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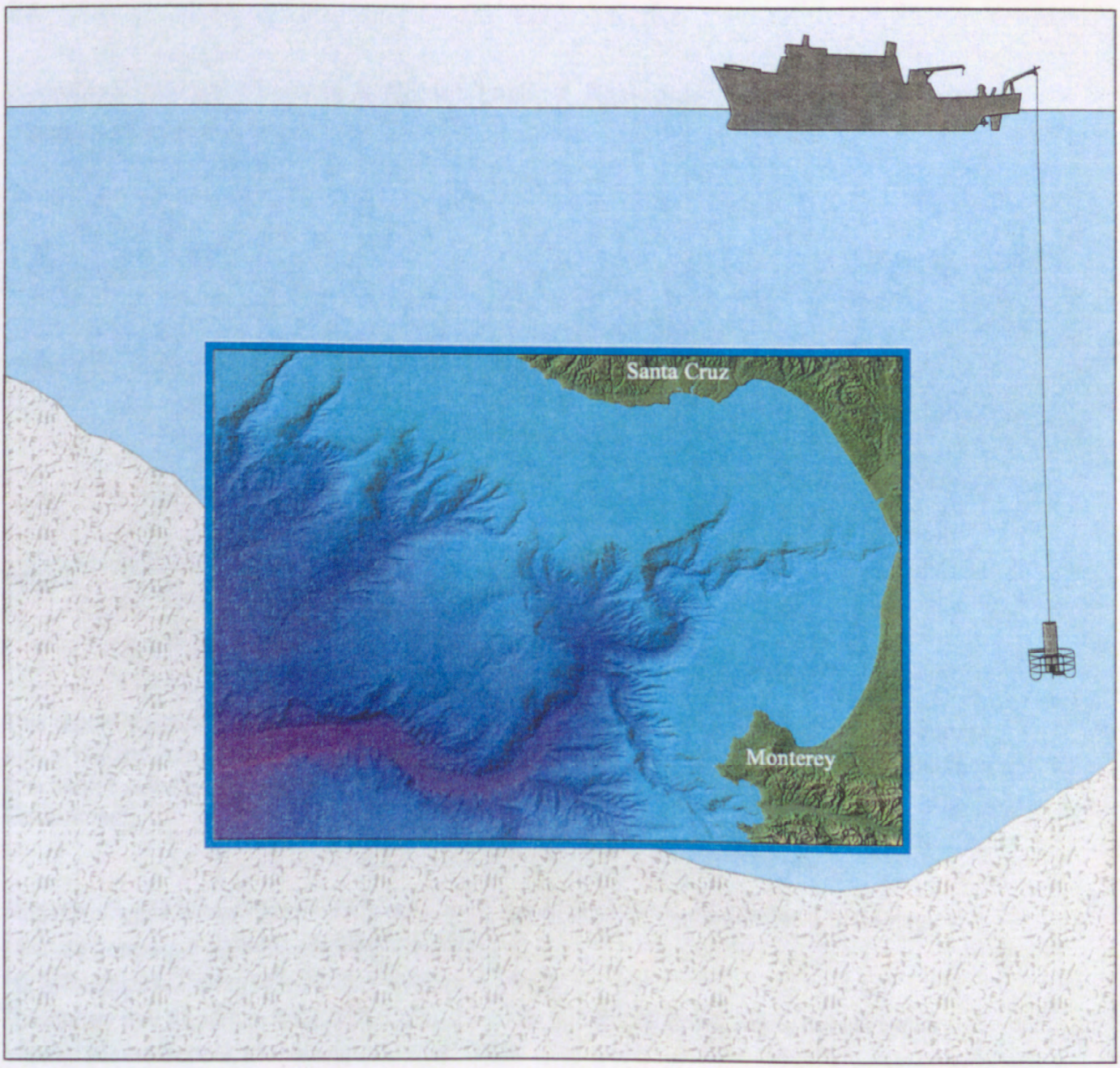
THE MONTEREY SUBMARINE CANYON, CALIFORNIA, CTD DATA REPORT PART C: THE R/V ROBERT GORDON SPROUL CRUISE S-1-94-MB, AUG. 17 - 22, 1994

Open-File Report 00-269



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THE MONTEREY SUBMARINE CANYON, CALIFORNIA, CTD DATA REPORT PART C: THE R/V ROBERT GORDON SPROUL CRUISE S-1-94-MB, AUG. 17 - 22, 1994

By

Jennifer L. Martin[1], Marlene A. Noble[2], Leslie K. Rosenfeld[3], Franklin B. Schwing[4], and Cynthia H. Pilskaln[5]

Open-File Report 00-269

2000

[1]U.S. Geological Survey, Menlo Park, California, 94025; work performed under U.S. Geological Survey Contract # 1434-HQ-96-30319 T.O. 7018
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By Jennifer L. Martin[1], Marlene A. Noble[2], Leslie K. Rosenfeld[3], Franklin B. Schwing[4], and Cynthia H. Pilskaln[5]

ABSTRACT

In August 1993, a program was begun to study the mechanisms that govern the circulation within and the transport of sediment and water through Monterey Submarine Canyon. This is a very large, deep submarine canyon off central California that incises the continental margin from the outer slope to close to the coastline. A key component of the study was to document the interactions between circulation patterns above the canyon, within the canyon, and past the mouth of the canyon.

The first part of this program entailed deploying a set of six moorings to measure current, temperature, salinity, and water clarity for one year within Monterey Canyon. The information from the moorings can be found in the U. S. Geological Survey Open File Report 95-838.

In the second part of this program, which is the subject of this report, four cruises were conducted during August 1993 to November 1994 within Monterey Bay and along the Monterey Canyon to collect salinity, temperature, and water clarity data with depth (CTD data).

The data from each of the four cruises are presented in detail in four separate reports. This report describes and depicts the data collected from the R/V Robert Gordon Sproul cruise S-1-94-MB (labeled in our reports as S-1-94-MB).

INTRODUCTION

In 1993, a program involving the U.S. Geological Survey (USGS), Monterey Bay Aquarium Research Institute (MBARI), the National Oceanic and Atmospheric Administration (NOAA), and the University of Maine was begun to study the mechanisms that govern the circulation within and the transport of sediment and bottom water through the Monterey Submarine Canyon.

Further remarks about the physical oceanography of the Monterey Submarine Canyon and how it relates to the purpose and scope of our program can be found in the introduction of U. S. Geological Survey Open File Report 00-267.

The first part of our program entailed deploying a set of six moorings to measure current, temperature, salinity, and water clarity. In the second part of this program, which is the subject of this report, four CTD cruises were conducted within Monterey Bay, along the axis of Monterey Canyon, and across the axis of the canyon during August 1993 to November 1994. The cruises measured salinity, temperature, and water clarity data with depth to determine the spatial patterns of these water properties within the study region.

The first survey was conducted in August 1993 (S-1-93-MB, U. S. Geological Survey Open File Report 00-267). In 1994, three other surveys were conducted: one in June (J-7-94-MB, U. S. Geological Survey Open File Report 00-268), one in August (S-1-94-MB)—the subject of this report—and one in November (J-13-94-MB, U. S. Geological Survey Open File Report 00-270). The number of stations occupied during each survey ranges

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[5]University of Maine, Orono, Maine, 04469

Table 1: Data types collected and derived from the Monterey Canyon CTD cruises

Ship Name		R/V Robert Gordon Sproul	R/V David Starr Jordan	R/V Robert Gordon Sproul	RV David Starr Jordan
Cruise Name		S-1-93-MB	J-7-94-MB	S-1-94-MB	J-13-94-MB
Dates of Cruise		Aug. 3 - 5, 1993	June 26 - 29, 1994	Aug. 17 - 22, 1994	Nov. 14 - 16, 1994
Number of Stations		23	32	28	28
Raw Data Collected					
Pressure	decibars	x	x	x	x
Temperature	°C	x	x	x	x
Conductivity	S/m	x	x	x	x
Transmission	volts	—	x	x	x
Derived Data					
Salinity	ppt	x	x	x	x
Potential Temperature	°C	x	x	x	x
Density, sigma-t	kg/m^3	x	x	x	x
Potential Density, sigma-theta	kg/m^3	x	x	x	x
Attenuation	1/m	—	x	x	x
Brunt-Väisälä frequency squared	$(radians/min)^2$	x	x	x	x

from 23 to 32 (Table 1).

The raw data collected by the CTD were conductivity, temperature, and pressure. Light transmission was collected for cruises J-7-94-MB, S-1-94-MB, and J-13-94-MB only (Table 1). Salinity, potential temperature, potential density, and the Brunt-Väisälä frequency (a measure of buoyancy) were derived from the raw data. Light attenuation was derived from the transmissivity data in cruises J-7-94-MB, S-1-94-MB, and J-13-94-MB.

The stations occupied during each cruise were located primarily at a dynamically "narrow" region of the canyon where one set of moorings was deployed, at a dynamically "wide" region where another set of moorings was deployed, and along the canyon axis between the narrow and wide regions. The locations of the stations for each cruise overlap each other for the most part so as to be able to observe seasonal changes. Figure 1 shows the locations of the CTD stations for the S-1-93-MB cruise.

In addition to the CTD stations, Figure 1 also shows the location of five of the six moorings deployed in the moored array. The moored array collected primarily current direction and velocity during August 1993 to August 1994. Sites NA and NN are located at the narrow section of the canyon and sites WA, WN, and WS are located at the wide section of the canyon. The distance along the canyon axis between sites NA and WA is 48 km. More detailed information from the moored array can be found in the U. S. Geological Survey Open File Report 95-838.

This report describes and depicts the data from the R/V Robert Gordon Sproul cruise S-1-94-MB (labeled in our reports as S-1-94-MB).

Instrumentation

A Sea-Bird SBE 9/11*plus* CTD profiler was used to obtain the conductivity, temperature, and depth measurements. All sensors were calibrated by the manufacturer's specifications before each deployment.

To measure water clarity (transmission), a Sea Tech transmissometer with a 25 cm path length was incorporated into the CTD system. The clear water reading was recorded before each cruise. The relation between the transmissometer reading and the amount of material suspended in the water column was derived using the calibration procedures described in Moody, et al., 1987.

Data sets and statistical methods

This report is primarily a pictorial description of the data collected. A table giving numerical values for the Brunt-Väisälä frequency is included in the graphs of that

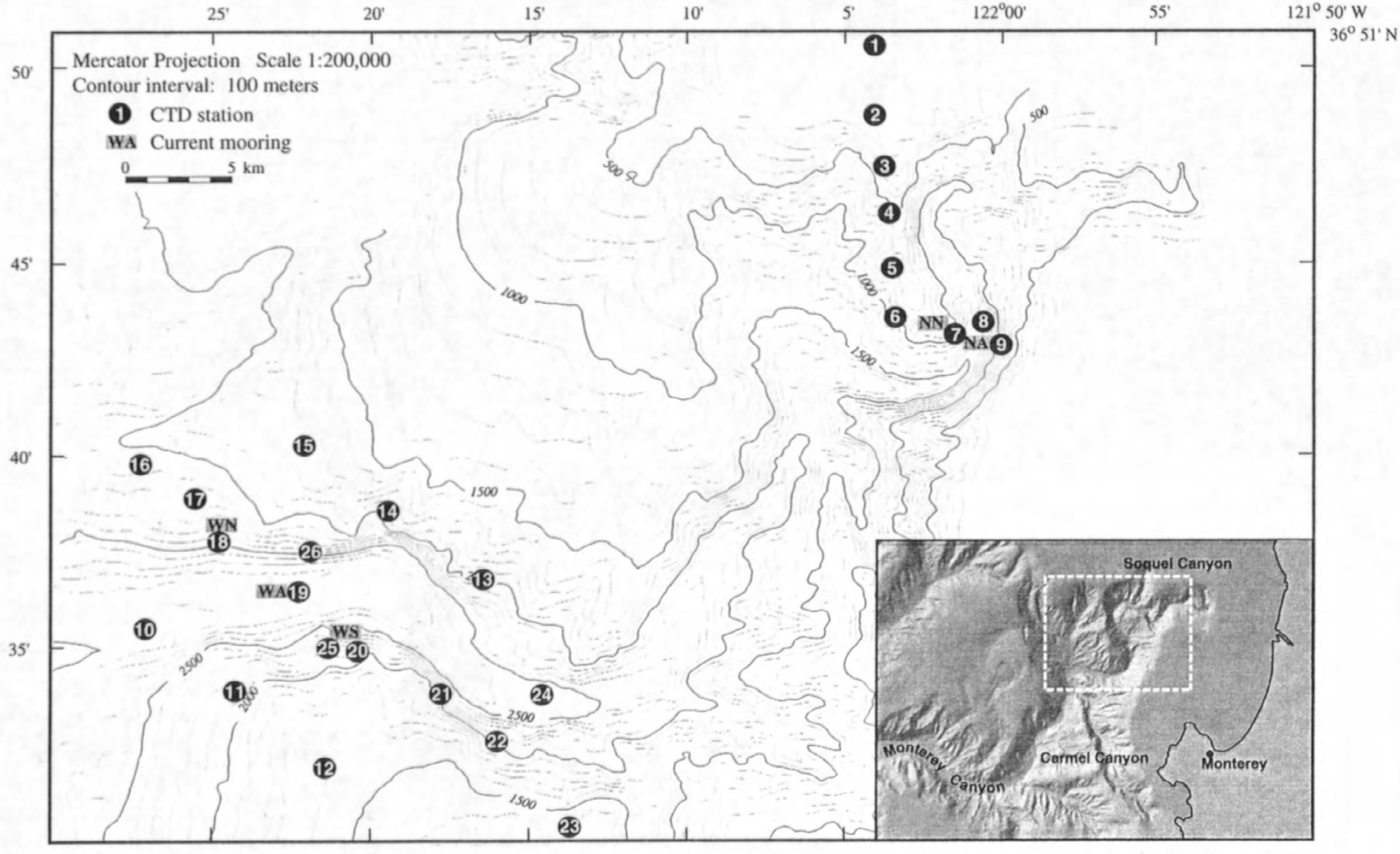

Figure 1. Station map of the Monterey Submarine Canyon S-1-94-MB CTD cruise. Current moorings are from the first part of this program, the Monterey Submarine Canyon Moored Array (Kinoshita and Noble, 1995), which was designed to describe circulation and sediment transport patterns in Monterey Canyon.

parameter. The data sets from each instrument package have been decoded, transcribed into scientific units, and passed through several processing steps. The data were checked for quality and errors caused by instrument noise or failures using Sea-Bird's standard processing programs. The data were averaged into 1 dbar bins and then further edited for obvious spikes and other bad data.

Salinity, potential temperature, and potential density were calculated using Unesco standard equations (Morgan, 1994).

Both transmissivity and attenuation are used to characterize water clarity. Transmission, recorded directly from the transmissometer, is in units of volts. Profile plots of pressure vs. transmissivity are located in Appendix C. Attenuation (c) is calculated from transmissivity by the equation

$$c = -\frac{1}{x}\ln\left(\frac{V_{sig}}{V_{ref}}\right)$$

where x is the instrument pathlength in meters, V_{sig} is the transmission voltage from the instrument, and V_{ref} is the instrument's clean water offset value in volts. Values of 0.25 m for the instrument pathlength and 4.8 volts for the clean water offset were used. Attenuation was used in the vertical profiles in Appendix A.

The Brunt-Väisälä frequency is used as a measure of buoyancy, or vertical stability. Profile plots of pressure vs. the square of the Brunt-Väisälä frequency are located in

Table 2: Station information from the S-1-94-MB CTD cruise.

Cruise	Cast	Lat (N) deg	Lat (N) min	Long (W) deg	Long (W) min	Date (GMT)	Time	Cast Depth (m)	Bottom Depth (m)
S-1-94-MB	1	36	50.57	122	03.98	17-Aug-94	02:48	81	95
S-1-94-MB	2	36	48.82	122	03.94	17-Aug-94	03:38	89	95
S-1-94-MB	3	36	47.49	122	03.60	17-Aug-94	04:11	166	170
S-1-94-MB	4	36	46.27	122	03.44	17-Aug-94	04:50	490	560
S-1-94-MB	5	36	44.89	122	03.36	17-Aug-94	05:51	586	625
S-1-94-MB	6	36	43.60	122	03.24	17-Aug-94	06:55	751	820
S-1-94-MB	7	36	43.22	122	01.41	17-Aug-94	08:05	916	1000
S-1-94-MB	8	36	43.46	122	00.49	17-Aug-94	09:11	1037	1234
S-1-94-MB	9	36	42.90	121	59.95	17-Aug-94	10:25	872	1047
S-1-94-MB	10	36	35.47	122	26.94	18-Aug-94	05:32	2850	2955
S-1-94-MB	11	36	33.90	122	24.18	18-Aug-94	08:15	2051	2145
S-1-94-MB	12	36	31.90	122	21.31	18-Aug-94	10:34	1551	1605
S-1-94-MB	13	36	36.70	122	16.37	18-Aug-94	12:27	1802	2050
S-1-94-MB	14	36	38.48	122	19.30	19-Aug-94	02:36	1801	1845
S-1-94-MB	15	36	40.20	122	21.99	19-Aug-94	04:15	1699	1750
S-1-94-MB	16	36	39.76	122	27.13	19-Aug-94	05:56	2004	2210
S-1-94-MB	17	36	38.92	122	25.49	19-Aug-94	07:59	2049	2150
S-1-94-MB	18	36	37.81	122	24.67	19-Aug-94	09:52	2360	2460
S-1-94-MB	19	36	36.48	122	22.14	19-Aug-94	12:01	2739	2840
S-1-94-MB	20	36	34.96	122	20.33	19-Aug-94	15:44	2025	2077
S-1-94-MB	21	36	33.83	122	17.69	19-Aug-94	17:31	1882	2190
S-1-94-MB	22	36	32.57	122	15.94	19-Aug-94	19:14	1925	1990
S-1-94-MB	23	36	30.35	122	13.57	19-Aug-94	21:03	1239	1380
S-1-94-MB	24	36	33.73	122	14.43	19-Aug-94	22:56	2466	2560
S-1-94-MB	25	36	34.95	122	21.33	20-Aug-94	01:44	1996	2200
S-1-94-MB	26	36	37.47	122	21.85	20-Aug-94	03:18	2205	2325
S-1-94-MB	t1	36	27.74	121	57.80	22-Aug-94	16:50	80	90
S-1-94-MB	t2	36	19.41	122	06.30	22-Aug-94	19:28	358	370

Table 3: Vertical Section Profile Grid Spacing

	Vertical Section Profiles of Potential Temperature, Salinity and Sigma-theta		Vertical Section Profiles of Attenuation	
	Horizontal Grid Spacing	Vertical Grid Spacing	Horizontal Grid Spacing	Vertical Grid Spacing
Along the Axis	distance between each station	every 10 db, from 0-500 db every 25 db, from 501-2550 db every 50 db, from 2551-3200 db	0.5 m	2.5 db
Narrow Section	distance between each station	every 10 db, from 0-500 db every 25 db, from 501-2550 db every 50 db, from 2551-3200 db	0.5 m	1.0 db
Wide Section 1	distance between each station	every 10 db, from 0-500 db every 25 db, from 501-2550 db every 50 db, from 2551-3200 db	0.5 m	1.0 db
Wide Section 2	distance between each station	every 10 db, from 0-500 db every 25 db, from 501-2550 db every 50 db, from 2551-3200 db	0.5 m	1.0 db

Appendix C. To calculate the Brunt-Väisälä frequency the records were averaged over an interval of 10 data points at a time to smooth out the data before processing. The square of the Brunt-Väisälä frequency (N^2) was then calculated according to

$$N^2 = -\frac{g}{\sigma_\theta}\left(\frac{\partial \sigma_\theta}{\partial z}\right)$$

where g is the acceleration due to gravity, σ_θ is the potential density, and $\frac{\partial \sigma_\theta}{\partial z}$ is the density gradient.

All times are in Greenwich mean time (GMT). All units for the variables are the same throughout the report (Table 1 and Table 2).

Vertical section profiles are included in Appendix A. Potential temperature, salinity, sigma-theta, and attenuation are contoured along several track lines (Figure A1): One along the canyon axis, one across the canyon at the narrow section and two across the canyon at the wide section.

For the plots of potential temperature, salinity, and sigma-theta, the horizontal grid spacing is divided into sections defined by the distance between each station (Table 3). Vertical grid spacing increases with increasing pressure. For attenuation, the data were smoothed using a 75-point moving average before being linearly interpolated into a grid pattern for plotting. The grid elements for attenuation are evenly spaced at either 0.5 m × 1.0 db or 0.5 m × 2.5 db (Table 3).

Contour intervals for the vertical section profiles are the same throughout. Note that the bottom depths represented on the plots are the bottom depths of the cast, not the actual depth to the sea floor. Casts generally came within 75 m of the sea floor (Table 2).

Plots of horizontal surfaces are included in Appendix B. Potential temperature, salinity, and sigma-theta were contoured on surfaces of constant pressure in the dynamically wide region of the canyon (Figure B1). Plots were made along isobaric surfaces of 1375 db, 1700 db, and 1975 db.

A Laplacian interpolation scheme was used to grid the data. The grid elements for each plot are evenly spaced; however, the number of grid elements (the number of grid boxes in the x-direction vs. the number of grid boxes in the y-direction) for each plot varies (see Table 4). The shaded bars for each plot are unique to that plot. Contour intervals for the variables are consistent throughout the plots (Table 4).

Profile plots of potential temperature, salinity, sigma-theta, transmissivity, and the Brunt-Väisälä frequency squared vs. pressure are included in Appendix C for all casts in the cruise. Tables of the Brunt-Väisälä frequency squared are included with the plots. Data is listed every 20 db up to 1000 db and every 50 db thereafter. Three scales of vertical axes were used in the plots:

0 db – 500 db for shallow stations;
0 db – 1500 db for intermediate stations; and
0 db – 3200 db for deep stations.

The scales of the horizontal axes are the same throughout.

Table 4: Horizontal Surface Plot Contour Intervals

Region	Variable	Isobar	Range	Contour Interval	No. of Grid Elements	
					X	Y
Wide	Potential Temperature	1375 db	2.78 - 2.98 °C	0.02 °C	6	8
		1700 db	2.18 - 2.44 °C	0.02 °C	6	7
		1975 db	1.84 - 1.98 °C	0.02 °C	6	6
	Sigma-theta	1375 db	27.510 - 27.542 kg/m^3	0.004 kg/m^3	6	8
		1700 db	27.594 - 27.636 kg/m^3	0.004 kg/m^3	6	7
		1975 db	27.662 - 27.682 kg/m^3	0.004 kg/m^3	6	6
	Salinity	1375 db	34.528 - 34.544 ppt	0.002 ppt	6	8
		1700 db	34.574 - 34.596 ppt	0.002 ppt	6	7
		1975 db	34.610 - 34.624 ppt	0.002 ppt	6	6

Other data collected

Measurements of dissolved oxygen current, temperature, and saturation were collected during the J-7-94-MB cruise, the S-1-94-MB cruise, and the J-13-94-MB cruise. If you would like a copy of these data please contact Marlene Noble at the U. S. Geological Survey (E-mail: mnoble@usgs.gov).

ACKNOWLEDGMENTS

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Appendix A Vertical Section Profiles

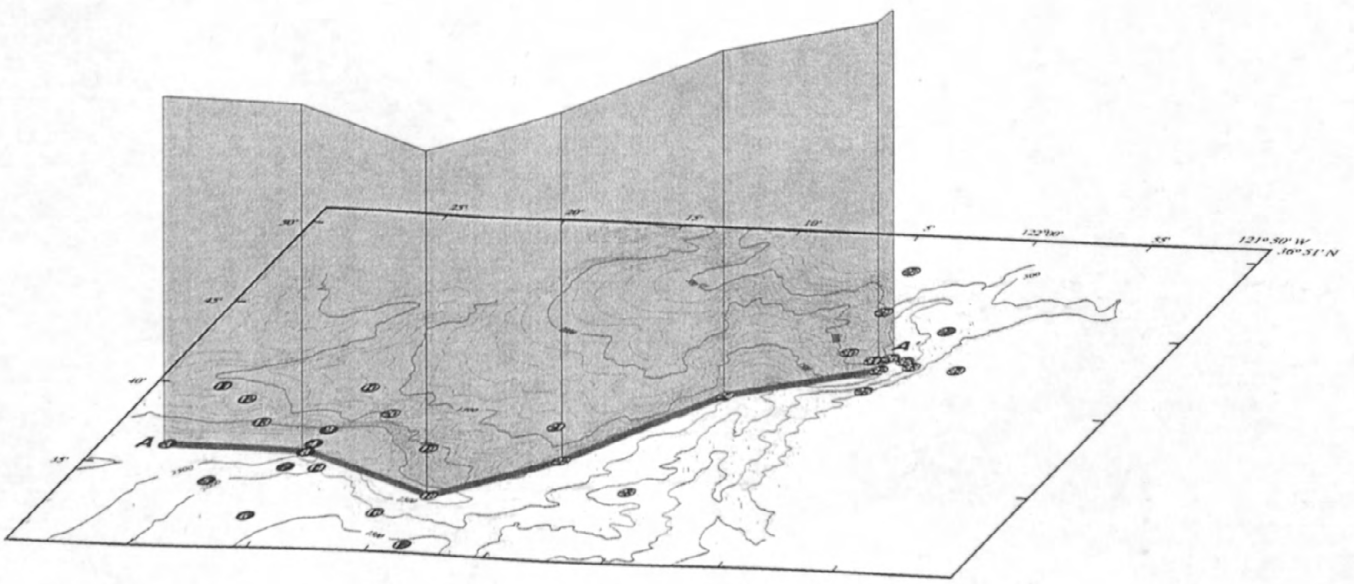
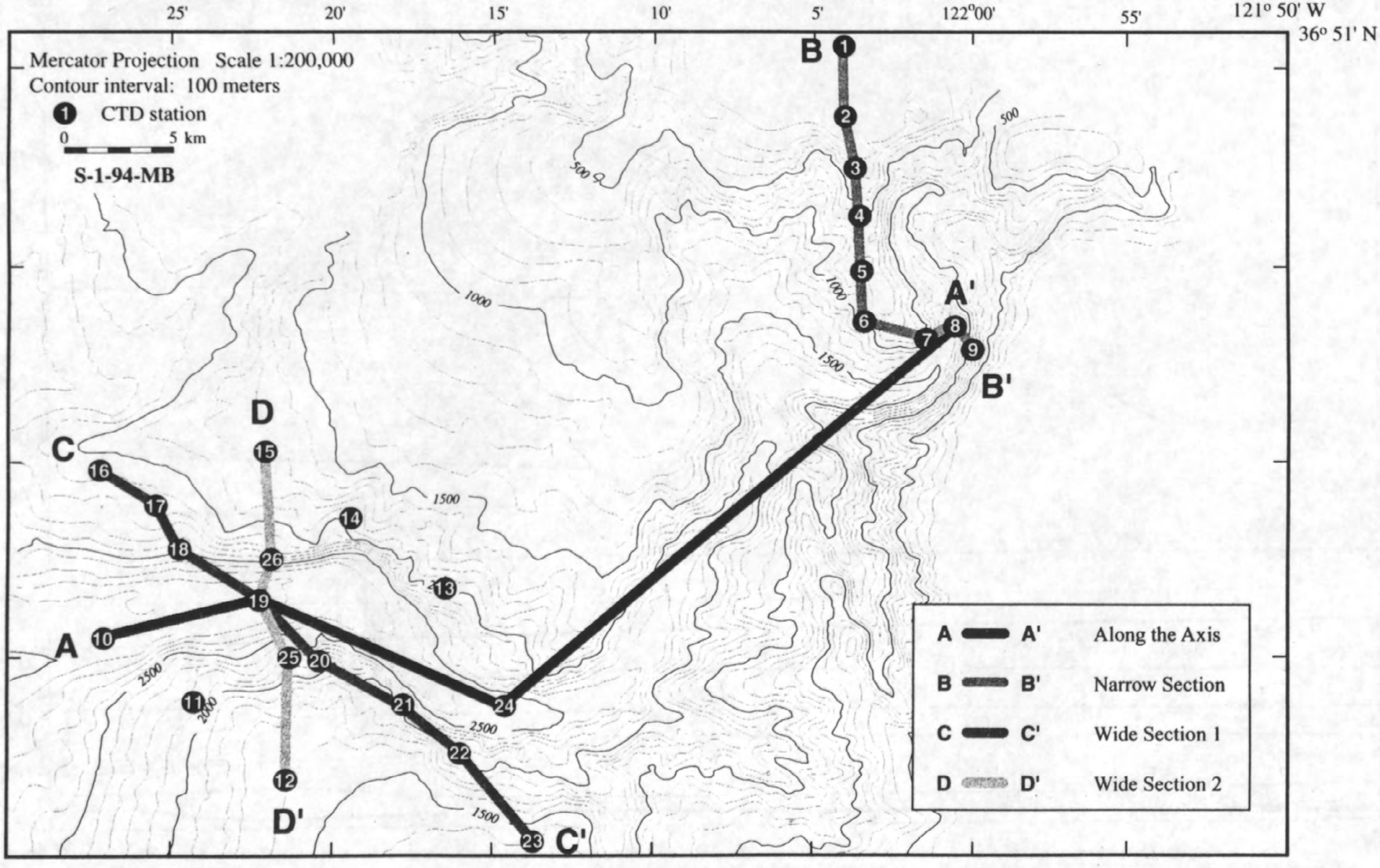
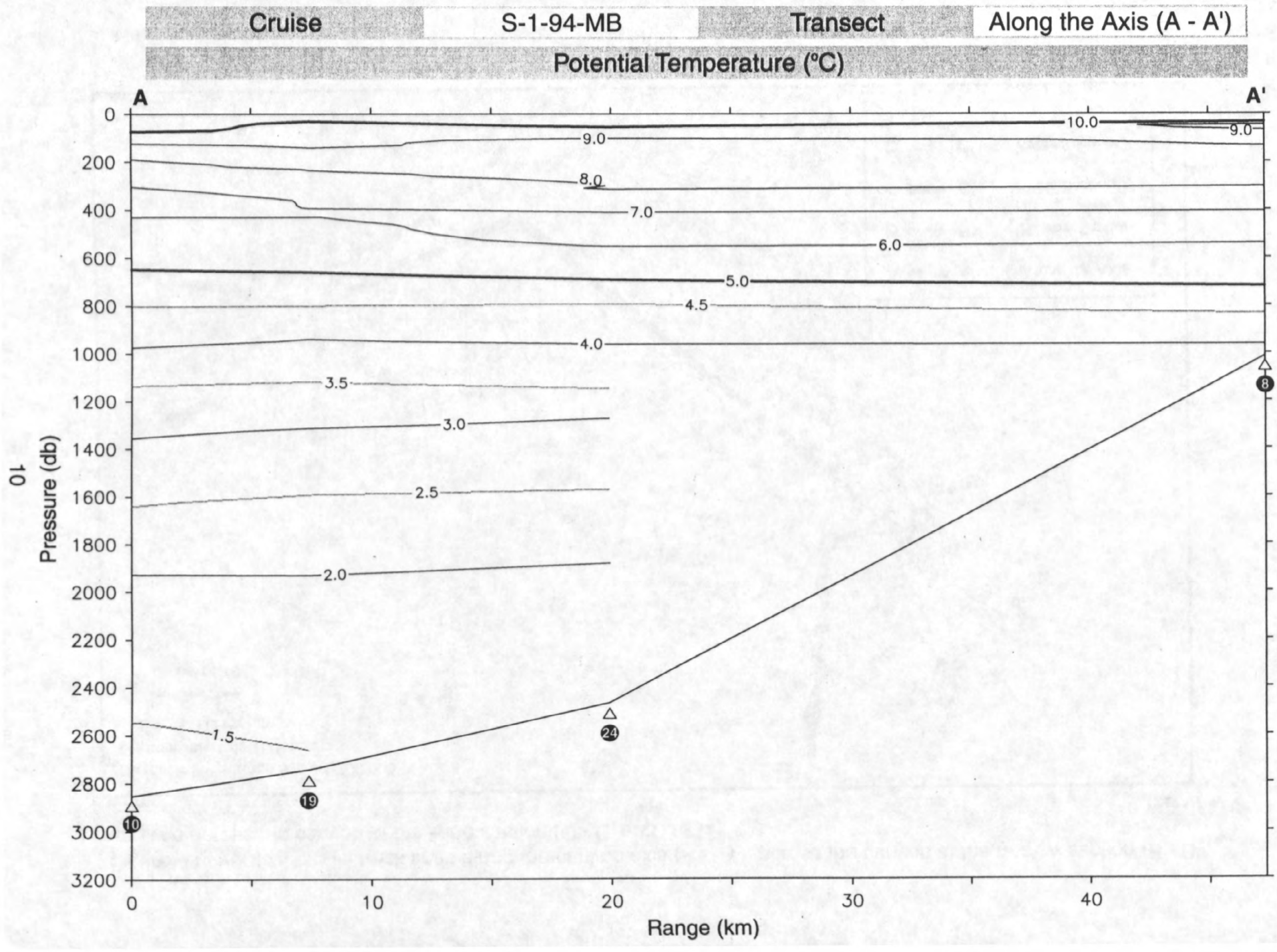
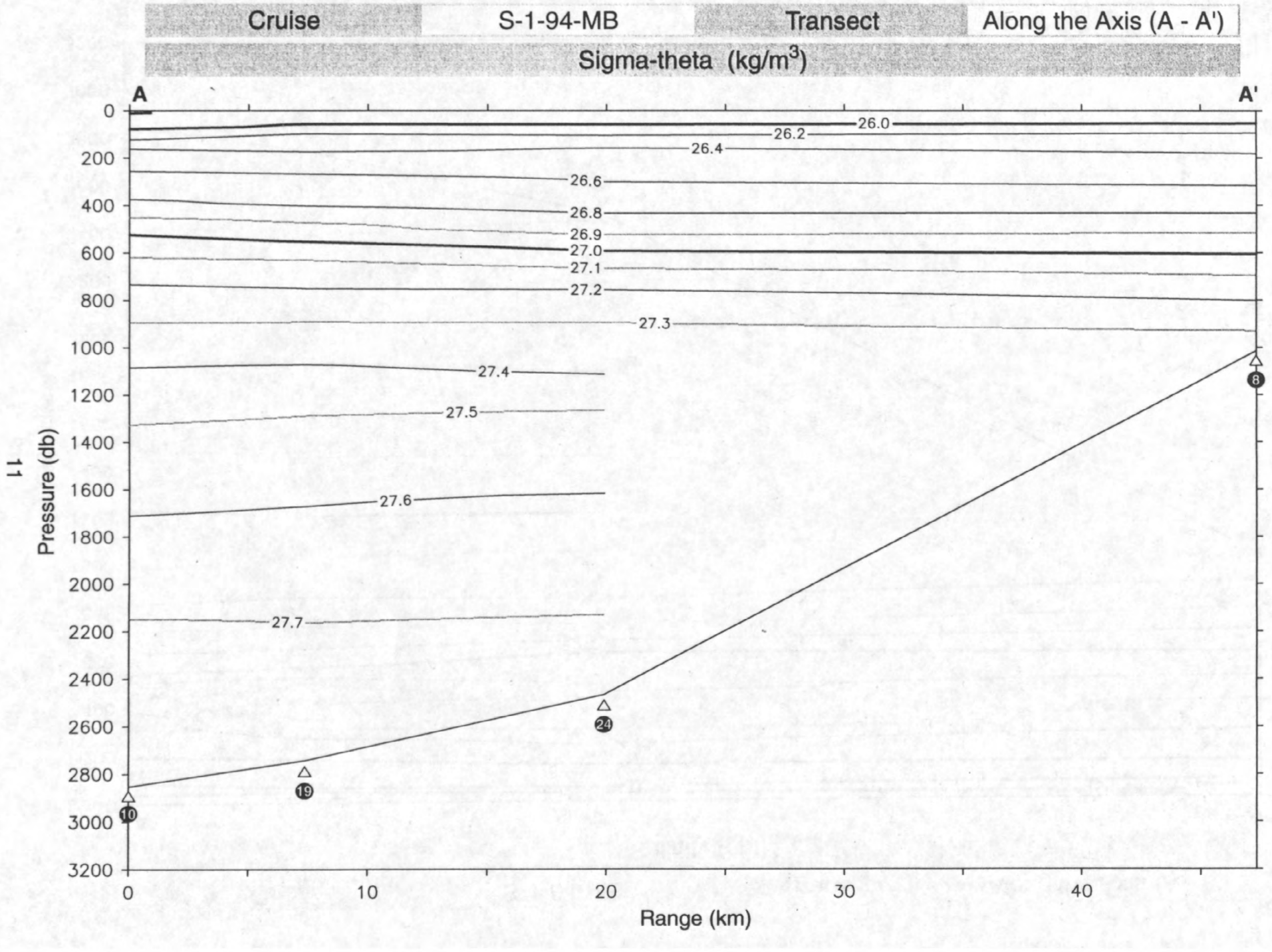
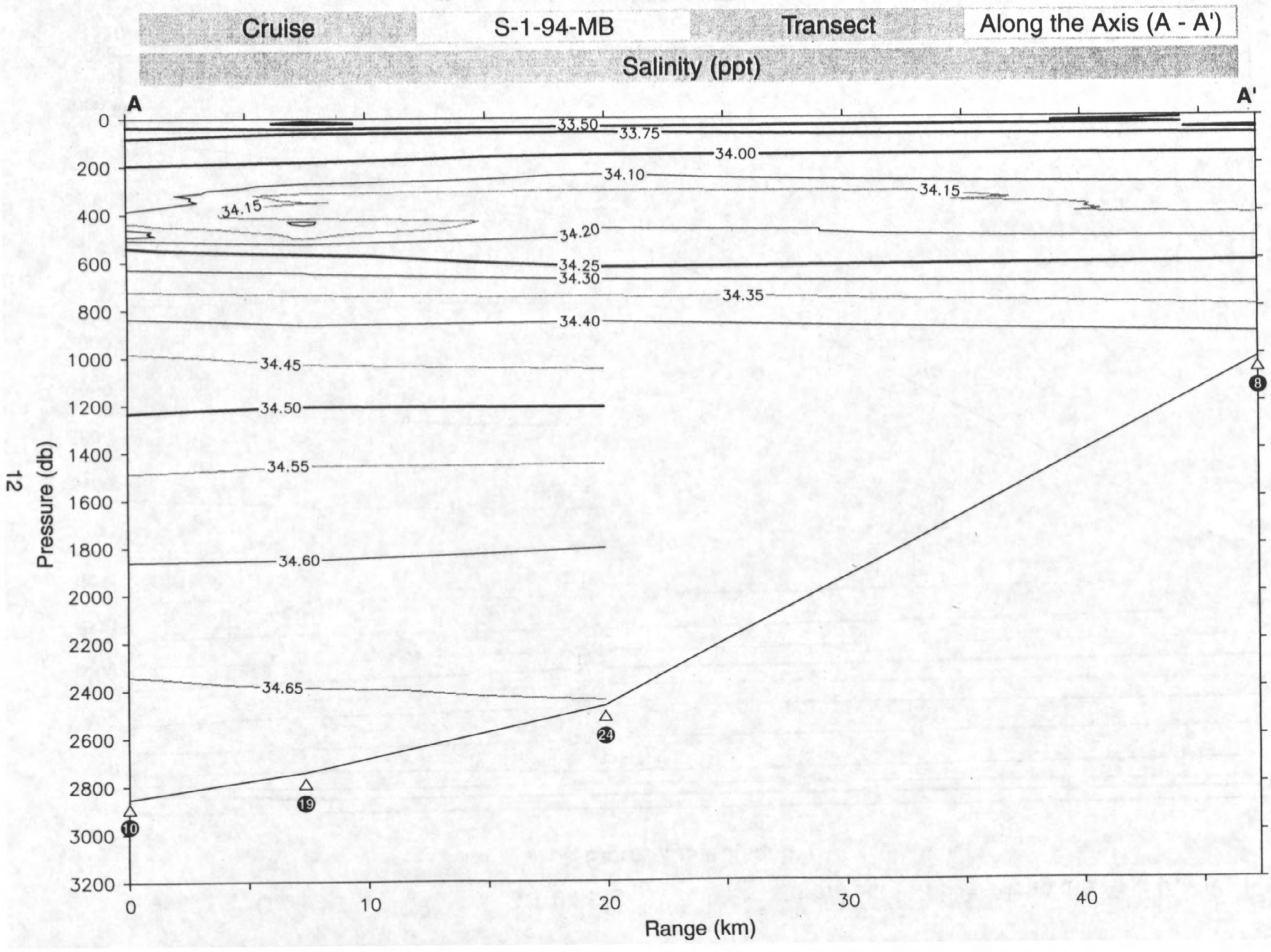


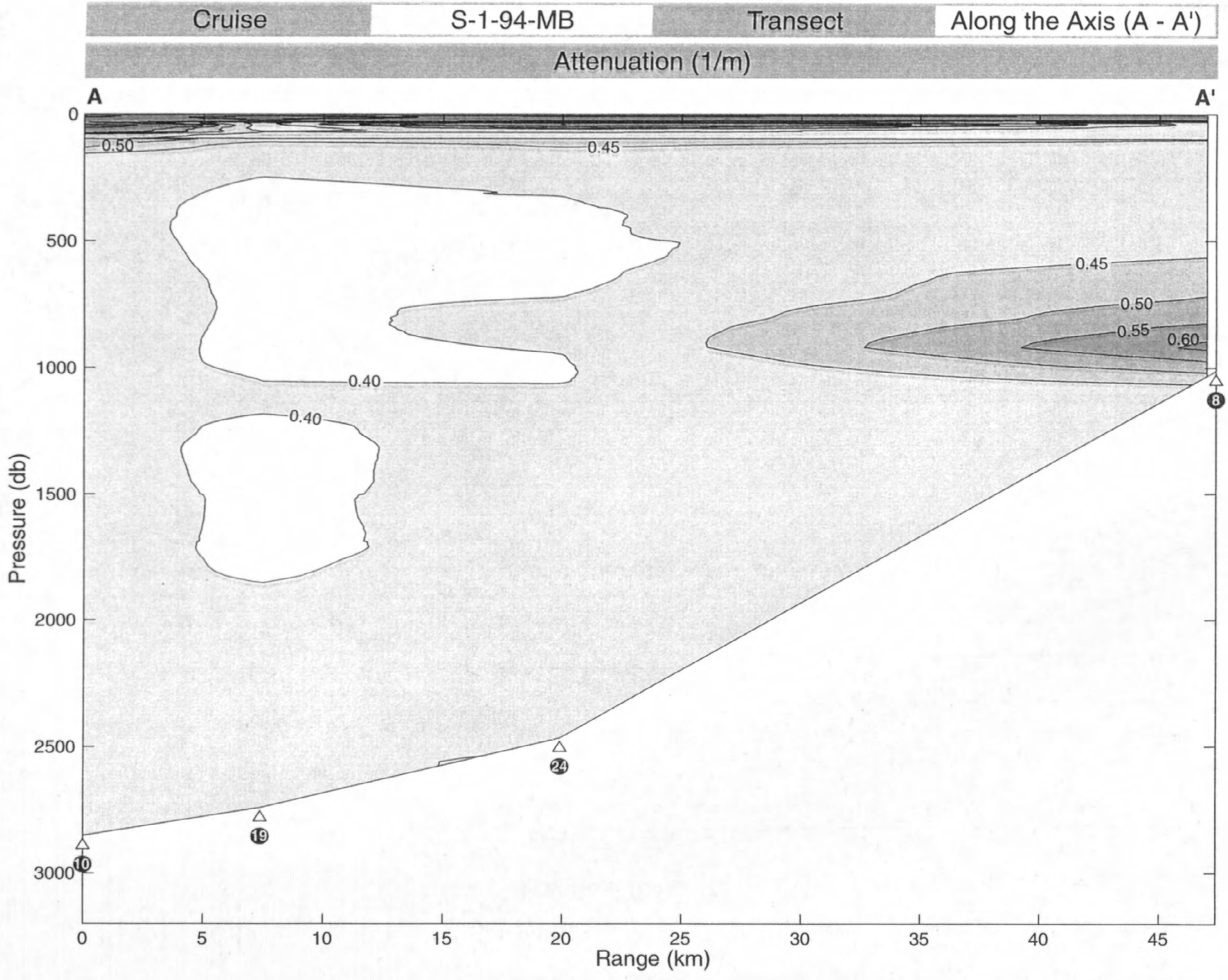
Figure A1. Vertical profile track lines along the canyon axis (A - A'), across the canyon at the narrow section (B - B'), and two across the canyon at the wide section (C - C' and D - D').




Cruise
S-1-94-MB
Transect
Along the Axis (A - A')
Potential Temperature (°C)
A
A'
10.0
9.0
9.0
8.0
7.0
6.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
Pressure (db)
Range (km)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0
10
20
30
40
10
19
24
8


Cruise
S-1-94-MB
Transect
Along the Axis (A - A')
Sigma-theta (kg/m3)
A
A'
26.0
26.2
26.4
26.6
26.8
26.9
27.0
27.1
27.2
27.3
27.4
27.5
27.6
27.7
10
19
24
8
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0
10
20
30
40
Range (km)


Cruise
S-1-94-MB
Transect
Along the Axis (A - A')
Salinity (ppt)
A
A'
33.50
33.75
34.00
34.10
34.15
34.15
34.20
34.25
34.30
34.35
34.40
34.45
34.50
34.55
34.60
34.65
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0
10
20
30
40
Range (km)
8
24
19
10


Cruise
S-1-94-MB
Transect
Along the Axis (A - A')
Attenuation (1/m)
A
A'
0
500
1000
1500
2000
2500
3000
Pressure (db)
0.50
0.45
0.40
0.40
0.45
0.50
0.55
0.60
8
24
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5
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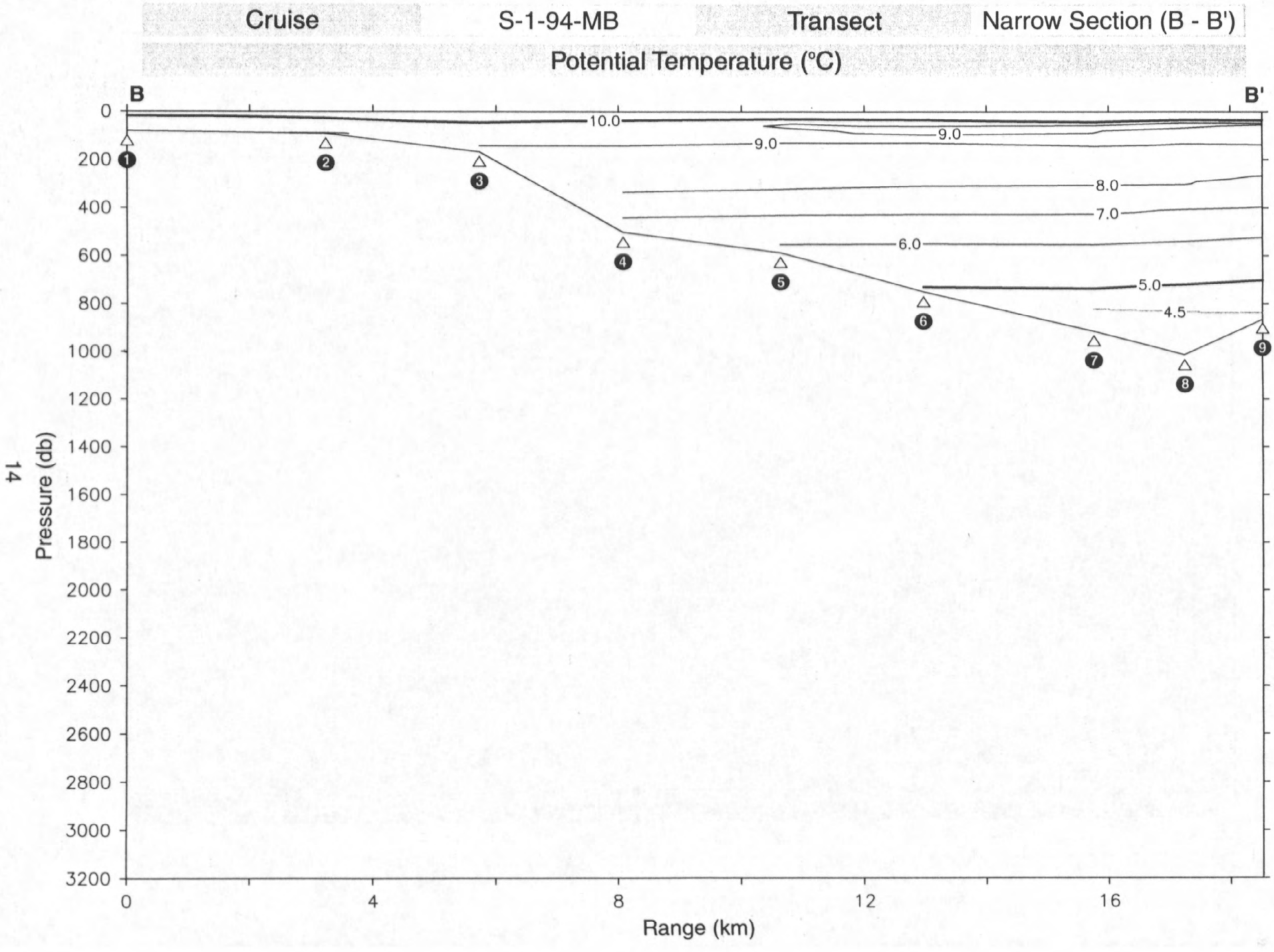
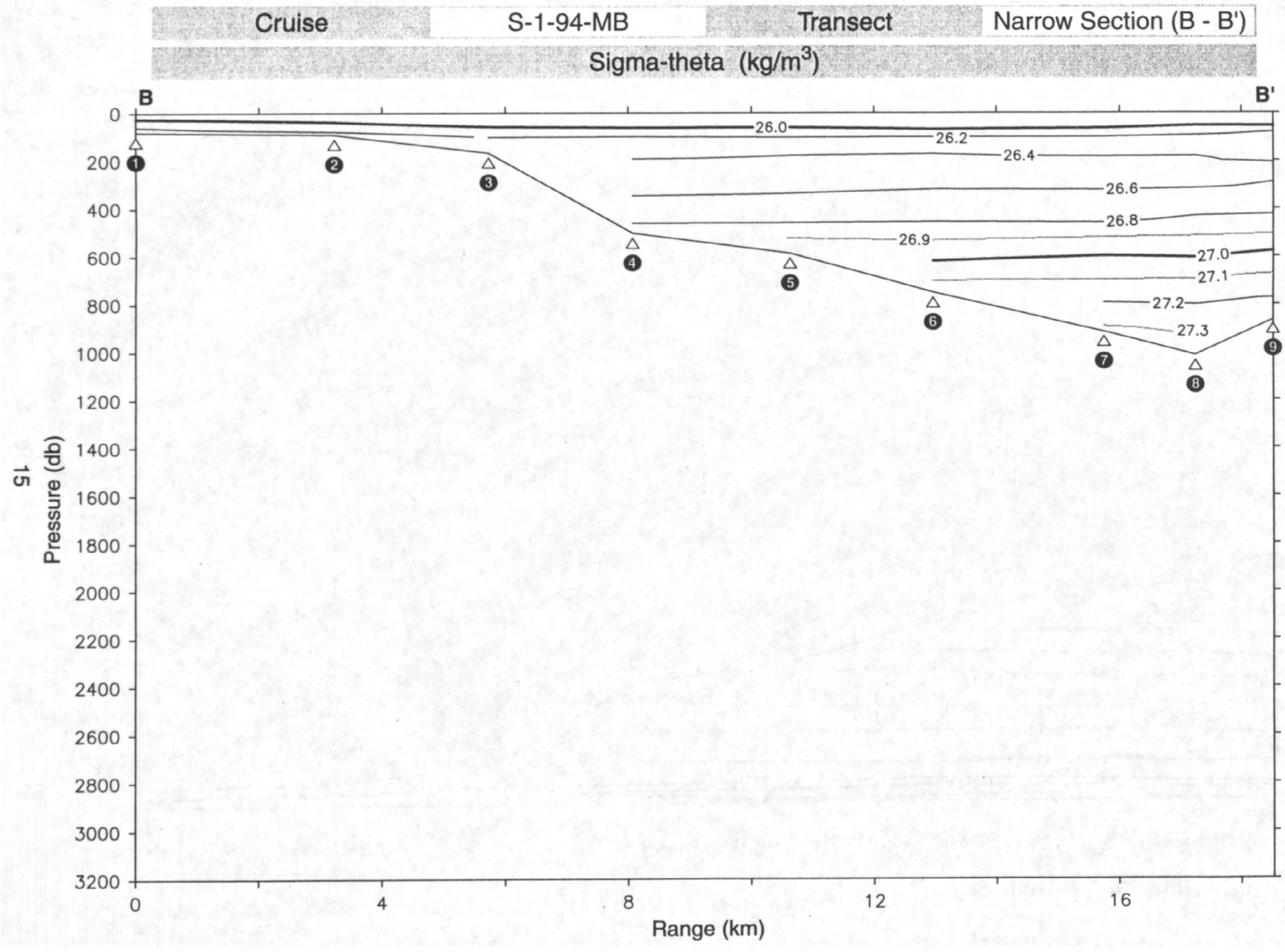
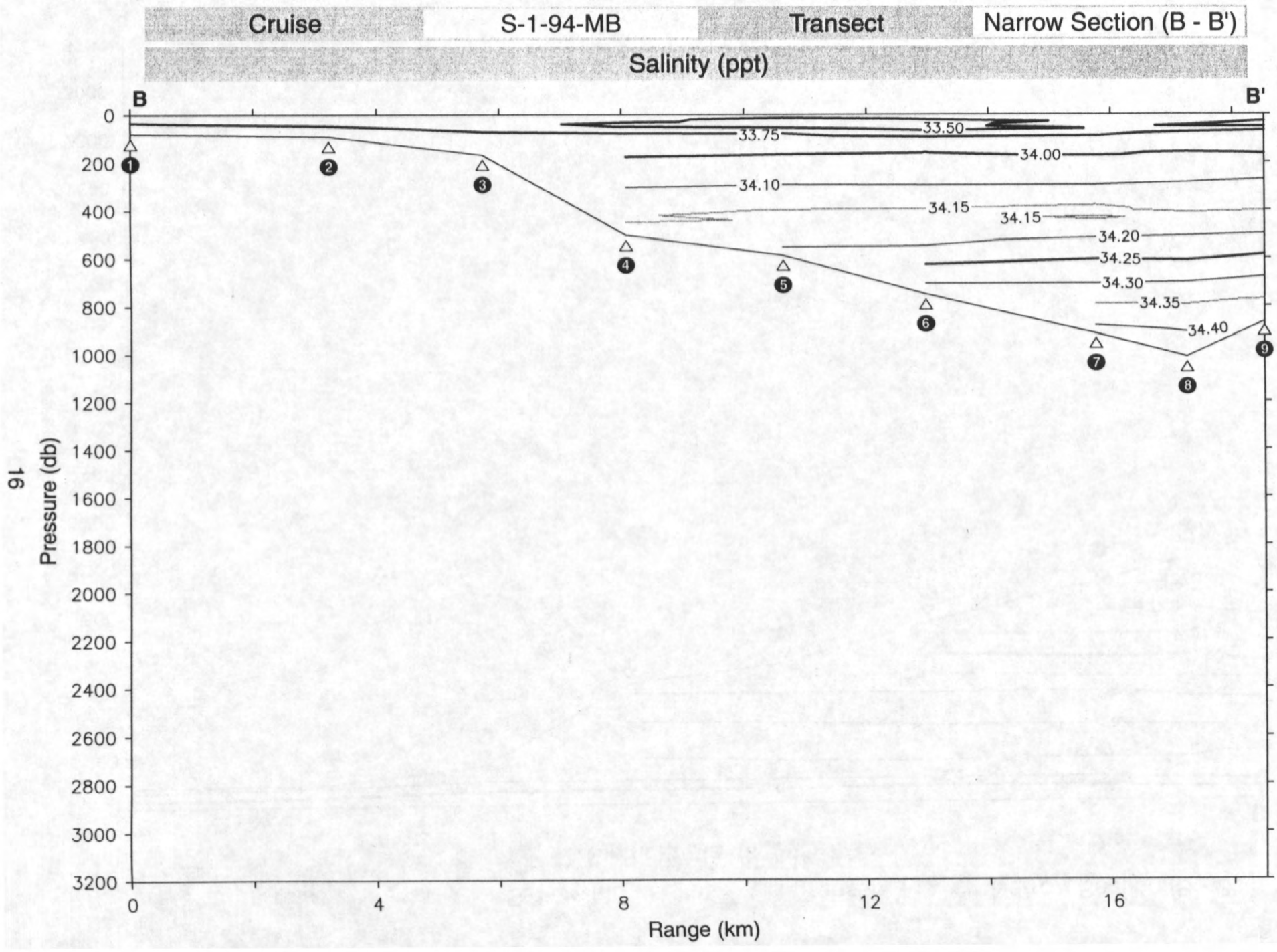
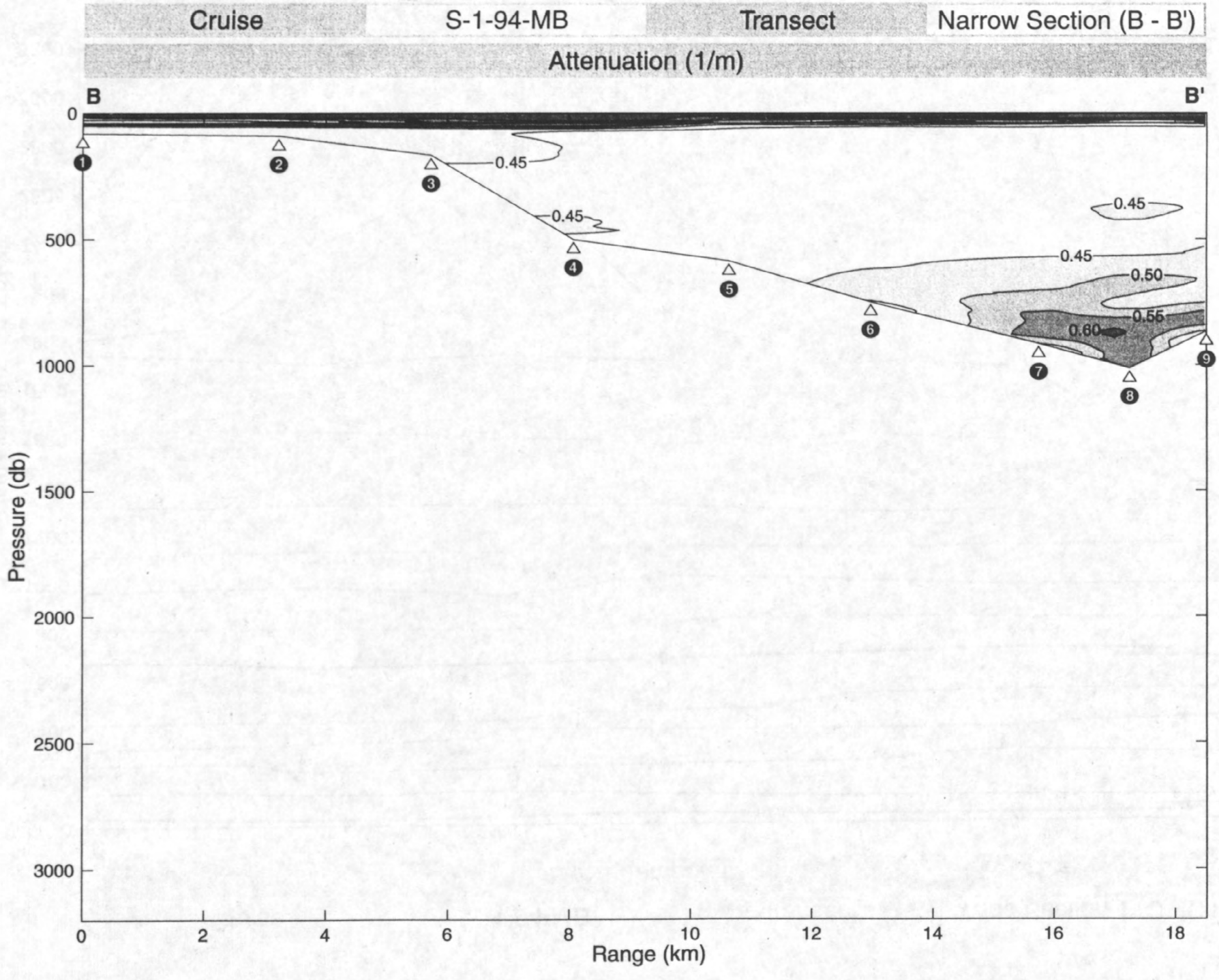
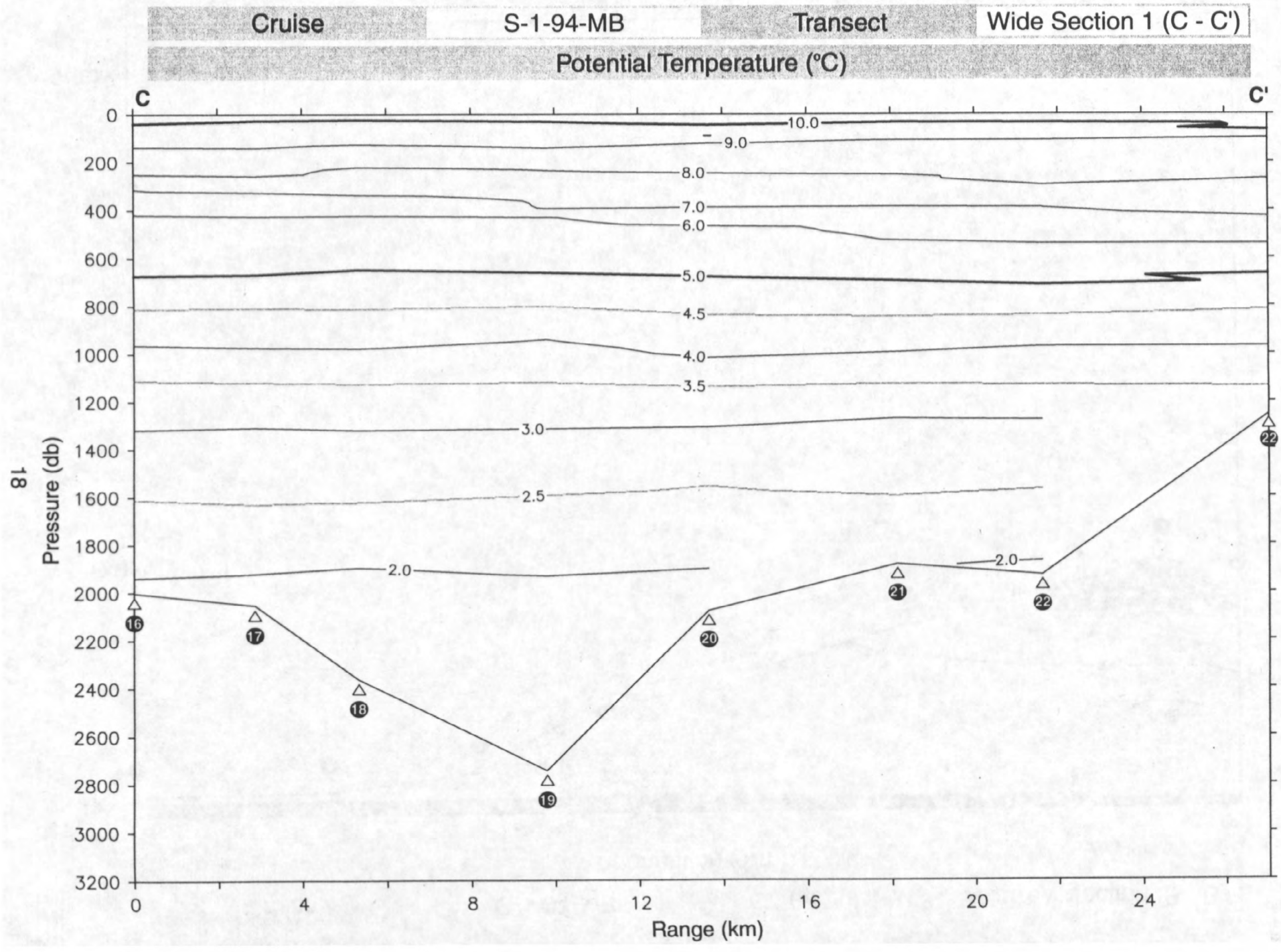
25
30
35
40
45
Range (km)

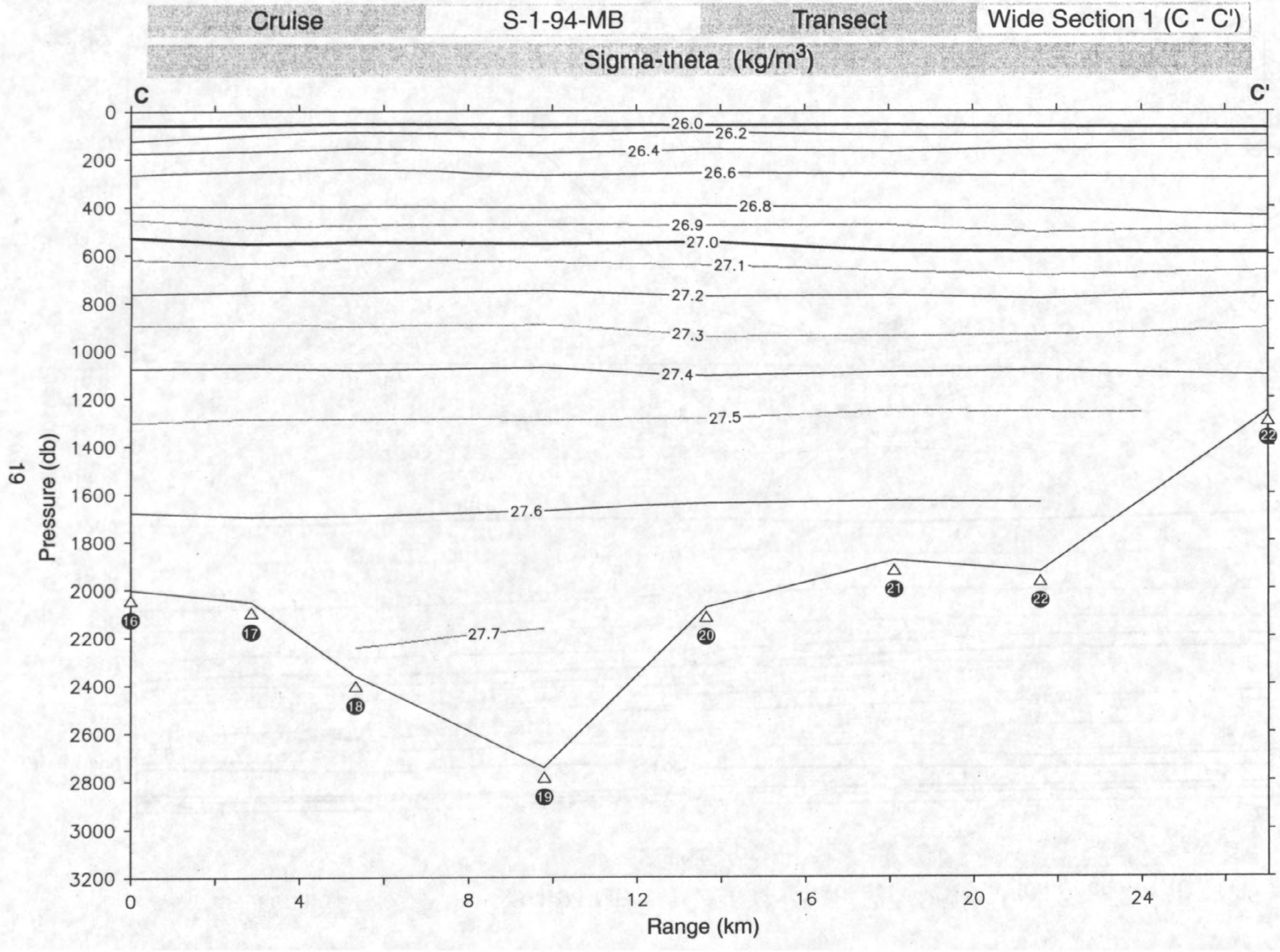

Cruise
S-1-94-MB
Transect
Narrow Section (B - B')
Potential Temperature (°C)
B
B'
10.0
9.0
9.0
8.0
7.0
6.0
5.0
4.5
1
2
3
4
5
6
7
8
9
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
Pressure (db)
0
4
8
12
16
Range (km)

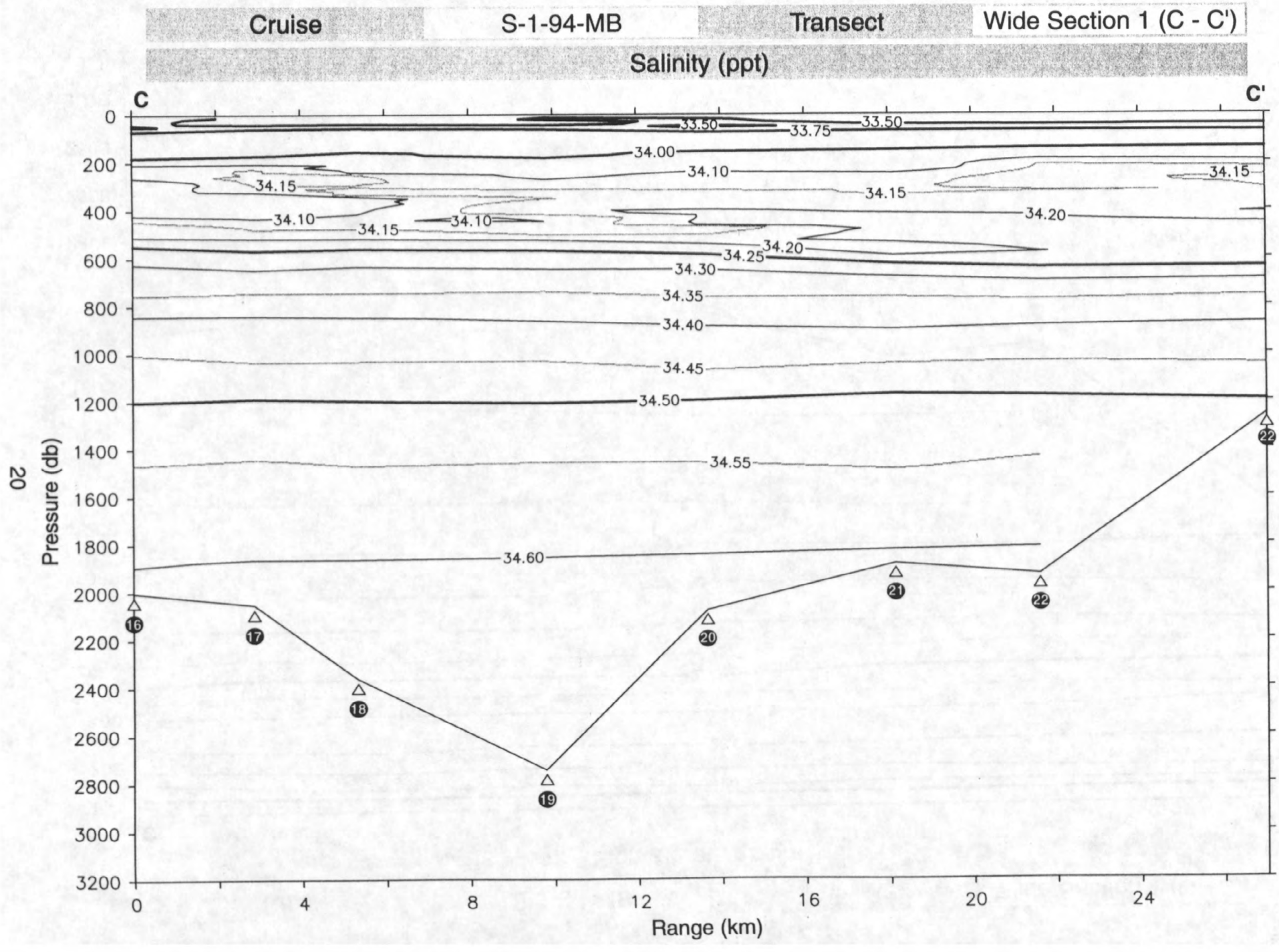

Cruise
S-1-94-MB
Transect
Narrow Section (B - B')
Sigma-theta (kg/m3)
B
B'
26.0
26.2
26.4
26.6
26.8
26.9
27.0
27.1
27.2
27.3
1
2
3
4
5
6
7
8
9
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0
4
8
12
16
Range (km)

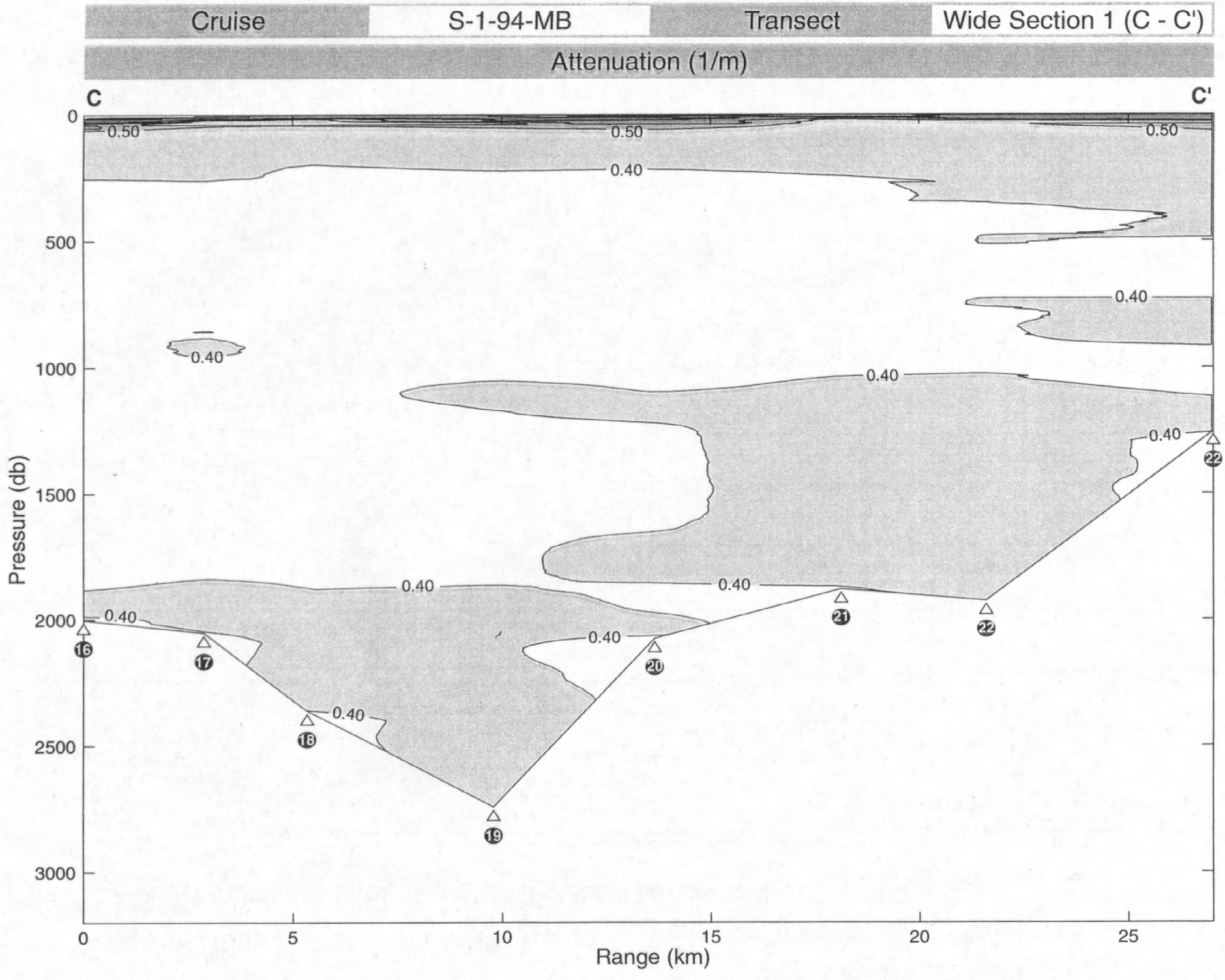

Cruise
S-1-94-MB
Transect
Narrow Section (B - B')
Salinity (ppt)
B
B'
33.75
33.50
34.00
34.10
34.15
34.15
34.20
34.25
34.30
34.35
34.40
1
2
3
4
5
6
7
8
9
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0
4
8
12
16
Range (km)

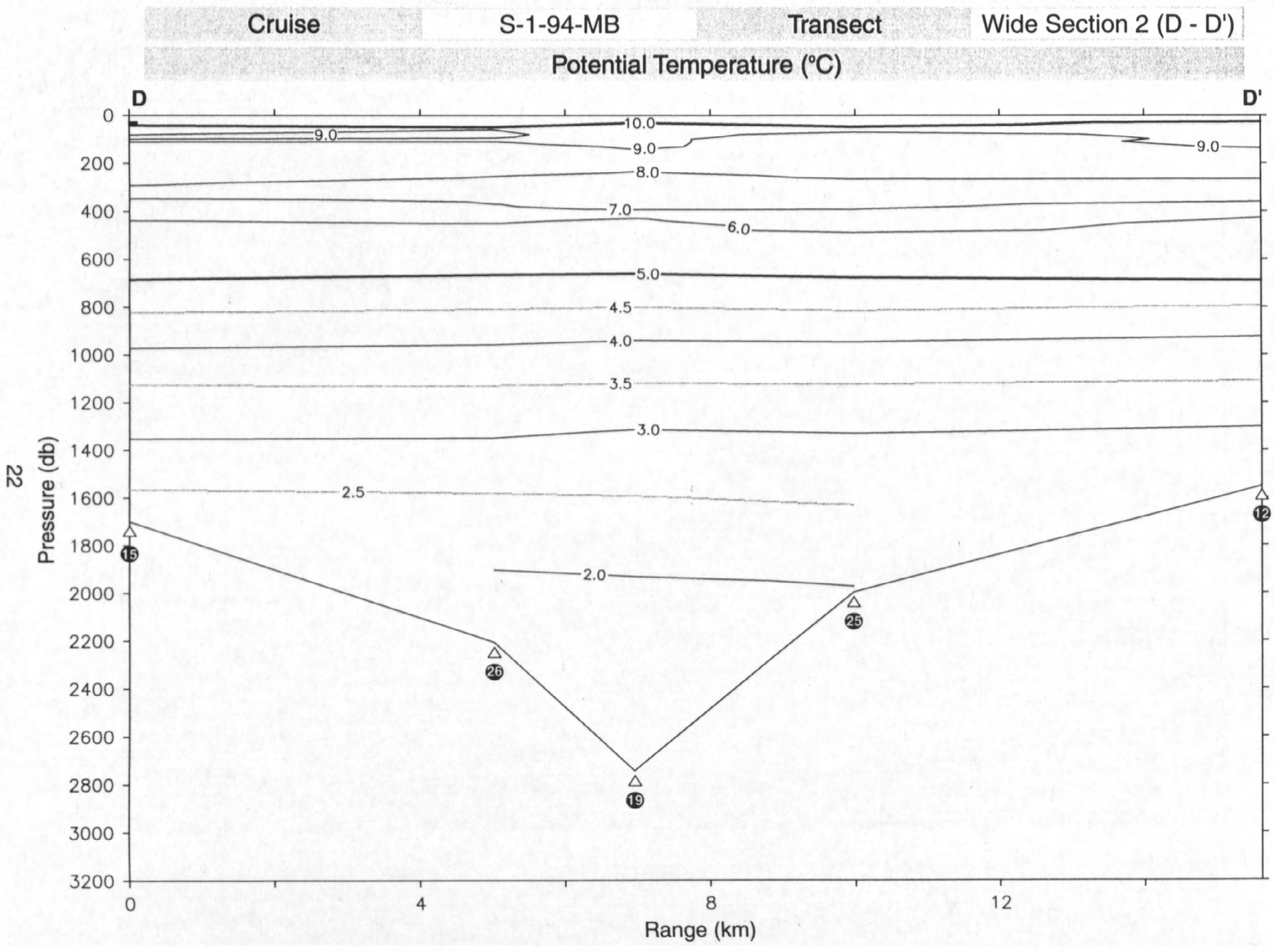

Cruise
S-1-94-MB
Transect
Narrow Section (B - B')
Attenuation (1/m)
B
B'
0
500
1000
1500
2000
2500
3000
Pressure (db)
0
2
4
6
8
10
12
14
16
18
Range (km)
0.45
0.45
0.45
0.45
0.50
0.55
0.60
1
2
3
4
5
6
7
8
9

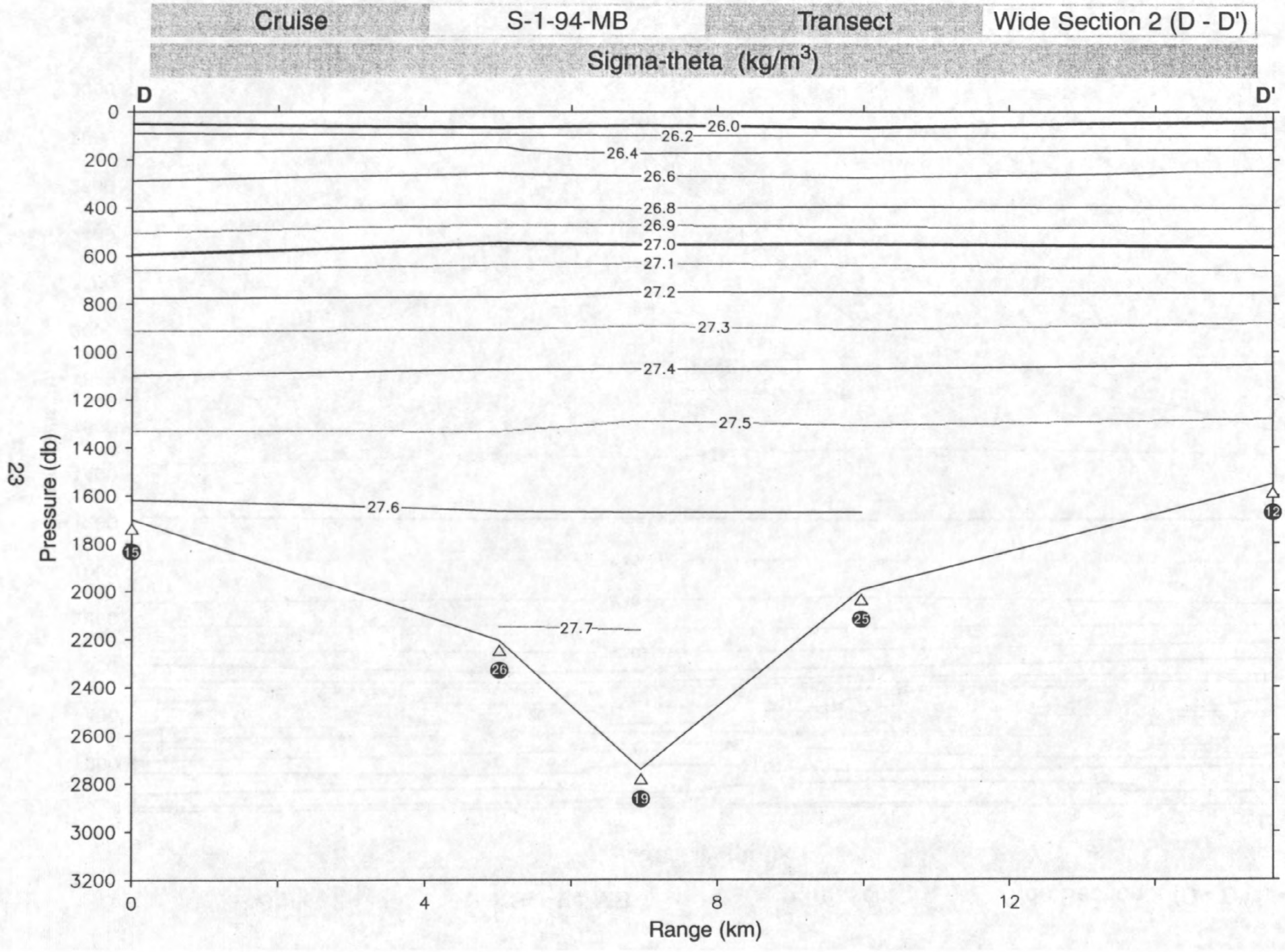

Cruise
S-1-94-MB
Transect
Wide Section 1 (C - C')
Potential Temperature (°C)
C
C'
10.0
9.0
8.0
7.0
6.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
2.0
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
16
17
18
19
20
21
22
22
0
4
8
12
16
20
24
Range (km)

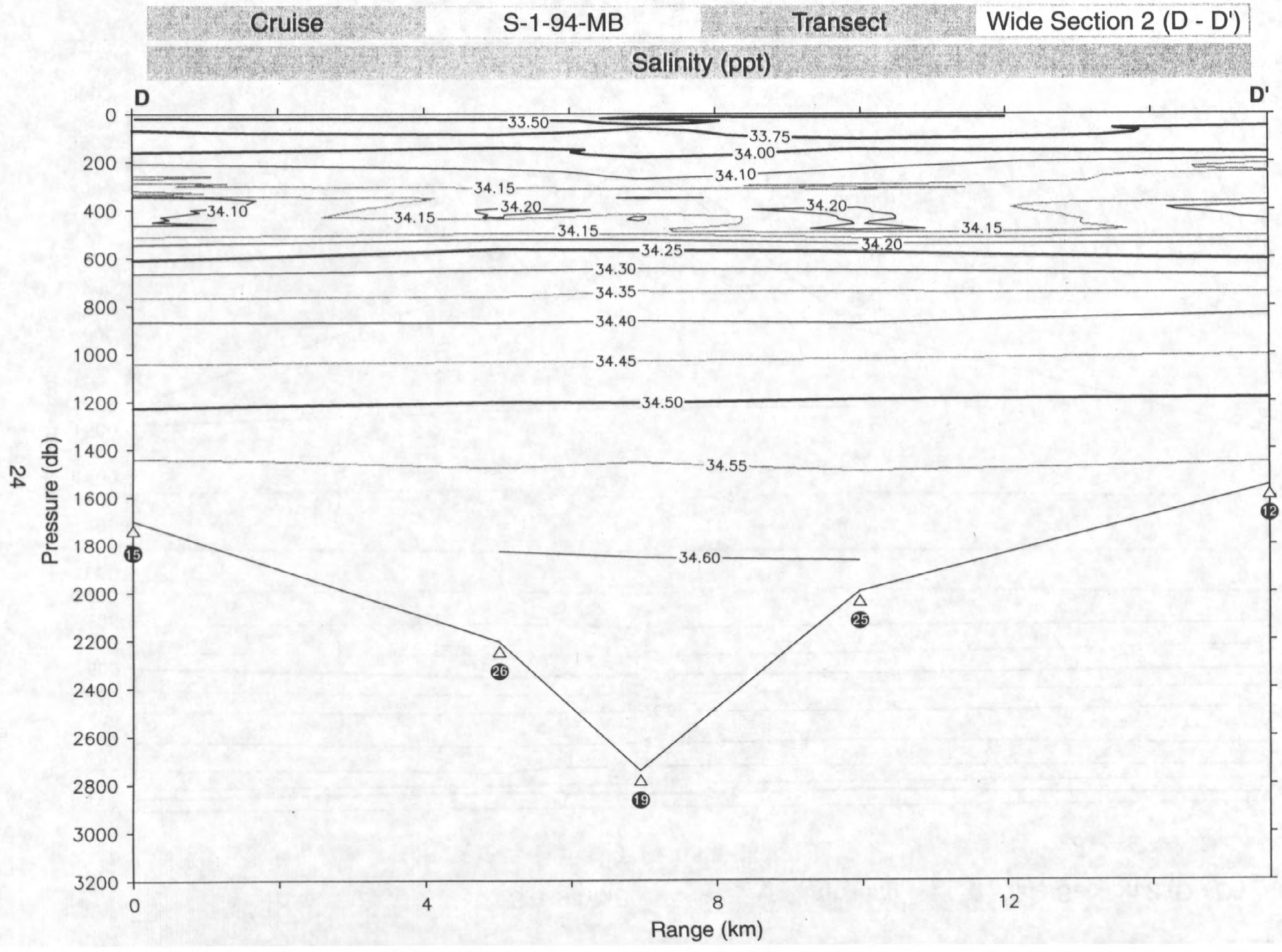

Cruise
S-1-94-MB
Transect
Wide Section 1 (C - C')
Sigma-theta (kg/m3)
C
C'
26.0
26.2
26.4
26.6
26.8
26.9
27.0
27.1
27.2
27.3
27.4
27.5
27.6
27.7
Pressure (db)
Range (km)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
4
8
12
16
20
24
16
17
18
19
20
21
22
22

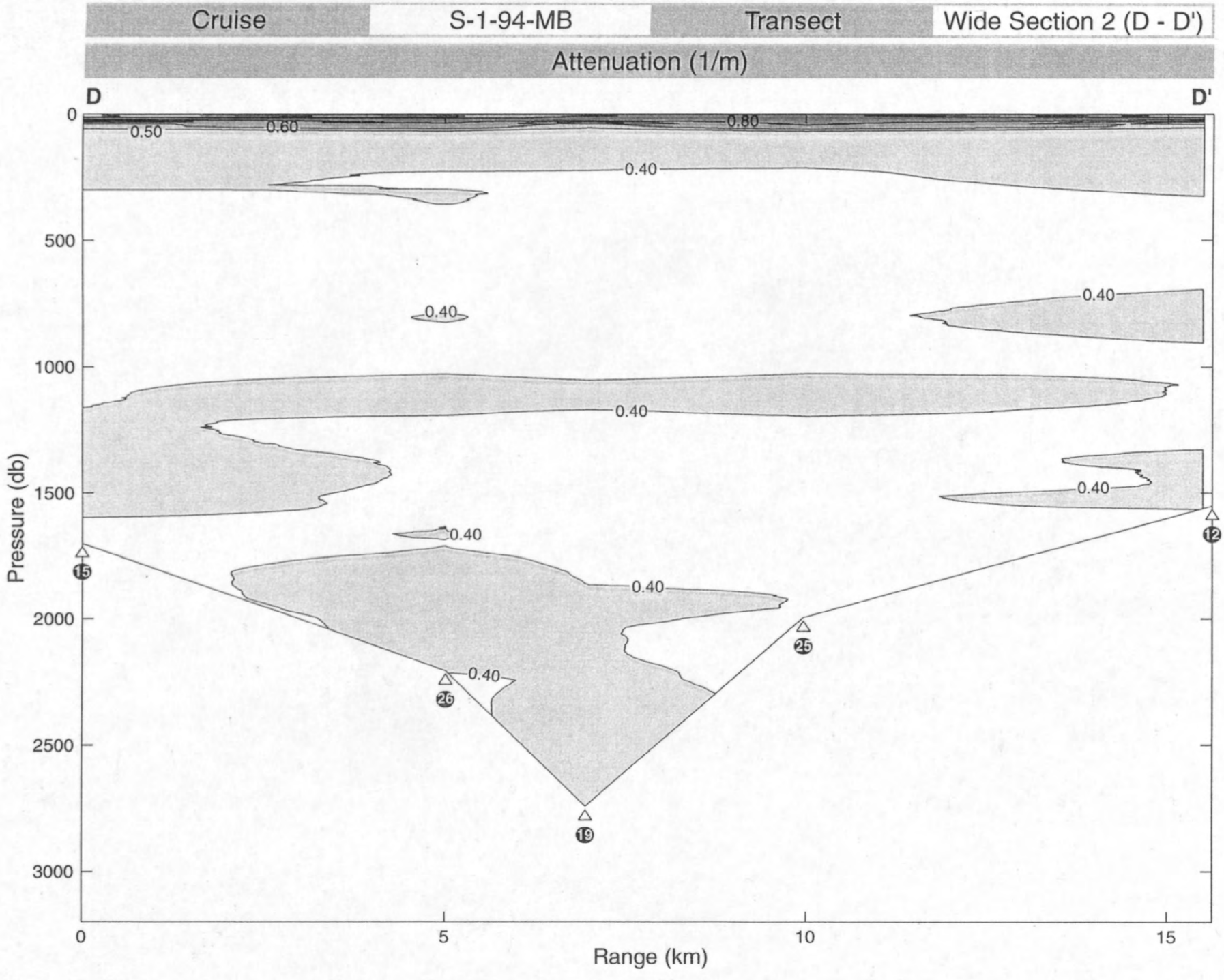

Cruise
S-1-94-MB
Transect
Wide Section 1 (C - C')
Salinity (ppt)
C
C'
33.50
33.75
33.50
34.00
34.10
34.15
34.15
34.15
34.10
34.10
34.15
34.20
34.20
34.25
34.30
34.35
34.40
34.45
34.50
34.55
34.60
Pressure (db)
Range (km)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0
4
8
12
16
20
24
16
17
18
19
20
21
22
22
20


Cruise
S-1-94-MB
Transect
Wide Section 1 (C - C')
Attenuation (1/m)
C
C'
0.50
0.40
Pressure (db)
Range (km)
0
500
1000
1500
2000
2500
3000
5
10
15
20
25
16
17
18
19
20
21
22


Cruise
S-1-94-MB
Transect
Wide Section 2 (D - D')
Potential Temperature (°C)
D
D'
10.0
9.0
9.0
9.0
8.0
7.0
6.0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
15
26
19
25
12
Pressure (db)
Range (km)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0
4
8
12


Cruise
S-1-94-MB
Transect
Wide Section 2 (D - D')
Sigma-theta (kg/m3)
D
D'
26.0
26.2
26.4
26.6
26.8
26.9
27.0
27.1
27.2
27.3
27.4
27.5
27.6
27.7
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
Range (km)
0
4
8
12
15
26
19
25
12


Cruise
S-1-94-MB
Transect
Wide Section 2 (D - D')
Salinity (ppt)
D
D'
33.50
33.75
34.00
34.10
34.15
34.20
34.25
34.30
34.35
34.40
34.45
34.50
34.55
34.60
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
15
26
19
25
12
0
4
8
12
Range (km)


Cruise
S-1-94-MB
Transect
Wide Section 2 (D - D')
Attenuation (1/m)
D
D'
0.50
0.60
0.80
0.40
0.40
0.40
0.40
0.40
0.40
0.40
0.40
Pressure (db)
0
500
1000
1500
2000
2500
3000
0
5
10
15
Range (km)
15
26
19
25
12

Appendix B Horizontal Surface Plots

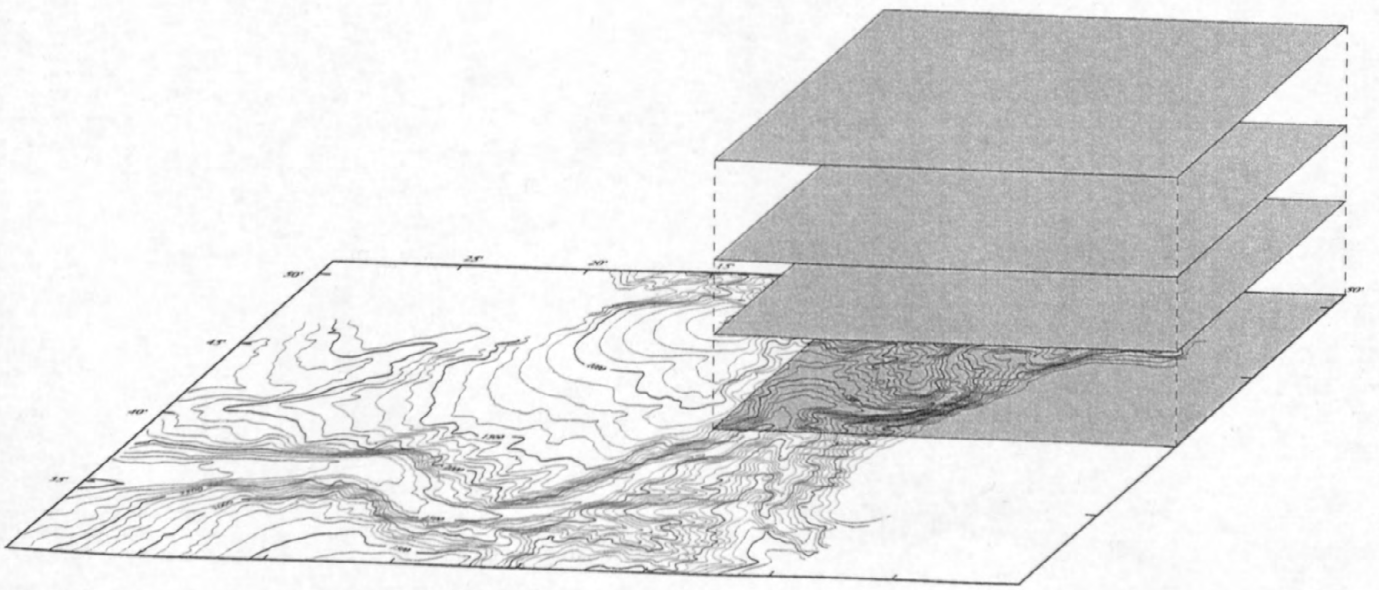
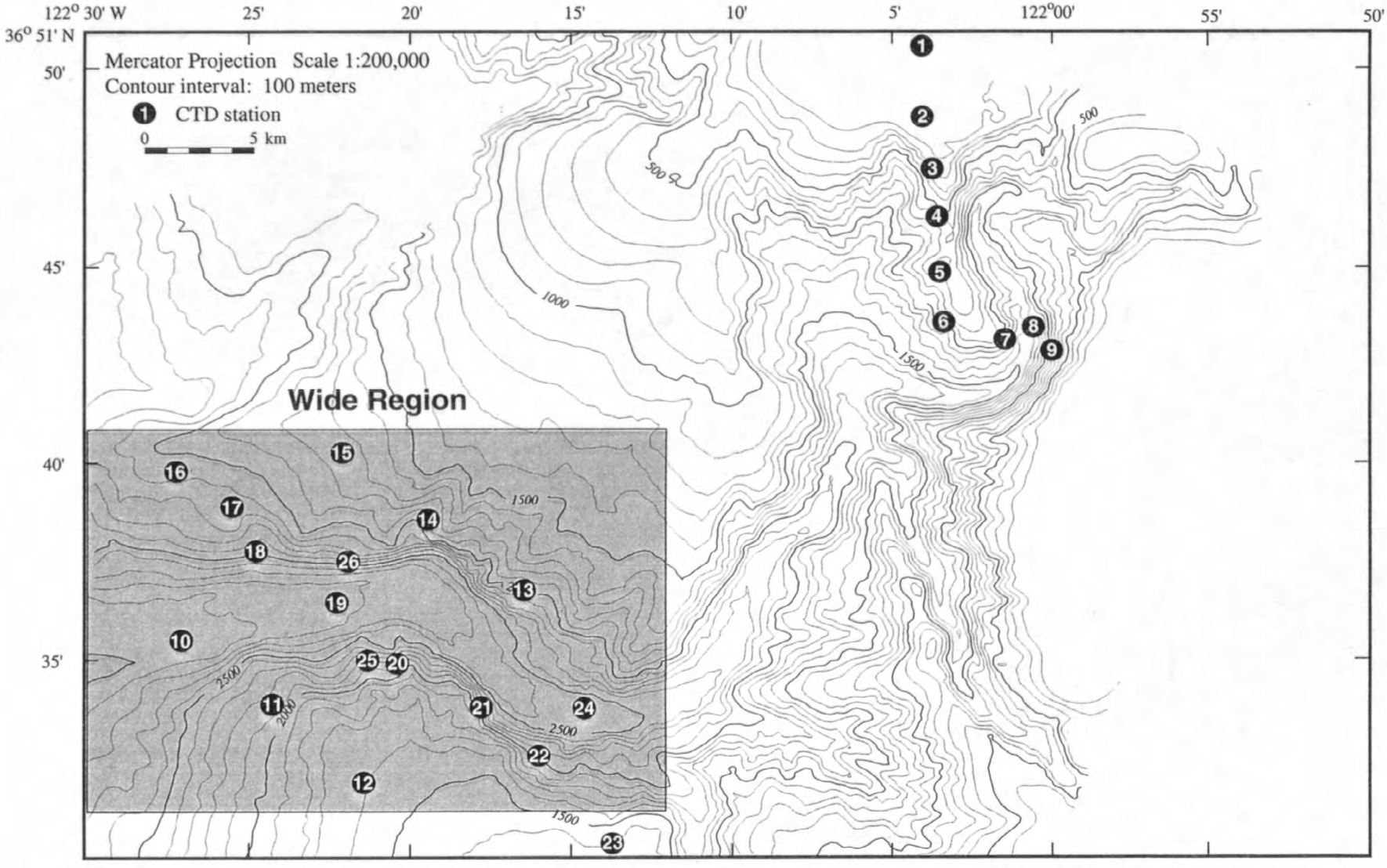
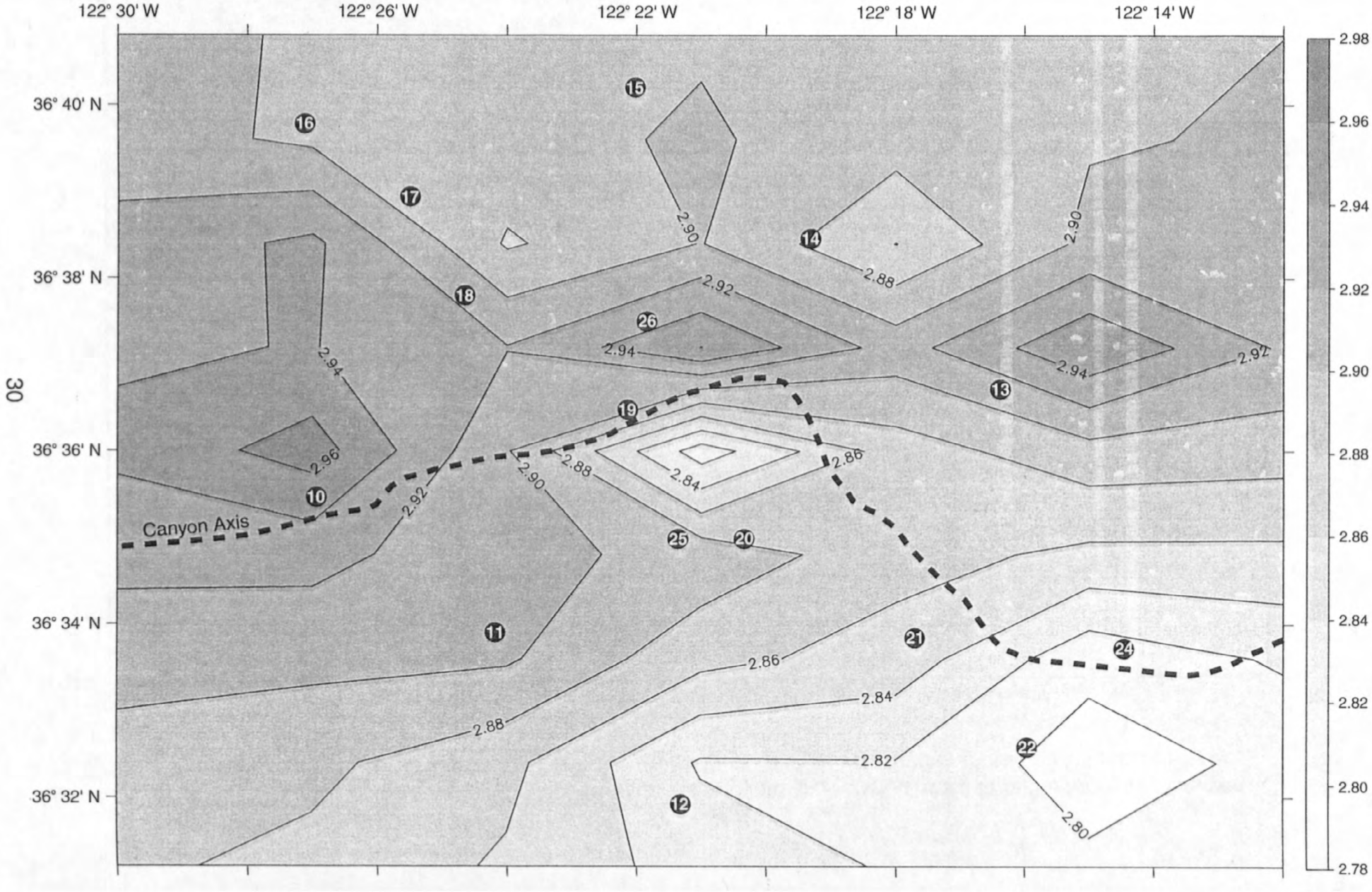


Figure B1. Location of the horizontal surface region in the dynamically "wide" section of the Monterey Canyon for the S-1-94-MB cruise. Potential temperature, sigma-theta, and salinity are contoured on isobaric surfaces of 1375 db, 1700 db, and 1975 db.



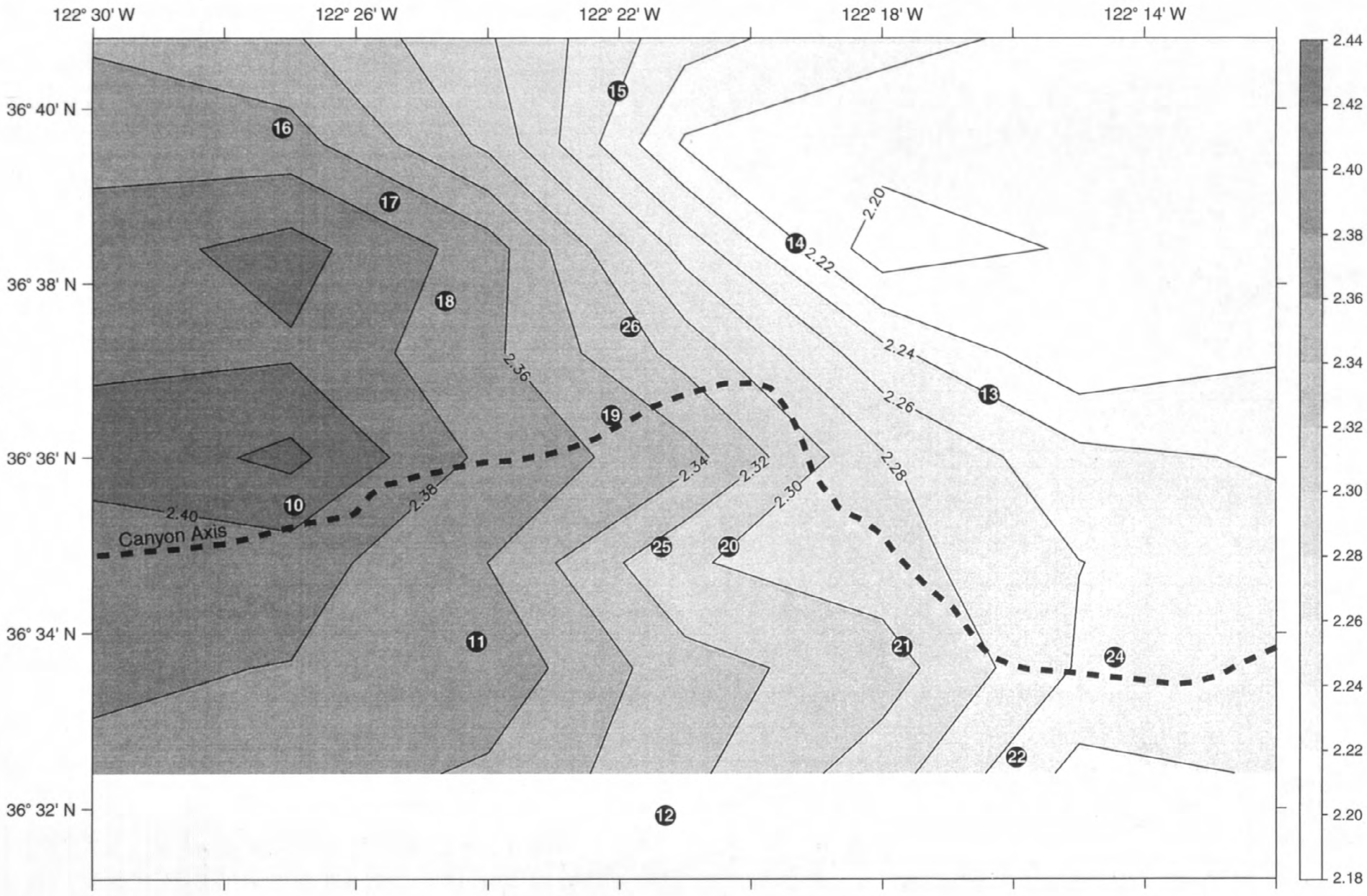
Cruise	S-1-94-MB	Region	Wide	Contouring Surface	1375 db

Potential Temperature (°C)



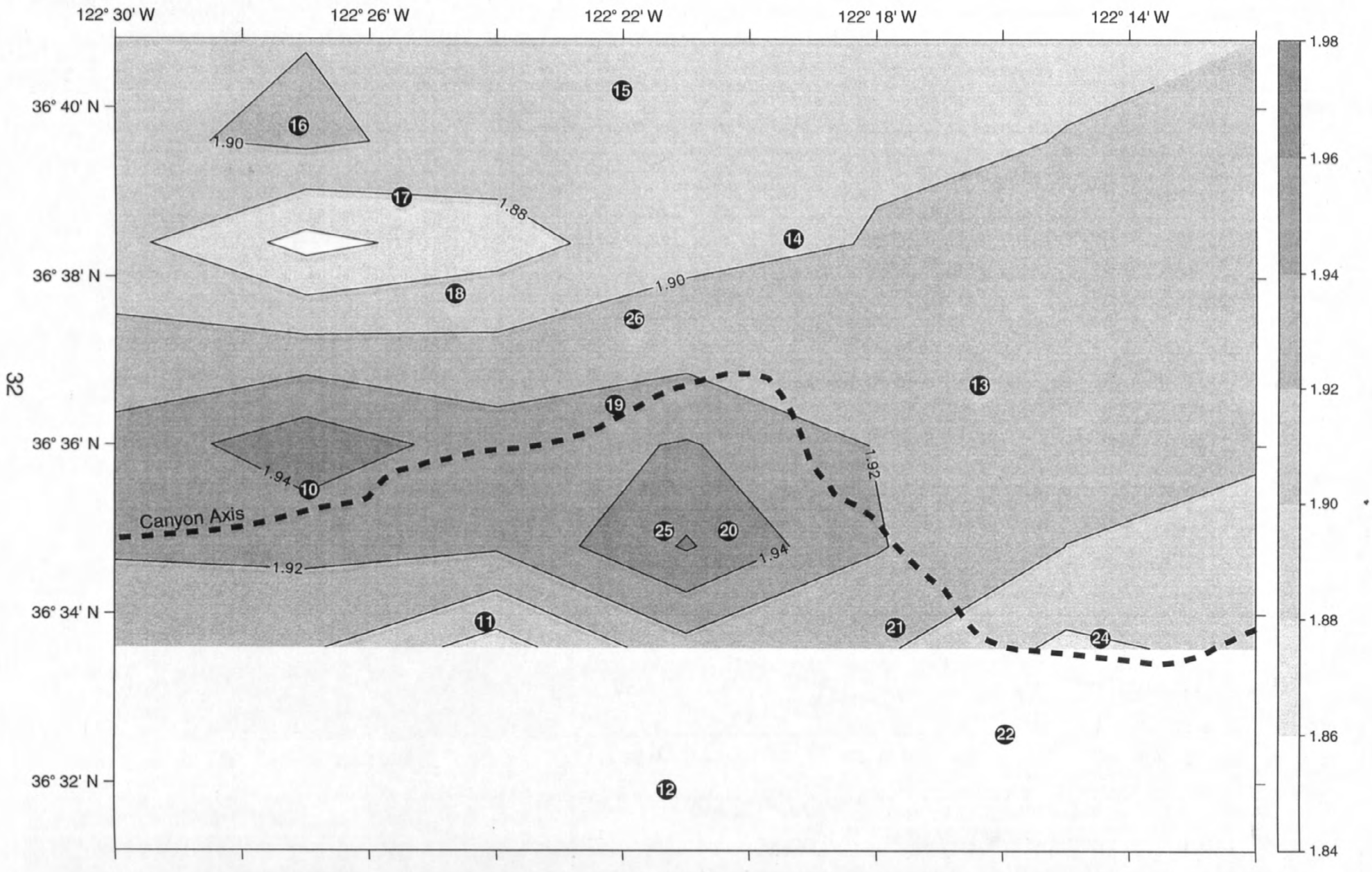
Cruise	S-1-94-MB	Region	Wide	Contouring Surface	1700 db

Potential Temperature (°C)



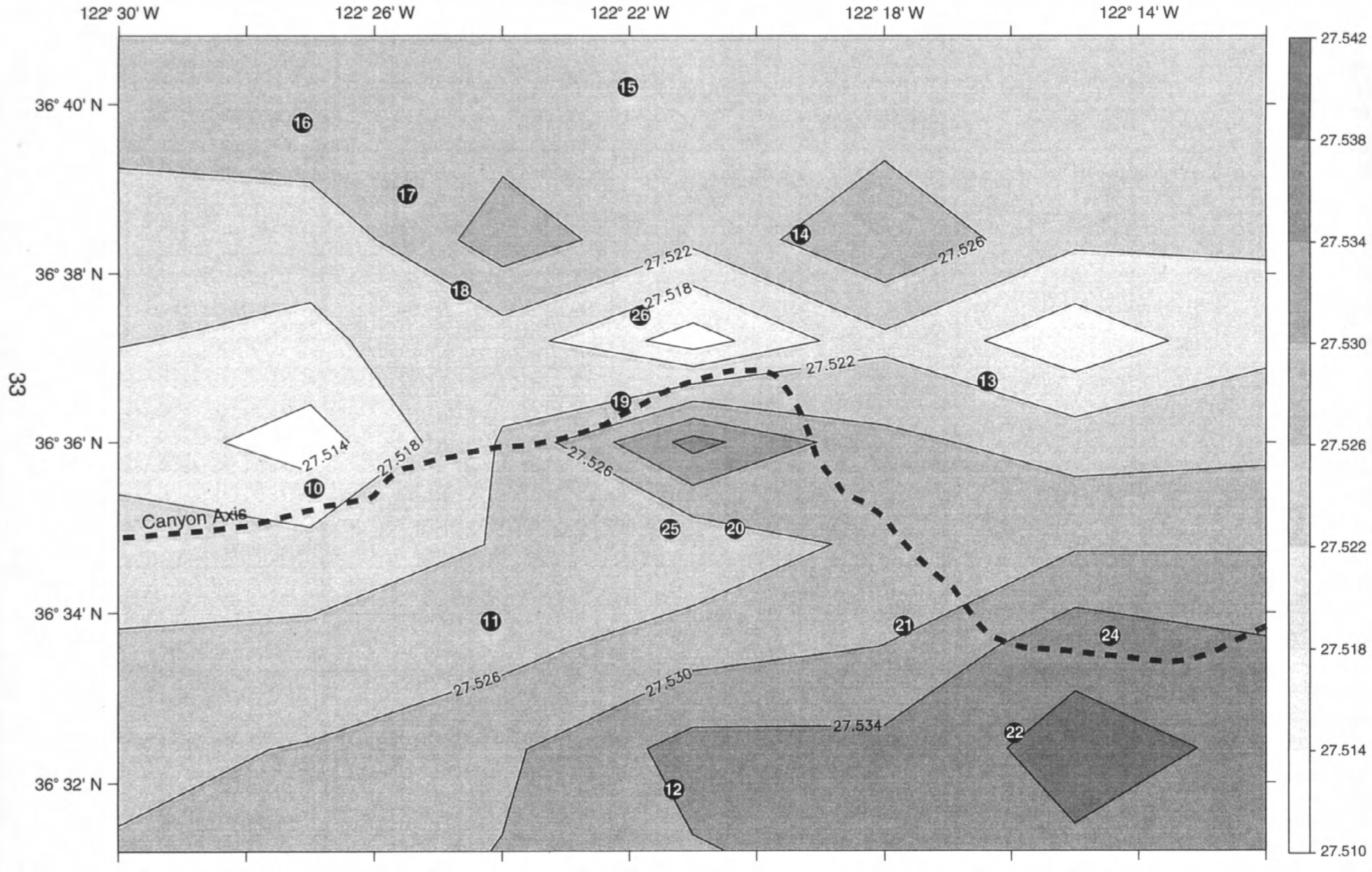
Cruise	S-1-94-MB	Region	Wide	Contouring Surface	1975 db

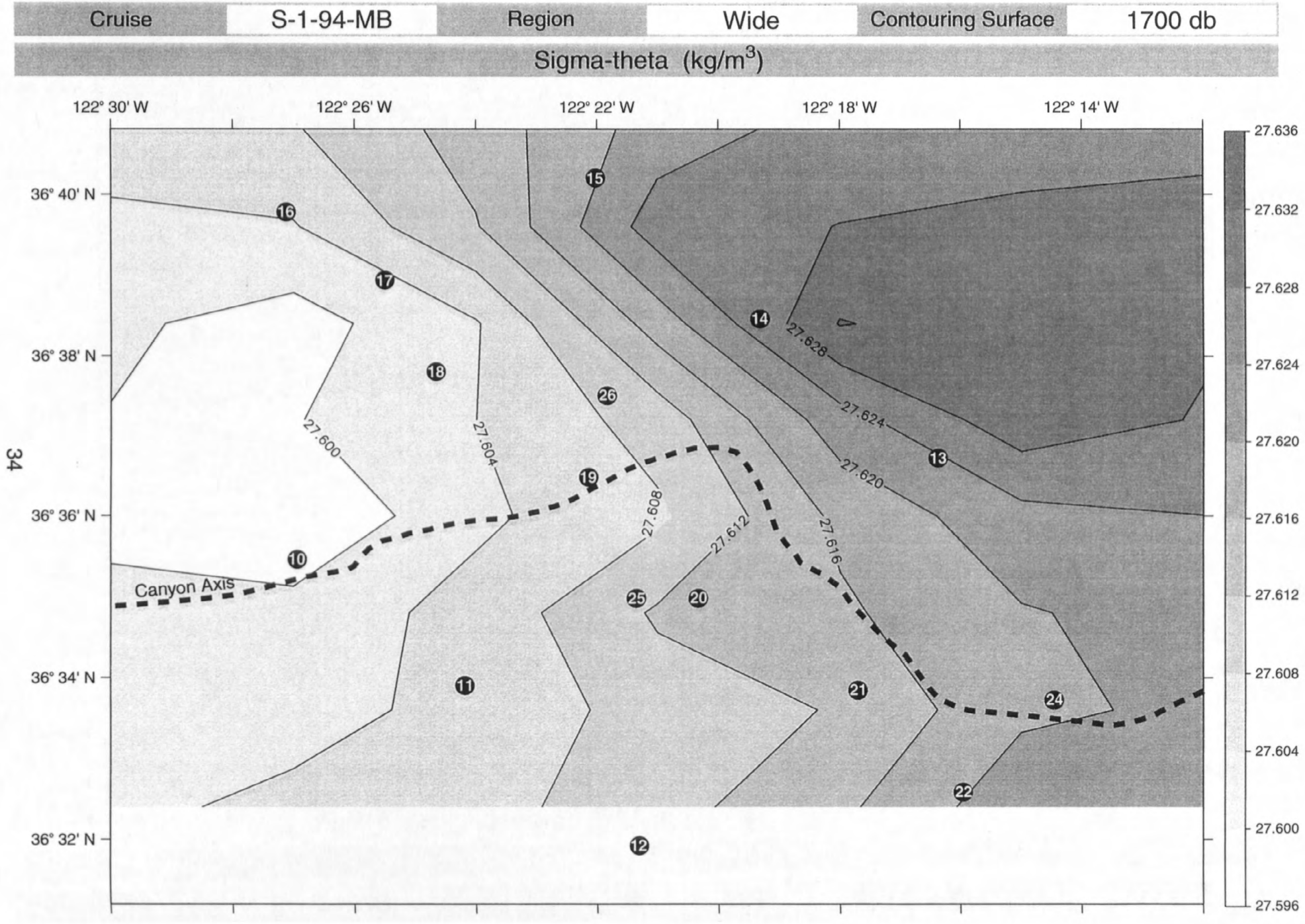
Potential Temperature (°C)

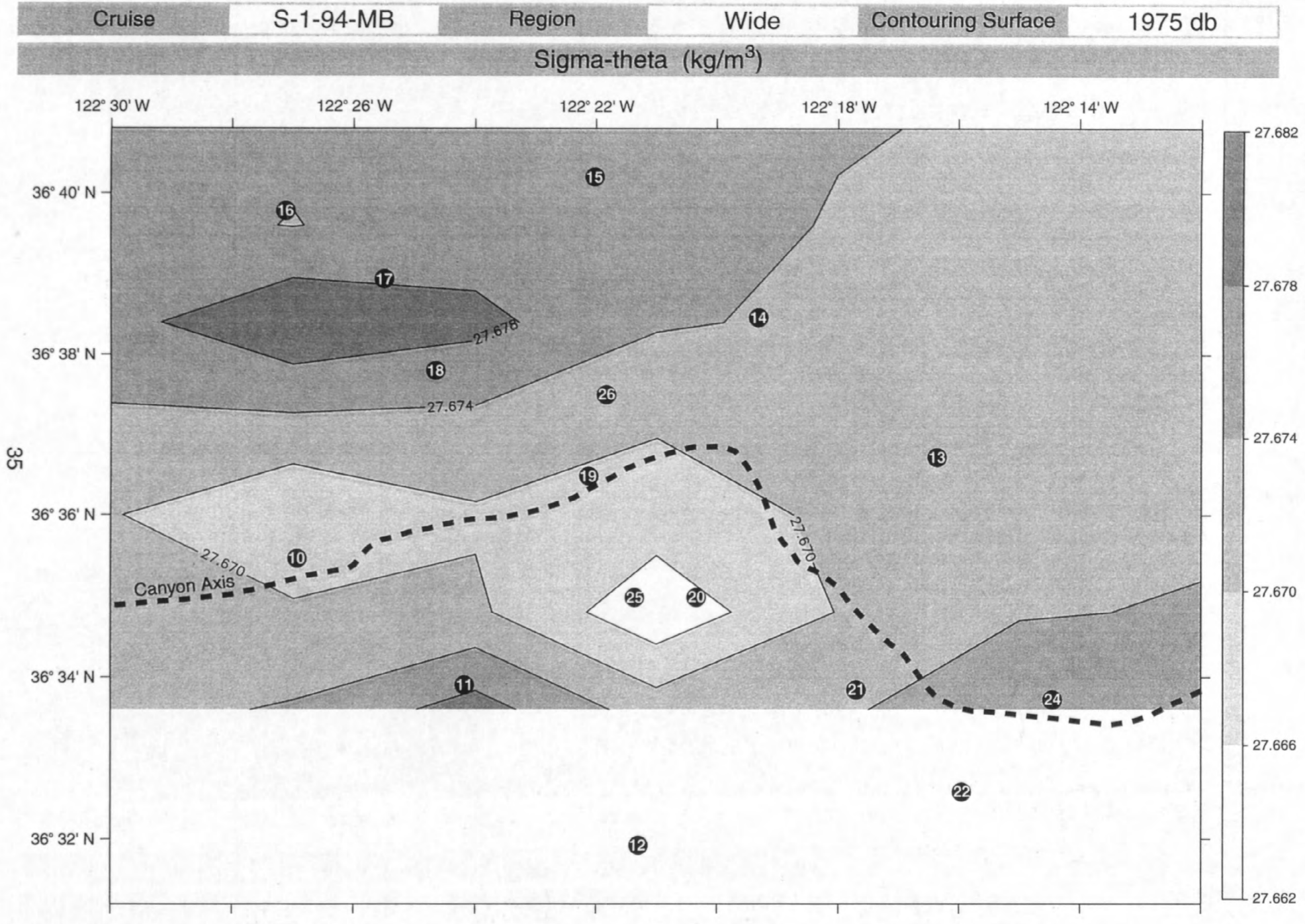


Cruise	S-1-94-MB	Region	Wide	Contouring Surface	1375 db

Sigma-theta (kg/m^3)

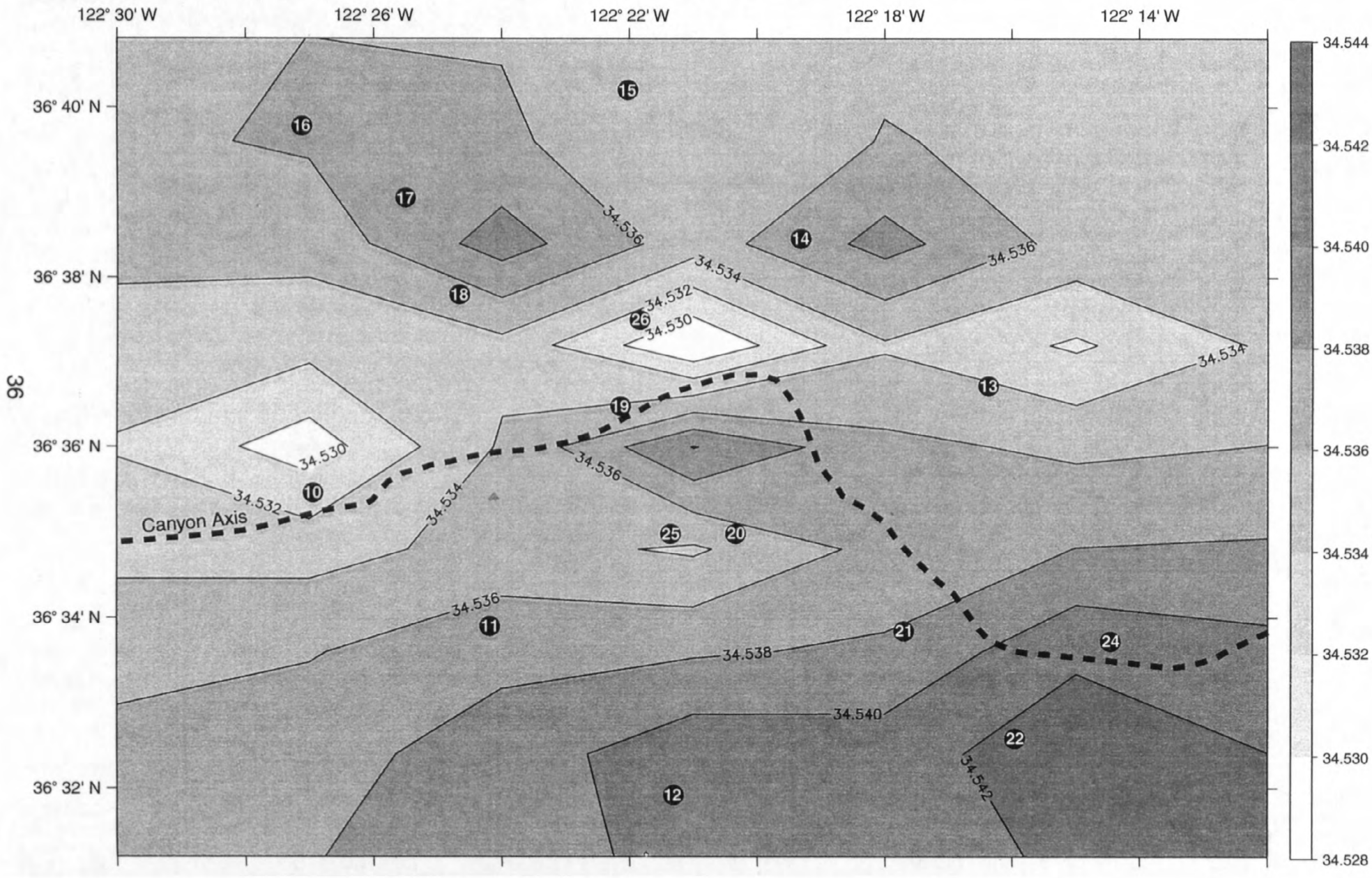


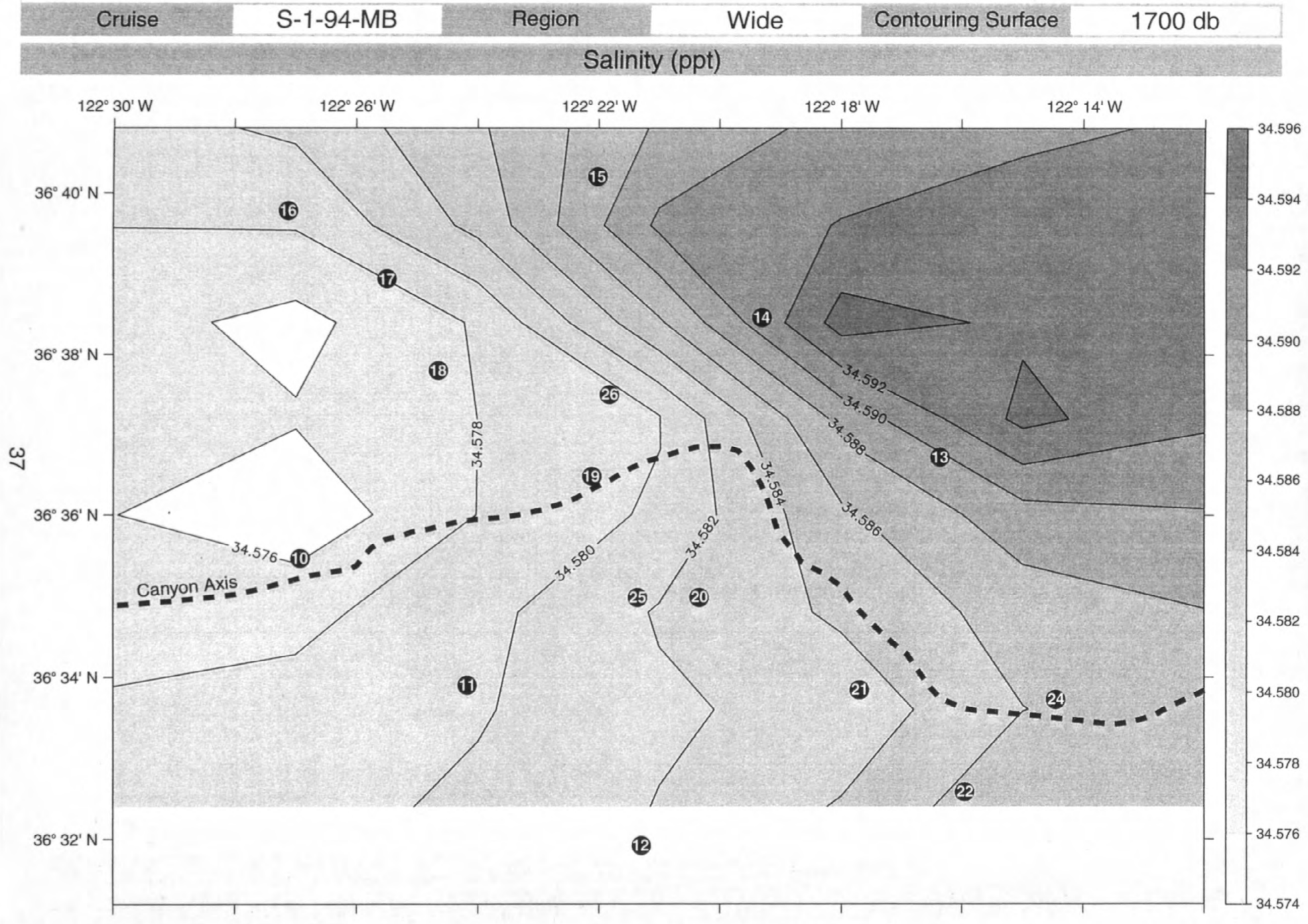

Cruise
S-1-94-MB
Region
Wide
Contouring Surface
1700 db
Sigma-theta (kg/m3)
122° 30' W
122° 26' W
122° 22' W
122° 18' W
122° 14' W
36° 40' N
36° 38' N
36° 36' N
36° 34' N
36° 32' N
27.600
27.604
27.608
27.612
27.616
27.620
27.624
27.628
Canyon Axis
27.636
27.632
27.628
27.624
27.620
27.616
27.612
27.608
27.604
27.600
27.596
34


Cruise
S-1-94-MB
Region
Wide
Contouring Surface
1975 db
Sigma-theta (kg/m3)
122° 30' W
122° 26' W
122° 22' W
122° 18' W
122° 14' W
36° 40' N
36° 38' N
36° 36' N
36° 34' N
36° 32' N
35
27.676
27.674
27.670
27.670
Canyon Axis
27.682
27.678
27.674
27.670
27.666
27.662
15
16
17
14
18
26
13
19
10
25
20
11
21
24
22
12

Cruise	S-1-94-MB	Region	Wide	Contouring Surface	1375 db

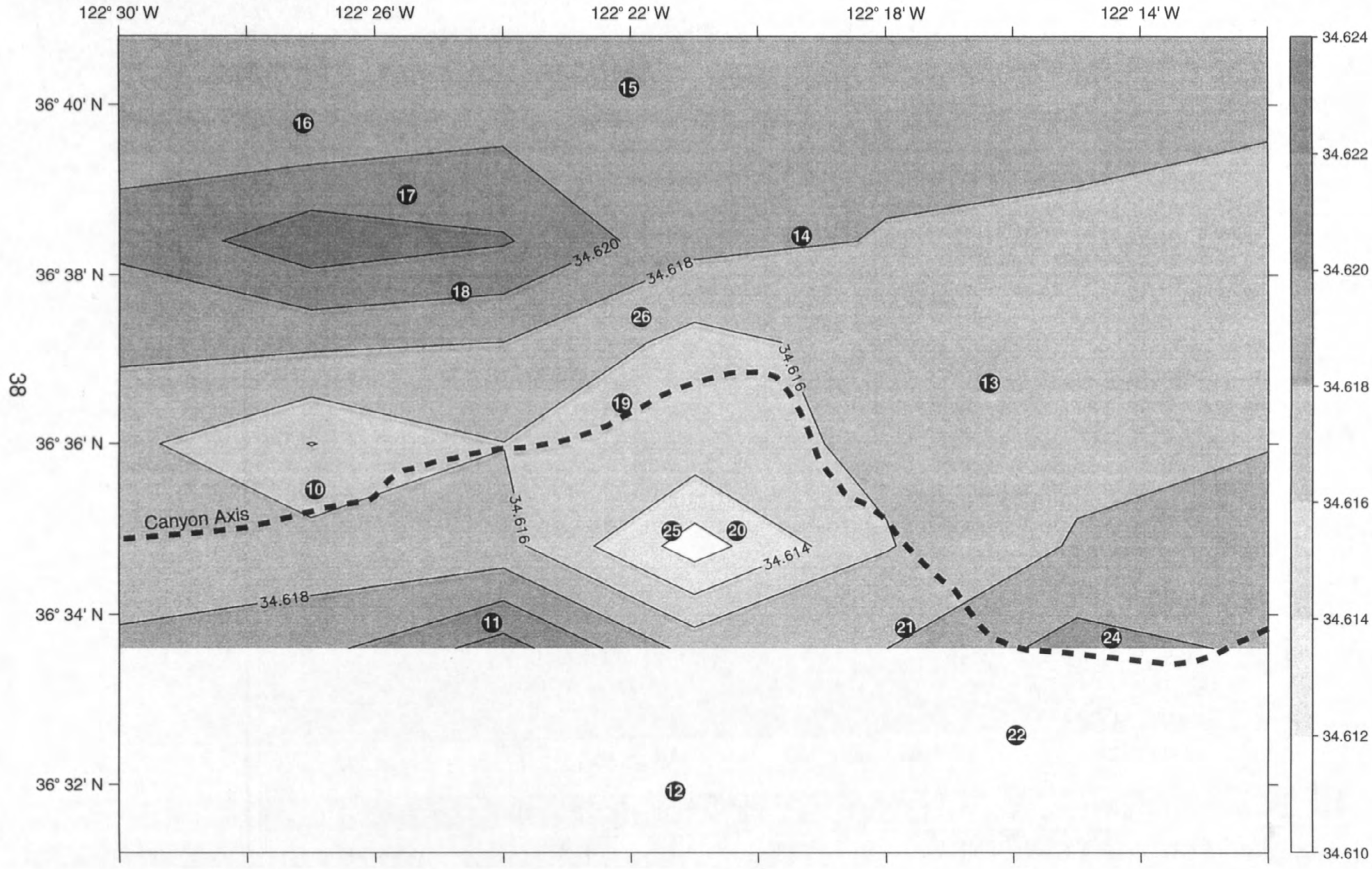
Salinity (ppt)



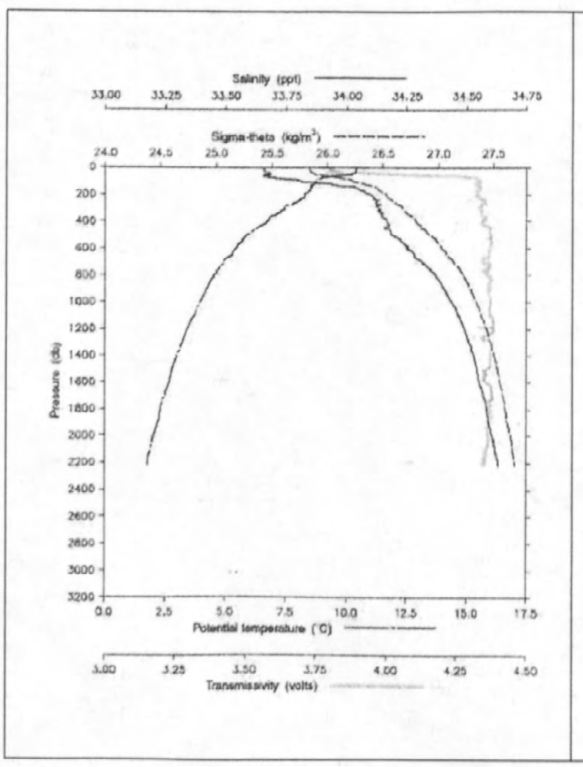

Cruise
S-1-94-MB
Region
Wide
Contouring Surface
1700 db
Salinity (ppt)
122° 30' W
122° 26' W
122° 22' W
122° 18' W
122° 14' W
36° 40' N
36° 38' N
36° 36' N
36° 34' N
36° 32' N
34.596
34.594
34.592
34.590
34.588
34.586
34.584
34.582
34.580
34.578
34.576
34.574
Canyon Axis
37

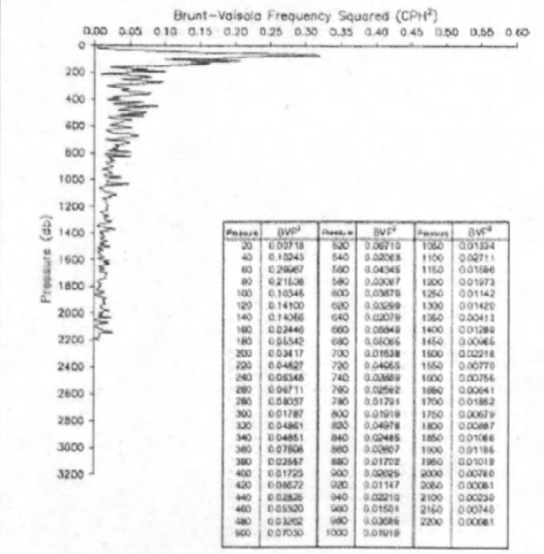
Cruise	S-1-94-MB	Region	Wide	Contouring Surface	1975 db

Salinity (ppt)



Appendix C Profile Plots of Casts





Pressure	BVF²	Pressure	BVF²	Pressure	BVF²
20	0.00718	520	0.00710	1020	0.01334
40	0.15243	540	0.02068	1100	0.02711
60	0.29567	560	0.04345	1150	0.01586
80	0.21538	580	0.03007	1200	0.01973
100	0.16345	600	0.03875	1250	0.01142
120	0.14100	620	0.03259	1300	0.01420
140	0.14066	640	0.02079	1350	0.00413
160	0.02446	660	0.05849	1400	0.01289
180	0.05542	680	0.05065	1450	0.00465
200	0.03417	700	0.01538	1500	0.02218
220	0.04627	720	0.04665	1550	0.00770
240	0.06348	740	0.03889	1600	0.00756
260	0.04711	760	0.02562	1650	0.00641
280	0.05037	780	0.01791	1700	0.01862
300	0.01787	800	0.01919	1750	0.00579
320	0.04861	820	0.04978	1800	0.00887
340	0.04851	840	0.02485	1850	0.01066
360	0.07806	860	0.02607	1900	0.01184
380	0.02997	880	0.01702	1950	0.01019
400	0.01720	900	0.02025	2000	0.00780
420	0.08672	920	0.01147	2050	0.00881
440	0.02826	940	0.02210	2100	0.00239
460	0.05320	960	0.01501	2150	0.00740
480	0.03252	980	0.03086	2200	0.00681
500	0.07030	1000	0.01919		

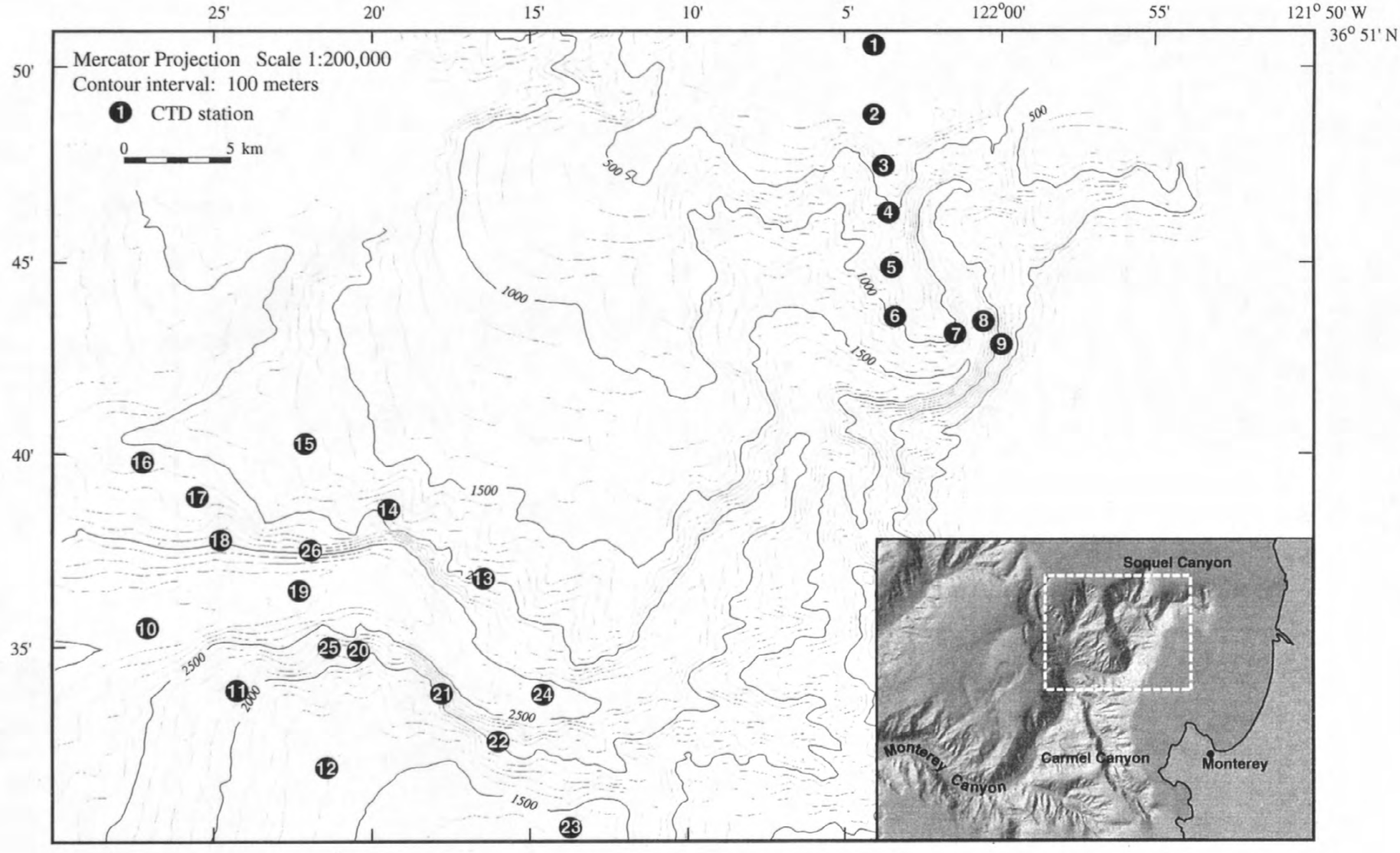
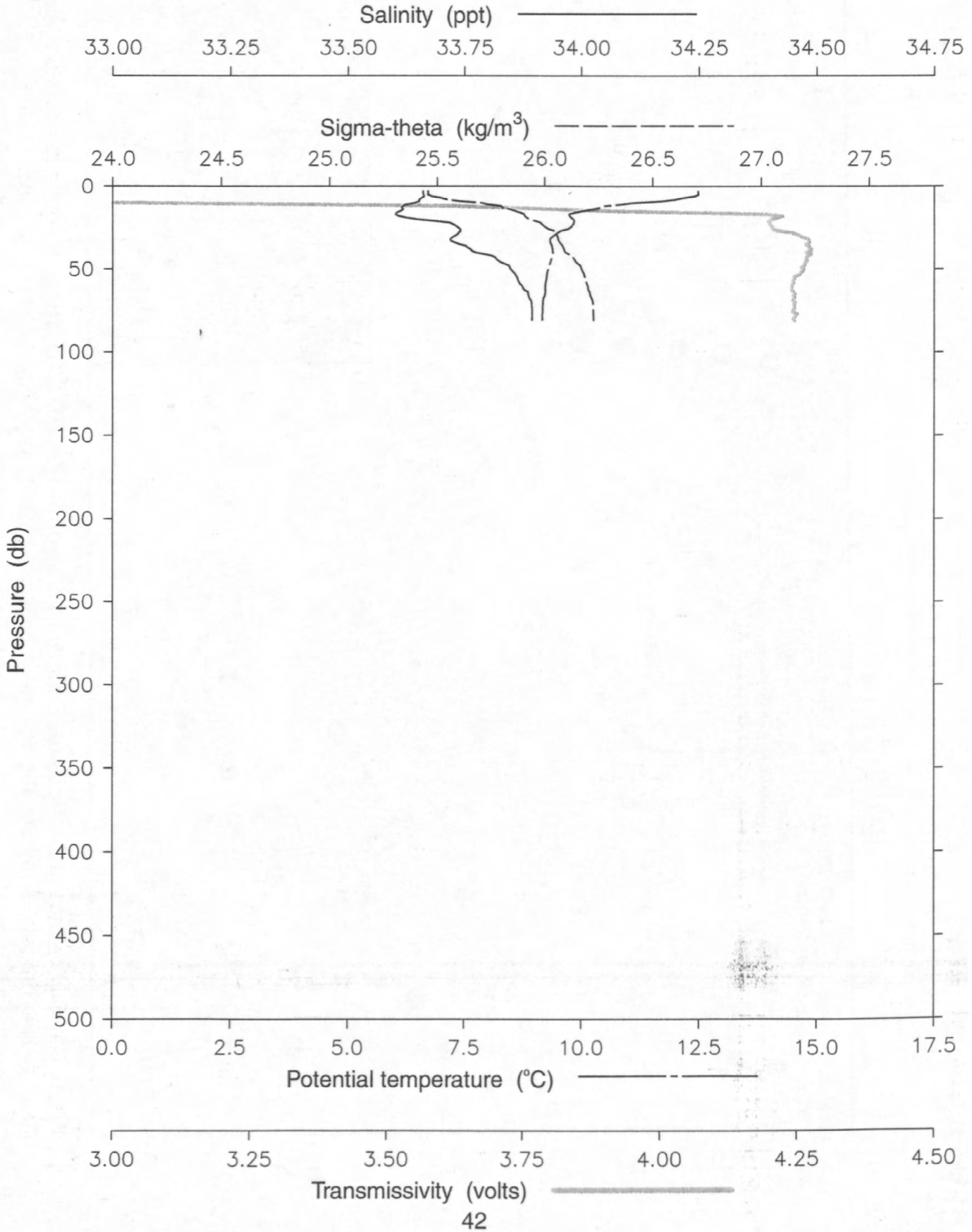
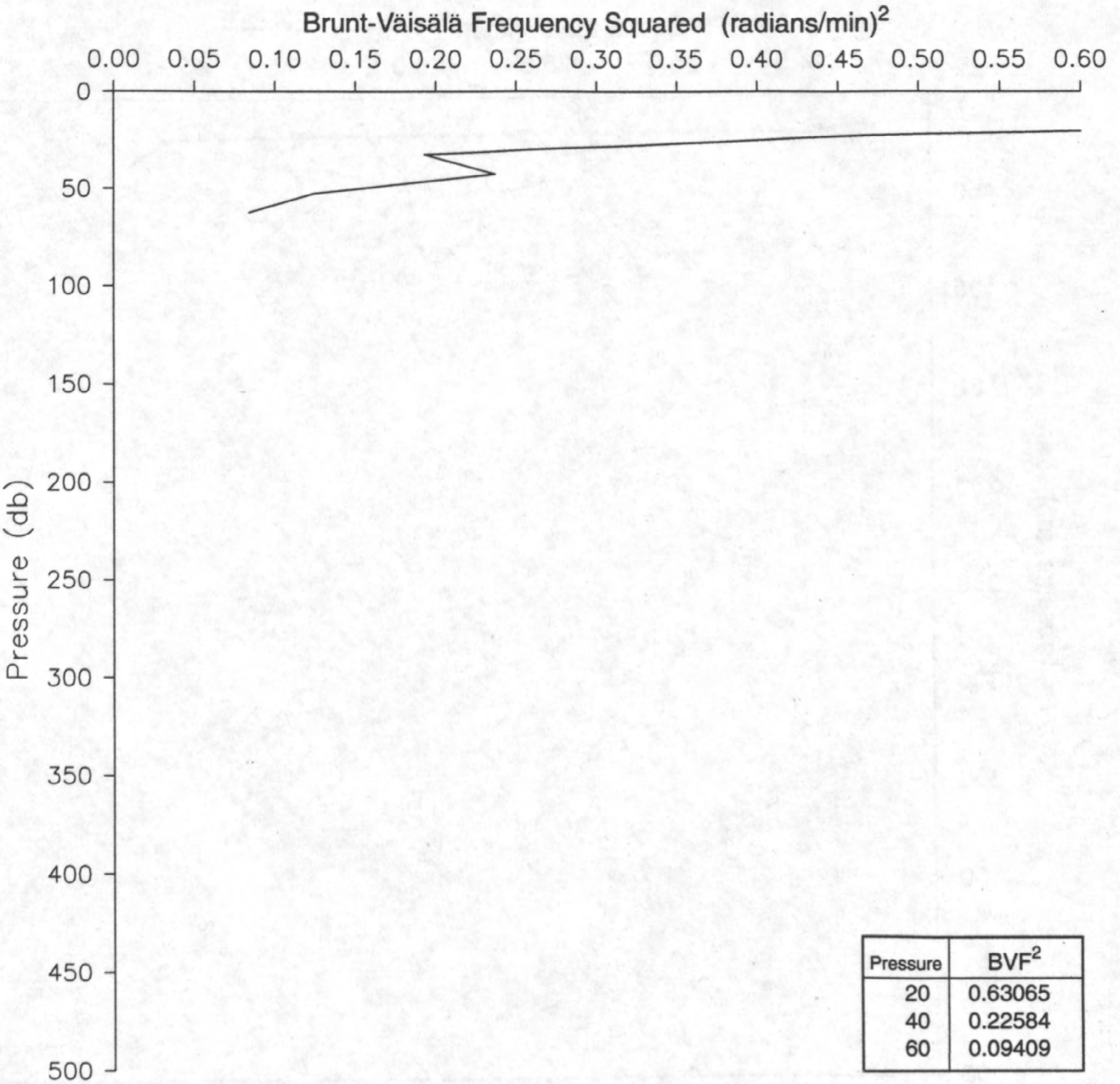


Figure C1. Station map of the Monterey Submarine Canyon S-1-94-MB CTD cruise. Potential temperature, sigma-theta, salinity, transmissivity, and the square of the Brunt-Väisälä frequency are plotted for each station.

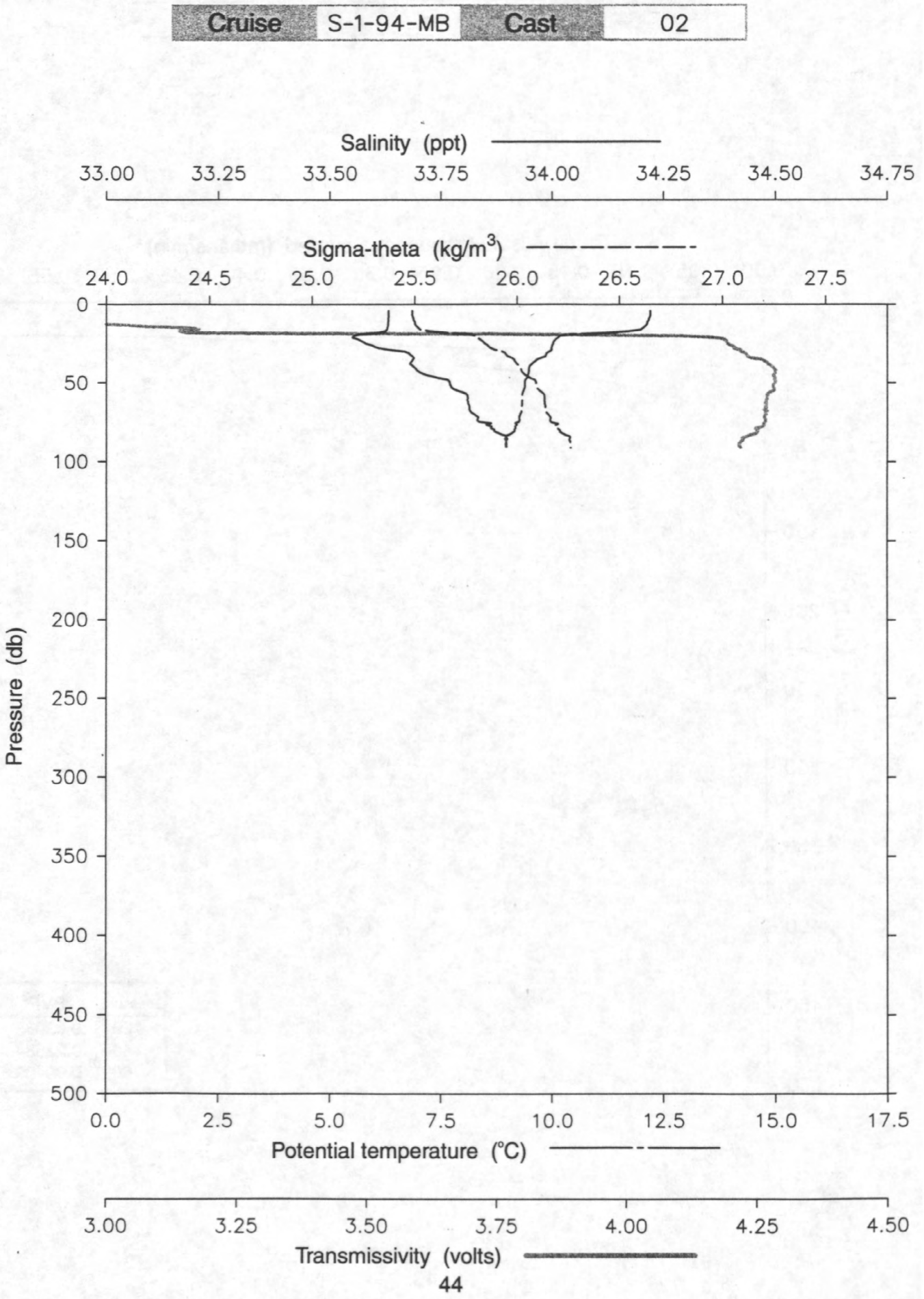
Cruise	S-1-94-MB	Cast	01



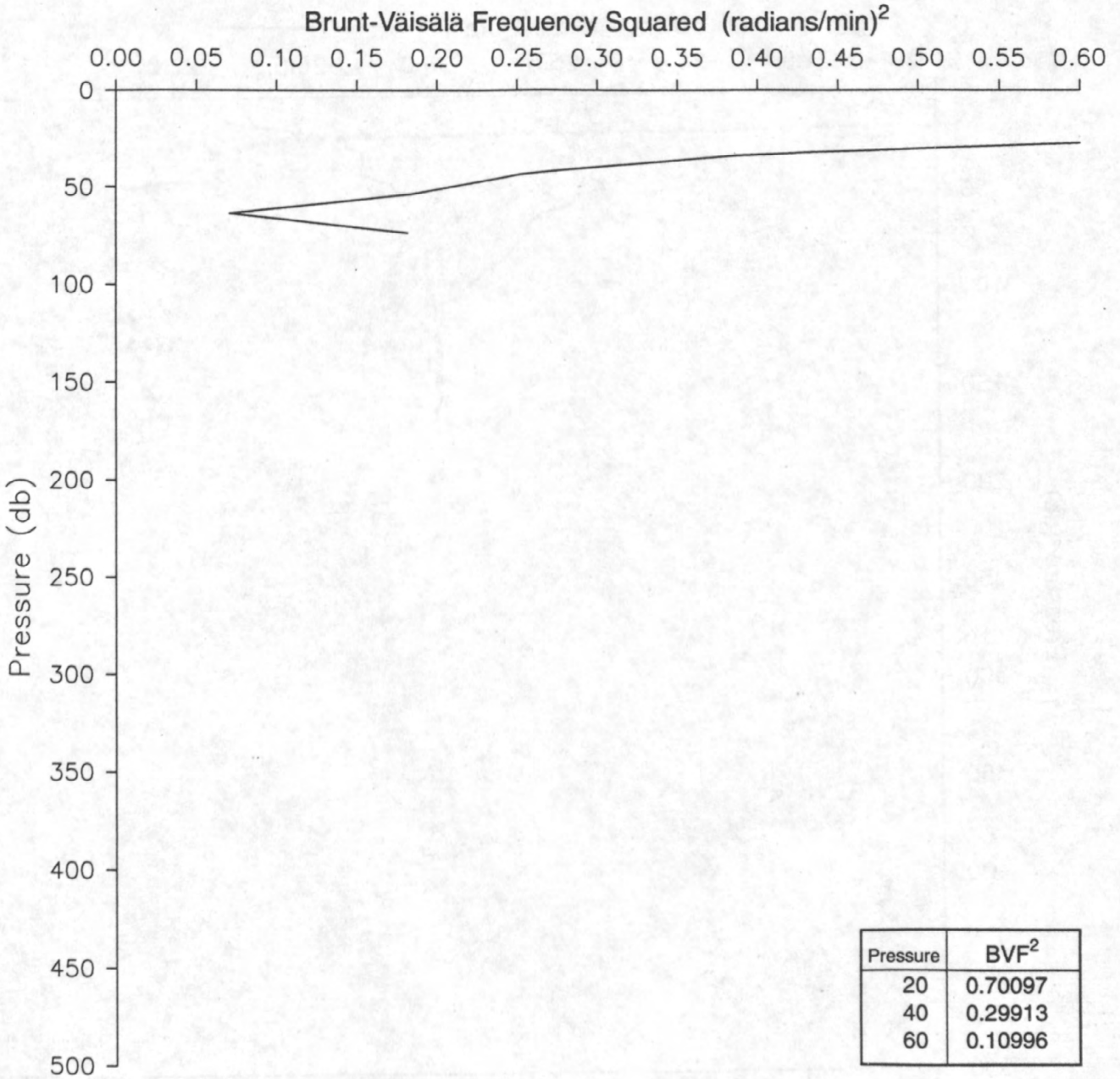
Cruise	S-1-94-MB	Cast	01



Pressure	BVF^2
20	0.63065
40	0.22584
60	0.09409

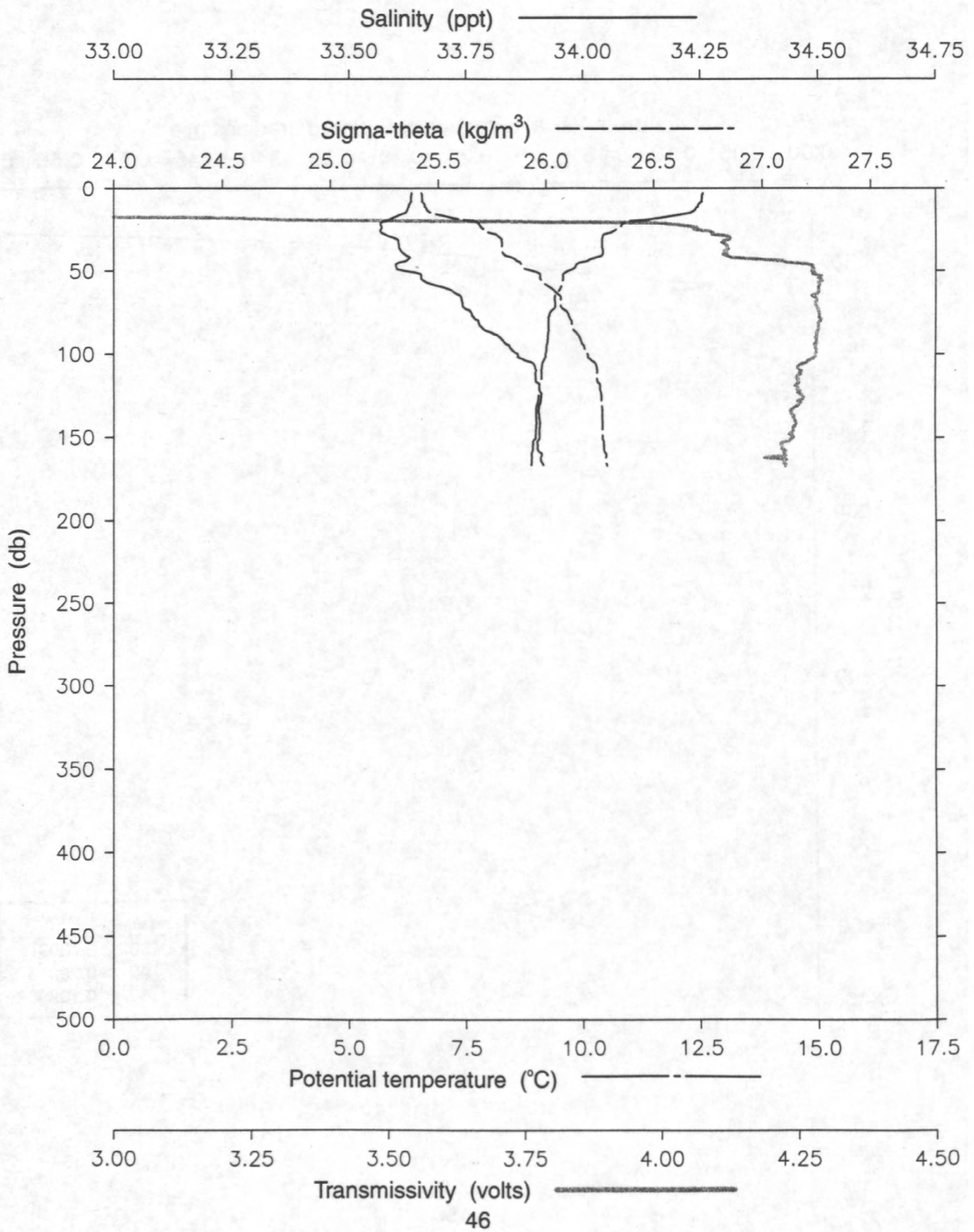

Cruise
S-1-94-MB
Cast
02
Salinity (ppt)
33.00
33.25
33.50
33.75
34.00
34.25
34.50
34.75
Sigma-theta (kg/m3)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
Pressure (db)
0
50
100
150
200
250
300
350
400
450
500
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Potential temperature (°C)
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Transmissivity (volts)

Cruise	S-1-94-MB	Cast	02

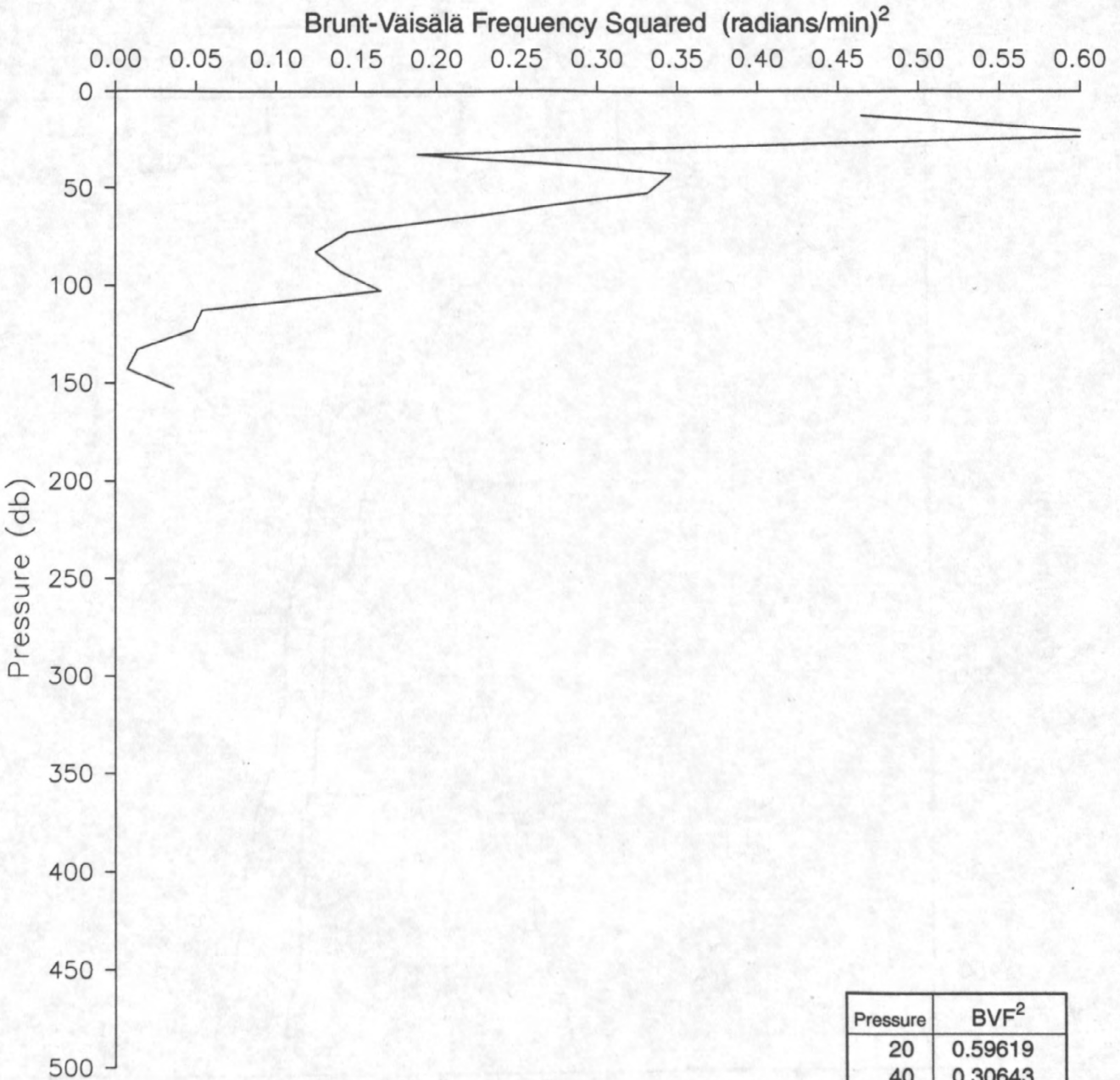


Pressure	BVF^2
20	0.70097
40	0.29913
60	0.10996

Cruise	S-1-94-MB	Cast	03

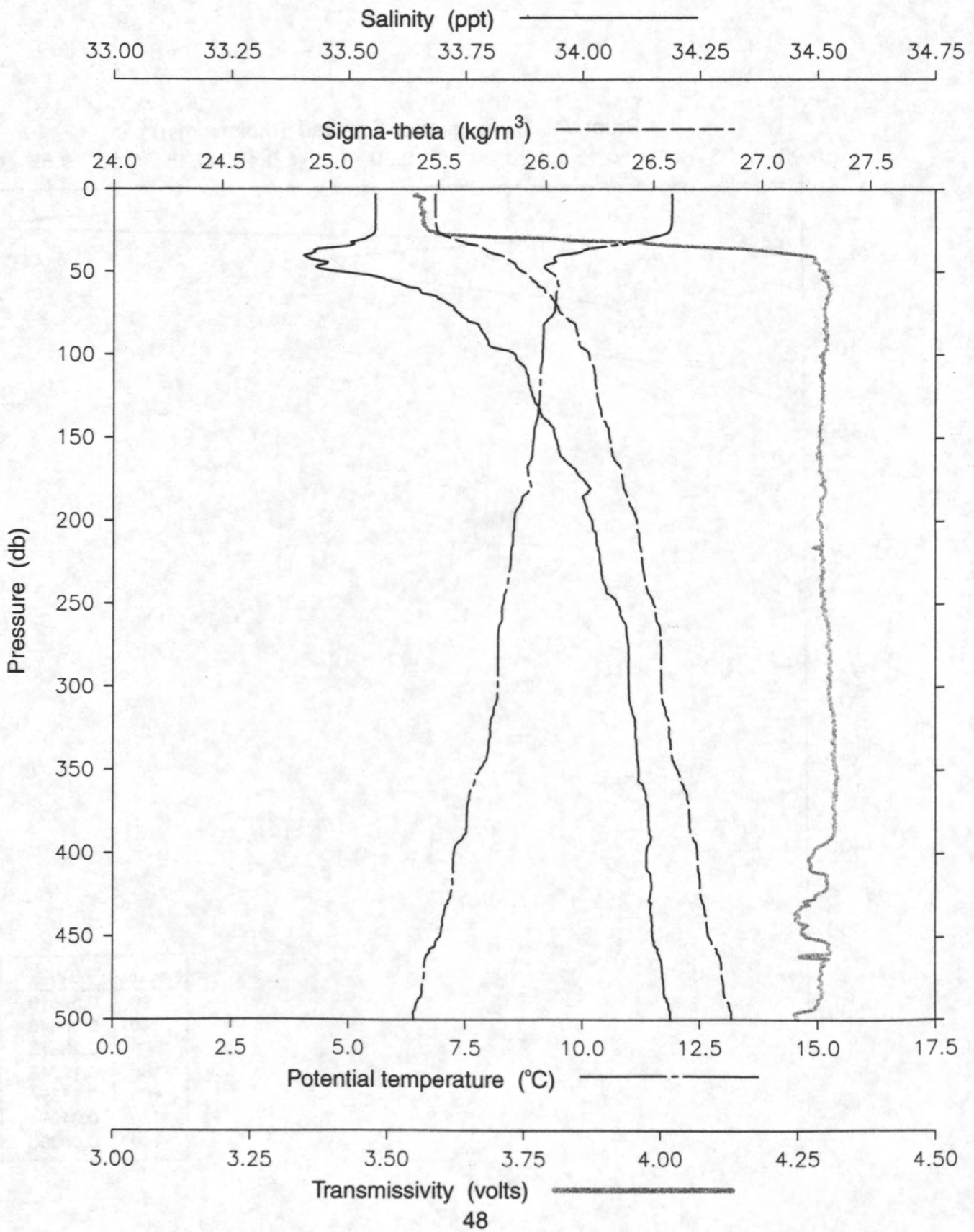


Cruise	S-1-94-MB	Cast	03

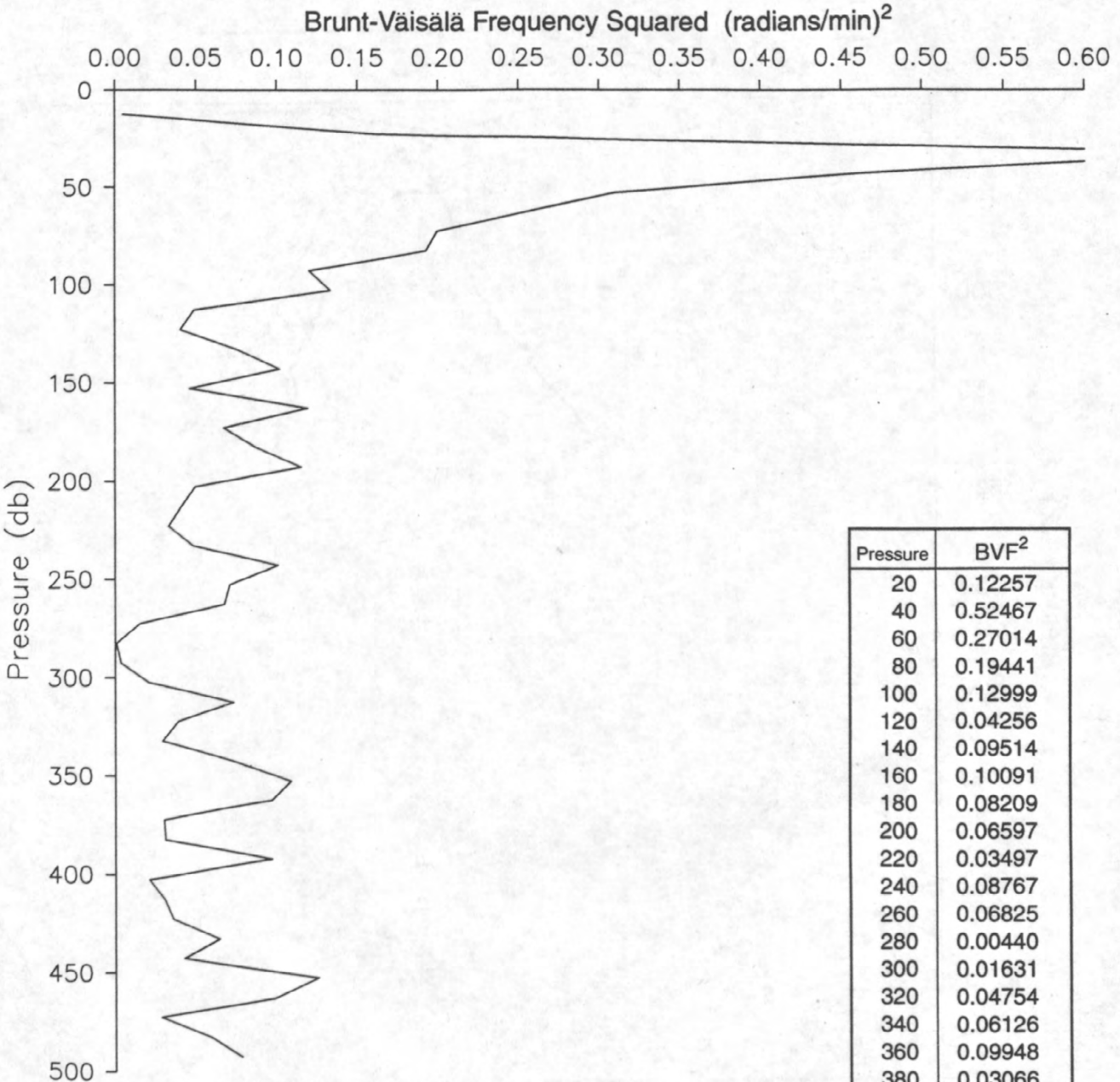


Pressure	BVF^2
20	0.59619
40	0.30643
60	0.26325
80	0.12946
100	0.15894
120	0.04961
140	0.00900

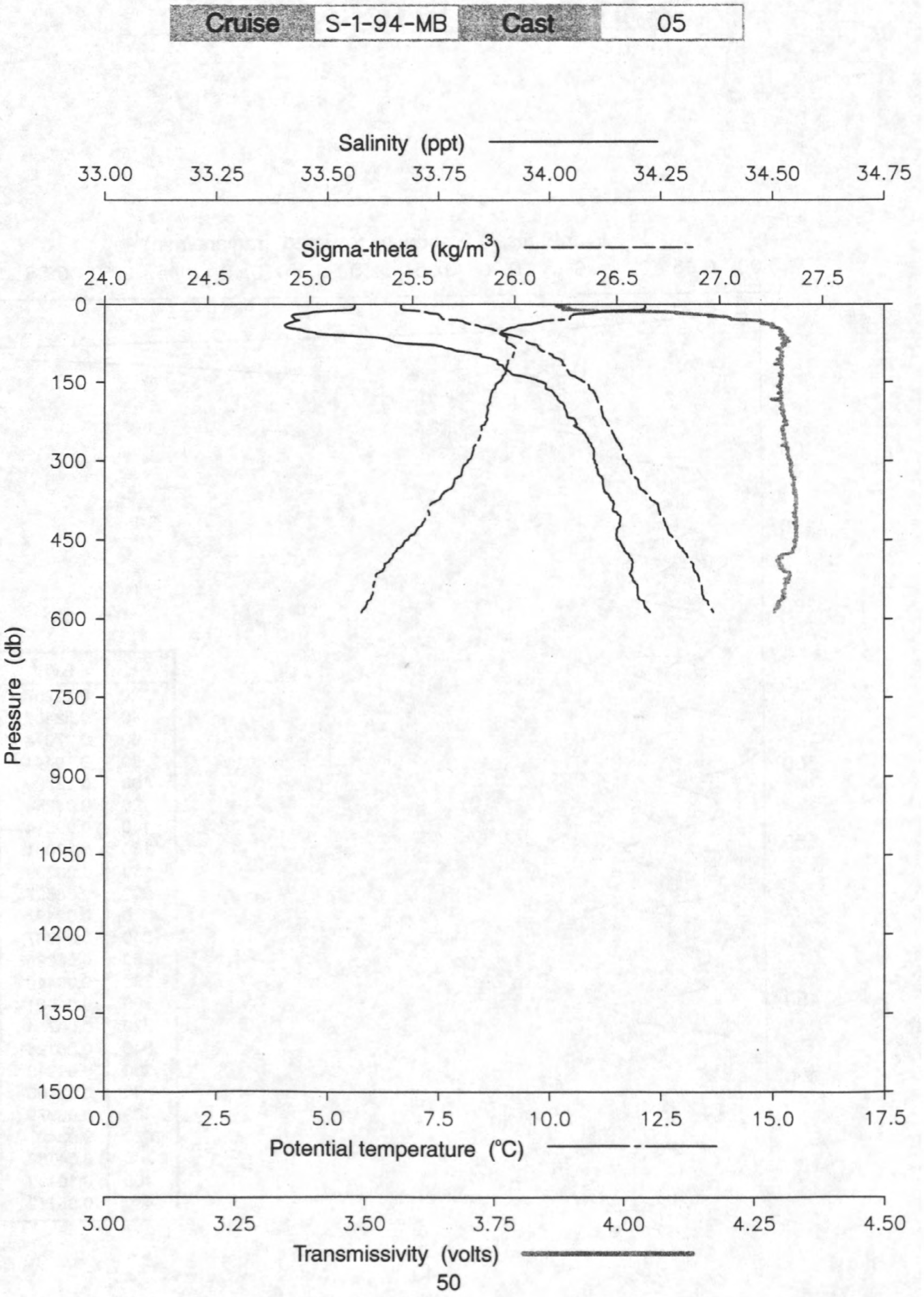
Cruise	S-1-94-MB	Cast	04



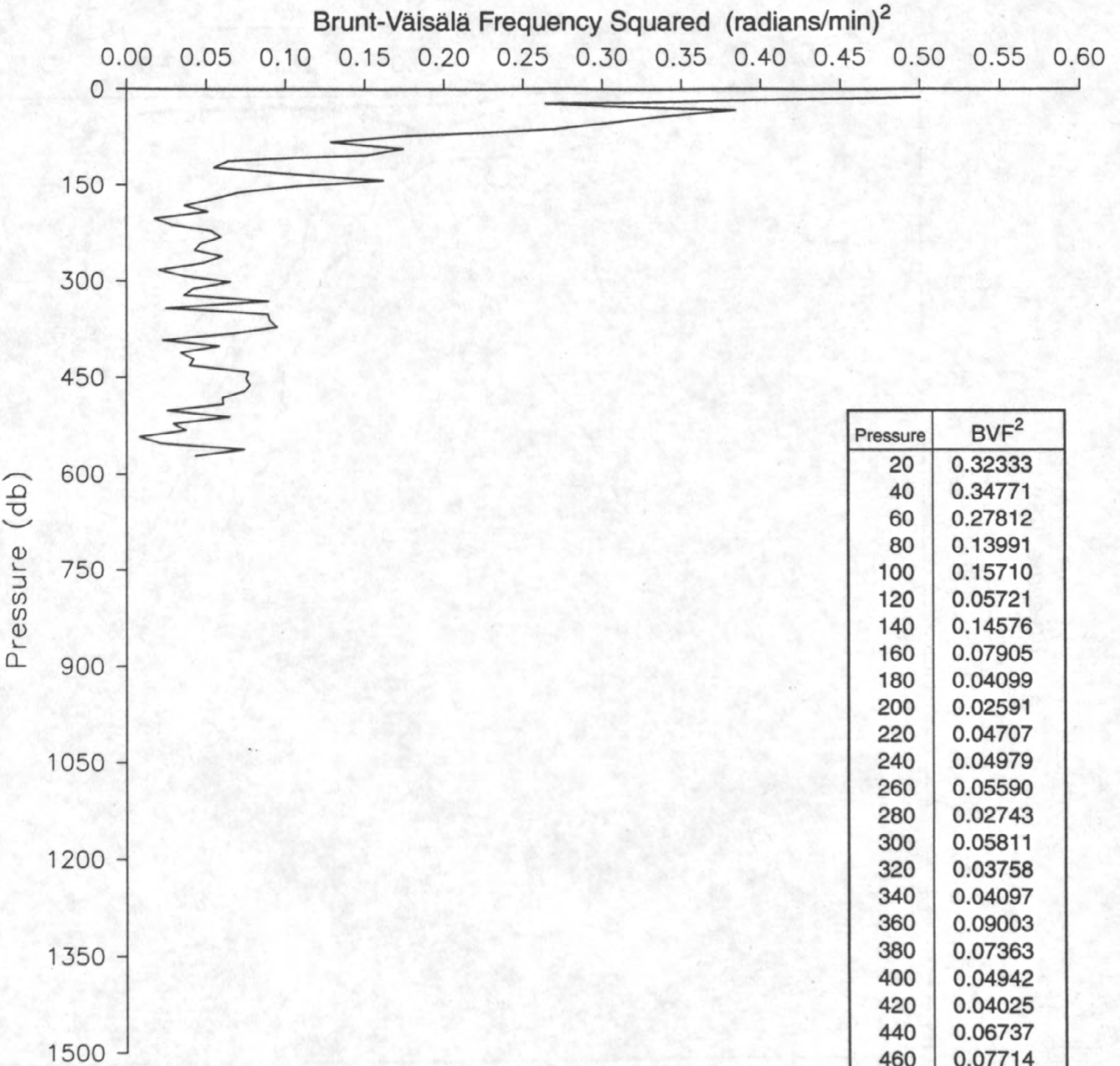
Cruise	S-1-94-MB	Cast	04



Pressure	BVF²
20	0.12257
40	0.52467
60	0.27014
80	0.19441
100	0.12999
120	0.04256
140	0.09514
160	0.10091
180	0.08209
200	0.06597
220	0.03497
240	0.08767
260	0.06825
280	0.00440
300	0.01631
320	0.04754
340	0.06126
360	0.09948
380	0.03066
400	0.03979
420	0.03427
440	0.04787
460	0.10493
480	0.05112

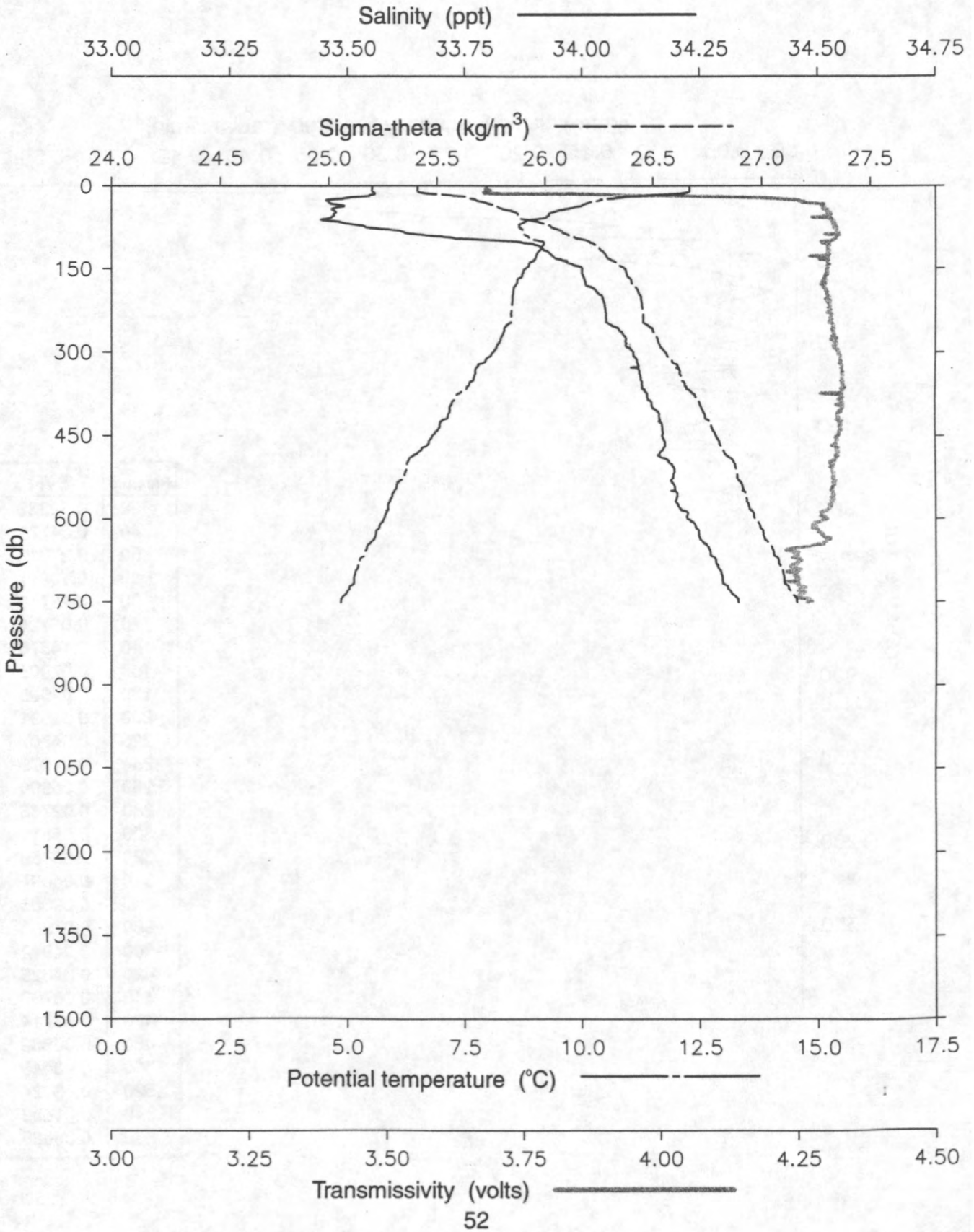

Cruise
S-1-94-MB
Cast
05
Salinity (ppt)
33.00
33.25
33.50
33.75
34.00
34.25
34.50
34.75
Sigma-theta (kg/m3)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
Pressure (db)
0
150
300
450
600
750
900
1050
1200
1350
1500
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Potential temperature (°C)
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Transmissivity (volts)

Cruise	S-1-94-MB	Cast	05

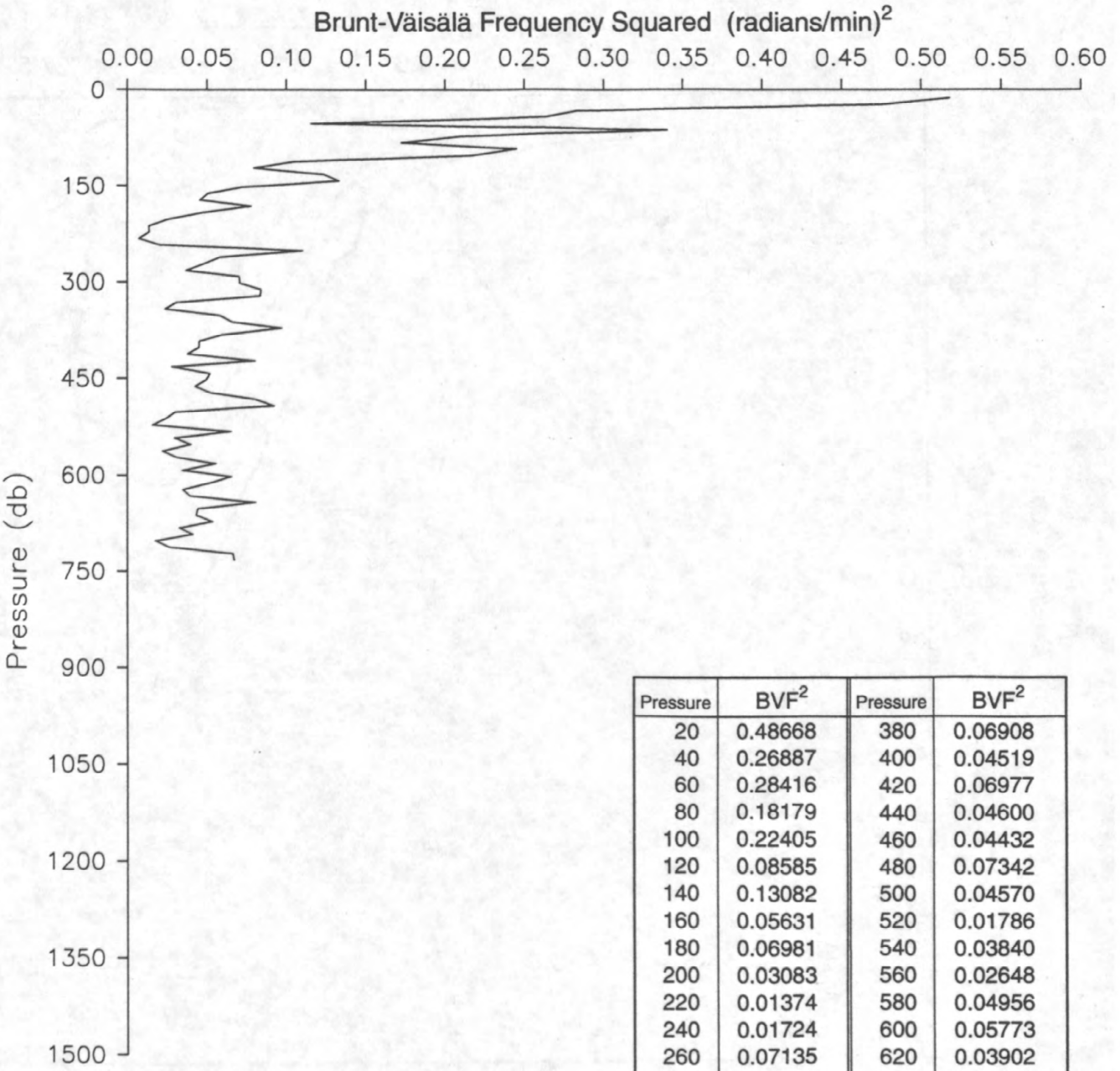


Pressure	BVF^2
20	0.32333
40	0.34771
60	0.27812
80	0.13991
100	0.15710
120	0.05721
140	0.14576
160	0.07905
180	0.04099
200	0.02591
220	0.04707
240	0.04979
260	0.05590
280	0.02743
300	0.05811
320	0.03758
340	0.04097
360	0.09003
380	0.07363
400	0.04942
420	0.04025
440	0.06737
460	0.07714
480	0.06389
500	0.03443
520	0.03824
540	0.01536
560	0.06085

Cruise	S-1-94-MB	Cast	06

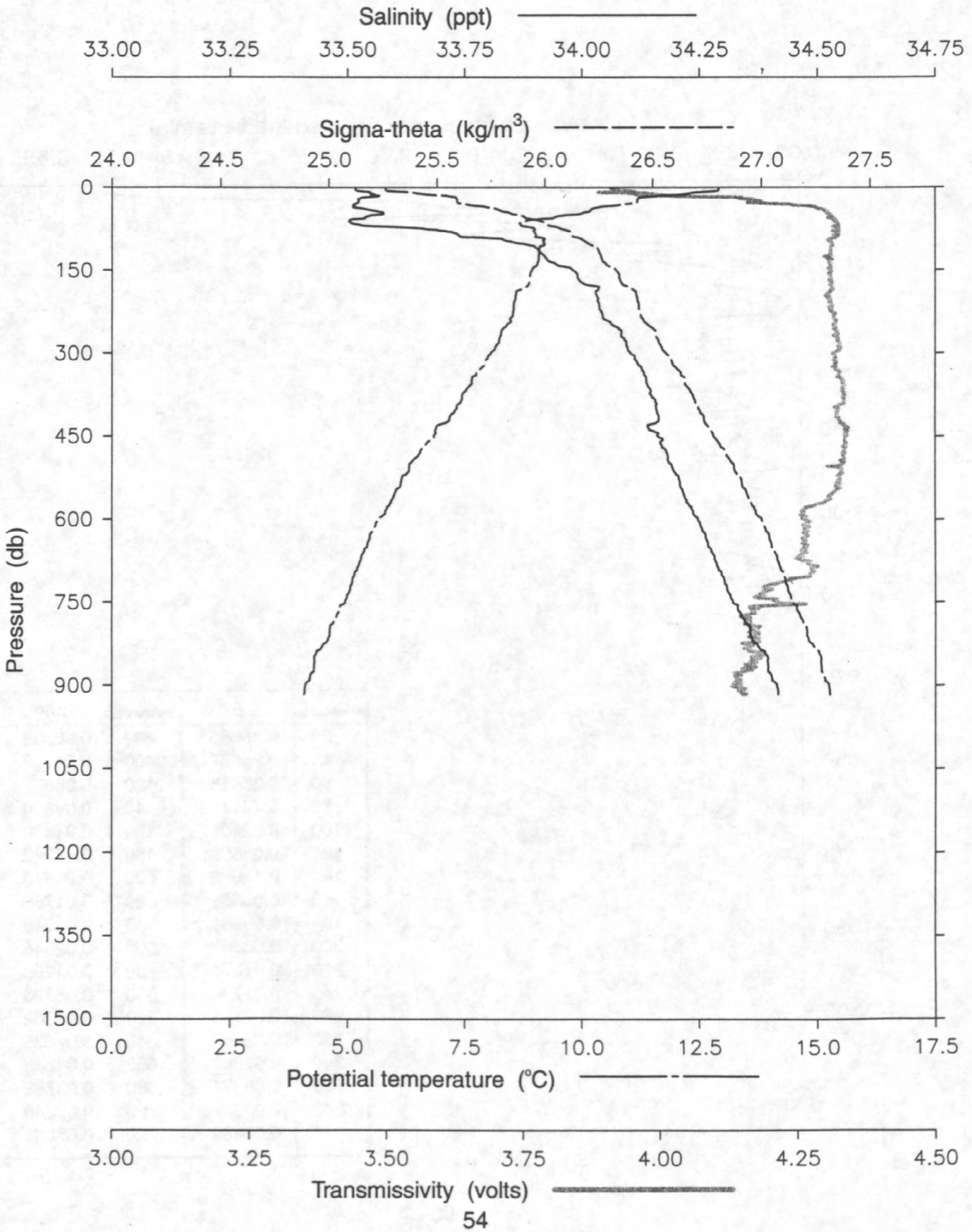


Cruise	S-1-94-MB	Cast	06

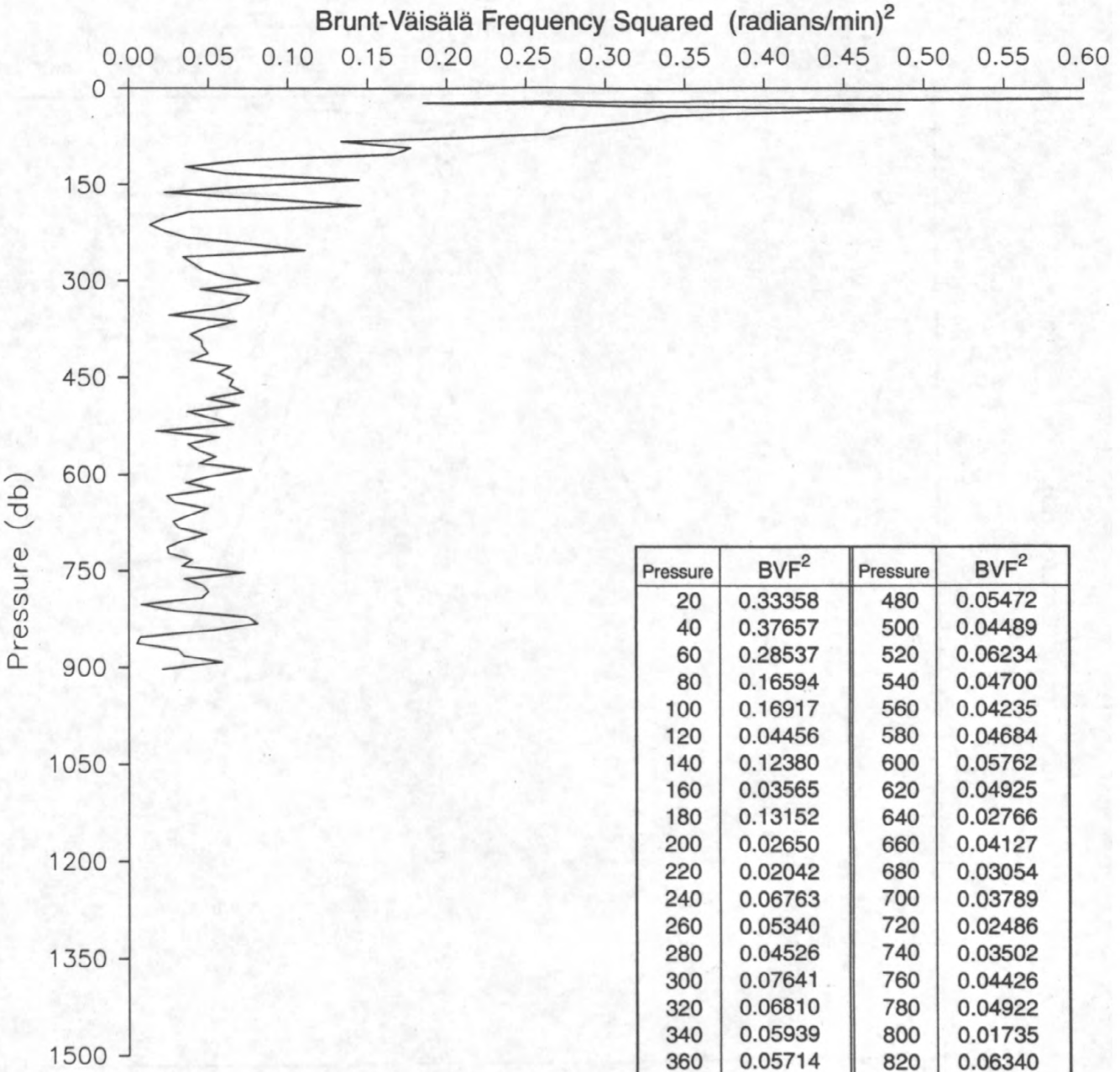


Pressure	BVF^2	Pressure	BVF^2
20	0.48668	380	0.06908
40	0.26887	400	0.04519
60	0.28416	420	0.06977
80	0.18179	440	0.04600
100	0.22405	460	0.04432
120	0.08585	480	0.07342
140	0.13082	500	0.04570
160	0.05631	520	0.01786
180	0.06981	540	0.03840
200	0.03083	560	0.02648
220	0.01374	580	0.04956
240	0.01724	600	0.05773
260	0.07135	620	0.03902
280	0.03964	640	0.07038
300	0.07069	660	0.04348
320	0.08371	680	0.03783
340	0.02547	700	0.02345
360	0.06389	720	0.05631

Cruise	S-1-94-MB	Cast	07

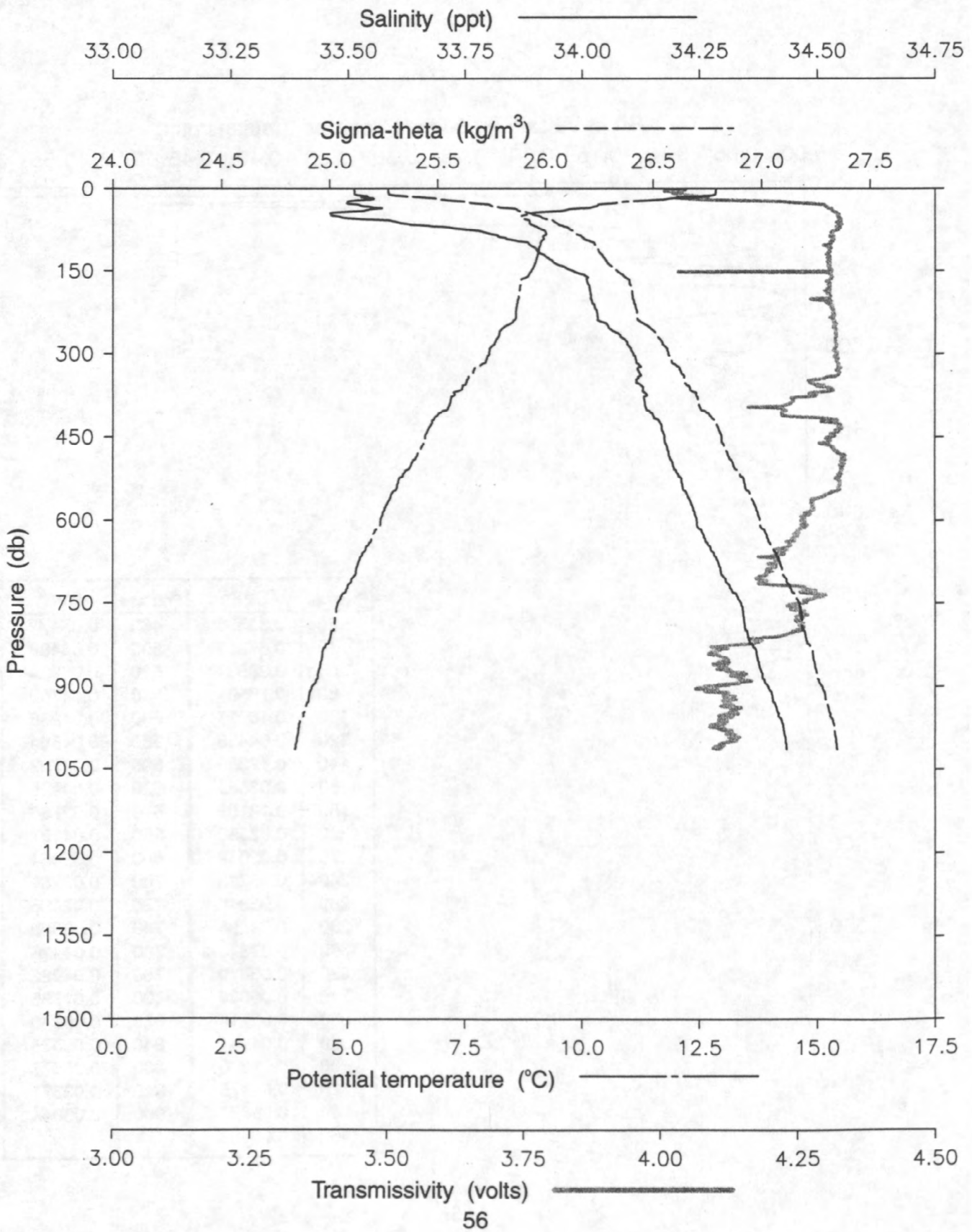


Cruise	S-1-94-MB	Cast	07

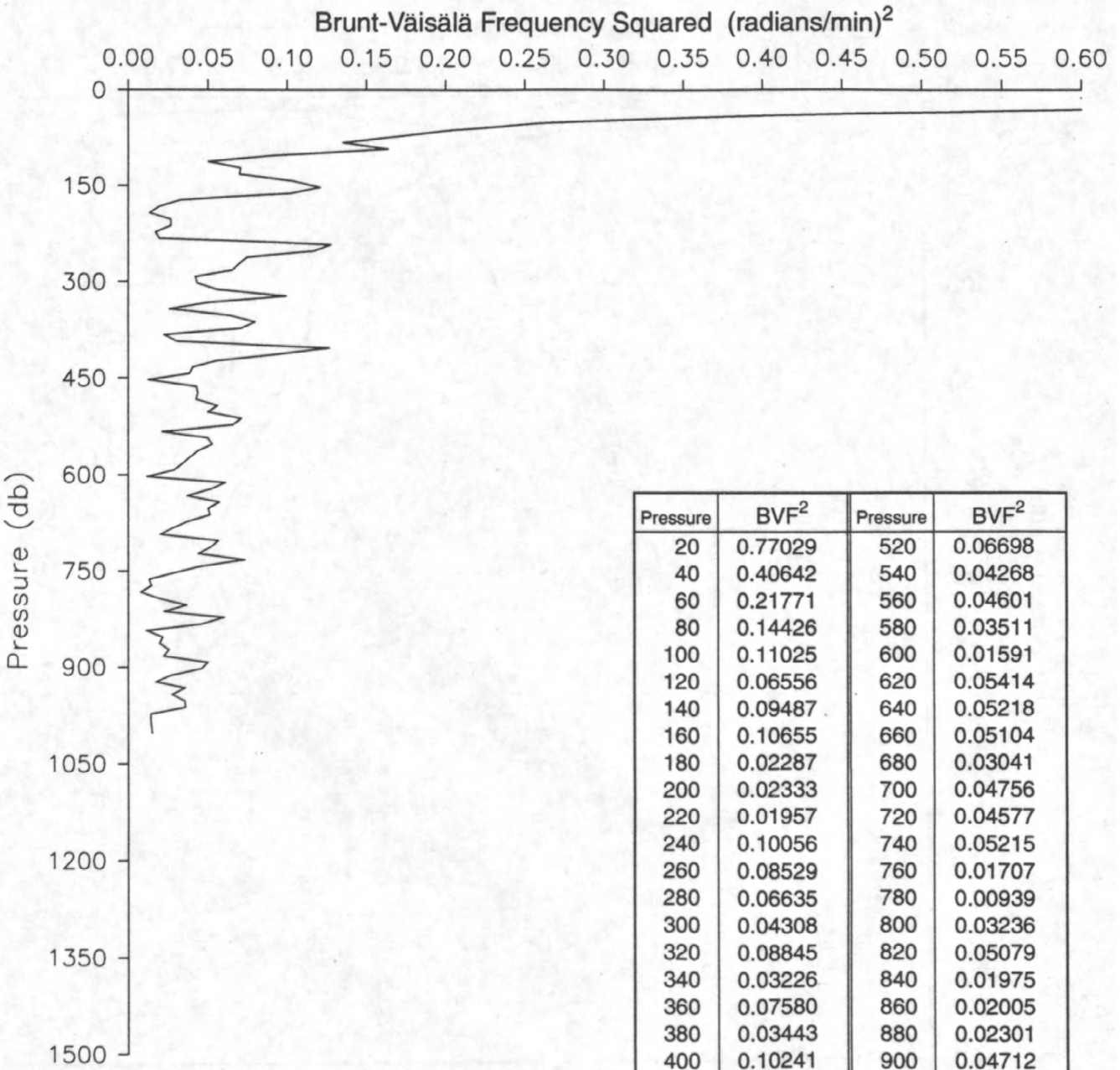


Pressure	BVF^2	Pressure	BVF^2
20	0.33358	480	0.05472
40	0.37657	500	0.04489
60	0.28537	520	0.06234
80	0.16594	540	0.04700
100	0.16917	560	0.04235
120	0.04456	580	0.04684
140	0.12380	600	0.05762
160	0.03565	620	0.04925
180	0.13152	640	0.02766
200	0.02650	660	0.04127
220	0.02042	680	0.03054
240	0.06763	700	0.03789
260	0.05340	720	0.02486
280	0.04526	740	0.03502
300	0.07641	760	0.04426
320	0.06810	780	0.04922
340	0.05939	800	0.01735
360	0.05714	820	0.06340
380	0.04141	840	0.06075
400	0.04620	860	0.00572
420	0.04175	880	0.03371
440	0.05826	900	0.03044
460	0.06404		

Cruise	S-1-94-MB	Cast	08

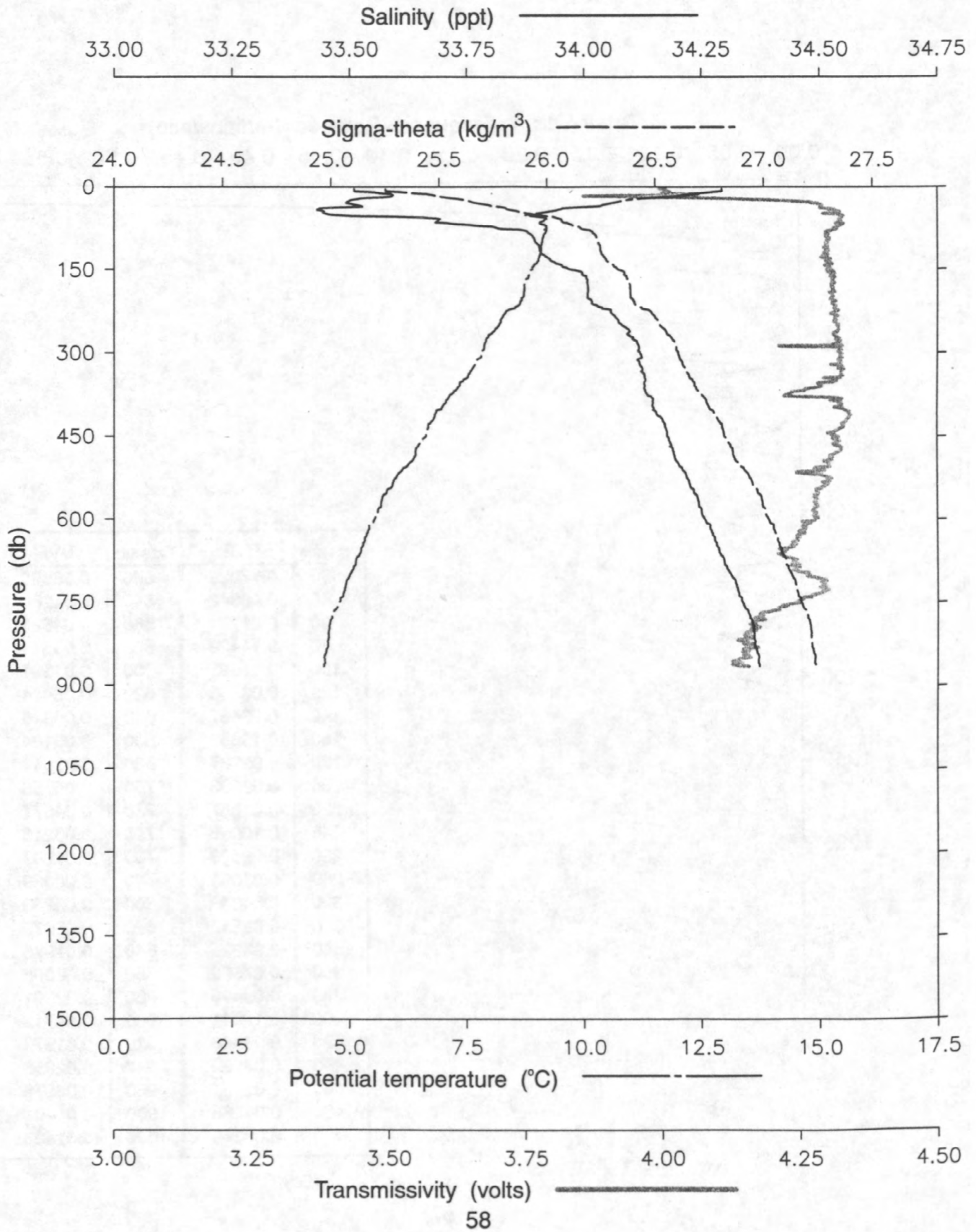


Cruise	S-1-94-MB	Cast	08

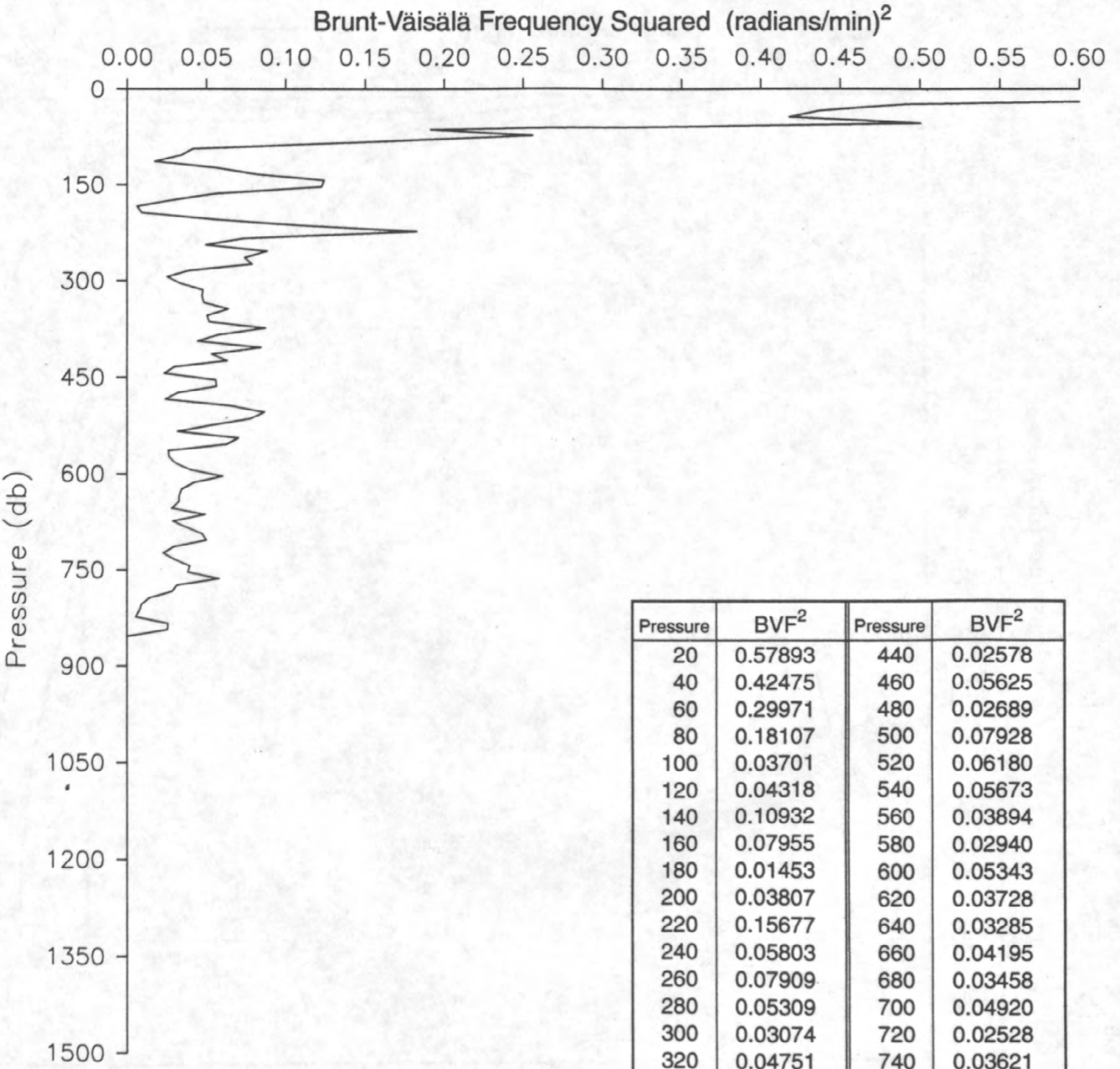


Pressure	BVF^2	Pressure	BVF^2
20	0.77029	520	0.06698
40	0.40642	540	0.04268
60	0.21771	560	0.04601
80	0.14426	580	0.03511
100	0.11025	600	0.01591
120	0.06556	620	0.05414
140	0.09487	640	0.05218
160	0.10655	660	0.05104
180	0.02287	680	0.03041
200	0.02333	700	0.04756
220	0.01957	720	0.04577
240	0.10056	740	0.05215
260	0.08529	760	0.01707
280	0.06635	780	0.00939
300	0.04308	800	0.03236
320	0.08845	820	0.05079
340	0.03226	840	0.01975
360	0.07580	860	0.02005
380	0.03443	880	0.02301
400	0.10241	900	0.04712
420	0.06463	920	0.01972
440	0.03899	940	0.02953
460	0.03521	960	0.03576
480	0.04288	980	0.01401
500	0.05149	1000	0.01483

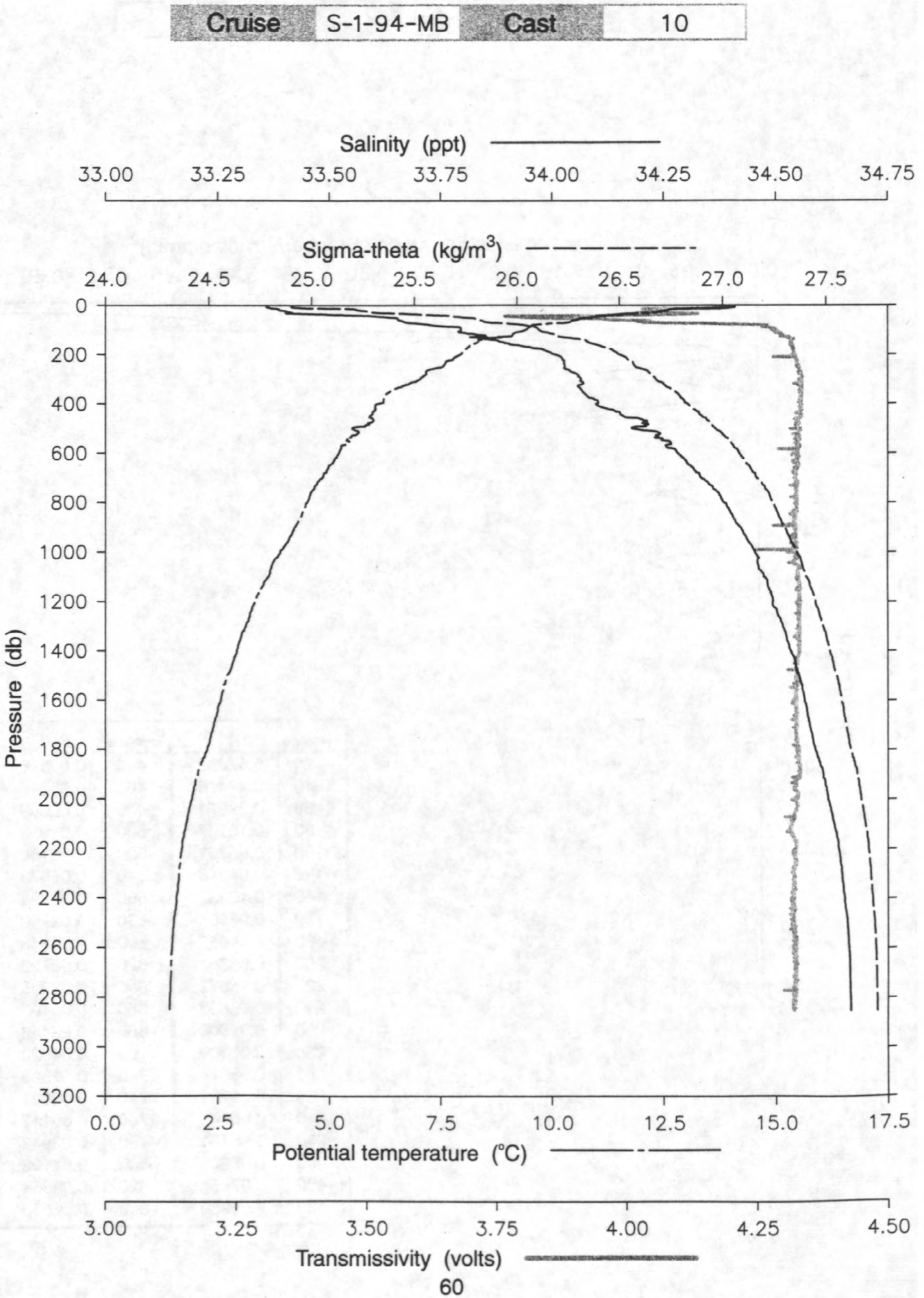
Cruise	S-1-94-MB	Cast	09



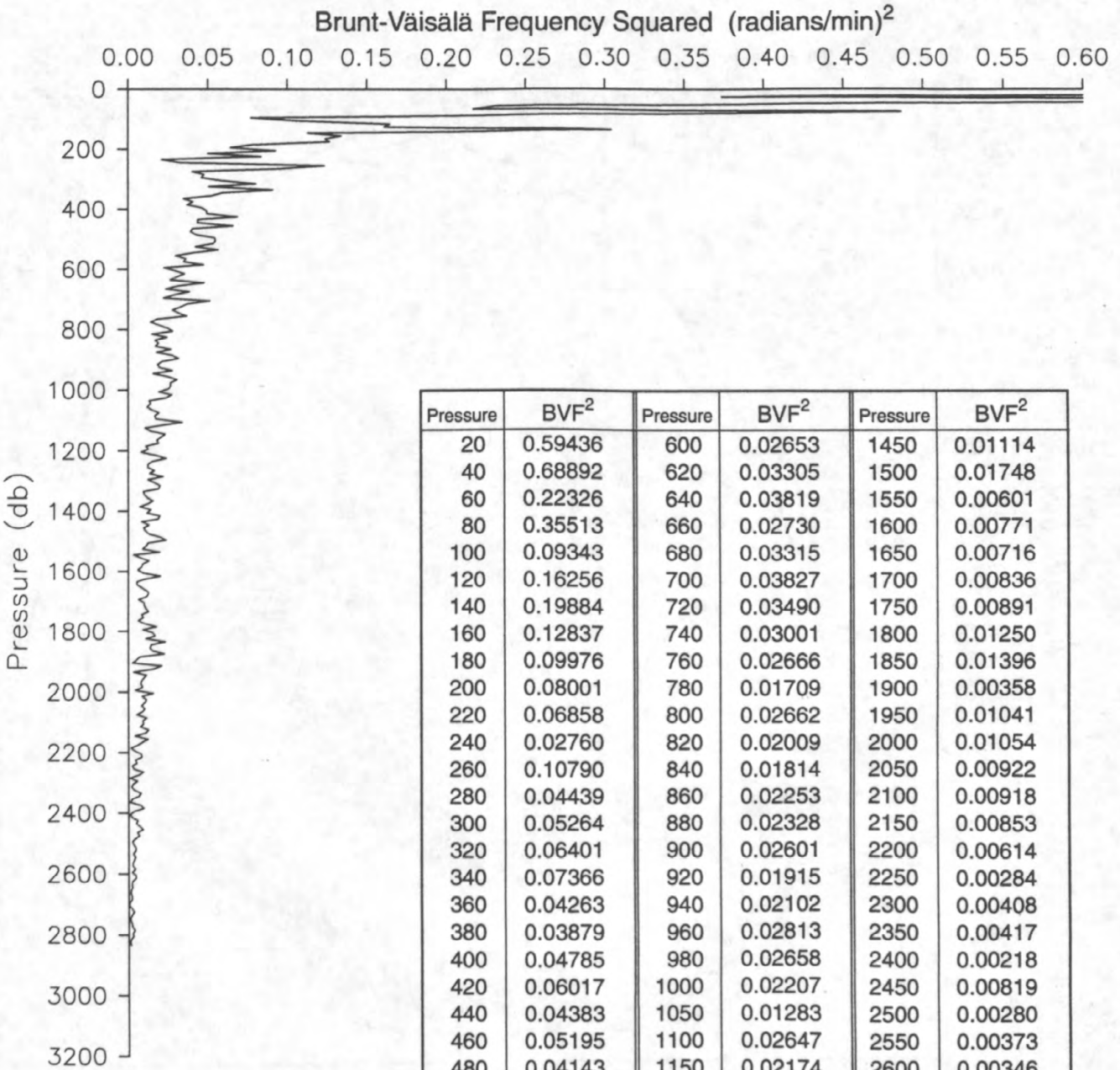
Cruise	S-1-94-MB	Cast	09



Pressure	BVF^2	Pressure	BVF^2
20	0.57893	440	0.02578
40	0.42475	460	0.05625
60	0.29971	480	0.02689
80	0.18107	500	0.07928
100	0.03701	520	0.06180
120	0.04318	540	0.05673
140	0.10932	560	0.03894
160	0.07955	580	0.02940
180	0.01453	600	0.05343
200	0.03807	620	0.03728
220	0.15677	640	0.03285
240	0.05803	660	0.04195
260	0.07909	680	0.03458
280	0.05309	700	0.04920
300	0.03074	720	0.02528
320	0.04751	740	0.03621
340	0.05848	760	0.05117
360	0.05131	780	0.02942
380	0.06803	800	0.01102
400	0.07057	820	0.00634
420	0.05980	840	0.02569

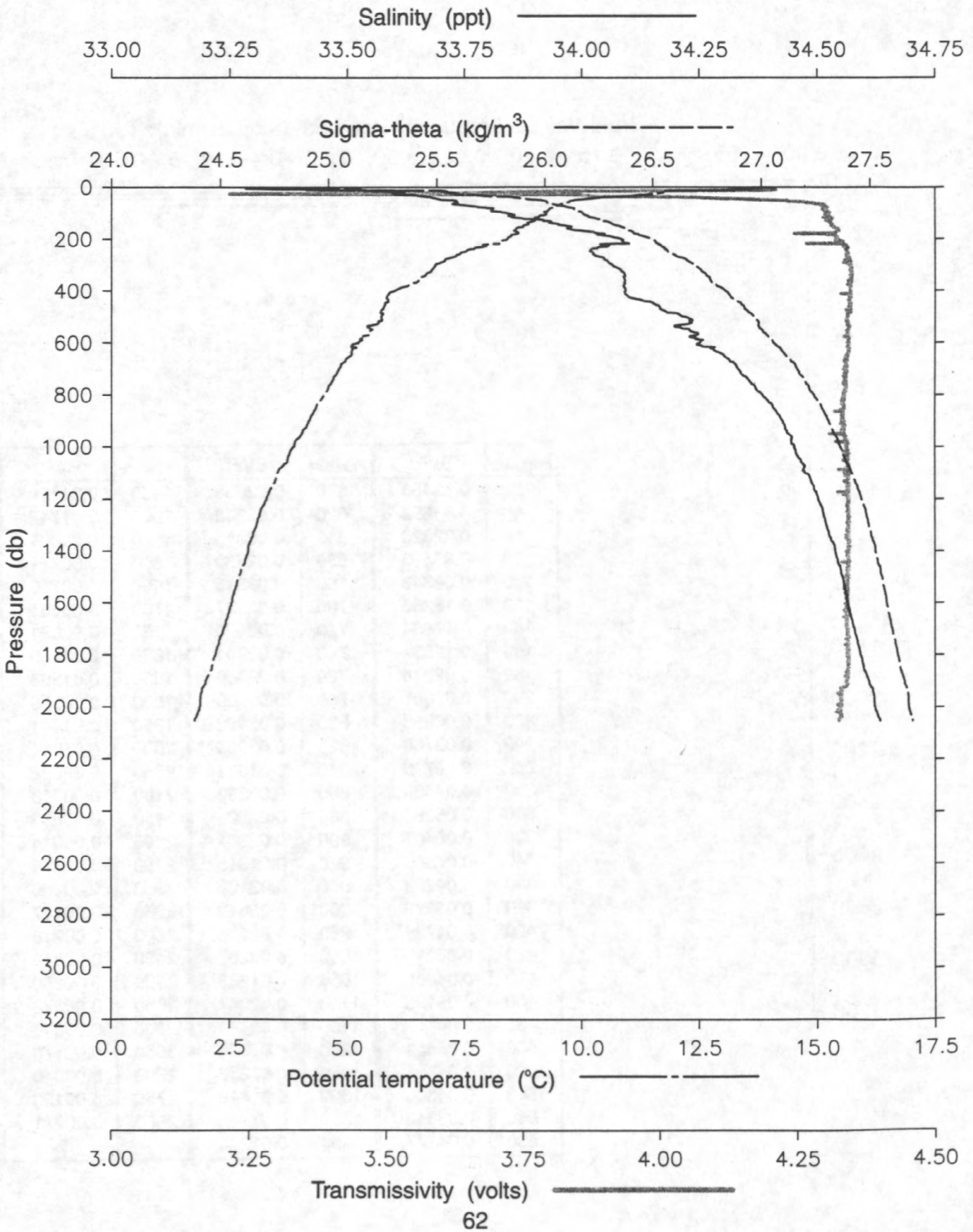

Cruise
S-1-94-MB
Cast
10
Salinity (ppt)
33.00
33.25
33.50
33.75
34.00
34.25
34.50
34.75
Sigma-theta (kg/m3)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Potential temperature (°C)
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Transmissivity (volts)

Cruise	S-1-94-MB	Cast	10

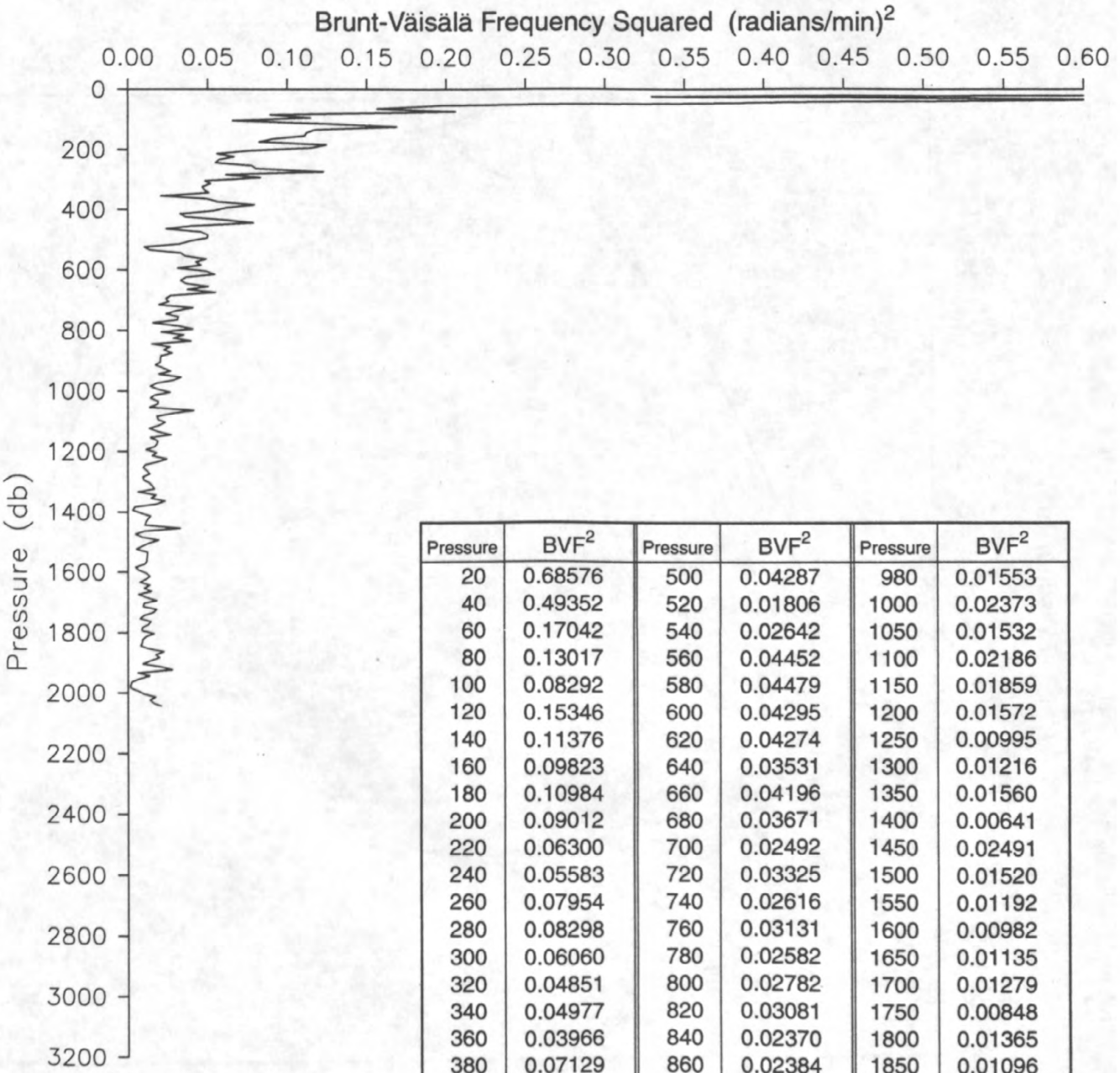


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.59436	600	0.02653	1450	0.01114
40	0.68892	620	0.03305	1500	0.01748
60	0.22326	640	0.03819	1550	0.00601
80	0.35513	660	0.02730	1600	0.00771
100	0.09343	680	0.03315	1650	0.00716
120	0.16256	700	0.03827	1700	0.00836
140	0.19884	720	0.03490	1750	0.00891
160	0.12837	740	0.03001	1800	0.01250
180	0.09976	760	0.02666	1850	0.01396
200	0.08001	780	0.01709	1900	0.00358
220	0.06858	800	0.02662	1950	0.01041
240	0.02760	820	0.02009	2000	0.01054
260	0.10790	840	0.01814	2050	0.00922
280	0.04439	860	0.02253	2100	0.00918
300	0.05264	880	0.02328	2150	0.00853
320	0.06401	900	0.02601	2200	0.00614
340	0.07366	920	0.01915	2250	0.00284
360	0.04263	940	0.02102	2300	0.00408
380	0.03879	960	0.02813	2350	0.00417
400	0.04785	980	0.02658	2400	0.00218
420	0.06017	1000	0.02207	2450	0.00819
440	0.04383	1050	0.01283	2500	0.00280
460	0.05195	1100	0.02647	2550	0.00373
480	0.04143	1150	0.02174	2600	0.00346
500	0.05461	1200	0.01005	2650	0.00179
520	0.04731	1250	0.01233	2700	0.00040
540	0.04806	1300	0.01449	2750	0.00120
560	0.03348	1350	0.01113	2800	0.00271
580	0.04177	1400	0.01278		

Cruise	S-1-94-MB	Cast	11

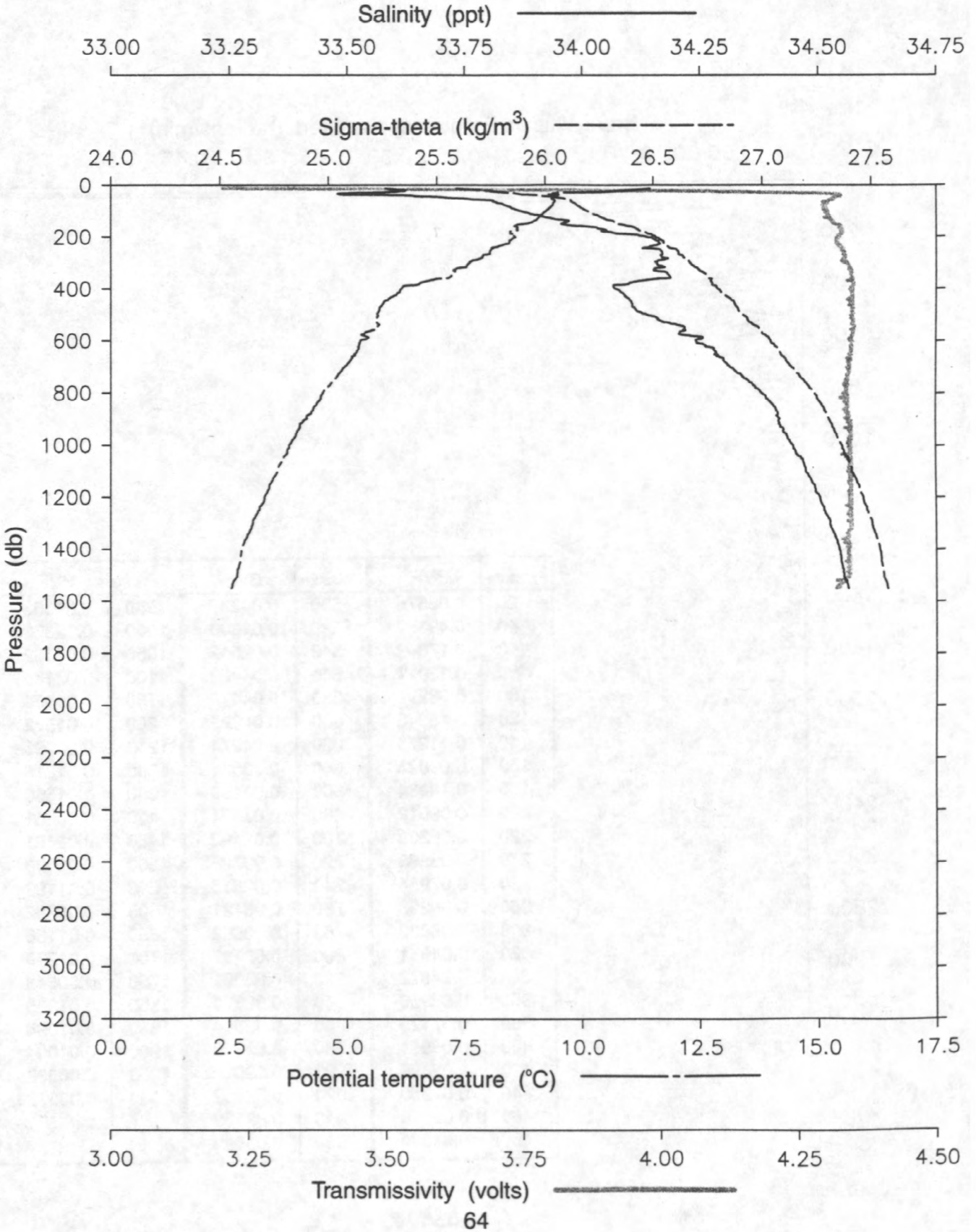


Cruise	S-1-94-MB	Cast	11

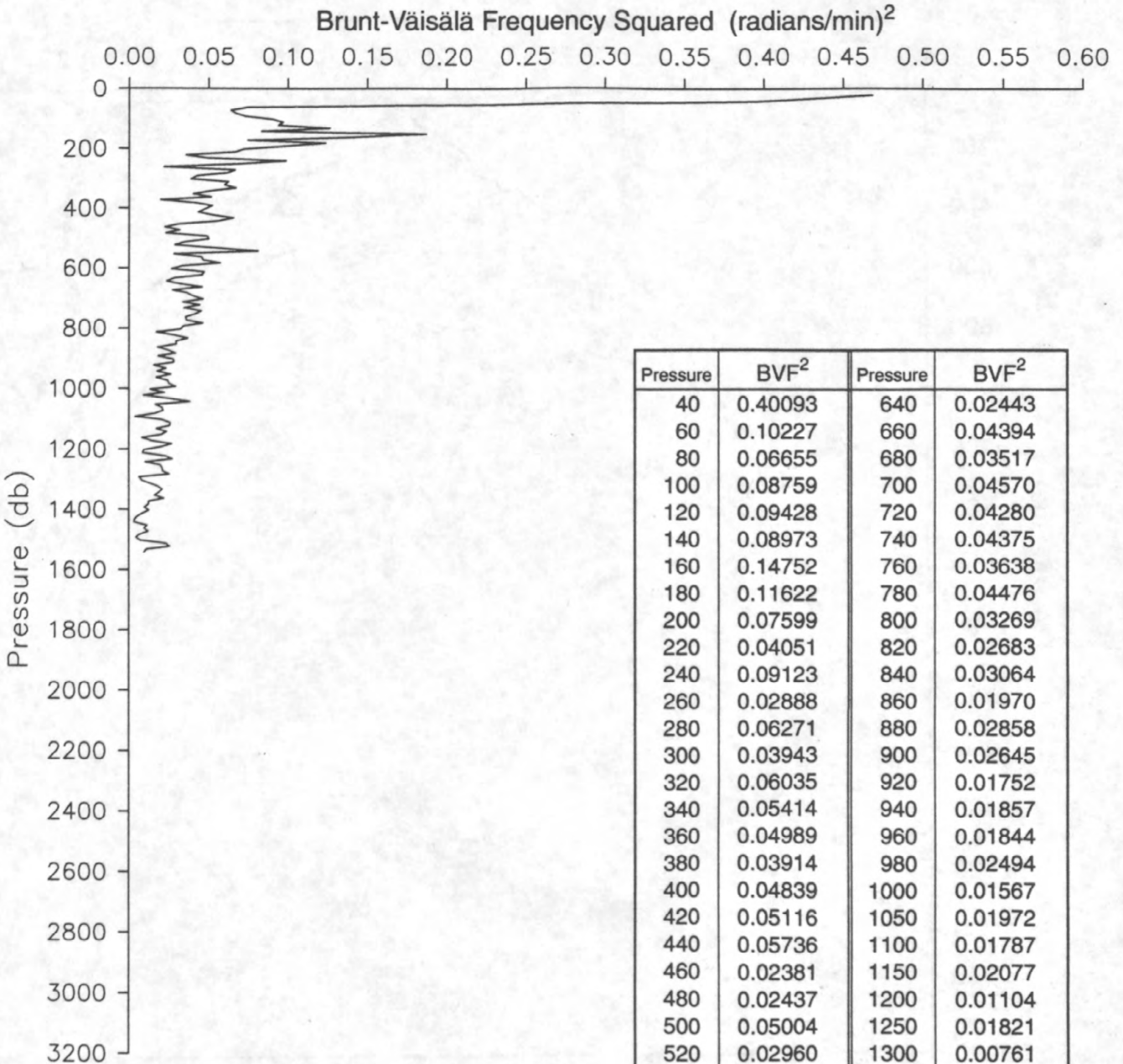


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.68576	500	0.04287	980	0.01553
40	0.49352	520	0.01806	1000	0.02373
60	0.17042	540	0.02642	1050	0.01532
80	0.13017	560	0.04452	1100	0.02186
100	0.08292	580	0.04479	1150	0.01859
120	0.15346	600	0.04295	1200	0.01572
140	0.11376	620	0.04274	1250	0.00995
160	0.09823	640	0.03531	1300	0.01216
180	0.10984	660	0.04196	1350	0.01560
200	0.09012	680	0.03671	1400	0.00641
220	0.06300	700	0.02492	1450	0.02491
240	0.05583	720	0.03325	1500	0.01520
260	0.07954	740	0.02616	1550	0.01192
280	0.08298	760	0.03131	1600	0.00982
300	0.06060	780	0.02582	1650	0.01135
320	0.04851	800	0.02782	1700	0.01279
340	0.04977	820	0.03081	1750	0.00848
360	0.03966	840	0.02370	1800	0.01365
380	0.07129	860	0.02384	1850	0.01096
400	0.05651	880	0.02310	1900	0.01094
420	0.03499	900	0.02038	1950	0.00922
440	0.07259	920	0.02062	2000	0.00872
460	0.02974	940	0.02198		
480	0.04883	960	0.03029		

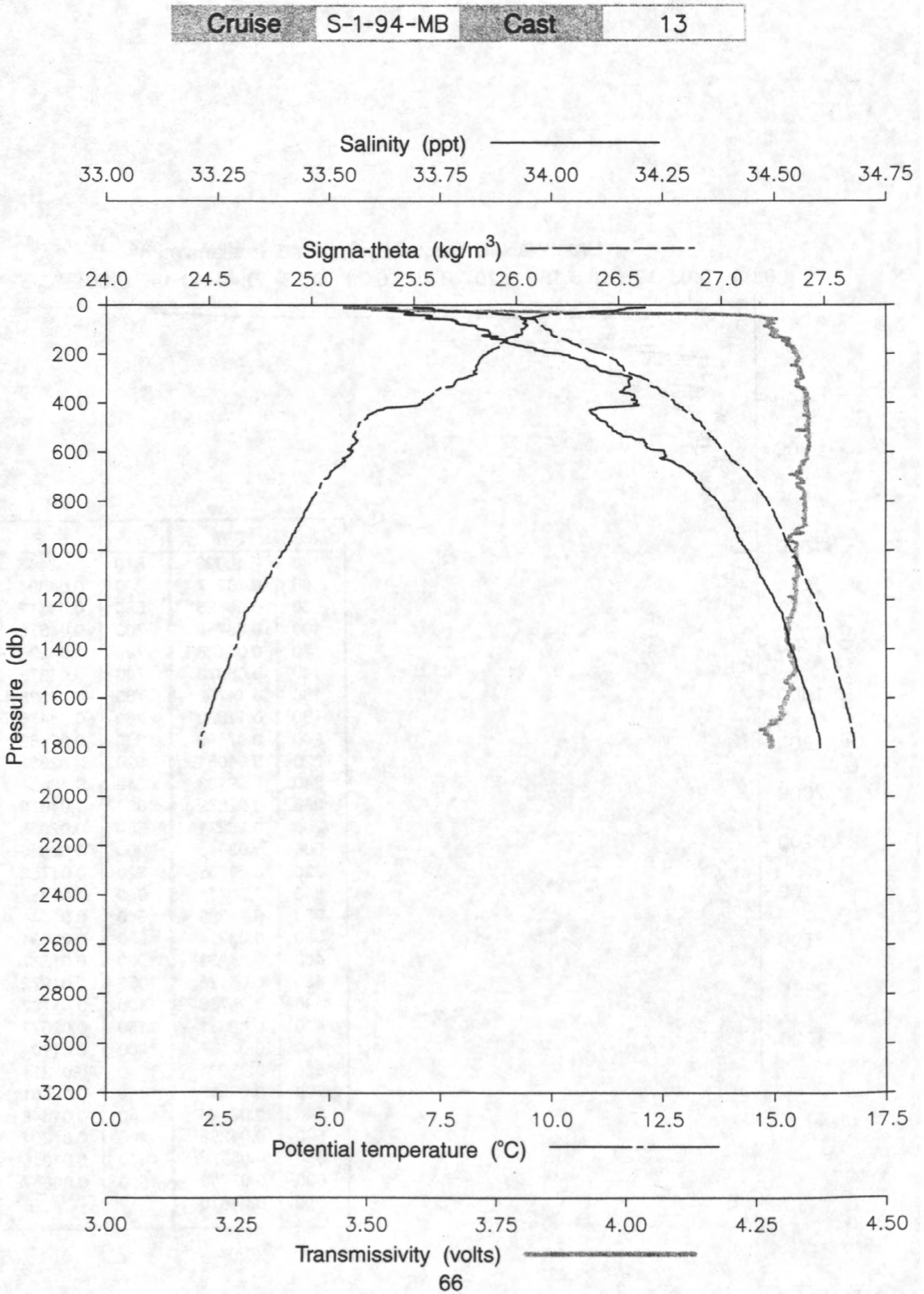
Cruise	S-1-94-MB	Cast	12



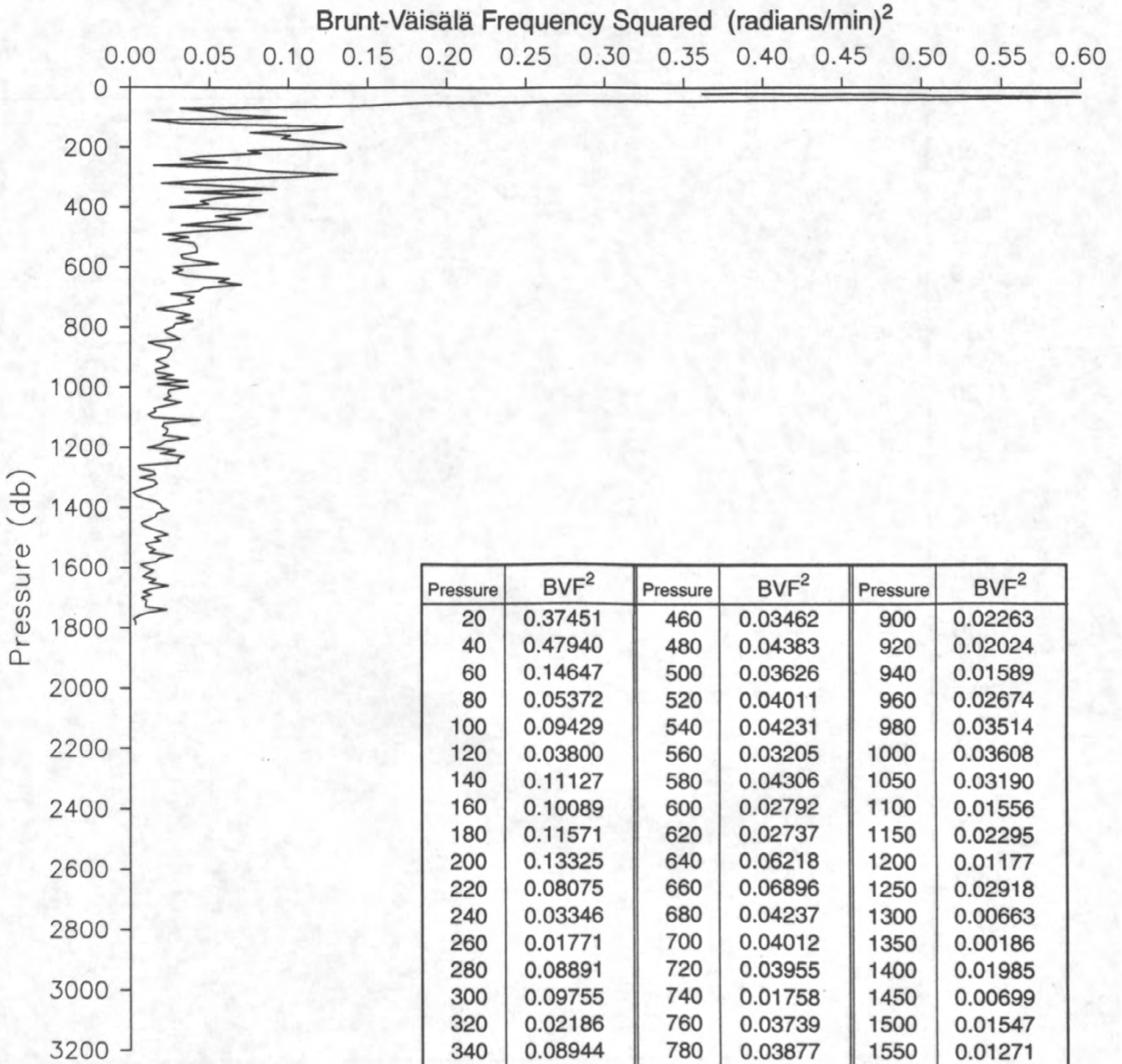
Cruise	S-1-94-MB	Cast	12



Pressure	BVF²	Pressure	BVF²
40	0.40093	640	0.02443
60	0.10227	660	0.04394
80	0.06655	680	0.03517
100	0.08759	700	0.04570
120	0.09428	720	0.04280
140	0.08973	740	0.04375
160	0.14752	760	0.03638
180	0.11622	780	0.04476
200	0.07599	800	0.03269
220	0.04051	820	0.02683
240	0.09123	840	0.03064
260	0.02888	860	0.01970
280	0.06271	880	0.02858
300	0.03943	900	0.02645
320	0.06035	920	0.01752
340	0.05414	940	0.01857
360	0.04989	960	0.01844
380	0.03914	980	0.02494
400	0.04839	1000	0.01567
420	0.05116	1050	0.01972
440	0.05736	1100	0.01787
460	0.02381	1150	0.02077
480	0.02437	1200	0.01104
500	0.05004	1250	0.01821
520	0.02960	1300	0.00761
540	0.07726	1350	0.01648
560	0.04298	1400	0.01204
580	0.05574	1450	0.01016
600	0.02769	1500	0.00667
620	0.04610		

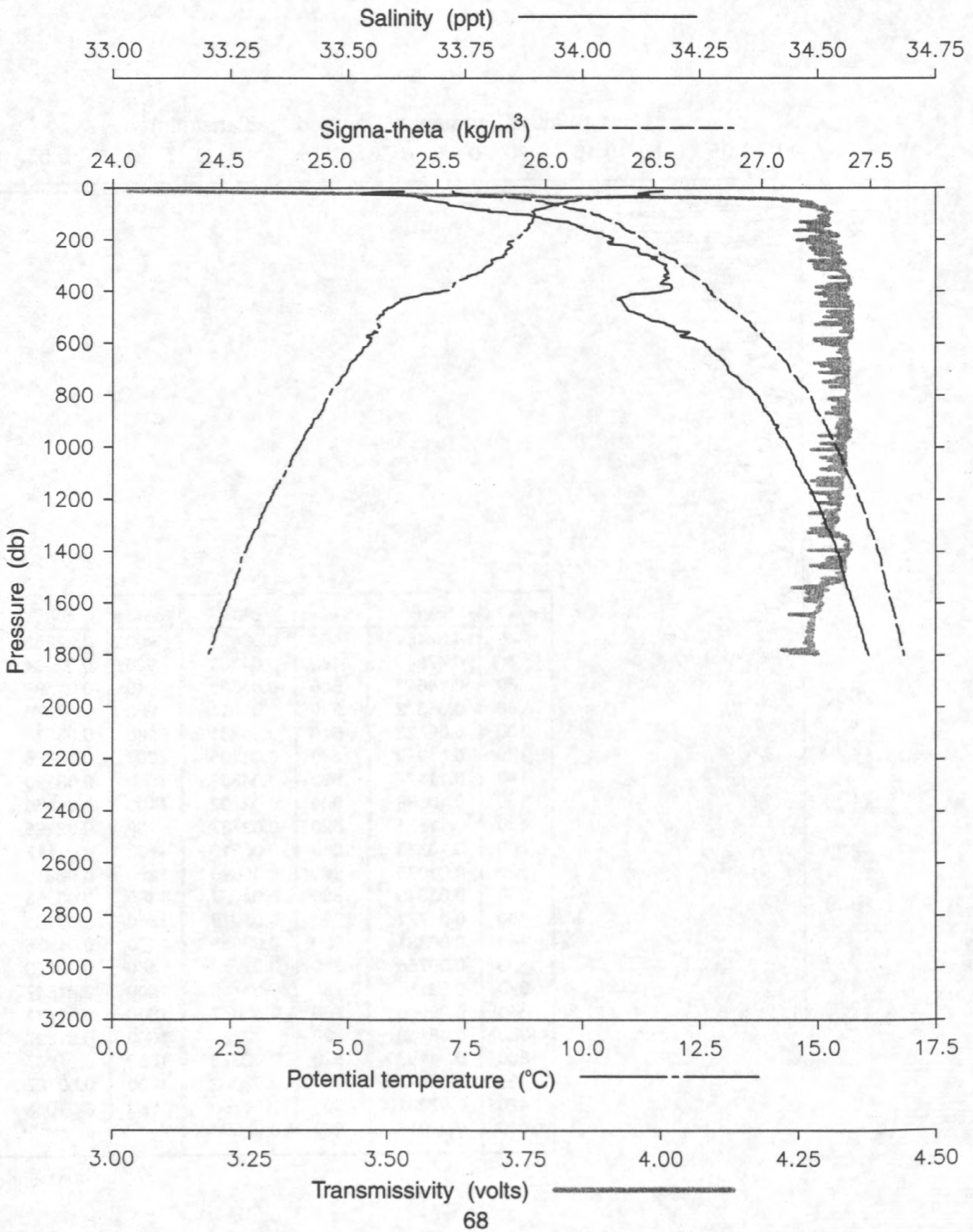

Cruise
S-1-94-MB
Cast
13
Salinity (ppt)
33.00
33.25
33.50
33.75
34.00
34.25
34.50
34.75
Sigma-theta (kg/m3)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Potential temperature (°C)
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Transmissivity (volts)

Cruise	S-1-94-MB	Cast	13

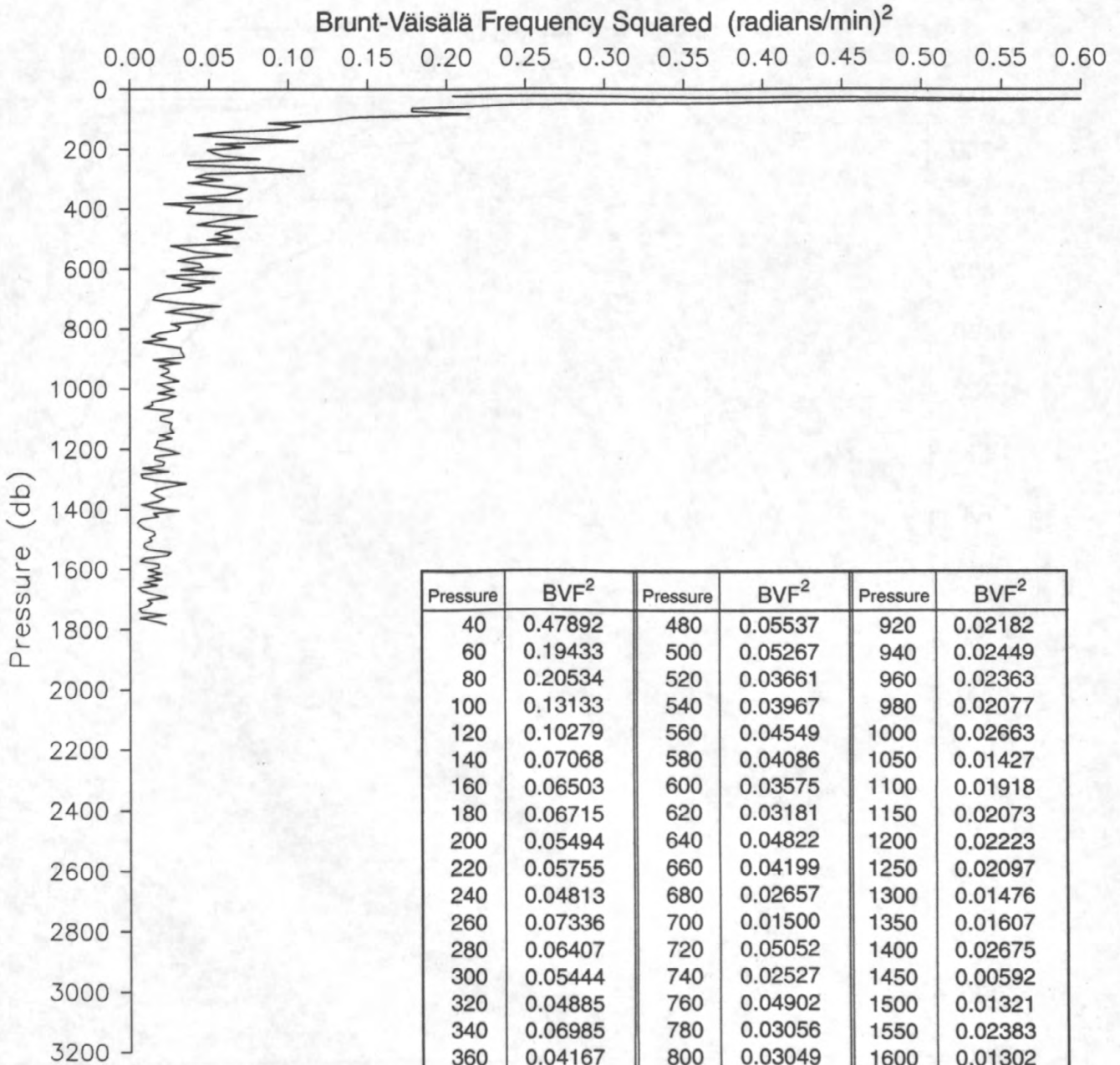


Pressure	BVF²	Pressure	BVF²	Pressure	BVF²
20	0.37451	460	0.03462	900	0.02263
40	0.47940	480	0.04383	920	0.02024
60	0.14647	500	0.03626	940	0.01589
80	0.05372	520	0.04011	960	0.02674
100	0.09429	540	0.04231	980	0.03514
120	0.03800	560	0.03205	1000	0.03608
140	0.11127	580	0.04306	1050	0.03190
160	0.10089	600	0.02792	1100	0.01556
180	0.11571	620	0.02737	1150	0.02295
200	0.13325	640	0.06218	1200	0.01177
220	0.08075	660	0.06896	1250	0.02918
240	0.03346	680	0.04237	1300	0.00663
260	0.01771	700	0.04012	1350	0.00186
280	0.08891	720	0.03955	1400	0.01985
300	0.09755	740	0.01758	1450	0.00699
320	0.02186	760	0.03739	1500	0.01547
340	0.08944	780	0.03877	1550	0.01271
360	0.08138	800	0.02724	1600	0.01027
380	0.04457	820	0.02323	1650	0.01247
400	0.02817	840	0.03063	1700	0.00727
420	0.07231	860	0.01700	1750	0.01058
440	0.06913	880	0.02590		

Cruise	S-1-94-MB	Cast	14

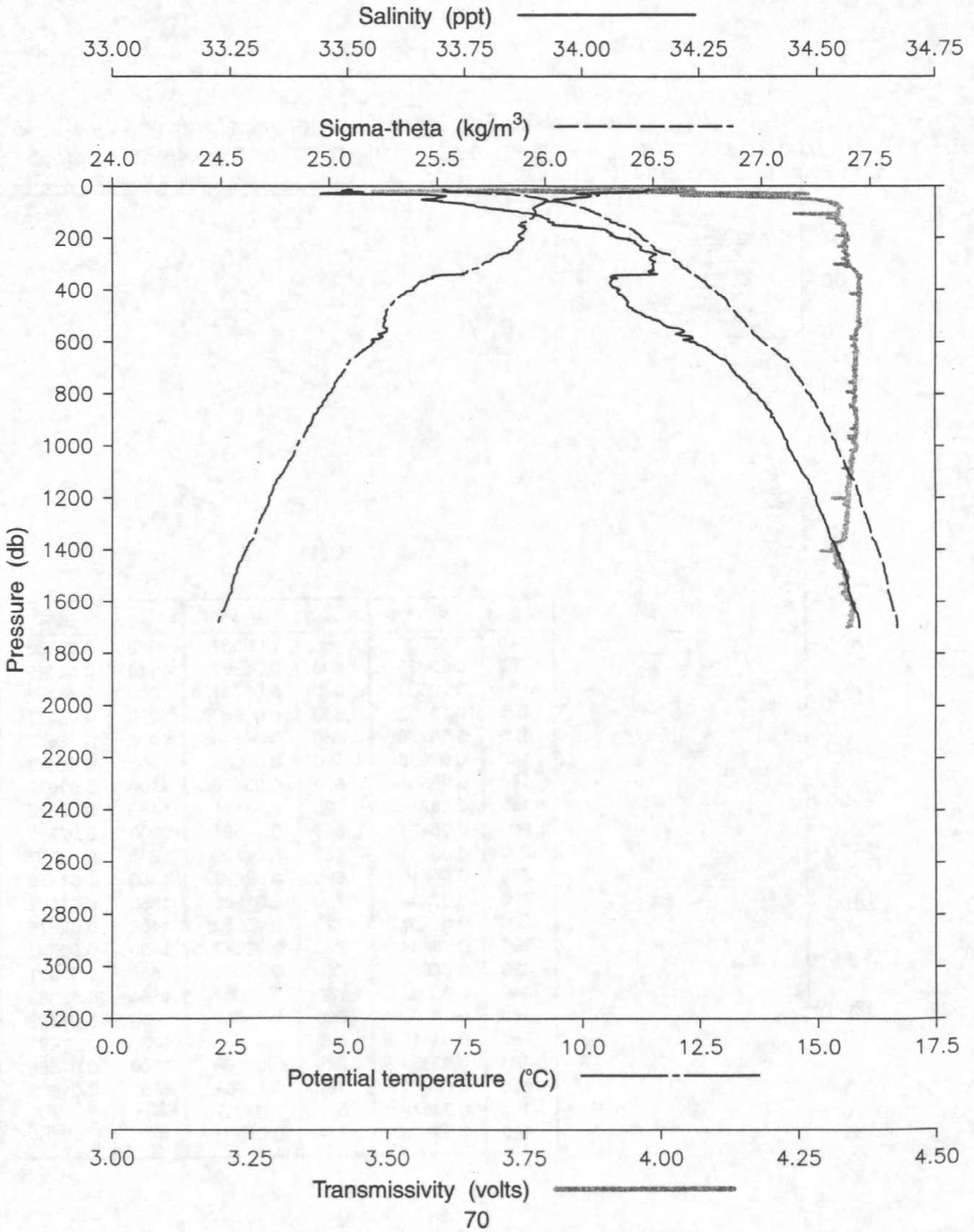


Cruise	S-1-94-MB	Cast	14

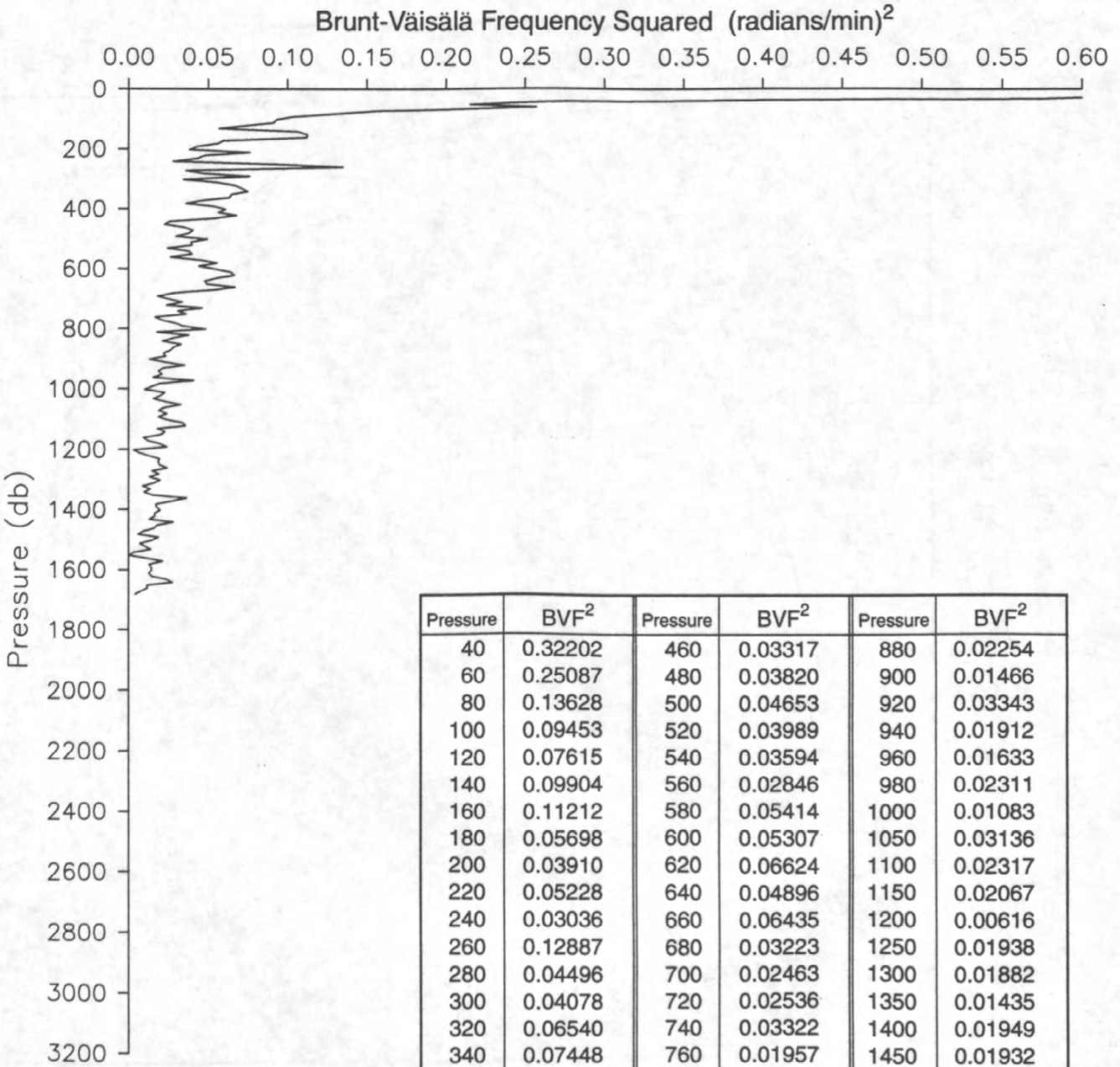


Pressure	BVF²	Pressure	BVF²	Pressure	BVF²
40	0.47892	480	0.05537	920	0.02182
60	0.19433	500	0.05267	940	0.02449
80	0.20534	520	0.03661	960	0.02363
100	0.13133	540	0.03967	980	0.02077
120	0.10279	560	0.04549	1000	0.02663
140	0.07068	580	0.04086	1050	0.01427
160	0.06503	600	0.03575	1100	0.01918
180	0.06715	620	0.03181	1150	0.02073
200	0.05494	640	0.04822	1200	0.02223
220	0.05755	660	0.04199	1250	0.02097
240	0.04813	680	0.02657	1300	0.01476
260	0.07336	700	0.01500	1350	0.01607
280	0.06407	720	0.05052	1400	0.02675
300	0.05444	740	0.02527	1450	0.00592
320	0.04885	760	0.04902	1500	0.01321
340	0.06985	780	0.03056	1550	0.02383
360	0.04167	800	0.03049	1600	0.01302
380	0.03410	820	0.01491	1650	0.01491
400	0.03881	840	0.01198	1700	0.01386
420	0.06921	860	0.02904	1750	0.01862
440	0.05479	880	0.03317		
460	0.06456	900	0.01951		

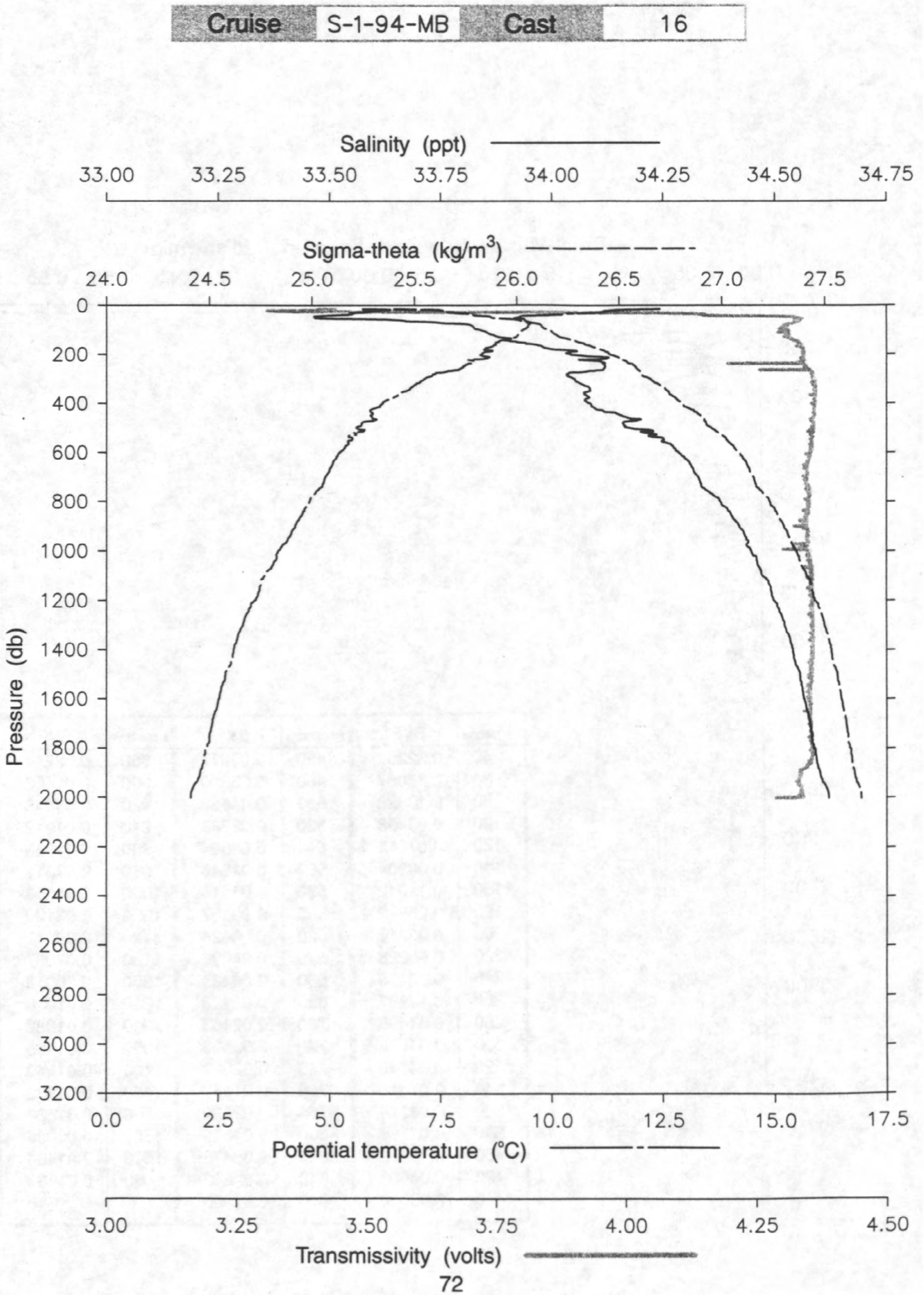
Cruise	S-1-94-MB	Cast	15



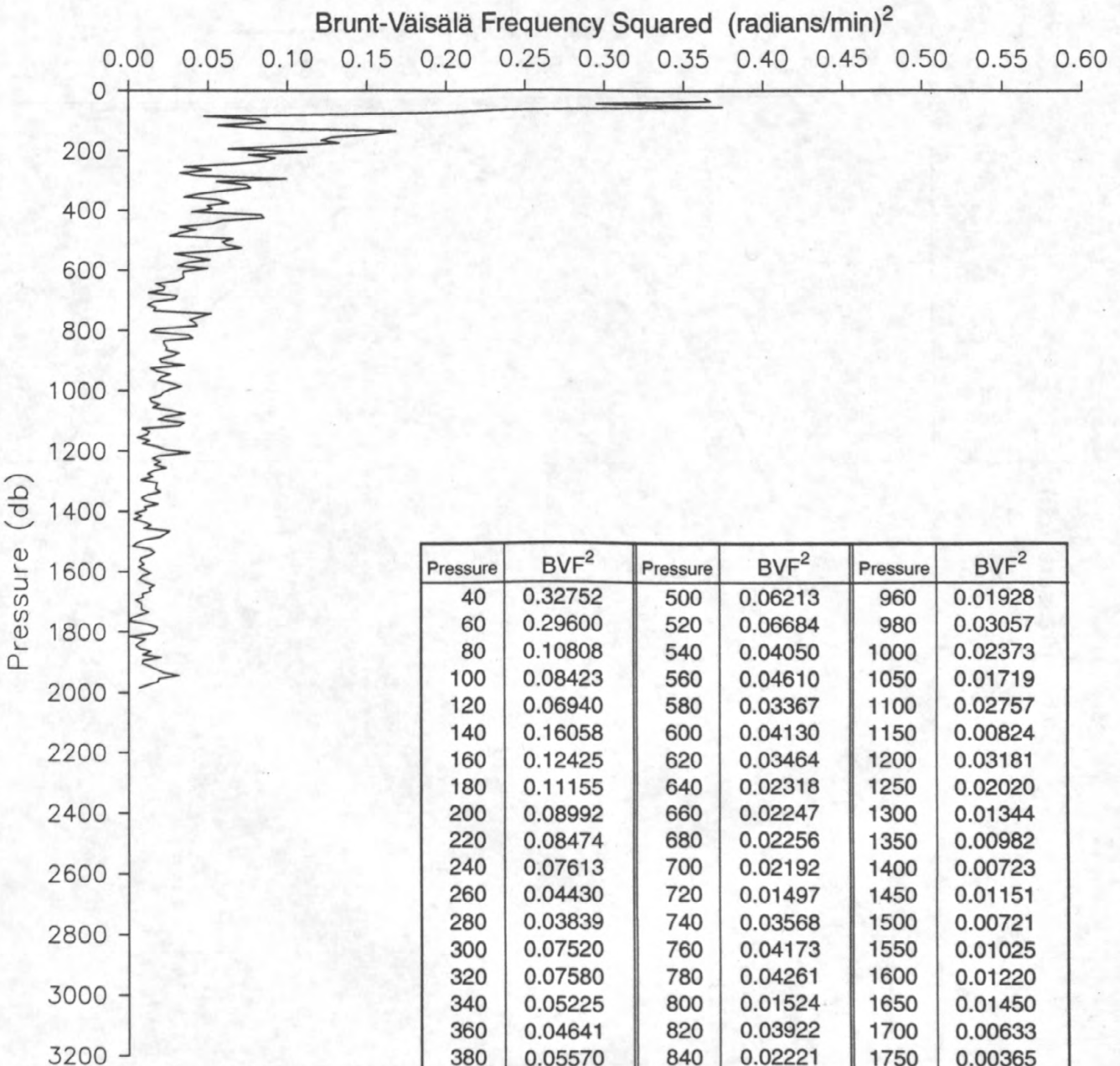
Cruise	S-1-94-MB	Cast	15



Pressure	BVF²	Pressure	BVF²	Pressure	BVF²
40	0.32202	460	0.03317	880	0.02254
60	0.25087	480	0.03820	900	0.01466
80	0.13628	500	0.04653	920	0.03343
100	0.09453	520	0.03989	940	0.01912
120	0.07615	540	0.03594	960	0.01633
140	0.09904	560	0.02846	980	0.02311
160	0.11212	580	0.05414	1000	0.01083
180	0.05698	600	0.05307	1050	0.03136
200	0.03910	620	0.06624	1100	0.02317
220	0.05228	640	0.04896	1150	0.02067
240	0.03036	660	0.06435	1200	0.00616
260	0.12887	680	0.03223	1250	0.01938
280	0.04496	700	0.02463	1300	0.01882
300	0.04078	720	0.02536	1350	0.01435
320	0.06540	740	0.03322	1400	0.01949
340	0.07448	760	0.01957	1450	0.01932
360	0.06378	780	0.02822	1500	0.01538
380	0.03768	800	0.04629	1550	0.00095
400	0.05982	820	0.03476	1600	0.01436
420	0.06606	840	0.02243	1650	0.01389
440	0.03000	860	0.02900		

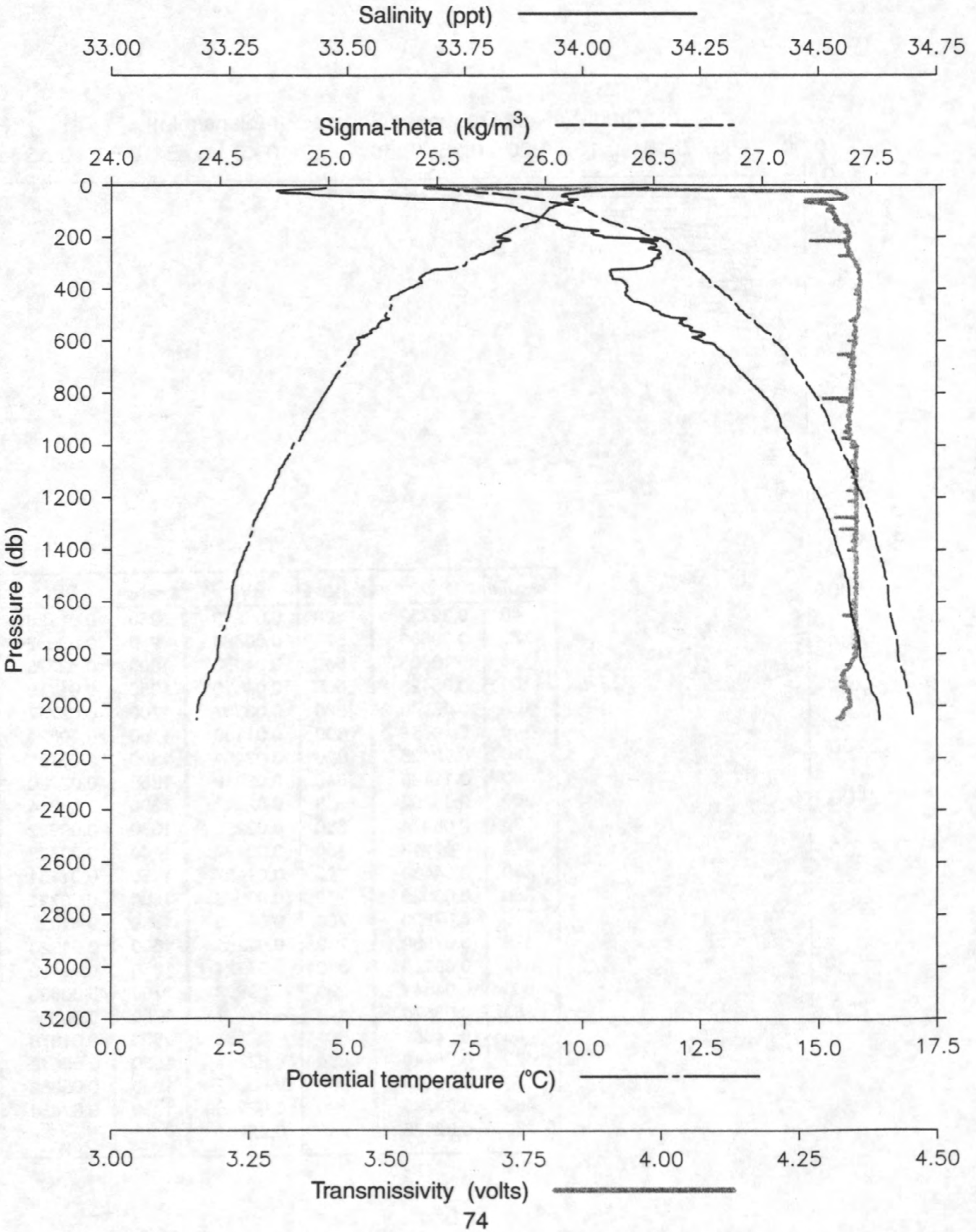

Cruise
S-1-94-MB
Cast
16
Salinity (ppt)
33.00
33.25
33.50
33.75
34.00
34.25
34.50
34.75
Sigma-theta (kg/m3)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Potential temperature (°C)
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Transmissivity (volts)

Cruise	S-1-94-MB	Cast	16

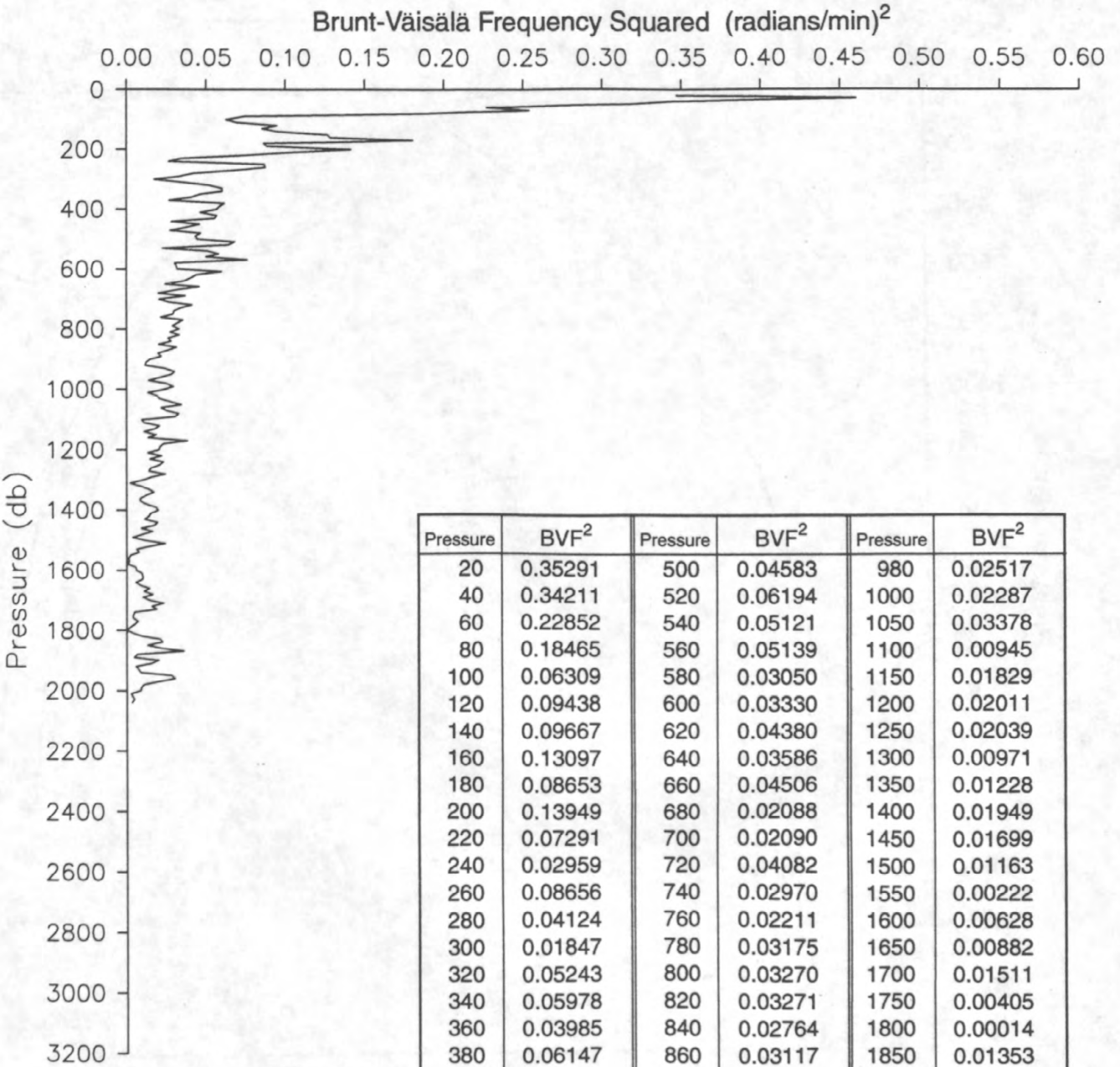


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
40	0.32752	500	0.06213	960	0.01928
60	0.29600	520	0.06684	980	0.03057
80	0.10808	540	0.04050	1000	0.02373
100	0.08423	560	0.04610	1050	0.01719
120	0.06940	580	0.03367	1100	0.02757
140	0.16058	600	0.04130	1150	0.00824
160	0.12425	620	0.03464	1200	0.03181
180	0.11155	640	0.02318	1250	0.02020
200	0.08992	660	0.02247	1300	0.01344
220	0.08474	680	0.02256	1350	0.00982
240	0.07613	700	0.02192	1400	0.00723
260	0.04430	720	0.01497	1450	0.01151
280	0.03839	740	0.03568	1500	0.00721
300	0.07520	760	0.04173	1550	0.01025
320	0.07580	780	0.04261	1600	0.01220
340	0.05225	800	0.01524	1650	0.01450
360	0.04641	820	0.03922	1700	0.00633
380	0.05570	840	0.02221	1750	0.00365
400	0.04552	860	0.02383	1800	0.01678
420	0.08448	880	0.02953	1850	0.00570
440	0.05558	900	0.02017	1900	0.00863
460	0.03785	920	0.02346	1950	0.02454
480	0.02875	940	0.02254		

Cruise	S-1-94-MB	Cast	17

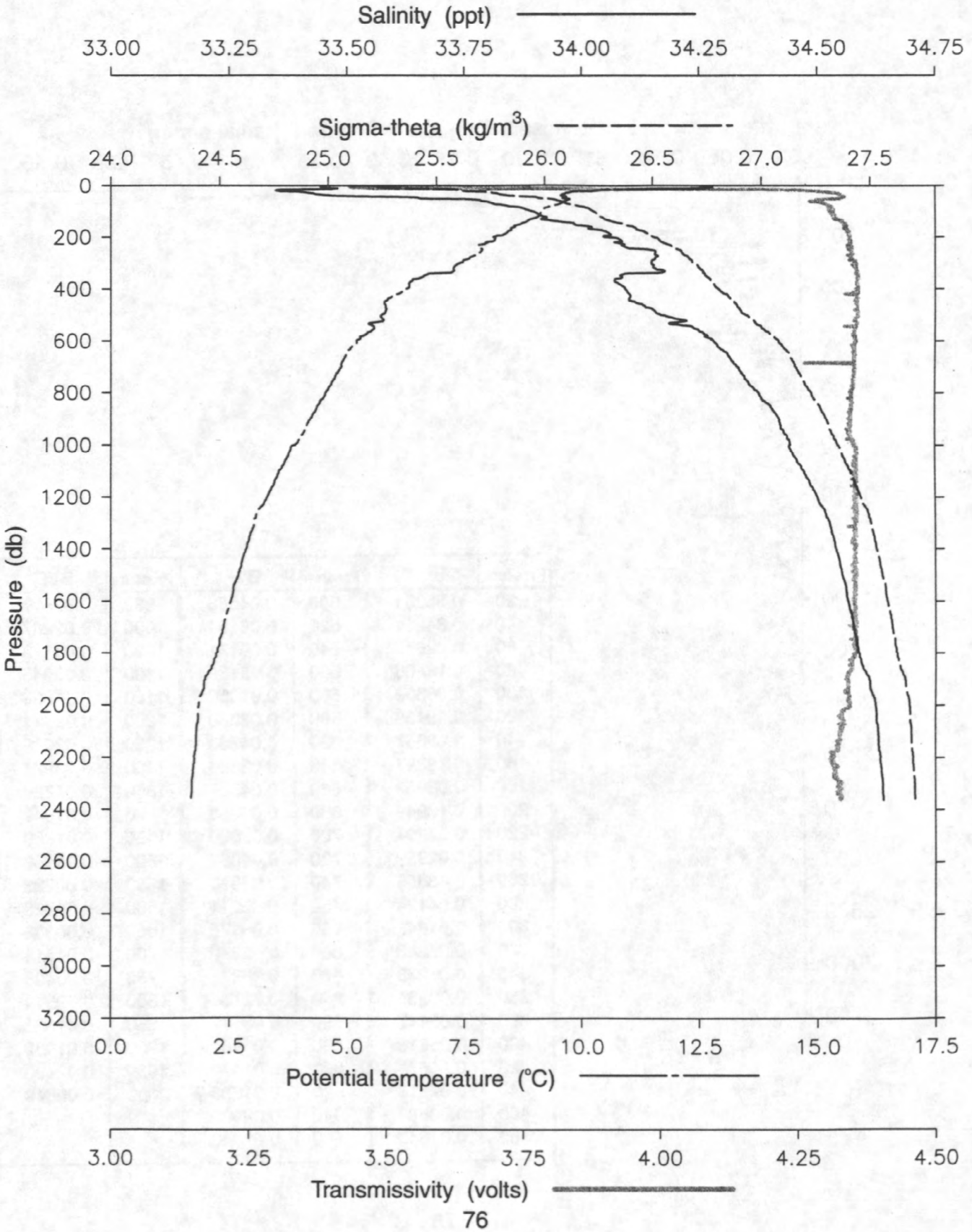


Cruise	S-1-94-MB	Cast	17

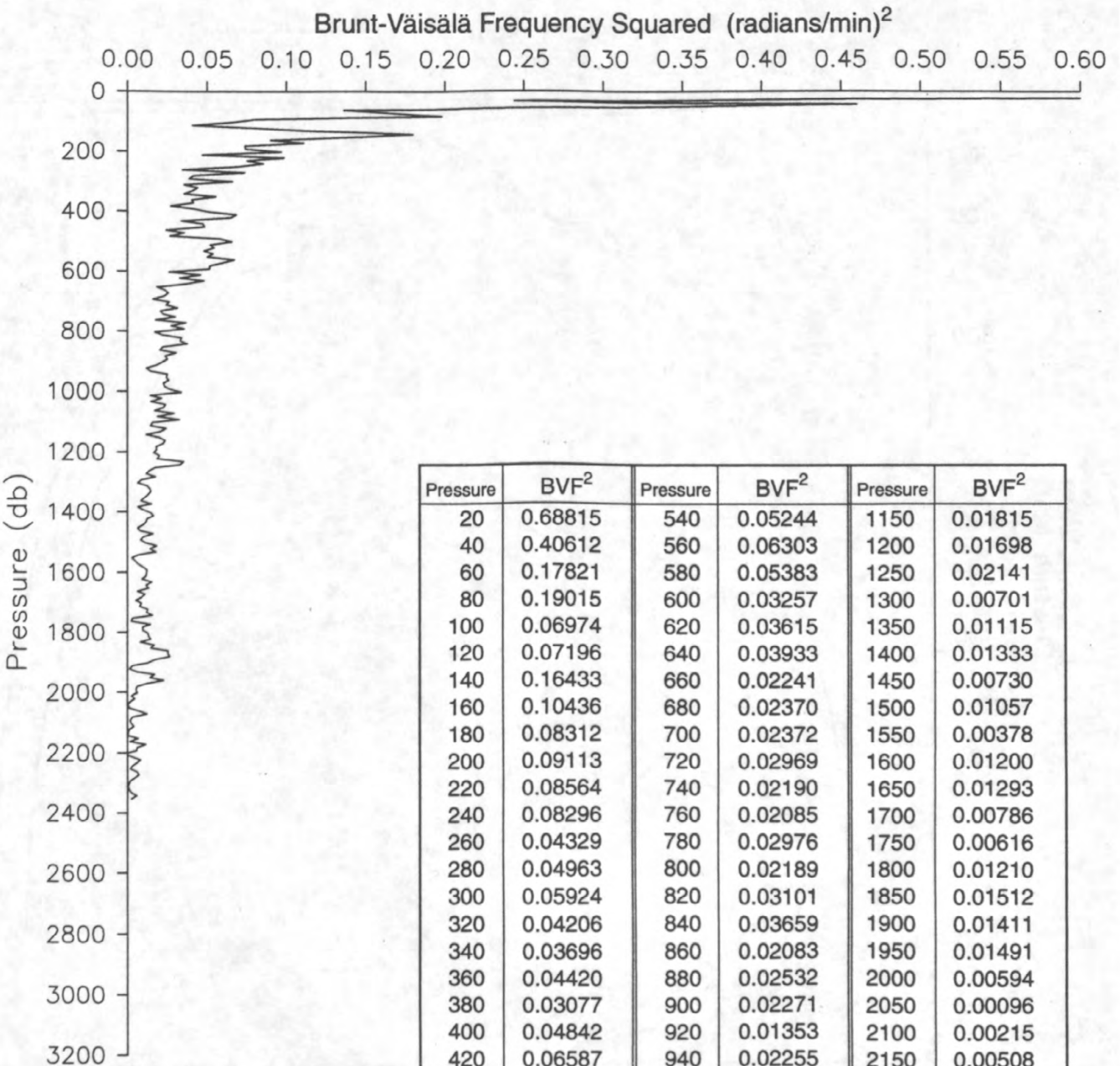


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.35291	500	0.04583	980	0.02517
40	0.34211	520	0.06194	1000	0.02287
60	0.22852	540	0.05121	1050	0.03378
80	0.18465	560	0.05139	1100	0.00945
100	0.06309	580	0.03050	1150	0.01829
120	0.09438	600	0.03330	1200	0.02011
140	0.09667	620	0.04380	1250	0.02039
160	0.13097	640	0.03586	1300	0.00971
180	0.08653	660	0.04506	1350	0.01228
200	0.13949	680	0.02088	1400	0.01949
220	0.07291	700	0.02090	1450	0.01699
240	0.02959	720	0.04082	1500	0.01163
260	0.08656	740	0.02970	1550	0.00222
280	0.04124	760	0.02211	1600	0.00628
300	0.01847	780	0.03175	1650	0.00882
320	0.05243	800	0.03270	1700	0.01511
340	0.05978	820	0.03271	1750	0.00405
360	0.03985	840	0.02764	1800	0.00014
380	0.06147	860	0.03117	1850	0.01353
400	0.05618	880	0.01984	1900	0.01969
420	0.05671	900	0.01470	1950	0.02800
440	0.02918	920	0.01235	2000	0.00849
460	0.03683	940	0.02988		
480	0.04645	960	0.02080		

Cruise	S-1-94-MB	Cast	18

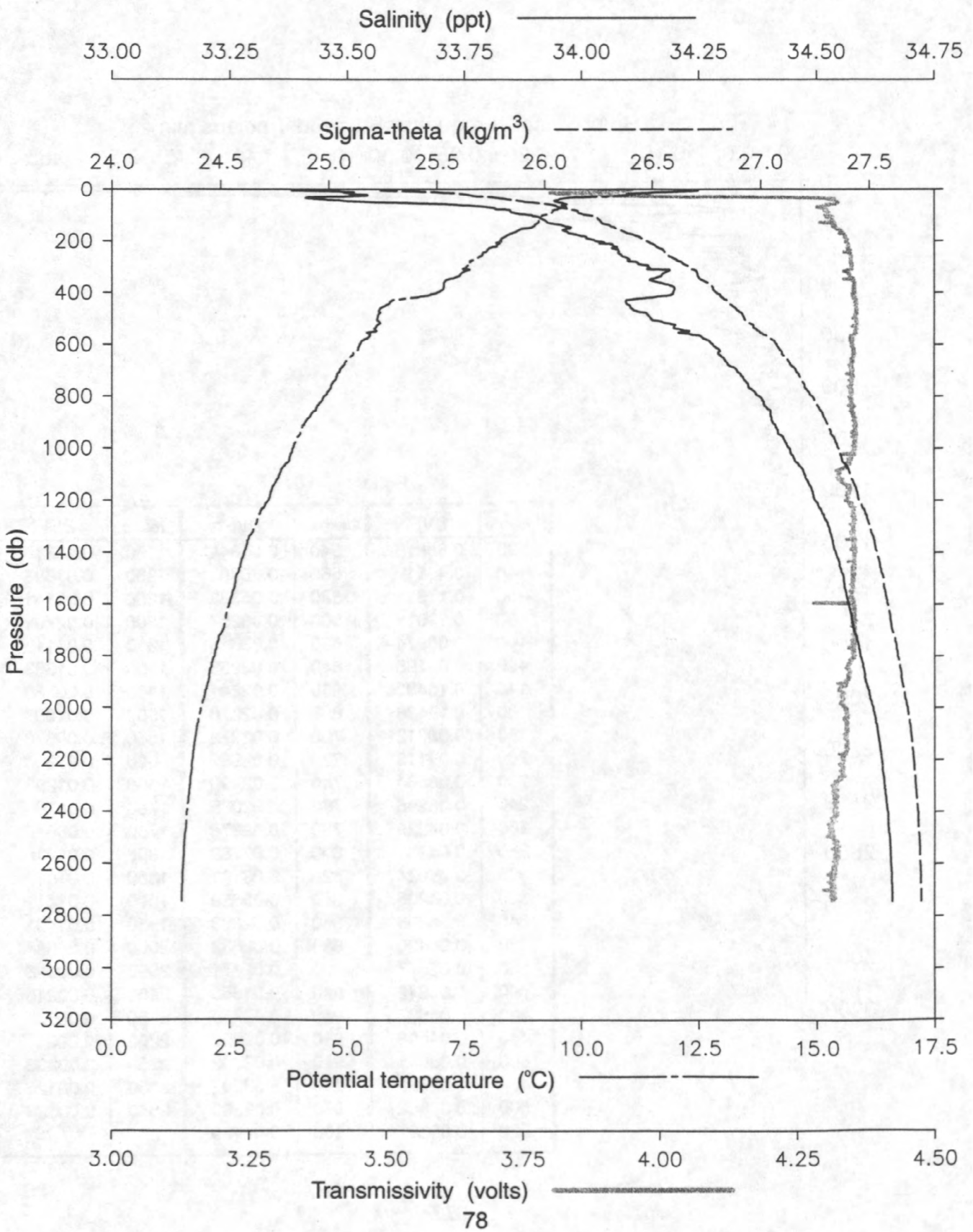


Cruise	S-1-94-MB	Cast	18

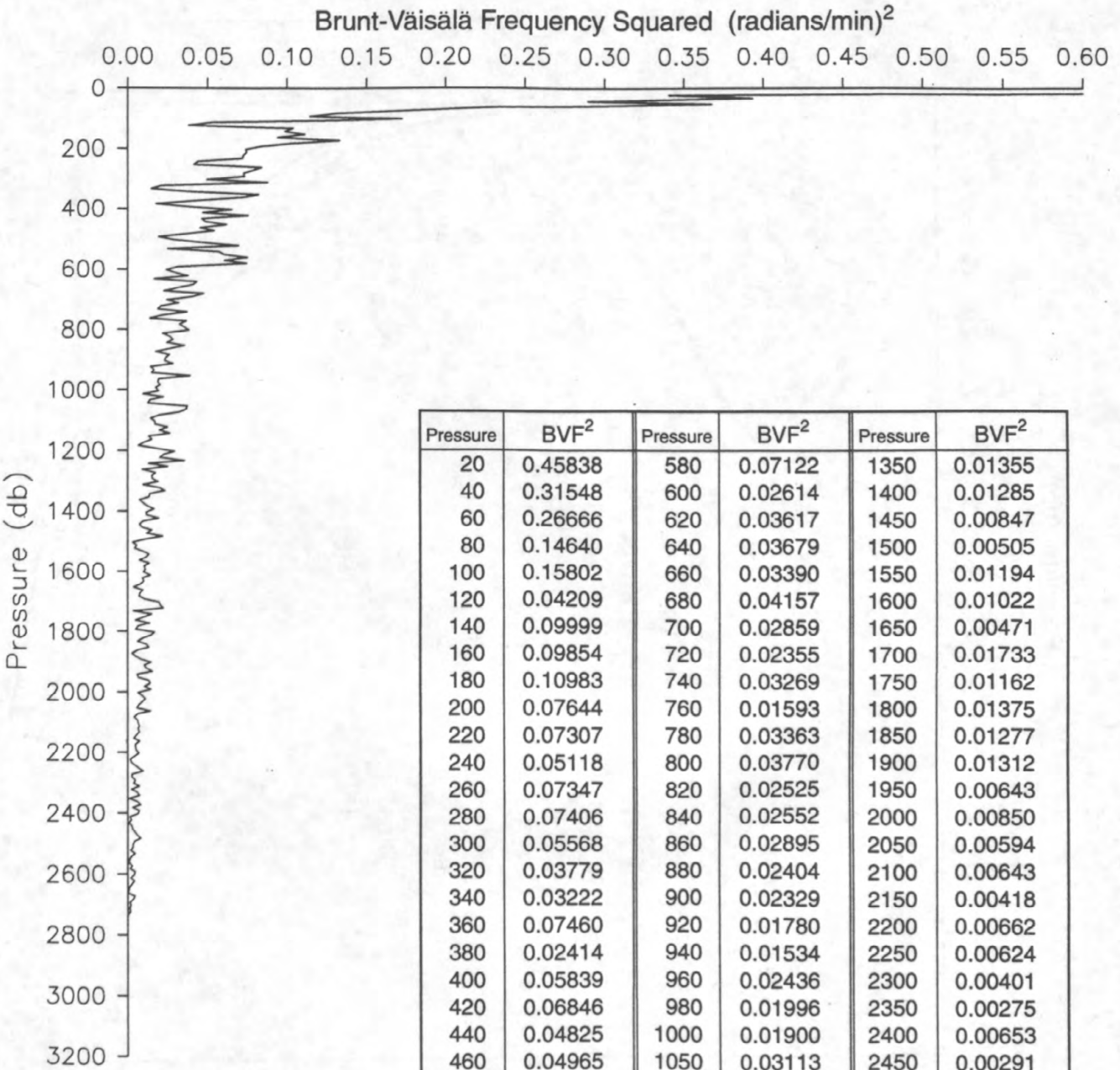


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.68815	540	0.05244	1150	0.01815
40	0.40612	560	0.06303	1200	0.01698
60	0.17821	580	0.05383	1250	0.02141
80	0.19015	600	0.03257	1300	0.00701
100	0.06974	620	0.03615	1350	0.01115
120	0.07196	640	0.03933	1400	0.01333
140	0.16433	660	0.02241	1450	0.00730
160	0.10436	680	0.02370	1500	0.01057
180	0.08312	700	0.02372	1550	0.00378
200	0.09113	720	0.02969	1600	0.01200
220	0.08564	740	0.02190	1650	0.01293
240	0.08296	760	0.02085	1700	0.00786
260	0.04329	780	0.02976	1750	0.00616
280	0.04963	800	0.02189	1800	0.01210
300	0.05924	820	0.03101	1850	0.01512
320	0.04206	840	0.03659	1900	0.01411
340	0.03696	860	0.02083	1950	0.01491
360	0.04420	880	0.02532	2000	0.00594
380	0.03077	900	0.02271	2050	0.00096
400	0.04842	920	0.01353	2100	0.00215
420	0.06587	940	0.02255	2150	0.00508
440	0.04408	960	0.02558	2200	-0.00003
460	0.03041	980	0.02309	2250	0.00203
480	0.02898	1000	0.03207	2300	0.00123
500	0.06382	1050	0.02308	2350	0.00326
520	0.05391	1100	0.01989		

Cruise	S-1-94-MB	Cast	19

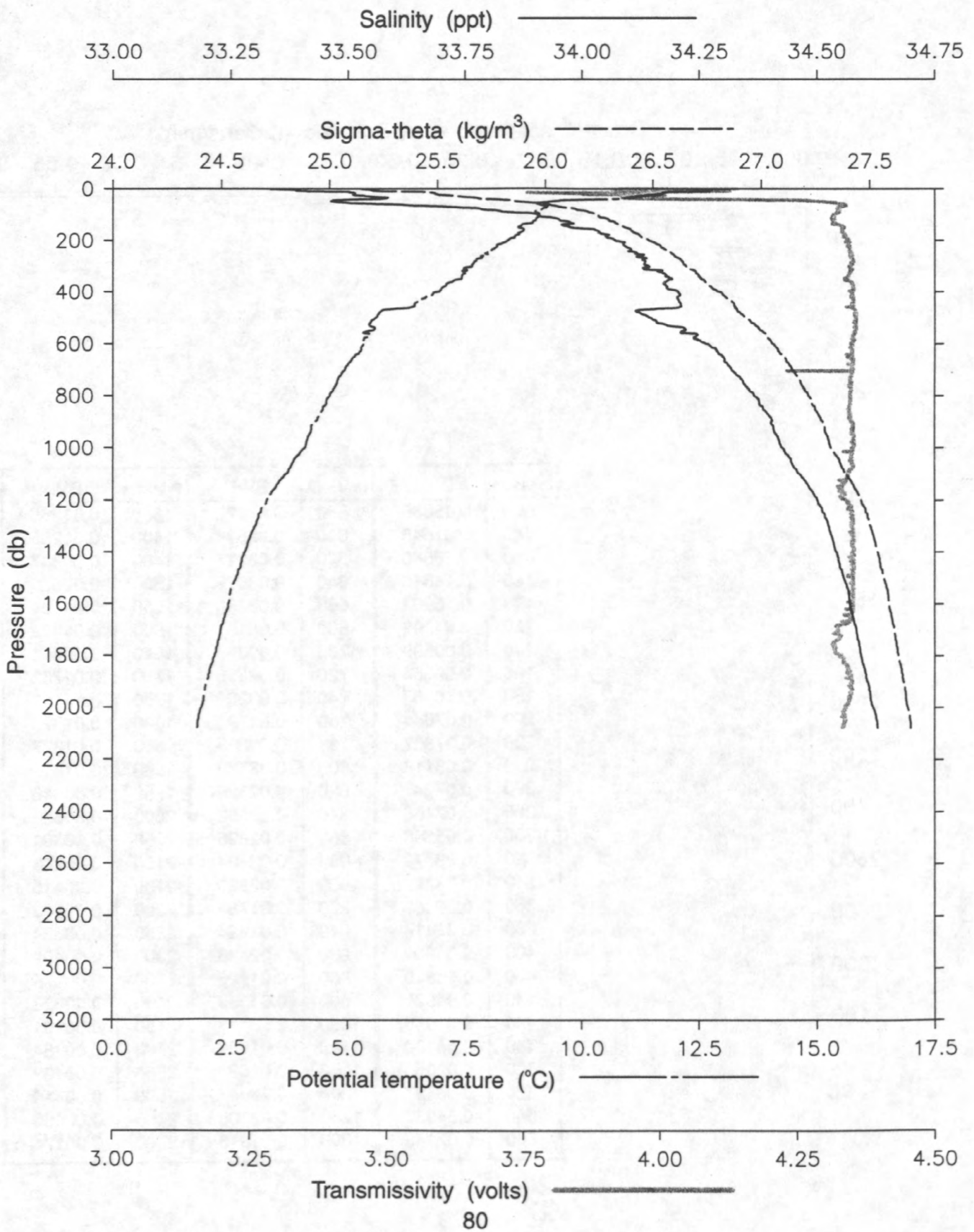


Cruise	S-1-94-MB	Cast	19

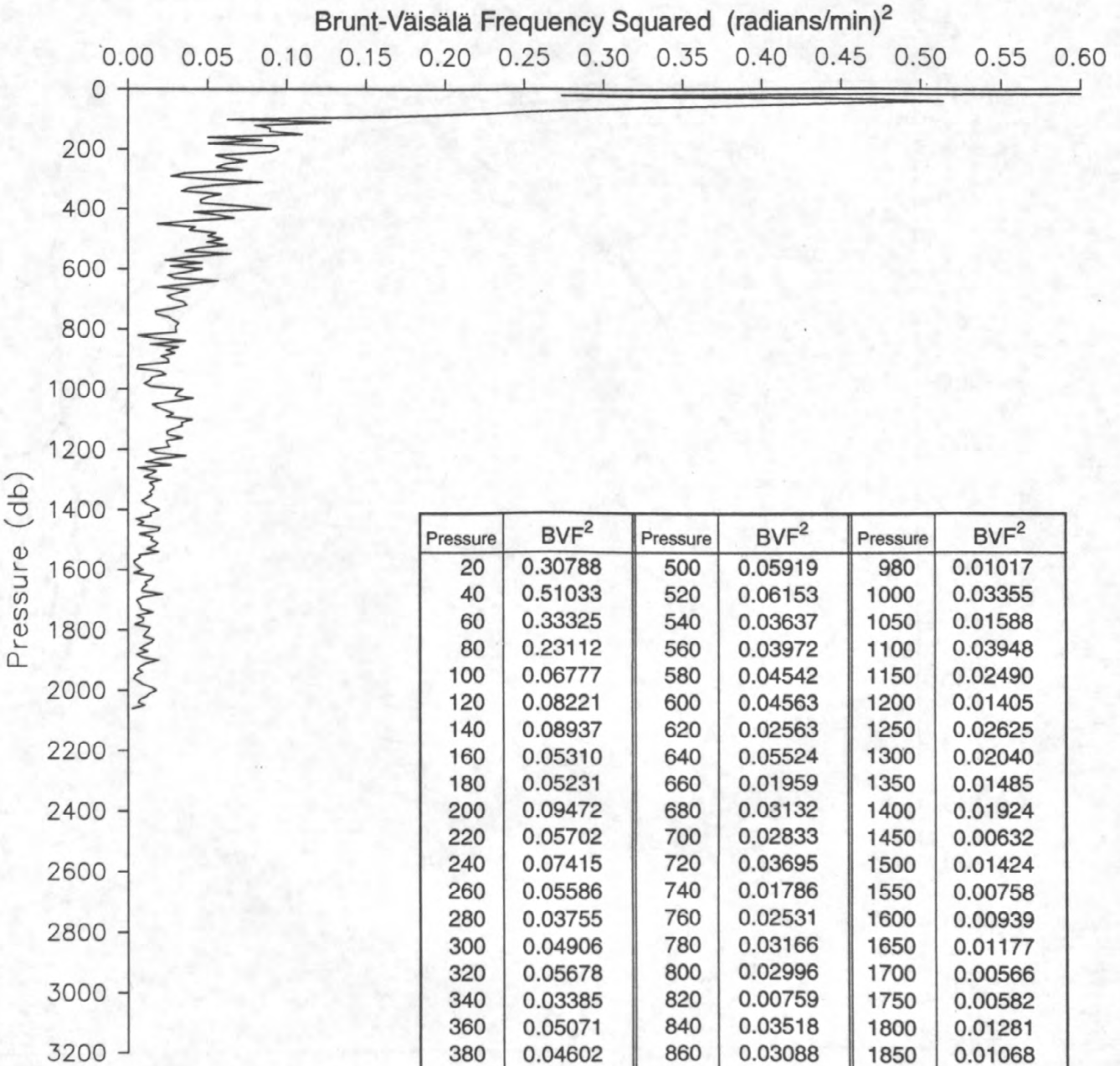


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.45838	580	0.07122	1350	0.01355
40	0.31548	600	0.02614	1400	0.01285
60	0.26666	620	0.03617	1450	0.00847
80	0.14640	640	0.03679	1500	0.00505
100	0.15802	660	0.03390	1550	0.01194
120	0.04209	680	0.04157	1600	0.01022
140	0.09999	700	0.02859	1650	0.00471
160	0.09854	720	0.02355	1700	0.01733
180	0.10983	740	0.03269	1750	0.01162
200	0.07644	760	0.01593	1800	0.01375
220	0.07307	780	0.03363	1850	0.01277
240	0.05118	800	0.03770	1900	0.01312
260	0.07347	820	0.02525	1950	0.00643
280	0.07406	840	0.02552	2000	0.00850
300	0.05568	860	0.02895	2050	0.00594
320	0.03779	880	0.02404	2100	0.00643
340	0.03222	900	0.02329	2150	0.00418
360	0.07460	920	0.01780	2200	0.00662
380	0.02414	940	0.01534	2250	0.00624
400	0.05839	960	0.02436	2300	0.00401
420	0.06846	980	0.01996	2350	0.00275
440	0.04825	1000	0.01900	2400	0.00653
460	0.04965	1050	0.03113	2450	0.00291
480	0.04190	1100	0.01638	2500	0.00354
500	0.02656	1150	0.01633	2550	0.00139
520	0.06427	1200	0.02647	2600	0.00414
540	0.04933	1250	0.02206	2650	0.00080
560	0.07148	1300	0.01813	2700	0.00174

Cruise	S-1-94-MB	Cast	20

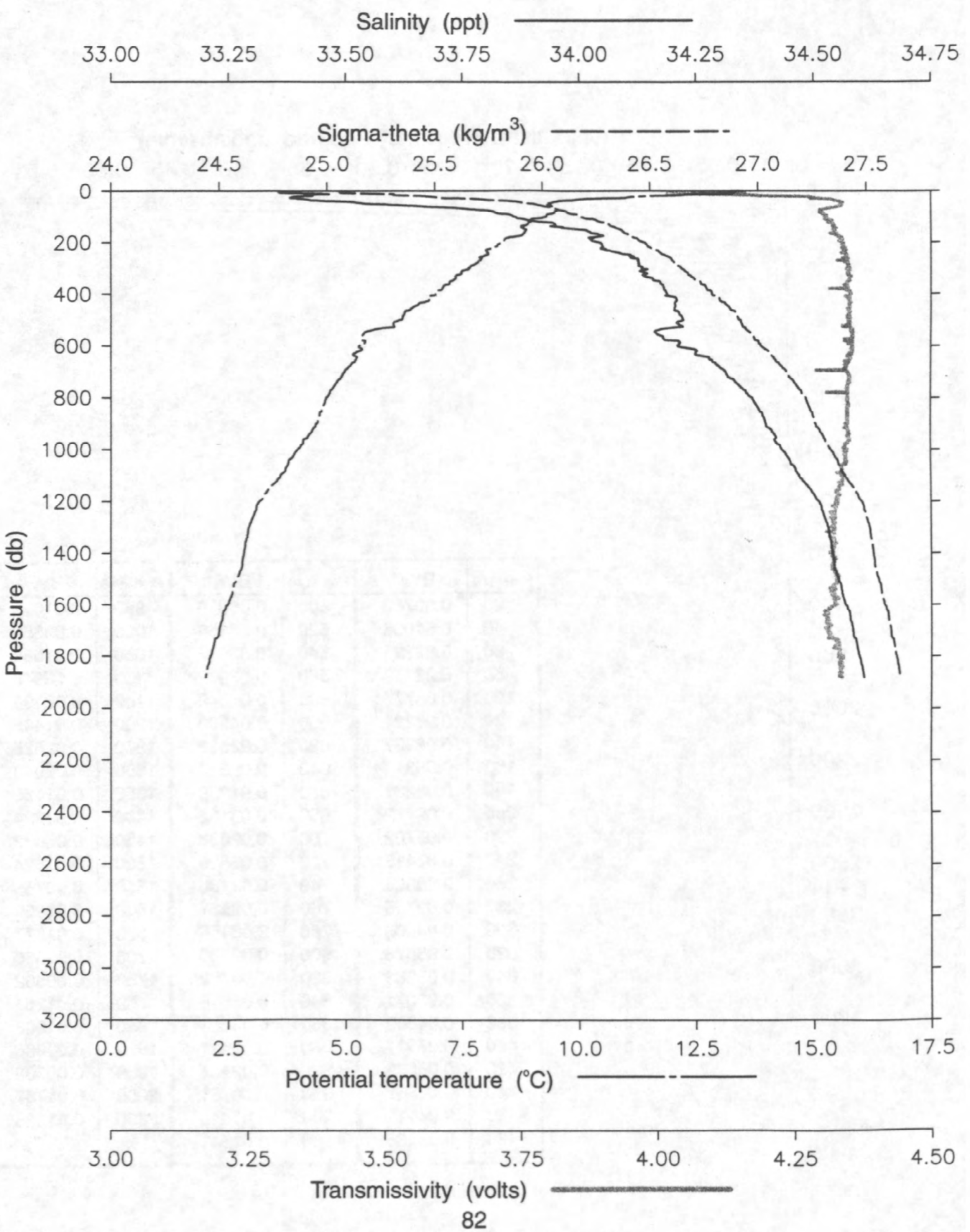


Cruise	S-1-94-MB	Cast	20

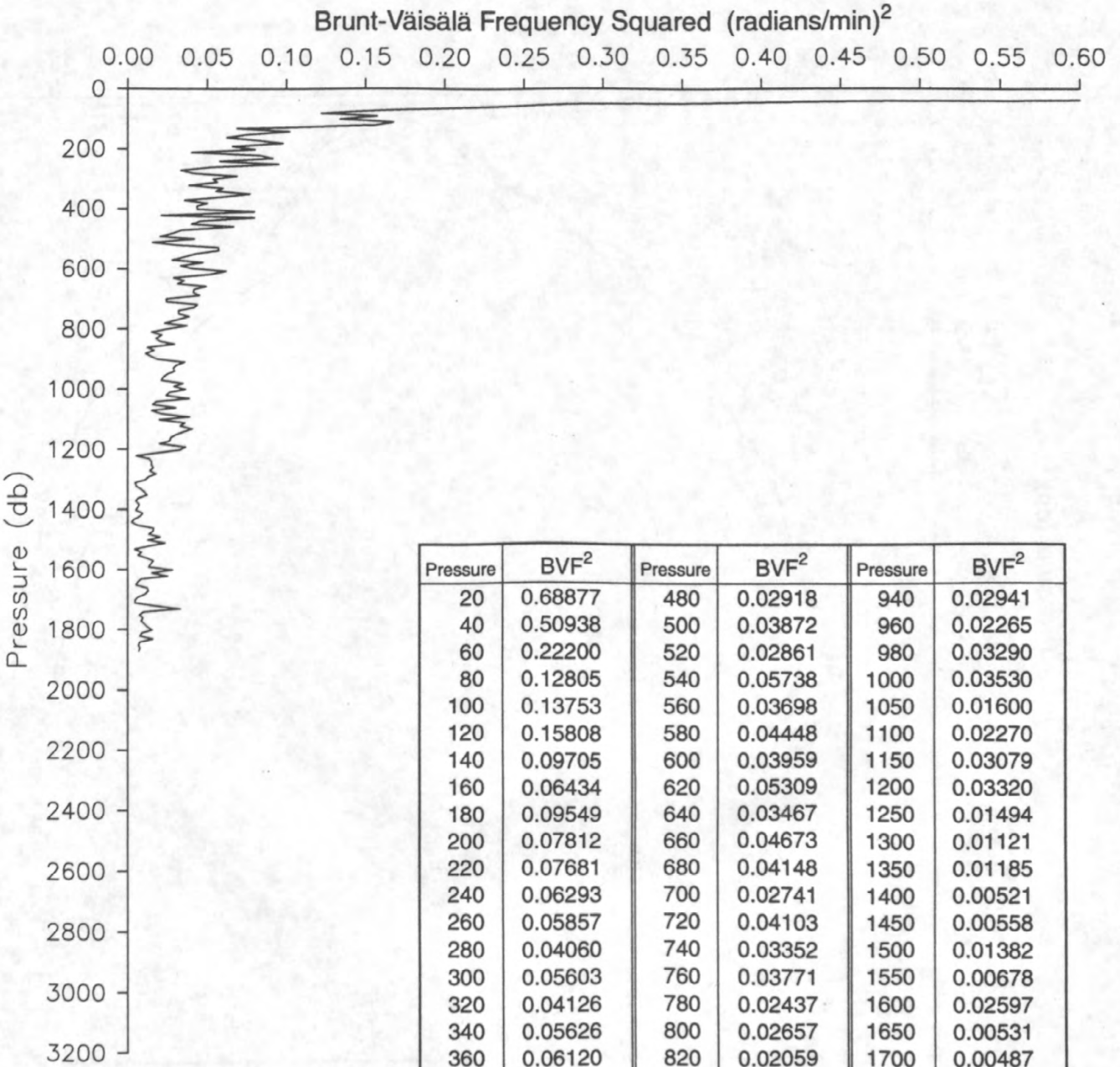


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.30788	500	0.05919	980	0.01017
40	0.51033	520	0.06153	1000	0.03355
60	0.33325	540	0.03637	1050	0.01588
80	0.23112	560	0.03972	1100	0.03948
100	0.06777	580	0.04542	1150	0.02490
120	0.08221	600	0.04563	1200	0.01405
140	0.08937	620	0.02563	1250	0.02625
160	0.05310	640	0.05524	1300	0.02040
180	0.05231	660	0.01959	1350	0.01485
200	0.09472	680	0.03132	1400	0.01924
220	0.05702	700	0.02833	1450	0.00632
240	0.07415	720	0.03695	1500	0.01424
260	0.05586	740	0.01786	1550	0.00758
280	0.03755	760	0.02531	1600	0.00939
300	0.04906	780	0.03166	1650	0.01177
320	0.05678	800	0.02996	1700	0.00566
340	0.03385	820	0.00759	1750	0.00582
360	0.05071	840	0.03518	1800	0.01281
380	0.04602	860	0.03088	1850	0.01068
400	0.08917	880	0.02921	1900	0.01880
420	0.05569	900	0.02494	1950	0.00502
440	0.03869	920	0.00731	2000	0.01757
460	0.04111	940	0.01946	2050	0.01033
480	0.05436	960	0.01541		

Cruise	S-1-94-MB	Cast	21

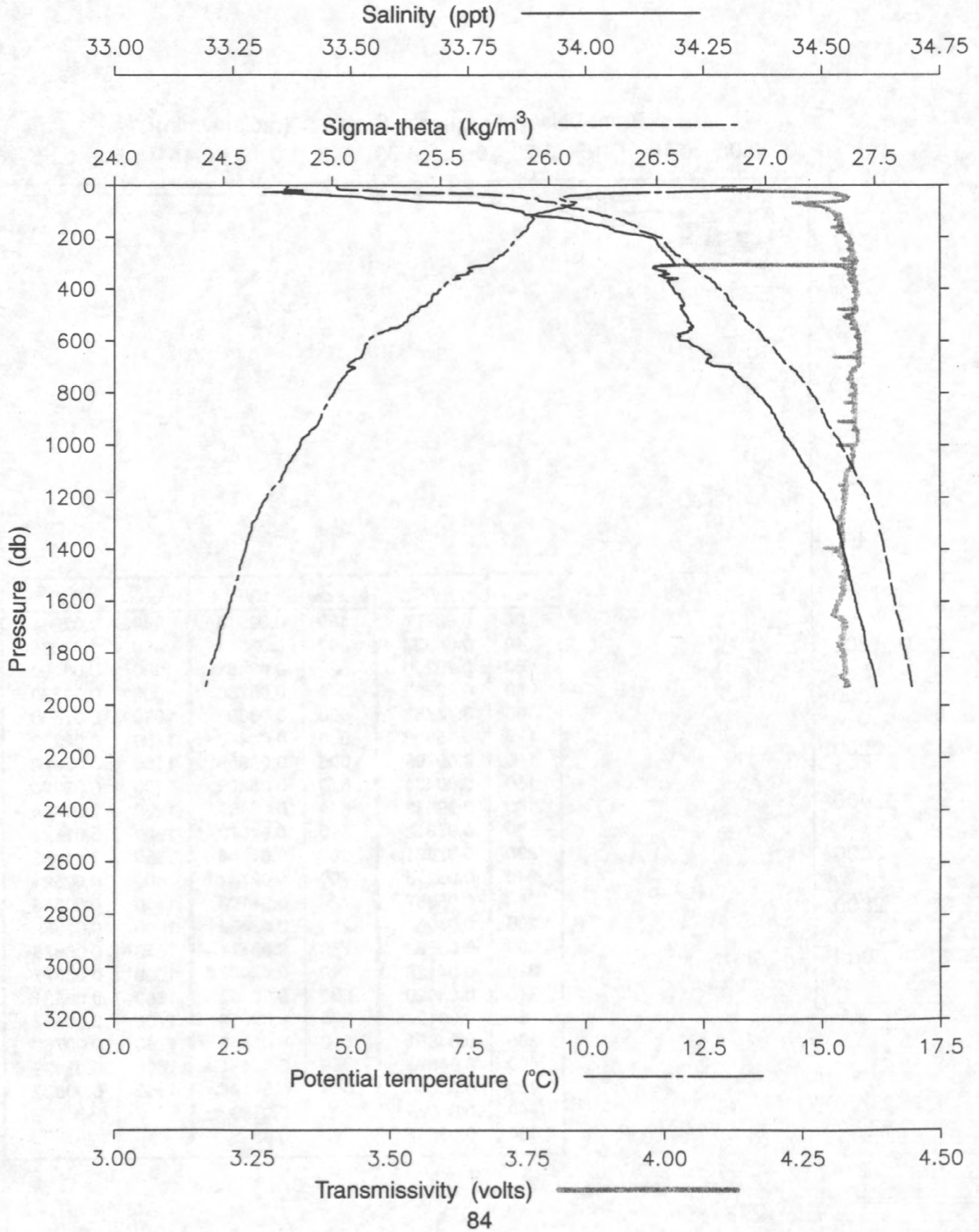


Cruise	S-1-94-MB	Cast	21

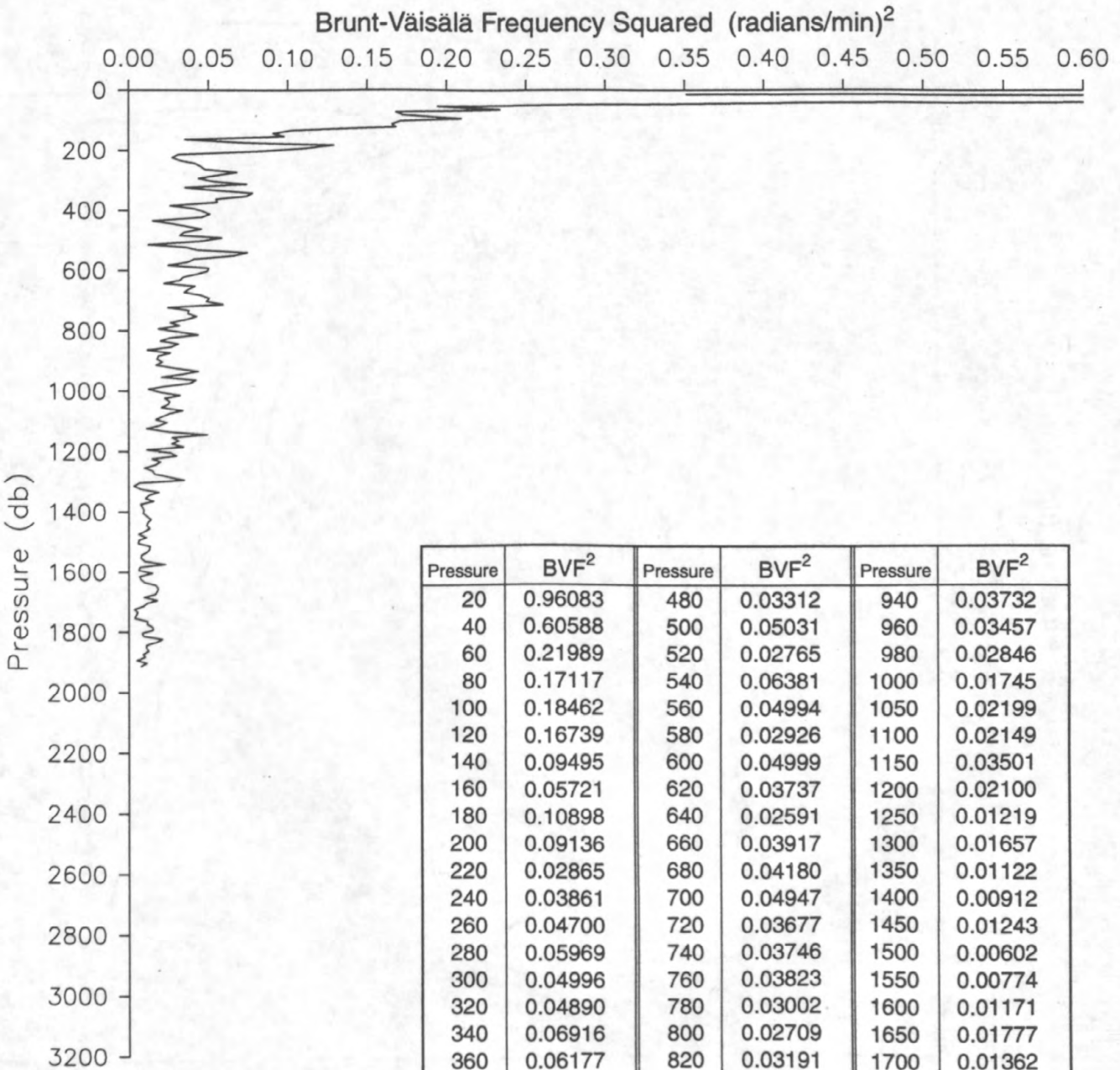


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.68877	480	0.02918	940	0.02941
40	0.50938	500	0.03872	960	0.02265
60	0.22200	520	0.02861	980	0.03290
80	0.12805	540	0.05738	1000	0.03530
100	0.13753	560	0.03698	1050	0.01600
120	0.15808	580	0.04448	1100	0.02270
140	0.09705	600	0.03959	1150	0.03079
160	0.06434	620	0.05309	1200	0.03320
180	0.09549	640	0.03467	1250	0.01494
200	0.07812	660	0.04673	1300	0.01121
220	0.07681	680	0.04148	1350	0.01185
240	0.06293	700	0.02741	1400	0.00521
260	0.05857	720	0.04103	1450	0.00558
280	0.04060	740	0.03352	1500	0.01382
300	0.05603	760	0.03771	1550	0.00678
320	0.04126	780	0.02437	1600	0.02597
340	0.05626	800	0.02657	1650	0.00531
360	0.06120	820	0.02059	1700	0.00487
380	0.04801	840	0.01965	1750	0.00762
400	0.04375	860	0.01481	1800	0.01499
420	0.02986	880	0.01196	1850	0.00690
440	0.05075	900	0.01808		
460	0.06267	920	0.03137		

Cruise	S-1-94-MB	Cast	22

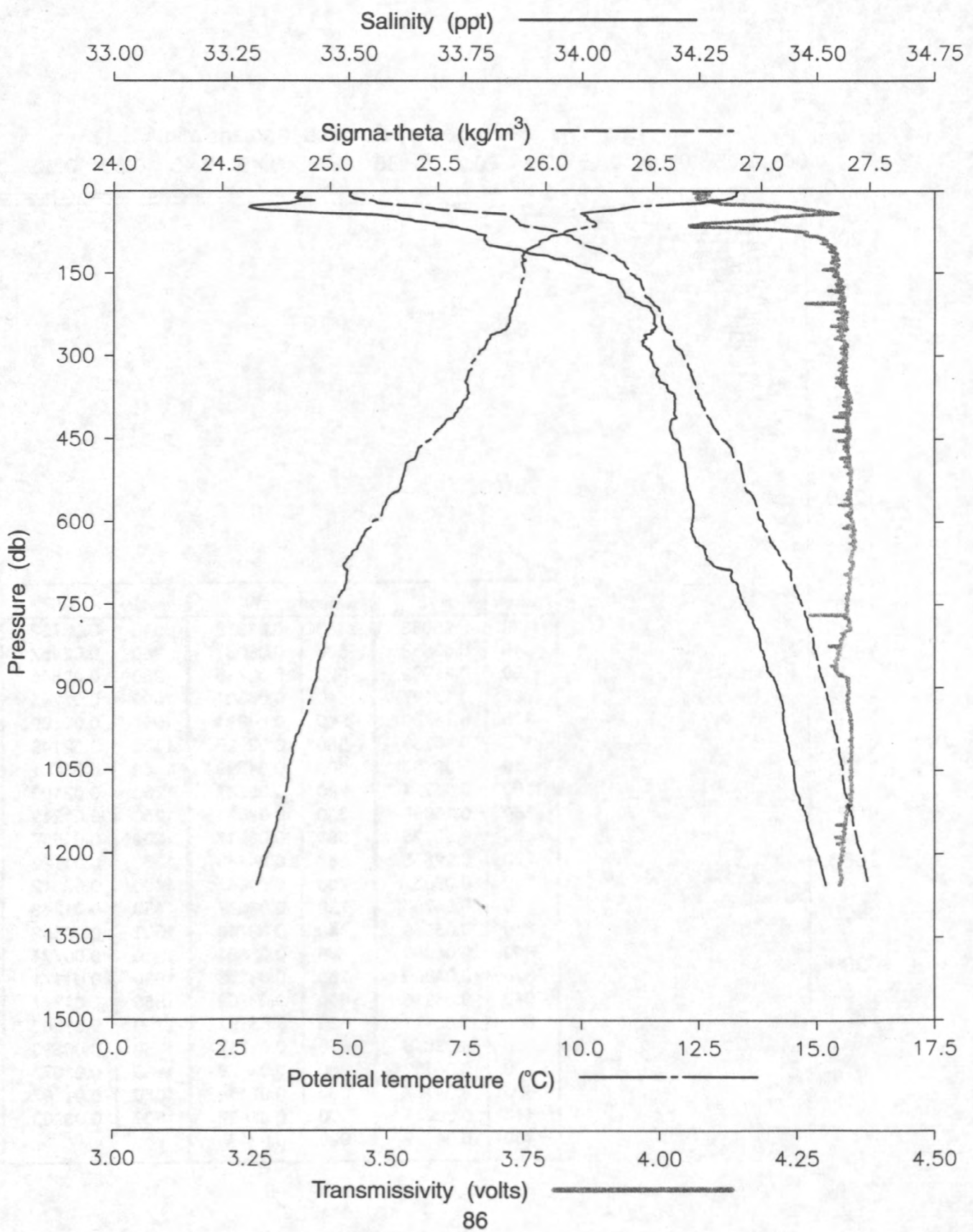


Cruise	S-1-94-MB	Cast	22

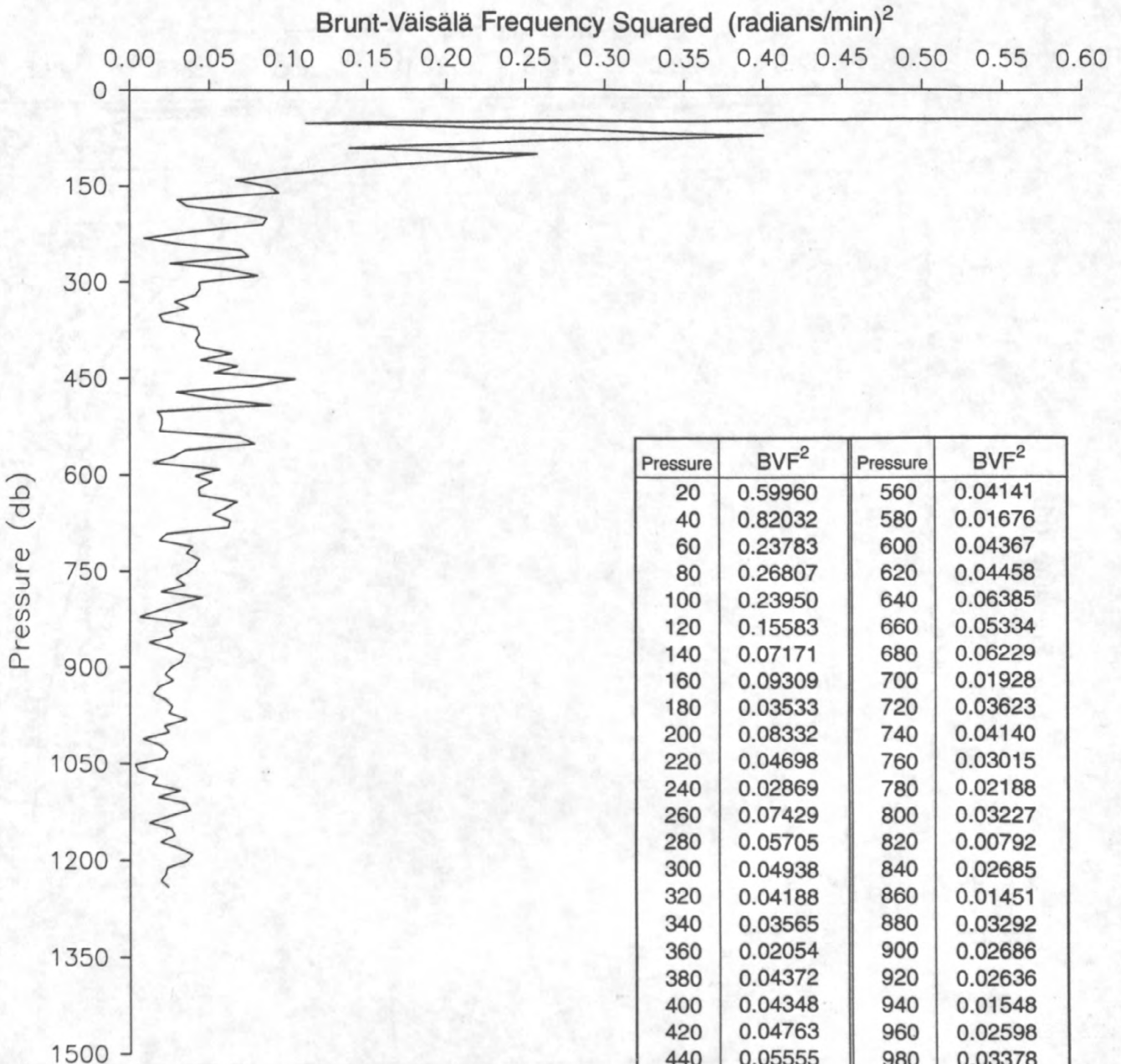


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.96083	480	0.03312	940	0.03732
40	0.60588	500	0.05031	960	0.03457
60	0.21989	520	0.02765	980	0.02846
80	0.17117	540	0.06381	1000	0.01745
100	0.18462	560	0.04994	1050	0.02199
120	0.16739	580	0.02926	1100	0.02149
140	0.09495	600	0.04999	1150	0.03501
160	0.05721	620	0.03737	1200	0.02100
180	0.10898	640	0.02591	1250	0.01219
200	0.09136	660	0.03917	1300	0.01657
220	0.02865	680	0.04180	1350	0.01122
240	0.03861	700	0.04947	1400	0.00912
260	0.04700	720	0.03677	1450	0.01243
280	0.05969	740	0.03746	1500	0.00602
300	0.04996	760	0.03823	1550	0.00774
320	0.04890	780	0.03002	1600	0.01171
340	0.06916	800	0.02709	1650	0.01777
360	0.06177	820	0.03191	1700	0.01362
380	0.03645	840	0.02717	1750	0.00390
400	0.04452	860	0.01689	1800	0.01077
420	0.04777	880	0.02114	1850	0.01107
440	0.02271	900	0.01992	1900	0.00903
460	0.04259	920	0.02478		

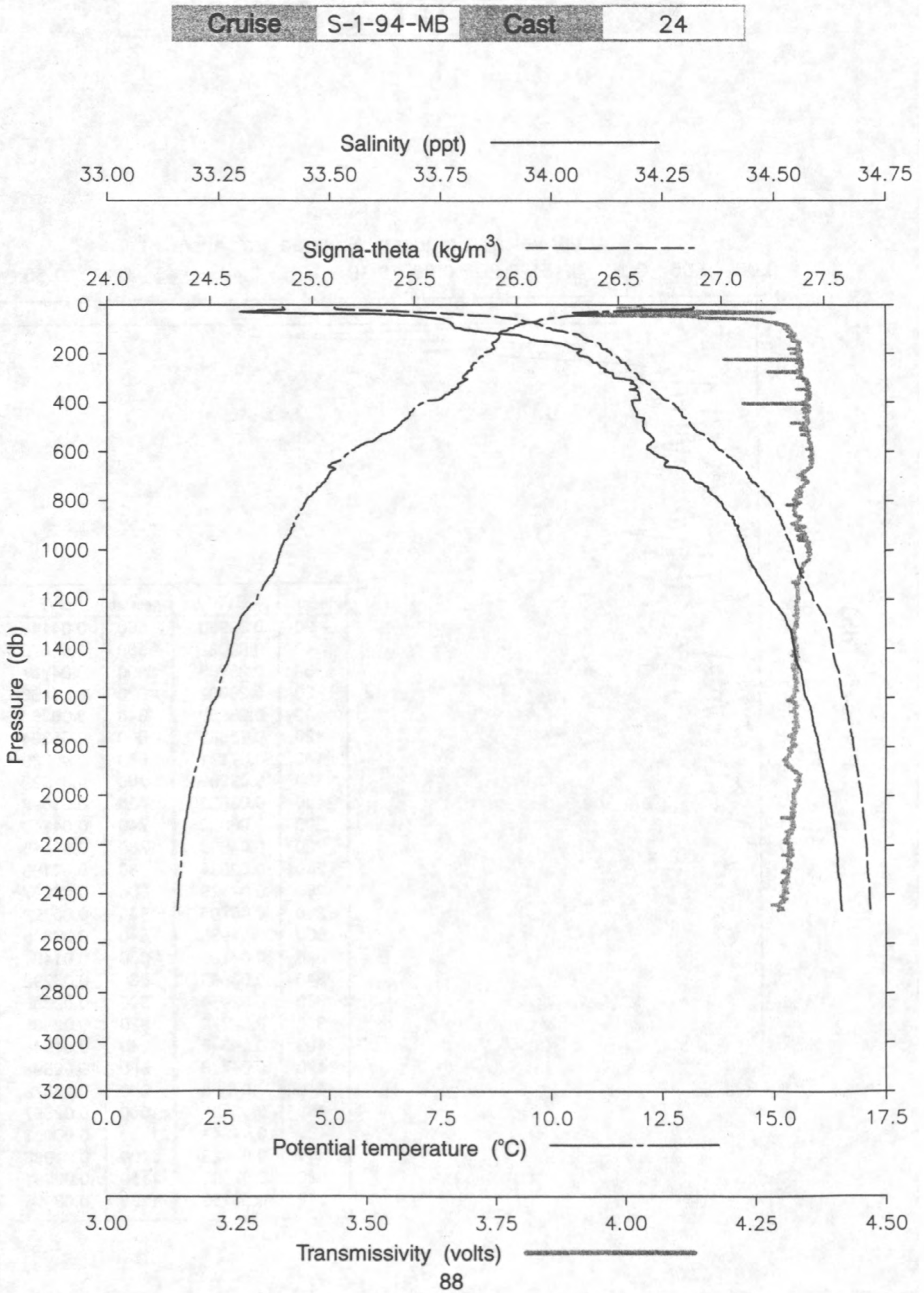
Cruise	S-1-94-MB	Cast	23



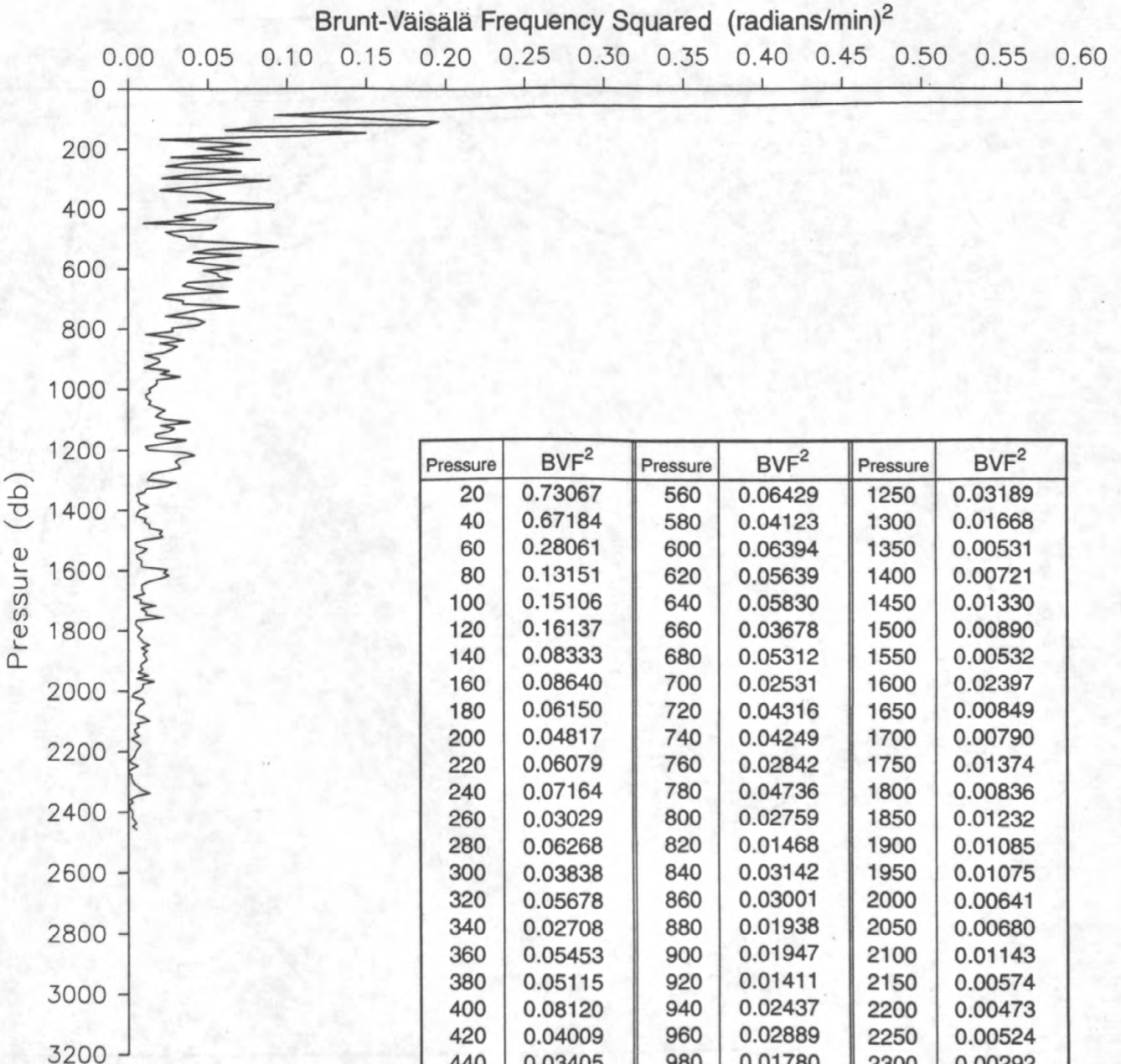
Cruise	S-1-94-MB	Cast	23



Pressure	BVF^2	Pressure	BVF^2
20	0.59960	560	0.04141
40	0.82032	580	0.01676
60	0.23783	600	0.04367
80	0.26807	620	0.04458
100	0.23950	640	0.06385
120	0.15583	660	0.05334
140	0.07171	680	0.06229
160	0.09309	700	0.01928
180	0.03533	720	0.03623
200	0.08332	740	0.04140
220	0.04698	760	0.03015
240	0.02869	780	0.02188
260	0.07429	800	0.03227
280	0.05705	820	0.00792
300	0.04938	840	0.02685
320	0.04188	860	0.01451
340	0.03565	880	0.03292
360	0.02054	900	0.02686
380	0.04372	920	0.02636
400	0.04348	940	0.01548
420	0.04763	960	0.02598
440	0.05555	980	0.03378
460	0.08325	1000	0.02397
480	0.04841	1050	0.00603
500	0.02823	1100	0.01983
520	0.02006	1150	0.02391
540	0.06155	1200	0.03586

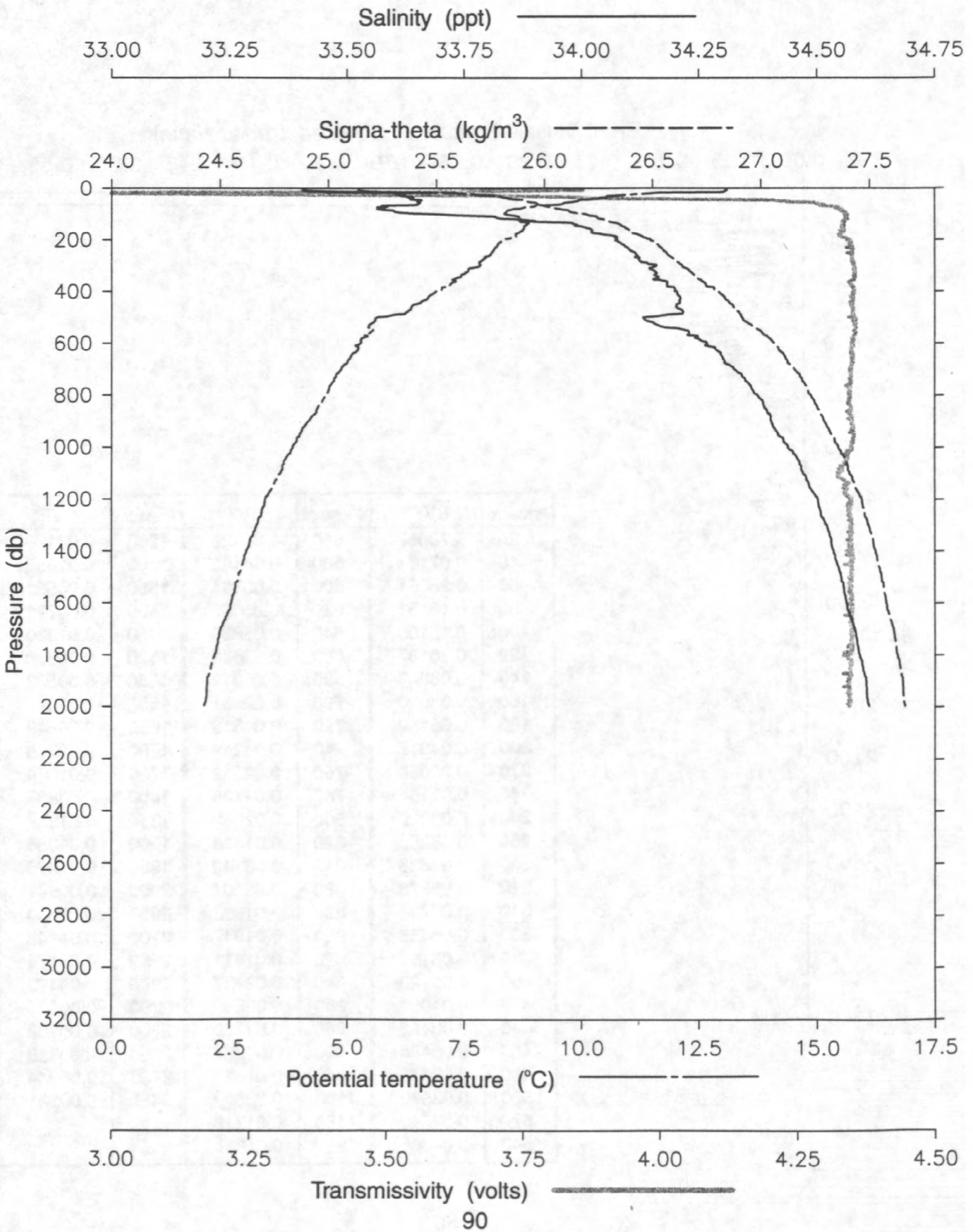

Cruise
S-1-94-MB
Cast
24
Salinity (ppt)
33.00
33.25
33.50
33.75
34.00
34.25
34.50
34.75
Sigma-theta (kg/m3)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Potential temperature (°C)
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Transmissivity (volts)

Cruise	S-1-94-MB	Cast	24

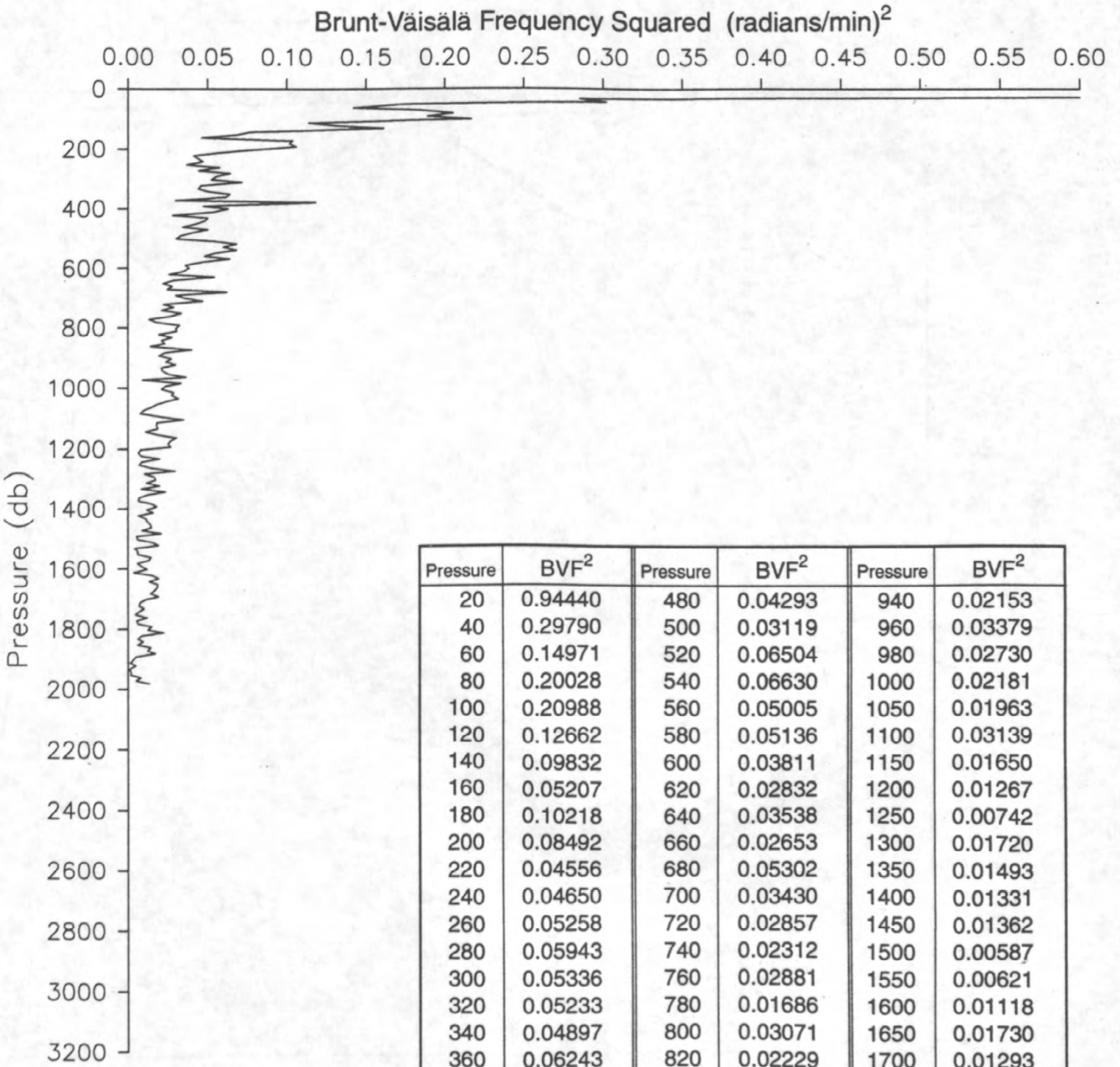


Pressure	BVF²	Pressure	BVF²	Pressure	BVF²
20	0.73067	560	0.06429	1250	0.03189
40	0.67184	580	0.04123	1300	0.01668
60	0.28061	600	0.06394	1350	0.00531
80	0.13151	620	0.05639	1400	0.00721
100	0.15106	640	0.05830	1450	0.01330
120	0.16137	660	0.03678	1500	0.00890
140	0.08333	680	0.05312	1550	0.00532
160	0.08640	700	0.02531	1600	0.02397
180	0.06150	720	0.04316	1650	0.00849
200	0.04817	740	0.04249	1700	0.00790
220	0.06079	760	0.02842	1750	0.01374
240	0.07164	780	0.04736	1800	0.00836
260	0.03029	800	0.02759	1850	0.01232
280	0.06268	820	0.01468	1900	0.01085
300	0.03838	840	0.03142	1950	0.01075
320	0.05678	860	0.03001	2000	0.00641
340	0.02708	880	0.01938	2050	0.00680
360	0.05453	900	0.01947	2100	0.01143
380	0.05115	920	0.01411	2150	0.00574
400	0.08120	940	0.02437	2200	0.00473
420	0.04009	960	0.02889	2250	0.00524
440	0.03405	980	0.01780	2300	0.00292
460	0.05494	1000	0.01327	2350	0.00398
480	0.02473	1050	0.01411	2400	0.00244
500	0.03670	1100	0.02697	2450	0.00321
520	0.07740	1150	0.01718		
540	0.04886	1200	0.01819		

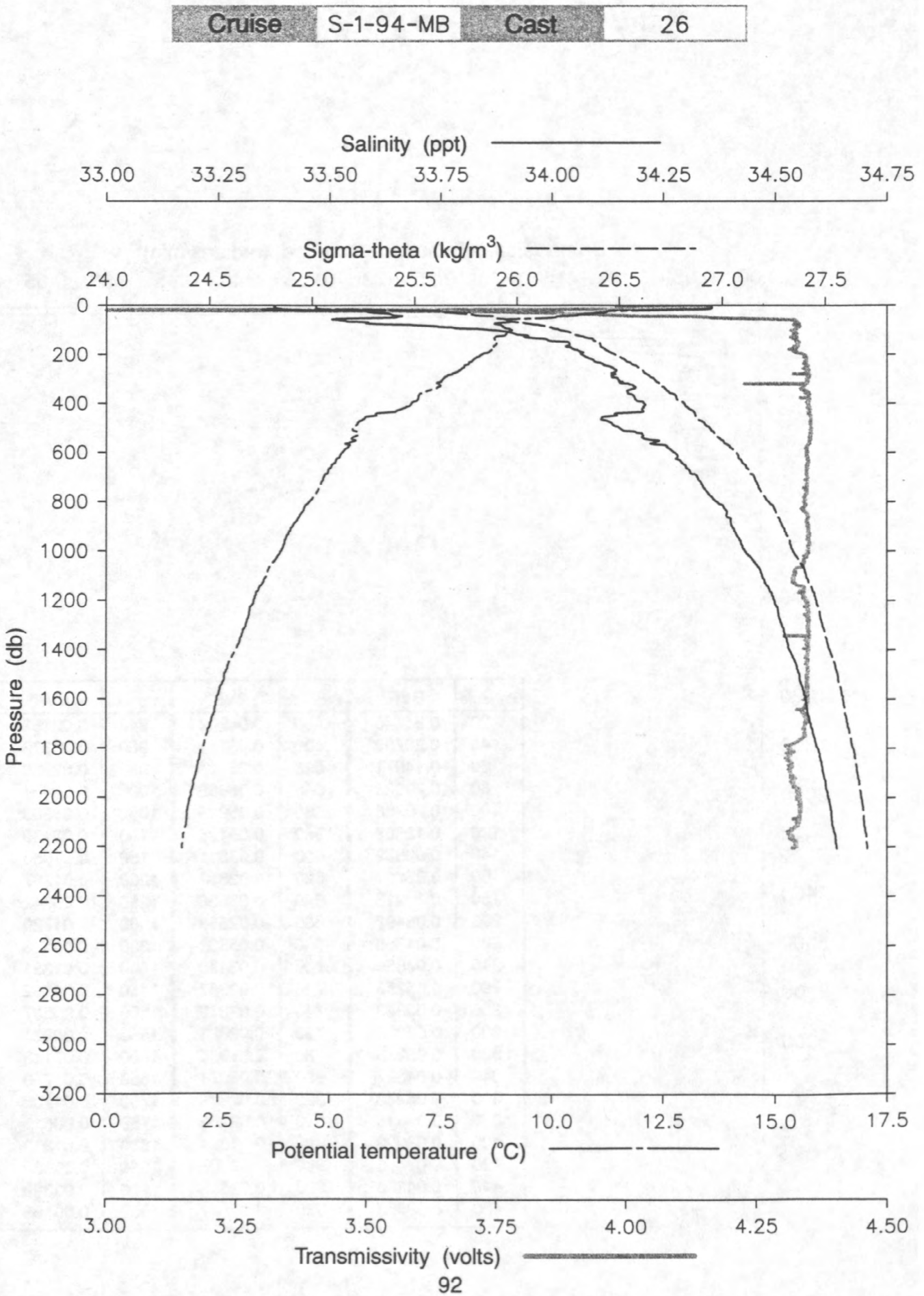
Cruise	S-1-94-MB	Cast	25



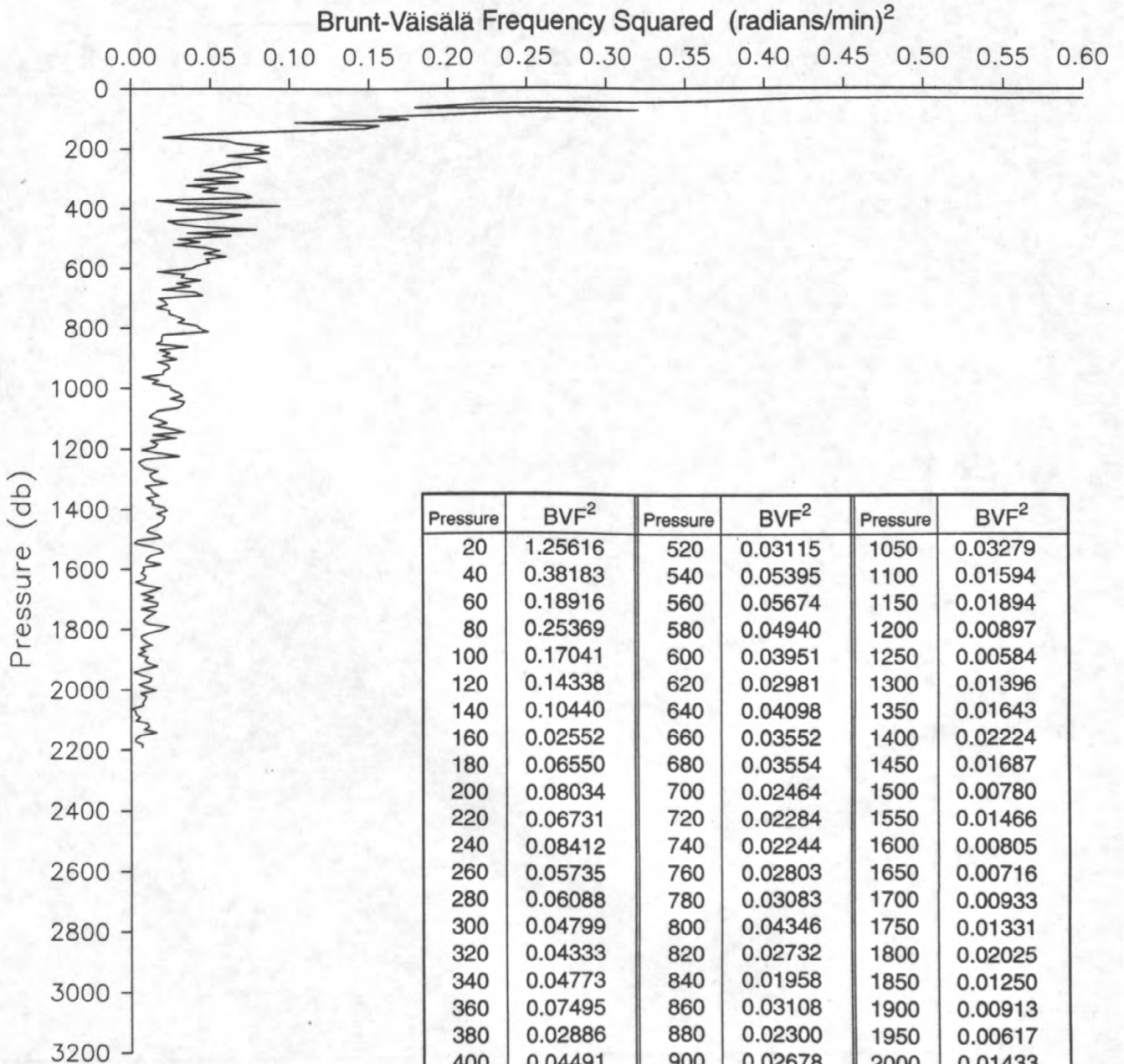
Cruise	S-1-94-MB	Cast	25



Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	0.94440	480	0.04293	940	0.02153
40	0.29790	500	0.03119	960	0.03379
60	0.14971	520	0.06504	980	0.02730
80	0.20028	540	0.06630	1000	0.02181
100	0.20988	560	0.05005	1050	0.01963
120	0.12662	580	0.05136	1100	0.03139
140	0.09832	600	0.03811	1150	0.01650
160	0.05207	620	0.02832	1200	0.01267
180	0.10218	640	0.03538	1250	0.00742
200	0.08492	660	0.02653	1300	0.01720
220	0.04556	680	0.05302	1350	0.01493
240	0.04650	700	0.03430	1400	0.01331
260	0.05258	720	0.02857	1450	0.01362
280	0.05943	740	0.02312	1500	0.00587
300	0.05336	760	0.02881	1550	0.00621
320	0.05233	780	0.01686	1600	0.01118
340	0.04897	800	0.03071	1650	0.01730
360	0.06243	820	0.02229	1700	0.01293
380	0.09618	840	0.02282	1750	0.00512
400	0.05923	860	0.01644	1800	0.01310
420	0.03455	880	0.02766	1850	0.00680
440	0.04905	900	0.02543	1900	0.00359
460	0.03653	920	0.02847	1950	0.00169

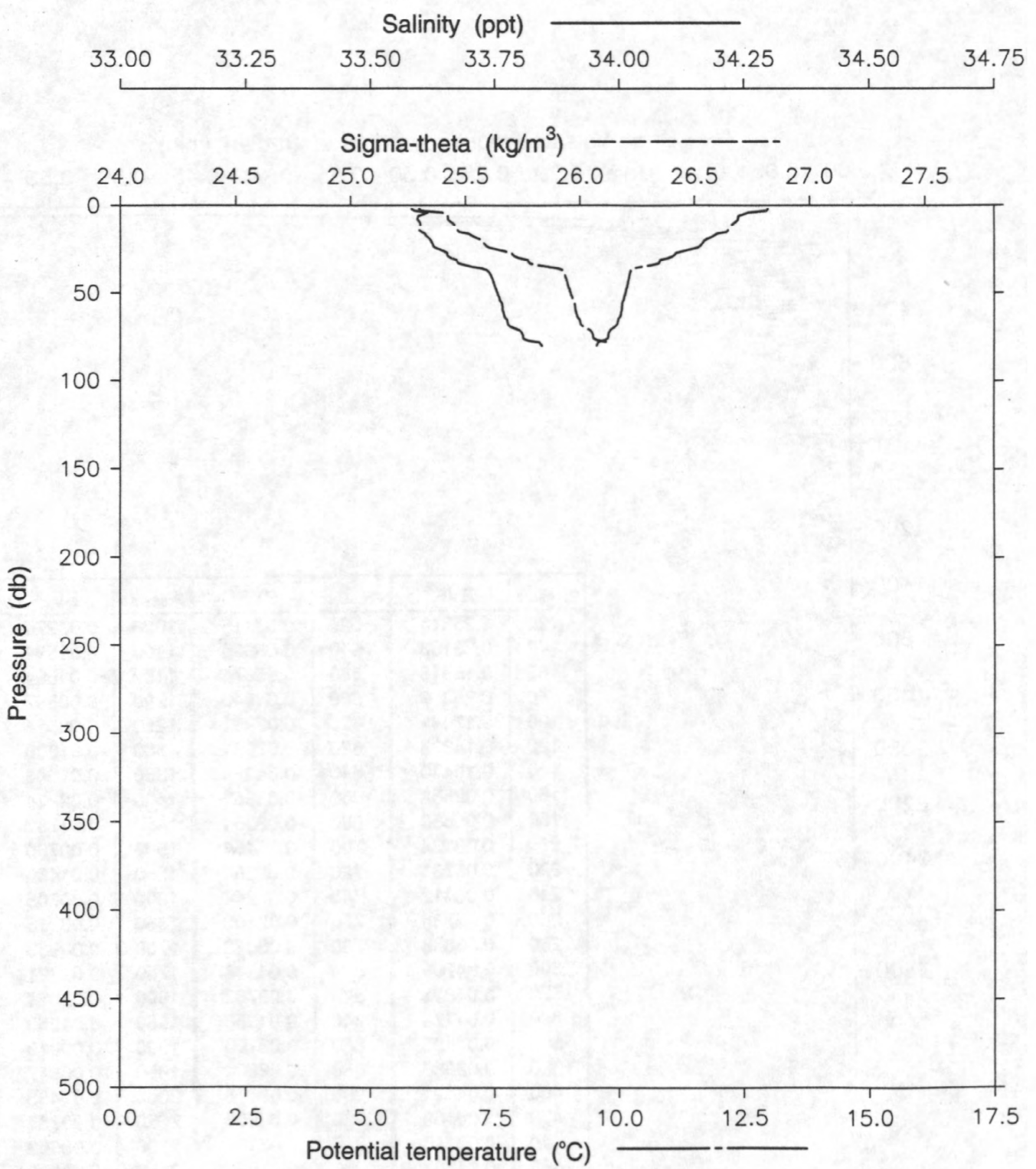

Cruise
S-1-94-MB
Cast
26
Salinity (ppt)
33.00
33.25
33.50
33.75
34.00
34.25
34.50
34.75
Sigma-theta (kg/m3)
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
Pressure (db)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Potential temperature (°C)
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Transmissivity (volts)

Cruise	S-1-94-MB	Cast	26

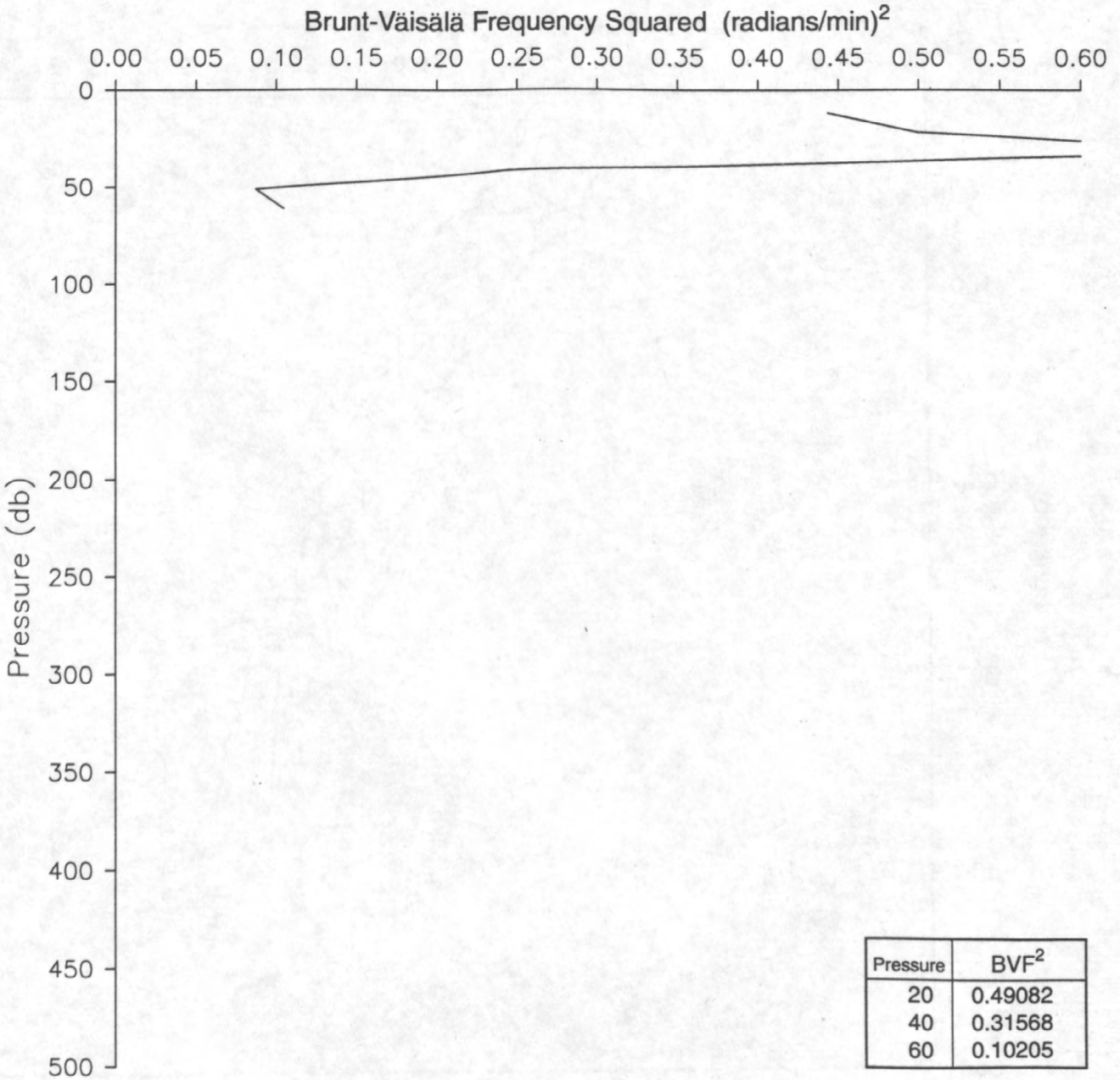


Pressure	BVF^2	Pressure	BVF^2	Pressure	BVF^2
20	1.25616	520	0.03115	1050	0.03279
40	0.38183	540	0.05395	1100	0.01594
60	0.18916	560	0.05674	1150	0.01894
80	0.25369	580	0.04940	1200	0.00897
100	0.17041	600	0.03951	1250	0.00584
120	0.14338	620	0.02981	1300	0.01396
140	0.10440	640	0.04098	1350	0.01643
160	0.02552	660	0.03552	1400	0.02224
180	0.06550	680	0.03554	1450	0.01687
200	0.08034	700	0.02464	1500	0.00780
220	0.06731	720	0.02284	1550	0.01466
240	0.08412	740	0.02244	1600	0.00805
260	0.05735	760	0.02803	1650	0.00716
280	0.06088	780	0.03083	1700	0.00933
300	0.04799	800	0.04346	1750	0.01331
320	0.04333	820	0.02732	1800	0.02025
340	0.04773	840	0.01958	1850	0.01250
360	0.07495	860	0.03108	1900	0.00913
380	0.02886	880	0.02300	1950	0.00617
400	0.04491	900	0.02678	2000	0.01433
420	0.06459	920	0.02205	2050	0.00755
440	0.03140	940	0.02160	2100	0.00362
460	0.04267	960	0.01055	2150	0.00838
480	0.04660	980	0.01466		
500	0.03825	1000	0.02524		

Cruise	S-1-94-MB	Cast	t1

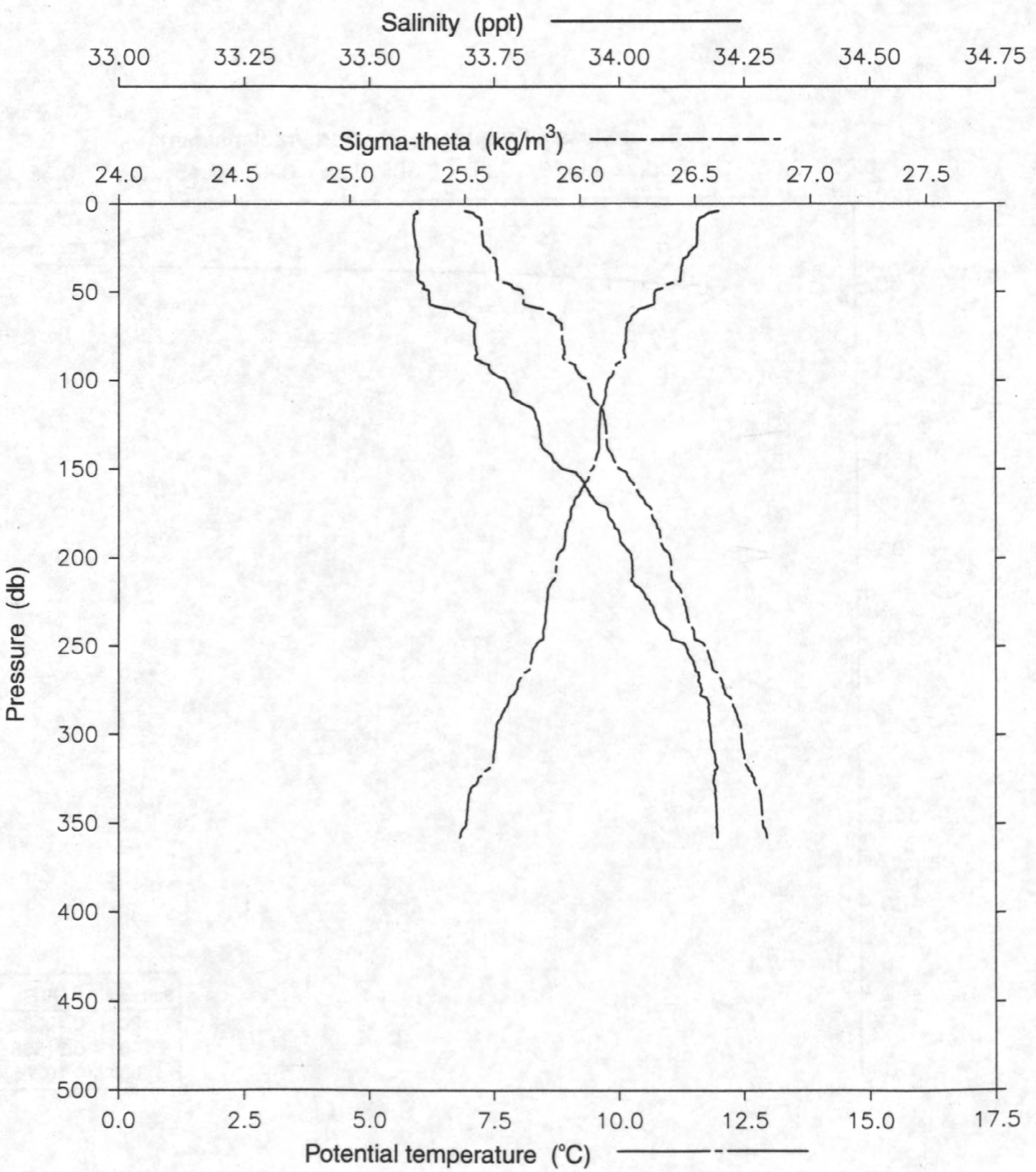


Cruise	S-1-94-MB	Cast	t1

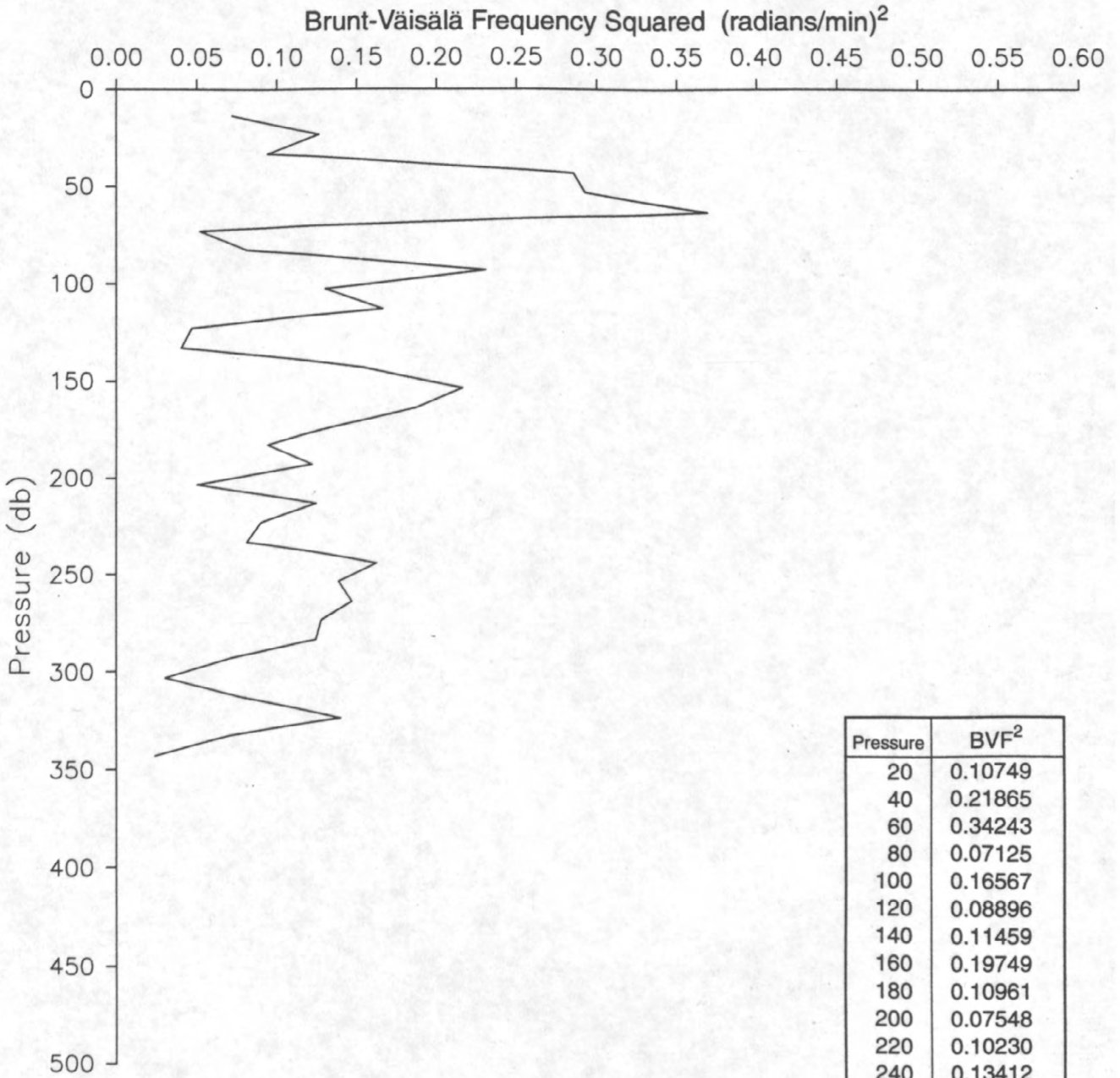


Pressure	BVF^2
20	0.49082
40	0.31568
60	0.10205

Cruise	S-1-94-MB	Cast	t2



Cruise	S-1-94-MB	Cast	t2



Pressure	BVF^2
20	0.10749
40	0.21865
60	0.34243
80	0.07125
100	0.16567
120	0.08896
140	0.11459
160	0.19749
180	0.10961
200	0.07548
220	0.10230
240	0.13412
260	0.14404
280	0.12560
300	0.04479
320	0.11780
340	0.04028