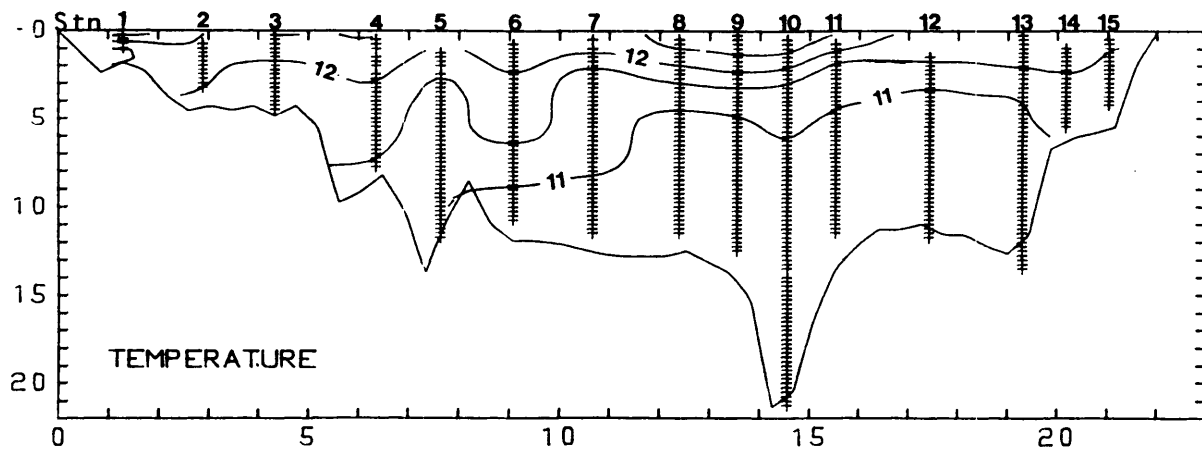
CRUISE #: 22

DATE: 9 MARCH 1983



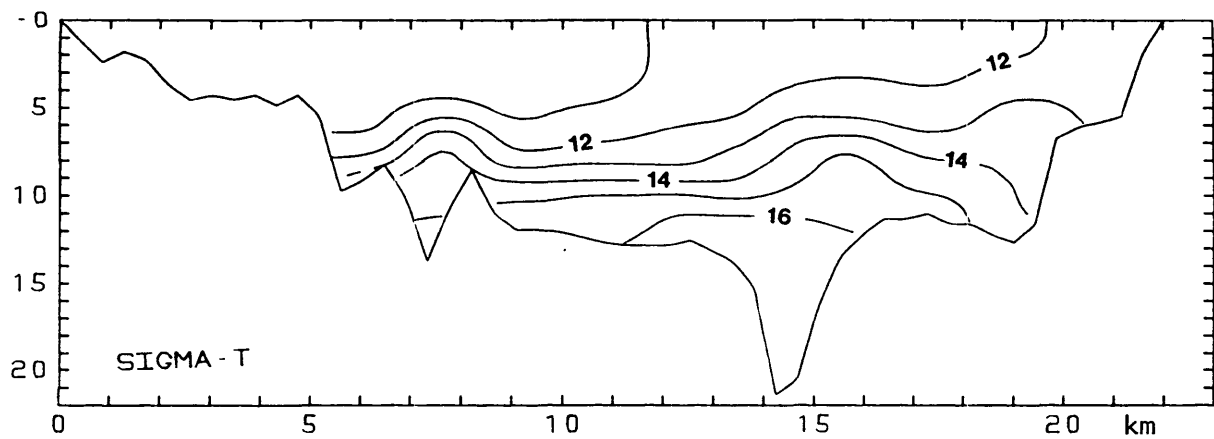
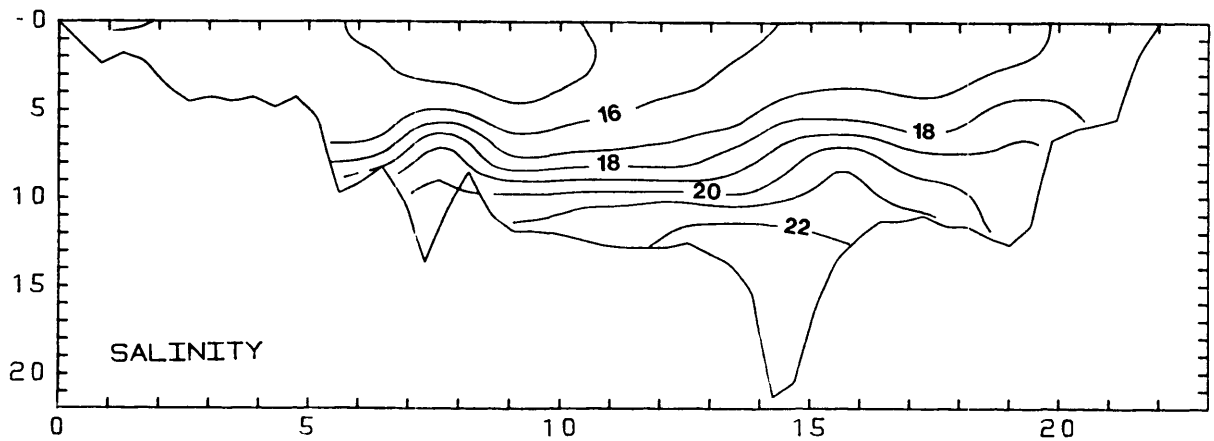
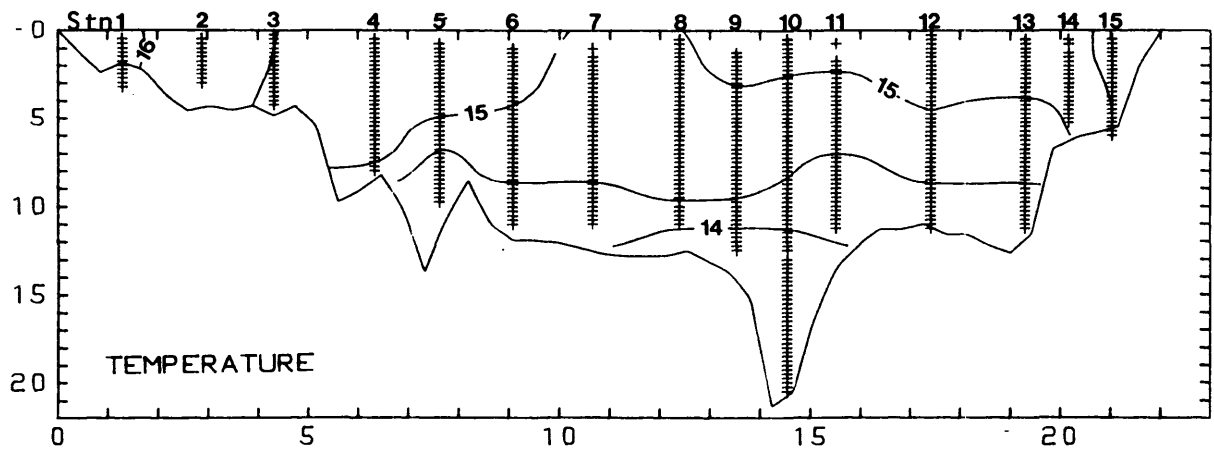
CRUISE #: 23

DATE: 22 MARCH 1983



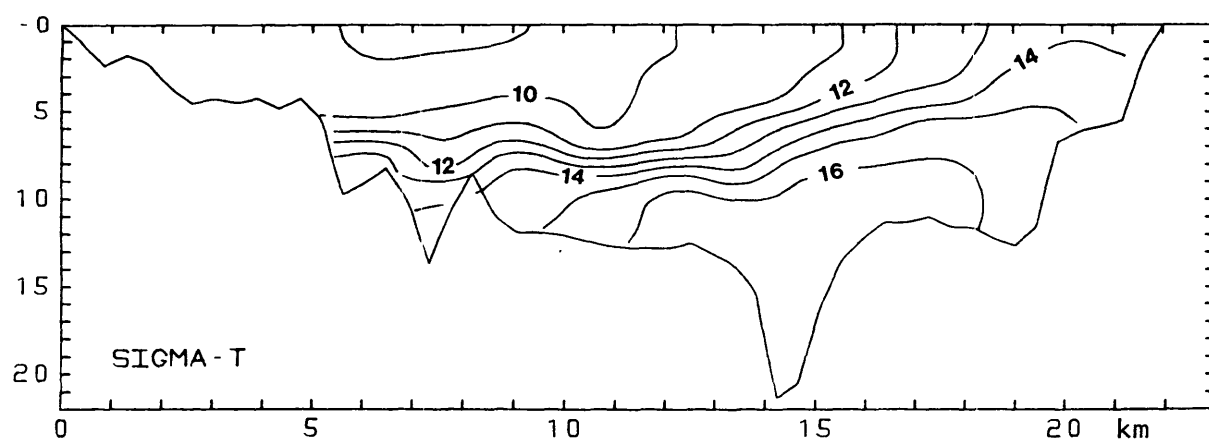
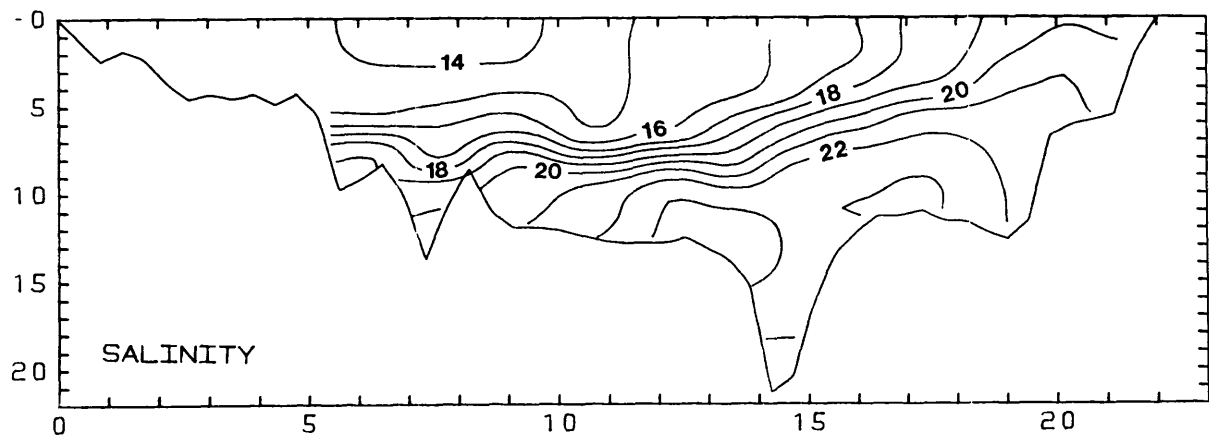
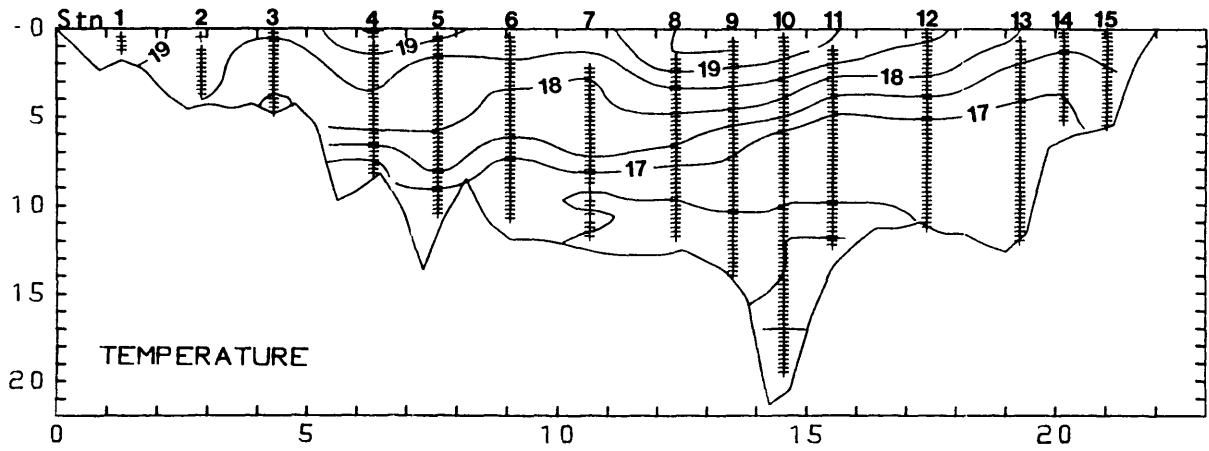
CRUISE #: 24

DATE: 27 APRIL 1983



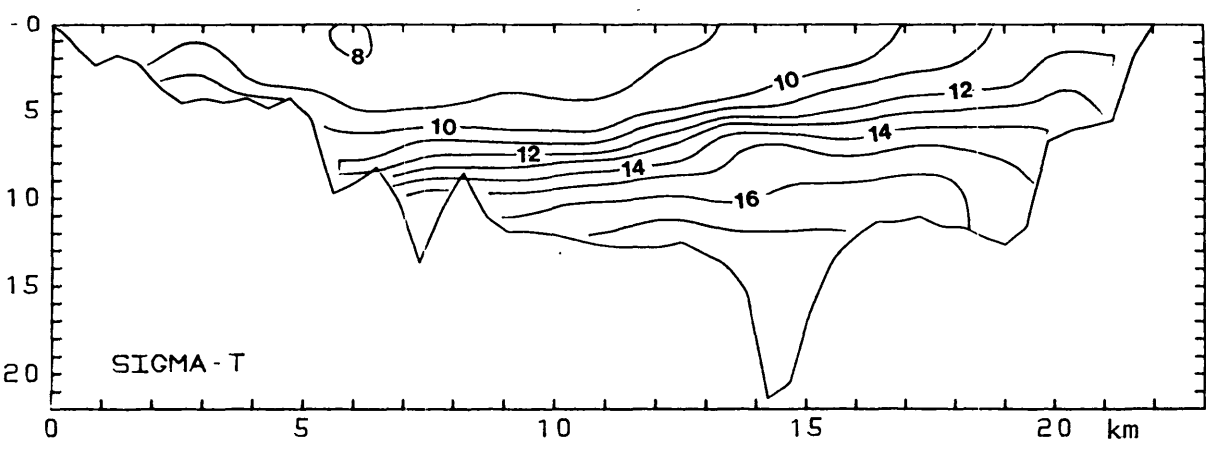
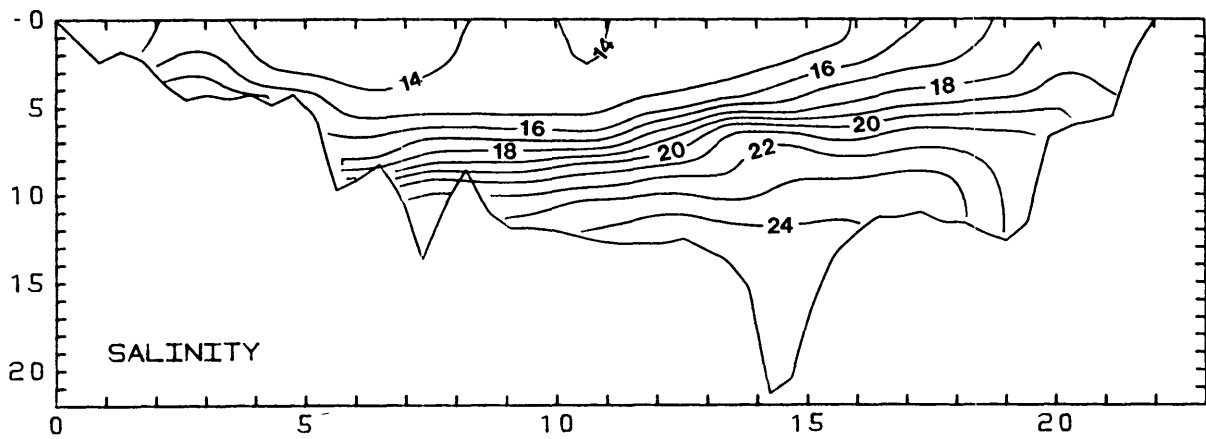
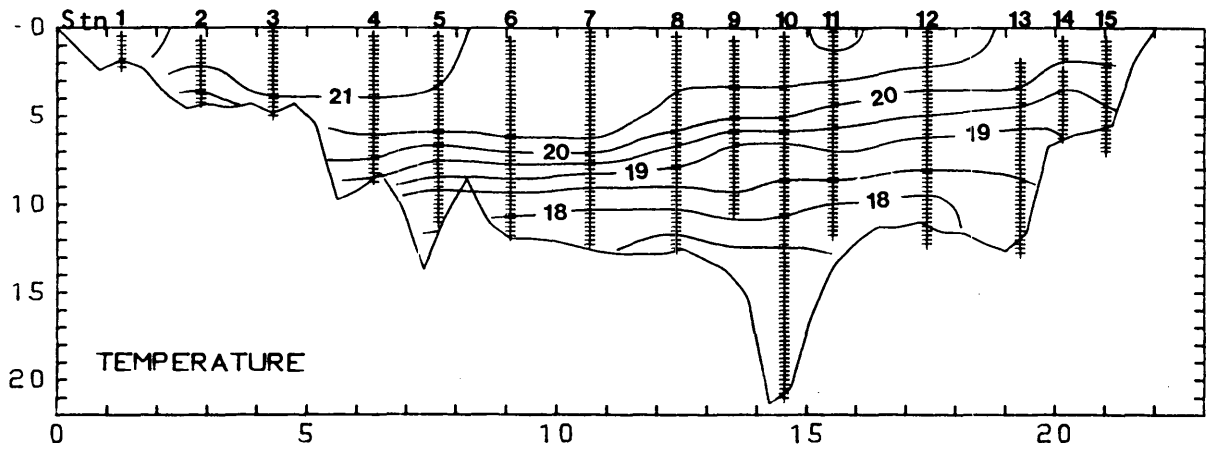
CRUISE #: 25

DATE: 11 MAY 1983



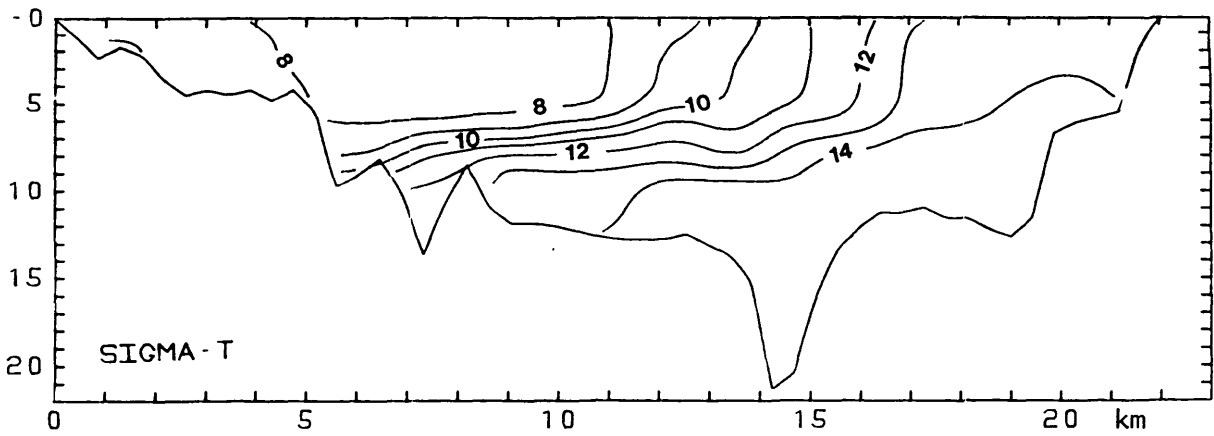
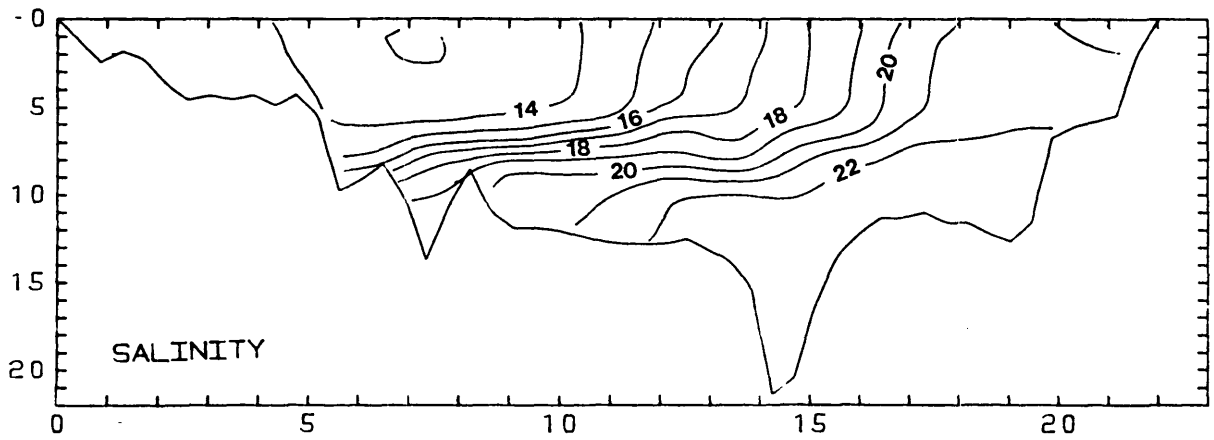
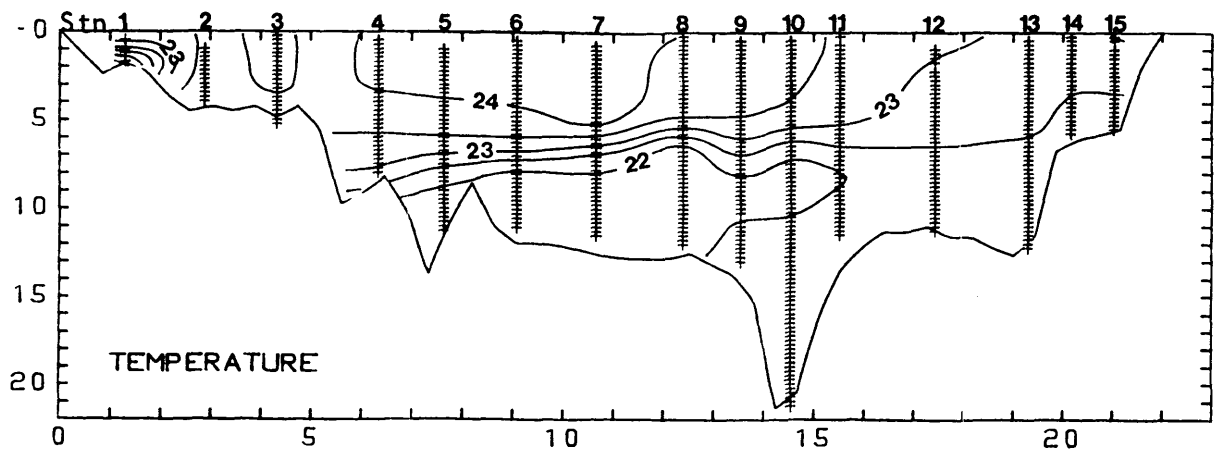
CRUISE #: 26

DATE: 25 MAY 1983



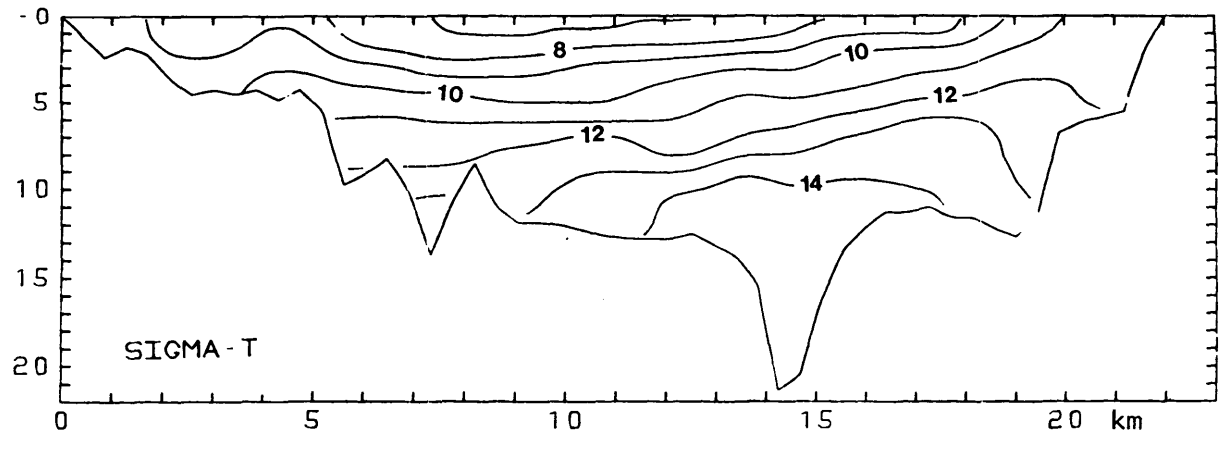
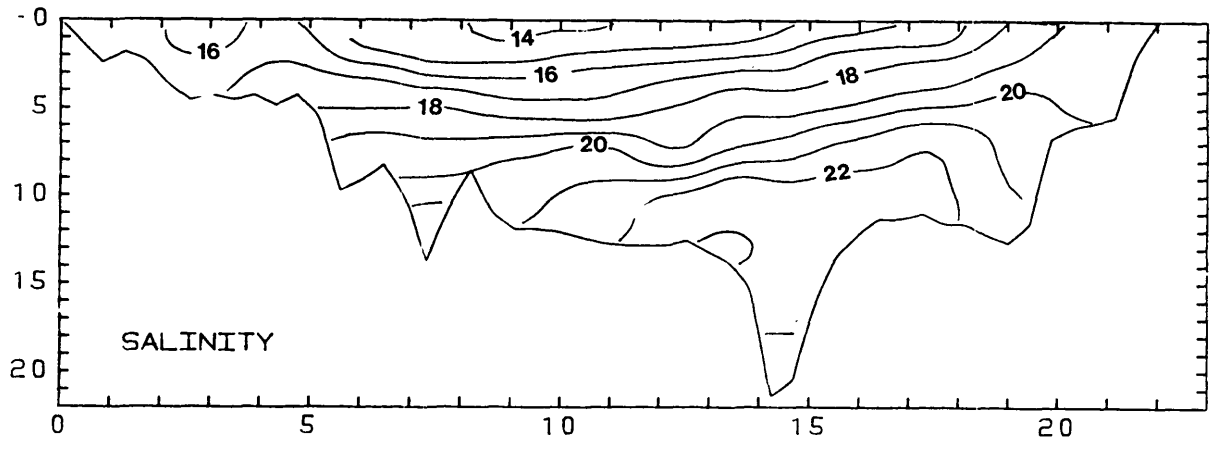
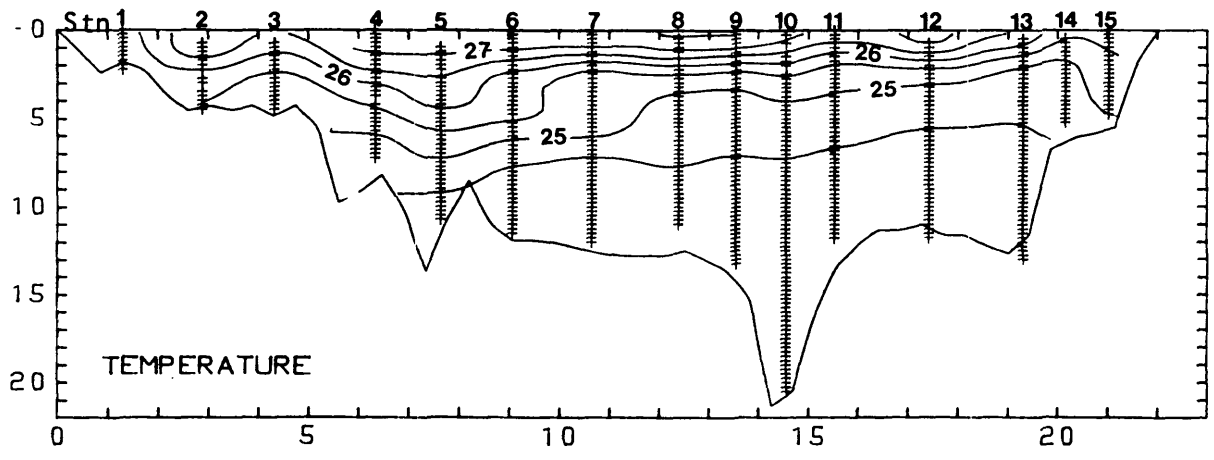
CRUISE #: 27

DATE: 9 JUNE 1983



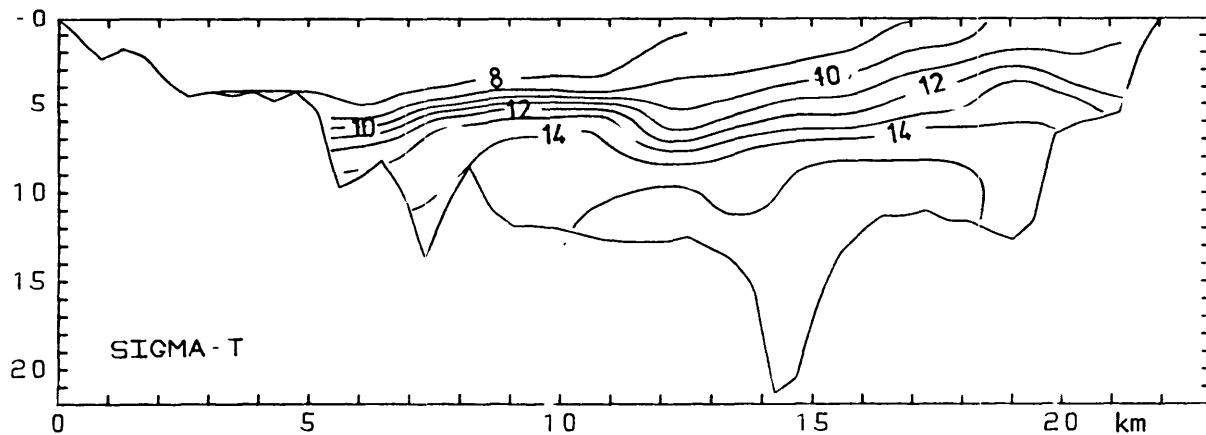
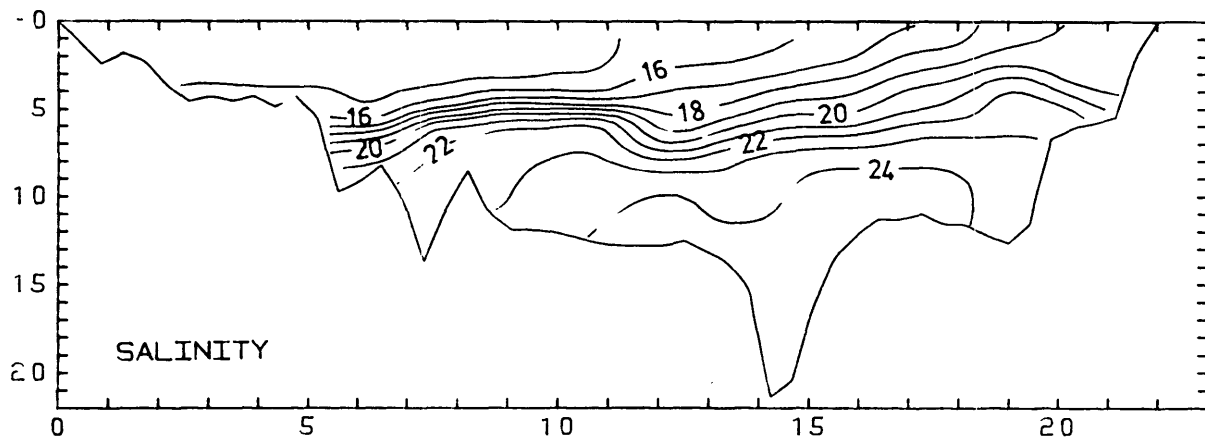
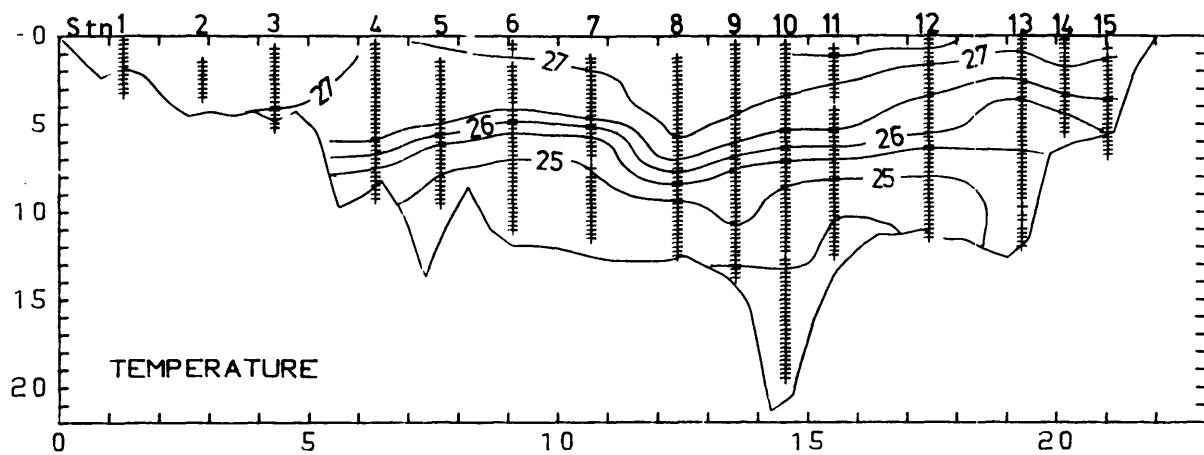
CRUISE #: 28

DATE: 22 JUNE 1983



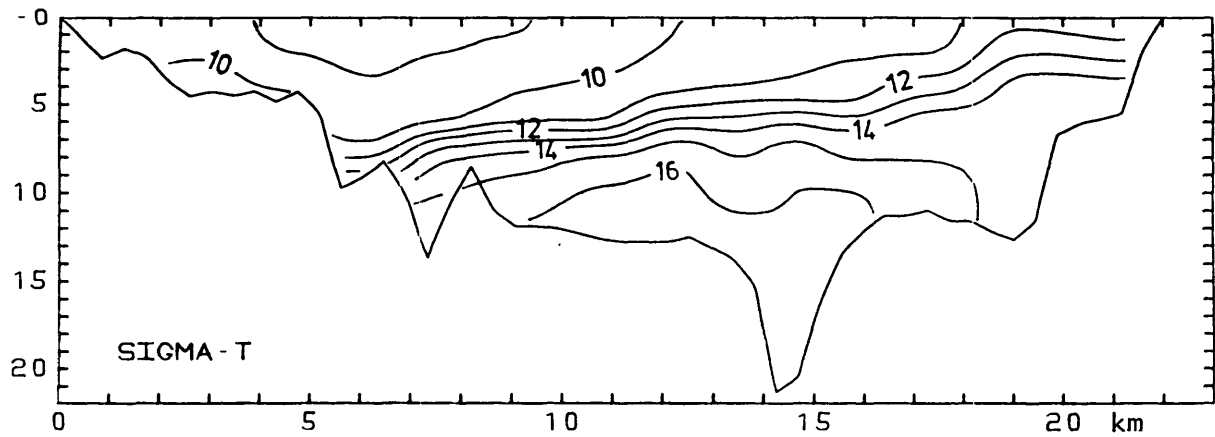
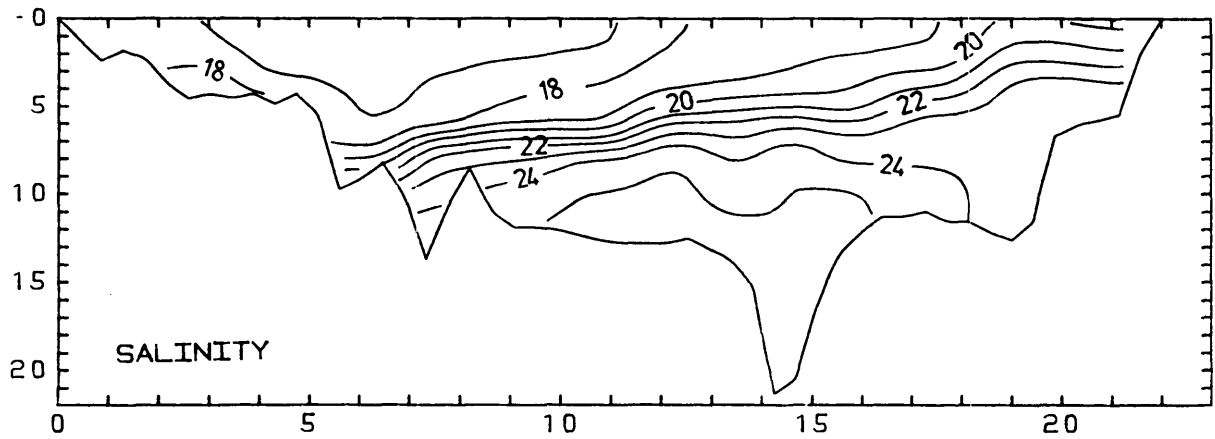
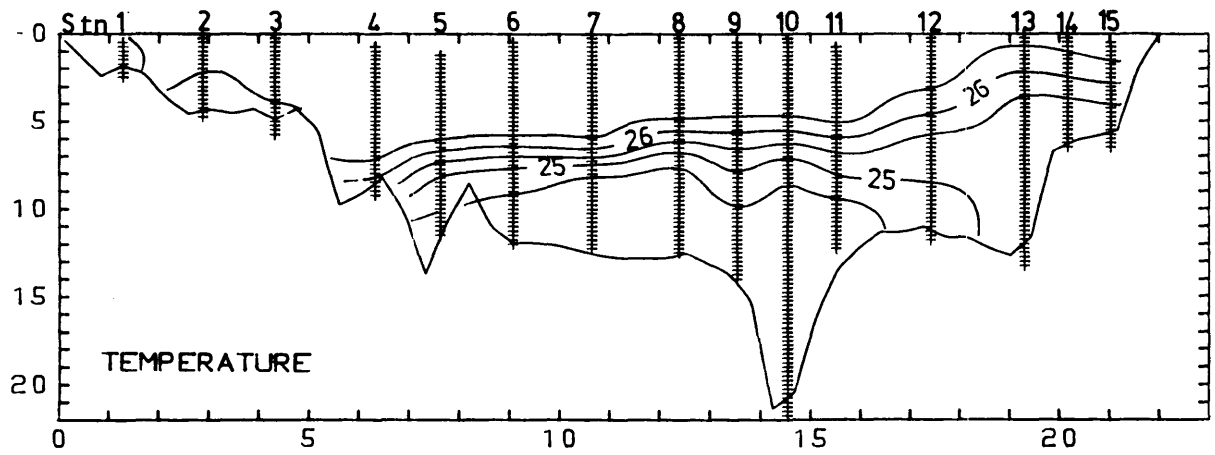
CRUISE #: 29

DATE: 13 JULY 1983



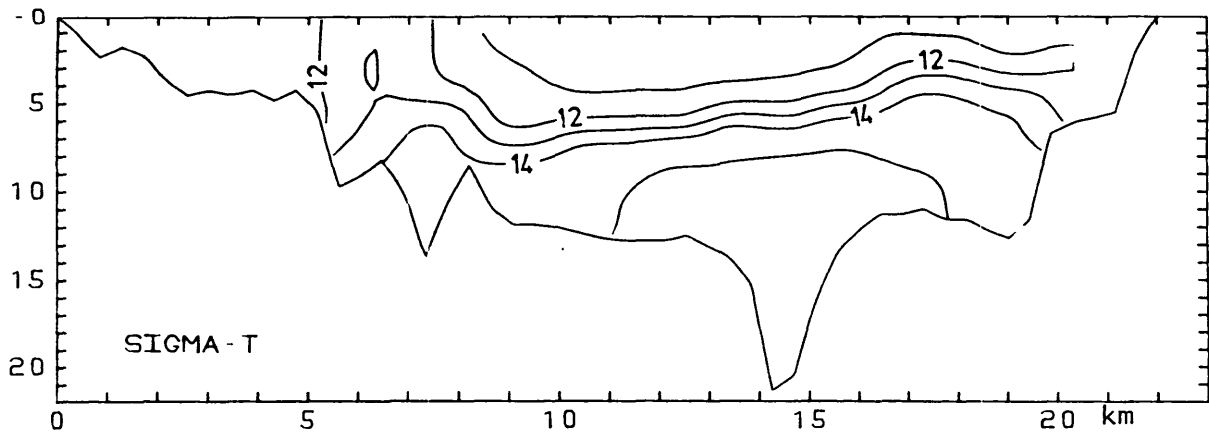
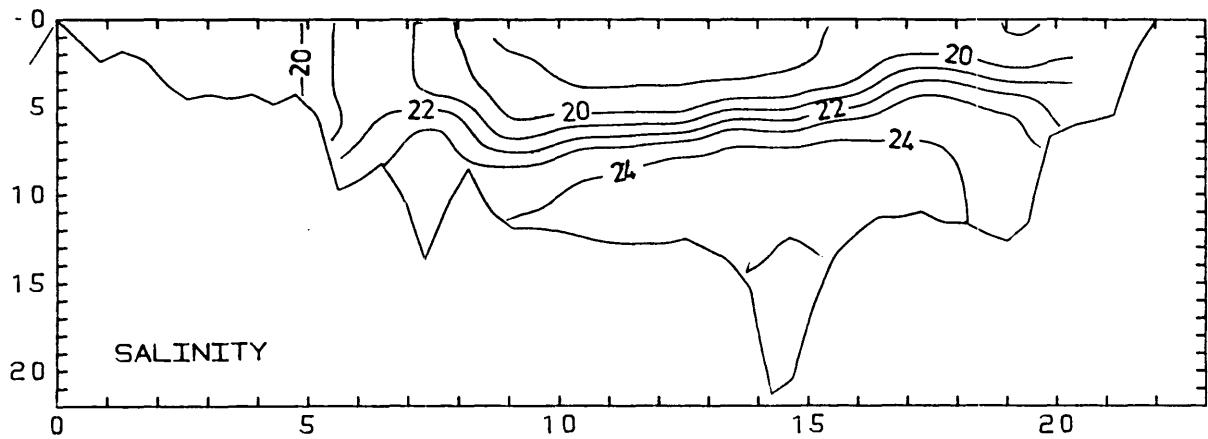
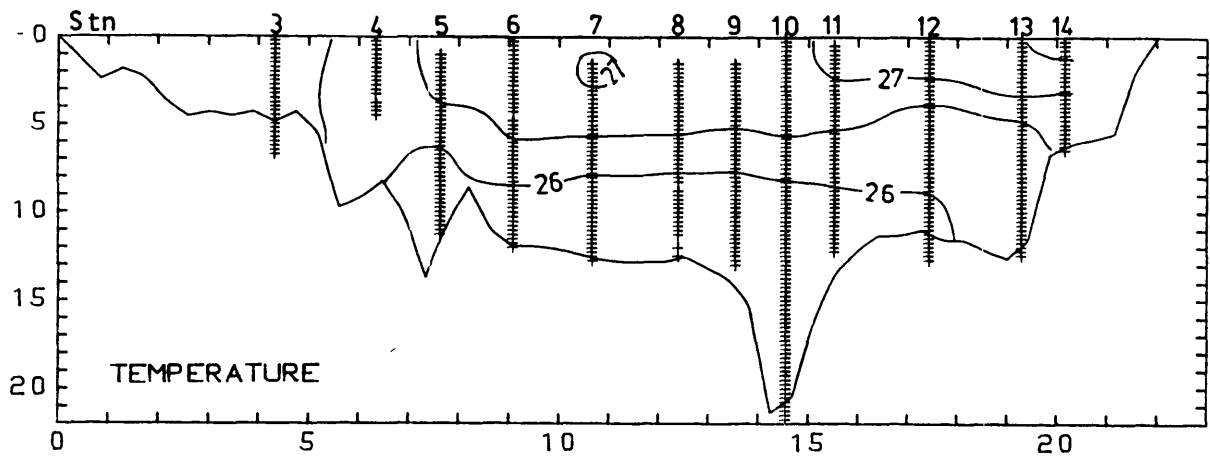
CRUISE #: 30

DATE: 27 JULY 1983



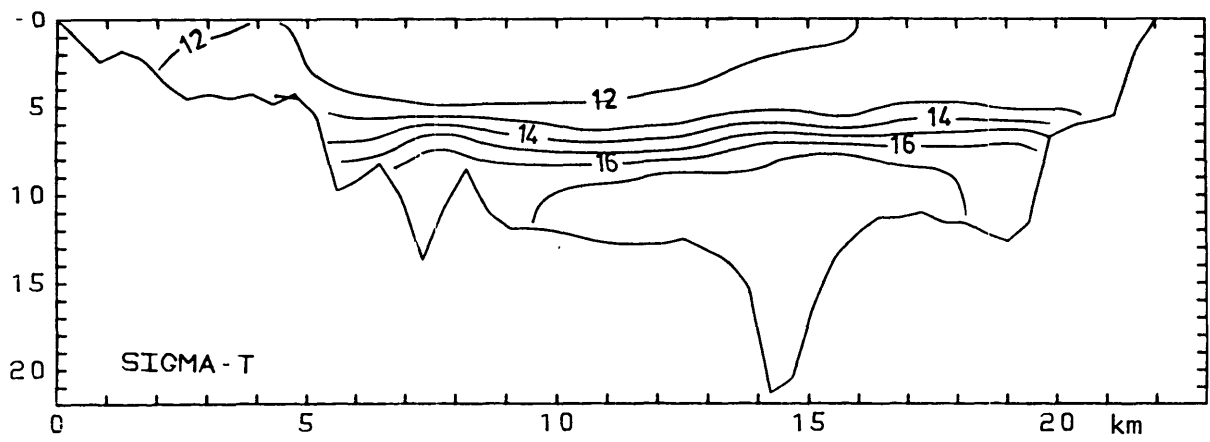
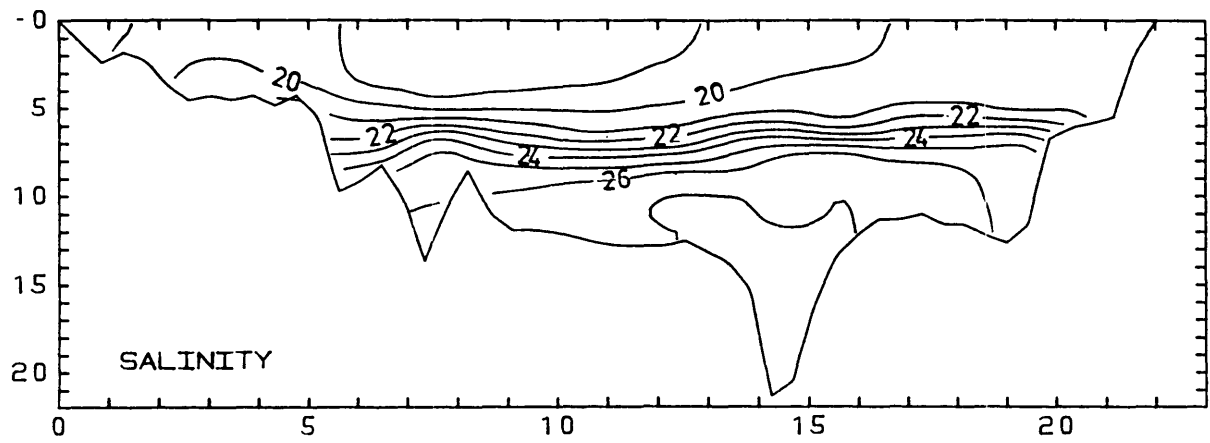
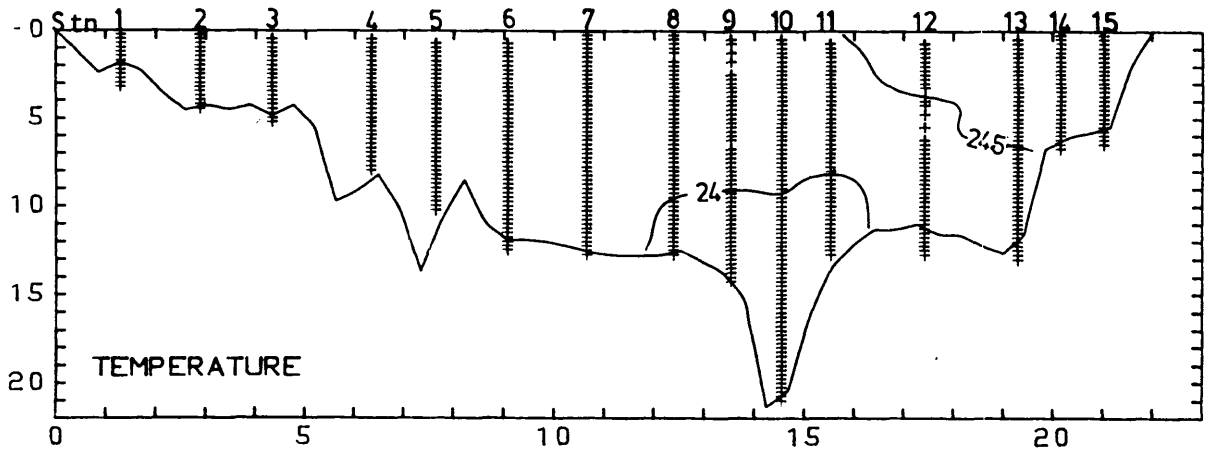
CRUISE #: 32

DATE: 23 AUGUST 1983



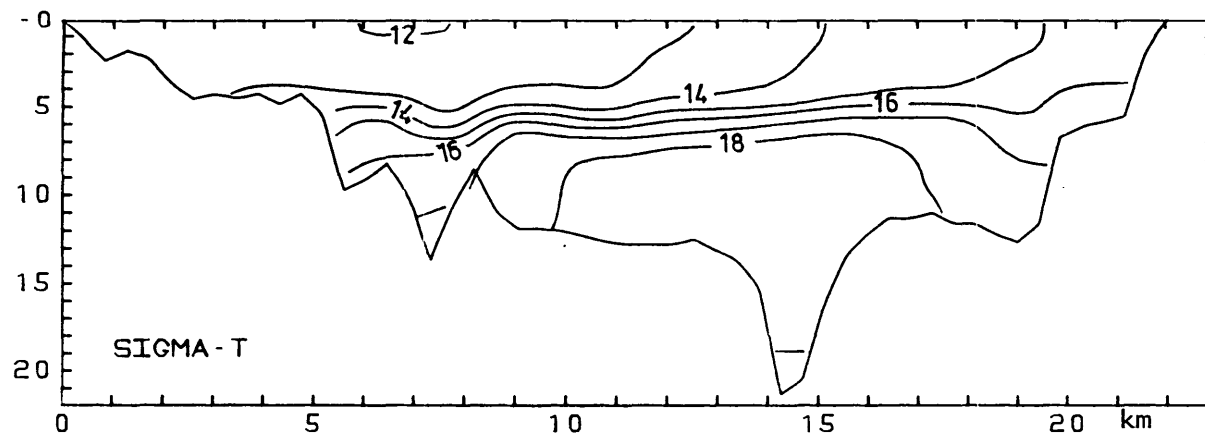
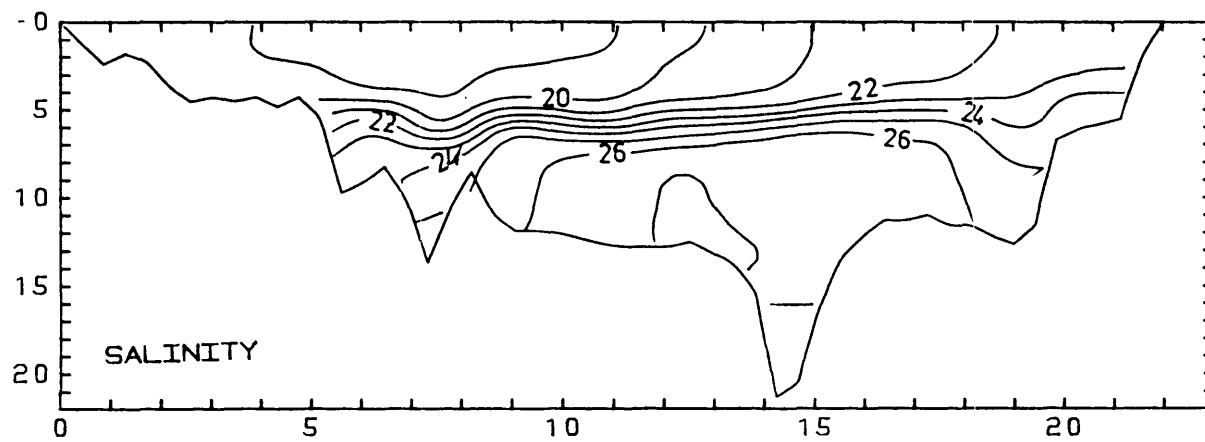
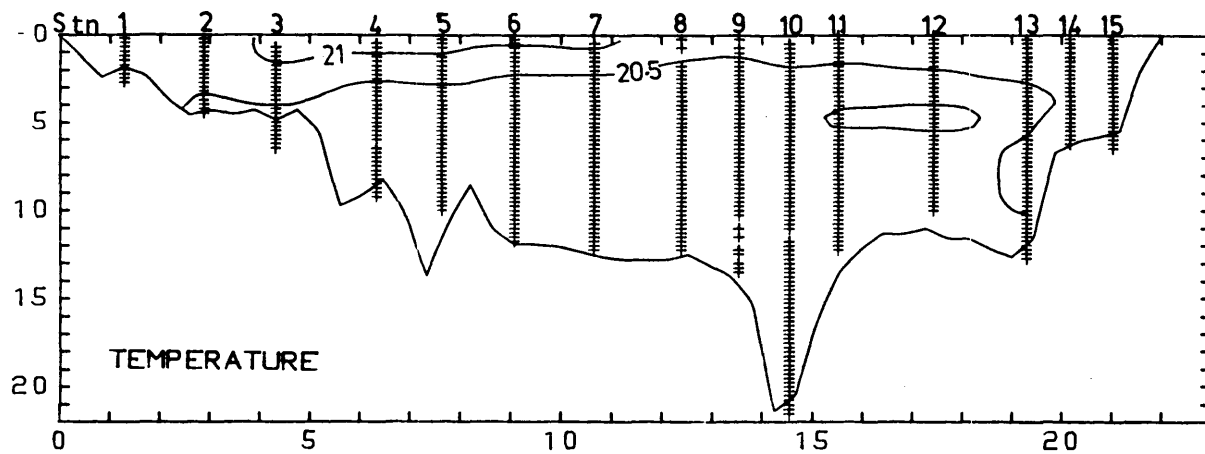
CRUISE #: 33

DATE: 6 SEPTEMBER 1983



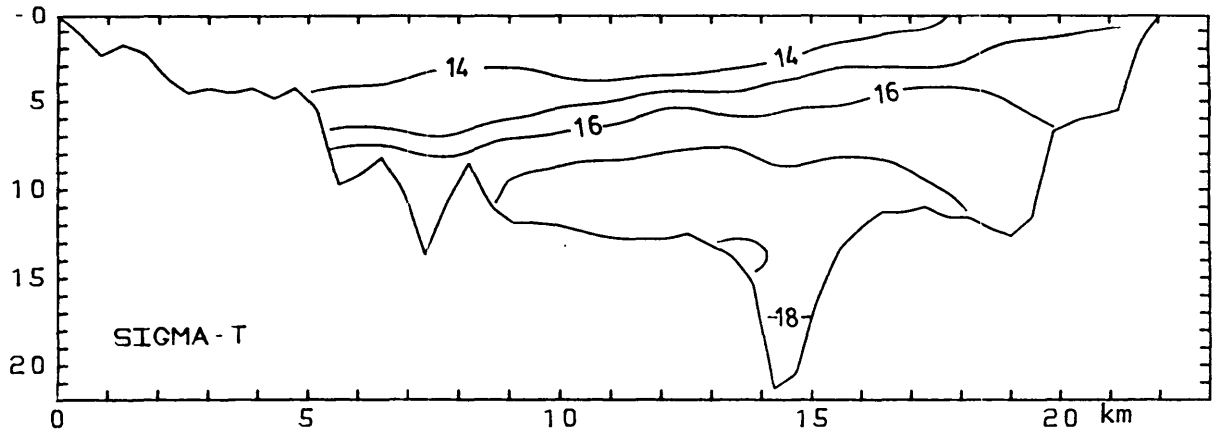
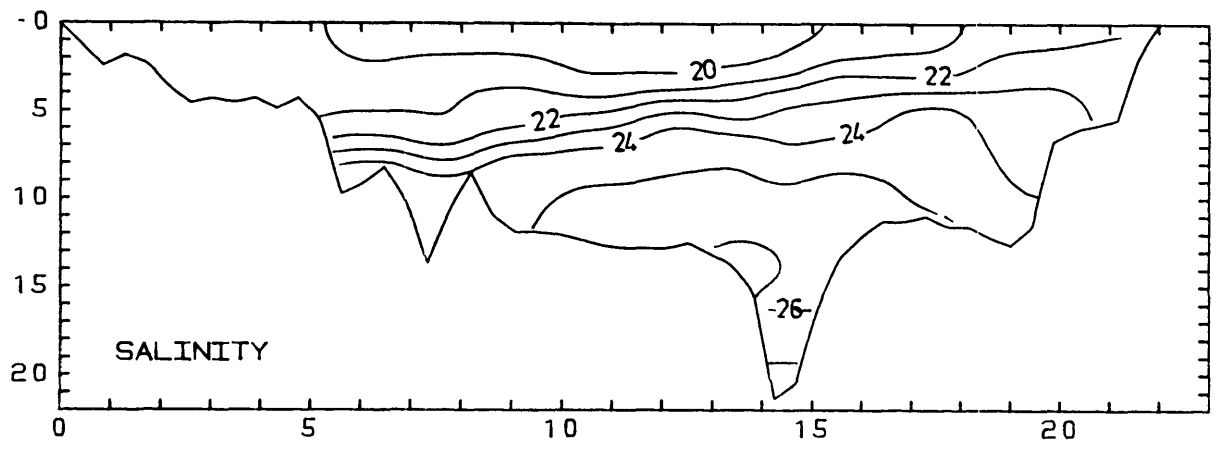
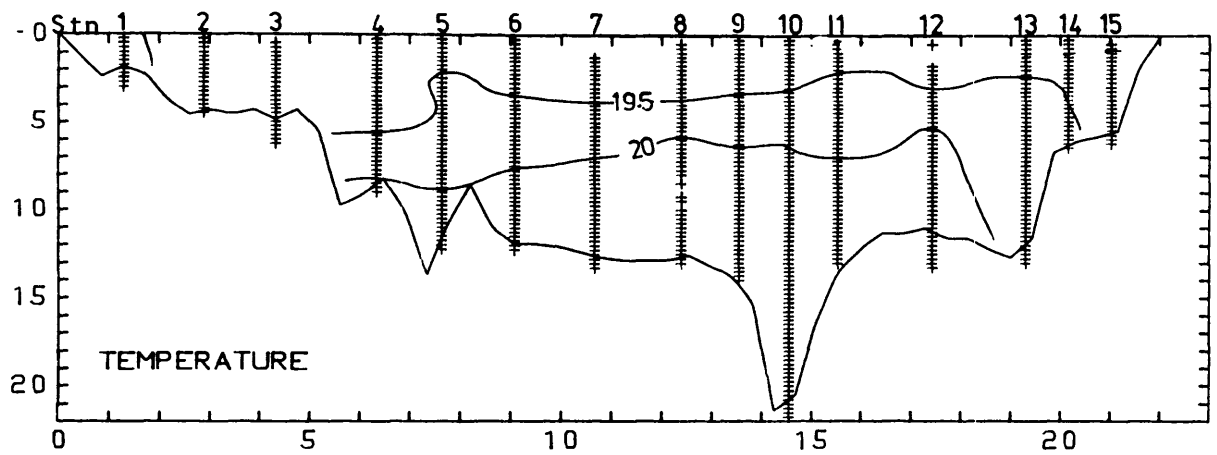
CRUISE #: 34

DATE: 20 SEPTEMBER 1983



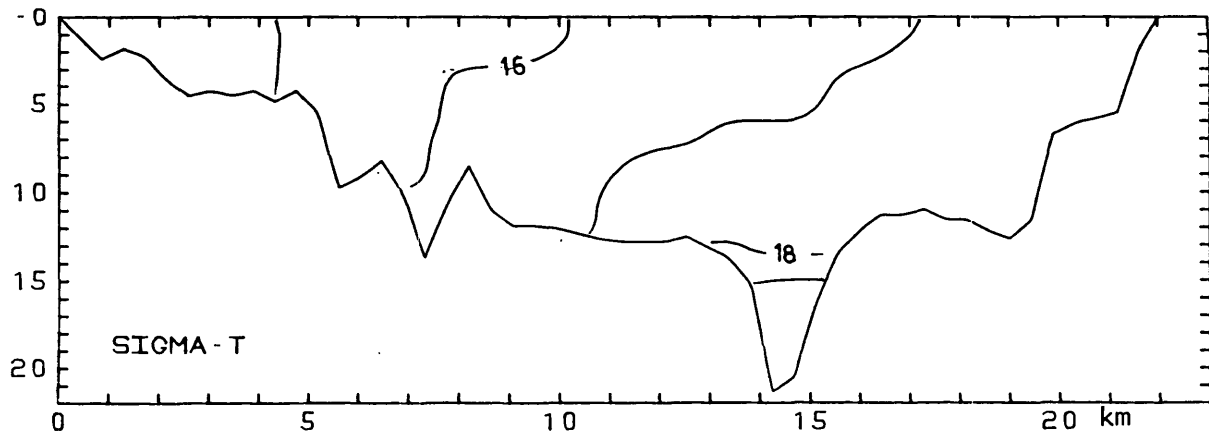
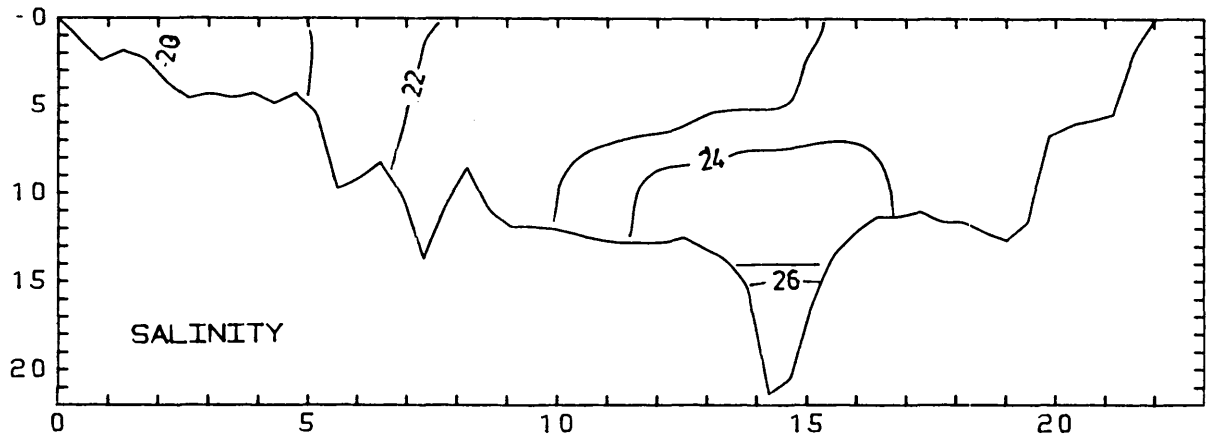
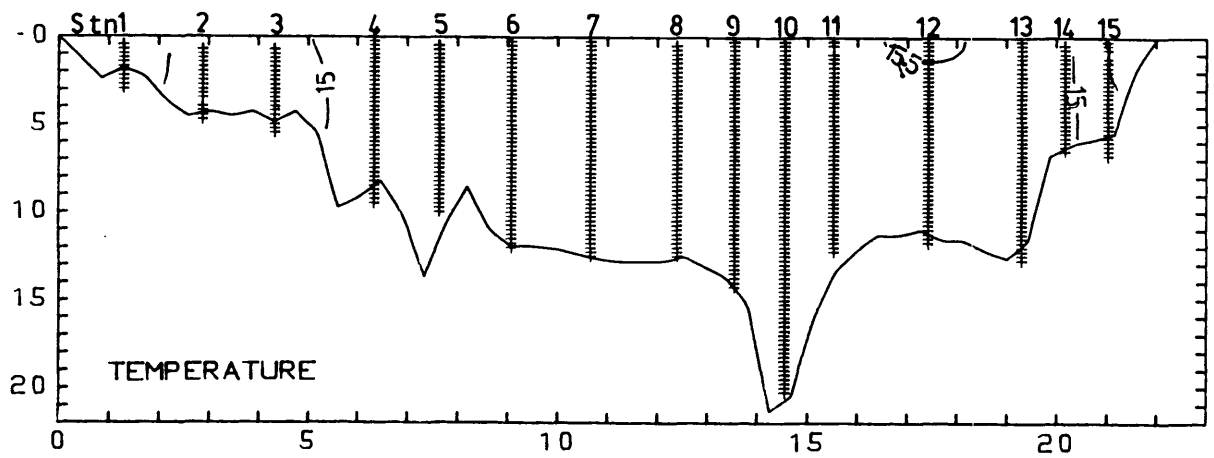
CRUISE #: 35

DATE: 3 OCTOBER 1983



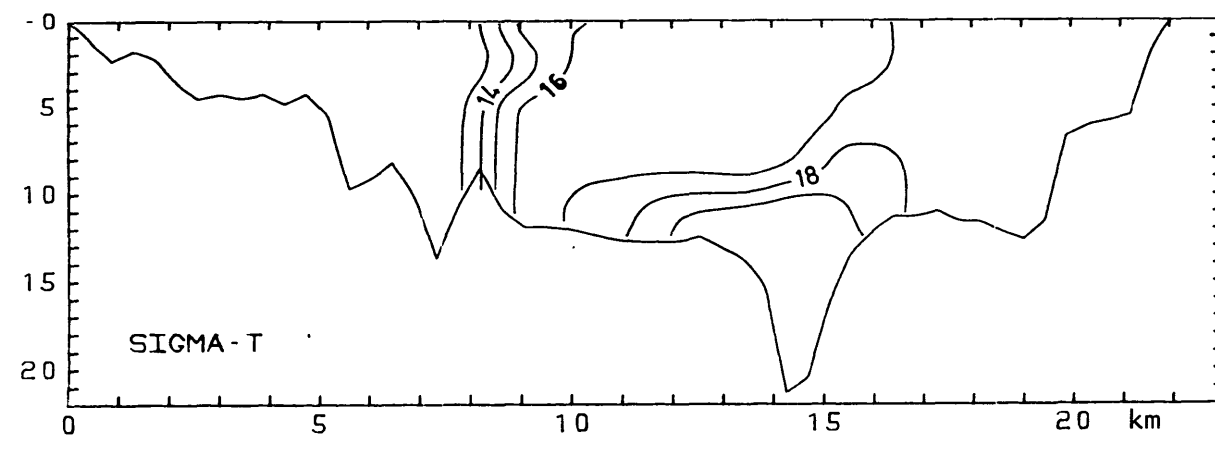
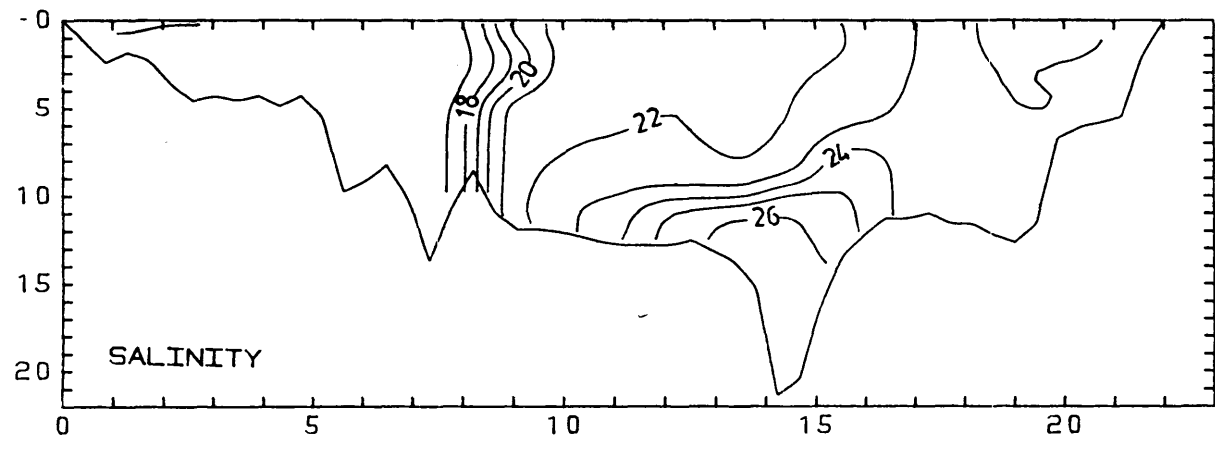
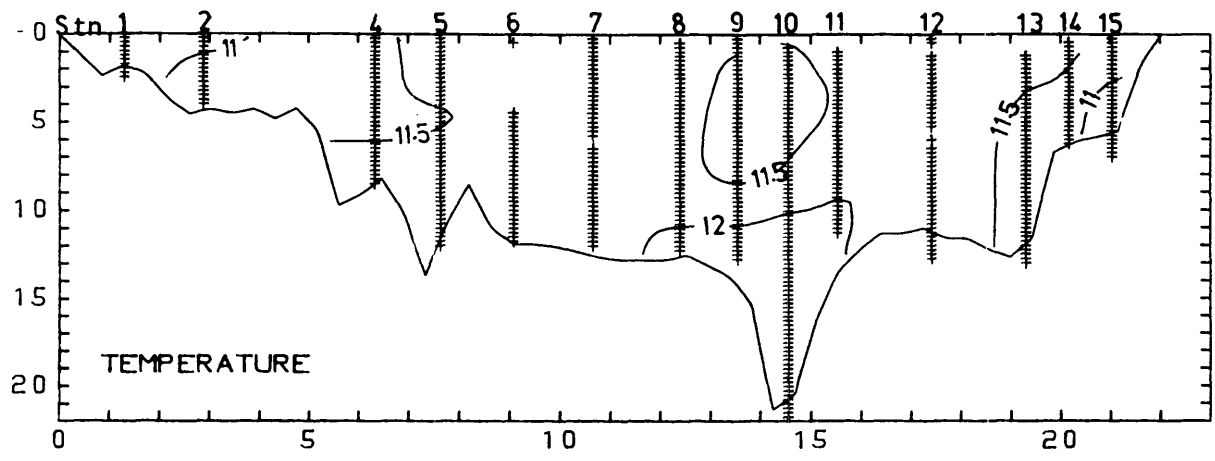
CRUISE #: 36

DATE: 18 OCTOBER 1983



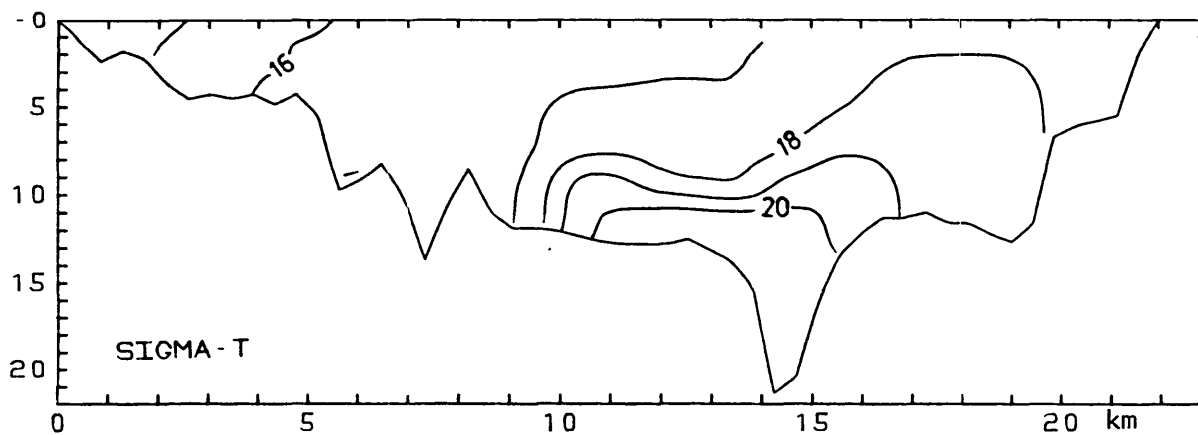
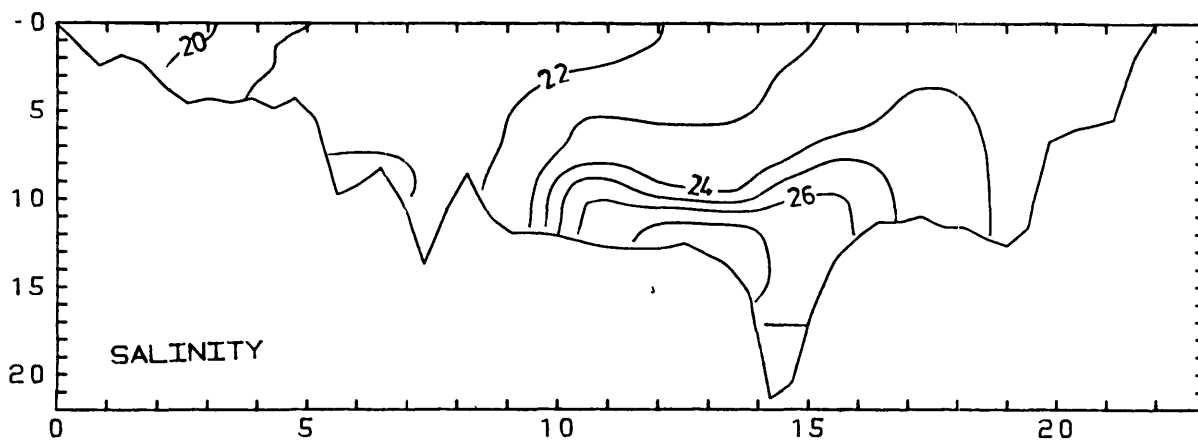
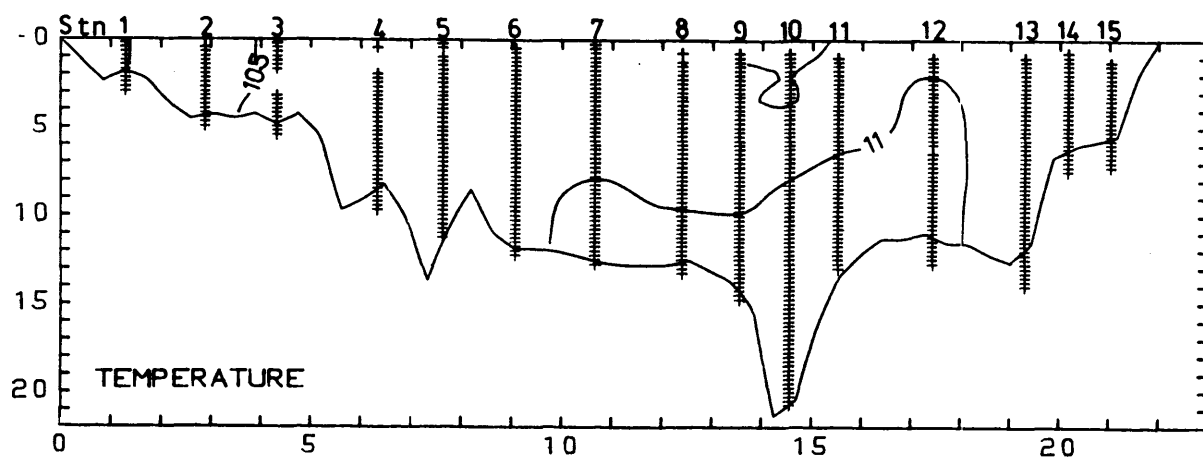
CRUISE #: 37

DATE: 1 NOVEMBER 1983



CRUISE #: 38

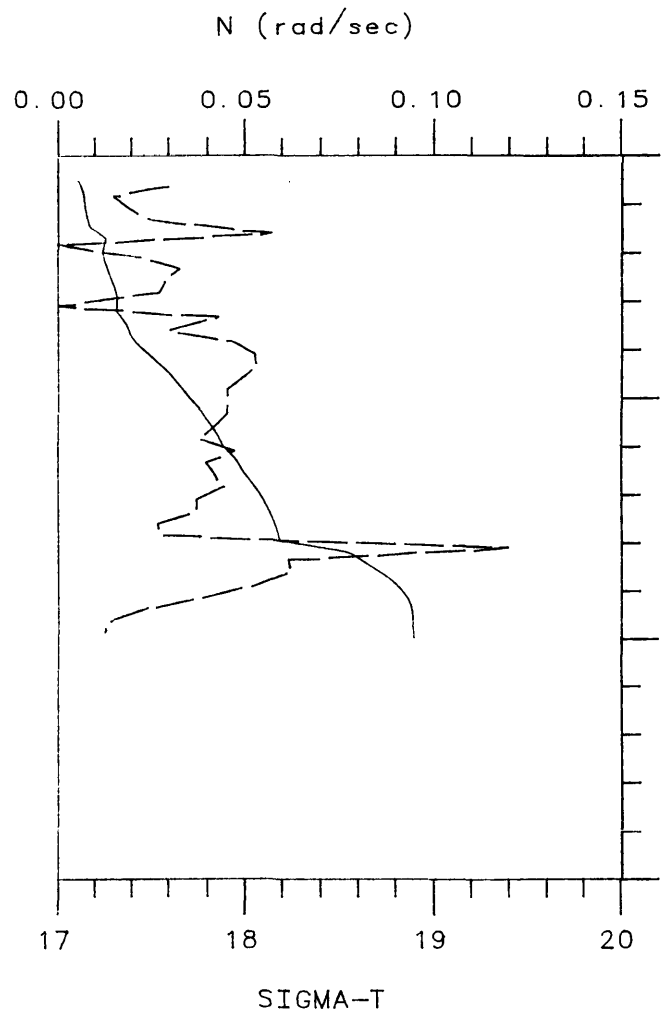
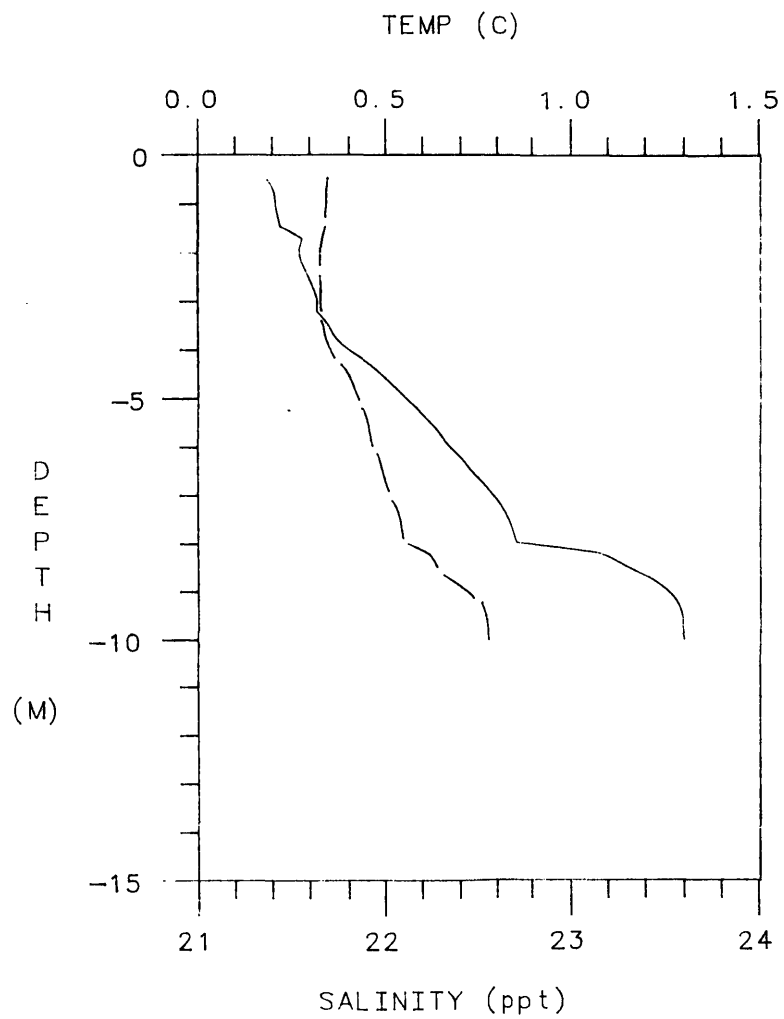
DATE: 18 NOVEMBER 1983



CRUISE #: 39

DATE: 5 DECEMBER 1983

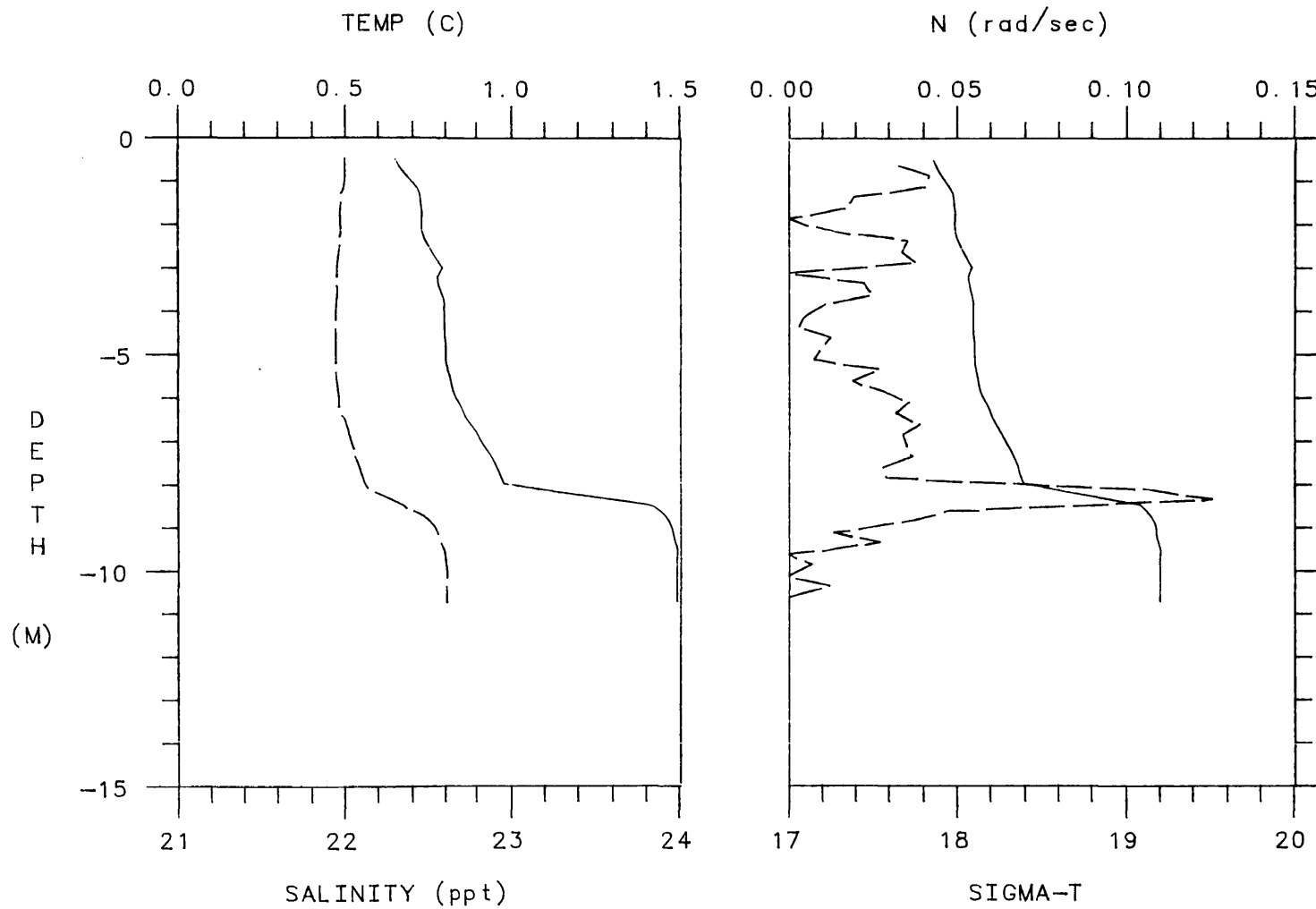
APPENDIX B
Vertical Profiles



CRUISE#02

STN:7A

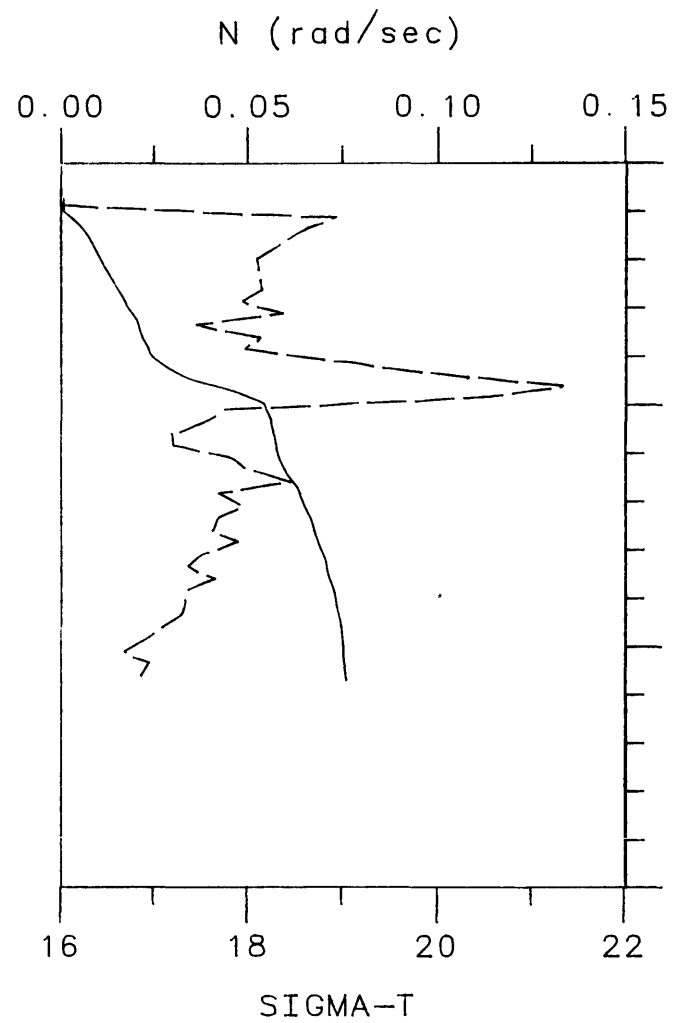
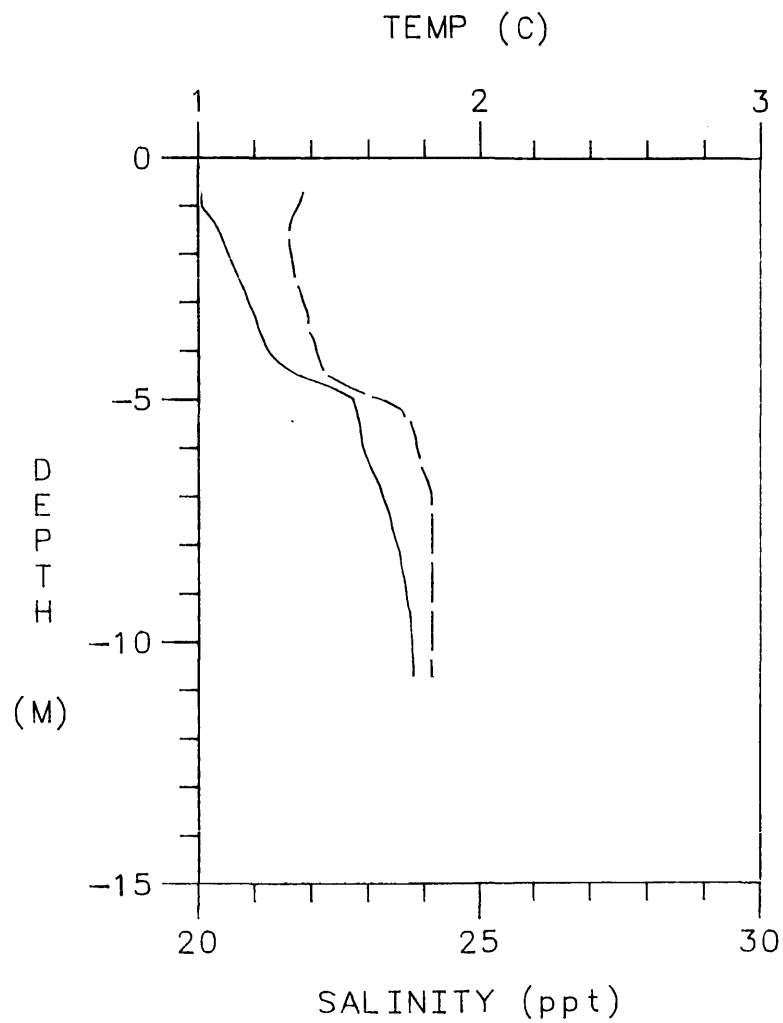
TIME: 1005EST



CRUISE#02

STN:07

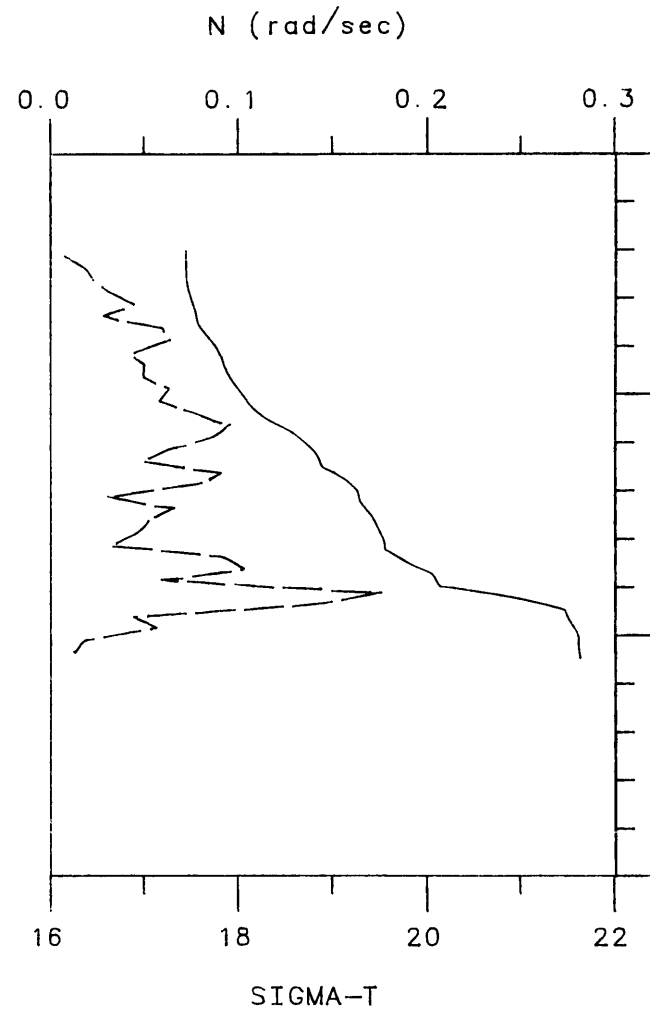
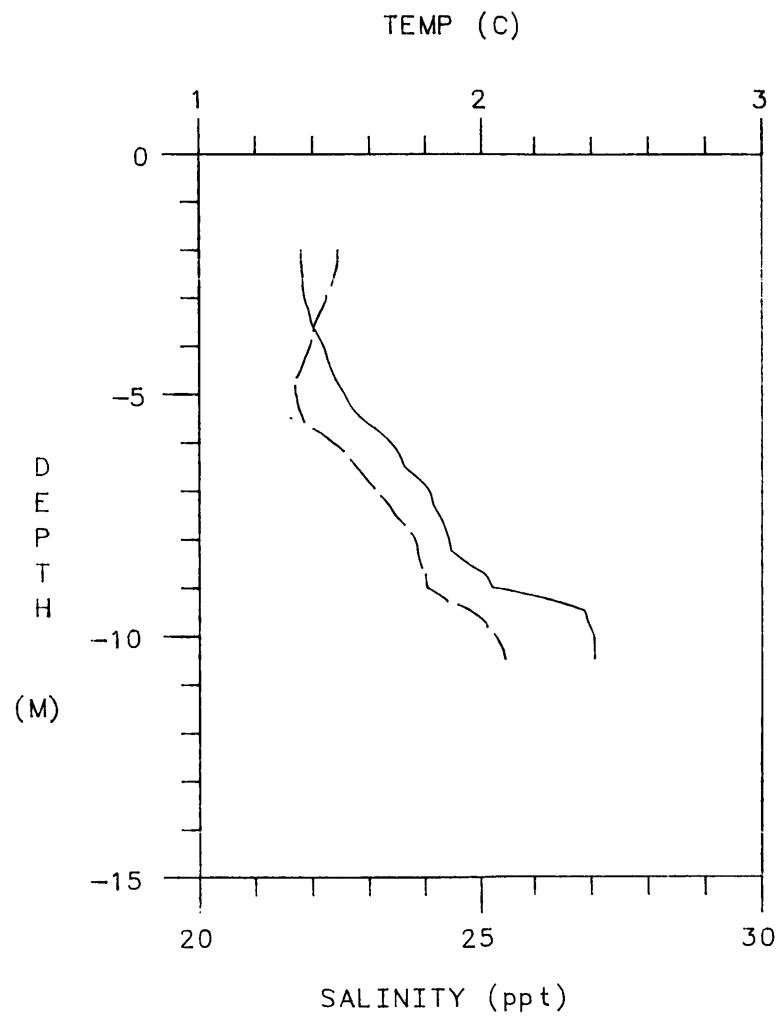
TIME: 1225EST



CRUISE#03

STN:7A

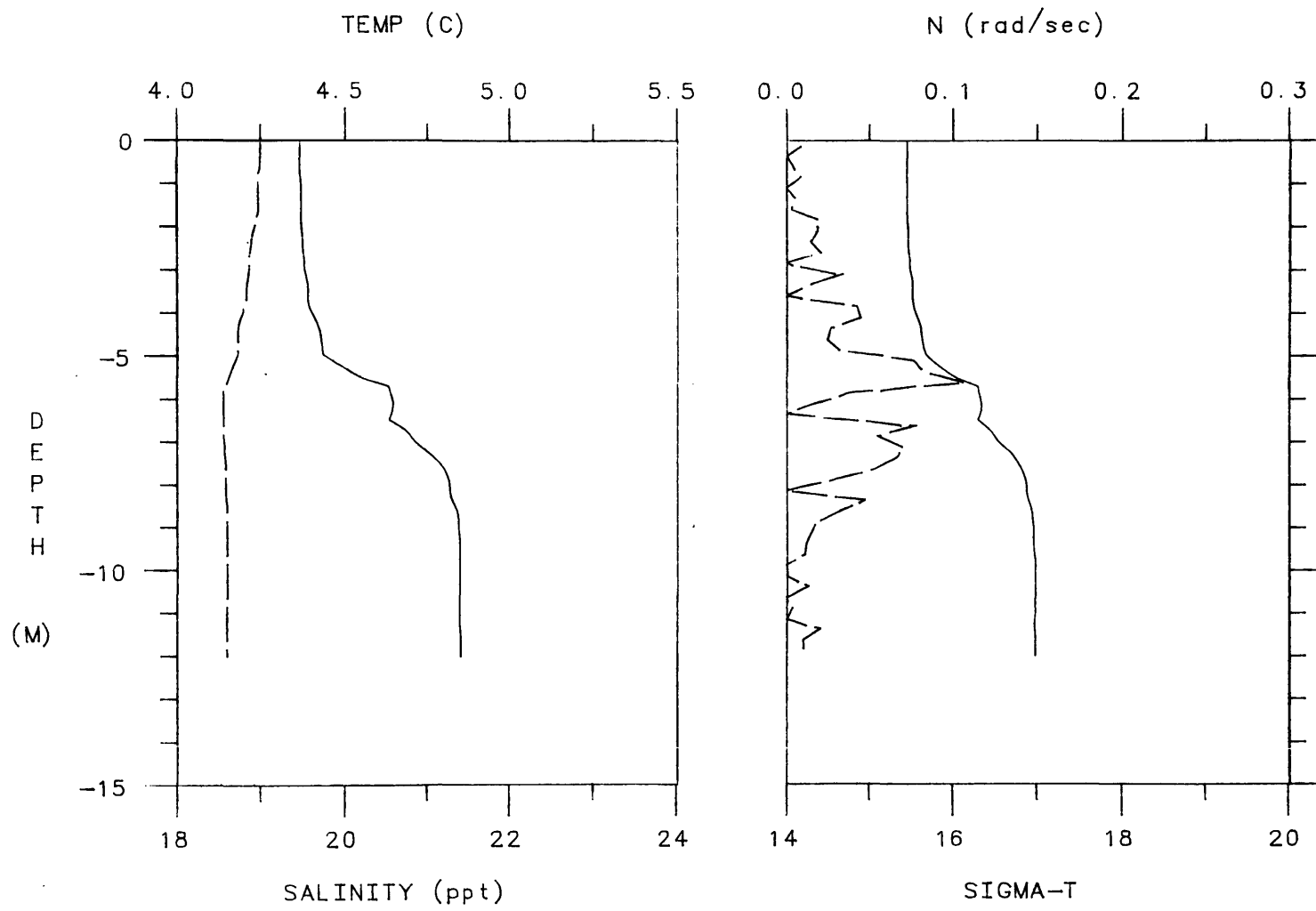
TIME:1105EST



CRUISE#03

STN:07

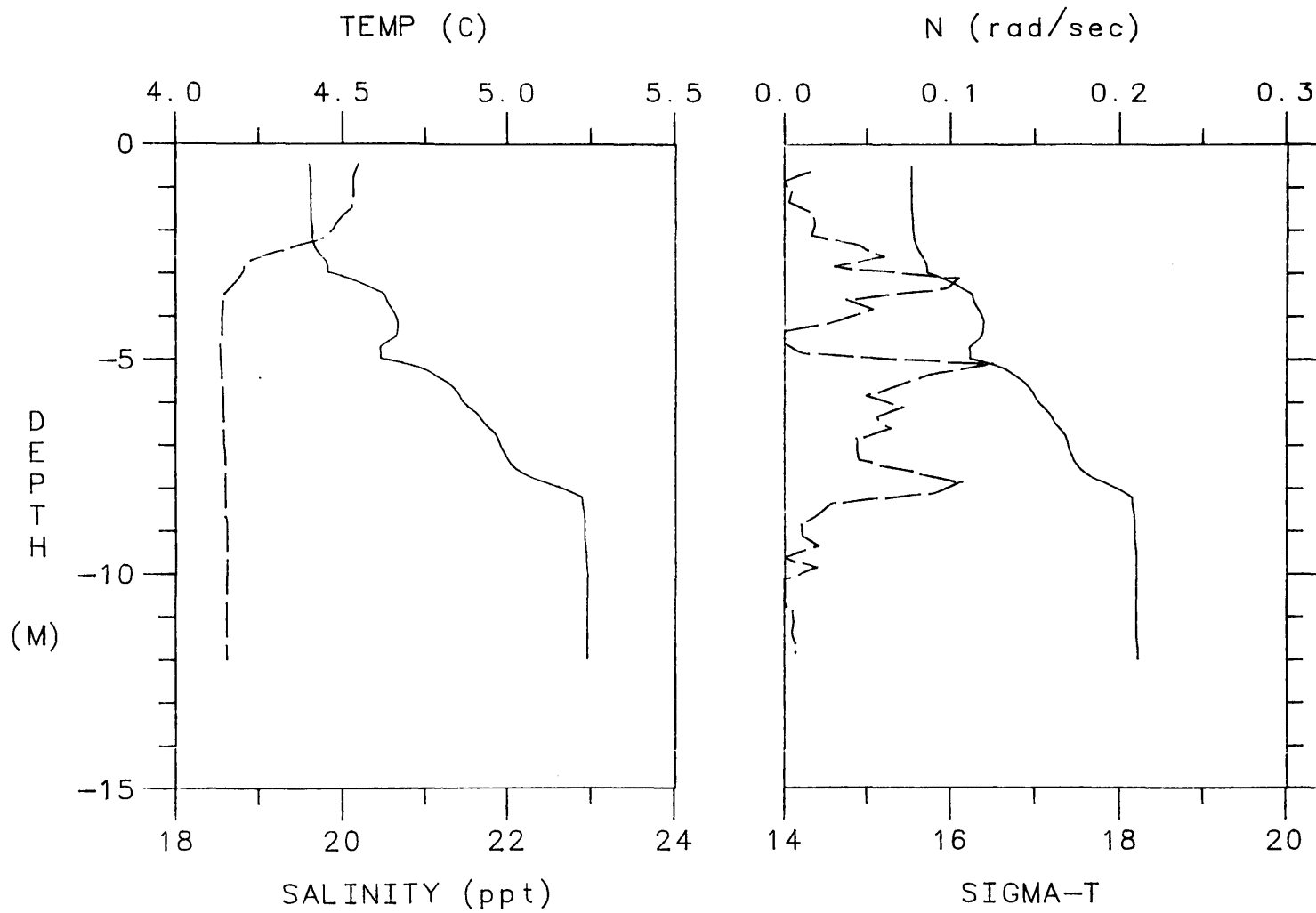
TIME: 1317EST



CRUISE#05

STN:07

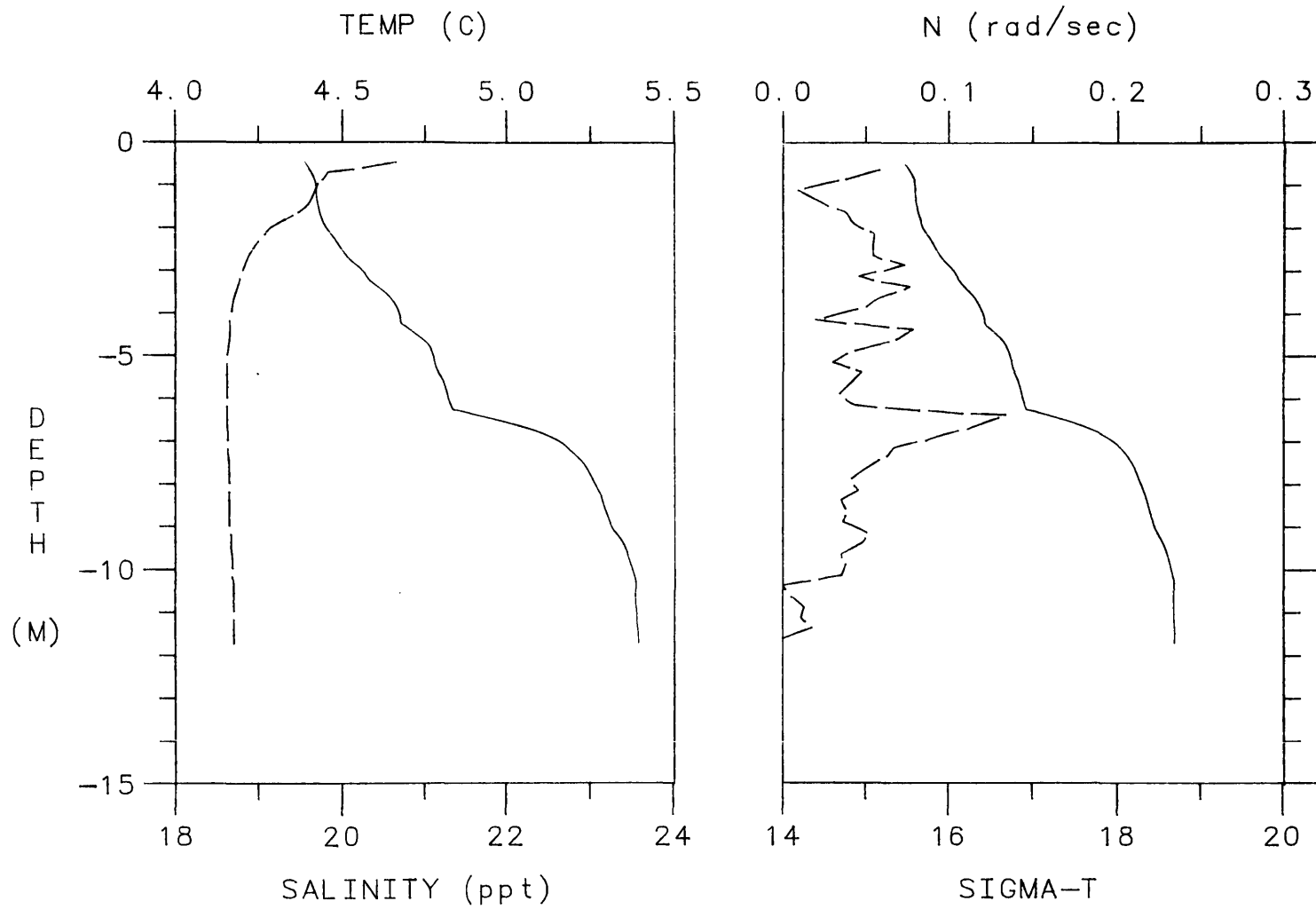
TIME: 1332EST



CRUISE#05

STN: 7A

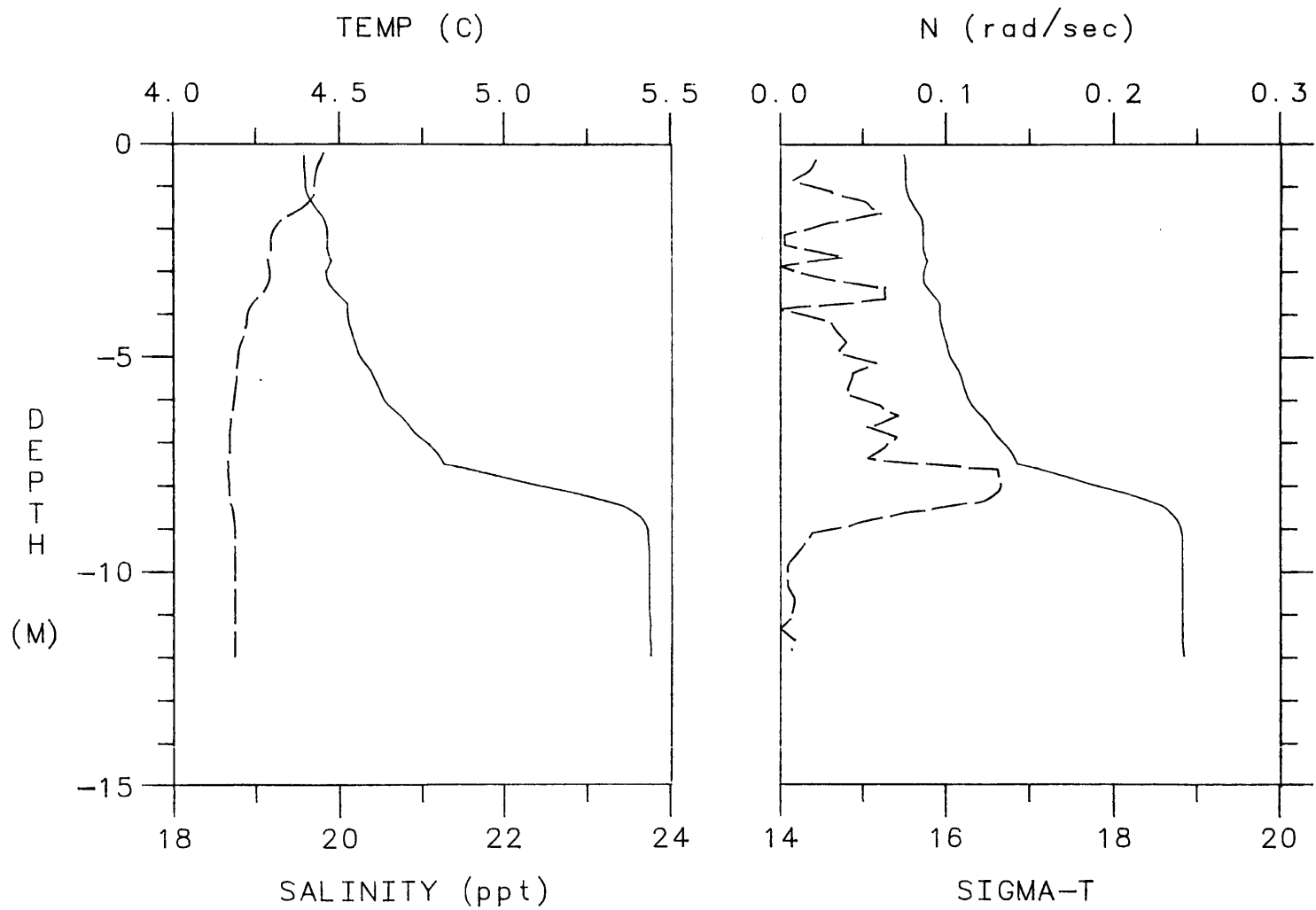
TIME: 1509EST



CRUISE #05

STN: 08

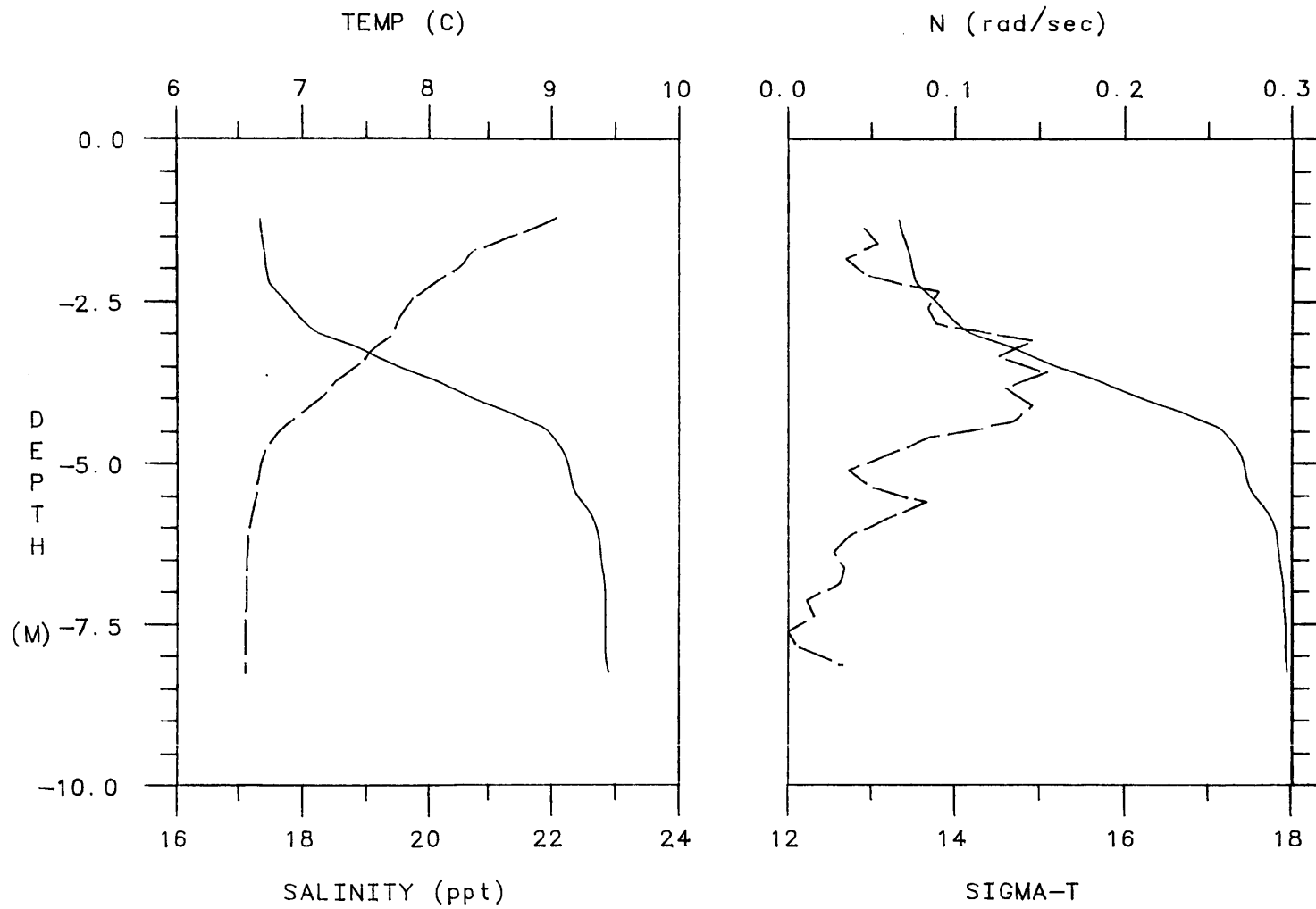
TIME: 1341EST



CRUISE#05

STN: 8A

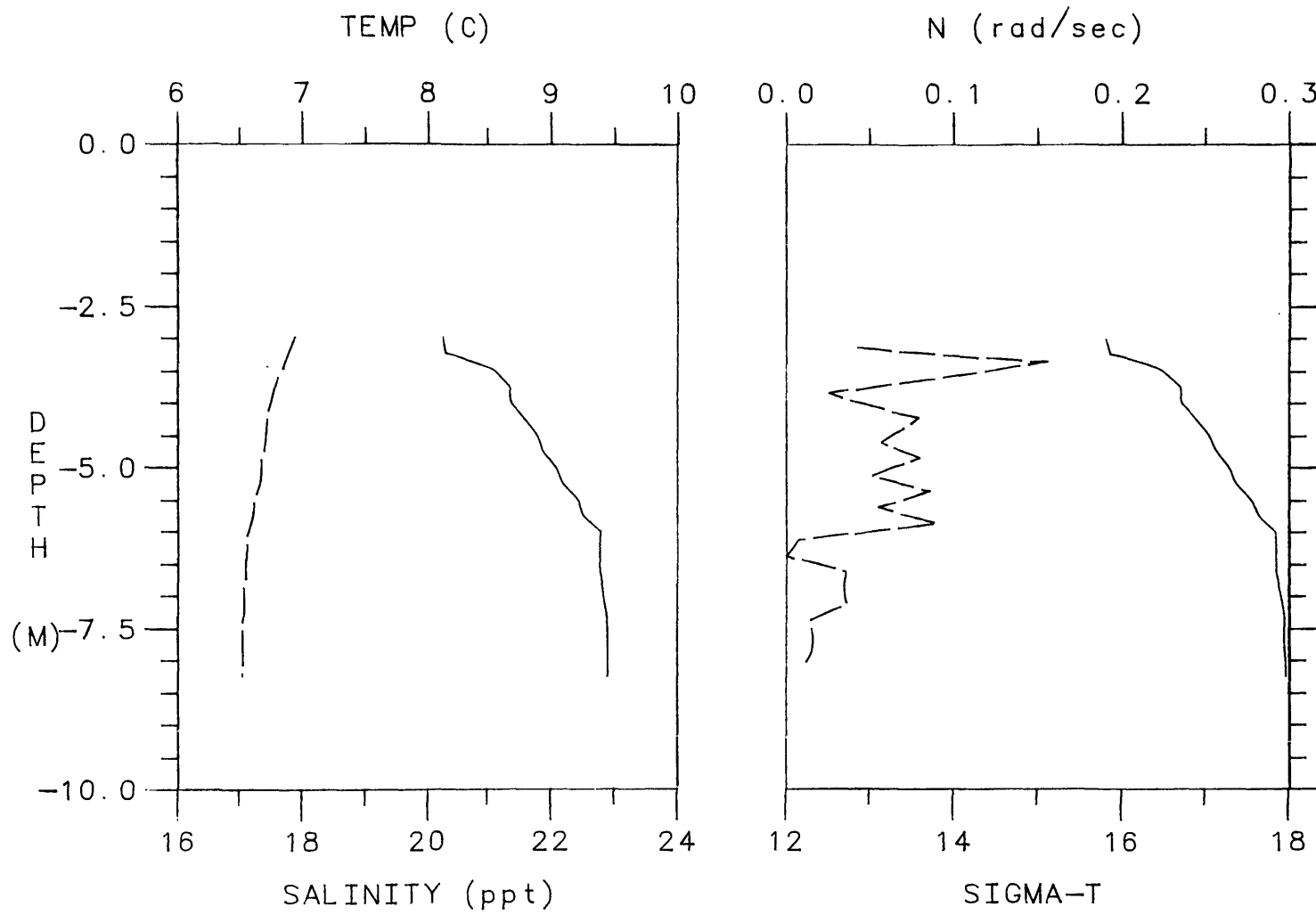
TIME: 1522EST



CRUISE#06

STN:04

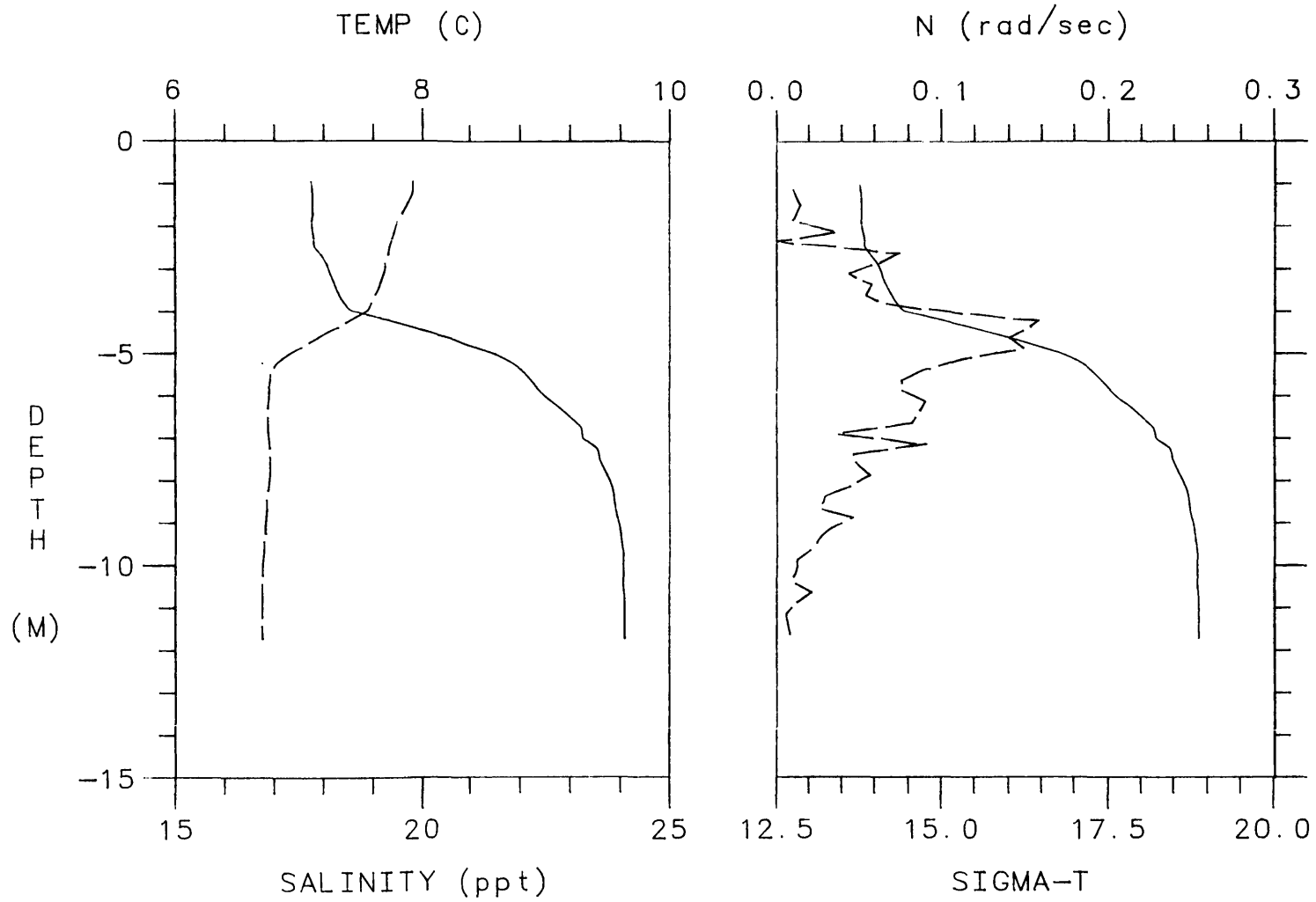
TIME: 1345EST



CRUISE#06

STN: 4R

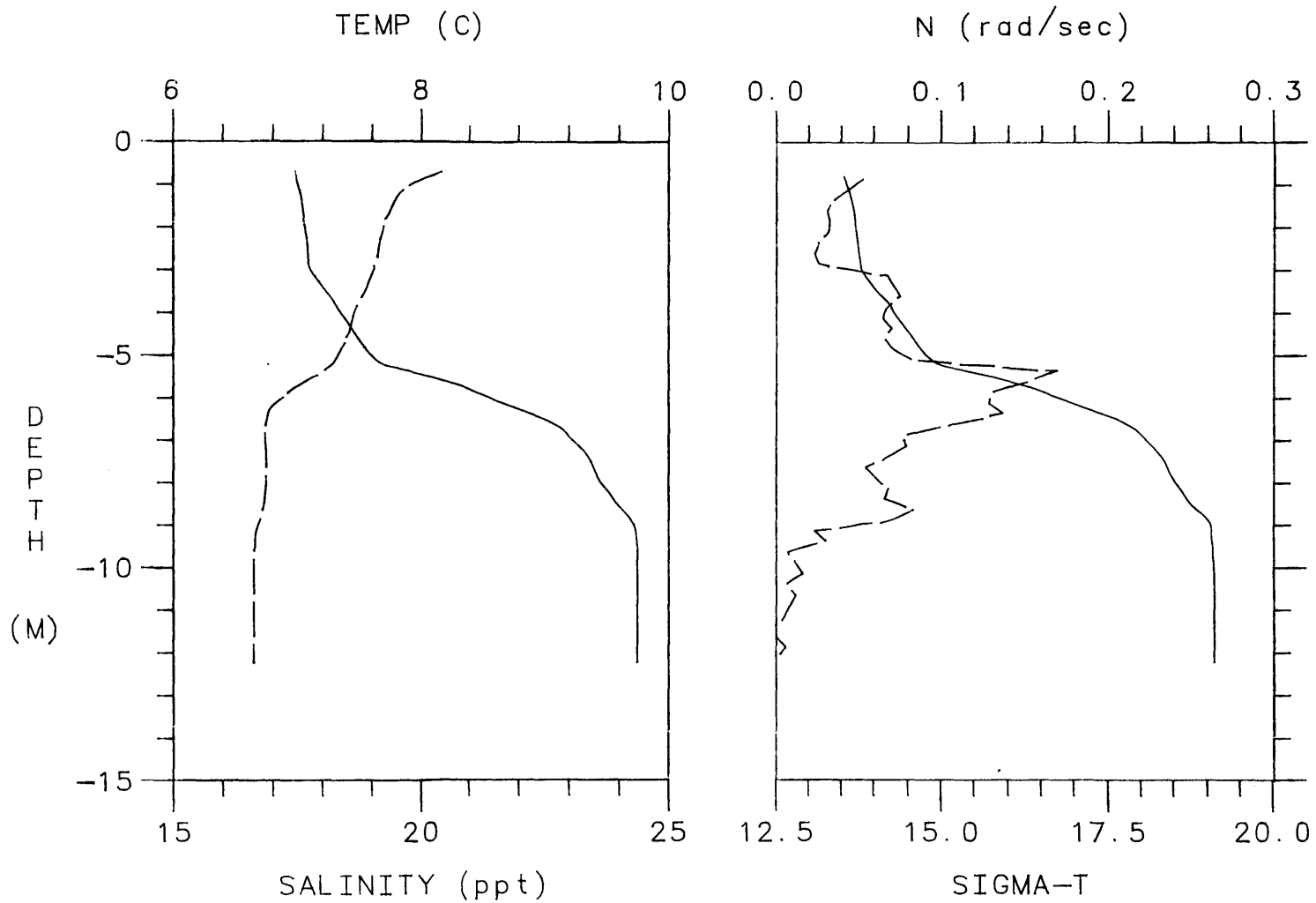
TIME: 1632EST



CRUISE#06

STN:7A

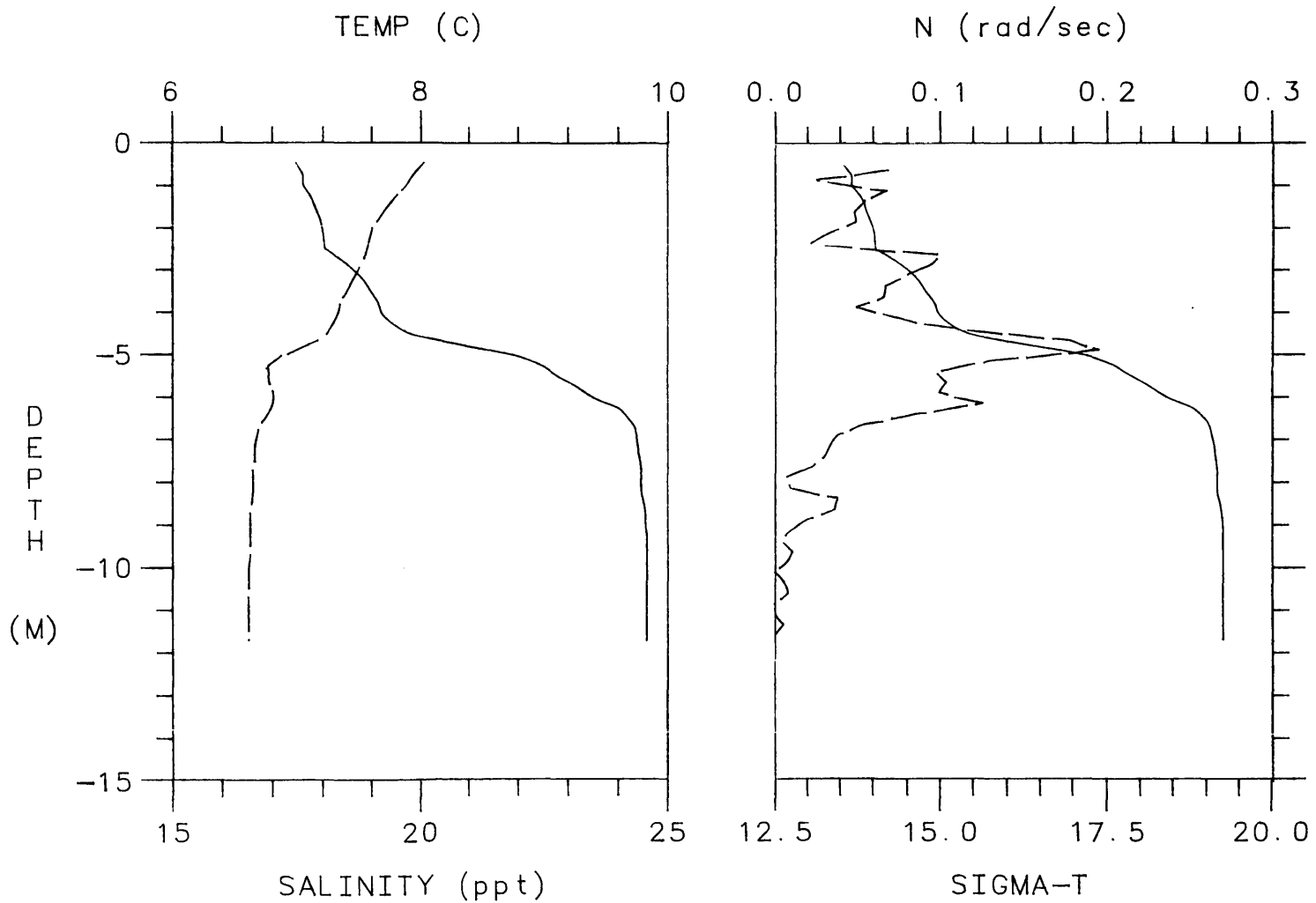
TIME:1235EST



CRUISE#06

STN: 07

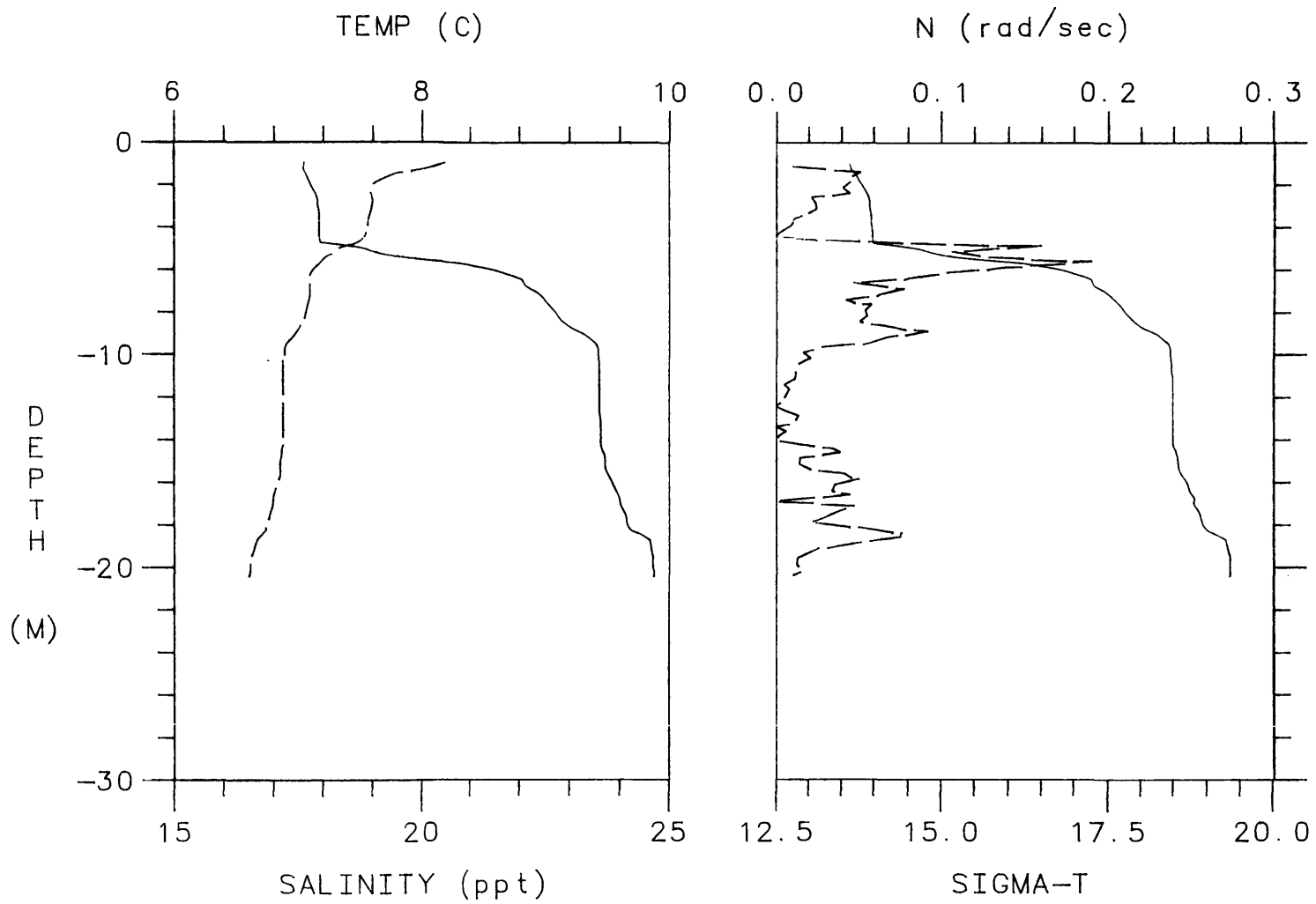
TIME: 1413EST



CRUISE#06

STN: 7R

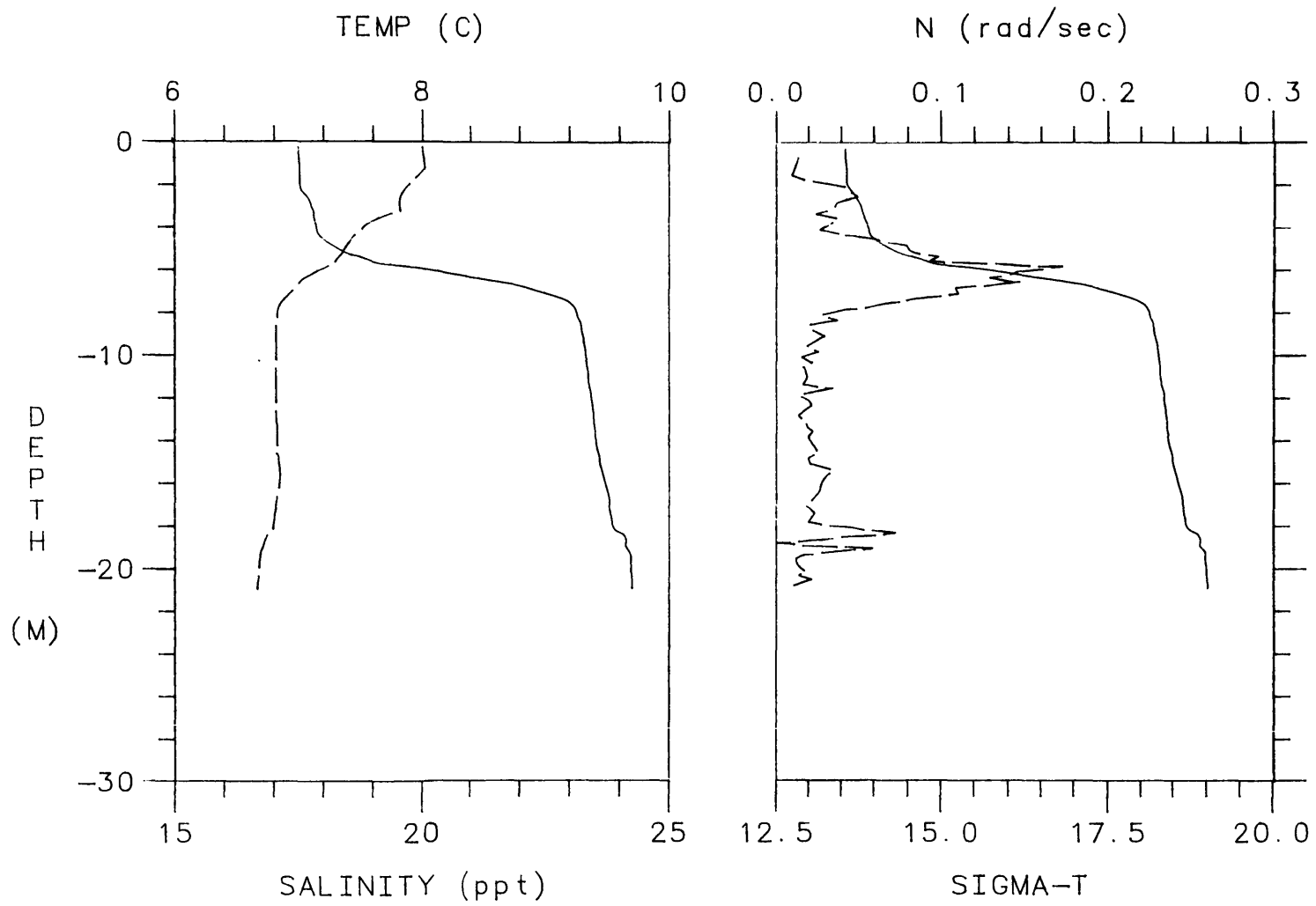
TIME: 1612EST



CRUISE#06

STN: 10

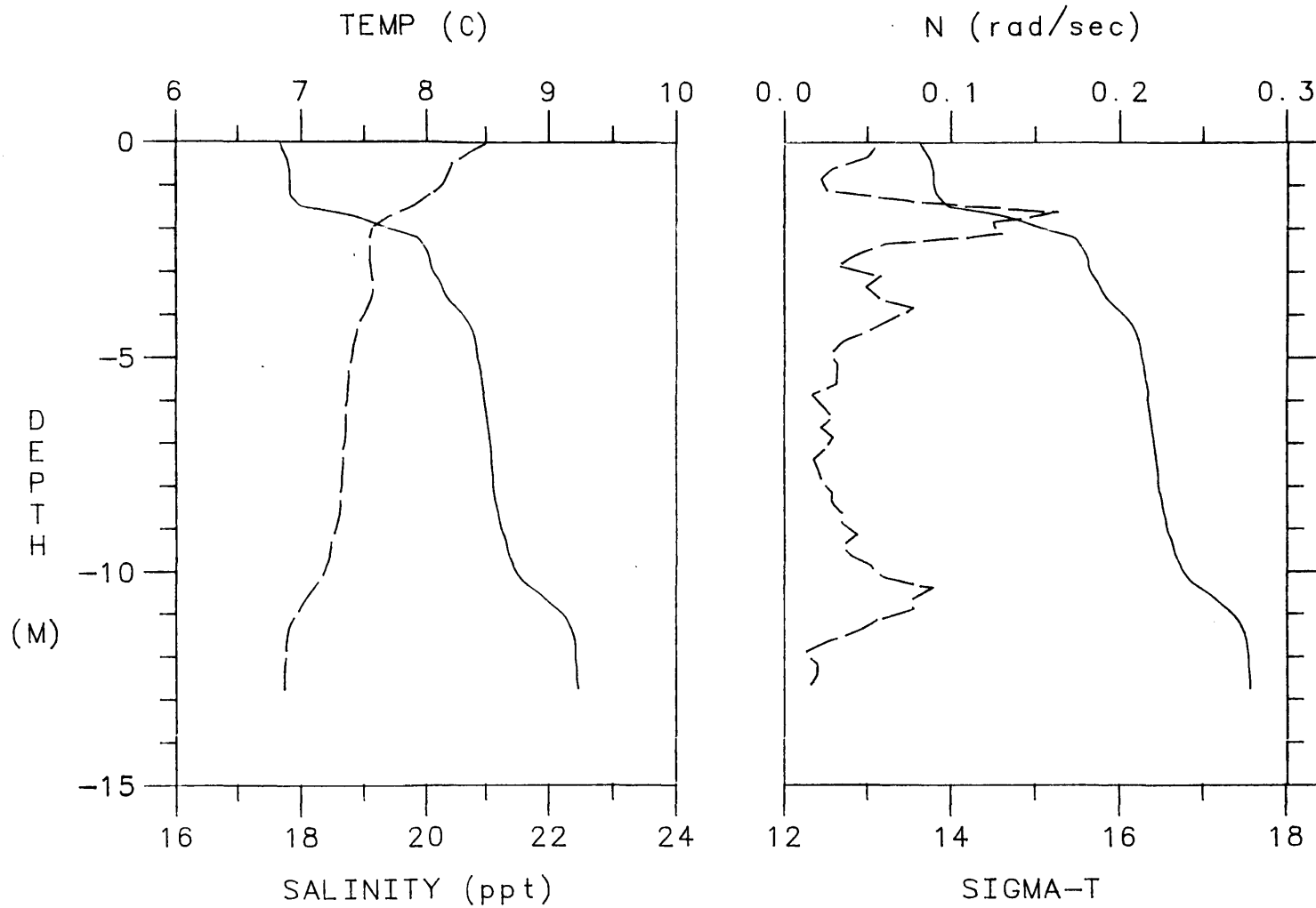
TIME: 1436EST



CRUISE#06

STN: 10R

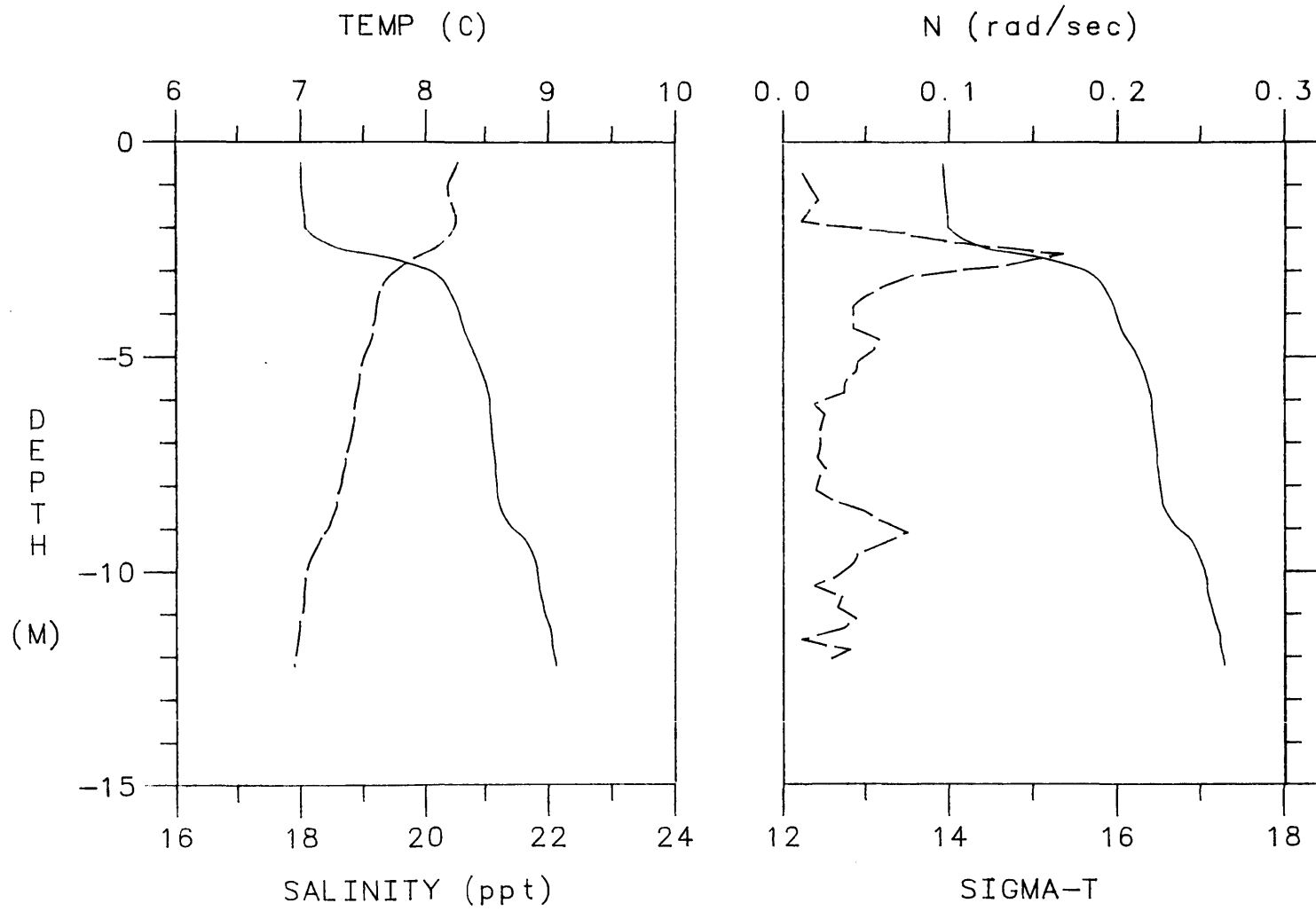
TIME: 1548EST



CRUISE#06

STN: 13

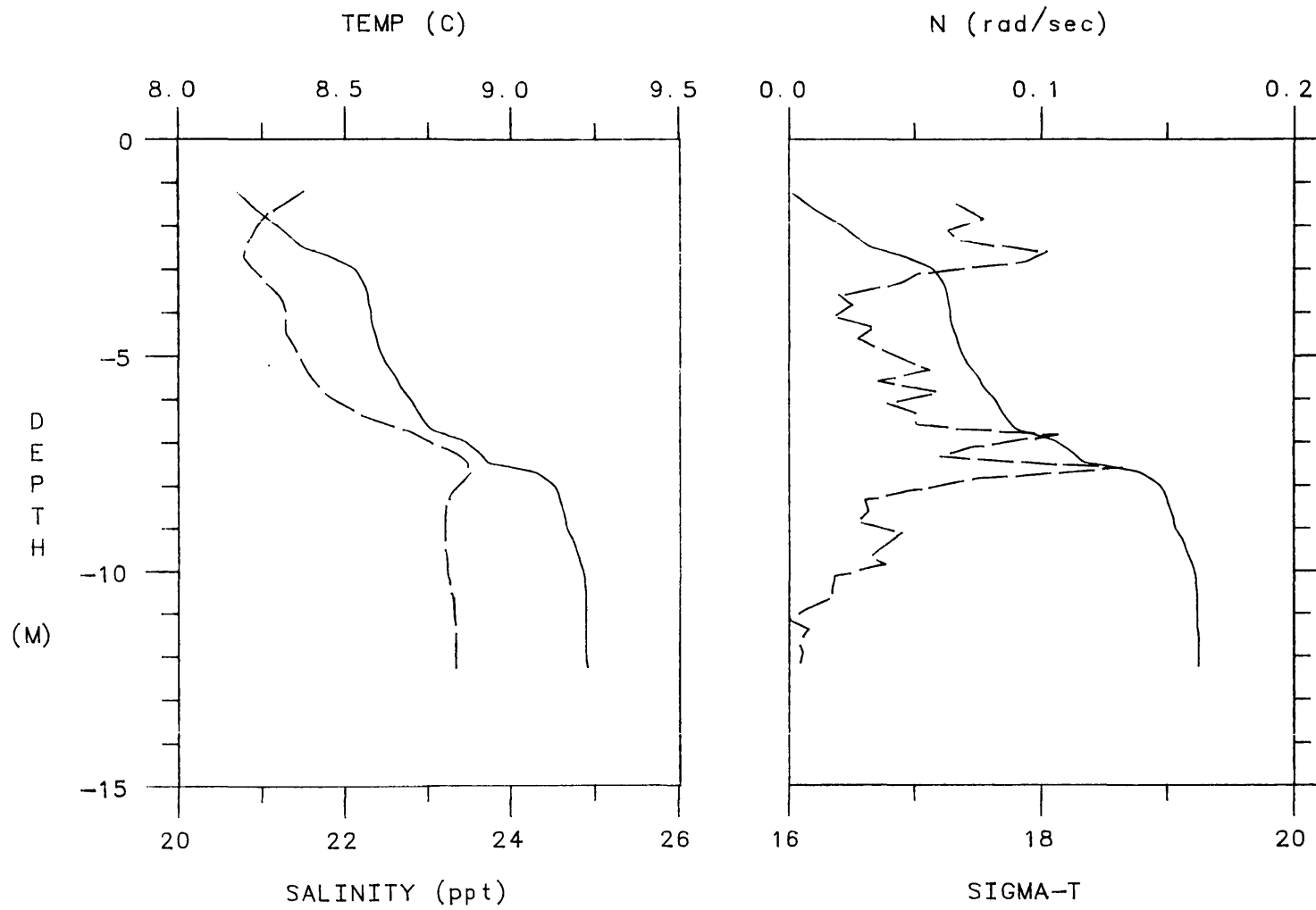
TIME: 1505EST



CRUISE#06

STN: 13R

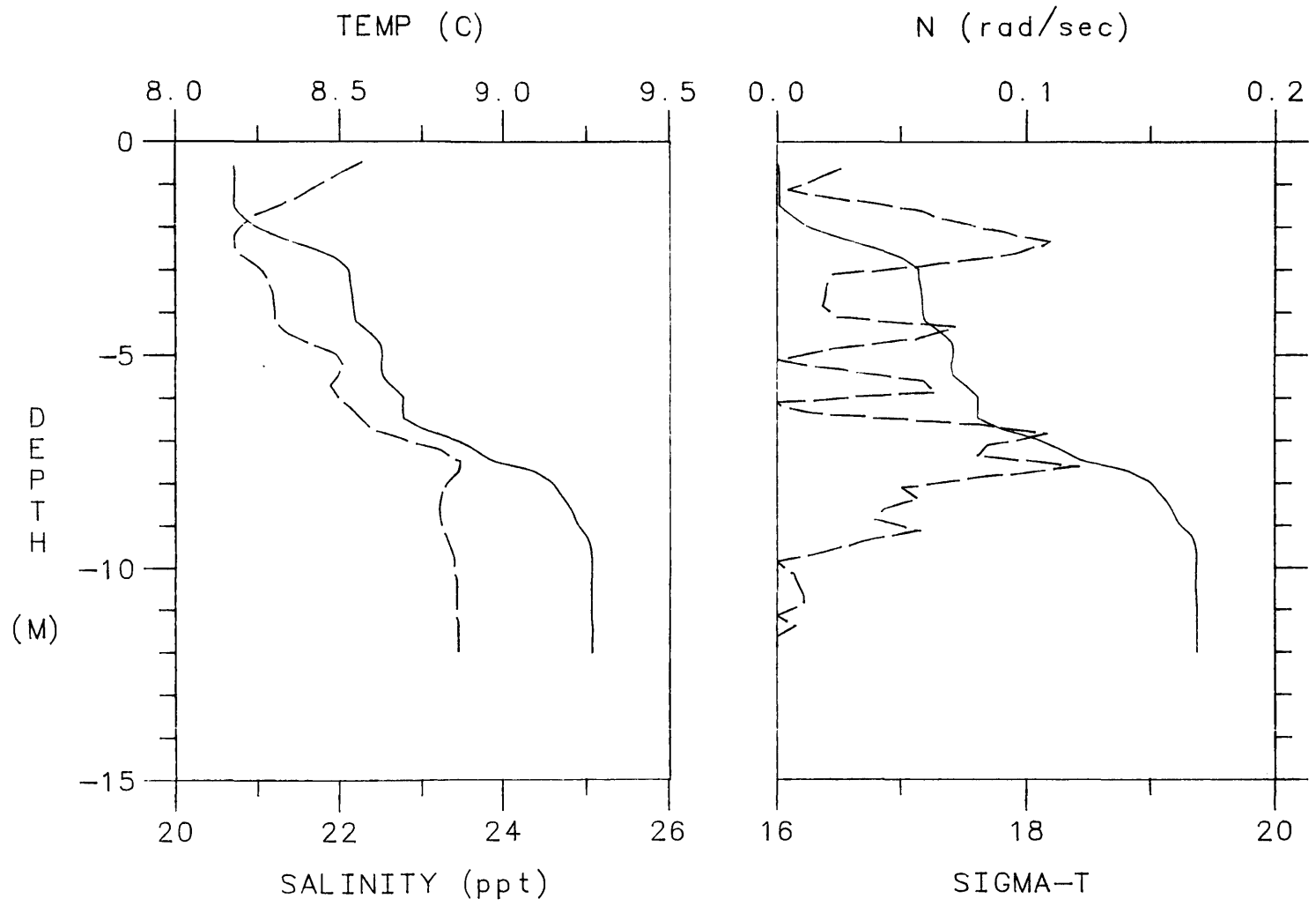
TIME: 1527EST



CRUISE#17

STN:07

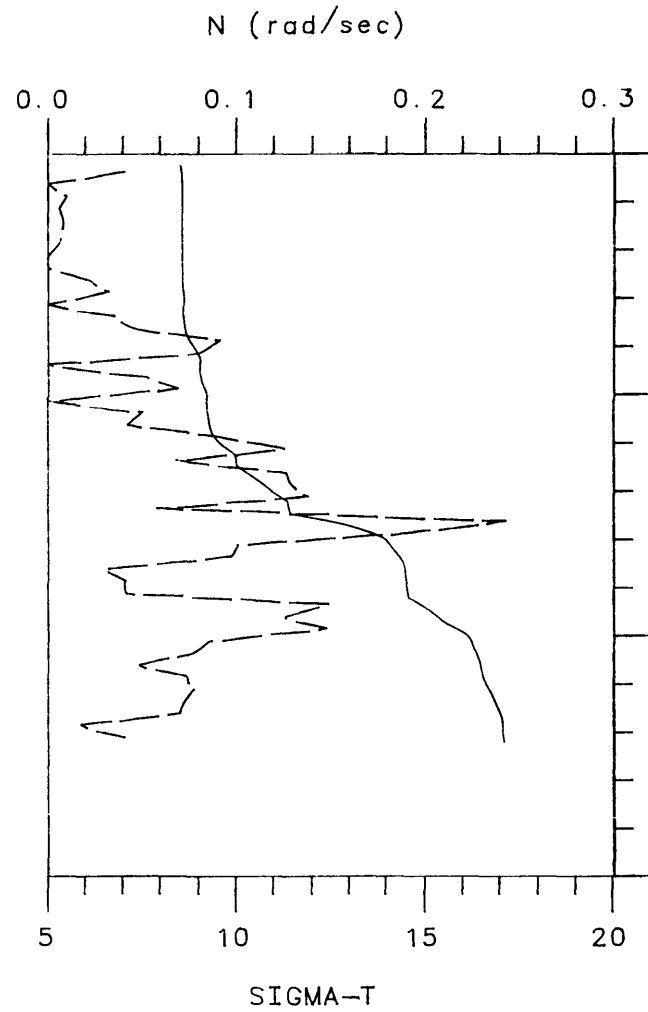
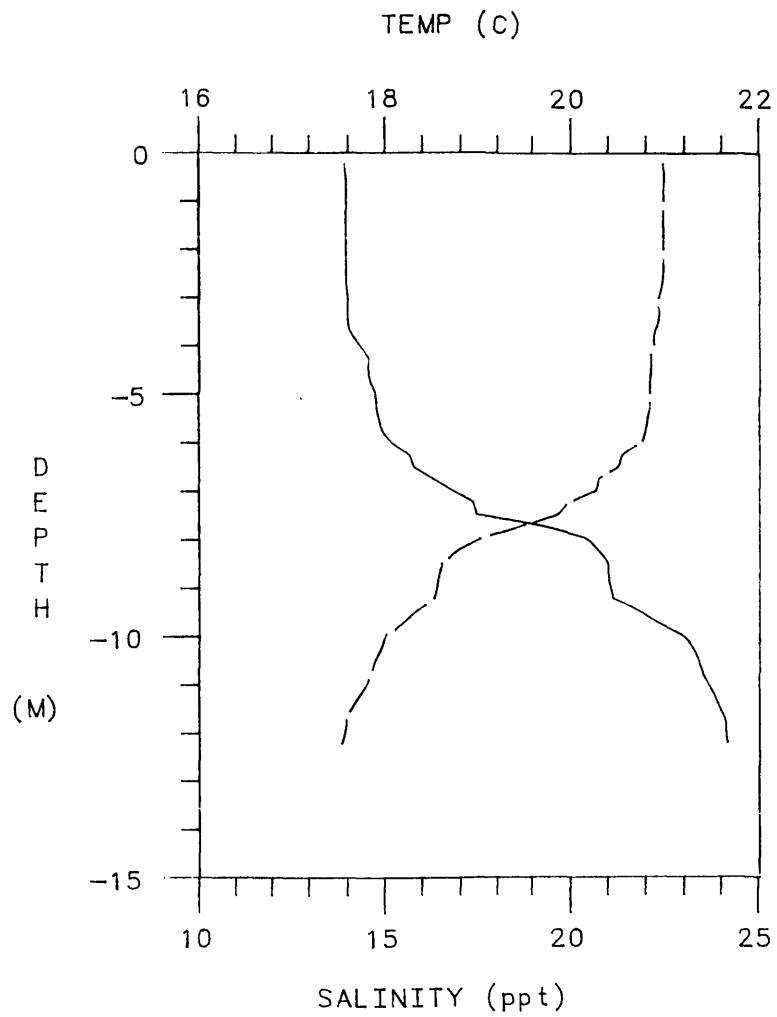
TIME:1408EST



CRUISE #17

STN: 7A

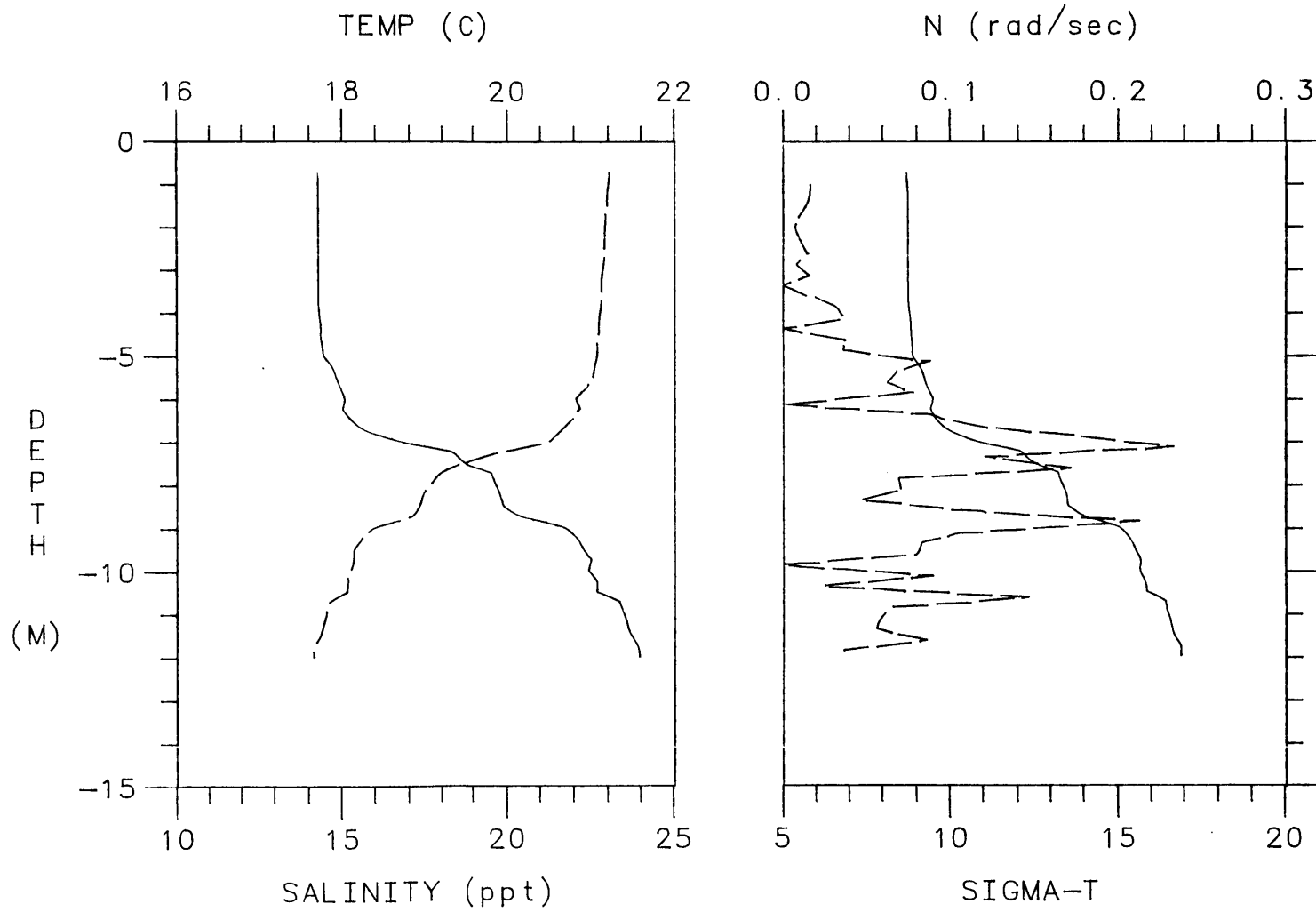
TIME: 1425EST



CRUISE#27

STN:07

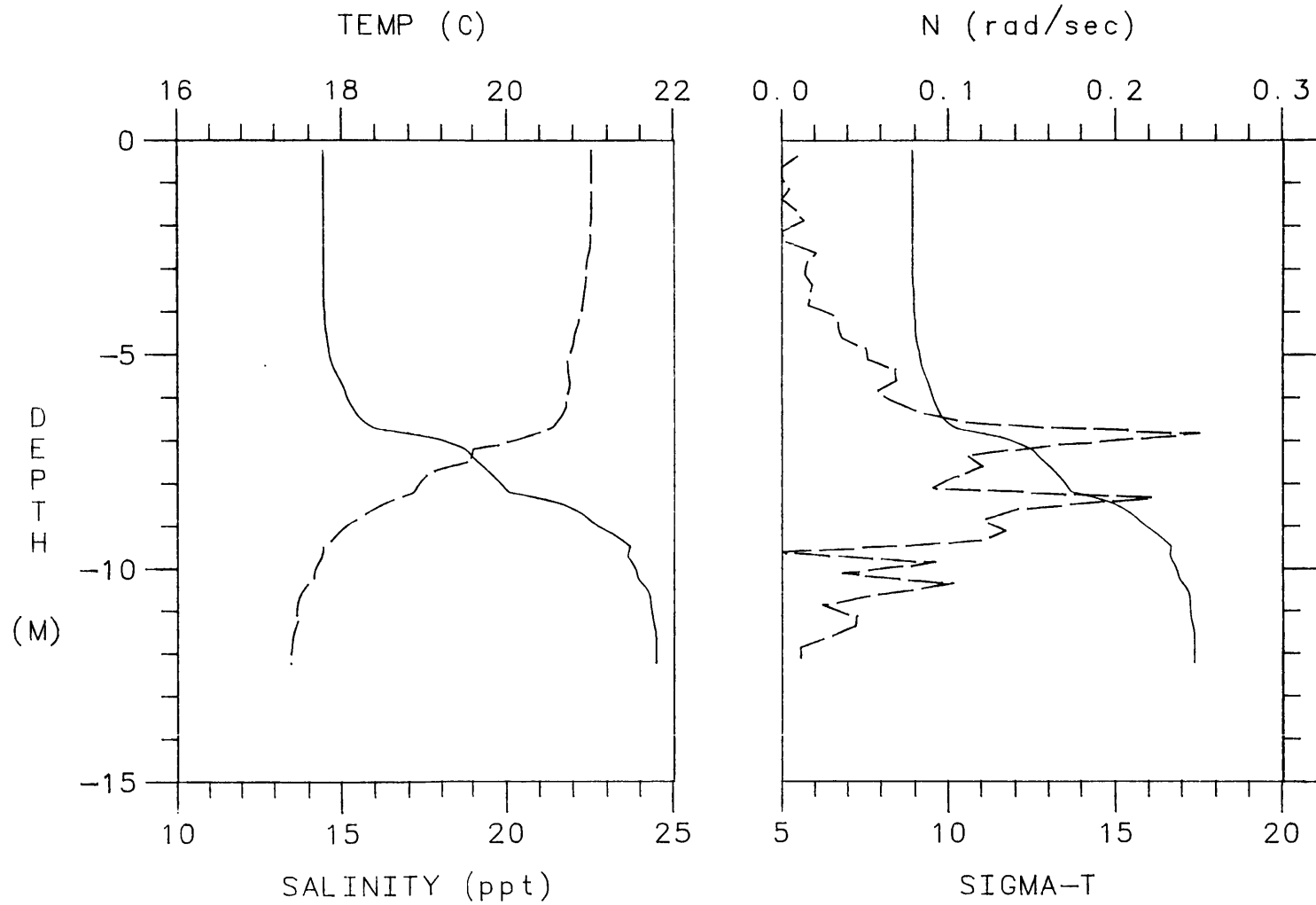
TIME:0851EST



CRUISE#27

STN:7A

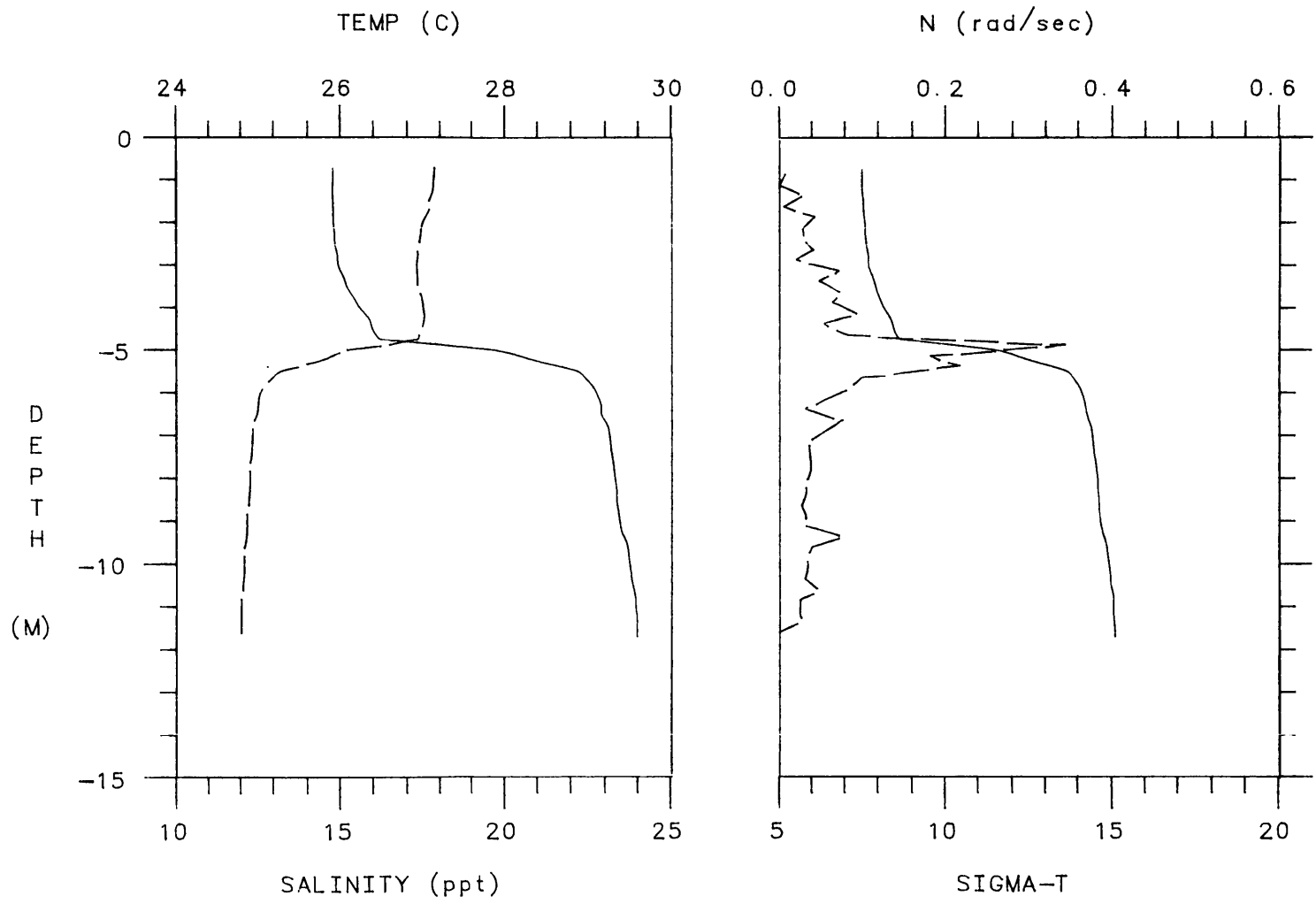
TIME:1056EST



CRUISE #27

STN: 7B

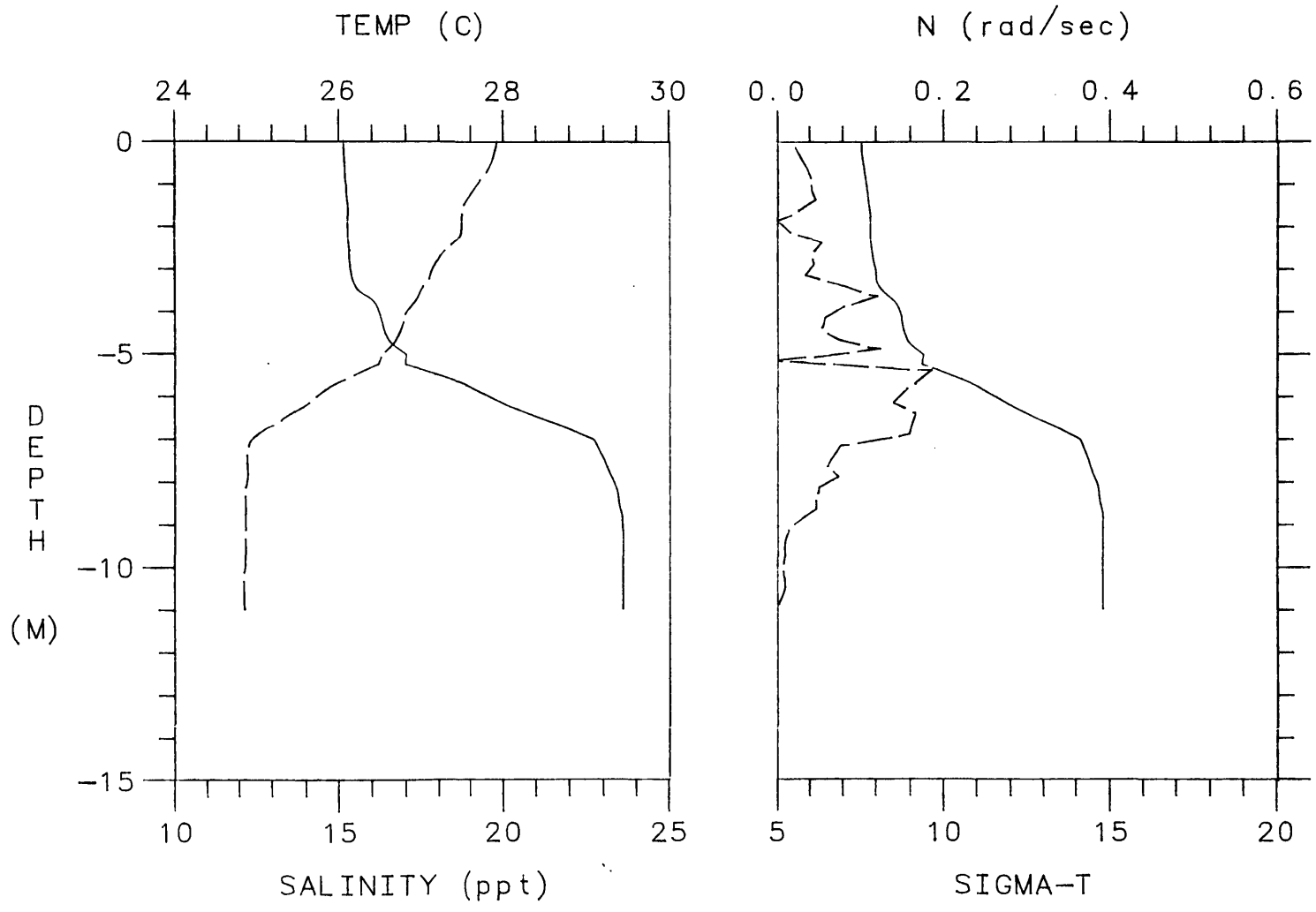
TIME: 1205EST



CRUISE#30

STN:07

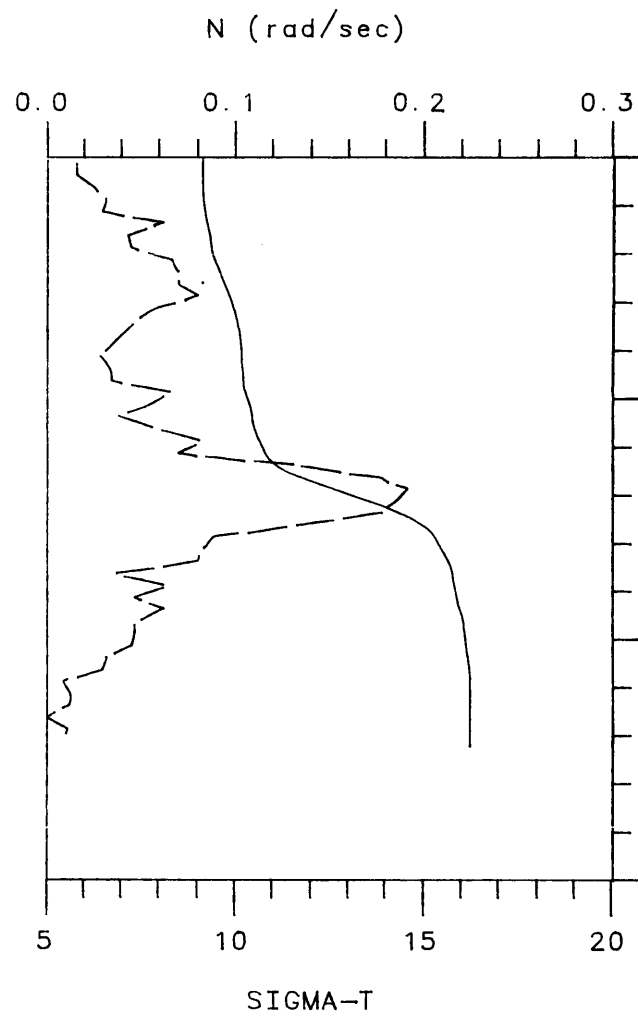
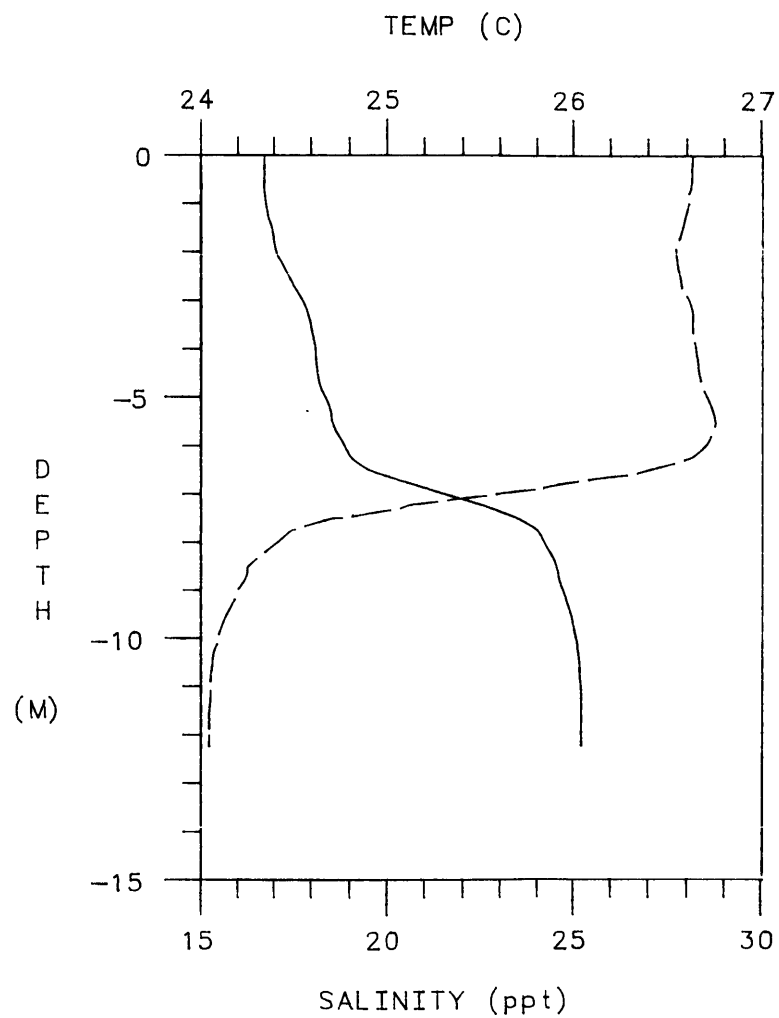
TIME:1003EST



CRUISE #30

STN: 7A

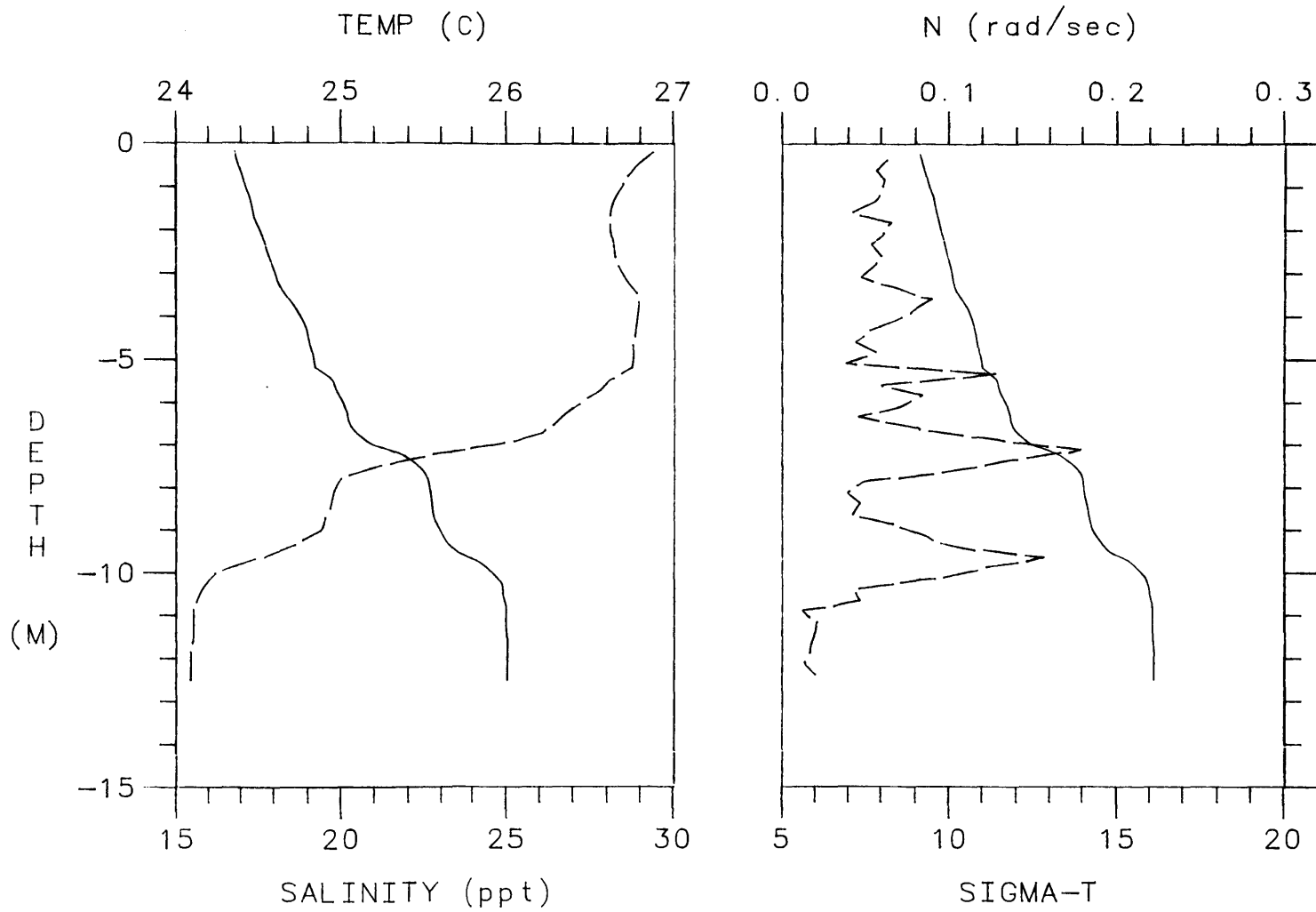
TIME: 1525EST



CRUISE#32

STN:07

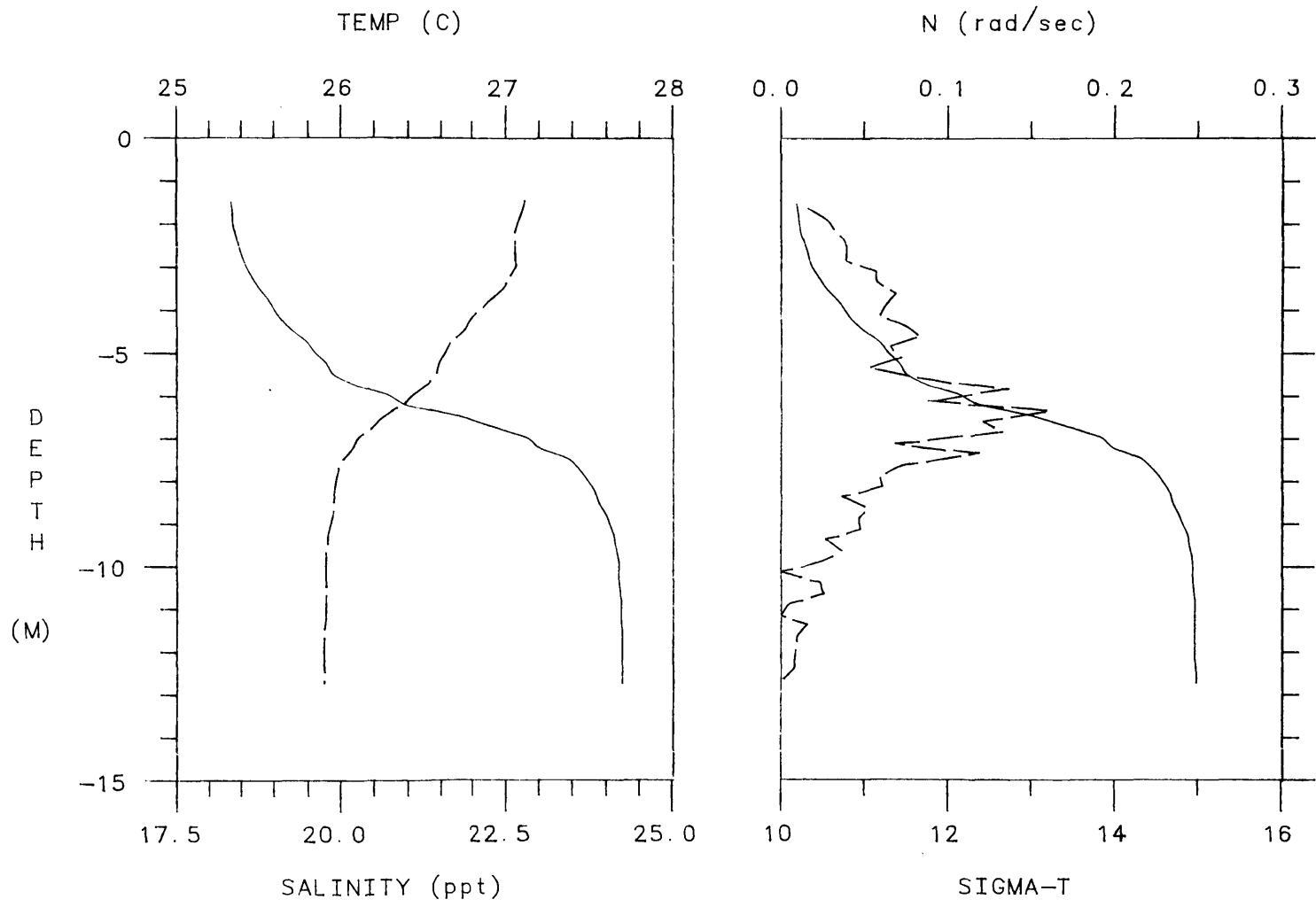
TIME:0805EST



CRUISE#32

STN: 7A

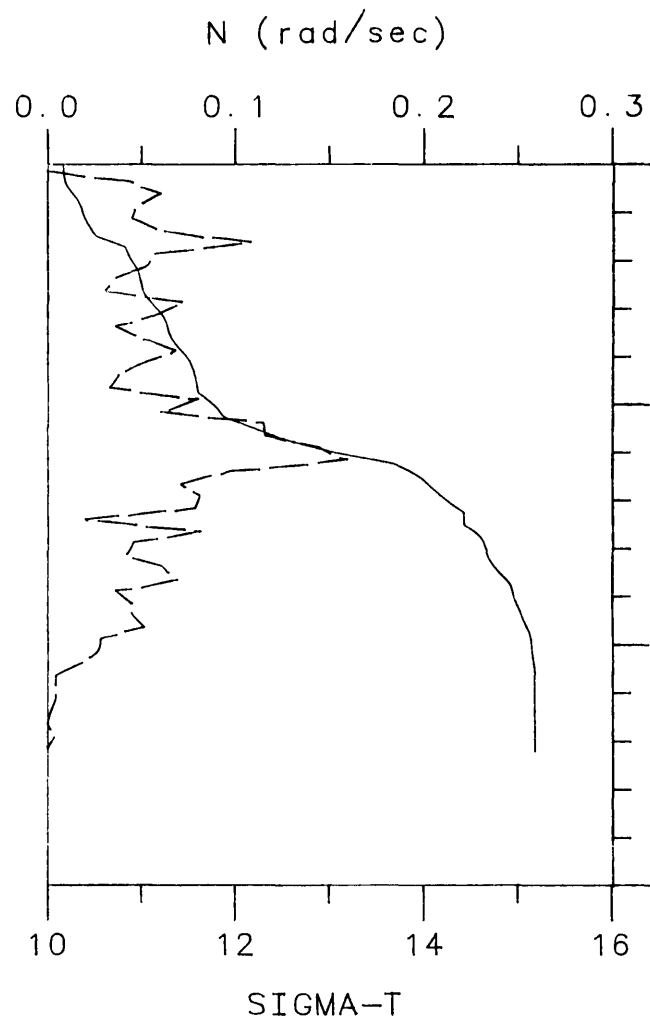
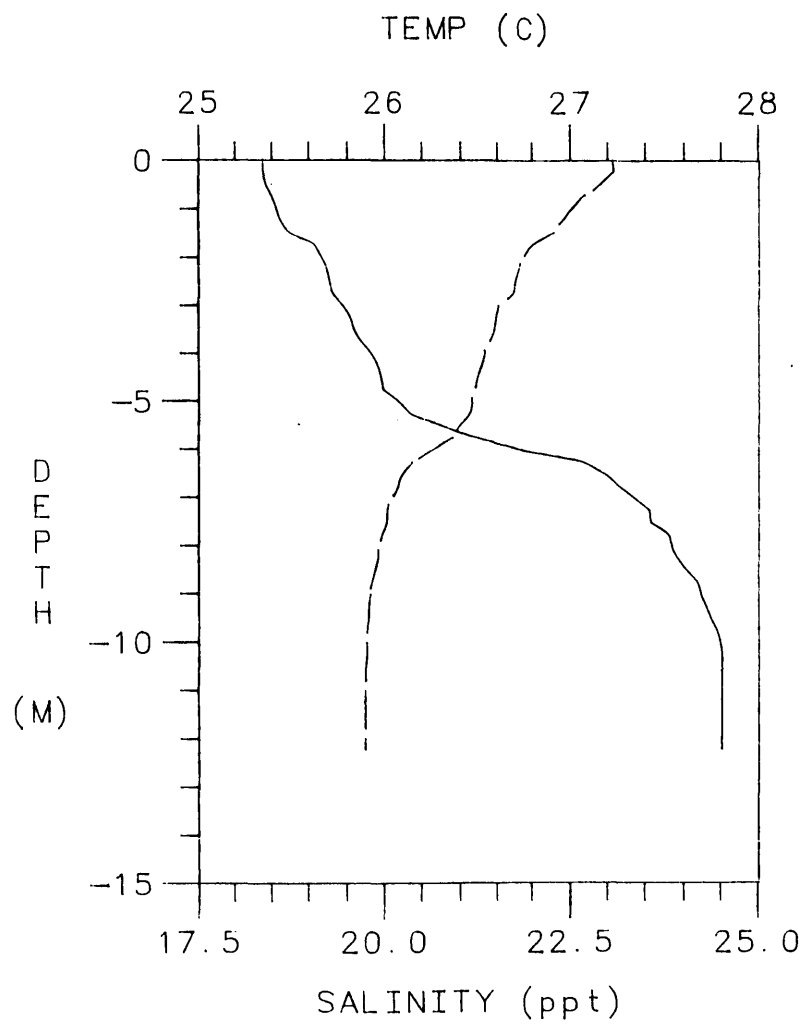
TIME: 0952EST



CRUISE#33

STN:07

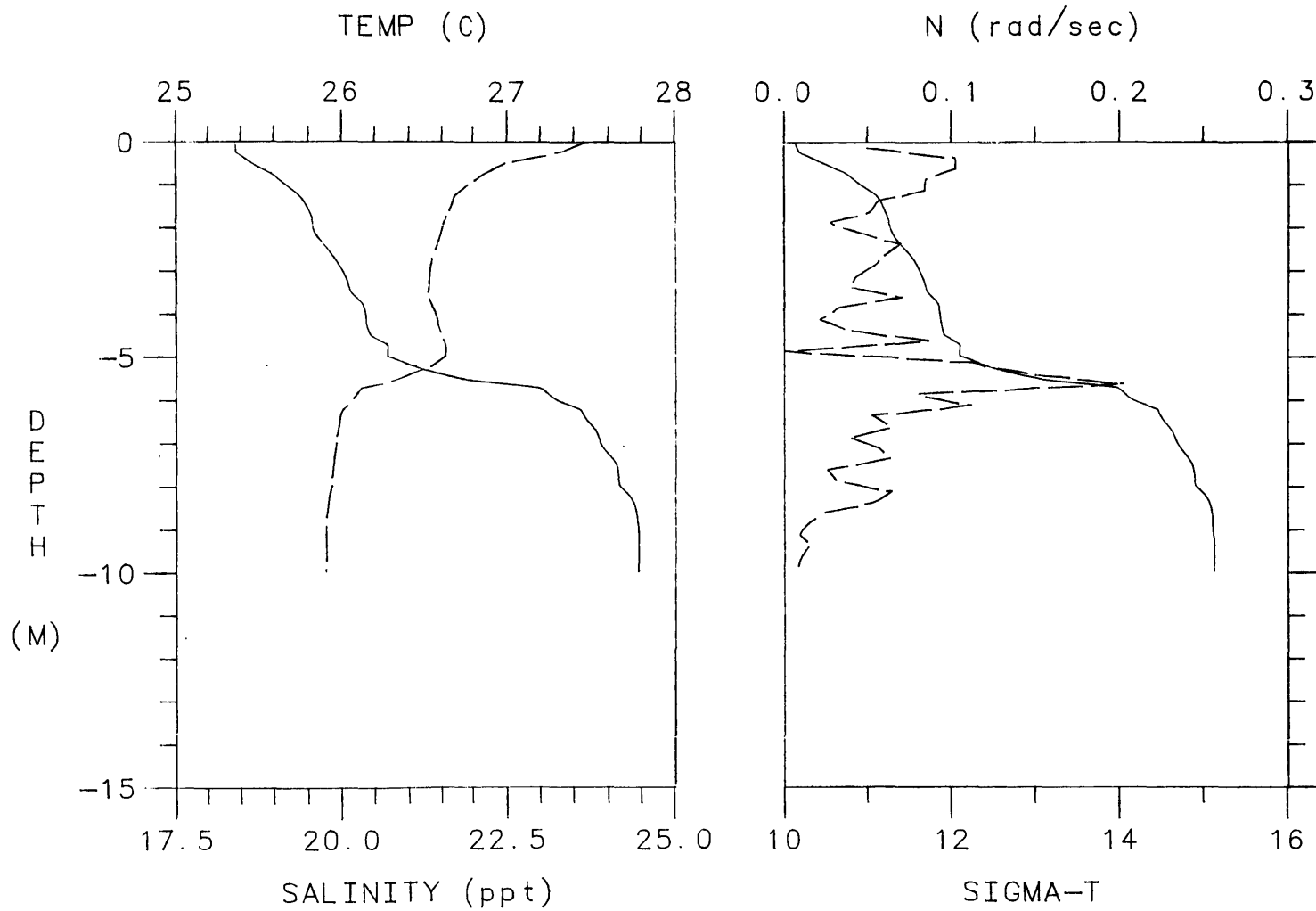
TIME:0956EST



CRUISE#33

STN:7A

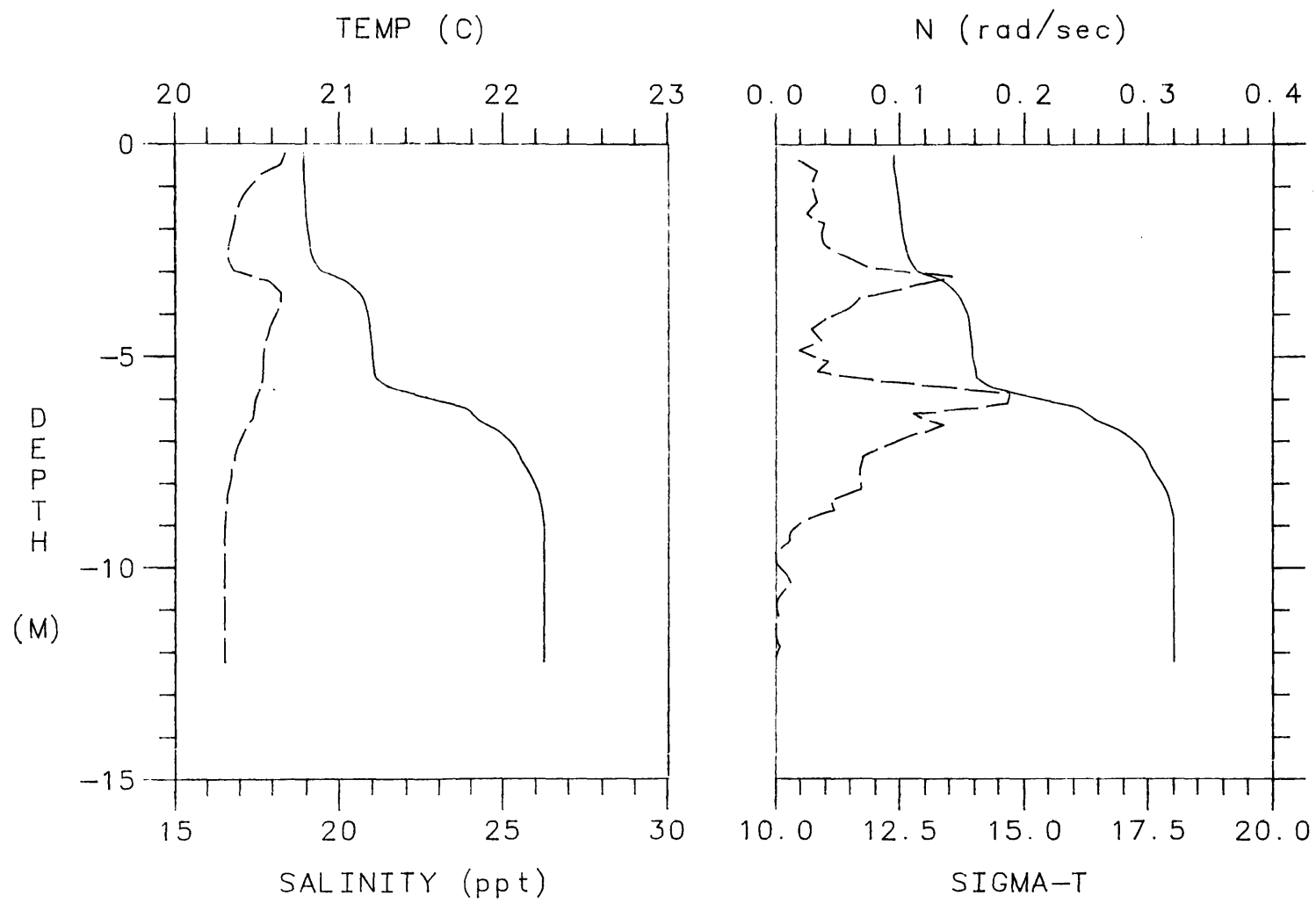
TIME:1151EST



CRUISE#33

STN: 7B

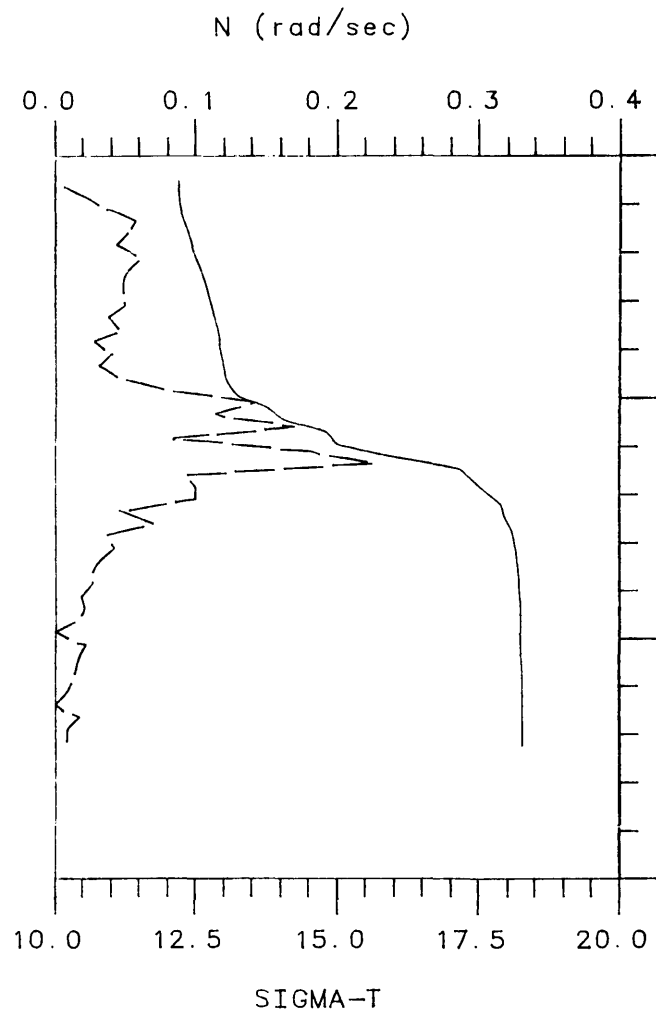
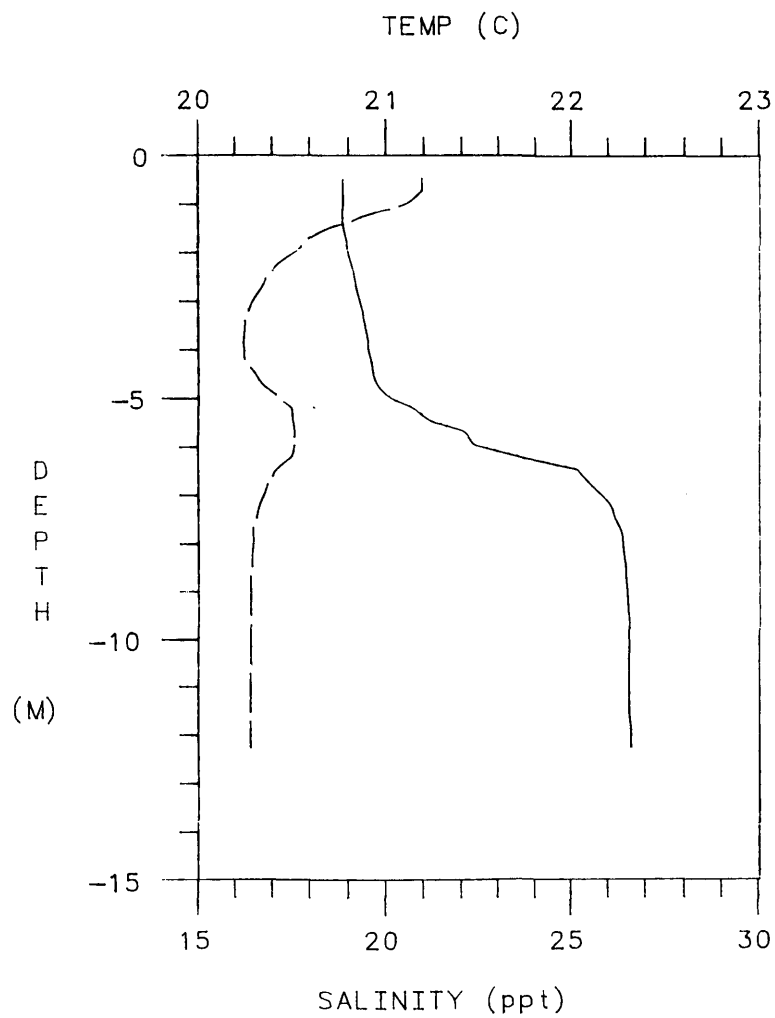
TIME: 1250EST



CRUISE #35

STN: 7A

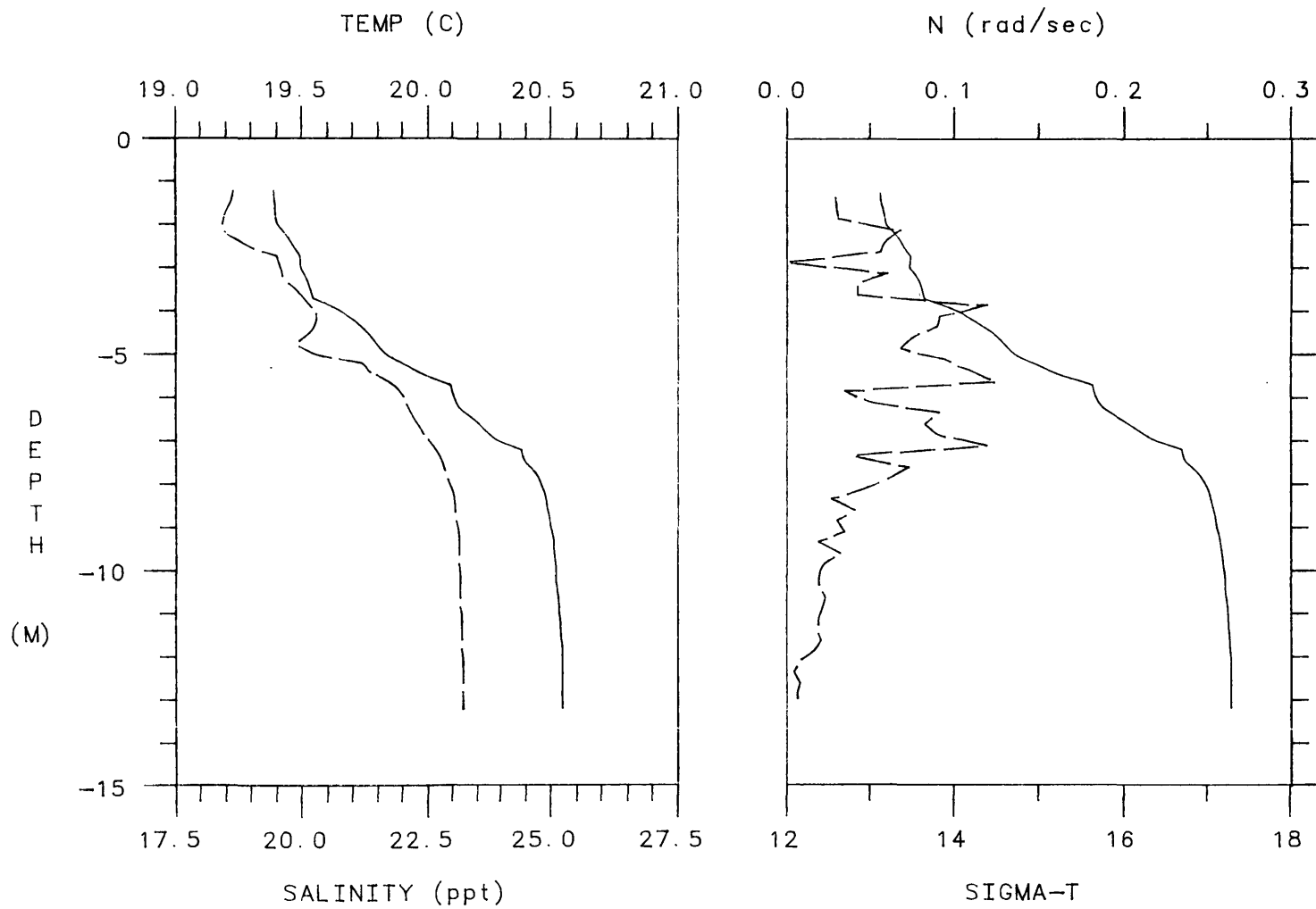
TIME: 1010EST



CRUISE#35

STN:07

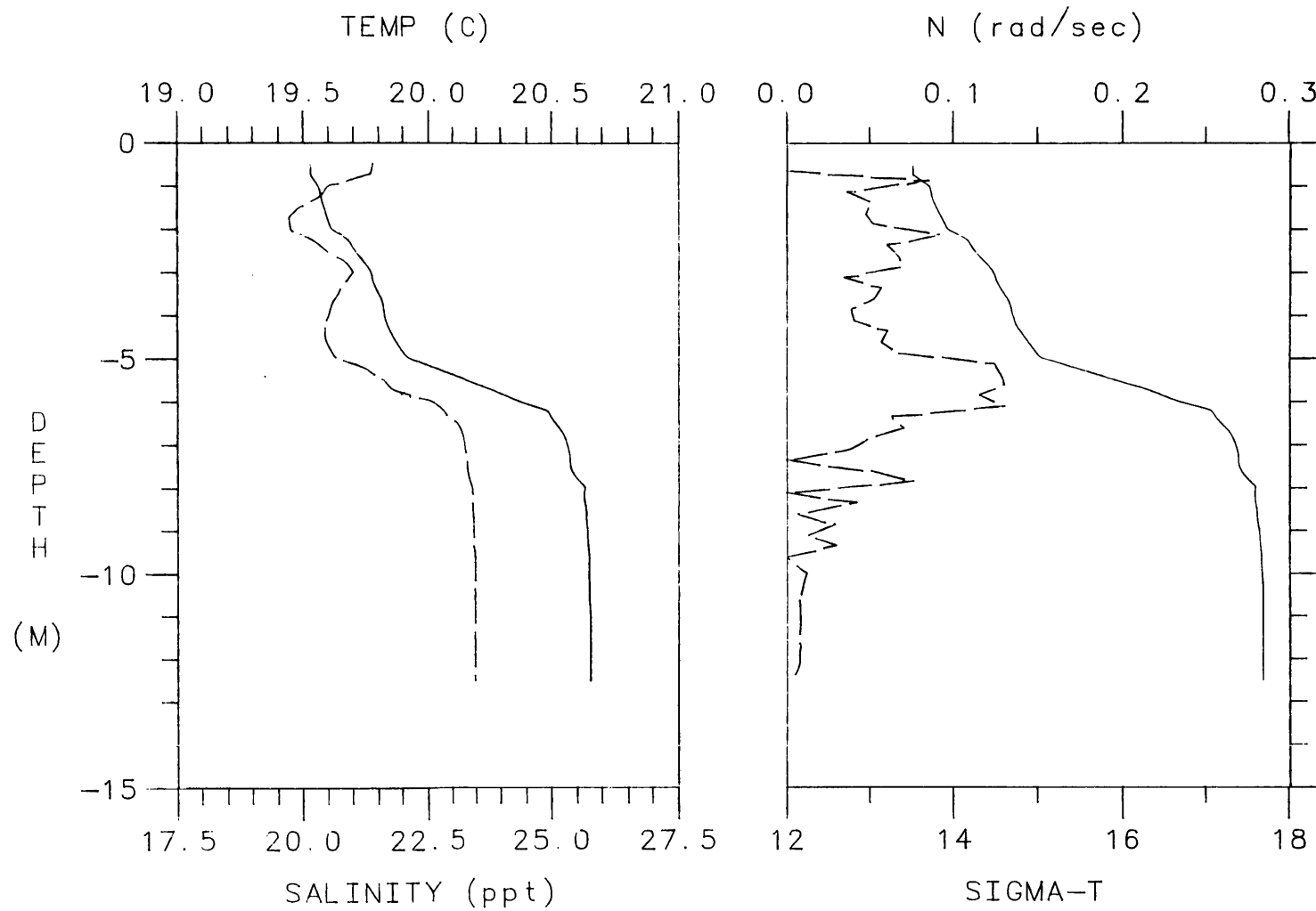
TIME: 1216EST



CRUISE#36

STN:07

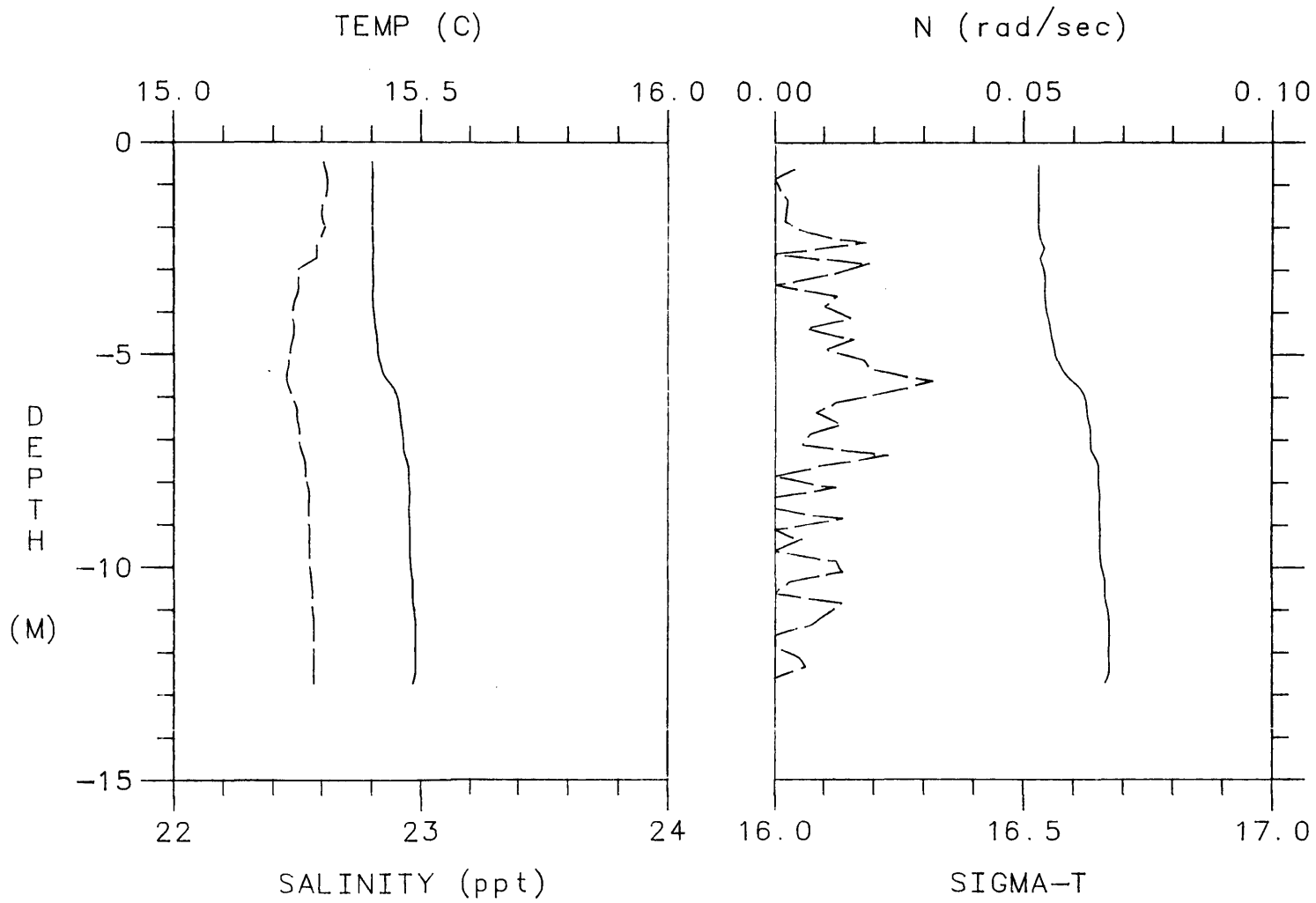
TIME:1023EST



CRUISE#36

STN:7A

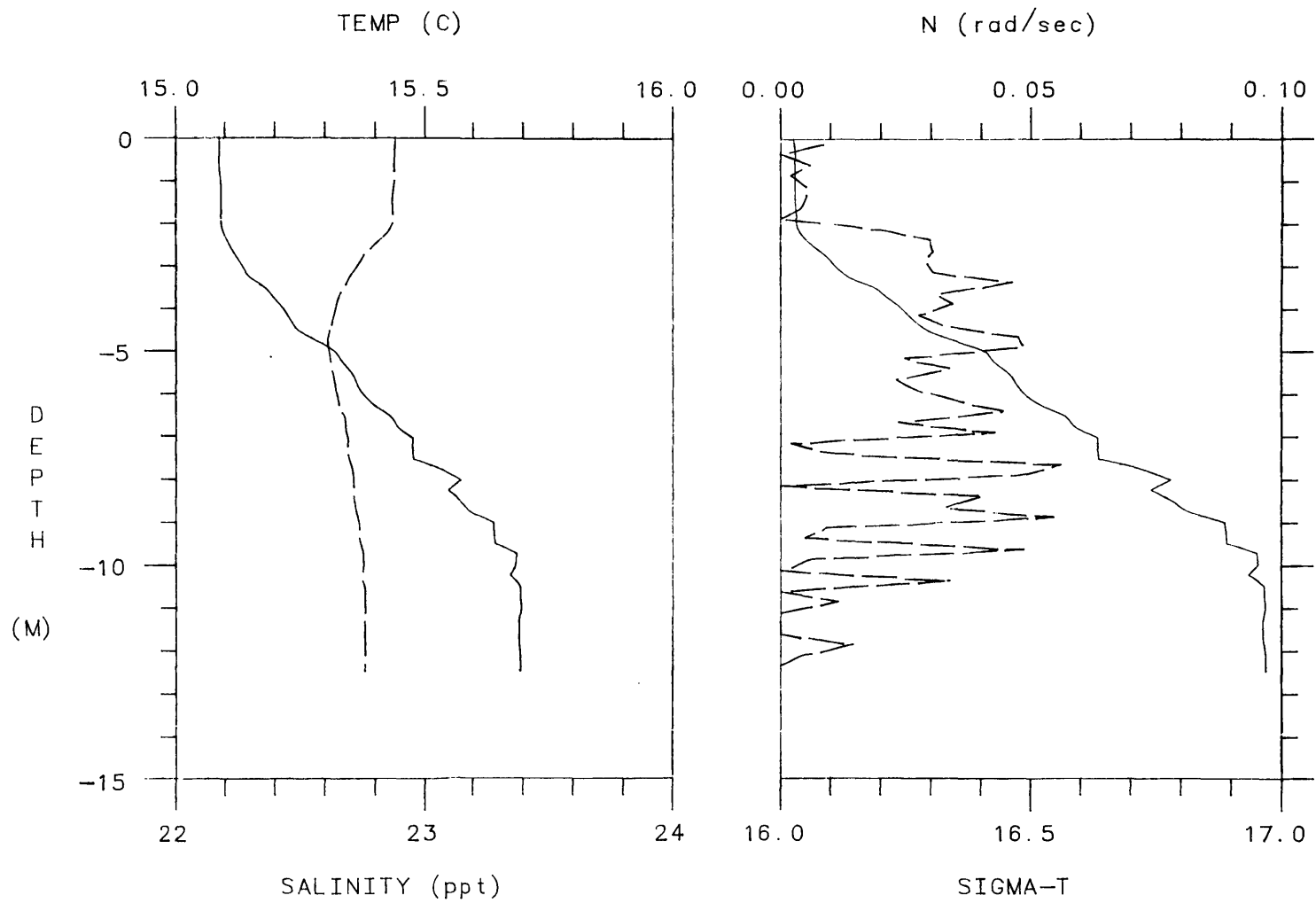
TIME:1359EST



CRUISE#37

STN:7A

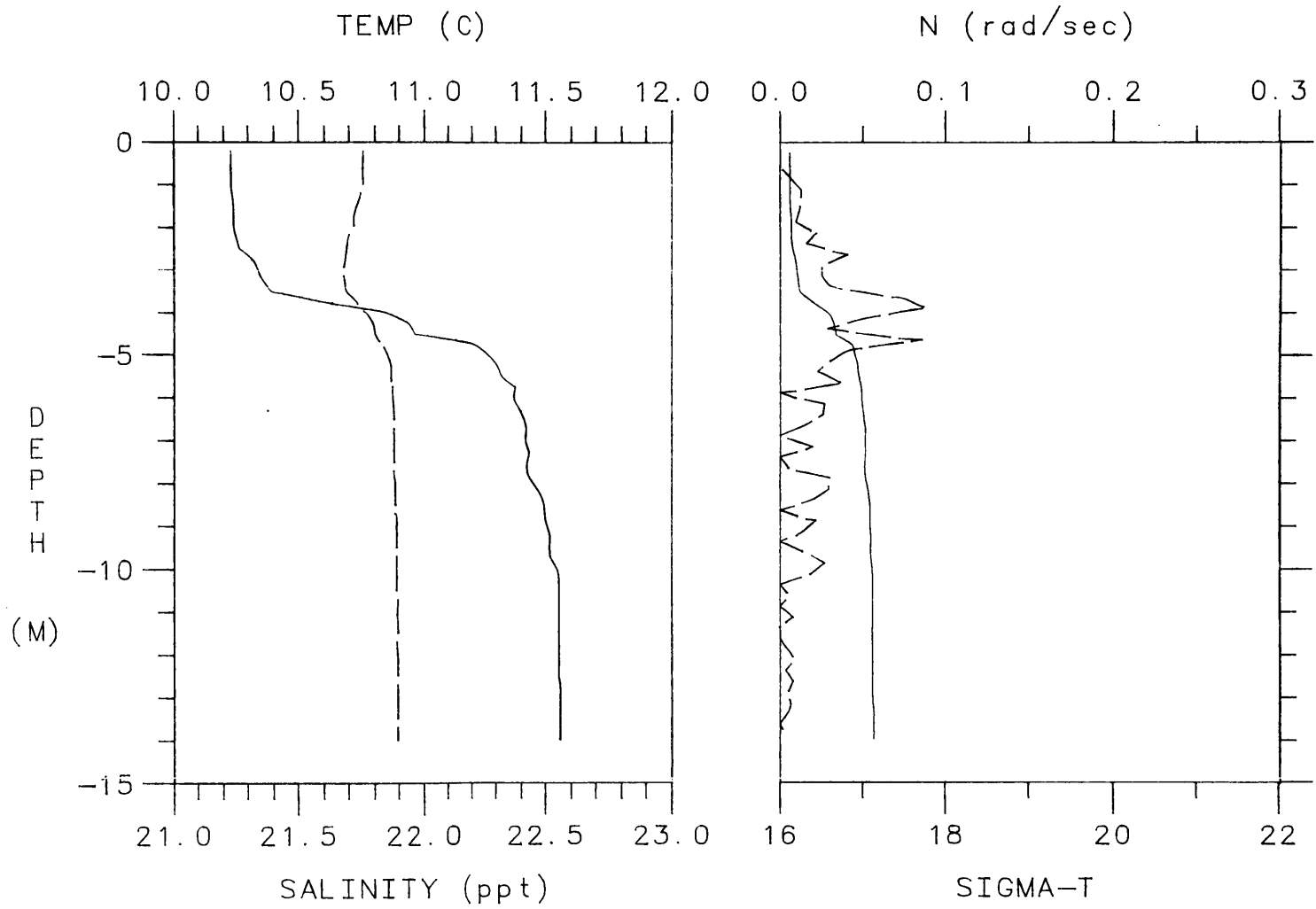
TIME:1122EST



CRUISE#37

STN:07

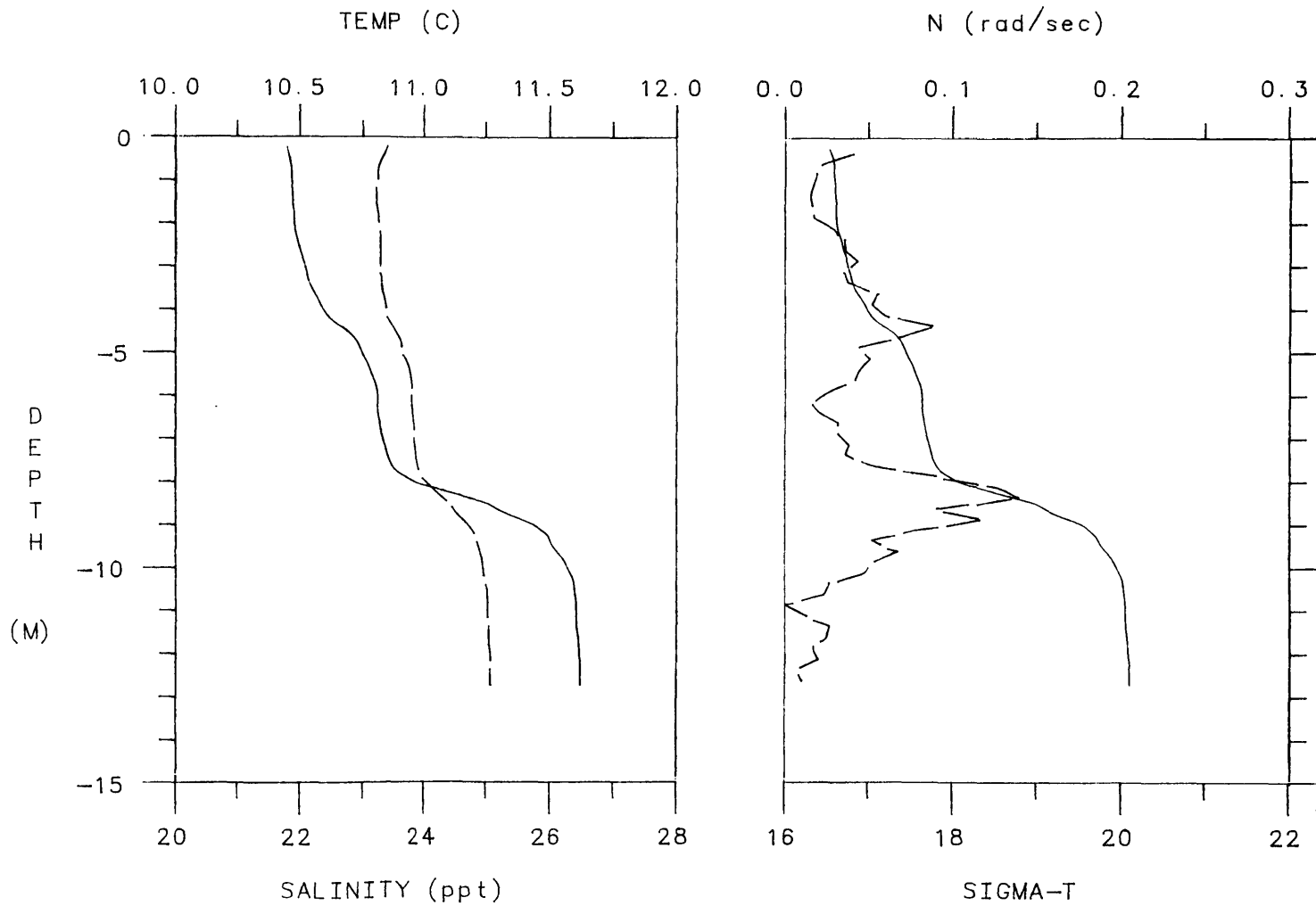
TIME:1326EST



CRUISE #39

STN: 7A

TIME: 1205EST



CRUISE#39

STN: 07

TIME: 1421EST

APPENDIX C

Surface and Bottom Dissolved Oxygen

CRUISE #:	07		08		09		10		11		12		13	
DATE:	08APRI1982		21APRI1982		05MAY1982		19MAY1982		03JUN1982		18JUN1982		30JUN1982	
	DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)	
STATIONS	S	B	S	B	S	B	S	B	S	B	S	B	S	B
1	---	10.93	---	10.83	10.03	9.97	8.30	8.44	10.05	9.80	7.77	7.47	6.57	6.73
2	---	10.71	---	11.54	11.19	10.90	9.33	9.13	10.39	6.15	7.25	6.92	7.52	7.24
3	---	10.50	---	11.40	11.14	11.35	8.48	---	7.68	6.53	7.80	6.96	7.90	6.81
4	---	10.30	---	10.59	12.57	10.86	8.97	6.16	8.70	6.35	7.71	6.84	7.89	5.83
5	---	10.26	---	10.01	13.03	8.36	8.89	4.85	10.51	5.65	7.19	5.85	8.16	5.27
6	---	10.32	---	9.85	12.97	8.18	9.11	4.26	8.94	6.57	7.98	5.10	8.54	8.00
7	---	10.36	---	---	12.63	7.23	9.47	5.45	11.07	5.70	7.67	5.91	7.74	4.72
8	---	10.42	---	9.41	12.42	7.37	10.34	5.70	8.36	4.82	8.38	4.34	7.92	5.35
9	---	9.21	---	---	12.40	7.55	10.38	5.86	8.70	5.55	9.16	4.95	7.64	5.16
10	---	10.08	---	9.02	12.73	7.17	10.06	5.76	8.78	5.25	8.63	5.30	7.42	5.37
11	---	10.64	---	9.35	12.83	8.10	10.73	5.96	8.96	5.60	8.79	4.81	7.24	5.90
12	---	10.40	---	9.89	12.28	7.84	10.86	6.78	8.90	5.66	8.32	5.12	7.68	6.59
13	---	10.34	---	10.17	11.57	8.20	10.18	6.64	8.26	6.24	8.30	7.23	7.66	5.77
14	---	10.56	---	11.38	11.19	9.68	10.18	9.92	---	7.28	9.23	8.64	7.10	6.75
15	---	10.56	---	---	10.60	9.68	9.56	9.51	7.62	7.08	8.24	8.12	7.44	6.37

CRUISE #:	15		16		17		18		20		21		22	
DATE:	07OCT1982		16NOV1982		15DEC1982		06JAN1983		03FEB1983		16FEB1983		09MAR1983	
	DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)	
STATIONS	S	B	S	B	S	B	S	B	S	B	S	B	S	B
1	7.74	7.94	11.90	12.70	11.20	11.38	---	---	---	11.28	11.96	11.86	---	13.46
2	7.94	9.02	11.84	12.10	11.66	10.70	---	10.37	---	10.76	12.10	11.90	12.06	12.18
3	8.50	7.38	11.24	10.40	10.94	10.86	---	10.89	11.30	10.40	12.54	---	12.02	12.08
4	9.40	---	10.50	12.22	11.28	10.98	10.31	10.61	11.98	10.46	11.96	12.12	12.36	11.22
5	10.38	---	11.54	10.26	10.66	9.88	10.75	10.33	11.04	---	12.74	11.34	12.42	10.50
6	11.34	7.12	13.02	10.18	11.84	10.68	11.00	10.23	11.14	10.16	12.18	11.74	12.66	11.48
7	10.90	7.58	11.82	---	10.66	9.68	10.87	---	11.06	10.28	12.18	12.08	12.80	10.88
8	7.72	6.26	8.62	8.70	10.68	10.00	10.75	---	11.72	10.70	13.30	11.30	12.32	11.04
9	11.80	7.14	11.58	12.96	11.92	9.56	10.77	9.83	11.22	10.60	12.10	11.32	11.98	11.02
10	10.18	6.68	13.06	13.02	10.82	10.04	10.77	9.65	10.96	---	11.80	10.98	11.82	11.52
11	8.58	7.52	12.00	11.44	11.24	9.86	10.61	10.03	10.96	10.84	12.08	11.36	12.22	11.46
12	9.42	8.26	11.84	---	10.92	10.78	10.33	10.07	11.10	11.22	12.02	11.62	11.80	12.50
13	10.12	7.46	11.30	---	10.30	---	10.57	10.11	11.10	10.74	11.88	11.14	12.18	11.24
14	9.40	9.06	13.38	---	10.92	11.54	10.65	10.21	11.12	10.22	11.46	11.50	11.46	12.22
15	8.18	8.28	12.56	---	10.74	10.92	10.63	10.27	10.50	10.08	11.88	---	10.18	11.00

CRUISE #:	23		24		25		26		27		28		29	
DATE:	22MAR1983		27APR1983		11MAY1983		25MAY1983		09JUN1983		22JUN1983		13JUL1983	
	DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)	
STATIONS	S	B	S	B	S	B	S	B	S	B	S	B	S	B
1	10.76	10.66	12.14	10.81	9.43	9.37	9.33	9.70	7.62	8.52	9.64	10.34	6.56	6.77
2	10.88	11.24	12.26	---	9.62	9.62	9.25	9.43	7.92	7.18	9.66	9.43	8.89	7.37
3	10.62	10.36	11.30	11.12	9.33	9.53	9.05	8.83	9.29	---	9.51	9.45	8.02	6.24
4	10.98	10.04	12.12	---	9.78	9.07	9.33	7.62	10.13	7.46	11.62	9.57	10.16	5.70
5	10.92	10.10	10.47	11.62	9.62	7.96	9.49	7.82	9.41	5.19	10.95	6.46	10.06	4.95
6	11.00	10.98	11.36	10.65	9.74	7.58	9.33	6.63	9.93	5.03	10.65	4.32	10.02	4.46
7	11.28	10.46	11.68	10.75	9.94	7.64	9.47	7.21	10.21	5.65	12.06	6.08	9.60	5.45
8	11.84	9.46	10.55	11.52	9.55	7.43	9.47	7.11	10.15	---	11.74	6.93	8.83	5.25
9	10.74	9.70	11.06	---	9.57	8.28	9.62	---	9.95	---	10.38	6.44	8.99	5.62
10	11.04	9.46	10.01	11.32	9.49	7.53	9.64	7.51	10.01	6.37	9.53	7.39	8.85	5.35
11	11.22	11.14	10.07	10.05	9.60	7.68	9.39	7.13	10.11	6.37	8.87	6.44	8.69	5.84
12	10.56	9.40	10.71	9.99	9.39	7.60	8.87	---	9.59	---	8.93	7.62	8.56	---
13	10.40	10.12	10.71	---	9.68	8.42	8.79	7.43	8.94	2.01	7.64	6.81	7.96	---
14	10.86	10.52	10.67	10.85	9.25	8.87	8.73	8.16	8.74	6.97	7.66	6.32	8.08	6.83
15	9.80	9.98	11.01	11.10	9.09	9.13	8.79	7.92	9.02	7.50	8.34	8.10	7.82	7.62

CRUISE #:	30		32		33		34		35		36		37	
DATE:	27JUL1983		23AUG1983		06SEP1983		20SEP1983		03OCT1983		18OCT1983		01NOV1983	
	DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)		DO(mg/l)	
STATIONS	S	B	S	B	S	B	S	B	S	B	S	B	S	B
1	7.43	7.33	6.73	---	5.41	5.33	7.62	---	8.26	8.12	10.68	10.11	10.15	10.18
2	7.53	6.66	6.83	6.43	5.39	5.69	7.62	7.45	7.57	---	8.53	8.79	9.75	9.79
3	7.35	5.25	---	---	5.65	5.61	7.07	6.52	8.96	9.61	9.42	8.35	9.30	9.32
4	7.07	2.91	8.10	7.14	5.27	4.76	8.69	6.14	8.73	7.08	9.00	7.68	9.75	9.00
5	7.43	3.11	---	---	6.73	---	8.18	4.61	8.85	6.43	10.11	6.70	8.81	8.94
6	7.31	3.54	8.04	3.86	6.51	---	8.34	---	8.81	---	9.52	8.29	9.00	8.75
7	7.43	---	---	---	7.44	4.86	8.38	4.67	9.06	---	9.18	6.60	9.04	7.92
8	8.04	4.12	7.64	4.30	7.30	4.76	8.46	5.13	9.42	6.47	10.38	7.03	9.44	7.92
9	7.84	4.38	00.00	---	7.30	5.27	8.59	---	9.22	7.06	10.32	0.20	9.30	7.80
10	7.96	4.08	7.48	5.33	7.32	5.00	7.84	4.71	7.89	6.24	10.36	6.07	9.18	7.78
11	7.78	4.26	---	---	7.44	5.31	9.31	5.60	9.16	6.71	10.54	6.21	8.81	7.94
12	7.78	4.28	7.64	4.92	7.64	5.19	8.99	5.86	9.28	6.87	10.07	7.76	8.49	8.31
13	7.41	4.34	---	---	7.82	5.55	8.18	5.05	9.34	7.02	10.24	7.86	8.61	8.23
14	7.31	5.56	7.34	5.73	8.00	6.73	8.38	8.40	9.08	8.20	9.32	9.20	8.77	8.69
15	7.33	6.26	---	---	---	---	7.74	8.24	9.32	7.53	9.75	10.17	9.20	8.87

