

AD-A098 182

NORTH CAROLINA UNIV AT CHAPEL HILL

F/G A/10

THE GULF STREAM MEANDERS EXPERIMENT. AXBT/PRT DATA REPORT, R/A --ETC(U)

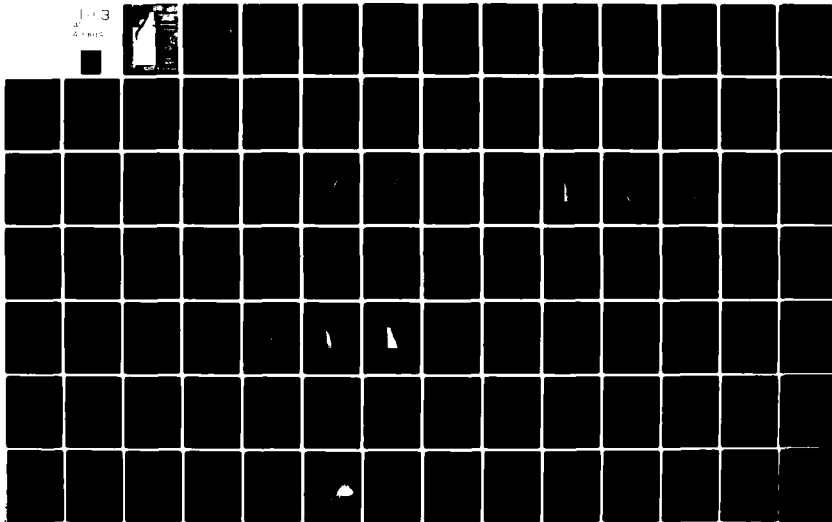
DEC 80 J M BANE, D A BROOKS, K R LORENSON

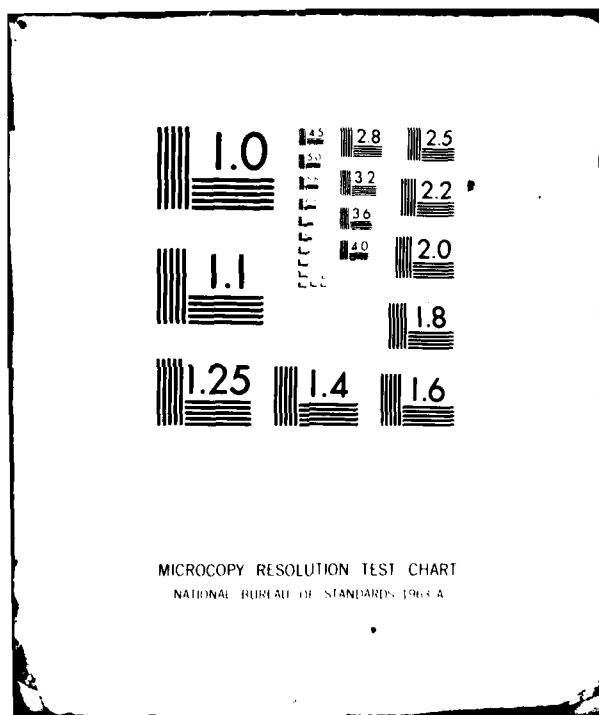
N00014-77-C-0354

NL

UNCLASSIFIED CMS-80-2

1-3
J
A-1015





AD A 098182

211

(15)

N00014-77-C-0354,
| NSF-OCE 77-25682

(12)

(6)

THE GULF STREAM MEANDERS EXPERIMENT.

AXBT/PRT Data Report,
R/A Project Birdseye Flights,
9-18 February 1979.

DTIC
ELECTE
APR 24 1981

by

(10)

John M./Bane
David A./Brooks†
Karen R./Lorenson
Cynthia M./Seay

(12) 2271

Curriculum in Marine Sciences
University of North Carolina
Chapel Hill

(9)

Technical Report Number CMS-80-2

(11)

December 1980

(14)

1 Texas A&M University

259500

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

FOREWARD

This is the fifth 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. AXBT/PRT Data Report, Feb 79 Flights. UNC Technical Report CMS-80-2, December 1980, 213 pp.
6. AXBT/PRT Data Report, Nov 79 Flights.
7. Final project technical report.

Accession For	
NTIS	GRAM
DTIC	TB
Unannounced	
Justification	
50 on file	
By	
Distribution	
Available to	
Special	
A	

TABLE OF CONTENTS

	<u>Page</u>
FOREWARD.....	ii
1. Introduction.....	1
2. Data Collection, Calibration, and Processing.....	3
3. Report Organization.....	7
FLIGHT 1: 9 FEBRUARY 1979.....	8
FLIGHT 2: 10 FEBRUARY 1979.....	29
FLIGHT 3: 11 FEBRUARY 1979.....	51
FLIGHT 4: 14 FEBRUARY 1979.....	76
FLIGHT 5: 15 FEBRUARY 1979.....	108
FLIGHT 6: 16 FEBRUARY 1979.....	130
FLIGHT 7: 17 FEBRUARY 1979.....	154
FLIGHT 8: 18 FEBRUARY 1979.....	181
TWO-DAY COMPOSITES.....	201
ACKNOWLEDGEMENTS.....	211
REFERENCES.....	212

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. PRT cross-stream surface temperature profiles, 9 February 1979.....	10
2. PRT sea surface temperature field, 9 February 1979. Dashed lines indicate positions of cross-stream data lines.....	12
3. AXBT station locations, 9 February 1979.....	13
4. AXBT vertical temperature profiles, 9 February 1979.....	15
5. AXBT temperatures at 1 meter, 9 February 1979. Small solid circles indicate AXBT drop-sites.....	16
6. AXBT temperatures at 100 meters, 9 February 1979.....	17
7. AXBT temperatures at 250 meters, 9 February 1979.....	18
8. AXBT temperatures at 350 meters, 9 February 1979.....	19
9. Topography of the 18°C isotherm, 9 February 1979.....	20
10. Topography of the 20°C isotherm, 9 February 1979.....	21
11. Cross-stream vertical temperature section along Line G, 9 February 1979.....	22
12. Cross-stream vertical temperature section along Line I, 9 February 1979.....	23
13. Cross-stream vertical temperature section along Line K, 9 February 1979.....	24
14. Cross-stream vertical temperature section along Line M, 9 February 1979.....	25
15. Alongshore vertical temperature section, 9 February 1979....	26
16. Alongshore vertical temperature section, 9 February 1979....	27
17. Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 9 February 1979..	28
18. PRT cross-stream surface temperature profiles, 10 February 1979.....	31
19. PRT sea surface temperature field, 10 February 1979. Dashed lines indicate positions of cross-stream data lines.....	33

20.	AXBT station locations, 10 February 1979.....	34
21.	AXBT vertical temperature profiles, 10 February 1979.....	36
22.	AXBT temperatures at 1 meter, 10 February 1979. Small solid circles indicate AXBT drop-sites.....	37
23.	AXBT temperatures at 100 meters, 10 February 1979.....	38
24.	AXBT temperatures at 250 meters, 10 February 1979.....	39
25.	AXBT temperatures at 350 meters, 10 February 1979.....	40
26.	Topography of the 18°C isotherm, 10 February 1979.....	41
27.	Topography of the 20°C isotherm, 10 February 1979.....	42
28.	Cross-stream vertical temperature section along Line M, 10 February 1979.....	43
29.	Cross-stream vertical temperature section along Line O, 10 February 1979.....	44
30.	Cross-stream vertical temperature section along Line Q, 10 February 1979.....	45
31.	Cross-stream vertical temperature section along Line S, 10 February 1979.....	46
32.	Cross-stream vertical temperature section along Line U, 10 February 1979.....	47
33.	Alongshore vertical temperature section, 10 February 1979...	48
34.	Alongshore vertical temperature section, 10 February 1979...	49
35.	Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 10 February 1979.	50
36.	PRT cross-stream surface temperature profiles, 11 February 1979.....	53
37.	PRT sea surface temperature field, 11 February 1979. Dashed lines indicate positions of cross-stream data lines.....	55
38.	AXBT station locations, 11 February 1979.....	56
39.	AXBT vertical temperature profiles, 11 February 1979.....	59
40.	AXBT temperatures at 1 meter, 11 February 1979. Small solid circles indicate AXBT drop-sites.....	60
41.	AXBT temperatures at 100 meters, 11 February 1979.....	61

42.	AXBT temperatures at 250 meters, 11 February 1979.....	62
43.	AXBT temperatures at 350 meters, 11 February 1979.....	63
44.	Topography of the 18°C isotherm, 11 February 1979.....	64
45.	Topography of the 20°C isotherm, 11 February 1979.....	65
46.	Cross-stream vertical temperature section along Line A, 11 February 1979.....	66
47.	Cross-stream vertical temperature section along Line C, 11 February 1979.....	67
48.	Cross-stream vertical temperature section along Line E, 11 February 1979.....	68
49.	Cross-stream vertical temperature section along Line G, 11 February 1979.....	69
50.	Cross-stream vertical temperature section along Line I, 11 February 1979.....	70
51.	Cross-stream vertical temperature section along Line K, 11 February 1979.....	71
52.	Alongshore vertical temperature section, 11 February 1979...	72
53.	Alongshore vertical temperature section, 11 February 1979...	73
54.	Alongshore vertical temperature section, 11 February 1979...	74
55.	Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 11 February 1979.	75
56.	PRT cross-stream surface temperature profiles, 14 February 1979.....	78
57.	PRT sea surface temperature field, 14 February 1979. Dashed lines indicate positions of cross-stream data lines.....	81
58.	AXBT station locations, 14 February 1979.....	82
59.	AXBT vertical temperature profiles, 14 February 1979.....	86
60.	AXBT temperatures at 1 meter, 14 February 1979. Small solid circles indicate AXBT drop-sites.....	88
61.	AXBT temperatures at 100 meters, 14 February 1979.....	89
62.	AXBT temperatures at 250 meters, 14 February 1979.....	90
63.	AXBT temperatures at 350 meters, 14 February 1979.....	91

64.	Topography of the 18°C isotherm, 14 February 1979.....	92
65.	Topography of the 20°C isotherm, 14 February 1979.....	93
66.	Cross-stream vertical temperature section along Line C, 14 February 1979.....	94
67.	Cross-stream vertical temperature section along Line E, 14 February 1979.....	95
68.	Cross-stream vertical temperature section along Line G, 14 February 1979.....	96
69.	Cross-stream vertical temperature section along Line I, 14 February 1979.....	97
70.	Cross-stream vertical temperature section along Line K, 14 February 1979.....	98
71.	Cross-stream vertical temperature section along Line M, 14 February 1979.....	99
72.	Cross-stream vertical temperature section along Line O, 14 February 1979.....	100
73.	Cross-stream vertical temperature section along Line Q, 14 February 1979.....	101
74.	Cross-stream vertical temperature section along Line S, 14 February 1979.....	102
75.	Cross-stream vertical temperature section along Line U, 14 February 1979.....	103
76.	Alongshore vertical temperature section, 14 February 1979...	104
77.	Alongshore vertical temperature section, 14 February 1979...	105
78.	Alongshore vertical temperature section, 14 February 1979...	106
79.	Difference between 1 meter AXBT and PRT temperatures ($T_{\text{AXBT}} - T_{\text{PRT}}$) versus consecutive AXBT drop number, 14 February 1979.	107
80.	PRT cross-stream surface temperature profiles, 15 February 1979.....	110
81.	PRT sea surface temperature field, 15 February 1979. Dashed lines indicate positions of cross-stream data lines.....	111
82.	AXBT station locations, 15 February 1979.....	112
83.	AXBT vertical temperature profiles, 15 February 1979.....	115

84.	AXBT temperatures at 1 meter, 15 February 1979. Small solid circles indicate AXBT drop-sites.....	116
85.	AXBT temperatures at 100 meters, 15 February 1979.....	117
86.	AXBT temperatures at 250 meters, 15 February 1979.....	118
87.	AXBT temperatures at 350 meters, 15 February 1979.....	119
88.	Topography of the 18°C isotherm, 15 February 1979.....	120
89.	Topography of the 20°C isotherm, 15 February 1979.....	121
90.	Cross-stream vertical temperature section along Line C, 15 February 1979.....	122
91.	Cross-stream vertical temperature section along Line E, 15 February 1979.....	123
92.	Cross-stream vertical temperature section along Line G, 15 February 1979.....	124
93.	Cross-stream vertical temperature section along Line I, 15 February 1979.....	125
94.	Cross-stream vertical temperature section along Line K, 15 February 1979.....	126
95.	Alongshore vertical temperature section, 15 February 1979...	127
96.	Alongshore vertical temperature section, 15 February 1979...	128
97.	Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 15 February 1979.	129
98.	PRT cross-stream surface temperature profiles, 16 February 1979.....	132
99.	PRT sea surface temperature field, 16 February 1979. Dashed lines indicate positions of cross-stream data lines.....	134
100.	AXBT station locations, 16 February 1979.....	135
101.	AXBT vertical temperature profiles, 16 February 1979.....	138
102.	AXBT temperatures at 1 meter, 16 February 1979. Small solid circles indicate AXBT drop-sites.....	139
103.	AXBT temperatures at 100 meters, 16 February 1979.....	140
104.	AXBT temperatures at 250 meters, 16 February 1979.....	141

105.	AXBT temperatures at 350 meters, 16 February 1979.....	142
106.	Topography of the 18°C isotherm, 16 February 1979.....	143
107.	Topography of the 20°C isotherm, 16 February 1979.....	144
108.	Cross-stream vertical temperature section along Line M, 16 February 1979.....	145
109.	Cross-stream vertical temperature section along Line O, 16 February 1979.....	146
110.	Cross-stream vertical temperature section along Line Q, 16 February 1979.....	147
111.	Cross-stream vertical temperature section along Line S, 16 February 1979.....	148
112.	Cross-stream vertical temperature section along Line U, 16 February 1979.....	149
113.	Cross-stream vertical temperature section along Line W, 16 February 1979.....	150
114.	Alongshore vertical temperature section, 16 February 1979...	151
115.	Alongshore vertical temperature section, 16 February 1979...	152
116.	Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 16 February 1979.	153
117.	PRT cross-stream surface temperature profiles, 17 February 1979.....	156
118.	PRT sea surface temperature field, 17 February 1979. Dashed lines indicate positions of cross-stream data lines.....	158
119.	AXBT station locations, 17 February 1979.....	159
120.	AXBT vertical temperature profiles, 17 February 1979.....	162
121.	AXBT temperatures at 1 meter, 17 February 1979. Small solid circles indicate AXBT drop-sites.....	164
122.	AXBT temperatures at 100 meters, 17 February 1979.....	165
123.	AXBT temperatures at 250 meters, 17 February 1979.....	166
124.	AXBT temperatures at 350 meters, 17 February 1979.....	167
125.	Topography of the 18°C isotherm, 17 February 1979.....	168
126.	Topography of the 20°C isotherm, 17 February 1979.....	169

127.	Cross-stream vertical temperature section along Line A, 17 February 1979.....	170
128.	Cross-stream vertical temperature section along Line C, 17 February 1979.....	171
129.	Cross-stream vertical temperature section along Line E, 17 February 1979.....	172
130.	Cross-stream vertical temperature section along Line G, 17 February 1979.....	173
131.	Cross-stream vertical temperature section along Line I, 17 February 1979.....	174
132.	Cross-stream vertical temperature section along Line K, 17 February 1979.....	175
133.	Cross-stream vertical temperature section along Line M, 17 February 1979.....	176
134.	Alongshore vertical temperature section, 17 February 1979...	177
135.	Alongshore vertical temperature section, 17 February 1979...	178
136.	Alongshore vertical temperature section, 17 February 1979...	179
137.	Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 17 February 1979.	180
138.	PRT cross-stream surface temperature profiles, 18 February 1979.....	183
139.	PRT sea surface temperature field, 18 February 1979. Dashed lines indicate positions of cross-stream data lines.....	184
140.	AXBT station locations.....	185
141.	AXBT vertical temperature profiles, 18 February 1979.....	187
142.	AXBT temperatures at 1 meter, 18 February 1979. Small solid circles indicate AXBT drop-sites.....	188
143.	AXBT temperatures at 100 meters, 18 February 1979.....	189
144.	AXBT temperatures at 250 meters, 18 February 1979.....	190
145.	AXBT temperatures at 350 meters, 18 February 1979.....	191
146.	Topography of the 18°C isotherm, 18 February 1979.....	192
147.	Topography of the 20°C isotherm, 18 February 1979.....	193

148.	Cross-stream vertical temperature section along Line O, 18 February 1979.....	194
149.	Cross-stream vertical temperature section along Line Q, 18 February 1979.....	195
150.	Cross-stream vertical temperature section along Line S, 18 February 1979.....	196
151.	Cross-stream vertical temperature section along Line U, 18 February 1979.....	197
152.	Alongshore vertical temperature section, 18 February 1979...	198
153.	Alongshore vertical temperature section, 18 February 1979...	199
154.	Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 18 February 1979.	200
155.	AXBT temperatures at 1 meter from 10 February data and shifted 11 February data.....	202
156.	AXBT temperatures at 100 meters from 10 February data and shifted 11 February data.....	203
157.	AXBT temperatures at 250 meters from 10 February data and shifted 11 February data.....	204
158.	AXBT temperatures at 1 meter from 16 February data and shifted 15 February data.....	205
159.	AXBT temperatures at 100 meters from 16 February data and shifted 15 February data.....	206
160.	AXBT temperatures at 250 meters from 16 February data and shifted 15 February data.....	207
161.	AXBT temperatures at 1 meter from 18 February data and shifted 17 February data.....	208
162.	AXBT temperatures at 100 meters from 18 February data and shifted 17 February data.....	209
163.	AXBT temperatures at 250 meters from 18 February dat and shifted 17 February data.....	210

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. 9 February 1979 PRT Line End Points.....	8
2. 9 February 1979 Flight Updates.....	9
3. 9 February 1979 PRT Calibration Temperatures and Times.....	9
4. 9 February 1979; AXBT Station coordinates, depths, and deployment times.....	14
5. 10 February 1979 PRT Line End Points.....	29
6. 10 February 1979 Flight Updates.....	30
7. 10 February 1979 PRT Calibration Temperatures and Times.....	30
8. 10 February 1979; AXBT Station coordinates, depths, and deployment times.....	35
9. 11 February 1979 PRT Line End Points.....	51
10. 11 February 1979 Flight Updates.....	52
11. 11 February 1979 PRT Calibration Temperatures and Times.....	52
12. 11 February 1979; AXBT Station coordinates, depths, and deployment times.....	57
13. 14 February 1979 PRT Line End Points.....	76
14. 14 February 1979 Flight Updates.....	77
15. 14 February 1979 PRT Calibration Temperatures and Times.....	77
16. 14 February 1979; AXBT Station coordinates, depths, and deployment times.....	83
17. 15 February 1979 PRT Line End Points.....	108
18. 15 February 1979 Flight Updates.....	109
19. 15 February 1979 PRT Calibration Temperatures and Times.....	109
20. 15 February 1979; AXBT Station coordinates, depths, and deployment times.....	113

21.	16 February 1979	PRT Line End Points.....	130
22.	16 February 1979	Flight Updates.....	131
23.	16 February 1979	PRT Calibration Temperatures and Times.....	131
24.	16 February 1979;	AXBT Station coordinates, depths, and deployment times.....	136
25.	17 February 1979	PRT Line End Points.....	154
26.	17 February 1979	Flight Updates.....	155
27.	17 February 1979	PRT Calibration Temperatures and Times.....	155
28.	17 February 1979;	AXBT Station coordinates, depths, and deployment times.....	160
29.	18 February 1979	PRT Line End Points.....	181
30.	18 February 1979	Flight Updates.....	182
31.	18 February 1979	PRT Calibration Temperatures and Times.....	182
32.	18 February 1979;	AXBT Station coordinates, depths, and deployment times.....	186

1. Introduction

This report documents surface and subsurface ocean temperature data collected in the Gulf Stream frontal zone along the continental margin between Savannah, Georgia, and Cape Hatteras, North Carolina. The data were collected during eight flights made aboard the Project Birdseye research aircraft, a Lockheed P-3A operated by the U.S. Naval Oceanographic Office and U.S. Navy Squadron VXN-8, based at Patuxent River Naval Air Station, Maryland. These rapid, extensive and intensive surveys provided essentially synoptic, three-dimensional views of the mesoscale features (specifically meanders) within the Gulf Stream. The surveys were made in support of the observational component of the Gulf Stream Meanders Experiment (GSME), sponsored by the Office of Naval Research and the National Science Foundation. Temperature data collected during five other aircraft surveys in November, 1979 are documented in the data report by Brooks and Bane (1981). Hydrographic data from four cruises during 1979 are reported in two other data reports (Brooks et al 1980a; Bane et al 1980a). The central component of the observational study was an array of four instrument moorings which supported ten Aanderaa RCM-4 current meters. The array was deployed during two separate four-month periods during 1979. The data from the winter mooring period are documented in the report by Brooks et al (1980b), and the summer data appear in the report by Bane and Brooks (1981).

The central objective of the GSME was to obtain a detailed description of the temporal and spatial properties of the mesoscale Gulf Stream meanders that propagate northeastward within the Stream

as it flows along the continental margin. Meanders have been observed to propagate from the Florida Straits, past Cape Hatteras, and into the central North Atlantic. Of particular interest is the subsurface meander structure and its evolution. The aerial surveys were designed to provide short time series of synoptic, three-dimensional views of the Stream's thermal frontal zone, with spatial resolution sufficient to define meanders and associated mesoscale features.

Measurements were made using air-dropped expendable bathythermographs (AXBT's) and a precision radiation thermometer (PRT). These instruments will be described in the following section. The data reported here are not "analyzed", nor are any interpretations given. For detailed interpretations of these data, see Bane et al (1980b, 1981), Lorenson (1980), and Seay (1981). The data set will be made available through the National Oceanographic Data Center.

2. Data Collection, Calibration, and Processing

Three types of data were recorded during each flight.

A. Sea surface temperature was recorded essentially continuously throughout each flight (over the study area) using a downward-looking Barnes Engineering model PRT-5 precision radiation thermometer. This PRT measures electromagnetic radiation in the 10.5 - 12.5 μm range, the thermal infrared band. From the operational flight altitude of 1000 feet, sea surface temperatures in the range 6°C to 24°C were measured and continuously recorded on a strip chart.

In-flight calibration data for the PRT-5 were obtained using a stirred water bath adjusted to various known temperatures within the range of observed sea surface temperatures. The bath temperatures were measured to within 0.05°C with a quartz-crystal thermometer. Calibrations were made frequently throughout each flight.

The sea surface temperature profiles were digitized from the strip chart record at inflection points to obtain a set of temperature versus time pairs. Positions, provided by the navigation logs, were assigned to these pairs. The digitized raw temperatures were corrected by using the calibration data. Interpolation between the calibration temperatures and times provided the "corrected" temperatures.

A set of corrected temperature versus position pairs was constructed for each flight. These have been plotted as cross-stream temperature profiles and hand contoured into surface tem-

perature patterns.

B. Subsurface temperature profiles were provided by AXBT's manufactured by Hermes Electronics Limited. A total of 422 good temperature traces were obtained for the eight surveys. The AXBT's were deployed along an established grid with nominal cross-stream spacing of 12.5 km and along-stream spacing of 50 km. To obtain optimal resolution, the selection of stations from the overall grid was made during each flight. The AXBT drops were numbered consecutively throughout the flight series. If a probe failed to return a useful temperature profile, the aircraft usually returned to the drop-site and deployed another probe. Thus, the spatial coverage was nearly complete.

The AXBT buoys (AN/SSQ 36) have a cylindrical construction approximately 93 cm in length and 12 cm in diameter. The buoys consist primarily of a probe and a frequency modulation transmitter. The probe is about 26 cm long and 10 cm in diameter with a glass-coated thermistor located at the tip. After launch from the aircraft, a parachute opens to slow and stabilize the buoy's descent. Upon striking the ocean surface, the parachute and the end plate separate from the floating buoy. An antenna raises up and begins transmitting a radio frequency carrier. Approximately one minute later, the probe is released from the surface buoy and begins its descent. Simultaneously, the carrier signal is modulated by an audio frequency which is proportional to the temperature sensed by the thermistor. This audio frequency is transmitted up a wire connecting the falling probe to the surface buoy. The FM signal is received by the aircraft for processing. More detailed descriptions of the AXBT's can be

found in Gent and Heuser (1980) and Sessions and Barnett (1980).

The audio frequency generated is proportional to the water temperature sensed by the thermistor according to the following equation:

$$f = a + bT$$

Where f is the audio frequency in Hertz, T is the water temperature in degrees Celsius, and a and b are constants. For this study $a = 1425.07$ and $b = 37.176$, which yield an accuracy of $\pm 0.2^\circ\text{C}$ (Sessions and Barnett, 1980).

Aboard the aircraft, the FM signal was converted to a DC voltage and the temperature trace was plotted as a function of time (depth) on one of three Hewlett-Packard plotters. Initially, the three plotters were calibrated such that the pen would sweep the graph at a rate proportional to the fall rate of the probe. Errors were noticed in the sweep rates of all three plotters following the final survey. For each plotter, an error rate (R_e) per trace was computed. The depth of each data point was recalculated according to the following formula:

$$D_{\text{new}} = \left[\frac{D_{\text{old}}}{R_i + nR_e} \right] R_i$$

where D_{new} is the actual ocean depth of the temperature value, D_{old} is the recorded depth of that value, R_i is the original sweep rate, and n is the consecutive number assigned to each trace according to the recording sequence. Application of these corrections should reduce the rate error from 8.6% to a maximum of 4.3%.

The temperature traces were digitized every 0.04 inches, which

is approximately equivalent to one temperature reading per meter of depth. For the data presentations, these temperature-depths pairs were reduced to a maximum number of seventy-one for each profile. These were composed of fifty-one values at four meter intervals for the depth range 0 to 200 meters, and values at ten meter intervals for depths greater than 200 meters. In all cases, the AXBT records were less than 400 meters in depth.

All figures were contoured by available computer contouring packages. Contouring of the alongshore and cross-stream temperature/depth fields was done by programs designed by T. B. Curtin and D. Britton at North Carolina State University. The horizontal temperature fields were contoured by the SURFACE II graphics system developed by the Kansas Geological Survey (Sampson, 1975). For the most part, the computer graphics were not altered. However some hand contouring was required to smooth small oscillations introduced by the graphics package. Additional hand contouring was required to define some of the filaments which were interpreted as isolated anomalies by the contouring system.

C. Aircraft position versus time logs were maintained by the Navy flight crew. The primary navigation equipment was a Litton Industries LTN-51 inertial navigation system. Additional position fixes were periodically provided by Loran C and NNSS (Navy Navigation Satellite System). Using the additional position information, linear interpolations were made to adjust the LTN-51 fixes. The Schuler oscillation was not factored into the adjustments. The updated position fixes were logged as functions of time and used for plotting the AXBT and PRT temperature data.

3. Report Organization

This report is divided into nine major sections, one for each flight and one for composite diagrams. For each flight, the PRT data is followed by the AXBT data. The PRT data presentations consist of a table of end point positions for the flight lines, a table of flight position updates, a table of PRT calibration temperatures and times, cross-stream surface temperature profiles, and the contoured sea surface temperature field. The AXBT data presentations consist of a diagram and a table of the station numbers and positions, AXBT vertical temperature profiles, horizontal subsurface temperature fields, topographies of isothermal surfaces, AXBT cross-stream vertical temperature sections, AXBT alongshore vertical temperature sections, and AXBT/PRT temperature correlations. Finally, horizontal temperature field composite diagrams constructed from two successive surveys are given.

FLIGHT 1: 9 FEBRUARY 1979

Survey Time: 1655:20 to 2147:53

Table 1. 9 February 1979 PRT Line End Points

TIME (Hr-Min-Sec)	LATITUDE (°N)	LONGITUDE (°W)	LINE
1656:02	34°46.81'	75°43.63'	A
1710:16	33°58.36'	75°10.68'	
1719:08	33°57.69'	75°09.58'	B
1739:47	34°10.15'	76°35.62'	
1852:05	32°49.14'	78°17.45'	N
1912:54	32°05.16'	77°02.61'	
1922:08	32°13.21'	76°44.02'	M
1946:12	32°51.05'	77°52.92'	
2005:10	33°06.79'	77°45.62'	L
2013:48	32°48.95'	77°12.83'	
2025:08	32°46.21'	76°38.70'	K
2055:08	33°17.58'	77°30.99'	
2106:29	33°35.80'	77°04.88'	I
2120:06	33°06.42'	76°12.40'	
2133:00	33°27.06'	75°49.99'	G
2144:28	33°45.05'	76°20.33'	

Table 2. 9 February 1979 Flight Updates

<u>TIME(Hrs.)</u>	<u>EVENT</u>	<u>OLD POSITION</u>	<u>NEW POSITION</u>	<u>TYPE OF FIX FOR UPDATES</u>
15.76	TAKEOFF			
17.07	NAV.	34°20.84'N	34°22.52'N	SATELLITE
	UPDATE	75°25.84'W	75°26.80'W	
22.80	NAV.	37°50.76'N	38°01.69'N	SATELLITE
	UPDATE	76°13.44'W	76°04.93'W	
21.78	LAST DATA POINT			

Table 3. 9 February 1979 PRT Calibration
Temperatures and Times

<u>TIME</u> (Hrs.)	<u>CALIBRATION TEMPERATURE (°C)</u>		
	10.00	17.00	24.00
16.70	0.50	0.49	-0.37
17.22	0.42	0.30	-0.08
18.12	0.40	0.23	-0.13
18.76	0.03	-0.12	-0.10
20.00	0.53	0.29	0.12
21.00	0.38	0.36	0.04
21.88	0.40	0.20	0.05

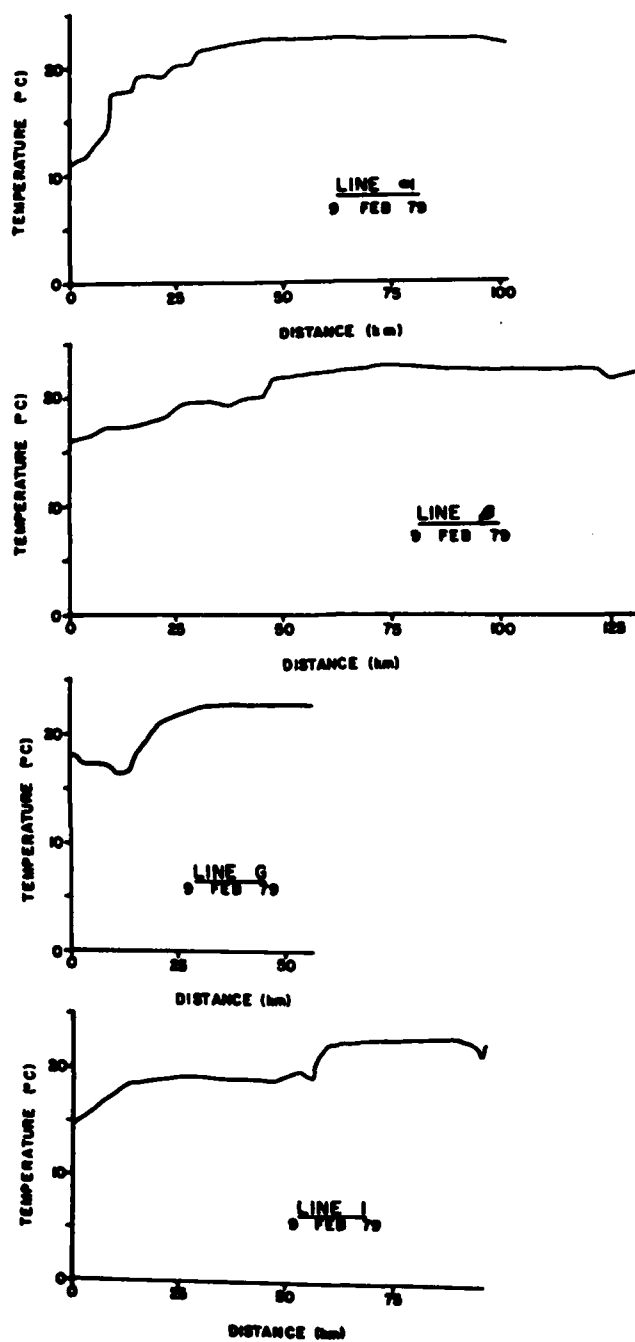


Figure 1. PRT cross-stream surface temperature profiles, 9 February 1979.

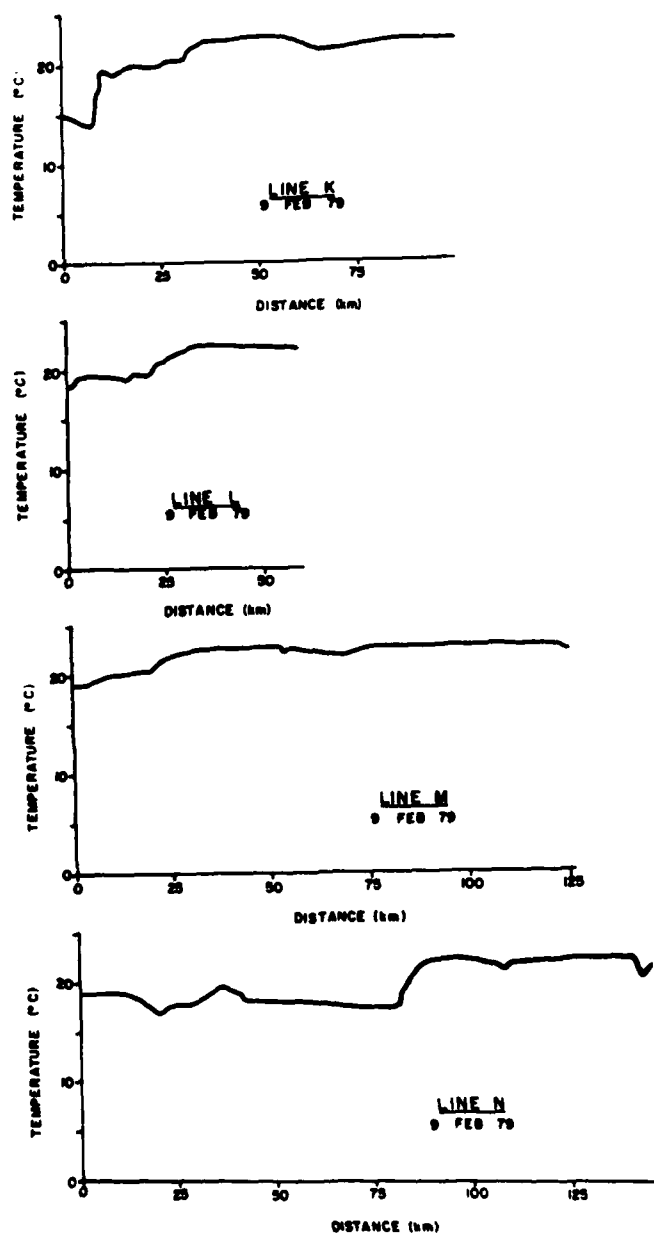


Figure 1 (cont'd).

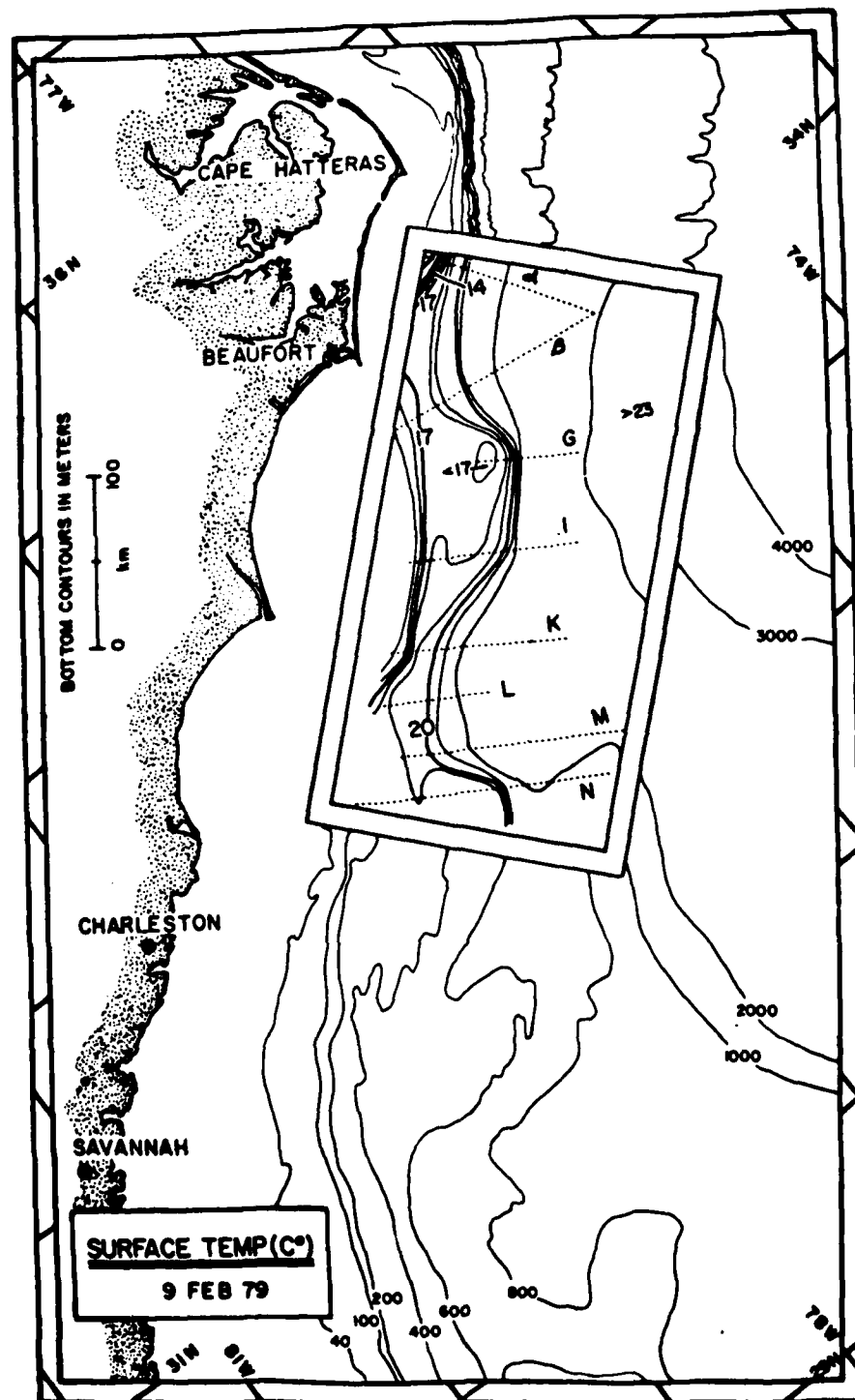


Figure 2. PRT sea surface temperature field, 9 February 1979. Dashed lines indicate positions of cross-stream data lines.

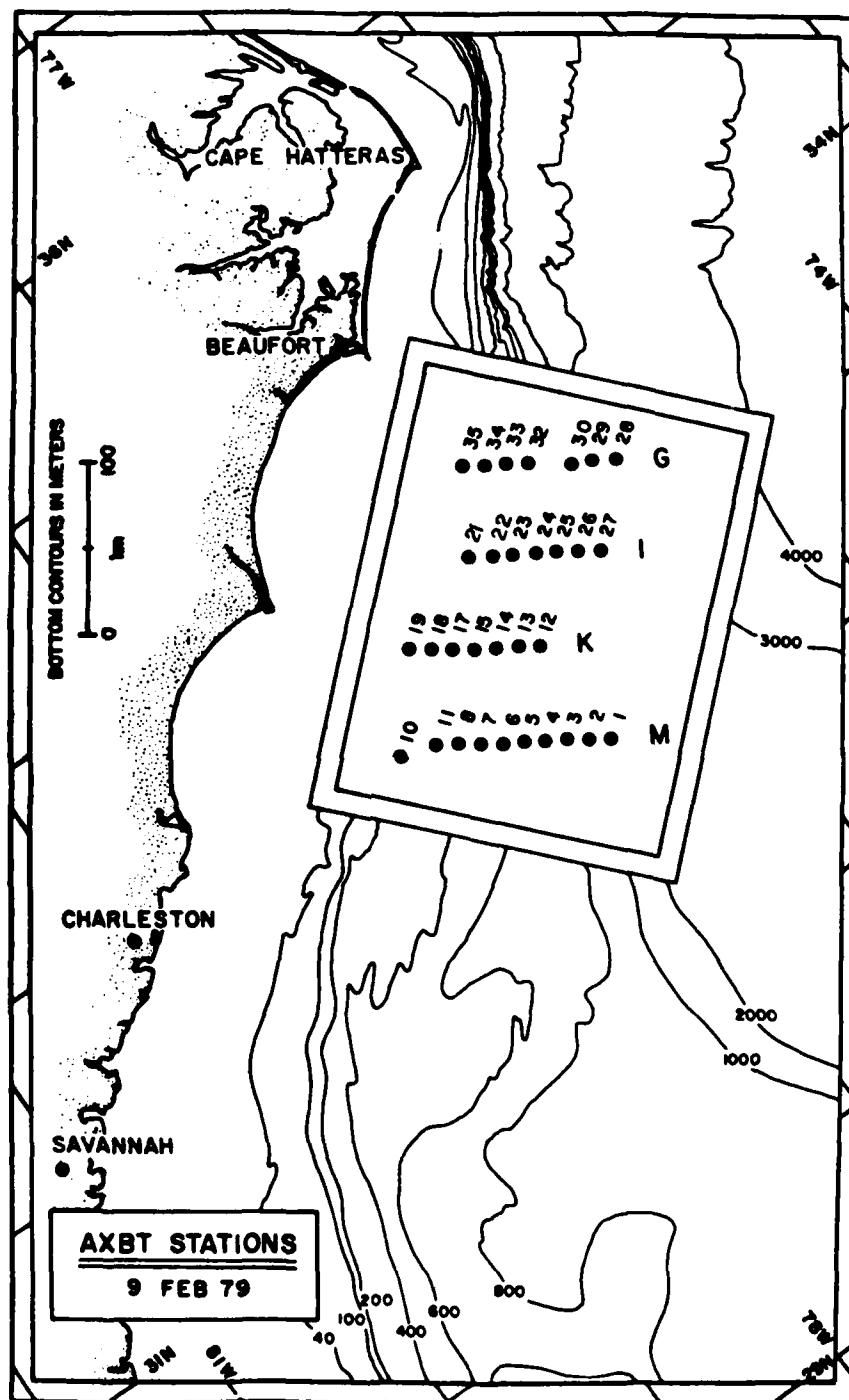


Figure 3. AXBT station locations, 9 February 1979.

Table 4. 9 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
001	32°16.1'	76°48.8'	370	1924:20
002	32°20.0'	76°55.3'	370	1926:49
003	32°24.0'	77°01.7'	380	1929:31
004	32°27.9'	77°08.3'	370	1932:09
005	32°31.8'	77°14.7'	370	1934:29
006	32°34.9'	77°21.3'	370	1936:48
007	32°39.6'	77°28.0'	370	1939:15
008	32°43.5'	77°34.4'	370	1941:42
010	32°51.4'	77°54.0'	370	1946:35
011	32°47.4'	77°40.8'	370	1954:25
012	32°52.0'	76°48.5'	370	2029:04
013	32°55.9'	76°54.8'	370	2031:35
014	33°00.0'	77°01.5'	370	2034:08
015	33°03.7'	77°08.2'	370	2036:32
017	33°07.9'	77°14.4'	171	2049:33
018	33°11.8'	77°21.0'	106	2051:53
019	33°15.8'	77°27.5'	85	2054:09
021	33°27.1'	76°48.9'	282	2110:40
022	33°23.3'	76°41.8'	380	2112:34
023	33°19.5'	76°35.5'	370	2114:21
024	33°15.9'	76°28.6'	370	2116:02
025	33°12.1'	76°22.1'	380	2117:43
026	33°08.2'	76°15.4'	370	2119:23
027	33°04.3'	76°09.0'	370	2121:04
028	33°23.4'	75°43.8'	370	2131:24
029	33°27.5'	75°50.7'	370	2133:53
030	33°31.0'	75°57.1'	370	2136:14
032	33°39.0'	76°10.1'	370	2141:05
033	33°43.1'	76°16.7'	370	2143:27
034	33°46.7'	76°23.4'	247	2145:38
035	33°50.8'	76°29.9'	40	2147:53

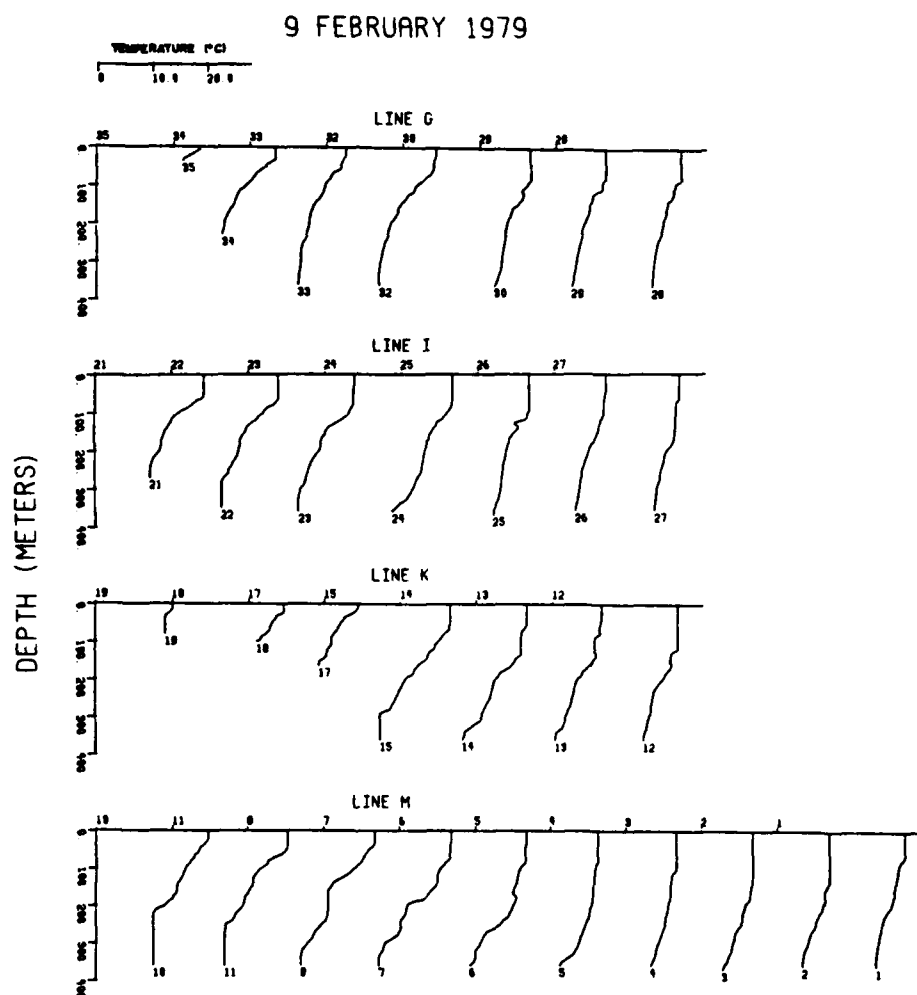


Figure 4. AXBT vertical temperature profiles, 9 February 1979.

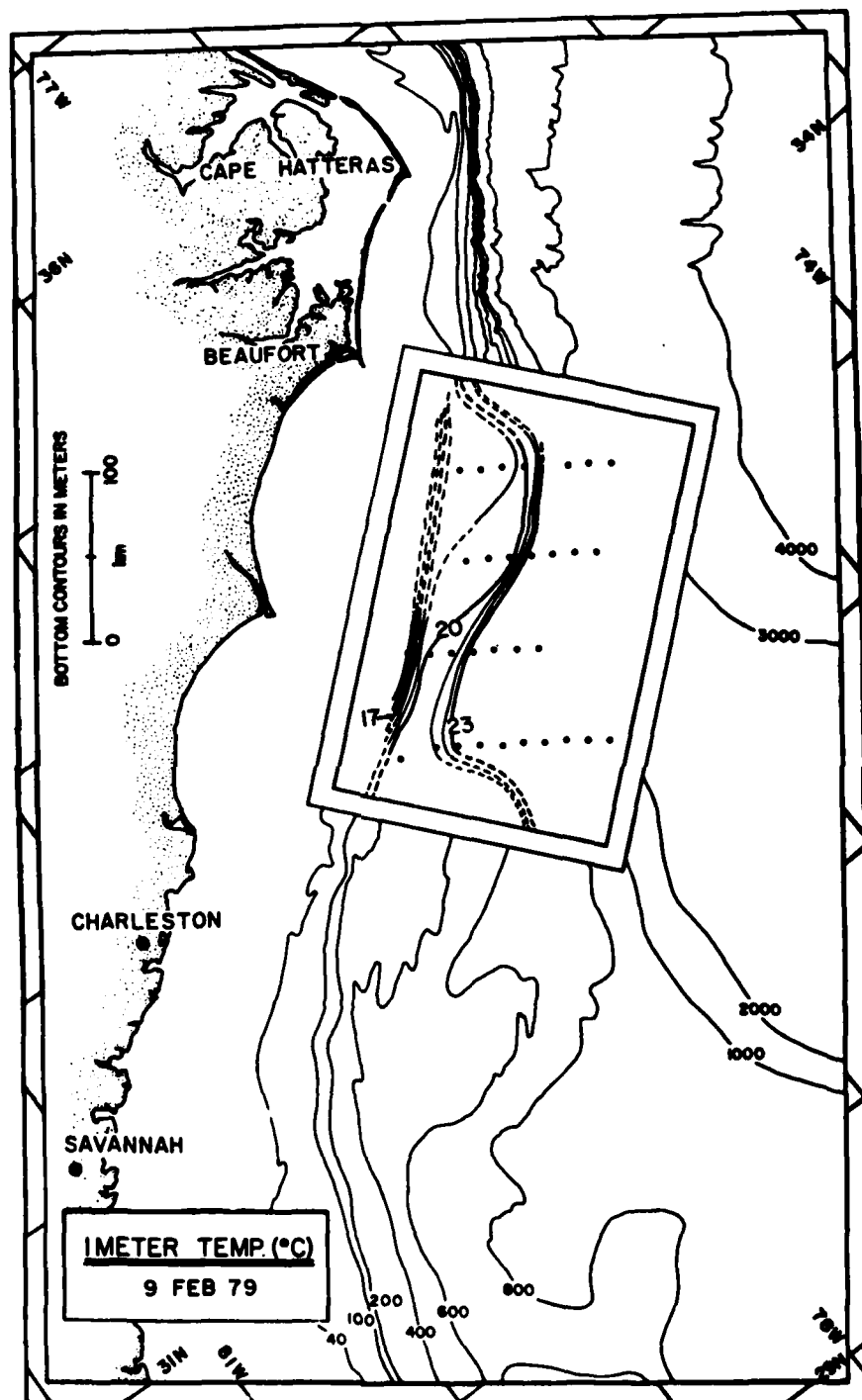


Figure 5. AXBT temperatures at 1 meter, 9 February 1979. Small solid circles indicate AXBT drop-sites.

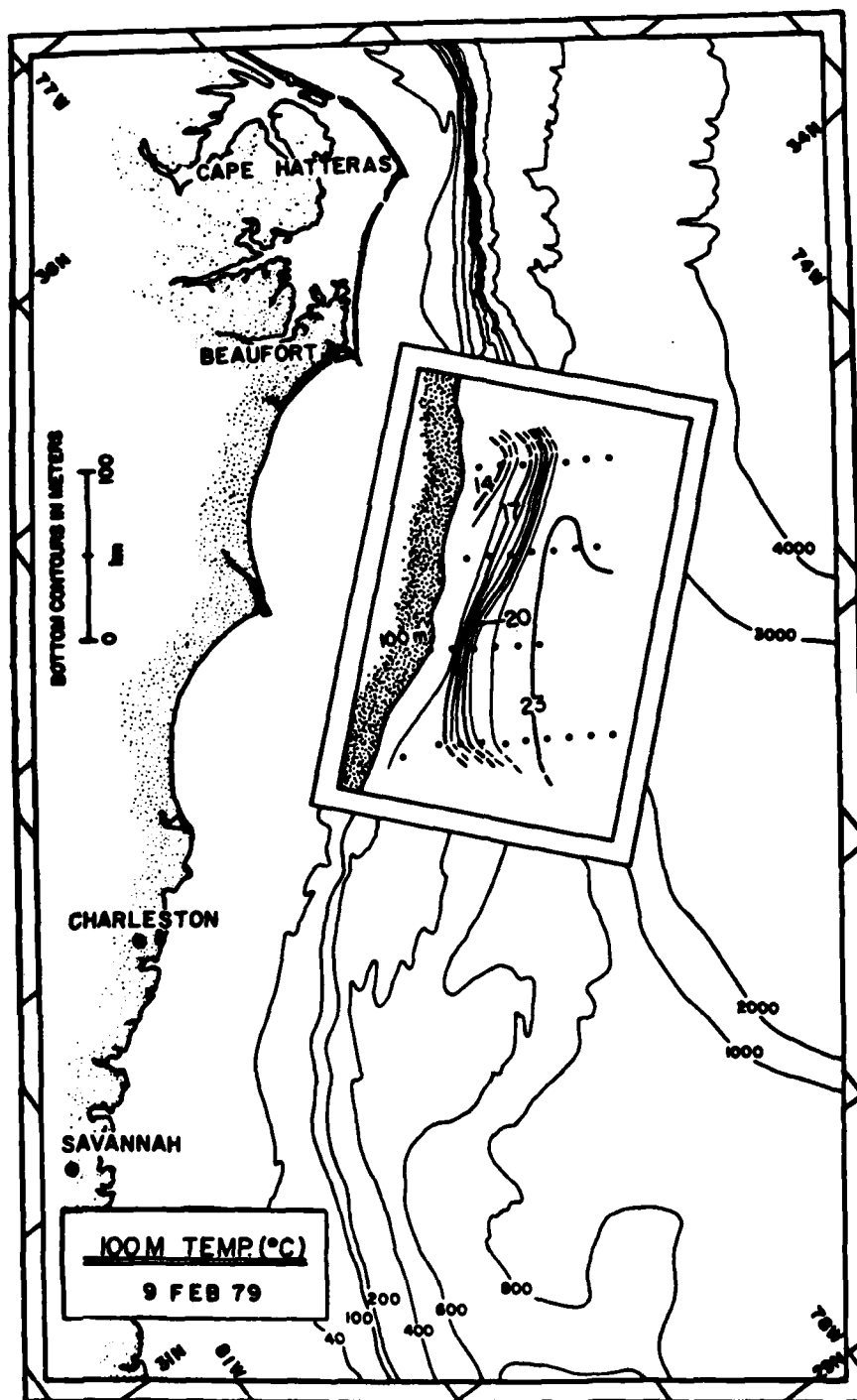


Figure 6. AXBT temperatures at 100 meters, 9 February 1979.

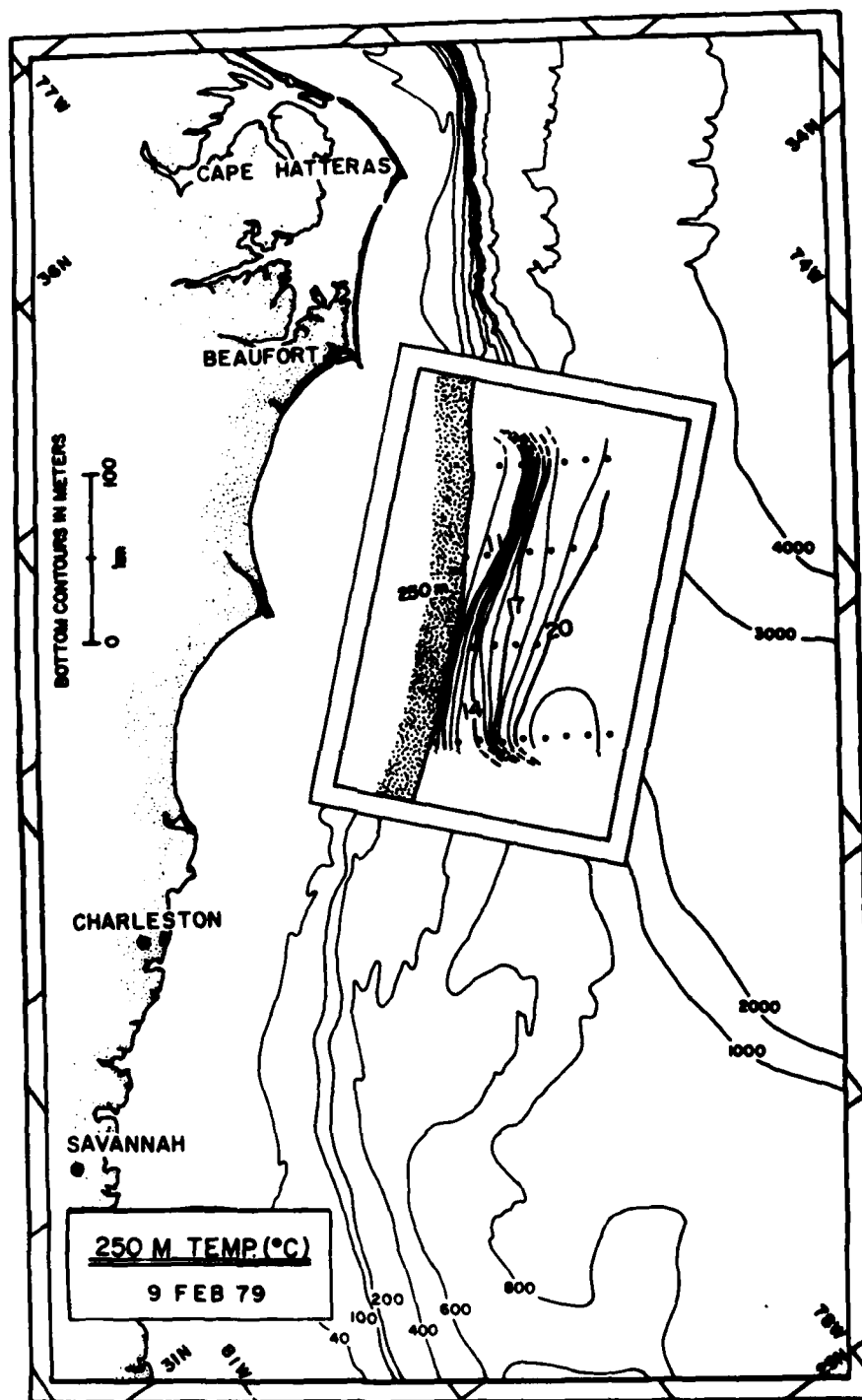


Figure 7. AXBT temperatures at 250 meters, 9 February 1979.

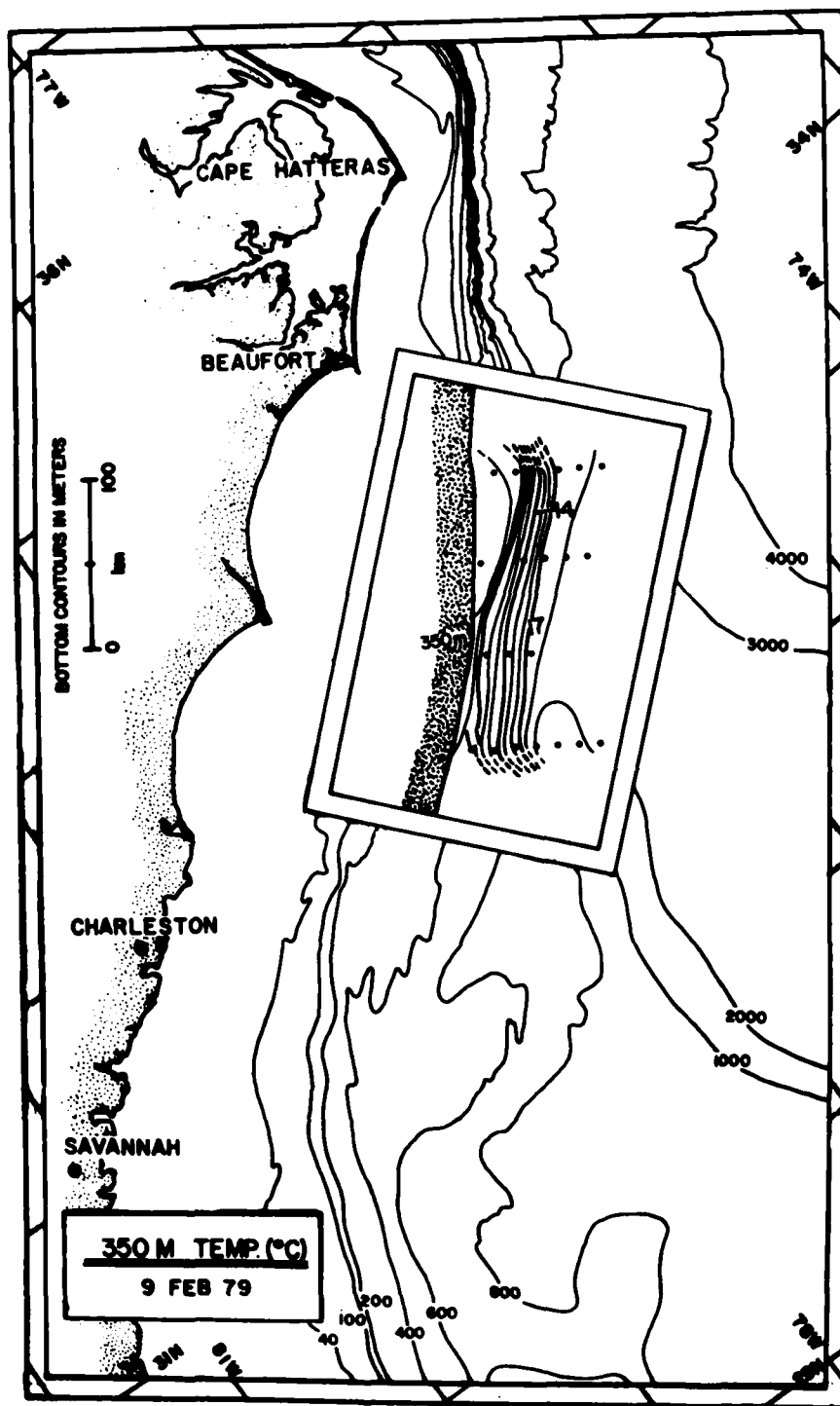


Figure 8. AXBT temperatures at 350 meters, 9 February 1979.

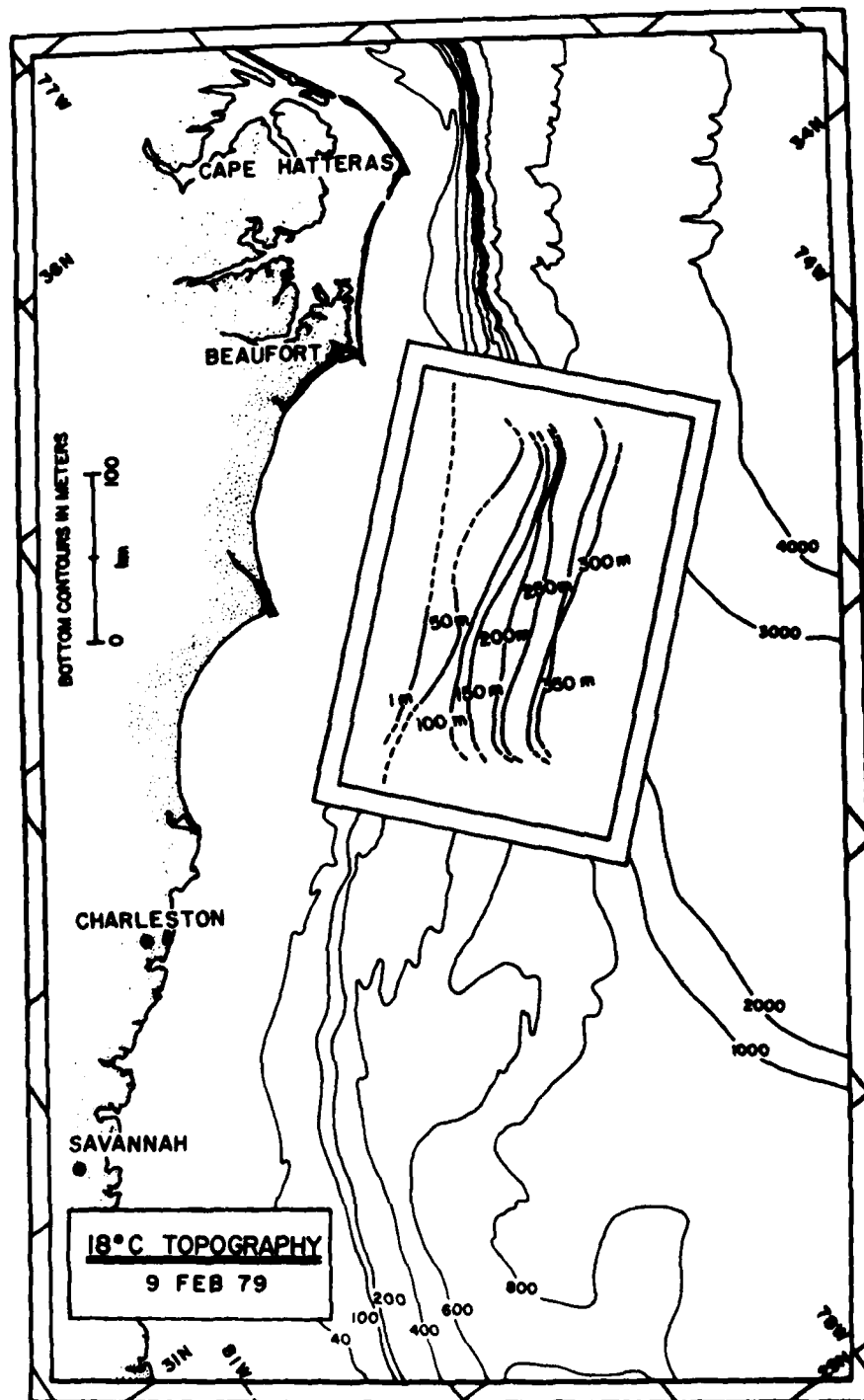


Figure 9. Tonography of the 18°C isotherm, 9 February 1979.

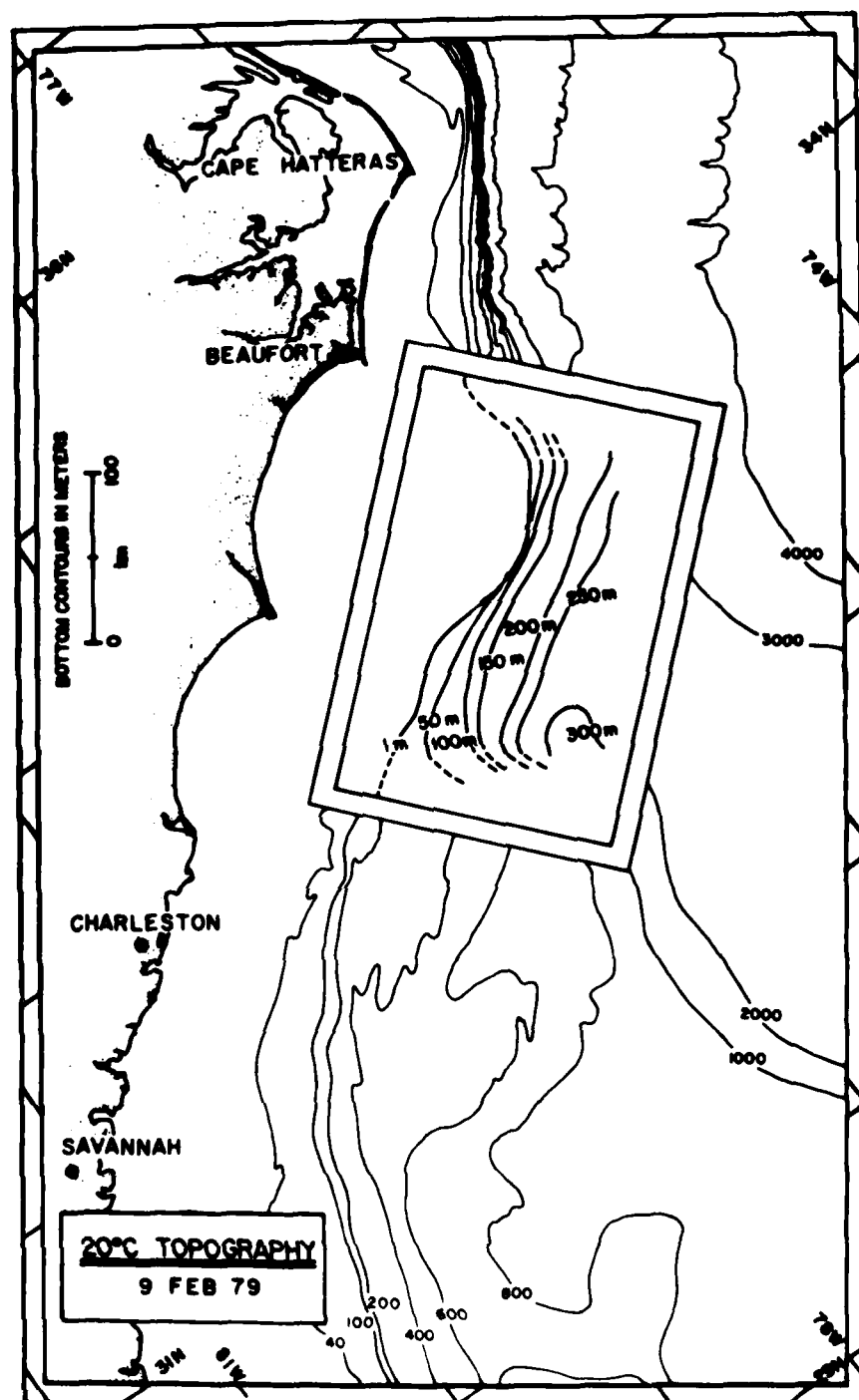


Figure 10. Topography of the 20°C isotherm, 9 February 1979.

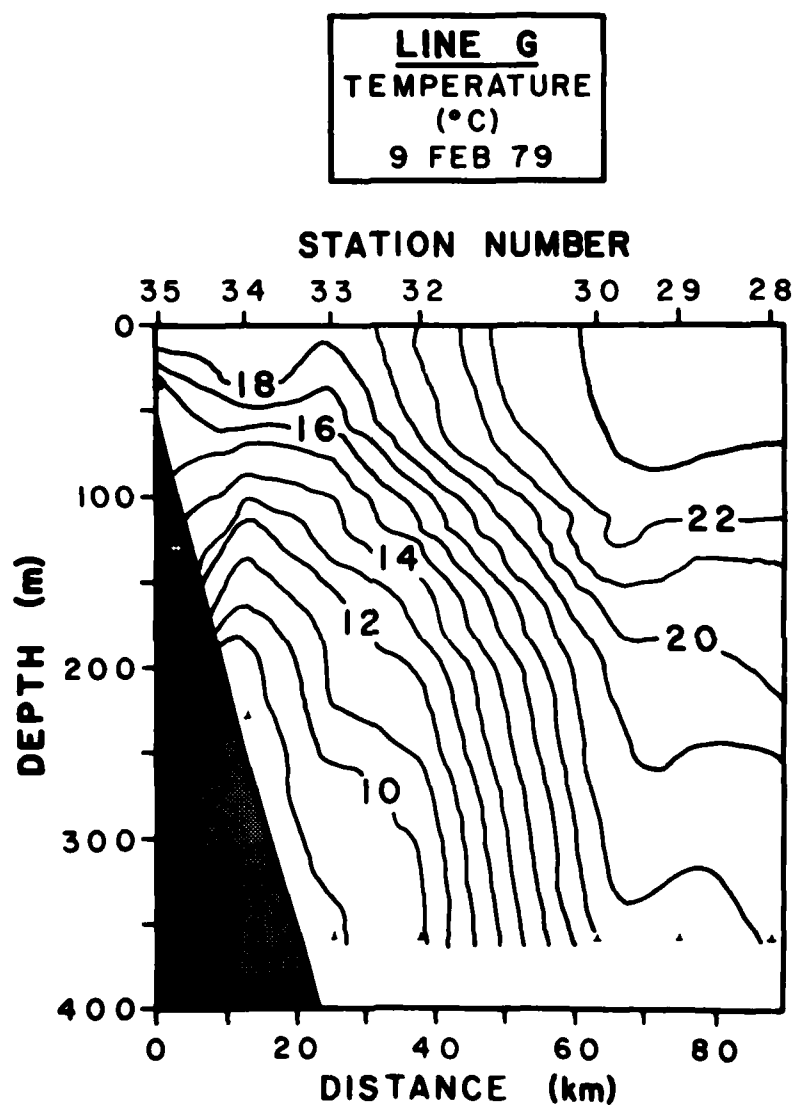


Figure 11. Cross-stream vertical temperature section along Line G, 9 February 1979.

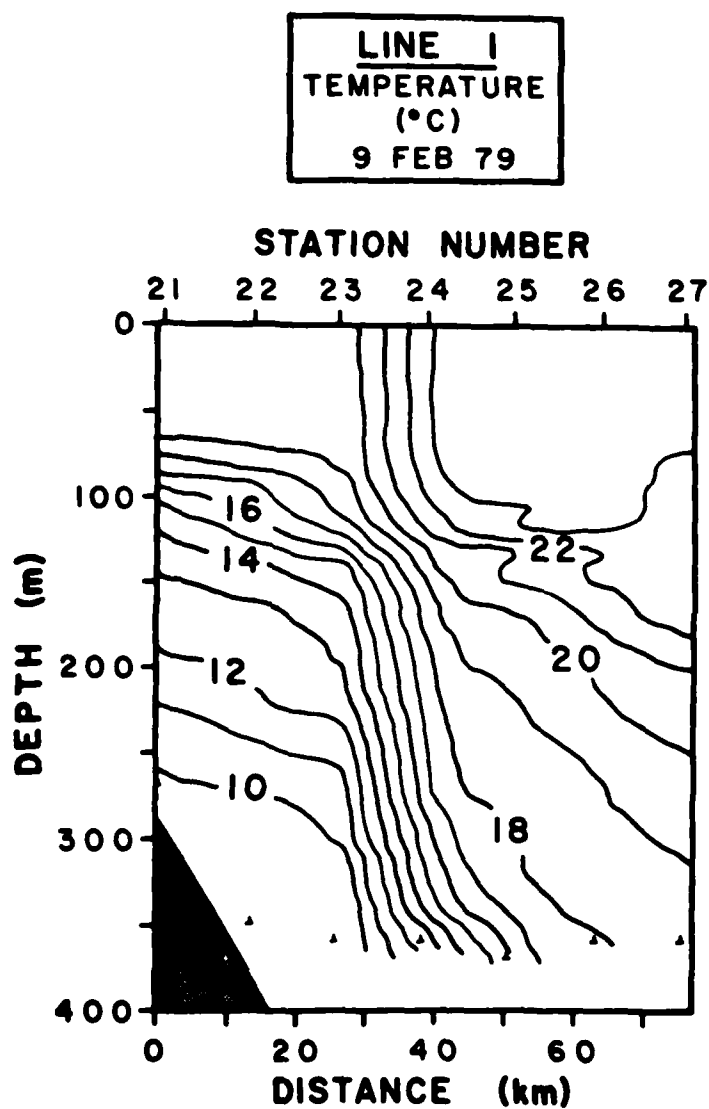


Figure 12. Cross-stream vertical temperature section along Line I, 9 February 1979.

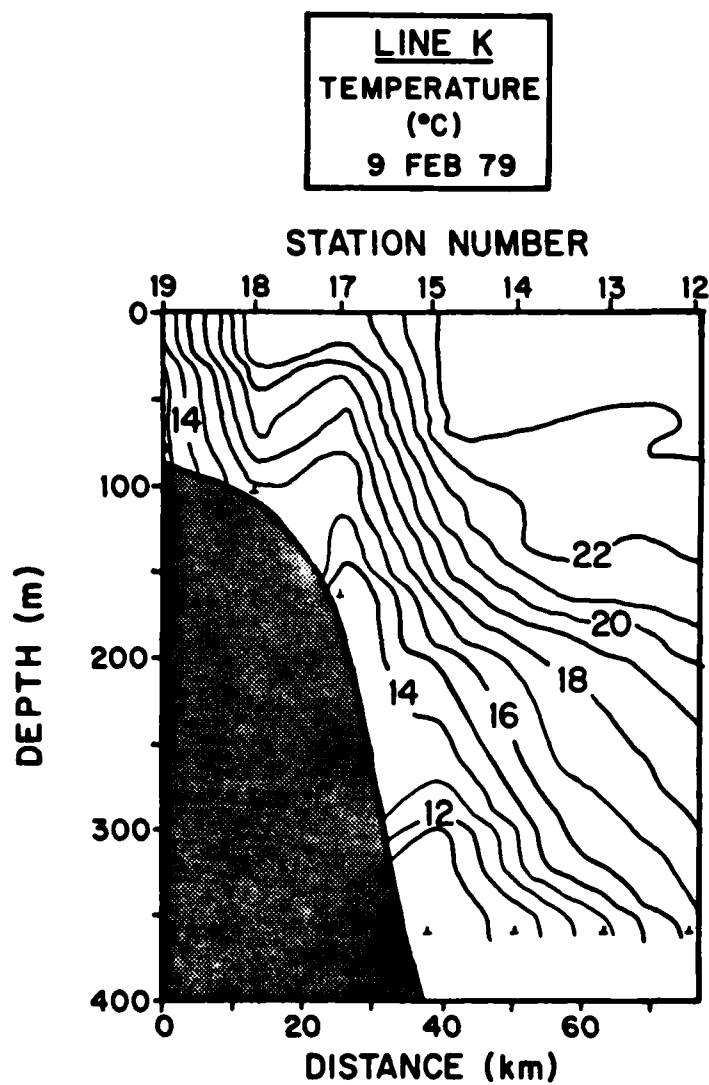


Figure 13. Cross-stream vertical temperature section along Line K, 9 February 1979.

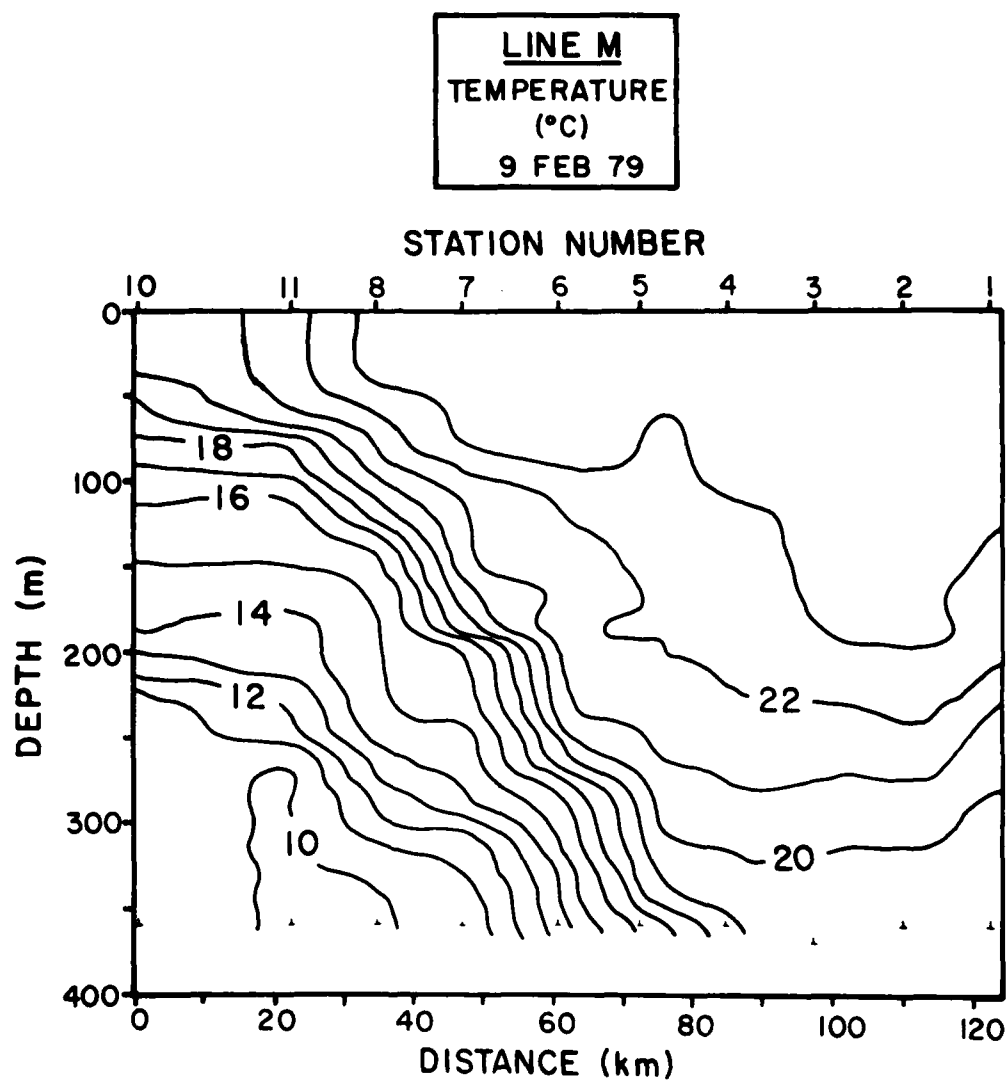


Figure 14. Cross-stream vertical temperature section along Line M, 9 February 1979.

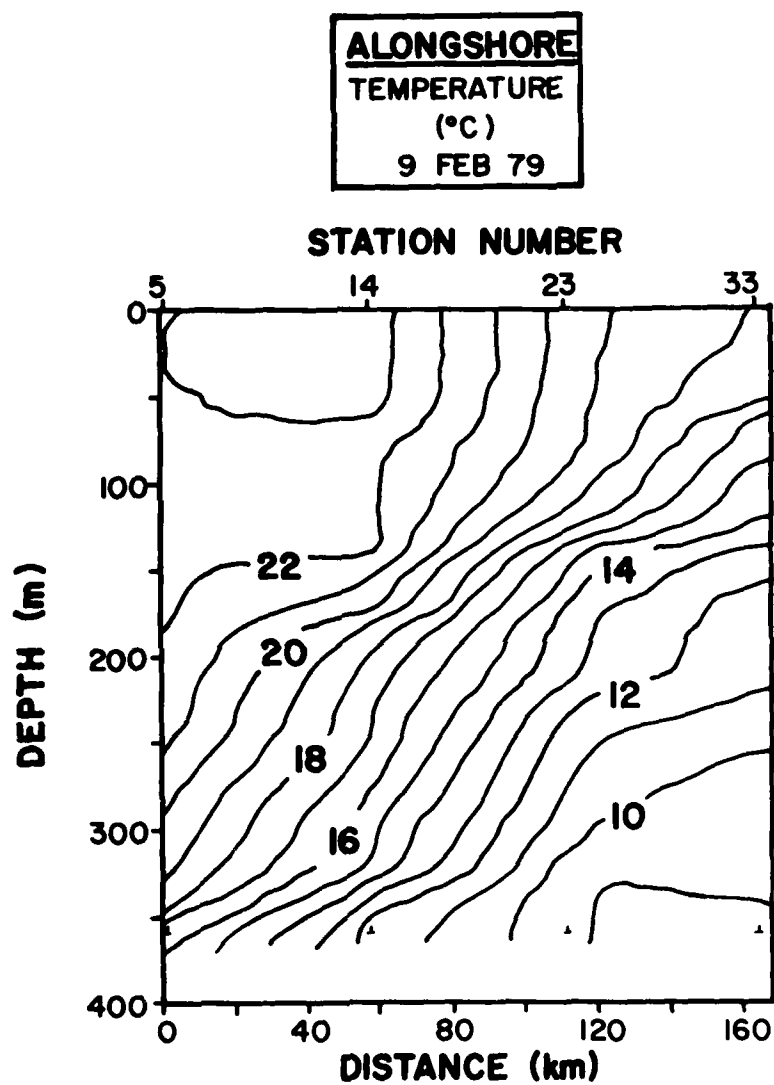


Figure 15. Alongshore vertical temperature section, 9 February 1979.

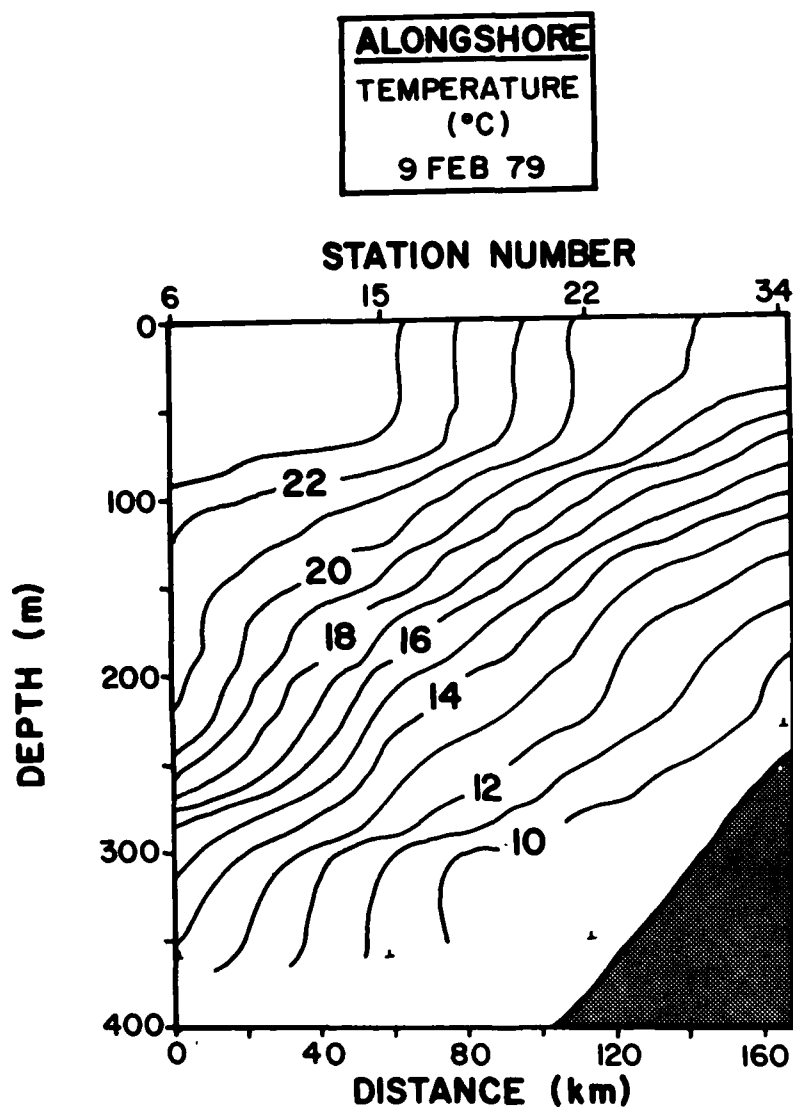


Figure 16. Alongshore vertical temperature section,
9 February 1979.

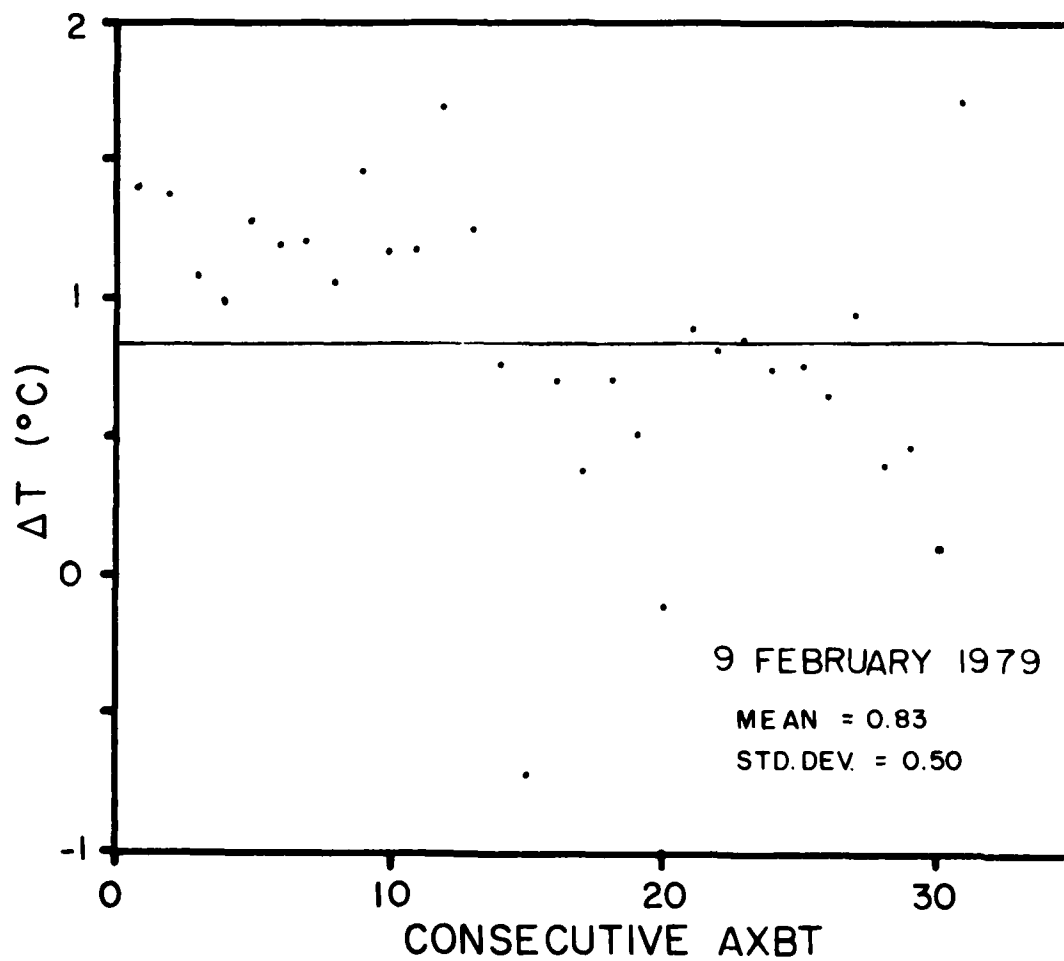


Figure 17. Difference between 1 meter AXBT and PRT temperatures ($T_{\text{AXBT}} - T_{\text{PRT}}$) versus consecutive AXBT drop number, 9 February 1979.

FLIGHT 2: 10 FEBRUARY 1979

Survey Time: 1841:10 to 2245:02

Table 5. 10 February 1979 PRT Line End Points

TIME (Hr-Min-Sec)	LATITUDE (°N)	LONGITUDE (°W)	LINE
1841:10	31°27.26'	79°51.01'	V
1850:06	31°07.92'	79°16.28'	
1857:29	31°12.29'	78°56.05'	U
1912:07	31°39.09'	79°41.20'	
2008:10	31°34.01'	78°37.64'	S
2022:19	32°01.39'	79°22.58'	
2027:29	32°11.67'	79°16.99'	R
2036:07	31°54.22'	78°43.69'	
2046:19	31°56.99'	78°18.54'	Q
2100:14	32°23.65'	79°04.17'	
2105:20	32°34.14'	78°56.99'	P
2123:24	31°56.62'	77°50.20'	
2134:05	31°52.22'	77°14.37'	O
2155:23	32°23.06'	78°06.15'	
2200:22	32°36.85'	78°06.19'	N
2211:20	32°13.94'	77°25.77'	
2231:05	32°14.17'	76°55.79'	M
2245:00	32°40.92'	77°41.70'	

Table 6. 10 February 1979 Flight Updates

<u>TIME(Hrs.)</u>	<u>EVENT</u>	<u>OLD POSITION</u>	<u>NEW POSITION</u>	<u>TYPE OF FIX FOR UPDATES</u>
16.133	TAKEOFF			
17.45	NAV. UPDATE			LTN-51 SATELLITE
21.96	NAV. UPDATE	32°30.51'N 78°11.59'W	32°29.92'N 78°08.11'W	
22.75	- No update at the end of the flight - Used previous section's error rate - Last data point			

Table 7. 10 February 1979 PRT Calibration
Temperatures and Times

<u>TIME</u> (Hrs.)	<u>CALIBRATION TEMPERATURE (°C)</u>		
	13.00	19.00	25.00
17.58	0.08	0.19	-0.23
18.62	0.29	-0.23	-0.15
19.76	0.11	-0.10	-0.45
21.45	-0.12	-0.31	-0.47
22.92	-0.13	-0.42	-0.56

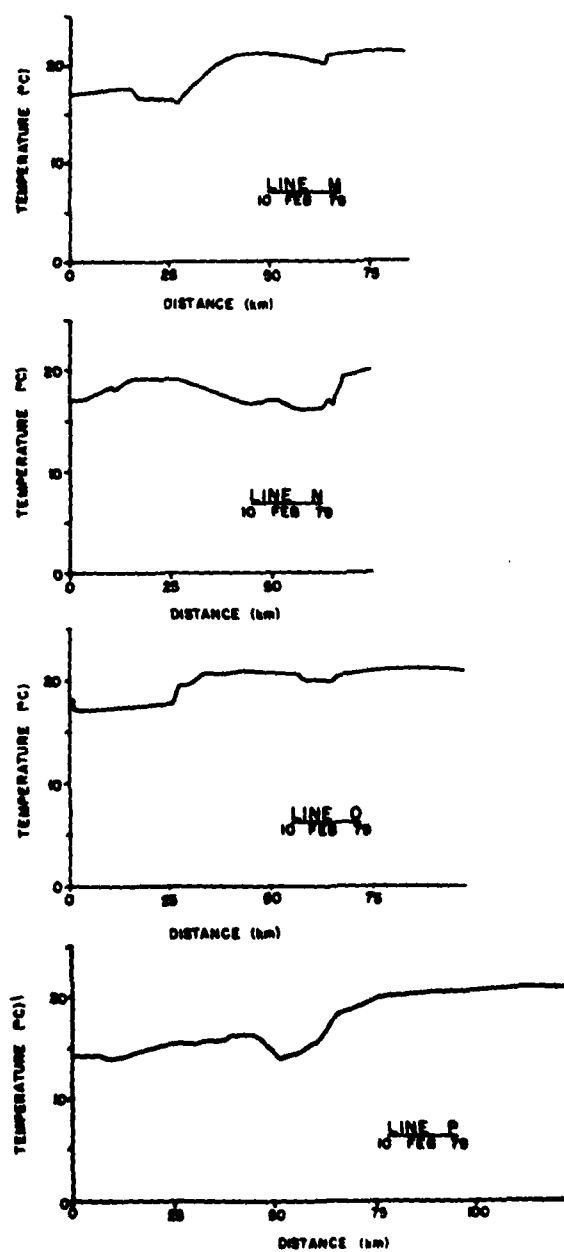


Figure 18. PRT cross-stream surface temperature profiles, 10 February 1979.

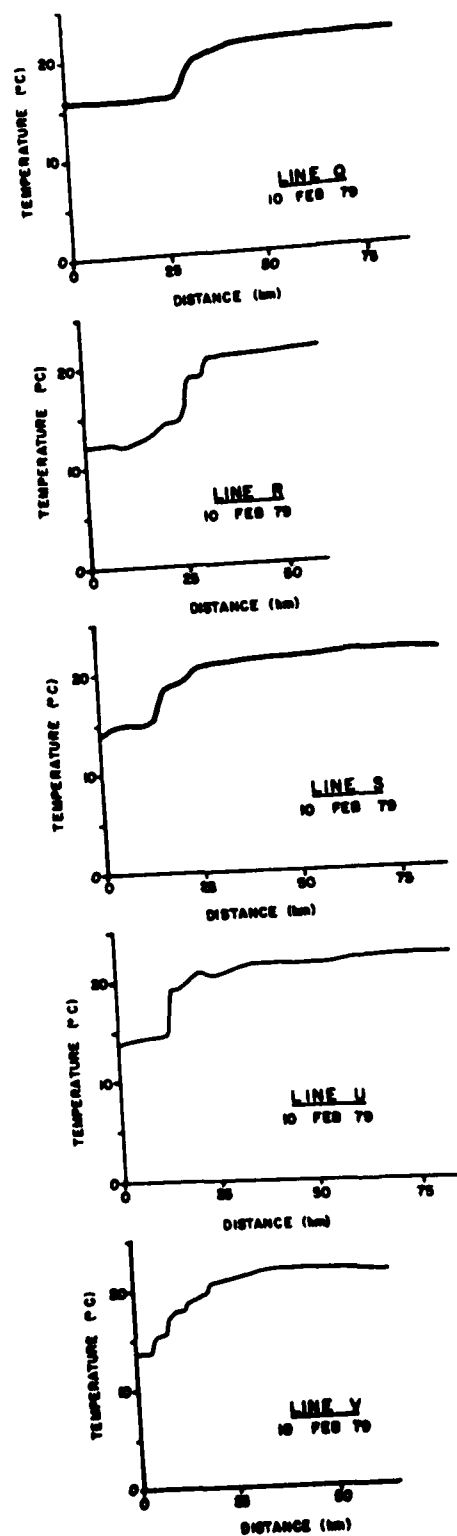


Figure 18 (cont'd).

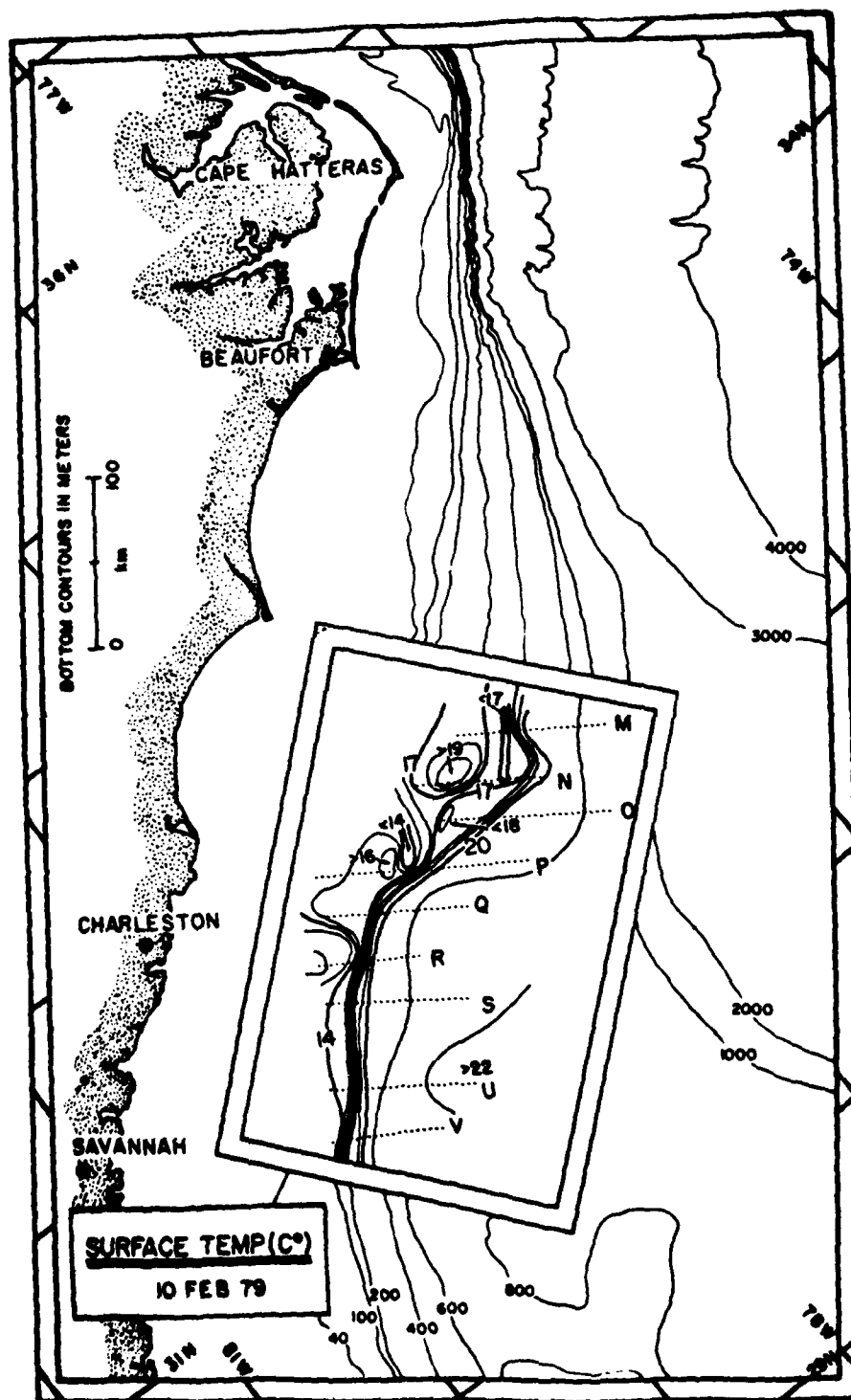


Figure 19. PRT sea surface temperature field, 10 February 1979. Dashed lines indicate positions of cross-stream data lines.

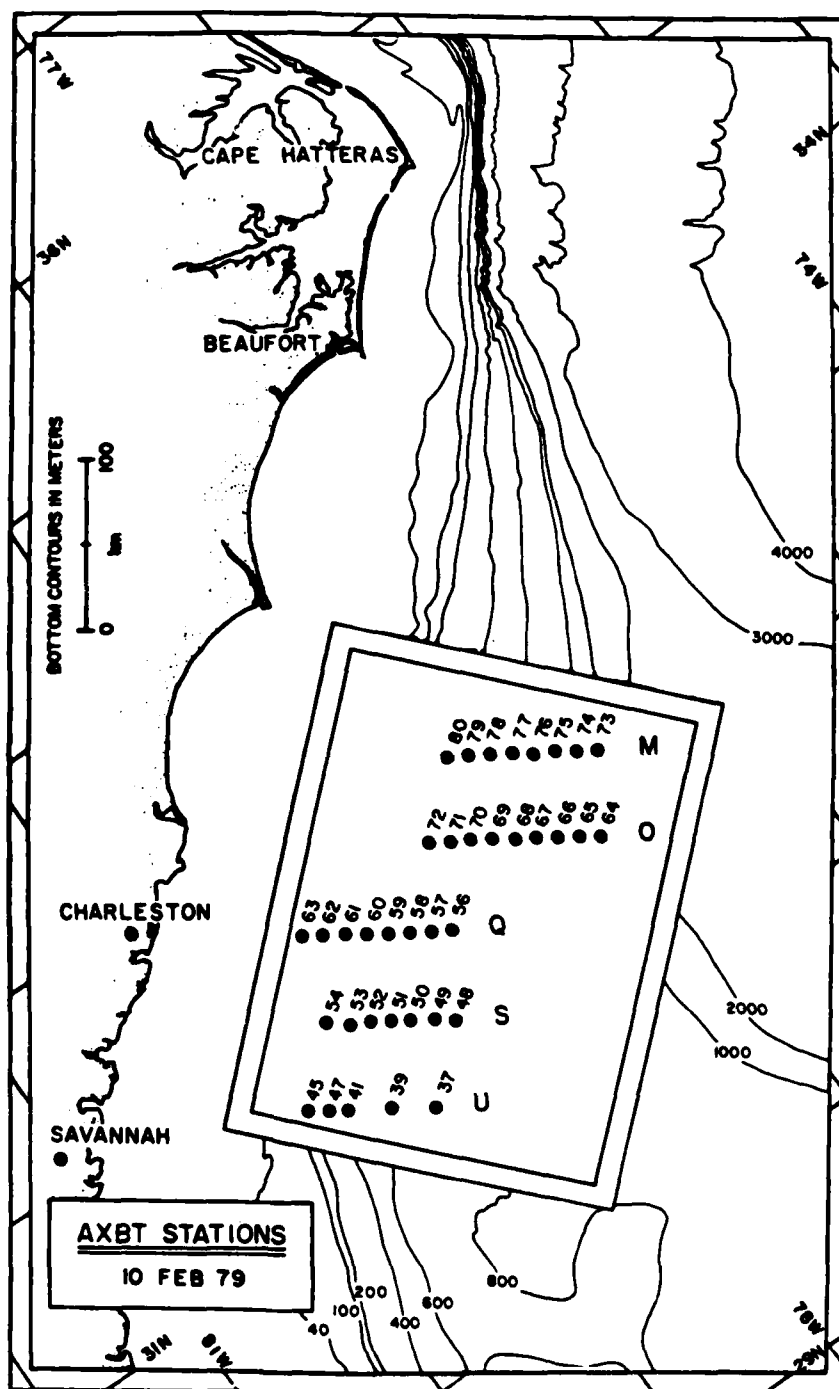


Figure 20. AXBT station locations, 10 February 1979.

Table 8. 10 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
037	31°16.2'	79°02.4'	370	1859:48
039	31°24.0'	79°15.4'	370	1904:08
041	31°31.9'	79°28.7'	204	1908:20
045	31°39.2'	79°40.9'	45	1925:17
047	31°35.3'	79°34.9'	60	1938:55
048	31°34.0'	78°37.8'	370	2008:13
049	31°38.6'	78°43.4'	370	2010:19
050	31°42.8'	78°50.6'	370	2012:37
051	31°46.1'	78°56.5'	370	2014:28
052	31°49.9'	79°02.9'	377	2016:32
053	31°52.7'	79°09.6'	150	2018:34
054	31°57.6'	79°16.1'	33	2020:36
056	31°57.0'	78°18.5'	370	2046:33
057	32°00.7'	78°25.1'	370	2048:33
058	32°04.5'	78°31.7'	370	2050:33
059	32°08.3'	78°38.1'	310	2052:32
060	32°12.3'	78°44.7'	310	2054:33
061	32°16.2'	78°51.0'	160	2056:28
062	32°20.0'	78°57.7'	40	2058:27
063	32°23.7'	79°04.2'	40	2100:21
064	31°52.2'	77°14.4'	370	2134:06
065	31°56.2'	77°20.6'	370	2136:07
066	32°00.2'	77°27.1'	370	2138:09
067	32°04.0'	77°33.6'	370	2140:11
068	32°07.8'	77°40.1'	370	2142:10
069	32°11.7'	77°46.6'	370	2144:06
070	32°16.1'	77°53.2'	370	2146:02
071	32°19.3'	77°59.6'	370	2147:55
072	32°23.1'	78°06.2'	298	2155:42
073	32°14.1'	76°55.8'	370	2231:09
074	32°17.9'	77°02.4'	370	2233:08
075	32°21.8'	77°08.9'	370	2235:11
076	32°25.4'	77°15.6'	370	2237:10
077	32°29.6'	77°21.9'	310	2239:09
078	32°33.3'	77°28.6'	370	2241:07
079	32°37.2'	77°35.2'	350	2243:07
080	32°40.9'	77°41.7'	200	2245:02

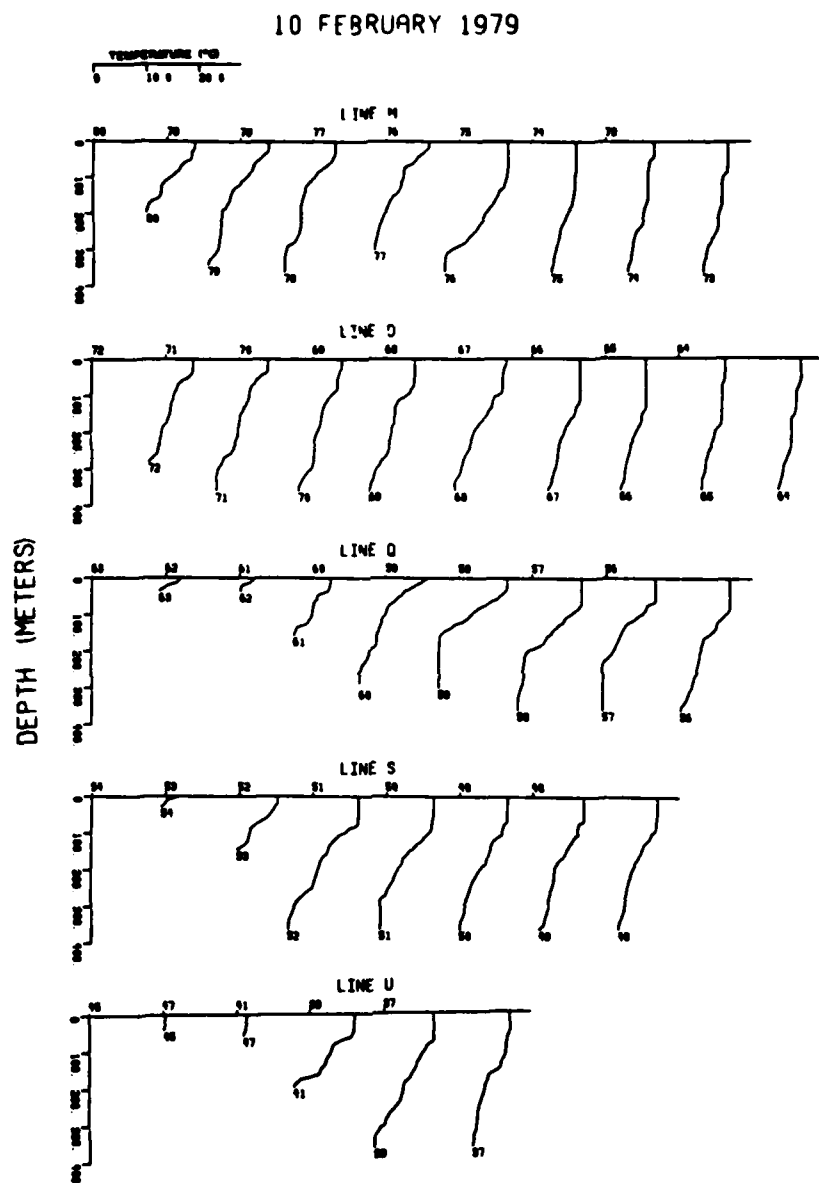


Figure 21. AXBT vertical temperature profiles, 10 February 1979.

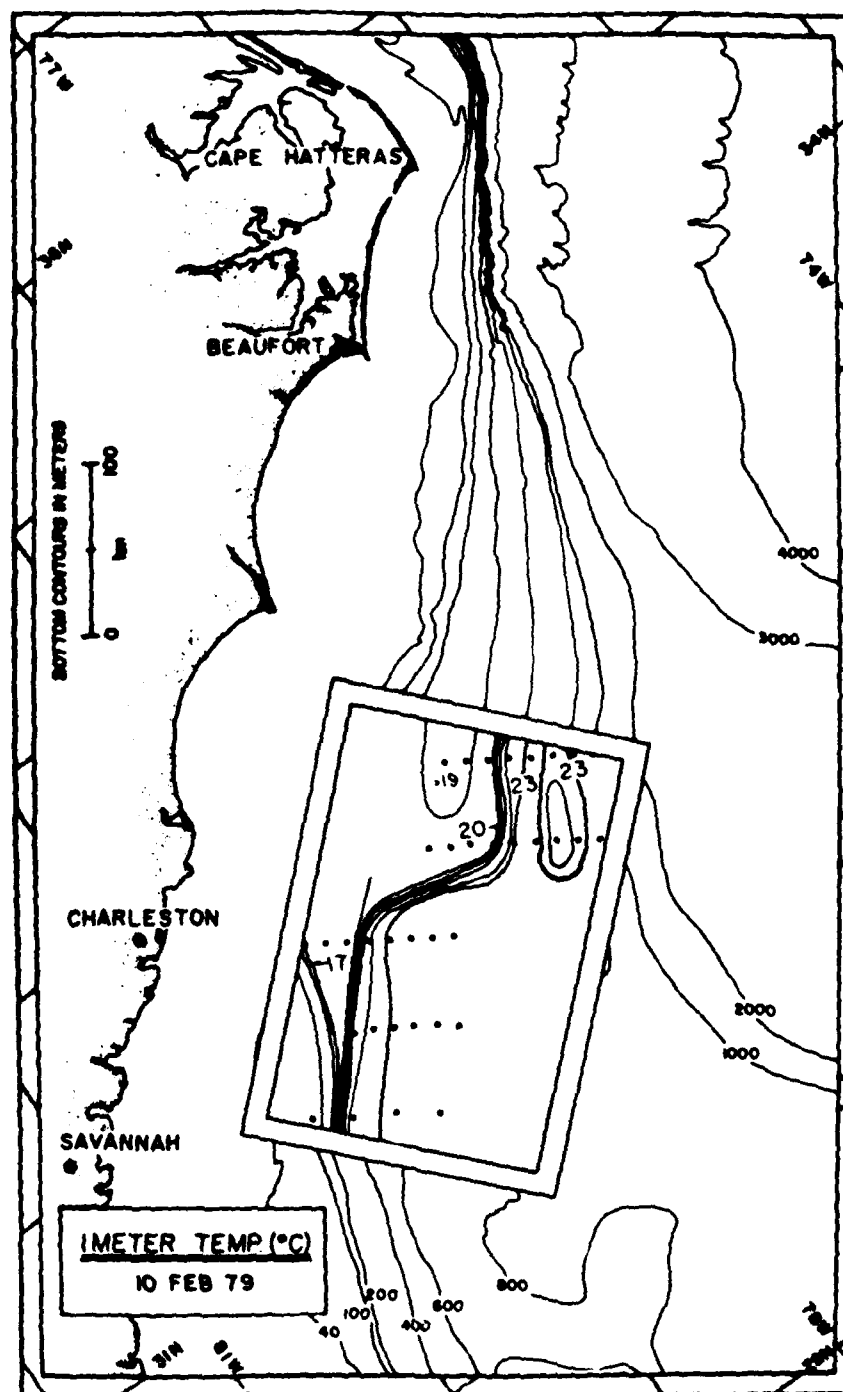


Figure 22. AXBT temperatures at 1 meter, 10 February 1979. Small solid circles indicate AXBT drop-sites.

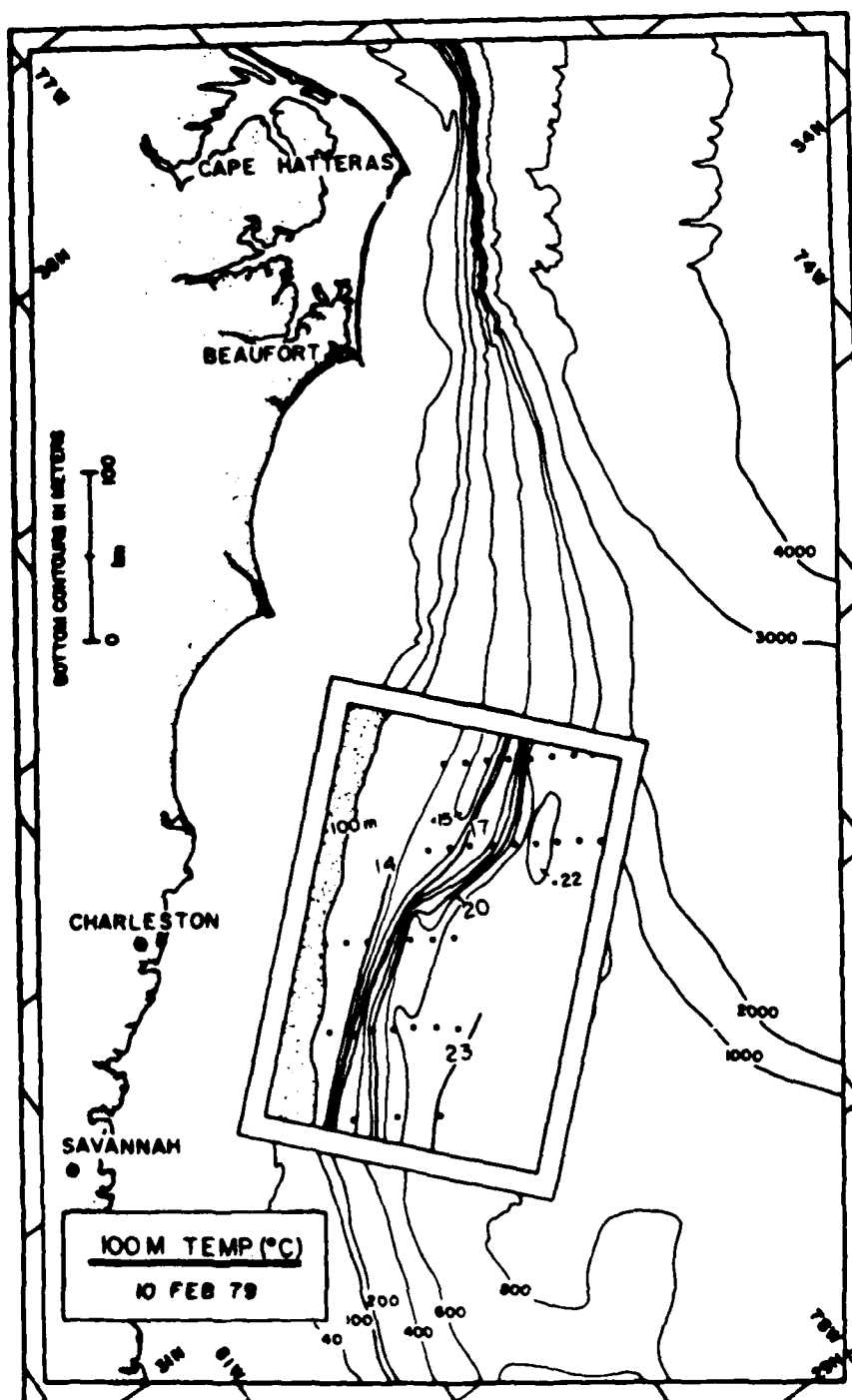


Figure 23. AXBT temperatures at 100 meters, 10 February 1979.

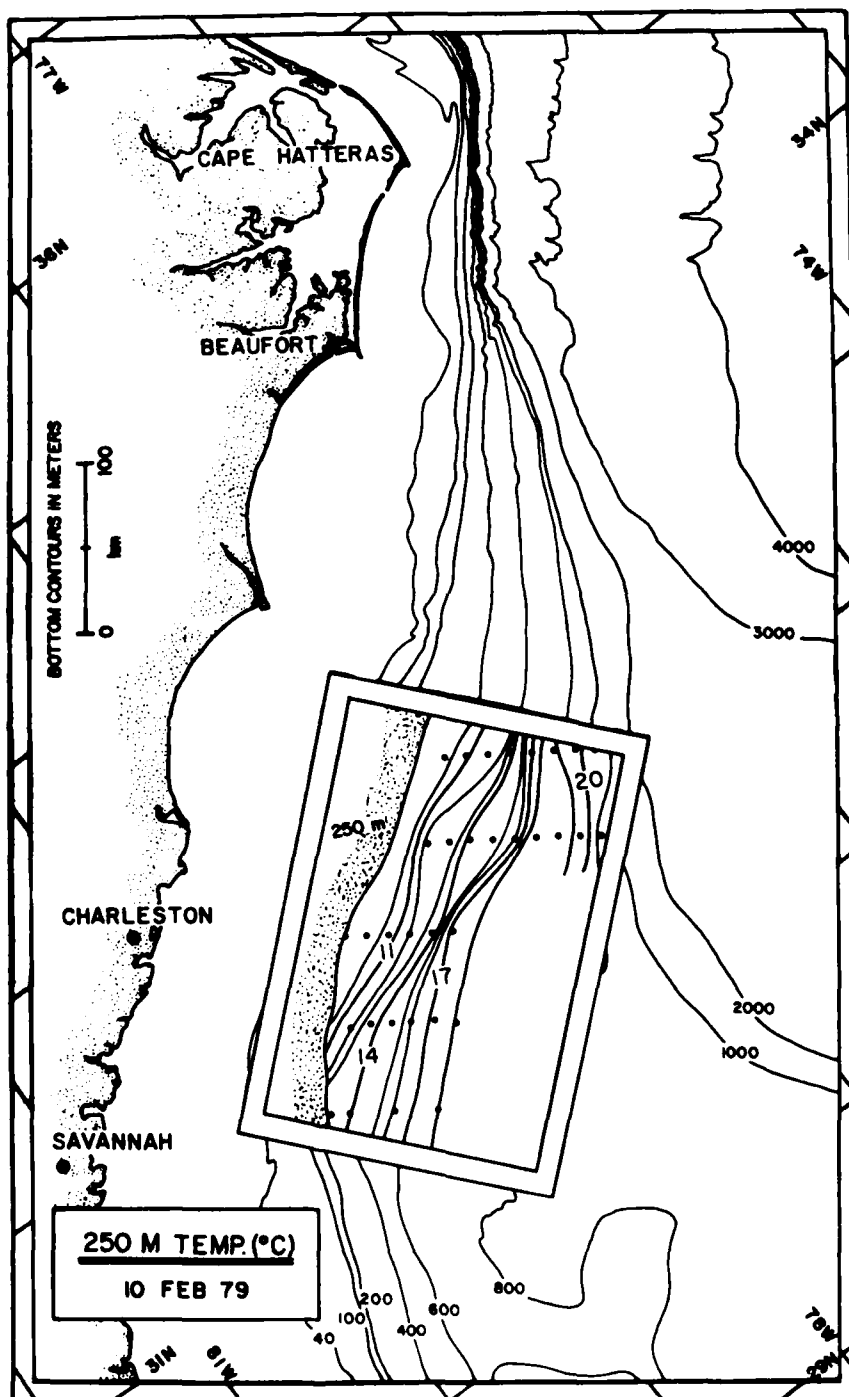


Figure 24. AXBT temperatures at 250 meters, 10 February 1979.

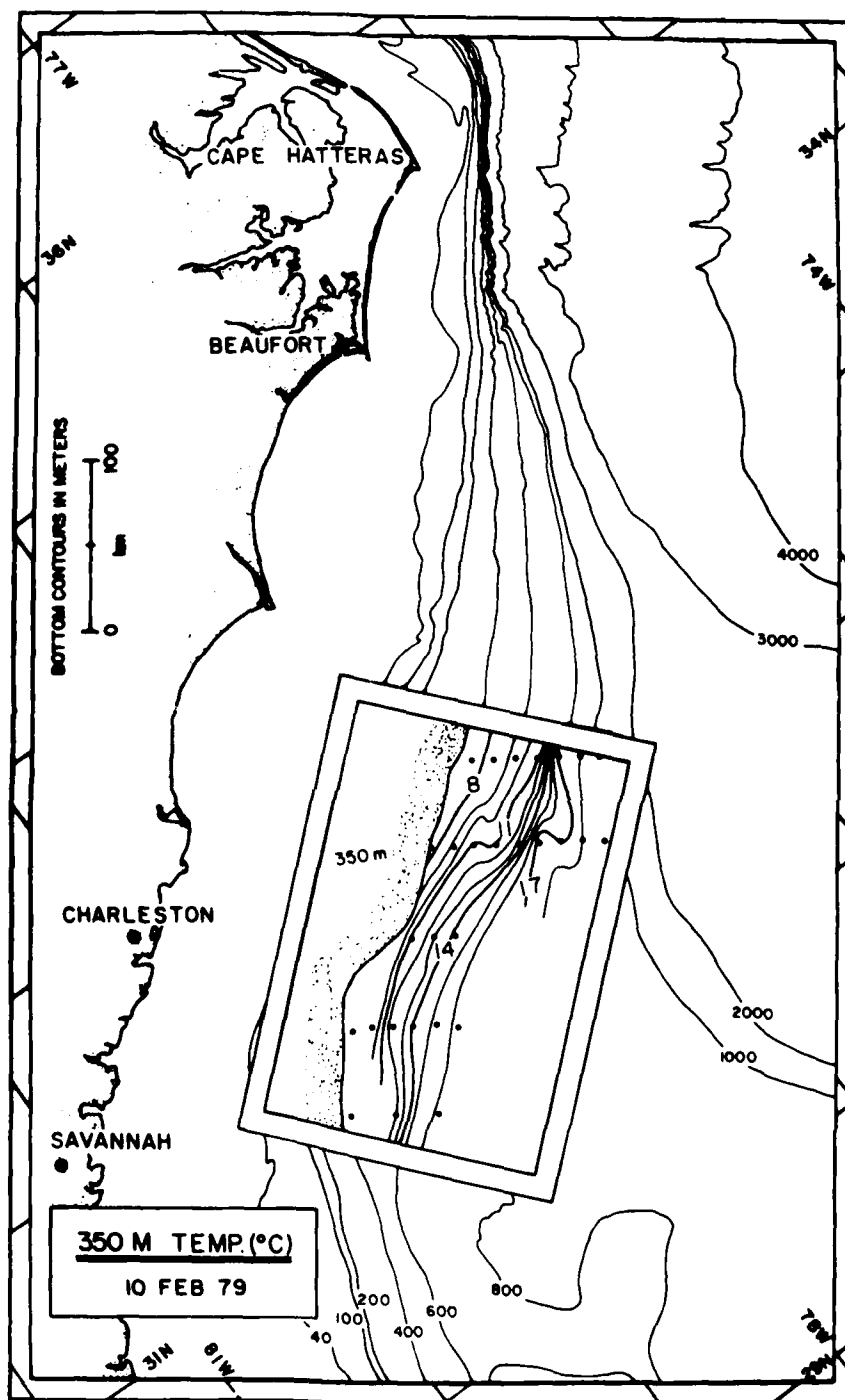


Figure 25. AXBT temperatures at 350 meters, 10 February 1979.

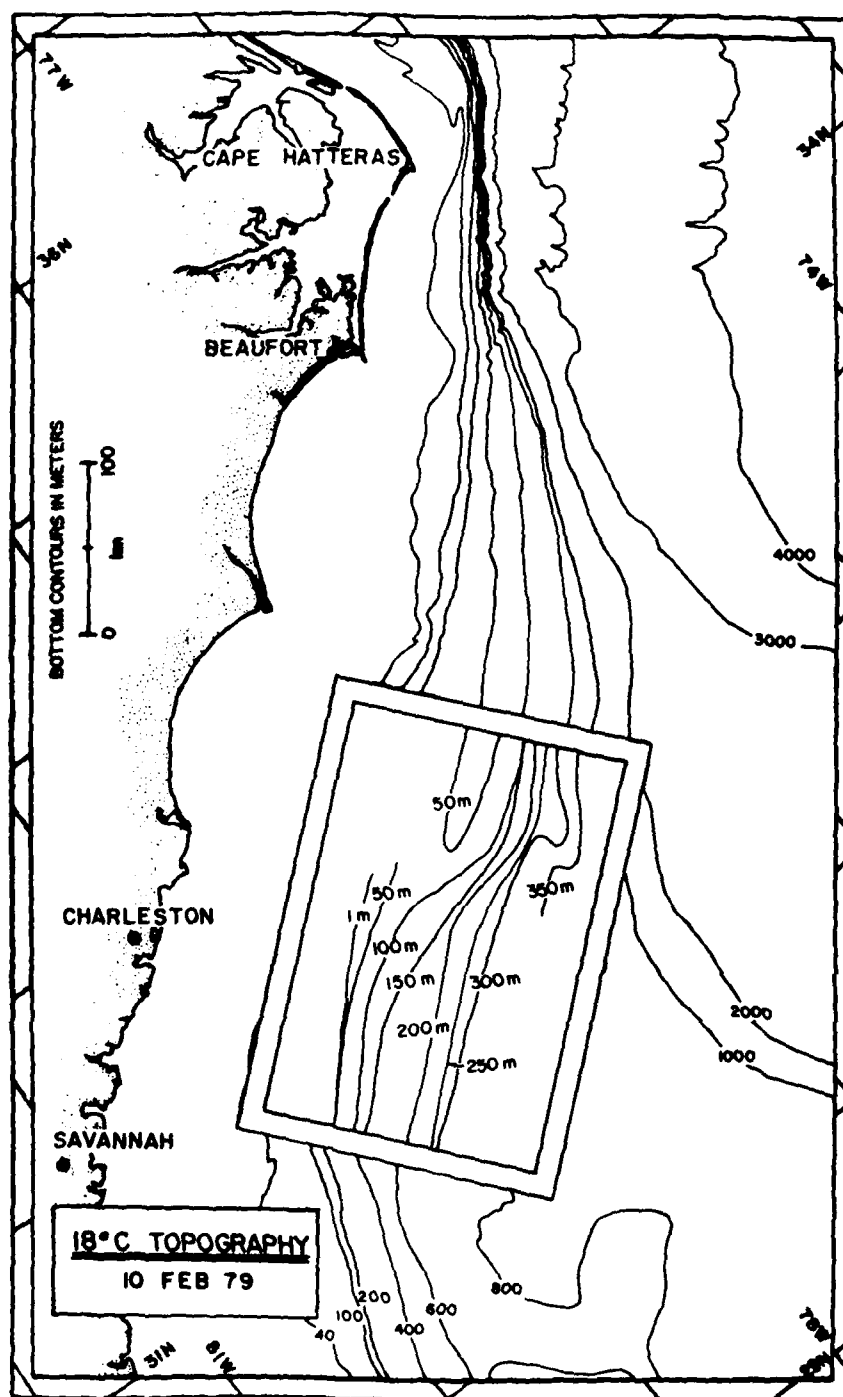


Figure 26. Topography of the 18°C isotherm, 10 February 1979.

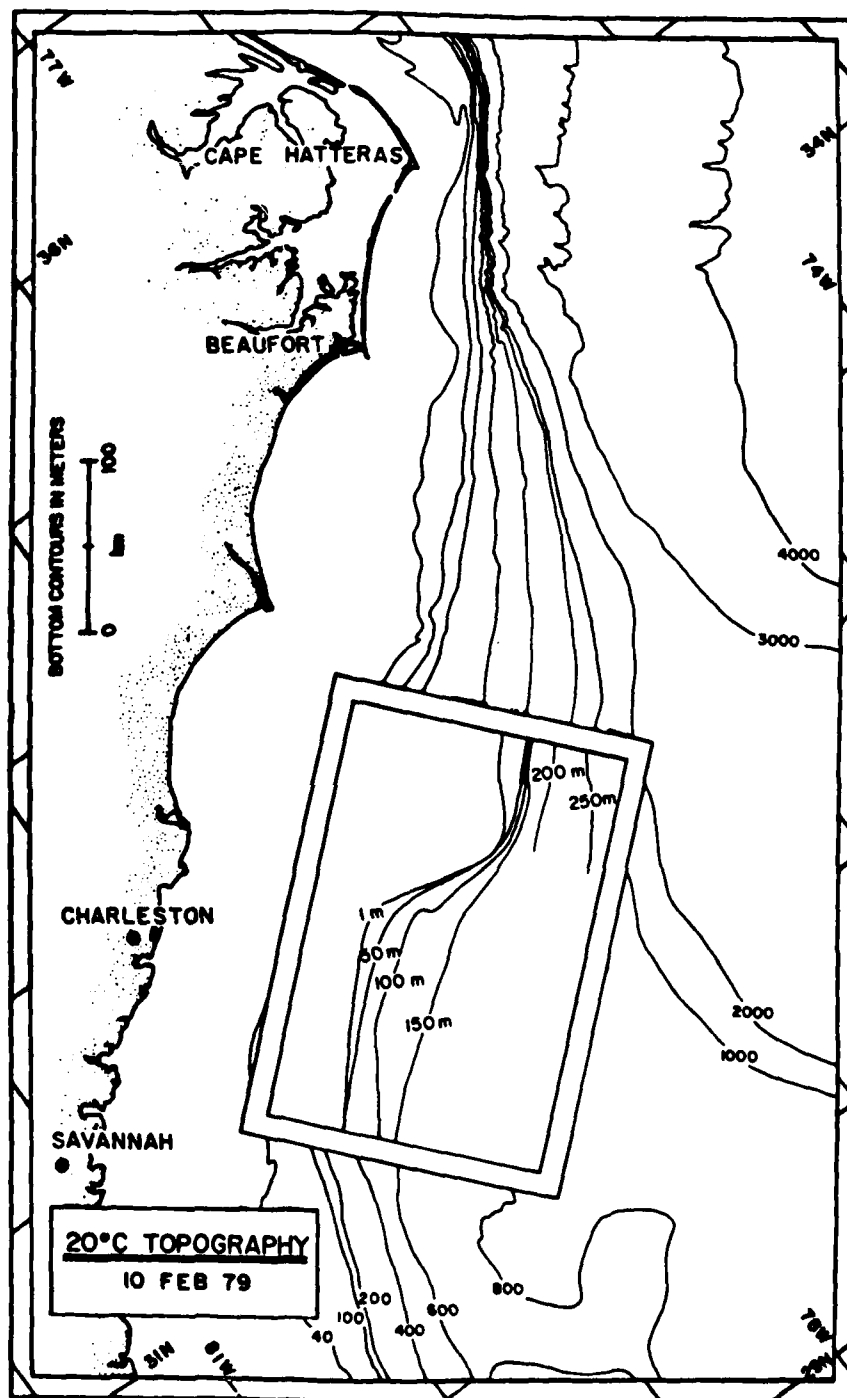


Figure 27. Topography of the 20°C isotherm, 10 February 1979.

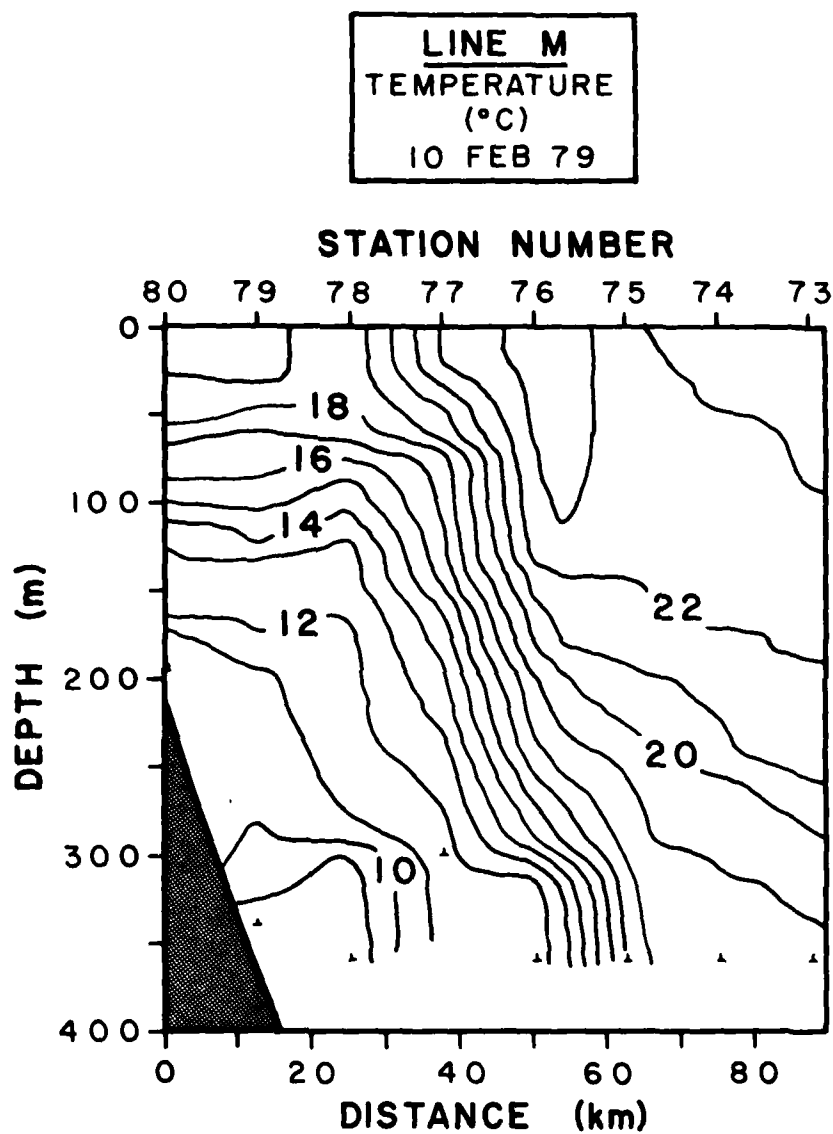


Figure 28. Cross-stream vertical temperature section along along Line M, 10 February 1979.

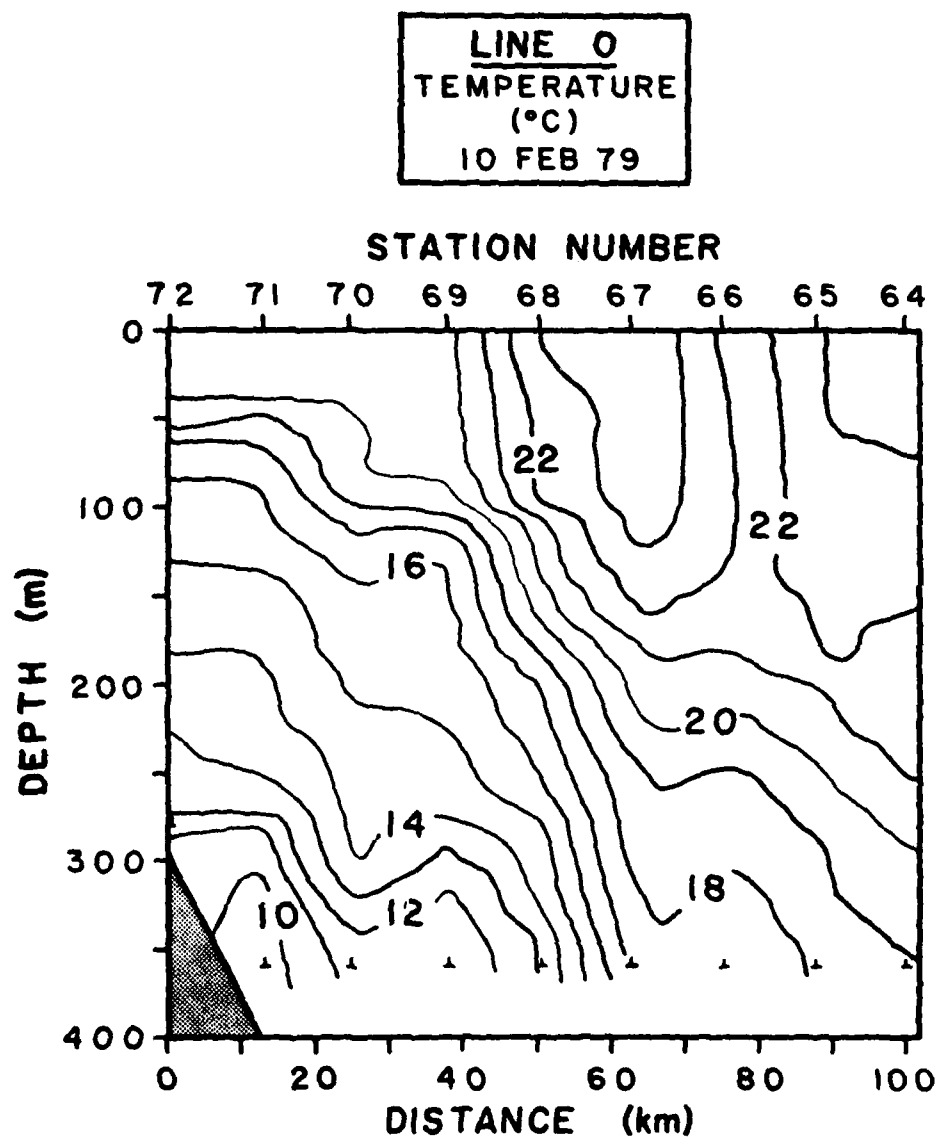


Figure 29. Cross-stream vertical temperature section along Line 0, 10 February 1979.

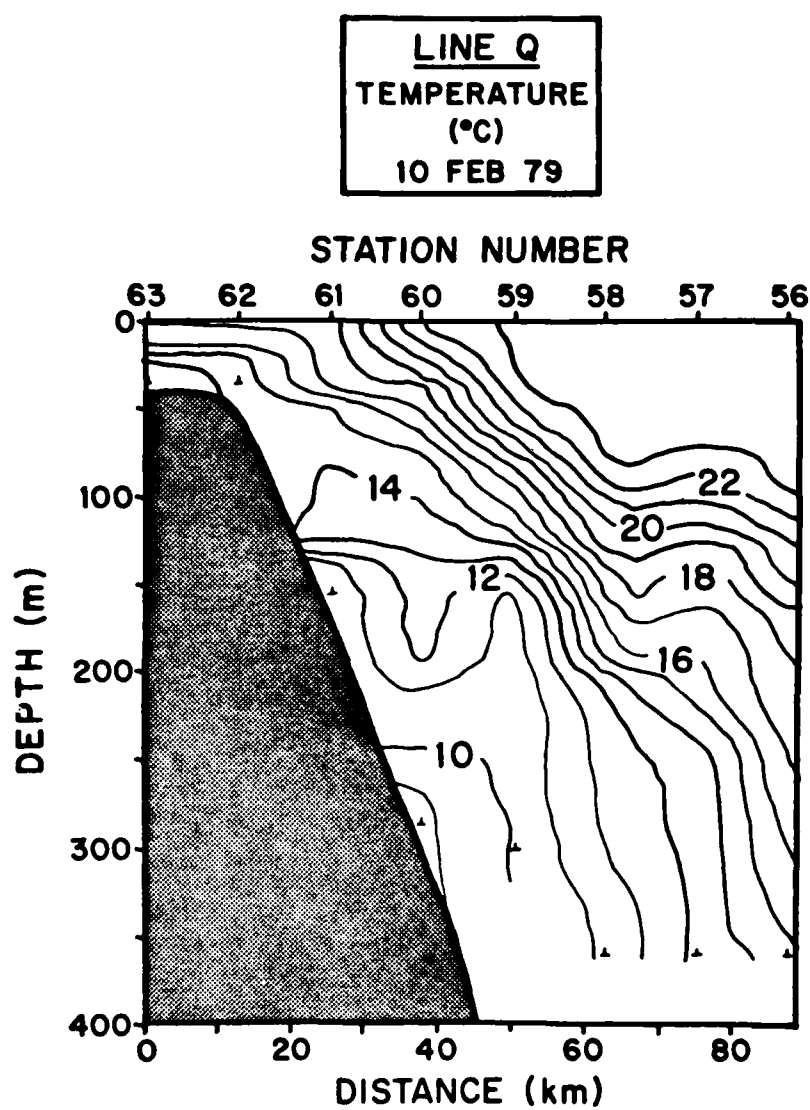


Figure 30. Cross-stream vertical temperature section along Line Q, 10 February 1979.

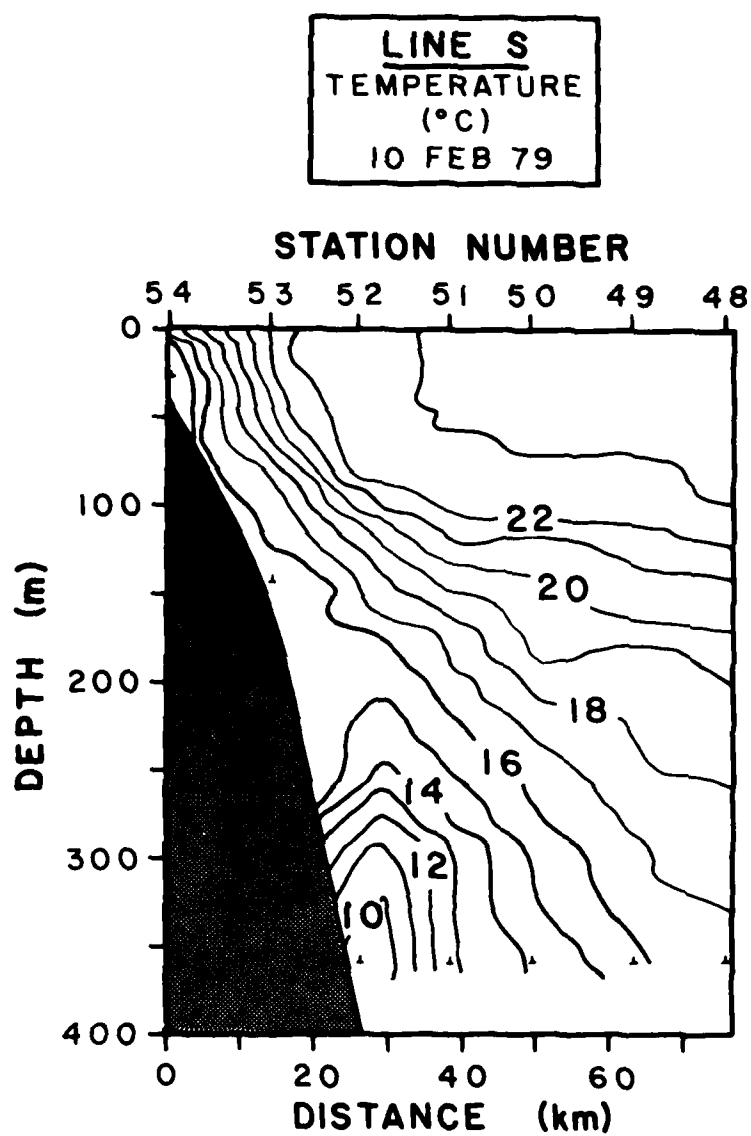


Figure 31. Cross-stream vertical temperature section along Line S, 10 February 1979.

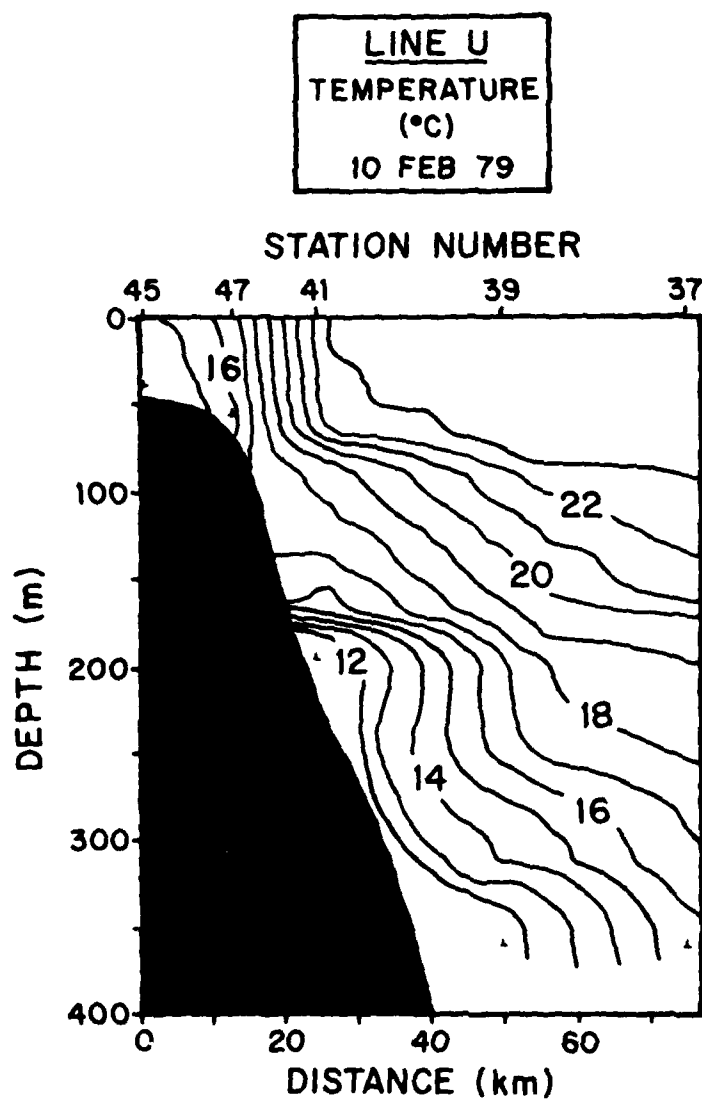


Figure 32. Cross-stream vertical temperature section along Line U, 10 February 1979.

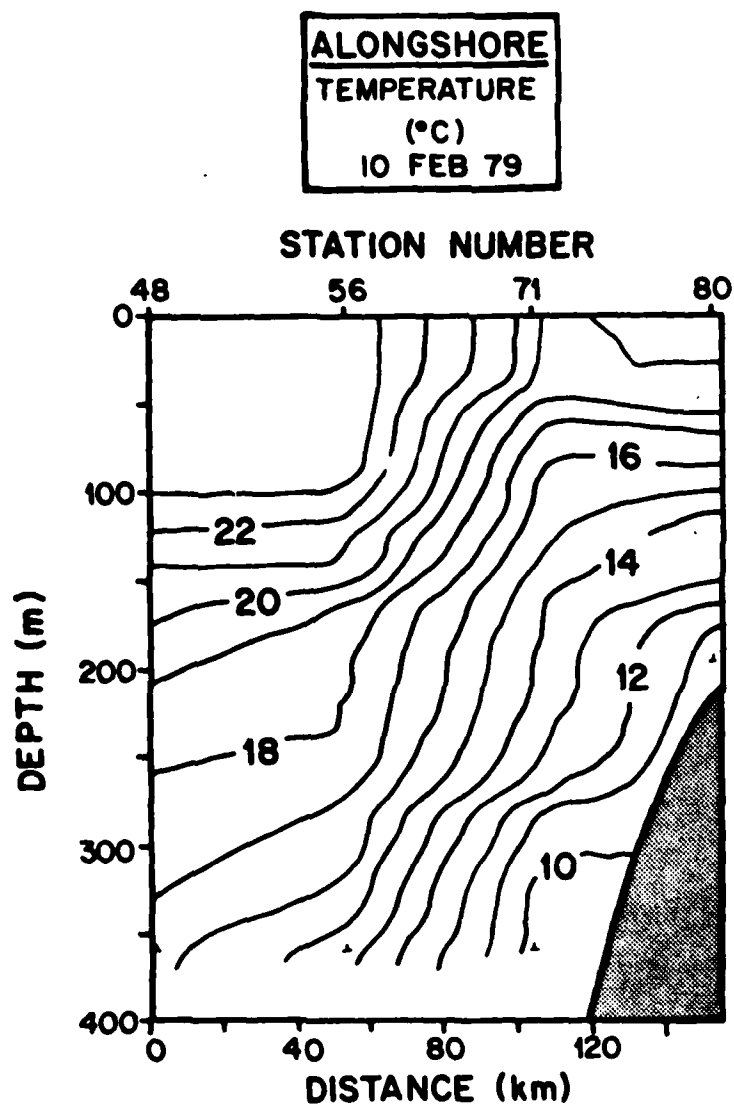


Figure 33. Alongshore vertical temperature section,
10 February 1979.

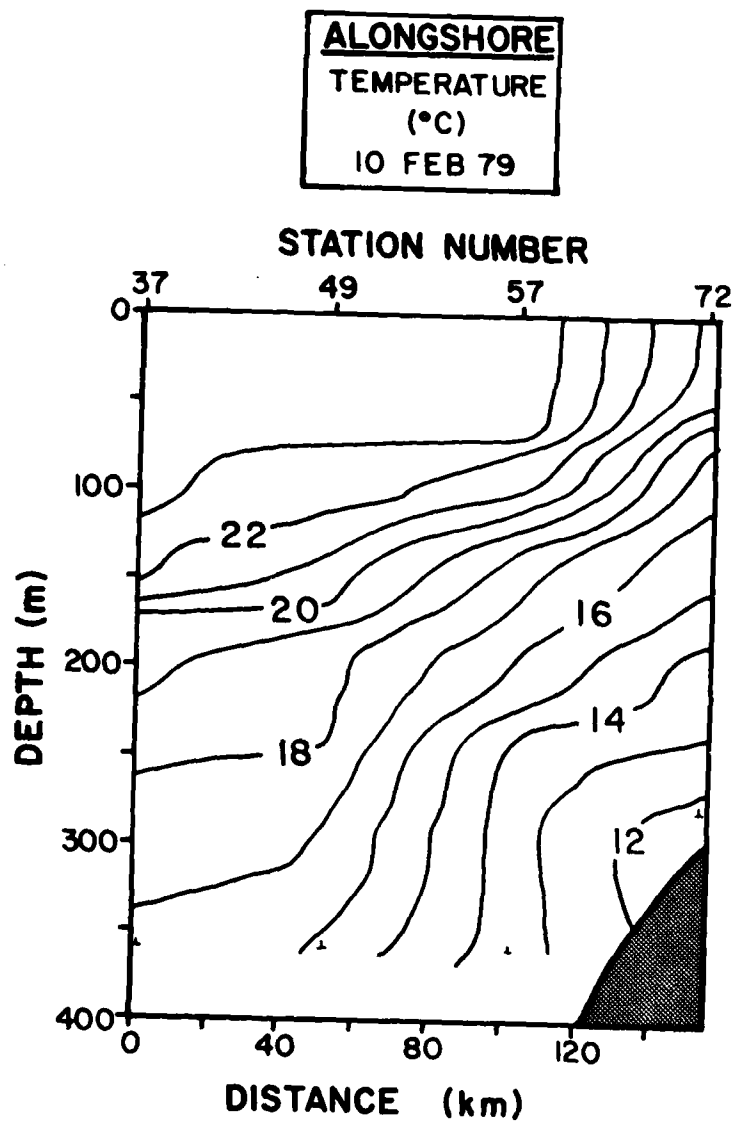


Figure 34. Alongshore vertical temperature section,
10 February 1979.

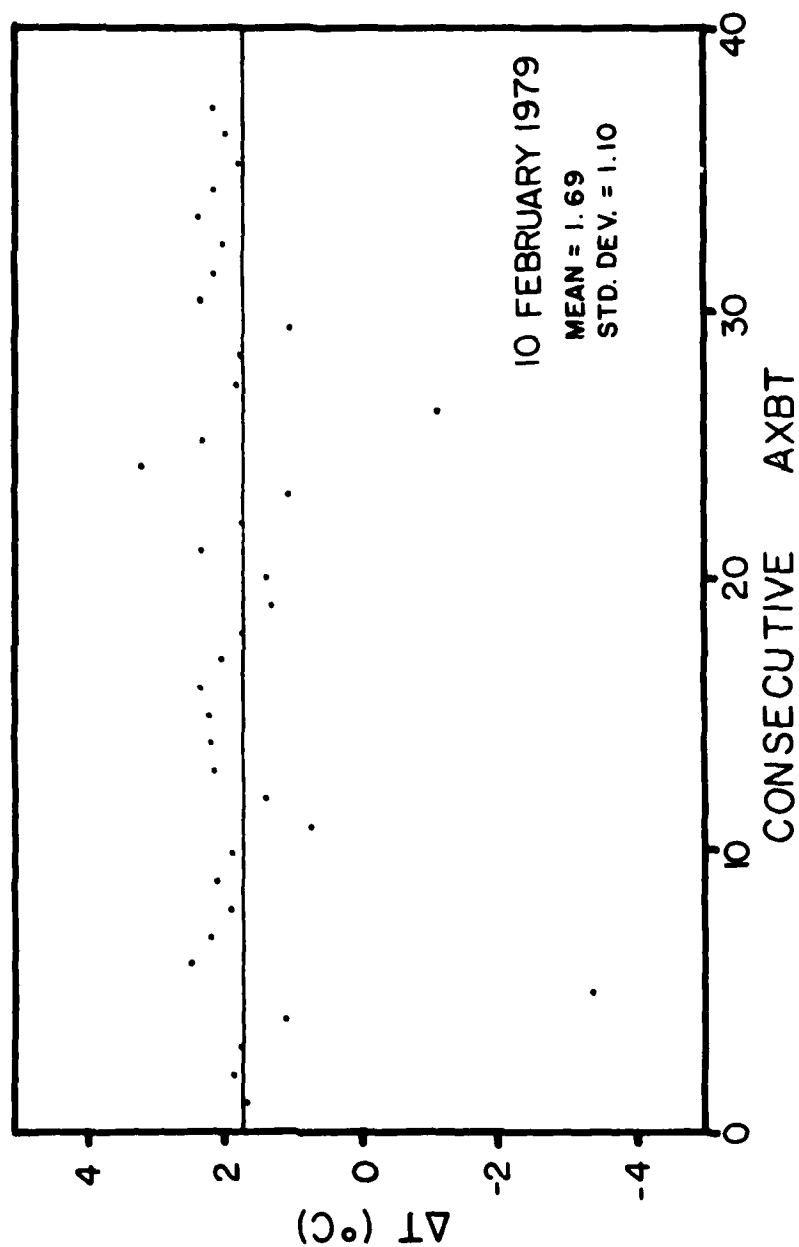


Figure 35. Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 10 February 1979.

FLIGHT 3: 11 FEBRUARY 1979

Survey Time: 1743:59 to 2227:15

Table 9. 11 February 1979 PRT Line End Points

TIME (Hr-Min-Sec)	LATITUDE (°N)	LONGITUDE (°W)	LINE
1743:59	32°41.44'	76°47.03'	K
1831:30	33°19.89'	77°53.03'	
1910:16	32°59.90'	76°22.10'	
1942:36	33°27.20'	77°08.60'	I
2001:12	33°45.40'	76°43.20'	
2032:22	33°14.20'	75°50.50'	
2036:43	33°36.82'	75°31.65'	E
2108:20	34°04.00'	76°18.80'	
2147:38	34°29.90'	76°06.30'	
2201:30	34°02.90'	75°19.40'	C
2212:11	34.21.10'	74°55.70'	
2227:15	34°48.80'	75°41.80'	

Table 10. 11 February 1979 Flight Updates

There were no navigation updates made during this flight.

Table 11. 11 February 1979 PRT Calibration Temperatures and Times

TIME (Hrs.)	CALIBRATION TEMPERATURE (°C)		
	10.00	17.00	24.00
16.28	0.91	0.79	0.68
17.28	0.49	0.49	0.40
18.65	0.45	0.73	0.30
19.93	0.56	0.17	0.09
21.25	0.31	0.22	-0.02
22.72	0.12	-0.28	-0.52

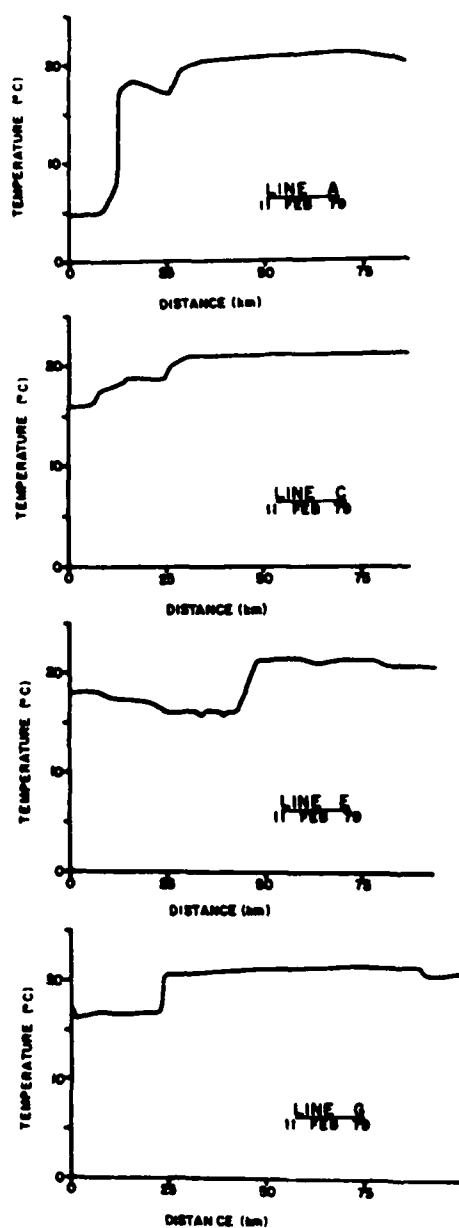


Figure 36. PRT cross-stream surface temperature profiles, 11 February 1979.

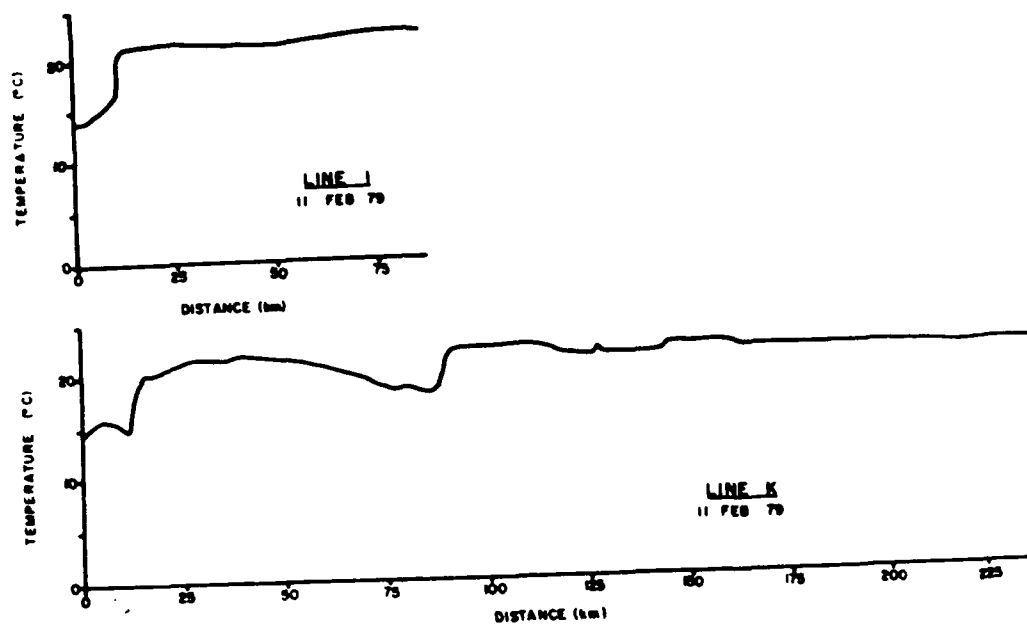


Figure 36 (cont'd).

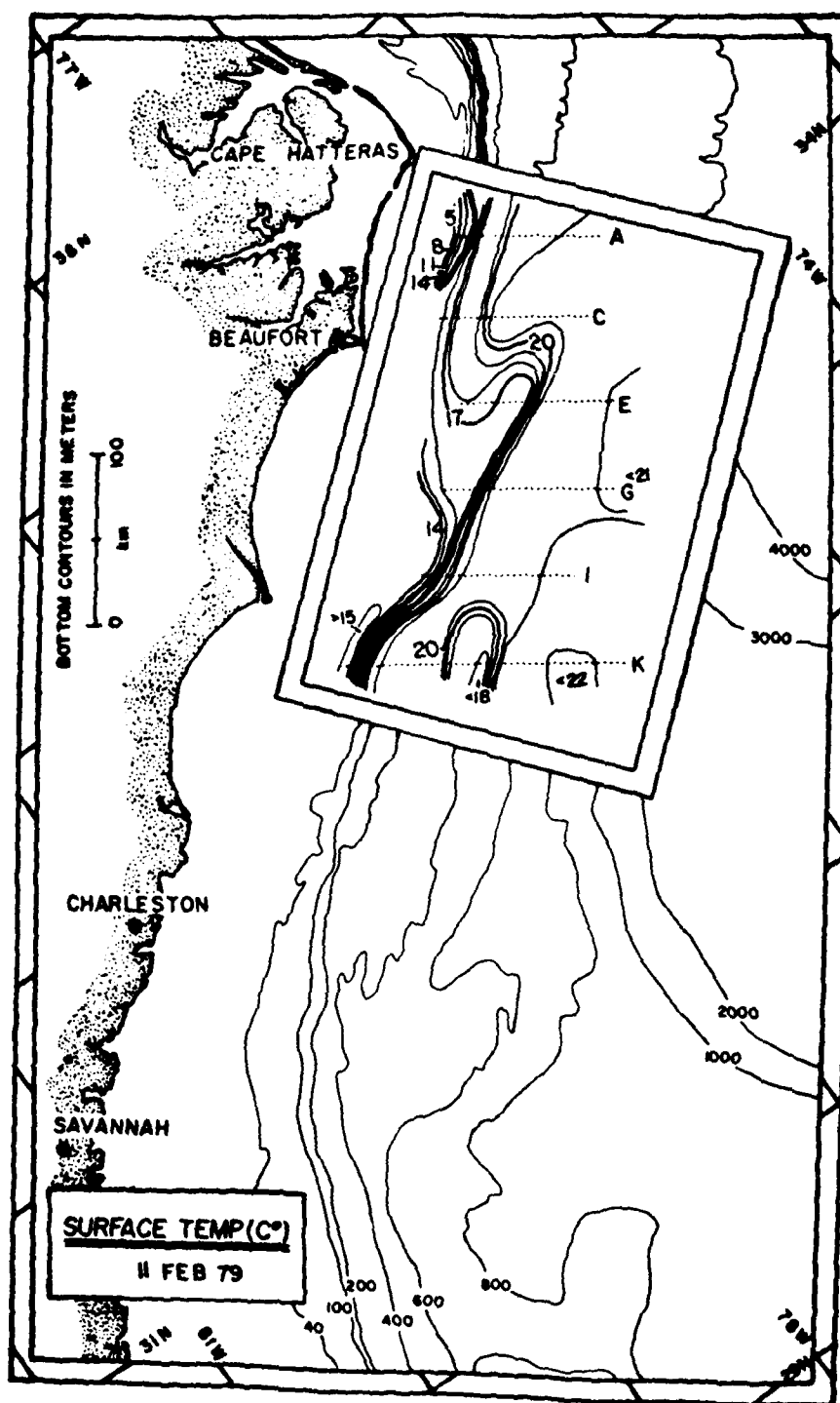


Figure 37. PRT sea surface temperature field, 11 February 1979. Dashed lines indicate positions of cross-stream data lines.

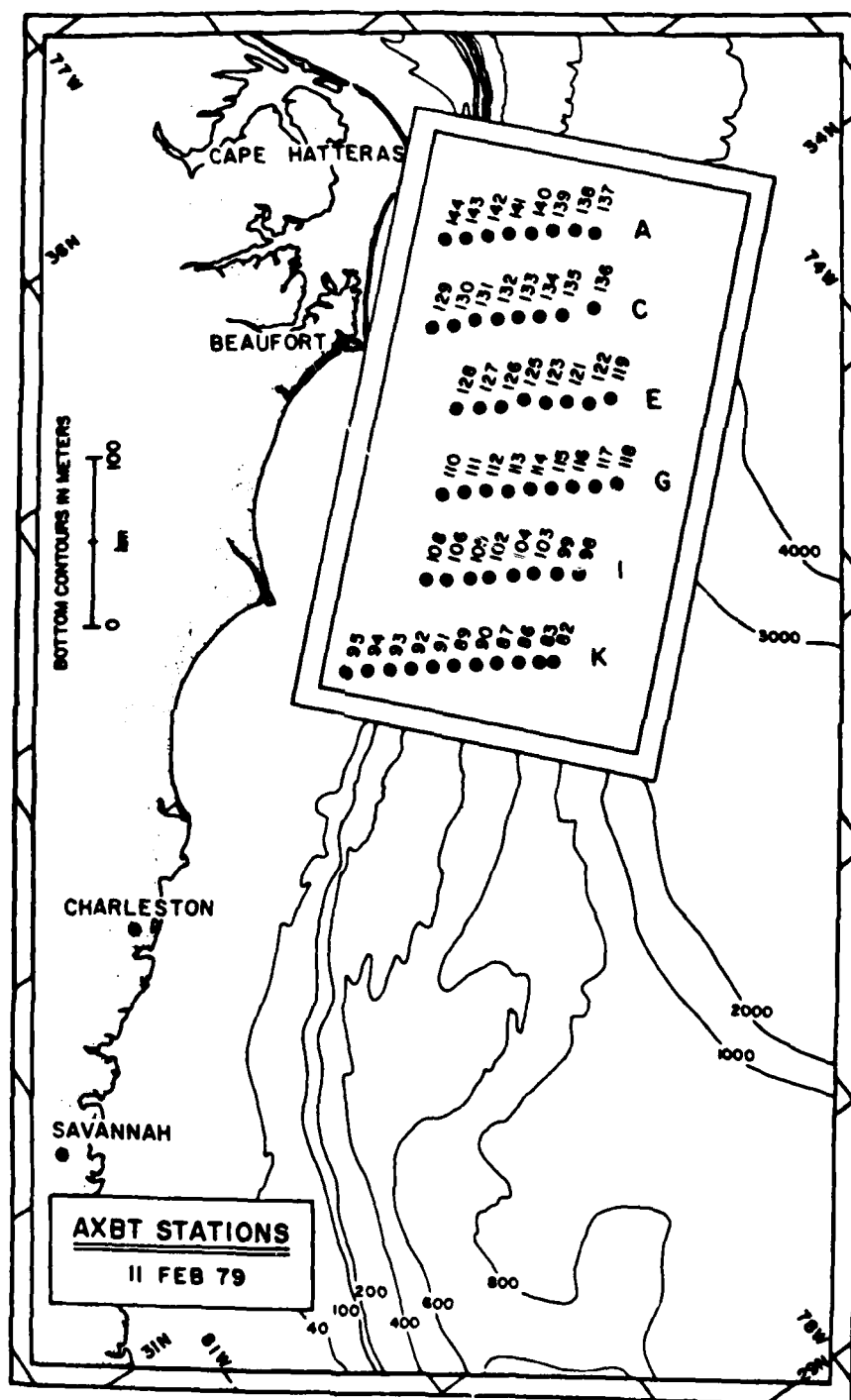


Figure 38. AXBT station locations, 11 February 1979.

Table 12. 11 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
082	32°43.2'	76°50.1'	370	1745:02
083	32°45.7'	76°93.9'	370	1746:16
086	32°49.1'	77°00.2'	370	1804:49
087	32°53.1'	77°06.8'	370	1806:46
089	33°00.7'	77°20.0'	210	1810:45
090	32°56.9'	77°13.3'	260	1819:47
091	33°04.6'	77°26.4'	120	1823:48
092	33°08.3'	77°33.2'	43	1825:45
093	33°12.1'	77°39.8'	370	1827:41
094	33°16.1'	77°46.3'	30	1829:37
095	33°19.9'	77°53.0'	11	1831:31
098	32°59.9'	76°22.1'	370	1910:14
099	33°03.9'	76°28.6'	380	1912:22
102	33°15.8'	76°48.9'	380	1918:42
103	33°08.0'	76°35.1'	370	1932:30
104	33°11.8'	76°41.3'	370	1934:31
105	33°19.3'	76°54.9'	275	1938:38
106	33°23.4'	77°02.3'	45	1940:45
108	33°27.2'	77°08.2'	30	1949:27
110	33°45.0'	76°43.6'	35	2006:35
111	33°41.7'	76°36.3'	103	2008:41
112	33°37.9'	76°29.6'	320	2010:38
113	33°33.8'	76°23.2'	350	2012:34
114	33°29.8'	76°16.6'	370	2014:32
115	33°26.3'	76°09.9'	370	2016:28
116	33°22.3'	76°03.8'	370	2018:30
117	33°18.3'	75°56.8'	370	2020:20
118	33°14.2'	75°50.5'	380	2022:14
119	33°36.8'	75°31.7'	370	2036:42
121	33°44.5'	75°45.0'	360	2040:54
122	33°39.9'	75°39.0'	370	2048:52
123	33°48.3'	75°51.7'	370	2053:01
125	33°53.3'	75°57.5'	370	2102:16
126	33°55.8'	76°05.4'	350	2104:21
127	33°59.8'	76°12.1'	120	2106:20
128	34°04.0'	76°18.8'	35	2108:20
129	34°29.9'	76°06.3'	25	2147:37
130	34°25.3'	75°59.9'	50	2149:43
131	34°22.4'	75°52.6'	118	2151:49
132	34°18.3'	75°45.8'	346	2153:52

Table 12 (con't). 11 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
133	34°14.9'	75°39.1'	370	2155:45
134	34°10.8'	75°32.7'	370	2157:34
135	34°06.9'	75°26.1'	370	2159:31
136	34°02.9'	75°19.4'	360	2201:30
137	34°21.1'	74°55.7'	370	2212:12
138	34°26.0'	75°00.8'	370	2215:00
139	34°30.1'	75°07.5'	360	2217:08
140	34°33.6'	75°14.4'	370	2219:14
141	34°37.6'	75°21.3'	360	2221:18
142	34°41.4'	75°27.8'	230	2223:16
143	34°44.9'	75°34.9'	26	2225:17
144	34°48.8'	75°41.8'	27	2227:15

11 FEBRUARY 1979

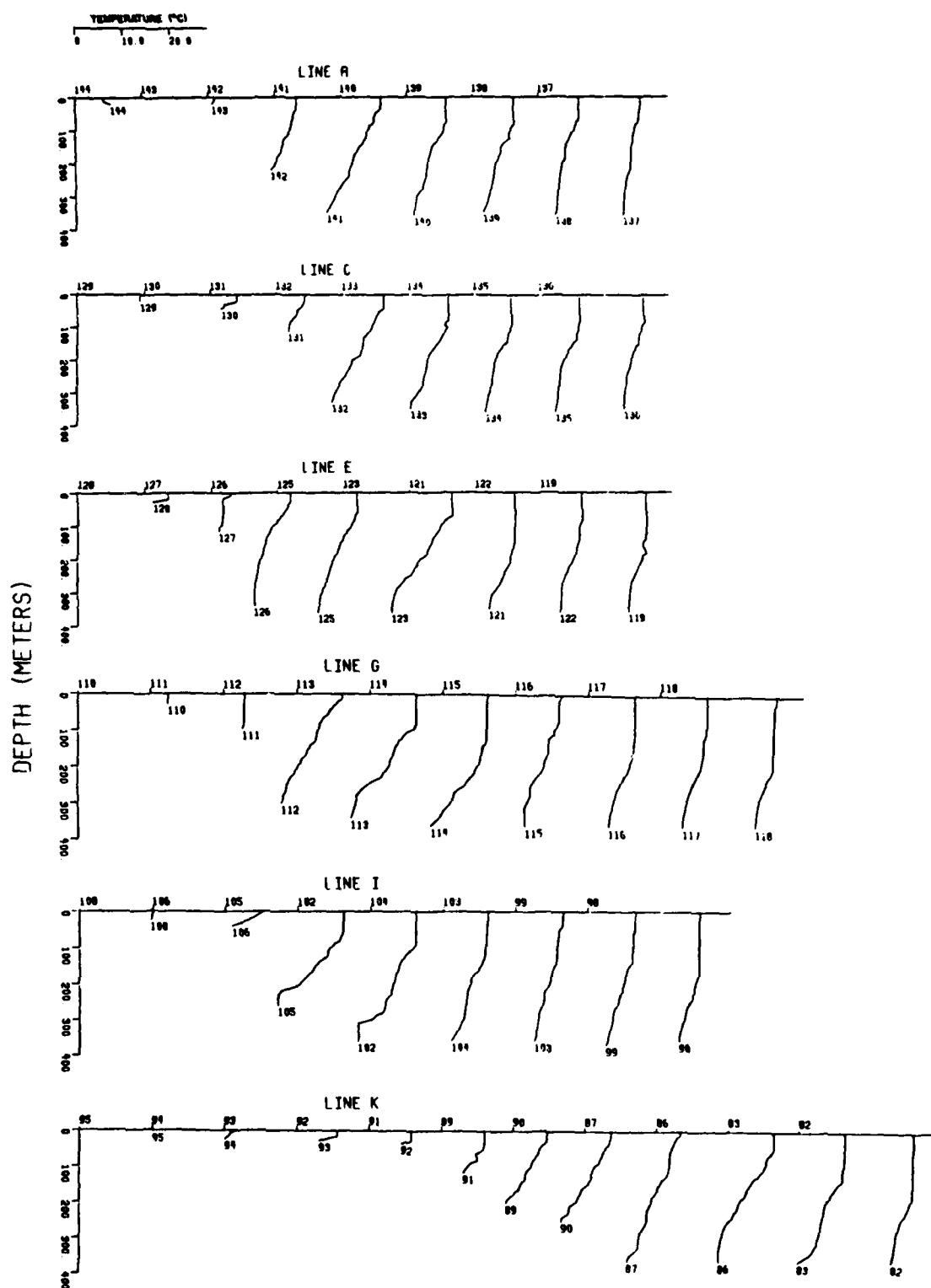


Figure 39. AXBT vertical temperature profiles, 11 February 1979.

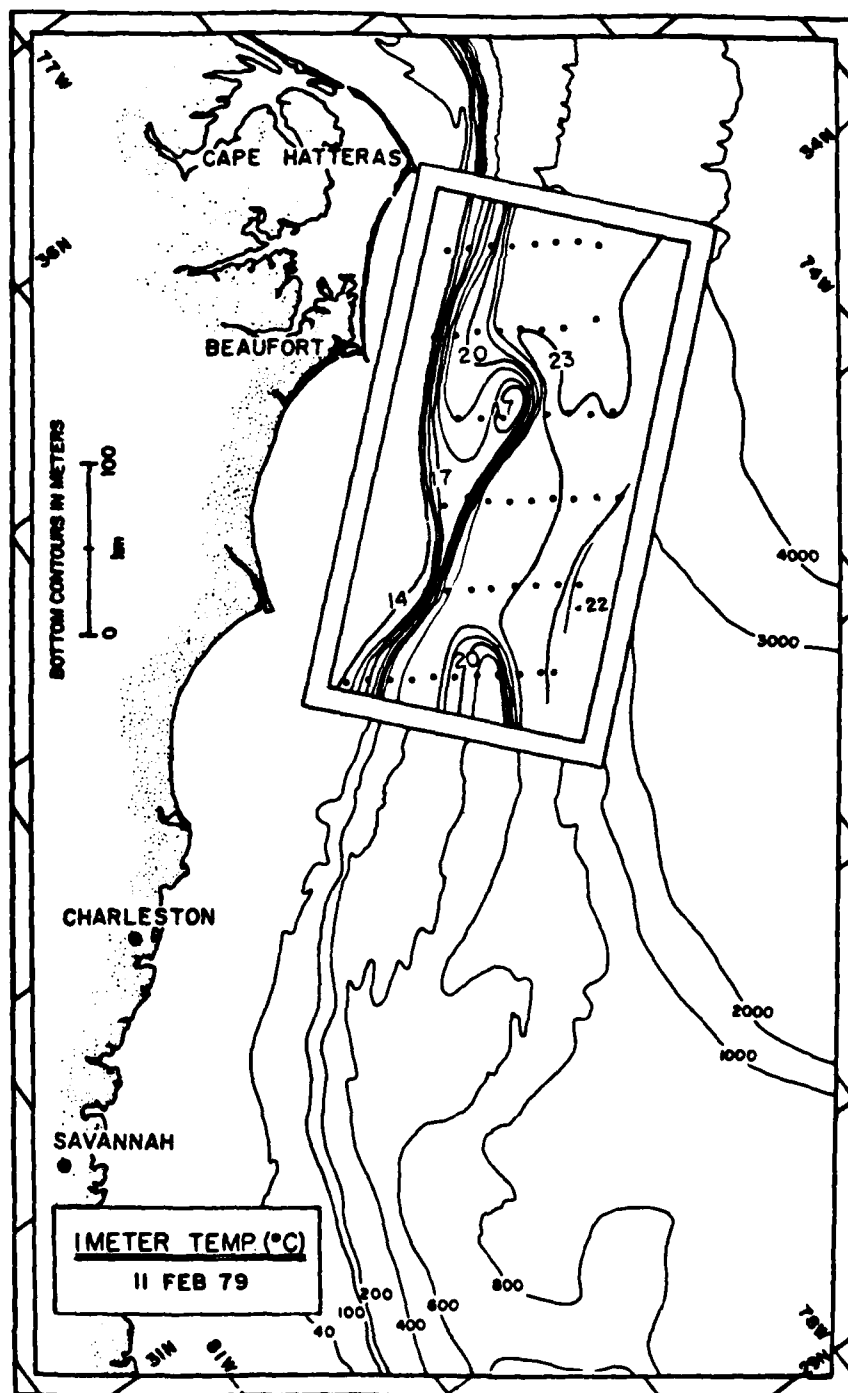


Figure 40. AXBT temperatures at 1 meter, 11 February 1979. Small solid circles indicate AXBT drop-sites.

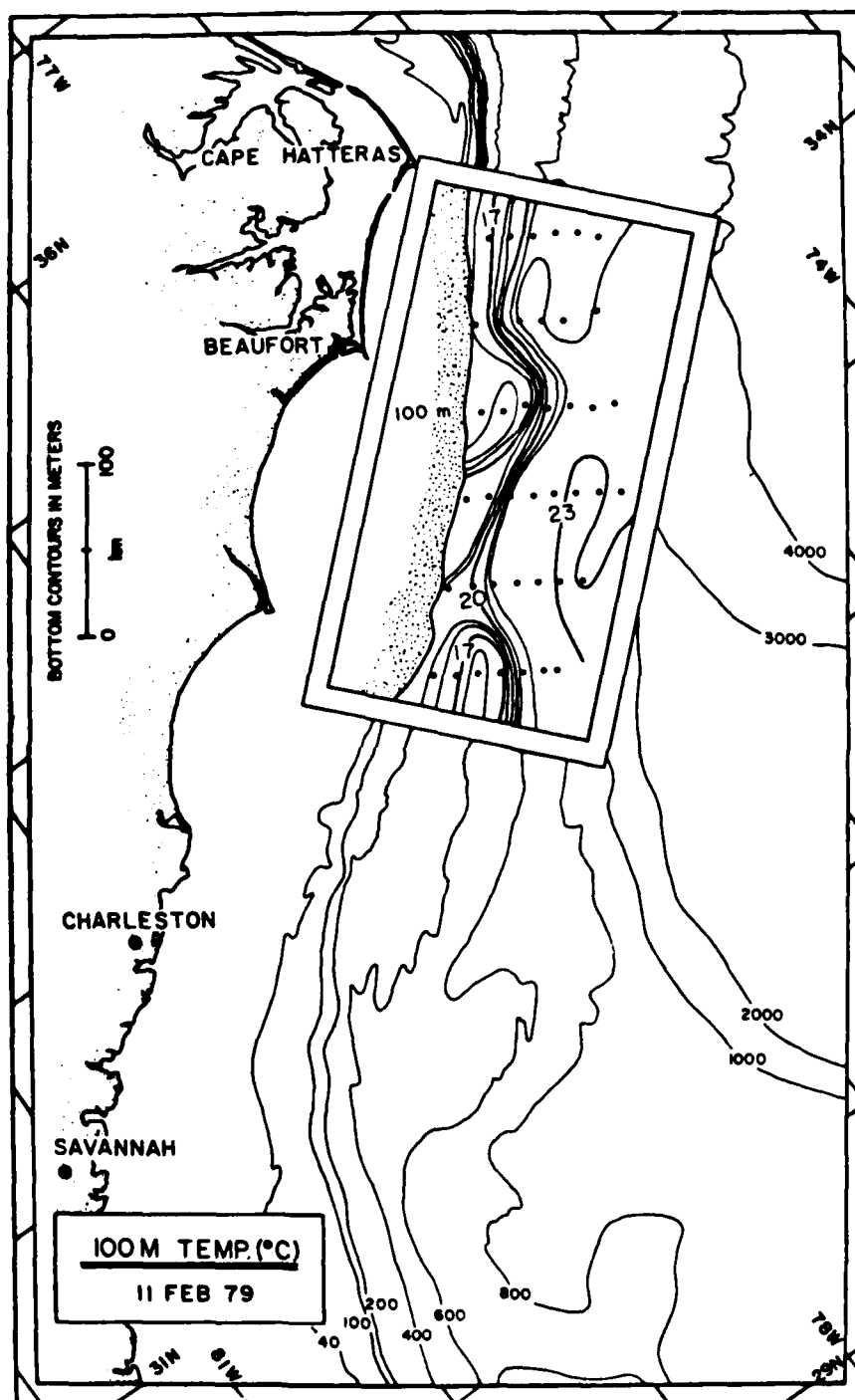


Figure 41. AXBT temperatures at 100 meters, 11 February 1979.

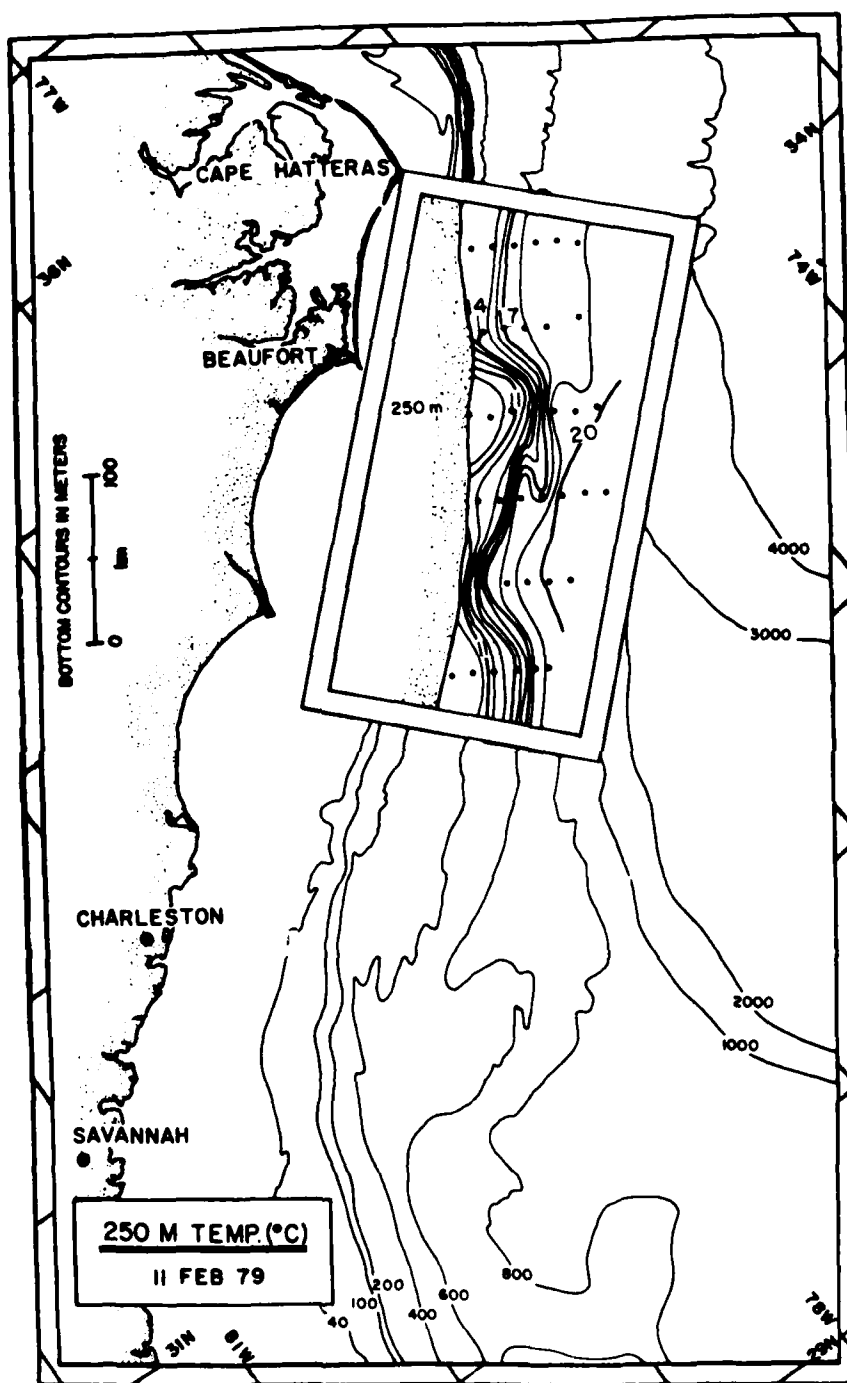


Figure 42. AXBT temperatures at 250 meters, 11 February 1979.

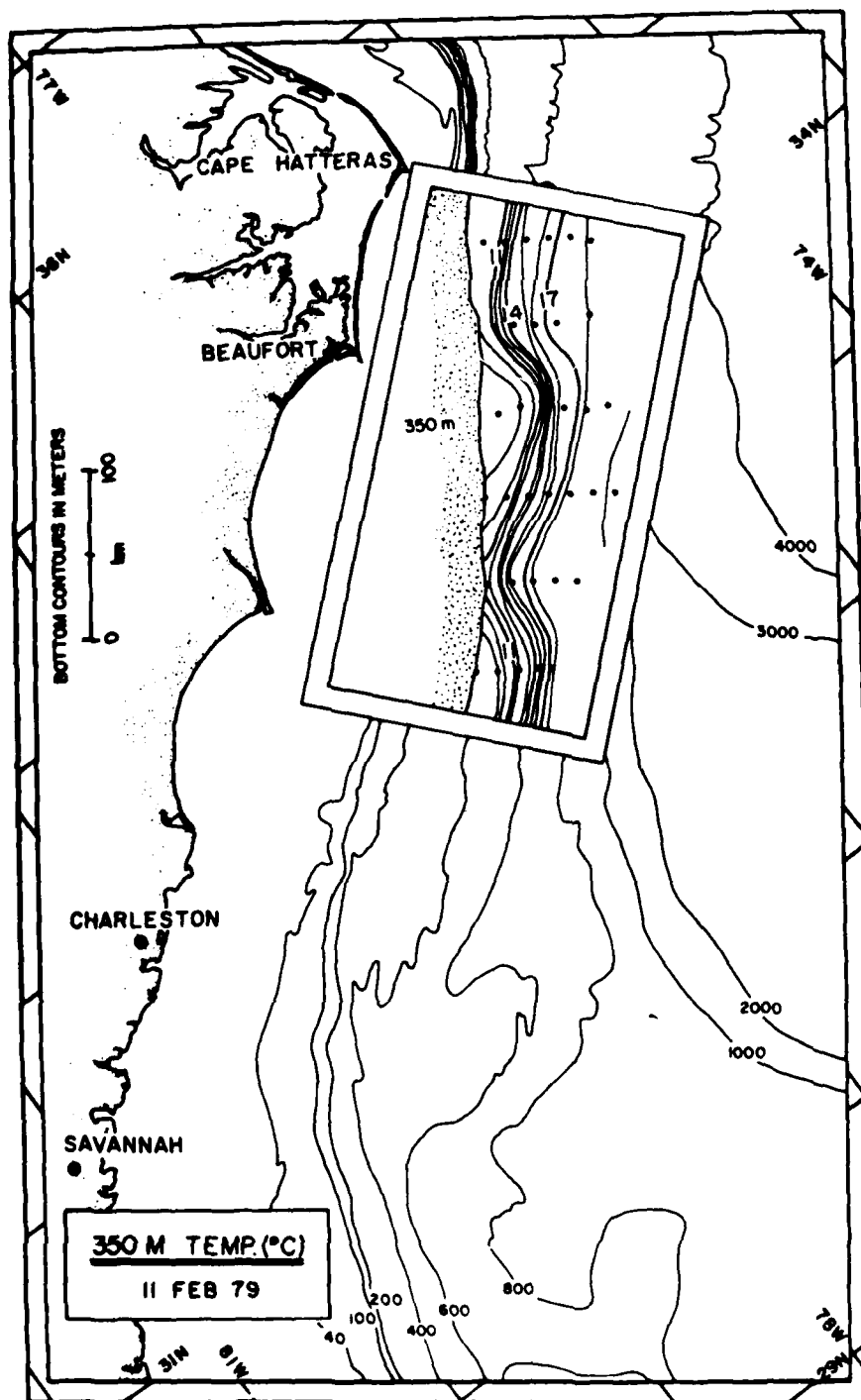


Figure 43. AXBT temperatures at 350 meters, 11 February 1979.

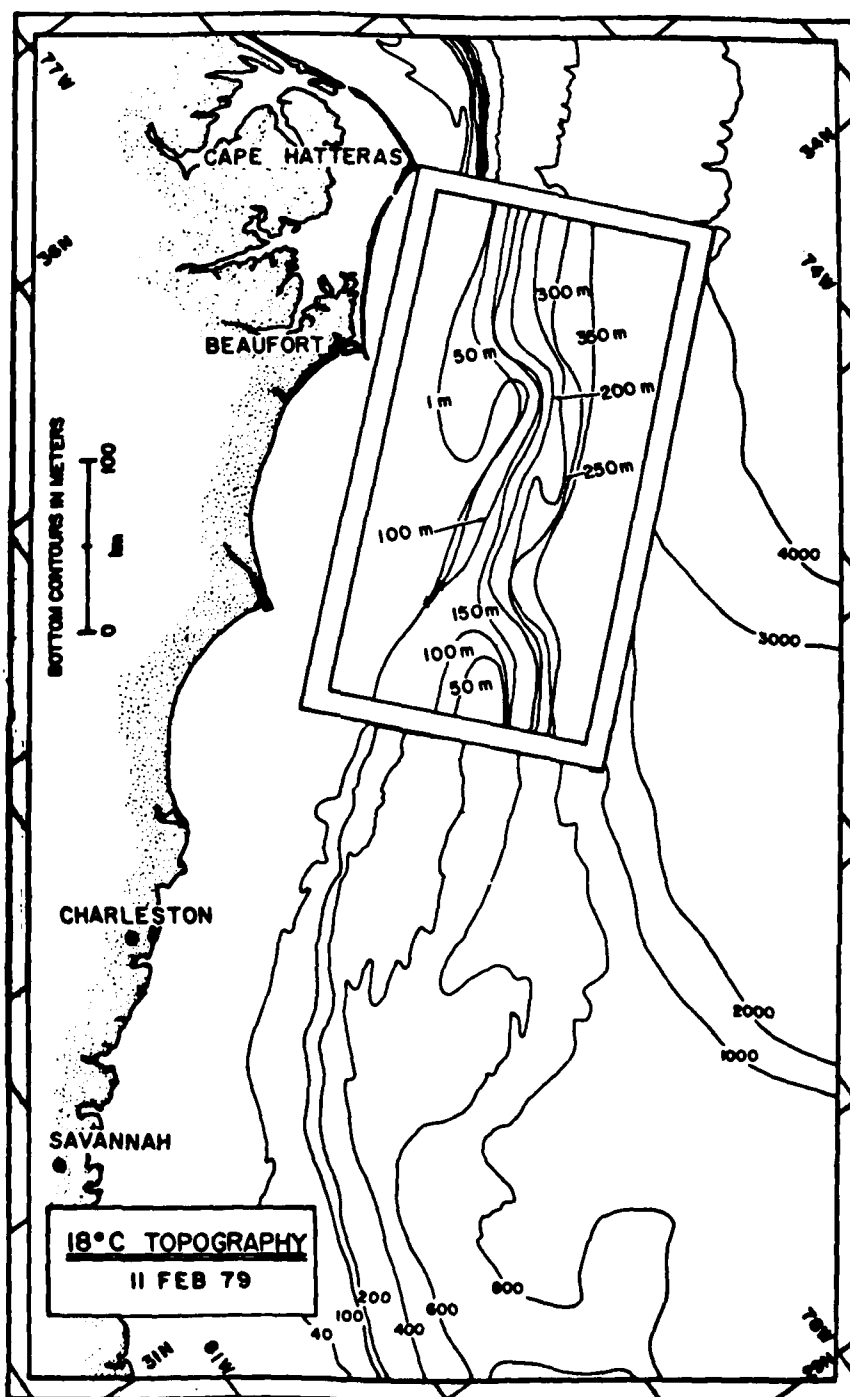


Figure 44. Topography of the 18°C isotherm, 11 February 1979.

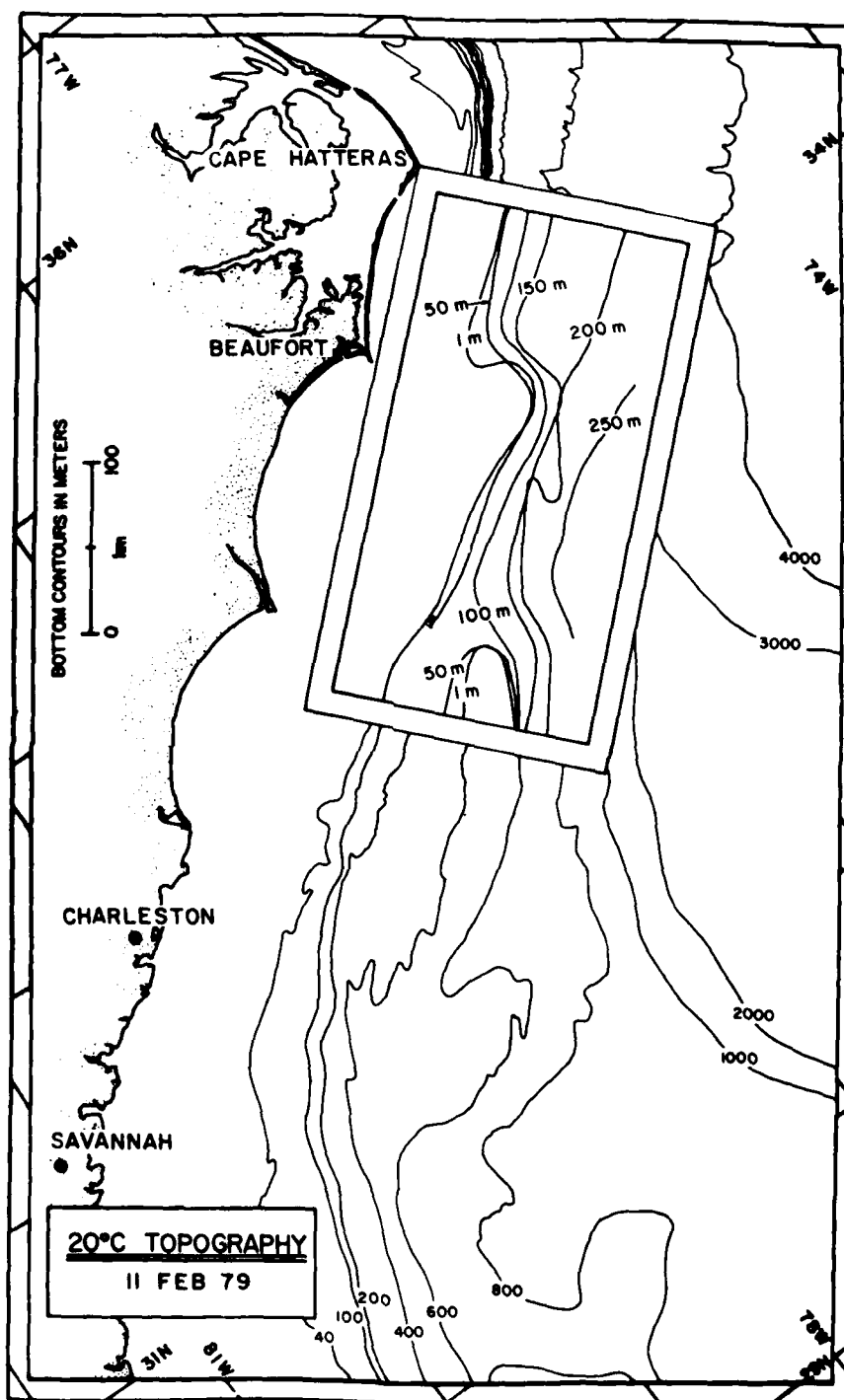


Figure 45. Topography of the 20°C isotherm, 11 February 1979.

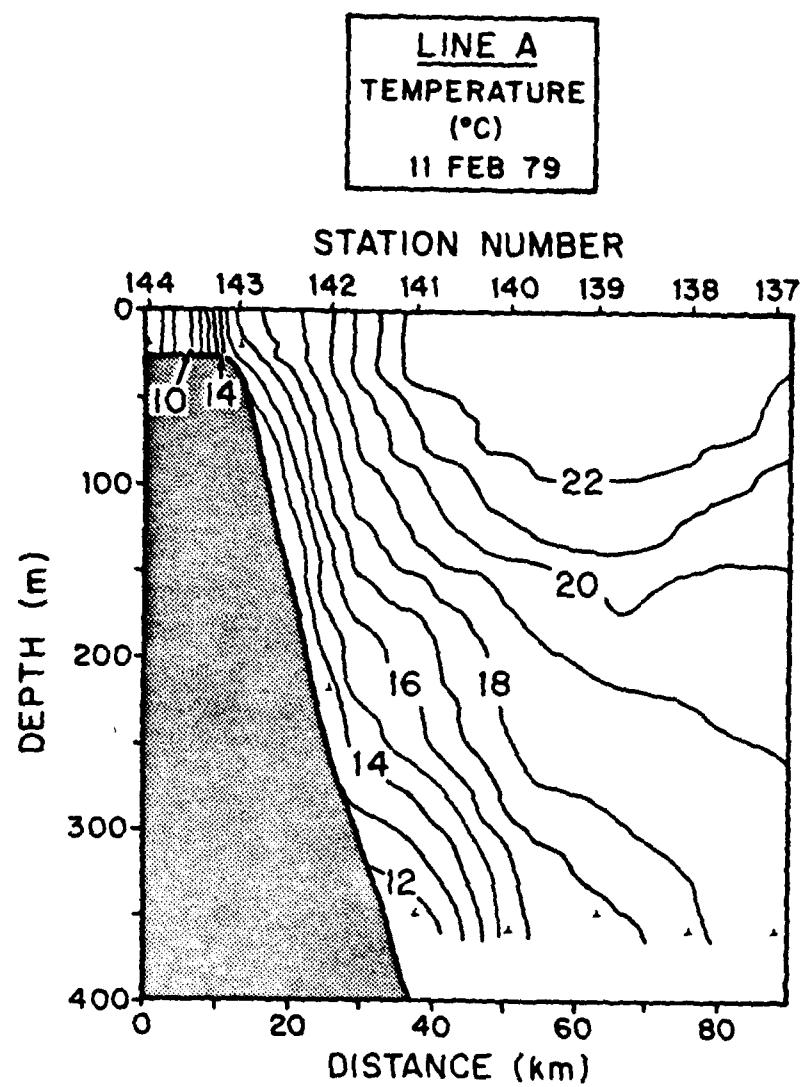


Figure 46. Cross-stream vertical temperature section along Line A, 11 February 1979.

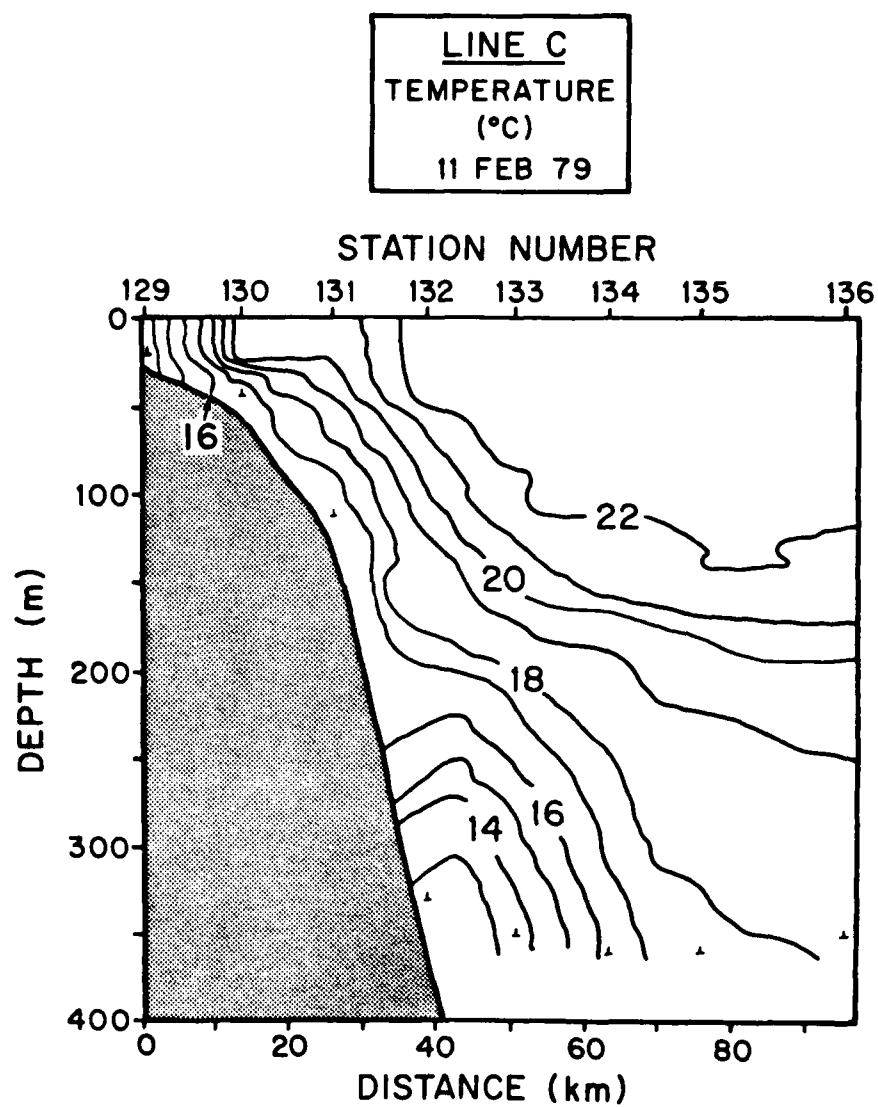


Figure 47. Cross-stream vertical temperature section along Line C, 11 February 1979.

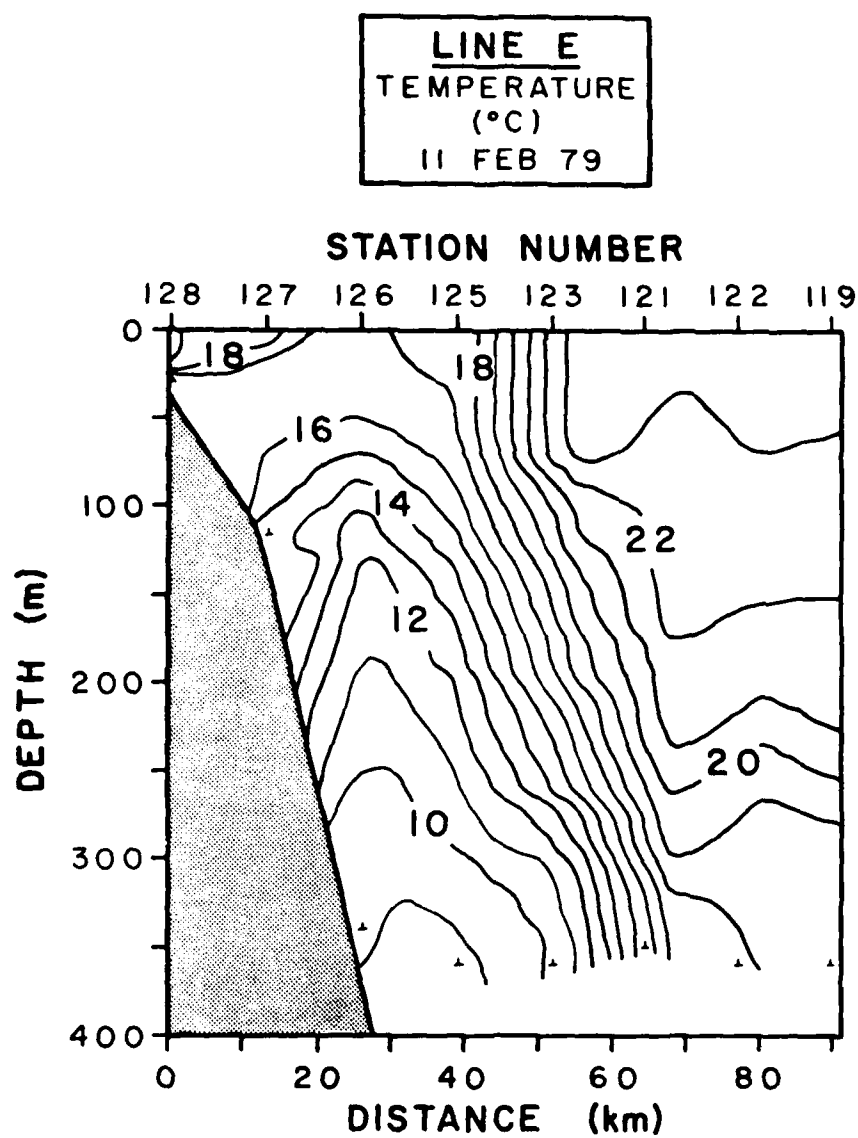


Figure 48. Cross-stream vertical temperature section along Line E, 11 February 1979.

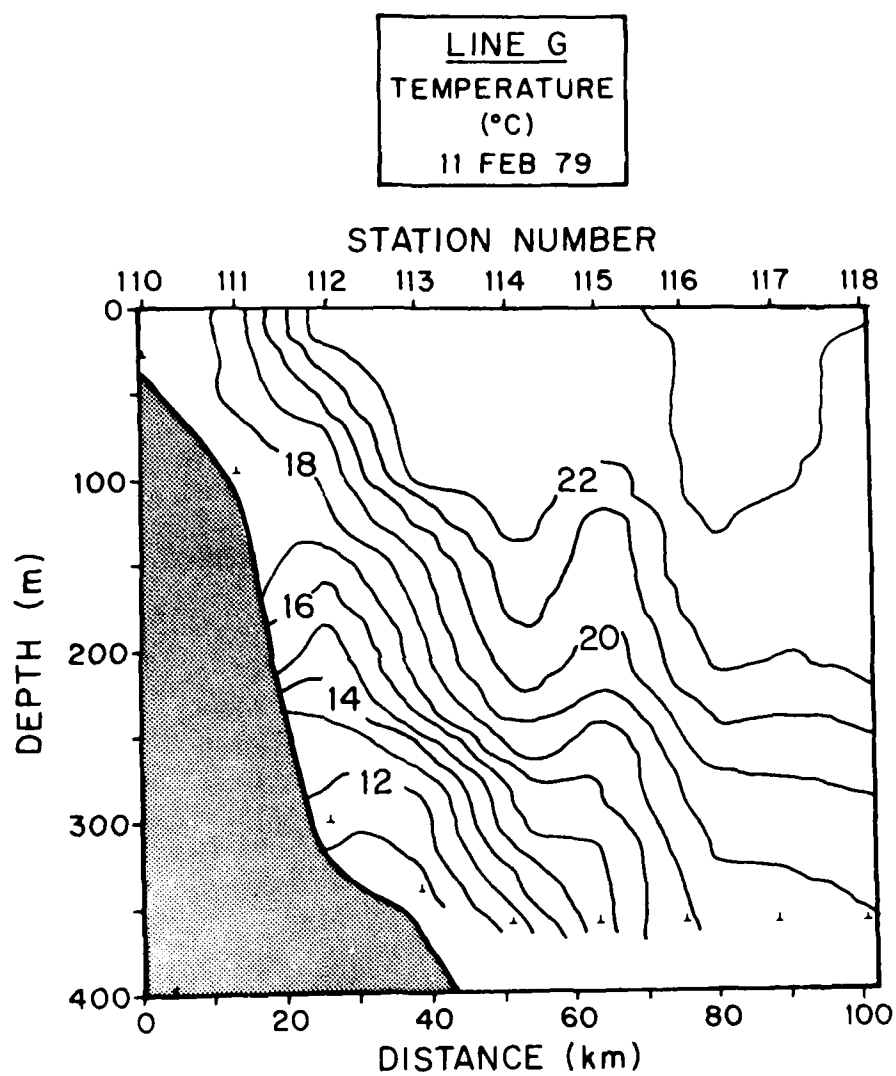


Figure 49. Cross-stream vertical temperature section along Line G, 11 February 1979.

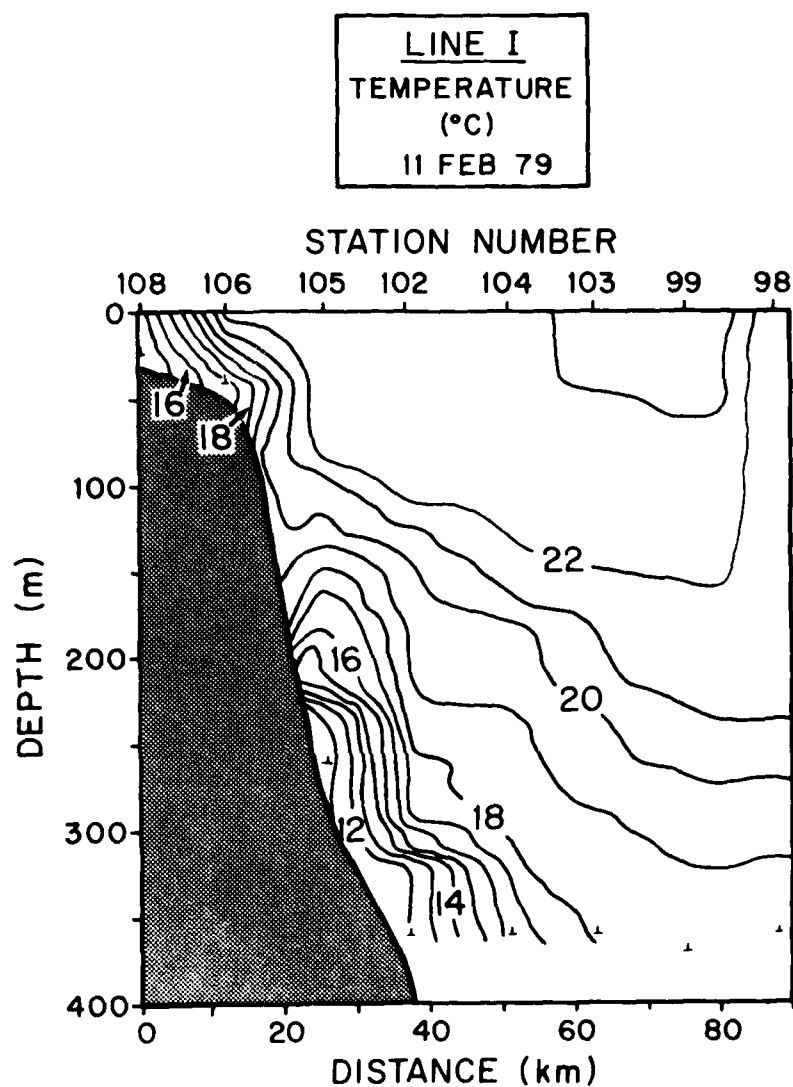


Figure 50. Cross-stream vertical temperature section along Line I, 11 February 1979.

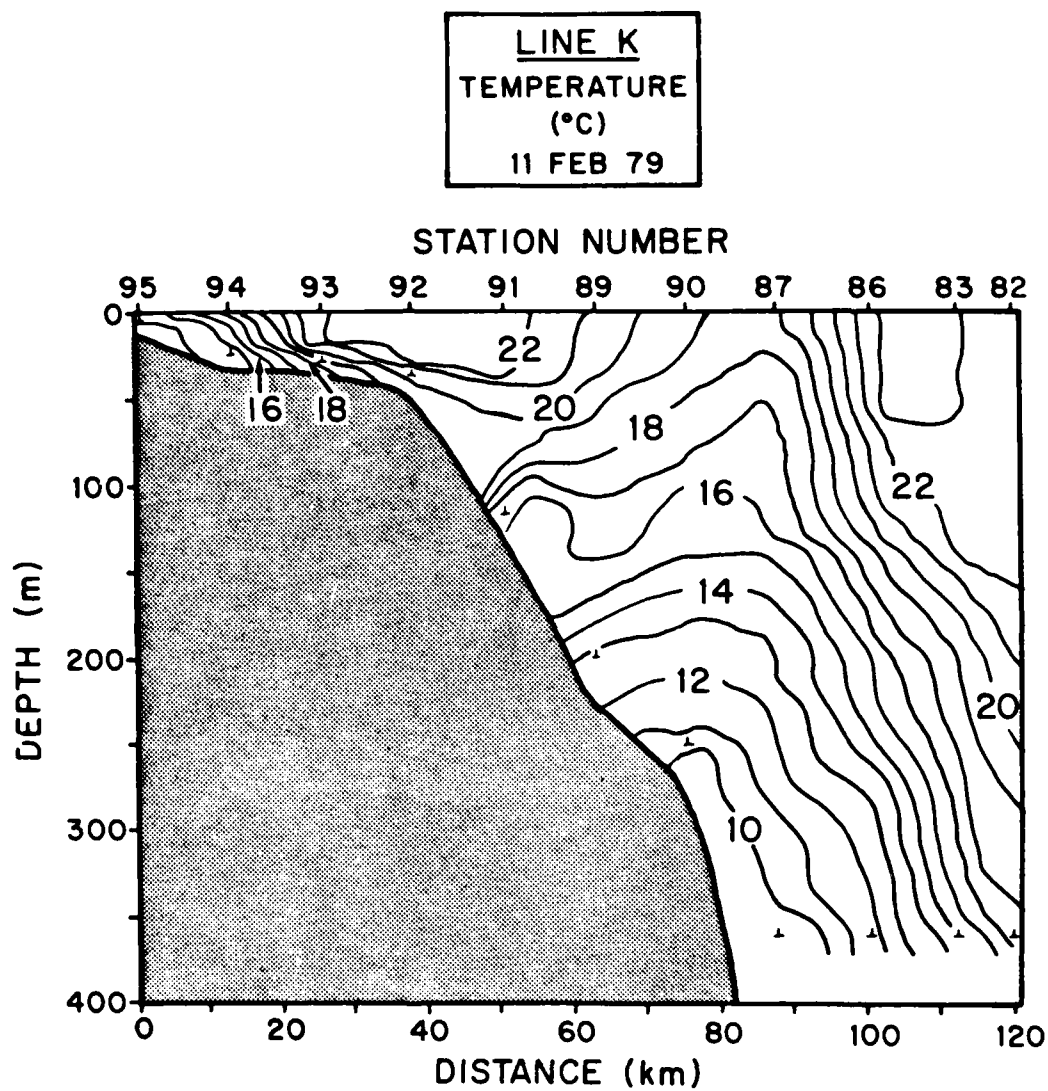


Figure 51. Cross-stream vertical temperature section along Line K, 11 February 1979.

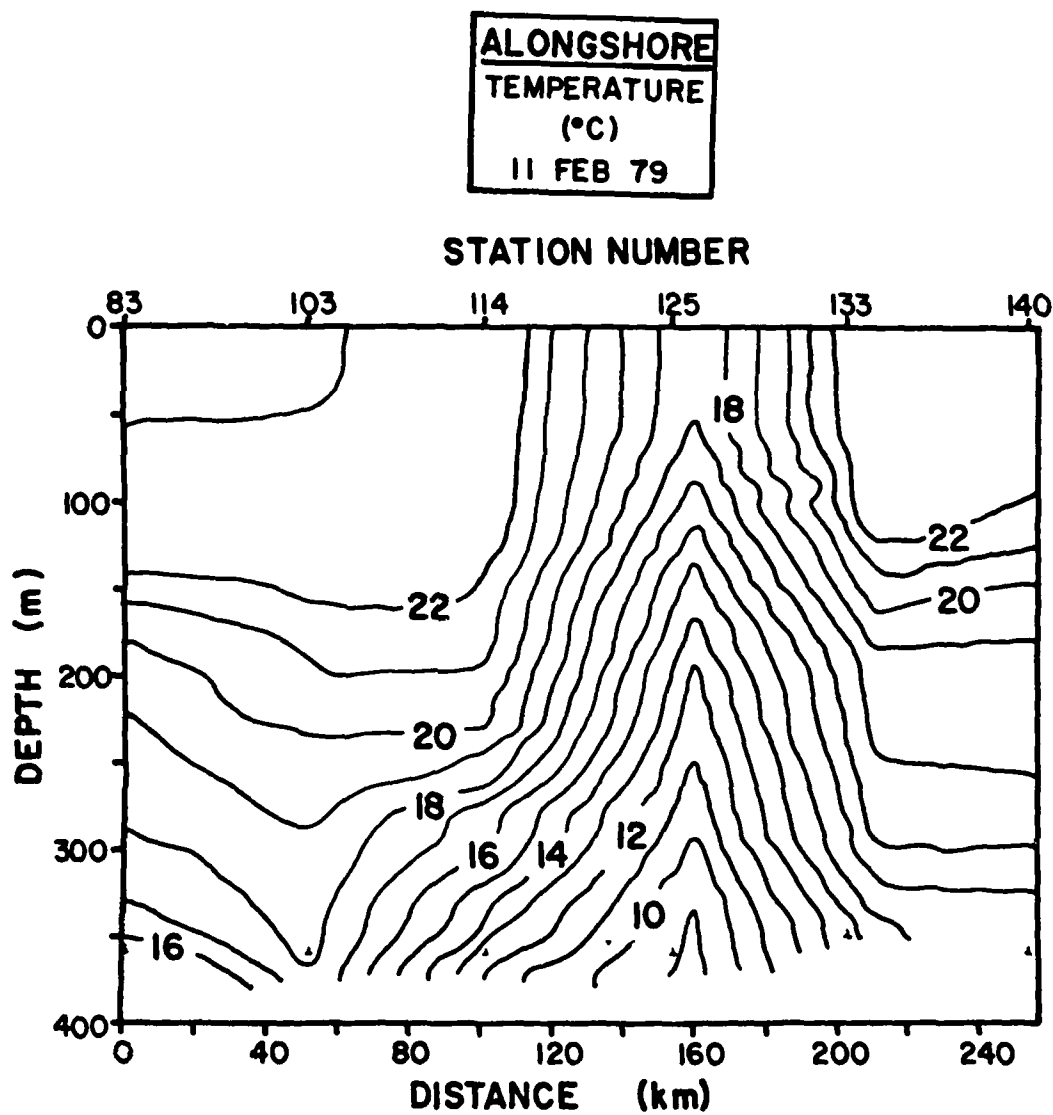


Figure 52. Alongshore vertical temperature section,
11 February 1979.

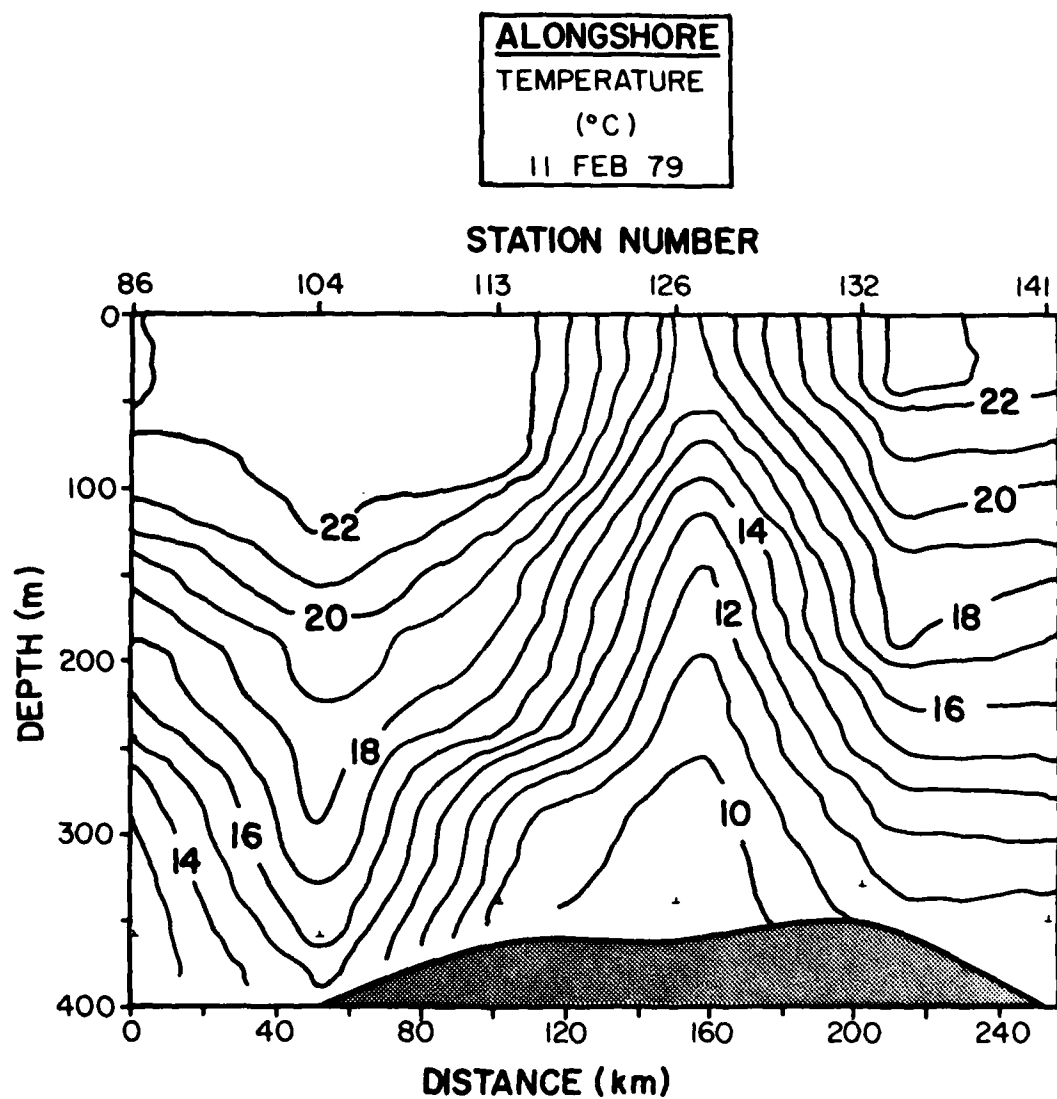


Figure 53. Alongshore vertical temperature section,
11 February 1979.

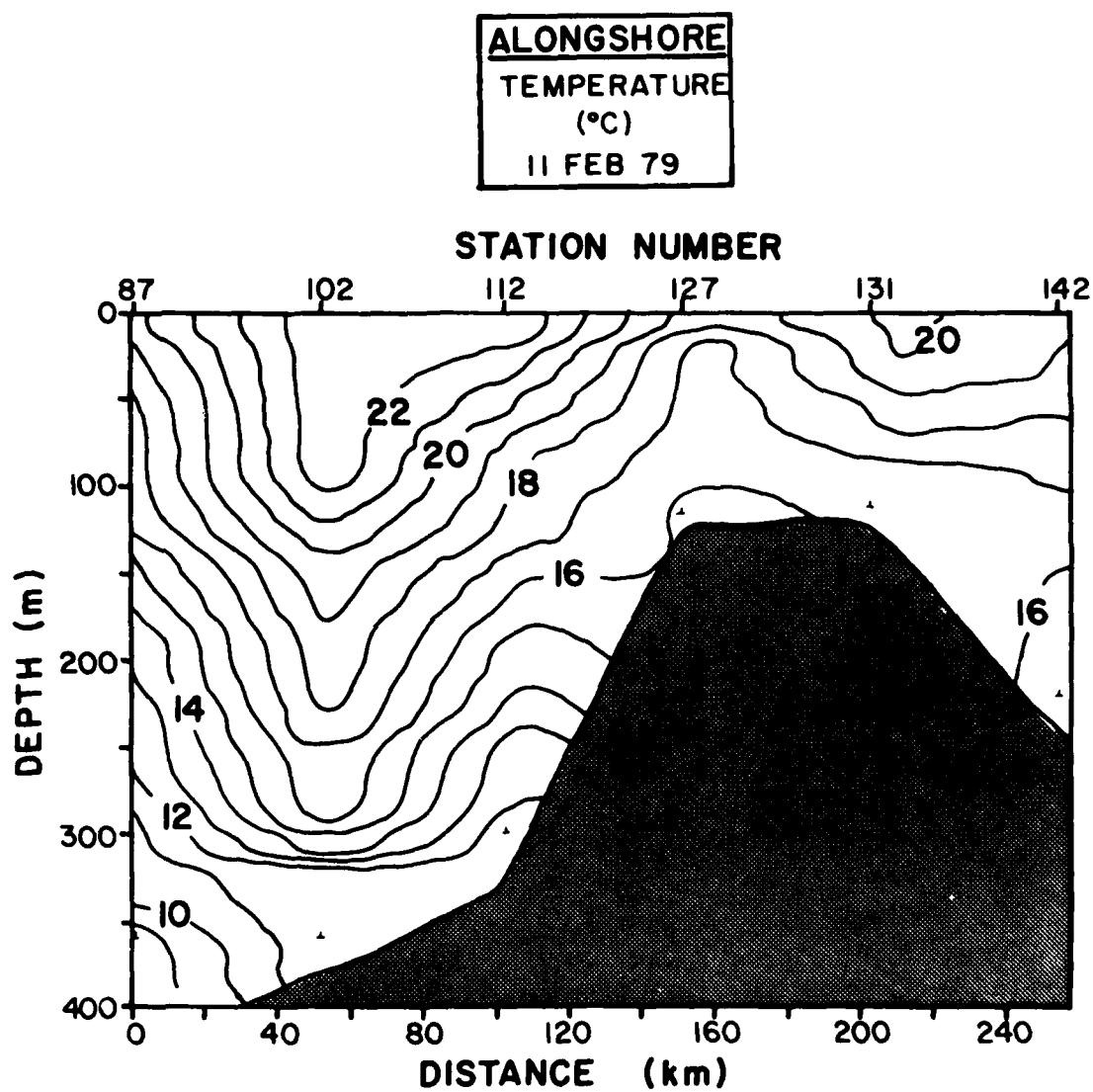


Figure 54. Alongshore vertical temperature section,
11 February 1979.

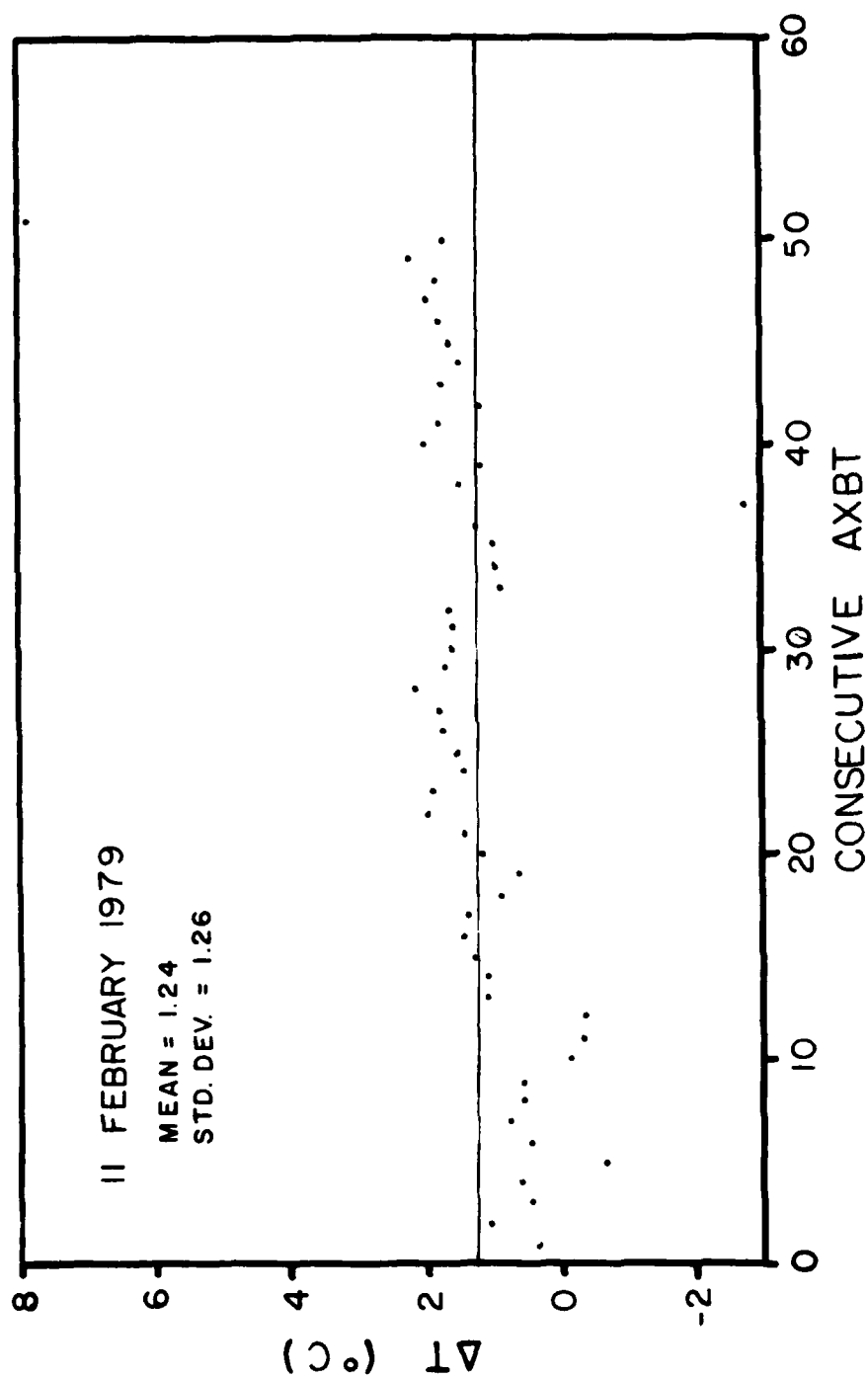


Figure 55. Difference between 1 meter AXBT and PRT temperatures ($T_{\text{AXBT}} - T_{\text{PRT}}$) versus consecutive AXBT drop number, 11 February 1979.

FLIGHT 4: 14 FEBRUARY 1979

Survey Time: 1426:52 to 2202:13

Table 13: 14 February 1979 PRT Line End Points

TIME (Hr-Min-Sec)	LATITUDE (°N)	LONGITUDE (°W)	LINE
1431:34	34°07.97'	75°31.33'	C
1443:05	34°29.77'	76°09.53'	
1501:26	34°06.85'	76°26.33'	E
1515:04	33°59.51'	76°12.75'	
1539:54	33°29.48'	76°20.63'	G
1614:46	33°53.45'	76°58.54'	
1639:58	33°09.09	76°35.12'	I
1654:32	33°37.35	77°22.31'	
1722:23	32°45.68'	76°47.31'	K
1744:02	33°27.51'	77°51.51'	
1816:19	32°17.85'	77°02.85'	M
1842:47	33°09.26'	78°32.14'	
1907:59	32°06.77'	77°37.86'	O
1926:42	32°42.22'	78°41.47'	
1954:18	31°51.06'	78°21.85'	Q
2012:00	32°27.36'	79°13.93'	
2013:19	32°25.61'	79°15.31'	QS
2022:19	32°08.09'	79°29.06'	
2025:12	32°04.63'	79°29.46'	S
2048:00	31°37.09'	78°39.84'	
2149:23	31°11.55'	78°51.29'	U
2201:44	31°35.72'	79°33.69'	

Table 14. 14 February 1979 Flight Updates

<u>TIME(Hrs.)</u>	<u>EVENT</u>	<u>OLD POSITION</u>	<u>NEW POSITION</u>	<u>TYPE OF FIX FOR UPDATES</u>
13.30	TAKEOFF			
16.08	NAV.	33°44.10'N	33°44.00'N	LTN-51
	UPDATE	76°48.30'W	76°51.00'W	
17.78	NAV.	33°19.01'N	33°25.00'N	LTN-51
	UPDATE	78°01.24'W	78°00.00'W	
18.75	NAV.	33°01.30'N	33°04.00'N	LTN-51
	UPDATE	78°27.04'W	78°31.00'W	
22.48	- no update at the end of the flight - used previous section's error rate - last data point			

Table 15. 14 February 1979 PRT Calibration
Temperatures and Times

<u>TIME</u>	<u>CALIBRATION TEMPERATURE (°C)</u>		
<u>(Hrs.)</u>	10.00	17.00	24.00
14.27	-0.74	-0.86	-0.59
15.47	-0.62	-0.68	-0.31
17.25	-0.42	-0.27	-0.08
19.08	-0.31	-0.49	-0.14
20.85	-0.40	-0.16	0.11
22.60	0.02	+0.25	0.36

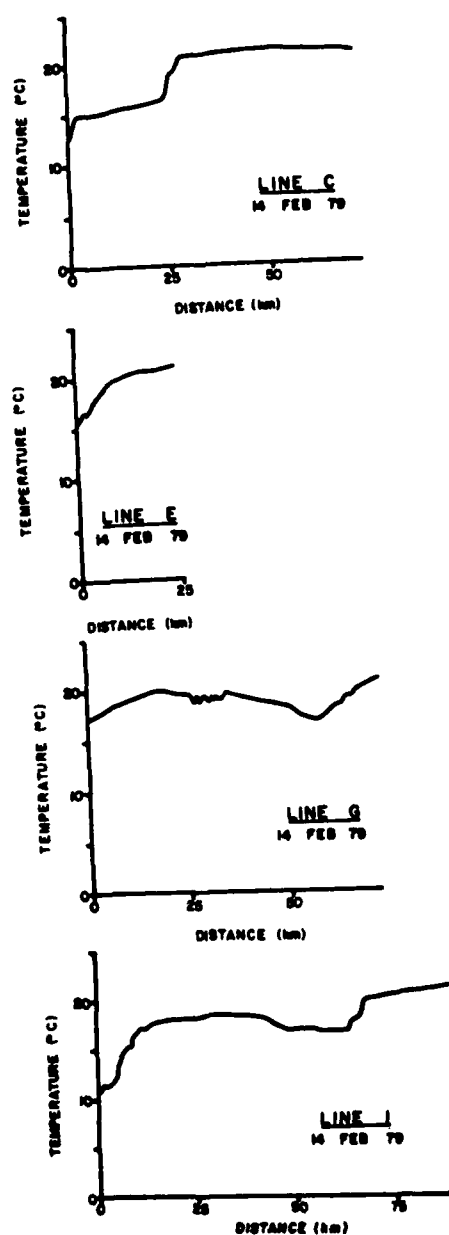


Figure 56. PRT cross-stream surface temperature profiles, 14 February 1979.

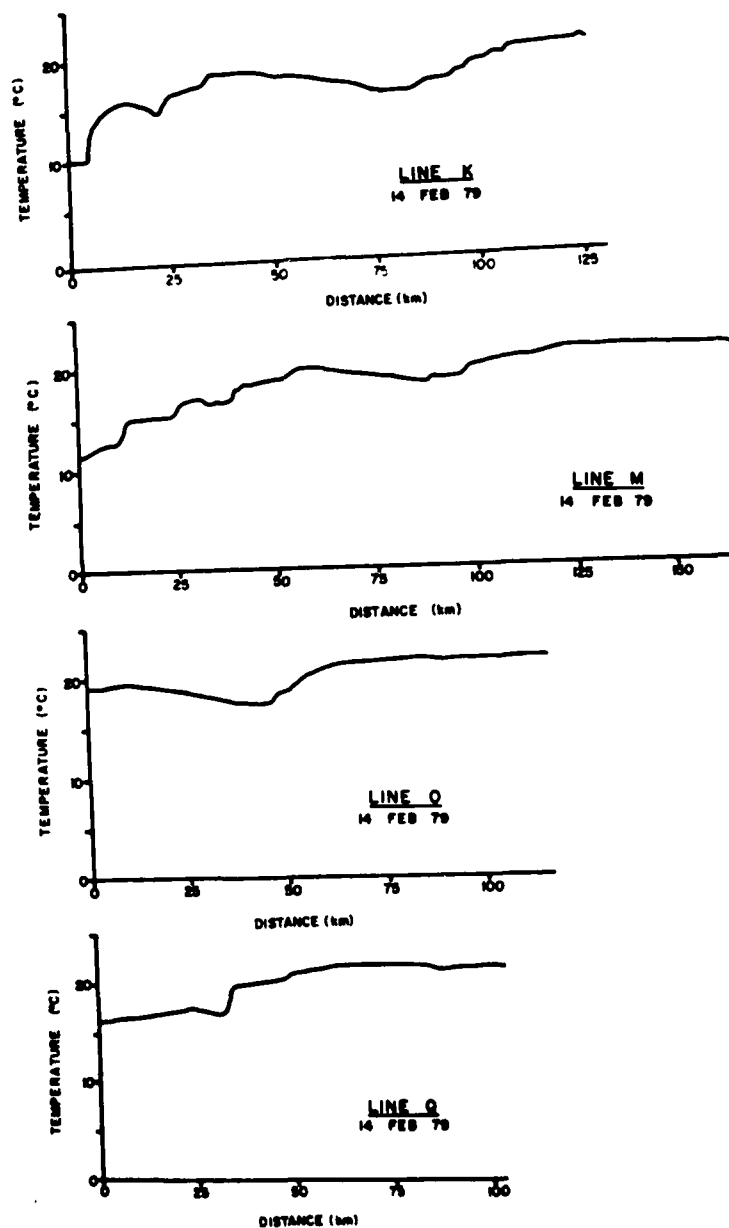


Figure 56 (cont'd).

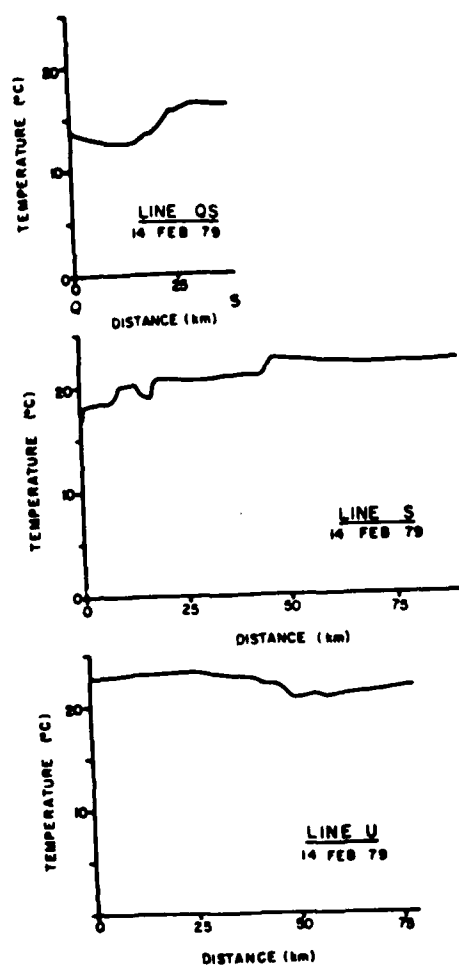


Figure 56 (cont'd).

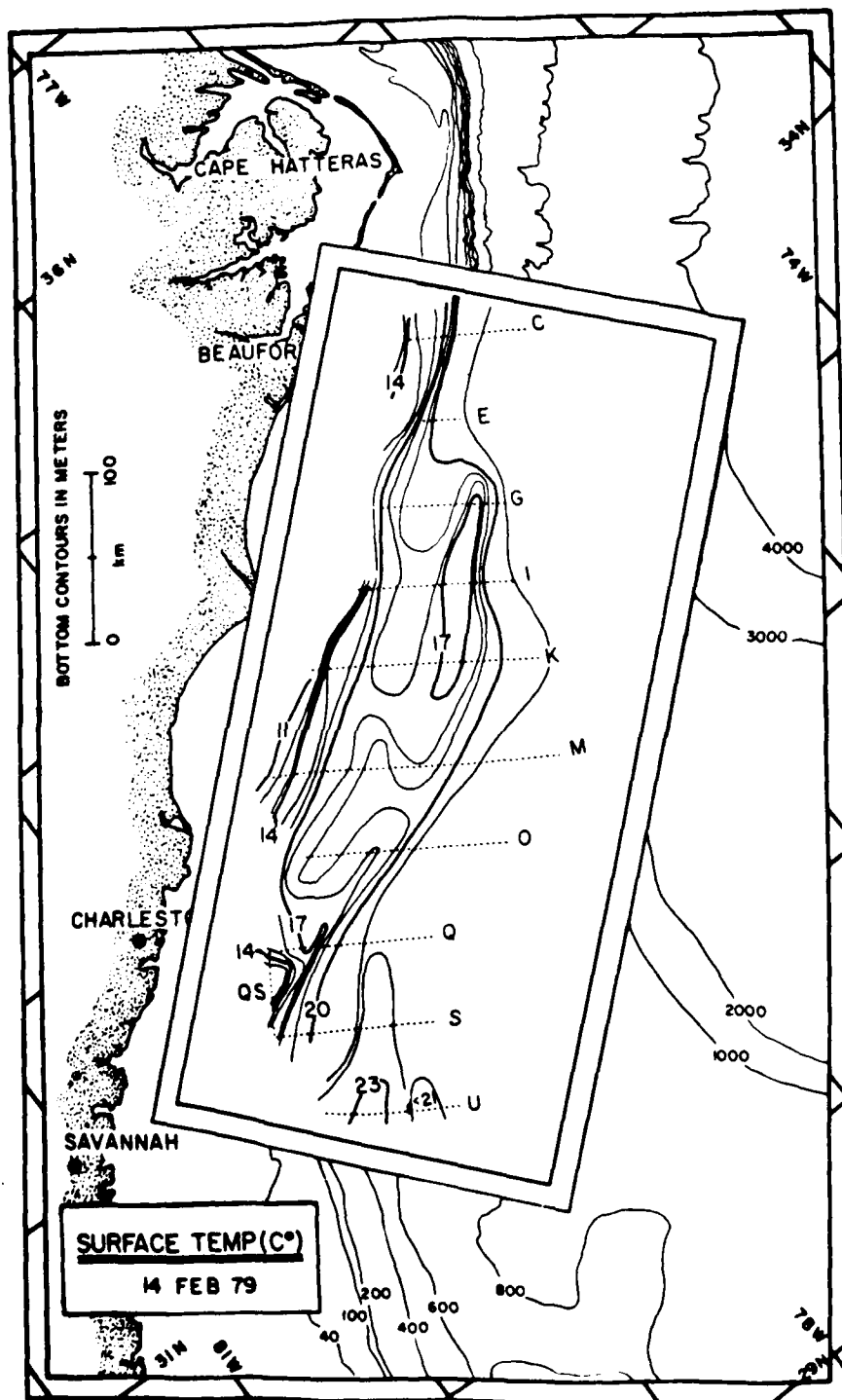


Figure 57. PRT sea surface temperature field, 14 February 1979. Dashed lines indicate positions of cross-stream data lines.

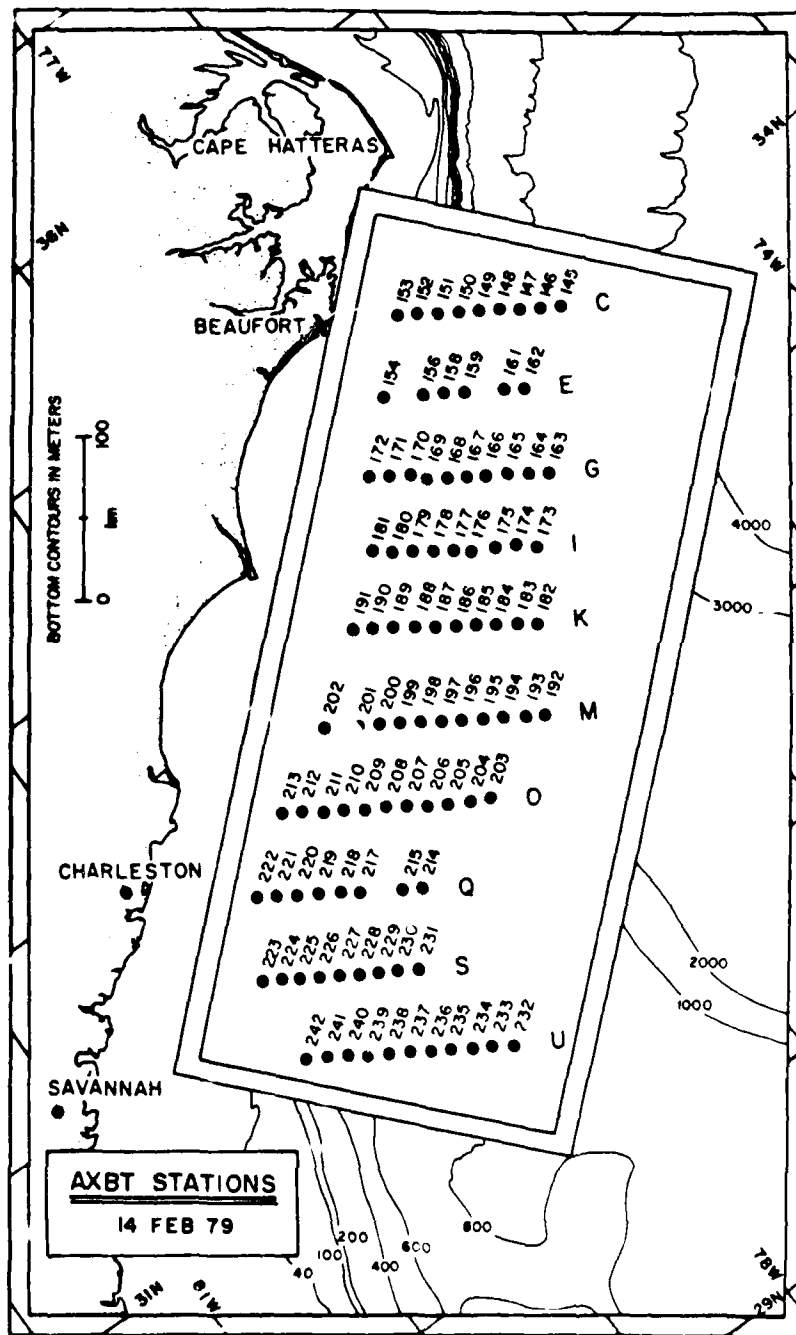


Figure 58. AXBT station locations, 14 February 1979.

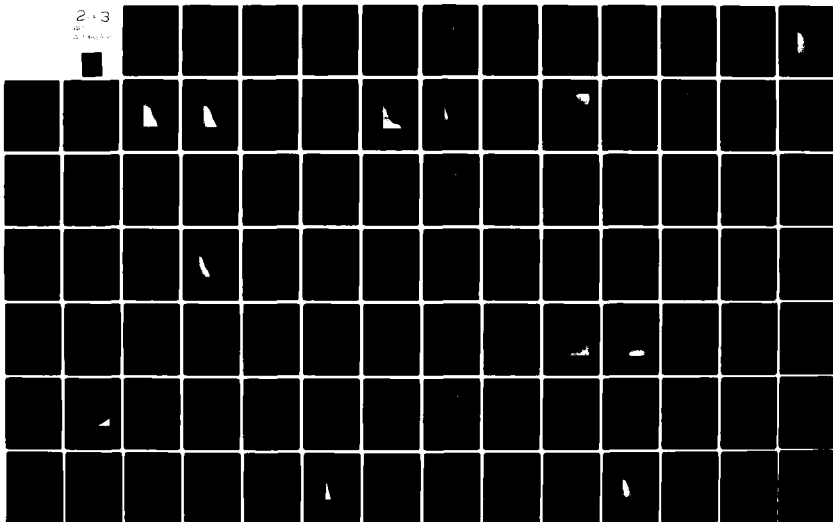
AD-A098 182

NORTH CAROLINA UNIV AT CHAPEL HILL
THE GULF STREAM MEANDERS EXPERIMENT. AXBT/PRT DATA REPORT, R/A --ETC(U)
DEC 80 J M BANE, D A BROOKS, K R LORENSON N00014-77-C-0354
CMS-80-2 NL

UNCLASSIFIED

2-3

2-3



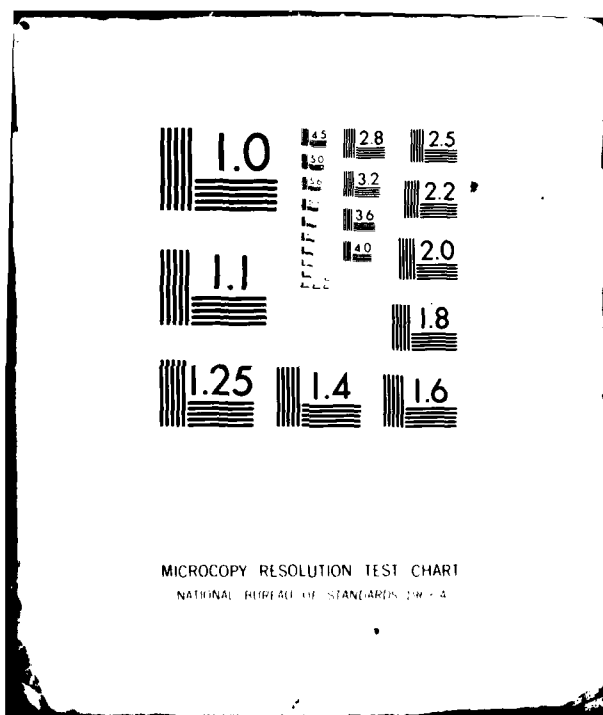


Table 16. 14 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
145	33°59.1'	75°16.1'	370	1426:52
146	34°02.9'	75°22.8'	360	1428:27
147	34°06.8'	75°29.5'	370	1431:02
148	34°10.9'	75°36.1'	370	1433:02
149	34°14.6'	75°43.0'	360	1435:05
150	34°18.6'	75°49.4'	370	1437:03
151	34°22.4'	75°56.3'	114	1439:01
152	34°26.2'	76°02.9'	50	1440:58
153	34°30.0'	76°09.9'	34	1442:55
154	34°11.4'	76°34.7'	37	1458:54
156	34°03.8'	76°21.3'	53	1502:55
158	34°00.5'	76°14.3'	210	1514:34
159	33°56.3'	76°08.0'	370	1516:30
161	33°48.9'	75°54.6'	360	1520:29
162	33°45.0'	75°48.1'	370	1522:25
163	33°18.2'	76°01.3'	370	1534:09
164	33°22.1'	76°07.8'	360	1536:05
165	33°26.2'	76°14.7'	370	1538:09
166	33°30.1'	76°21.8'	370	1540:16
167	33°33.7'	76°27.9'	360	1542:08
168	33°37.7'	76°34.5'	360	1544:07
169	33°41.4'	76°41.1'	95	1546:01
170	33°45.7'	76°44.9'	57	1611:04
171	33°49.8'	76°51.8'	42	1612:58
172	33°53.5'	76°58.7'	37	1614:50
173	33°01.7'	76°23.3'	360	1636:16
174	33°06.2'	76°29.3'	370	1638:24
175	33°09.7'	76°36.4'	370	1640:22
176	33°13.7'	76°44.6'	360	1642:26
177	33°17.6'	76°49.7'	300	1644:33
178	33°21.5'	76°56.3'	220	1646:40
179	33°25.6'	77°02.9'	60	1648:48
180	33°29.6'	77°09.3'	44	1650:45
181	33°33.9'	77°15.6'	37	1652:41
182	32°42.0'	76°41.3'	380	1720:25
183	32°46.1'	76°48.0'	370	1722:37
184	32°49.9'	76°54.5'	360	1724:42
185	32°53.9'	77°01.0'	370	1726:42
186	32°58.0'	77°07.5'	360	1728:46
187	33°01.9'	77°14.1'	340	1730:53

Table 16 (con't). 14 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Sec-Min)
188	33°05.8'	77°20.7'	250	1732:56
189	33°10.1'	77°27.2'	105	1735:01
190	33°13.8'	77°33.8'	45	1736:59
191	33°17.6'	77°40.5'	42	1739:00
192	32°16.9'	77°01.2'	370	1815:51
193	32°20.5'	77°07.9'	370	1817:49
194	32°24.7'	77°14.7'	360	1819:53
195	32°28.4'	77°21.5'	370	1821:52
196	32°32.4'	77°28.1'	370	1823:53
197	32°36.3'	77°34.8'	360	1825:54
198	32°40.1'	77°41.5'	370	1827:58
199	32°44.1'	77°48.1'	305	1829:57
200	32°48.1'	77°54.7'	265	1831:58
201	32°25.0'	78°01.6'	175	1833:58
202	32°58.2'	78°12.8'	40	1837:07
203	32°06.7'	77°37.8'	360	1908:00
204	32°09.8'	77°45.1'	370	1910:02
205	32°13.4'	77°52.1'	370	1912:04
206	32°17.3'	77°58.8'	360	1914:07
207	32°21.3'	78°05.3'	350	1916:05
208	32°25.3'	78°12.0'	320	1918:06
209	32°39.0'	78°18.9'	300	1920:04
210	32°32.9'	78°25.7'	220	1922:04
211	32°36.7'	78°32.4'	175	1924:01
212	32°40.7'	78°39.0'	105	1926:00
213	32°44.7'	78°45.6'	35	1927:59
214	31°57.0'	78°19.7'	370	1957:40
215	32°00.9'	78°26.3'	360	1958:37
217	32°08.6'	78°39.8'	330	2002:28
218	32°12.7'	78°46.1'	310	2004:21
219	32°16.7'	78°52.9'	300	2006:19
220	32°20.3'	79°00.2'	225	2008:18
221	32°24.4'	79°06.4'	85	2010:10
222	32°28.0'	79°13.3'	30	2012:03
223	32°05.5'	79°31.0'	30	2023:37
224	32°01.9'	79°24.6'	155	2025:35
225	31°58.8'	79°18.5'	340	2035:56
226	31°55.1'	79°12.1'	370	2037:54
227	31°51.4'	79°05.7'	360	2039:54
228	31°47.8'	78°59.2'	370	2041:53

Table 16 (con't). 14 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
229	31°44.2'	78°52.7'	370	2043:50
230	31°40.7'	78°46.2'	360	2045:52
231	31°37.0'	78°39.8'	370	2048:00
232	30°58.4'	78°28.4'	370	2142:40
233	31°02.2'	78°35.1'	360	2144:36
234	31°06.0'	78°41.6'	370	2146:33
235	31°09.9'	78°48.4'	370	2148:33
236	31°13.7'	78°55.1'	360	2150:31
237	31°17.5'	79°01.6'	370	2152:25
238	31°21.4'	79°08.4'	370	2154:21
239	31°25.1'	79°15.1'	360	2156:18
240	31°29.0'	79°21.8'	370	2158:15
241	31°32.8'	79°28.5'	380	2200:13
242	31°36.6'	79°35.3'	370	2202:13

14 FEBRUARY 1979

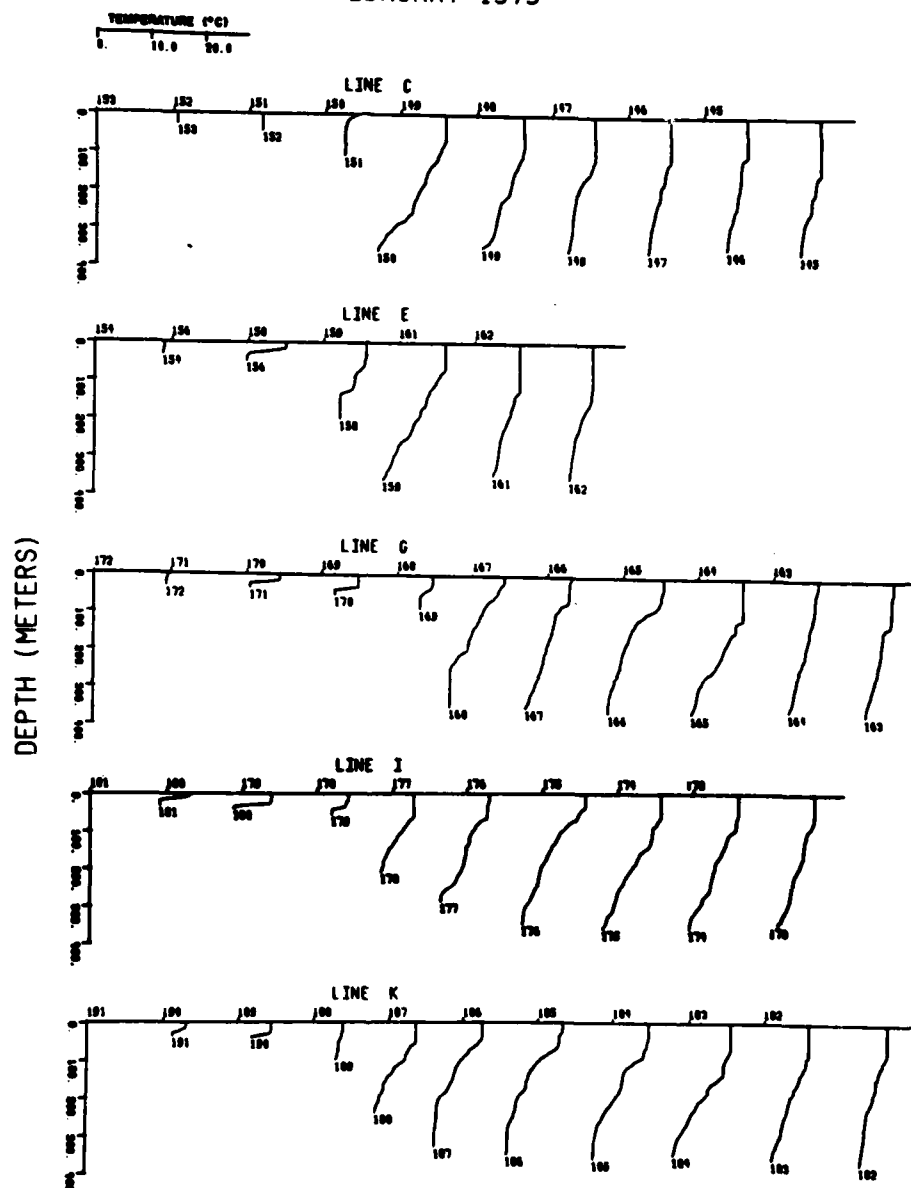


Figure 59. AXBT vertical temperature profiles,
14 February 1979.

14 FEBRUARY 1979

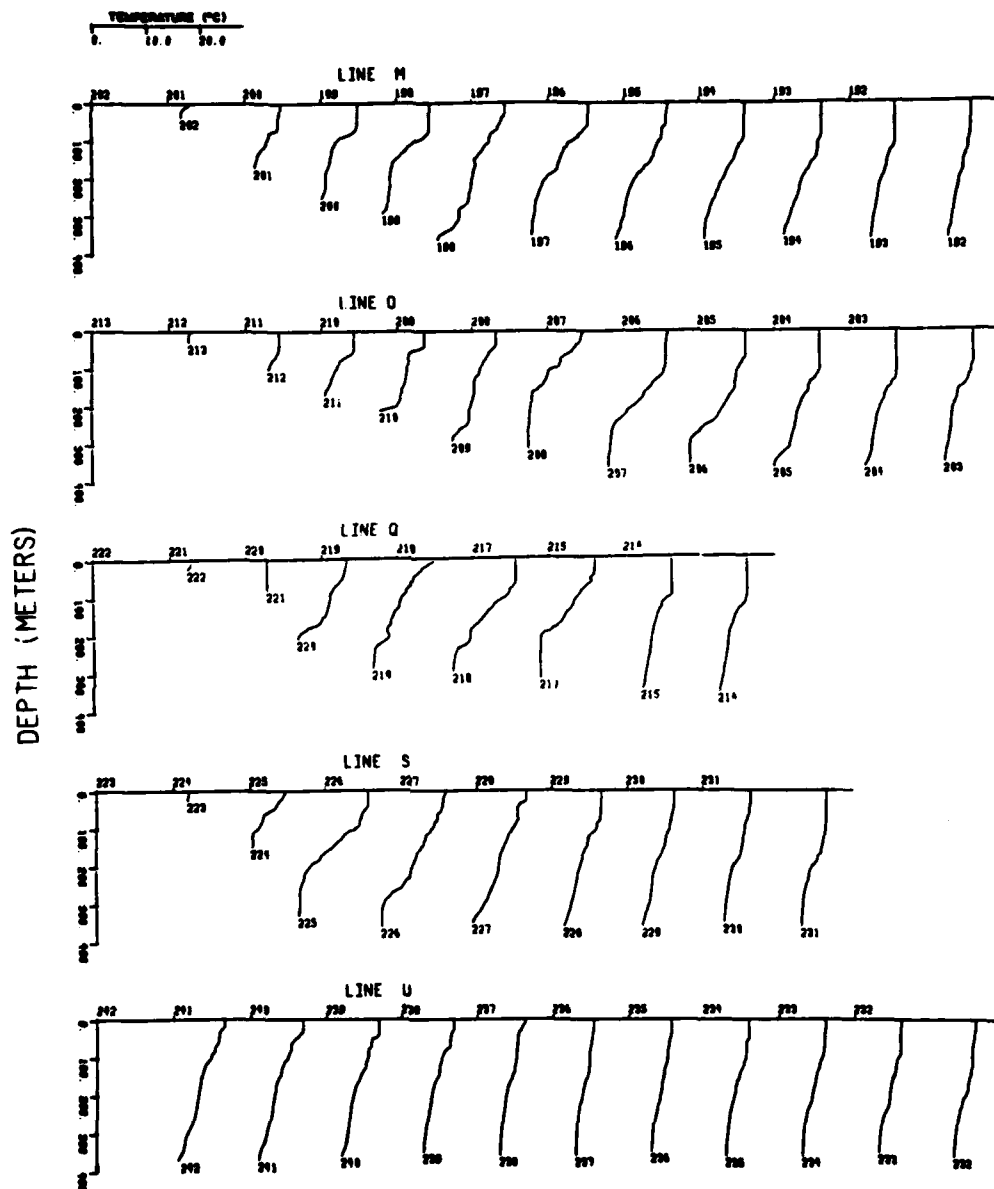


Figure 59 (cont'd).

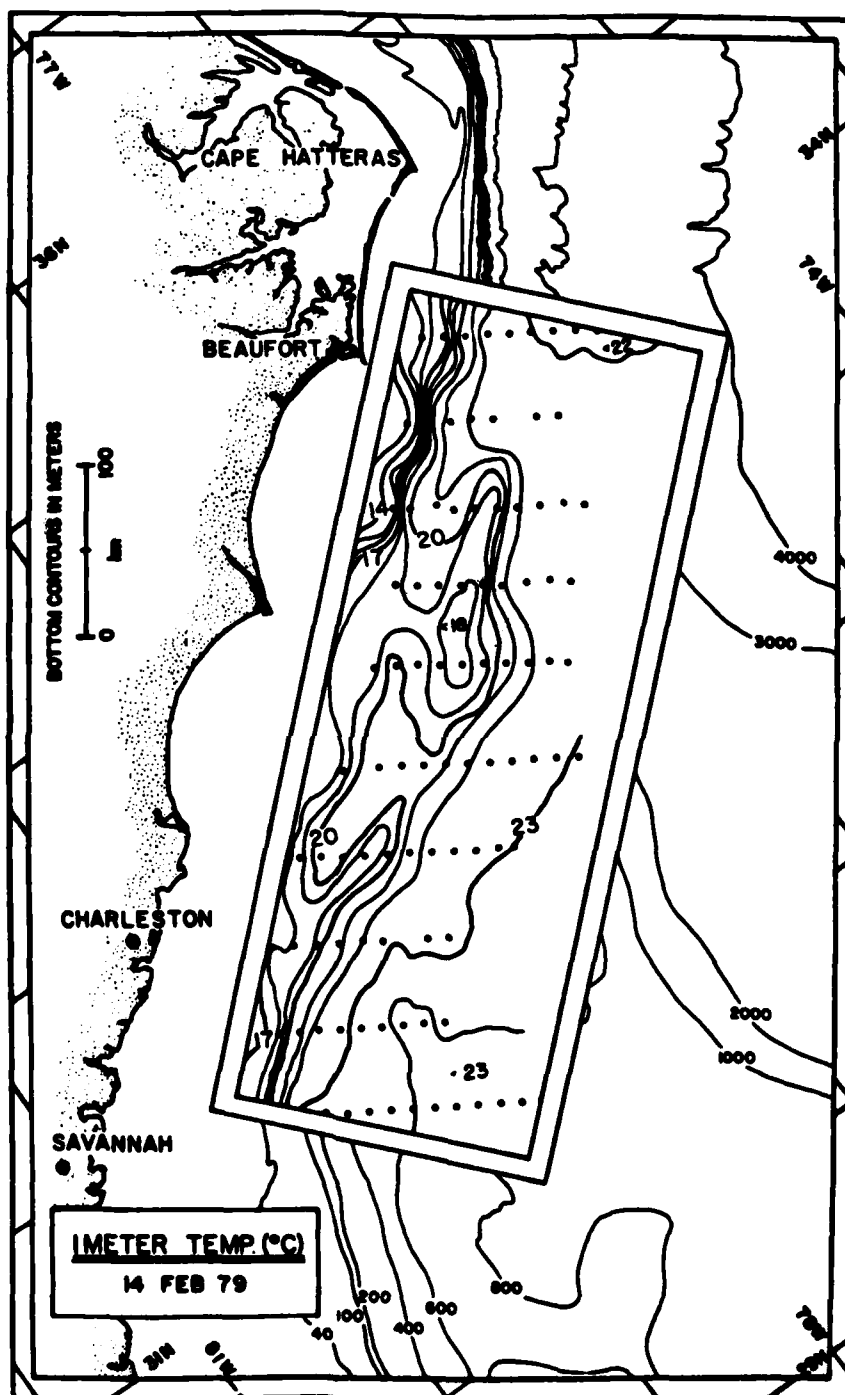


Figure 60. AXBT temperatures at 1 meter, 14 February 1979. Small solid circles indicate AXBT drop-sites.

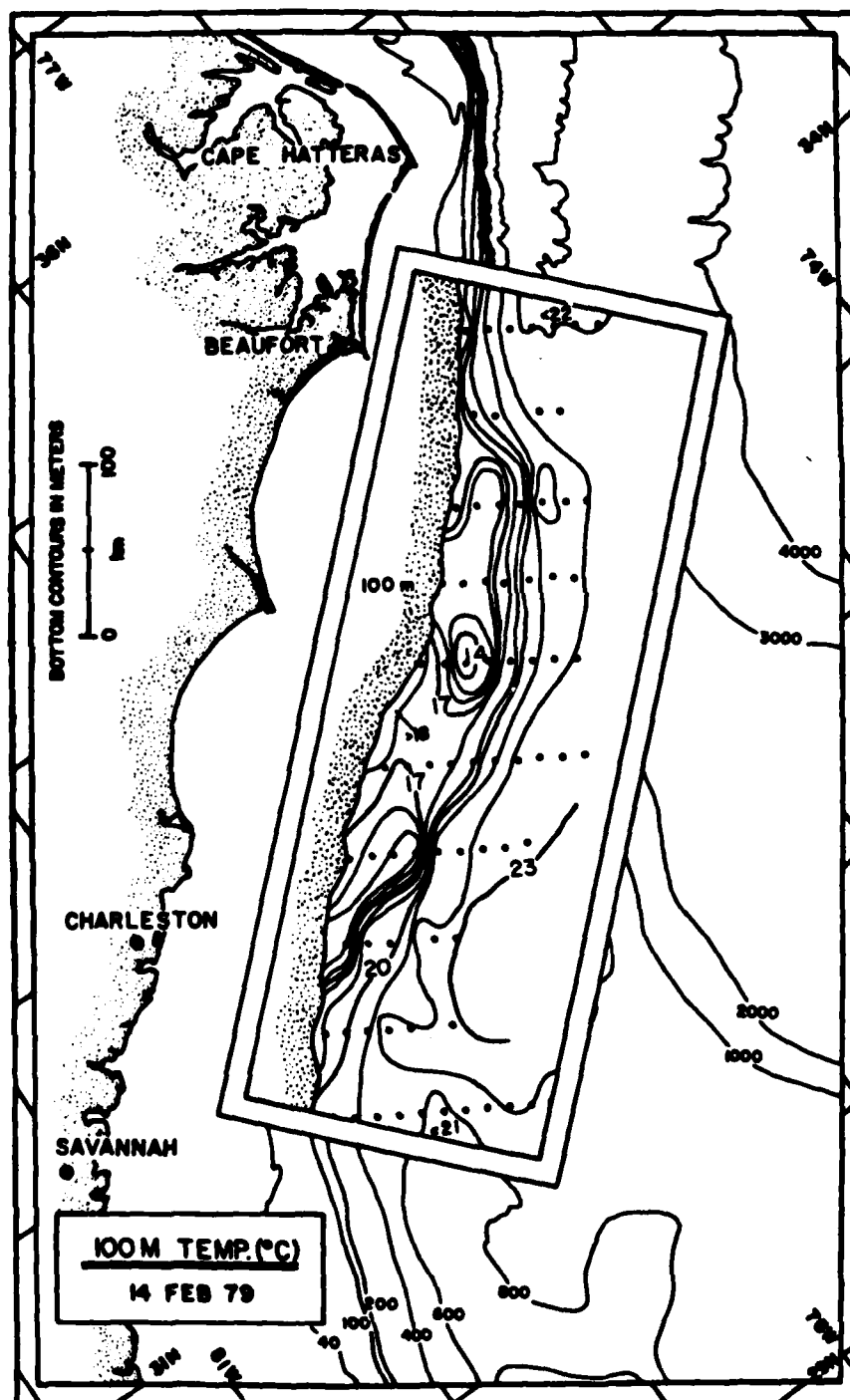


Figure 61. AXBT temperatures at 100 meters, 14 February 1979.

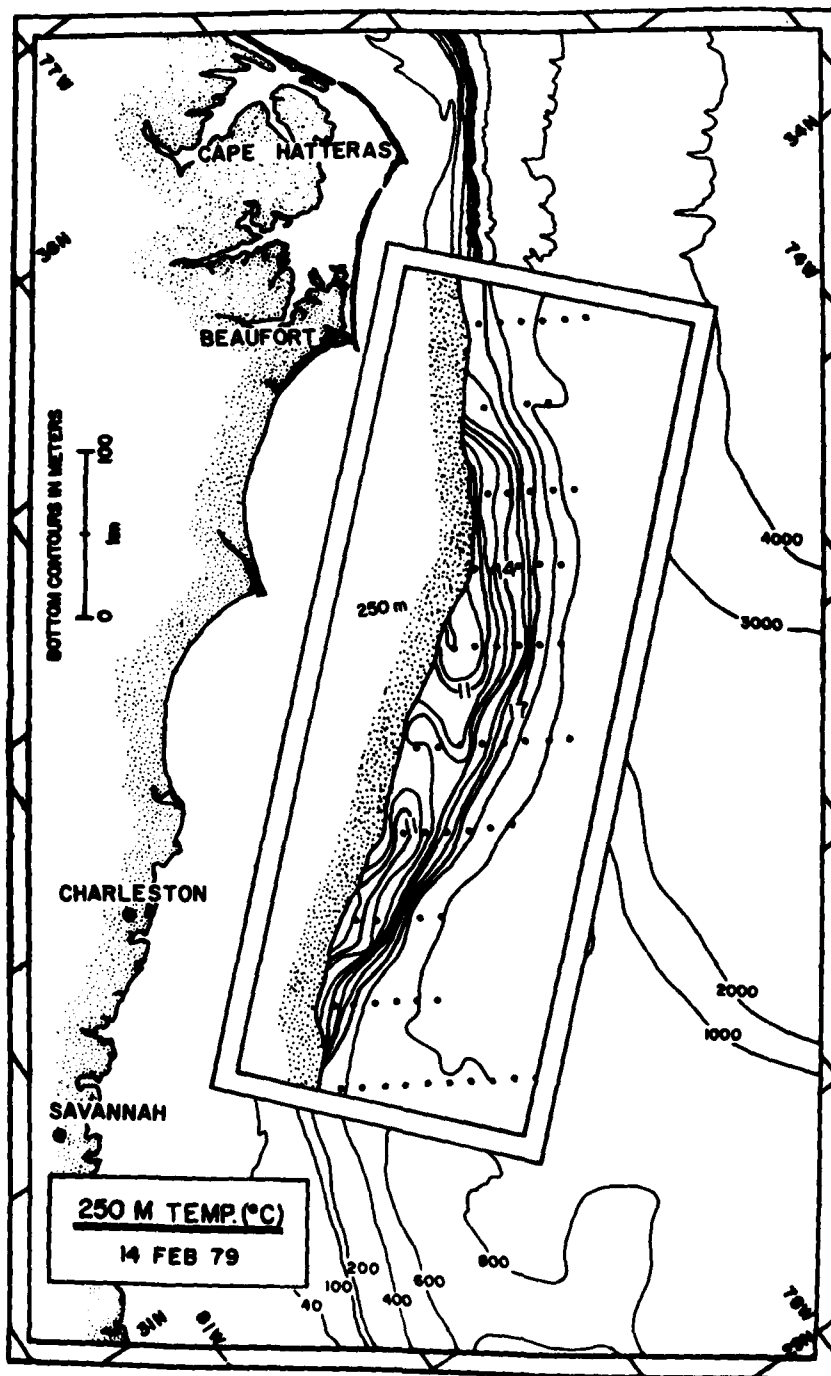


Figure 62. AXBT temperatures at 250 meters, 14 February 1979.

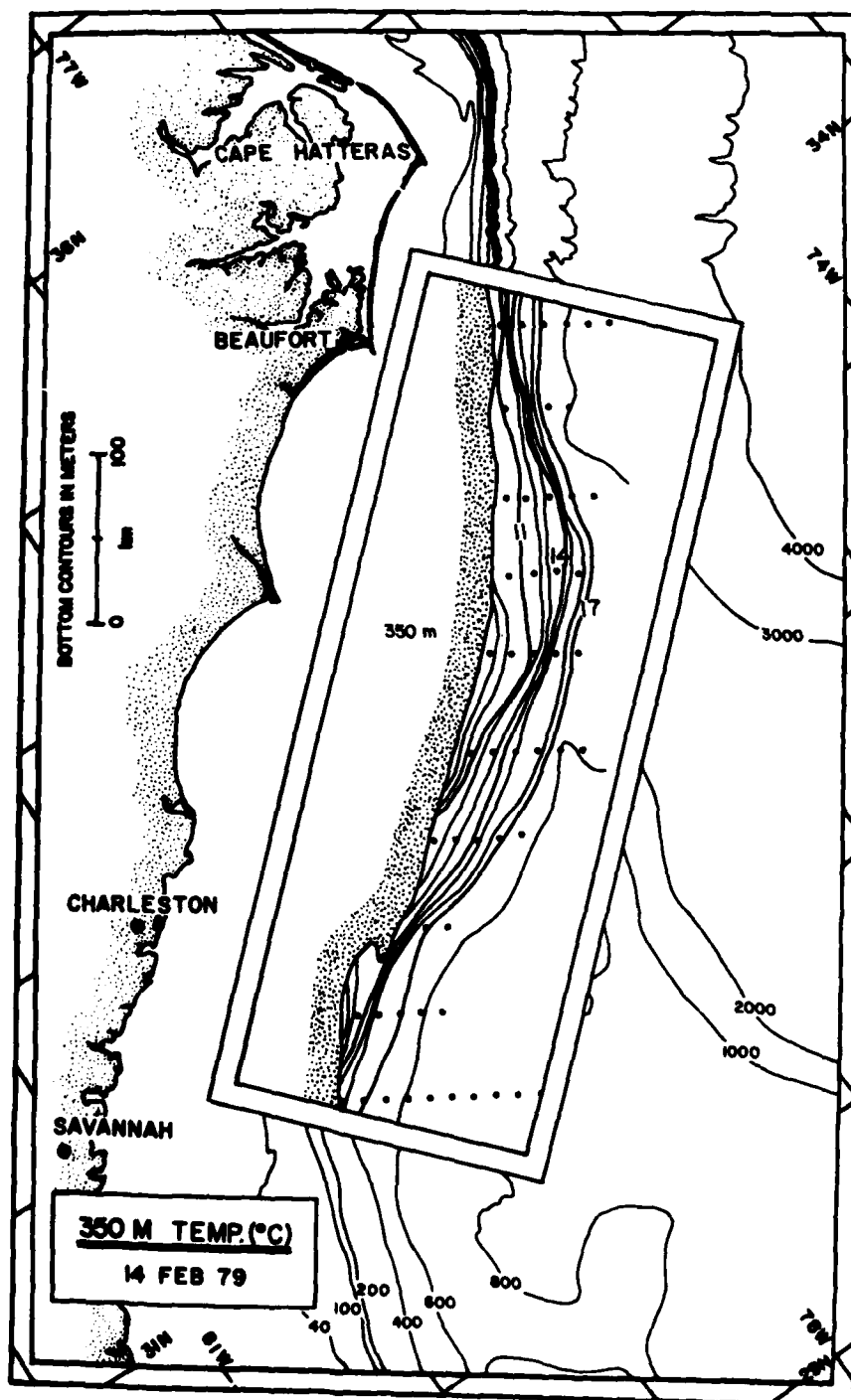


Figure 63. AXBT temperatures at 350 meters, 14 February 1979.

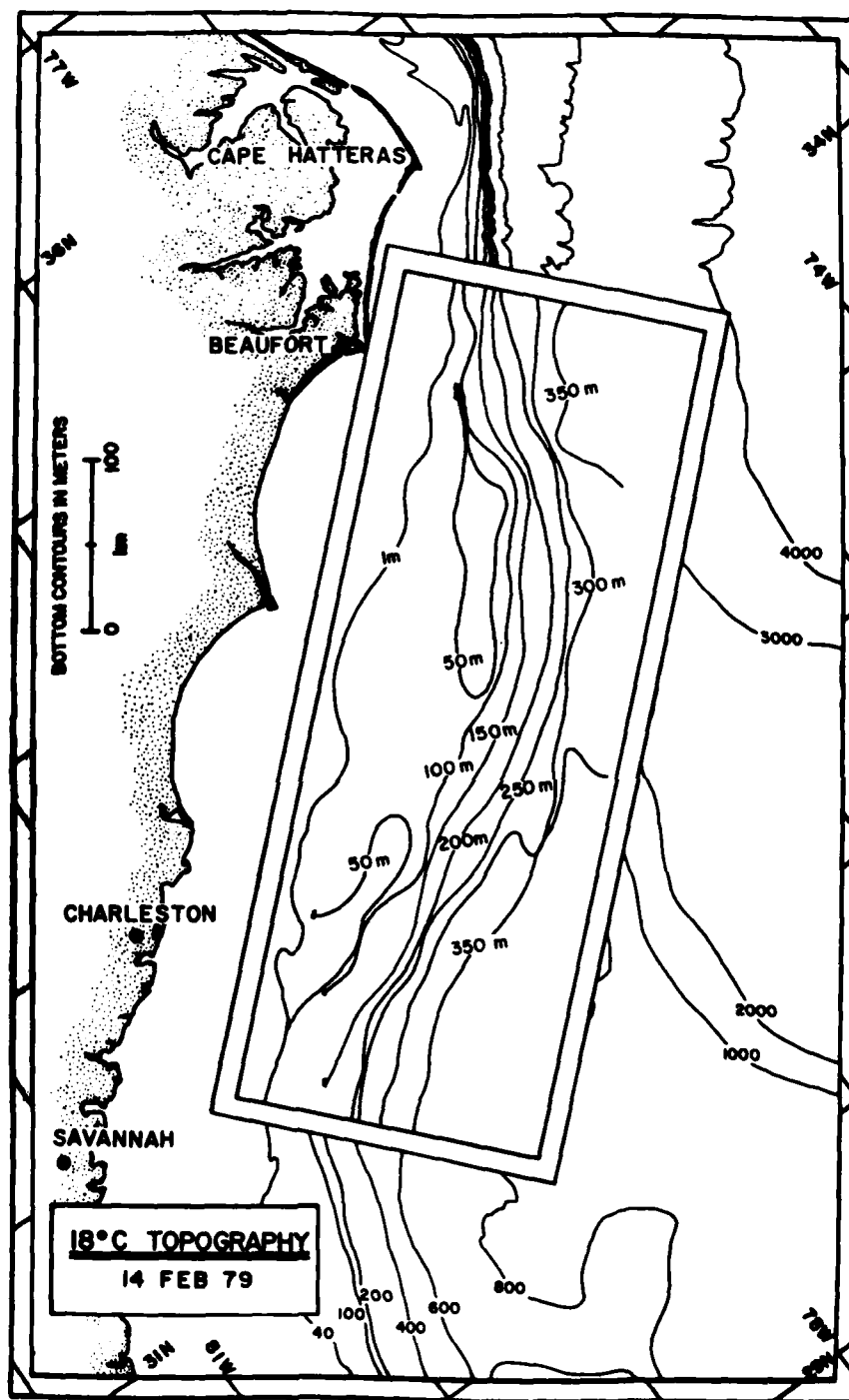


Figure 64. Topography of the 18°C isotherm, 14 February 1979.

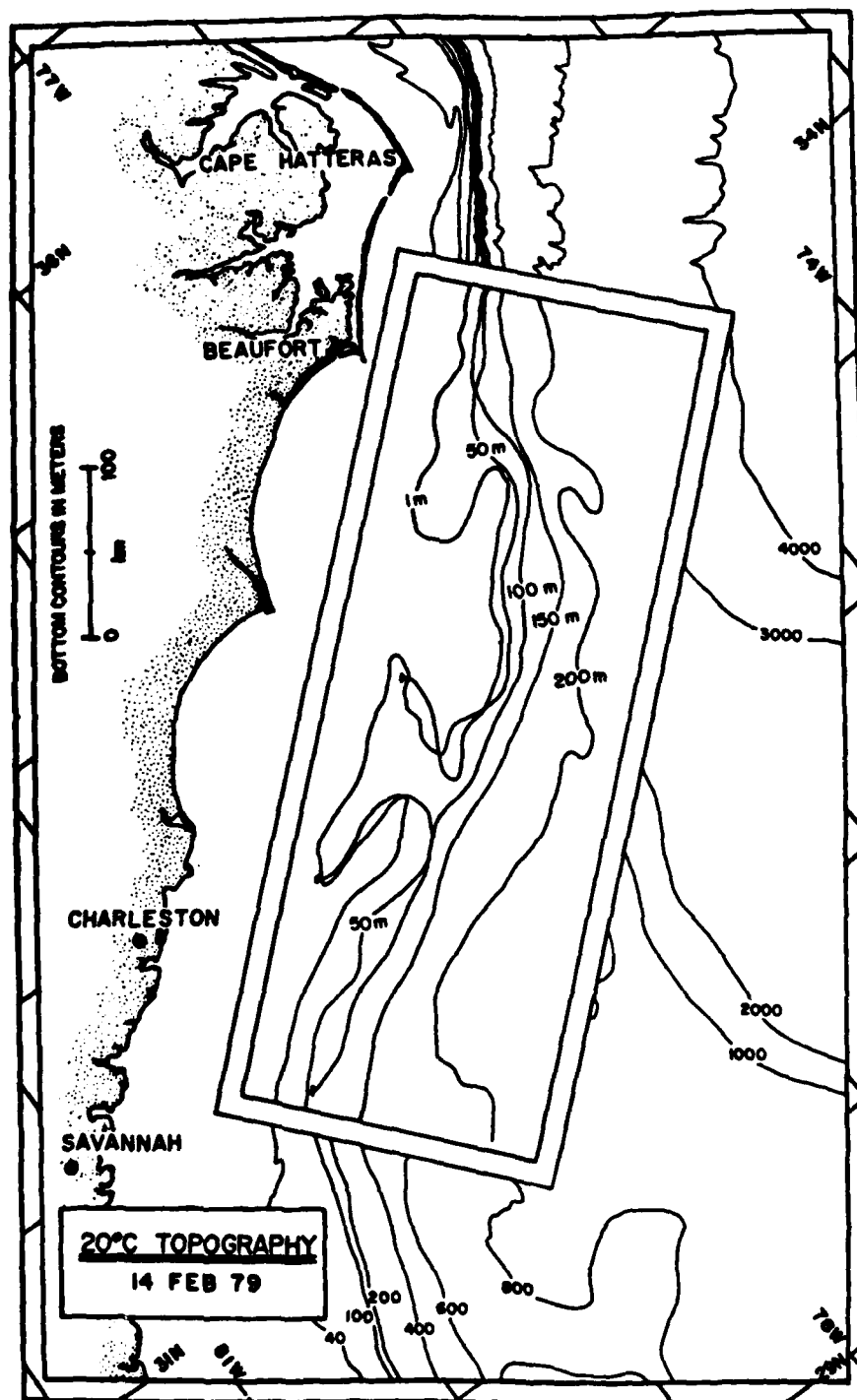


Figure 65. Topography of the 20°C isotherm, 14 February 1979.

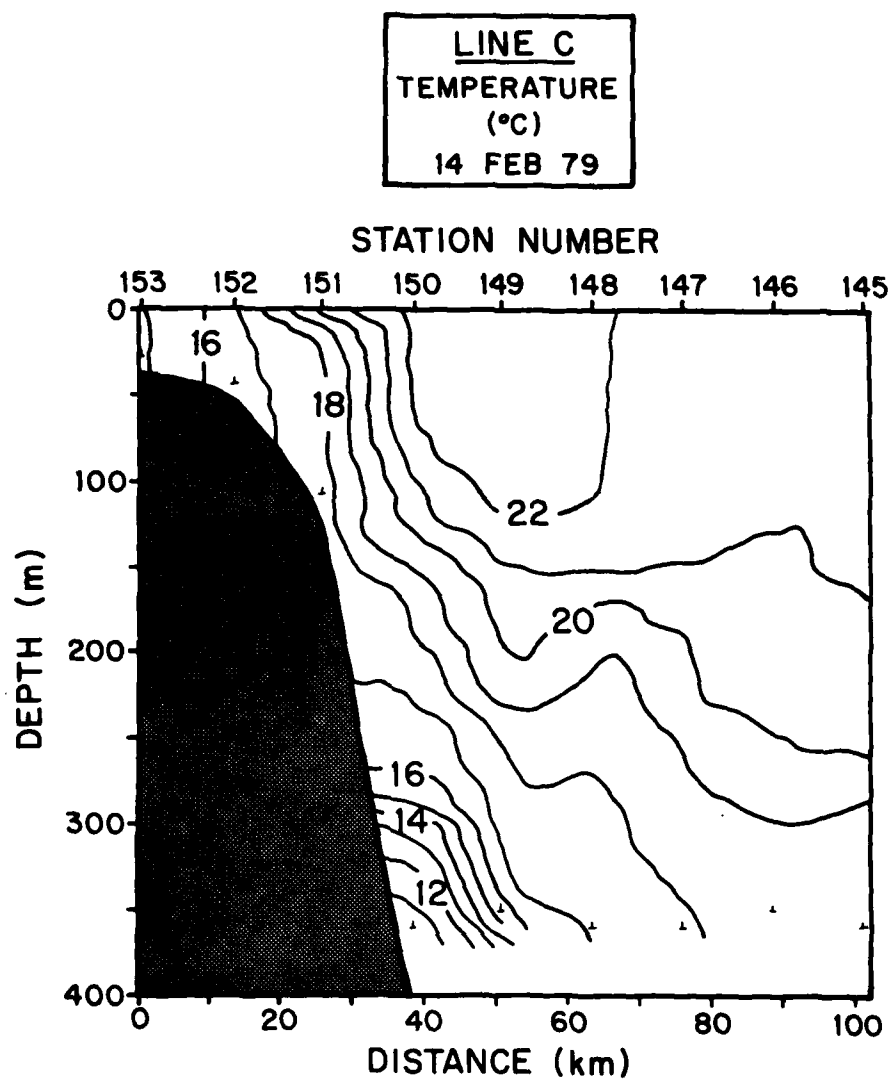


Figure 66. Cross-stream vertical temperature section along Line C, 14 February 1979.

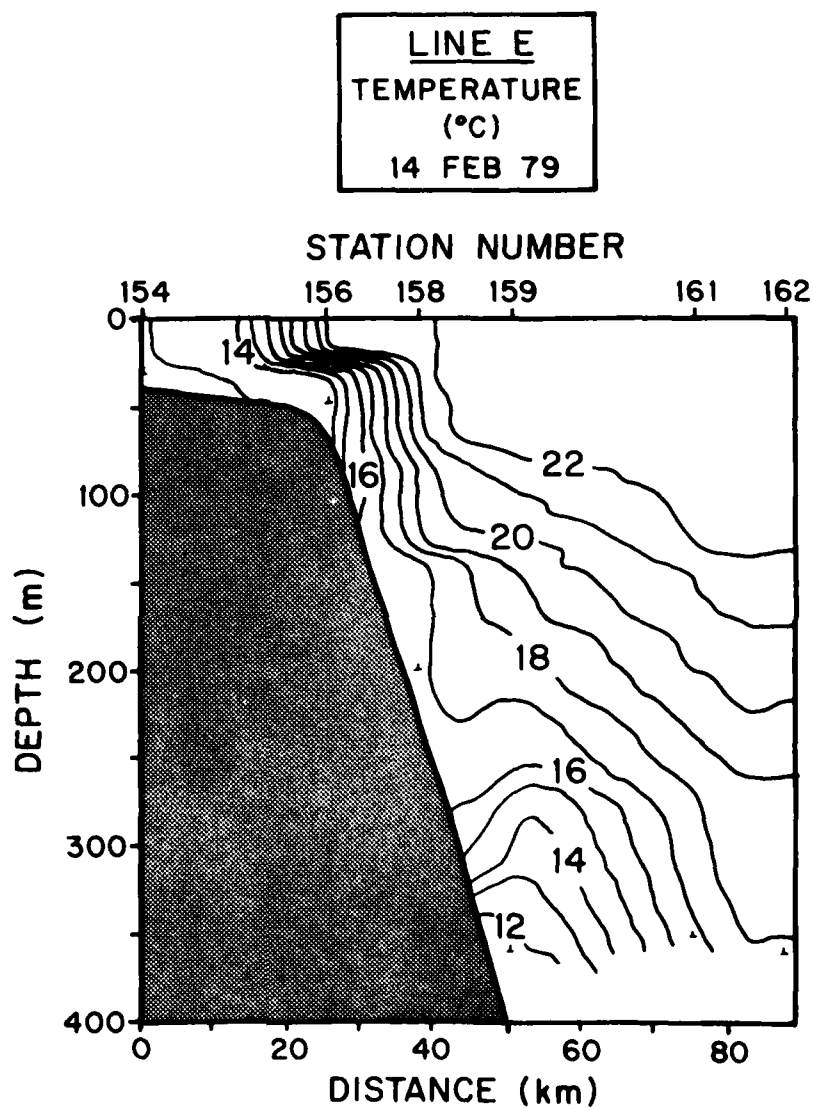


Figure 67. Cross-stream vertical temperature section along Line E, 14 February 1979.

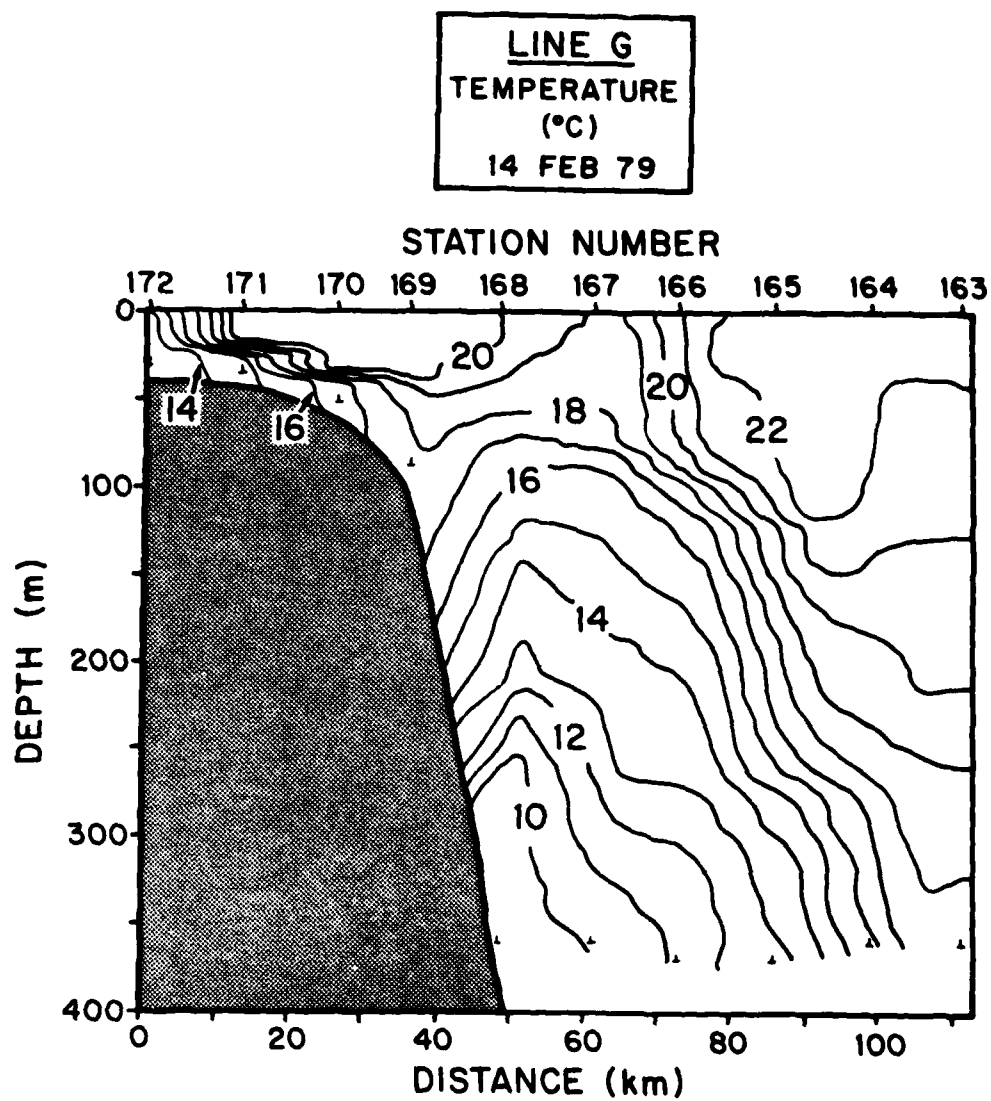


Figure 68. Cross-stream vertical temperature section along Line G, 14 February 1979.

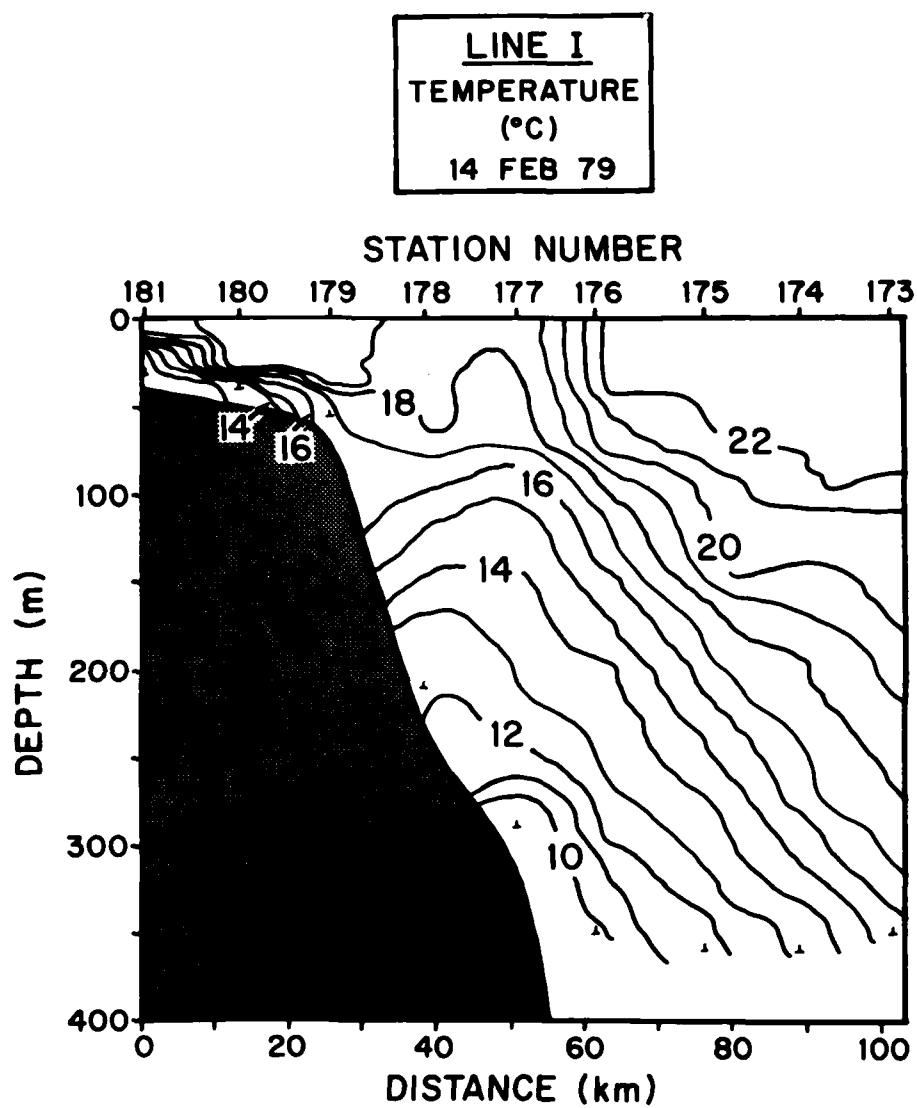


Figure 69. Cross-stream vertical temperature section along Line I, 14 February 1979.

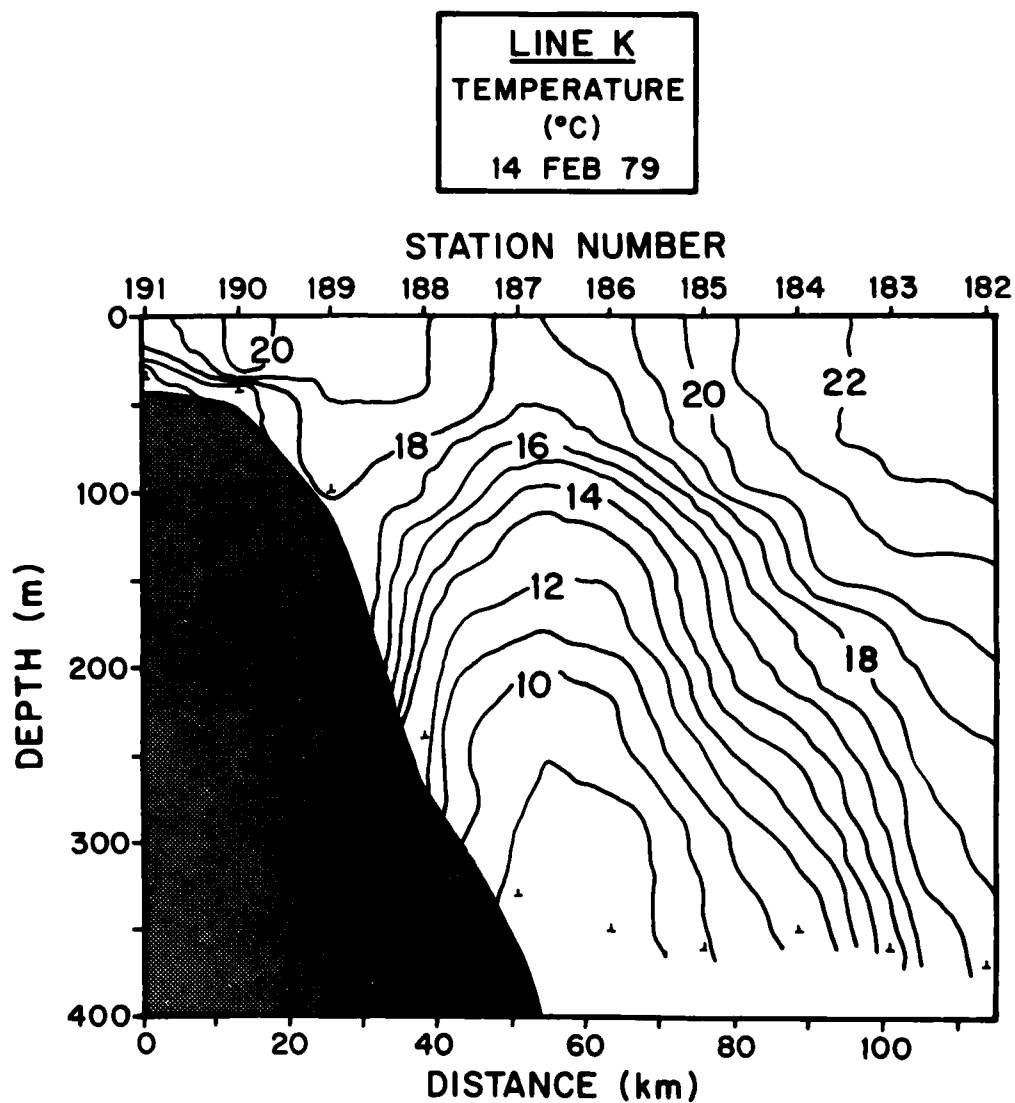


Figure 70. Cross-stream vertical temperature section along Line K, 14 February 1979.

LINE M
TEMPERATURE
(°C)
14 FEB 79

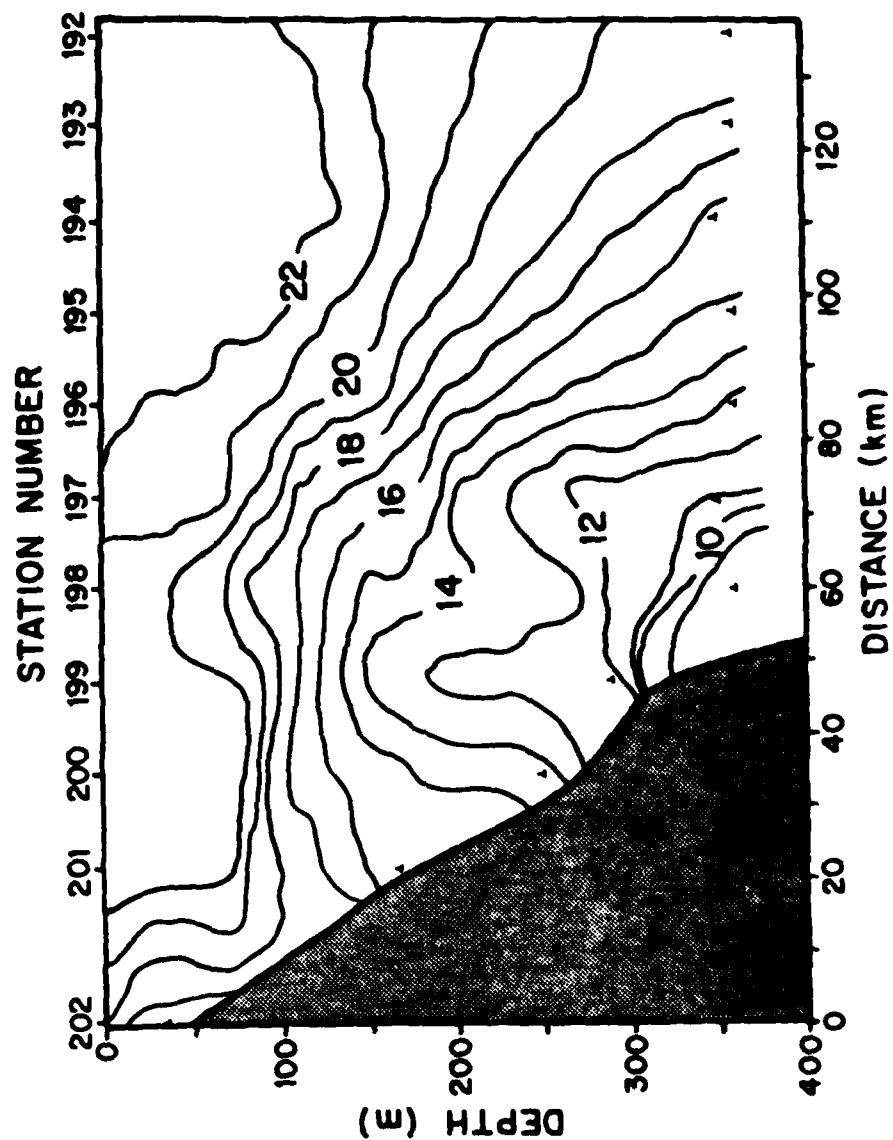


Figure 71. Cross-stream vertical temperature section along Line M, 14 February 1979.

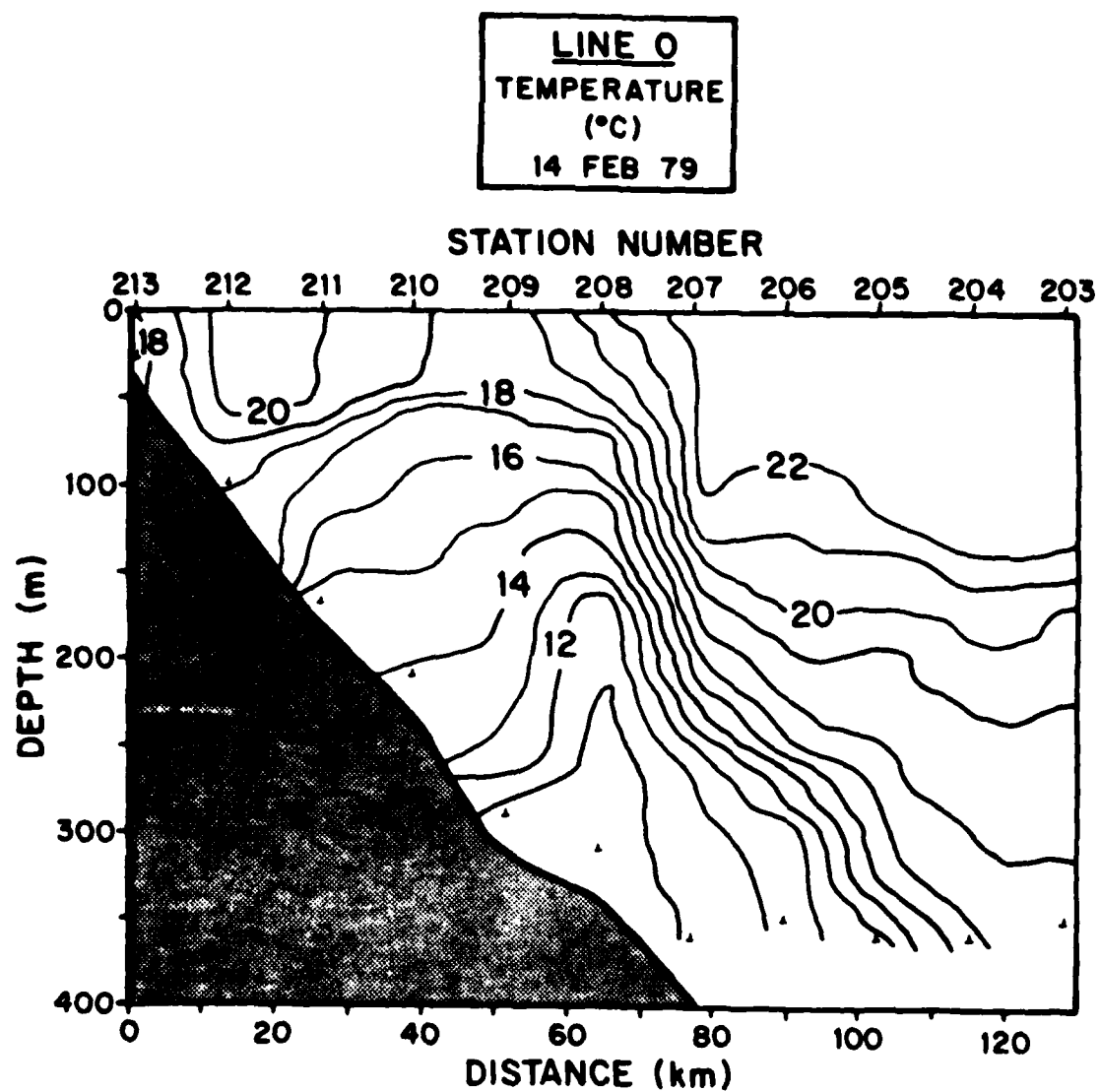


Figure 72. Cross-stream vertical temperature section along Line 0, 14 February 1979.

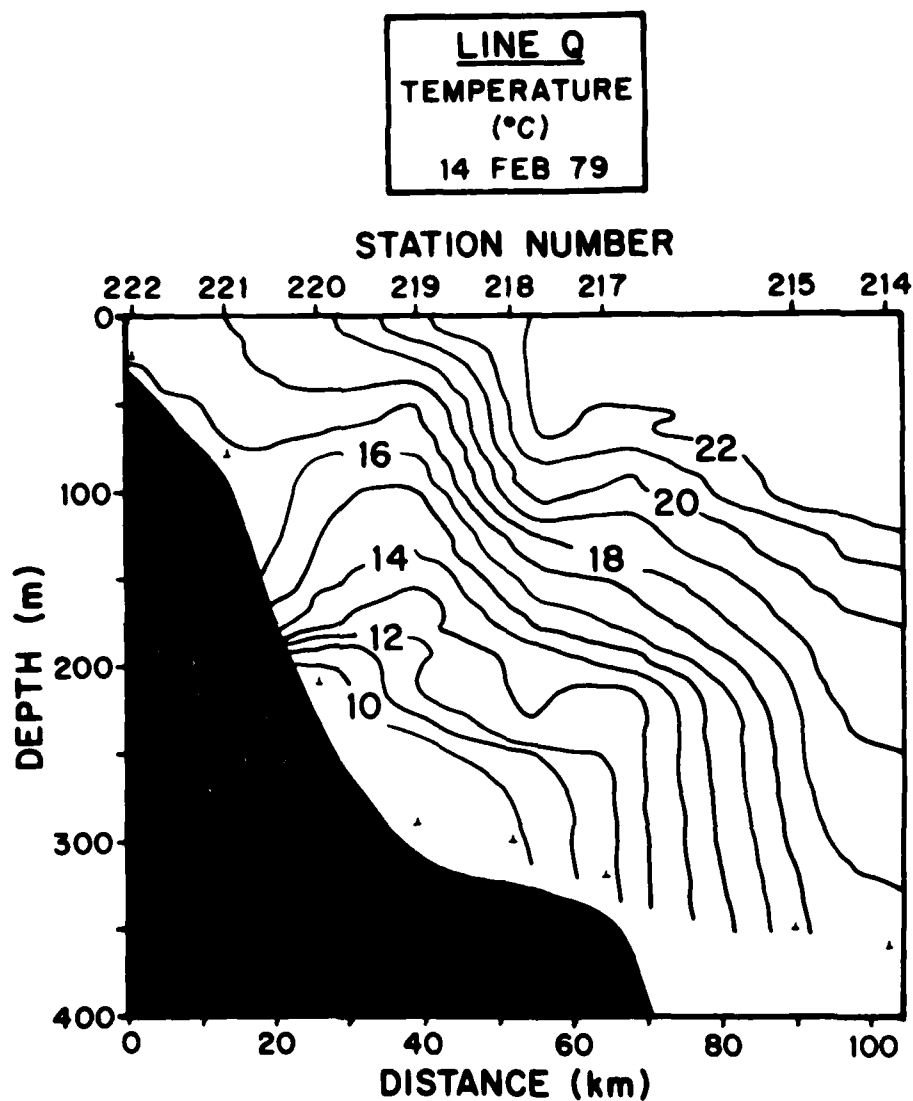


Figure 73. Cross-stream vertical temperature section along Line Q, 14 February 1979.

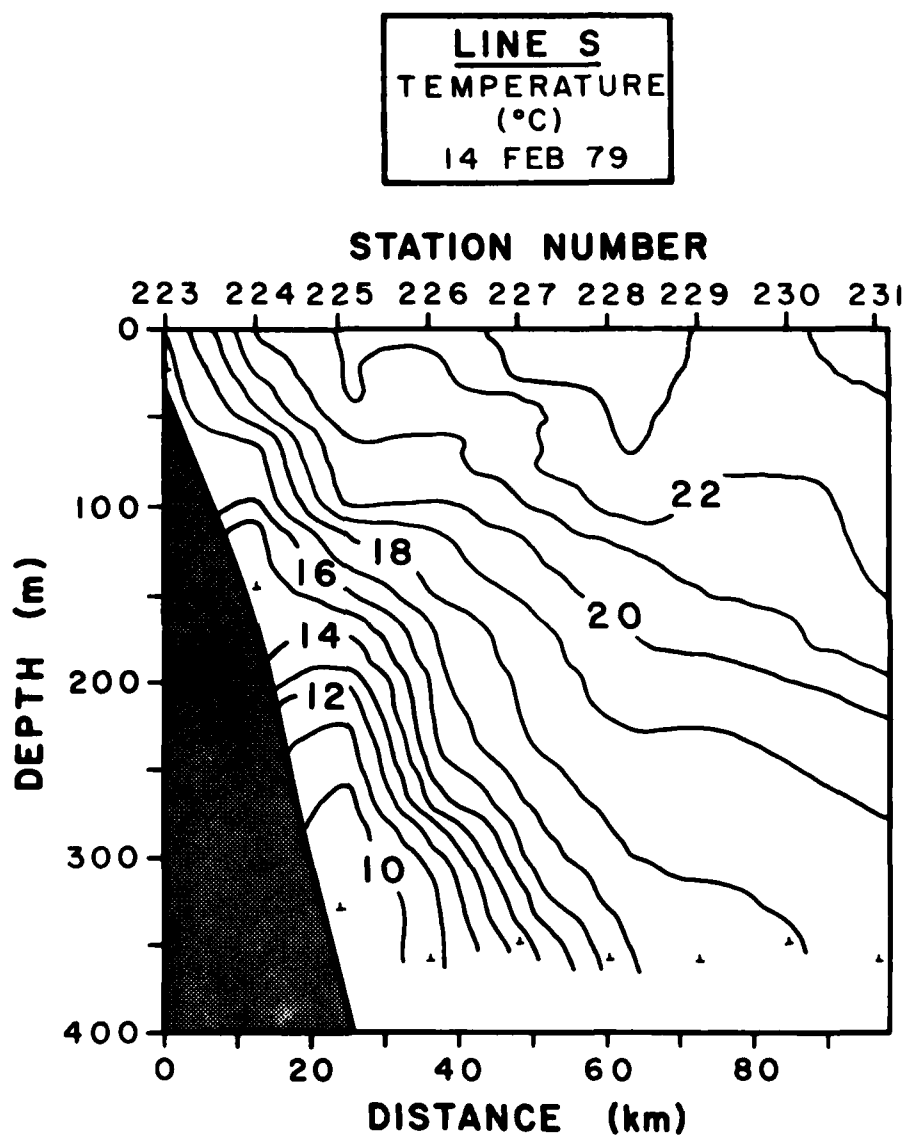


Figure 74. Cross-stream vertical temperature section along Line S, 14 February 1979.

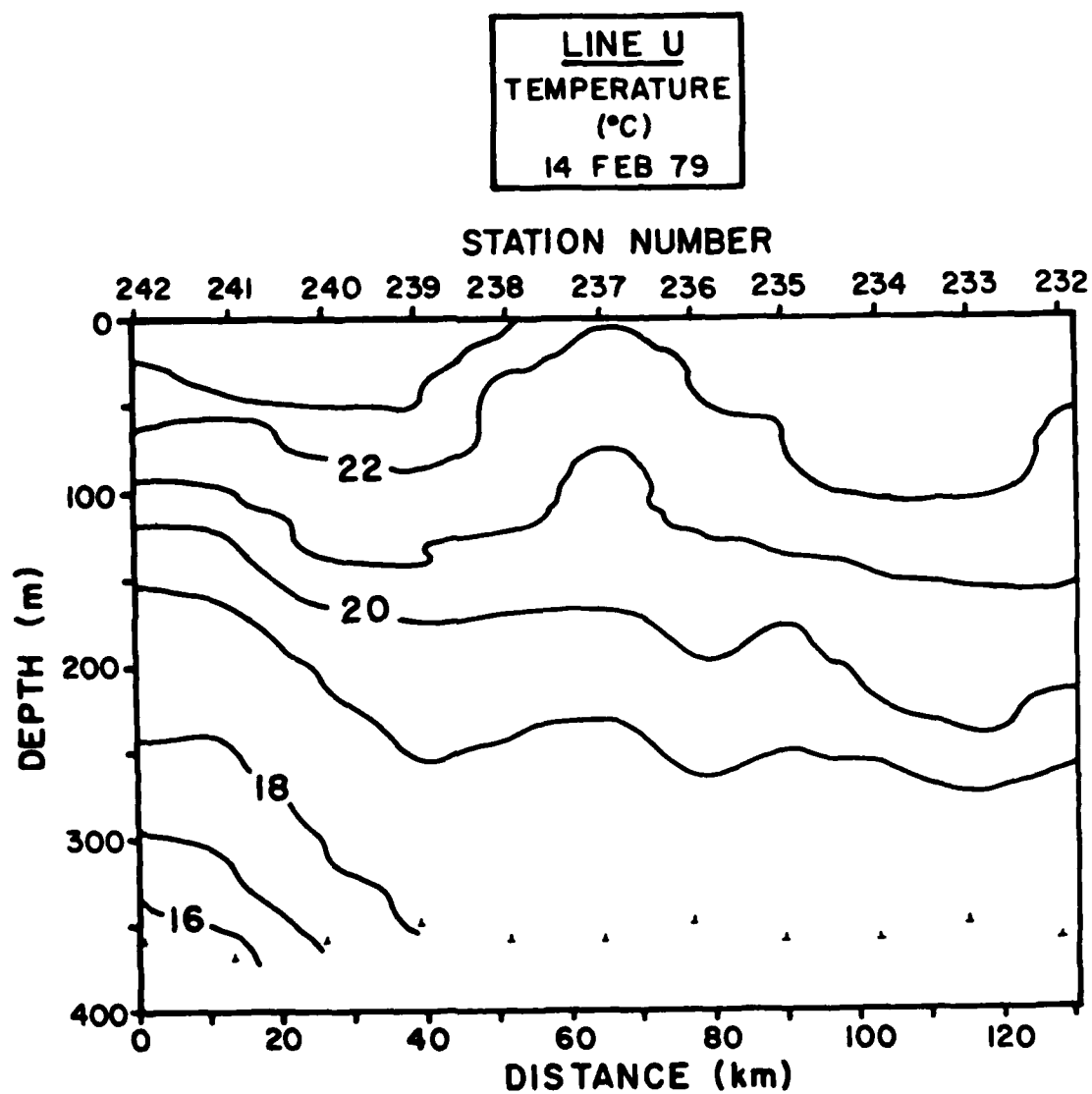


Figure 75. Cross-stream vertical temperature section along Line U, 14 February 1979.

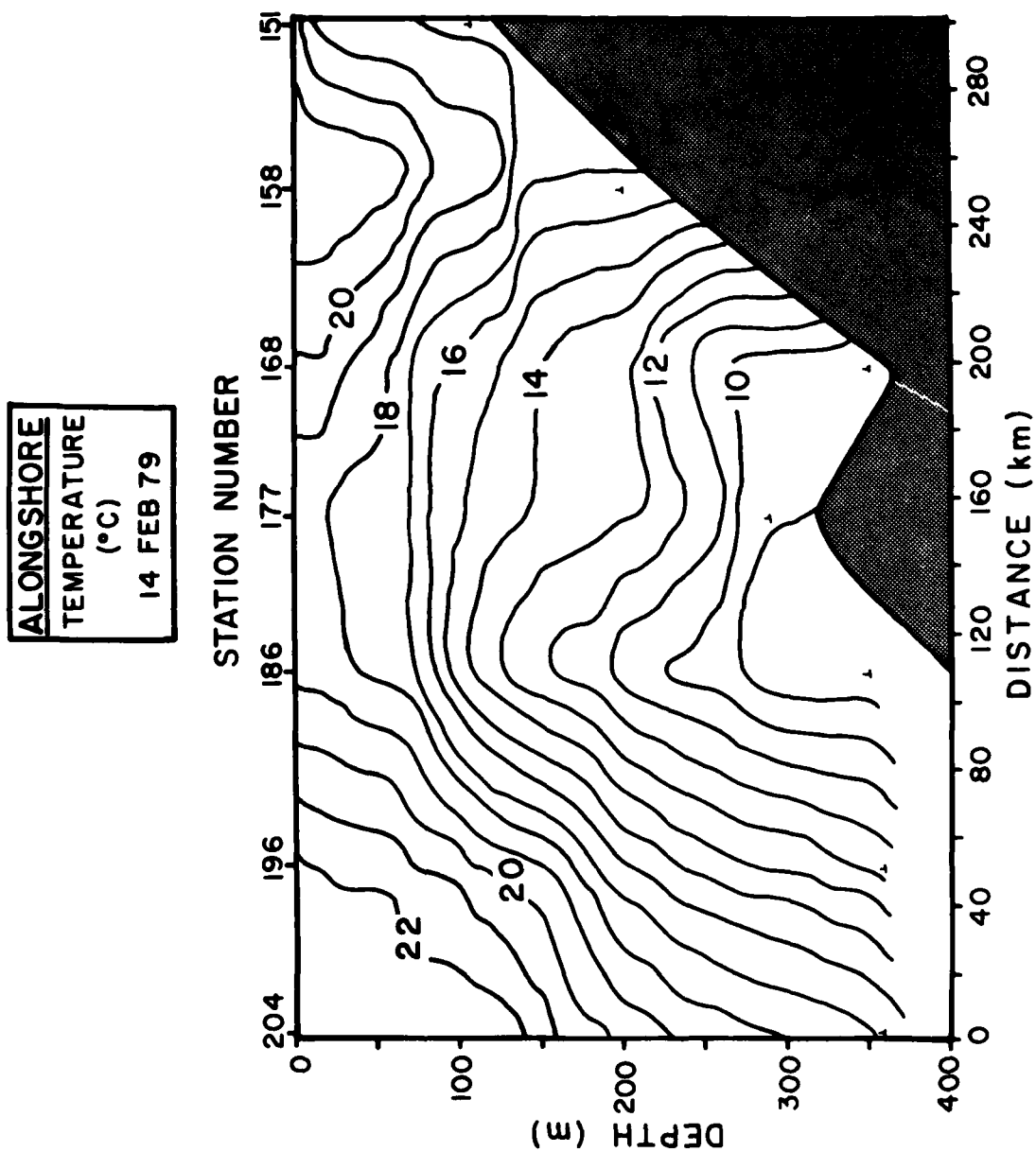


Figure 76. Alongshore vertical temperature section, 14 February 1979.

ALONGSHORE
TEMPERATURE
(°C)
14 FEB 79

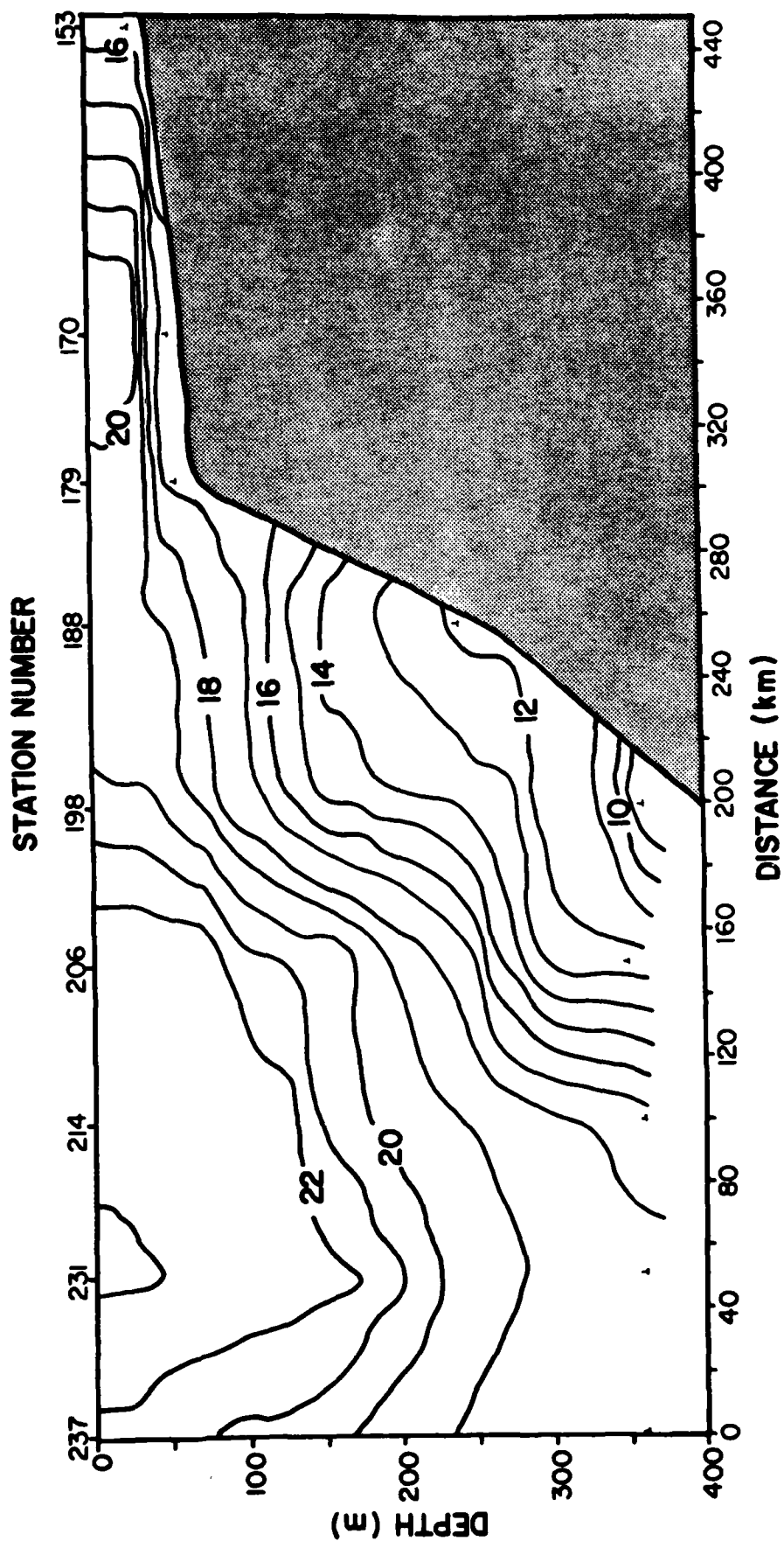


Figure 77. Alongshore vertical temperature section, 14 February 1979.

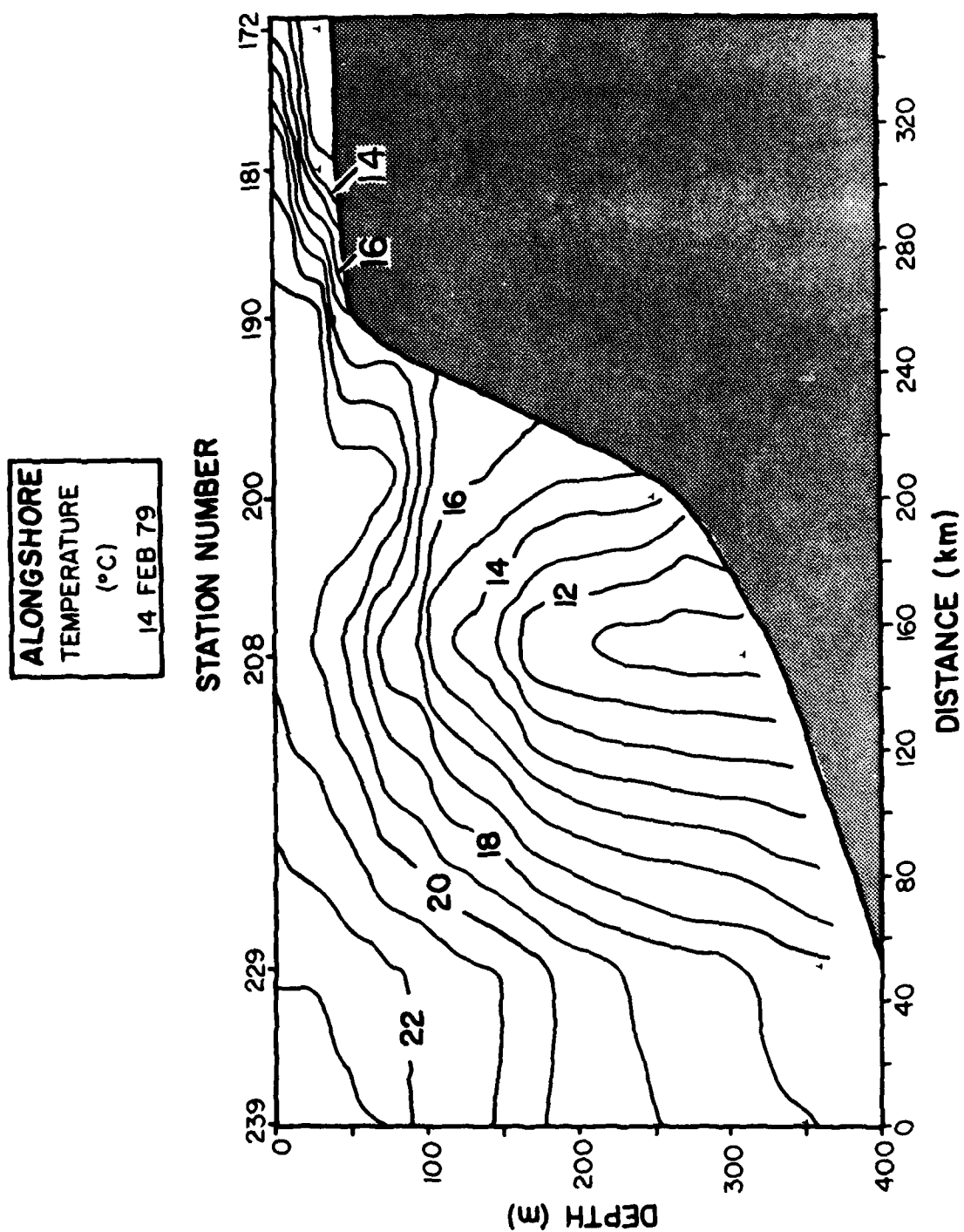


Figure 78. Alongshore vertical temperature section, 14 February 1979.

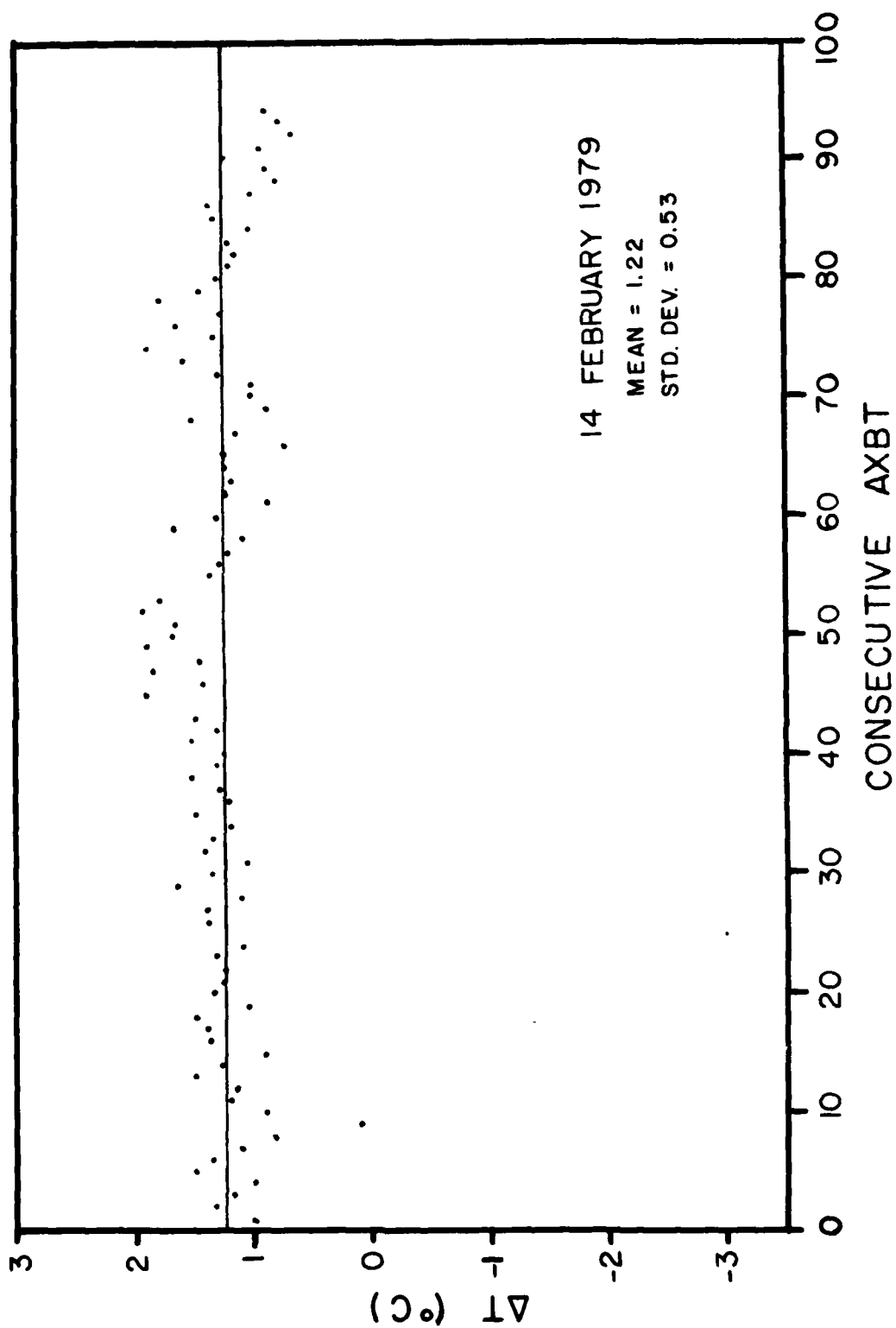


Figure 79. Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 14 February 1979.

FLIGHT 5: 15 FEBRUARY 1979

Survey Time: 1507:50 to 1959:50

Table 17. 15 February 1979 PRT Line End Points

TIME (Hr-Min-Sec)	LATITUDE (°N)	LONGITUDE (°W)	LINE
1507:52	34°33.42'	76°11.41'	C
1519:12	34°07.42'	75°26.33'	
1528:59	33°45.22'	75°46.88'	E
1541:24	34°11.71'	76°32.62'	
1550:10	33°50.93'	76°54.68'	G
1603:32	33°22.51'	76°03.01'	
1616:34	33°00.27'	76°23.30'	I
1635:27	33°34.21'	77°22.46'	
1655:37	32°35.59'	76°42.69'	K
1706:14	33°01.12'	77°19.96'	

Table 18. 15 February 1979 Flight Updates

<u>TIME(Hrs.)</u>	<u>EVENT</u>	<u>OLD POSITION</u>	<u>NEW POSITION</u>	<u>TYPE OF FIX FOR UPDATES</u>
14.18	TAKEOFF			
19.85	NAV.	32°59.24'N	32°58.96'N	LTN-51
	UPDATE	77°21.43'W	77°20.63'W	
20.58	- no update at the end of the flight - used previous section's error rate - last data point			

Table 19. 15 February 1979 PRT Calibration Temperatures and Times

<u>TIME (Hrs.)</u>	<u>CALIBRATION TEMPERATURE (°C)</u>		
	10.00	17.00	24.00
15.08	0.73	0.64	0.42
15.82	0.65	0.60	0.21
17.65	0.67	0.13	-0.20
19.53	-0.01	-0.09	-0.47
20.60	0.22	-0.25	-0.40

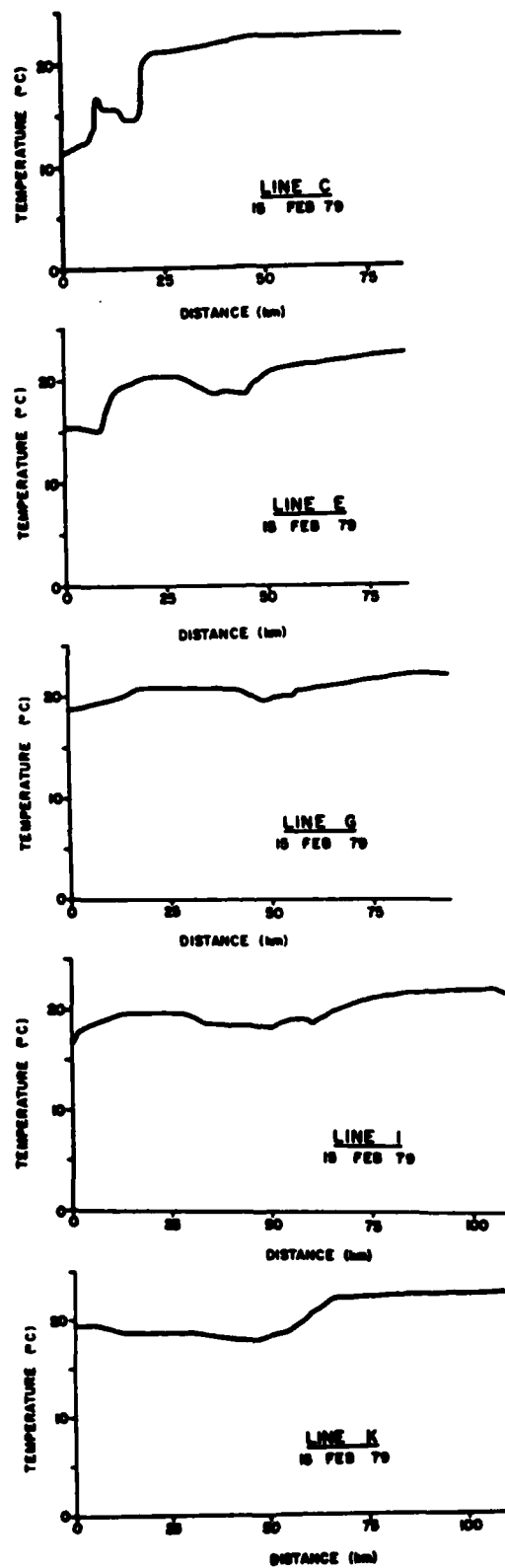


Figure 80. PRT cross-stream surface temperature profiles, 15 February 1979.

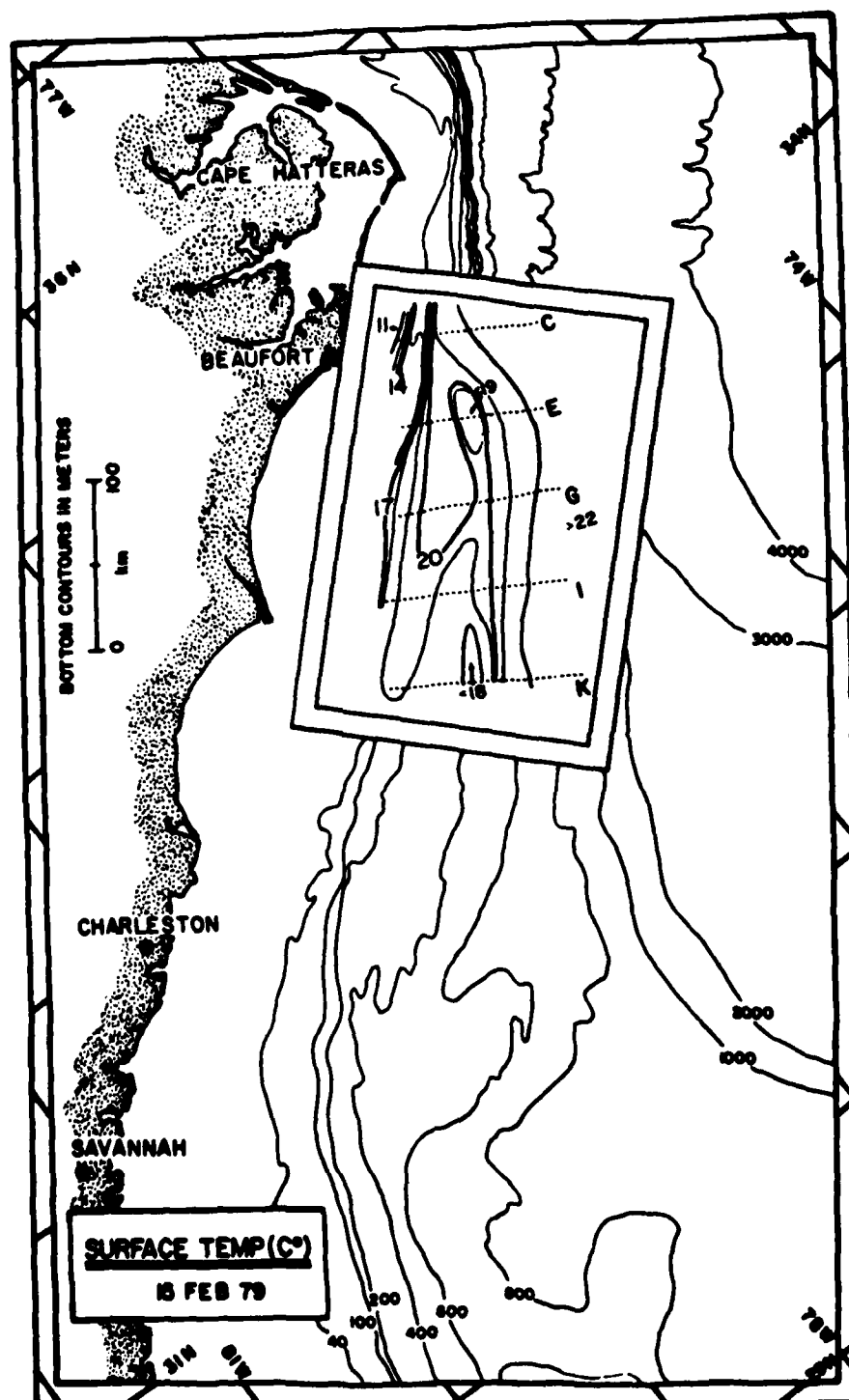


Figure 81. PRT sea surface temperature field, 15 February 1979. Dashed lines indicate positions of cross-stream data lines.

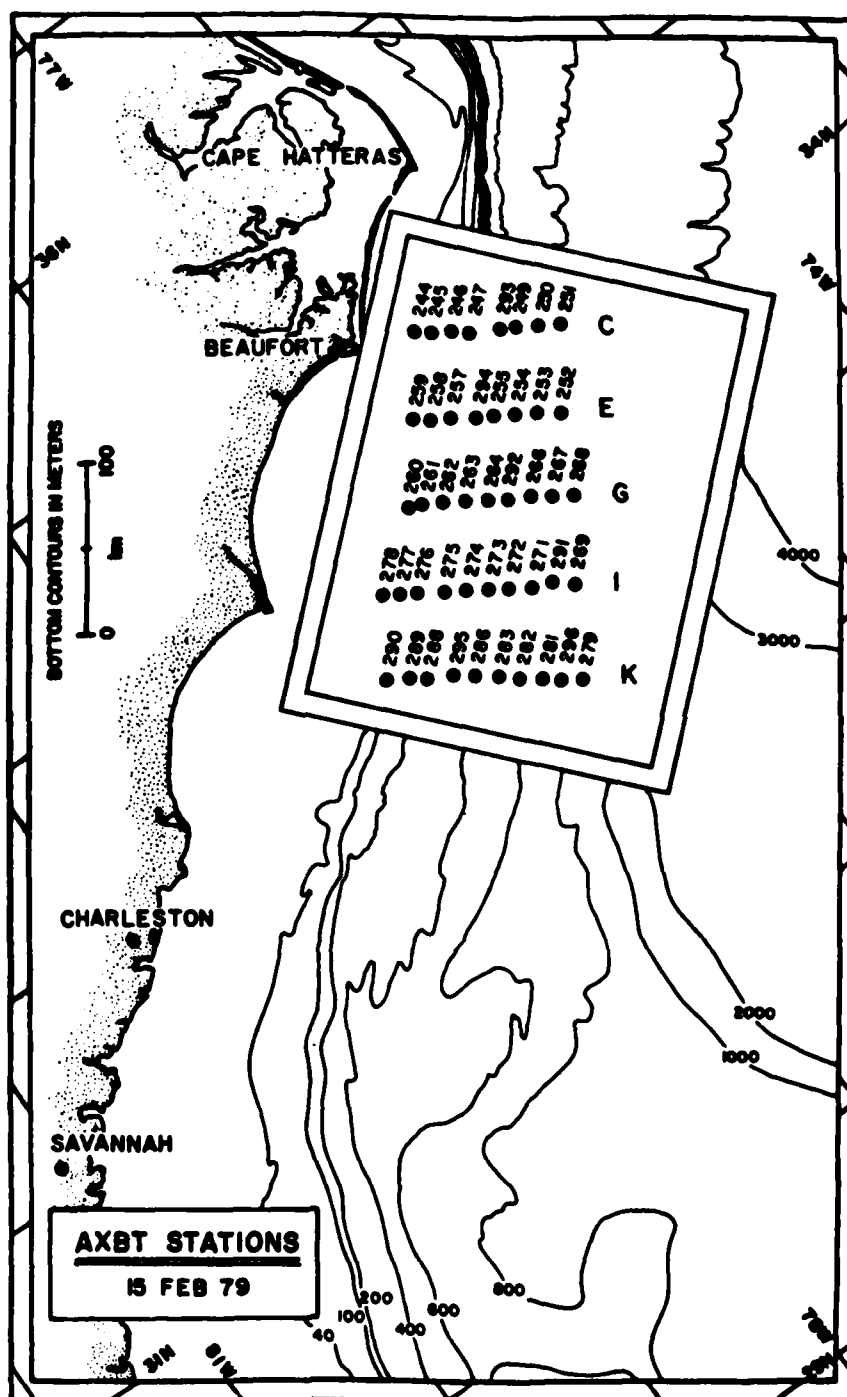


Figure 82. AXBT station locations, 15 February 1979.

Table 20. 15 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
244	34°33.4'	76°11.4'	33	1507:50
245	34°29.9'	76°06.8'	40	1509:10
246	34°26.6'	76°00.1'	71	1510:45
247	34°22.5'	75°53.3'	217	1512:55
249	34°15.2'	75°39.8'	360	1515:53
250	34°11.2'	75°33.1'	380	1517:33
251	34°07.4'	75°26.3'	360	1519:13
252	33°45.3'	75°46.9'	370	1528:59
253	33°49.8'	75°54.5'	370	1531:01
254	33°53.6'	76°01.1'	360	1532:47
255	33°57.4'	76°08.0'	370	1534:39
257	34°05.0'	76°21.1'	96	1538:18
258	34°08.4'	76°27.5'	40	1540:08
259	34°11.7'	76°32.6'	21	1541:39
260	33°50.9'	76°54.7'	35	1550:08
261	33°49.0'	76°49.8'	40	1551:19
262	33°45.6'	76°43.0'	55	1553:05
263	33°41.7'	76°36.0'	374	1554:57
264	33°37.7'	76°29.5'	370	1556:42
266	33°30.4'	76°16.2'	360	1600:06
267	33°26.5'	76°09.6'	370	1601:48
268	33°22.5'	76°03.0'	370	1603:31
269	33°00.3'	76°23.3'	360	1616:35
271	33°07.6'	76°36.8'	380	1620:57
272	33°11.7'	76°43.8'	360	1623:03
273	33°15.5'	76°49.8'	368	1625:06
274	33°19.2'	76°56.5'	313	1627:13
275	33°23.0'	77°03.2'	150	1629:17
276	33°27.8'	77°11.4'	35	1631:15
277	33°31.0'	77°16.8'	32	1633:29
278	33°34.2'	77°22.5'	25	1635:27
279	32°35.6'	76°42.7'	370	1655:37
281	32°43.1'	76°54.4'	360	1658:55
282	32°47.8'	77°00.8'	370	1700:45
283	32°52.2'	77°06.6'	330	1702:30
286	32°56.8'	77°13.1'	380	1710:14
288	33°04.9'	77°27.9'	216	1716:14
289	33°08.3'	77°33.1'	86	1717:42
290	33°12.4'	77°40.2'	43	1719:38
291	33°05.2'	76°29.2'	370	1734:21

Table 20 (con't). 15 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
292	33°34.0'	76°23.3'	380	1837:28
293	34°17.9'	75°45.0'	360	1905:43
294	34°00.3'	76°13.7'	125	1927:29
295	33°00.8'	77°19.5'	304	1950:24
296	32°39.5'	76°49.4'	370	1959:50

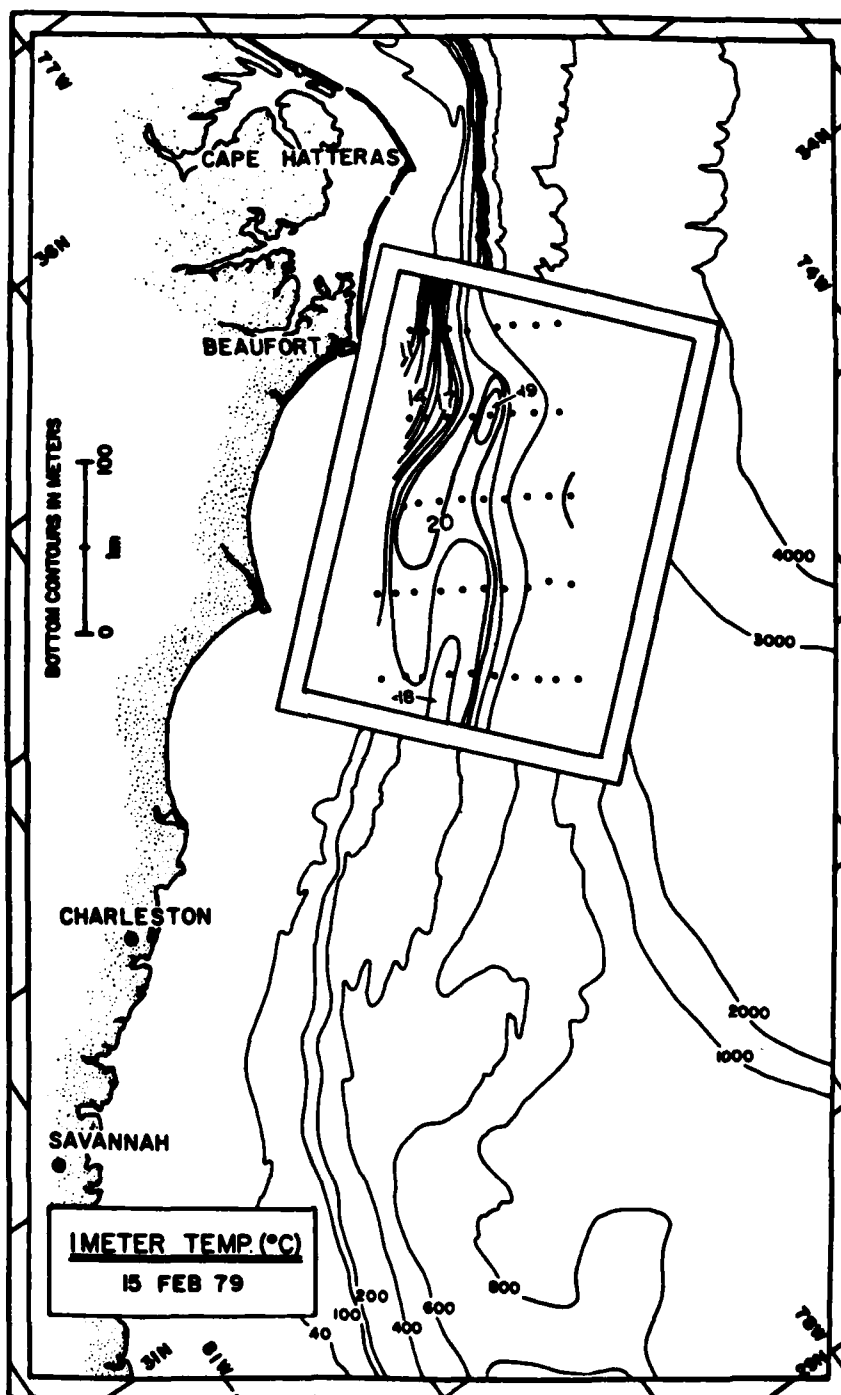


Figure 84. AXBT temperatures at 1 meter, 15 February 1979. Small solid circles indicate AXBT drop-sites.

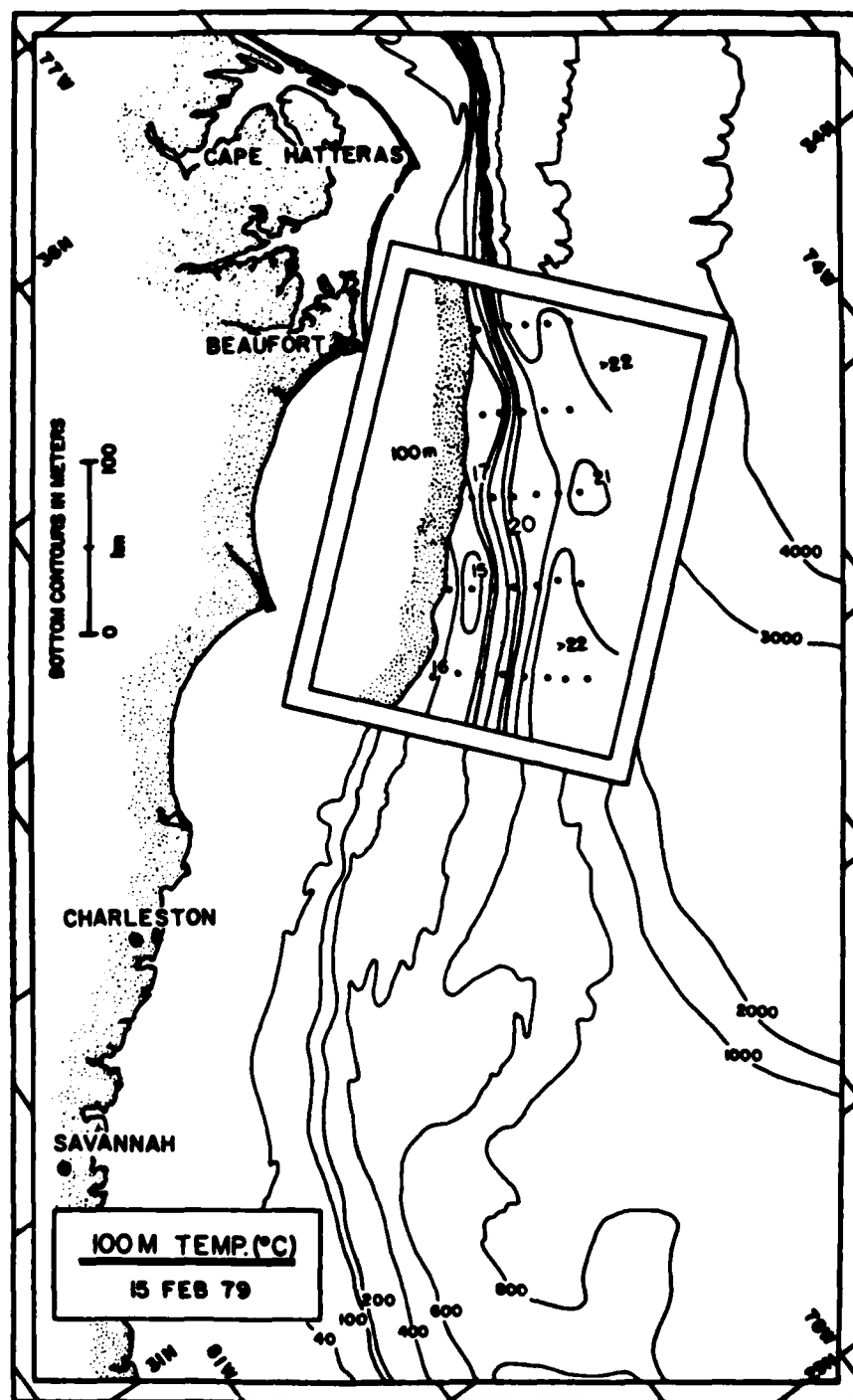


Figure 85. AXBT temperatures at 100 meters, 15 February 1979.

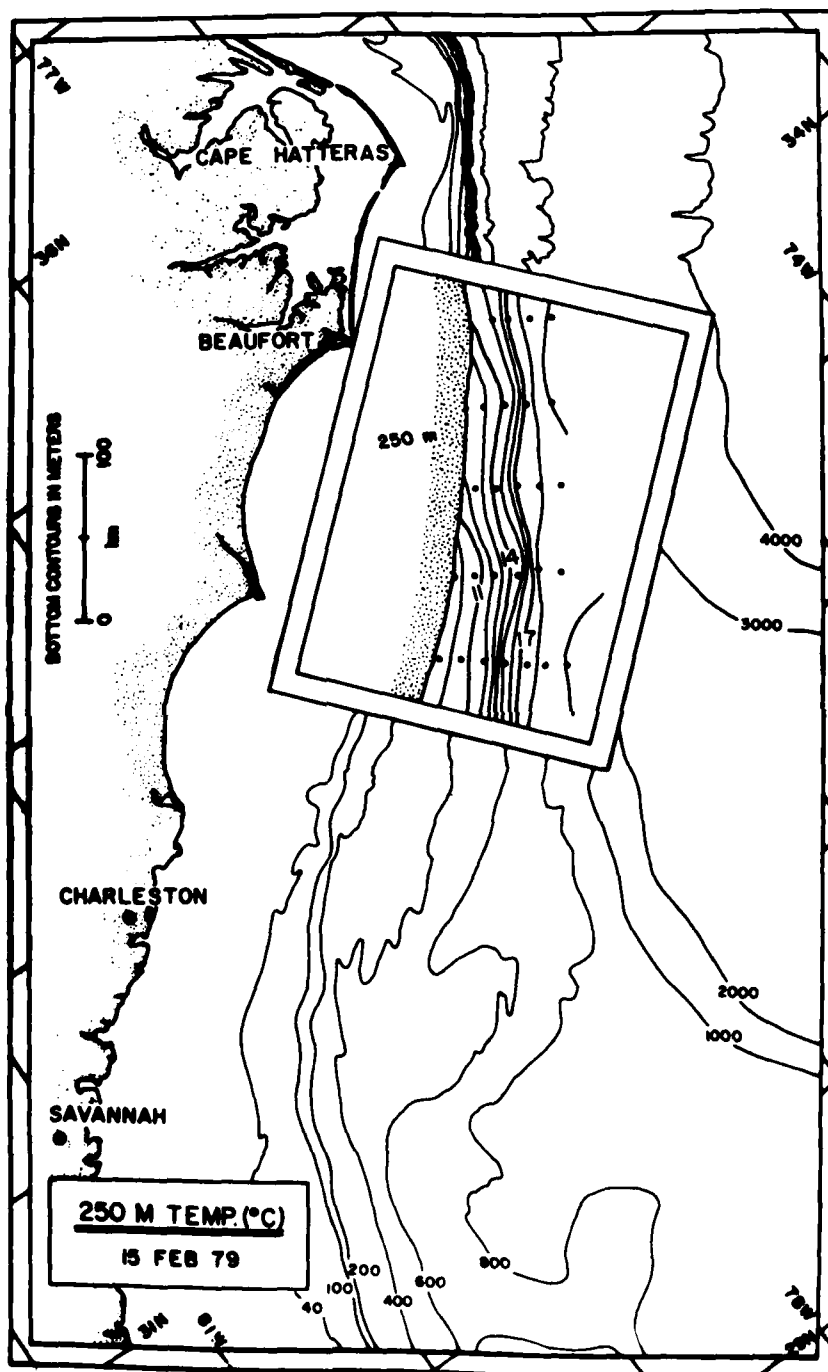


Figure 86. AXBT temperatures at 250 meters, 15 February 1979.

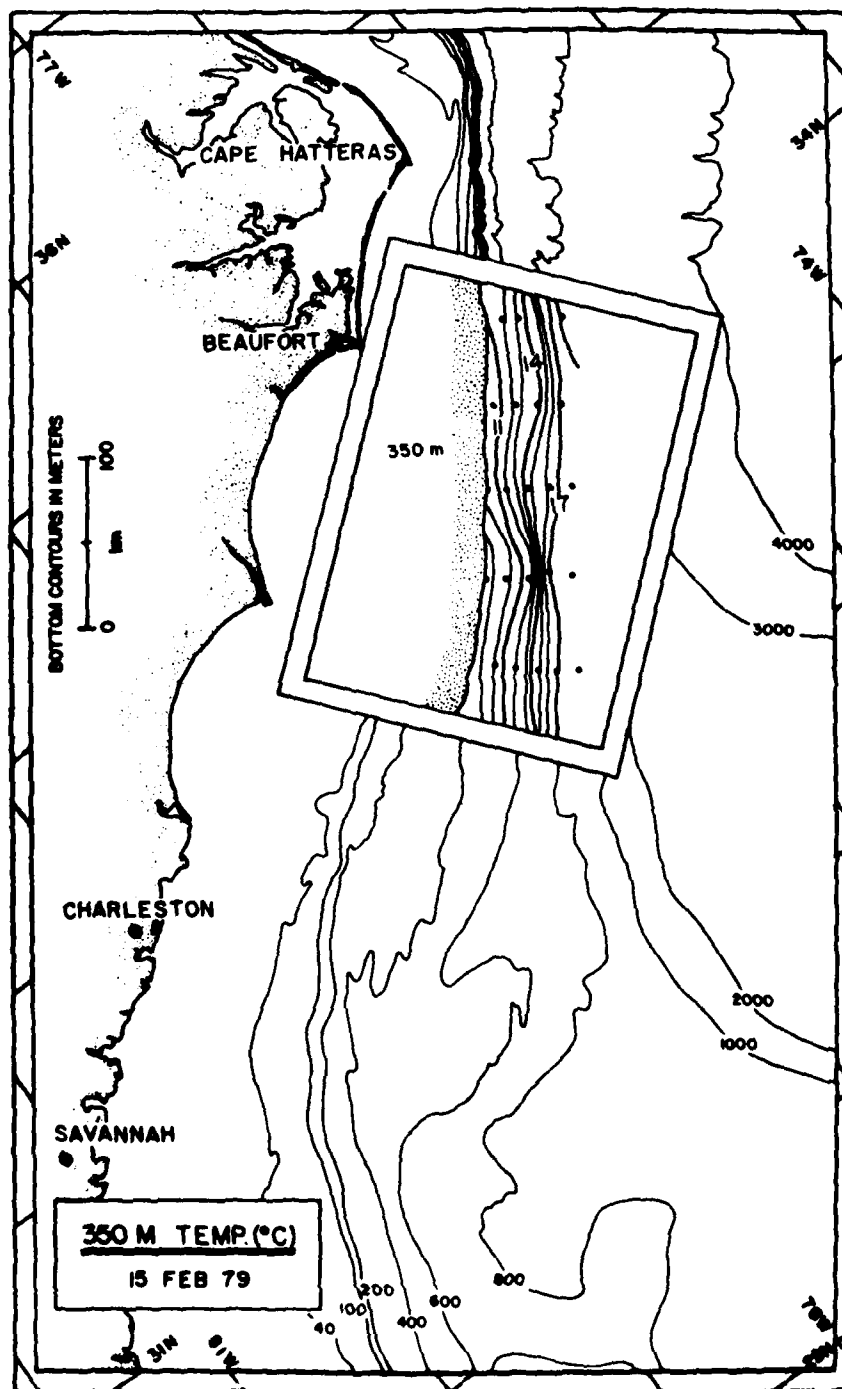


Figure 87. AXBT temperatures at 350 meters, 15 February 1979.

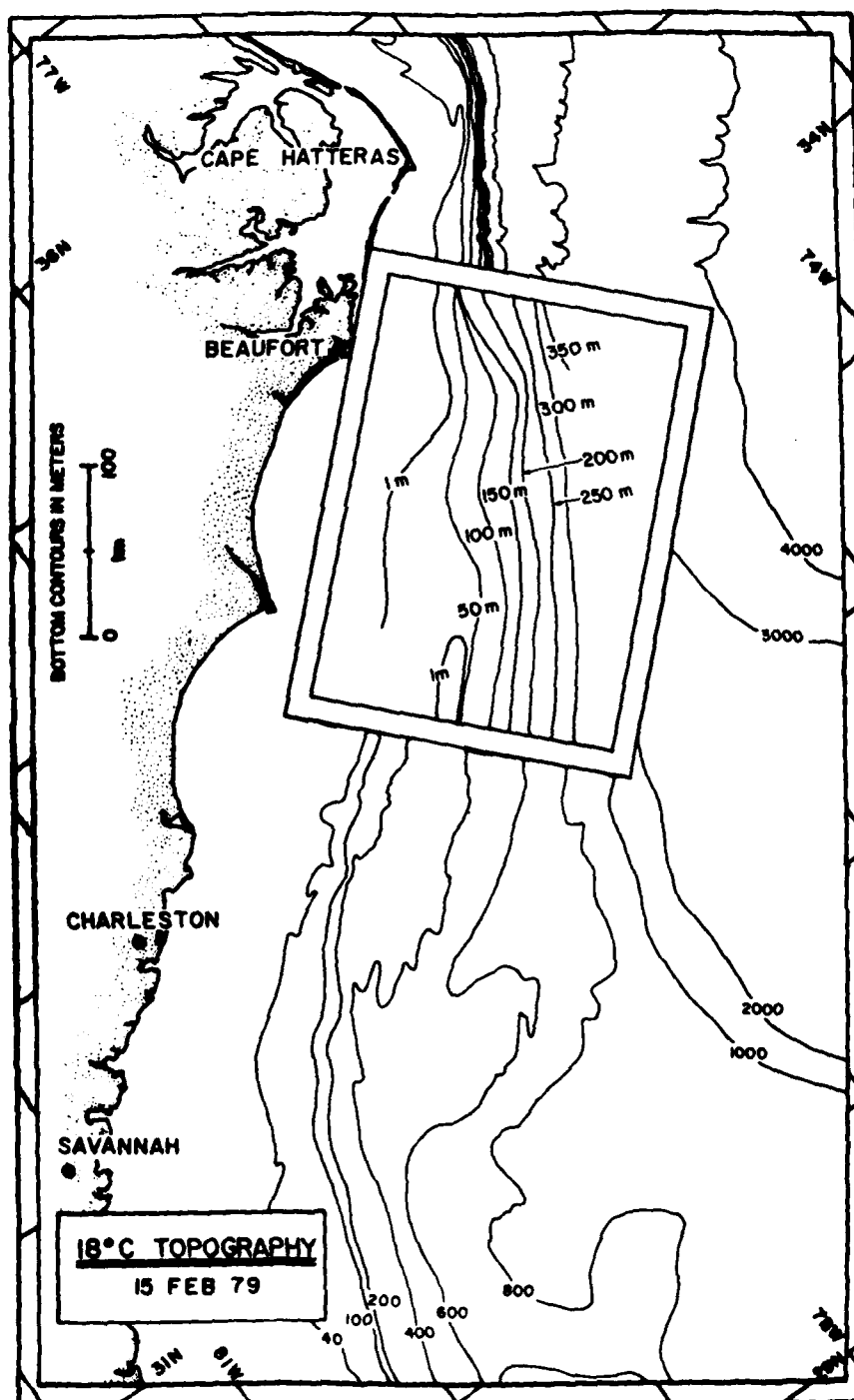


Figure 88. Topography of the 18°C isotherm, 15 February 1979.

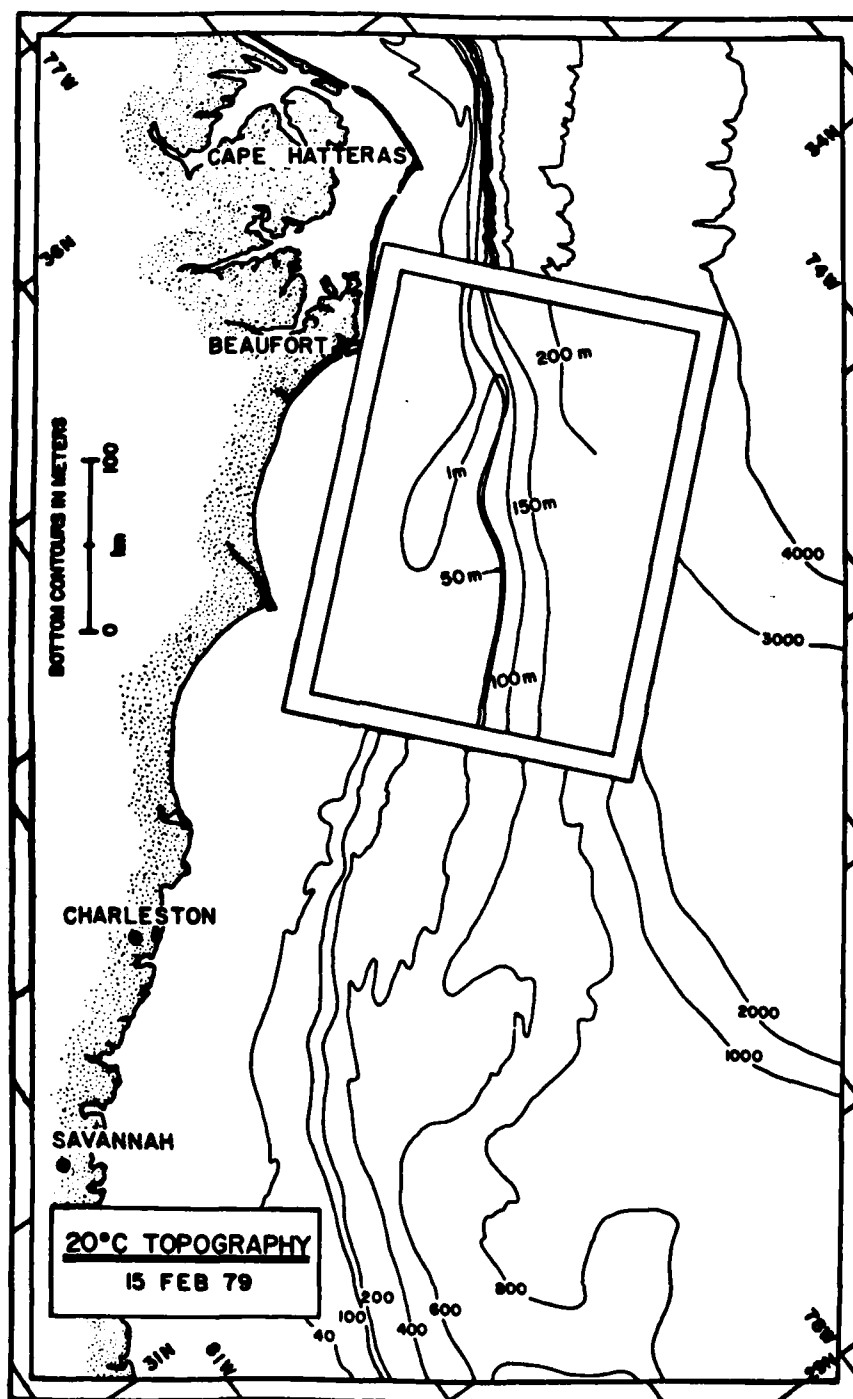


Figure 89. Topography of the 20°C isotherm, 15 February 1979.

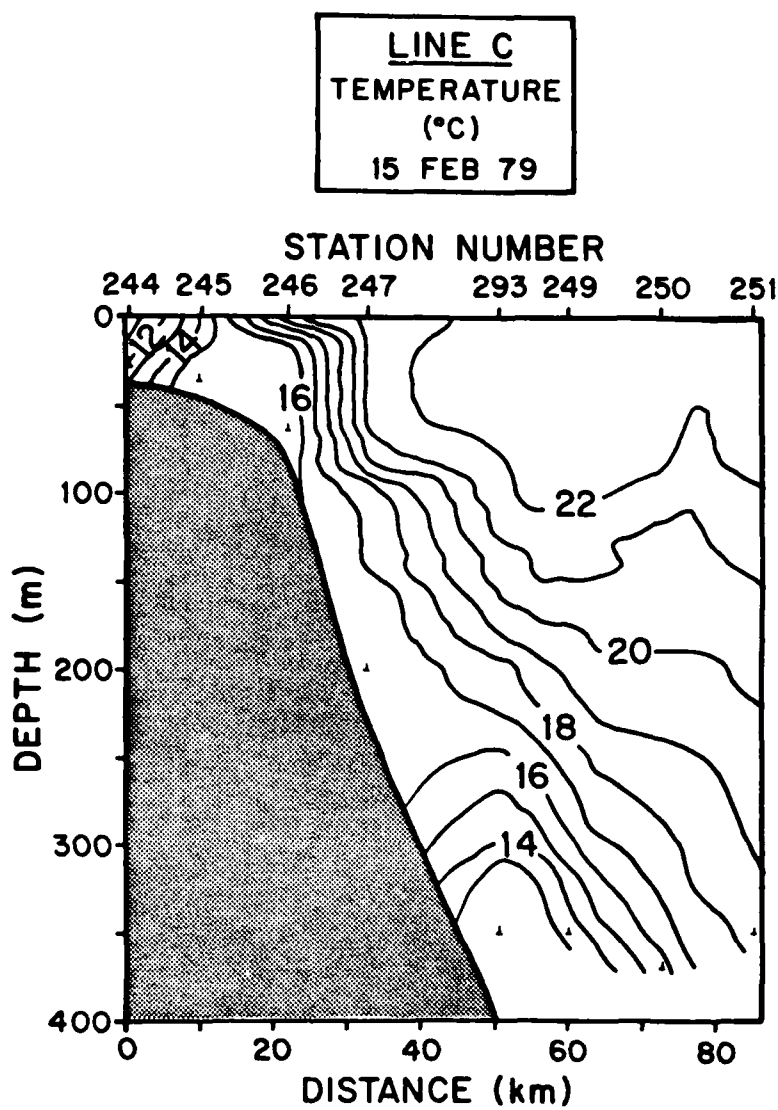


Figure 90. Cross-stream vertical temperature section along Line C, 15 February 1979.

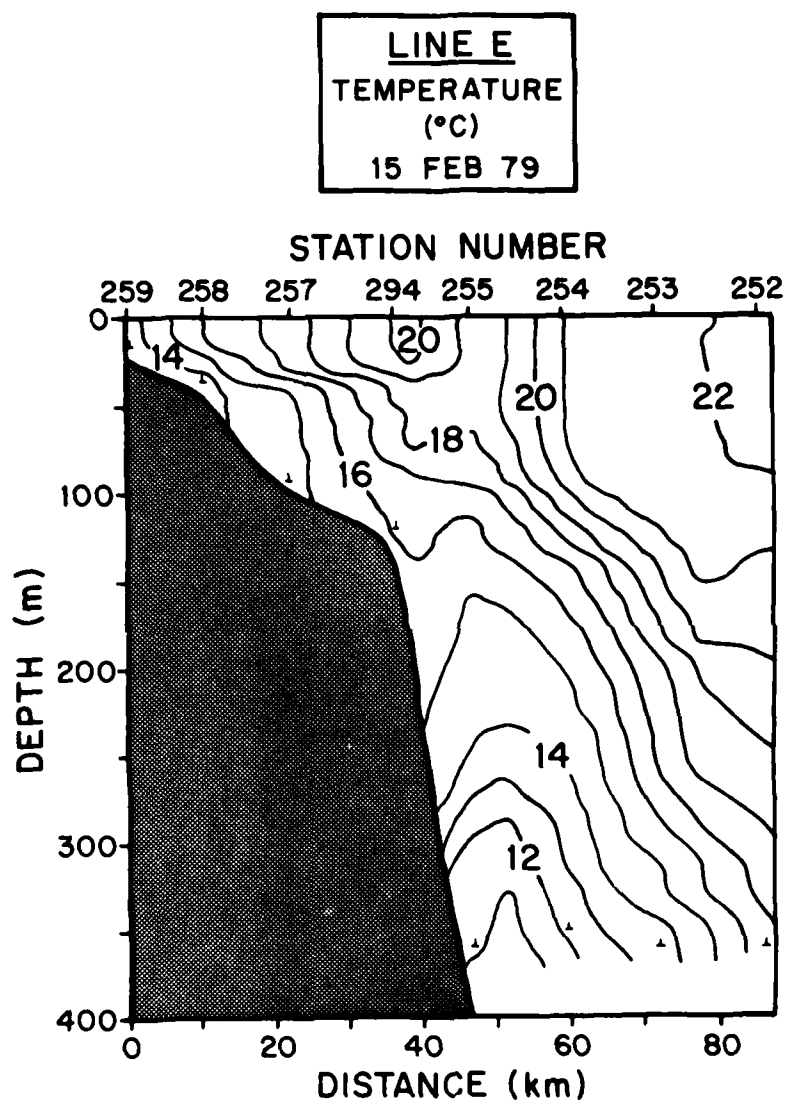


Figure 91. Cross-stream vertical temperature section along Line E, 15 February 1979.

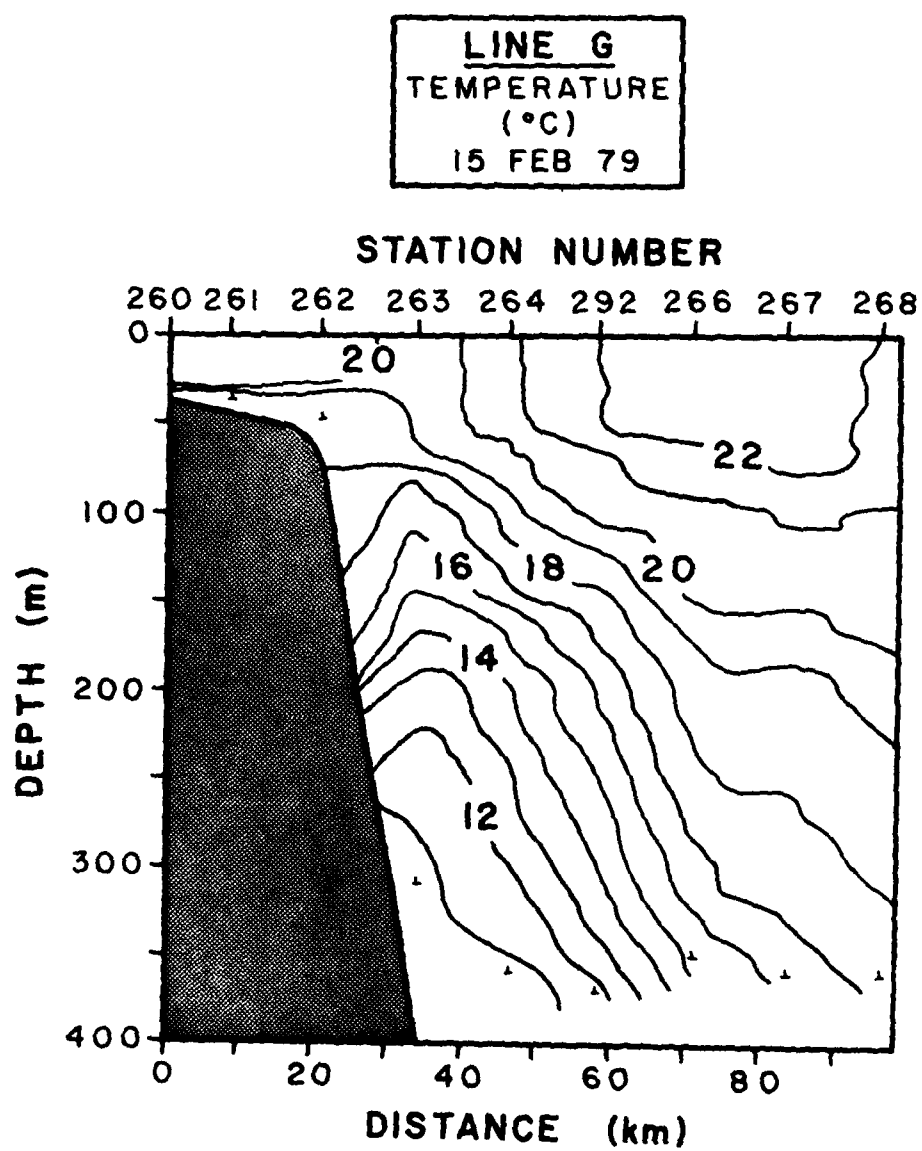


Figure 92. Cross-stream vertical temperature section along Line G, 15 February 1979.

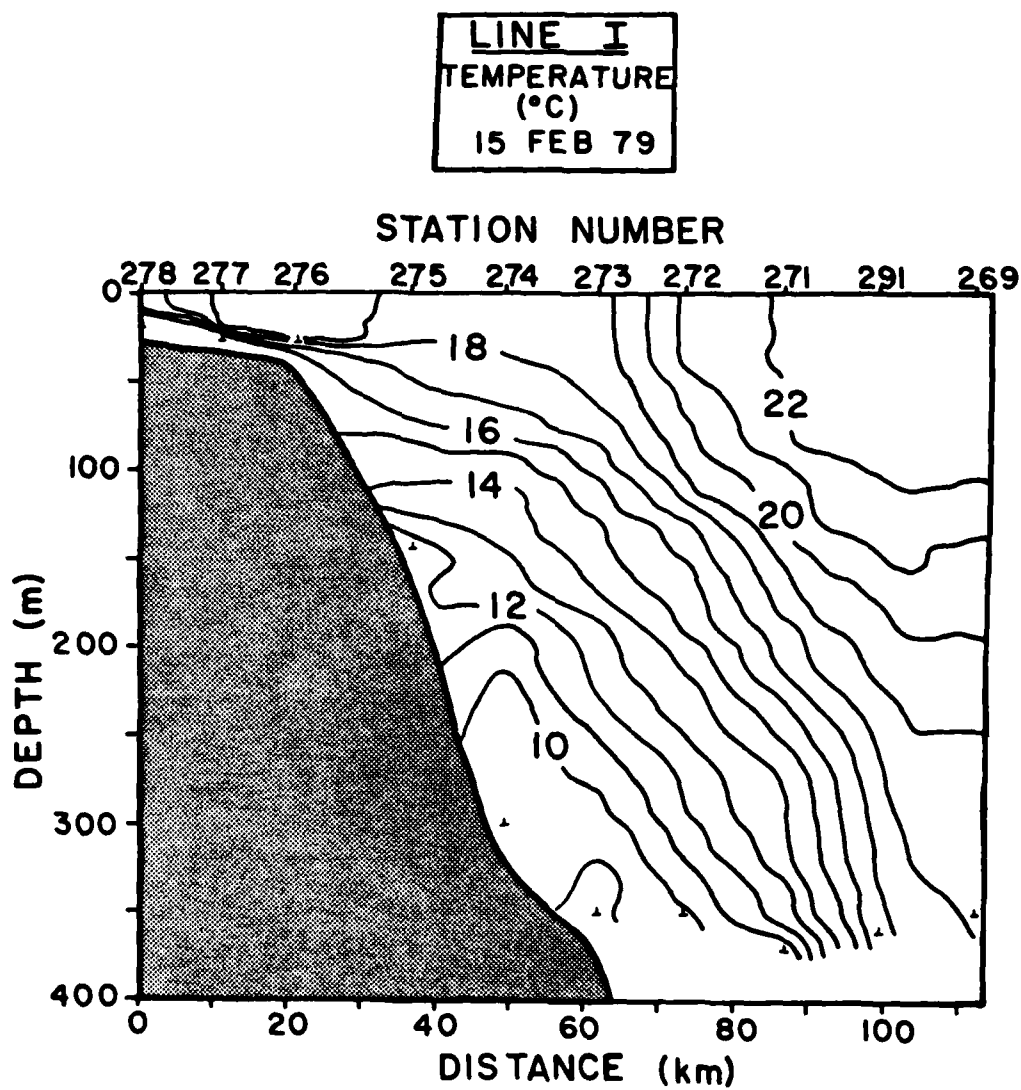


Figure 93. Cross-stream vertical temperature section along Line I, 15 February 1979.

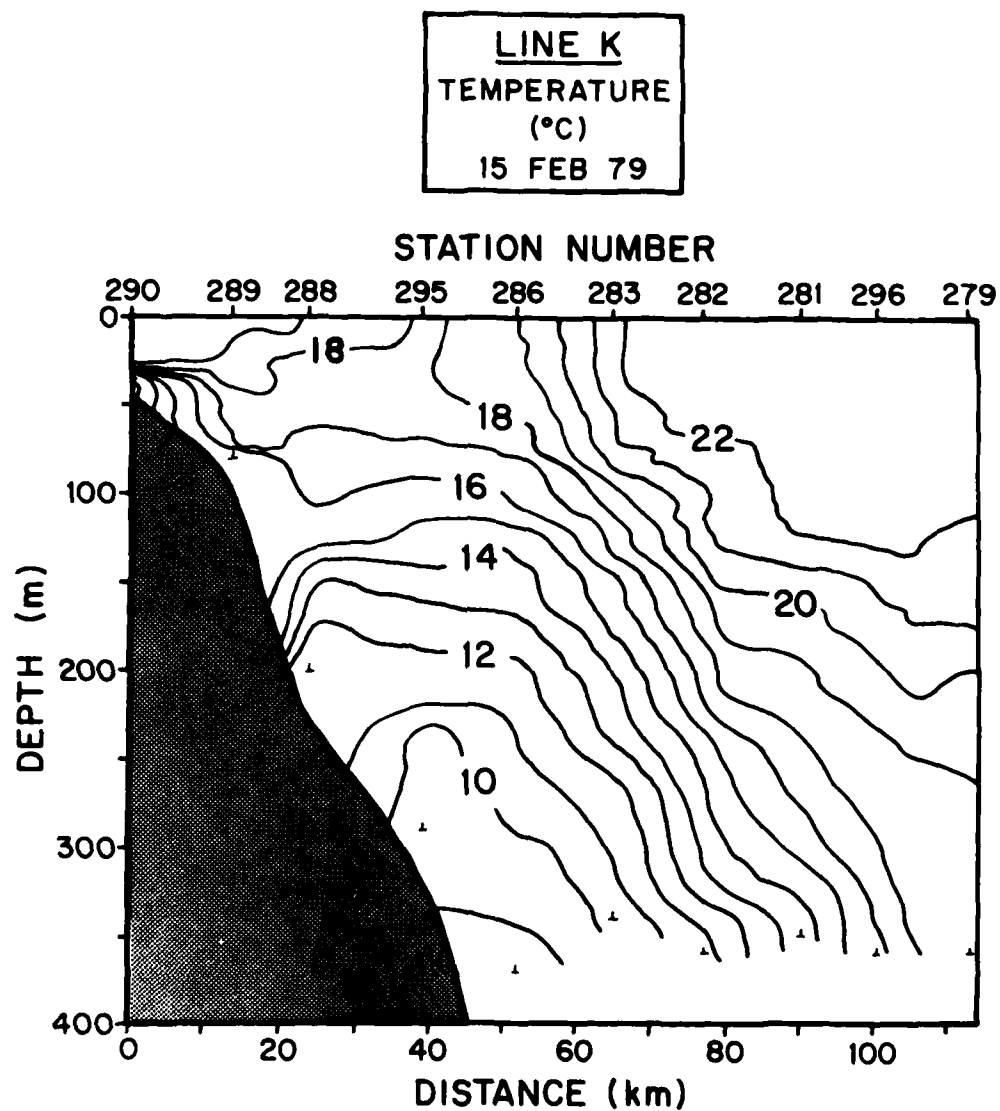


Figure 94. Cross-stream vertical temperature section along Line K, 15 February 1979.

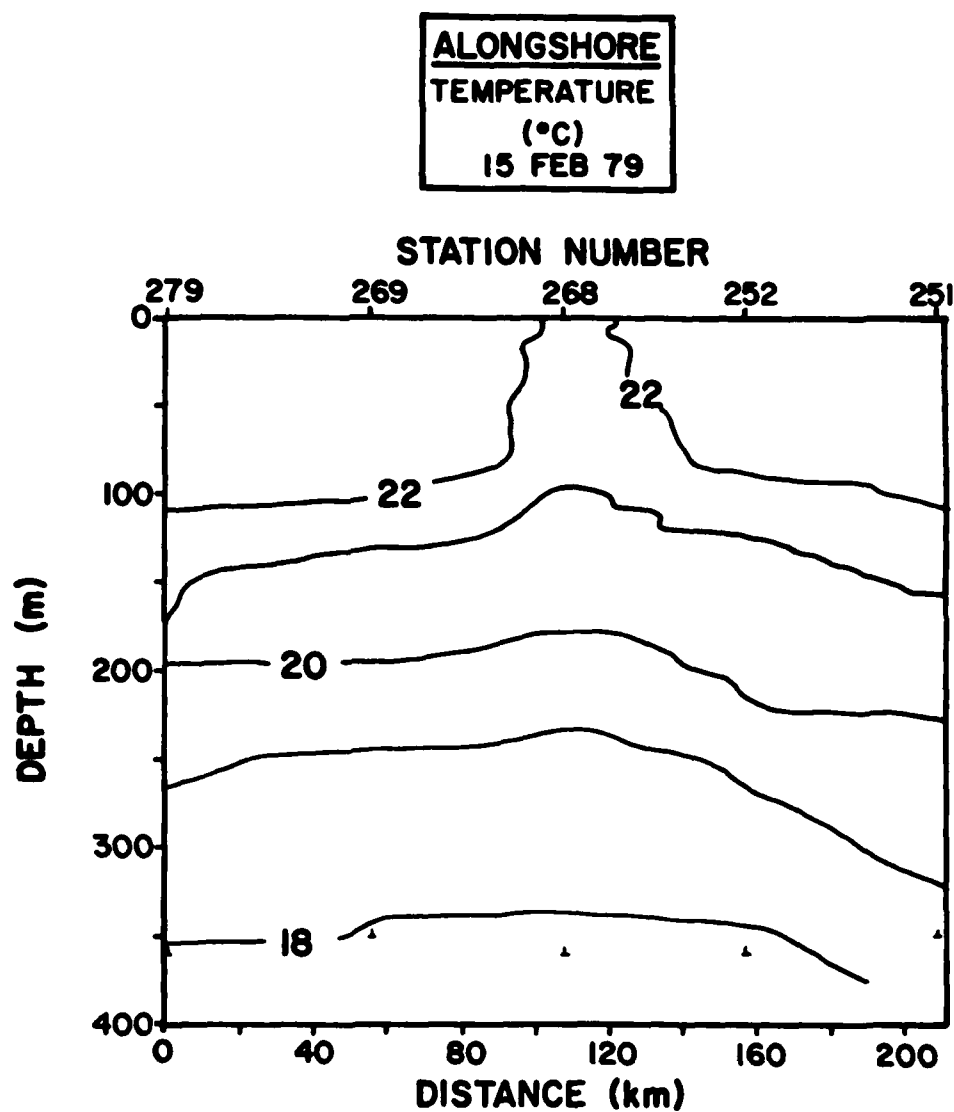


Figure 95. Alongshore vertical temperature section,
15 February 1979.

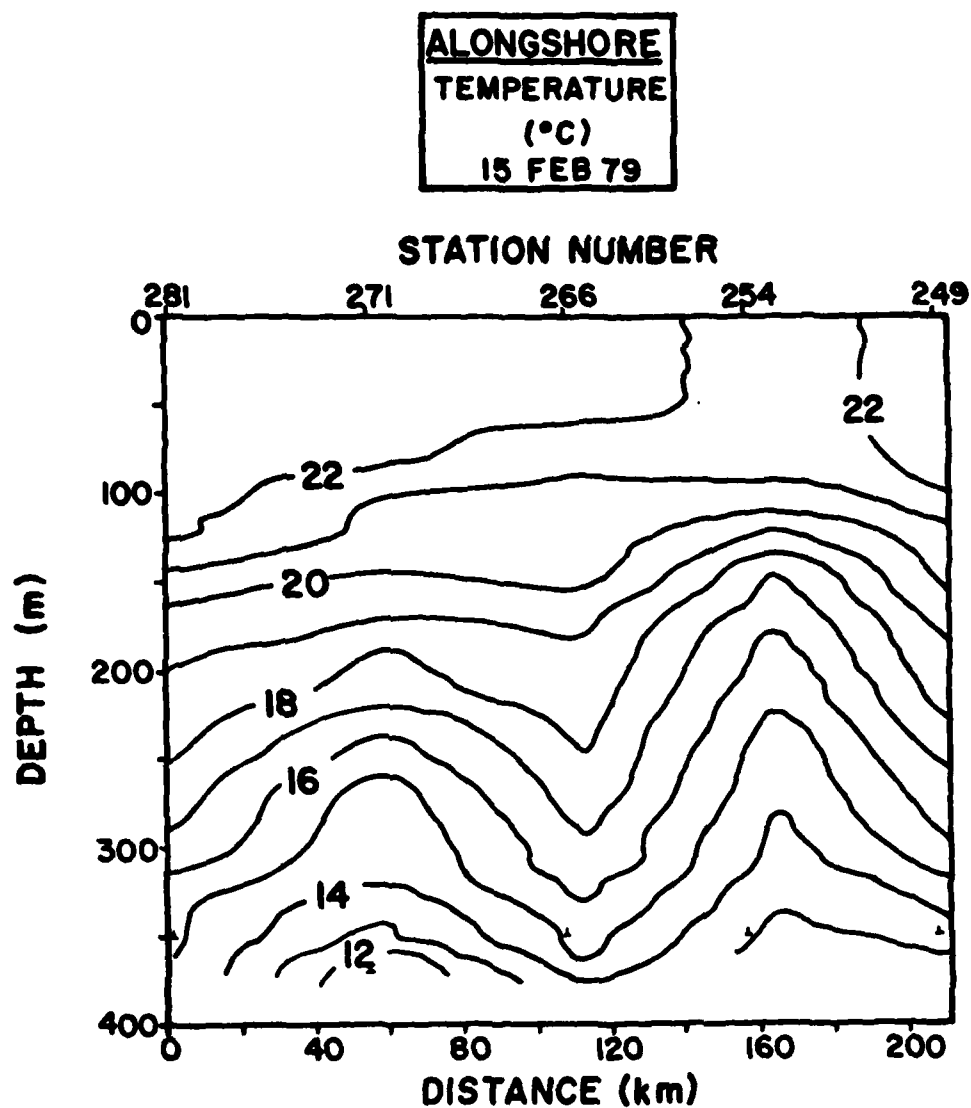


Figure 96. Alongshore vertical temperature section,
15 February 1979.

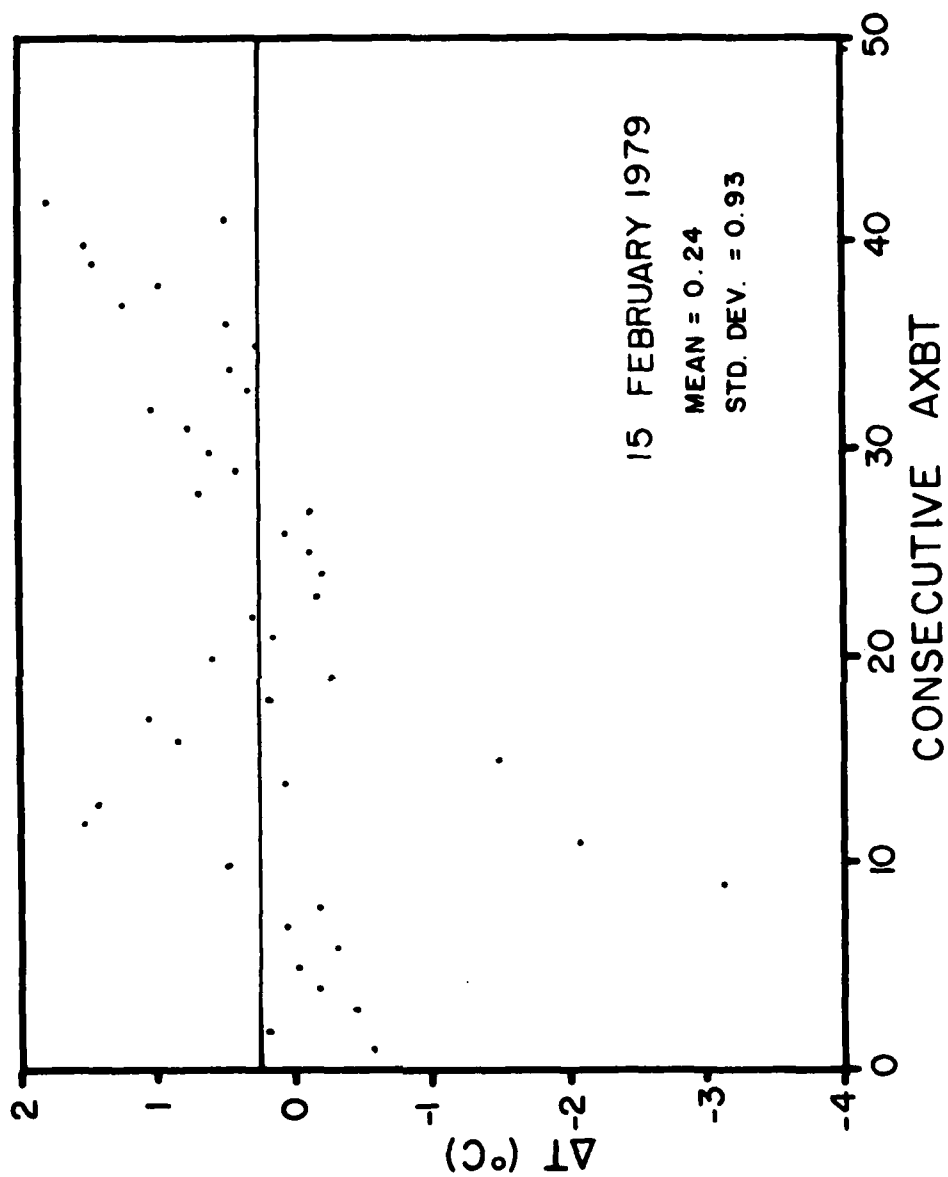


Figure 97. Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT drop number, 15 February 1979.

FLIGHT 6: 16 FEBRUARY 1979

Survey Time: 1636:28 to 2106:26

Table 21. 16 February 1979 PRT Line End Points

TIME (Hr-Min-Sec)	LATITUDE (°N)	LONGITUDE (°W)	LINE
1636:28	33°02.07'	78°23.75'	M
1702:09	32°07.47'	76°49.50'	
1729:50	31°47.70'	77°12.62'	O
1758:30	32°38.22'	78°44.39'	
1811:28	32°20.60'	79°12.61'	Q
1845:00	31°14.98'	77°21.36'	
1912:14	31°04.33'	77°47.72'	S
1941:49	32°01.92'	79°22.29'	
1952:48	31°38.90'	79°38.03'	U
2019:01	30°42.66'	77°57.49'	
2048:54	30°50.44'	79°13.62'	W
2106:25	31°23.78'	80°10.12'	

Table 22. 16 February 1979 Flight Updates

<u>TIME(Hrs.)</u>	<u>EVENT</u>	<u>OLD POSITION</u>	<u>NEW POSITION</u>	<u>TYPE OF FIX FOR UPDATES</u>
15.12	TAKEOFF			
18.75	NAV.	31°18.76'N	31°16.00'N	LTN-51
	UPDATE	77°16.17'W	77°21.00'W	
18.88	NAV.	31°01.20'N	31°05.00'N	LTN-51
	UPDATE	77°36.80'W	77°42.00'W	
20.36	NAV.	30°39.81'N	30°40.00'N	LTN-51
	UPDATE	78°08.42'W	78°00.00'W	
21.72	NAV.	31°33.93'N	31°38.00'N	LTN-51
	UPDATE	80°09.30'W	80°07.00'W	
21.72	-last data point			

Table 23. 16 February 1979 PRT Calibration
Temperatures and Times

<u>TIME (Hrs.)</u>	<u>CALIBRATION TEMPERATURE (°C)</u>		
	12.00	18.00	24.00
16.47	0.69	0.53	0.23
17.05	0.59	0.38	0.04
18.10	0.34	0.00	-0.27
19.77	0.05	-0.27	-0.57
20.42	-0.03	-0.27	-0.47
22.02	-0.20	-0.29	-0.34

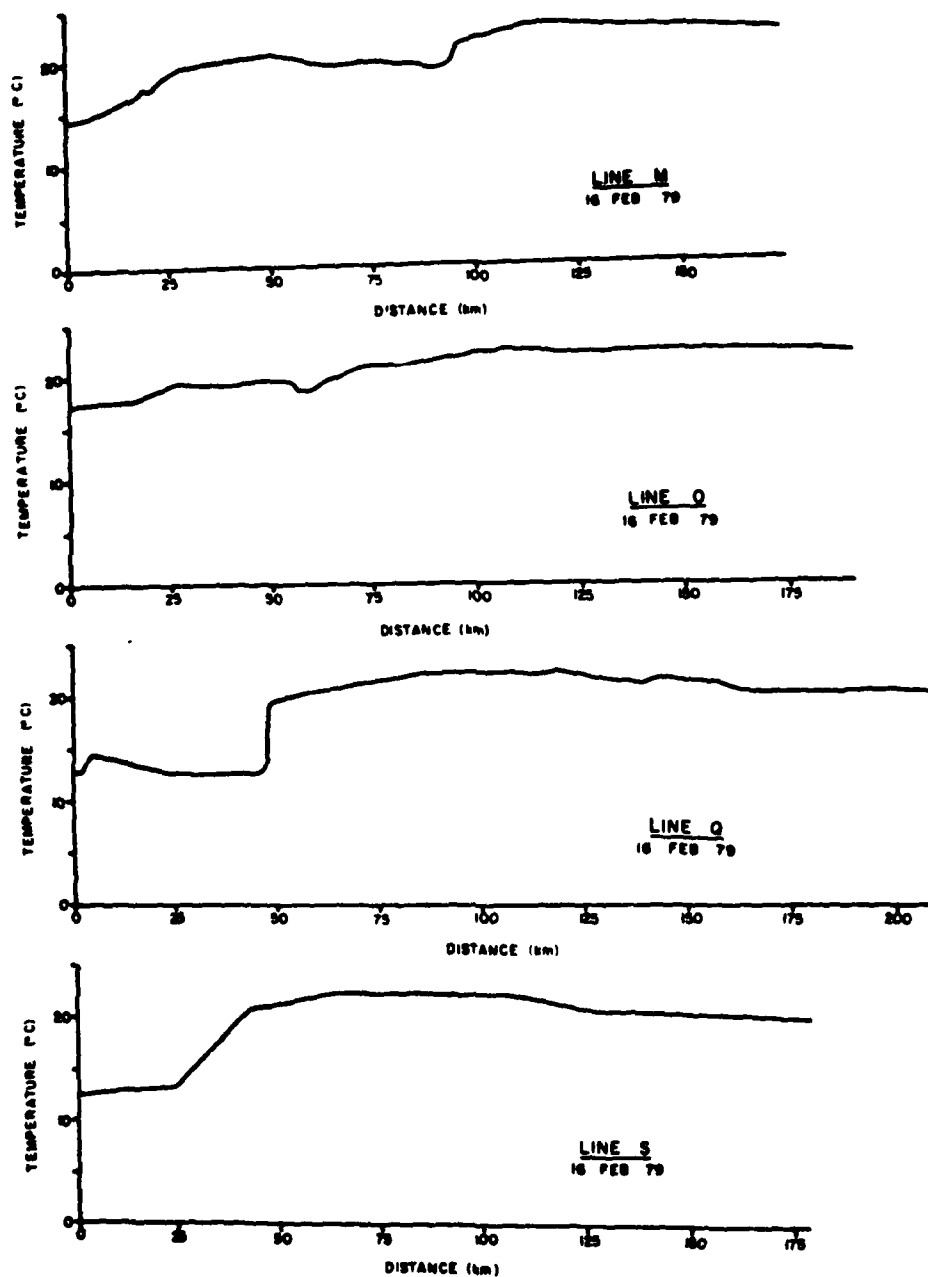


Figure 98. Cross-stream surface temperature profiles, 16 February 1979.

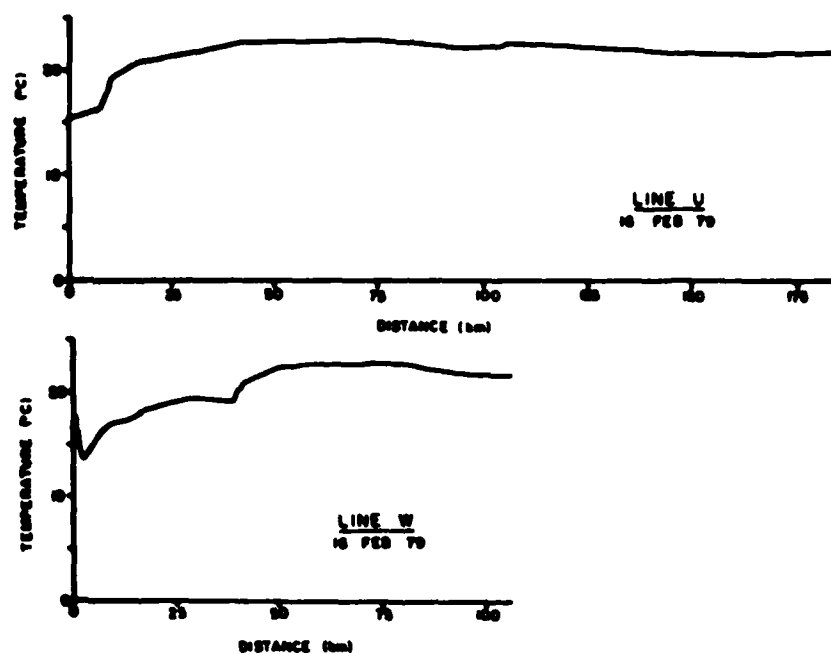


Figure 98 (cont'd).

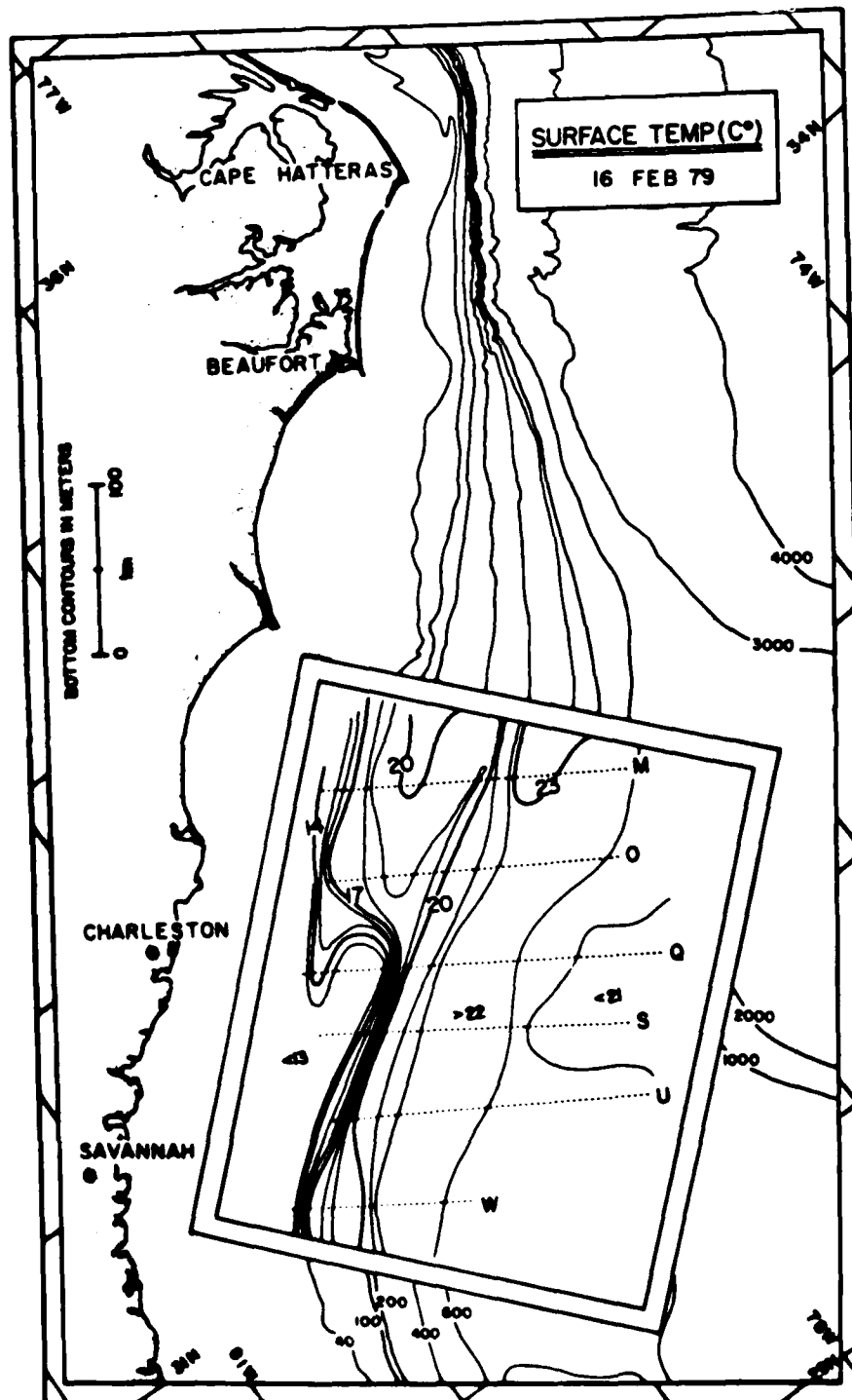


Figure 99. PRT sea surface temperature field, 16 February 1979. Dashed lines indicate positions of cross-stream data lines.

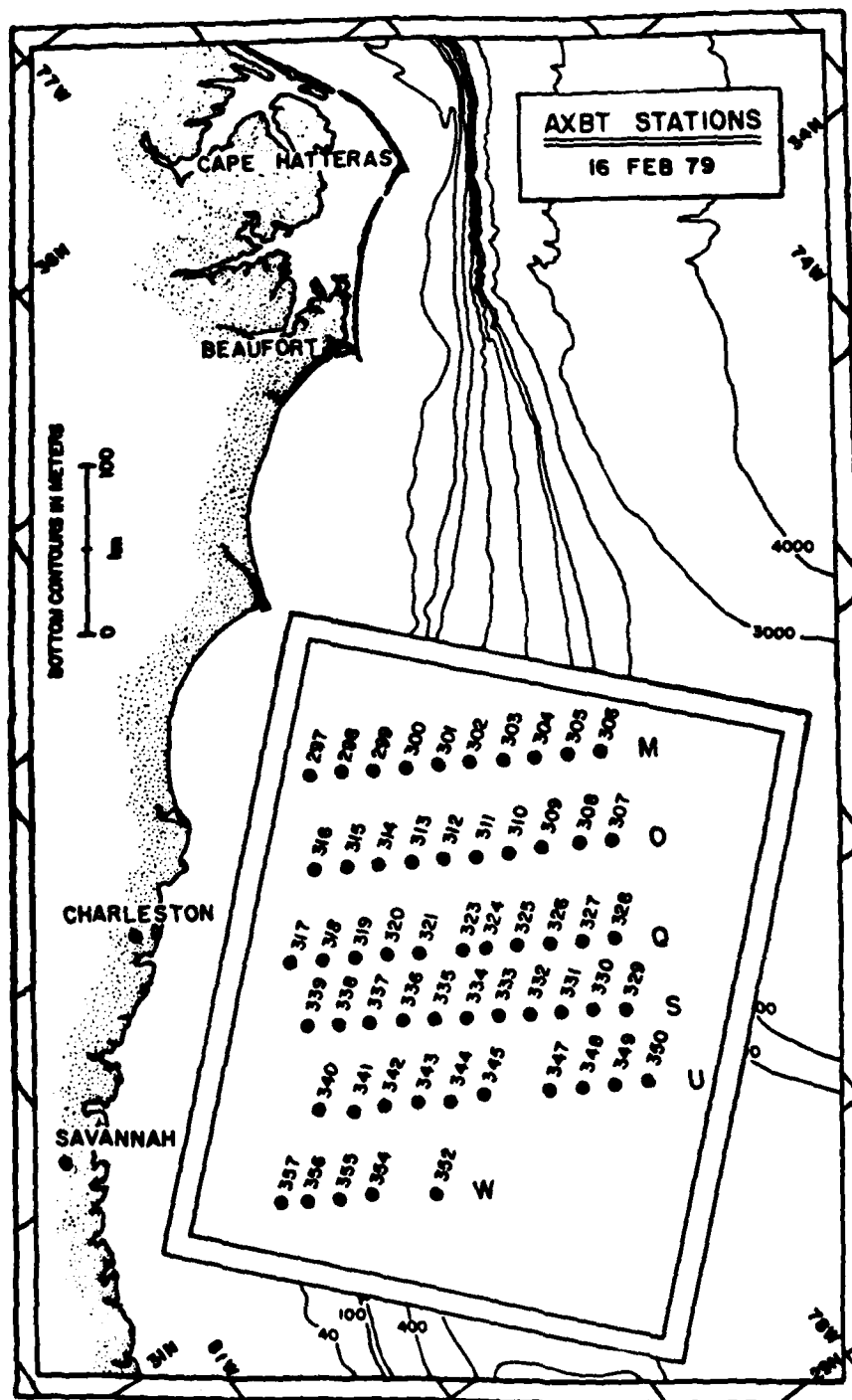


Figure 100. AXBT station locations, 16 February 1979.

Table 24. 16 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
297	33°02.1'	78°23.8'	50	1636:28
298	32°56.8'	78°13.6'	164	1638:49
299	32°50.7'	78°04.1'	250	1641:28
300	32°44.9'	77°54.1'	350	1644:13
301	32°39.4'	77°44.2'	360	1646:58
302	32°33.8'	77°34.3'	350	1649:42
303	32°27.9'	77°24.4'	370	1652:26
304	32°22.2'	77°14.8'	360	1655:06
305	32°16.7'	77°04.7'	380	1657:51
306	32°10.9'	76°55.0'	380	1700:35
307	31°47.7'	77°12.6'	370	1729:50
308	31°53.2'	77°22.4'	350	1733:03
309	31°59.5'	77°34.3'	370	1736:42
310	32°04.4'	77°44.7'	380	1739:52
311	32°09.9'	77°54.8'	370	1743:02
312	32°15.7'	78°04.5'	350	1746:10
313	32°21.3'	78°14.4'	267	1749:15
314	32°26.9'	78°24.4'	250	1752:21
315	32°32.7'	78°34.3'	122	1755:25
316	32°38.2'	78°44.4'	40	1758:30
317	32°20.6'	79°12.6'	50	1811:29
318	32°14.7'	79°02.8'	130	1814:13
319	32°09.3'	78°52.8'	361	1816:58
320	32°03.6'	78°43.0'	350	1819:45
321	31°57.9'	78°33.0'	270	1822:32
323	31°50.4'	78°20.0'	320	1826:09
324	31°46.4'	78°13.5'	370	1827:59
325	31°40.9'	78°03.7'	380	1830:41
326	31°35.3'	77°53.9'	370	1833:23
327	31°29.3'	77°44.4'	350	1836:09
328	31°23.7'	77°34.7'	370	1838:58
329	31°04.3'	77°47.7'	370	1912:16
330	31°10.6'	77°56.7'	380	1915:16
331	31°16.2'	78°06.5'	370	1918:17
332	31°21.7'	78°16.2'	350	1921:15
333	31°27.7'	78°25.2'	370	1924:13
334	31°33.4'	78°34.6'	380	1927:09
335	31°39.0'	78°44.2'	370	1930:06
336	31°44.9'	78°53.7'	350	1933:04
337	31°50.6'	79°03.3'	370	1936:01

Table 24 (con't). 16 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
338	31°56.5'	79°12.6'	170	1938:55
339	32°01.9'	79°22.3'	80	1941:50
340	31°38.9'	79°38.0'	70	1952:49
341	31°32.4'	79°28.0'	350	1955:27
342	31°27.5'	79°18.2'	380	1958:03
343	31°22.5'	79°07.6'	370	2000:37
344	31°16.1'	78°58.0'	350	2003:14
345	31°11.4'	78°47.3'	370	2005:51
347	30°59.7'	78°27.6'	370	2011:09
348	30°54.1'	78°17.6'	350	2013:46
349	30°48.4'	78°07.7'	370	2016:22
350	30°42.7'	77°57.5'	380	2019:02
352	30°56.3'	79°23.0'	360	2051:57
354	31°08.6'	79°41.9'	260	2057:57
355	31°13.4'	79°52.3'	60	2100:58
356	31°19.2'	80°02.0'	40	2103:58
357	31°23.8'	80°10.1'	30	2106:26

16 FEBRUARY 1979

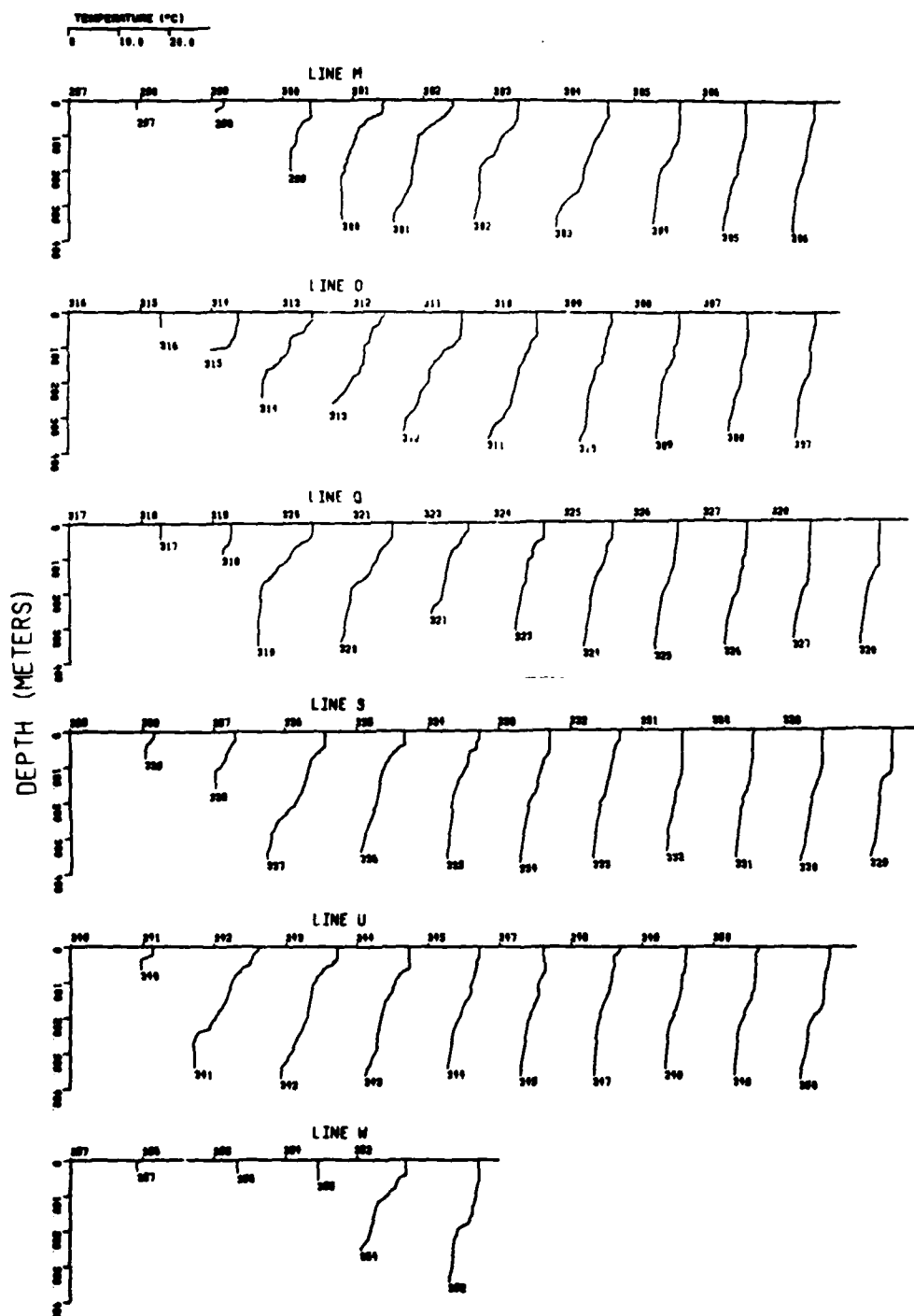


Figure 101. AXBT vertical temperature profiles, 16 February 1979.

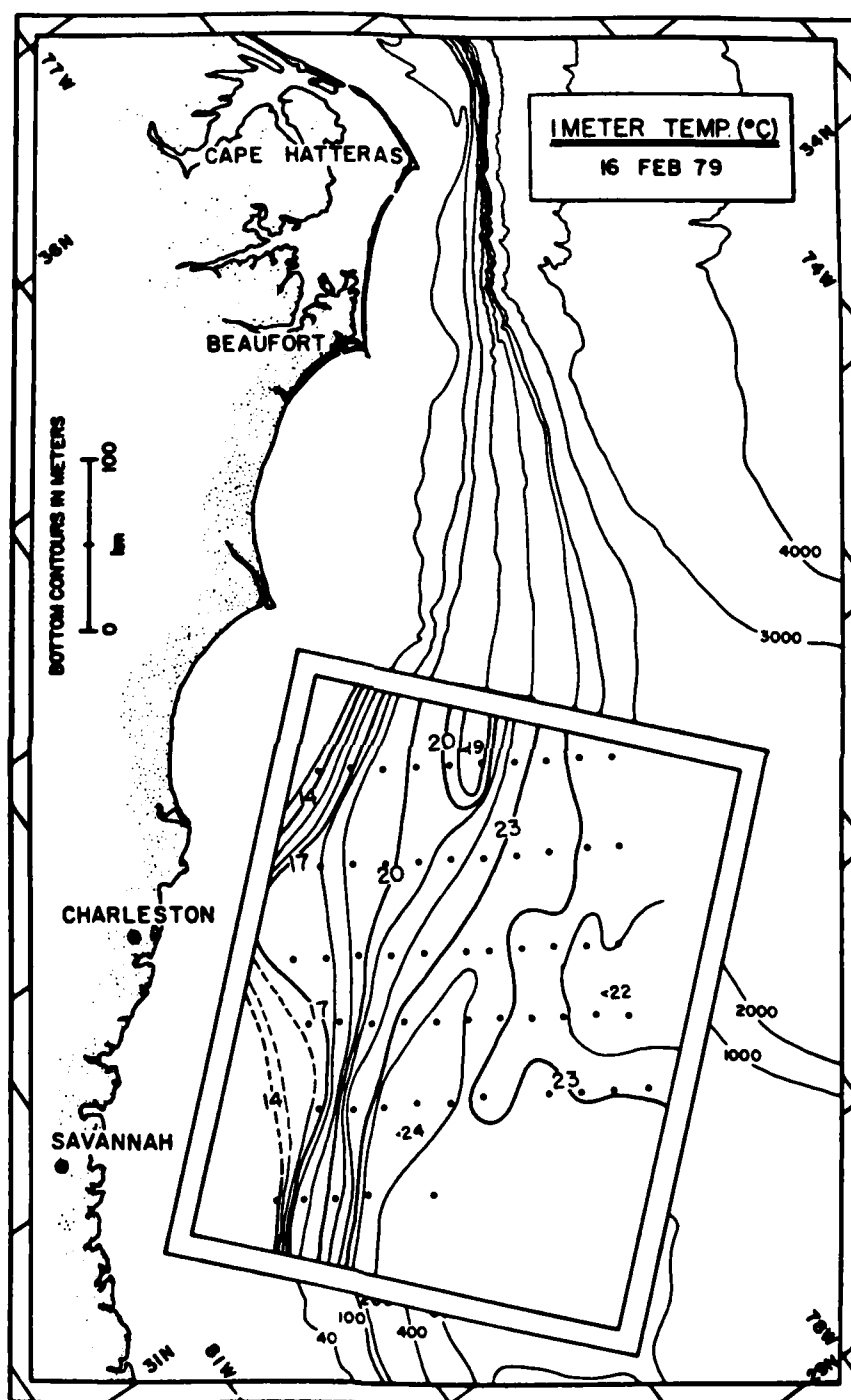


Figure 102. AXBT temperatures at 1 meter, 16 February 1979. Small solid circles indicate AXBT drop-sites.

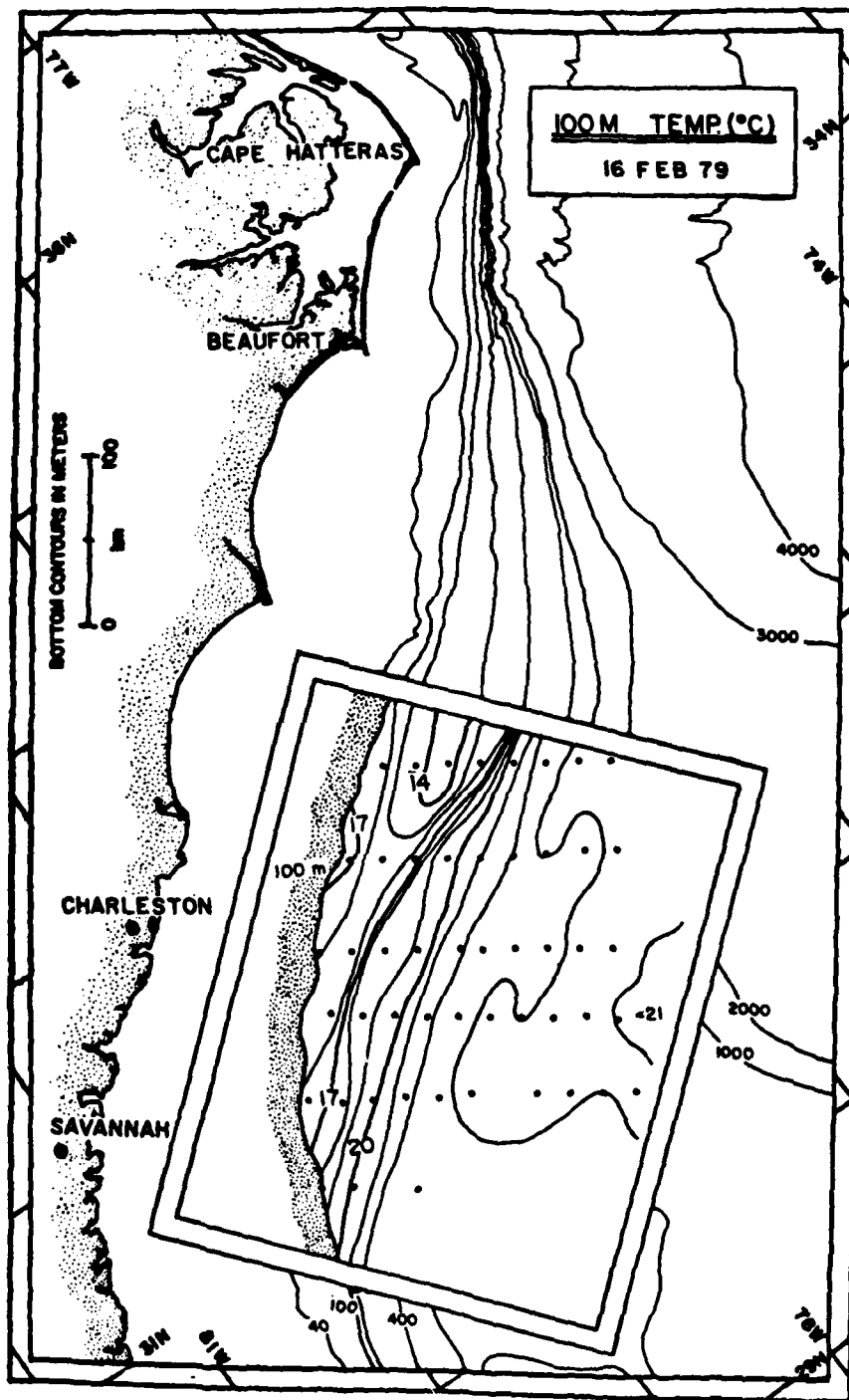


Figure 103. AXBT temperatures at 100 meters, 16 February 1979.

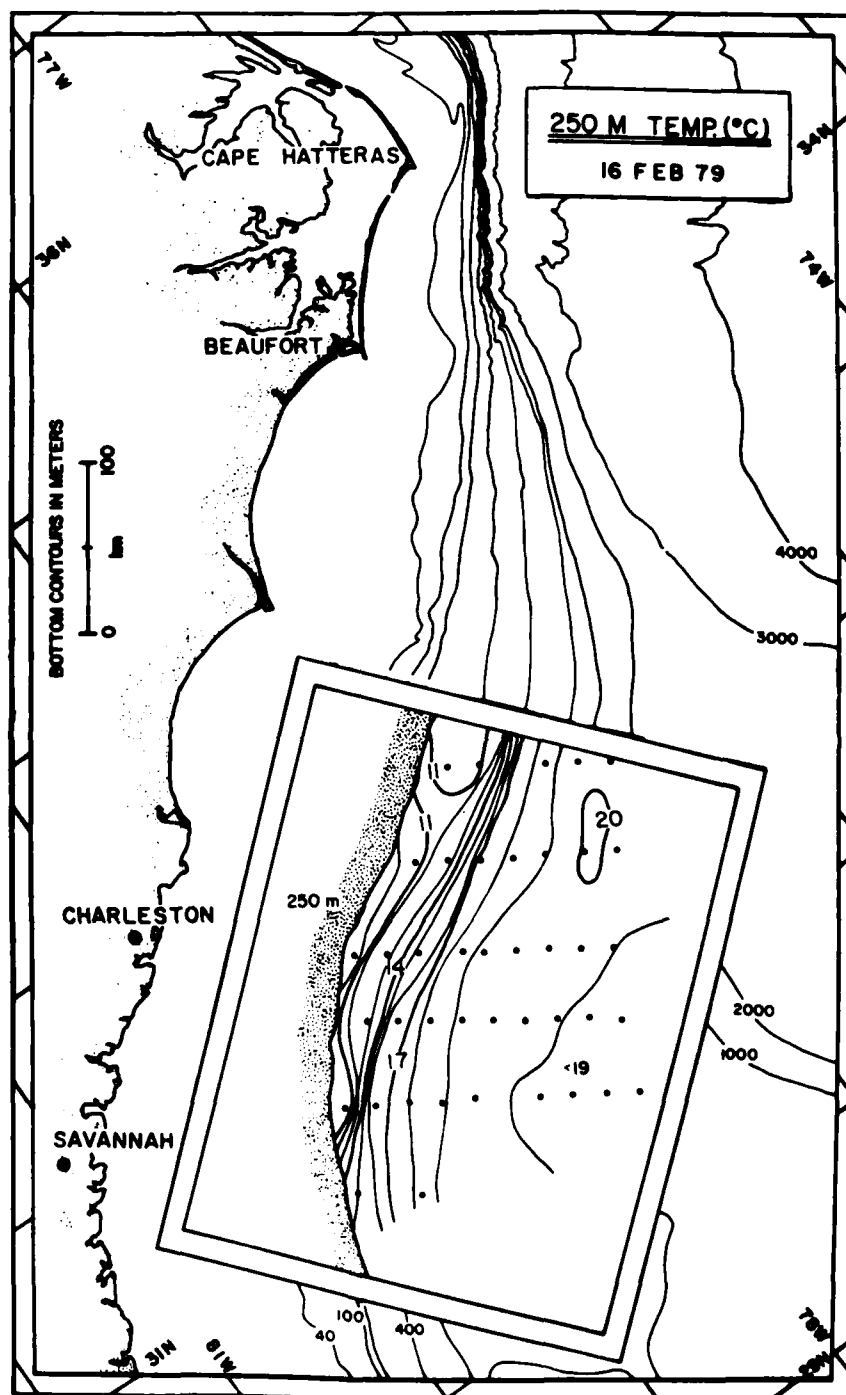


Figure 104. AXBT temperatures at 250 meters, 16 February 1979.

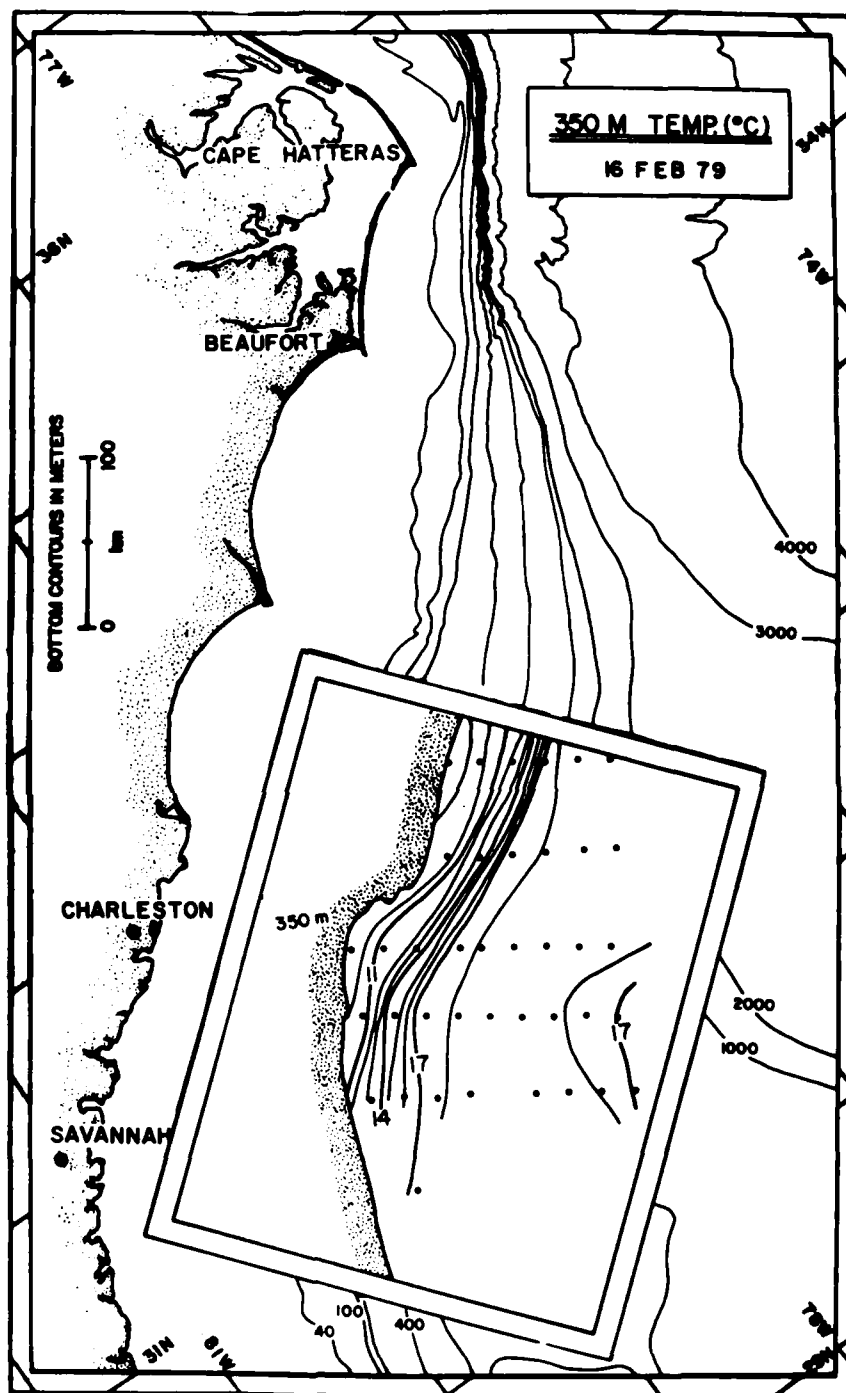


Figure 105. AXBT temperatures at 350 meters, 16 February 1979.

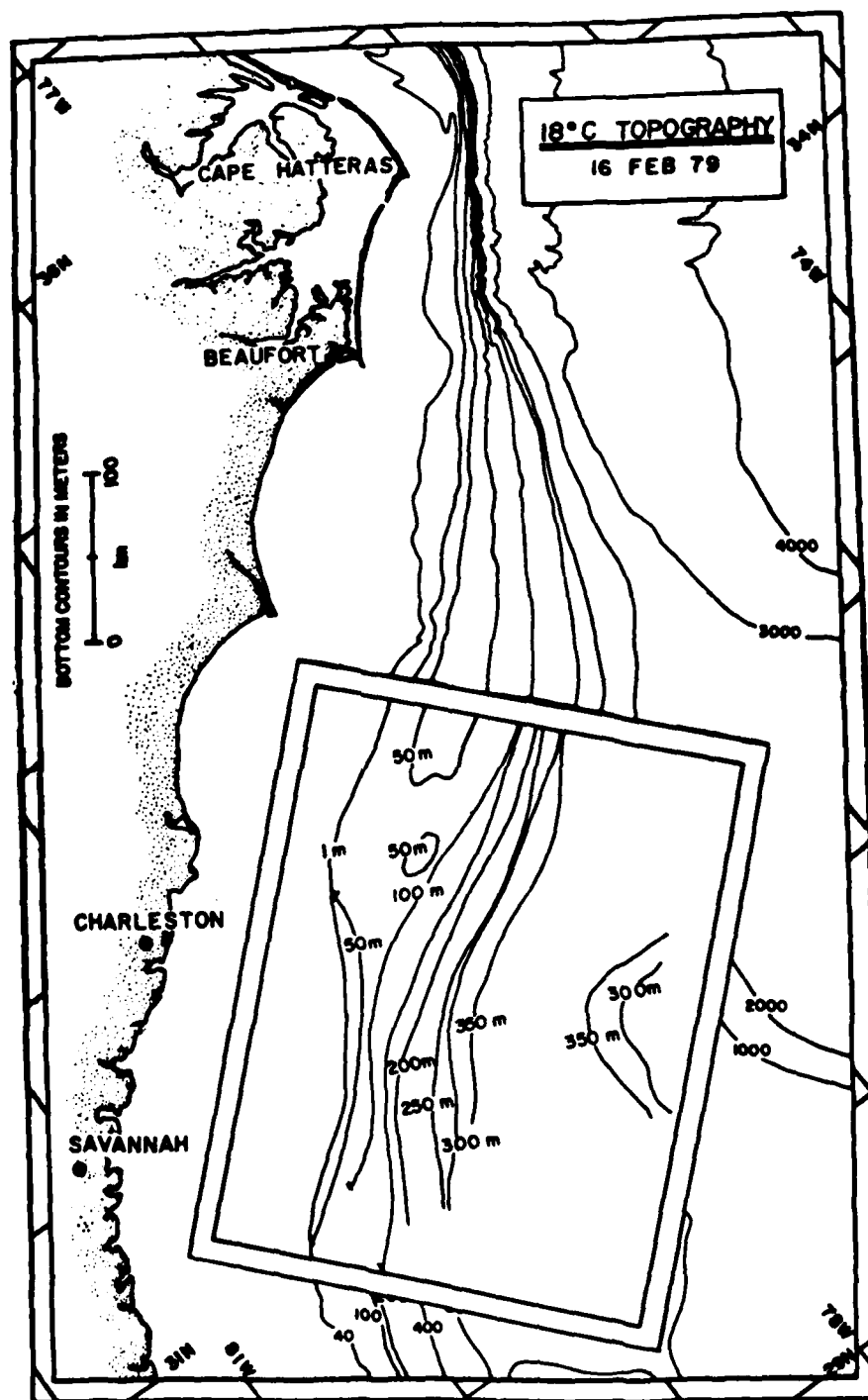


Figure 106. Topography of the 18°C isotherm, 16 February 1979.

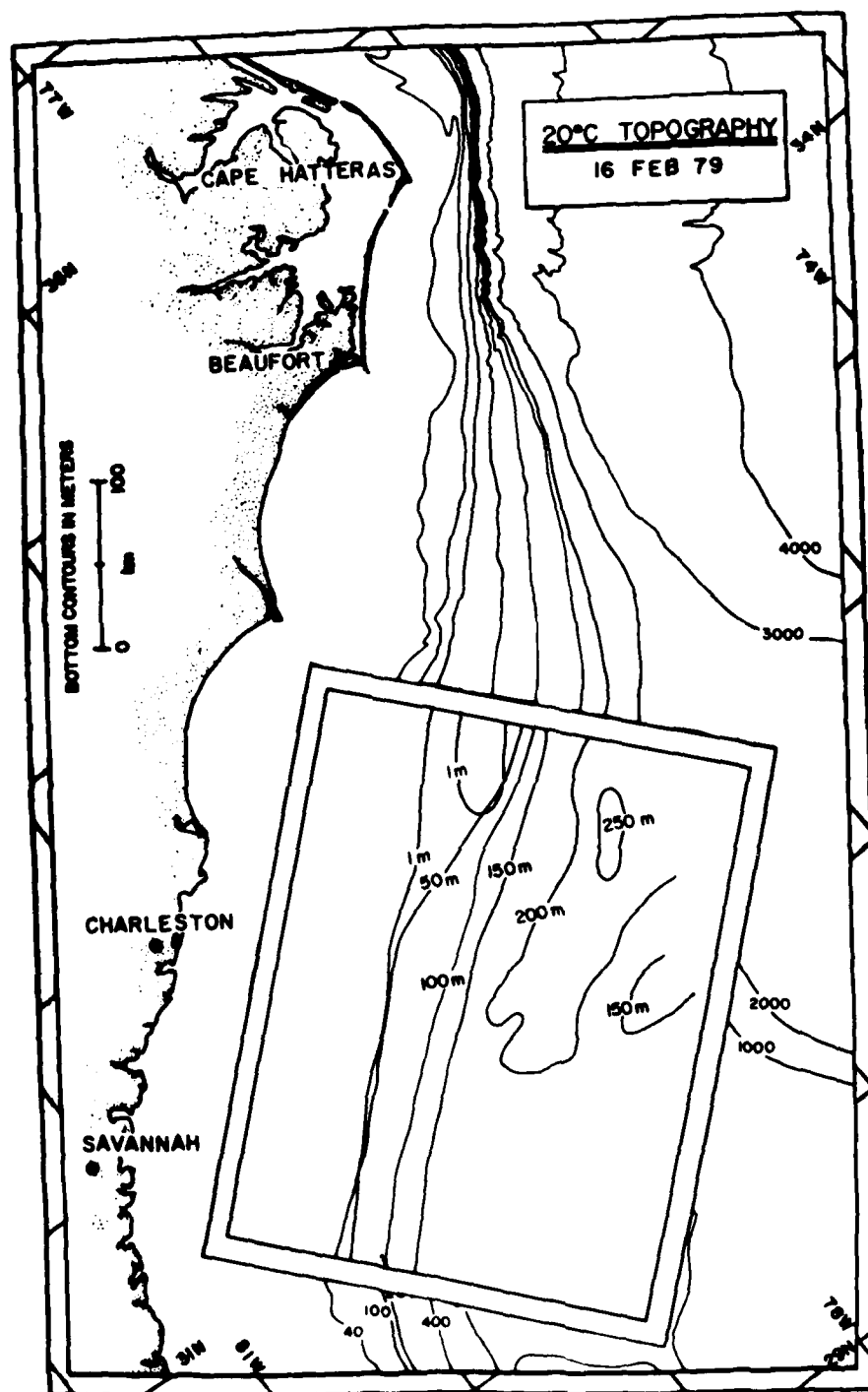


Figure 107. Topography of the 20°C isotherm, 16 February 1979.

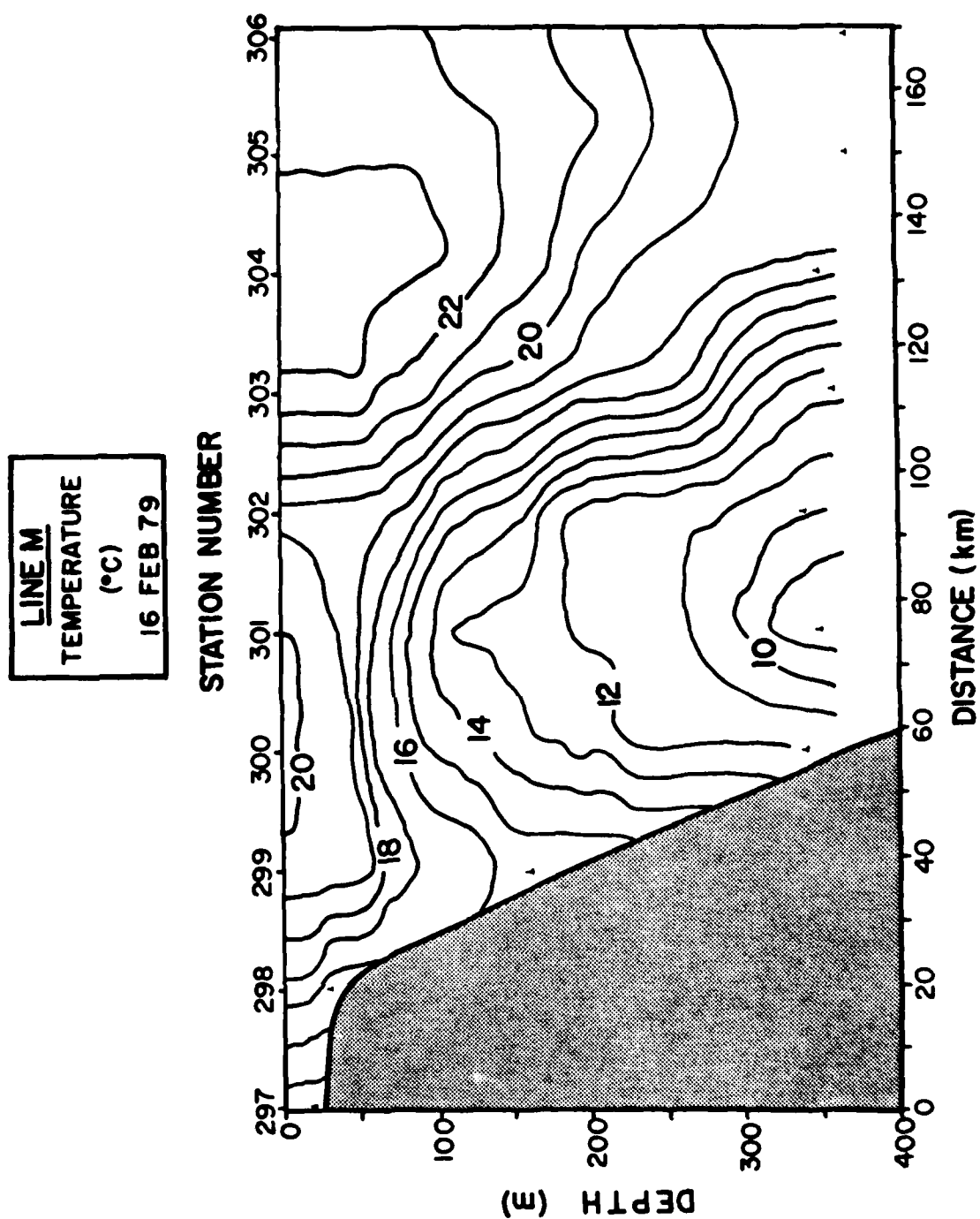


Figure 108. Cross-stream vertical temperature section along Line M, 16 February 1979.

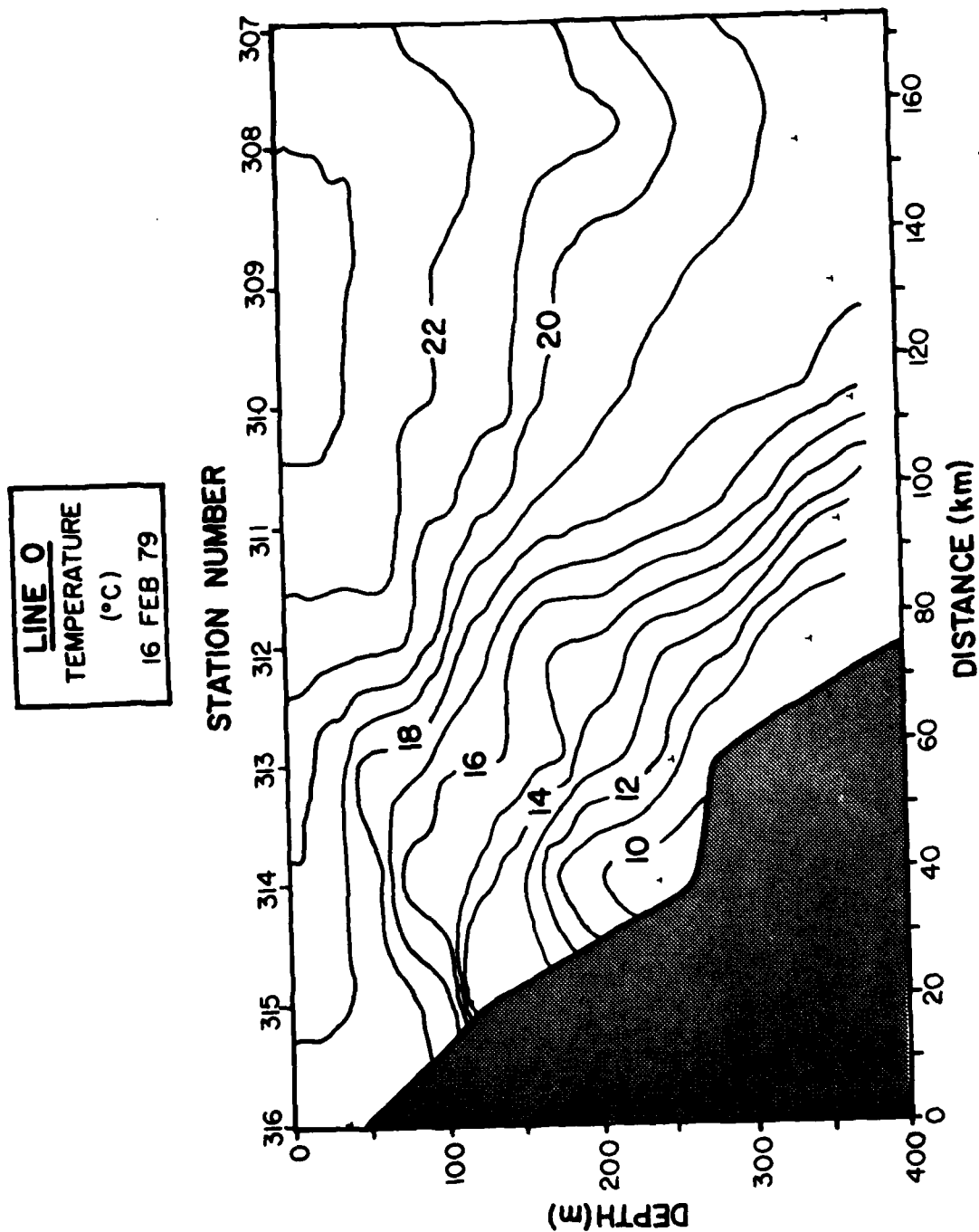


Figure 109. Cross-stream vertical temperature section along Line 0, 16 February 1979.

LINE Q
TEMPERATURE
(°C)
16 FEB 79

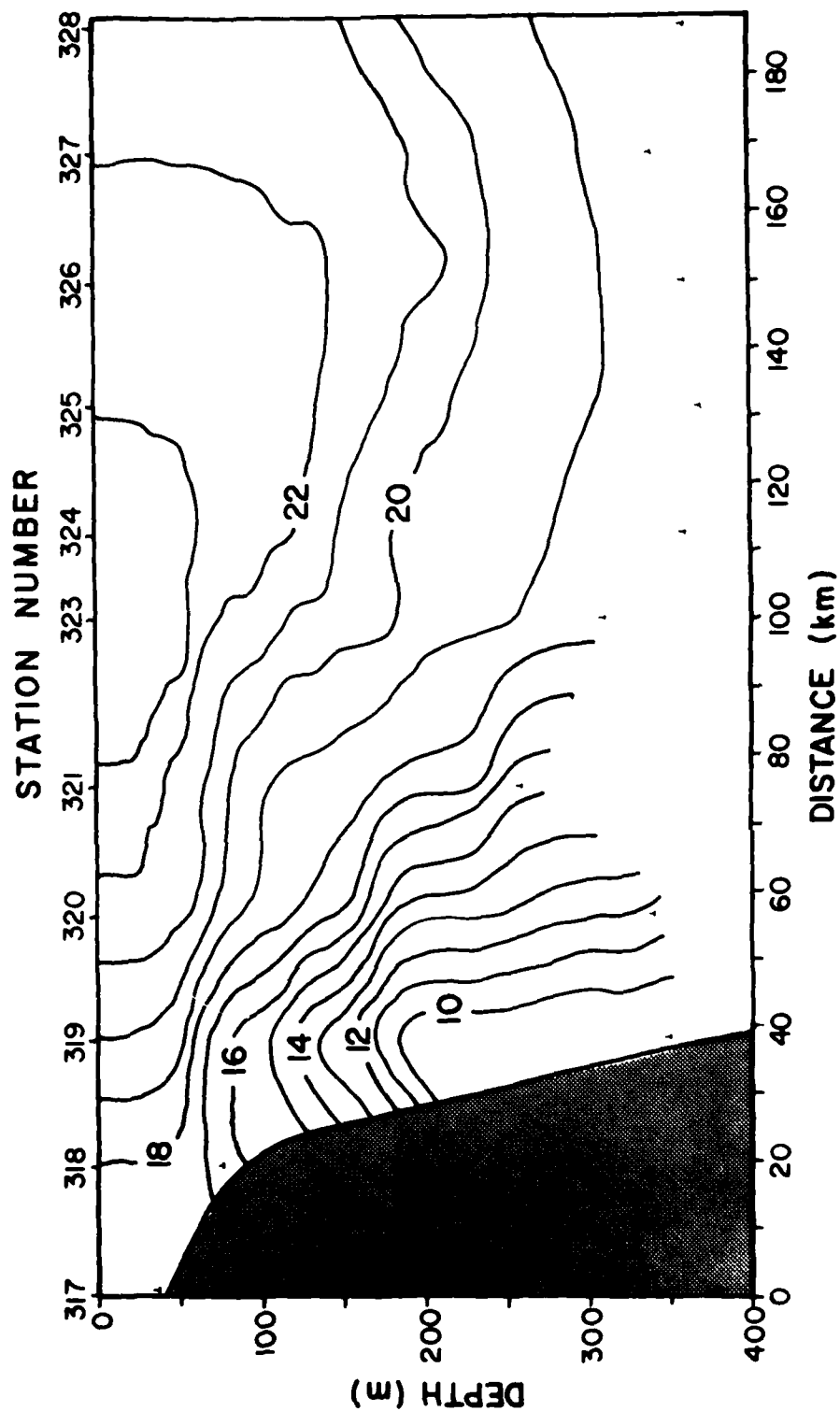


Figure 110. Cross-stream vertical temperature section along Line Q, 16 February 1979.

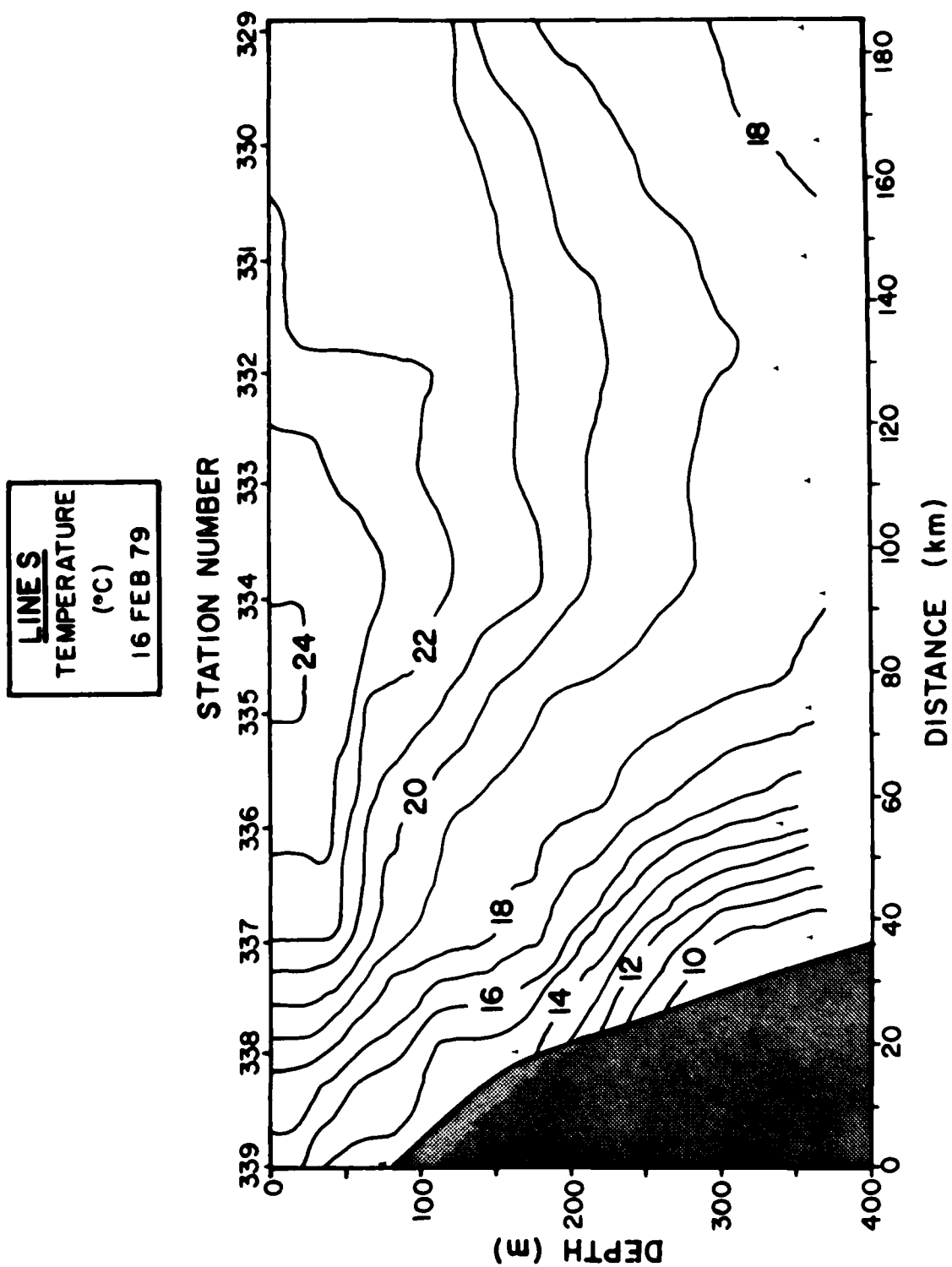


Figure 111. Cross-stream vertical temperature section along Line S, 16 February 1979.

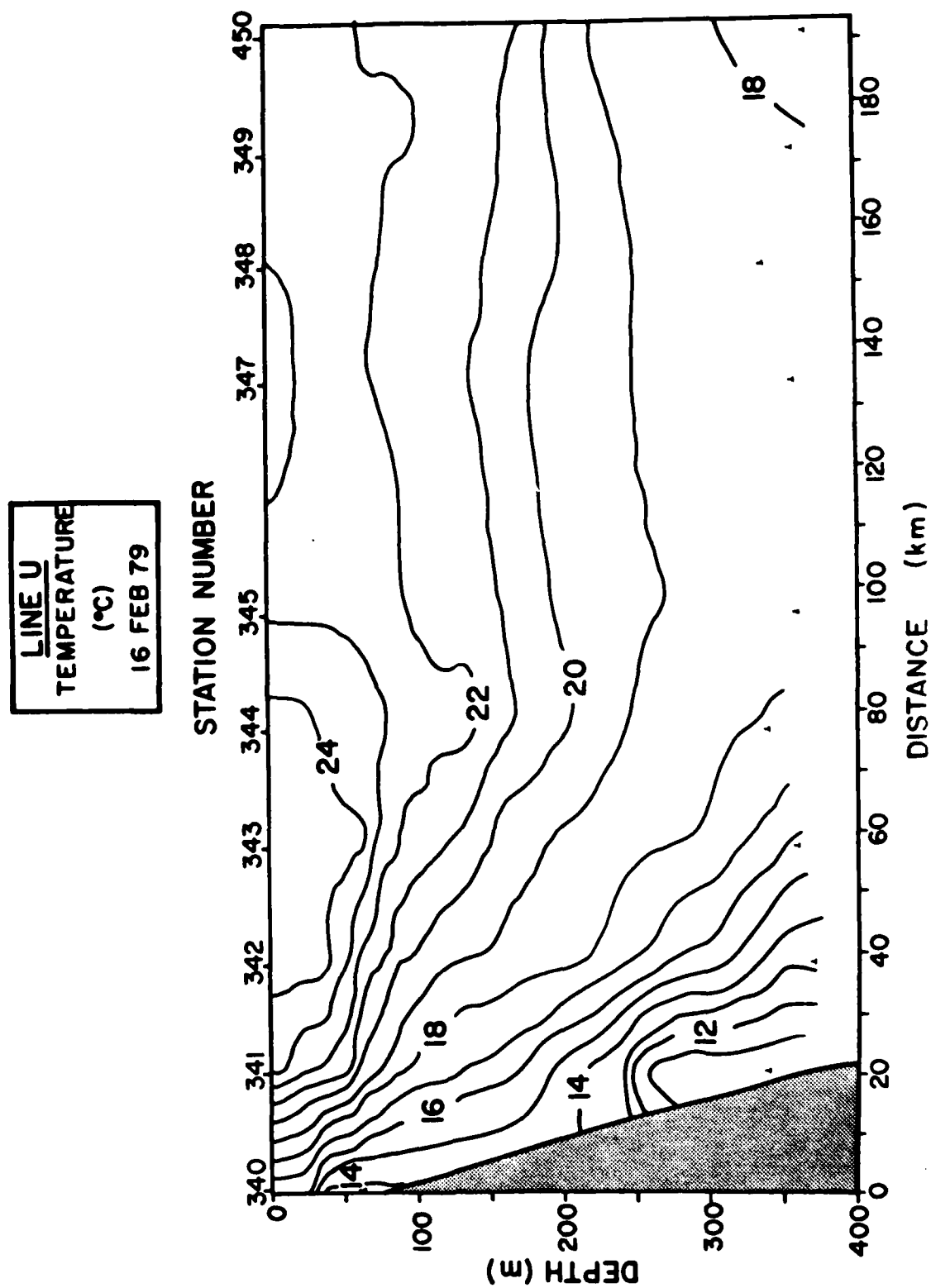


Figure 112. Cross-stream vertical temperature section along Line U, 16 February 1979.

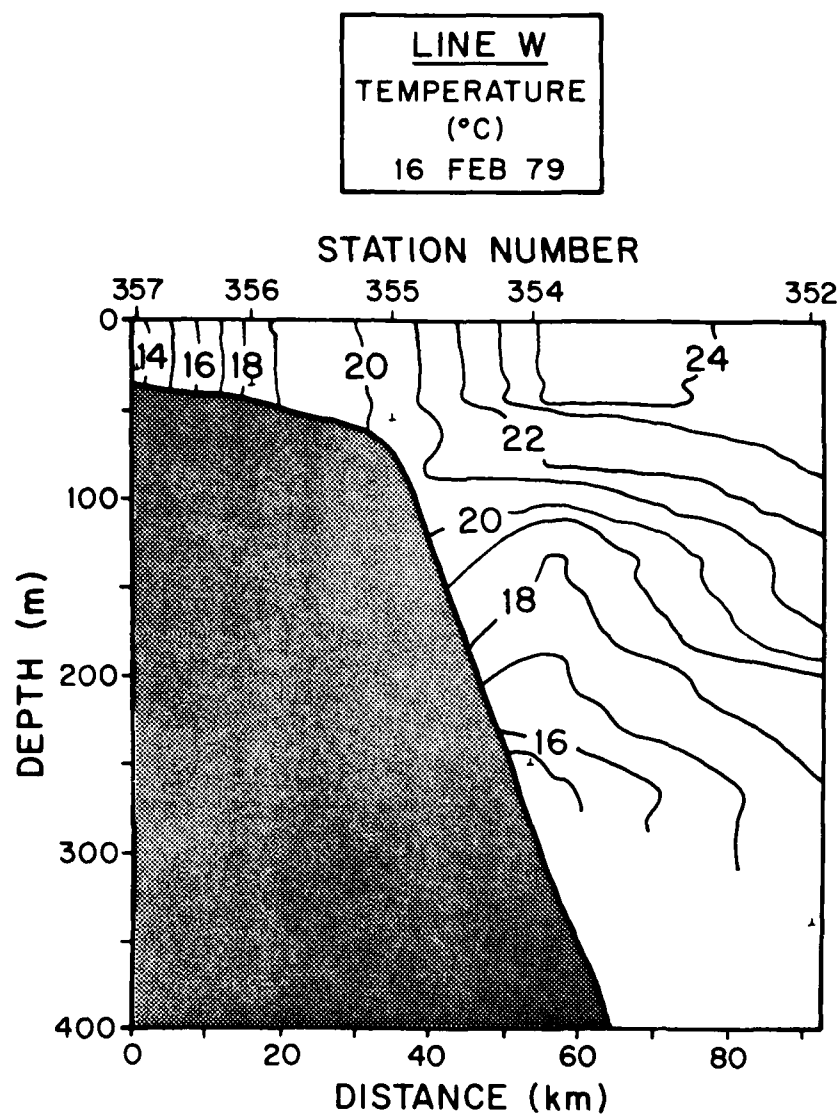


Figure 113. Cross-stream vertical temperature section along Line W, 16 February 1979.

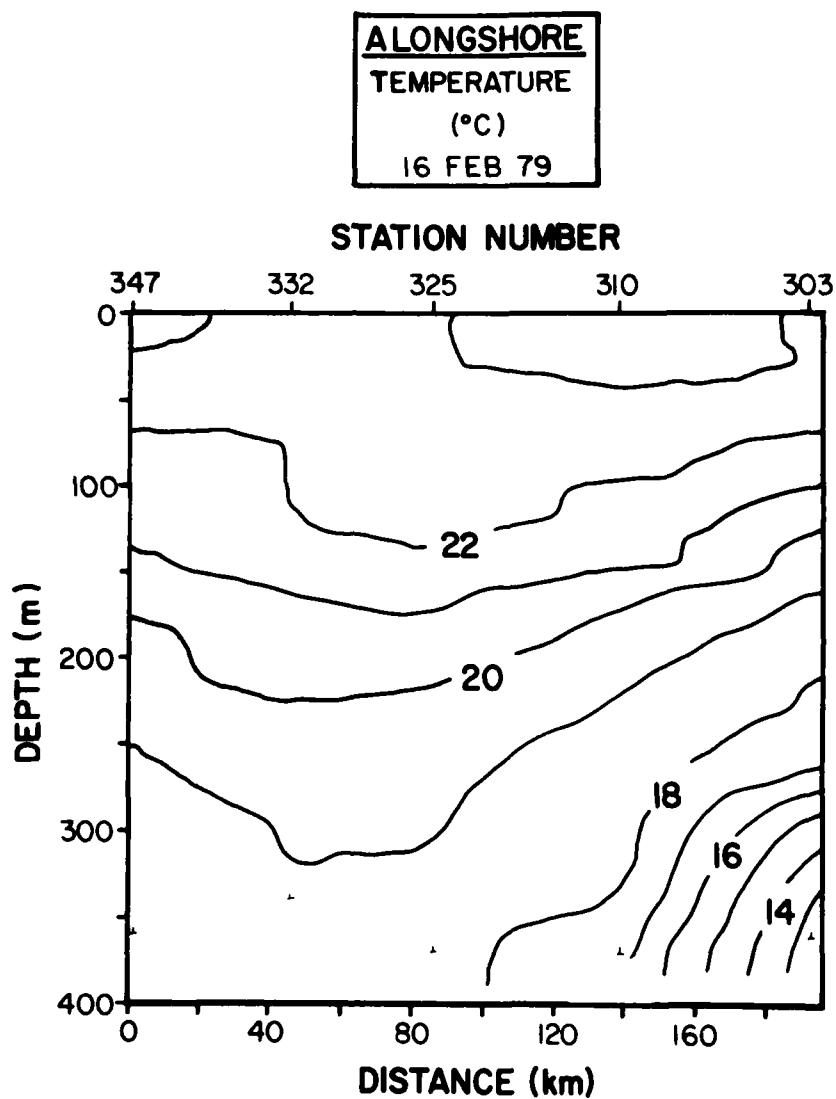


Figure 114. Alongshore vertical temperature section,
16 February 1979.

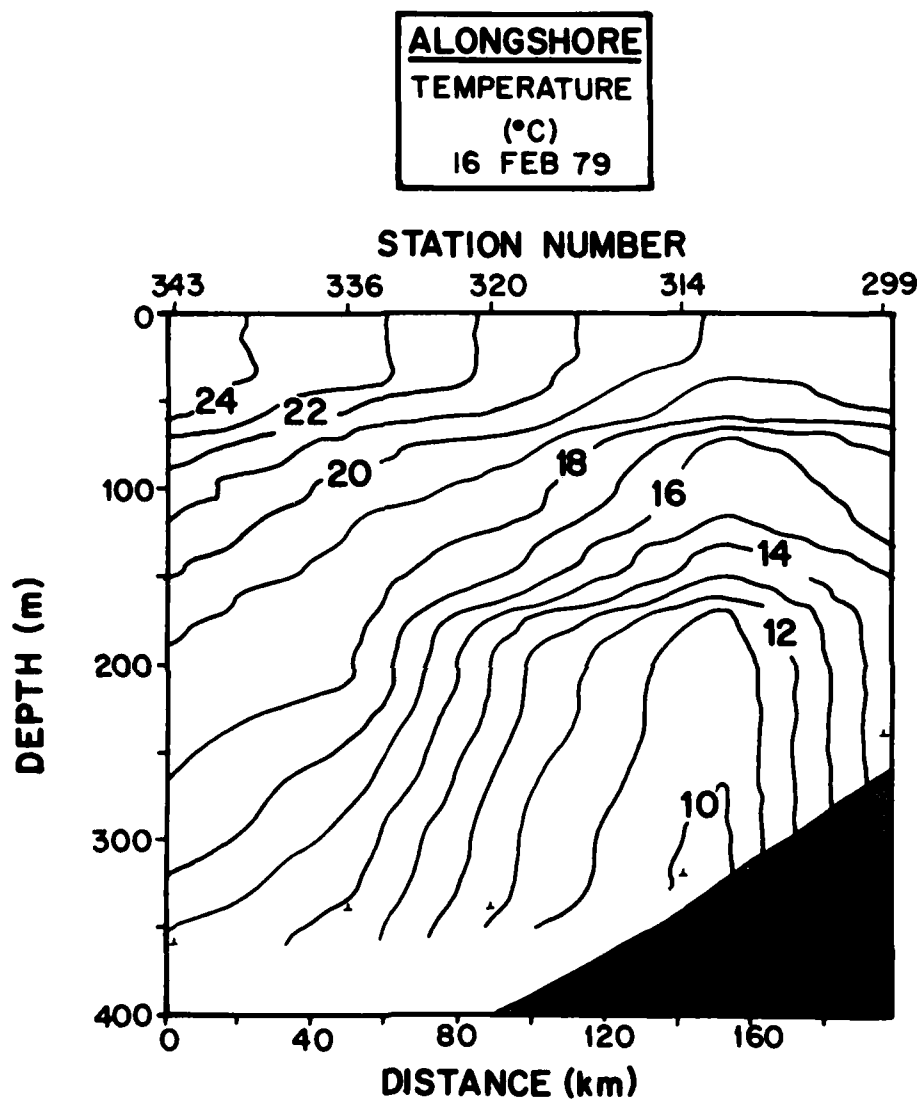


Figure 115. Alongshore vertical temperature section,
16 February 1979.

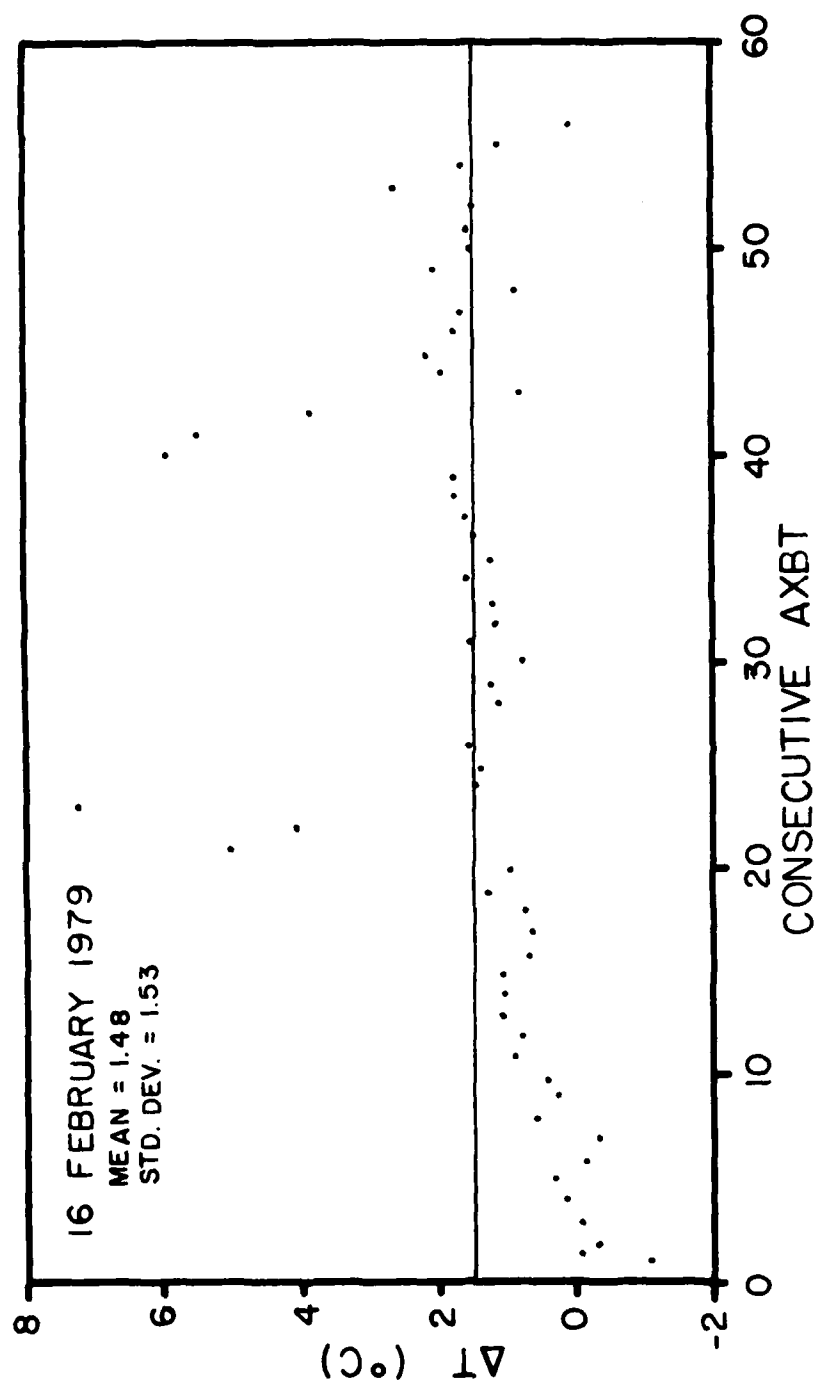


Figure 116. Difference between 1 meter AXBT and PRT temperatures ($T_{\text{AXBT}} - T_{\text{PRT}}$) versus consecutive AXBT drop number, 16 February 1979.

FLIGHT 7: 17 FEBRUARY 1979

Survey Time: 1541:02 to 1857:50

Table 25. 17 February 1979 PRT Line End Points

TIME (Hr-Min-Sec)	LATITUDE (°N)	LONGITUDE (°W)	LINE
1541:02	34°48.27'	75°44.32'	A
1548:22	34°34.54'	75°18.24'	C
1605:56	33°59.27'	75°16.77'	
1624:12	34°31.14'	76°17.99'	E
1632:10	34°11.93'	76°31.53'	
1650:17	33°39.13'	75°30.27'	G
1701:26	33°18.69'	75°58.37'	
1719:16	33°54.38'	76°57.41'	I
1728:16	33°35.97'	77°20.94'	
1747:17	33°02.97'	76°19.83'	K
1759:10	32°41.21'	76°40.98'	
1816:55	33°16.80'	77°39.65'	M
1828:23	33°07.41'	78°18.90'	
1857:50	32°19.06'	76°47.88'	

Table 26. 17 February 1979 Flight Updates

<u>TIME(Hrs.)</u>	<u>EVENT</u>	<u>OLD POSITION</u>	<u>NEW POSITION</u>	<u>TYPE OF FIX FOR UPDATES</u>
14.72	TAKEOFF			
16.40	NAV.	34°31.22'N	34°31.00'N	LTN-51
	UPDATE	76°14.40'W	76°18.00'W	
16.93	NAV.	33°19.21'N	33°21.03'N	SATELLITE
	UPDATE	75°40.33'W	75°39.25'W	
19.76	- no update at the end of the flight - used previous section's error rate - last data point			

Table 27. 17 February 1979 PRT Calibration
Temperatures and Times

<u>TIME</u>	<u>CALIBRATION TEMPERATURE (°C)</u>		
<u>(Hrs.)</u>	10.00	17.00	24.00
15.56	0.72	0.86	0.83
16.03	0.91	0.90	0.76
17.42	1.19	0.88	0.48
19.05	0.51	0.25	0.03

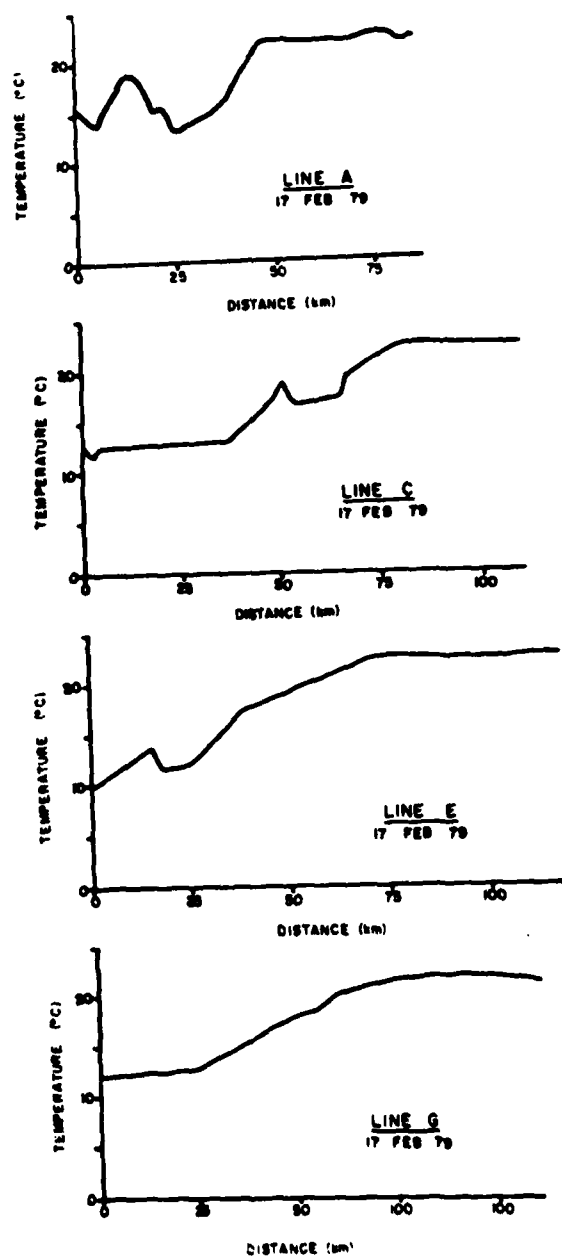


Figure 117. PRT cross-stream surface temperature profiles, 17 February 1979.

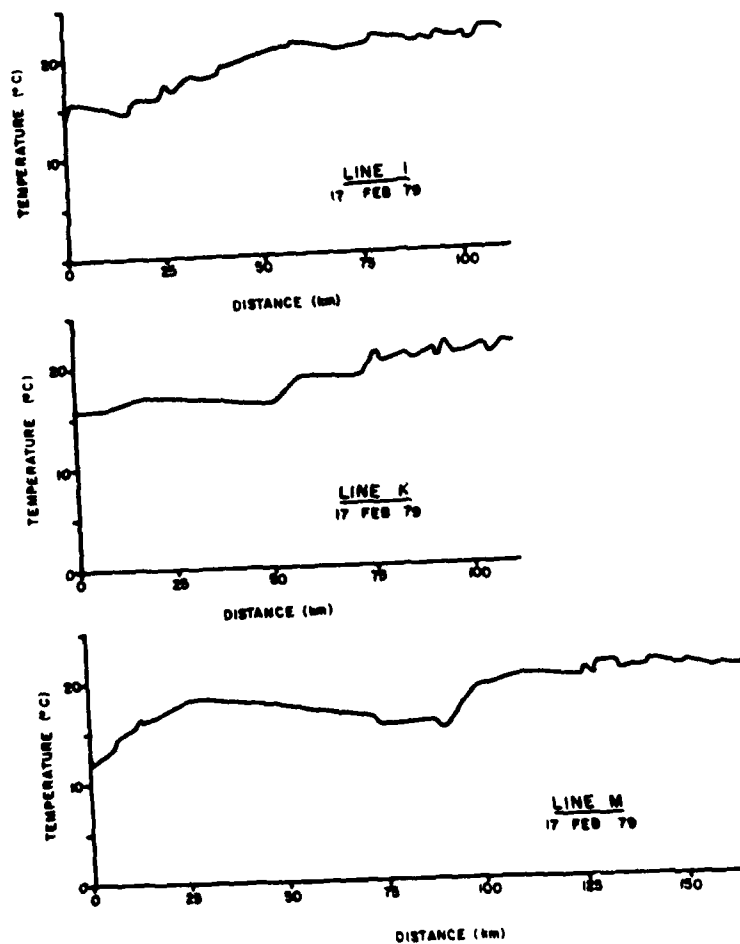


Figure 117 (cont'd).



Figure 118. PRT sea surface temperature field, 17 February 1979. Dashed lines indicate positions of cross-stream data lines.

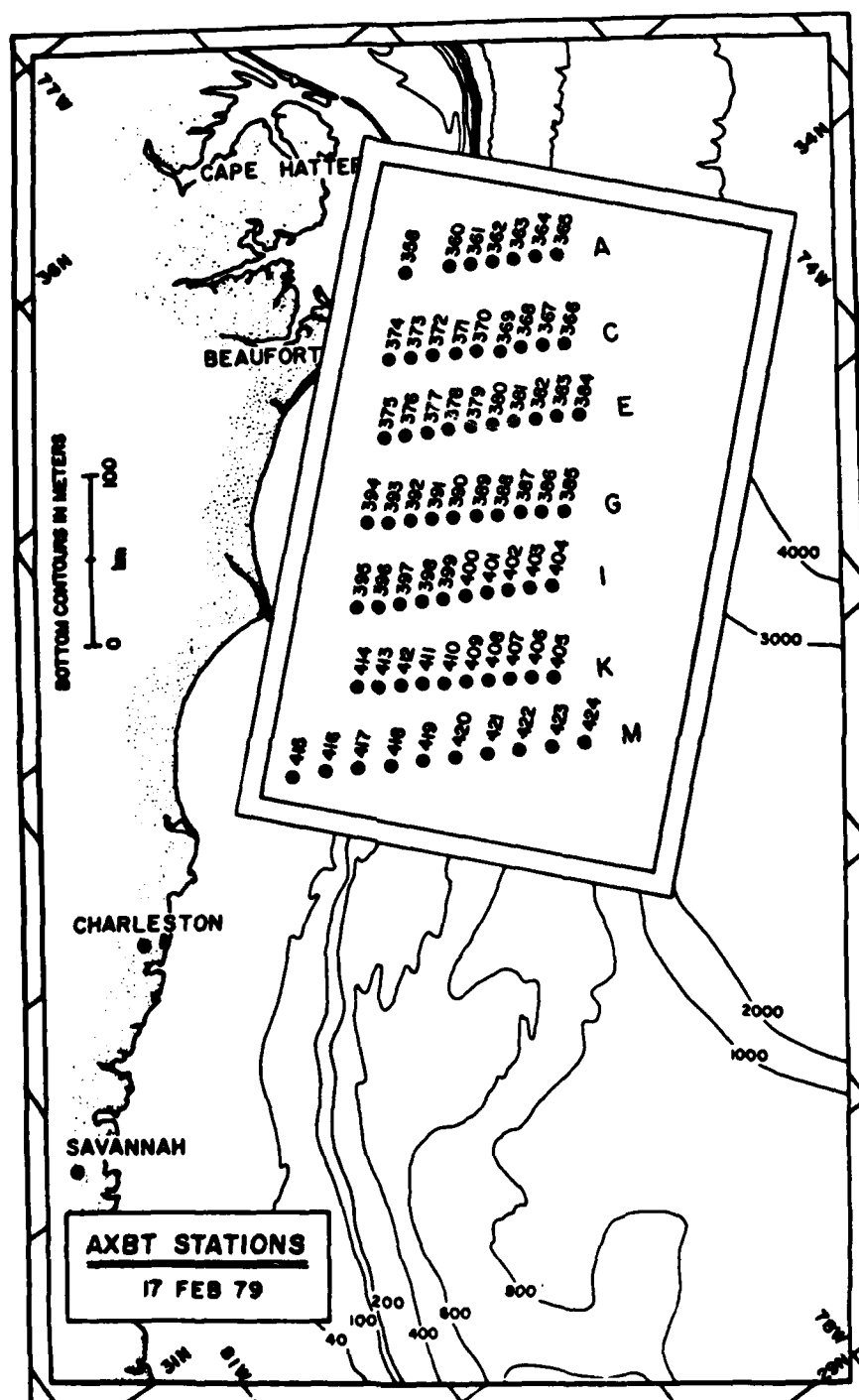


Figure 119. AXBT station locations, 17 February 1979.

Table 28. 17 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
358	34°48.3'	75°44.3'	60	1541:02
360	34°41.1'	75°30.0'	370	1545:05
361	34°37.2'	75°23.5'	370	1546:42
362	34°33.7'	75°16.6'	350	1548:49
363	34°30.0'	75°09.9'	370	1550:44
364	34°26.2'	75°03.2'	380	1552:42
365	34°22.3'	74°56.6'	350	1554:39
366	33°59.3'	75°16.8'	370	1605:56
367	34°03.1'	75°23.4'	370	1607:57
368	34°06.9'	75°30.3'	350	1610:01
369	34°10.0'	75°37.2'	370	1612:04
370	34°14.8'	75°43.7'	370	1614:07
371	34°18.4'	75°50.4'	350	1616:10
372	34°22.4'	75°57.2'	161	1618:16
373	34°26.0'	76°04.1'	65	1620:20
374	34°30.1'	76°10.8'	35	1622:24
375	34°11.9'	76°31.5'	45	1632:08
376	34°08.2'	76°24.8'	57	1634:05
377	34°04.6'	76°17.9'	77	1636:08
378	34°01.1'	76°11.1'	286	1638:07
379	33°57.5'	76°04.1'	370	1640:11
380	33°53.6'	75°57.5'	350	1642:18
381	33°50.1'	75°50.6'	370	1644:23
382	33°46.4'	75°43.8'	370	1646:19
383	33°42.8'	75°37.1'	350	1648:17
384	33°39.1'	75°30.3'	370	1650:15
385	33°18.7'	75°58.4'	370	1701:25
386	33°22.8'	76°05.0'	350	1703:26
387	33°26.9'	76°11.2'	370	1705:26
388	33°30.7'	76°18.0'	370	1707:28
389	33°34.7'	76°24.4'	350	1709:27
390	33°38.9'	76°31.4'	370	1711:34
391	33°42.8'	76°37.8'	156	1713:26
392	33°46.6'	76°44.4'	50	1715:20
393	33°50.4'	76°51.1'	43	1717:19
394	33°54.4'	76°57.4'	37	1719:14
395	33°36.0'	77°20.9'	35	1728:14
396	33°32.1'	77°14.3'	40	1730:25
397	33°28.8'	77°07.5'	48	1732:30
398	33°25.1'	77°00.5'	250	1734:40

Table 28 (con't). 17 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
399	33°21.4'	76°53.8'	332	1736:48
400	33°17.7'	76°46.9'	240	1738:53
401	33°14.3'	76°40.1'	350	1740:55
402	33°10.7'	76°33.4'	370	1743:01
403	33°07.0'	76°26.8'	370	1745:10
404	33°03.0'	76°19.8'	350	1747:18
405	32°41.2'	76°41.0'	370	1759:09
406	32°45.3'	76°47.4'	380	1801:11
407	32°49.3'	76°53.9'	350	1803:15
408	32°53.0'	77°00.4'	370	1805:15
409	32°57.1'	77°07.0'	300	1807:17
410	33°01.1'	77°13.6'	350	1809:18
411	33°05.1'	77°20.0'	282	1811:13
412	33°09.1'	77°26.5'	166	1813:05
413	33°12.8'	77°33.3'	61	1815:00
414	33°16.8'	77°39.7'	50	1816:55
415	33°07.4'	78°18.9'	35	1828:25
416	33°02.6'	78°08.4'	42	1831:35
417	32°57.1'	77°58.5'	138	1834:49
418	32°51.4'	77°48.3'	225	1838:07
419	32°46.3'	77°38.1'	370	1841:21
420	32°40.8'	77°28.2'	350	1844:44
421	32°35.3'	77°18.2'	370	1848:01
422	32°30.1'	77°08.0'	380	1851:21
423	32°24.4'	76°58.1'	370	1854:37
424	32°19.1'	76°47.9'	350	1857:50

17 FEBRUARY 1979

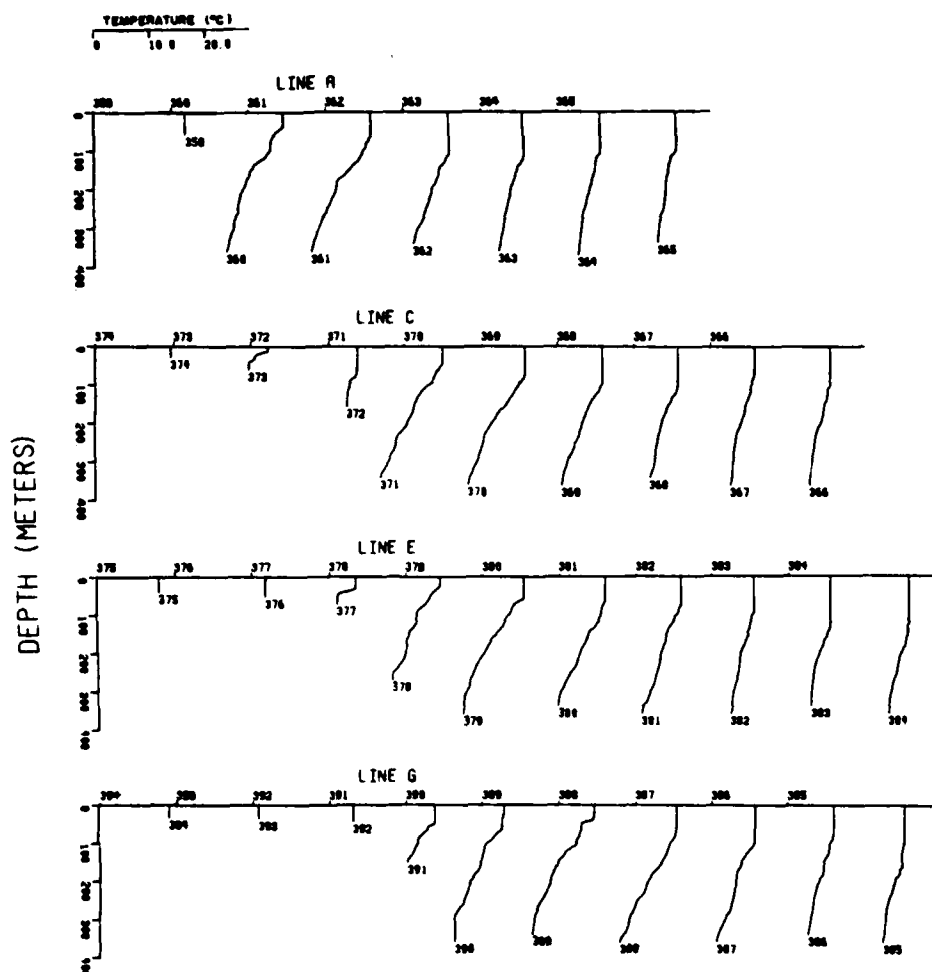


Figure 120. AXBT vertical temperature profiles,
17 February 1979.

17 FEBRUARY 1979

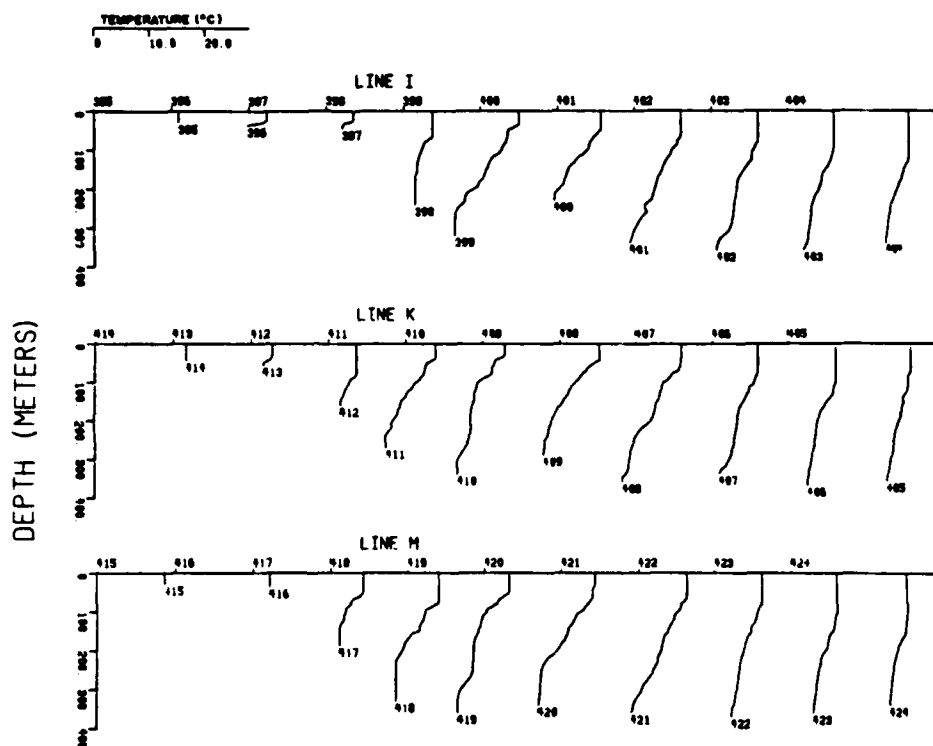


Figure 120 (cont'd).

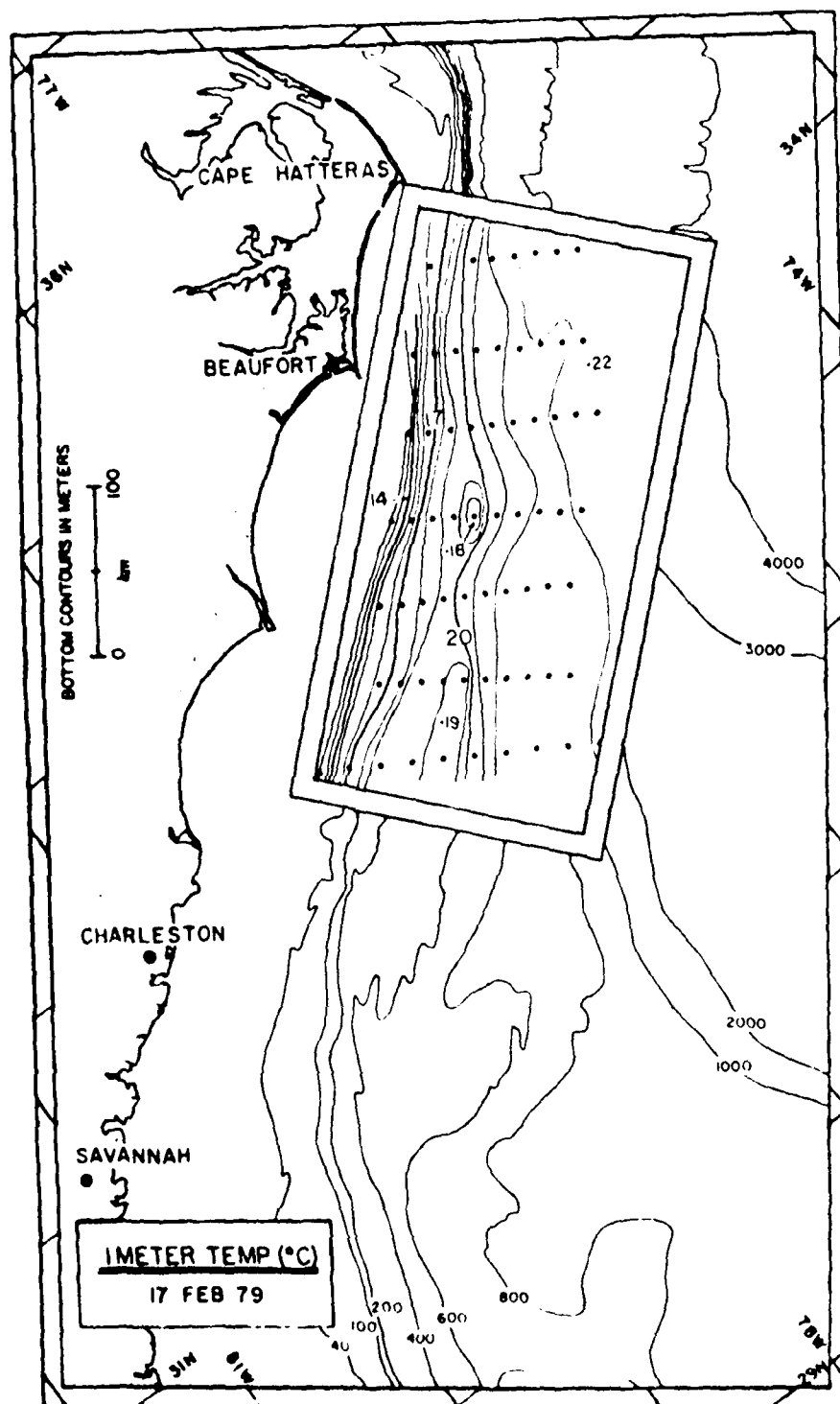


Figure 121. AXBT temperatures at 1 meter, 17 February 1979. Small solid circles indicate AXBT drop-sites.

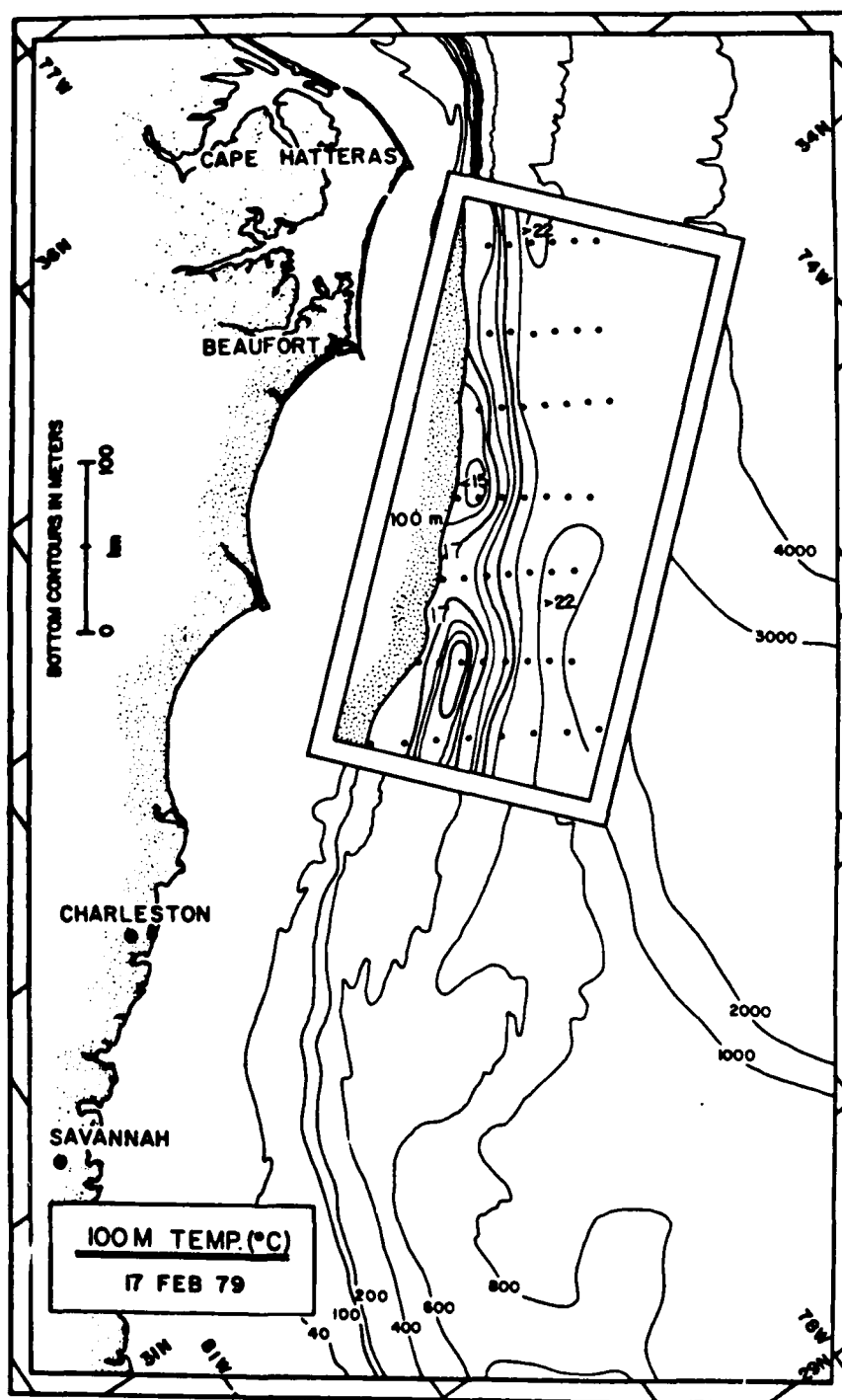


Figure 122. AXBT temperatures at 100 meters, 17 February 1979.

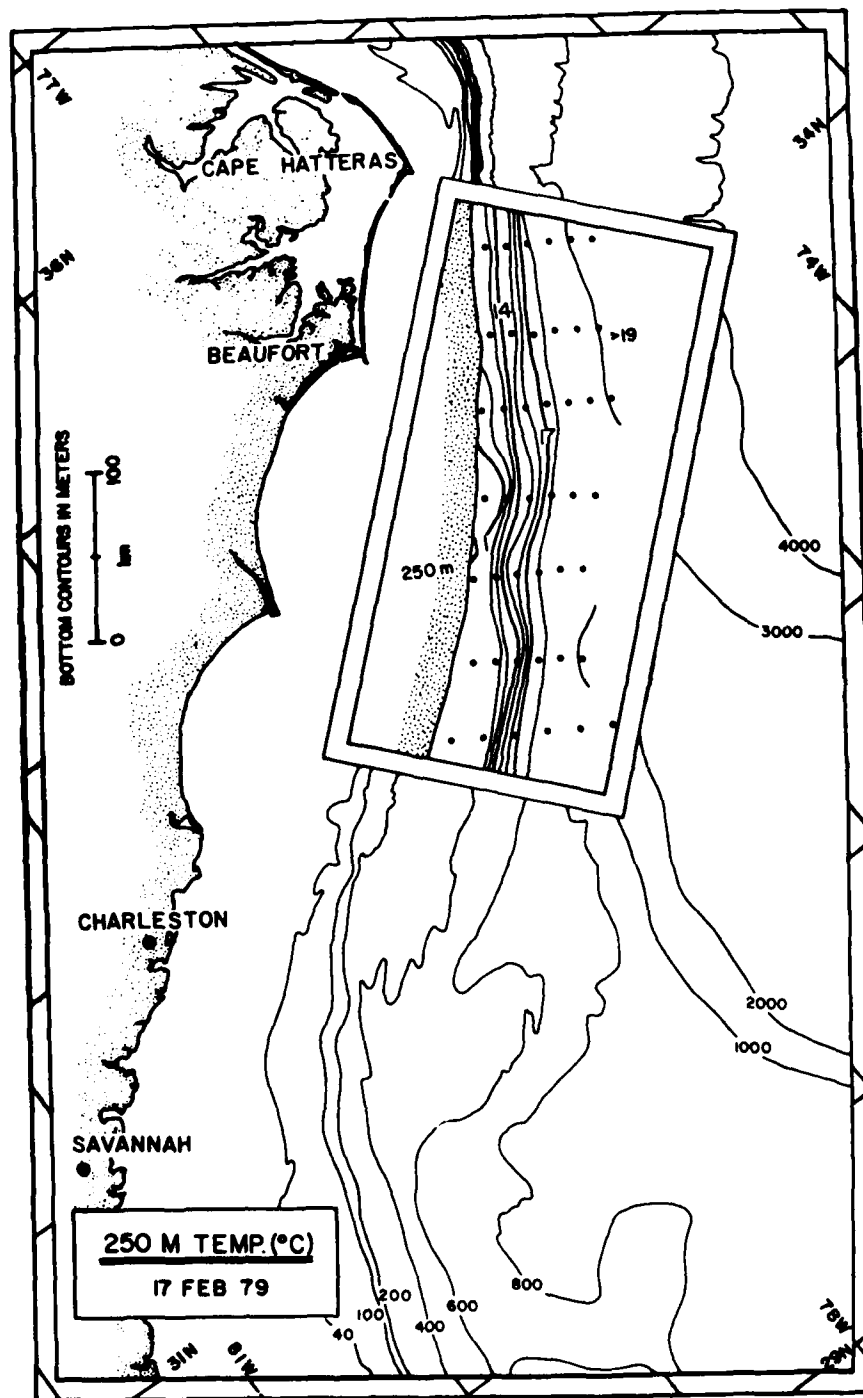


Figure 123. AXBT temperatures at 250 meters, 17 February 1979.

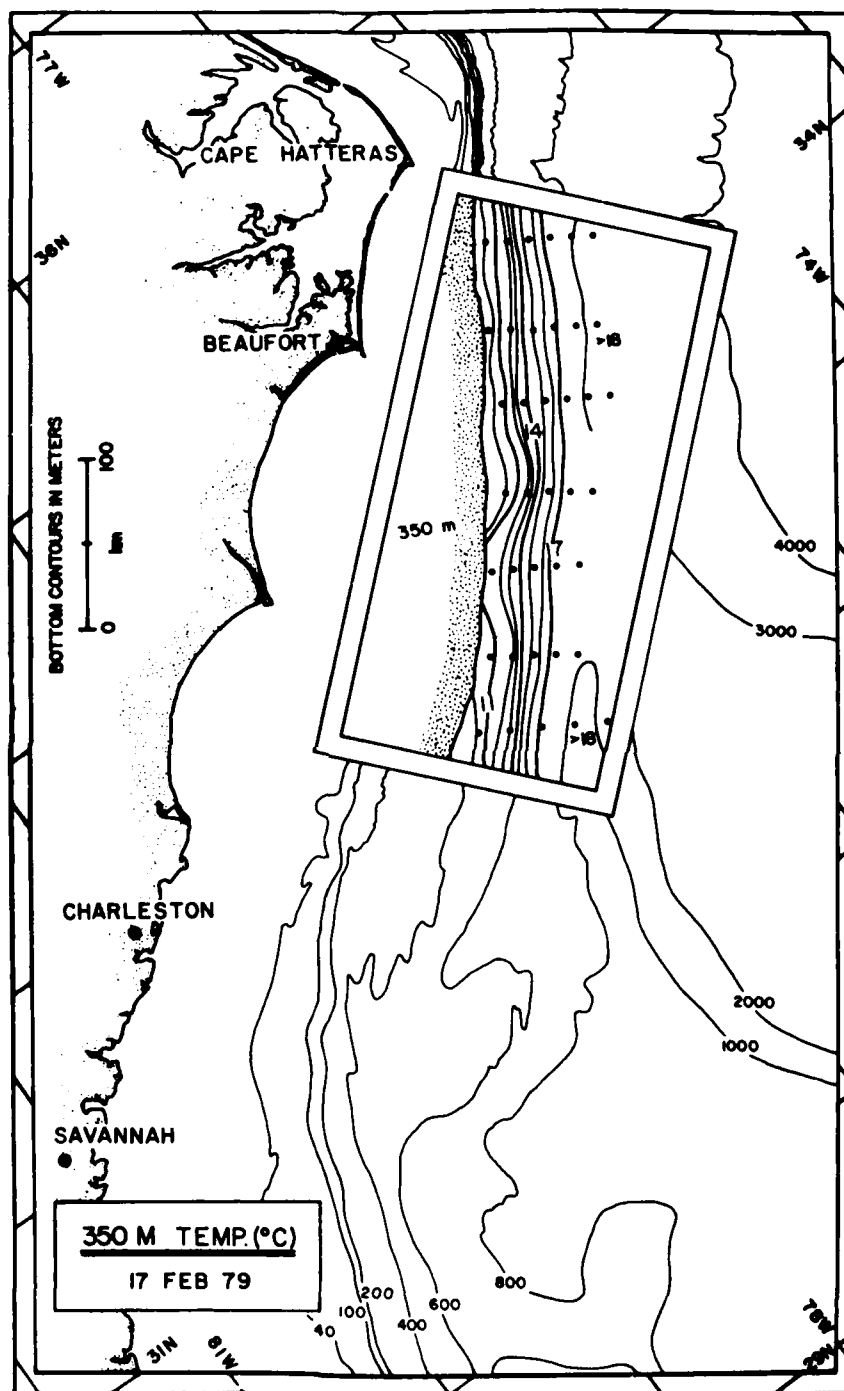


Figure 124. AXBT temperatures at 350 meters, 17 February 1979.

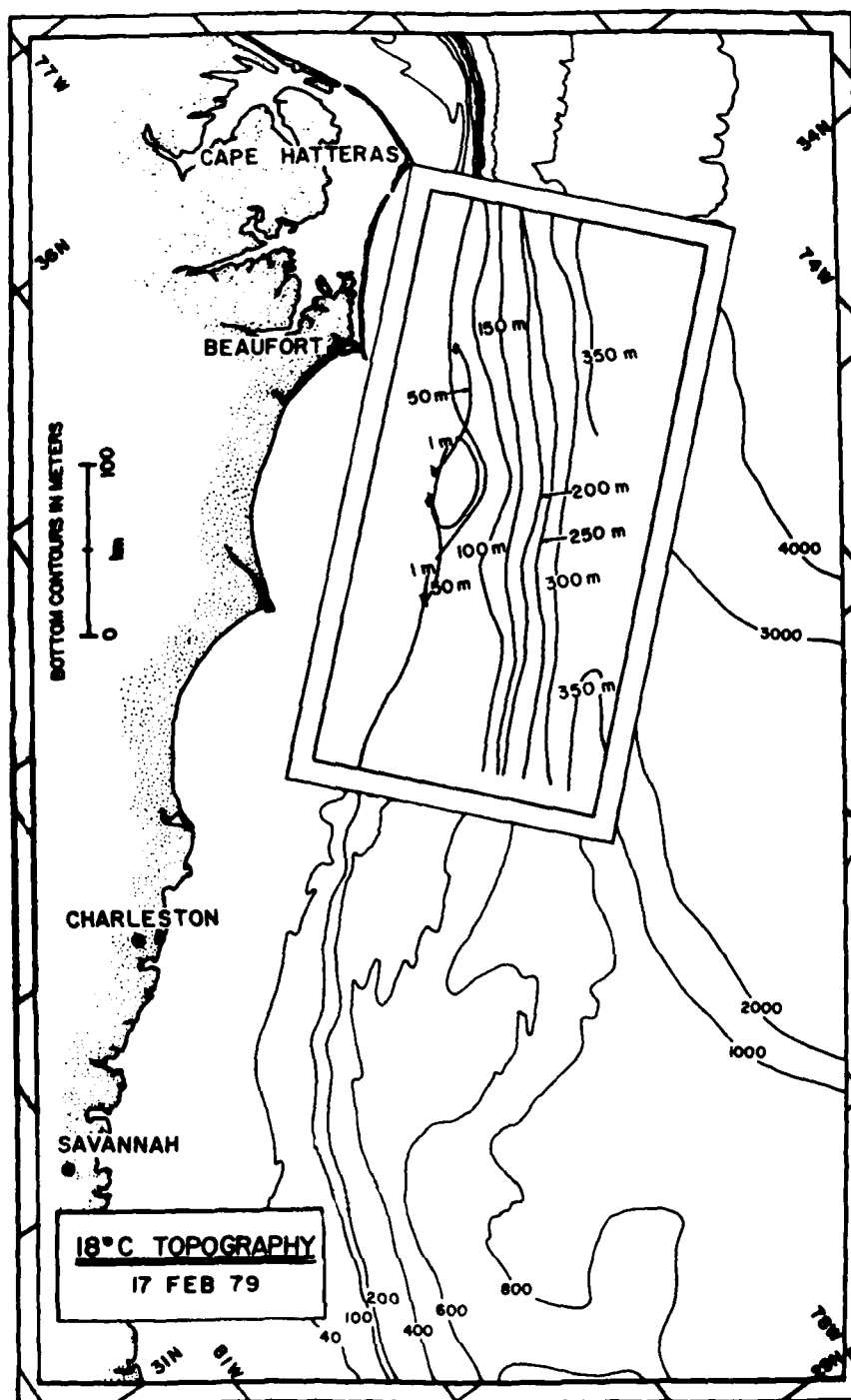


Figure 125. Topography of the 18°C isotherm, 17 February 1979.

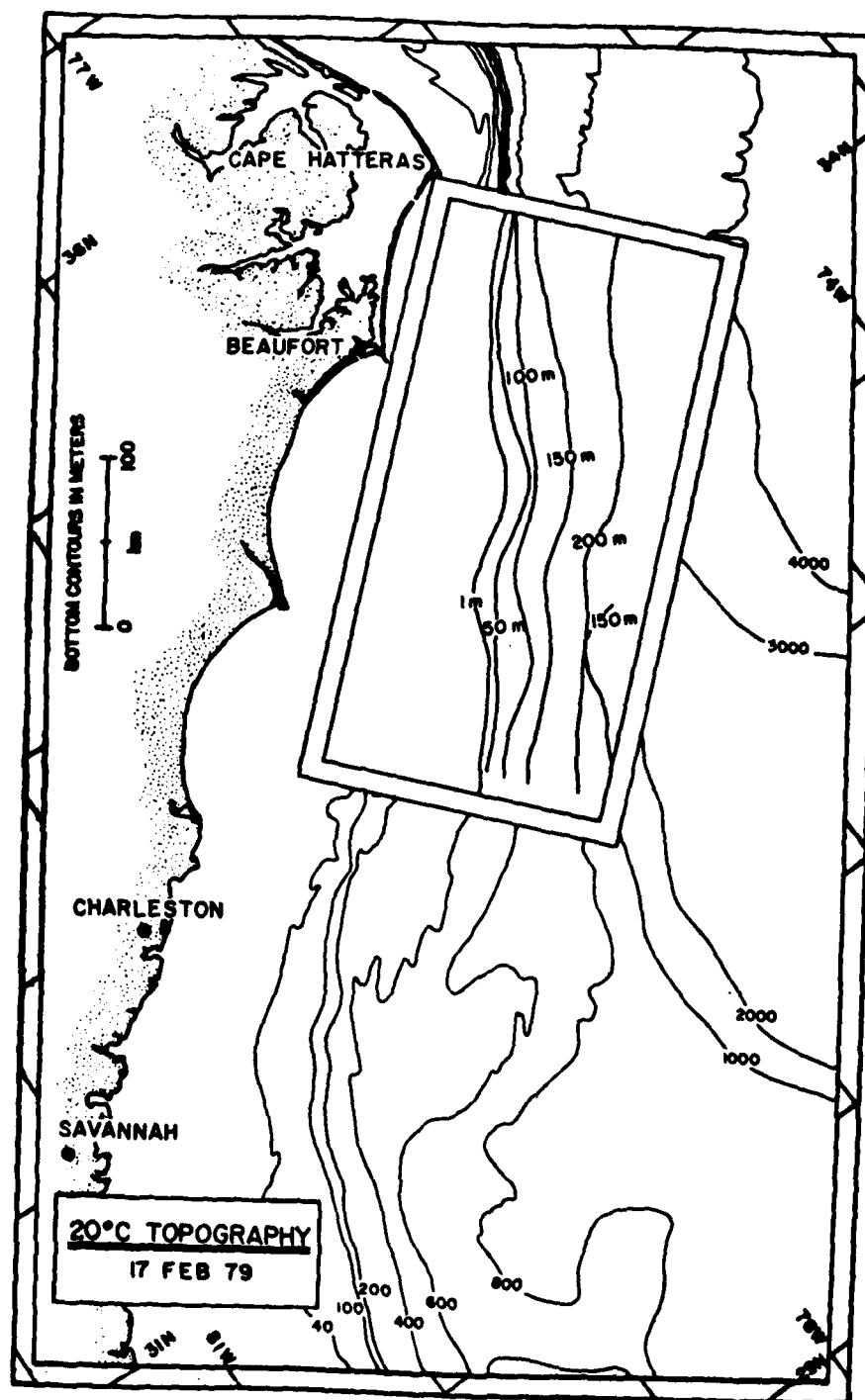


Figure 126. Topography of the 20°C isotherm, 17 February 1979.

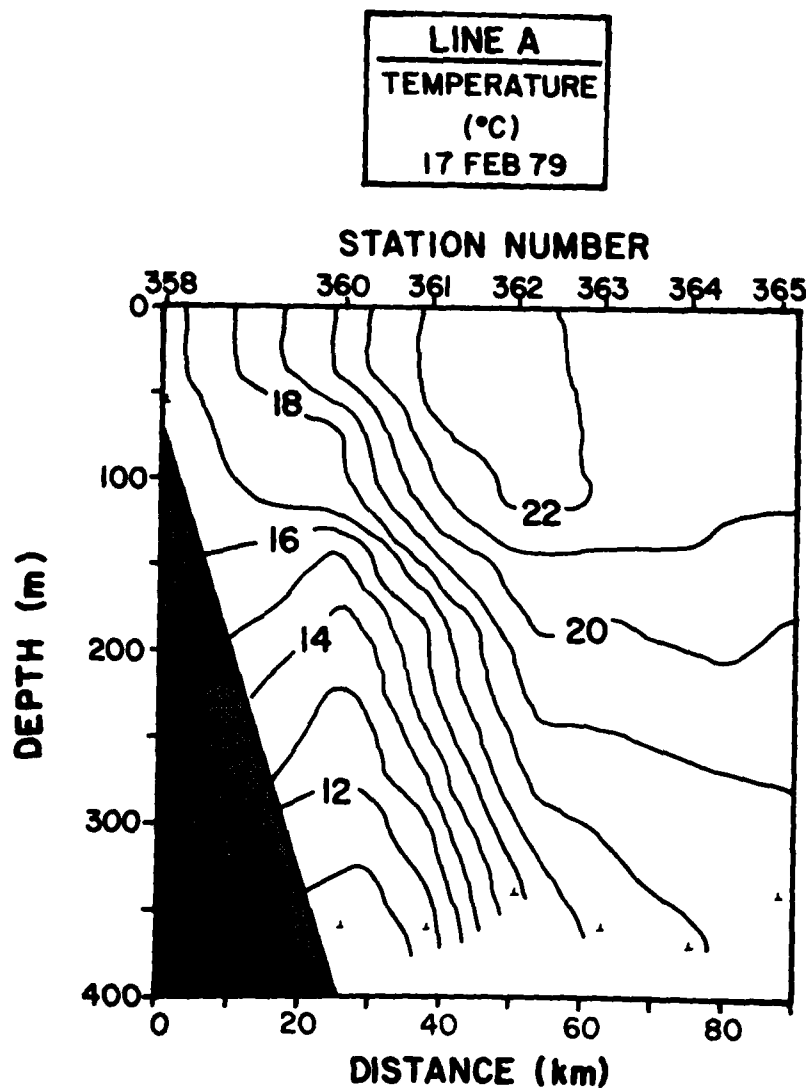


Figure 127. Cross-stream vertical temperature section along Line A, 17 February 1979.

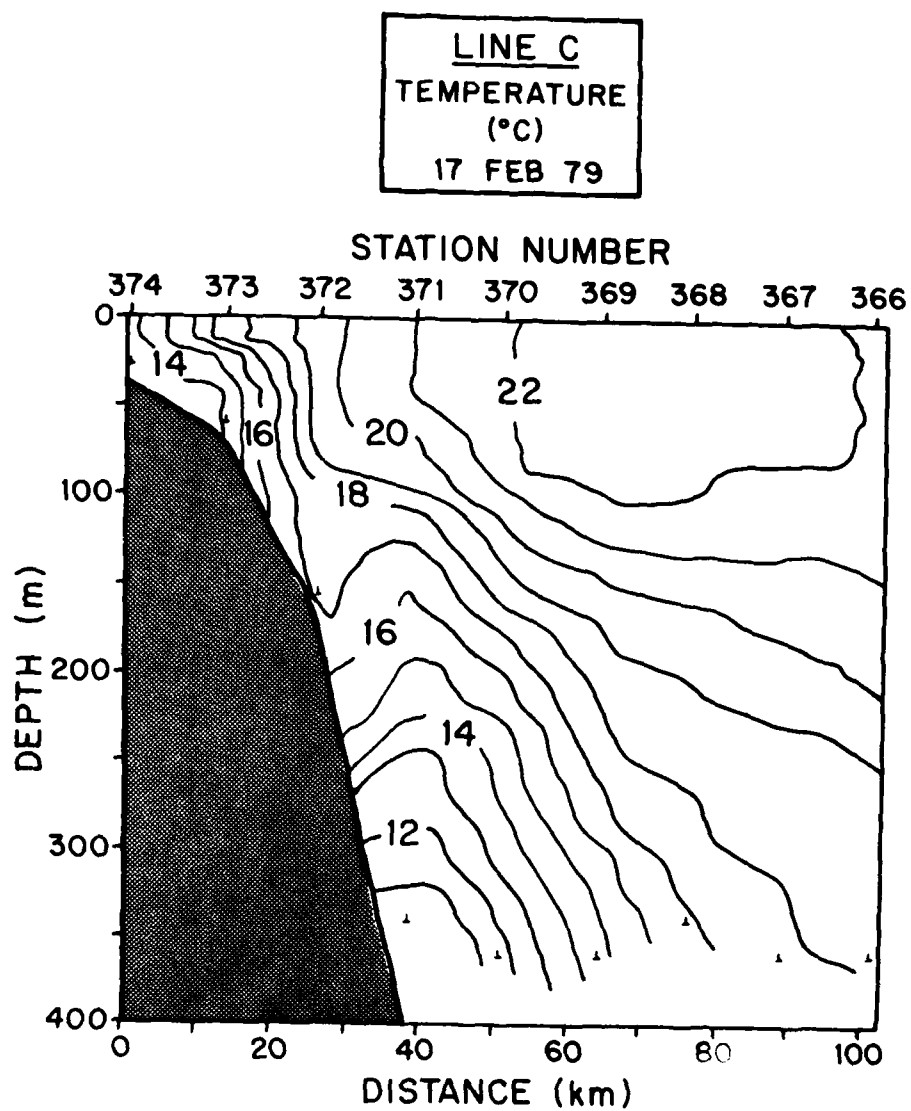


Figure 128. Cross-stream vertical temperature section along Line C, 17 February 1979.

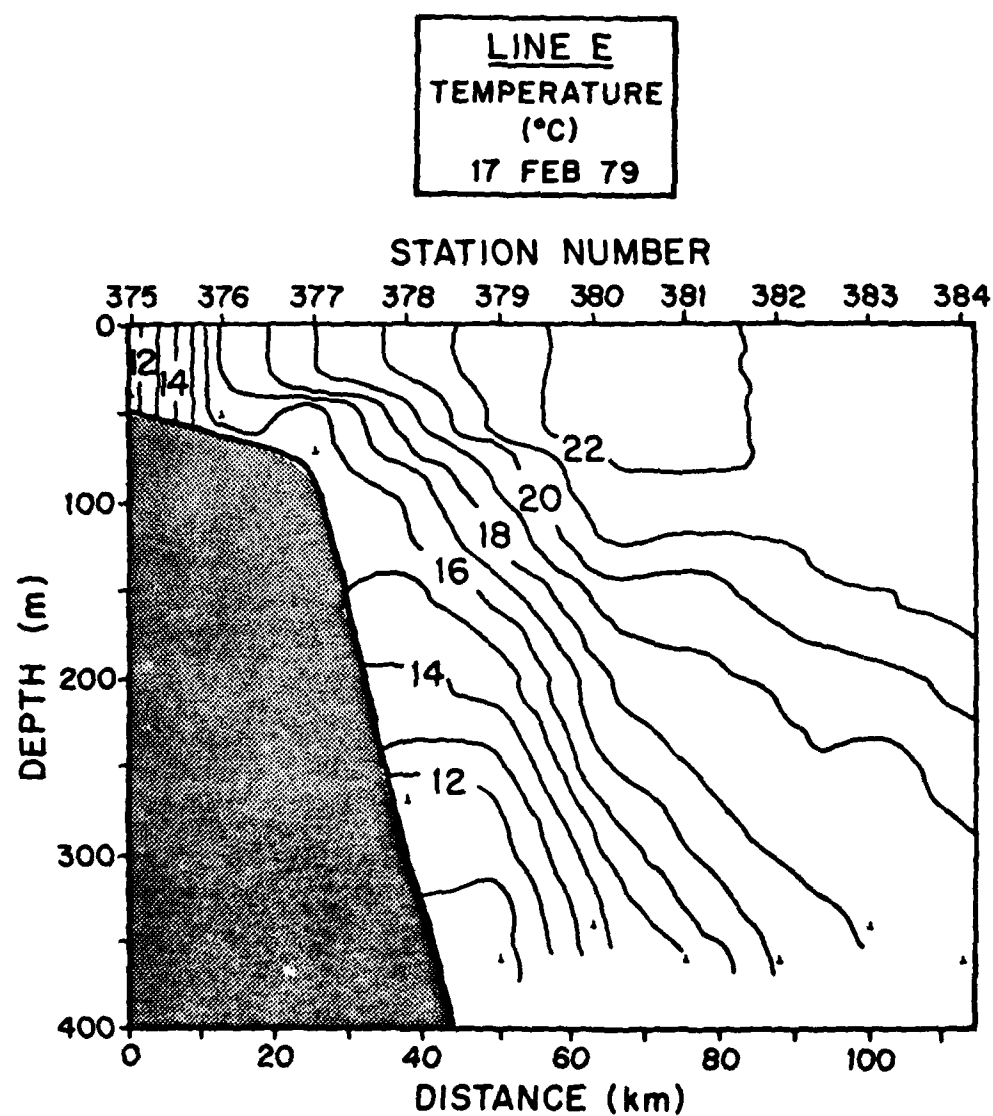


Figure 129. Cross-stream vertical temperature section along Line E, 17 February 1979.

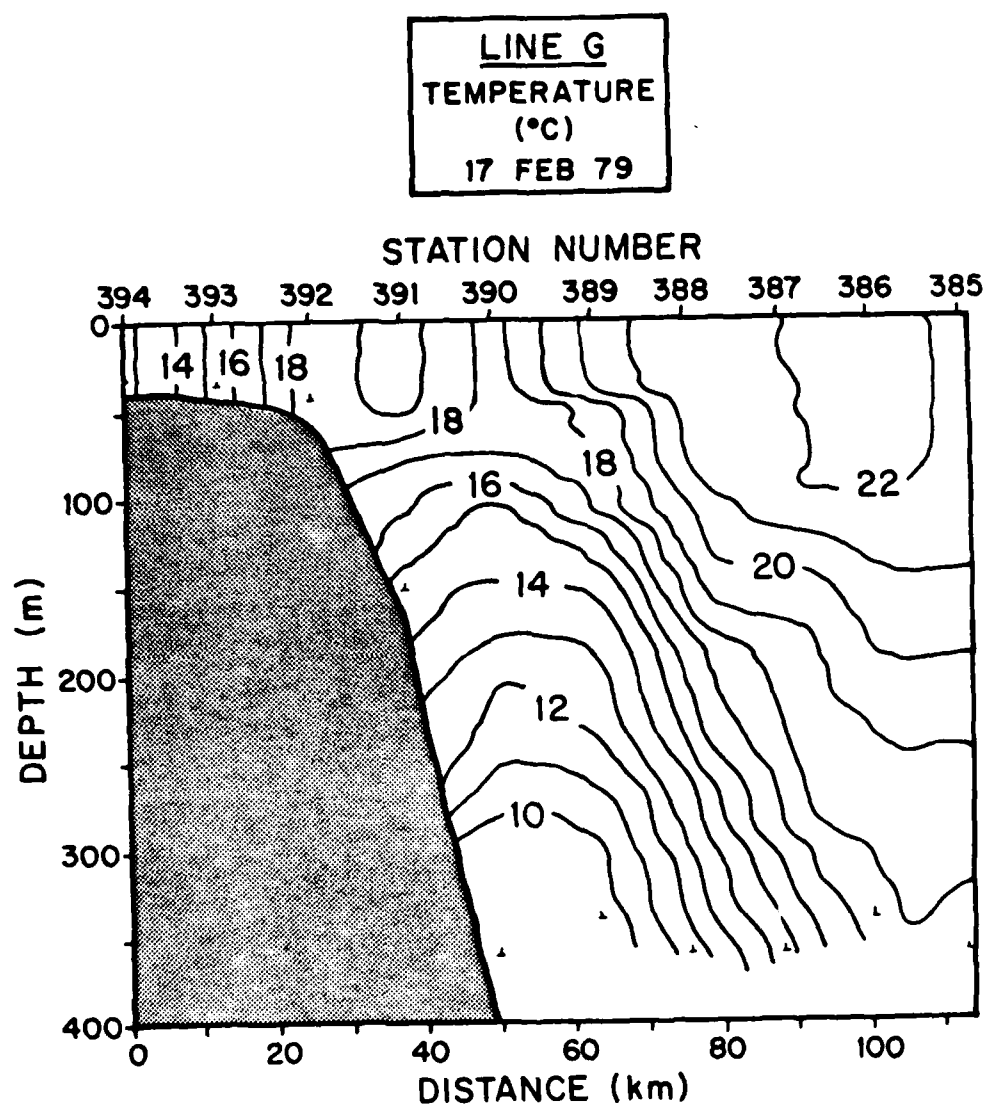


Figure 130. Cross-stream vertical temperature section along Line G, 17 February 1979.

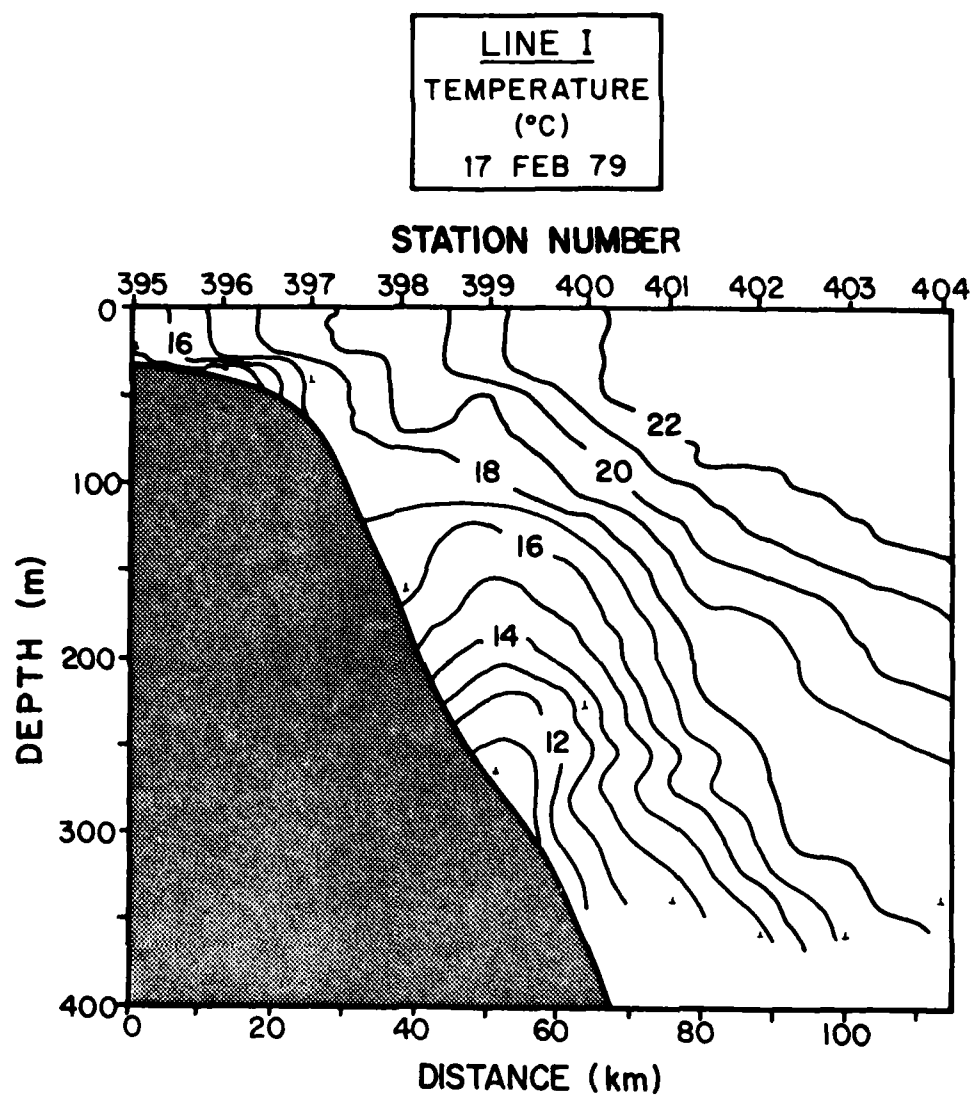


Figure 131. Cross-stream vertical temperature section along Line I, 17 February 1979.

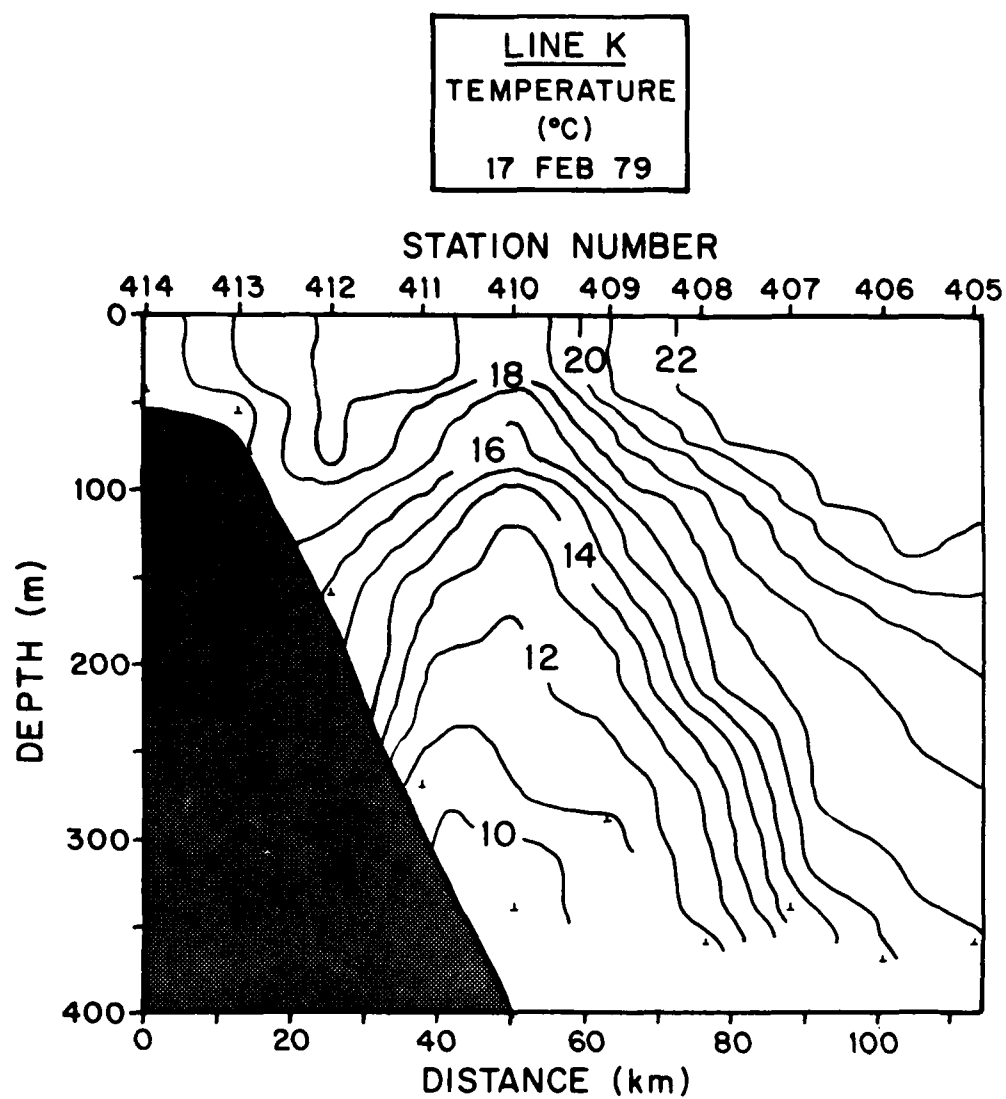


Figure 132. Cross-stream vertical temperature section along Line K, 17 February 1979.

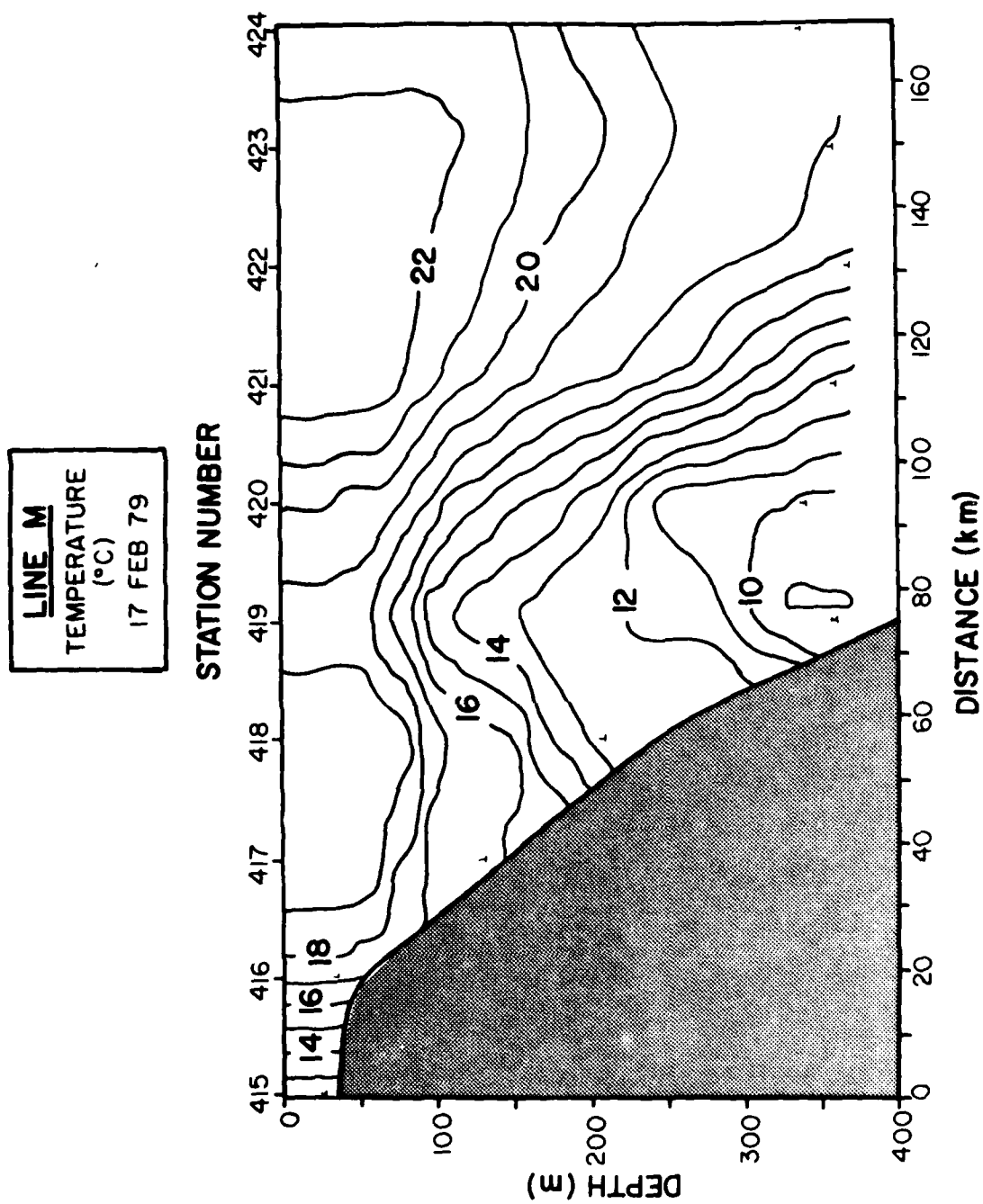


Figure 133. Cross-stream vertical temperature section along Line M, 17 February 1979.

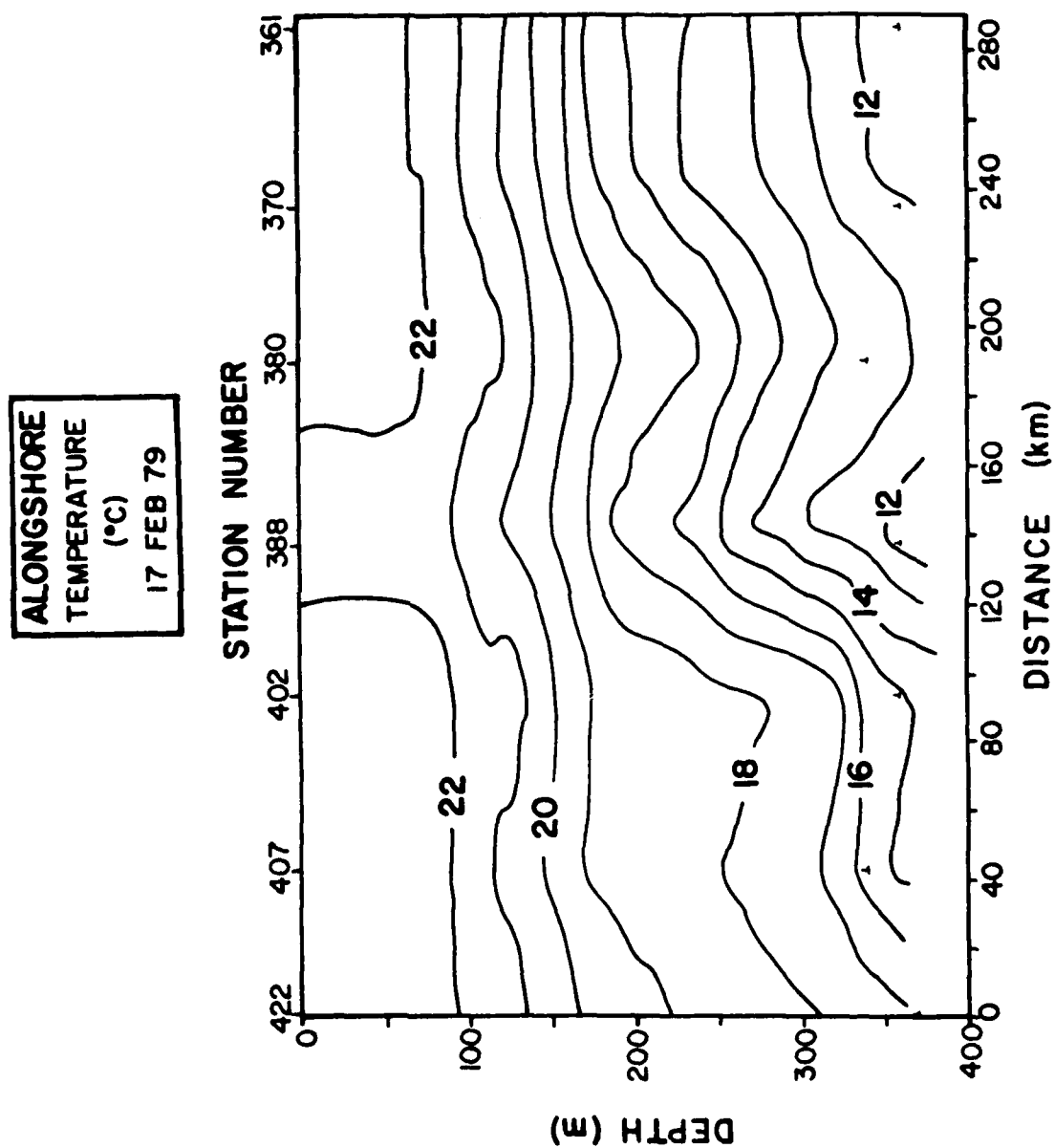


Figure 134. Alongshore vertical temperature section, 17 February 1979.

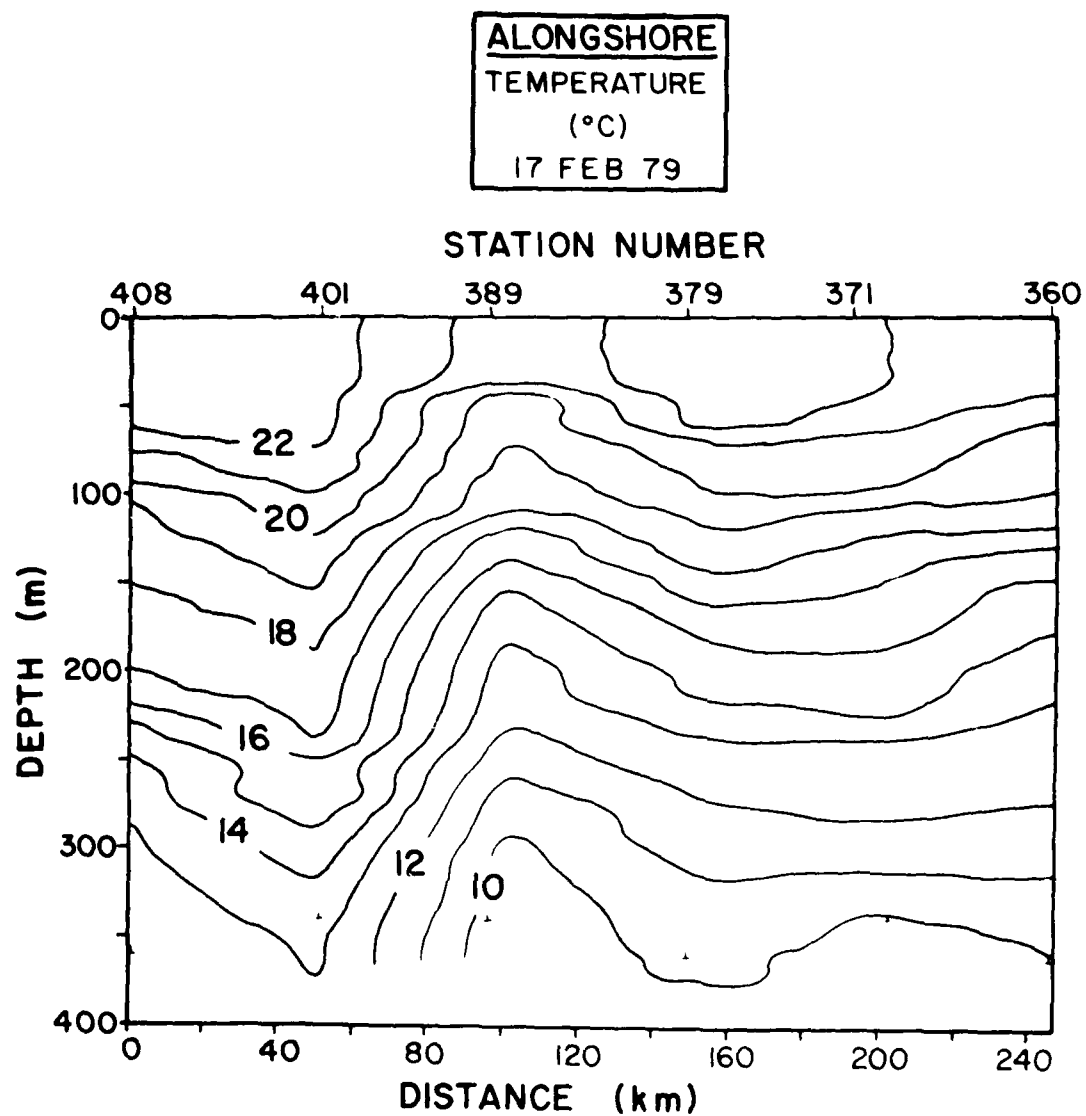


Figure 135. Alongshore vertical temperature section,
17 February 1979.

AD-A098 182

NORTH CAROLINA UNIV AT CHAPEL HILL

F/G R/10

THE GULF STREAM MEANDERS EXPERIMENT. AXBT/PRT DATA REPORT, R/A --ETC(U)

DEC 80 J M BANE, D A BROOKS, K R LORENSON

N00014-77-C-0354

UNCLASSIFIED

CMS-80-2

NL

3-3

4-1

5-1

6-1

7-1

8-1

9-1

10-1

11-1

12-1

13-1

14-1

15-1

16-1

17-1

18-1

19-1

20-1

21-1

22-1

23-1

24-1

25-1

26-1

27-1

28-1

29-1

30-1

31-1

32-1

33-1

34-1

35-1

36-1

37-1

38-1

39-1

40-1

41-1

42-1

43-1

44-1

45-1

46-1

47-1

48-1

49-1

50-1

51-1

52-1

53-1

54-1

55-1

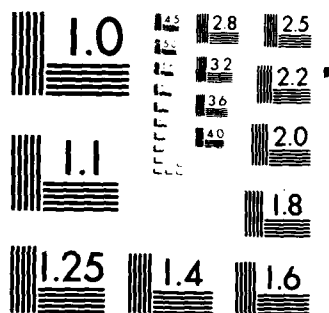
END

DATE

FILED

5-81

DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

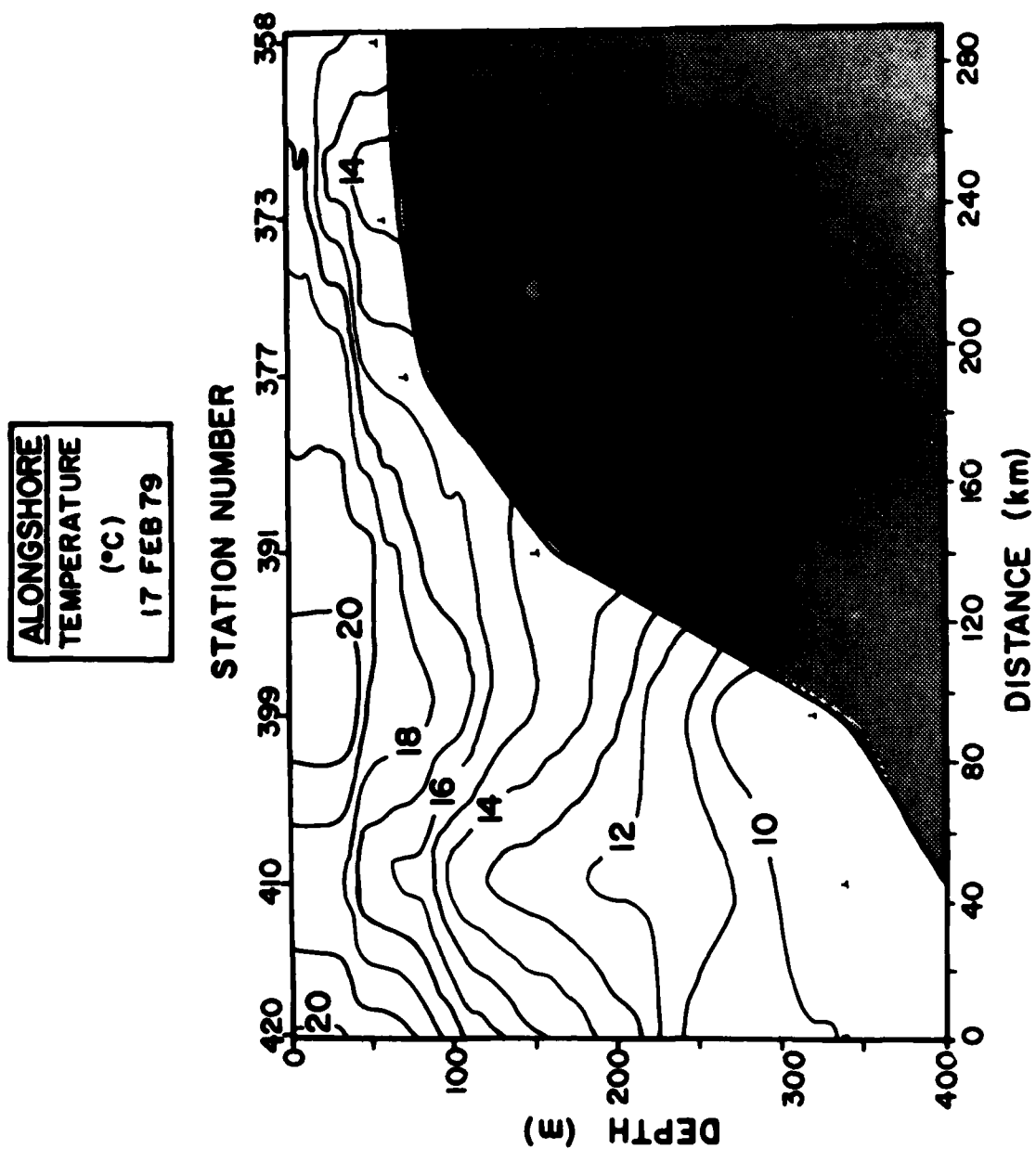


Figure 136. Alongshore vertical temperature section, 17 February 1979.

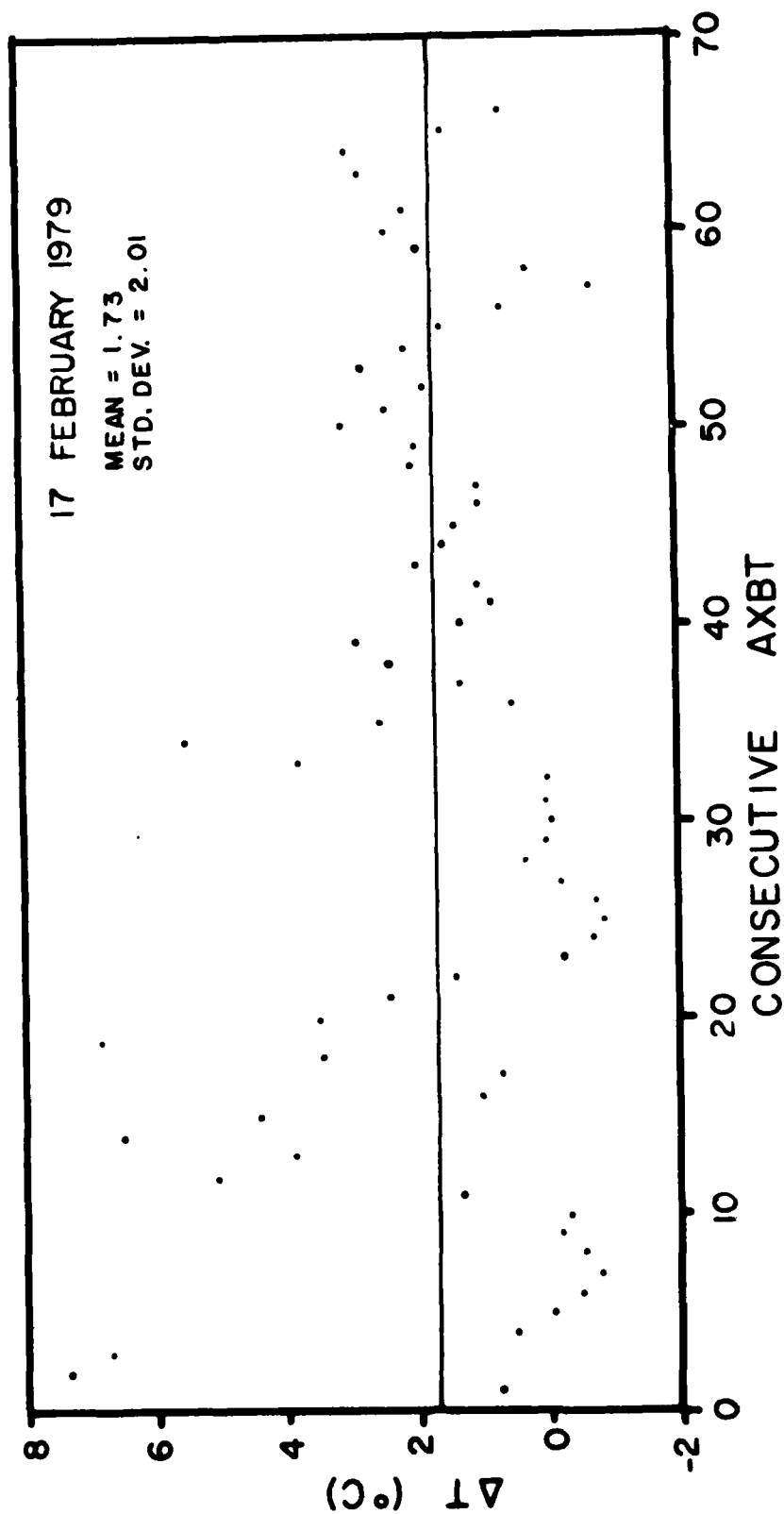


Figure 137. Difference between 1 meter AXBT and PRT temperatures ($T_{AXBT} - T_{PRT}$) versus consecutive AXBT number, 17 February 1979.

FLIGHT 8: 18 FEBRUARY 1979

Survey Time: 1621:33 to 1952:27

Table 29. 18 February 1979 PRT Line End Points

TIME (Hr-Min-Sec)	LATITUDE (°N)	LONGITUDE (°W)	LINE
1621:32	32°46.51'	78°51.05'	O
1707:44	31°51.60'	77°11.09'	
1718:04	31°28.90'	77°30.01'	Q
1743:23	32°24.27'	79°08.50'	
1753:38	32°01.16'	79°25.91'	S
1854:38	31°05.76'	77°45.31'	
1905:53	30°43.10'	77°51.32'	U
1927:23	31°40.69'	79°40.91'	

Table 30. 18 February 1979 Flight Updates

<u>TIME(Hrs.)</u>	<u>EVENT</u>	<u>OLD POSITION</u>	<u>NEW POSITION</u>	<u>TYPE OF FIX FOR UPDATES</u>
14.89	TAKEOFF			
15.76	NAV.	34°37.34'N	34°37.87'N	SATELLITE
	UPDATE	77°36.51'W	77°35.23'W	
17.56	NAV.	32°02.96'N	32°05.47'N	SATELLITE
	UPDATE	78°32.08'W	78°31.07'W	
20.48	NAV.	32°37.10'N	32°39.00'N	LTN-51
	UPDATE	78°01.79'W	77°56.00'W	
	- last data point			

Table 31. 18 February 1979 PRT Calibration
Temperatures and Times

<u>TIME</u> (Hrs.)	<u>CALIBRATION TEMPERATURE (°C)</u>		
	12.00	18.00	24.00
16.20	1.23	1.08	0.85
17.18	0.93	0.83	0.50
18.75	0.72	0.47	0.20
19.95	0.34	0.13	-0.27
21.12	0.23	0.00	-0.47

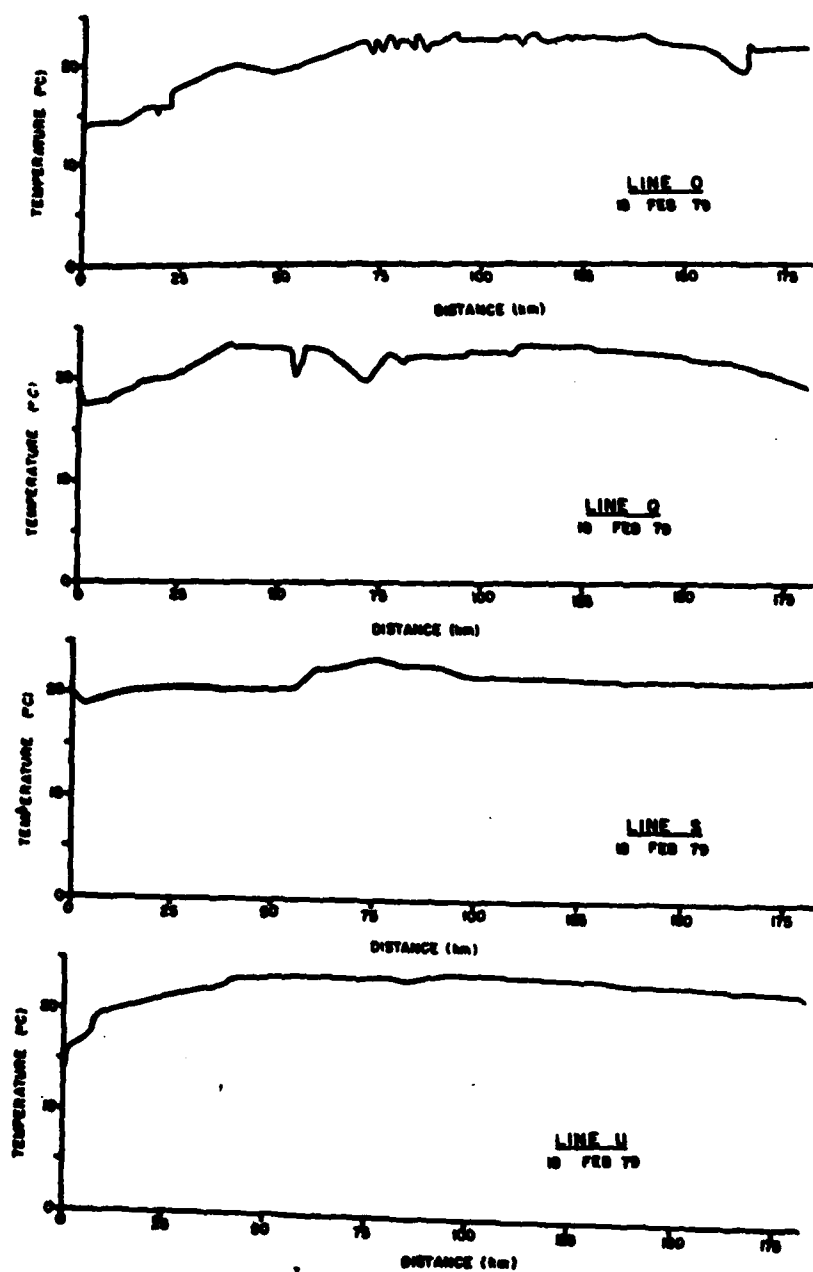


Figure 138. PRT cross-stream surface temperature profiles, 18 February 1979.

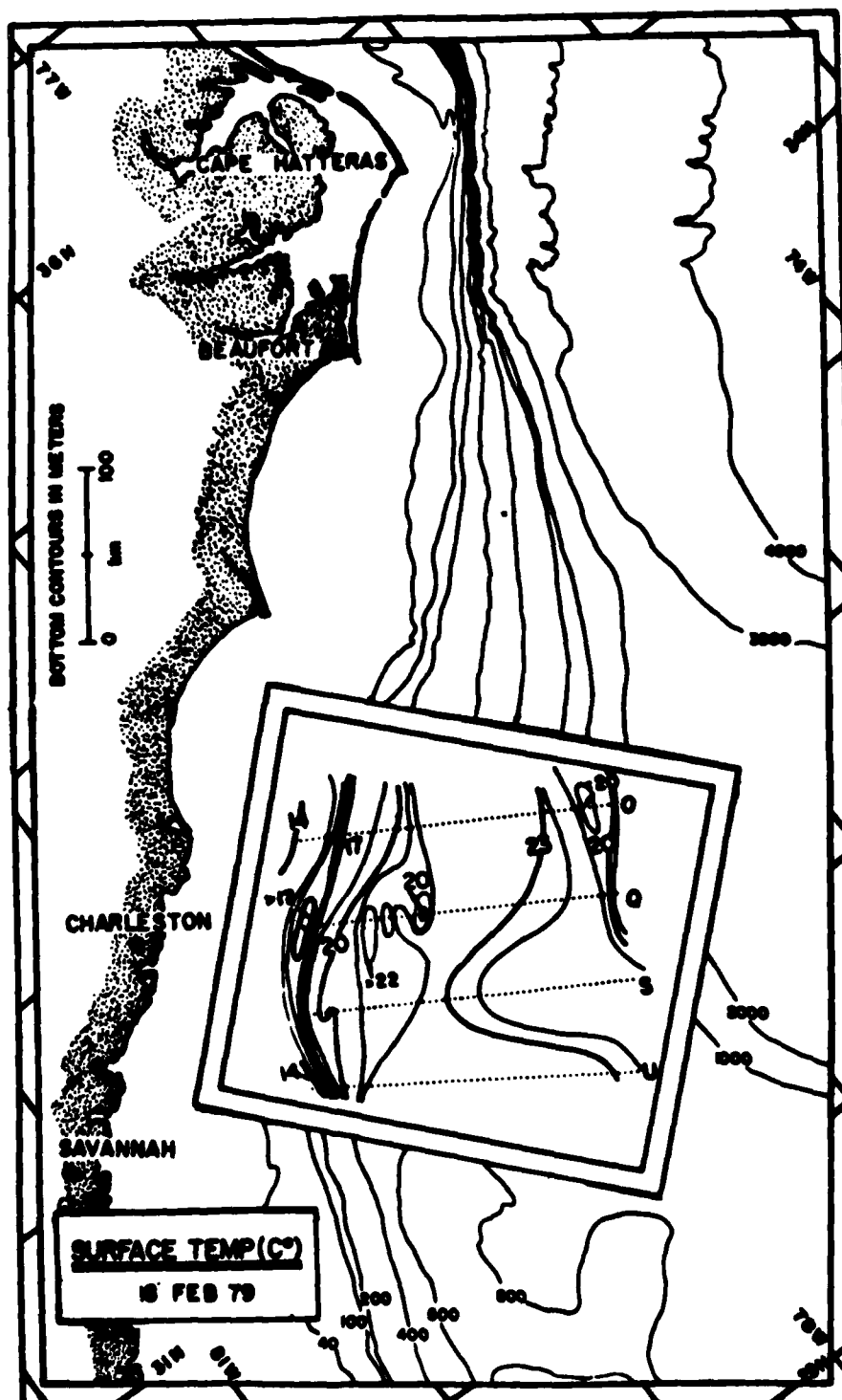


Figure 139. PRT sea surface temperature field, 18 February 1979. Dashed lines indicate positions of cross-stream data lines.

Table 32. 18 February 1979; AXBT Station coordinates, depths, and deployment times.

AXBT Station Number	Latitude (°N)	Longitude (°W)	Depth of Trace (m)	Time-GMT (Hr-Min-Sec)
428	32°46.5'	78°51.1'	34	1621:33
429	32°41.0'	78°41.0'	38	1625:27
430	32°35.6'	78°31.0'	199	1629:18
431	32°30.1'	78°21.0'	211	1633:04
432	32°24.5'	78°10.9'	333	1636:58
433	32°19.0'	78°00.9'	350	1640:32
434	32°13.6'	77°50.9'	370	1644:02
435	32°08.0'	77°41.1'	380	1647:45
436	32°02.6'	77°30.0'	370	1651:28
438	31°57.2'	77°19.5'	370	1703:56
439	31°51.6'	77°11.1'	350	1707:43
440	31°28.9'	77°30.0'	370	1718:05
441	31°34.9'	77°39.7'	380	1720:44
442	31°40.6'	77°49.5'	330	1723:15
443	31°46.3'	77°59.3'	350	1725:46
444	31°52.4'	78°08.8'	380	1728:18
445	31°58.0'	78°18.8'	350	1730:50
446	32°03.9'	78°28.4'	370	1733:19
447	32°07.1'	78°39.2'	323	1735:51
448	32°12.9'	78°48.9'	280	1738:21
449	32°18.4'	78°58.8'	100	1740:50
450	32°24.3'	79°08.5'	58	1743:23
451	32°01.2'	79°25.9'	58	1753:39
452	31°55.8'	79°15.8'	155	1757:30
454	31°50.7'	79°05.2'	380	1808:05
456	31°44.9'	78°55.3'	350	1818:39
457	31°39.2'	78°45.3'	370	1822:12
458	31°33.8'	78°35.2'	350	1825:42
459	31°28.3'	78°25.3'	380	1829:10
460	31°22.7'	78°15.3'	370	1832:37
461	31°16.9'	78°05.5'	350	1836:09
462	31°11.4'	77°55.6'	380	1839:43
464	31°05.8'	77°45.3'	340	1854:40
467	30°55.0'	78°23.5'	380	1911:09
470	31°06.3'	78°42.9'	370	1916:28
471	31°29.2'	79°21.6'	340	1927:23
472	31°40.7'	79°40.9'	85	1933:23
473	31°34.0'	79°30.3'	195	1939:01
474	31°23.0'	79°10.3'	380	1945:12
475	31°11.9'	78°50.3'	380	1952:27

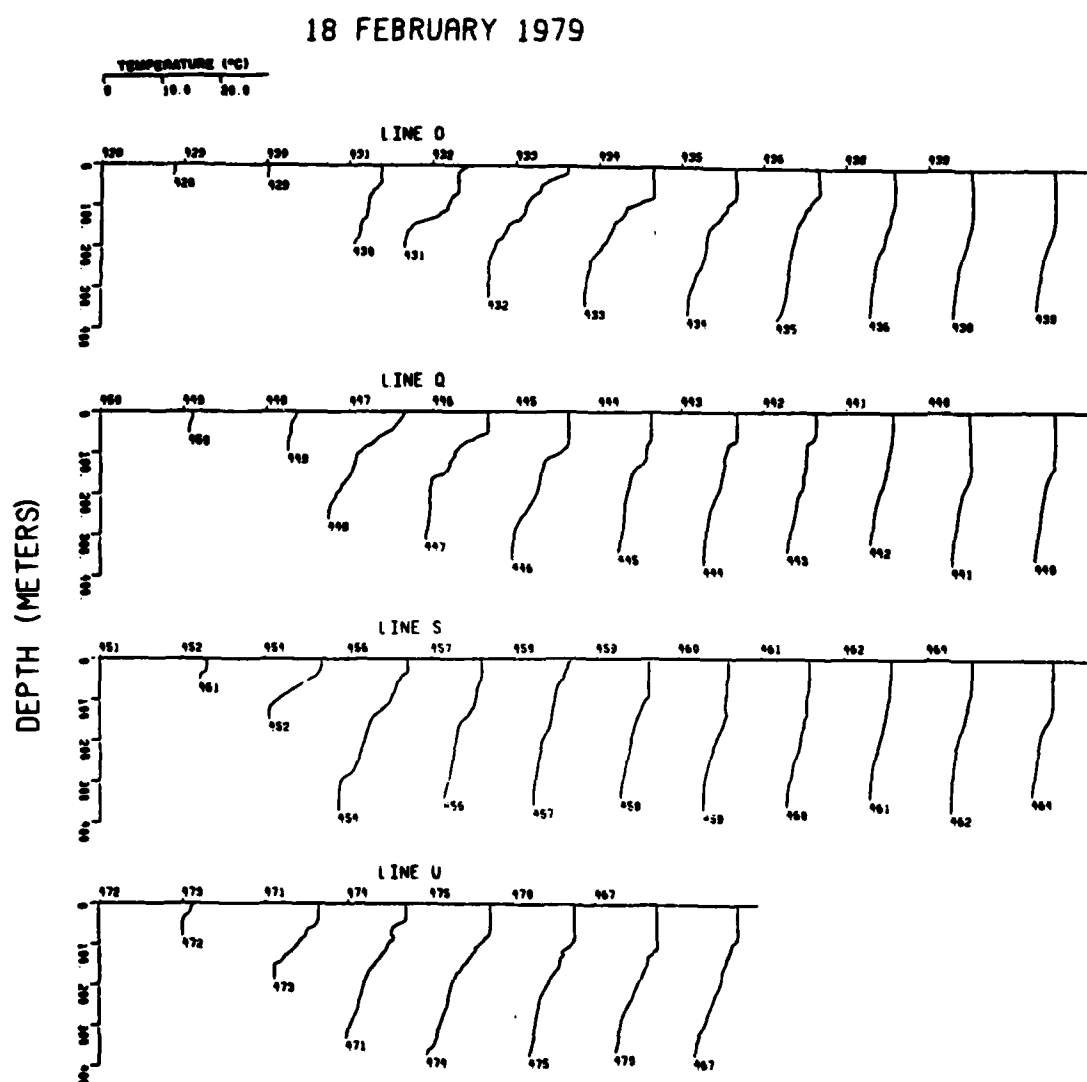


Figure 141. AXBT vertical temperature profiles, 18 February 1979.

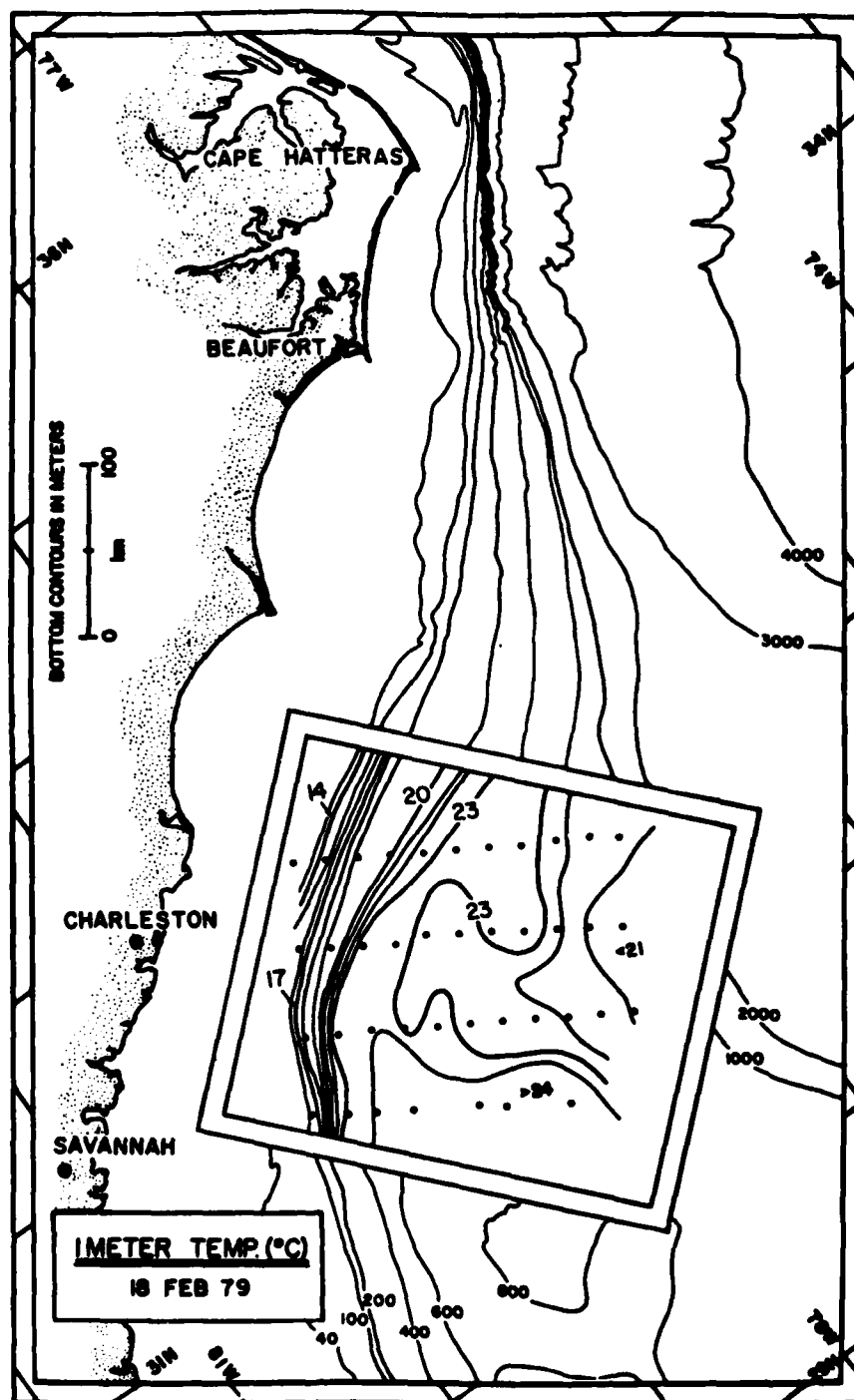


Figure 142. AXBT temperatures at 1 meter, 18 February 1979. Small solid circles indicate AXBT drop-sites.

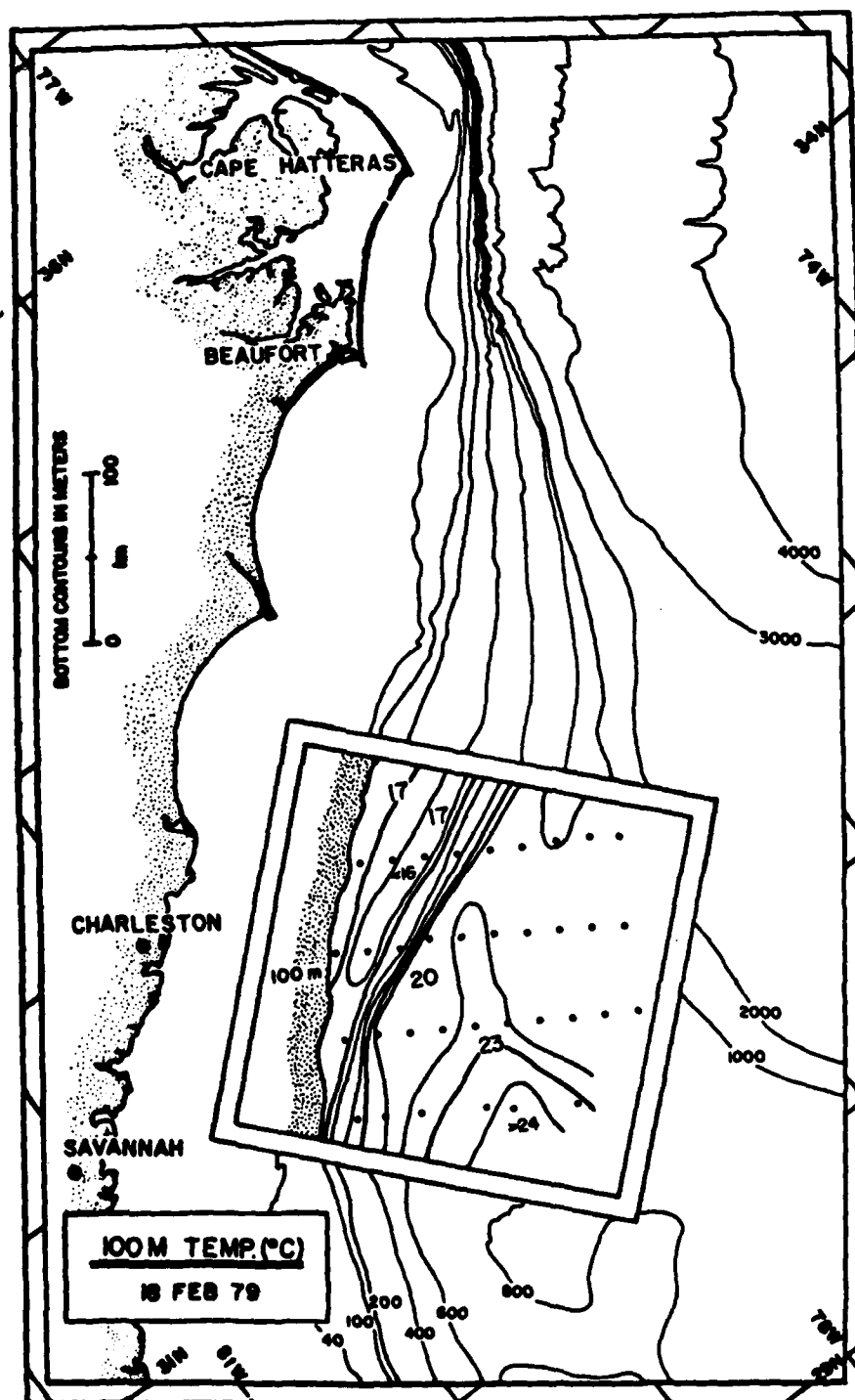


Figure 143. AXBT temperatures at 100 meters, 18 February 1979.

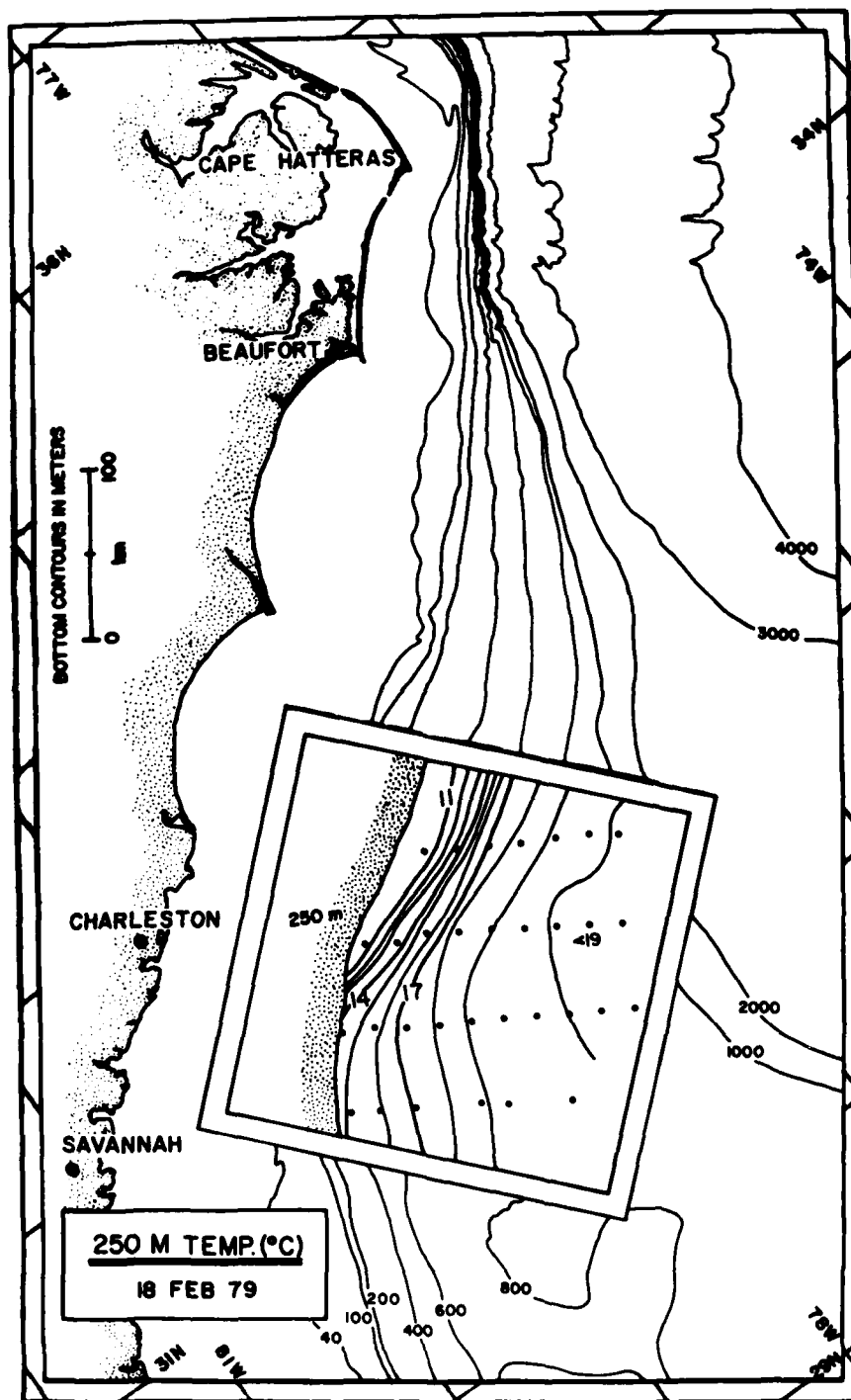


Figure 144. AXBT temperatures at 250 meters, 18 February 1979.

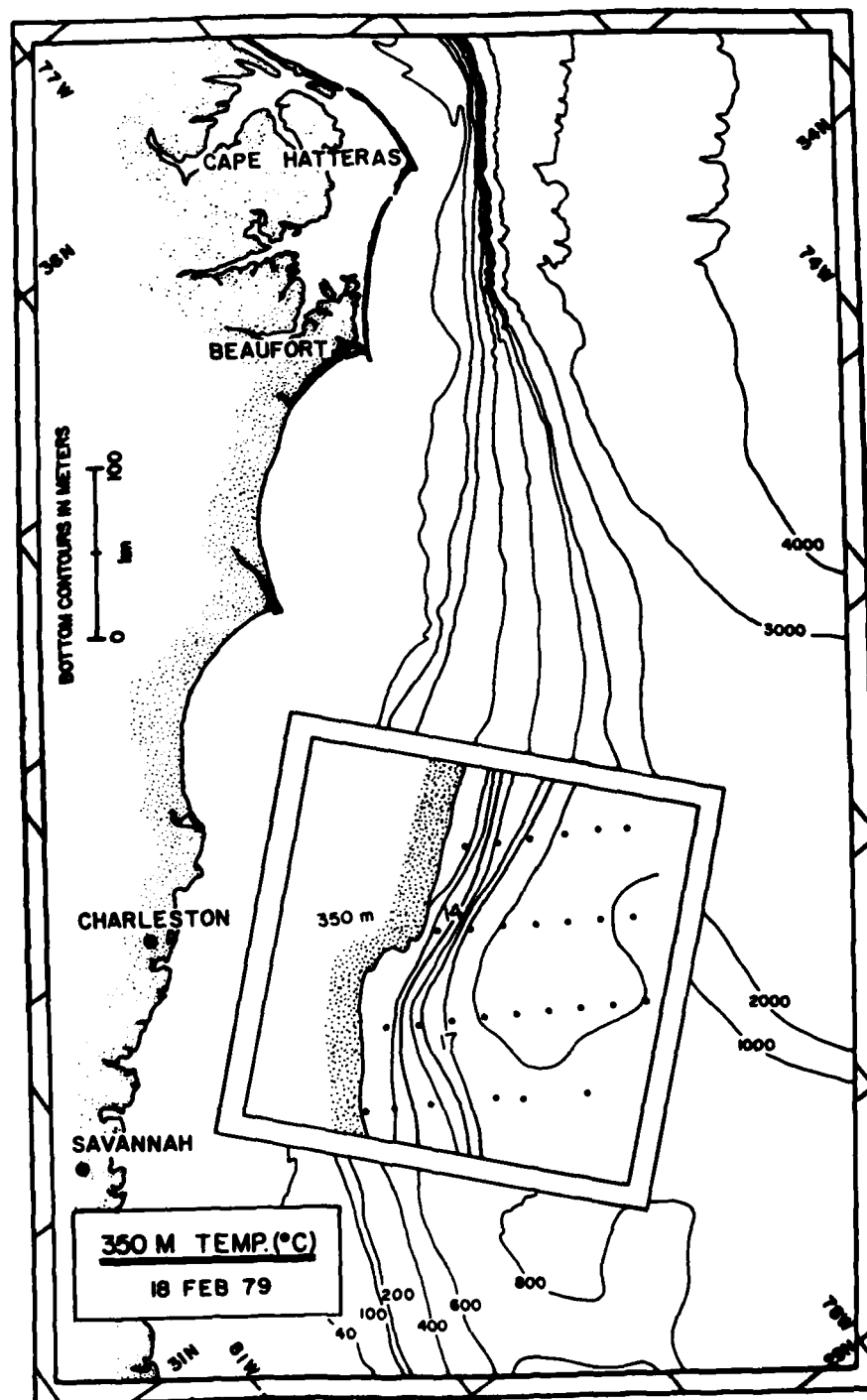


Figure 145. AXBT temperatures at 350 meters, 18 February 1979.

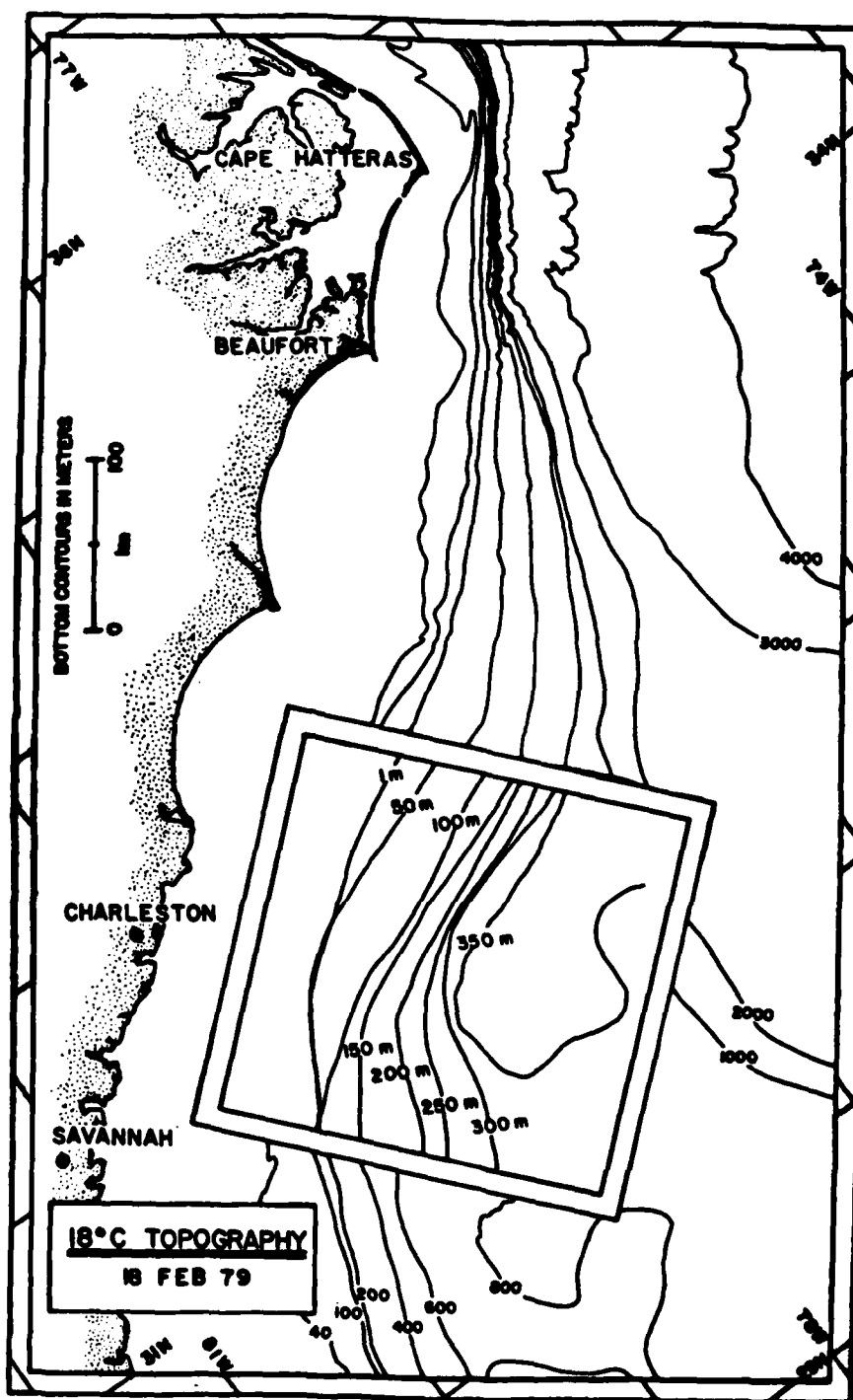


Figure 146. Topography of the 18°C isotherm, 18 February 1979.

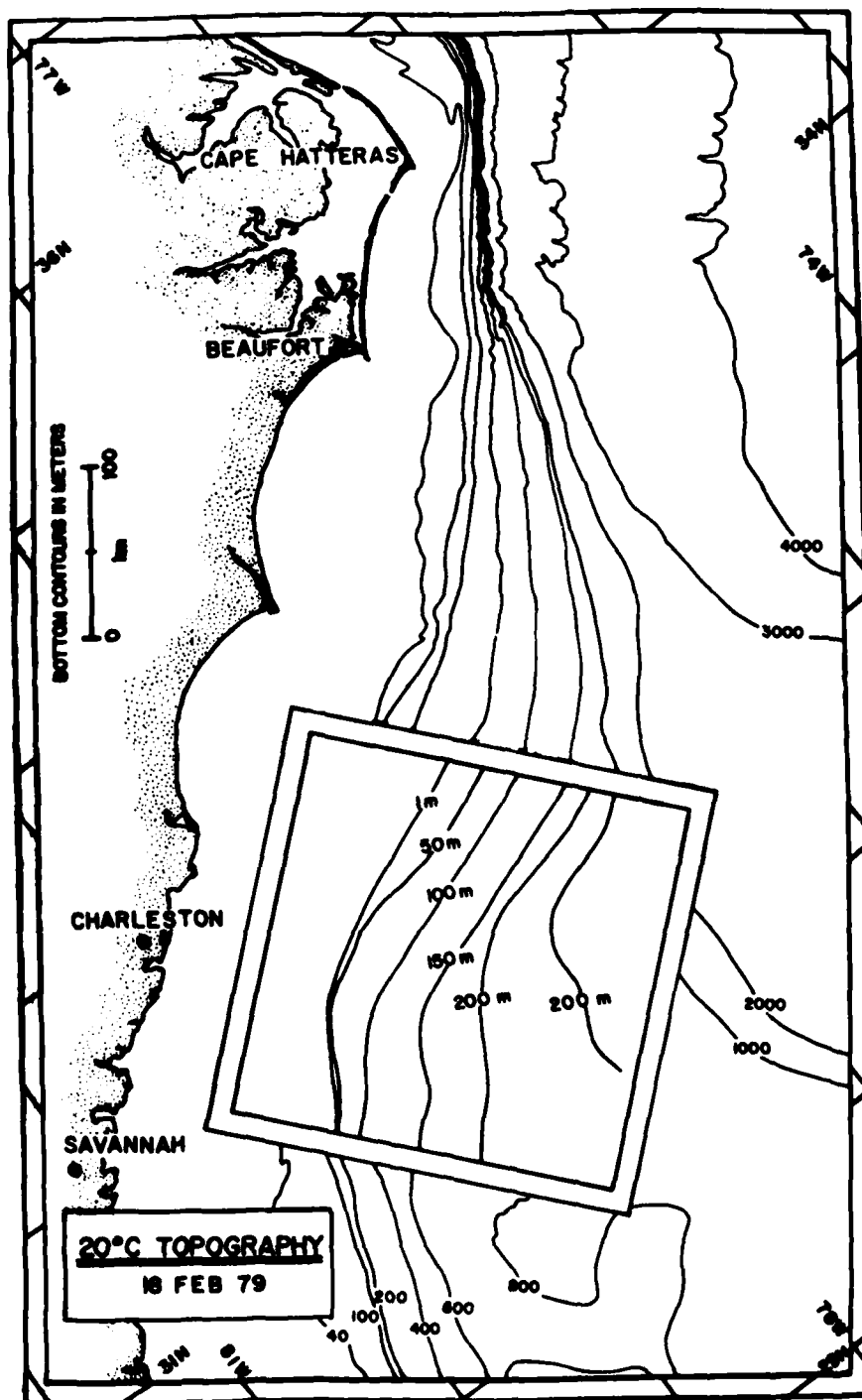


Figure 147. Topography of the 20°C isotherm, 18 February 1979.

LINE Q
TEMPERATURE
(°C)
18 FEB 79

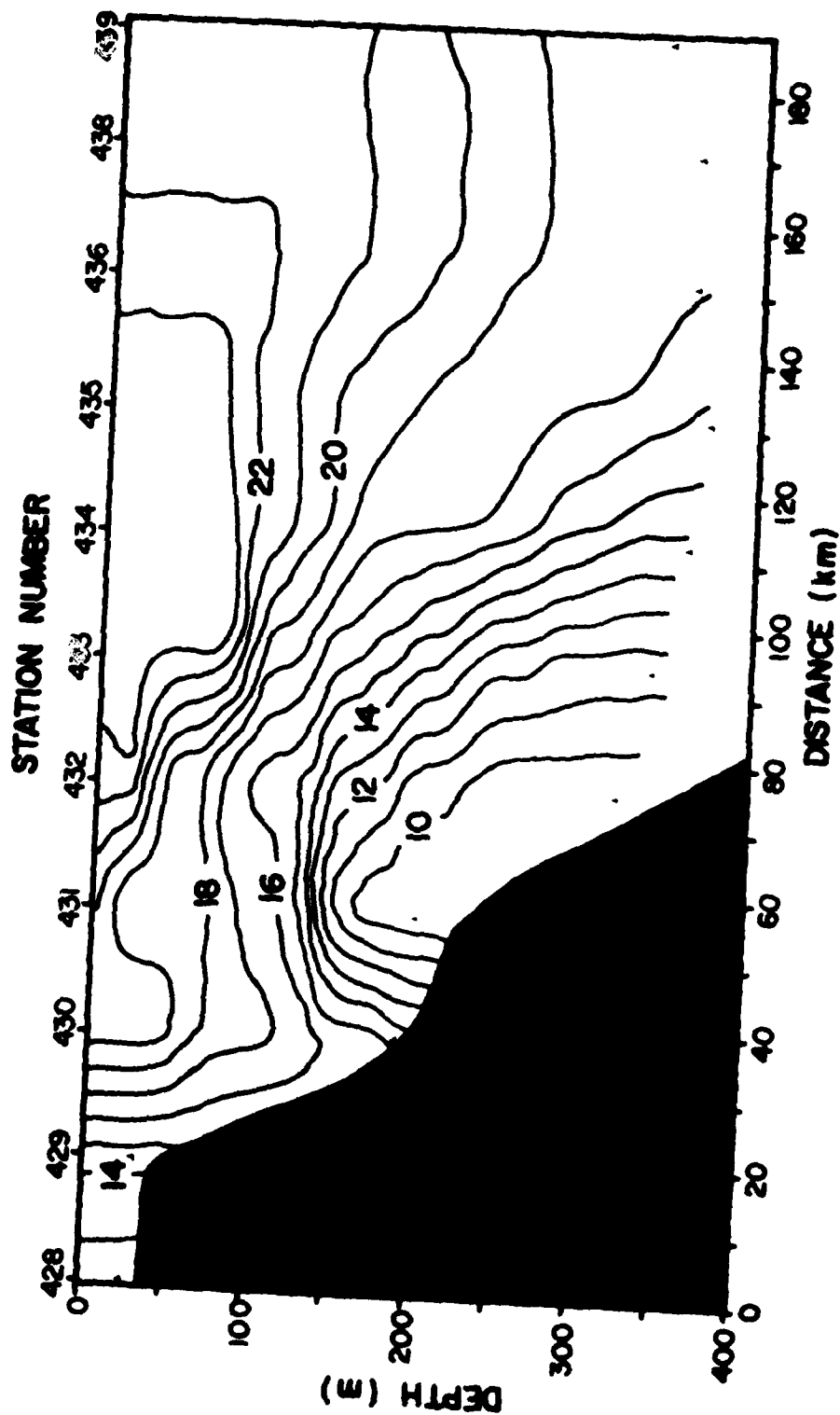


Figure 148. Cross-stream vertical temperature section along Line Q, 18 February 1979.

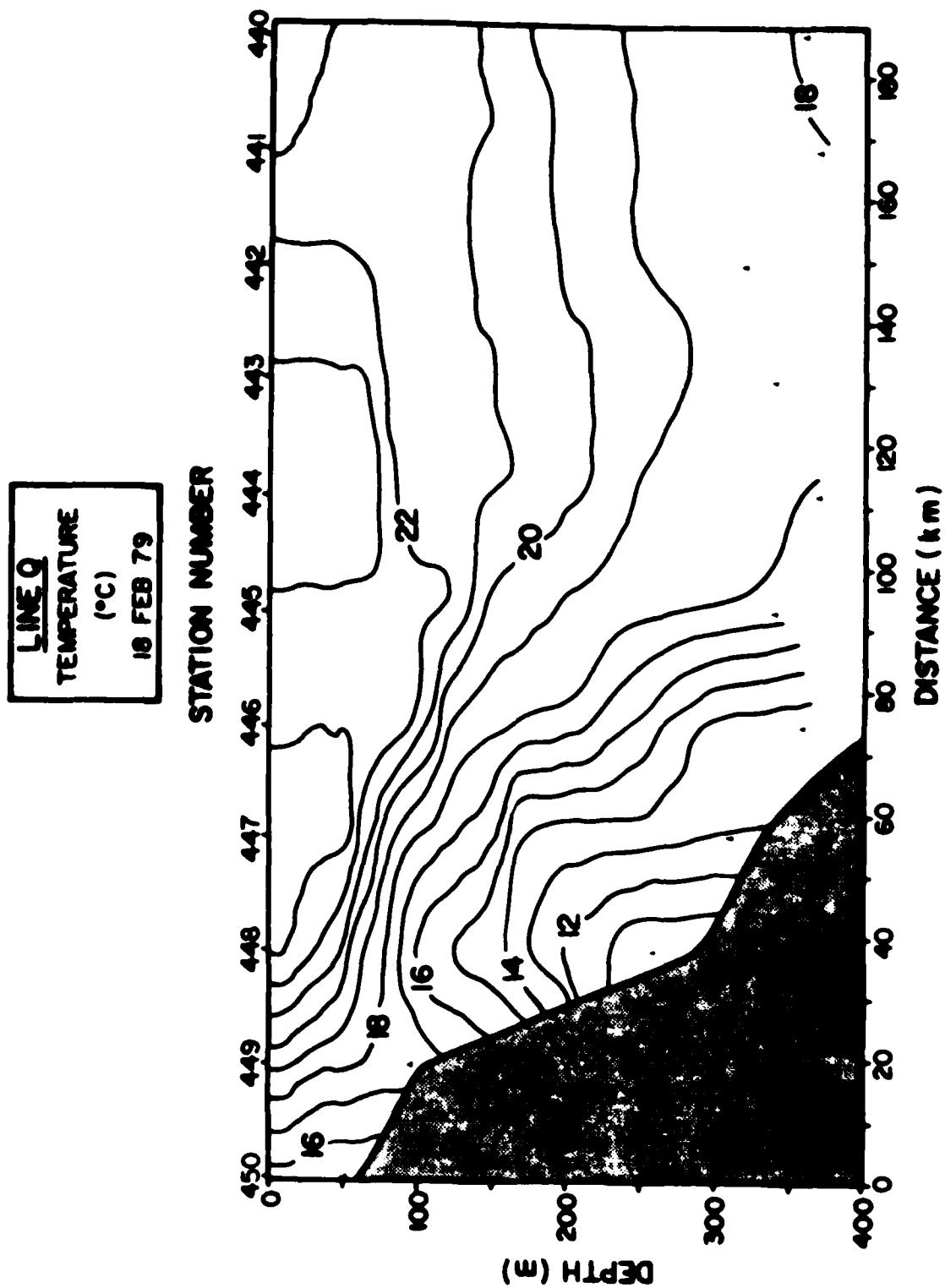


Figure 149. Cross-stream vertical temperature section along Line Q, 18 February 1979.

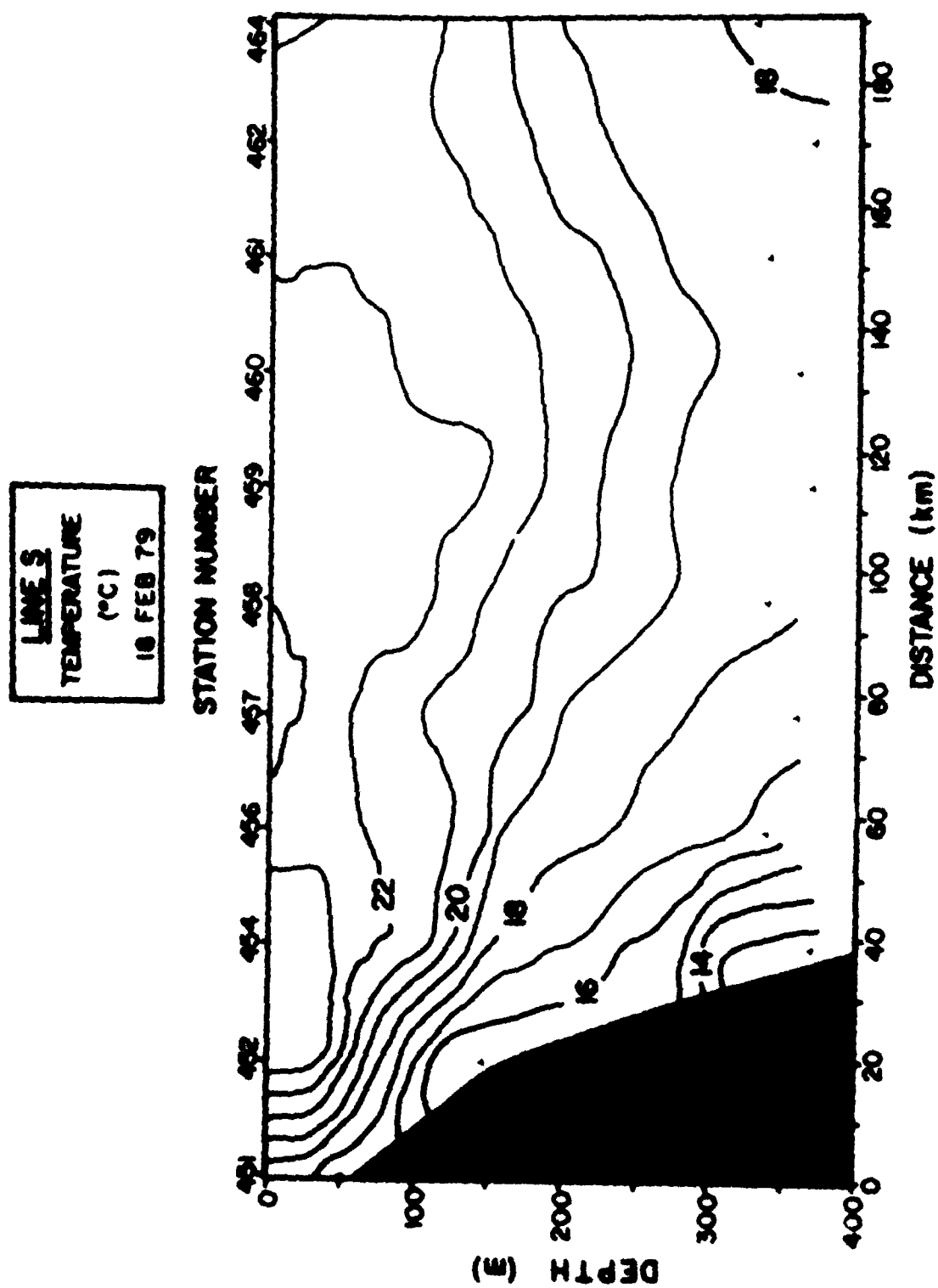


Figure 150. Cross-stream vertical temperature section along Line S, 18 February 1979.

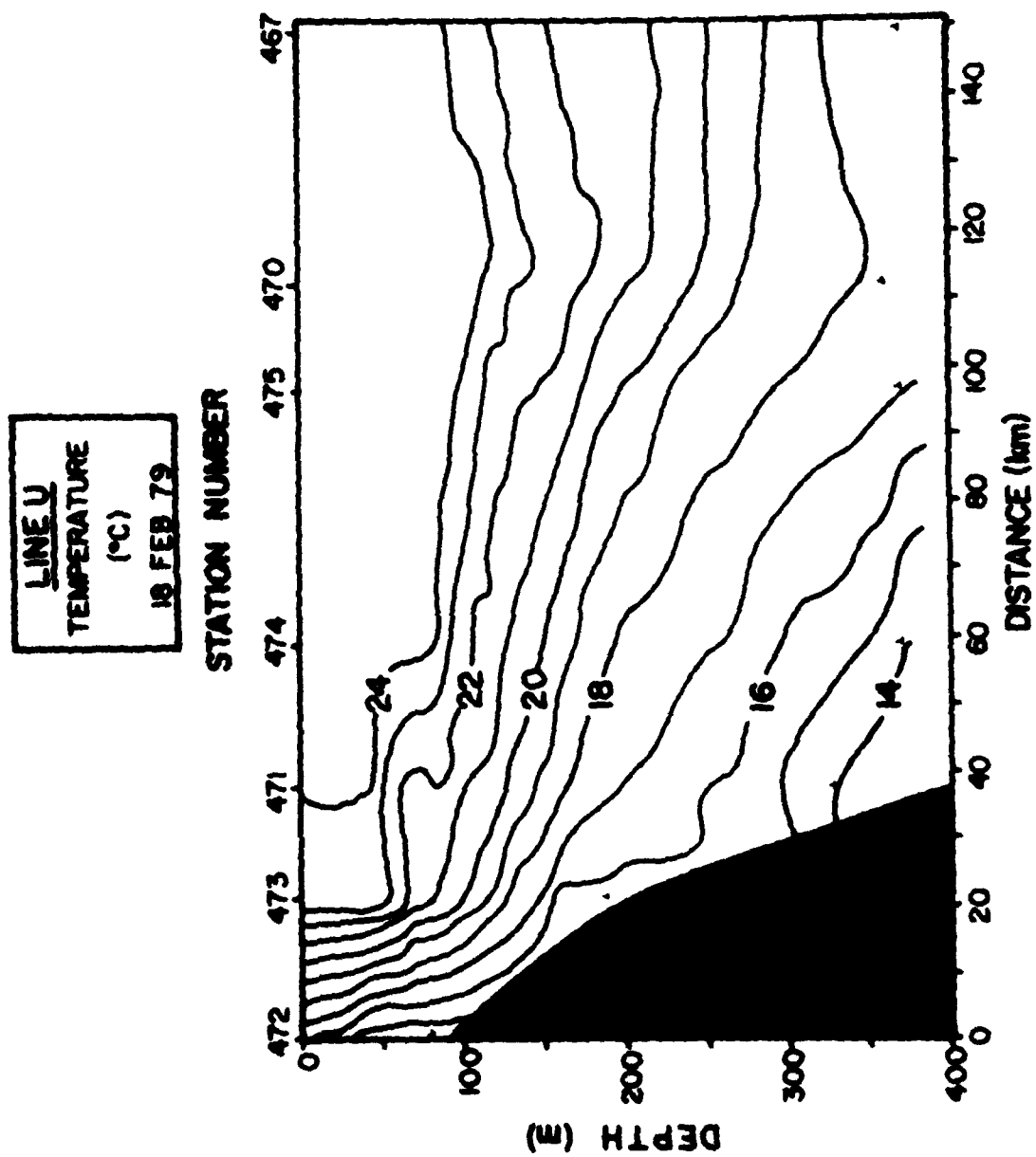


Figure 151. Cross-stream vertical temperature section along Line U, 18 February 1979.

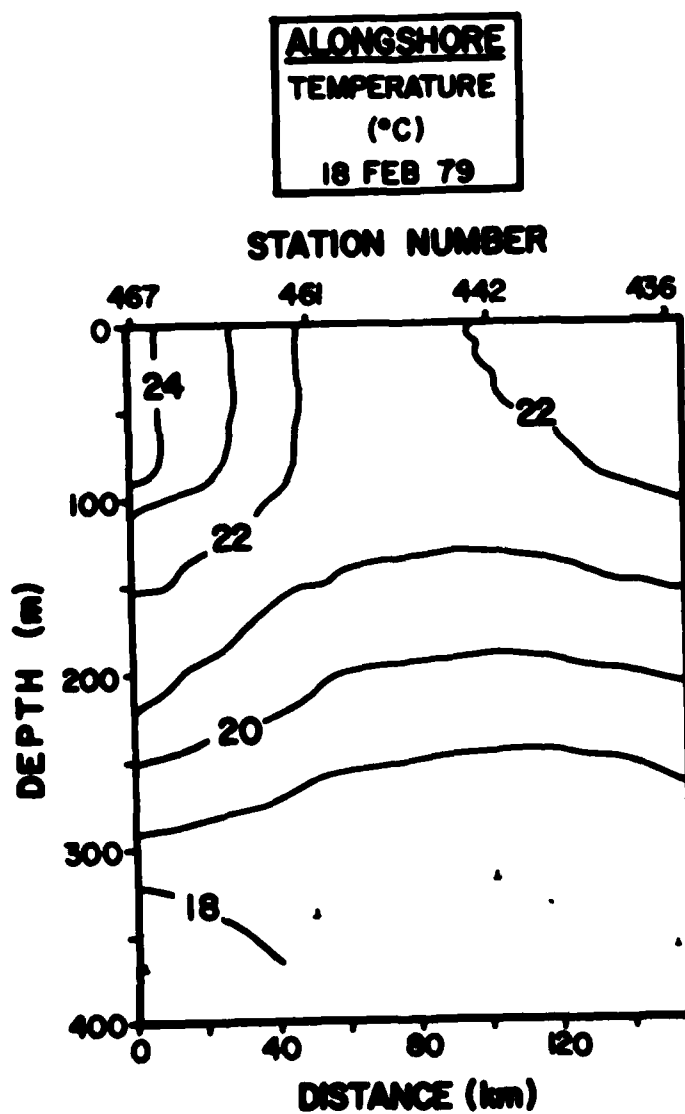


Figure 152. Alongshore vertical temperature section,
18 February 1979.

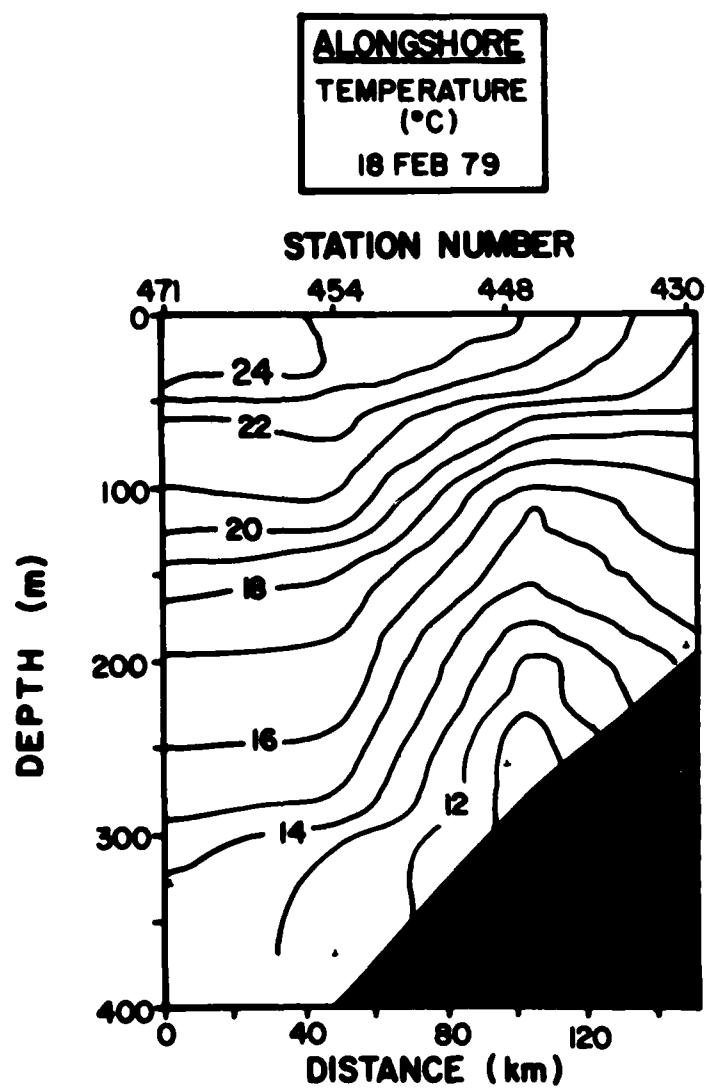


Figure 153. Alongshore vertical temperature section
18 February 1979.

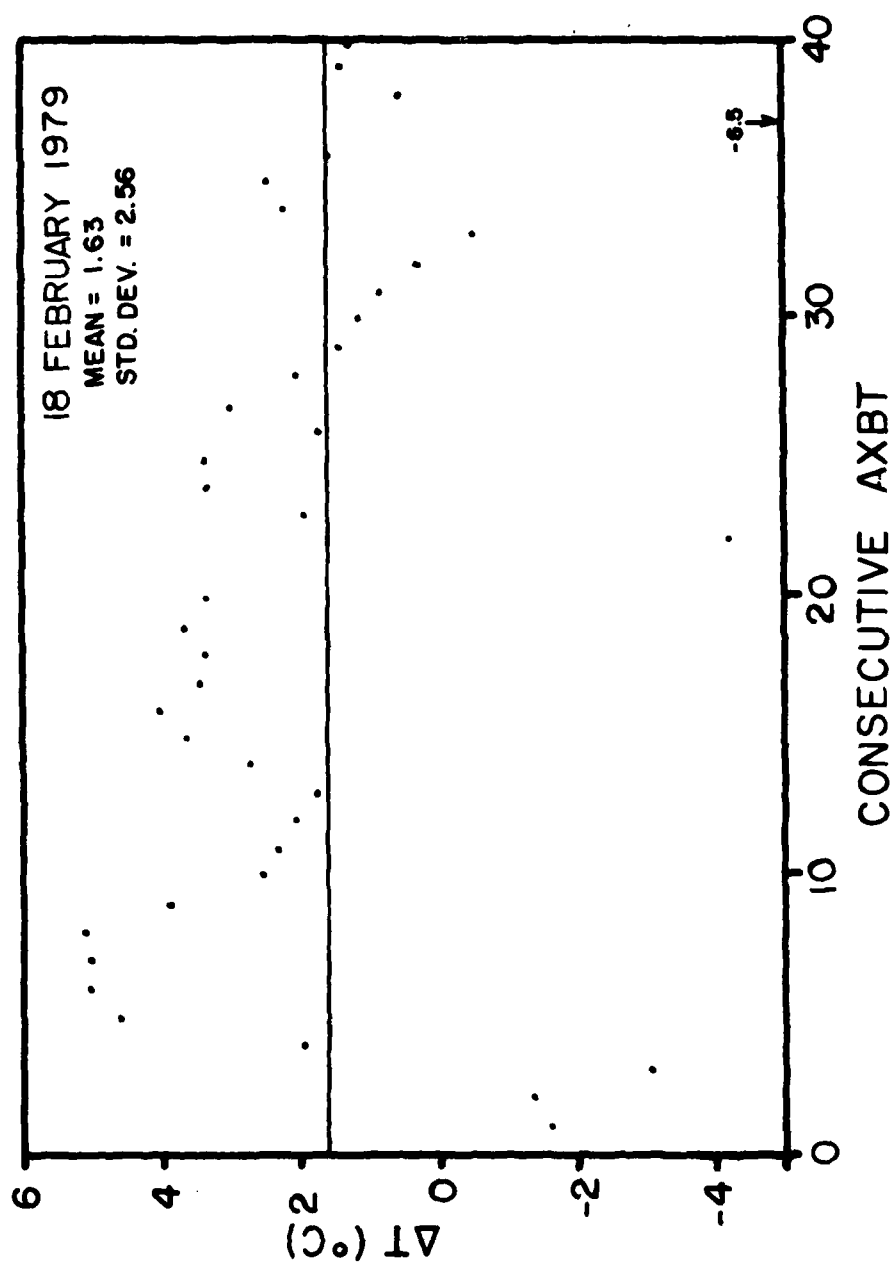


Figure 154. Difference between 1 meter AXBT and PRT temperatures ($T_{\text{AXBT}} - T_{\text{PRT}}$) versus consecutive AXBT drop number, 18 February 1979.

TWO-DAY COMPOSITES

The following displays were constructed using the data from two consecutive surveys.

Figures 155 through 157 were constructed from the surveys on 10 and 11 February 1979, with the data from 11 February shifted 30km upstream to account for meander propagation.

Figures 158 through 160 were constructed from the surveys on 15 and 16 February 1979, with the data from 15 February shifted 30km downstream to account for meander propagation.

Figures 161 through 163 were constructed from the surveys on 17 and 18 February 1979, with the data from 17 February shifted 30km downstream to account for meander propagation.

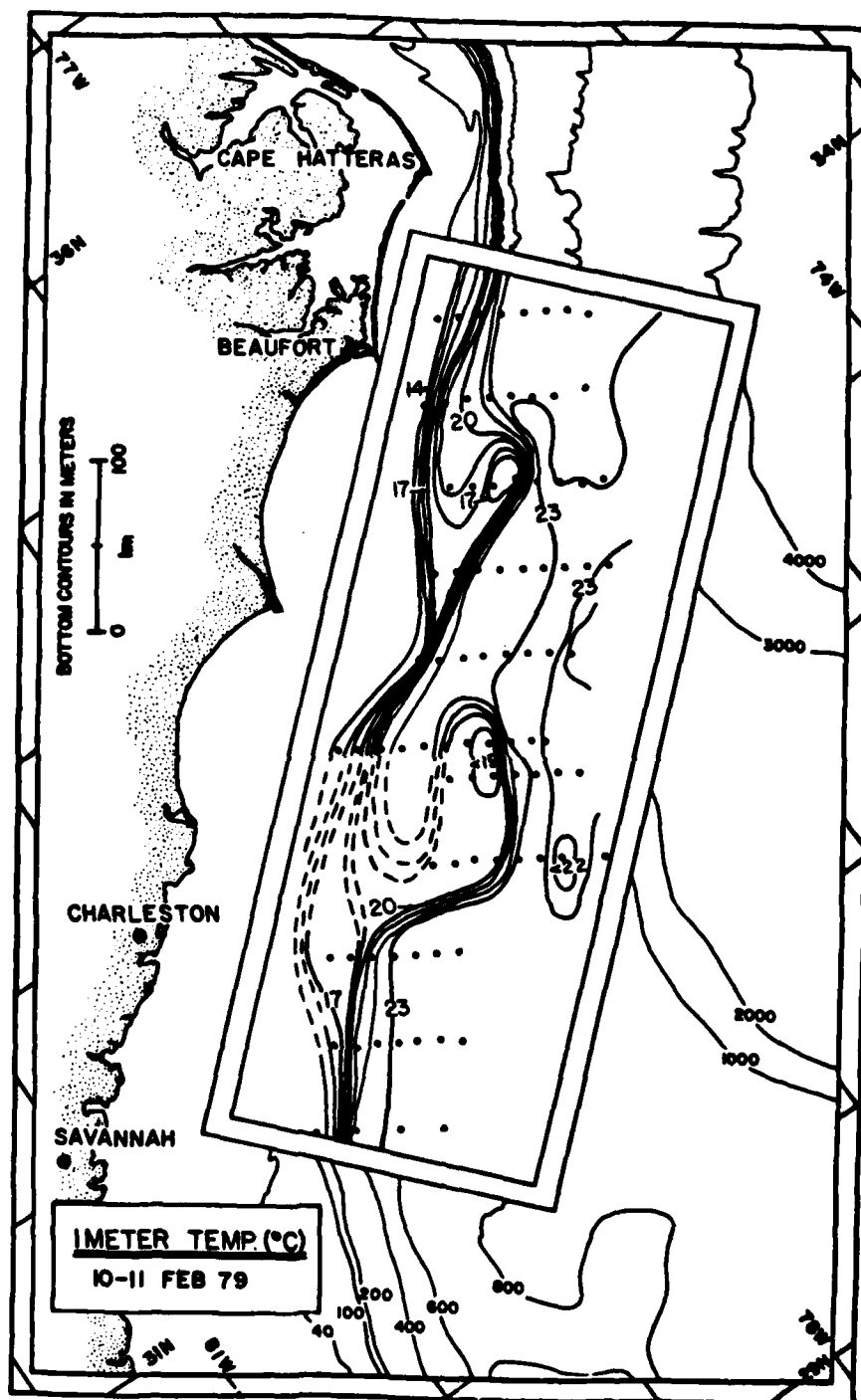


Figure 155. AXBT temperatures at 1 meter from 10 February data and shifted 11 February data.

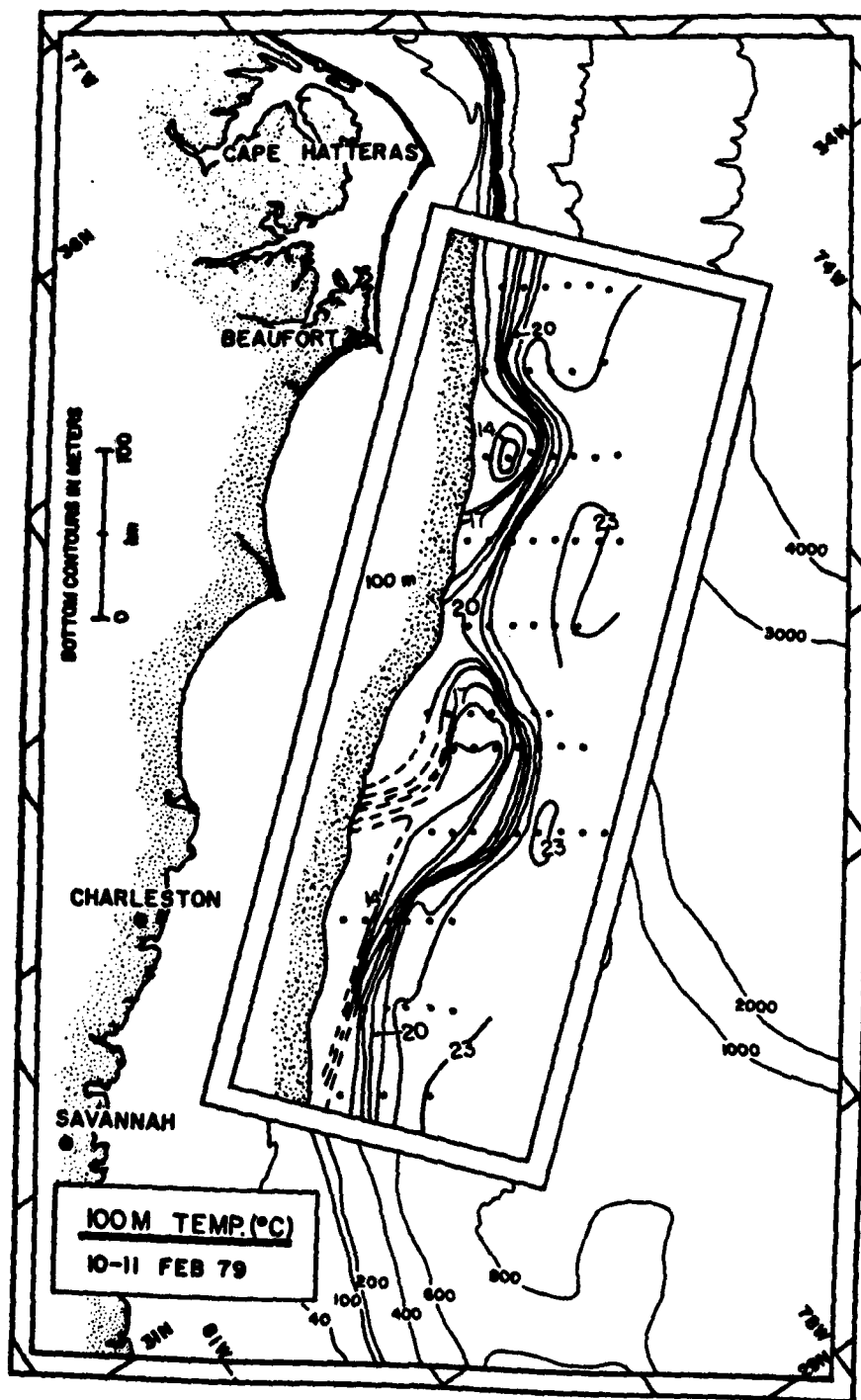


Figure 156. AXBT temperatures at 100 meters from 10 February data and shifted 11 February data.

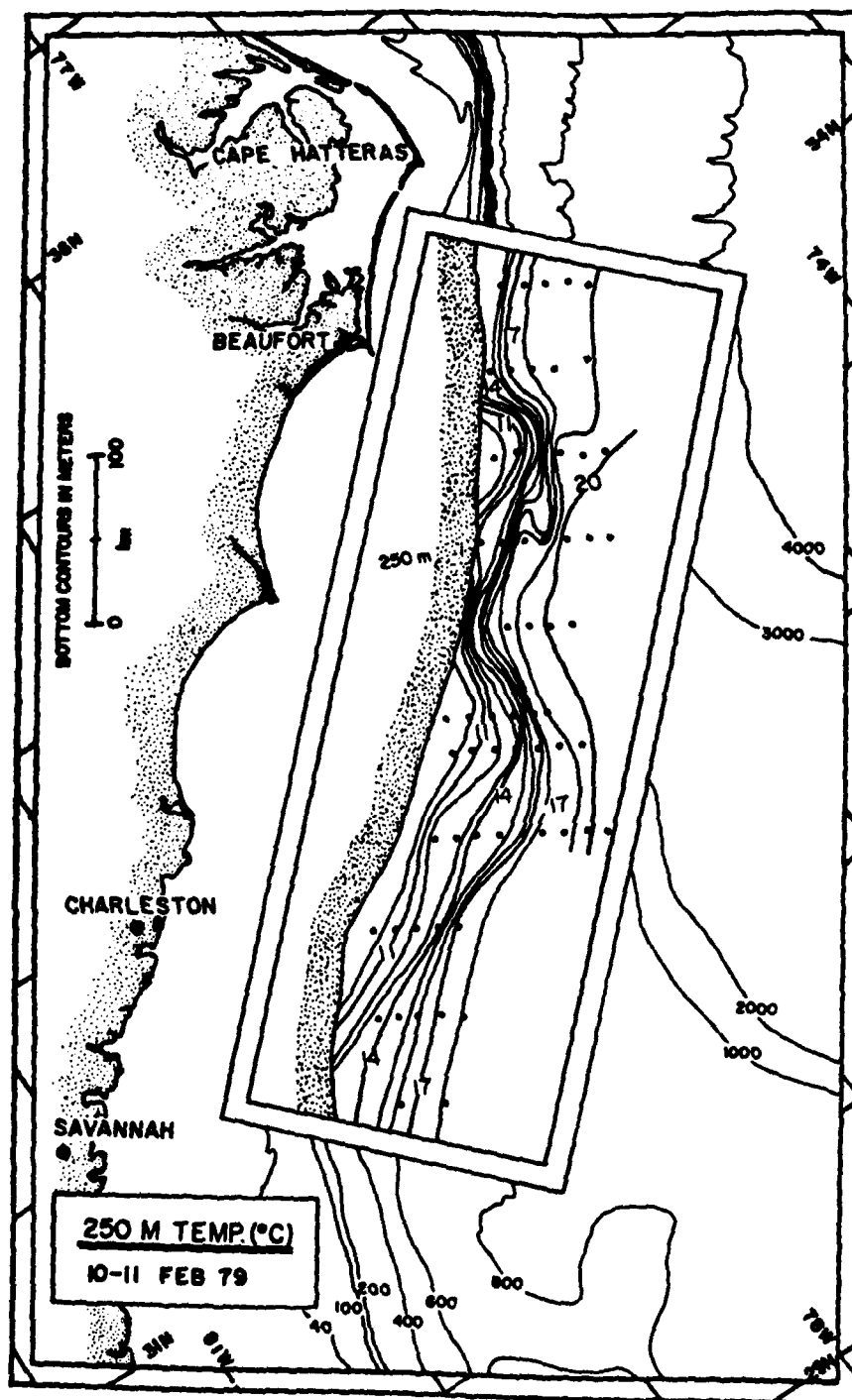


Figure 157. AXBT temperatures at 250 meters from 10 February data and shifted 11 February data.

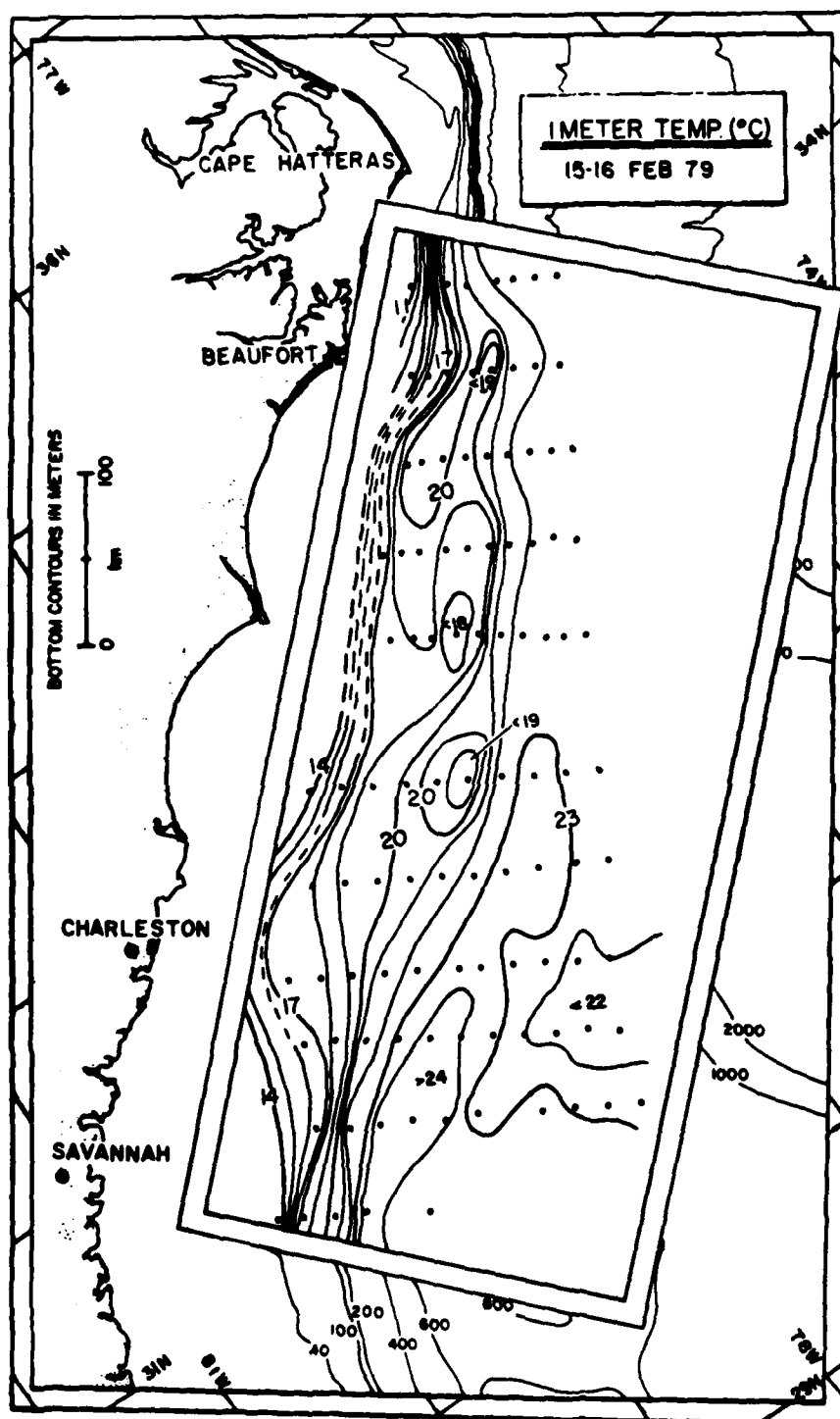


Figure 158. AXBT temperatures at 1 meter from 16 February data and shifted 15 February data.

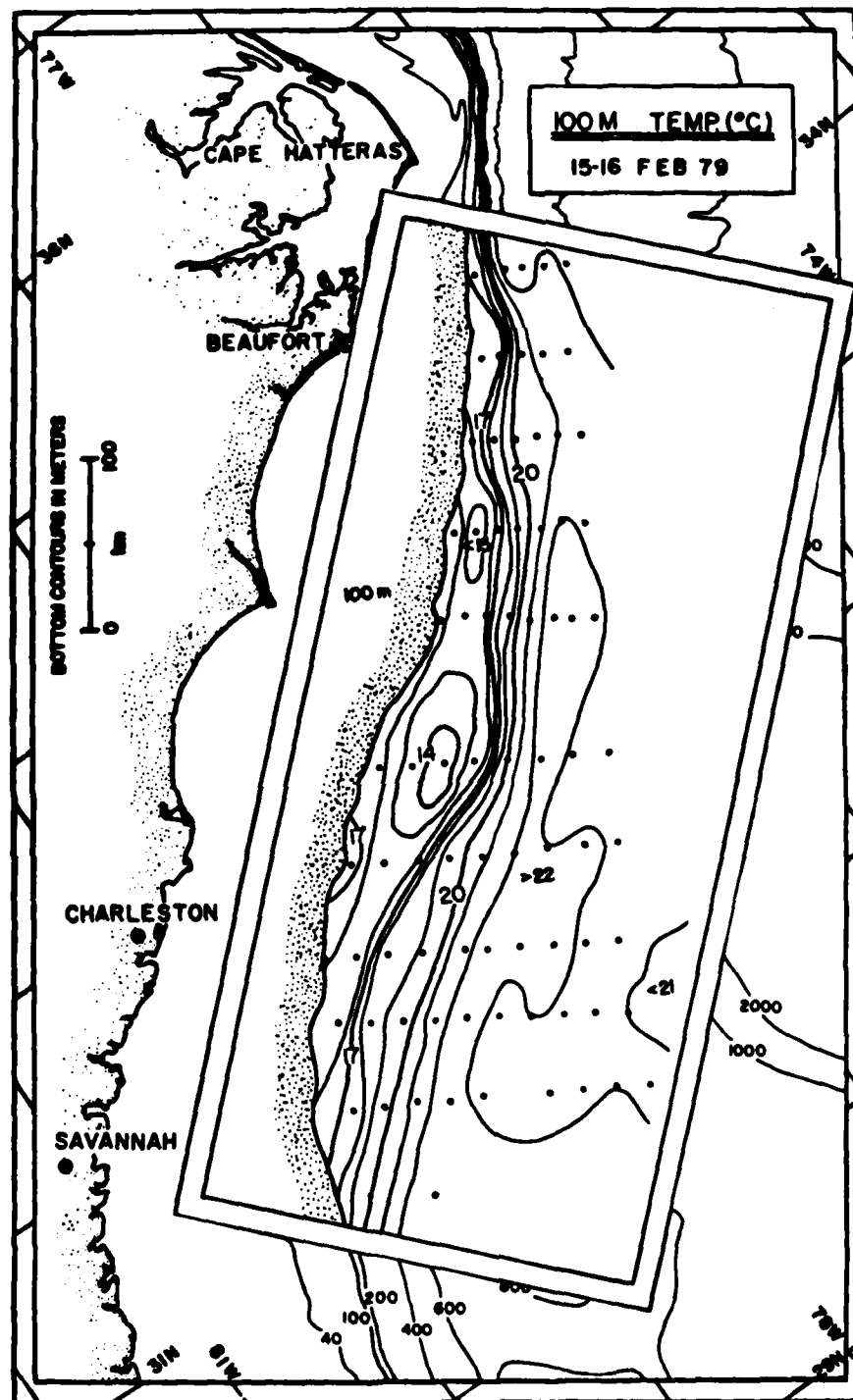


Figure 159. AXBT temperatures at 100 meters from 16 February data and shifted 15 February data.

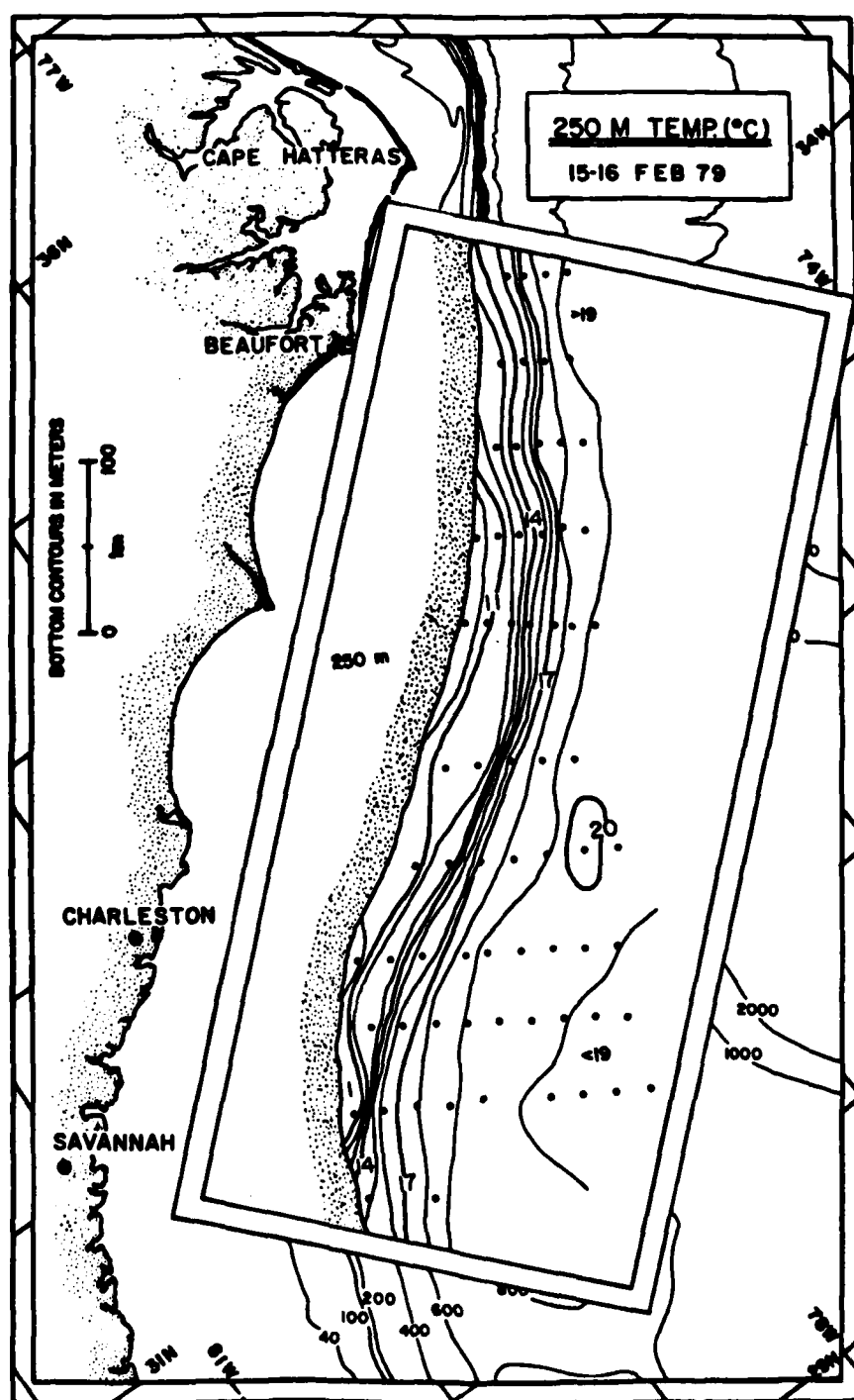


Figure 160. AXBT temperatures at 250 meters from 16 February data and shifted 15 February data.

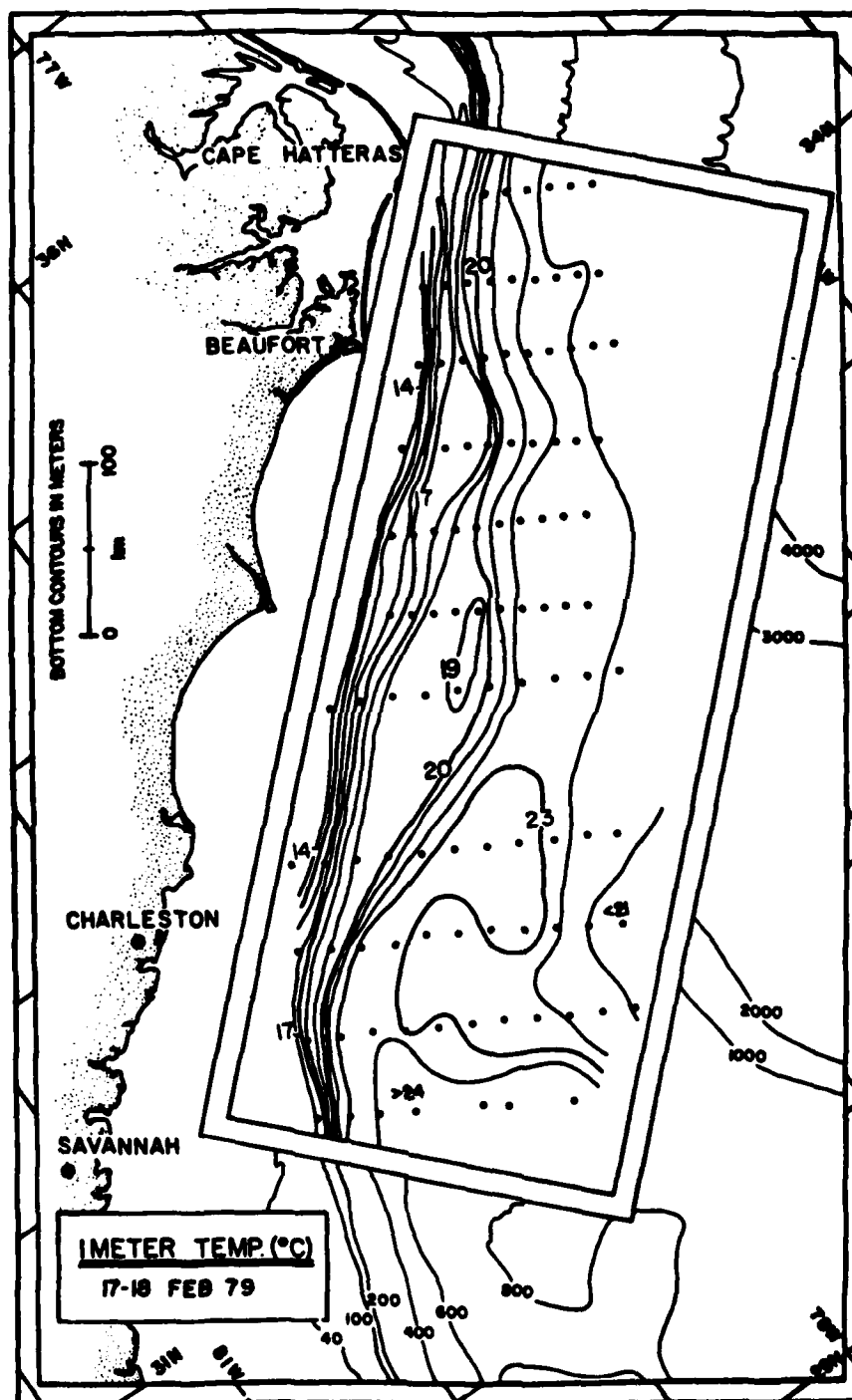


Figure 161. AXBT temperatures at 1 meter from 18 February data and shifted 17 February data.

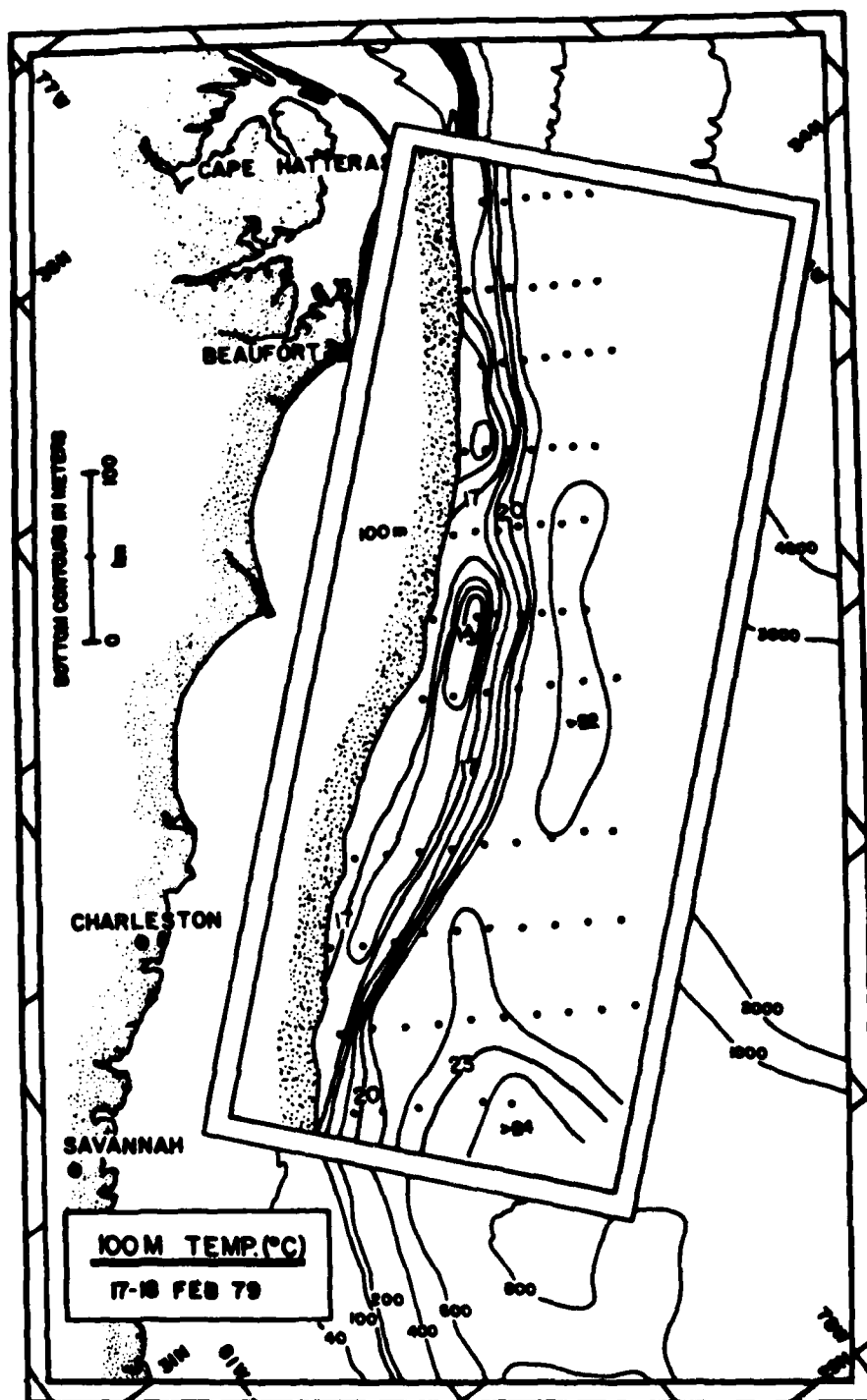


Figure 162. AXBT temperatures at 100 meters from 18 February dat and shifted 17 February data.

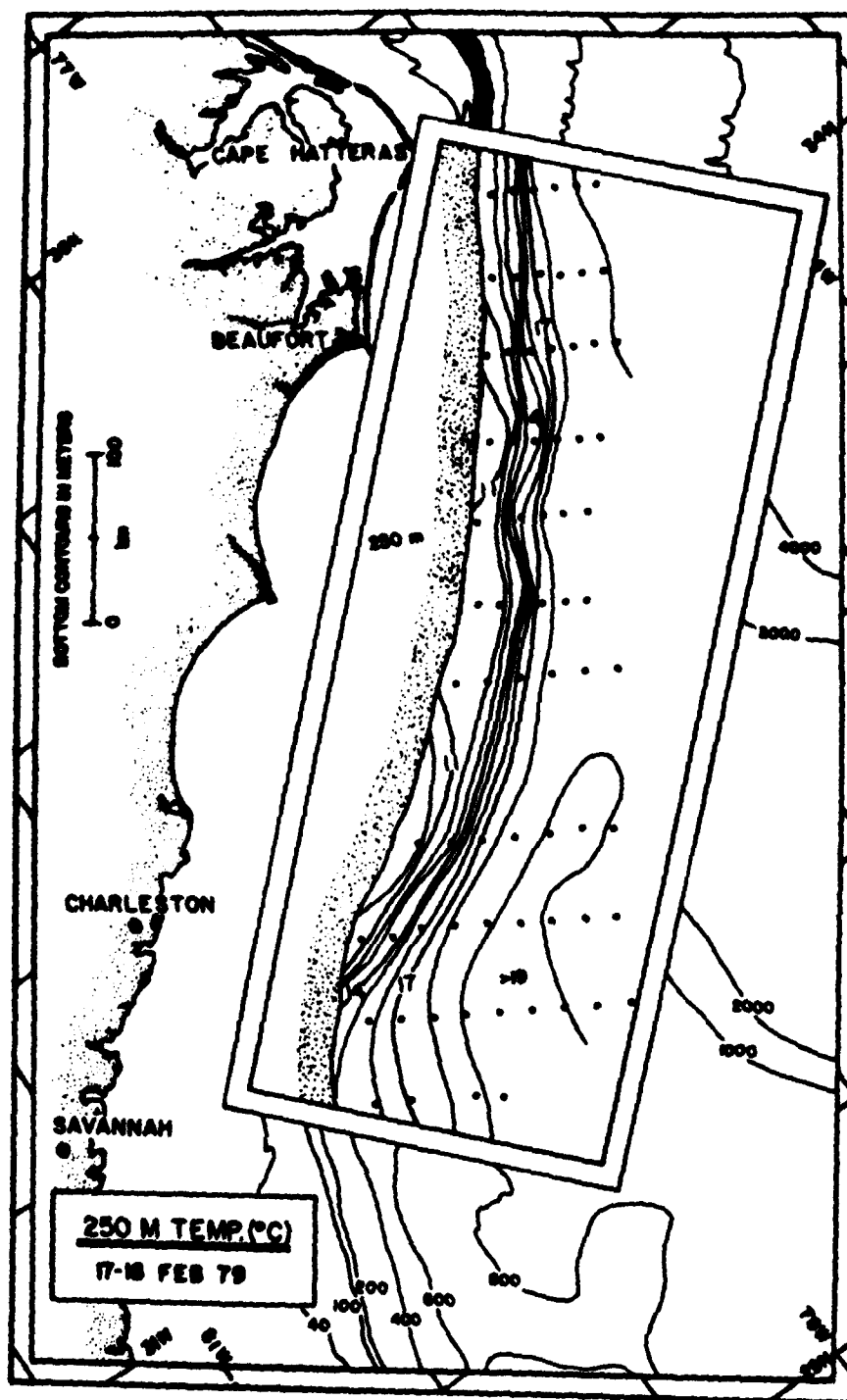


Figure 163. AXBT temperatures at 250 meters from 18 February data and shifted 17 February data.

ACKNOWLEDGEMENTS

The Gulf Stream Meanders Experiment was supported by the Office of Naval Research, contract number N00014-77-C-0354, and by the National Science Foundation, grant numbers OCE 77-25682 and OCE 79-06710. We thank the crews of U.S. Navy Squadron VXN-8 and the personnel of the Airborne Oceanography Section of the U.S. Naval Oceanographic Office for their assistance in the collection of the AXBT and PRT data aboard the R/A Project Birdseye. Special thanks to Messrs. Gary Athey and Jeffrey Kerling for their fine work before and during the flight. Numerous people assisted in the data collection, among them are many of the graduate students at the University of North Carolina, Texas A and M University, and North Carolina State University. We thank Russell Ault for his assistance with the tedious processing of data and Kimberly Clark for drafting the final figures. Schatzie Fisher typed the numerous tables and text of this report. We thank Dr. Richard Legeckis of NOAA/NESS for providing us with the satellite cover photo, which makes the motivation for this experiment clear in an instant.

REFERENCES

- Bane, J.M., D.A. Brooks, and M.J. Ignaszewski. 1980a. The Gulf Stream meanders experiment: Hydrographic data report, R/V Endeavor cruises EN-040 (2-8 Aug. 79) and EN-045 (16-23 Nov. 79). Texas A&M University. Reference 80-11-T. 150pp.
- _____, D.A. Brooks, K.R. Lorenson, and C.M. Seay. 1980b. Three-dimensional view of a Gulf Stream meander between Savannah, GA and Cape Hatteras, NC. Gulfstream 6:3-7.
- _____, and D. A. Brooks. 1981. The Gulf Stream meanders experiment: Current meter, atmospheric, and sea level data report. August to November, 1979 mooring period. Univ. of North Carolina Report (in preparation).
- _____, D.A. Brooks, and K.R. Lorenson. 1981. Synoptic observations of three-dimensional structure, propagation and evolution of Gulf Stream meanders along the Carolina continental margin. J. Geophys. Res. (submitted).
- Brooks, D.A., J.M. Bane, and M.J. Ignaszewski. 1980a. The Gulf Stream meanders experiment: Hydrographic data report, R/V Endeavor cruises EN-031 (12-19 January 1979) EN-037 (23-29 May 1979). Texas A&M Univ. Reference 80-1-T. 145pp.
- _____, J.M. Bane, R.L. Cohen, and P. Blankenship. 1980b. The Gulf Stream meanders experiment: Current meter, atmospheric, and sea level data report for the January to May, 1979 mooring period. Texas A&M Univ. Reference 80-8-T. 264pp.
- _____, and J.M. Bane. 1981. The Gulf Stream meanders experiment: AXBT/PRT data report, R/A Seascan flights, 21-29 November 1979. Univ. of North Carolina. Report (in preparation).
- Gent, A.E. and P.J. Heuser. 1980. A discussion of the airborne expendable bathythermograph (AXBT, SSQ-36 BTS) laboratory temperature accuracy and time constant test. Naval Oceanographic Office Technical Note TN 6300-1-80. 53pp.
- Lorenson, K.R. 1980. Three-dimensional, mesoscale characteristics of the Gulf Stream thermal frontal zone south of Cape Hatteras. Master's thesis. University of North Carolina, Chapel Hill, NC. 181pp.
- Sampson, R.J. 1975. SURFACE II Graphics System. Lawrence, Kansas: Kansas Geological Survey. 240pp.

Seay, C.M. 1981. Characteristics of the Gulf Stream sea surface temperature field south of Cape Hatteras. Master's thesis University of North Carolina, Chapel Hill, NC. (in preparation).

Sessions, M.H. and T. P. Barnett. 1980. The airborne expendable bathythermograph for oceanographic measurements. Proceedings of the Near-surface Ocean Experimental Technology Workshop. (R.C. Swenson and R.S. Mesecar, chairmen). Naval Oceans Research and Development Activity. NSTL Station, MS 125-137.

DATE
FILMED
8