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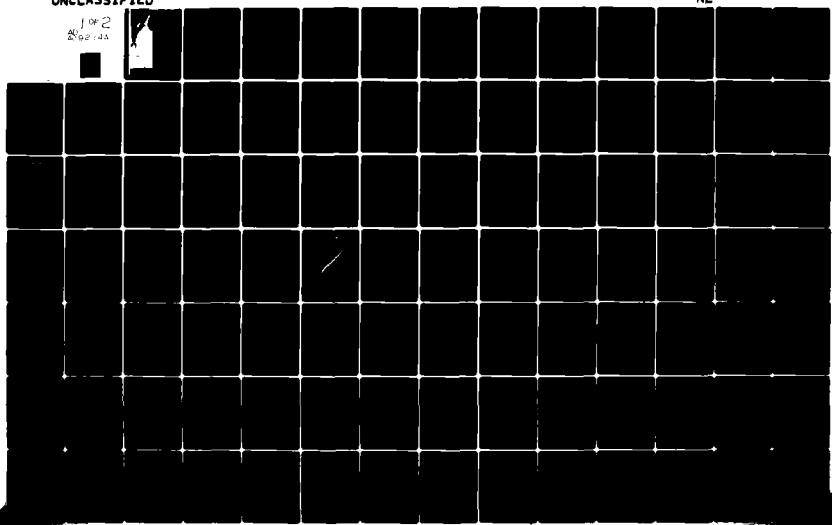
THE GULF STREAM MEANDERS EXPERIMENT. HYDROGRAPHIC DATA REPORT. --ETC(U)

SEP 80 J M BANE, D A BROOKS, M J IGNASZEWSKI N00014-77-C-0354

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THE GULF STREAM MEANDERS EXPERIMENT

Hydrographic Data Report

R/V Endeavor Cruises

EN-040 (2-8 August 1979)

EN-045 (16-23 November 1979)

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NOV 18 1980
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by

John M. Bane

David A. Brooks

Mark J. Ignaszewski

Texas A&M University

Reference 80-10-T

September 1980

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Gulf Stream

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FOREWORD

This is the third in a sequence of seven reports from the Gulf Stream Meanders Experiment. The field phases of the experiment were implemented as a joint project of principal investigators at Texas A&M University (DAB), and at the University of North Carolina at Chapel Hill (JMB). The complete set of reports, not necessarily listed in their order of availability, is expected to be:

1. Hydrographic Data Report, EN-031 (Jan 79) and EN-037 (May 79). TAMU Technical Report 80-1-T, January 1980, 145 pp.
2. Current Meter, Atmospheric, and Sea Level Data Report for the January to May 1979 Mooring Period. TAMU Technical Report 80-7-T, July 1980, 264 pp.
3. Hydrographic Data Report, EN-040 (Aug 79) and EN-045 (Nov 79). TAMU Technical Report 80-10-T, September 1980, 170 pp.
4. Current Meter, Atmospheric, and Sea Level Data Report for the August to November 1979 Mooring Period.
5. Air-dropped XBT survey data report, Feb 79.
6. Air-dropped XBT survey data report, Nov 79.
7. Final project technical report.

Reports number 4, 5, and 6 will be issued at the University of North Carolina.

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Contents

	<i>page</i>
FOREWORD	ii
SECTION 1. Introduction	1
SECTION 2. Data Collection, Calibration and Processing	3
2.1. STD Data	3
2.2. XBT Data	5
2.3. Derived hydrographic quantities	6
2.4. Contoured fields	7
SECTION 3. Report Organization	8
PART I - Cruise EN-040	9
PART II - Cruise EN-045	89
Acknowledgments	169
References	170

List of Tables

<i>Table</i>		<i>page</i>
1.	EN-040 Station Summary	10
2.	EN-045 Station Summary	90

List of Figures

<i>Figure</i>		<i>page</i>
1.	Map of study setting showing hydrographic stations occupied during cruises EN-040 and EN-045.	14
2.	Detailed ship tracks for cruise EN-040. The solid dots represent XBT stations. The circles represent STD/XBT stations with the on-station drift shown by the dotted lines. The crosses represent current meter mooring locations.	15
3.	Meteorological parameters recorded aboard ship during cruise EN-040.	16
4.	Wind and swell observations recorded aboard ship during cruise EN-040. The wind vectors point in the direction from which the wind was blowing, corrected for ships motion. The double arrowheads show the range of the recorded Beaufort scale. The swell vectors point in the direction from which the swell came. The circles represent times of no observations.	17
5.	STD-measured minus bottle calibration salinity values and XBT-measured minus reversing thermometer temperature values for EN-040. STD salinity values were corrected by subtracting 0.07‰; no temperature correction was applied. Erroneous data points are flagged by horizontal bars.	18
6.	Individual STD/XBT station profiles of temperature, salinity and derived quantities sigma-t and N^2 for EN-040. Station locations are shown in Figure 2.	19
7.	STD/XBT section contours of temperature, salinity and derived sigma-t and N^2 fields for Transect A. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units, and 0.5×10^{-4} rad ² ·s ⁻² , respectively.	29
8.	STD/XBT section contours of temperature, salinity and derived sigma-t and N^2 fields for Transect H. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units, and 0.5×10^{-4} rad ² ·s ⁻² , respectively.	33
9.	T-S diagram showing all STD/XBT points for EN-040 (crosses) and the resulting T-S correlation line fit by spline interpolation, which has been displaced to the right by 0.5‰. The stations used to generate the T-S correlation are listed in section 2.3.	37
10.	Comparison of surface bucket and XBT surface temperatures	38

11.	Individual XBT station temperature profiles. The profiles have not been forced to agree with surface bucket temperatures.	40
12.	Section contours of temperature and derived salinity, σ_t -t and N^2 fields for Transect A. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	57
13.	Section contours of temperature and derived salinity, σ_t -t and N^2 fields for Transect B. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	61
14.	Section contours of temperature and derived salinity, σ_t -t and N^2 fields for Transect C. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	65
15.	Section contours of temperature and derived salinity, σ_t -t and N^2 fields for Transect D. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	69
16.	Section contours of temperature and derived salinity, σ_t -t and N^2 fields for Transect F. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	73
17.	Section contours of temperature and derived salinity, σ_t -t and N^2 fields for Transect H-1. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	77
18.	Section contours of temperature and derived salinity, σ_t -t and N^2 fields for Transect H-2. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	81
19.	Section contours of temperature and derived salinity, σ_t -t and N^2 fields for Transect H6 to A6. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	85
20.	Detailed ship tracks for cruise EN-045. The solid dots represent XBT stations. The circles represent STD stations; the on-station drift is shown by the dotted lines. The crosses represent current meter mooring locations.	94
21.	Meteorological parameters recorded aboard ship during cruise EN-045.	95
22.	Wind and swell observations recorded aboard ship during cruise EN-040. The vectors point in the direction from which the wind was blowing, corrected for ship motion. The double arrowheads show the range of the recorded Beaufort scale. The swell vectors point in the direction from which the swell came.	96
23.	STD-measured minus bottle calibration values of salinity and temperature for EN-045. STD salinity values were corrected by subtracting 0.07‰; no temperature correction was applied. Erroneous data points are flagged by horizontal bars.	97

24.	Individual STD station profiles of temperature, salinity and derived quantities sigma-t and N^2 for EN-045. Station locations are shown in Figure 20.	98
25.	STD section contours of temperature, salinity and derived sigma-t, and N^2 fields for Transect G. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	114
26.	STD section contours of temperature, salinity and derived sigma-t, and N^2 fields for Transect X. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	118
27.	STD section contours of temperature, salinity and derived sigma-t, and N^2 fields for Transect Z. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	122
28.	T-S diagram showing all STD points for EN-045 (crosses) and the resulting T-S correlation line fit by spline interpolation, which has been displaced to the right by 0.5‰. The stations used to generate this T-S correlation are listed in section 2.3.	126
29.	Comparison of surface bucket and XBT surface temperatures for EN-045.	127
30.	Individual XBT station temperature profiles. Station locations are shown in Figure 20. The profiles have not been forced to agree with surface bucket temperatures.	129
31.	Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect A. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	142
32.	Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect B. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	146
33.	Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect GA. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	150
34.	Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect W. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	154
35.	Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect X. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	158
36.	Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect Z. Contour intervals are 1 C°, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively.	162

37. Historical temperature and salinity data collected in the hatched half degree squares were obtained from the NODC files and used to compute seasonal (summer and winter) T-S correlations for comparison with T-S correlations obtained from this study. 166
38. Comparison of NODC historical T-S correlation with those from cruises EN-040 and EN-045. The EN-040 and EN-045 correlations are the same as those shown in Figure 9 and 28, respectively. 167
39. Comparison of the T-S correlations obtained during the four cruises which comprised the two field phases of this project. The data from cruises EN-031 and EN-037 are documented in Brooks *et al.*, 1980. 168

SECTION 1

Introduction

This report documents hydrographic data collected during two cruises in R/V *Endeavor* in 1979: EN-040 (2-8 Aug) and EN-045 (16-23 Nov). These cruises were part of the second field phase of the Gulf Stream Meander project, sponsored by the National Science Foundation and the Office of Naval Research. The hydrographic data from two additional cruises during the first 1979 field phase of the project are documented in a separate report, (Brooks *et al.*, 1980). The hydrographic measurements were made in support of a moored instrument program. The data from the moored instruments (primarily current meters) are reported in separate data reports for the winter (Brooks *et al.*, 1980) and summer (Bane *et al.*, 1980) 1979 field phases.

The objective of the hydrographic program was to vertically and horizontally map the temperature and salinity fields of the Gulf Stream, hopefully as a meander passed through the moored instrument array. The hydrographic measurements were made in conjunction with mooring deployment and recovery operations.

The data reported here were collected with a Plessey 9040 STD system attached to a Niskin rosette sampler equipped with Niskin sample bottles and reversing thermometers. In addition, many temperature profiles were made with a Sippican XBT System. Surface bucket samples were taken at most stations. Beyond the presentation of contoured fields of certain derived

hydrographic quantities (e.g., σ_t), the data are not "analyzed." Interpretation of the data is not provided here. The data set will be made available to interested persons through the National Oceanographic Data Center.

SECTION 2

Data Collection, Calibration and Processing

2.1 STD DATA

The Plessey STD and its recording system were part of the shipboard scientific equipment of the R/V *Endeavor*. The calibration and maintenance of this equipment was performed by personnel from the University of Rhode Island, the ship operating institution.

Calibration samples, taken to provide scale corrections of temperature and salinity, if necessary, were collected with a Niskin rosette sampler. Samples were taken after equilibration stops at the greatest cast depth, on the upcast at various mid-depths, and at 10 m below the surface. Some of the mid-depth samples were used to confirm interesting features in the profiles, such as the sub-surface salinity maximum characteristic of Gulf Stream waters.

Due to problems with the recording equipment, there were significant differences in the method of STD data collection between the two cruises. The method used on each of the cruises will be explained separately.

2.1.1 Cruise EN-040

The temperature channel of the analog data recorder (Speedomax) was not functioning properly on this cruise. Thus we obtained only profiles of salinity versus depth from the STD casts. To make these traces useful, an XBT was dropped on each STD station to provide the temperature versus depth profile.

Throughout the remainder of this data report these stations will be referred to as STD/XBT stations. A total of 19 STD/XBT stations were taken on this cruise.

The XBT traces were digitized at TAMU using the XBT software; the method and resolutions are given in section 2.2. The salinity traces were digitized at TAMU on a Hewlett-Packard (HP) model 9864 digitizer under the control of a HP model 9830A calculator. The digitizing resolution was 0.002‰ in salinity and 0.79 m in depth. The salinity traces were digitized at the limit of the digitizer resolution in depth and interpolated to one meter intervals. These data were then block averaged over 5 m intervals. The digitized XBT traces were interpolated to 5 m intervals, and combined with the salinity data to give salinity and temperature versus depth for each STD/XBT station.

The calibration data for this cruise shows a good agreement between the STD-measured salinities and the sample bottle salinities. The temperature data shows greater variability. This variability is caused by the XBT's being less accurate in both temperature and depth than the STD; also, the XBT's were dropped as much as 45 minutes before the samples were taken on the upcast of the STD, during which time the ship was experiencing on-station drift. Based on these calibration results, the salinities were corrected by subtracting 0.07‰; no corrections were applied to the temperature data.

2.1.2 Cruise EN-045

The STD data on this cruise were recorded in the form of real-time analog profiles of temperature and salinity on a Speedomax plotter. These profiles were digitized with a resolution of 0.002‰ in salinity and 0.005 °C in temperature. The depth resolution on the shallow casts (less than 750 m) was 0.79 m. On the deep casts (greater than 750 m), the resolution was 1.58 m.

The plots were digitized at the limit of the digitizer resolution in depth, and interpolated to one meter intervals. The one meter data were then block averaged over 5 m intervals.

The calibration data from the 31 STD casts made on this cruise show a good agreement between the STD-measured and the sample bottle values of temperature and salinity. Salinity corrections were applied by subtracting 0.07‰. No temperature corrections were applied since the mean difference (-0.01°C) was near the limit of STD and thermometer accuracy.

2.2 XBT DATA

Sippican T-4 and T-7 XBT's were used for the bulk of the temperature casts. Sippican T-10 XBT's were used for a few stations on the W line during cruise EN-045. XBT's were used to provide the best synoptic coverage possible. The XBT traces were digitized at TAMU on the same equipment that was used for the STD traces; a set of standard software exists at TAMU for the digitizing and subsequent processing of XBT's. The XBT traces are digitized at uneven depth intervals such that a straight line drawn between successive pairs of points will reconstruct the trace. The XBT graph paper is non-linear in both temperature and depth, resulting in digitizer resolution variation from 0.051°C to 0.061°C in temperature for all XBT traces. The depth resolution was 0.878 m to 0.971 m for all XBT stations except W10 to W15; the resolution for these was 0.372 m to 0.400 m in depth. Surface bucket temperatures were taken at most stations and are compared to surface XBT temperatures in this report. Due to poor XBT trace resolution immediately after launch, ships motion, thermistor equilibration delays and relatively imprecise ($\pm 0.1^{\circ}\text{C}$) bucket thermometers, the XBT profiles have not been forced to agree with surface bucket temperatures.

2.3 DERIVED HYDROGRAPHIC QUANTITIES

The STD data were used to generate a T-S correlation for each cruise. The stations are separated into those which have only waters characteristic of the Gulf Stream and those which show coastal influences. The coastal influences show up as relatively fresh water near the surface; in general, the T-S correlation of these stations merges with that of the characteristic Gulf Stream waters at depth. A line was hand drawn through the T-S pairs of those stations which display only characteristic Gulf Stream water. These stations were A10, A11, A12, A13, A14, H9 and H10 for EN-040 and A12, A13, A14, G9, G10, G11, Z13, Z15, X9, X10 and X11 for EN-045. A cubic spline fit was made to this line, resulting in a functional relationship between temperature and salinity. Derived profiles of salinity were computed from all XBT profiles using the T-S correlation. The derived salinity and other hydrographic fields computed from the temperature and derived salinity are estimates of the actual Gulf Stream fields, but they exclude the influences of coastal waters. The greatest error will occur at the inshore stations near the surface. At the end of Part II there is a comparison of the T-S correlations of EN-040 and EN-045 with NODC historical T-S correlation for the same area. Summer and winter historical T-S correlations are shown.

The temperature and salinity (measured or derived) profiles were used to generate derived hydrographic profiles of sigma-t (σ_t) and Brunt-Väisälä frequency (N^2) for each station. The hydrographic parameters were calculated using algorithms developed at Scripps Institute of Oceanography as part of their Capricorn system. The computational results obtained by these algorithms have been shown to be in good agreement with the results of algorithms used by other institutions (Sweers, 1974). The Brunt-Väisälä frequency was computed as

$$N^2 = g \left[\frac{-1}{\rho} \frac{\partial \rho}{\partial z} - \frac{g}{C^2} \right]$$

where C is the speed of sound propagation.

2.4 CONTOURED FIELDS

Much of the data in this report is presented as contoured cross-stream sections of directly measured and derived hydrographic fields. This format lacks the details of the individual station profiles, due to necessary smoothing by the contouring routine. The contouring routine performs a series of interpolations in order to draw the sections. First, the parameter is linearly interpolated to standard depths at each station. Then the values at each depth level are interpolated horizontally to an evenly-spaced grid by a cubic spline under tension. The contours are then drawn through the grid by a cubic spline under tension.

There has been no subjective editing performed on these contours. The only "editing" present is in the smoothing built into the contouring routine. This can cause some unrealistic-looking features in the sections, especially in some of the derived fields.

SECTION 3

Report Organization

This report consists of two major parts, one for each cruise. Each part consists of a table of station names, dates, and positions followed by a map of the study area, meteorological and sea state data, STD calibration data, STD section contours, T-S correlations, XBT calibration data, XBT station profiles, and XBT section contours.

Following Part II, a comparison between NODC historical T-S data and the T-S correlation from each of the two cruises is shown. The area over which the historical data were taken is also shown. A comparison of the T-S correlations of the four cruises which comprised the two field phases of this project is also shown.

Part I

Cruise EN-040

The objective of cruise EN-040 was to deploy four current meter moorings and then perform a hydrographic survey of the array area; the survey was to consist of eight cross-Stream transects, running upstream, and one along-Stream transect, approximately along the 400 m isobath.

Problems with an acoustic release necessitated our return to shore after completing the deployment of three current meter moorings and one STD/XBT transect along the transect furthest downstream. On the way toward shore a XBT transect was run along the same transect.

The hydrographic survey was continued, approximately 18 hours later, along an upstream transect. A short break (one hour) was taken in one of the transects to redeploy the last current meter mooring. A total of six cross-Stream transects and one along-Stream transect were taken.

Station	Date/Time (GMT)	Latitude (N)	Longitude (W)	Station Type	Cast Depth (m)	Discrete Samples
Mooring A	3 Aug 79/0405	33°28.3'	76°52.6'	deployment	200	0
Mooring B	0647	33°21.9'	76°41.3'	deployment	410	0
Mooring C	1036	33°51.1'	76°14.7'	deployment	400	0
Mooring D	1556	33°55.4'	76°11.5'	deployment	390	0
H02	3 Aug 79/1826	34°18.7'	76°24.4'	STD/XBT	25	Bucket; 2
H03	2135	34°15.3'	76°16.9'	STD/XBT	28	Bucket; 2
H04	2223	34°11.6'	76°13.2'	STD/XBT	28	Bucket; 2
H05	2326	34°08.3'	76°08.3'	XBT	150	Bucket
H06	2358	34°05.1'	76°03.1'	STD/XBT	325	Bucket; 4
H07	4 Aug 79/0222	34°01.5'	75°58.0'	STD/XBT	365	Bucket; 5
H08	0620	33°59.3'	75°51.4'	STD/XBT	220	Bucket; 3
H09	1105	33°55.8'	75°47.1'	STD/XBT	750	Bucket; 6
H10	1421	33°52.6'	75°41.8'	STD/XBT	750	Bucket; 4
H09	4 Aug 79/1751	33°55.8'	75°47.3'	XBT	757	0
H08	1827	33°59.2'	75°53.9'	XBT	595	0
H06	1920	34°05.0'	76°03.1'	XBT	350	0
H05	1948	34°08.3'	76°08.4'	XBT	98	0
H04	2016	34°11.5'	76°13.6'	XBT	43	0
H03	2046	34°14.6'	76°19.0'	XBT	33	0
H02	2110	34°18.0'	76°22.8'	XBT	35	0
F01	5 Aug 79/1344	34°10.3'	76°38.7'	XBT	36	0
F02	1410	34°07.1'	76°33.6'	XBT	38	0
F03	1436	34°03.8'	76°28.2'	XBT	42	0
F04	1502	34°00.6'	76°23.2'	XBT	47	0
F05	1530	33°57.4'	76°17.7'	XBT	197	0
F06	1557	33°54.3'	76°13.2'	XBT	388	0
F07	1624	33°51.1'	76°07.6'	XBT	506	0
F08	1653	33°47.8'	76°02.5'	XBT	616	0
F09	1726	33°44.4'	75°56.8'	XBT	880	0
F10	1756	33°41.1'	75°52.1'	XBT	937	0
F11	1834	33°38.0'	75°46.8'	XBT	905	0
F12	1850	33°34.9'	75°41.7'	XBT	897	0
F13	1916	33°31.7'	75°36.5'	XBT	894	0
F14	1945	33°28.5'	75°31.3'	XBT	923	0
F15	2014	33°25.3'	75°26.2'	XBT	921	Bucket

Table 1. EN-040 Station Summary. This table is continued on the next 3 pages.

EN-040

Station	Date/Time (GMT)	Latitude (N)	Longitude (W)	Station Type	Cast Depth (m)	Discrete Samples
D15	5 Aug 79/2120	33°14.5'	75°36.0'	XBT	800	Bucket
D14		33°17.2'	75°41.0'	XBT	862	Bucket
D13		33°20.8'	75°46.3'	XBT	917	Bucket
D12		33°24.2'	75°51.5'	XBT	918	Bucket
D11		33°27.0'	75°57.0'	XBT	907	Bucket
D10		33°30.6'	76°01.9'	XBT	880	Bucket
D09		33°33.8'	76°07.1'	XBT	729	Bucket
D08		33°36.9'	76°12.4'	XBT	601	Bucket
D07		33°40.1'	76°17.8'	XBT	490	Bucket
D06		33°43.8'	76°23.0'	XBT	375	Bucket
D05	6 Aug 79/0015	33°46.5'	76°28.0'	XBT	233	Bucket
D04		33°49.8'	76°32.9'	XBT	65	Bucket
D03		33°53.3'	76°38.3'	XBT	43	Bucket
D02		33°56.2'	76°43.3'	XBT	30	Bucket
D01		33°59.4'	76°48.5'	XBT	32	Bucket
C01		33°48.5'	76°58.2'	XBT	37	Bucket
C02		33°45.4'	76°53.0'	XBT	42	Bucket
C03		33°42.5'	76°47.8'	XBT	42	Bucket
C04		33°38.9'	76°42.6'	XBT	159	Bucket
C05		33°35.5'	76°37.5'	XBT	265	Bucket
C06	6 Aug 79/0425	33°32.6'	76°32.2'	XBT	399	Bucket
C07		33°29.3'	76°27.0'	XBT	505	Bucket
C08		33°26.1'	76°21.9'	XBT	591	Bucket
C09		33°22.9'	76°16.5'	XBT	697	Bucket
C10		33°20.0'	76°11.5'	XBT	822	Bucket
C11		33°16.5'	76°06.5'	XBT	866	Bucket
C12		33°13.3'	76°01.3'	XBT	873	Bucket
C13		33°10.5'	75°55.1'	XBT	890	Bucket
C14		33°06.8'	75°50.9'	XBT	892	Bucket
C15		33°03.6'	75°45.8'	XBT	878	Bucket

EN-040

Station	Date/Time (GMT)	Latitude (N)	Longitude (W)	Station Type	Cast Depth (m)	Discrete Samples
B15	6 Aug 79/1140	32°52.8'	75°55.5'	XBT	867	Bucket
B14	1207	32°56.0'	76°00.8'	XBT	871	Bucket
B13	1237	32°59.1'	76°06.1'	XBT	796	Bucket
B12	1305	33°02.4'	76°11.0'	XBT	852	Bucket
B11	1335	33°05.8'	76°16.3'	XBT	850	Bucket
B10	1403	33°08.8'	76°21.4'	XBT	799	Bucket
B09	1432	33°12.0'	76°26.4'	XBT	684	Bucket
B08	1502	33°15.3'	76°31.6'	XBT	518	Bucket
B07	1533	33°18.5'	76°36.7'	XBT	499	Bucket
B06	1620	33°22.0'	76°41.5'	XBT	400	Bucket
B05	1657	33°25.5'	76°47.2'	XBT	276	Bucket
B04	1724	33°28.1'	76°52.1'	XBT	207	Bucket
Mooring A	6 Aug 79/1731	33°28.2'	76°52.1'	deployment	200	0
B03	6 Aug 79/1815	33°31.3'	76°57.5'	XBT	60	Bucket
B02	1845	33°34.5'	77°02.6'	XBT	36	Bucket
B01	1910	33°37.8'	77°07.9'	XBT	29	Bucket
A01	6 Aug 79/2120	33°26.8'	77°17.4'	STD/XBT	25	2
A02	2248	33°23.9'	77°12.2'	STD/XBT	33	4
A03	7 Aug 79/0009	33°20.7'	77°05.5'	STD/XBT	110	5
A04	0205	33°17.3'	77°01.9'	STD/XBT	215	6
A05	0404	33°14.2'	76°56.7'	STD/XBT	272	Bucket; 6
A06	0617	33°10.9'	76°51.6'	STD/XBT	289	Bucket; 12
A07	0914	33°08.0'	76°44.8'	STD/XBT	467	Bucket; 12
A08	1127	33°04.8'	76°41.1'	STD/XBT	490	Bucket; 12
A09	1459	33°01.4'	76°35.8'	STD/XBT	605	Bucket; 12
A10	1800	32°58.1'	76°30.6'	STD/XBT	665	Bucket; 11
A11	2114	32°54.9'	76°25.6'	STD/XBT	730	Bucket; 11
A12	2345	32°51.6'	76°20.4'	STD/XBT	745	Bucket; 12
A13	8 Aug 79/0158	32°48.4'	76°15.2'	STD/XBT	725	Bucket; 12
A14	0401	32°45.2'	76°10.3'	STD/XBT	750	12 Bucket; 11

EN-040

Station	Date/Time (GMT)	Latitude (N)	Longitude (W)	Station Type	Cast Depth (m)	Discrete Samples
A06	8 Aug 79/1022	33°10.7'	76°51.7'	XBT	400	Bucket
AB	1052	33°16.3'	76°46.7'	XBT	410	Bucket
B06	1125	33°20.4'	76°41.4'	XBT	419	Bucket
BC	1208	33°27.8'	76°36.7'	XBT	381	Bucket
C06	1239	33°32.5'	76°32.2'	XBT	383	Bucket
CD	1309	33°38.0'	76°27.5'	XBT	393	Bucket
D06	1342	33°43.5'	76°22.7'	XBT	384	Bucket
DF	1431	33°48.9'	76°17.7'	XBT	449	Bucket
F06	1504	33°54.6'	76°12.5'	XBT	370	Bucket
FH	1556	33°59.9'	76°08.0'	XBT	361	Bucket
H06	1634	34°05.2'	76°03.1'	XBT	352	Bucket

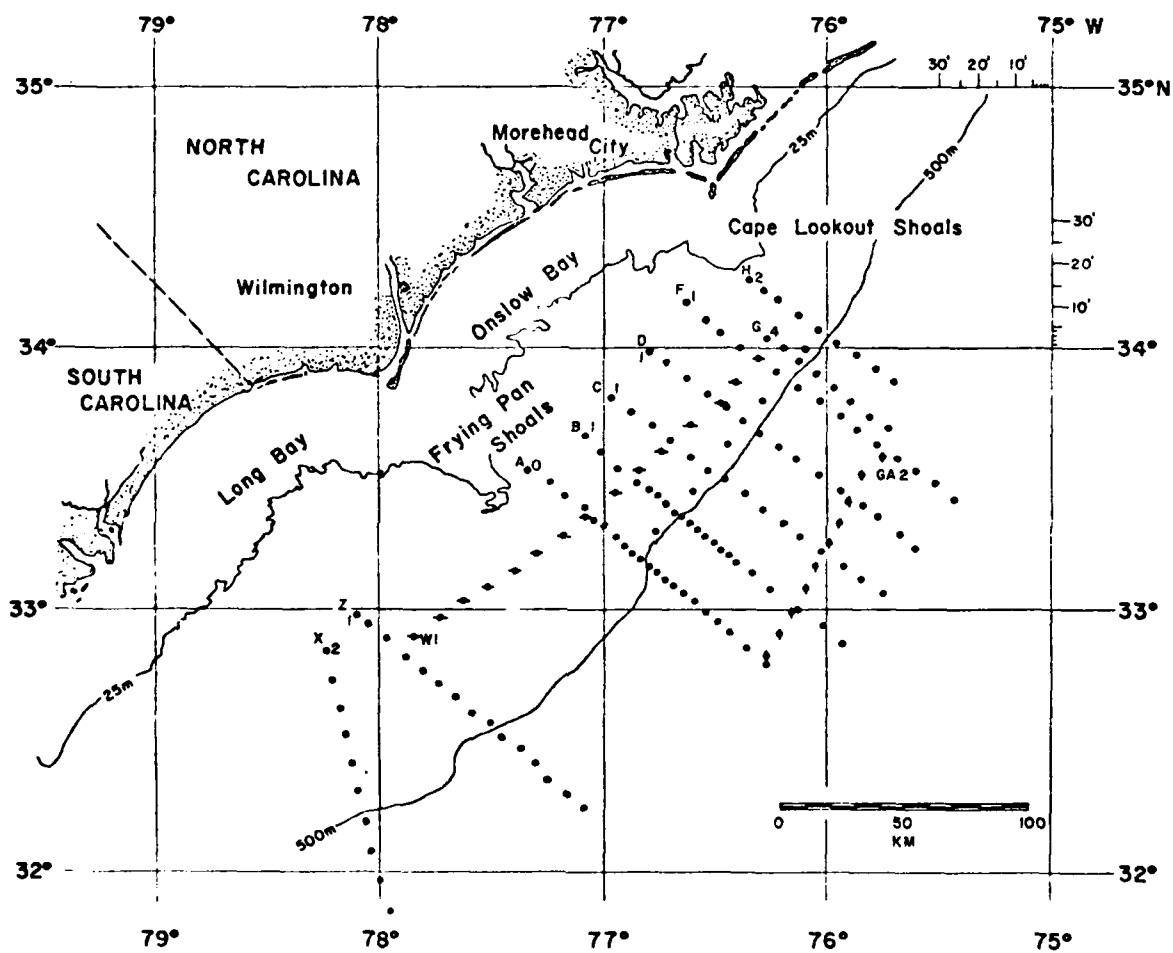


Figure 1. Map of study setting showing hydrographic stations occupied during cruises EN-040 and EN-045.

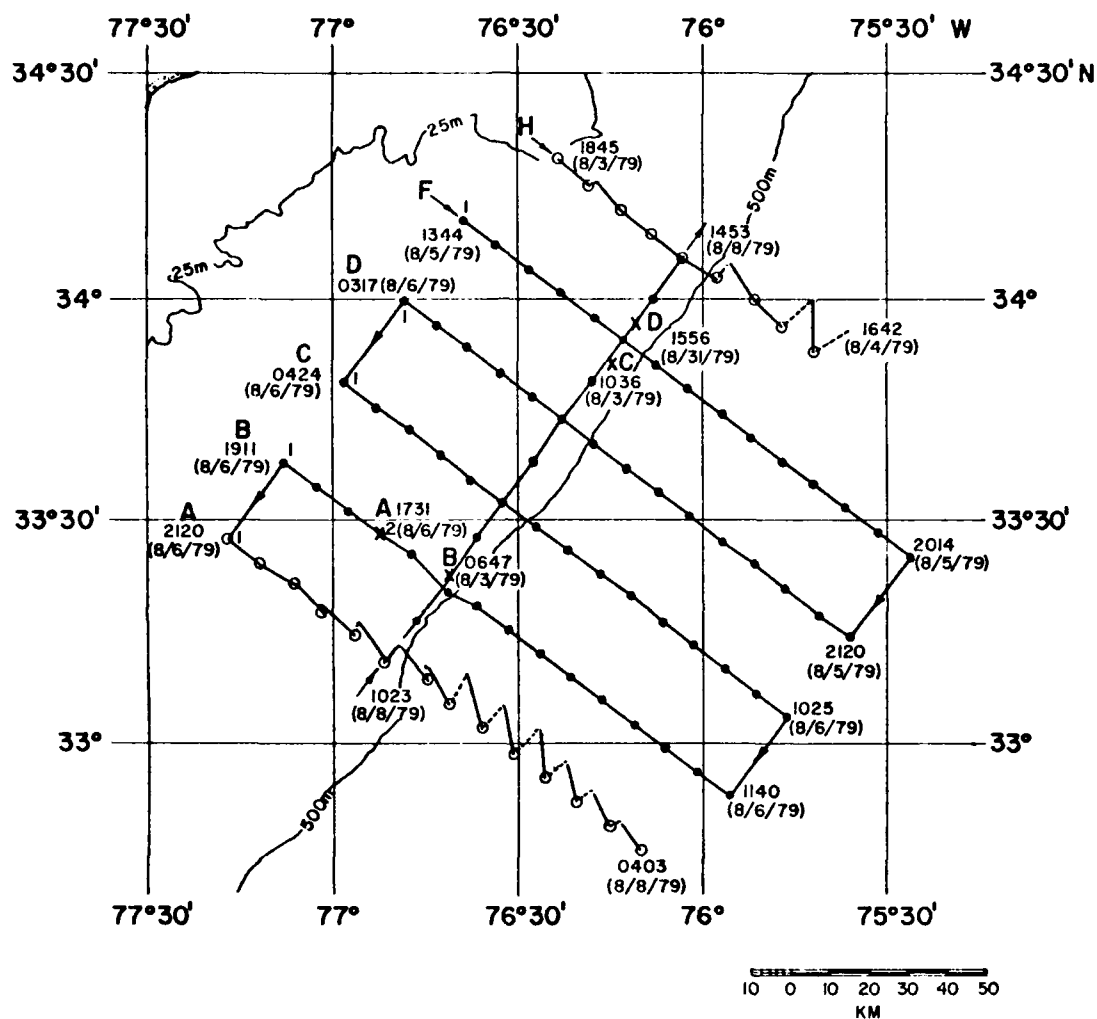


Figure 2. Detailed ship tracks for cruise EN-040. The solid dots represent XBT stations. The circles represent STD/XBT stations with the on-station drift shown by the dotted lines. The crosses represent current meter mooring locations.

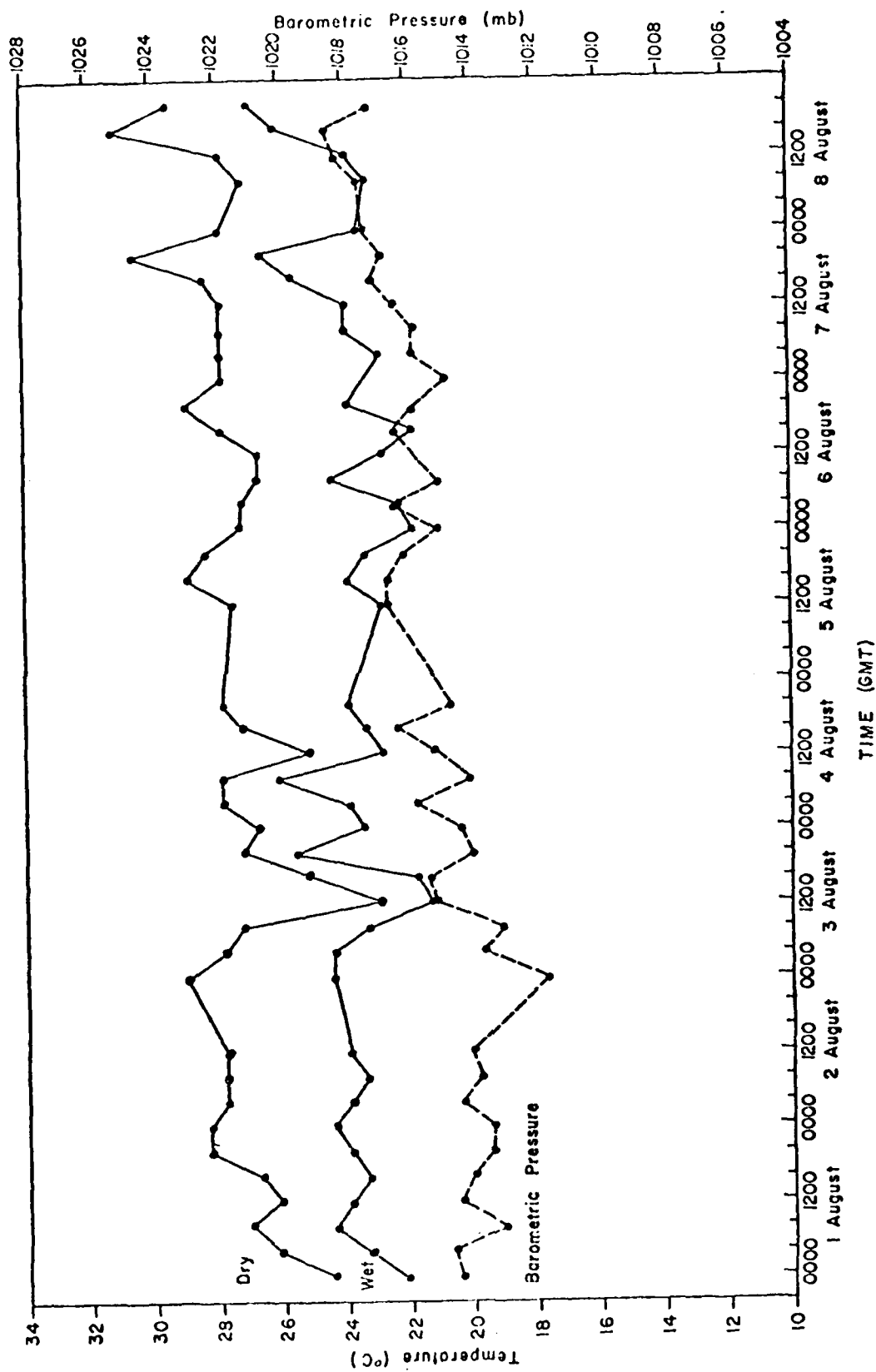


Figure 3. Meteorological parameters recorded aboard ship during cruise EN-040.

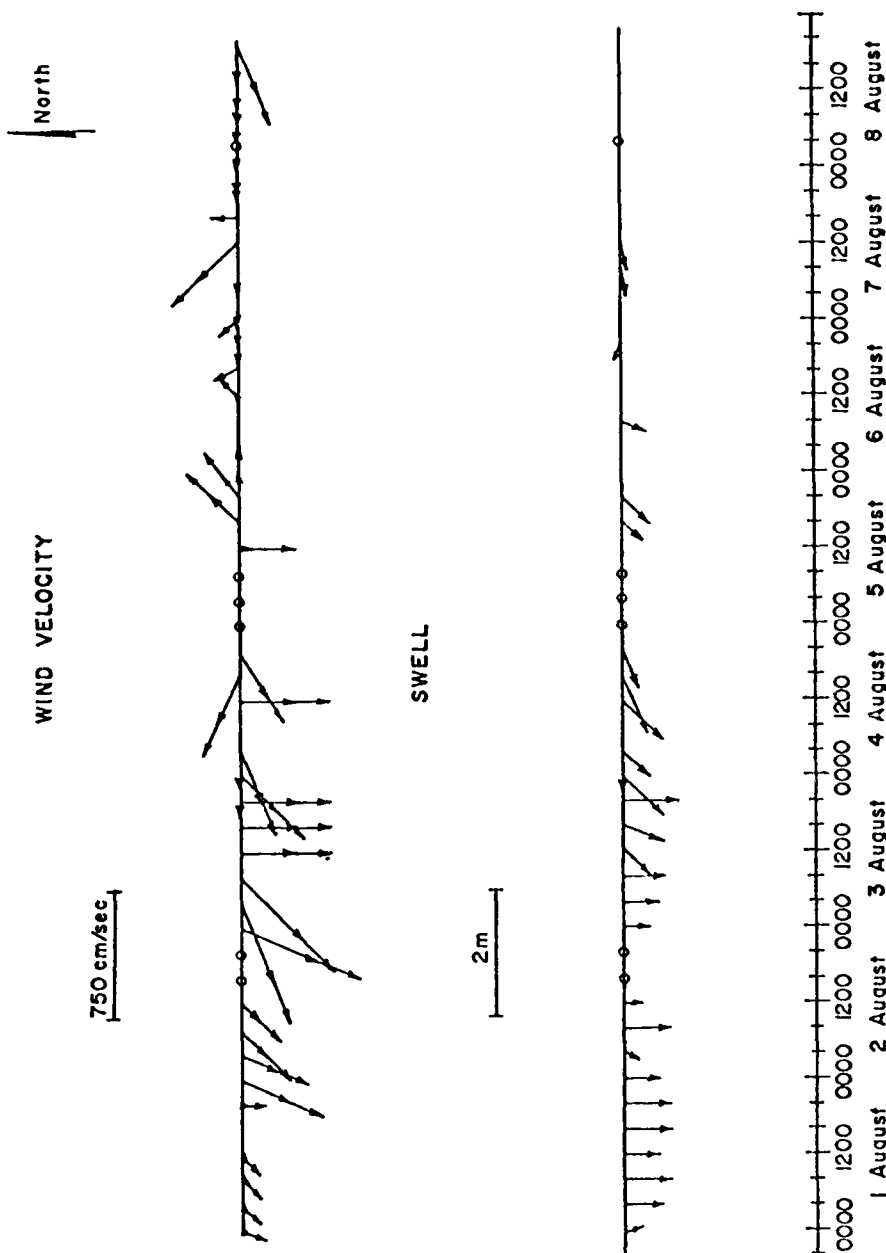


Figure 4. Wind and swell observations recorded aboard ship during cruise EN-040. The wind vectors point in the direction from which the wind was blowing, corrected for ships motion. The double arrowheads show the range of the recorded Beaufort scale. The swell vectors point in the direction from which the swell came. The circles represent times of no observations.

CRUISE EN-040

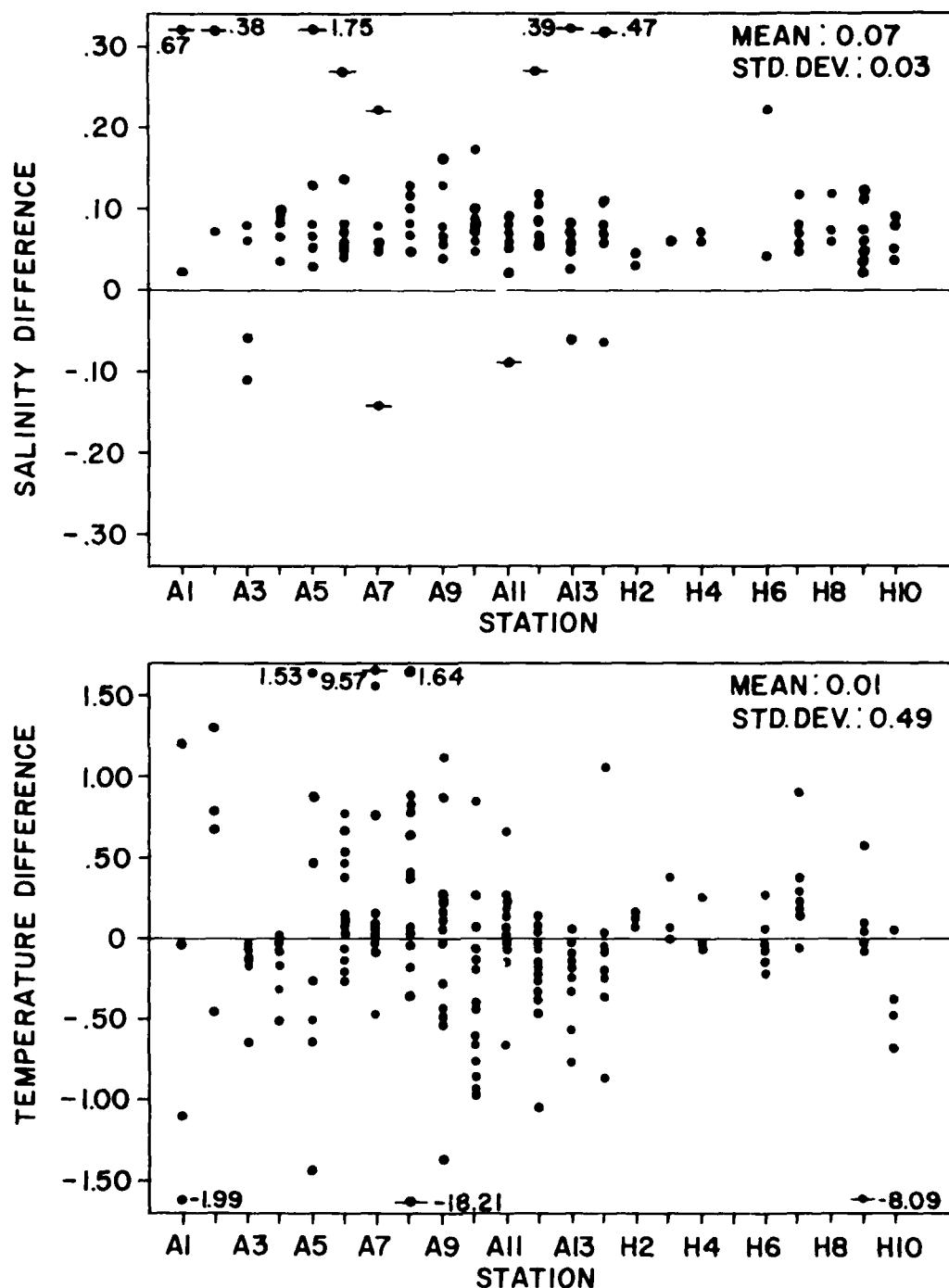


Figure 5. STD-measured minus bottle calibration salinity values and XBT-measured minus reversing thermometer temperature values for EN-040. STD salinity values were corrected by subtracting 0.07‰; no temperature correction was applied. Erroneous data points are flagged by horizontal bars.

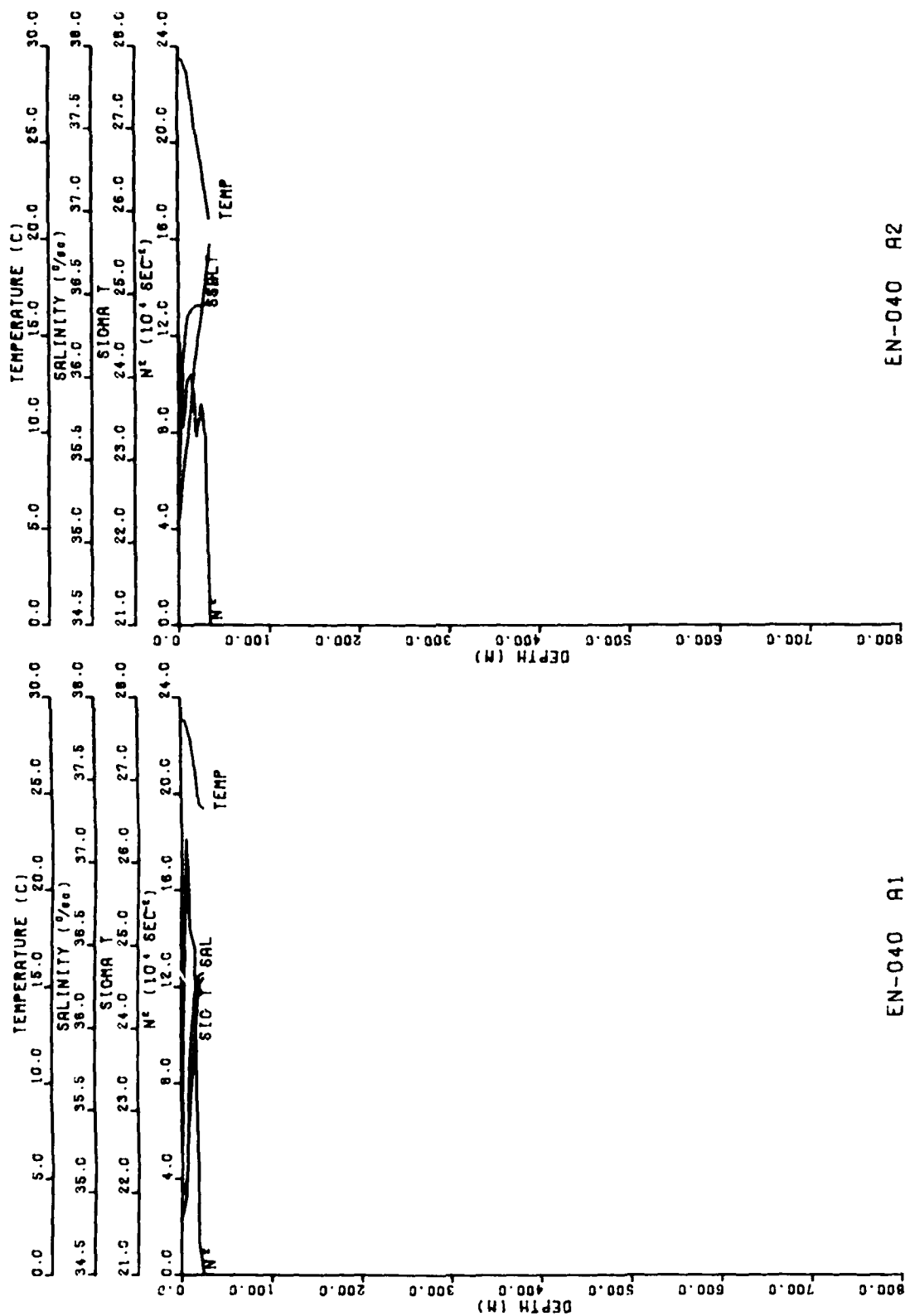
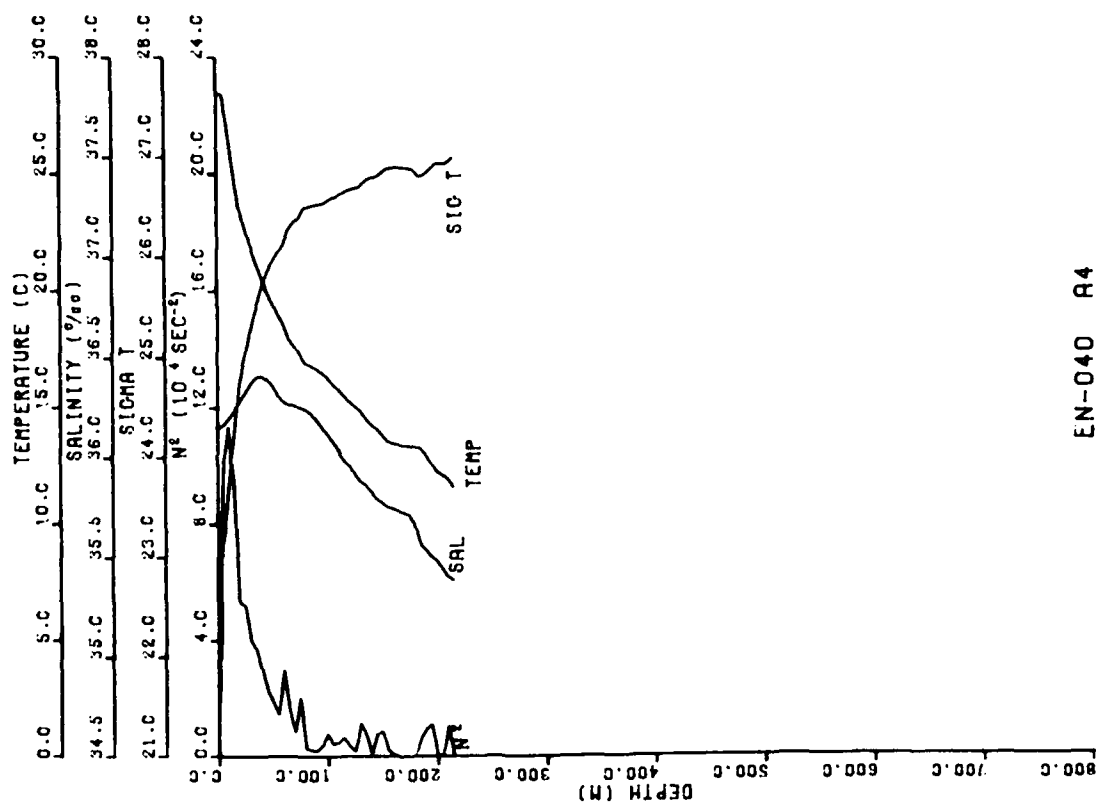
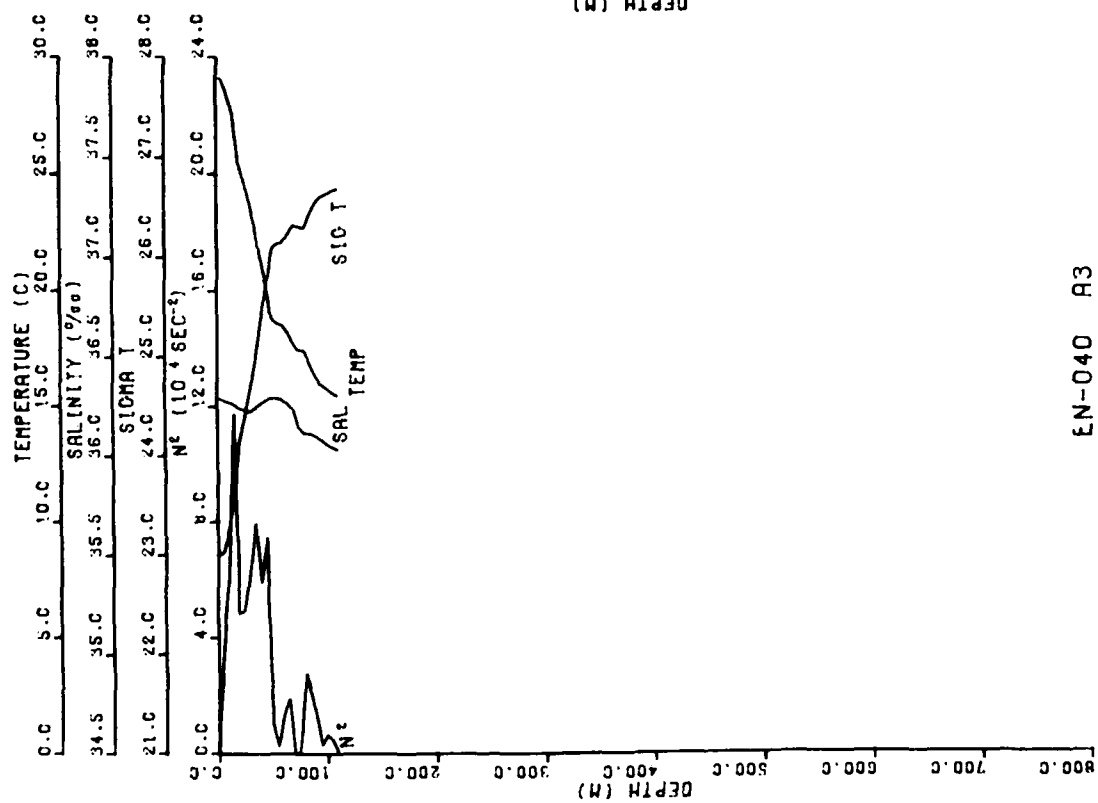


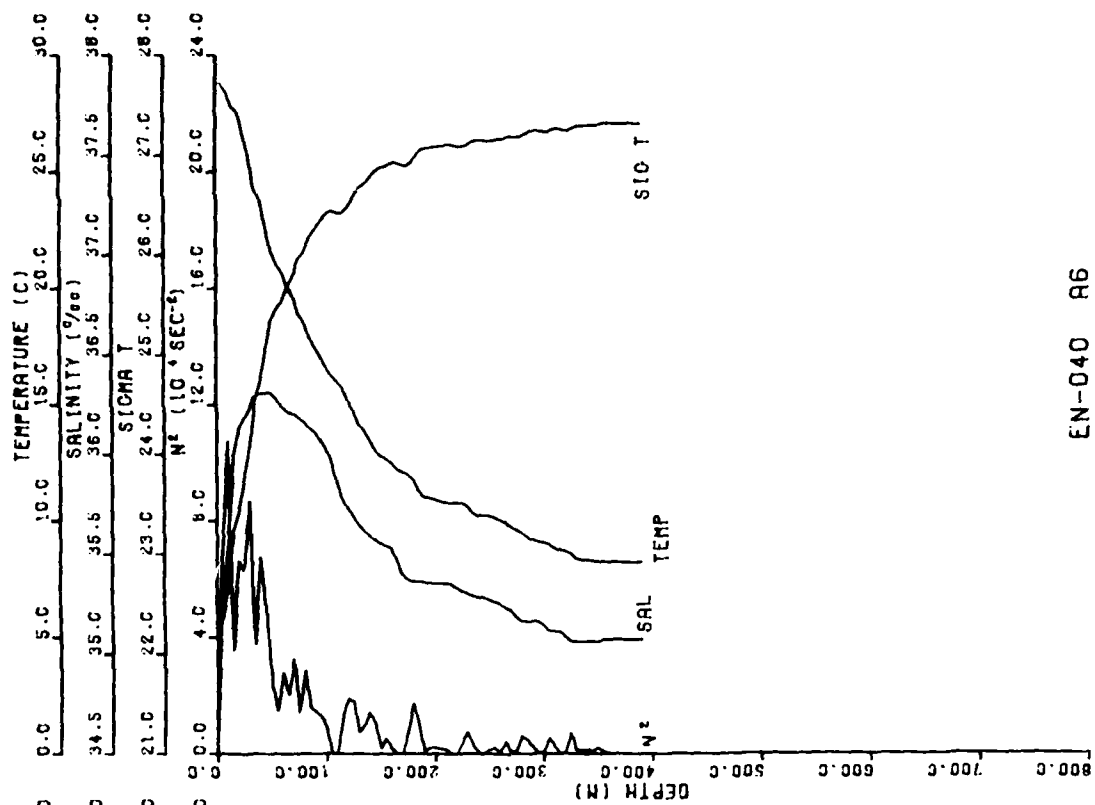
Figure 6. Individual STD/XBT station profiles of temperature, salinity and derived quantities sigma-t and N² for EN-040. Station locations are shown in Figure 2. This figure is continued on the next 9 pages.



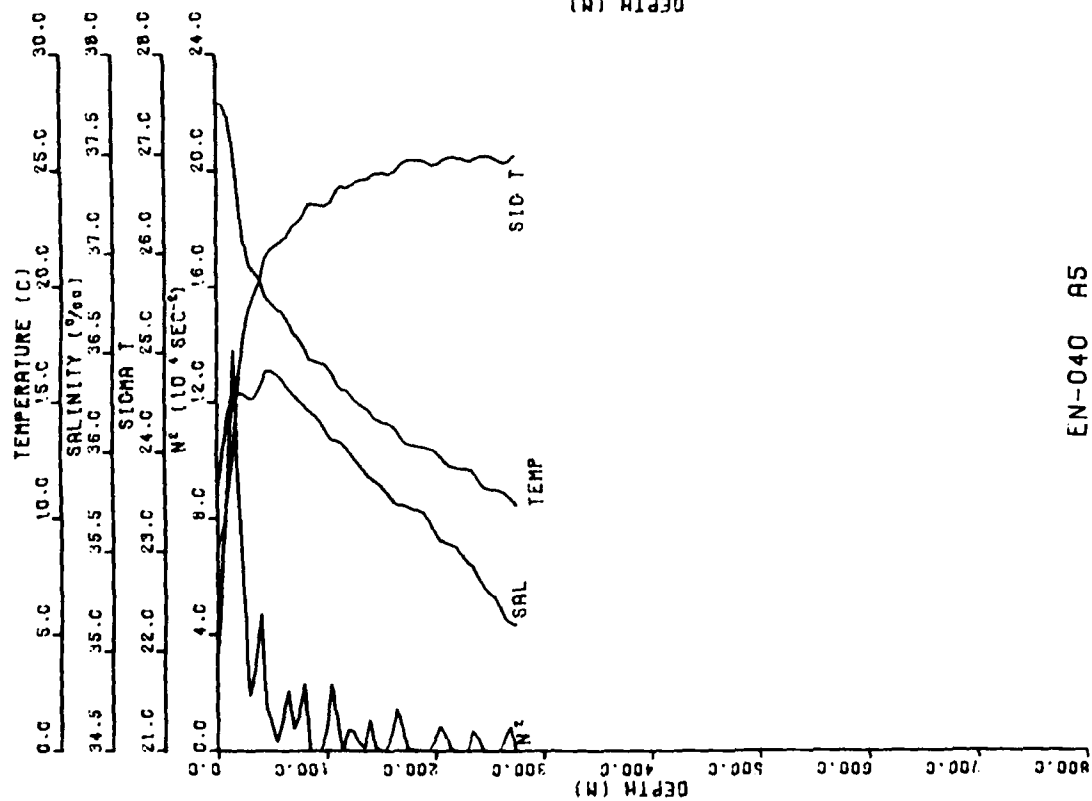
EN-040 R4



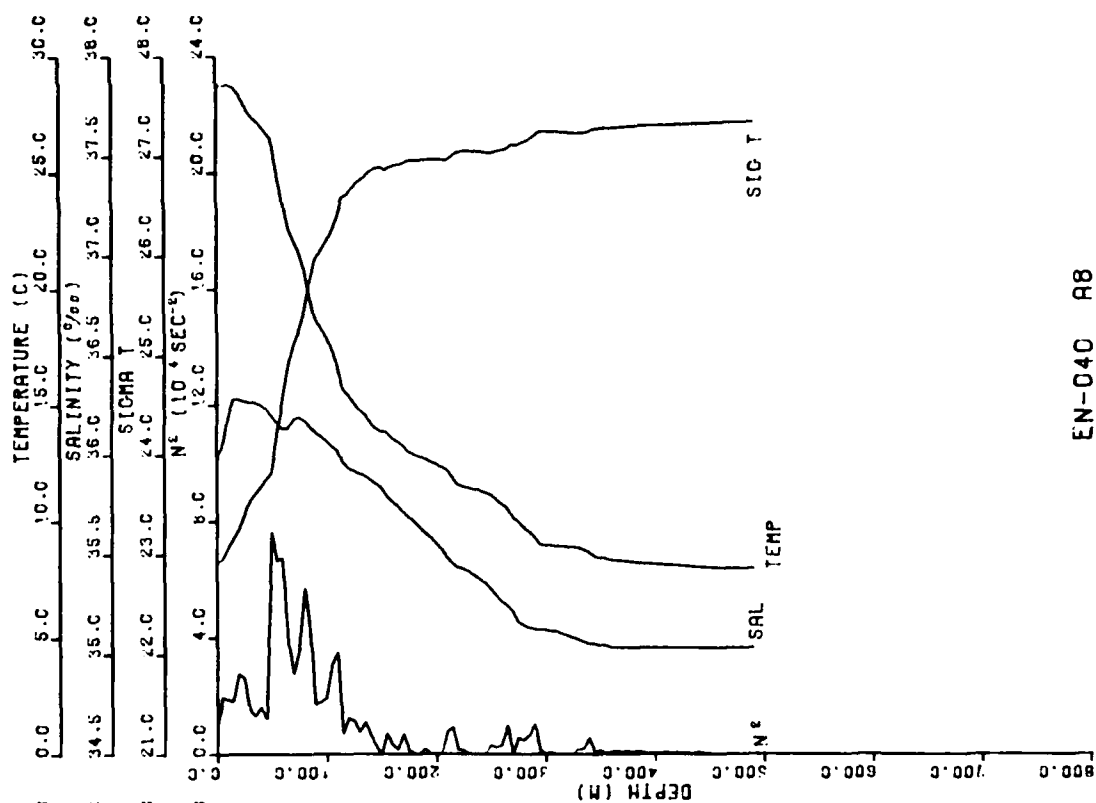
EN-040 A3



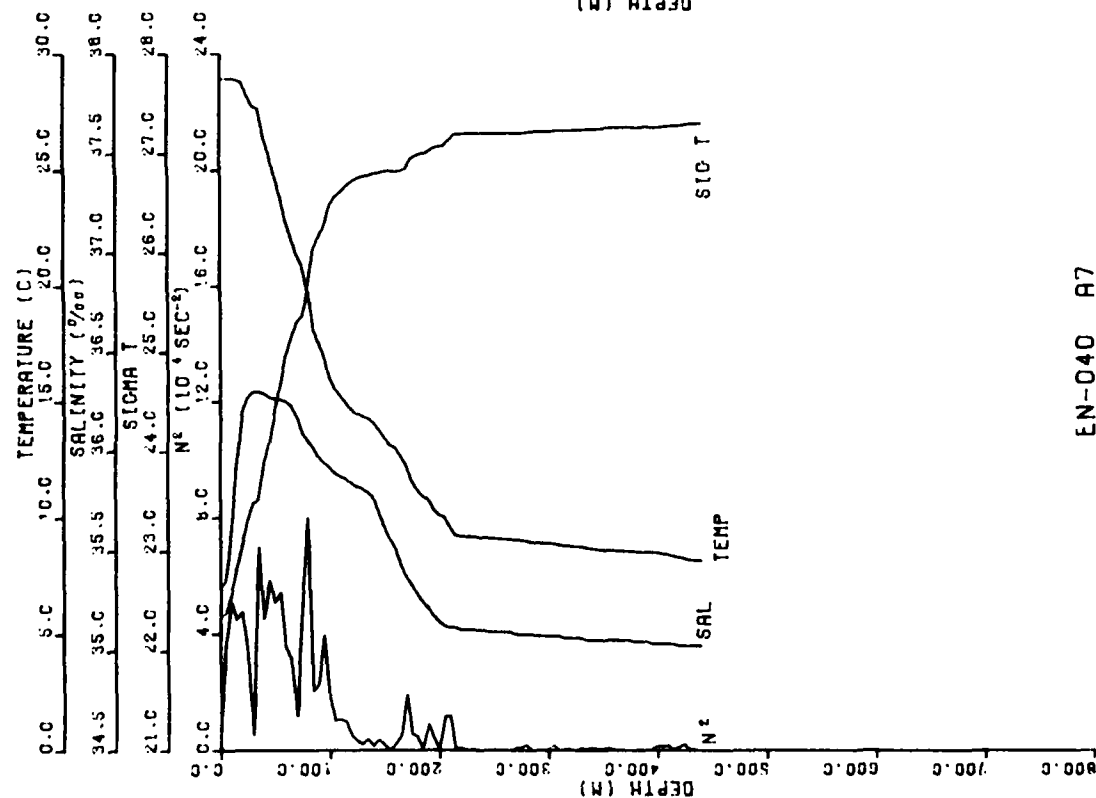
EN-040 AS



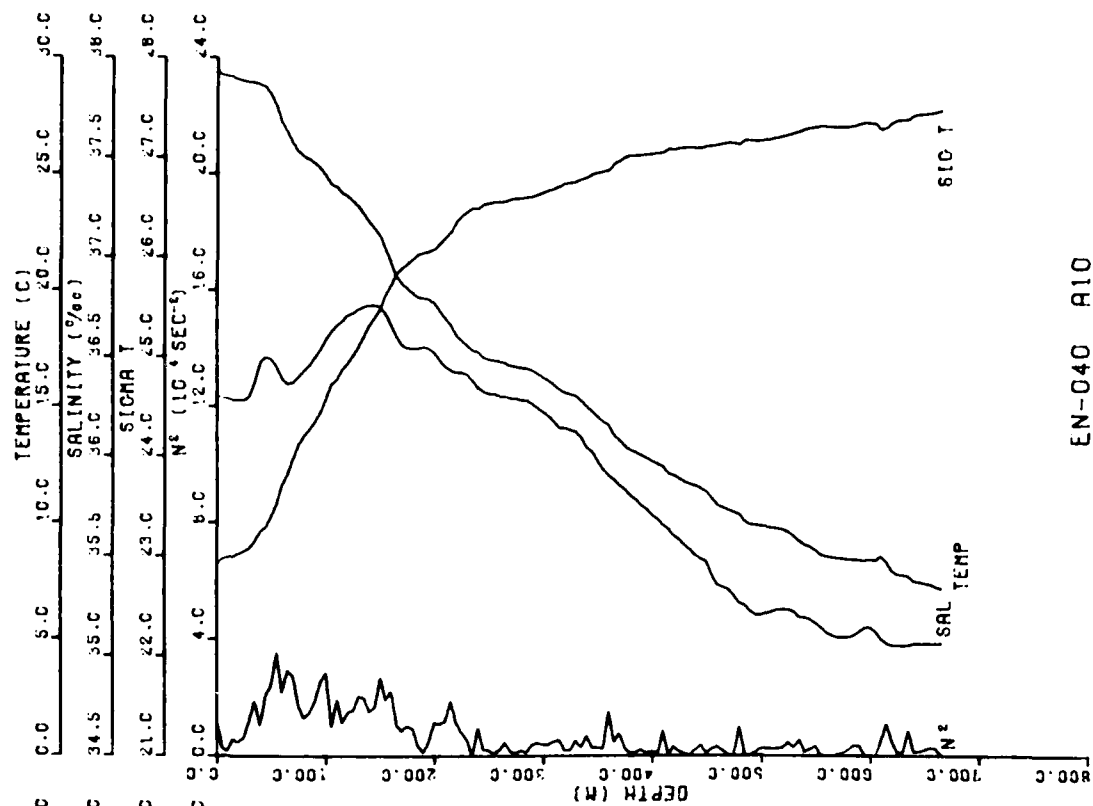
EN-040 AS



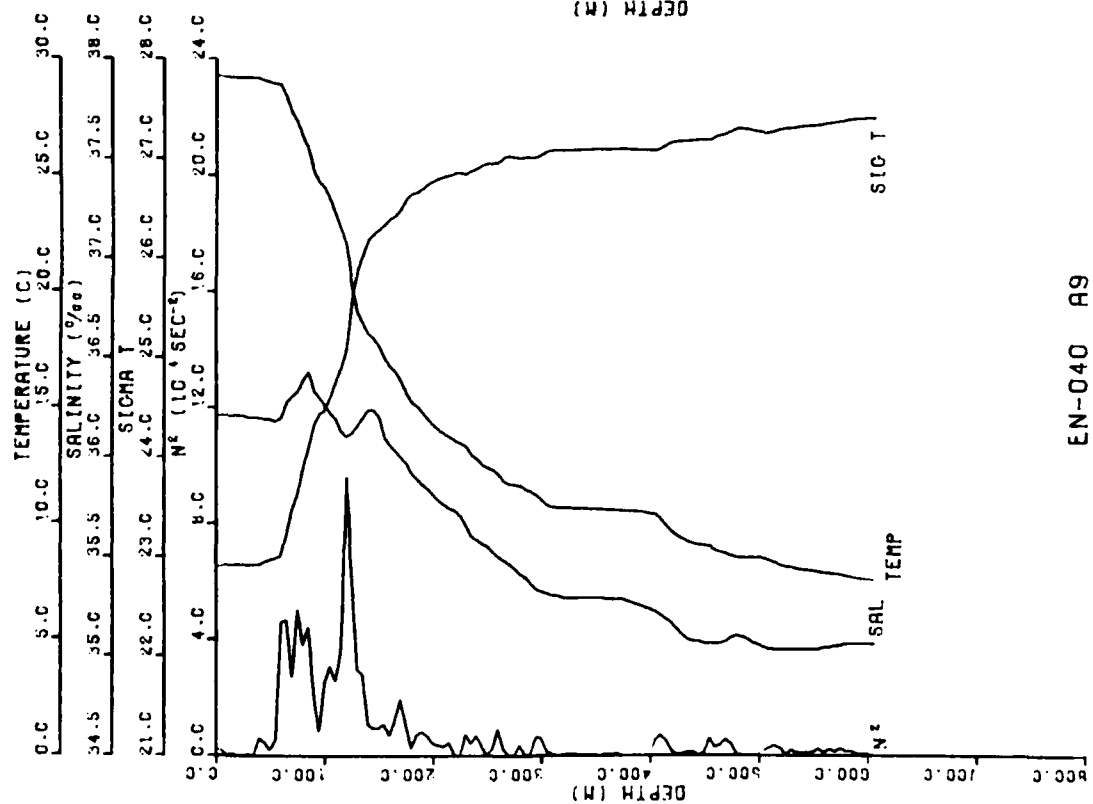
EN-040 A8



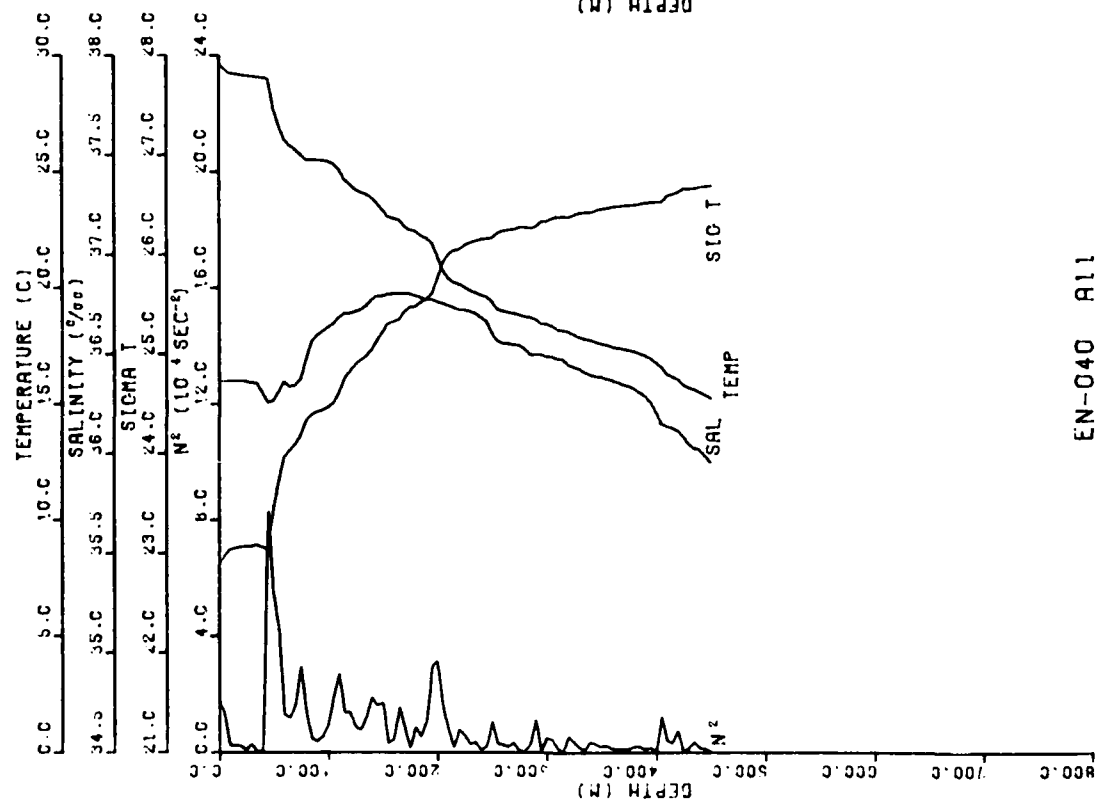
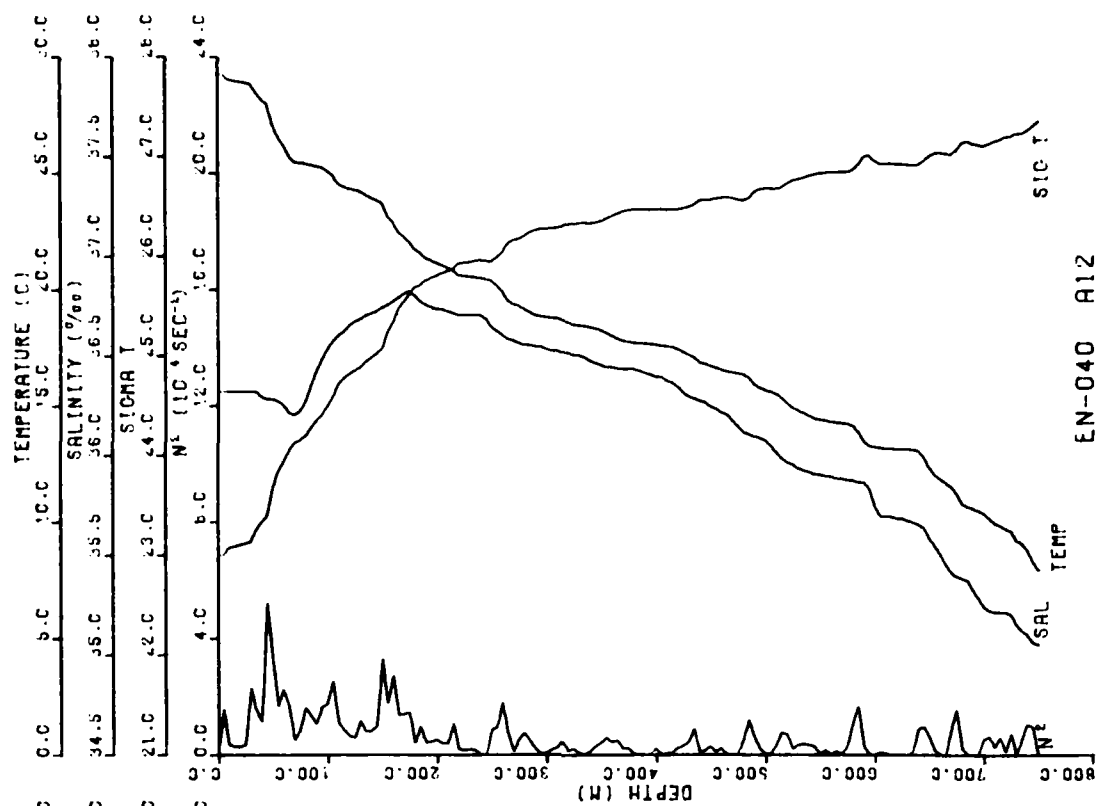
EN-040 A7

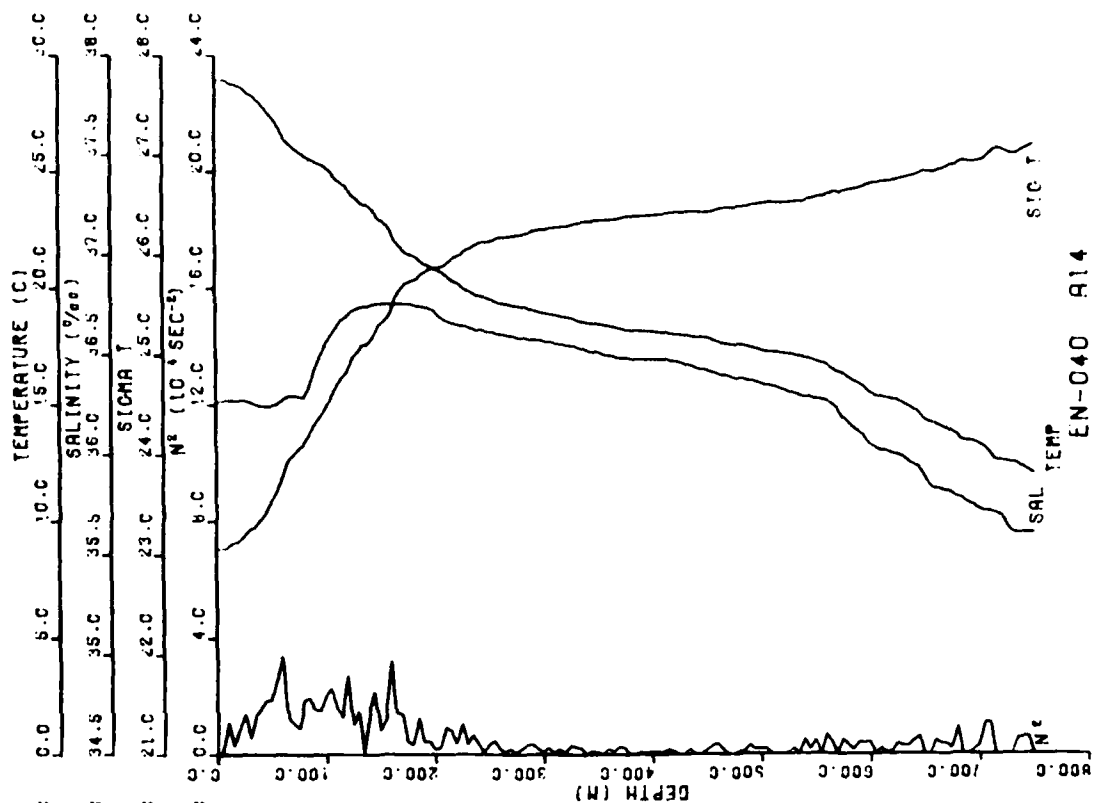


EN-040 A10

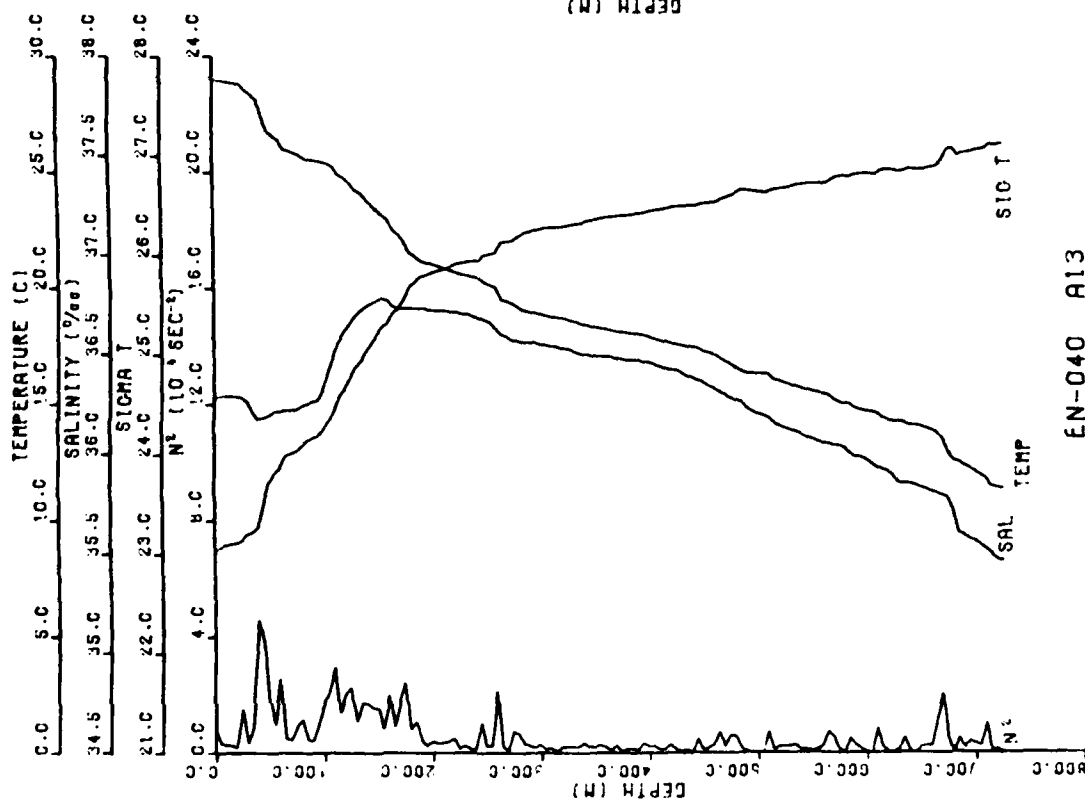


EN-040 A9

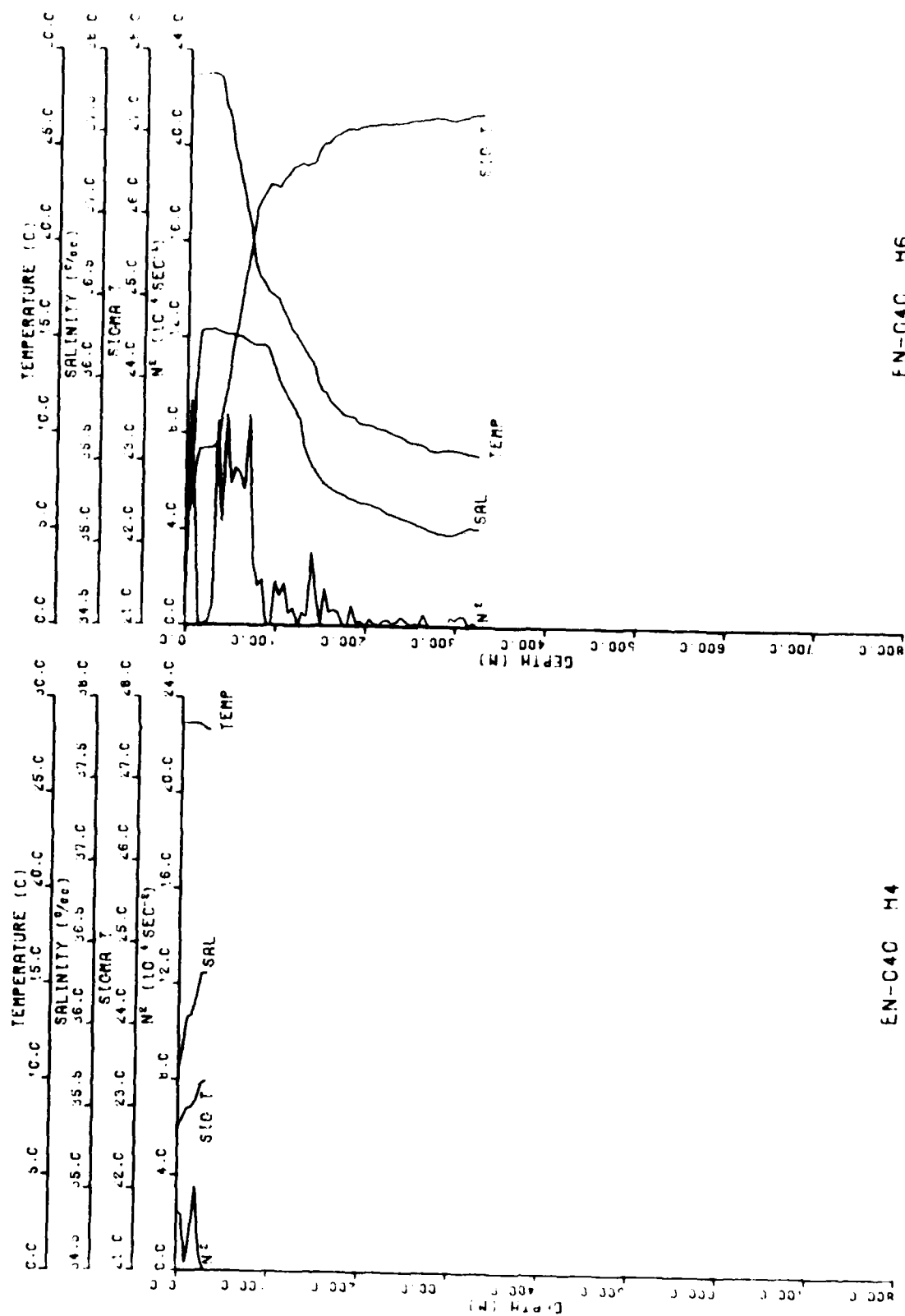




EN-040 A14

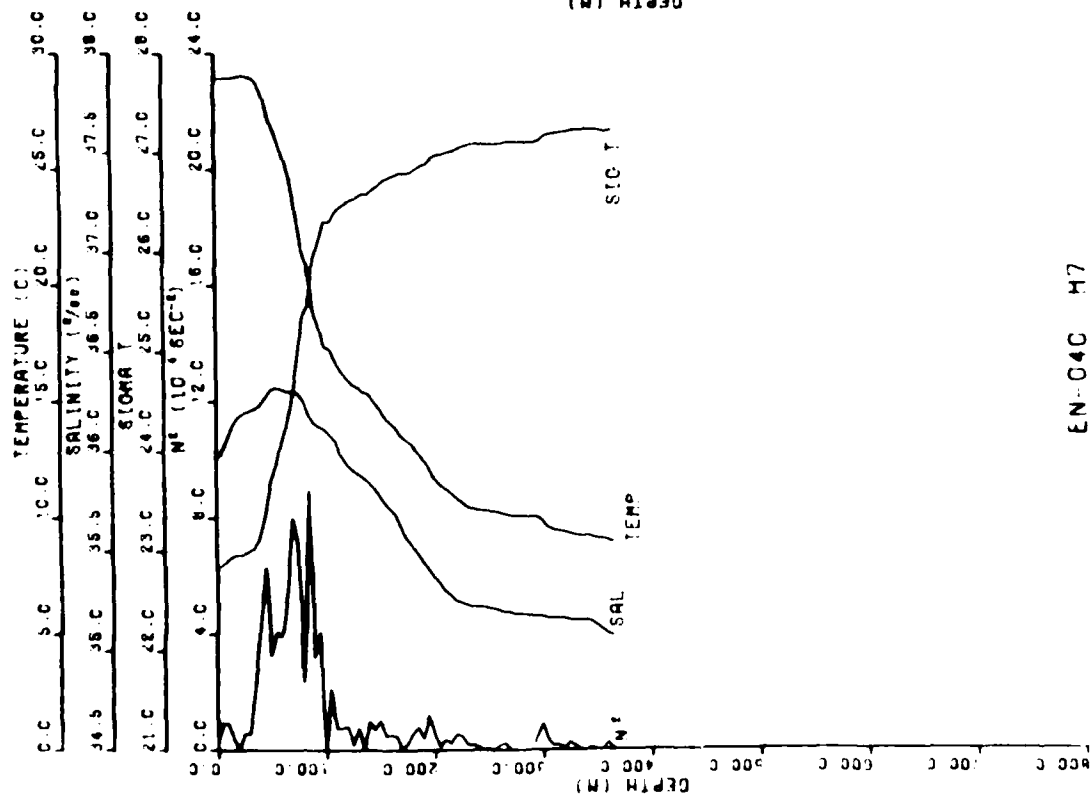
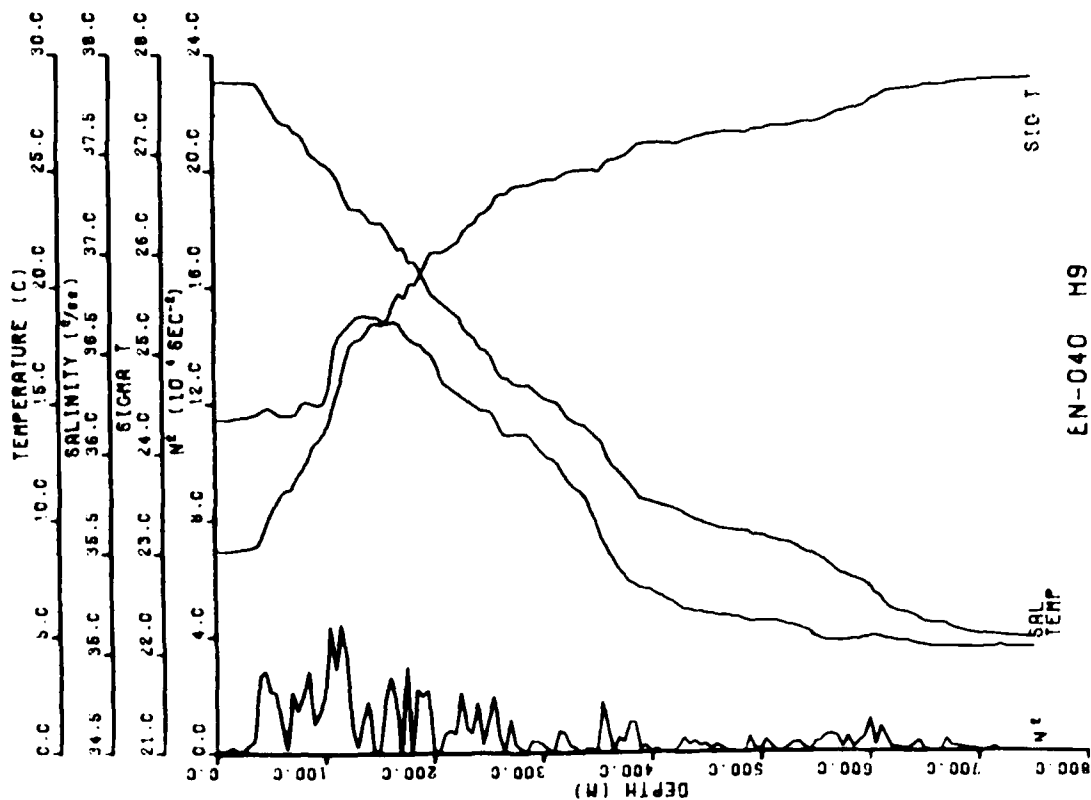


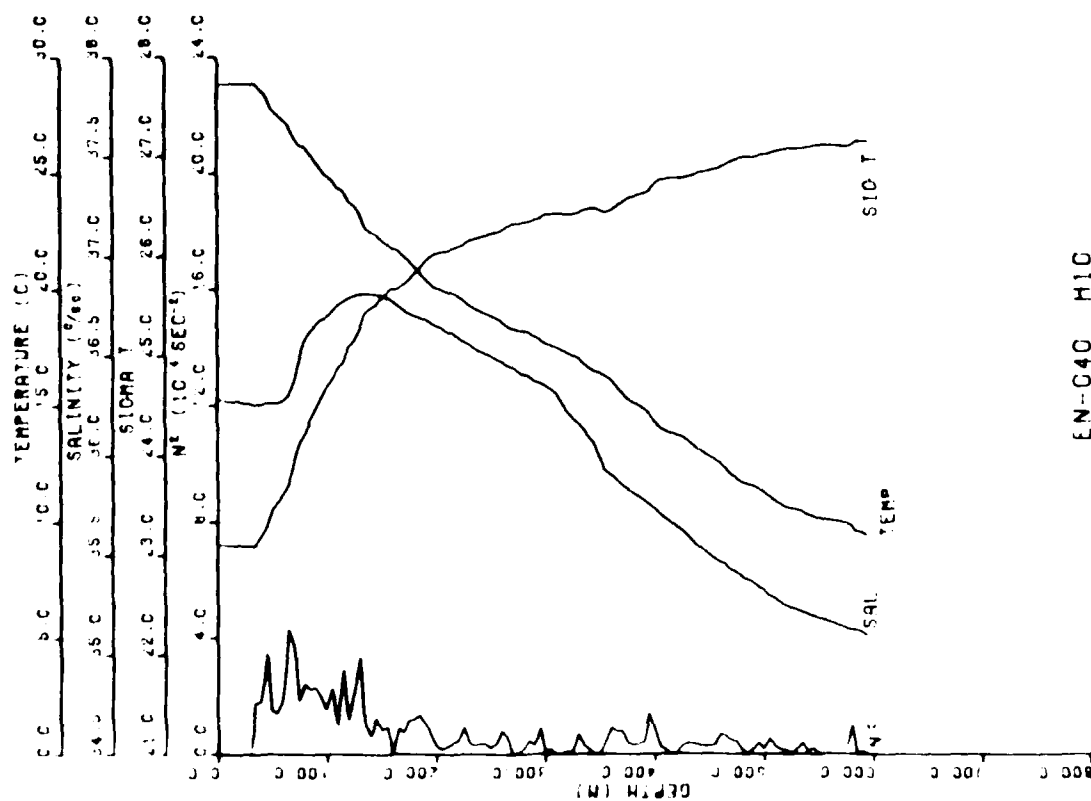
EN-040 A13



EN-C40 H4

EN-C40 H6





EN-C40 H10

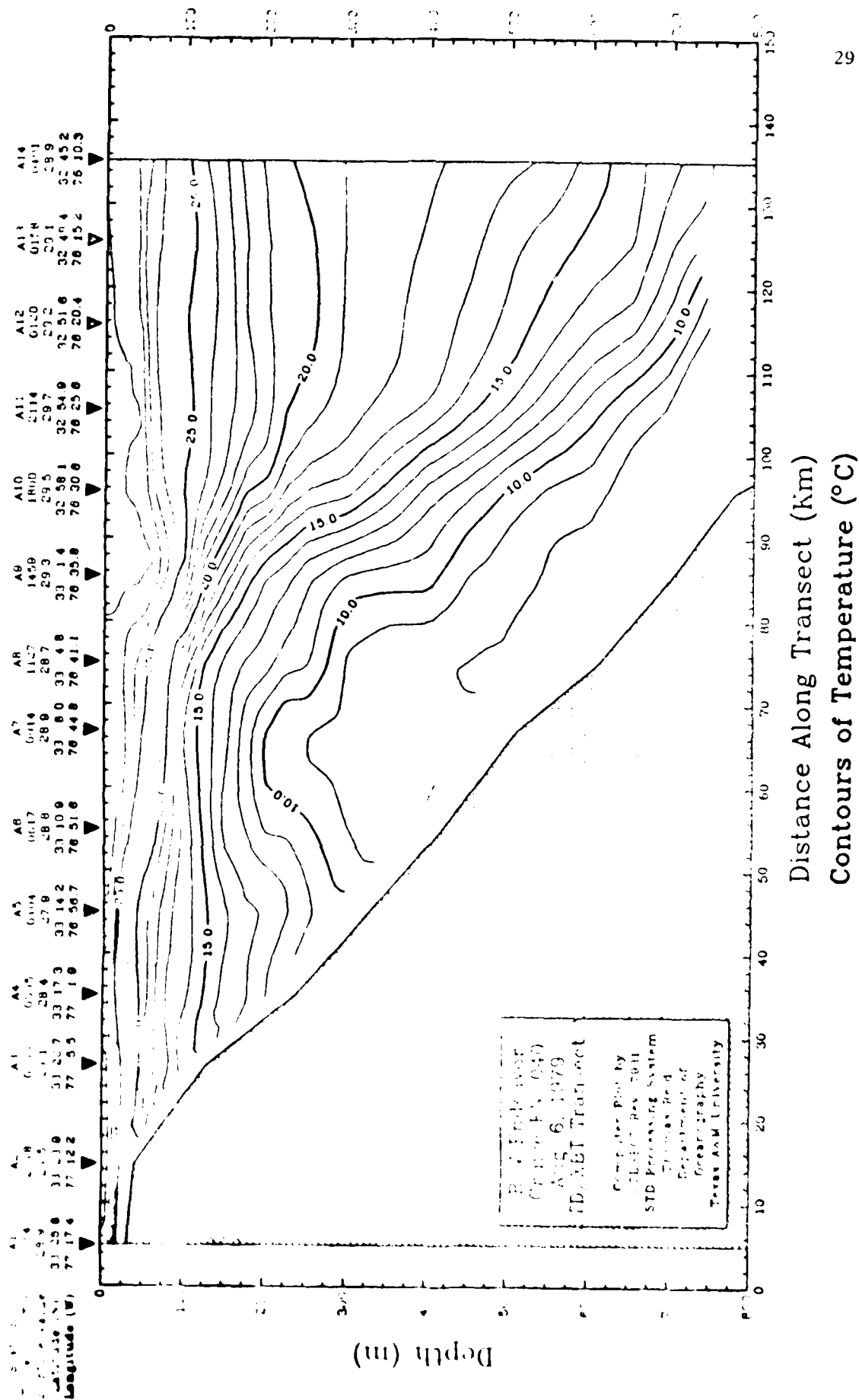
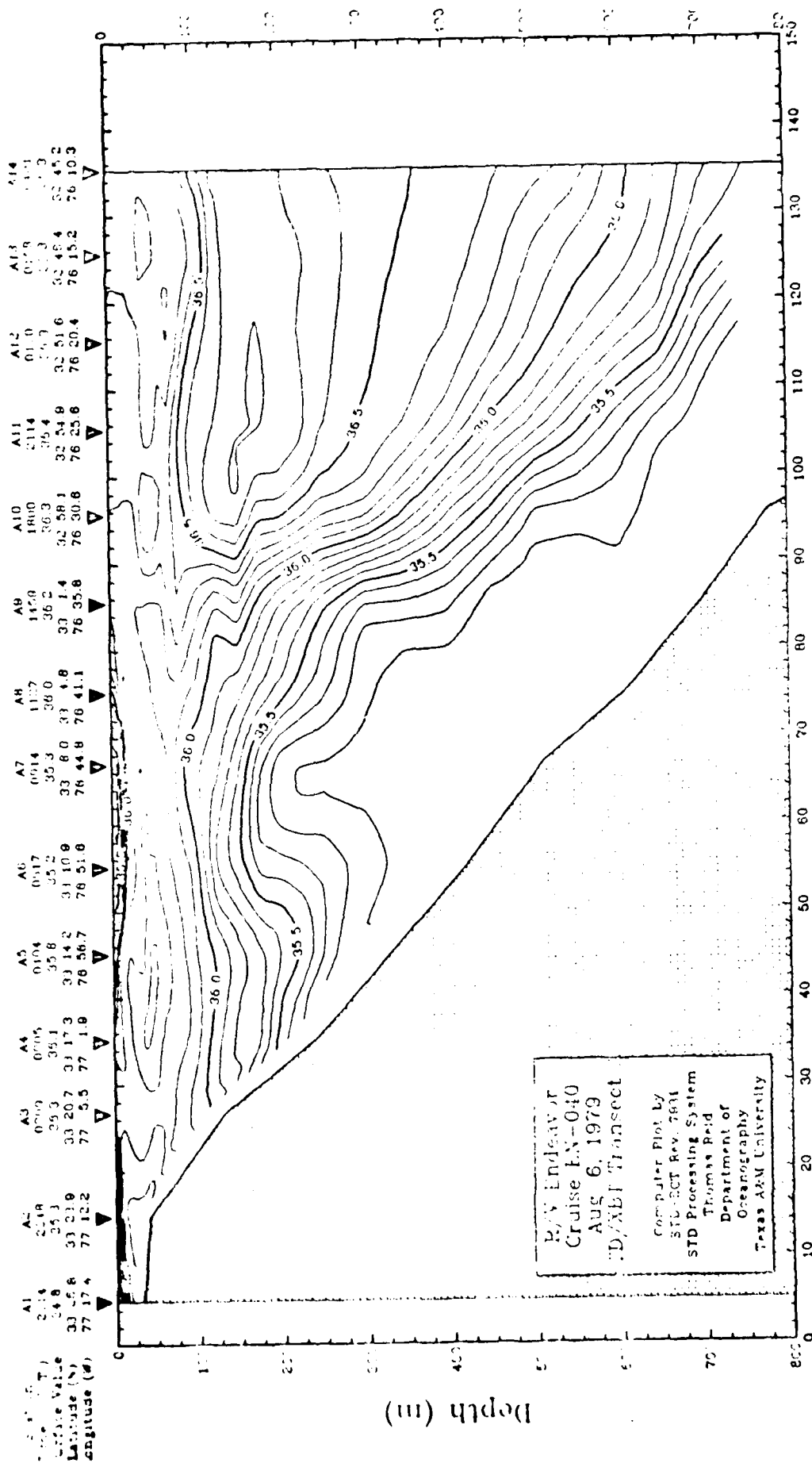
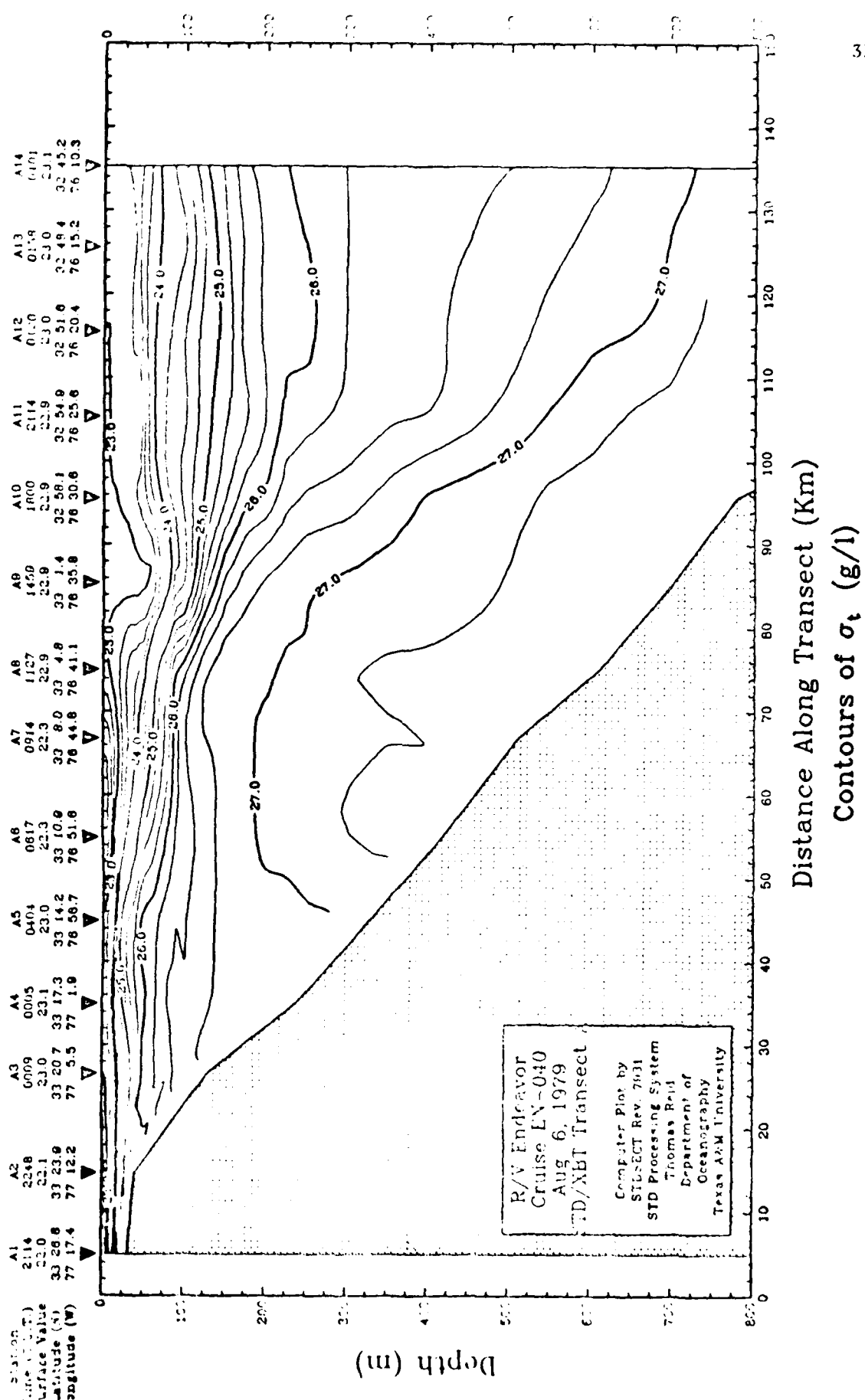
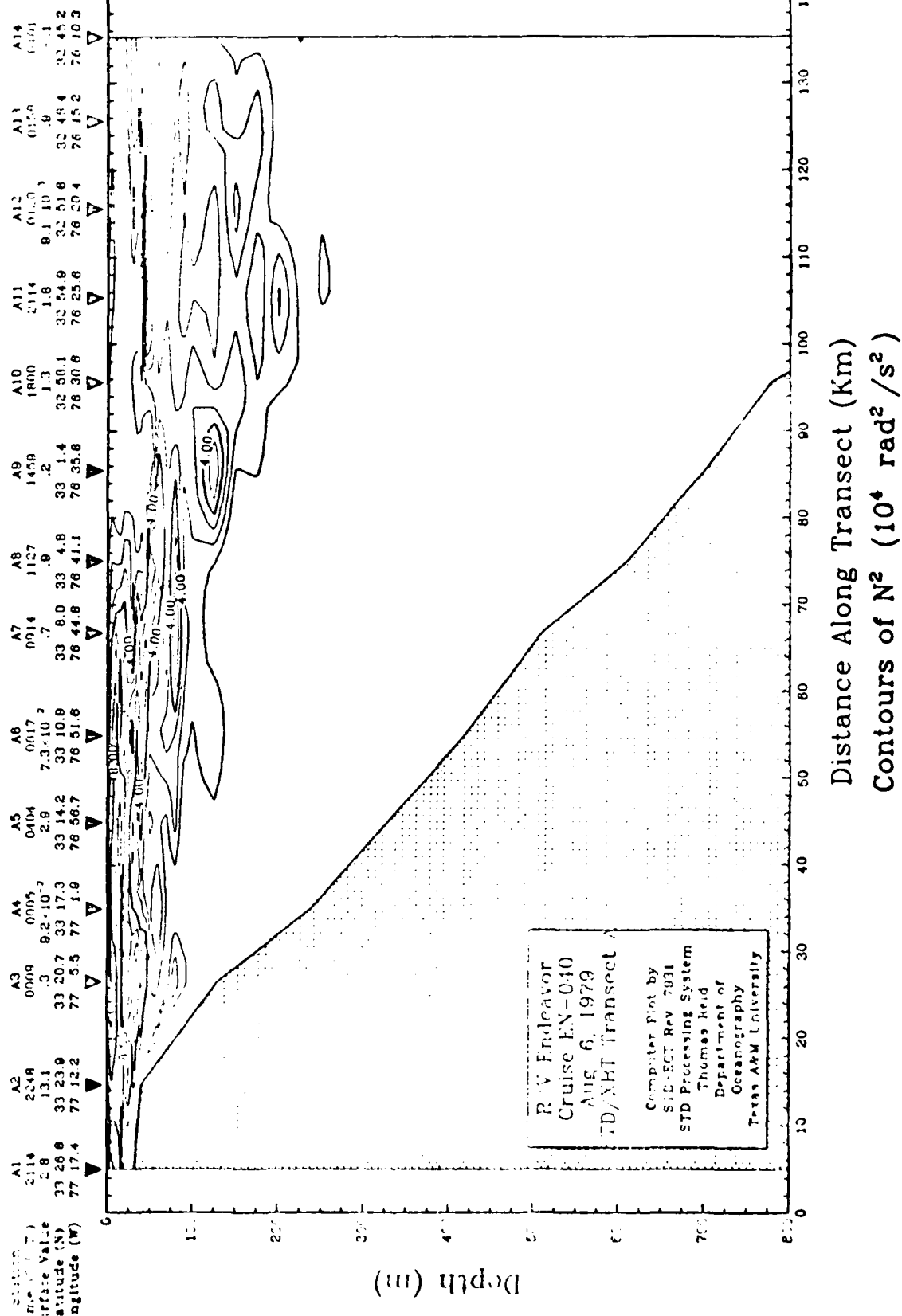


Figure 7. STD/XBT section contours of temperature, salinity and derived sigma-t and N² fields for Transect A. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units, and 0.5 × 10⁻⁴ rad²/s², respectively. This figure is continued on the next 3 pages.







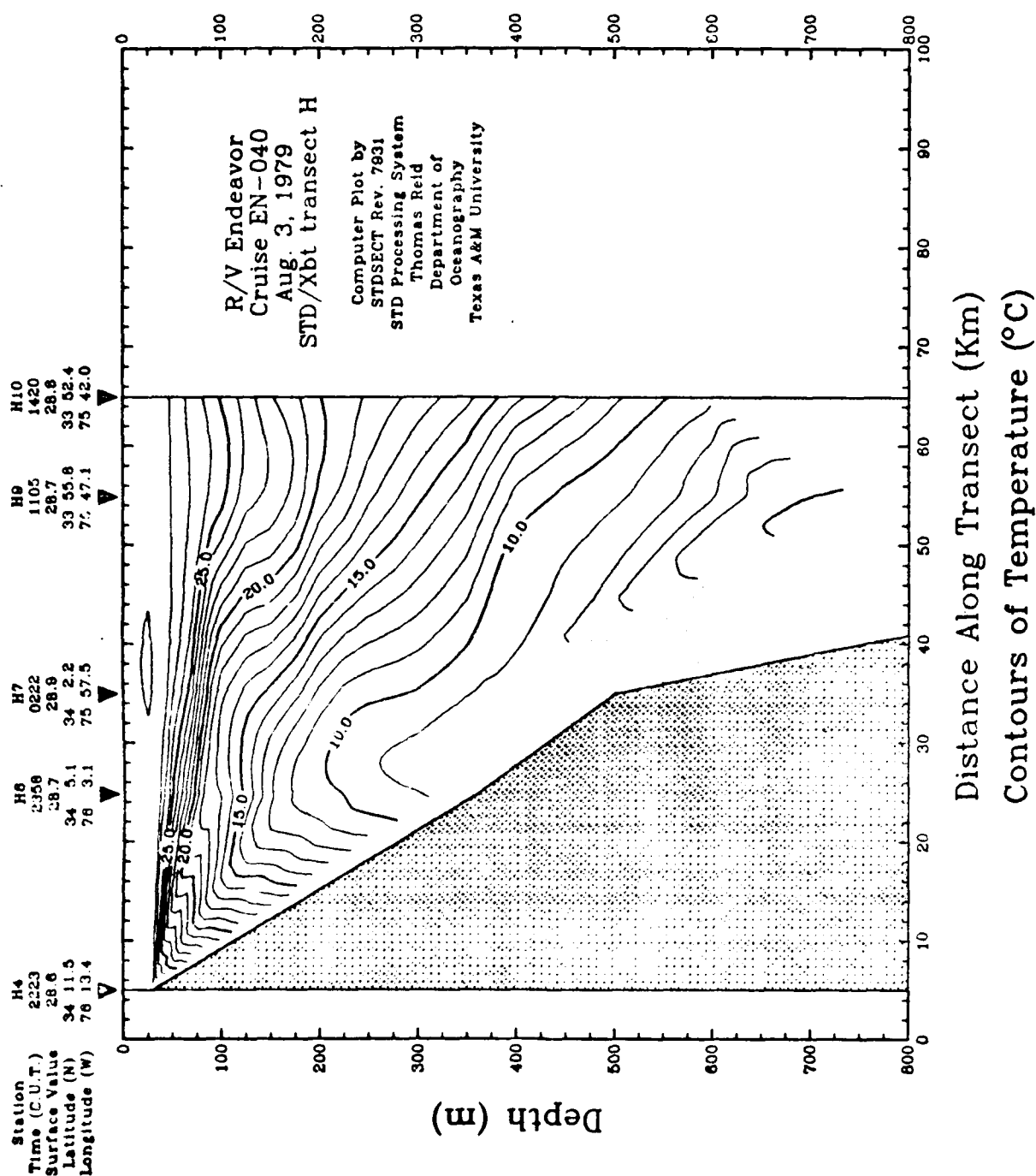
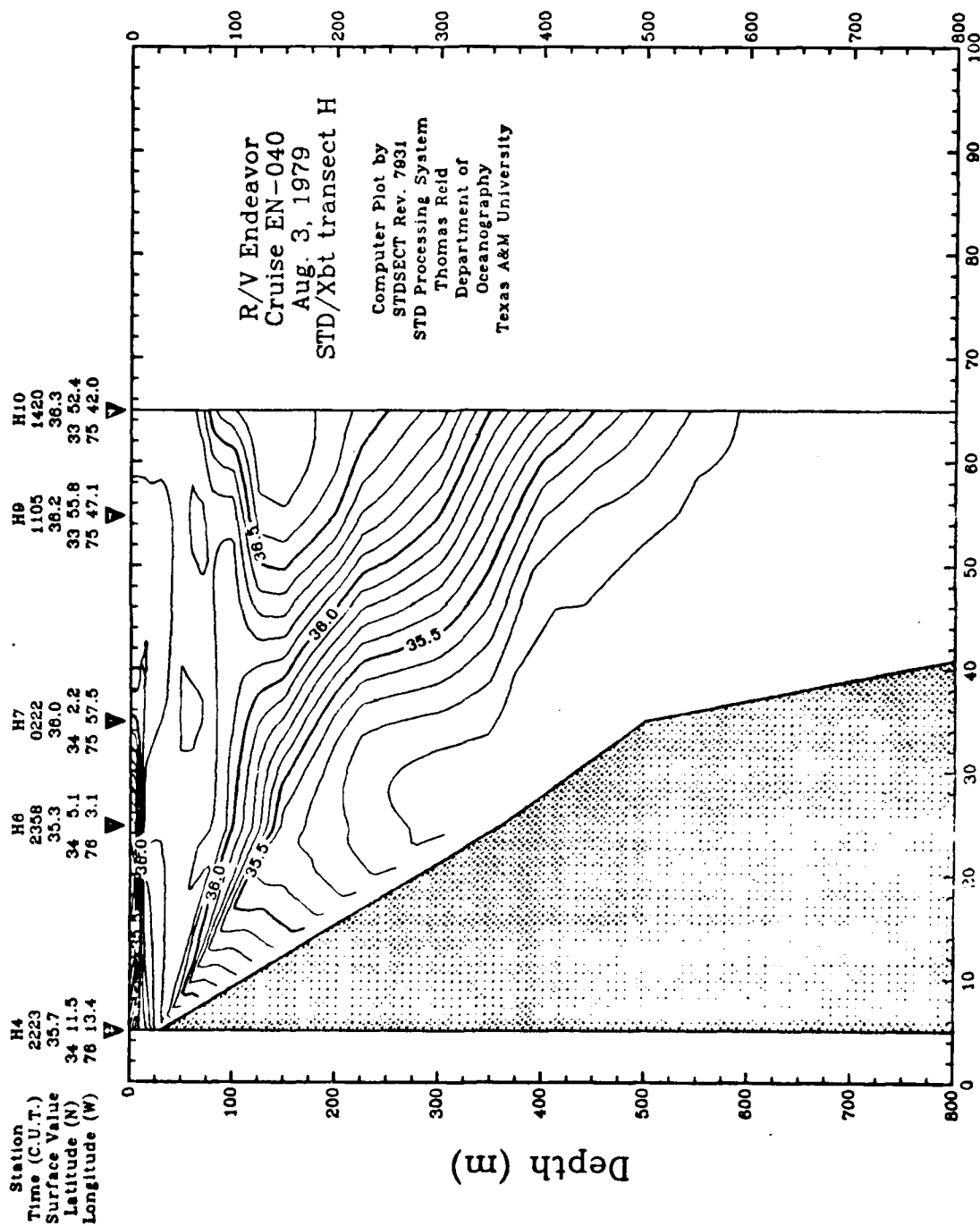
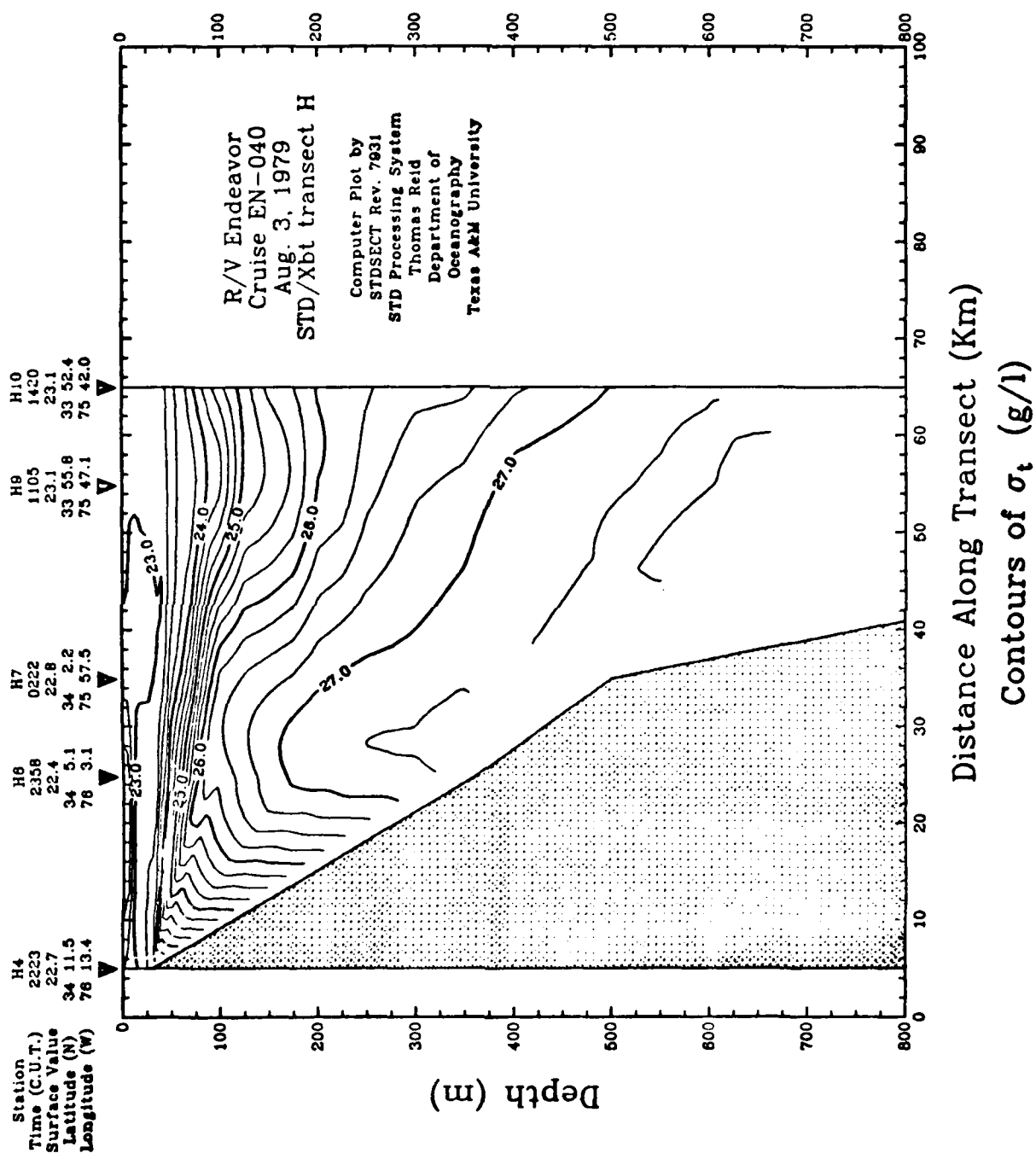
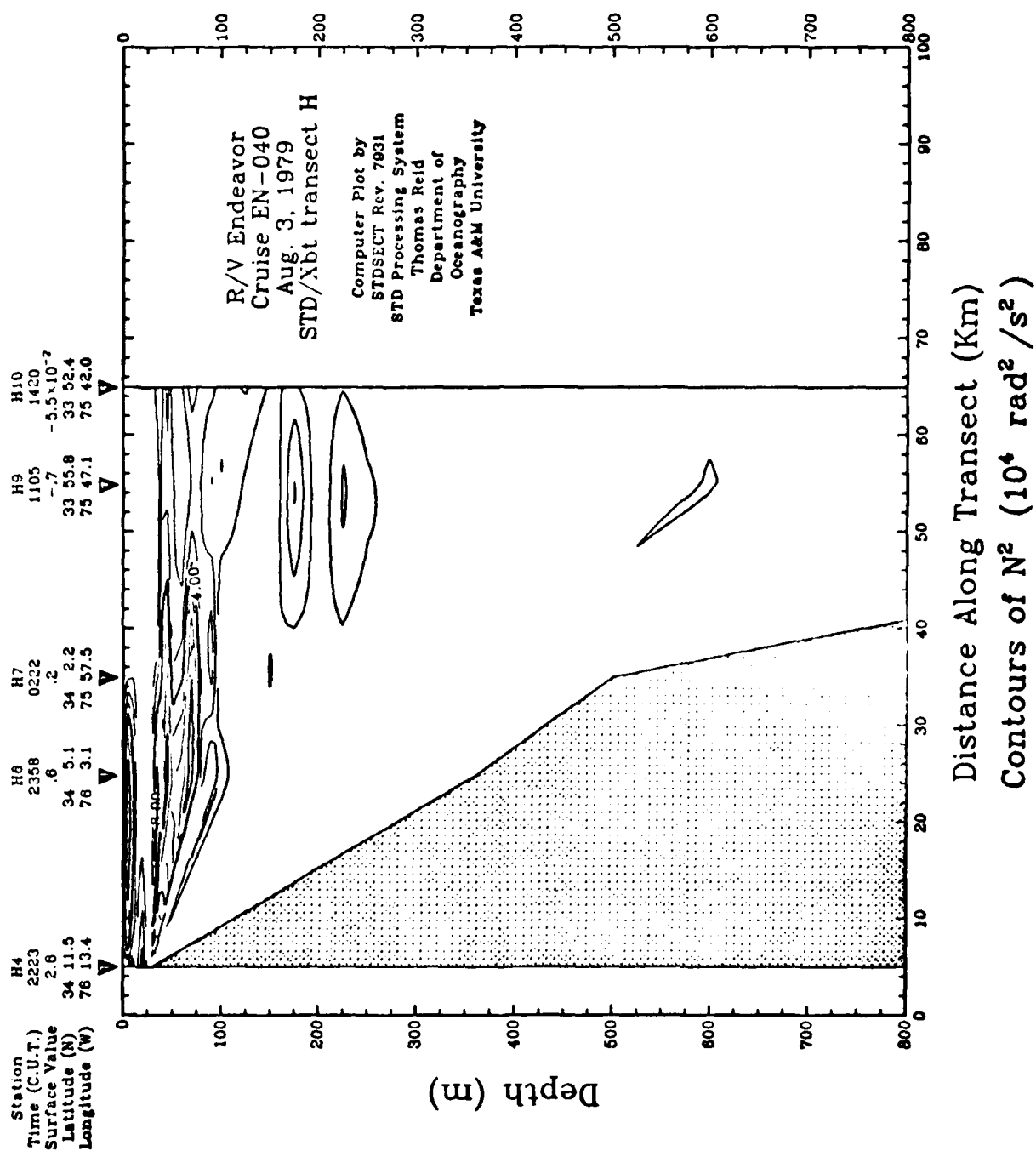


Figure 8. STD, XBT section contours of temperature, salinity and derived sigma-t and N_2 fields for Transect H. Contour intervals are 1°C , 0.1‰ , $0.25 \sigma_t$ units, and $0.5 \times 10^{-4} \text{ rad} \cdot \text{s}^{-2}$, respectively. This figure is continued on the next 3 pages.







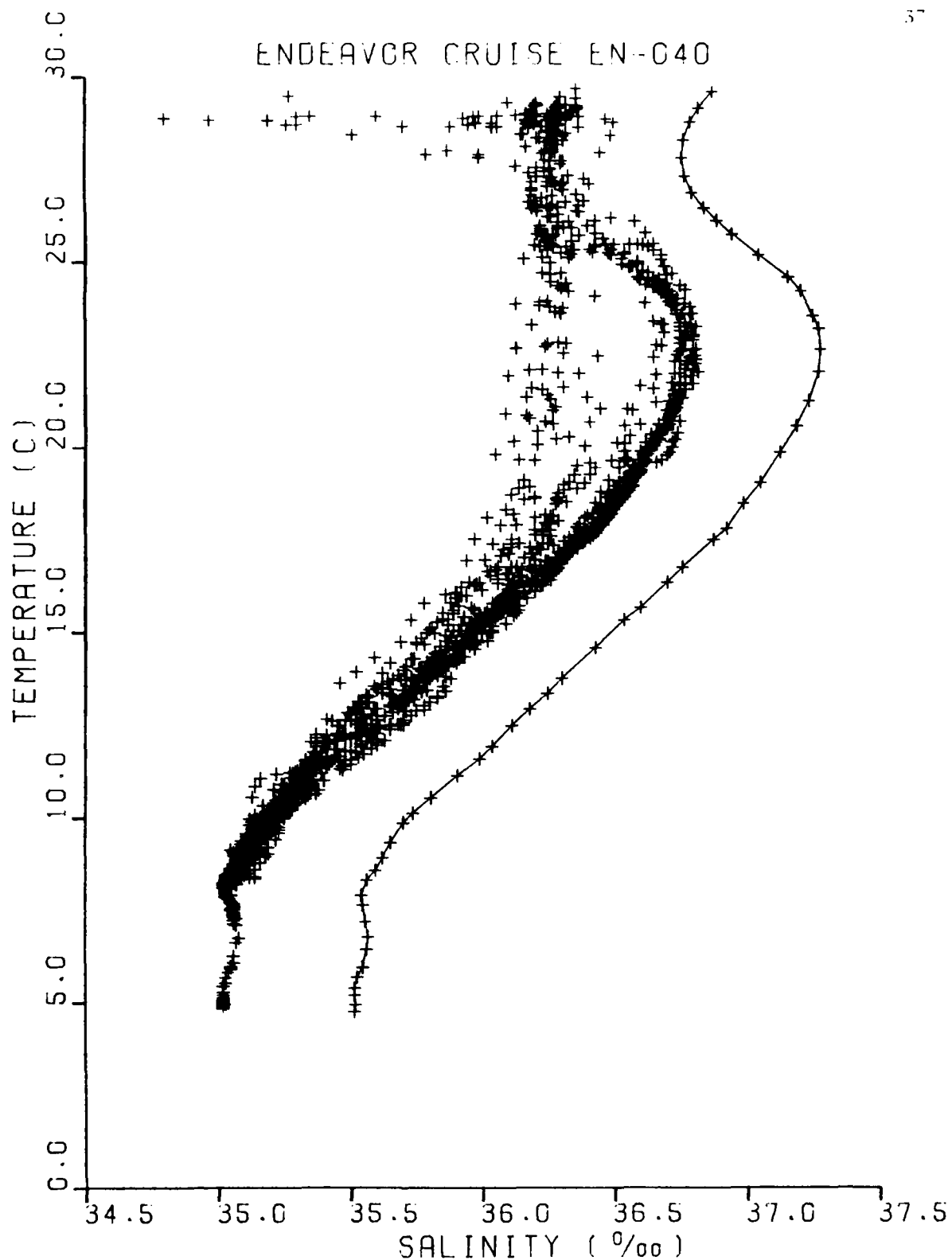


Figure 9. T-S diagram showing all STD/XBT points for EN-040 (crosses) and the resulting T-S correlation line fit by spline interpolation, which has been displaced to the right by 0.5‰. The stations used to generate the T-S correlation are listed in section 2.3.

BUCKET TEMP. MINUS XBT SURFACE TEMP.

R/V ENDERBORG CRUISE EN-040

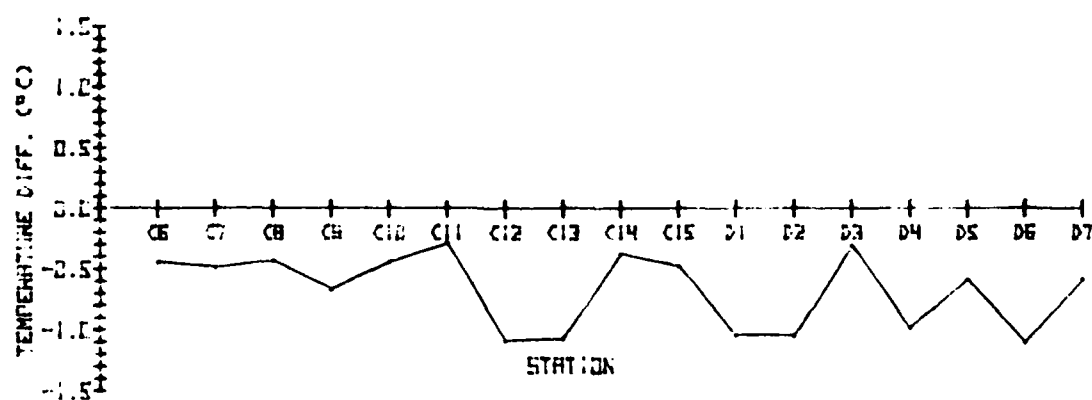
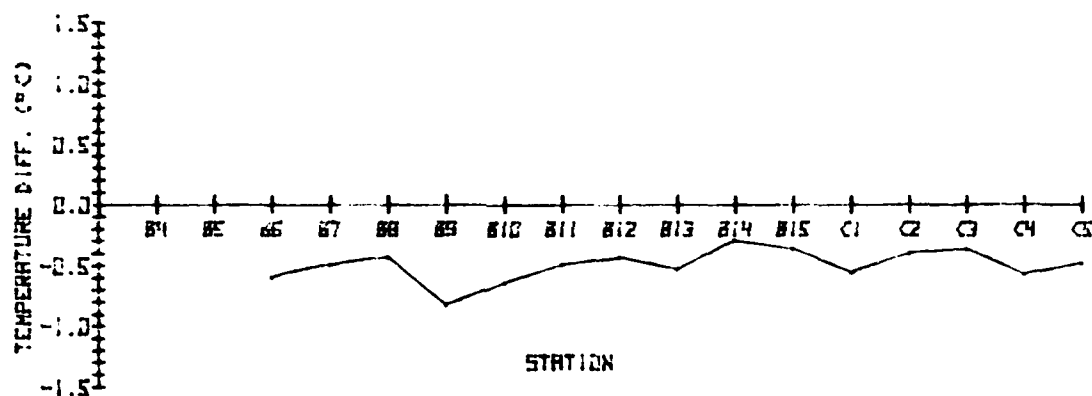
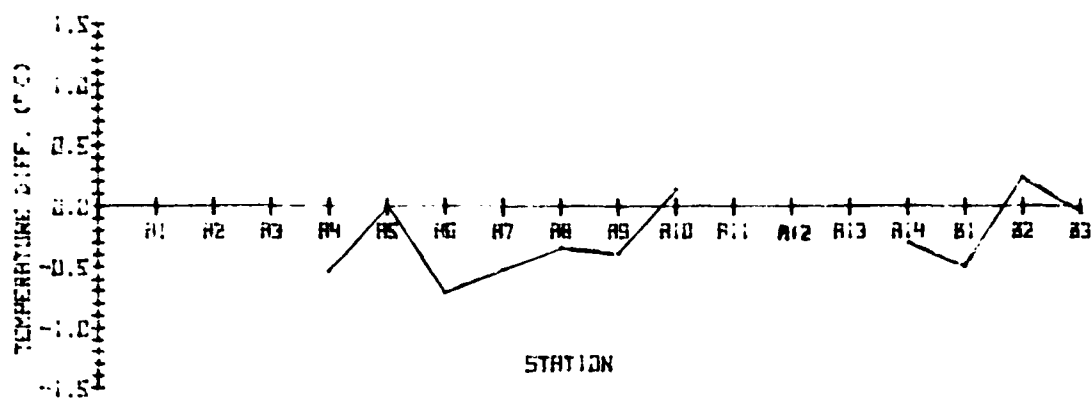
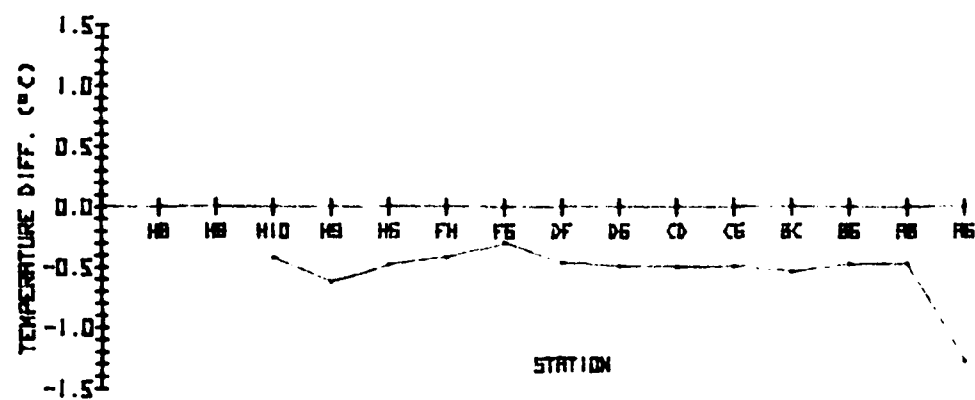
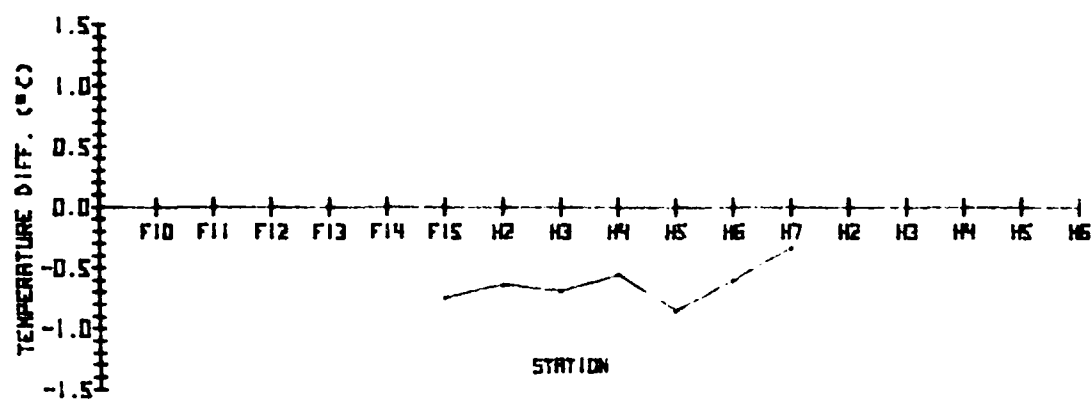
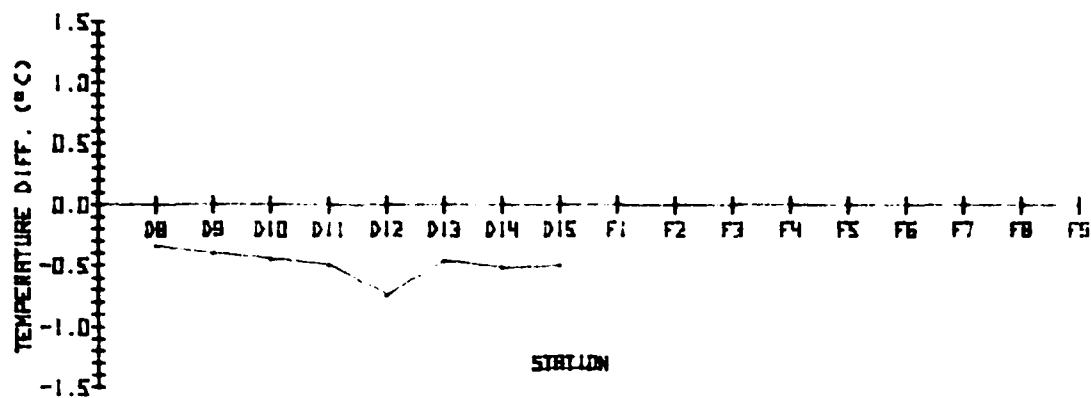


Figure 10. Comparison of surface bucket and XBT surface temperatures for EN-040. This figure is continued on the next page.

BUCKET TEMP. MINUS NET SURFACE TEMP.

R/V ENDAVOR CRUISE EN-040



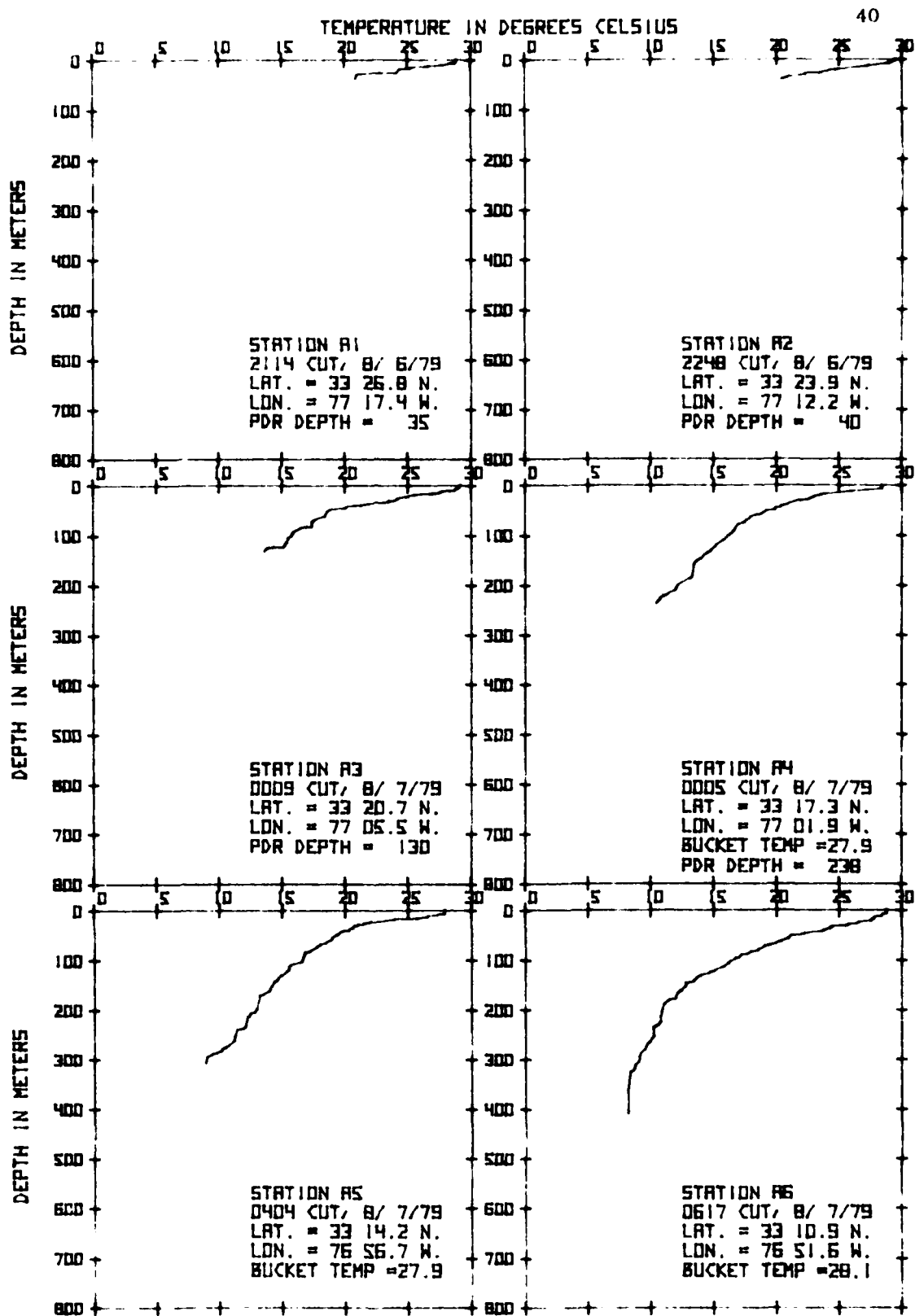
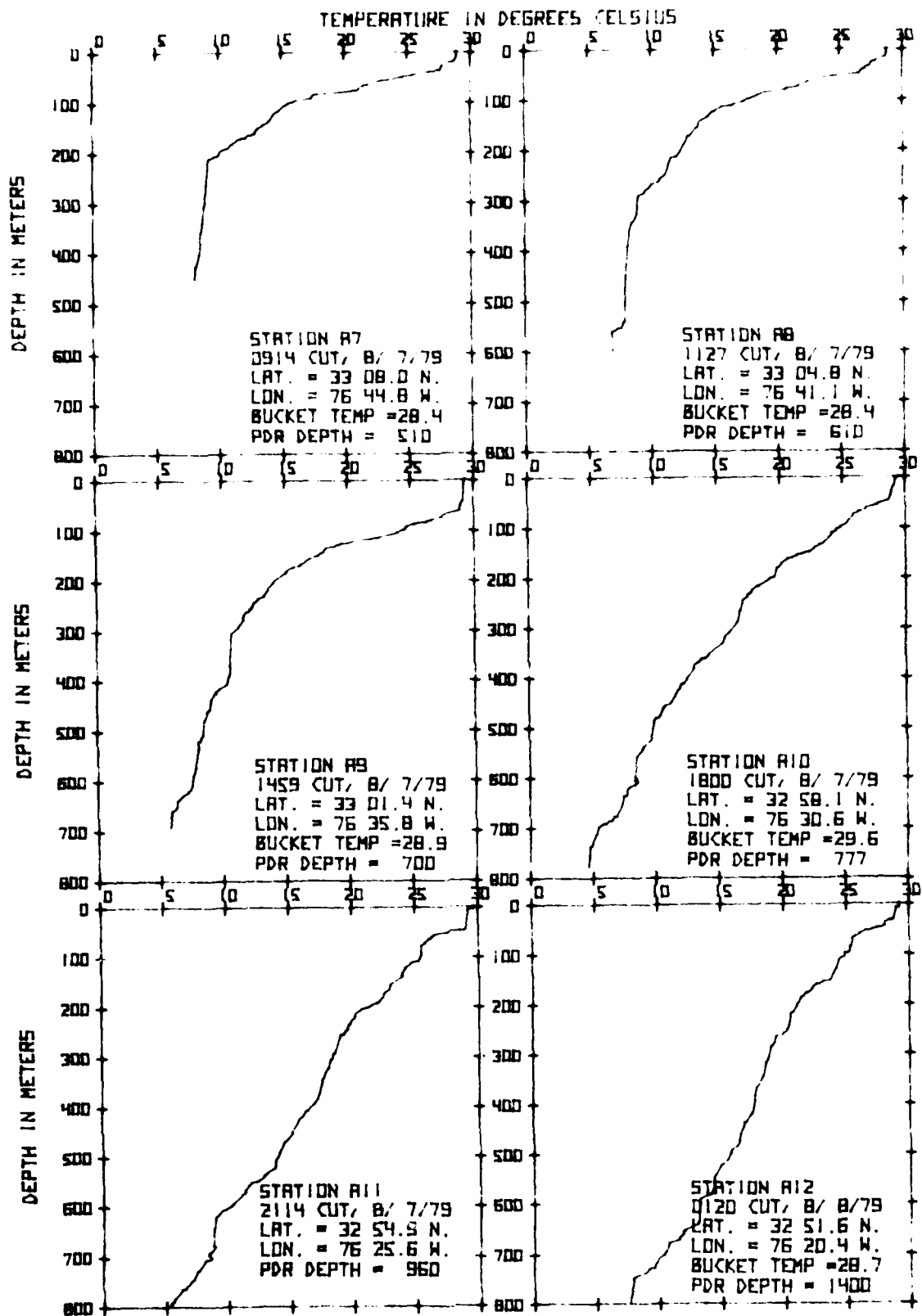
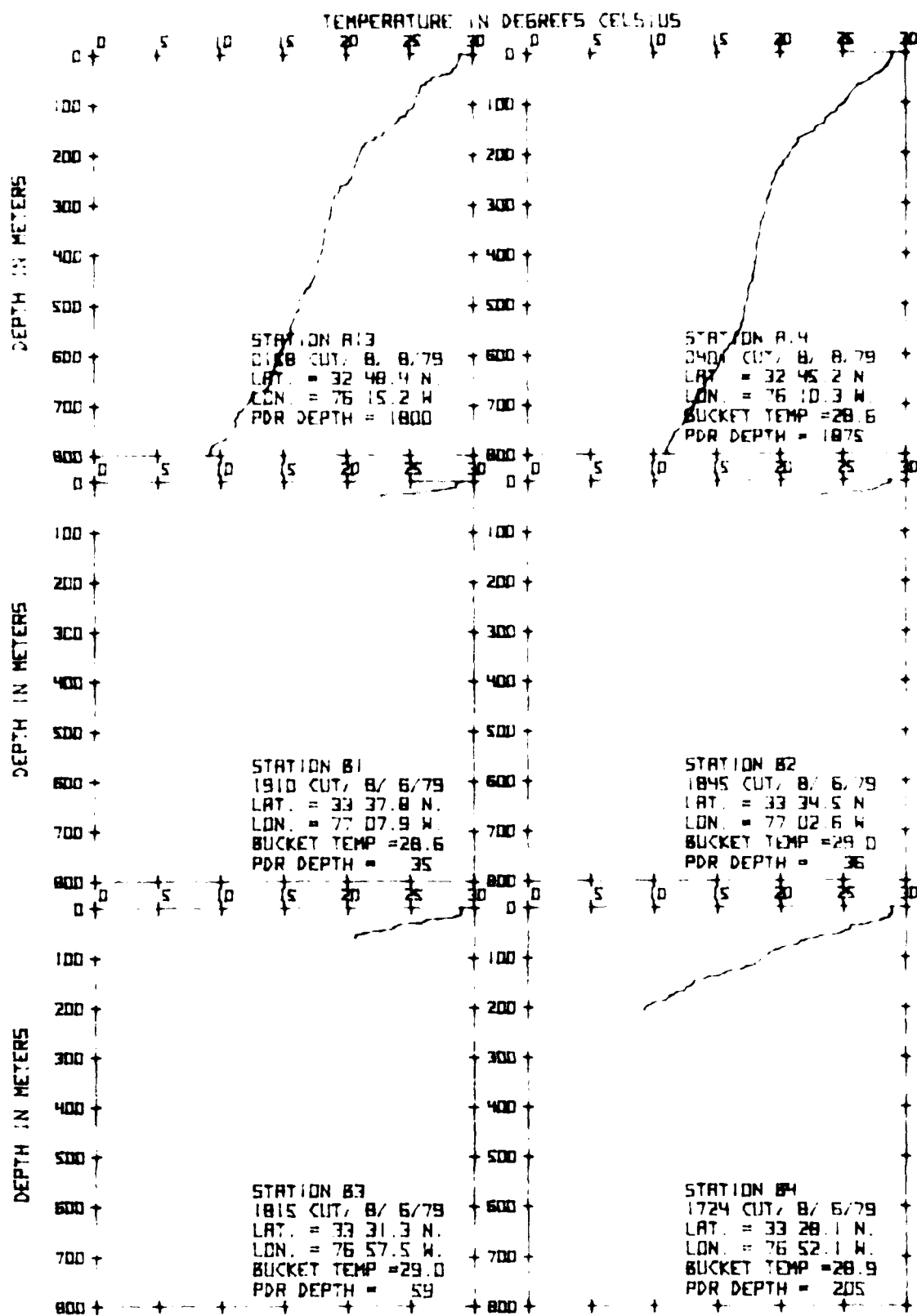
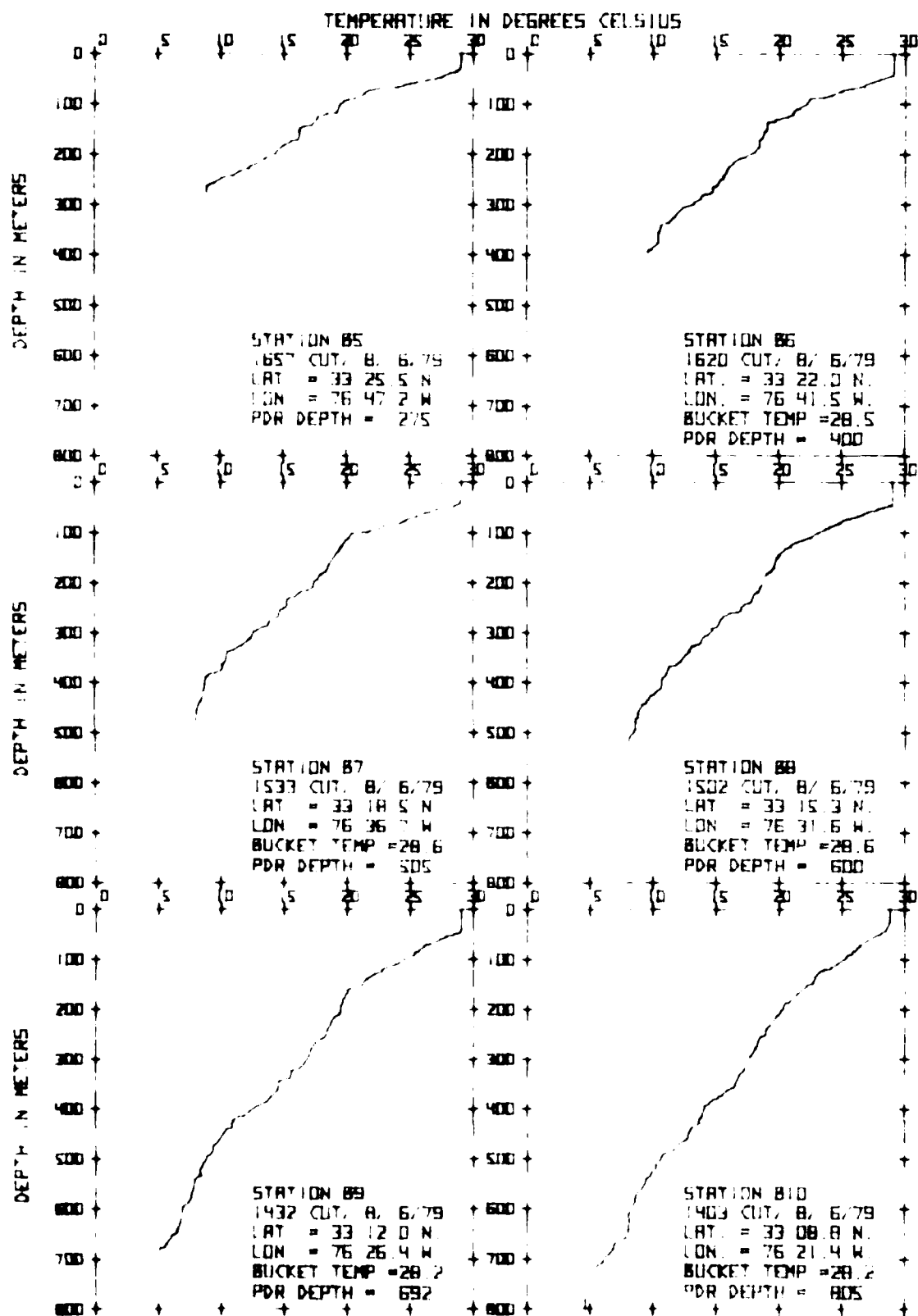
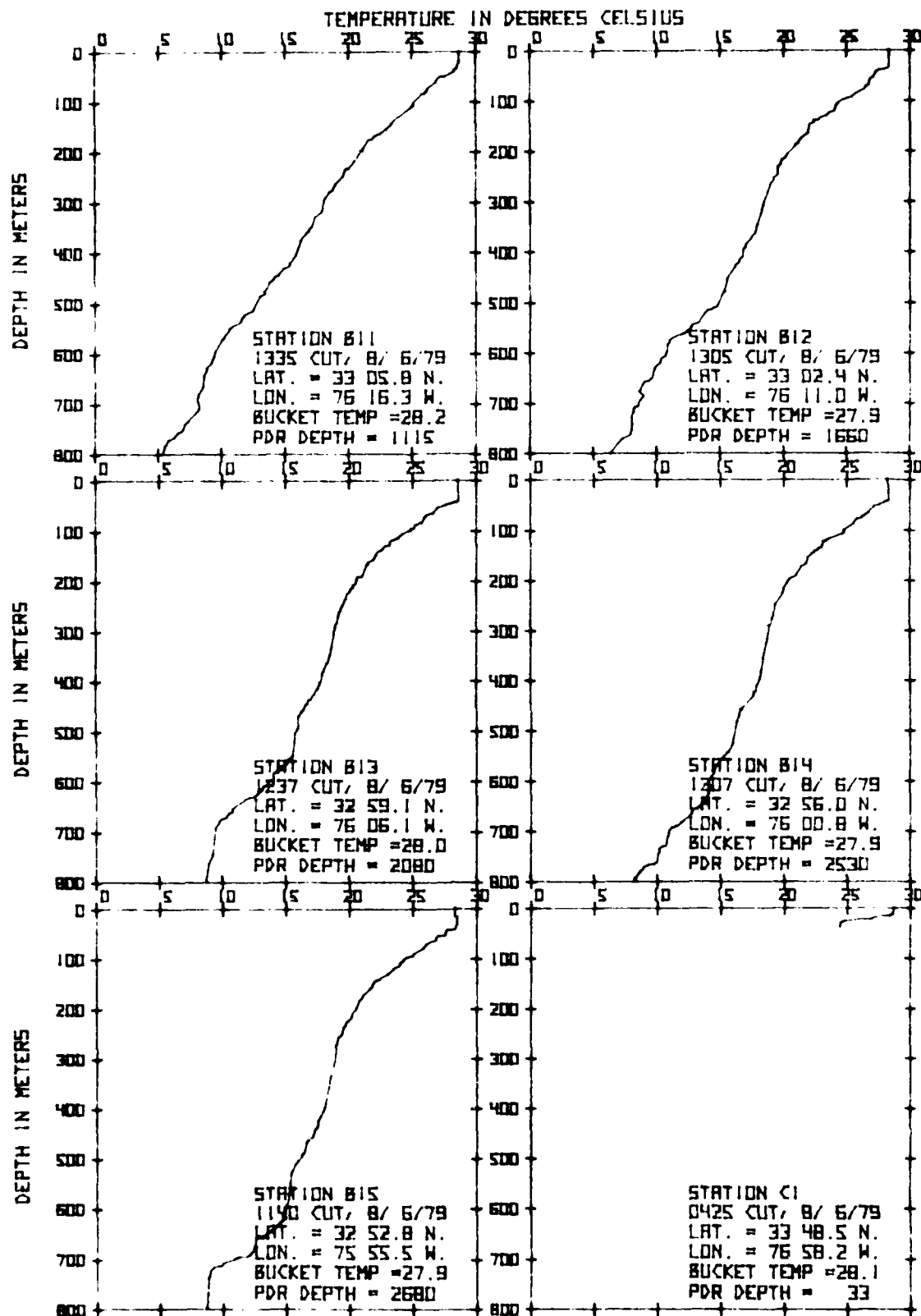


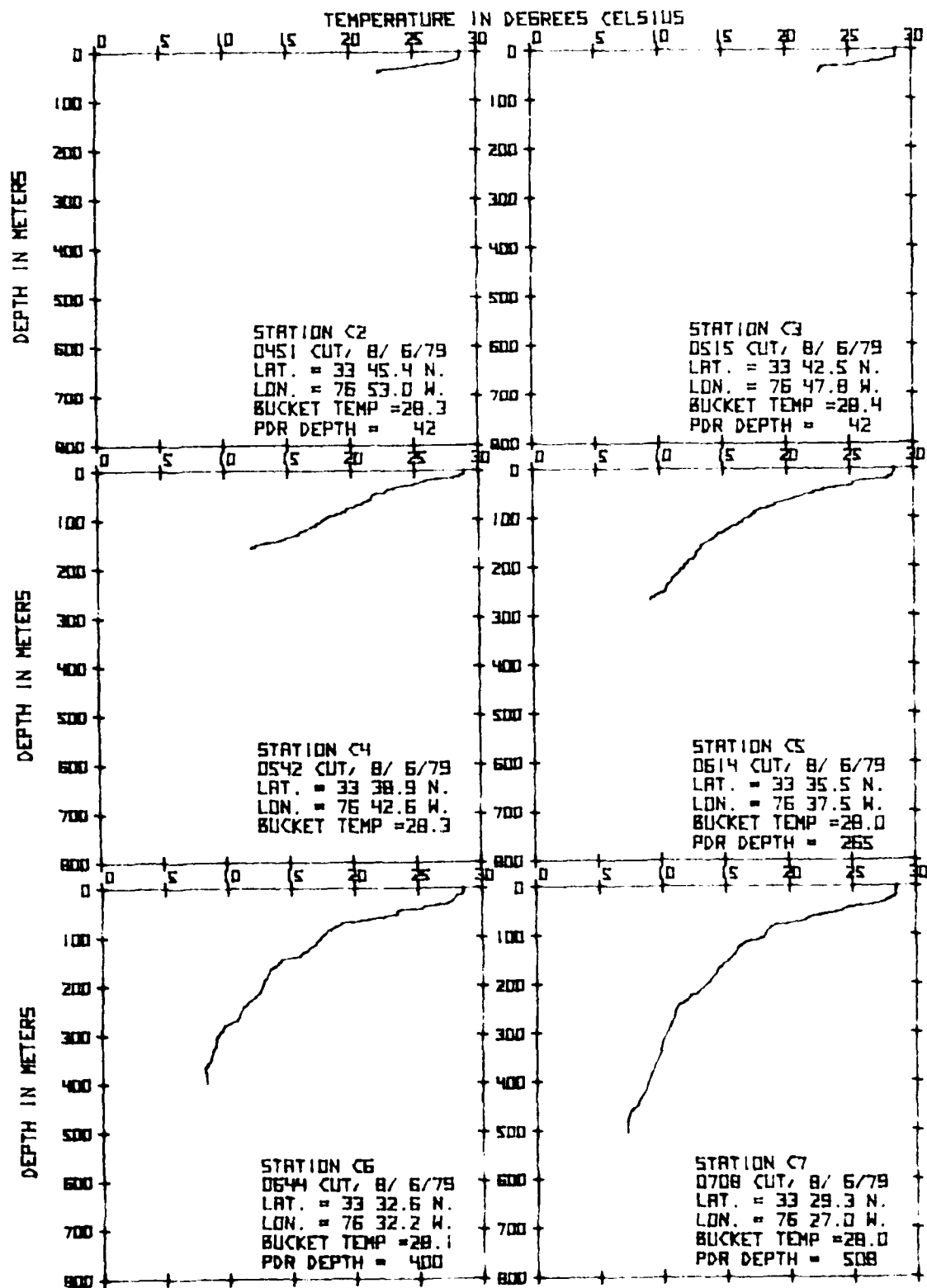
Figure 11. Individual XBT station temperature profiles. caption Station locations are shown in Figure 2. The profiles have not been forced to agree with surface bucket temperatures. This figure is continued on the next 16 pages.

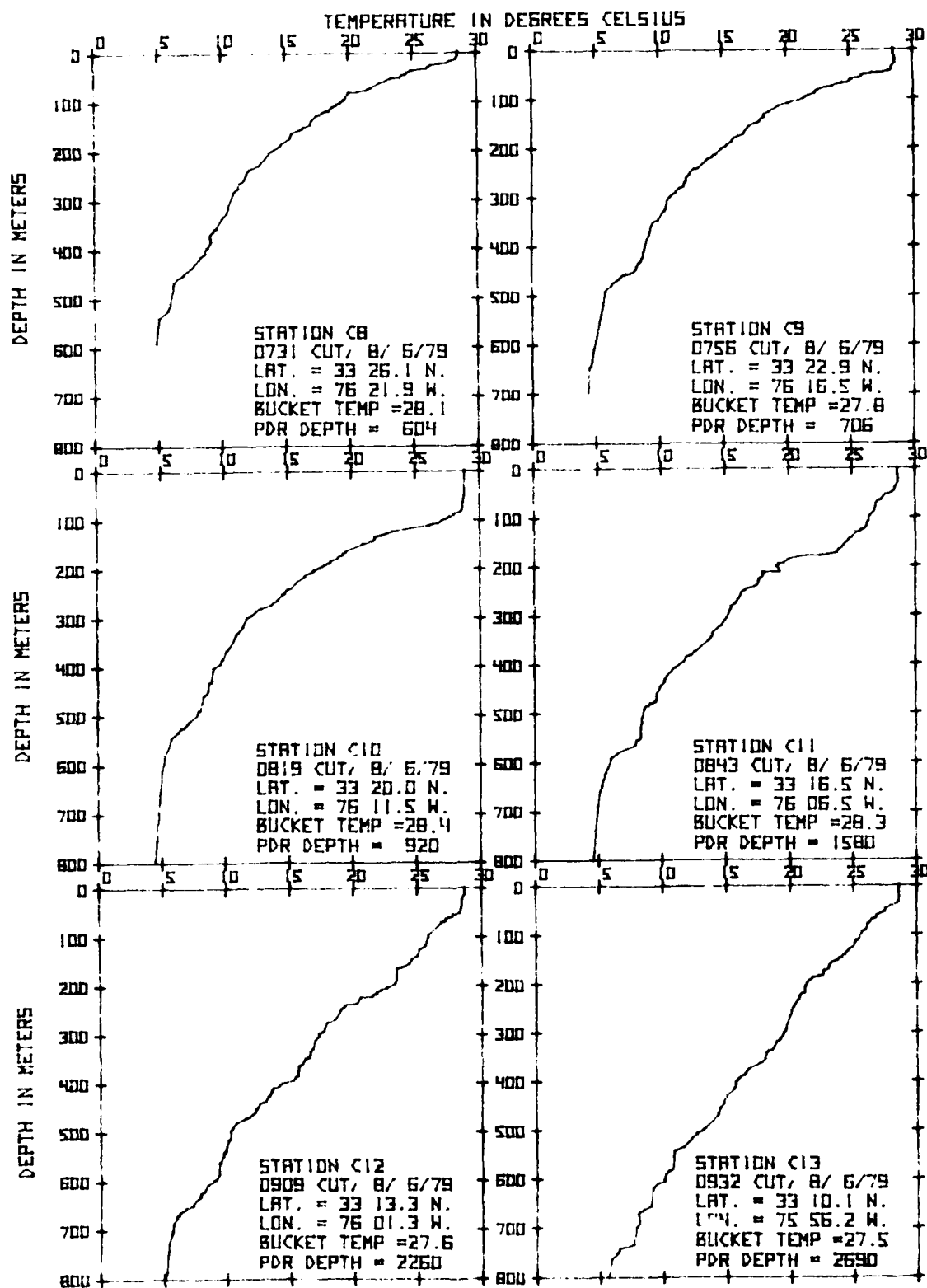


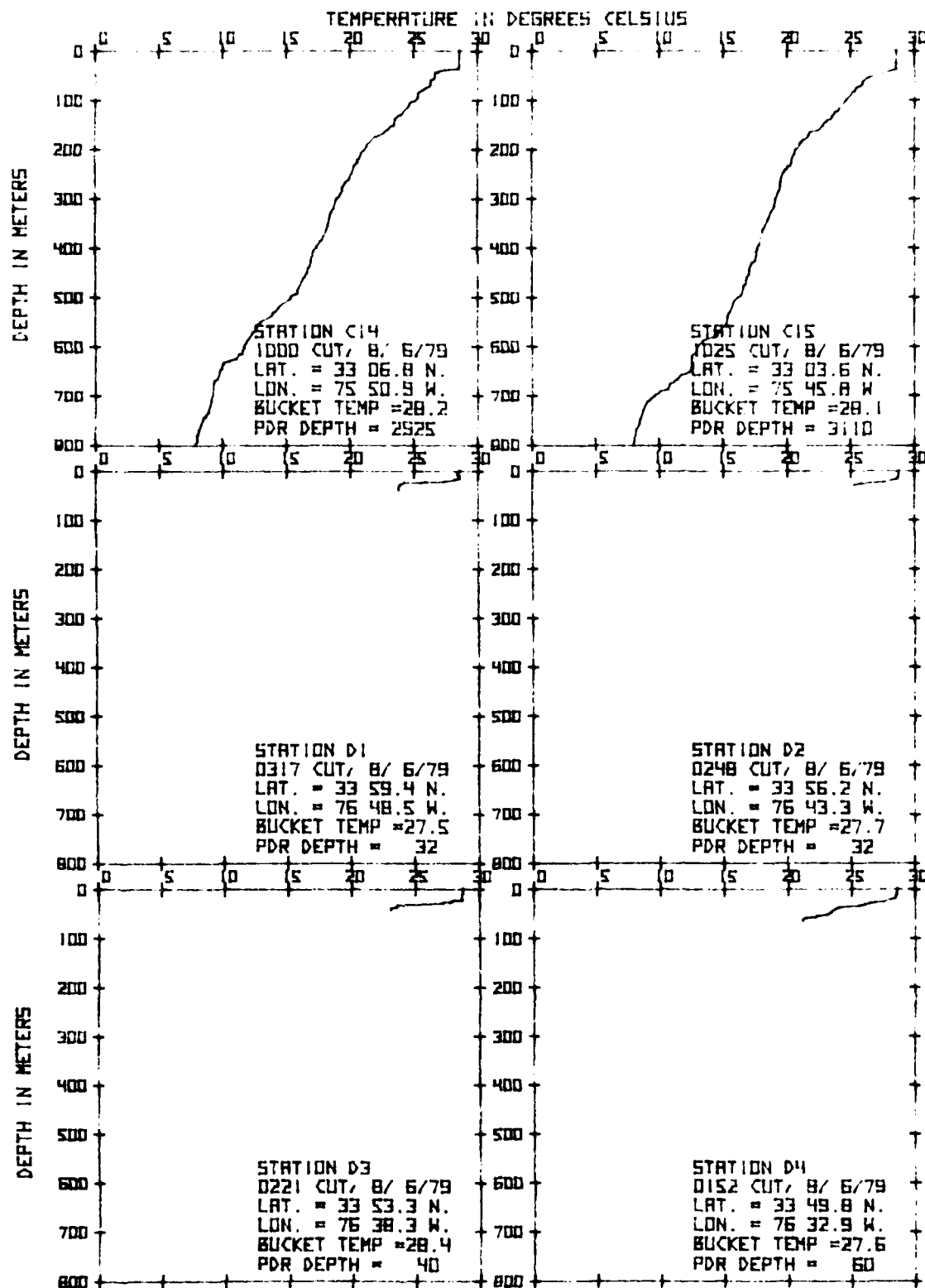


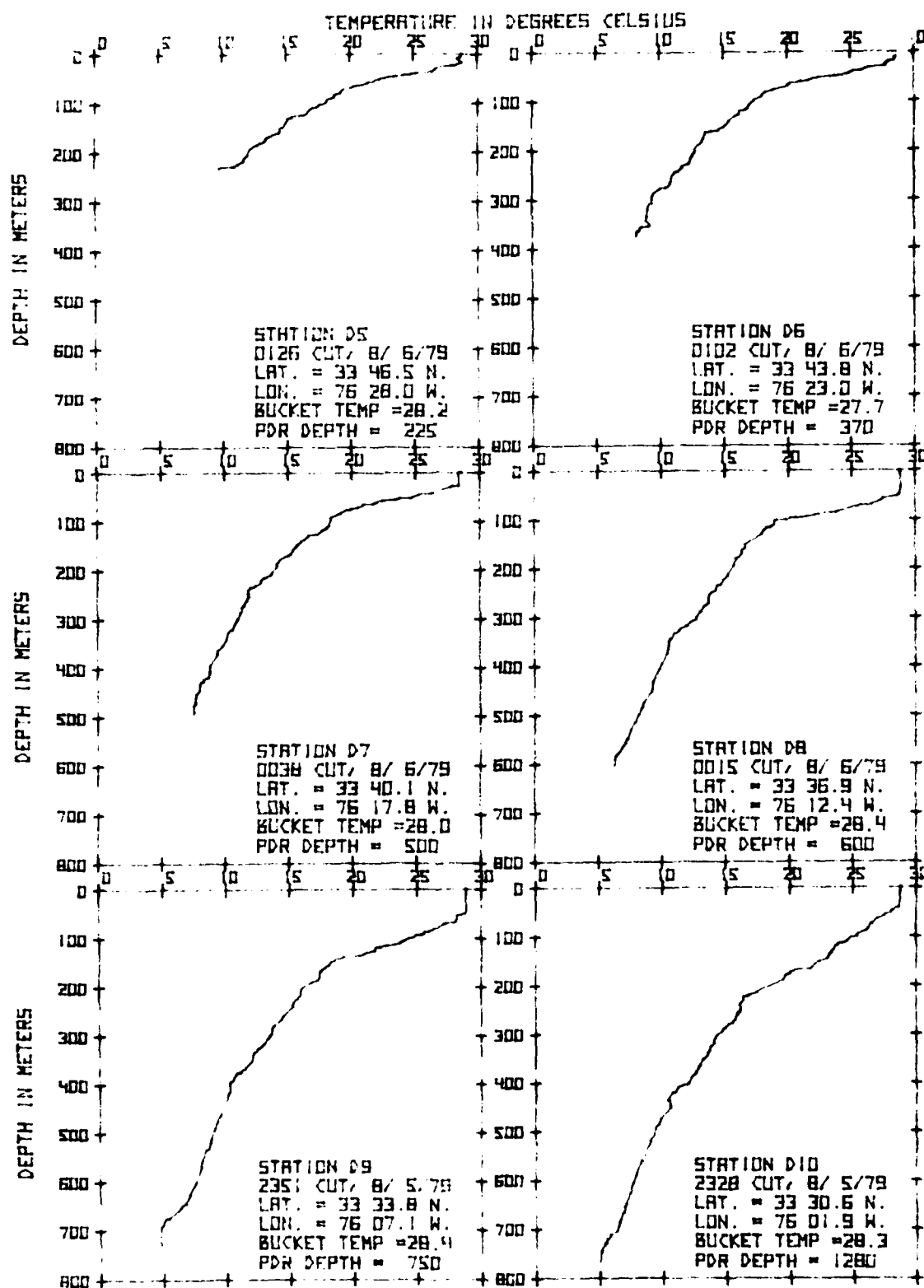


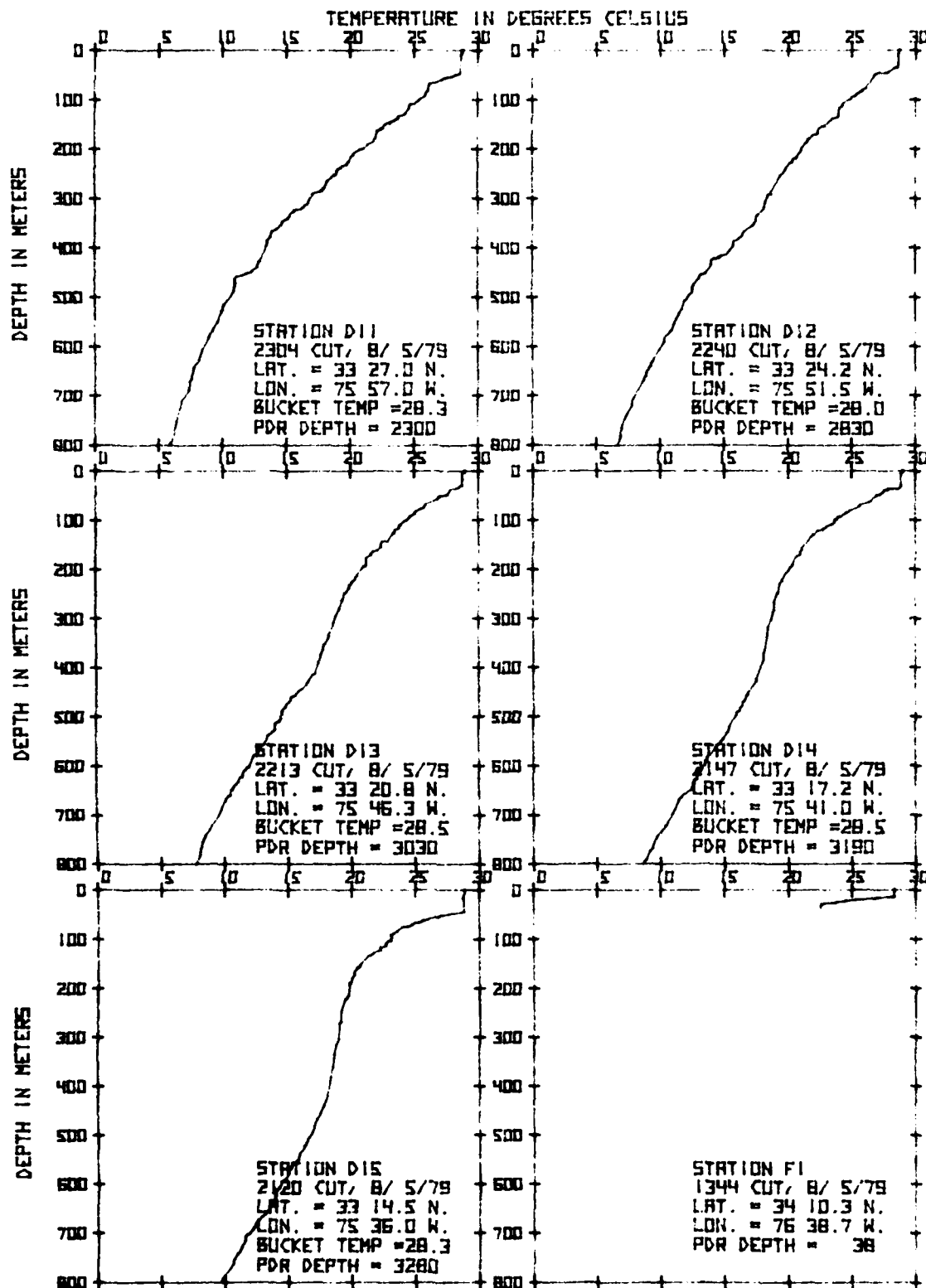


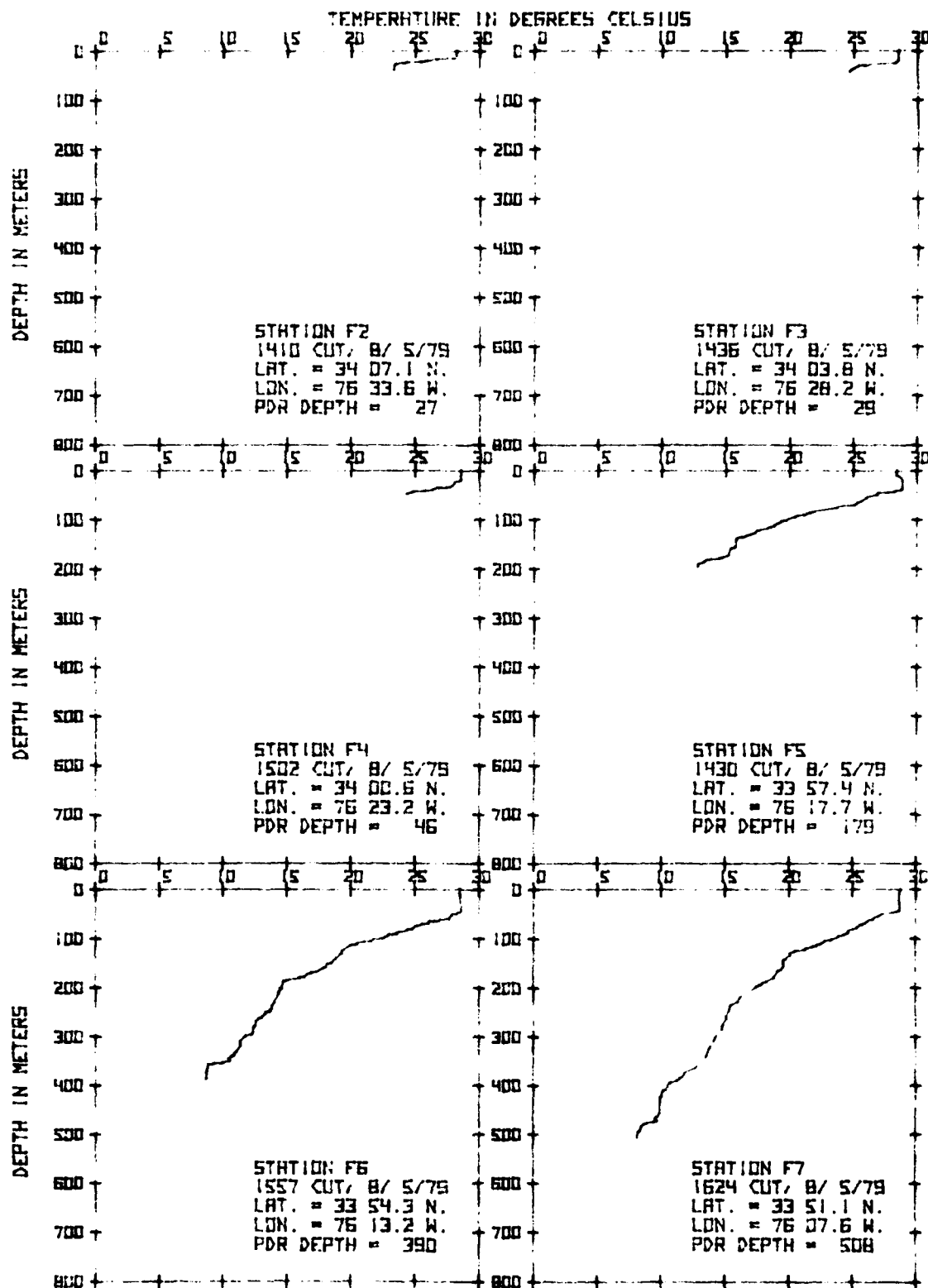


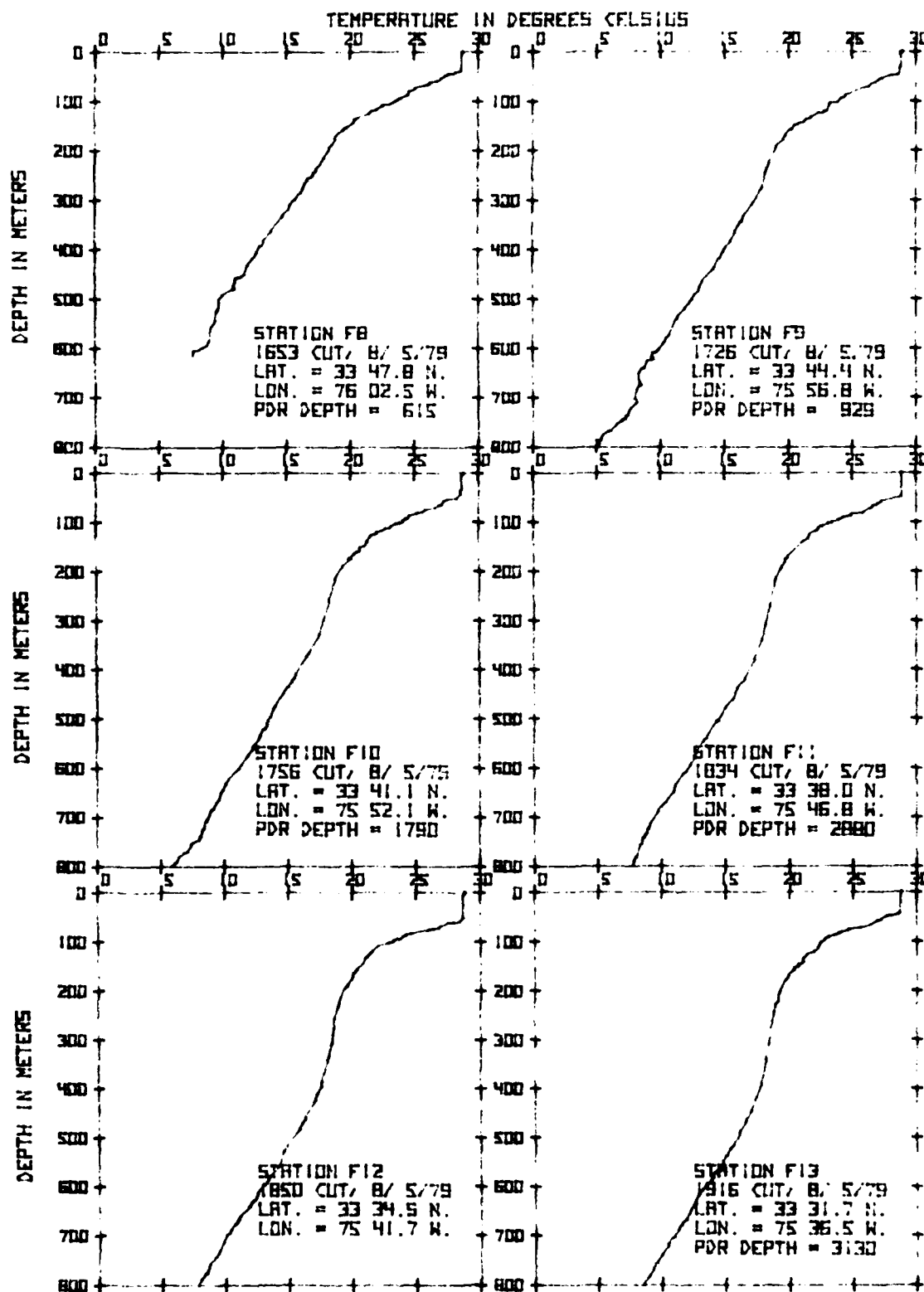


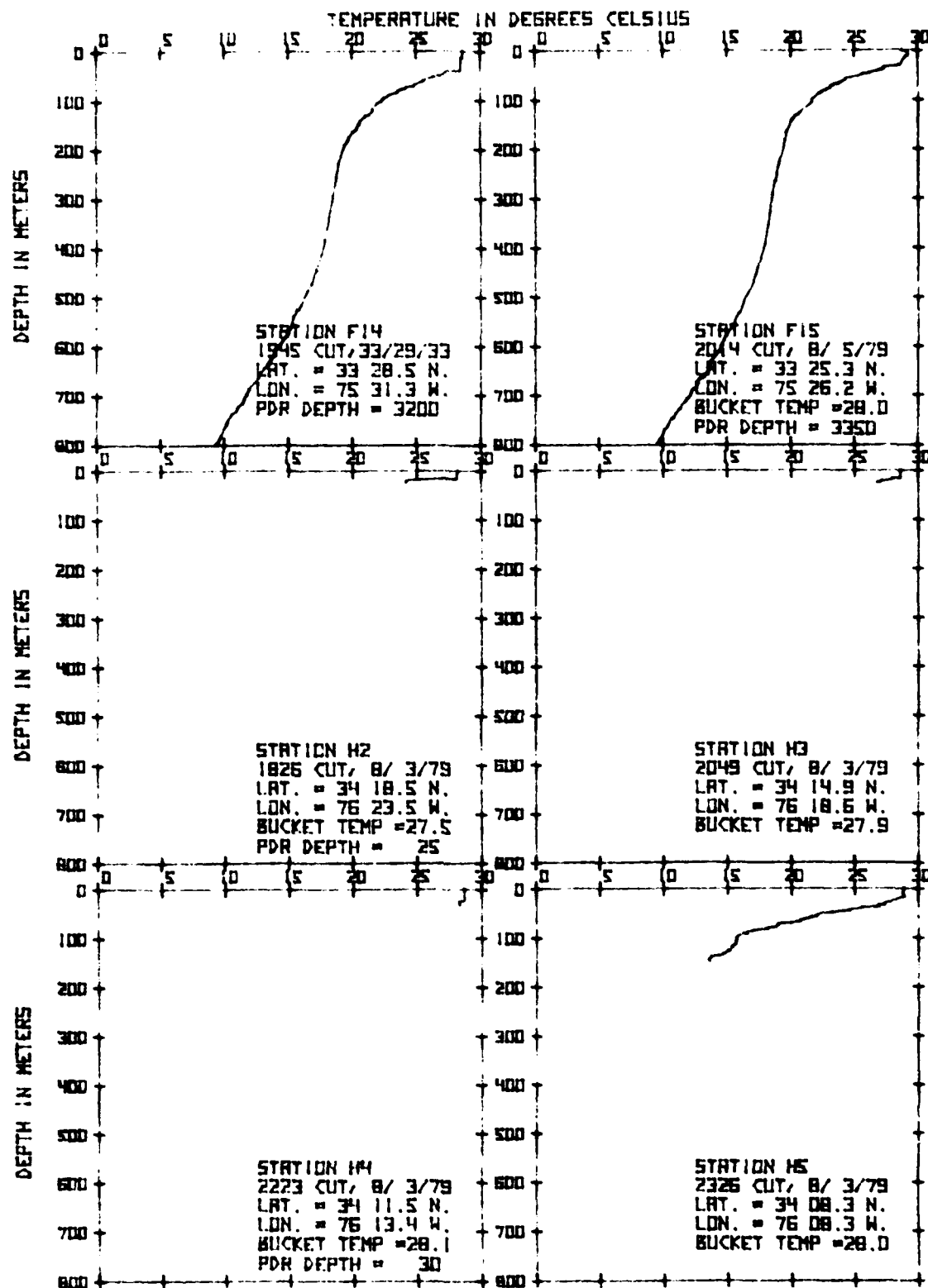


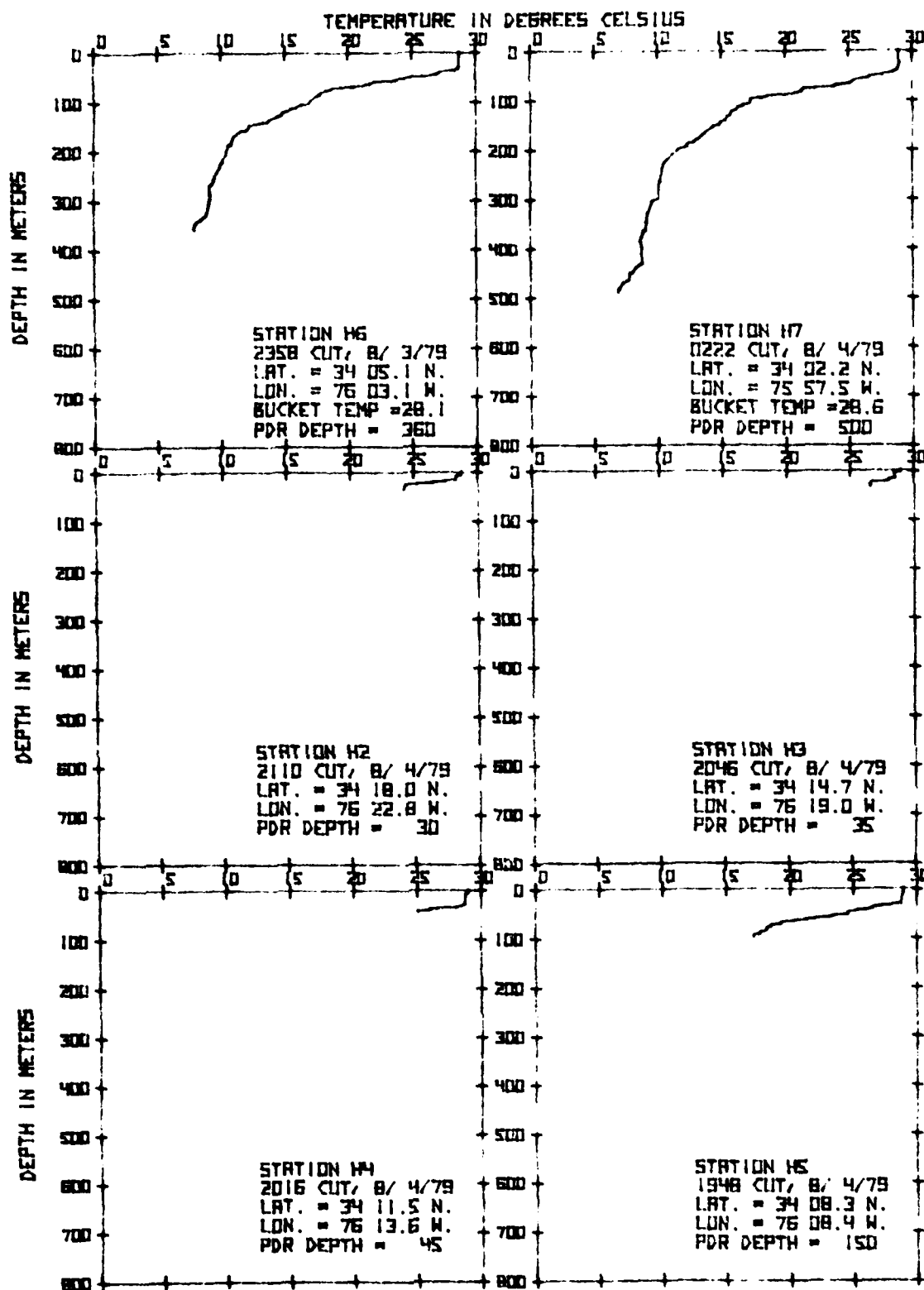


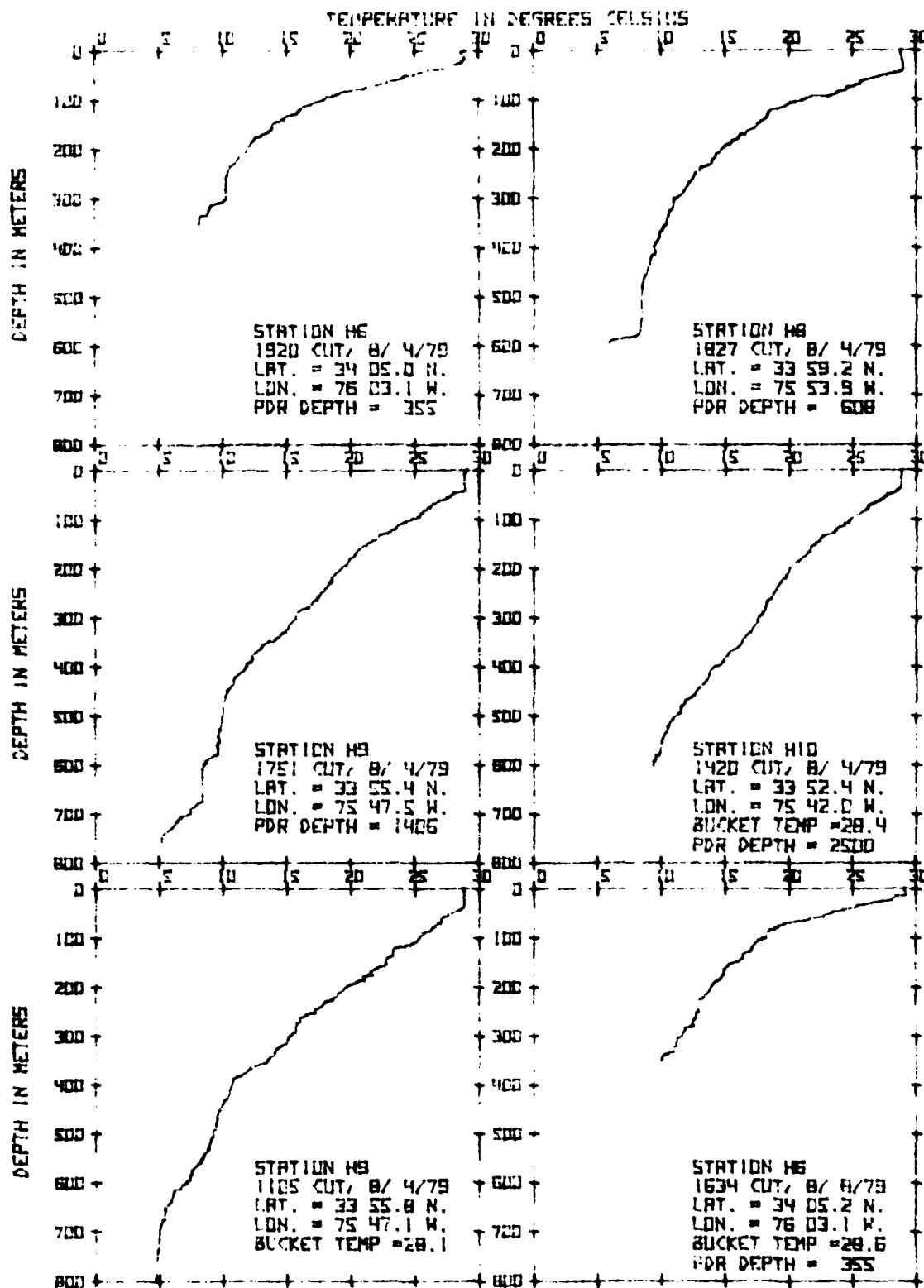


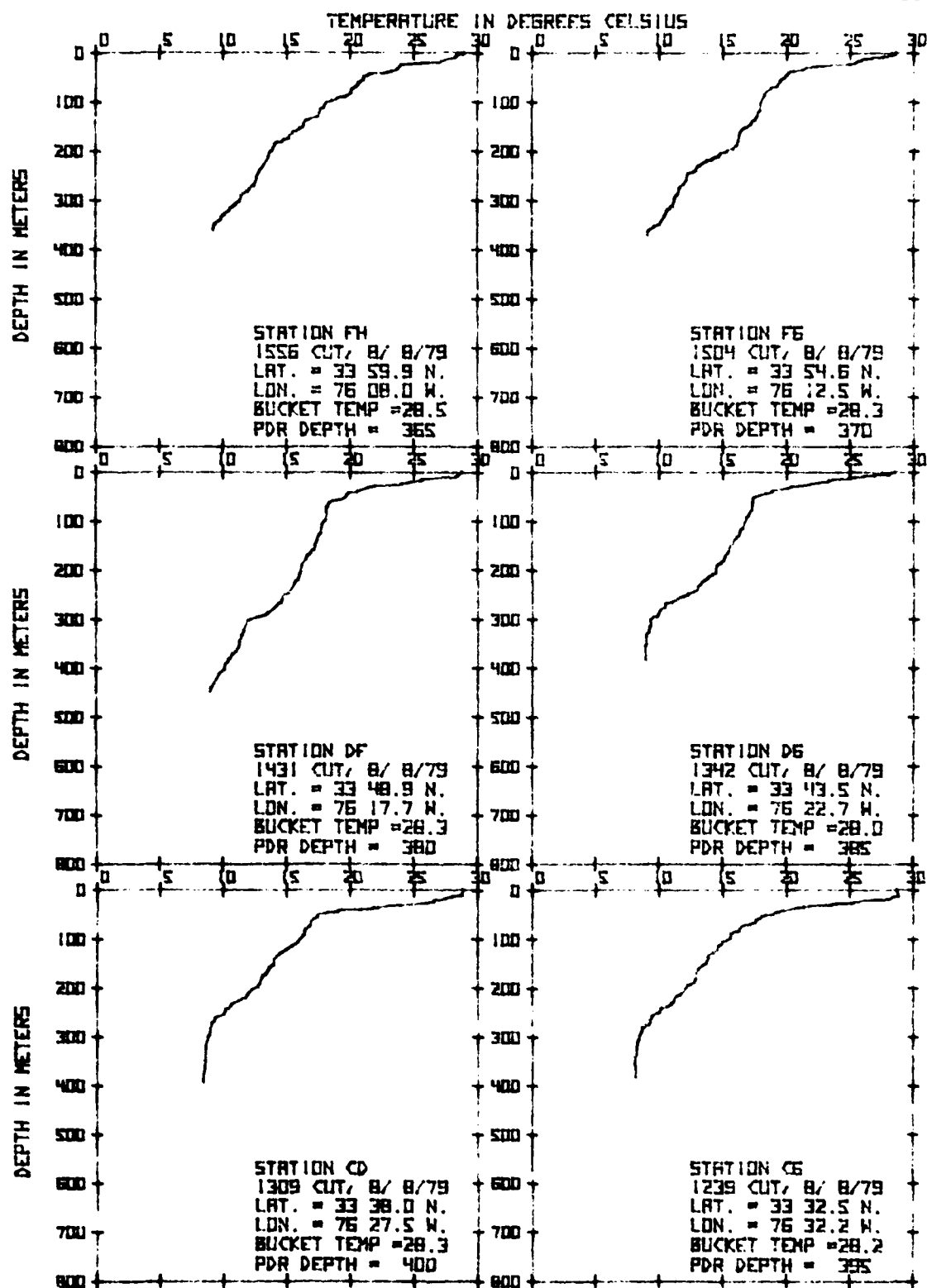


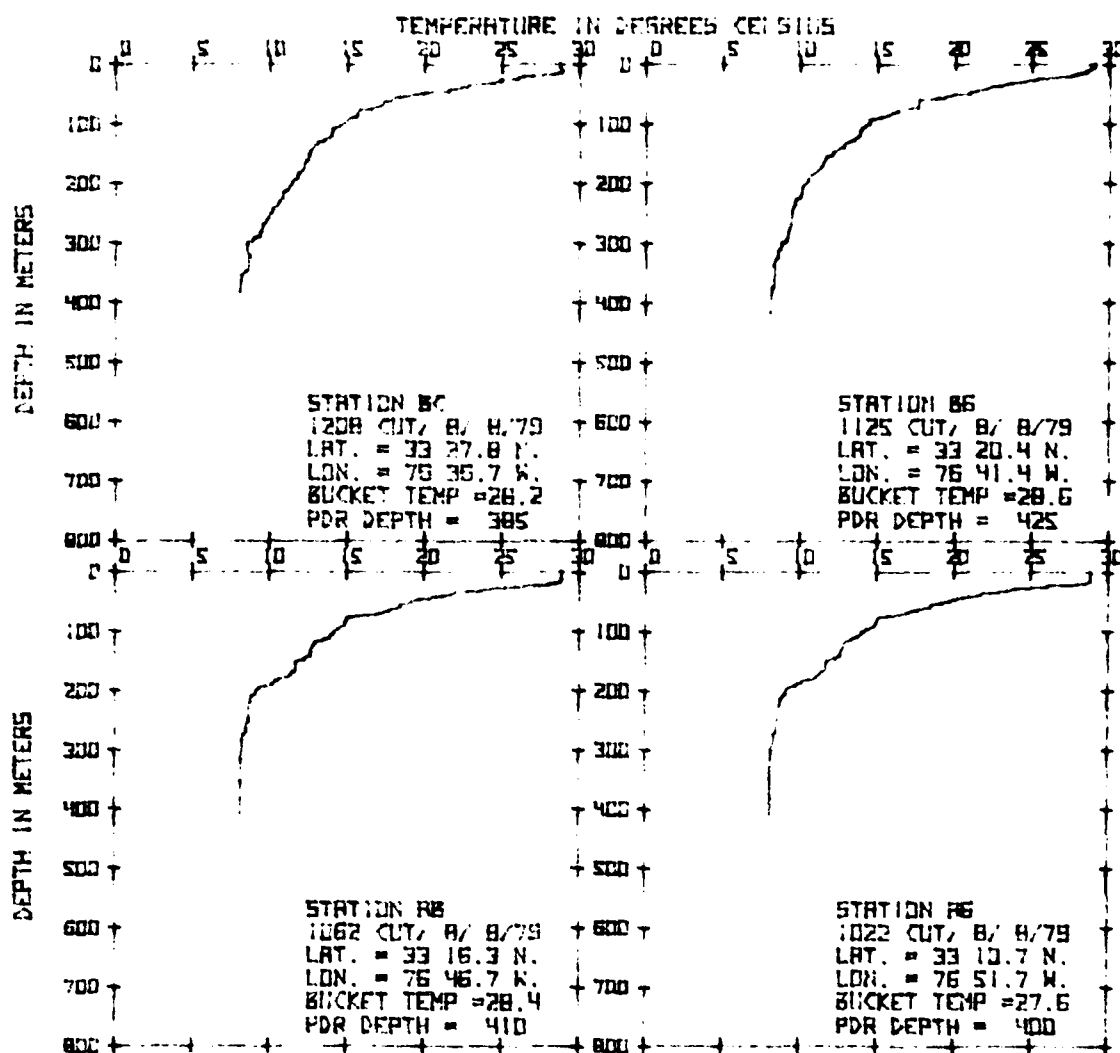












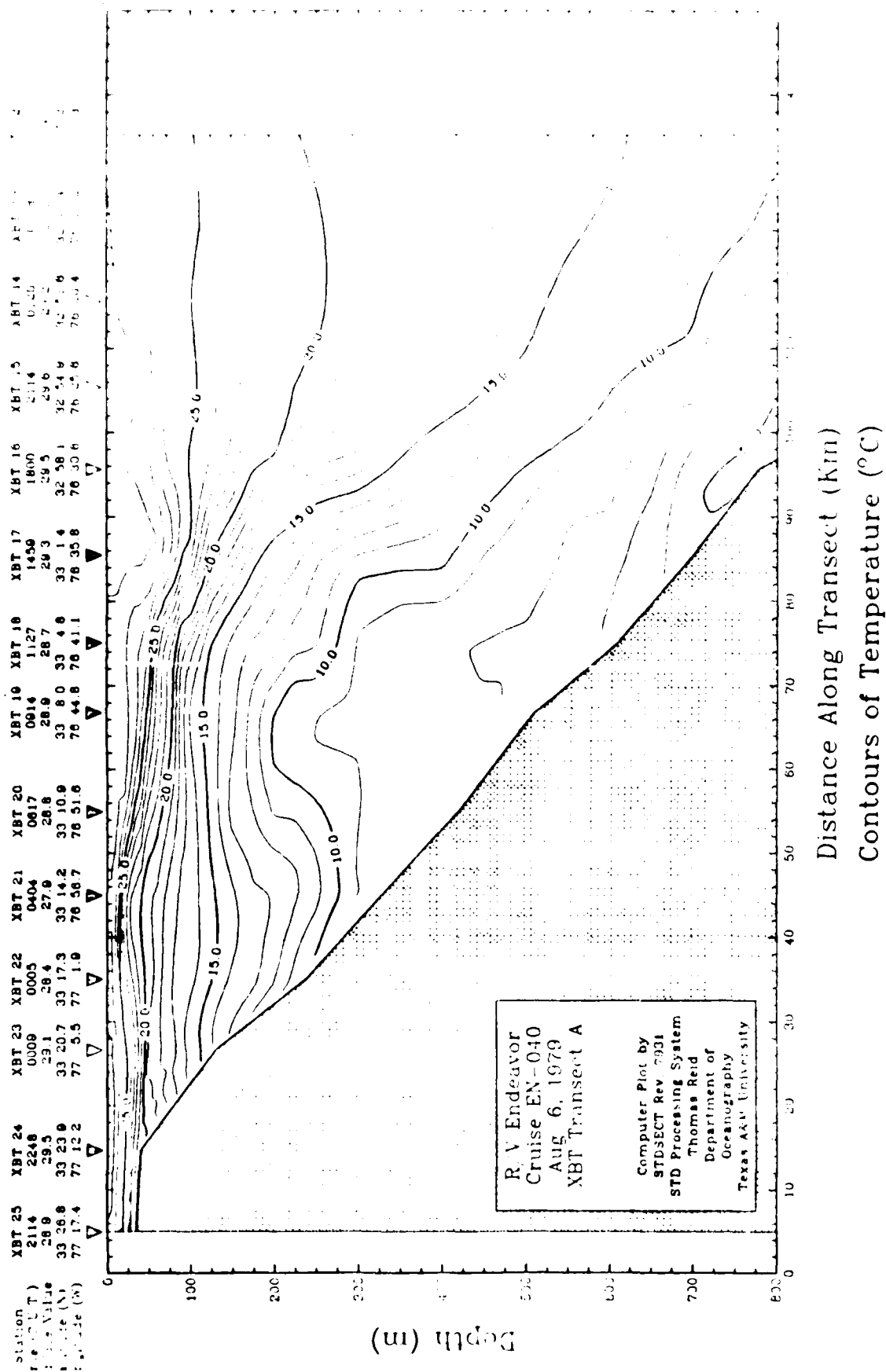
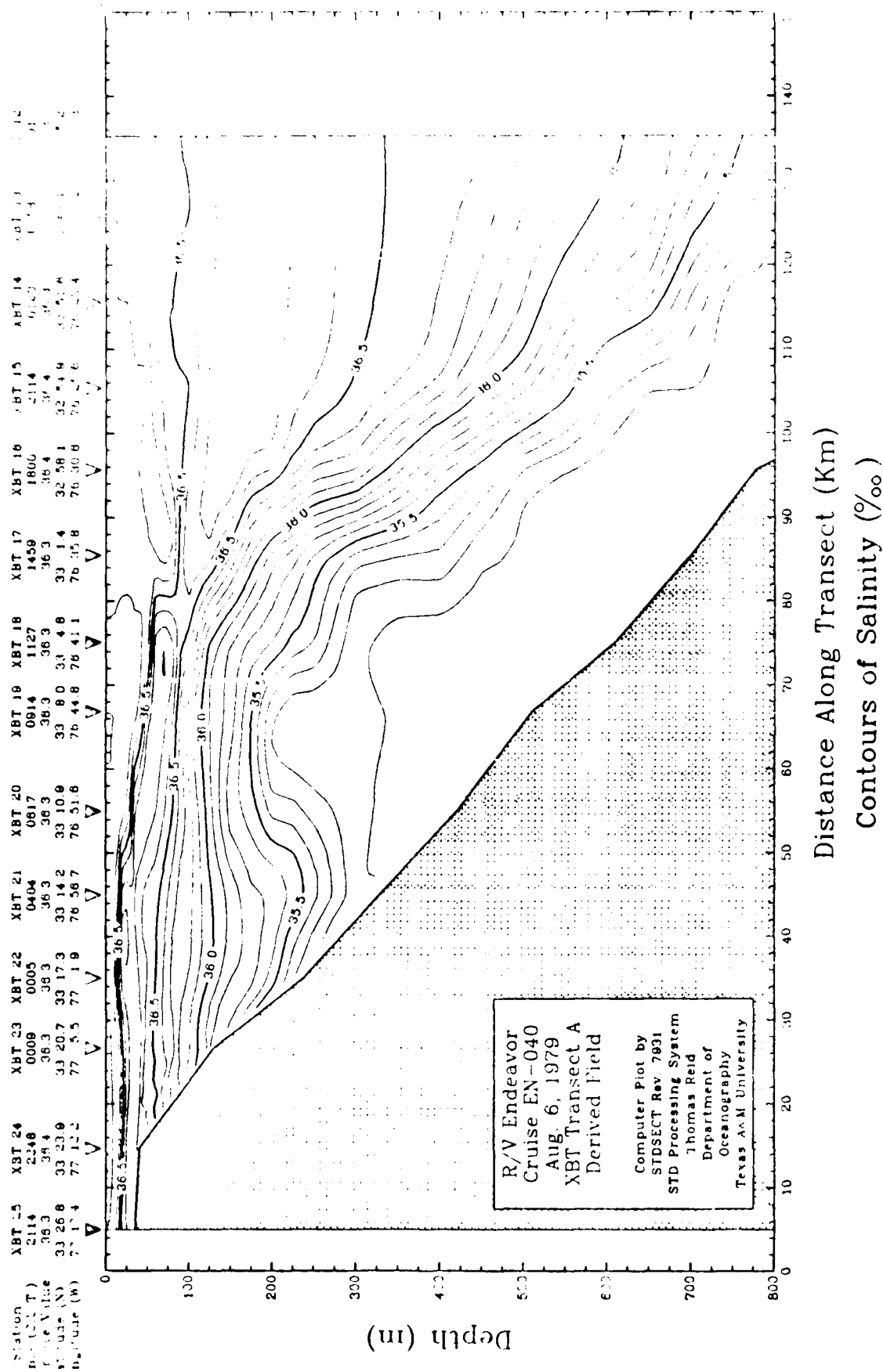
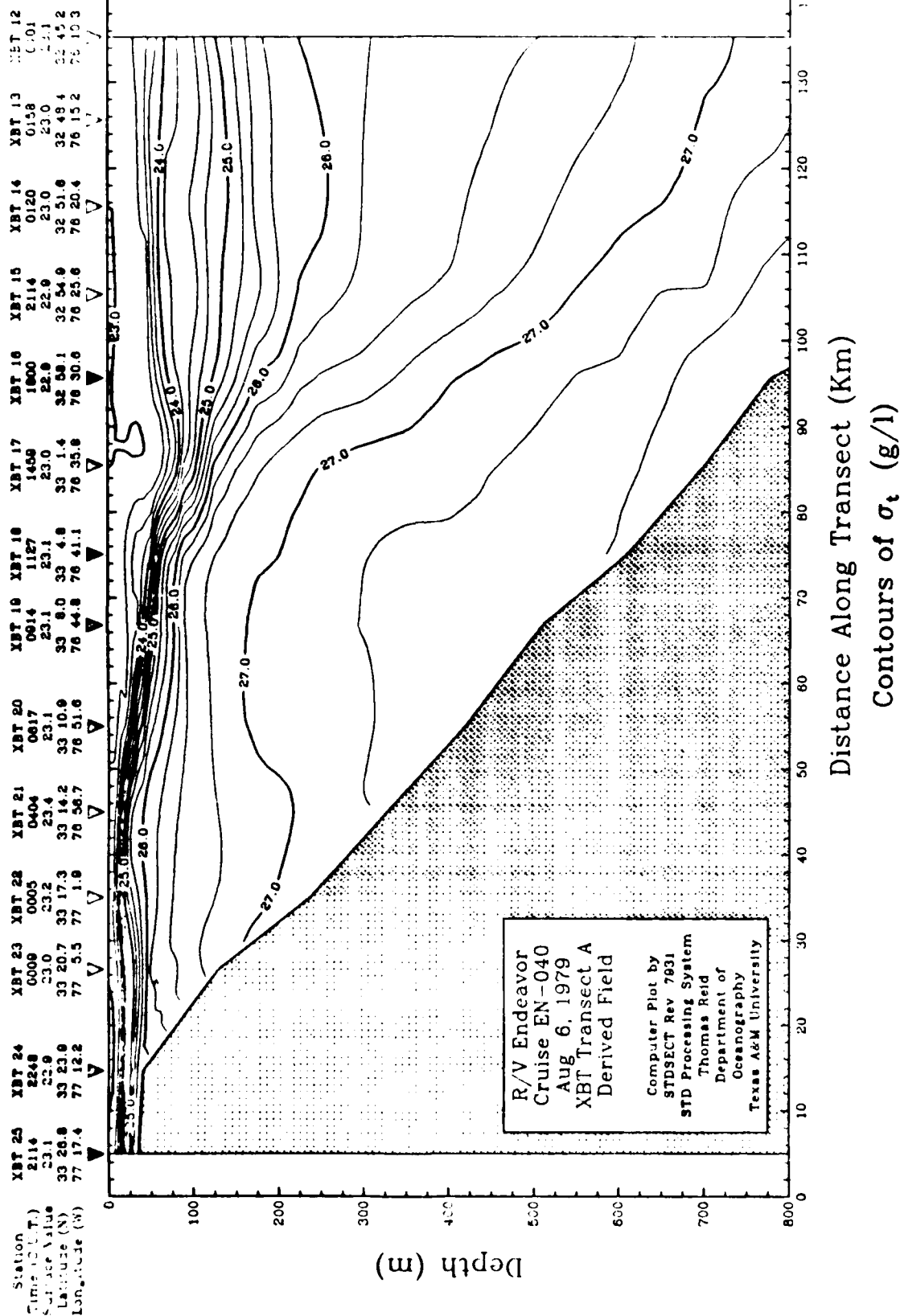
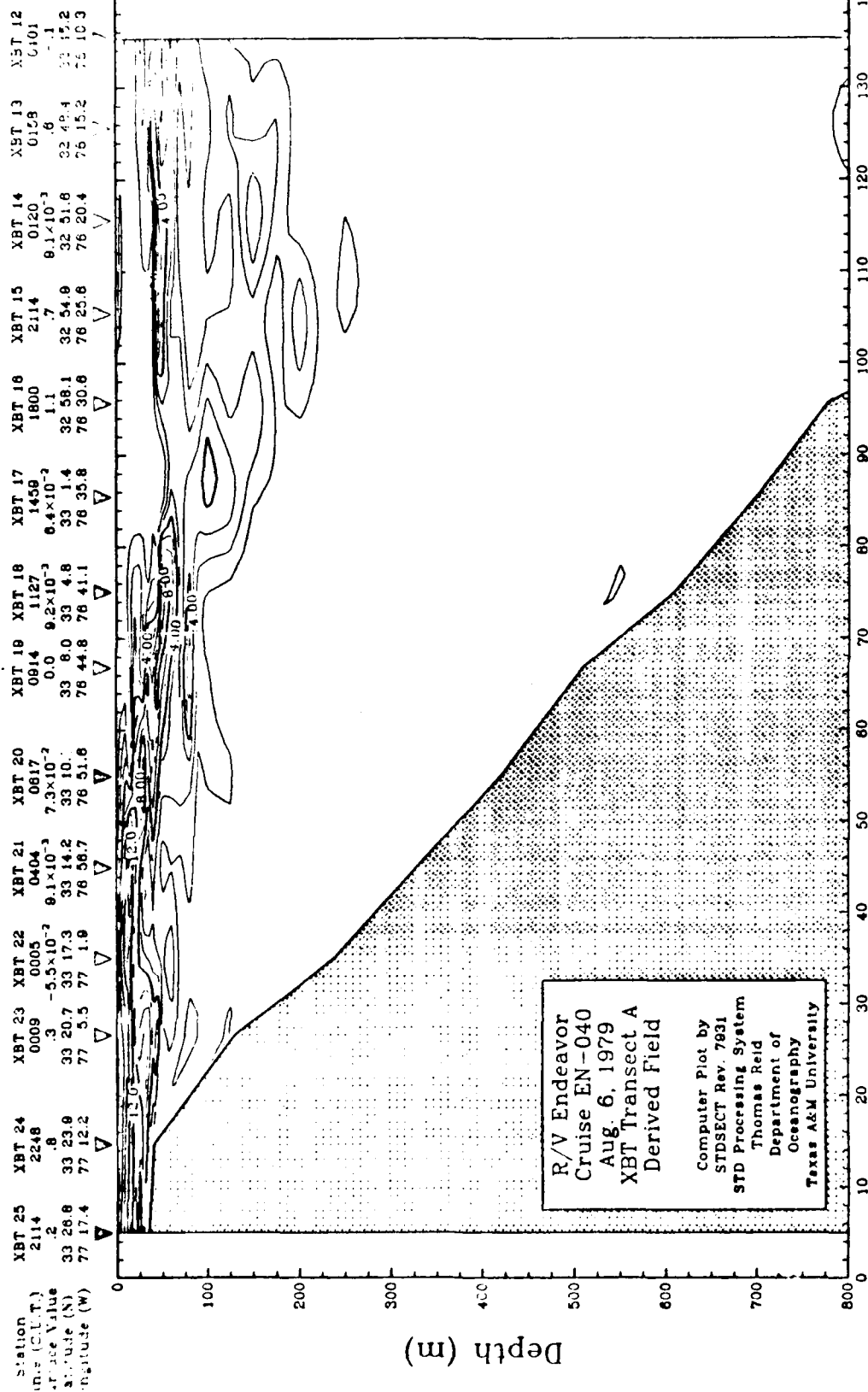


Figure 12. Section contours of temperature and depth. Contours are plotted and NC fields for Transect A contour interval is 0.5°C. The depth is plotted at 10 m intervals.







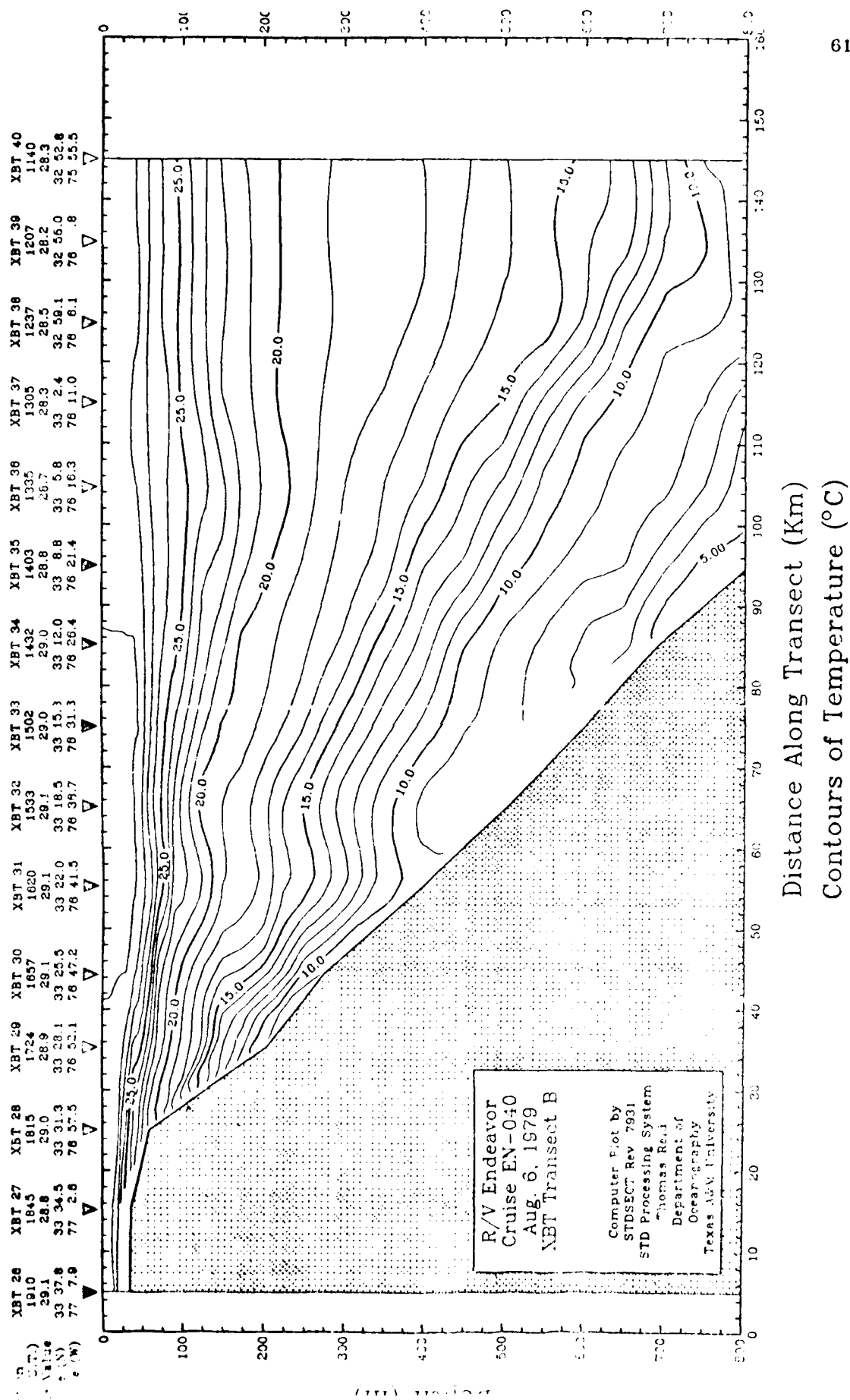
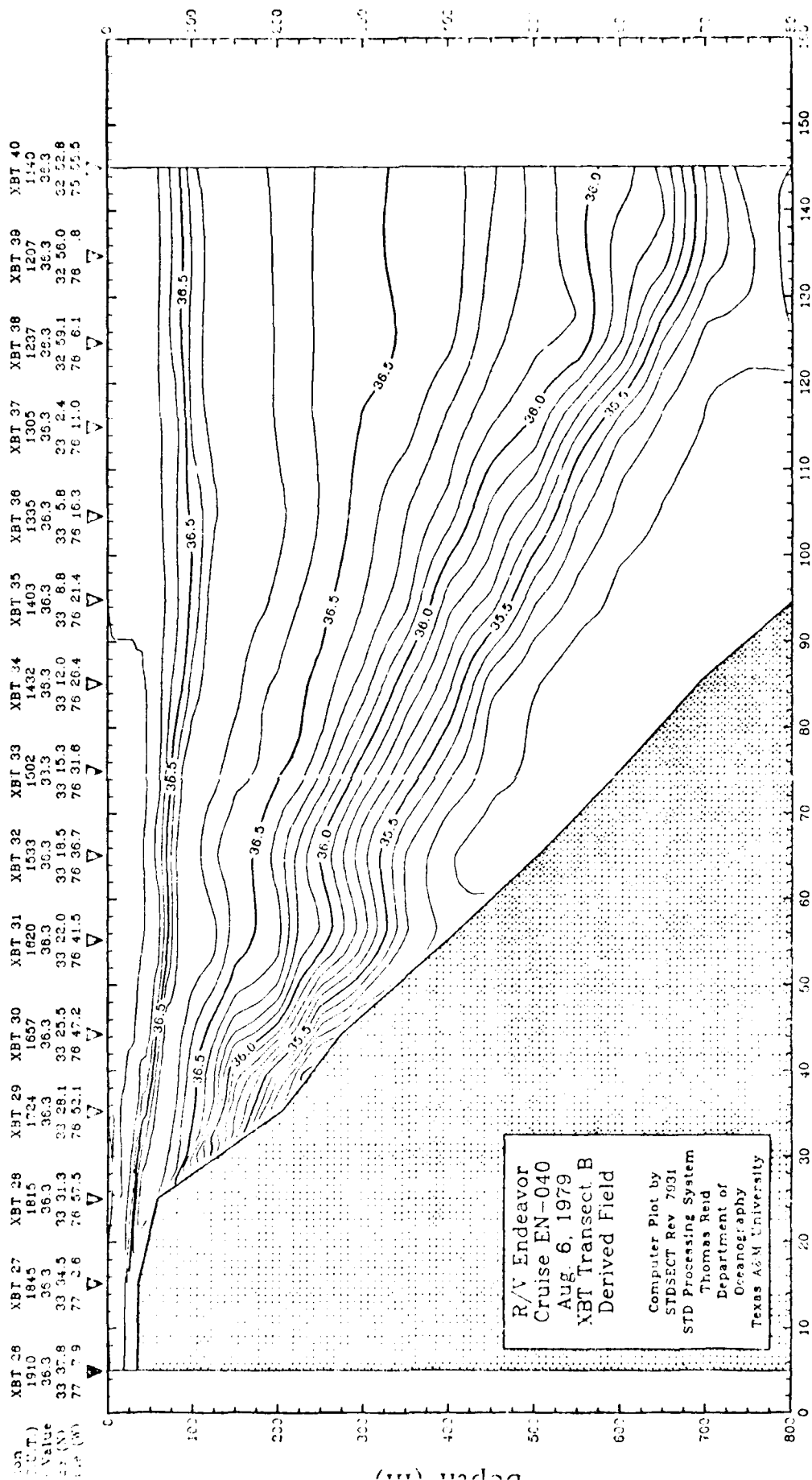
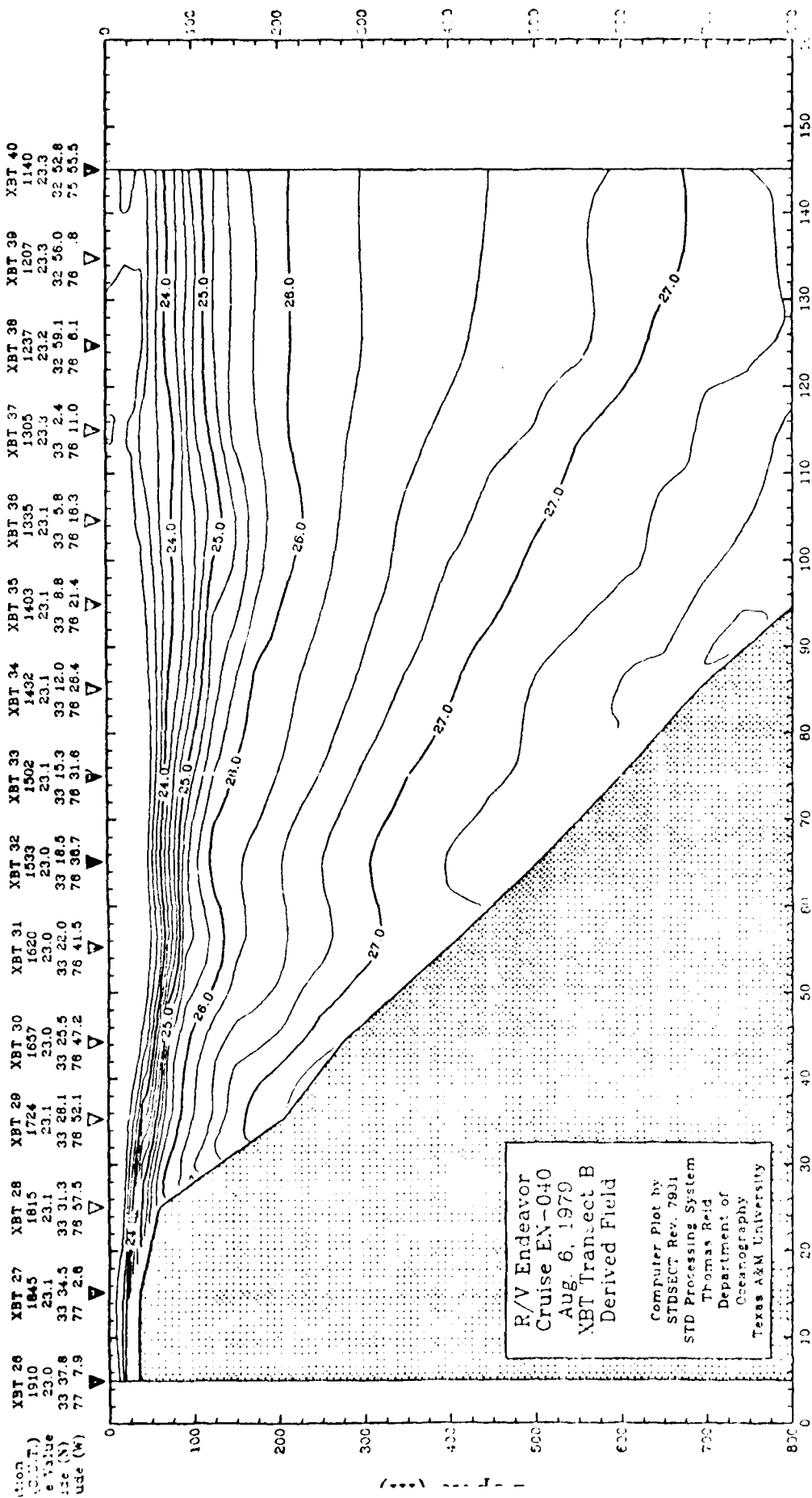
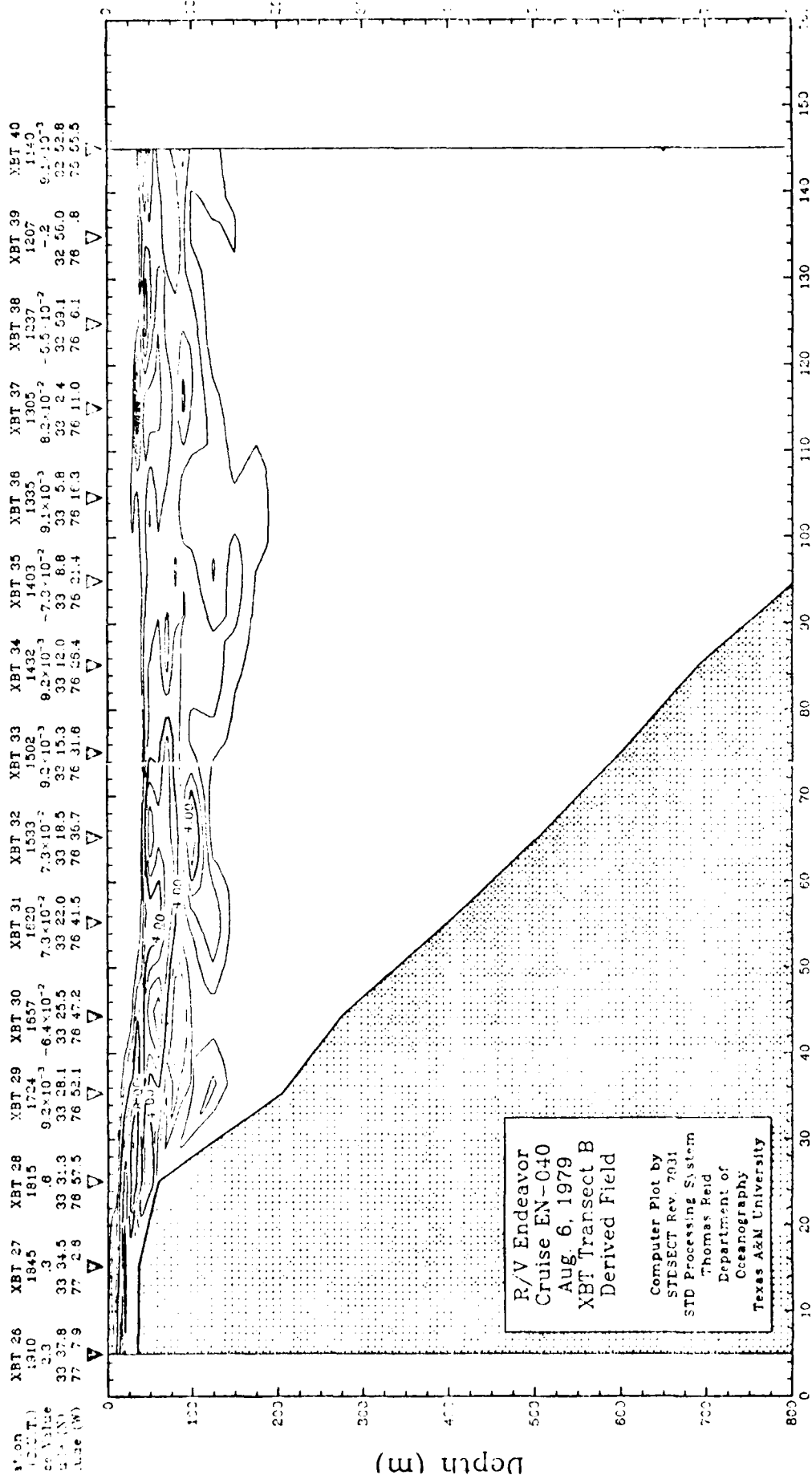


Figure 13 Section contours of temperature and derived salinity, sigma-t and N_2 fields for Transect B. Contour intervals are 1°C , 0.1psu , $0.2\sigma_t$ units and $0.5 \cdot 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages.



Distance Along Transect (Km)
 Contours of Salinity (‰)





Distance Along Transect (Km)
Contours of N^2 ($10^4 \text{ rad}^2/\text{s}^2$)

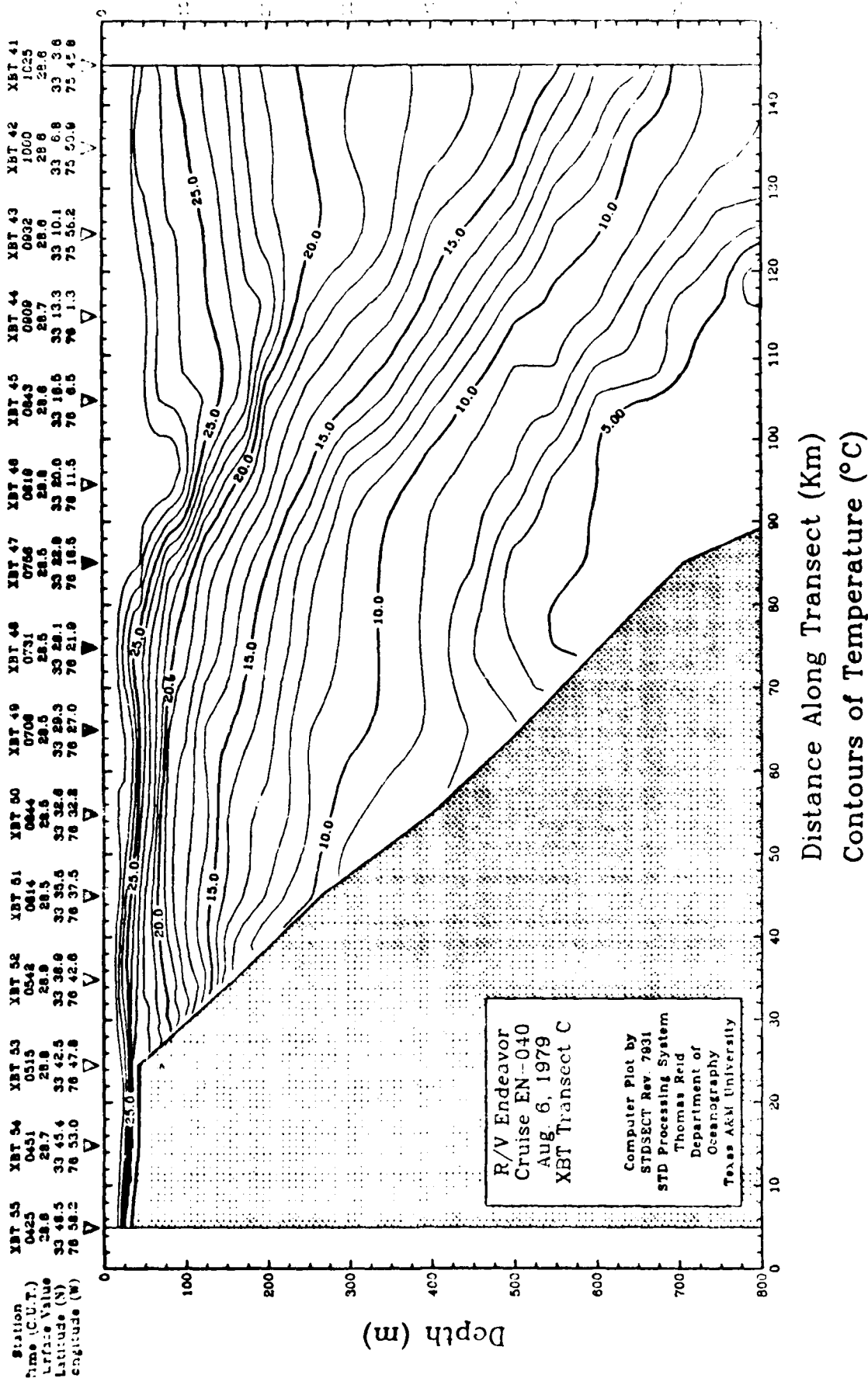
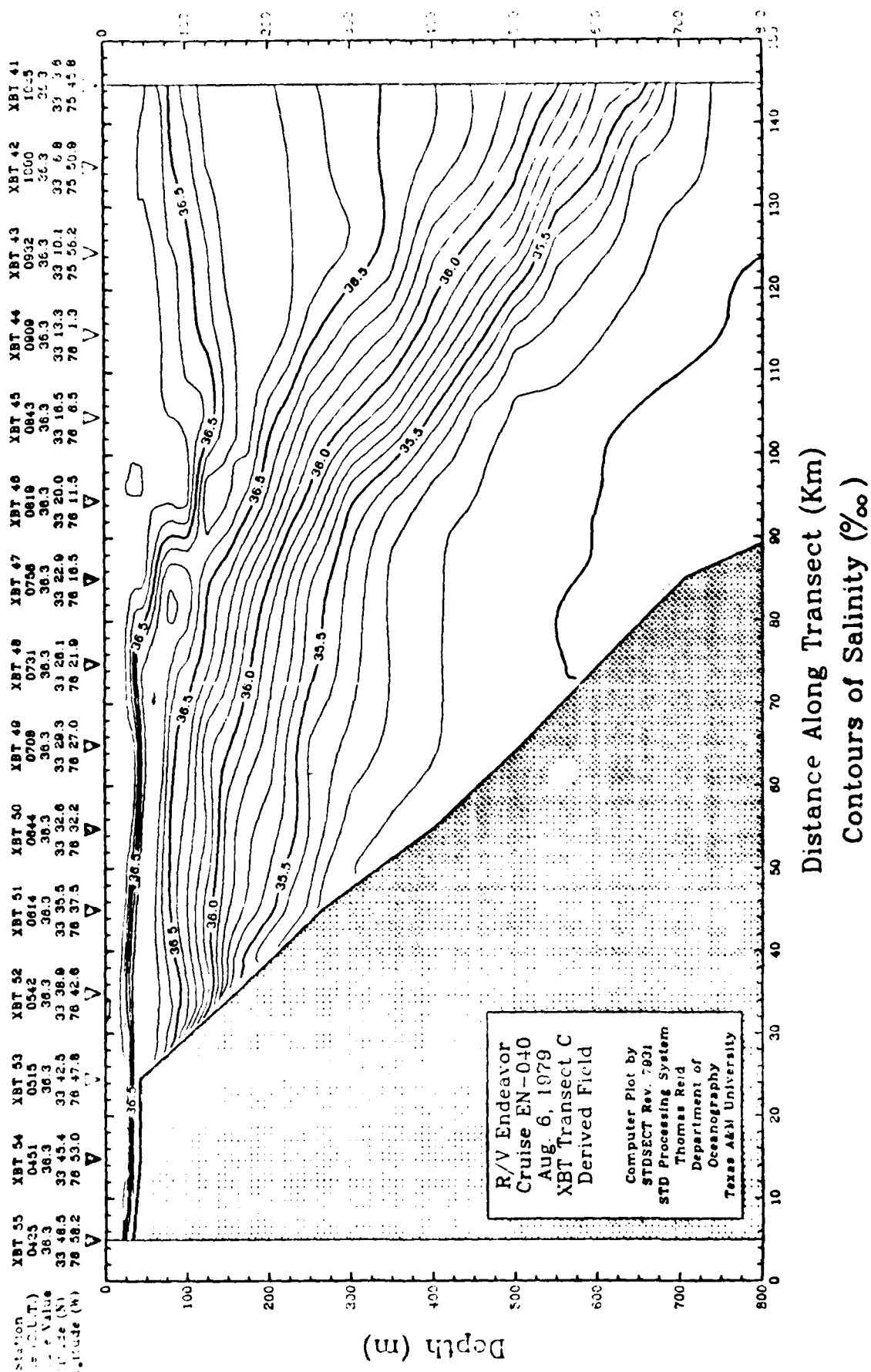
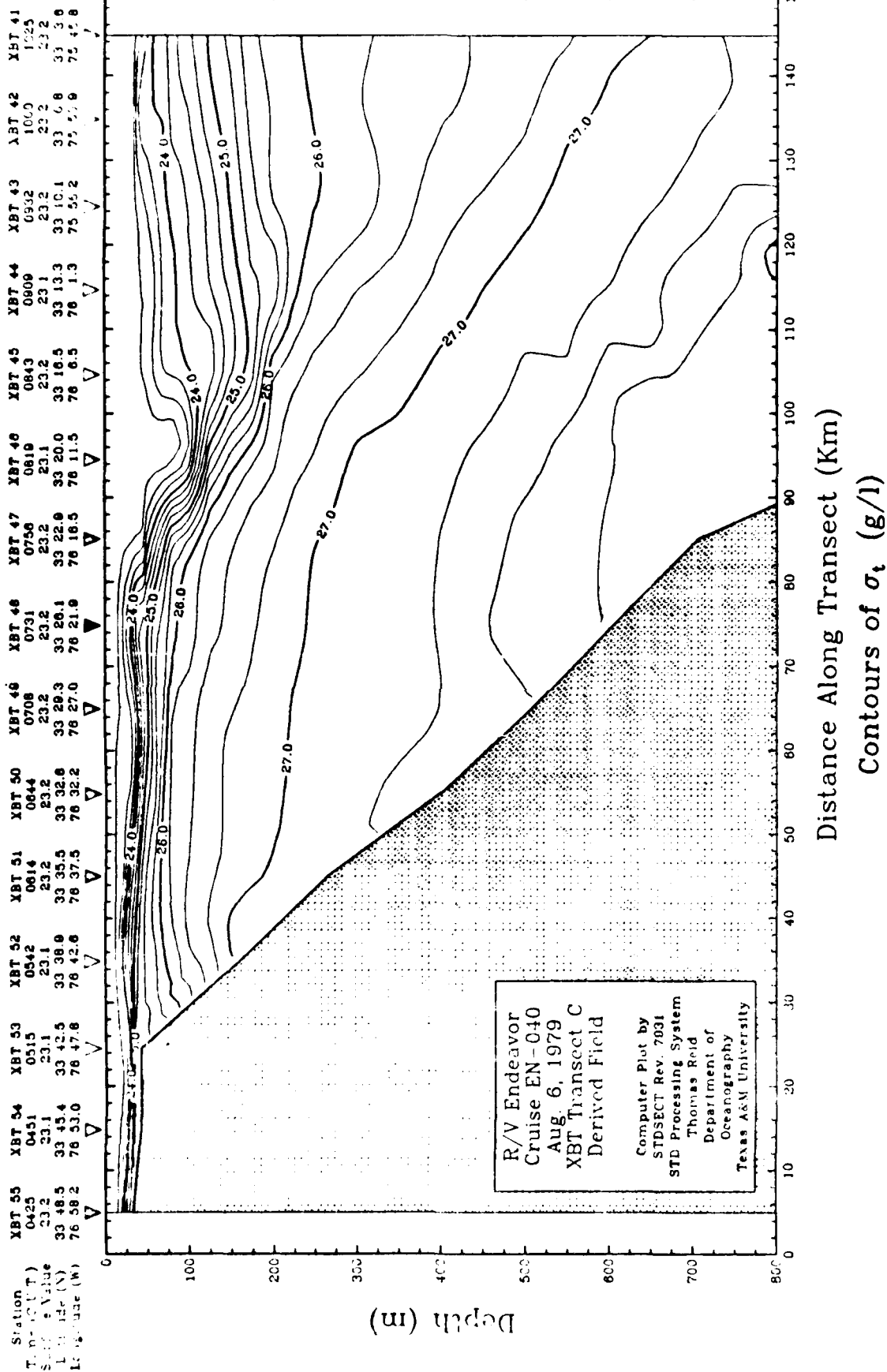
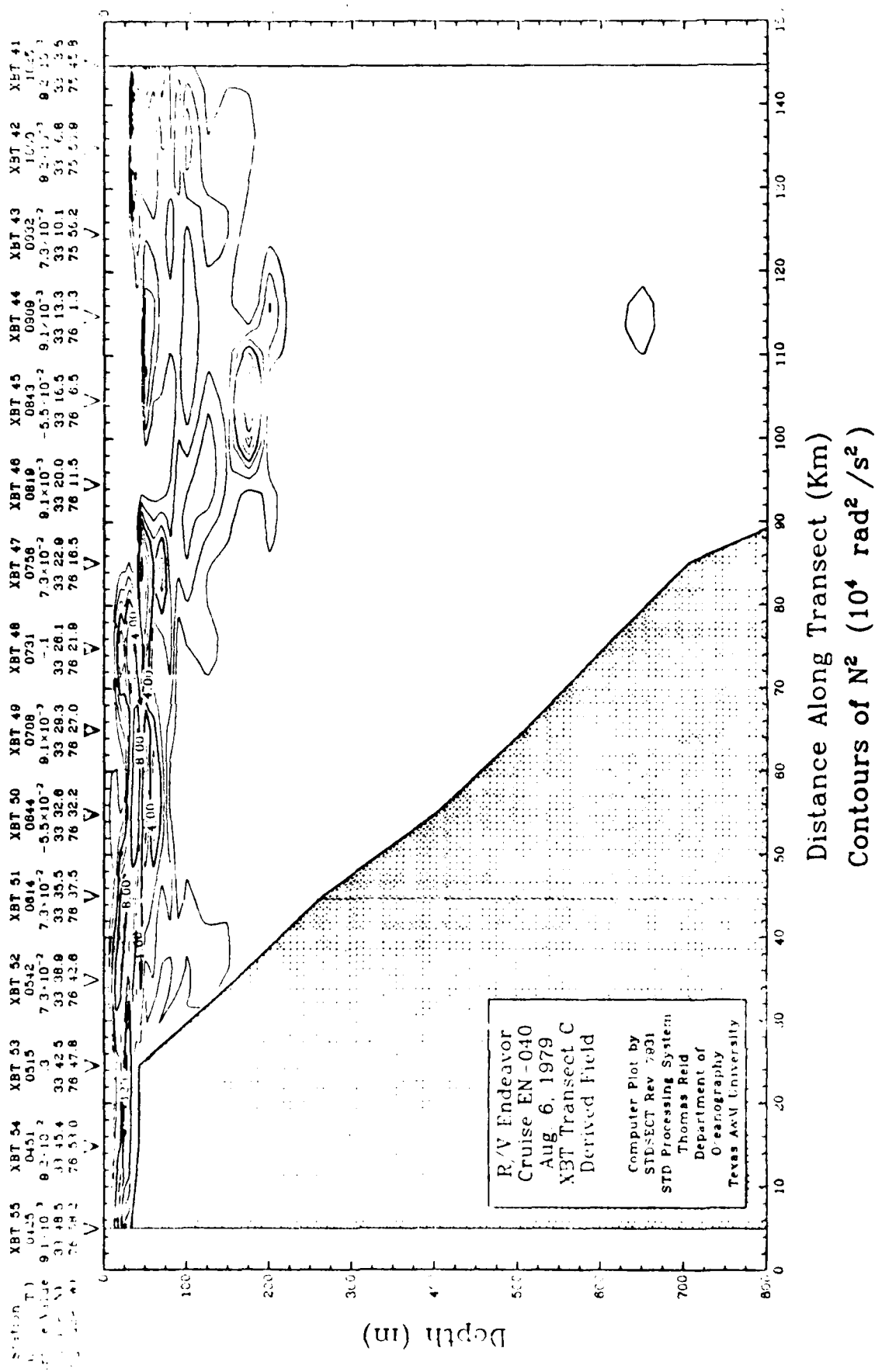


Figure 14. Section contours of temperature and derived salinity, sigma-t and N_2 fields for Transect C. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages.







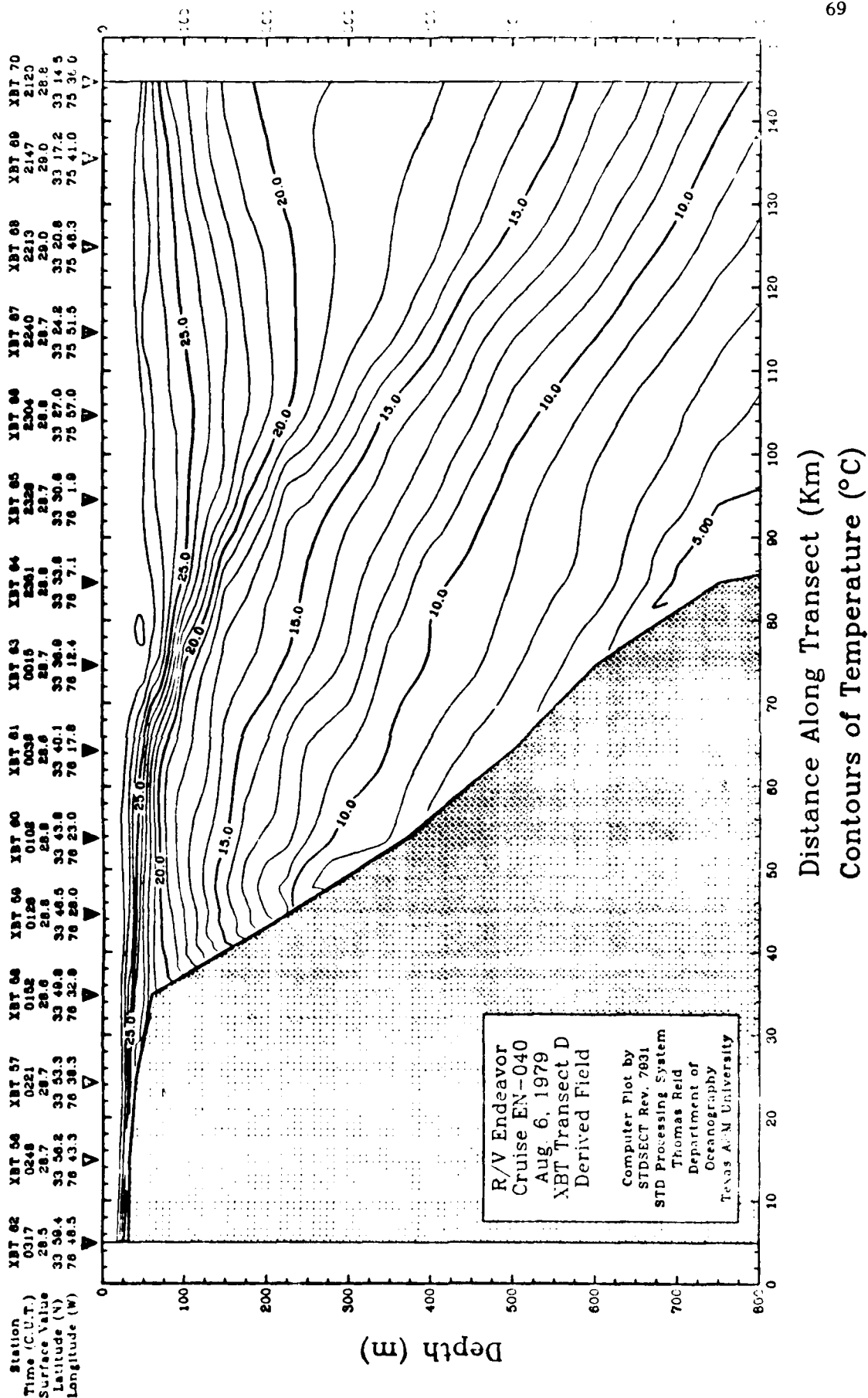
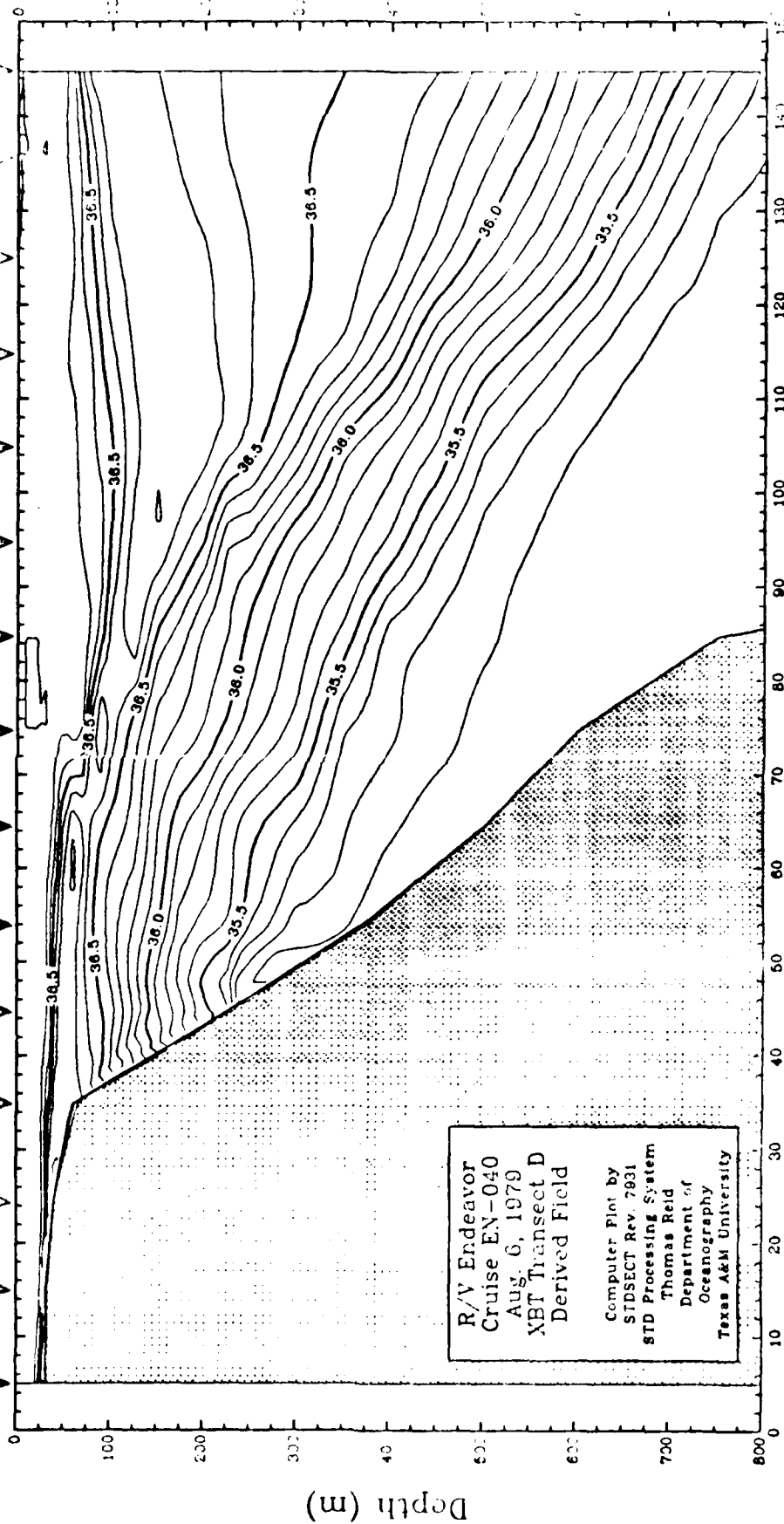


Figure 15. Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect D. Contour intervals are 1°C , 0.1‰ , $0.25 \sigma_t$ units and $0.5 \times 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages.

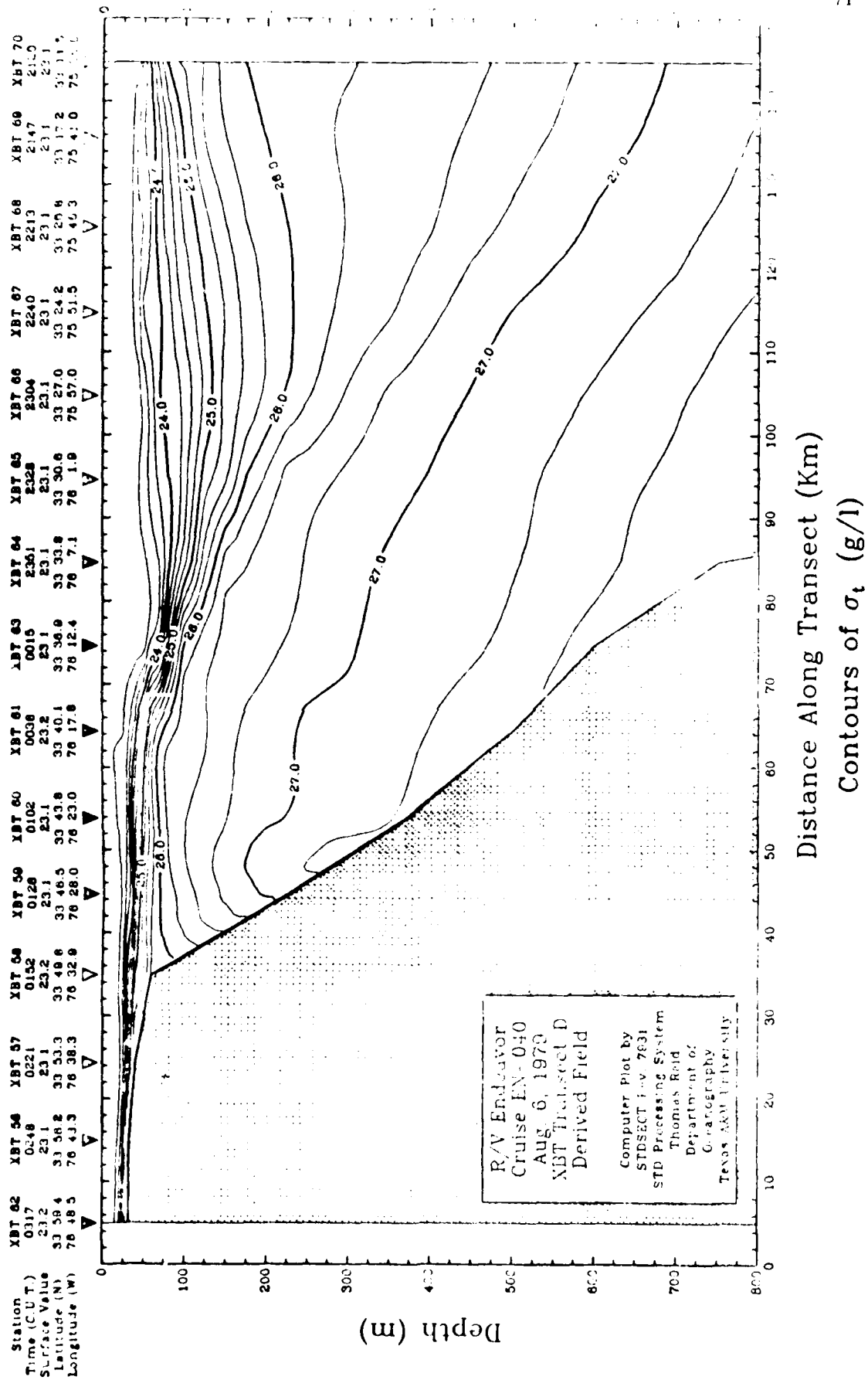
Station
 Time (GMT)
 Surface Value
 Latitude (N)
 Longitude (W)

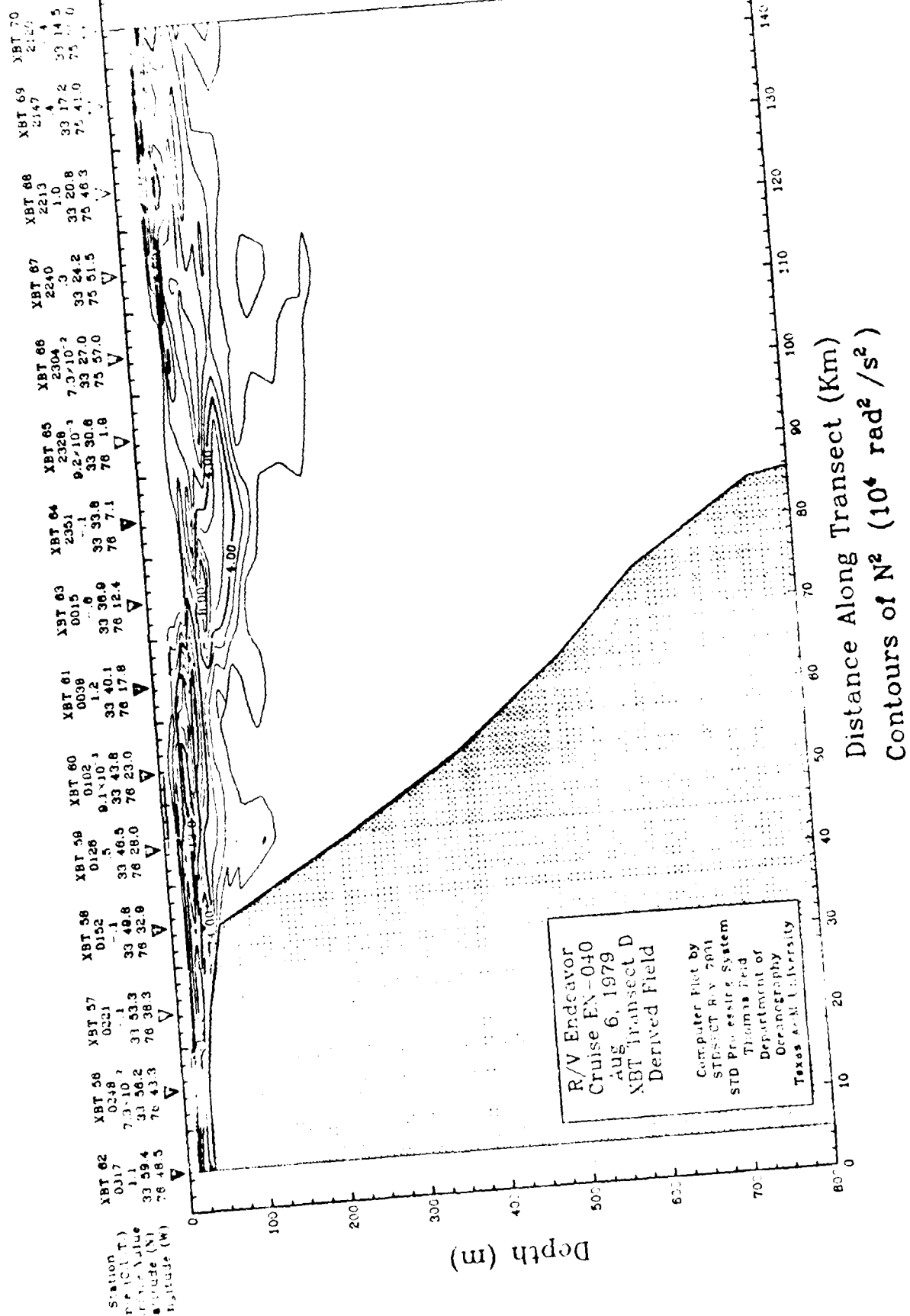
XBT 62	XBT 56	XBT 57	XBT 58	XBT 59	XBT 60	XBT 61	XBT 63	XBT 64	XBT 65	XBT 66	XBT 67	XBT 68	XBT 69	XBT 70
0317	0248	0221	0152	0126	0102	0038	0015	2351	2328	2304	2240	2213	2147	2120
36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	35.9	35.3
33 59.4	33 56.2	33 53.3	33 49.8	33 46.5	33 43.8	33 40.1	33 36.9	33 33.8	33 30.6	33 27.0	33 24.2	33 20.8	33 17.2	33 14.5
76 48.5	76 43.3	76 38.3	76 32.9	76 28.0	76 23.0	76 17.8	76 12.4	76 7.1	76 1.8	75 57.0	75 51.5	75 46.3	75 41.0	75 36.0



Distance Along Transect (Km)

Contours of Salinity (‰)





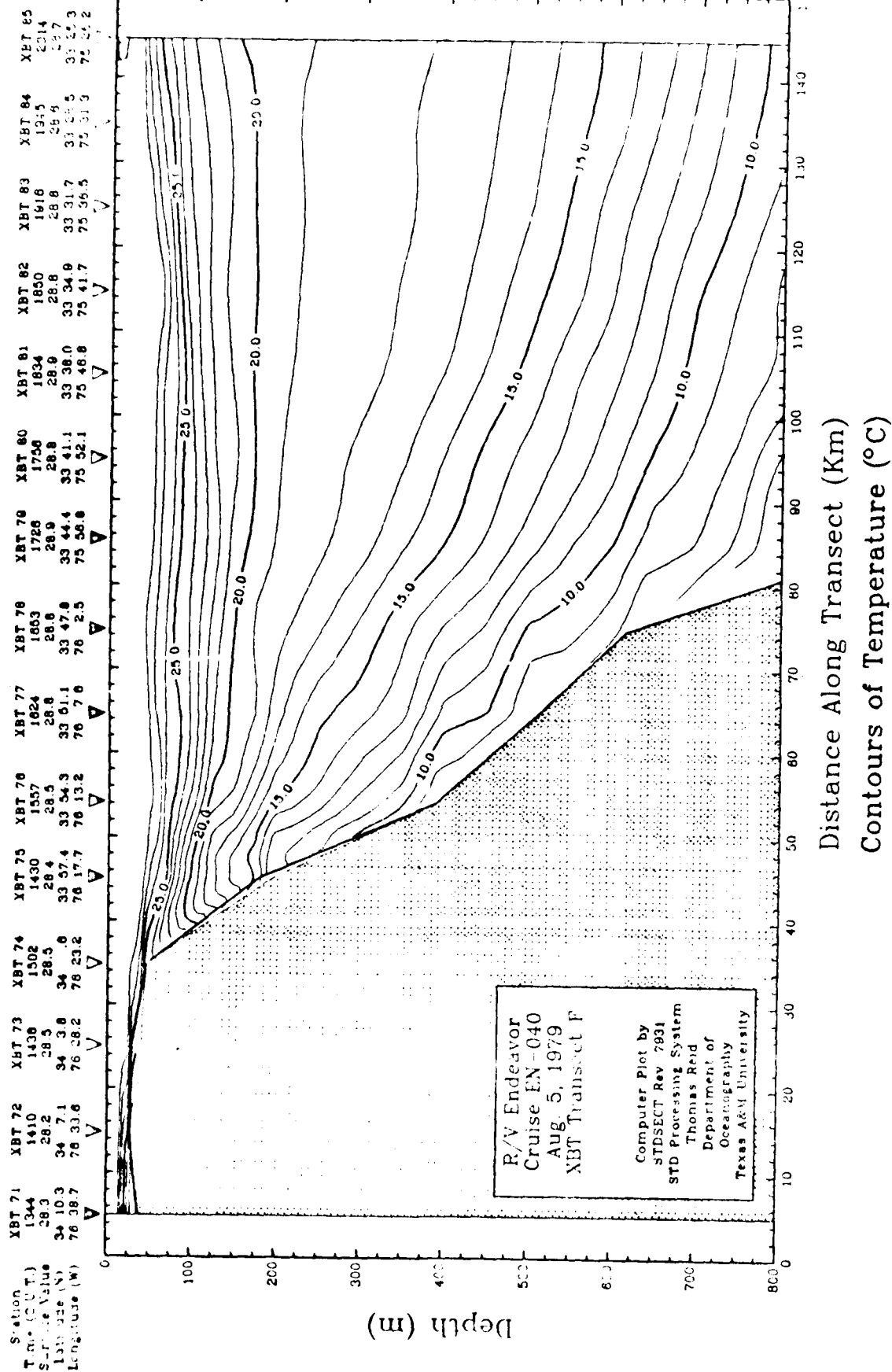
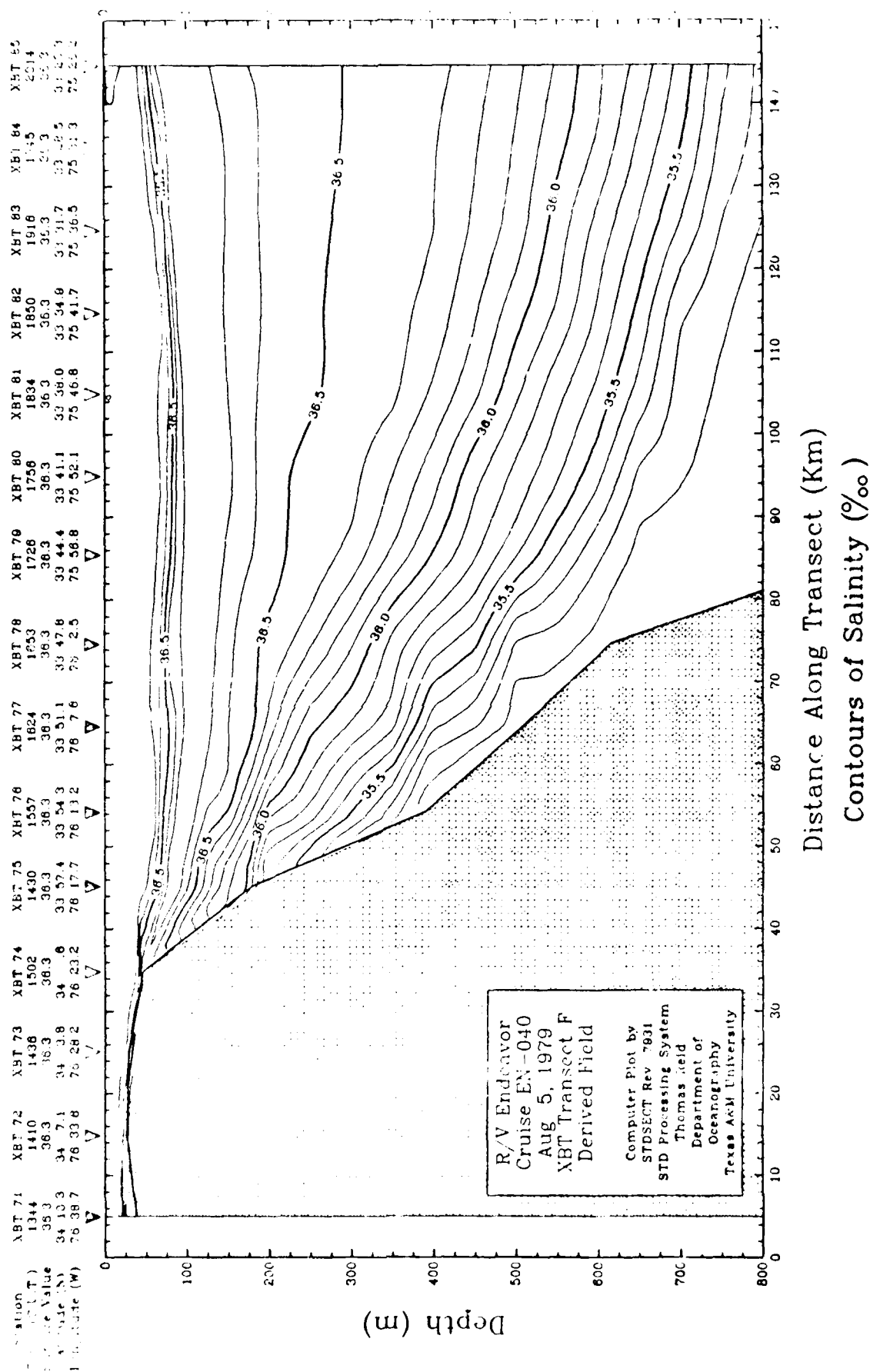
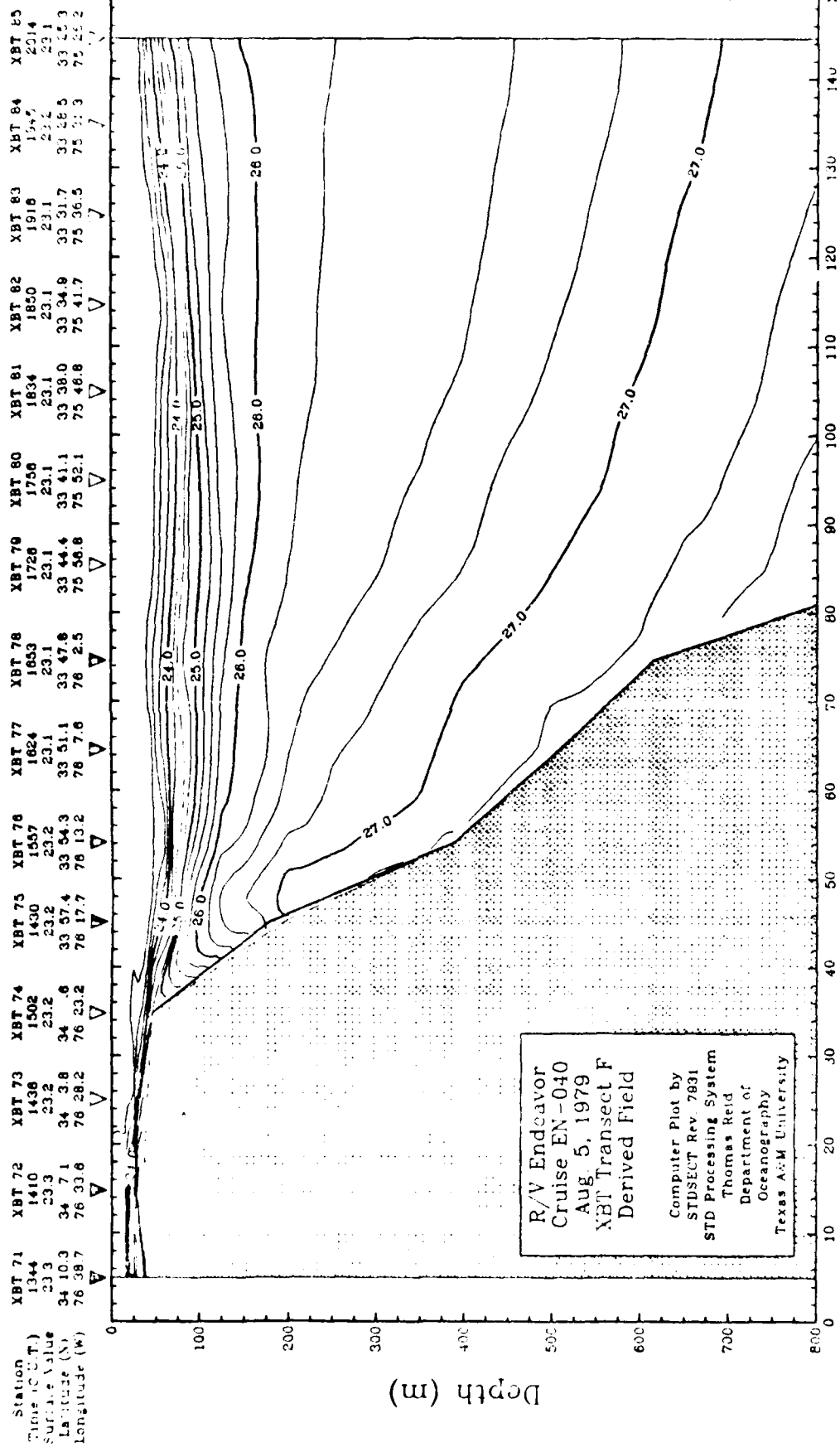
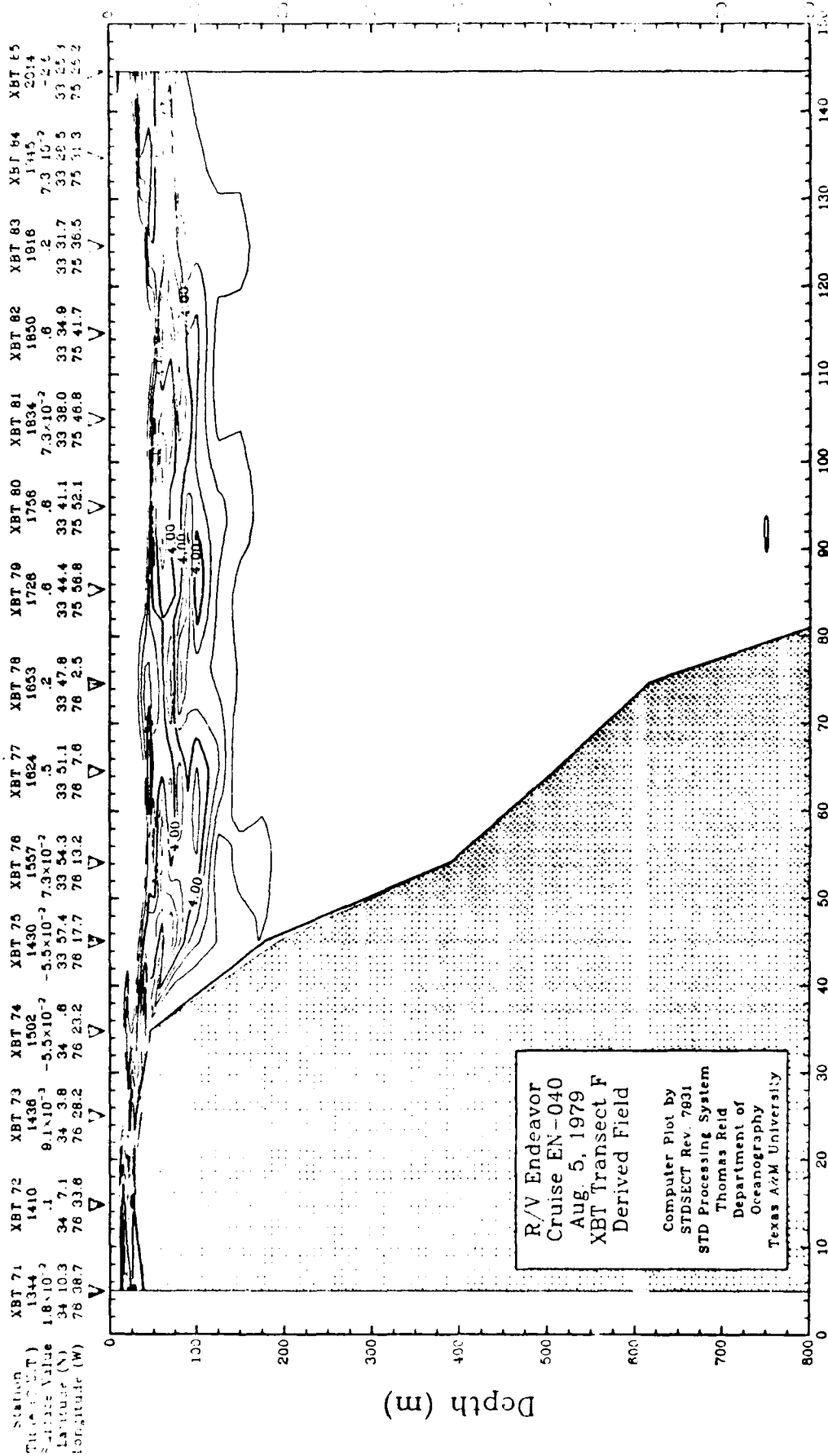


Figure 16. Section contours of temperature and derived salinity, sigma-t and N_2 fields for Transect F. Contour intervals are 1°C, 0.1‰, 0.25 σ_t units and 0.5×10^{-4} and 2×10^{-4} , respectively. This figure is continued on the next 3 pages







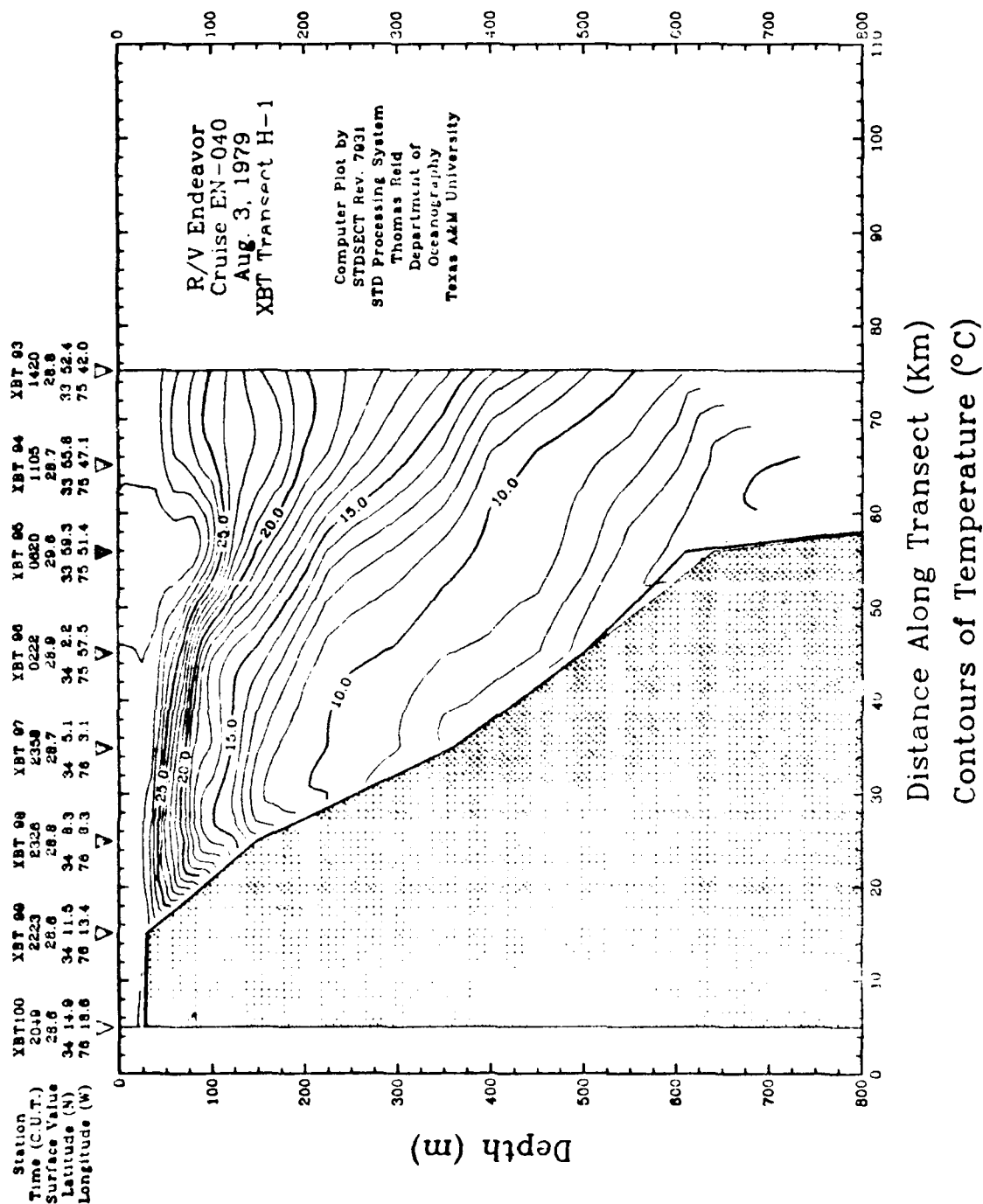
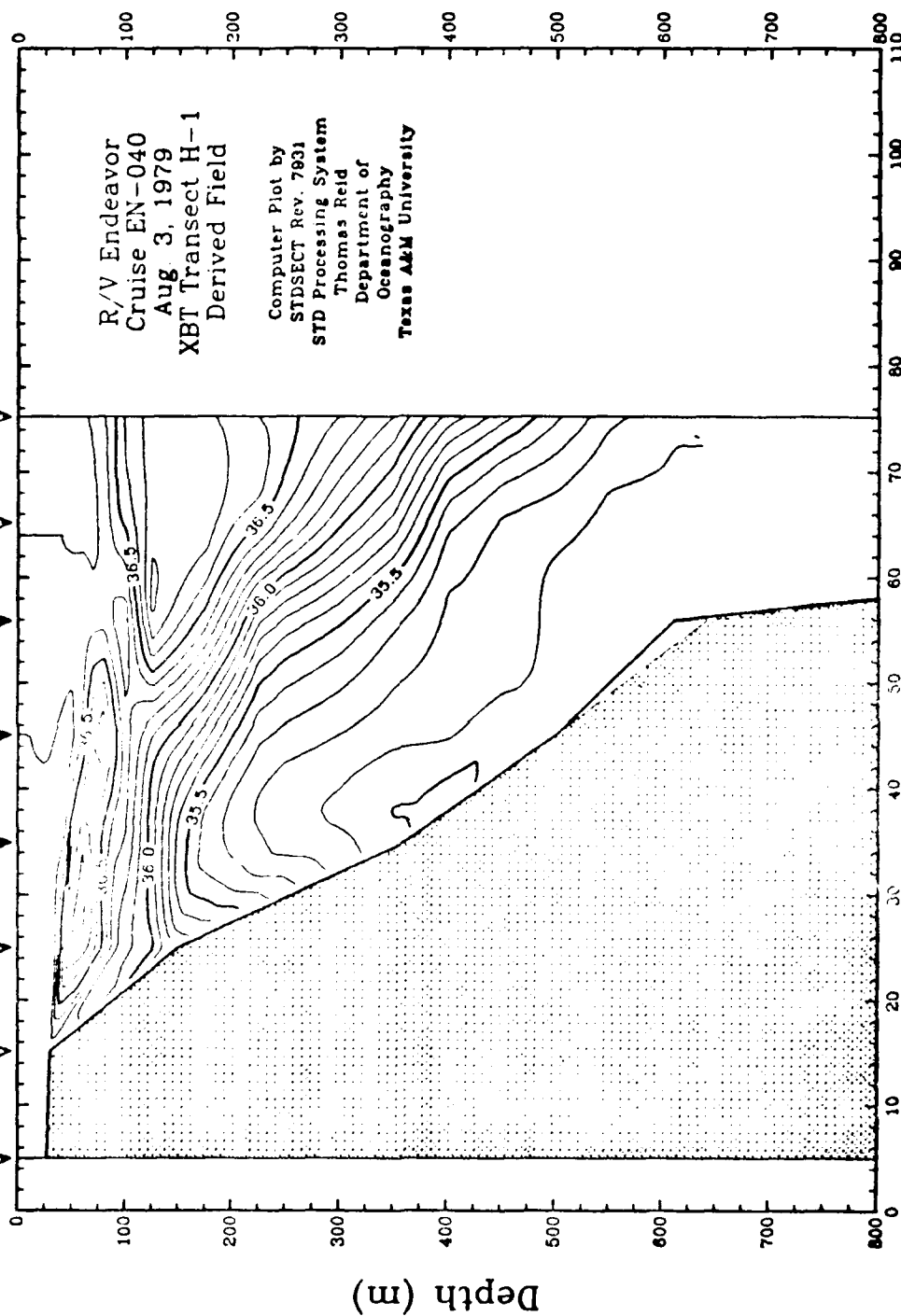
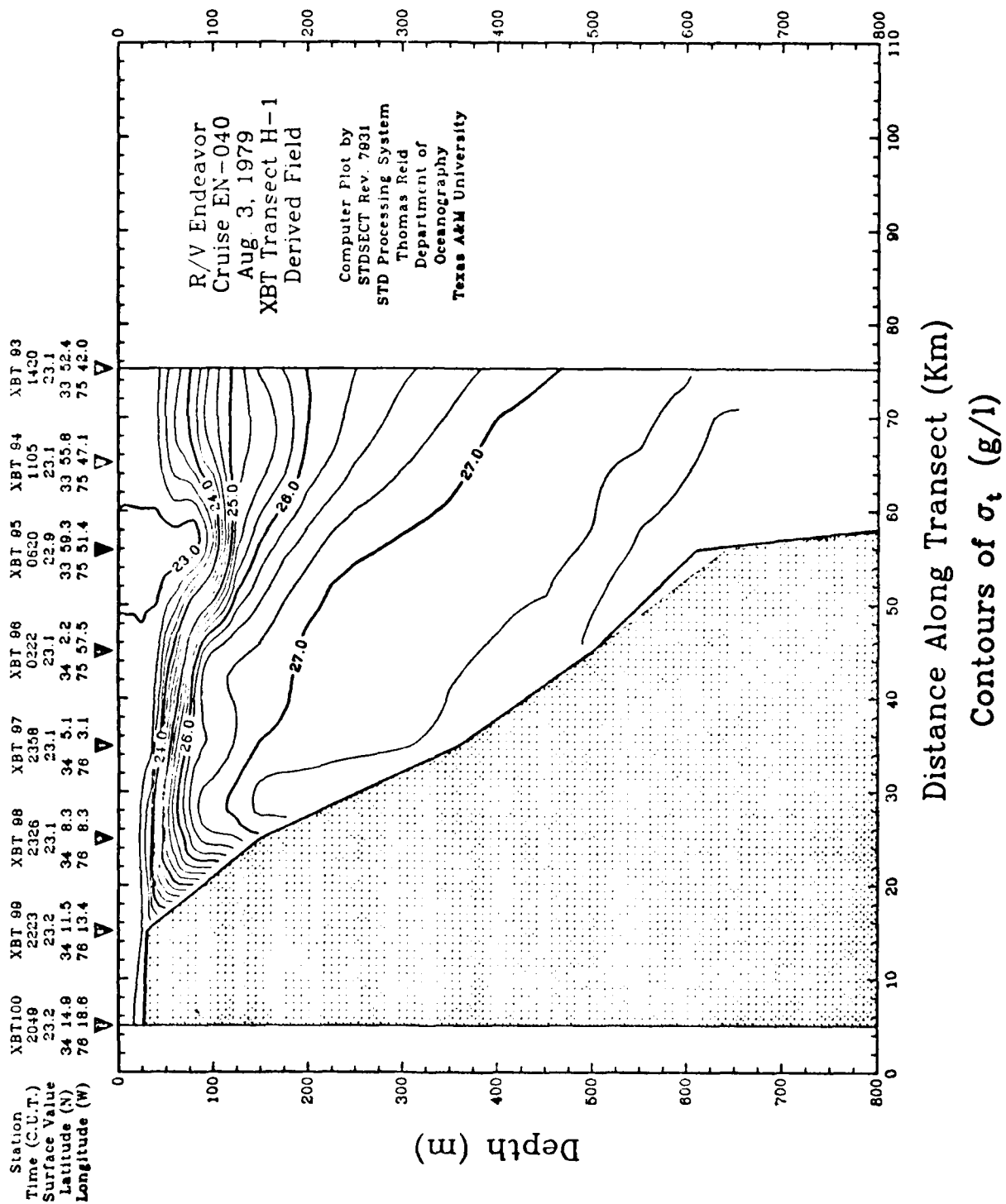


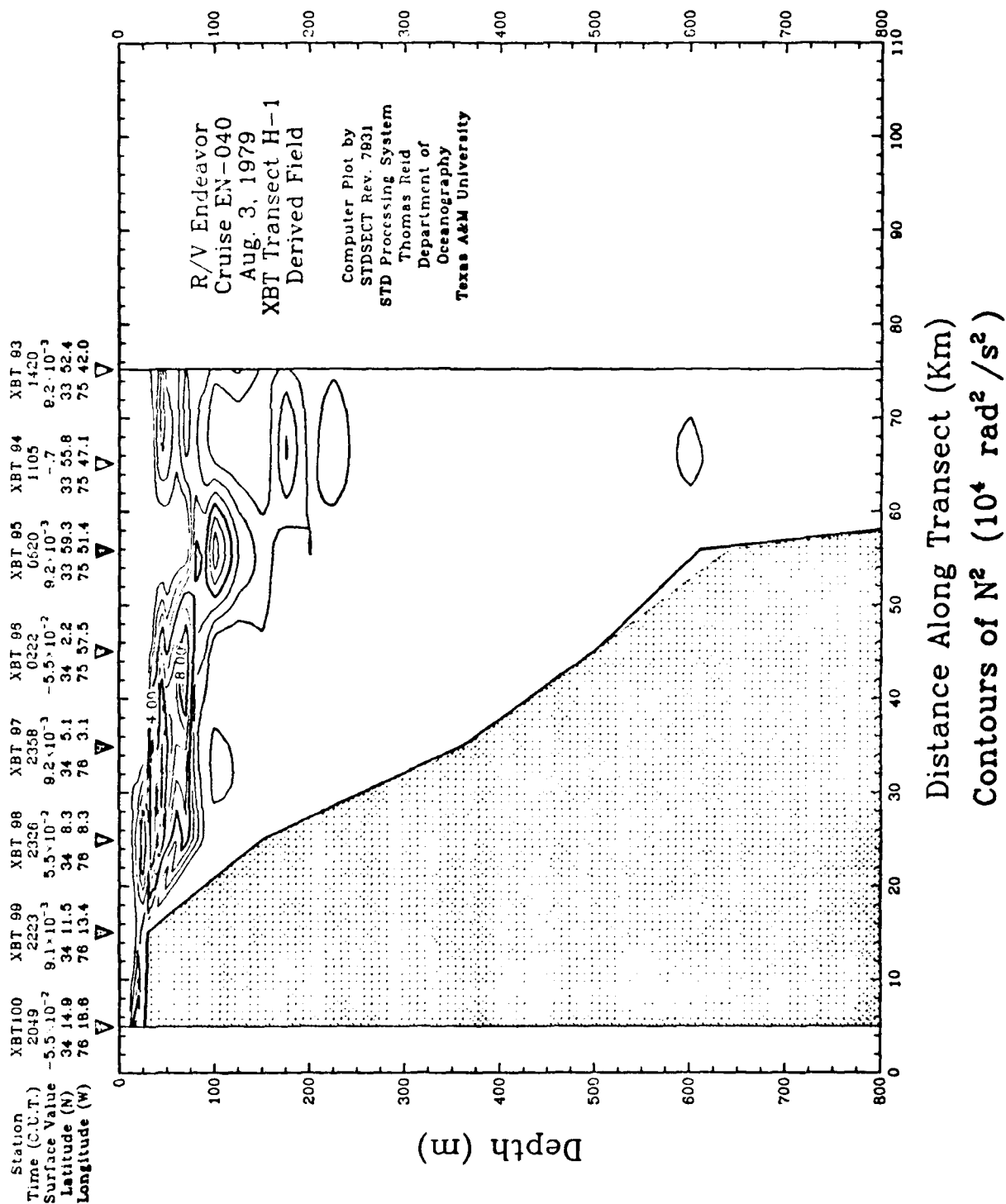
Figure 17 Section contours of temperature and derived salinity, sigma-t and N^2 fields for transect H-1. Contour intervals are 1°C, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages.

Station XBT 99 XBT 98 XBT 97 XBT 96 XBT 95 XBT 94 XBT 93
 Time (C.U.T.) 2049 2125 2358 0112 0620 1105 1420
 Surface Value 36.3 36.3 36.3 36.3 36.4 36.3 36.3
 Latitude (N) 34 14.9 34 11.5 34 8.3 34 5.1 34 2.2 33 59.3 33 52.4
 Longitude (W) 76 18.6 76 13.4 76 8.3 76 3.1 75 57.5 75 51.4 75 47.1 75 42.0



Distance Along Transect (Km)
 Contours of Salinity (‰)





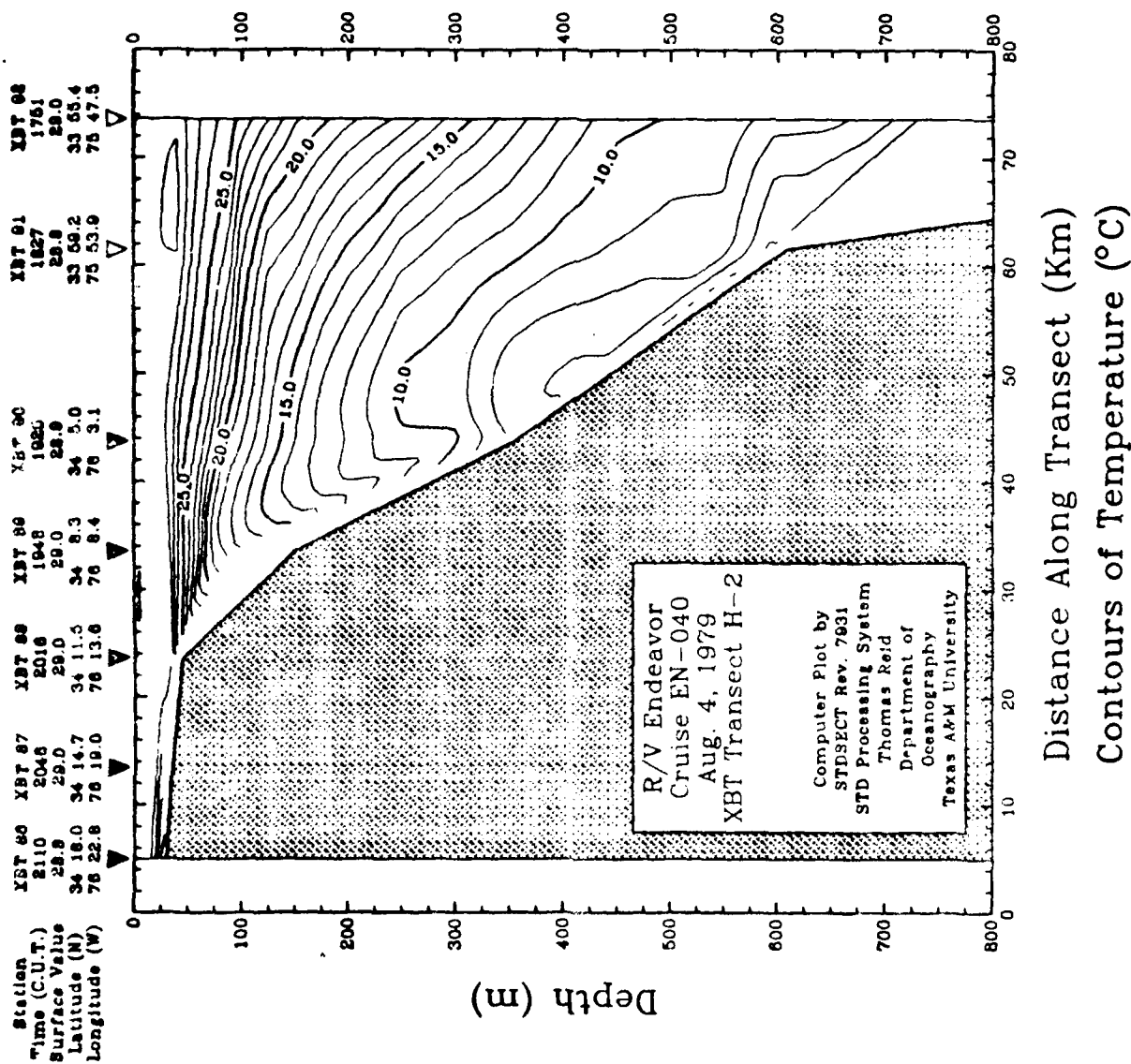
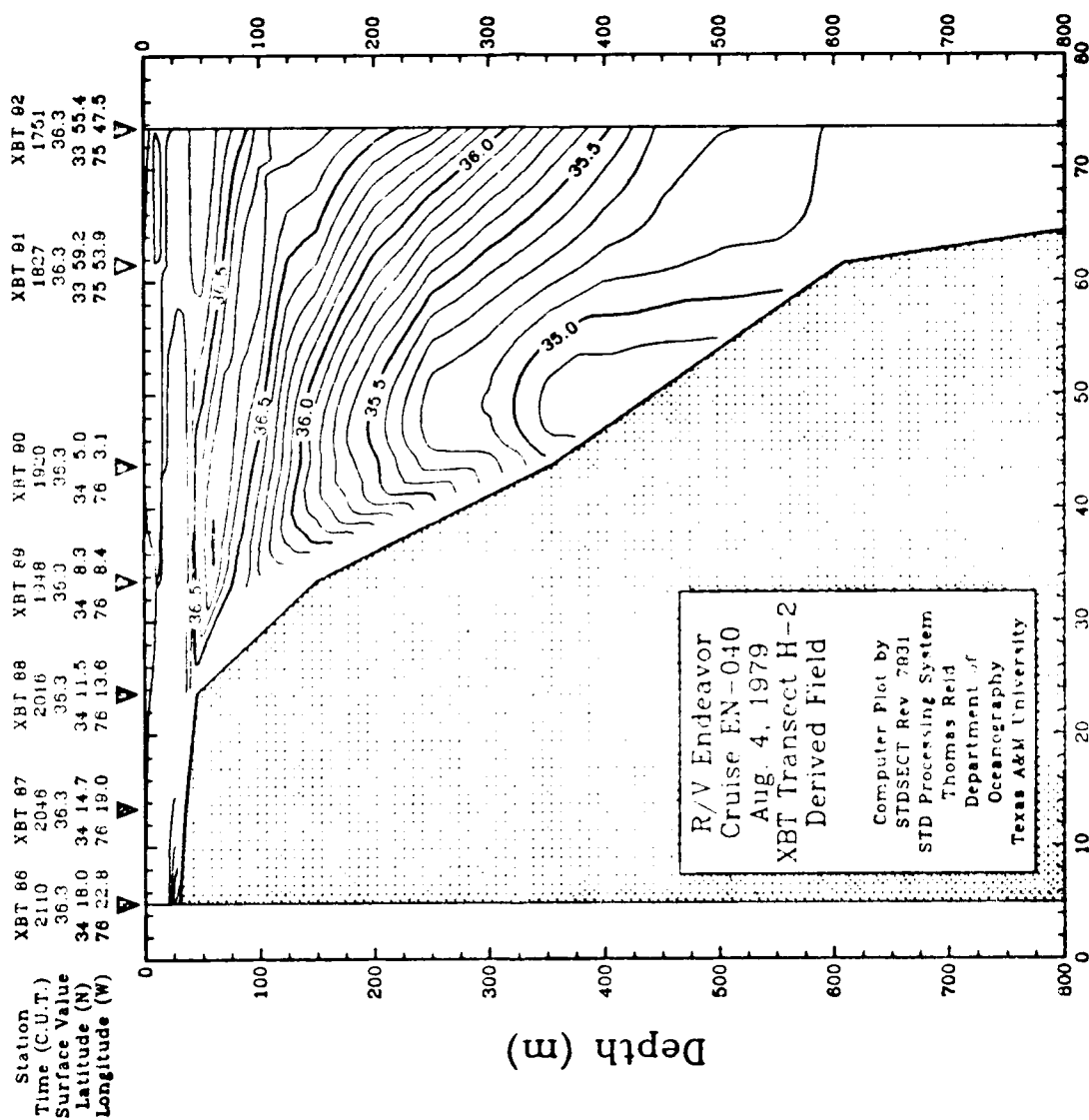
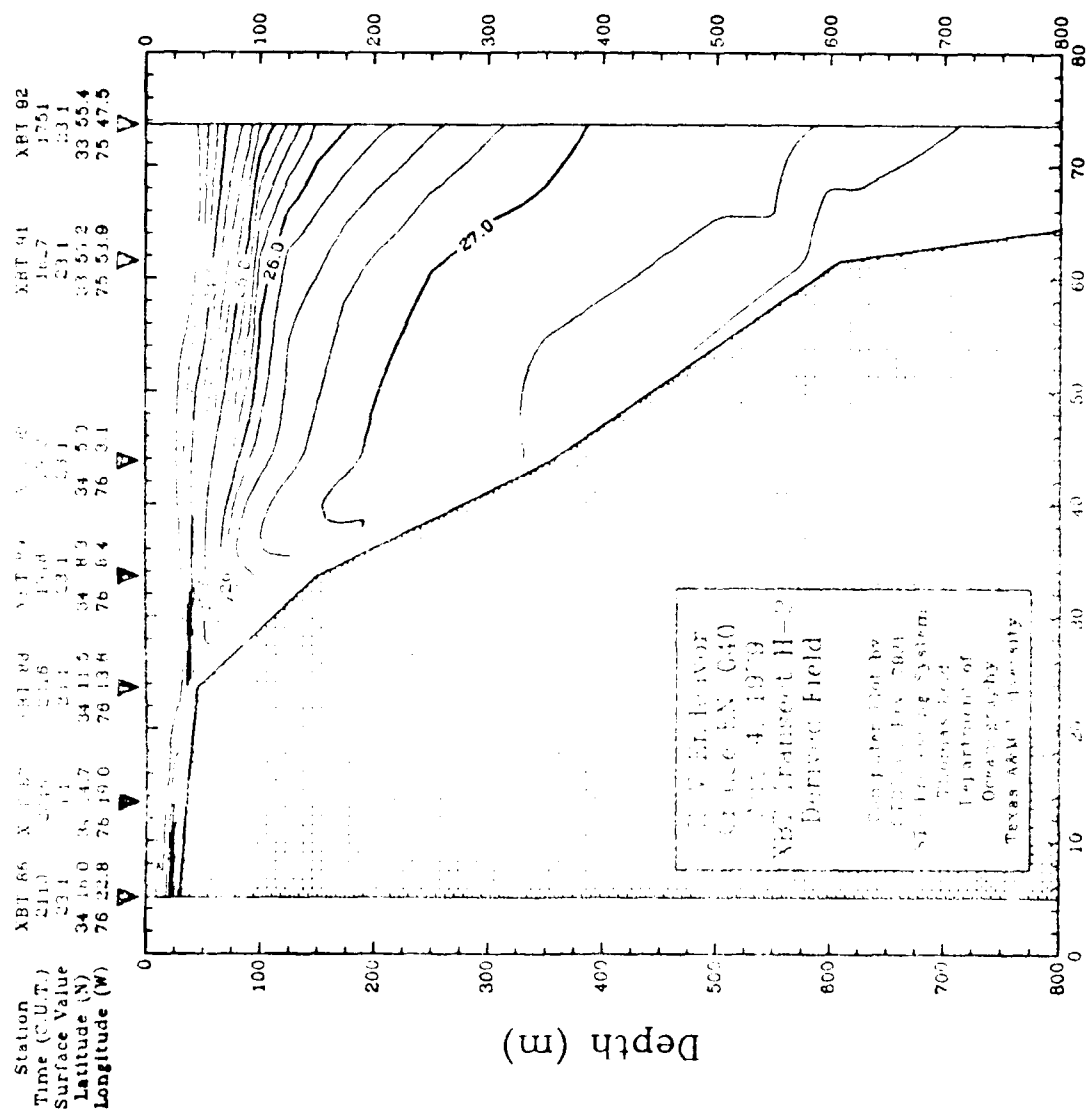
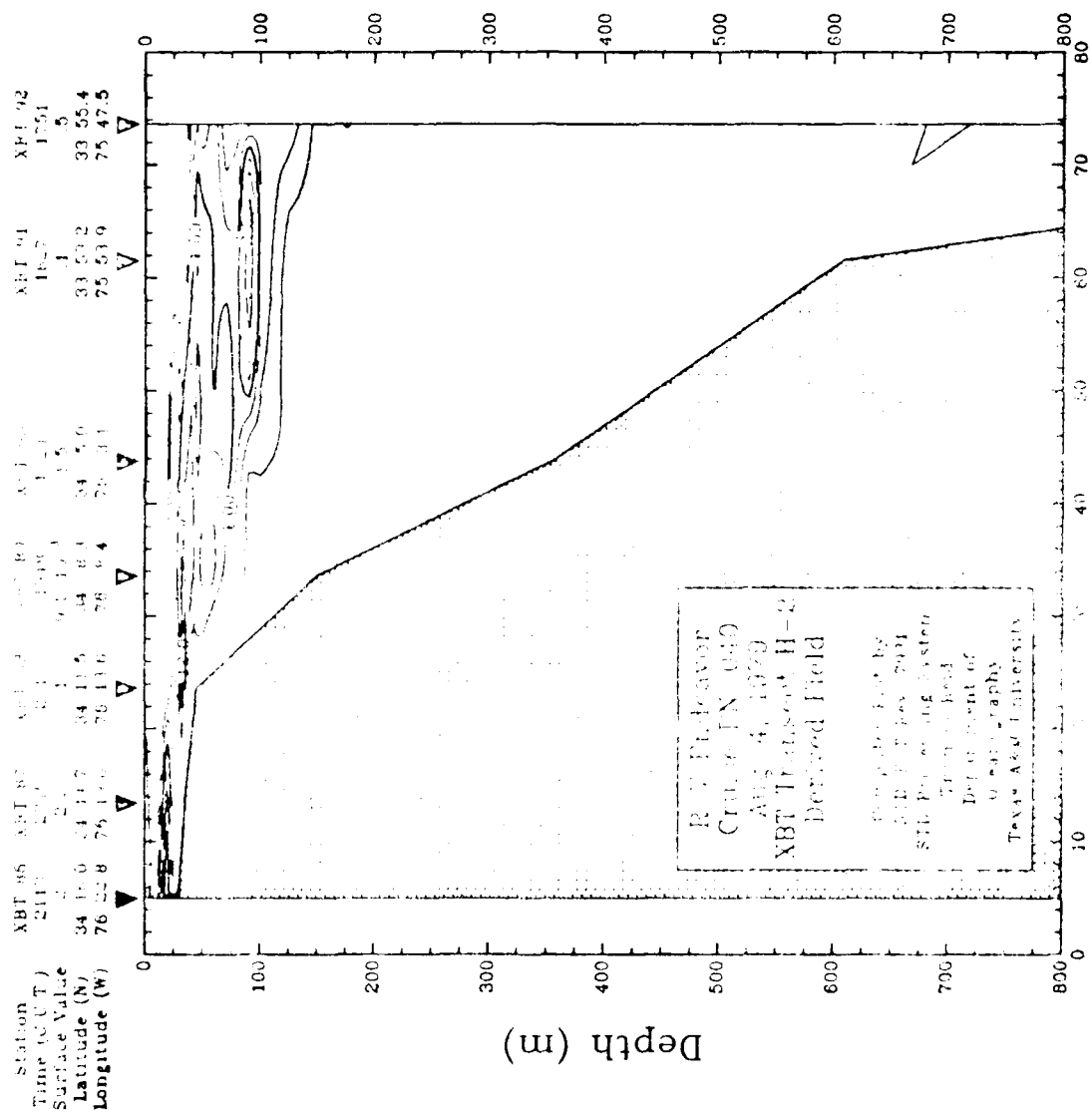
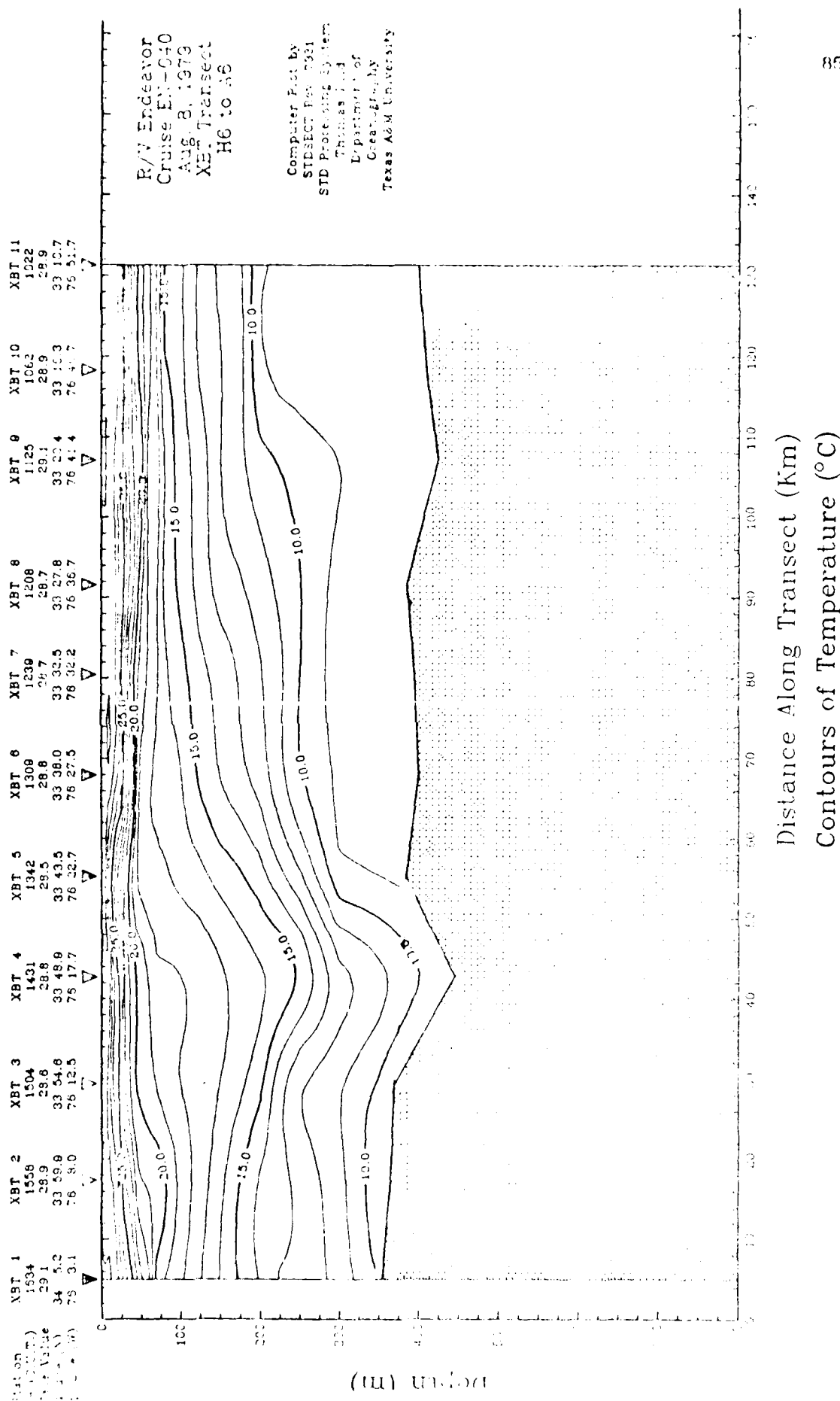


Figure 18. Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect H-2. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units and 0.5×10^{-4} rad²/s², respectively. This figure is continued on the next 3 pages.

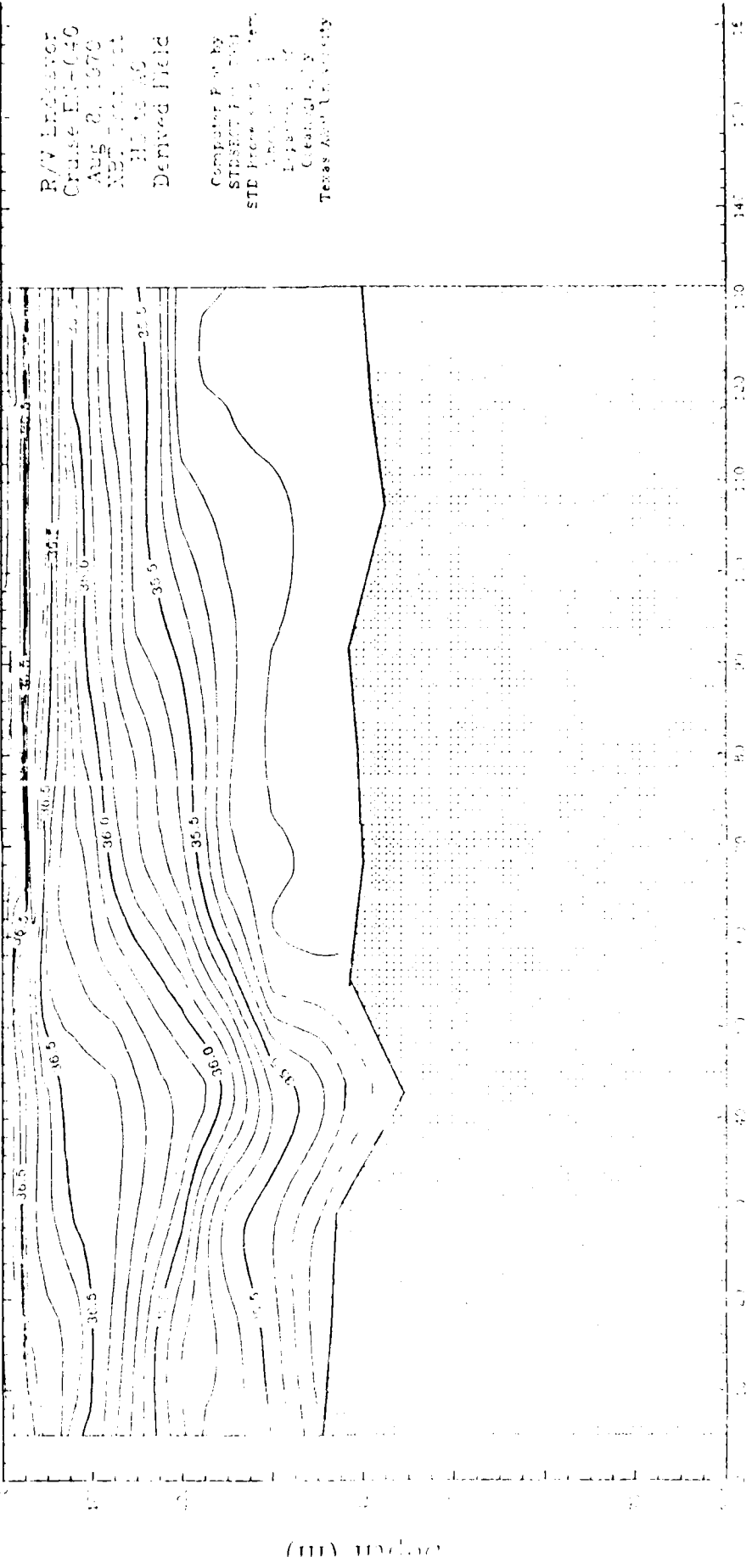




Distance Along Transect (Km)
Contours of N^2 ($10^4 \text{ rad}^2/\text{s}^2$)



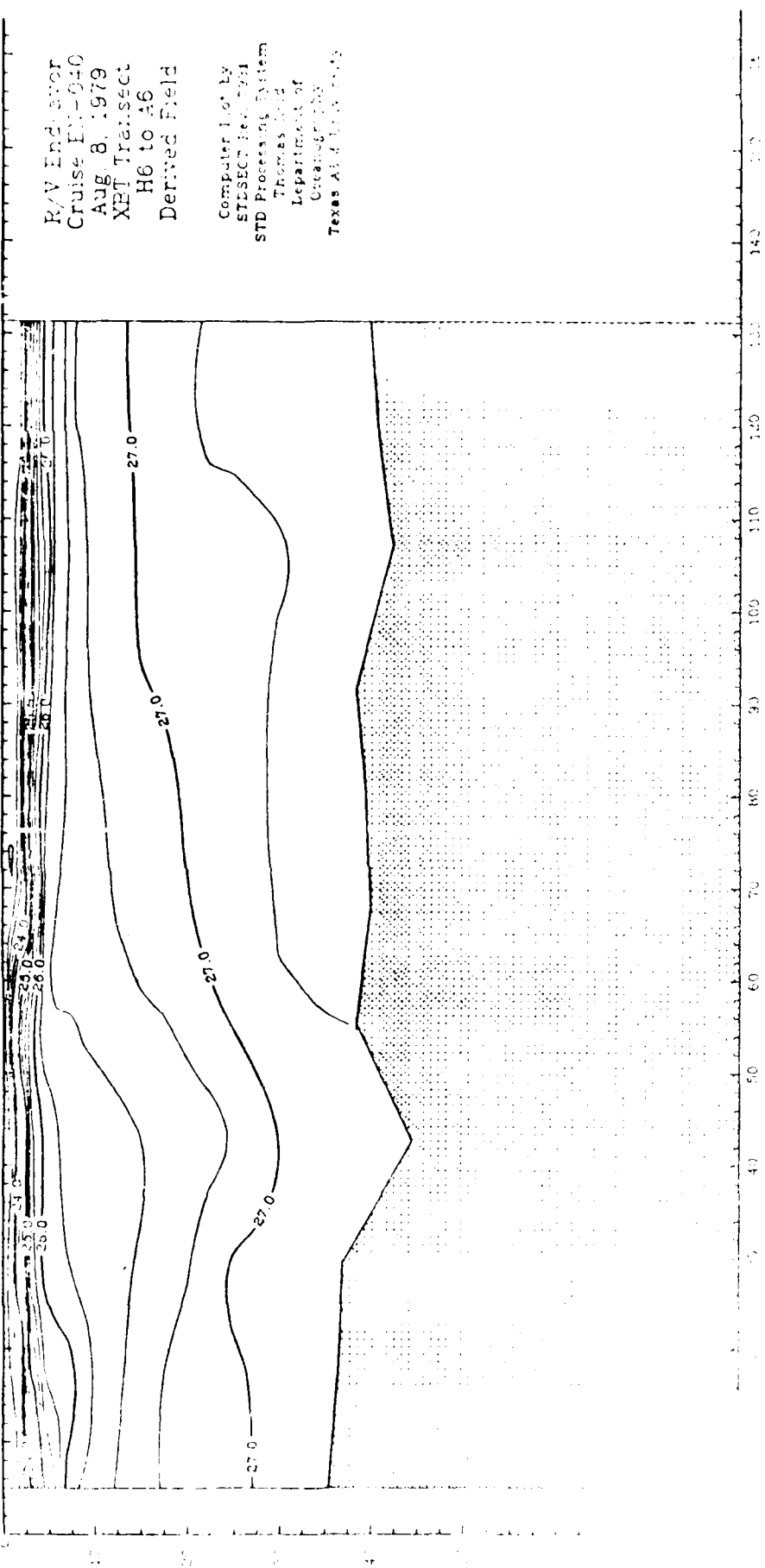
XBT 1	XBT 2	XBT 3	XBT 4	XBT 5	XBT 6	XBT 7	XBT 8	XBT 9	XBT 10	XBT 11
1534	1556	1504	1431	1340	1309	1339	1208	1125	1062	1022
32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3
33.589	33.589	33.589	33.589	33.589	33.589	33.589	33.589	33.589	33.589	33.589
75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80



R/V Endeavor
 Cruise ENE-040
 AUG 2, 1970
 XBT T-11111
 H-11111
 Derived Field
 Computer Plot by
 STDSER 11111
 STD Processing System
 Department of
 Oceanography
 Texas A&M University

Distance Along Transect (Km)
 Contours of Salinity (‰)

XBT 1	XBT 2	XBT 3	XBT 4	XBT 5	XBT 6	XBT 7	XBT 8	XBT 9	XBT 10	XBT 11
1534	1556	1504	1431	1342	1309	1239	1208	1125	1062	1022
23.1	23.1	23.2	23.1	23.2	23.1	23.1	23.1	23.0	23.1	23.1
33.52	33.59	33.54	33.48	33.43	33.38	33.32	33.27	33.20	33.16	33.10
78.31	78.80	78.12	79.17	78.22	78.27	78.32	78.36	78.41	78.46	78.51



Distance Along Transect (Km)
Contours of σ_t (g/l)

R/V Endeavor
Cruise EM-040
Aug. 8, 1979
XBT Transect
H6 to A6
Derived Field

Computer Plot by
STDSCT Rev. 7/81
STD Processing System
Thomas 1042
Department of
Geography 1355
Texas A&M Univ. 77725

AD-A092 144

NORTH CAROLINA UNIV AT CHAPEL HILL

F/G 8/10

THE GULF STREAM MEANDERS EXPERIMENT. HYDROGRAPHIC DATA REPORT. --ETC(U)

SEP 80 J M BANE, D A BROOKS, M J IGNASZEWSKI N00014-77-C-0354

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2 of 2
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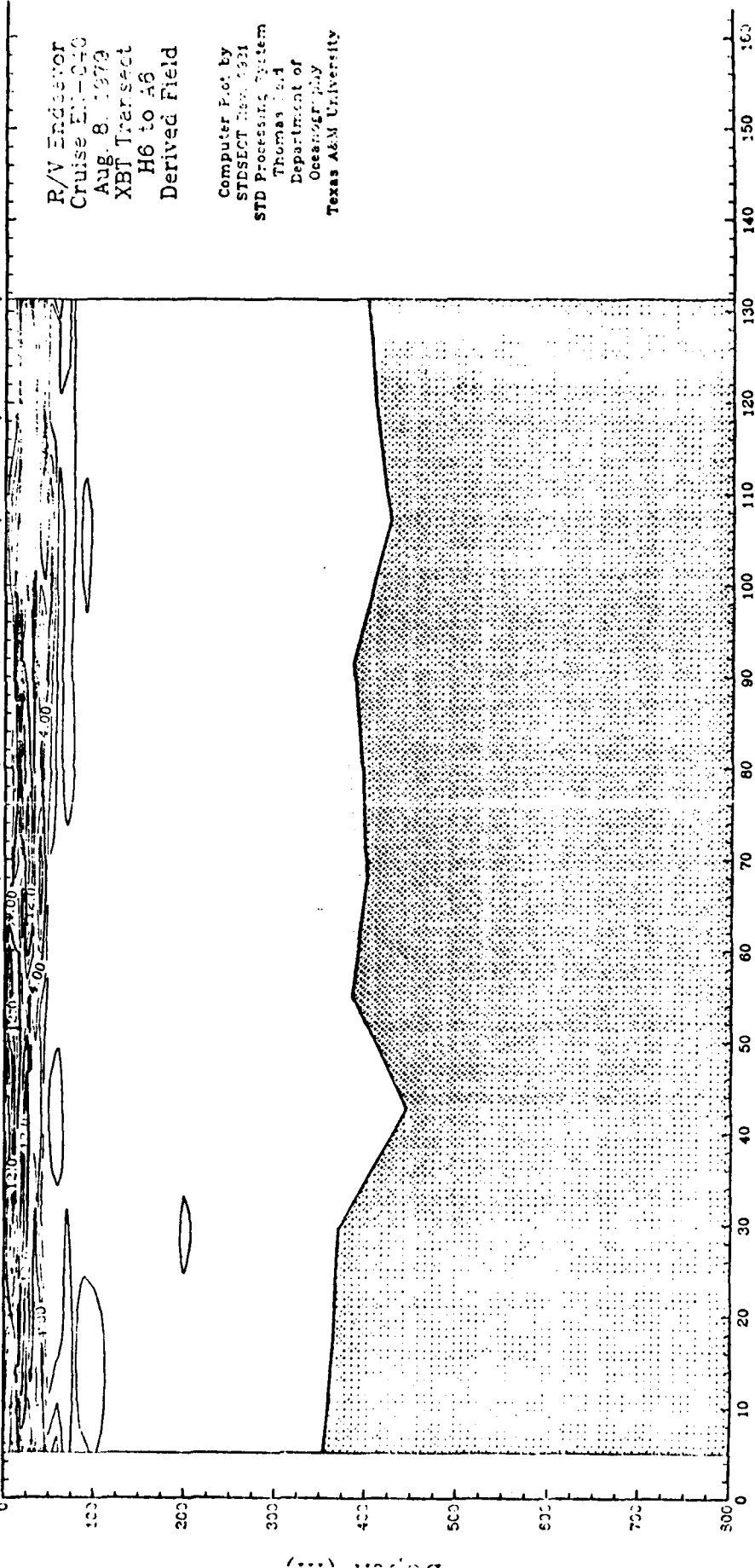


END

DATE
FILMED

DTIC

Con	XBT 1	XBT 2	XBT 3	XBT 4	XBT 5	XBT 6	XBT 7	XBT 8	XBT 9	XBT 10	XBT 11
Temp (°C)	1634	1556	1504	1431	1342	1309	1239	1208	1125	1062	1022
Salinity	-4	2.4	.5	1.3	1.7	.1	-5	-4	9.2x10 ⁻³	-1	-2
Lat (N)	34 5.2	33 59.9	33 54.6	33 48.8	33 43.5	33 38.0	33 32.5	33 27.8	33 20.4	33 16.3	33 10.7
Long (W)	76 3.1	76 8.0	76 12.5	76 17.7	76 22.7	76 27.5	76 32.2	76 36.7	76 41.4	76 46.7	76 51.7



R/V Endeavor
Cruise EN-040
Aug. 8, 1979
XBT Intercept
H6 to A6
Derived Field

Computer Plot by
STDSECT Rev. 1931
STD Processing System
Thomas Reid
Department of
Oceanography
Texas A&M University

Distance Along Transect (Km)
Contours of N^2 ($10^4 \text{ rad}^2/\text{s}^2$)

Part II

Cruise EN-045

The objective of cruise EN-045 was to retrieve the four current meter moorings that were deployed during EN-040 and to conduct a hydrographic survey of the Gulf Stream off North and South Carolina. The data gathered by the four current meter moorings are documented in another report (Bane, *et al.*, 1980).

Station	Date/Time (GMT)	Latitude (N)	Longitude (W)	Station Type	Cast Depth (m)	Discrete Samples
Mooring D	17 Nov 79/2030	33°55.4'	76°11.5'	retrieval	390	0
B03		33°32.6'	76°55.9'	XBT	86	Bucket
B04	18 Nov 79/0437	33°29.1'	76°50.8'	XBT	211	Bucket
B04-A	0505	33°27.6'	76°48.7'	XBT	240	Bucket
B05	0515	33°26.3'	76°47.1'	XBT	275	Bucket
B05-A	0544	33°24.3'	76°43.9'	XBT	318	Bucket
B06	0600	33°21.9'	76°41.4'	XBT	404	Bucket
B06-A	0604	33°20.9'	76°40.8'	XBT	420	Bucket
B07	0622	33°19.9'	76°37.9'	XBT	475	Bucket
B07-A	0634	33°18.4'	76°35.6'	XBT	523	Bucket
B08	0647	33°16.6'	76°33.2'	XBT	570	Bucket
B08-A	0657	33°15.0'	76°31.5'	XBT	602	Bucket
B09	0710	33°13.5'	76°29.0'	XBT	645	Bucket
B09-A	0725	33°12.0'	76°26.7'	XBT	688	Bucket
B10	0740	33°10.3'	76°23.9'	XBT	742	Bucket
B11	0805	33°07.1'	76°20.0'	XBT	750	Bucket
B12	0830	33°05.0'	76°15.2'	XBT	800	Bucket
B13	0852	33°01.9'	76°11.5'	XBT	800	Bucket
Mooring B		33°21.9'	76°41.3'	retrieval	410	0
Mooring A	1340	33°28.2'	76°52.1'	retrieval	200	0
Mooring C	1650	33°51.1'	76°14.7'	retrieval	400	0
G04	18 Nov 79/2103	34°03.5'	76°16.5'	STD	75	Bucket; 2
G05	2230	34°00.5'	76°12.0'	STD	325	Bucket; 4
G06	2359	33°57.2'	76°07.6'	STD	407	Bucket; 4
G07	19 Nov 79/0153	33°54.0'	76°03.0'	STD	500	Bucket; 3
G08	0854	33°50.8'	75°58.5'	STD	555	Bucket; 4
G09	0645	33°47.5'	75°54.0'	STD	570	Bucket; 4
G10	1037	33°44.6'	75°49.3'	STD	1012	Bucket; 4
G11	1248	33°41.2'	75°45.0'	STD	1000	Bucket; 4

Table 2. EN-045 Station Summary. This table is continued on the next 3 pages.

Station	Date/Time (GMT)	Latitude (N)	Longitude (W)	Station Type	Cast Depth (m)	Discrete Samples
GA02	19 Nov 79/1515	33°35.1'	75°47.8'	XBT	450	0
GA03	1545	33°30.1'	75°50.6'	XBT	450	0
GA04	1615	33°25.1'	75°53.4'	XBT	450	0
GA05	1645	33°19.9'	75°56.4'	XBT	450	0
GA06	1715	33°14.8'	75°59.5'	XBT	450	0
GA07	1745	33°09.5'	76°02.6'	XBT	450	0
GA08	1815	33°04.3'	76°05.8'	XBT	450	0
GA09	1845	32°59.3'	76°08.8'	XBT	450	0
GA10	1914	32°53.9'	76°11.7'	XBT	450	0
GA11	1945	32°49.1'	76°15.8'	XBT	450	0
Al4	19 Nov 79/2007	32°47.6'	76°17.4'	STD	1000	Bucket; 4
Al3	2212	32°50.7'	76°21.7'	STD	1030	Bucket; 4
Al2	20 Nov 79/0019	32°53.9'	76°26.0'	STD	930	Bucket; 4
A09-A	20 Nov 79/0603	33°02.9'	76°36.4'	XBT	665	Bucket
A09	0619	33°03.4'	76°35.9'	XBT	638	Bucket
A08-A	0635	33°05.9'	76°41.6'	XBT	588	Bucket
A08	0653	33°06.6'	76°44.0'	XBT	540	Bucket
A07-A	0715	33°08.9'	76°46.6'	XBT	490	Bucket
A07	0727	33°09.7'	76°48.5'	XBT	460	Bucket
A06-A	0743	33°11.5'	76°50.7'	XBT	411	Bucket
A06	0757	33°13.0'	76°53.0'	XBT	360	Bucket
A05-A	0810	33°14.5'	76°55.1'	XBT	311	Bucket
A05	0824	33°16.0'	76°57.5'	XBT	300	Bucket
A04-A	0841	33°18.2'	77°00.0'	XBT	260	Bucket
A04	0852	33°19.5'	77°02.3'	XBT	214	Bucket
A03	0918	33°22.5'	77°06.0'	XBT	125	Bucket
A02	0944	33°25.7'	77°10.7'	XBT	40	Bucket
A01	0909	33°28.9'	77°15.1'	XBT	35	Bucket
A00	0936	33°31.9'	77°20.0'	XBT	32	Bucket

EN-045

Station	Date/Time (GMT)	Latitude (N)	Longitude (W)	Station Type	Cast Depth (m)	Discrete Samples
Z01	20 Nov 79/1600	32°57.6'	78°06.3'	STD	30	Bucket; 3
Z02	1715	32°56.6'	78°03.1'	STD	95	Bucket; 4
Z03	1907	32°53.1'	77°58.1'	STD	145	Bucket; 4
Z04	2058	32°49.1'	77°52.7'	STD	197	Bucket; 4
Z05	2242	32°46.5'	77°48.5'	STD	197	Bucket; 4
Z06	21 Nov 79/0002	32°43.0'	77°44.0'	XBT	261	Bucket
Z07	0038	32°40.1'	77°39.3'	STD	310	Bucket; 4
Z08	0208	32°36.5'	77°35.5'	XBT	440	0
Z09	0238	32°34.2'	77°30.7'	STD	450	Bucket; 4
Z10	0424	32°31.0'	77°27.9'	XBT	450	0
Z11	0502	32°28.1'	77°22.2'	STD	600	Bucket; 4
Z12	0715	32°24.9'	77°18.1'	XBT	686	0
Z13	0757	32°21.2'	77°14.4'	STD	721	Bucket; 4
Z14	0852	32°18.5'	77°08.5'	XBT	450	Bucket
Z15	1021	32°15.0'	77°05.1'	STD	745	Bucket; 4
X11	21 Nov 79/2114	31°51.5'	77°57.5'	STD, XBT	580	Bucket; 4
X10	2300	31°58.6'	77°59.4'	STD, XBT	585	Bucket; 4
X09	22 Nov 79/0059	32°04.9'	78°01.5'	STD, XBT	527	Bucket; 4
X08	0311	32°11.6'	78°02.1'	STD, XBT	420	Bucket; 4
X07	0514	32°18.2'	78°04.1'	STD, XBT	373	Bucket; 4
X06	0715	32°25.4'	78°06.1'	STD, XBT	315	Bucket; 4
X05	0918	32°31.3'	78°07.8'	STD, XBT	240	Bucket; 4
X04	1028	32°37.5'	78°10.2'	STD, XBT	195	Bucket; 3
X03	1103	32°44.0'	78°12.0'	STD, XBT	160	Bucket; 3
X02	1328	32°51.0'	78°13.3'	STD, XBT	130	Bucket; 3

EN-045

Station	Date/Time (GMT)	Latitude (N)	Longitude (W)	Station Type	Cast Depth (m)	Discrete Samples
W01	22 Nov 79/ 1534	32°54.7'	77°50.5'	XBT	198	0
W02	1604	32°58.3'	77°43.9'	XBT	187	0
W03	1634	33°01.8'	77°37.2'	XBT	189	0
W04	1704	33°05.3'	77°30.5'	XBT	187	0
W05	1734	33°08.9'	77°23.9'	XBT	160	0
W06	1804	33°12.7'	77°17.3'	XBT	133	0
W07	1834	33°16.6'	77°10.5'	XBT	158	0
W08	1904	33°21.3'	77°04.0'	XBT	161	0
W09	1934	33°26.6'	76°57.9'	XBT	164	0
W10	2006	33°32.0'	76°51.0'	XBT	160	0
W11	2034	33°36.8'	76°44.1'	XBT	176	0
W12	2105	33°42.3'	76°37.5'	XBT	177	0
W13	2135	33°47.7'	76°30.7'	XBT	182	0
W14	2204	33°52.9'	76°24.0'	XBT	188	0
W15	2234	33°58.3'	76°17.4'	XBT	200	0

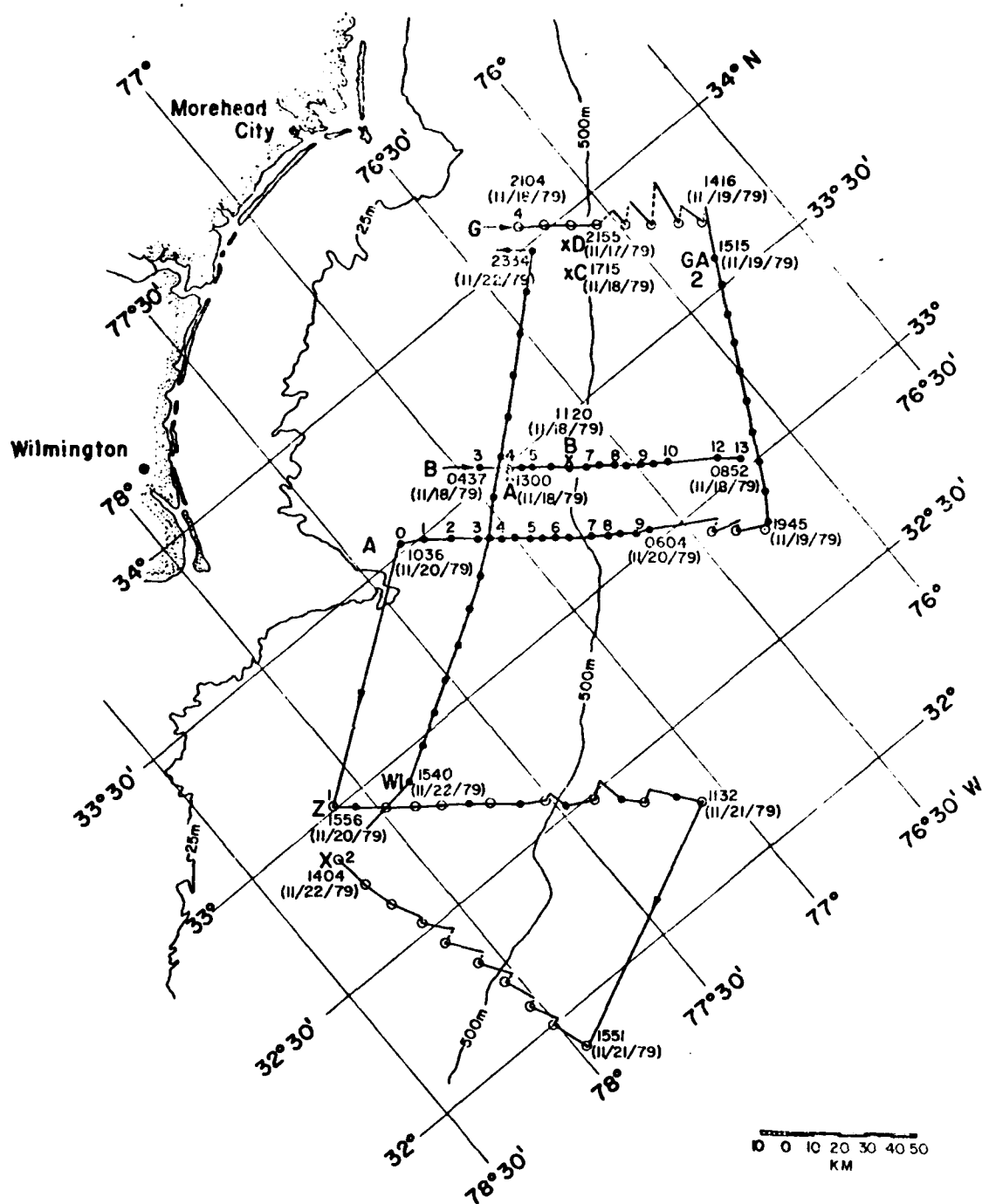


Figure 20. Detailed ship tracks for cruise EN-045. The solid dots represent XBT stations. The circles represent STD stations; the on-station drift is shown by the dotted lines. The crosses represent current meter mooring locations.

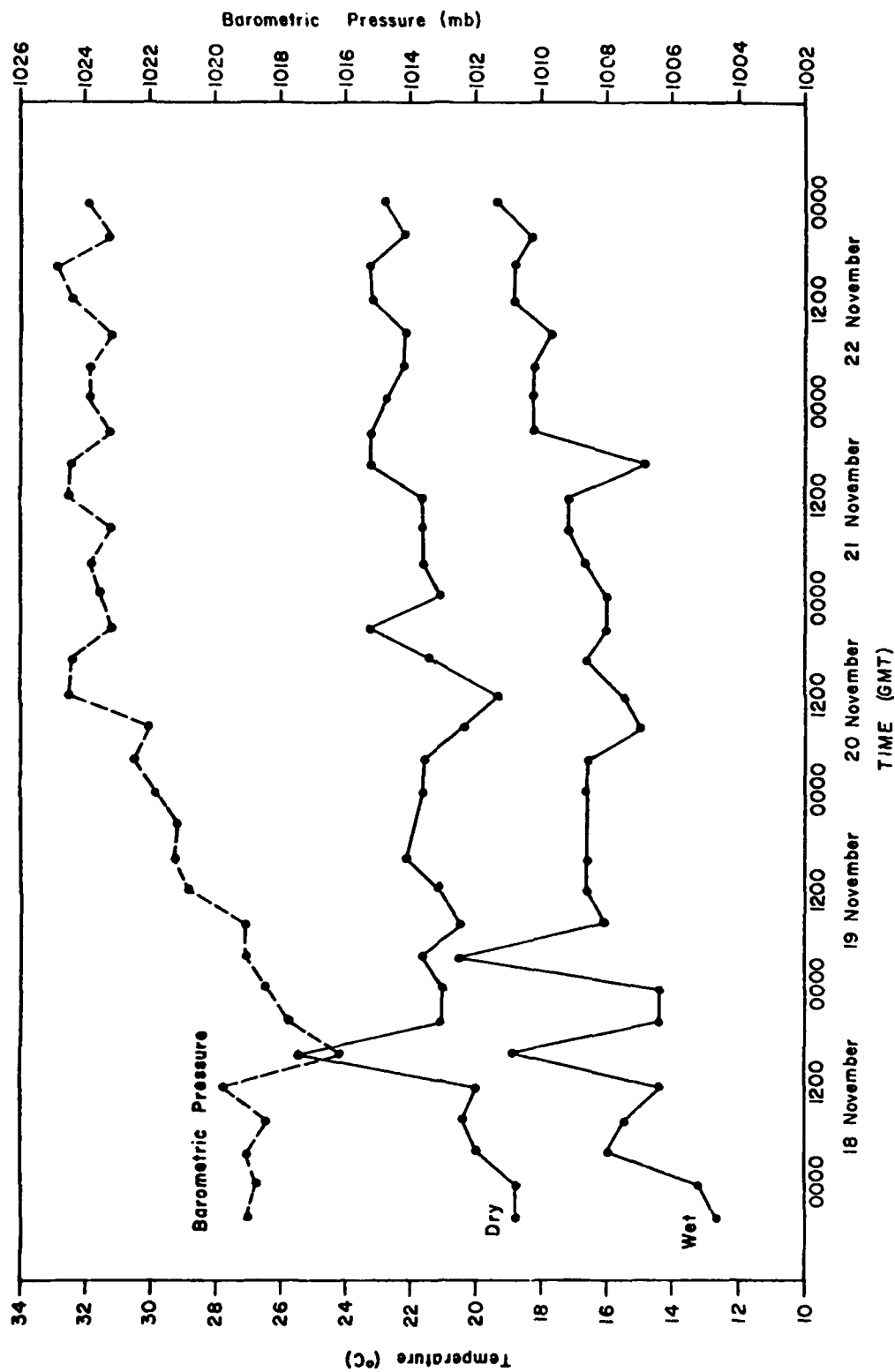


Figure 21. Meteorological parameters recorded aboard ship during cruise EN-045.

CRUISE EN-045

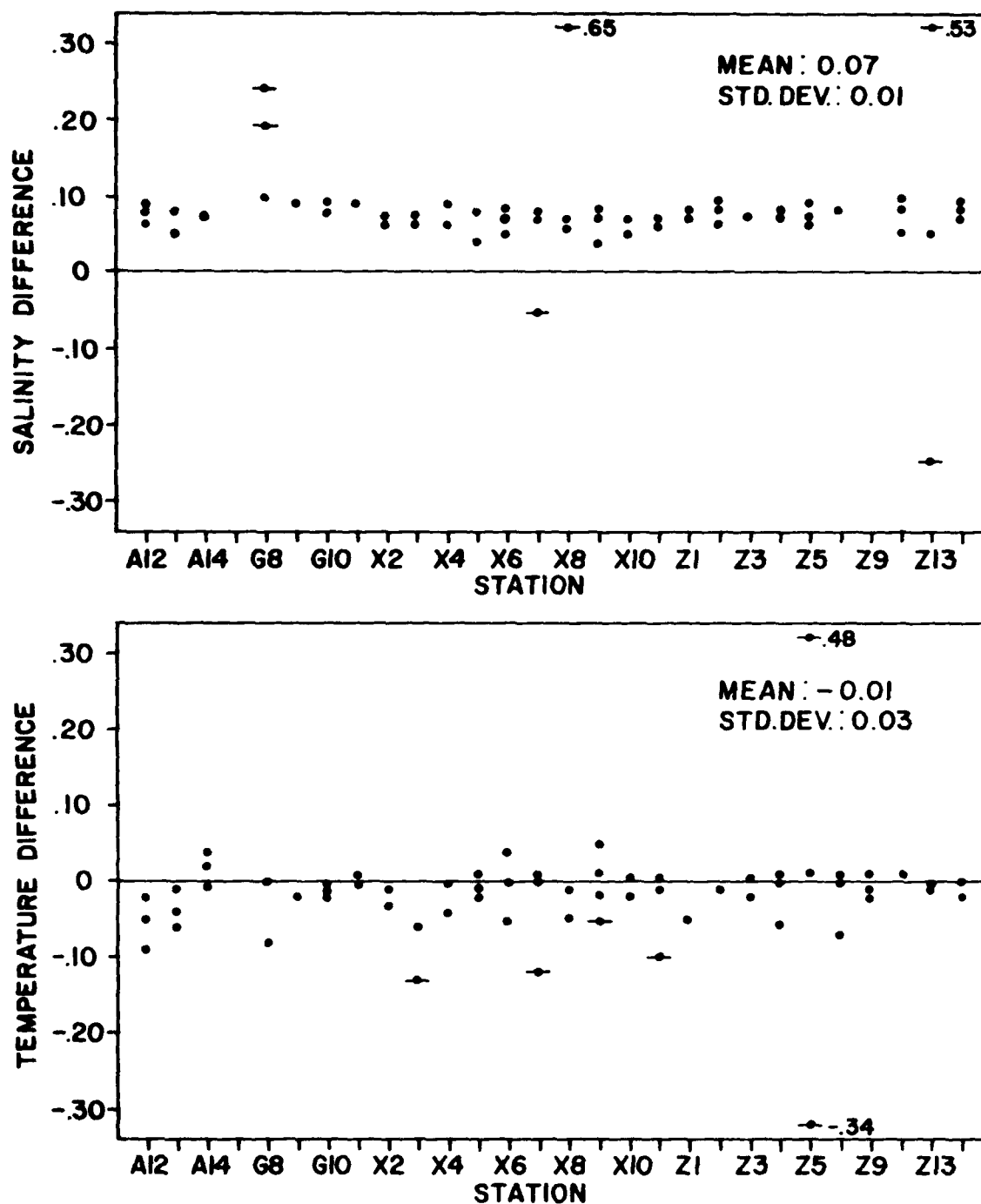


Figure 23. STD-measured minus bottle calibration values of salinity and temperature for EN-045. STD salinity values were corrected by subtracting 0.07‰; no temperature correction was applied. Erroneous data points are flagged by horizontal bars.

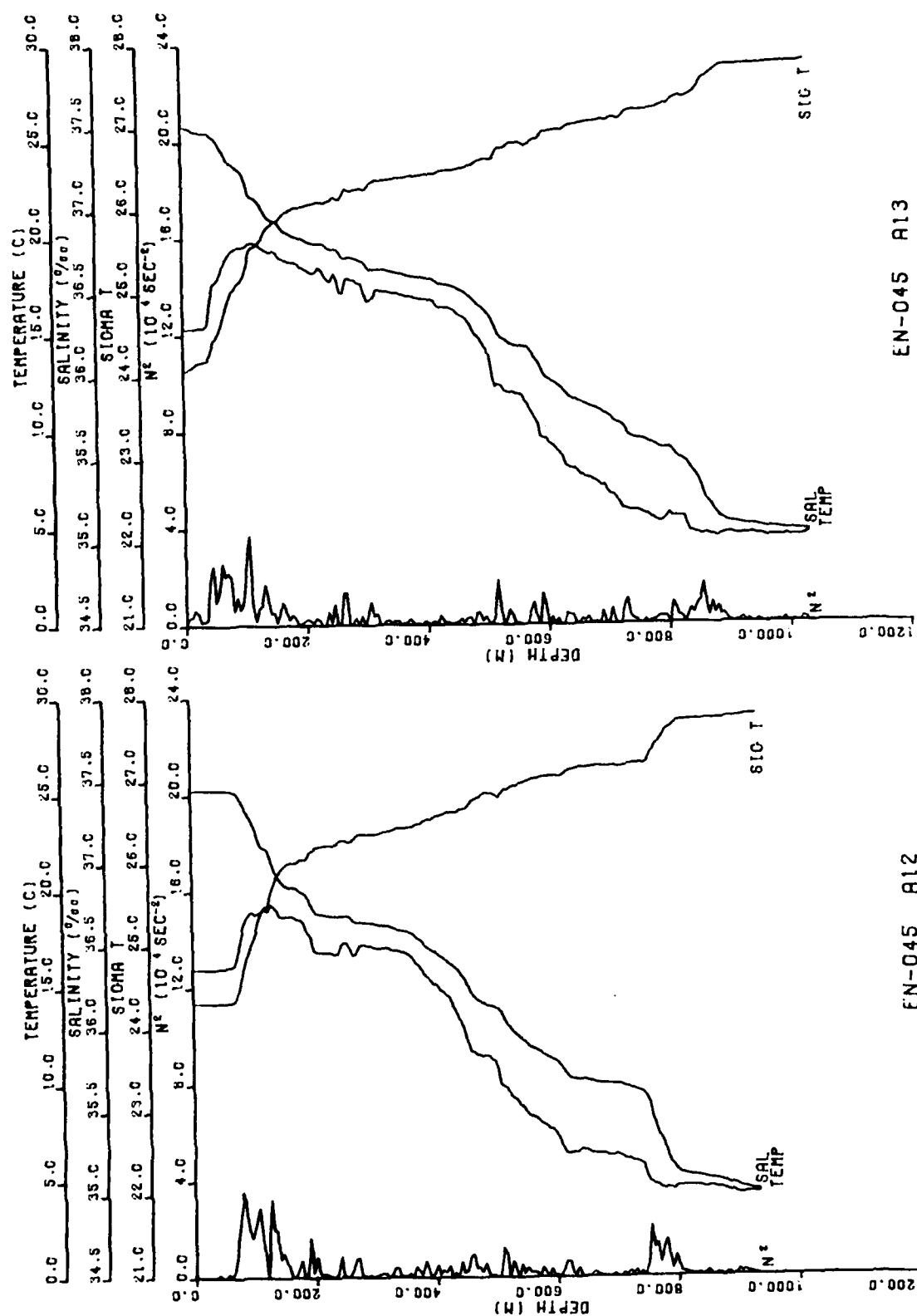
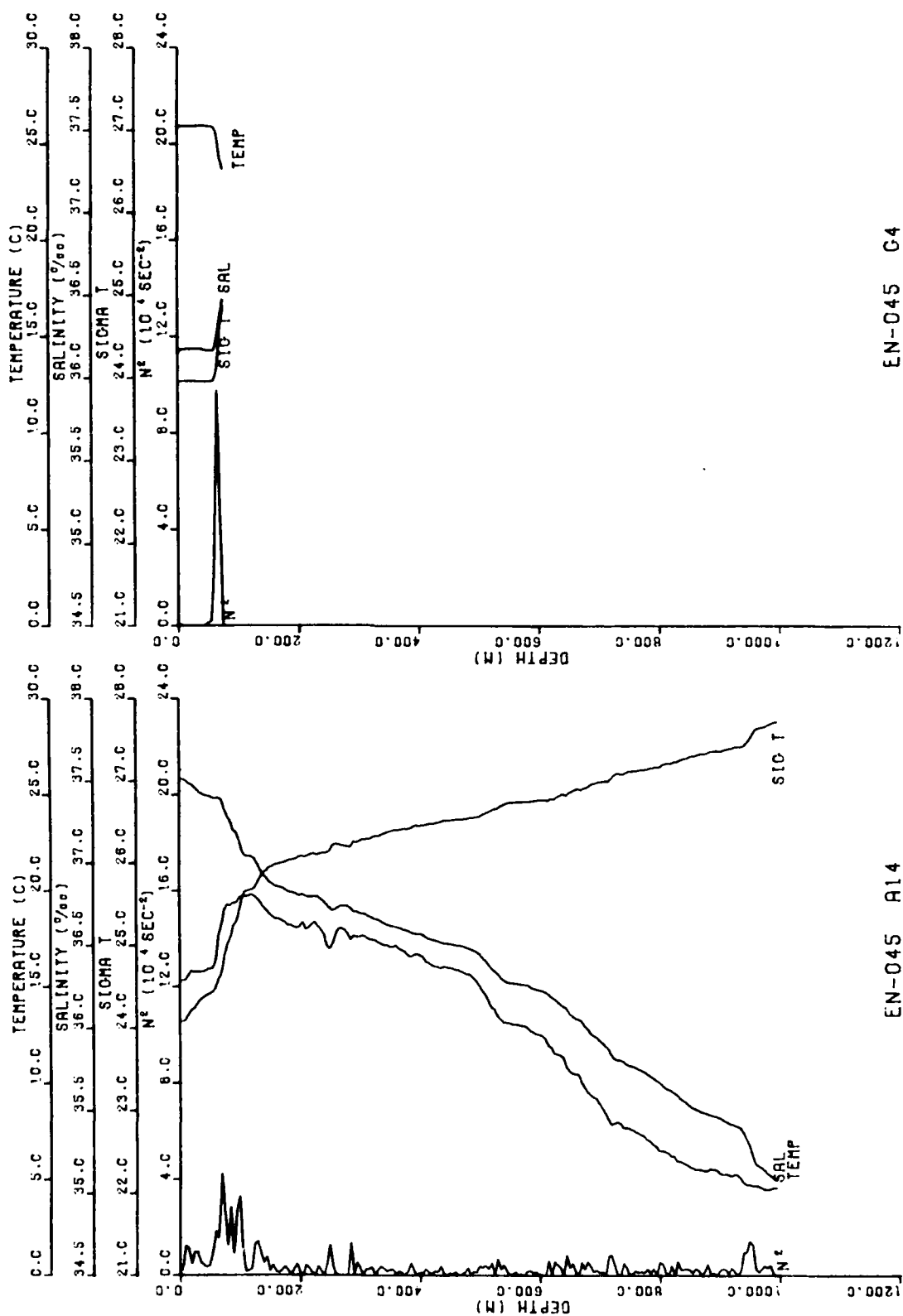
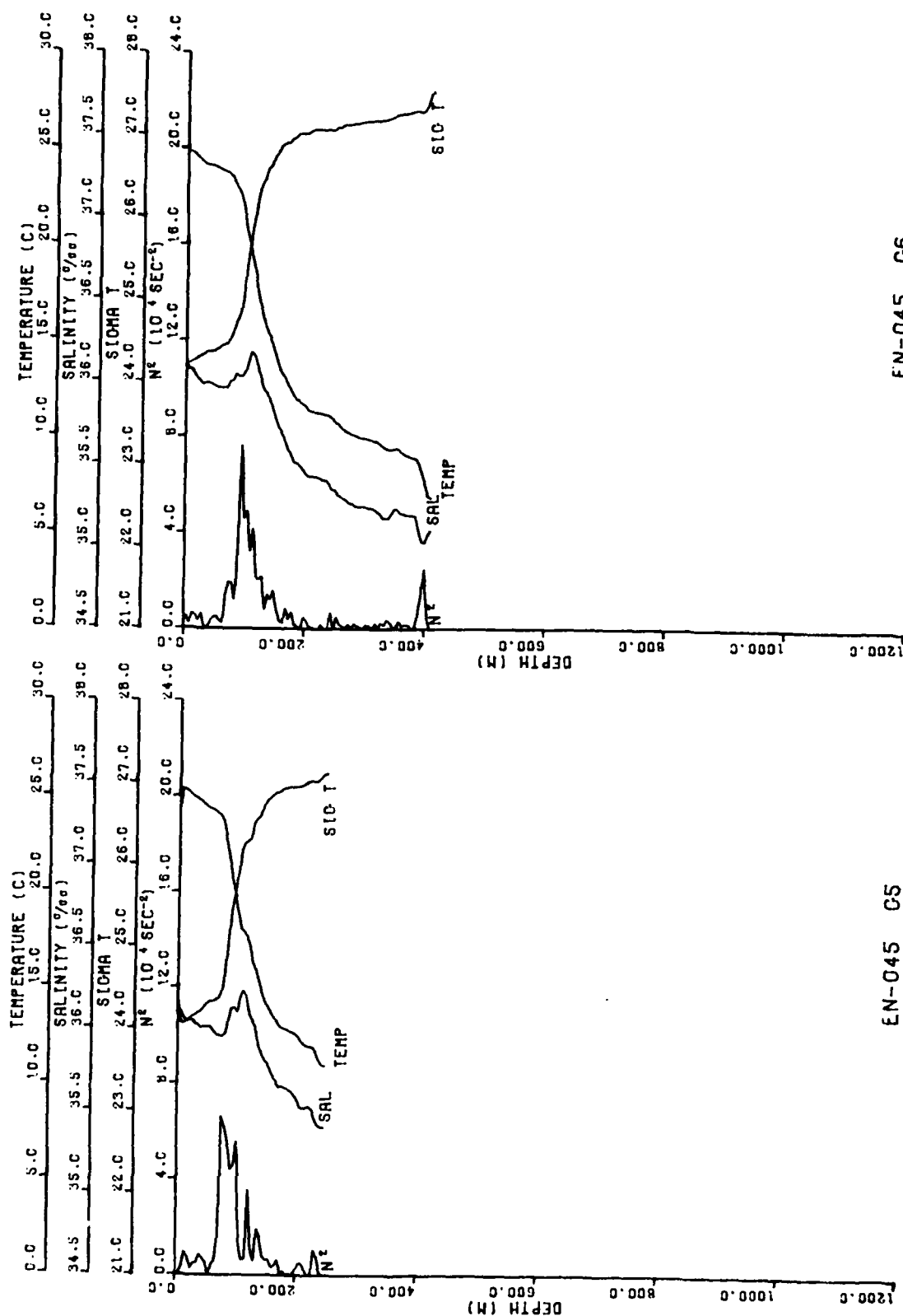


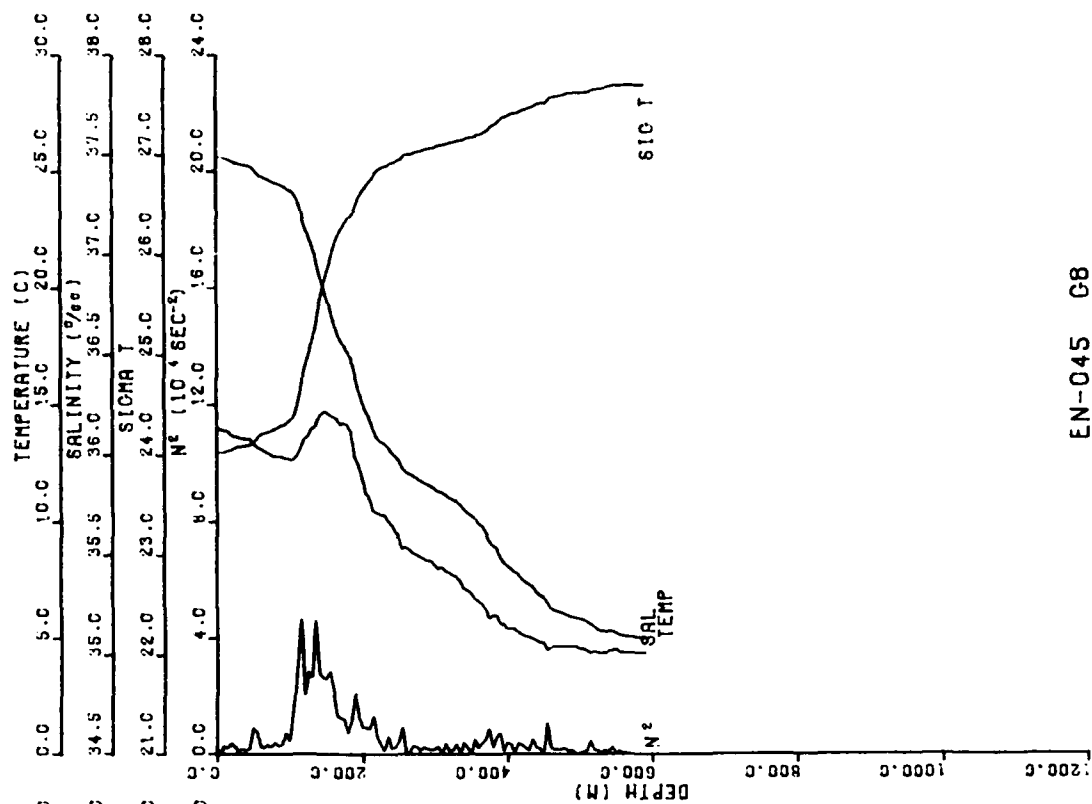
Figure 24. Individual STD station profile, of temperature, salinity and derived quantities sigma-t and N₂ for EN-045. Station locations are shown in Figure 20. This figure is continued on the next 15 pages.



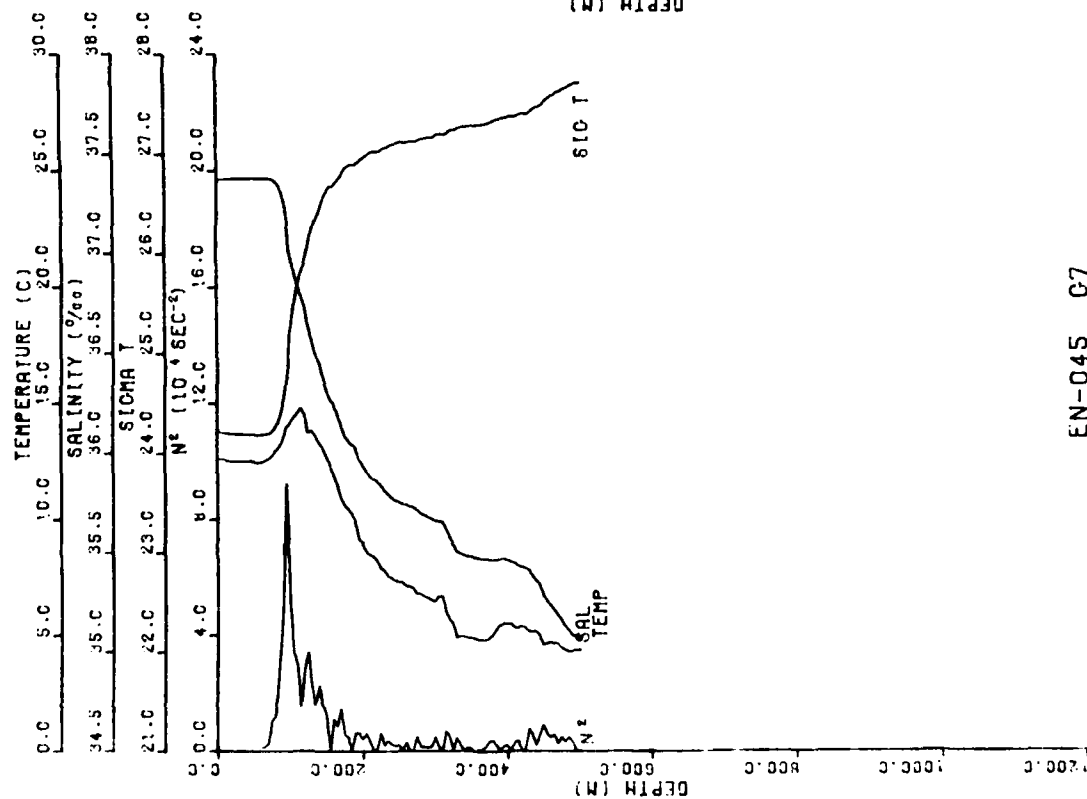
EN-045 A14

EN-045 G4

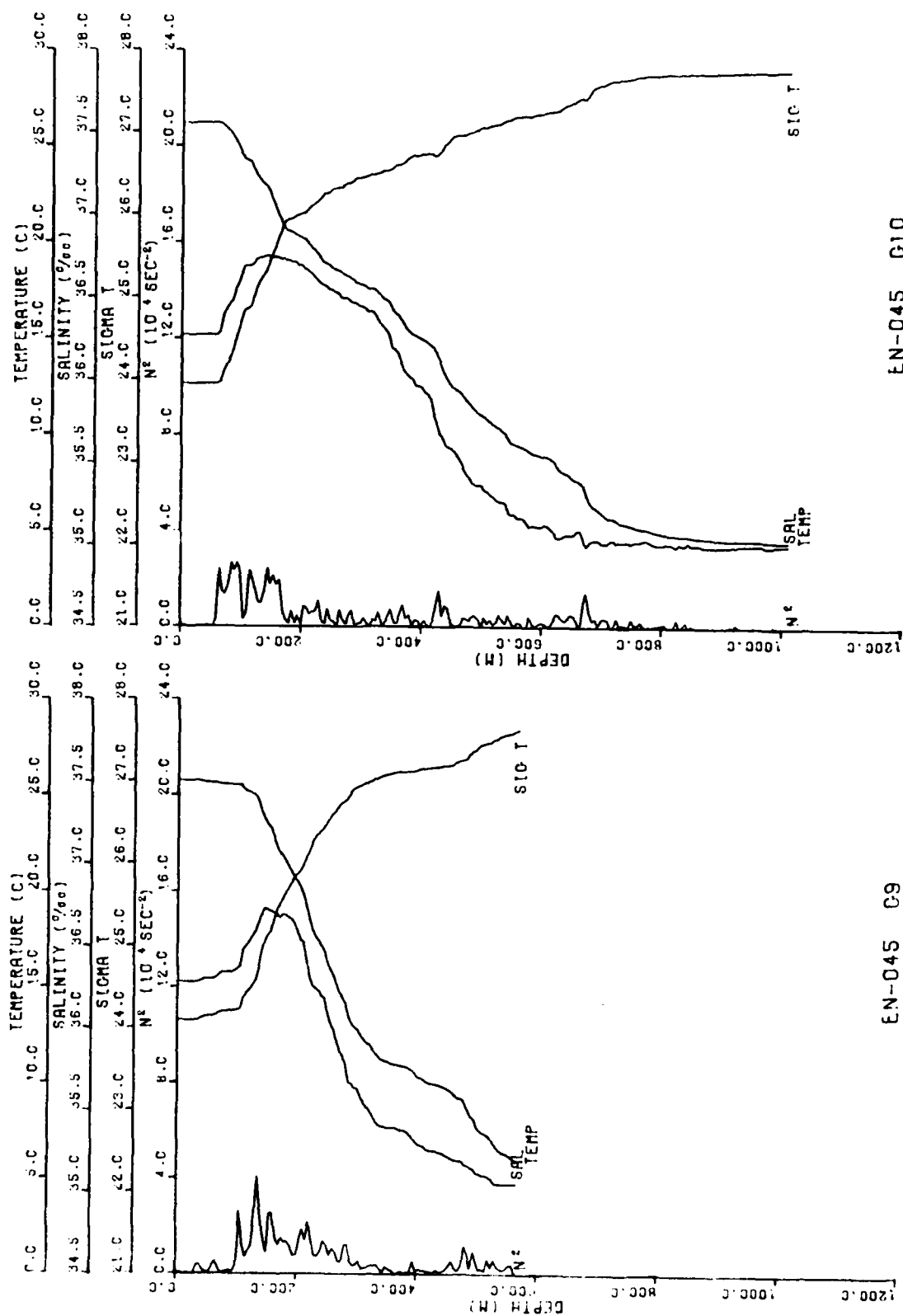




EN-045 C8

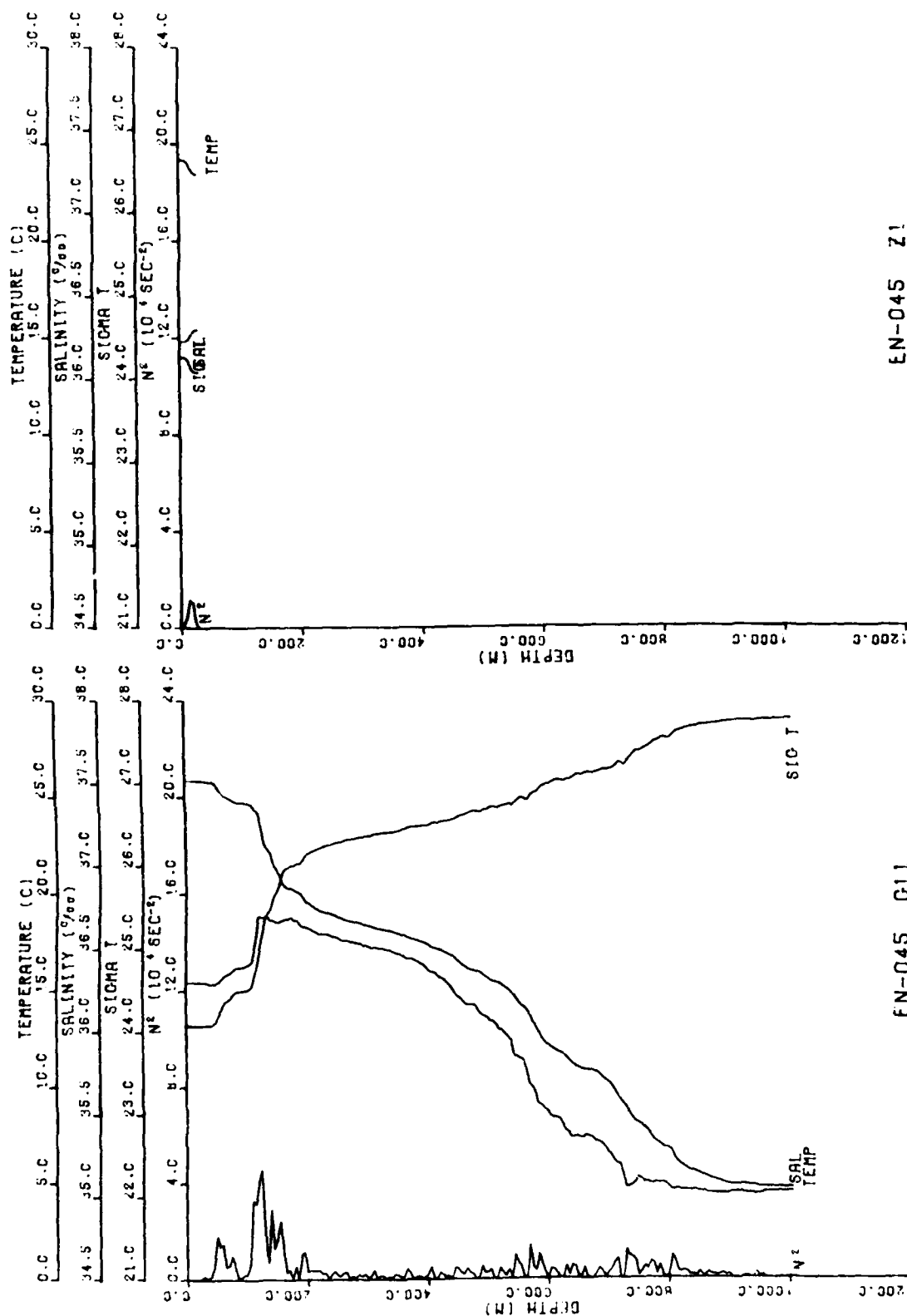


EN-045 C7



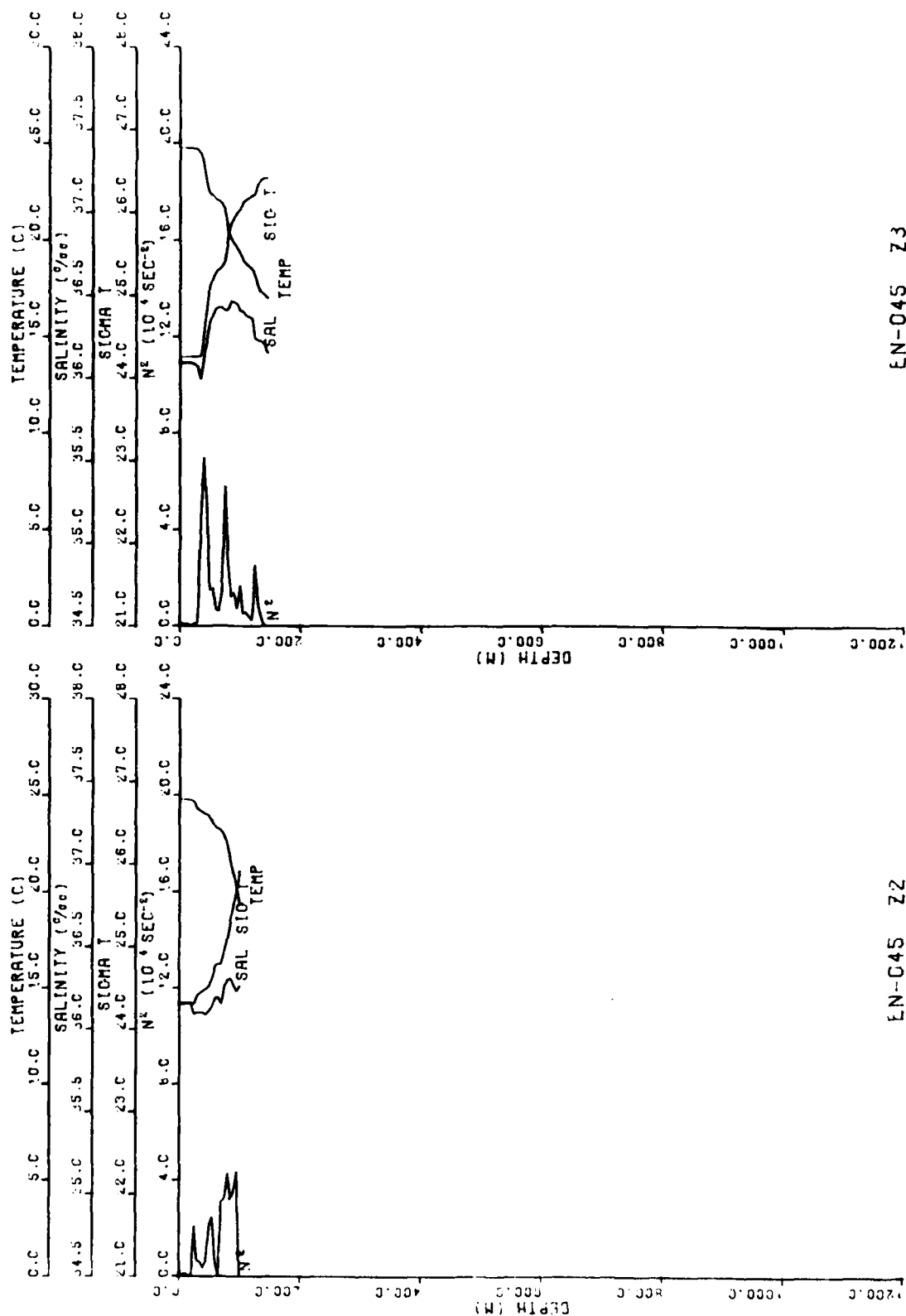
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EN-045 C9



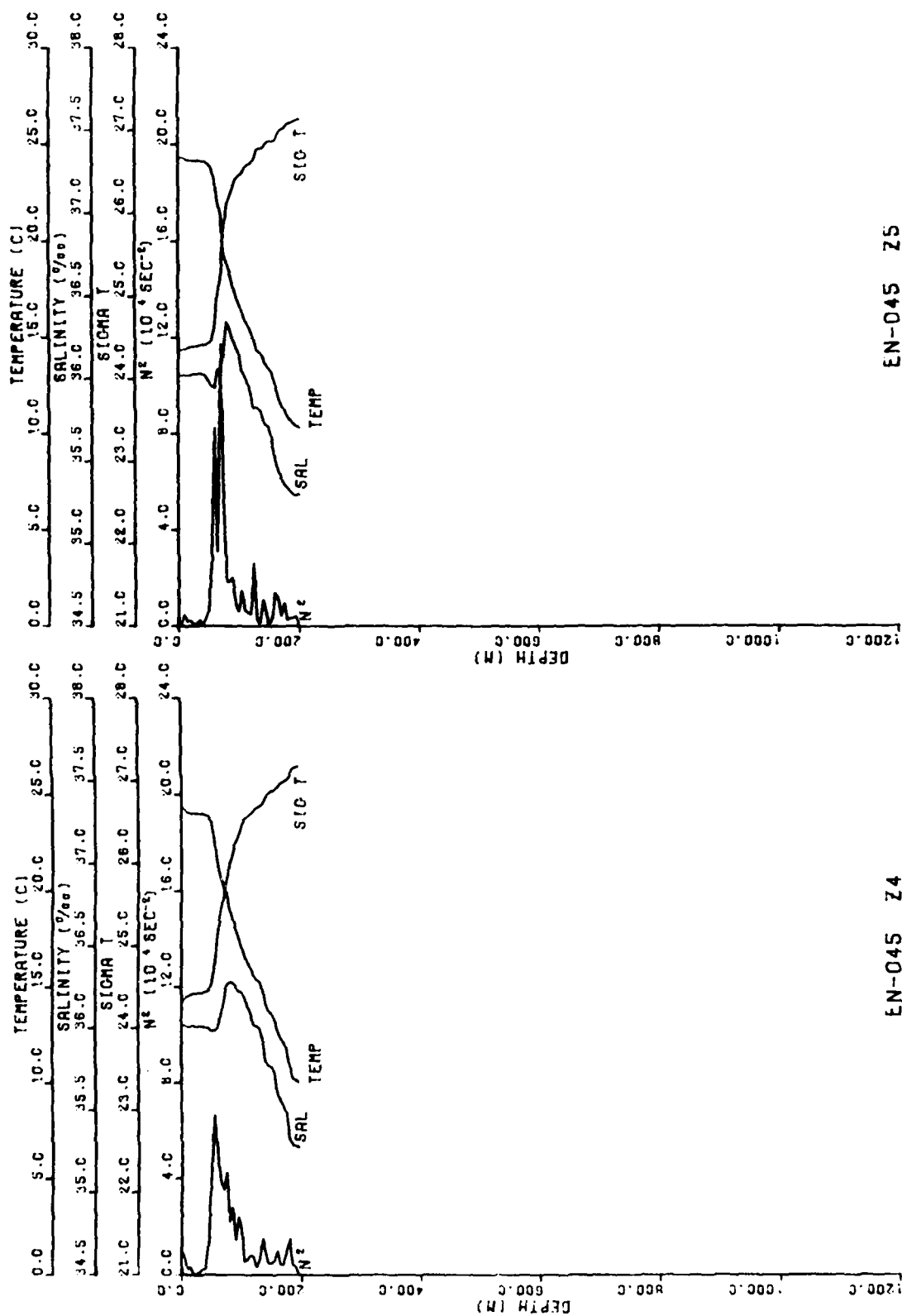
EN-045 Gil

EN-045 Z!

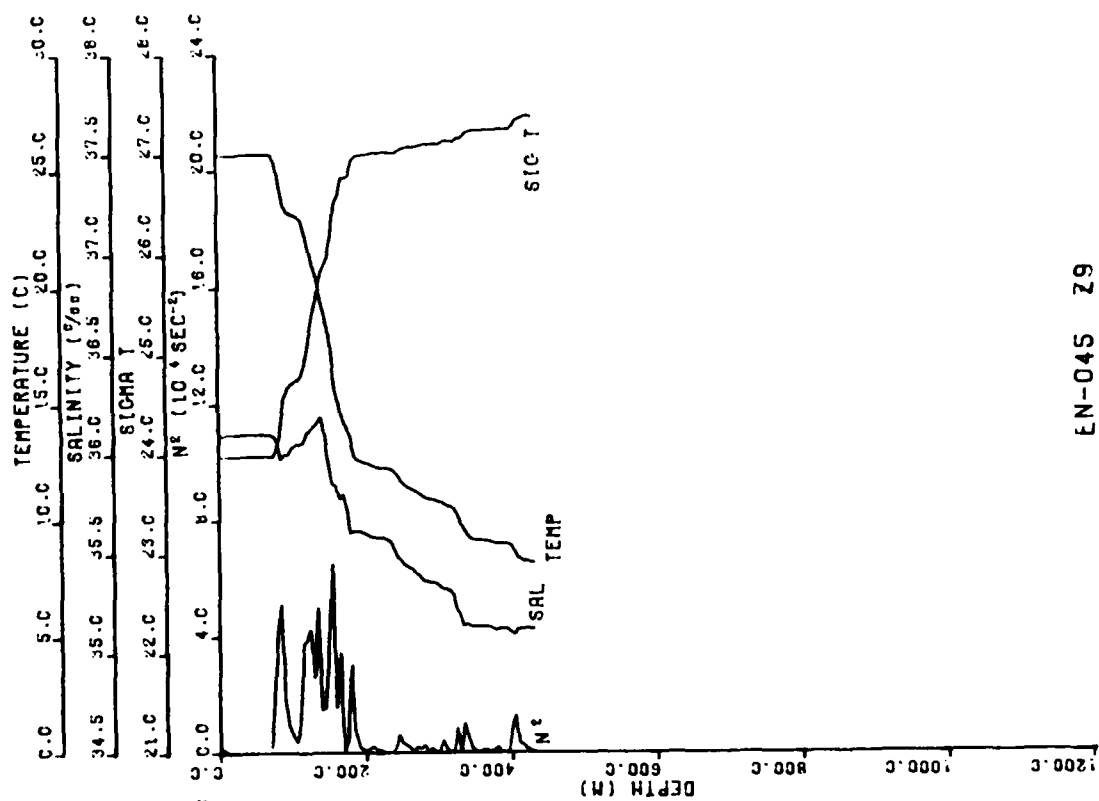


EN-045 Z3

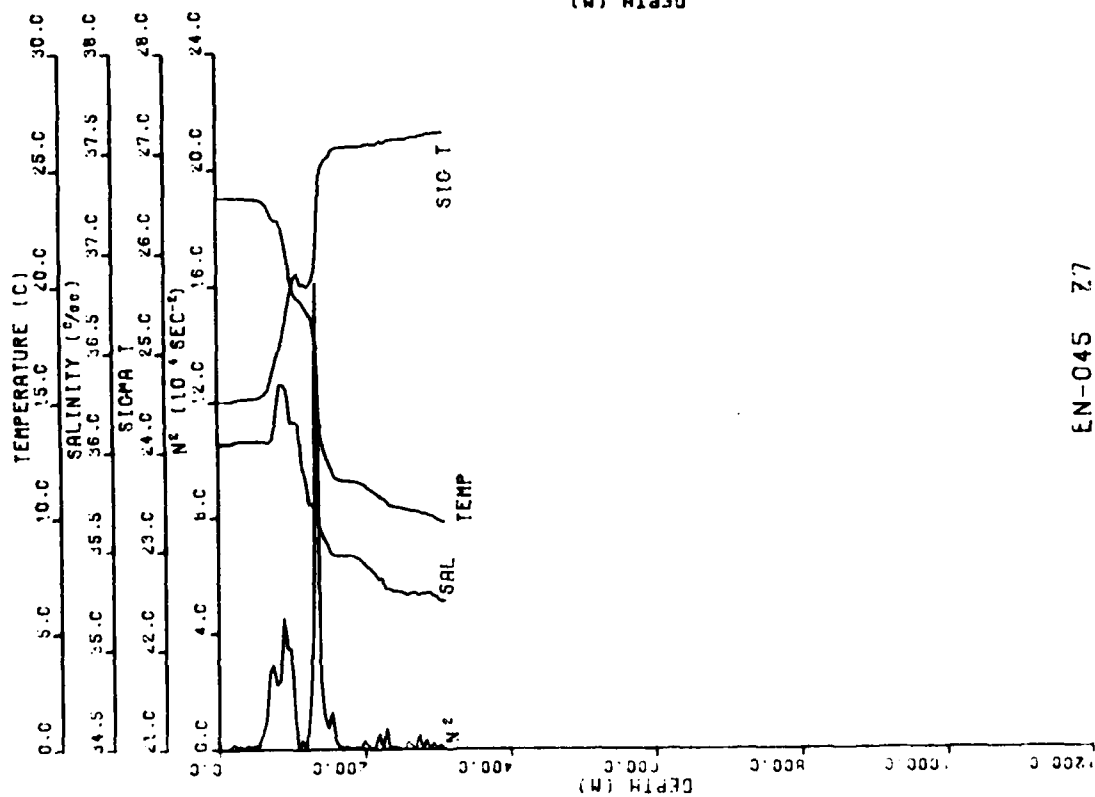
EN-045 Z2



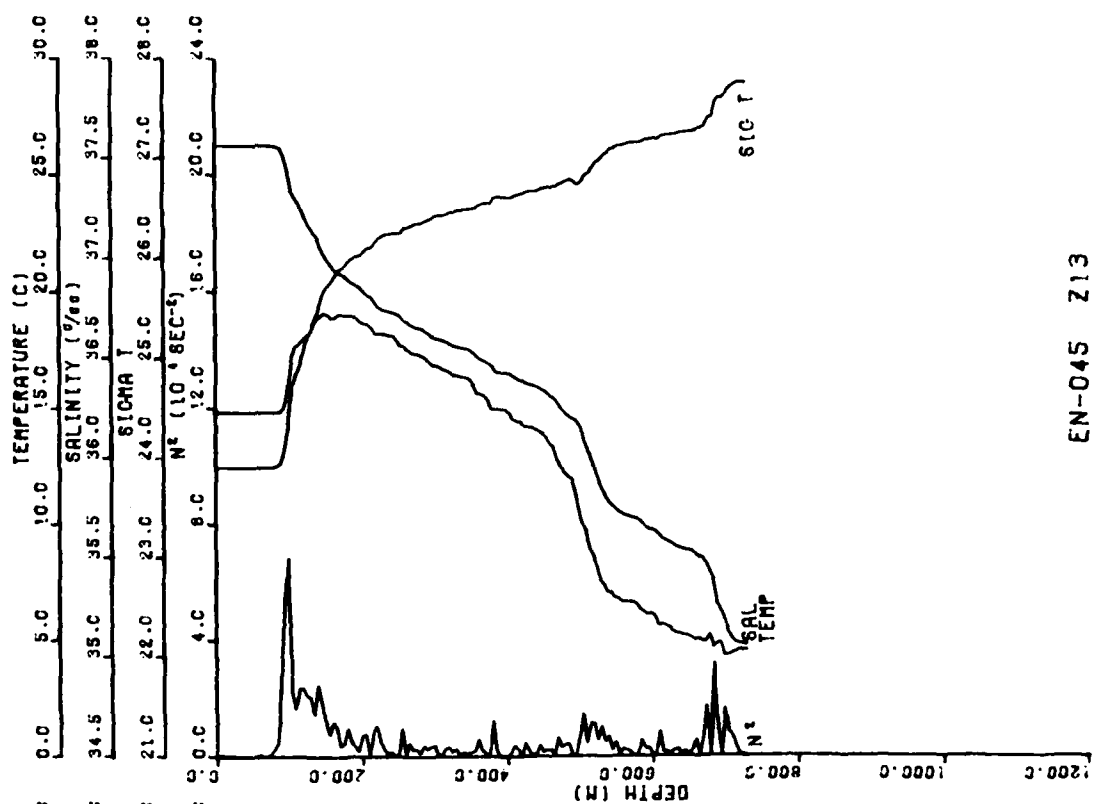
EN-045 29



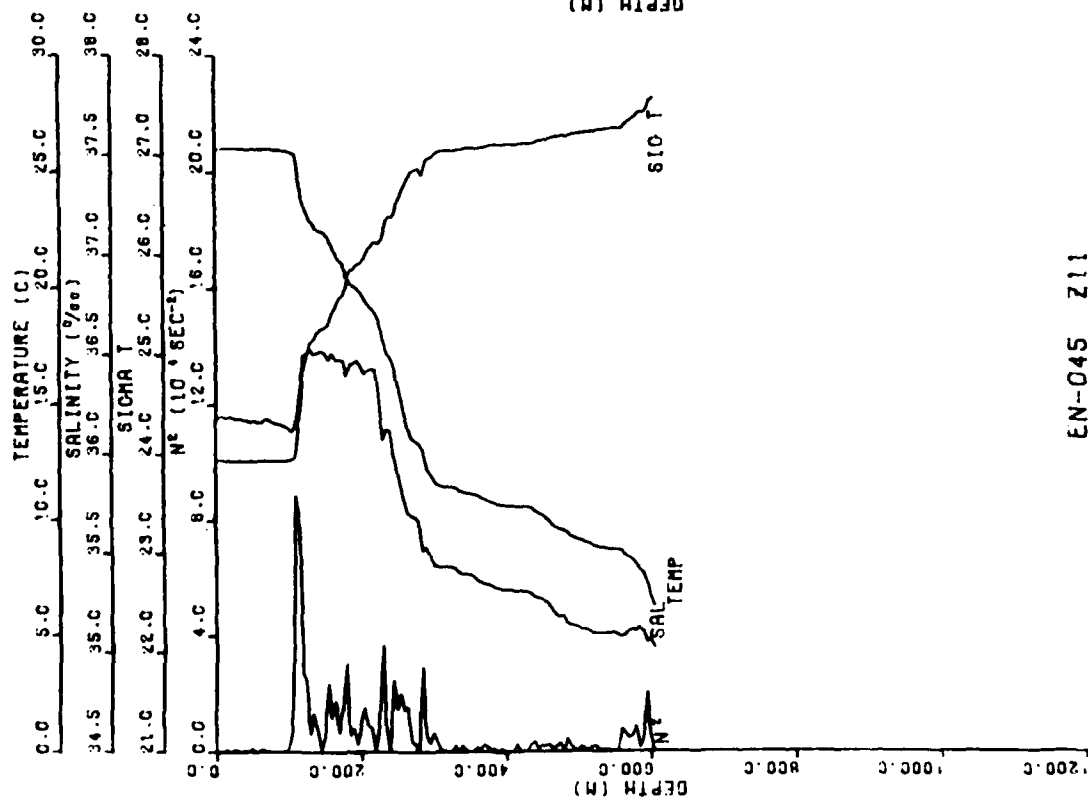
EN-045 27



EN-045 Z13

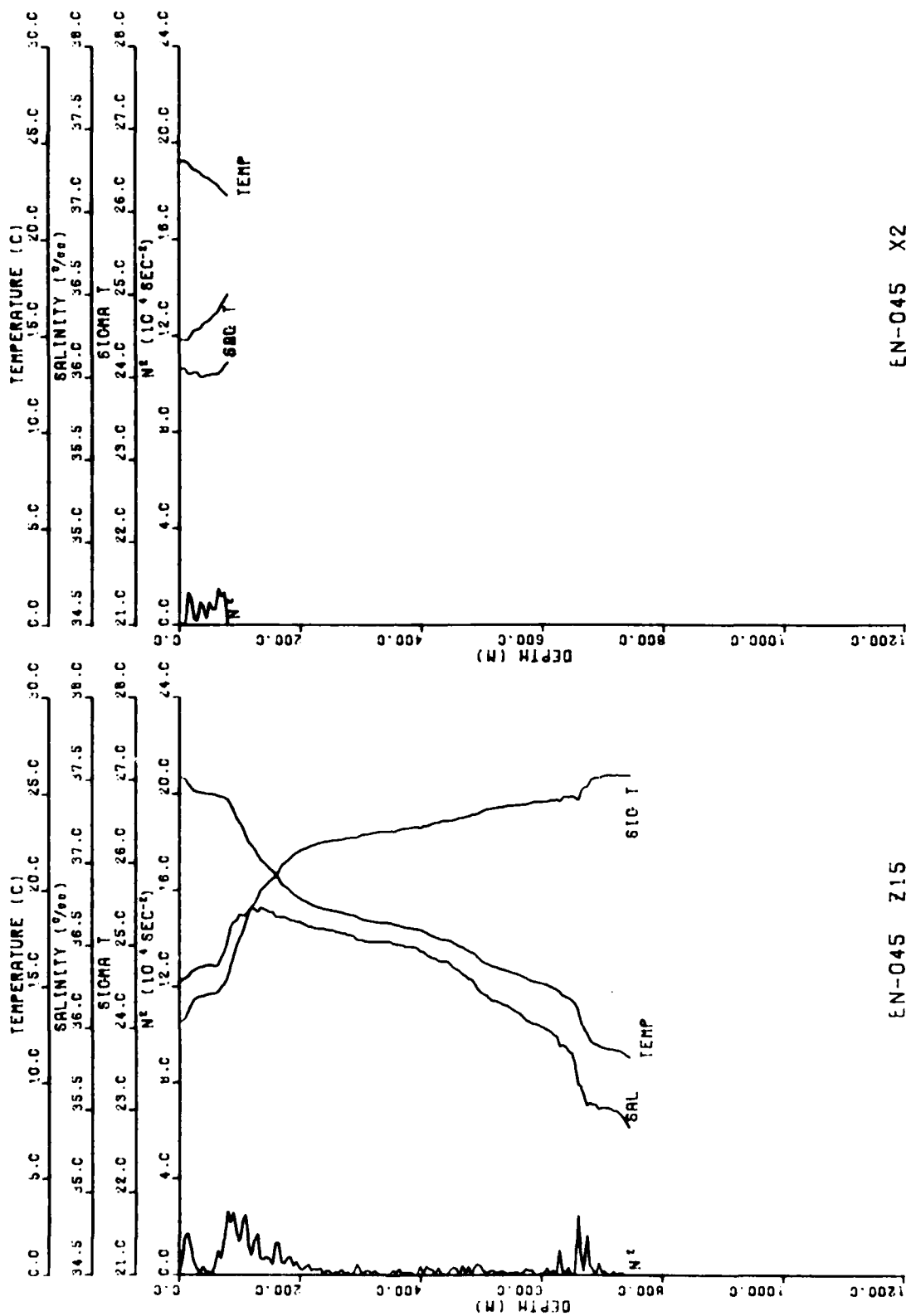


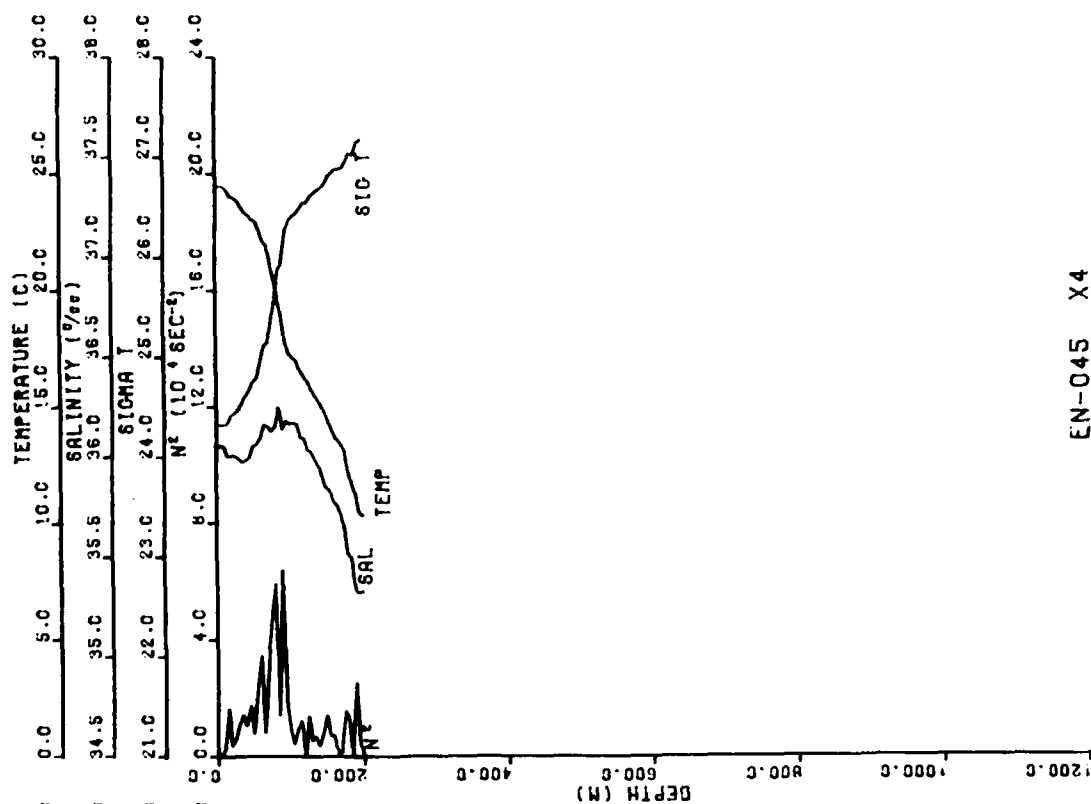
EN-045 Z11



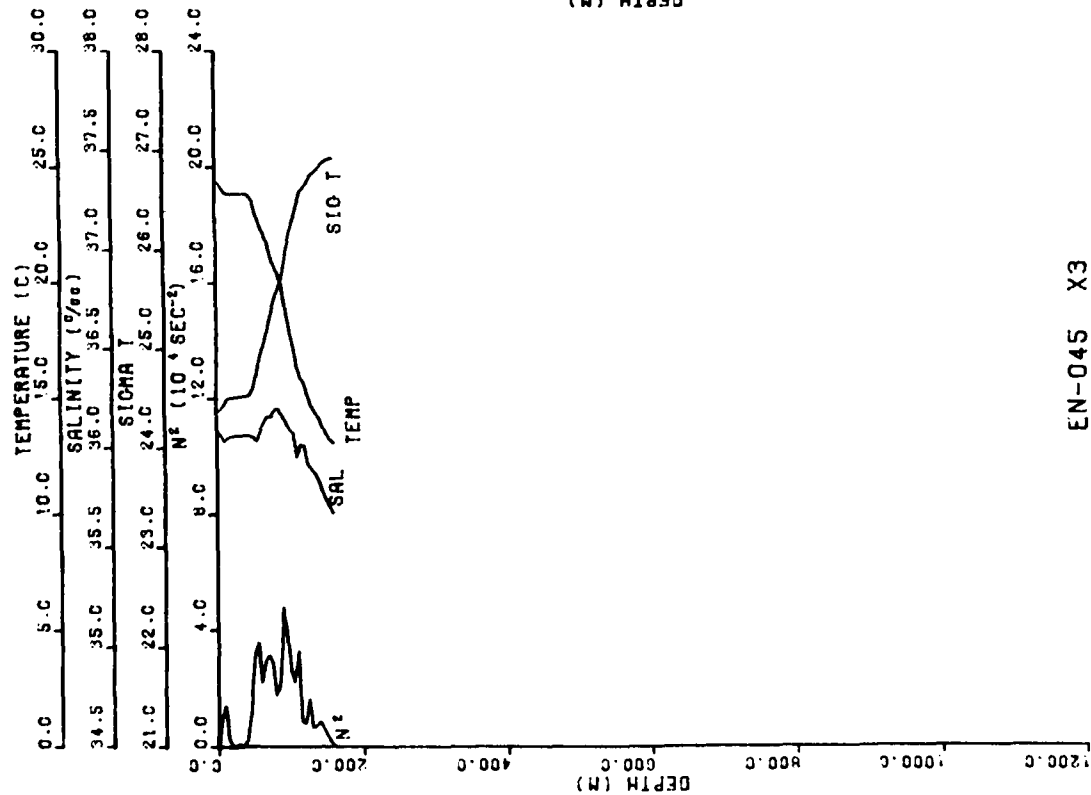
EN-045 X2

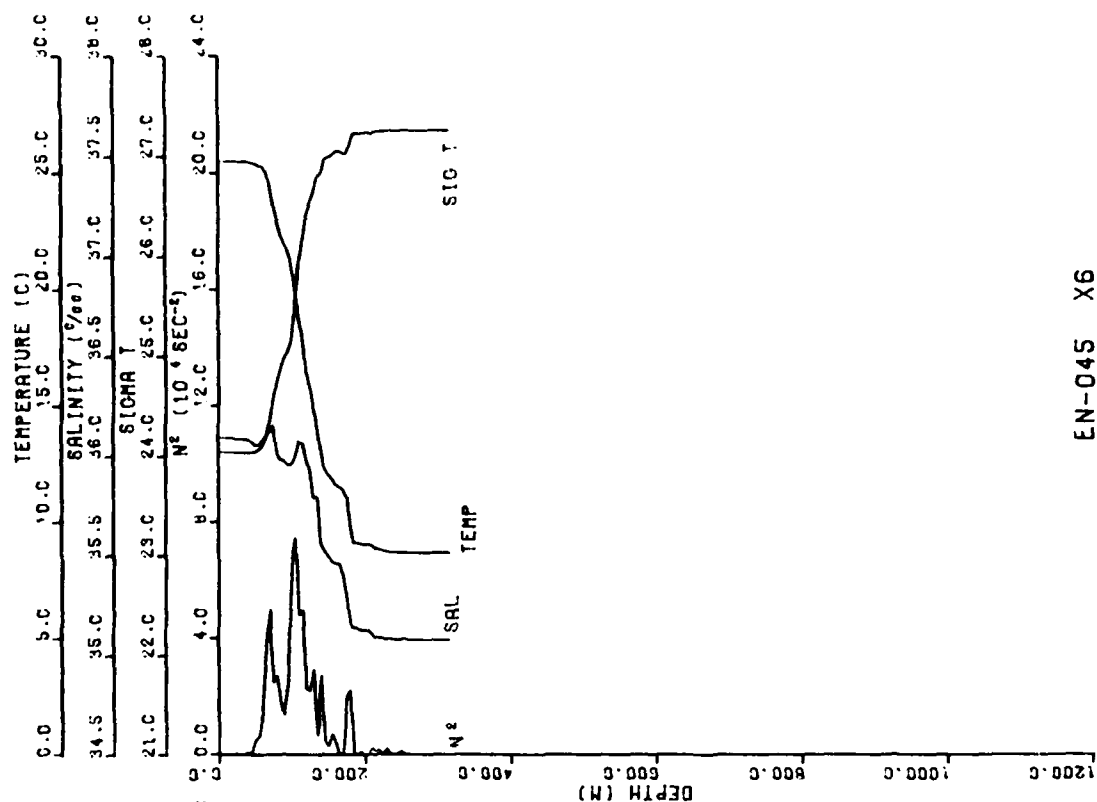
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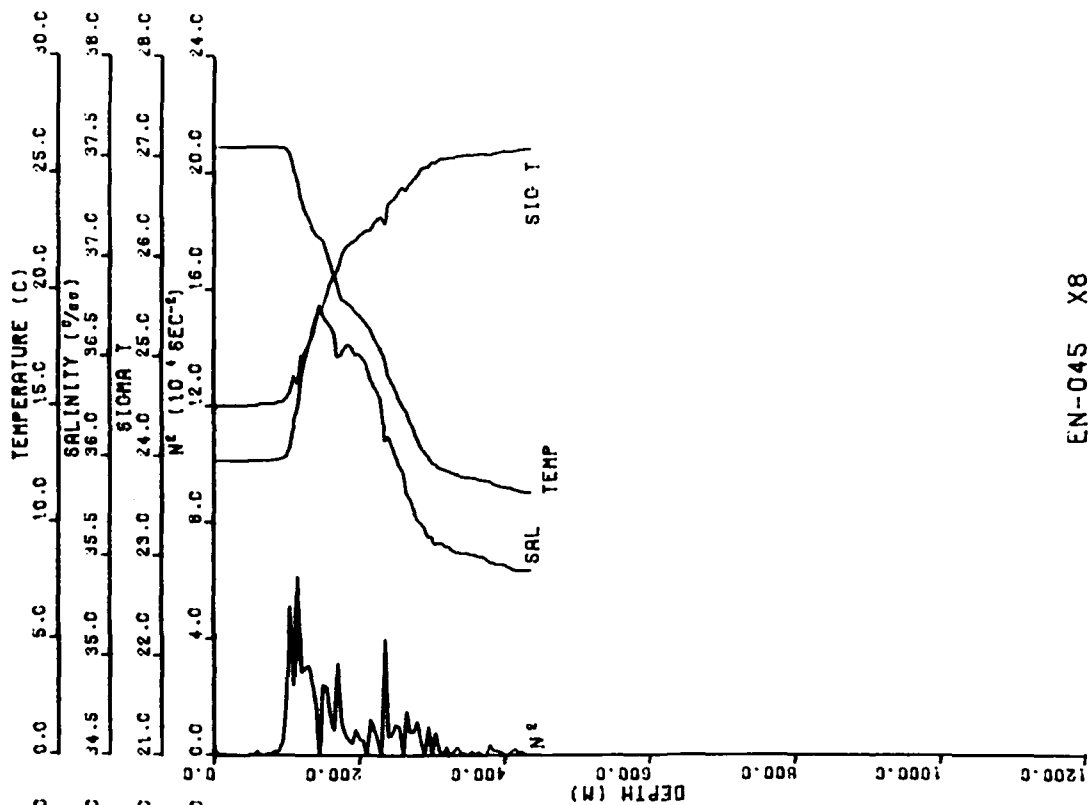




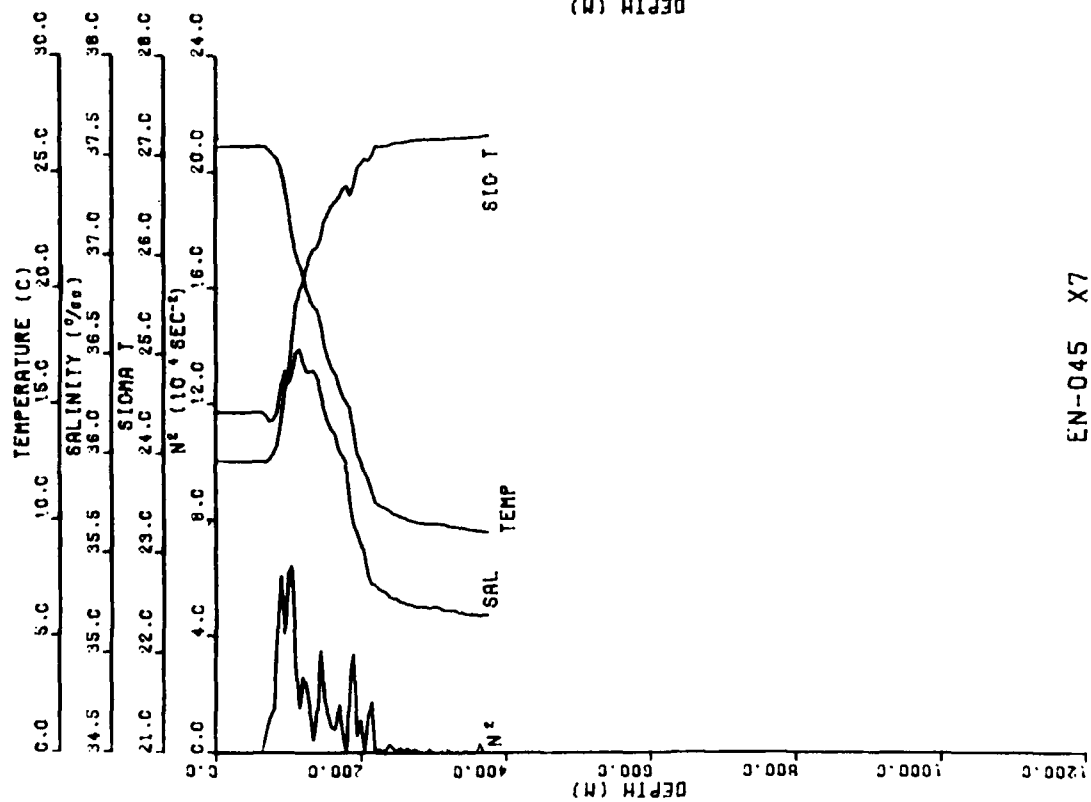
EN-045 X4



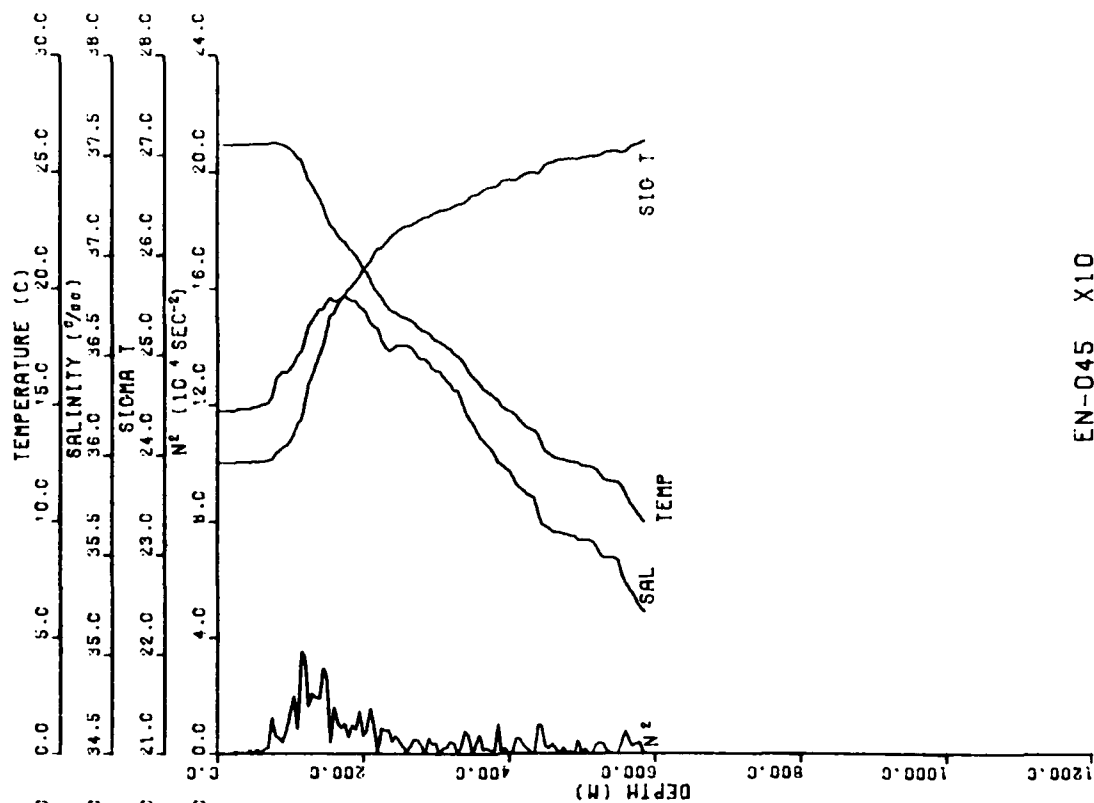




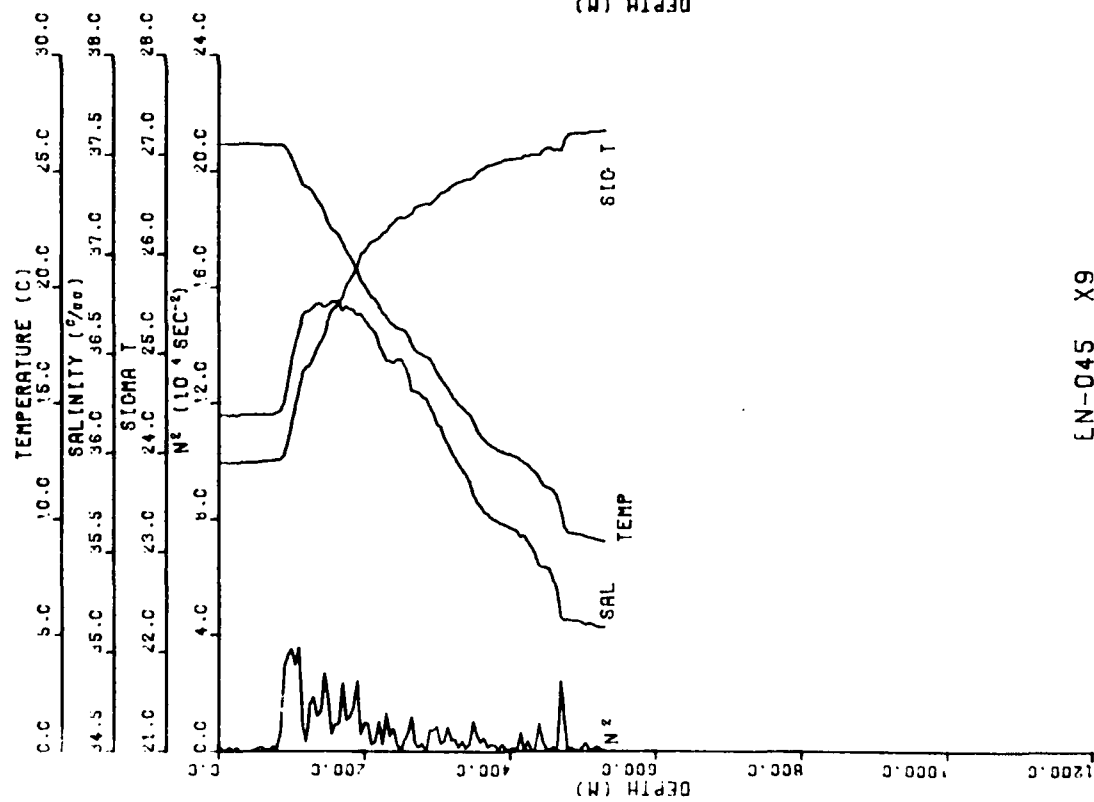
EN-045 X8



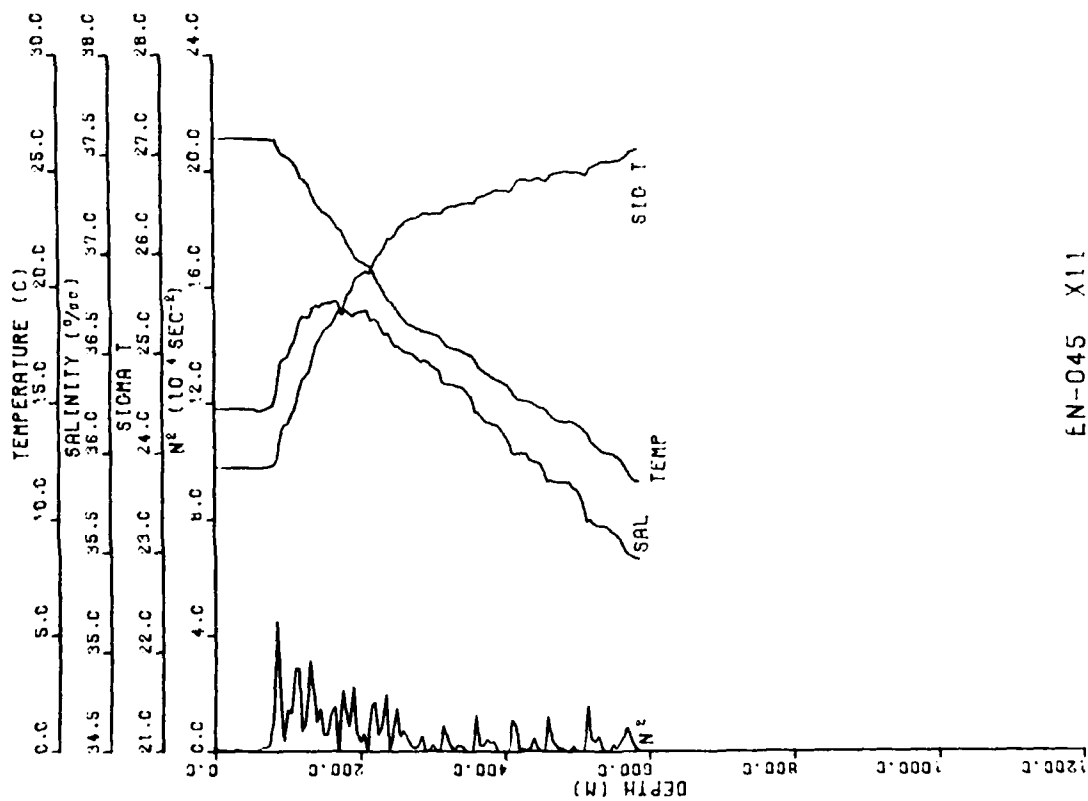
EN-045 X7



EN-045 X10



EN-045 X9



EN-045 X11

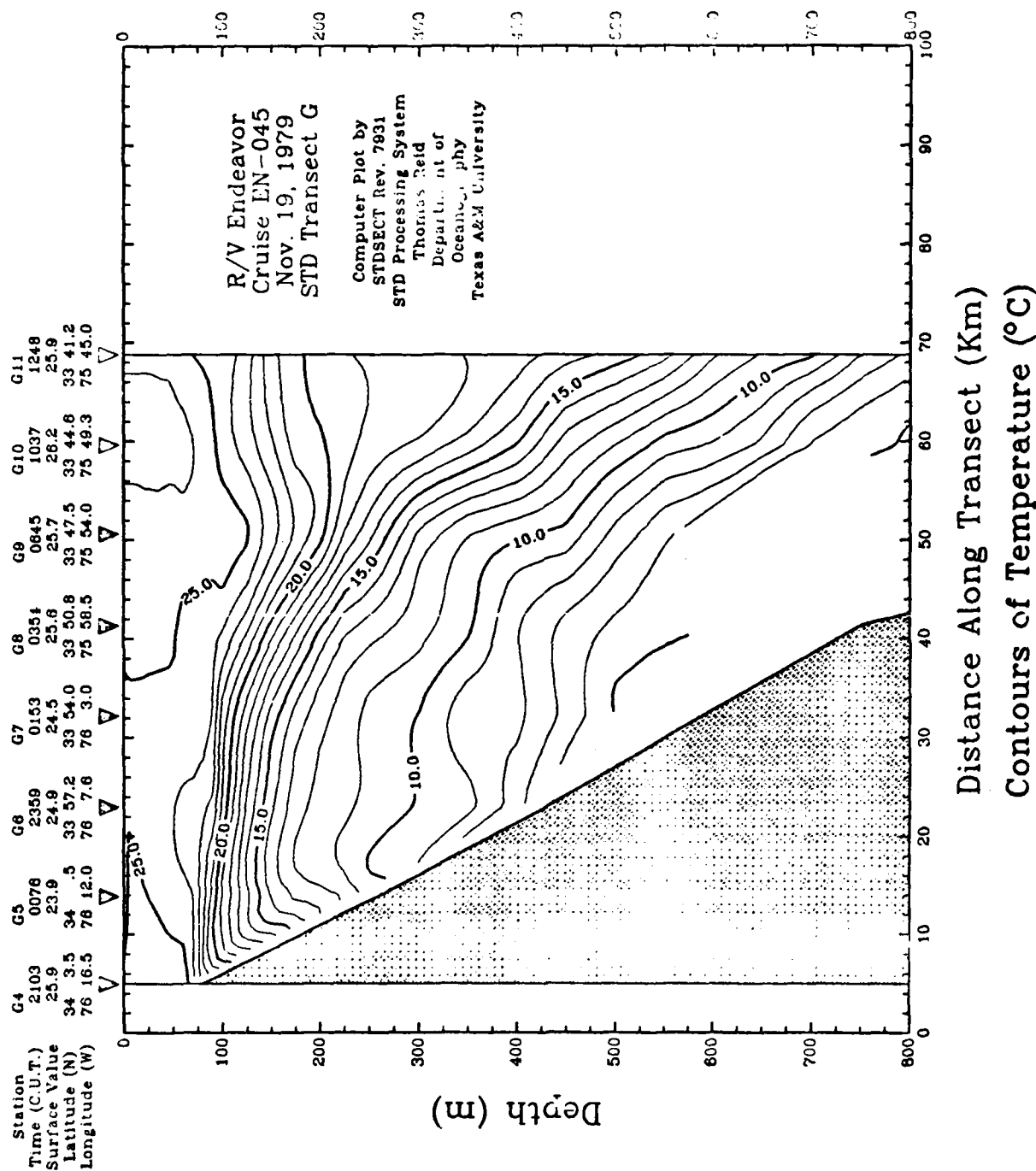
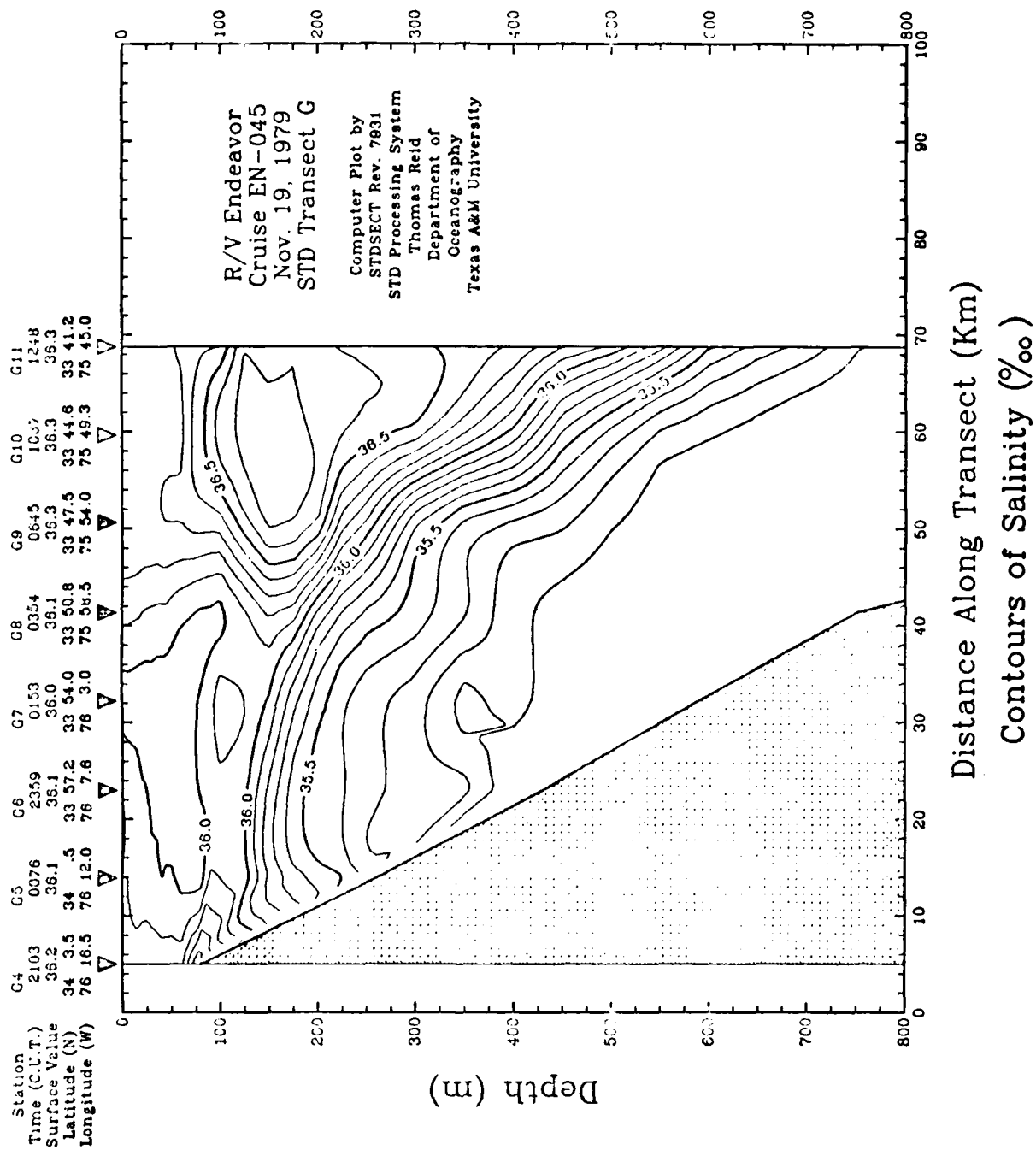
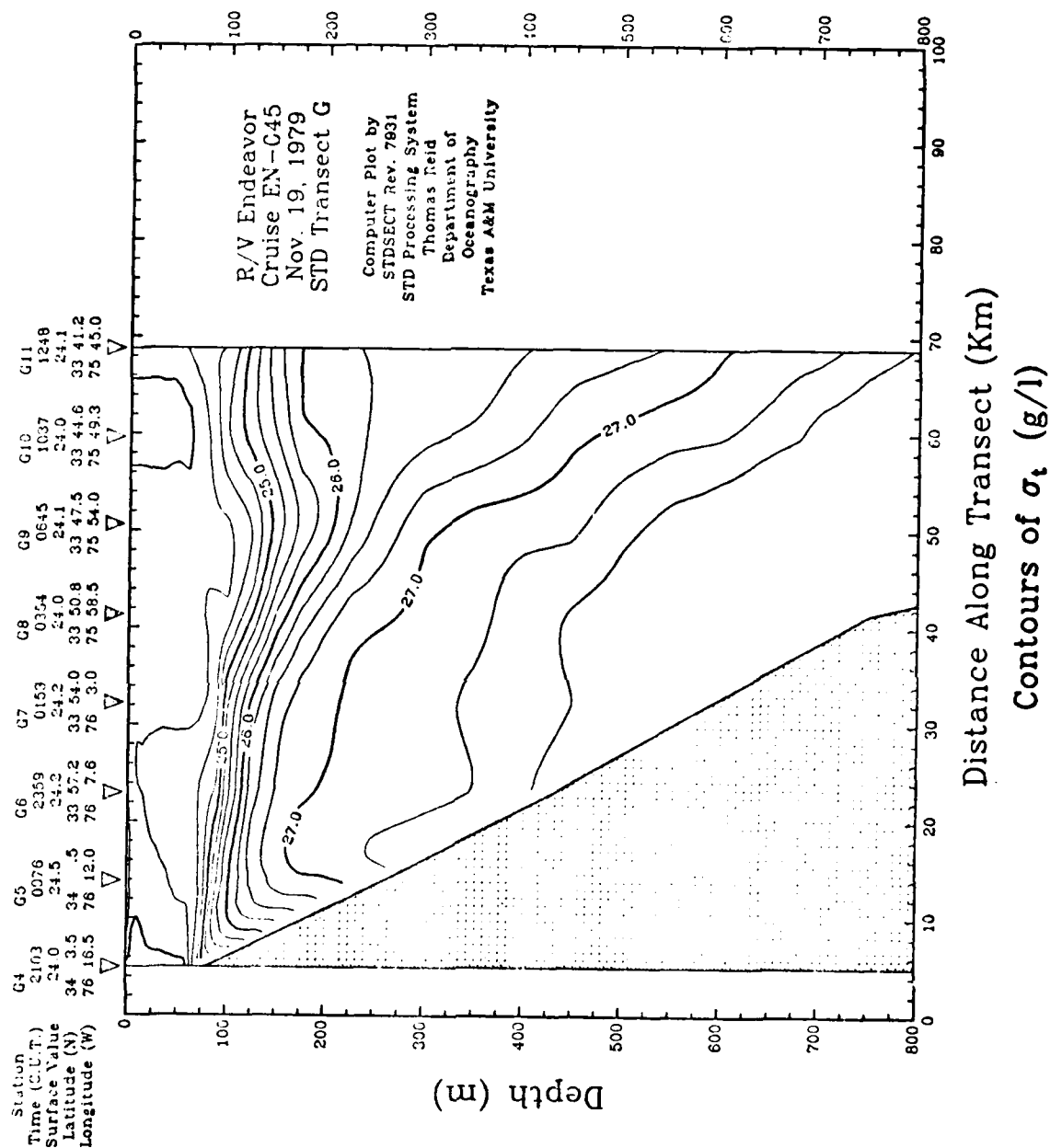
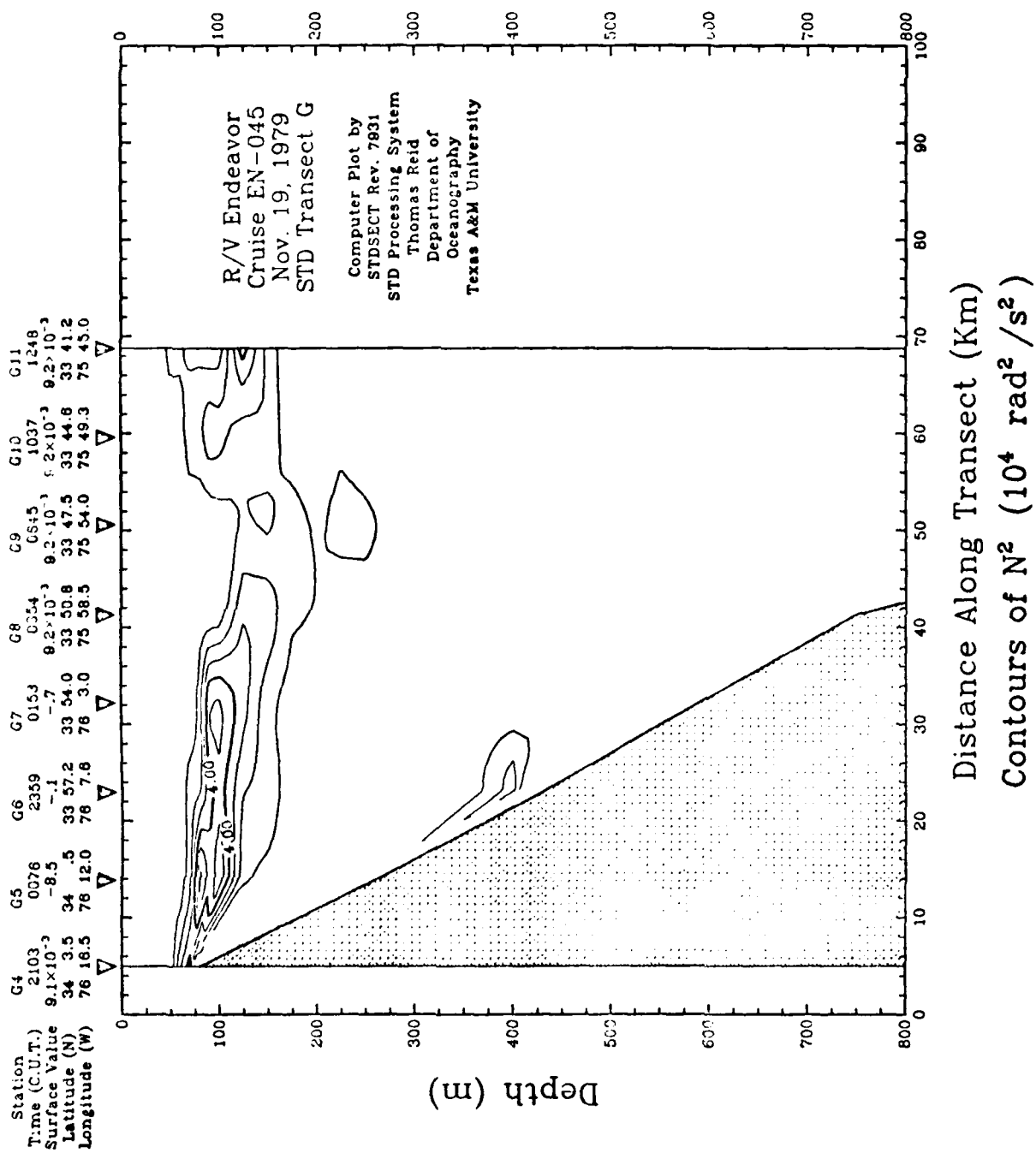
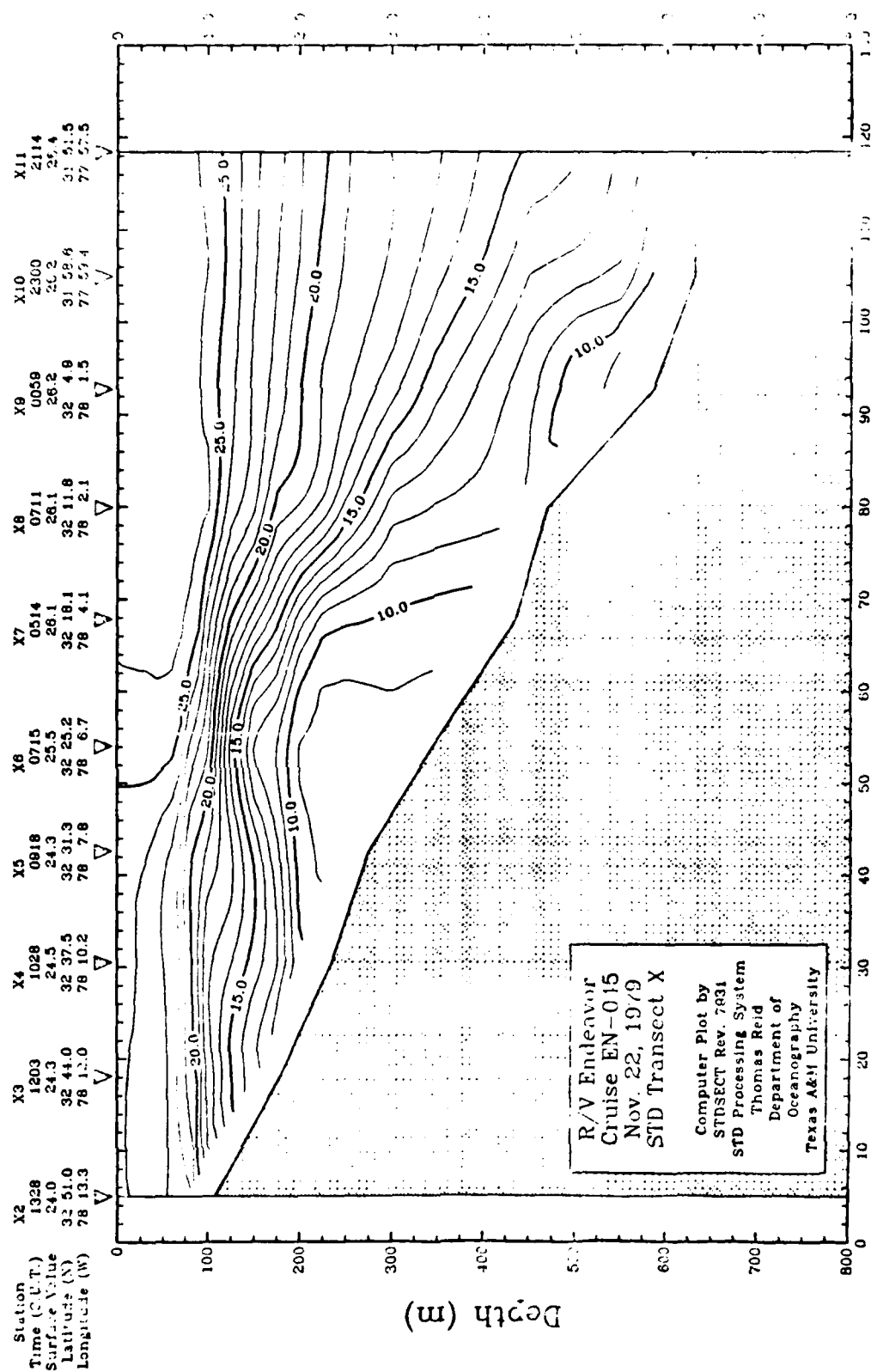


Figure 25. STD section contours of temperature, salinity and derived sigma-t, and N^2 fields for Transect G. Contour intervals are 1°C , 0.1‰ , $0.25 \sigma_t$ units and $0.5 \cdot 10^{-4} \text{ rad}^2 \text{s}^{-2}$, respectively. This figure is continued on the next 3 pages.



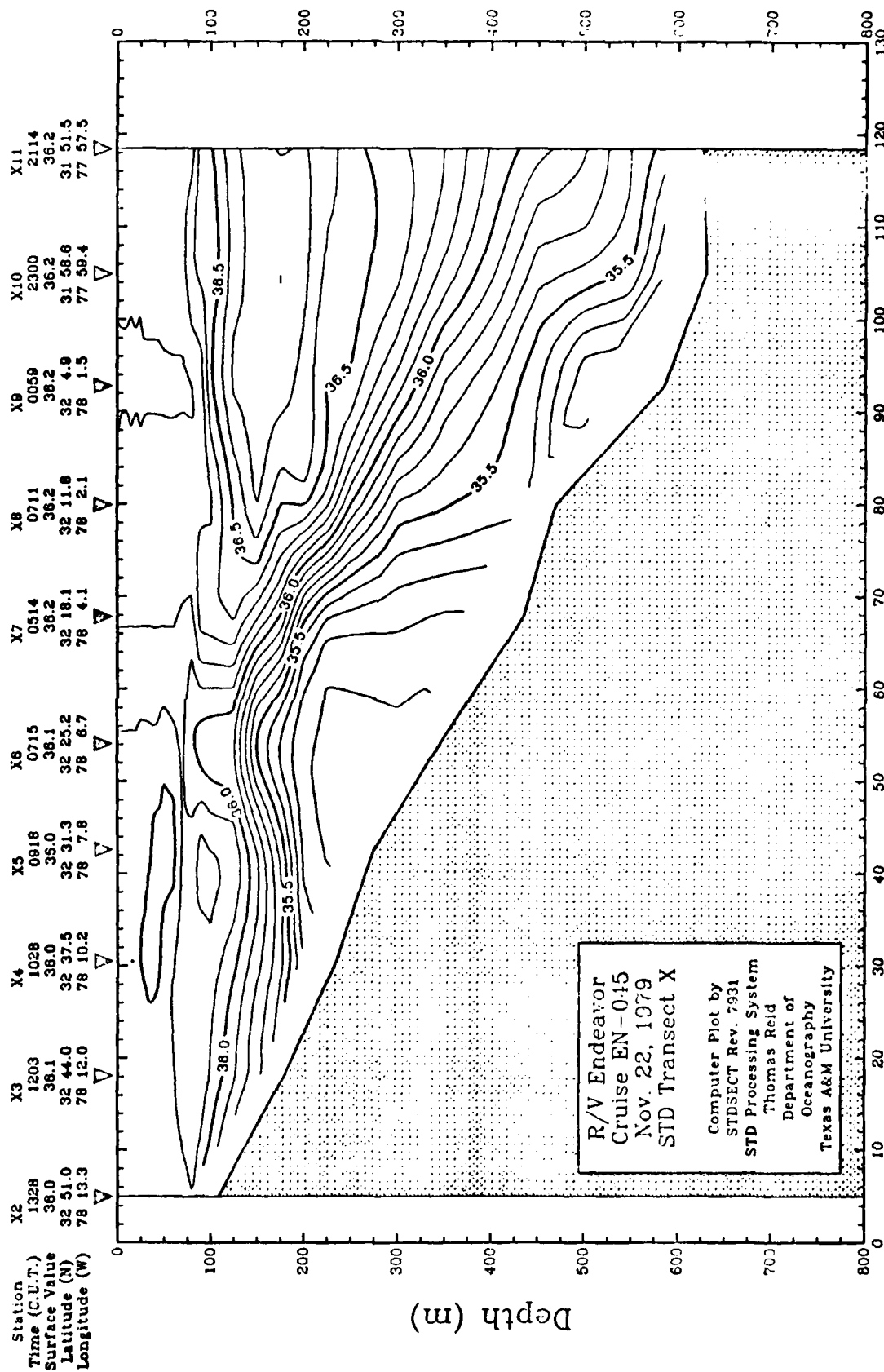


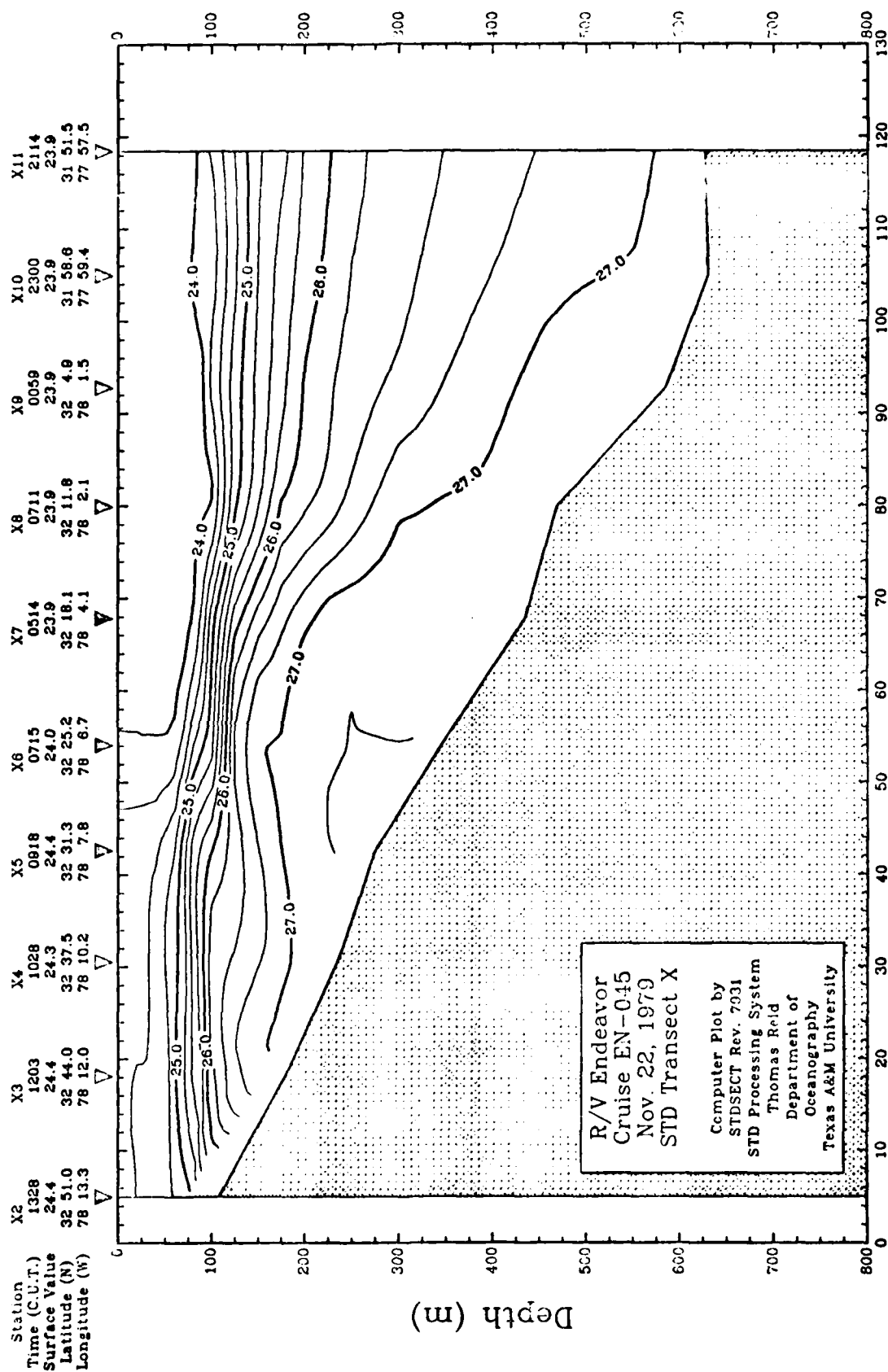


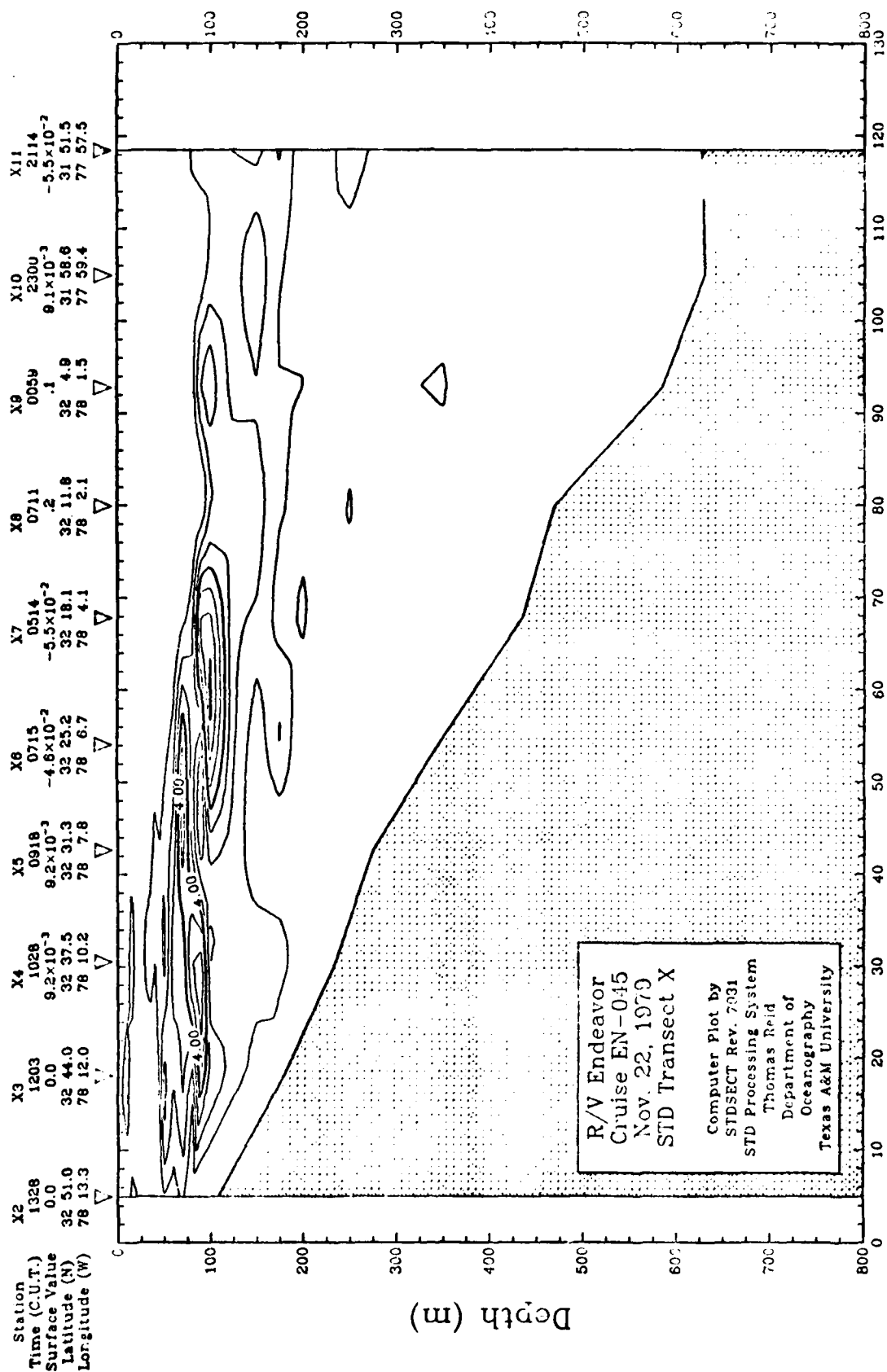


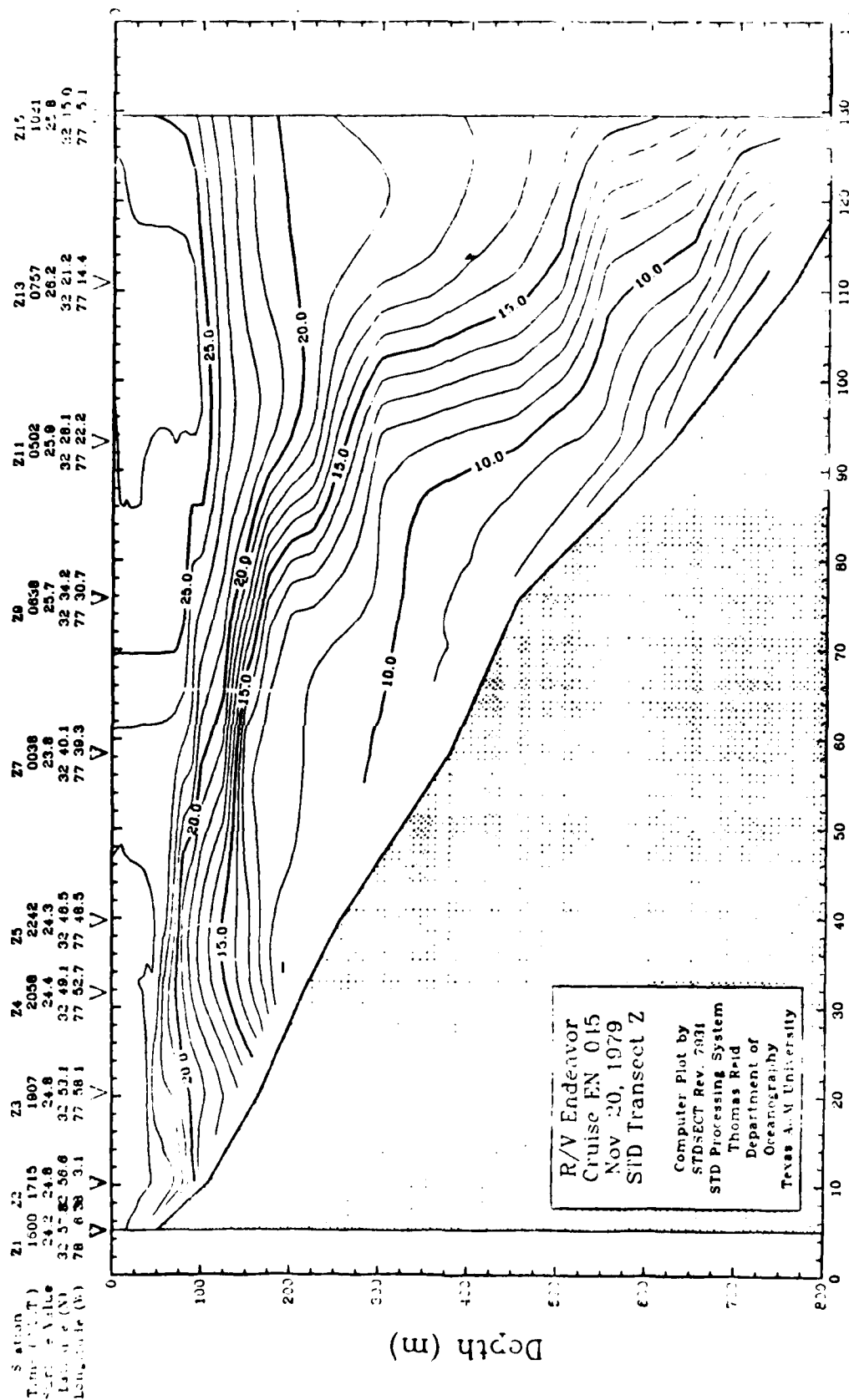
Distance Along Transect (Km)
Contours of Temperature (°C)

Figure 26 STD section contours of temperature, salinity and derived sigma-t, and N^2 fields for Transect X. Contour intervals are 1 0.1%, 0.25 σ_t units and 0.5×10^{-4} $\text{rad}^2 \text{s}^{-2}$, respectively. This figure is continued on the next 3 pages.



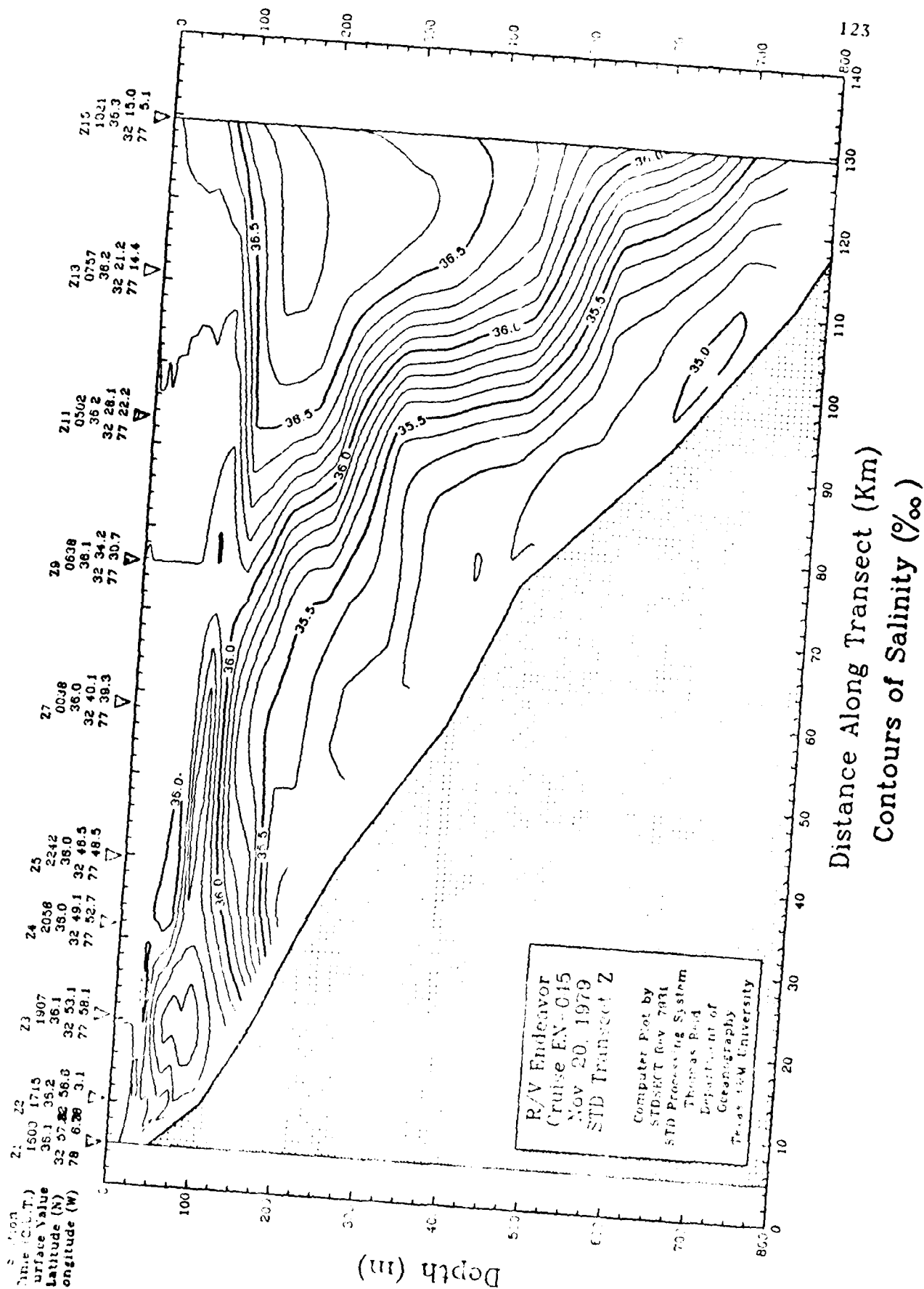


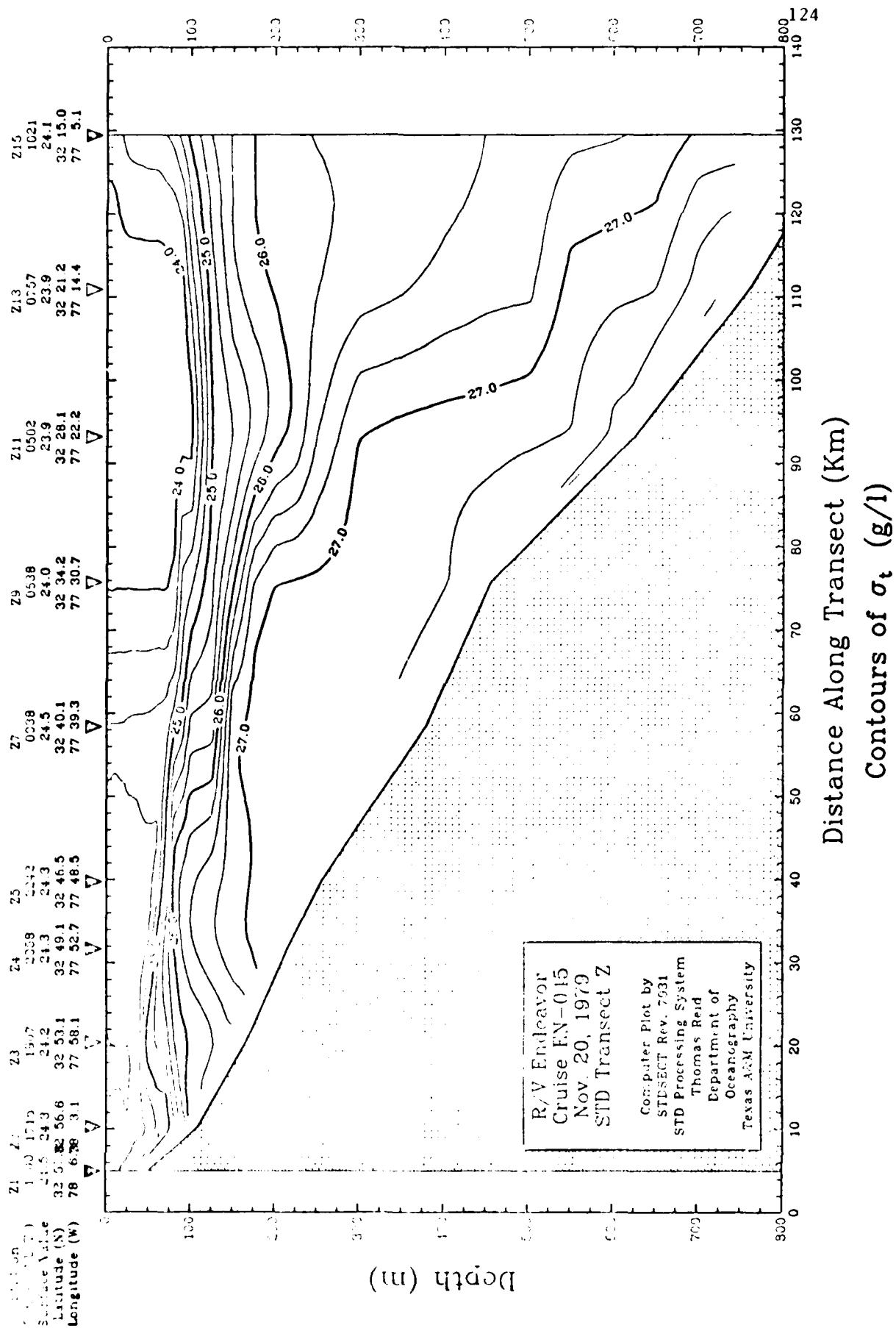




Distance Along Transect (Km)
Contours of Temperature (°C)

Figure 27. STD section contours of temperature, salinity and derived sigma-t, and N^2 fields for Transect Z. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units and $0.5 \times 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages





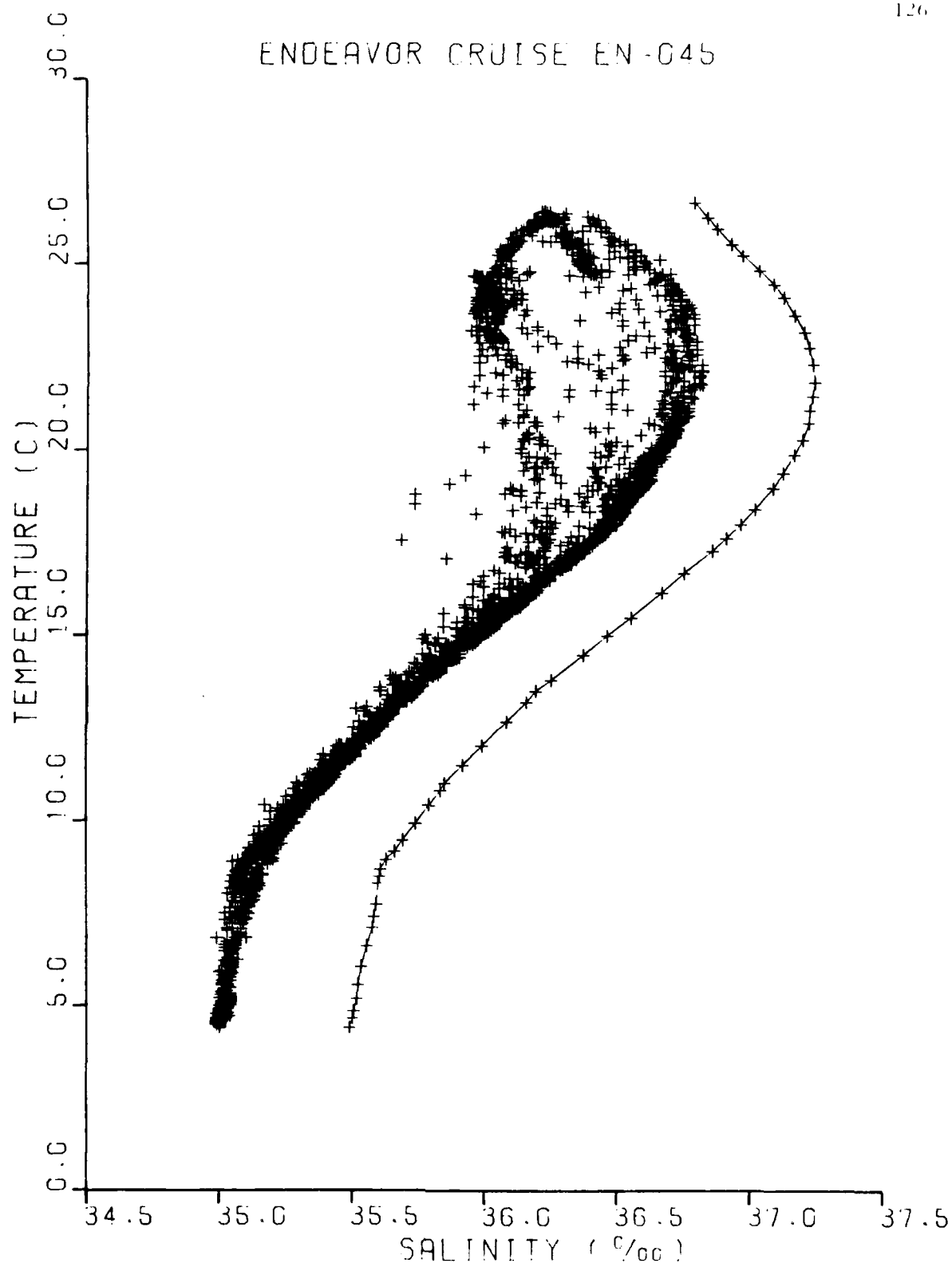


Figure 28. T-S diagram showing all STD points for EN-045 (crosses) and the resulting T-S correlation line fit by spline interpolation, which has been displaced to the right by 0.5‰. The stations used to generate this T-S correlation are listed in section 2.3

BUCKET TEMP. MINUS XBT SURFACE TEMP.

R/V ENDERVOR CRUISE EN-045

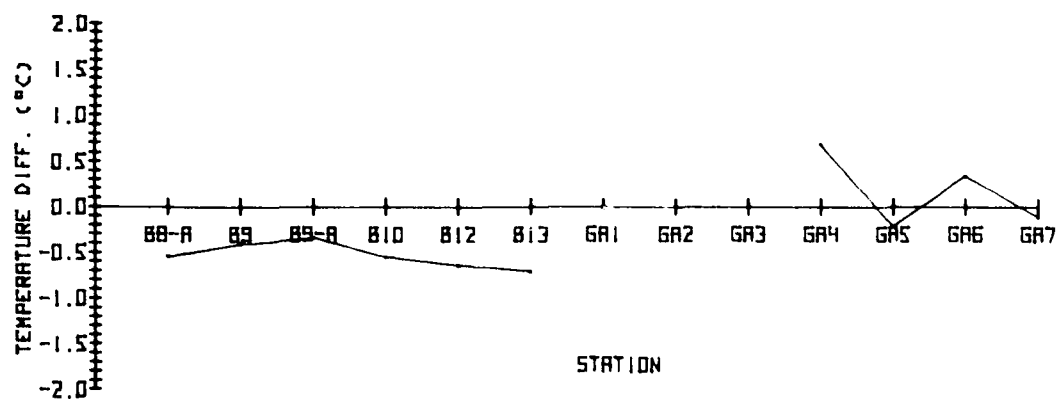
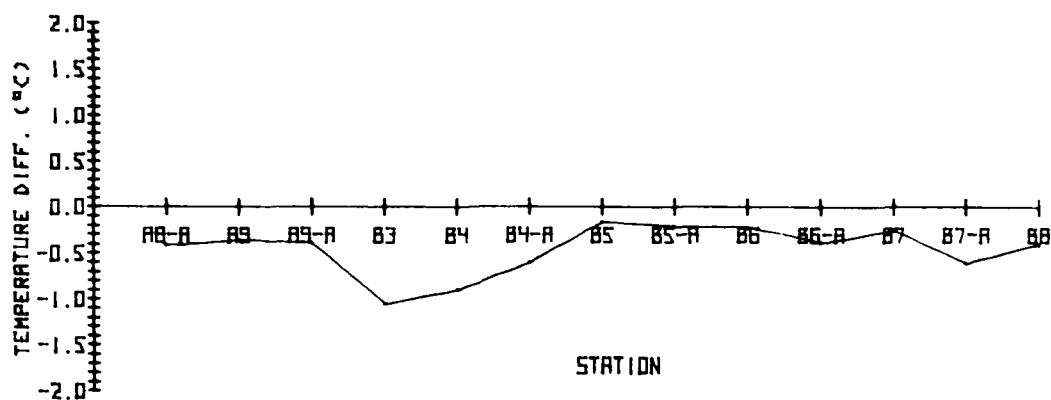
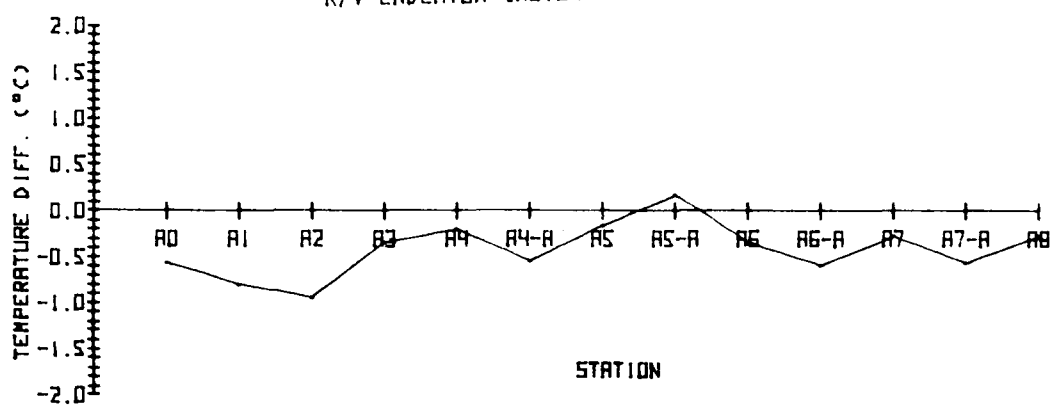
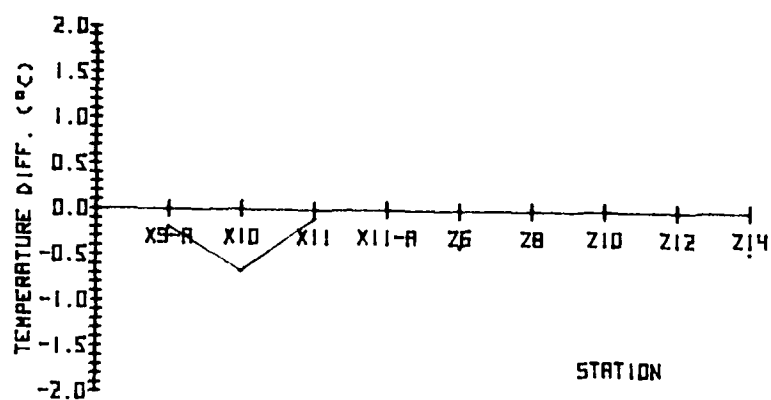
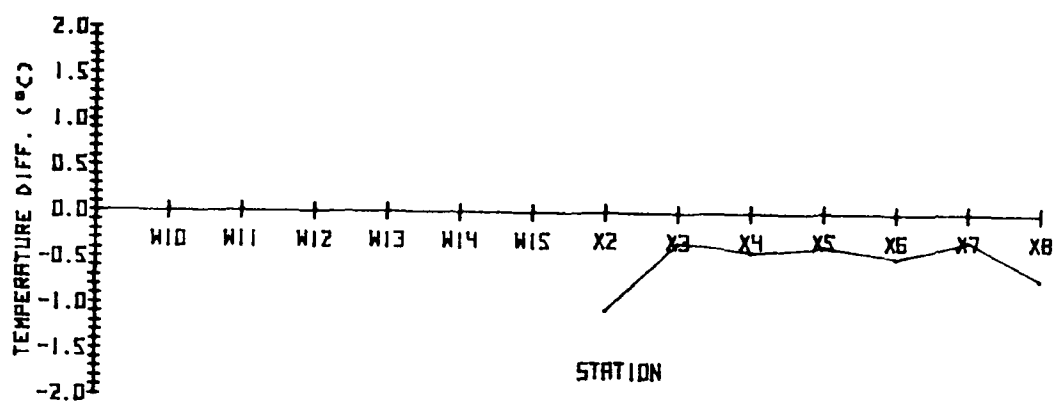
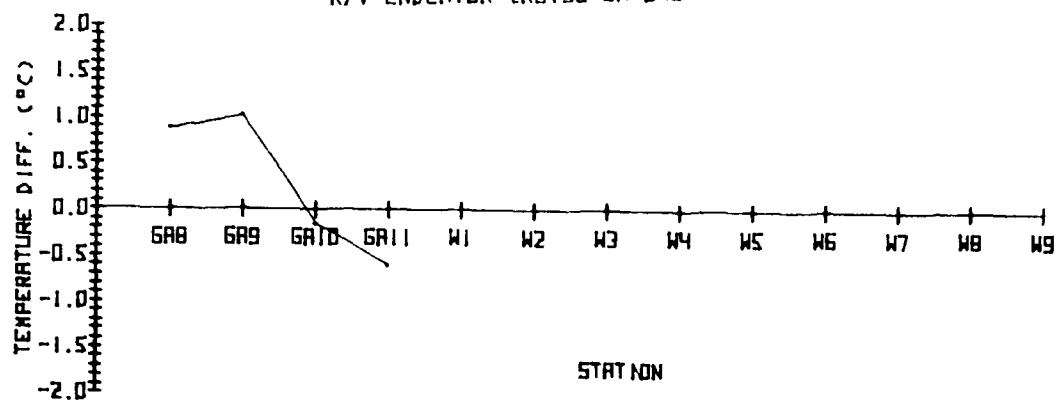


Figure 29. Comparison of surface bucket and XBT surface temperatures for EN-045. This figure is continued on the next page.

BUCKET TEMP. MINUS XBT SURFACE TEMP.

R/V ENDEAVOR CRUISE EN-045



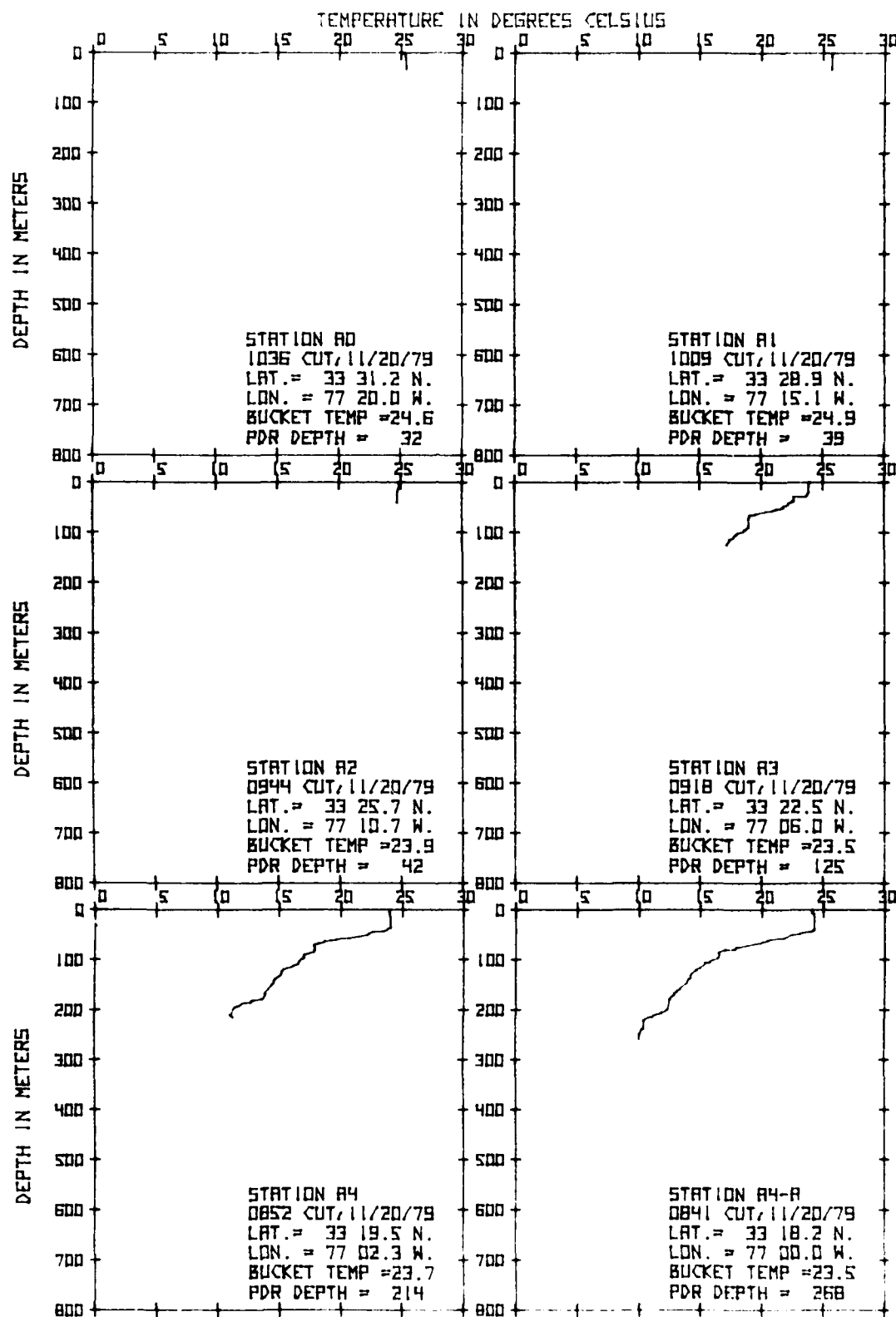
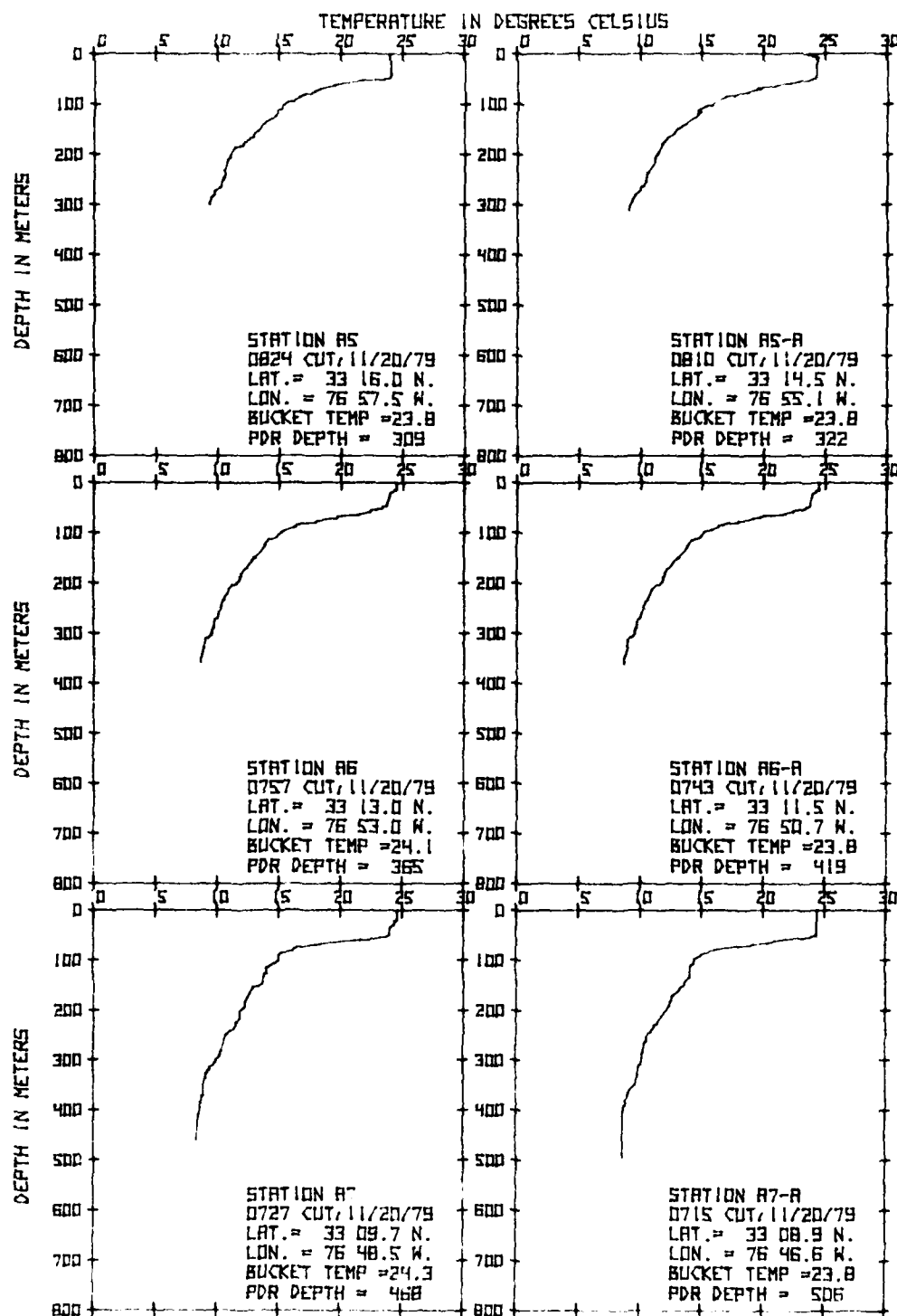
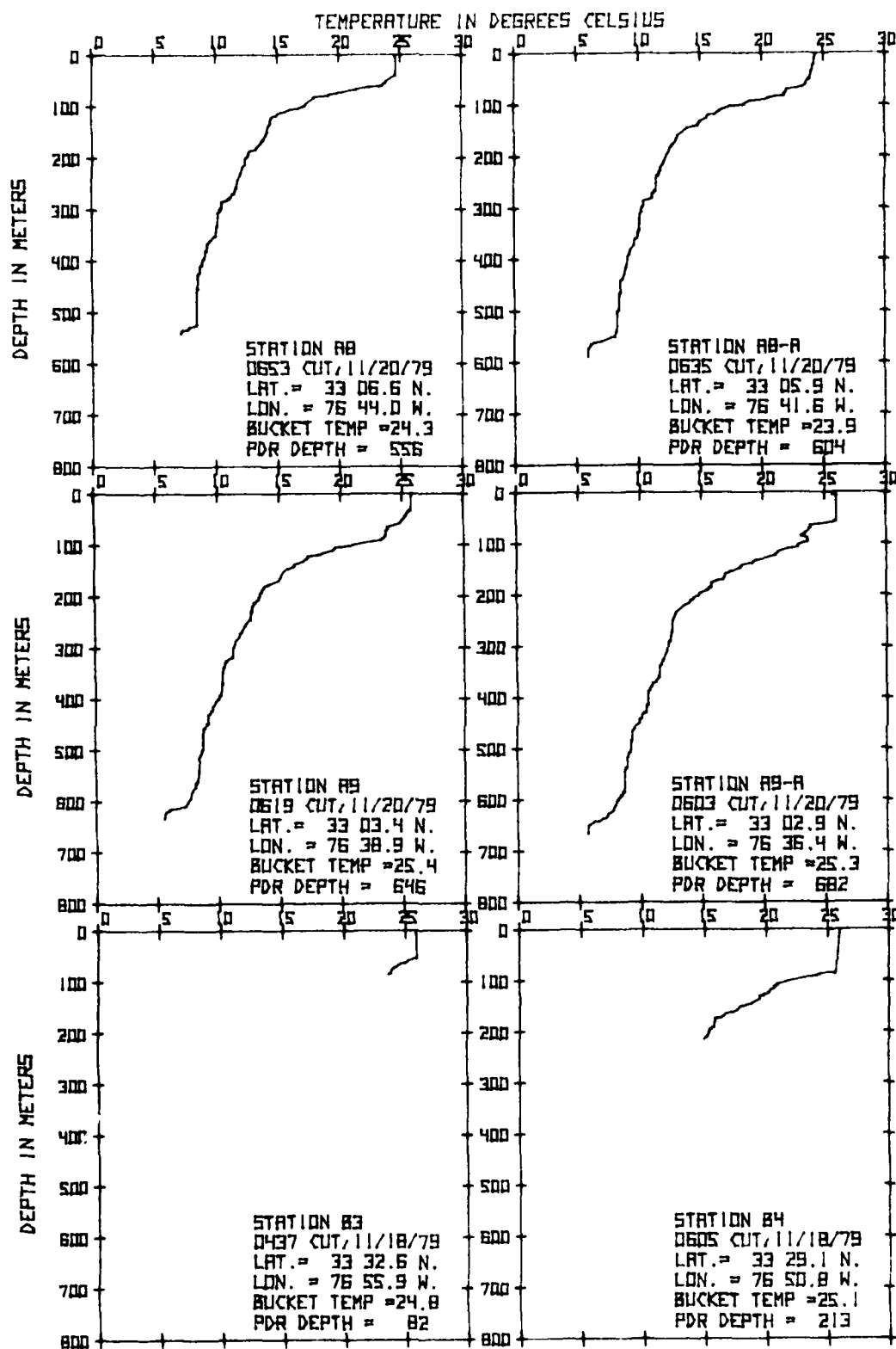
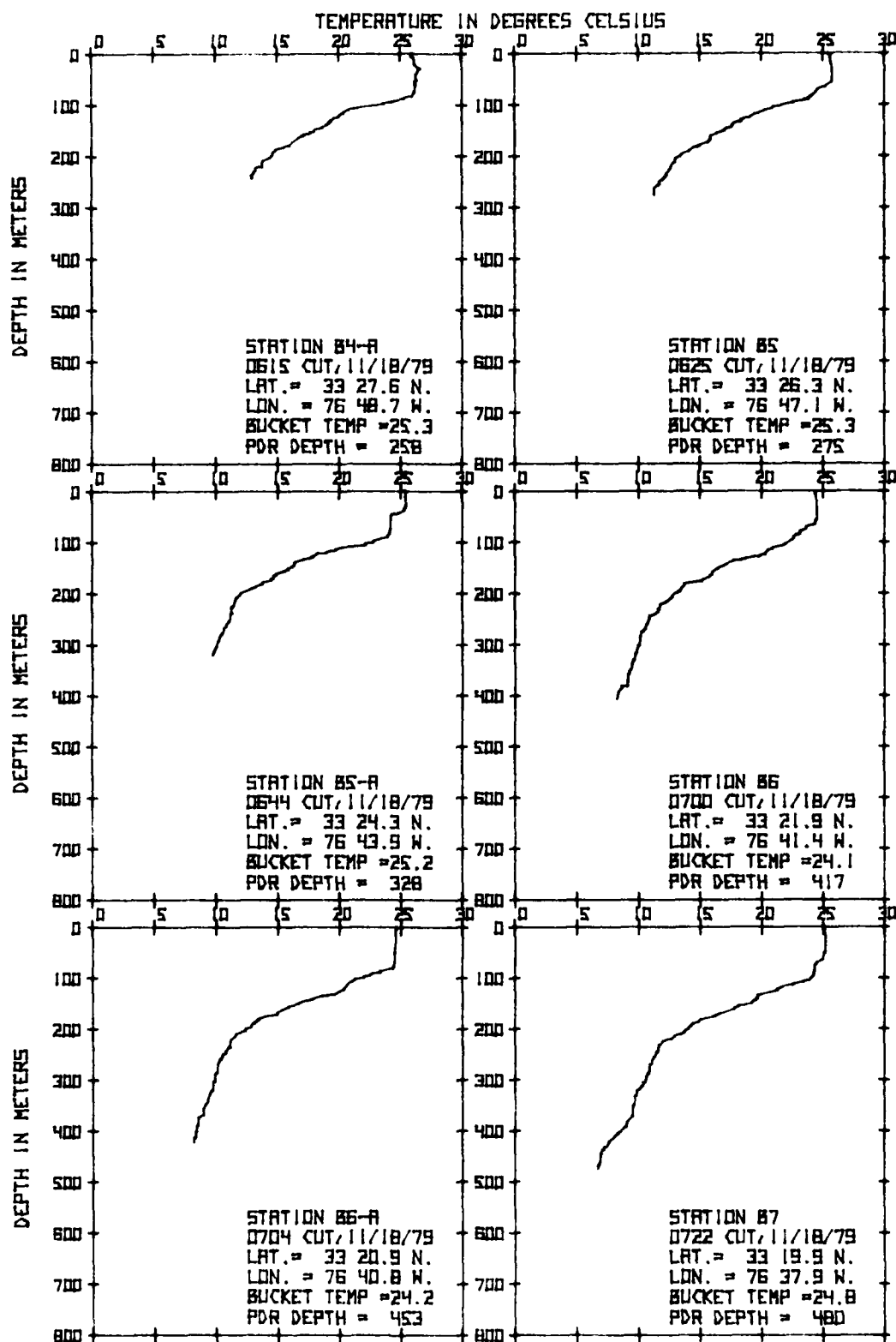
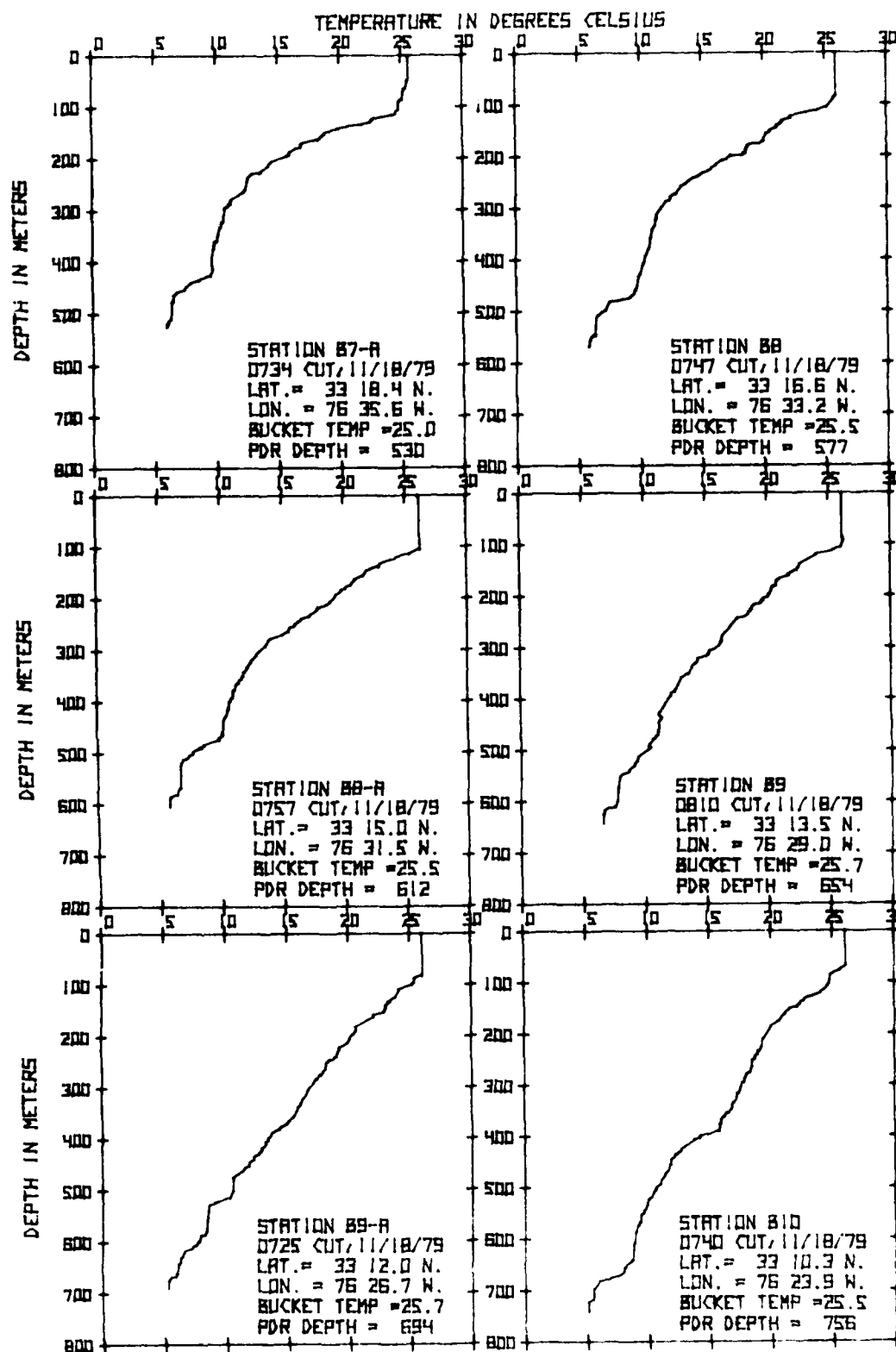


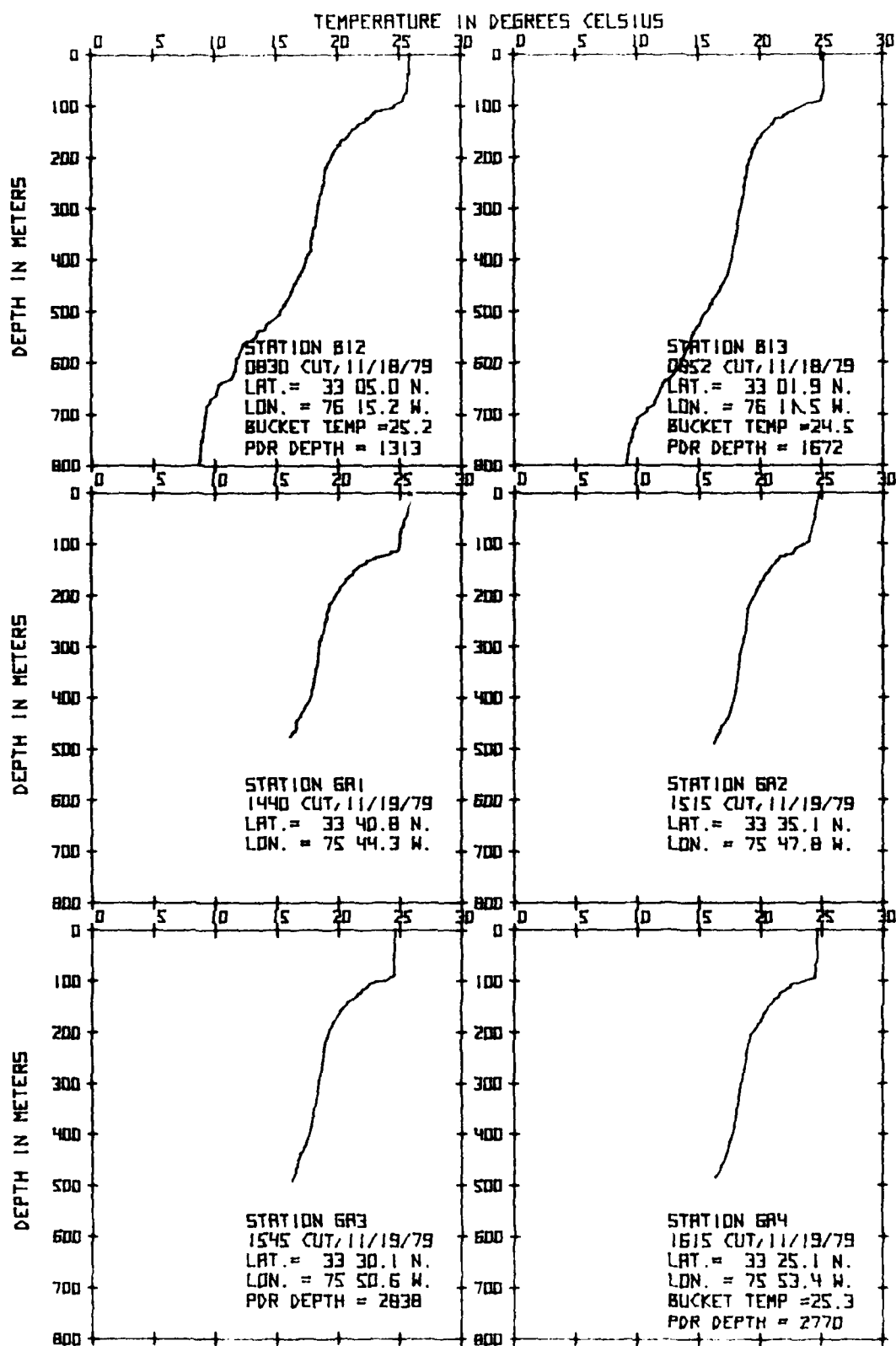
Figure 30. Individual XBT station temperature profiles. Station locations are shown in Figure 20. The profiles have not been forced to agree with surface bucket temperatures. This figure is continued on the next 12 pages.

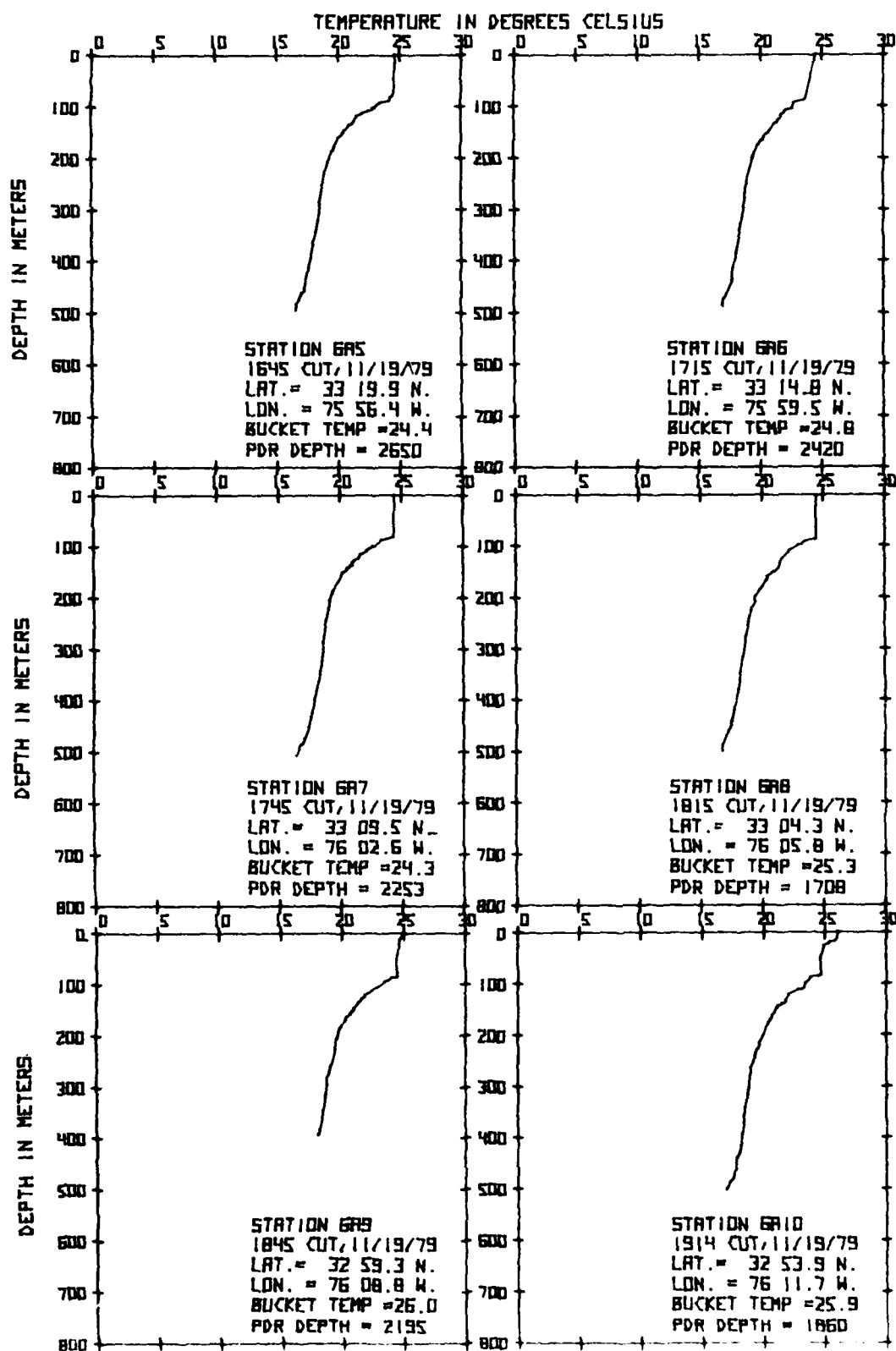


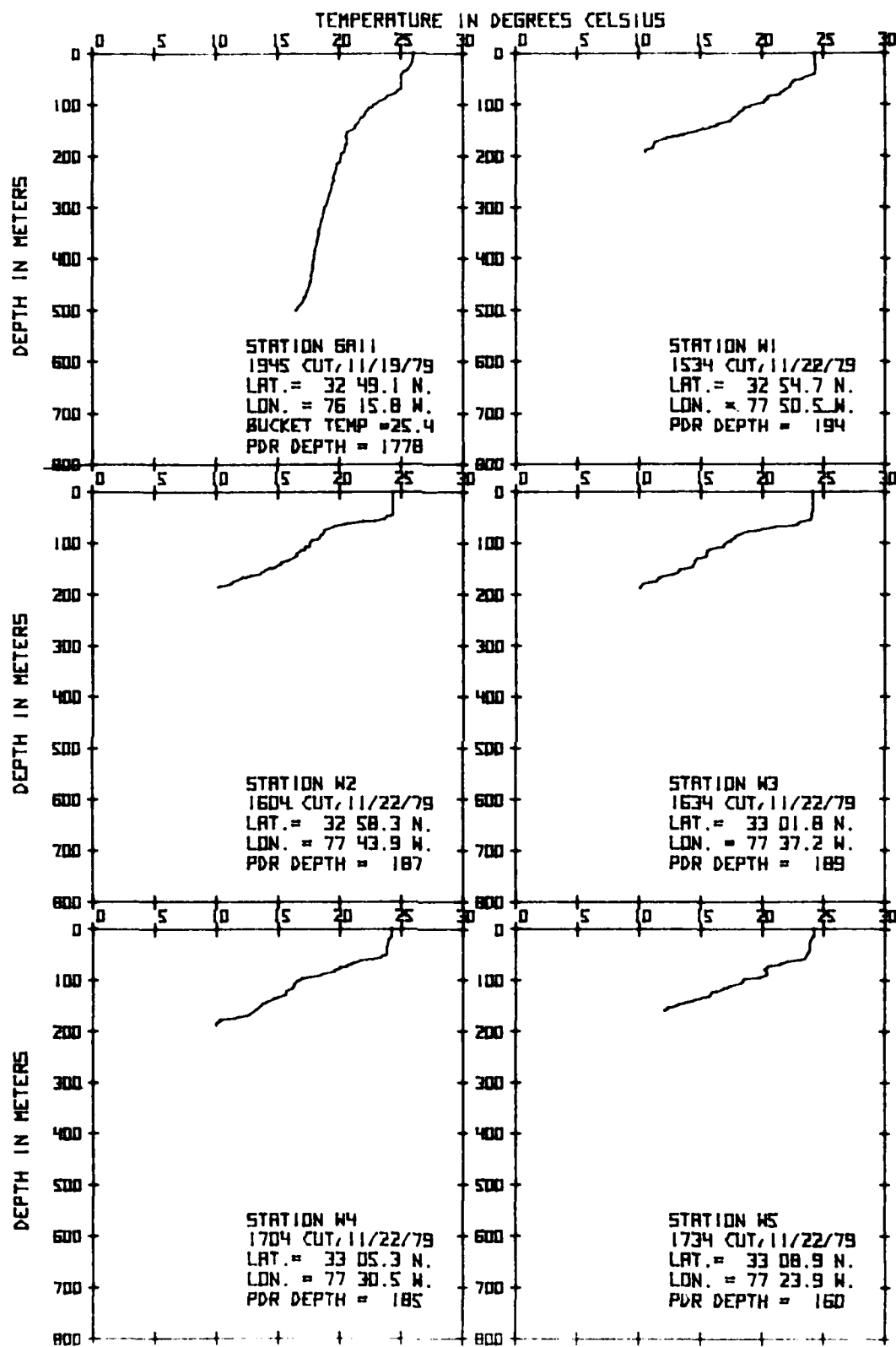


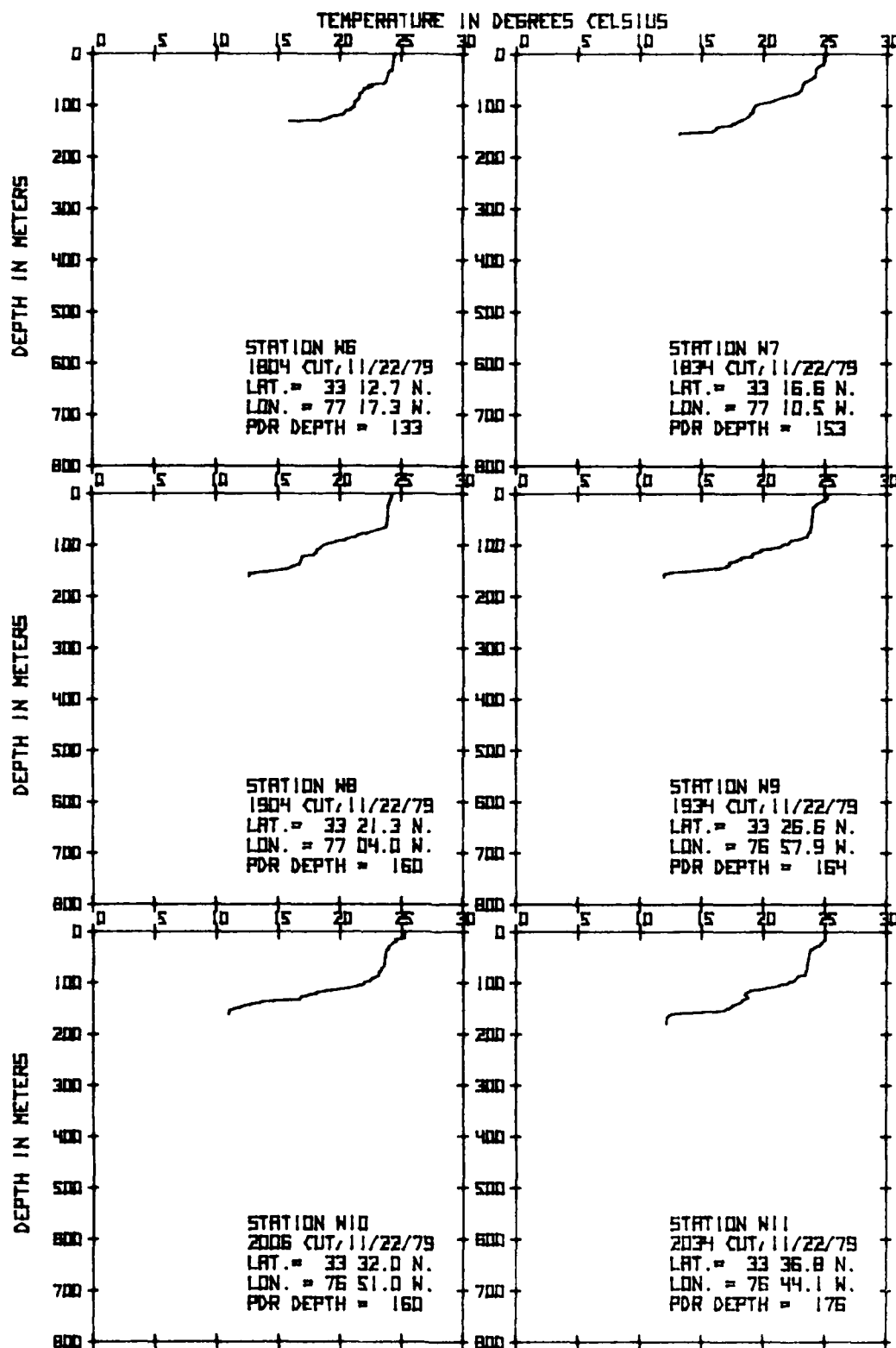


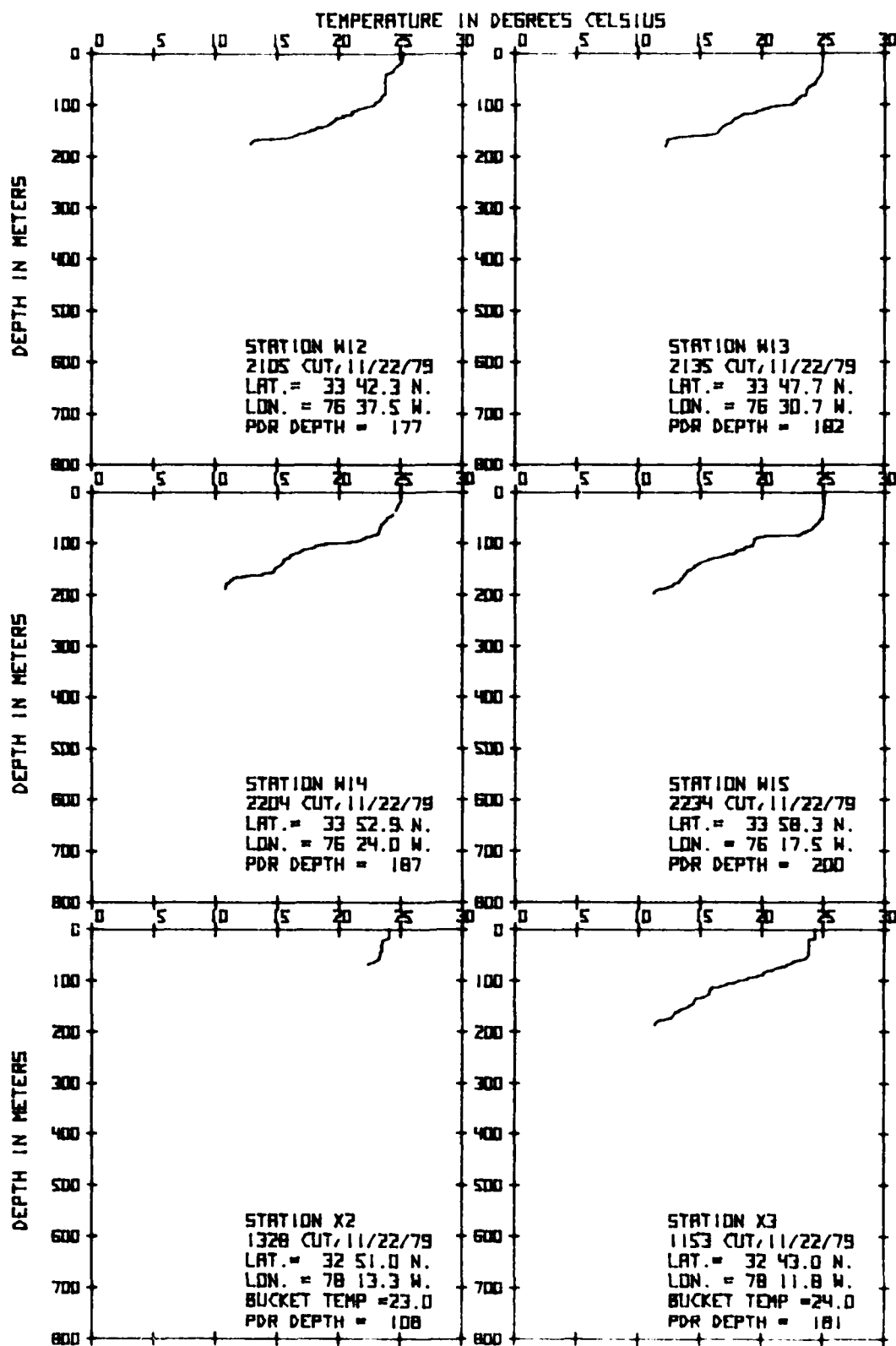


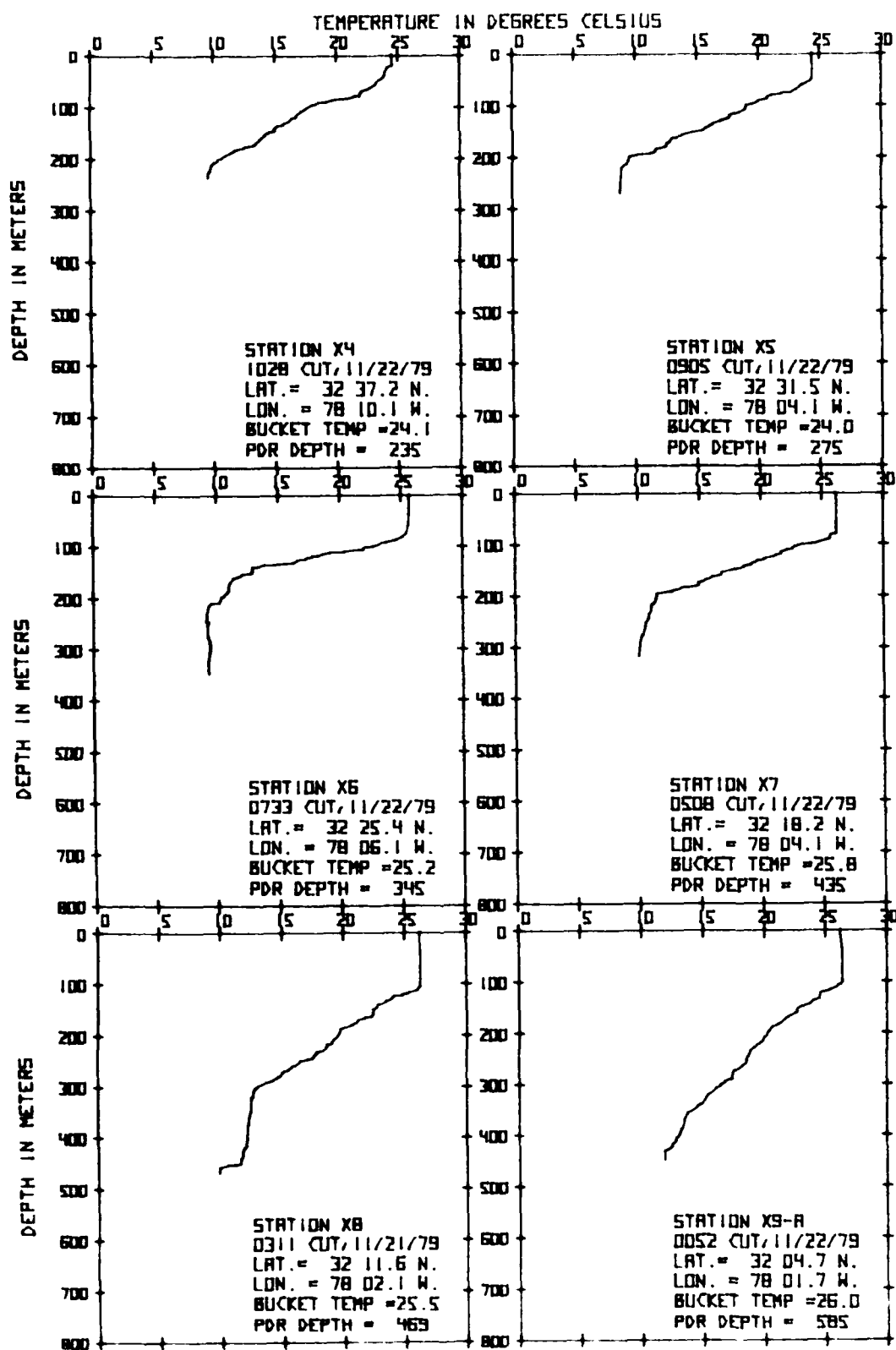


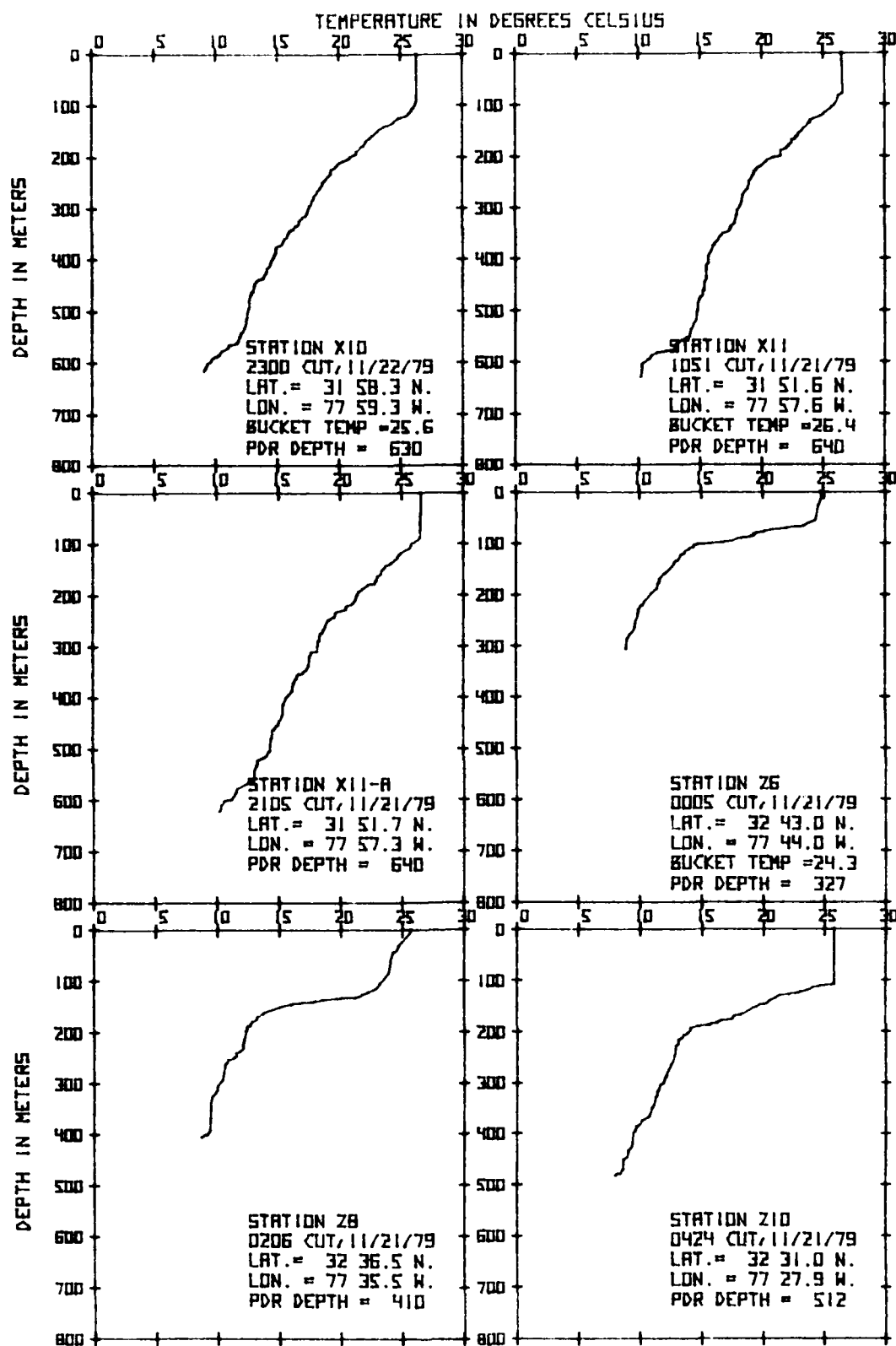


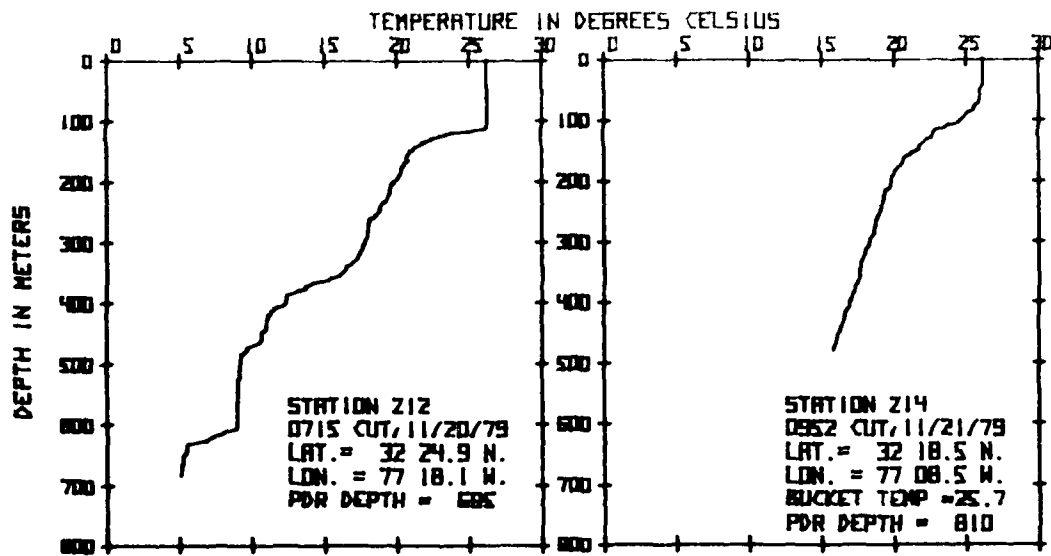












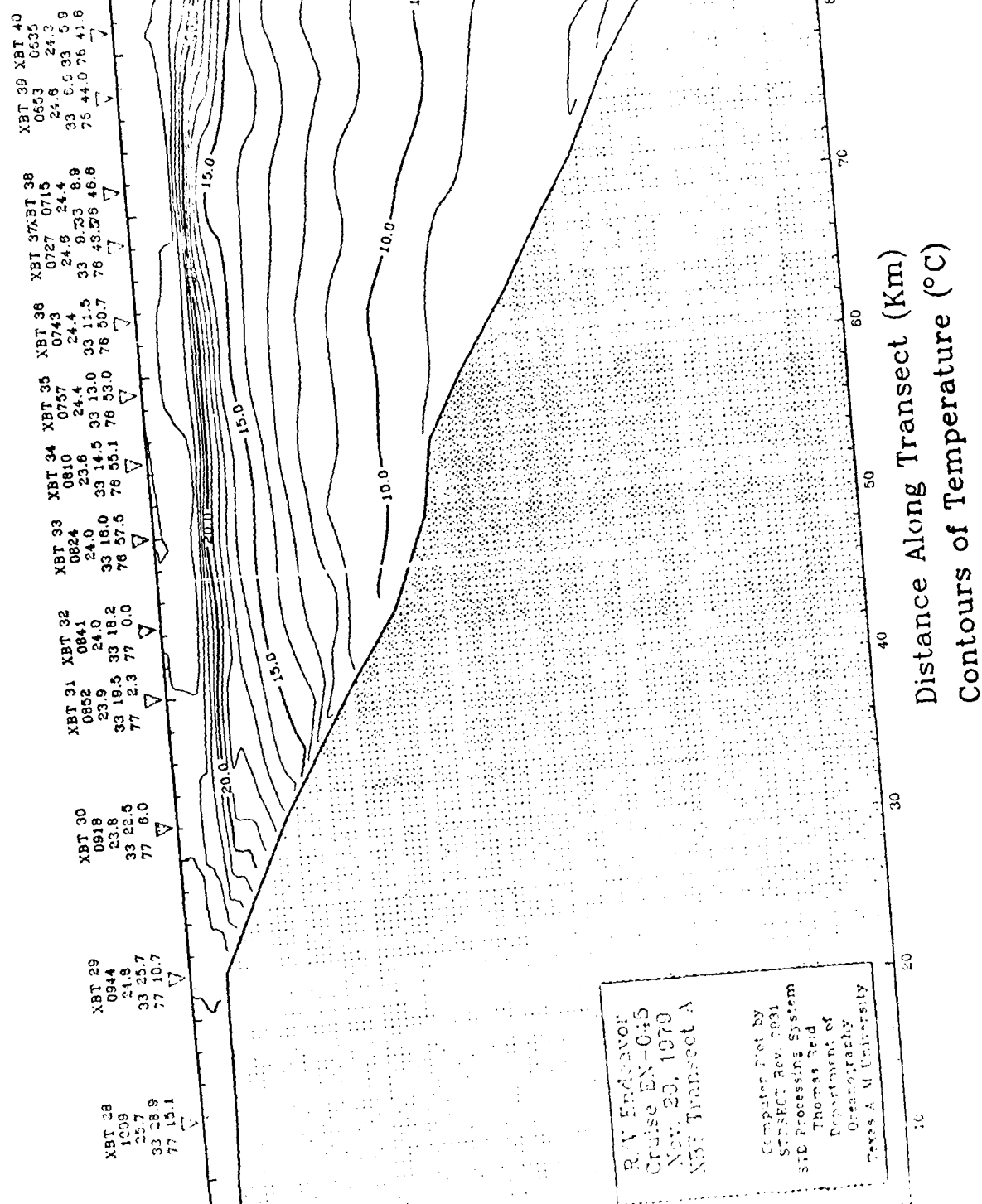
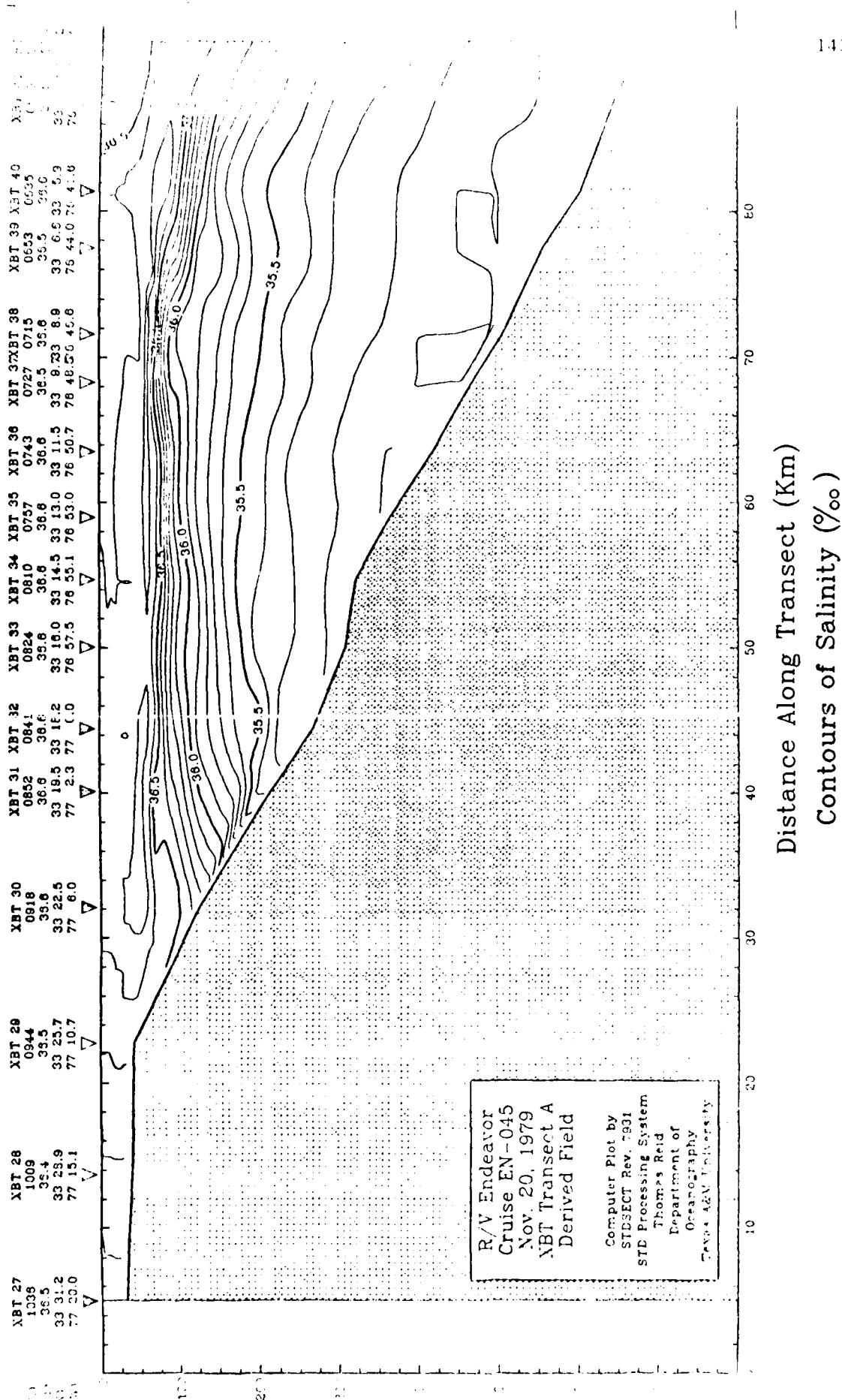
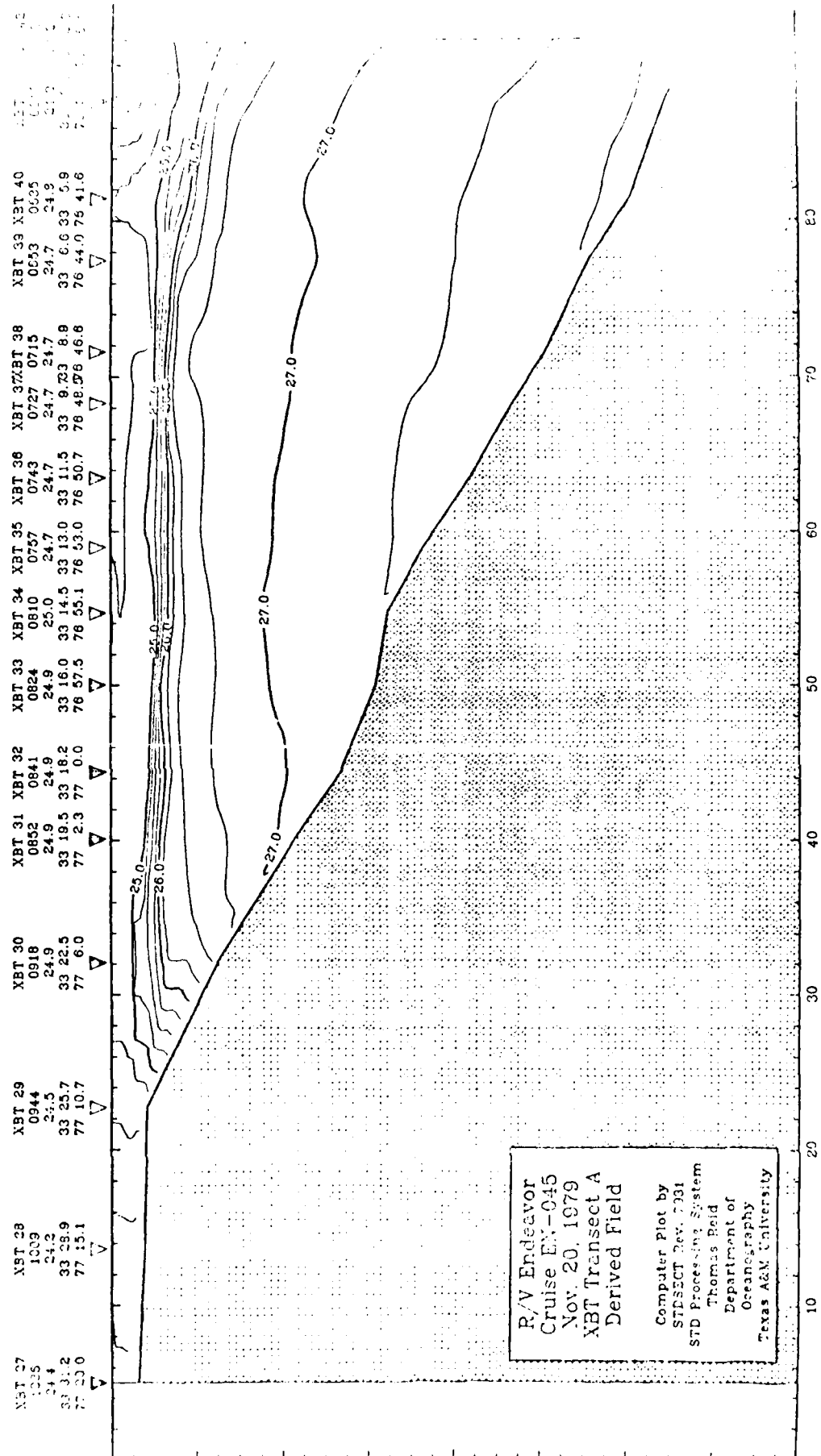
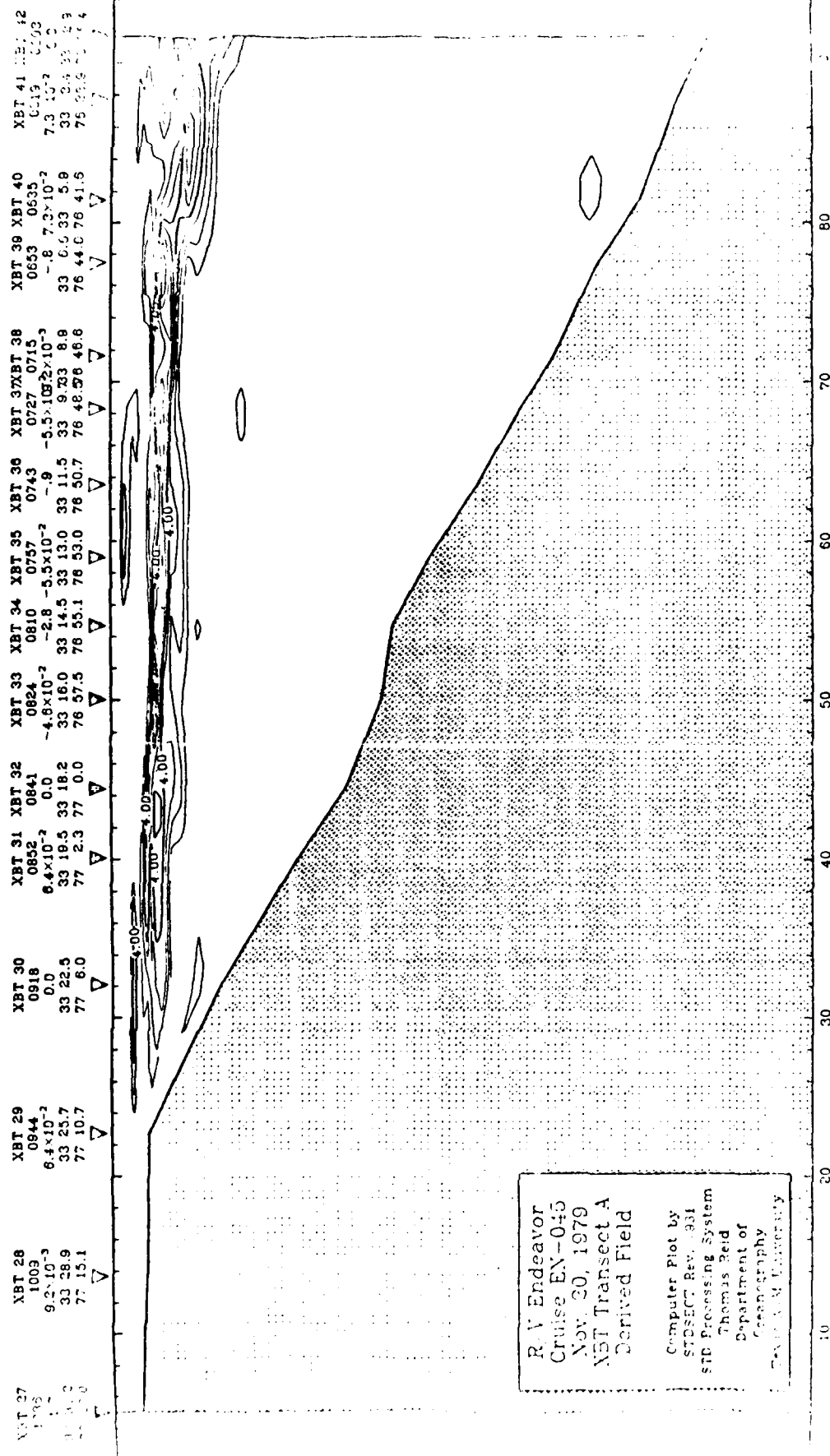


Figure 31. Section contours of temperature and derived salinity, sigma-t and N₂ fields for Transect A. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units, and 0.5 × 10⁻⁴ rad² s⁻², respectively. This figure is continued on the next 3 pages.





Distance Along Transect (Km)
Contours of σ_t (g/l)



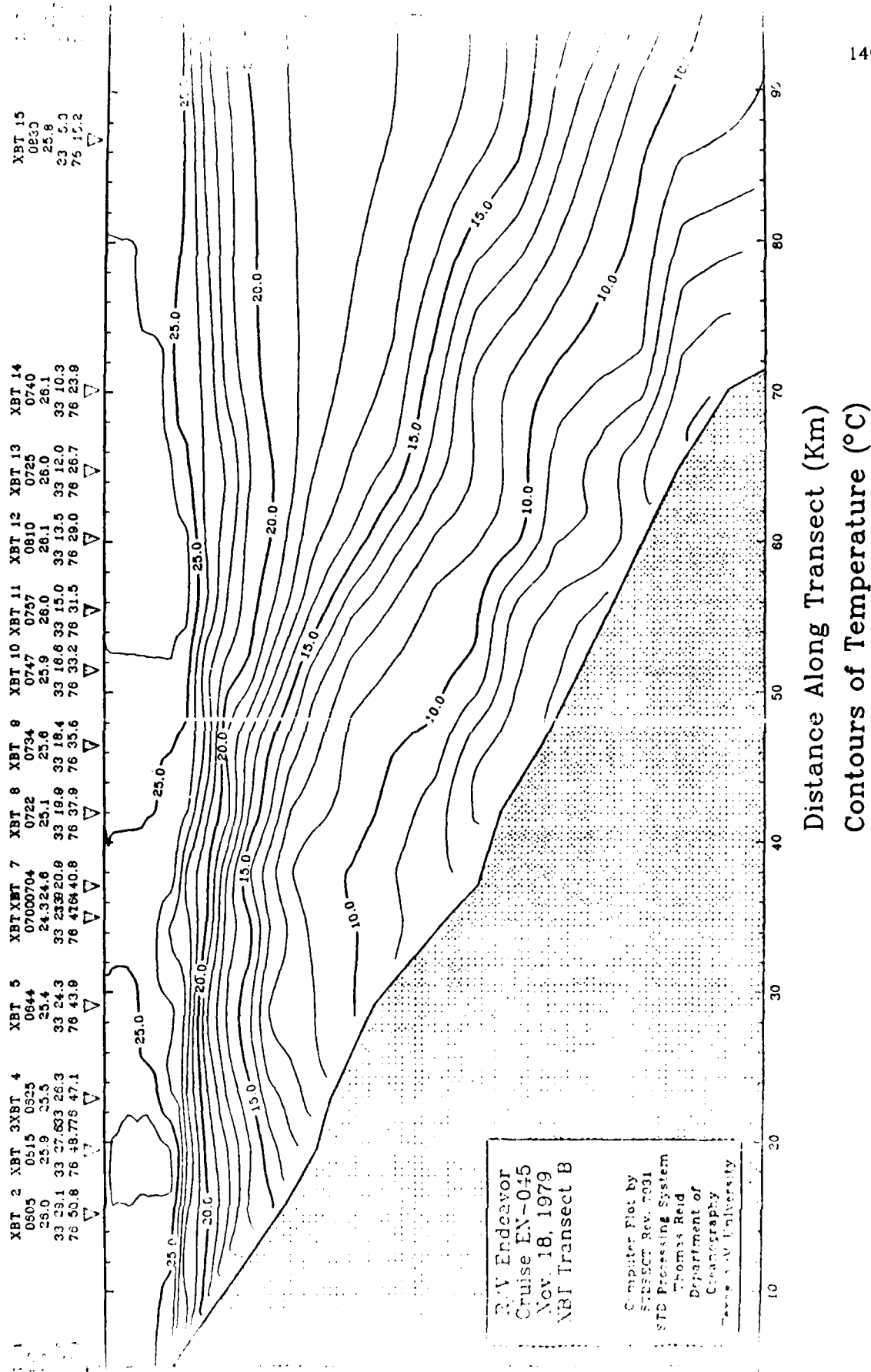
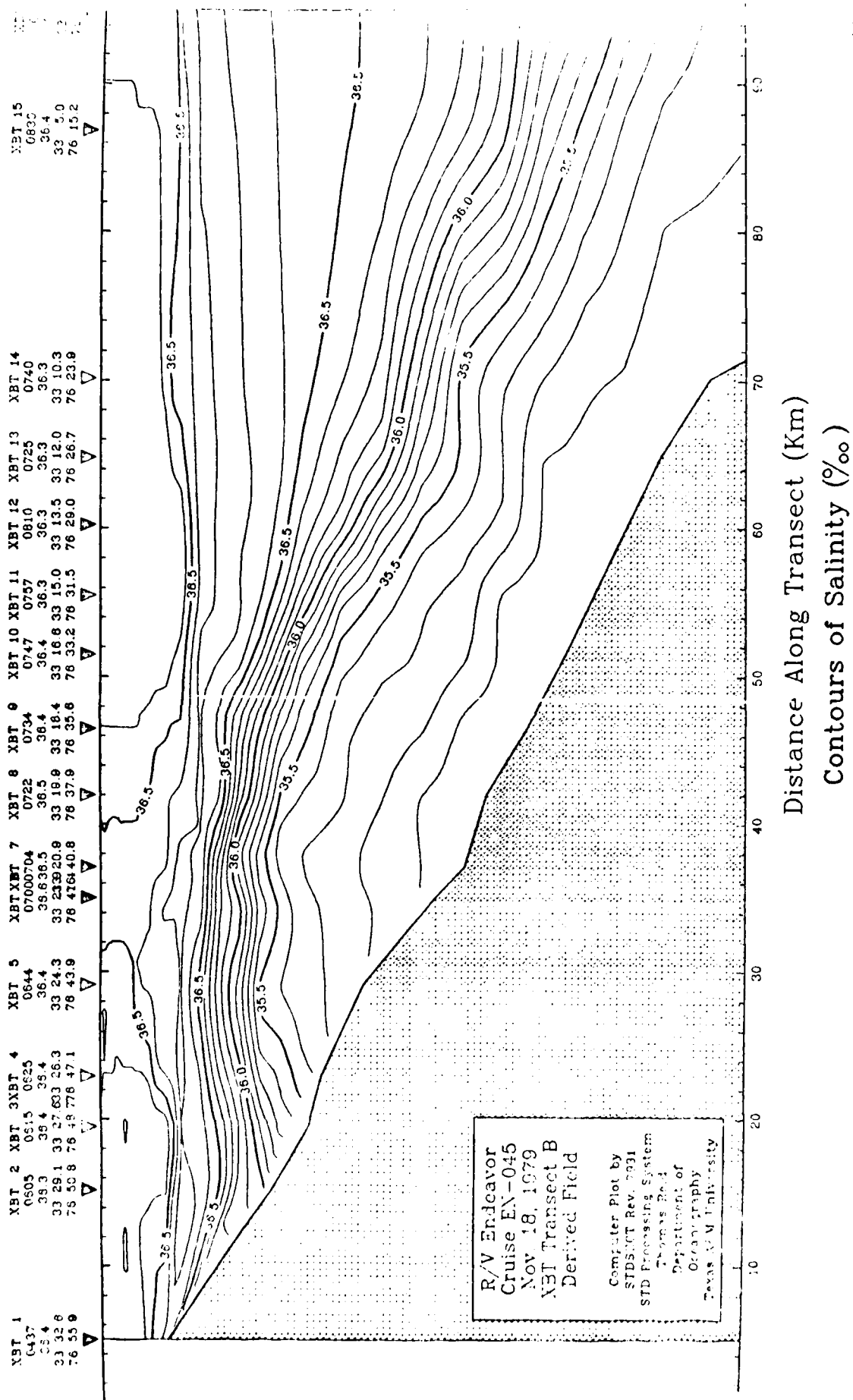
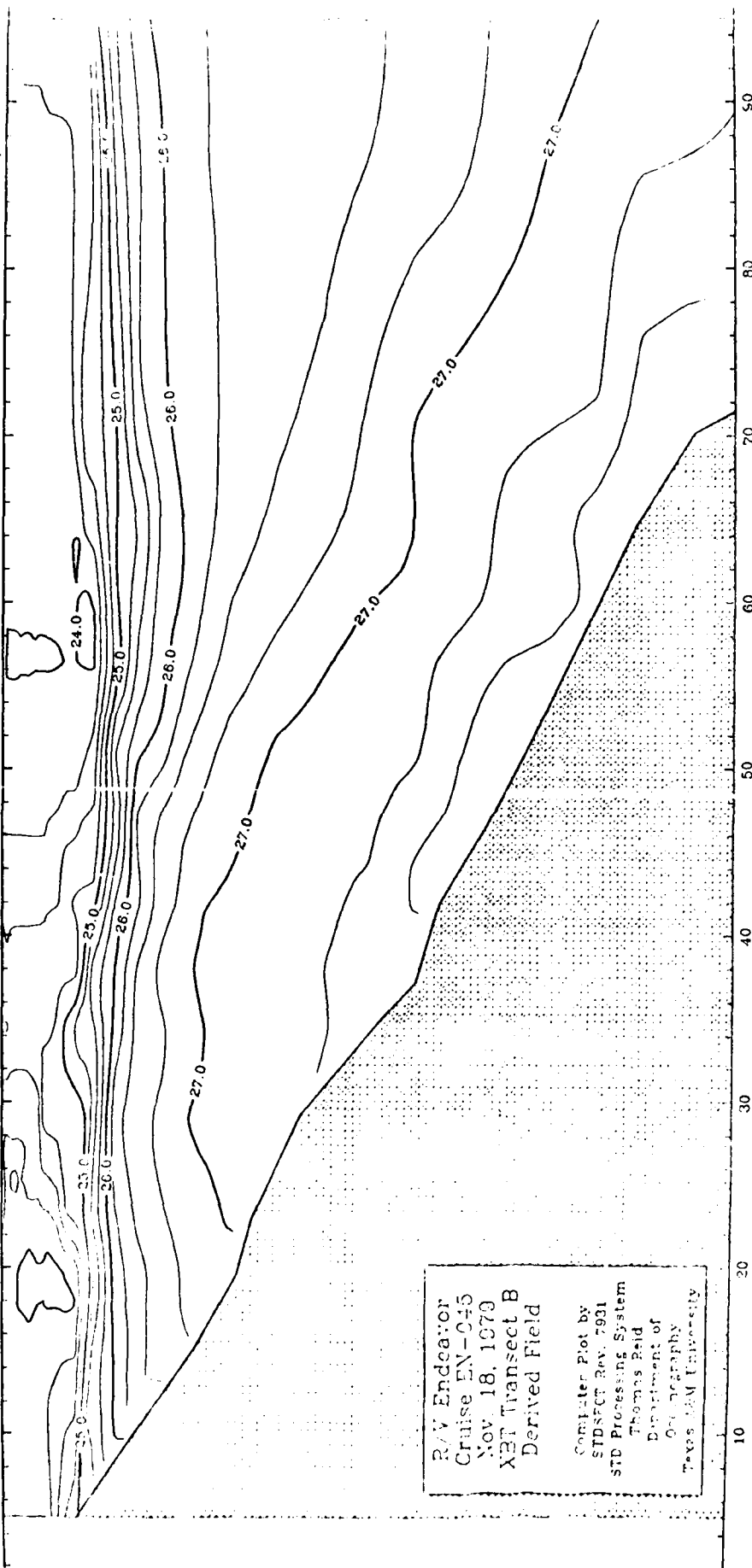


Figure 32. Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect B. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \cdot \text{s}^{-2}$, respectively. This figure is continued on the next 3 pages.

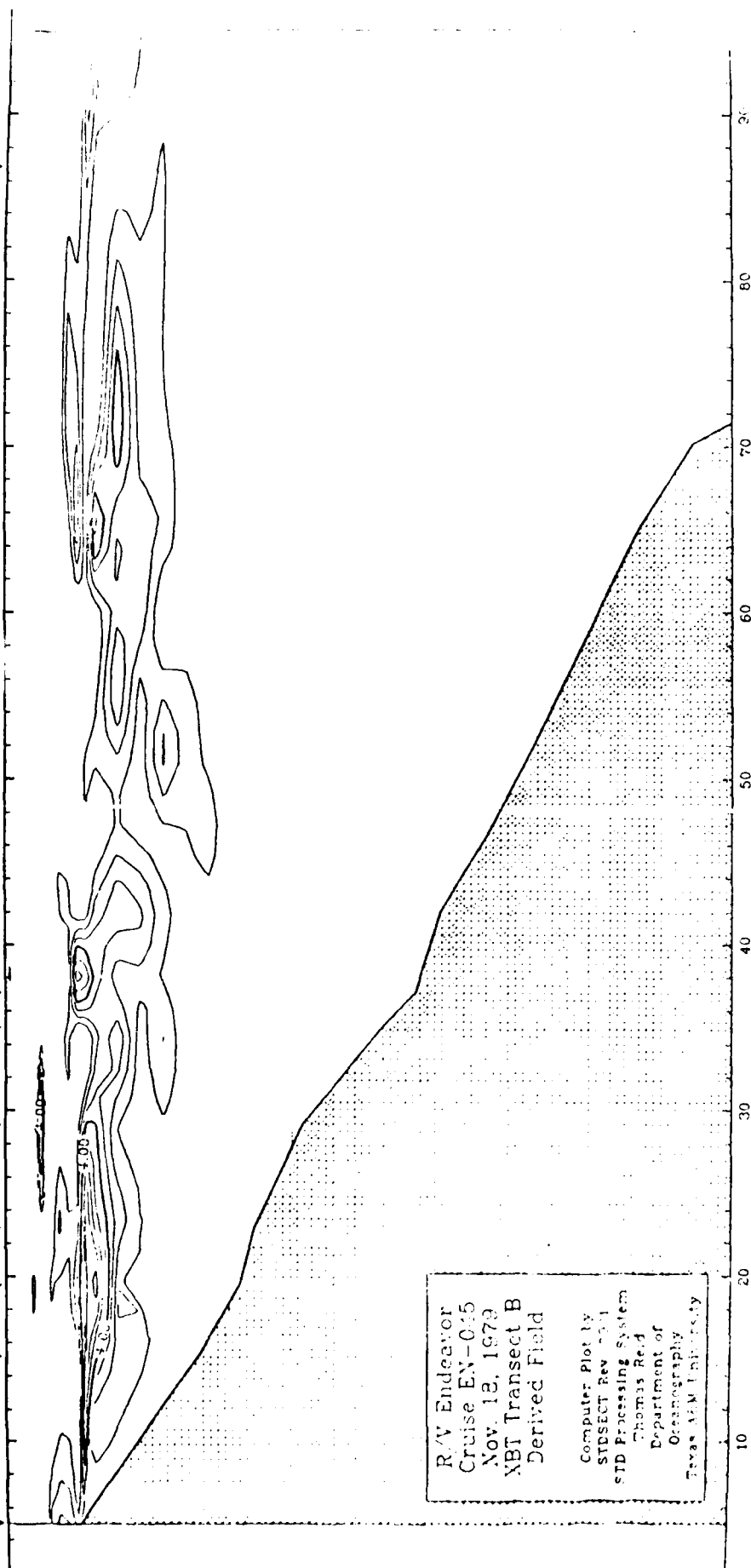


XBT 1	XBT 2	XBT 3	XBT 4	XBT 5	XBT 6	XBT 7	XBT 8	XBT 9	XBT 10	XBT 11	XBT 12	XBT 13	XBT 14	XBT 15
0437	0505	0515	0525	0644	0700	0704	0722	0734	0747	0757	0810	0725	0740	0830
24.1	24.1	24.1	24.3	24.3	24.8	24.7	24.5	24.2	24.1	24.1	24.0	24.1	24.1	24.1
33 22.6	33 29.1	33 37.6	33 43.9	33 43.9	33 23.9	33 20.9	33 19.9	33 18.4	33 16.6	33 15.0	33 13.5	33 12.0	33 10.3	33 5.0
76 53.9	76 52.8	76 48.7	76 47.1	76 43.9	76 40.8	76 37.9	76 35.6	76 33.2	76 31.5	76 29.0	76 26.7	76 23.9	76 21.2	76 15.2



Distance Along Transect (Km)
Contours of σ_t (g/l)

XBT 1	XBT 2	XBT 3	XBT 4	XBT 5	XBT 6	XBT 7	XBT 8	XBT 9	XBT 10	XBT 11	XBT 12	XBT 13	XBT 14	XBT 15
0437	0605	0815	0825	0844	0722	0700	0734	0747	0757	0810	0725	0740	0750	0830
-3	3	9.1×10^{-3}	-1.2	-4	-7	9.1×10^{-3}	0.0	9.1×10^{-3}	-1.2	-5.5×10^{-3}	8.2×10^{-3}	8.1×10^{-3}	0.0	0.0
33 32.8	33 29.1	33 27.63	33 26.3	33 24.3	33 19.9	33 20.9	33 18.4	33 16.6	33 15.0	33 13.5	33 12.0	33 10.3	33 9.0	33 7.0
75 55.8	76 50.8	76 48.76	76 47.1	76 43.9	76 37.9	76 40.8	76 35.6	76 33.2	76 31.5	76 29.0	76 26.7	76 23.9	76 21.2	76 18.0



Distance Along Transect (Km)
Contours of N^2 ($10^4 \text{ rad}^2/\text{s}^2$)

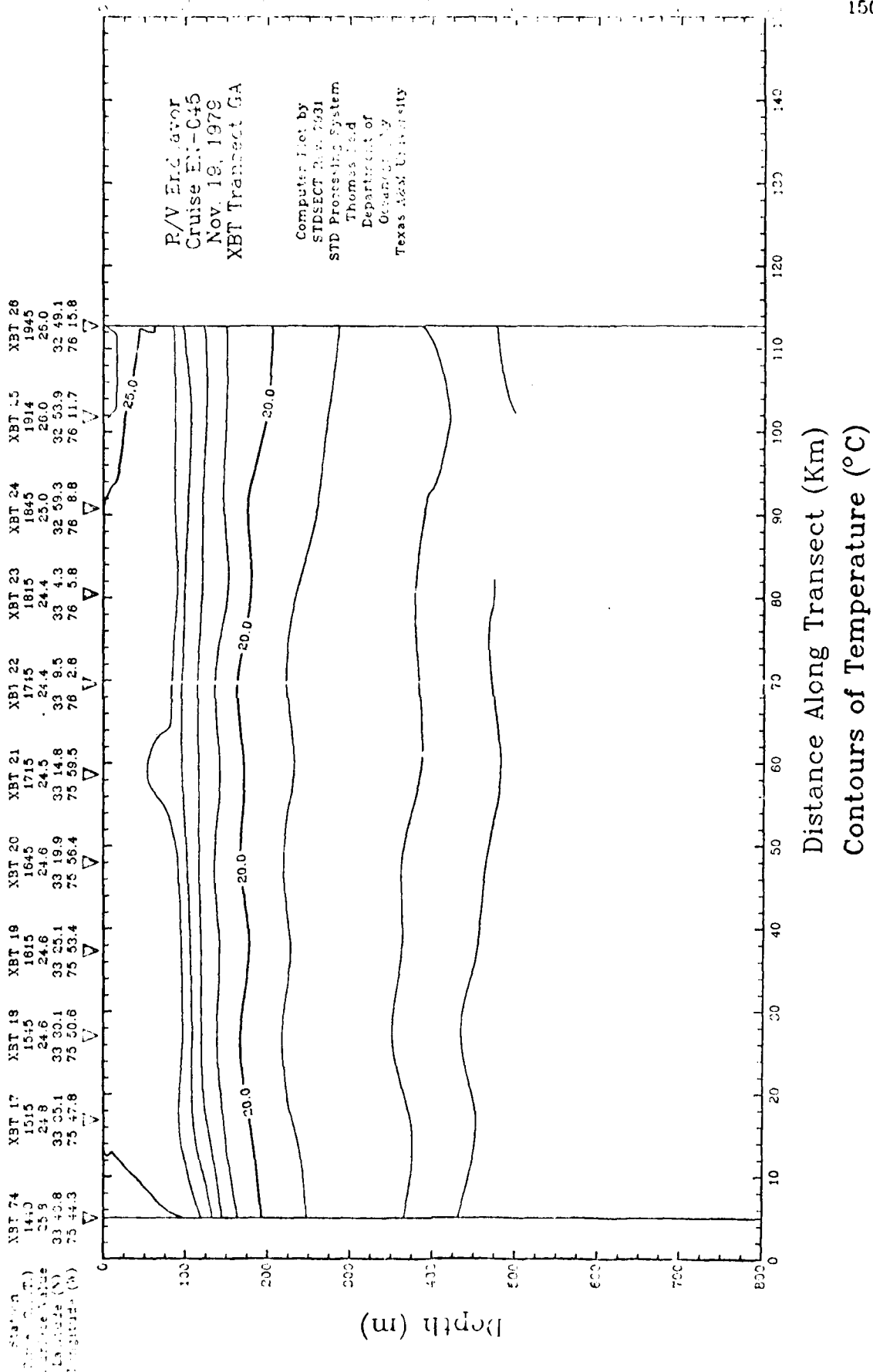
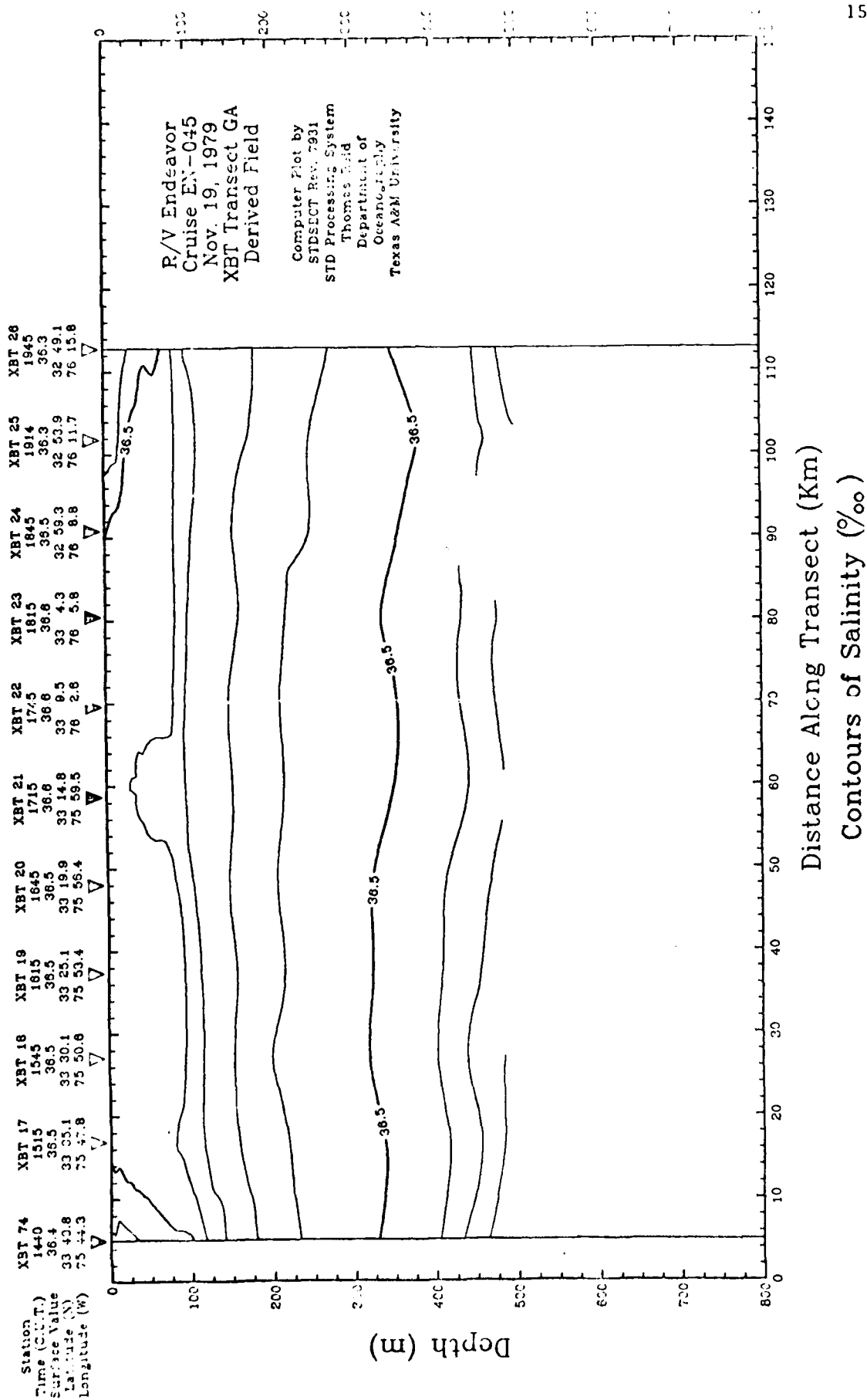
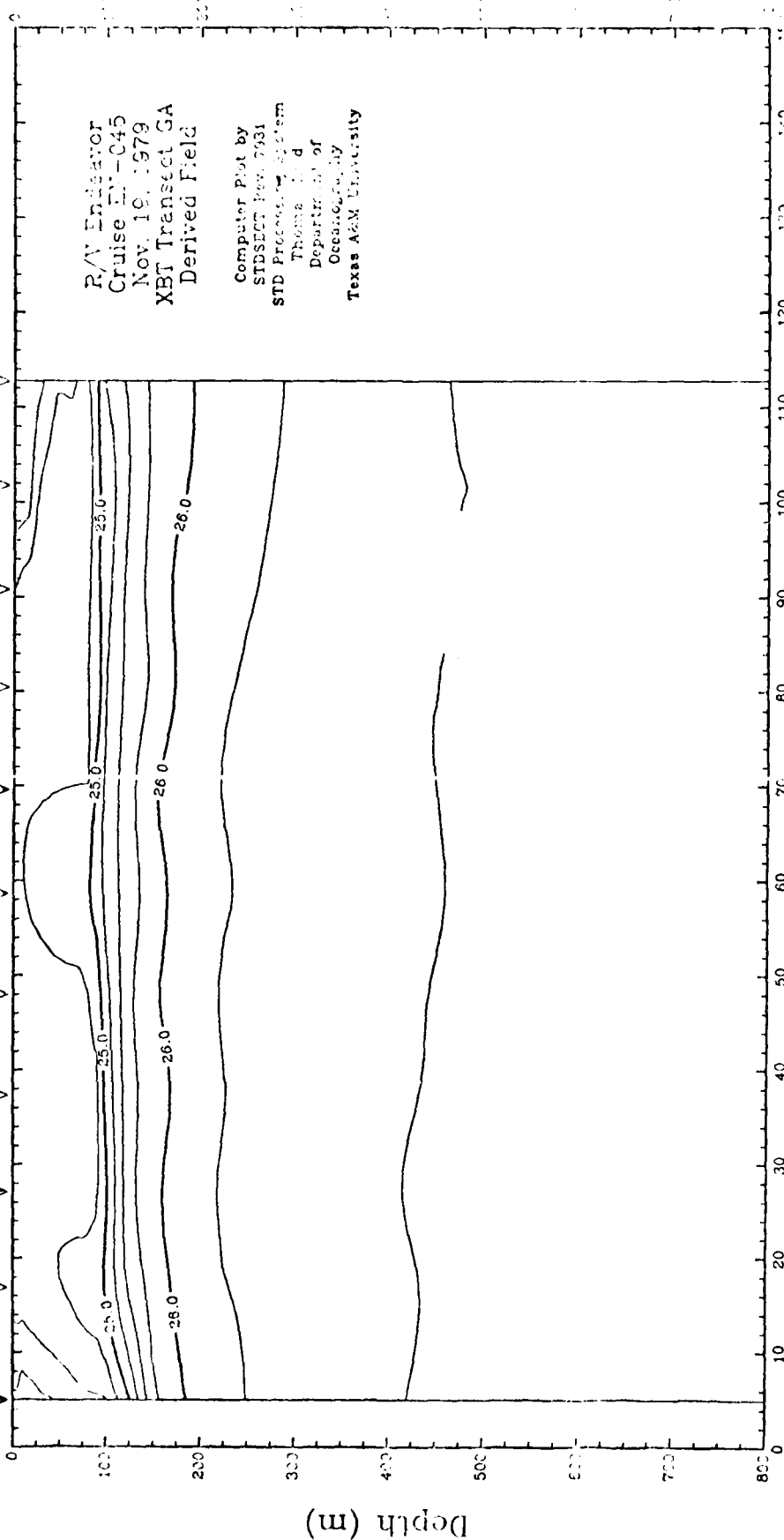


Figure 33. Section contours of temperature and derived salinity, sigma-t and N^2 fields for Transect GA. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages.



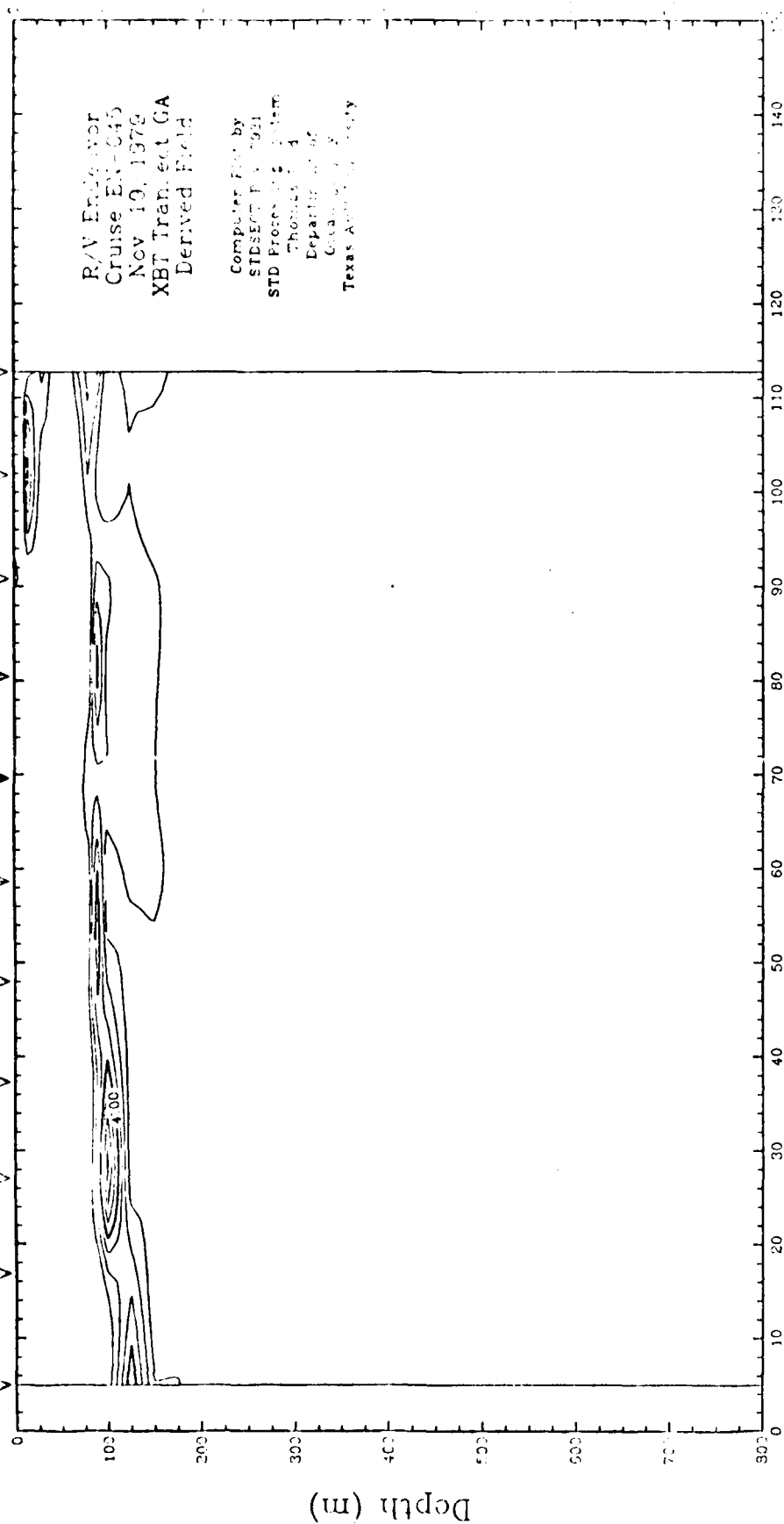
Station	XBT 74	XBT 17	XBT 18	XBT 19	XBT 20	XBT 21	XBT 22	XBT 23	XBT 24	XBT 25	XBT 26
Time (GMT)	1440	1515	1545	1615	1645	1715	1745	1815	1845	1914	1945
Surface Value	24.2	24.8	24.6	24.6	24.6	24.7	24.7	24.7	24.5	24.1	24.1
Latitude (N)	33 40.8	33 35.1	33 20.1	33 25.1	33 19.9	33 14.8	33 11.5	33 4.3	32 59.3	32 53.9	32 49.1
Longitude (W)	75 44.3	75 47.9	75 50.6	75 53.4	75 53.4	75 59.3	76 1.6	76 5.8	76 8.8	76 11.7	76 15.8



Distance Along Transect (Km)
Contours of σ_t (g/l)

Station
 1440
 Cruise Name
 33 40.8
 Latitude (N)
 75 44.3
 Longitude (W)

XBT 74	XBT 17	XBT 18	XBT 19	XBT 20	XBT 21	XBT 22	XBT 23	XBT 24	XBT 25	XBT 26
1440	1515	1545	1615	1645	1715	1745	1815	1845	1914	1945
.5	.4	5.5×10^{-2}	9.2×10^{-3}	6.4×10^{-2}	.3	.1	6.4×10^{-2}	1.1	.2	.1
33 40.8	33 35.1	33 30.1	33 25.1	33 19.9	33 14.8	33 9.5	33 4.3	32 59.3	32 53.9	32 49.1
75 44.3	75 47.8	75 50.6	75 53.4	75 56.4	75 59.5	76 2.5	76 5.8	76 8.8	76 11.7	76 15.8



Distance Along Transect (Km)
 Contours of N^2 ($10^4 \text{ rad}^2/\text{s}^2$)

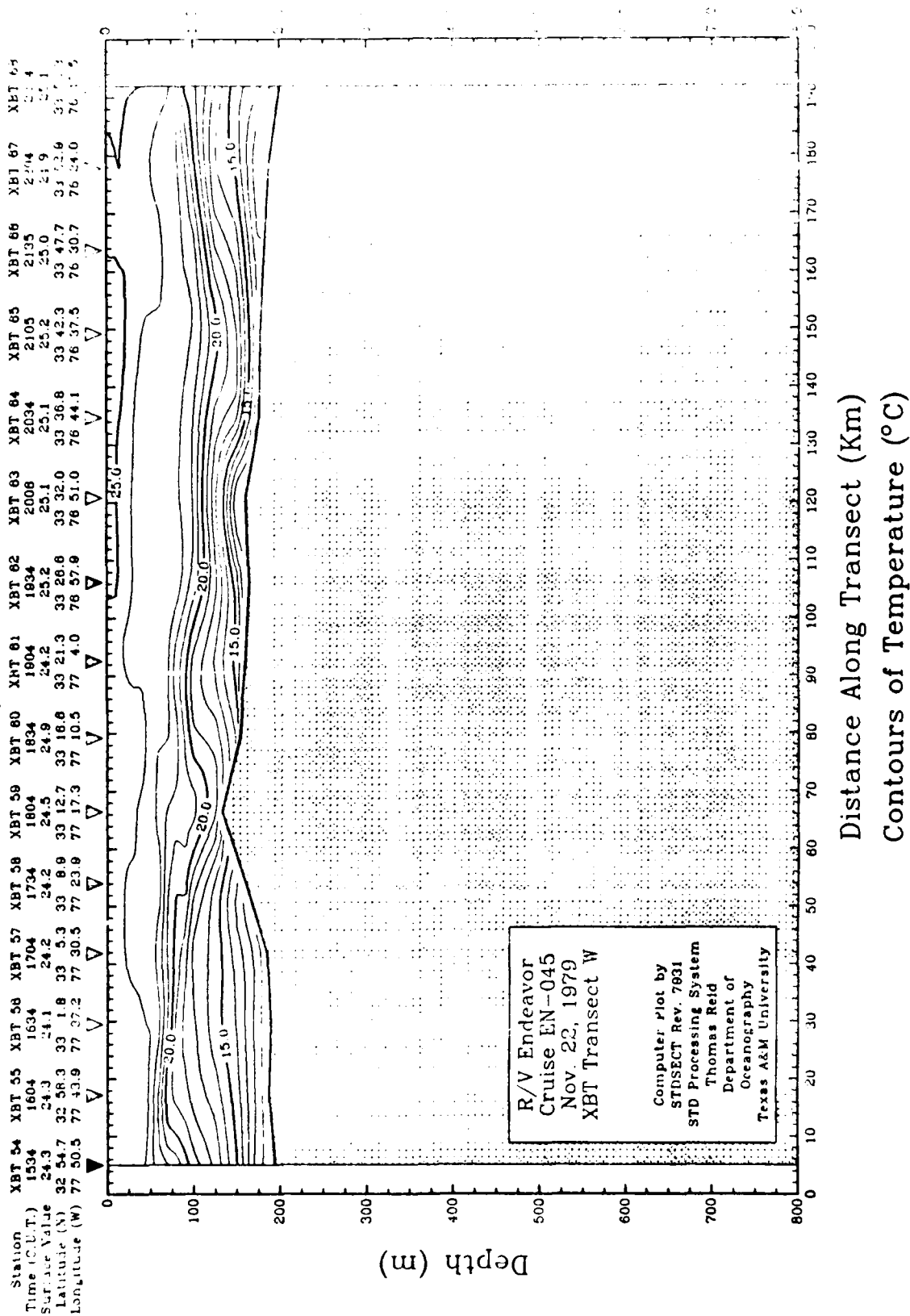
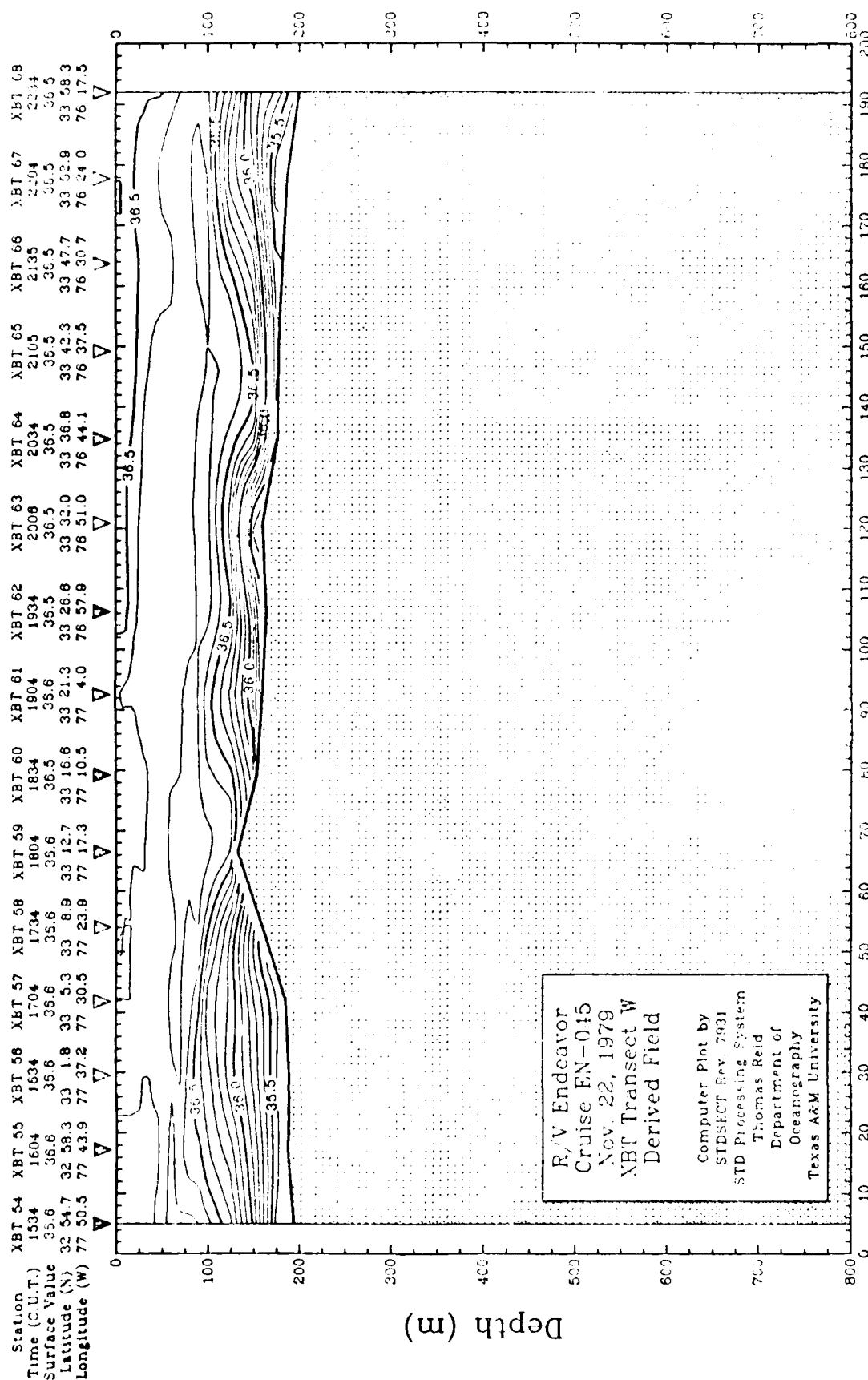
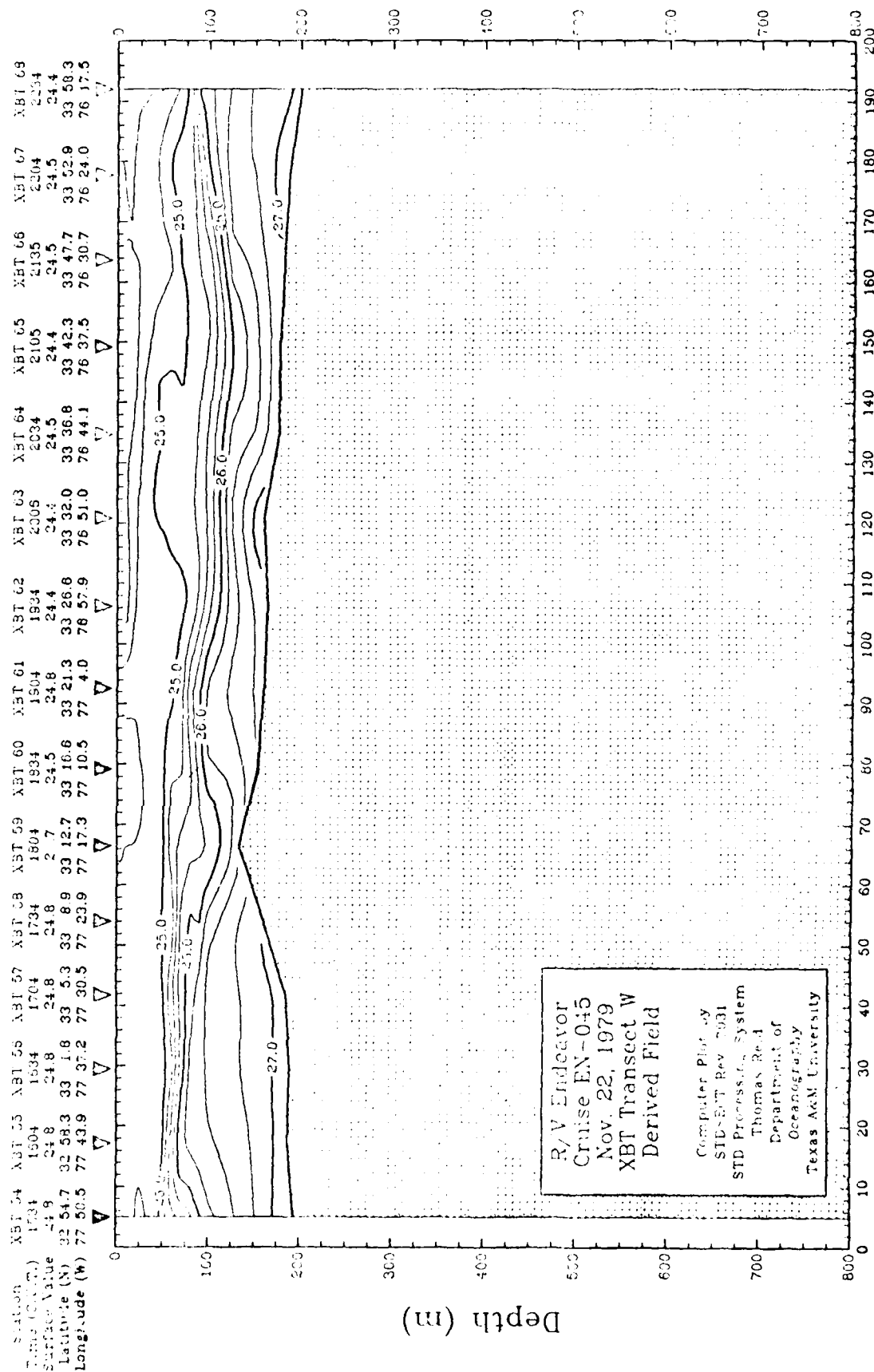
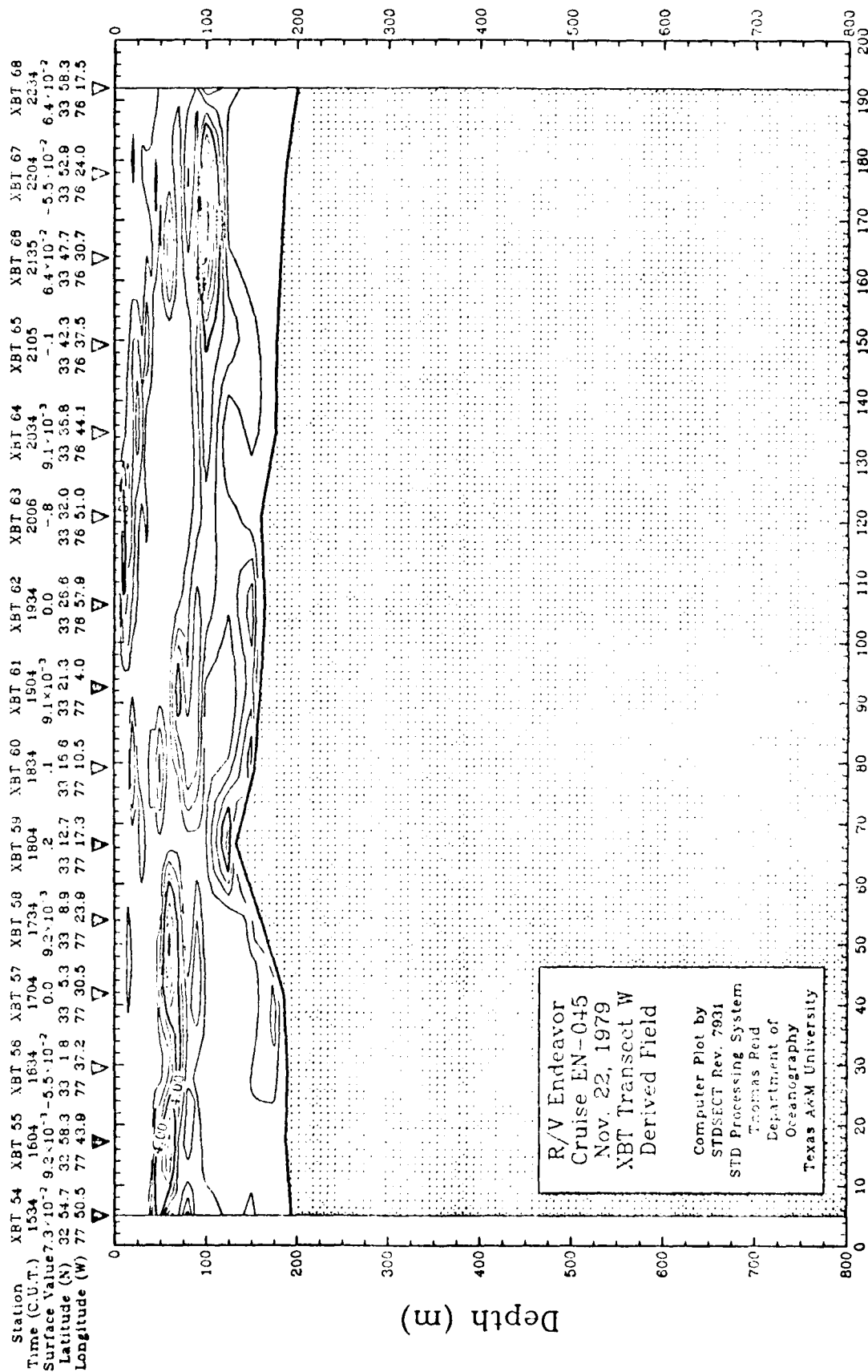


Figure 34. Section contours of temperature and derived salinity, sigma-t and N_2 fields for Transect W. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages.







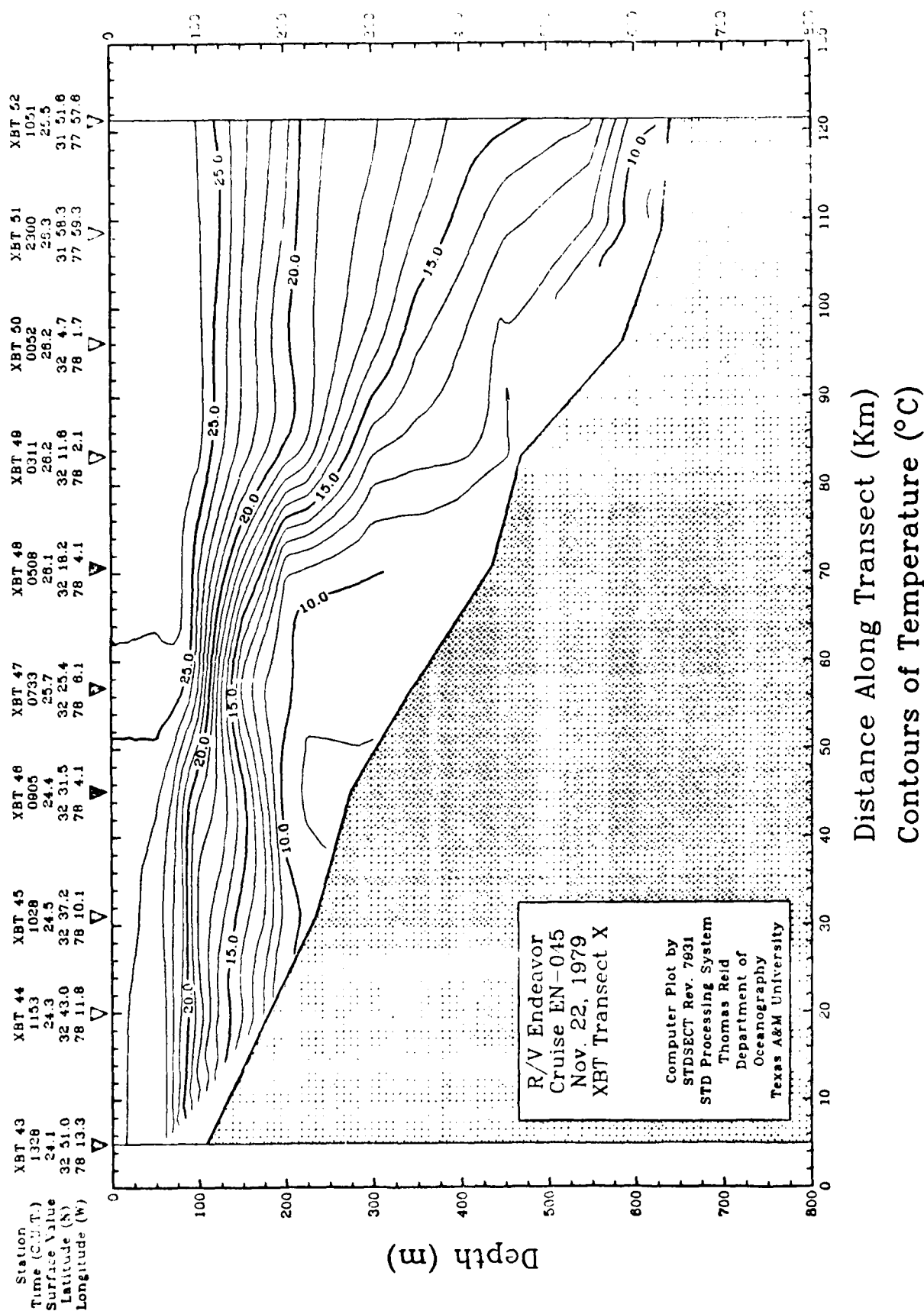
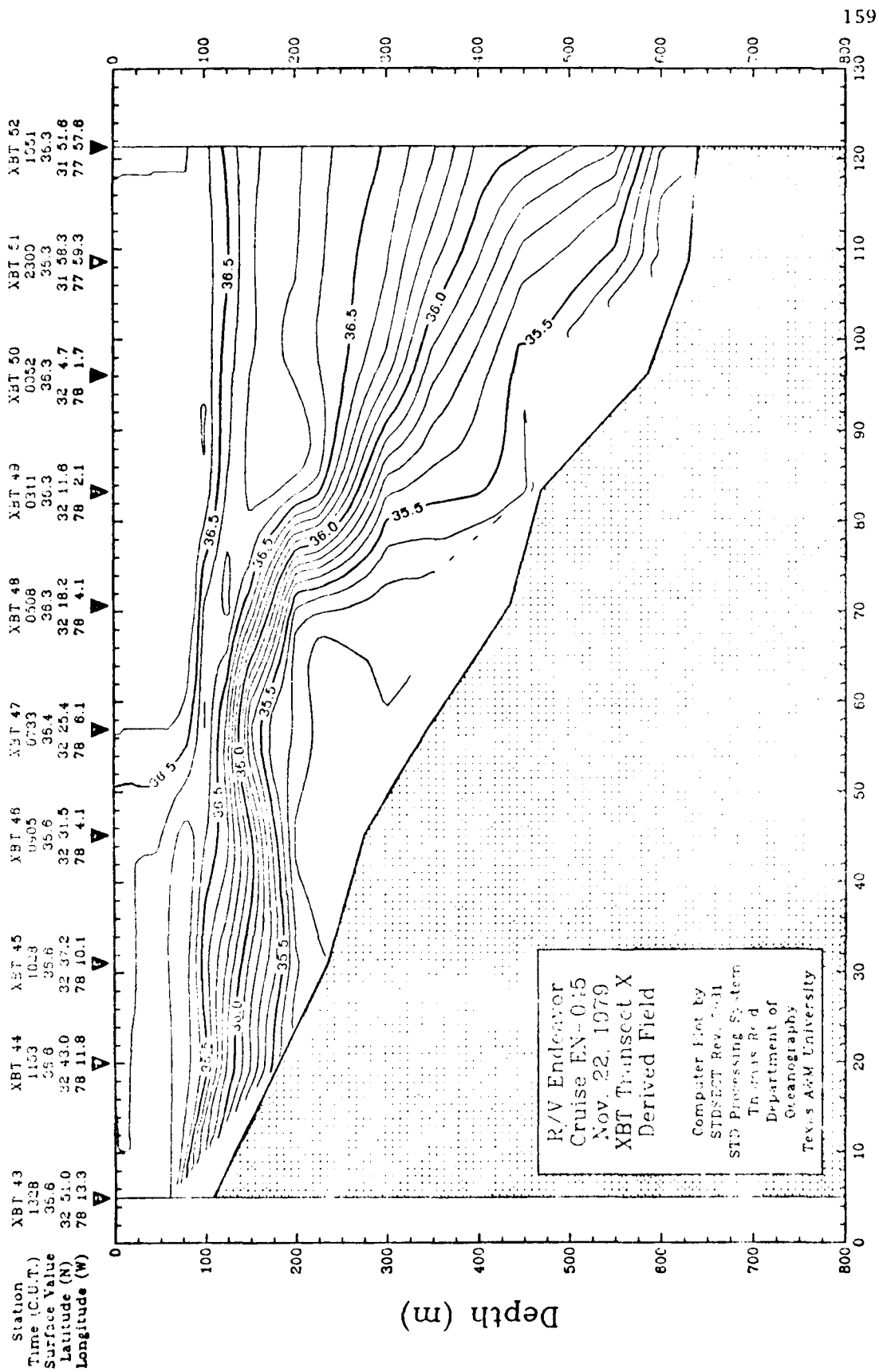
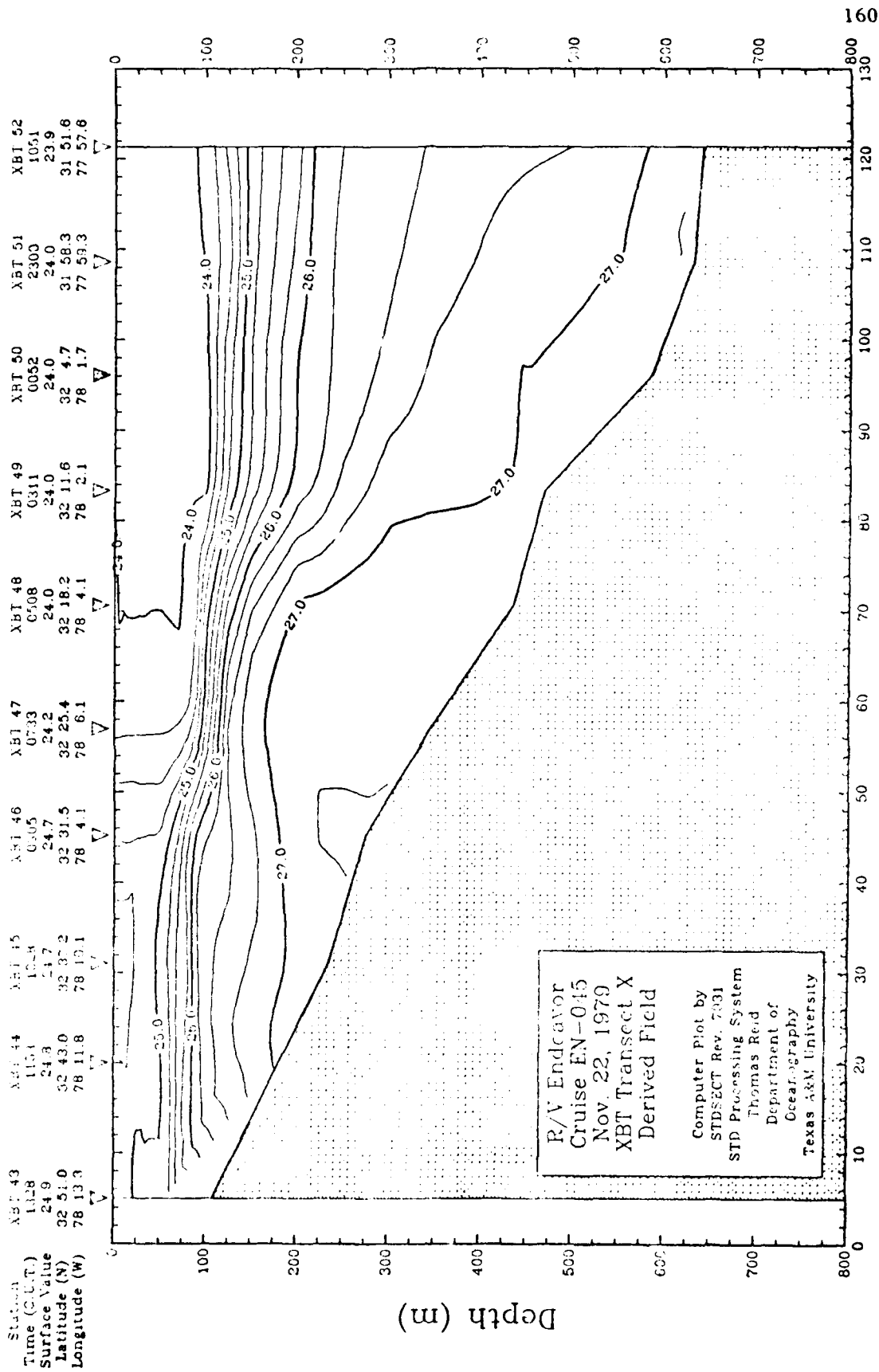


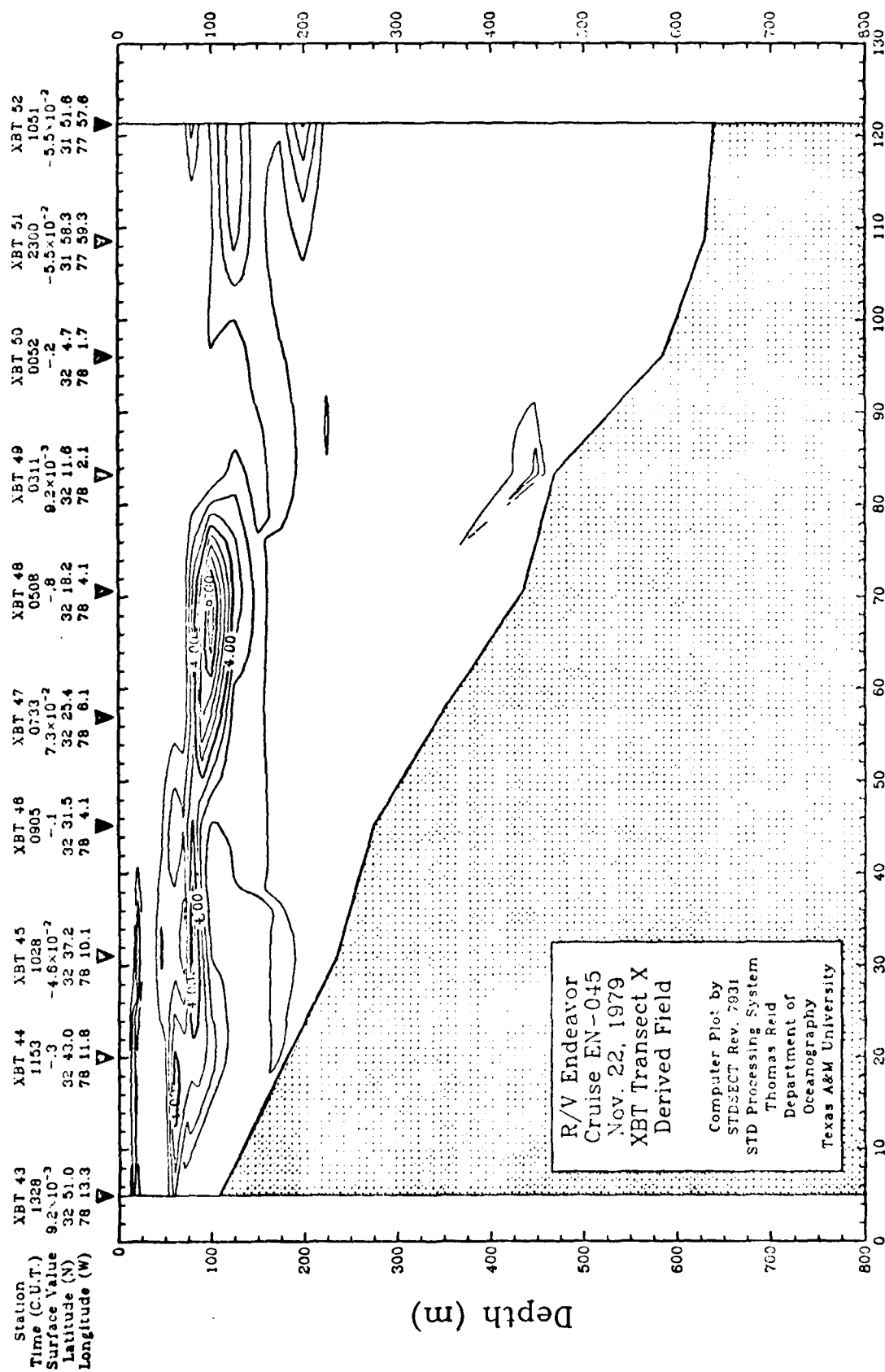
Figure 35. Section contours of temperature and derived salinity, sigma-t and N_2 fields for Transect X. Contour intervals are 1 °C, 0.1‰, 0.25 σ_t units, and $0.5 \times 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages.





Distance Along Transect (Km)

Contours of σ_t (g/l)



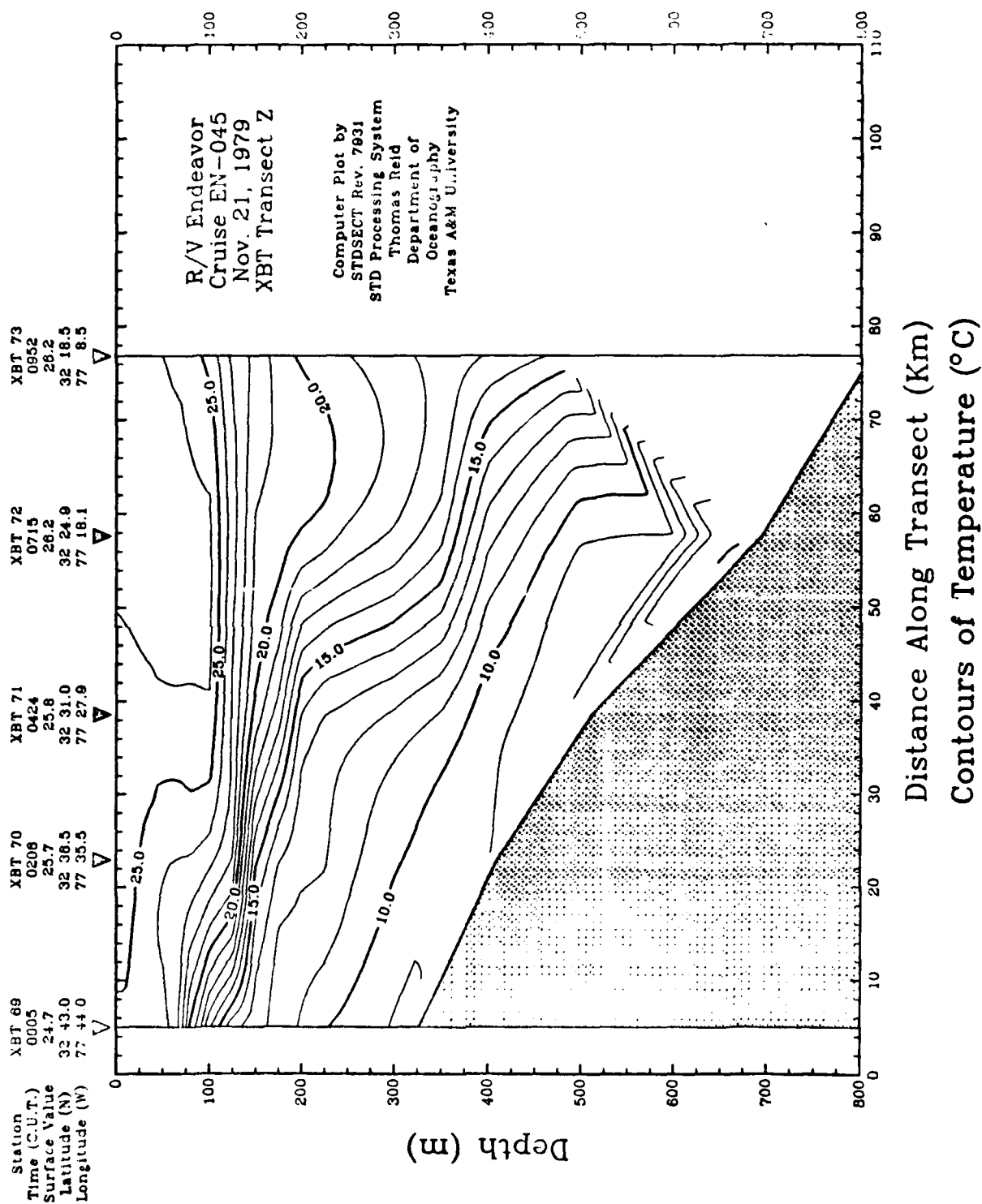
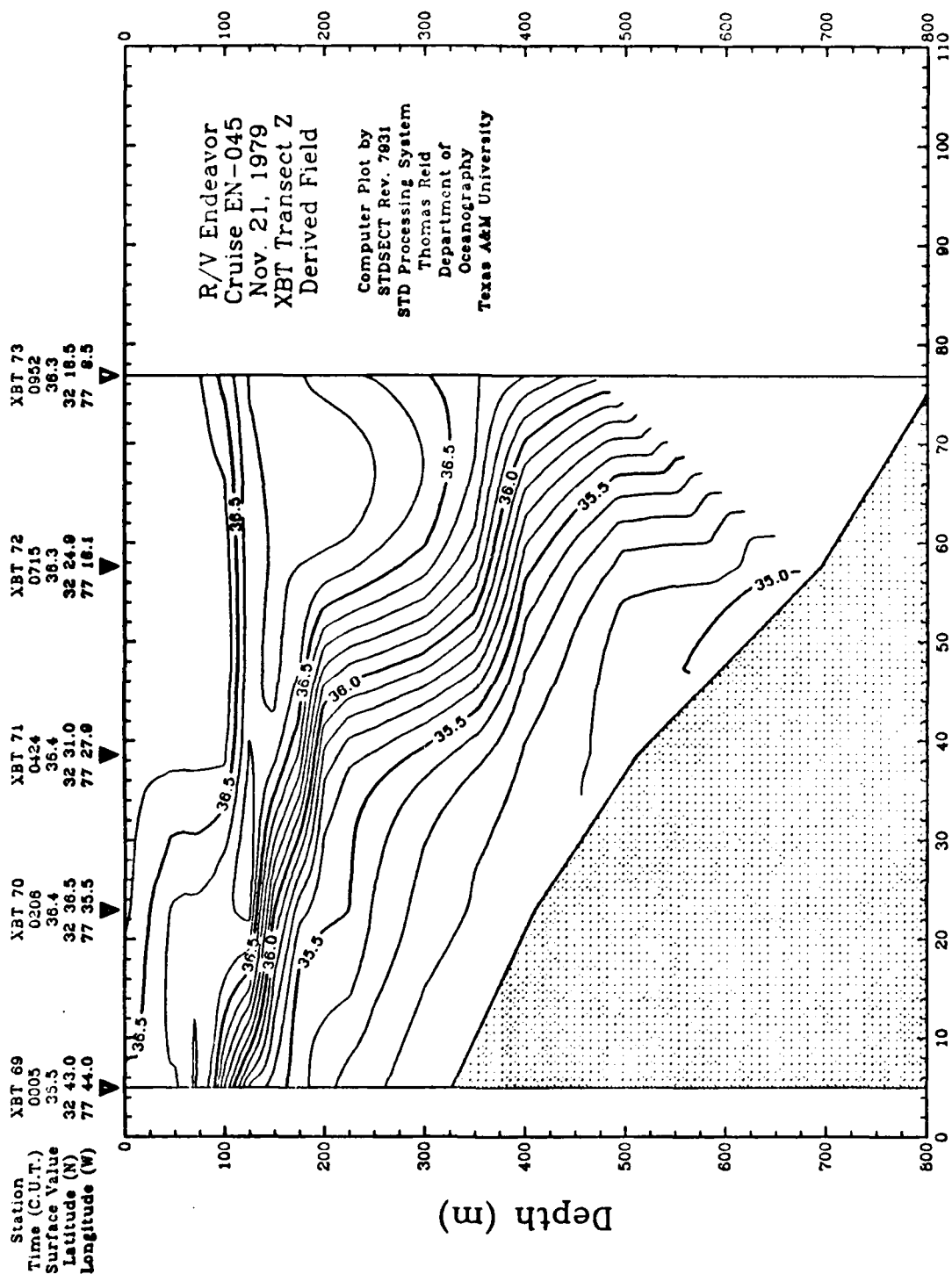
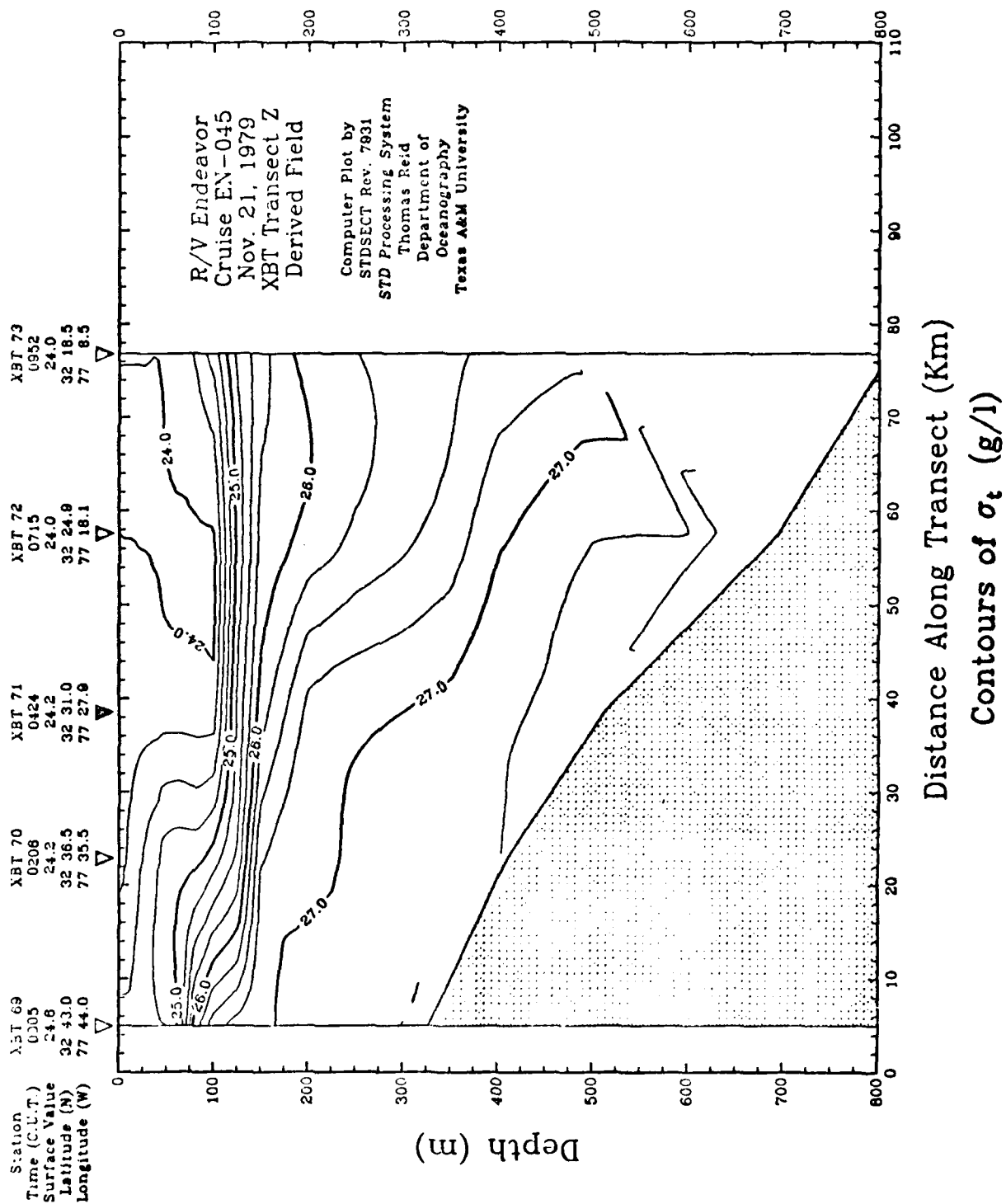
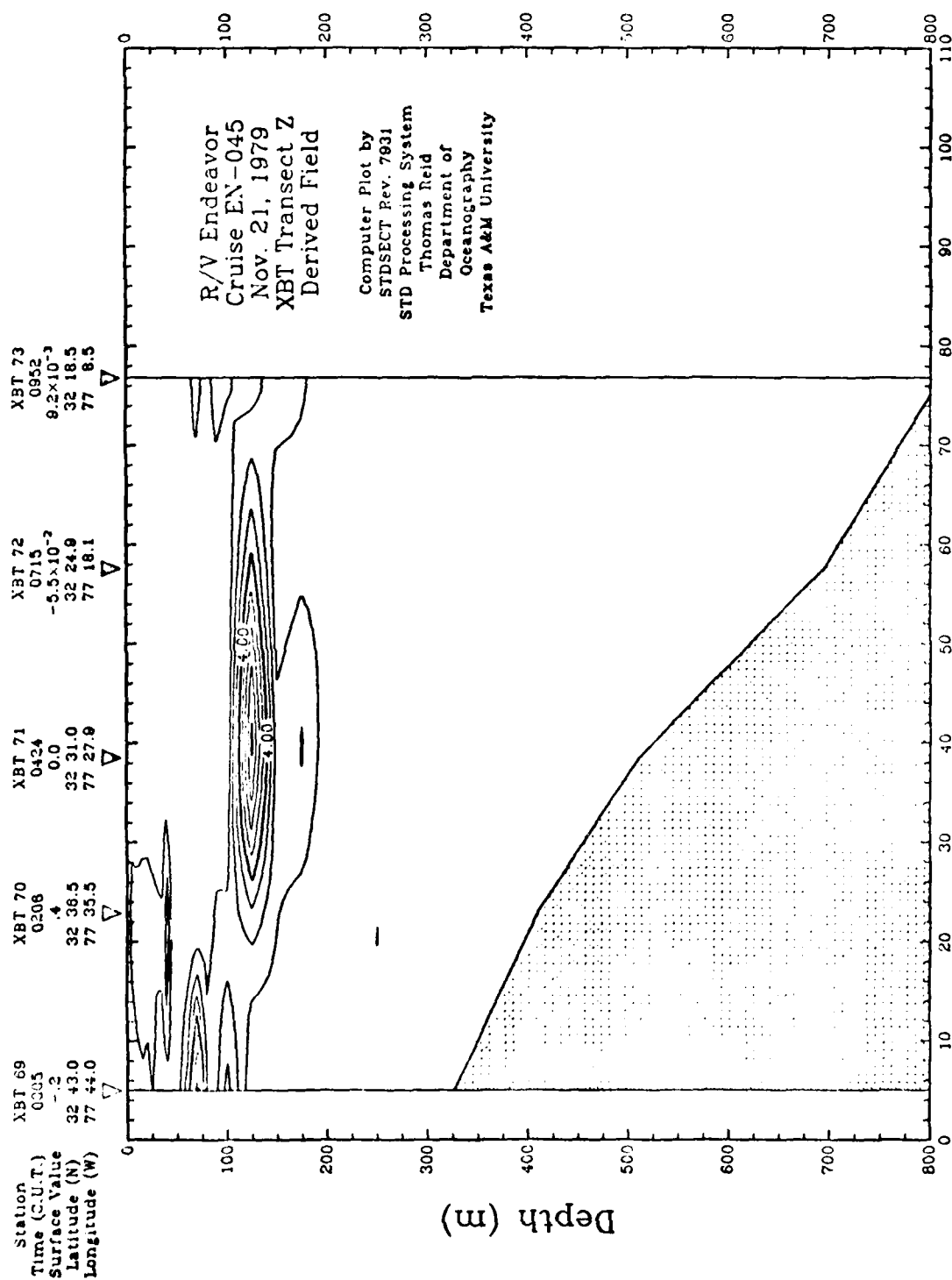


Figure 36. Section contours of temperature and derived salinity, sigma-t and N_2 fields for Transect Z. Contour intervals are 1°C , 0.1‰ , $0.25 \sigma_t$ units, and $0.5 \times 10^{-4} \text{ rad}^2 \text{ s}^{-2}$, respectively. This figure is continued on the next 3 pages.







Distance Along Transect (Km)
Contours of N^2 ($10^4 \text{ rad}^2/\text{s}^2$)

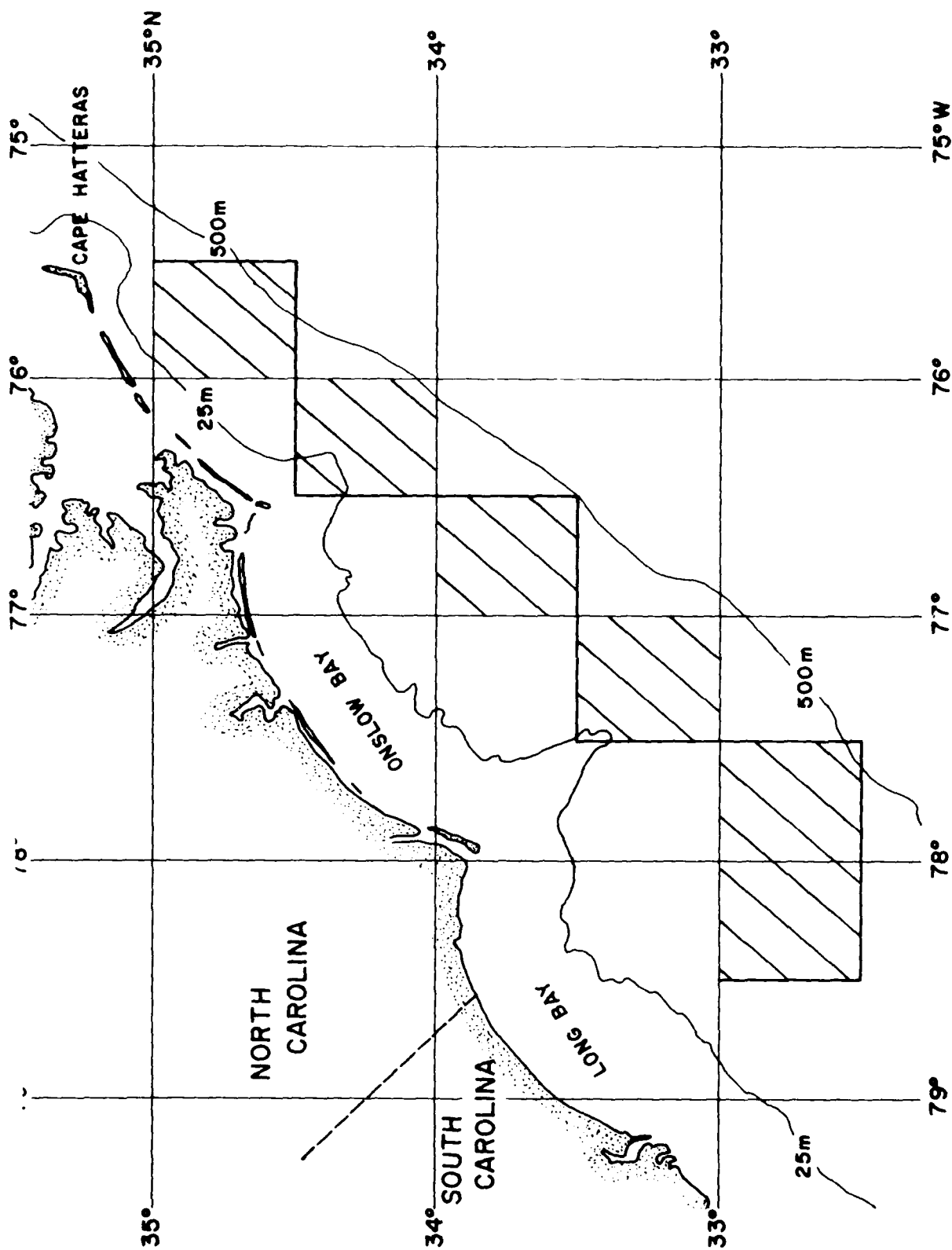


Figure 37. Historical temperature and salinity data collected in the hatched half-degree squares were obtained from the NODC files and used to compute seasonal (summer and winter) T-S correlations for comparison with T-S correlations obtained from this study.

HISTORICAL T-S COMPARISON

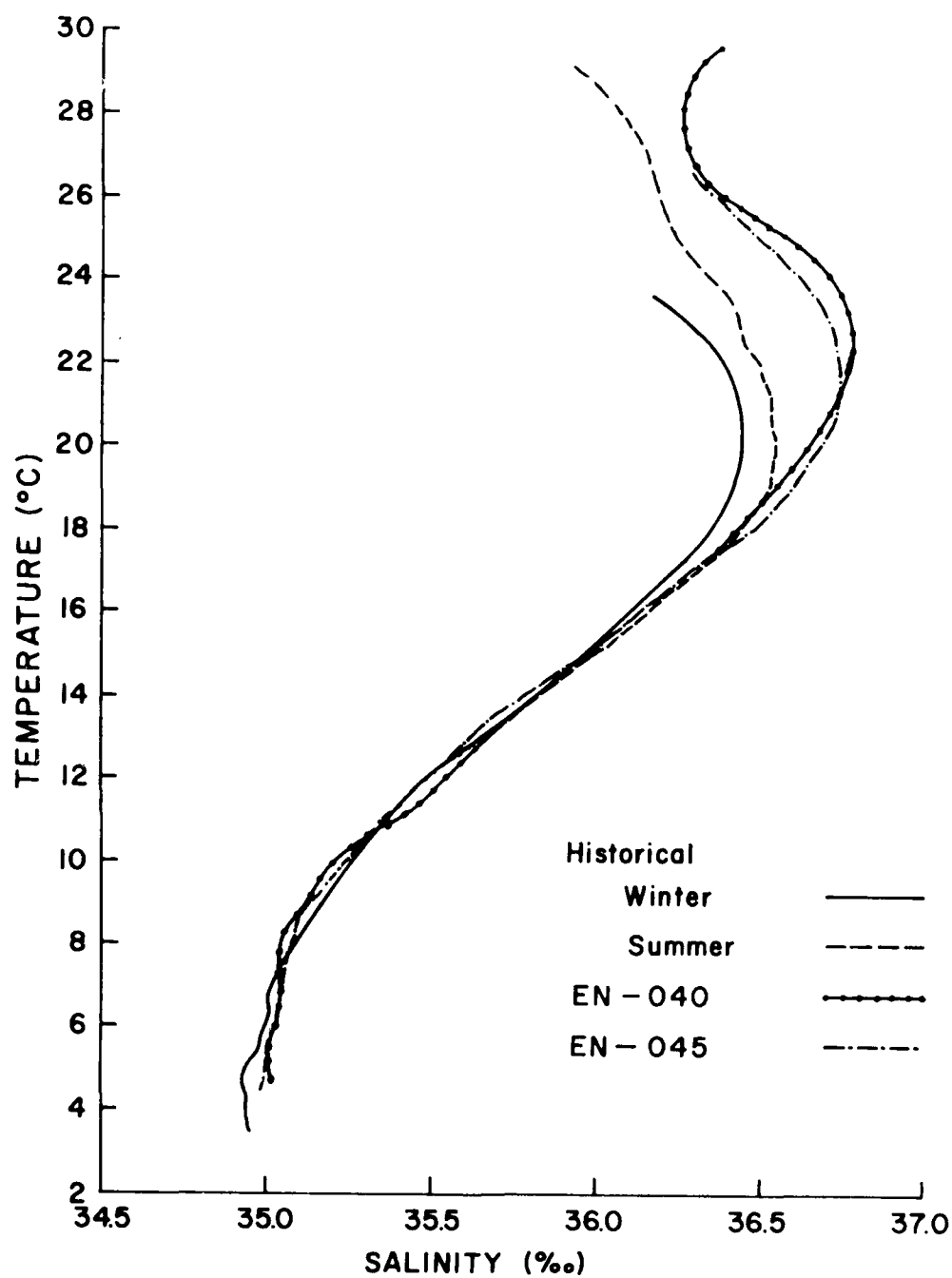


Figure 38. Comparison of NODC historical T-S correlation with those from cruises EN-040 and EN-045. The EN-040 and EN-045 correlations are the same as those shown in Figure 9 and 28, respectively.

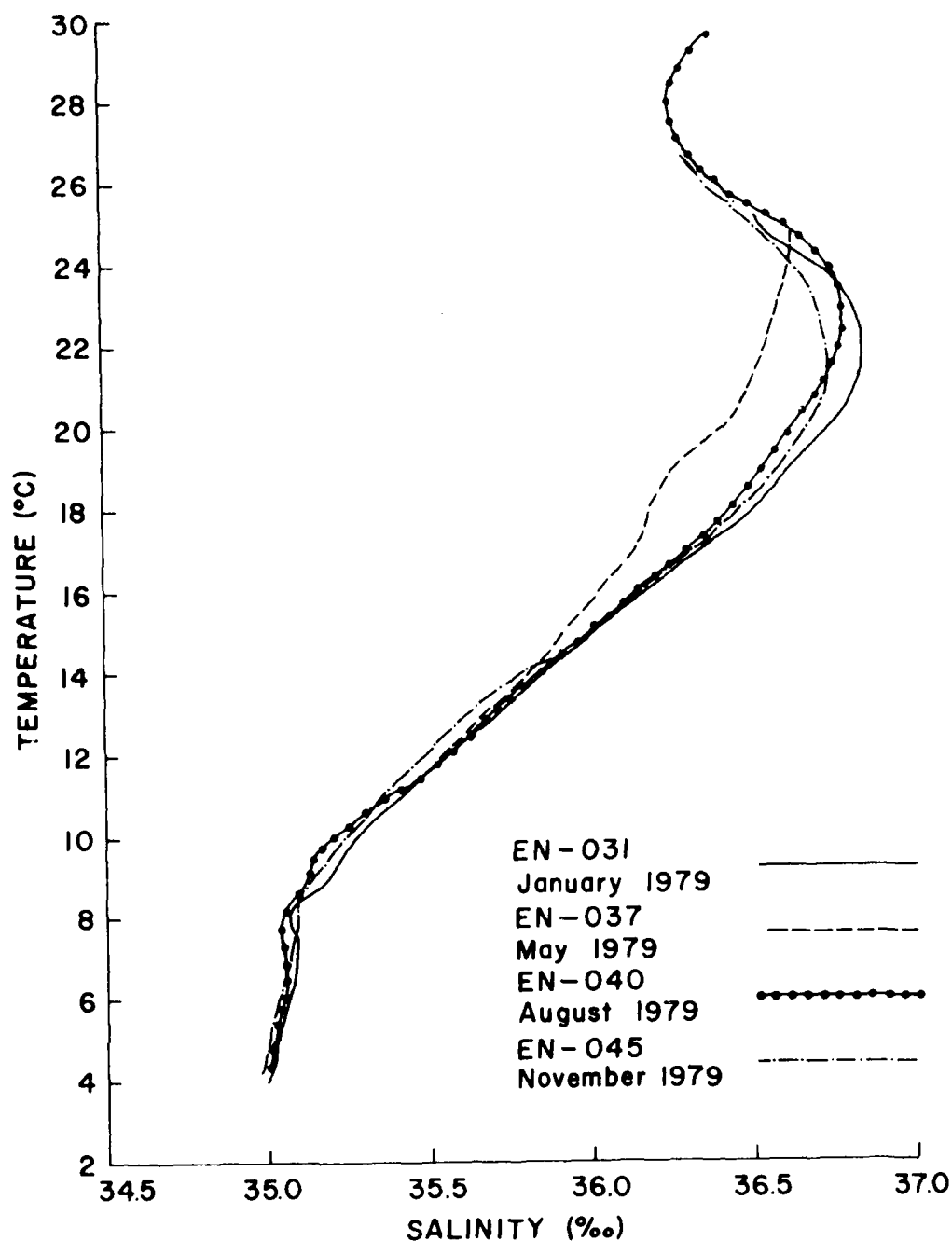


Figure 39. Comparison of the T-S correlations obtained during the four cruises which comprised the two field phases of this project. The data from cruises EN-031 and EN-037 are documented in Brooks *et al.*, 1980.

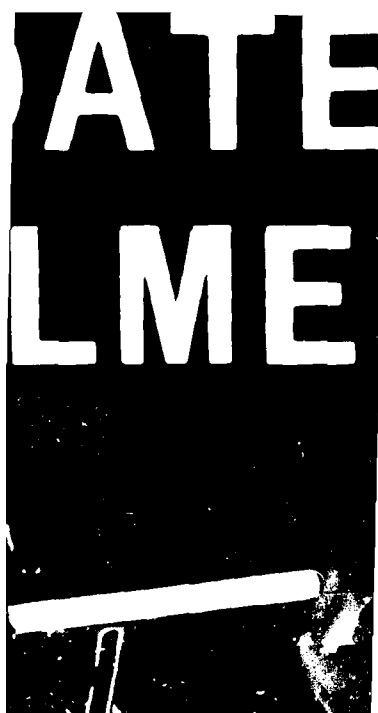
Acknowledgments

The Gulf Stream Meanders Experiment was supported by the National Science Foundation grants OCE77-25682 and OCE79-06710; and by the Office of Naval Research, contract number N-00014-77-C-0354. We thank Dr. Tom Curtin of North Carolina State University for the loan of an acoustic release to replace one which failed during cruise EN-040. As noted in the first two reports of this sequence, many graduate students and staff at Texas A&M University, North Carolina State University, and the University of North Carolina have contributed to the success of this project. A considerable amount of software and graphics development was necessary during the preparation of the Gulf Stream hydrographic data reports, and we acknowledge the expert services of Mr. Tom Reid of Texas A&M University in computer programming and systems development. We thank captain Bennett and the crew of R/V *Endeavor* for effective services at sea during these cruises.

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ATE
LME

A high-contrast, black and white image showing a dark, textured surface. A bright, horizontal line or object is visible near the bottom, possibly a piece of wood or a metal rod. The overall appearance is grainy and abstract, with the text 'ATE' and 'LME' overlaid in a bold, sans-serif font.