

GC
57
.N6
no.61

NOAA Technical Memorandum NOS OMA 61

106-MILE DUMPSITE PHYSICAL OCEANOGRAPHY PROJECT: HYDROGRAPHIC DATA REPORT OF THE DELAWARE II 90-08 CRUISE

Rockville, Maryland
July 1991



U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service

**Office of Oceanography and Marine Assessment
National Ocean Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce**

The Office of Oceanography and Marine Assessment (OMA) provides decisionmakers with comprehensive, scientific information on characteristics of the oceans, coastal areas, and estuaries of the USA. The information ranges from strategic, rational assessments of coastal and estuarine environmental quality to real-time information for navigation or hazardous materials spill response. For example, OMA monitors the rise and fall of water levels at about 200 coastal locations of the USA (including the Great Lakes); predicts the times and heights of high and low tides; and provides information critical to national defense, safe navigation, marine boundary determination, environmental management, and coastal engineering. Currently, OMA is installing the Next Generation Water Level Measurement System that will replace by 1992 existing water level measurement and data processing technologies. Through its National Status and Trends Program, OMA uses uniform techniques to monitor toxic chemical contamination of bottom-feeding fish, mussels and oysters, and sediments at 200 locations throughout the USA. A related OMA program of directed research examines the relationships between contaminant exposure and indicators of biological responses in fish and shellfish.

OMA uses computer-based circulation models and innovative measurement technologies to develop new information products, including real-time circulation data, circulation forecasts under various meteorological conditions, and circulation data atlases. OMA provides critical scientific support to the U.S. Coast Guard during spills of oil or hazardous materials into marine or estuarine environments. This support includes spill trajectory predictions, chemical hazard analyses, and assessments of the sensitivity of marine and estuarine environments to spills. The program provides similar support to the U.S. Environmental Protection Agency's Superfund Program during emergency responses at, and for the cleanup of, abandoned hazardous waste sites in coastal areas. To fulfill the responsibilities of the Secretary of Commerce as a trustee for living marine resources, OMA conducts comprehensive assessments of damages to coastal and marine resources from discharges of oil and hazardous materials.

OMA collects, synthesizes, and distributes information on the use of the coastal and oceanic resources of the USA to identify compatibilities and conflicts and to determine research needs and priorities. It conducts comprehensive, strategic assessments of multiple resource uses in coastal, estuarine, and oceanic areas for decisionmaking by NOAA, other Federal agencies, state agencies, Congress, industry, and public interest groups. It publishes a series of thematic data atlases on major regions of the U.S. Exclusive Economic Zone and on selected characteristics of major U.S. estuaries. It also manages, for the U.S. Department of the Interior, a program of environmental assessments of the effects of oil and gas development on the Alaskan outer continental shelf.

OMA implements NOAA responsibilities under Title II of the Marine Protection, Research, and Sanctuaries Act of 1972; Section 6 of the National Ocean Pollution Planning Act of 1978; and other Federal laws. OMA has three major line organizations: The Physical Oceanography Division, the Ocean Assessments Division and the Ocean Systems Division.

57
N6
70.61

NOAA Technical Memorandum NOS OMA 61

**106-MILE DUMPSITE PHYSICAL OCEANOGRAPHY PROJECT:
HYDROGRAPHIC DATA REPORT OF THE DELAWARE II 90-08 CRUISE**

Frank Aikman, III
and
Malcolm B. Empie

Rockville, Maryland
July 1991



United States
Department of Commerce
Robert A. Mosbacher, Secretary

National Oceanic and
Atmospheric Administration
John A. Knauss, Under Secretary

National Ocean Service
Virginia K. Tippie
Assistant Administrator

Notice

Mention of a commercial company or product does not constitute an endorsement by NOAA. Use for publicity or advertising purposes of information from this publication concerning proprietary products or the tests of such products is not authorized.

TABLE OF CONTENTS

	Page
PART 1 THE DATA REPORT	1.1
I. DATA COLLECTION, PROCESSING AND FORMAT	1.3
A. INTRODUCTION	1.3
B. DATA COLLECTION AND INSTRUMENTATION	1.3
1. Continuous Profiles	1.3
2. Water Sample Collection and Analysis	1.9
3. Expendable Bathythermograph (XBT) Data	1.9
C. DATA PROCESSING	1.11
1. Sensor Time Constant Matching	1.11
2. Decimation	1.11
3. Calibration	1.11
4. Data Editing	1.11
D. DATA REPORT FORMAT	1.12
1. CTD/TR Data	1.12
2. XBT Data	1.13
II. CTD/TR DATA	1.15
III. XBT DATA	1.109
PART 2 HYDROGRAPHIC STRUCTURE	2.1
I. PREFACE	2.3
II. MAPS	2.3
III. TRANSECTS	2.4
IV. FIGURES	2.5
ACKNOWLEDGEMENTS	2.47
REFERENCES	2.47

PART 1

THE DATA REPORT

I. DATA COLLECTION, PROCESSING AND FORMAT

A. INTRODUCTION

As part of the joint NOAA/EPA/USCG 106-Mile Dumpsite Project (Battelle, 1990), the first NOAA Midwater Fish and Oceanography Study occurred from 6 to 18 August, 1990 on the R/V DELAWARE II, Cruise 90-08. The objectives of the study were to: (1) collect samples of midwater fish (principally myctophidae and sternoptychidae) and their prey; (2) collect conductivity, temperature, and transmissometer versus depth (CTD/TR) profiles and expendable bathythermographs (XBT) in a broad area of the Middle Atlantic Bight (MAB); and (3) conduct a synoptic CTD/TR survey and deploy eight satellite-tracked drifters in the immediate vicinity of the Dumpsite. The purpose of the hydrographic sampling was to provide water mass identification at all stations where midwater fish trawls were taken, to acquire a three-dimensional description of the structure in the vicinity of the Dumpsite, and to identify surface and subsurface water mass structure at the drifter deployment sites (EOPB, 1991).

This report presents the hydrographic data from this cruise, including the CTD/TR data from 46 stations and temperature profiles from 39 XBT stations (Figure 1.1; Tables 1A and 1B). A description of the instruments and methods used for collection, data processing techniques, and data characteristics is presented next, followed by graphical and tabular presentation of the data. In addition, representative maps and transects of physical properties are presented, along with a brief description of the hydrographic structure, to assist those interested in interpreting biological and chemical results in terms of the physical structure.

B. DATA COLLECTION AND INSTRUMENTATION

1. Continuous Profiles

A Sea-Bird Electronics, Inc. (SBE) 9-01b CTD was used as the primary profiling instrument, fitted with a Sea Tech, Inc. 25 cm transmissometer, in addition to the standard sensors. This CTD was fitted with a TC duct assembly and a 3000 rpm pump. The TC duct improves both the resolution and accuracy of salinity (and density) data by channeling the same water past both the temperature and conductivity sensors. With a constant flow rate a constant time lag in conductivity is assured and the temperature and conductivity measurements can be digitally aligned with high precision (see part I.C1). The specifications of the CTD/TR as given by the manufacturers are given in Table 2. A more thorough description of the SBE modular CTD system can be found in Pederson, 1984.

The data acquisition was accomplished using a SEARAM memory module, which plugs into the SBE 9 underwater unit in lieu of a connection via conductive wire to a deck unit. SEARAM obtains power from 12 alkaline batteries and decodes and stores the serial data stream in CMOS memory. Because of memory storage constraints, the data stream, which was obtained at a scan rate of 24 Hz, was averaged internally over 12 scans and recorded at a rate of 2 samples per second. When the CTD was recovered, the memory contents were read via an RS-232 link to an IBM-XT compatible

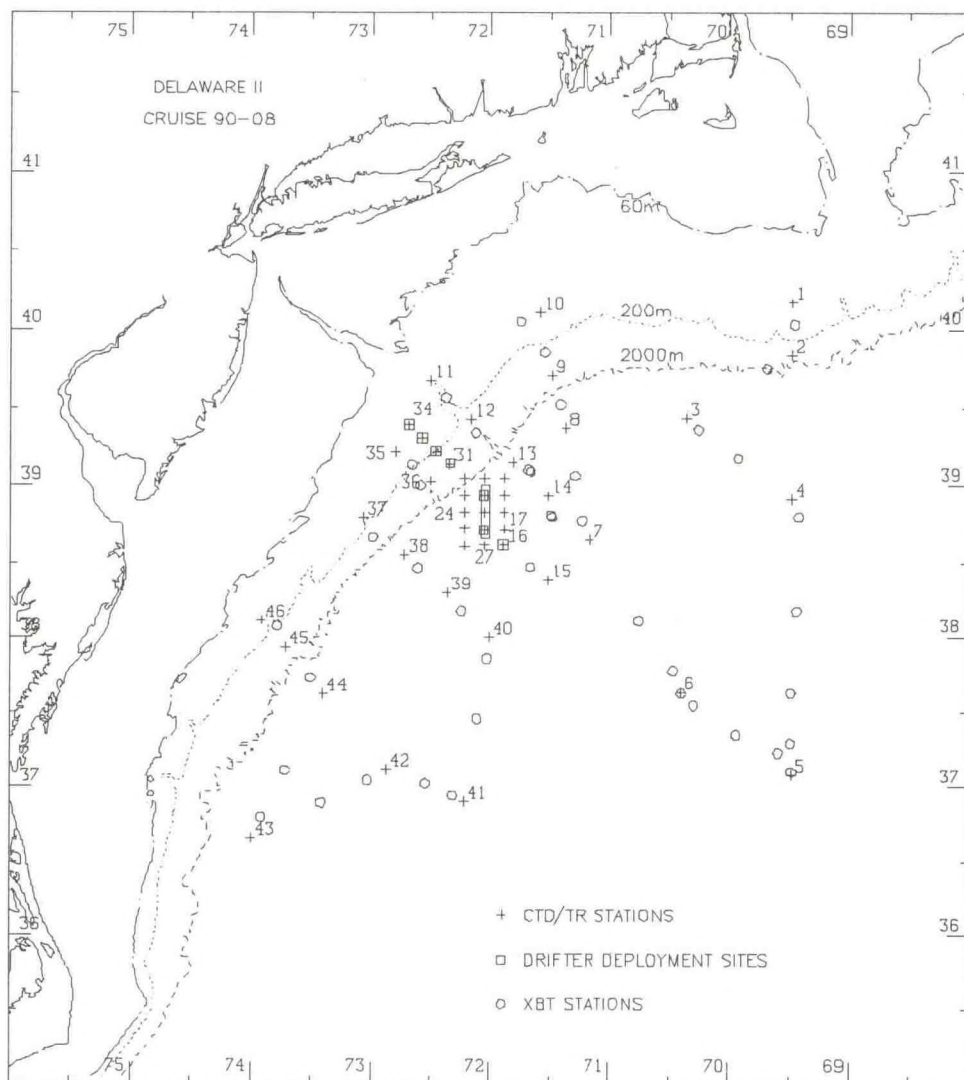


Figure 1.1: Location of CTD/TR, XBT and drifter deployment sites in the Middle Atlantic Bight from the DELAWARE II Cruise 90-08 of 6-18 August, 1990. The three isobaths shown are 60, 200 and 2000 meters. CTD stations are marked by pluses and station numbers; XBT profiles by circles; and drifter deployment sites by squares. The 106-Mile Dumpsite is the rectangle outlined in the center of the figure with its upper right corner at 39°N, 72°W.

computer. We used SBE's SEASOFT software package for retrieval, processing, display and archival of data.

Initially, because of winch constraints, we were limited to lowering rates of 20 m/min, but midway through the cruise we were able to increase this to a nominal 60 m/min rate. Fortunately, because of the TC duct and pump assembly, these changes in profile rates had no effect on the conductivity measurement.

A SBE 19 (SEACAT Profiler) was used as a backup throughout the cruise. It was needed once, on station 13, when the battery pack failed on the SBE 9. The SEACAT profiler did not have a transmissometer, so that parameter is missing on station 13, and it lacked a TC duct, which resulted in a noisy salinity profile. However, SBE 9 and 19 comparisons were done on stations 12 and 14, and the temperature and salinity values agree very well, so we have confidence in the correctness of the station 13 data.

The general routine was to do a CTD/TR profile first when arriving on station. This was followed by a double oblique plankton tow to a maximum depth of 200 m, which in turn was followed by an Isaacs-Kidd midwater fish trawl. These CTD/TR profiles nominally extend to 500 m depth during daytime hours, 300 m at night or to a few meters above bottom at shallower stations. These depths were determined by the expected tow depth for midwater fish. In addition, there was a more intensive synoptic CTD/TR survey made of the immediate 106-Mile Dumpsite area and on a transect to the northwest (to deploy satellite-tracked drifters). With the exception of a few stations during the synoptic survey, there were no tows made on these stations (#'s 16-34).

TABLE 1A
CTD STATION LOG

<u>CTD#</u>	<u>Latitude(N)</u>	<u>Longitude(W)</u>	<u>Date</u>		<u>Time(UT)</u>
			<u>Julian</u>	<u>y/m/d</u>	
1	40°09.91'	69°28.49'	219	90/8/7	0855
2	39°49.95'	69°28.87'	219	90/8/7	1504
3	39°25.94'	70°21.05'	220	90/8/8	0104
4	38°55.03'	69°28.88'	220	90/8/8	0851
5	37°04.98'	69°28.77'	221	90/8/9	0028
6	37°38.10'	70°23.47'	221	90/8/9	1152
7	38°39.06'	71°09.94'	221	90/8/9	2124
8	39°22.15'	71°21.86'	222	90/8/10	0445
9	39°42.12'	71°28.96'	222	90/8/10	0943
10	40°06.07'	71°35.03'	222	90/8/10	1517
11	39°40.12'	72°29.88'	222	90/8/10	2218
12	39°25.05'	72°09.89'	223	90/8/11	0238
13	39°09.03'	71°48.87'	223	90/8/11	0815
14	38°56.07'	71°31.00'	223	90/8/11	1320
15	38°22.99'	71°30.98'	223	90/8/11	2023
16	38°36.93'	71°53.18'	224	90/8/12	0138
17	38°43.51'	71°52.96'	224	90/8/12	0525
18	38°49.98'	71°53.06'	224	90/8/12	0640
19	38°56.40'	71°52.90'	224	90/8/12	1024
20	39°03.05'	71°53.01'	224	90/8/12	1146
21	39°02.96'	72°03.03'	224	90/8/12	1318
22	39°02.76'	72°13.04'	224	90/8/12	1452
23	38°56.31'	72°13.00'	224	90/8/12	1607
24	38°49.84'	72°13.01'	224	90/8/12	1717
25	38°43.57'	72°13.21'	224	90/8/12	2138
26	38°36.88'	72°12.97'	224	90/8/12	2257
27	38°36.98'	72°03.02'	225	90/8/13	0439
28	38°43.49'	72°03.04'	225	90/8/13	0559
29	38°49.83'	72°02.83'	225	90/8/13	1116
30	38°56.46'	72°03.17'	225	90/8/13	1240
31	39°08.37'	72°20.27'	225	90/8/13	1520
32	39°13.05'	72°27.14'	225	90/8/13	1643
33	39°18.03'	72°34.14'	225	90/8/13	1758
34	39°23.04'	72°41.03'	225	90/8/13	1905
35	39°12.93'	72°47.95'	225	90/8/13	2044
36	39°01.97'	72°29.93'	226	90/8/14	0024
37	38°47.83'	73°04.04'	226	90/8/14	0830
38	38°33.06'	72°43.13'	226	90/8/14	1314
39	38°17.94'	72°21.90'	226	90/8/14	1833
40	38°00.00'	72°00.16'	226	90/8/14	2333
41	36°54.36'	72°12.84'	227	90/8/15	0857
42	37°07.05'	72°52.00'	227	90/8/15	1609
43	36°39.20'	74°00.04'	228	90/8/16	0107
44	37°37.13'	73°23.85'	228	90/8/16	0934
45	37°56.08'	73°43.07'	228	90/8/16	1415
46	38°06.93'	73°55.04'	228	90/8/16	1910

TABLE 1A
CTD STATION LOG

<u>Water</u> <u>Depth(m)</u>	<u>CTD Max.</u> <u>Depth(m)</u>	<u>Sal.</u> <u>Sample</u>	<u>Comments</u>
85	81	T1	
1400	302	-	
2500	501	T2	
3014	480	T3	
4500	490	T4	
4000	445	T5	
2800	501	T6	
2555	500	T7	
1427	503	T8	
87	78	T9	
105	102	T10	
1100	301	-	
2208	301	T11	40-50° wire angle. CTD Battery failure.
2450	503	T12	
2800	503	T13	
2650	300	T14	Drifter #15130 deployed.
2653	300	T15	
2562	300	T16	
2287	300	T17	
2196	301	T18	
1800	300	T19	
1800	300	T20	
2048	303	T21	
2536	502	T22	
2635	302	T23	
2196	500	T26	
2653	300	T27	
2610	303	T28	Drifter #15131 deployed.
2470	300	T24	
2350	300	T29	Drifters #15132 and #15133 deployed.
1000	301	T30	Drifter #15134 deployed.
287	275	T25	Drifter #15135 deployed.
140	138	T31	Drifter #15136 deployed.
100	96	T32	Drifter #15137 deployed. Large wire angle.
92	90	T33	
1300	253	-	Wire angle > 45°
133	130	T34	
2550	503	T35	
2818	500	T36	
3000	500	-	
3477	500	T37	789m wire out.
2930	504	T38	
2440	300	-	
2507	300	T39	
1630	500	T40	
118	103	-	

TABLE 1B

XBT LOG

<u>XBT#</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Date</u>		<u>Time</u>	<u>XBT</u>	<u>Depth(m)</u>
			<u>Julian</u>	<u>y/m/d</u>	<u>(UT)</u>	<u>Type</u>	
1	40°01.8'	69°27.6'	219	90/8/7	1335	T10	104
2	39°44.8'	69°41.1'	219	90/8/7	2122	T4	1954
3	39°21.4'	70°15.3'	220	90/8/8	0412	T4	2500
4	39°10.5'	69°55.5'	220	90/8/8	0626	T4	2500
5	38°48.09'	69°25.36'	220	90/8/8	1338	T4	3000
6	38°10.4'	69°26.2'	220	90/8/8	1713	T4	3000
7	37°37.67'	69°28.18'	220	90/8/8	2100	T4	4500
8	37°17.6'	69°29.10'	220	90/8/8	2300	T4	4560
10	37°06.1'	69°28.9'	221	90/8/9	0010	T4	4580
11	37°13.7'	69°35.4'	221	90/8/9	0409	T4	4500
12	37°21.0'	69°56.2'	221	90/8/9	0903	T4	3000
13	37°32.75'	70°17.45'	221	90/8/9	1100	T4	4075
14	37°37.50'	70°23.61'	221	90/8/9	1140	T4	4000
15	37°46.53'	70°27.84'	221	90/8/9	1544	T4	4000
16	38°06.56'	70°45.0'	221	90/8/9	1756	T4	3000
17	38°46.70'	71°13.66'	222	90/8/10	0110	T4	2700
18	39°03.88'	71°17.30'	222	90/8/10	0300	T4	2500
19	39°31.17'	71°24.81'	222	90/8/10	0834	T4	2500
20	39°51.20'	71°32.66'	222	90/8/10	1352	T4	442
21	40°02.7'	71°44.77'	222	90/8/10	1802	T10	91
22	39°33.58'	72°22.48'	223	90/8/11	0115	T10	110
24	39°20.18'	72°07.38'	223	90/8/11	0612	T4	647
26	39°05.35'	71°39.64'	223	90/8/11	1153	T4	2200
28	38°47.98'	71°29.02'	223	90/8/11	1733	T4	2500
29	38°28.31'	71°39.52'	224	90/8/12	0005	T4	2800
30	39°07.96'	72°39.39'	225	90/8/13	2320	T10	262
31	39°00.14'	72°35.27'	226	90/8/14	0359	T4	1300
32	38°40.22'	72°58.95'	226	90/8/14	1118	T4	650
33	38°27.85'	72°36.53'	226	90/8/14	1705	T4	2400
35	38°10.60'	72°14.61'	226	90/8/14	2207	T4	2944
37	37°27.34'	72°06.66'	227	90/8/15	0457	T4	3000
38	36°56.48'	72°18.97'	227	90/8/15	1307	T4	3000
39	37°01.42'	72°32.67'	227	90/8/15	1430	T4	2800
40	37°02.79'	73°01.74'	227	90/8/15	1949	T4	2983
41	36°53.64'	73°25.07'	227	90/8/15	2153	T4	2882
42	36°47.68'	73°55.13'	228	90/8/16	0410	T4	2400
43	37°06.69'	73°42.95'	228	90/8/16	0615	T4	2452
44	37°43.63'	73°30.27'	228	90/8/16	1235	T4	2500
45	38°04.61'	73°46.90'	228	90/8/16	1823	T4	1000

TABLE 2
SBE 9-01B SPECIFICATIONS*

SENSOR	RANGE	ACCURACY	RESOLUTION
SBE 3-01/F THERMOMETER	-5 to +35 °C	0.004 °C	0.0003 °C
SBE 4-01/0 CONDUCTIVITY METER	0 to 7 S/m	0.0003 S/m	0.00004 S/m
PAROSCIENTIFIC DIGIQUARTZ MODEL 4xK PRESSURE SENSOR	0 to 2068 dbar	1.03 dbar	0.08 dbar
SEA TECH, Inc. TRANSMISSOMETER (25 cm)	0 to 100%	0.5 %	0.1 %

* As specified by the manufacturer (Sea-Bird Electronics, Inc.)

2. Water Sample Collection and Analysis

A 1.7 liter Niskin bottle was attached above the CTD/TR and tripped by messenger at the bottom of each cast. A water sample was drawn and saved for later analysis for salinity (on a Guildline Model 8400 Autosol) at the National Marine Fisheries Service Laboratory in Narragansett, RI. Table 3 presents a comparison of CTD and bottle salinities for each station throughout the cruise.

3. Expendable Bathythermograph (XBT) Data

XBT profiles were taken at the end of each midwater fish tow and halfway between most pairs of CTD/TR stations. A total of 45 XBT probes were deployed, of which 6 failed completely, 8 were noisy below certain depths and had to be trimmed, and 31 were completely good. This results in a total of 39 XBT temperature profiles that are presented in this report. In general, T4's were used (450 m), except for the four shallowest XBT stations where T10's were used (250 m).

TABLE 3

Listings of CTD, bottle, and difference (CTD-bottle) salinities (psu) for DE II 90-08

<u>STA</u>	<u>CTD</u>	<u>BOTTLE</u>	<u>DIFF.</u>		
1	33.8108	33.8122	-0.0014	Overall	
3	35.0102	35.0104	-0.0002	Mean	-0.0435
4	35.0046	35.0083	-0.0037	Standard deviation	0.0986
5	36.4368	36.4513	-0.0145		
6	35.0372	35.0533	-0.0161	Corrected	
7	35.0296	35.0506	-0.0210	Mean	-0.0264
8	35.0512	35.0657	-0.0145	Standard deviation	0.0334
9	35.0212	35.0793	-0.0581		
10	34.3129	34.3231	-0.0102		
11	33.3647	33.4242	-0.0595		
13	35.1432	35.3070	-0.1638 *		
14	35.0055	35.1685	-0.1630 *		
15	35.0252	35.0663	-0.0411		
16	35.0815	35.1853	-0.1038 *		
17	35.1739	35.1892	-0.0153		
18	35.1983	35.2209	-0.0226		
19	35.1264	35.1803	-0.0539		
20	35.1392	35.1536	-0.0144		
21	35.1496	36.5953	-0.4457 *		
22	35.1073	35.1183	-0.0110		
23	35.0987	35.1114	-0.0127		
24	34.9999	35.0035	-0.0036		
25	35.1486	35.1762	-0.0276		
26	35.0300	35.0559	-0.0259		
27	35.1285	35.1599	-0.0314		
28	35.1683	35.1902	-0.0219		
29	35.1553	35.2006	-0.0453		
30	35.1214	35.1723	-0.0509		
31	35.0947	35.1199	-0.0252		
32	35.2163	35.2253	-0.0090		
33	35.2882	35.2999	-0.0117		
34	34.3212	34.0903	0.2309 *		
35	33.8439	33.7713	0.0726		
37	35.1117	35.1209	-0.0092		
38	34.9938	35.0463	-0.0525		
39	35.0421	35.0748	-0.0327		
41	35.0279	35.3622	-0.3343 *		
42	34.9664	34.9837	-0.0173		
44	35.0257	35.0754	-0.0497		
45	34.9773	35.0262	-0.0489		

* Differences greater than one standard deviation (0.0986) were removed to calculate the corrected mean and standard deviation

C. DATA PROCESSING

1. Sensor Time Constant Matching

Because of the inherent mismatch of time constants for the temperature and conductivity sensors in the SBE 9-01b, it was necessary to run a diagnostic test to determine if this mismatch of sensor responses resulted in the familiar "salinity spiking" which can occur at step changes in T and S. Even with the TC Duct, which eliminates variable flushing rates of the conductivity cell, some adjustment may be necessary. A number of CTD/TR profiles (sampled and recorded at 24 Hz) with sharp temperature steps over a 10 decibar (dbar) interval were chosen, and conductivity was incrementally advanced and lagged at 0.04 second steps. Doing this did not improve the salinity trace, and it was decided that the default alignment resulted in minimal salinity spiking.

2. Decimation

The raw downcast files were averaged to give a 1 dbar pressure series, and a pressure filter which excludes any scans where the pressure signal is not increasing by at least 0.25 dbar/sec was applied. The derived variables (i.e. salinity, density) were computed from the decimated values of temperature, conductivity and pressure, and at this point the data were converted to ASCII engineering units.

3. Calibration

We relied strictly on pre-cruise laboratory calibrations of the sensors by the Northwest Regional Calibration Center. Logistical constraints prohibited any Rosette bottle sampling for *in situ* calibration. In fact, in coastal regions such as this, where both large property gradients and large time-dependent changes exist, the application of such *in situ* techniques is difficult. The single salinity sample collected at the bottom of each cast was intended only to monitor any abrupt or drastic changes in CTD conductivity (there were none). The salinity samples had to be preserved and processed post-cruise. Unfortunately, due to salinometer problems, these samples were not run until 2 months after the cruise. The bottle salinities are consistently high relative to the CTD salinity (more likely an indication of evaporation in the stored water samples, rather than any CTD errors - see Table 3), and there is not any distinct trend to these differences as a function of time throughout the cruise.

4. Data Editing

Final editing was performed by hand. Outlying points were identified graphically and corrected by interpolation between surrounding good data points from above and below.

D. DATA REPORT FORMAT

1. CTD/TR DATA

Chapter II of PART 1 contains listings and plots of the CTD/TR data. Each station's data consists of:

- a) A standard level listing (at 10 dbar intervals from 1 to 100 dbar and at 25 dbar intervals below 100 dbar), preceded by header information which contains:

Line 1:	SHIP:	R/V DELAWARE II
	CRUISE:	90-08
	STATION:	CTD/TR station number
	DATE:	year/month/day
	TIME:	Universal Time (GMT)
	DEPTH:	water depth (in meters)
Line 2:	POSITION:	latitude (N), longitude (W)
	WIND:	speed (in knots); direction (degrees true)
	AIR TEMP:	degrees Centigrade ($^{\circ}\text{C}$)

Followed by the CTD/TR data listings with columns identified as:

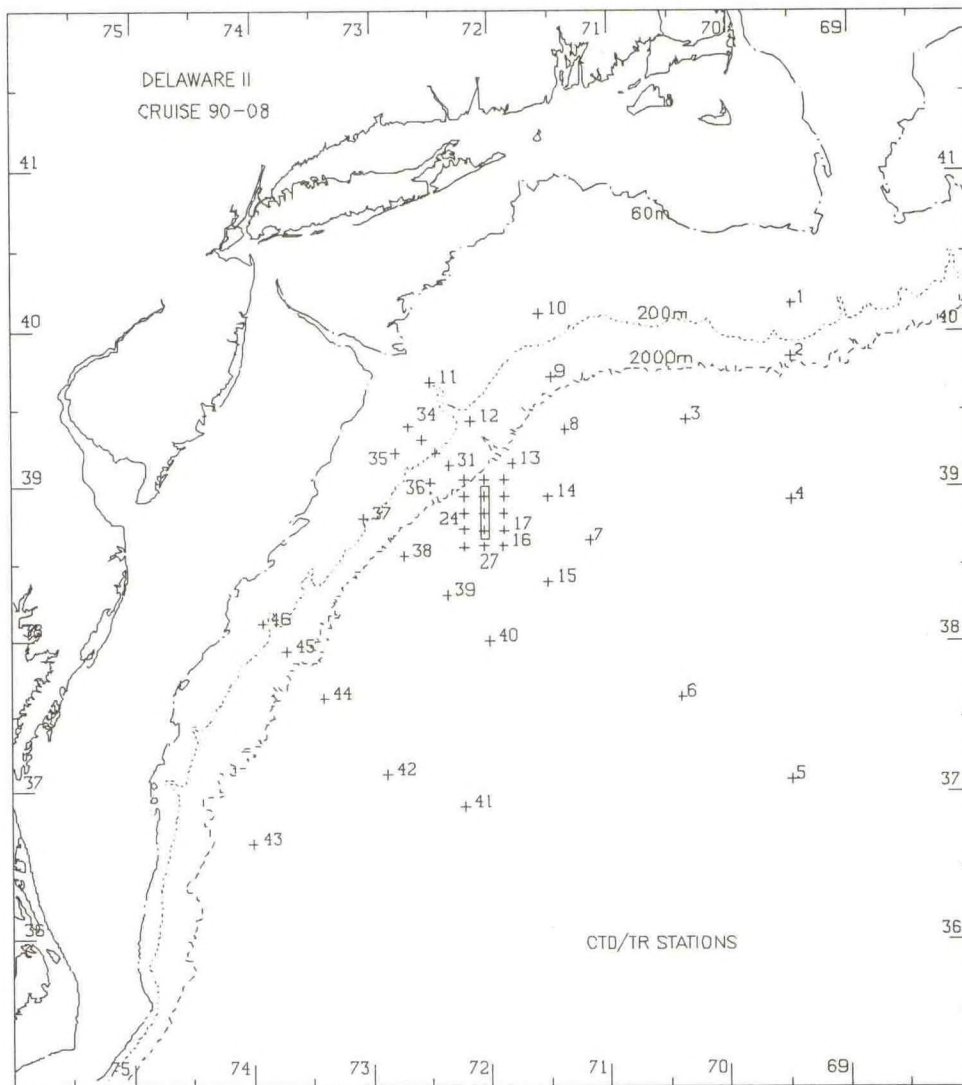
PR	pressure in decibars (dbar)
TE	<i>in situ</i> temperature ($^{\circ}\text{C}$)
PT	potential temperature ($^{\circ}\text{C}$)
SA	salinity (psu)
SO	potential density anomaly (sigma theta units), using 0 dbar as a reference level (Bryden, 1973 and UNESCO, 1983)
TR	transmissivity (% transmission)

- b) A potential temperature vs. salinity diagram with overlain sigma theta (potential density) surfaces; and
- c) Profiles of potential temperature (5 to 30 $^{\circ}\text{C}$), salinity (31 to 37 psu), potential density (20 to 28 sigma theta units), and transmissivity (70 to 90 %) versus pressure (dbar). These profiles are plotted at three different pressure scales (0 to 100; 0 to 300; or 0 to 500 dbar), depending on the CTD/TR lowering depth. The decimated data is used here. For transmissivity and sigma theta a point is plotted every dbar, while potential temperature (solid) and salinity (dashed) profiles are plotted as lines.

2. XBT DATA

Chapter III of PART 1 contains plots of the temperature profiles from a total of 39 'good' XBT's of the 45 probes deployed. Eight temperature profiles had to be edited by hand where the data were obviously bad below certain depths, but the upper parts of these profiles have been preserved (#'s 10,20,21,22,26,28,30 and 33). In what follows, each temperature profile is plotted as a function of depth (meters) at a scale of 0 to 500 m for the T4's (nominally 450 m) and 0 to 300m for the T10's (nominally 250 m - XBT #'s 1,21,22, and 30).

II. CTD/TR DATA

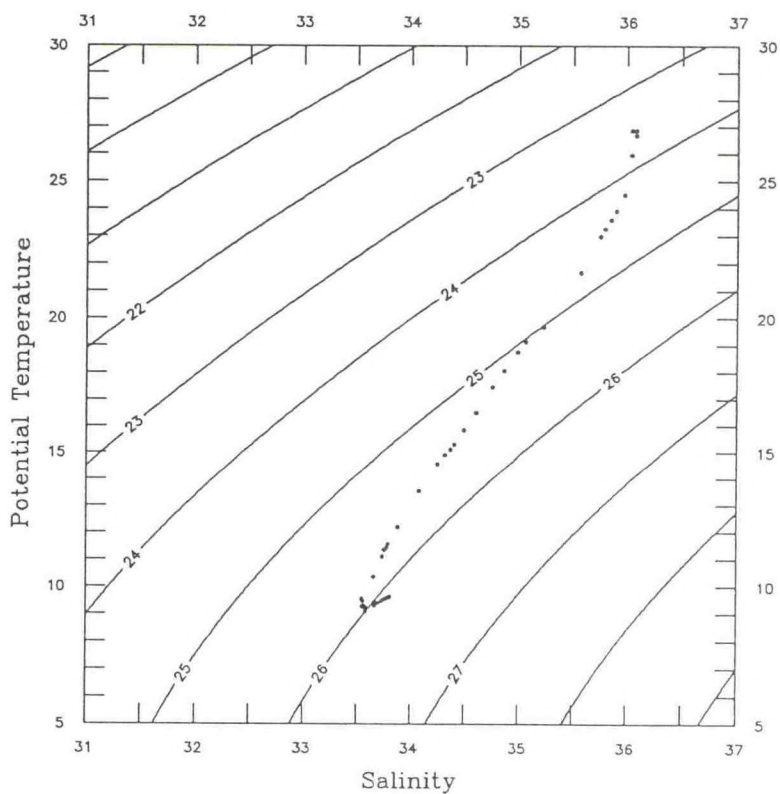


Listings and plots of the CTD/TR data follow. For each station (positions shown above) we present:

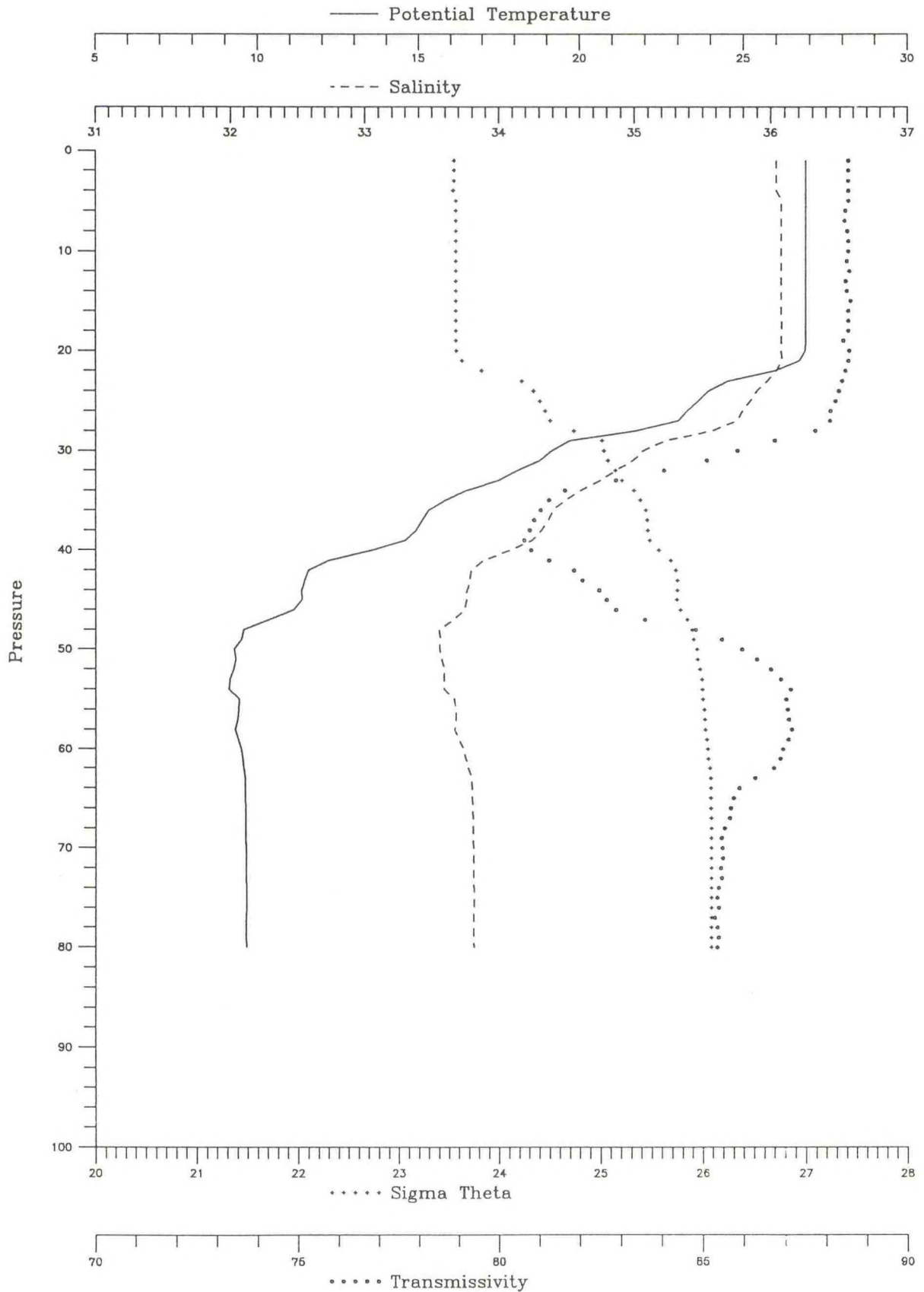
1. A 2 line header;
2. A standard level listing;
3. A potential temperature ($^{\circ}\text{C}$) vs. salinity (psu) diagram with overlain potential density (sigma theta units) surfaces; and
4. Profiles of potential temperature (5 to 30 $^{\circ}\text{C}$), salinity (31 to 37 psu), potential density (20 to 28 sigma theta units), and transmissivity (70 to 90 percent) versus pressure (dbar).

R/V DELAWARE II 90-08 Station: 01 Date: 90/08/07 GMT: 0901 Depth: 85 m
 Position: 40 09.91N 69 28.49W Wind: 10 kts Dir: 180 deg. Air Temp: 24.9C

PR	TE	PT	SA	SO	TR
1	26.8693	26.8699	36.0400	23.5500	88.54
10	26.8799	26.8776	36.0773	23.5707	88.55
20	26.8646	26.8600	36.0774	23.5764	88.57
30	19.1439	19.1386	35.0637	25.0358	85.85
40	13.5575	13.5519	34.0806	25.5708	80.79
50	9.2850	9.2796	33.5532	25.9411	85.96
60	9.5001	9.4935	33.7347	26.0484	86.95
70	9.6436	9.6359	33.8075	26.0820	85.48
80	9.6589	9.6500	33.8108	26.0822	85.35

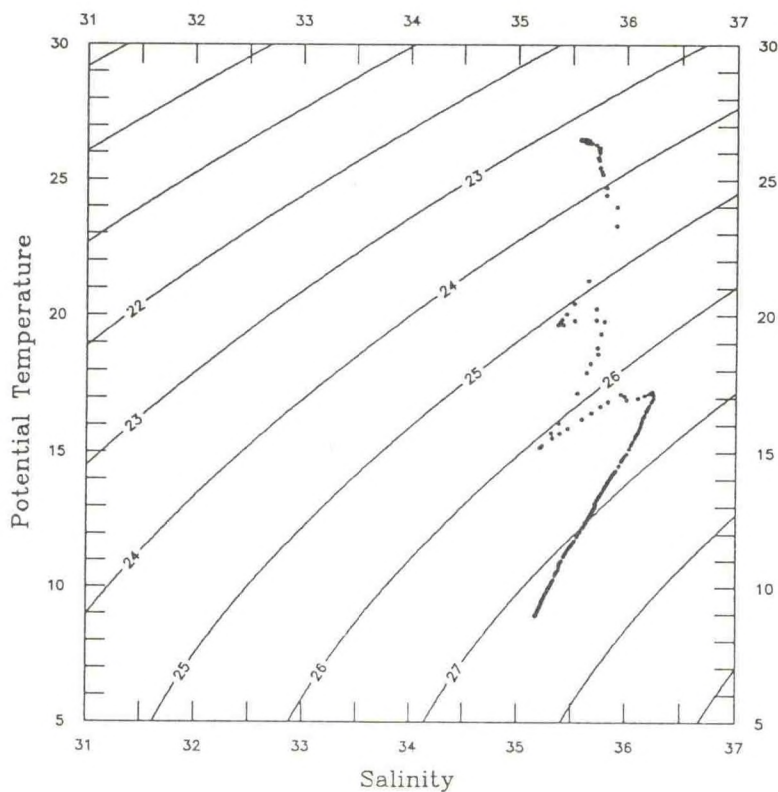


Station 1



R/V DELAWARE II 90-08 Station: 02 Date: 90/08/07 GMT: 1505 Depth:1400 m
 Position: 39 49.95N 69 28.87W Wind: 2 kts Dir: 320 deg. Air Temp: 28.0C

PR	TE	PT	SA	SO	TR
1	26.4848	26.4864	35.6509	23.3736	88.00
10	26.3919	26.3896	35.6210	23.3816	88.11
20	25.8459	25.8415	35.7327	23.6377	88.35
30	20.4488	20.4431	35.5198	25.0416	86.69
40	19.8111	19.8037	35.7952	25.4215	86.95
50	15.2050	15.1973	35.2047	26.0870	88.38
60	16.9612	16.9513	36.0038	26.2977	88.29
70	16.7191	16.7076	36.2134	26.5167	88.85
80	16.2188	16.2059	36.1489	26.5850	89.22
90	15.6914	15.6773	36.0974	26.6670	89.33
100	14.8586	14.8435	35.9826	26.7653	89.33
125	13.9292	13.9111	35.8332	26.8508	89.62
150	13.1206	13.0997	35.7161	26.9283	89.56
175	12.8091	12.7852	35.6803	26.9641	89.65
200	12.4805	12.4535	35.6325	26.9928	89.72
225	11.2939	11.2655	35.4425	27.0721	89.49
250	10.3192	10.2894	35.3333	27.1625	89.27
275	9.5730	9.5417	35.2348	27.2135	89.26
300	9.0151	8.9822	35.1740	27.2577	89.23

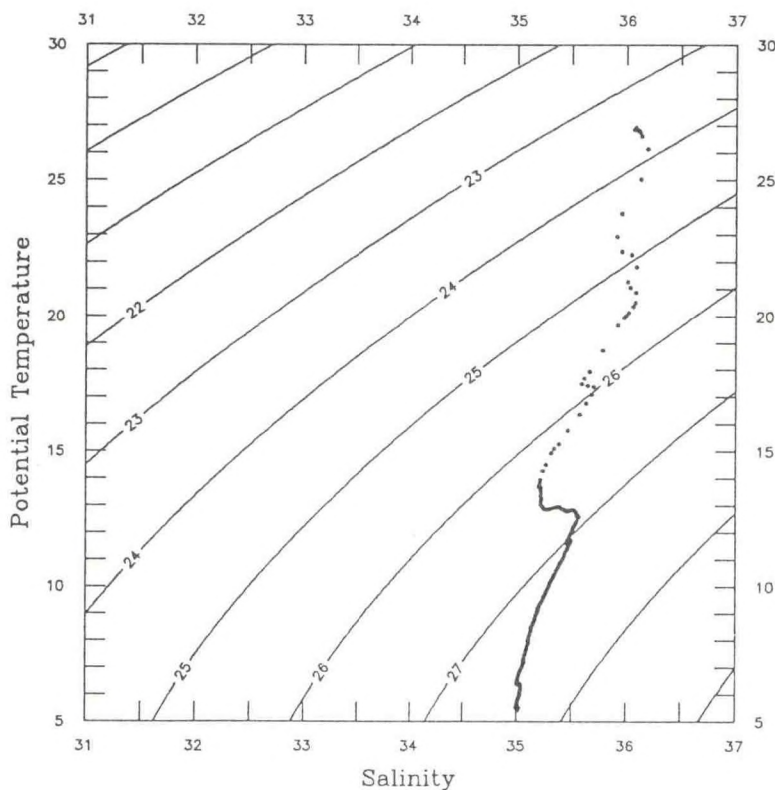


Station 2



R/V DELAWARE II 90-08 Station: 03 Date: 90/08/08 GMT: 0105 Depth: 2500m
 Position: 39 25.94N 70 21.05W Wind: 0 kts Dir: deg. Air Temp: 27.0C

PR	TE	PT	SA	SO	TR
1	26.9512	26.9521	36.0800	23.5500	87.95
10	26.8703	26.8681	36.0736	23.5710	88.06
20	26.7985	26.7939	36.1165	23.6270	88.07
30	22.2904	22.2844	36.0454	24.9335	87.92
40	19.7093	19.7020	35.9209	25.5442	86.02
50	15.7850	15.7771	35.4620	26.1549	87.37
60	13.6993	13.6908	35.2022	26.4089	88.21
70	13.0548	13.0452	35.2161	26.5519	88.38
80	12.9448	12.9338	35.3346	26.6662	88.74
90	12.8905	12.8781	35.4178	26.7418	89.04
100	12.8176	12.8039	35.4451	26.7779	89.08
125	12.6554	12.6385	35.5544	26.8956	89.26
150	11.9828	11.9631	35.4901	26.9776	89.29
175	11.4495	11.4272	35.4578	27.0538	89.43
200	10.7434	10.7190	35.3739	27.1181	89.44
225	9.9589	9.9327	35.2811	27.1836	89.53
250	9.3236	9.2956	35.2070	27.2325	89.27
275	8.7991	8.7694	35.1620	27.2824	89.26
300	8.0489	8.0181	35.1065	27.3551	89.41
325	7.4006	7.3688	35.0668	27.4195	89.38
350	6.9044	6.8714	35.0308	27.4612	89.34
375	6.4639	6.4299	35.0014	27.4979	89.28
400	6.3092	6.2732	35.0343	27.5446	89.28
425	6.0730	6.0355	35.0305	27.5725	89.28
450	5.7696	5.7308	35.0073	27.5928	89.32
475	5.5604	5.5202	34.9961	27.6101	89.30
500	5.5225	5.4802	35.0135	27.6288	89.33

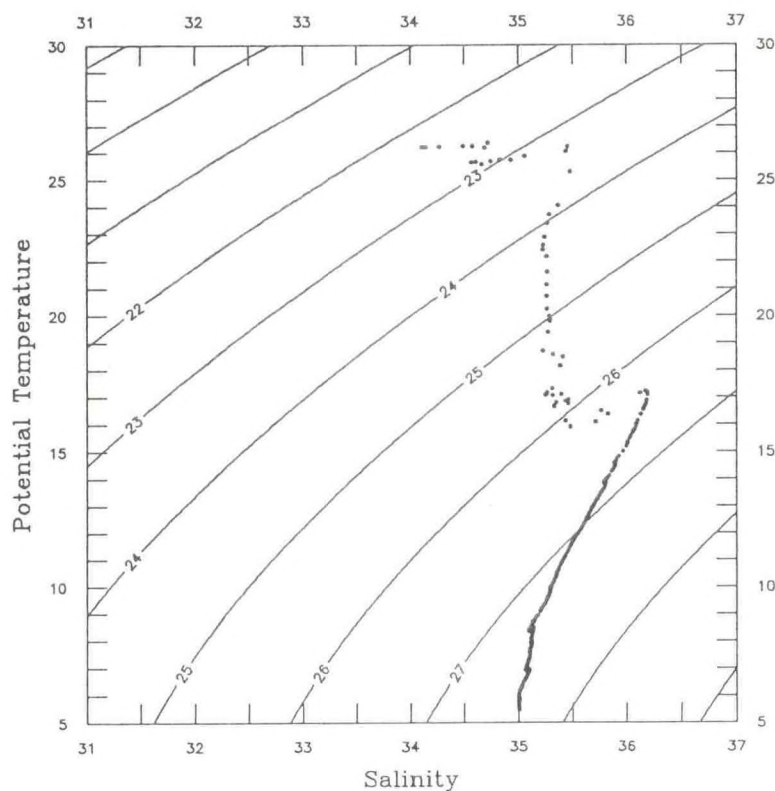


Station 3

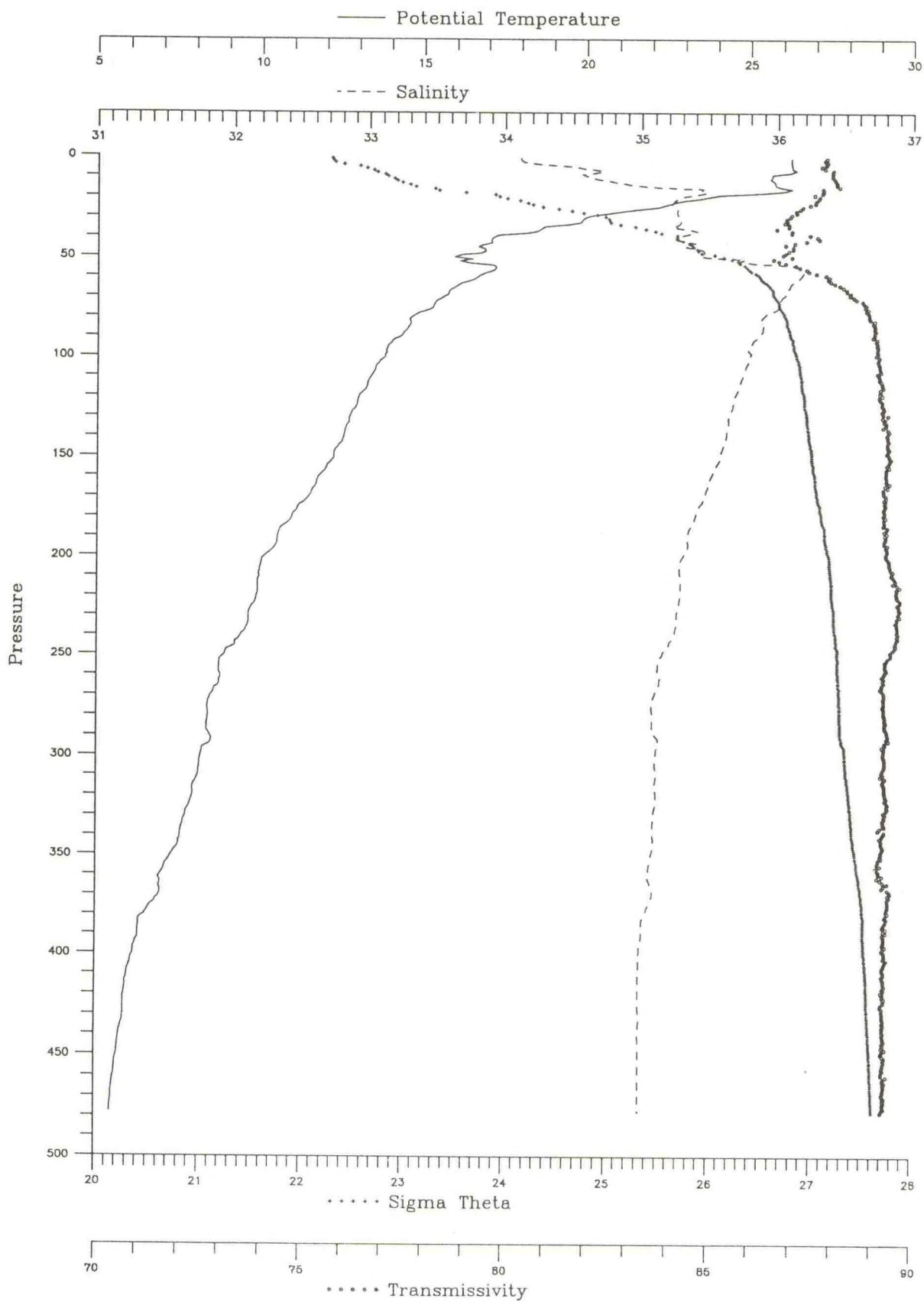


R/V DELAWARE II 90-08 Station: 04 Date: 90/08/08 GMT: 0853 Depth: 3000m
 Position: 38 55.03N 69 28.88W Wind: 5 kts Dir: 210 deg. Air Temp: 24.8C

PR	TE	PT	SA	SO	TR
1	26.2208	26.2216	34.1100	22.2900	87.84
10	25.6587	25.6565	34.6073	22.8455	87.99
20	23.7240	23.7198	35.2804	23.9382	87.67
30	20.0003	19.9948	35.2810	24.9787	86.95
40	17.1611	17.1545	35.2592	25.6774	87.62
50	15.9338	15.9259	35.4740	26.1302	87.00
60	16.6644	16.6545	36.1612	26.4892	87.92
70	15.6013	15.5904	36.0335	26.6376	88.52
80	14.6466	14.6346	35.8889	26.7386	88.91
90	14.2897	14.2764	35.8590	26.7930	89.00
100	13.8193	13.8049	35.8016	26.8487	89.16
125	12.9335	12.9163	35.6705	26.9301	89.27
150	12.2522	12.2323	35.5824	26.9972	89.42
175	11.1554	11.1335	35.4258	27.0834	89.31
200	10.1319	10.1084	35.3065	27.1732	89.36
225	9.7582	9.7323	35.2775	27.2148	89.67
250	8.9250	8.8978	35.1572	27.2581	89.47
275	8.4153	8.3864	35.0876	27.2840	89.28
300	8.2023	8.1712	35.1155	27.3390	89.30
325	7.8644	7.8315	35.1136	27.3887	89.39
350	7.3201	7.2860	35.0881	27.4481	89.23
375	6.7263	6.6914	35.0696	27.5165	89.43
400	6.1741	6.1386	35.0041	27.5383	89.35
425	5.9057	5.8687	34.9996	27.5694	89.27
450	5.7044	5.6658	35.0025	27.5972	89.32
475	5.5270	5.4869	35.0025	27.6192	89.33
478	5.5186	5.4783	35.0046	27.6219	89.28

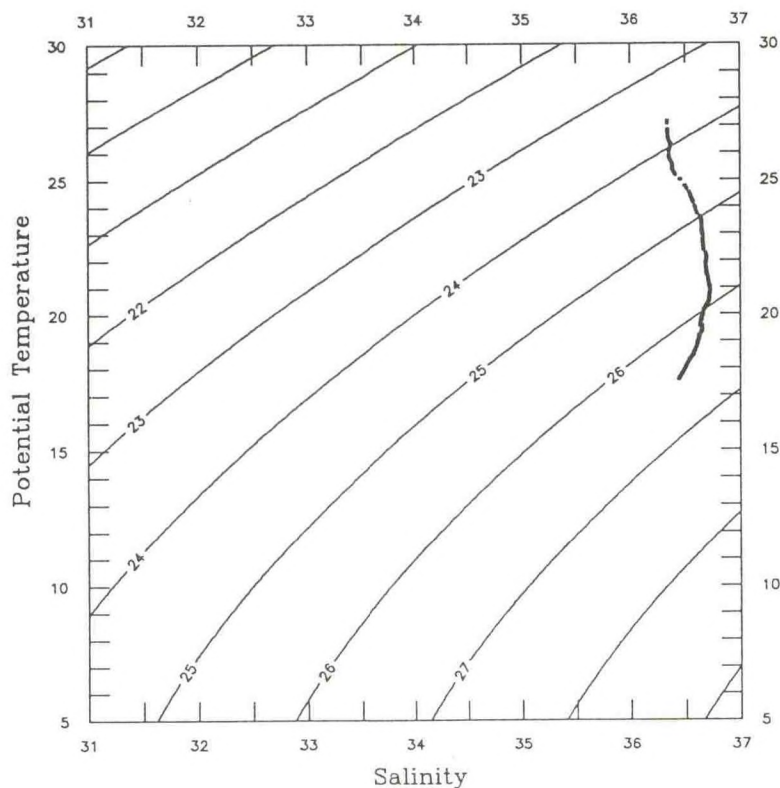


Station 4

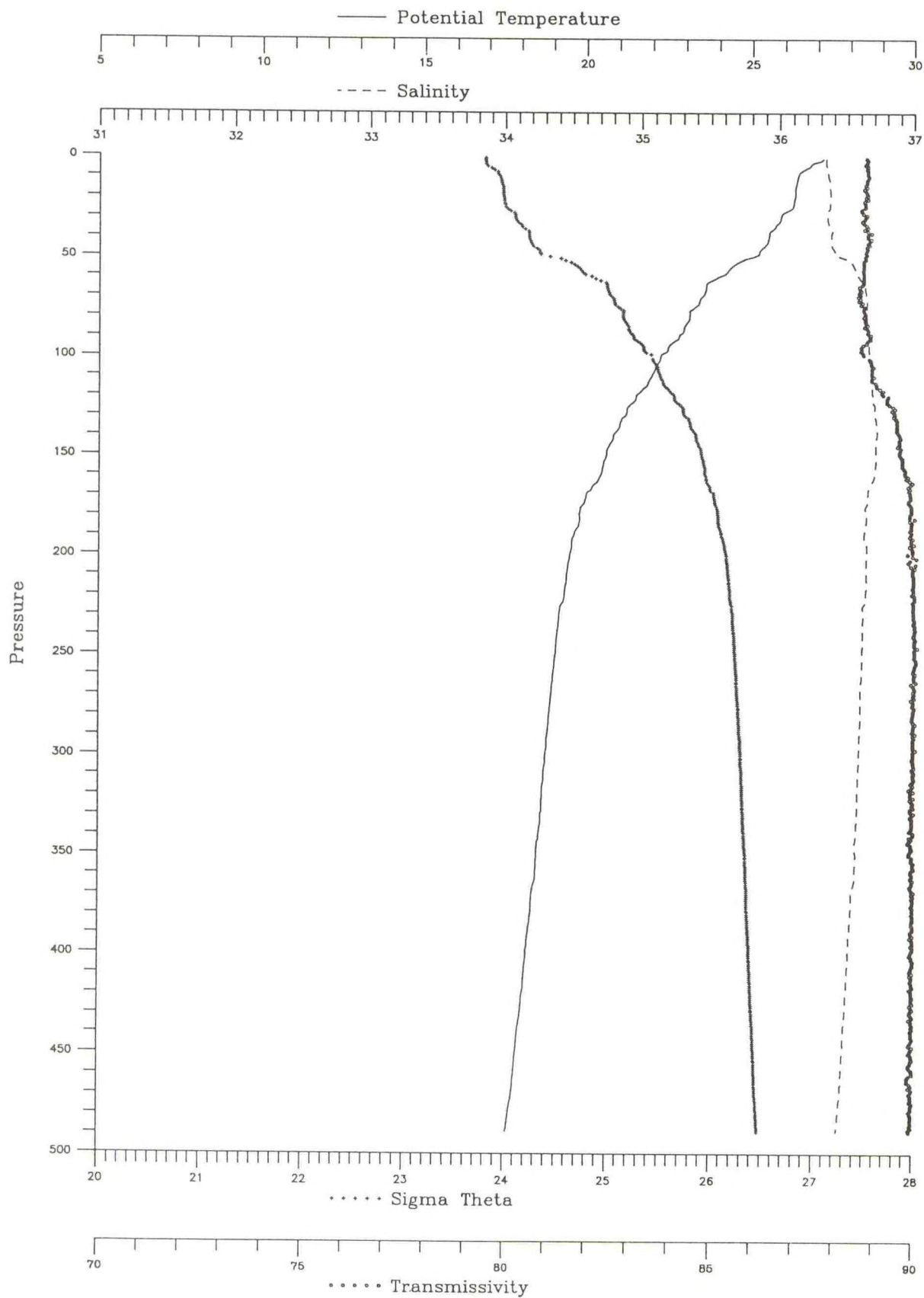


R/V DELAWARE II 90-08 Station: 05 Date: 90/08/09 GMT: 0029 Depth: 4500m
 Position: 37 04.98N 69 28.77W Wind: 3 kts Dir: 320 deg. Air Temp: 26.3C

PR	TE	PT	SA	SO	TR
1	27.1560	27.1555	36.3380	23.8000	88.80
10	26.3856	26.3833	36.3562	23.9383	88.86
20	26.2964	26.2919	36.3689	23.9767	88.78
30	25.8698	25.8631	36.3489	24.0962	88.78
40	25.5106	25.5018	36.3796	24.2318	88.84
50	25.0145	25.0036	36.4534	24.4408	88.77
60	24.0027	23.9900	36.5842	24.8460	88.74
70	23.5002	23.4856	36.6433	25.0402	88.60
80	23.1178	23.1013	36.6452	25.1541	88.74
90	22.8023	22.7839	36.6572	25.2553	88.90
100	22.2600	22.2400	36.6827	25.4300	88.80
125	21.2951	21.2707	36.7072	25.7210	89.48
150	20.6293	20.6007	36.7171	25.9121	89.68
175	19.8817	19.8491	36.6416	26.0559	89.95
200	19.5327	19.4960	36.6484	26.1541	89.99
225	19.2555	19.2146	36.6223	26.2075	90.01
250	19.1100	19.0647	36.6192	26.2439	90.03
275	18.9617	18.9121	36.6072	26.2740	89.99
300	18.8271	18.7733	36.5960	26.3010	90.01
325	18.7172	18.6591	36.5833	26.3204	89.99
350	18.5774	18.5151	36.5720	26.3484	89.91
375	18.4123	18.3460	36.5391	26.3659	90.00
400	18.2675	18.1971	36.5196	26.3884	89.96
425	18.1243	18.0498	36.5007	26.4107	90.01
450	17.9554	17.8770	36.4784	26.4366	89.93
475	17.7875	17.7053	36.4550	26.4610	90.01
489	17.6650	17.5808	36.4368	26.4777	89.94

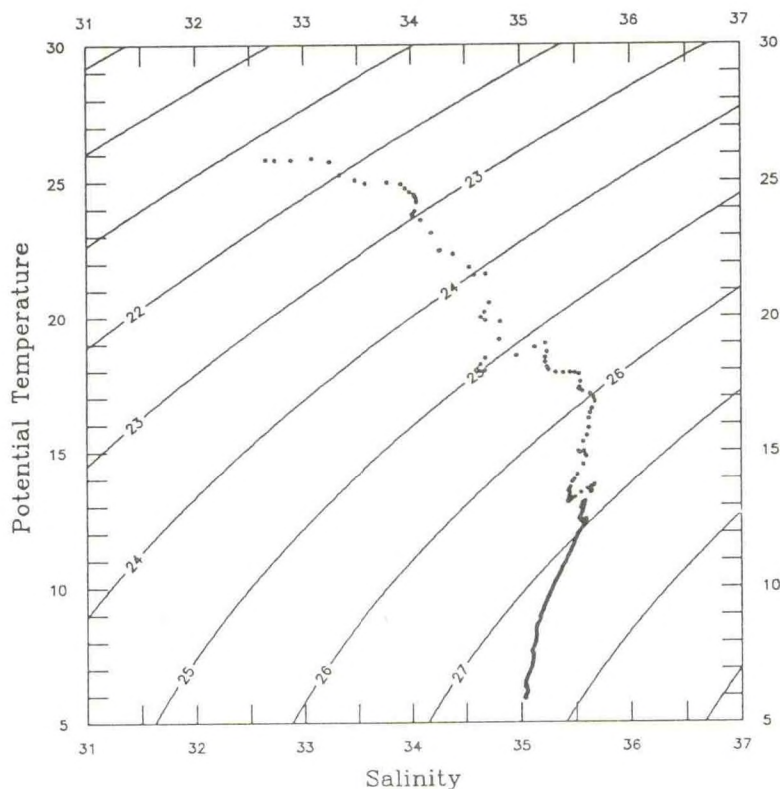


Station 5

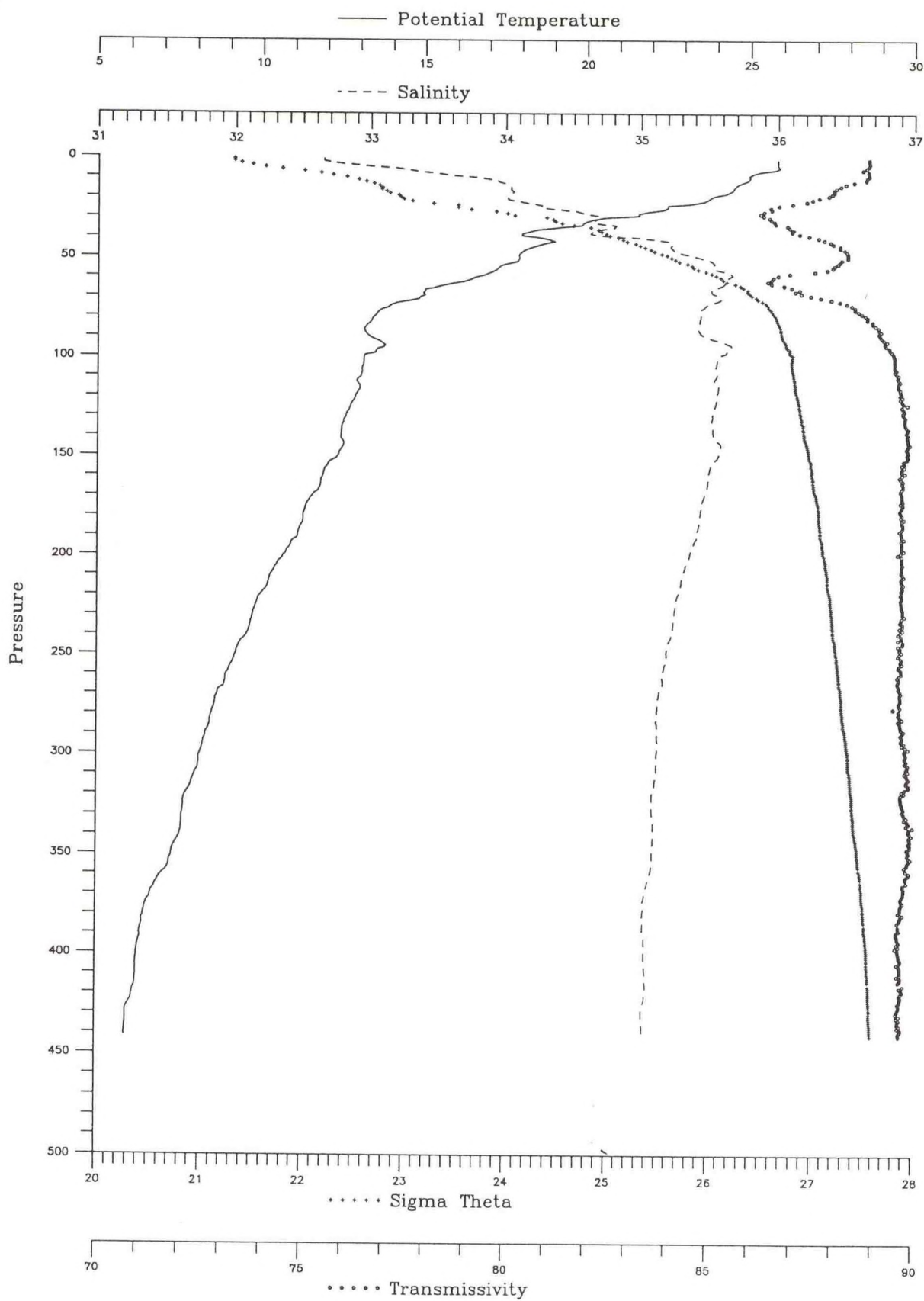


R/V DELAWARE II 90-08 Station: 06 Date: 90/08/09 GMT: 1153 Depth: 4000m
 Position: 37 38.10N 70 23.47W Wind: 4 kts Dir: 070 deg. Air Temp: 26.8C

PR	TE	PT	SA	SO	TR
1	25.8188	25.8187	32.6500	21.3200	88.87
10	24.9897	24.9876	33.7834	22.4277	88.81
20	23.8042	23.8001	34.0122	22.9542	87.64
30	20.5458	20.5402	34.7140	24.4017	86.45
40	18.5575	18.5505	34.9600	25.1055	87.63
50	17.9321	17.9235	35.4437	25.6319	88.35
60	16.5762	16.5665	35.6421	26.1109	86.55
70	14.8631	14.8525	35.5838	26.4555	87.69
80	13.4214	13.4102	35.4417	26.6523	88.85
90	13.3324	13.3198	35.4914	26.7093	89.19
100	13.1465	13.1326	35.5675	26.8065	89.53
125	12.7357	12.7187	35.5478	26.8745	89.71
150	12.3515	12.3315	35.5696	26.9680	89.86
175	11.3774	11.3552	35.4502	27.0614	89.72
200	10.6882	10.6639	35.3676	27.1230	89.72
225	9.8555	9.8295	35.2649	27.1885	89.72
250	9.2333	9.2055	35.2019	27.2433	89.63
275	8.6057	8.5765	35.1385	27.2944	89.66
300	8.1562	8.1252	35.1318	27.3588	89.84
325	7.6678	7.6354	35.0968	27.4044	89.75
350	7.3194	7.2853	35.1006	27.4581	89.89
375	6.5588	6.5245	35.0358	27.5124	89.74
400	6.2808	6.2449	35.0470	27.5584	89.68
425	6.0517	6.0143	35.0395	27.5823	89.67
441	5.9376	5.8991	35.0372	27.5952	89.69

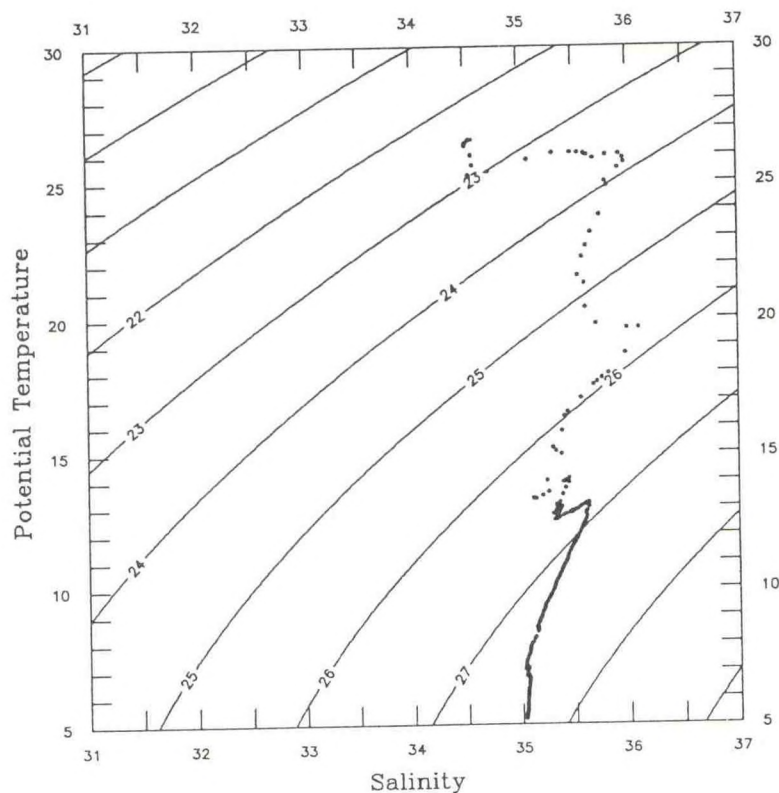


Station 6



R/V DELAWARE II 90-08 Station: 07 Date: 90/08/09 GMT: 2127 Depth: 2800m
 Position: 38 39.06N 71 09.94W Wind: 12 kts Dir: 120 deg. Air Temp: 27.1C

PR	TE	PT	SA	SO	TR
1	26.5721	26.5758	34.5600	22.5200	87.57
10	25.6294	25.6272	34.5749	22.8301	87.90
20	25.9862	25.9817	35.6355	23.5206	88.13
30	23.1538	23.1477	35.6613	24.3940	86.86
40	17.9544	17.9475	35.8155	25.9114	82.48
50	15.0835	15.0759	35.3247	26.2064	82.78
60	14.0873	14.0786	35.4432	26.5138	86.22
70	12.9756	12.9660	35.3346	26.6597	87.92
80	12.7780	12.7672	35.3438	26.7067	88.33
90	12.6106	12.5984	35.3502	26.7451	88.80
100	12.7992	12.7856	35.4606	26.7936	89.24
125	12.4619	12.4452	35.5850	26.9576	89.40
150	11.2300	11.2112	35.4304	27.0726	89.62
175	10.4804	10.4594	35.3443	27.1413	89.52
200	9.4091	9.3867	35.2124	27.2217	89.61
225	8.7914	8.7672	35.1543	27.2767	89.68
250	8.0347	8.0092	35.0897	27.3433	89.67
275	7.4772	7.4503	35.0465	27.3918	89.64
300	7.0693	7.0408	35.0223	27.4310	89.65
325	6.8329	6.8025	35.0361	27.4748	89.67
350	6.6566	6.6244	35.0619	27.5195	89.62
375	6.2642	6.2307	35.0477	27.5608	89.62
400	6.0231	5.9880	35.0464	27.5912	89.57
425	5.7391	5.7027	35.0442	27.6255	89.62
450	5.5827	5.5446	35.0398	27.6417	89.60
475	5.4306	5.3909	35.0368	27.6581	89.62
500	5.2641	5.2228	35.0288	27.6720	89.67

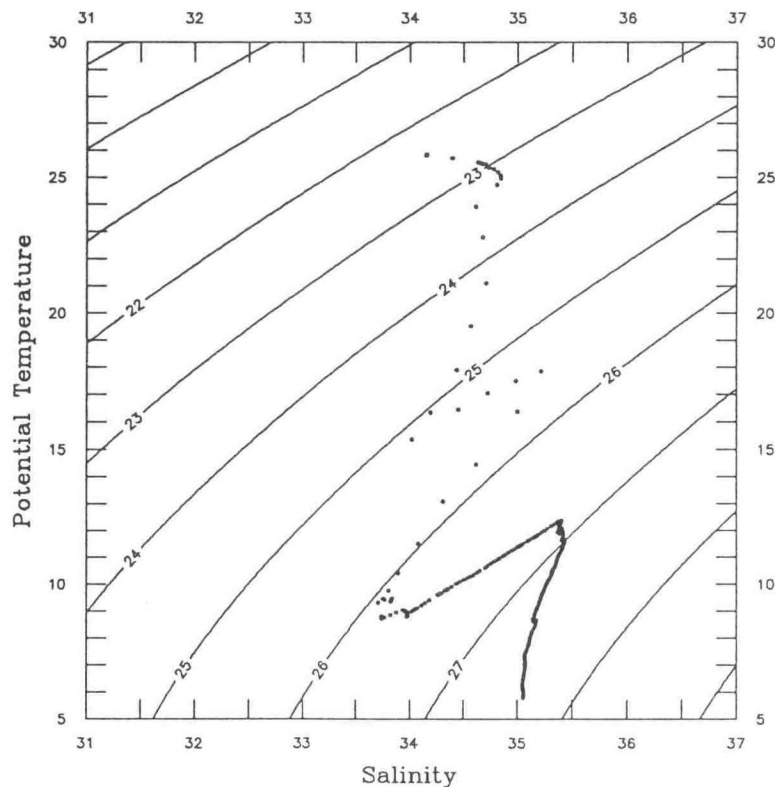


Station 7

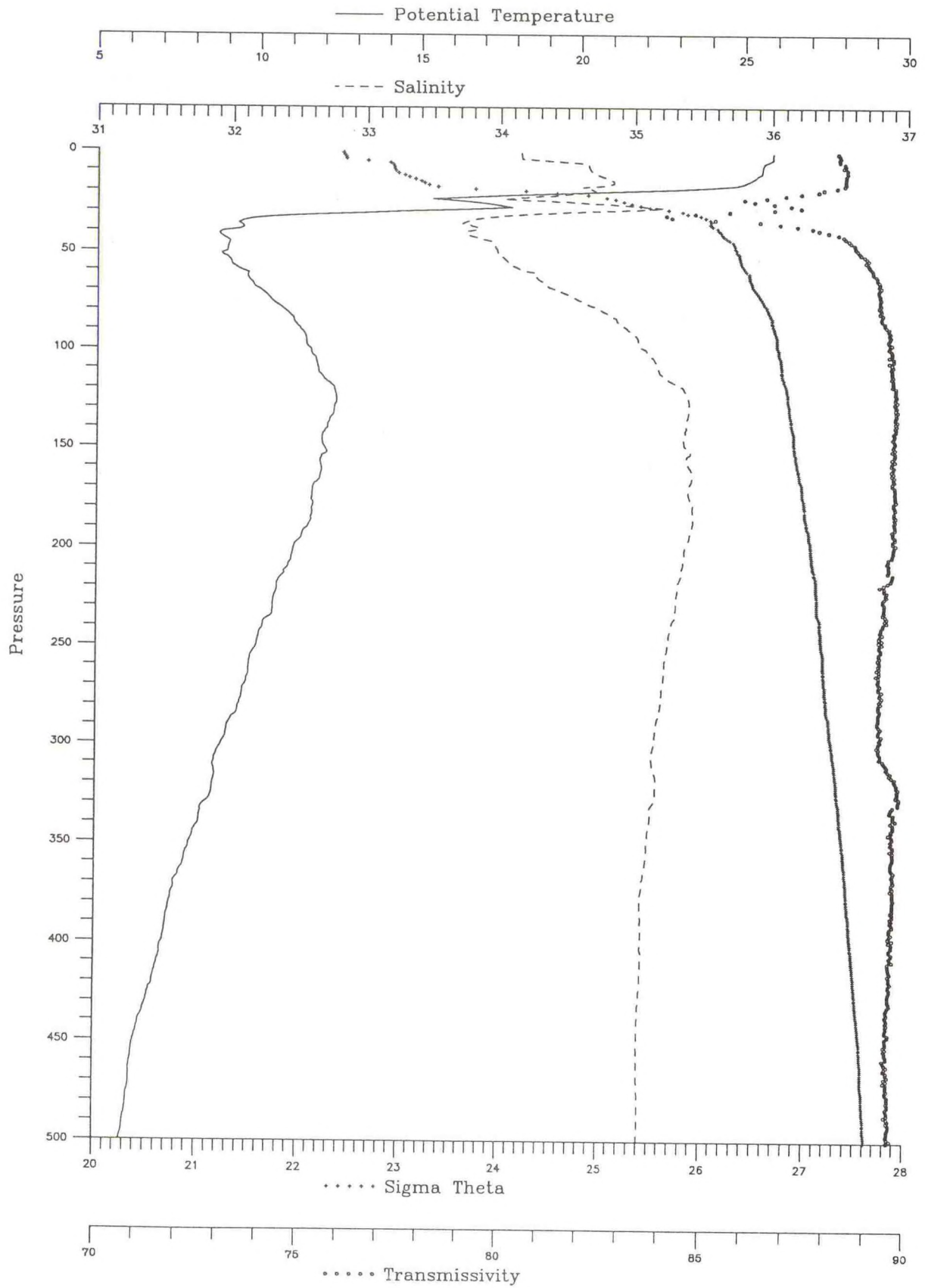


R/V DELAWARE II 90-08 Station: 08 Date: 90/08/10 GMT: 0448 Depth: 2555m
 Position: 39 22.15N 71 21.86W Wind: 10 kts Dir: 160 deg. Air Temp: 25.0C

PR	TE	PT	SA	SO	TR
1	25.8515	25.8428	34.1520	22.4200	88.25
10	25.5104	25.5082	34.6705	22.9388	88.47
20	21.1136	21.1098	34.7075	24.2430	87.78
30	14.4621	14.4577	34.6151	25.7915	85.62
40	8.8205	8.8163	33.7436	26.1636	88.02
50	8.9751	8.9698	33.9779	26.3229	88.78
60	9.4304	9.4238	34.1858	26.4125	89.13
70	10.0346	10.0266	34.4358	26.5072	89.27
80	10.7787	10.7690	34.7531	26.6252	89.35
90	11.2793	11.2681	34.9527	26.6902	89.53
100	11.6104	11.5977	35.0842	26.7313	89.60
125	12.4016	12.3849	35.3941	26.8212	89.70
150	12.0553	12.0356	35.3863	26.8830	89.70
175	11.6623	11.6399	35.4056	26.9734	89.72
200	11.1042	11.0793	35.3721	27.0514	89.69
225	10.5015	10.4745	35.3129	27.1141	89.47
250	9.9557	9.9266	35.2530	27.1627	89.35
275	9.5227	9.4916	35.2103	27.2026	89.42
300	8.8952	8.8625	35.1562	27.2630	89.33
325	8.6061	8.5714	35.1685	27.3187	89.82
350	7.9250	7.8893	35.1092	27.3765	89.66
375	7.4071	7.3703	35.0673	27.4196	89.72
400	7.1355	7.0970	35.0692	27.4600	89.70
425	6.7301	6.6905	35.0613	27.5100	89.64
450	6.2824	6.2419	35.0478	27.5594	89.57
475	6.1245	6.0822	35.0546	27.5855	89.57
500	5.8733	5.8296	35.0531	27.6166	89.61

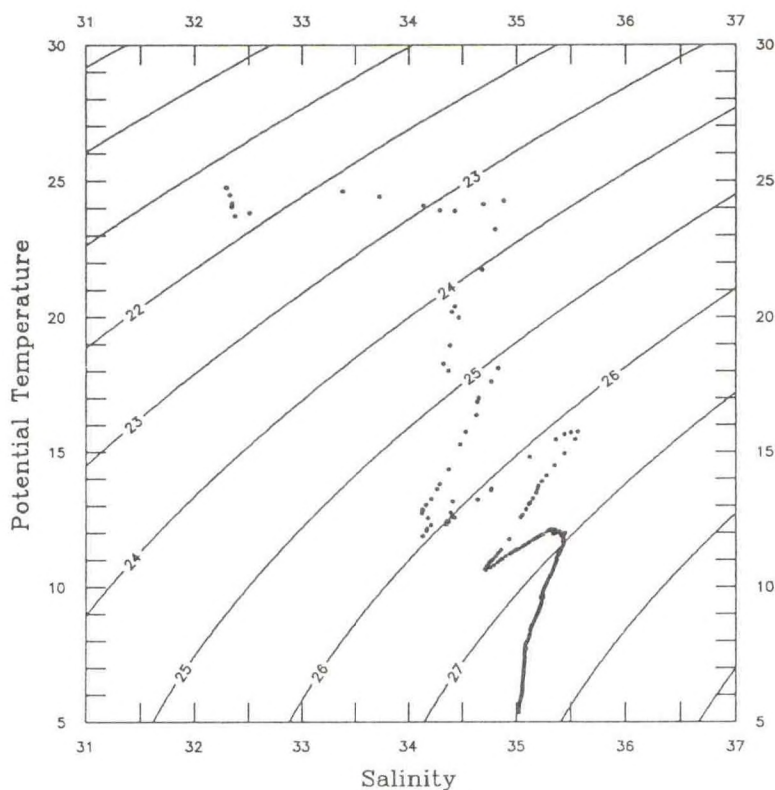


Station 8

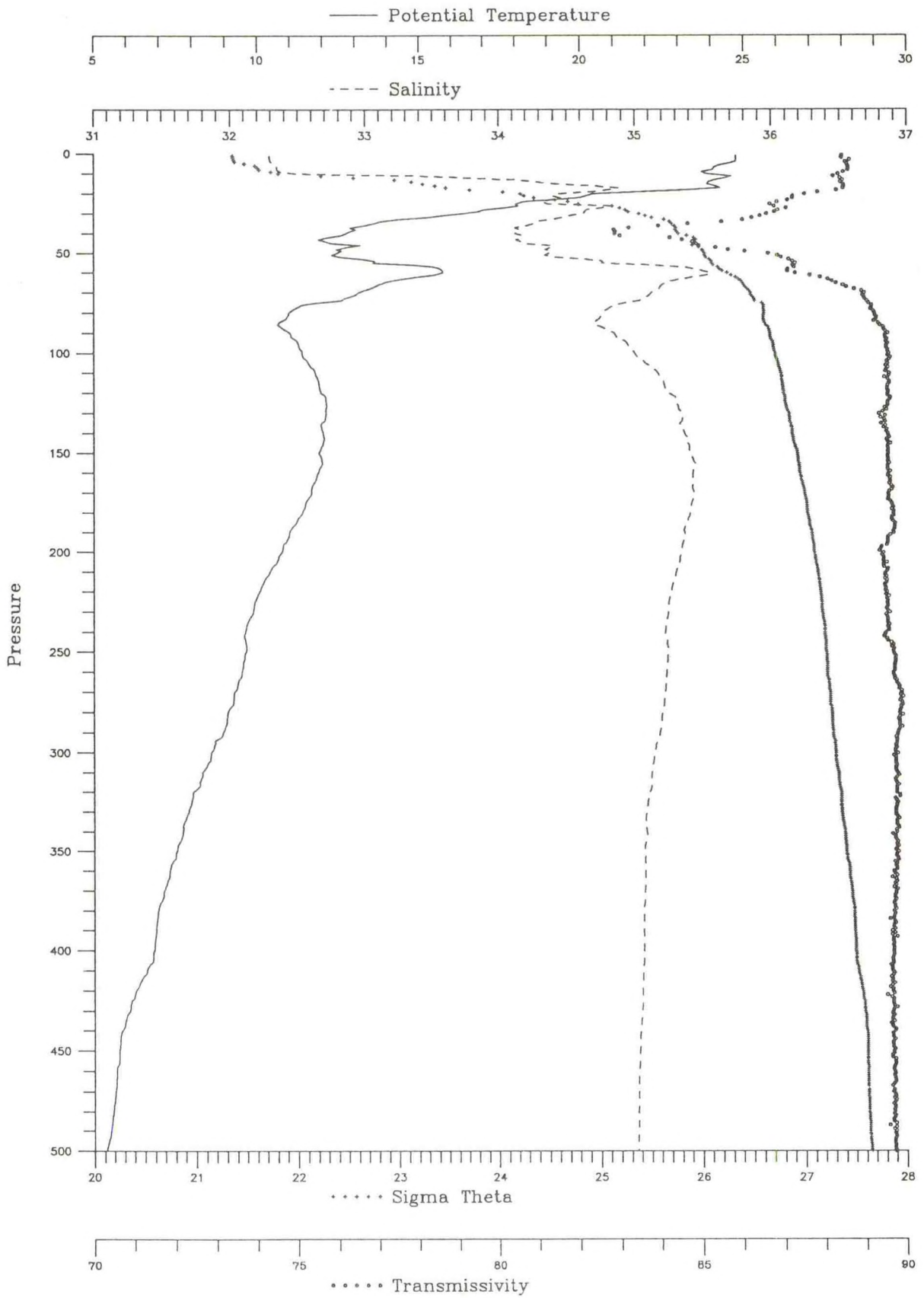


R/V DELAWARE II 90-08 Station: 09 Date: 90/08/10 GMT: 0945 Depth: 1427m
 Position: 39 42.12N 71 28.96W Wind: 6 kts Dir: 160 deg. Air Temp: 25.0C

PR	TE	PT	SA	SO	TR
1	24.7674	24.7672	32.2920	21.3600	88.40
10	23.8358	23.8337	32.5125	21.8097	88.30
20	20.4105	20.4067	34.4262	24.2171	87.48
30	16.3834	16.3786	34.6257	25.3736	86.56
40	12.7467	12.7414	34.1218	25.7643	82.84
50	12.4342	12.4276	34.3716	26.0194	86.60
60	15.7632	15.7538	35.5610	26.2365	87.25
70	13.1208	13.1111	35.1213	26.4651	88.95
80	10.9858	10.9761	34.7636	26.5963	89.20
90	11.0257	11.0147	34.8489	26.6557	89.53
100	11.4055	11.3930	35.0036	26.7068	89.55
125	12.1455	12.1290	35.3111	26.8065	89.52
150	11.9233	11.9038	35.4046	26.9225	89.54
175	11.5115	11.4892	35.4182	27.0115	89.62
200	10.7944	10.7700	35.3431	27.0849	89.42
225	9.9598	9.9336	35.2502	27.1592	89.51
250	9.6769	9.6483	35.2455	27.2040	89.67
275	9.2995	9.2687	35.2161	27.2441	89.88
300	8.6176	8.5856	35.1434	27.2968	89.77
325	8.0164	7.9831	35.0946	27.3510	89.77
350	7.5747	7.5400	35.0708	27.3979	89.78
375	7.1069	7.0710	35.0700	27.4643	89.69
400	6.8732	6.8355	35.0642	27.4925	89.66
425	6.1850	6.1471	35.0556	27.5779	89.65
450	5.8038	5.7649	35.0335	27.6093	89.66
475	5.6692	5.6286	35.0235	27.6184	89.69
500	5.4140	5.3722	35.0216	27.6483	89.72

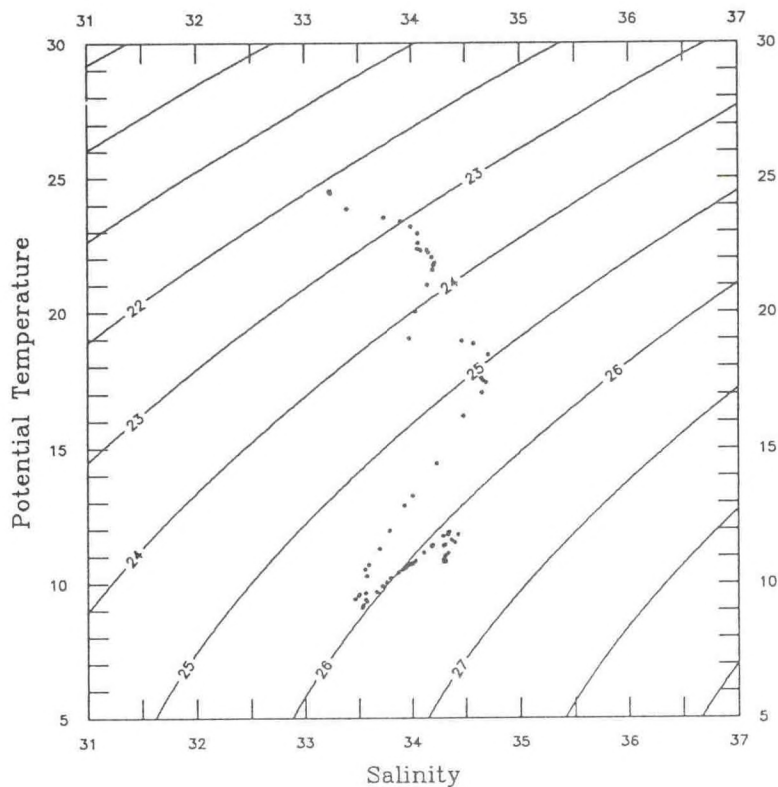


Station 9

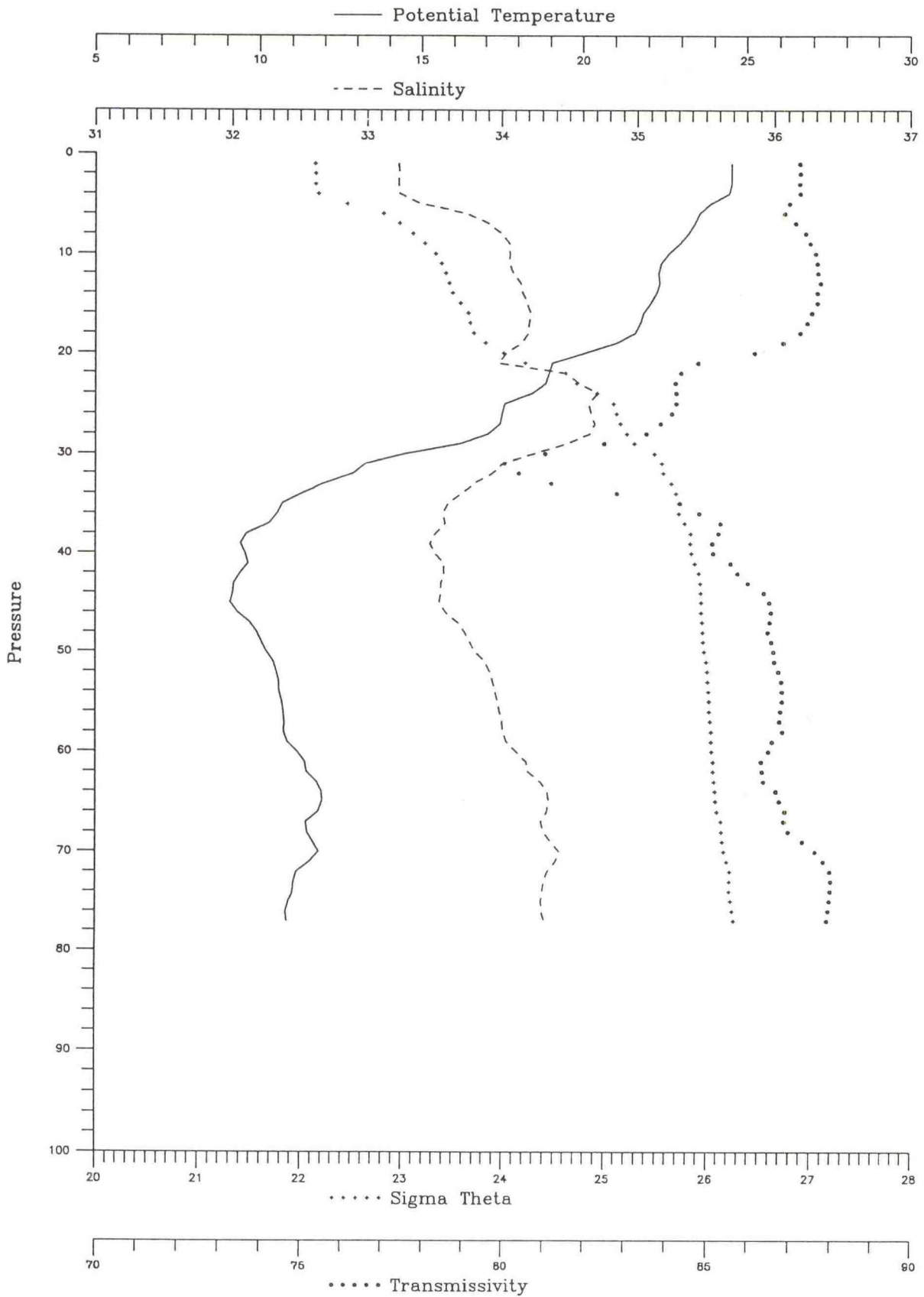


R/V DELAWARE II 90-08 Station: 10 Date: 90/08/10 GMT: 1519 Depth: 88 m
 Position: 40 06.07N 71 35.03W Wind: 14 kts Dir: 125 deg. Air Temp: 26.0C

PR	TE	PT	SA	SO	TR
1	24.5230	24.5228	33.2300	22.1475	87.27
10	22.5997	22.5977	34.0586	23.3362	87.65
20	20.0445	20.0408	34.0362	24.0176	86.18
30	14.4665	14.4621	34.2302	25.4949	81.06
40	9.5678	9.5635	33.5006	25.8539	85.17
50	10.2272	10.2215	33.8036	25.9805	86.64
60	11.1670	11.1597	34.1092	26.0535	86.52
70	11.8381	11.8292	34.4258	26.1760	87.64
77	10.8437	10.8344	34.3129	26.2706	87.93

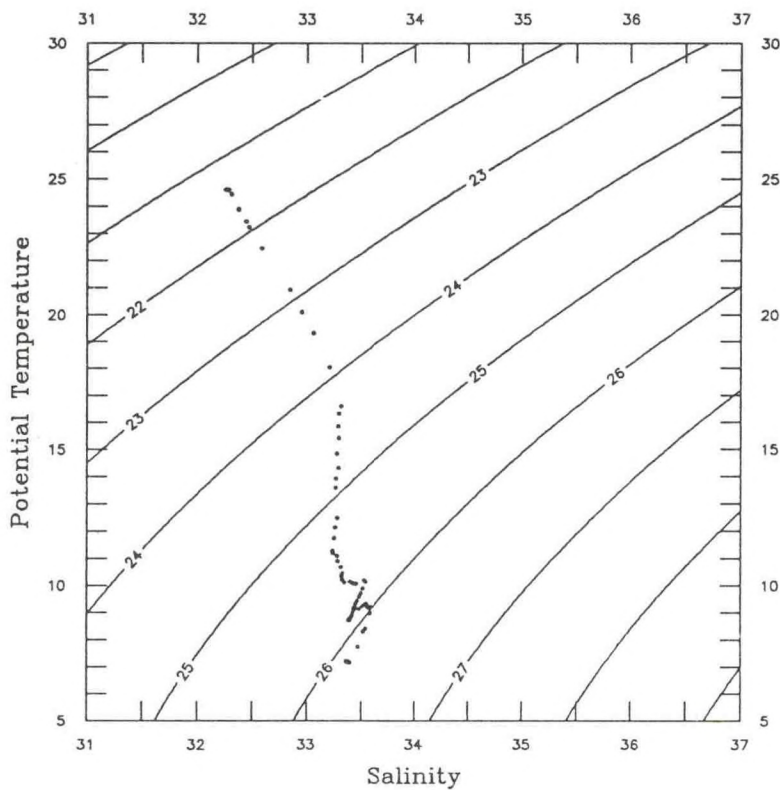


Station 10

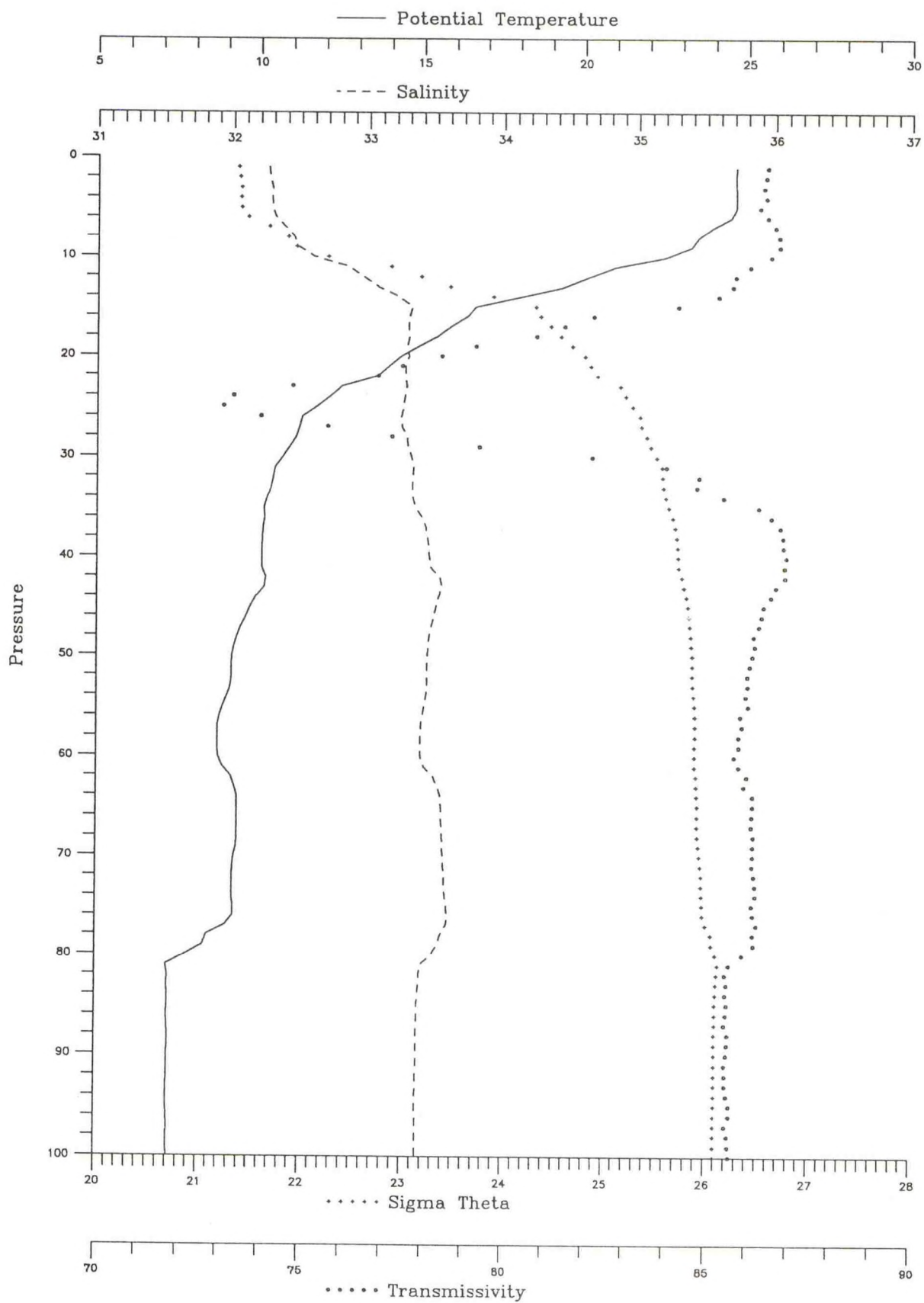


R/V DELAWARE II 90-08 Station: 11 Date: 90/08/10 GMT: 2219 Depth: 103 m
 Position: 39 40.12N 72 29.88W Wind: 12 kts Dir: 150 deg. Air Temp: 24.7C

PR	TE	PT	SA	SO	TR
1	24.6131	24.6128	32.2600	21.3800	86.46
10	22.4667	22.4647	32.5902	22.2598	86.55
20	14.3138	14.3109	33.2907	24.8020	78.45
30	10.6982	10.6947	33.3138	25.5169	82.20
40	10.0887	10.0841	33.4504	25.7283	86.96
50	9.1831	9.1778	33.4396	25.8685	86.14
60	8.7551	8.7488	33.3866	25.8943	85.70
70	9.2618	9.2542	33.5570	25.9481	86.17
80	7.7726	7.7649	33.4737	26.1097	85.92
90	7.2307	7.2224	33.3682	26.1033	85.55
100	7.2469	7.2376	33.3647	26.0984	85.62

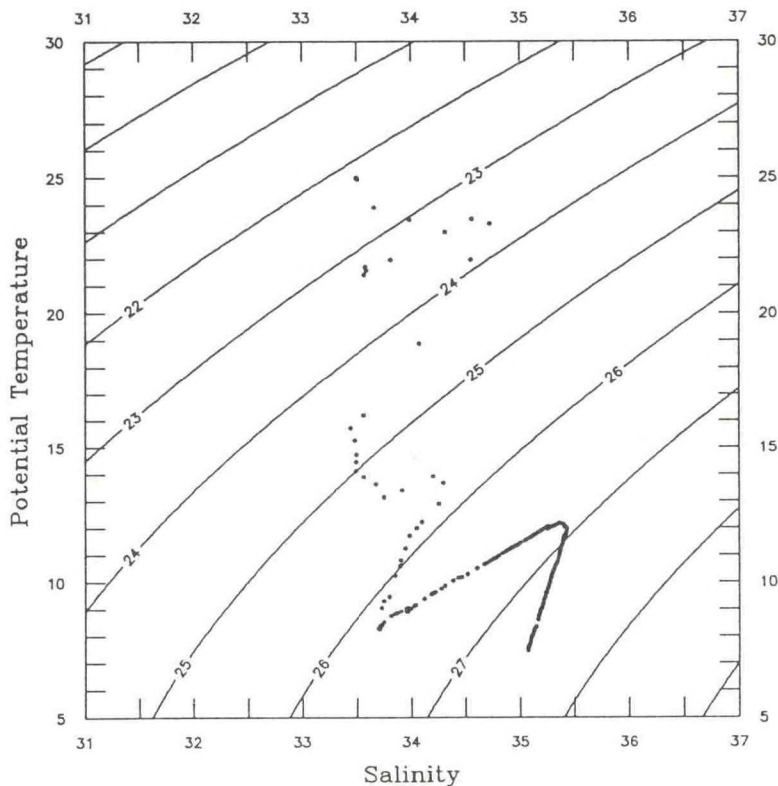


Station 11

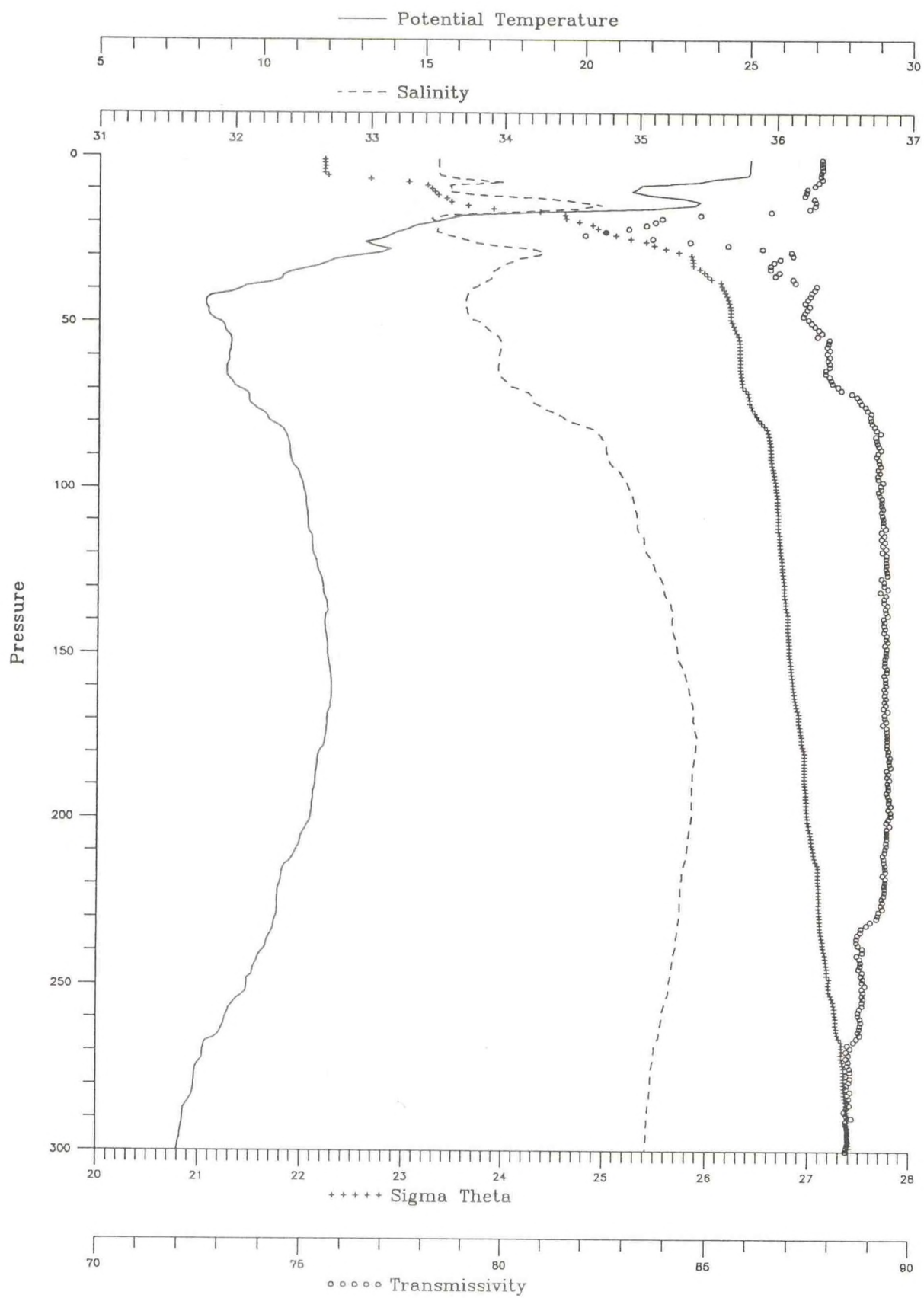


R/V DELAWARE II 90-08 Station: 12 Date: 90/08/11 GMT: 0240 Depth: 1100m
 Position: 39 25.05N 72 09.89W Wind: 11 kts Dir: 160 deg. Air Temp: 24.6C

PR	TE	PT	SA	SO	TR
1	25.0131	25.0130	33.5000	22.2100	87.75
10	21.5877	21.5858	33.5953	23.2668	87.39
20	15.2827	15.2797	33.4813	24.7410	83.71
30	12.9144	12.9104	34.2528	25.8328	87.05
40	9.3196	9.3153	33.7500	26.1450	87.58
50	8.7683	8.7631	33.8161	26.2286	87.51
60	8.9902	8.9839	33.9616	26.3079	87.96
70	9.4033	9.3956	34.1201	26.3657	88.25
80	10.3155	10.3061	34.5150	26.5210	89.01
90	10.8927	10.8818	34.7672	26.6160	89.13
100	11.3083	11.2958	34.9304	26.6678	89.25
125	11.7755	11.7594	35.1264	26.7337	89.40
150	12.0757	12.0561	35.2887	26.8032	89.39
175	12.0089	11.9859	35.4299	26.9264	89.43
200	11.5584	11.5328	35.3936	26.9842	89.47
225	10.5494	10.5223	35.3119	27.1049	89.33
250	9.6362	9.6077	35.2342	27.2020	88.91
275	8.0802	8.0520	35.1104	27.3531	88.53
300	7.5216	7.4921	35.0683	27.4029	88.43

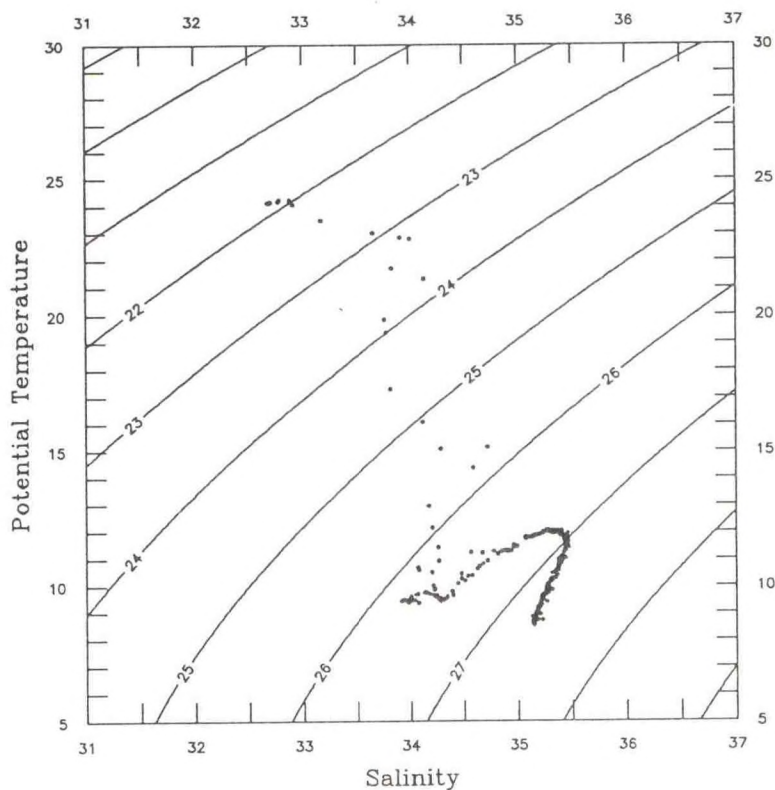


Station 12

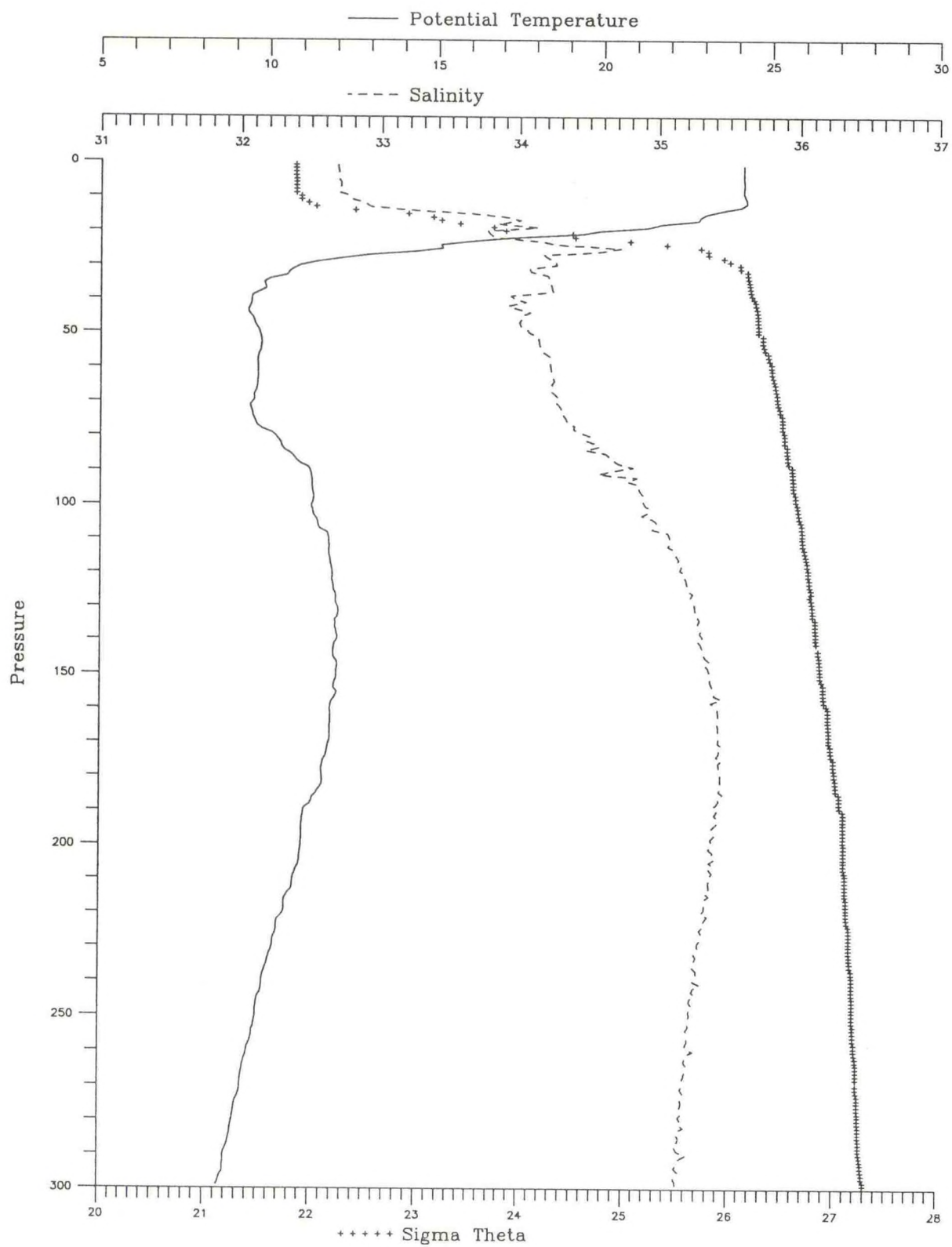


R/V DELAWARE II 90-08 Station: 13 Date: 90/08/11 GMT: 0818 Depth: 2208m
 Position: 39 09.03N 71 48.87W Wind: 20 kts Dir: 170 deg. Air Temp: 25.9C

PR	TE	PT	SA	SO	TR
1	24.1445	24.1443	32.6848	21.8480	0.00
10	24.1918	24.1897	32.7803	21.9008	0.00
20	19.8499	19.8462	33.7655	23.8624	0.00
30	10.9524	10.9488	34.2650	26.1000	0.00
40	9.4725	9.4681	33.9618	26.2301	0.00
50	9.7177	9.7122	34.0687	26.2734	0.00
60	9.6778	9.6711	34.2226	26.4005	0.00
70	9.5213	9.5136	34.2600	26.4558	0.00
80	10.2038	10.1945	34.5059	26.5232	0.00
90	11.2402	11.2291	34.6687	26.5990	0.00
100	11.2929	11.2804	34.9008	26.6475	0.00
125	11.9512	11.9349	35.2226	26.7751	0.00
150	12.0472	12.0276	35.3665	26.8692	0.00
175	11.6823	11.6598	35.4574	27.0009	0.00
200	11.0279	11.0031	35.3839	27.0995	0.00
225	10.2992	10.2724	35.3041	27.1528	0.00
250	9.6961	9.6675	35.2408	27.1900	0.00
275	9.0995	9.0692	35.1822	27.2411	0.00
299	8.5730	8.5412	35.1432	27.3036	0.00

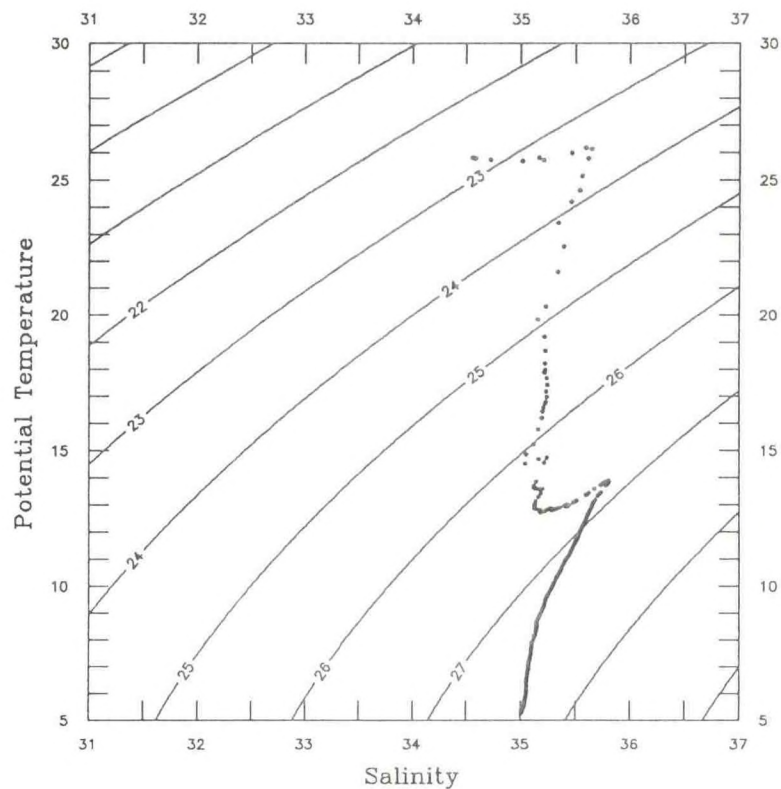


Station 13



R/V DELAWARE II 90-08 Station: 14 Date: 90/08/11 GMT: 1321 Depth: 2450m
 Position: 38 56.07N 71 31.00W Wind: 24 kts Dir: 190 deg. Air Temp: 25.6C

PR	TE	PT	SA	SO	TR
1	25.8330	25.8328	34.5550	22.7500	88.20
10	25.8248	25.8226	34.5603	22.7586	88.14
20	26.1583	26.1538	35.6437	23.4729	88.32
30	19.2252	19.2198	35.2147	25.1300	87.76
40	16.8134	16.8069	35.2262	25.7347	87.78
50	14.7652	14.7577	35.2348	26.2069	85.65
60	13.1481	13.1398	35.1351	26.4701	88.52
70	12.7343	12.7249	35.1720	26.5818	88.99
80	12.8215	12.8106	35.2859	26.6531	89.23
90	12.9591	12.9468	35.4191	26.7291	89.46
100	13.7450	13.7307	35.7256	26.8055	89.64
125	13.1973	13.1798	35.6792	26.8834	89.56
150	12.5013	12.4811	35.5925	26.9563	89.56
175	11.7765	11.7538	35.5116	27.0343	89.52
200	10.9558	10.9311	35.4021	27.1018	89.43
225	10.0283	10.0020	35.2877	27.1768	89.43
250	9.3853	9.3572	35.2173	27.2304	89.59
275	8.8687	8.8389	35.1619	27.2712	89.56
300	8.4388	8.4072	35.1406	27.3224	89.48
325	7.8786	7.8457	35.1006	27.3763	89.33
350	7.3901	7.3559	35.0876	27.4377	89.52
375	6.9287	6.8932	35.0667	27.4865	89.50
400	6.5097	6.4731	35.0540	27.5336	89.43
425	6.2161	6.1782	35.0509	27.5702	89.47
450	5.9357	5.8964	35.0457	27.6023	89.47
475	5.6553	5.6147	35.0338	27.6282	89.47
500	5.3530	5.3114	35.0074	27.6444	89.50

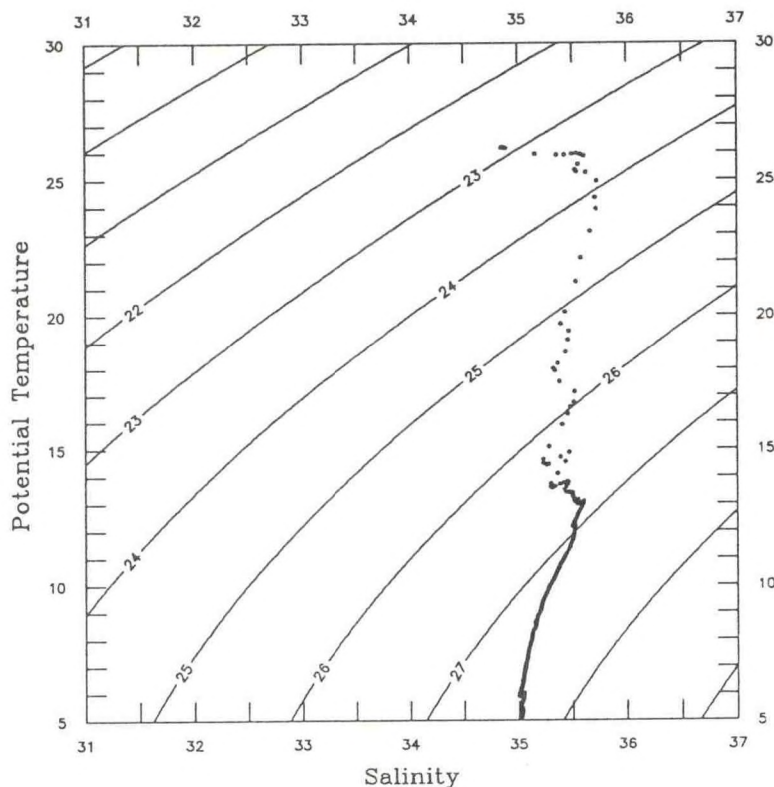


Station 14

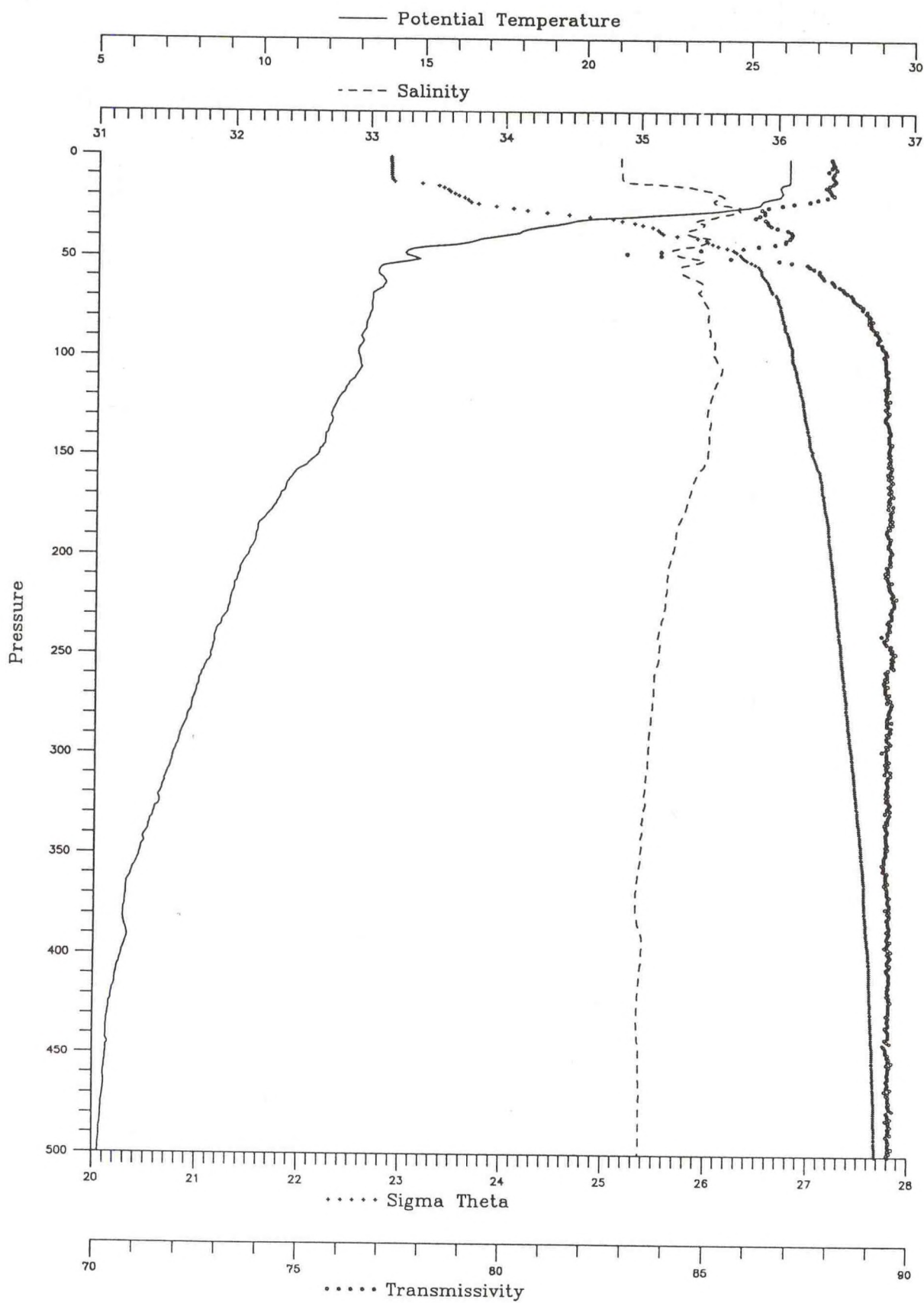


R/V DELAWARE II 90-08 Station: 15 Date: 90/08/11 GMT: 2026 Depth: 2800m
 Position: 38 22.99N 71 30.98W Wind: 14 kts Dir: 210 deg. Air Temp: 25.1C

PR	TE	PT	SA	SO	TR
1	26.1813	26.1808	34.8490	22.8610	87.96
10	26.1825	26.1803	34.8559	22.8703	87.99
20	25.8739	25.8695	35.6037	23.5315	87.85
30	21.2675	21.2617	35.5282	24.8257	86.11
40	17.1445	17.1379	35.5167	25.8789	86.94
50	14.7218	14.7143	35.3853	26.3325	85.51
60	13.7251	13.7166	35.3787	26.5400	87.79
70	13.4343	13.4244	35.4666	26.6686	88.50
80	13.3150	13.3039	35.4949	26.7153	88.90
90	13.0859	13.0735	35.5123	26.7757	89.18
100	13.0312	13.0174	35.5502	26.8164	89.32
125	12.2822	12.2656	35.5036	26.9296	89.33
150	11.7517	11.7324	35.4999	27.0292	89.47
175	10.4886	10.4676	35.3467	27.1417	89.42
200	9.6687	9.6459	35.2480	27.2063	89.47
225	9.0988	9.0741	35.1981	27.2617	89.53
250	8.5363	8.5099	35.1515	27.3150	89.53
275	7.9764	7.9485	35.1110	27.3691	89.52
300	7.4114	7.3821	35.0801	27.4281	89.43
325	6.9964	6.9656	35.0636	27.4740	89.48
350	6.4009	6.3693	35.0327	27.5307	89.39
375	5.9730	5.9403	34.9998	27.5604	89.52
400	5.8830	5.8484	35.0431	27.6064	89.56
425	5.5190	5.4833	35.0128	27.6278	89.52
450	5.4384	5.4008	35.0272	27.6493	89.50
475	5.3189	5.2795	35.0326	27.6682	89.55
500	5.2068	5.1658	35.0276	27.6779	89.52

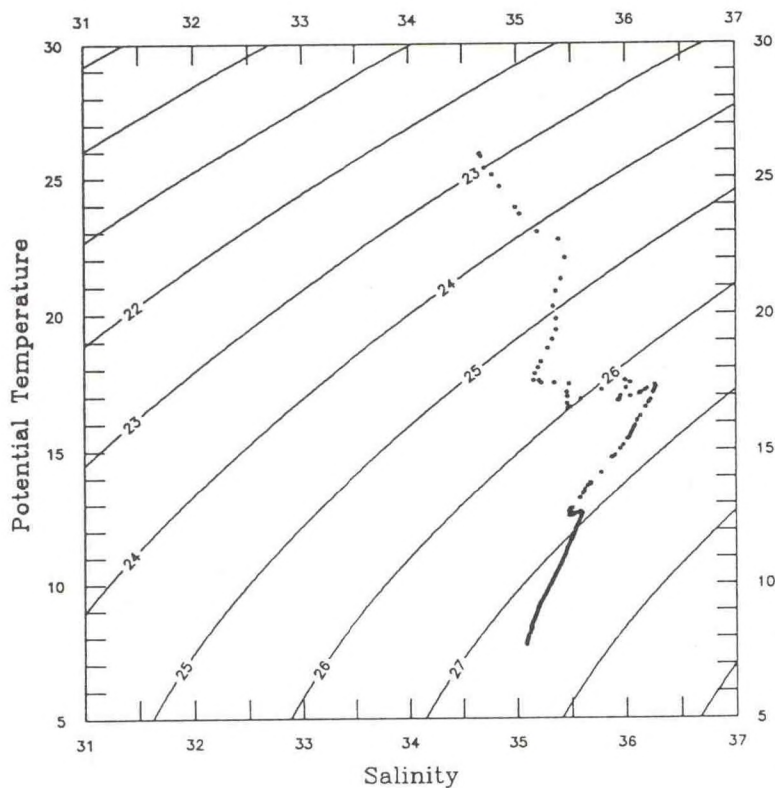


Station 15

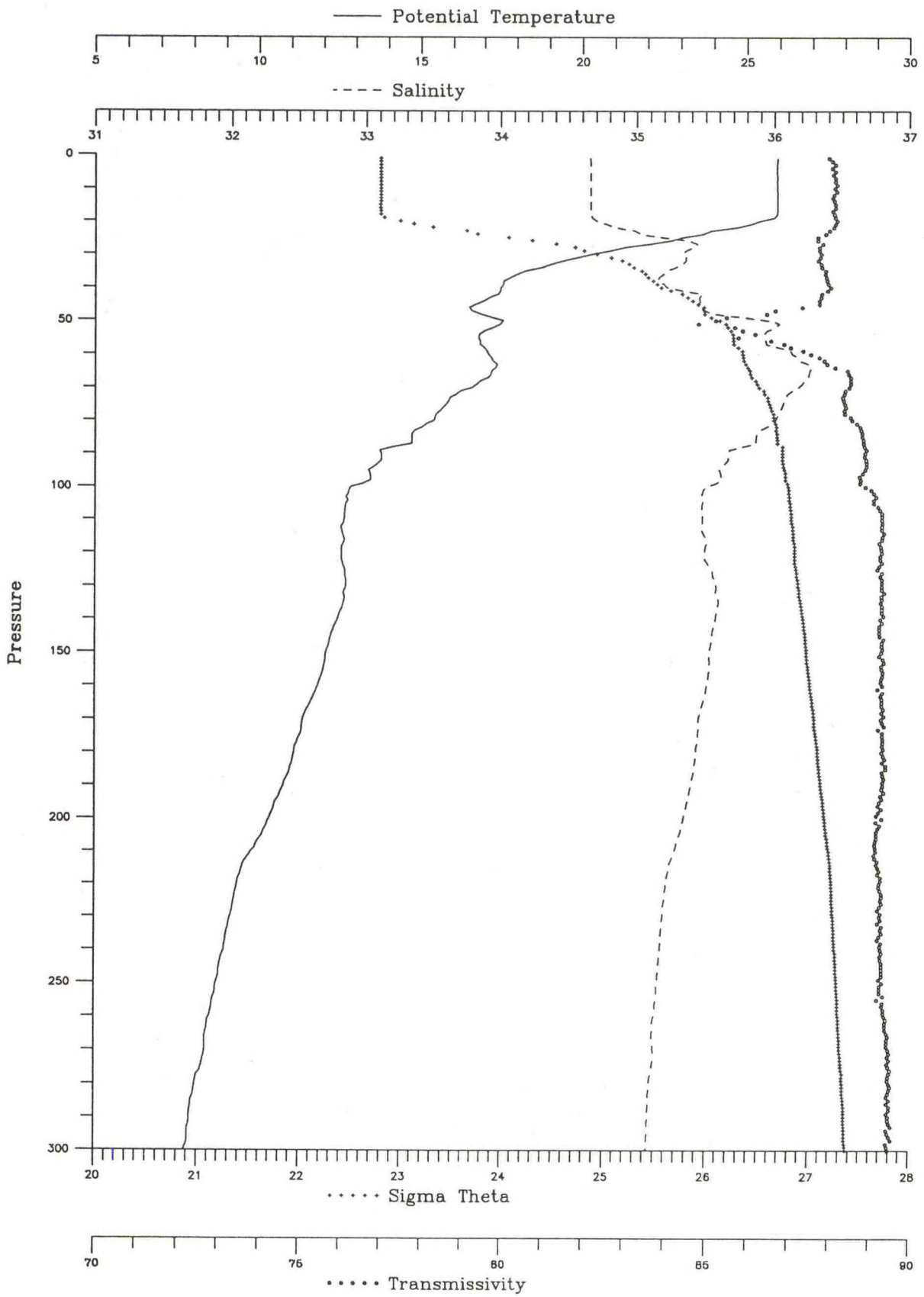


R/V DELAWARE II 90-08 Station: 16 Date: 90/08/12 GMT: 0140 Depth: 2650m
 Position: 38 36.93N 71 53.18W Wind: 10 kts Dir: 225 deg. Air Temp: 25.9C

PR	TE	PT	SA	SO	TR
1	25.9150	25.9149	34.6550	22.8050	88.00
10	25.9129	25.9106	34.6570	22.8043	88.15
20	25.3857	25.3813	34.6988	22.9991	88.20
30	20.2917	20.2861	35.3298	24.9385	87.81
40	17.4909	17.4842	35.2193	25.5673	88.05
50	17.5722	17.5637	35.9878	26.1373	85.24
60	17.1175	17.1075	36.1352	26.3611	87.56
70	16.5910	16.5796	36.1756	26.5180	88.51
80	15.4196	15.4072	36.0098	26.6607	88.58
90	13.8079	13.7949	35.6736	26.7460	88.91
100	12.8573	12.8436	35.5043	26.8059	88.92
125	12.6865	12.6696	35.5476	26.8842	89.22
150	12.0987	12.0789	35.5307	26.9868	89.32
175	11.2855	11.2635	35.4494	27.0777	89.35
200	10.3496	10.3258	35.3439	27.1645	89.33
225	9.2752	9.2501	35.2048	27.2383	89.30
250	8.7443	8.7175	35.1544	27.2846	89.34
275	8.2800	8.2514	35.1201	27.3303	89.50
300	7.7730	7.7429	35.0779	27.3737	89.49

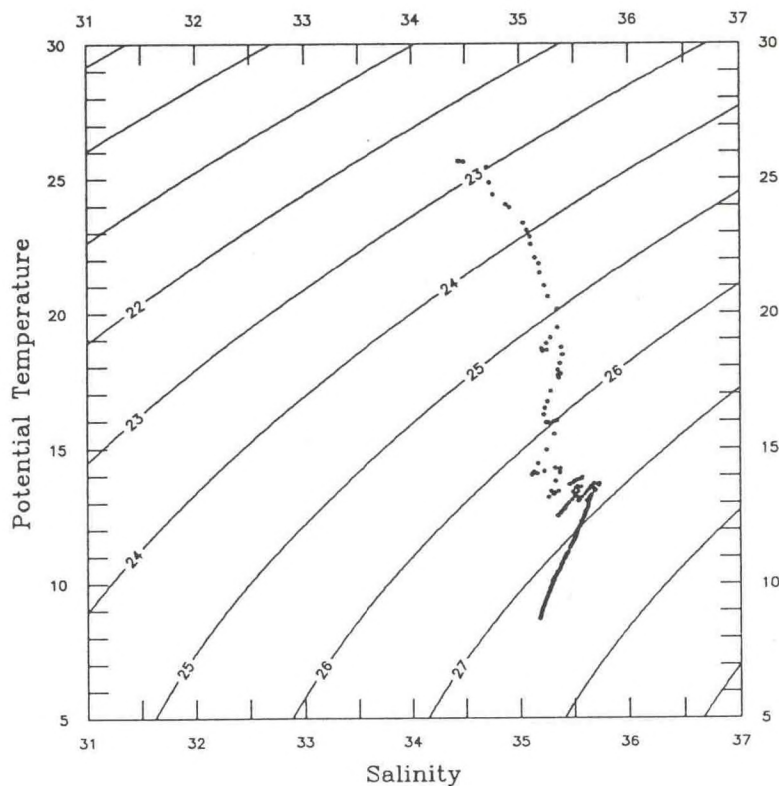


Station 16

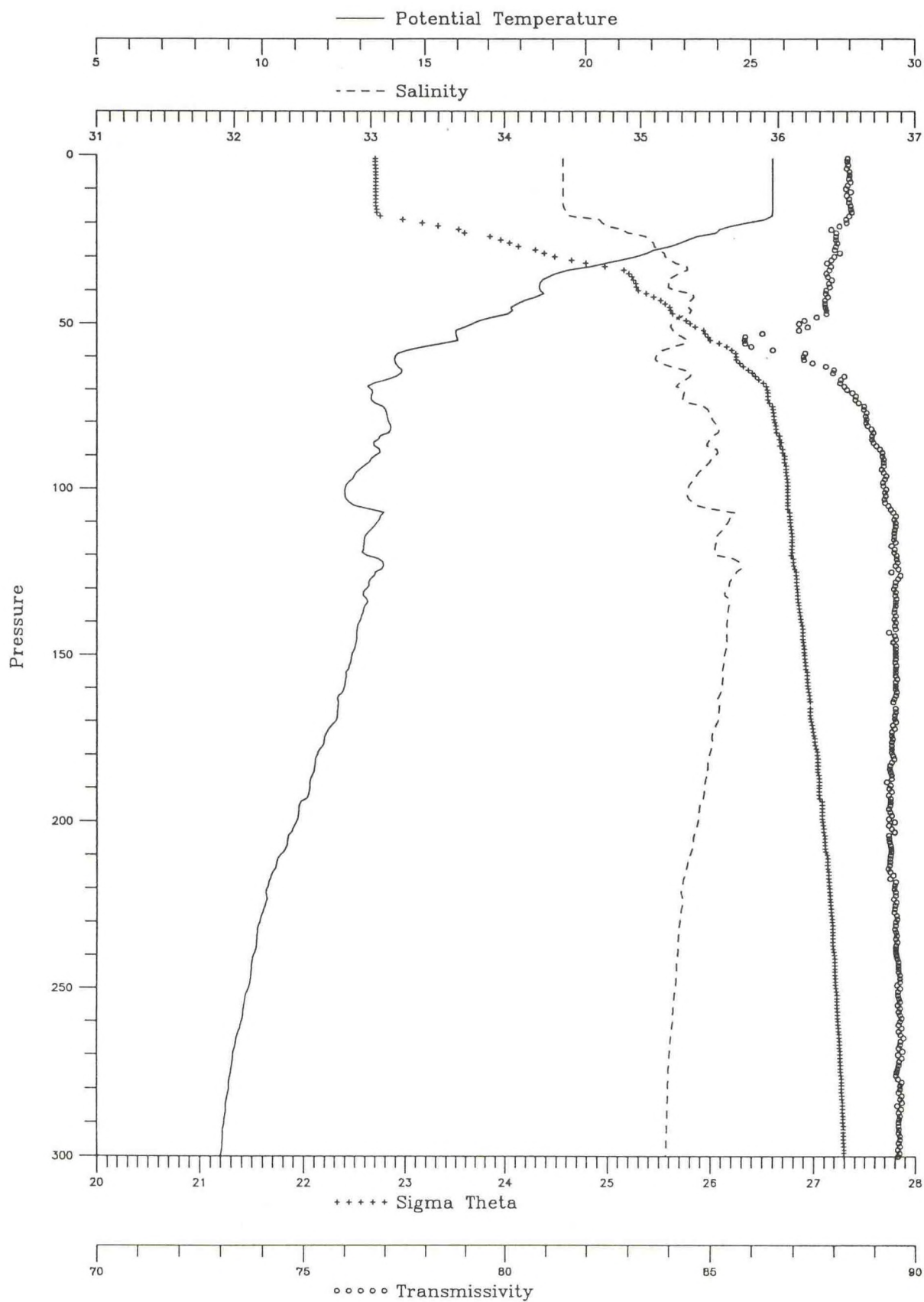


R/V DELAWARE II 90-08 Station: 17 Date: 90/08/12 GMT: 0528 Depth: 2653m
 Position: 38 43.51N 71 52.96W Wind: 11 kts Dir: 245 deg. Air Temp: 25.9C

PR	TE	PT	SA	SO	TR
1	25.6655	25.6651	34.4311	22.7090	88.35
10	25.6609	25.6587	34.4314	22.7120	88.31
20	24.8592	24.8549	34.7191	23.1748	88.32
30	21.5040	21.4982	35.1776	24.4939	88.02
40	18.6136	18.6065	35.2403	25.3059	87.82
50	16.4823	16.4743	35.2238	25.8110	87.16
60	14.0757	14.0670	35.1065	26.2560	87.27
70	13.3684	13.3586	35.3066	26.5583	88.33
80	13.8745	13.8630	35.5343	26.6298	88.80
90	13.4386	13.4259	35.5369	26.7228	89.20
100	12.5384	12.5249	35.3417	26.7530	89.29
125	13.4872	13.4695	35.6950	26.8362	89.42
150	12.7561	12.7357	35.6084	26.9182	89.52
175	11.9090	11.8862	35.5153	27.0119	89.45
200	11.0564	11.0315	35.4138	27.0926	89.50
225	10.1213	10.0949	35.2988	27.1695	89.51
250	9.6070	9.5786	35.2473	27.2171	89.62
275	9.0846	9.0543	35.1964	27.2636	89.54
300	8.7827	8.7503	35.1781	27.2980	89.57

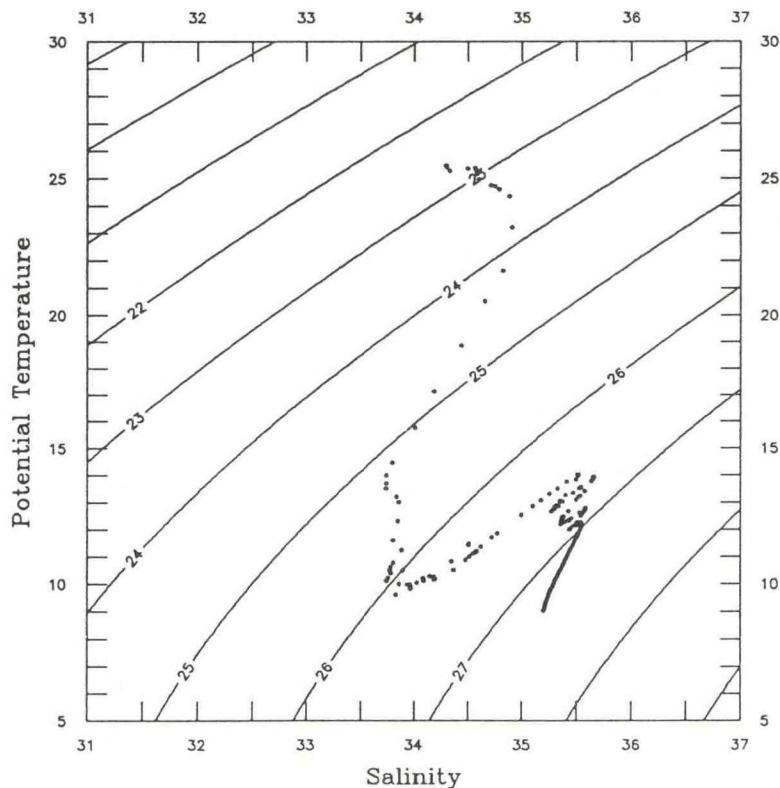


Station 17

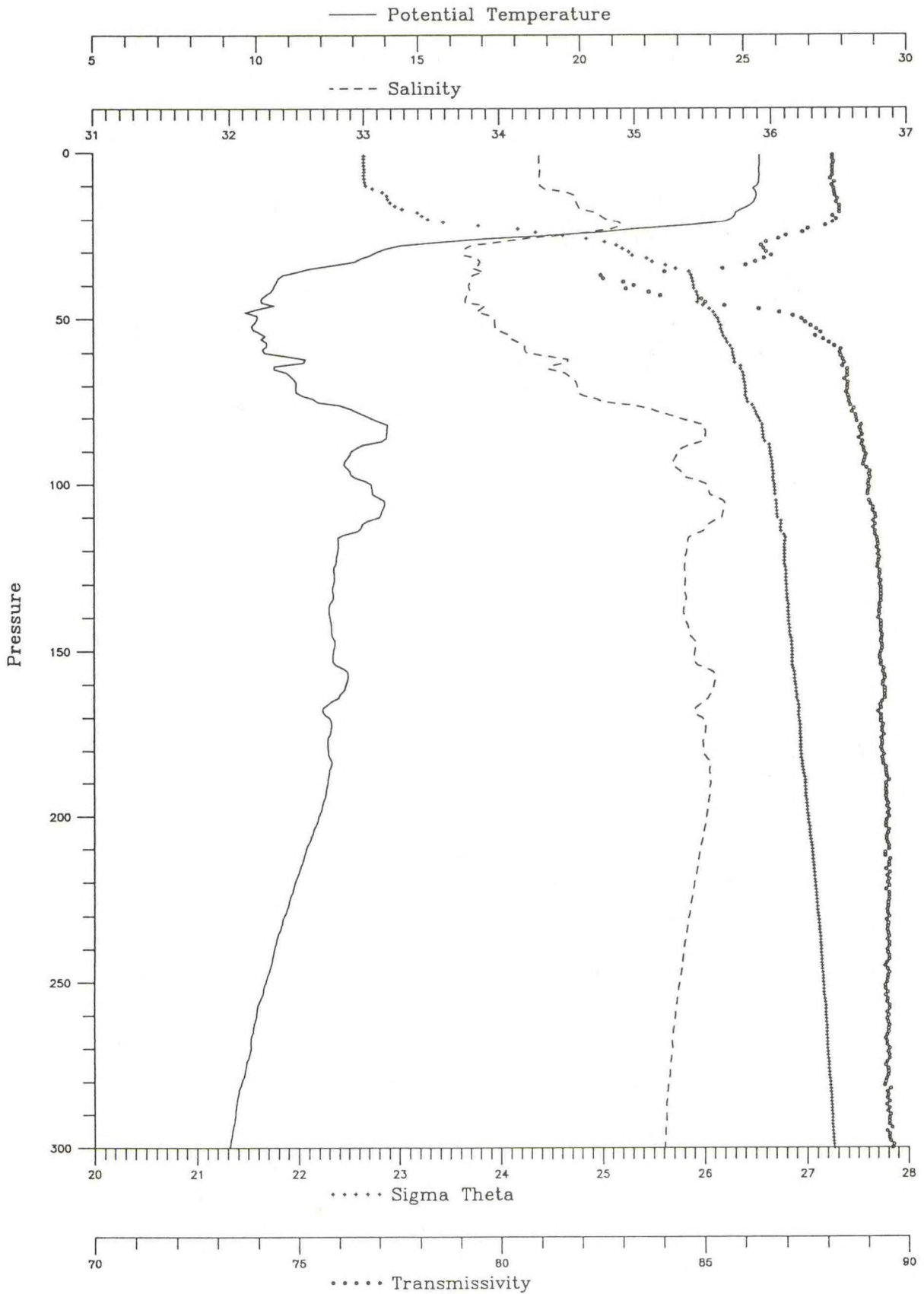


R/V DELAWARE II 90-08 Station: 18 Date: 90/08/12 GMT: 0643 Depth: 2562m
 Position: 38 49.98N 71 53.06W Wind: 12 kts Dir: 265 deg. Air Temp: 25.9C

PR	TE	PT	SA	SO	TR
1	25.4790	25.4785	34.2918	22.6619	88.16
10	25.4287	25.4265	34.2997	22.6839	88.14
20	24.6216	24.6173	34.7848	23.2960	88.25
30	13.7227	13.7185	33.7418	25.2738	86.54
40	10.5382	10.5335	33.7729	25.9027	83.30
50	10.0058	10.0001	33.9603	26.1405	87.40
60	10.2190	10.2120	34.1960	26.2884	88.33
70	11.2000	11.1913	34.5725	26.4084	88.51
80	13.5257	13.5144	35.3248	26.5403	88.72
90	12.9159	12.9036	35.3095	26.6528	88.92
100	13.5463	13.5321	35.5219	26.6892	89.02
125	12.3685	12.3519	35.3545	26.7969	89.25
150	12.3561	12.3361	35.4311	26.8595	89.33
175	12.2555	12.2323	35.5064	26.9382	89.40
200	11.8930	11.8669	35.5143	27.0148	89.53
225	10.9957	10.9678	35.4049	27.0973	89.52
250	10.2555	10.2258	35.3125	27.1574	89.46
275	9.6526	9.6211	35.2440	27.2073	89.43
300	9.1454	9.1122	35.2051	27.2610	89.60

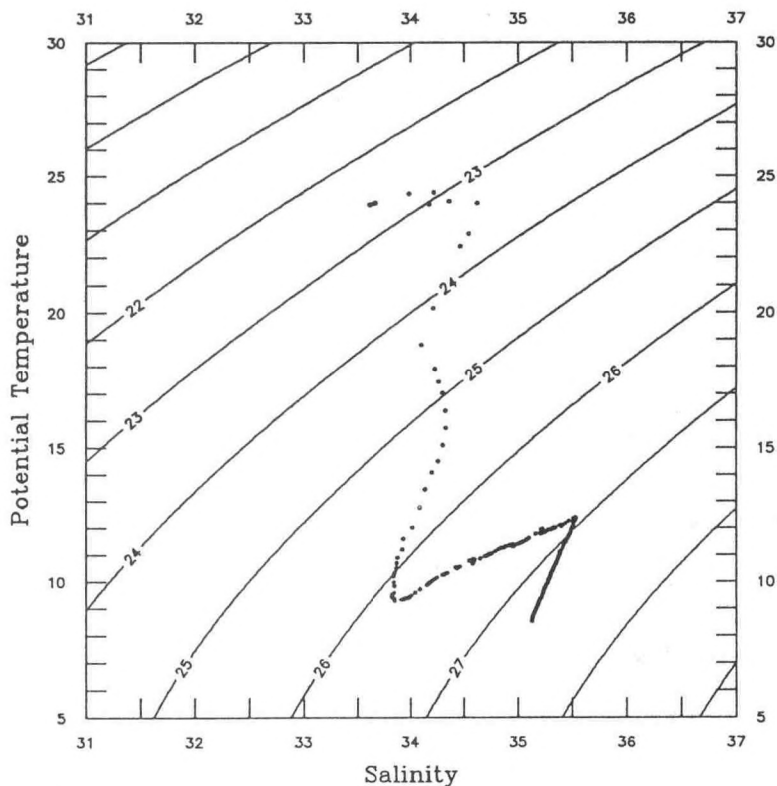


Station 18

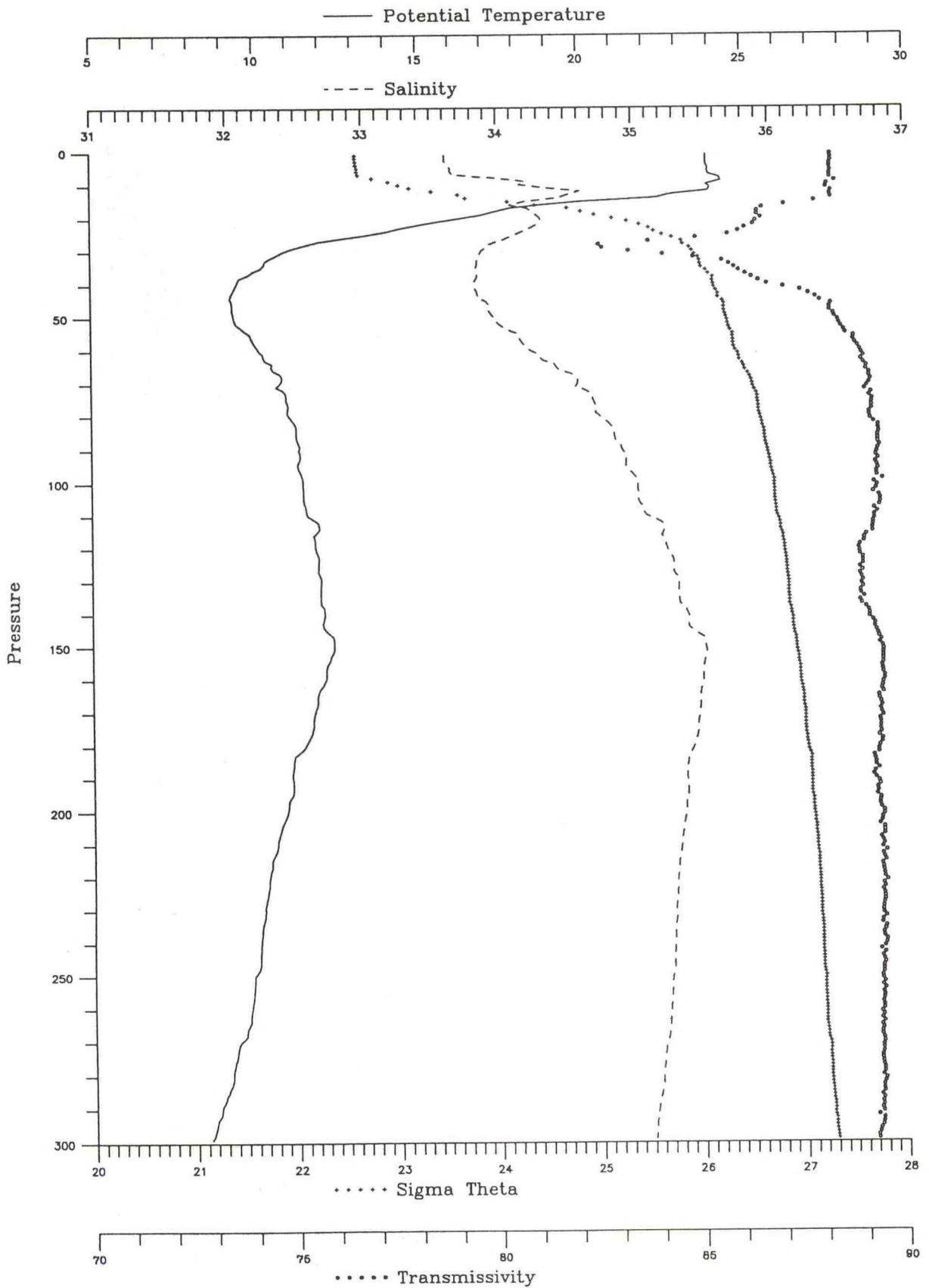


R/V DELAWARE II 90-08 Station: 19 Date: 90/08/12 GMT: 1025 Depth: 2287m
 Position: 38 56.40N 71 52.90W Wind: 10 kts Dir: 260 deg. Air Temp: 25.2C

PR	TE	PT	SA	SO	TR
1	23.9499	23.9497	33.6120	22.6050	88.20
10	23.9625	23.9604	34.1730	23.0286	88.12
20	16.3742	16.3710	34.3244	25.1437	86.49
30	10.9171	10.9135	33.8820	25.9208	83.25
40	9.4740	9.4696	33.8272	26.1246	86.62
50	9.4034	9.3979	33.9730	26.2503	88.28
60	10.1685	10.1616	34.2454	26.3355	88.90
70	10.7728	10.7644	34.5897	26.4987	89.13
80	11.0775	11.0677	34.7535	26.5718	89.13
90	11.3721	11.3608	34.9183	26.6464	89.33
100	11.4916	11.4790	35.0296	26.7111	89.23
125	11.9616	11.9453	35.2934	26.8281	88.94
150	12.4158	12.3957	35.5235	26.9195	89.41
175	11.7375	11.7149	35.4643	27.0048	89.36
200	10.9566	10.9319	35.3713	27.0777	89.43
225	10.3232	10.2964	35.3013	27.1364	89.41
250	9.8978	9.8688	35.2594	27.1775	89.35
275	9.3379	9.3071	35.1979	27.2235	89.33
299	8.5608	8.5290	35.1264	27.2923	89.23

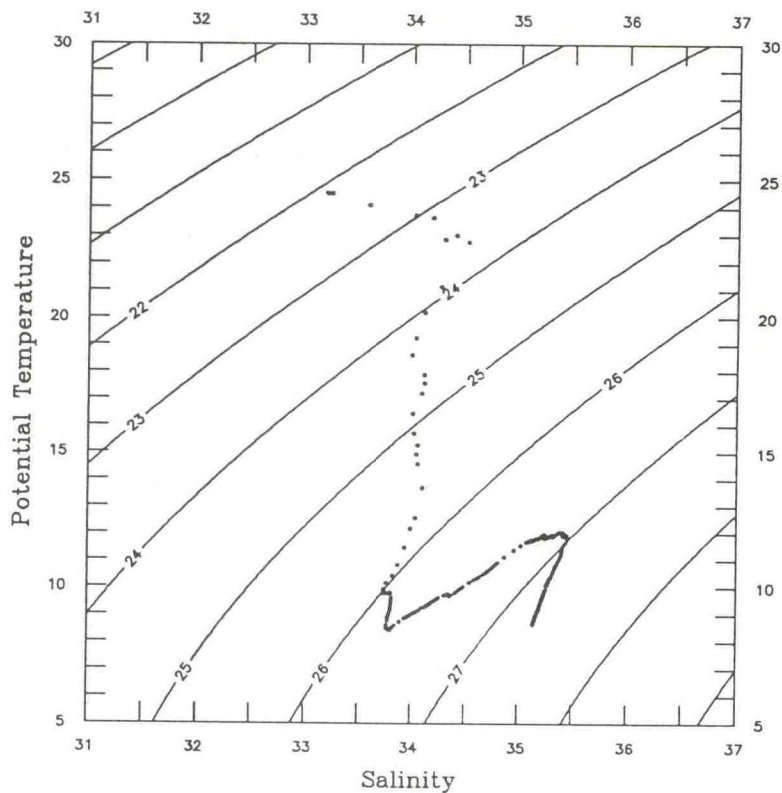


Station 19

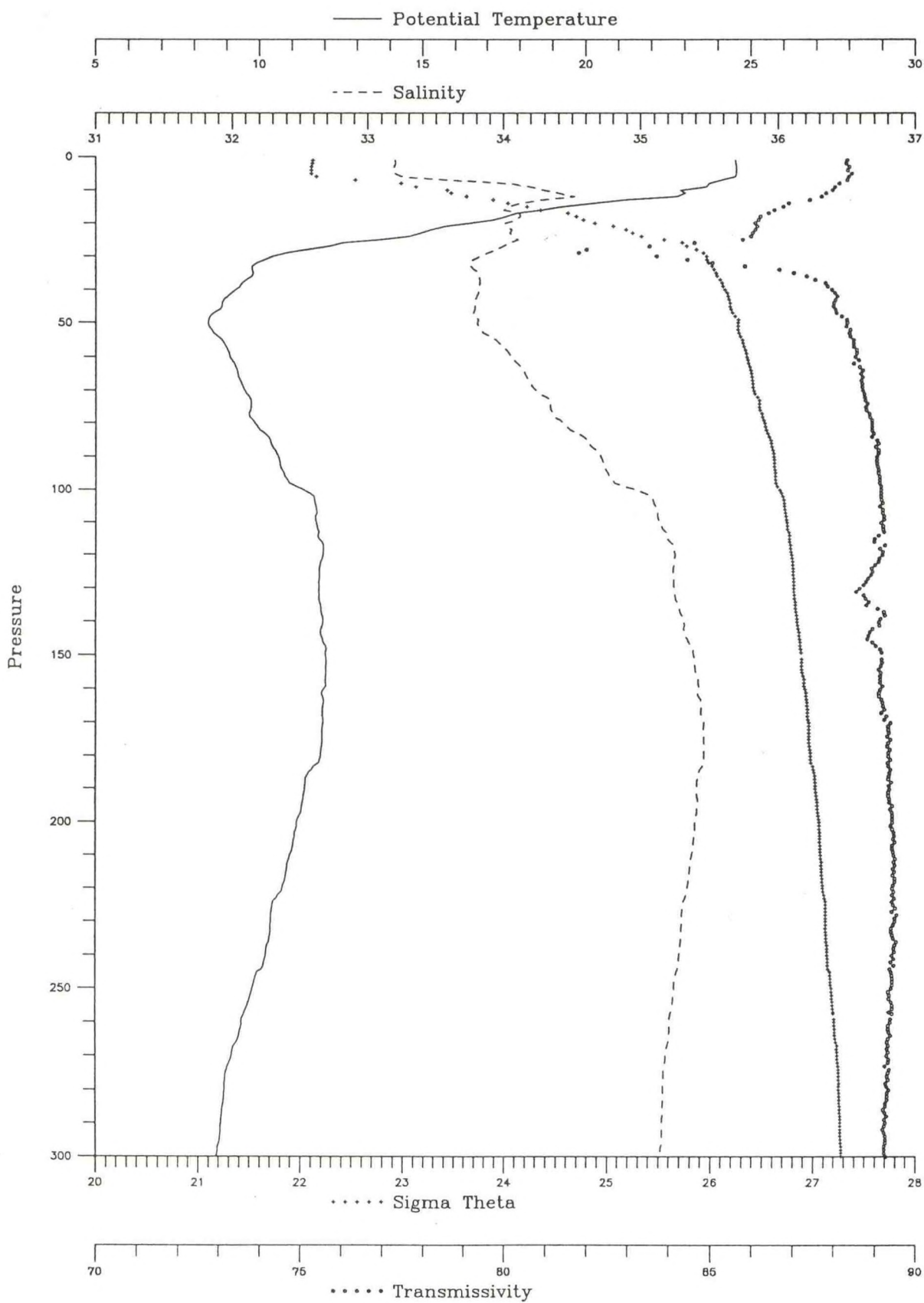


R/V DELAWARE II 90-08 Station: 20 Date: 90/08/12 GMT: 1147 Depth: 2196m
 Position: 39 03.05N 71 53.01W Wind: 10 kts Dir: 270 deg. Air Temp: 25.0C

PR	TE	PT	SA	SO	TR
1	24.5234	24.5234	33.1980	22.1247	88.35
10	22.8713	22.8693	34.2973	23.4401	87.99
20	16.4564	16.4532	34.0103	24.8836	86.10
30	10.4231	10.4197	33.8329	25.9693	83.72
40	9.2753	9.2710	33.8146	26.1470	87.97
50	8.4356	8.4305	33.8048	26.2710	88.35
60	9.1001	9.0936	34.0506	26.3601	88.54
70	9.5785	9.5707	34.2366	26.4281	88.73
80	9.8816	9.8725	34.4352	26.5329	88.94
90	10.5921	10.5813	34.7084	26.6237	89.07
100	11.3872	11.3747	34.9611	26.6771	89.16
125	11.8533	11.8371	35.2361	26.8042	88.94
150	12.0534	12.0338	35.3818	26.8798	89.16
175	11.9367	11.9139	35.4526	26.9579	89.38
200	11.1564	11.1314	35.3894	27.0554	89.43
225	10.4078	10.3809	35.2997	27.1203	89.45
250	9.7999	9.7711	35.2398	27.1788	89.40
275	8.9874	8.9573	35.1624	27.2526	89.33
300	8.7204	8.6881	35.1403	27.2782	89.27

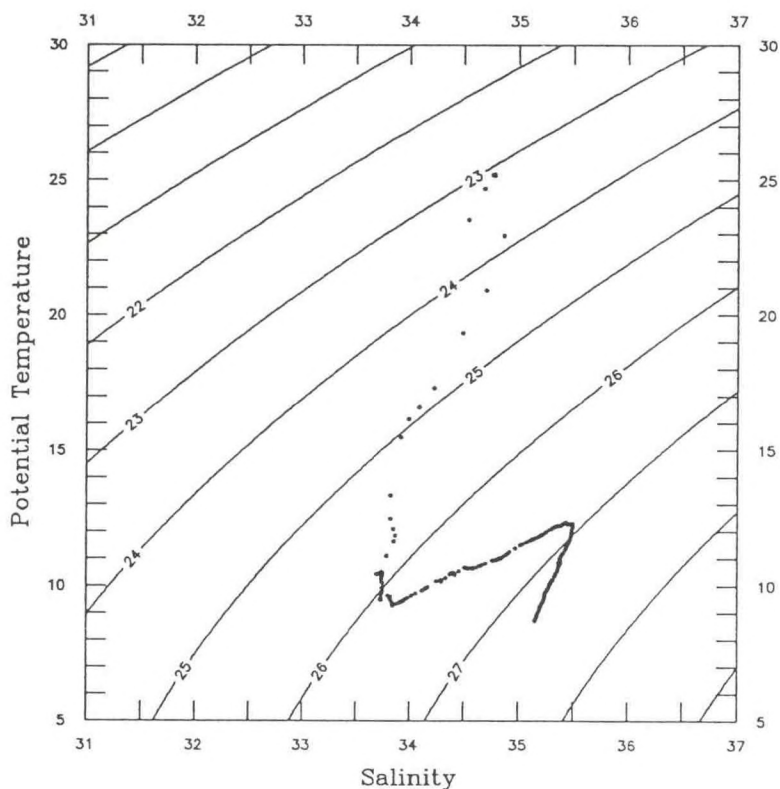


Station 20

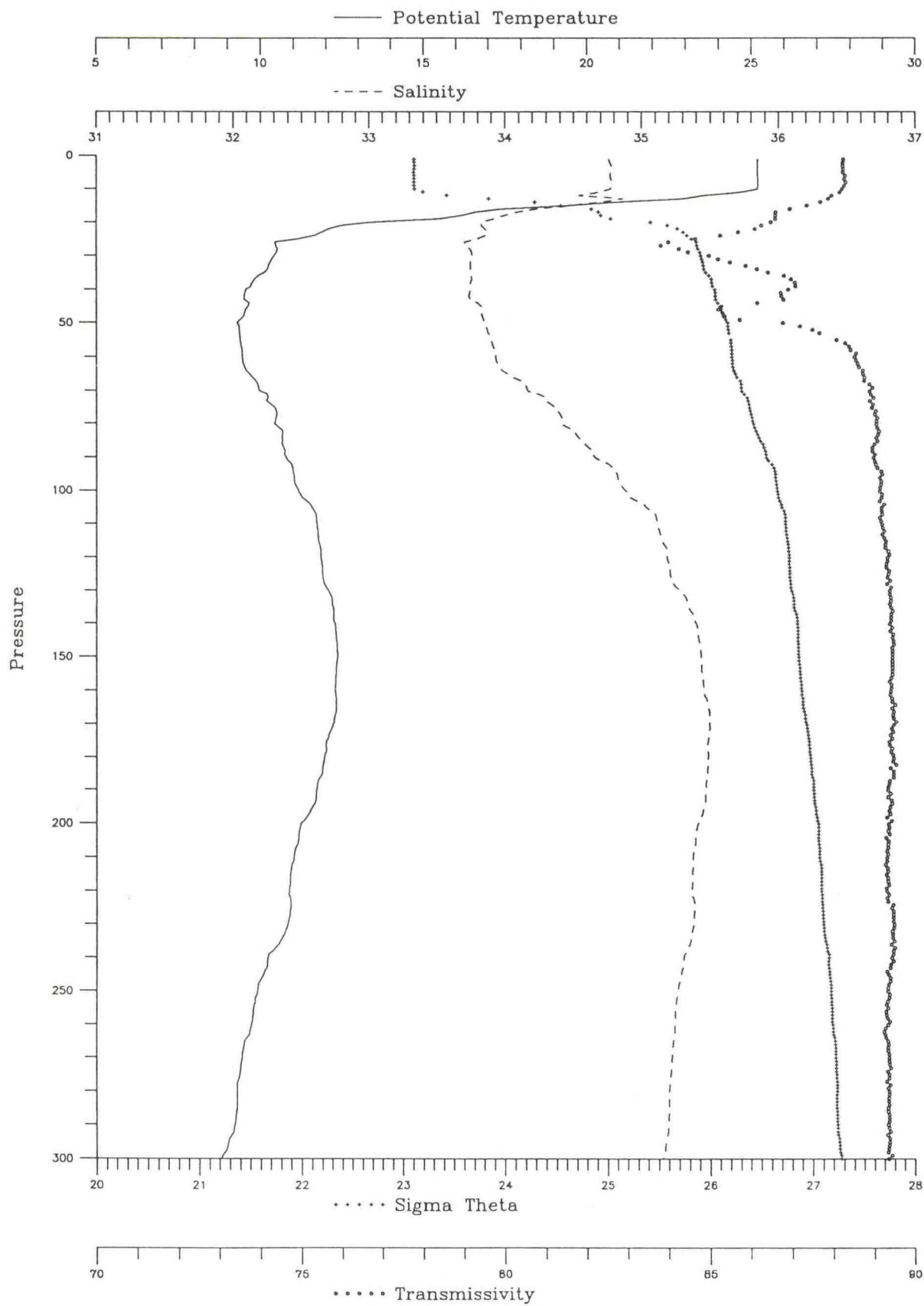


R/V DELAWARE II 90-08 Station: 21 Date: 90/08/12 GMT: 1320 Depth: 1800m
 Position: 39 02.96N 72 03.03W Wind: 10 kts Dir: 250 deg. Air Temp: 25.0C

PR	TE	PT	SA	SO	TR
1	25.1969	25.1966	34.7600	23.1100	88.23
10	25.1940	25.1919	34.7725	23.1127	88.20
20	13.3407	13.3379	33.8286	25.4210	86.48
30	10.4138	10.4103	33.7551	25.9103	84.97
40	9.5593	9.5549	33.7438	26.0455	86.90
50	9.3071	9.3017	33.8489	26.1688	86.77
60	9.4544	9.4478	33.9332	26.2110	88.51
70	9.9834	9.9754	34.1688	26.3074	88.87
80	10.4316	10.4222	34.4158	26.4234	89.04
90	10.7867	10.7759	34.6598	26.5513	88.97
100	11.1764	11.1640	34.8858	26.6572	89.13
125	11.9005	11.8843	35.2078	26.7733	89.33
150	12.3679	12.3479	35.4327	26.8584	89.43
175	12.0333	12.0104	35.4822	26.9623	89.36
200	11.2494	11.2243	35.4082	27.0529	89.34
225	10.9440	10.9162	35.3857	27.0918	89.43
250	9.9241	9.8950	35.2632	27.1760	89.33
275	9.3870	9.3561	35.2109	27.2256	89.36
300	8.8185	8.7861	35.1547	27.2740	89.34

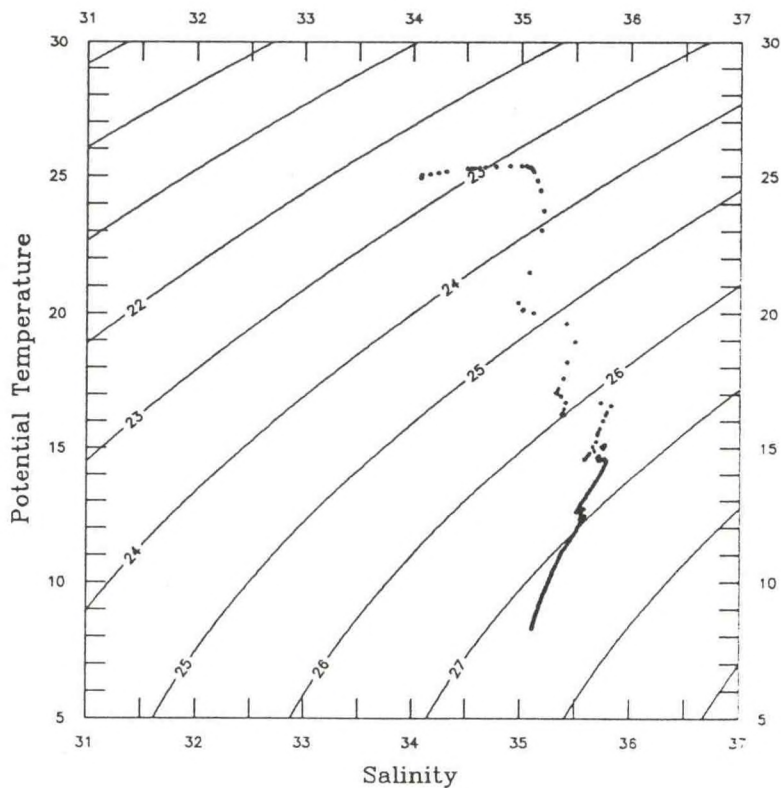


Station 21

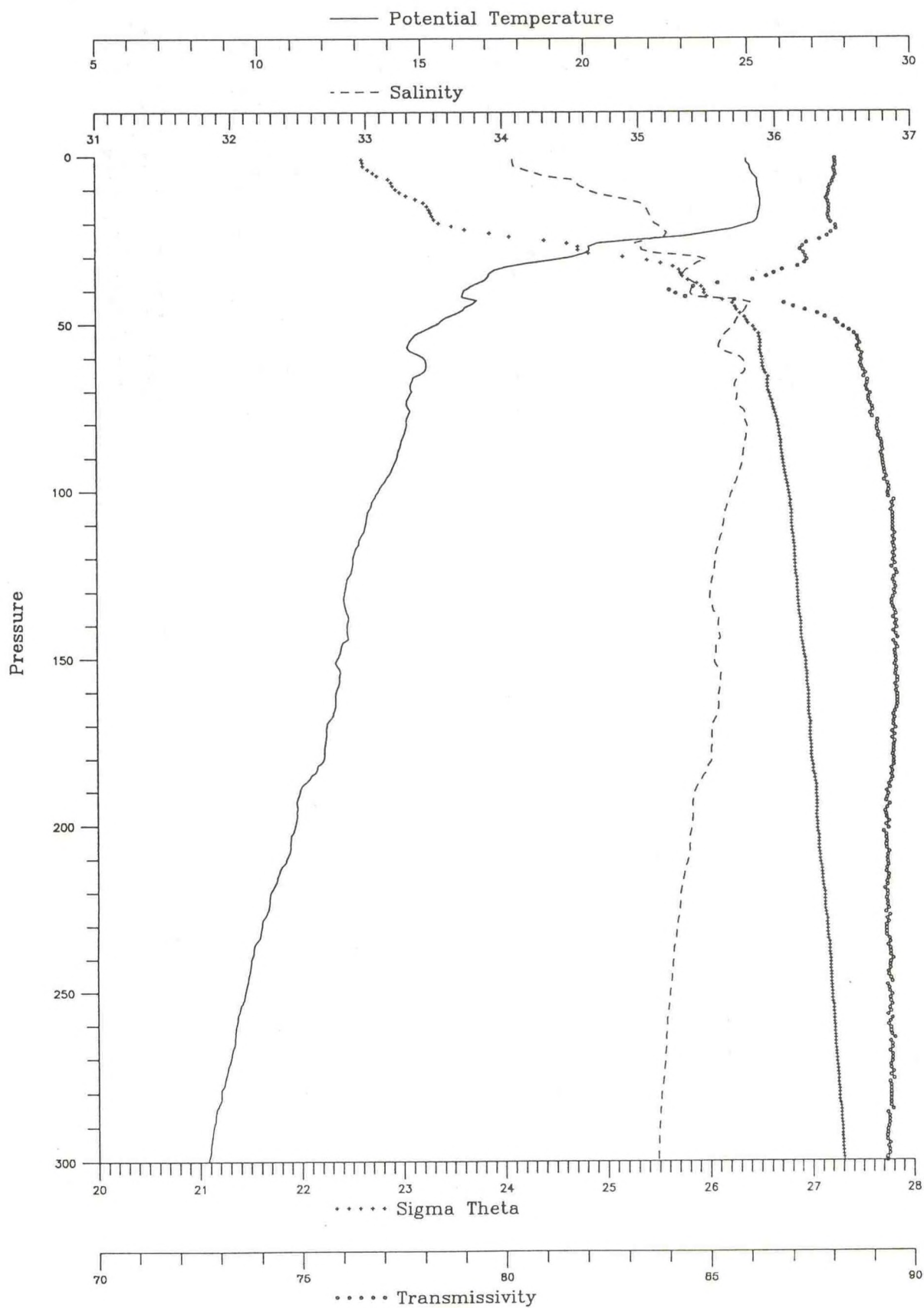


R/V DELAWARE II 90-08 Station: 22 Date: 90/08/12 GMT: 1453 Depth: 1800m
 Position: 39 02.76N 72 13.04W Wind: 8 kts Dir: 260 deg. Air Temp: 25.0C

PR	TE	PT	SA	SO	TR
1	24.9491	24.9492	34.0750	22.6200	88.13
10	25.3128	25.3106	34.6137	22.9565	87.99
20	25.1823	25.1780	35.1103	23.3722	88.03
30	19.6374	19.6319	35.4172	25.1778	87.40
40	16.3198	16.3134	35.3810	25.9693	84.07
50	15.5217	15.5139	35.7016	26.3991	88.19
60	15.0811	15.0720	35.7398	26.5274	88.75
70	14.7093	14.6988	35.7105	26.5869	88.90
80	14.5511	14.5392	35.7859	26.6798	89.16
90	14.2428	14.2296	35.7552	26.7229	89.27
100	13.6776	13.6633	35.6758	26.7810	89.43
125	12.7999	12.7828	35.5343	26.8513	89.62
150	12.4084	12.3884	35.5473	26.9395	89.59
175	12.0319	12.0089	35.5172	26.9898	89.55
200	11.0837	11.0588	35.3701	27.0537	89.33
225	10.2587	10.2321	35.2777	27.1291	89.38
250	9.5420	9.5137	35.2033	27.1935	89.40
275	8.9540	8.9240	35.1547	27.2520	89.43
300	8.4034	8.3719	35.1126	27.3059	89.33

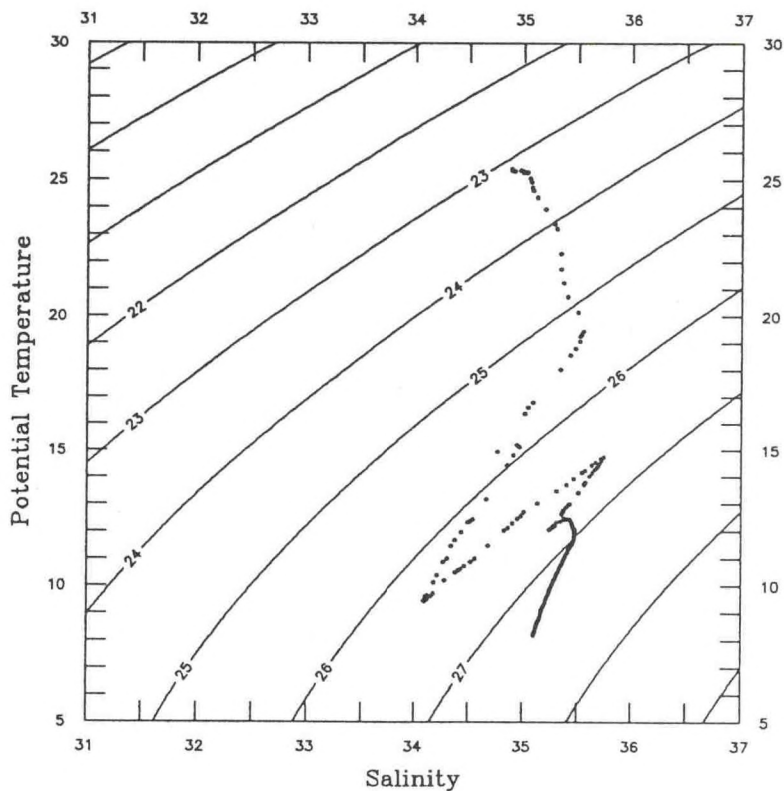


Station 22

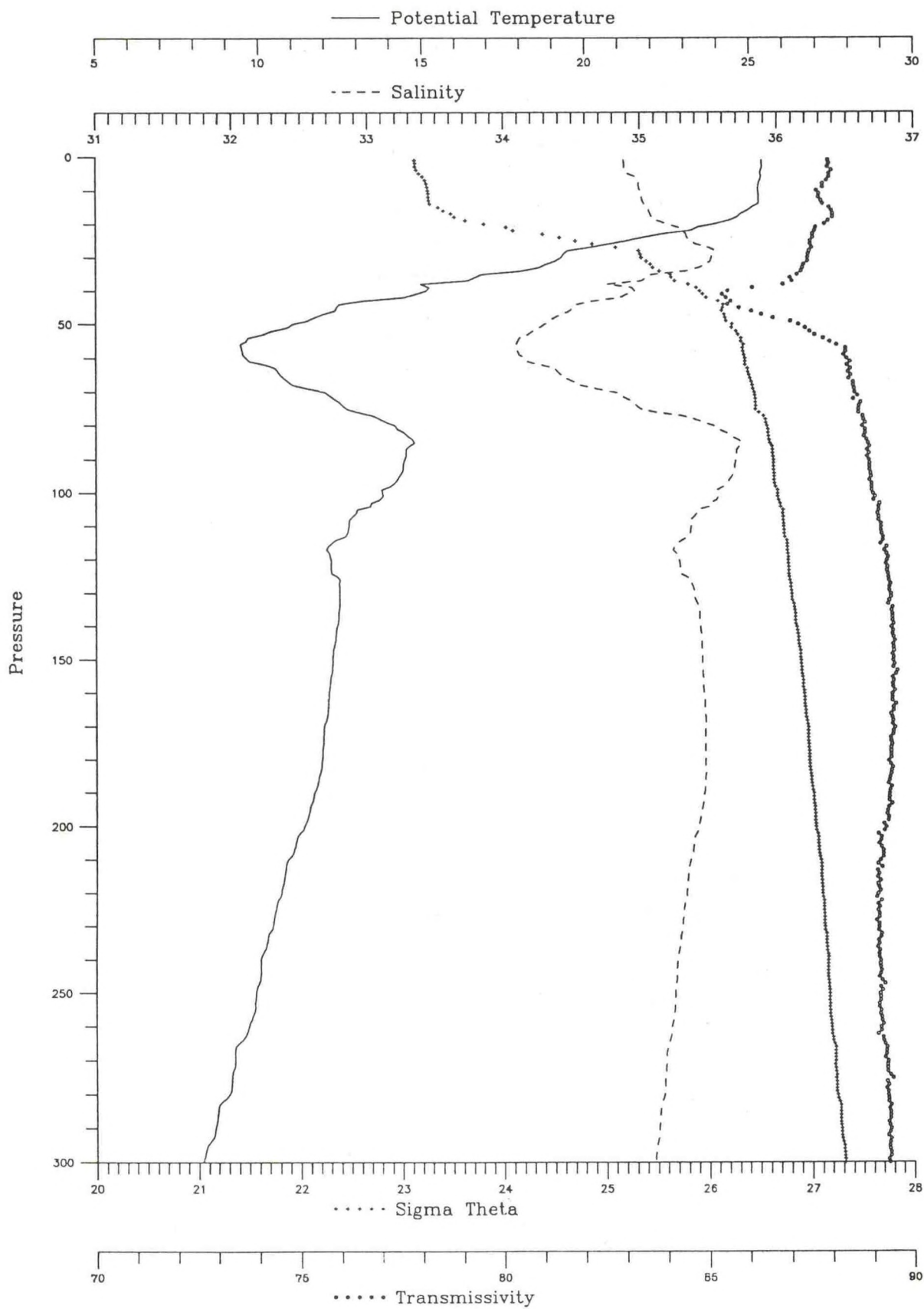


R/V DELAWARE II 90-08 Station: 23 Date: 90/08/12 GMT: 1610 Depth: 2048m
 Position: 38 56.31N 72 13.00W Wind: 10 kts Dir: 260 deg. Air Temp: 25.7C

PR	TE	PT	SA	SO	TR
1	25.3644	25.3663	34.8840	23.1300	87.90
10	25.2733	25.2711	34.9980	23.2589	87.62
20	23.9489	23.9447	35.1971	23.8087	87.81
30	19.2792	19.2738	35.5184	25.3483	87.40
40	15.1382	15.1321	34.9638	25.9157	85.47
50	11.0297	11.0236	34.3039	26.2299	87.18
60	9.6396	9.6329	34.1554	26.3543	88.35
70	12.0438	12.0347	34.8250	26.4469	88.54
80	14.1794	14.1678	35.5385	26.5686	88.73
90	14.4678	14.4544	35.6985	26.6307	88.89
100	13.8089	13.7946	35.5680	26.6702	88.99
125	12.3936	12.3769	35.3390	26.7801	89.37
150	12.2725	12.2526	35.4510	26.8913	89.48
175	11.9768	11.9539	35.4713	26.9648	89.45
200	11.3865	11.3612	35.4188	27.0358	89.30
225	10.5132	10.4861	35.3127	27.1119	89.10
250	9.9155	9.8865	35.2486	27.1661	89.15
275	9.1813	9.1508	35.1747	27.2309	89.47
300	8.2795	8.2482	35.1015	27.3163	89.38

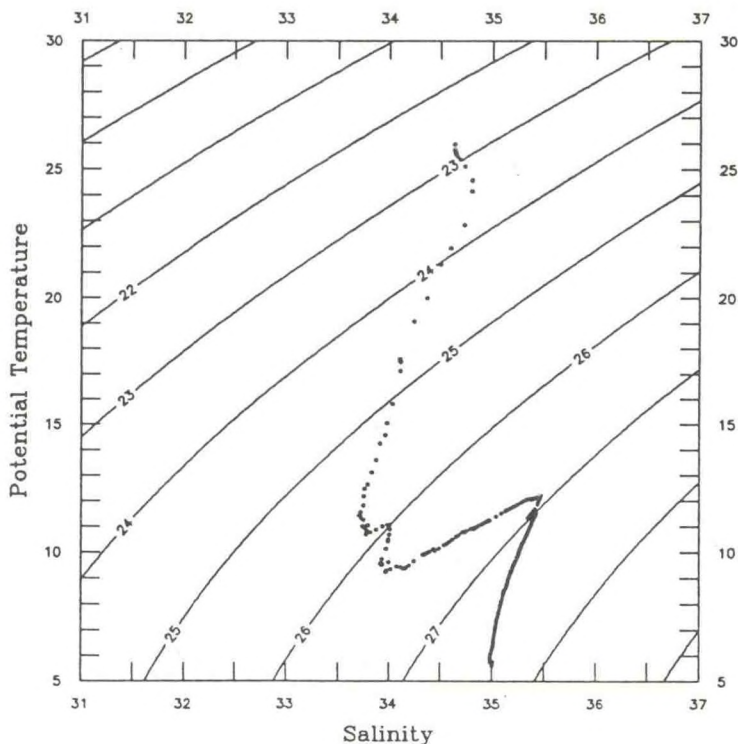


Station 23

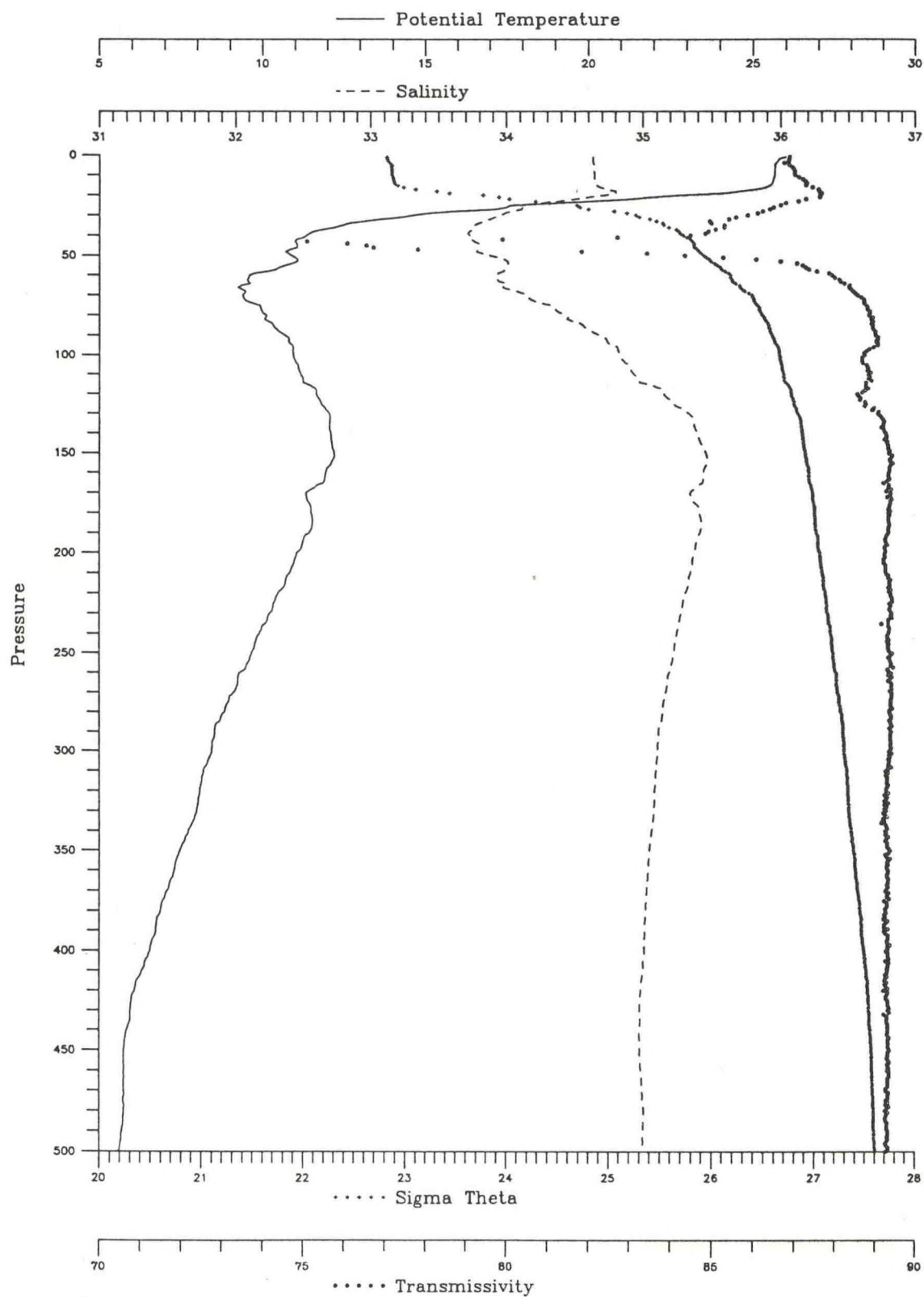


R/V DELAWARE II 90-08 Station: 24 Date: 90/08/12 GMT: 1720 Depth: 2536m
 Position: 38 49.84N 72 13.01W Wind: 10 kts Dir: 265 deg. Air Temp: 26.1C

PR	TE	PT	SA	SO	TR
1	26.0972	25.9765	34.6321	22.8240	86.88
10	25.6524	25.6502	34.6419	22.8735	87.01
20	22.8530	22.8489	34.7255	23.7705	87.63
30	14.5885	14.5841	33.9639	25.2638	85.87
40	11.3516	11.3467	33.7285	25.7233	84.48
50	10.8953	10.8893	33.8790	25.9228	84.35
60	9.6004	9.5938	33.9244	26.1803	87.93
70	9.3970	9.3893	34.1458	26.3869	88.56
80	10.1419	10.1326	34.4341	26.4878	88.85
90	10.6975	10.6867	34.6795	26.5826	89.01
100	10.9564	10.9442	34.8324	26.6556	88.74
125	11.8271	11.8109	35.2222	26.7984	88.77
150	12.2280	12.2081	35.4583	26.9055	89.35
175	11.4475	11.4253	35.3746	26.9895	89.38
200	11.0697	11.0448	35.3684	27.0549	89.25
225	10.3628	10.3360	35.2881	27.1191	89.36
250	9.6947	9.6661	35.2212	27.1820	89.43
275	8.9819	8.9519	35.1526	27.2458	89.39
300	8.4803	8.4486	35.1078	27.2903	89.35
325	8.0671	8.0337	35.0849	27.3358	89.23
350	7.5035	7.4690	35.0491	27.3912	89.38
375	6.9788	6.9433	35.0273	27.4485	89.23
400	6.5812	6.5444	35.0151	27.4934	89.28
425	6.0167	5.9794	34.9814	27.5409	89.33
450	5.7824	5.7436	34.9793	27.5691	89.37
475	5.7686	5.7276	34.9993	27.5869	89.28
500	5.6363	5.5936	35.0004	27.6044	89.28

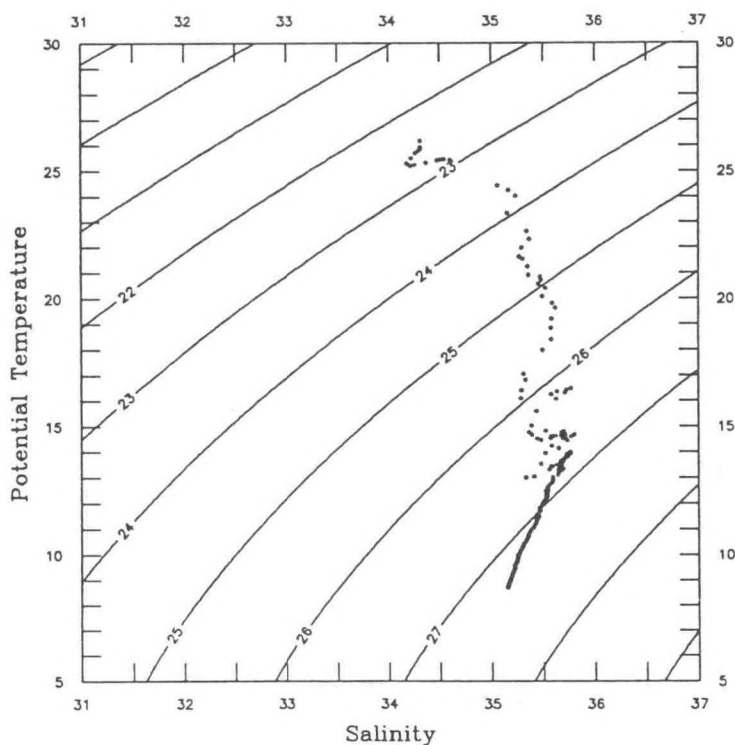


Station 24

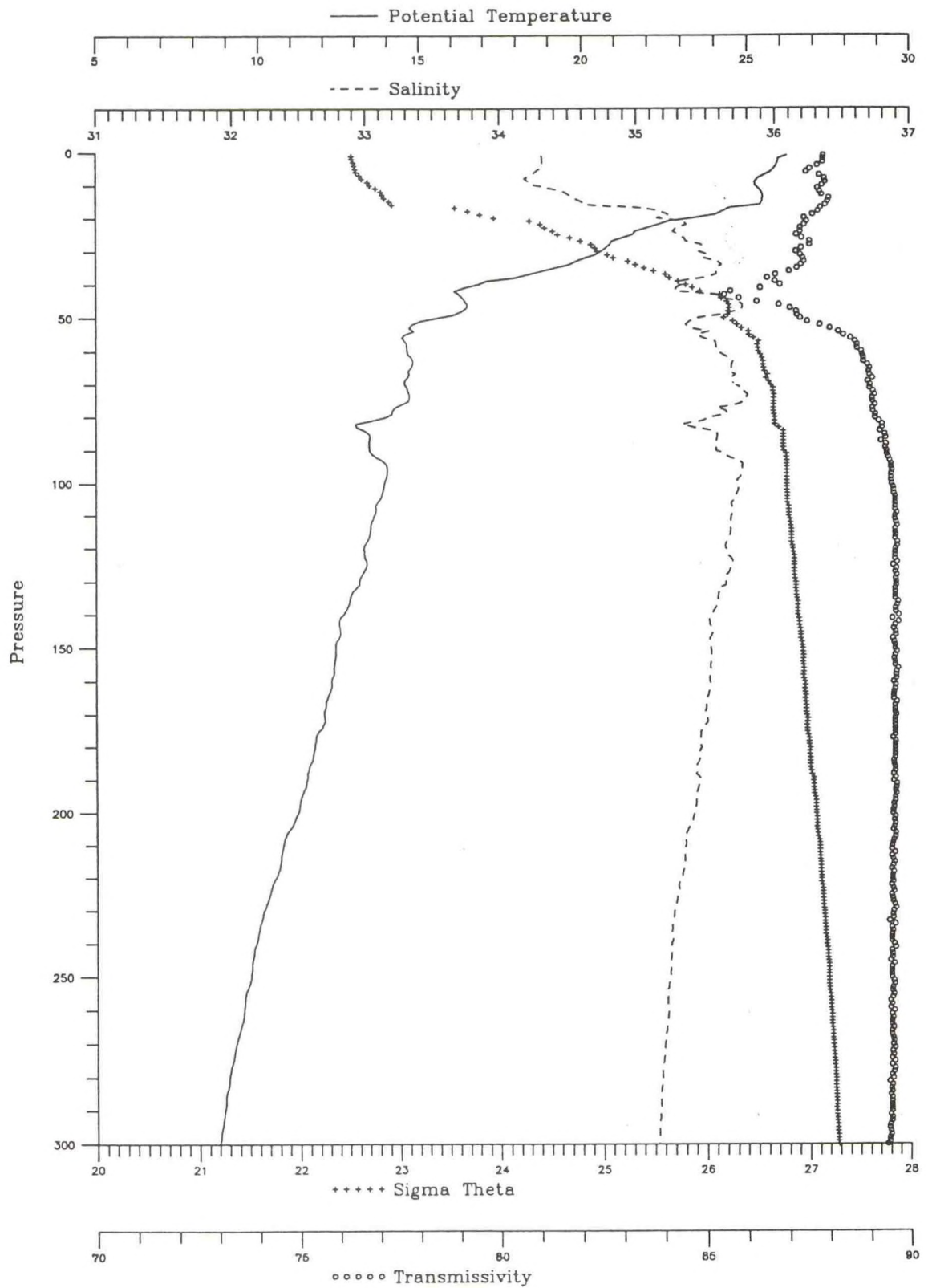


R/V DELAWARE II 90-08 Station: 25 Date: 90/08/12 GMT: 2141 Depth: 2635m
 Position: 38 43.57N 72 13.21W Wind: 8 kts Dir: 290 deg. Air Temp: 26.8C

PR	TE	PT	SA	SO	TR
1	26.2364	26.1910	34.3115	22.5300	87.85
10	25.2453	25.2431	34.2607	22.7105	87.82
20	23.3742	23.3700	35.1534	23.9446	87.38
30	20.5869	20.5813	35.4487	24.9503	87.17
40	16.8318	16.8252	35.3245	25.8059	86.79
50	15.6111	15.6033	35.4306	26.1701	87.28
60	14.6360	14.6271	35.5818	26.5032	88.79
70	14.5566	14.5461	35.7091	26.6191	89.00
80	13.9666	13.9550	35.5161	26.6584	89.13
90	13.4522	13.4395	35.5712	26.7465	89.41
100	13.9114	13.8969	35.7325	26.7780	89.54
125	13.3669	13.3493	35.6864	26.8493	89.57
150	12.3923	12.3723	35.5315	26.9304	89.62
175	11.8602	11.8375	35.4591	26.9775	89.62
200	11.2148	11.1898	35.4106	27.0612	89.56
225	10.3311	10.3043	35.2888	27.1252	89.52
250	9.7471	9.7184	35.2380	27.1863	89.52
275	9.1822	9.1517	35.1869	27.2403	89.59
300	8.7644	8.7320	35.1505	27.2793	89.41

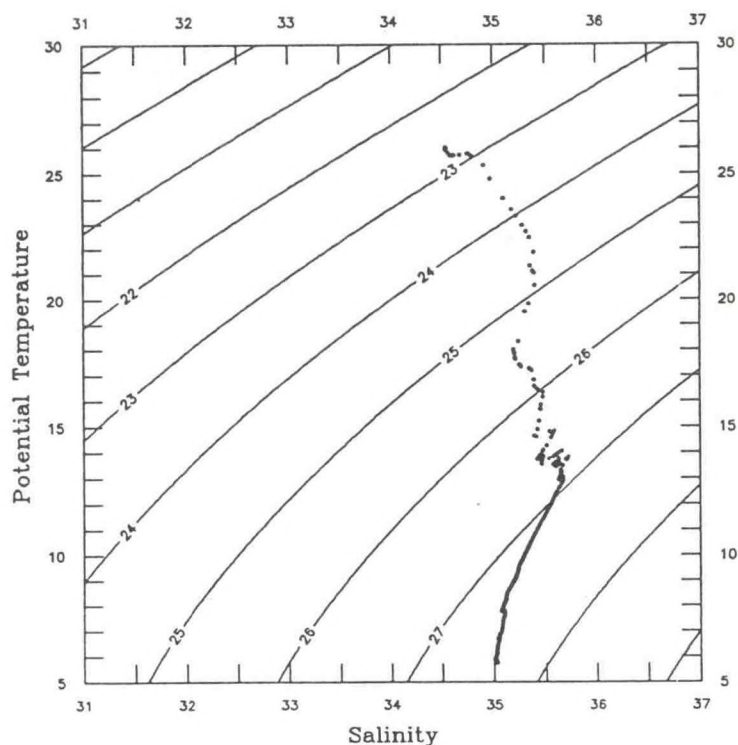


Station 25



R/V DELAWARE II 90-08 Station: 26 Date: 90/08/12 GMT: 2259 Depth: 2196m
 Position: 38 36.88N 72 12.97W Wind: 6 kts Dir: 230 deg. Air Temp: 25.9C

PR	TE	PT	SA	SO	TR
1	25.9168	25.9506	34.5410	22.6810	86.23
10	25.7417	25.7394	34.6222	22.8311	88.12
20	24.0335	24.0293	35.1015	23.7112	88.06
30	20.5711	20.5655	35.4000	24.9174	87.69
40	17.2918	17.2851	35.3427	25.7100	87.24
50	14.9144	14.9069	35.4198	26.3172	86.91
60	14.0541	14.0454	35.4621	26.5355	88.56
70	13.7764	13.7663	35.5277	26.6450	88.85
80	13.5793	13.5680	35.5712	26.7199	89.07
90	13.4852	13.4725	35.5950	26.7581	89.23
100	13.5047	13.4906	35.6573	26.8026	89.38
125	13.0837	13.0664	35.6349	26.8722	89.44
150	12.4205	12.4004	35.5902	26.9705	89.48
175	11.5489	11.5266	35.4817	27.0538	89.52
200	10.7315	10.7071	35.3741	27.1204	89.47
225	10.2319	10.2053	35.3159	27.1637	89.59
250	9.6637	9.6351	35.2478	27.2080	89.52
275	9.1573	9.1268	35.2093	27.2619	89.62
300	8.4042	8.3726	35.1194	27.3111	89.50
325	7.8855	7.8526	35.0749	27.3551	89.52
350	7.5911	7.5563	35.0943	27.4140	89.52
375	6.9471	6.9117	35.0586	27.4775	89.29
400	6.4956	6.4591	35.0359	27.5212	89.33
425	6.2046	6.1666	35.0299	27.5551	89.45
450	5.8622	5.8231	35.0132	27.5859	89.43
475	5.8184	5.7773	35.0316	27.6062	89.47
477	5.7873	5.7461	35.0300	27.6089	89.43

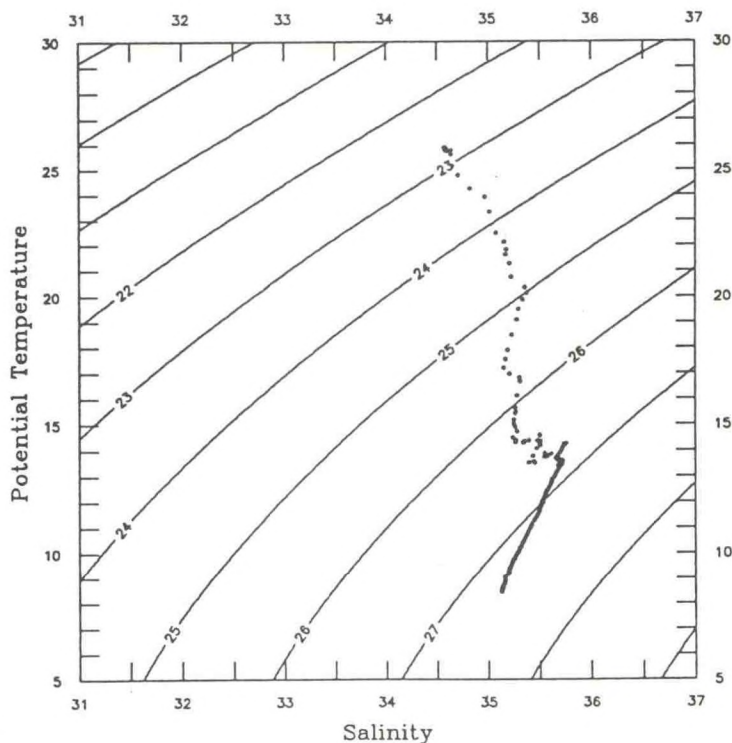


Station 26

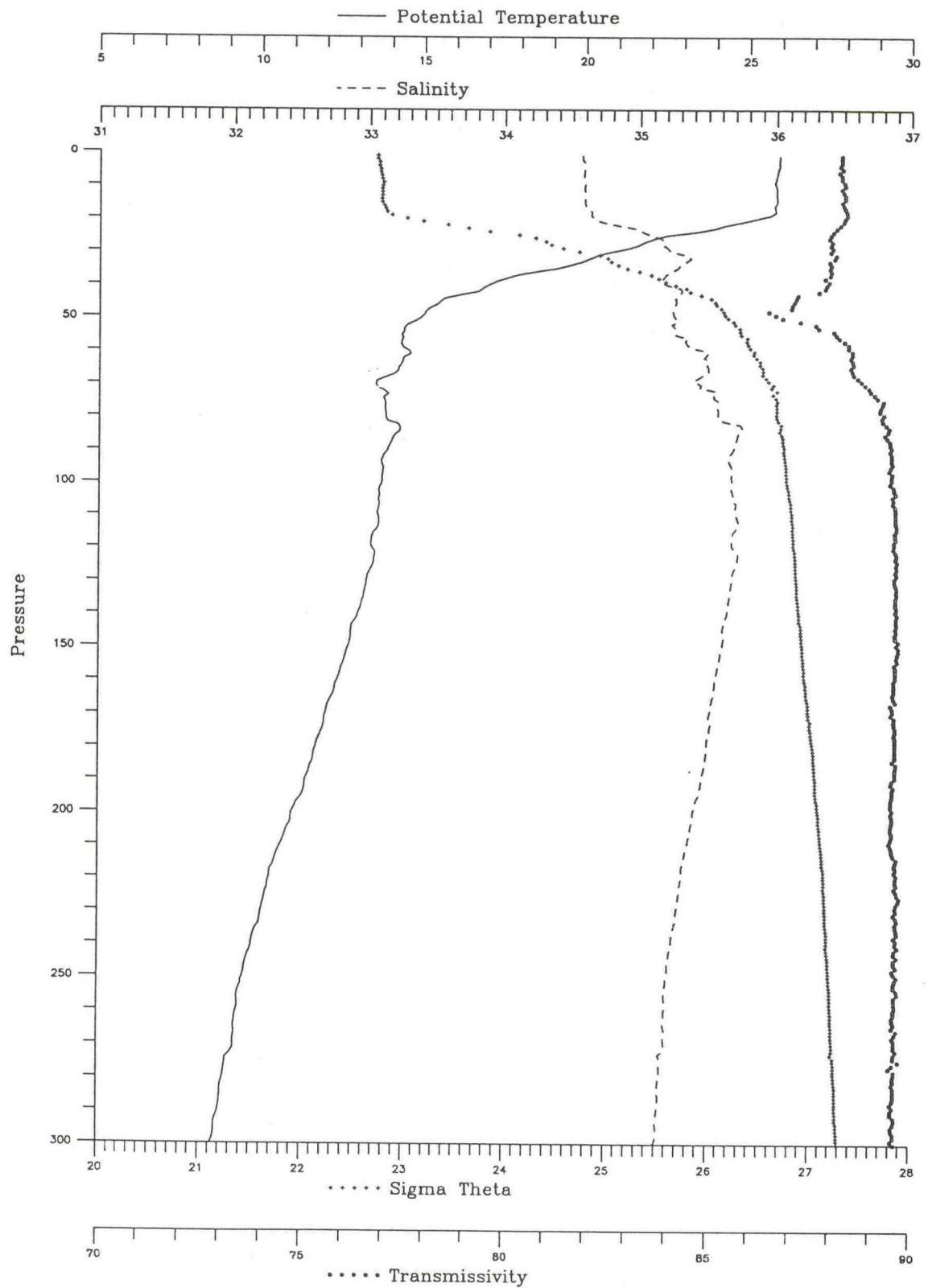


R/V DELAWARE II 90-08 Station: 27 Date: 90/08/13 GMT: 0440 Depth: 2653m
 Position: 38 36.98N 72 03.02W Wind: 9 kts Dir: 255 deg. Air Temp: 25.7C

PR	TE	PT	SA	SO	TR
1	25.9096	25.9093	34.5700	22.7385	88.27
10	25.8042	25.8020	34.5882	22.7861	88.35
20	25.1689	25.1646	34.6510	23.0293	88.35
30	20.7625	20.7569	35.2212	24.7296	88.00
40	16.9832	16.9766	35.2043	25.6777	87.90
50	14.9041	14.8966	35.2557	26.1926	86.81
60	14.5691	14.5602	35.4937	26.4496	88.54
70	13.5233	13.5134	35.4475	26.6355	88.86
80	13.8302	13.8187	35.5739	26.6697	89.28
90	13.8905	13.8775	35.6803	26.7397	89.49
100	13.6989	13.6846	35.6685	26.7710	89.49
125	13.4468	13.4291	35.7050	26.8522	89.64
150	12.6932	12.6728	35.6017	26.9255	89.69
175	11.9055	11.8827	35.5146	27.0120	89.62
200	10.9889	10.9641	35.3999	27.0941	89.53
225	10.1884	10.1618	35.3008	27.1594	89.69
250	9.4981	9.4699	35.2092	27.2054	89.69
275	8.9837	8.9537	35.1640	27.2544	89.74
300	8.5390	8.5072	35.1242	27.2940	89.64

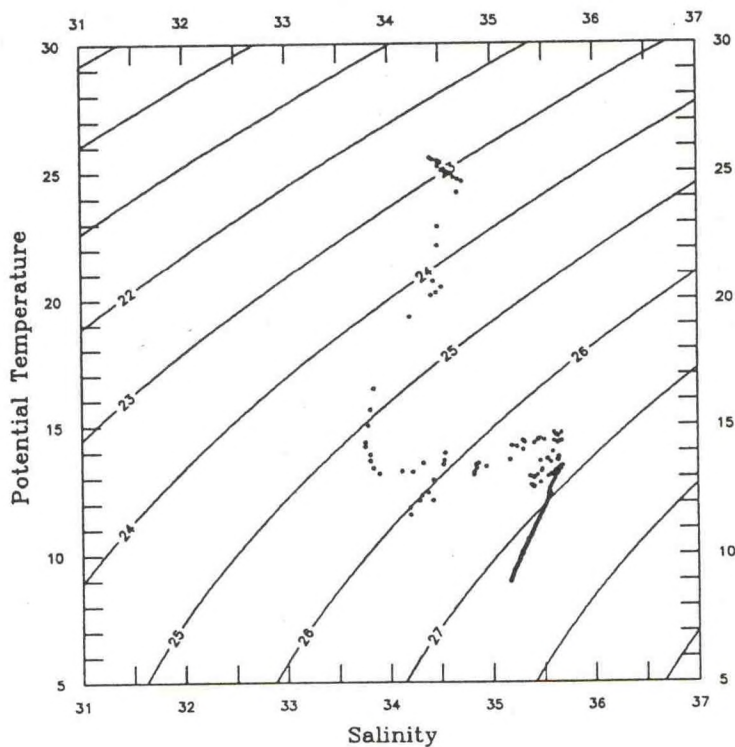


Station 27

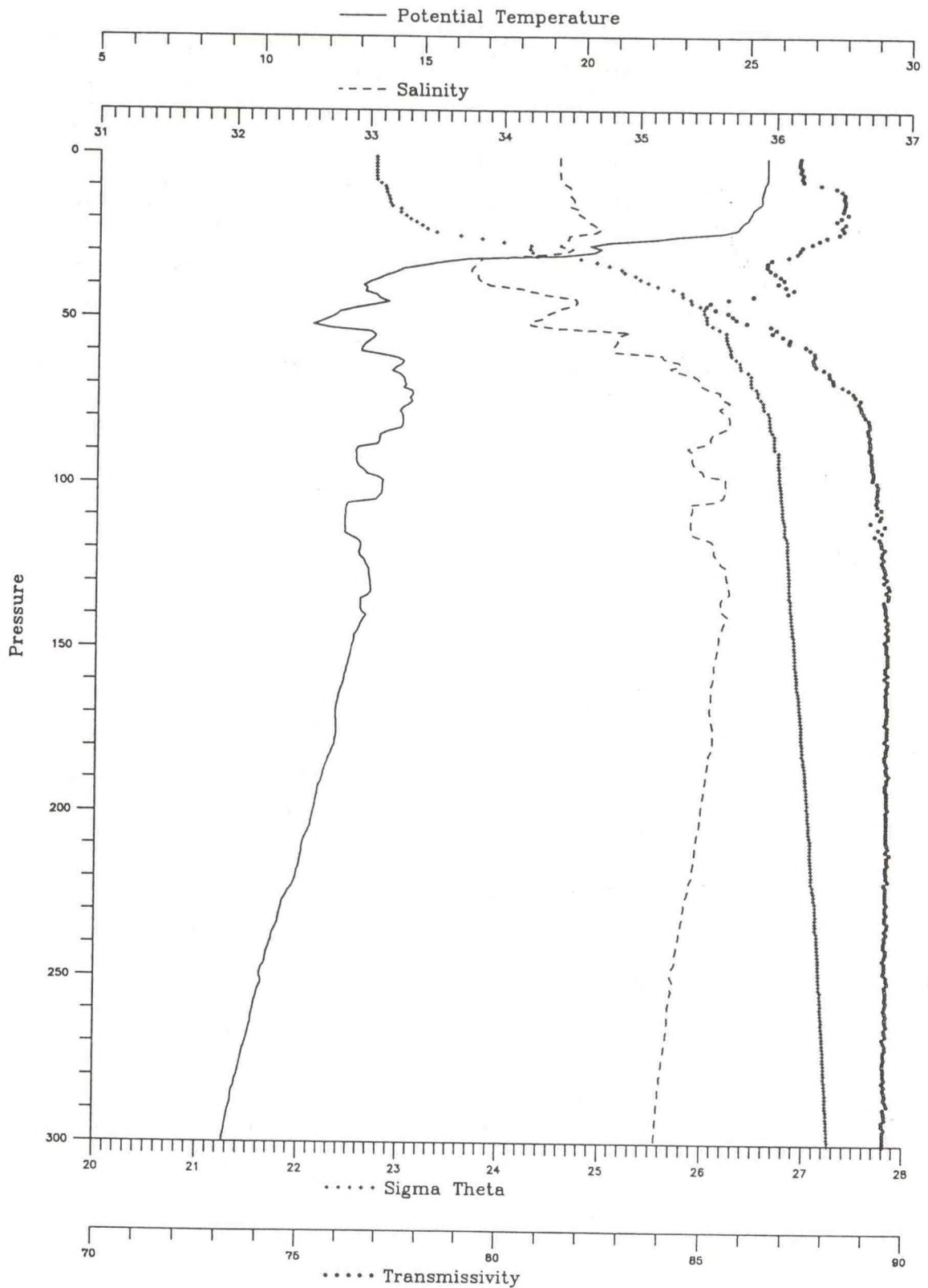


R/V DELAWARE II 90-08 Station: 28 Date: 90/08/13 GMT: 0559 Depth: 2610m
 Position: 38 43.49N 72 03.04W Wind: 7 kts Dir: 265 deg. Air Temp: 25.0C

PR	TE	PT	SA	SO	TR
1	25.5618	25.5615	34.4094	22.7255	87.25
10	25.4493	25.4471	34.4831	22.8161	88.13
20	24.9587	24.9544	34.6146	23.0657	88.14
30	20.2729	20.2673	34.4617	24.2819	87.18
40	13.1686	13.1631	33.9018	25.5102	86.90
50	12.1027	12.0963	34.2928	25.9920	85.70
60	13.1139	13.1056	34.8185	26.2317	87.63
70	14.5145	14.5041	35.4601	26.4358	88.33
80	14.4249	14.4131	35.6716	26.6188	88.99
90	12.9804	12.9681	35.3994	26.7065	89.07
100	13.8028	13.7884	35.6437	26.7300	89.25
125	13.3391	13.3215	35.6488	26.8200	89.43
150	12.8738	12.8532	35.5951	26.8843	89.49
175	12.4032	12.3798	35.5673	26.9567	89.52
200	11.6994	11.6736	35.4872	27.0305	89.52
225	10.9042	10.8764	35.3897	27.1020	89.52
250	10.0951	10.0657	35.2778	27.1581	89.57
275	9.5339	9.5027	35.2193	27.2079	89.51
300	8.9867	8.9538	35.1696	27.2588	89.52

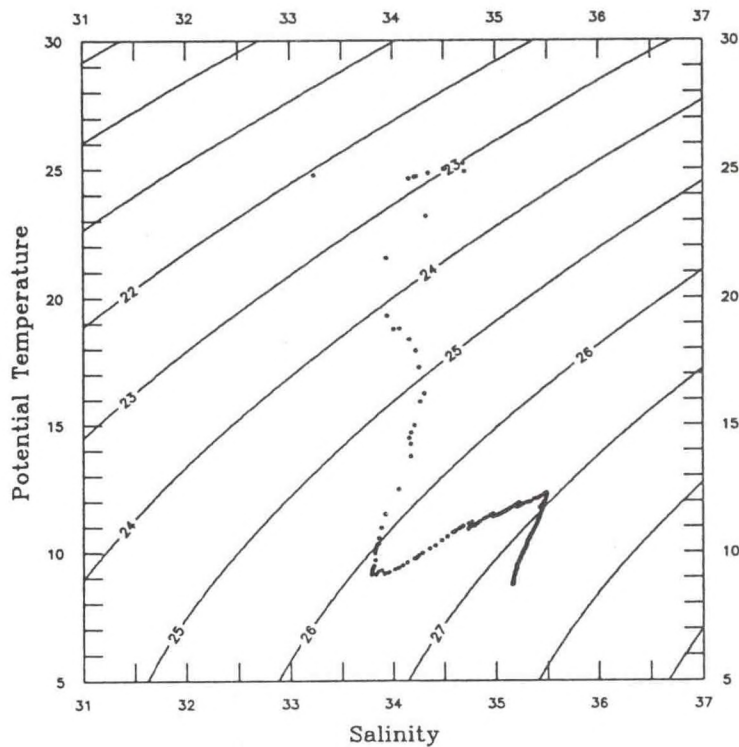


Station 28

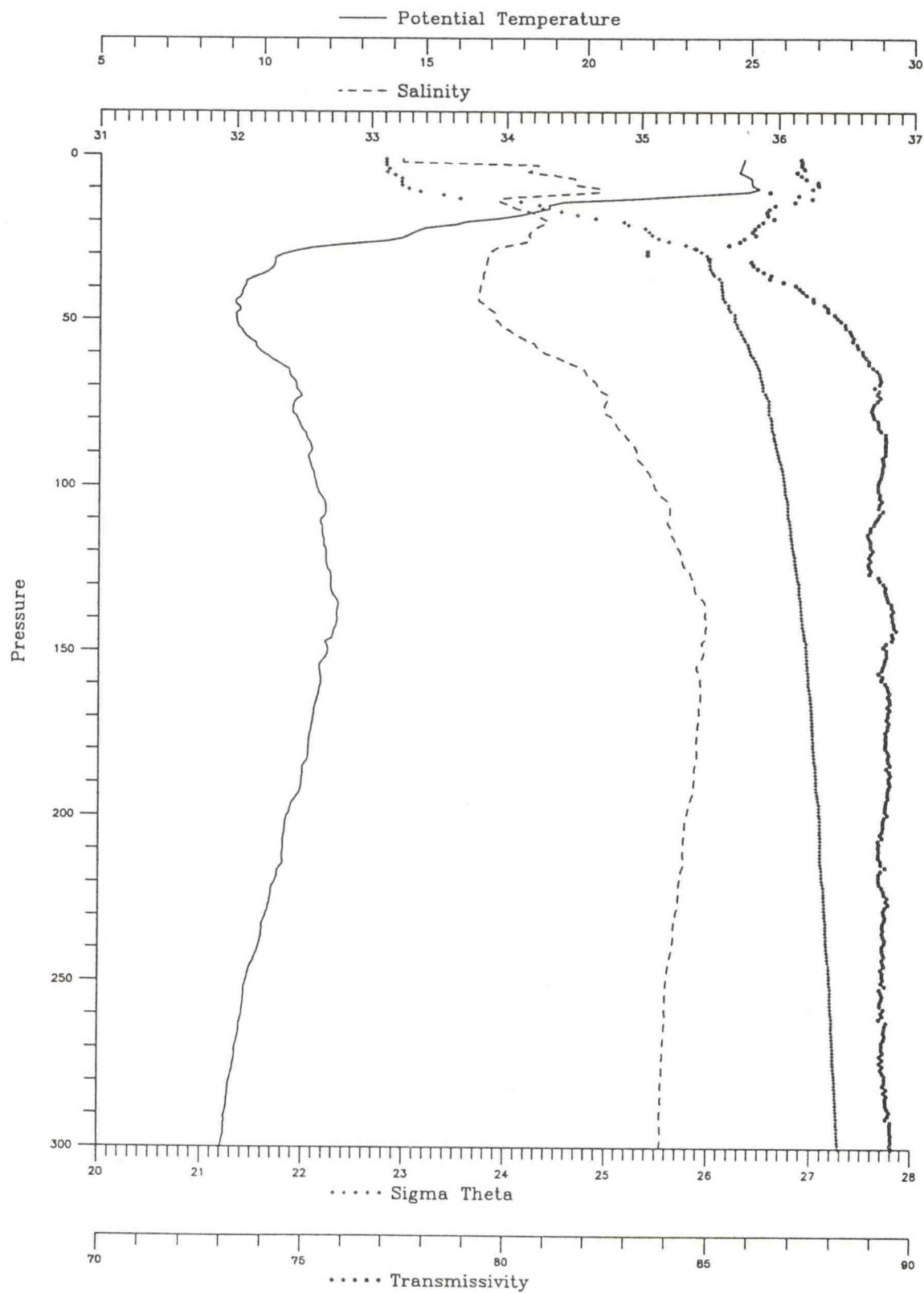


R/V DELAWARE II 90-08 Station: 29 Date: 90/08/13 GMT: 1117 Depth: 2470m
 Position: 38 49.83N 72 02.83W Wind: 10 kts Dir: 230 deg. Air Temp: 25.1C

PR	TE	PT	SA	SO	TR
1	24.7744	24.7757	33.2323	22.8100	87.20
10	25.2381	25.2359	34.6850	23.0332	87.48
20	16.2573	16.2541	34.3054	25.1568	86.28
30	10.5821	10.5785	33.8624	25.9646	83.47
40	9.4041	9.3997	33.8061	26.1195	87.17
50	9.1833	9.1779	33.9212	26.2453	88.18
60	9.9912	9.9844	34.2874	26.3986	88.74
70	11.0331	11.0245	34.6757	26.5190	89.03
80	11.0698	11.0599	34.7947	26.6053	89.11
90	11.4648	11.4535	34.9687	26.6684	89.30
100	11.6722	11.6594	35.1046	26.7356	89.13
125	12.0230	12.0067	35.3334	26.8475	88.96
150	12.0378	12.0181	35.4695	26.9510	89.35
175	11.5051	11.4828	35.4187	27.0131	89.35
200	10.7906	10.7661	35.3441	27.0864	89.30
225	10.2903	10.2635	35.2896	27.1329	89.37
250	9.5699	9.5415	35.2060	27.1910	89.26
275	9.1728	9.1424	35.1762	27.2335	89.30
300	8.8094	8.7770	35.1615	27.2807	89.53

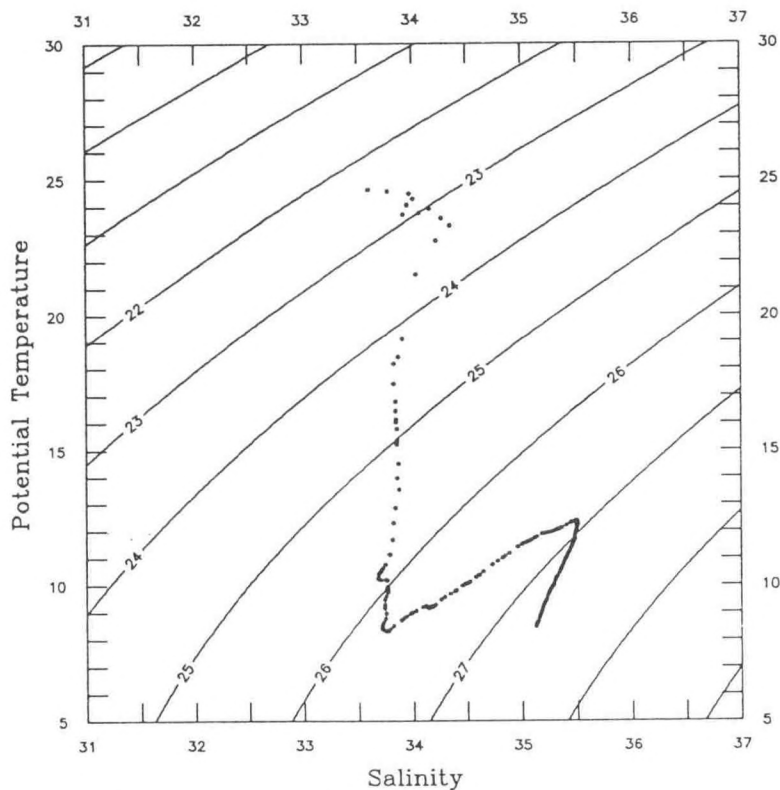


Station 29

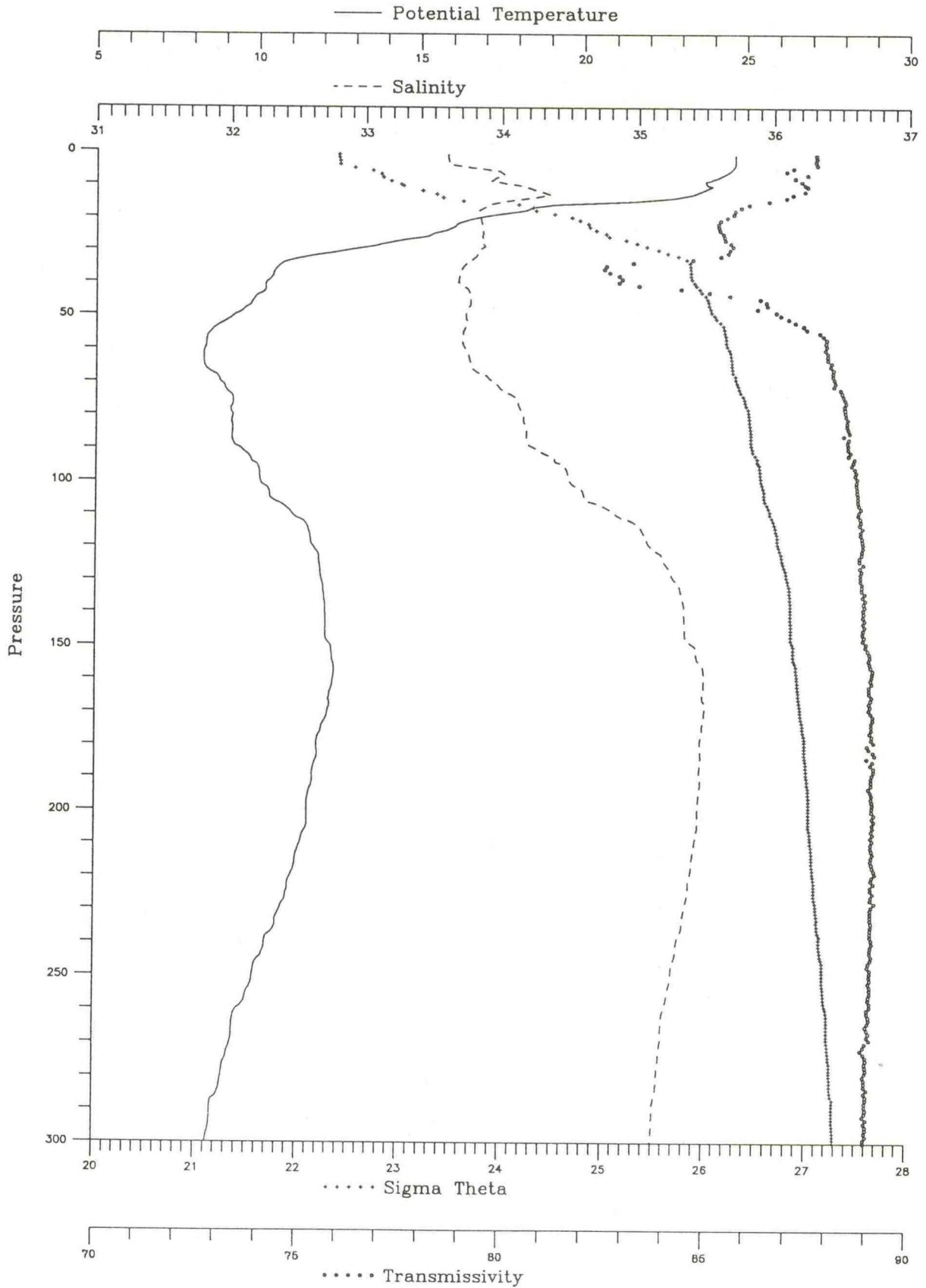


R/V DELAWARE II 90-08 Station: 30 Date: 90/08/13 GMT: 1241 Depth: 2350m
 Position: 38 56.46N 72 03.17W Wind: 6 kts Dir: 255 deg. Air Temp: 25.3C

PR	TE	PT	SA	SO	TR
1	24.6302	24.6313	33.5990	22.3930	87.68
10	23.7602	23.7581	34.0658	23.0070	87.40
20	16.7968	16.7935	33.8421	24.6752	85.51
30	12.8524	12.8484	33.8408	25.5252	85.58
40	10.2361	10.2315	33.6794	25.8819	82.85
50	9.2820	9.2766	33.7381	26.0862	86.83
60	8.3617	8.3556	33.7339	26.2267	87.93
70	8.8668	8.8595	33.9355	26.3071	88.18
80	9.2397	9.2310	34.1631	26.4261	88.45
90	9.4762	9.4662	34.2555	26.4600	88.50
100	10.0904	10.0789	34.5031	26.5509	88.72
125	11.9301	11.9139	35.2065	26.7666	88.90
150	12.3086	12.2887	35.4309	26.8686	88.97
175	12.0204	11.9975	35.4851	26.9671	89.13
200	11.5888	11.5632	35.4585	27.0290	89.15
225	10.9624	10.9345	35.3855	27.0882	89.18
250	9.9420	9.9129	35.2650	27.1744	89.11
275	9.1168	9.0864	35.1791	27.2448	89.04
300	8.5392	8.5074	35.1239	27.2937	88.99

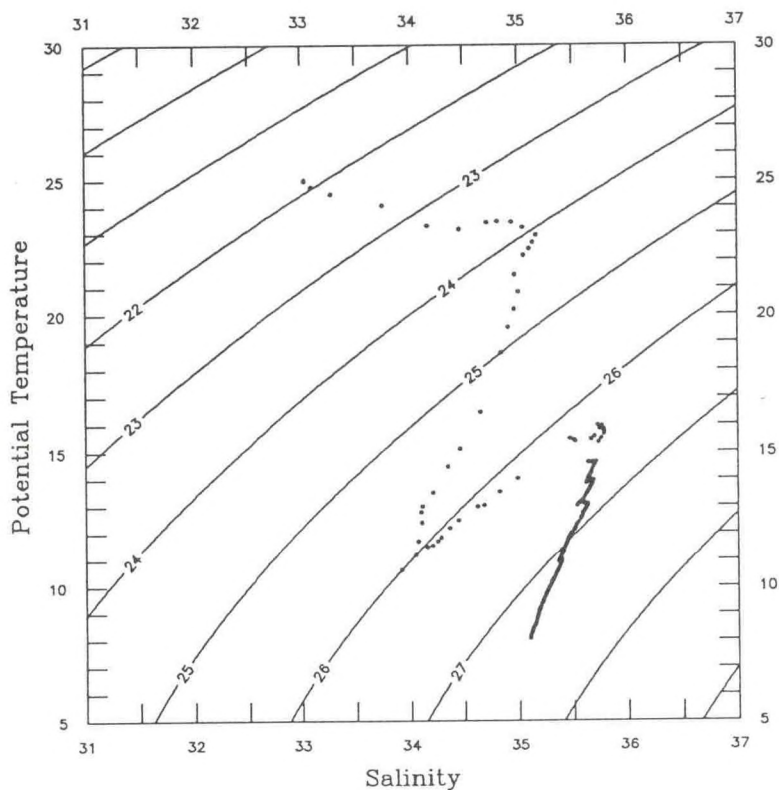


Station 30

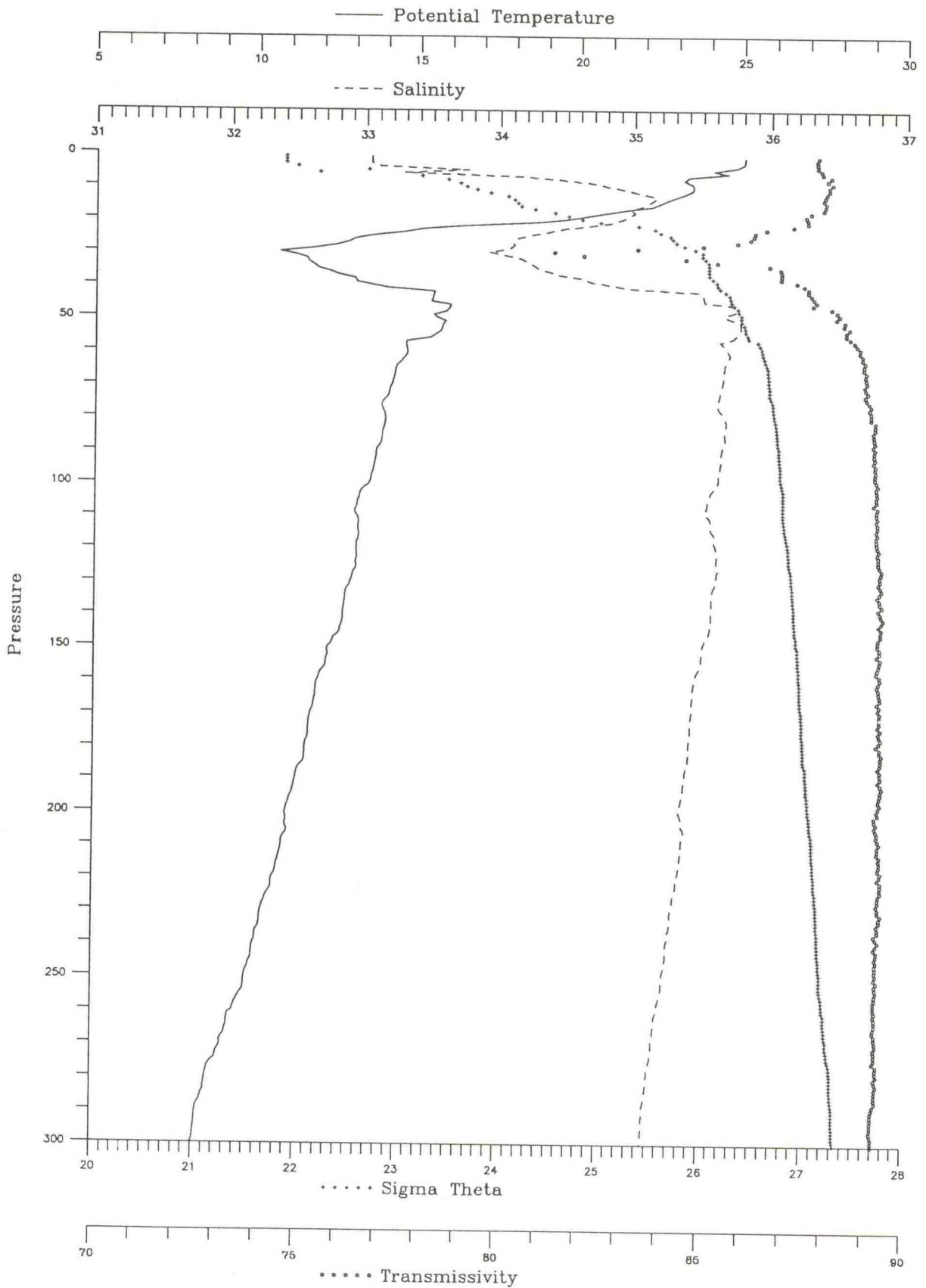


R/V DELAWARE II 90-08 Station: 31 Date: 90/08/13 GMT: 1522 Depth: 1000m
 Position: 39 08.37N 72 20.27W Wind: 9 kts Dir: 225 deg. Air Temp: 26.2C

PR	TE	PT	SA	SO	TR
1	25.0200	25.0197	33.0350	21.8630	87.79
10	23.4494	23.4473	34.8100	23.6615	88.06
20	19.5400	19.5364	34.9046	24.8114	87.54
30	10.6561	10.6526	33.9186	25.9959	81.35
40	13.5334	13.5278	34.8217	26.1478	87.47
50	15.5765	15.5687	35.6902	26.3780	88.27
60	14.6551	14.6461	35.6948	26.5863	88.84
70	14.1589	14.1486	35.6461	26.6558	88.97
80	13.9927	13.9811	35.6712	26.7107	89.13
90	13.6877	13.6748	35.6455	26.7552	89.21
100	13.4582	13.4440	35.6152	26.7797	89.31
125	13.1024	13.0851	35.6240	26.8599	89.37
150	12.2257	12.2059	35.5111	26.9470	89.38
175	11.6501	11.6277	35.4309	26.9954	89.37
200	10.9612	10.9365	35.3560	27.0650	89.37
225	10.4064	10.3795	35.3224	27.1382	89.40
250	9.7502	9.7215	35.2415	27.1885	89.32
275	8.7676	8.7380	35.1568	27.2832	89.29
300	8.1396	8.1087	35.0974	27.3343	89.27

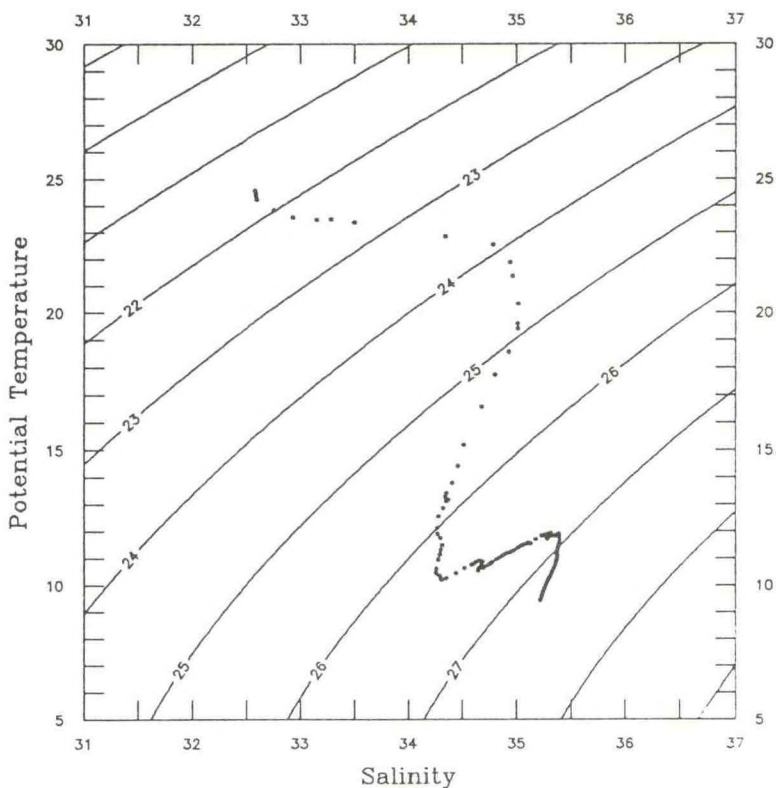


Station 31

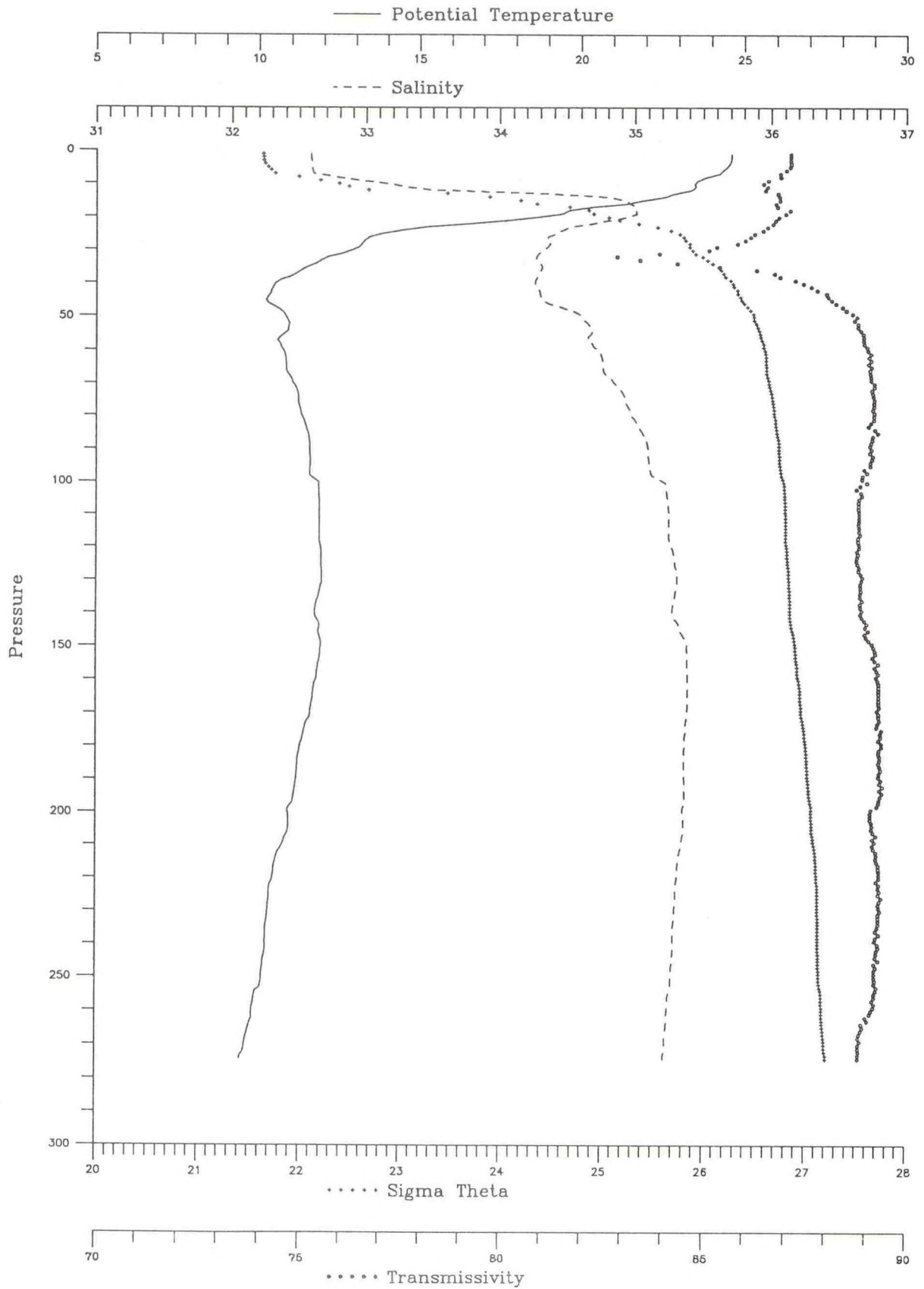


R/V DELAWARE II 90-08 Station: 32 Date: 90/08/13 GMT: 1647 Depth: 287 m
 Position: 39 13.05N 72 27.14W Wind: 10 kts Dir: 210 deg. Air Temp: 25.3C

PR	TE	PT	SA	SO	TR
1	24.5960	24.5956	32.5840	21.6425	87.14
10	23.4900	23.4880	33.1511	22.3933	86.47
20	18.5988	18.5953	34.9265	25.0686	86.84
30	12.8735	12.8694	34.3227	25.8948	85.13
40	10.5022	10.4975	34.2549	26.2849	87.45
50	10.8228	10.8167	34.5998	26.4972	88.77
60	10.7682	10.7610	34.7251	26.6049	89.05
70	11.0828	11.0742	34.8519	26.6472	89.21
80	11.3293	11.3193	34.9765	26.6993	89.20
90	11.5851	11.5736	35.0953	26.7445	89.14
100	11.8744	11.8614	35.2249	26.7909	89.03
125	11.9450	11.9288	35.2948	26.8324	88.80
150	11.9324	11.9129	35.3860	26.9063	89.20
175	11.4272	11.4050	35.3788	26.9965	89.40
200	10.9398	10.9151	35.3558	27.0686	89.13
225	10.3633	10.3364	35.3031	27.1308	89.33
250	10.1430	10.1136	35.2727	27.1458	89.23
274	9.4705	9.4395	35.2163	27.2161	88.83

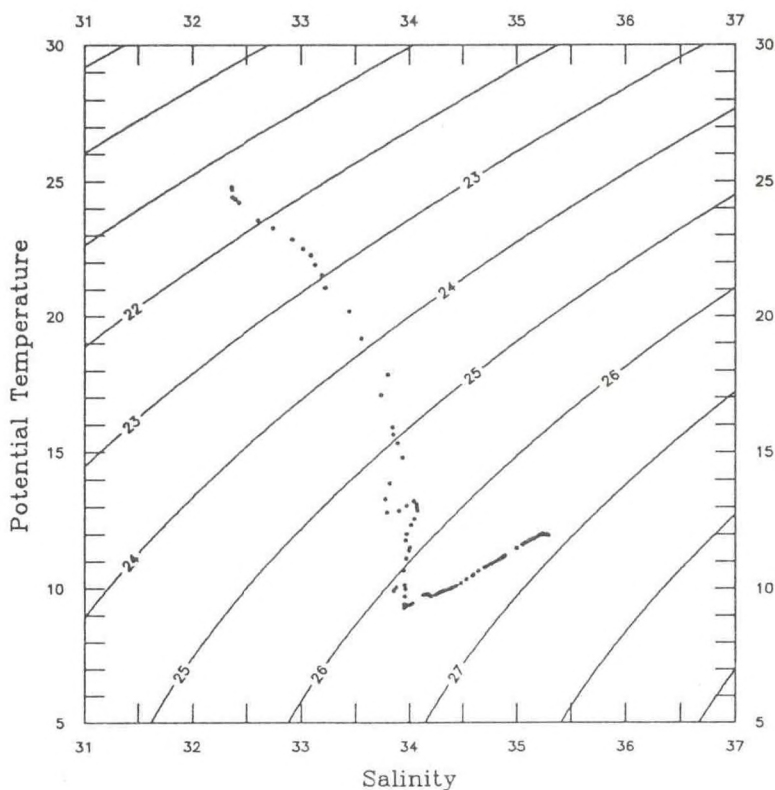


Station 32

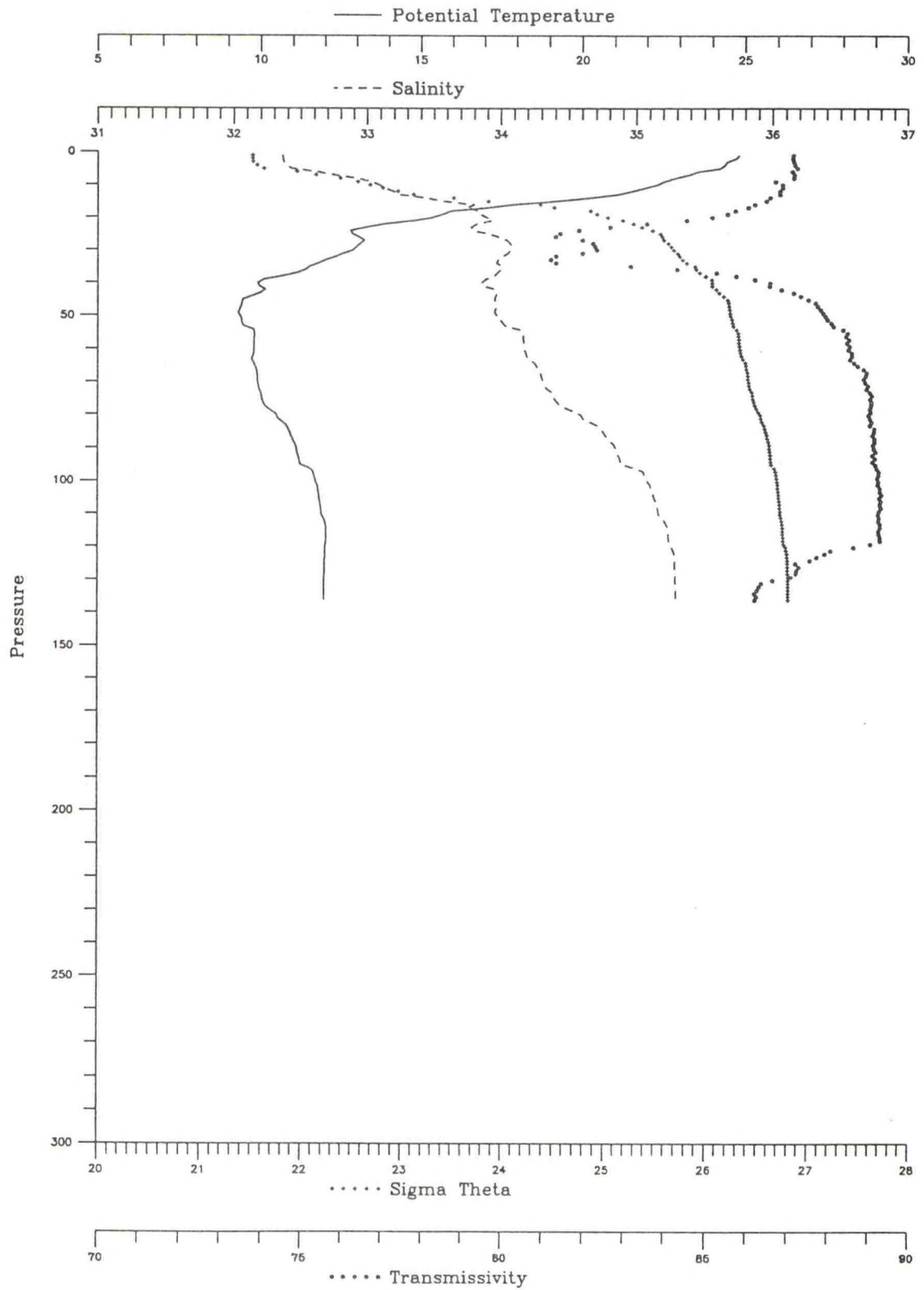


R/V DELAWARE II 90-08 Station: 33 Date: 90/08/13 GMT: 1802 Depth: 140 m
 Position: 39 18.03N 72 34.14W Wind: 12 kts Dir: 210 deg. Air Temp: 26.0C

PR	TE	PT	SA	S0	TR
1	24.7912	24.8044	32.3600	21.5200	87.17
10	22.2812	22.2792	33.0911	22.6918	86.90
20	15.3417	15.3387	33.8928	25.0449	85.19
30	12.8887	12.8847	34.0732	25.6984	82.34
40	9.9216	9.9171	33.8575	26.0742	86.60
50	9.3756	9.3702	33.9700	26.2525	87.96
60	9.7961	9.7894	34.1738	26.3427	88.53
70	9.9263	9.9183	34.3134	26.4300	88.94
80	10.5029	10.4934	34.5867	26.5443	89.03
90	11.1150	11.1039	34.8410	26.6333	89.16
100	11.7355	11.7227	35.0834	26.7072	89.27
125	12.0096	11.9933	35.2840	26.8116	87.22
136	11.9954	11.9777	35.2882	26.8179	86.22

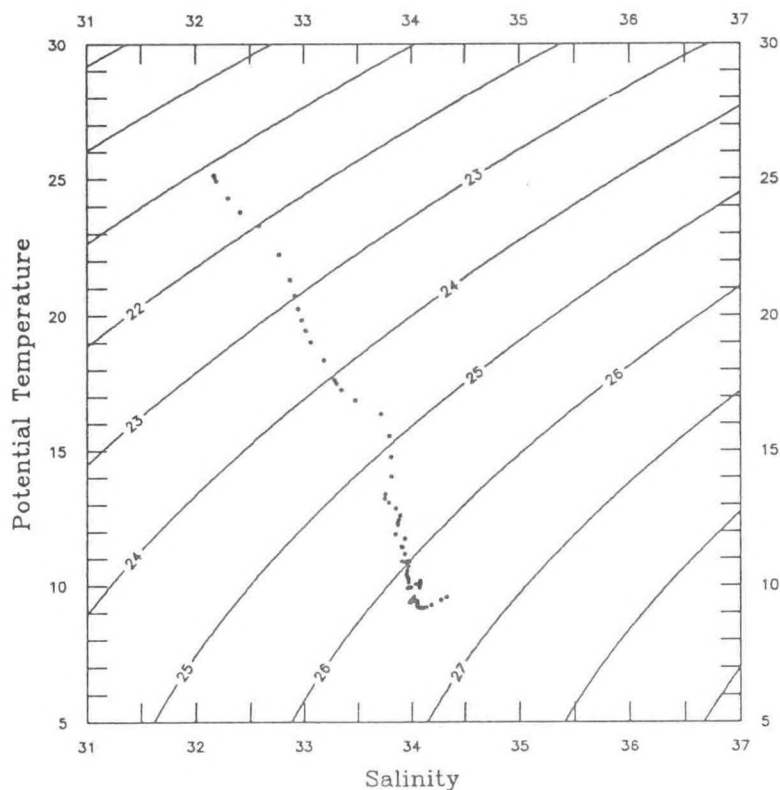


Station 33

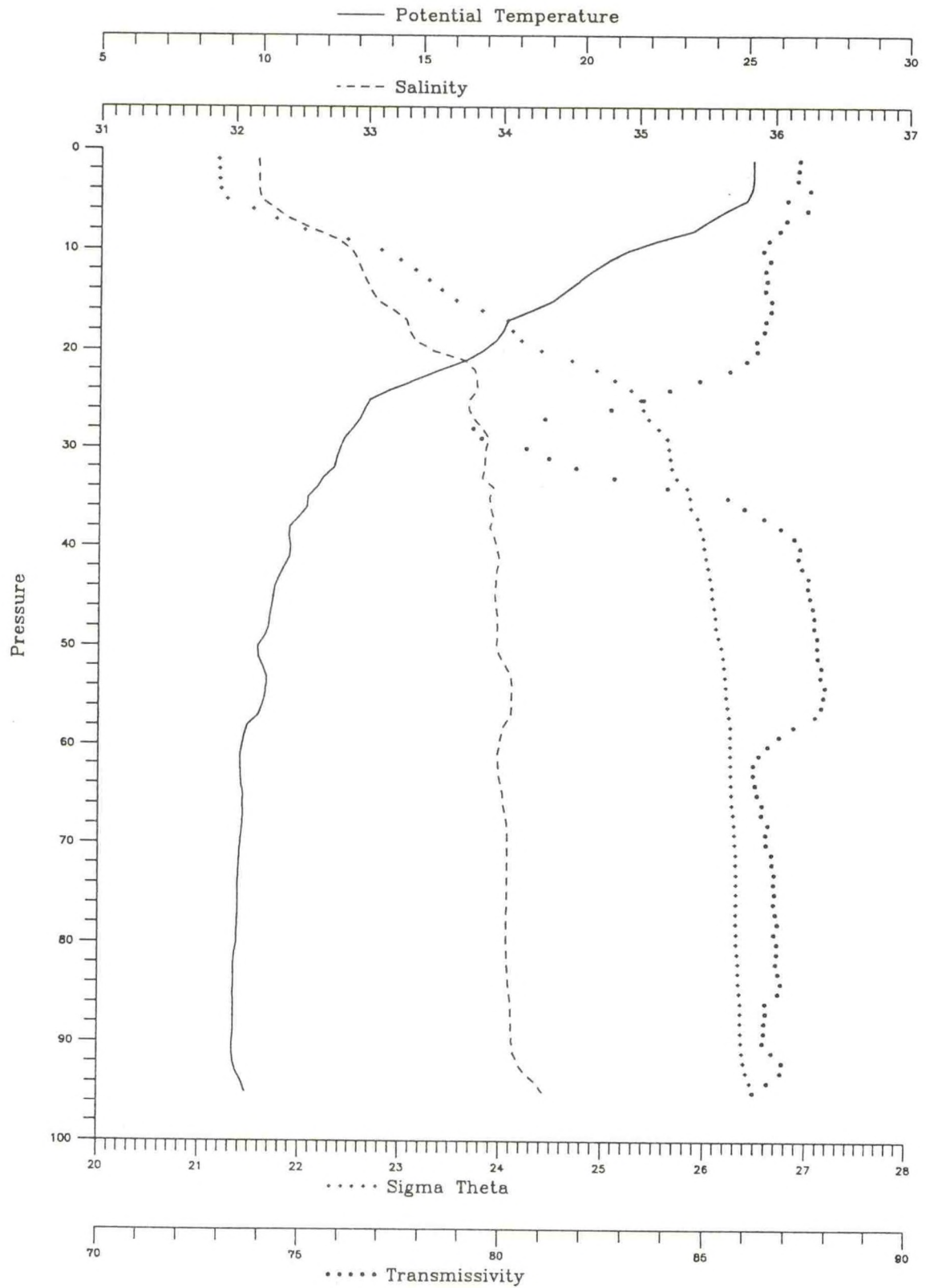


R/V DELAWARE II 90-08 Station: 34 Date: 90/08/13 GMT: 1907 Depth: 100 m
 Position: 39 23.04N 72 41.03W Wind: 12 kts Dir: 200 deg. Air Temp: 25.7C

PR	TE	PT	SA	SO	TR
1	25.1455	25.1451	32.1675	21.1600	87.25
10	21.3189	21.3170	32.8724	22.7907	86.37
20	16.8883	16.8850	33.4800	24.3759	86.24
30	12.4588	12.4549	33.8805	25.6332	80.59
40	10.9397	10.9349	33.9648	25.9815	87.32
50	9.9273	9.9216	33.9641	26.1567	87.74
60	9.4618	9.4552	33.9877	26.2525	86.55
70	9.4270	9.4193	34.0517	26.3084	86.53
80	9.3163	9.3075	34.0494	26.3248	86.81
90	9.1969	9.1872	34.0934	26.3786	86.47
95	9.6122	9.6016	34.3212	26.4891	86.24

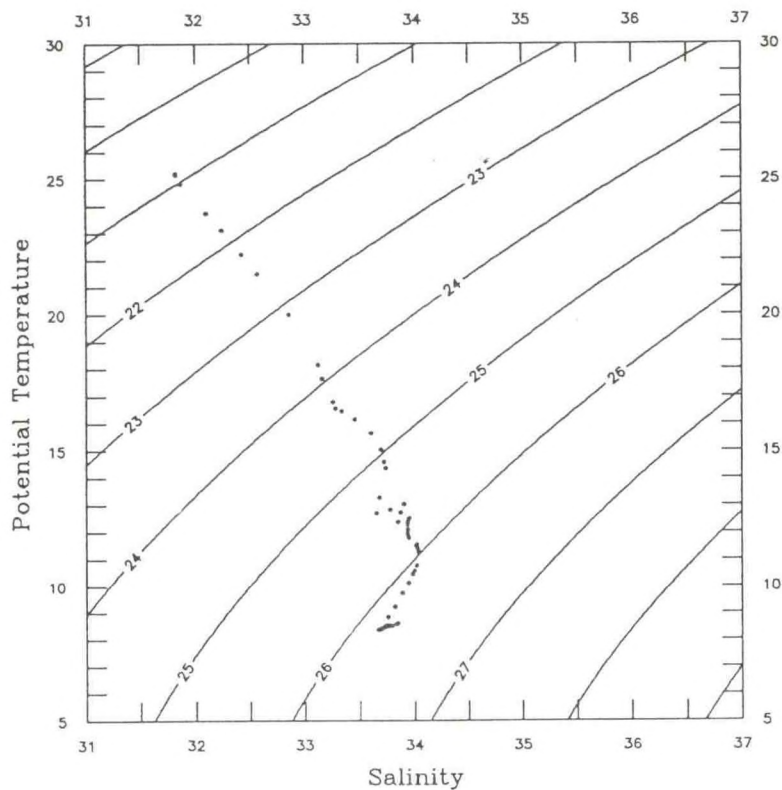


Station 34

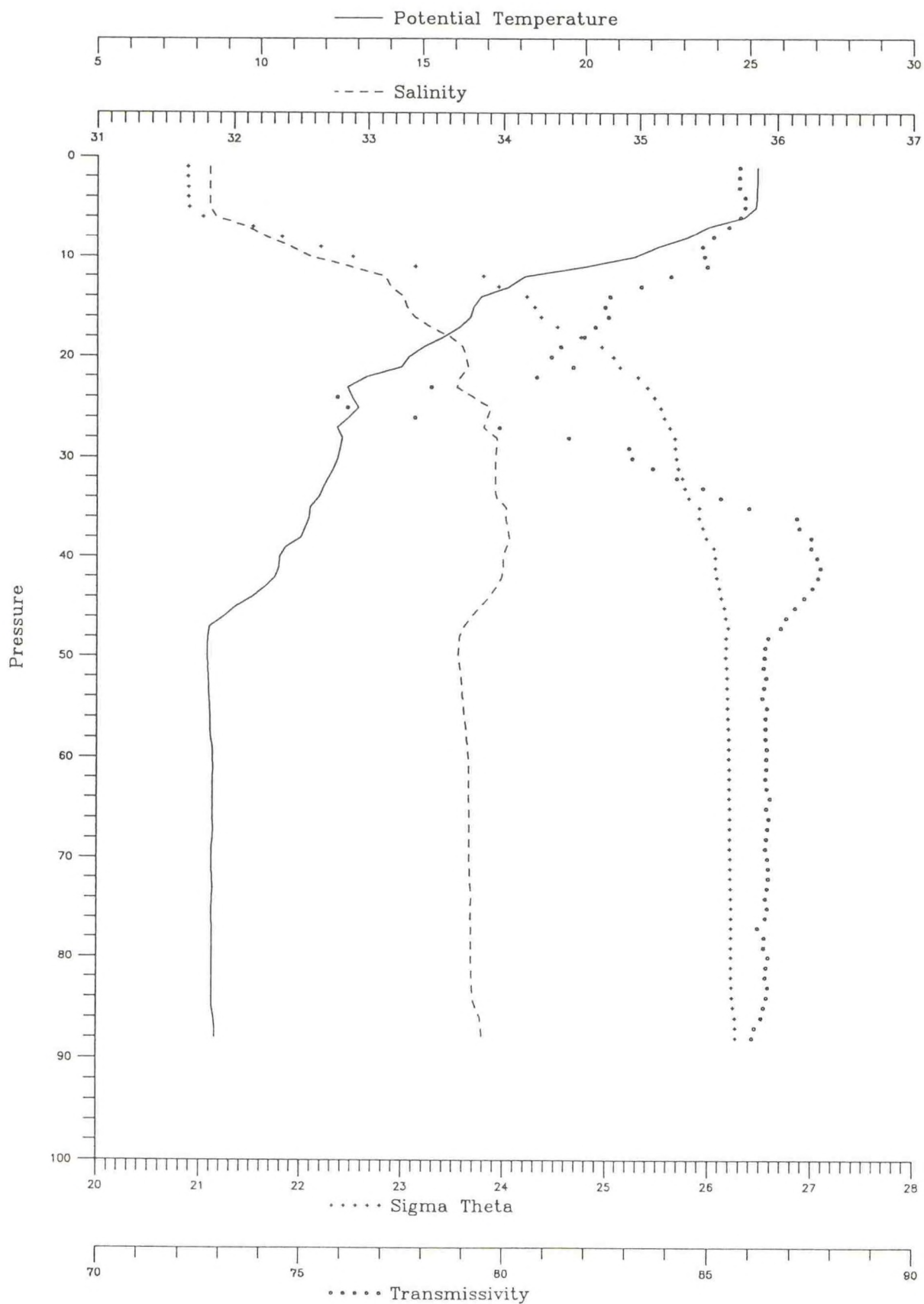


R/V DELAWARE II 90-08 Station: 35 Date: 90/08/13 GMT: 2045 Depth: 92 m
 Position: 39 12.93N 72 47.95W Wind: 14 kts Dir: 210 deg. Air Temp: 25.4C

PR	TE	PT	SA	SO	TR
1	25.2204	25.2203	31.8220	20.8800	85.75
10	21.4986	21.4967	32.5699	22.5119	84.90
20	14.5906	14.5877	33.7220	25.0763	81.17
30	12.4050	12.4011	33.9415	25.6909	83.15
40	10.5951	10.5904	33.9983	26.0685	87.65
50	8.3700	8.3649	33.6673	26.1730	86.37
60	8.5490	8.5429	33.7438	26.2060	86.42
70	8.5129	8.5058	33.7514	26.2176	86.45
80	8.5270	8.5187	33.7663	26.2273	86.47
88	8.6152	8.6061	33.8439	26.2747	86.08

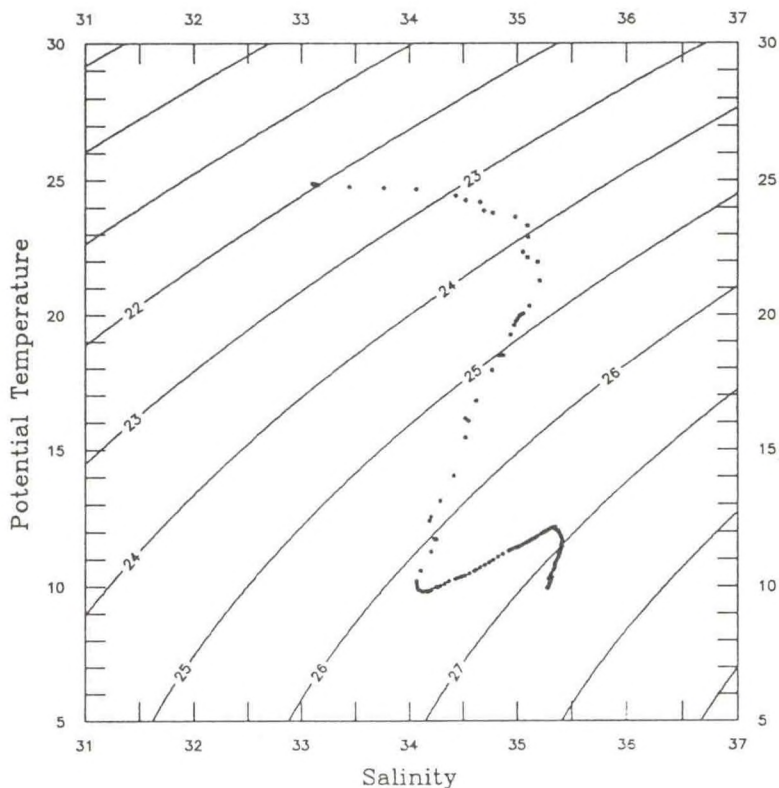


Station 35

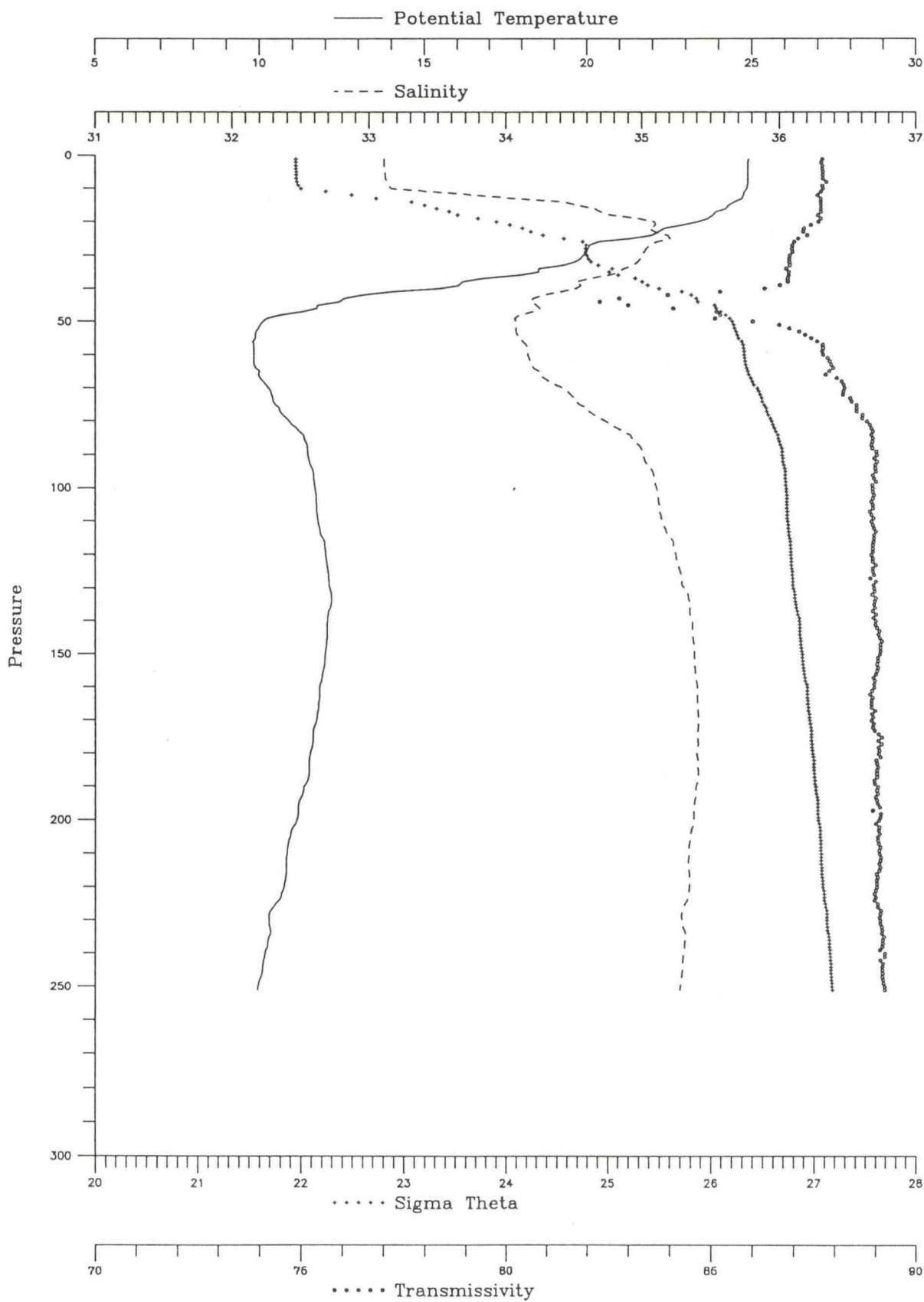


R/V DELAWARE II 90-08 Station: 36 Date: 90/08/14 GMT: 0026 Depth: 1300m
 Position: 39 01.97N 72 29.93W Wind: 22 kts Dir: 220 deg. Air Temp: 25.2C

PR	TE	PT	SA	SO	TR
1	24.8841	24.8864	33.1050	21.9500	87.70
10	24.8423	24.8402	33.1585	22.0001	87.72
20	23.3445	23.3404	35.0930	23.9071	87.61
30	19.8730	19.8675	35.0008	24.7985	86.92
40	15.4618	15.4556	34.5177	25.5004	86.31
50	10.1190	10.1133	34.0714	26.2080	86.02
60	9.8396	9.8328	34.1610	26.3254	87.73
70	10.3001	10.2919	34.4212	26.4503	88.25
80	10.9126	10.9028	34.7384	26.5898	88.80
90	11.4757	11.4643	35.0045	26.6942	89.04
100	11.7013	11.6885	35.1073	26.7322	88.94
125	12.1032	12.0868	35.2800	26.7905	88.94
150	12.0149	11.9953	35.3811	26.8867	89.11
175	11.6505	11.6281	35.4066	26.9764	89.16
200	11.1591	11.1341	35.3772	27.0454	89.09
225	10.5126	10.4855	35.3105	27.1103	89.06
250	9.9861	9.9569	35.2774	27.1765	89.23
251	9.9682	9.9390	35.2753	27.1779	89.23

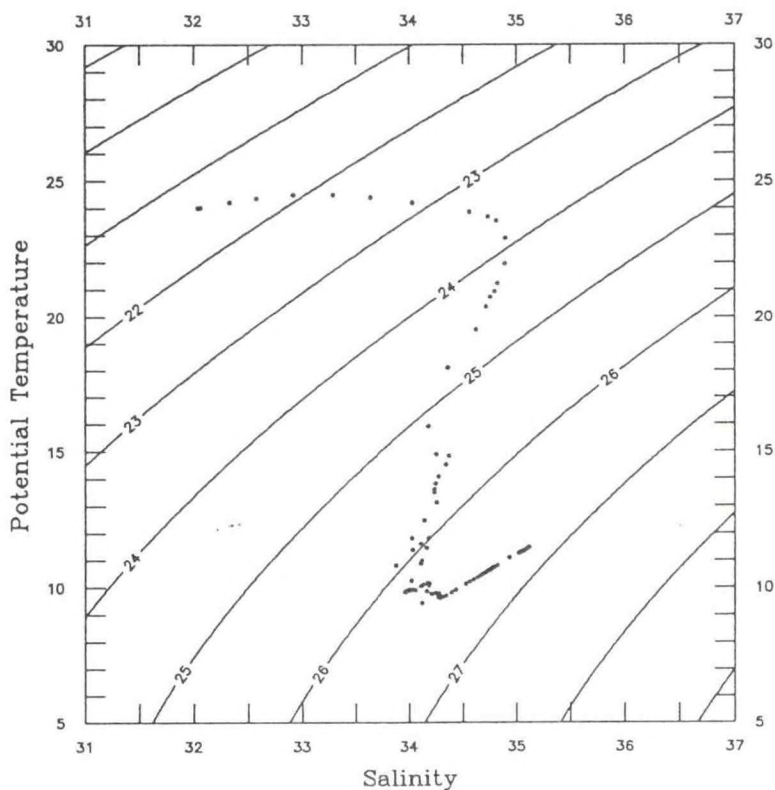


Station 36

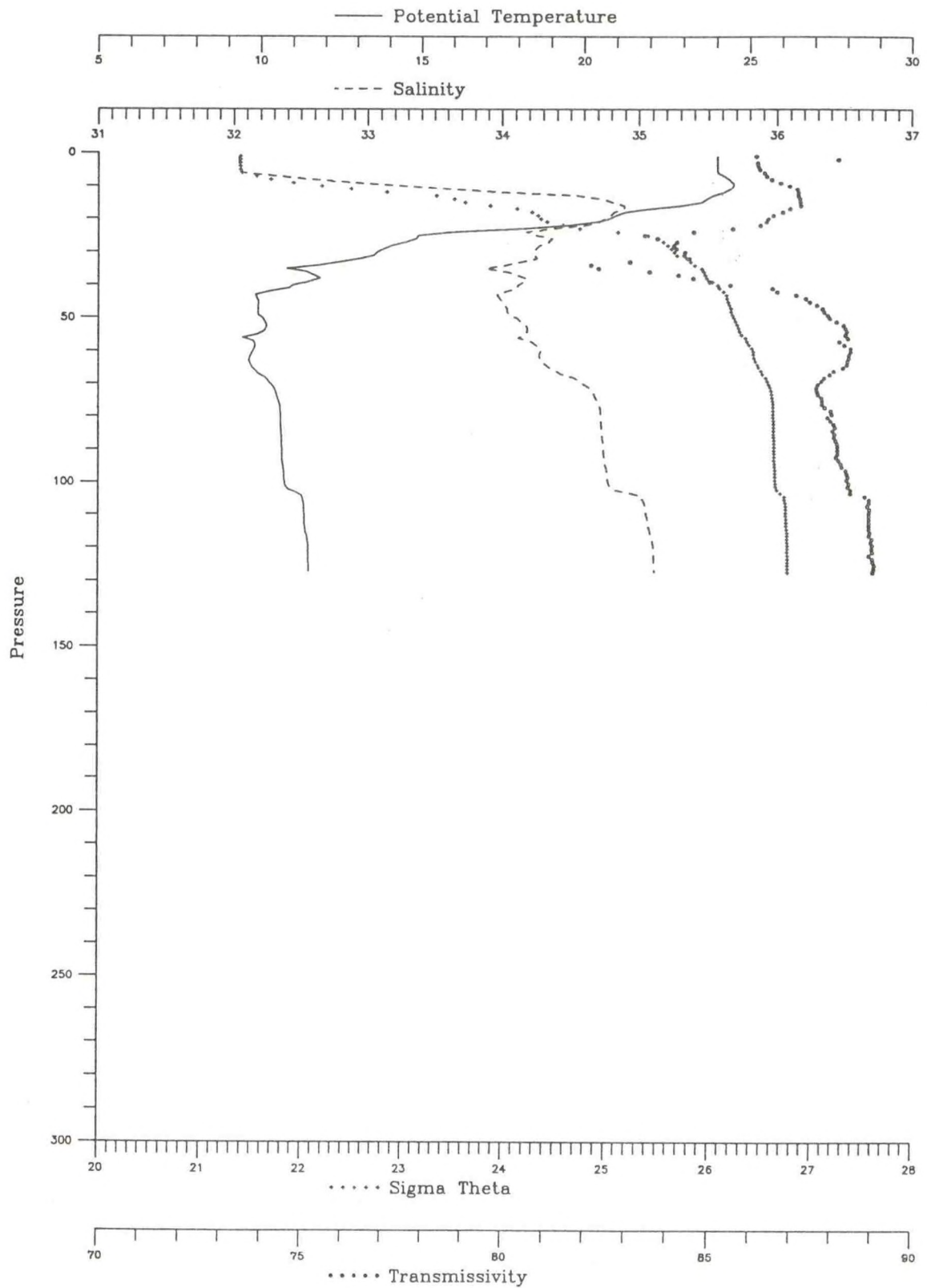


R/V DELAWARE II 90-08 Station: 37 Date: 90/08/14 GMT: 0833 Depth: 133 m
 Position: 38 47.83N 73 04.04W Wind: 14 kts Dir: 260 deg. Air Temp: 25.1C

PR	TE	PT	SA	SO	TR
1	24.0146	24.0142	32.0380	21.3980	86.15
10	24.5006	24.4985	33.2892	22.2010	86.97
20	20.7490	20.7452	34.7517	24.3751	86.45
30	13.6207	13.6165	34.2306	25.6726	84.43
40	10.9982	10.9933	34.1151	26.0878	85.52
50	10.0587	10.0530	34.1070	26.2460	87.96
60	9.7496	9.7429	34.2772	26.4312	88.48
70	10.3116	10.3034	34.5943	26.5834	87.67
80	10.6140	10.6044	34.7204	26.6290	87.91
90	10.6613	10.6505	34.7398	26.6360	88.16
100	10.7509	10.7388	34.7757	26.6482	88.44
125	11.5041	11.4882	35.1104	26.7722	89.08
127	11.5060	11.4899	35.1117	26.7729	89.04

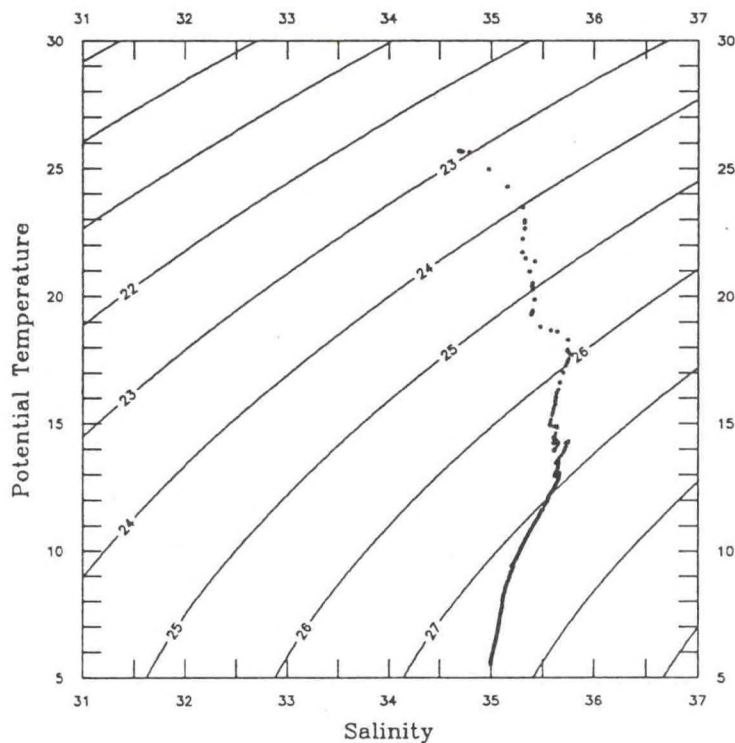


Station 37

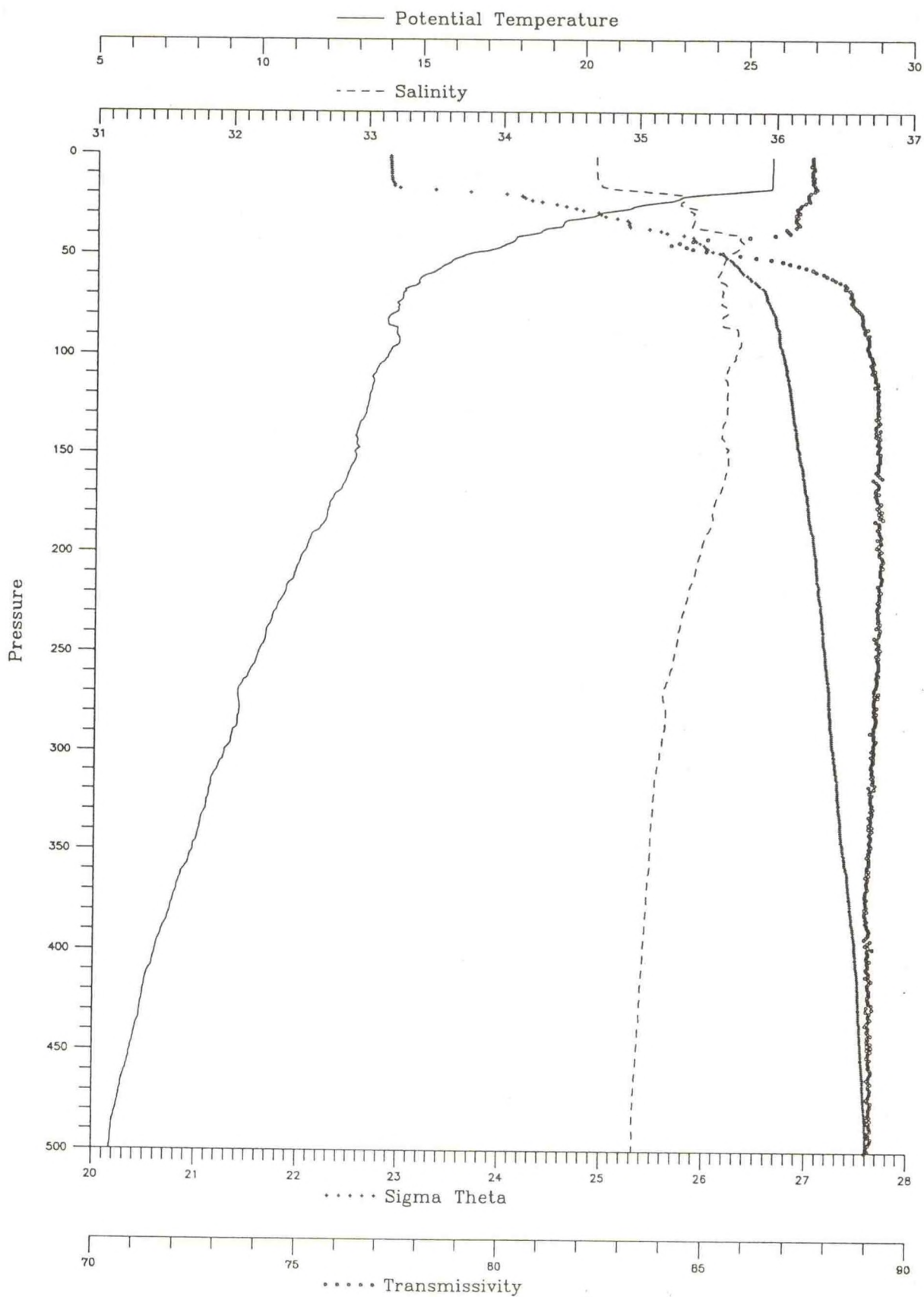


R/V DELAWARE II 90-08 Station: 38 Date: 90/08/14 GMT: 1315 Depth: 2550m
 Position: 38 33.06N 72 43.13W Wind: 12 kts Dir: 305 deg. Air Temp: 25.6C

PR	TE	PT	SA	SO	TR
1	25.7142	25.7141	34.6820	22.8800	87.54
10	25.7016	25.6994	34.6850	22.8908	87.52
20	23.4886	23.4844	35.3036	24.0248	87.43
30	20.4107	20.4050	35.3919	24.9543	87.13
40	18.3198	18.3129	35.7436	25.7649	86.63
50	16.3574	16.3494	35.6486	26.1667	85.78
60	15.1601	15.1510	35.5759	26.3835	87.89
70	14.4185	14.4082	35.6085	26.5711	88.48
80	14.0337	14.0221	35.6181	26.6610	88.77
90	14.2795	14.2663	35.7343	26.6988	88.90
100	13.9733	13.9588	35.7082	26.7440	89.01
125	13.3580	13.3404	35.6529	26.8302	89.17
150	12.9919	12.9712	35.6497	26.9029	89.23
175	12.2017	12.1785	35.5593	26.9898	89.23
200	11.4128	11.3874	35.4593	27.0625	89.23
225	10.6460	10.6187	35.3530	27.1198	89.23
250	10.0573	10.0280	35.2781	27.1649	89.17
275	9.4562	9.4251	35.2061	27.2104	89.13
300	9.0240	8.9911	35.1754	27.2574	89.13
325	8.4866	8.4522	35.1310	27.3079	89.07
350	8.0640	8.0280	35.1102	27.3565	89.03
375	7.4492	7.4123	35.0843	27.4270	88.97
400	6.9254	6.8875	35.0656	27.4864	89.04
425	6.5268	6.4878	35.0444	27.5241	89.07
450	6.1886	6.1484	35.0237	27.5525	89.07
475	5.8334	5.7922	35.0014	27.5805	89.14
500	5.5796	5.5371	34.9949	27.6071	88.98

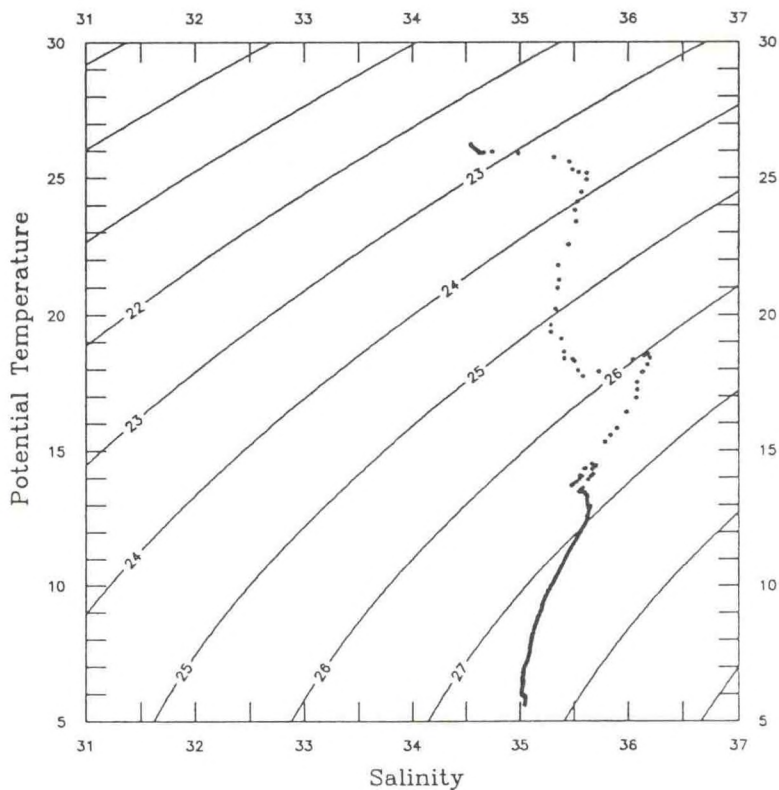


Station 38



R/V DELAWARE II 90-08 Station: 39 Date: 90/08/14 GMT: 1837 Depth: 2818m
 Position: 38 17.94N 72 21.90W Wind: 10 kts Dir: 340 deg. Air Temp: 26.0C

PR	TE	PT	SA	SO	TR
1	26.2672	26.2585	34.5435	22.6102	88.34
10	26.0472	26.0449	34.5961	22.7166	88.29
20	25.9572	25.9528	34.6593	22.7929	88.16
30	24.1609	24.1545	35.5287	23.9974	87.96
40	19.1364	19.1292	35.3808	25.2804	87.67
50	18.5807	18.5718	36.1780	26.0323	85.62
60	15.5721	15.5627	35.8340	26.4900	88.16
70	14.0706	14.0604	35.5737	26.6186	88.55
80	13.5617	13.5504	35.5523	26.7090	88.81
90	13.4078	13.3951	35.5995	26.7776	89.08
100	13.2944	13.2804	35.6208	26.8176	89.18
125	12.8528	12.8357	35.6377	26.9209	89.33
150	12.0263	12.0066	35.5549	27.0196	89.36
175	11.3868	11.3647	35.4582	27.0658	89.52
200	10.7677	10.7433	35.3845	27.1221	89.52
225	10.0972	10.0707	35.3018	27.1760	89.52
250	9.4685	9.4403	35.2188	27.2179	89.52
275	8.9537	8.9237	35.1784	27.2706	89.48
300	8.5094	8.4776	35.1350	27.3071	89.47
325	7.8925	7.8596	35.0965	27.3710	89.52
350	7.4152	7.3809	35.0751	27.4243	89.42
375	6.8352	6.8001	35.0324	27.4723	89.42
400	6.3737	6.3375	35.0214	27.5259	89.43
425	6.0176	5.9803	35.0123	27.5652	89.33
450	5.9856	5.9461	35.0443	27.5949	89.52
475	5.8584	5.8171	35.0471	27.6135	89.42
500	5.6669	5.6240	35.0431	27.6344	89.48

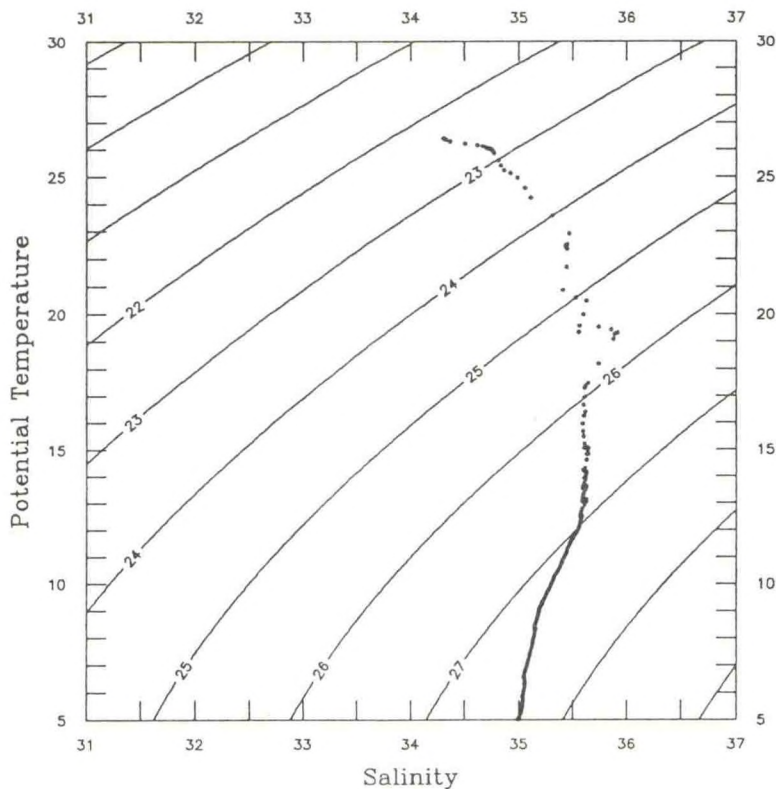


Station 39

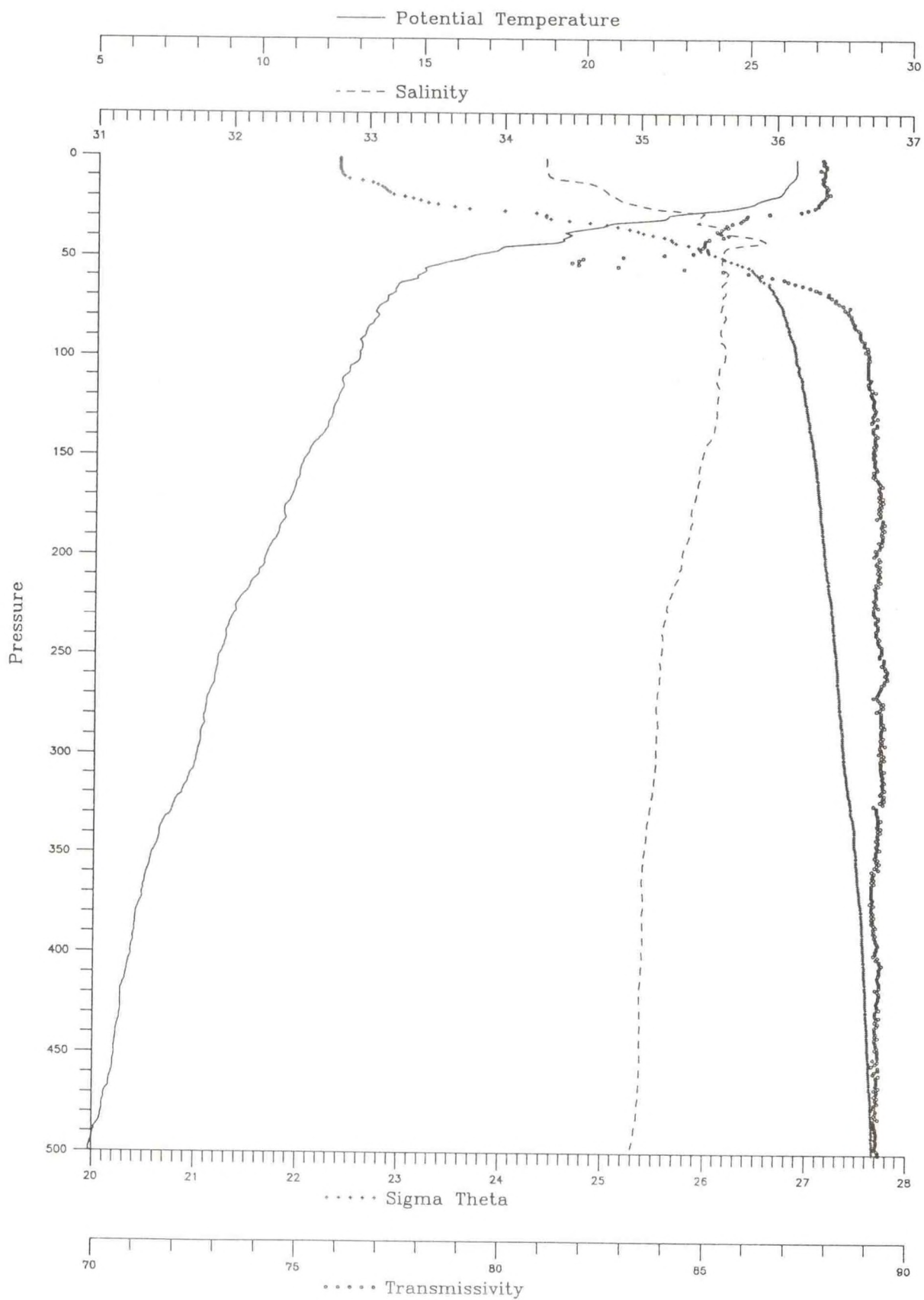


R/V DELAWARE II 90-08 Station: 40 Date: 90/08/14 GMT: 2335 Depth: 3000m
 Position: 38 00.00N 72 00.16W Wind: 8 kts Dir: 010 deg. Air Temp: 25.0C

PR	TE	PT	SA	SO	TR
1	26.4272	26.4268	34.3040	22.3790	87.78
10	26.3691	26.3669	34.3280	22.4138	87.77
20	25.6071	25.6027	34.8093	23.0145	87.82
30	22.4888	22.4828	35.4249	24.4058	85.91
40	19.4540	19.4468	35.8540	25.5599	85.34
50	16.4054	16.3974	35.6147	26.1295	82.90
60	14.8420	14.8330	35.6259	26.4923	86.55
70	13.9269	13.9168	35.6028	26.6714	88.01
80	13.6401	13.6288	35.6273	26.7507	88.51
90	13.2286	13.2161	35.5949	26.8107	88.74
100	13.0842	13.0704	35.6259	26.8644	88.94
125	12.3033	12.2866	35.5623	26.9710	89.10
150	11.4721	11.4531	35.4651	27.0547	89.10
175	10.8299	10.8084	35.3904	27.1149	89.24
200	10.2533	10.2296	35.3223	27.1645	89.25
225	9.3306	9.3055	35.2121	27.2349	89.24
250	8.8502	8.8232	35.1712	27.2810	89.28
275	8.4640	8.4350	35.1409	27.3183	89.38
300	8.1845	8.1534	35.1431	27.3634	89.34
325	7.5083	7.4763	35.1057	27.4346	89.16
350	6.8246	6.7919	35.0599	27.4951	89.23
375	6.4590	6.4249	35.0545	27.5405	89.18
400	6.1871	6.1515	35.0472	27.5707	89.18
425	5.8874	5.8505	35.0338	27.5987	89.28
450	5.7103	5.6718	35.0390	27.6253	89.30
475	5.3456	5.3062	35.0221	27.6567	89.23
500	4.9291	4.8891	34.9767	27.6699	89.33

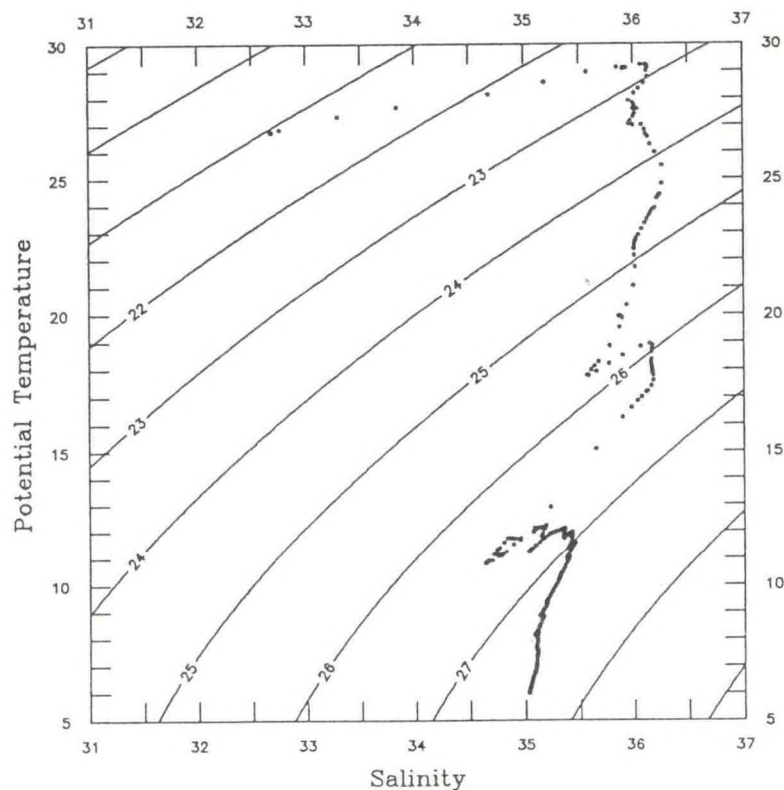


Station 40

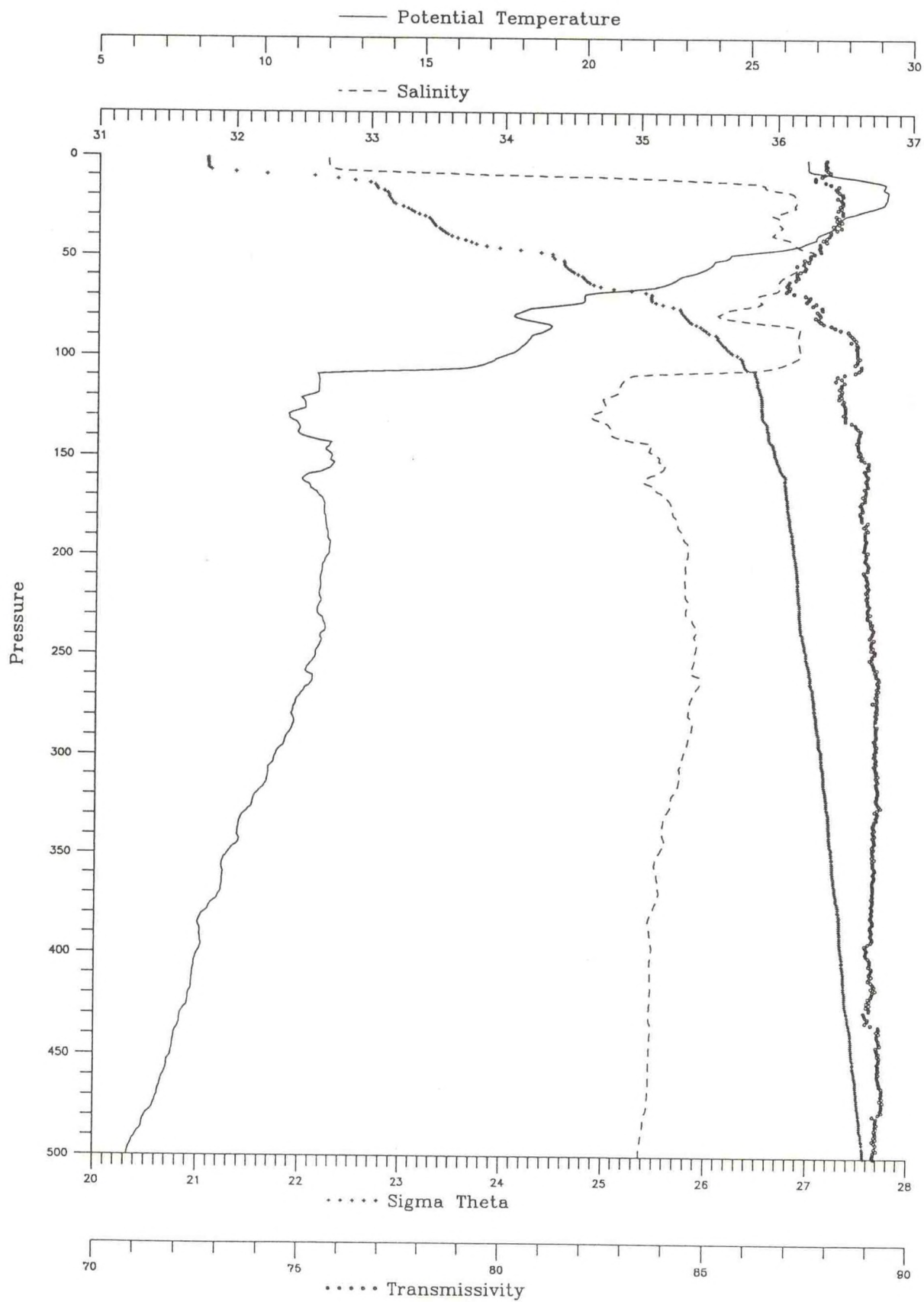


R/V DELAWARE II 90-08 Station: 41 Date: 90/08/15 GMT: 0858 Depth: 3477m
 Position: 36 54.36N 72 12.84W Wind: 12 kts Dir: 025 deg. Air Temp: 25.0C

PR	TE	PT	SA	SO	TR
1	26.7469	26.7468	32.6820	21.0530	87.85
10	28.1657	28.1633	34.6774	22.1009	87.57
20	29.2139	29.2090	36.1247	22.8409	88.12
30	27.8332	27.8262	35.9977	23.2042	88.16
40	27.0128	27.0036	35.9966	23.4696	87.87
50	24.3711	24.3604	36.2296	24.4665	87.47
60	22.9068	22.8946	36.0412	24.7556	87.17
70	19.9436	19.9307	35.8541	25.4330	87.47
80	17.7938	17.7802	35.5786	25.7706	87.60
90	18.3225	18.3068	36.1540	26.0808	88.55
100	17.4159	17.3990	36.1583	26.3084	88.70
125	11.3520	11.3363	34.7401	26.5200	88.35
150	12.1962	12.1764	35.1435	26.6672	88.75
175	11.9734	11.9506	35.2336	26.7806	88.79
200	12.0942	12.0679	35.3576	26.8544	88.89
225	11.8230	11.7938	35.3542	26.9043	88.97
250	11.7258	11.6935	35.4137	26.9695	89.06
275	11.0819	11.0476	35.3729	27.0579	89.20
300	10.5131	10.4769	35.3310	27.1278	89.17
325	9.8087	9.7711	35.2420	27.1805	89.30
350	9.0629	9.0243	35.1525	27.2341	89.10
375	8.5658	8.5257	35.1329	27.2980	89.08
400	8.1758	8.1341	35.1070	27.3380	88.97
425	7.8780	7.8346	35.1021	27.3792	88.98
450	7.3906	7.3463	35.1012	27.4498	89.32
475	6.8687	6.8237	35.0846	27.5102	89.38
501	6.0490	6.0046	35.0279	27.5744	89.17

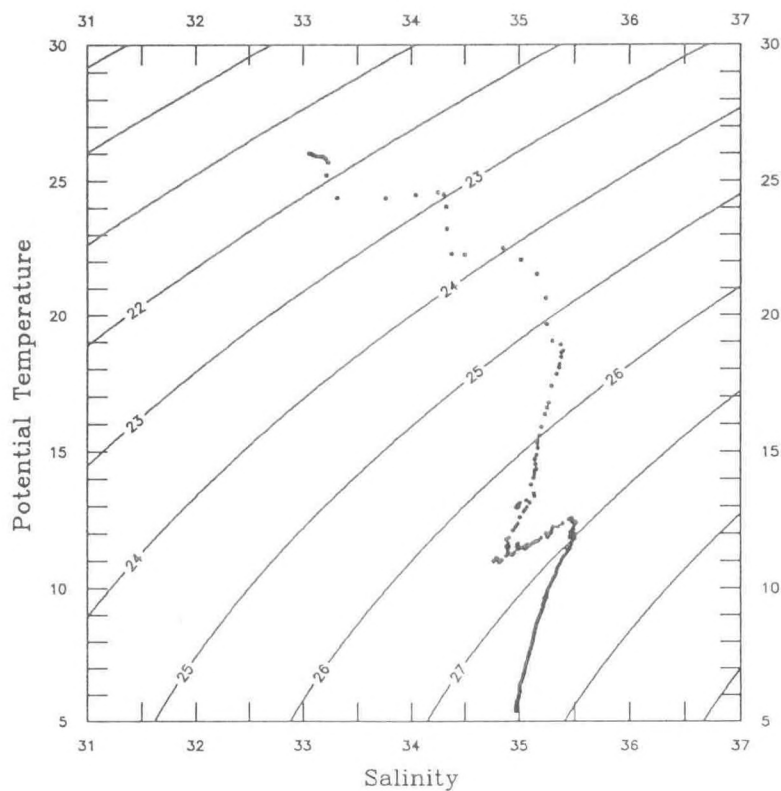


Station 41



R/V DELAWARE II 90-08 Station: 42 Date: 90/08/15 GMT: 1612 Depth: 2930m
 Position: 37 07.05N 72 52.00W Wind: 12 kts Dir: 065 deg. Air Temp: 25.2C

PR	TE	PT	SA	SO	TR
1	26.0247	26.0247	33.0560	21.5620	87.68
10	25.6976	25.6954	33.2309	21.7950	87.81
20	22.2745	22.2705	34.4969	23.7612	86.41
30	18.4466	18.4414	35.3827	25.4564	87.03
40	15.4252	15.4191	35.1682	26.0094	86.89
50	14.1918	14.1845	35.1402	26.2572	85.86
60	13.2291	13.2207	35.0657	26.3999	86.46
70	12.1327	12.1236	34.9409	26.5200	87.57
80	11.5483	11.5381	34.9077	26.6052	88.06
90	11.6237	11.6122	34.9731	26.6422	88.45
100	11.5077	11.4950	35.0207	26.7011	88.55
125	11.9730	11.9567	35.2704	26.8081	88.54
150	12.4788	12.4586	35.5052	26.8930	88.79
175	11.8868	11.8640	35.4508	26.9660	88.79
200	11.2065	11.1814	35.4039	27.0575	88.84
225	10.4590	10.4320	35.3186	27.1260	88.75
250	9.7704	9.7417	35.2529	27.1940	88.84
275	9.2558	9.2252	35.2080	27.2449	88.80
300	8.6958	8.6636	35.1581	27.2960	88.84
325	8.3550	8.3209	35.1342	27.3307	88.80
350	8.0459	8.0099	35.1203	27.3672	88.94
375	7.4934	7.4563	35.0837	27.4202	88.84
400	6.9310	6.8931	35.0479	27.4717	88.82
425	6.3928	6.3543	34.9991	27.5060	88.80
450	6.0271	5.9875	34.9948	27.5505	88.85
475	5.6818	5.6412	34.9698	27.5743	88.84
500	5.4682	5.4262	34.9674	27.5988	88.87

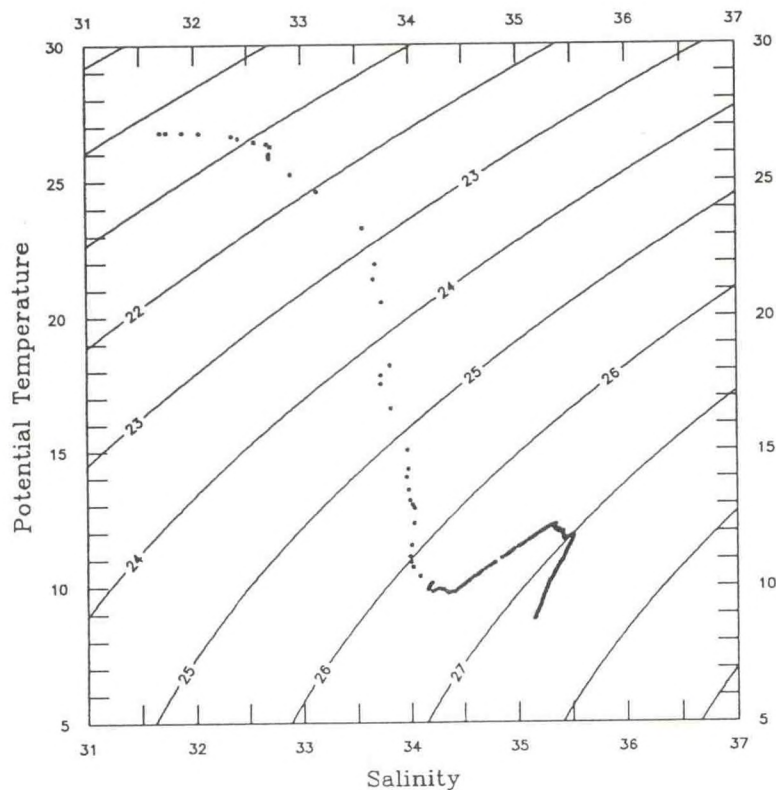


Station 42

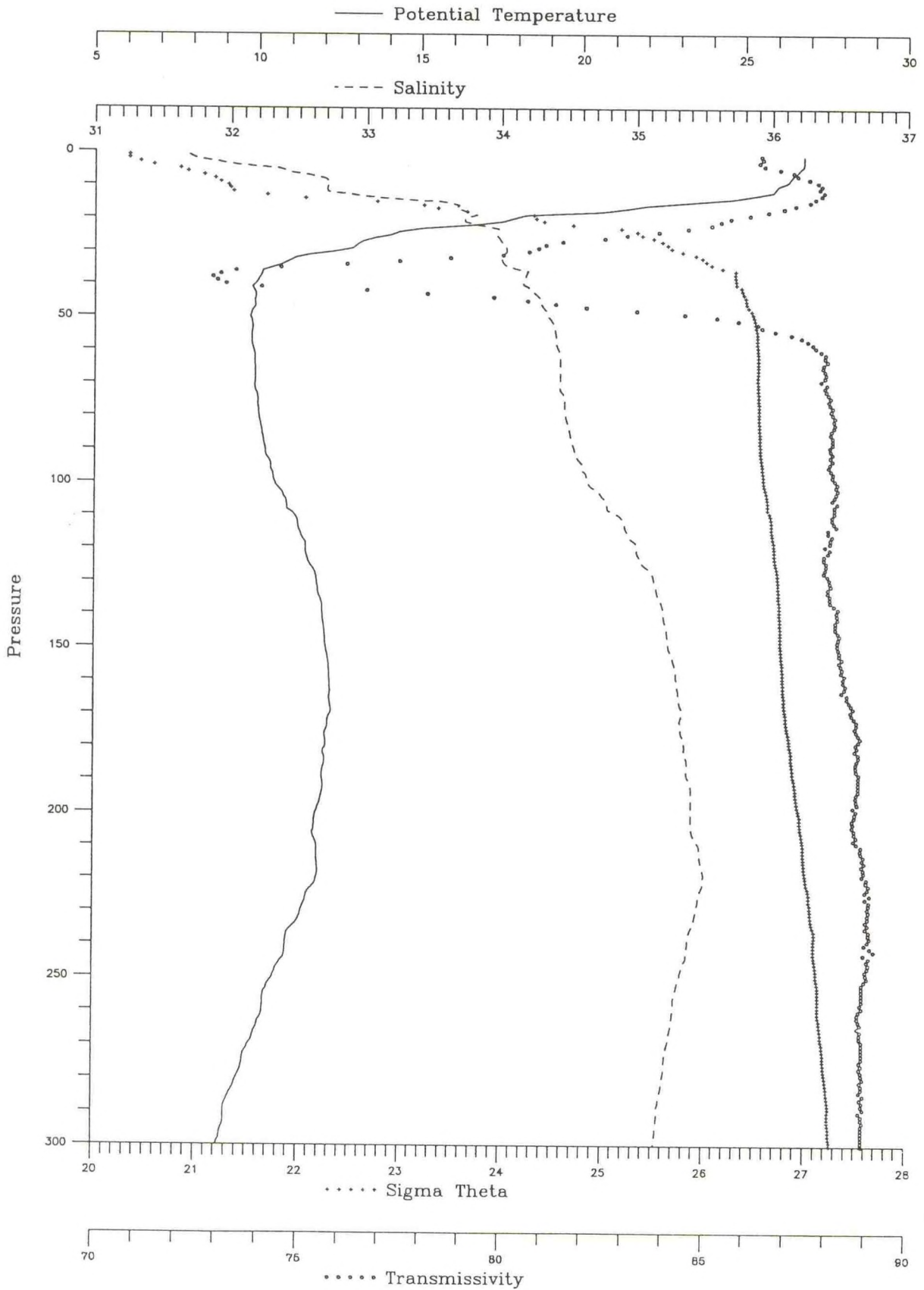


R/V DELAWARE II 90-08 Station: 43 Date: 90/08/16 GMT: 0108 Depth: 2440m
 Position: 36 39.20N 74 00.04W Wind: 12 kts Dir: 095 deg. Air Temp: 25.6C

PR	TE	PT	SA	SO	TR
1	26.7925	26.7921	31.6901	20.3340	86.38
10	26.0044	26.0022	32.7045	21.3038	87.87
20	17.8448	17.8414	33.7266	24.3367	85.63
30	12.3347	12.3308	34.0336	25.7757	80.67
40	9.9001	9.8956	34.1571	26.3118	73.21
50	9.7596	9.7540	34.3509	26.4869	85.29
60	9.8561	9.8493	34.4220	26.5265	87.86
70	9.9012	9.8932	34.4331	26.5278	88.01
80	10.0236	10.0144	34.4752	26.5401	88.21
90	10.2288	10.2183	34.5389	26.5549	88.11
100	10.5271	10.5153	34.6460	26.5867	88.28
125	11.6273	11.6113	35.0586	26.7088	88.01
150	12.1140	12.0943	35.2431	26.7604	88.32
175	12.1169	12.0938	35.3345	26.8315	88.78
200	11.8227	11.7968	35.4123	26.9488	88.75
225	11.5440	11.5152	35.4731	27.0493	89.13
250	10.5375	10.5073	35.3326	27.1236	89.07
275	9.6341	9.6027	35.2250	27.1956	88.89
300	8.8729	8.8403	35.1516	27.2629	88.94

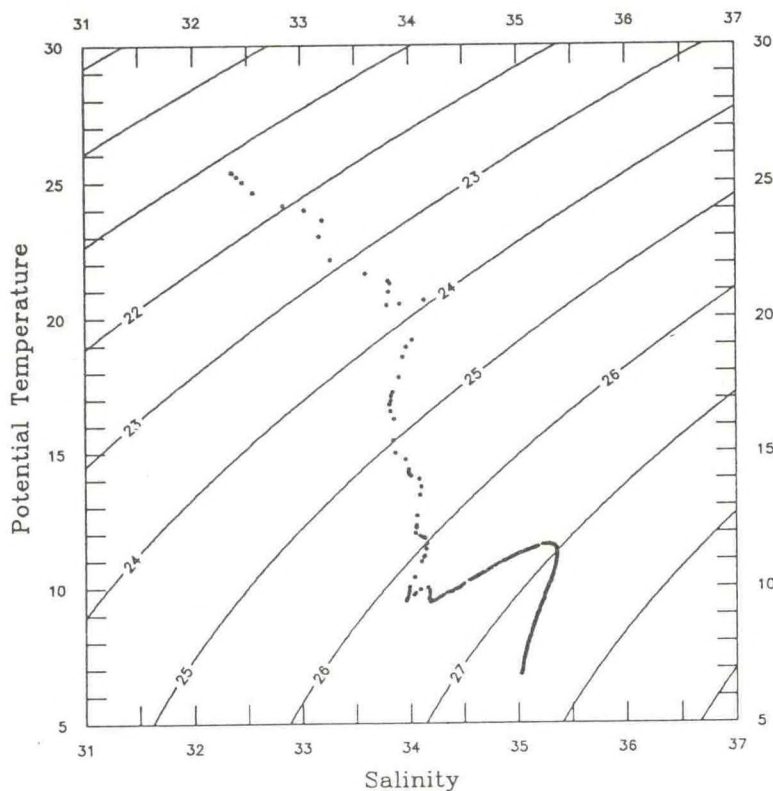


Station 43

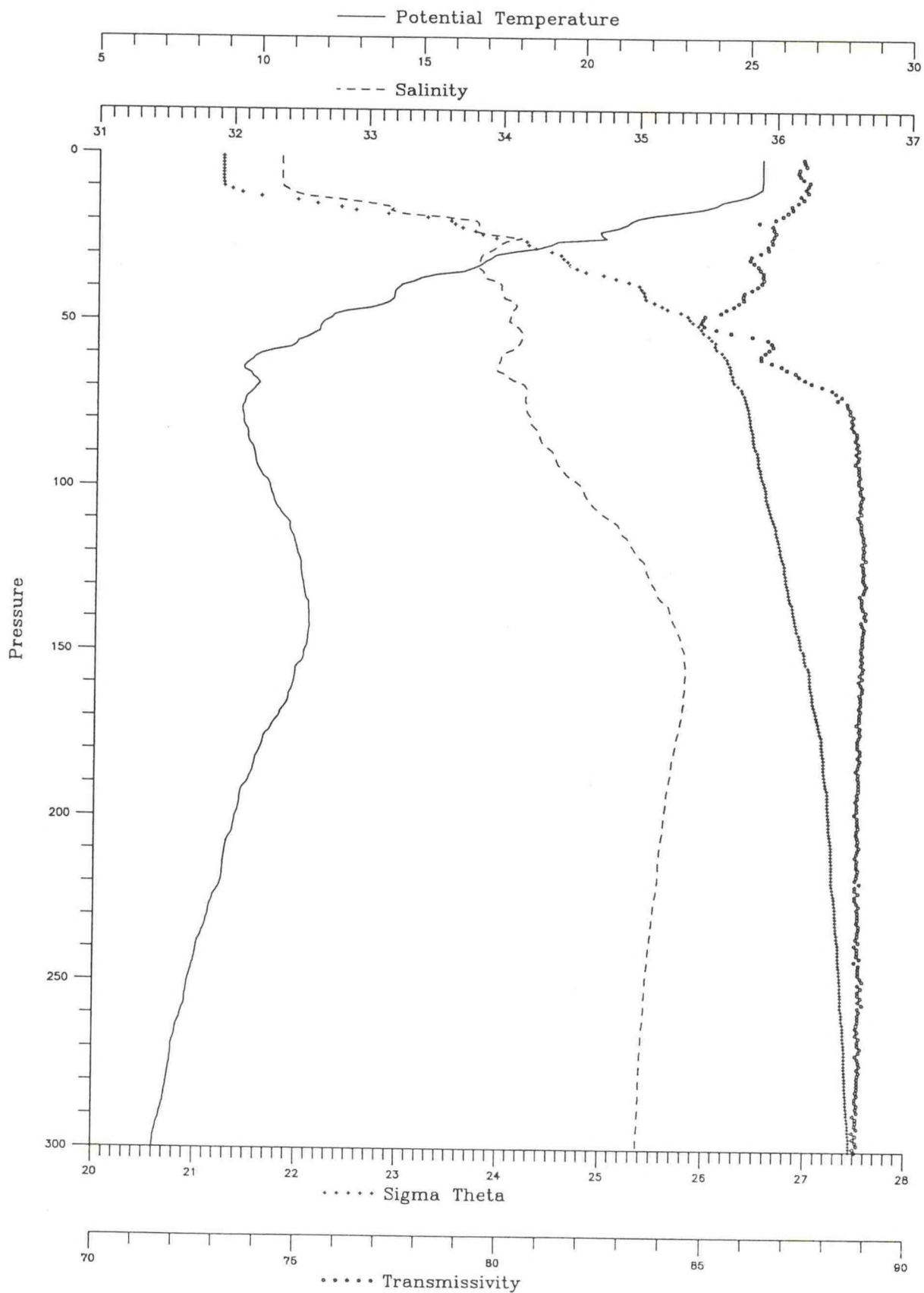


R/V DELAWARE II 90-08 Station: 44 Date: 90/08/16 GMT: 0937 Depth: 2507m
 Position: 37 37.13N 73 23.85W Wind: 8 kts Dir: 120 deg. Air Temp: 24.7C

PR	TE	PT	SA	SO	TR
1	25.3899	25.3880	32.3546	21.2280	87.32
10	25.3708	25.3686	32.3621	21.2396	87.37
20	21.3848	21.3809	33.8059	23.4830	86.23
30	17.2738	17.2689	33.8468	24.5666	86.04
40	14.2672	14.2615	33.9896	25.3522	86.06
50	12.0071	12.0007	34.0496	25.8513	84.83
60	10.0383	10.0314	33.9931	26.1608	86.30
70	9.9062	9.8983	34.1804	26.3295	88.05
80	9.5218	9.5129	34.2114	26.4179	88.58
90	9.8719	9.8617	34.3843	26.4950	88.74
100	10.3704	10.3586	34.5954	26.5746	88.77
125	11.3429	11.3272	35.0678	26.7689	88.89
150	11.4474	11.4284	35.3525	26.9717	88.87
175	10.2893	10.2685	35.3052	27.1443	88.80
200	9.3669	9.3446	35.2109	27.2275	88.79
225	8.6995	8.6755	35.1467	27.2852	88.78
250	7.9562	7.9308	35.0865	27.3525	88.83
275	7.4092	7.3824	35.0511	27.4052	88.84
300	6.9159	6.8877	35.0291	27.4576	88.79

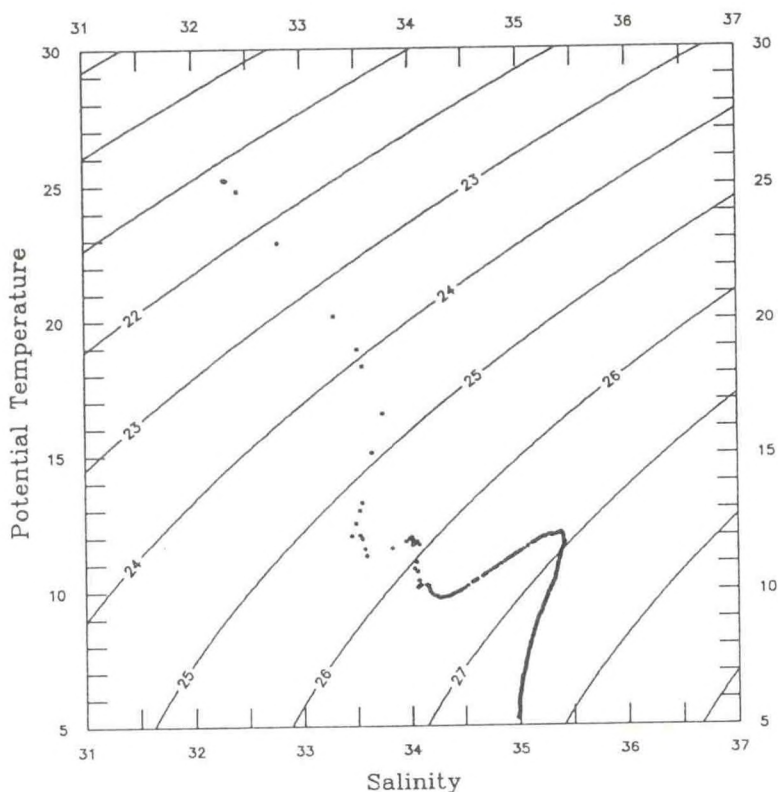


Station 44



R/V DELAWARE II 90-08 Station: 45 Date: 90/08/16 GMT: 1416 Depth: 1630m
 Position: 37 56.08N 73 43.07W Wind: 14 kts Dir: 135 deg. Air Temp: 26.8C

PR	TE	PT	SA	SO	TR
1	25.2302	25.2302	32.2900	21.2300	87.62
10	25.2172	25.2151	32.2961	21.2363	87.70
20	13.2738	13.2710	33.5493	25.2152	84.08
30	11.9448	11.9410	33.9857	25.8130	82.86
40	10.8249	10.8201	34.0292	26.0521	83.76
50	9.9775	9.9718	34.1776	26.3149	87.05
60	9.7985	9.7917	34.3172	26.4543	87.96
70	9.9077	9.8997	34.3954	26.4972	88.38
80	10.3329	10.3235	34.5681	26.5595	88.55
90	10.8180	10.8071	34.7618	26.6253	88.74
100	11.2870	11.2746	34.9406	26.6797	88.75
125	12.0035	11.9872	35.2188	26.7621	88.74
150	12.0393	12.0197	35.4027	26.8988	88.85
175	11.3576	11.3355	35.3737	27.0055	88.74
200	10.6219	10.5977	35.3312	27.1065	88.83
225	9.7275	9.7018	35.2426	27.1927	88.85
250	9.0856	9.0581	35.1732	27.2448	88.80
275	8.5978	8.5685	35.1321	27.2906	88.79
300	7.9027	7.8723	35.0835	27.3589	88.84
325	7.3772	7.3455	35.0540	27.4128	88.89
350	6.8542	6.8214	35.0204	27.4599	88.87
375	6.4249	6.3910	35.0071	27.5076	88.81
400	6.2004	6.1648	34.9983	27.5303	88.75
425	6.0399	6.0025	34.9931	27.5472	88.51
450	5.8586	5.8195	34.9870	27.5656	88.74
475	5.7402	5.6994	34.9901	27.5831	88.55
500	5.4249	5.3830	34.9827	27.6162	88.65

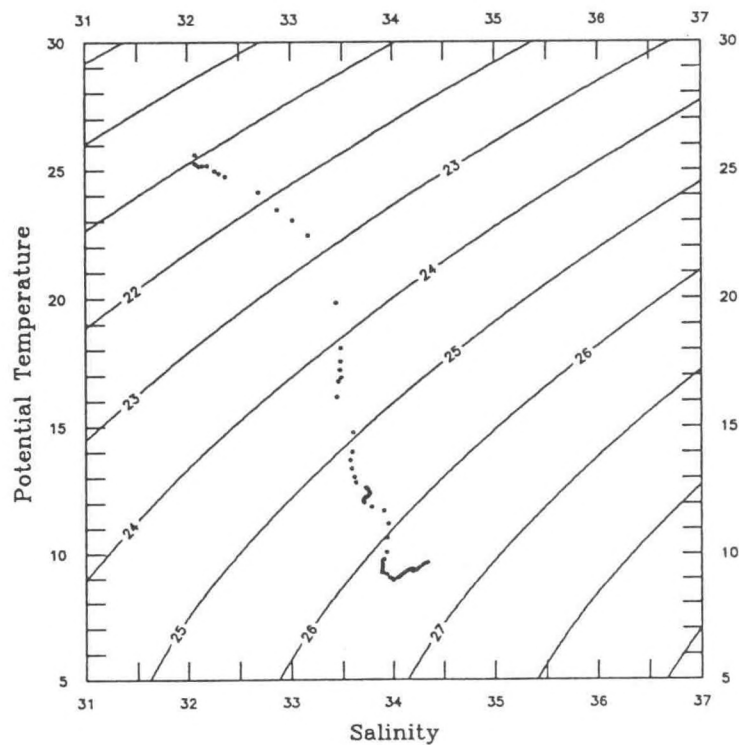


Station 45

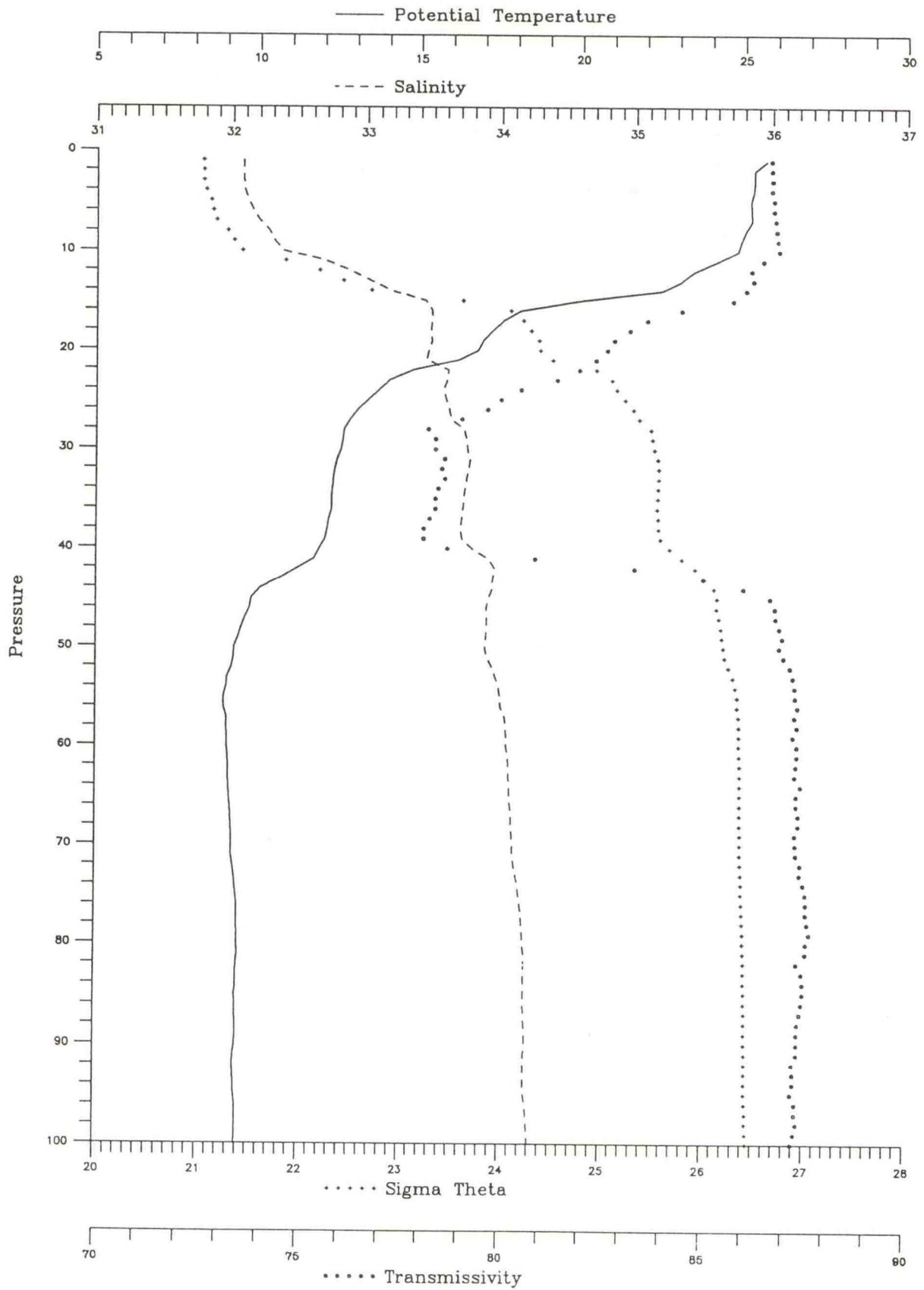


R/V DELAWARE II 90-08 Station: 46 Date: 90/08/16 GMT: 1913 Depth: 118 m
 Position: 38 06.93N 73 55.04W Wind: 04 kts Dir: 125 deg. Air Temp: 27.3C

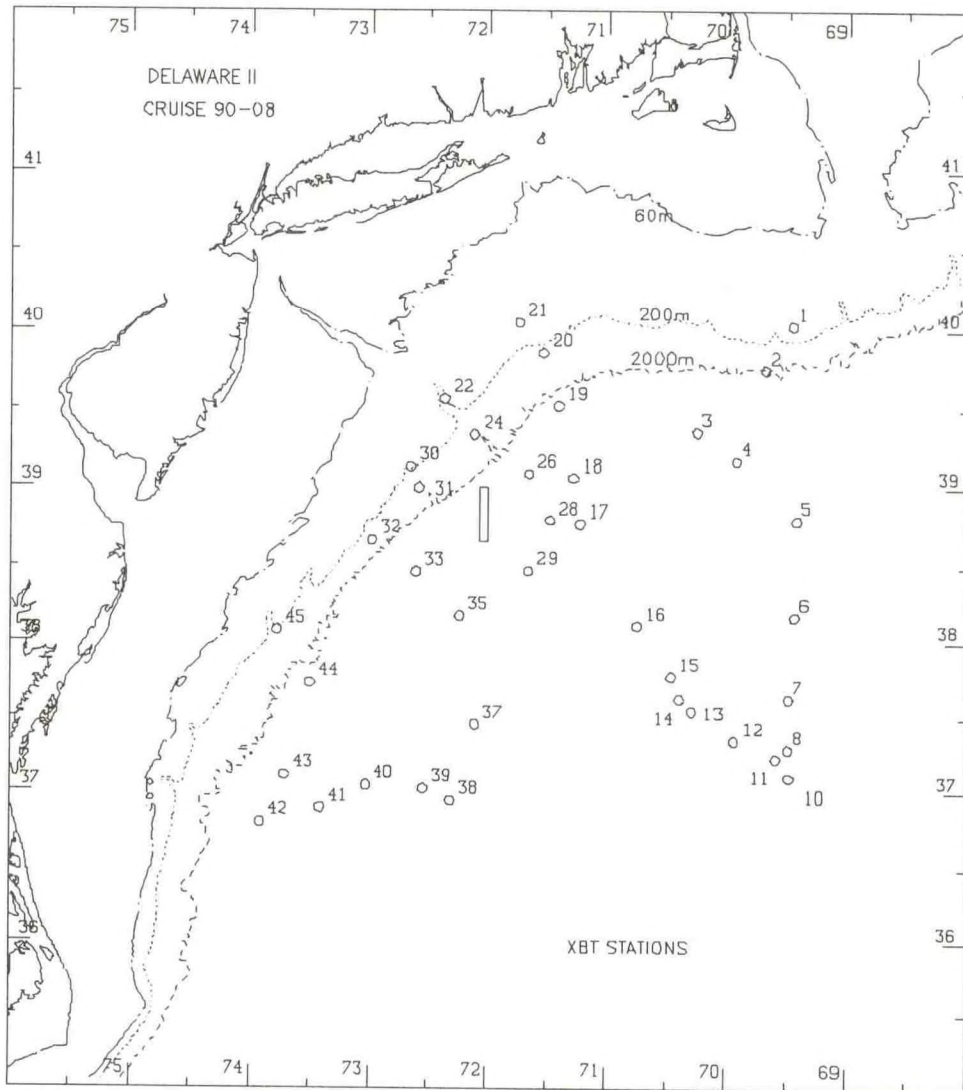
PR	TE	PT	SA	SO	TR
1	25.7292	25.6325	32.0780	21.0400	86.63
10	24.7651	24.7630	32.3672	21.4258	86.82
20	16.7790	16.7758	33.4605	24.3864	82.63
30	12.5460	12.5421	33.7545	25.5186	78.39
40	11.8734	11.8684	33.7909	25.6754	78.69
50	9.2703	9.2649	33.8896	26.2067	86.88
60	9.0575	9.0511	34.0492	26.3658	87.33
70	9.2103	9.2027	34.0998	26.3811	87.30
80	9.4115	9.4027	34.1829	26.4137	87.58
90	9.3688	9.3589	34.2013	26.4352	87.37
100	9.3649	9.3539	34.2284	26.4573	87.24
106	9.6698	9.6579	34.3392	26.4939	87.66



Station 46

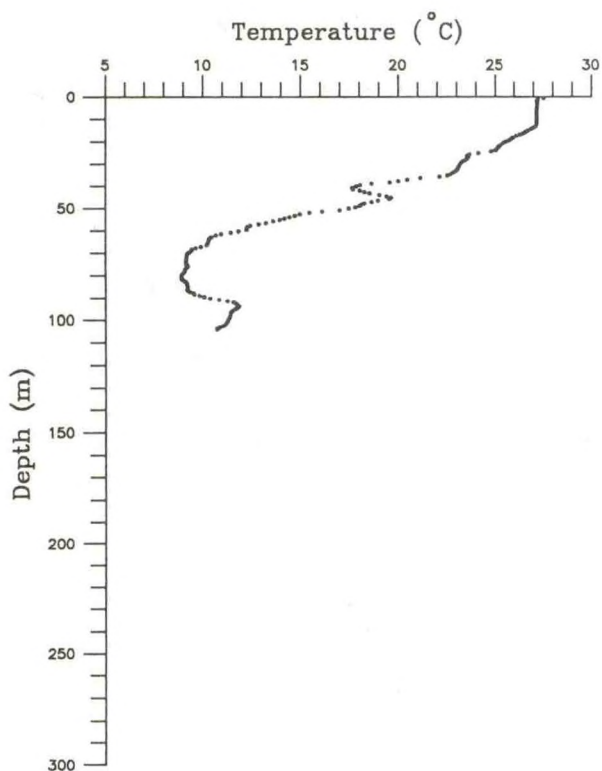


III. XBT DATA

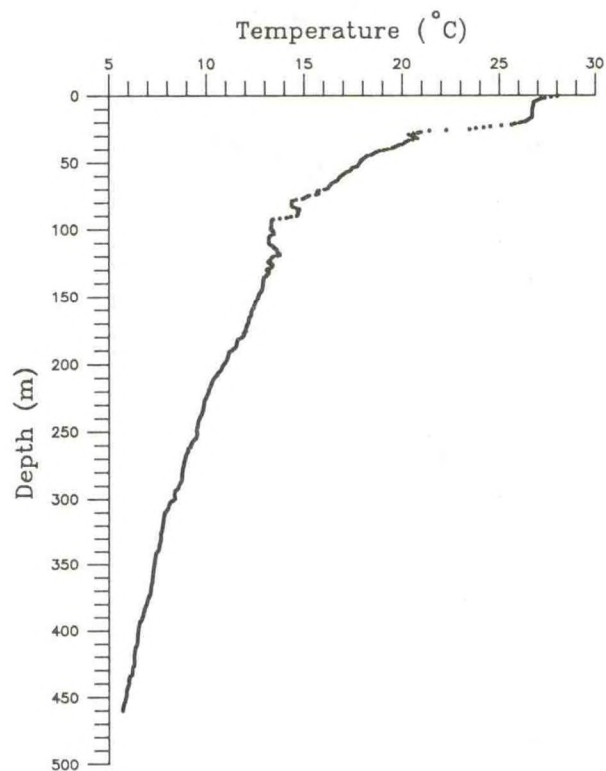


A total of 39 good XBT temperature profiles resulted from the 45 probes deployed (see the station map above). Four temperature profiles per page are presented in what follows, as a function of depth (meters) at a scale of 0 to 500 m for the T4's (450 m) and 0 to 300 m for the T10's (XBT #'s 1, 21, 22, and 30).

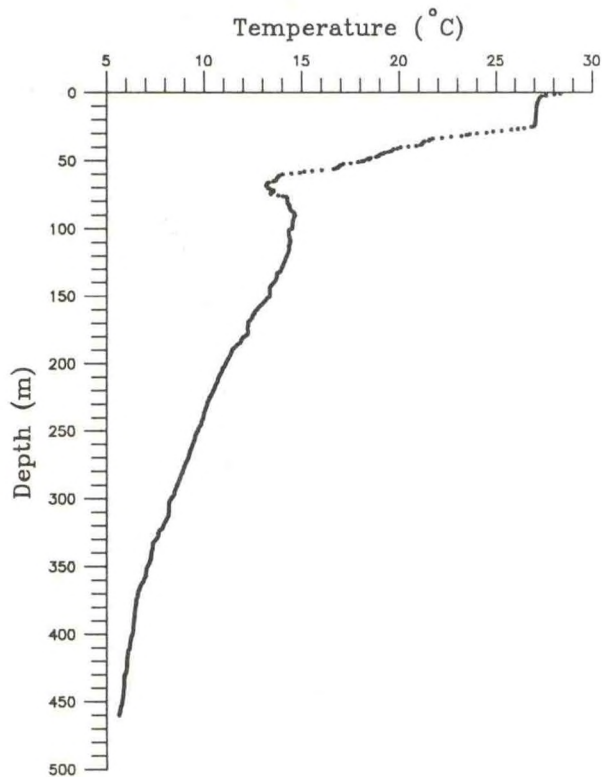
XBT 1



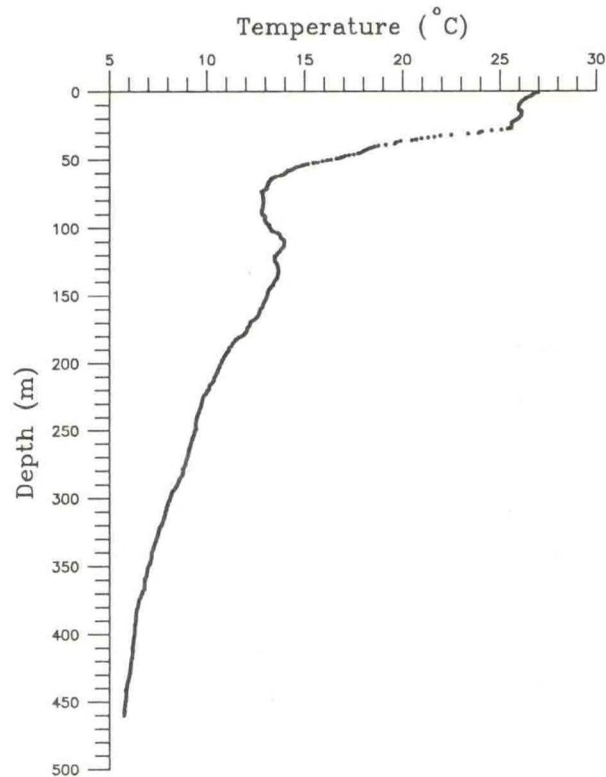
XBT 2



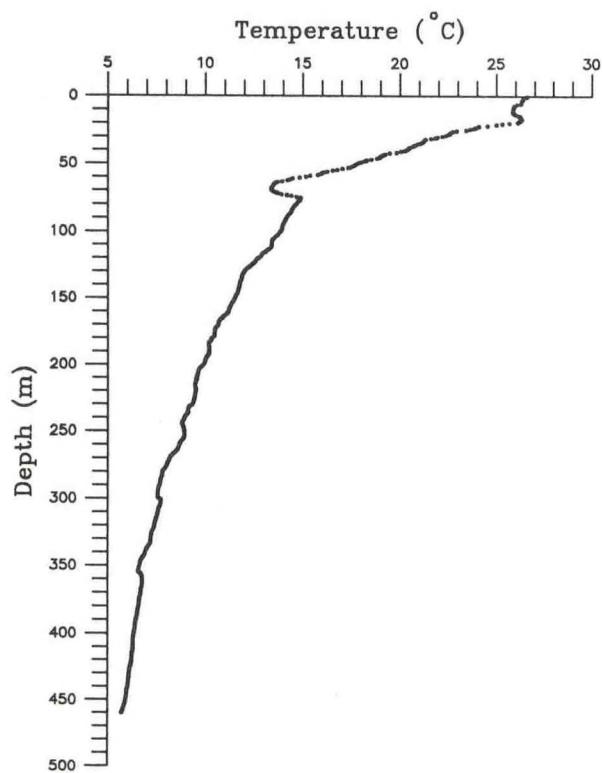
XBT 3



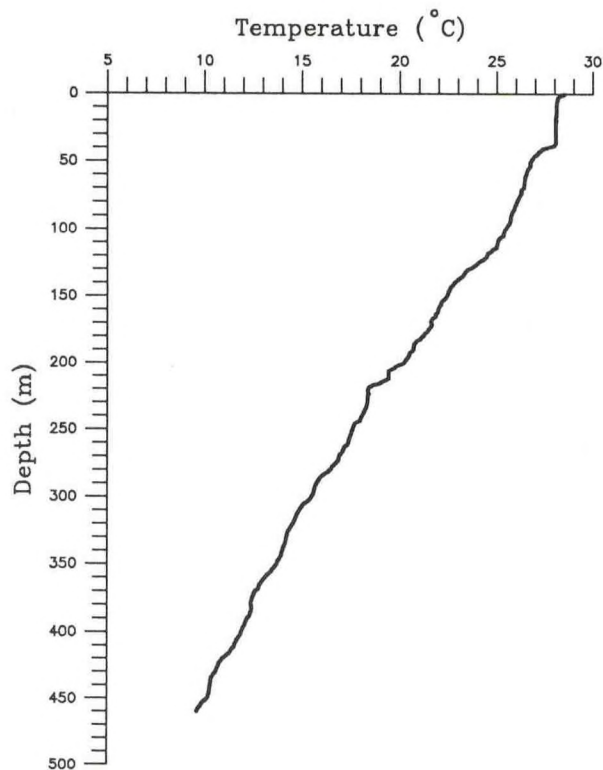
XBT 4



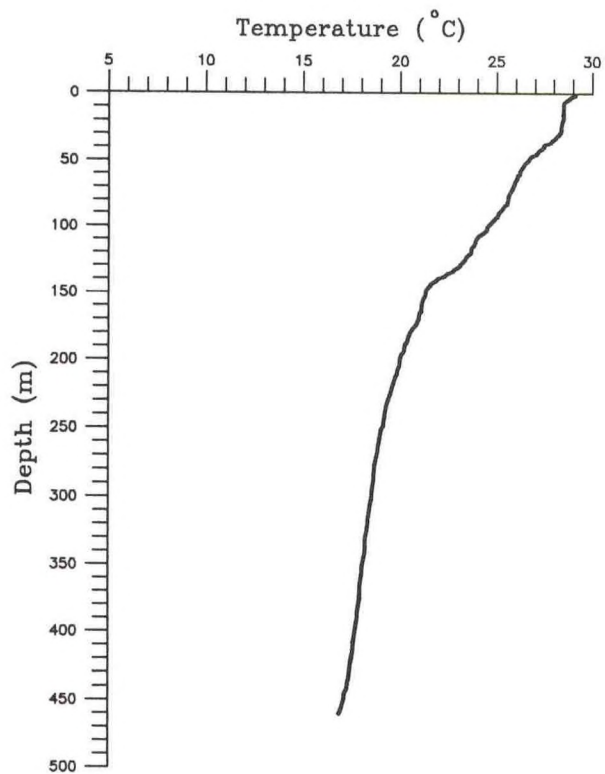
XBT 5



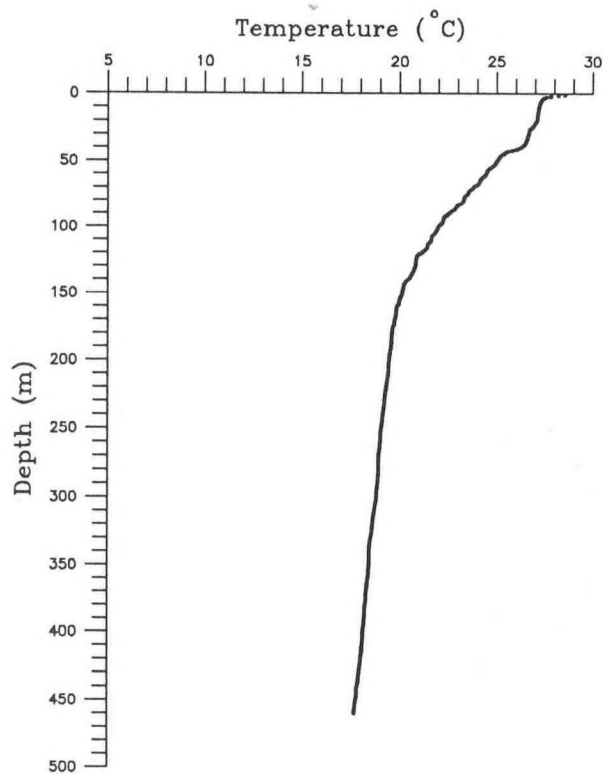
XBT 6

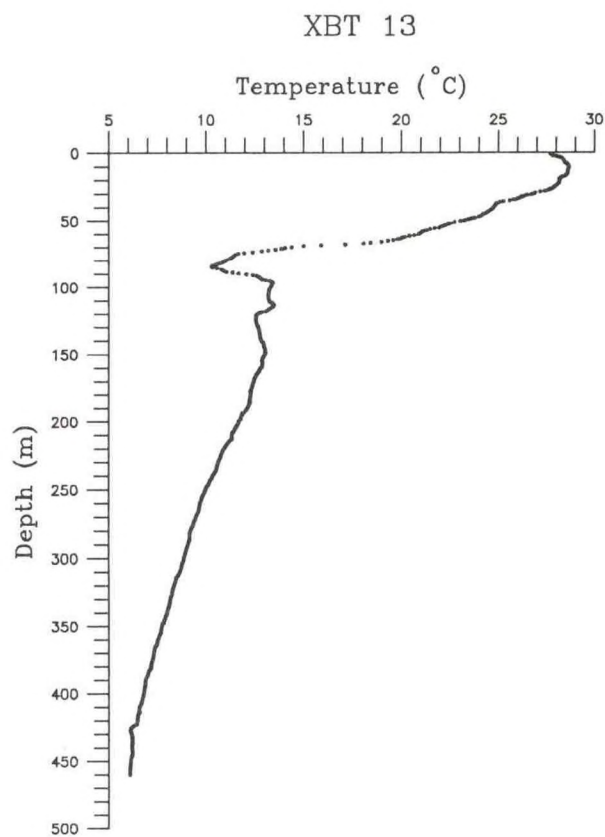
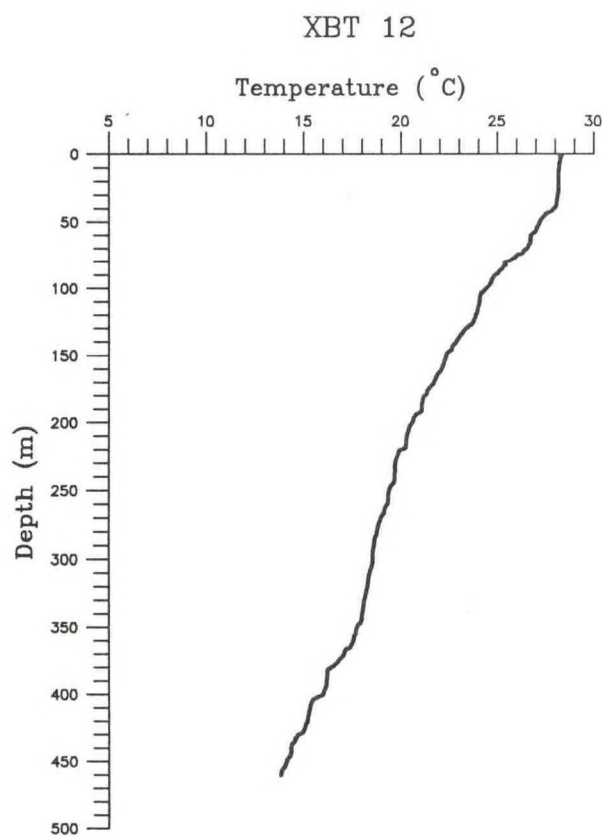
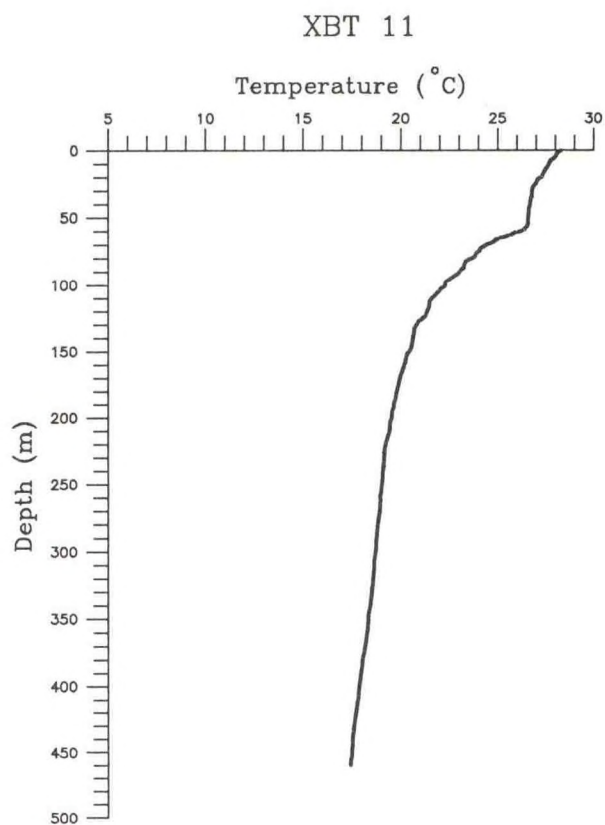
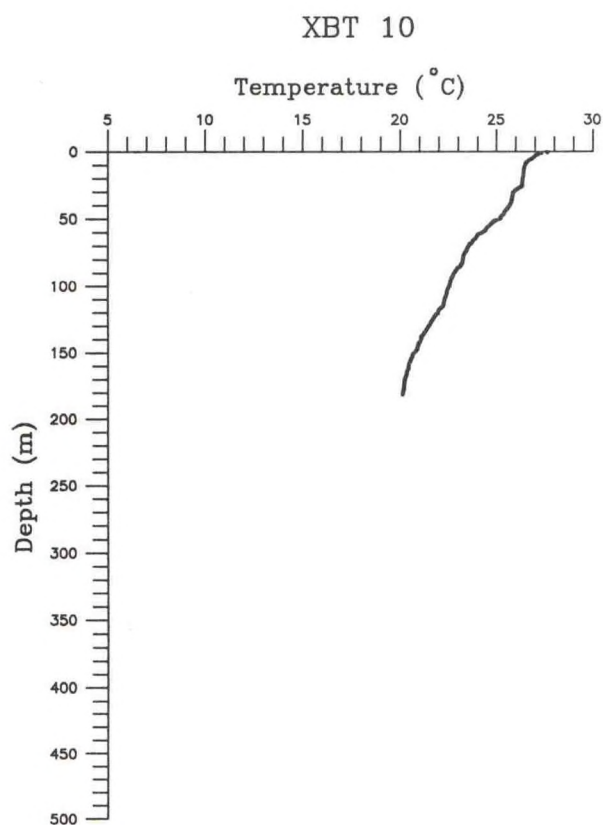


XBT 7

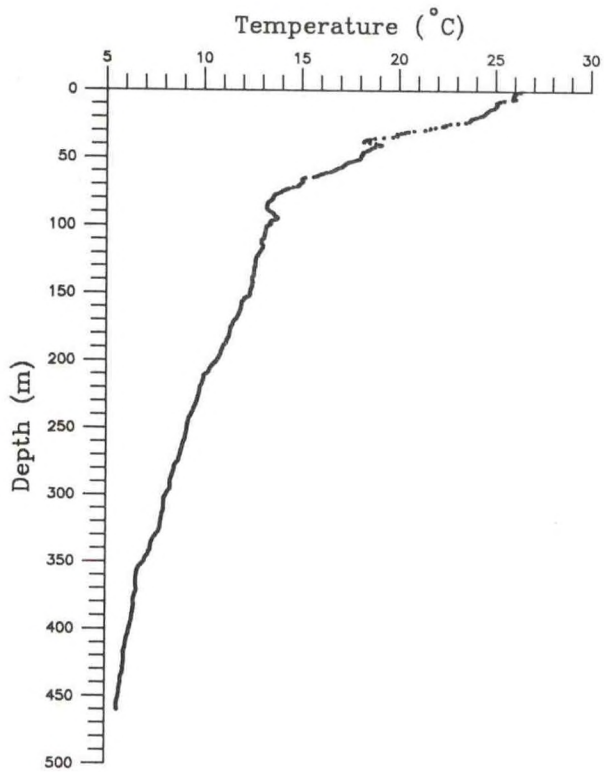


XBT 8

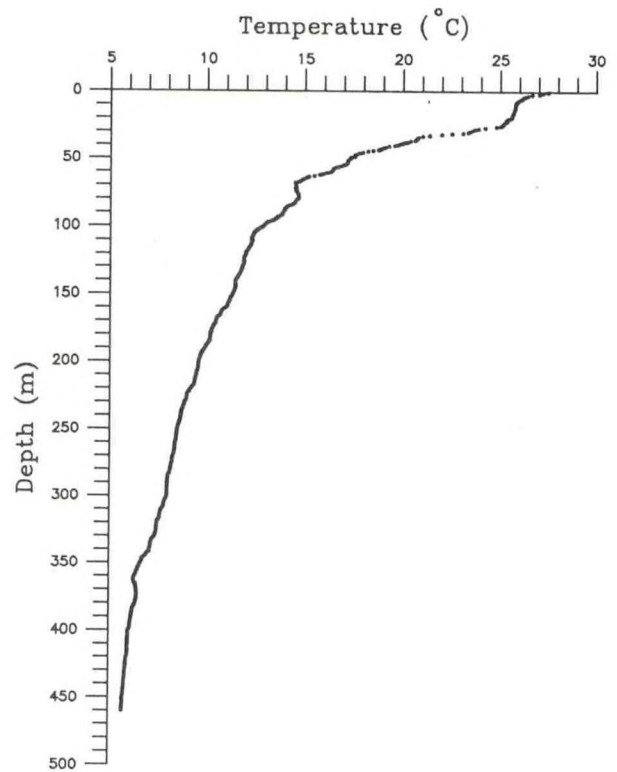




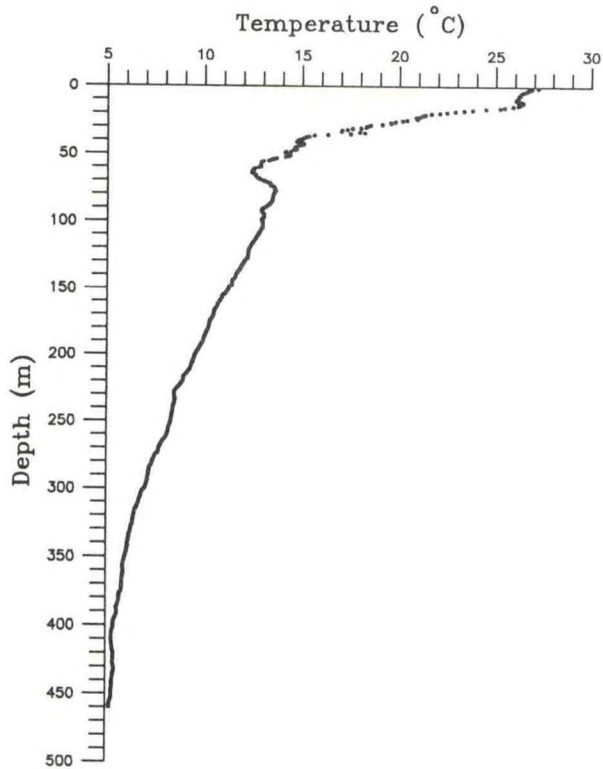
XBT 14



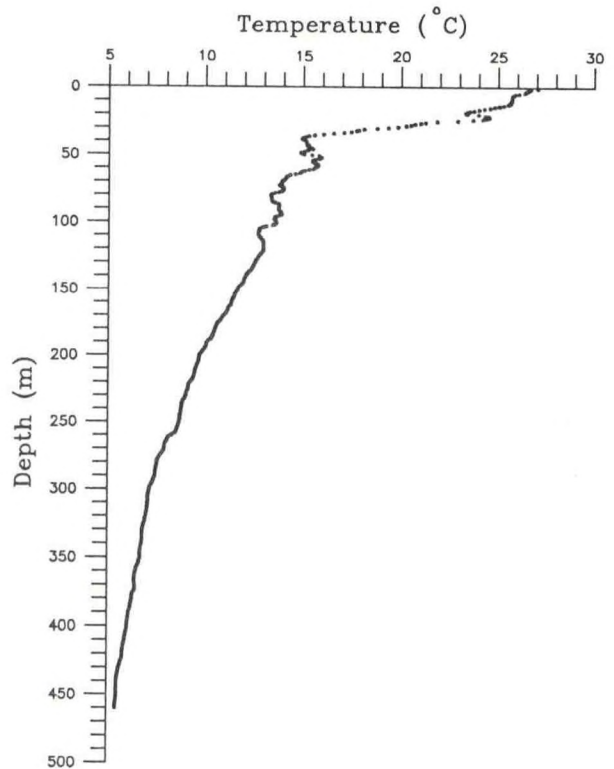
XBT 15



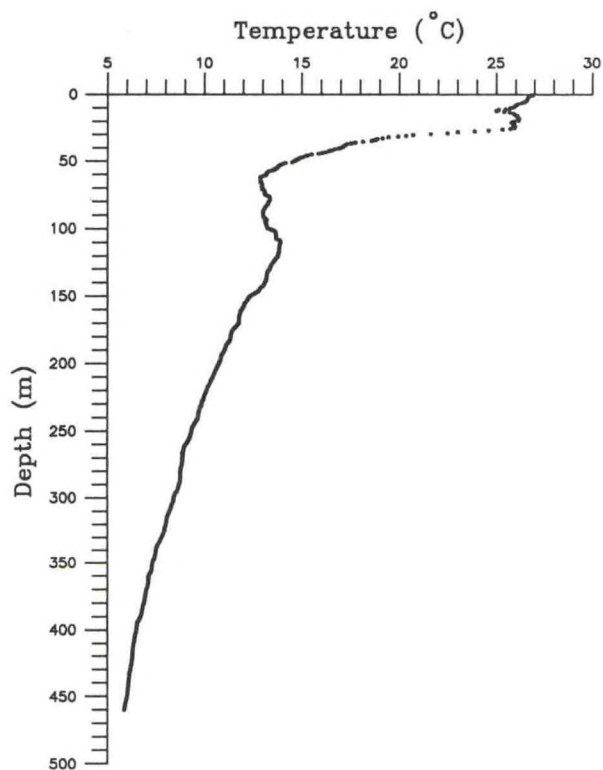
XBT 16



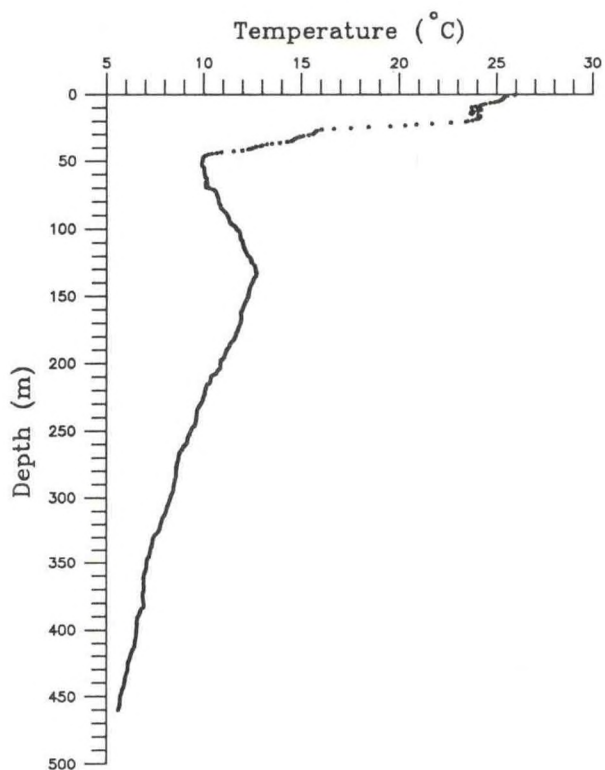
XBT 17



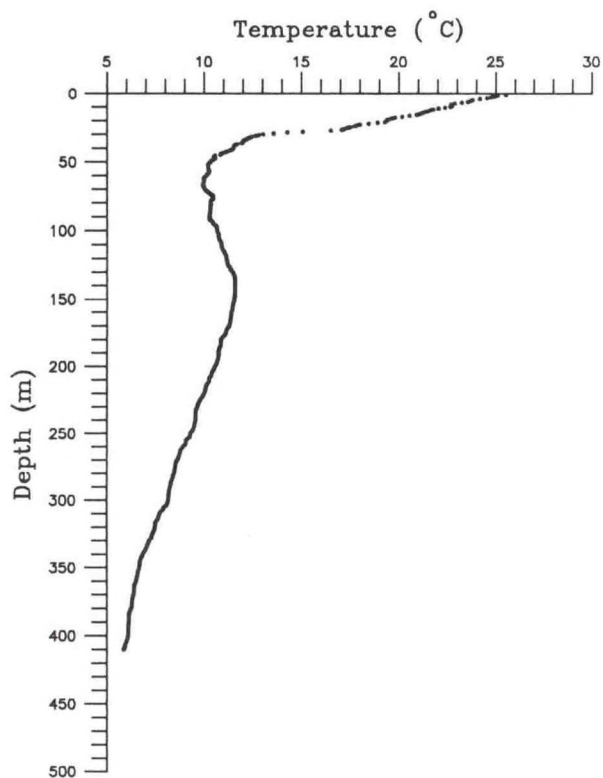
XBT 18



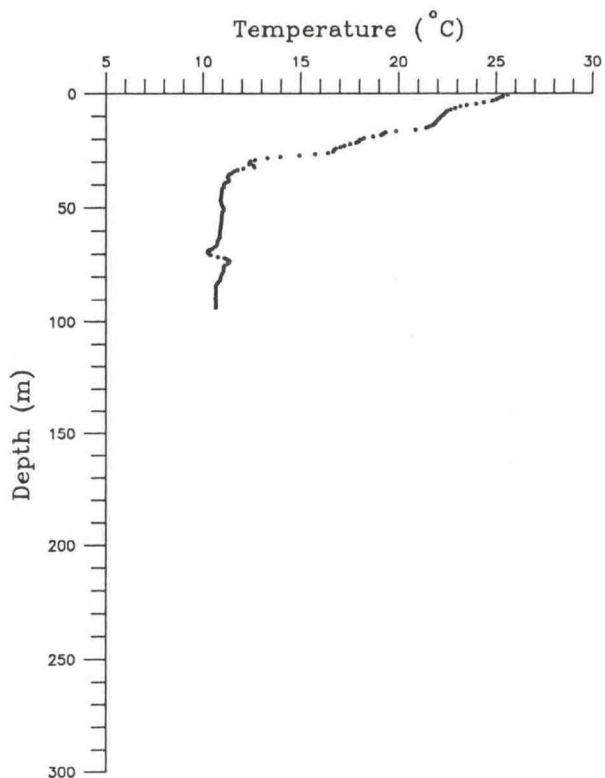
XBT 19



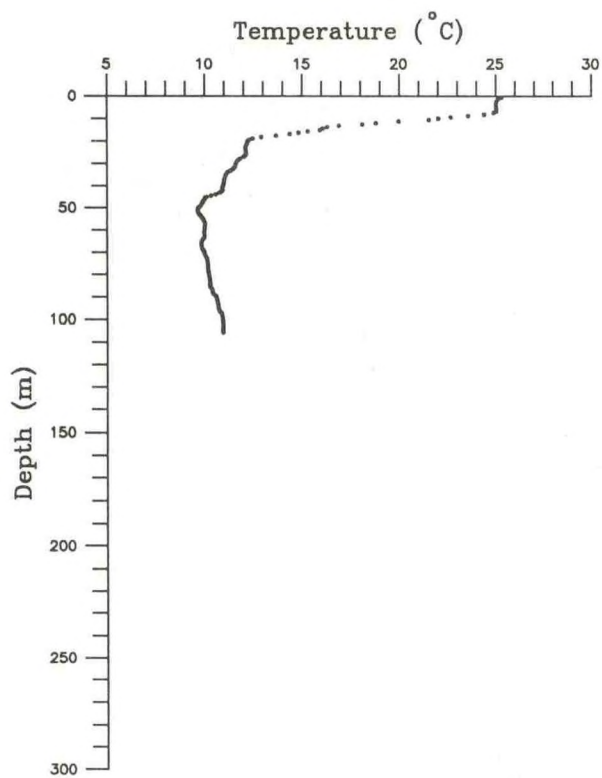
XBT 20



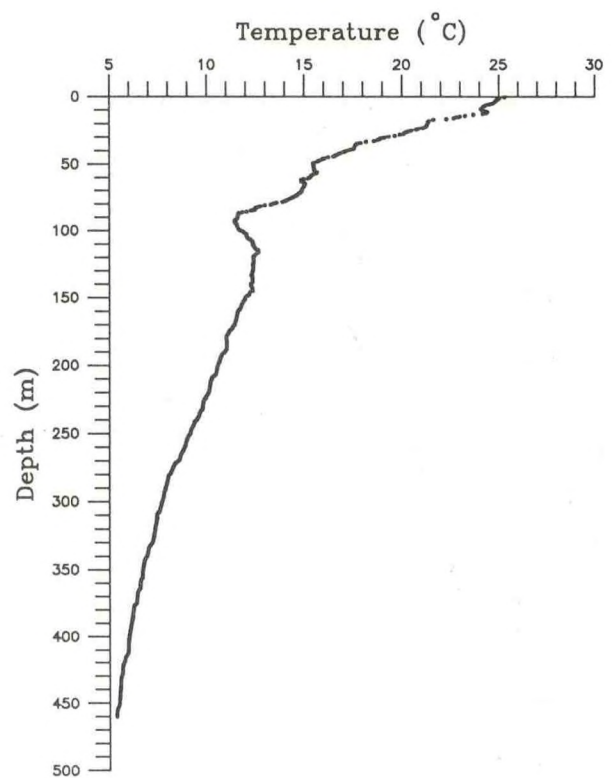
XBT 21



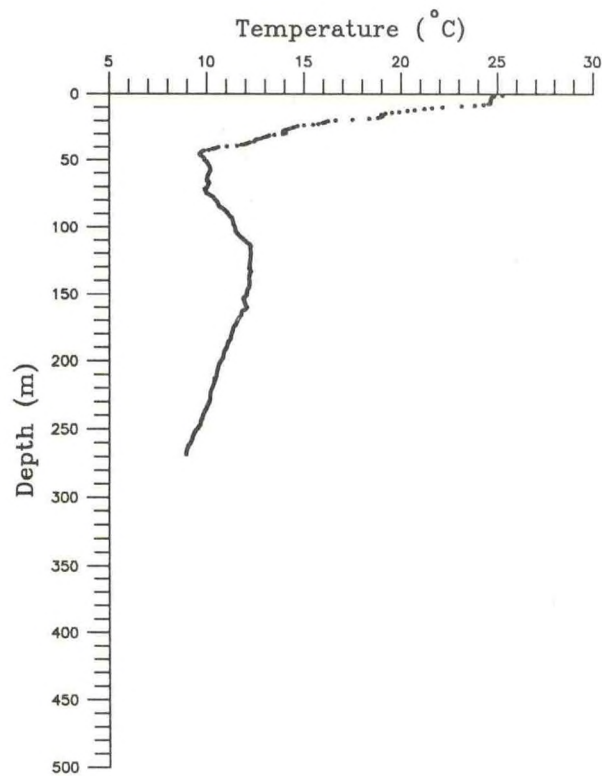
XBT 22



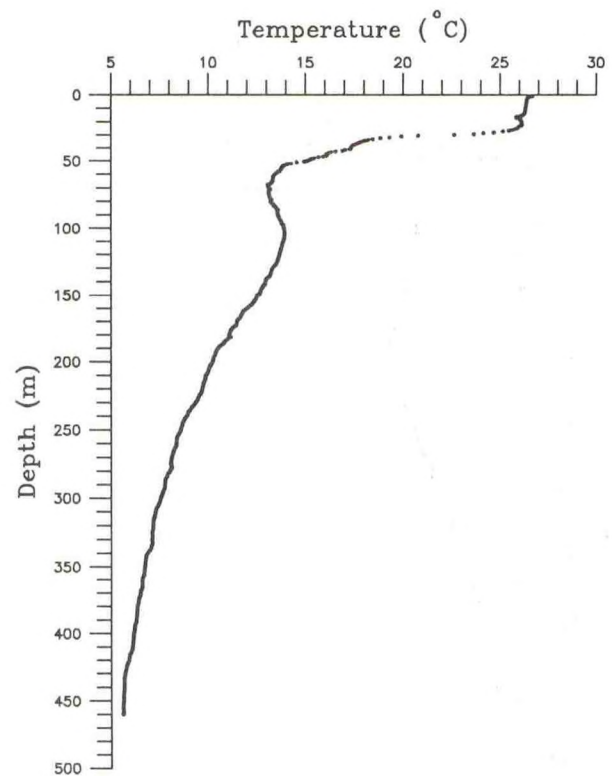
XBT 24



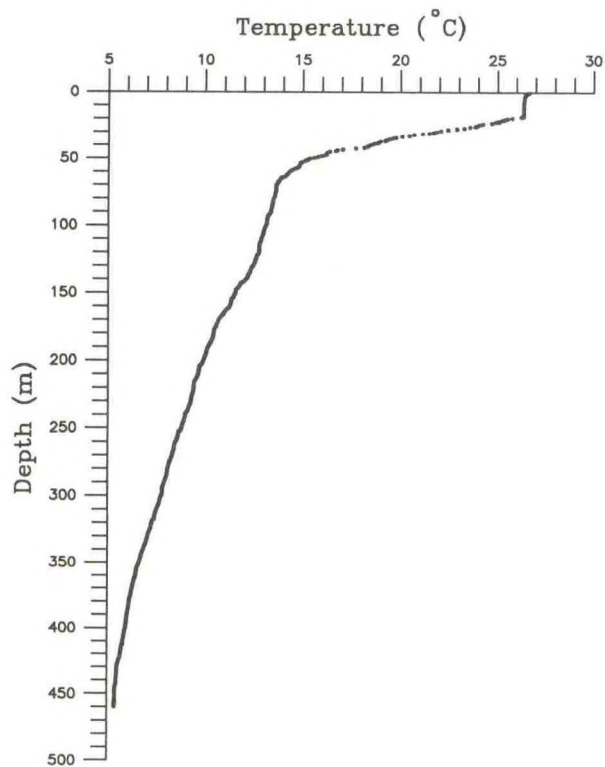
XBT 26



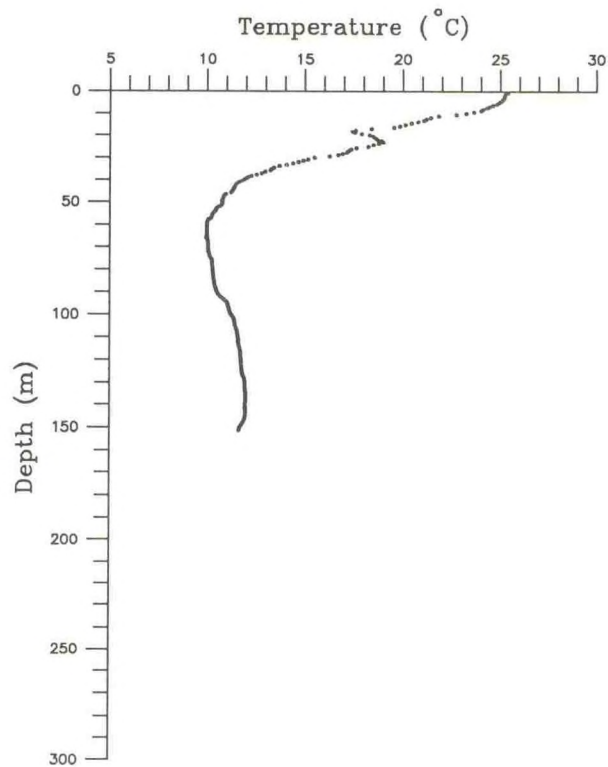
XBT 28



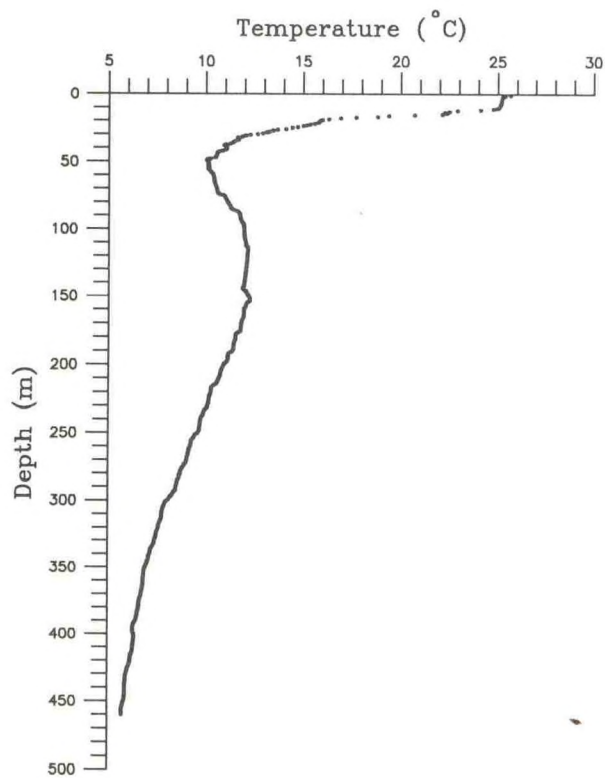
XBT 29



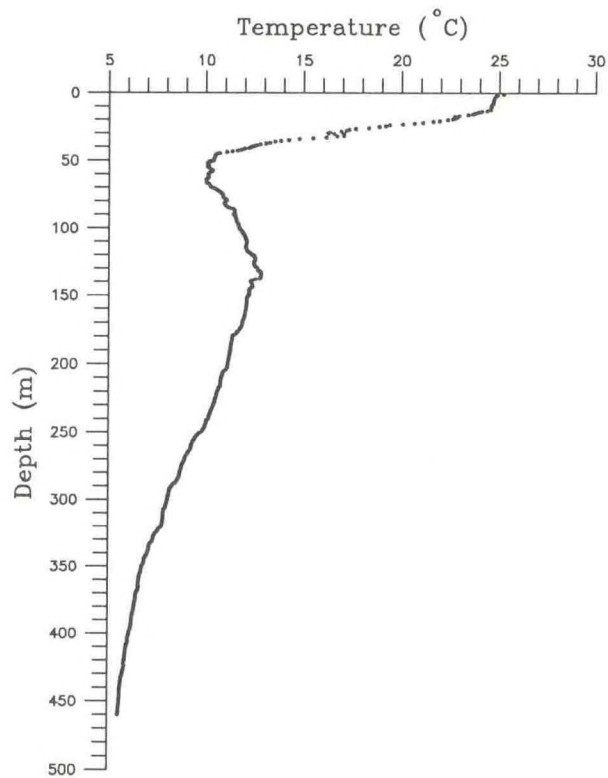
XBT 30



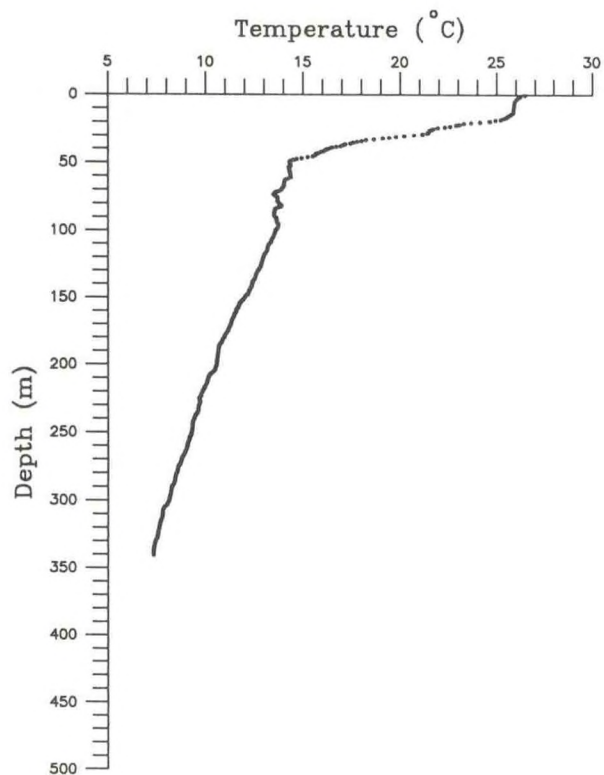
XBT 31



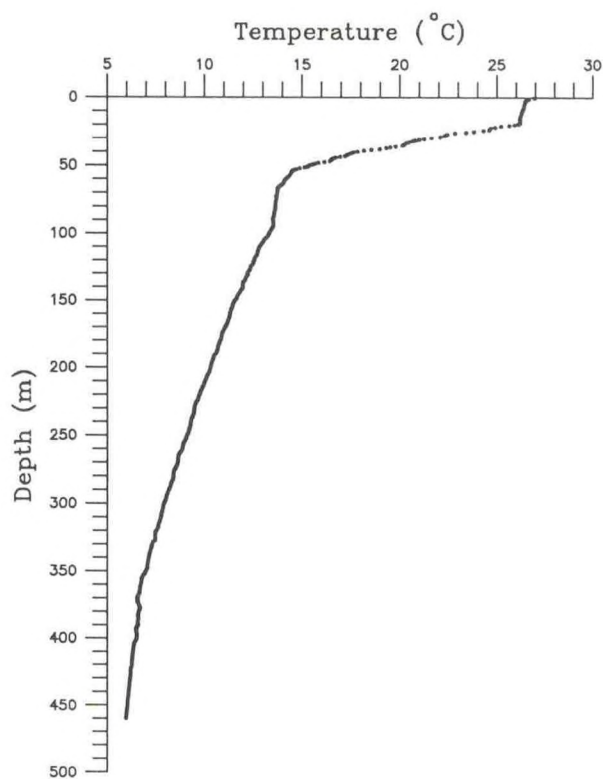
XBT 32



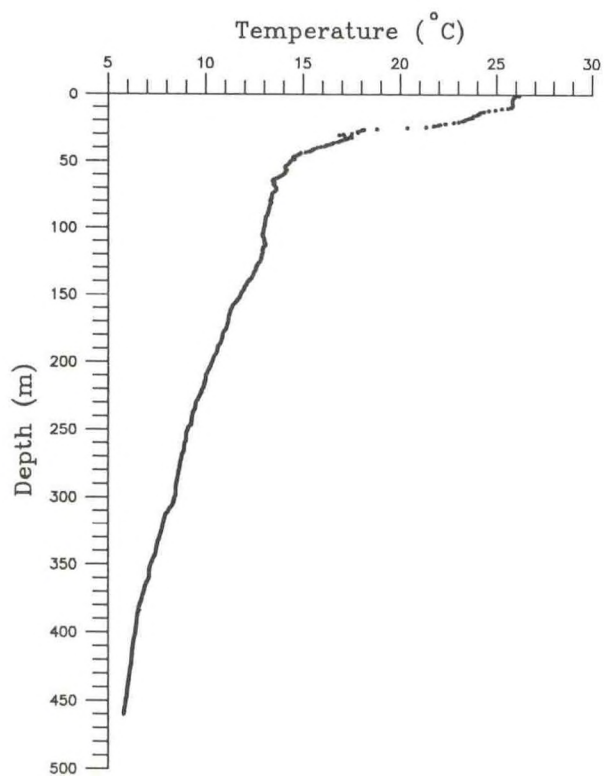
XBT 33



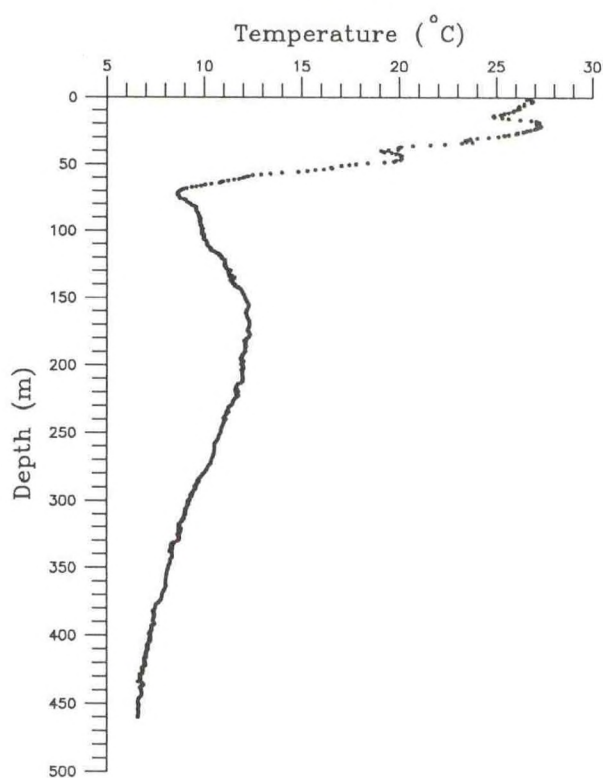
XBT 35



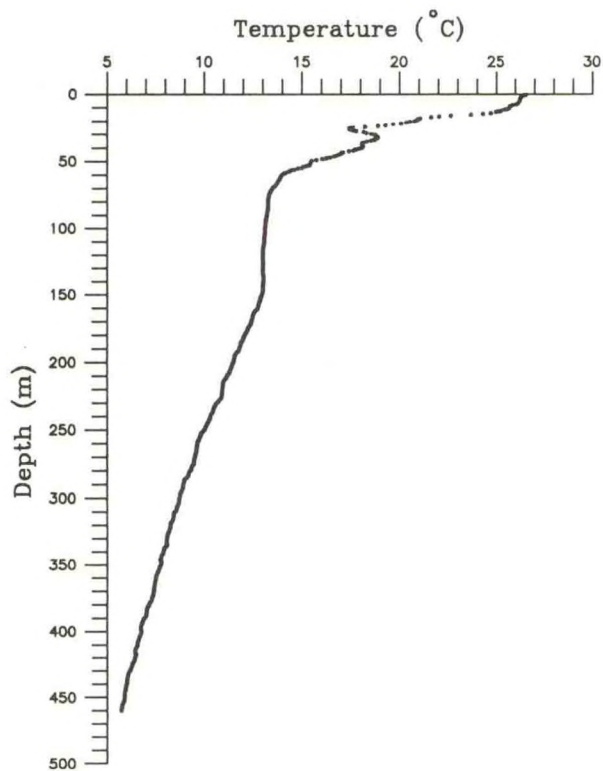
XBT 37



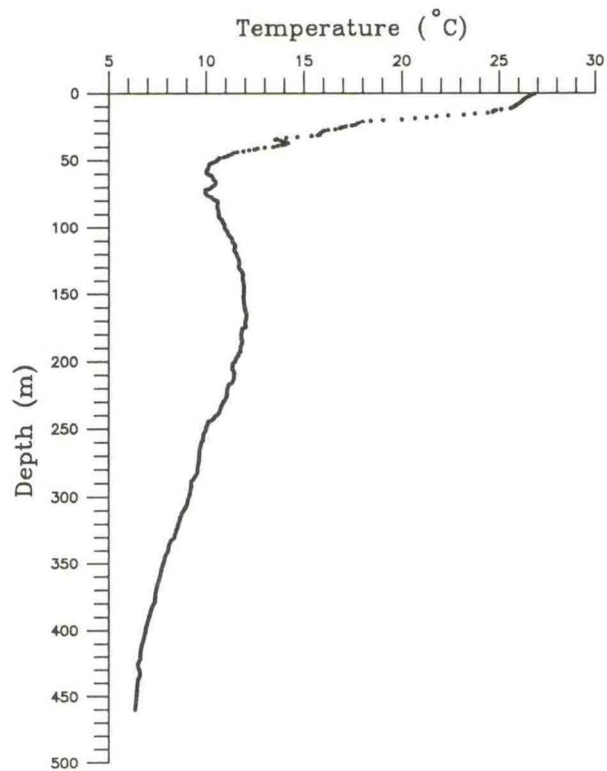
XBT 38



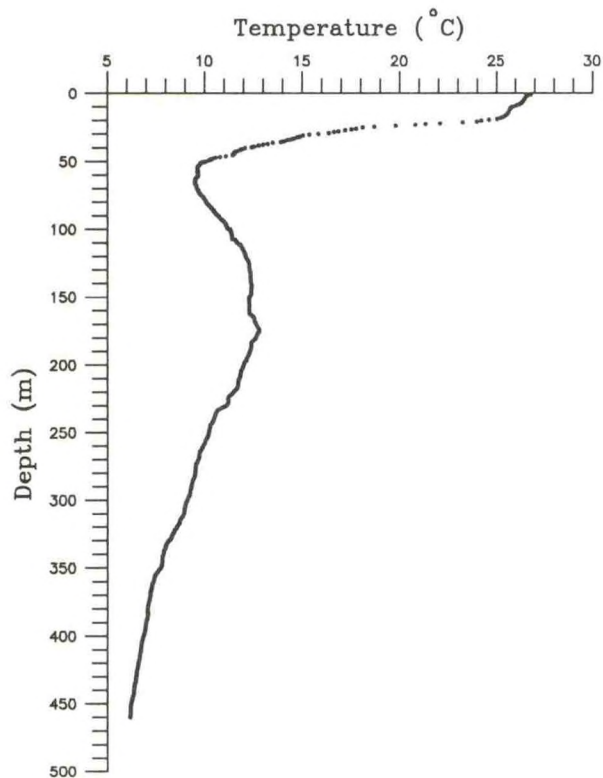
XBT 39



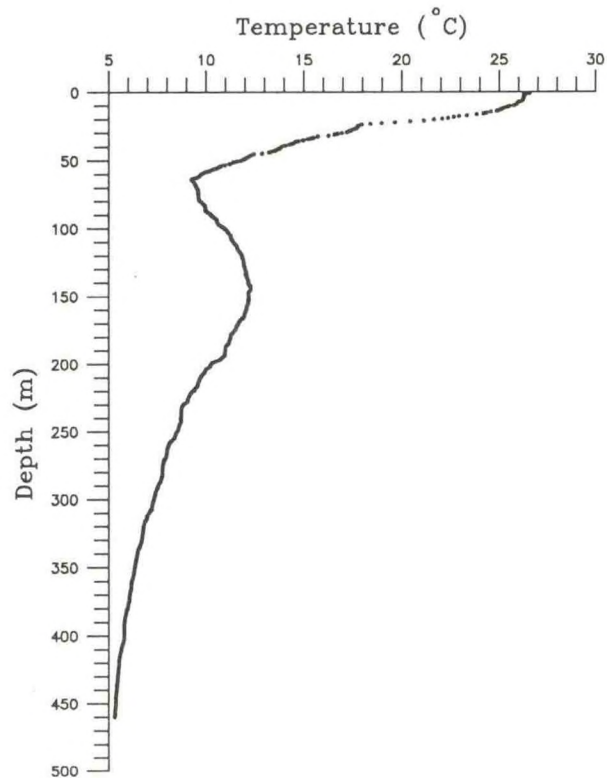
XBT 40



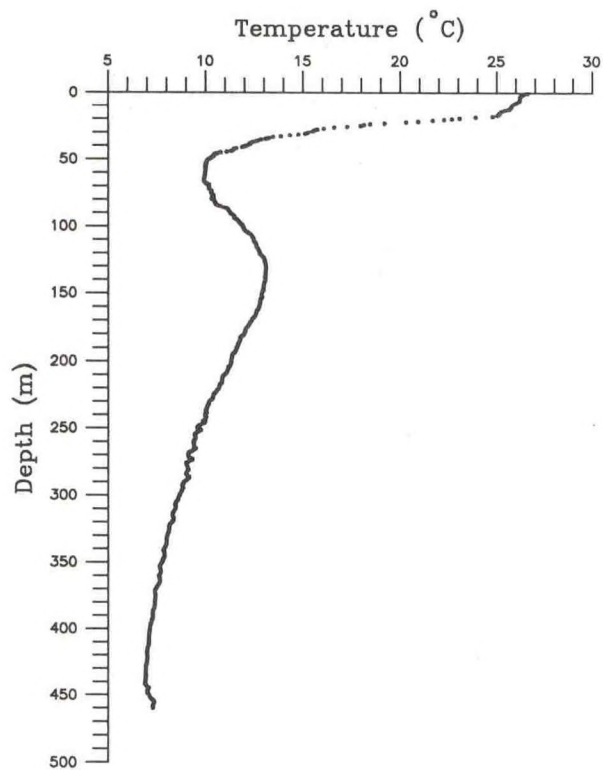
XBT 41



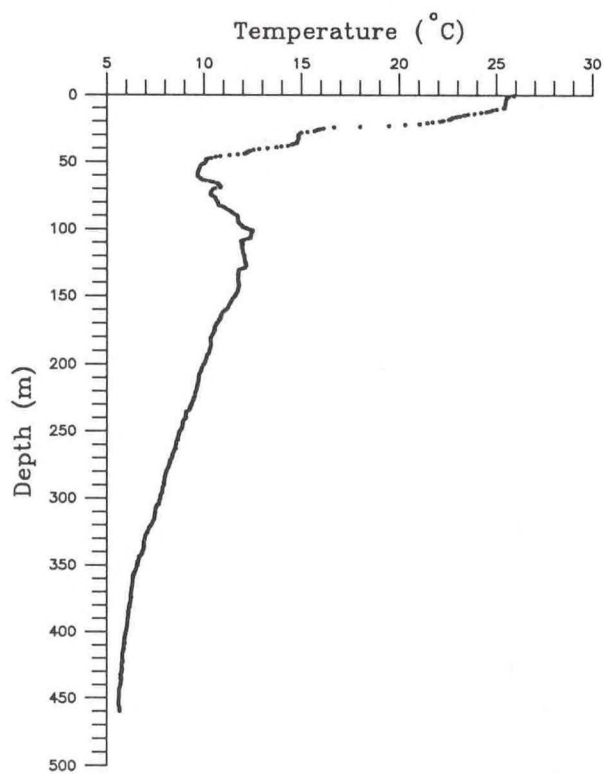
XBT 42



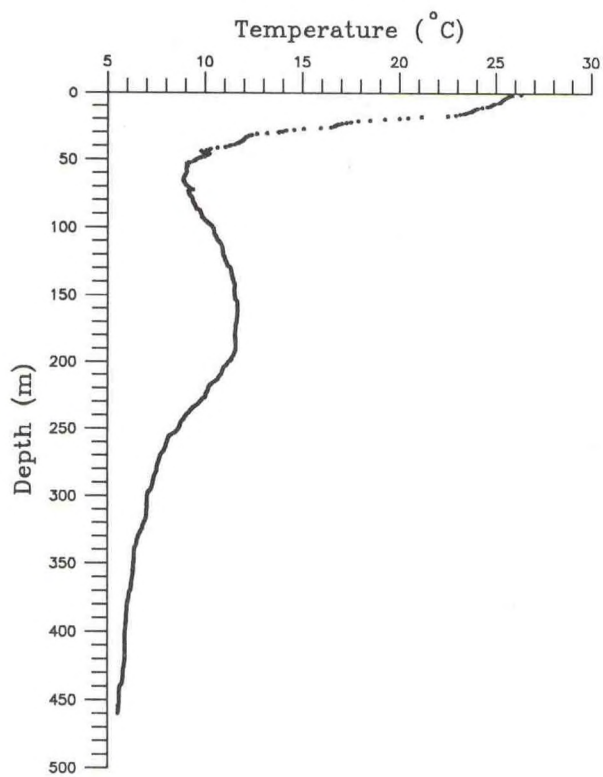
XBT 43



XBT 44



XBT 45



PART 2

HYDROGRAPHIC STRUCTURE

I. PREFACE

In this Part we briefly describe the hydrography and water mass structure during August 1990, primarily through the use of maps and transects from the CTD/TR data of the DELAWARE II 90-08 Cruise. This description is not intended as a complete interpretation of the 3-dimensional water mass structure during this cruise, but as a resource for the chemists and biologists wishing to interpret their results from the analysis of midwater fish in terms of the hydrographic structure.

The 106-Mile Dumpsite is located over the outer continental slope, and it is covered primarily (approximately 67 percent of the time) by slope water (Bisagni, 1985). However, it is not infrequently affected by generally cooler and fresher shelf water (19 percent of the time) or generally warmer and saltier warm core rings (12 percent of the time) (Bisagni, 1985). There were no warm core rings in the vicinity during August 1990; however, as we shall see, the shelf water did extend seaward to the Dumpsite during this survey.

II. MAPS

During summer heating of the surface waters diminishes the surface temperature signature of the shelf-slope front (often referred to as the shelf break front, because it is usually found at the shelf break), the thermohaline feature that separates cooler, fresher shelf waters from warmer, saltier slope waters. August 1990 was no exception, however some temperature structure is evident in Figure 2.1a, which shows the surface (1 m) temperature in plan view based on the CTD stations. Salinity (Figure 2.1b) is a better indicator of the front in summer, and historically the 34 psu isohaline is used to define the front. The surface expression of the shelf-slope front curves across the 106-Mile Dumpsite, from the southwest to the northeast, thus rendering the Dumpsite, in part at least, covered by shelf water. Figures 2.1c and d show the density and transmissivity at 1 m for the same area. Note that temperature and salinity compensate one another in defining the density signature of the frontal region, and it is the salinity field which defines a density field of increasing density offshore. Figures 2.2a,b,c and d show the same parameters at 75 m, and the 75 m salinity map (Figure 2.2b), in particular, indicates the shoreward extension of the shelf-slope front (34 psu isohaline). This is often referred to as the 'foot' of the front, close to where the shoreward sloping front intersects the bottom on its shoreward end. Figure 2.1b (salinity at 1 m) can best be used to describe the rest of the field in the region of this synoptic survey. Stations 4,6 and 41 were taken just shoreward of the Gulf Stream (Station 5 is just seaward of the Gulf Stream), and each of them contains fresher shelf water at the surface. This is shelf water that has become entrained along the northern wall of the Gulf Stream (most likely originating where shelf water is forced to exit the shelf, somewhere north of Cape Hatteras), and is often referred to as 'Ford' water, first described by Ford, et al. (1952). It is not considered to be a steady feature of the stratification in this region, but rather an intermittent feature, thus it may be unusual that this water is found at each out of the three stations taken close to the north wall of the Gulf Stream during this survey.

III. TRANSECTS

Seven transects (Figure 2.3) are constructed from this cruise. For each of the seven transects we present (a) potential temperature ($^{\circ}\text{C}$); (b) salinity (psu); (c) potential density (sigma theta units); and (d) transmissivity (% transmission) sections as a function of pressure (dbar) and distance (km) offshore from the most shoreward station of each transect (Figures 2.4, 5, 6, 7, 8, 9, and 10).

Each transect reveals the dominant feature of the summer stratification, the seasonal thermocline, which extends from the shelf, across the shelf break and slope to the Gulf Stream. Over the shelf the thermocline extends from roughly 10 to 40 m depth, and caps the remnant cooler near-bottom water of winter, the cold pool. The 'nose', or seaward extent, of the cold pool extends out over the shelf break to varying degrees, depending on which transect we consider. The shelf-slope front is best defined in the salinity field during the summer, because its temperature expression is overwhelmed by the seasonal thermocline in the upper 40 m.

Here we will describe the cross-shore stratification by considering each transect in turn.

TRANSECT 1: A sparsely defined transect (Figures 2.4a,b,c,d) of four stations extending from the outer shelf to seaward of the Gulf Stream. Stations 1 and 2 crudely define the shelf-slope frontal region below 20 m depth. Unusually salty (36 psu) water is found in the surface mixed layer at both these stations, indicative of possible Gulf Stream influence on the outer shelf (see Figures 2.1a and b). Stations 4 and 5 straddle the Gulf Stream, with Station 4 revealing low salinity 'Ford' water over the upper 50 m of the water column just shoreward of the Gulf Stream. Station 5 is just seaward of the Gulf Stream in Sargasso Sea water.

TRANSECT 2: The surface expression of the shelf-slope front occurs between stations 8 and 9 (Figures 2.5a,b,c,d), with the freshest (32.3 psu) surface water found at station 9. This is because the front turns shoreward northeast of station 9 and influences station 10 (see Figure 2.1b). The 'nose' of the cold pool is evident at station 10, centered at about 50 m depth. An apparently independent bolus of shelf-like water is evident at station 8, below the thermocline and centered at 50 m depth. This could be evidence of the process of 'calving' (Cresswell, 1967) of shelf water boluses into the slope water mass, but is more likely evidence of the 3-dimensionality of the convoluted shelf-slope frontal region (see Transect 4).

TRANSECT 3: The shelf-slope front extends further offshore in this transect (Figures 2.6a,b,c,d), breaking the surface between stations 13 and 14. Further shoreward the front is evident again at the surface between stations 11 and 12, because of the convoluted nature of the front (see Figure 2.1b). The pycnocline (thermocline) is shallower over the shelf, where it sits above the cold pool. Between stations 13 and 14 the pycnocline deepens slightly, marking the transition from shelf to slope water. There is some evidence of a salinity maximum in the pycnocline (Gordon and Aikman, 1981) over the outer shelf, which can represent a mechanism for the transport of slope water characteristics onto the shelf during the stratified summer season (Aikman and Posmentier, 1985).

TRANSECT 4: This is the most densely sampled transect (Figures 2.7a,b,c,d) and dissects the convoluted frontal region as it twists across the Dumpsite. What appears to be a seaward bolus of cold pool water centered at 50 m depth between stations 30 and 18 is in fact shelf water that is still attached to its parent water mass. The front intersects the surface between

and 22 and a pycnocline salinity maximum is evident at these same stations, indicative of the shoreward transport of salt in the seasonal pycnocline.

TRANSECT 5: This, the longest transect, extends from the outer shelf, across the shelf break, slope and Gulf Stream (Figures 2.8a,b,c,d). The shelf-slope front is apparent between the two most shoreward stations (35 and 36). Stations 24, 28 and 16 intersect the southwestern extent of the shelf filament that turns offshore further upstream, and the hydrographic signature of this feature is a confusing series of interleaved layers of shelf and slope waters extending to greater than 100 m depth. 'Ford' water is again apparent at station 6, down to a depth of approximately 50 m, and with a surface salinity of 32.65 psu just shoreward of the north wall of the Gulf Stream.

TRANSECT 6: The shelf-slope front intersects the surface between stations 37 and 38 in this transect (Figures 2.9a,b,c,d), with the 'nose' of the cold pool barely evident at station 37.

TRANSECT 7: The surface expression of the shelf-slope front is not evident in this transect (Figures 2.10a,b,c,d). The 34 psu isohaline extends seaward of station 42, and thus this part of the front is unresolved. The cold pool is evident at the three inner stations (46,45 and 44), but not seaward of station 44. Although not resolved by this data, it's possible that the seaward extension of the shelf-slope front here represents the act of shelf water exiting the continental shelf and being entrained along the inner edge of the Gulf Stream (as witnessed by the presence of shelf water along the inner edge of the Gulf Stream at stations 41, 6 and 4).

IV. FIGURES

The following figures present the maps (plan views) and transects constructed from the CTD/TR data of the DELAWARE II 90-08 cruise. These figures have been referred to throughout the preceding text of PART 2, describing the hydrographic structure.

MAPS

The eight maps which follow represent the horizontally contoured fields of temperature, salinity, potential density and transmissivity at two levels in the water column, 1 m and 75 m, as a function of latitude and longitude. The CTD/TR station numbers and locations are indicated on the maps. These maps include:

At 1 m:

- Figure 2.1a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.1b Salinity (psu)
- Figure 2.1c Potential density (sigma theta units)
- Figure 2.1d Transmissivity (percent)

At 75 m:

- Figure 2.2a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.2b Salinity (psu)
- Figure 2.2c Potential density (sigma theta units)
- Figure 2.2d Transmissivity (percent)

TRANSECTS

The twenty-eight transects present the contoured fields of these same parameters for each of seven cross-shore sections, as a function of pressure (dbar) and distance offshore (km) from the most shoreward station. The CTD/TR station locations are indicated across the top of each figure. These figures include:

- Figure 2.3 Station map showing the seven transects

Transect 1:

- Figure 2.4a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.4b Salinity (psu)
- Figure 2.4c Potential density (sigma theta units)
- Figure 2.4d Transmissivity (percent)

Transect 2:

- Figure 2.5a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.5b Salinity (psu)
- Figure 2.5c Potential density (sigma theta units)
- Figure 2.5d Transmissivity (percent)

Transect 3:

- Figure 2.6a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.6b Salinity (psu)
- Figure 2.6c Potential density (sigma theta units)
- Figure 2.6d Transmissivity (percent)

Transect 4:

- Figure 2.7a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.7b Salinity (psu)
- Figure 2.7c Potential density (sigma theta units)
- Figure 2.7d Transmissivity (percent)

Transect 5:

- Figure 2.8a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.8b Salinity (psu)
- Figure 2.8c Potential density (sigma theta units)
- Figure 2.8d Transmissivity (percent)

Transect 6:

- Figure 2.9a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.9b Salinity (psu)
- Figure 2.9c Potential density (sigma theta units)
- Figure 2.9d Transmissivity (percent)

Transect 7:

- Figure 2.10a Potential Temperature ($^{\circ}\text{C}$)
- Figure 2.10b Salinity (psu)
- Figure 2.10c Potential density (sigma theta units)
- Figure 2.10d Transmissivity (percent)

DE 90-08, August 1990: Temperature at 1m

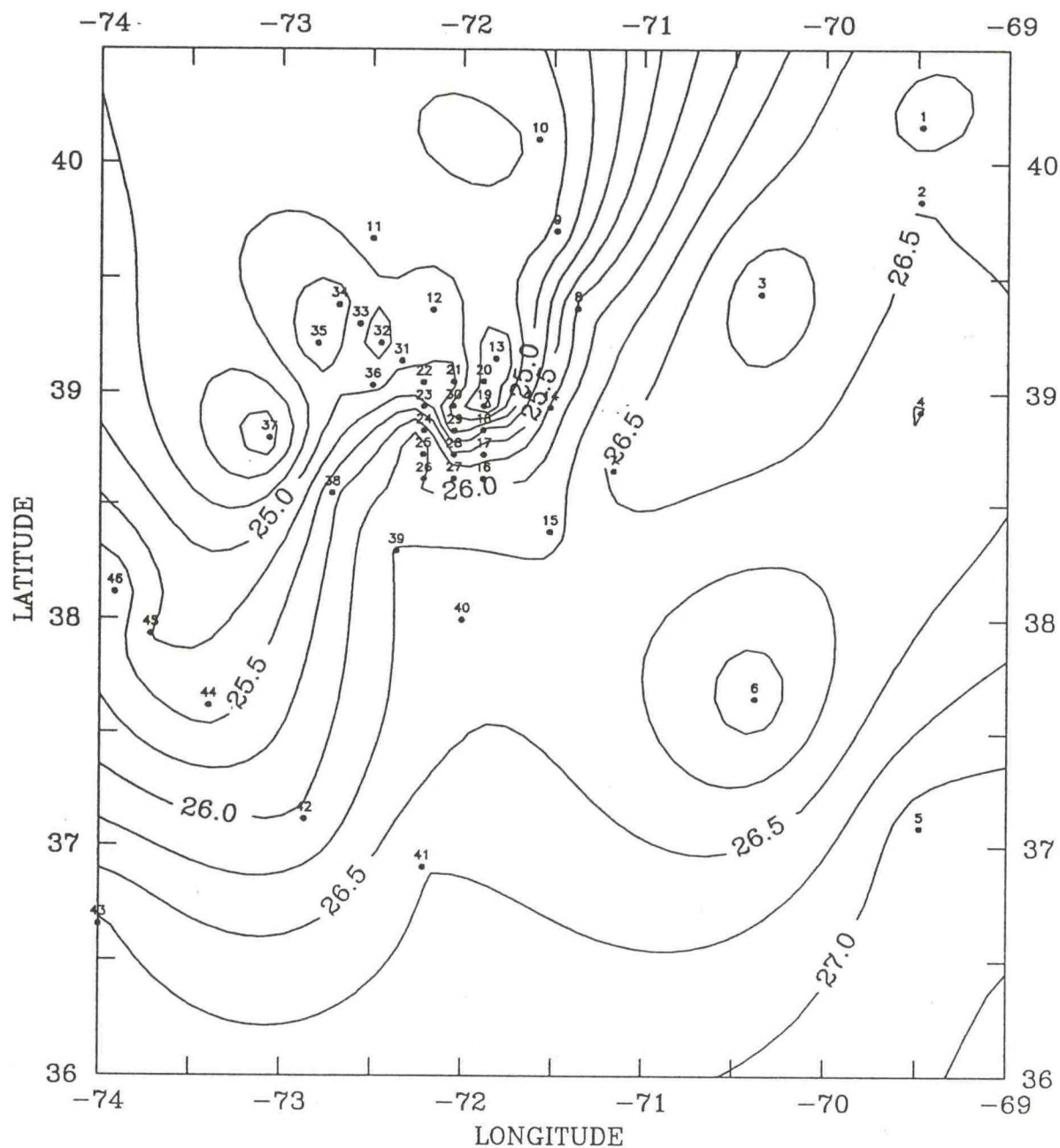


Figure 2.1a

DE 90-08, August 1990: Salinity at 1m

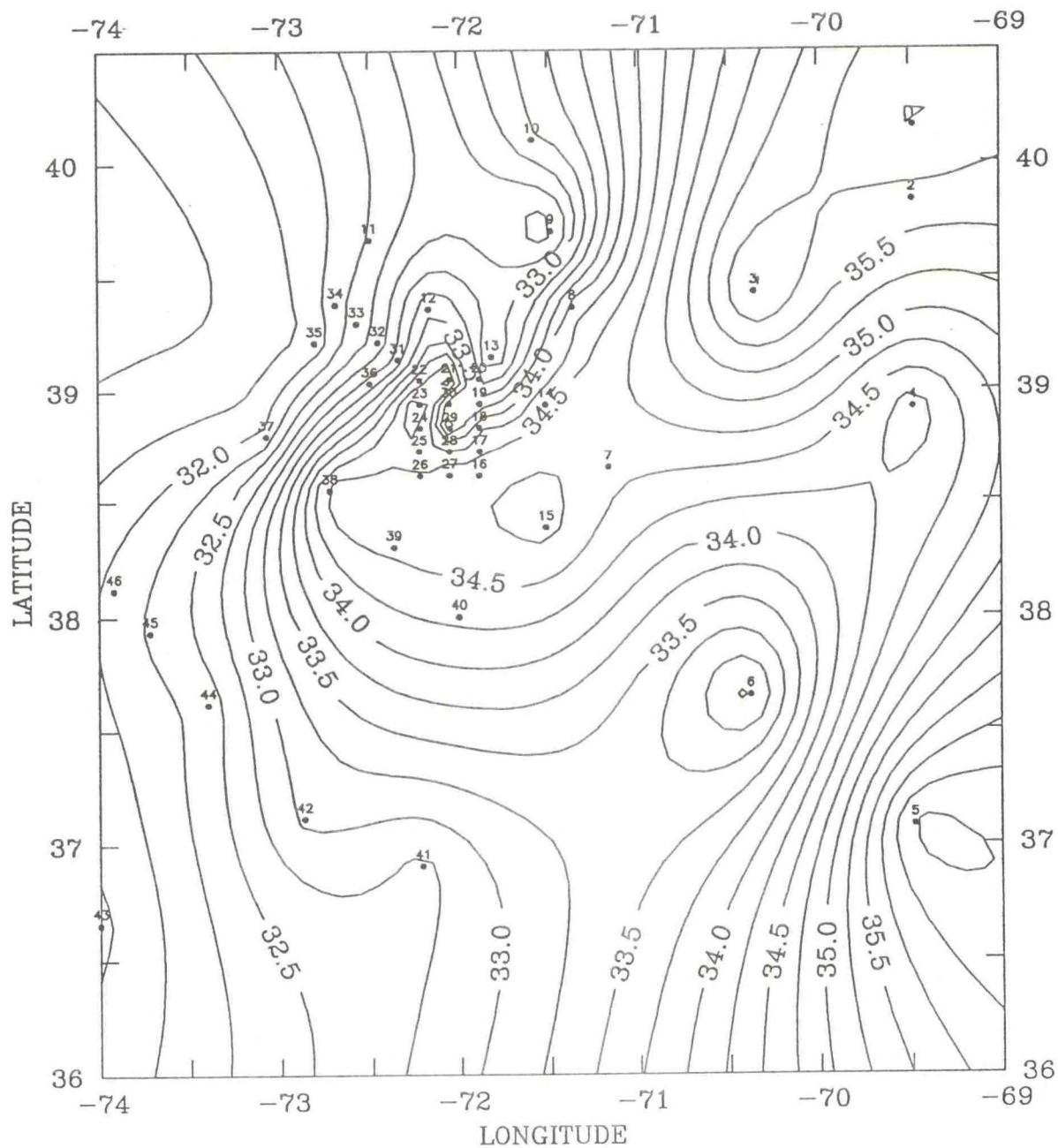


Figure 2.1b
2.10

DE 90-08, August 1990: Density (sigma theta) at 1m

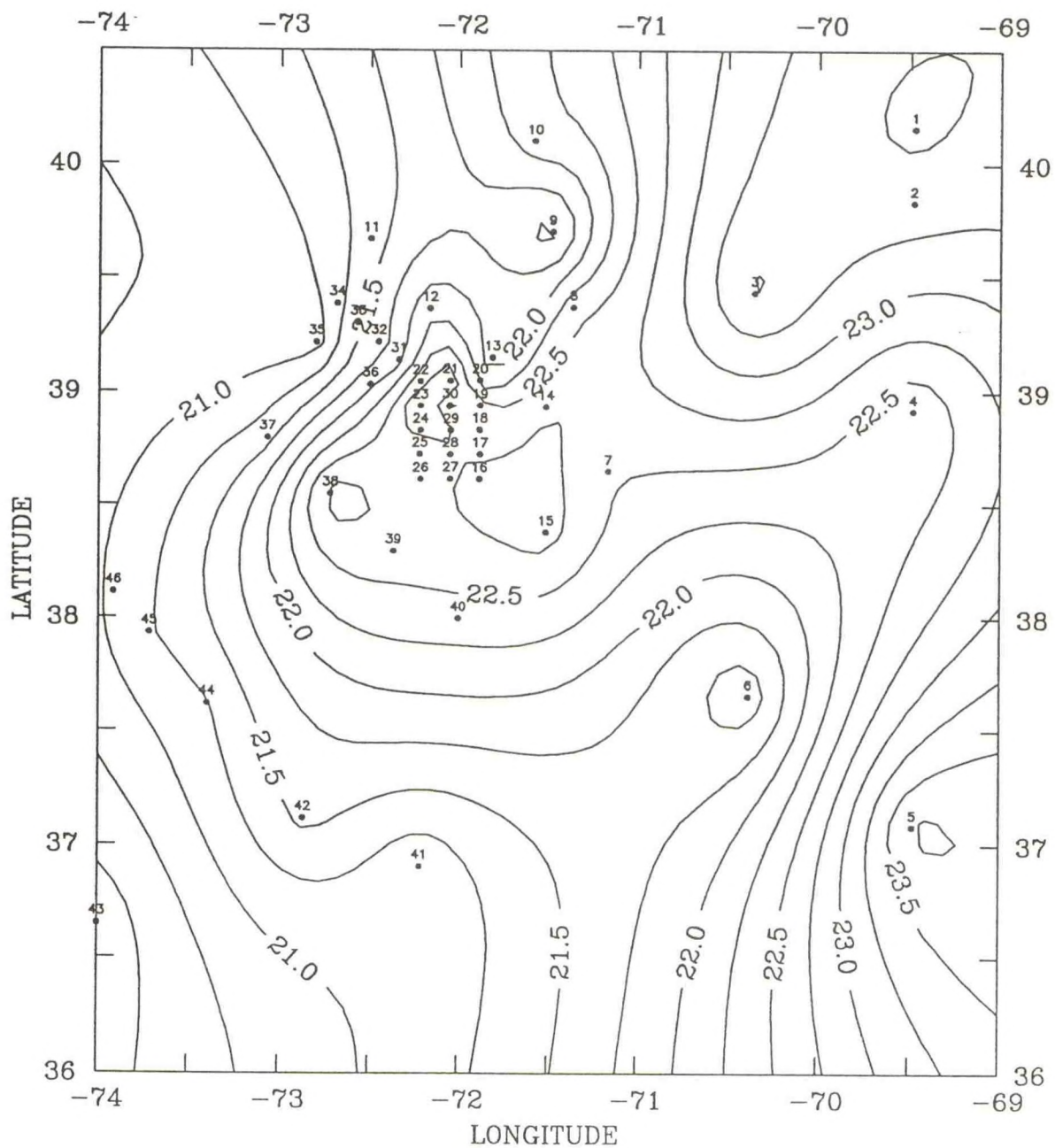


Figure 2.1c

DE 90-08, August 1990: Transmissivity at 1m

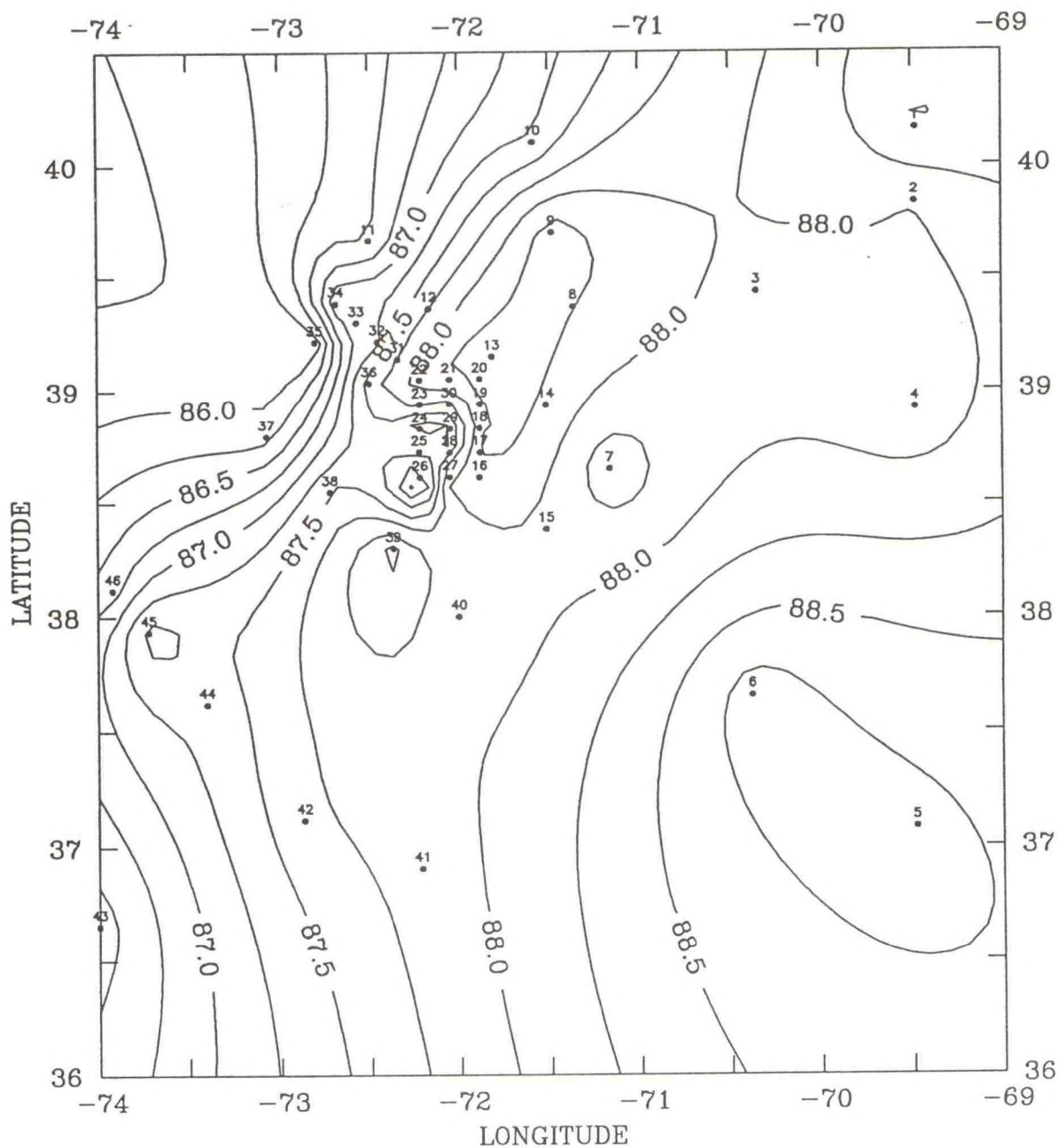


Figure 2.1d

DE 90-08, August 1990: Temperature at 75m

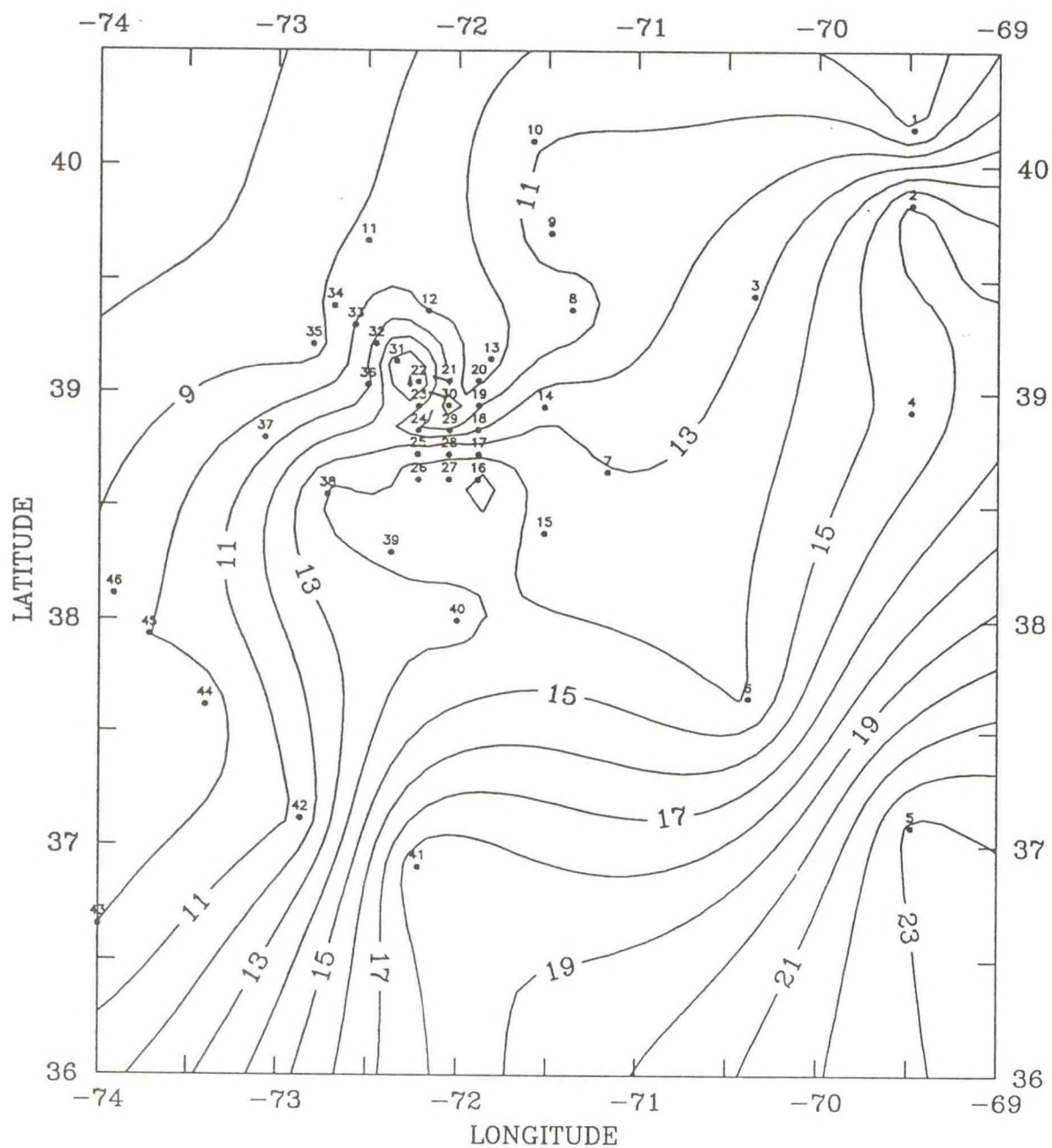


Figure 2.2a

DE 90-08, August 1990: Salinity at 75m

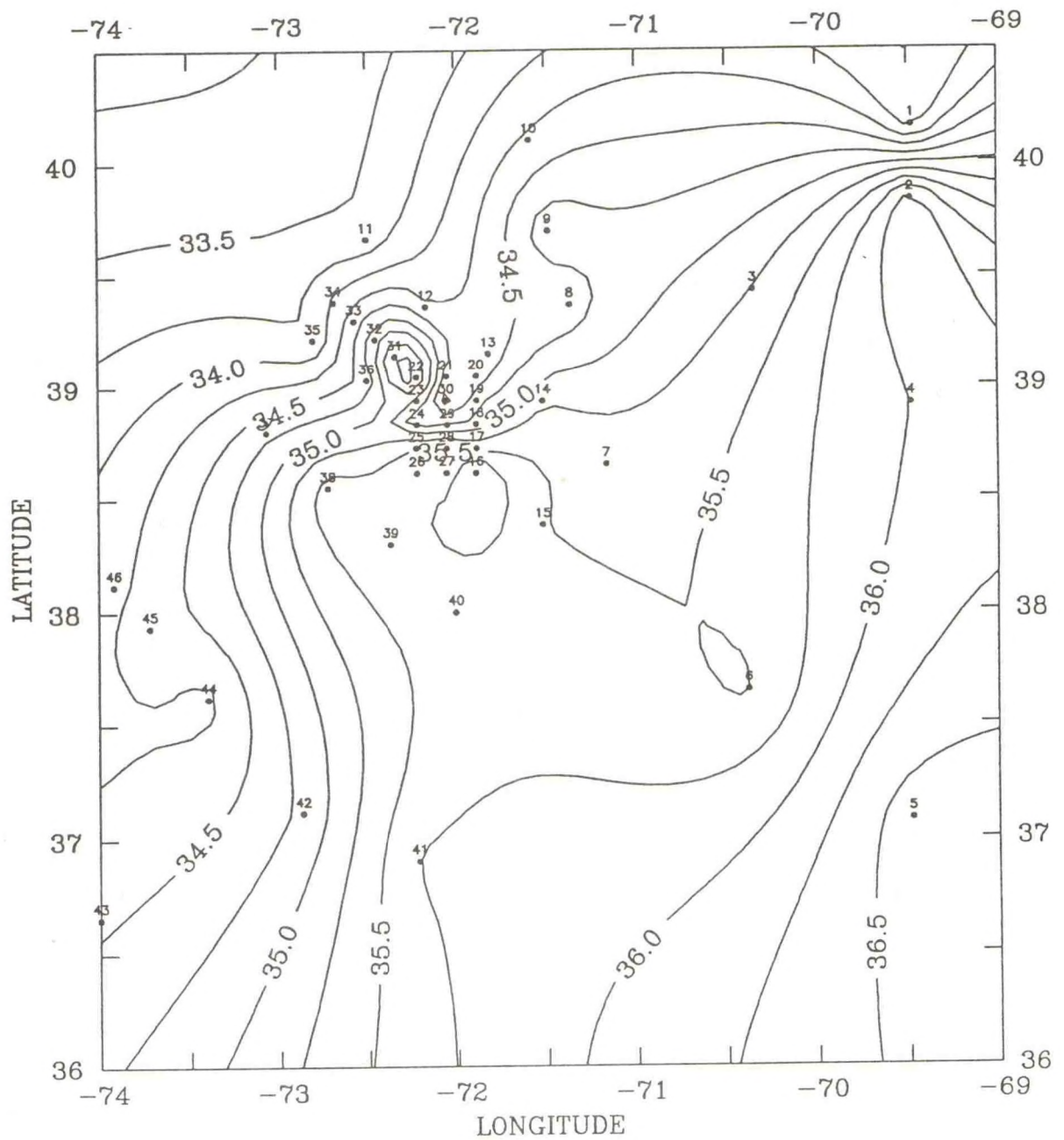


Figure 2.2b

DE 90-08, August 1990: Density (sigma theta) at 75m

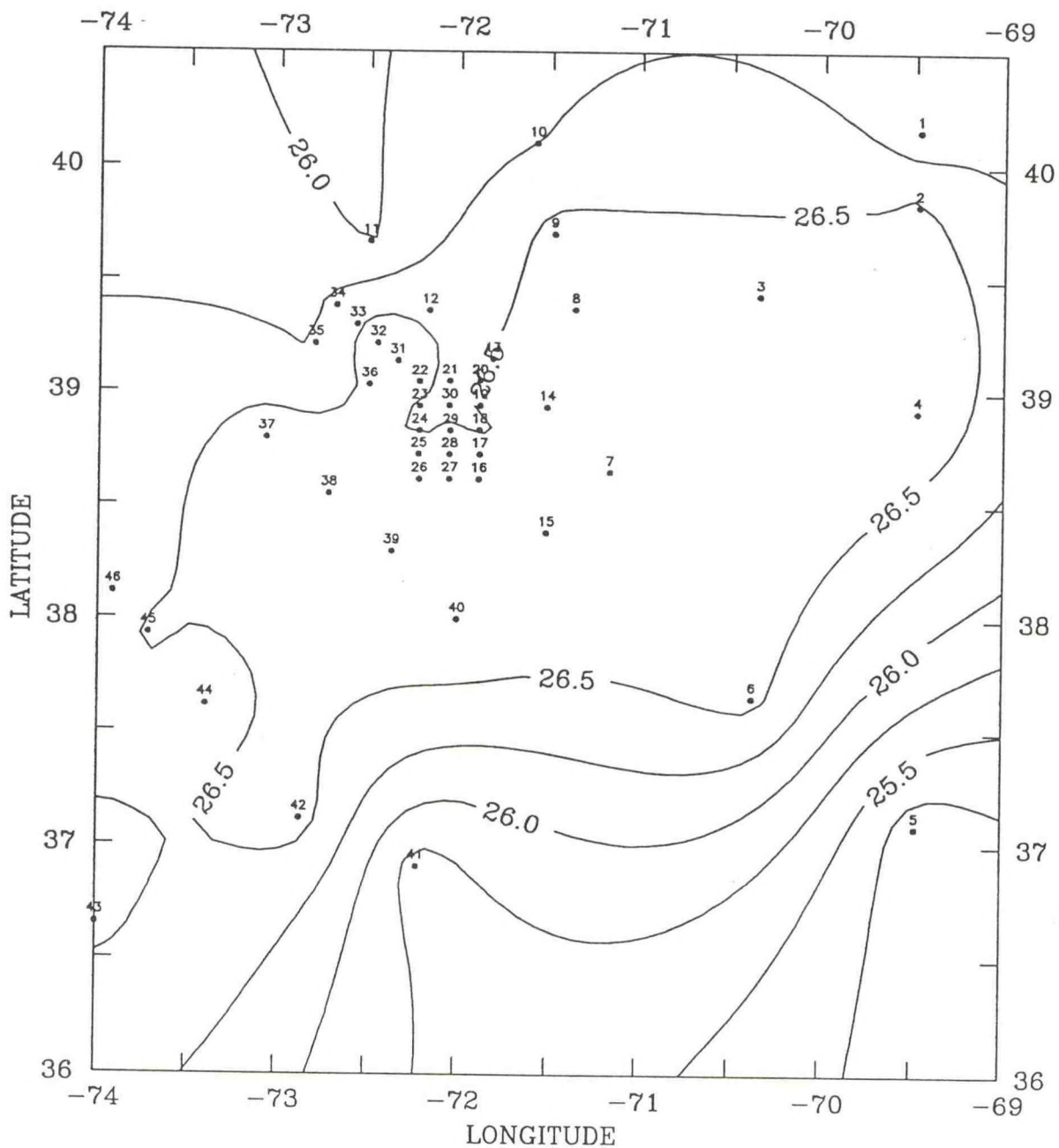


Figure 2.2c

DE 90-08, August 1990: Transmissivity at 75m

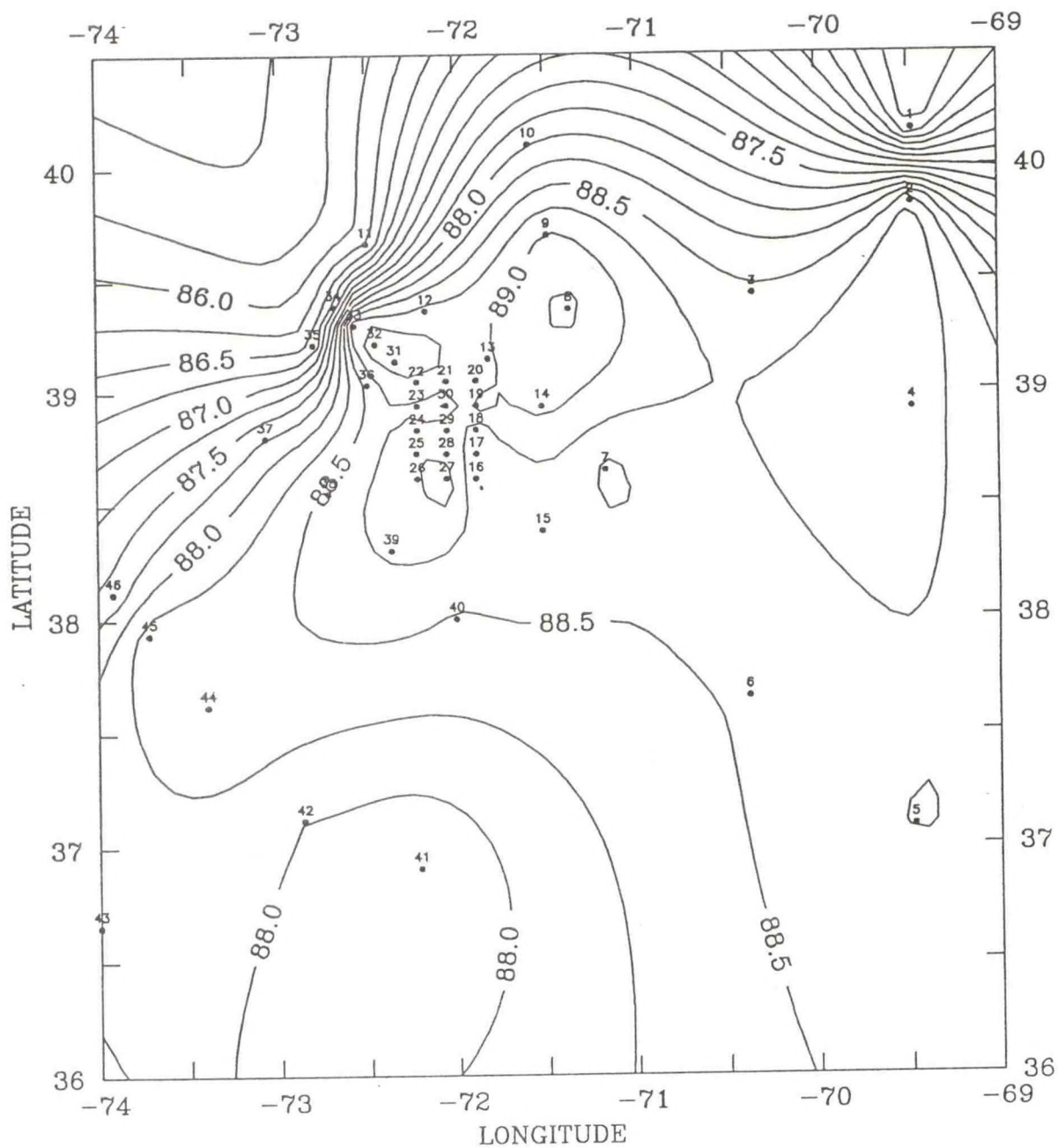


Figure 2.2d

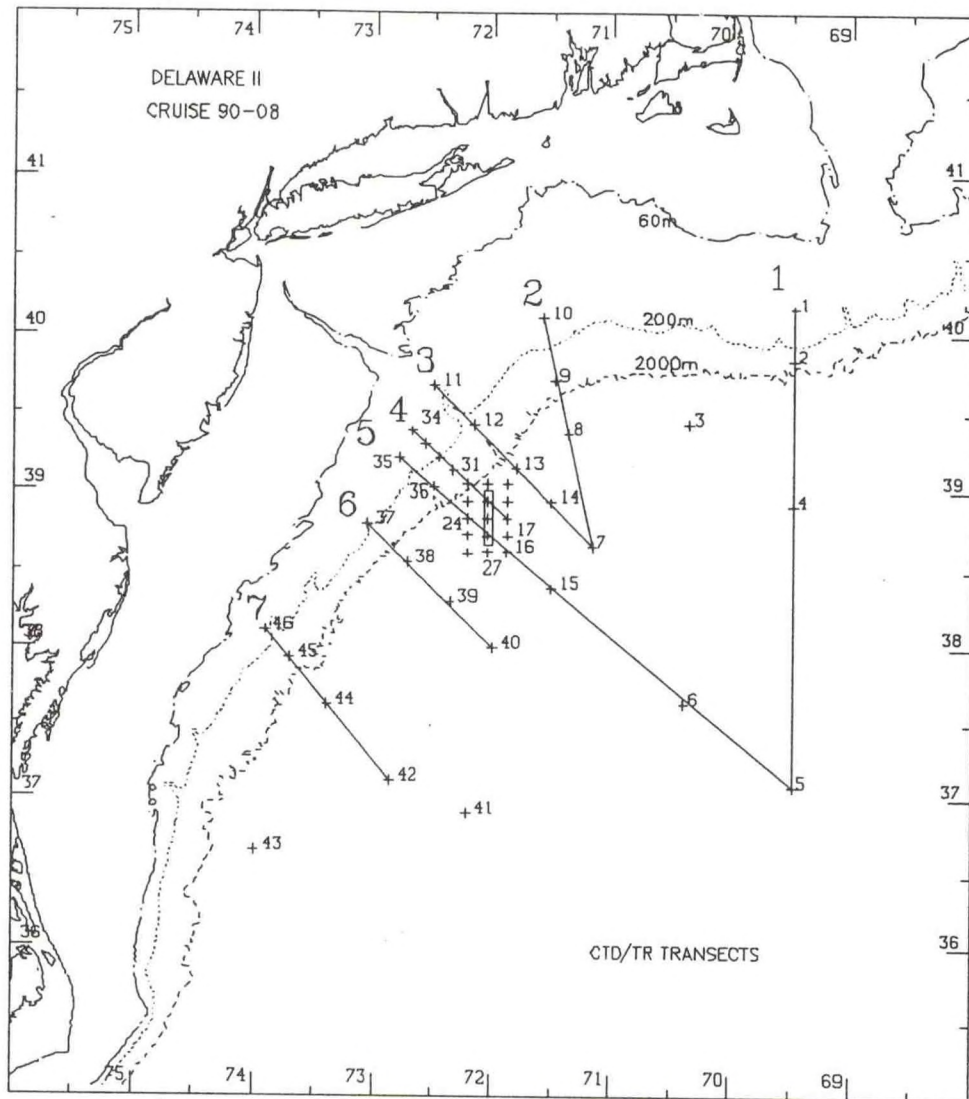


Figure 2.3

Seven transects constructed from the CTD/TR data for DELaware II 90-08. In what follows, four parameters (potential temperature, salinity, potential density and transmissivity) are contoured for each transect.

DE 90-08, August 1990: Potential Temperature, Transect 1

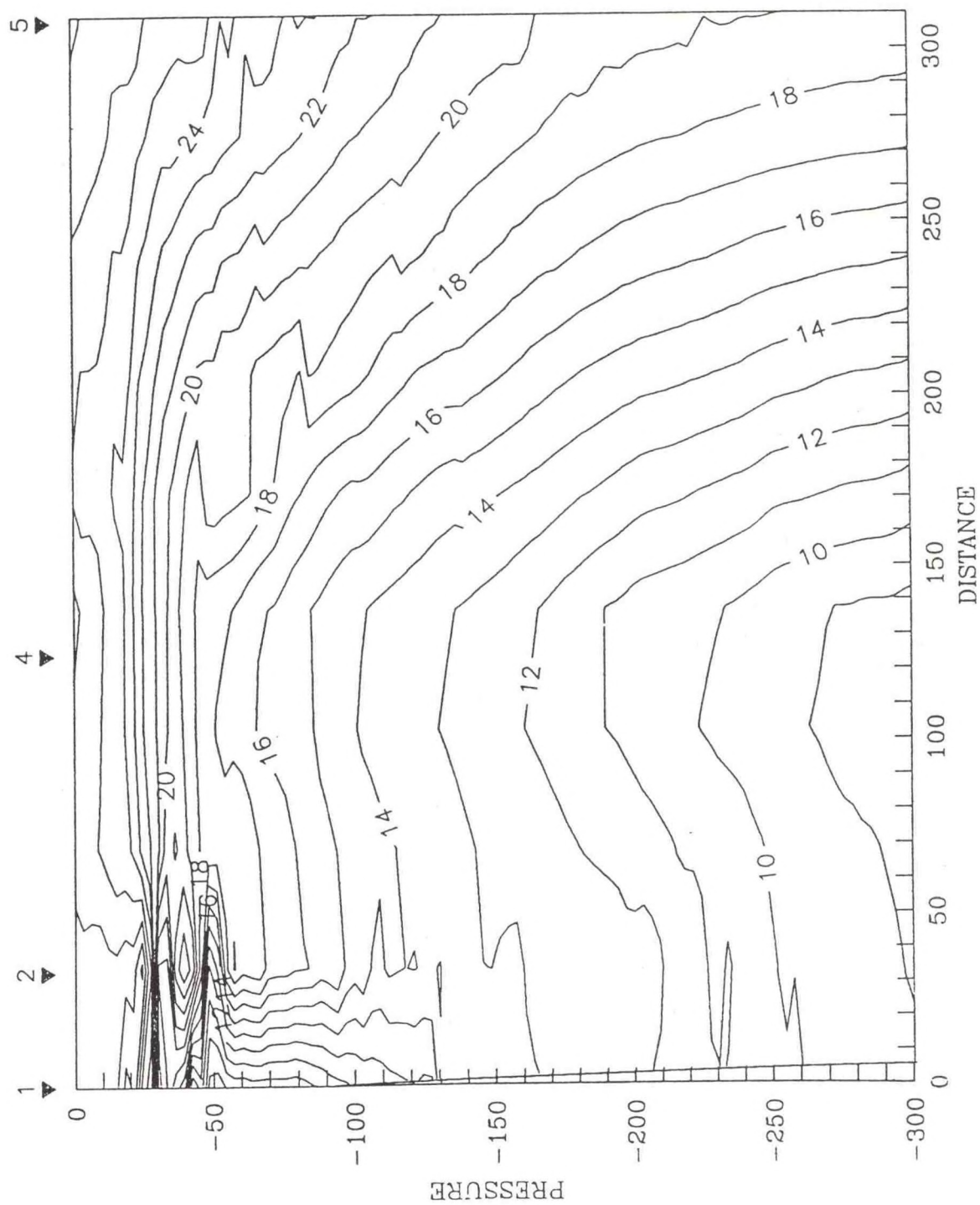


Figure 2.4a

DE 90-08, August 1990: Salinity, Transect 1

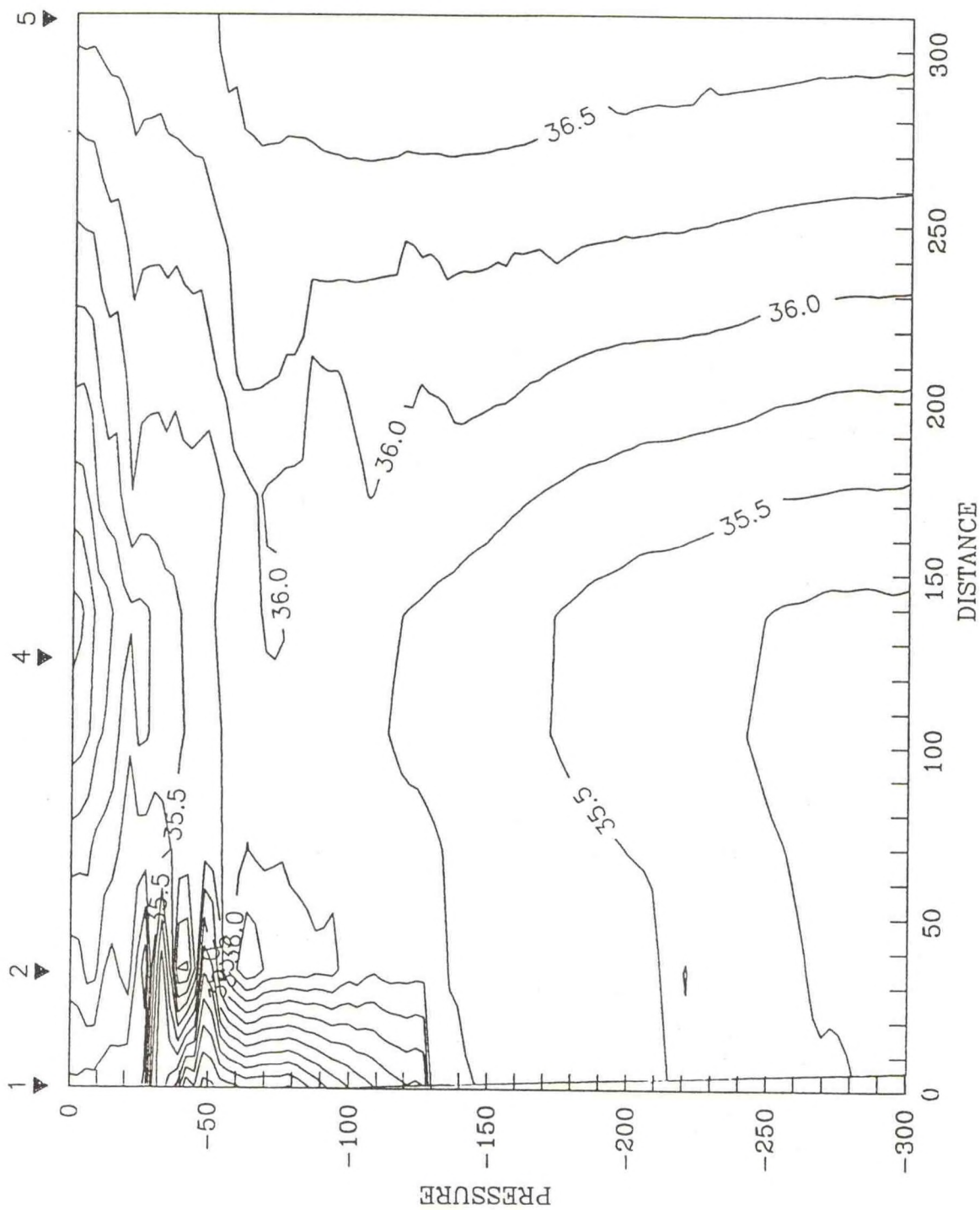


Figure 2.4b

DE 90-08, August 1990: Density (sigma theta), Transect 1

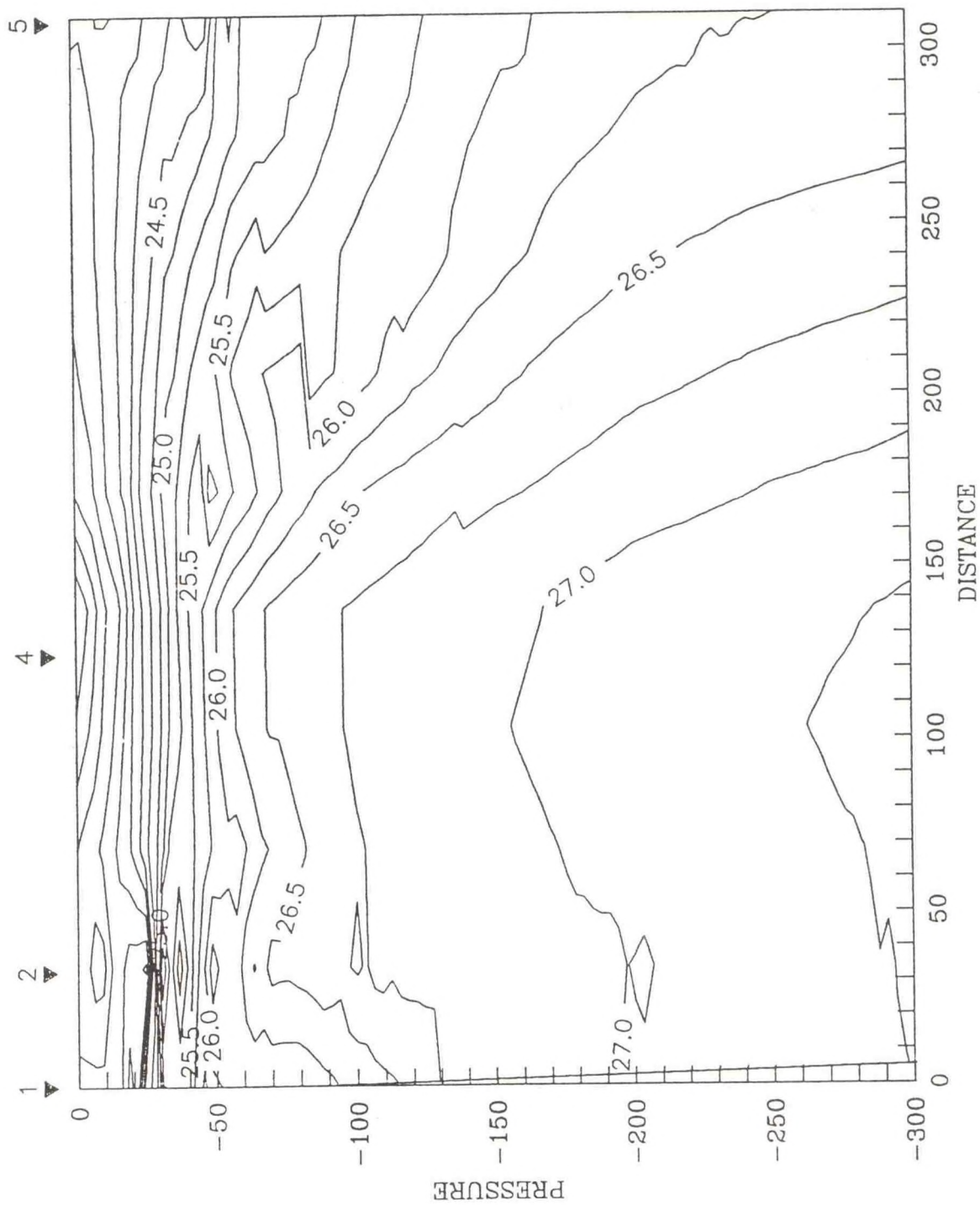


Figure 2.4c

DE 90-08, August 1990: Transmissivity, Transect 1

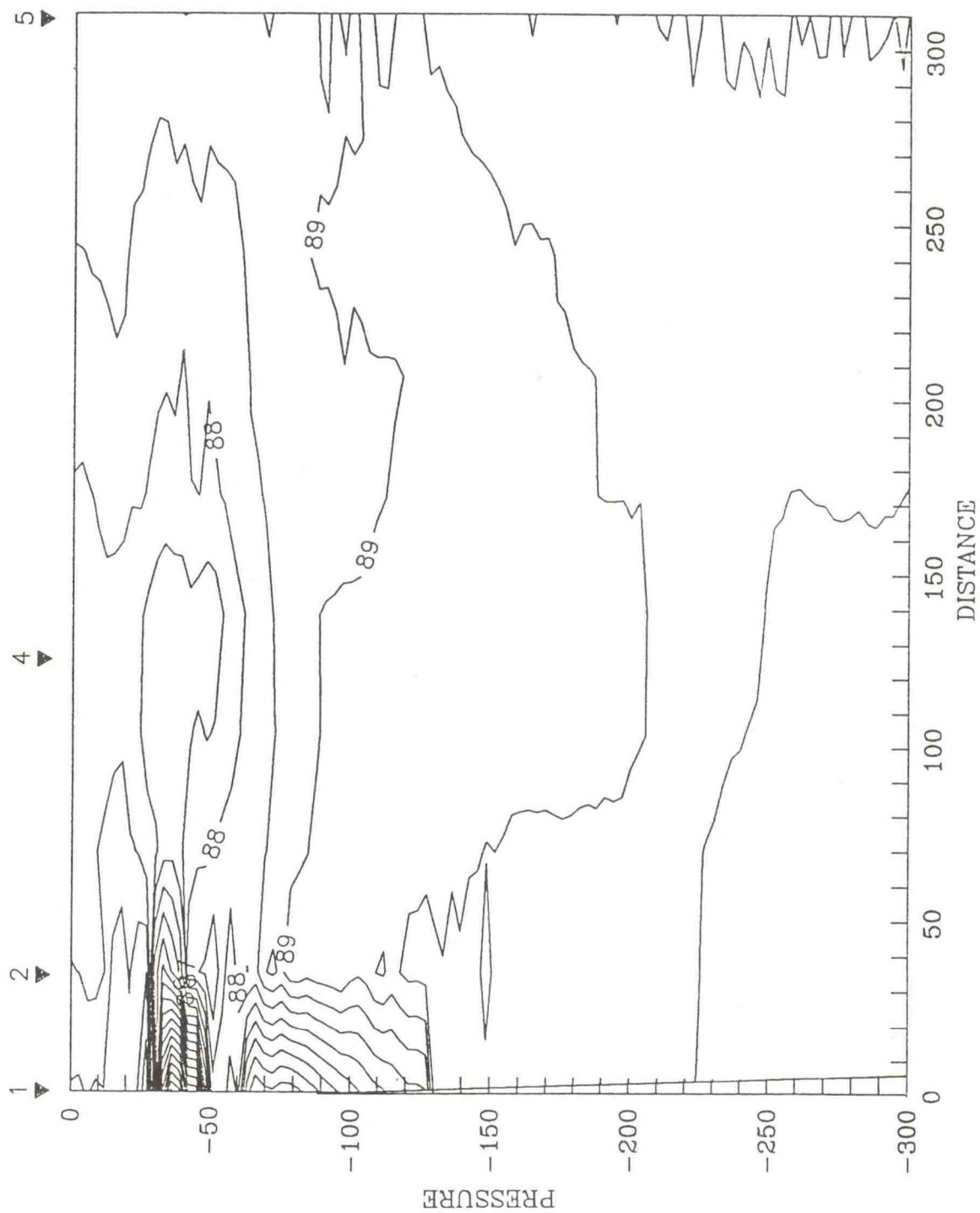


Figure 2.4d

DE 90-08, August 1990: Potential Temperature, Transect 2

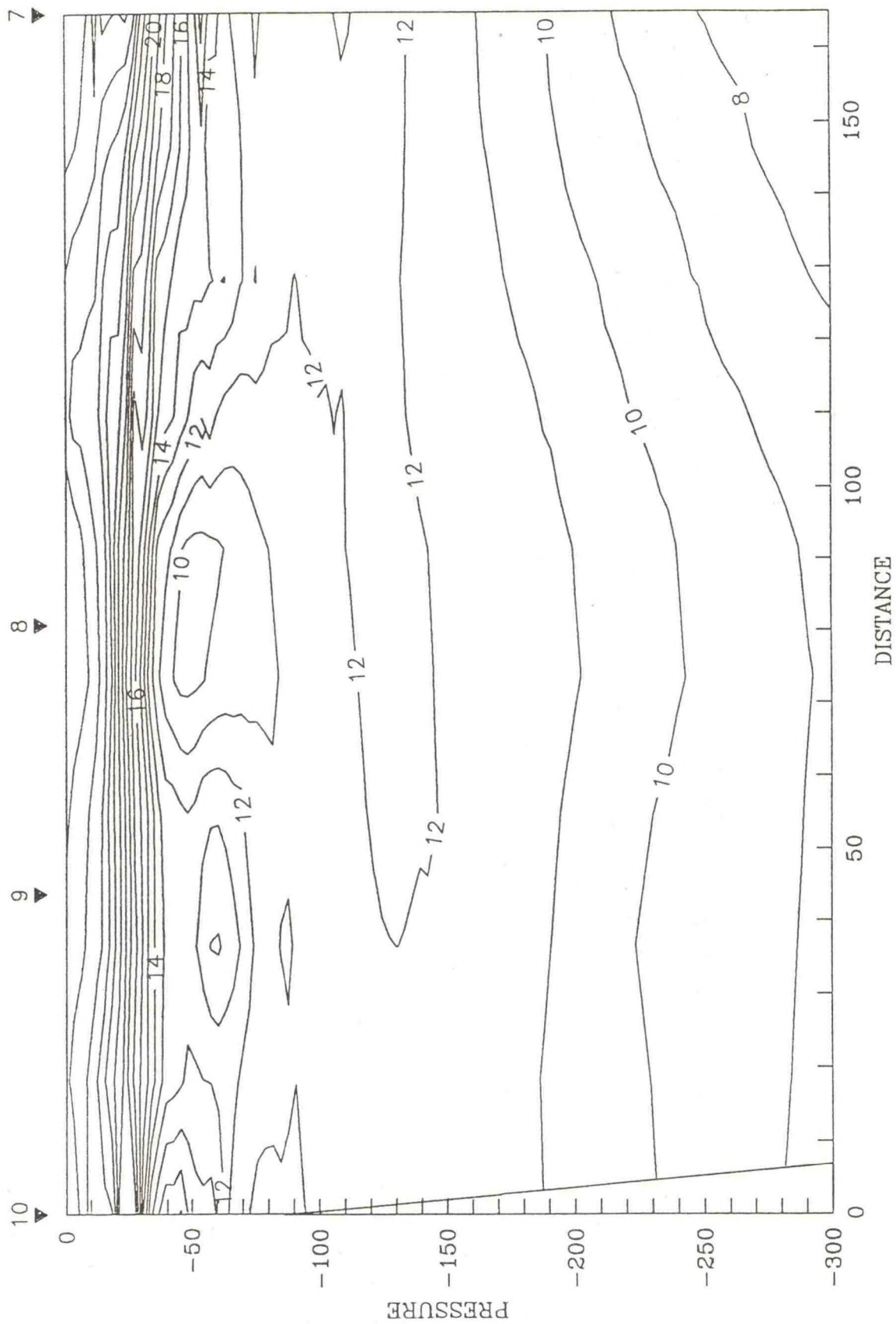


Figure 2.5a

DE 90-08, August 1990: Salinity, Transect 2

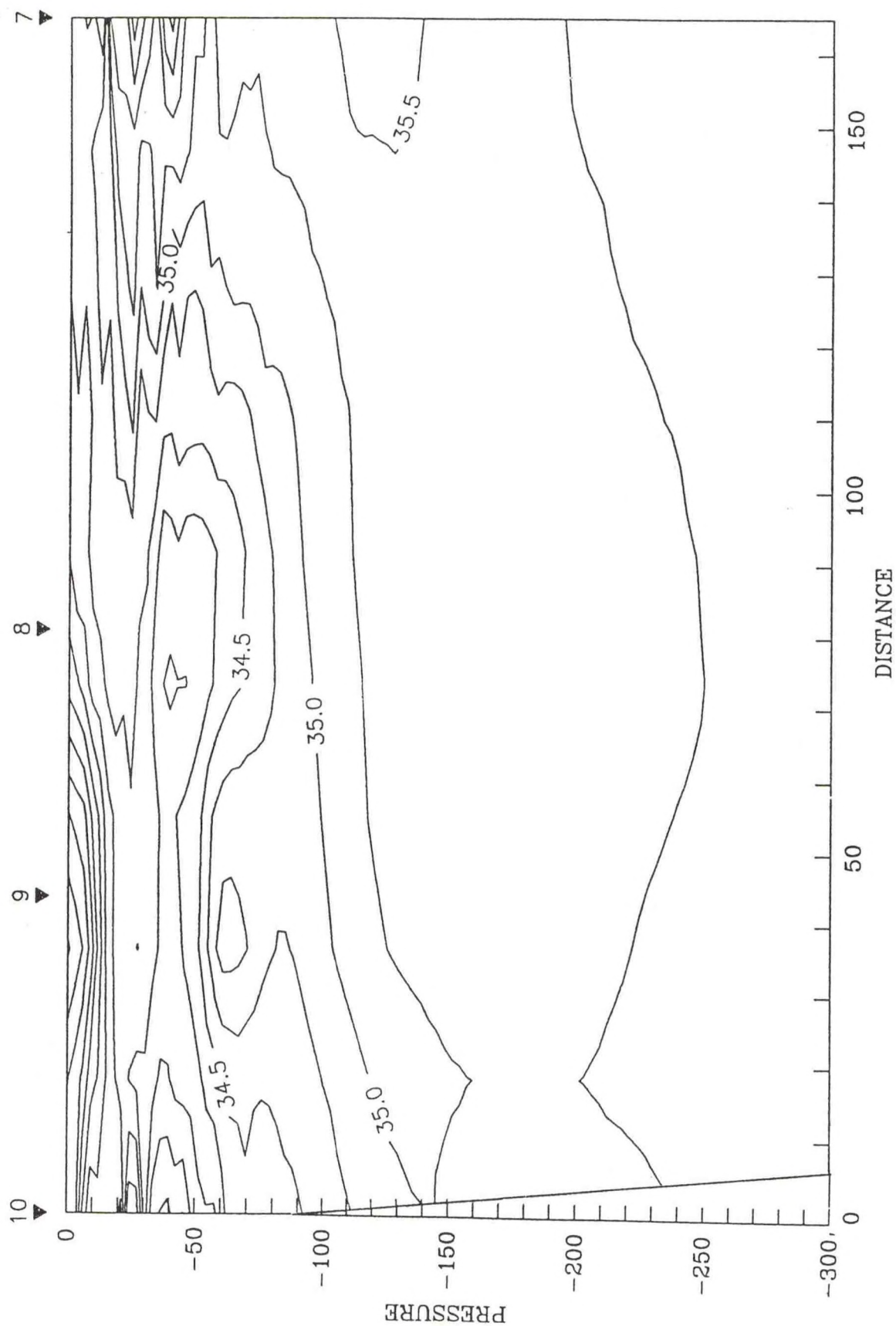


Figure 2.5b

DE 90-08, August 1990: Density (sigma theta), Transect 2



Figure 2.5c

DE 90-08, August 1990: Transmissivity, Transect 2

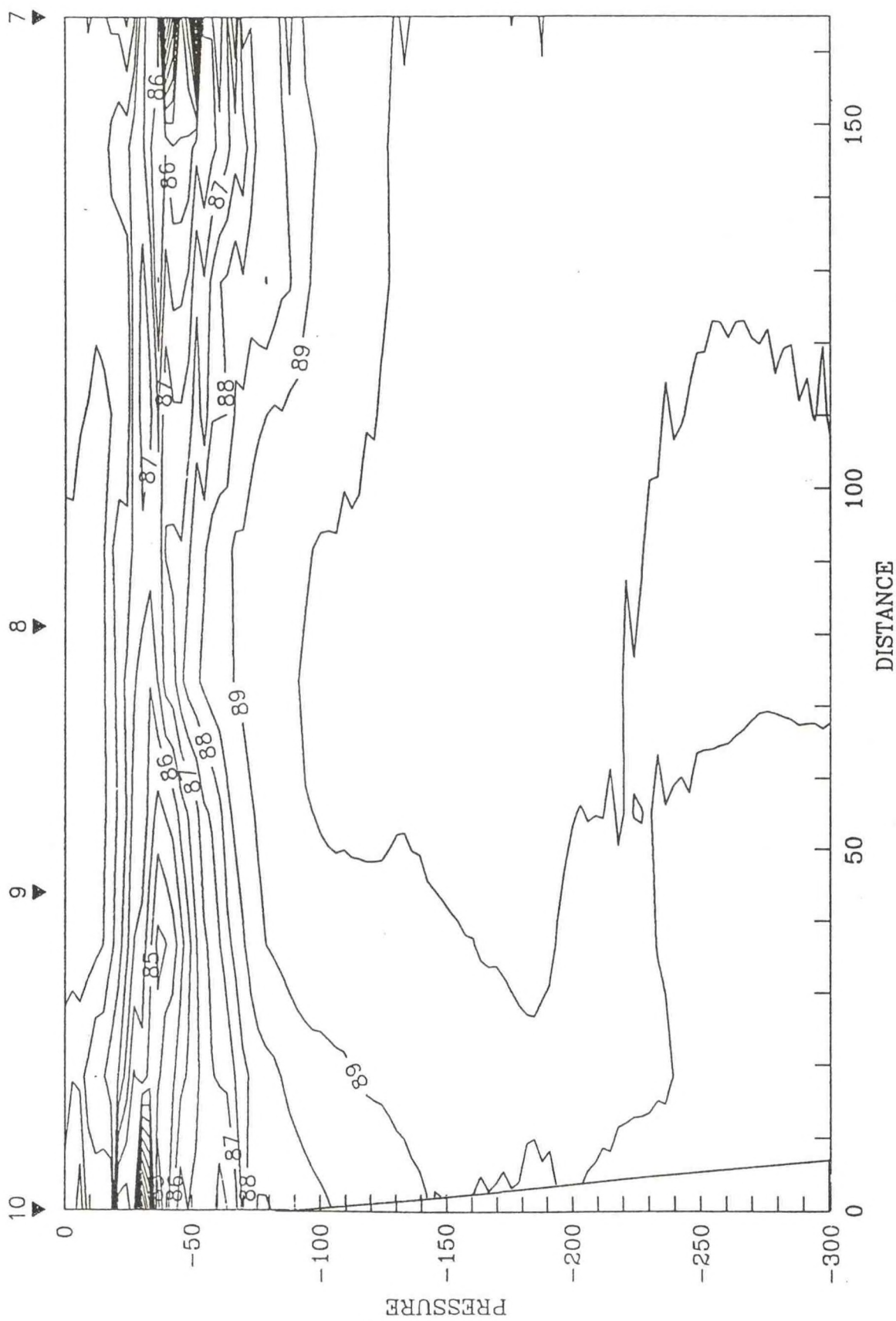


Figure 2.5d

DE 90-08, August 1990: Potential Temperature, Transect 3

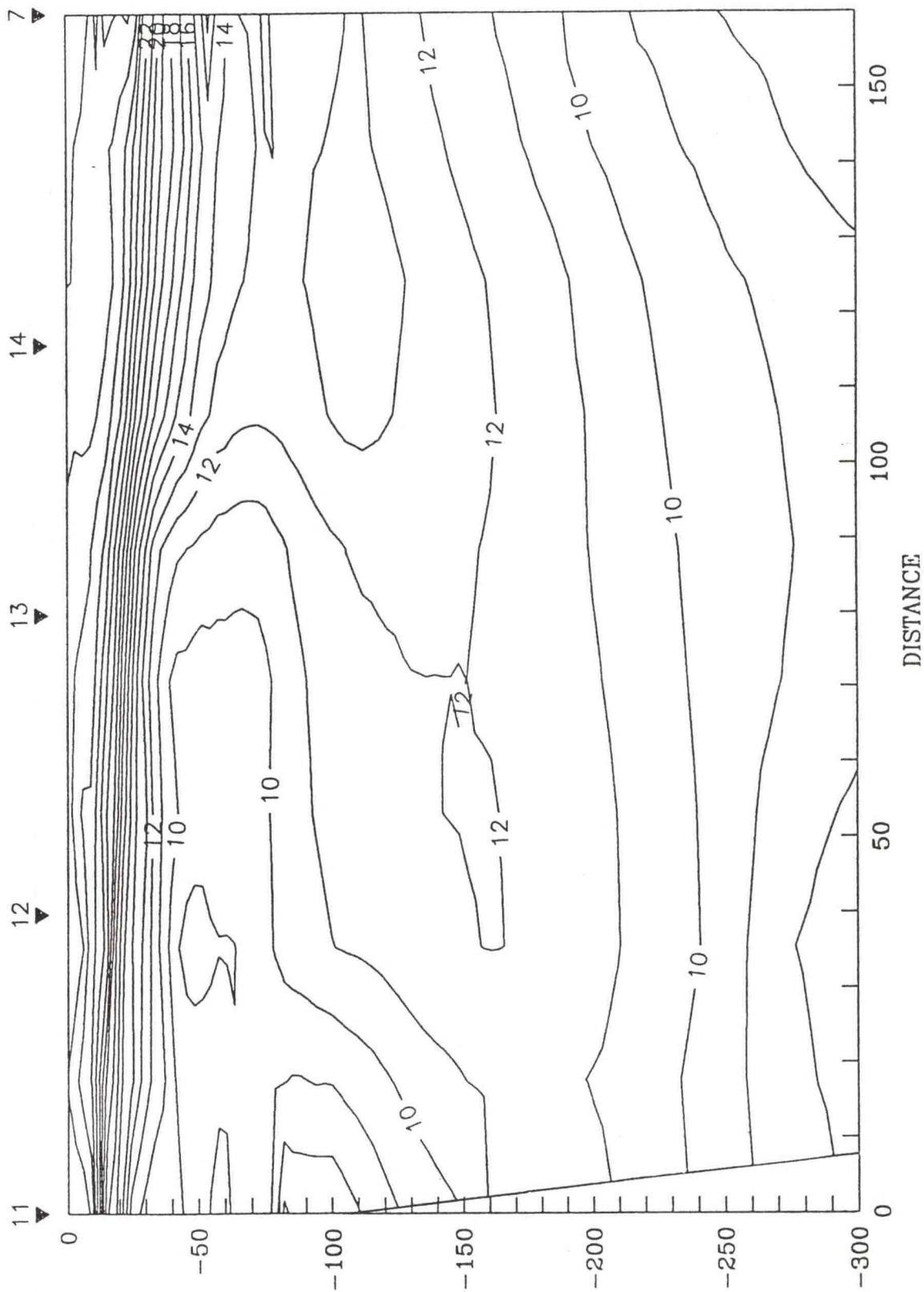


Figure 2.6a

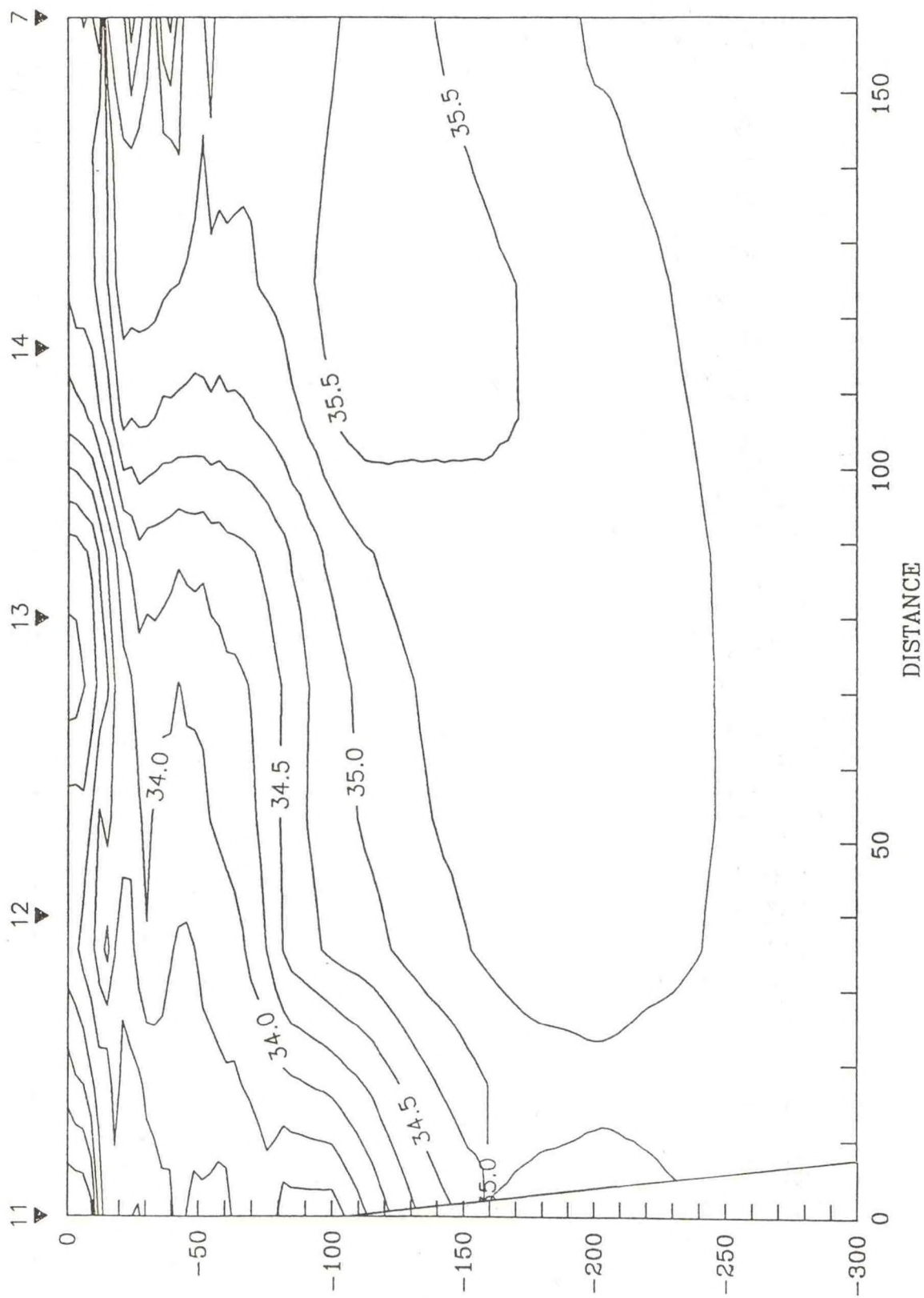


Figure 2.6b

DE 90-08, August 1990: Density (sigma theta), Transect 3

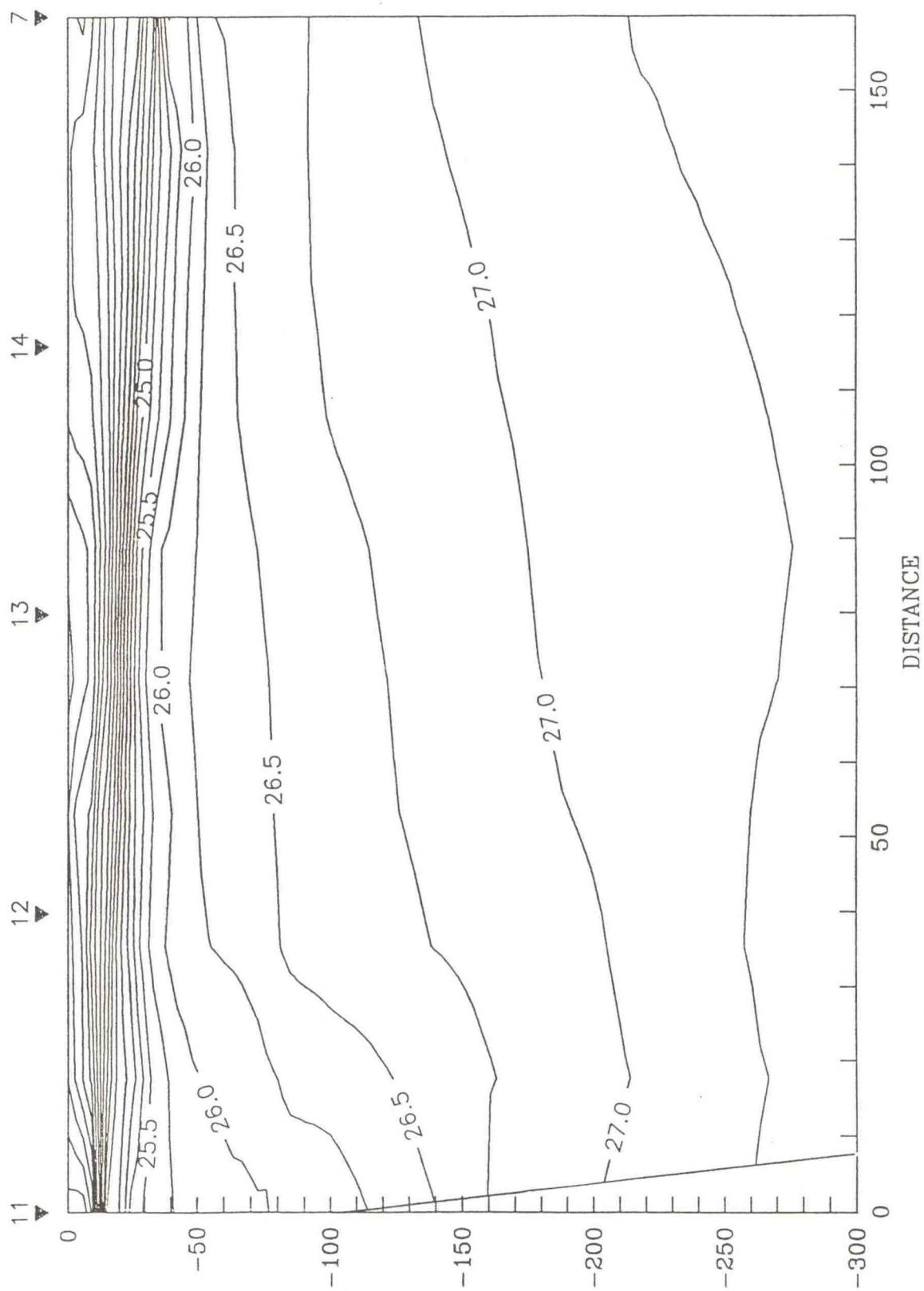


Figure 2.6c

DE 90-08, August 1990: Transmissivity, Transect 3

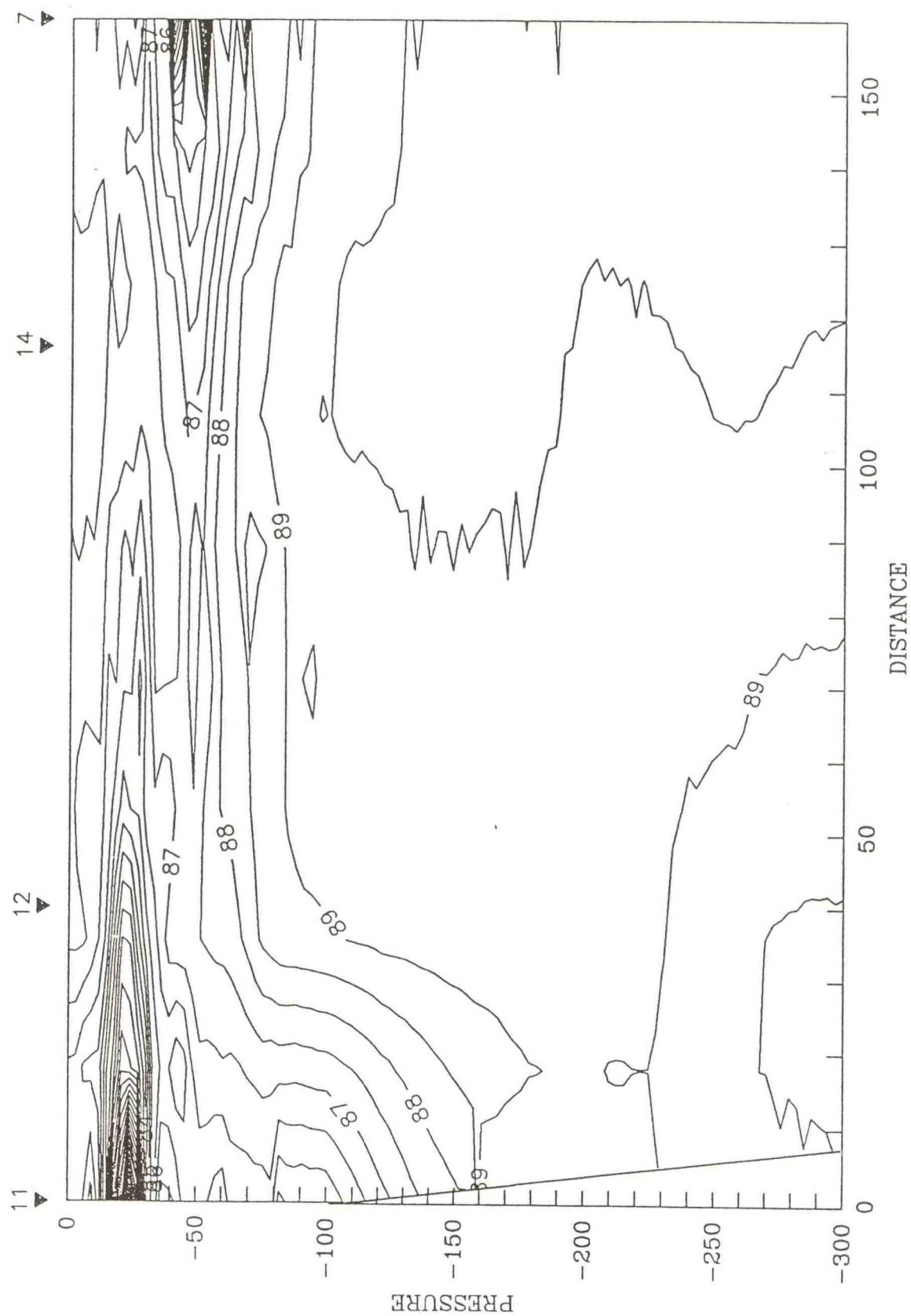


Figure 2.6d

DE 90-08, August 1990: Potential Temperature, Transect 4

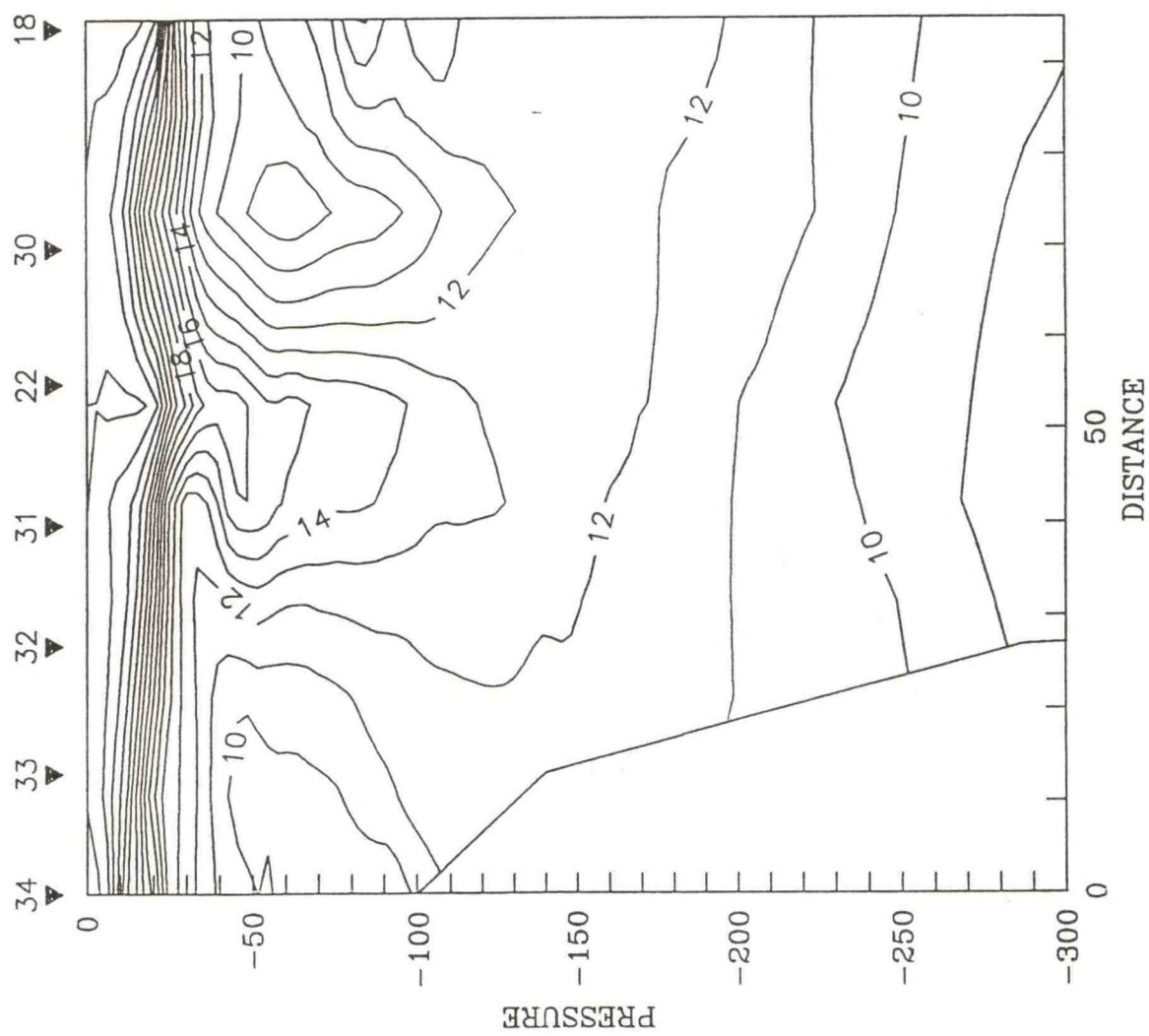


Figure 2.7a

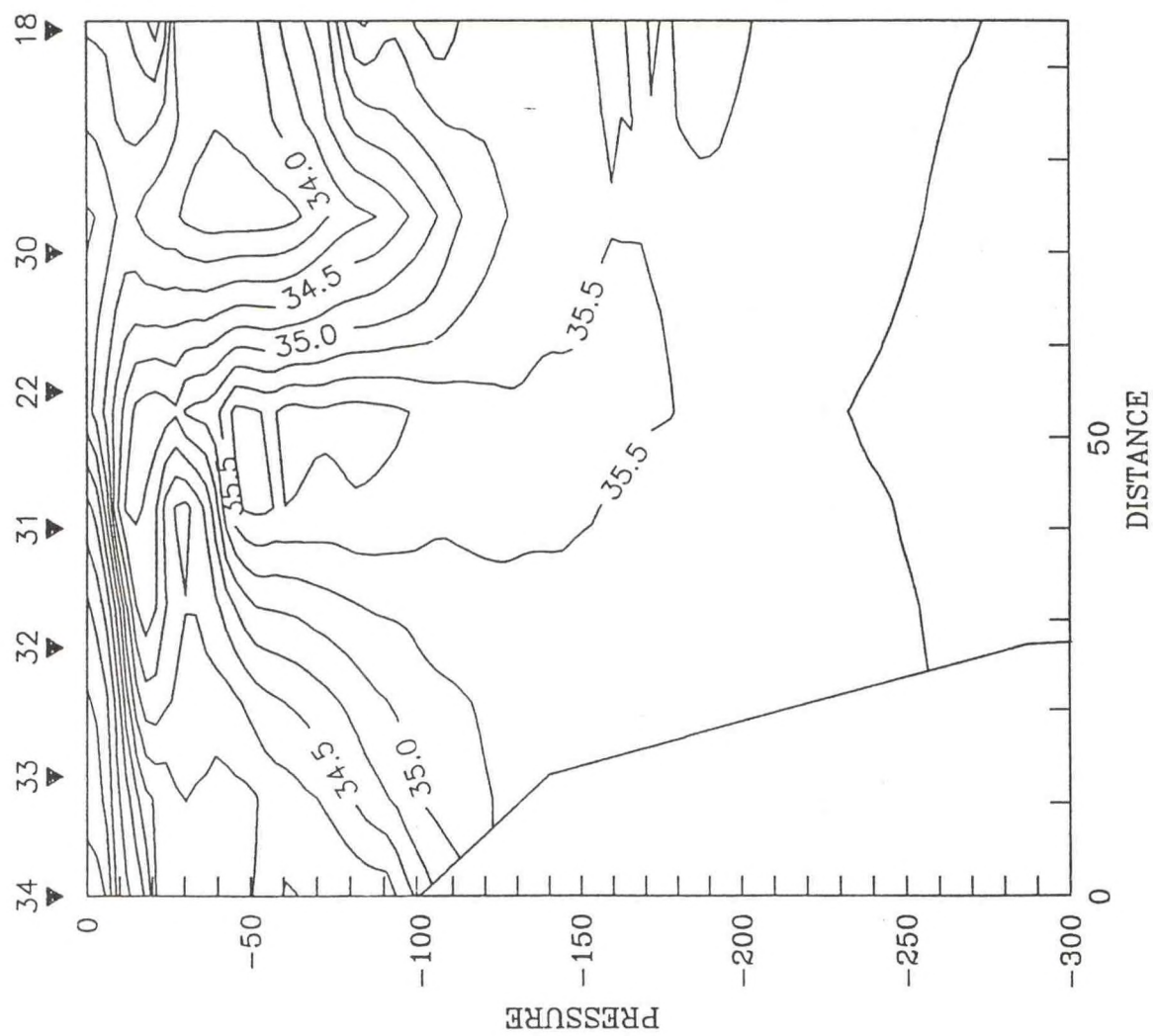


Figure 2.7b

DE 90-08, August 1990: Density (sigma theta), Transect 4

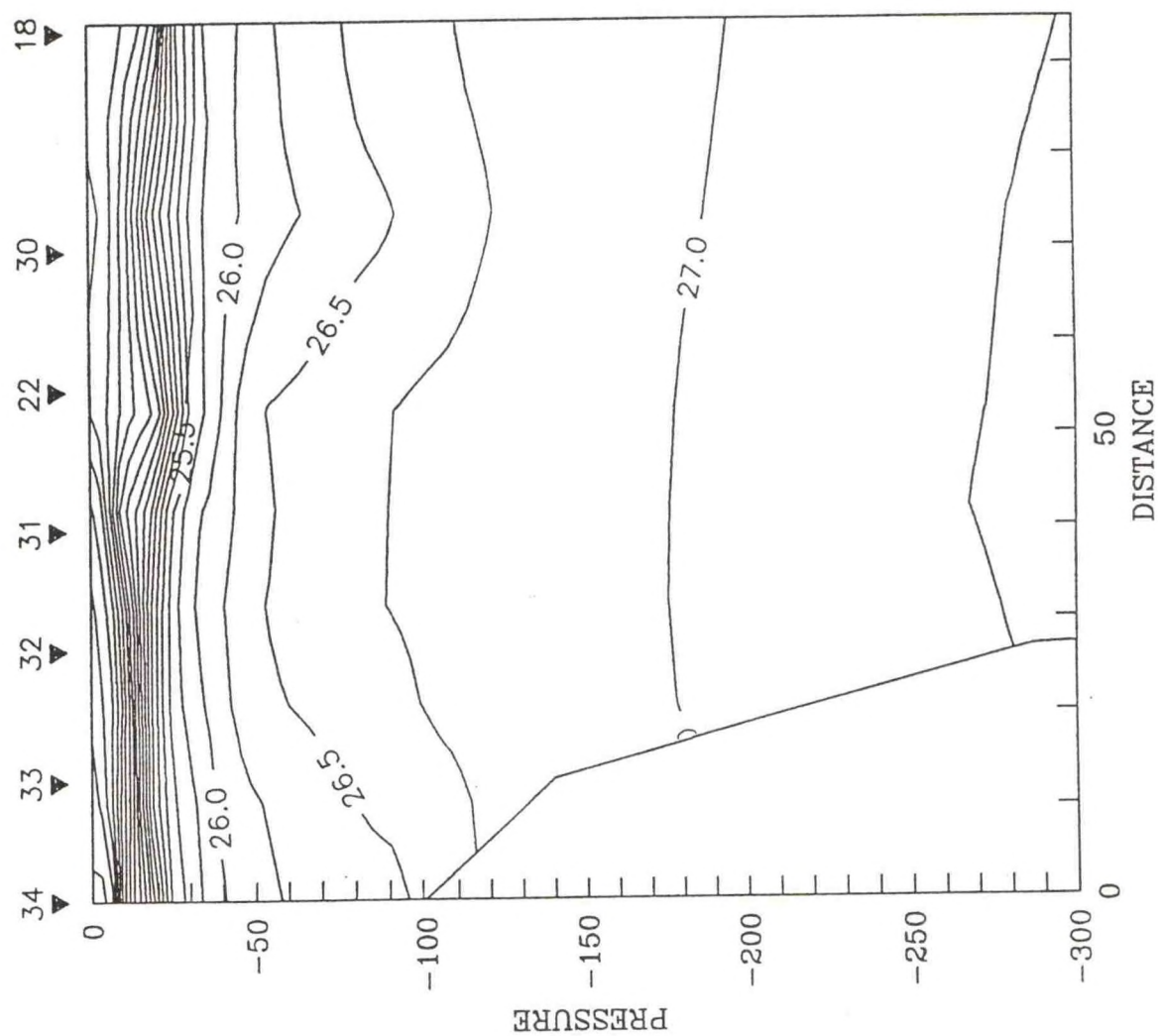


Figure 2.7c

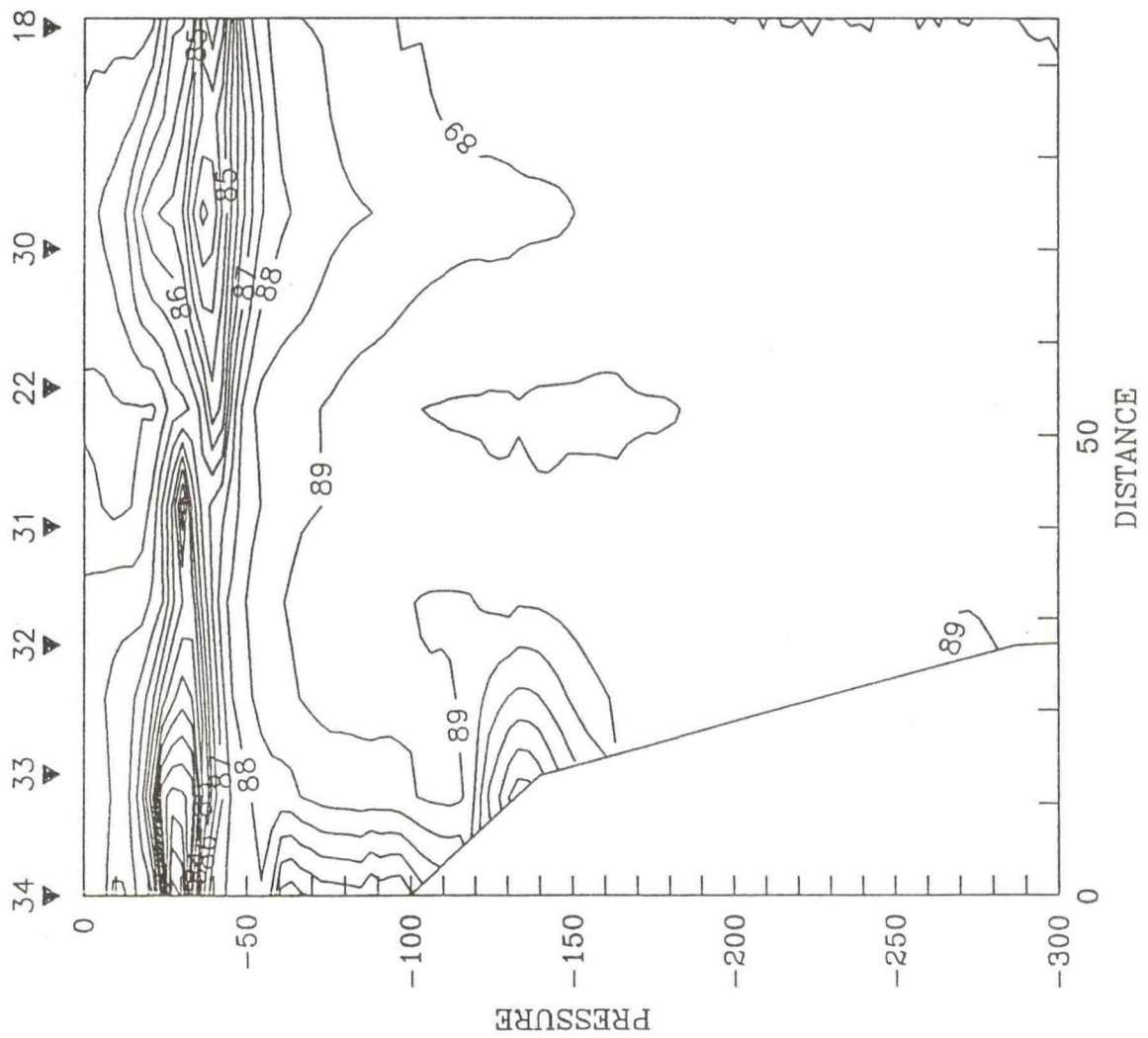


Figure 2.7d

DE 90-08, August 1990: Potential Temperature, Transect 5

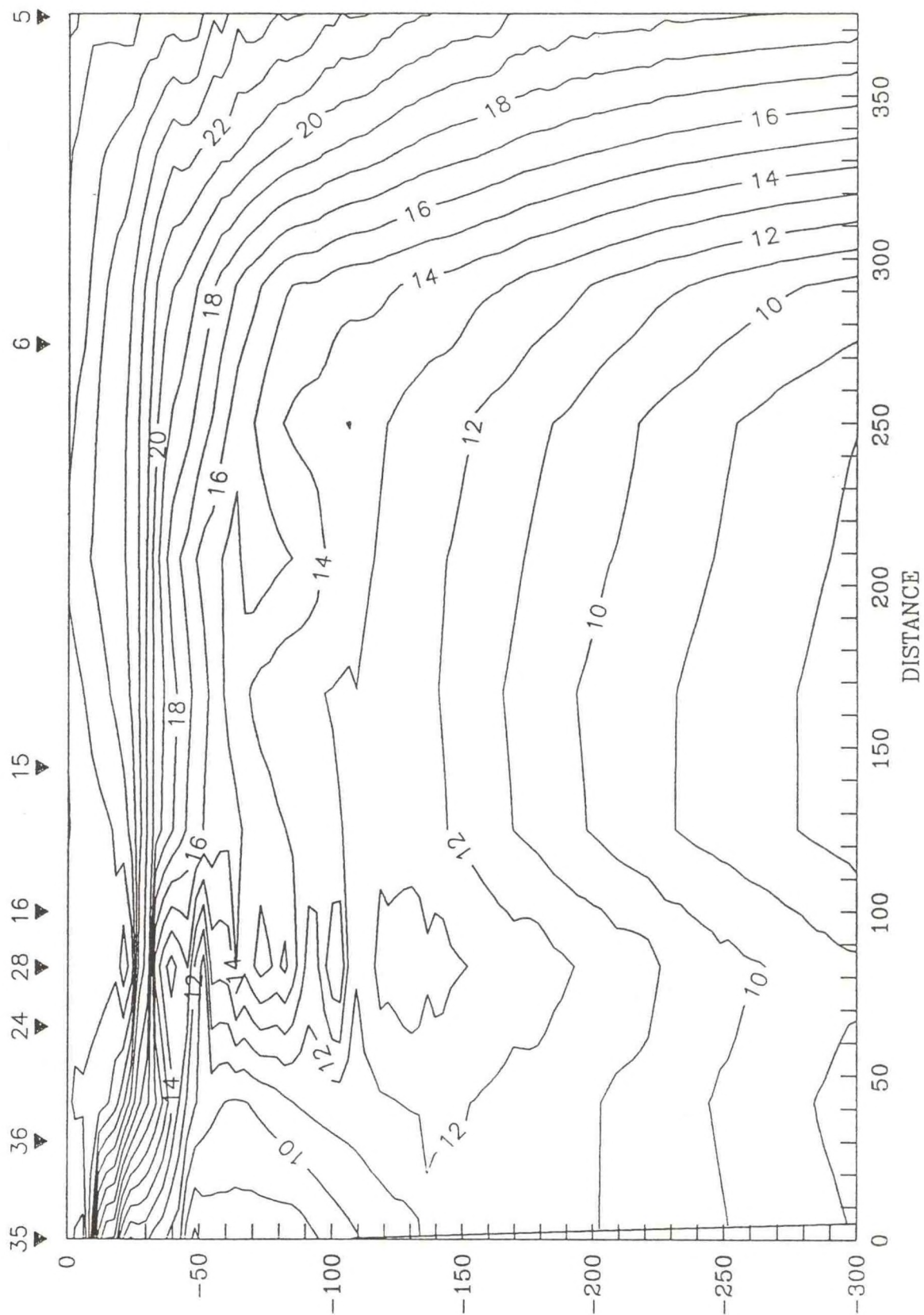


Figure 2.8a

DE 90-08, August 1990: Salinity, Transect 5

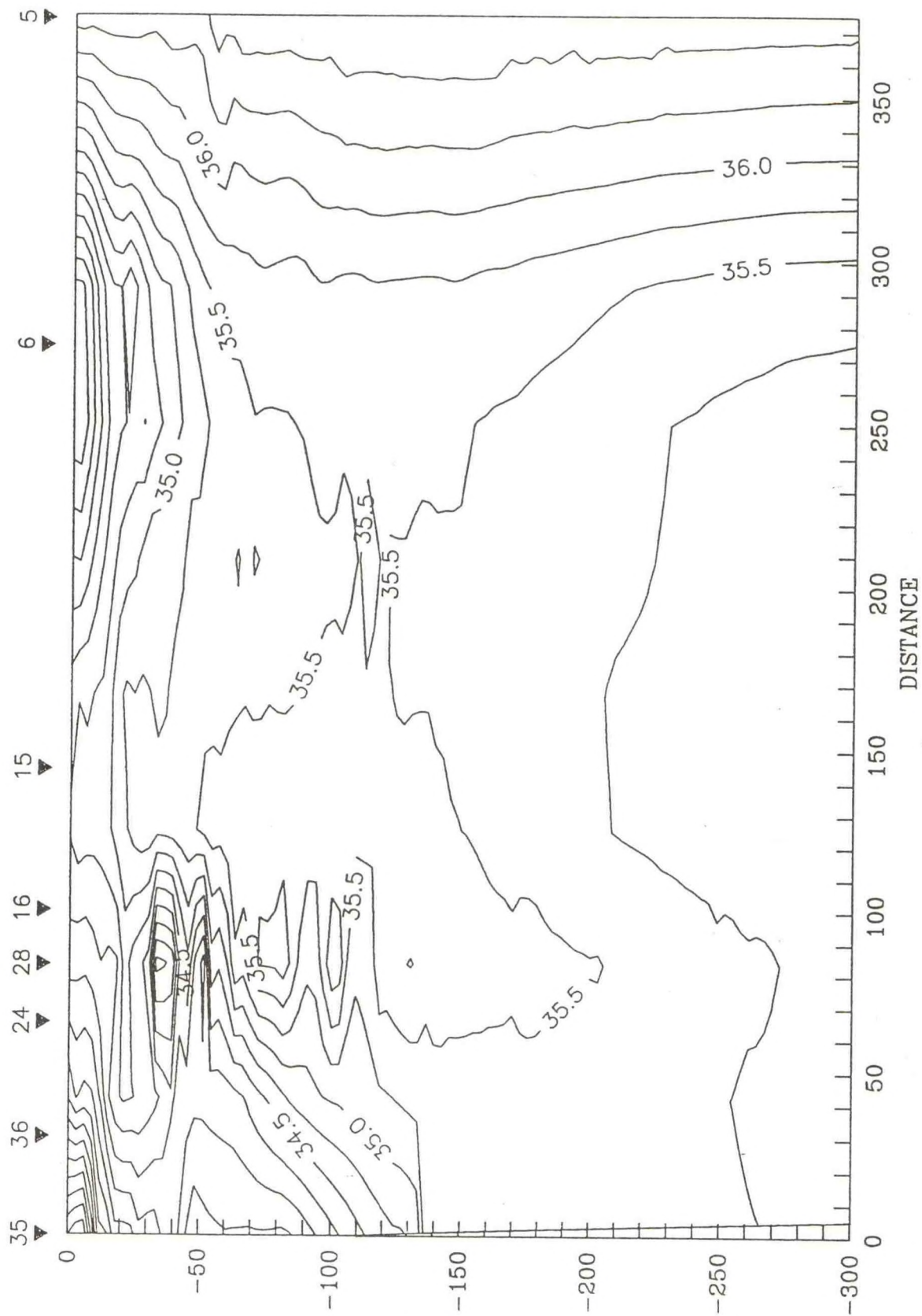


Figure 2.8b

DE 90-08, August 1990: Density (sigma theta), Transect 5

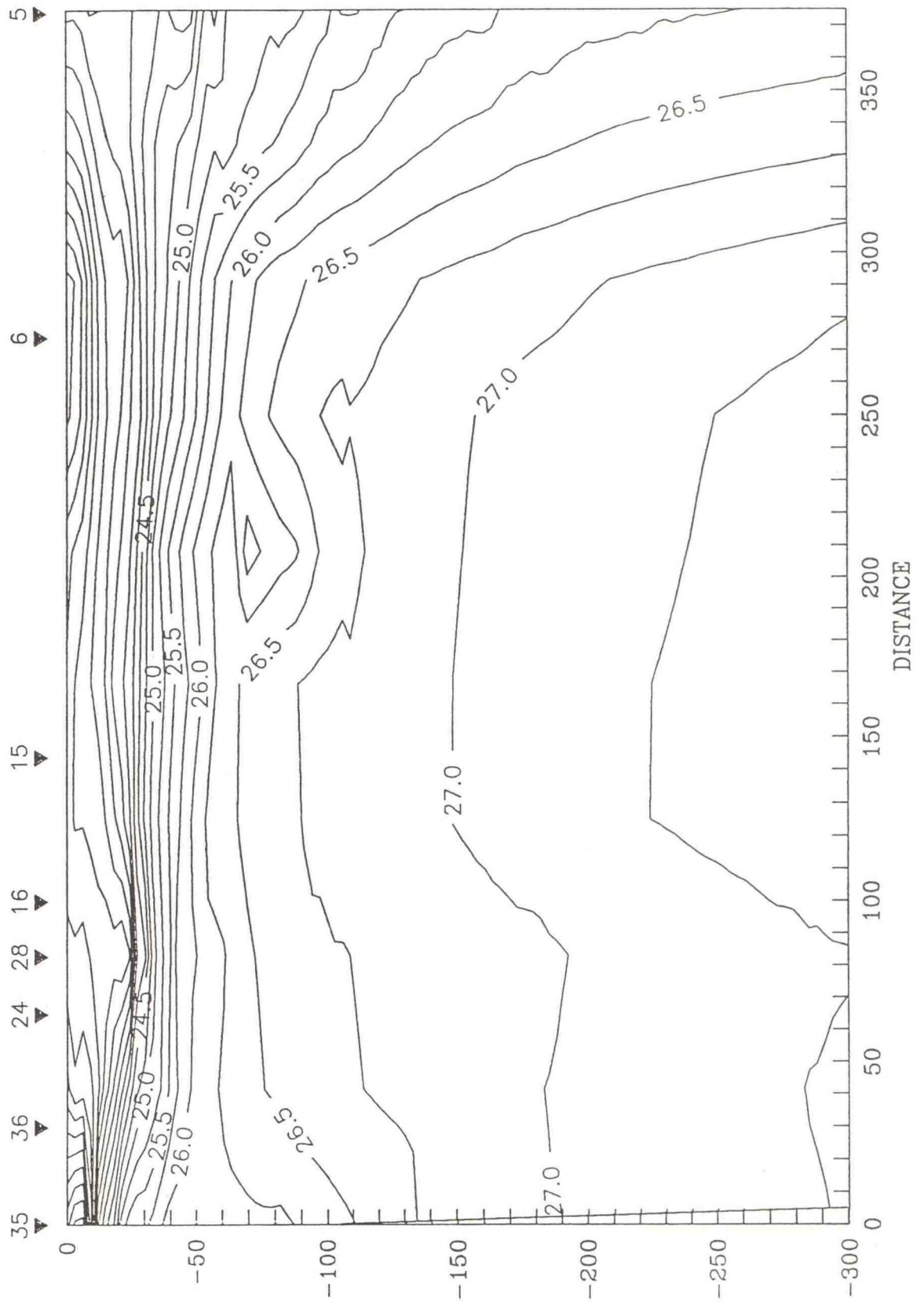


Figure 2.8c

DE 90-08, August 1990: Transmissivity, Transect 5

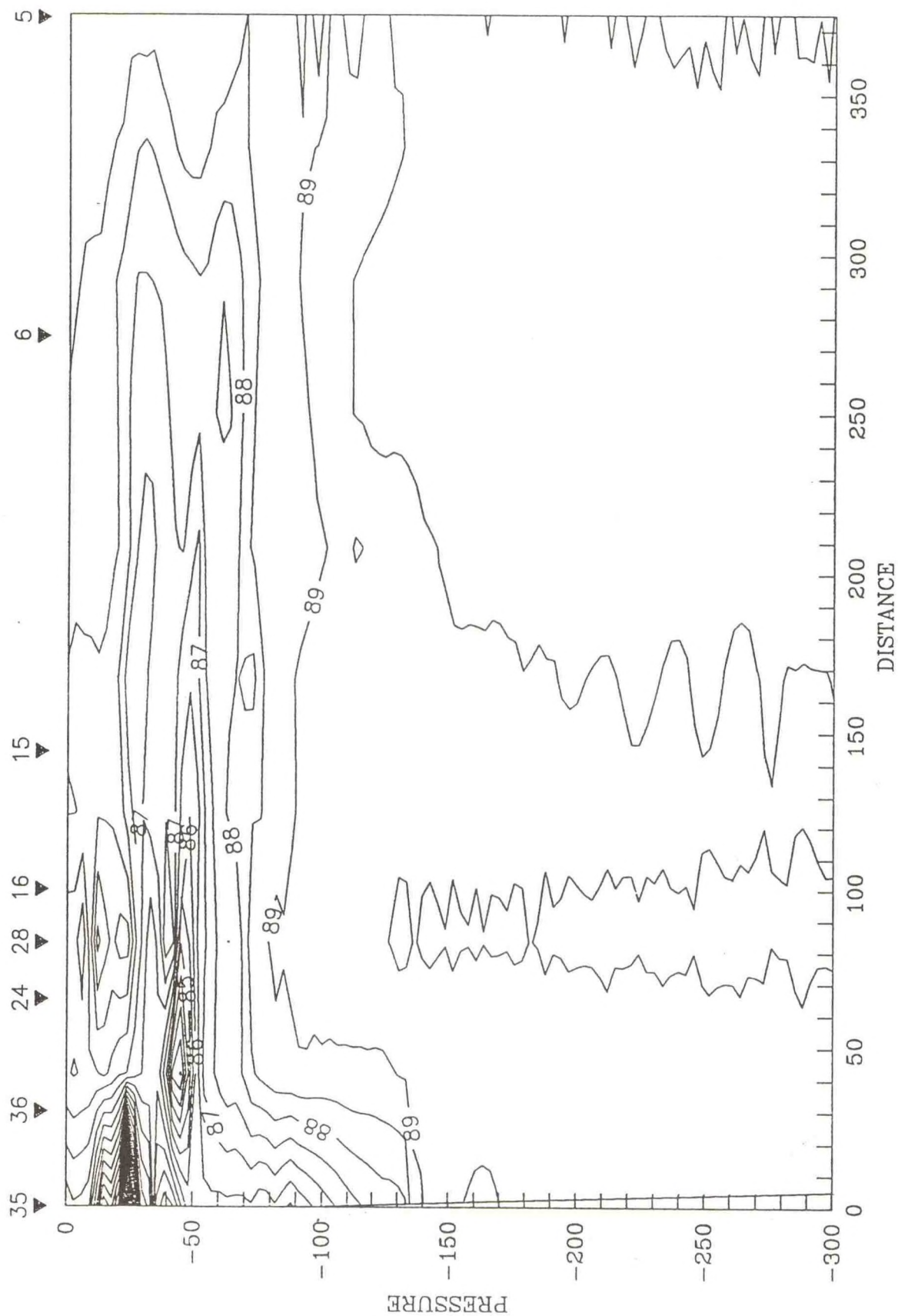


Figure 2.8d

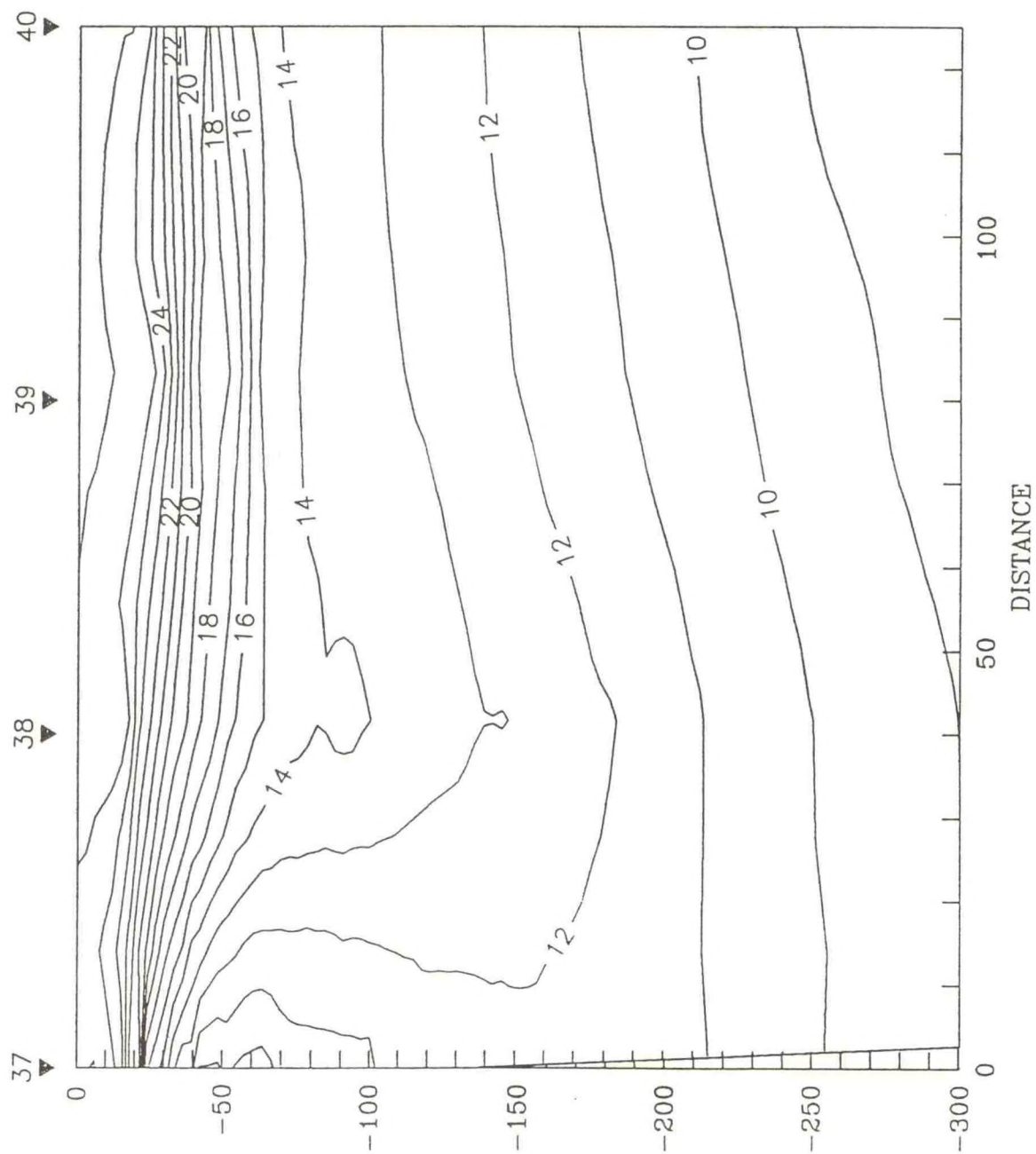


Figure 2.9a

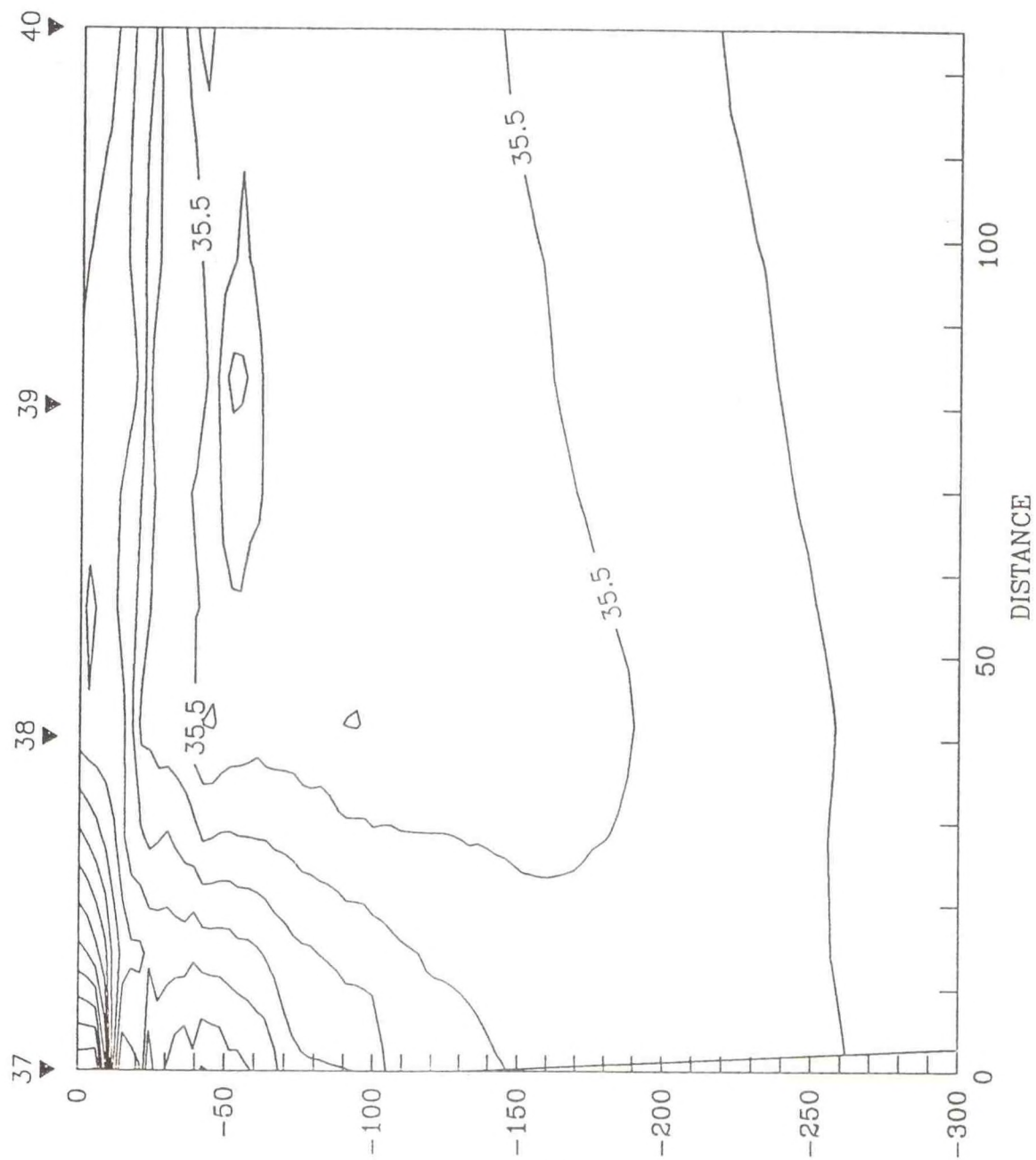


Figure 2.9b

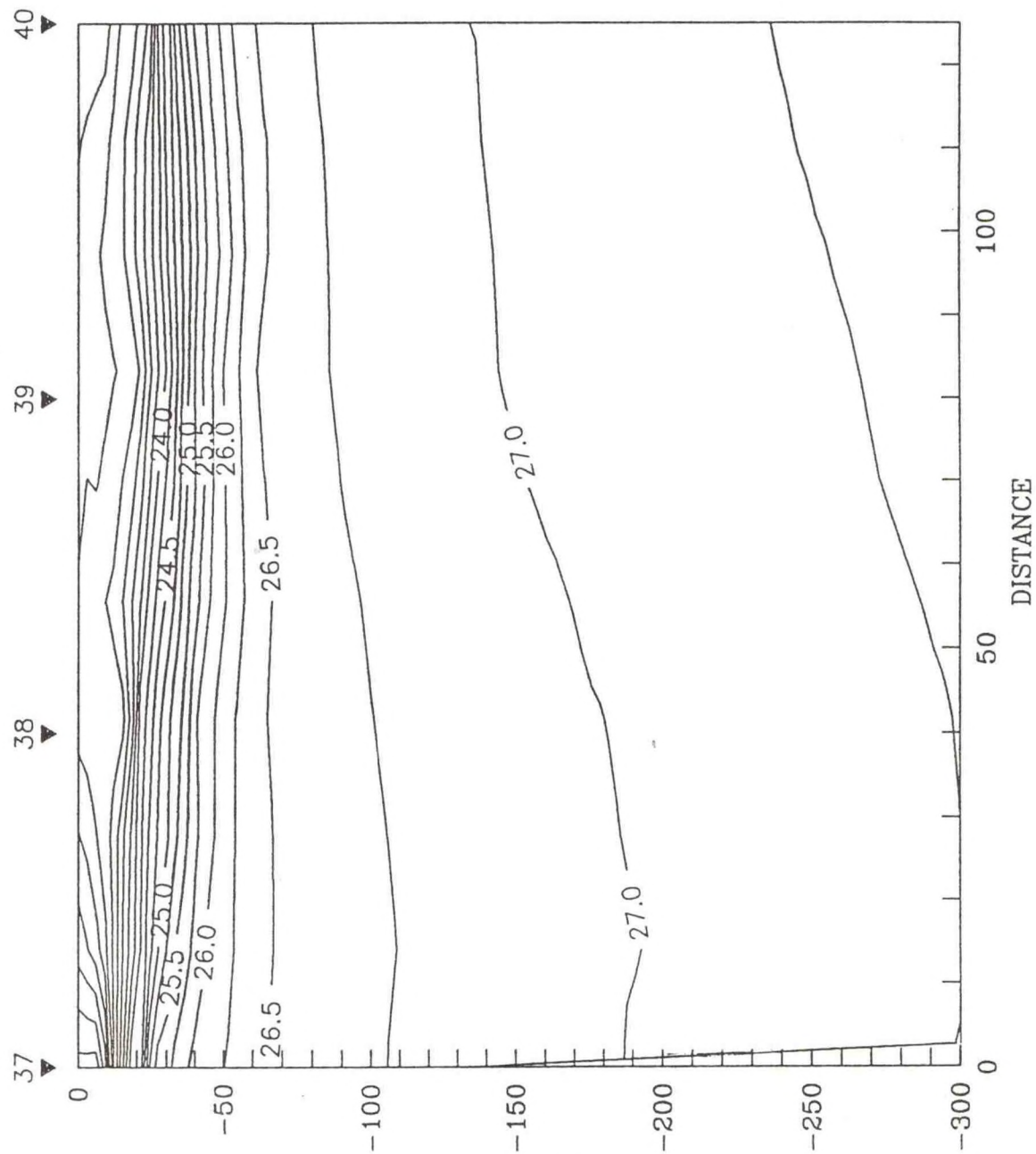


Figure 2.9c

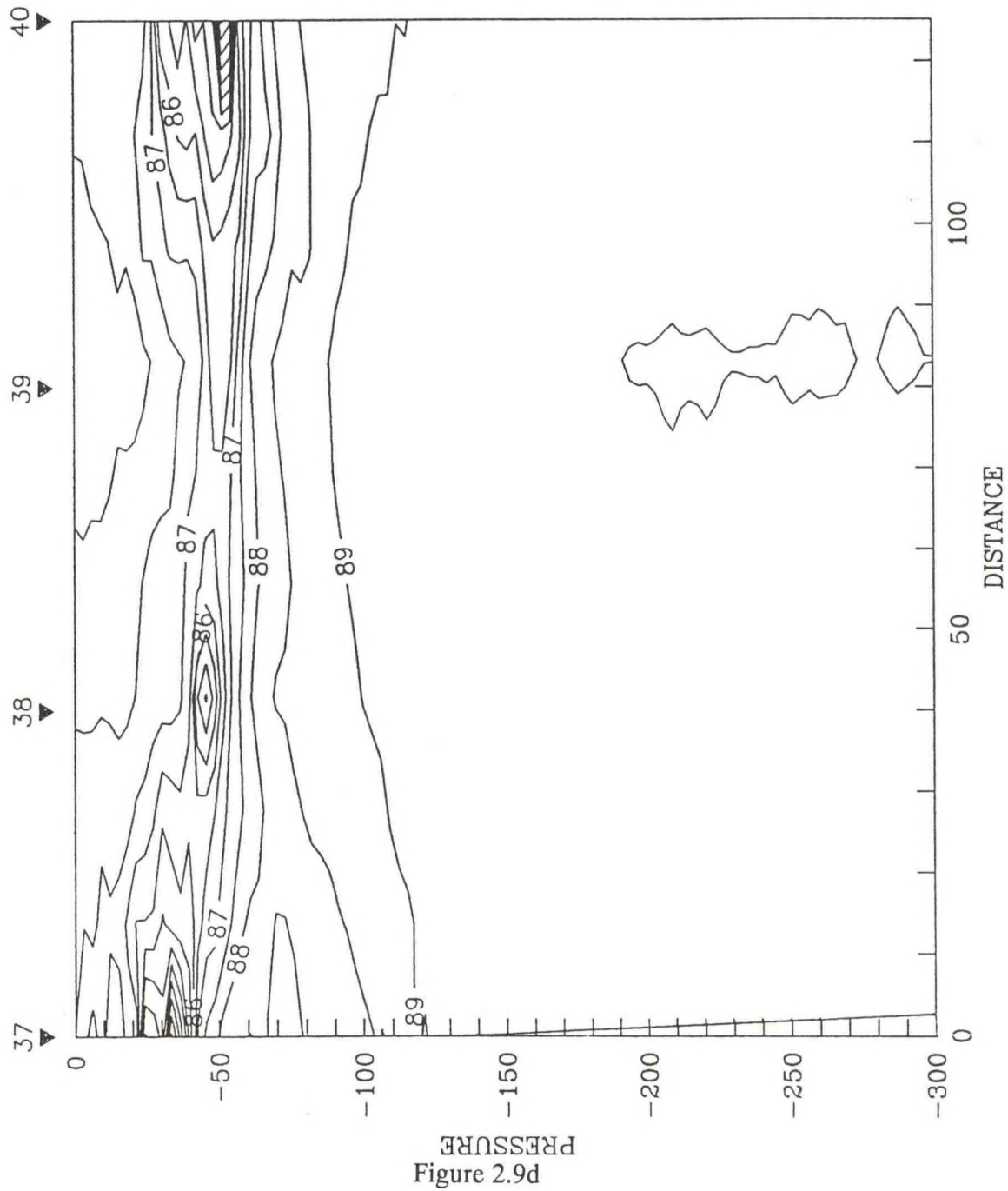


Figure 2.9d

DE 90-08, August 1990: Potential Temperature, Transect 7

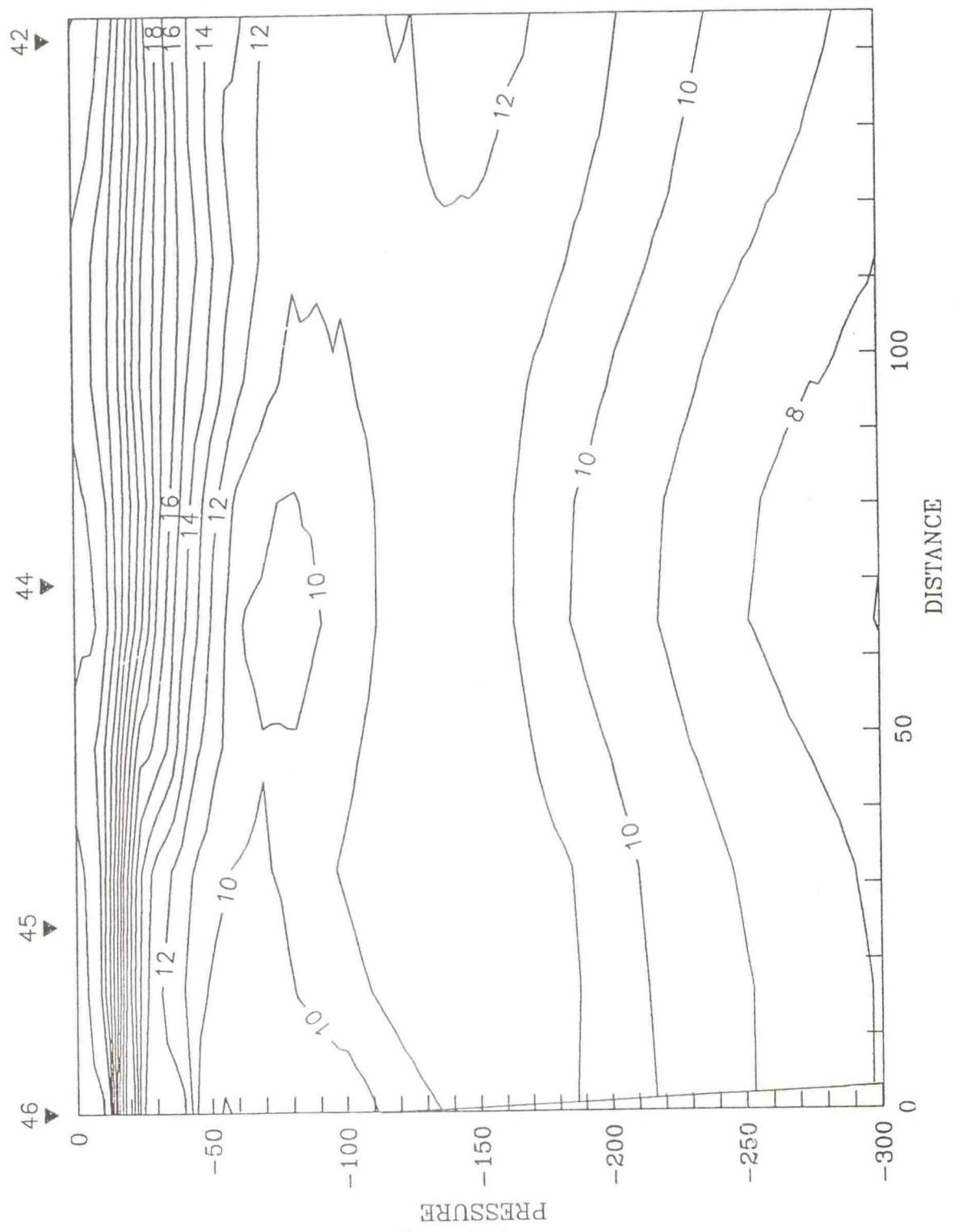


Figure 2.10a

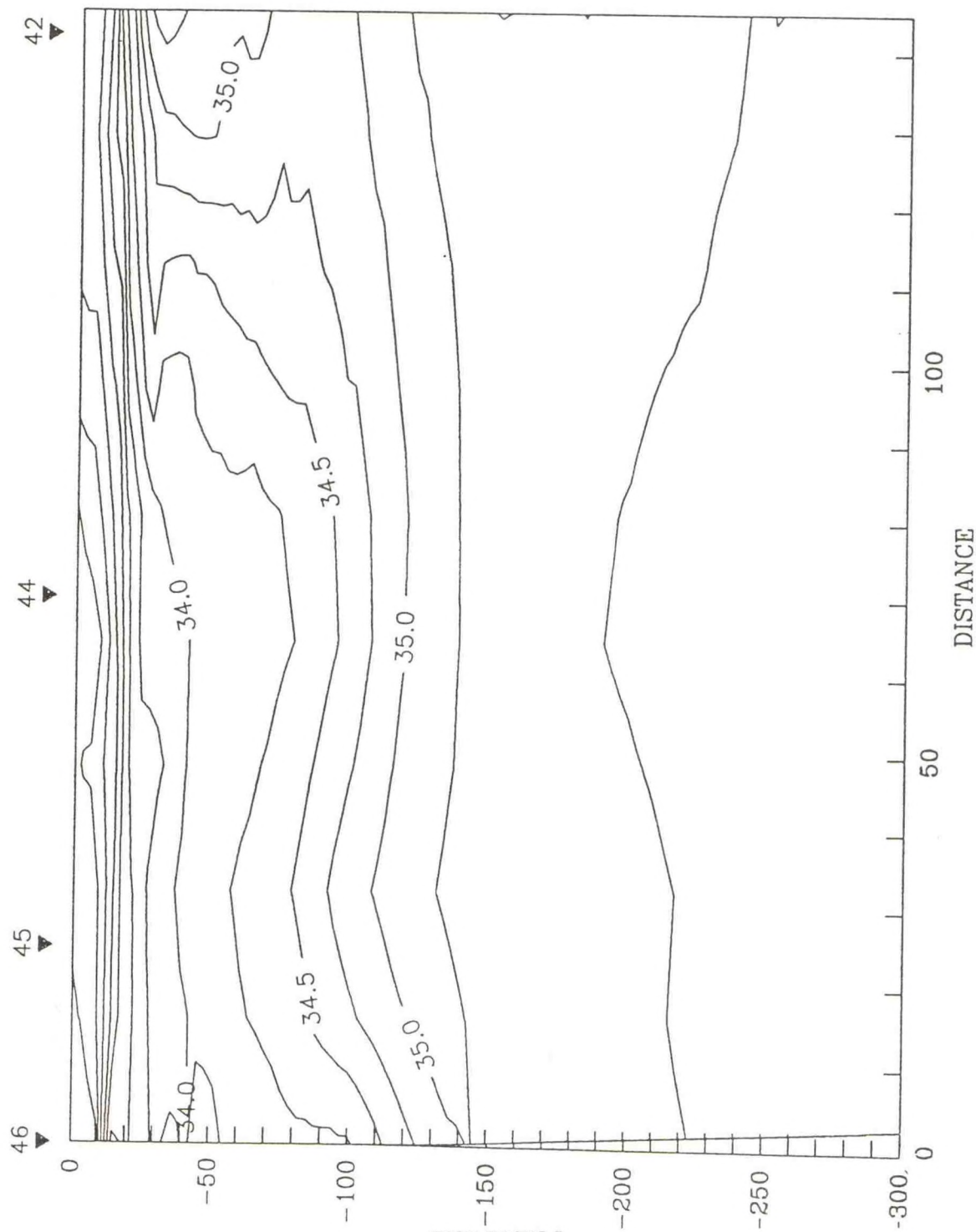


Figure 2.10b

DE 90-08, August 1990: Density (sigma theta), Transect 7

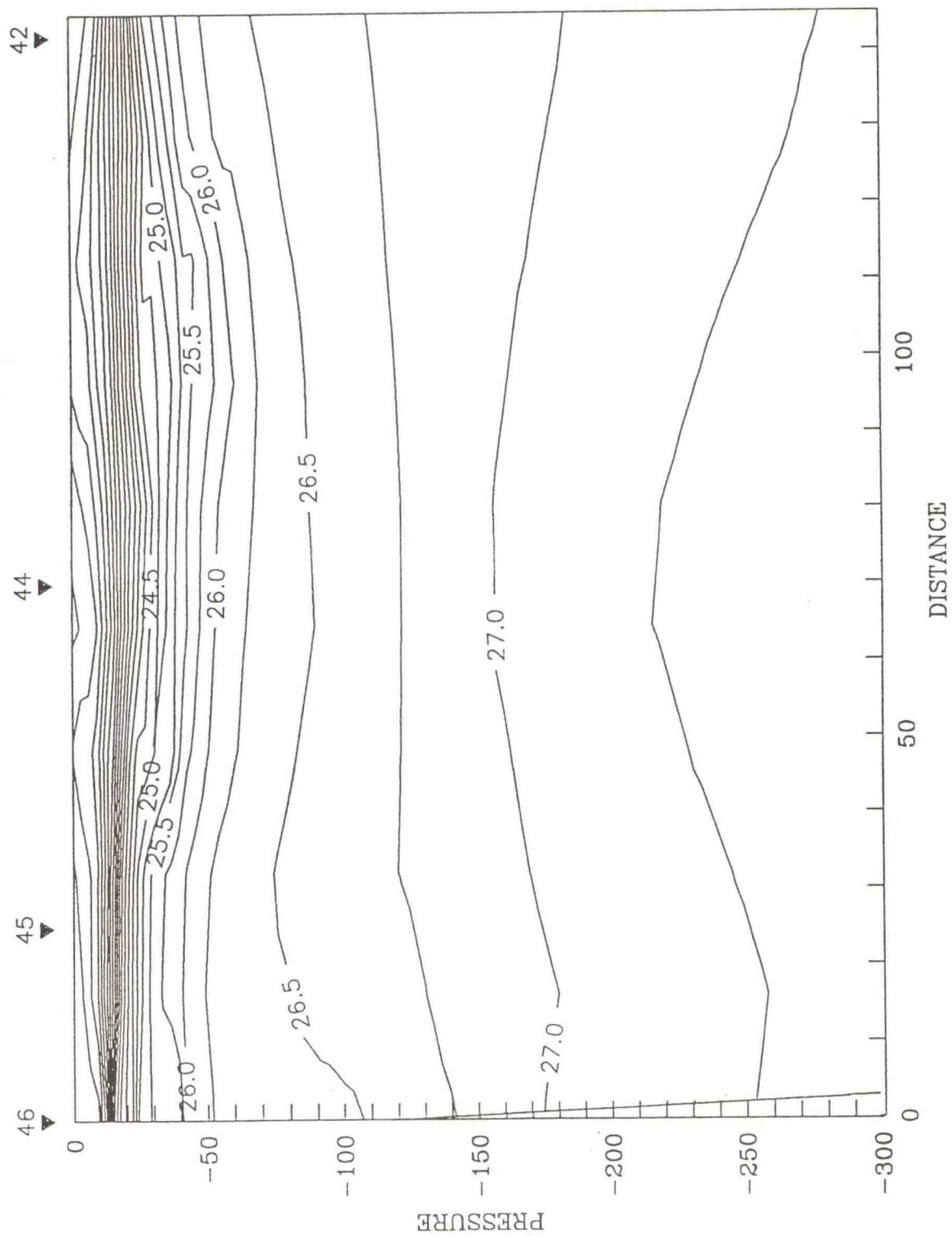


Figure 2.10c

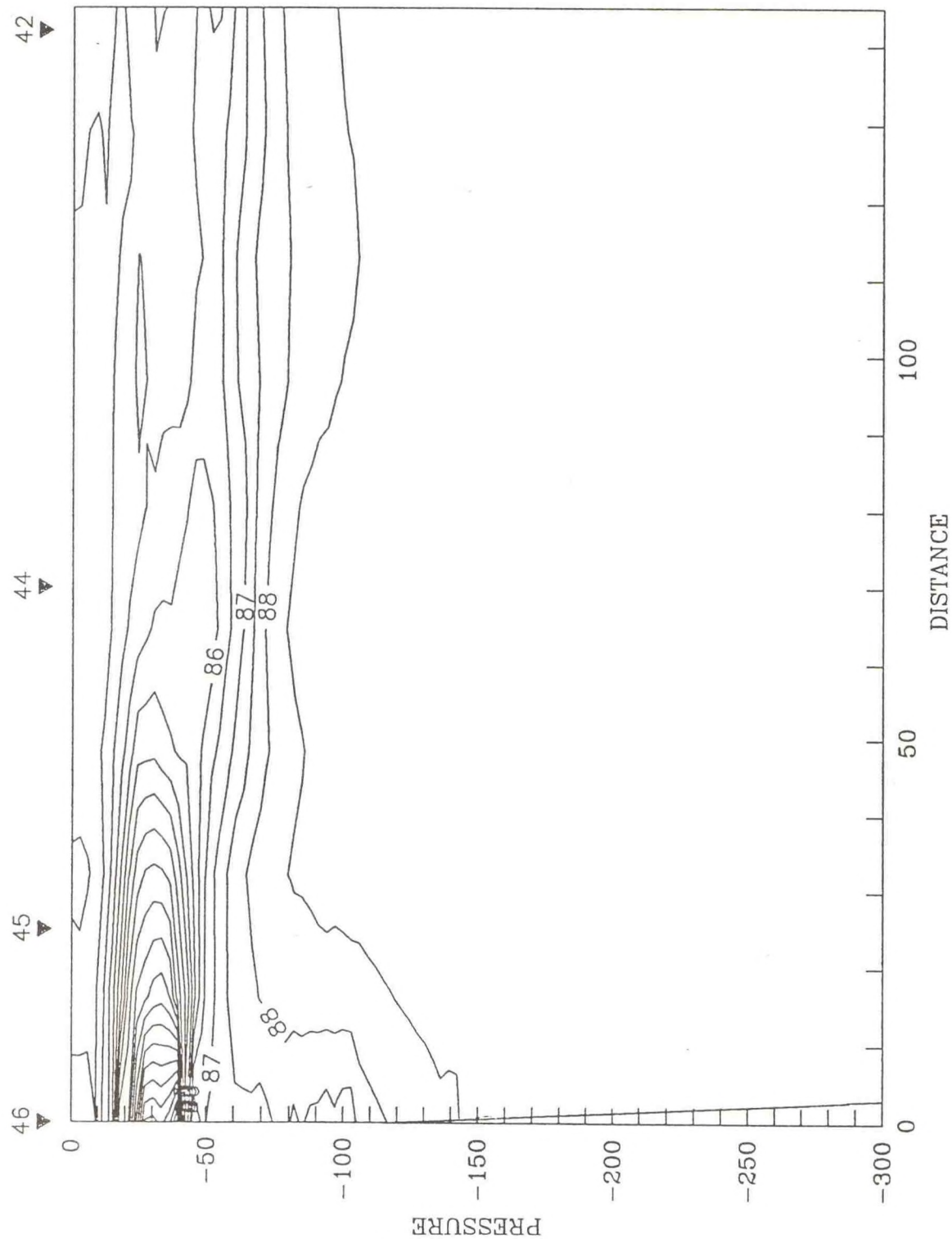


Figure 2.10d

ACKNOWLEDGEMENTS

We are particularly grateful to Tamara Holzwarth (NMFS) for her capable assistance, and to the competent and congenial Captain and crew of the R/V DELAWARE II. Cary Wong (NOS) assisted us in diagnostic testing of the temperature and conductivity sensor time constant mismatch.

REFERENCES

- Aikman, F. III and E. S. Posmentier, 1985. Stratification and shelf/slope interaction in the Middle Atlantic Bight, J. Geophys. Res., 90(C3), 4895-4905.
- Battelle, 1990. 106-Mile Deepwater Municipal Sludge Site Monitoring, Research and Surveillance Plan, EPA Contract No. 68-C8-0105, Joint Plan of EPA, NOAA and USCG, 90p.
- Bendat, J. S. and A. G. Piersol, 1971. Random Data: Analysis and Measurement Procedures. John Wiley and Sons, Inc., New York, 407p.
- Bisagni, J.J., 1985. Long-term correlation of industrial waste disposal at the 106-Mile Dumpsite with receiving water masses: October 1976 through September 1985. Applied Science Assos. report to NEFC/NMFS/NOAA, contract NA-84-EQ-A-00266, 17pp.
- Bryden, H. L., 1973. New polynomials for thermal expansion, adiabatic temperature gradient and potential temperature of sea water. Deep Sea Res., 20(4), 401-408.
- Cresswell, G.H., 1967. Quasi-synoptic monthly hydrography of the transition region between coastal and slope water south of Cape Cod, MA. W.H.O.I. Ref. No. 67-35 (unpublished manuscript).
- EOPB, 1991. 106-Mile Dumpsite Physical Oceanography Project: EOPB progress Report for 1990. Estuarine and Ocean Physics Branch, OMA/NOS/NOAA, 28p.
- Ford, W.L., J.R. Longard and R.E. Banks, 1952. On the nature, occurrence and origin of cold, low salinity water along the edge of the Gulf Stream. J. Mar. Res., 11(3), 281-293.
- Gordon, A.L. and F. Aikman III, 1981. Salinity maximum in the pycnocline of the Middle Atlantic Bight. Limnol. Oceanogr., 26(1), 123-130.
- Pederson, Arthur M., 1984. A modular high resolution CTD system with computer-controlled sample rate. presented at the Mar. Tech. Soc. STD Conference & Workshop, San Diego, CA, February, 1984.
- UNESCO, 1983. Algorithms for computation of fundamental properties of seawater. UNESCO technical papers in Marine Science #44.