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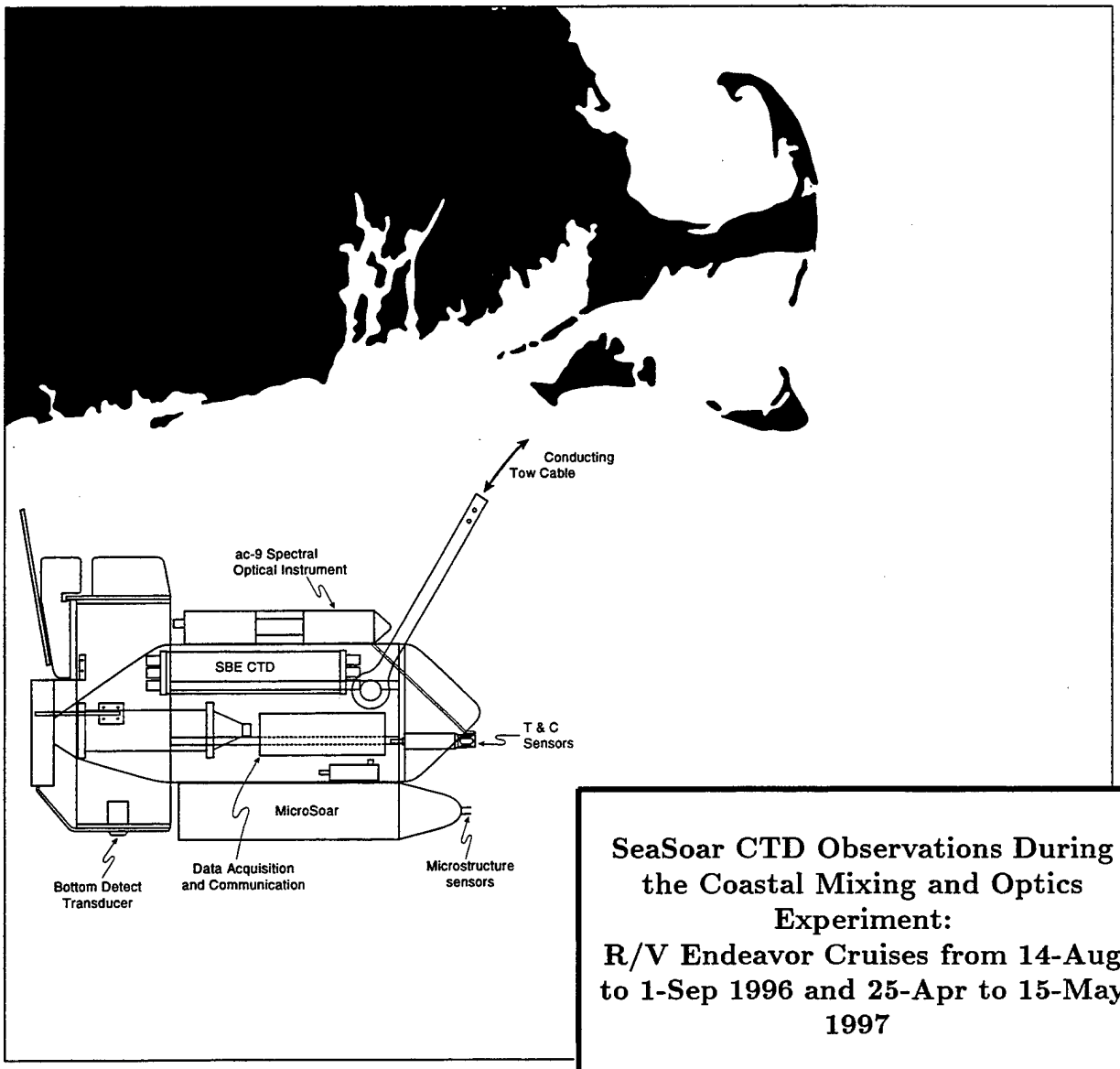

SeaSoar CTD Observations During the Coastal Mixing and Optics Experiment: R/V Endeavor Cruises from 14-Aug to 1-Sep 1996 and 25-Apr to 15-May 1997

by

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http://diana.oce.orst.edu/cmoweb/csr/main.html

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Table of Contents

Introduction	1
SeaSoar Instrumentation and Data Acquisition	3
Cruise Narrative, R/V Endeavor E9608, August 14 to September 1 1996	6
Cruise Narrative, R/V Endeavor E9704, April 25 to May 15 1997	12
CTD Data Acquisition, Calibration and Data Processing	18
SeaSoar Data Acquisition and At-Sea Processing	20
SeaSoar Temperature and Conductivity Calibration	21
Post-Processing of SeaSoar Data	21
Data Presentation	28
Acknowledgements	28
References	45
E9608 CTD Data	47
E9704 CTD Data	97
E9608 Big Box Maps of Temperature, Salinity and σ_t	117
E9608 Small Box Maps of Temperature, Salinity and σ_t	217
E9608 Vertical Sections of Temperature, Salinity and σ_t	255
E9704 Big Box Maps of Temperature, Salinity and σ_t	303
E9704 Small Box Maps of Temperature, Salinity and σ_t	371
E9704 Vertical Sections of Temperature, Salinity and σ_t	421
Appendix: Time Series of Maximum T/C Correlations and Lags	473

Introduction

Two physical oceanography cruises on the R/V Endeavor were conducted by the co-PIs Jack Barth and Mike Kosro as part of the ONR-sponsored Coastal Mixing and Optics (CMO) Accelerated Research Initiative. The objective was to rapidly survey a region around 40.5N, 70.5W where a set of moorings and a stationary vessel conducting profiling operations were located (Figure 1). The first cruise took place during a period of strong summer stratification (14 August to 01 September 1996); the second cruise was conducted in the following spring (25 April to 15 May 1997) as water over the shelf restratified after mixing by winter storms. The water column was sampled by towing the undulating vehicle SeaSoar from the surface to within 5-7 m of the bottom (Figure 2). The vehicle was equipped with a standard SeaBird

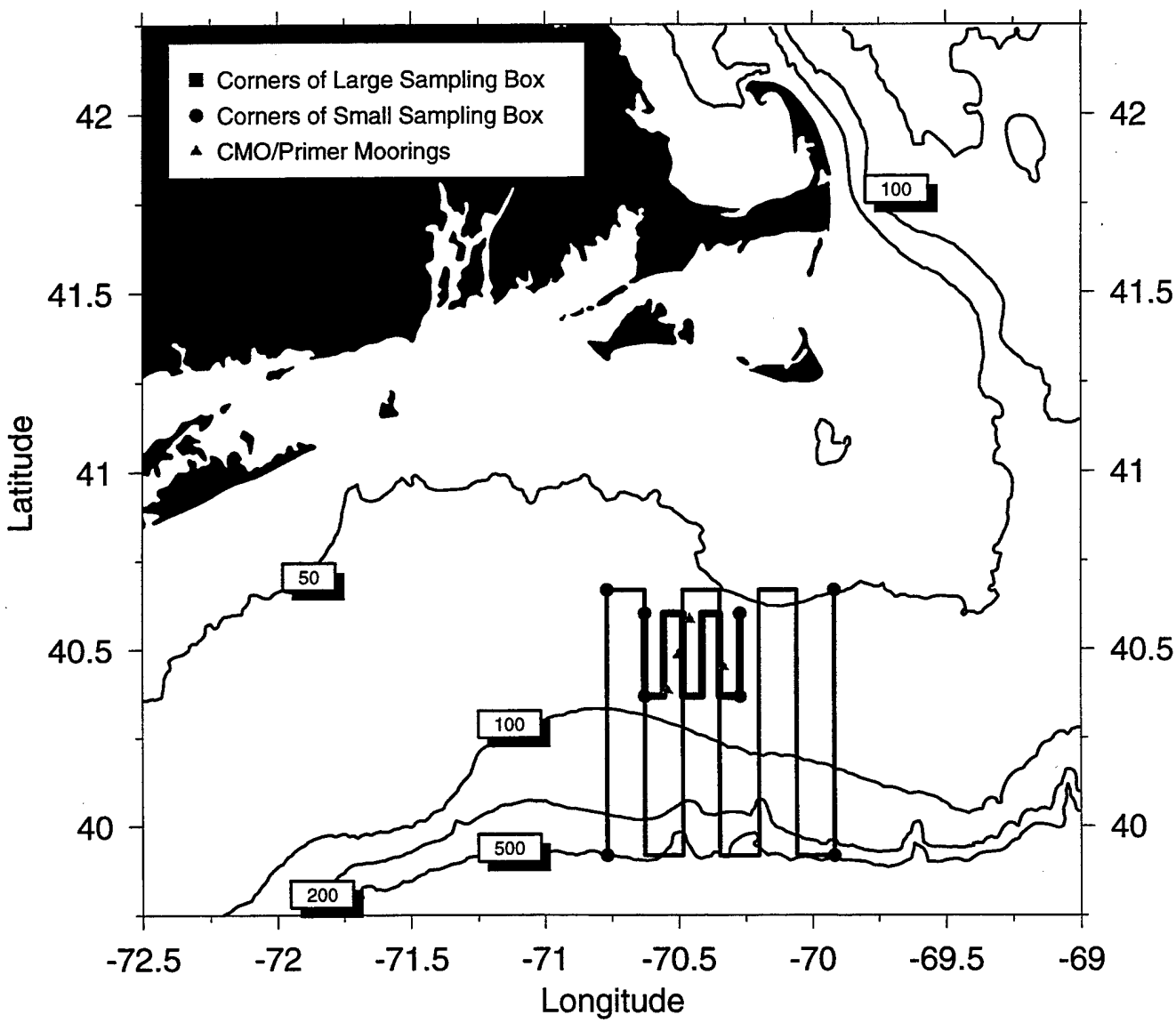

Figure 1: Map of the Coastal Mixing and Optics study region in the Middle Atlantic Bight south of Cape Cod, Massachusetts. Bottom topography in meters.

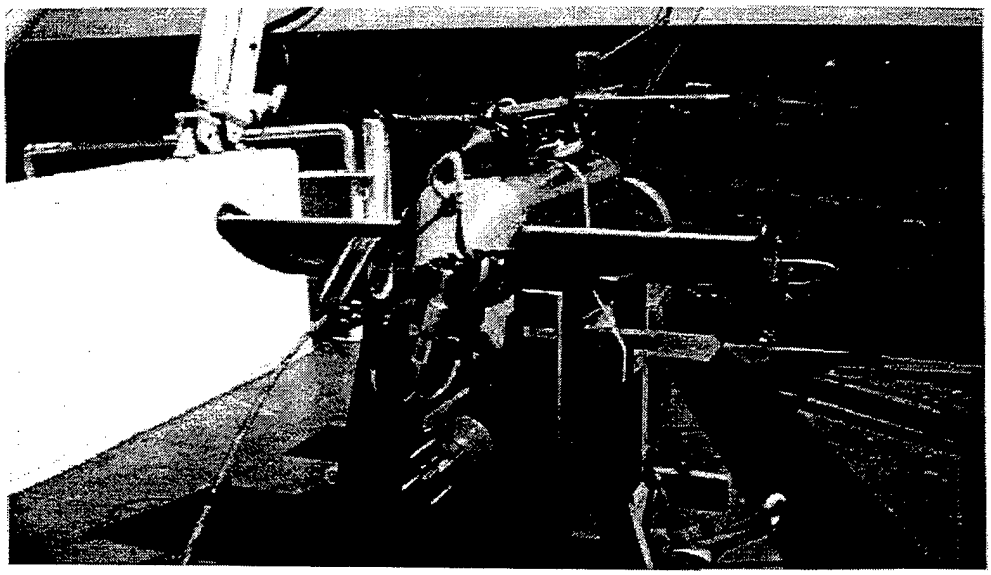

Figure 2: The towed undulating vehicle SeaSoar as equipped for use during the Coastal Mixing and Optics experiment.

9/11+ CTD sensor to measure conductivity, temperature, and depth; a nine-wavelength light absorption and attenuation meter (WETLabs ac-9); and a new microstructure instrument developed by OSU (MicroSoar) which measured conductivity and temperature at a very high frequency sampling rate using robust, fast-response probes (Figure 3).

The SeaSoar tows were concentrated in two areas: a small box pattern covering roughly 25 by 30 km centered on 40.5N, 70.5W (in 70 m of water on the mid-shelf) and with north-south lines separated by about 6 km; and a big box pattern covering roughly a 70 by 80 km area which included the small box region but extended out over the continental slope and with north-south lines separated by about 12 km (Figure 1). Each of these boxes was sampled repeatedly during both the summer and spring surveys. Maps and sections of hydrographic properties, water velocity (from a shipboard Acoustic Doppler Current Profiler) and optical properties were thus obtained over the continental shelf and slope. Between SeaSoar tows, CTD/rosette casts were also made. Underway surface temperature, salinity, and meteorological measurements were made continuously.

Along with SeaSoar profiling, the measurement of subsurface velocities using a shipboard acoustic Doppler current profiler (ADCP) was a primary activity during the R/V Endeavor CMO cruises. To achieve higher vertical resolution, Endeavor's standard 150-kHz ADCP transducer was replaced with a 300-kHz transducer from Oregon State University (OSU). A mounting bracket was fabricated to mate the OSU transducer head to the Endeavor's transducer well, and Steve Pierce (OSU) and the University of Rhode Island (URI) Marine Technicians installed and tested the 300-kHz unit prior to sailing. Currents were measured with a resolution of every 4-m in the vertical, as compared with the 8-m bins available from the 150-kHz unit. For a full report on the ADCP data collected onboard Endeavor during the two CMO SeaSoar/ADCP cruises see Pierce *et al.* (1998) and *http://diana.oce.orst.edu/cmoweb/adcp/main.html.*

An additional piece of instrumentation was available during the summer survey in 1996. To augment the R/V Endeavor's standard underway meteorological measurements, Jim Edson (Woods Hole Oceanographic Institution) made measurements of wind stress using a sonic anemometer mounted on Endeavor's bow mast. Inquiries regarding the sonic anemometer data should be directed to Dr. Edson.

During the two R/V Endeavor CMO cruises, 24 days of continuous SeaSoar profiling were conducted. This resulted in approximately 34,900 vertical profiles of the water column over the continental shelf and slope. In this report, we detail the SeaSoar data acquisition system, data calibration and processing techniques, and present cross-shelf vertical sections and horizontal maps of temperature, salinity and density. For an online version of the report, featuring sections and maps in color, see *http://diana.oce.orst.edu/cmoweb/csr/main.html.*

SeaSoar Instrumentation and Data Acquisition

The SeaSoar vehicle was equipped with the pressure case of a SeaBird Electronics (SBE) 9/11+ CTD mounted inside the vehicle with dual temperature and conductivity (T/C) sensors both mounted pointing forward through SeaSoar's nose (Figure 3, 4). Dual SBE pumps mounted inside the vehicle ensured a steady flow past the T/C sensors. The WETLabs ac-9 was mounted on top of SeaSoar in a rigid saddle and with a streamlined nose cone to

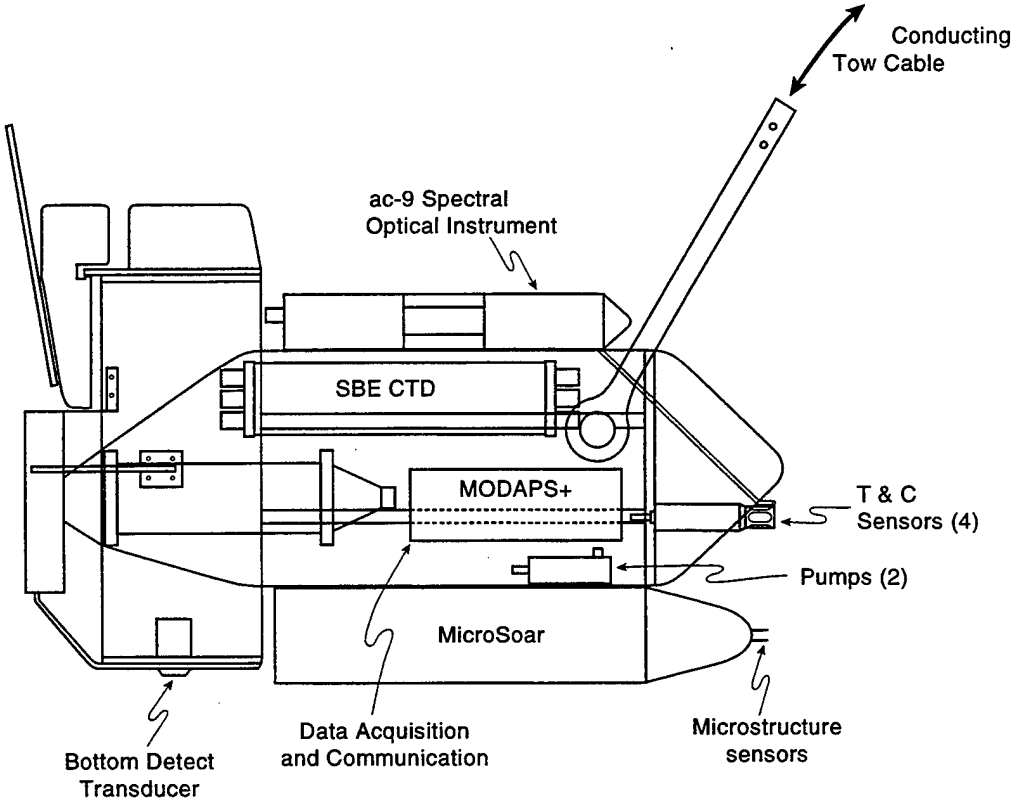

Figure 3: Schematic of SeaSoar as equipped for use during the Coastal Mixing and Optics experiment.

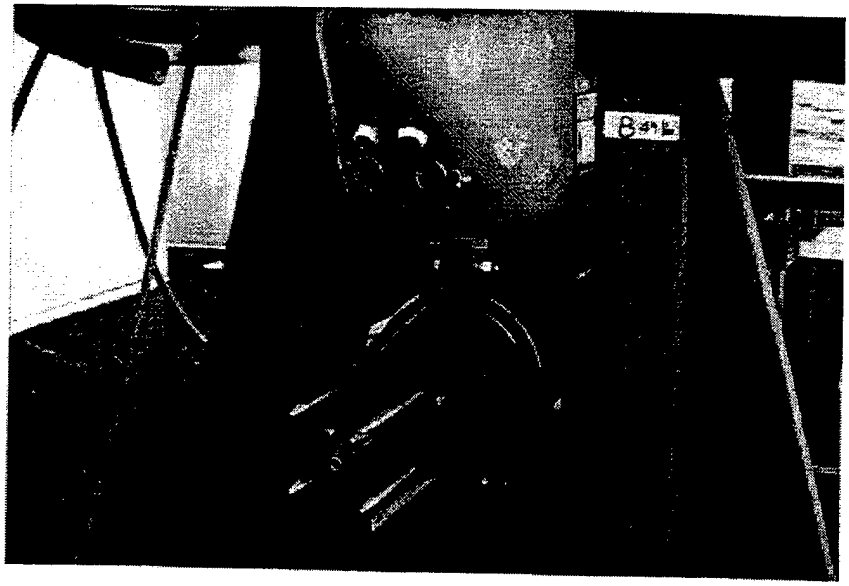

Figure 4: Closeup view of dual T/C sensors (middle), optical flow inlet and outlet (top), and microstructure sensors (bottom) on the front of SeaSoar.

minimize drag. Water for the ac-9 was pumped from an inlet/outlet just above the CTD T/C sensors in the nose of SeaSoar. For more details of the ac-9 installation, operation and data processing see Barth and Bogucki (1998); for the data report see Barth *et al.* (1998) and *http://diana.oce.orst.edu/cmoweb/ac9/main.html.* An additional optical instrument, a prototype single-channel fluorometer (FlashPak, WETLabs, Inc.) flown at the request of CMO investigator Dr. Paula Coble (University of South Florida), was mounted alongside the ac-9 on top of SeaSoar. The FlashPak was placed downstream of the ac-9 in the pumped optics water supply, and was powered by and returned data via the SBE CTD.

The new microstructure instrument (MicroSoar) was carried on the bottom of the SeaSoar. Normally there is a streamlined lead weight in that location, so the MicroSoar pressure case had lead weights added in the form of a streamlined nose cone to match the weight it was replacing. The MicroSoar is capable of either sending its entire data stream ($\sim$ 1 MByte per minute or 16 kBytes per second) topside or storing all the data internally on hard disks and just sending a subset of the data topside to monitor data quality. For more details about the MicroSoar, see Dillon *et al.* (1998); for the data report see Erofeev *et al.* (1998) and *http://diana.oce.orst.edu/cmoweb/micro/main.html.*

During the CMO SeaSoar cruises, SeaSoar was towed using a bare (i.e., no streamlined fairing attached as required for deep tow profiling; see Barth *et al.*, 1996), 5/16" armored, seven-conductor (plus ground) cable from a trawl winch aboard Endeavor. Flight characteristics were similar to previous experiments using bare-cable towing (e.g., Barth *et al.*, 1996) with maximum depths reached of around 105 m. The vehicle profiled from the surface to 105 m and back in approximately 4 minutes at the deep ends of the north-south survey lines, and it took about 1.5 minutes to cycle down to 55 m and back at the shallow ends of the lines. The presence of the external instruments – ac-9 and FlashPak on top, MicroSoar on bottom – did not adversely impact the flight performance of the SeaSoar system in this bare

cable configuration.

The SeaSoar vehicle was also equipped with an engineering package measuring wing angle, propeller rotation rate, pitch and roll. These sensors were connected to the analog-to-digital (A/D) channels of the SBE CTD. The propeller rotation rate sensor worked well throughout the cruise. The pitch and roll sensors returned good data for the majority of the cruise, but eventually failed presumably due to the inability of the inclinometers to handle the repeated high accelerations typical of SeaSoar flight. These tilt sensors have subsequently been replaced with sturdier oil-filled versions. The wing angle sensor was damaged almost immediately due to improper alignment of the coupling piece between the SeaSoar hydraulic unit and the wing angle potentiometer shaft. Even with perfect alignment, though, the wing angle sensor is not designed for the stresses in this environment, and a new design needs to be found. Lastly, a 200-kHz Datasonics echosounder was mounted on the lower tail fin of SeaSoar pointing down (Figure 3), to measure the distance between the vehicle and the bottom. Power to the altimeter was supplied on two of the tow cable's seven conductors, and data were returned via one of the CTD's A/D channels. The echosounder worked well returning altitude when the vehicle leveled out near the bottom of its trajectory and that data was available to the SeaSoar operator as well as for possible input to the automatic flight control software (details below).

To supply power to each of the instruments onboard SeaSoar and to return a merged data stream, a prototype power supply and signal multiplexor unit was used during the August 1996 CMO SeaSoar/ADCP cruise. The Modular Ocean Data and Power System Plus (MODAPS+) was manufactured by WETLabs, Inc., Philomath, Oregon, motivated by the need of Oregon State University scientists for a system capable of supplying more power and returning more data than possible with WETLabs' existing MODAPS (WETLabs, 1994). The MODAPS+ was installed inside the SeaSoar vehicle (Figure 3) and operated using 3 wires plus ground of the conducting tow cable. A topside power supply sent 300 volts down the cable where the subunit converted and parceled out power to the CTD, ac-9, ac-9 pump and to the MicroSoar. The data from each of these instruments was multiplexed and sent topside for storage as raw binary files on a PC. The signals were also split out by the MODAPS+ deckunit and sent to each instrument's data display computer. The CTD signal was passed through a WETLabs SBE deckunit emulator (a 286-based processor card) whose purpose was to turn the CTD signal communicated by MODAPS+ into that produced by a standard SBE 11 deckunit. The CTD data stream was then fed into data acquisition, display and flight control systems (details below). The ac-9 datastream was sent to an acquisition and display package running on a UNIX workstation (Barth and Bogucki, 1998), and the MicroSoar data went into a PC-based, LabWindows/CVI display system (Erofeev *et al.*, 1998).

The CTD data stream coming out of the MODAPS+ deckunit and SBE deckunit emulator was fed to a PC-based data acquisition system. The acquisition system recorded the data on hard disk, distributed a subsample of the data to both the display and flight control systems, and echoed the entire 24-Hz stream to a UNIX SPARCstation for real-time data processing. When possible, the GPS navigation was also input to the CTD acquisition system and merged with the CTD data; otherwise it was recorded on an alternate computer and merged using a common time base in a post-processing step. The display system includes

various user-specified plots in real time (e.g. time series of conductivity, color raster vertical sections of temperature, etc.). The real-time data processing outputs one-second averaged values for quality control and scientific use at sea. The digital flight control system was used in place of the manufacturer-supplied SeaSoar control system. The digital controller used the CTD pressure signal along with user specified minimum and maximum depths for the profiles as input to a simple expert system to control the SeaSoar flight path. Control signals get transmitted to the SeaSoar vehicle over the two remaining conducting cable wires as in the original Chelsea controller. A hydraulic unit taking power from the SeaSoar impeller responds to the control signals to change the wing angle. Along with the maximum target depth, the flight control software also allowed the user to specify a height above the bottom at which to override the target and signal the vehicle to turn up. While the SeaSoar carried an echosounder for bottom detection, it was used as a backup to the Endeavor's CHIRP sonar system. In practice, the CHIRP sonar was found to be more desirable, mostly because SeaSoar vehicle motion limited the ability of the its onboard echosounder to pick up the bottom except near the bottom of the sawtooth-shaped flight pattern. Using the ship's echosounder has the added advantage that a bottom obstacle or sudden depth change is observed several tens of seconds before the vehicle reaches the obstacle (depending on cable out and ship speed). This allows more than enough time for an operator override "wings up" command to be issued and the vehicle to respond. The SeaSoar flight direction changes within just a few seconds while being towed on a short, bare cable.

Cruise Narrative, R/V Endeavor E9608, August 14 to September 1 1996

R/V Endeavor sailed at 1400 on 14 August 1996 (all times UTC) with the science party from Oregon State University, a technician from WETLabs Inc. (Philomath, Oregon), and a marine technician and a graduate student from the University of Rhode Island (URI) aboard (Table 1). This was Endeavor cruise EN-287, but we shall refer to it as E9608 to conform to our traditional way of naming cruises using the first letter of the ship's name, followed by the year and month. The cruise was split into a 5-day leg, during which three individuals (Chang, Hankins and Holt) assisted in setting up and testing equipment to assure quality data collection, and then disembarked. This was followed by an approximately two-week long second leg.

At 2000 on 14 August, a CTD/rosette cast was conducted at 40.9°N, 70.5°W at a station previously sampled during the CMO project. Bill Fanning, URI Marine Technician, trained the science party in the use of the CTD/rosette system. See Table 2 and Figure 5 for information on the CTD stations occupied during E9608. The Endeavor then proceeded south along 70.5°W, checking for fishing gear, primarily fixed individual lobster pots marked with surface buoys and strings of lobster pots marked on both ends by surface buoys and sometimes with radar reflectors. Fortunately, the 70.5°W line was not too heavily populated with lobster gear. We proceeded to south of the shelfbreak ($\sim$ 40°N), where there was a local concentration of fishing gear, checking the southern end of the "big box" survey region. We then occupied 6 CTD stations from 39°54' to 40°19' N. The next activity was to visually survey for, and electronically chart, fishing gear on the six north-south lines of the "small box" survey grid. During the time it took to conduct the visual survey (approximately 0850–2300 15 August) we conducted a dip test of the SeaSoar vehicle to check for proper instrument performance and data acquisition.

Table 1: E9608 cruise participants with their institution and primary responsibility.

Jack Barth	OSU	Chief Scientist; SeaSoar	
P. Michael Kosro	OSU	Co-Chief Scientist; SeaSoar, ADCP	
Wonil Chang	URI	Graduate Student; Edson flux package	Leg I only
Tim Ebling	OSU	Graduate Student; ac-9, SeaSoar	
Anatoli Erofeev	OSU	Technician; MicroSoar	
Bill Fanning	URI	Marine Technician	
Linda Fayler	OSU	Marine Technician; SeaSoar	
Jane Fleischbein	OSU	Technician; CTD, SeaSoar	
Doug Hankins	WETLabs, Inc.	Technician; MODAPS+, ac-9	Leg I only
Tim Holt	OSU	Marine Technician; SeaSoar	Leg I only
Glenn May	OSU	Graduate Student; MicroSoar	
Kieran O'Driscoll	OSU	Graduate Student; MicroSoar	
Robert O'Malley	OSU	Technician; SeaSoar, CTD	
Steve Pierce	OSU	Technician; ADCP, SeaSoar	
Marc Willis	OSU	Marine Technician; SeaSoar	

The 15 August dip test was successful and the visual survey of the small box was completed by the end of that day. At 2314, SeaSoar was launched to begin the first survey of the small box grid (SB1). See Figure 9 and Table 8 at the end of the Data Presentation section for details on the SeaSoar sections and grids. During the first tow, MODAPS+ intermittently (approximately every 30 s) dropped data scans from the CTD as well as sending occasionally spurious data packets. This impacted the CTD acquisition system as well as the real-time processing system, both of which trap for continuity breaks in the CTD records (usually a rare event while operating the SBE 9/11+ with an SBE deckunit). When the acquisition software detects a break in the CTD scan sequence, it re-initializes the deckunit emulator and commences acquisition again. This takes almost ten seconds to do, and directly impacts the flight control software which must fly "blind" during the dropouts, and either continue on its course or determine that the CTD signal has really disappeared and issue automatic "wings up" commands until the problem is solved. Flying blind is not desirable should the MODAPS+ data dropouts occur near the bottom as the vehicle descends. It is also undesirable to get "wings up" software overrides ever thirty seconds or so, curtailing full water column profiles. All OSU software systems were modified through several iterations by OSU personnel to handle the data dropouts, spurious data and the need for true resets from the MODAPS+ CTD data stream. Also, the MODAPS+ SBE deckunit emulator was not processing the second T and C channels from the dual sensors mounted on SeaSoar. The dual sensor capability has proven useful during SeaSoar operations in productive coastal waters to limit data loss due to (usually temporary) fouling of one T/C sensor pair by biological material. Experience has also shown that one or the other of the sensor pairs generally produces better quality data, the selection of which is not made until the data post-processing phase.

Table 2: Summary of CTD stations during E9608.

Station No.	Date 1996	Time UTC	Latitude N	Longitude W	Cast Depth (m)
1	14 AUG	1937	40 54.0'	70 30.0'	50
2	15 AUG	0327	39 54.0'	70 30.3'	1060
3	15 AUG	0509	39 59.0'	70 30.0'	643
4	15 AUG	0628	40 04.0'	70 30.0'	165
5	15 AUG	0732	40 09.0'	70 30.0'	118
6	15 AUG	0850	40 14.0'	70 30.2'	113
7	15 AUG	0949	40 19.2'	70 30.1'	93
8	22 AUG	0513	40 17.9'	70 21.4'	89
9	22 AUG	0524	40 17.9'	70 21.4'	88
10	22 AUG	0530	40 17.9'	70 21.4'	88
11	22 AUG	0538	40 17.9'	70 21.4'	88
12	22 AUG	0545	40 18.0'	70 21.6'	88
13	22 AUG	0553	40 18.0'	70 21.6'	88
14	22 AUG	0559	40 18.1'	70 21.7'	88
15	22 AUG	0606	40 18.1'	70 21.7'	87
16	22 AUG	0614	40 18.3'	70 21.8'	87
17	22 AUG	0622	40 18.3'	70 21.8'	88
18	22 AUG	0628	40 18.4'	70 21.8'	87
19	22 AUG	0635	40 18.4'	70 21.8'	88
20	22 AUG	0641	40 18.4'	70 21.8'	91
21	22 AUG	0649	40 18.5'	70 21.7'	87
22	22 AUG	0655	40 18.5'	70 21.7'	86
23	22 AUG	2256	40 25.0'	70 21.0'	71
24	22 AUG	2348	40 19.9'	70 20.9'	86
25	23 AUG	0043	40 15.0'	70 20.8'	97
26	23 AUG	0152	40 10.1'	70 20.8'	109
27	23 AUG	0255	40 04.9'	70 21.0'	155
28	23 AUG	0405	39 59.8'	70 21.0'	261
29	23 AUG	0522	39 54.7'	70 20.9'	570
30	23 AUG	0744	40 00.2'	70 12.1'	434
31	23 AUG	0847	40 02.6'	70 12.0'	322
32	23 AUG	0937	40 05.0'	70 12.1'	151
33	23 AUG	1023	40 07.6'	70 12.1'	118
34	23 AUG	1103	40 10.1'	70 12.0'	106
35	23 AUG	1140	40 12.5'	70 12.0'	96
36	23 AUG	1226	40 15.0'	70 12.0'	93
37	23 AUG	1322	40 20.0'	70 12.0'	81
38	23 AUG	1450	40 30.0'	70 12.0'	61
39	23 AUG	1545	40 36.0'	70 11.9'	51
40	23 AUG	1632	40 39.9'	70 11.7'	41
41	23 AUG	1725	40 40.0'	70 03.4'	41
42	23 AUG	1811	40 36.0'	70 03.5'	51
43	23 AUG	1904	40 30.0'	70 03.5'	60
44	23 AUG	2020	40 20.0'	70 03.5'	80
45	23 AUG	2157	40 15.0'	70 03.5'	95
46	23 AUG	2235	40 12.4'	70 03.5'	96

At 0840 on 16 August, SeaSoar was recovered after high tensions (around 3000 lbs) were recorded presumably due to snagging lobster fishing gear. High tensions did not persist, as the vehicle slipped off the moored fishing gear. The vehicle was recovered for inspections and no damage was done to the SeaSoar vehicle or to the onboard sensors. However, a connector in the FlashPak water supply had broken due to strong flow past the exposed fitting. It was decided at that point to remove the FlashPak from the optical water supply and to fit it with a forward-pointing elbow connector so that the FlashPak would flush in the oncoming flow.

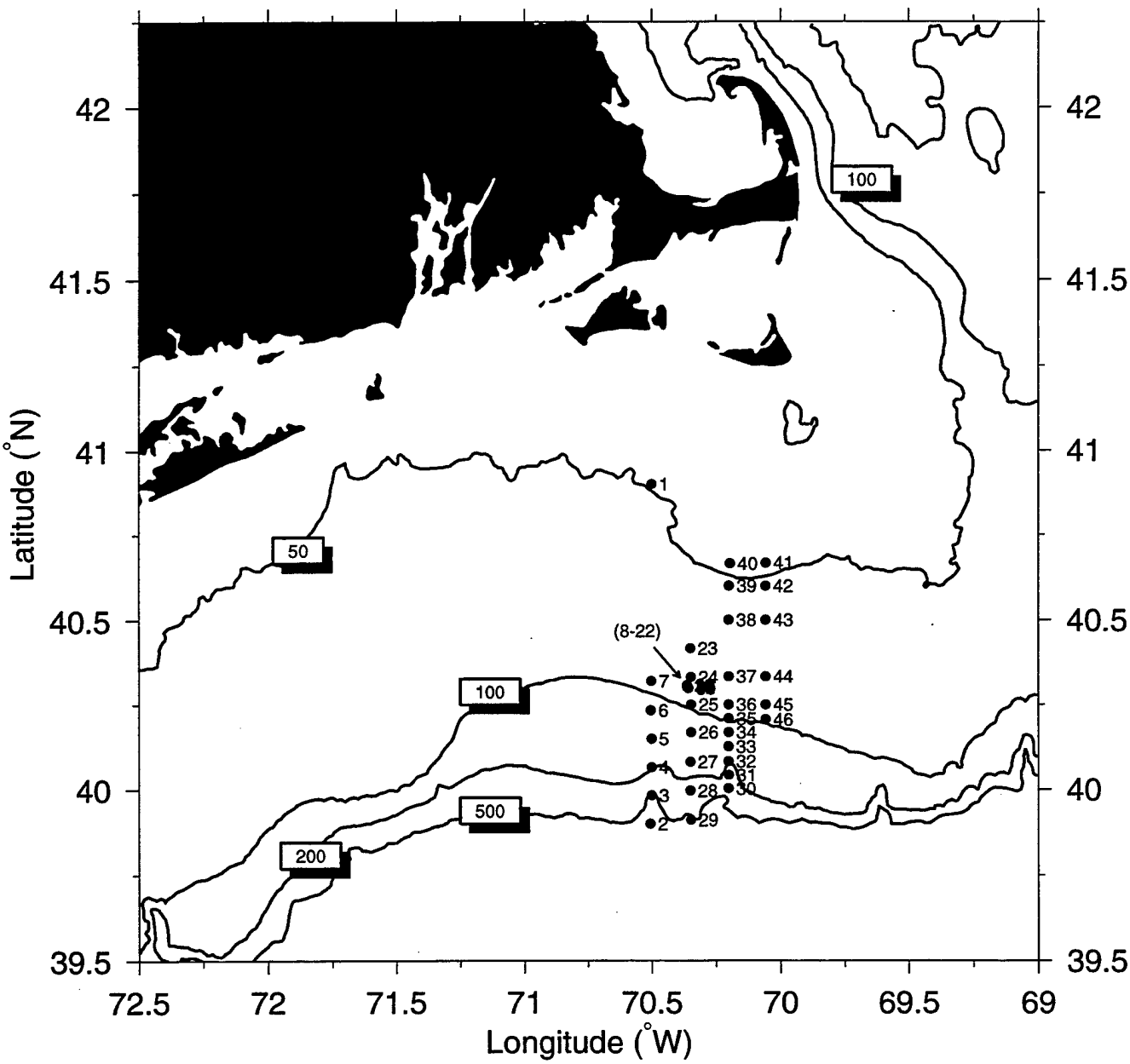

Figure 5: CTD station locations for E9608. Bottom topography in meters.

SeaSoar was redeployed at 0930 on 16 August, towed through completion of SB1, then recovered at 1535. The optical flow tubes and windows on the ac-9 were cleaned and re-installed, as was done between every SeaSoar tow throughout the remainder of the cruise. Since MODAPS+ could not maintain the bandwidth required to bring the full MicroSoar data stream to the surface, data stored on its hard drives were transferred to topside computers via a direct connection while MicroSoar was on deck between tows. Meanwhile, a visual survey and electronic charting of fishing gear on the "big box" sampling grid was carried out on the north-south lines to the east of the small box grid (Figure 1).

At 0111 on 17 August, SeaSoar was deployed at 40°N on line F (70° 3.5' W) (see Figure 9a) for the first big box survey (BB1). BB1 was completed at 0900 on 18 August and after a short transit, SB2 was begun. SB2 was completed at 0130 on 19 August and after an hour and half to test some new flight software, SeaSoar was recovered and the transit to the URI Narragansett pier was begun.

We arrived dockside at URI (Narragansett, RI) at 1200 on 19 August and three scientists (Chang, Hankins and Holt) disembarked. A new set of EPROMS was received from WETLabs containing MODAPS+ SBE emulator code to process the secondary T/C data correctly. The EPROMS were installed and tested successfully.

At 1700 on 19 August, R/V Endeavor sailed for the second leg of the CMO SeaSoar/ADCP survey with a reduced science party of 12 (Table 1). SeaSoar was deployed at 0130 on 20 August at the northeast corner of the small box survey grid for the start of SB3. SB3 was completed at 1445 on 20 August when SeaSoar was recovered and then readied for the next tow (optics cleaned, MicroSoar data transferred, etc.). At 1700 on 20 August, SeaSoar was deployed on the north end of line A for the start of BB2. At the south end of line C, SeaSoar was recovered at 1130 on 21 August to realign the absorption flow tube on the ac-9 which had come ajar. In the middle of line C, ADCP data stopped being acquired due to failure of a board in the ADCP deck unit. A replacement board was available on board, installed and tested successfully.

SeaSoar was deployed at the south end of line C at 1300 on 21 August and then towed north, repeating line C to collect good light absorption and ADCP data. Beginning at approximately 1530, more frequent data dropouts and eventual loss of signal from the MODAPS+ SBE emulator data stream occurred. Cycling the power to the SBE emulator card sometimes successfully restarted the CTD data stream. This did not always work, so cycling power to the entire MODAPS+ system was needed to recover the full data stream. After data loss became more frequent, SeaSoar was recovered at 2230 on 21 August.

From late on 21 August through 22 August, a series of tests (on deck, in the lab, and eventually with the MODAPS+ subunit pressure case opened up) were conducted in an effort to fix the MODAPS+ data communication problem. Meanwhile, a time series of 15 CTD casts to 85 m was made at 40°18'N, 70°21.4'W. No obvious failed or unseated components were found inside the MODAPS+ subunit, so it was reinstalled in SeaSoar for further towing. At 2057 on 22 August, SeaSoar was deployed, but the MODAPS+ system only worked for one and a half undulations before failing. At 2217 it was decided to recover SeaSoar and remove the MODAPS+ power and communications module and to replace it with a solution based on a WETLabs MODAPS (WETLabs, 1994) which was brought along

as a spare. During this changeover on 23 August, CTD stations were performed every 5 nautical miles along the big box lines D and E in an effort to complete BB2.

Since the backup MODAPS was not capable of powering and communicating with MicroSoar, the latter was reconfigured to accept 300 volts directly from topside by installing a power converter inside the MicroSoar pressure case to supply 15 volts to the instrument. A new RS-232 communications channel was also installed in the MicroSoar subunit to allow it to communicate via MODAPS (the previous MicroSoar-MODAPS+ communication was via ethernet). The CTD and ac-9 continued to run via MODAPS, and required three of the seven conducting wires plus ground; the SeaSoar control signals required two wires; and the remaining two conducting wires were being used to power the MicroSoar. Because of this, the power to the echosounder (altimeter) onboard the SeaSoar was no longer available. This was deemed acceptable since SeaSoar was being flown using depth information from the ship's CHIRP sonar.

At 2311 on 23 August during the 47th CTD cast of the cruise, the pressure signal on Endeavor's SBE 9/11+ failed, thus ending the series of CTD stations at the end of BB2. Bill Fanning, URI Marine Technician, was unable to rectify the problem at sea after pursuing the problem with SBE technicians.

At 1240 on 24 August, SeaSoar with the new configuration based on the old MODAPS was deployed. It was found that stable CTD and ac-9 data were only obtainable with the MicroSoar turned off, presumably due to interference between the MODAPS communication lines and the MicroSoar power lines. At 1500, after diagnosing a possible short in the conducting cable, the SeaSoar was recovered. One of the conductors was shorted, so it and the three wires carrying the MODAPS signal and power were reterminated. At 1949, the SeaSoar was redeployed and successfully towed three times from east to west over the small box grid (SB4, SB5, SB6). During this tow, the MicroSoar was not powered up since stable CTD and ac-9 data communication was not possible with it running. At 1700 on 26 August, SeaSoar was recovered and readied for the next deployment (optics cleaned). While the SeaSoar was on deck, the MicroSoar was detached and moved to the lab. A capacitor was installed in the MicroSoar to isolate it from the MODAPS RS-485 communication lines and a successful deck test with stable CTD, ac-9 and MicroSoar data communication was performed.

While SeaSoar was on deck, a visual survey and electronic charting of fishing gear on the "butterfly" sampling pattern (Figure 9c) was done. At 2350 on 26 August, SeaSoar was deployed and reliable data from all onboard instruments was being acquired. Unfortunately, a short developed on the SeaSoar control conductors and the vehicle was recovered at 0100 on 27 August. After reterminating all conductors, SeaSoar was deployed at 0400 for the start of sampling on the butterfly (BF) pattern. Three complete cycles of the butterfly pattern were completed (BF1-BF3) before recovering SeaSoar at 2130 on 27 August. After cleaning the optics and transferring MicroSoar data, the SeaSoar was redeployed at 2344 to begin an approximately 24-hour period of sampling aimed at capturing internal solitary wave (ISW) packets (solitons) as they propagated through the CMO region. During previous tows (e.g., the north-south line on BF3), we had noticed evidence for packets of ISWs in both the CTD and optical data. Once a soliton was observed, the propagation direction was estimated by assuming they were formed at the shelfbreak to the southeast of our study region; we then

attempted to recross the soliton packets in a direction orthogonal to the wave crests. This was repeated several times, and included towing the SeaSoar at a number of fixed (± 1 m) levels across the soliton packets. At 0109 on 29 August, the SeaSoar was recovered and the optics cleaned and MicroSoar data transferred. At 0348, SeaSoar was deployed and towed for SB7 and SB8 before being recovered at 1216 on 30 August. Upon inspection, the ac-9 attenuation flow tube had sea slime stuck in it which contributed to degraded data during the previous tow. The optics were cleaned for the next deployment.

At 1453 on 30 August, SeaSoar was deployed and towed on SB9 followed by sampling on BB3. Around 0600 on 31 August it was noticed that the ac-9 absorption data looked fouled, so SeaSoar was recovered at 0810, the ac-9 optics cleaned, followed by SeaSoar being redeployed at 0856. Sampling was continued on BB3 until 1109 on 1 September when the SeaSoar was recovered and the Endeavor began a transit to Newport, RI to wait out the passage of Hurricane Edouard which had been steadily moving north along approximately 70°W.

At 1700 on 1 September, Endeavor was dockside in Newport, RI ending the science portion of E9608; Hurricane Edouard turned east and passed over Cape Cod approximately 12 hours later. On 3 September from 1230 to 1400, the Endeavor transited from Newport to the URI Narragansett pier, thus ending cruise E9608 (EN-287). See Figure 6 for a summary of the meteorological and surface information for this cruise.

In summary, despite a number of instrumental challenges, a total of 11 days of SeaSoar towing were conducted yielding high-quality CTD, optical and microstructure data. Nine occupations of the small box grid, three of the big box grid, three repeats of the butterfly pattern and a day of soliton chasing were completed. The total number of water column profiles produced by SeaSoar was approximately 17,400. In addition, 46 CTD/rosette stations were occupied. Overall, this was a very successful cruise and operation of SeaSoar in this region of considerable shipping and fishing activity could not have been accomplished without the superb efforts of the captain, mates and crew of the R/V Endeavor. In particular, the electronic charting of lobster fishing gear and the around-the-clock vigilance of the captain and mates made it possible to slalom along the survey grids.

Cruise Narrative, R/V Endeavor Cruise E9704, April 25 to May 15 1997

This was the second of two physical oceanography cruises conducted by the co-PIs Jack Barth and Mike Kosro as part of the ONR-sponsored Coastal Mixing and Optics Accelerated Research Initiative. This was Endeavor cruise EN-299, or E9704 using our cruise naming convention. The 300-kHz ADCP transducer was reinstalled to obtain 4 m vertical resolution of subsurface velocities (Pierce *et al.*, 1998). The SeaSoar vehicle was equipped as in the August 1996 CMO cruise (E9608): SBE 9/11+ CTD; WETLabs ac-9; MicroSoar and a next-generation prototype single-channel fluorometer (WETLabs FlashPak). A major difference from E9608 was that the WETLabs MODAPS+ power and data communications module did not work when installed in SeaSoar and connected to the seven-conductor tow cable while dockside. Given that result, the SeaSoar vehicle was loaded with the old WETLabs MODAPS as done during the second half of E9608.

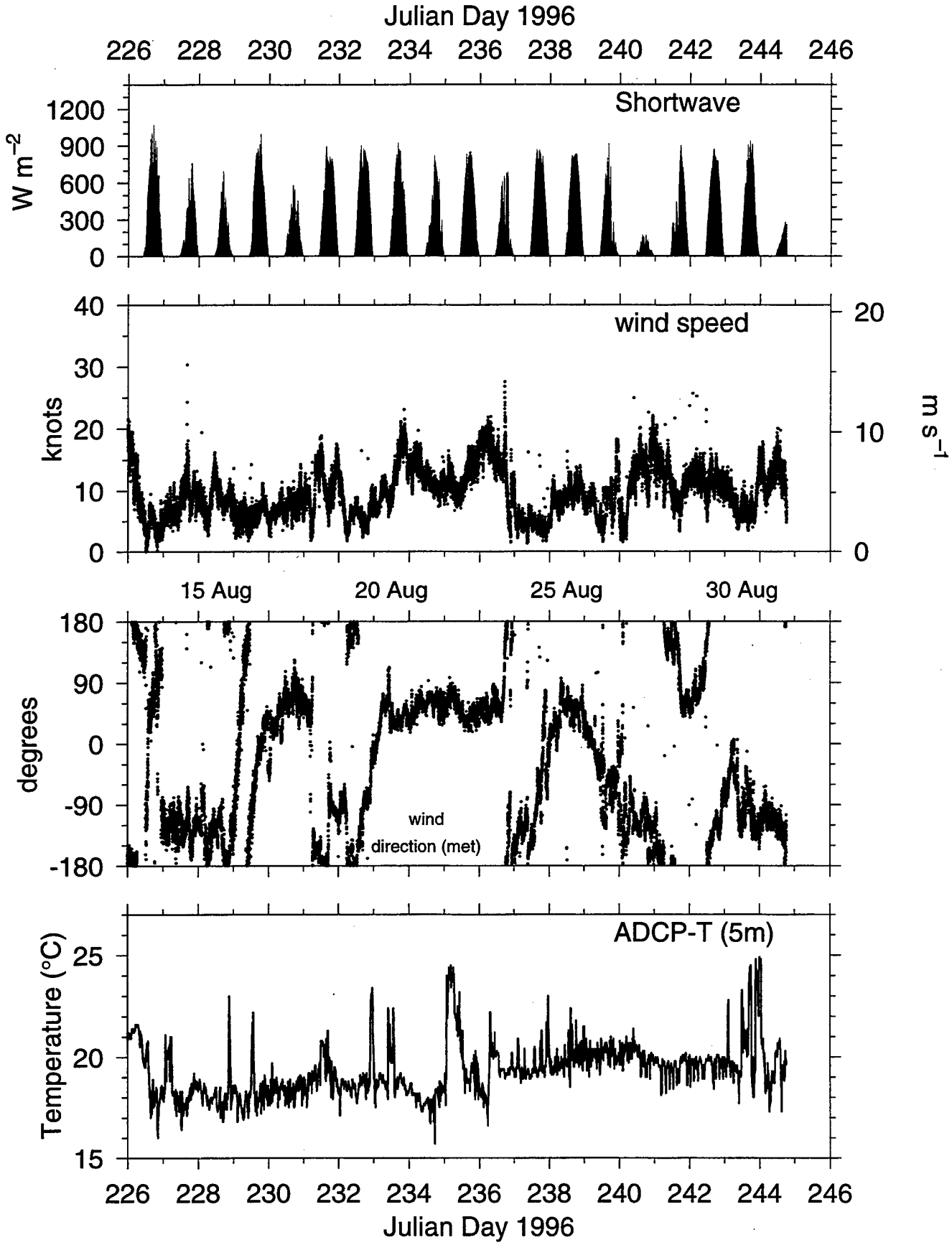

Figure 6: Wind speed, wind direction and solar radiation from the R/V Endeavor's meteorological instruments, and 5-m water temperature from the ADCP transducer well during E9608.

After waiting out a storm on the original sailing day of 24 April, the R/V Endeavor sailed from Narraganset, Rhode Island at 1300 UTC on 25 April 1997 (all times UTC) with the science party from Oregon State University aboard (Table 3). A CTD/rosette cast was conducted at 40.9°N, 70.5°W at a station sampled previously during the CMO project. Bill Fanning, URI Marine Technician, again trained the scientists in use of the CTD/rosette system. See Table 4 and Figure 7 for information on the CTD stations occupied in E9704. After the CTD cast, a transit to the south along 70.5W was conducted to visually survey for fishing gear so that the ship could avoid obstacles while towing SeaSoar along this NS line. Locations of visible gear were marked on the electronic chart on the bridge of the Endeavor. At 0100 on 26 April, arrived at 39.9N, 70.5W and made a CTD/rosette cast to 1000 m. Turned to north and began a CTD section of seven more casts along 70.5°W finishing near 40.5°N at 1000. For the remainder of that day, conducted a visual survey for fishing gear on the SB sampling grid working from west to east. At 0038 27-April, SeaSoar was launched to begin the SB1 survey. See Figure 10 and Table 9 at the end of the Data Presentation section for details on the SeaSoar sections and grids. At 1240, SeaSoar was recovered after the flight pattern degraded. Inspection showed a faulty hydraulic unit which provides power to change the wing angle. We proceeded to replace the hydraulic unit while making use of the time to conduct a visual survey for fishing gear on the BB survey grid. At 2220, SeaSoar was deployed and towed to the north to begin SB2. At 1450 on 28 April, SeaSoar was recovered at the captain's request as a storm built (Figure 8).

Early on 29 April, SeaSoar was redeployed and then towed on the SB sampling grid for SB3 and SB4. At 0150 on 30 April, SeaSoar was recovered after communication with the vehicle was lost. Inspection showed the need to replace two shorted pigtail leads near the SeaSoar bridle which had worn through. As a result of the short, a communication channel within the SeaSoar data telemetry unit (MODAPS) was made inoperative. After attempts

Table 3: E9704 cruise participants with their institution and primary responsibility.

Jack Barth	OSU	Chief Scientist; SeaSoar
P. Michael Kosro	OSU	Co-Chief Scientist; SeaSoar, ADCP
Darek Bogucki	OSU	Scientist; ac-9, SeaSoar
Andy Dale	OSU	Scientist; MicroSoar, SeaSoar
Tom Dillon	OSU	Scientist; MicroSoar
Anatoli Erofeev	OSU	Technician; MicroSoar
Bill Fanning	URI	Marine Technician
Linda Fayler	OSU	Marine Technician; SeaSoar
Glenn May	OSU	Graduate Student; MicroSoar
Robert O'Malley	OSU	Technician; SeaSoar, CTD
Steve Pierce	OSU	Technician; ADCP, SeaSoar
R. Kipp Shearman	OSU	Graduate Student; SeaSoar
Marc Willis	OSU	Marine Technician; SeaSoar

Table 4: Summary of CTD stations during E9704.

Station No.	Date 1997	Time UTC	Latitude N	Longitude W	Cast Depth (m)
1	25 APR	1835	40 54.0'	70 29.9'	51
2	26 APR	0048	39 54.0'	70 30.1'	995
3	26 APR	0232	39 58.9'	70 30.1'	623
4	26 APR	0359	40 04.1'	70 30.1'	165
5	26 APR	0500	40 09.1'	70 30.0'	118
6	26 APR	0600	40 14.1'	70 30.0'	63
7	26 APR	0650	40 19.0'	70 30.0'	91
8	26 APR	0757	40 23.9'	70 29.9'	77
9	26 APR	0841	40 28.0'	70 29.9'	71
10	30 APR	2040	40 36.7'	70 25.8'	13
11	07 MAY	0023	40 28.8'	70 22.8'	60
12	11 MAY	0324	39 49.0'	70 29.9'	1455
13	11 MAY	0519	39 53.8'	70 30.2'	1070
14	11 MAY	0700	39 58.9'	70 30.2'	592
15	11 MAY	0823	40 03.9'	70 30.0'	177
16	11 MAY	0930	40 08.9'	70 30.1'	120

to fix the unit, OSU scientists aboard the nearby R/V Knorr – located at 40.5°N, 70.5°W and conducting vertical profiling operations as part of the CMO experiment – offered to loan us their spare MODAPS. It was brought over by small boat and installed in SeaSoar, but the communication channel still did not function properly. During testing of the spare communications unit, a shallow CTD cast was conducted to test Endeavor's CTD winch #1. The winch drum was rubbing on the clutch plate and stripping off metal. We were informed by the captain to consider limiting the number and depth of any future CTDs. Meanwhile, OSU scientists onboard R/V Knorr repaired the formerly defective communications unit and delivered it back to Endeavor via a floating transfer since the high winds and seas made a small boat transfer unsafe. We installed the repaired unit in the SeaSoar but were still not successful in getting the communication unit to perform up to specifications. We then made the decision to hook the SeaBird CTD onboard SeaSoar directly to its deck unit rather than going through the defective communications unit. The ac-9 instrument and data continued to be run from the MODAPS, but now the RS-485 MODAPS communications on the sea cable was being run in parallel with the SBE data telemetry and thus there was potential for crosstalk. However, with both systems powered up and running data was successfully acquired from both the CTD and the ac-9 (as well as from the MicroSoar which sent data via MODAPS to monitor the performance of the microstructure sensors). At 0200 on 2 May, SeaSoar was ready for deployment but a 10 hour delay was necessitated by high winds and seas. At 1200 on 2 May, SeaSoar was deployed and towed on SB5 and SB6. At 0200 on 4 May, the SeaSoar was recovered as the weather worsened.

At 1230 on 4 May, SeaSoar was deployed and towed on the BB grid, completing BB1 at around 1800 on 6 May. This was followed immediately by SeaSoar surveys SB7 and

SB8. During SB8, the counterweight on SeaSoar's rudder fell off, which acts in concert with the rudder to keep the vehicle flying level and right-side-up. Upon recovery of the vehicle at 1945 on 7 May during rough seas, the MicroSoar microstructure probes were damaged necessitating replacement. A CTD cast was performed to test the repaired CTD winch #1. The winch was deemed to be working properly again and the go-ahead was given for future deep CTD casts. SeaSoar was deployed again at 0530 on 8 May and towed on the remainder of SB8. At 1320, SeaSoar failed to respond to wing angle changes and was recovered. Upon inspection, the 1/2" stainless steel push rod in the hydraulic unit had broken, presumably

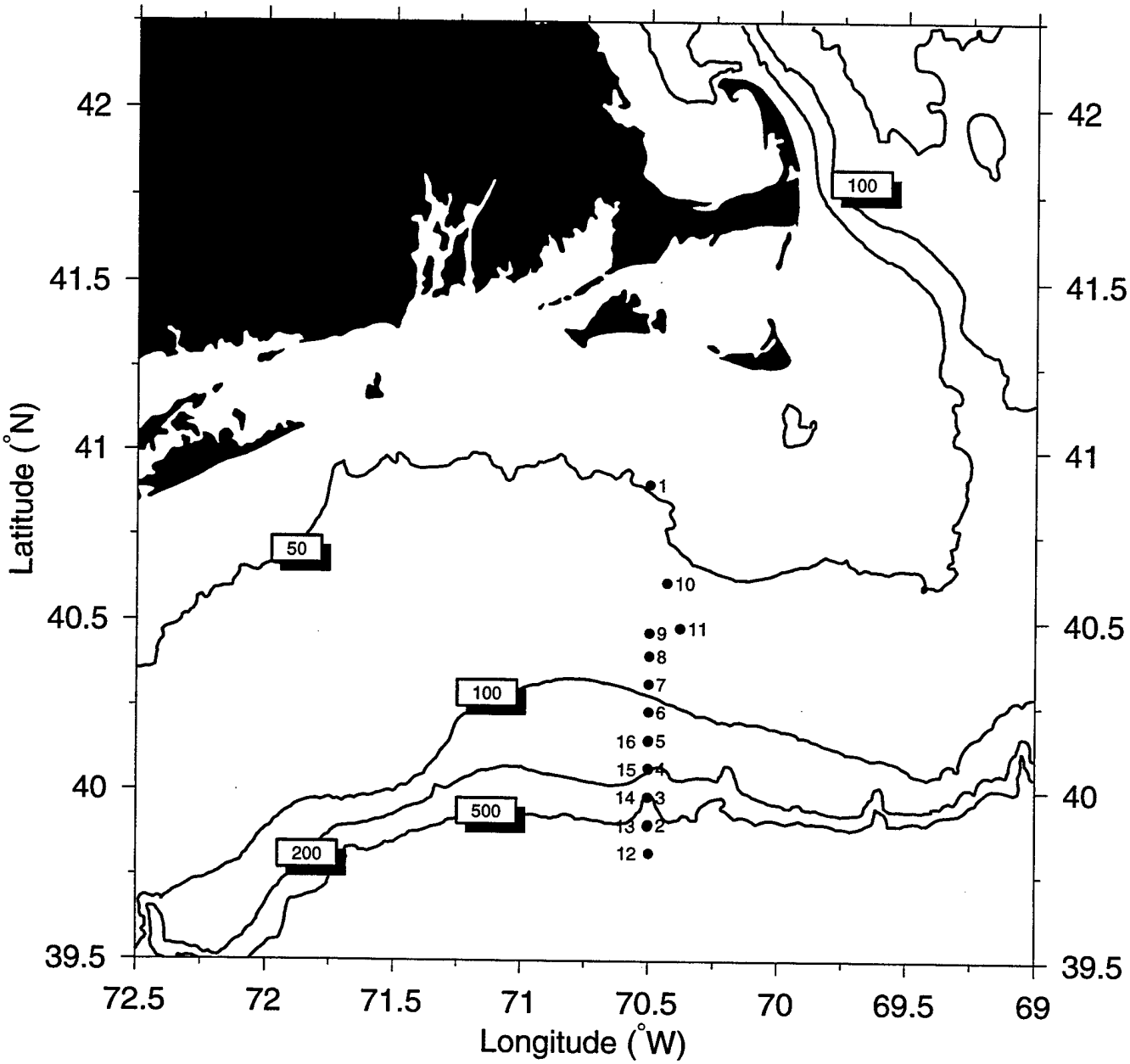

Figure 7: CTD station locations for E9704. Bottom topography in meters.

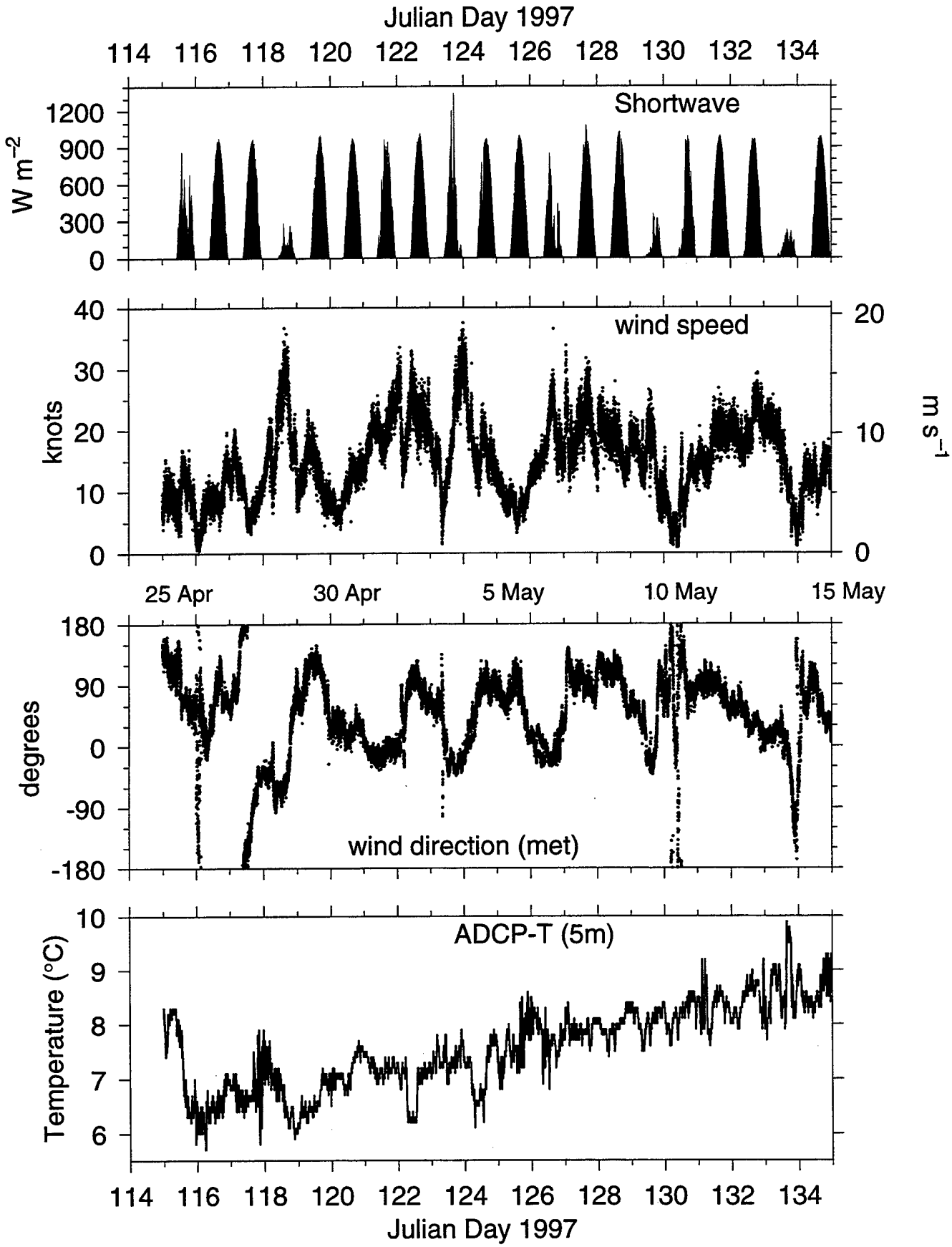

Figure 8: Wind speed, wind direction and solar radiation from the R/V Endeavor's meteorological instruments, and 5-m water temperature from the ADCP transducer well during E9704.

by excessive use over the last 10 days as SeaSoar completed a full undulation in this shallow-water experiment every 1-4 minutes (compared with deep-water, 300+ m undulations which take about 10 minutes). A new hydraulic unit was installed, and the SeaSoar was back in the water at 1900. SB8 was completed, followed by surveys SB9 and SB10 and recovery of SeaSoar at 1705 on 10 May.

On the morning of 11 May, we completed five CTD casts along 70.5°W from 39.83 to 40.15°N. We deployed the SeaSoar at 1100 and completed surveys SB11 and SB12 by 1455 on 12 May. We then began surveying on the BB grid for the second time (BB2). On 13 May at 0955 the ship's #1 generator failed and ship speed fell below 5 knots, the minimum required for SeaSoar to fly. The vehicle began sinking with 230 m of cable out in 87 m of water. The engineers reacted quickly and brought the #2 generator on line and the SeaSoar cable was immediately brought in at full speed. From the CTD onboard SeaSoar, the closest approach to the bottom was determined to be 3 m. The remainder of BB2 was completed by 2300 on 14 May, SeaSoar was recovered and the transit to Narragansett was begun. We arrived dockside at 1215 (0815 local) on 15 May 1997. See Figure 8 for a summary of the meteorological and surface observations for this cruise.

Overall, a very successful cruise with in excess of 13 days continuous towing of the SeaSoar vehicle including 12 occupations of the small box centered around the CMO central site and 2 occupations of the larger box which included sampling the shelfbreak frontal region out over the continental slope. The total number of water column profiles produced by SeaSoar was approximately 17,500. As during E9608, operation of SeaSoar in this region of considerable shipping and fishing activity could not have been accomplished without the superb efforts of the captain, mates and crew of the R/V Endeavor.

CTD Data Acquisition, Calibration and Data Processing

All CTD/rosette casts were made with an SBE 9/11-plus CTD system equipped with dual ducted temperature and conductivity sensors (Table 5).

CTD casts were made along the 70.5°W CMO central line and also used as a backup to the SeaSoar system (Figures 5 and 7). A total of 46 CTD casts were made in E9608, and 16 casts were made in E9704. The maximum sampling depth was 1060 m in E9608 (Table 2) and 1455 for the E9704 survey (Table 4). Raw 24-Hz CTD data were acquired on an IBM-compatible PC using the SEASAVE module of SEASOFT version 4.219 (Anon., 1995); temperature and conductivity data were recorded from both pumped sensor ducts.

At each station a few salinity samples were collected from Niskin bottles at two or more depths for *in situ* calibration of the conductivity sensors; CTD values at the same depth (calculated from the most recent manufacturer's pre-cruise calibration) were recorded both by the PC and manually on the station log sheets. Samples were analyzed while at sea on a Guildline Autosal 8400A Salinometer that was standardized with IAPSO Standard Water at the beginning and end of each batch of 24 samples. Sample conductivities were calculated using the sample salinity value with the CTD temperature and pressure values; a value of 42.914 mmho cm^{-1} for conductivity of standard sea water at 15°C (Culkin and Smith, 1980) was used to convert the measured sample conductivity ratios to conductivity. Analysis of the

Table 5: Instruments and sensors used during E9608 and E9704 for CTD and SeaSoar salinity sampling, and date of most recent manufacturer's pre-cruise calibration.

System (Instrument)	Sensor	SN	Pre-Cruise Calibration
E9608			
CTD/Rosette			
SBE 9/11 plus	P	63505	01 January 1996
	T1	2034	06 July 1996
	T2	2107	09 July 1996
	C1	1745	23 July 1996
	C2	1749	23 July 1996
SeaSoar CTD			
SBE 9/11 plus, SN 428	P	64256	28 November 1995
	T1	2127	26 March 1996
	T2	2128	26 March 1996
	C1	1737	22 March 1996
	C2	1738	22 March 1996
E9704			
CTD/Rosette			
SBE 9/11 plus	P	64853	21 August 1996
	T1	2034	06 July 1996
	T2	2107	09 July 1996
	C1	1745	23 July 1996
	C2	200	06 February 1997
SeaSoar CTD			
SBE 9/11 plus, SN 428	P	64256	28 November 1995
	T1	2127	26 October 1996
	T2	2128	26 October 1996
	C1	1737	10 October 1996
	C2	1738	10 October 1996

sample and CTD conductivity differences showed no conductivity corrections were needed for the primary sensors for either E9608 or E9704 (Table 6).

CTD data were processed on an IBM-compatible PC using applicable SEASOFT modules. Data from the primary sensors were used for final processing for all CTD stations. The DATCNV module of SEASOFT was used with the pre-cruise calibration constants to calculate 24-Hz values of pressure, temperature and conductivity from the raw frequencies. When necessary, the output data file was edited to remove any spikes and any values inadvertently recorded before the pressure minimum at the beginning of the cast. The CELLTM module was used to correct for the thermal mass of the conductivity cell, assumed to have a thermal anomaly amplitude of 0.03 and a time constant of 9 seconds. Ascending portions of the 24-Hz data file were removed by LOOPEDIT with the minimum velocity set to 0.0 m s^{-1}. The remaining data were averaged to 1-db values using BINAVG. The final processed data files consist of 1-db values of pressure, temperature and conductivity. These processed data files were transferred to a SUN computer where we used standard algorithms (Fofonoff and Millard, 1983) to calculate salinity, potential temperature, density anomaly (sigma-theta), specific volume anomaly, and geopotential anomaly (dynamic height).

SeaSoar Data Acquisition and At-Sea Processing

The Chelsea Instruments SeaSoar vehicle was equipped with a SBE 9/11-plus CTD with dual temperature and conductivity sensors (Table 5). The inlets and outlets of both dual T/C ducts were plumbed pointing forward through a hole in the nose of the SeaSoar (Figure 4) (Barth et al., 1996). Data from the FlashPak fluorometer was sent through one of the available A/D channels on the CTD.

Raw 24-Hz CTD data from the SeaSoar vehicle were logged and distributed by a PC-based acquisition system. The acquisition software allowed for user placement of flags in the data stream to mark the collection of salinity samples from the R/V Endeavor flow-through system, and to mark heading changes along sampling lines. The software also automaticly set flags to indicate missing GPS data from a designated serial stream. In the first survey (E9608) it was necessary to record the GPS stream on another computer system, and then to merge it with the CTD data using a common time base in a post-processing step. In

Table 6: Results of *in situ* calibration samples for CTD/Rosette sensor pair S1 for E9608 and E9704: Station number (Sta), number of samples (N), and the average and standard deviations of the conductivity and salinity differences between the sample values and the corrected CTD data.

Sta	N	Average C1	Std. Dev. C1	Average S1	Std. Dev. S1
E9608 1-46	49	0.001	0.015	0.001	0.015
E9704 1-16	25	0.000	0.004	0.000	0.005

the second survey (E9704) the GPS data was logged by the CTD acquisition system as an incoming serial stream.

The acquisition system logged the raw 24-Hz data and any additional serial streams onto an external disk (a removable optical disk in E9608, and a JAZ disk in E9704). This file was also echoed to a SUN SPARCstation by serial stream, which logged a redundant copy to another external disk (either optical or JAZ). The SPARCstation further processed the data in real-time, producing one-second averages of the CTD data and any recorded A/D channels. Position information was supplied by the GPS data, if it were already present, or was inserted in a post-processing step. For real-time examination of the data, fixed offsets between the T and C time series were applied, along with fixed amplitudes and time constants for the thermal mass corrections.

Time-series and vertical profile plots of the one-second data were made at the end of each hour for science analysis and to monitor data quality. The 1-Hz real-time data were used to calculate five-minute average temperature and salinity values in two-db vertical bins. These gridded values were used for at-sea analysis of the changing three-dimensional structure observed in the small and large box areas.

SeaSoar Temperature and Conductivity Calibration

For the August, 1996 survey (E9608), the SBE temperature and conductivity sensors used calibration values obtained by SeaBird Electronics in March of 1996. Then, in October following the survey, these sensors were calibrated again by SeaBird Electronics in preparation for the E9704 survey. Both surveys thus used very recent pre-cruise calibrations, obtained directly from the manufacturer of the sensors.

Post-processing of SeaSoar Data

Salinity data derived from SeaBird ducted temperature and conductivity sensors are subject to errors from three separate sources (Larson, 1992): (1) poor alignment of the 24-Hz temperature and conductivity data, (2) poor compensation for the transfer of heat between the mantle of the conductivity cell and the water flowing through it, and (3) mismatch of the effective time constants of the temperature and conductivity measurements. High-speed pumps, ducted-flow geometry, and sensor design to match response times are hardware measures which help to reduce these errors. Software is then used to align the temperature and conductivity data by some offset (typically 1.75 scans); a two-point recursive formula is applied to correct for the thermal mass of the conductivity cell (Lueck, 1990); and, in the case where one wishes to examine fine-scale features with high-frequency data, digital filtering can be applied to assure response function matching between the temperature and conductivity sensors (N. Larson, 1992, personal communication). For the results reported here, only the thermal mass correction and the offset between T and C need to be addressed in post-processing.

The primary complication for processing CTD data from the SeaSoar is that the sensors may experience a variable flow rate (Huyer *et al*, 1993). Although this variability is diminished with the use of the forward pointing sensors, it is still present in the data (Barth *et*

al, 1996). Variable flow rate has been attributed to dynamic pressure differences, partly between the inside and outside of the vehicle and partly along the exterior of the vehicle nose where duct inlet and outlet ports may be on different streamlines. Possible sources of such pressure gradients include high dive/climb rates (sometimes greater than 3 m s^{-1}, superimposed on a horizontal tow speed of 4 m s^{-1} and perturbations of the flow field around the vehicle, associated perhaps with a persistent roll angle or strong cross-currents. Rather than having a constant offset between the T and C signals, we must correct for a variable lag. The variable flow rate also impacts the thermal mass correction, where the amplitude and time constant of the correction are inversely proportional to flow rate (Lueck, 1991; Morrison *et al*, 1994). In addition, biological fouling can further impact the calculated lags between T and C, independent of flow rate. The time response of the thermistor can be changed due to partial fouling, resulting in an offset in the observed lags between T and C (Kosro *et al*, 1995) which returns to normal if the fouling clears. Also, in environments where growth is possible, the time response can gradually change over a period of days. Such fouling often precludes the use of data from those sensors.

Because of the repeated sampling of the water column by the SeaSoar, it is possible to examine the T-S plots of consecutive profiles to determine the effects of the thermal mass correction. This was done qualitatively in previous reports to determine the scaling of the amplitude of the thermal mass correction (alpha) to the observed lags, given a fixed time constant (tau) (Huyer *et al*, 1993; Kosro *et al*, 1995). Now we do it quantitatively (Barth, *et al* 1996) and allow both alpha and tau to be variables, which is consistent with Morrison *et al* (1994). Using the hourly T-S diagrams we now optimize for the proportionality of alpha and tau to the lags (described below).

Before the data can be post-processed, three preliminary steps are required: (1) the sensors are calibrated (described earlier) using *in situ* data and/or recent calibrations from the manufacturer, (2) the time-series of lags between 24-Hz temperature and conductivity data are computed and cleaned (see below), and (3) the optimal proportionality values between the observed lags and the thermal mass correction variables are determined. Once these steps are completed, the SeaSoar data can be post-processed. The final calibration values are used for the sensors; the time-series of lags are used to offset the temperature and conductivity signals; and a thermal mass correction is applied to the data, where the thermal mass variables alpha and tau are scaled proportional to the observed lags. The final data are output as 1-Hz values, using a 24-point boxcar filter.

There was one additional preliminary step required due to the use of the MODAPS (and MODAPS+) data communication modules in these surveys. The CTD scans arrive with a modulus number attached indicating the scan number. This number goes from 0 to 255 and then wraps around again to 0. With 24-Hz data, slightly more than 10 seconds of consecutive scans are received before the scan number gets re-used. One of the problems that showed up with respect to the MODAPS was that the processor in the deckunit emulator could not keep up with the data rate. It periodicly had jumps in the scan number indicating places where scans were dropped. The jump in the scan number indicates how many records have been lost, and the gap can be accounted for (assuming no more than ten seconds have passed in the break). At the same time, however, there were intermittent "fossil scans" left in the processor stream that should not have been there (always two scans that were out of order

and shouldn't have been there). These skips in the scan sequence had to be recognized as spurious data, and ignored in the processing. Finally, those cases where the MODAPS went through resets needed to be identified, so that those gaps in excess of ten seconds could be recognized.

Use and cleaning of the time-series of lags between first-differenced temperature and conductivity has been described in previous reports (e.g. Huyer *et al.*, 1993). In general, a single depth zones was used for the SeaSoar, extending from 10 meters down to 90 meters. A second zone was used for the deeper big box surveys, for those values greater than 90 meters. Lags are calculated in these zones for ascending and descending trajectories. The lags are then cleaned by discarding outliers from data segments of short duration and/or having relatively low correlation coefficients, and replacing them with local estimates of the lag based on nearby values; the lags are applied throughout the complete SeaSoar trace. Once the lags were calculated, they were examined to determine the preferred sensor pair. It has been our experience that the sensor pair with the least noisy time-series of lags also yields the most reliable T-S diagrams. The final lags for the preferred sensor pair of each tow are shown in the Appendix.

To apply a thermal mass correction we follow Lueck (1991) who presented a two-point recursive formula involving an amplitude (alpha) and a time constant (tau). We implement this with a recursive algorithm provided by SeaBird:

$$\Delta C_n = -bC_{n-1} + a(dC/dT)(T_n - T_{n-1}),$$

where

$$a = 2\alpha/(2 + \beta\Delta t)$$
$$b = 1 - 2a/\alpha$$
$$\beta = 1/\tau$$
$$dC/dT = 0.1(1 + 0.006(T_n - 20)),$$

and ΔC_n is the conductivity correction at time n, C_{n-1} is the conductivity (in S m^{-1}) at the preceding time, T_n and T_{n-1} are the temperatures (°C) at times n and $n-1$, and Δt is the time between scans (1/24 sec). The amplitude of the correction is α, and τ denotes the time constant.

Lueck suggested that α was inversely proportional to flow rate, and that τ was weakly proportional to the inverse of the flow rate. Morrison *et al* (1994) developed this further: α is inversely proportional as before, but now τ is inversely proportional to the square root of the flow rate. In our data, the observed T-C lag is also inversely proportional to flow rate. Note that if α is proportional to 1/V, and 1/V is proportional to the lag, then α is also proportional to the lag; therefore α and τ can instead be posed in terms of the lag: α is now directly proportional to the T-C lag, and τ is directly proportional to the square root of the lag. The advantage in doing this is that lag values are readily observable from the data while flow rates are not.

Suppose we did not correct for the thermal mass of the conductivity cell. During a down trace the cell would be warmer than the water and would be leaking heat into the water within the conductivity cell; the measured conductivity would then be higher than the conductivity

of the surrounding water. If no thermal mass correction is applied, then salinity is too high during descent, and too low during ascent. This has the appearance of a hysteresis loop when plotted on a T-S diagram. If a thermal mass correction is applied by systematicly increasing alpha and tau, the hysteresis loop would diminish until the up-trace lies on top of the down-trace, yielding the best estimates for α and τ. If the thermal mass correction is too strong (α and τ too large, for instance) the hysteresis loop would reappear on the other side, with the salinity now too low during descent.

If we calculate the area (in T-S space) between successive up- and down-traces, then the optimal thermal mass correction is the one which minimizes this area; we would then have the proper settings for α and τ. Since α and τ are both proportional to the observed lags but with the possibility of a constant offset, we seek optimal settings for the slopes and offsets of α and τ.

$$\alpha = \alpha_{\text{offset}} + (\alpha_{\text{slope}} * lag)$$

$$\tau = \tau_{\text{offset}} + (\tau_{\text{slope}} * \sqrt{lag})$$

If we consider the area in T-S space as our function and the slopes and offsets as variables, optimal settings are found by minimizing the function of four variables. There are well established routines for this. We chose to use one from the International Math and Science Library (IMSL) which uses a quasi-Newton method and a finite-difference gradient (routine UMINF).

Test hours were chosen for the two different sensor pairs used in these cruises (see Table 4), and for the use of different deckunits (MODAPS or SBE). This test data set was then processed with an initial slope and offset for alpha and tau, and the area in T-S space between successive up- and down-traces was computed for each of the hours, and then summed as a whole. The IMSL routine was used to vary the values for the slopes and offsets until a minimum of the summed area was found. These slopes and offsets which minimized the area for the test data were then applied as the settings for the appropriate tows. The results are summarized in Table 7.

This technique worked except in two special cases, present in both surveys. In these cases, the lags actually become negative, and there was no closure on the T-S diagrams using the above methods. Two different techniques were applied in an attempt to deal with these sections. Given the negative values of the lags, the dependence of alpha and tau on lag was removed, and optimization for the best constant alpha and tau was calculated, and T-S diagrams produced. The other technique allowed alpha to be negative, and let tau approach zero (but not become negative). While this approach was applied as broadly as possible, in some cases the optimized fit had to be calculated for every hour of these problem areas. This type of processing needed to be applied to the E9608 survey for tow 13, 14, and the last seven hours of tow 15. This is about 20% of the total E9608 processing. The results for the non-standard processing are summarized in Table 7a and Table 7b.

Using the variable lags (shown in the Appendix) and the thermal mass slopes and offsets (Table 7), realigned and corrected 24-Hz temperature and conductivity data were obtained

and used to calculate 24-Hz salinity, and these were averaged to yield 1-Hz values stored in hourly files. An automated cleaning was then applied which checked the difference of the primary and secondary sensor salinity estimates against the average and standard deviation of that same difference for the entire tow. This was done until the minimum and maximum differences were within about seven standard deviations of the mean. Hand cleaning the T-S diagrams, whereby obvious outliers in T-S space were removed, then followed.

Table 7: Optimized thermal mass corrections.

survey	tow	preferred sensor	α slope	α offset	τ slope	τ offset
E9608						
	1-4	primary	3.63986E-03	8.17338E-03	1.34045	7.15313
	5-11	secondary	1.36112E-02	9.42820E-04	1.31194	7.14569
	12	primary	3.45307E-04	7.28931E-03	1.34034	7.14983
	13	primary	—	*see Table 7a*	—	—
	14	primary	—	*see Table 7b*	—	—
	15	primary	—	*see Table 7b*	—	—
E9704						
	1,3,7,11	primary	4.57995E-03	9.05908E-03	1.35344	7.13541
	2,4-6,8-10	secondary	1.05232E-02	4.73931E-03	1.32314	7.14211

Table 7: a: Optimized thermal mass corrections: E9608 tow 13.

survey	tow	preferred sensor	α slope	α offset	τ slope	τ offset
E9608						
tow	**13**	primary				
29 Aug	until	09:00	0.0	4.01268E-03	0.0	10.04491
		11:00	0.0	2.94549E-03	0.0	7.62696
		12:00	0.0	4.75136E-03	0.0	17.7352
		13:00	0.0	4.75136E-03	0.0	11.1047
		14:00	0.0	1.39790E-03	0.0	7.23991
		15:00	0.0	-2.65650E-05	0.0	7.18746
		16:00	0.0	4.89696E-03	0.0	16.5150
		17:00	0.0	1.85687E-03	0.0	7.06793
		18:00	0.0	9.14342E-04	0.0	7.04713
		19:00	0.0	-2.69090E-03	0.0	5.44722
		20:00	0.0	-3.57582E-03	0.0	4.97589
		21:00	0.0	-3.69797E-03	0.0	6.24787
		22:00	0.0	-2.38152E-02	0.0	0.671557
30 Aug	until	00:00	0.0	-1.42138E-03	0.0	6.74673
		02:00	0.0	-0.288972	0.0	0.169528
		03:00	0.0	-0.436084	0.0	0.124113
		04:00	0.0	-0.247314	0.0	0.167259
		06:00	0.0	-0.332755	0.0	0.135383
		07:00	0.0	-0.278772	0.0	0.170762
		08:00	0.0	-0.138776	0.0	0.361698
		09:00	0.0	-0.674390	0.0	8.71068E-2
		11:00	0.0	-0.394545	0.0	0.143963
		end of tow	0.0	-0.305679	0.0	0.168227

Table 7: b: Optimized thermal mass corrections: E9608 tow 14 and 15.

survey	tow	preferred sensor	α slope	α offset	τ slope	τ offset
E9608						
tow	**14**	primary				
30 Aug	until	15:00	-3.27199E-03	1.90969E-02	1.29791	7.16333
		16:00	1.62853E-02	-6.81579E-03	1.29179	7.15007
		16:56	6.58852E-03	-1.73048E-04	2.07760	7.54586
		17:00	-3.94587E-02	1.81899E-02	1.26932	7.20417
		18:00	-3.77518E-02	2.26998E-02	1.23127	7.79208
		19:00	-8.00649E-03	7.48899E-03	0.216862	13.9549
		19:28	-1.69879E-02	5.11229E-03	1.28057	7.22541
		20:00	0.0	-0.350919	0.0	0.126464
		21:00	-1.69879E-02	5.11229E-03	1.28057	7.22541
31 Aug		02:00	2.23209E-03	9.07206E-03	-0.600963	11.6064
		05:00	-7.74393E-03	1.14100E-02	1.94850	14.5282
		07:00	-4.67418E-03	7.56242E-03	2.07646	7.87831
		end of tow	2.48708E-03	3.93080E-03	2.70567	9.34682
E9608						
tow	**15**	primary				
01 Sep	until	04:00	3.45307E-04	7.28931E-03	1.34034	7.14983
		05:00	-1.92784E-03	1.00920E-02	1.65121	12.9506
		06:00	1.18881E-02	2.88564E-04	1.27599	7.65739
		08:00	5.43742E-03	4.33544E-03	1.33822	7.14737
		08:06	1.90066E-03	1.17213E-02	1.54842	7.15094
		08:50	-1.63035E-02	1.45706E-02	1.34064	7.15013
		09:00	5.55474E-02	-9.97840E-03	1.37425	7.33695
		11:00	-2.17150E-02	1.13343E-02	1.26706	7.33247
		end of tow	-3.69925E-02	1.46555E-02	1.33918	7.12958

Data Presentation

The final 1-Hz data files contain unfiltered GPS latitude and longitude; pressure; temperature, salinity and sigma-t from the preferred sensor pair; date and time (in both decimal day-of-year and integer year, month, day, hour, minute, second); an integer representing various flags (thousands digit of 1 indicates collection of a water sample from the 5-m intake, hundreds digit of 1 indicates the beginning of a new ascending or descending profile, tens digit of 1 indicates missing GPS data filled by linear interpolation, and ones digit indicates preferred sensors from the port side (0) or the starboard side (1) of the forward-pointing intakes); and voltage (0-5 volts) from the WETLabs FlashPak.

In the body of this report, we summarize the results of the conventional CTD casts and the thermohaline data from the SeaSoar tows. For the CTD stations, we provide plots of the vertical profiles of temperature, salinity, and sigma-t and listings of observed and calculated variables at standard pressures.

For the SeaSoar observations, we split the tow data into the small box and big box surveys. See Table 8 and Figure 9 for the E9608 survey, and Table 9 and Figure 10 for the E9704 survey. Sections which connect one box to another were used in the maps for both boxes. Maps of temperature, salinity, and sigma-t are shown for every ten meters between 5 and 75 meters depth for the small box surveys; the big box surveys continue that down to 105 meters. Data used in the maps were obtained by first binning the data into 2-db bins in the vertical, and 1.25 km bins in the horizontal. Then, the depth of interest was extracted from the appropriate sections for the maps. Contour maps were then created by gridding these data using "zgrid" (Crain, 1968, unpublished). The small box grid used a spacing of 0.025° longitude (2.13 km) in E-W spacing, and 0.0125° latitude (1.4 km) in N-S spacing, while the big box grids used twice that (0.05° = 4.25 km E-W and 0.025° = 2.8 km N-S spacing). Any grid point more that two grid spaces away from a data point was set to be undefined.

Vertical sections of temperature, salinity and sigma-t are shown for each of the SeaSoar lines. These sections are countoured using "zgrid" from the 1.25-km, 2-db averaged data.

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Table 8: E9608 Section Times

	section name	start time	stop time
Small Box 1	line1	15-Aug-96 23:20:18	16-Aug-96 01:59:54
	line1_2	16-Aug-96 01:59:55	16-Aug-96 02:23:46
	line2	16-Aug-96 02:39:56	16-Aug-96 04:19:04
	line2_3	16-Aug-96 04:19:05	16-Aug-96 04:44:54
	line3	16-Aug-96 04:44:55	16-Aug-96 07:01:37
	line3_4	16-Aug-96 07:01:38	16-Aug-96 07:30:59
	line4a	16-Aug-96 07:31:00	16-Aug-96 08:36:09
	line4b	16-Aug-96 09:39:42	16-Aug-96 10:35:54
	line4_5	16-Aug-96 10:35:55	16-Aug-96 11:13:50
	line5	16-Aug-96 11:13:51	16-Aug-96 13:10:14
	line5_6	16-Aug-96 13:10:15	16-Aug-96 13:38:06
	line6	16-Aug-96 13:38:07	16-Aug-96 15:27:16
Big Box 1	lineF	17-Aug-96 02:00:01	17-Aug-96 06:10:49
	lineE_F	17-Aug-96 06:10:50	17-Aug-96 07:00:21
	lineE	17-Aug-96 07:00:22	17-Aug-96 12:42:01
	lineD_E	17-Aug-96 12:50:43	17-Aug-96 13:42:58
	lineD	17-Aug-96 13:42:59	17-Aug-96 19:24:19
	lineC_D	17-Aug-96 19:24:20	17-Aug-96 20:11:58
	lineC	17-Aug-96 20:11:59	18-Aug-96 00:36:39
	lineB_C	18-Aug-96 00:36:40	18-Aug-96 01:28:16
	lineB	18-Aug-96 01:28:17	18-Aug-96 07:21:50
	bb1_sb2	18-Aug-96 08:28:01	18-Aug-96 09:07:44
Small Box 2	line1	18-Aug-96 09:35:18	18-Aug-96 11:31:21
	line1_2	18-Aug-96 11:31:22	18-Aug-96 11:59:06
	line2	18-Aug-96 11:59:07	18-Aug-96 13:44:25
	line2_3	18-Aug-96 13:44:26	18-Aug-96 14:12:57
	line3	18-Aug-96 14:12:58	18-Aug-96 16:06:00
	line3_4	18-Aug-96 17:07:09	18-Aug-96 17:35:17
	line4	18-Aug-96 18:02:09	18-Aug-96 19:42:21
	line4_5	18-Aug-96 19:42:22	18-Aug-96 20:06:23
	line5	18-Aug-96 21:06:45	18-Aug-96 23:12:05
	line5_6	18-Aug-96 23:12:06	18-Aug-96 23:46:51
	line6	18-Aug-96 23:46:52	19-Aug-96 01:45:26
	sb2_sb3	19-Aug-96 01:45:27	19-Aug-96 03:08:38
Small Box 3	line6	20-Aug-96 01:39:27	20-Aug-96 03:27:23
	line5_6	20-Aug-96 03:27:24	20-Aug-96 03:56:24
	line5	20-Aug-96 03:56:25	20-Aug-96 05:40:13
	line4_5	20-Aug-96 05:40:14	20-Aug-96 06:04:19
	line4	20-Aug-96 06:04:20	20-Aug-96 07:51:16
	line3_4	20-Aug-96 07:51:17	20-Aug-96 08:17:15
	line3	20-Aug-96 08:17:16	20-Aug-96 10:05:16
	line2_3	20-Aug-96 10:05:17	20-Aug-96 10:30:04
	line2	20-Aug-96 10:30:05	20-Aug-96 12:13:46
	line1_2	20-Aug-96 12:13:47	20-Aug-96 12:48:18
	line1	20-Aug-96 12:48:19	20-Aug-96 14:40:19

Table 8 (continued): E9608 Section Times

	section name	start time	stop time
Big Box 2	lineA	20-Aug-96 17:03:21	20-Aug-96 22:18:46
	lineA_B	20-Aug-96 22:18:47	20-Aug-96 23:06:20
	lineB	20-Aug-96 23:06:21	21-Aug-96 04:53:03
	lineB_C	21-Aug-96 04:53:04	21-Aug-96 05:43:16
	lineC1	21-Aug-96 05:43:17	21-Aug-96 11:11:17
	lineC2	21-Aug-96 13:01:22	21-Aug-96 19:35:29
	lineC_D	21-Aug-96 19:35:30	21-Aug-96 20:23:40
	lineD	21-Aug-96 20:23:41	21-Aug-96 21:58:43
Small Box 4	line6	24-Aug-96 20:01:44	24-Aug-96 22:14:03
	line5_6	24-Aug-96 22:14:04	24-Aug-96 22:42:18
	line5	24-Aug-96 22:42:19	25-Aug-96 00:27:36
	line4_5	25-Aug-96 00:27:37	25-Aug-96 00:51:36
	line4	25-Aug-96 00:51:37	25-Aug-96 02:37:21
	line3_4	25-Aug-96 02:37:22	25-Aug-96 03:01:10
	line3	25-Aug-96 03:01:11	25-Aug-96 04:55:27
	line2_3	25-Aug-96 04:55:28	25-Aug-96 05:18:58
	line2	25-Aug-96 05:18:59	25-Aug-96 07:07:04
	line1_2	25-Aug-96 07:07:05	25-Aug-96 07:30:20
	line1	25-Aug-96 07:30:21	25-Aug-96 09:21:25
	sb4_sb5	25-Aug-96 09:21:26	25-Aug-96 11:34:55
Small Box 5	line6	25-Aug-96 11:34:56	25-Aug-96 13:31:44
	line5_6	25-Aug-96 13:31:45	25-Aug-96 13:59:09
	line5	25-Aug-96 13:59:10	25-Aug-96 15:52:39
	line4_5	25-Aug-96 15:52:40	25-Aug-96 16:17:11
	line4	25-Aug-96 16:17:12	25-Aug-96 18:14:59
	line3_4	25-Aug-96 18:15:00	25-Aug-96 18:38:20
	line3	25-Aug-96 18:38:21	25-Aug-96 20:24:41
	line2_3	25-Aug-96 20:24:42	25-Aug-96 20:51:21
	line2	25-Aug-96 20:51:22	25-Aug-96 22:48:44
	line1_2	25-Aug-96 22:48:45	25-Aug-96 23:14:43
	line1	25-Aug-96 23:14:44	26-Aug-96 01:05:56
	sb5_sb6	26-Aug-96 01:05:57	26-Aug-96 03:11:38
Small Box 6	line6	26-Aug-96 03:11:39	26-Aug-96 04:55:38
	line5_6	26-Aug-96 04:55:39	26-Aug-96 05:20:15
	line5	26-Aug-96 05:20:16	26-Aug-96 07:08:54
	line4_5	26-Aug-96 07:08:55	26-Aug-96 07:31:14
	line4	26-Aug-96 07:31:15	26-Aug-96 09:30:49
	line3_4	26-Aug-96 09:30:50	26-Aug-96 09:57:15
	line3	26-Aug-96 09:57:16	26-Aug-96 11:48:17
	line2_3	26-Aug-96 11:48:18	26-Aug-96 12:14:25
	line2	26-Aug-96 12:14:26	26-Aug-96 14:21:14
	line1_2	26-Aug-96 14:21:15	26-Aug-96 14:48:22
	line1	26-Aug-96 14:48:23	26-Aug-96 16:53:29
Butterfly 1	weA	26-Aug-96 23:59:40	27-Aug-96 00:59:48
	weB	27-Aug-96 04:05:59	27-Aug-96 05:25:22
	en	27-Aug-96 05:25:23	27-Aug-96 07:16:07
	ns	27-Aug-96 07:16:08	27-Aug-96 09:46:25
	sw	27-Aug-96 09:46:26	27-Aug-96 11:12:19

Table 8 (continued): E9608 Section Times

	section name	start time	stop time
Butterfly 2	we	27-Aug-96 11:12:20	27-Aug-96 14:15:11
	en0	27-Aug-96 14:15:12	27-Aug-96 14:51:30
	en1	27-Aug-96 14:51:31	27-Aug-96 15:22:20
	en	27-Aug-96 15:22:21	27-Aug-96 17:31:05
	ns	27-Aug-96 17:31:06	27-Aug-96 20:00:15
	sw	27-Aug-96 20:00:16	27-Aug-96 21:28:56
Butterfly 3	we	27-Aug-96 23:52:14	28-Aug-96 02:36:24
	en	28-Aug-96 02:36:25	28-Aug-96 04:48:56
	ns	28-Aug-96 04:48:57	28-Aug-96 07:19:26
	sw	28-Aug-96 07:19:27	28-Aug-96 08:51:39
Butterfly 4	line1_4	28-Aug-96 09:41:28	28-Aug-96 11:09:23
	ns	28-Aug-96 11:09:24	28-Aug-96 14:53:05
	sn	28-Aug-96 14:53:06	28-Aug-96 17:09:54
Solitons	a	28-Aug-96 17:09:55	28-Aug-96 17:50:39
	b	28-Aug-96 17:50:40	28-Aug-96 18:17:37
	b_c	28-Aug-96 18:17:38	28-Aug-96 18:22:15
	c	28-Aug-96 18:22:16	28-Aug-96 18:58:20
	d	28-Aug-96 18:58:21	28-Aug-96 19:26:34
	e	28-Aug-96 19:26:35	28-Aug-96 19:50:45
	f	28-Aug-96 19:50:46	28-Aug-96 20:15:42
	g	28-Aug-96 20:15:43	28-Aug-96 21:00:00
	h	28-Aug-96 21:00:01	28-Aug-96 22:22:00
	i	28-Aug-96 22:22:01	28-Aug-96 23:36:58
	j	28-Aug-96 23:36:59	29-Aug-96 00:02:32
	k	29-Aug-96 00:02:33	29-Aug-96 00:18:30
	l	29-Aug-96 00:18:31	29-Aug-96 00:23:41
Small Box 7	line6	29-Aug-96 04:00:03	29-Aug-96 05:53:19
	line5_6	29-Aug-96 05:53:20	29-Aug-96 06:21:21
	line5	29-Aug-96 06:55:17	29-Aug-96 09:03:37
	line4_5	29-Aug-96 09:03:38	29-Aug-96 09:28:10
	line4	29-Aug-96 09:28:11	29-Aug-96 11:33:18
	line3_4	29-Aug-96 11:33:19	29-Aug-96 11:59:58
	line3	29-Aug-96 11:59:59	29-Aug-96 13:52:43
	line2_3	29-Aug-96 13:52:44	29-Aug-96 14:18:42
	line2	29-Aug-96 14:18:43	29-Aug-96 16:14:56
	line1_2	29-Aug-96 16:14:57	29-Aug-96 16:42:12
	line1	29-Aug-96 16:42:13	29-Aug-96 18:50:35
	sb7_sb8	29-Aug-96 18:50:36	29-Aug-96 21:17:35
Small Box 8	line6	29-Aug-96 21:17:36	29-Aug-96 23:24:30
	line5_6	29-Aug-96 23:24:31	29-Aug-96 23:53:13
	line5	29-Aug-96 23:53:14	30-Aug-96 01:44:01
	line4_5	30-Aug-96 01:44:02	30-Aug-96 02:09:33
	line4	30-Aug-96 02:09:34	30-Aug-96 04:10:58
	line3_4	30-Aug-96 04:10:59	30-Aug-96 04:38:14
	line3	30-Aug-96 04:38:15	30-Aug-96 06:52:04
	line2_3	30-Aug-96 06:52:05	30-Aug-96 07:19:44
	line2	30-Aug-96 07:19:45	30-Aug-96 09:16:53
	line1_2	30-Aug-96 09:16:54	30-Aug-96 09:43:08
	line1	30-Aug-96 10:06:17	30-Aug-96 12:10:57

Table 8 (continued): E9608 Section Times

	section name	start time	stop time
Small Box 9	line6	30-Aug-96 14:52:14	30-Aug-96 16:51:13
	line5_6	30-Aug-96 16:51:14	30-Aug-96 17:19:02
	line5	30-Aug-96 17:19:03	30-Aug-96 19:23:28
	line4_5	30-Aug-96 19:23:29	30-Aug-96 19:53:05
	line4	30-Aug-96 19:53:06	30-Aug-96 21:45:12
	line3_4	30-Aug-96 21:45:13	30-Aug-96 22:08:56
	line3	30-Aug-96 22:08:57	30-Aug-96 23:59:22
	line2_3	30-Aug-96 23:59:23	31-Aug-96 00:26:12
	line2	31-Aug-96 00:26:13	31-Aug-96 02:29:09
	line1_2	31-Aug-96 02:29:10	31-Aug-96 02:57:00
	line1	31-Aug-96 02:57:01	31-Aug-96 04:53:39
	sb9_bb3	31-Aug-96 04:53:40	31-Aug-96 05:49:02
Big Box 3	lineC0	31-Aug-96 05:49:03	31-Aug-96 08:02:39
	lineC1	31-Aug-96 09:00:40	31-Aug-96 14:28:56
	lineC_Ds	31-Aug-96 14:28:57	31-Aug-96 15:19:51
	lineDs	31-Aug-96 15:23:45	31-Aug-96 19:00:59
	lineD_Es	31-Aug-96 19:01:00	31-Aug-96 20:06:29
	lineEs	31-Aug-96 20:06:30	31-Aug-96 23:29:47
	lineE_Fs	31-Aug-96 23:29:48	01-Sep-96 00:21:49
	lineF	01-Sep-96 00:21:50	01-Sep-96 04:46:06
	lineE_Fn	01-Sep-96 04:46:07	01-Sep-96 05:37:24
	lineEn	01-Sep-96 05:37:25	01-Sep-96 06:13:59
	lineD_En	01-Sep-96 06:14:00	01-Sep-96 07:05:38
	lineDn	01-Sep-96 07:05:39	01-Sep-96 07:45:11
	lineC_Dn	01-Sep-96 07:45:12	01-Sep-96 08:32:33
	lineC2	01-Sep-96 08:32:34	01-Sep-96 11:08:14

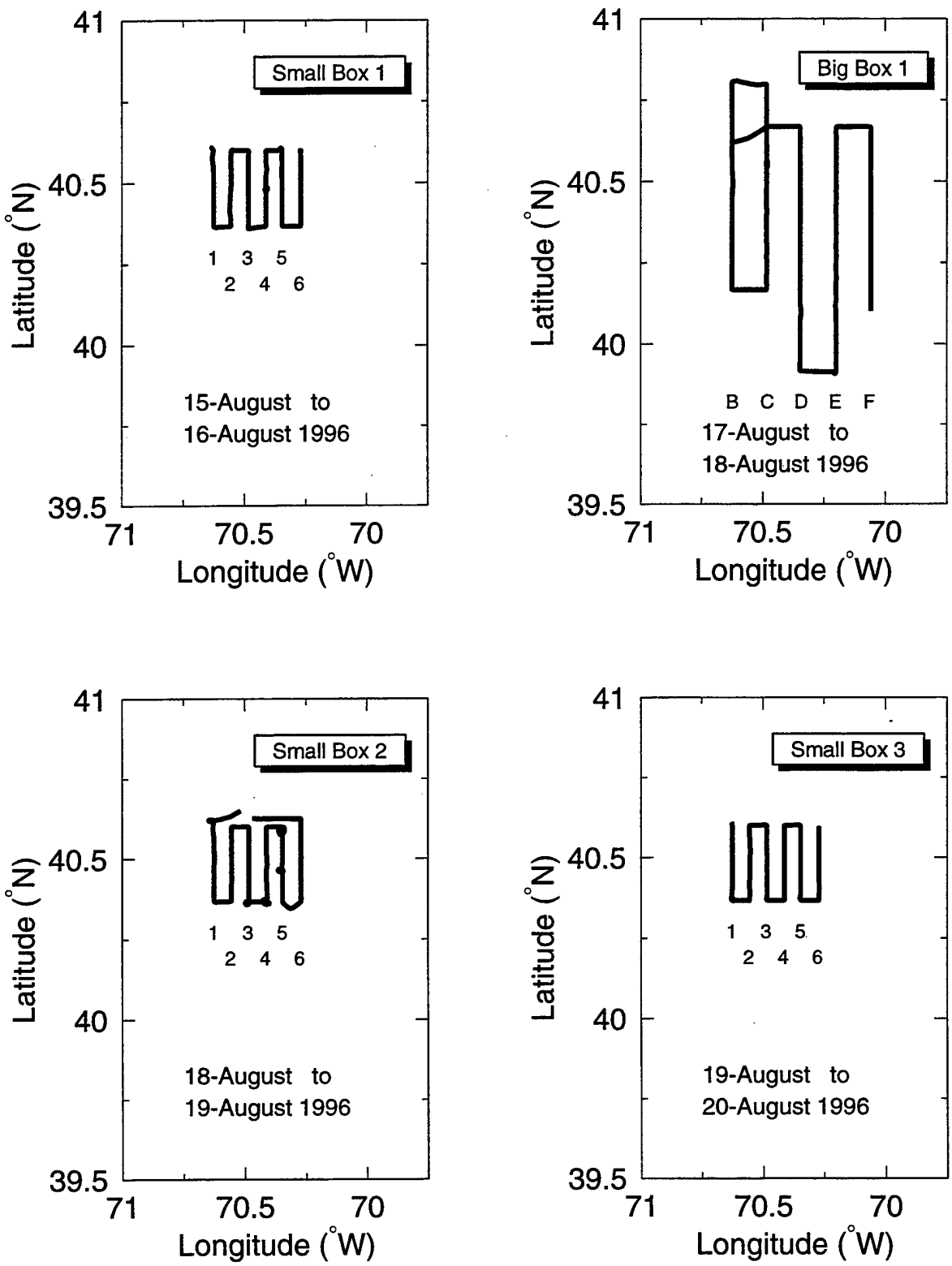

Figure 9: a: Cruise tracks during the E9608 SeaSoar surveys. See Table 8 for individual line start and stop times.

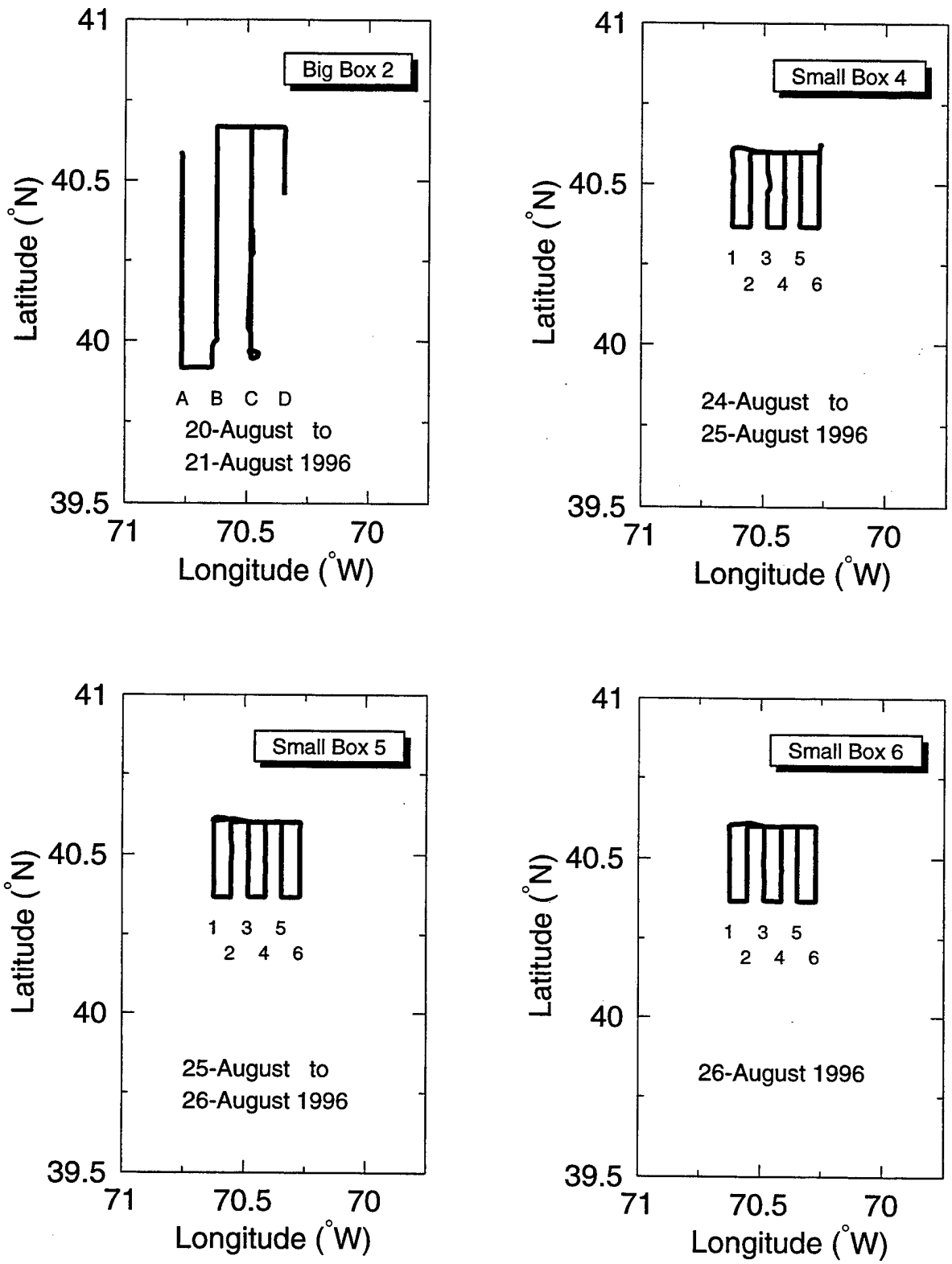

Figure 9: b: Cruise tracks during the E9608 SeaSoar surveys. See Table 8 for individual line start and stop times.

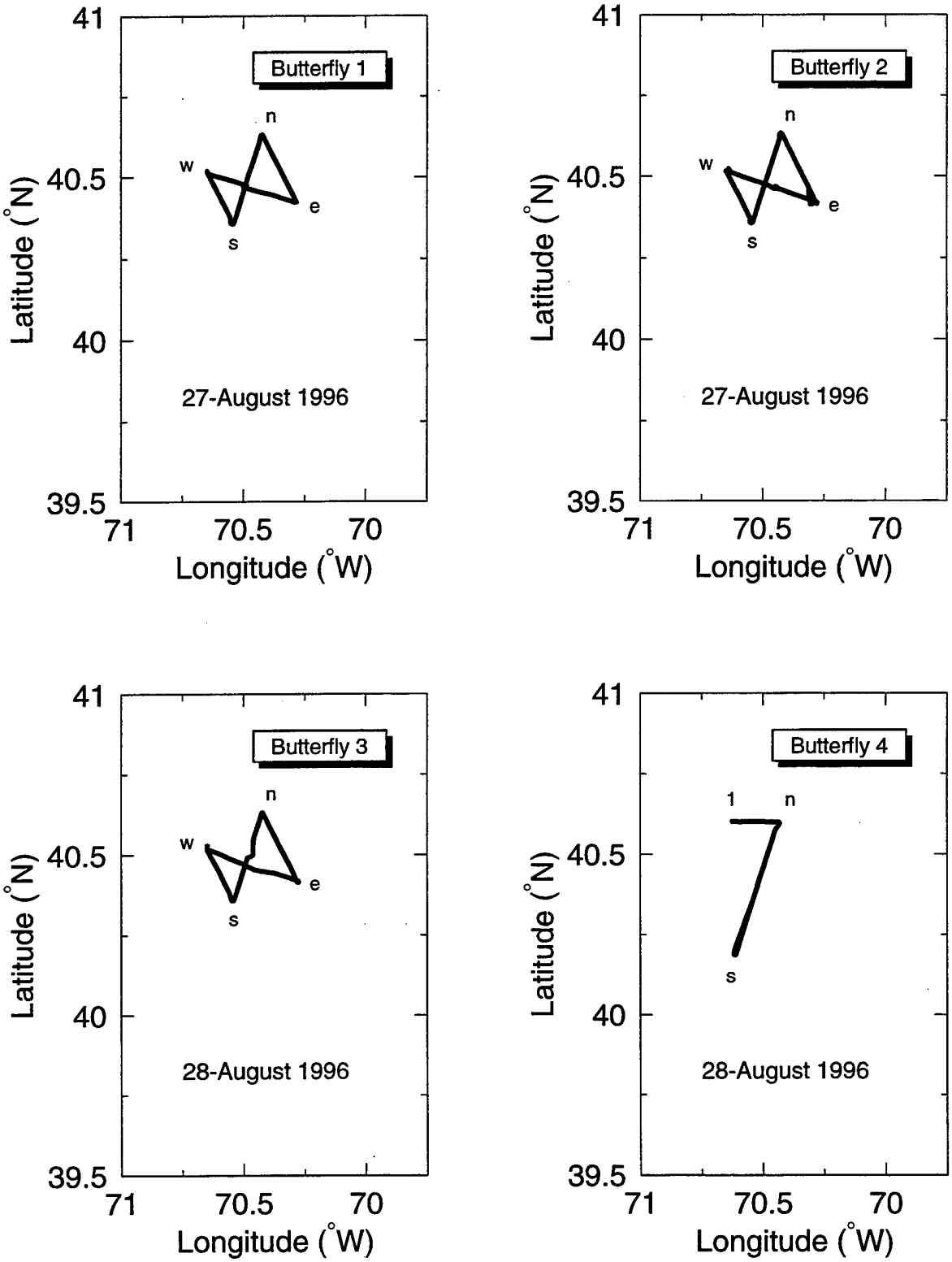

Figure 9: c: Cruise tracks during the E9608 SeaSoar surveys. See Table 8 for individual line start and stop times.

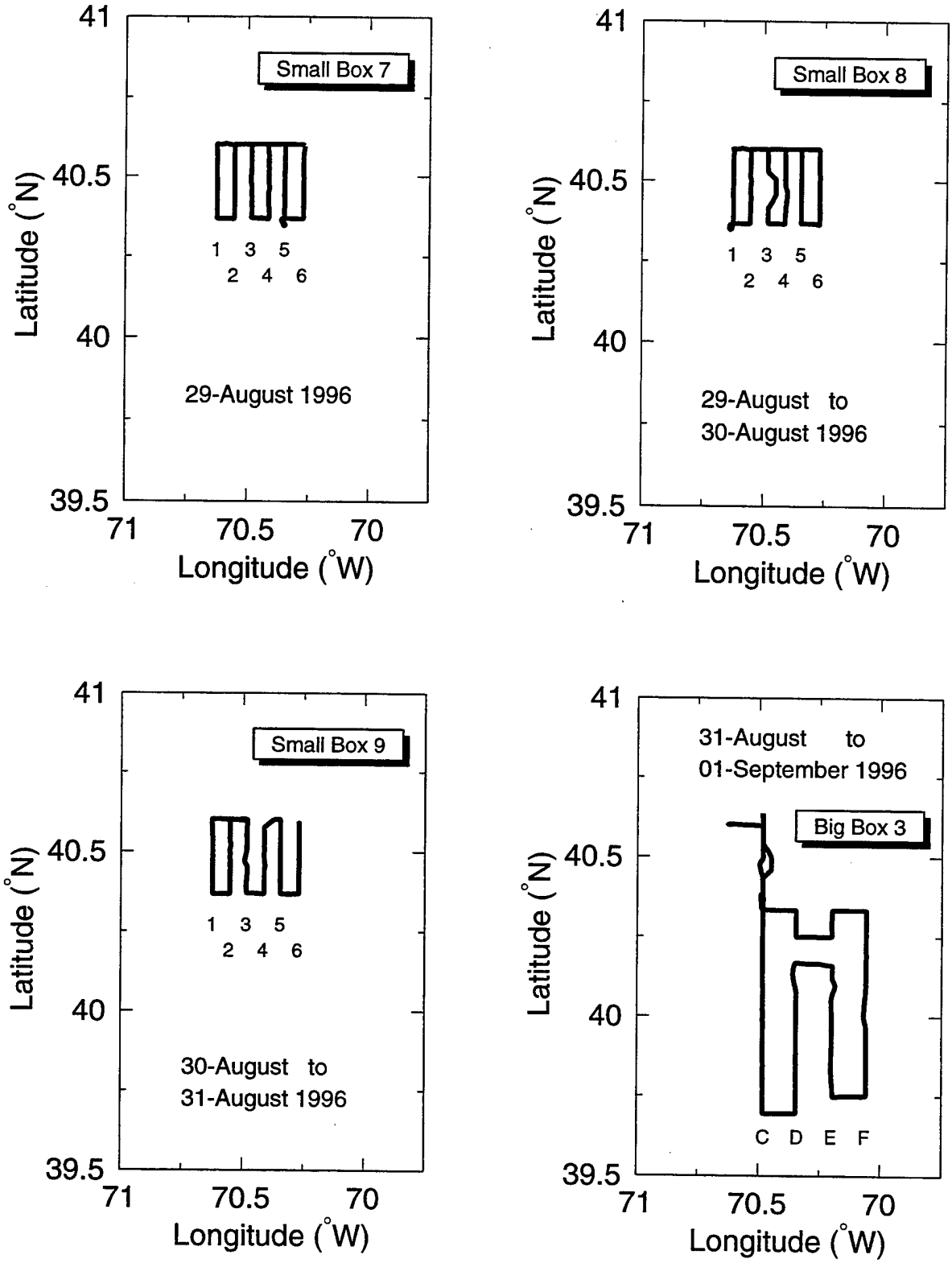

Figure 9: d: Cruise tracks during the E9608 SeaSoar surveys. See Table 8 for individual line start and stop times.

Table 9: E9704 Section Times

	section name	start time	stop time
Small Box 1	line6	27-Apr-97 00:45:09	27-Apr-97 03:36:16
	line5_6	27-Apr-97 03:36:17	27-Apr-97 04:17:47
	line5	27-Apr-97 04:17:48	27-Apr-97 07:18:30
	line4_5	27-Apr-97 07:18:31	27-Apr-97 07:45:10
	line4	27-Apr-97 07:45:11	27-Apr-97 09:35:28
	line3_4	27-Apr-97 09:35:29	27-Apr-97 10:01:16
	line3	27-Apr-97 10:01:17	27-Apr-97 12:31:48
Small Box 2	lineB	27-Apr-97 22:27:00	28-Apr-97 01:37:23
	line1	28-Apr-97 01:46:28	28-Apr-97 03:49:47
	line1-2	28-Apr-97 03:49:48	28-Apr-97 04:19:01
	line2	28-Apr-97 04:19:02	28-Apr-97 06:24:10
	line2_3	28-Apr-97 06:24:11	28-Apr-97 06:53:27
	line3	28-Apr-97 06:53:28	28-Apr-97 09:29:11
	line3_4	28-Apr-97 09:29:12	28-Apr-97 09:57:09
	line4	28-Apr-97 09:57:10	28-Apr-97 11:52:14
	line4_5	28-Apr-97 11:52:15	28-Apr-97 12:20:59
	line5	28-Apr-97 12:21:00	28-Apr-97 14:36:18
Small Box 3	line6a	29-Apr-97 01:13:35	29-Apr-97 03:27:24
	line6b	29-Apr-97 03:36:08	29-Apr-97 05:45:12
	line5_6	29-Apr-97 05:45:13	29-Apr-97 06:17:12
	line5	29-Apr-97 06:17:13	29-Apr-97 08:23:24
	line4_5	29-Apr-97 08:23:25	29-Apr-97 08:51:37
	line4	29-Apr-97 08:51:38	29-Apr-97 10:51:48
	line3_4	29-Apr-97 10:51:49	29-Apr-97 11:21:16
	line3	29-Apr-97 11:21:17	29-Apr-97 13:27:57
	line2_3	29-Apr-97 13:27:58	29-Apr-97 13:55:47
	line2	29-Apr-97 13:55:48	29-Apr-97 16:06:58
	line1_2	29-Apr-97 16:06:59	29-Apr-97 16:36:19
	line1	29-Apr-97 16:36:20	29-Apr-97 18:40:47
	sb3_sb4	29-Apr-97 18:40:48	29-Apr-97 20:54:07
Small Box 4	line6	29-Apr-97 20:54:08	29-Apr-97 22:57:04
	line5_6	29-Apr-97 22:57:05	29-Apr-97 23:28:05
	line5	29-Apr-97 23:28:06	30-Apr-97 00:55:17
Small Box 5	lineE	02-May-97 12:38:20	02-May-97 17:34:53
	lineE_6	02-May-97 17:34:54	02-May-97 18:05:51
	line6	02-May-97 18:05:52	02-May-97 20:17:31
	line5	02-May-97 20:55:32	02-May-97 22:46:31
	line4_5	02-May-97 22:46:32	02-May-97 23:18:52
	line4	02-May-97 23:18:53	03-May-97 01:13:32
	line3_4	03-May-97 01:13:33	03-May-97 01:45:46
	line3	03-May-97 01:45:47	03-May-97 04:08:59
	line2_3	03-May-97 04:09:00	03-May-97 04:43:35
	line2	03-May-97 04:43:36	03-May-97 06:47:04
	line1_2	03-May-97 06:47:05	03-May-97 07:17:57
	line1	03-May-97 07:17:58	03-May-97 09:23:40
	sb5_sb6	03-May-97 09:23:41	03-May-97 11:45:42

Table 9 (continued): E9704 Section Times

	section name	start time	stop time
Small Box 6	line6	03-May-97 11:45:43	03-May-97 13:50:16
	line5_6	03-May-97 13:50:17	03-May-97 14:20:46
	line5	03-May-97 14:20:47	03-May-97 16:26:08
	line4_5	03-May-97 16:26:09	03-May-97 16:53:30
	line4	03-May-97 16:53:31	03-May-97 19:08:28
	line3_4	03-May-97 19:08:29	03-May-97 19:41:59
	line3	03-May-97 19:42:00	03-May-97 21:35:08
	line2_3	03-May-97 21:35:09	03-May-97 22:06:51
	line2	03-May-97 22:06:52	04-May-97 00:49:17
	line1_2	04-May-97 00:49:18	04-May-97 01:23:13
	line1	04-May-97 01:23:14	04-May-97 02:09:45
Big Box 1	lineA	04-May-97 12:36:20	04-May-97 19:04:37
	lineA_B	04-May-97 19:04:38	04-May-97 20:04:36
	lineB	04-May-97 20:04:37	05-May-97 01:42:15
	lineB_C	05-May-97 01:42:16	05-May-97 02:43:33
	lineC	05-May-97 02:43:34	05-May-97 08:16:20
	lineC_D	05-May-97 08:16:21	05-May-97 09:16:59
	lineD	05-May-97 09:17:00	05-May-97 16:04:09
	lineD_E	05-May-97 16:04:10	05-May-97 17:06:16
	lineE1	05-May-97 17:06:17	05-May-97 20:48:29
	lineE	05-May-97 17:06:17	06-May-97 00:32:47
	lineE2	05-May-97 21:49:09	06-May-97 00:32:47
	lineE_F	06-May-97 00:32:48	06-May-97 01:24:53
	lineF	06-May-97 03:37:07	06-May-97 10:15:19
	lineF_G	06-May-97 10:15:20	06-May-97 11:10:33
	lineG	06-May-97 11:10:34	06-May-97 17:32:19
	bb1_sb7a	06-May-97 17:32:20	06-May-97 19:58:08
	bb1_sb7b	06-May-97 19:58:09	06-May-97 20:33:16
Small Box 7	line6	06-May-97 20:33:17	06-May-97 22:38:39
	line5_6	06-May-97 22:38:40	06-May-97 23:09:59
	line5	06-May-97 23:10:00	07-May-97 01:09:38
	line4_5	07-May-97 01:09:39	07-May-97 01:39:37
	line4	07-May-97 01:39:38	07-May-97 03:44:06
	line3_4	07-May-97 03:44:07	07-May-97 04:16:01
	line3a	07-May-97 04:16:02	07-May-97 06:37:09
	line3b	07-May-97 06:37:10	07-May-97 08:40:52
	line2_3	07-May-97 08:40:53	07-May-97 09:08:56
	line2	07-May-97 09:08:57	07-May-97 11:06:37
	line1_2	07-May-97 11:06:38	07-May-97 11:37:04
	line1	07-May-97 11:37:05	07-May-97 13:50:55

Table 9 (continued): E9704 Section Times

	section name	start time	stop time
Small Box 8	line1a	07-May-97 13:50:56	07-May-97 15:07:21
	bf1lineWE	07-May-97 15:07:22	07-May-97 17:30:08
	line6a	07-May-97 17:30:09	07-May-97 18:16:28
	line6b	07-May-97 18:16:29	07-May-97 19:33:38
	line6	07-May-97 18:16:29	08-May-97 07:01:54
	line6c	08-May-97 05:39:23	08-May-97 07:01:54
	line5_6	08-May-97 07:01:55	08-May-97 07:33:50
	line5	08-May-97 07:33:51	08-May-97 09:32:51
	line4_5	08-May-97 09:32:52	08-May-97 09:57:29
	line4	08-May-97 09:57:30	08-May-97 11:57:19
	line3_4	08-May-97 11:57:20	08-May-97 12:26:30
	line3a	08-May-97 12:26:31	08-May-97 13:04:50
	line3	08-May-97 18:57:28	08-May-97 20:48:19
	line2_3	08-May-97 20:48:20	08-May-97 21:16:07
	line2	08-May-97 21:16:08	08-May-97 23:14:50
	line1_2	08-May-97 23:14:51	08-May-97 23:41:51
	line1	08-May-97 23:41:52	09-May-97 01:57:21
Small Box 9	line1a	09-May-97 01:57:22	09-May-97 03:11:53
	bf2lineWE	09-May-97 03:11:54	09-May-97 05:34:20
	line6a	09-May-97 05:34:21	09-May-97 06:01:59
	line6	09-May-97 06:02:00	09-May-97 08:14:59
	line5_6	09-May-97 08:15:00	09-May-97 08:45:55
	line5	09-May-97 09:08:07	09-May-97 11:09:21
	line4_5	09-May-97 11:09:22	09-May-97 11:35:03
	line4	09-May-97 11:35:04	09-May-97 13:33:29
	line3_4	09-May-97 13:33:30	09-May-97 14:00:01
	line3	09-May-97 14:00:02	09-May-97 16:16:43
	line2_3	09-May-97 16:16:44	09-May-97 16:44:59
	line2	09-May-97 16:45:00	09-May-97 18:32:48
	line1_2	09-May-97 18:32:49	09-May-97 19:03:17
	line1	09-May-97 19:03:18	09-May-97 21:11:56
Small Box 10	line1a	09-May-97 21:41:01	09-May-97 22:43:54
	bf3lineWE	09-May-97 22:43:55	10-May-97 01:01:16
	line6a	10-May-97 01:13:01	10-May-97 01:54:14
	line6	10-May-97 01:54:15	10-May-97 04:03:42
	line5_6	10-May-97 04:03:43	10-May-97 04:36:24
	line5	10-May-97 04:36:25	10-May-97 06:45:54
	line4_5	10-May-97 06:45:55	10-May-97 07:13:24
	line4	10-May-97 07:13:25	10-May-97 09:23:11
	line3_4	10-May-97 09:23:12	10-May-97 09:48:14
	line3	10-May-97 09:48:15	10-May-97 11:49:59
	line2_3	10-May-97 11:50:00	10-May-97 12:17:32
	line2	10-May-97 12:17:33	10-May-97 14:10:31
	line1_2	10-May-97 14:10:32	10-May-97 14:38:22
	line1	10-May-97 14:38:23	10-May-97 17:05:23

Table 9 (continued): E9704 Section Times

	section name	start time	stop time
Small Box 11	line1	11-May-97 11:22:01	11-May-97 13:30:36
	line1_2	11-May-97 13:30:37	11-May-97 13:58:56
	line2	11-May-97 13:58:57	11-May-97 16:02:36
	line2_3	11-May-97 16:02:37	11-May-97 16:28:16
	line3	11-May-97 16:28:17	11-May-97 18:32:42
	line3_4	11-May-97 18:32:43	11-May-97 18:57:40
	line4	11-May-97 18:57:41	11-May-97 20:58:52
	line4_5	11-May-97 20:58:53	11-May-97 21:23:36
	line5	11-May-97 21:23:37	11-May-97 23:28:16
	line5_6	11-May-97 23:28:17	11-May-97 23:58:16
	line6	11-May-97 23:58:17	12-May-97 02:08:30
Small Box 12	line5_6	12-May-97 02:08:31	12-May-97 02:42:59
	line5	12-May-97 02:43:00	12-May-97 04:44:15
	line4_5	12-May-97 04:44:16	12-May-97 05:16:47
	line4	12-May-97 05:16:48	12-May-97 07:23:49
	line3_4	12-May-97 07:23:50	12-May-97 07:55:09
	line3	12-May-97 07:55:10	12-May-97 10:00:55
	line2_3	12-May-97 10:00:56	12-May-97 10:29:45
	line2	12-May-97 10:29:46	12-May-97 12:25:17
	line1_2	12-May-97 12:25:18	12-May-97 12:51:33
	line1	12-May-97 12:51:34	12-May-97 14:53:06
	sb12_bb2	12-May-97 14:53:07	12-May-97 15:59:34
Big Box 2	lineC	12-May-97 15:59:35	12-May-97 22:35:59
	lineA_C	12-May-97 22:36:00	13-May-97 00:26:26
	lineA	13-May-97 00:26:27	13-May-97 06:52:16
	lineA_B	13-May-97 06:52:17	13-May-97 07:48:21
	lineB	13-May-97 07:48:22	13-May-97 14:21:03
	lineC_D	13-May-97 17:57:27	13-May-97 18:59:24
	lineD	13-May-97 18:59:25	14-May-97 01:34:10
	lineD_E	14-May-97 01:34:11	14-May-97 02:31:03
	lineE	14-May-97 02:31:04	14-May-97 08:50:57
	lineE_F	14-May-97 08:50:58	14-May-97 09:45:29
	lineF	14-May-97 09:45:30	14-May-97 15:31:35
	lineF_G	14-May-97 15:31:36	14-May-97 16:29:04
	lineG	14-May-97 16:29:05	14-May-97 23:07:09

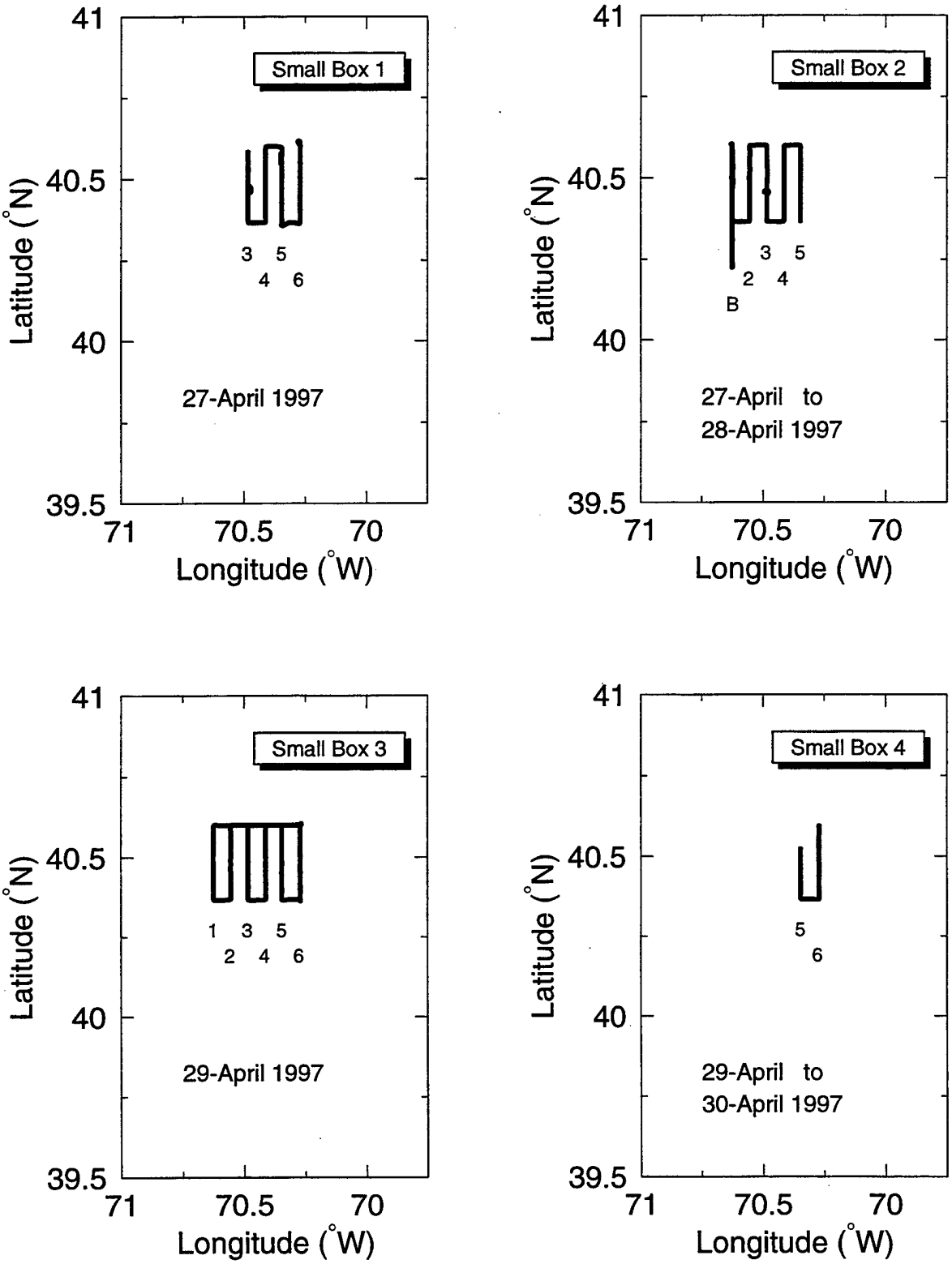

Figure 10: a: Cruise tracks during the E9704 SeaSoar surveys. See Table 9 for individual line start and stop times.

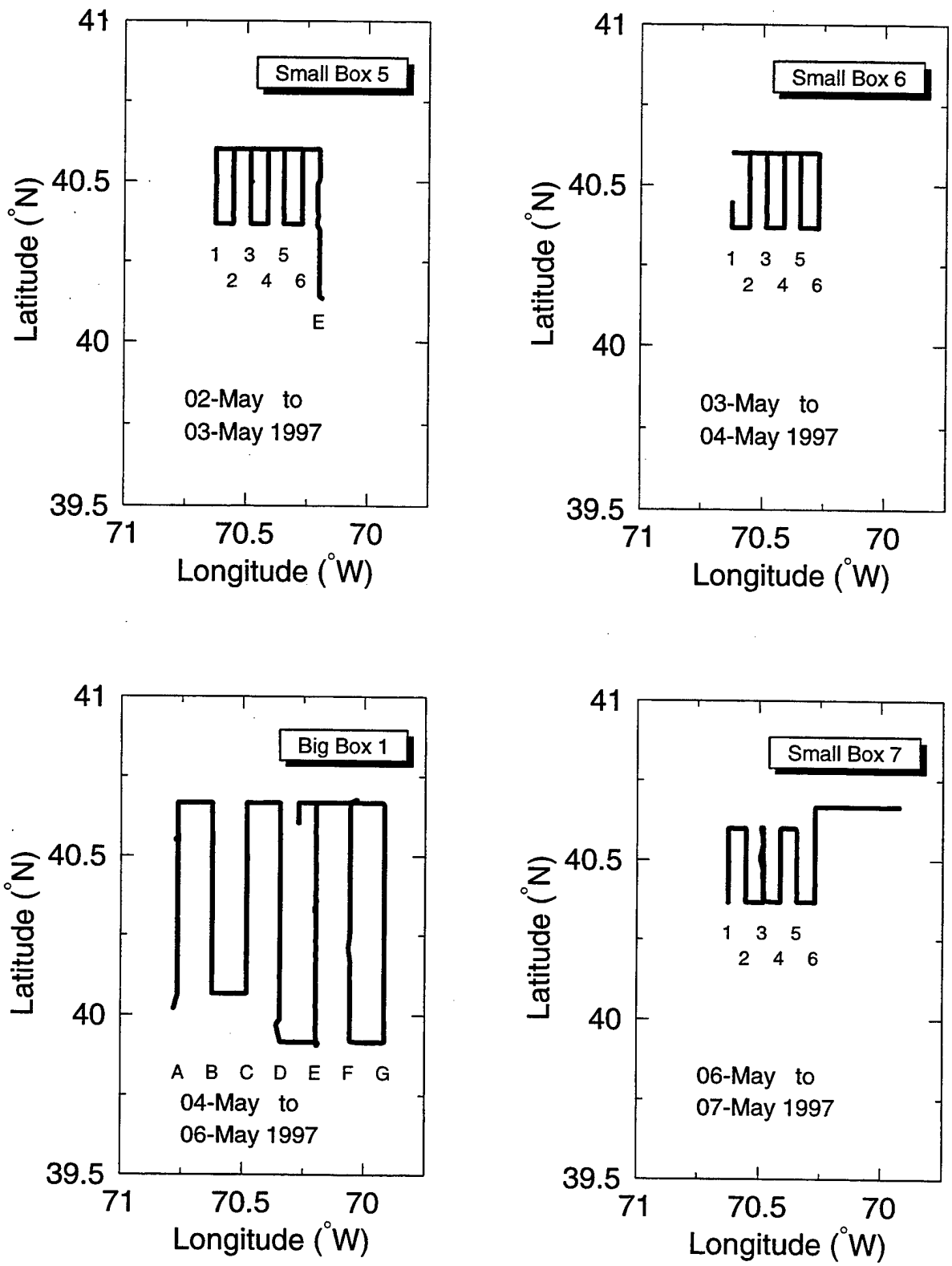

Figure 10: b: Cruise tracks during the E9704 SeaSoar surveys. See Table 9 for individual line start and stop times.

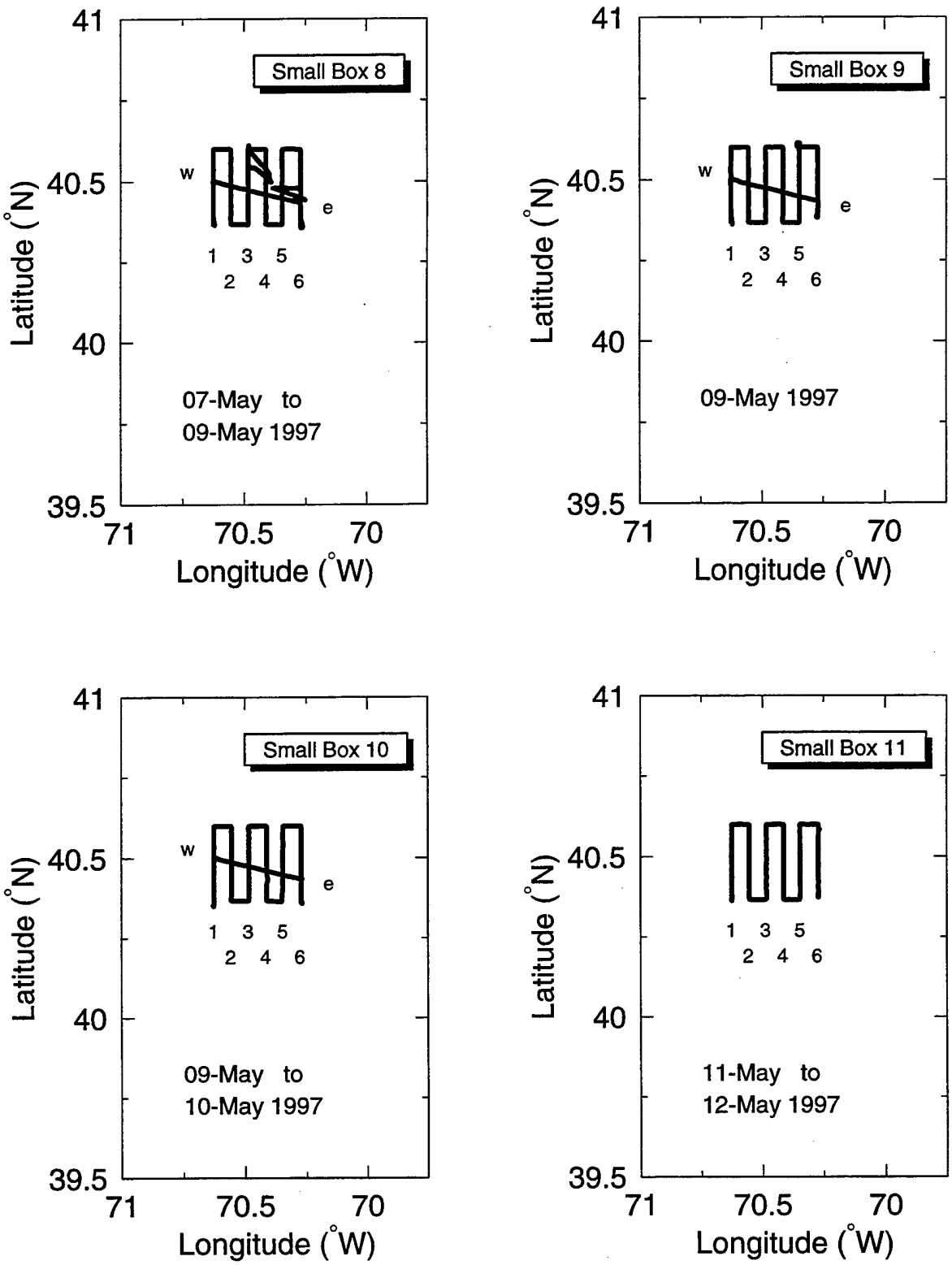

Figure 10: c: Cruise tracks during the E9704 SeaSoar surveys. See Table 9 for individual line start and stop times.

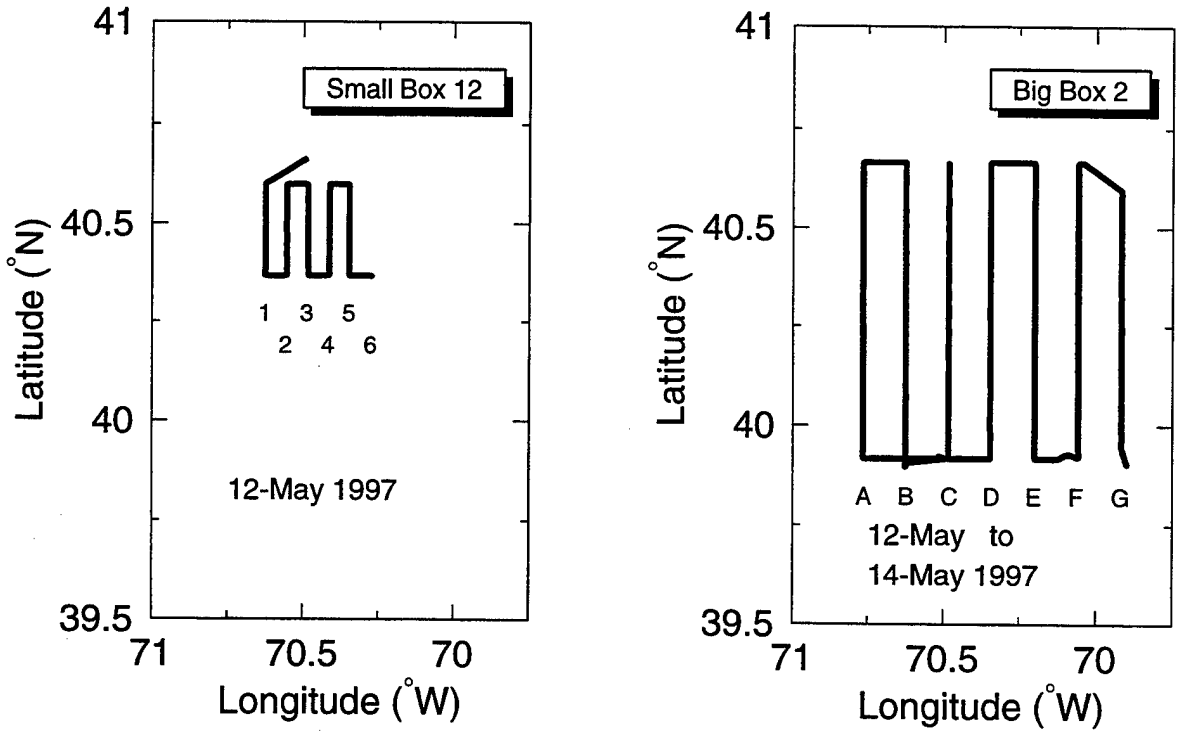

Figure 10: d: Cruise tracks during the E9704 SeaSoar surveys. See Table 9 for individual line start and stop times.

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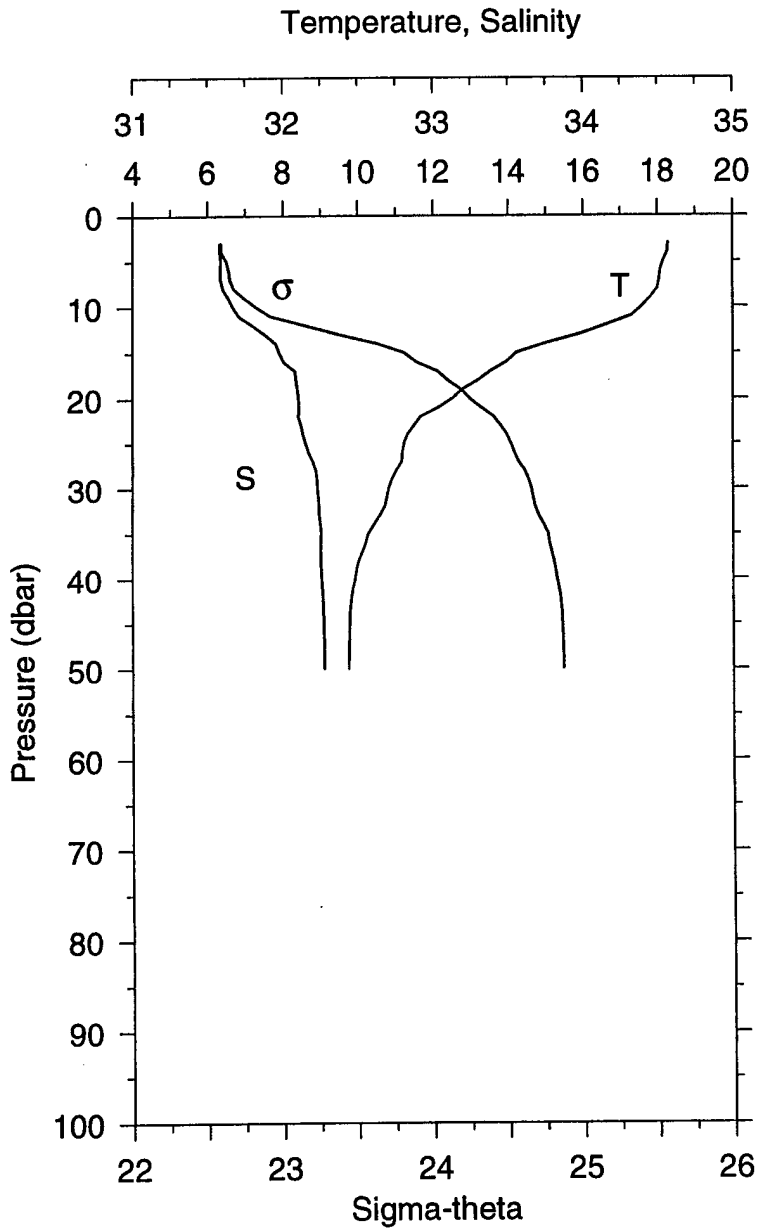
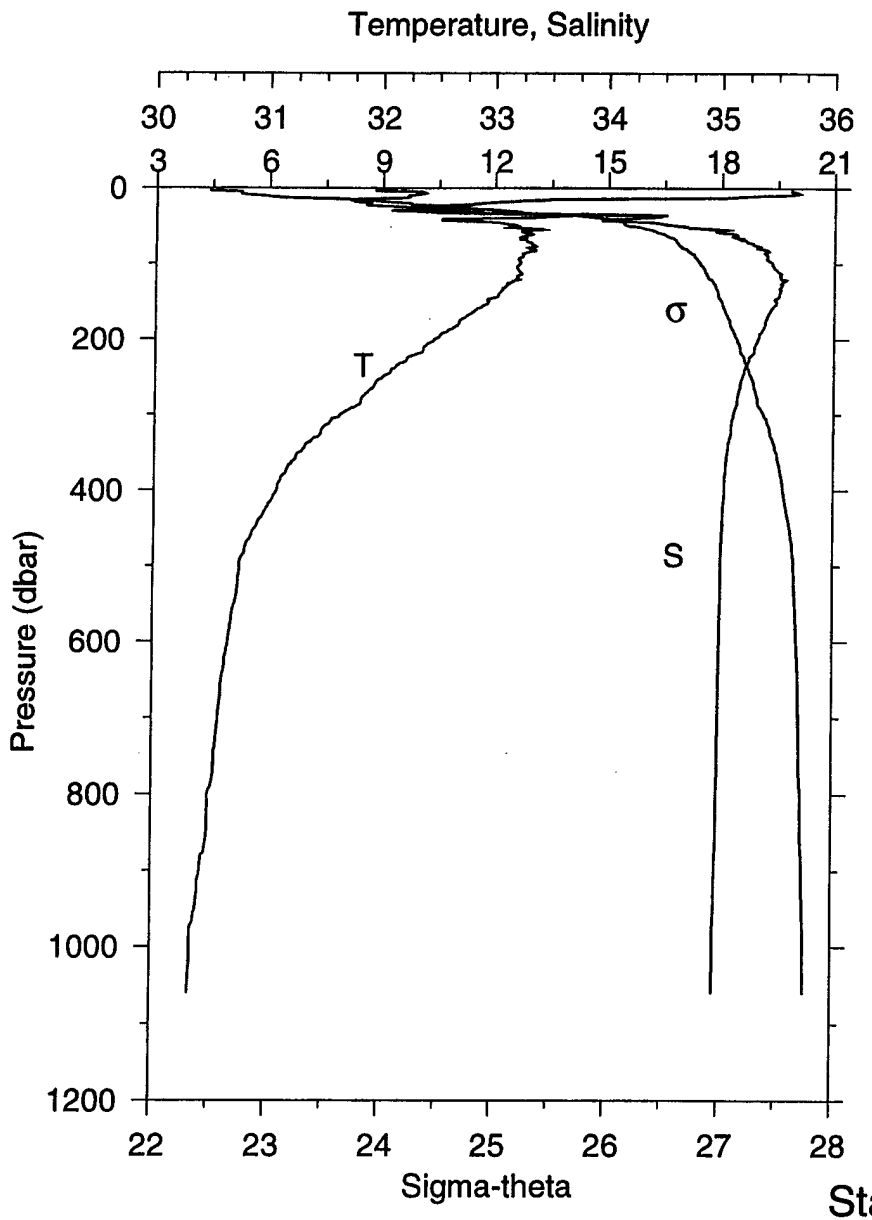
E9608 CTD Data

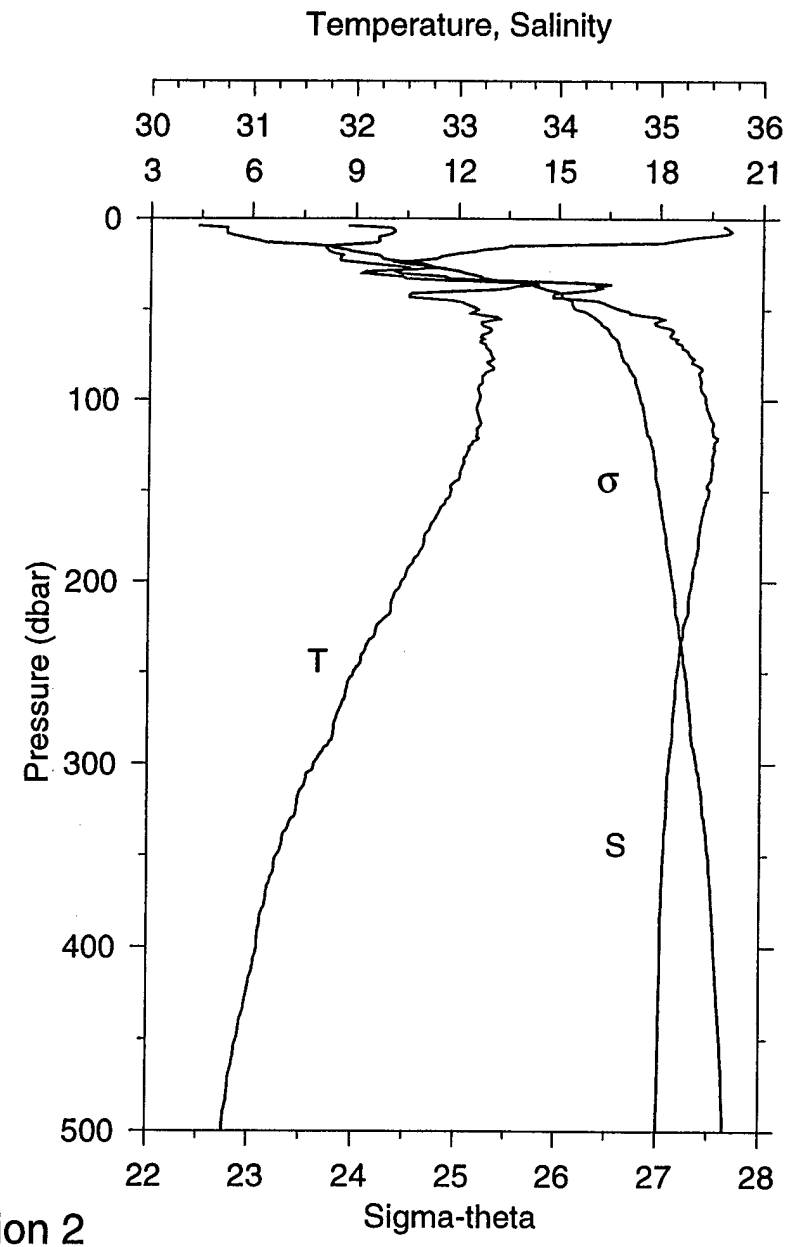
For each station, we present plots of the vertical profiles of temperature, salinity and σ_θ, and a listing of the observed and derived variables at standard pressures. Header data includes the CTD Station Number, Latitude (degrees and minutes North), Longitude (degrees and minutes West), Date and Time (UTC), and Bottom Depth (in meters).



STA: 1 LAT: 40 54.0 N LONG: 70 30.0 W
14 AUG 1996 1937 GMT DEPTH 52

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	18.285	31.581	18.284	22.588	525.0	0.158
10	17.581	31.667	17.579	22.823	502.7	0.520
20	12.519	32.103	12.517	24.243	367.3	0.943
30	10.816	32.231	10.812	24.653	328.4	1.286
40	9.928	32.257	9.923	24.824	312.3	1.606
50	9.747	32.274	9.742	24.867	308.4	1.915

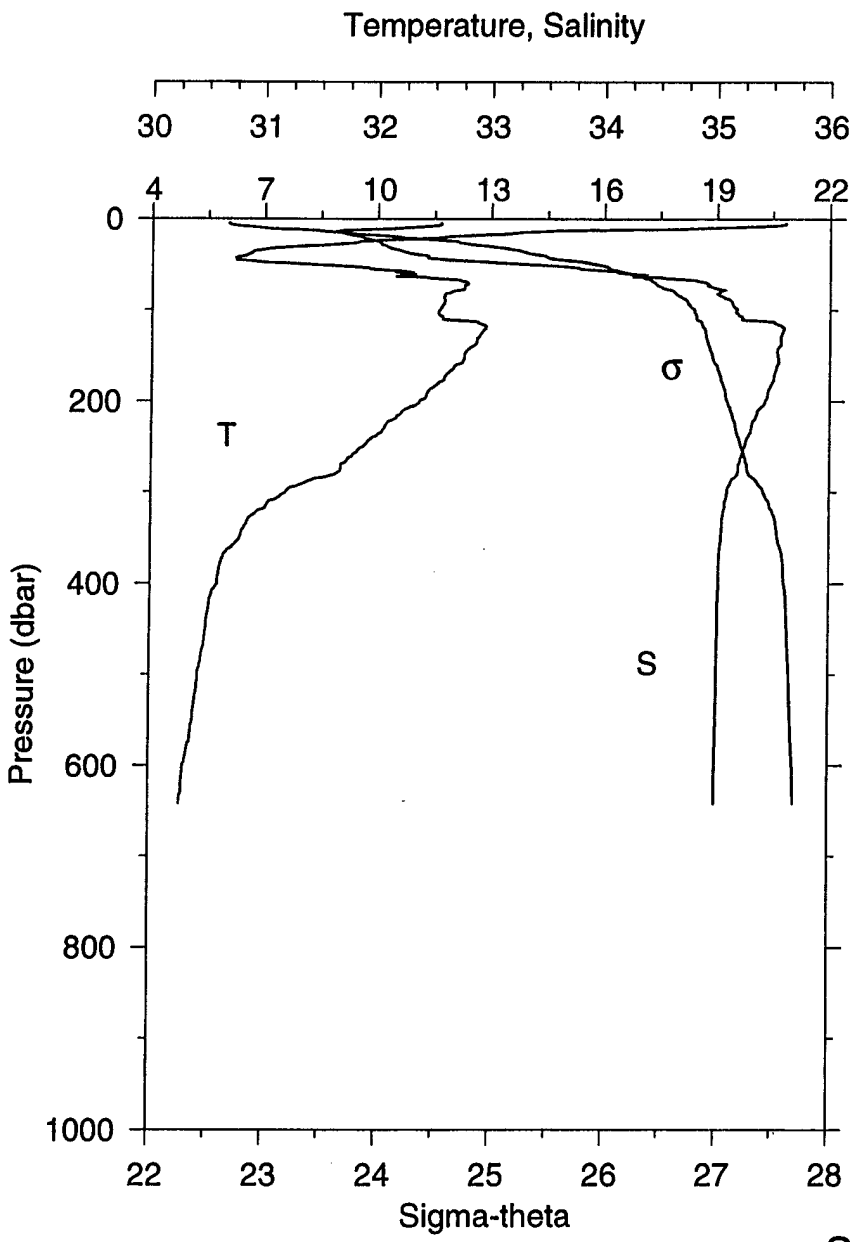

Temperature, Salinity
30 31 32 33 34 35 36
3 6 9 12 15 18 21
0
200
400
600
800
1000
1200
Pressure (dbar)
T
σ
S
22 23 24 25 26 27 28
Sigma-theta

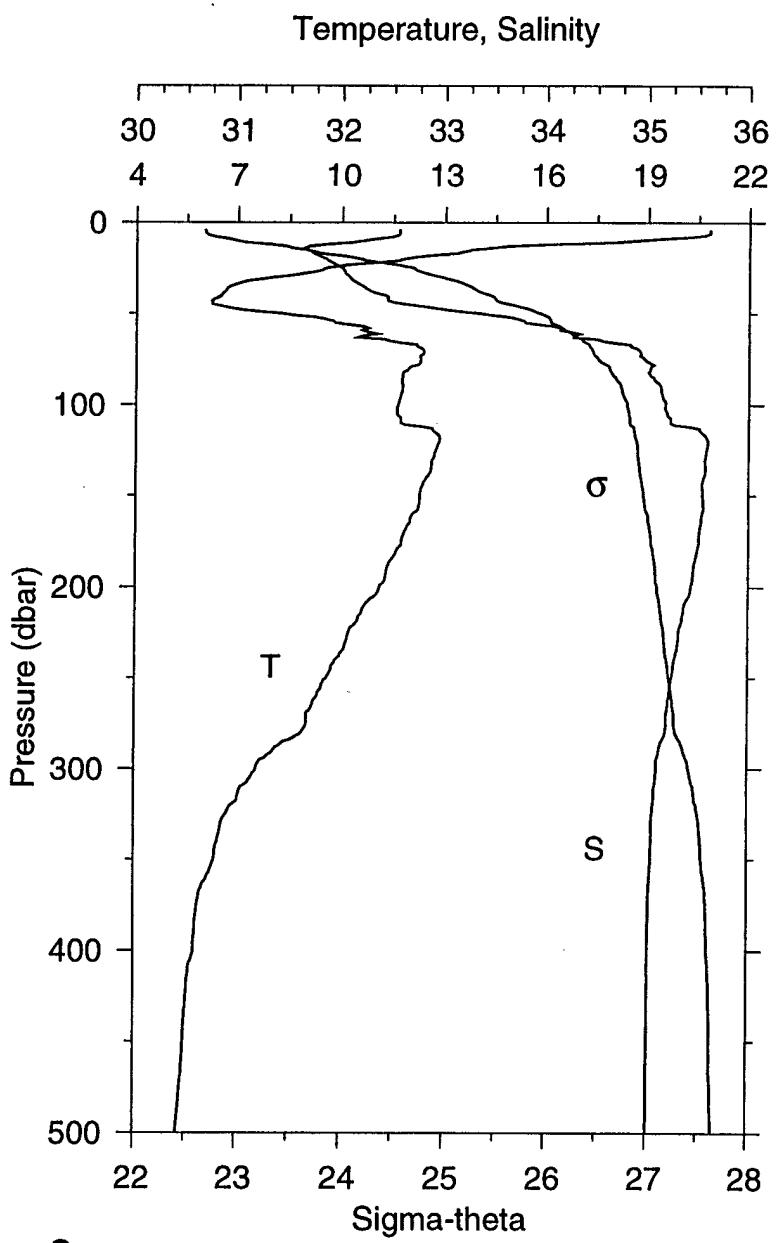

Temperature, Salinity
30 31 32 33 34 35 36
3 6 9 12 15 18 21
0
100
200
300
400
500
Pressure (dbar)
T
σ
S
22 23 24 25 26 27 28
Sigma-theta

Station 2

STA: 2 LAT: 39 54.0 N LONG: 70 30.3 W
15 AUG 1996 0327 GMT DEPTH 1068

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	19.826	31.926	19.825	22.465	536.8	0.215
10	19.086	32.224	19.084	22.881	497.2	0.521
20	11.713	31.878	11.711	24.219	369.6	0.952
30	9.207	32.421	9.204	25.068	288.9	1.283
40	11.788	34.163	11.783	25.981	202.6	1.528
50	12.592	34.616	12.585	26.178	184.1	1.720
60	12.946	35.097	12.937	26.481	155.7	1.887
70	12.839	35.220	12.829	26.598	144.9	2.036
80	12.917	35.348	12.906	26.682	137.3	2.178
90	12.750	35.408	12.737	26.762	129.9	2.311
100	12.662	35.450	12.649	26.813	125.4	2.439
110	12.654	35.503	12.639	26.856	121.6	2.562
120	12.576	35.544	12.560	26.903	117.4	2.682
130	12.292	35.529	12.275	26.948	113.4	2.797
140	12.111	35.515	12.092	26.972	111.3	2.909
150	11.845	35.491	11.825	27.005	108.4	3.019
175	11.063	35.392	11.041	27.074	102.3	3.284
200	10.401	35.327	10.377	27.143	96.2	3.533
225	9.685	35.249	9.660	27.205	90.6	3.767
250	9.025	35.191	8.998	27.268	84.8	3.987
275	8.535	35.152	8.506	27.316	80.5	4.193
300	7.898	35.113	7.868	27.383	74.3	4.389
350	6.819	35.062	6.786	27.497	63.6	4.732
400	6.257	35.039	6.221	27.555	58.5	5.035
450	5.673	35.021	5.634	27.615	52.9	5.314
500	5.284	35.010	5.243	27.655	49.5	5.568
600	4.991	35.002	4.943	27.683	47.7	6.055
700	4.741	34.992	4.685	27.706	46.4	6.523
800	4.485	34.982	4.422	27.727	45.1	6.984
900	4.292	34.973	4.222	27.741	44.5	7.435
1000	4.040	34.958	3.963	27.757	43.4	7.874
1060	3.991	34.956	3.910	27.761	43.6	8.136

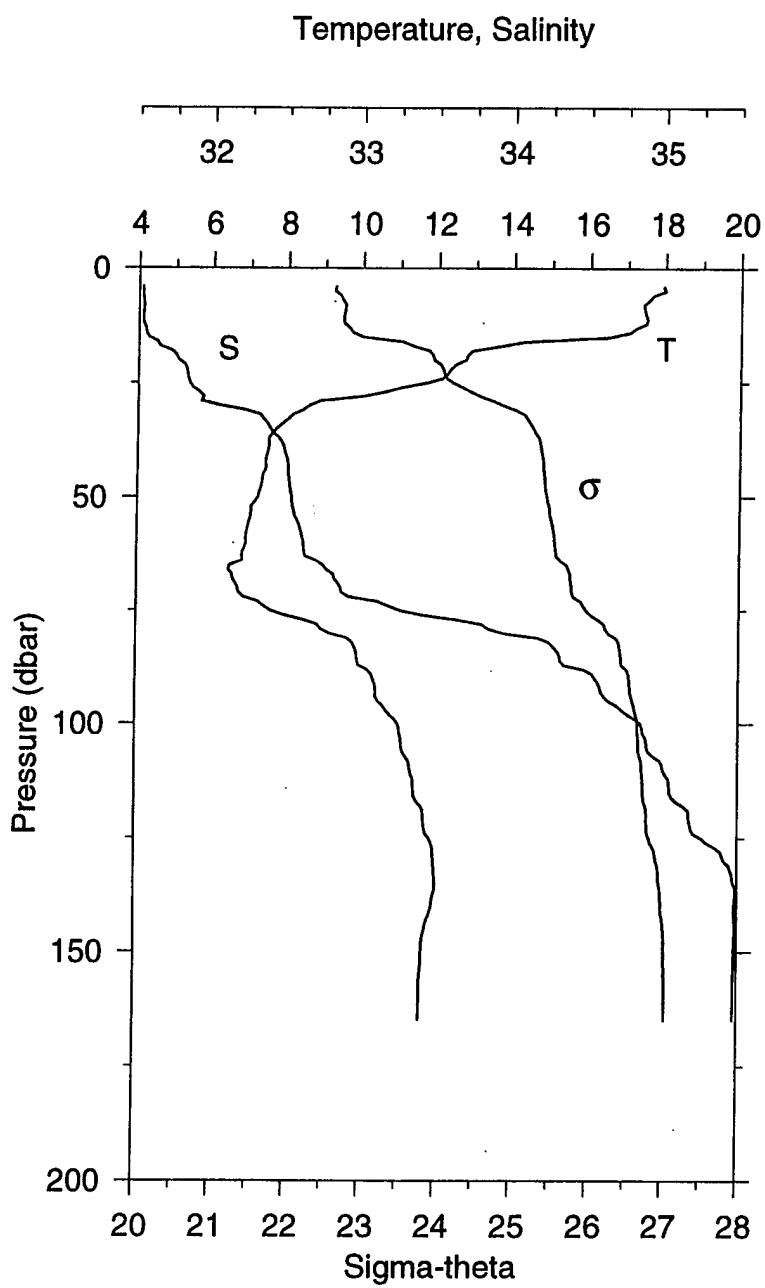

Temperature, Salinity
30 31 32 33 34 35 36
4 7 10 13 16 19 22
0
200
400
600
800
1000
Pressure (dbar)
T
σ
S
22 23 24 25 26 27 28
Sigma-theta


Temperature, Salinity
30 31 32 33 34 35 36
4 7 10 13 16 19 22
0
100
200
300
400
500
Pressure (dbar)
σ
T
S
22 23 24 25 26 27 28
Sigma-theta

Station 3

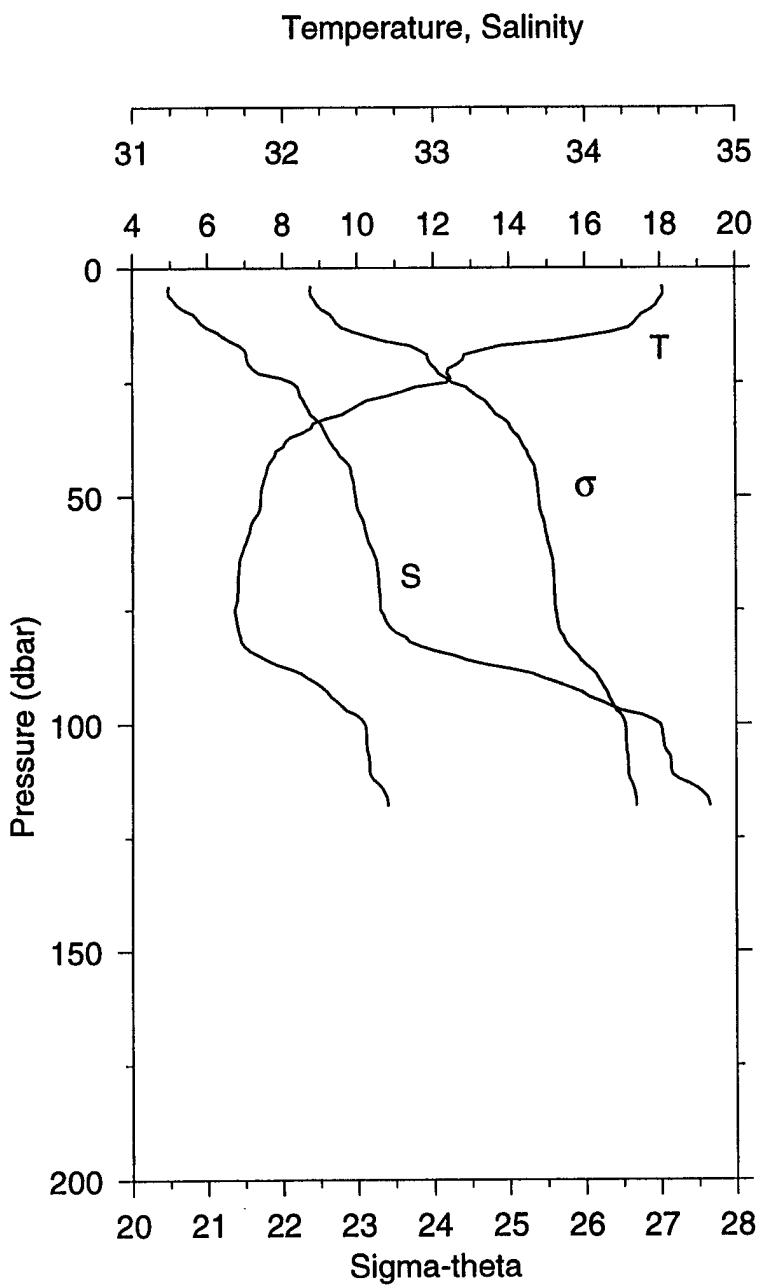
STA: 3 LAT: 39 59.0 N LONG: 70 30.0 W
15 AUG 1996 0509 GMT DEPTH 667

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	20.833	32.550	20.833	22.676	516.6	0.207
10	18.689	32.218	18.687	22.976	488.2	0.512
20	11.793	31.847	11.790	24.181	373.3	0.939
30	8.083	32.071	8.080	24.963	298.8	1.271
40	6.516	32.412	6.513	25.444	253.0	1.545
50	8.248	33.339	8.243	25.934	206.8	1.778
60	10.745	34.233	10.738	26.226	179.7	1.972
70	12.364	34.910	12.355	26.451	158.8	2.140
80	11.949	35.022	11.939	26.618	143.2	2.292
90	11.766	35.124	11.754	26.733	132.6	2.430
100	11.638	35.174	11.625	26.796	126.8	2.560
110	11.712	35.224	11.698	26.821	124.7	2.685
120	12.851	35.597	12.834	26.890	118.8	2.806
130	12.647	35.565	12.629	26.906	117.5	2.924
140	12.470	35.554	12.451	26.932	115.2	3.041
150	12.284	35.543	12.264	26.960	112.8	3.155
175	11.759	35.508	11.736	27.035	106.3	3.428
200	11.114	35.430	11.089	27.095	101.0	3.687
225	10.235	35.315	10.208	27.162	94.9	3.932
250	9.607	35.247	9.579	27.217	90.0	4.163
275	9.030	35.196	9.000	27.272	85.0	4.381
300	7.582	35.097	7.552	27.417	70.9	4.575
350	6.370	35.046	6.338	27.545	58.7	4.891
400	5.769	35.022	5.735	27.604	53.4	5.166
450	5.478	35.016	5.441	27.636	50.8	5.423
500	5.274	35.009	5.233	27.656	49.4	5.674
600	4.908	34.998	4.860	27.690	46.9	6.159
643	4.809	34.995	4.758	27.700	46.4	6.360



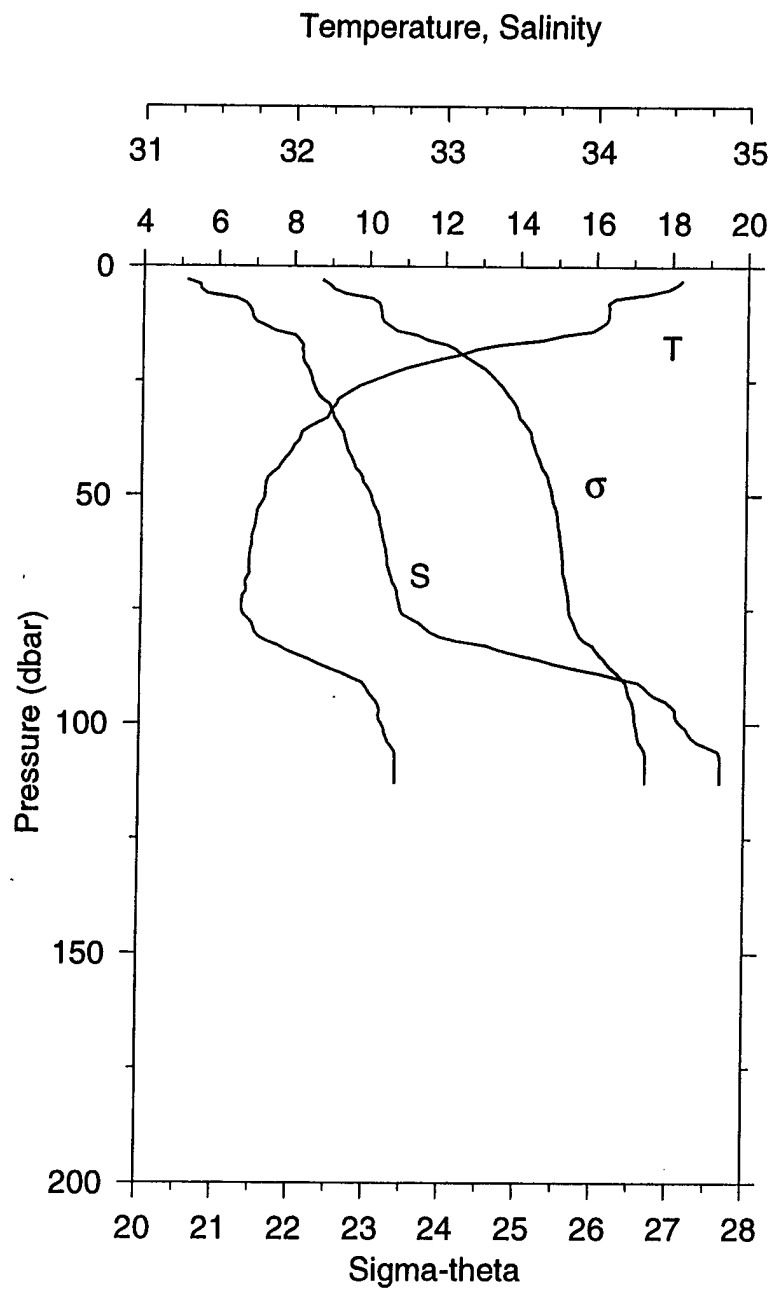
STA: 4 LAT: 40 4.0 N LONG: 70 30.0 W
15 AUG 1996 0628 GMT DEPTH 179

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	17.923	31.524	17.922	22.632	520.8	0.208
10	17.456	31.528	17.454	22.746	510.1	0.517
20	12.722	31.764	12.720	23.942	396.1	0.979
30	8.580	32.038	8.577	24.864	308.2	1.341
40	7.483	32.483	7.479	25.371	260.0	1.615
50	7.218	32.530	7.214	25.445	253.2	1.871
60	6.907	32.612	6.901	25.551	243.2	2.119
70	6.695	32.862	6.689	25.776	221.9	2.351
80	9.158	33.949	9.150	26.271	175.5	2.551
90	10.326	34.547	10.315	26.545	150.1	2.711
100	11.002	34.854	10.989	26.664	139.1	2.856
110	11.324	35.003	11.310	26.722	134.0	2.994
120	11.682	35.177	11.667	26.790	127.9	3.125
130	11.965	35.412	11.948	26.920	115.9	3.248
140	11.922	35.483	11.904	26.984	110.2	3.361
150	11.654	35.482	11.635	27.034	105.6	3.468
165	11.590	35.476	11.569	27.042	105.3	3.626



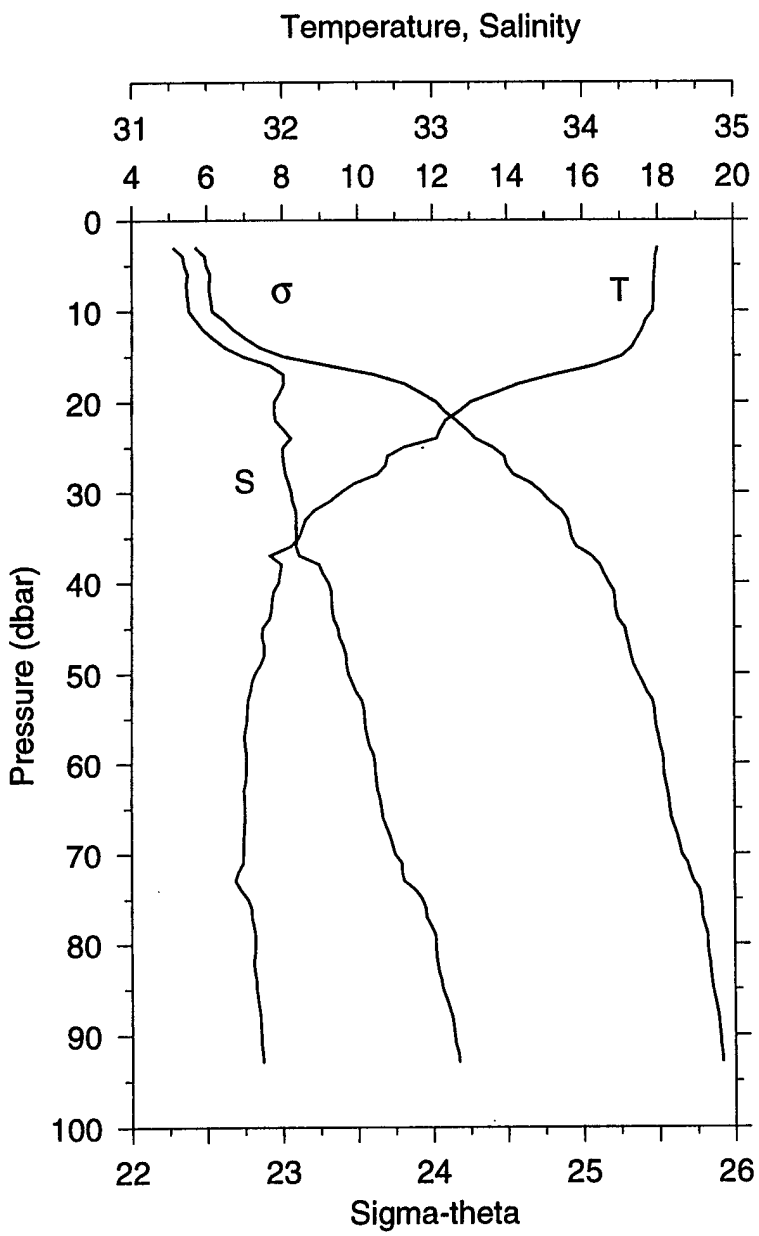
STA: 5 LAT: 40 9.0 N LONG: 70 30.0 W
15 AUG 1996 0732 GMT DEPTH 124

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.065	31.242	18.064	22.381	544.8	0.218
10	17.525	31.402	17.524	22.633	520.9	0.541
20	12.778	31.761	12.775	23.929	397.3	1.005
30	10.019	32.155	10.015	24.729	321.2	1.367
40	7.824	32.364	7.820	25.230	273.5	1.662
50	7.414	32.486	7.410	25.384	259.0	1.926
60	7.029	32.571	7.023	25.503	247.8	2.180
70	6.813	32.641	6.807	25.587	239.9	2.422
80	6.836	32.755	6.829	25.673	231.8	2.659
90	8.660	33.723	8.651	26.173	184.9	2.869
100	10.189	34.497	10.178	26.529	151.7	3.037
110	10.302	34.569	10.290	26.566	148.5	3.188
118	10.808	34.829	10.794	26.680	138.0	3.302



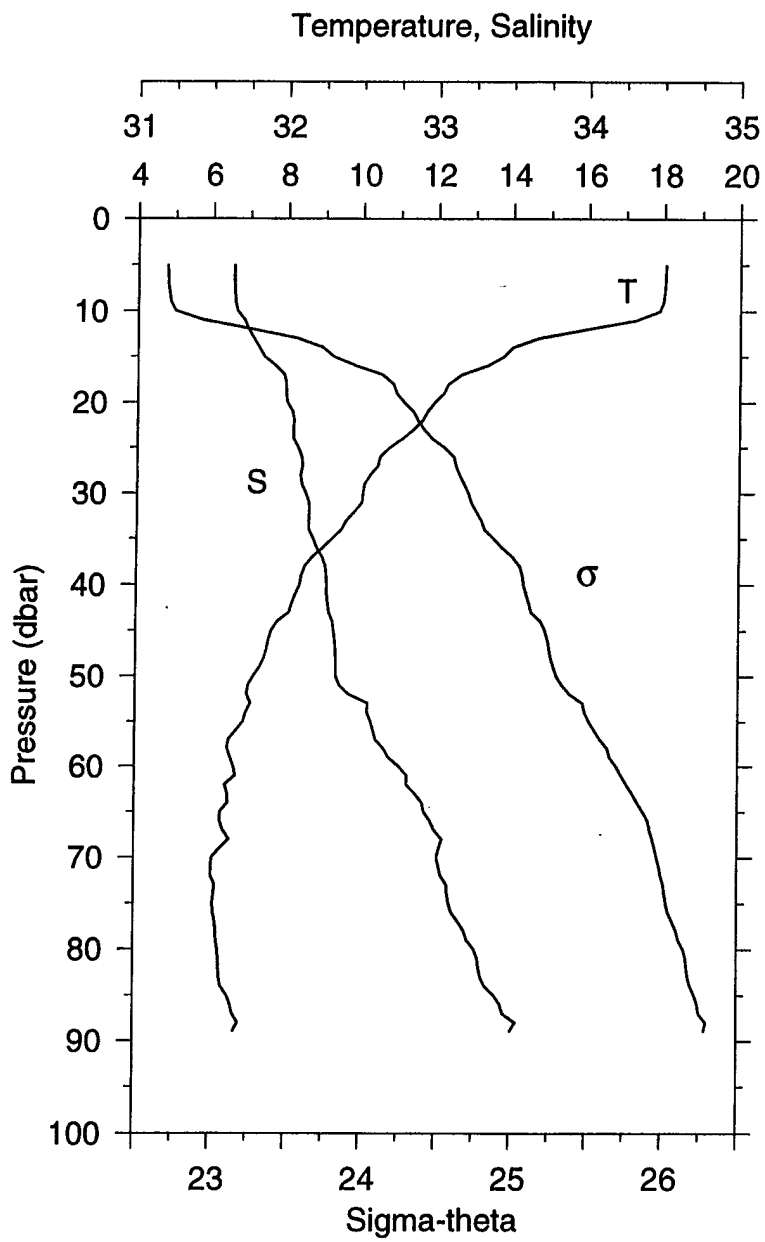
STA: 6 LAT: 40 14.0 N LONG: 70 30.2 W
15 AUG 1996 0850 GMT DEPTH 115

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	18.255	31.286	18.255	22.370	545.9	0.164
10	16.326	31.722	16.324	23.156	470.9	0.516
20	11.965	32.062	11.963	24.315	360.4	0.939
30	9.137	32.238	9.134	24.936	301.4	1.265
40	7.971	32.361	7.967	25.206	275.8	1.553
50	7.278	32.522	7.274	25.431	254.5	1.817
60	6.926	32.603	6.920	25.542	244.0	2.065
70	6.776	32.683	6.770	25.624	236.3	2.306
80	7.018	32.916	7.011	25.776	222.1	2.537
90	9.602	34.156	9.592	26.361	167.3	2.732
100	10.410	34.575	10.398	26.552	149.6	2.887
110	10.786	34.839	10.772	26.692	136.7	3.029



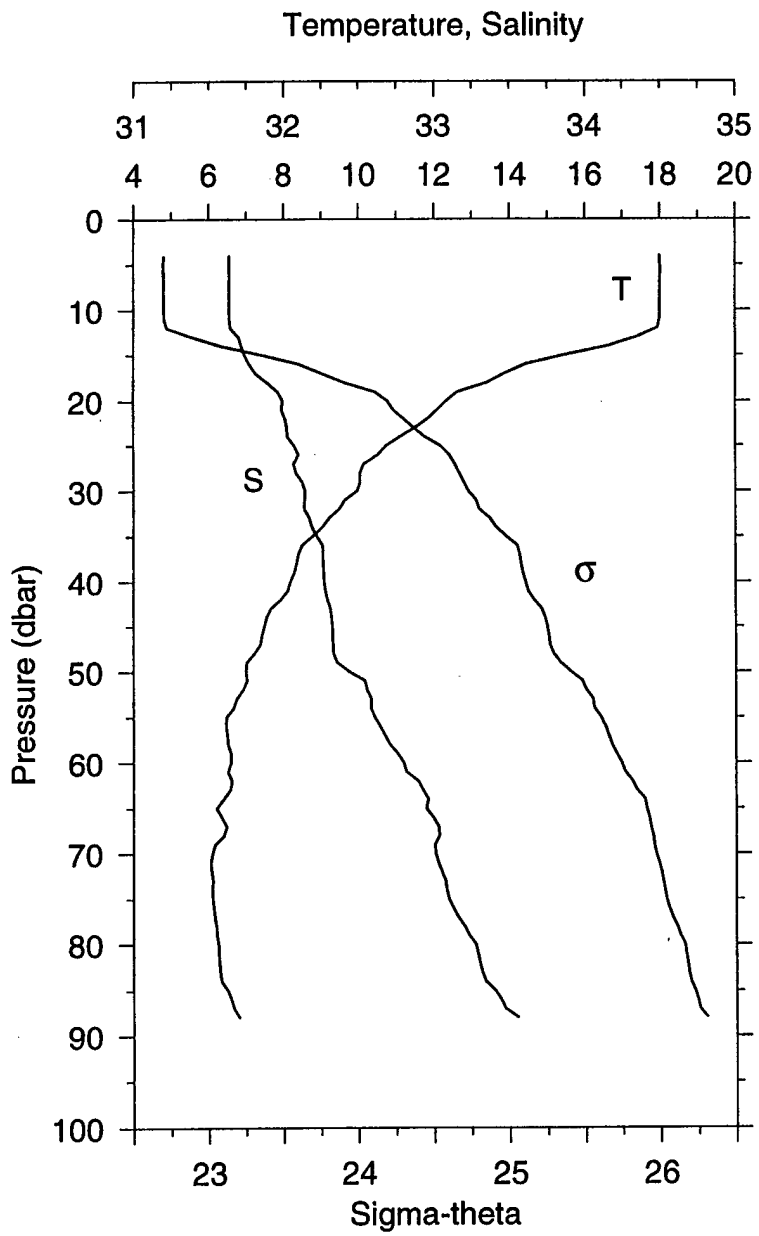
STA: 7 LAT: 40 19.2 N LONG: 70 30.1 W
15 AUG 1996 0949 GMT DEPTH 97

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	17.994	31.277	17.993	22.425	540.5	0.162
10	17.868	31.381	17.866	22.536	530.2	0.535
20	13.018	31.947	13.015	24.026	388.0	1.004
30	9.560	32.059	9.556	24.729	321.1	1.359
40	7.908	32.306	7.904	25.173	279.0	1.658
50	7.274	32.438	7.270	25.365	260.7	1.928
60	7.054	32.613	7.048	25.532	245.0	2.179
70	6.970	32.747	6.964	25.649	234.0	2.419
80	7.285	33.020	7.277	25.821	217.9	2.643
90	7.422	33.143	7.414	25.899	210.7	2.858
93	7.478	33.173	7.470	25.915	209.2	2.920



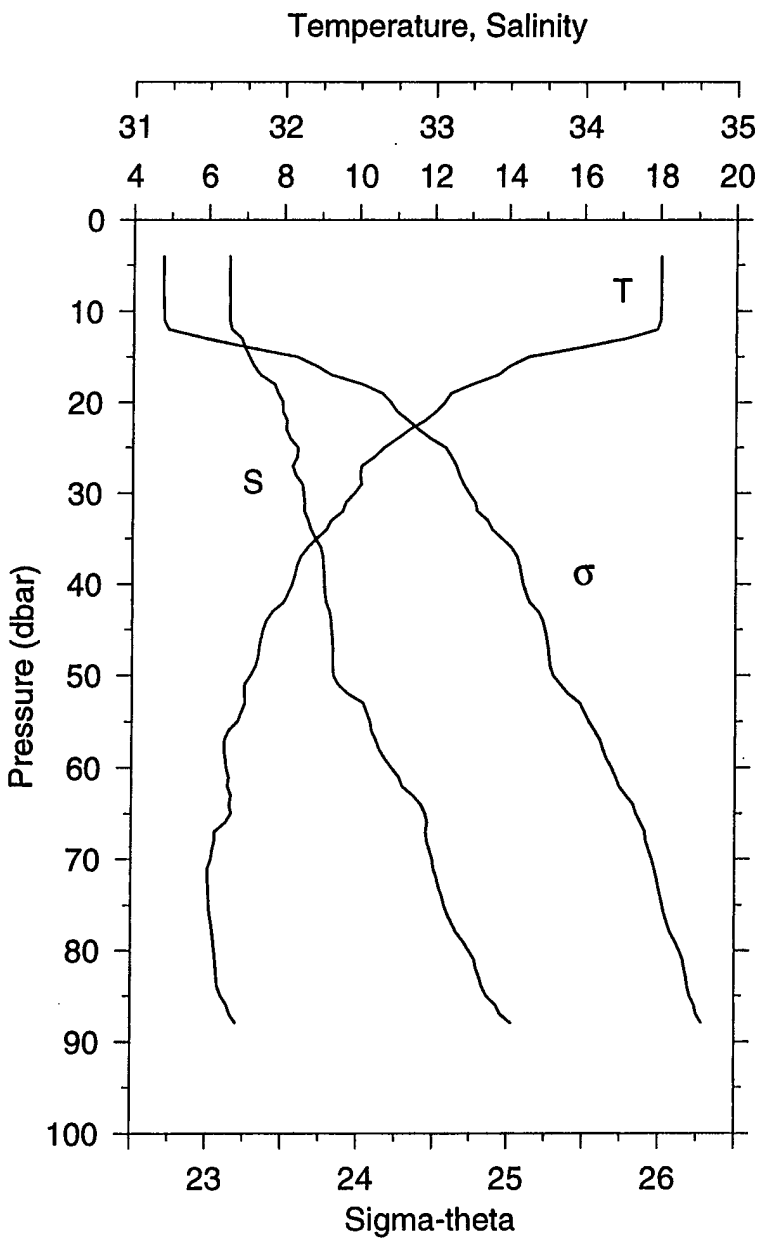
STA: 8 LAT: 40 17.9 N LONG: 70 21.4 W
22 AUG 1996 0513 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
5	18.036	31.639	18.035	22.692	515.1	0.258
10	17.878	31.660	17.876	22.747	510.0	0.514
20	11.917	31.996	11.915	24.274	364.4	0.931
30	10.020	32.124	10.017	24.705	323.5	1.272
40	8.349	32.265	8.346	25.077	288.1	1.578
50	7.143	32.332	7.138	25.299	267.0	1.855
60	6.638	32.758	6.633	25.702	228.9	2.101
70	6.077	33.012	6.071	25.973	203.1	2.315
80	6.245	33.263	6.238	26.151	186.4	2.511
89	6.667	33.504	6.659	26.286	173.8	2.673



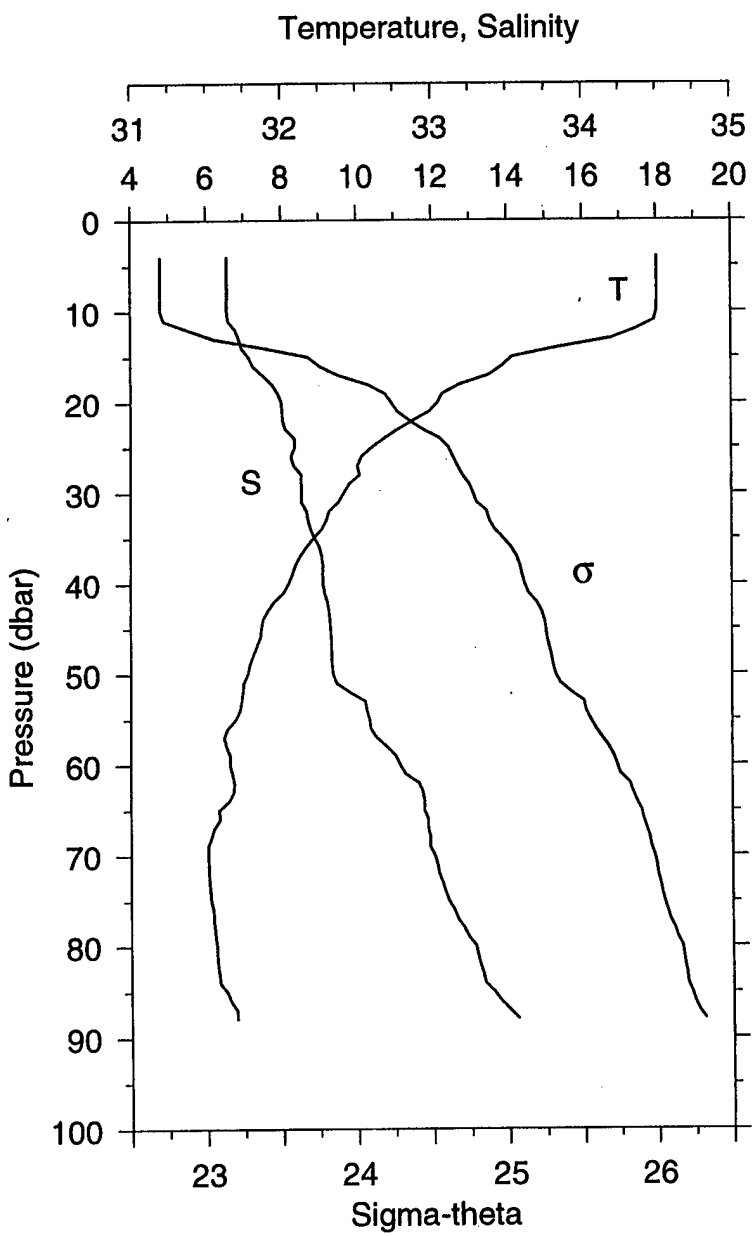
STA: 9 LAT: 40 17.9 N LONG: 70 21.4 W
22 AUG 1996 0524 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	17.999	31.640	17.998	22.702	514.1	0.206
10	18.003	31.639	18.001	22.701	514.4	0.514
20	12.336	31.996	12.334	24.195	371.9	0.966
30	9.973	32.144	9.970	24.728	321.2	1.309
40	8.183	32.273	8.179	25.107	285.2	1.609
50	6.995	32.440	6.990	25.404	257.0	1.882
60	6.592	32.798	6.586	25.740	225.2	2.121
70	6.092	33.009	6.087	25.969	203.5	2.332
80	6.254	33.275	6.248	26.159	185.7	2.528
88	6.822	33.555	6.814	26.306	172.0	2.673



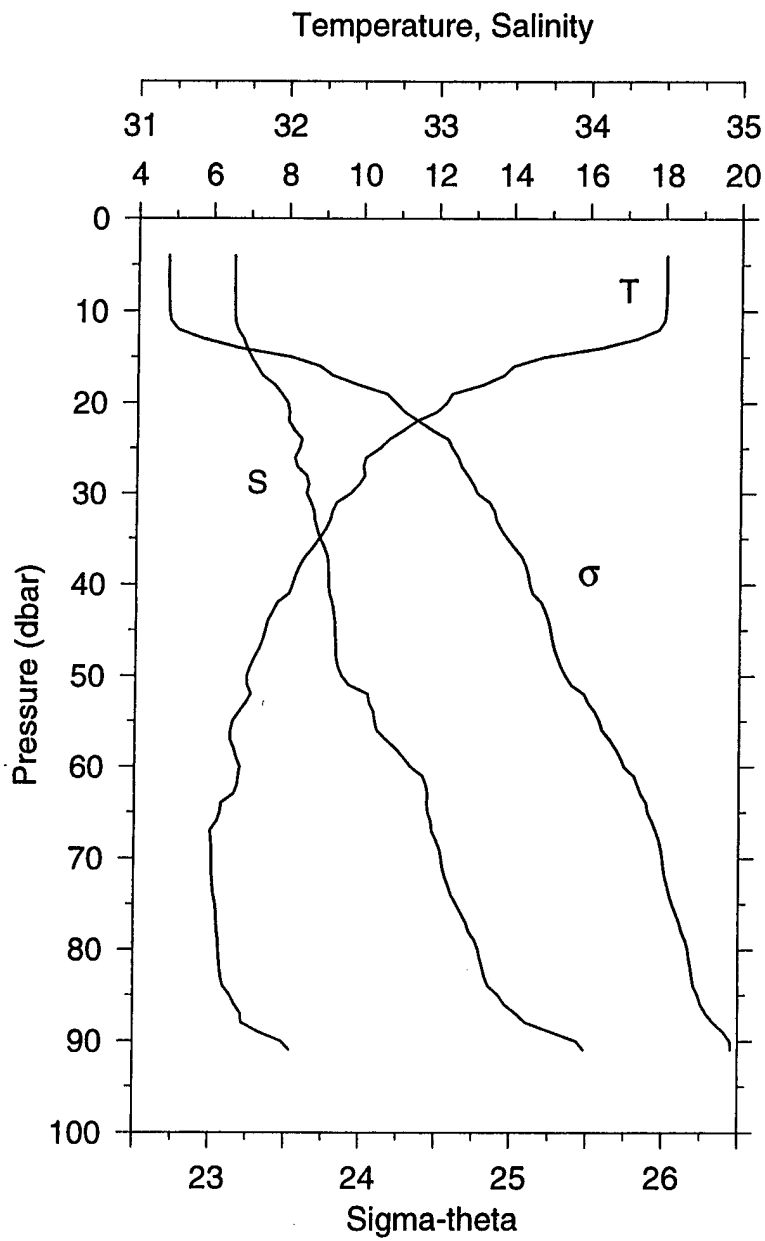
STA: 10 LAT: 40 17.9 N LONG: 70 21.4 W
22 AUG 1996 0530 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.010	31.638	18.010	22.697	514.6	0.206
10	18.006	31.642	18.004	22.702	514.3	0.515
20	12.271	31.995	12.268	24.207	370.8	0.958
30	9.892	32.136	9.889	24.735	320.6	1.300
40	8.246	32.272	8.242	25.097	286.2	1.601
50	7.162	32.335	7.158	25.299	267.0	1.875
60	6.525	32.723	6.520	25.689	230.0	2.121
70	6.132	32.997	6.126	25.955	204.9	2.337
80	6.228	33.245	6.222	26.138	187.6	2.535
88	6.816	33.530	6.808	26.287	173.7	2.680



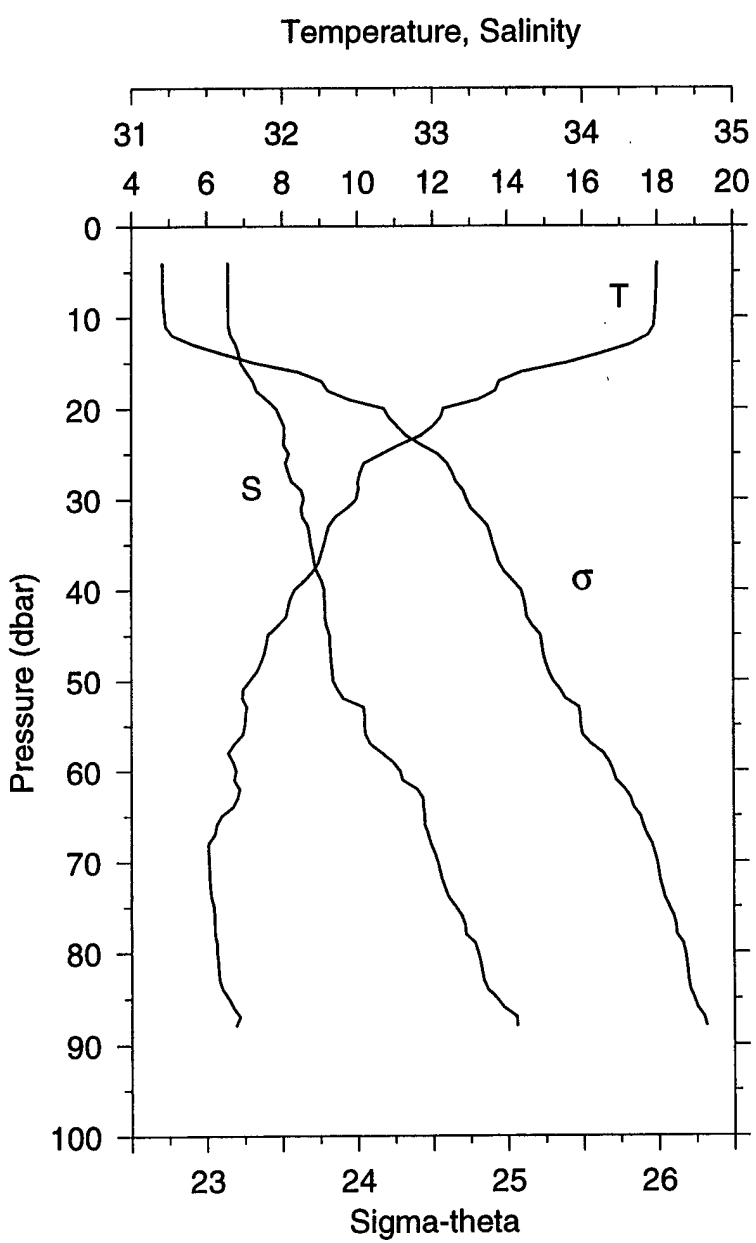
STA: 11 LAT: 40 17.9 N LONG: 70 21.4 W
22 AUG 1996 0538 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.020	31.639	18.020	22.696	514.7	0.206
10	18.012	31.640	18.010	22.699	514.6	0.515
20	12.162	32.000	12.159	24.231	368.5	0.952
30	9.661	32.135	9.658	24.772	317.0	1.290
40	8.173	32.275	8.169	25.110	284.9	1.590
50	7.090	32.340	7.085	25.313	265.7	1.863
60	6.622	32.788	6.617	25.727	226.4	2.107
70	6.035	33.012	6.029	25.978	202.6	2.319
80	6.256	33.281	6.250	26.163	185.3	2.515
88	6.789	33.564	6.781	26.318	170.8	2.659



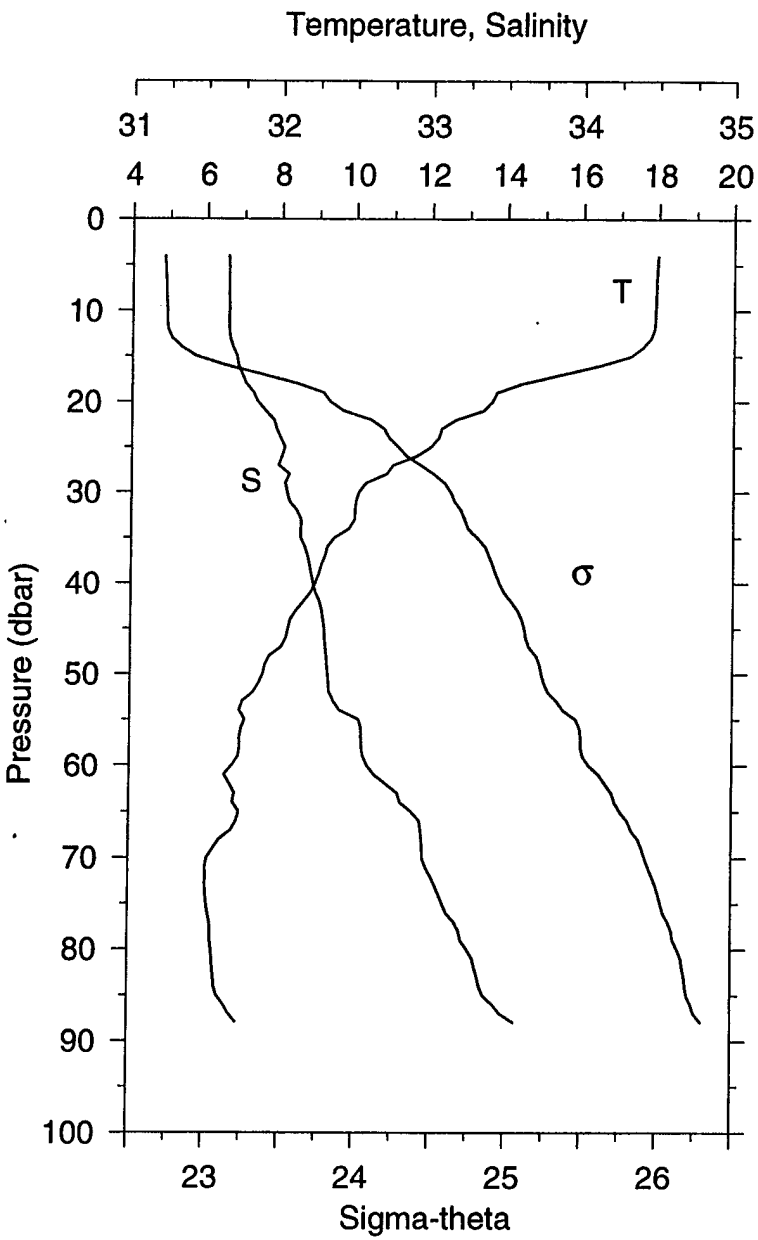
STA: 12 LAT: 40 18.0 N LONG: 70 21.6 W
22 AUG 1996 0545 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.018	31.638	18.017	22.696	514.7	0.206
10	18.000	31.641	17.998	22.703	514.2	0.515
20	12.218	31.996	12.216	24.217	369.8	0.961
30	9.677	32.128	9.674	24.764	317.8	1.299
40	8.154	32.277	8.151	25.114	284.5	1.597
50	6.960	32.370	6.956	25.354	261.8	1.869
60	6.794	32.837	6.789	25.743	224.9	2.111
70	6.059	33.040	6.053	25.998	200.8	2.321
80	6.259	33.289	6.253	26.169	184.7	2.515
90	7.933	33.935	7.924	26.449	158.7	2.691
91	8.165	33.986	8.156	26.455	158.2	2.707



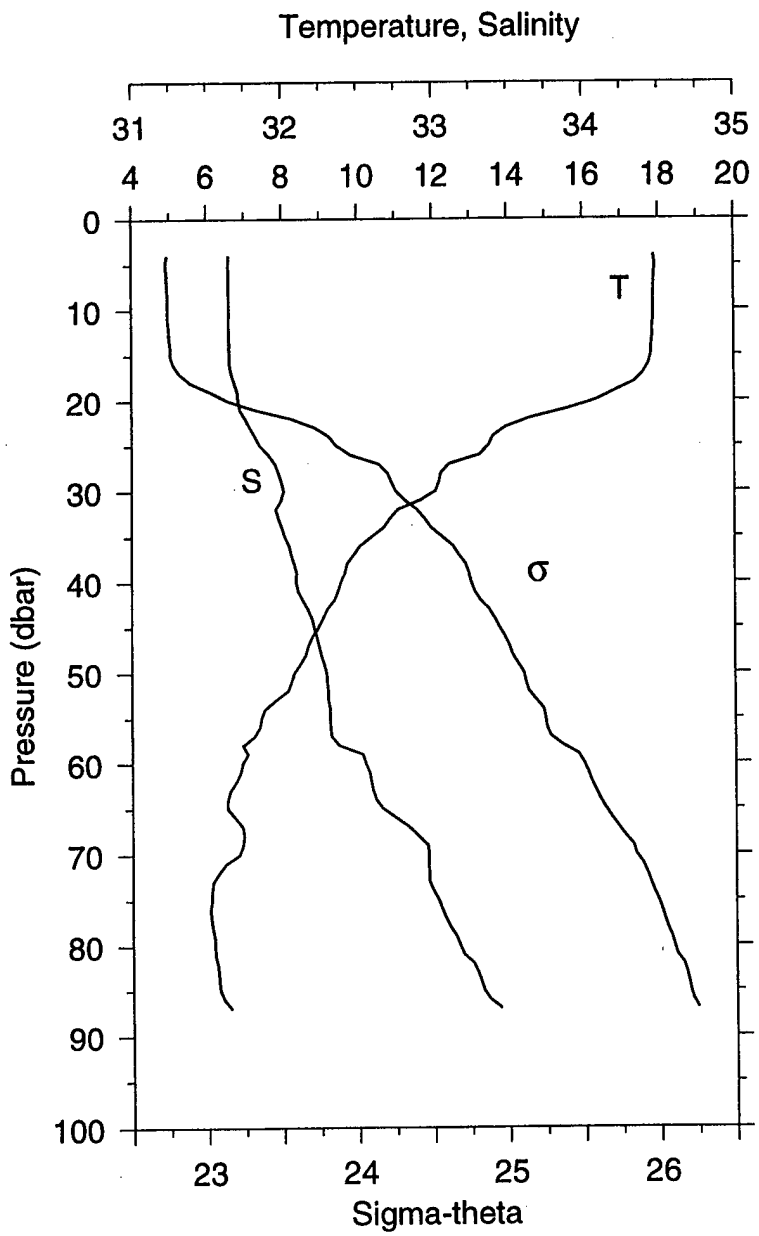
STA: 13 LAT: 40 18.0 N LONG: 70 21.6 W
22 AUG 1996 0553 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	17.999	31.641	17.999	22.703	514.0	0.206
10	17.934	31.647	17.932	22.723	512.3	0.514
20	12.299	31.963	12.297	24.177	373.7	0.967
30	9.975	32.145	9.972	24.728	321.2	1.312
40	8.335	32.280	8.332	25.090	286.9	1.616
50	7.143	32.335	7.139	25.301	266.8	1.893
60	6.787	32.784	6.782	25.702	228.8	2.141
70	6.055	33.032	6.049	25.992	201.3	2.355
80	6.265	33.299	6.258	26.176	184.0	2.548
88	6.763	33.560	6.755	26.318	170.8	2.692



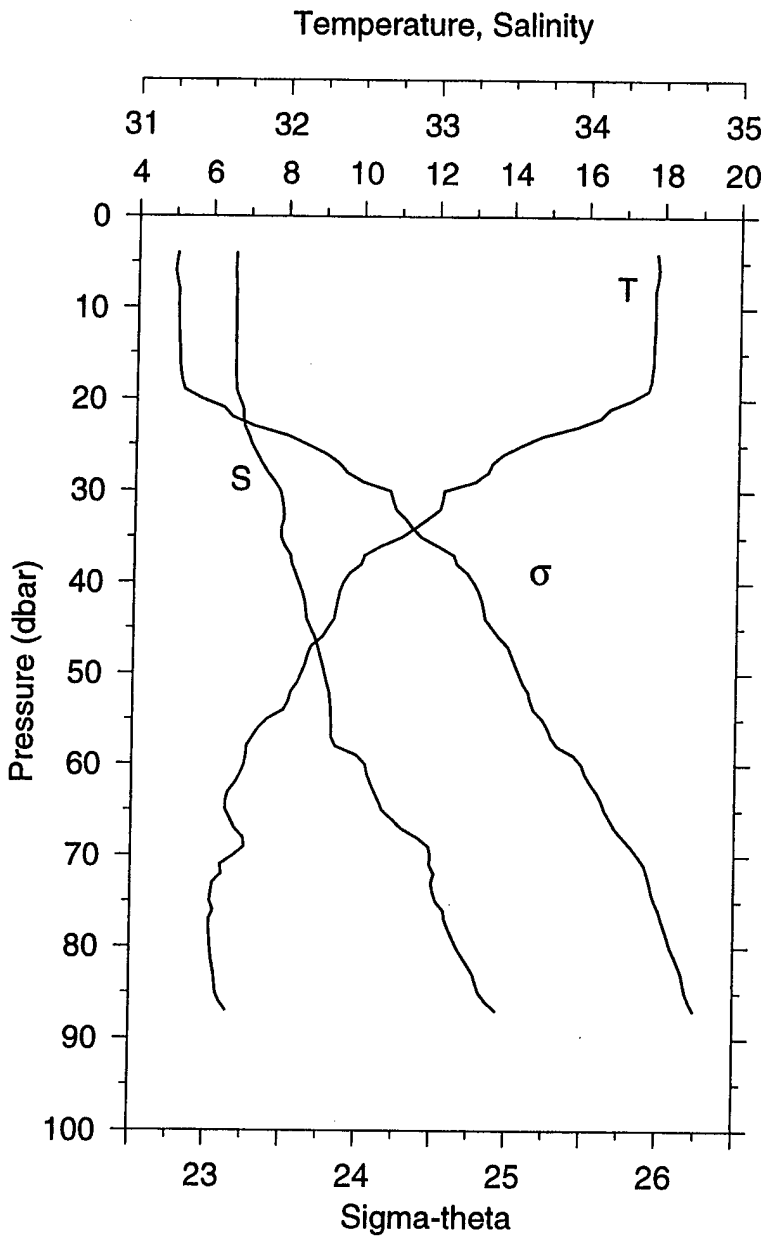
STA: 14 LAT: 40 18.1 N LONG: 70 21.7 W
22 AUG 1996 0559 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	17.967	31.643	17.966	22.712	513.1	0.205
10	17.908	31.648	17.906	22.730	511.6	0.513
20	13.610	31.841	13.607	23.827	407.0	0.988
30	10.085	32.040	10.081	24.629	330.7	1.352
40	8.927	32.218	8.923	24.953	300.0	1.666
50	7.547	32.319	7.542	25.234	273.2	1.951
60	6.760	32.587	6.755	25.551	243.1	2.208
70	6.103	32.958	6.098	25.927	207.5	2.431
80	6.239	33.257	6.232	26.146	186.8	2.628
88	6.910	33.570	6.902	26.306	172.0	2.773



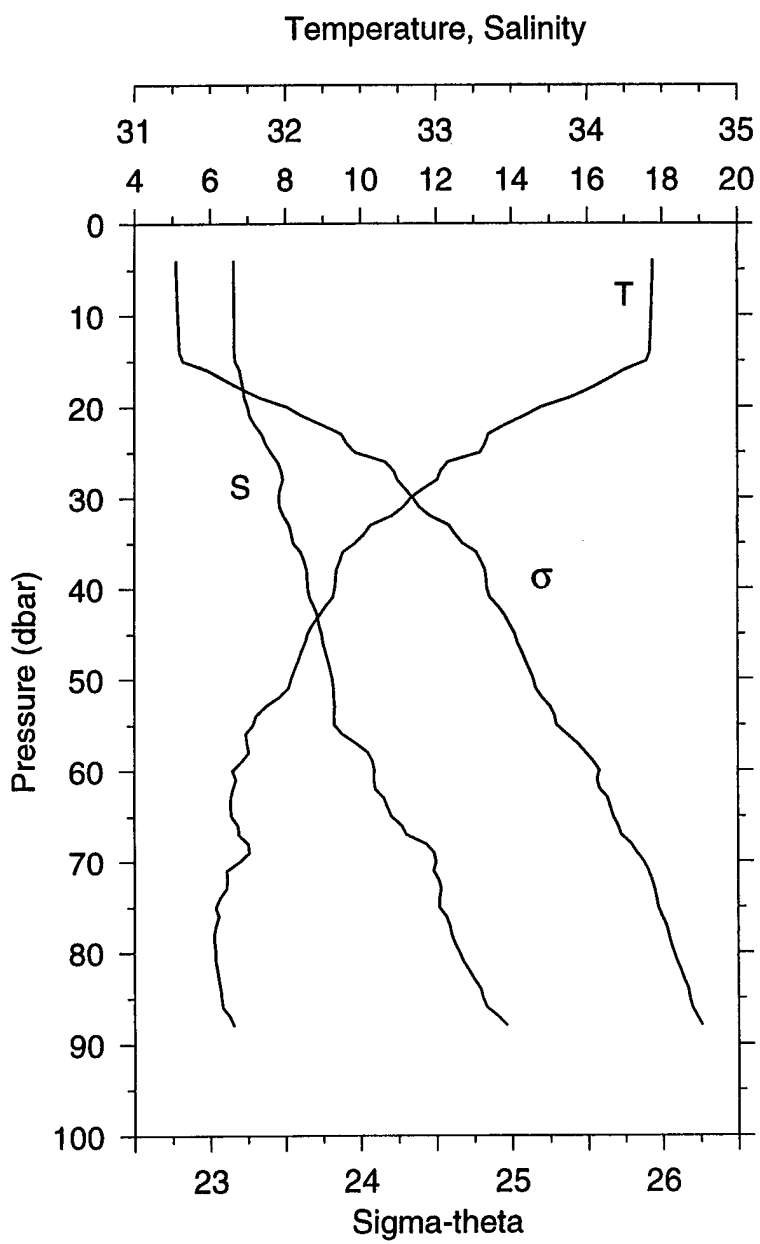
STA: 15 LAT: 40 18.1 N LONG: 70 21.7 W
22 AUG 1996 0606 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	17.882	31.650	17.882	22.738	510.7	0.204
10	17.871	31.650	17.869	22.740	510.6	0.511
20	16.348	31.712	16.345	23.143	472.4	1.014
30	12.085	32.012	12.081	24.255	366.5	1.419
40	9.561	32.093	9.556	24.756	318.8	1.757
50	8.322	32.294	8.317	25.104	285.7	2.059
60	6.937	32.550	6.932	25.499	248.2	2.330
70	6.849	32.967	6.842	25.839	216.0	2.564
80	6.177	33.173	6.170	26.088	192.4	2.766
87	6.615	33.445	6.607	26.246	177.5	2.896



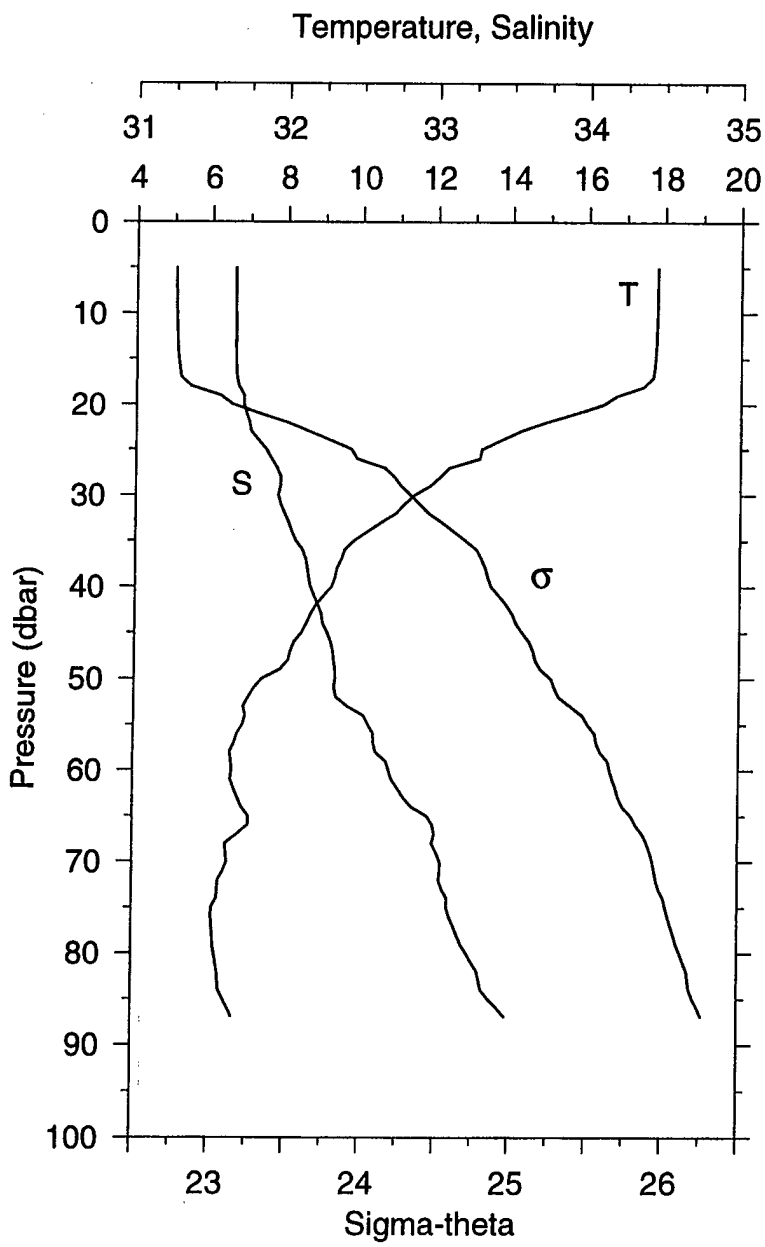
STA: 16 LAT: 40 18.3 N LONG: 70 21.8 W
22 AUG 1996 0614 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	17.795	31.654	17.795	22.761	508.4	0.203
10	17.761	31.655	17.759	22.771	507.7	0.509
20	17.183	31.686	17.180	22.931	492.7	1.015
30	12.214	31.965	12.210	24.194	372.2	1.446
40	9.565	32.097	9.561	24.758	318.6	1.794
50	8.476	32.272	8.471	25.064	289.6	2.099
60	6.995	32.550	6.990	25.491	248.9	2.372
70	6.739	32.987	6.733	25.869	213.1	2.605
80	6.150	33.168	6.143	26.087	192.4	2.807
87	6.585	33.436	6.578	26.243	177.8	2.937



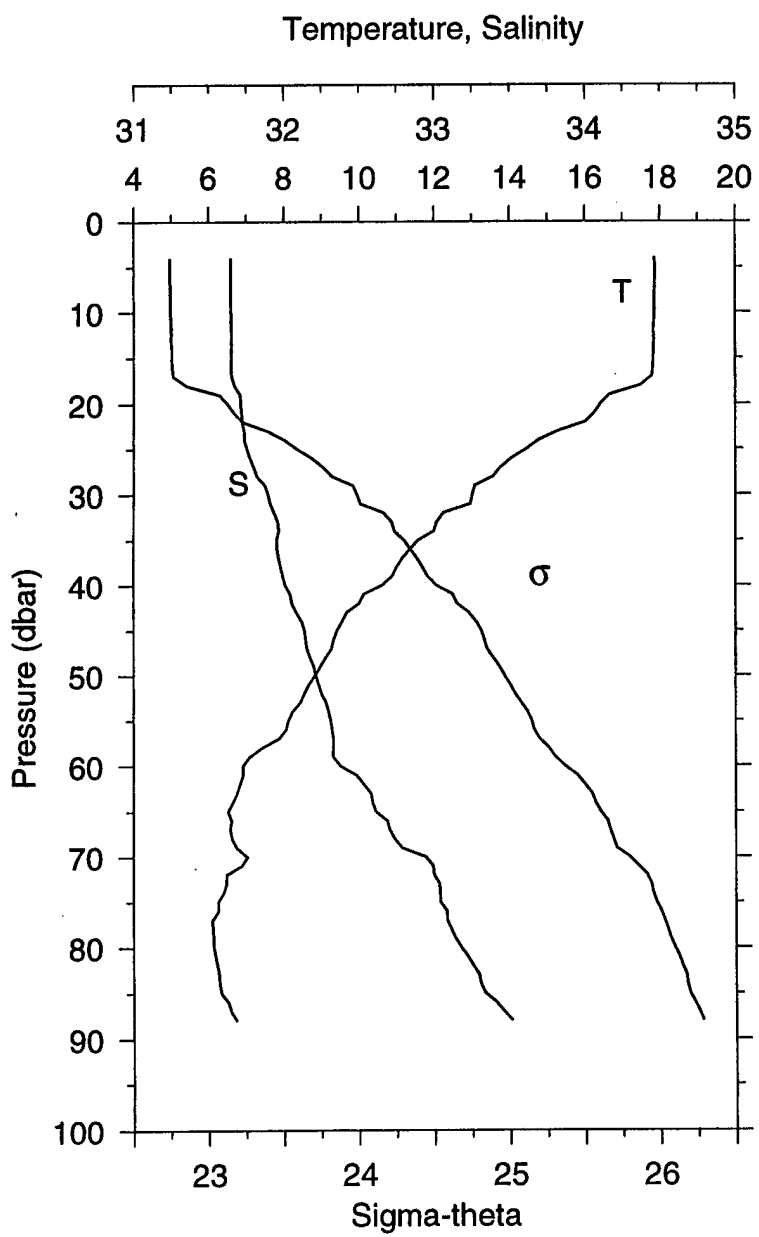
STA: 17 LAT: 40 18.3 N LONG: 70 21.8 W
22 AUG 1996 0622 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	17.751	31.657	17.750	22.775	507.1	0.203
10	17.717	31.659	17.716	22.784	506.4	0.507
20	14.796	31.750	14.793	23.513	437.1	0.995
30	11.341	31.956	11.337	24.347	357.7	1.386
40	9.325	32.150	9.321	24.837	311.0	1.715
50	8.153	32.313	8.148	25.143	282.0	2.010
60	6.585	32.591	6.580	25.577	240.7	2.273
70	6.776	32.998	6.770	25.873	212.7	2.504
80	6.141	33.153	6.134	26.077	193.4	2.706
88	6.626	33.465	6.618	26.261	176.2	2.855



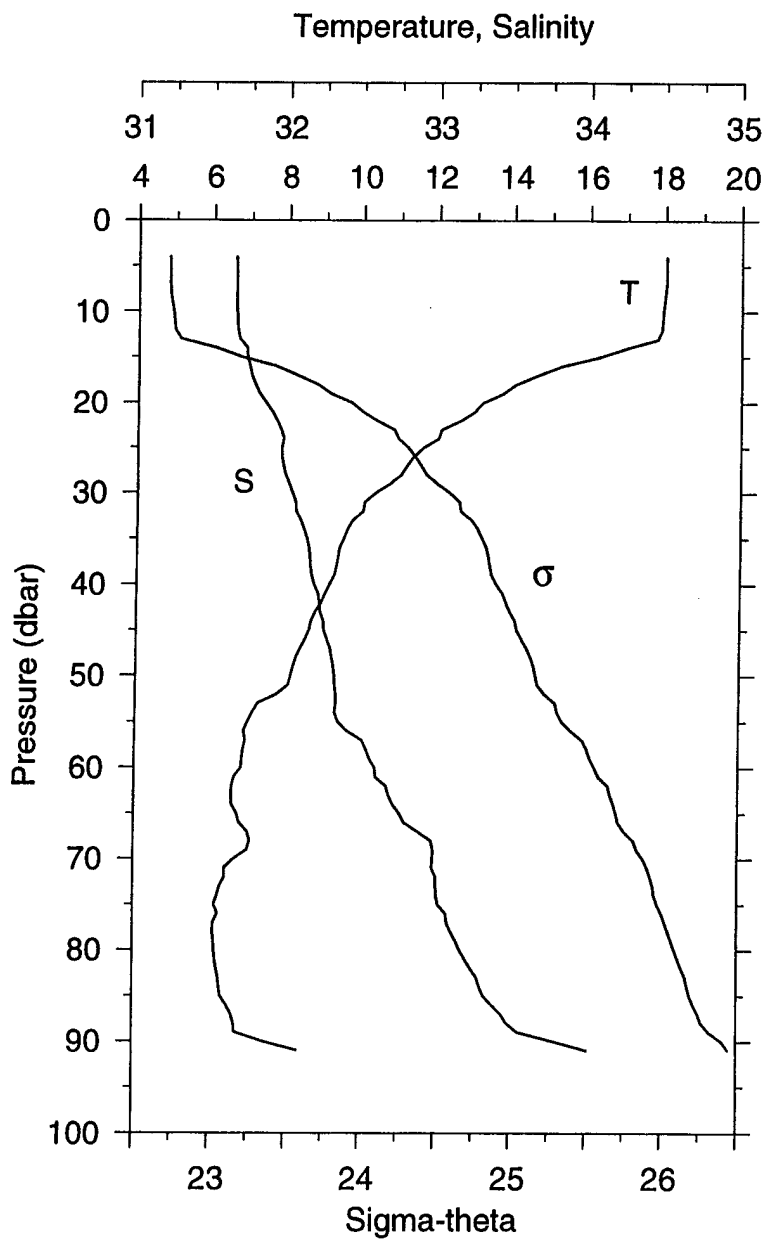
STA: 18 LAT: 40 18.4 N LONG: 70 21.8 W
22 AUG 1996 0628 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
5	17.802	31.654	17.801	22.760	508.6	0.254
10	17.791	31.655	17.789	22.764	508.4	0.509
20	16.379	31.712	16.376	23.136	473.1	1.011
30	11.400	31.943	11.397	24.326	359.6	1.416
40	9.214	32.162	9.210	24.864	308.4	1.745
50	7.378	32.331	7.373	25.267	270.1	2.034
60	6.611	32.695	6.606	25.656	233.2	2.284
70	6.494	33.038	6.488	25.941	206.2	2.504
80	6.192	33.222	6.185	26.125	188.8	2.702
87	6.662	33.480	6.654	26.268	175.5	2.830



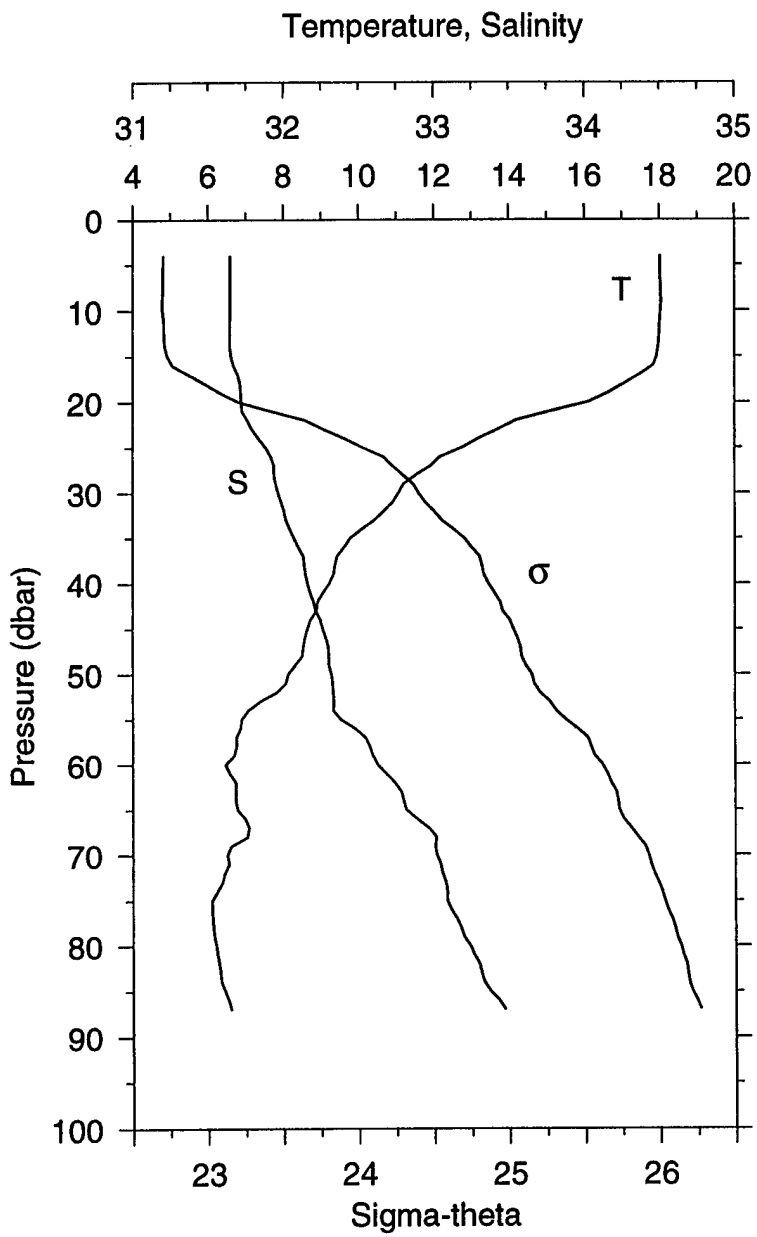
STA: 19 LAT: 40 18.4 N LONG: 70 21.8 W
22 AUG 1996 0635 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	17.864	31.651	17.863	22.743	510.2	0.204
10	17.855	31.651	17.854	22.745	510.2	0.510
20	16.422	31.715	16.419	23.129	473.8	1.014
30	13.021	31.896	13.017	23.987	392.0	1.446
40	10.616	32.010	10.611	24.516	341.7	1.810
50	8.834	32.215	8.829	24.965	299.0	2.126
60	6.914	32.376	6.909	25.364	260.9	2.408
70	7.037	32.945	7.030	25.796	220.1	2.647
80	6.140	33.177	6.133	26.096	191.6	2.850
88	6.746	33.513	6.739	26.283	174.1	2.997



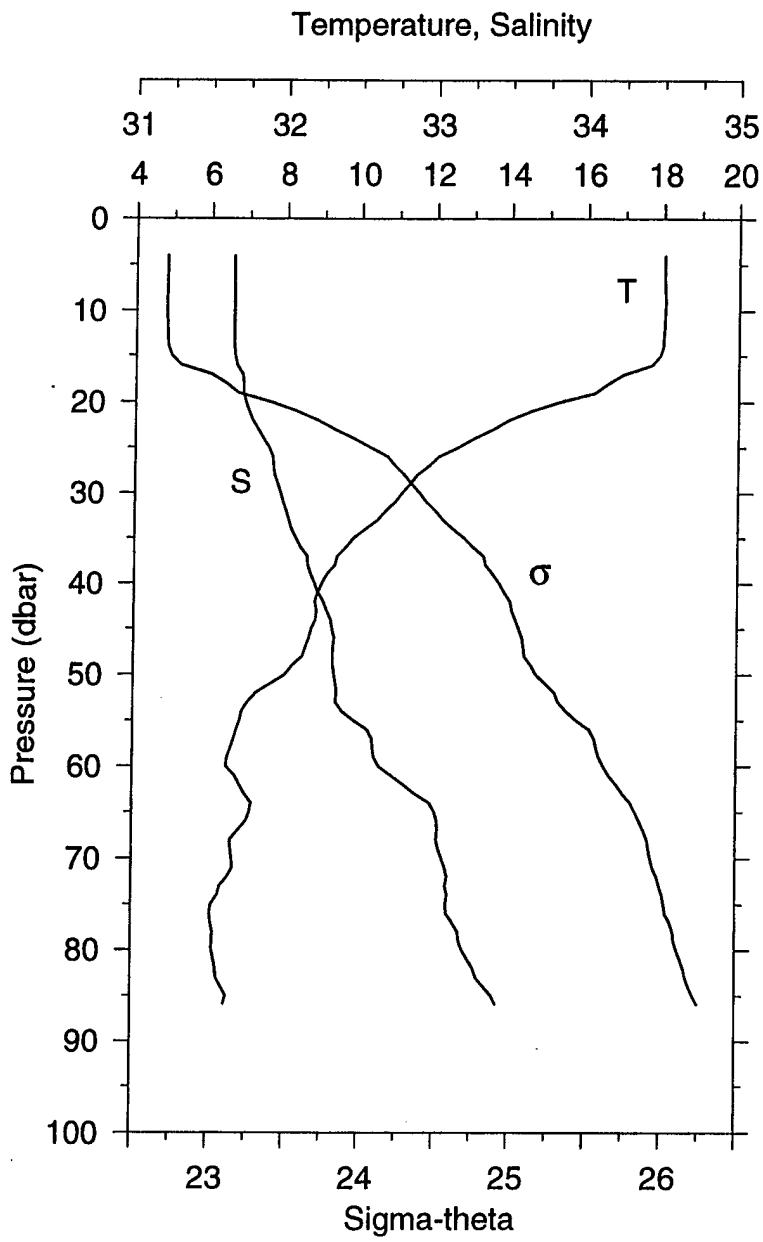
STA: 20 LAT: 40 18.4 N LONG: 70 21.8 W
22 AUG 1996 0641 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.005	31.645	18.005	22.704	513.9	0.206
10	17.923	31.649	17.921	22.728	511.8	0.514
20	13.158	31.846	13.155	23.921	398.1	0.979
30	10.343	32.026	10.340	24.575	335.9	1.343
40	9.135	32.180	9.130	24.891	305.9	1.661
50	8.105	32.319	8.100	25.154	280.9	1.953
60	6.819	32.598	6.814	25.551	243.1	2.215
70	6.656	32.988	6.650	25.881	212.0	2.444
80	6.146	33.170	6.139	26.090	192.2	2.646
90	7.454	33.796	7.446	26.408	162.4	2.827
91	8.381	34.020	8.372	26.449	158.8	2.843



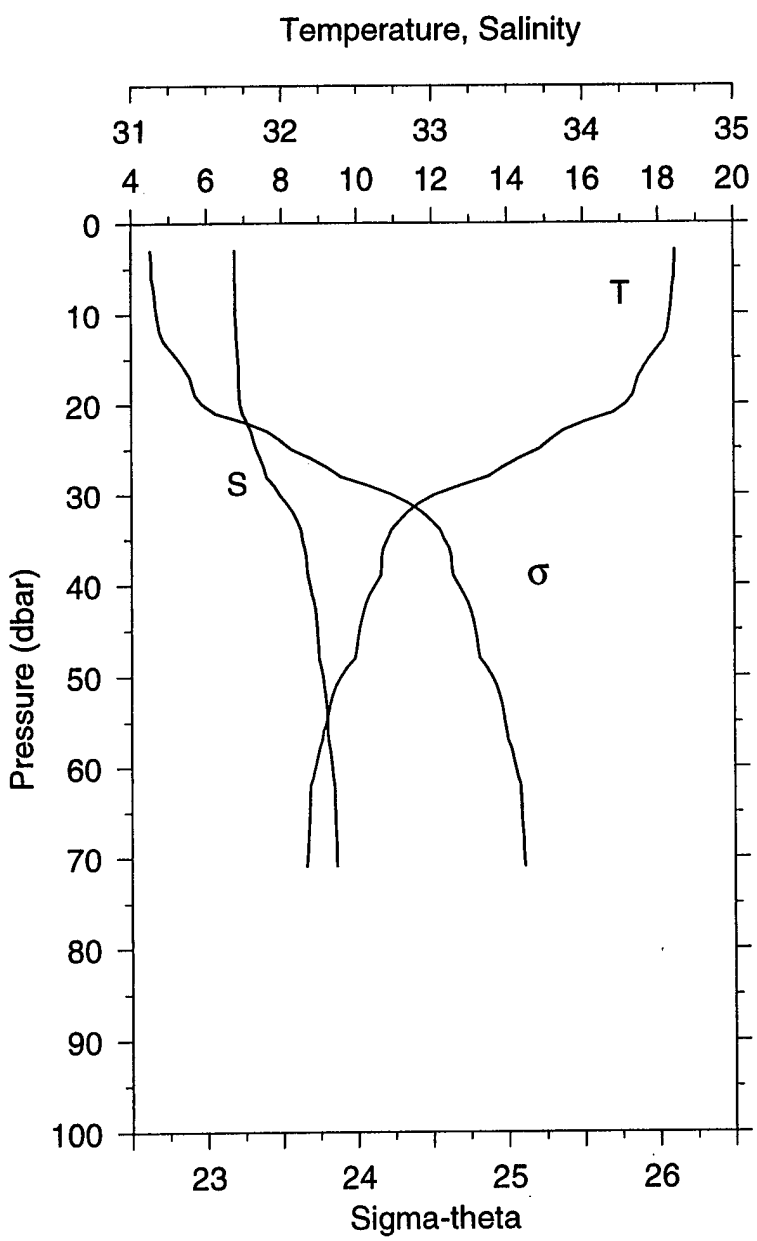
STA: 21 LAT: 40 18.5 N LONG: 70 21.7 W
22 AUG 1996 0649 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.023	31.648	18.022	22.702	514.1	0.206
10	18.041	31.649	18.039	22.699	514.6	0.514
20	16.095	31.720	16.092	23.207	466.3	1.017
30	11.074	31.966	11.070	24.402	352.4	1.411
40	9.223	32.162	9.219	24.863	308.5	1.738
50	8.128	32.320	8.123	25.152	281.1	2.032
60	6.468	32.625	6.463	25.618	236.7	2.292
70	6.509	33.019	6.503	25.924	207.9	2.515
80	6.208	33.239	6.201	26.136	187.8	2.713
87	6.611	33.471	6.604	26.268	175.5	2.841



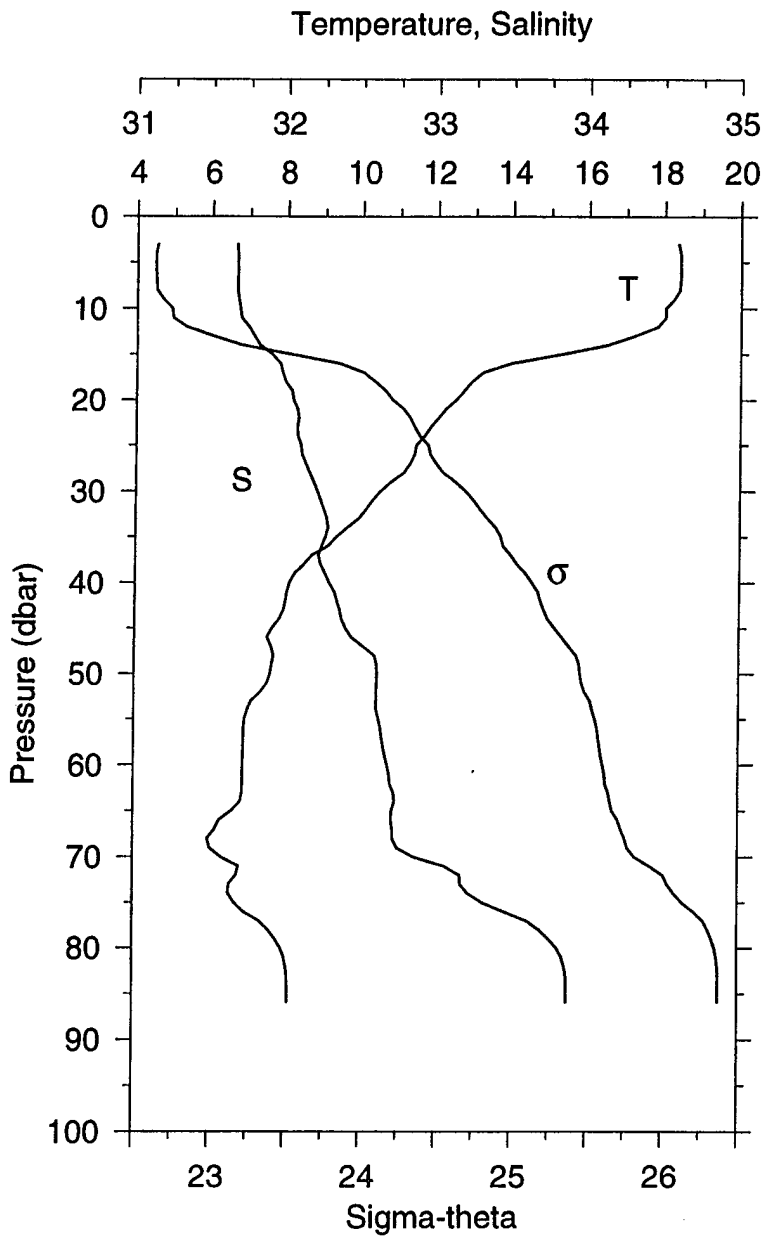
STA: 22 LAT: 40 18.5 N LONG: 70 21.7 W
22 AUG 1996 0655 GMT DEPTH 96

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.009	31.647	18.009	22.705	513.9	0.206
10	18.030	31.649	18.028	22.701	514.4	0.514
20	15.277	31.729	15.274	23.394	448.5	1.013
30	11.108	31.965	11.104	24.395	353.0	1.403
40	8.981	32.197	8.977	24.928	302.3	1.729
50	8.024	32.332	8.019	25.176	278.8	2.019
60	6.475	32.636	6.470	25.627	235.9	2.274
70	6.651	33.060	6.645	25.938	206.5	2.492
80	6.147	33.200	6.140	26.113	190.0	2.690
86	6.453	33.426	6.446	26.252	176.9	2.800



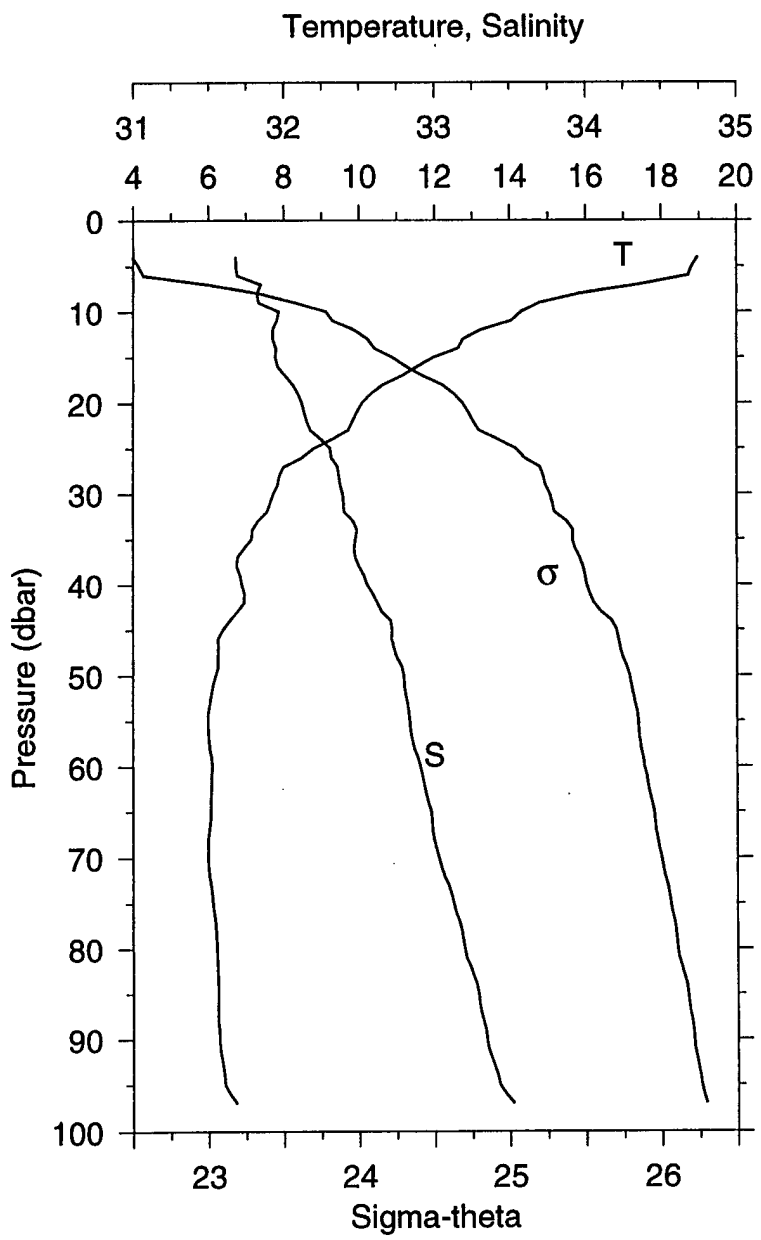
STA: 23 LAT: 40 25.0 N LONG: 70 21.0 W
22 AUG 1996 2256 GMT DEPTH 78

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	18.454	31.687	18.453	22.627	521.2	0.156
10	18.310	31.693	18.308	22.668	517.6	0.520
20	17.129	31.721	17.126	22.971	488.9	1.025
30	12.094	31.985	12.091	24.232	368.6	1.456
40	10.484	32.184	10.480	24.674	326.6	1.795
50	9.563	32.271	9.557	24.894	305.8	2.112
60	8.877	32.331	8.871	25.049	291.2	2.409
70	8.664	32.359	8.657	25.103	286.1	2.697
71	8.638	32.361	8.631	25.109	285.7	2.726



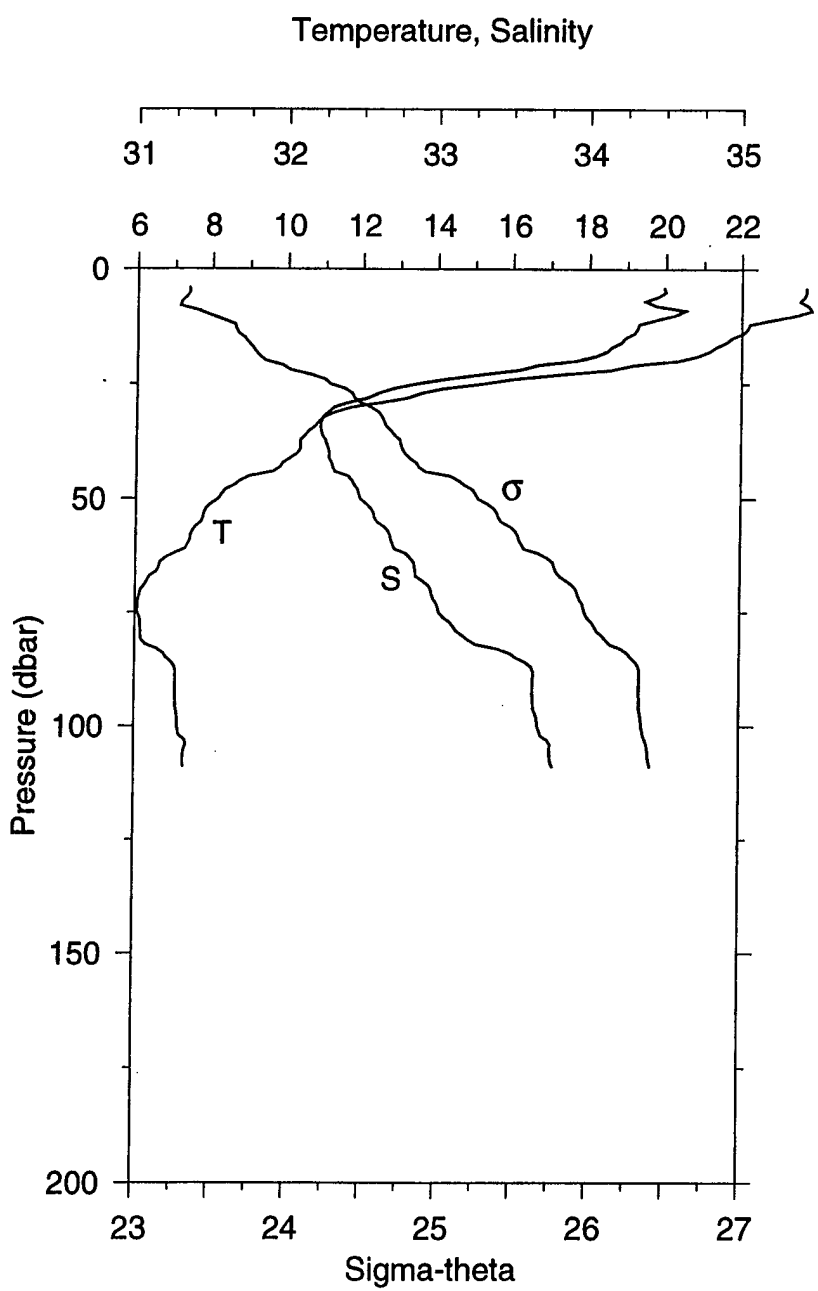
STA: 24 LAT: 40 19.9 N LONG: 70 20.9 W
22 AUG 1996 2348 GMT DEPTH 92

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	18.339	31.661	18.338	22.636	520.4	0.156
10	18.010	31.682	18.008	22.731	511.5	0.520
20	12.495	32.040	12.493	24.199	371.5	0.960
30	10.484	32.202	10.481	24.688	325.1	1.310
40	8.093	32.287	8.089	25.131	283.0	1.613
50	7.598	32.609	7.593	25.455	252.3	1.881
60	6.885	32.680	6.880	25.607	237.8	2.125
70	6.332	32.860	6.326	25.821	217.6	2.355
80	7.926	33.810	7.918	26.352	167.7	2.542
86	8.109	33.873	8.100	26.374	165.7	2.642



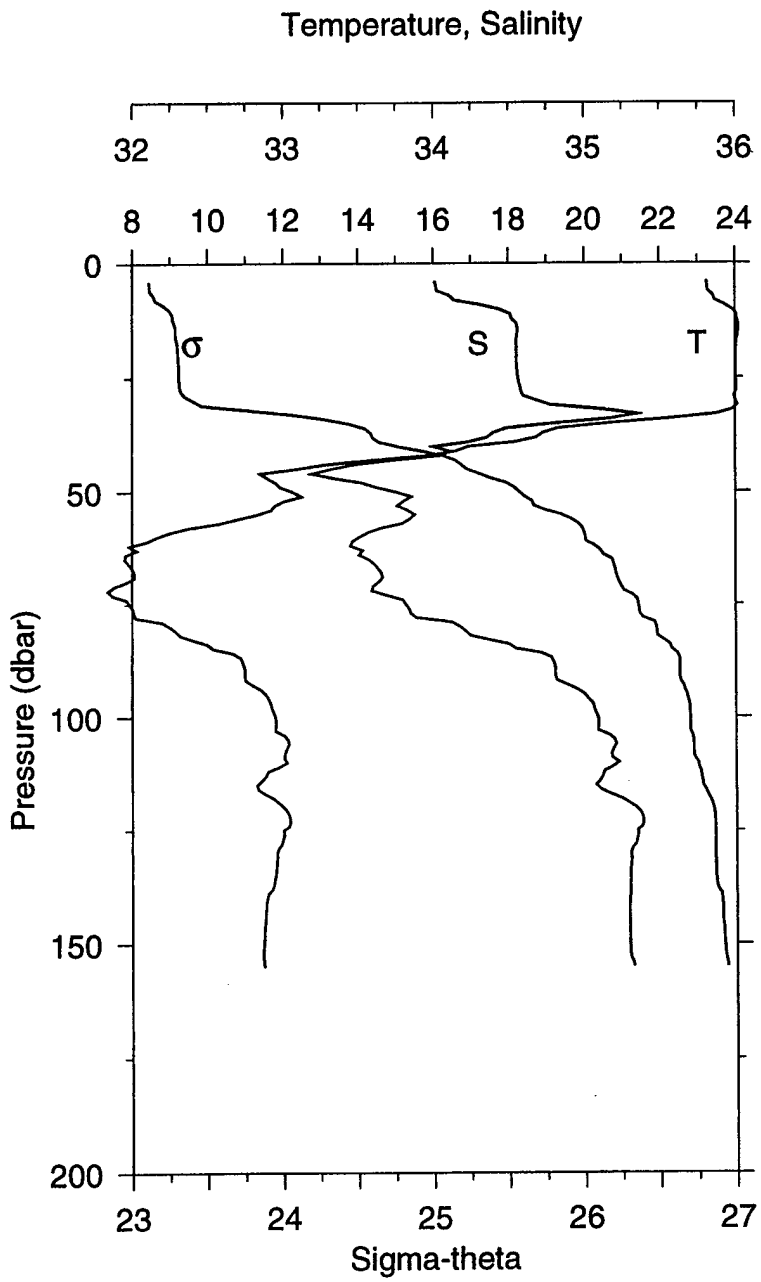
STA: 25 LAT: 40 15.0 N LONG: 70 20.8 W
23 AUG 1996 0043 GMT DEPTH 103

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.968	31.682	18.968	22.497	533.8	0.214
10	14.310	31.968	14.309	23.782	411.1	0.503
20	10.090	32.121	10.088	24.690	324.7	0.872
30	7.723	32.391	7.720	25.265	270.0	1.167
40	6.887	32.553	6.883	25.507	247.1	1.424
50	6.189	32.797	6.185	25.789	220.3	1.656
60	6.103	32.906	6.098	25.886	211.3	1.871
70	5.981	33.028	5.975	25.998	200.8	2.077
80	6.215	33.199	6.209	26.103	190.9	2.273
90	6.284	33.344	6.276	26.210	181.0	2.458
97	6.745	33.522	6.736	26.290	173.5	2.582



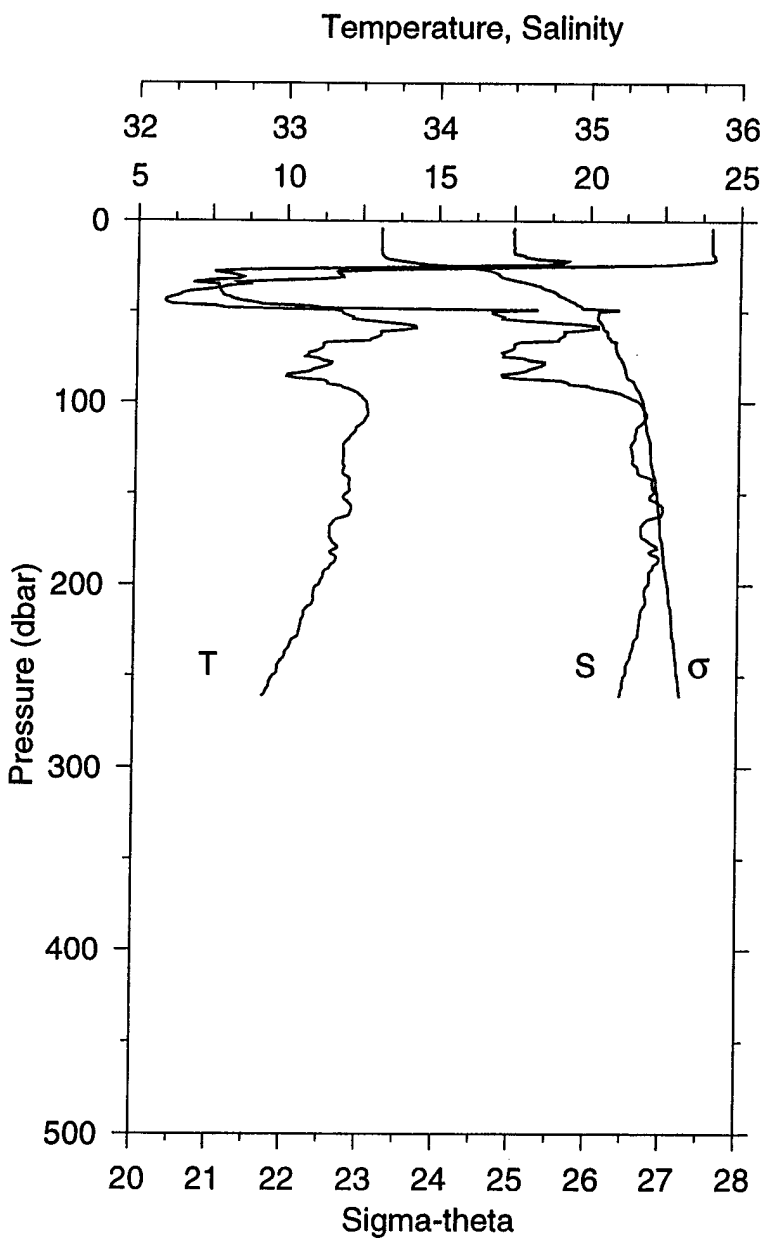
STA: 26 LAT: 40 10.1 N LONG: 70 20.8 W
23 AUG 1996 0152 GMT DEPTH 119

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	23.698	34.485	23.697	23.343	453.0	0.181
10	23.429	34.561	23.427	23.479	440.2	0.453
20	20.338	33.920	20.334	23.851	405.0	0.872
30	11.702	32.309	11.699	24.556	337.8	1.238
40	10.263	32.277	10.259	24.784	316.2	1.563
50	8.193	32.488	8.188	25.275	269.5	1.855
60	7.379	32.707	7.373	25.563	242.1	2.109
70	6.144	32.963	6.138	25.926	207.6	2.331
80	6.144	33.177	6.137	26.096	191.6	2.533
90	7.084	33.645	7.076	26.341	168.7	2.709
100	7.149	33.678	7.139	26.359	167.2	2.877
109	7.311	33.780	7.301	26.416	161.9	3.025



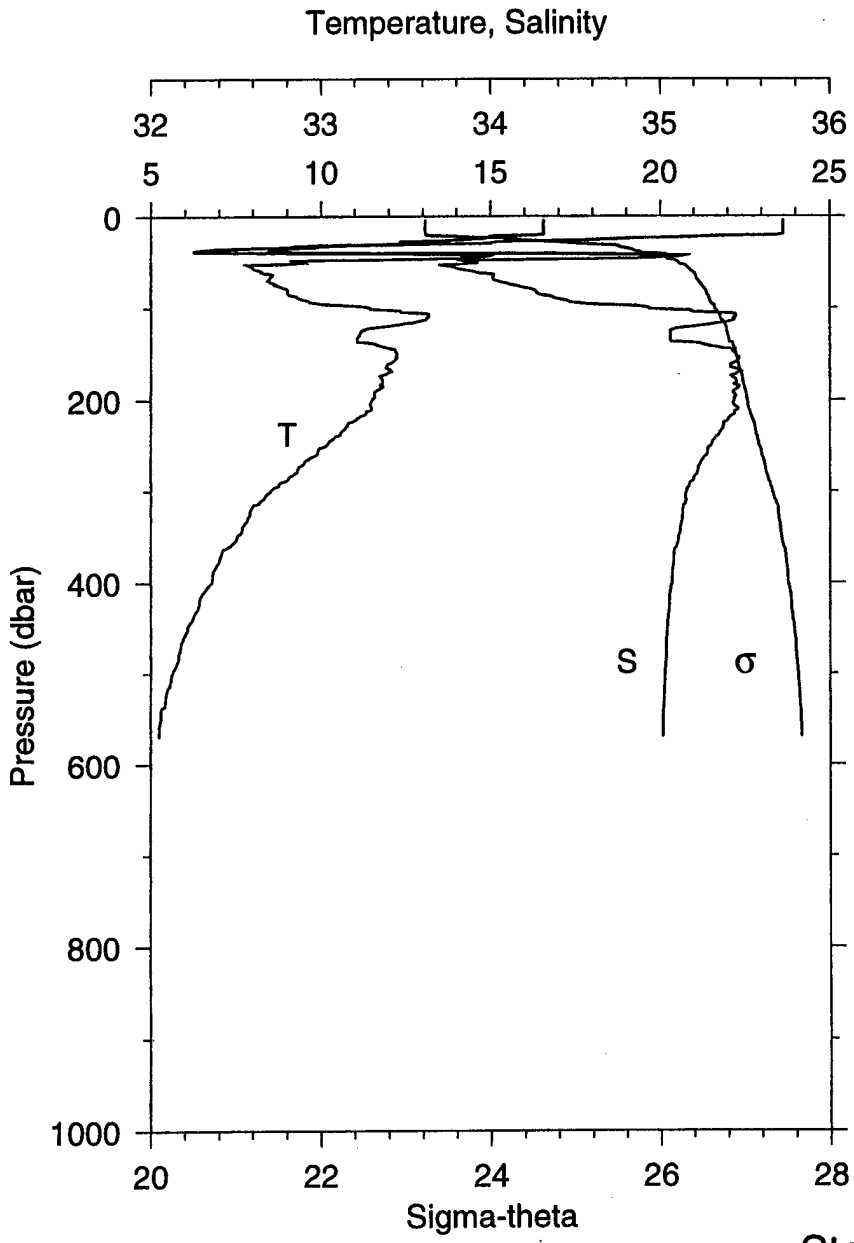
STA: 27 LAT: 40 4.9 N LONG: 70 21.0 W
23 AUG 1996 0255 GMT DEPTH 157

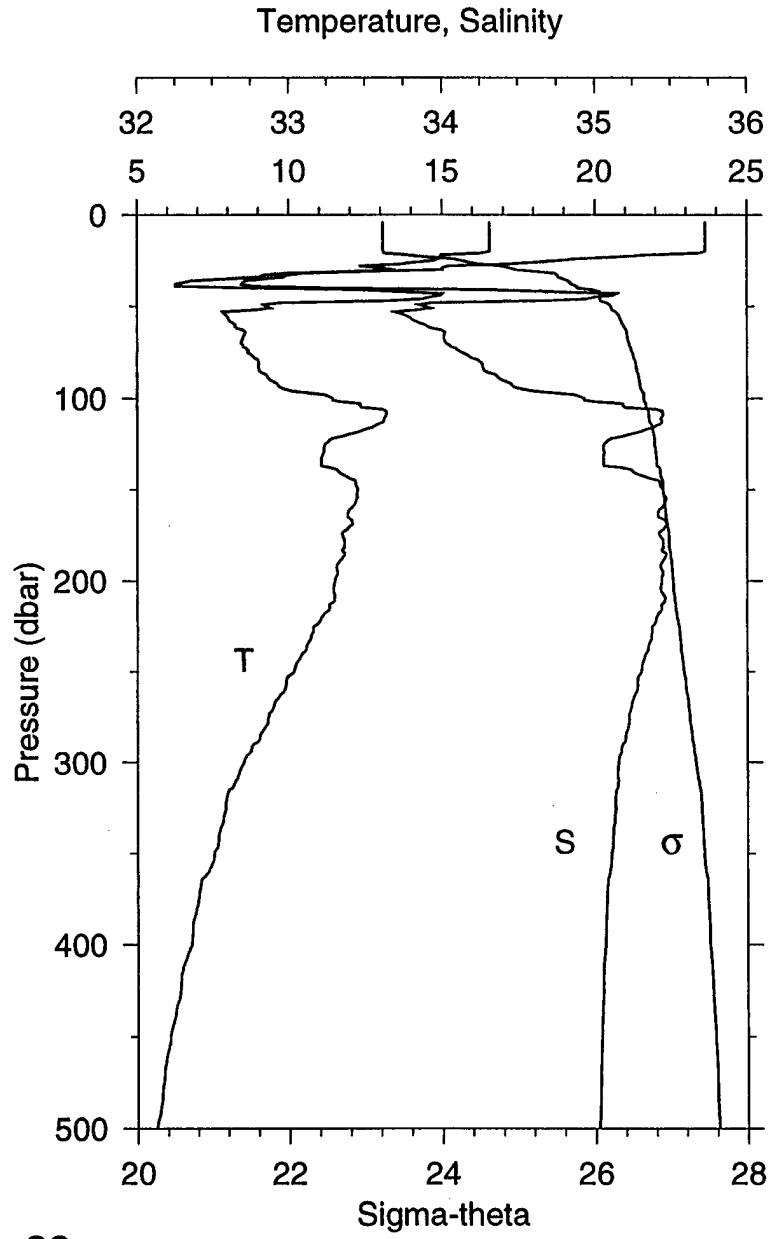
P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	23.254	34.012	23.253	23.113	474.9	0.190
10	23.913	34.441	23.911	23.246	462.4	0.473
20	24.007	34.553	24.003	23.304	457.4	0.932
30	23.999	34.686	23.993	23.407	447.9	1.388
40	16.934	34.004	16.927	24.768	318.2	1.756
50	12.260	33.749	12.253	25.570	241.9	2.029
60	8.644	33.508	8.638	26.006	200.2	2.247
70	7.852	33.639	7.846	26.228	179.2	2.435
80	8.998	34.178	8.989	26.476	156.1	2.603
90	10.988	34.808	10.976	26.631	142.1	2.750
100	11.797	35.088	11.784	26.699	136.0	2.889
110	12.097	35.226	12.083	26.750	131.6	3.023
120	12.038	35.341	12.023	26.851	122.3	3.151
130	11.837	35.306	11.820	26.862	121.4	3.272
140	11.570	35.296	11.553	26.904	117.6	3.393
150	11.479	35.295	11.459	26.921	116.3	3.510
155	11.493	35.324	11.473	26.941	114.5	3.568



STA: 28 LAT: 39 59.8 N LONG: 70 21.0 W
23 AUG 1996 0405 GMT DEPTH 280

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	24.047	34.494	24.047	23.246	462.2	0.185
10	24.051	34.494	24.049	23.246	462.5	0.462
20	24.137	34.580	24.133	23.286	459.1	0.925
30	11.856	32.670	11.852	24.808	313.8	1.303
40	6.482	32.567	6.479	25.571	241.0	1.579
50	11.828	34.359	11.822	26.125	189.1	1.795
60	13.857	34.973	13.848	26.199	182.6	1.982
70	11.213	34.507	11.204	26.355	167.7	2.156
80	11.341	34.683	11.331	26.469	157.2	2.319
90	11.359	34.869	11.348	26.610	144.1	2.472
100	12.659	35.341	12.645	26.728	133.4	2.610
110	12.620	35.375	12.605	26.763	130.4	2.742
120	12.105	35.314	12.090	26.816	125.5	2.870
130	11.937	35.300	11.920	26.838	123.7	2.994
140	11.964	35.364	11.945	26.883	119.7	3.117
150	12.027	35.433	12.007	26.925	116.1	3.234
175	11.535	35.387	11.513	26.982	111.1	3.519
200	11.160	35.408	11.134	27.069	103.4	3.787
225	10.526	35.346	10.499	27.136	97.5	4.037
250	9.647	35.252	9.619	27.214	90.2	4.272
261	9.287	35.221	9.258	27.250	86.9	4.370

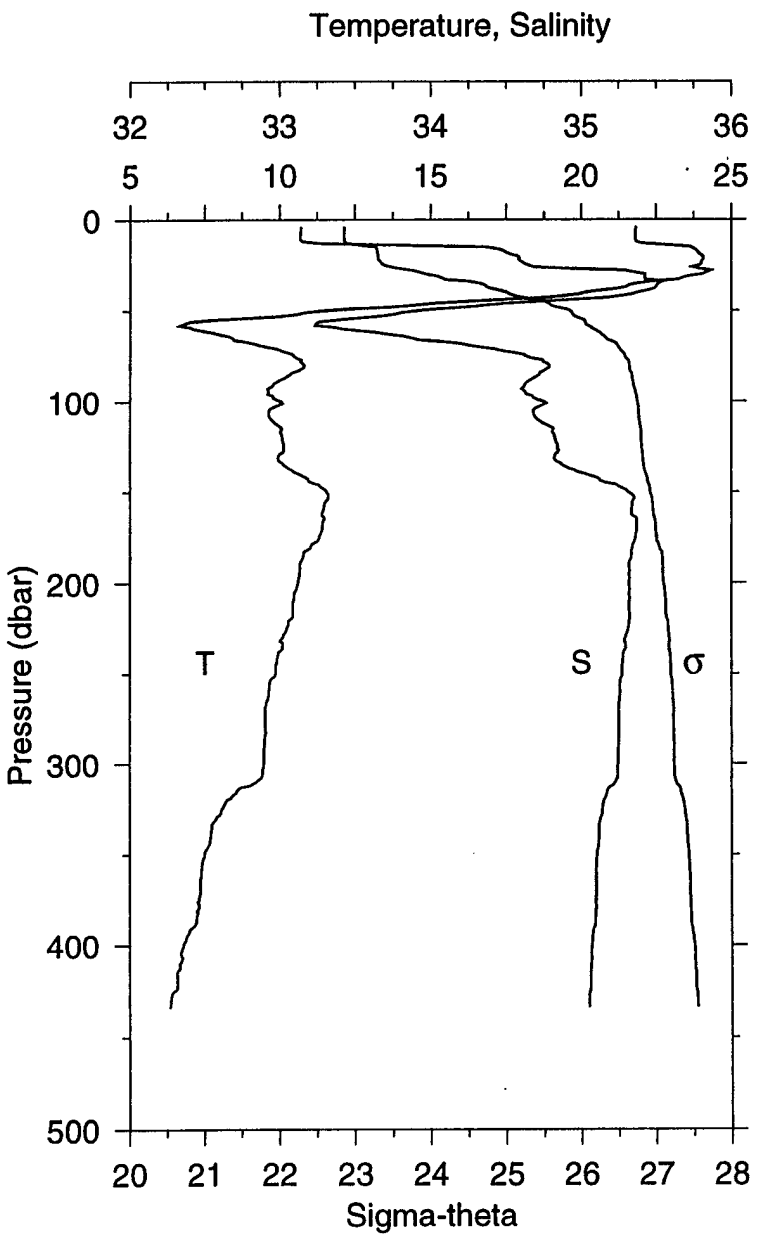

Temperature, Salinity
32
33
34
35
36
5
10
15
20
25
0
200
400
600
800
1000
Pressure (dbar)
T
S
σ
20
22
24
26
28
Sigma-theta


Temperature, Salinity
32
33
34
35
36
5
10
15
20
25
0
100
200
300
400
500
Pressure (dbar)
T
S
σ
20
22
24
26
28
Sigma-theta

Station 29

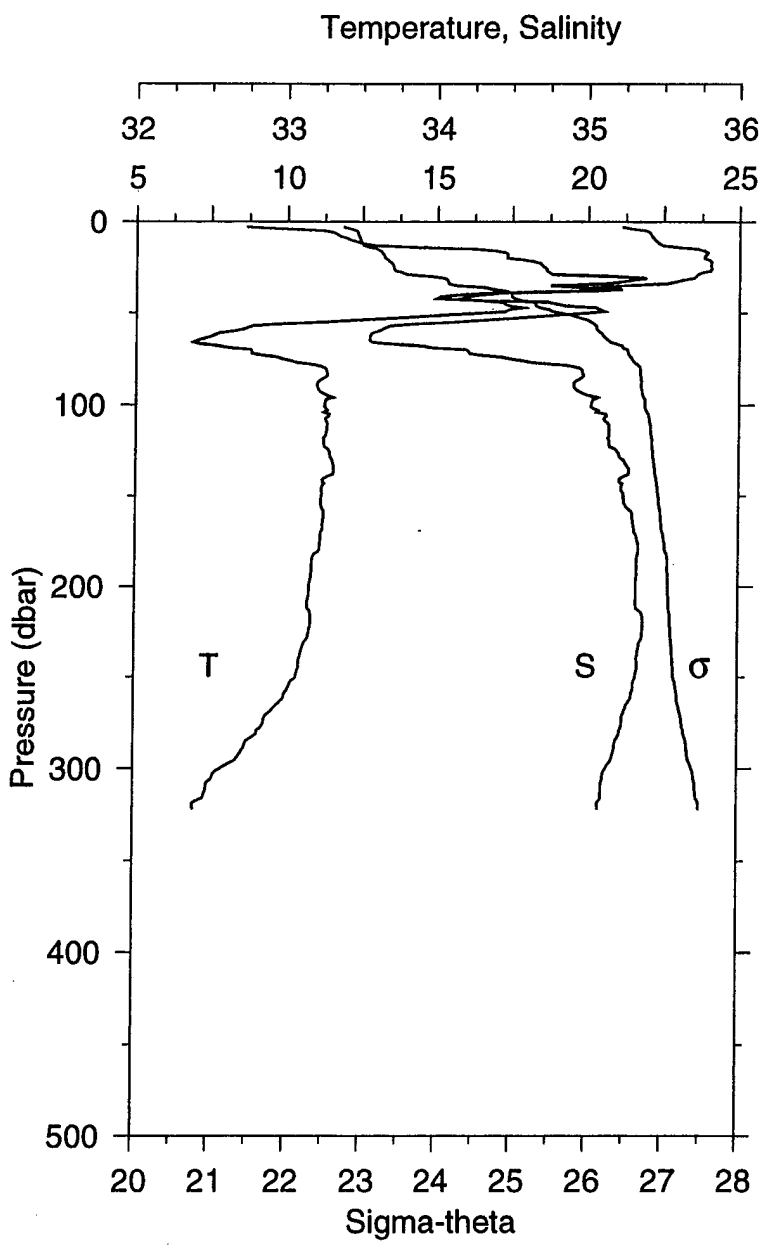
STA: 29 LAT: 39 54.8 N LONG: 70 20.9 W
23 AUG 1996 0522 GMT DEPTH 576

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	23.628	34.312	23.627	23.232	463.6	0.185
10	23.636	34.311	23.634	23.229	464.0	0.464
20	23.624	34.311	23.620	23.233	464.1	0.928
30	15.016	33.697	15.011	24.966	298.9	1.304
40	8.690	33.223	8.686	25.776	221.7	1.547
50	9.252	33.889	9.247	26.209	180.8	1.741
60	8.246	33.893	8.240	26.369	165.7	1.914
70	8.426	34.025	8.419	26.445	158.7	2.076
80	9.010	34.247	9.001	26.529	151.1	2.230
90	9.396	34.393	9.386	26.581	146.5	2.379
100	11.440	34.929	11.428	26.642	141.3	2.523
110	13.163	35.443	13.148	26.707	135.9	2.661
120	11.926	35.219	11.911	26.777	129.2	2.794
130	11.132	35.060	11.116	26.802	126.9	2.922
140	11.627	35.250	11.609	26.858	122.0	3.047
150	12.249	35.446	12.229	26.892	119.2	3.167
175	11.755	35.424	11.733	26.970	112.4	3.457
200	11.513	35.438	11.487	27.027	107.5	3.732
225	10.818	35.376	10.790	27.107	100.3	3.994
250	10.156	35.302	10.126	27.166	95.0	4.239
275	9.332	35.224	9.301	27.245	87.7	4.466
300	8.517	35.154	8.485	27.321	80.6	4.677
350	7.533	35.107	7.498	27.432	70.3	5.048
400	6.782	35.067	6.745	27.507	63.5	5.378
450	6.069	35.037	6.029	27.579	56.8	5.677
500	5.622	35.023	5.580	27.624	52.7	5.951
570	5.233	35.012	5.185	27.663	49.5	6.306



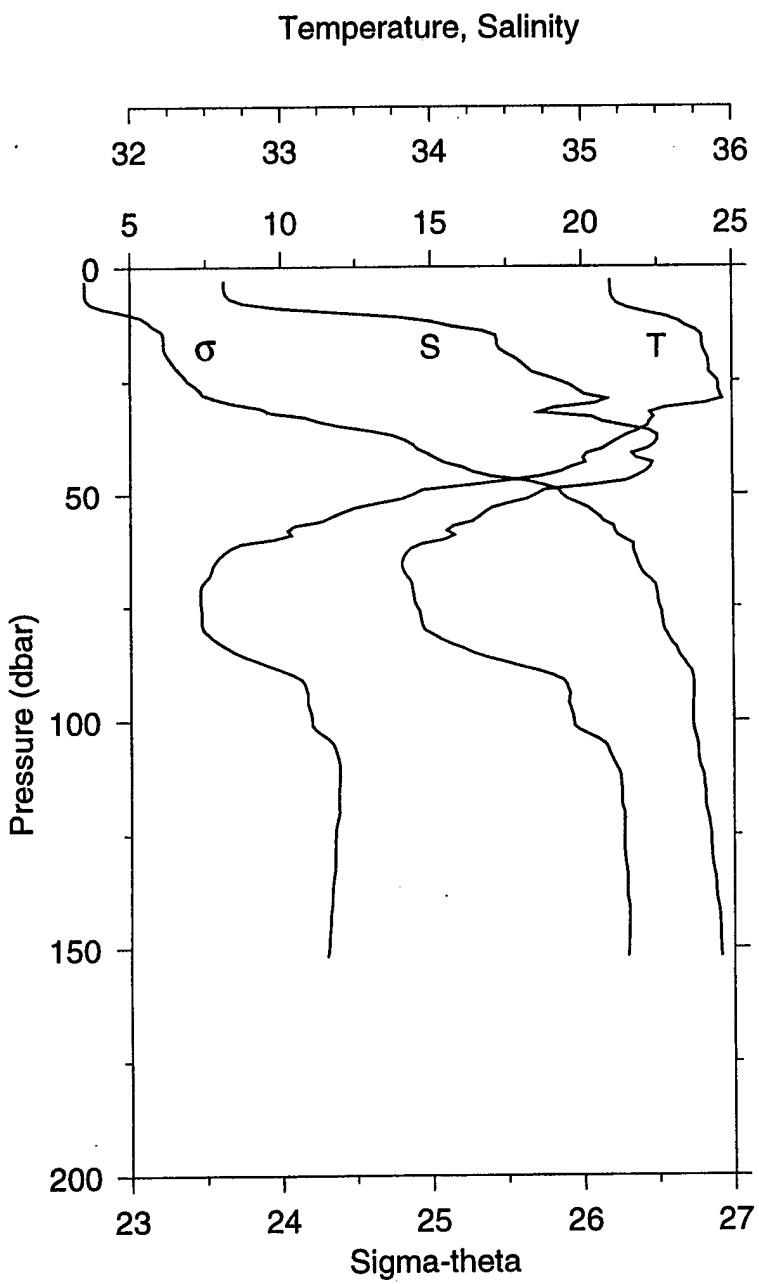
STA: 30 LAT: 40 0.2 N LONG: 70 12.1 W
23 AUG 1996 0744 GMT DEPTH 462

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	21.815	33.141	21.815	22.859	499.1	0.200
10	21.808	33.137	21.806	22.858	499.4	0.499
20	24.052	34.577	24.047	23.309	456.9	0.974
30	24.041	35.426	24.035	23.955	395.7	1.412
40	20.172	35.383	20.164	25.012	295.3	1.754
50	11.498	33.923	11.492	25.848	215.4	2.009
60	7.156	33.426	7.150	26.159	185.6	2.209
70	9.623	34.330	9.615	26.494	154.3	2.378
80	10.818	34.786	10.809	26.643	140.6	2.524
90	9.814	34.627	9.804	26.695	135.8	2.662
100	10.044	34.747	10.032	26.749	130.9	2.795
110	9.727	34.709	9.715	26.773	128.8	2.925
120	10.087	34.824	10.073	26.802	126.3	3.052
130	9.966	34.822	9.951	26.822	124.7	3.178
140	10.627	35.024	10.611	26.864	121.1	3.301
150	11.552	35.309	11.532	26.919	116.5	3.420
175	11.318	35.362	11.295	27.004	109.0	3.700
200	10.616	35.320	10.592	27.099	100.4	3.957
225	10.237	35.312	10.210	27.160	95.1	4.202
250	9.856	35.270	9.827	27.193	92.3	4.435
275	9.528	35.249	9.497	27.232	89.0	4.660
300	9.471	35.245	9.437	27.239	88.9	4.883
350	7.502	35.105	7.467	27.435	70.0	5.271
400	6.781	35.069	6.743	27.509	63.3	5.609
434	6.345	35.052	6.306	27.554	59.2	5.818



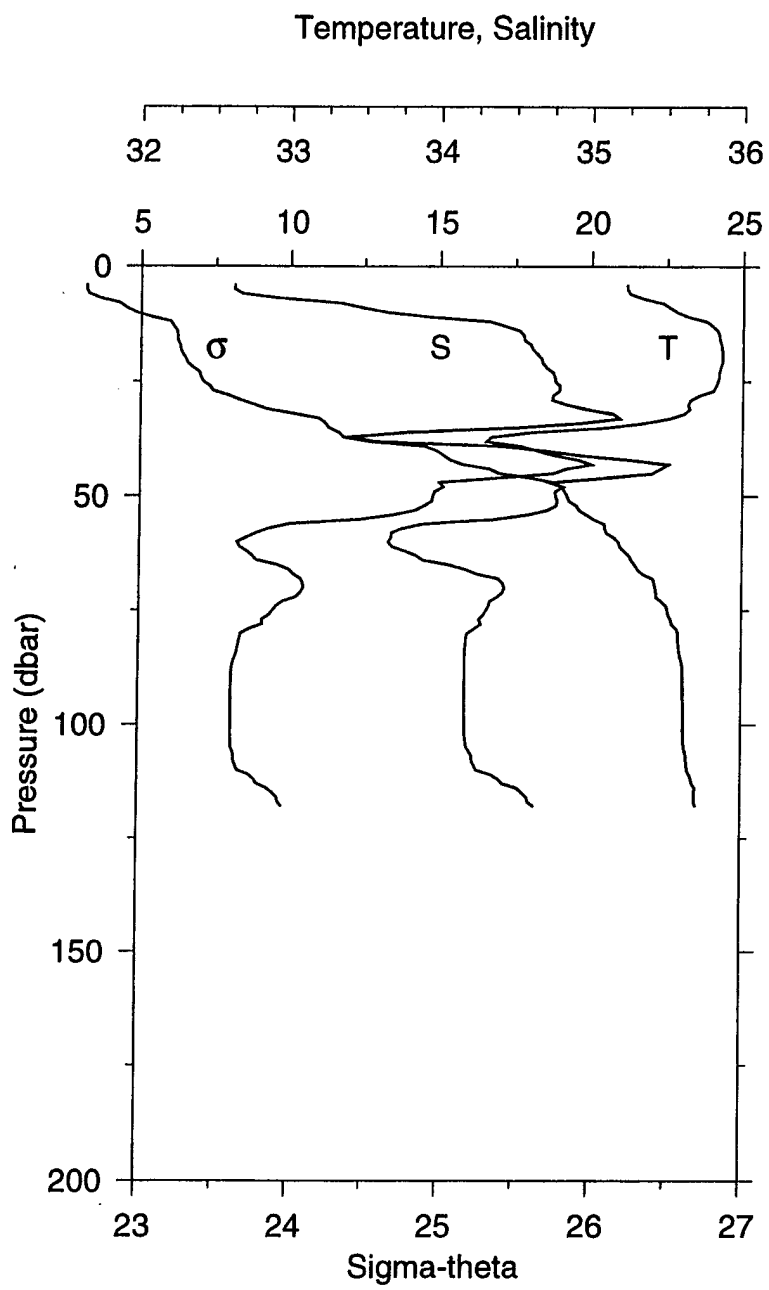
STA: 31 LAT: 40 2.6 N LONG: 70 12.0 W
23 AUG 1996 0847 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	21.104	32.725	21.104	22.736	510.8	0.153
10	22.183	33.413	22.181	22.963	489.4	0.500
20	23.813	34.463	23.808	23.293	458.3	0.973
30	23.548	35.170	23.542	23.907	400.2	1.417
40	16.468	34.144	16.461	24.984	297.6	1.766
50	16.474	34.989	16.466	25.632	236.4	2.036
60	8.221	33.601	8.215	26.143	187.1	2.238
70	8.798	34.194	8.790	26.520	151.7	2.410
80	11.263	34.947	11.253	26.688	136.4	2.556
90	11.014	34.909	11.003	26.704	135.1	2.691
100	11.248	35.023	11.236	26.751	131.0	2.824
110	11.337	35.132	11.324	26.820	124.7	2.952
120	11.225	35.140	11.210	26.847	122.4	3.075
130	11.492	35.234	11.476	26.871	120.5	3.197
140	11.267	35.222	11.250	26.903	117.6	3.316
150	11.160	35.237	11.141	26.935	114.8	3.432
175	11.133	35.330	11.111	27.013	108.1	3.712
200	10.782	35.325	10.758	27.073	102.9	3.973
225	10.788	35.369	10.761	27.107	100.4	4.227
250	10.361	35.324	10.331	27.148	96.9	4.473
275	9.289	35.236	9.258	27.261	86.1	4.701
300	7.905	35.133	7.875	27.397	72.9	4.902
322	7.002	35.085	6.971	27.490	64.0	5.051



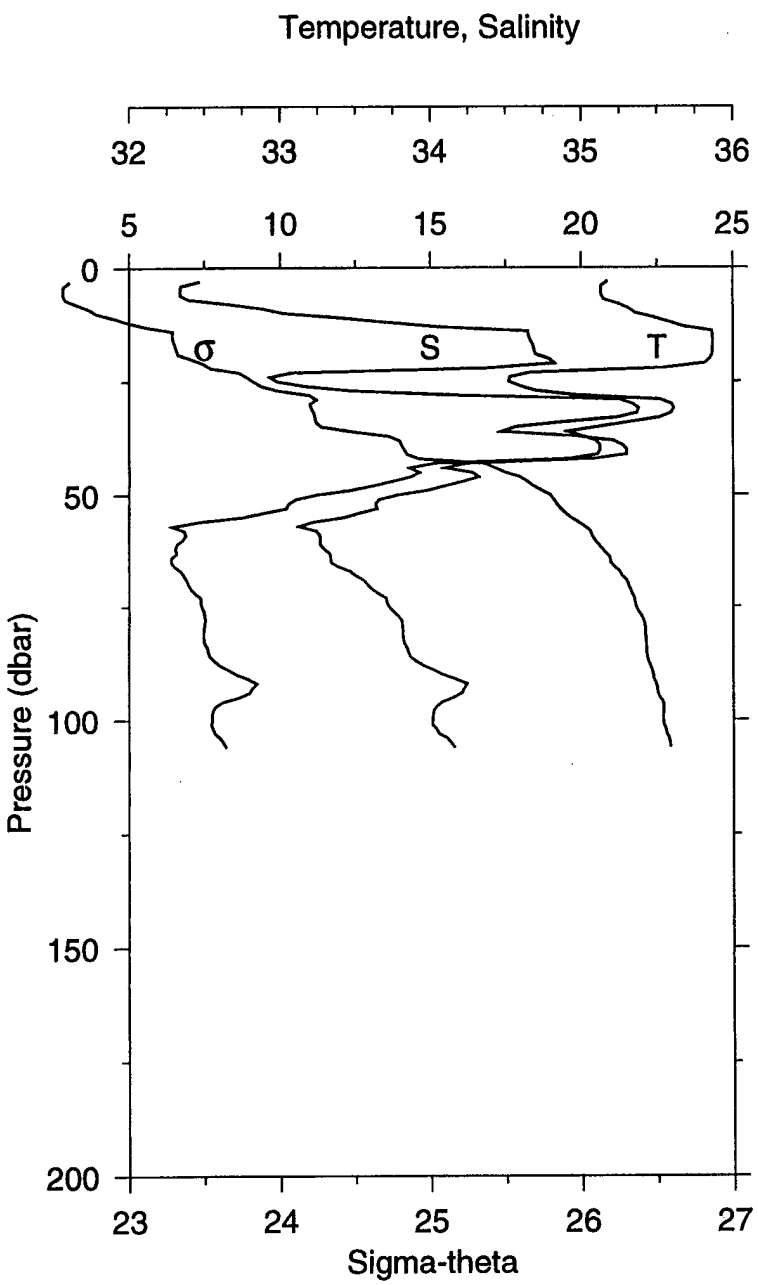
STA: 32 LAT: 40 5.0 N LONG: 70 12.1 W
23 AUG 1996 0937 GMT DEPTH 158

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	20.961	32.622	20.961	22.697	514.6	0.154
10	22.104	33.374	22.102	22.956	490.2	0.512
20	24.179	34.558	24.174	23.257	461.8	0.981
30	24.104	35.091	24.097	23.683	421.6	1.429
40	20.697	35.435	20.689	24.911	304.9	1.783
50	14.430	34.700	14.423	25.866	213.9	2.045
60	9.752	34.089	9.746	26.284	174.0	2.237
70	7.355	33.872	7.348	26.482	155.0	2.402
80	7.401	33.956	7.394	26.542	149.6	2.554
90	10.393	34.796	10.382	26.727	132.8	2.695
100	11.007	34.939	10.995	26.729	133.0	2.828
110	11.934	35.221	11.920	26.777	129.0	2.959
120	11.916	35.273	11.901	26.821	125.0	3.085
130	11.760	35.276	11.743	26.853	122.2	3.208
140	11.658	35.298	11.640	26.890	119.0	3.329
150	11.554	35.300	11.535	26.911	117.2	3.447
151	11.546	35.300	11.527	26.912	117.1	3.459



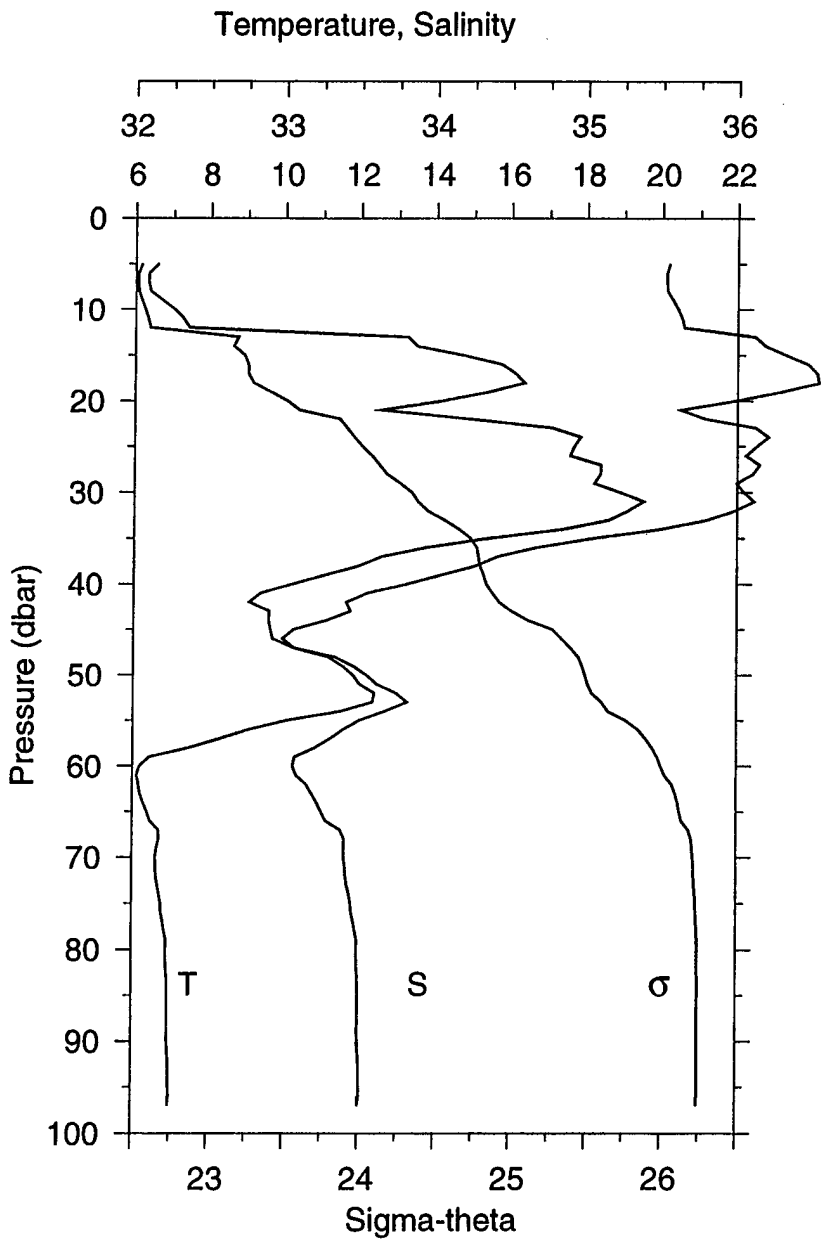
STA: 33 LAT: 40 7.6 N LONG: 70 12.1 W
23 AUG 1996 1023 GMT DEPTH 121

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	21.170	32.622	21.170	22.640	520.0	0.208
10	22.834	33.651	22.832	22.961	489.7	0.513
20	24.323	34.667	24.319	23.296	458.1	0.979
30	23.201	34.838	23.195	23.756	414.6	1.422
40	18.243	34.697	18.236	24.983	297.9	1.784
50	14.781	34.768	14.773	25.843	216.1	2.039
60	8.263	33.664	8.257	26.187	183.0	2.239
70	10.477	34.434	10.469	26.430	160.6	2.411
80	8.392	34.191	8.384	26.581	146.0	2.564
90	8.087	34.175	8.078	26.615	143.0	2.709
100	8.081	34.179	8.071	26.619	142.8	2.852
110	8.314	34.259	8.303	26.647	140.4	2.993
118	9.807	34.640	9.793	26.706	135.3	3.103



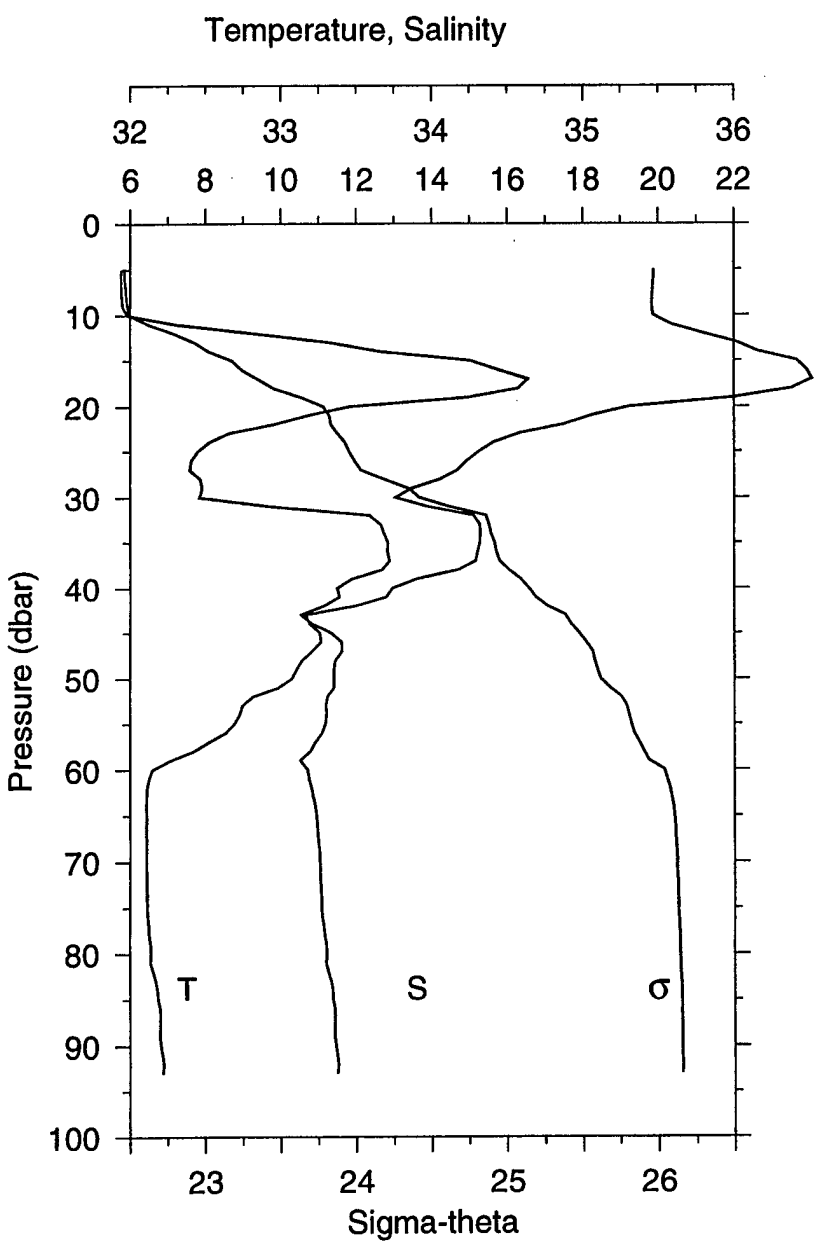
STA: 34 LAT: 40 10.1 N LONG: 70 12.0 W
23 AUG 1996 1103 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	20.866	32.467	20.866	22.604	523.5	0.157
10	21.766	33.022	21.764	22.782	506.7	0.522
20	24.244	34.789	24.240	23.412	447.0	0.990
30	22.982	35.339	22.976	24.199	372.3	1.396
40	20.628	35.299	20.620	24.826	313.0	1.745
50	11.226	33.788	11.220	25.793	220.6	2.003
60	6.766	33.267	6.761	26.086	192.4	2.209
70	6.956	33.580	6.950	26.307	171.6	2.391
80	7.478	33.815	7.470	26.420	161.1	2.557
90	8.560	34.085	8.551	26.472	156.6	2.717
100	7.749	34.014	7.739	26.538	150.3	2.869
106	8.211	34.161	8.201	26.585	146.1	2.958



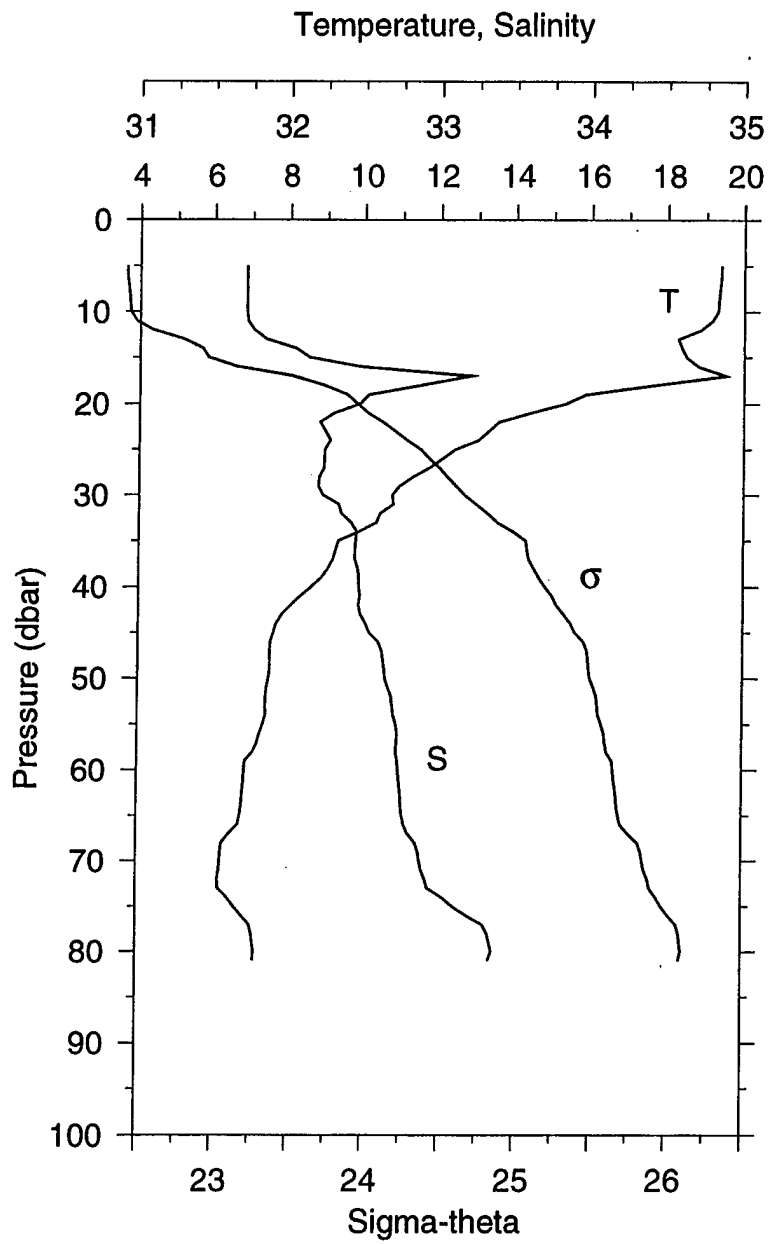
STA: 35 LAT: 40 12.5 N LONG: 70 12.0 W
23 AUG 1996 1140 GMT DEPTH 101

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
5	20.189	32.150	20.188	22.542	529.5	0.265
10	20.414	32.254	20.412	22.562	527.7	0.530
20	21.916	34.039	21.912	23.514	437.2	1.007
30	22.178	35.224	22.172	24.341	358.8	1.399
40	13.217	33.048	13.212	24.840	311.1	1.728
50	11.826	33.546	11.820	25.494	249.0	2.004
60	6.180	33.059	6.175	25.998	200.7	2.229
70	6.614	33.402	6.608	26.213	180.5	2.418
80	6.900	33.489	6.893	26.244	177.7	2.597
90	6.949	33.497	6.941	26.243	178.0	2.774
96	6.976	33.502	6.967	26.243	178.1	2.881



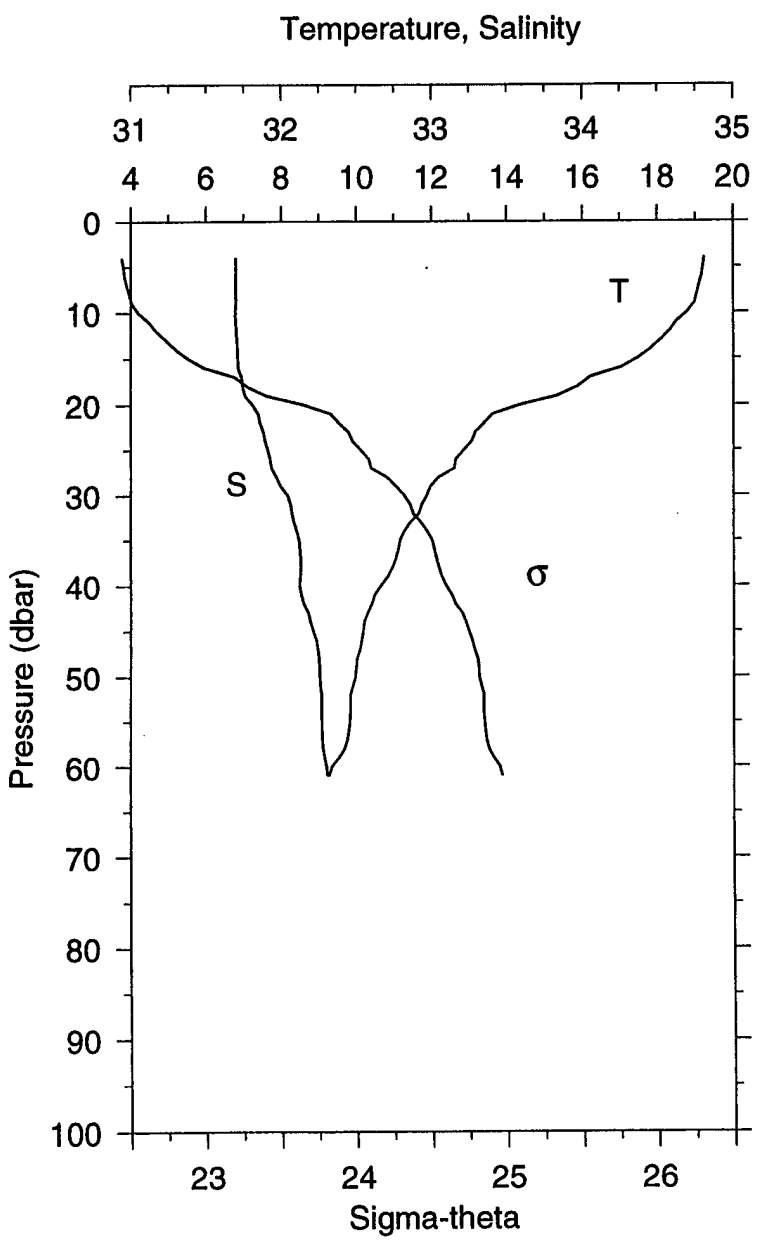
STA: 36 LAT: 40 15.0 N LONG: 70 12.0 W
23 AUG 1996 1226 GMT DEPTH 97

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
5	19.878	31.940	19.877	22.463	537.1	0.269
10	19.870	31.980	19.868	22.495	534.1	0.537
20	19.243	33.456	19.240	23.782	411.6	1.010
30	13.043	32.460	13.039	24.419	350.9	1.400
40	12.959	33.374	12.954	25.143	282.2	1.706
50	10.288	33.352	10.282	25.618	237.1	1.960
60	6.581	33.178	6.575	26.040	196.7	2.178
70	6.438	33.258	6.432	26.122	189.1	2.369
80	6.552	33.305	6.545	26.144	187.1	2.557
90	6.825	33.363	6.817	26.154	186.4	2.744
93	6.876	33.374	6.868	26.156	186.2	2.800



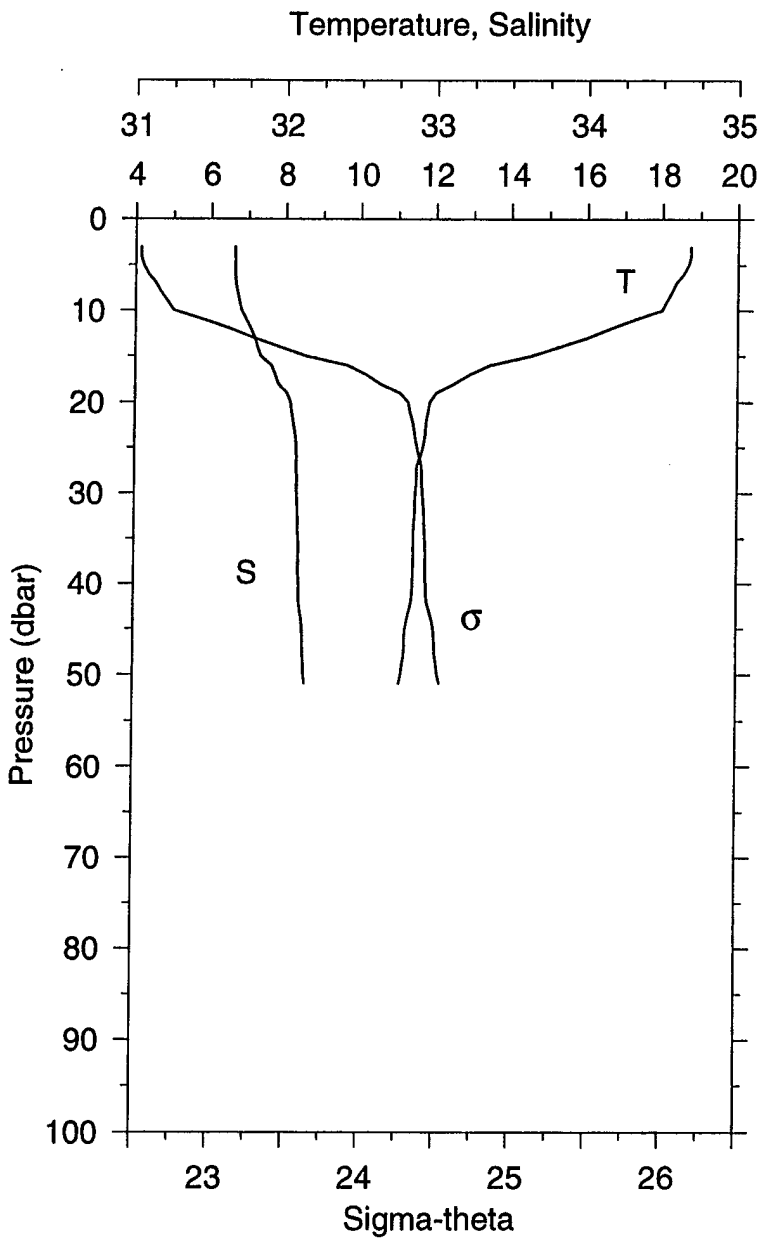
STA: 37 LAT: 40 20.0 N LONG: 70 12.0 W
23 AUG 1996 1322 GMT DEPTH 86

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
5	19.391	31.711	19.390	22.412	541.9	0.271
10	19.301	31.712	19.300	22.436	539.7	0.541
20	15.320	32.467	15.317	23.952	395.2	1.016
30	10.739	32.225	10.735	24.662	327.6	1.375
40	8.604	32.468	8.600	25.197	276.7	1.671
50	7.481	32.645	7.477	25.499	248.0	1.930
60	6.853	32.736	6.848	25.656	233.2	2.171
70	6.225	32.883	6.220	25.853	214.5	2.397
80	7.139	33.358	7.131	26.108	190.7	2.599
81	7.118	33.338	7.110	26.095	191.9	2.618



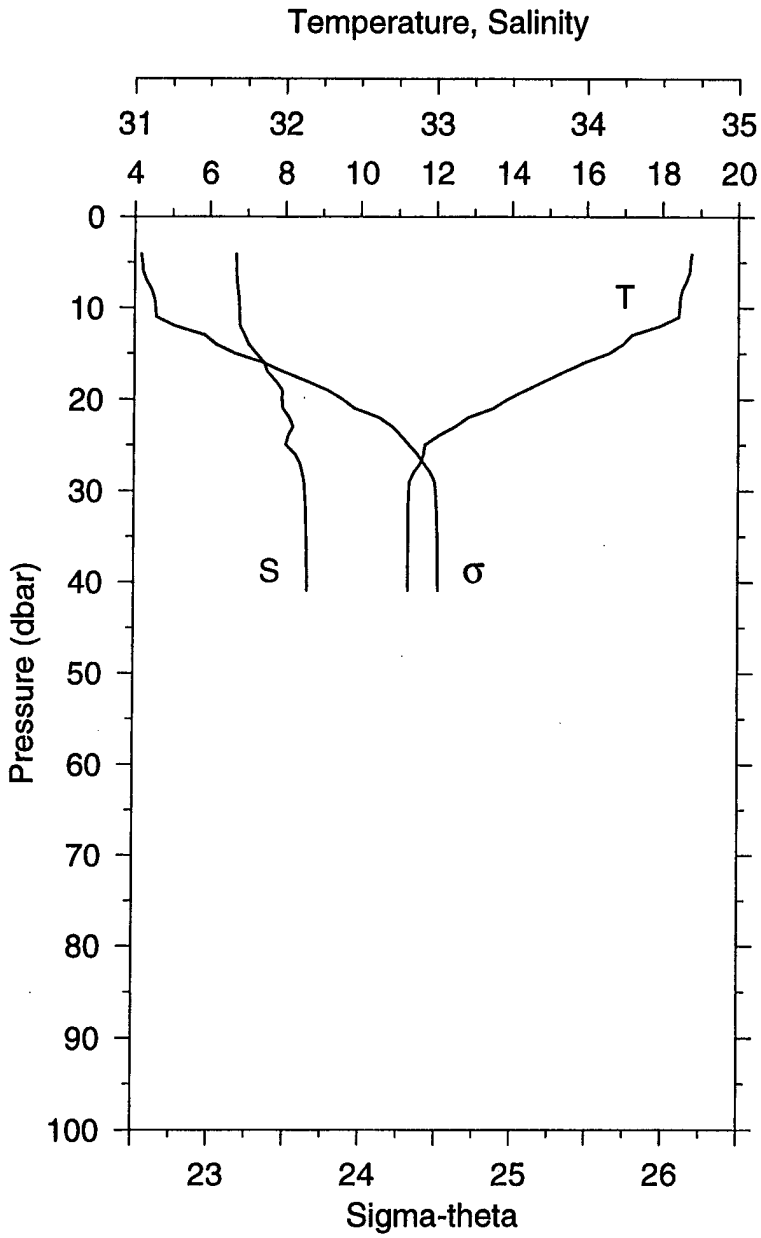
STA: 38 LAT: 40 30.0 N LONG: 70 12.0 W
23 AUG 1996 1450 GMT DEPTH 66

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	19.244	31.698	19.243	22.439	539.3	0.216
10	18.792	31.694	18.791	22.549	528.9	0.537
20	14.367	31.808	14.364	23.647	424.3	1.026
30	11.874	32.041	11.870	24.317	360.5	1.414
40	10.641	32.119	10.636	24.597	334.0	1.760
50	9.967	32.255	9.962	24.816	313.3	2.081
60	9.342	32.298	9.335	24.951	300.5	2.390
61	9.256	32.305	9.249	24.970	298.7	2.420



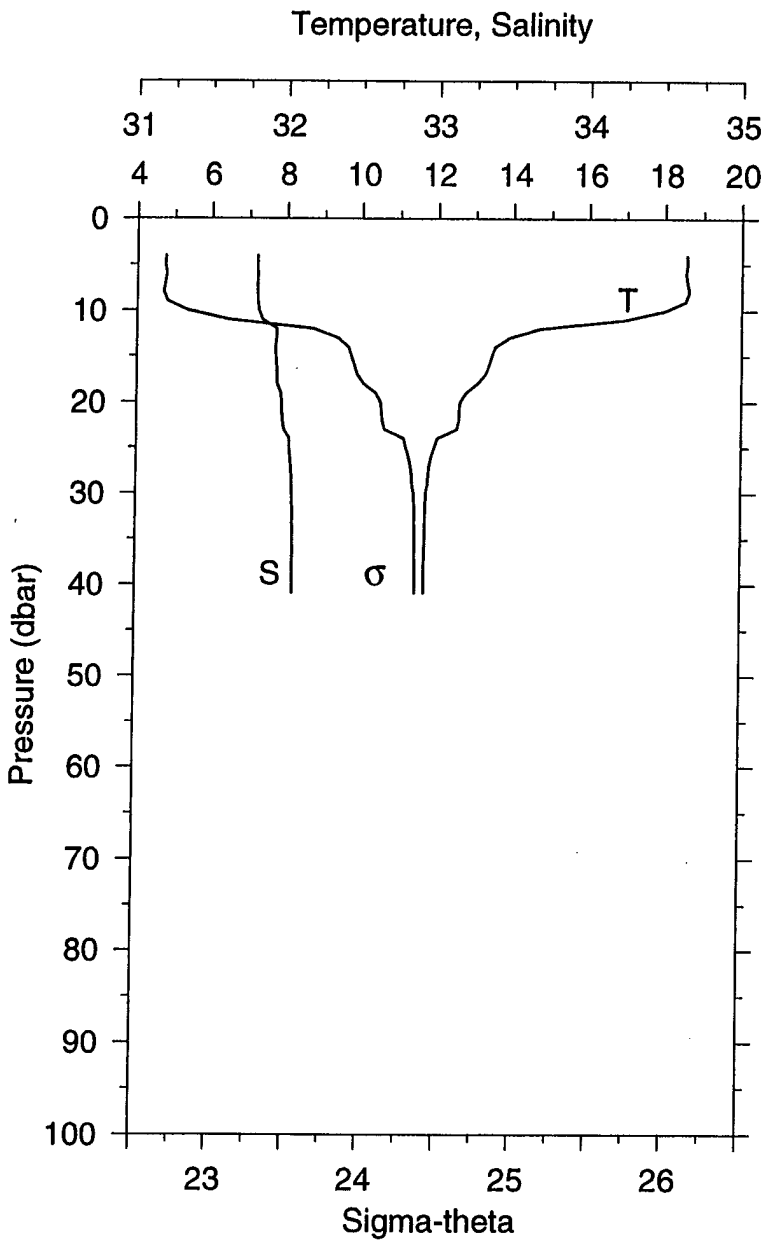
STA: 39 LAT: 40 36.0 N LONG: 70 11.9 W
23 AUG 1996 1545 GMT DEPTH 56

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	18.735	31.658	18.735	22.536	530.0	0.159
10	17.988	31.703	17.987	22.753	509.4	0.525
20	11.842	32.034	11.840	24.317	360.3	0.950
30	11.477	32.079	11.474	24.418	350.9	1.305
40	11.419	32.096	11.414	24.442	348.8	1.654
50	11.129	32.134	11.123	24.523	341.3	1.999
51	11.075	32.141	11.069	24.538	339.8	2.033



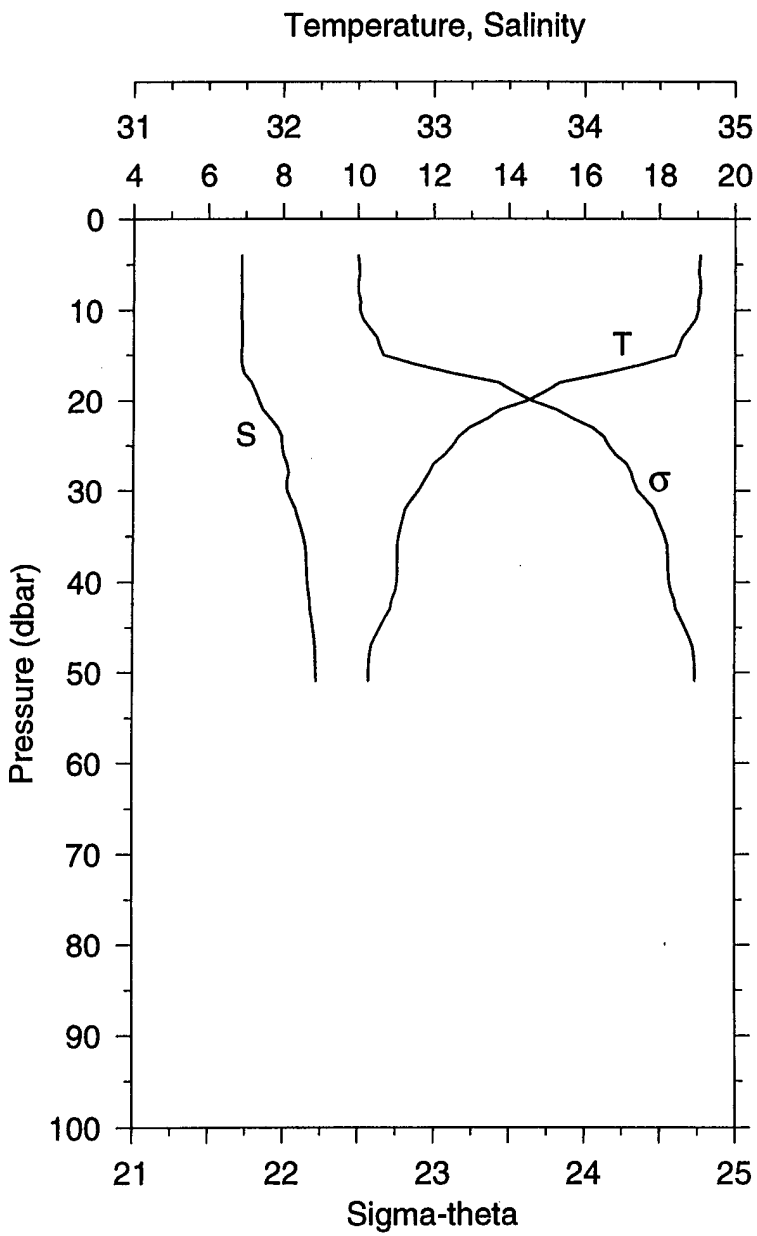
STA: 40 LAT: 40 39.9 N LONG: 70 11.7 W
23 AUG 1996 1632 GMT DEPTH 46

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.761	31.673	18.760	22.541	529.5	0.212
10	18.444	31.696	18.442	22.637	520.6	0.527
20	13.881	31.978	13.879	23.878	402.2	0.993
30	11.267	32.130	11.263	24.495	343.5	1.357
40	11.253	32.147	11.248	24.511	342.2	1.700
41	11.254	32.148	11.249	24.512	342.2	1.734



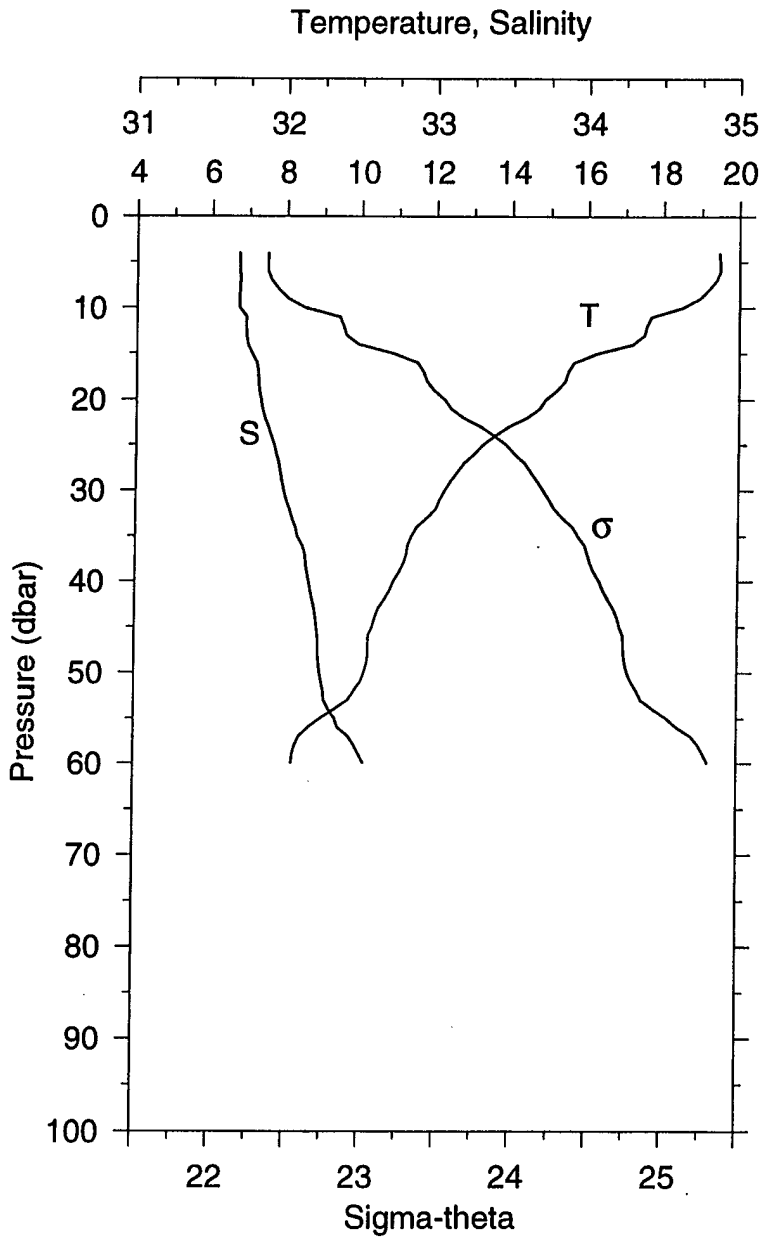
STA: 41 LAT: 40 40.0 N LONG: 70 3.4 W
23 AUG 1996 1725 GMT DEPTH 46

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	18.555	31.799	18.554	22.688	515.5	0.206
10	18.004	31.812	18.002	22.832	501.9	0.515
20	12.594	31.965	12.592	24.122	378.9	0.925
30	11.706	32.039	11.702	24.345	357.8	1.291
40	11.669	32.046	11.664	24.358	356.8	1.649
41	11.668	32.046	11.663	24.358	356.8	1.684



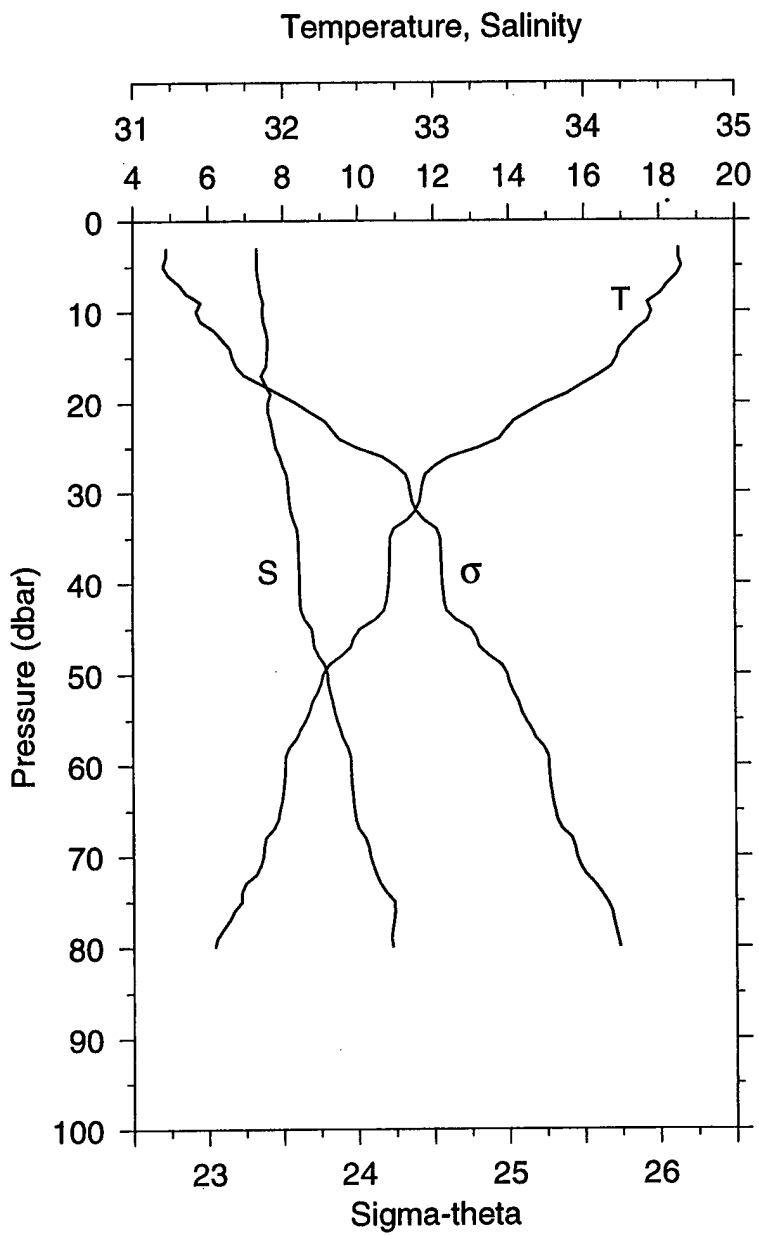
STA: 42 LAT: 40 36.0 N LONG: 70 3.5 W
23 AUG 1996 1811 GMT DEPTH 57

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	19.078	31.720	19.077	22.498	533.6	0.213
10	19.026	31.721	19.025	22.512	532.5	0.533
20	14.480	31.837	14.477	23.646	424.3	1.028
30	11.605	32.027	11.601	24.354	356.9	1.407
40	11.038	32.163	11.033	24.562	337.4	1.750
50	10.294	32.221	10.288	24.735	321.0	2.078
51	10.294	32.223	10.288	24.737	320.9	2.110



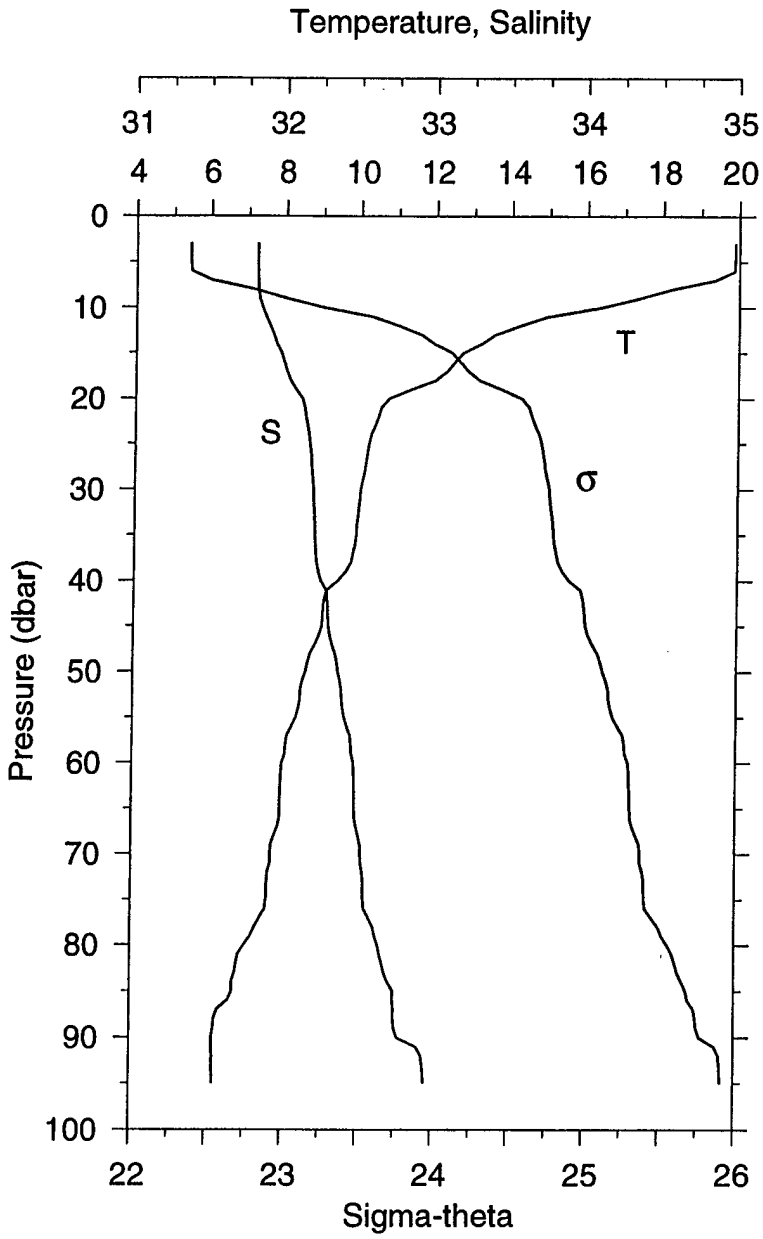
STA: 43 LAT: 40 30.0 N LONG: 70 3.5 W
23 AUG 1996 1904 GMT DEPTH 66

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	19.466	31.682	19.465	22.371	545.7	0.218
10	18.487	31.681	18.485	22.615	522.6	0.543
20	14.877	31.827	14.874	23.555	433.1	1.013
30	12.233	31.983	12.229	24.205	371.2	1.412
40	10.884	32.155	10.879	24.583	335.4	1.763
50	10.125	32.234	10.119	24.773	317.3	2.087
60	8.196	32.531	8.190	25.308	266.5	2.380



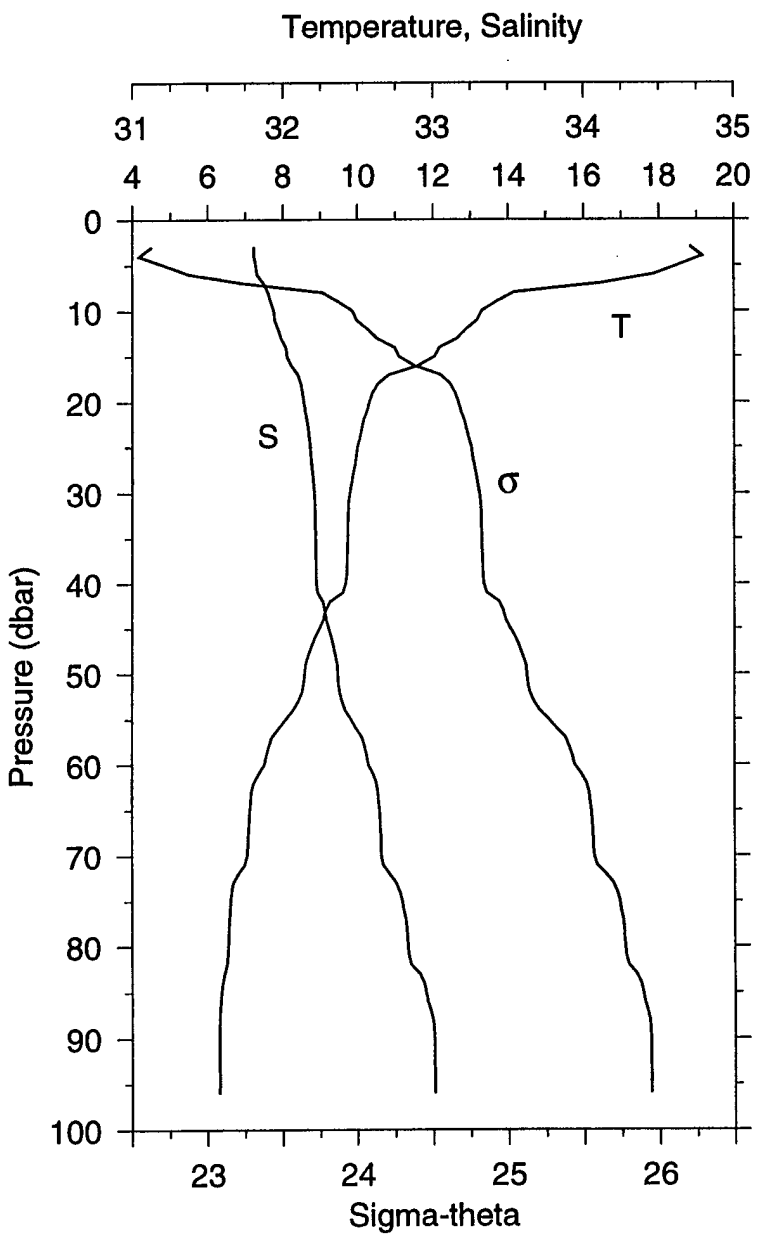
STA: 44 LAT: 40 20.0 N LONG: 70 3.5 W
23 AUG 1996 2020 GMT DEPTH 86

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	18.507	31.828	18.506	22.722	512.1	0.154
10	17.799	31.865	17.797	22.922	493.3	0.507
20	14.979	31.901	14.976	23.590	429.7	0.975
30	11.683	32.038	11.679	24.349	357.5	1.364
40	10.817	32.112	10.813	24.560	337.5	1.707
50	9.084	32.298	9.079	24.991	296.6	2.029
60	8.054	32.453	8.048	25.267	270.3	2.312
70	7.464	32.578	7.458	25.449	253.1	2.577
80	6.168	32.725	6.161	25.735	225.8	2.813



STA: 45 LAT: 40 15.0 N LONG: 70 3.5 W
23 AUG 1996 2157 GMT DEPTH 97

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	19.895	31.809	19.894	22.358	547.0	0.164
10	16.351	31.840	16.349	23.241	462.8	0.531
20	10.757	32.110	10.755	24.569	336.3	0.919
30	10.017	32.190	10.014	24.756	318.6	1.244
40	9.436	32.244	9.432	24.893	305.7	1.559
50	8.596	32.366	8.591	25.119	284.3	1.852
60	7.994	32.473	7.988	25.291	268.0	2.129
70	7.707	32.524	7.700	25.373	260.4	2.394
80	7.032	32.645	7.025	25.561	242.5	2.649
90	6.179	32.777	6.171	25.775	222.2	2.881
95	6.204	32.957	6.196	25.914	209.1	2.986

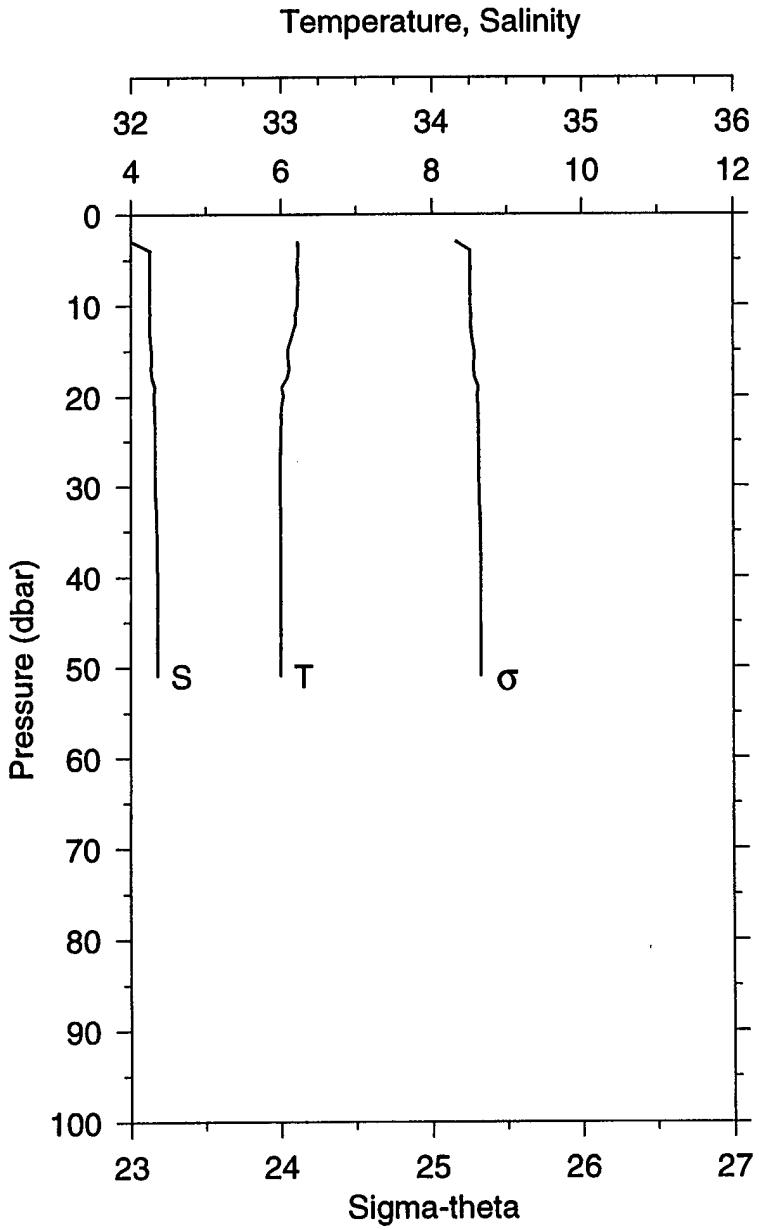


STA: 46 LAT: 40 12.4 N LONG: 70 3.5 W
23 AUG 1996 2235 GMT DEPTH 101

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	18.834	31.808	18.834	22.626	521.3	0.156
10	13.299	31.939	13.297	23.965	393.6	0.484
20	10.311	32.139	10.309	24.668	326.8	0.844
30	9.790	32.209	9.787	24.808	313.6	1.163
40	9.683	32.224	9.679	24.838	310.9	1.475
50	8.581	32.367	8.576	25.122	284.0	1.770
60	7.510	32.572	7.505	25.438	254.0	2.040
70	7.052	32.656	7.046	25.567	241.9	2.285
80	6.552	32.832	6.545	25.771	222.5	2.513
90	6.315	33.005	6.307	25.938	206.7	2.726
96	6.316	33.010	6.308	25.942	206.4	2.850

E9704 CTD Data

For each station, we present plots of the vertical profiles of temperature, salinity and σ_θ, and a listing of the observed and derived variables at standard pressures. Header data includes the CTD Station Number, Latitude (degrees and minutes North), Longitude (degrees and minutes West), Date and Time (UTC), and Bottom Depth (in meters).

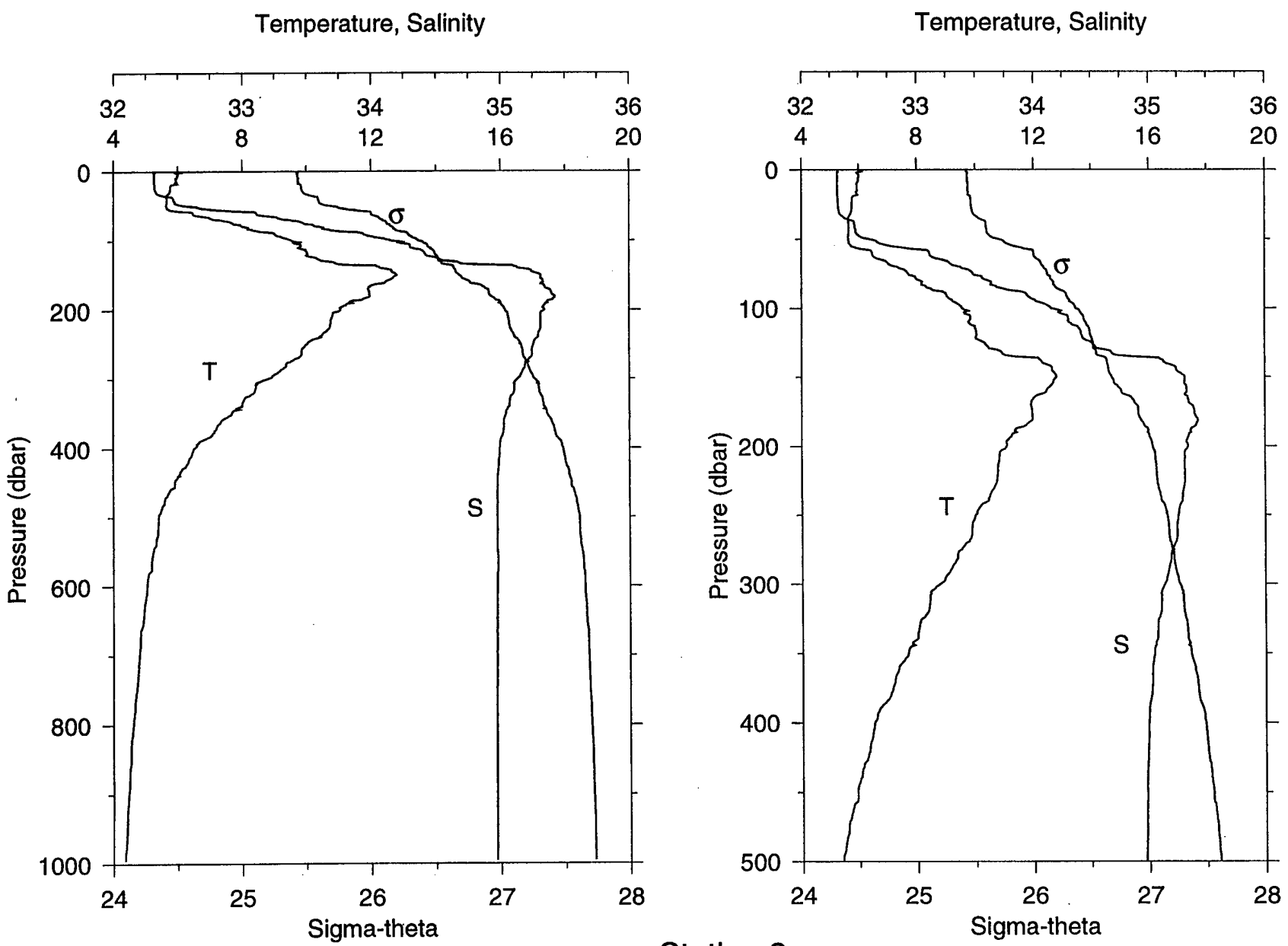


STA: 1 LAT: 40 54.0 N LONG: 70 29.9 W
25 APR 1997 1835 GMT DEPTH 53

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	6.225	32.006	6.225	25.160	279.6	0.084
10	6.221	32.125	6.220	25.255	270.6	0.274
20	6.036	32.154	6.035	25.300	266.4	0.542
30	5.993	32.163	5.991	25.312	265.4	0.808
40	5.998	32.177	5.995	25.323	264.5	1.073
50	5.996	32.179	5.992	25.325	264.4	1.337
51	5.995	32.179	5.991	25.325	264.4	1.364

STA: 2 LAT: 39 54.0 N LONG: 70 30.1 W
26 APR 1997 0048 GMT DEPTH 1076

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
1	6.155	32.326	6.155	25.422	254.7	0.025
10	5.932	32.314	5.931	25.440	253.1	0.254
20	5.781	32.318	5.780	25.460	251.2	0.507
30	5.745	32.331	5.743	25.475	249.9	0.757
40	5.651	32.464	5.648	25.591	239.0	1.002
50	5.637	32.597	5.633	25.699	228.9	1.239
60	6.469	33.111	6.464	26.001	200.4	1.453
70	7.341	33.374	7.334	26.092	192.0	1.650
80	8.100	33.604	8.092	26.164	185.5	1.839
90	9.023	33.944	9.013	26.289	174.0	2.020
100	9.557	34.151	9.546	26.366	167.1	2.190
110	9.763	34.307	9.751	26.454	159.0	2.352
120	10.039	34.423	10.025	26.498	155.2	2.509
130	10.726	34.629	10.711	26.539	151.7	2.662
140	12.346	35.149	12.327	26.642	142.7	2.809
150	12.803	35.313	12.783	26.680	139.5	2.951
175	11.953	35.394	11.930	26.910	118.2	3.271
200	11.064	35.341	11.040	27.034	106.7	3.551
225	10.728	35.311	10.701	27.072	103.6	3.812
250	9.984	35.253	9.955	27.158	95.7	4.063
275	9.511	35.213	9.480	27.206	91.4	4.298
300	8.774	35.135	8.742	27.265	86.0	4.521
350	7.680	35.041	7.645	27.359	77.3	4.928
400	6.507	34.992	6.471	27.485	65.3	5.284
450	5.914	34.975	5.875	27.550	59.4	5.597
500	5.406	34.971	5.364	27.609	53.9	5.878
600	5.042	34.969	4.993	27.652	50.7	6.402
700	4.795	34.967	4.739	27.680	48.9	6.900
800	4.614	34.967	4.550	27.700	47.8	7.385
900	4.463	34.966	4.392	27.717	47.1	7.858
995	4.362	34.966	4.284	27.729	46.8	8.305


Temperature, Salinity
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200
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600
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Pressure (dbar)
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25
26
27
28
Sigma-theta
Temperature, Salinity
32
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35
36
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Pressure (dbar)
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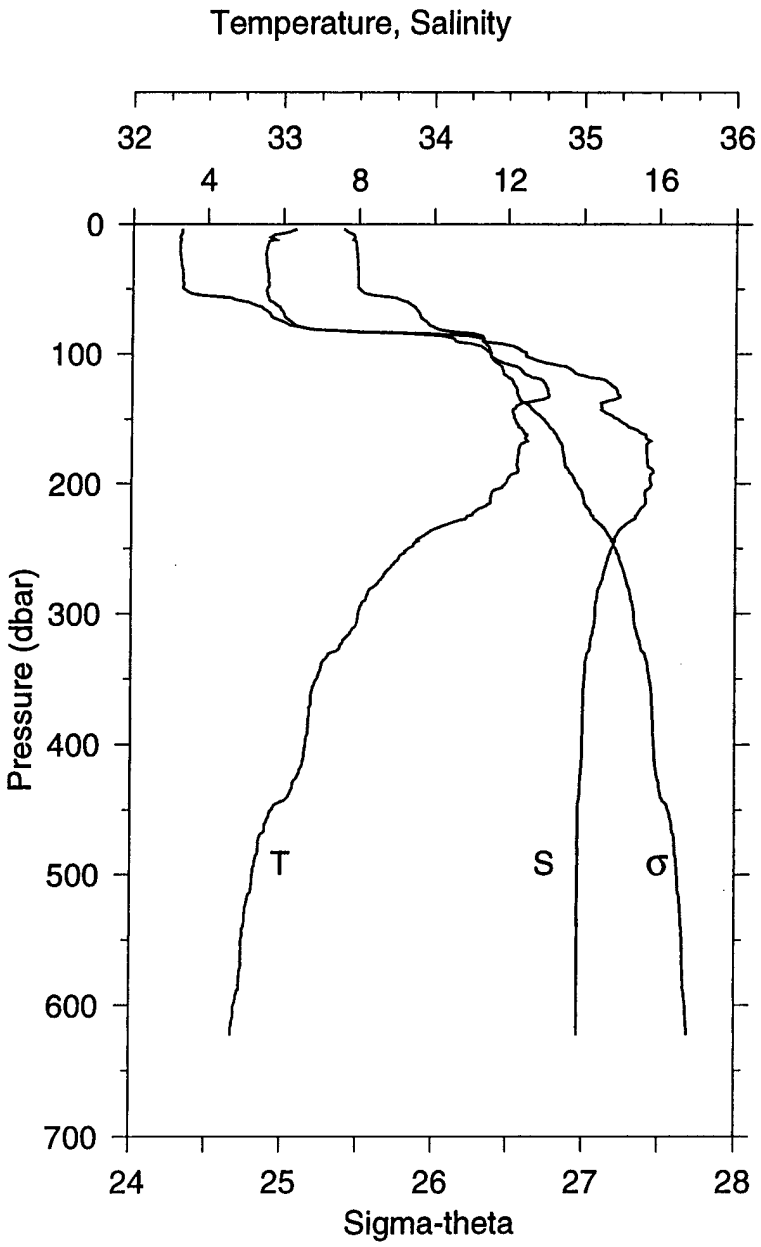
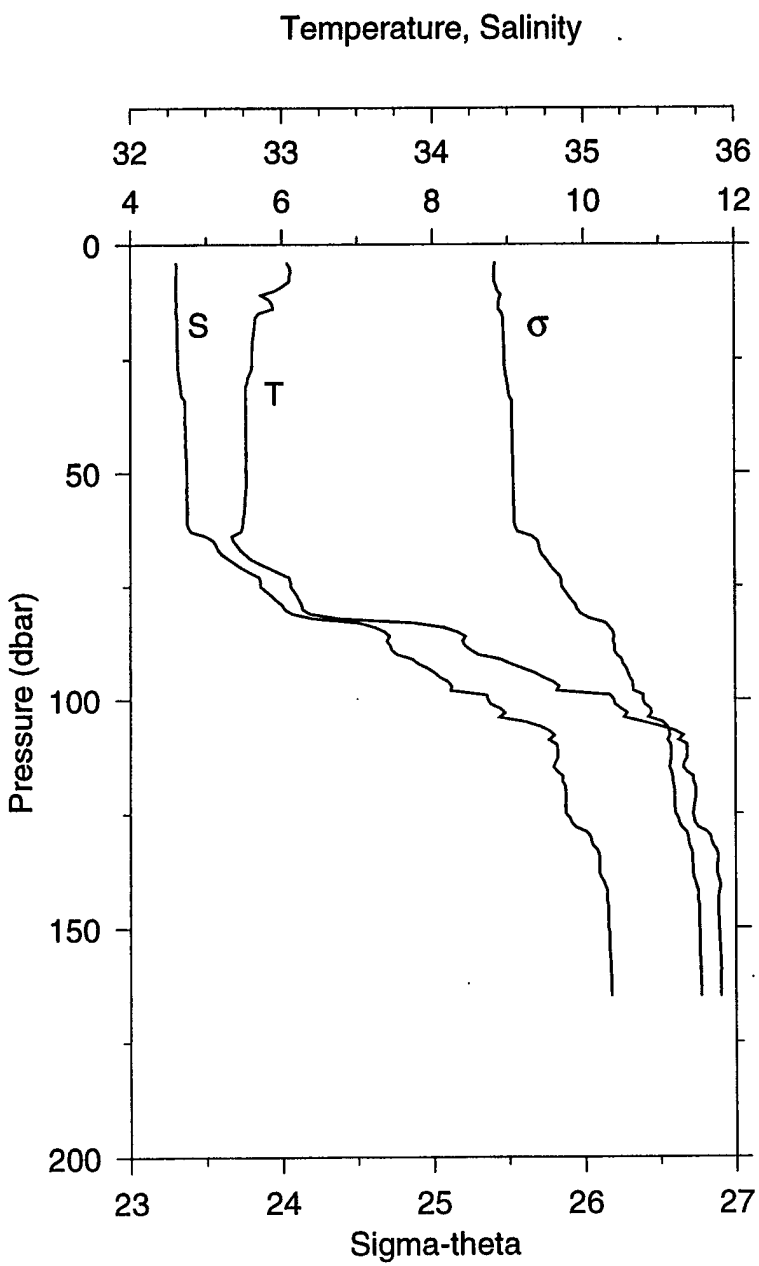
Sigma-theta

Station 2



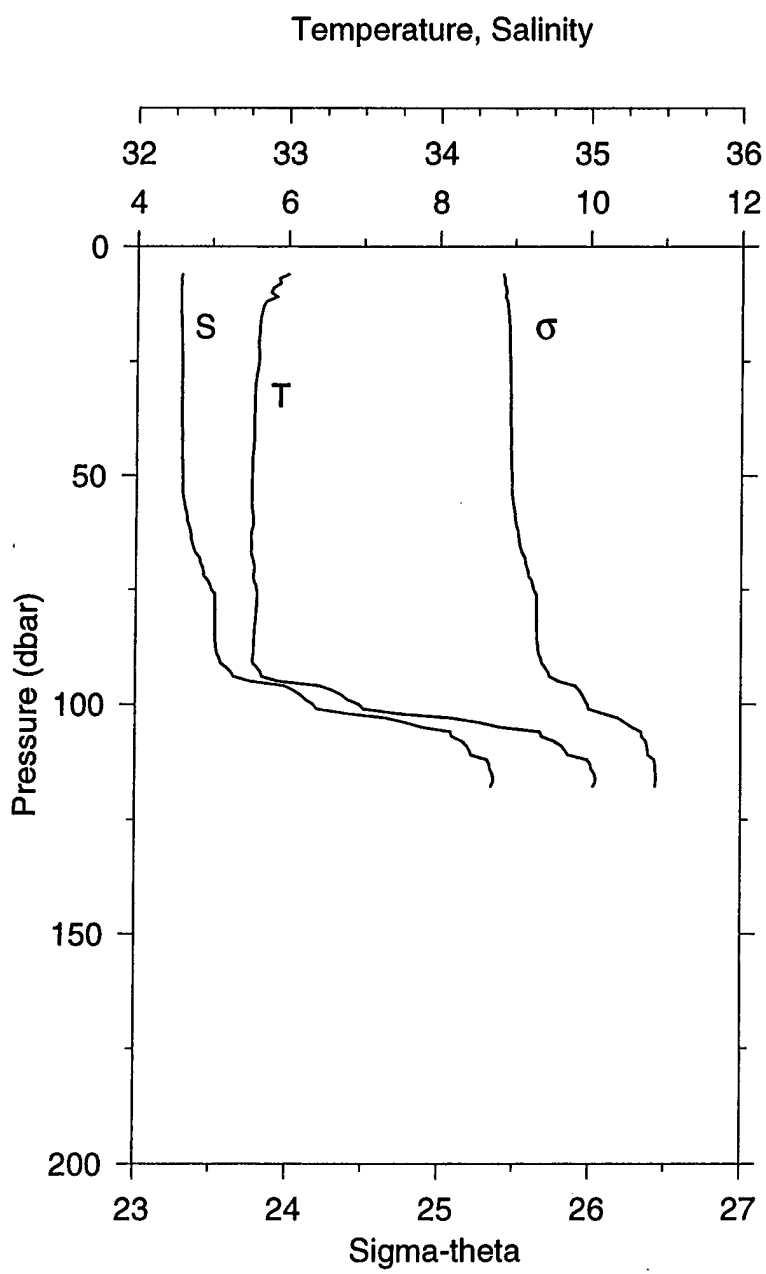
STA: 3 LAT: 39 58.9 N LONG: 70 30.1 W
26 APR 1997 0232 GMT DEPTH 660

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	6.337	32.324	6.337	25.397	257.0	0.103
10	5.657	32.311	5.656	25.470	250.2	0.255
20	5.547	32.311	5.546	25.483	249.1	0.504
30	5.552	32.321	5.550	25.490	248.5	0.753
40	5.614	32.334	5.611	25.493	248.3	1.001
50	5.554	32.338	5.551	25.503	247.4	1.250
60	5.735	32.770	5.730	25.823	217.1	1.484
70	6.030	32.919	6.025	25.905	209.5	1.697
80	6.608	33.141	6.601	26.008	200.1	1.903
90	10.585	34.328	10.574	26.328	170.6	2.082
100	11.524	34.617	11.511	26.384	165.8	2.250
110	12.231	34.883	12.216	26.457	159.3	2.413
120	12.881	35.135	12.865	26.526	153.2	2.571
130	13.049	35.223	13.031	26.560	150.3	2.722
140	12.221	35.118	12.203	26.642	142.6	2.870
150	12.183	35.228	12.164	26.735	134.0	3.009
175	12.286	35.419	12.263	26.865	122.5	3.327
200	11.942	35.449	11.916	26.955	114.6	3.626
225	10.913	35.347	10.886	27.067	104.1	3.900
250	9.346	35.189	9.318	27.215	90.0	4.141
275	8.571	35.124	8.542	27.288	83.1	4.357
300	8.025	35.080	7.994	27.338	78.6	4.558
350	6.940	35.012	6.907	27.441	69.0	4.928
400	6.647	34.998	6.610	27.471	66.7	5.265
450	5.753	34.971	5.715	27.566	57.7	5.585
500	5.258	34.969	5.216	27.626	52.2	5.857
623	4.697	34.968	4.648	27.690	46.9	6.463



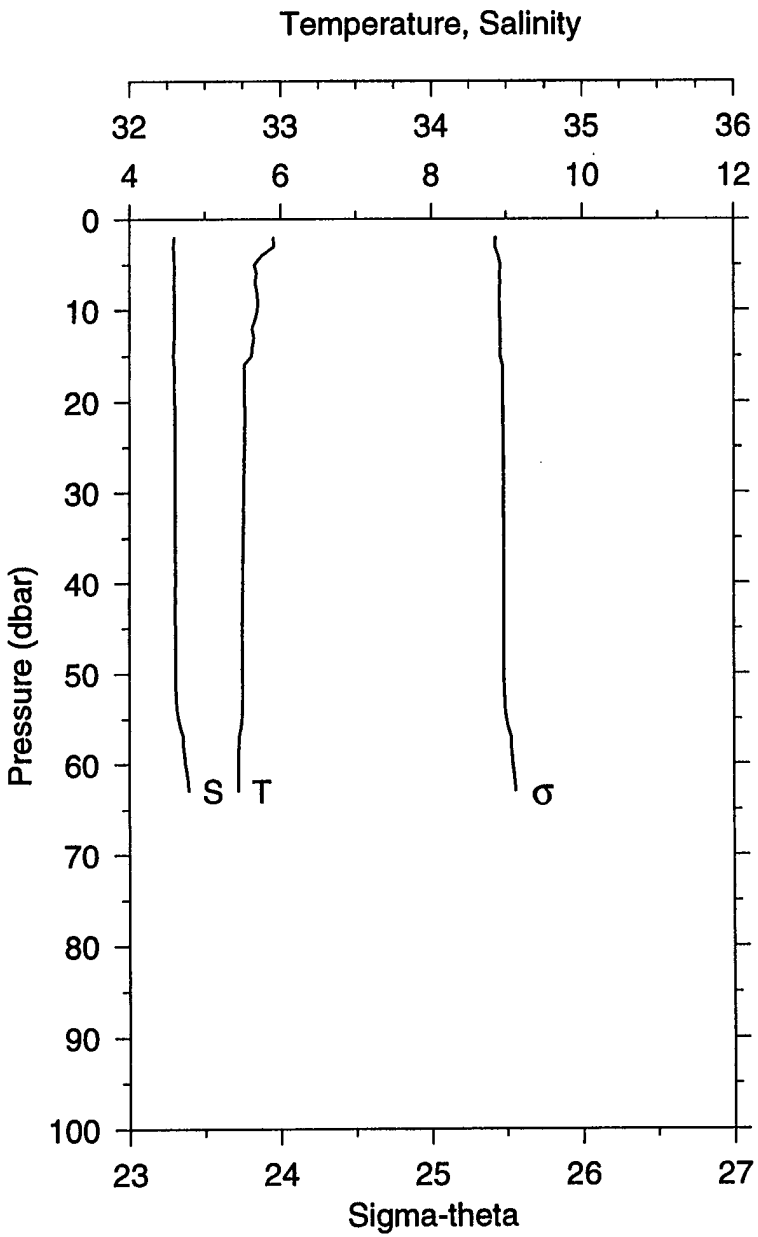
STA: 4 LAT: 40 4.1 N LONG: 70 30.1 W
26 APR 1997 0359 GMT DEPTH 180

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
4	6.064	32.303	6.064	25.414	255.4	0.102
10	5.917	32.300	5.916	25.430	253.9	0.255
20	5.623	32.309	5.622	25.472	250.1	0.507
30	5.546	32.326	5.544	25.494	248.1	0.757
40	5.525	32.363	5.522	25.526	245.1	1.003
50	5.531	32.372	5.527	25.533	244.6	1.247
60	5.493	32.376	5.489	25.540	244.0	1.492
70	5.700	32.692	5.695	25.766	222.7	1.725
80	6.274	33.020	6.268	25.955	205.0	1.939
90	8.604	33.767	8.595	26.217	180.8	2.127
100	10.392	34.364	10.380	26.390	165.0	2.299
110	11.359	34.817	11.345	26.571	148.3	2.455
120	11.476	34.876	11.461	26.595	146.3	2.603
130	11.668	35.039	11.651	26.686	138.0	2.747
140	11.790	35.129	11.771	26.733	133.8	2.883
150	11.776	35.157	11.756	26.758	131.7	3.015
165	11.799	35.177	11.777	26.769	131.1	3.212



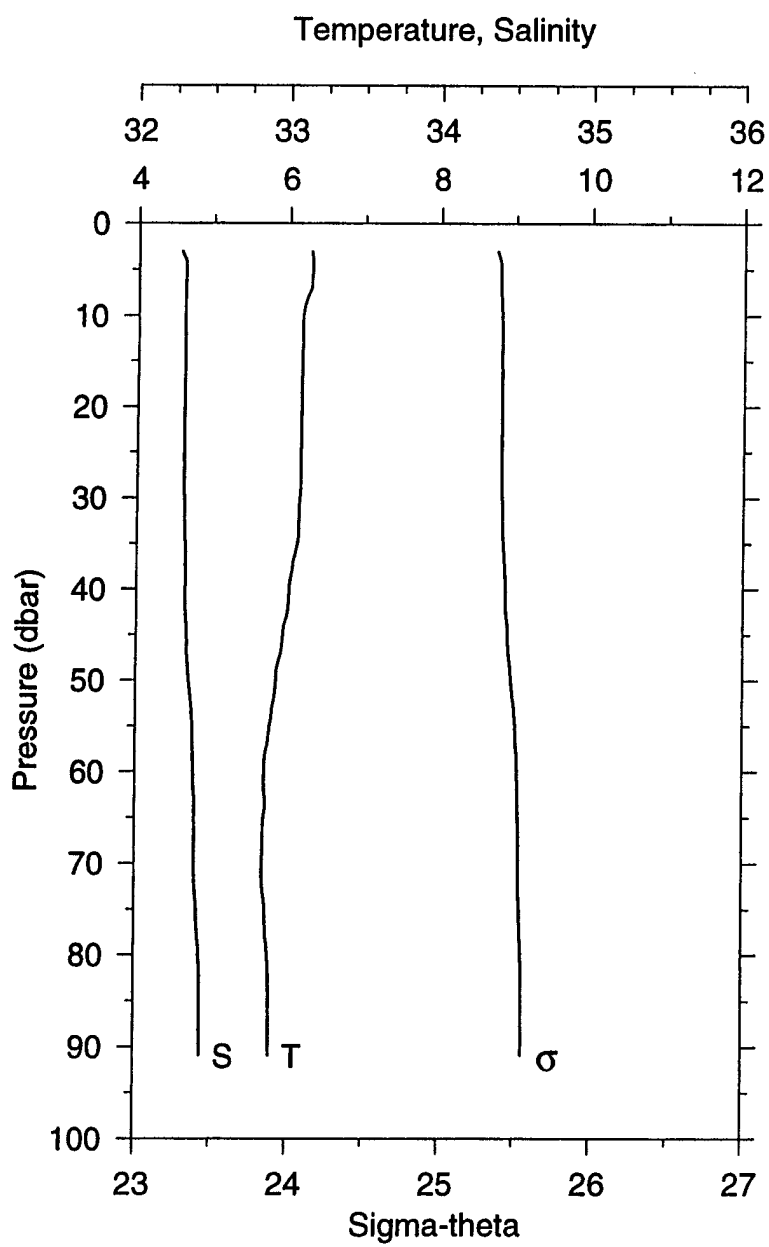
STA: 5 LAT: 40 9.1 N LONG: 70 30.0 W
26 APR 1997 0500 GMT DEPTH 121

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
6	6.008	32.297	6.008	25.416	255.2	0.153
10	5.768	32.286	5.767	25.437	253.3	0.255
20	5.615	32.296	5.614	25.462	251.0	0.507
30	5.575	32.300	5.573	25.471	250.3	0.757
40	5.560	32.302	5.557	25.474	250.1	1.008
50	5.533	32.306	5.529	25.480	249.6	1.257
60	5.555	32.341	5.550	25.506	247.3	1.506
70	5.575	32.441	5.570	25.582	240.1	1.750
80	5.592	32.525	5.586	25.647	234.1	1.986
90	5.555	32.556	5.548	25.676	231.5	2.220
100	6.954	33.176	6.945	25.990	202.1	2.437
110	9.681	34.207	9.668	26.389	165.2	2.616
118	10.049	34.348	10.036	26.437	160.8	2.745



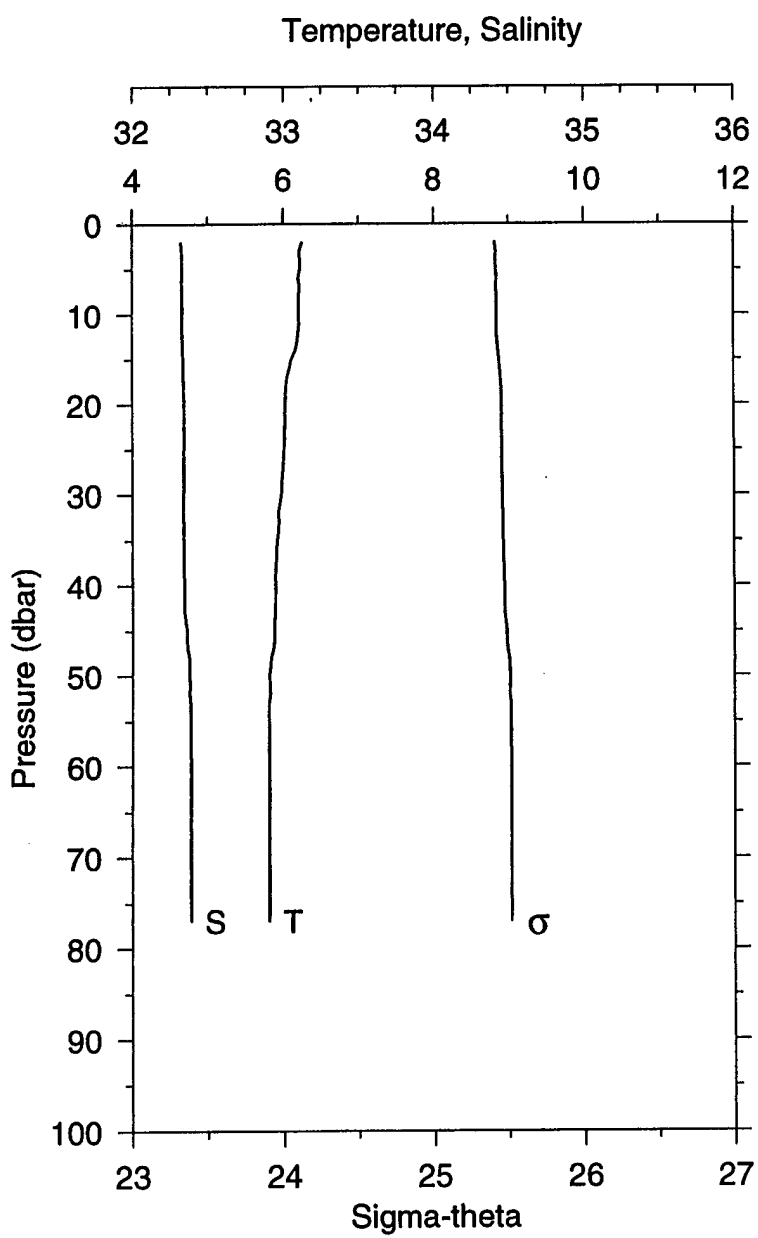
STA: 6 LAT: 40 14.1 N LONG: 70 30.0 W
26 APR 1997 0600 GMT DEPTH 115

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
2	5.904	32.297	5.904	25.429	254.0	0.051
10	5.698	32.297	5.697	25.454	251.7	0.252
20	5.527	32.300	5.525	25.476	249.7	0.503
30	5.520	32.303	5.517	25.480	249.4	0.753
40	5.504	32.305	5.501	25.483	249.3	1.002
50	5.499	32.306	5.495	25.484	249.2	1.251
60	5.445	32.369	5.440	25.540	244.0	1.498
63	5.445	32.394	5.440	25.560	242.1	1.571



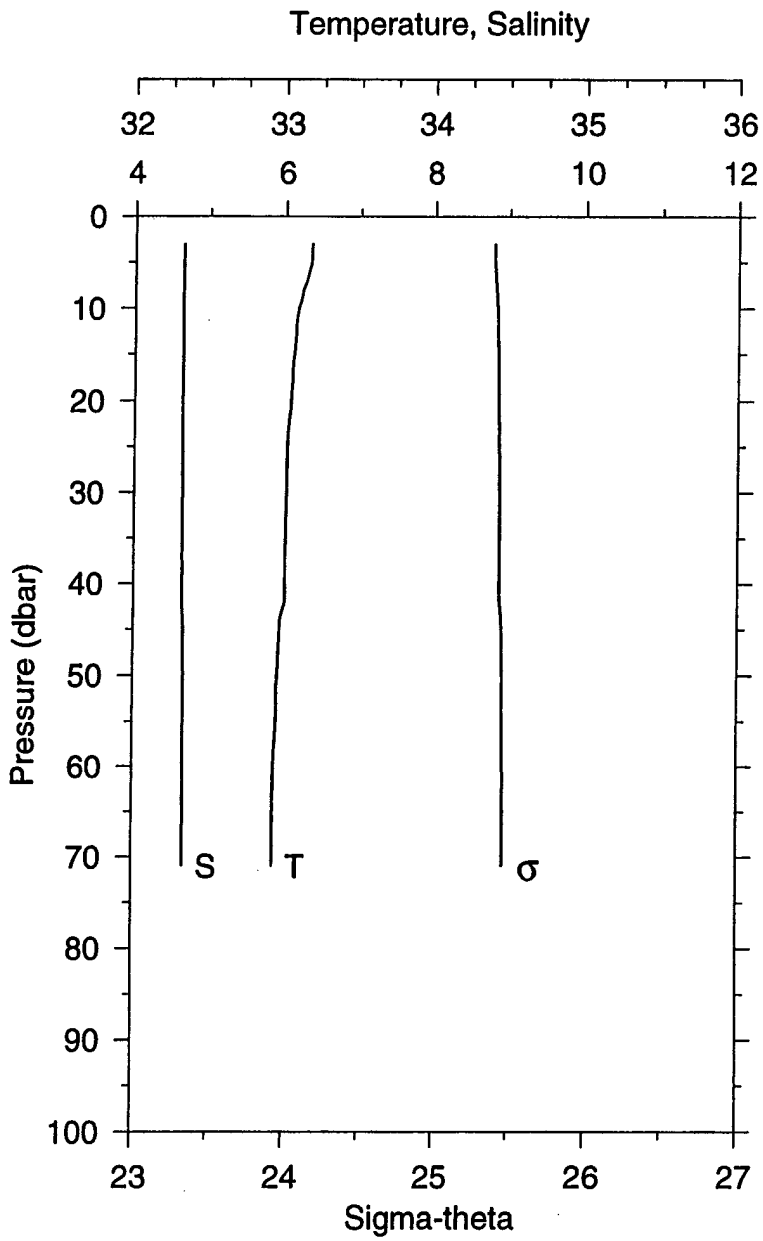
STA: 7 LAT: 40 19.0 N LONG: 70 30.0 W
26 APR 1997 0650 GMT DEPTH 95

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	6.282	32.281	6.282	25.370	259.6	0.078
10	6.172	32.305	6.171	25.403	256.5	0.258
20	6.162	32.308	6.161	25.406	256.3	0.514
30	6.147	32.312	6.144	25.411	256.0	0.771
40	6.017	32.324	6.014	25.437	253.6	1.026
50	5.856	32.350	5.852	25.477	249.9	1.278
60	5.711	32.385	5.706	25.522	245.8	1.525
70	5.686	32.395	5.680	25.533	244.8	1.770
80	5.763	32.429	5.756	25.551	243.2	2.015
90	5.787	32.438	5.780	25.555	243.0	2.258
91	5.788	32.439	5.781	25.556	242.9	2.282



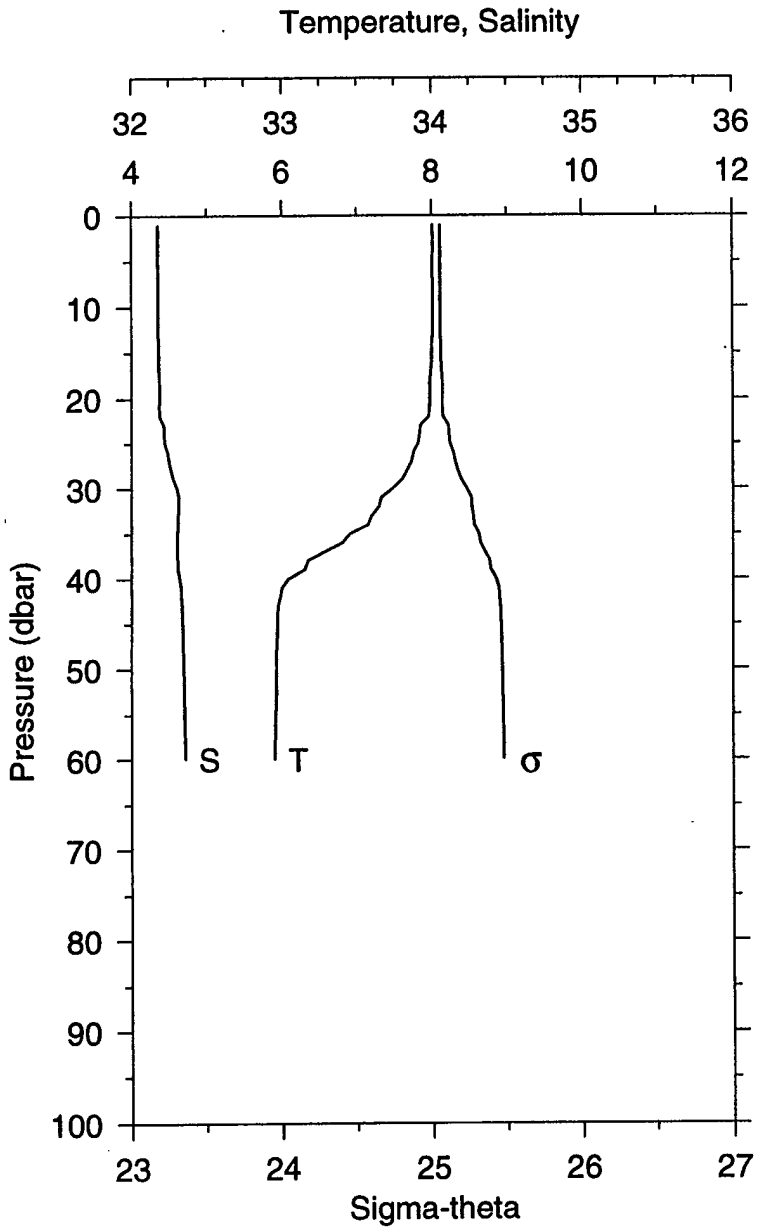
STA: 8 LAT: 40 23.9 N LONG: 70 29.9 W
26 APR 1997 0757 GMT DEPTH 80

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
2	6.252	32.323	6.251	25.407	256.1	0.051
10	6.201	32.332	6.200	25.421	254.9	0.255
20	6.025	32.342	6.023	25.450	252.2	0.509
30	5.970	32.339	5.967	25.454	251.9	0.761
40	5.887	32.342	5.884	25.467	250.8	1.012
50	5.805	32.378	5.801	25.506	247.2	1.262
60	5.803	32.386	5.798	25.512	246.7	1.509
70	5.807	32.387	5.802	25.513	246.8	1.755
77	5.808	32.388	5.801	25.513	246.8	1.928



STA: 9 LAT: 40 28.0 N LONG: 70 29.9 W
26 APR 1997 0841 GMT DEPTH 75

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	6.343	32.325	6.343	25.397	257.0	0.077
10	6.169	32.321	6.168	25.416	255.4	0.257
20	6.079	32.321	6.077	25.427	254.4	0.511
30	6.023	32.325	6.020	25.437	253.5	0.765
40	6.010	32.324	6.007	25.438	253.5	1.019
50	5.912	32.337	5.909	25.460	251.6	1.271
60	5.873	32.338	5.868	25.466	251.1	1.523
70	5.867	32.340	5.861	25.468	251.0	1.774
71	5.867	32.340	5.861	25.468	251.0	1.799

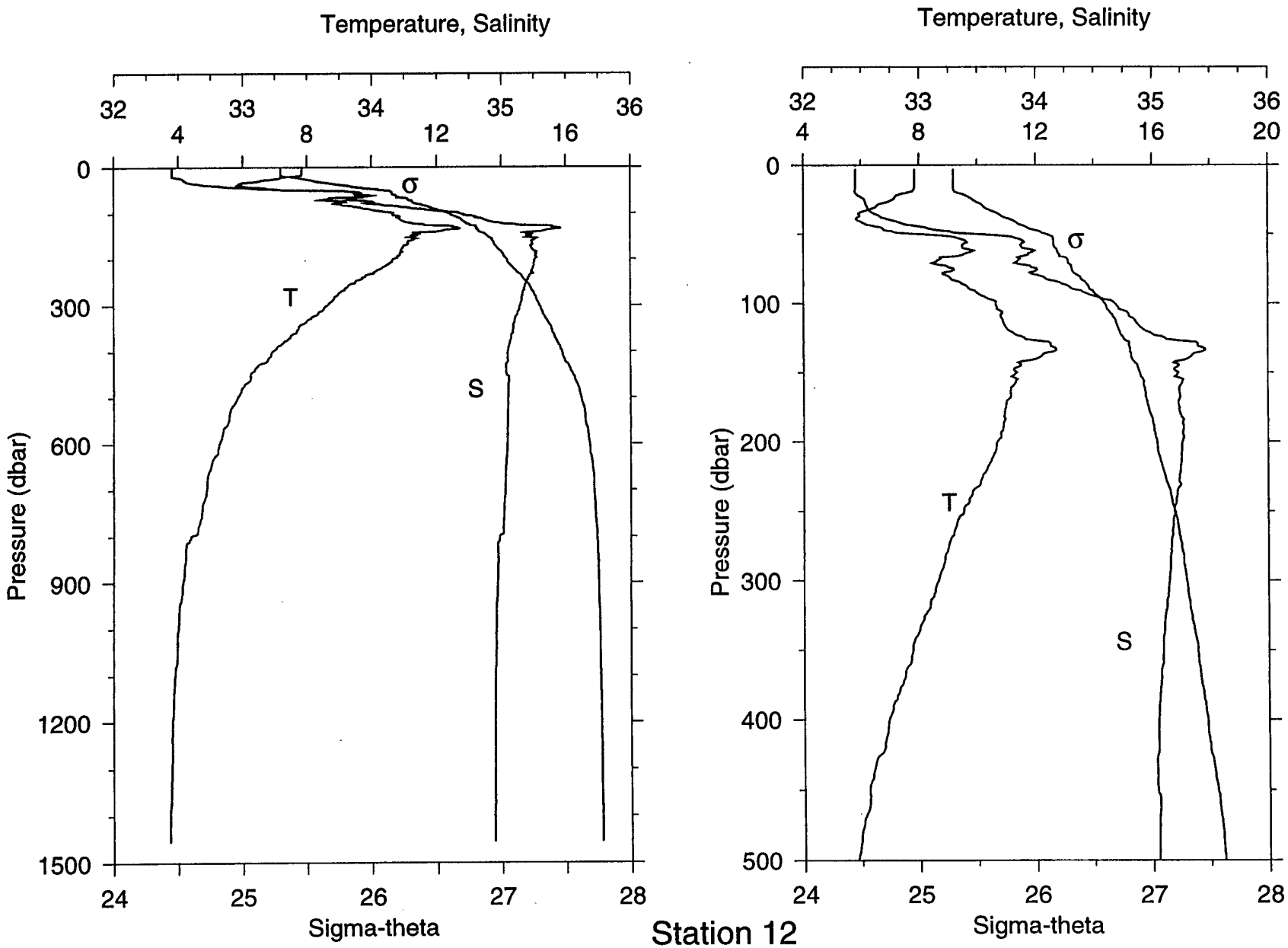


STA: 11 LAT: 40 28.8 N LONG: 70 22.8 W
07 MAY 1997 0023 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
1	8.014	32.178	8.014	25.057	289.4	0.029
10	8.013	32.177	8.012	25.056	289.6	0.289
20	7.968	32.188	7.966	25.071	288.3	0.579
30	7.477	32.303	7.474	25.231	273.2	0.861
40	6.087	32.322	6.084	25.427	254.7	1.126
50	5.926	32.347	5.922	25.466	251.0	1.378
60	5.909	32.358	5.904	25.477	250.0	1.629

STA: 12 LAT: 39 49.0 N LONG: 70 29.9 W
11 MAY 1997 0324 GMT DEPTH 1570

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	7.851	32.453	7.850	25.296	266.6	0.080
10	7.846	32.452	7.845	25.296	266.8	0.267
20	7.574	32.451	7.572	25.333	263.4	0.533
30	6.528	32.553	6.525	25.554	242.5	0.785
40	5.894	32.772	5.891	25.806	218.6	1.016
50	7.909	33.472	7.904	26.088	192.2	1.223
60	9.490	33.888	9.483	26.170	184.8	1.409
70	8.580	33.842	8.573	26.278	174.6	1.589
80	8.937	34.023	8.929	26.364	166.7	1.761
90	9.761	34.329	9.751	26.470	157.0	1.922
100	10.629	34.681	10.617	26.596	145.5	2.073
110	10.811	34.815	10.798	26.669	138.9	2.215
120	11.104	34.948	11.089	26.720	134.4	2.352
130	12.510	35.395	12.493	26.801	127.4	2.483
140	12.044	35.313	12.025	26.828	124.9	2.609
150	11.356	35.231	11.337	26.894	118.8	2.730
175	10.973	35.238	10.951	26.970	112.1	3.018
200	10.676	35.263	10.652	27.043	105.7	3.289
225	10.170	35.238	10.143	27.114	99.4	3.547
250	9.511	35.198	9.483	27.194	92.0	3.786
275	8.985	35.166	8.955	27.256	86.5	4.008
300	8.642	35.148	8.610	27.297	82.9	4.220
350	7.748	35.093	7.713	27.390	74.4	4.614
400	6.931	35.049	6.893	27.472	66.9	4.968
450	6.249	35.039	6.209	27.557	59.0	5.285
500	5.847	35.051	5.804	27.618	53.6	5.565
600	5.272	35.043	5.222	27.683	48.1	6.071
700	4.874	35.027	4.818	27.718	45.5	6.535
800	4.397	34.983	4.335	27.737	44.0	6.983
900	4.143	34.966	4.074	27.752	43.1	7.417
1000	4.001	34.956	3.924	27.760	43.1	7.848
1455	3.744	34.940	3.631	27.776	45.1	9.845


Temperature, Salinity
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Pressure (dbar)
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Sigma-theta
Temperature, Salinity
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Pressure (dbar)
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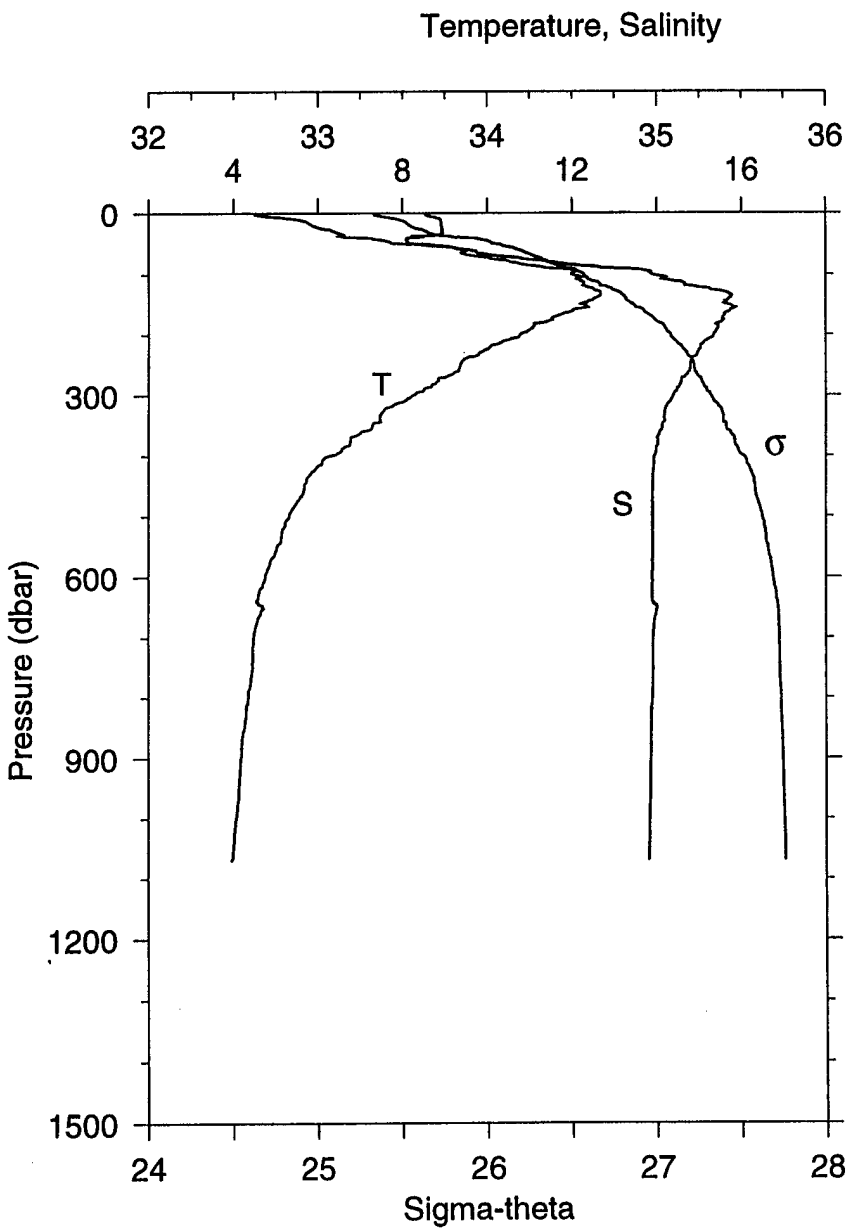
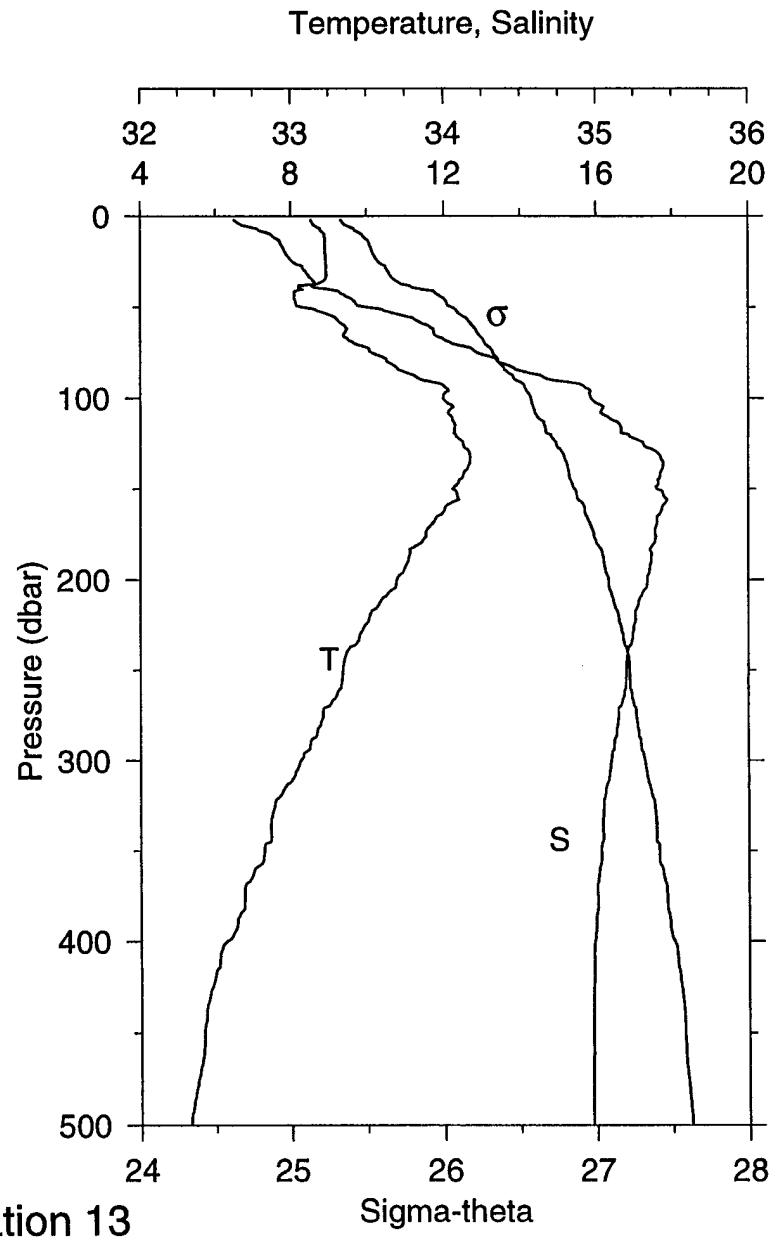
Sigma-theta

Station 12

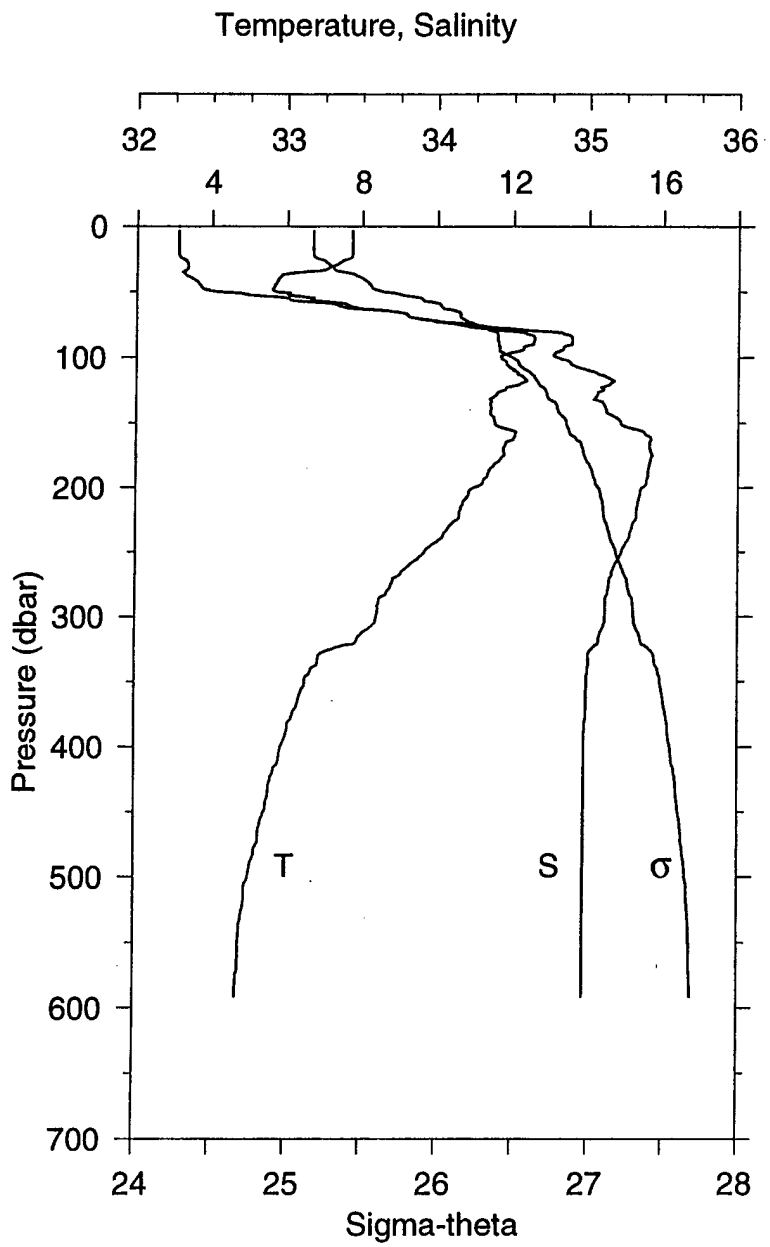
STA: 13 LAT: 39 53.8 N LONG: 70 30.2 W
11 MAY 1997 0519 GMT DEPTH 1150

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
2	8.527	32.622	8.527	25.329	263.5	0.053
10	8.894	32.870	8.893	25.468	250.5	0.259
20	8.916	32.966	8.914	25.539	243.8	0.505
30	8.932	33.098	8.929	25.640	234.4	0.745
40	8.297	33.256	8.293	25.861	213.6	0.973
50	8.296	33.499	8.291	26.052	195.6	1.175
60	9.420	33.899	9.414	26.190	182.9	1.364
70	9.692	34.059	9.684	26.271	175.5	1.543
80	10.552	34.359	10.542	26.358	167.5	1.713
90	11.479	34.725	11.468	26.476	156.8	1.876
100	11.986	34.969	11.973	26.570	148.2	2.027
110	12.191	35.070	12.176	26.610	144.8	2.174
120	12.316	35.217	12.301	26.700	136.5	2.315
130	12.676	35.405	12.659	26.776	129.8	2.448
140	12.563	35.429	12.544	26.817	126.1	2.576
150	12.235	35.399	12.215	26.858	122.4	2.701
175	11.533	35.389	11.510	26.985	110.9	2.991
200	10.775	35.335	10.750	27.082	102.0	3.256
225	9.946	35.250	9.920	27.161	94.8	3.503
250	9.362	35.199	9.334	27.220	89.5	3.733
275	8.847	35.147	8.817	27.263	85.7	3.953
300	8.248	35.098	8.217	27.318	80.6	4.162
350	7.284	35.032	7.250	27.409	72.3	4.541
400	6.280	34.985	6.244	27.510	62.7	4.880
450	5.677	34.975	5.639	27.579	56.3	5.174
500	5.315	34.974	5.273	27.622	52.6	5.448
600	4.756	34.972	4.708	27.687	47.0	5.944
700	4.471	34.977	4.417	27.723	44.3	6.394
800	4.347	34.973	4.285	27.734	44.2	6.838
900	4.169	34.962	4.100	27.745	43.8	7.279
1000	4.060	34.957	3.983	27.754	43.8	7.718
1070	3.975	34.954	3.893	27.761	43.6	8.024


Temperature, Salinity
32
33
34
35
36
4
8
12
16
0
300
600
900
1200
1500
Pressure (dbar)
T
S
σ
24
25
26
27
28
Sigma-theta

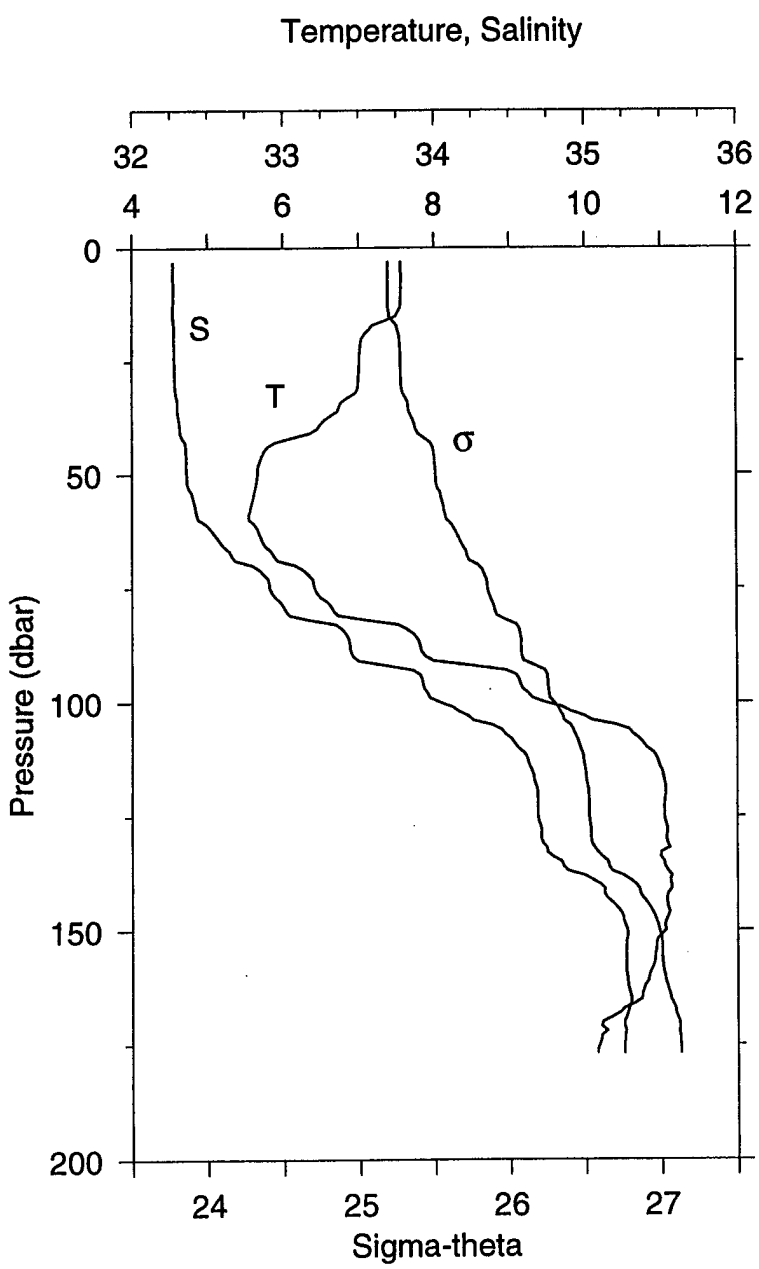

Temperature, Salinity
32
33
34
35
36
4
8
12
16
20
0
100
200
300
400
500
Pressure (dbar)
σ
T
S
24
25
26
27
28
Sigma-theta

Station 13



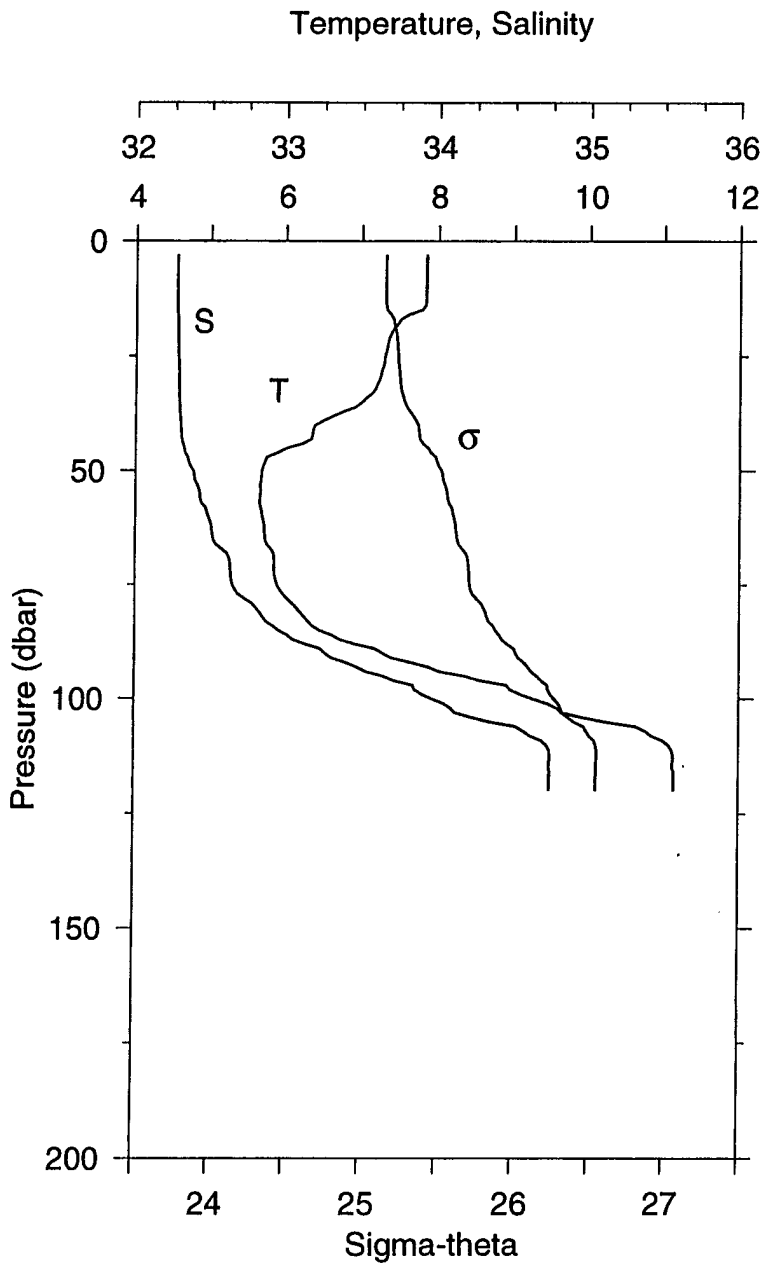
STA: 14 LAT: 39 58.9 N LONG: 70 30.2 W
11 MAY 1997 0700 GMT DEPTH 670

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	7.731	32.275	7.731	25.173	278.4	0.084
10	7.733	32.275	7.732	25.173	278.5	0.278
20	7.732	32.275	7.731	25.173	278.6	0.557
30	7.258	32.339	7.256	25.289	267.7	0.831
40	5.770	32.367	5.767	25.501	247.6	1.090
50	5.694	32.529	5.690	25.638	234.6	1.332
60	7.622	33.334	7.616	26.021	198.7	1.545
70	9.377	33.847	9.369	26.156	186.3	1.736
80	11.876	34.681	11.866	26.368	166.9	1.914
90	12.513	34.885	12.501	26.403	163.9	2.078
100	11.671	34.792	11.658	26.493	155.5	2.240
110	11.997	34.997	11.983	26.591	146.6	2.391
120	12.193	35.145	12.177	26.668	139.5	2.534
130	11.505	35.051	11.489	26.726	134.2	2.670
140	11.416	35.119	11.398	26.796	127.8	2.800
150	11.516	35.214	11.497	26.851	122.9	2.925
175	11.774	35.429	11.751	26.971	112.3	3.219
200	10.969	35.361	10.944	27.068	103.5	3.488
225	10.530	35.314	10.503	27.110	99.9	3.742
250	9.691	35.224	9.662	27.185	93.0	3.983
275	8.811	35.140	8.781	27.263	85.6	4.206
300	8.410	35.114	8.379	27.306	81.9	4.414
350	6.516	34.993	6.484	27.484	64.6	4.779
400	5.892	34.976	5.857	27.552	58.4	5.086
450	5.442	34.974	5.405	27.607	53.5	5.365
500	5.028	34.971	4.987	27.654	49.2	5.621
592	4.699	34.969	4.652	27.691	46.4	6.056



STA: 15 LAT: 40 3.9 N LONG: 70 30.0 W
11 MAY 1997 0823 GMT DEPTH 180

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	7.558	32.272	7.558	25.195	276.3	0.083
10	7.556	32.272	7.555	25.195	276.4	0.276
20	7.041	32.277	7.039	25.270	269.4	0.550
30	6.990	32.283	6.987	25.281	268.4	0.819
40	6.448	32.314	6.444	25.375	259.5	1.083
50	5.665	32.362	5.661	25.510	246.8	1.333
60	5.551	32.438	5.546	25.583	239.9	1.577
70	6.158	32.795	6.152	25.792	220.3	1.808
80	6.661	33.017	6.654	25.903	210.0	2.022
90	7.880	33.459	7.871	26.082	193.4	2.220
100	9.466	34.039	9.455	26.293	174.0	2.400
110	10.811	34.556	10.798	26.467	158.1	2.566
120	11.057	34.684	11.043	26.522	153.1	2.721
130	11.068	34.708	11.052	26.539	151.7	2.873
140	11.128	35.100	11.110	26.834	124.1	3.014
150	11.055	35.275	11.037	26.983	110.2	3.131
175	10.186	35.257	10.166	27.125	97.2	3.391
177	10.163	35.257	10.142	27.128	96.9	3.410



STA: 16 LAT: 40 8.9 N LONG: 70 30.1 W
11 MAY 1997 0930 GMT DEPTH 124

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	SVA (CL/T)	DYN HT (J/KG)
3	7.842	32.272	7.842	25.155	280.1	0.084
10	7.840	32.272	7.839	25.155	280.2	0.280
20	7.386	32.278	7.384	25.224	273.8	0.558
30	7.231	32.285	7.229	25.250	271.4	0.830
40	6.391	32.299	6.388	25.371	259.9	1.098
50	5.688	32.385	5.684	25.525	245.4	1.351
60	5.693	32.486	5.688	25.604	237.9	1.593
70	5.858	32.634	5.853	25.701	228.9	1.827
80	6.148	32.805	6.142	25.801	219.6	2.054
90	7.291	33.266	7.283	26.015	199.7	2.265
100	9.261	33.969	9.251	26.271	176.0	2.452
110	11.070	34.723	11.057	26.550	150.2	2.615
120	11.144	34.742	11.130	26.551	150.4	2.765

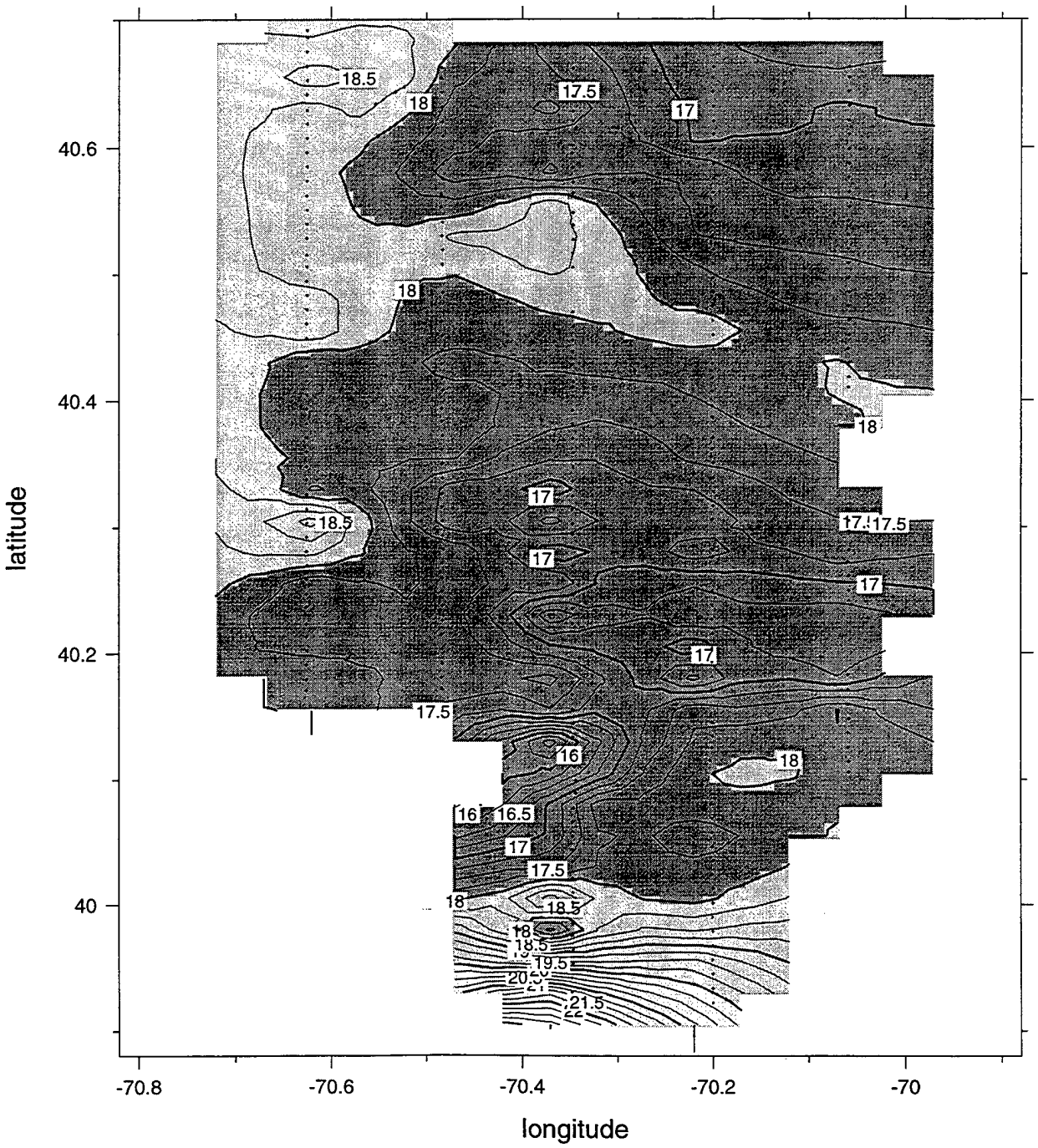
E9608 Big Box Maps of Temperature, Salinity and σ_t

E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 5 dbar

Temperature (°C)

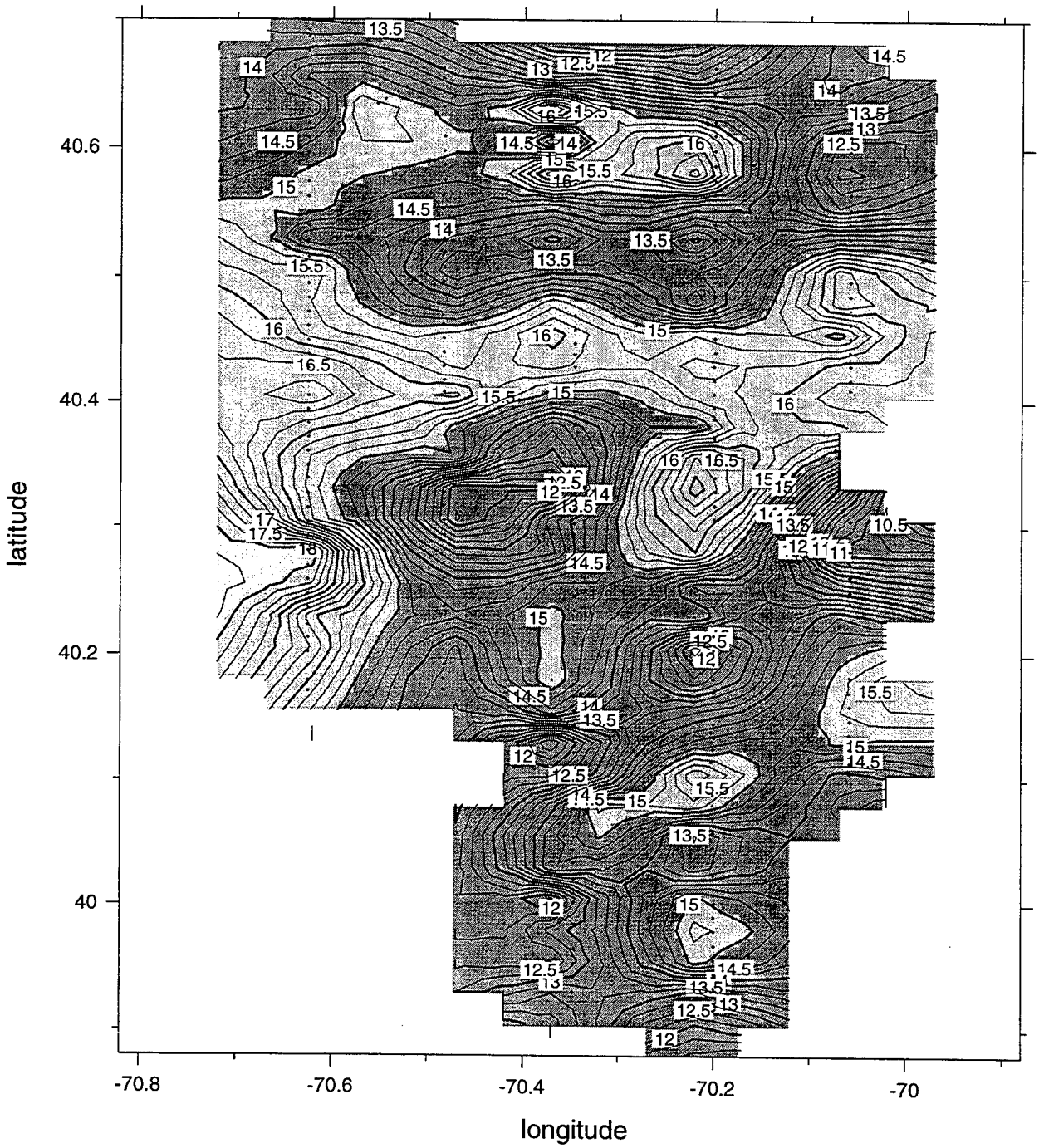


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 15 dbar

Temperature (°C)

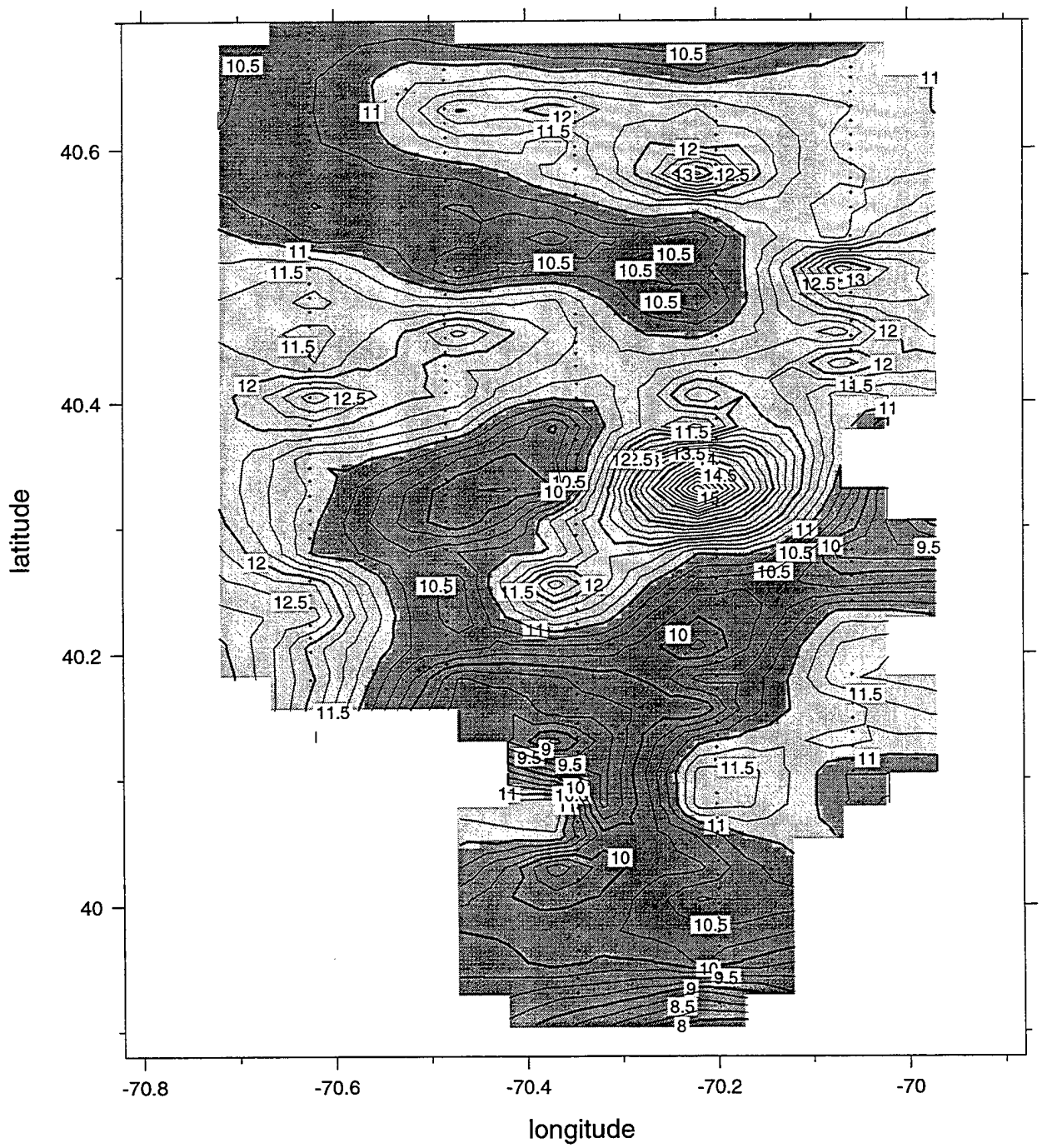


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 25 dbar

Temperature (°C)

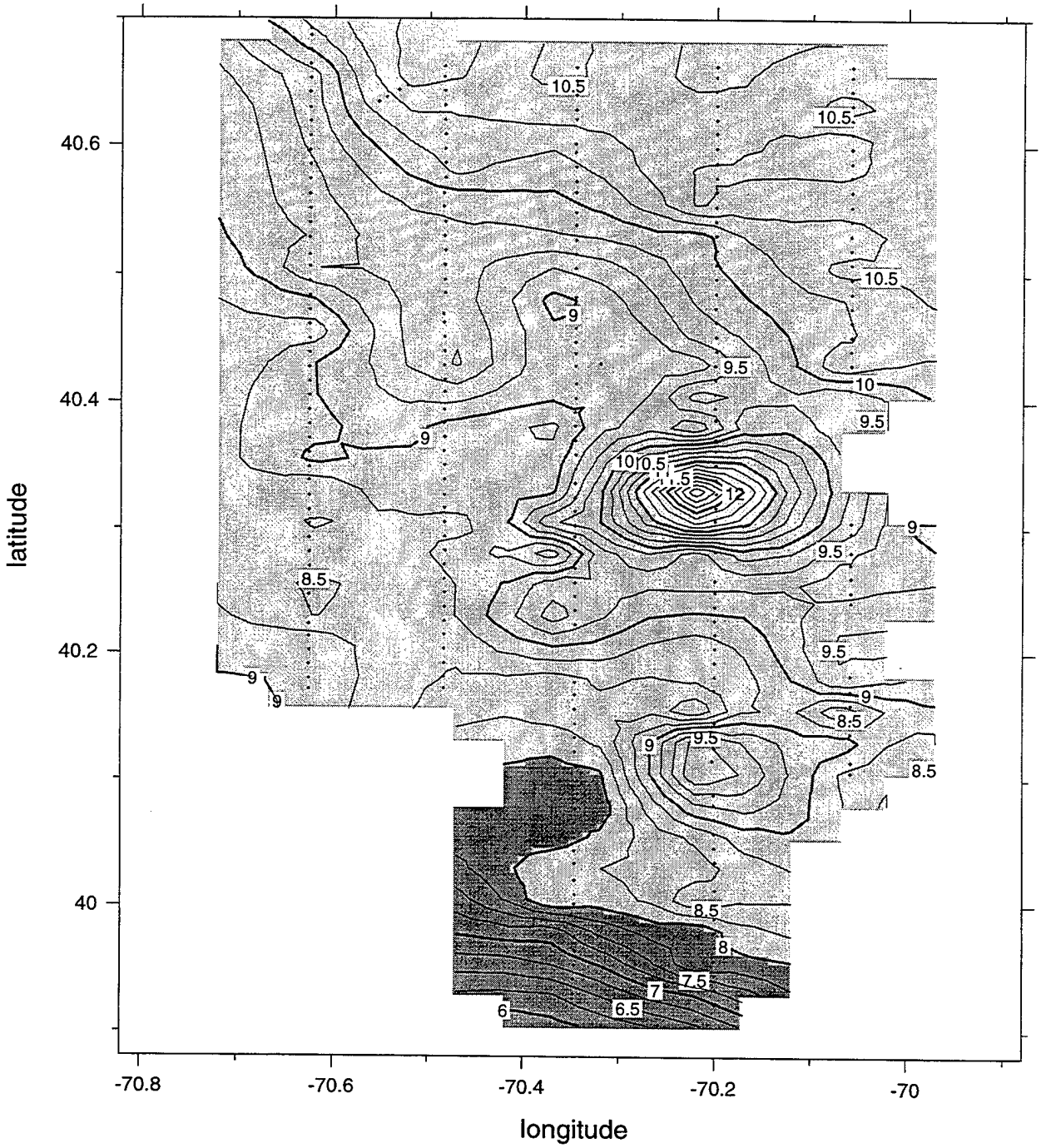


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 35 dbar

Temperature (°C)

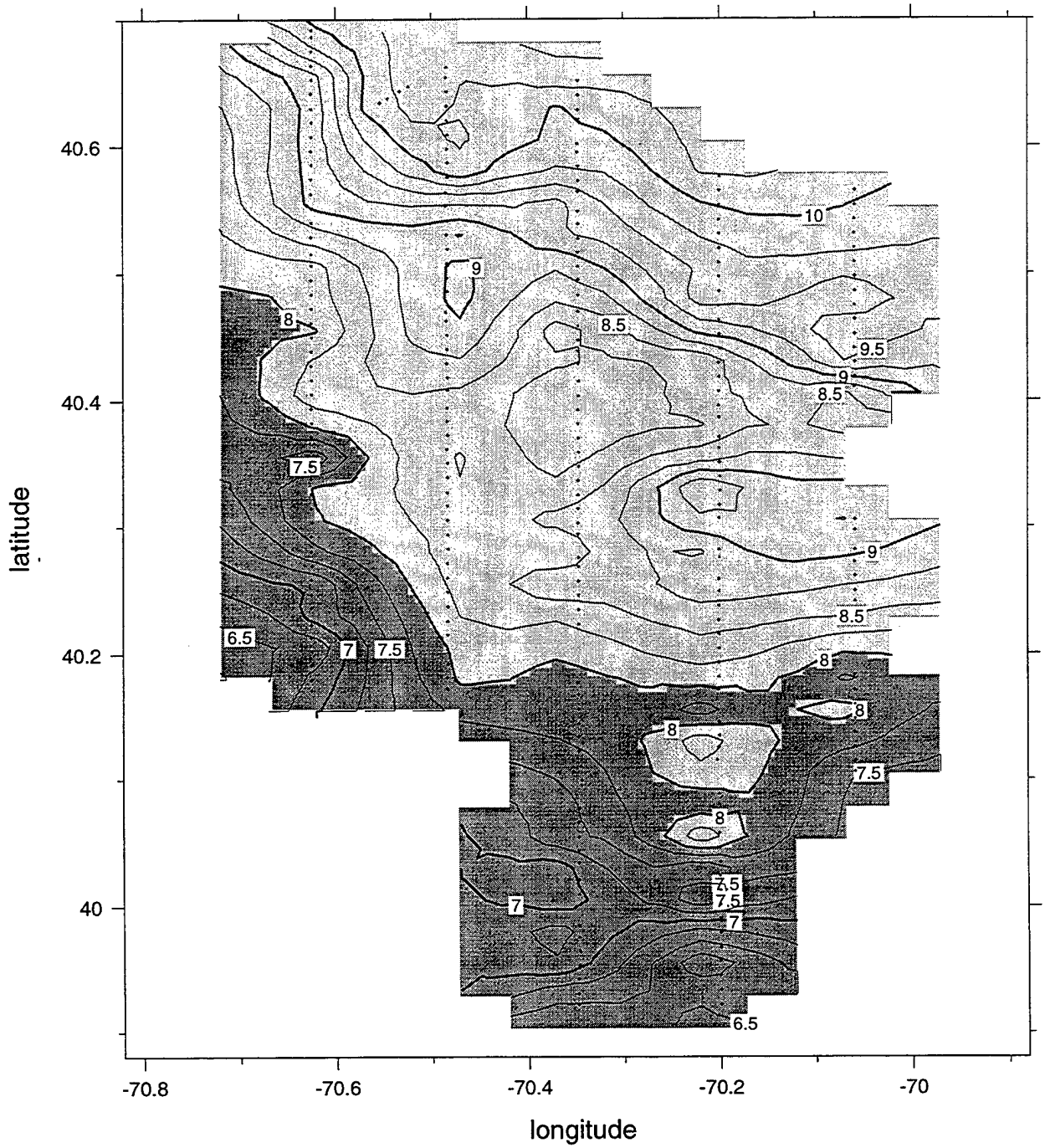


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 45 dbar

Temperature (°C)

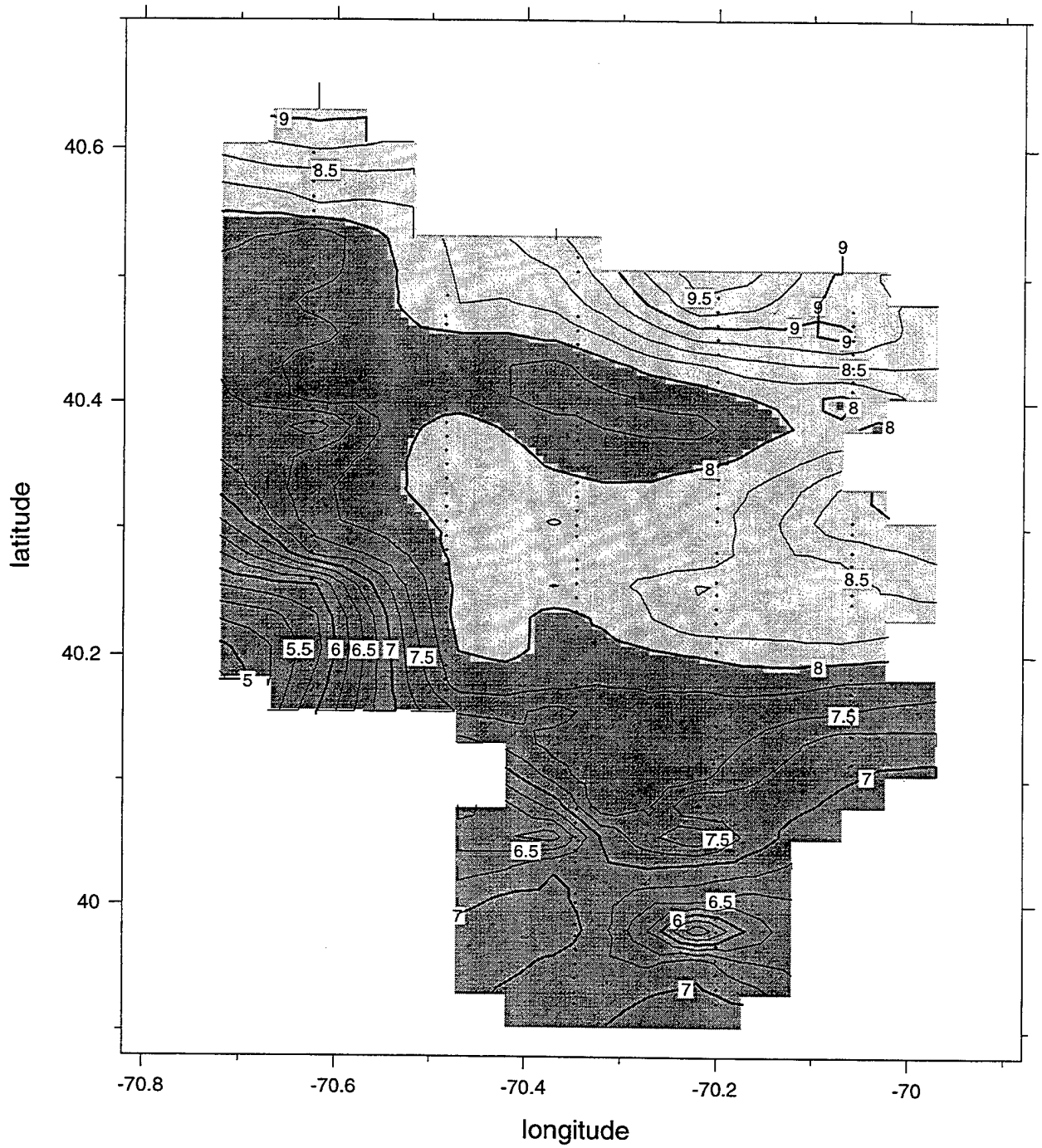


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 55 dbar

Temperature (°C)

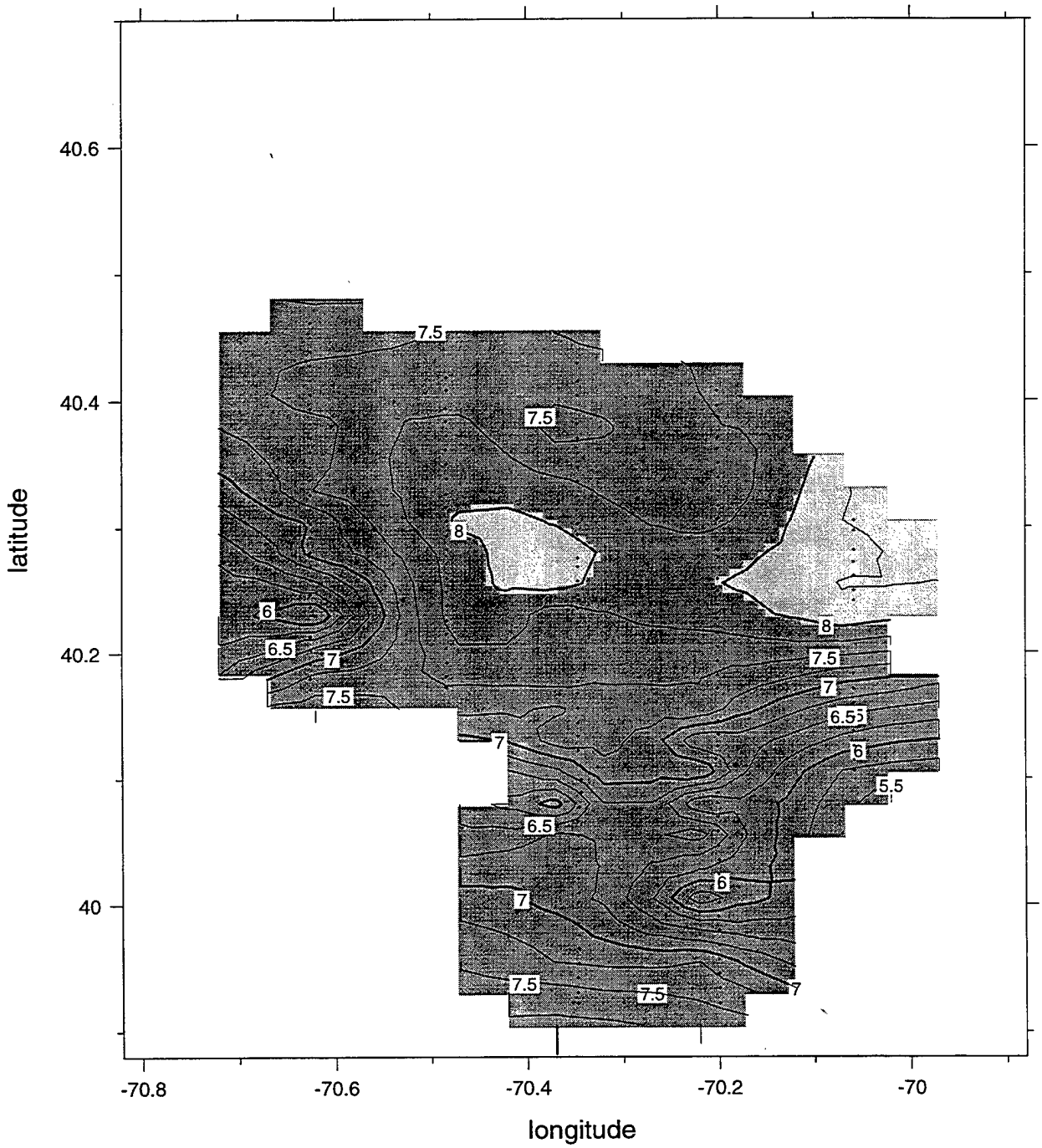


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 65 dbar

Temperature (°C)

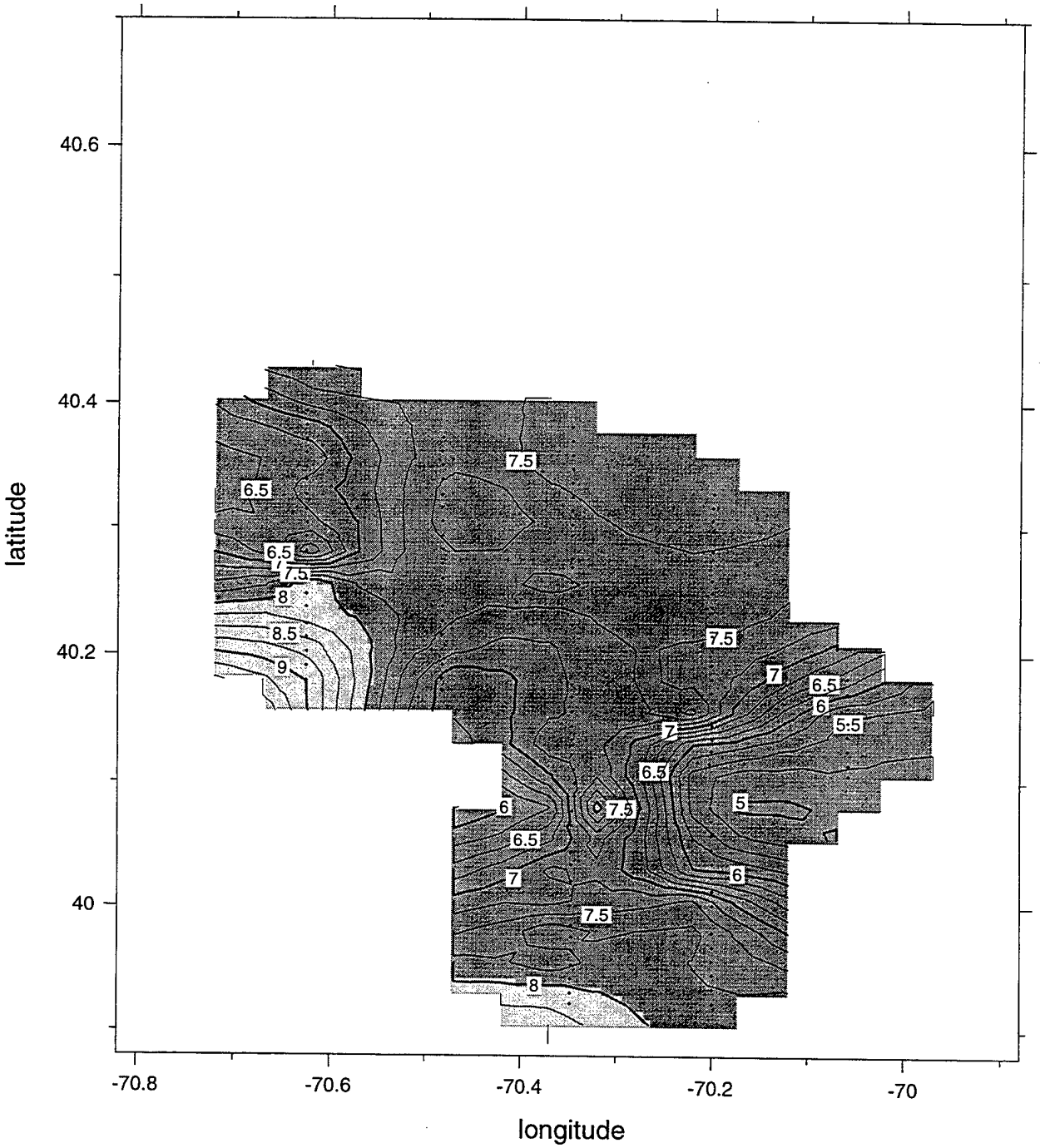


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 75 dbar

Temperature (°C)

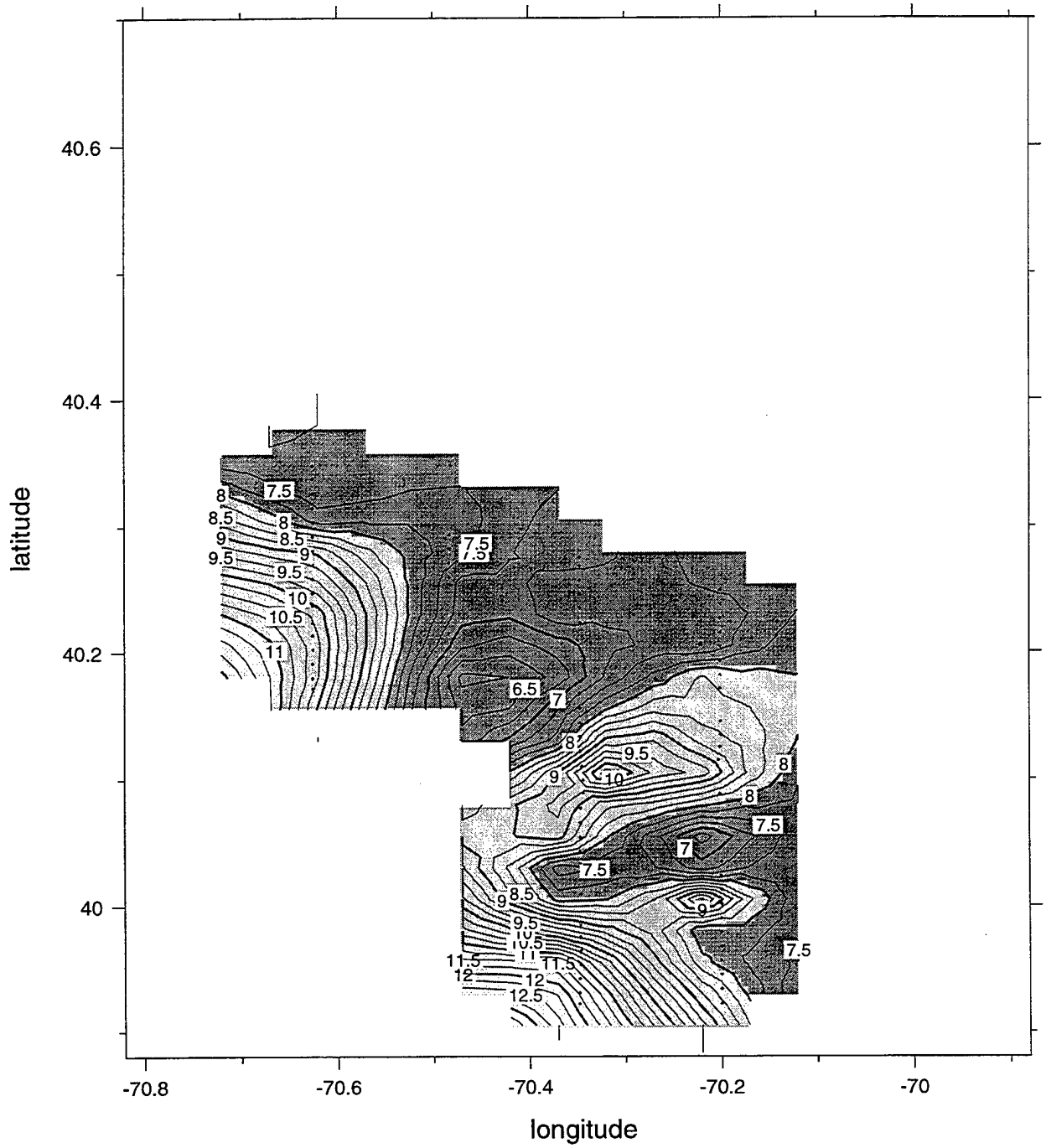


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 85 dbar

Temperature (°C)

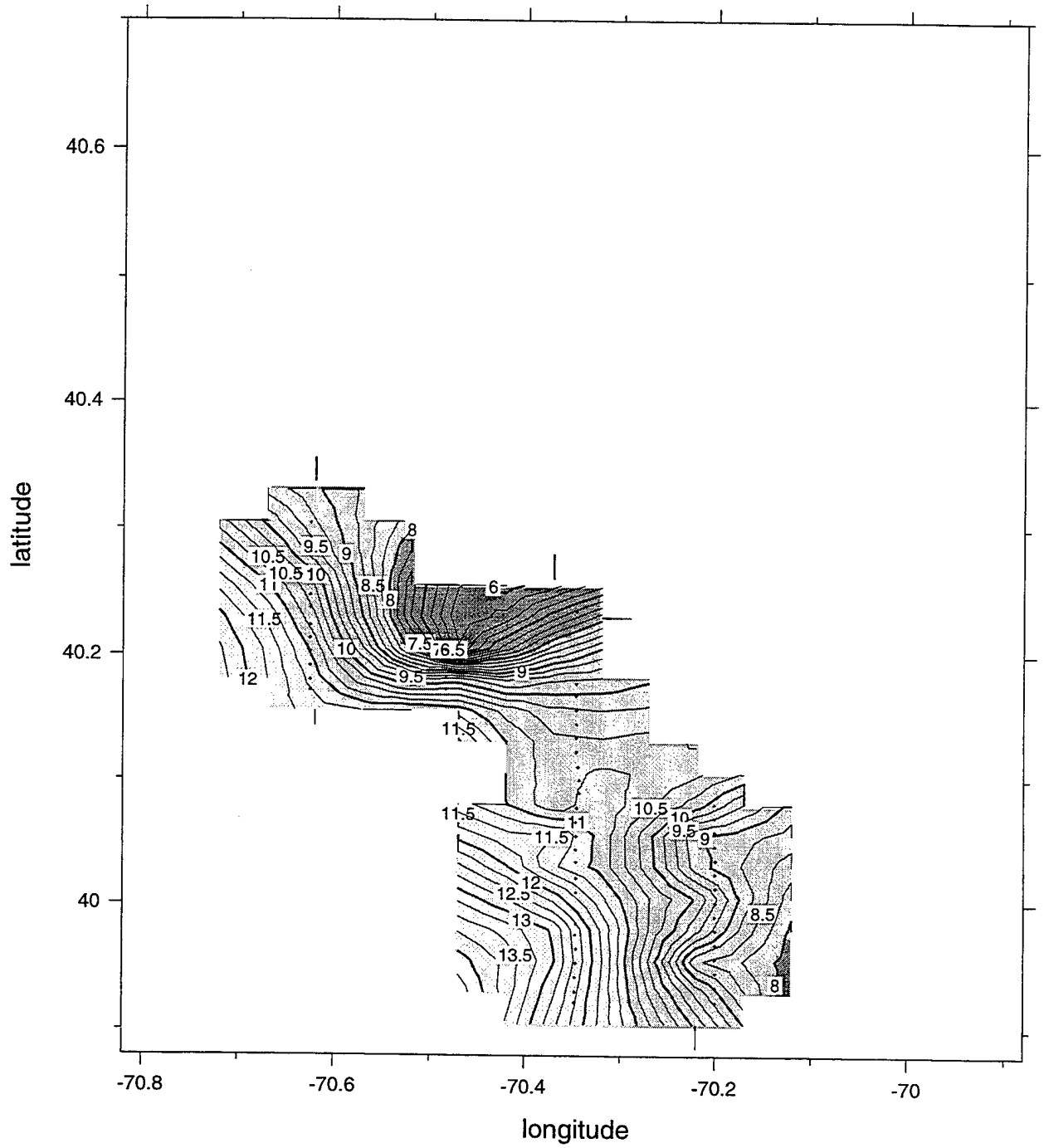


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 95 dbar

Temperature (°C)

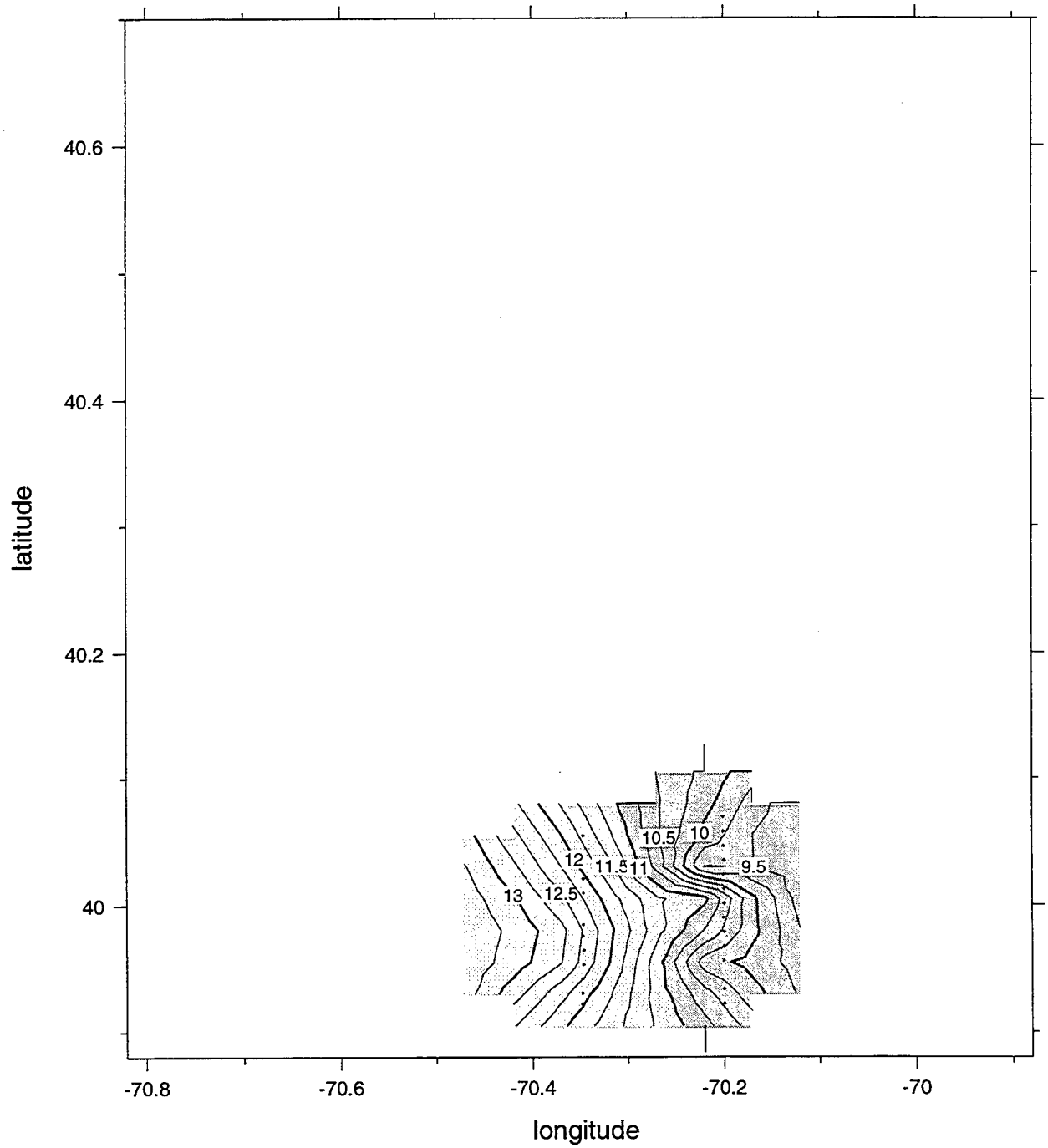


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 105 dbar

Temperature (°C)

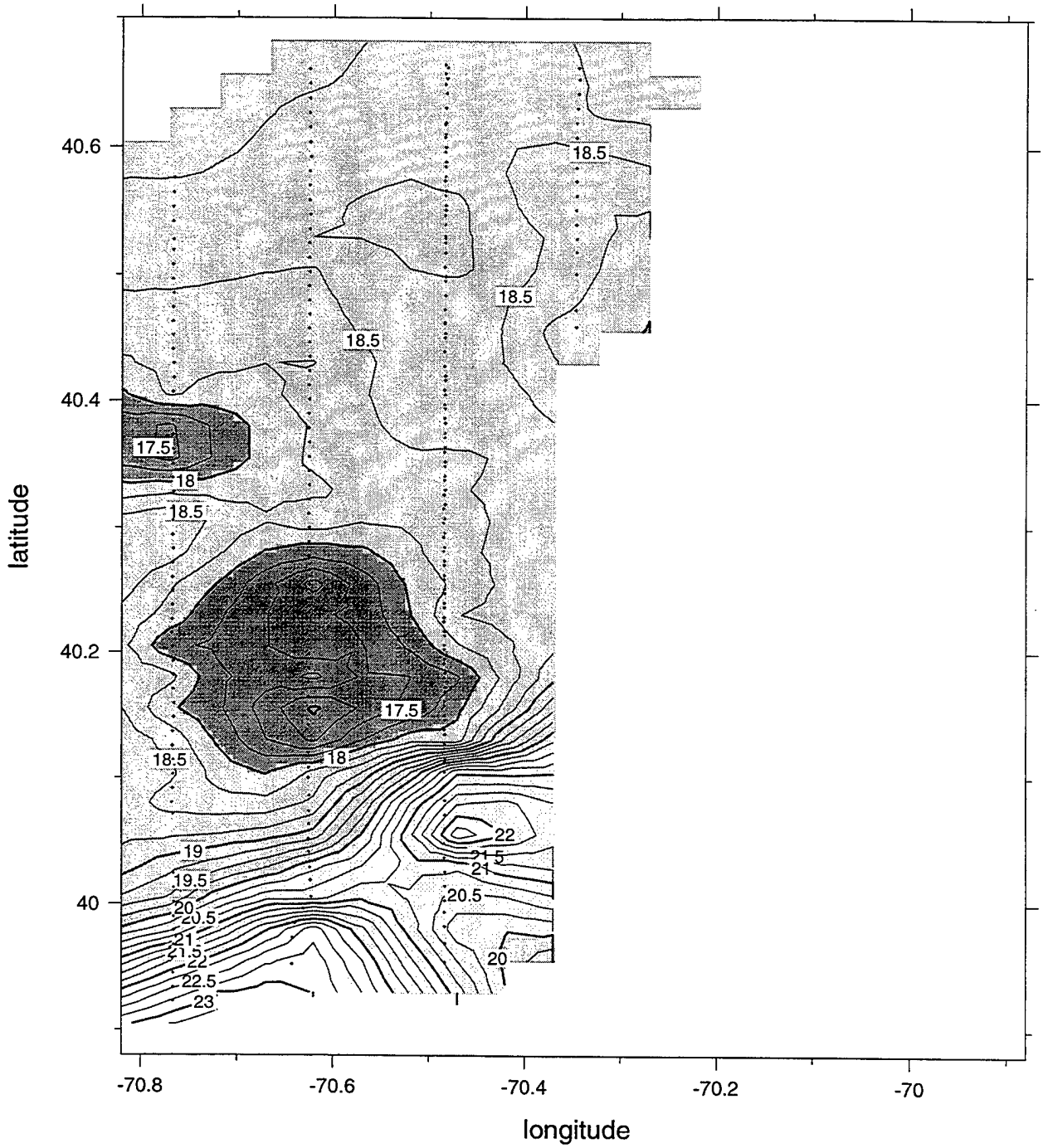


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 5 dbar

Temperature (°C)

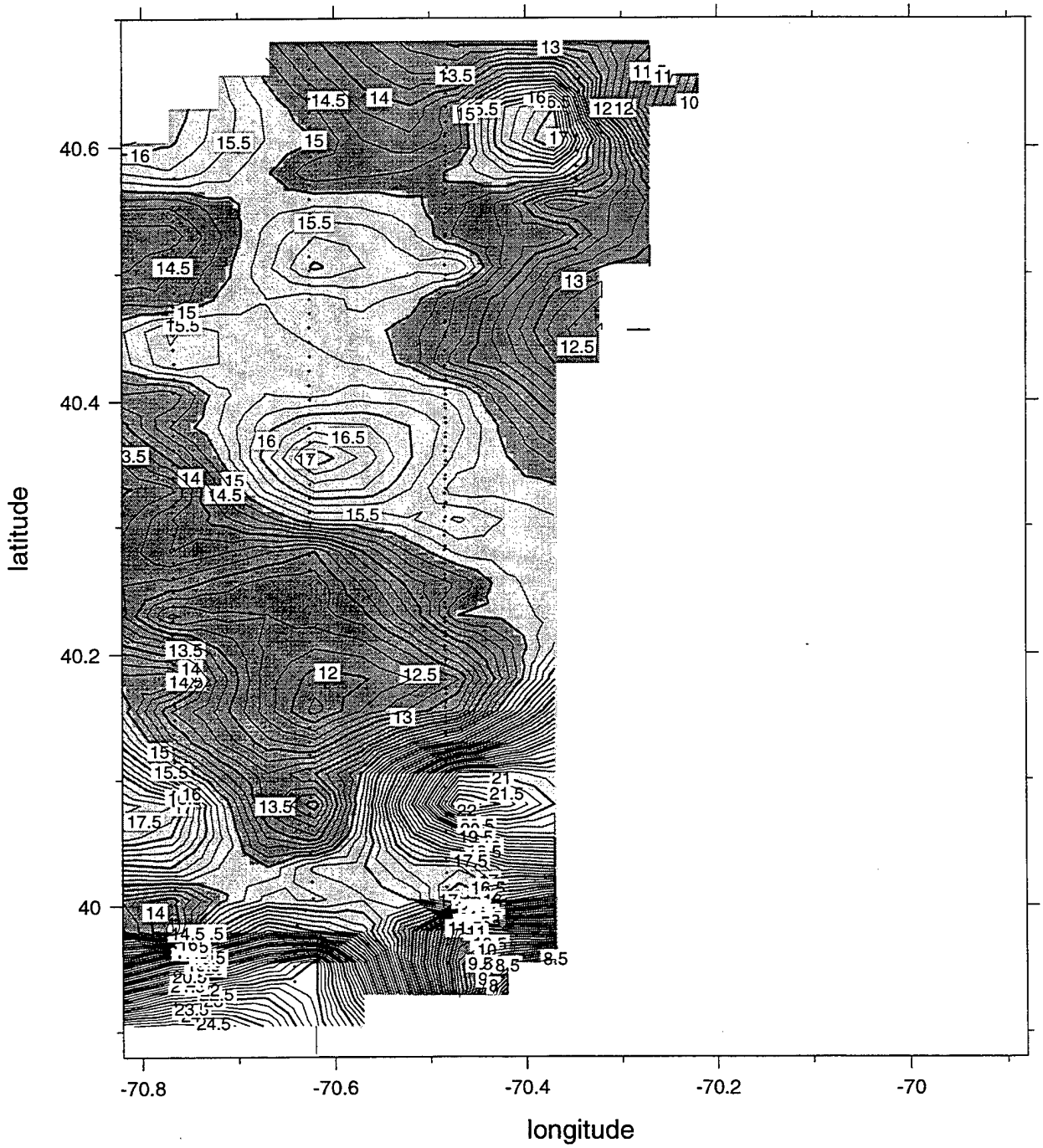


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 15 dbar

Temperature (°C)

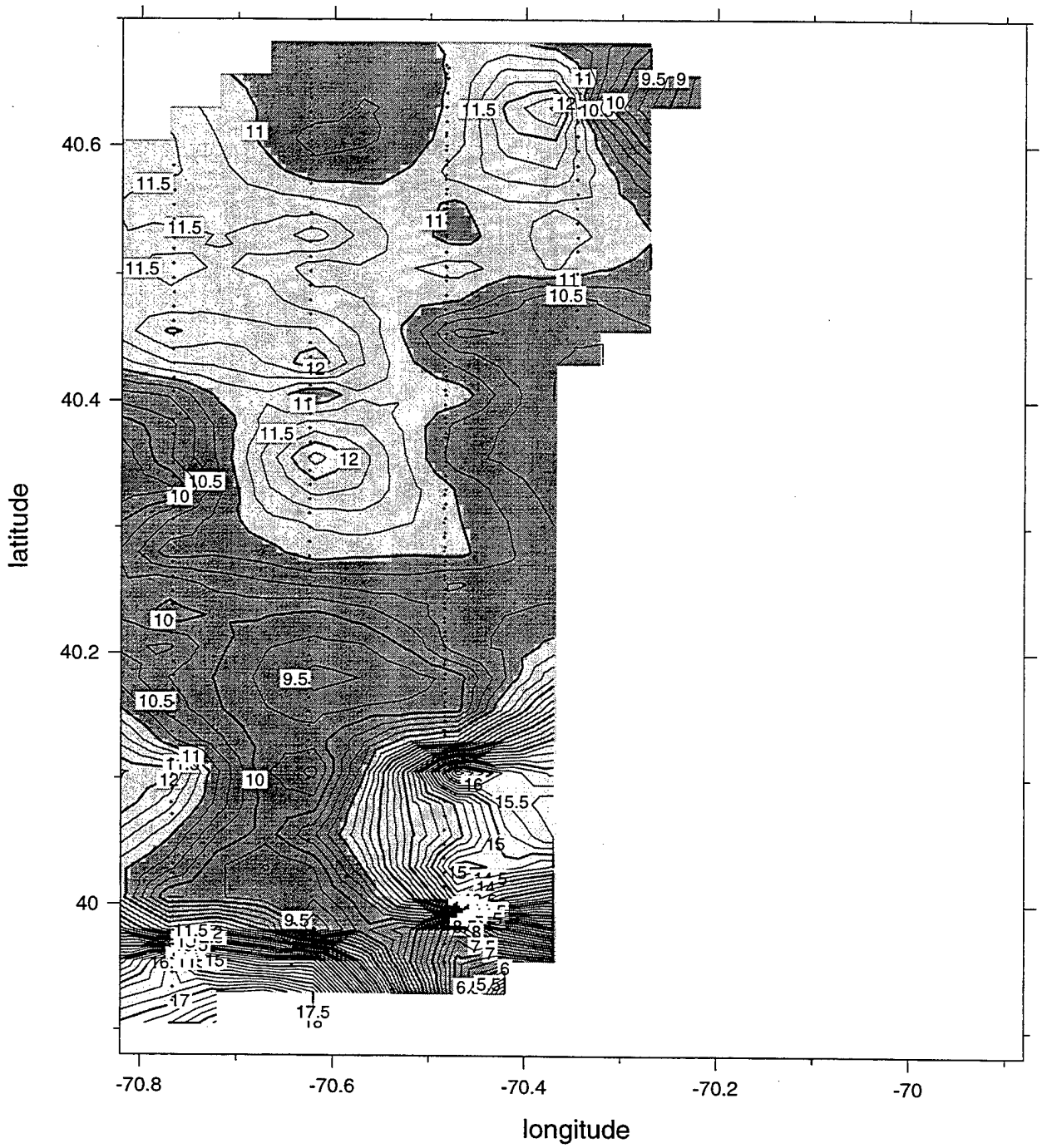


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 25 dbar

Temperature (°C)

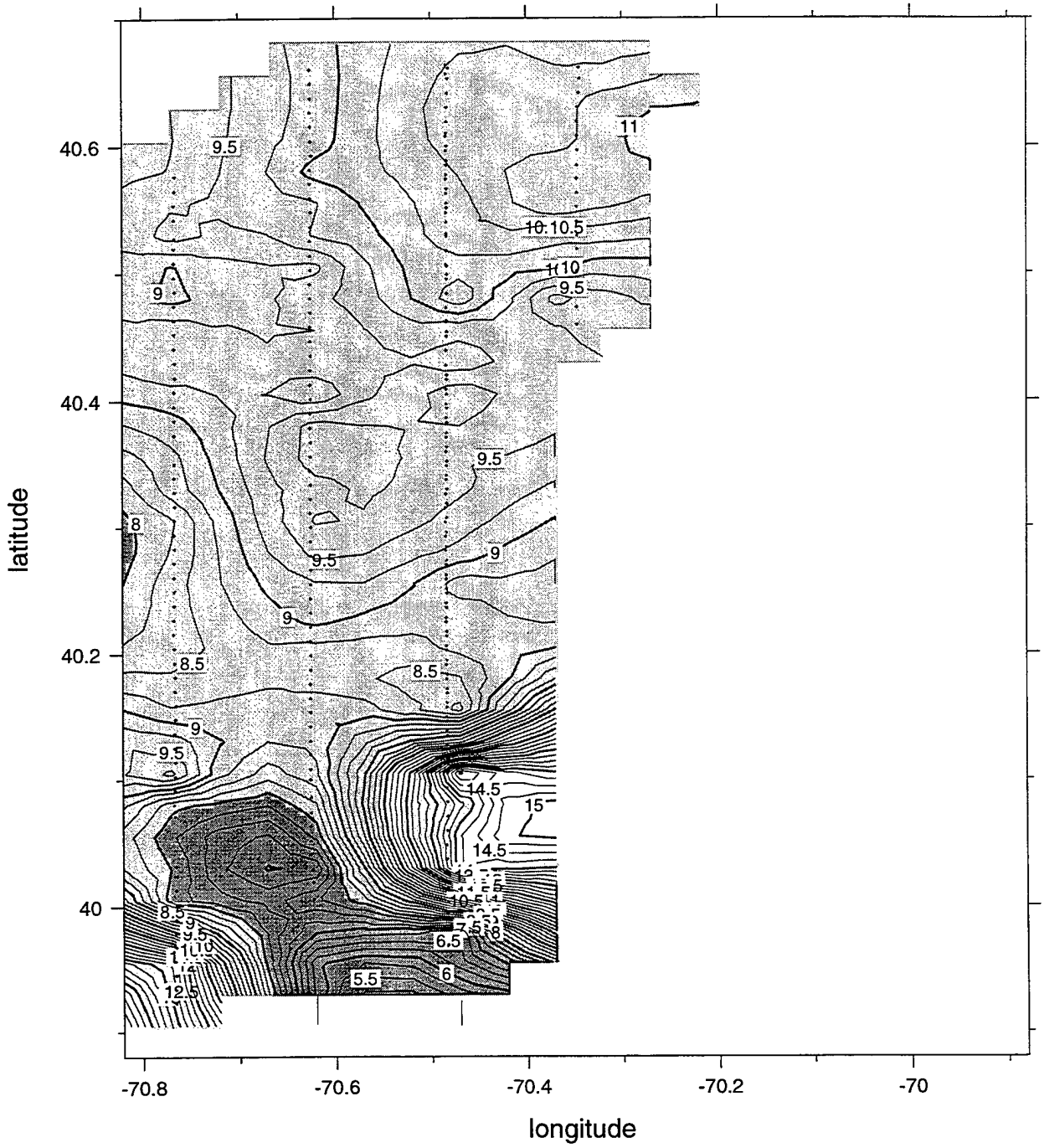


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 35 dbar

Temperature (°C)

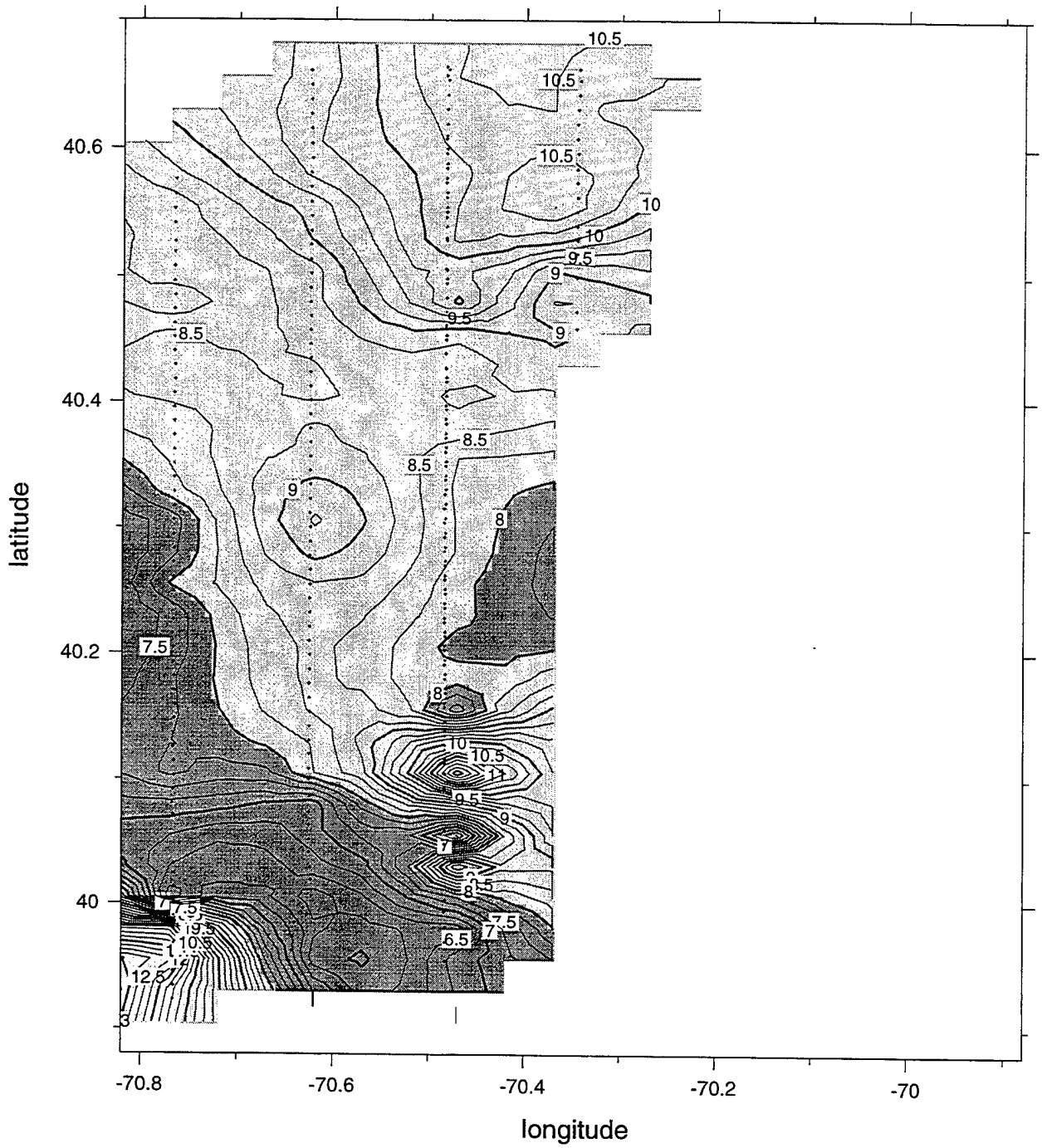


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 45 dbar

Temperature (°C)

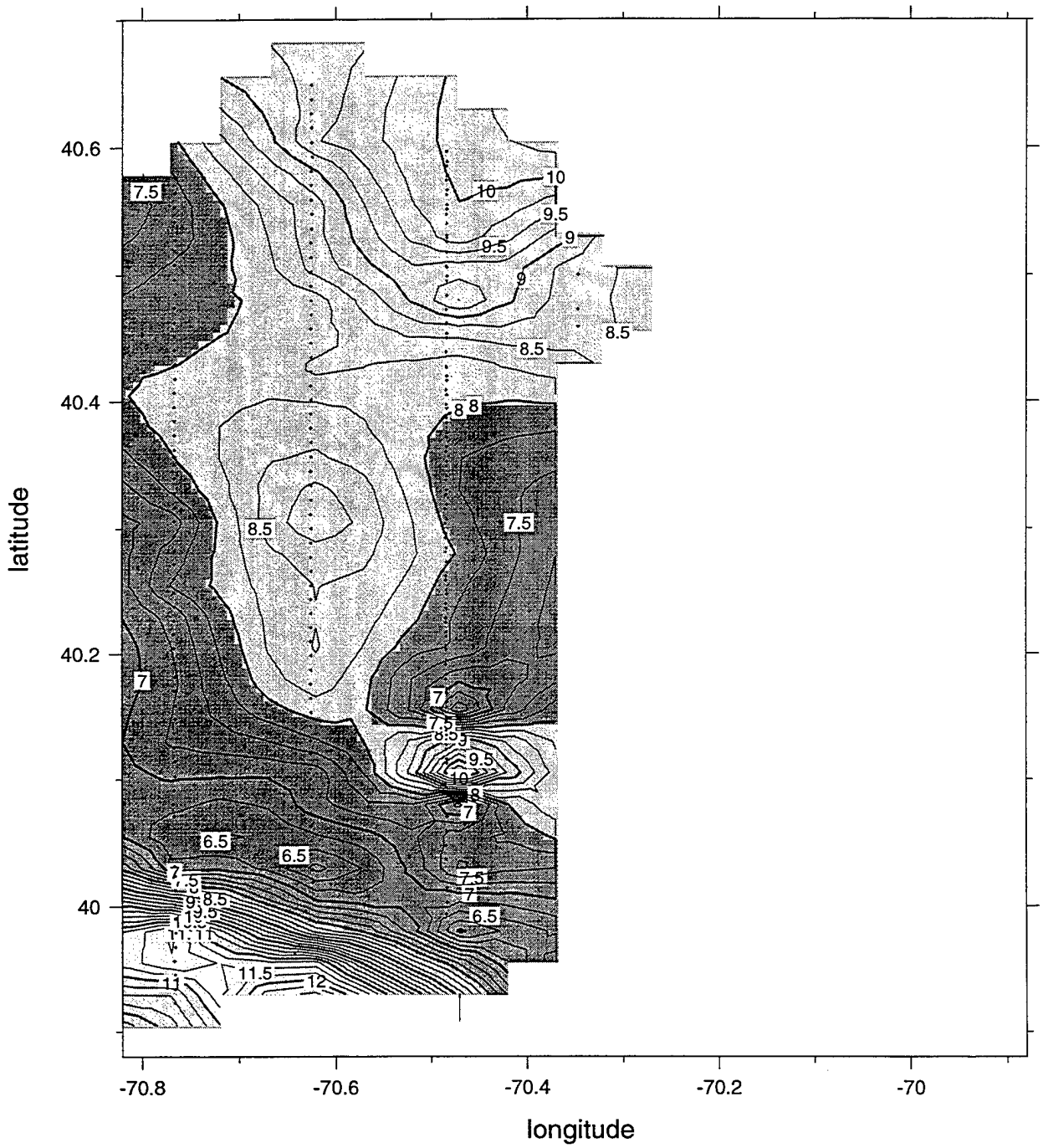


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 55 dbar

Temperature (°C)

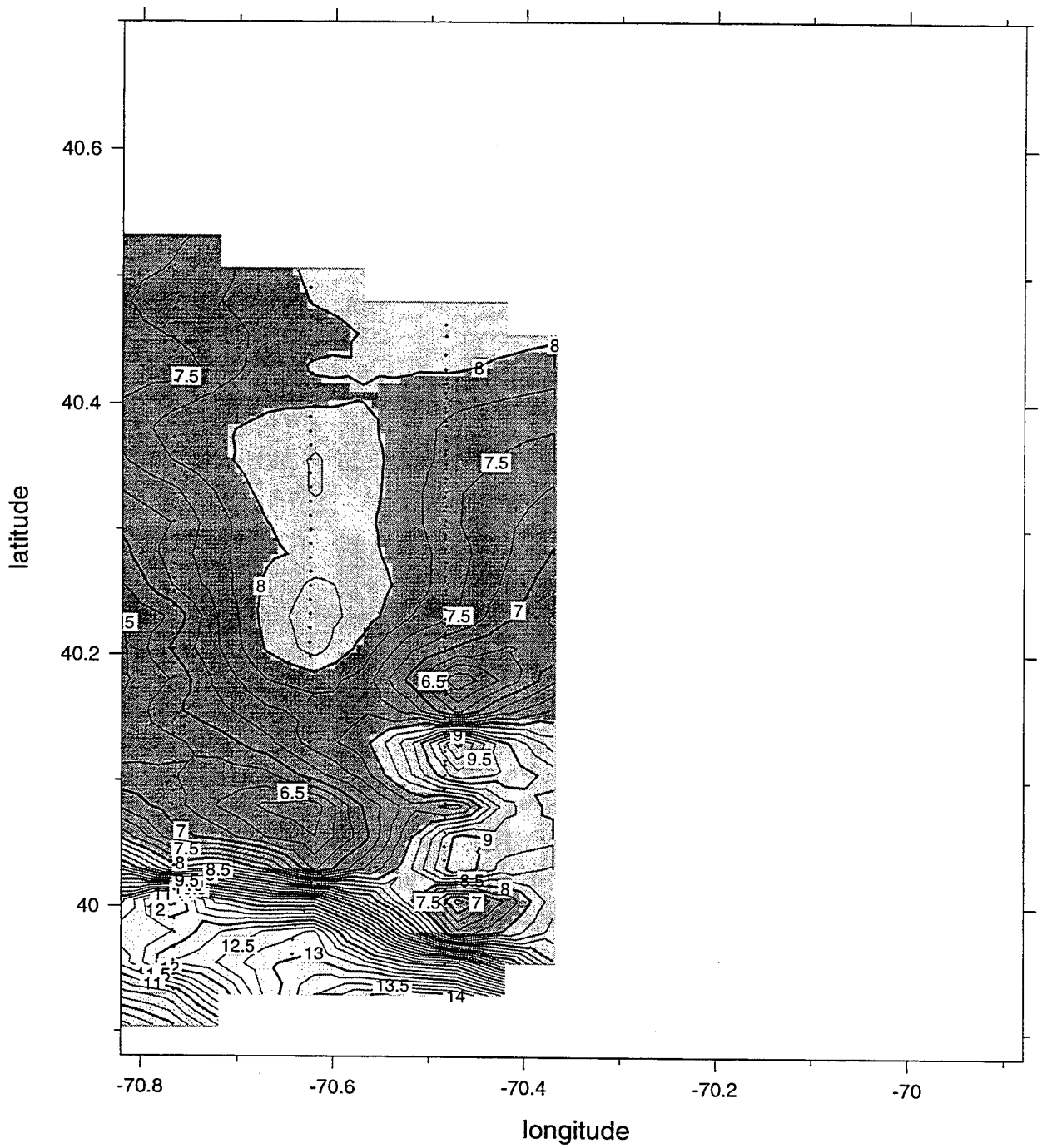


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 65 dbar

Temperature (°C)

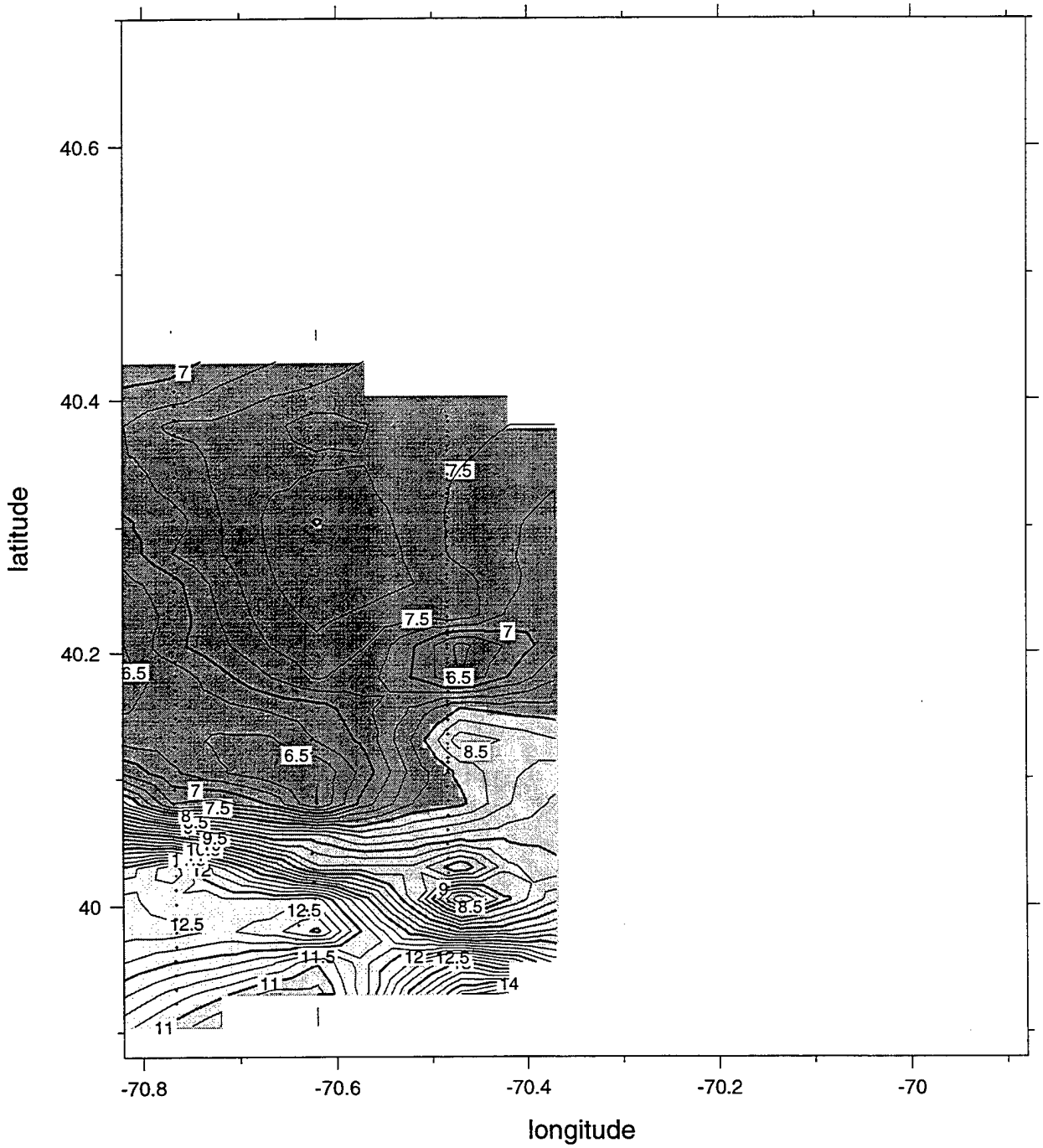


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 75 dbar

Temperature (°C)

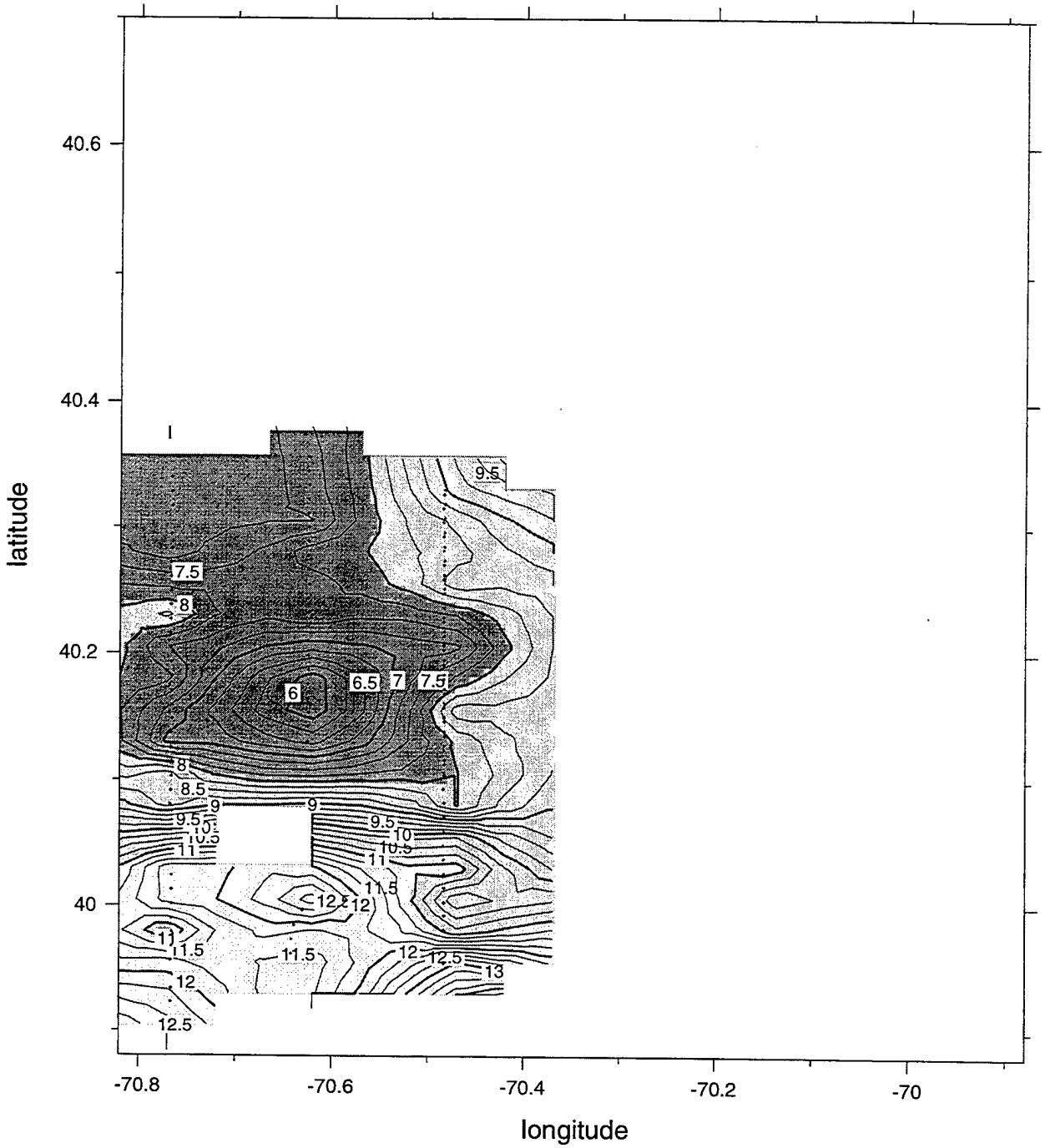


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 85 dbar

Temperature (°C)

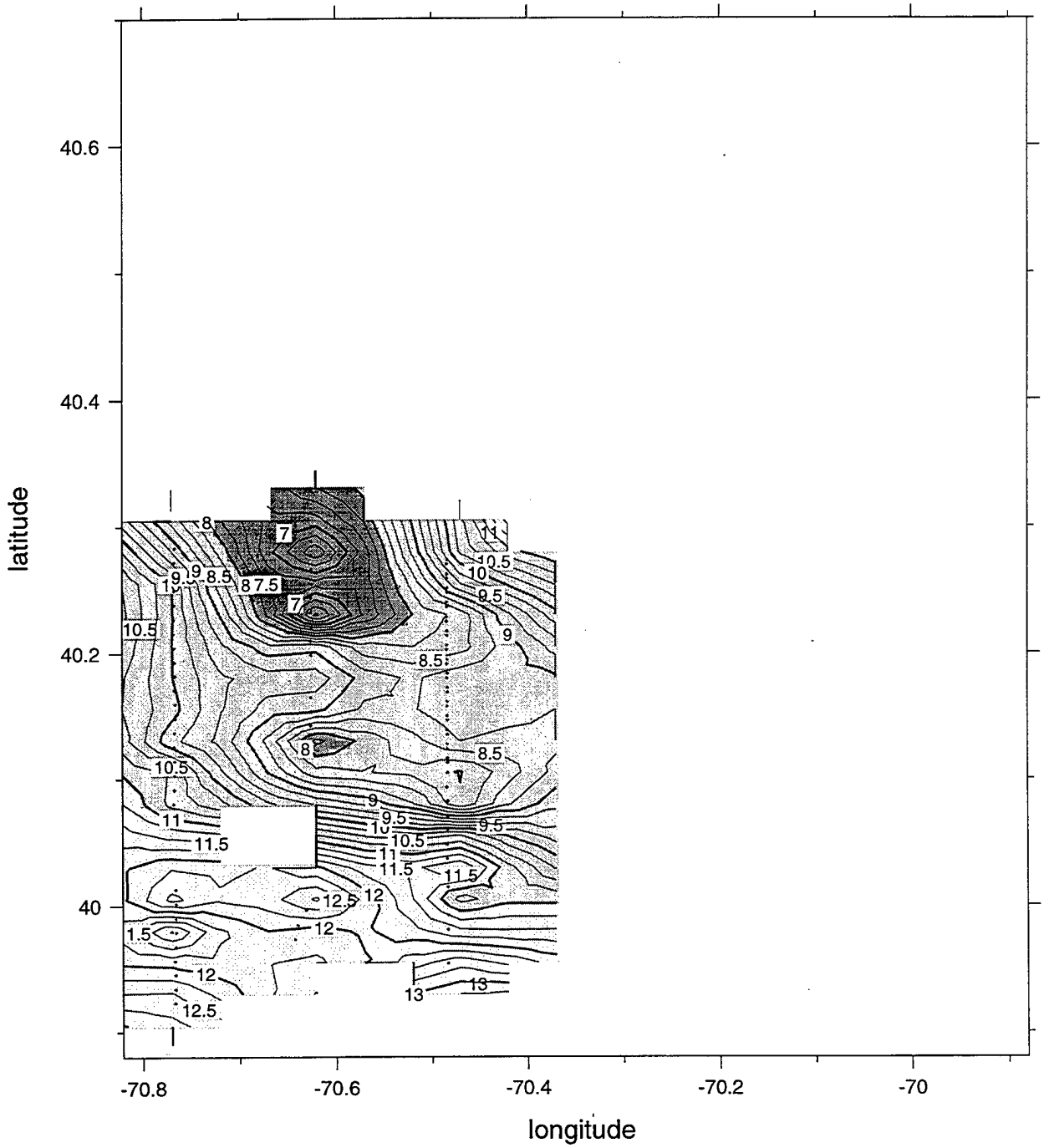


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 95 dbar

Temperature (°C)

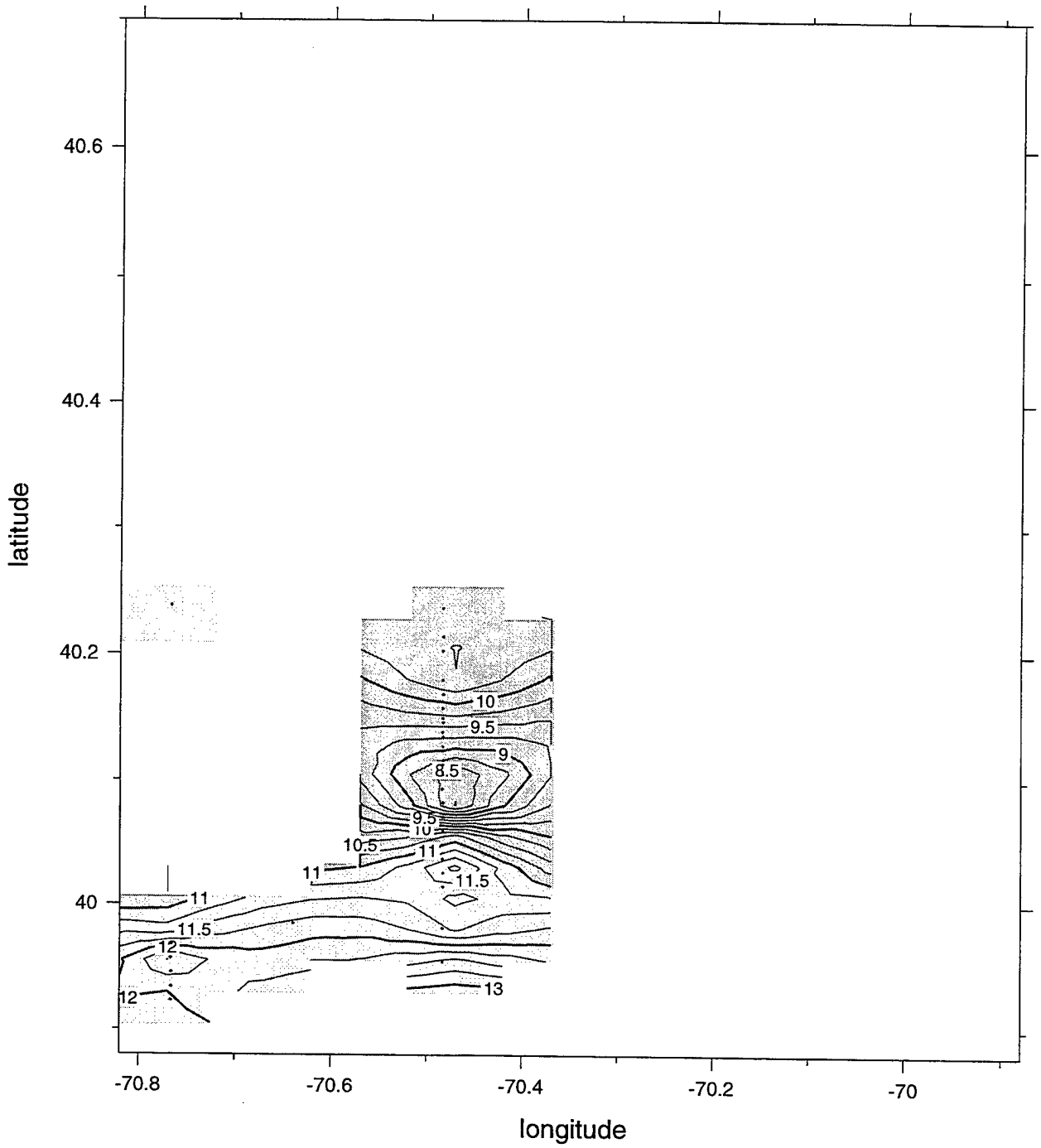


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 105 dbar

Temperature (°C)

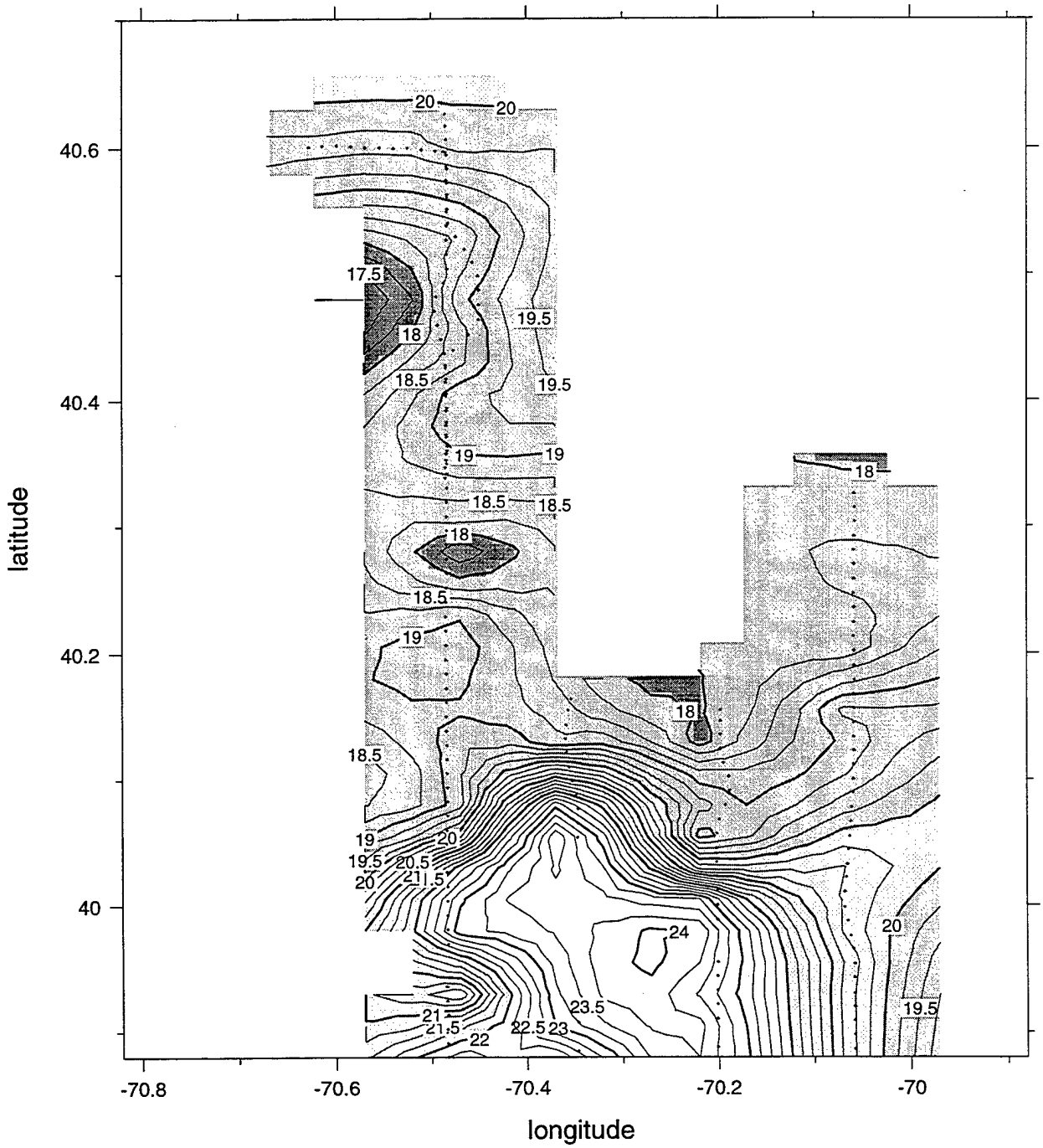


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 5 dbar

Temperature (°C)

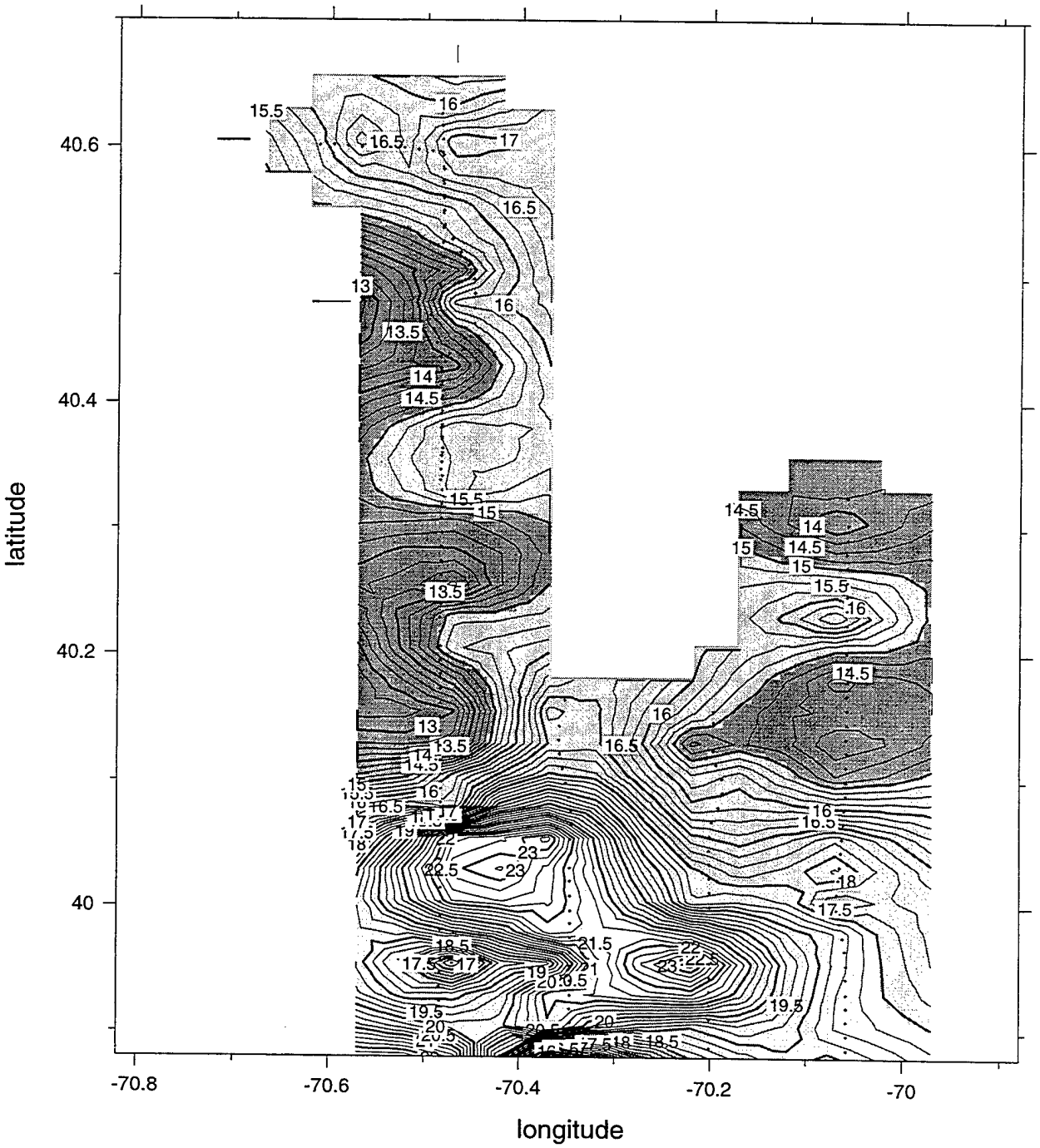


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 15 dbar

Temperature (°C)

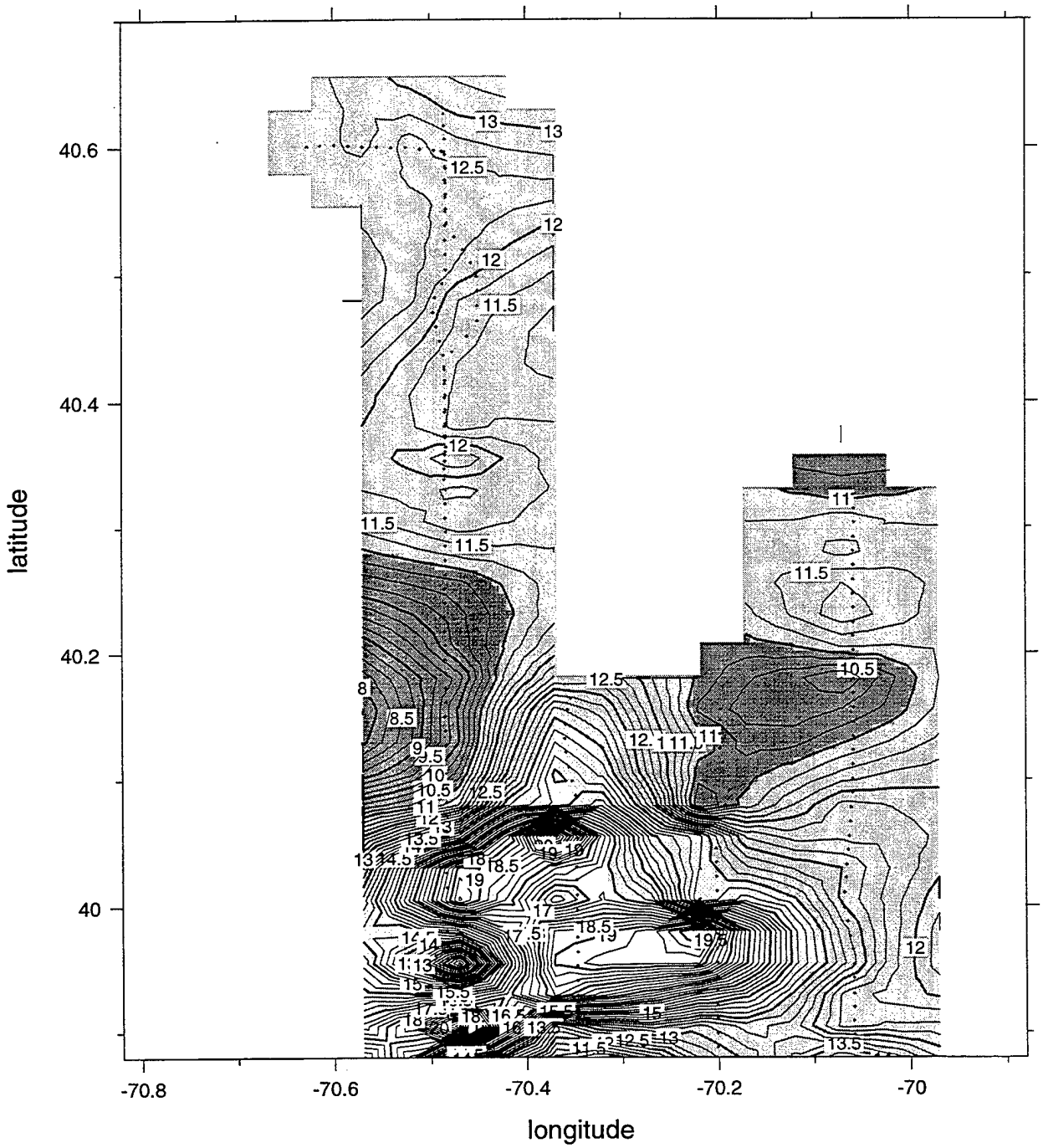


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 25 dbar

Temperature (°C)

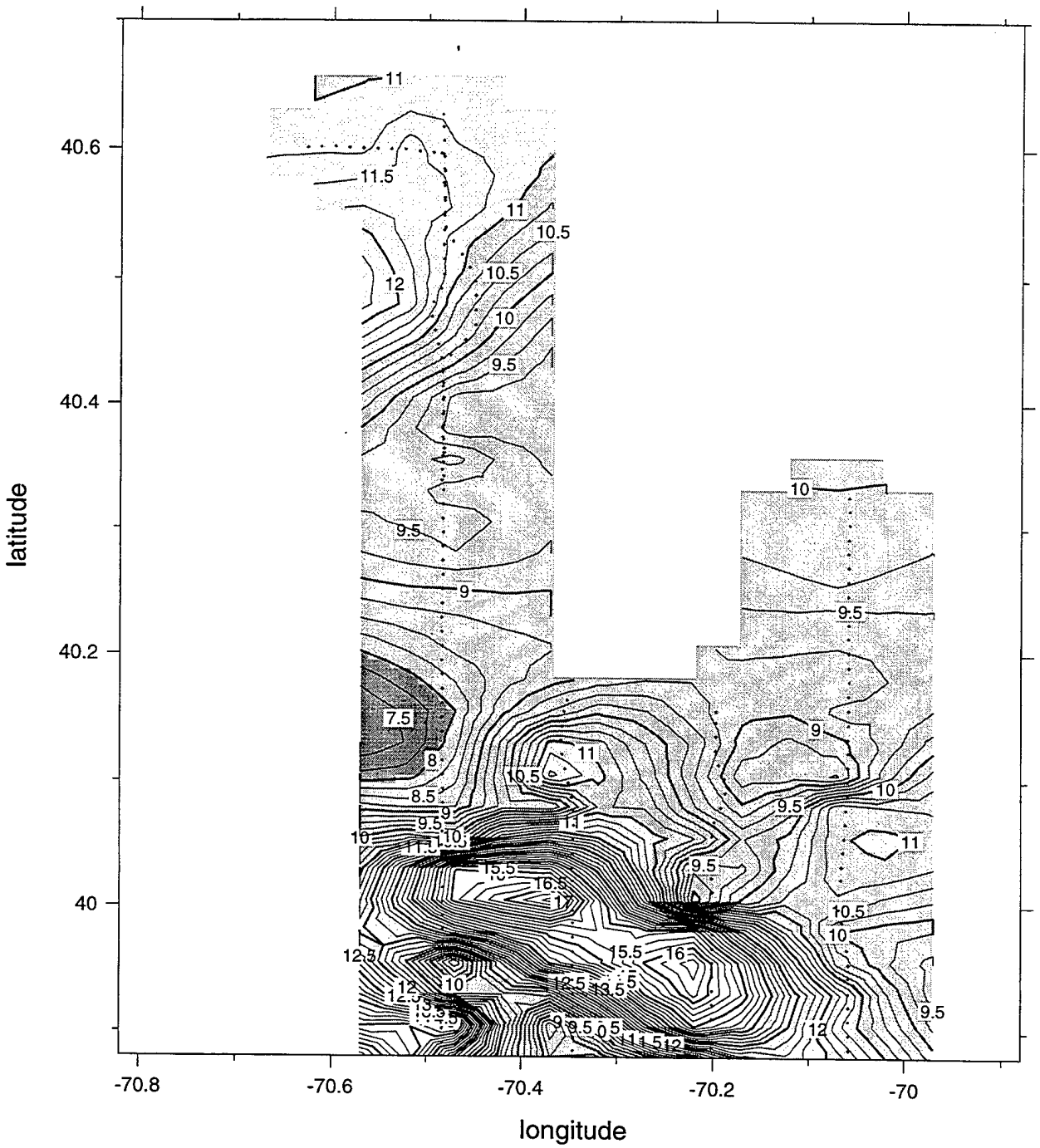


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 35 dbar

Temperature (°C)

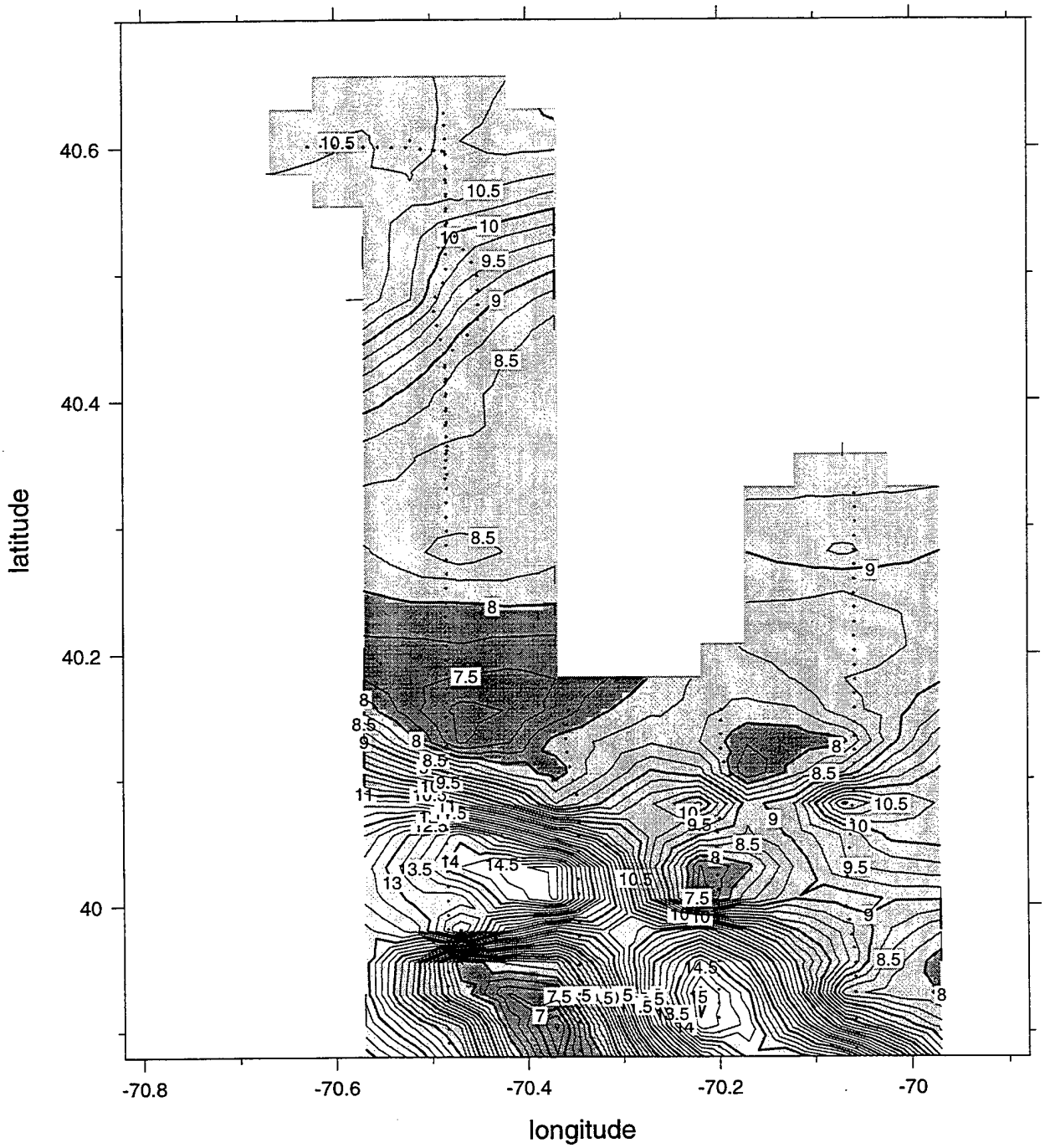


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 45 dbar

Temperature (°C)

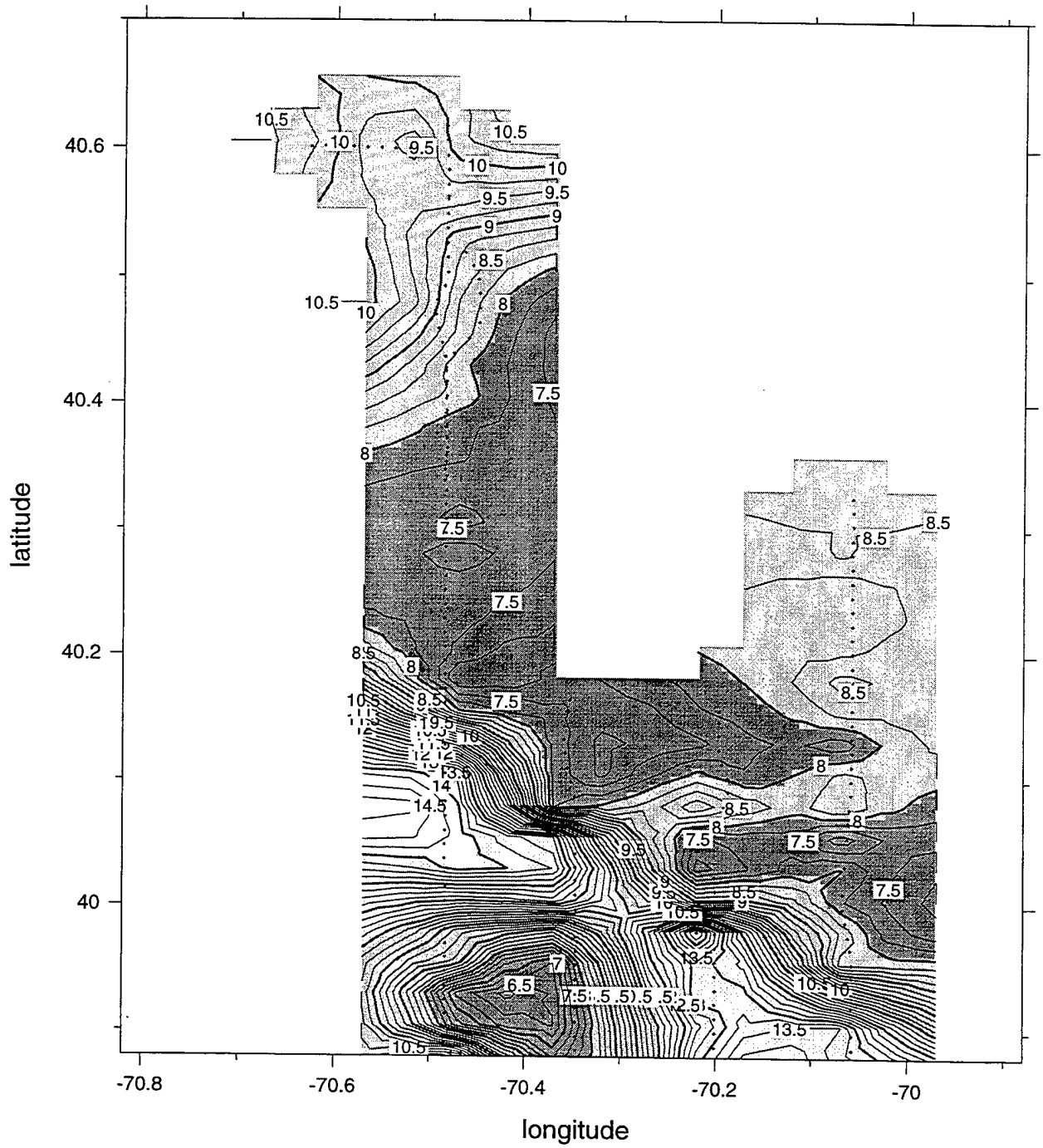


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 55 dbar

Temperature (°C)

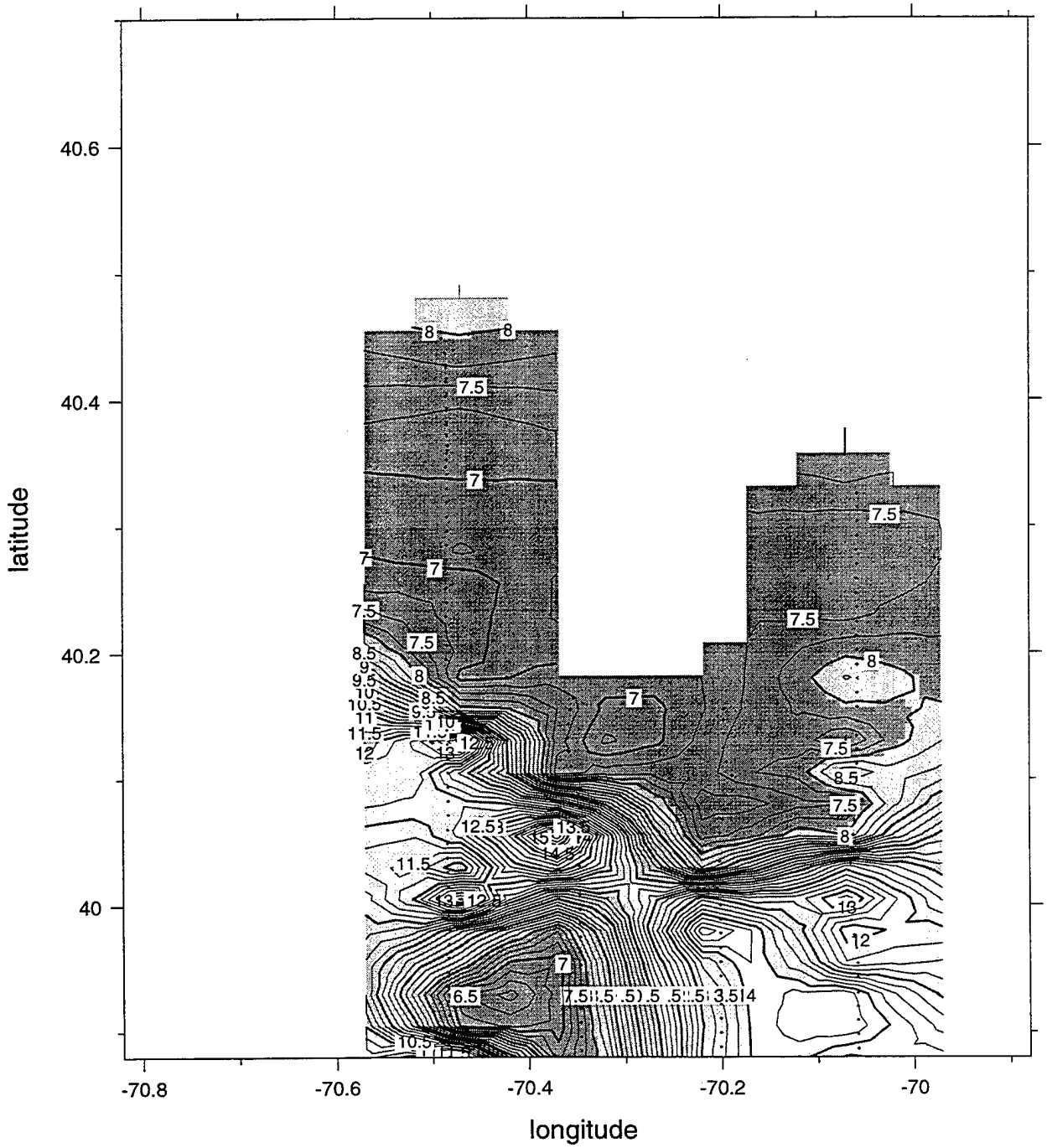


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 65 dbar

Temperature (°C)

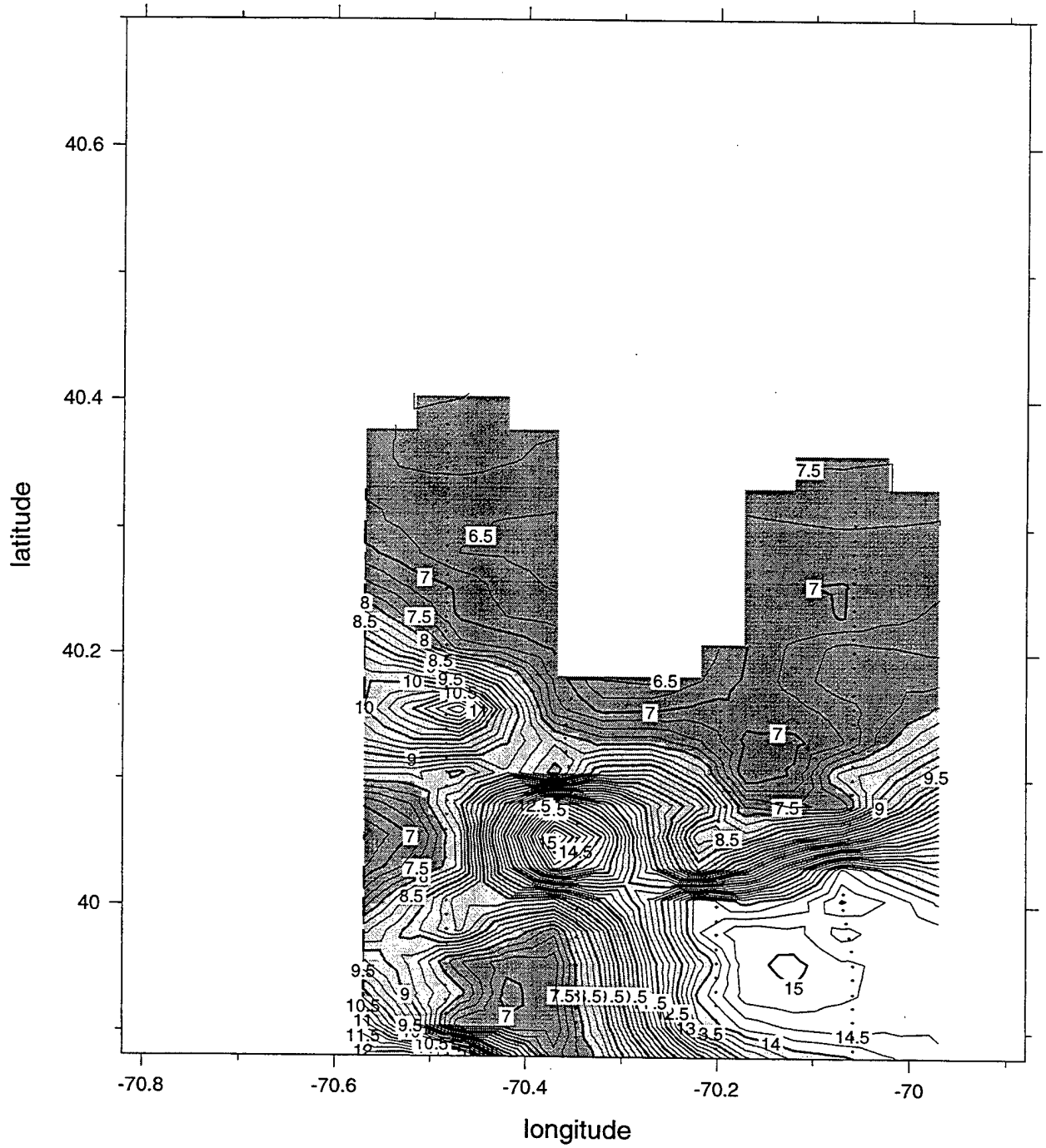


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 75 dbar

Temperature (°C)

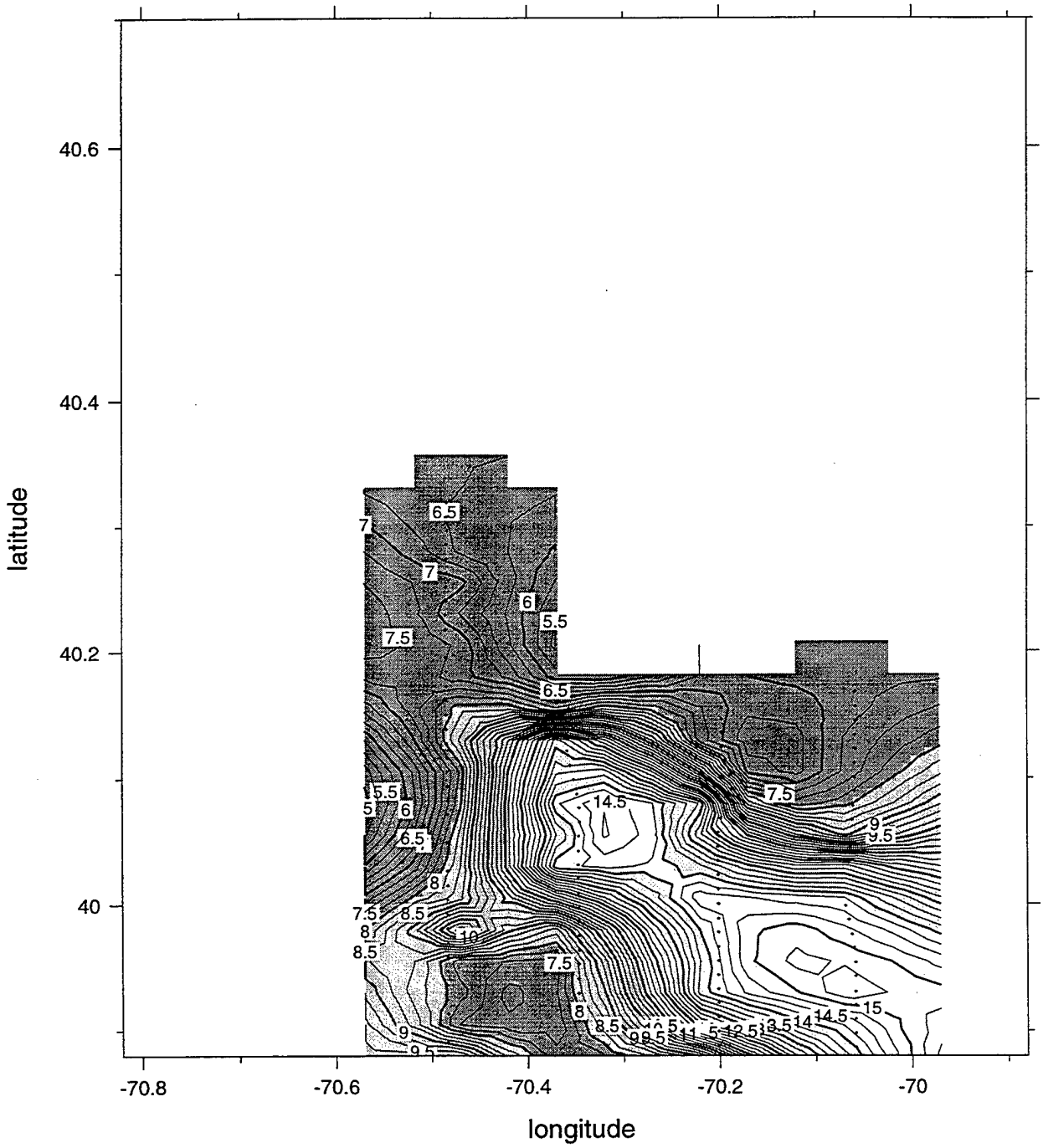


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 85 dbar

Temperature (°C)

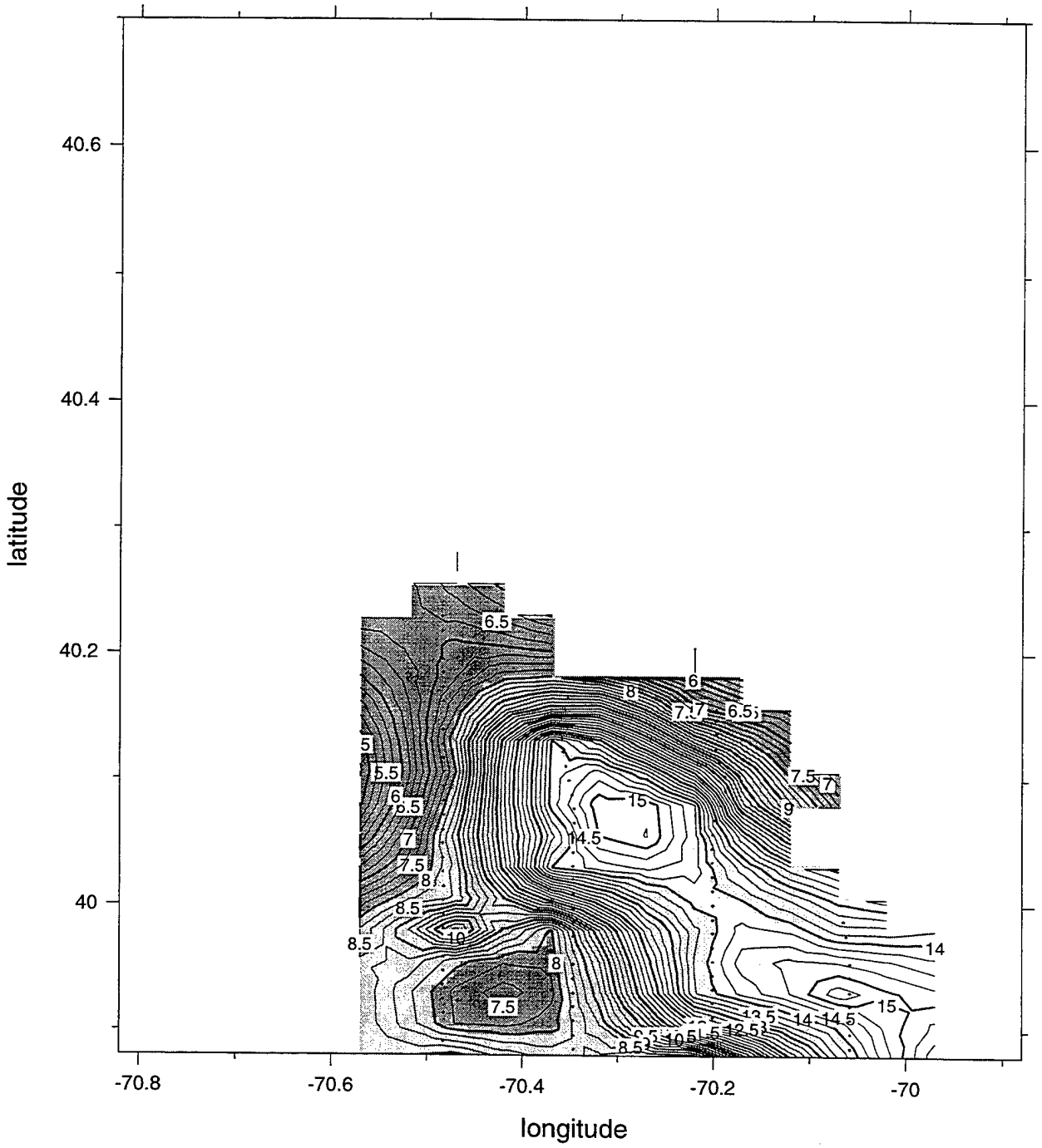


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 95 dbar

Temperature (°C)

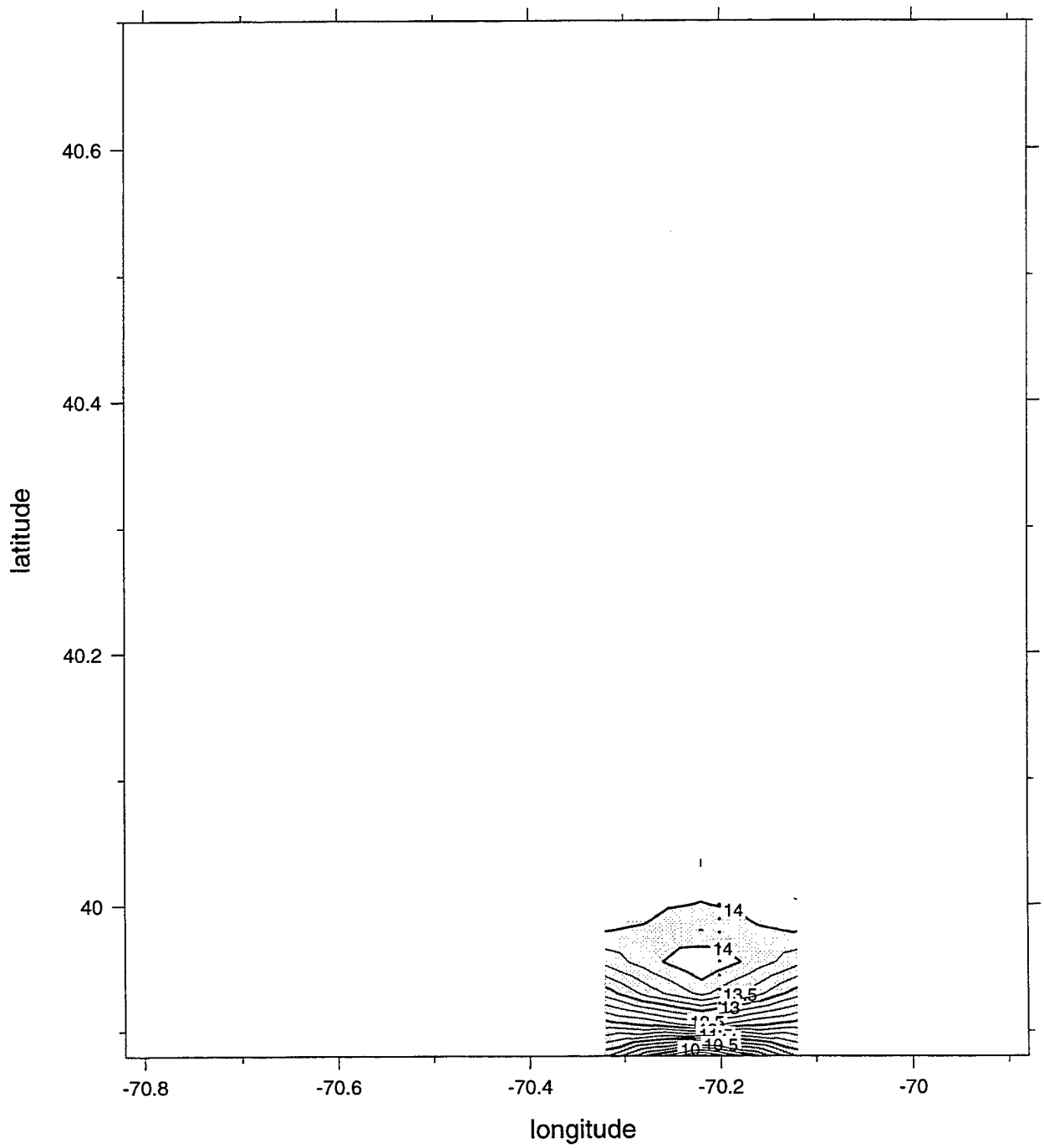


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 105 dbar

Temperature (°C)

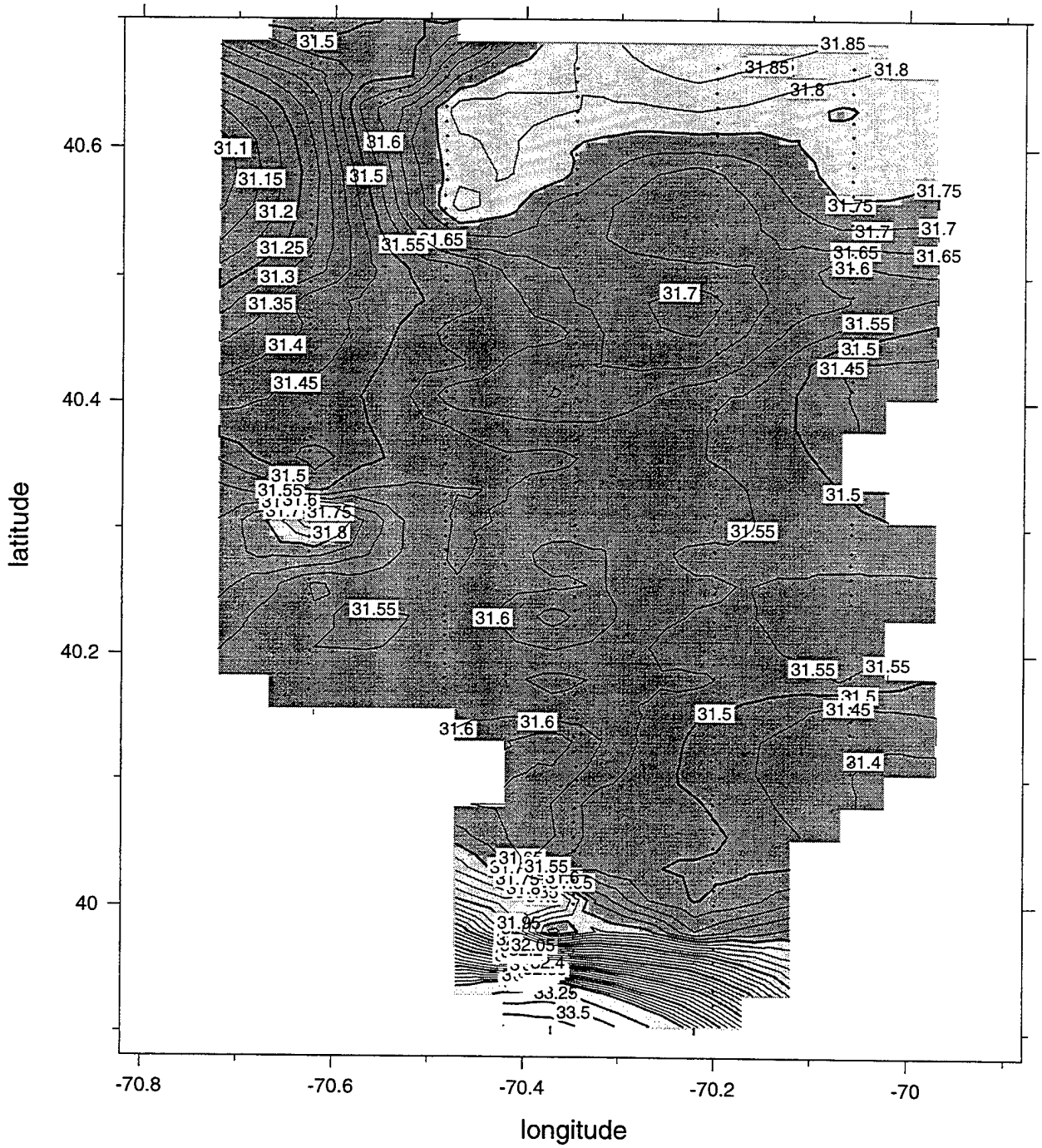


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 5 dbar

Salinity (PSS)

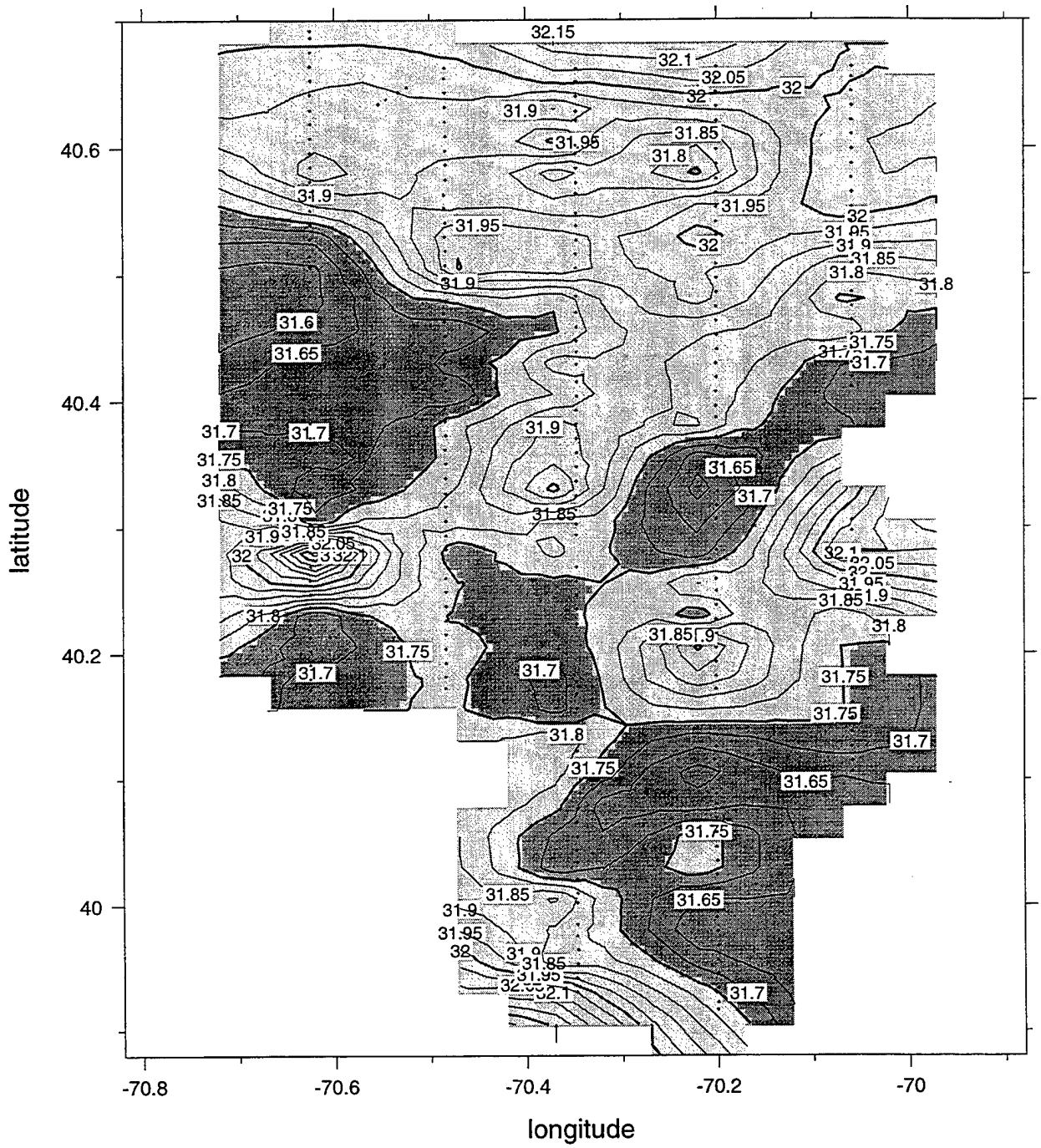


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 15 dbar

Salinity (PSS)

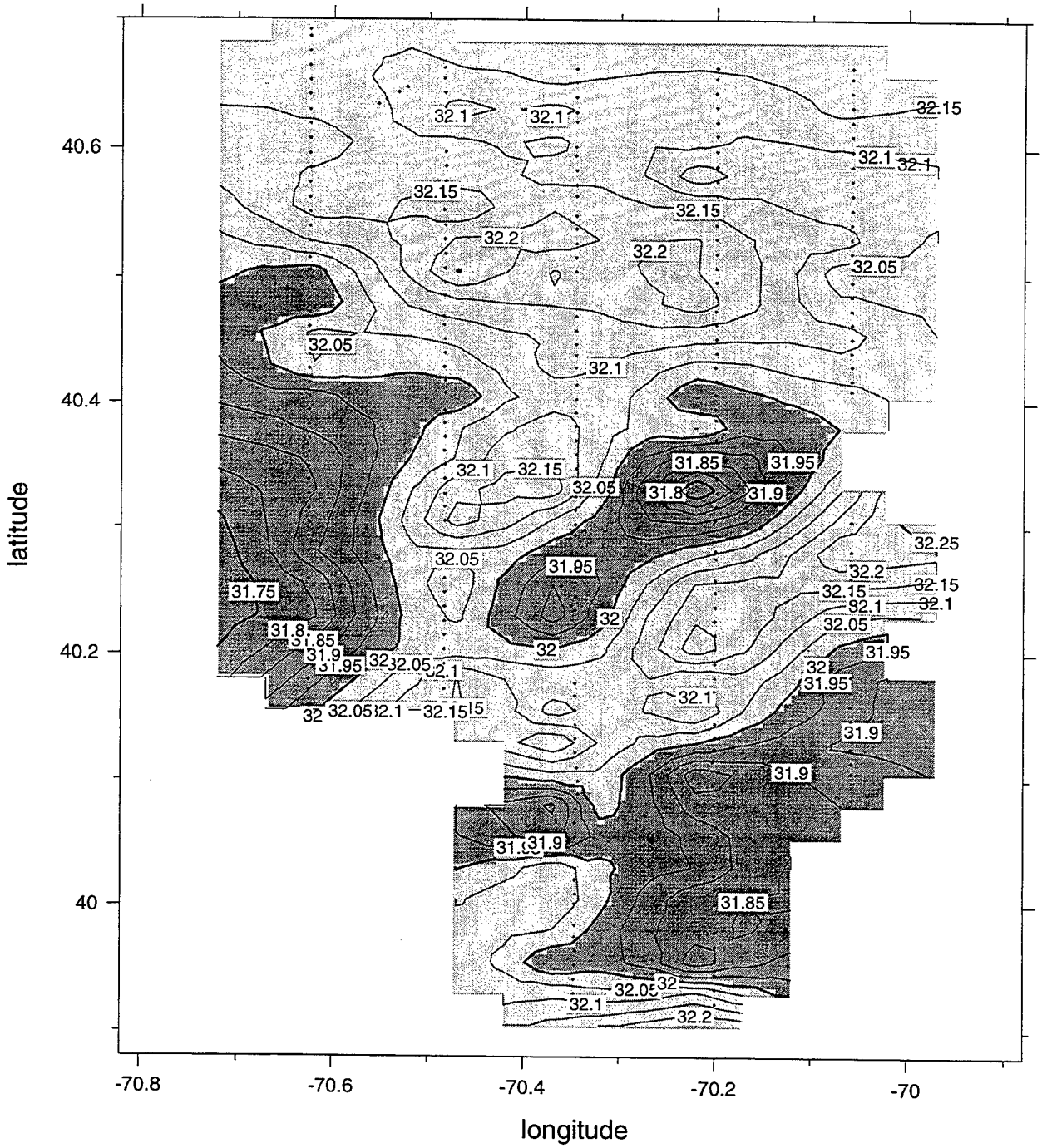


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 25 dbar

Salinity (PSS)

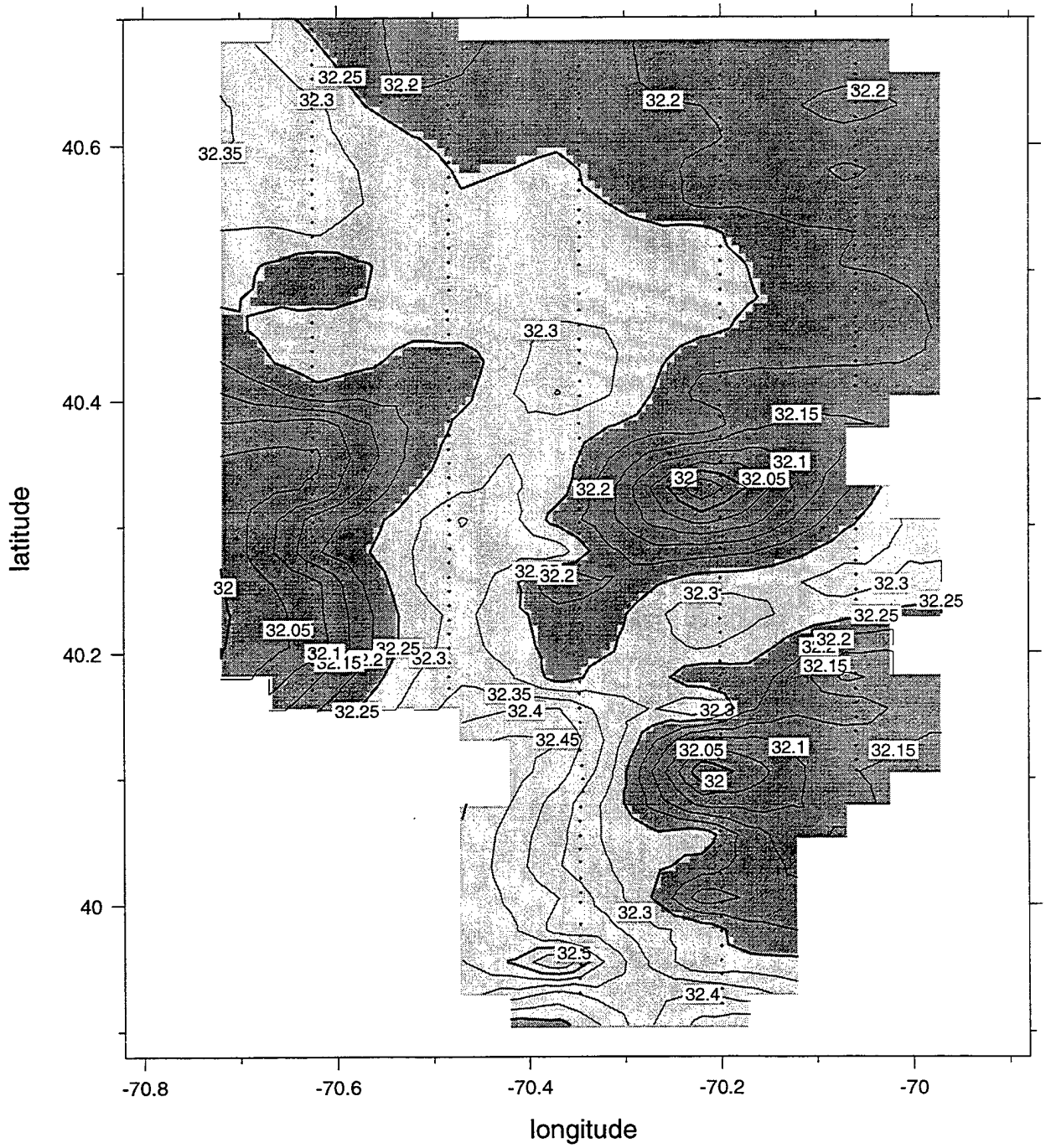


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 35 dbar

Salinity (PSS)

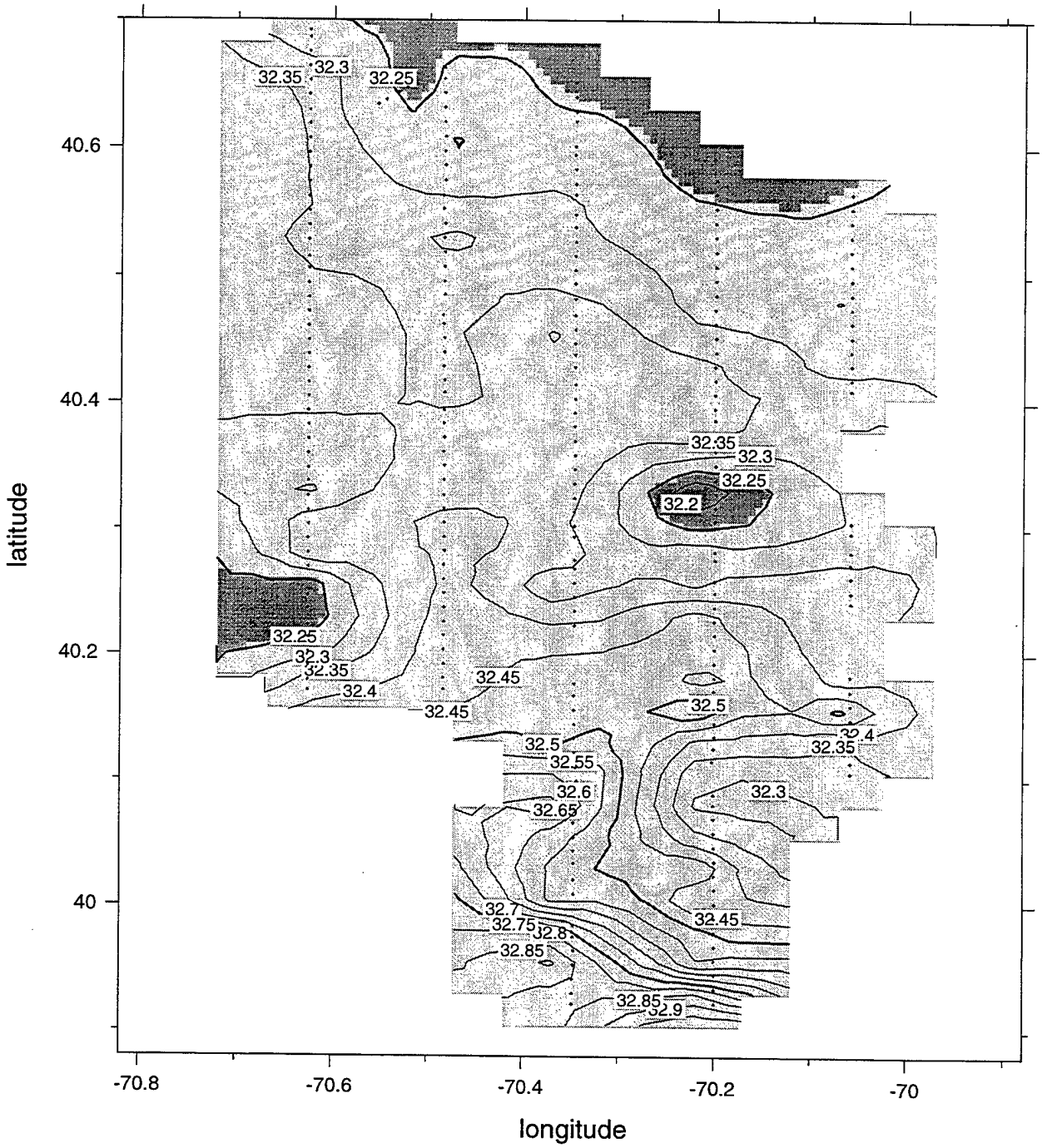


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 45 dbar

Salinity (PSS)

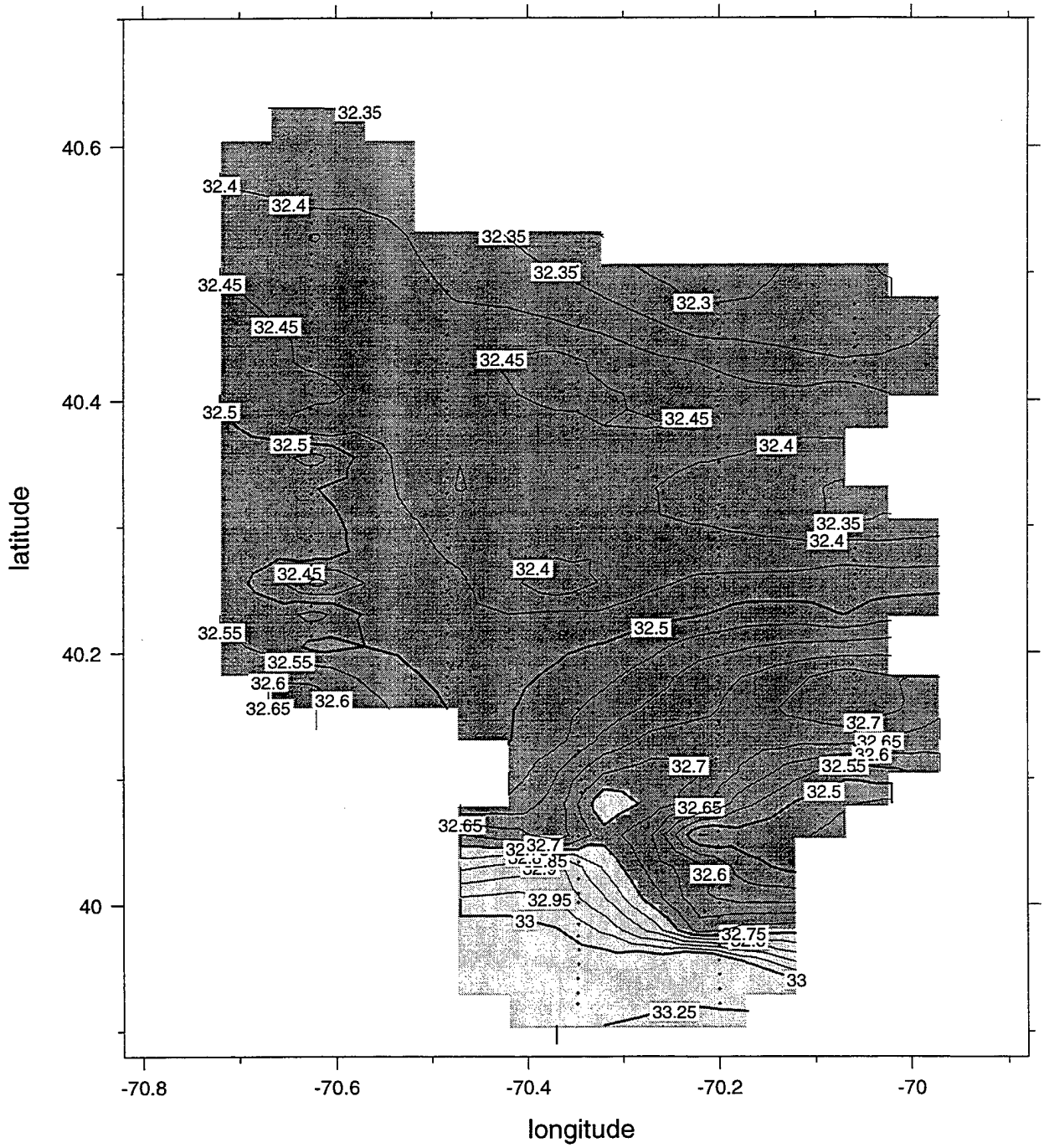


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 55 dbar

Salinity (PSS)

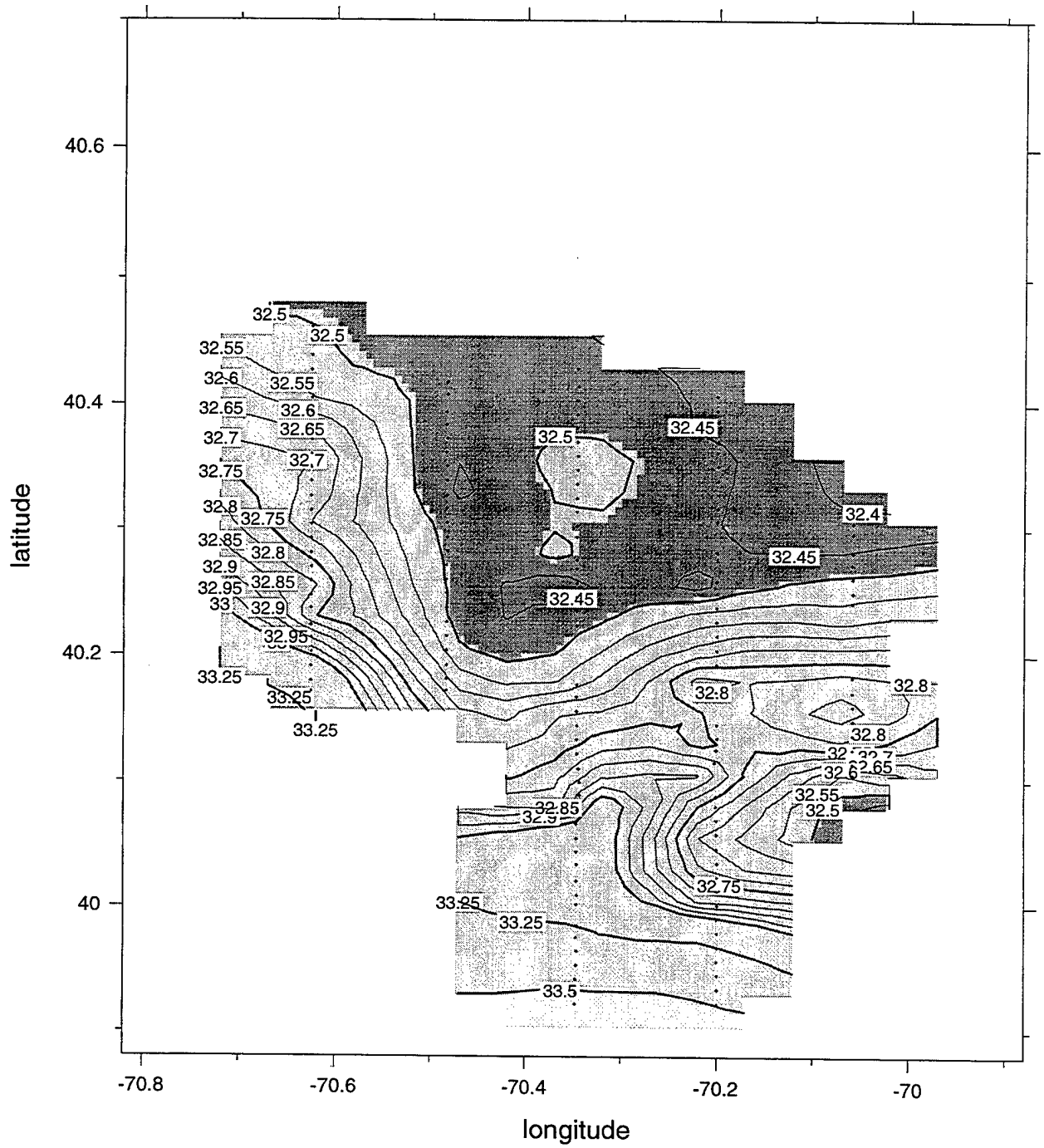


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 65 dbar

Salinity (PSS)

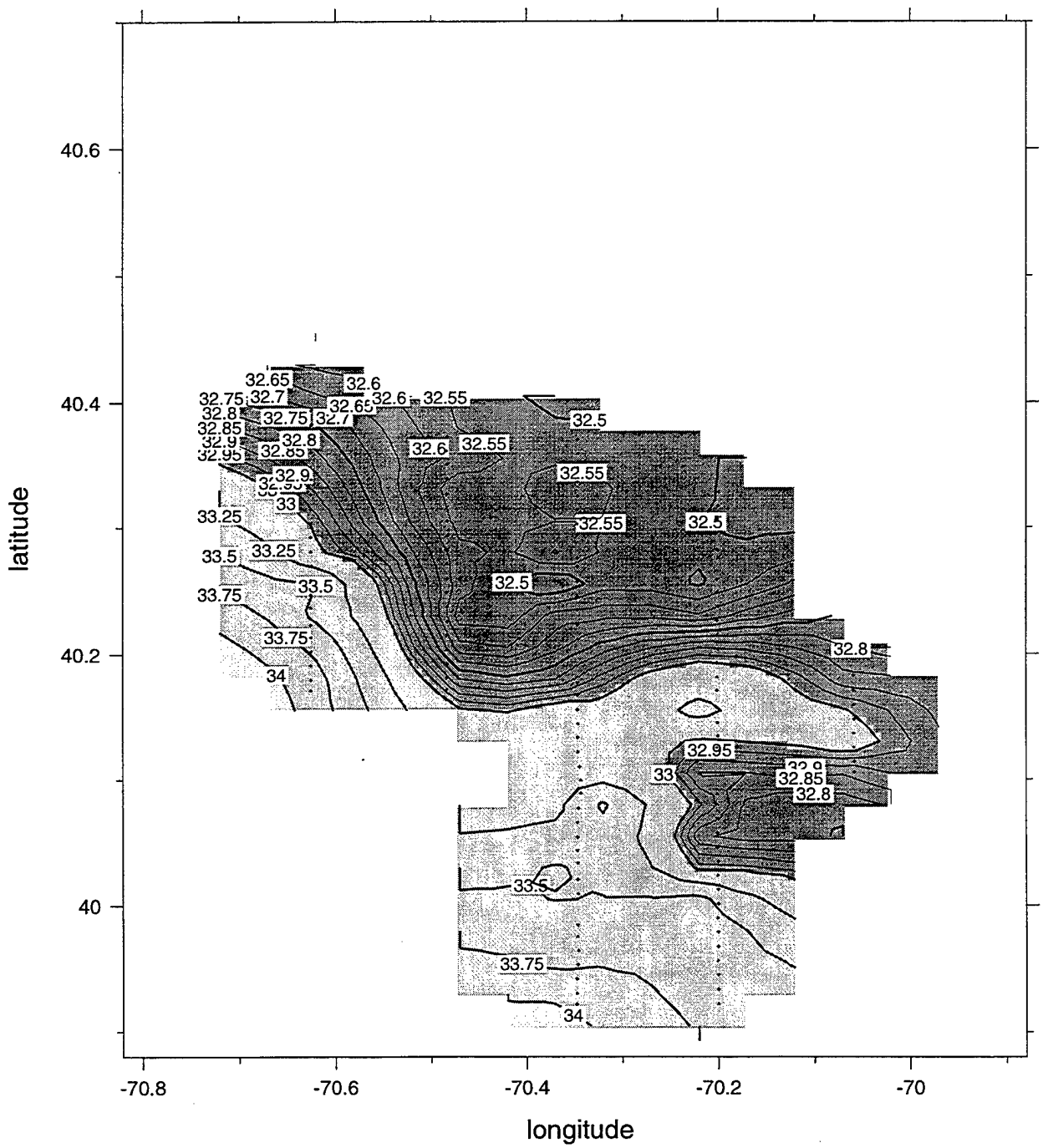


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 75 dbar

Salinity (PSS)

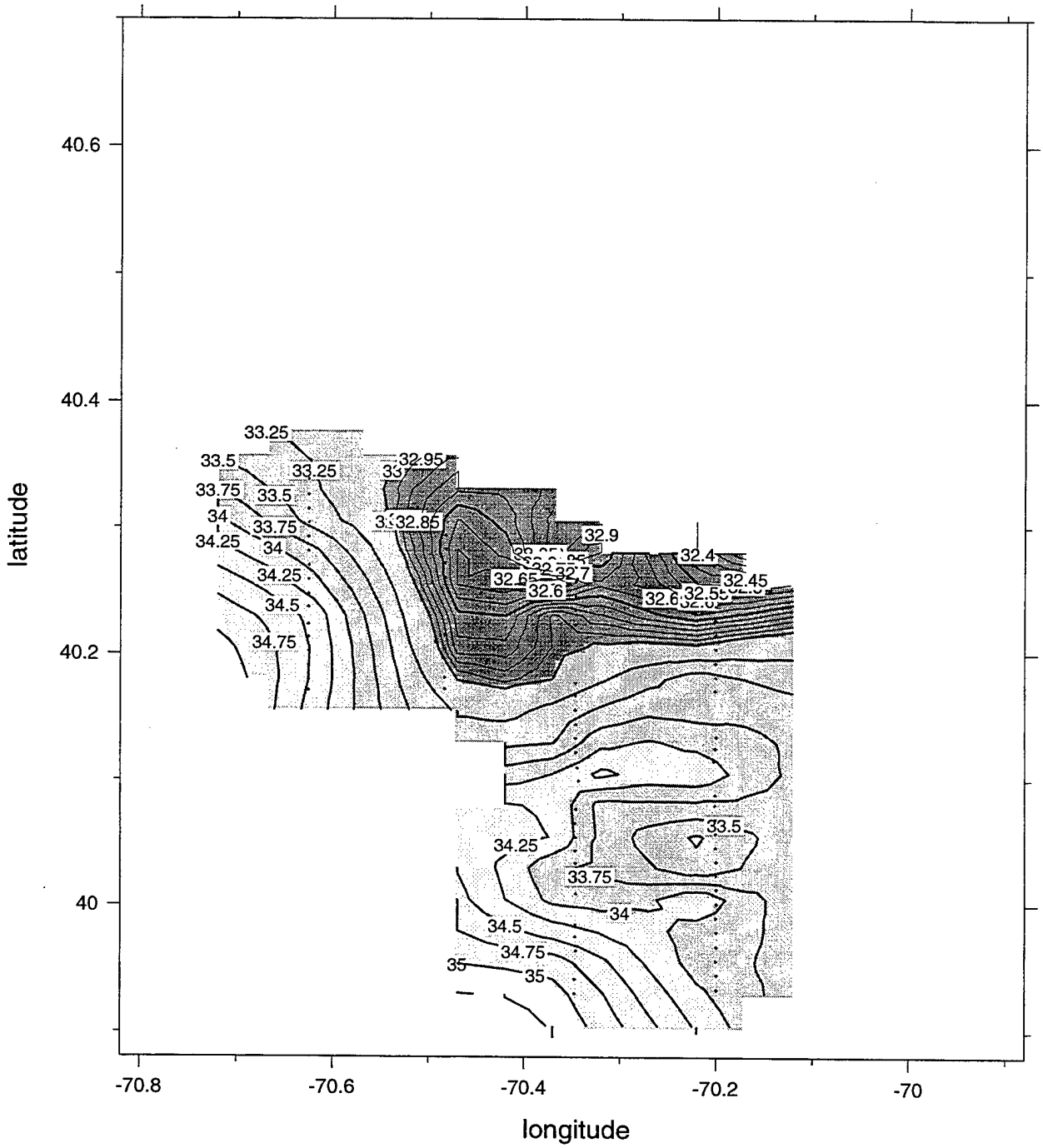


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 85 dbar

Salinity (PSS)

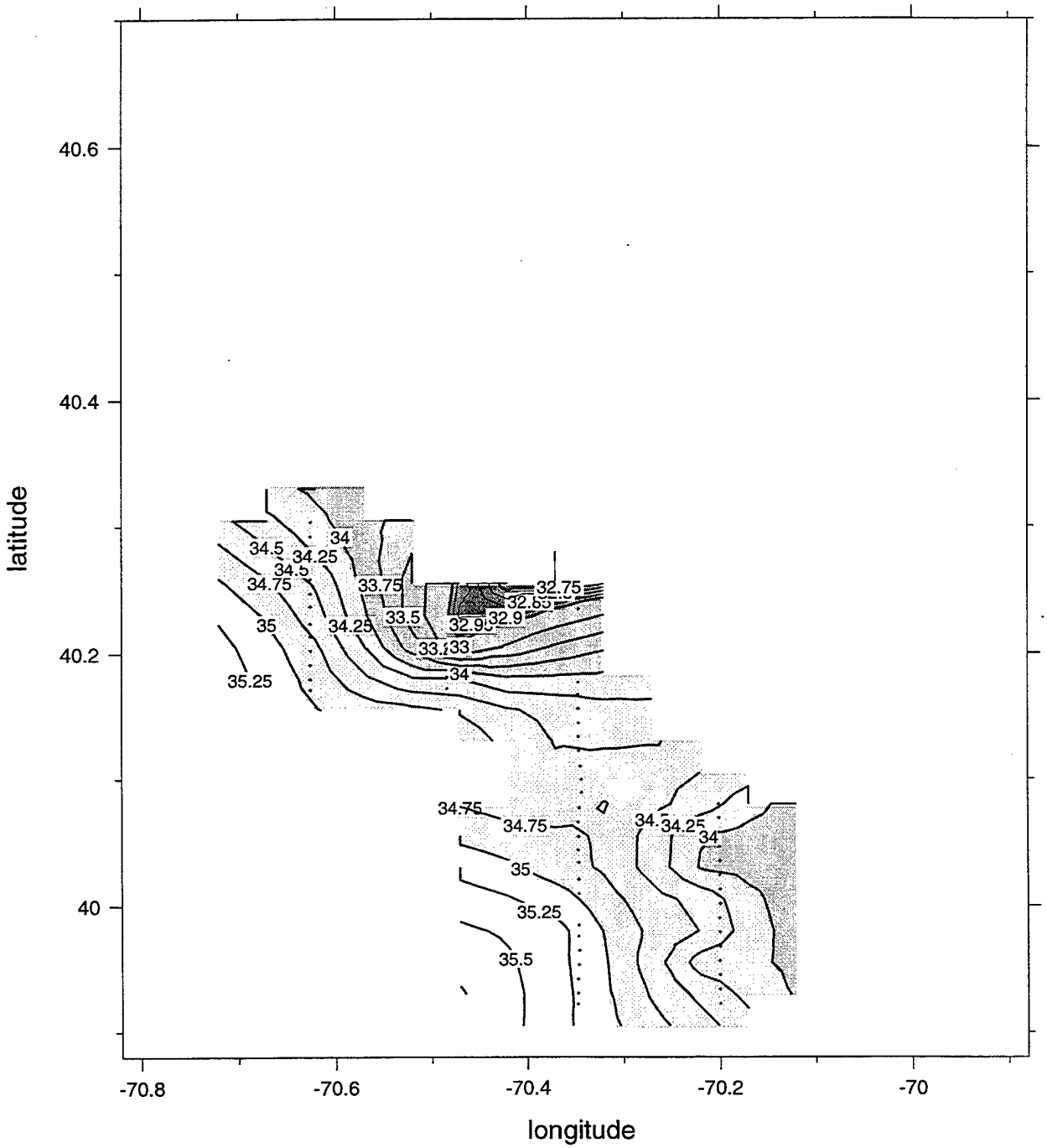


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 95 dbar

Salinity (PSS)

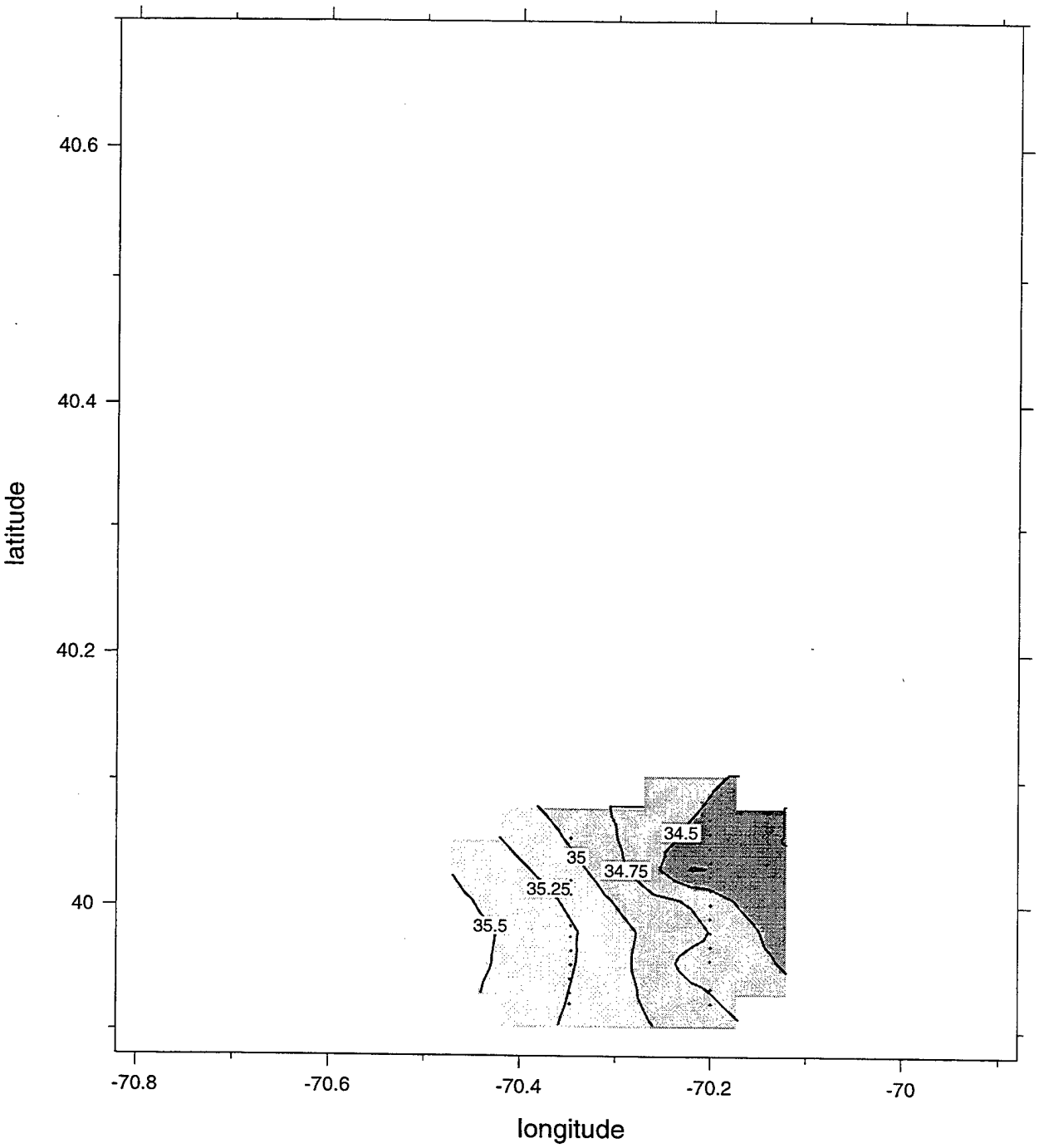


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 105 dbar

Salinity (PSS)

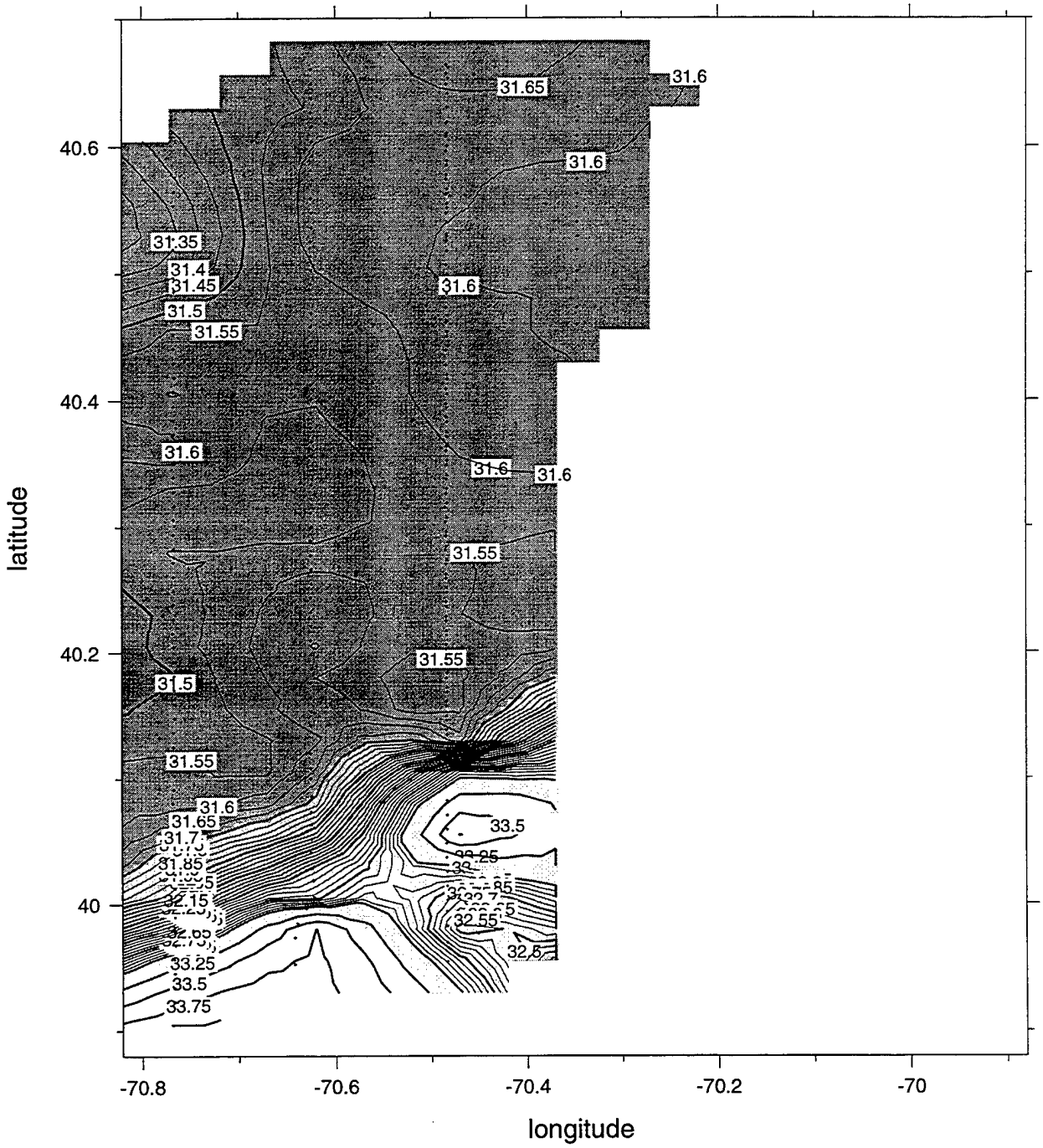


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 5 dbar

Salinity (PSS)

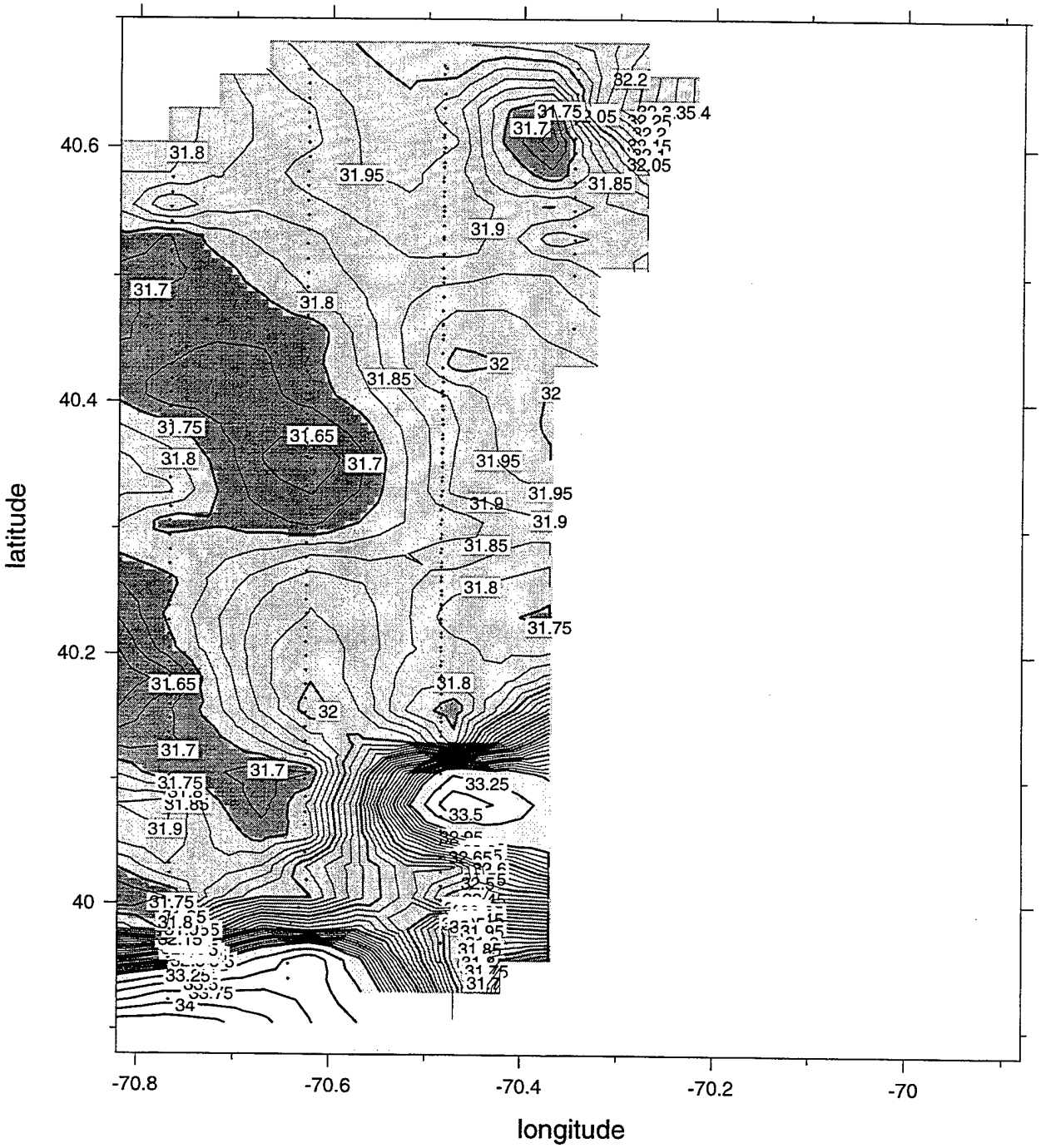


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 15 dbar

Salinity (PSS)

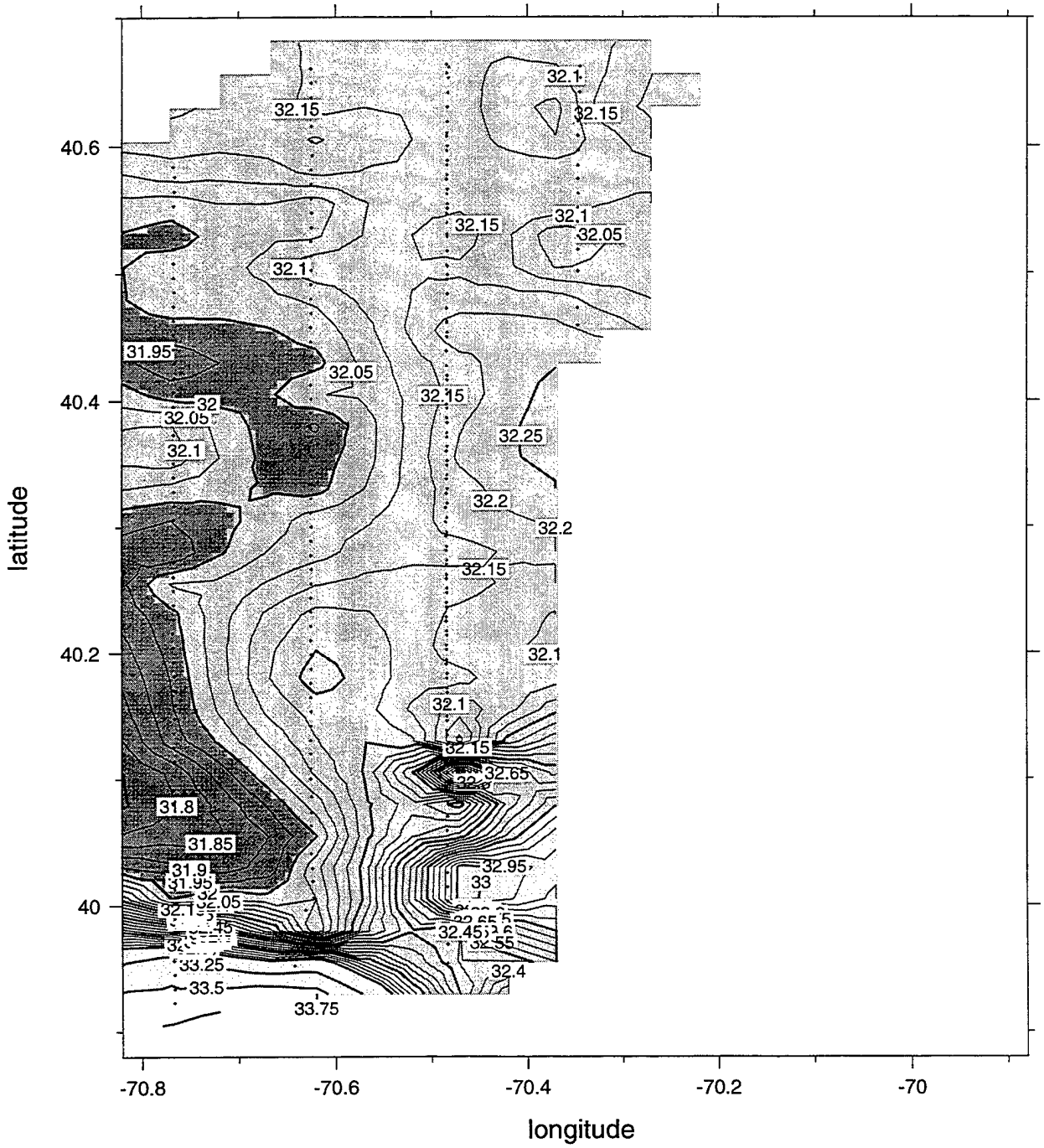


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 25 dbar

Salinity (PSS)

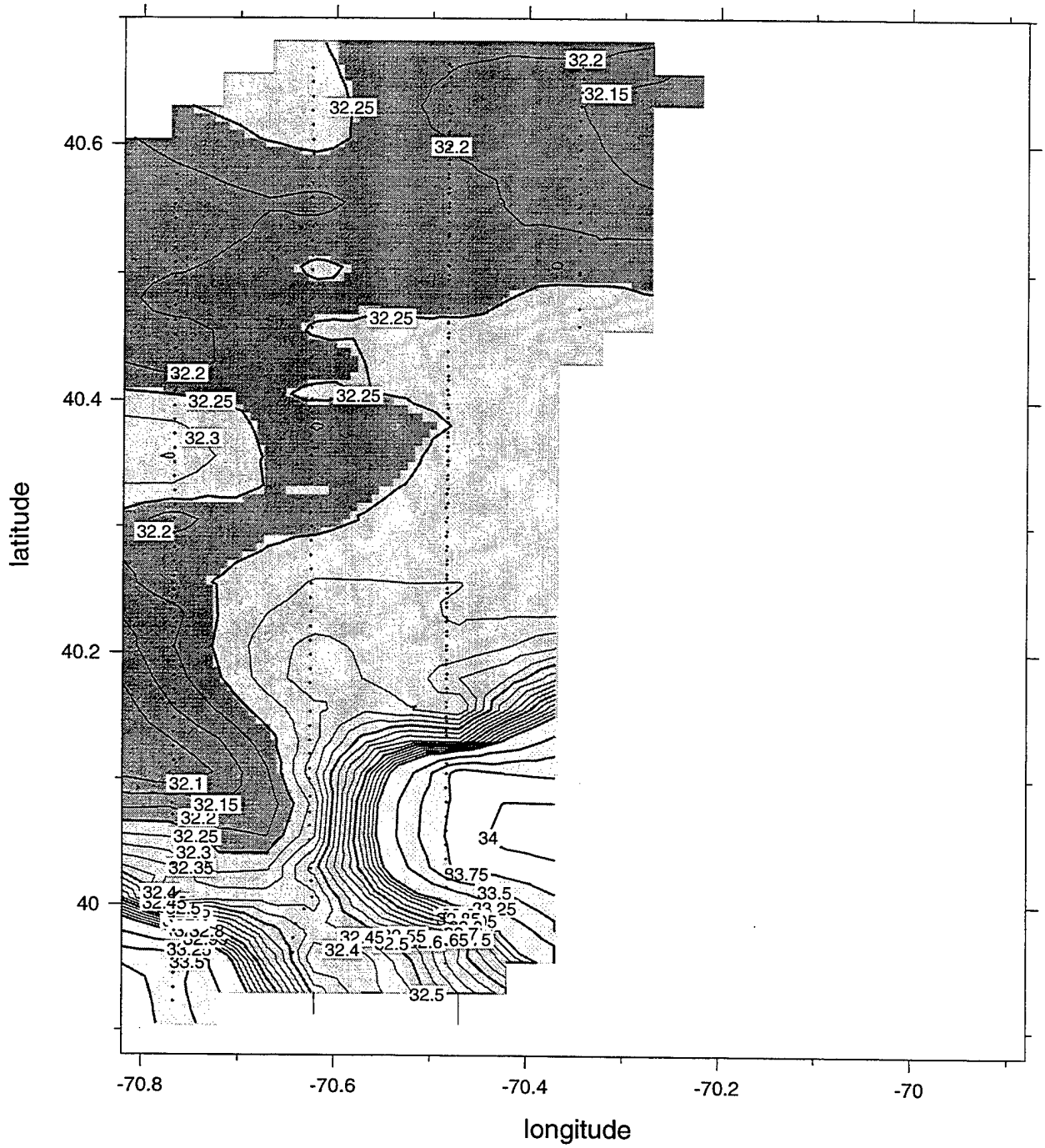


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 35 dbar

Salinity (PSS)

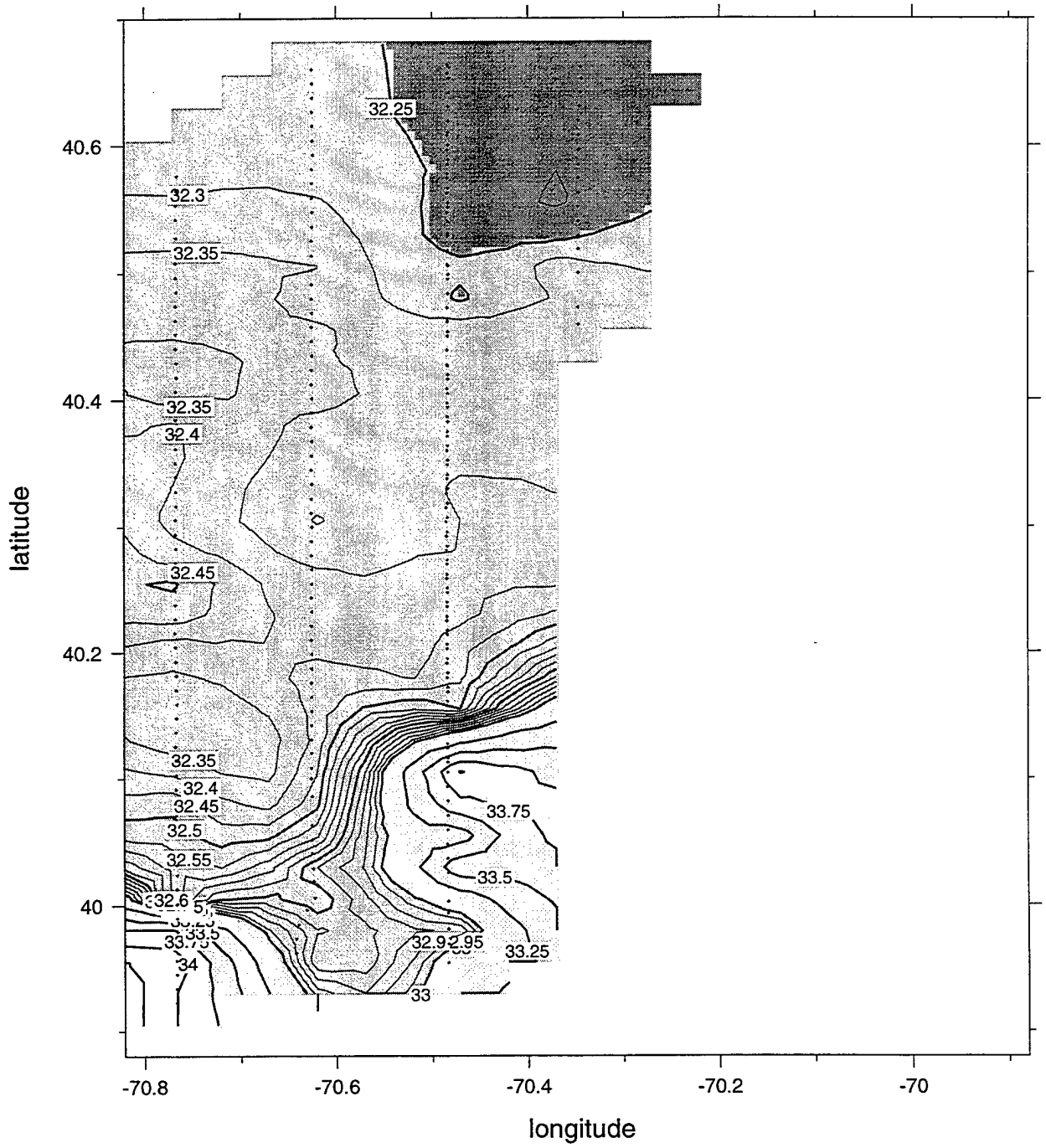


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 45 dbar

Salinity (PSS)

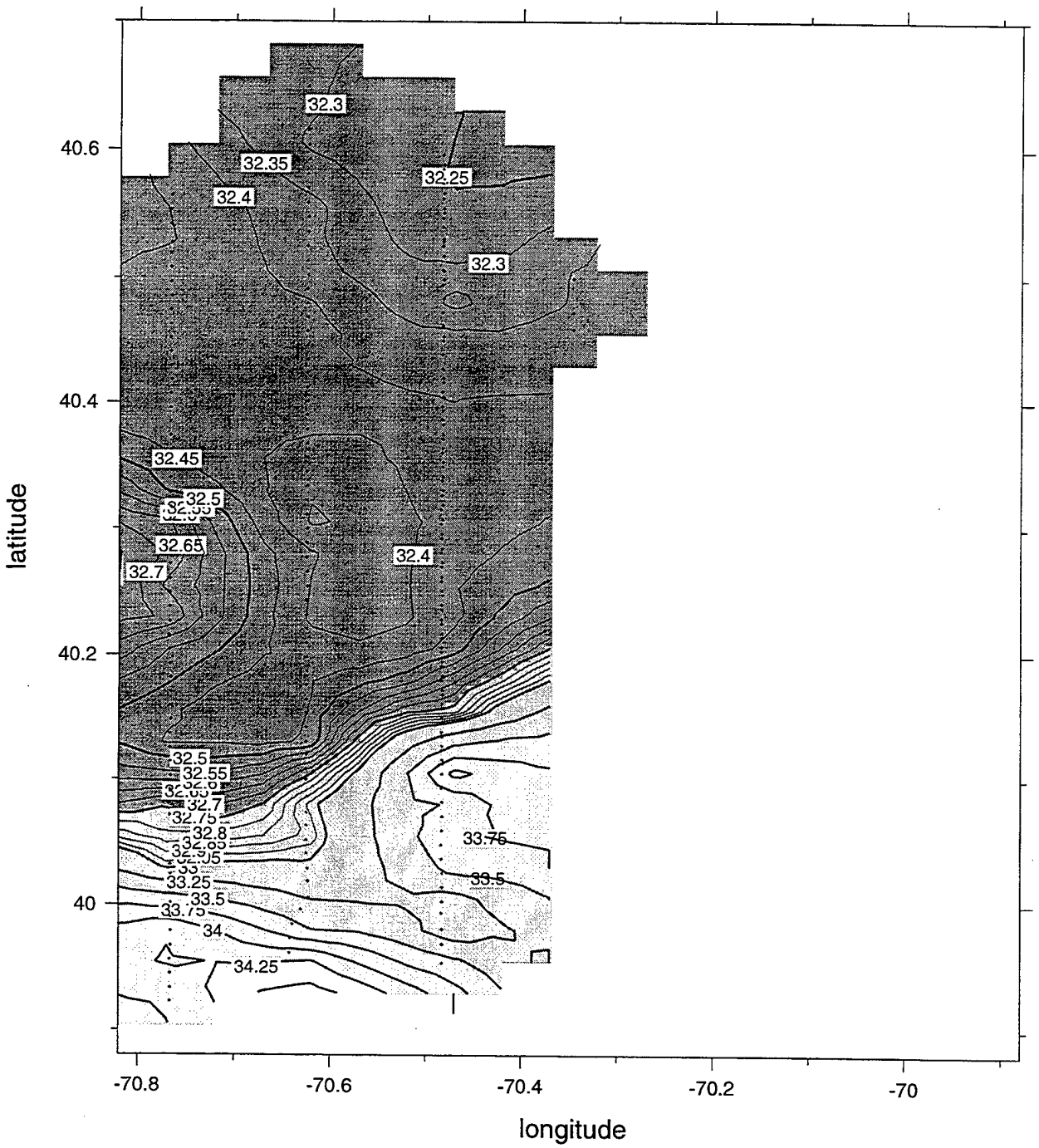


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 55 dbar

Salinity (PSS)

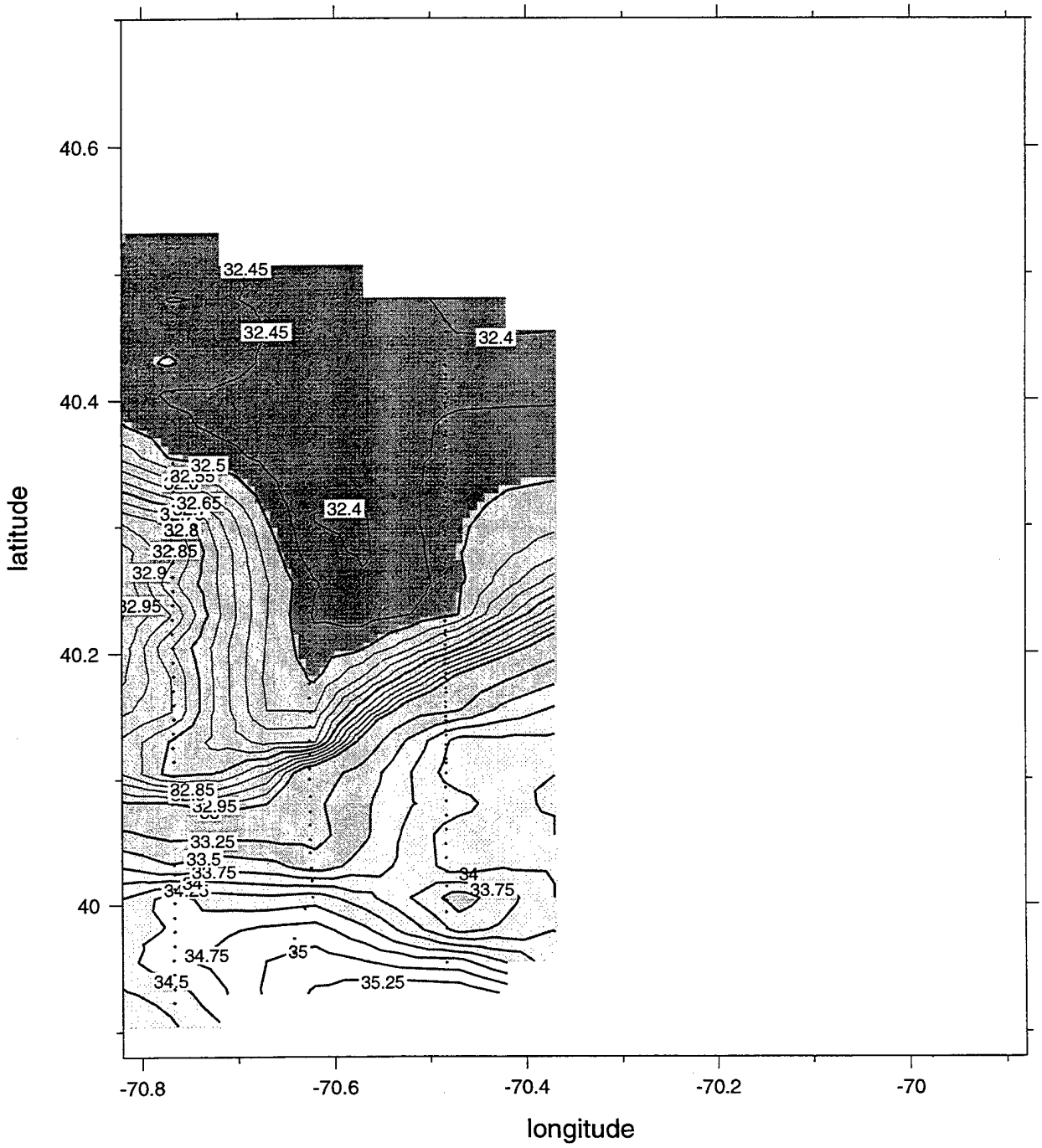


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 65 dbar

Salinity (PSS)

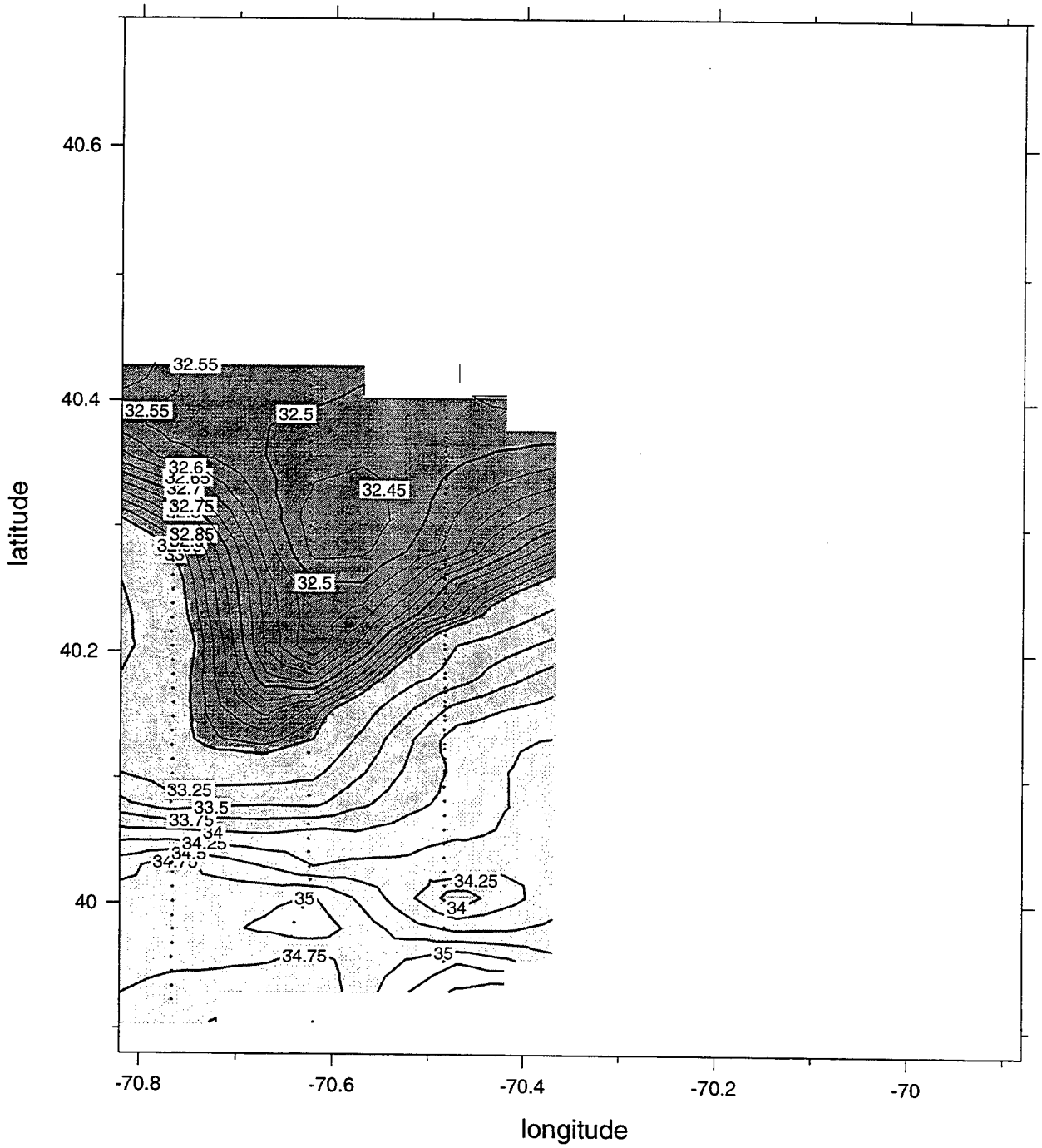


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 75 dbar

Salinity (PSS)

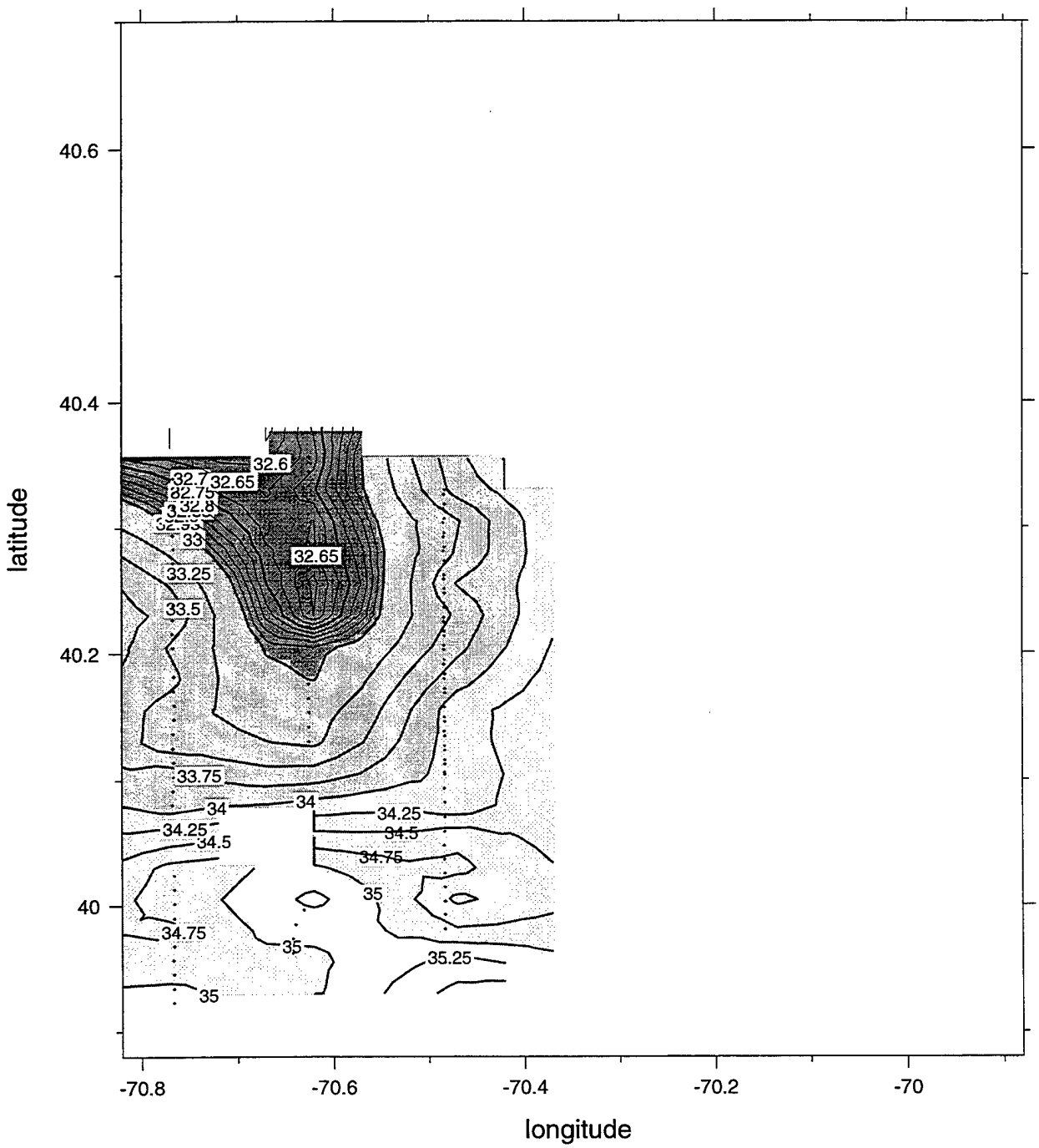


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 85 dbar

Salinity (PSS)

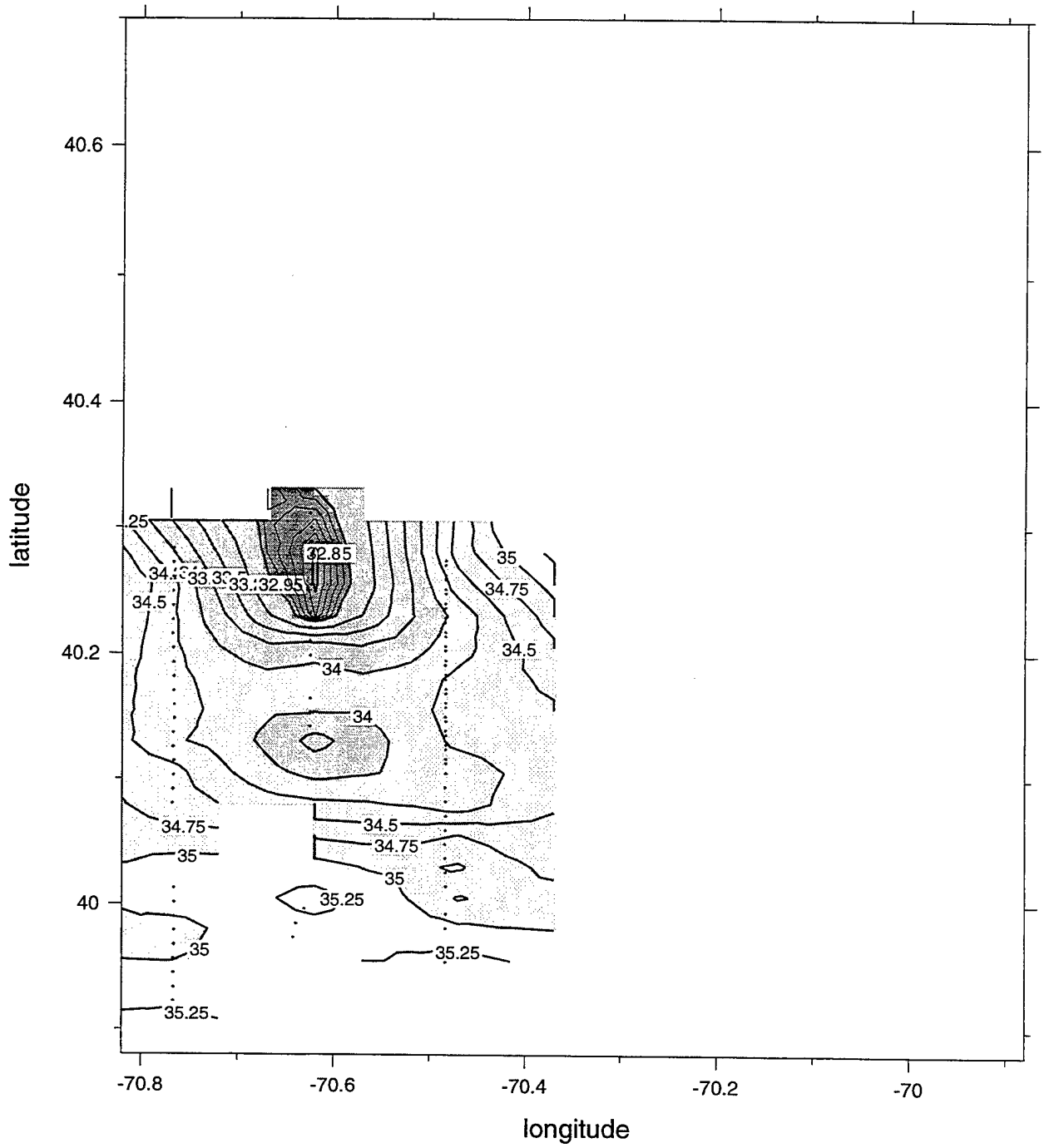


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 95 dbar

Salinity (PSS)

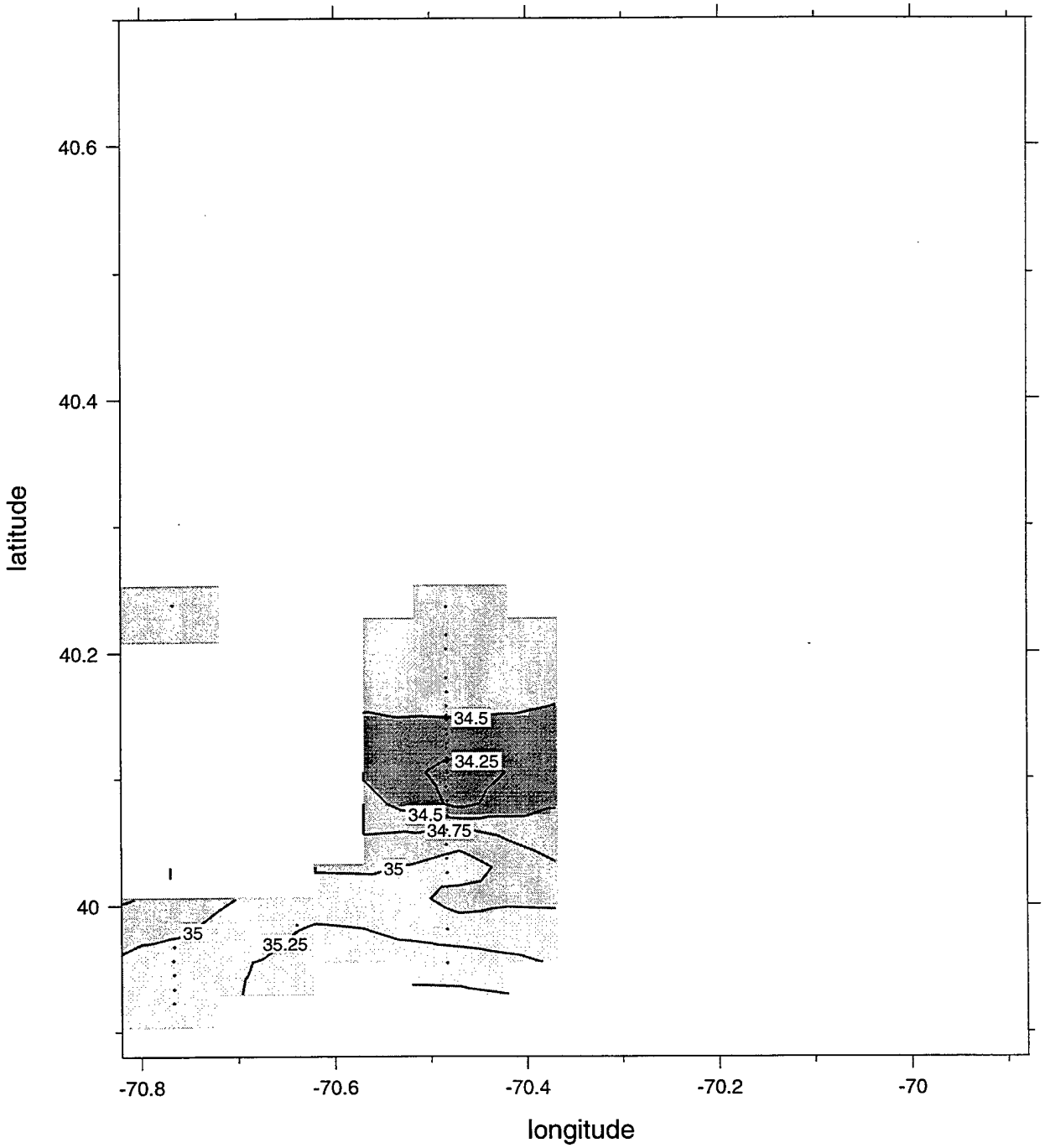


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 105 dbar

Salinity (PSS)

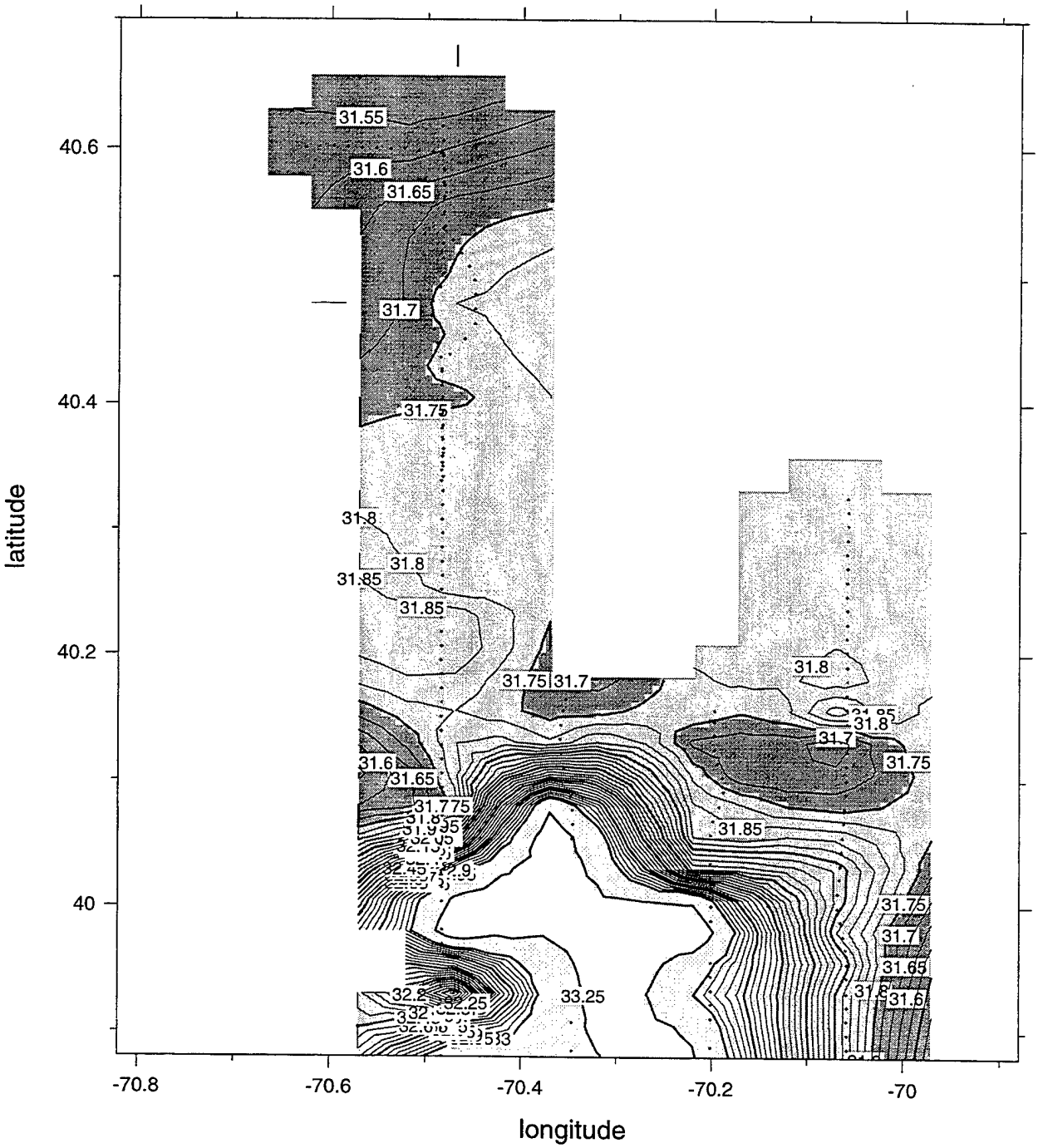


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 5 dbar

Salinity (PSS)

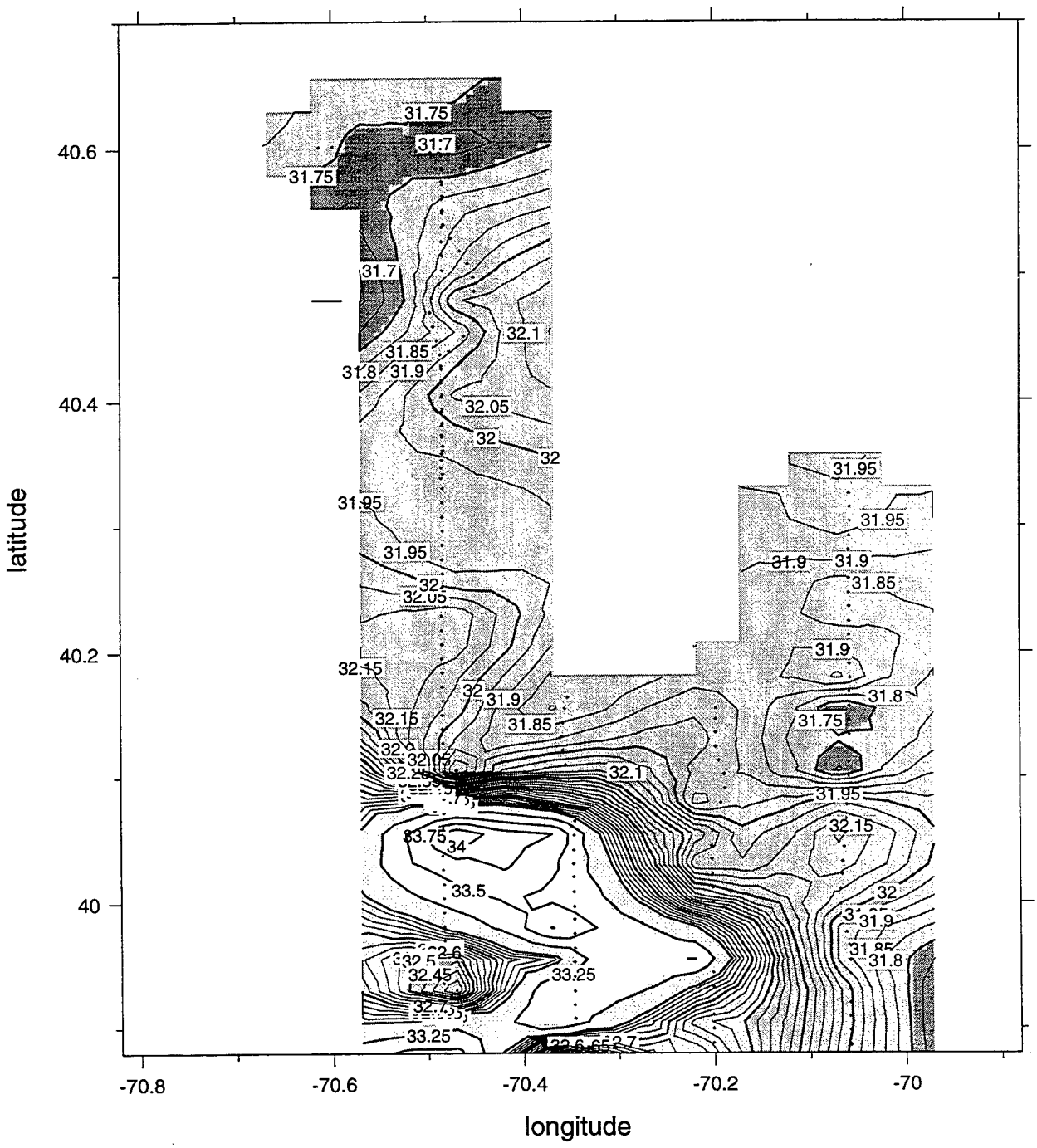


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 15 dbar

Salinity (PSS)

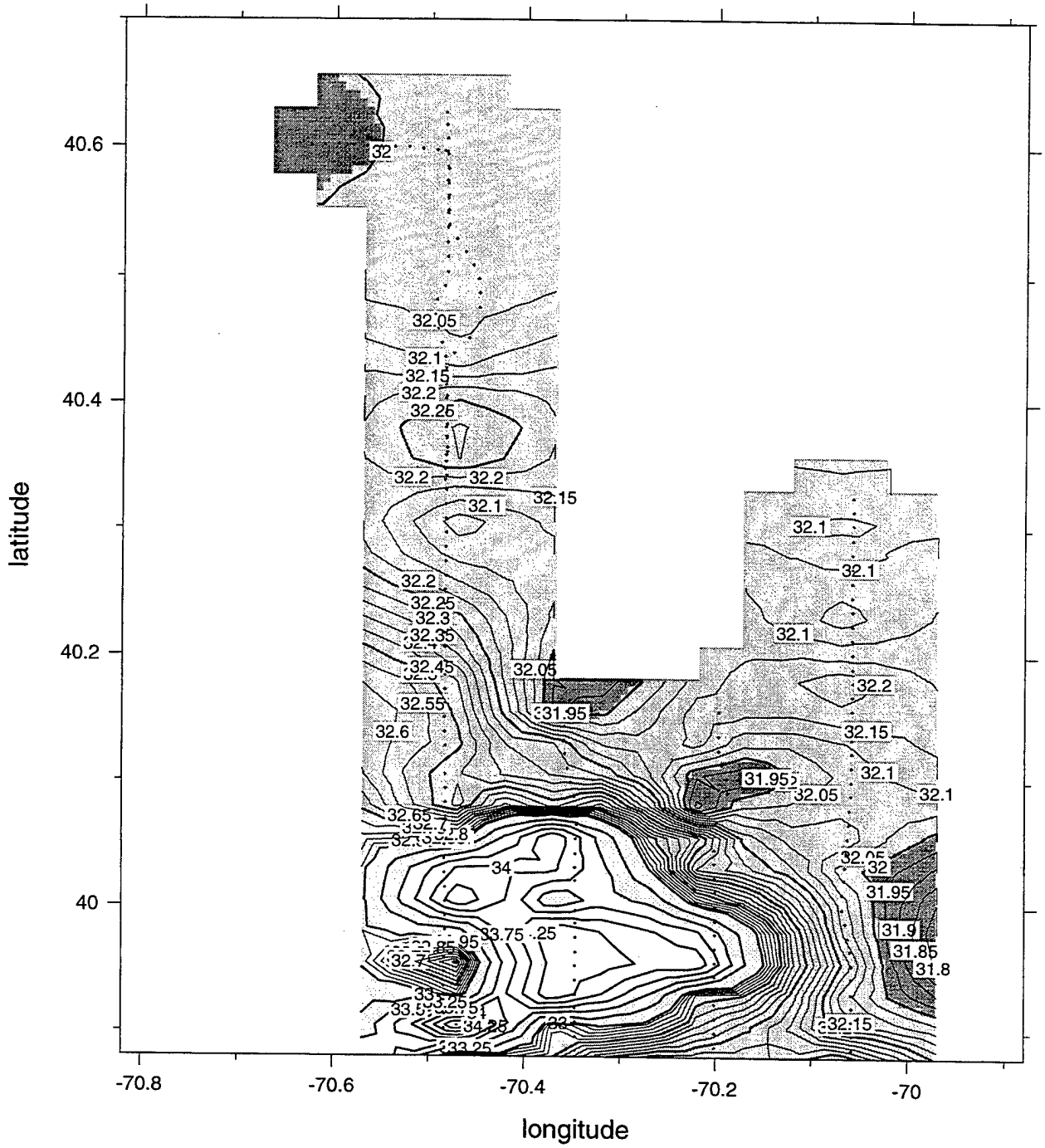


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 25 dbar

Salinity (PSS)

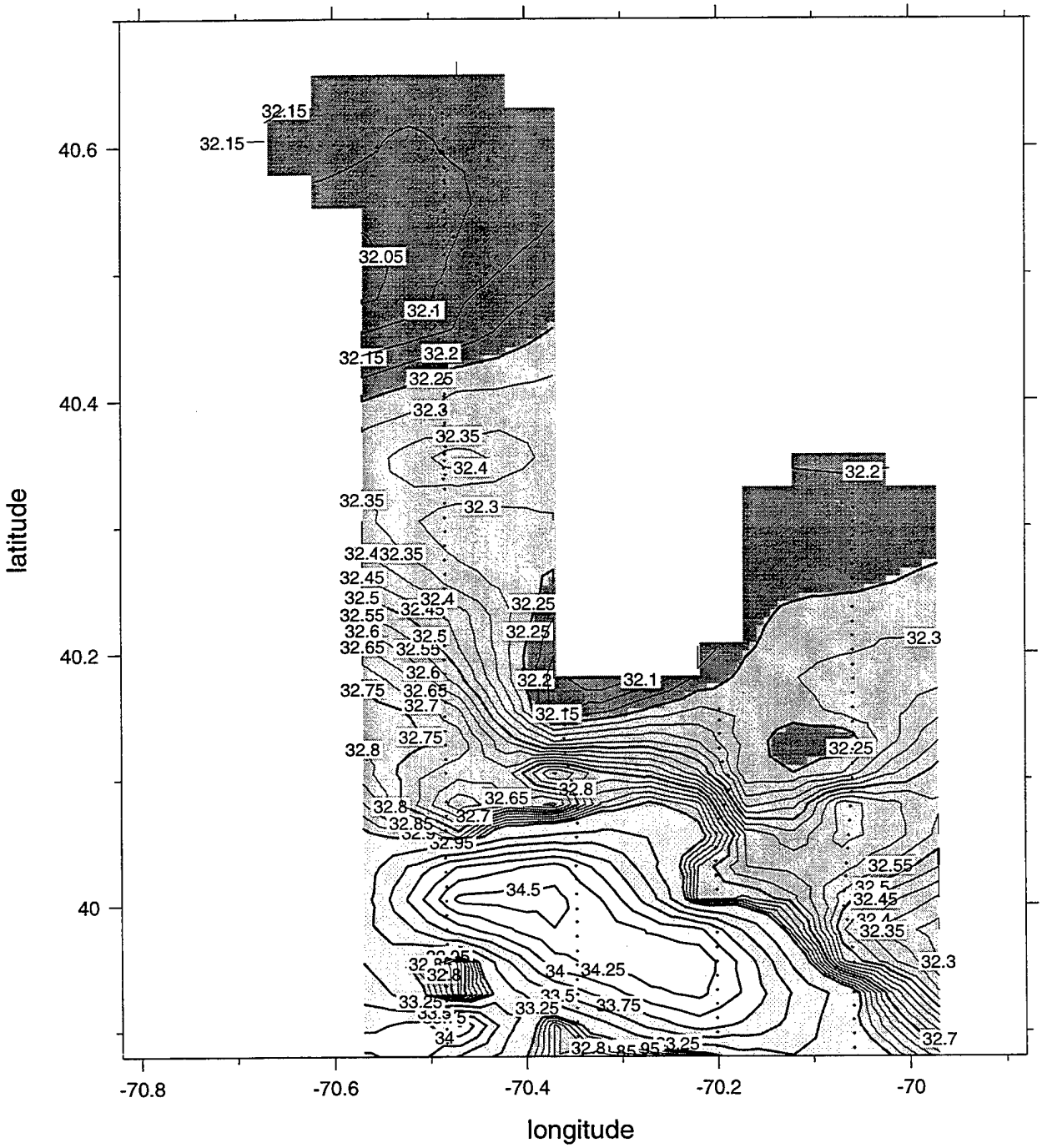


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 35 dbar

Salinity (PSS)

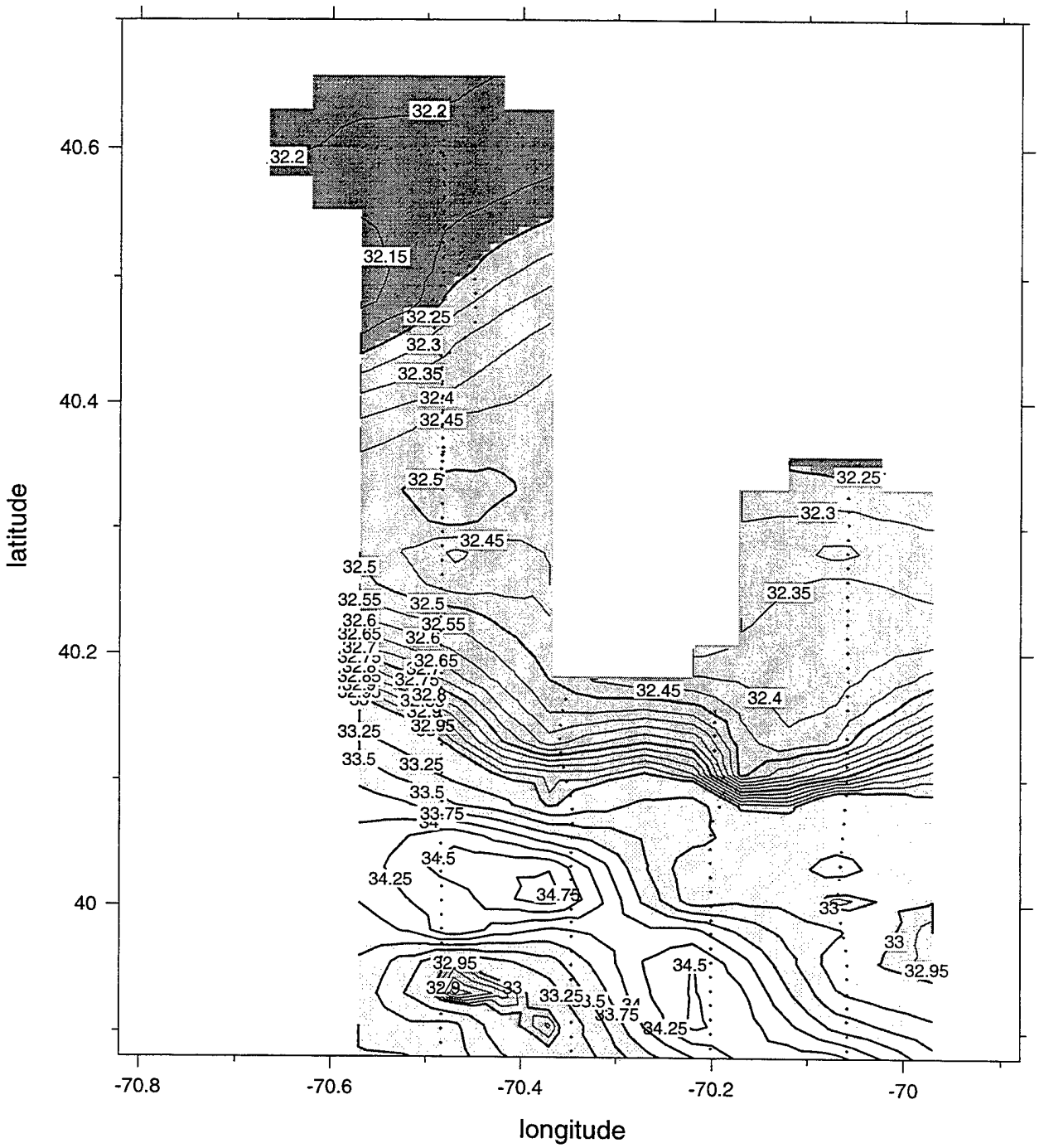


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 45 dbar

Salinity (PSS)

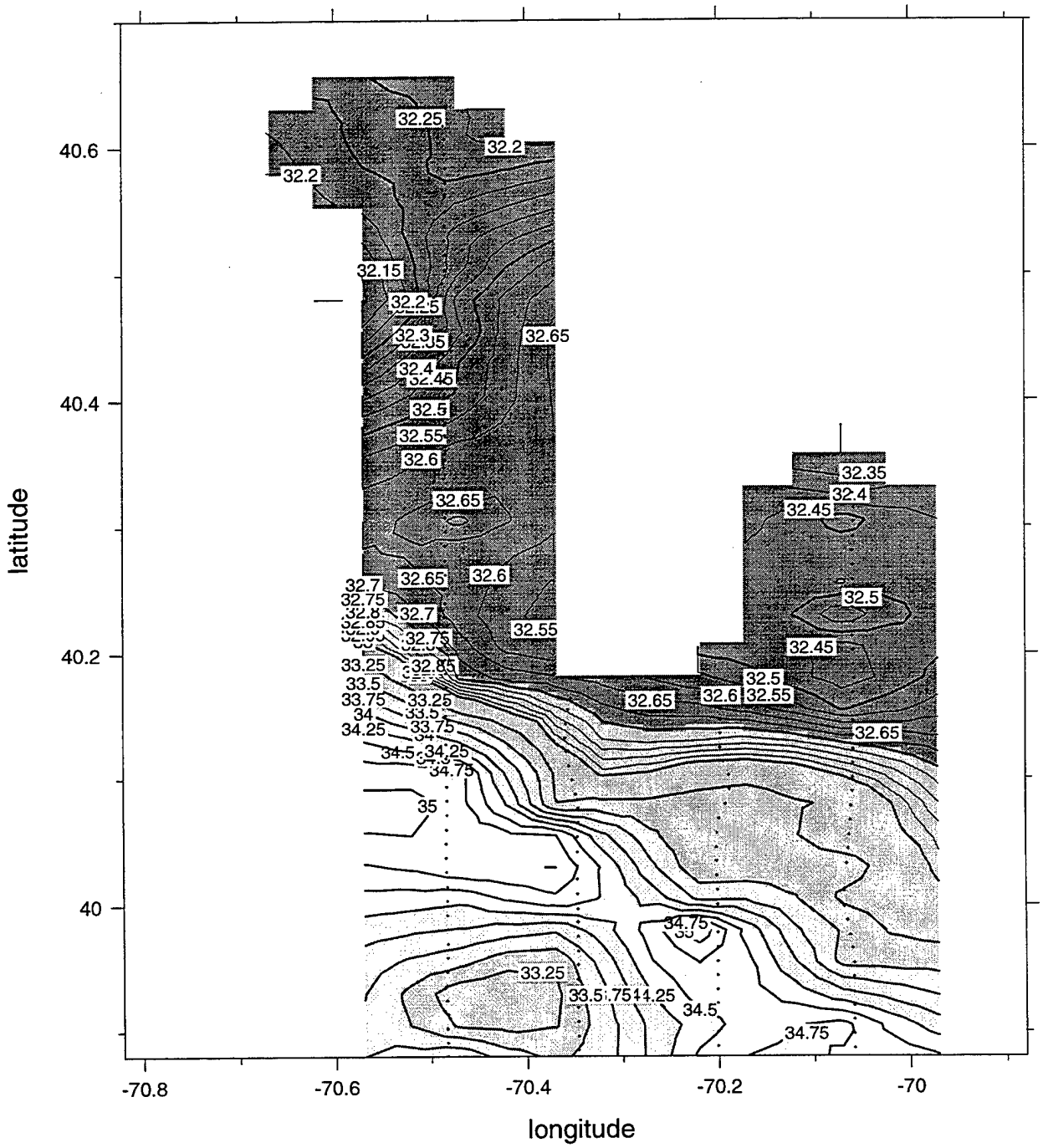


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 55 dbar

Salinity (PSS)

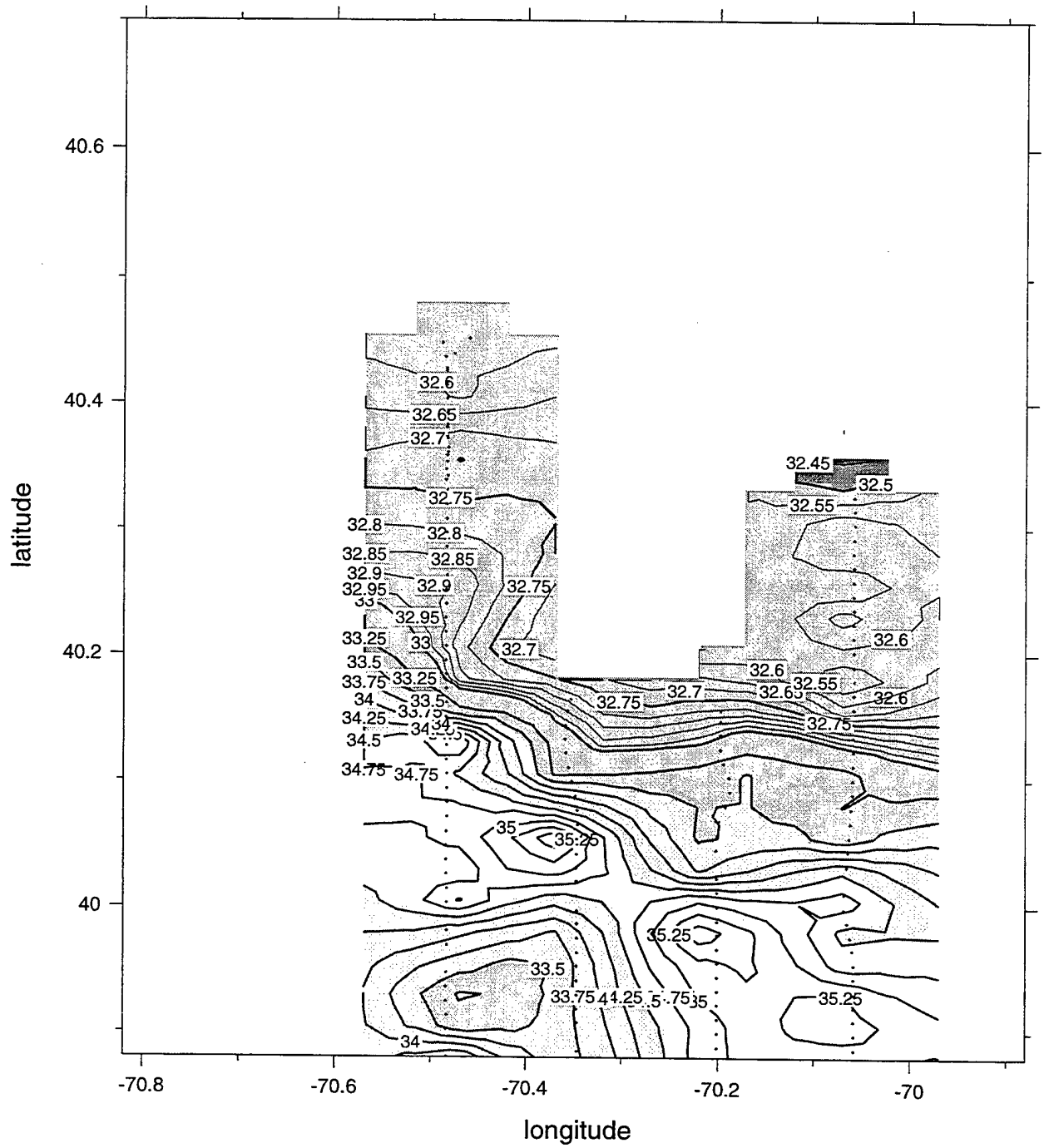


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 65 dbar

Salinity (PSS)

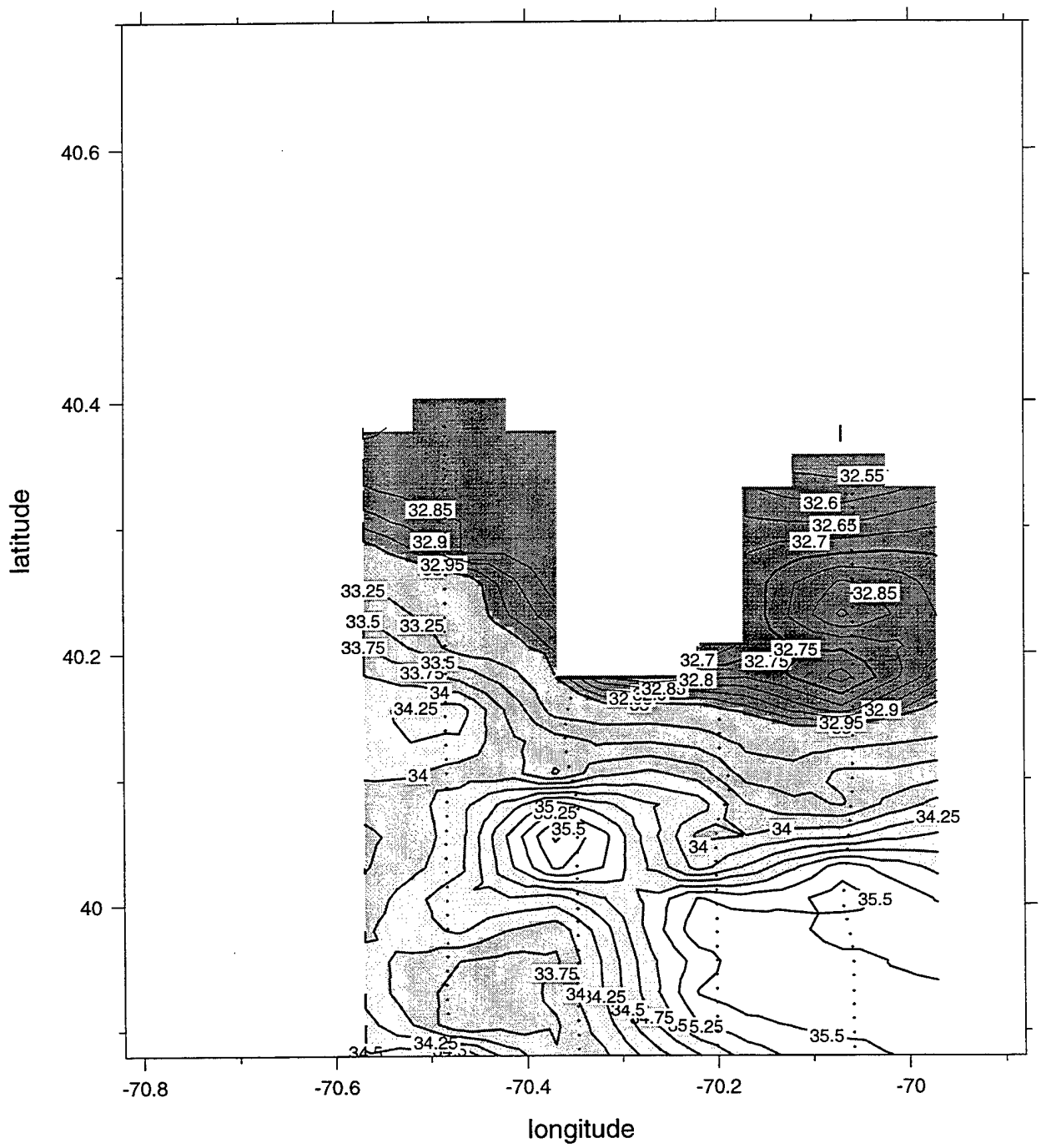


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 75 dbar

Salinity (PSS)

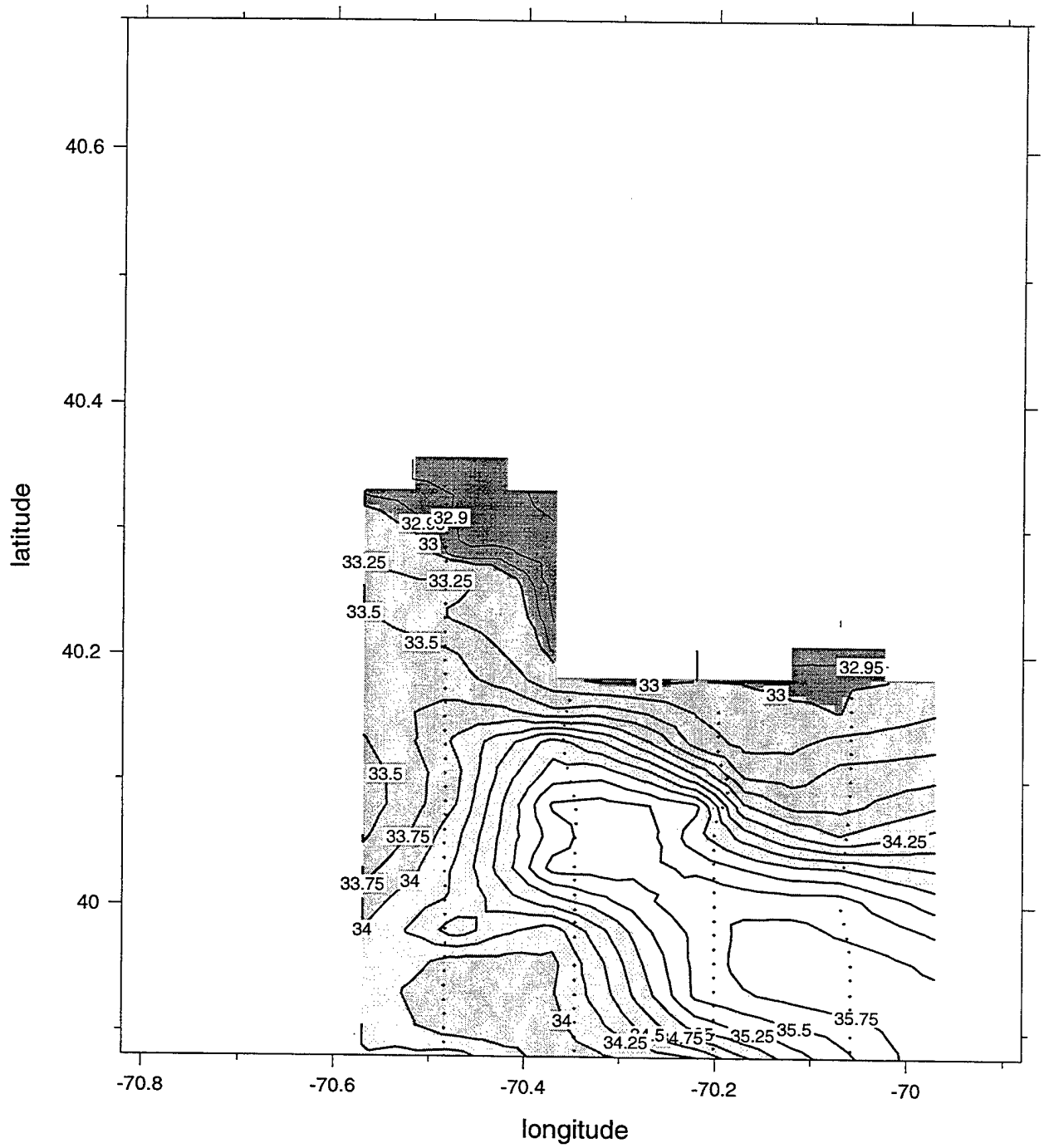


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 85 dbar

Salinity (PSS)

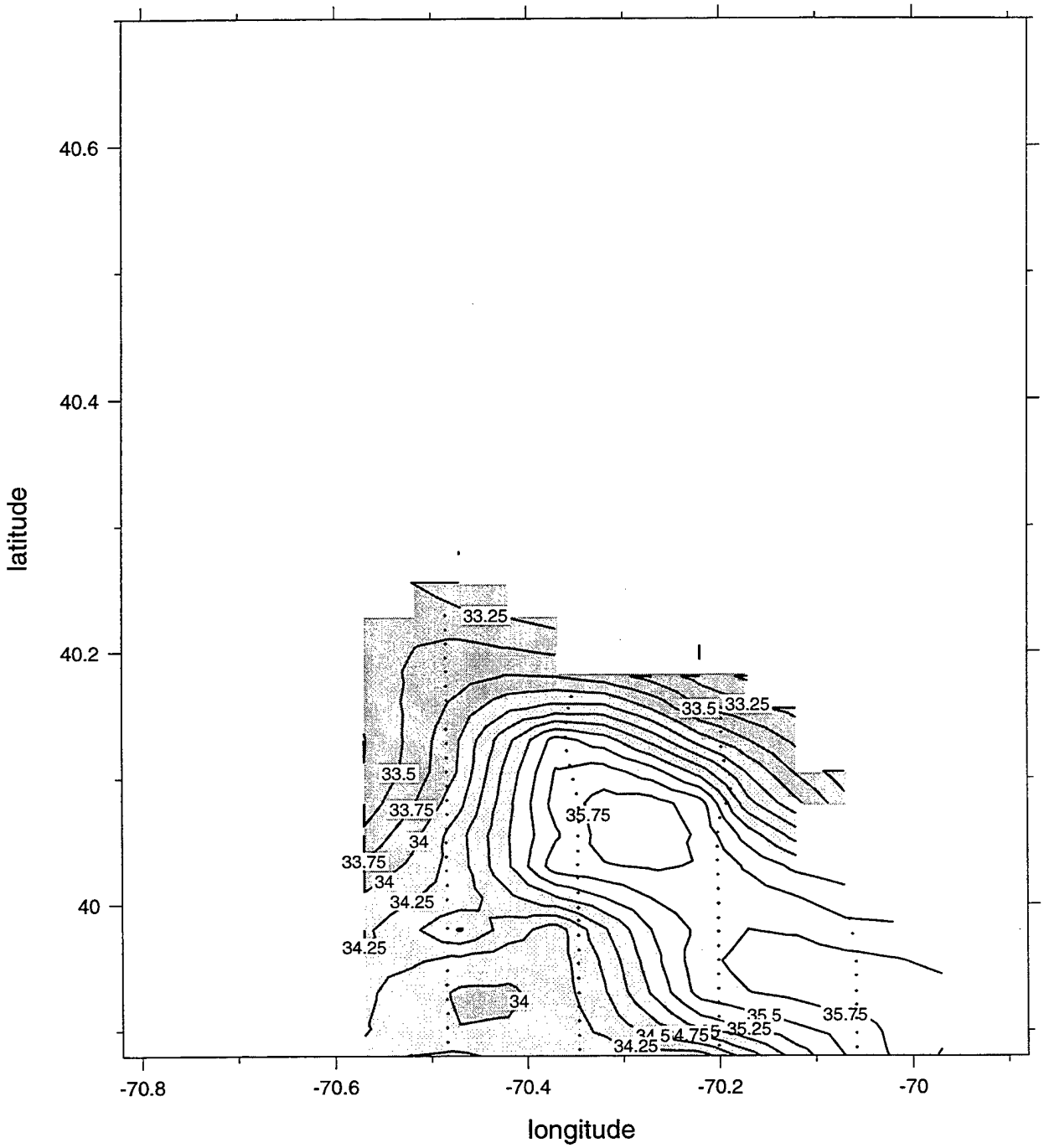


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 95 dbar

Salinity (PSS)

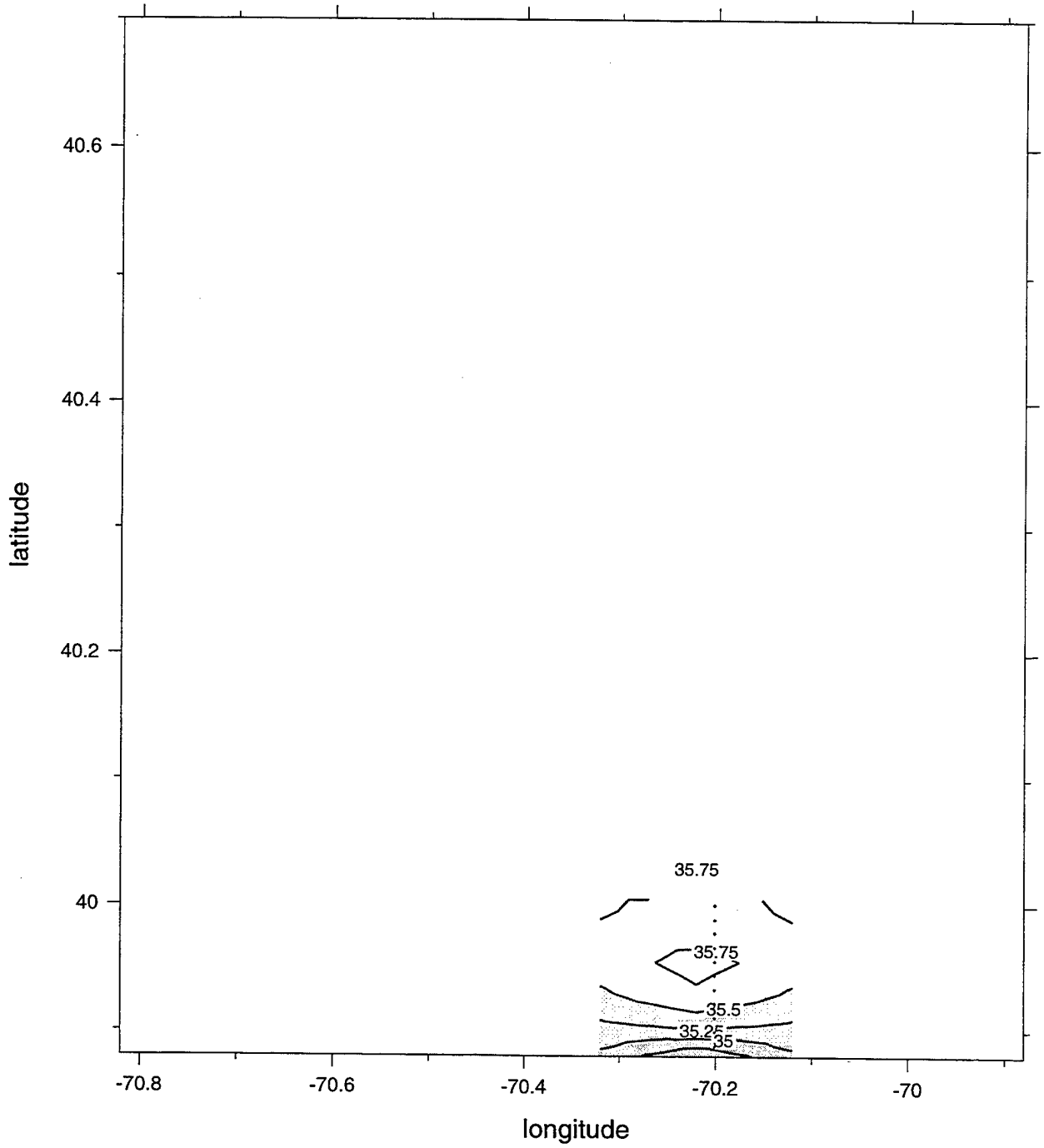


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 105 dbar

Salinity (PSS)

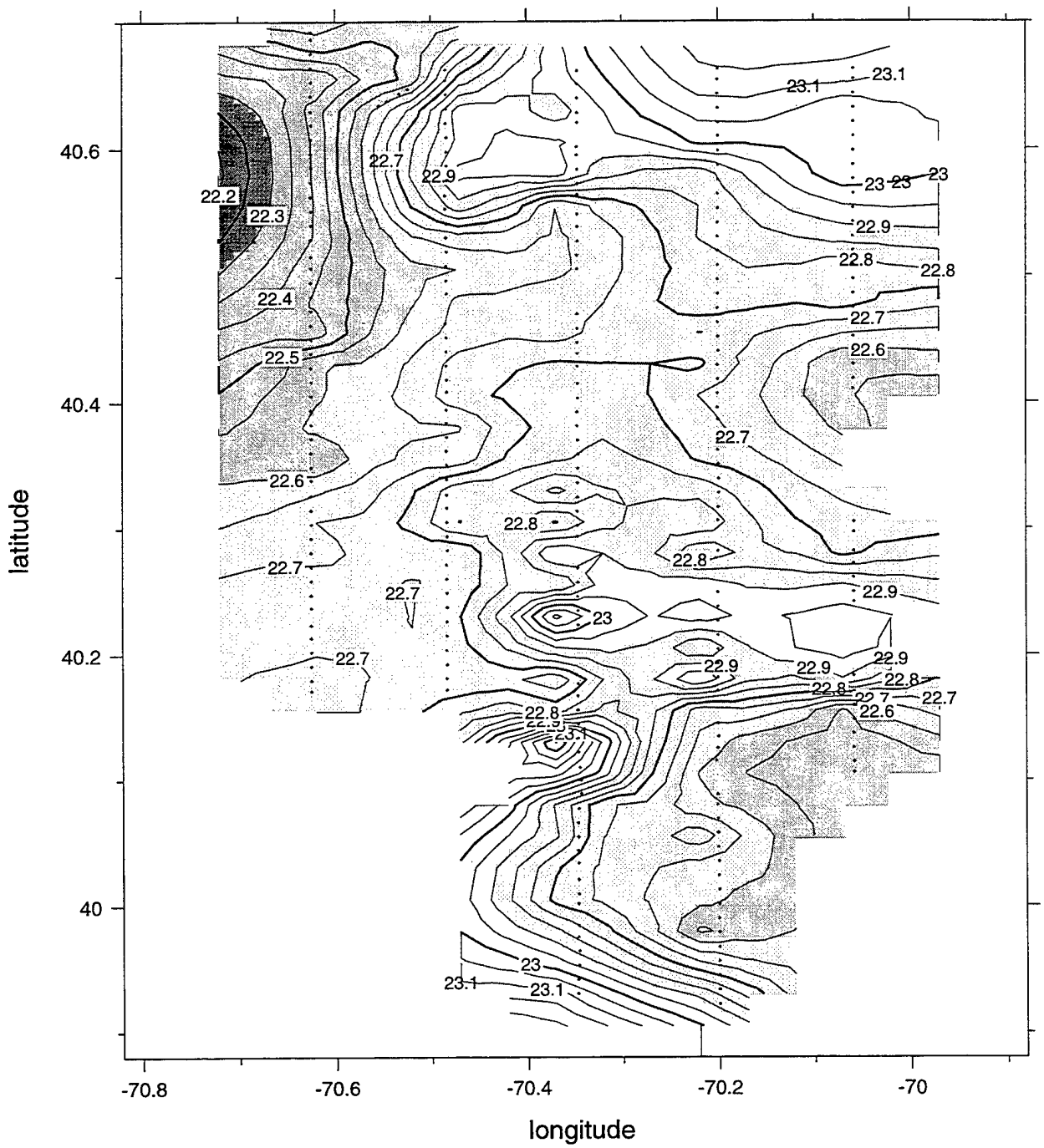


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 5 dbar

σ_t $(kg\ m^{-3})$

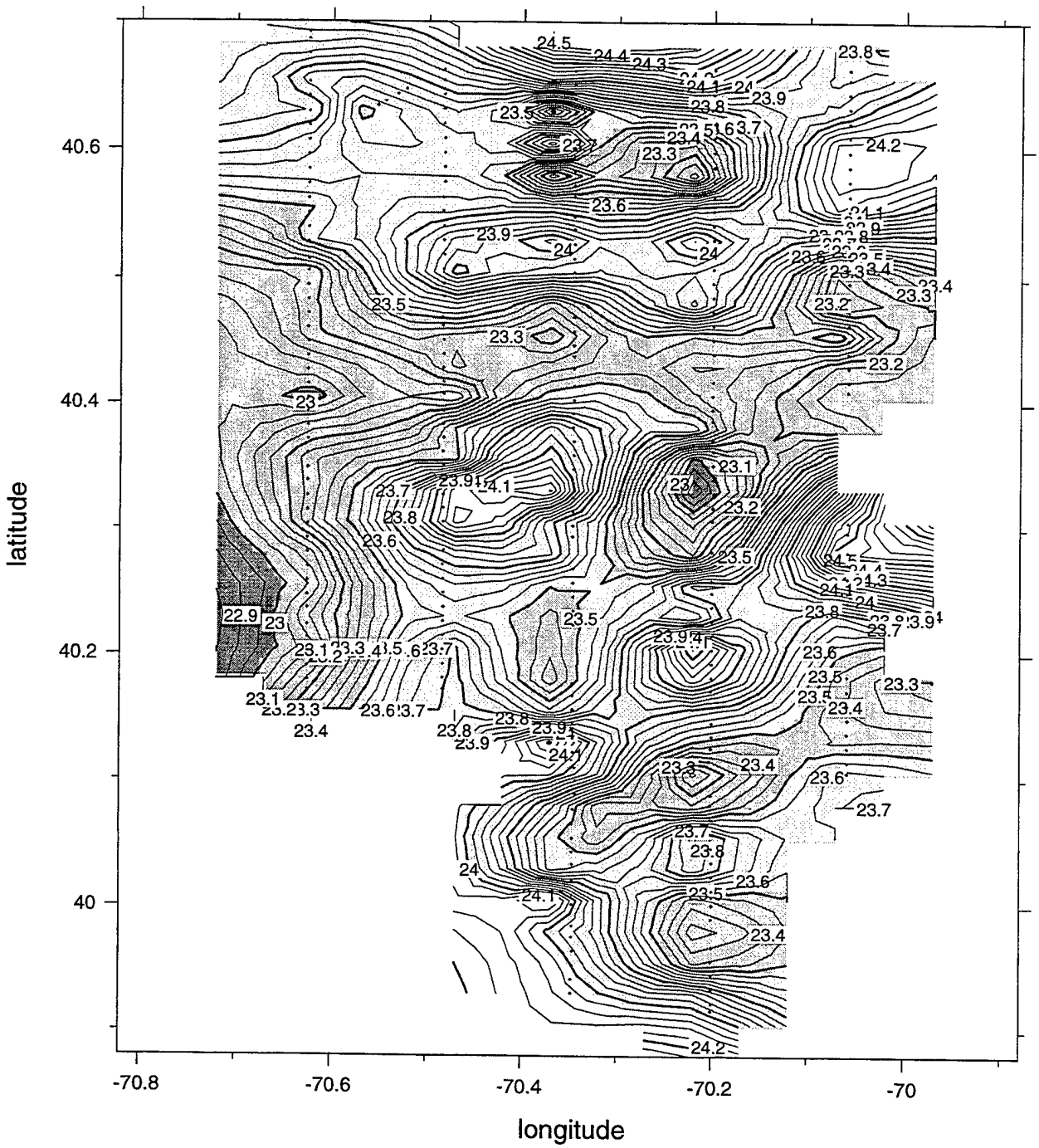


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 15 dbar

σ_t $(kg\ m^{-3})$

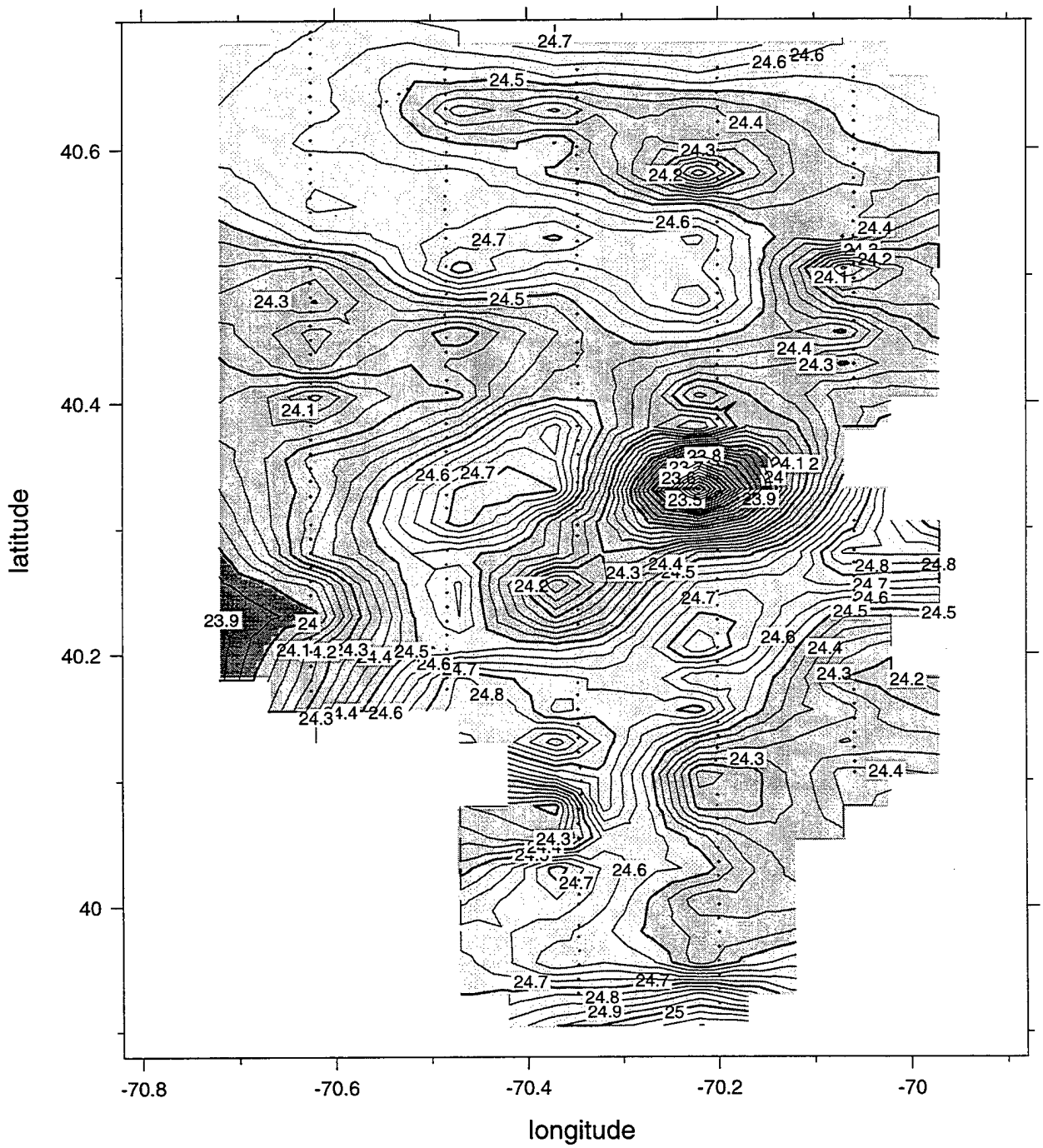


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 25 dbar

σ_t $(kg\ m^{-3})$

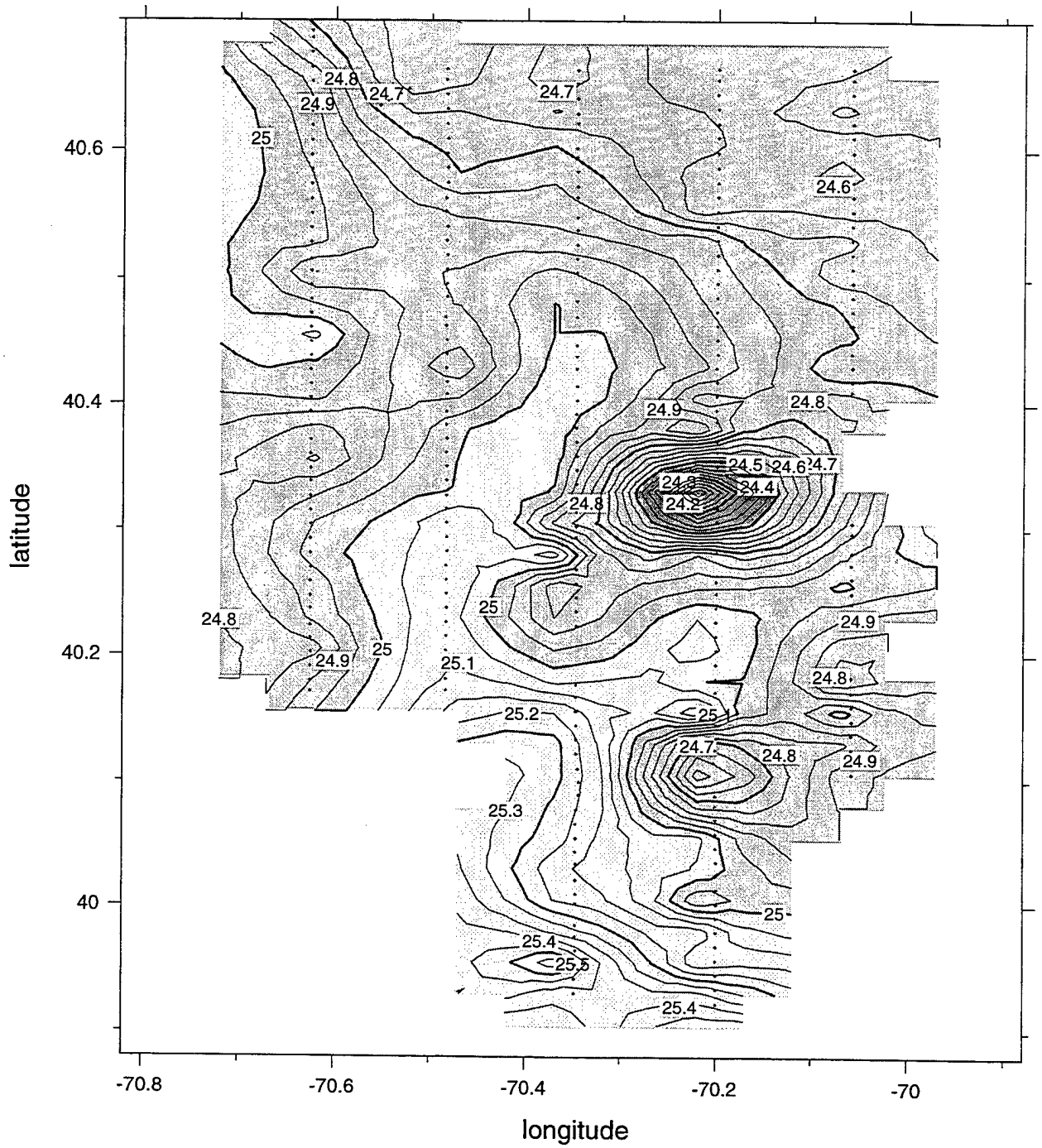


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 35 dbar

σ_t $(kg\ m^{-3})$

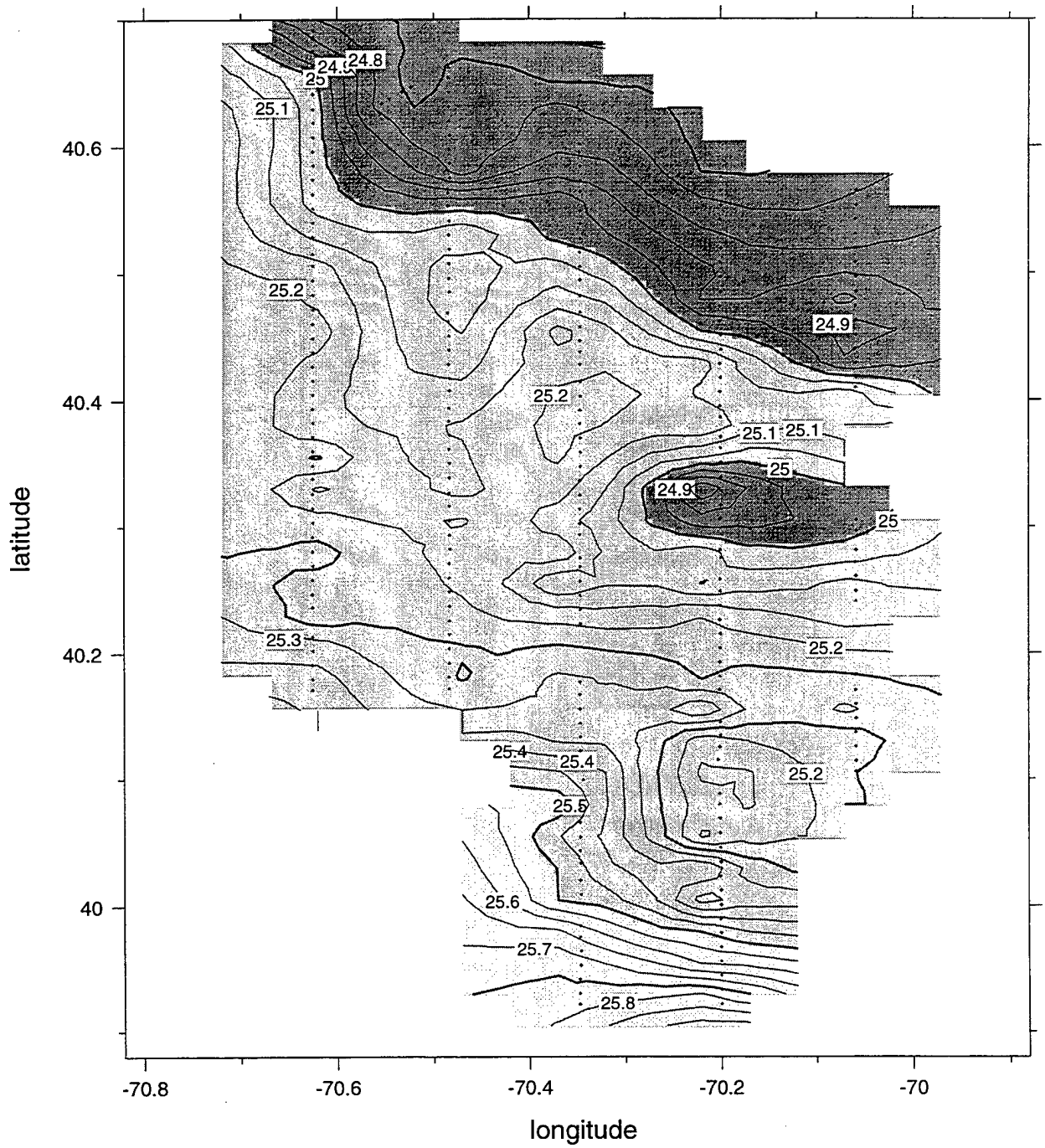


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 45 dbar

σ_t $(kg\ m^{-3})$

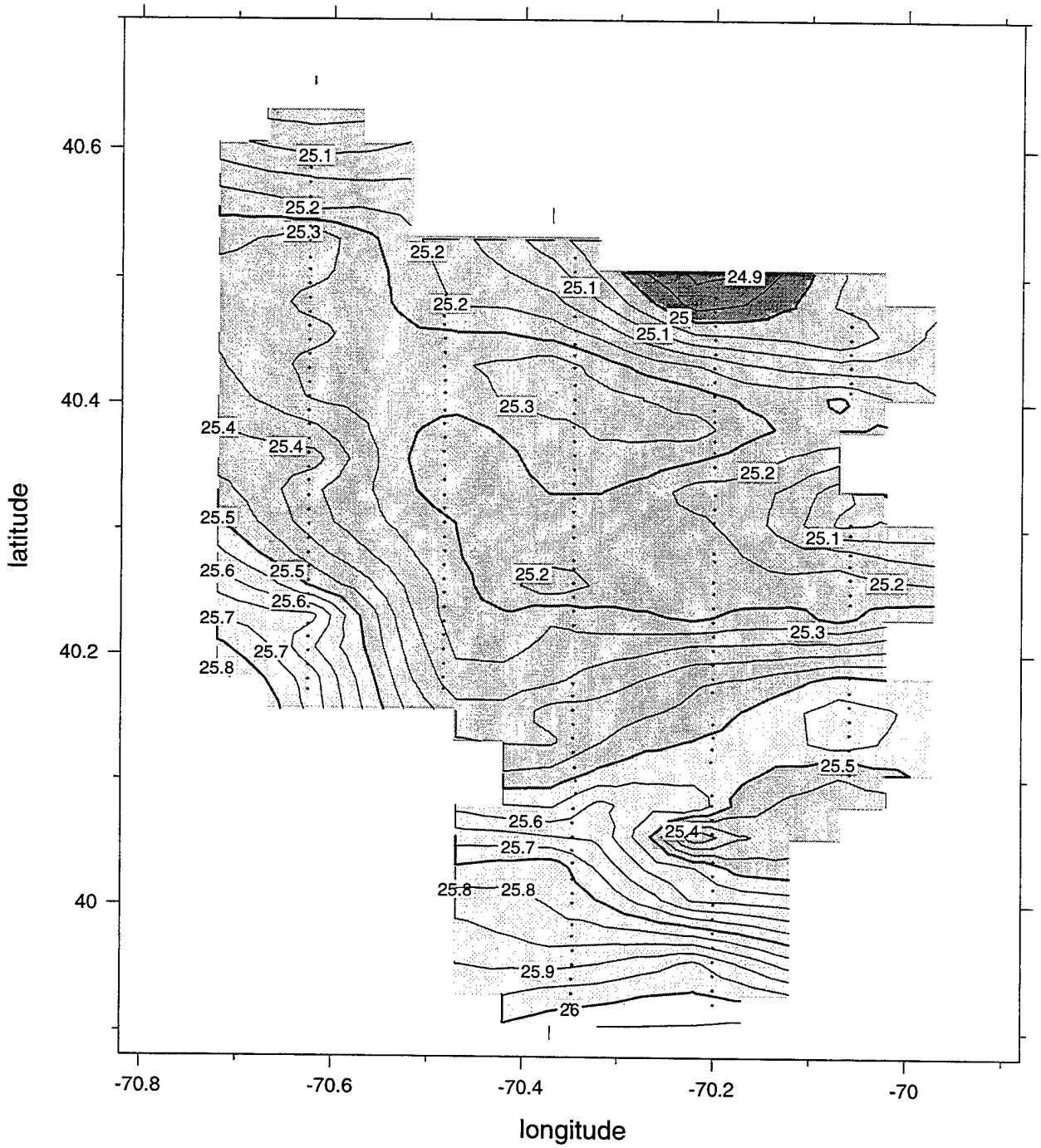


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 55 dbar

σ_t $(kg\ m^{-3})$

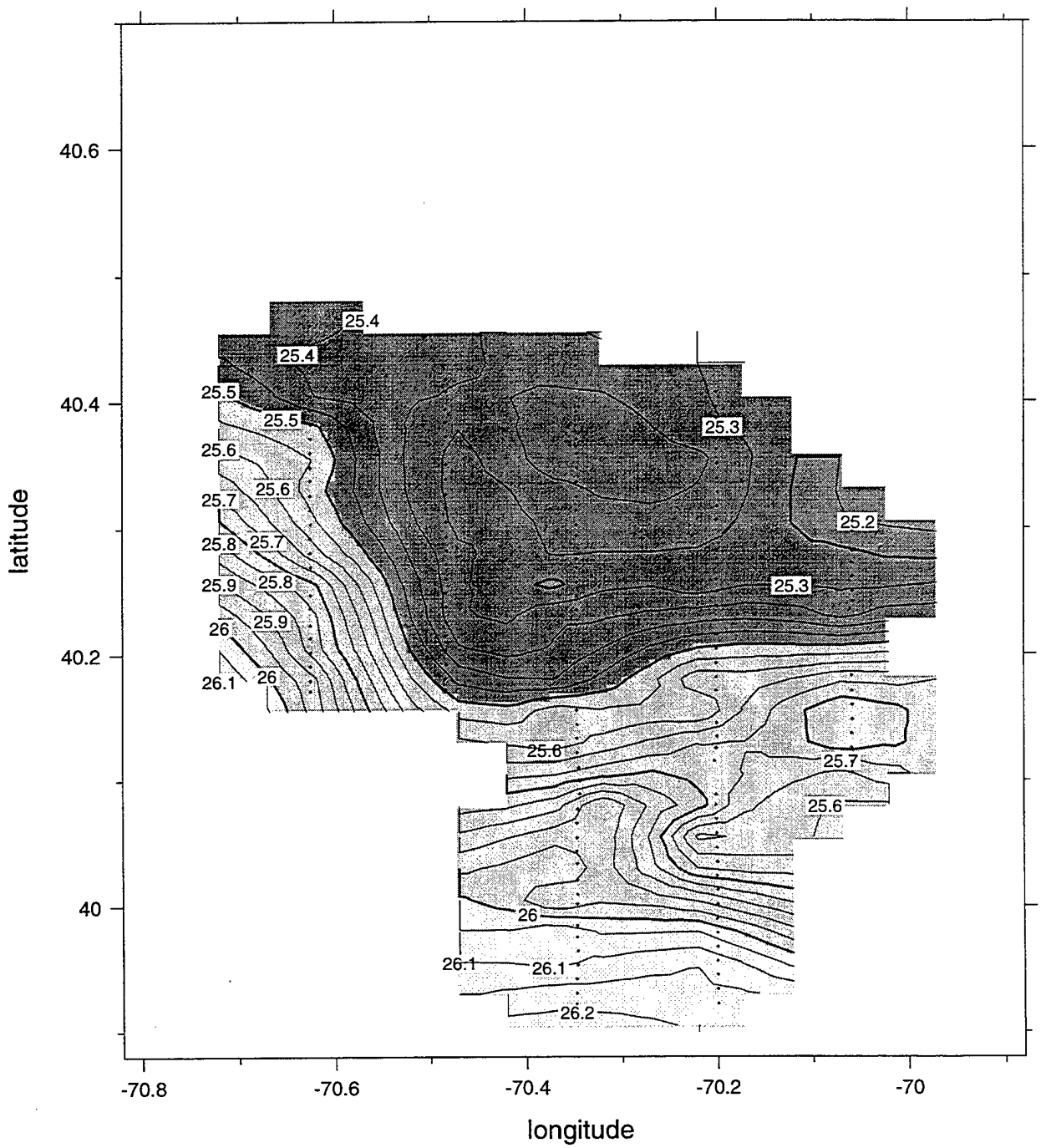


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 65 dbar

σ_t $(kg\ m^{-3})$

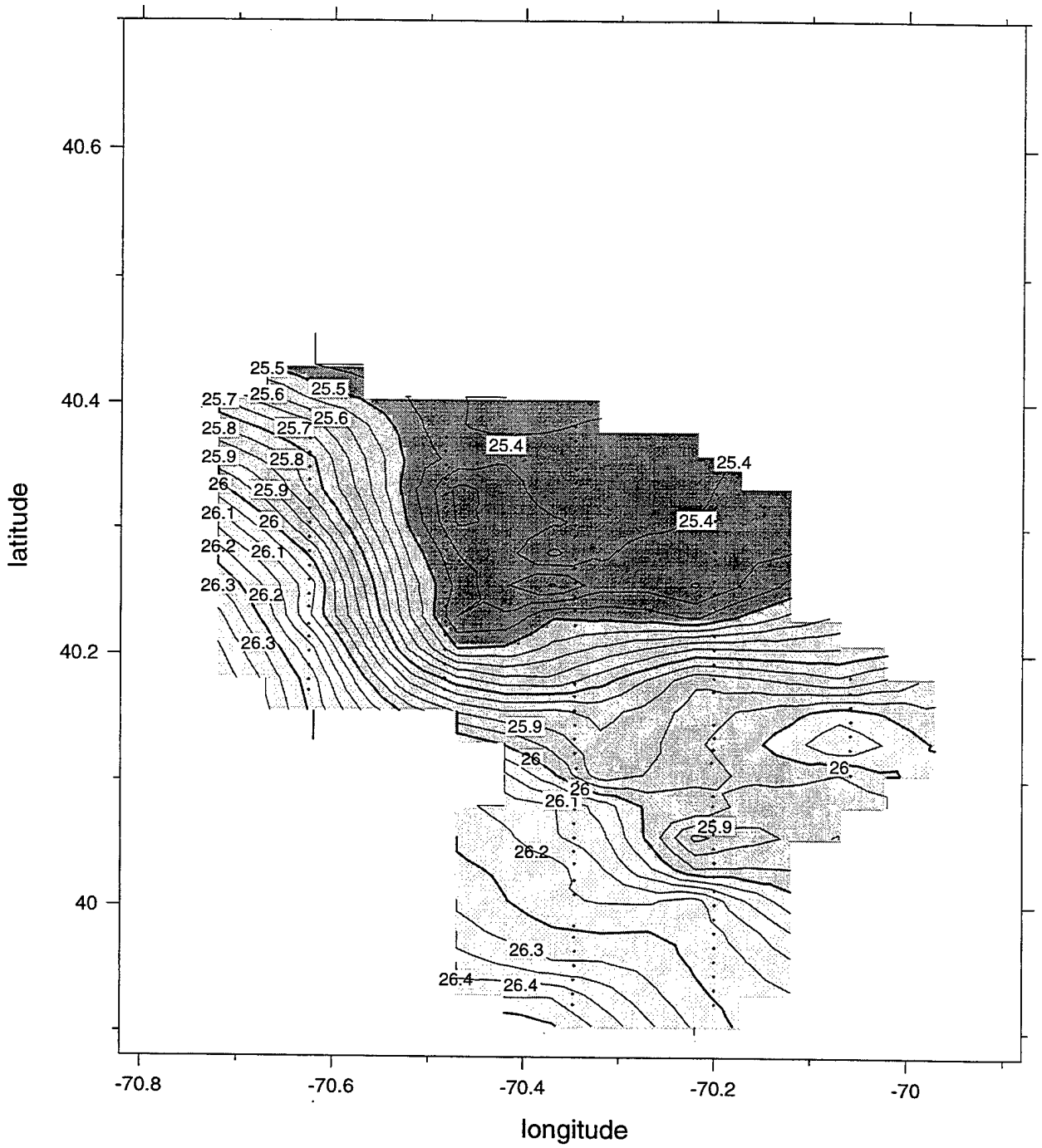


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 75 dbar

σ_t $(kg\ m^{-3})$

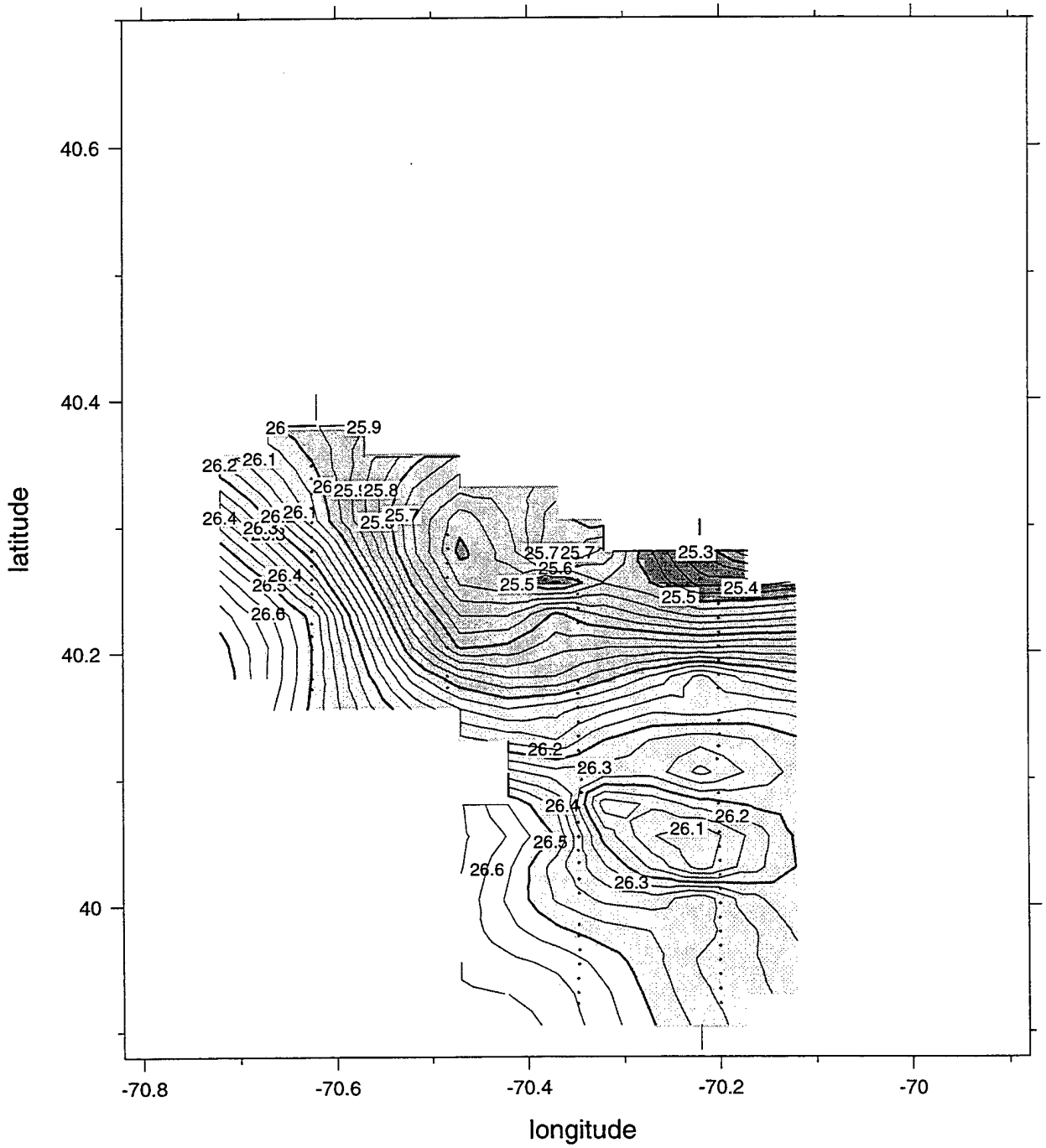


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 85 dbar

σ_t $(kg\ m^{-3})$

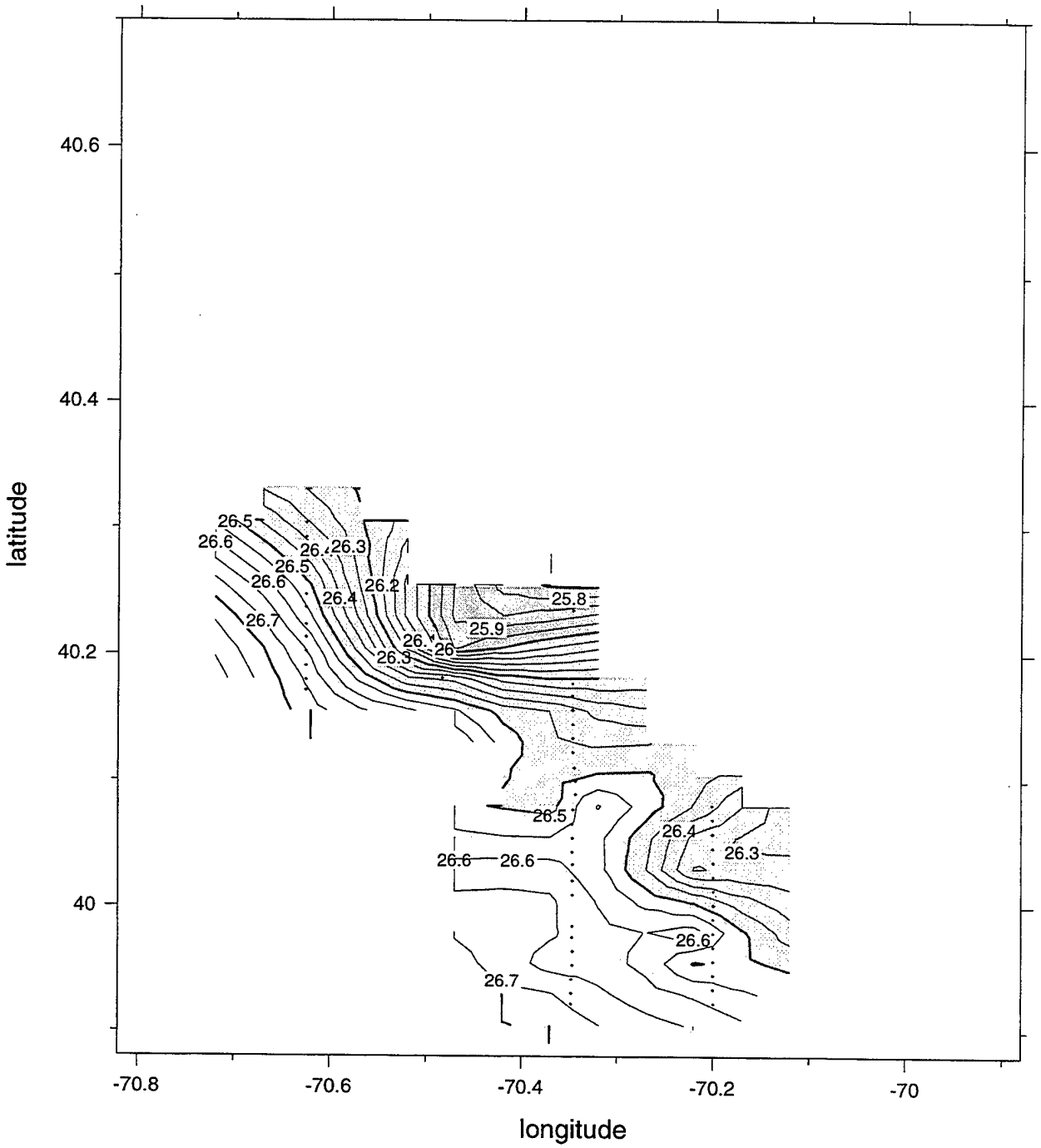


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 95 dbar

σ_t $(kg\ m^{-3})$

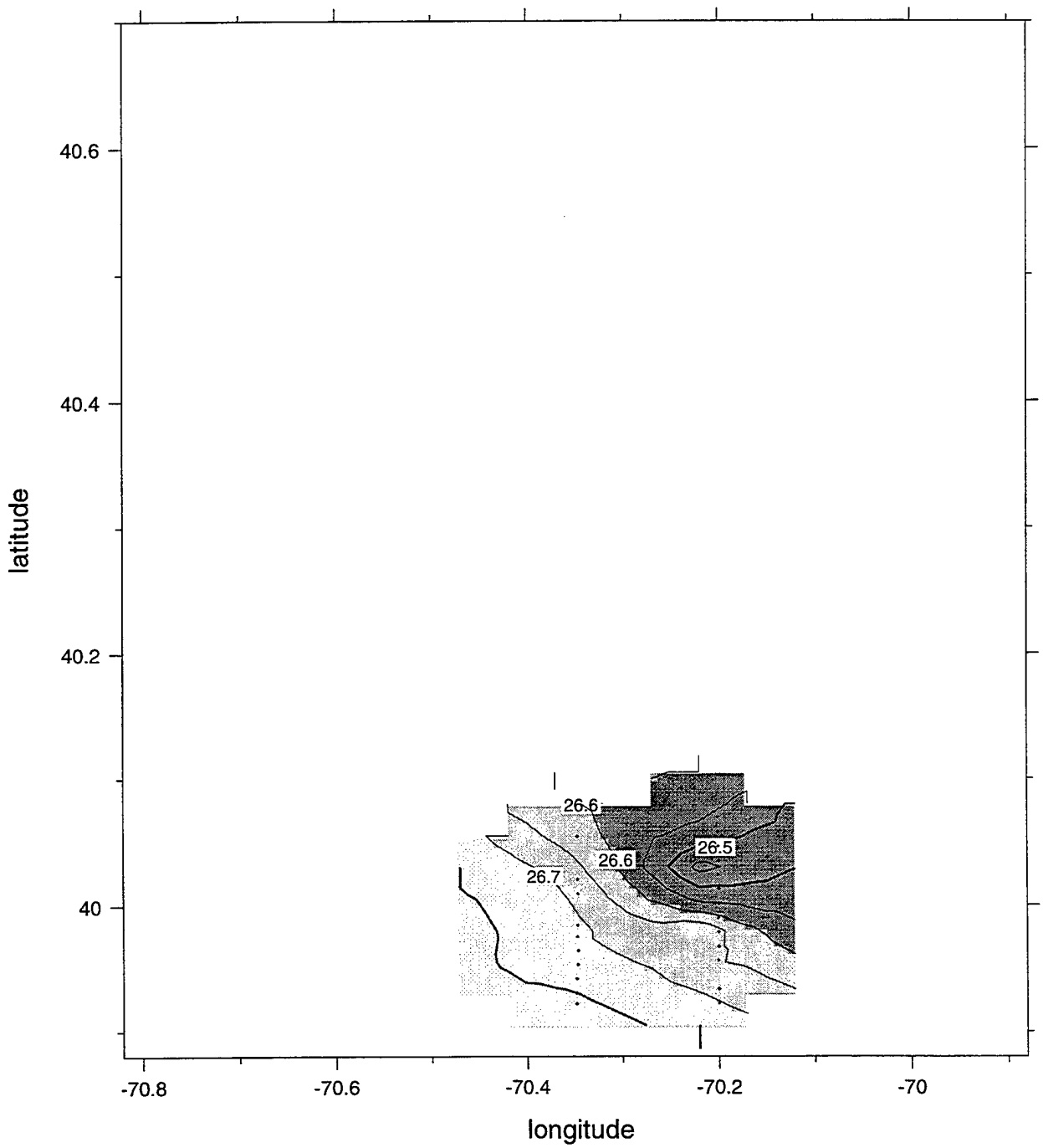


E9608 Big Box 1

17-Aug-96 02:01:16 - 18-Aug-96 09:07:03

Map View at 105 dbar

σ_t $(kg\ m^{-3})$

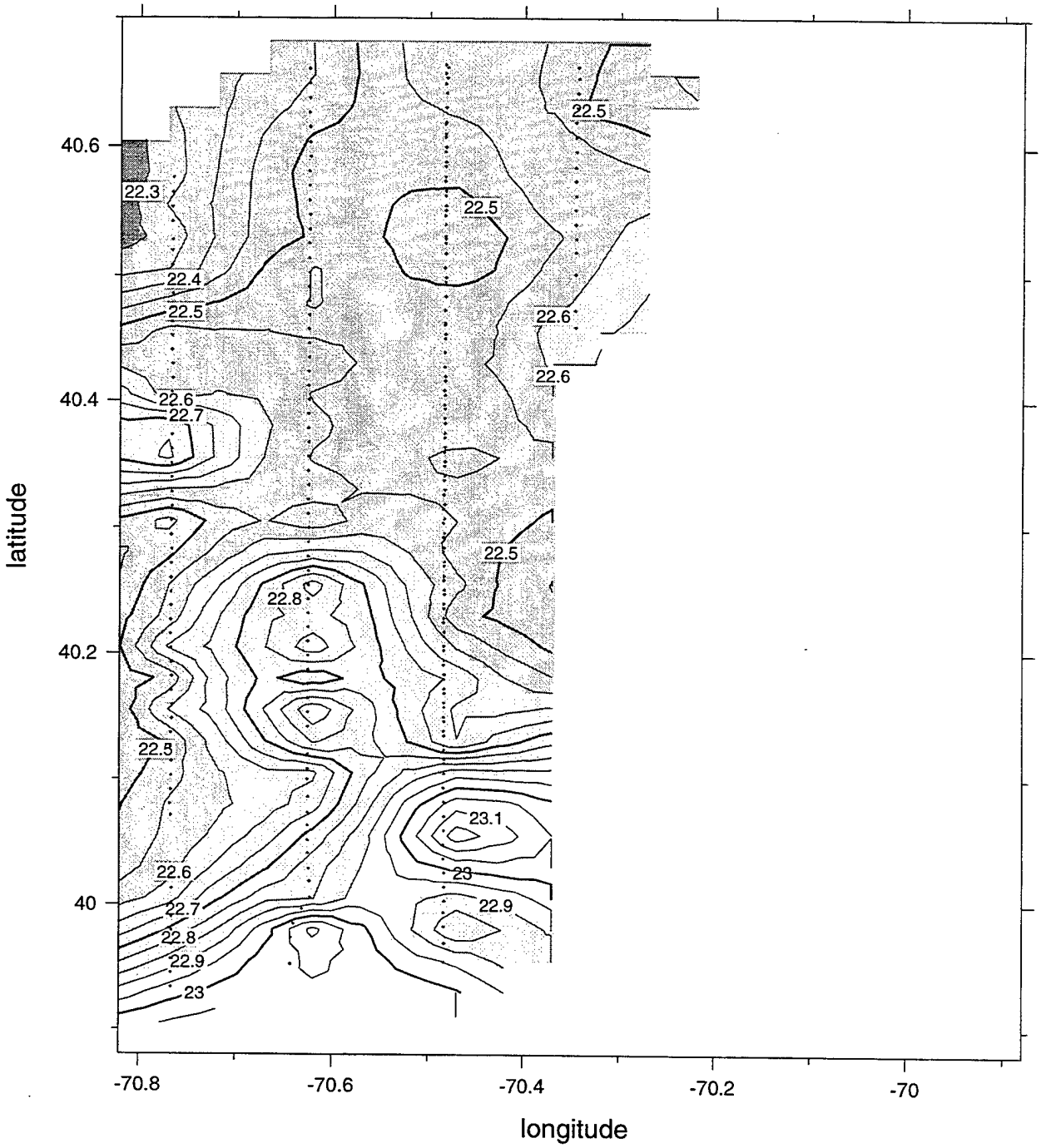


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 5 dbar

σ_t $(kg\ m^{-3})$

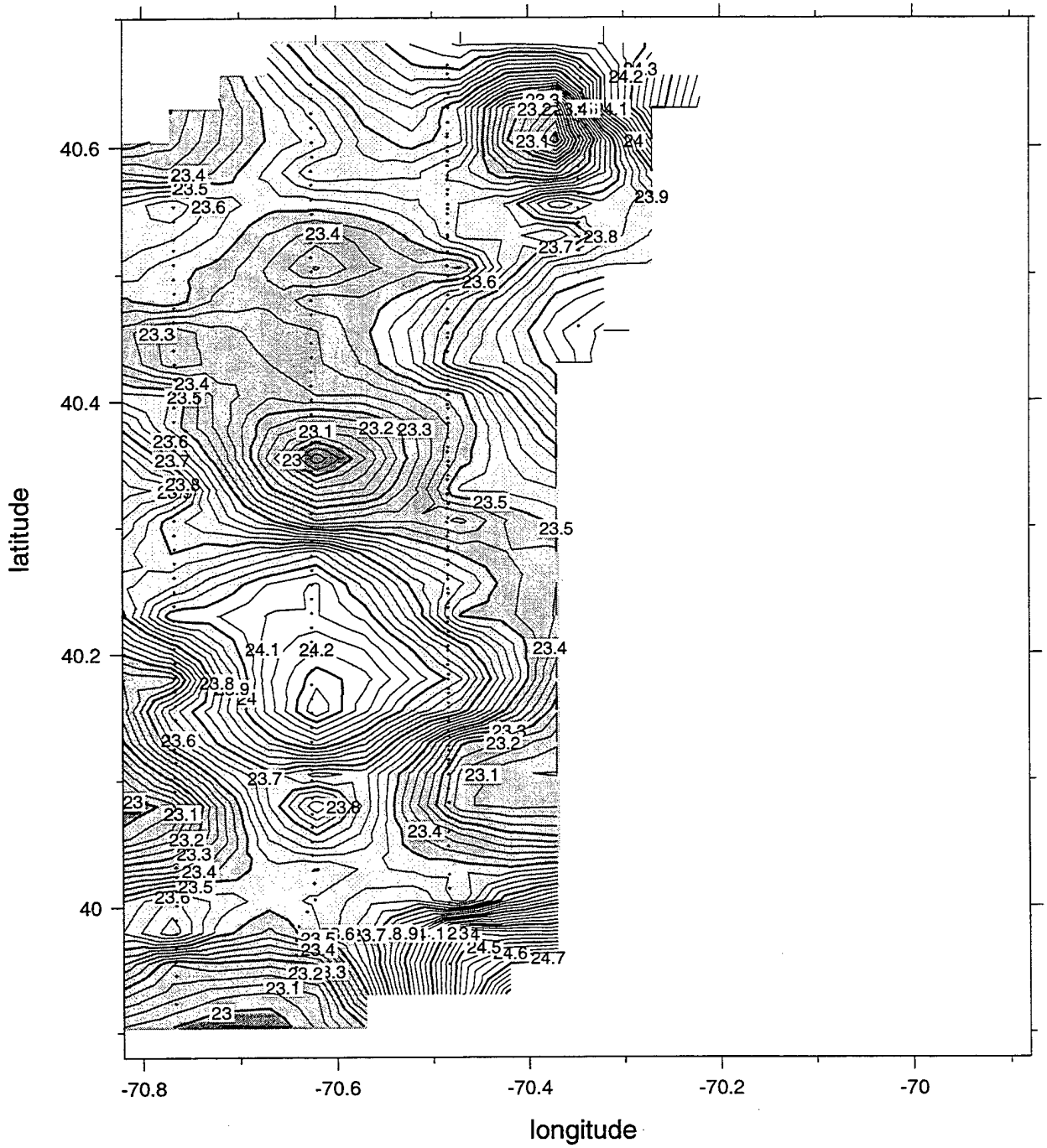


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 15 dbar

σ_t $(kg\ m^{-3})$

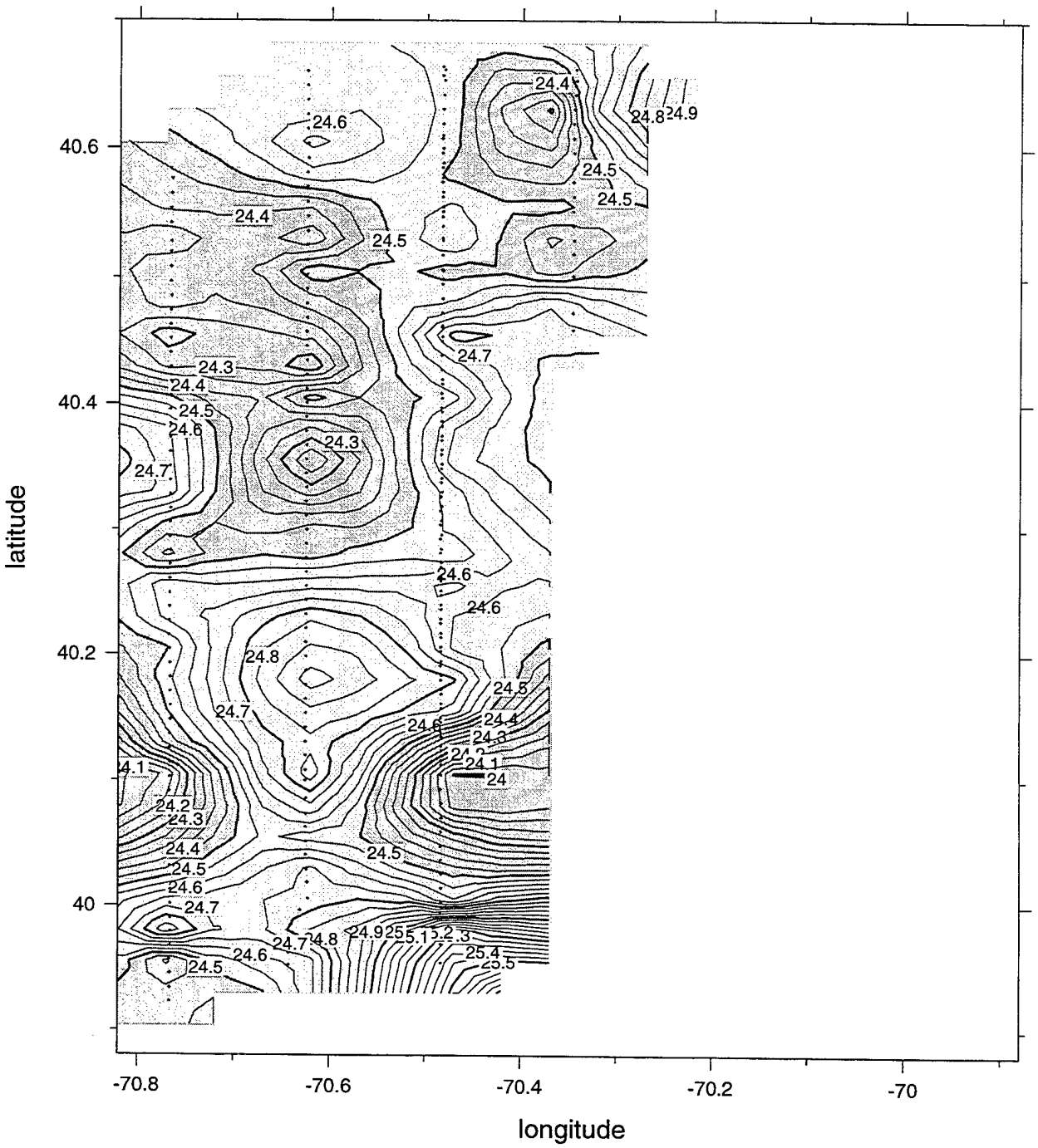


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 25 dbar

σ_t $(kg\ m^{-3})$

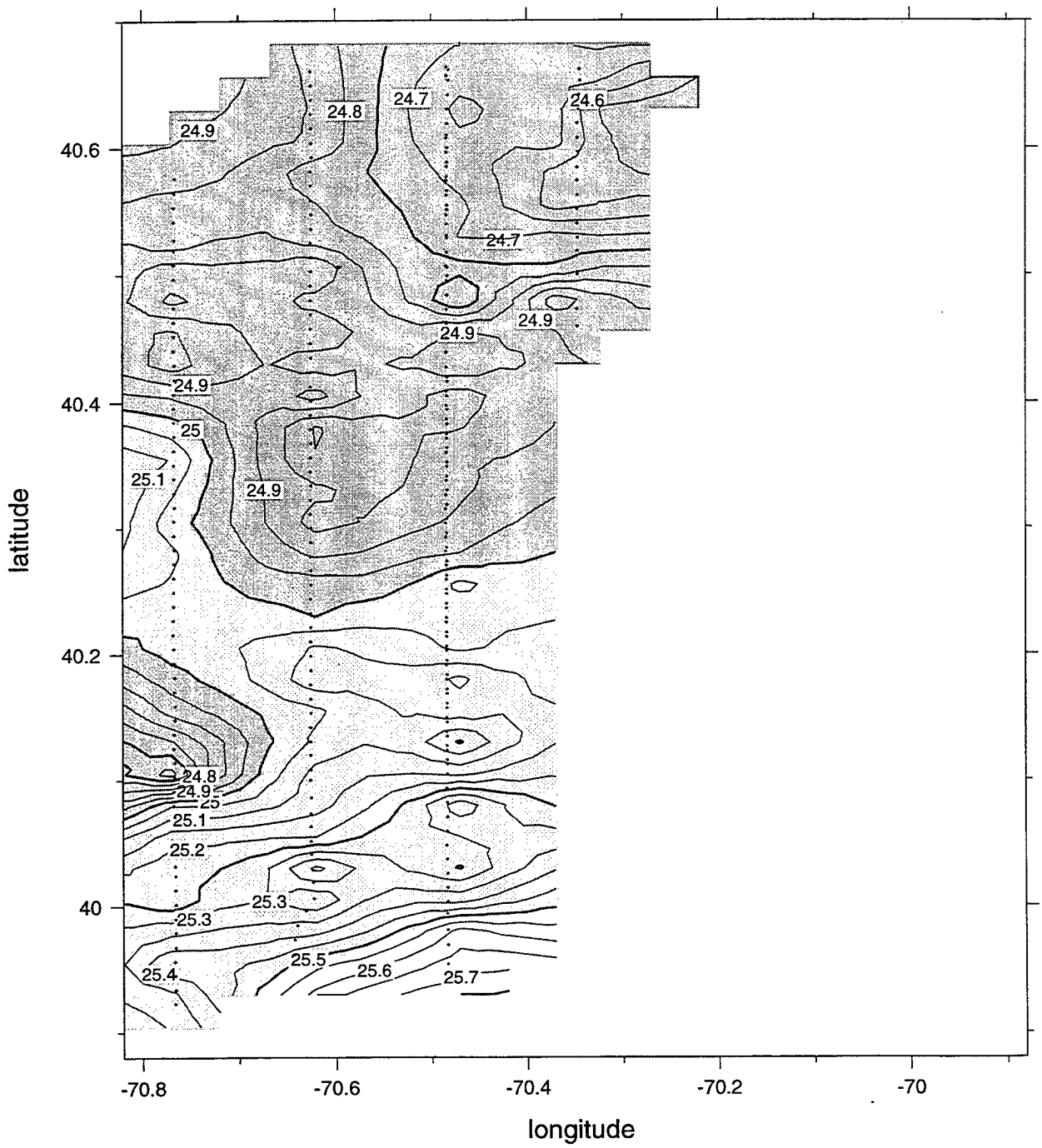


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 35 dbar

σ_t $(kg\ m^{-3})$

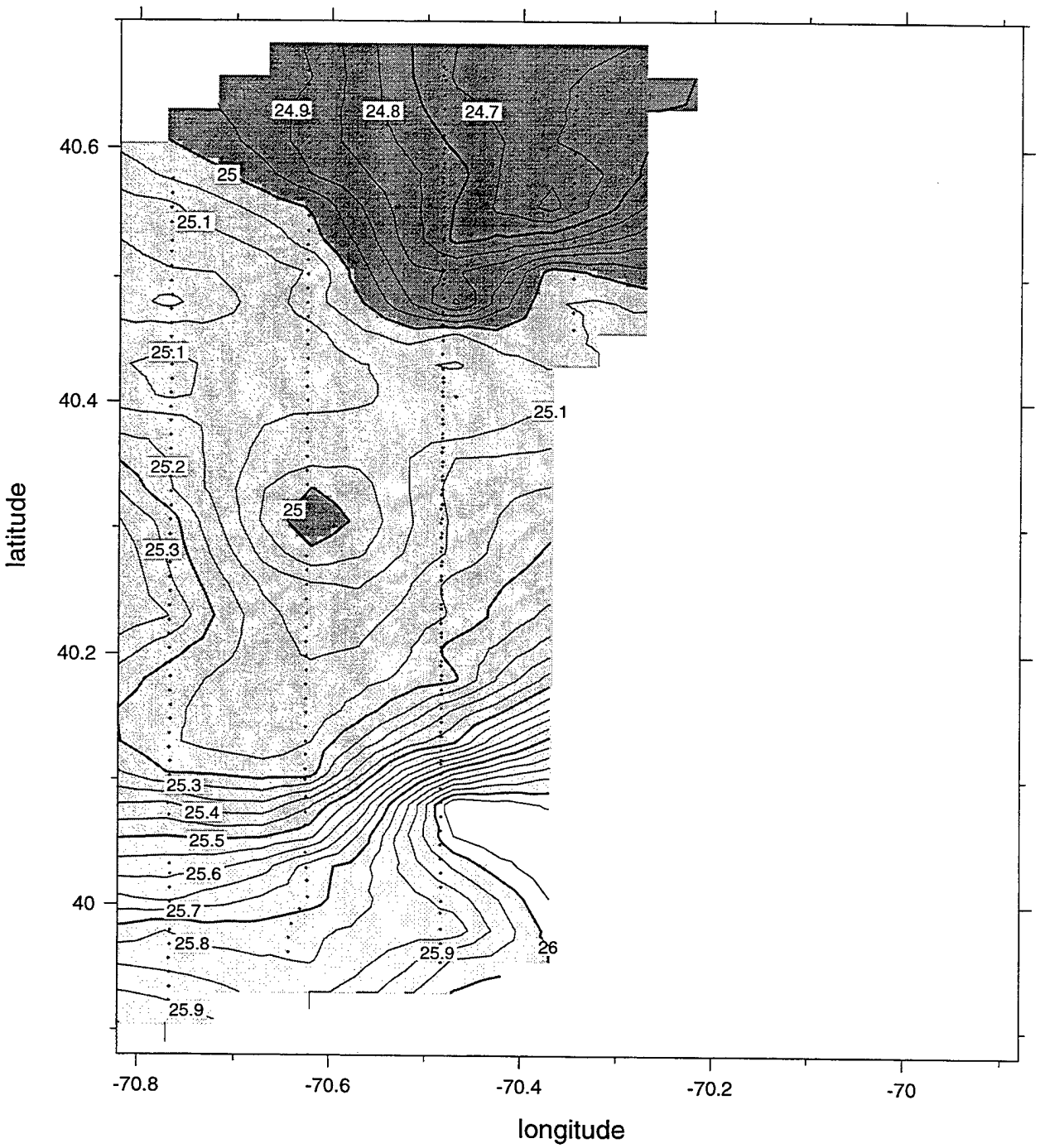


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 45 dbar

σ_t $(kg\ m^{-3})$

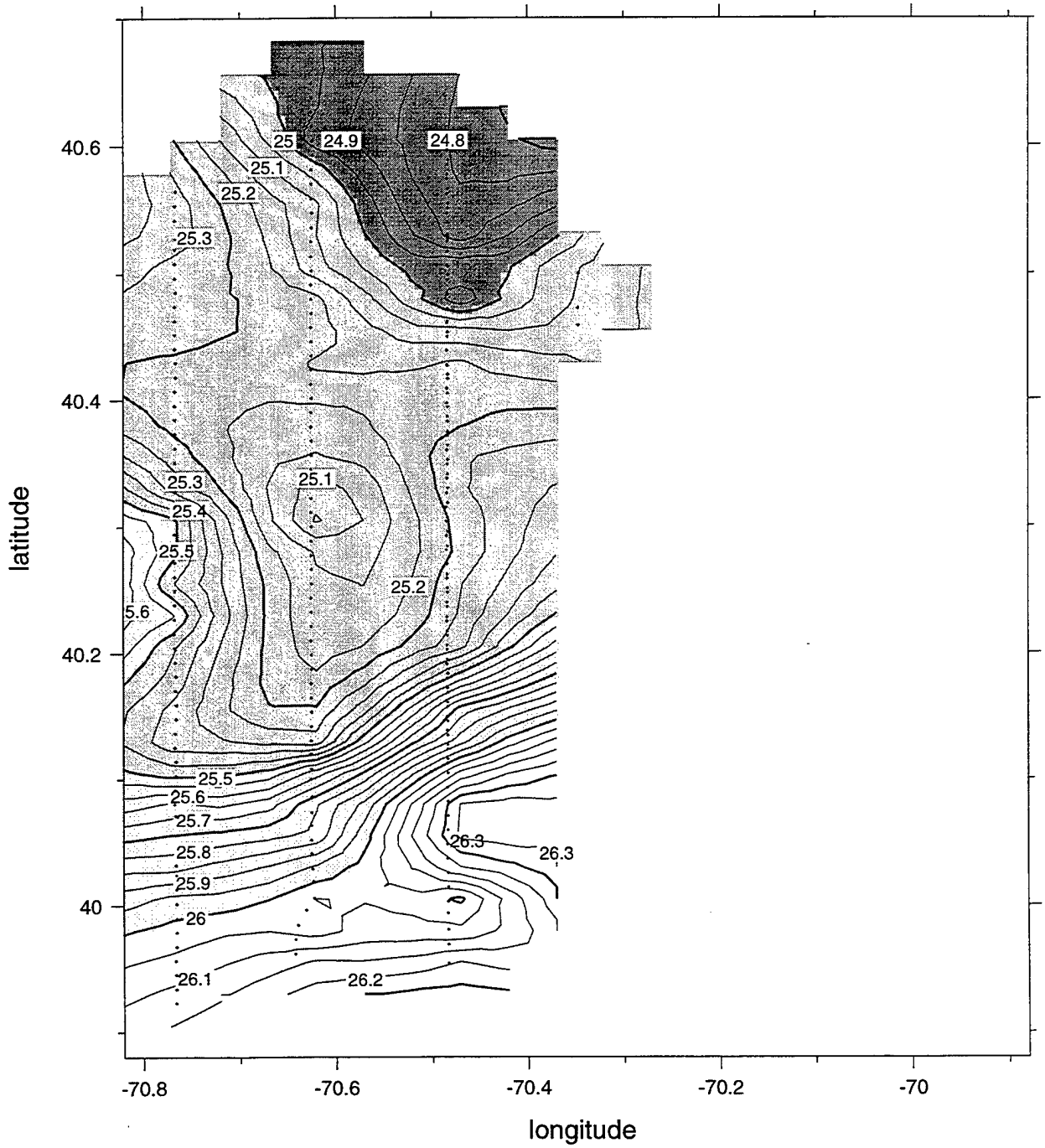


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 55 dbar

σ_t $(kg\ m^{-3})$

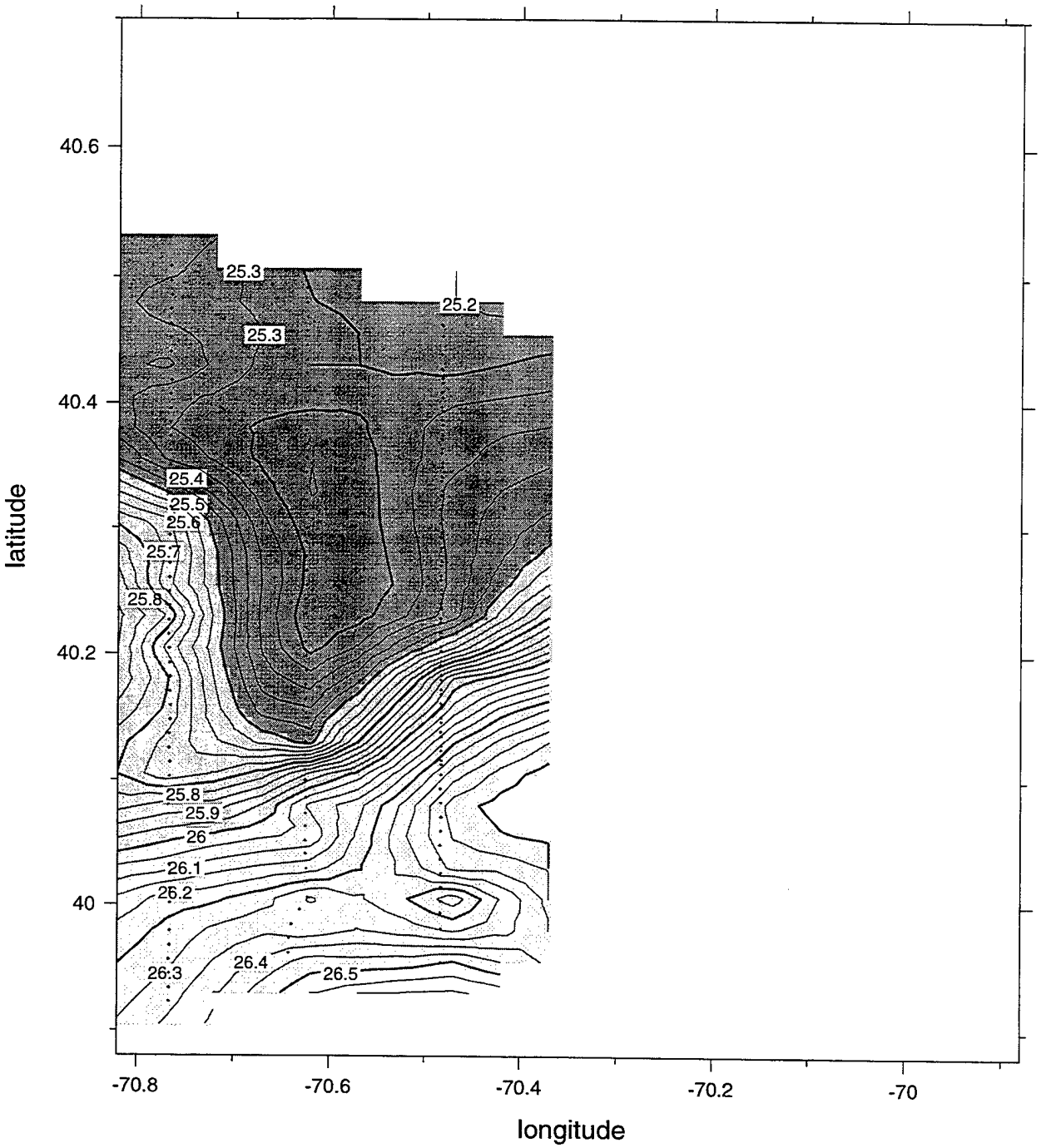


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 65 dbar

σ_t $(kg\ m^{-3})$

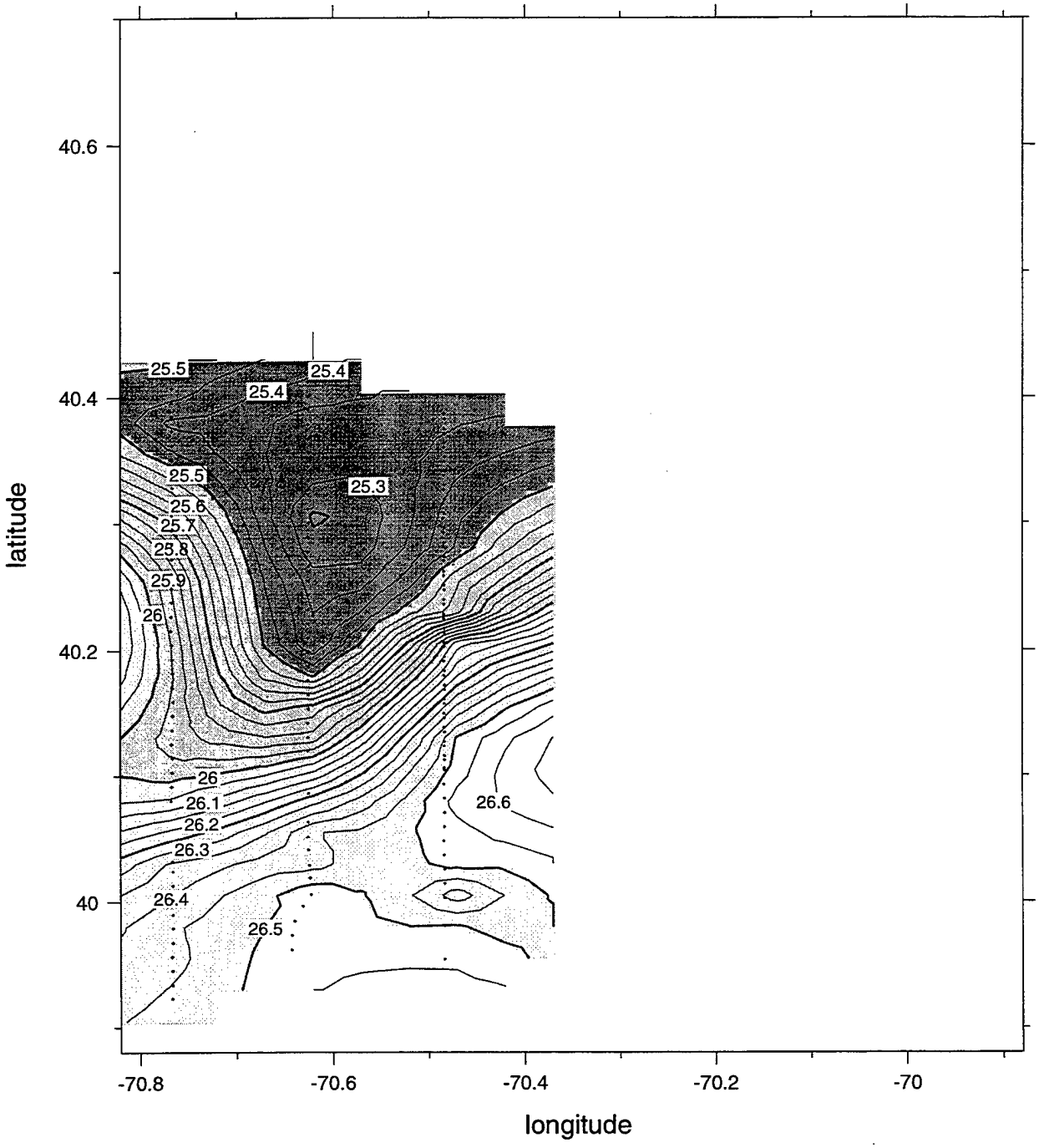


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 75 dbar

σ_t $(kg\ m^{-3})$

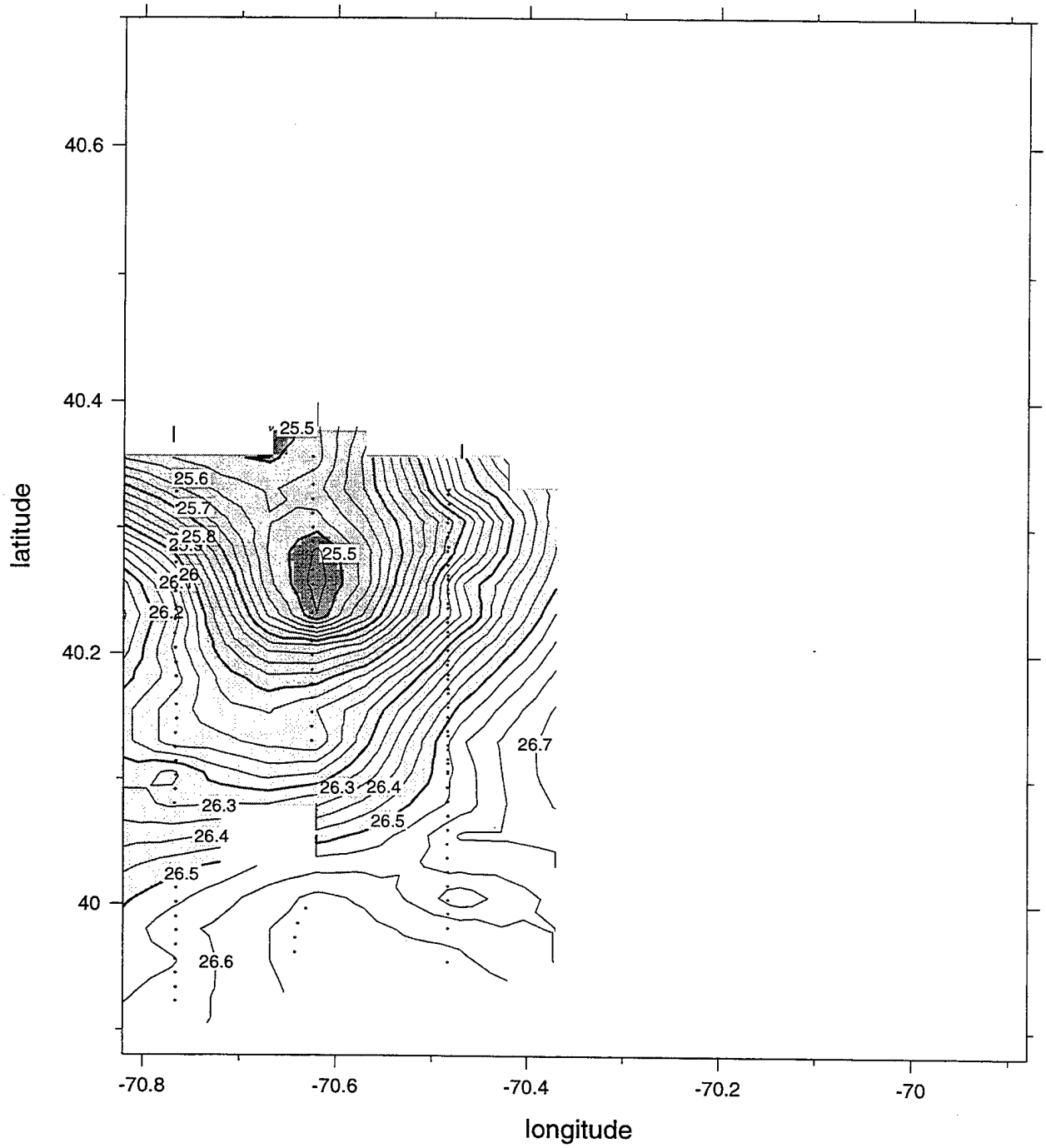


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 85 dbar

σ_t $(kg\ m^{-3})$

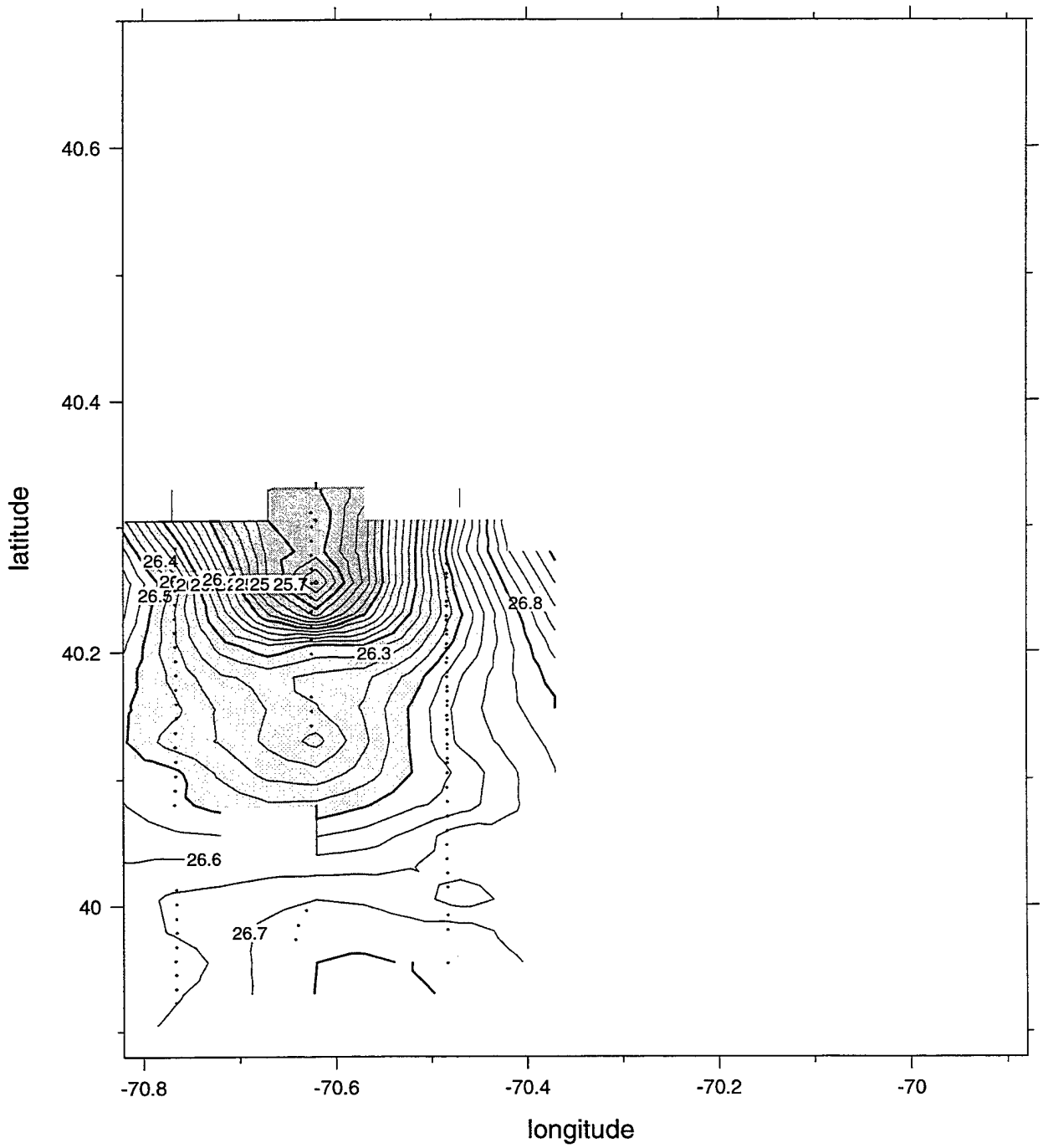


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 95 dbar

σ_t $(kg\ m^{-3})$

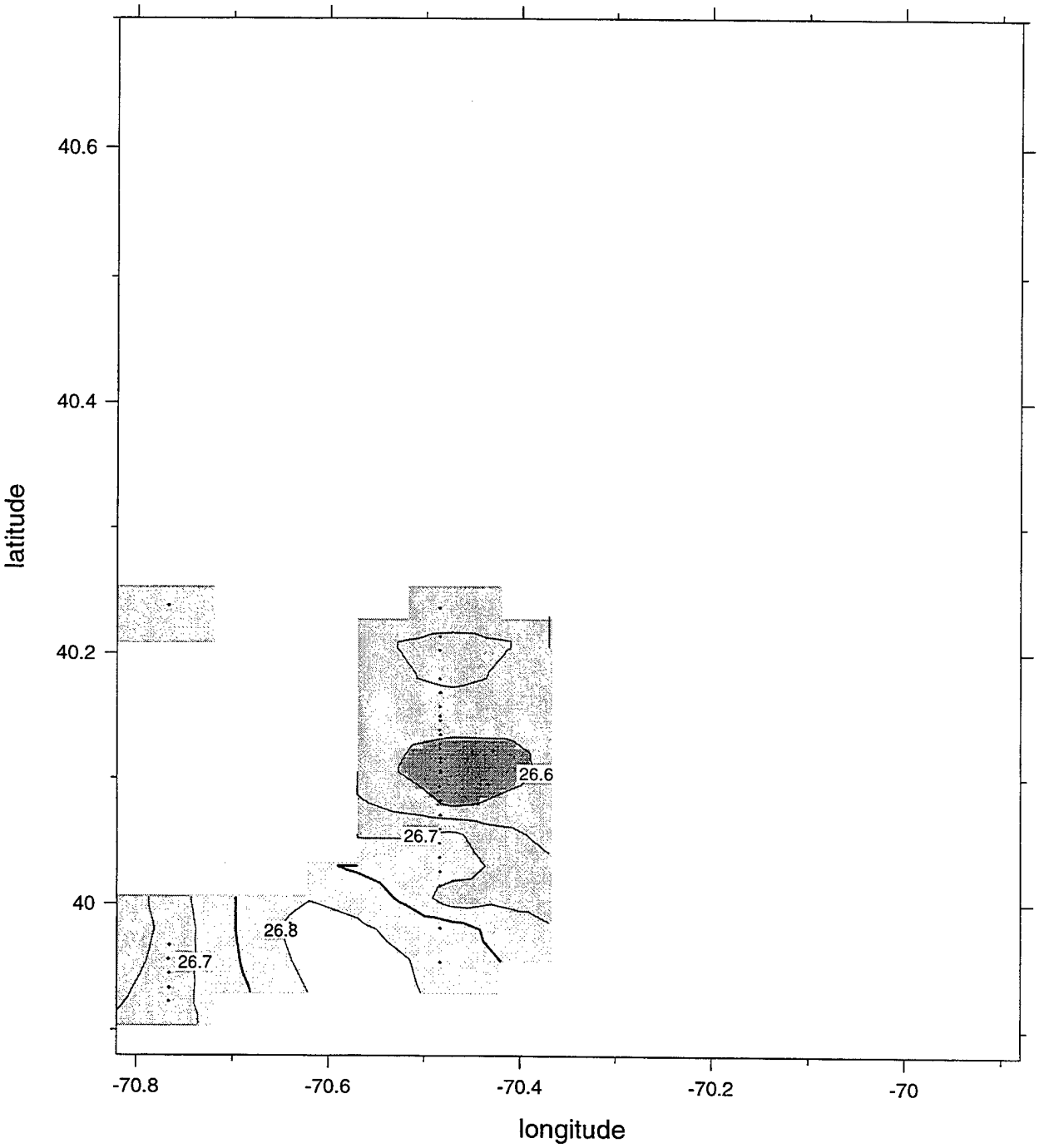


E9608 Big Box 2

20-Aug-96 17:05:39 - 21-Aug-96 21:57:57

Map View at 105 dbar

σ_t $(kg\ m^{-3})$

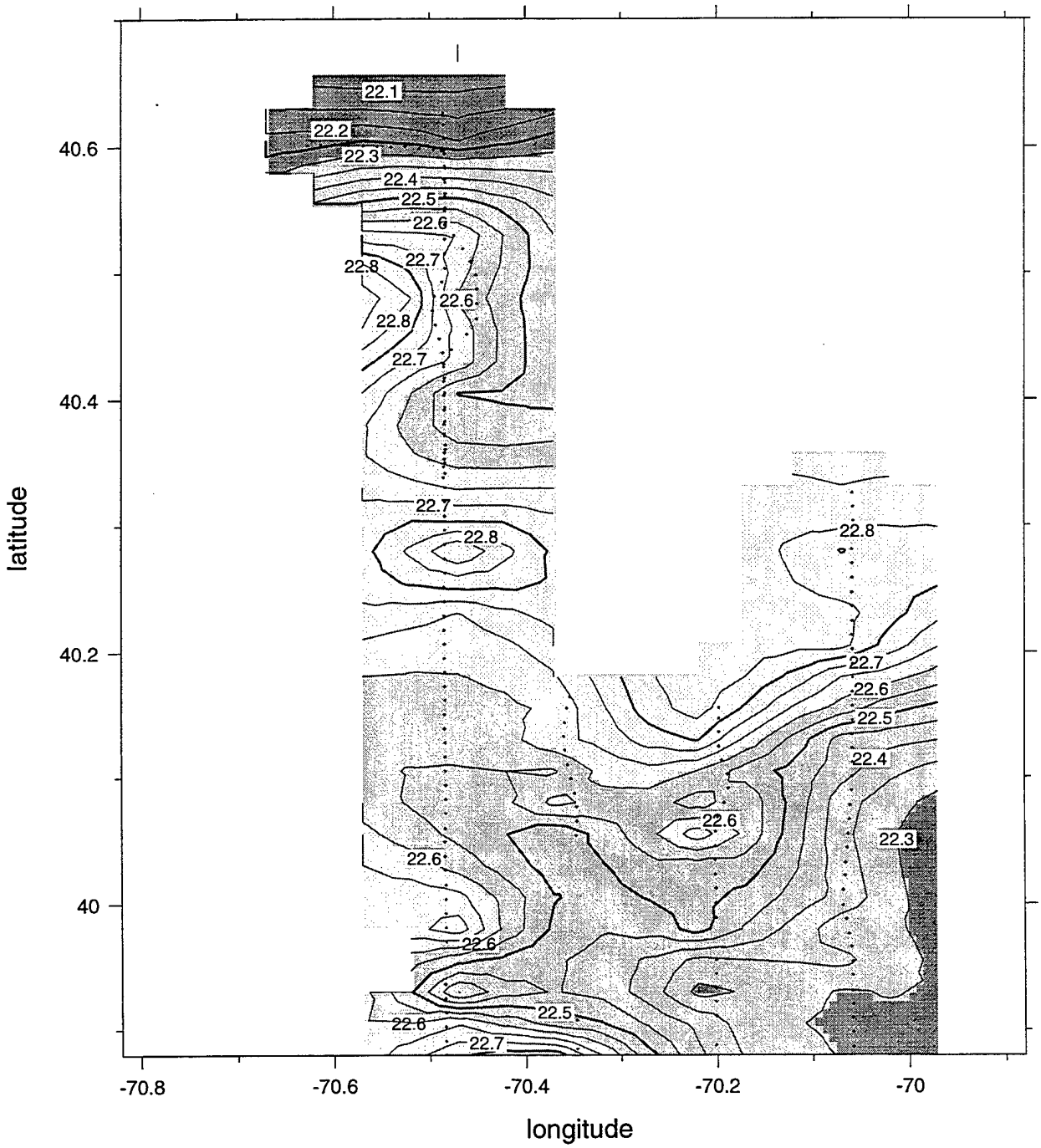


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 5 dbar

σ_t $(kg\ m^{-3})$

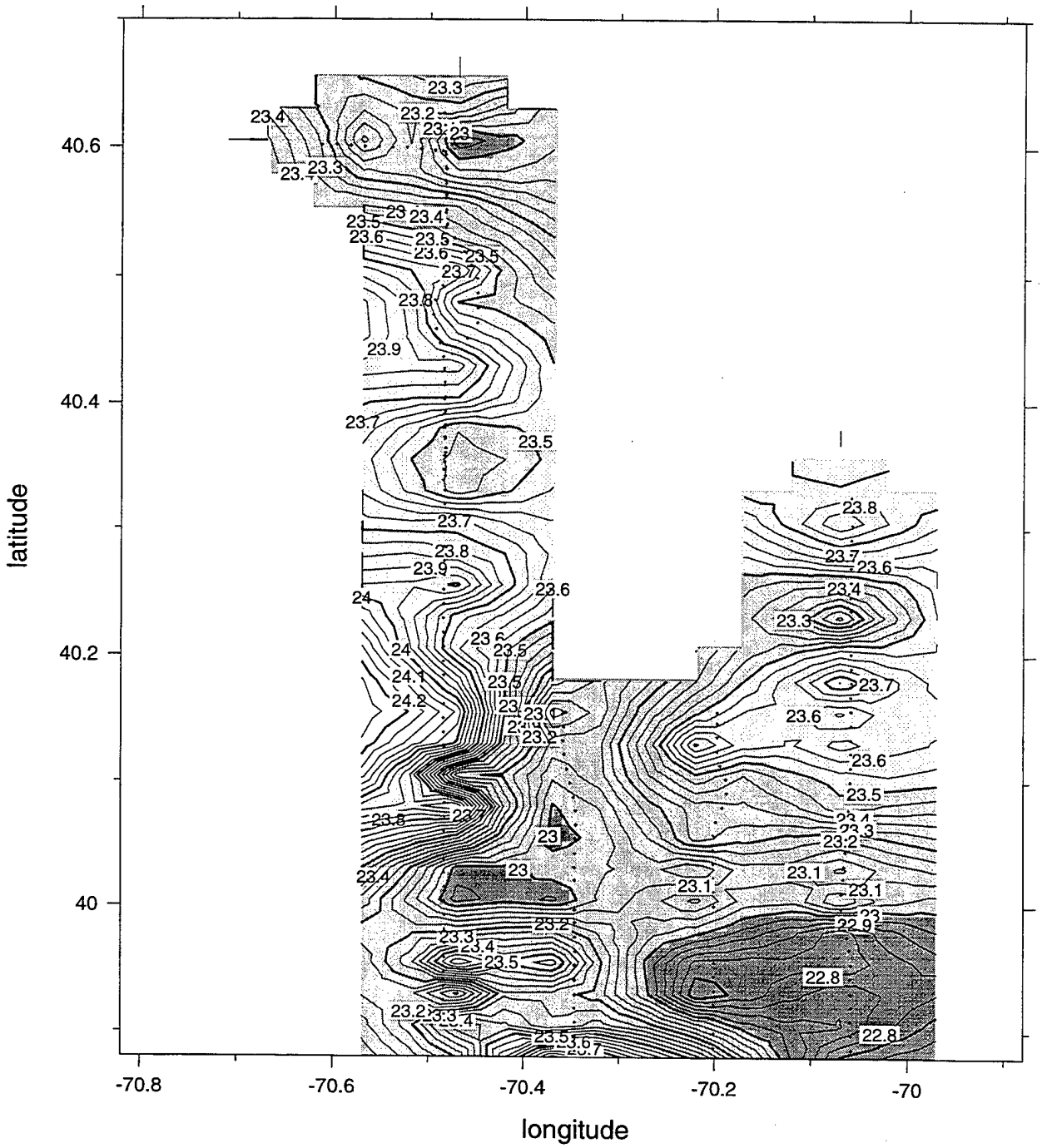


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 15 dbar

σ_t $(kg\ m^{-3})$

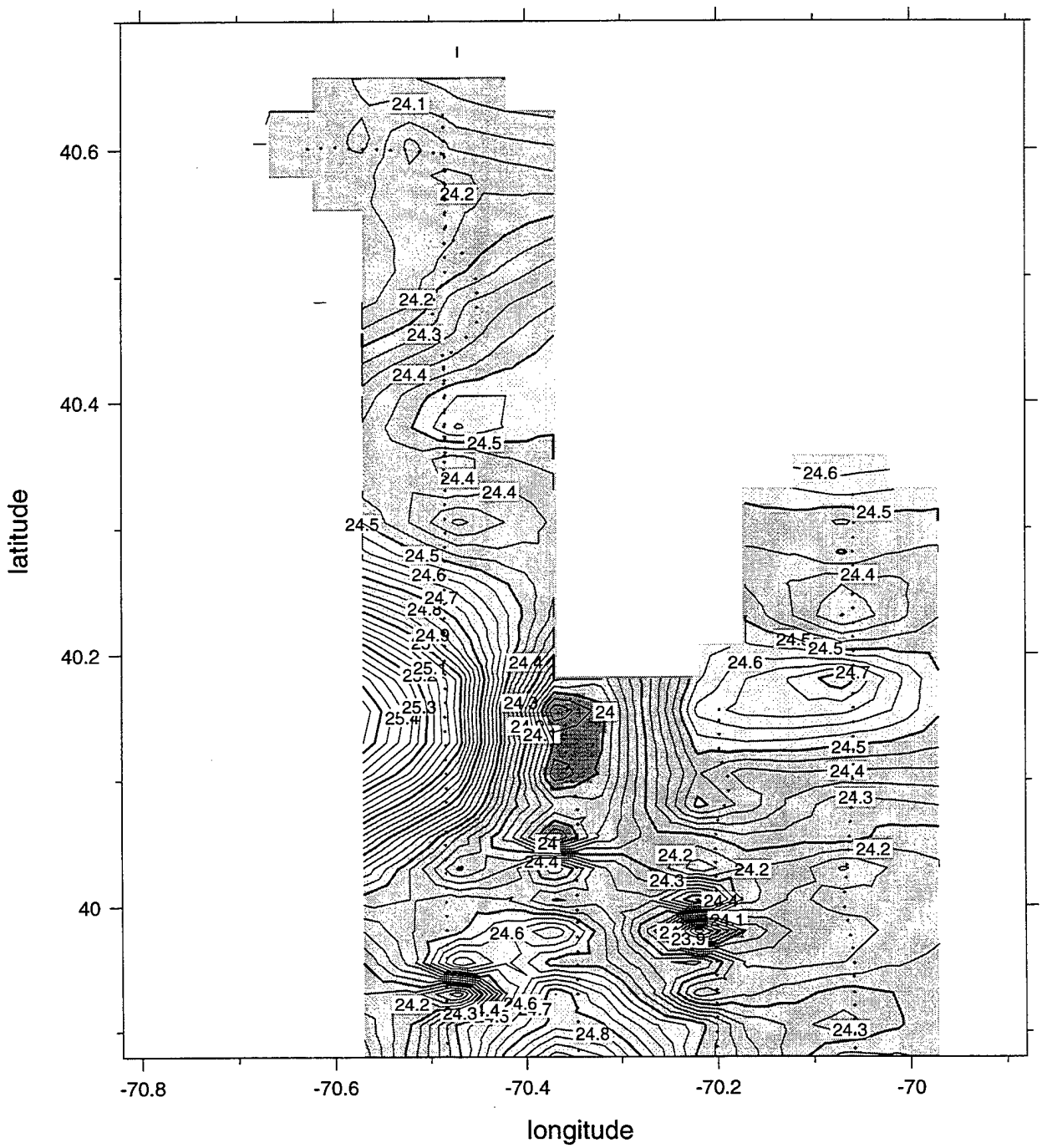


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 25 dbar

σ_t $(kg\ m^{-3})$

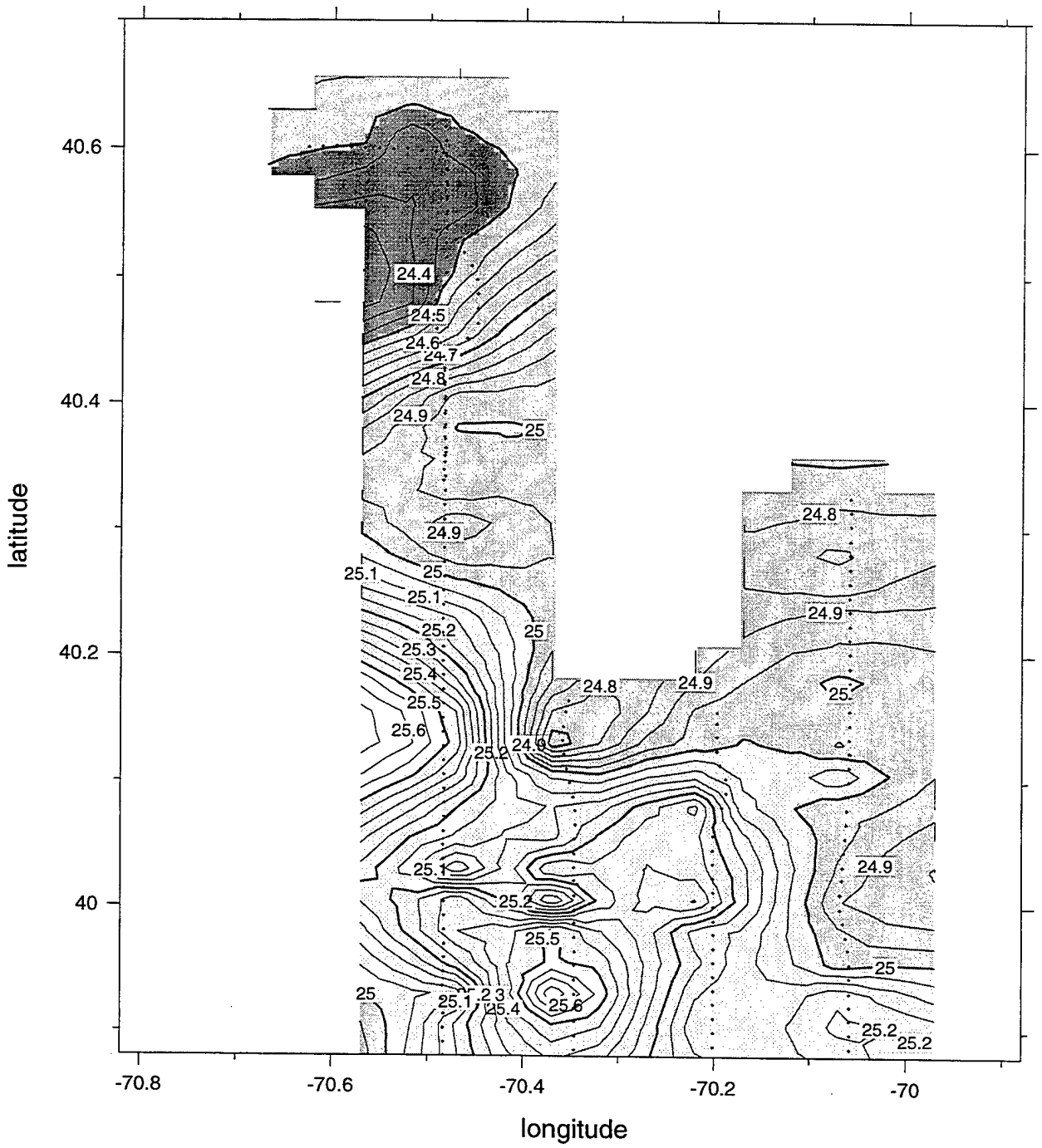


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 35 dbar

σ_t $(kg\ m^{-3})$

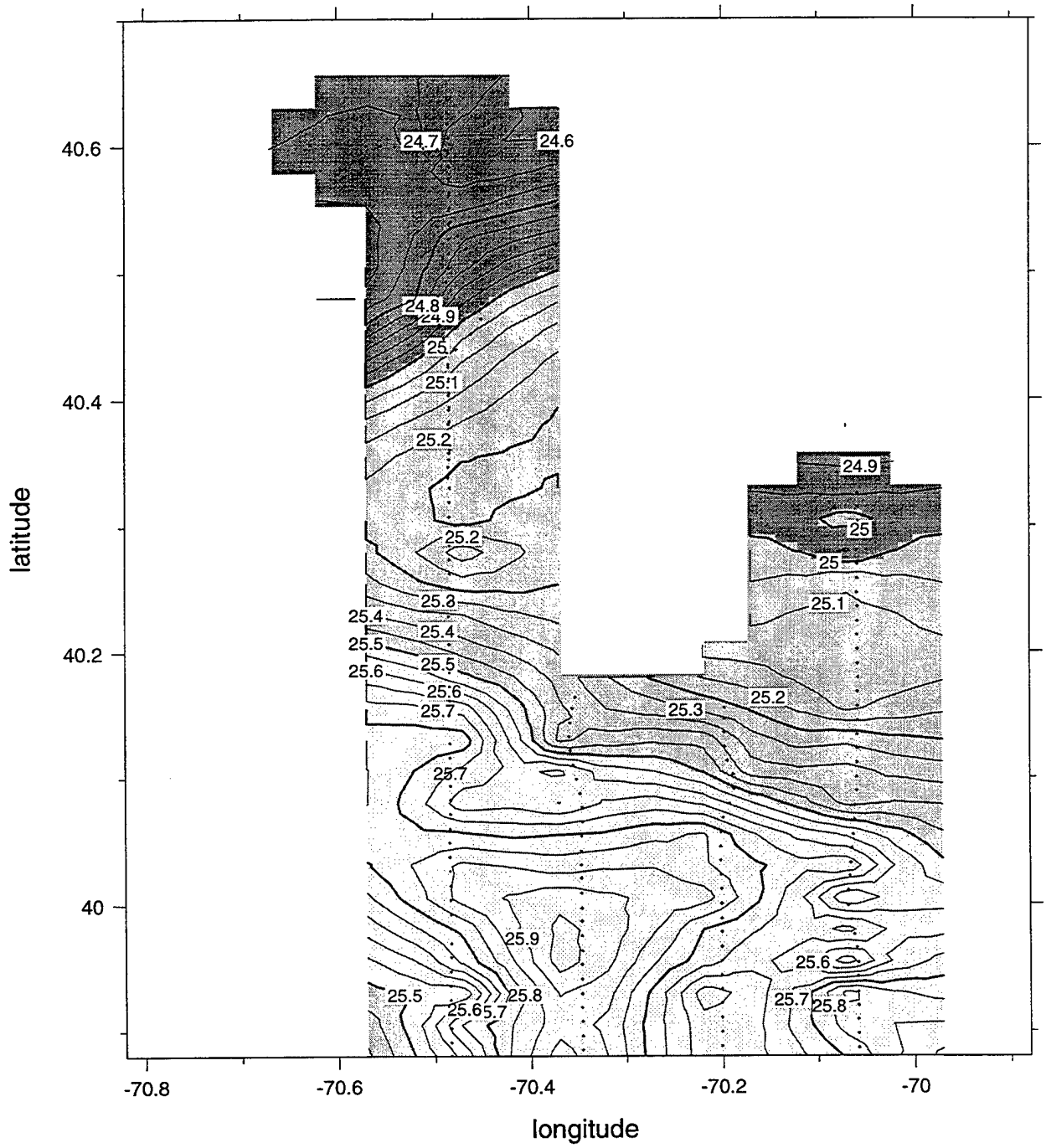


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 45 dbar

σ_t $(kg\ m^{-3})$

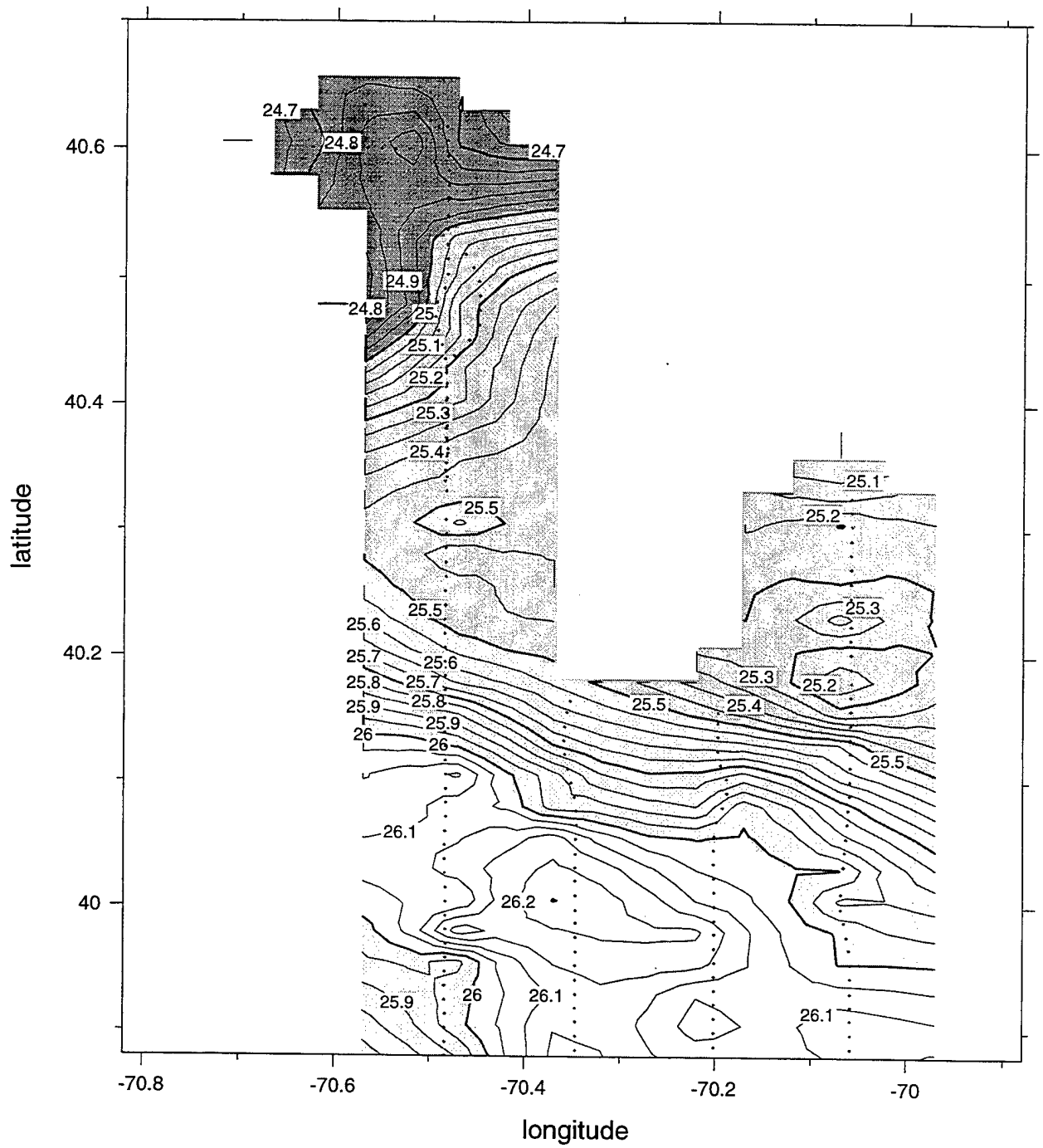


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 55 dbar

σ_t $(kg\ m^{-3})$

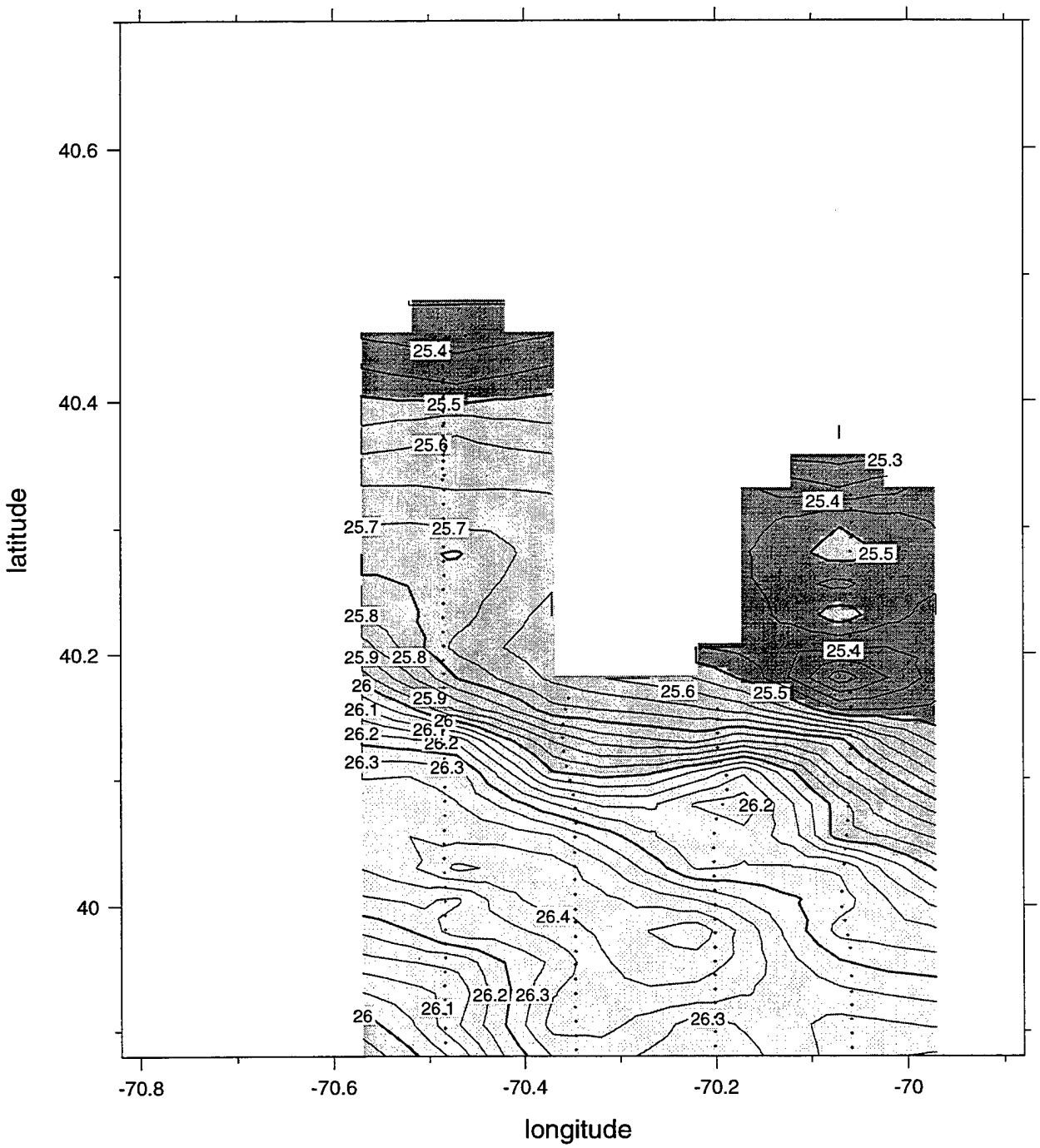


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 65 dbar

σ_t $(kg\ m^{-3})$

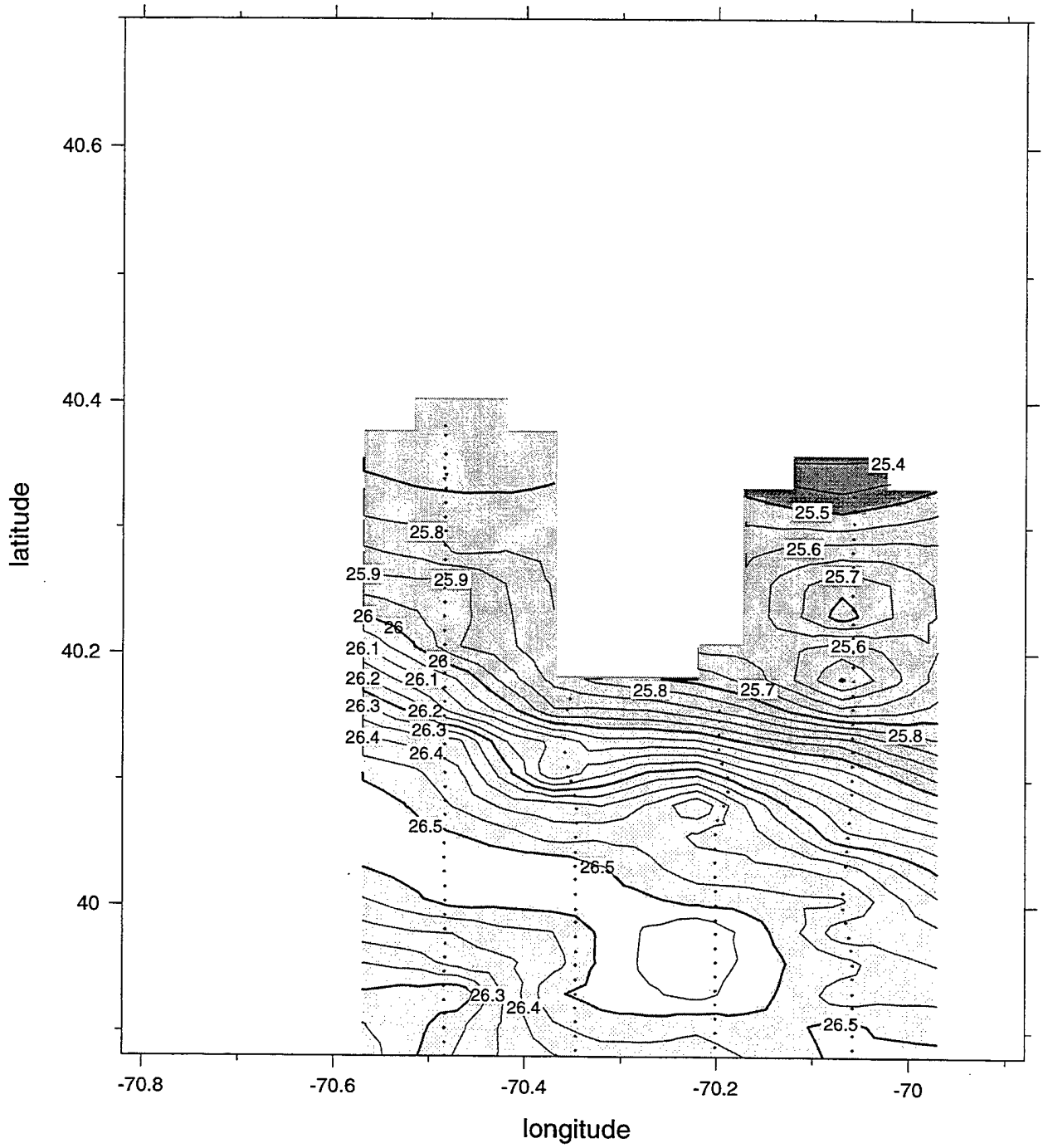


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 75 dbar

σ_t $(kg\ m^{-3})$

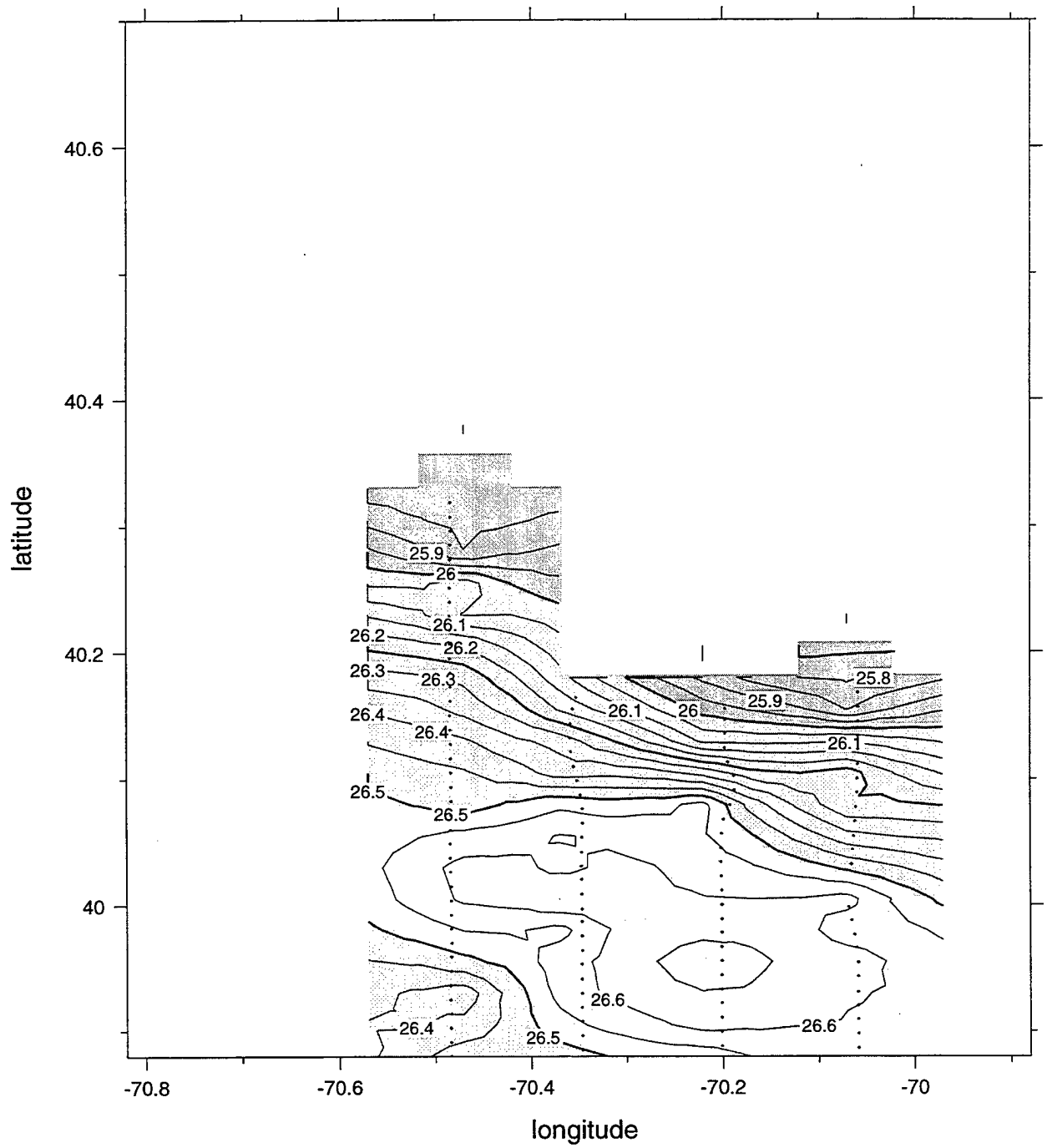


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 85 dbar

σ_t $(kg\ m^{-3})$

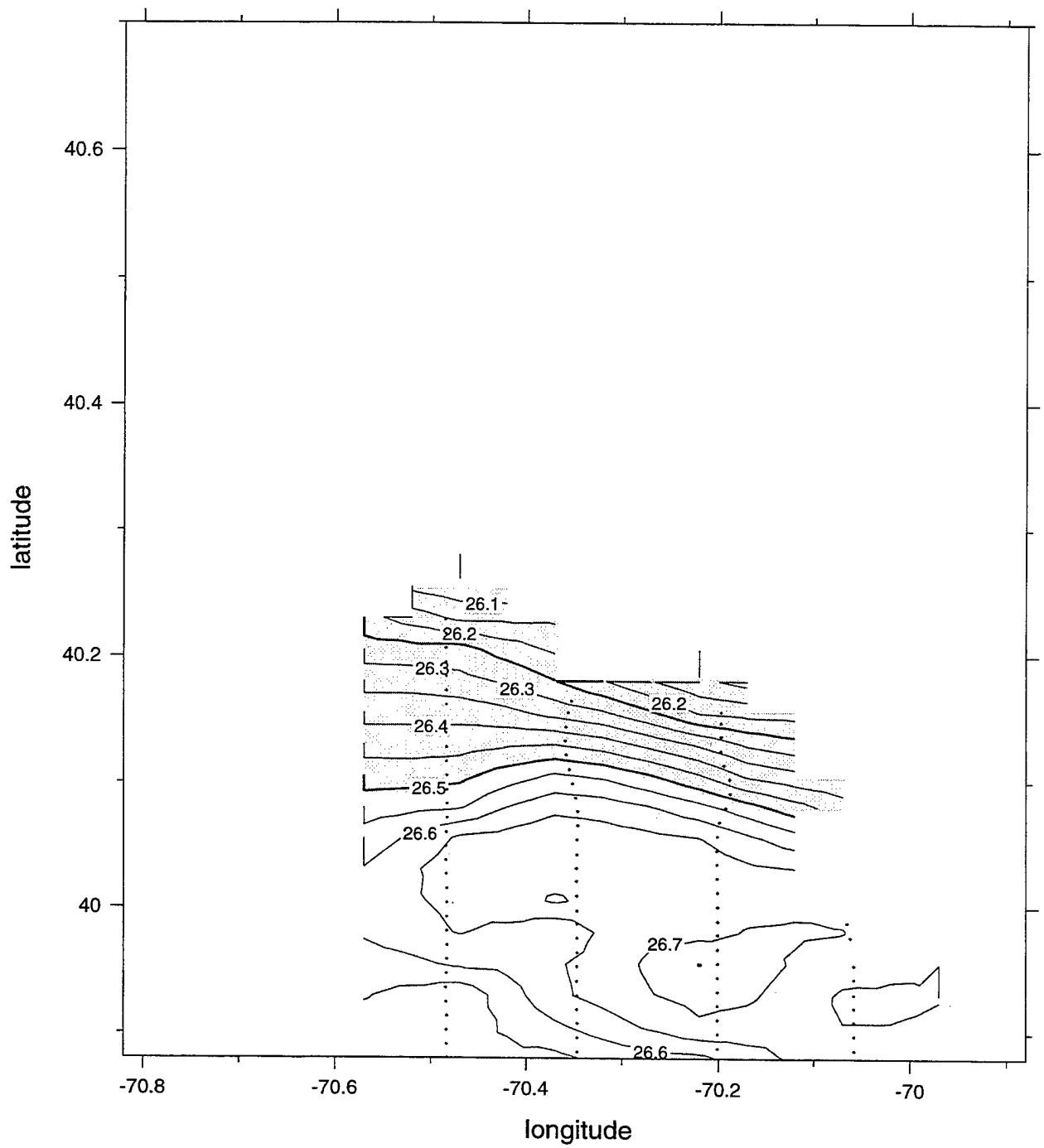


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 95 dbar

σ_t $(kg\ m^{-3})$

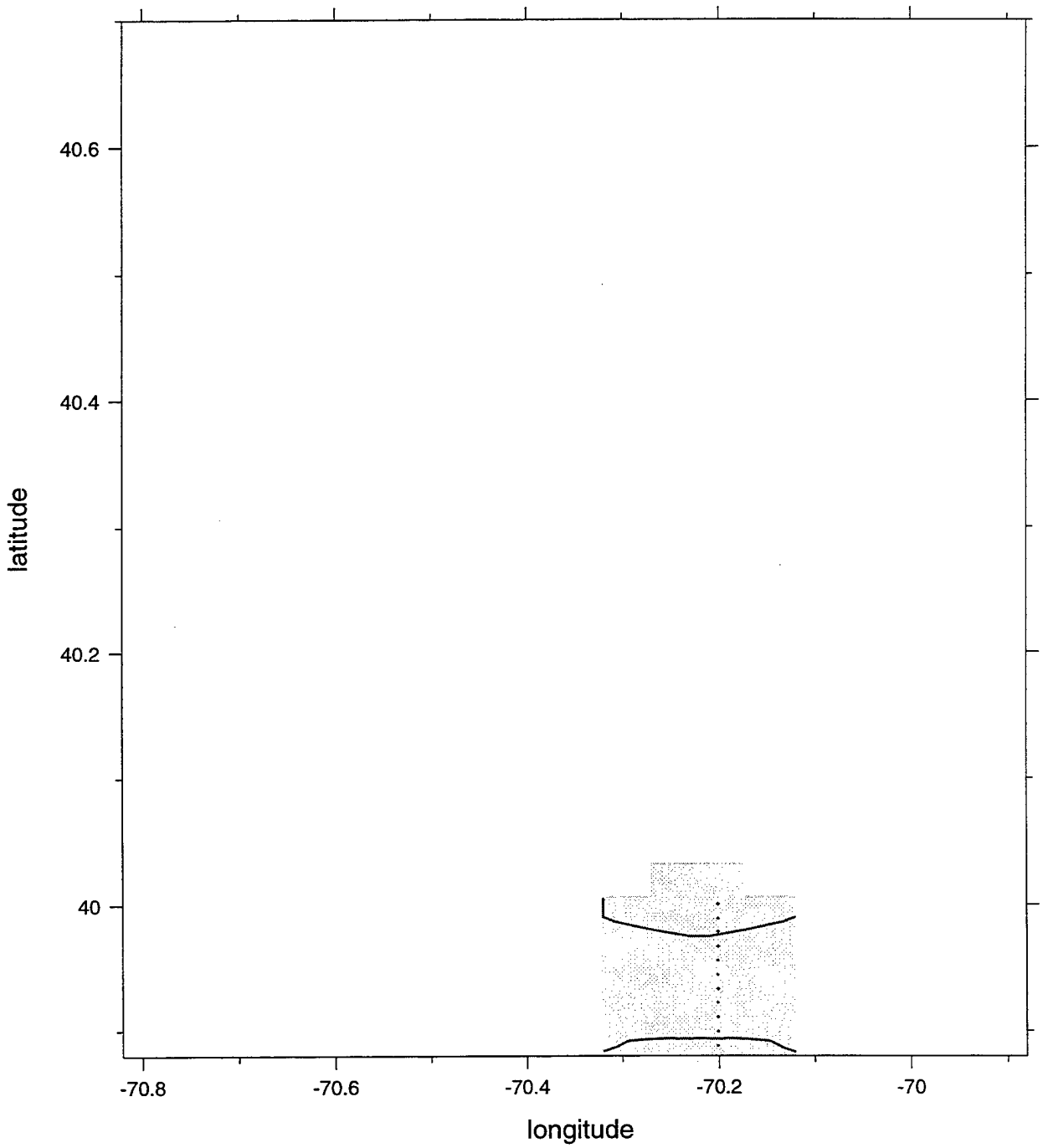


E9608 Big Box 3

31-Aug-96 04:54:18 - 01-Sep-96 11:03:50

Map View at 105 dbar

σ_t $(kg\ m^{-3})$



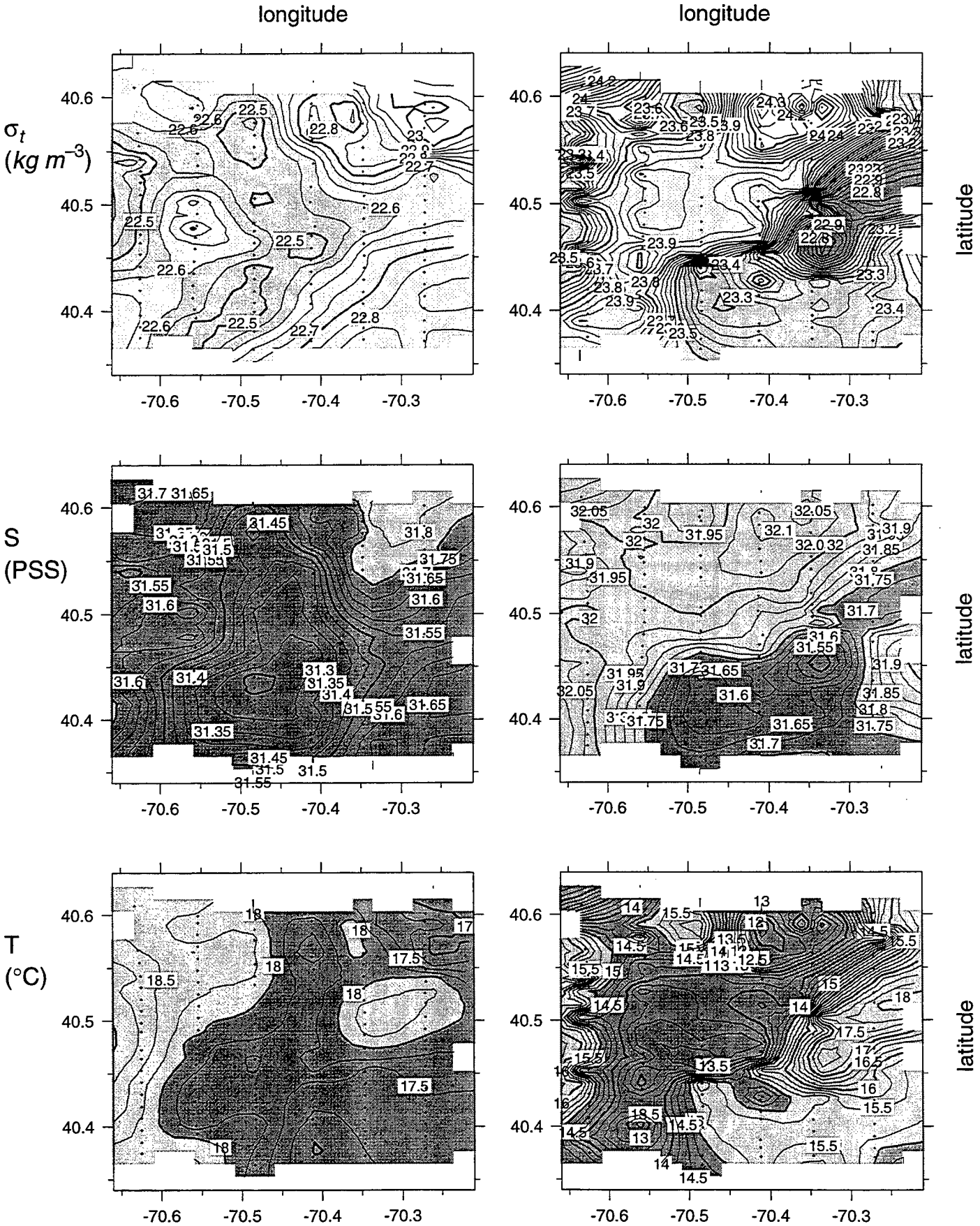
E9608 Small Box Maps of Temperature, Salinity and σ_t

E9608 Small Box 1

15-Aug-96 23:24:49 - 16-Aug-96 15:26:14

Map View at 5 dbar

Map View at 15 dbar

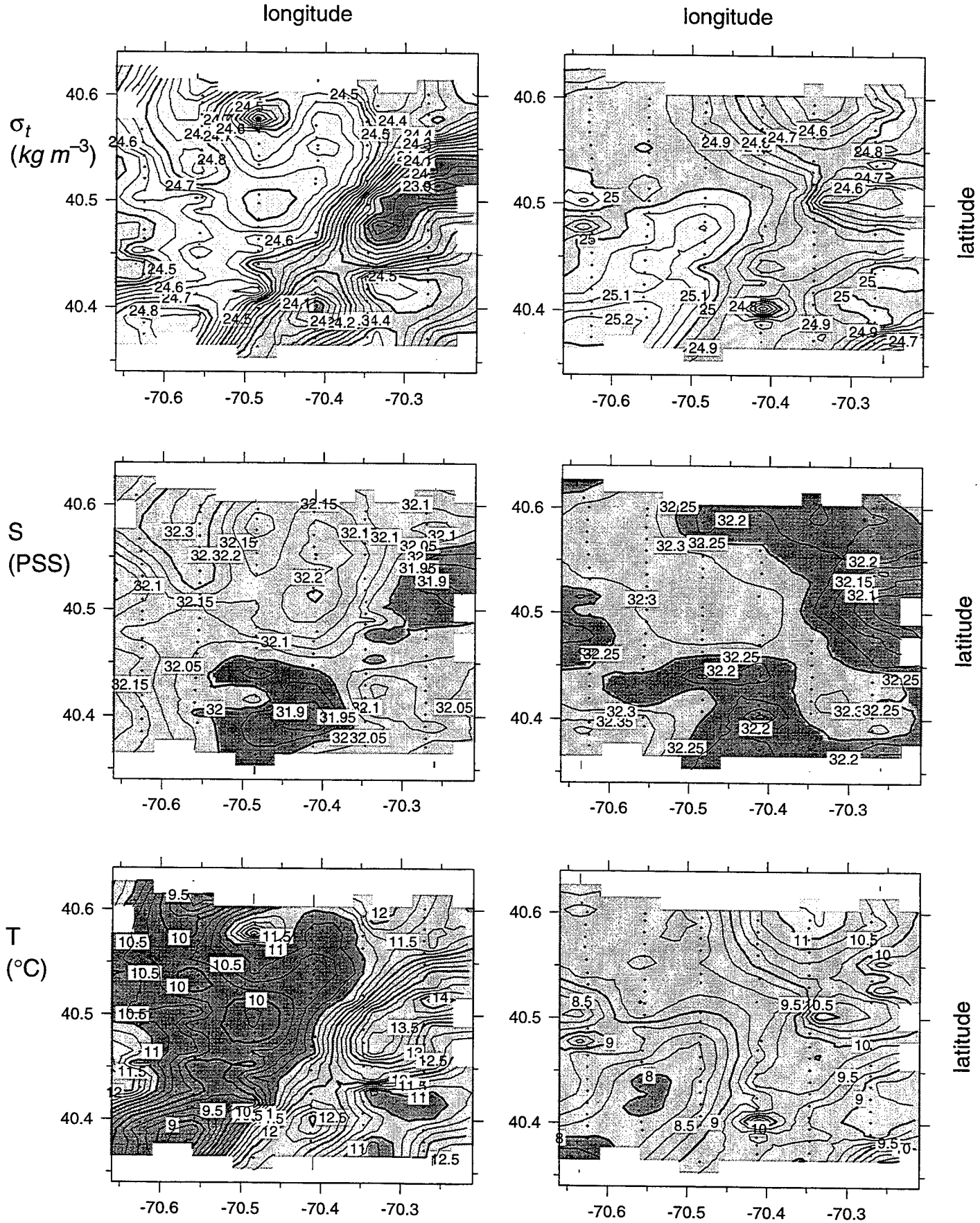


E9608 Small Box 1

15-Aug-96 23:24:49 - 16-Aug-96 15:26:14

Map View at 25 dbar

Map View at 35 dbar

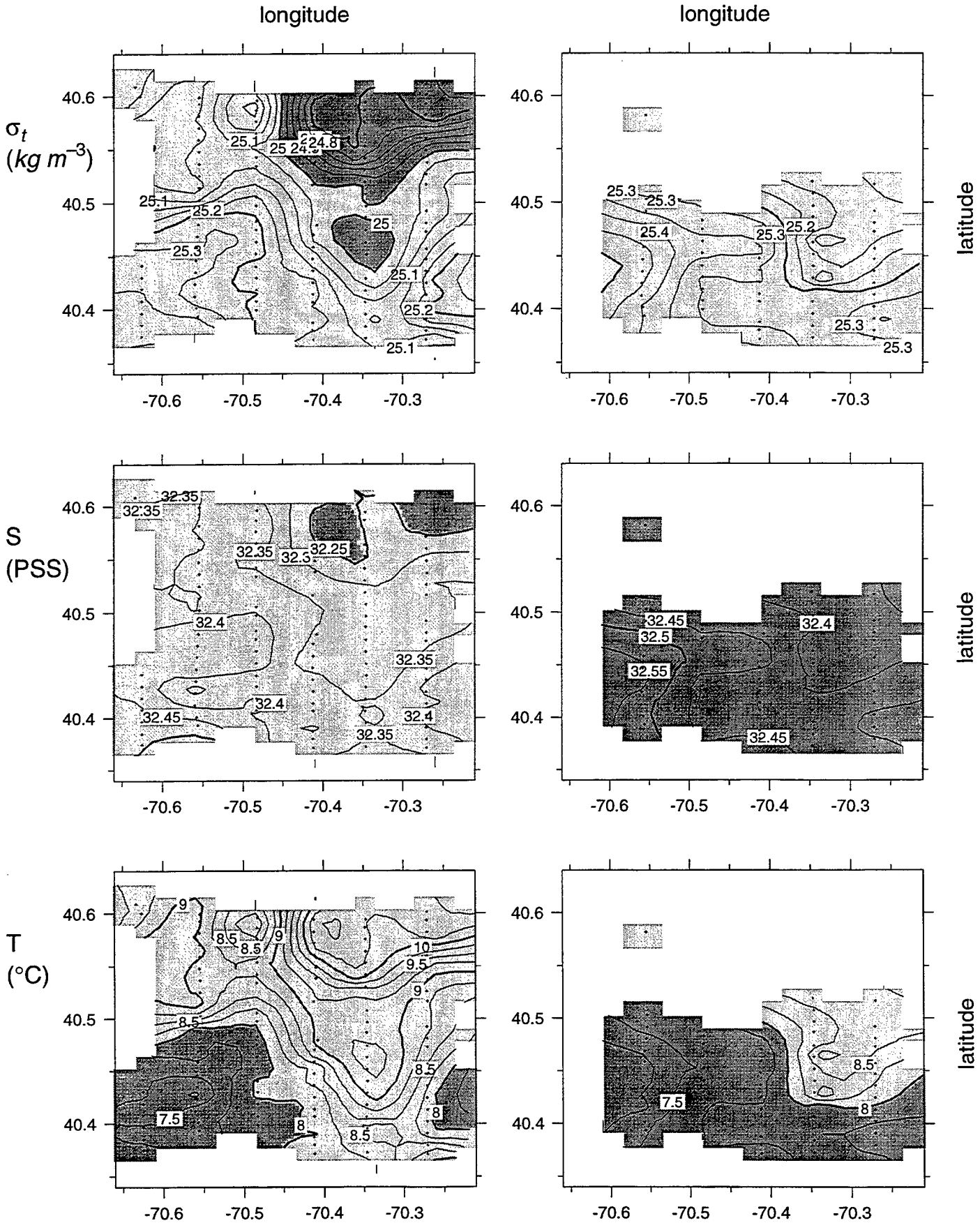


E9608 Small Box 1

15-Aug-96 23:24:49 - 16-Aug-96 15:26:14

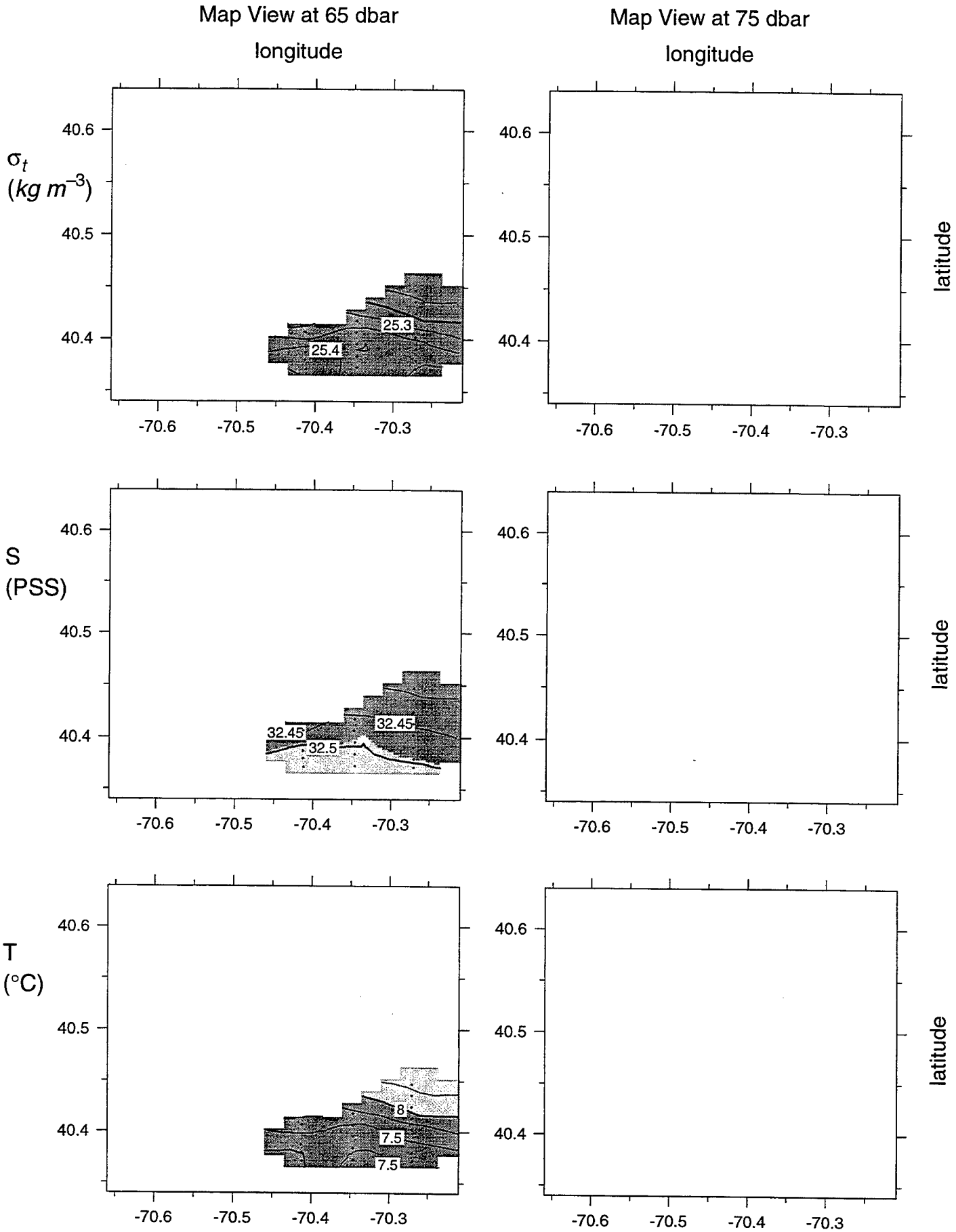
Map View at 45 dbar

Map View at 55 dbar



E9608 Small Box 1

15-Aug-96 23:24:49 - 16-Aug-96 15:26:14

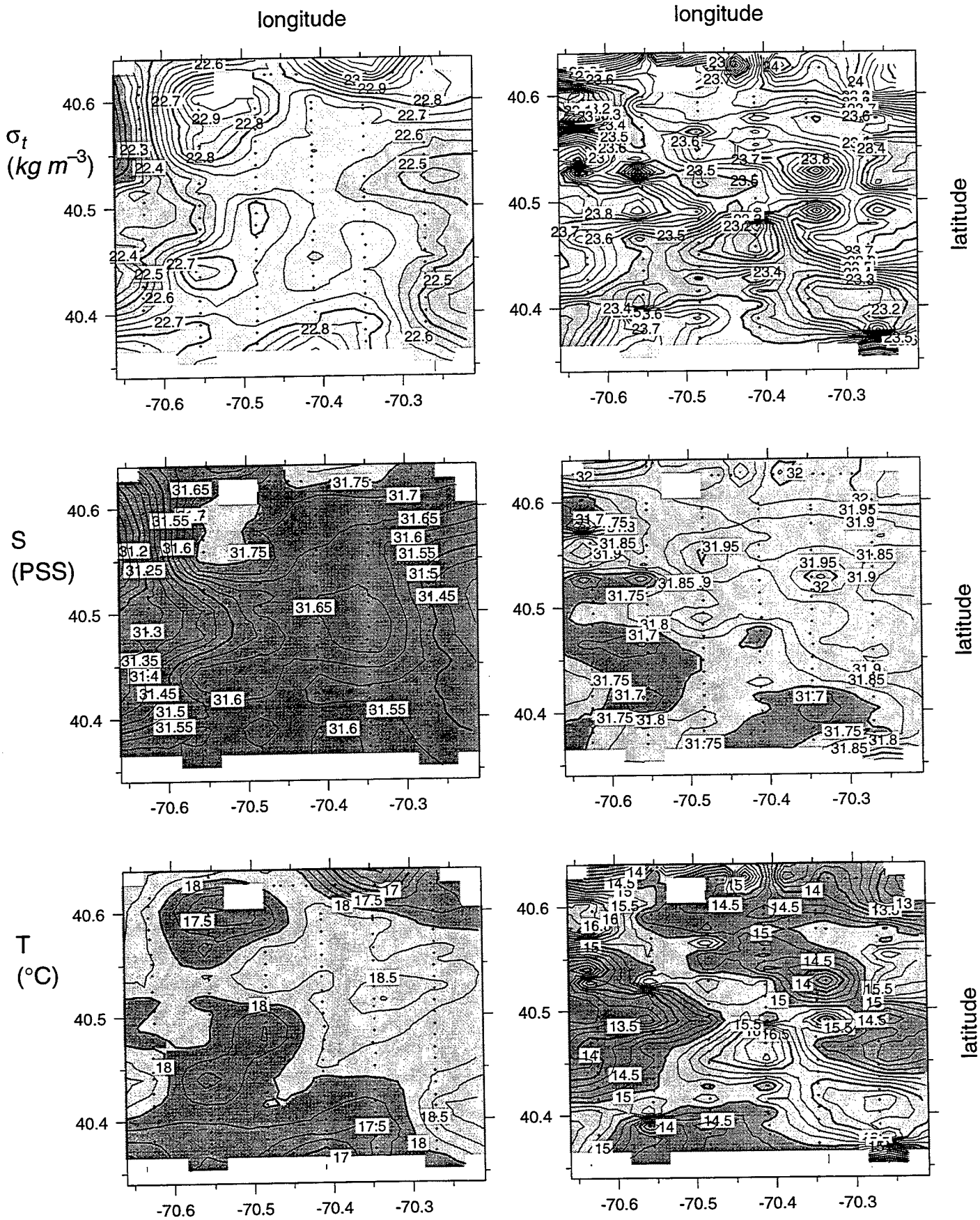


E9608 Small Box 2

18-Aug-96 08:29:23 - 19-Aug-96 03:08:27

Map View at 5 dbar

Map View at 15 dbar

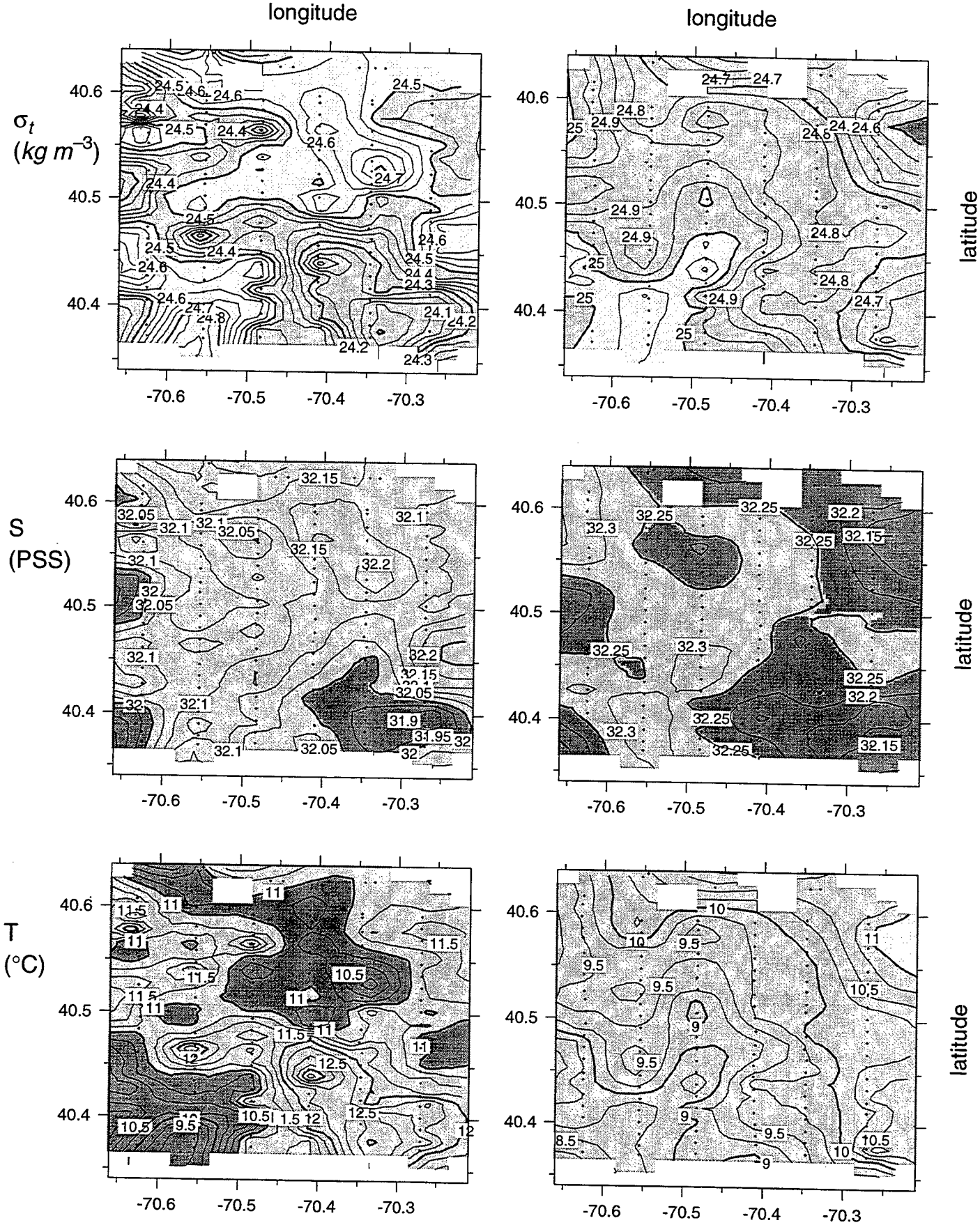


E9608 Small Box 2

18-Aug-96 08:29:23 - 19-Aug-96 03:08:27

Map View at 25 dbar

Map View at 35 dbar

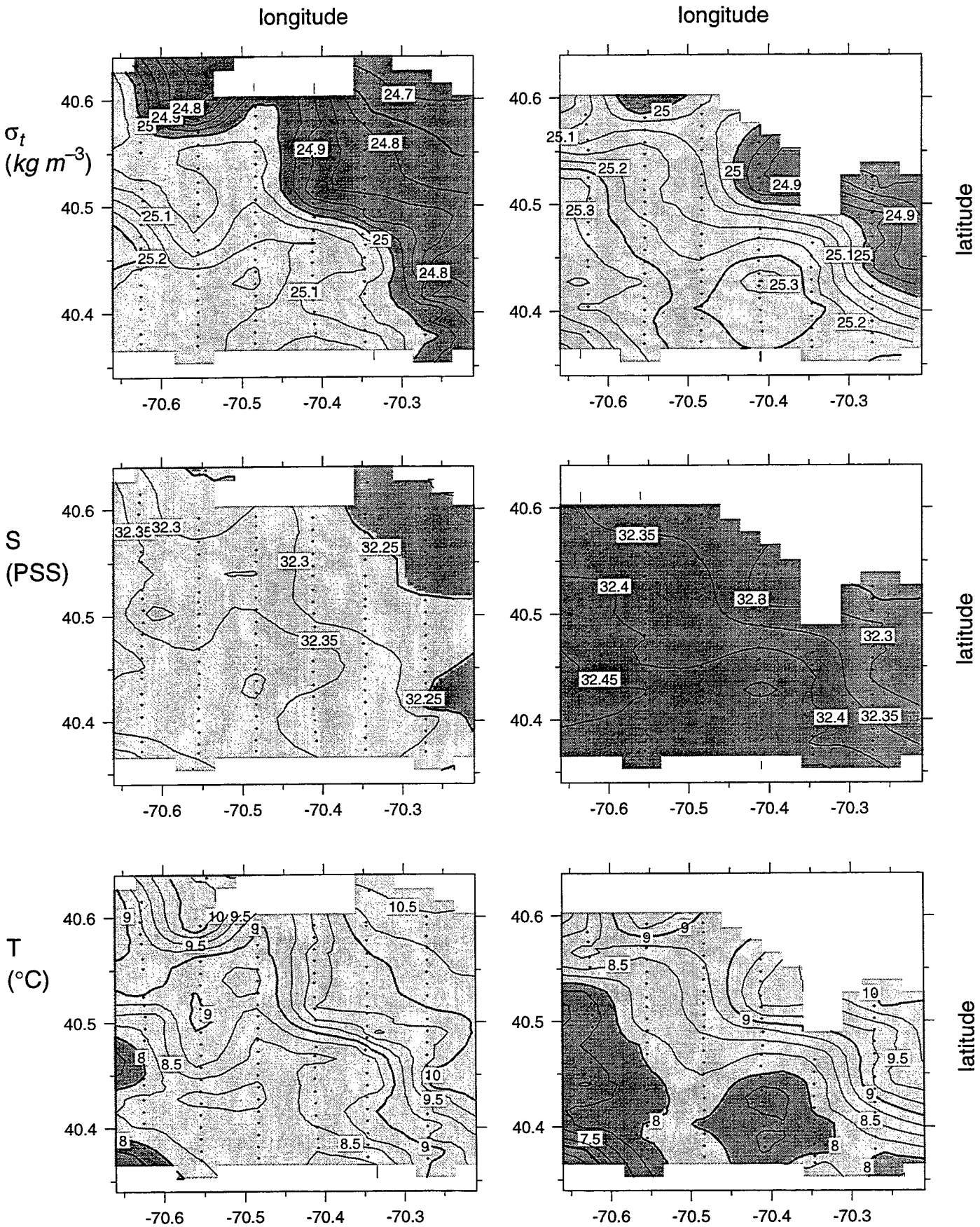


E9608 Small Box 2

18-Aug-96 08:29:23 - 19-Aug-96 03:08:27

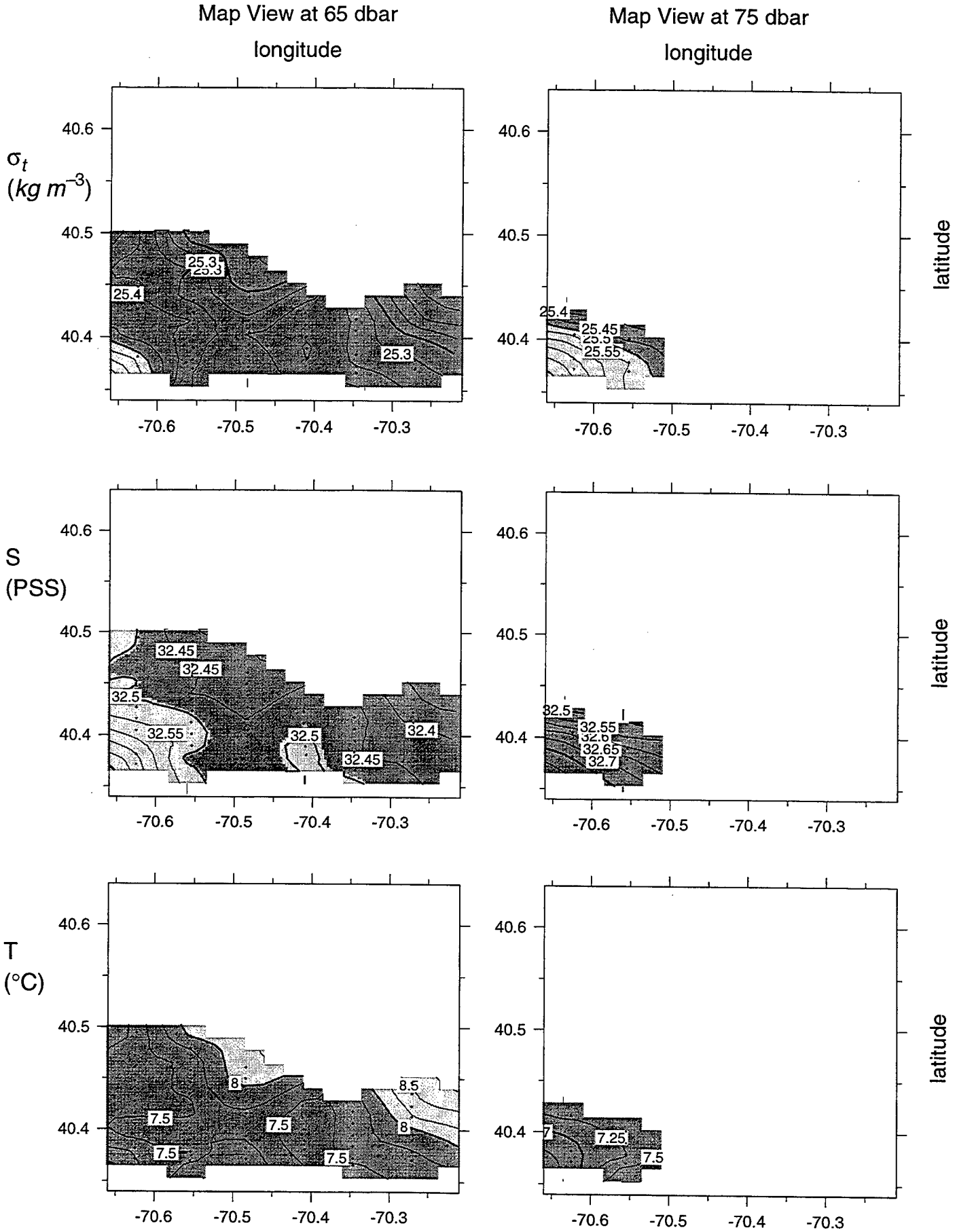
Map View at 45 dbar

Map View at 55 dbar



E9608 Small Box 2

18-Aug-96 08:29:23 - 19-Aug-96 03:08:27

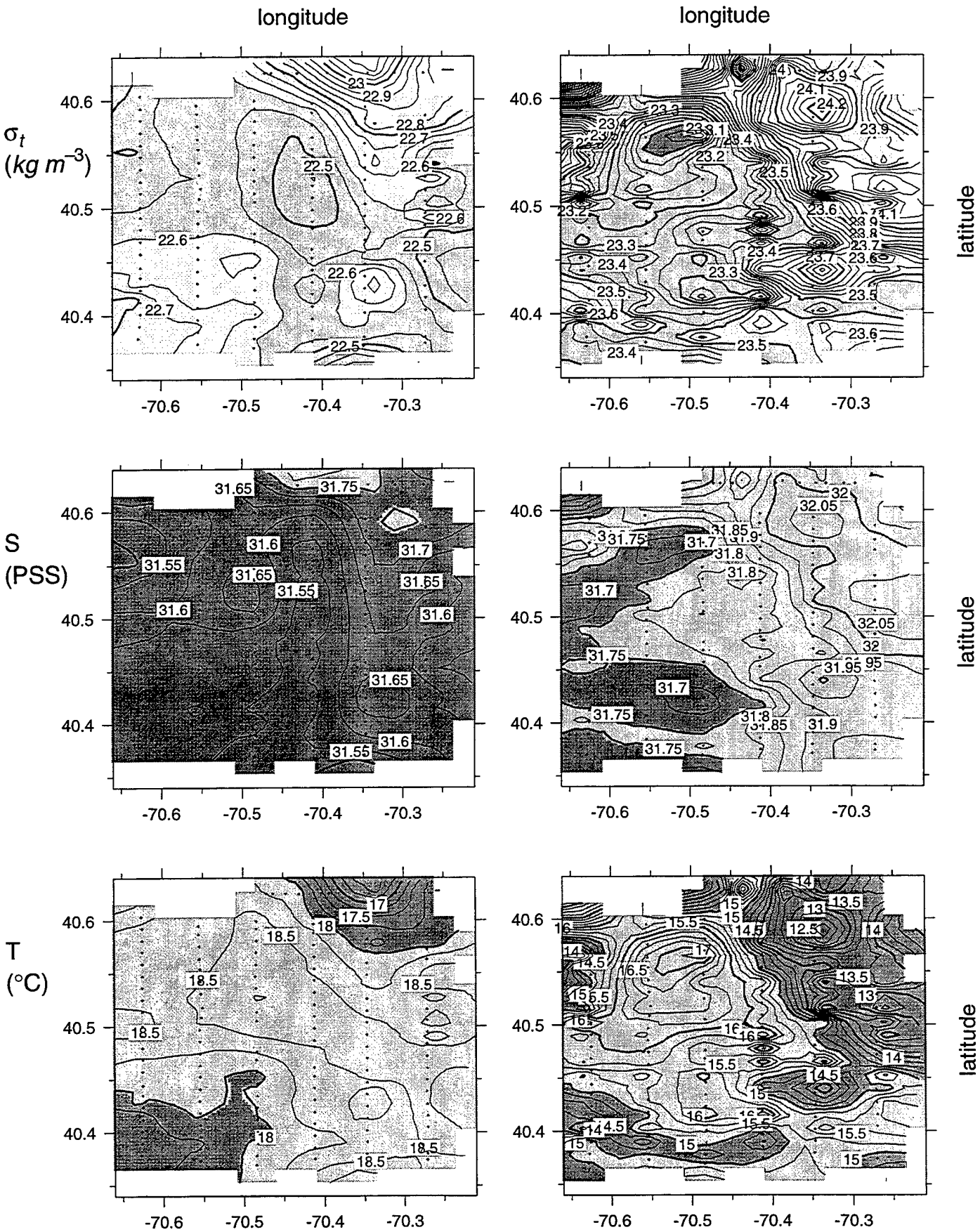


E9608 Small Box 3

19-Aug-96 01:49:13 - 20-Aug-96 14:37:11

Map View at 5 dbar

Map View at 15 dbar

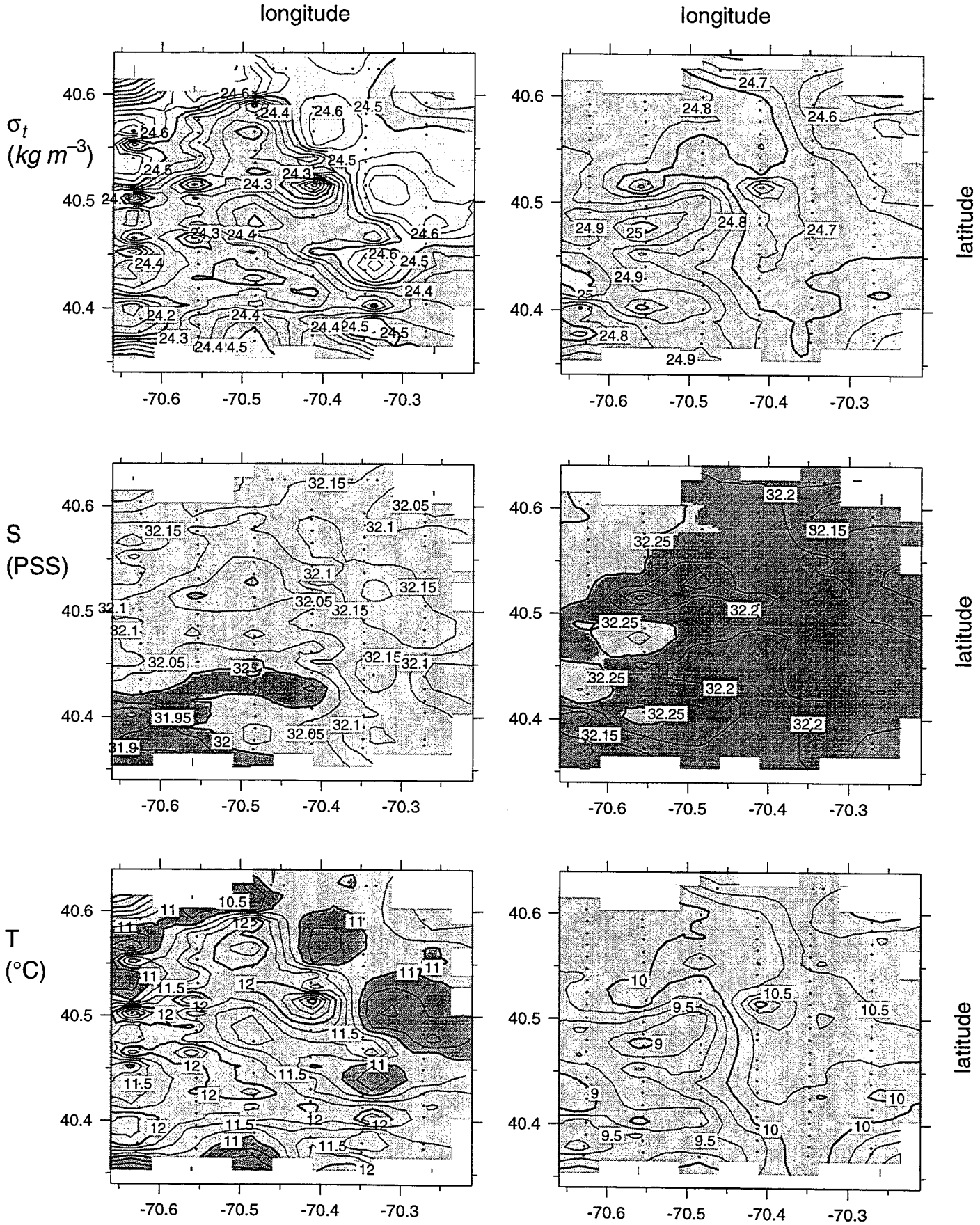


E9608 Small Box 3

19-Aug-96 01:49:13 - 20-Aug-96 14:37:11

Map View at 25 dbar

Map View at 35 dbar

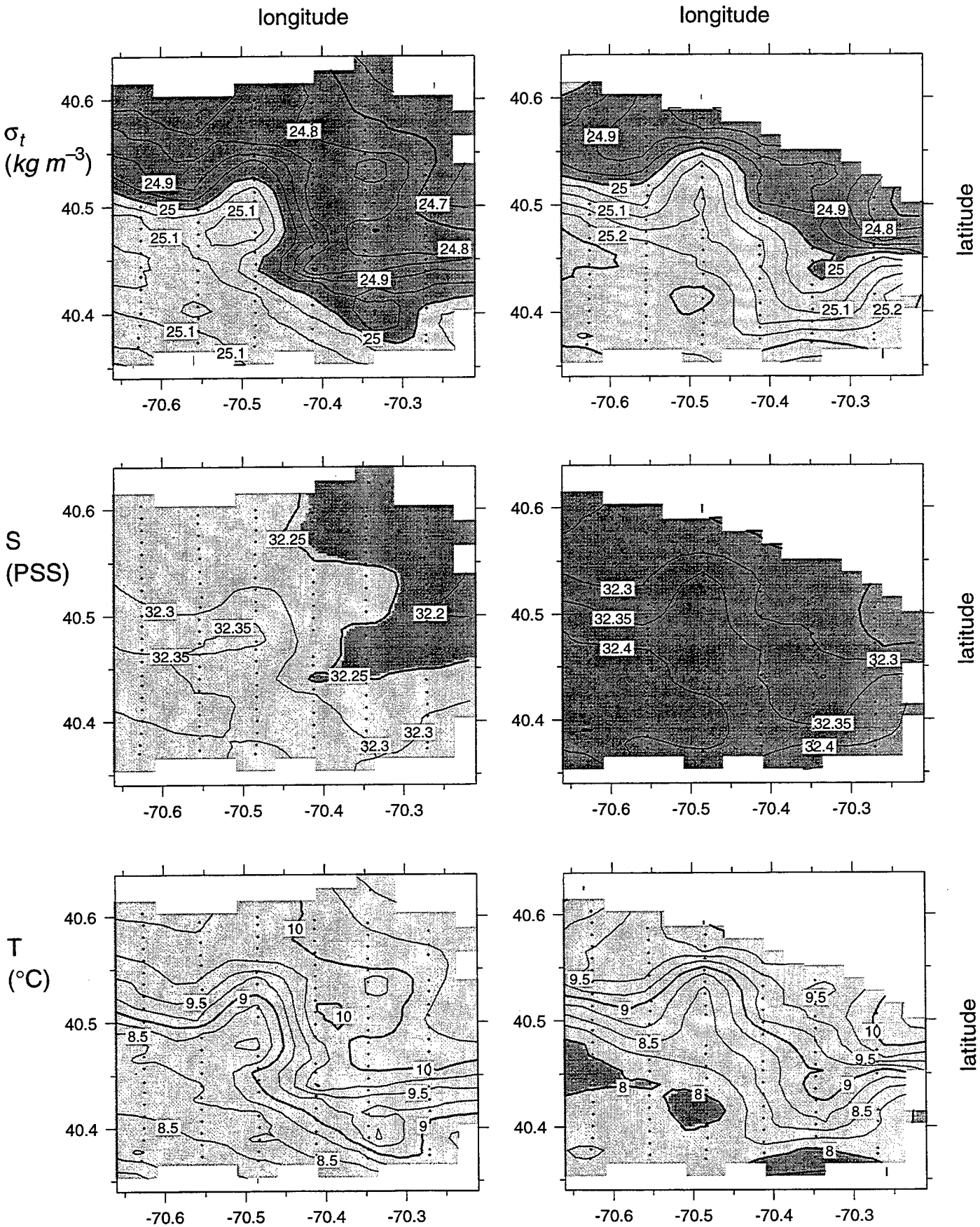


E9608 Small Box 3

19-Aug-96 01:49:13 - 20-Aug-96 14:37:11

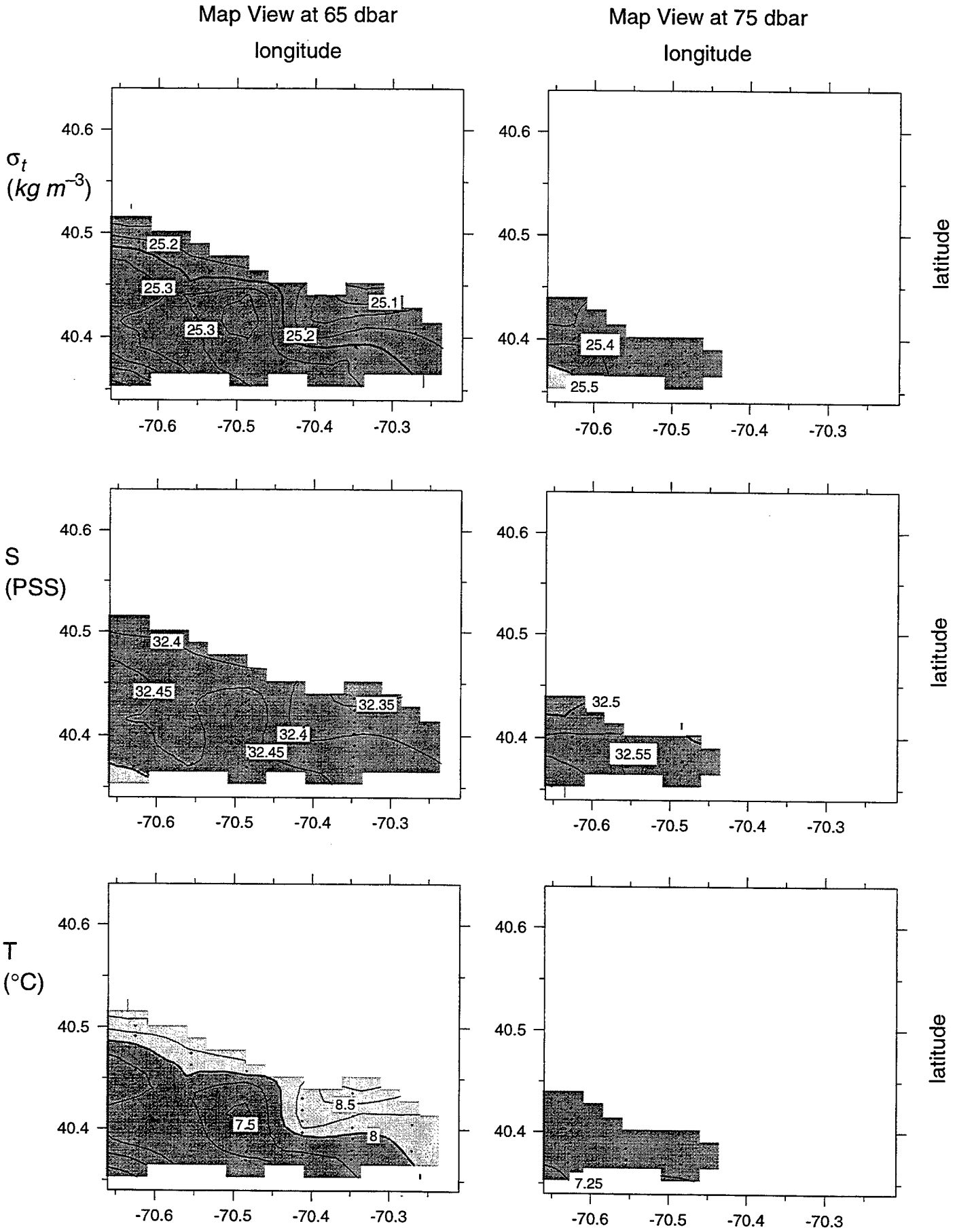
Map View at 45 dbar

Map View at 55 dbar



E9608 Small Box 3

19-Aug-96 01:49:13 - 20-Aug-96 14:37:11

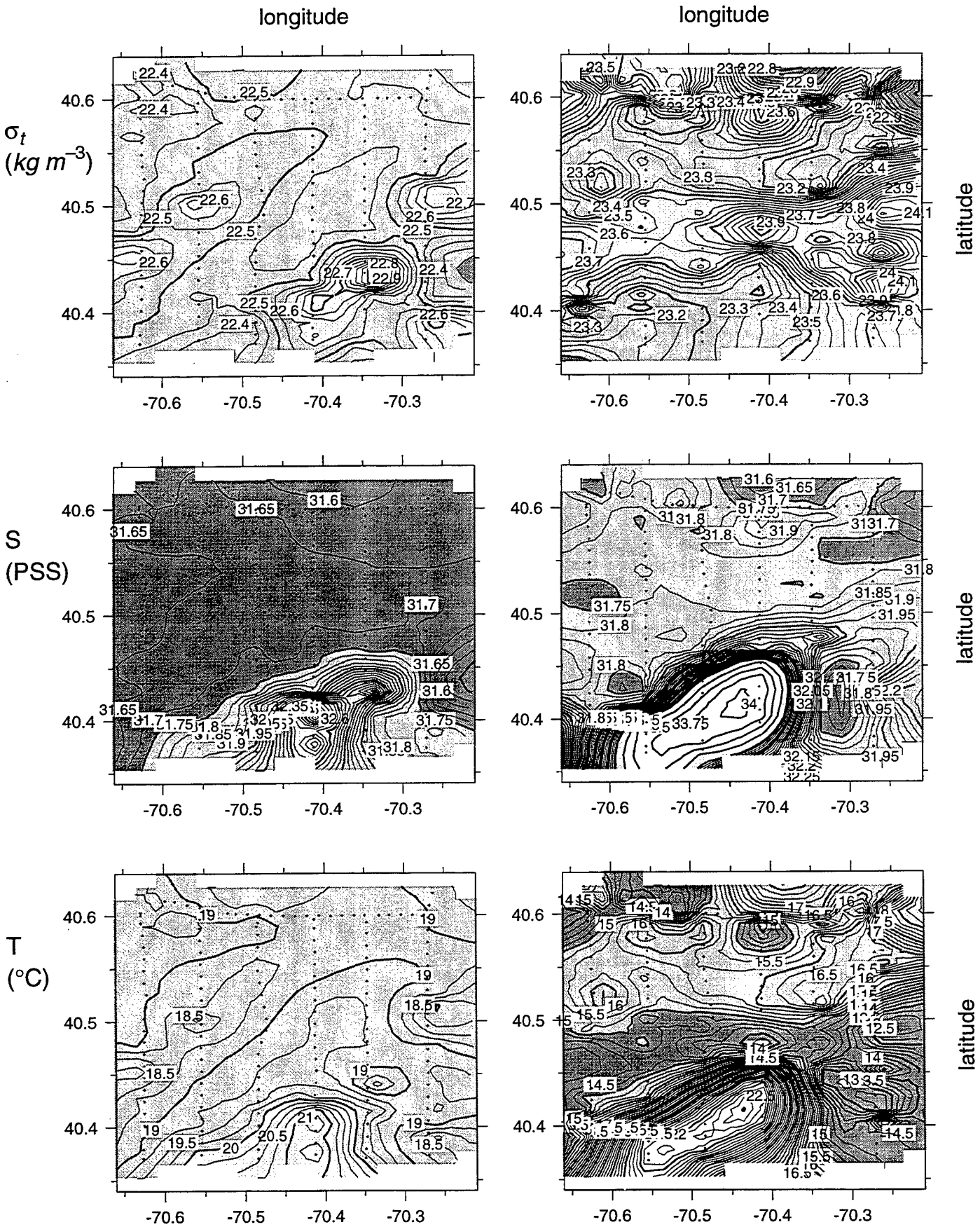


E9608 Small Box 4

24-Aug-96 20:07:03 - 25-Aug-96 11:32:38

Map View at 5 dbar

Map View at 15 dbar

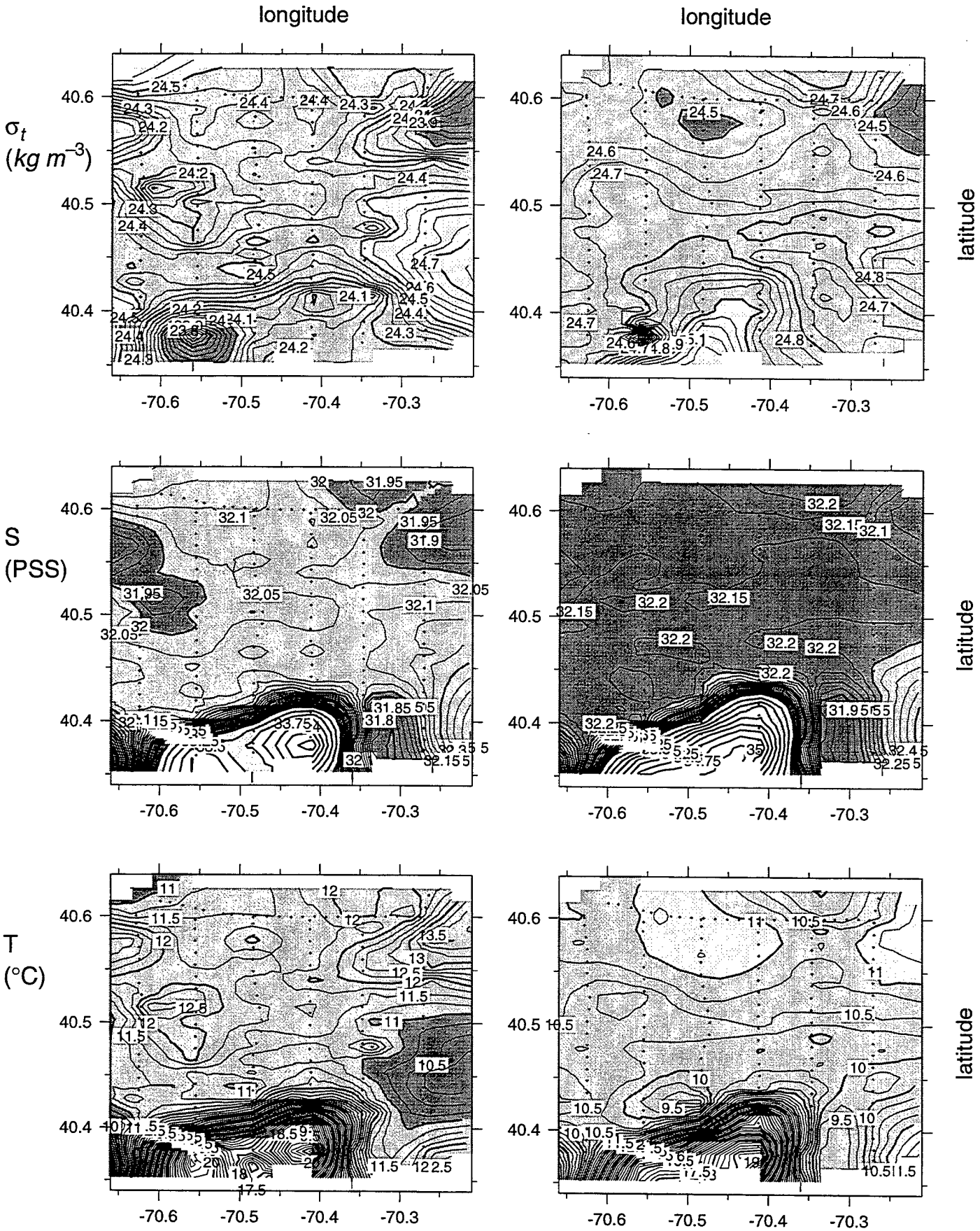


E9608 Small Box 4

24-Aug-96 20:07:03 - 25-Aug-96 11:32:38

Map View at 25 dbar

Map View at 35 dbar

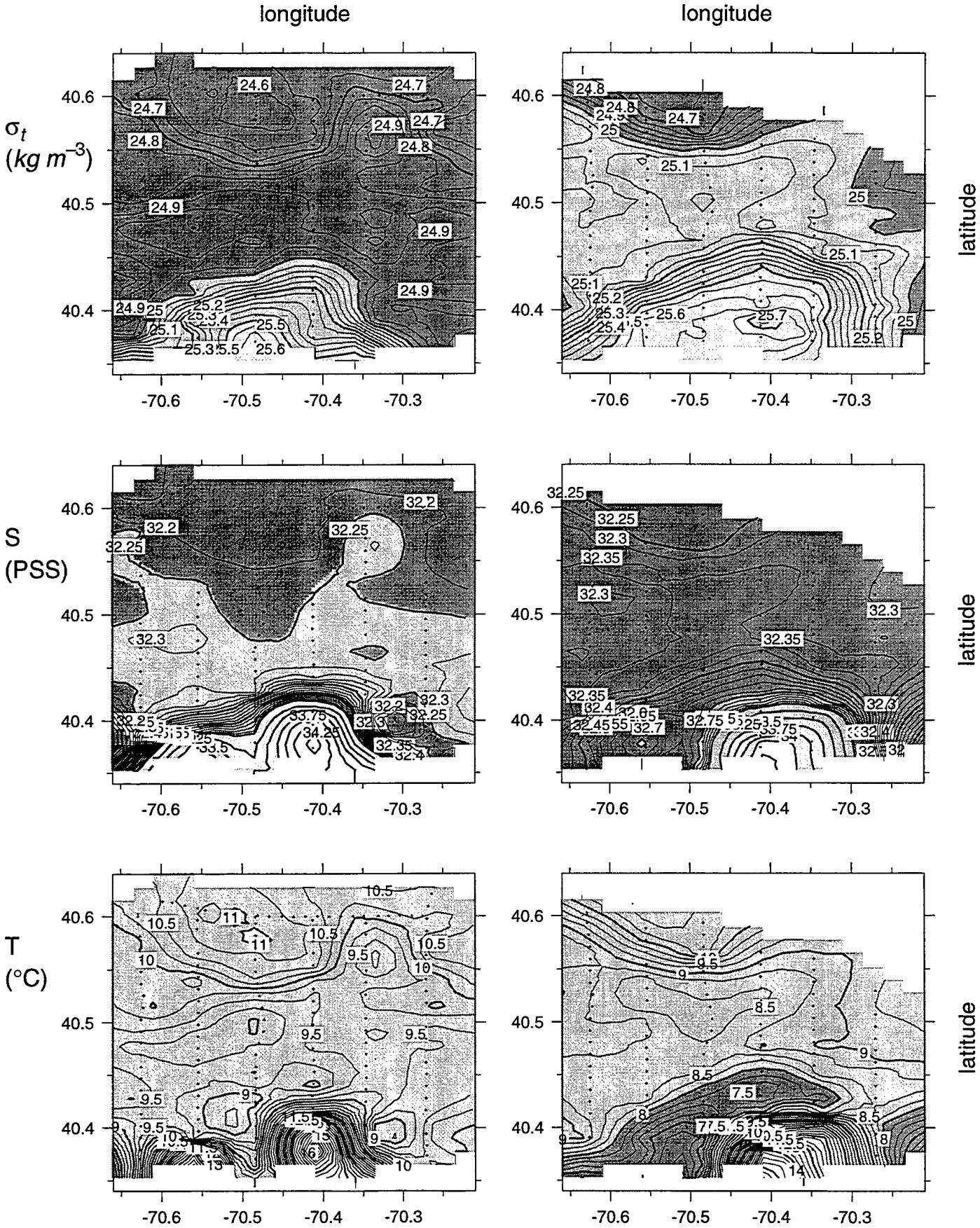


E9608 Small Box 4

24-Aug-96 20:07:03 - 25-Aug-96 11:32:38

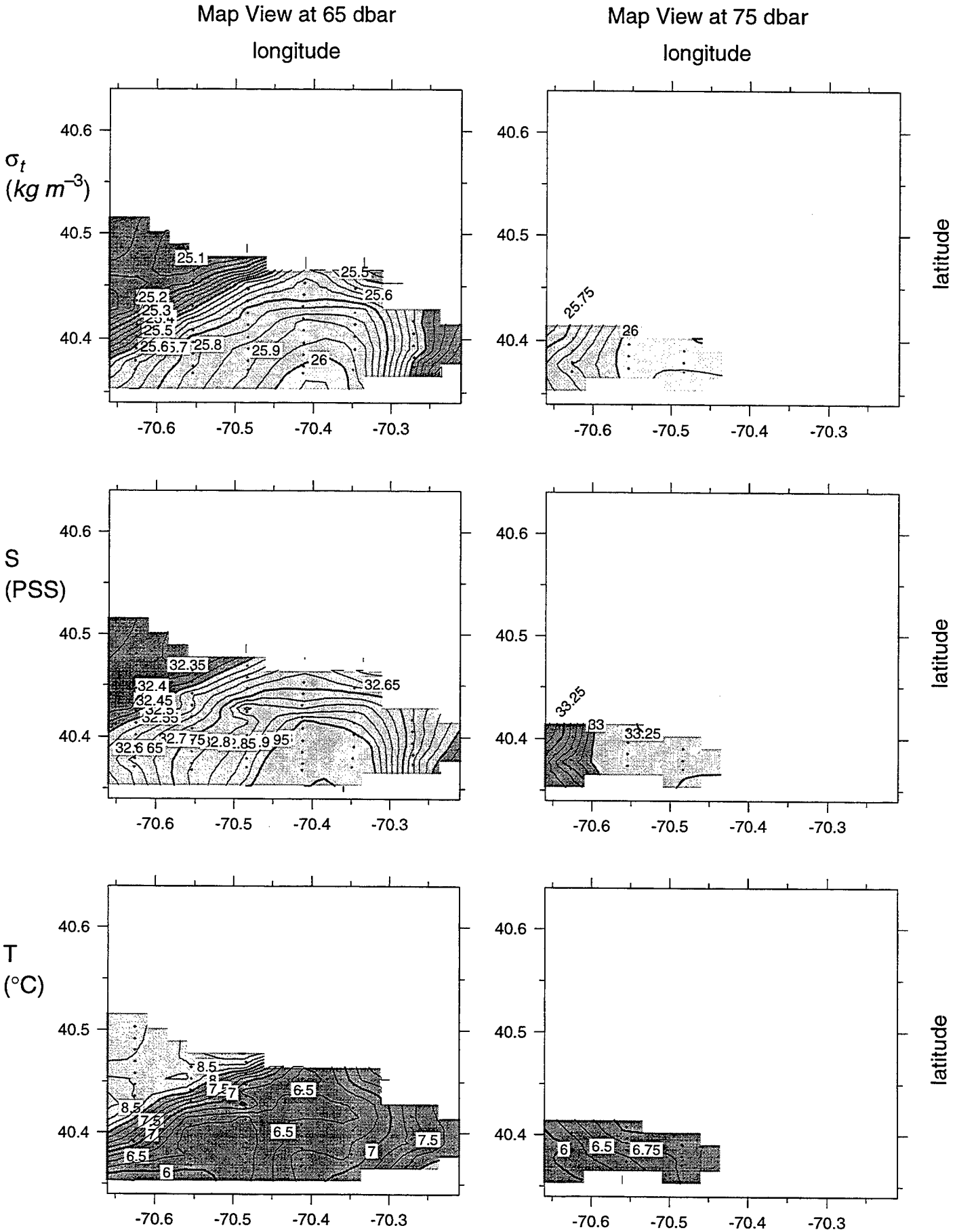
Map View at 45 dbar

Map View at 55 dbar



E9608 Small Box 4

24-Aug-96 20:07:03 - 25-Aug-96 11:32:38

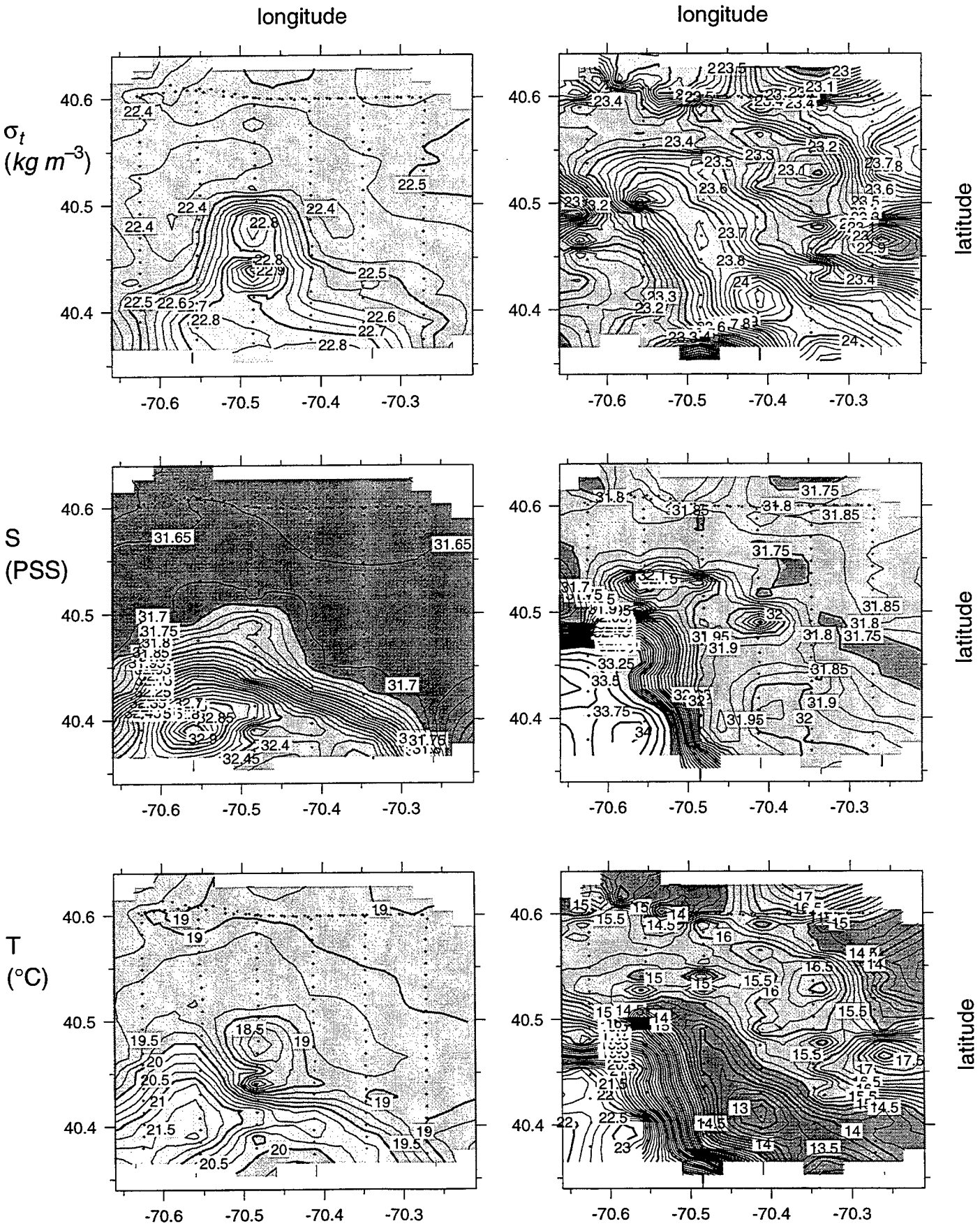


E9608 Small Box 5

25-Aug-96 09:21:39 - 26-Aug-96 03:10:31

Map View at 5 dbar

Map View at 15 dbar

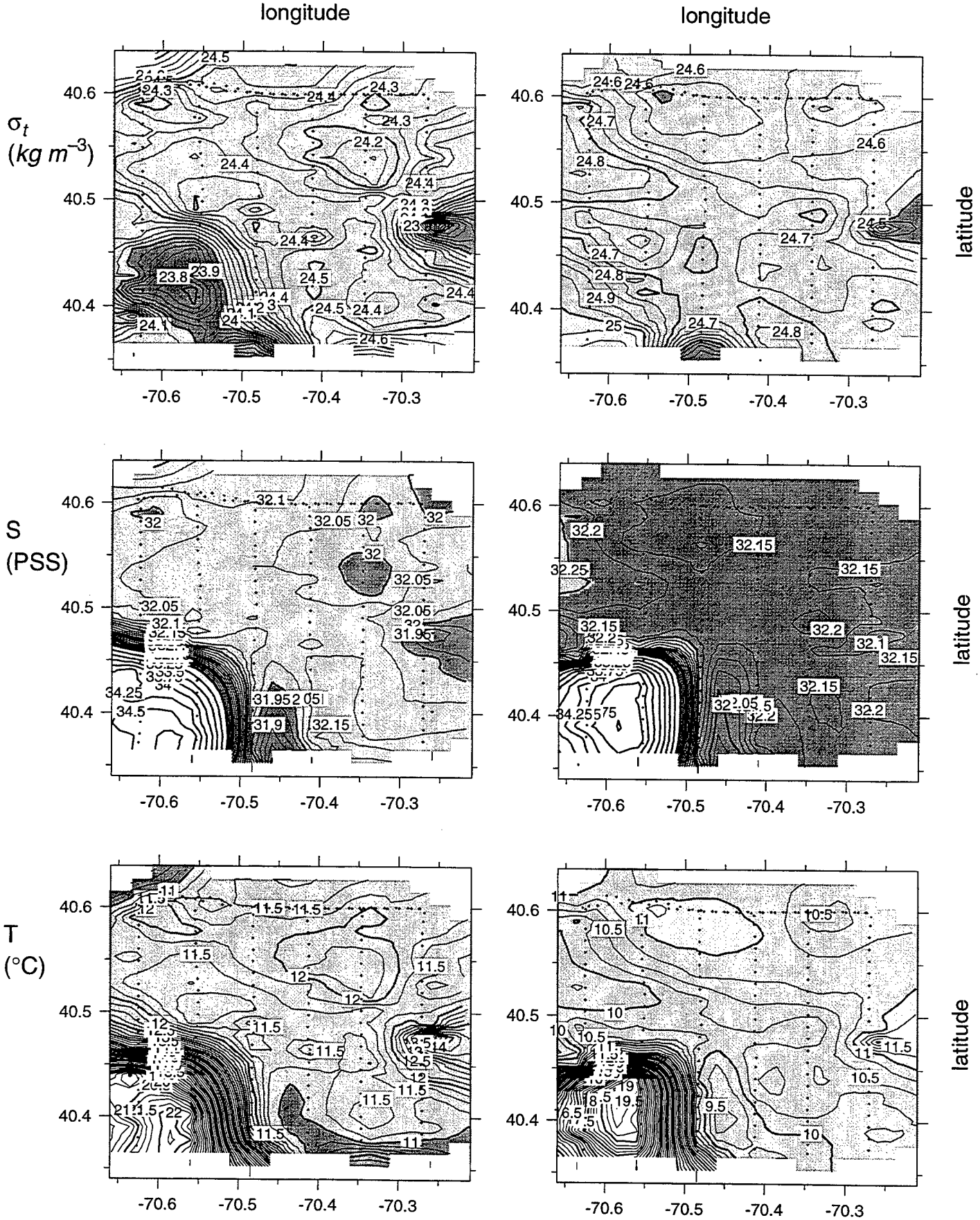


E9608 Small Box 5

25-Aug-96 09:21:39 - 26-Aug-96 03:10:31

Map View at 25 dbar

Map View at 35 dbar

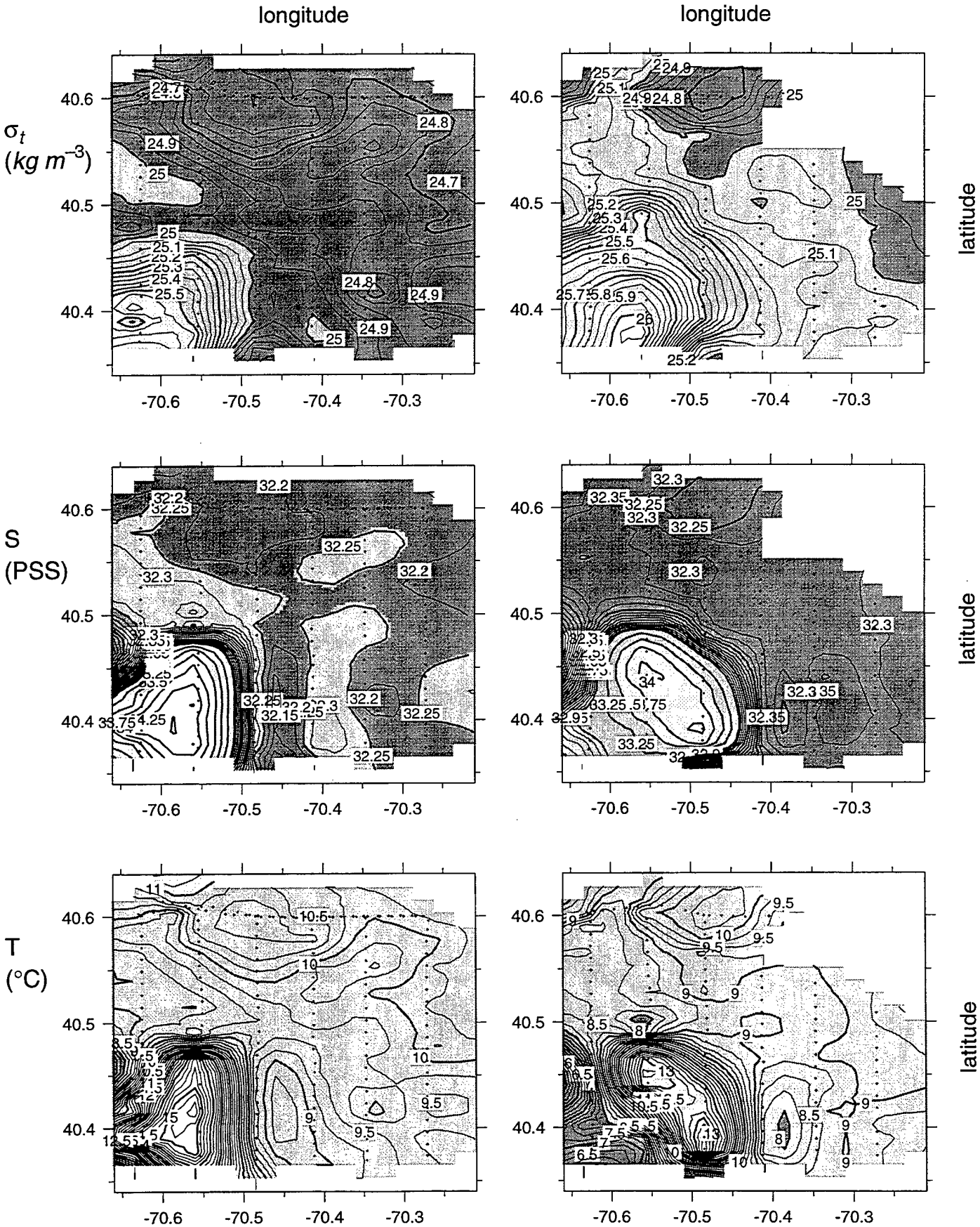


E9608 Small Box 5

25-Aug-96 09:21:39 - 26-Aug-96 03:10:31

Map View at 45 dbar

Map View at 55 dbar

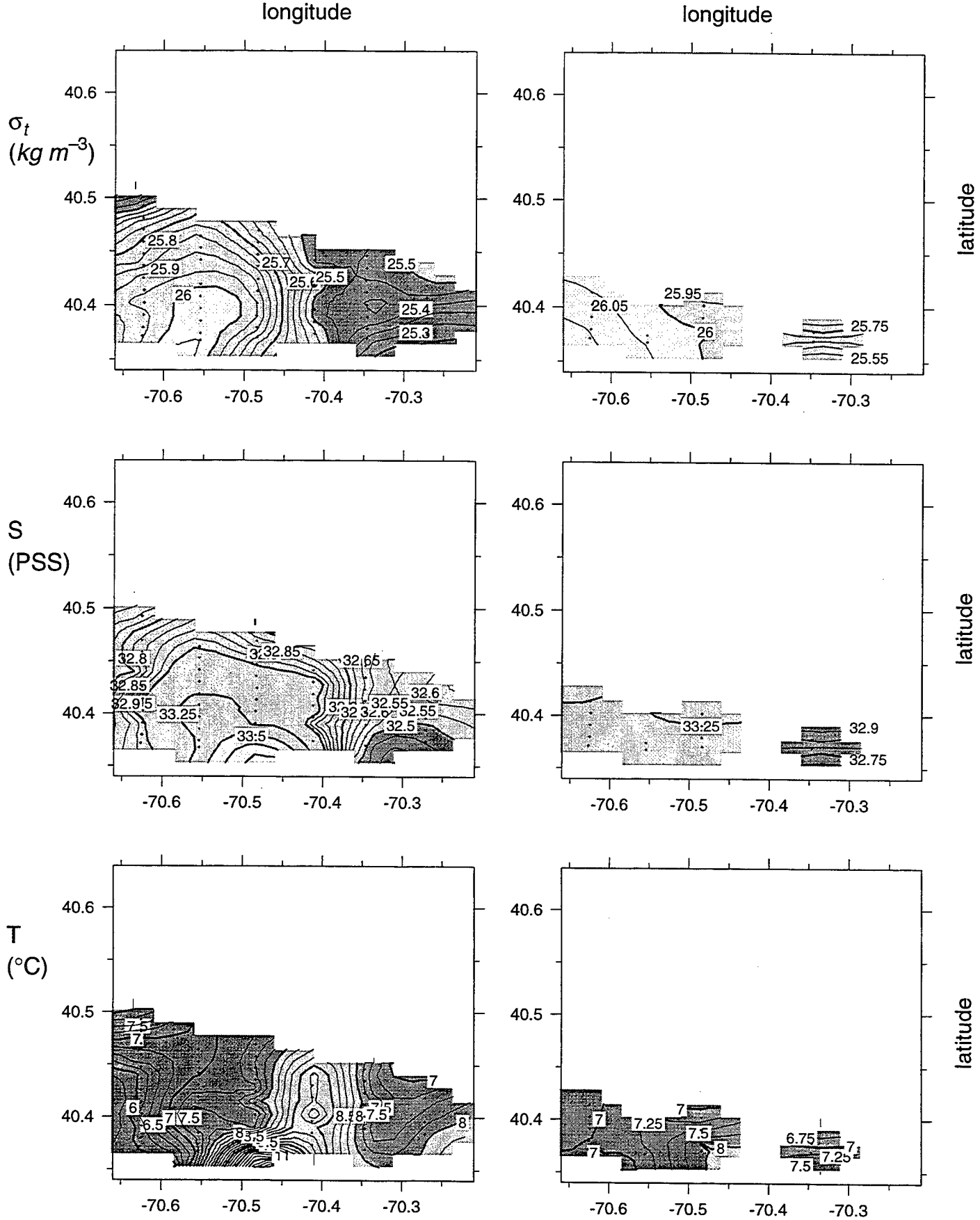


E9608 Small Box 5

25-Aug-96 09:21:39 - 26-Aug-96 03:10:31

Map View at 65 dbar

Map View at 75 dbar

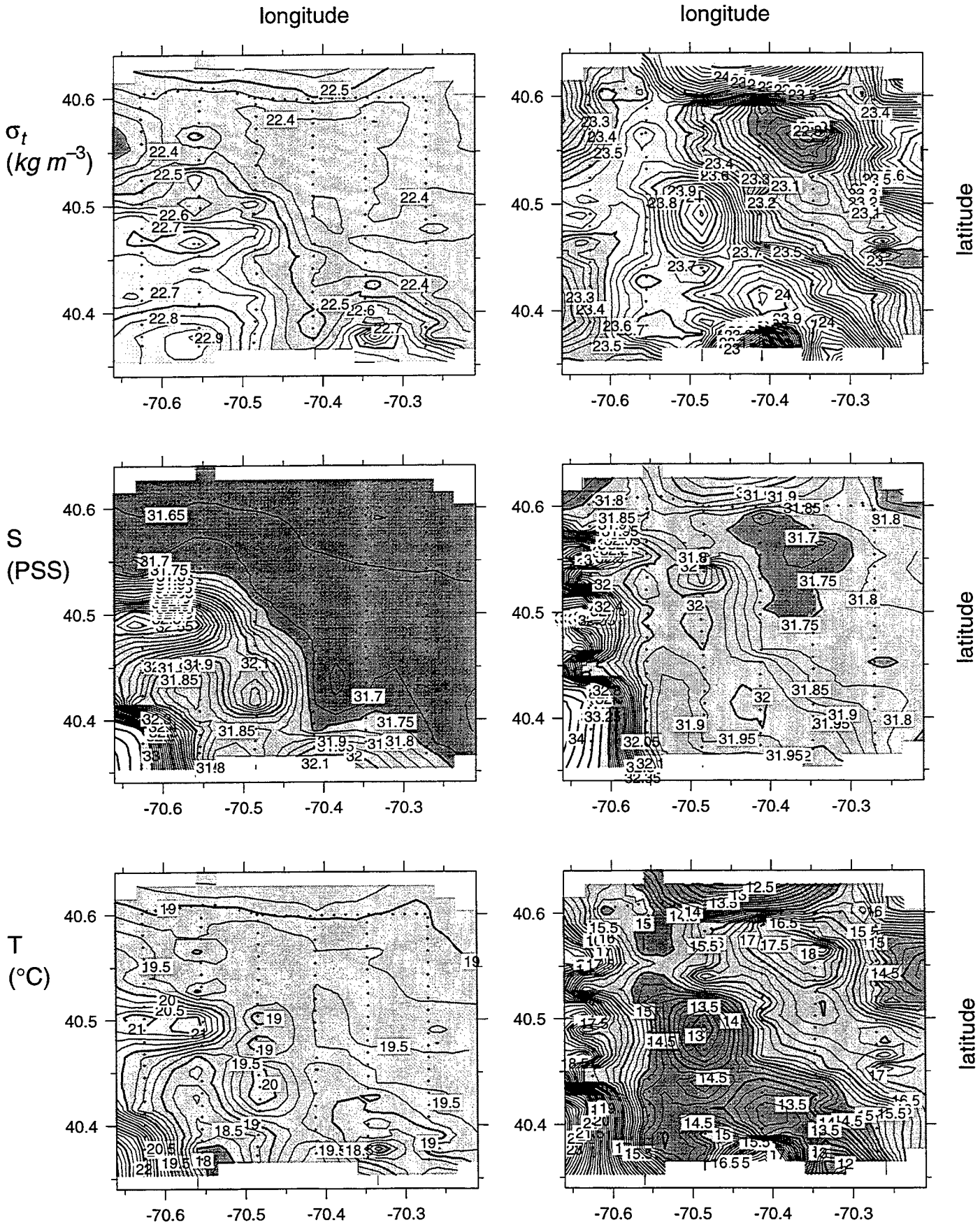


E9608 Small Box 6

26-Aug-96 01:07:24 - 26-Aug-96 16:51:30

Map View at 5 dbar

Map View at 15 dbar

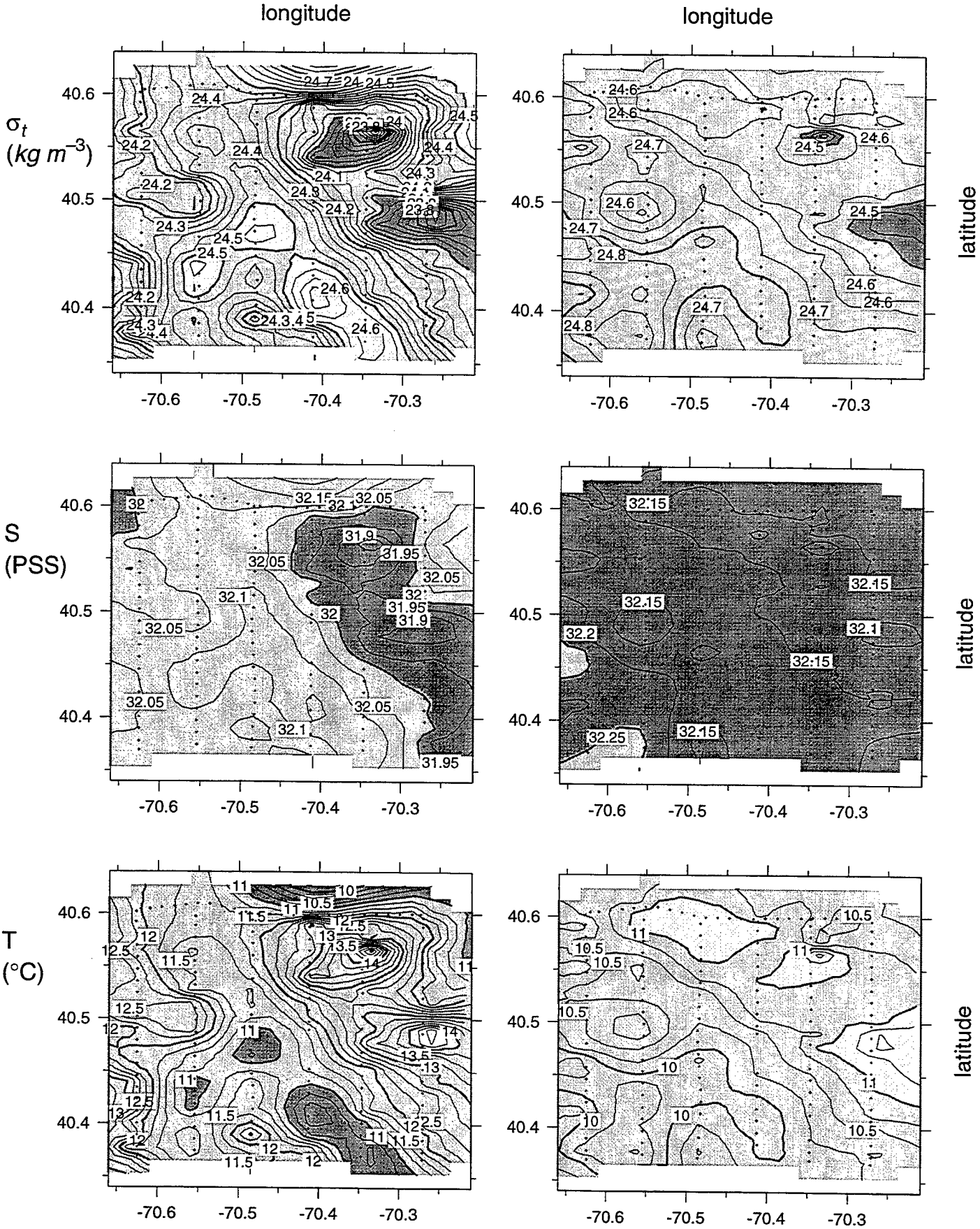


E9608 Small Box 6

26-Aug-96 01:07:24 - 26-Aug-96 16:51:30

Map View at 25 dbar

Map View at 35 dbar

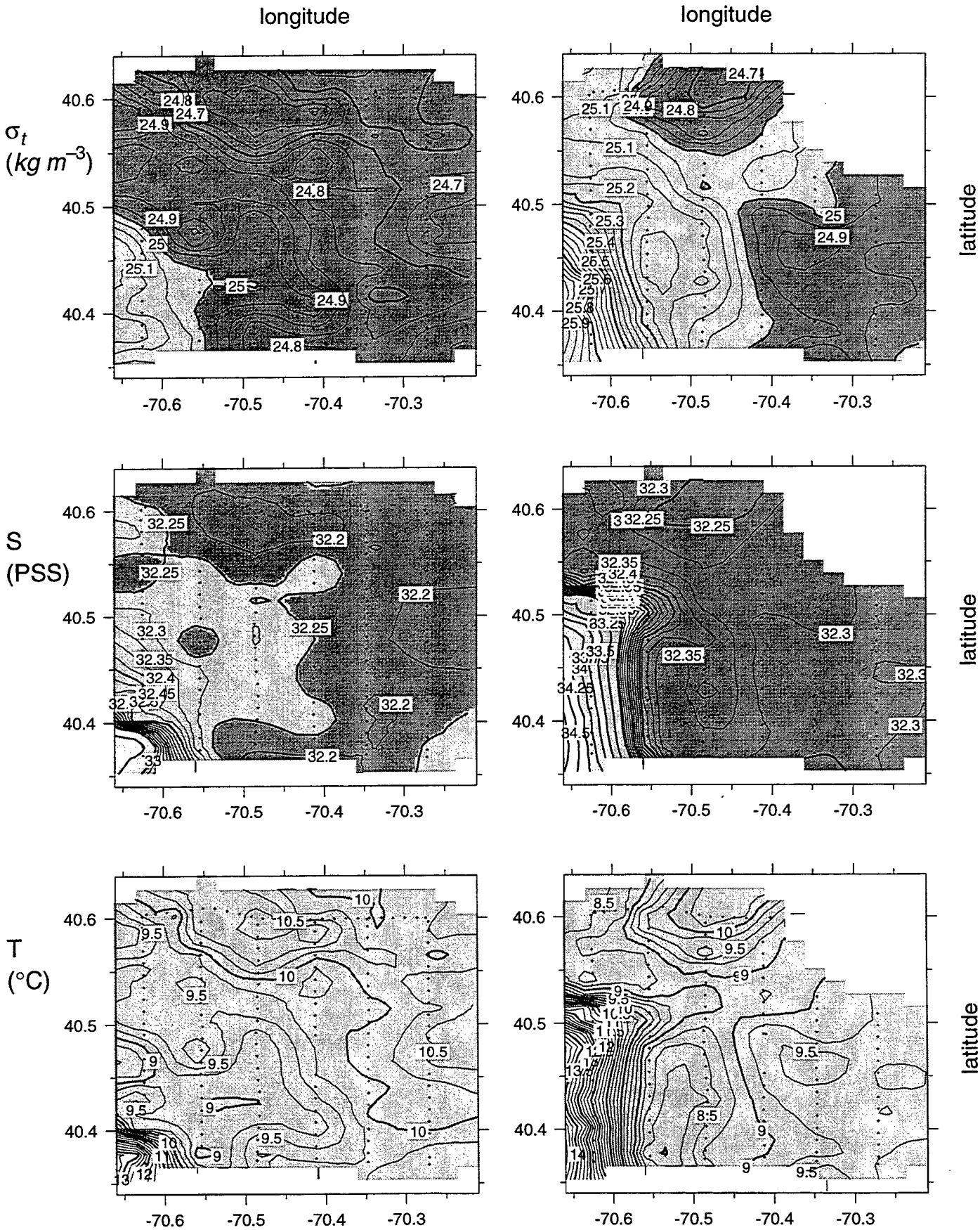


E9608 Small Box 6

26-Aug-96 01:07:24 - 26-Aug-96 16:51:30

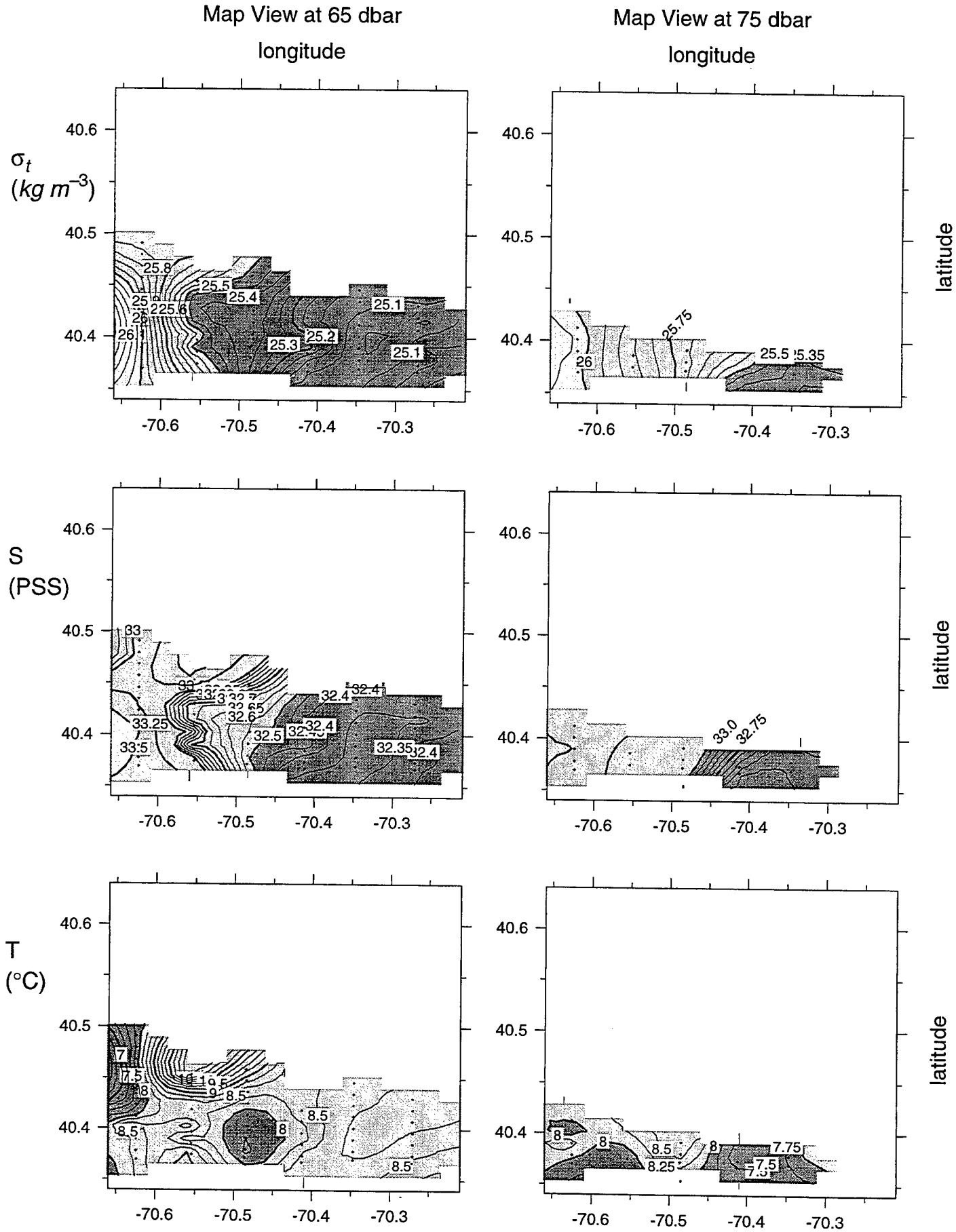
Map View at 45 dbar

Map View at 55 dbar



E9608 Small Box 6

26-Aug-96 01:07:24 - 26-Aug-96 16:51:30

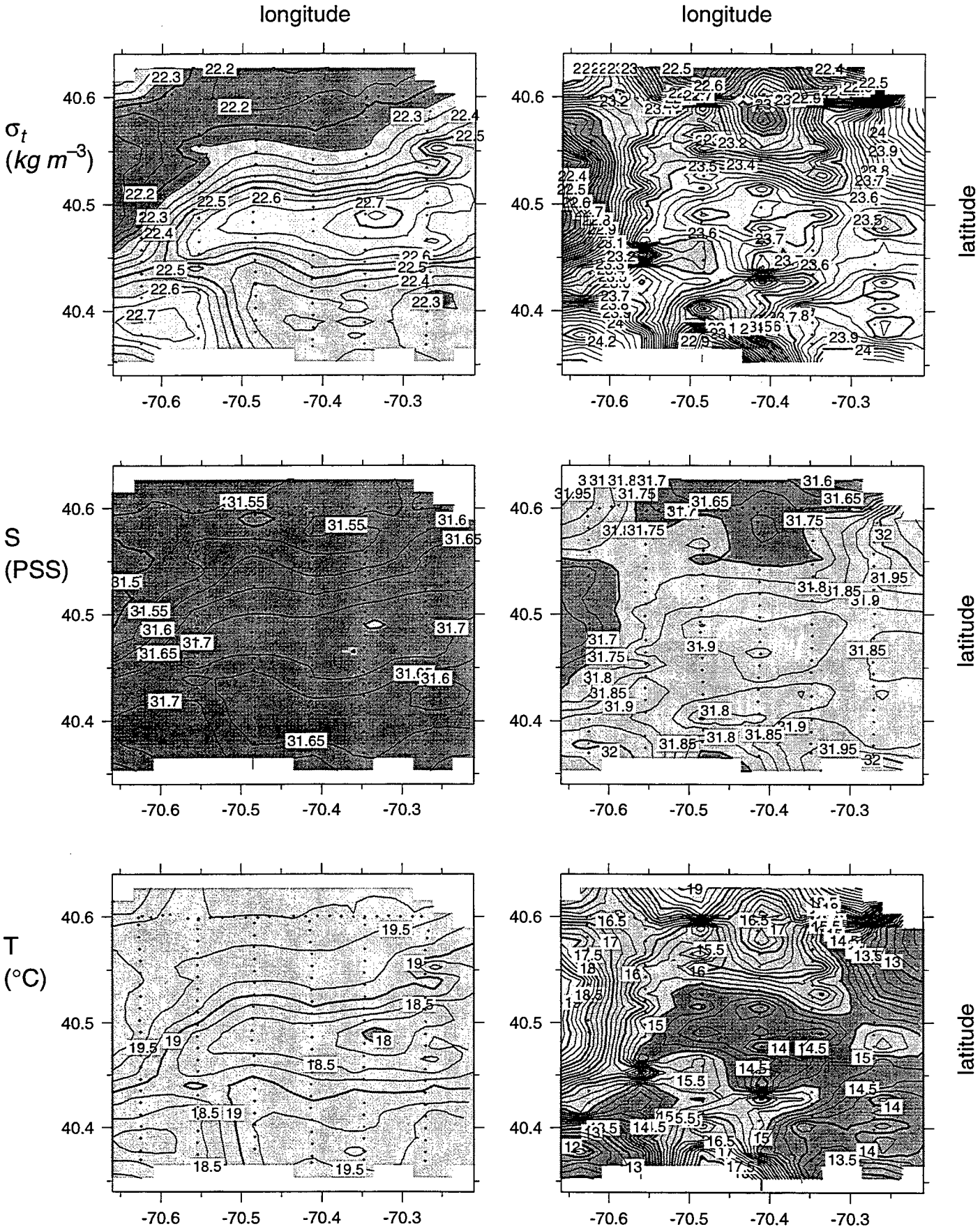


E9608 Small Box 7

29-Aug-96 04:02:08 - 29-Aug-96 21:15:46

Map View at 5 dbar

Map View at 15 dbar

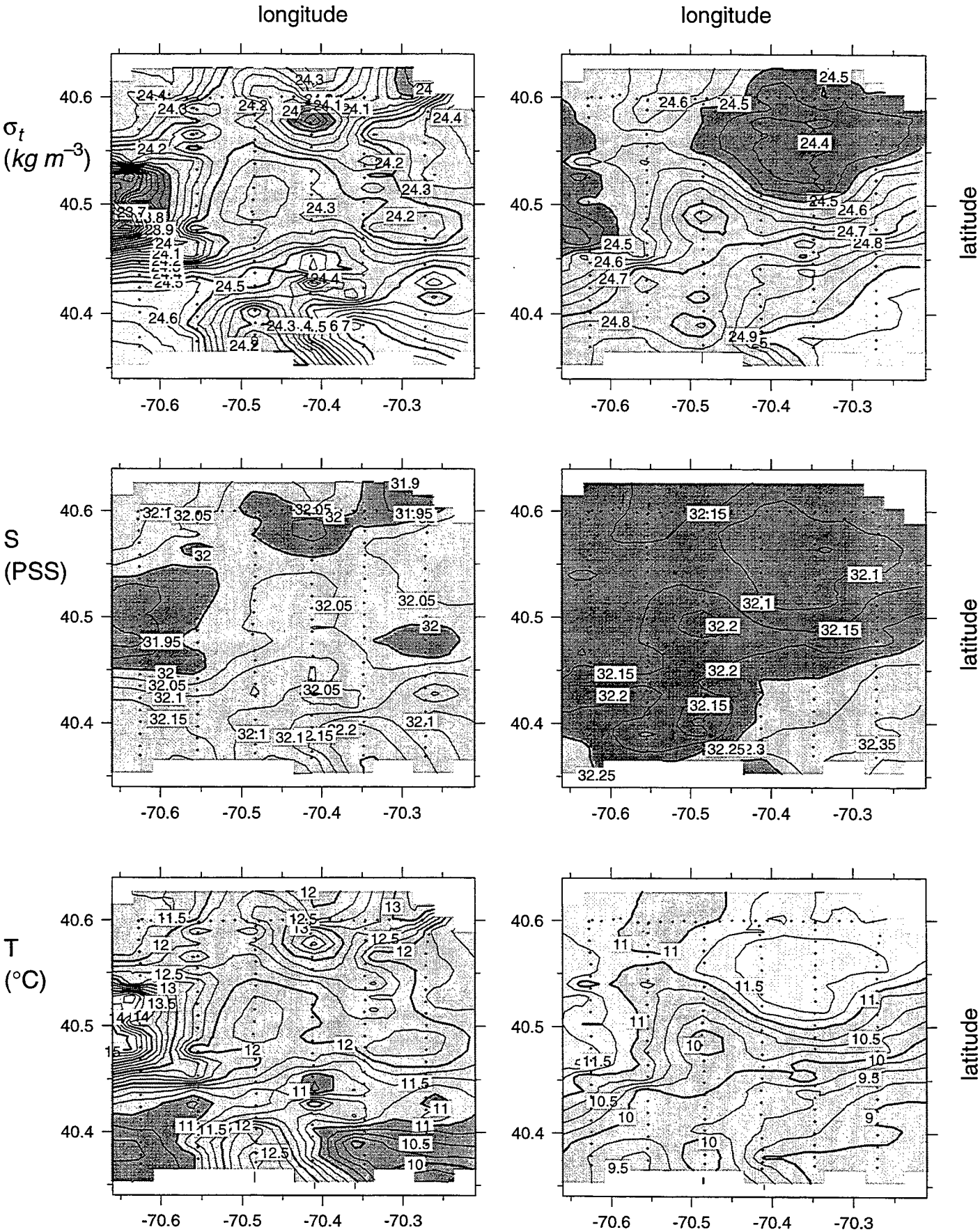


E9608 Small Box 7

29-Aug-96 04:02:08 - 29-Aug-96 21:15:46

Map View at 25 dbar

Map View at 35 dbar

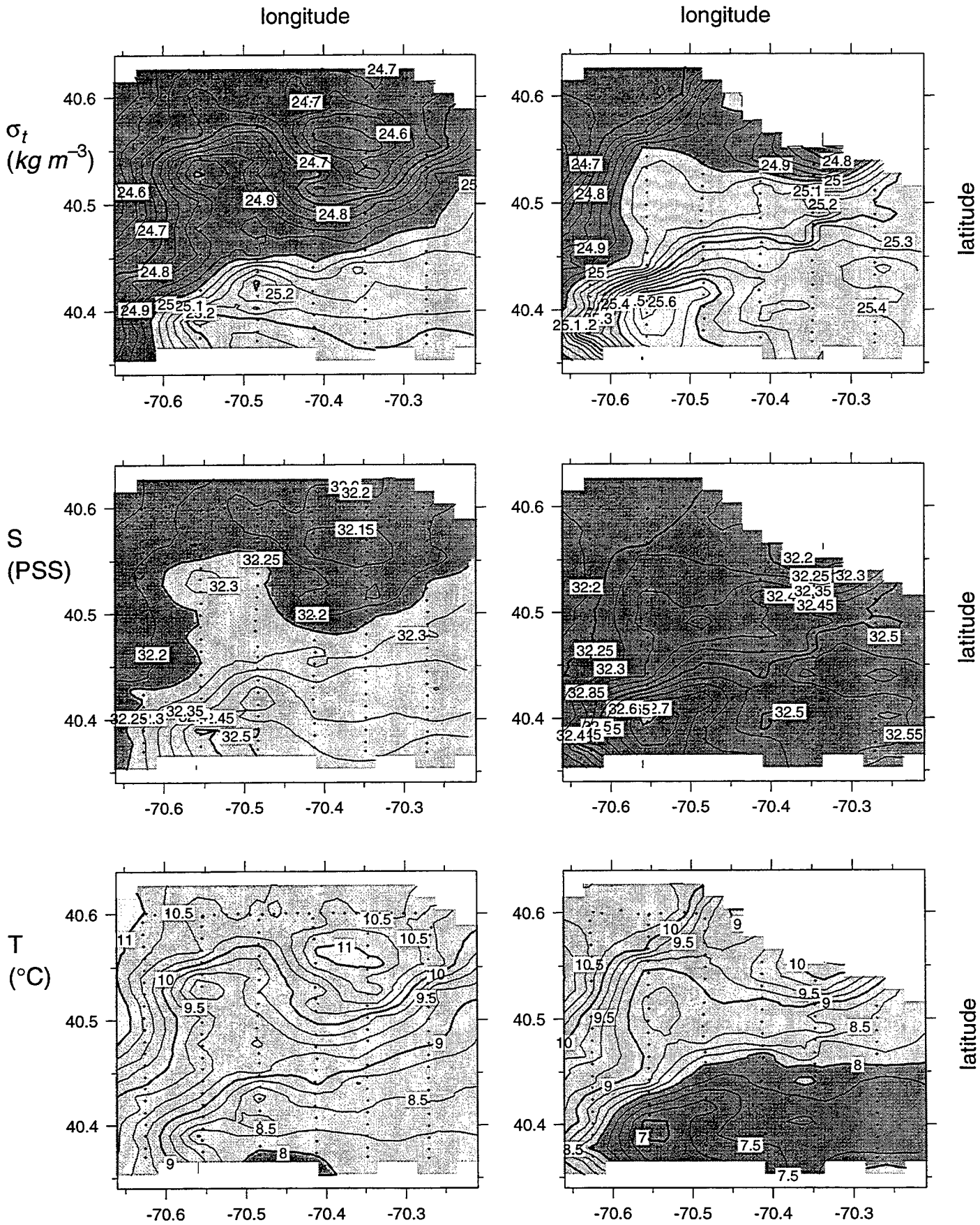


E9608 Small Box 7

29-Aug-96 04:02:08 - 29-Aug-96 21:15:46

Map View at 45 dbar

Map View at 55 dbar

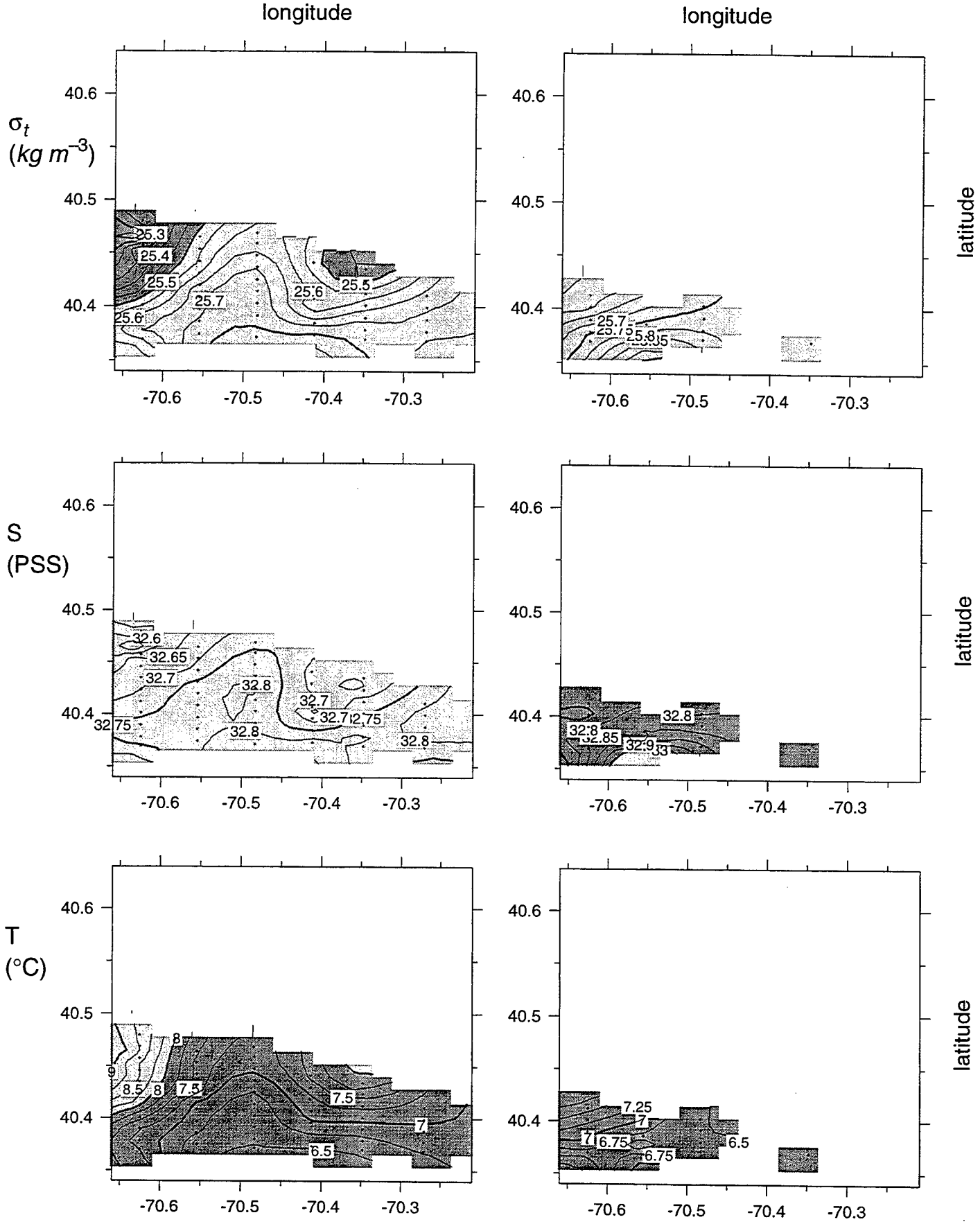


E9608 Small Box 7

29-Aug-96 04:02:08 - 29-Aug-96 21:15:46

Map View at 65 dbar

Map View at 75 dbar

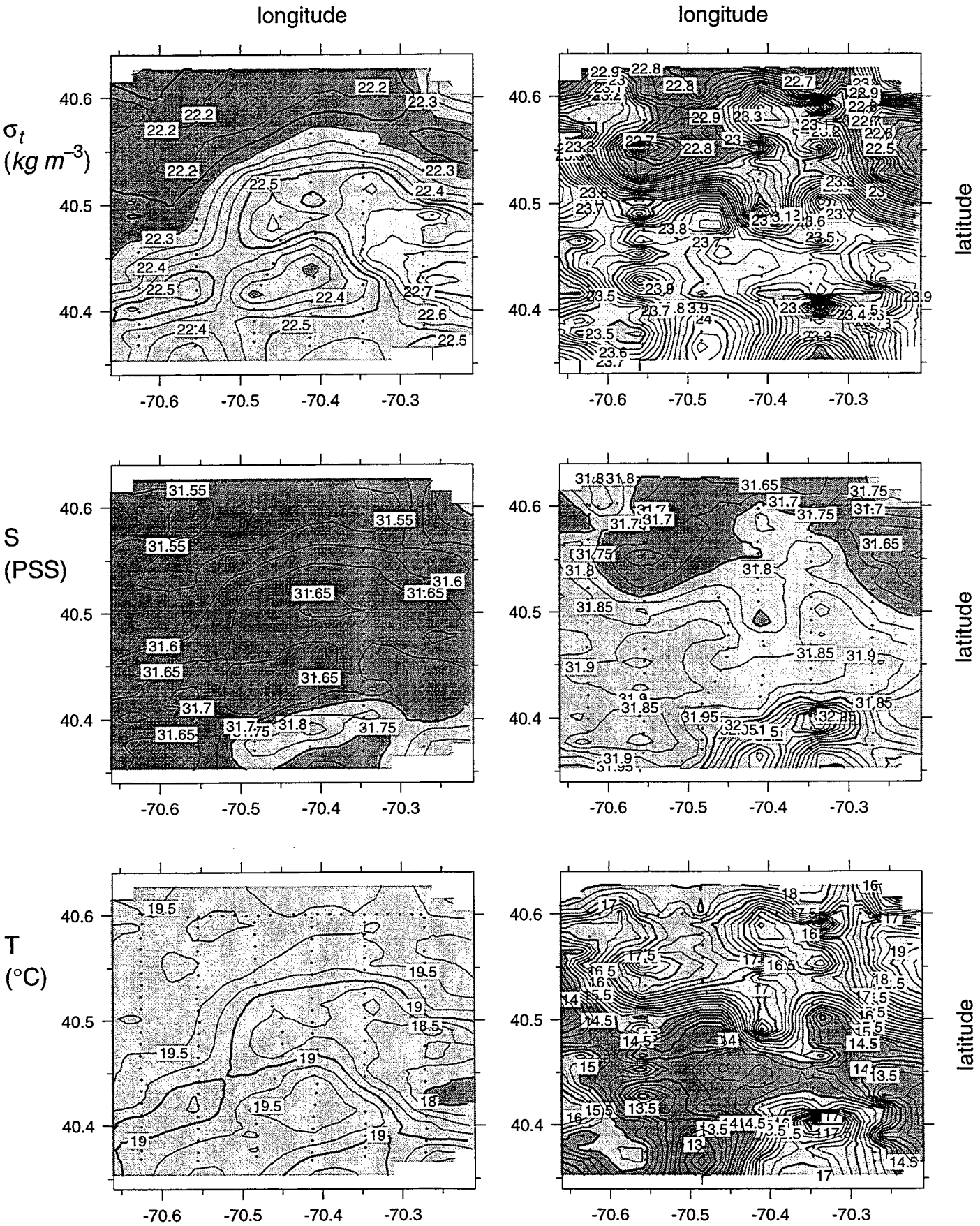


E9608 Small Box 8

29-Aug-96 18:52:09 - 30-Aug-96 12:10:56

Map View at 5 dbar

Map View at 15 dbar

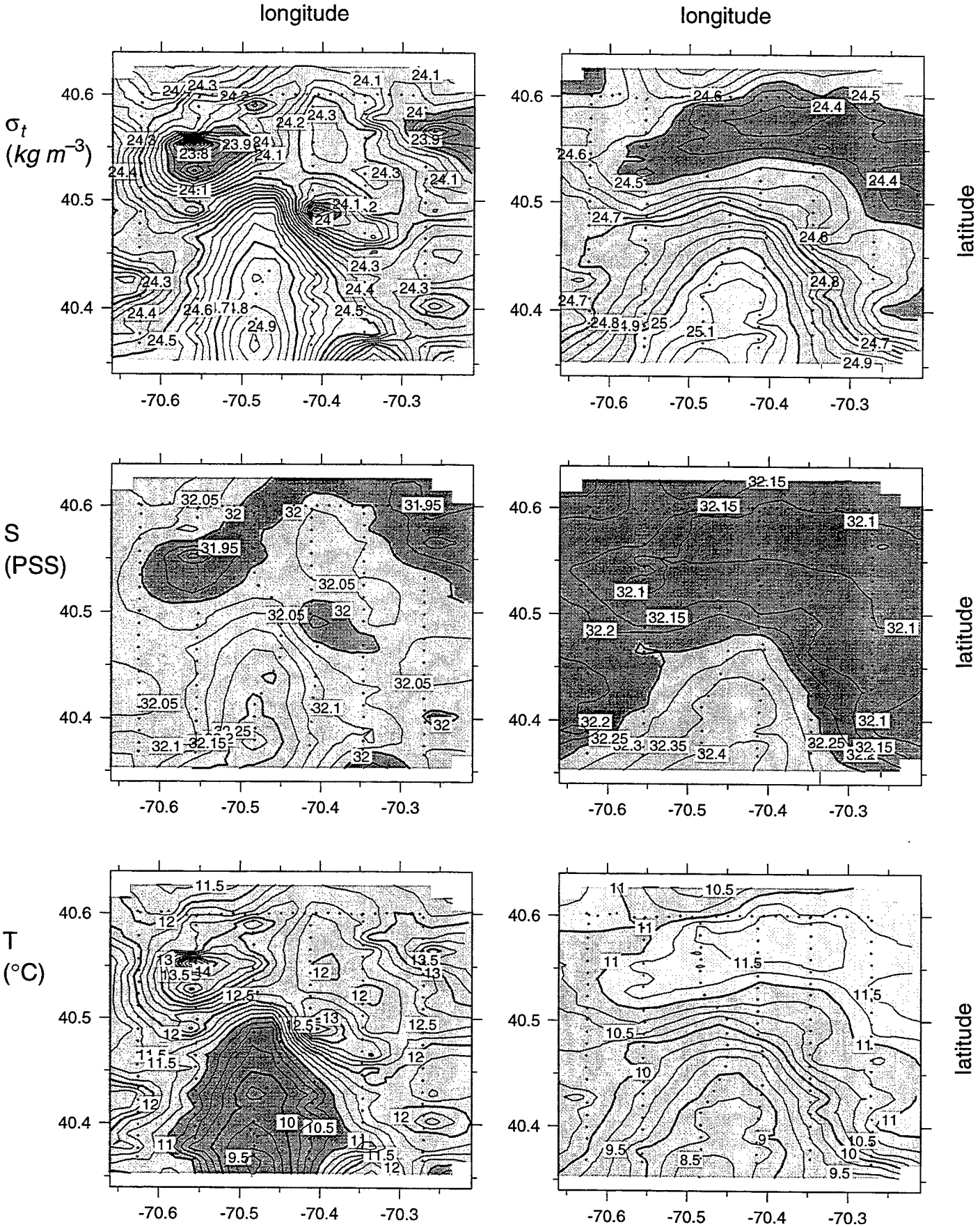


E9608 Small Box 8

29-Aug-96 18:52:09 - 30-Aug-96 12:10:56

Map View at 25 dbar

Map View at 35 dbar

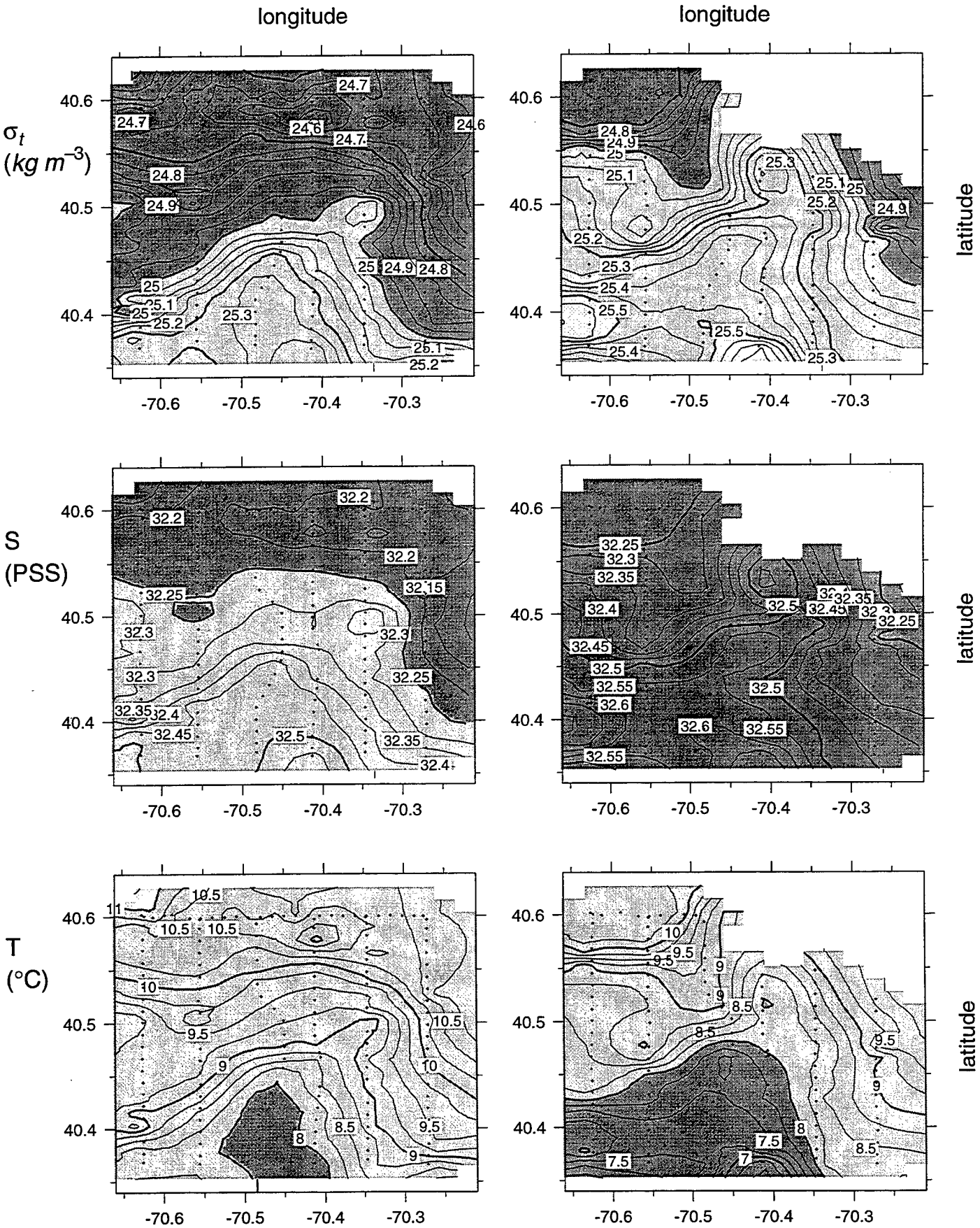


E9608 Small Box 8

29-Aug-96 18:52:09 - 30-Aug-96 12:10:56

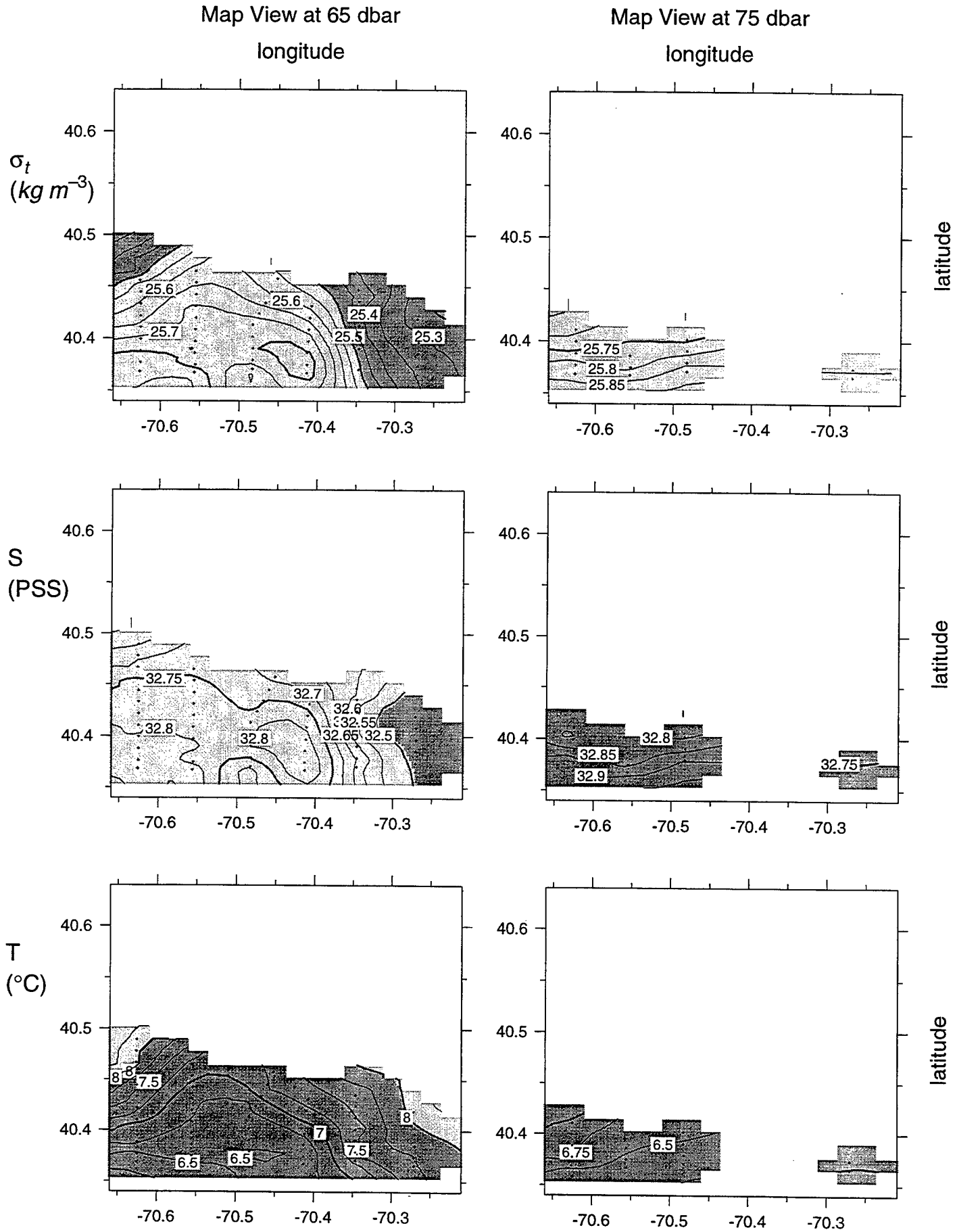
Map View at 45 dbar

Map View at 55 dbar



E9608 Small Box 8

29-Aug-96 18:52:09 - 30-Aug-96 12:10:56

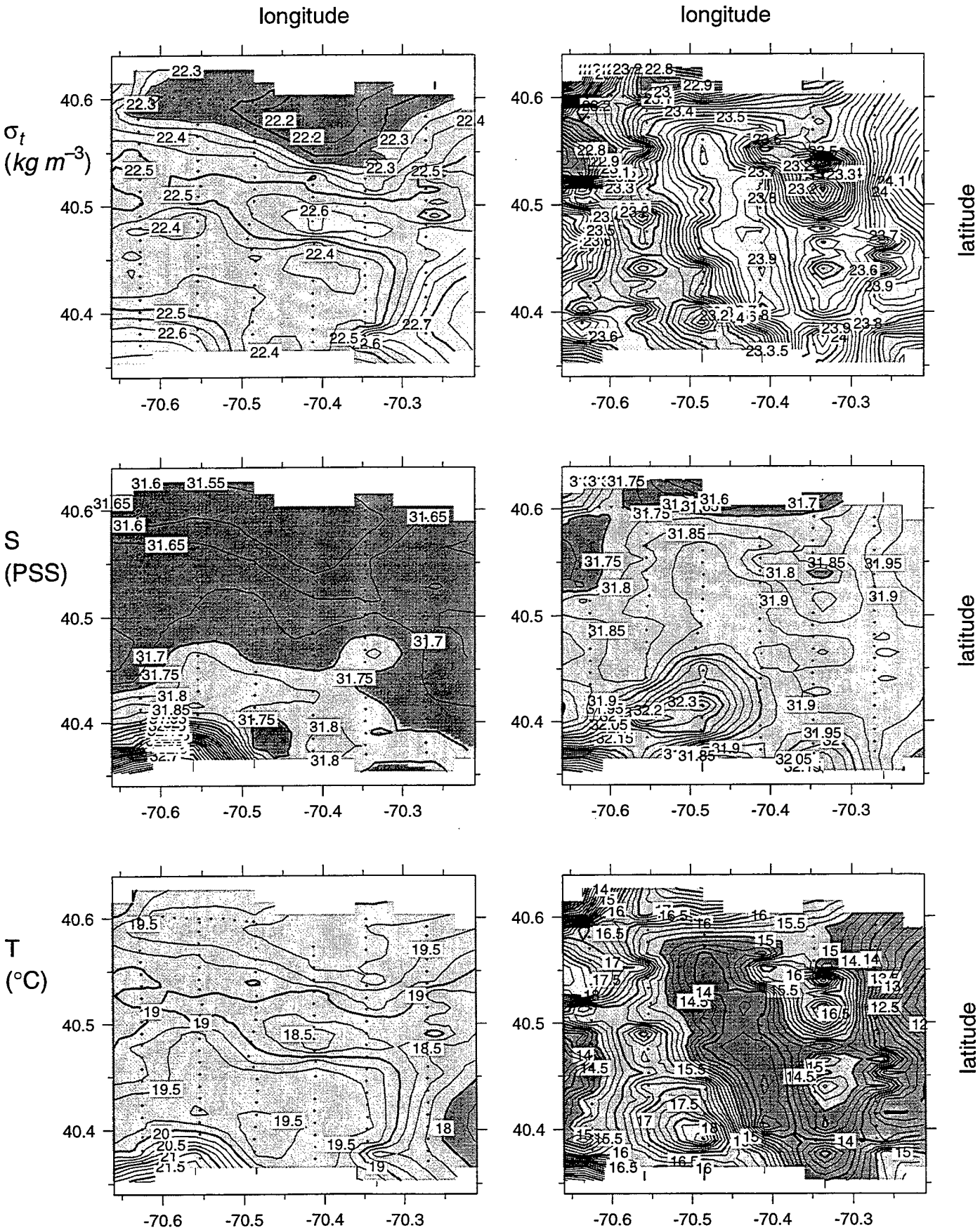


E9608 Small Box 9

30-Aug-96 14:53:44 - 31-Aug-96 05:48:35

Map View at 5 dbar

Map View at 15 dbar

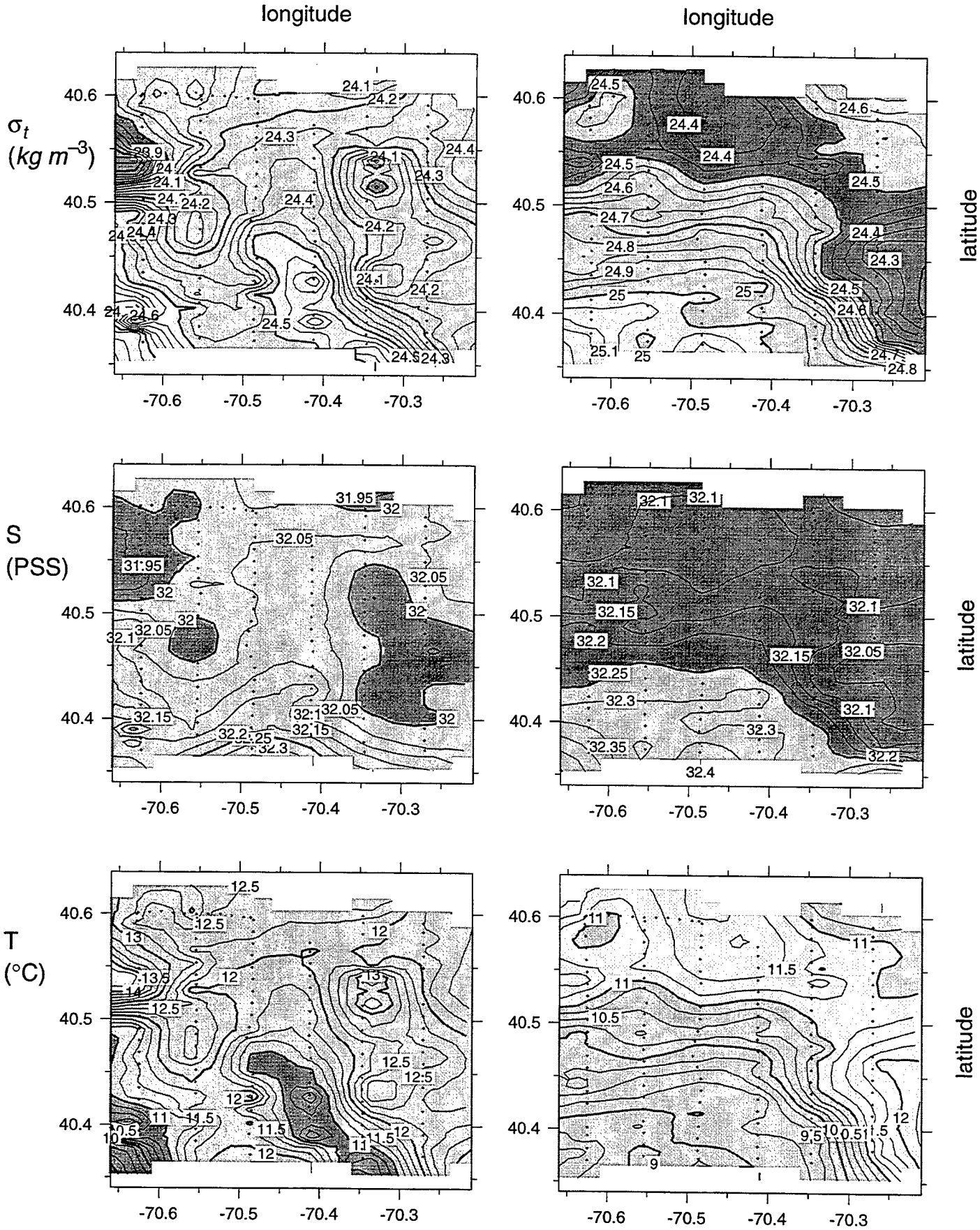


E9608 Small Box 9

30-Aug-96 14:53:44 - 31-Aug-96 05:48:35

Map View at 25 dbar

Map View at 35 dbar

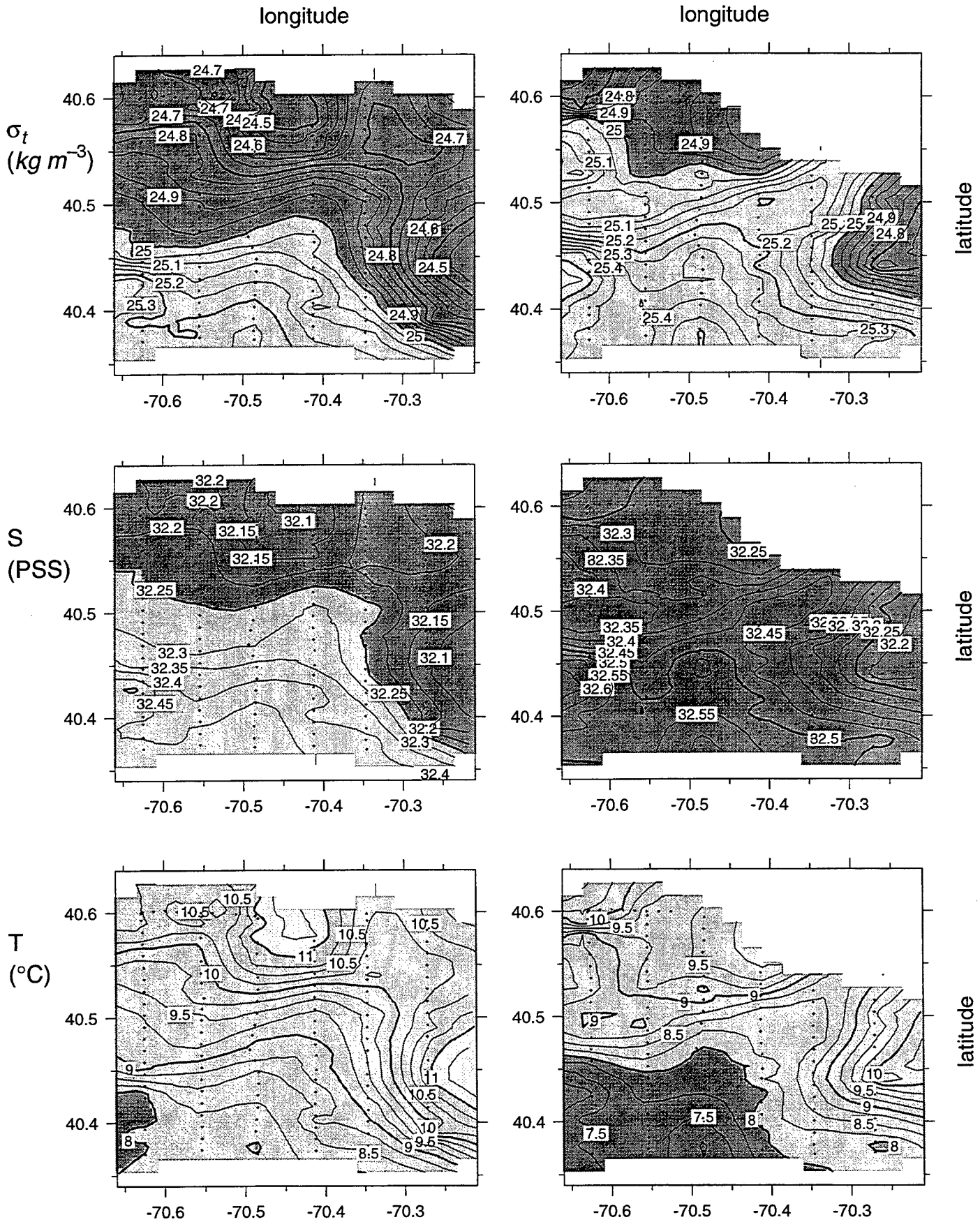


E9608 Small Box 9

30-Aug-96 14:53:44 - 31-Aug-96 05:48:35

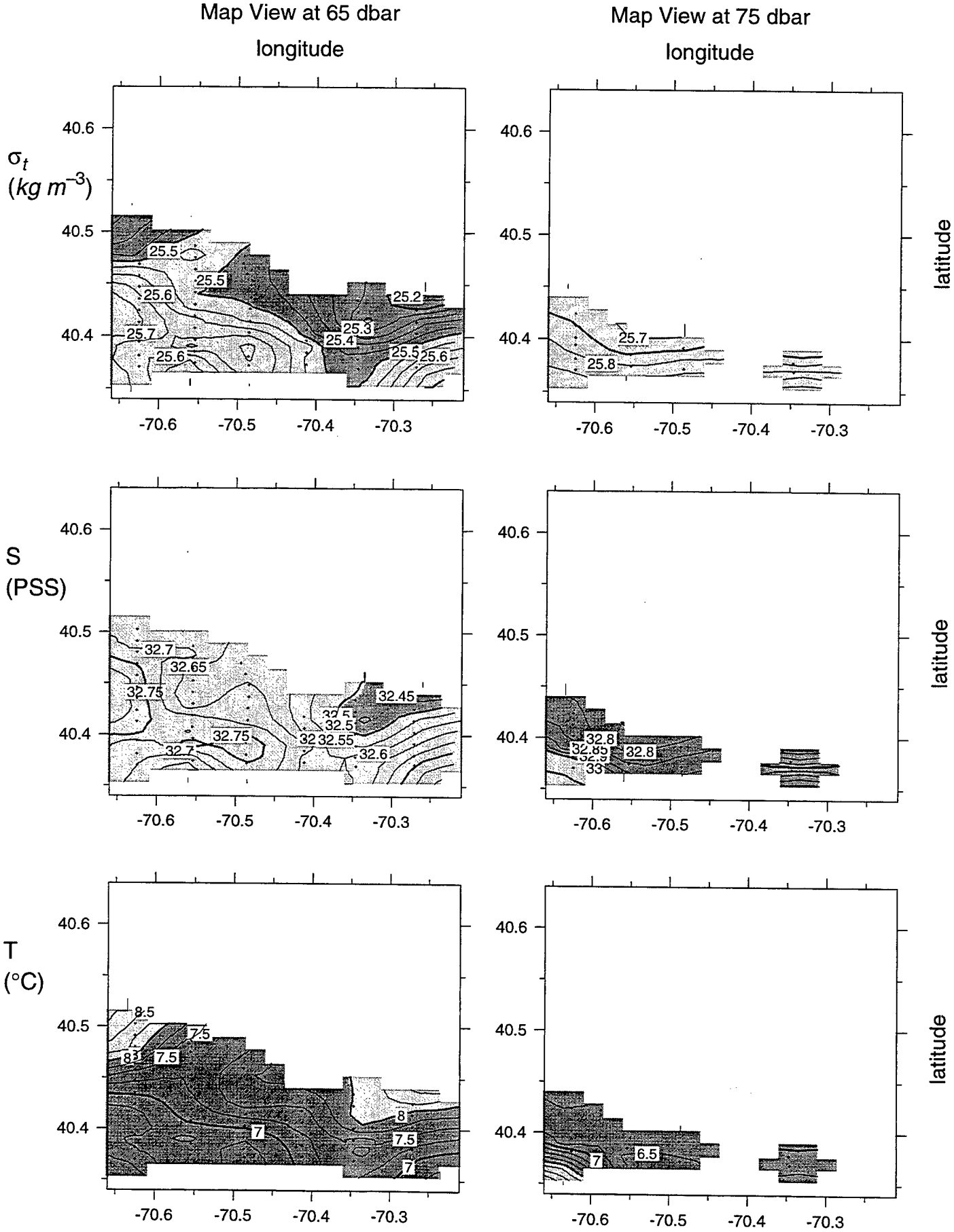
Map View at 45 dbar

Map View at 55 dbar



E9608 Small Box 9

30-Aug-96 14:53:44 - 31-Aug-96 05:48:35

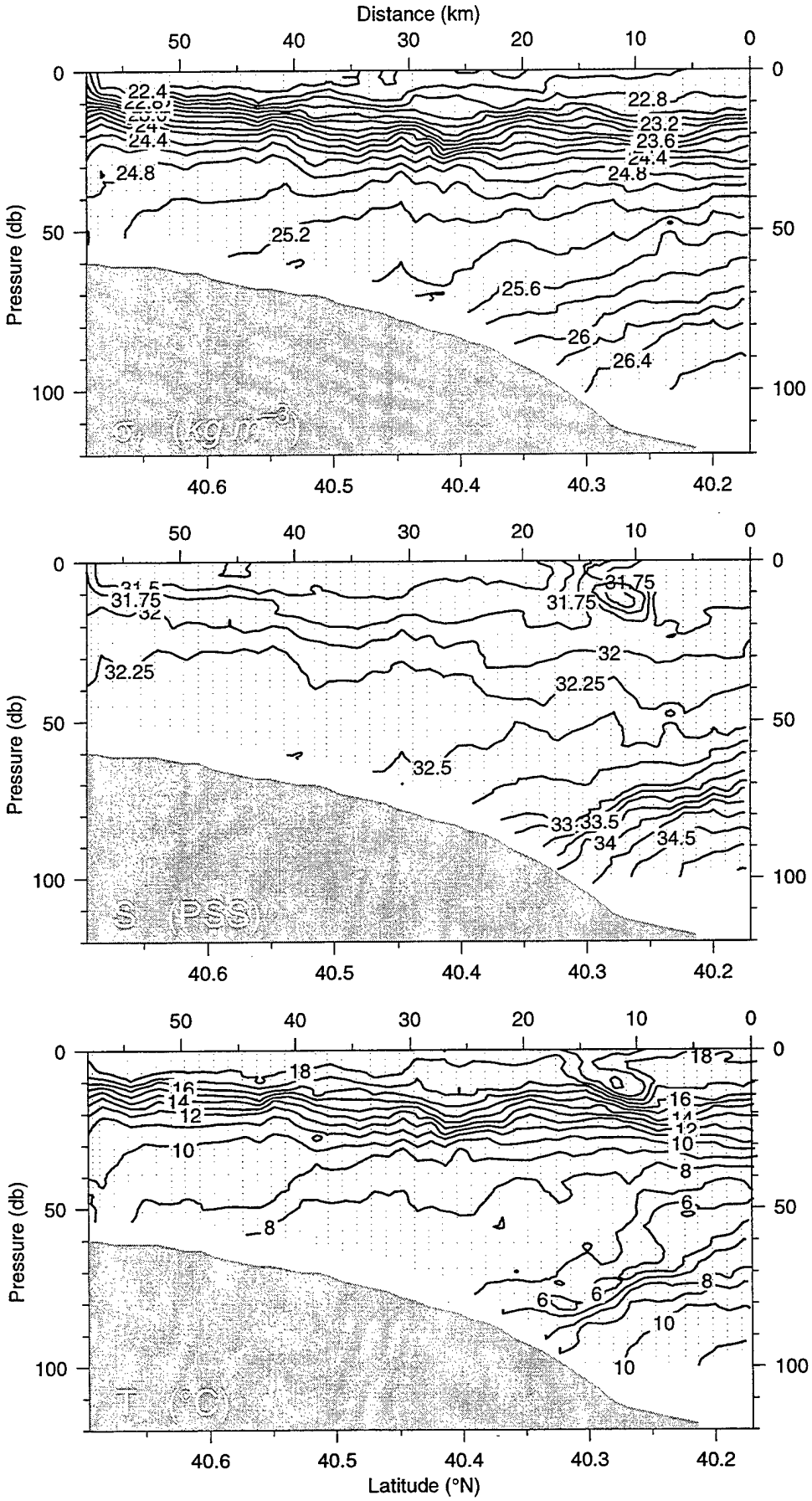


E9608 Vertical Sections of Temperature, Salinity and σ_t

E9608 Big Box 1

18-Aug-96 01:29:38 - 18-Aug-96 06:23:59

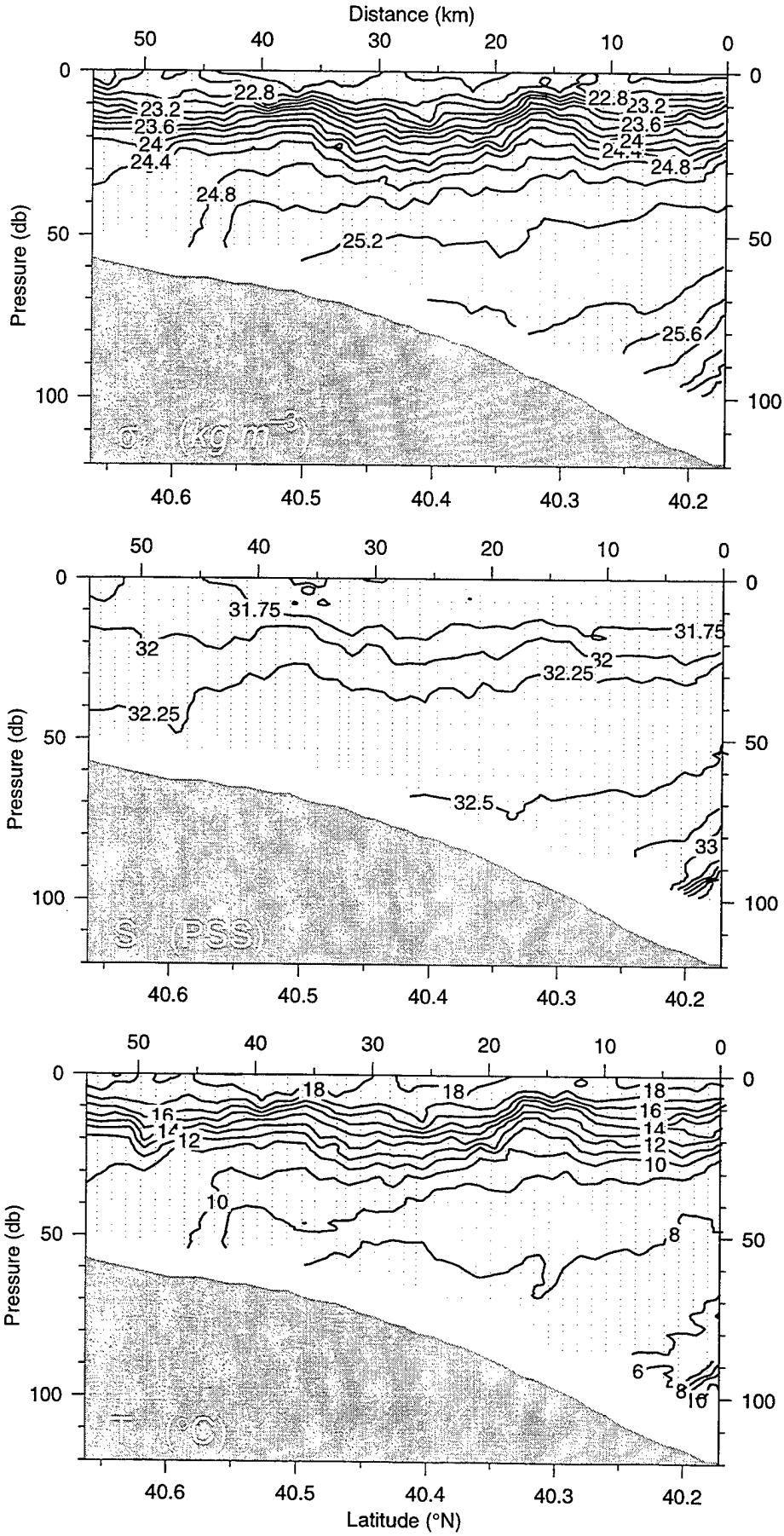
Line B



E9608 Big Box 1

17-Aug-96 20:13:24 - 18-Aug-96 00:34:59

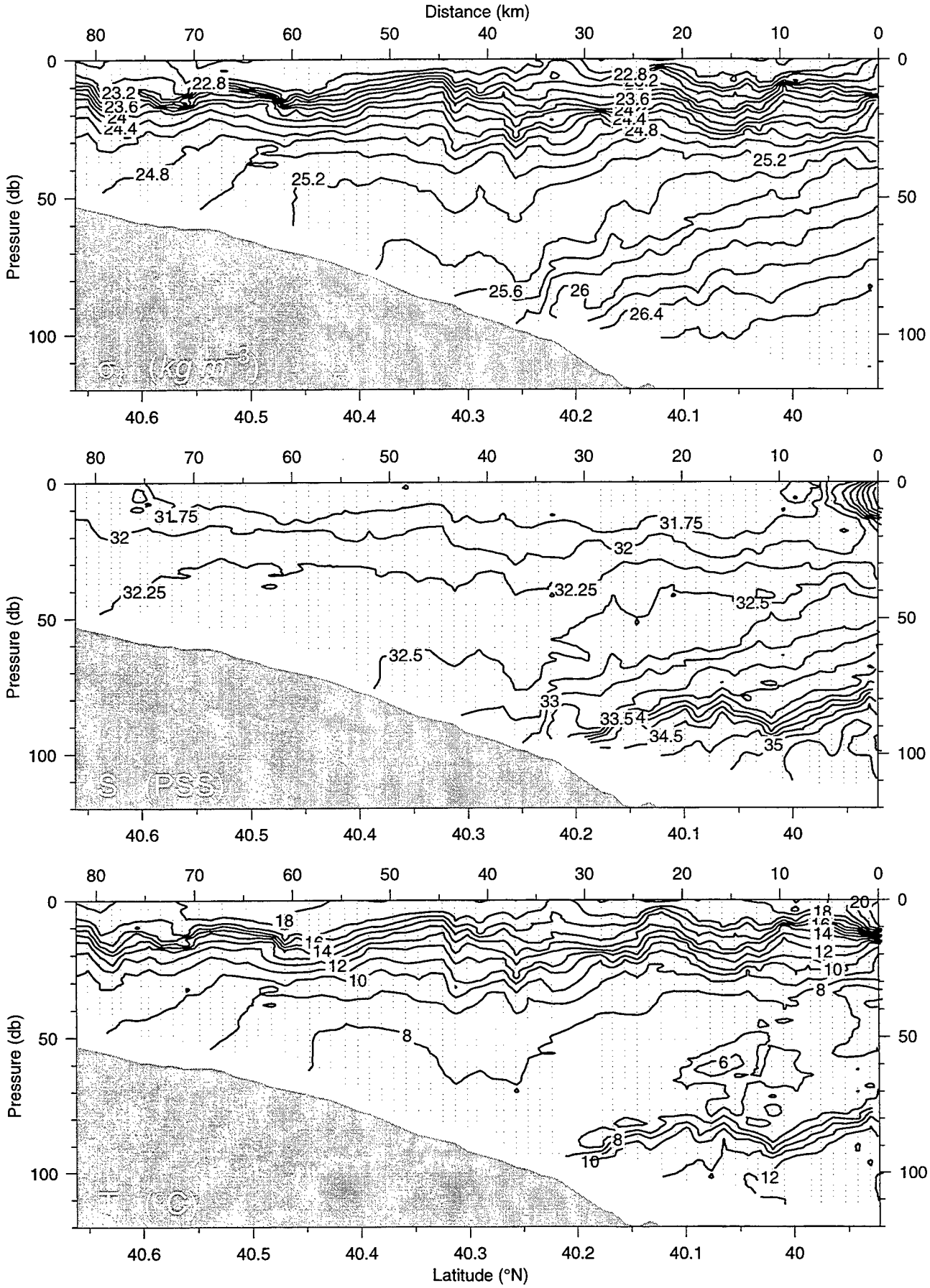
Line C



E9608 Big Box 1

17-Aug-96 13:44:21 - 17-Aug-96 19:22:19

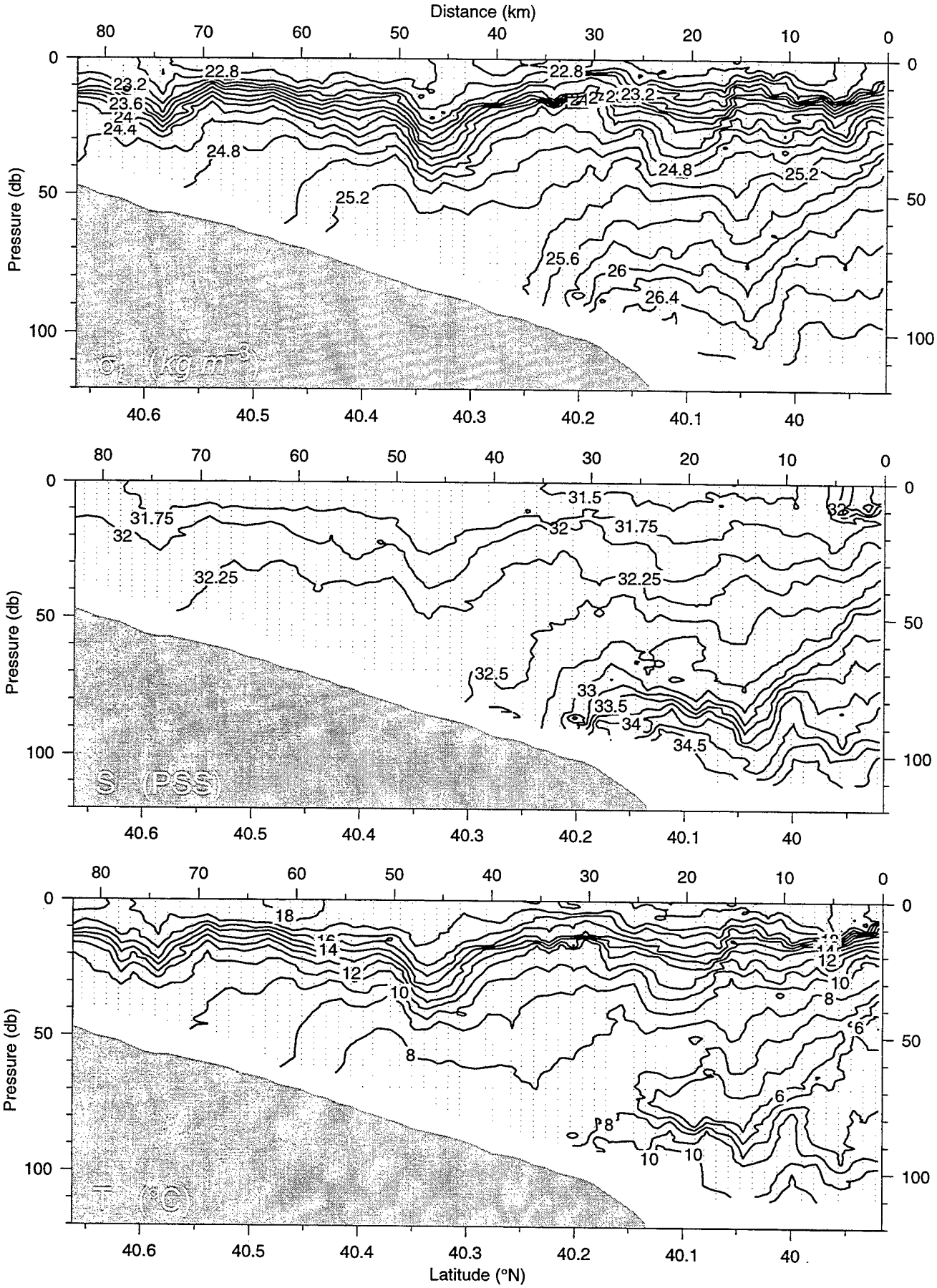
Line D



E9608 Big Box 1

17-Aug-96 07:01:40 - 17-Aug-96 12:39:20

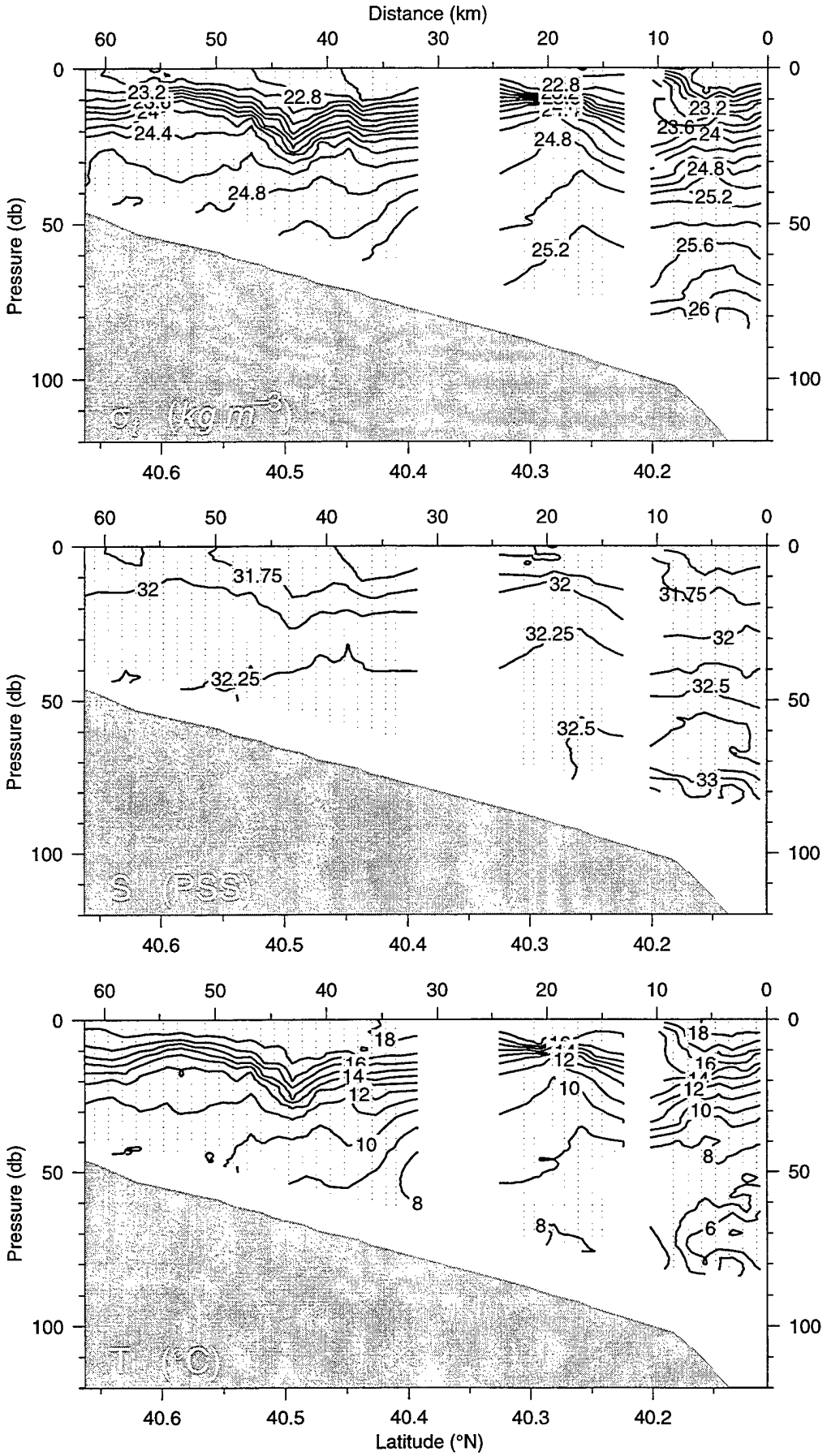
Line E



E9608 Big Box 1

17-Aug-96 02:01:16 - 17-Aug-96 06:09:37

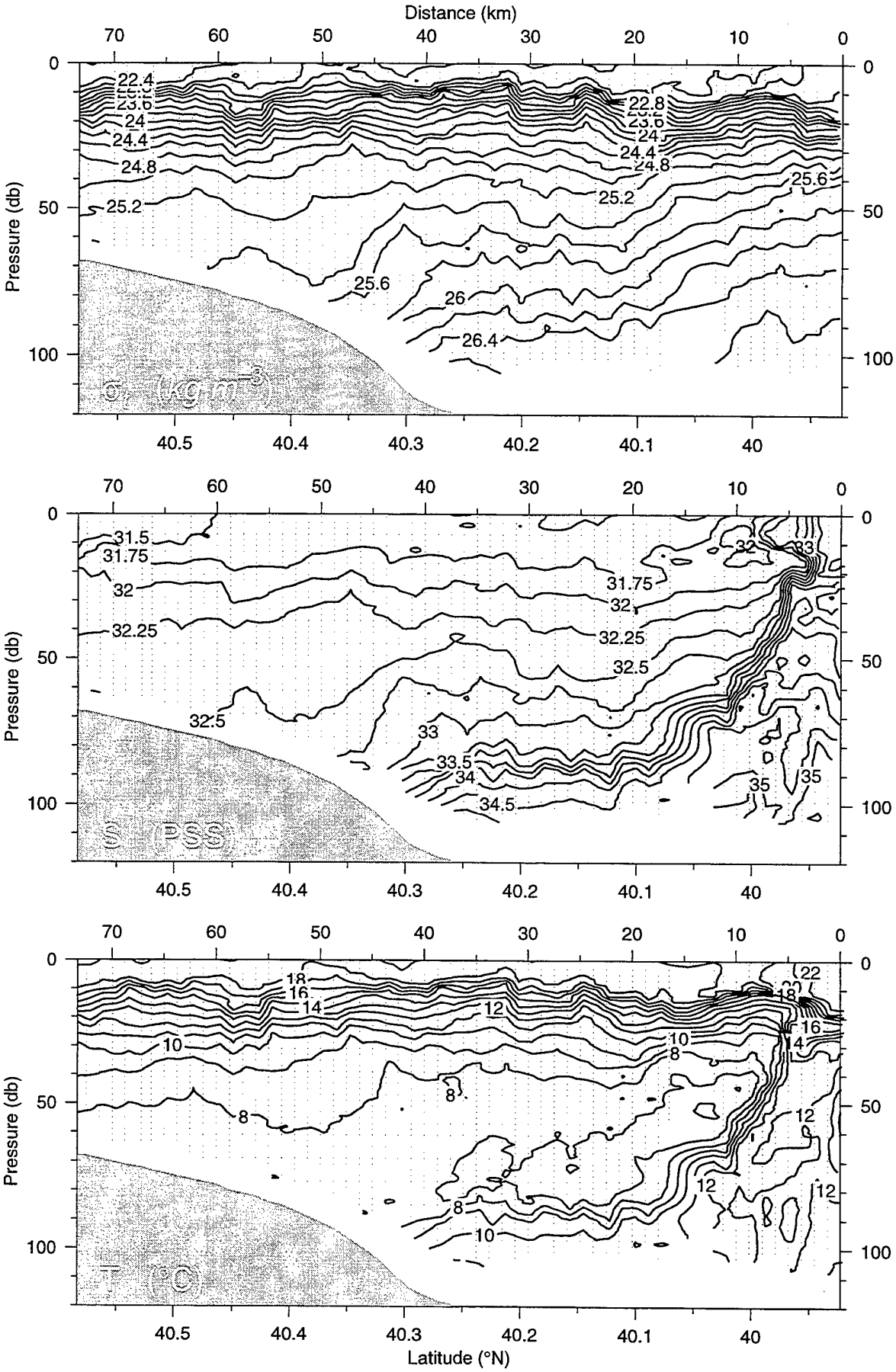
Line F



E9608 Big Box 2

20-Aug-96 17:05:39 - 20-Aug-96 22:16:22

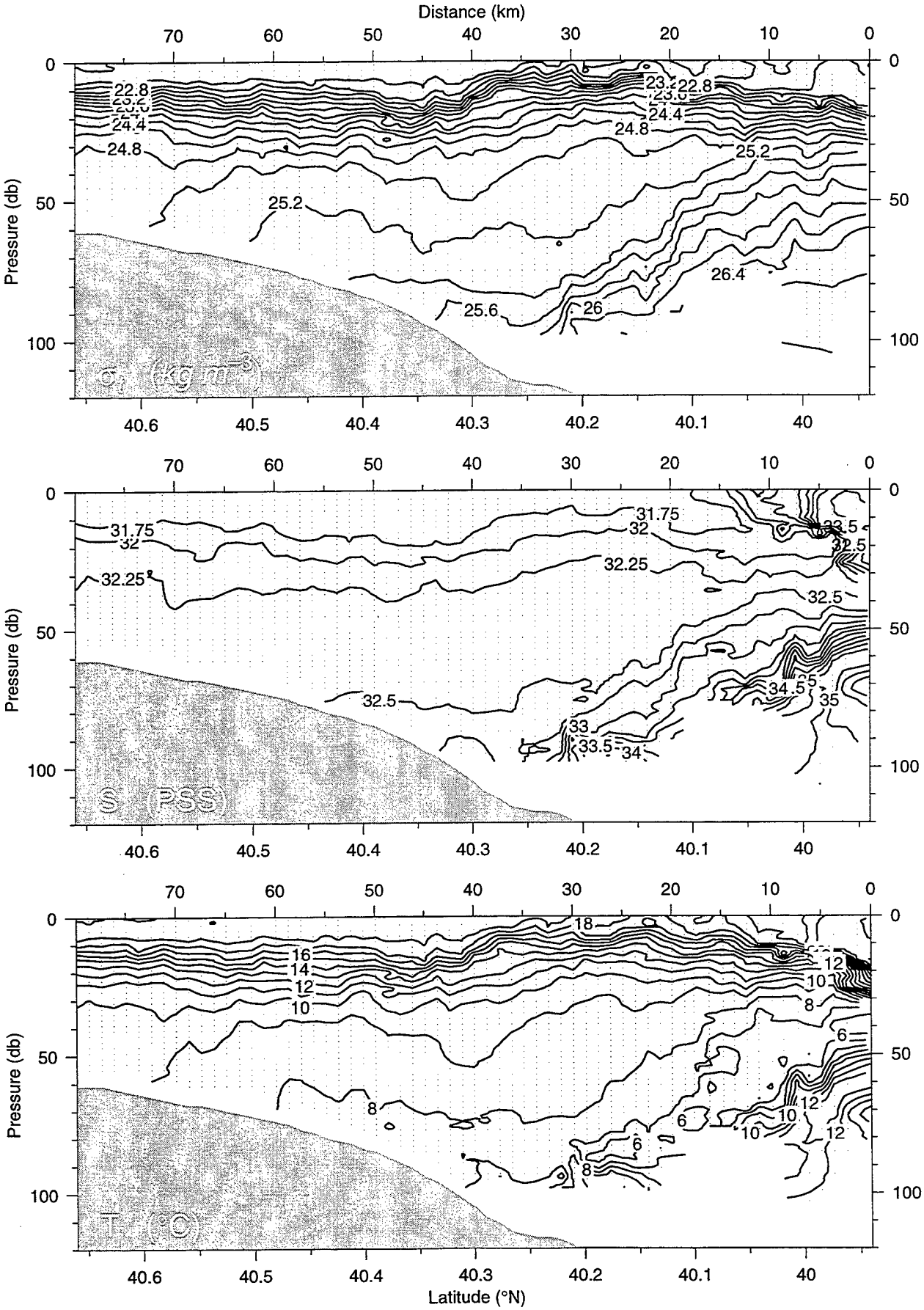
Line A



E9608 Big Box 2

20-Aug-96 23:12:26 - 21-Aug-96 04:50:36

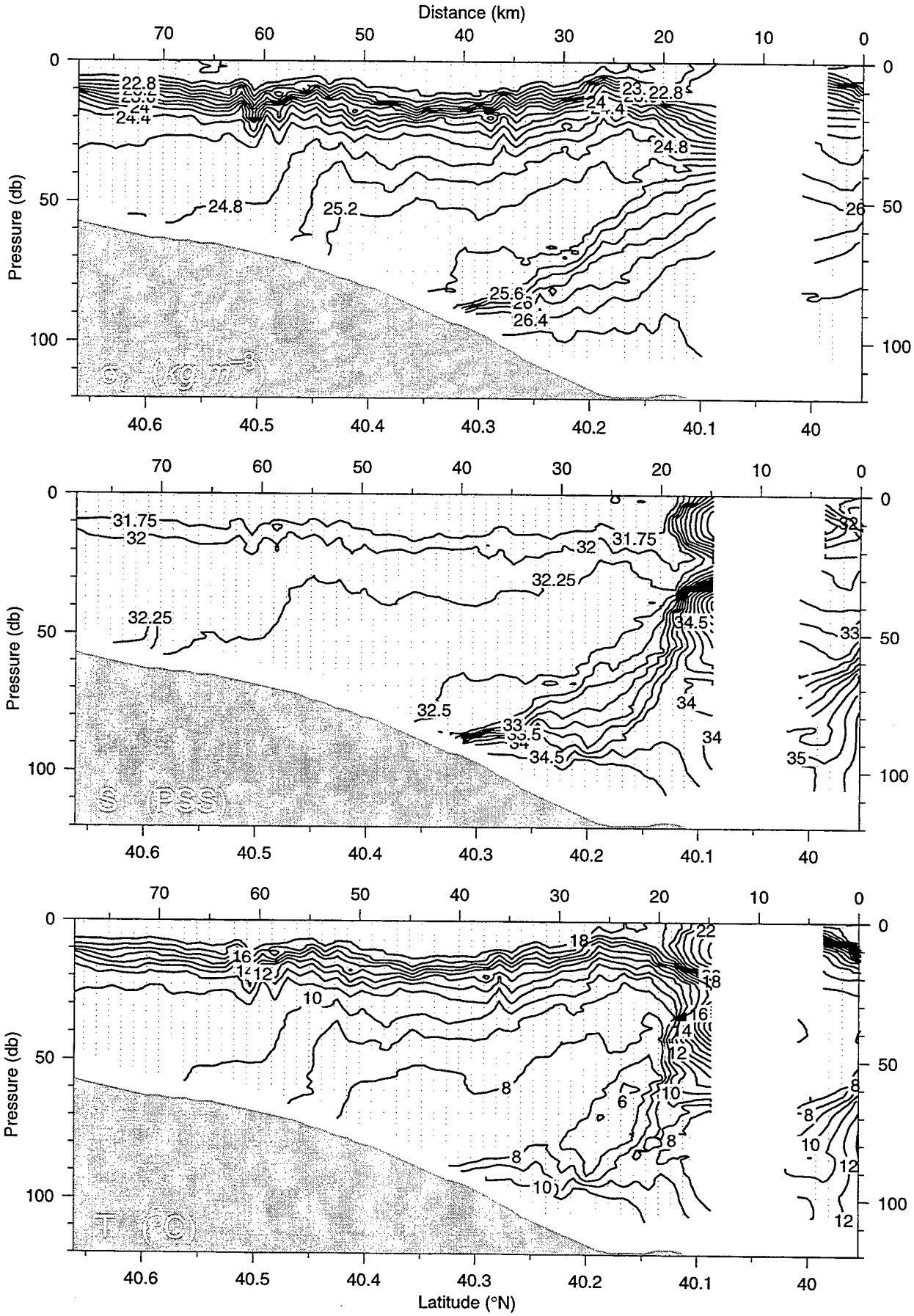
Line B



E9608 Big Box 2

21-Aug-96 05:44:38 - 21-Aug-96 11:09:30

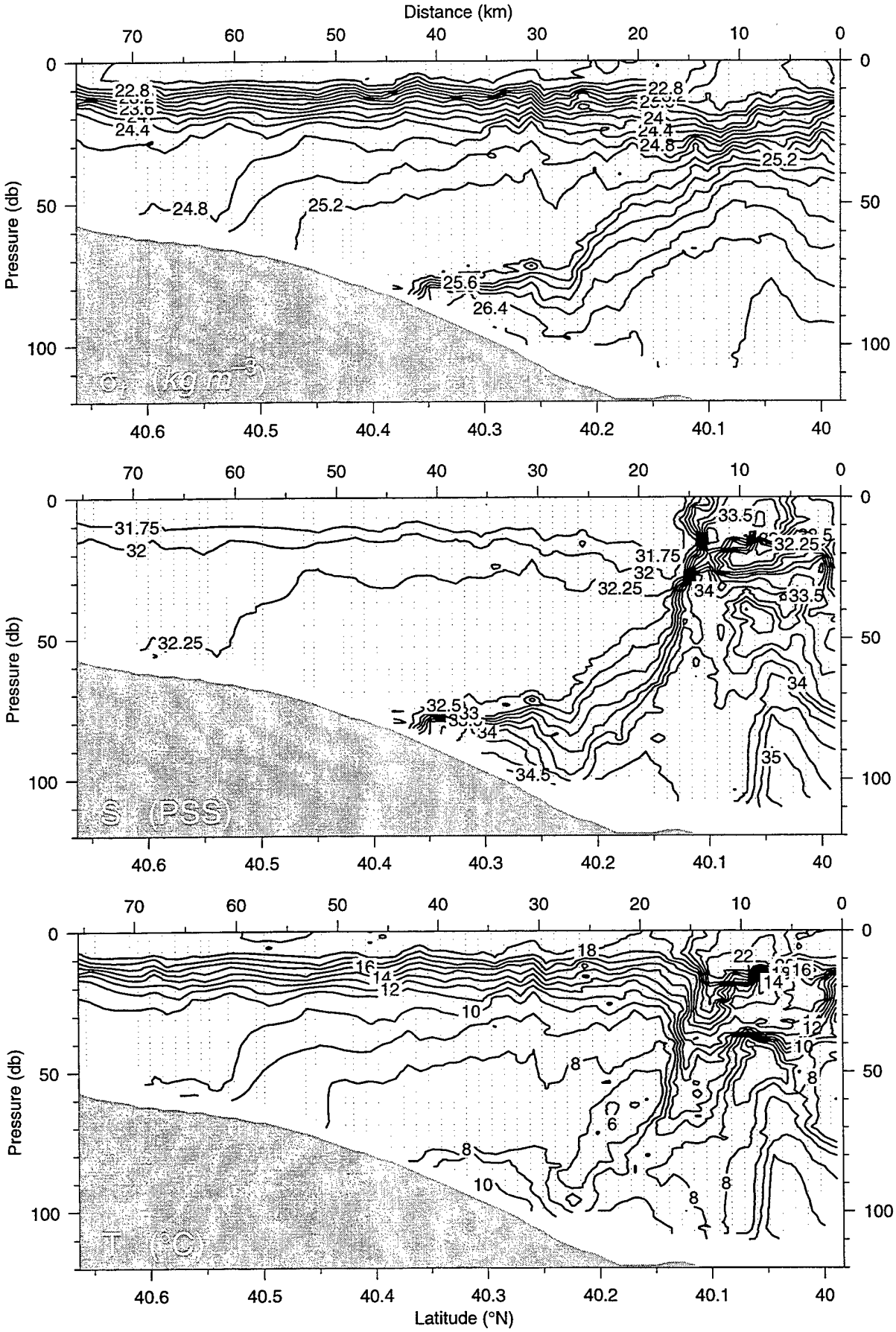
Line C1



E9608 Big Box 2

21-Aug-96 13:02:46 - 21-Aug-96 19:34:49

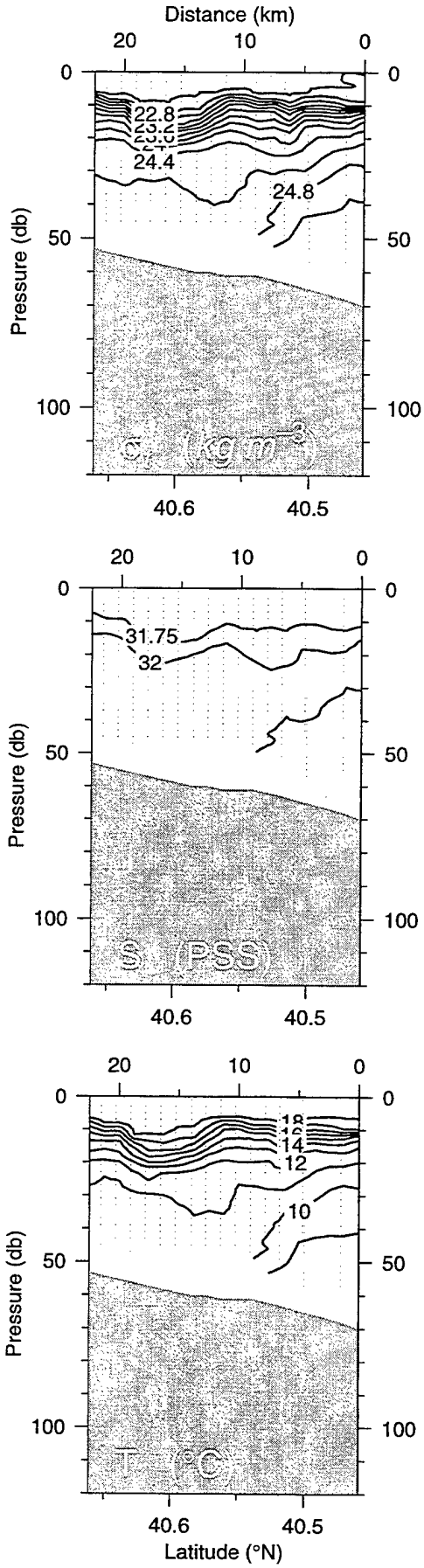
Line C2



E9608 Big Box 2

21-Aug-96 20:25:01 - 21-Aug-96 21:57:57

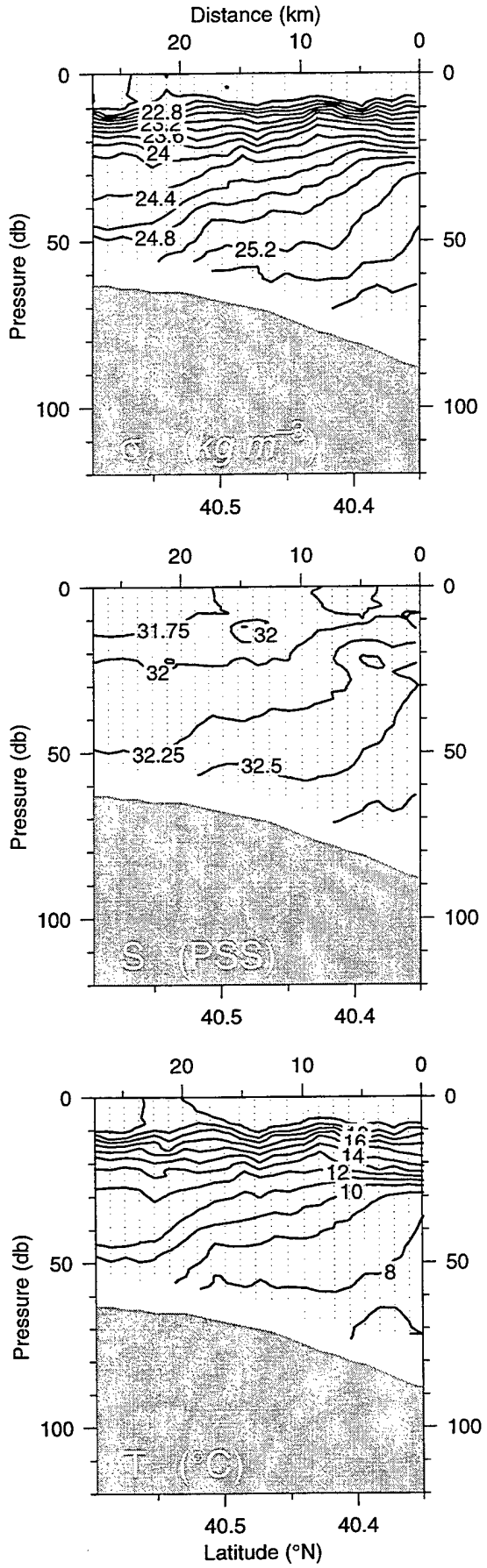
Line D



E9608 Big Box 3

31-Aug-96 05:49:24 - 31-Aug-96 07:58:58

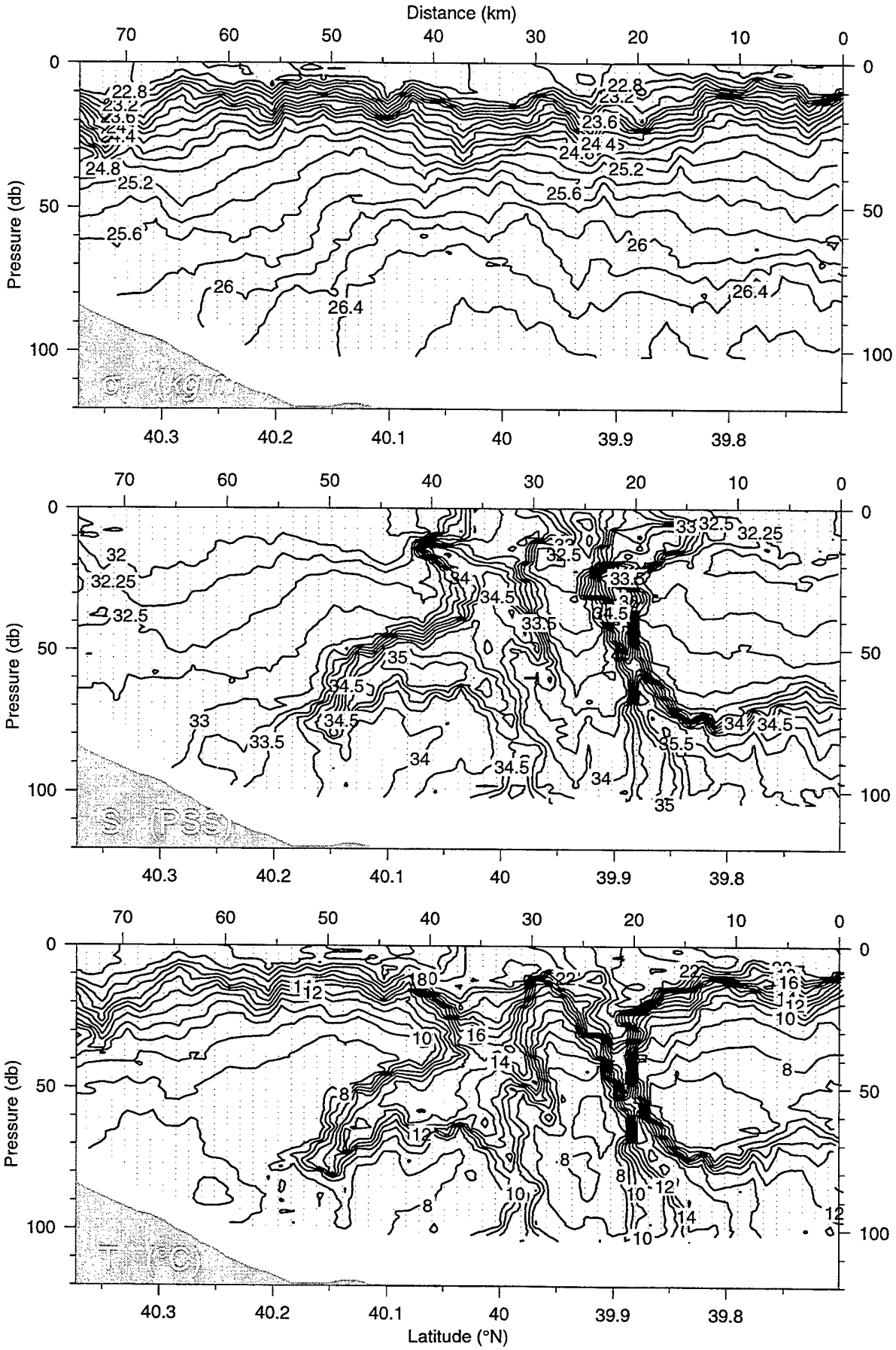
Line C0



E9608 Big Box 3

31-Aug-96 09:02:58 - 31-Aug-96 14:27:10

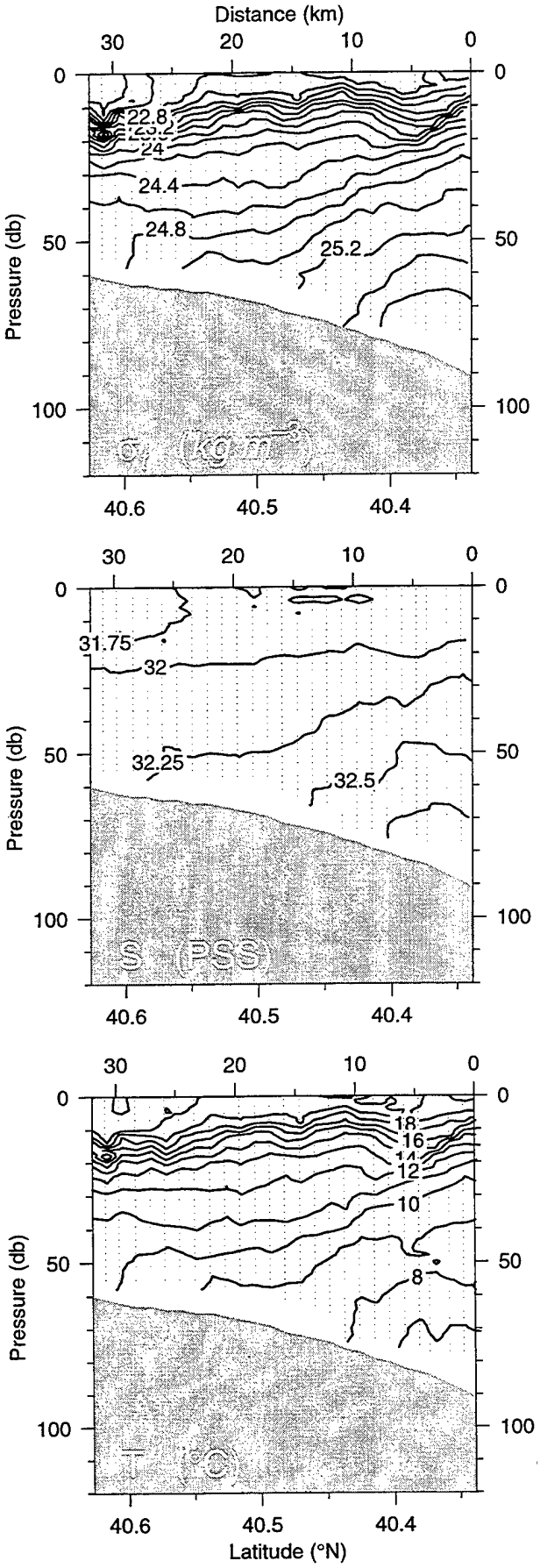
Line C1



E9608 Big Box 3

01-Sep-96 08:34:03 - 01-Sep-96 11:03:50

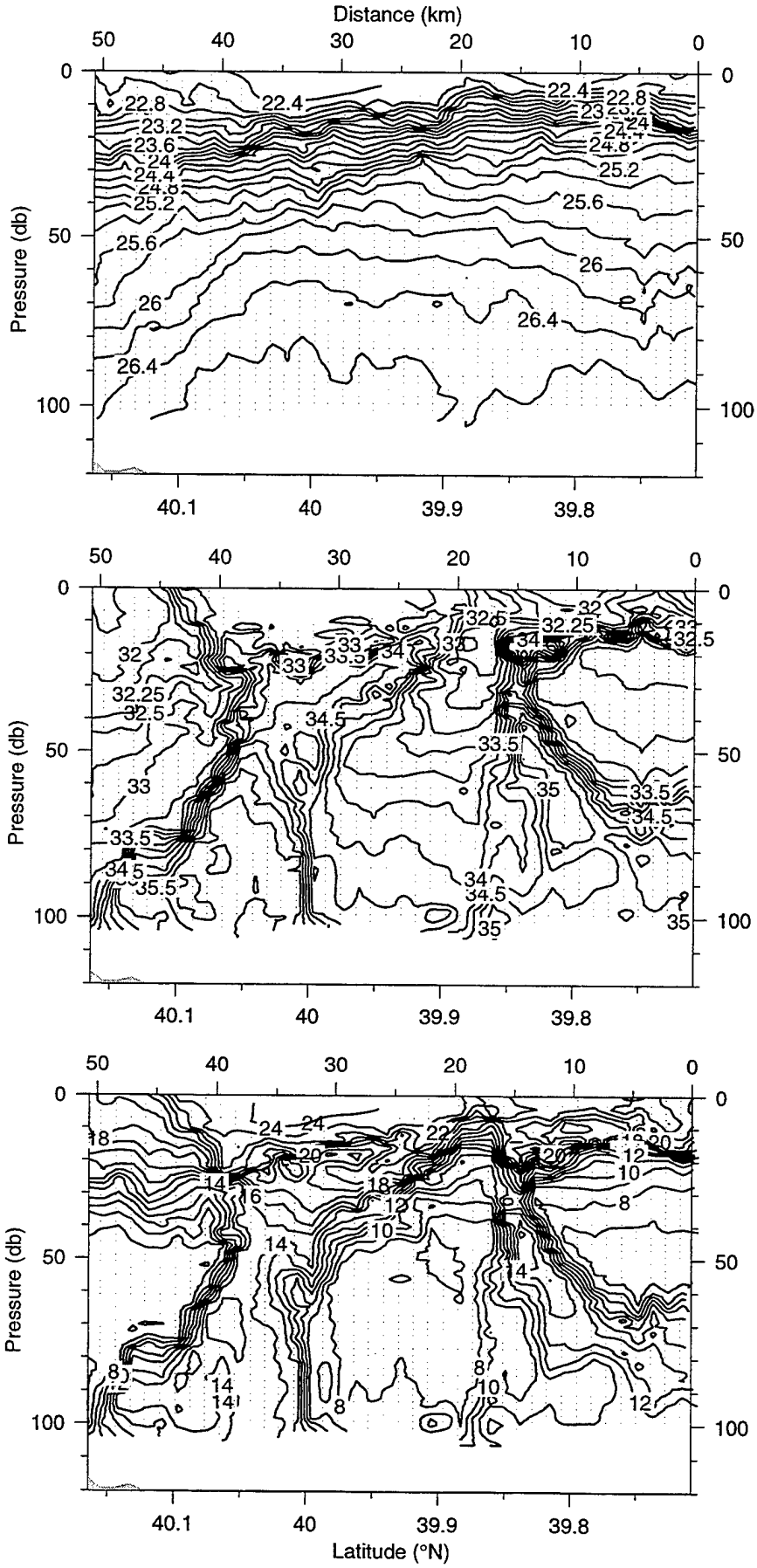
Line C2



E9608 Big Box 3

31-Aug-96 15:25:08 - 31-Aug-96 18:59:20

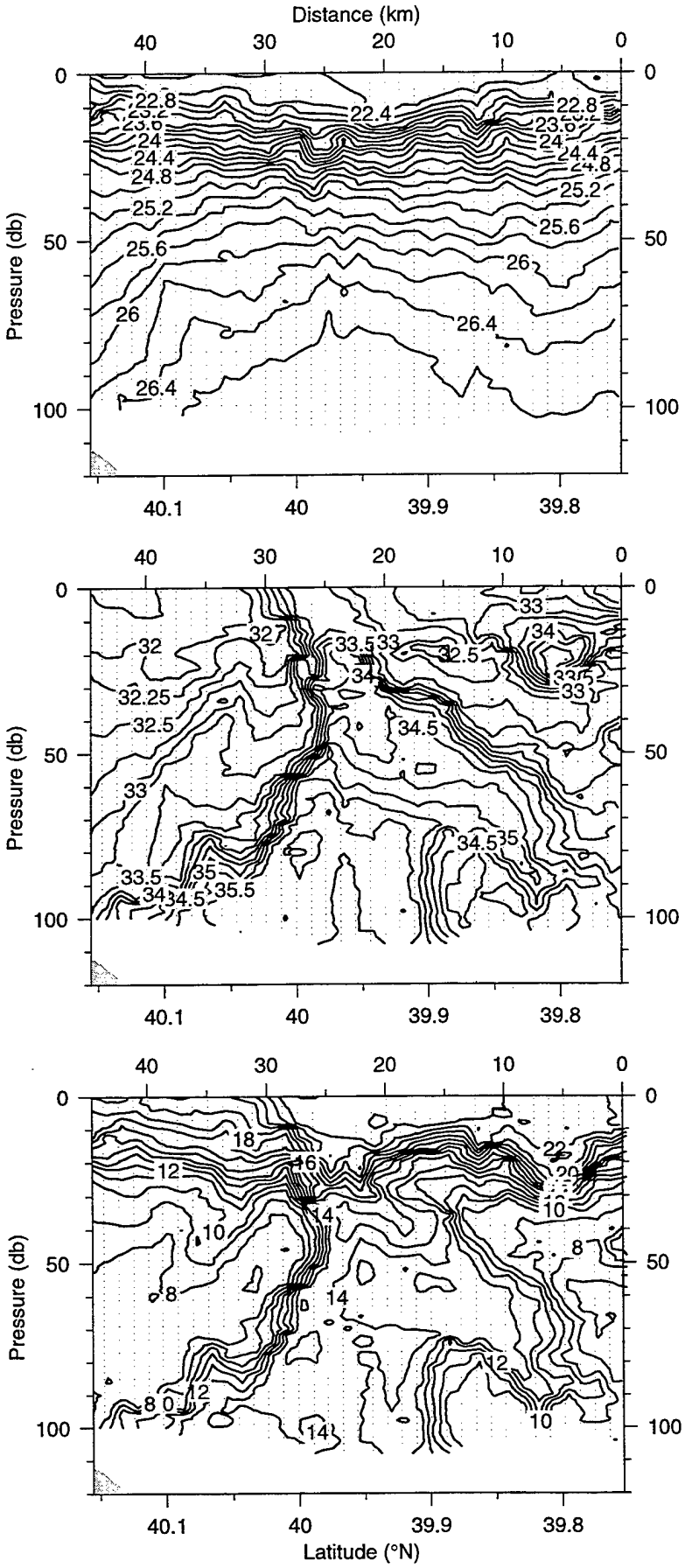
Line Ds



E9608 Big Box 3

31-Aug-96 20:07:58 - 31-Aug-96 23:27:23

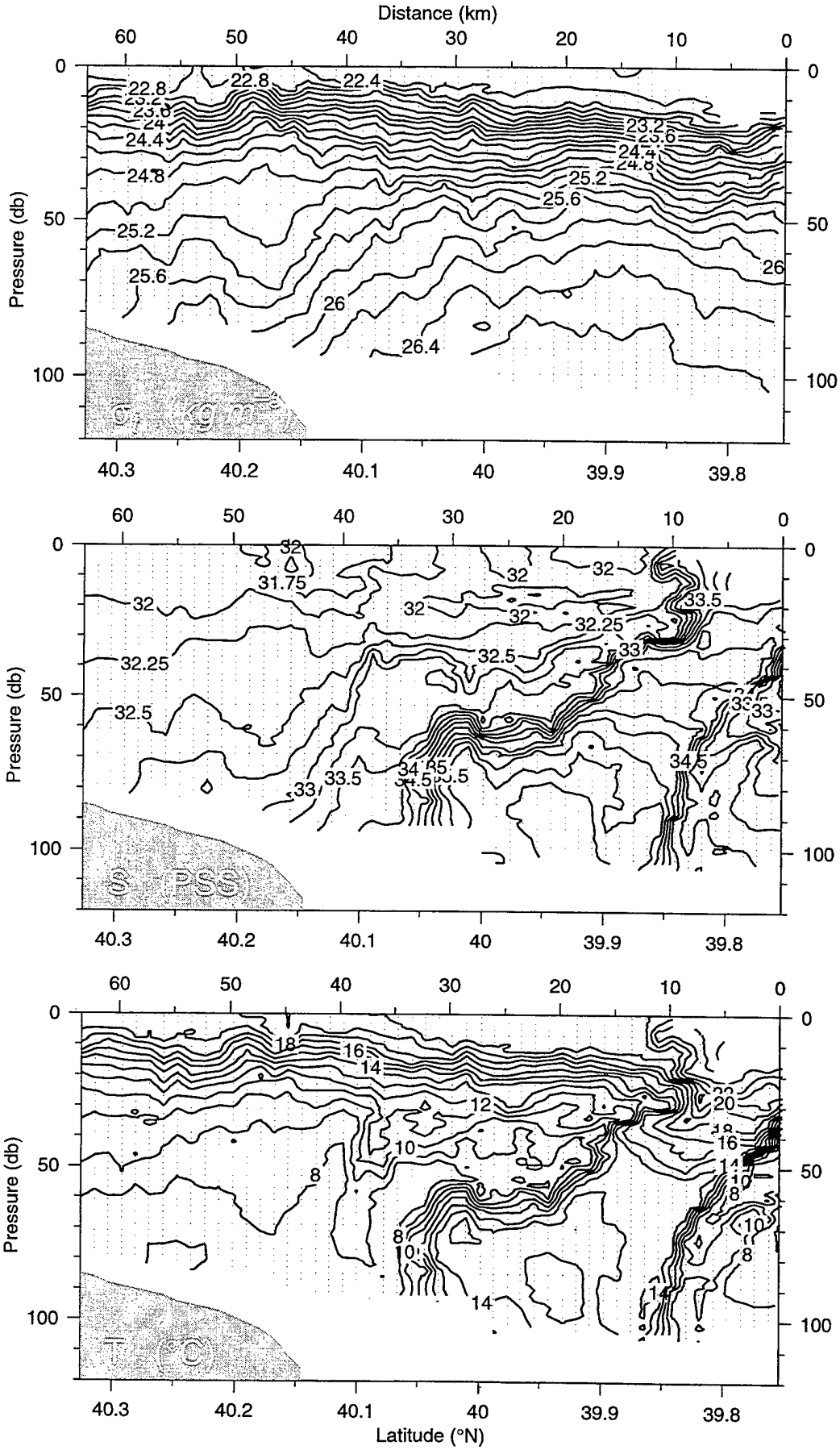
Line Es



E9608 Big Box 3

01-Sep-96 00:23:03 - 01-Sep-96 04:43:36

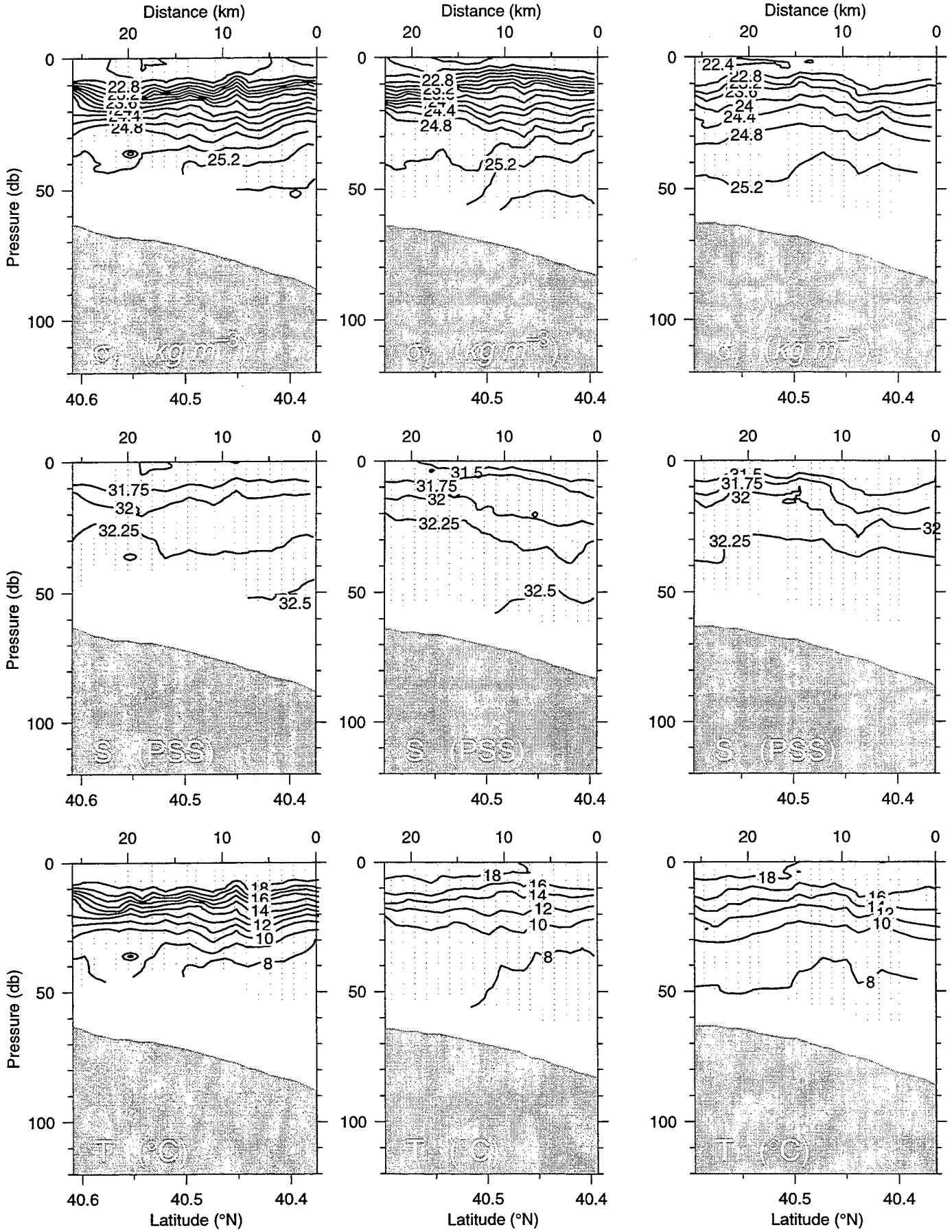
Line F



E9608 Small Box 1

15-Aug-96 23:24 - 16-Aug-96 01:59 | 16-Aug-96 02:41 - 16-Aug-96 04:18 | 16-Aug-96 04:46 - 16-Aug-96 06:54

Line 1 | Line 2 | Line 3

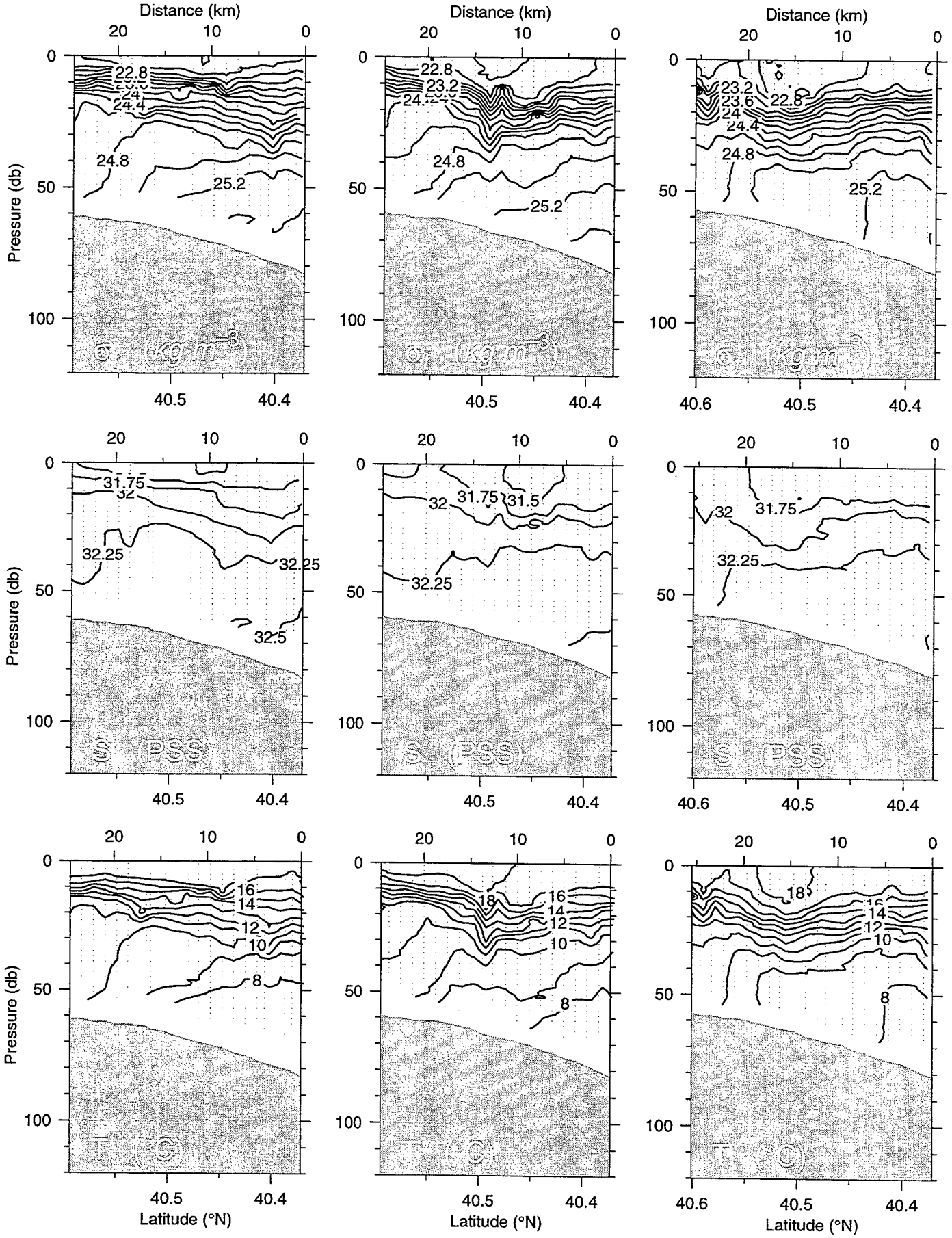


E9608 Small Box 1

16-Aug-96 07:32 - 16-Aug-96 10:33
Line 4

16-Aug-96 11:15 - 16-Aug-96 13:07
Line 5

16-Aug-96 13:39 - 16-Aug-96 15:26
Line 6

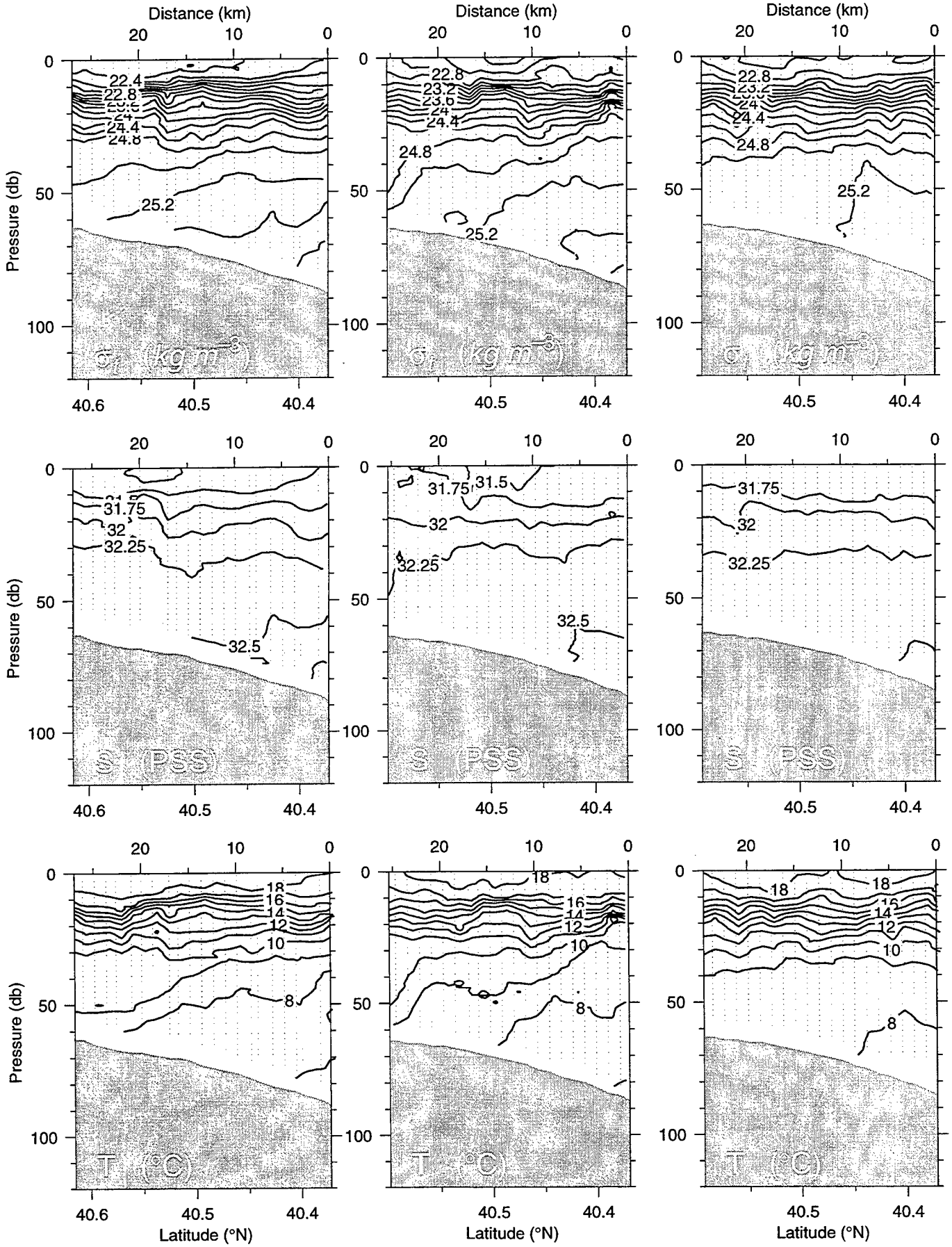


E9608 Small Box 2

18-Aug-96 09:36 - 18-Aug-96 11:29
Line 1

18-Aug-96 12:00 - 18-Aug-96 13:44
Line 2

18-Aug-96 14:14 - 18-Aug-96 16:03
Line 3

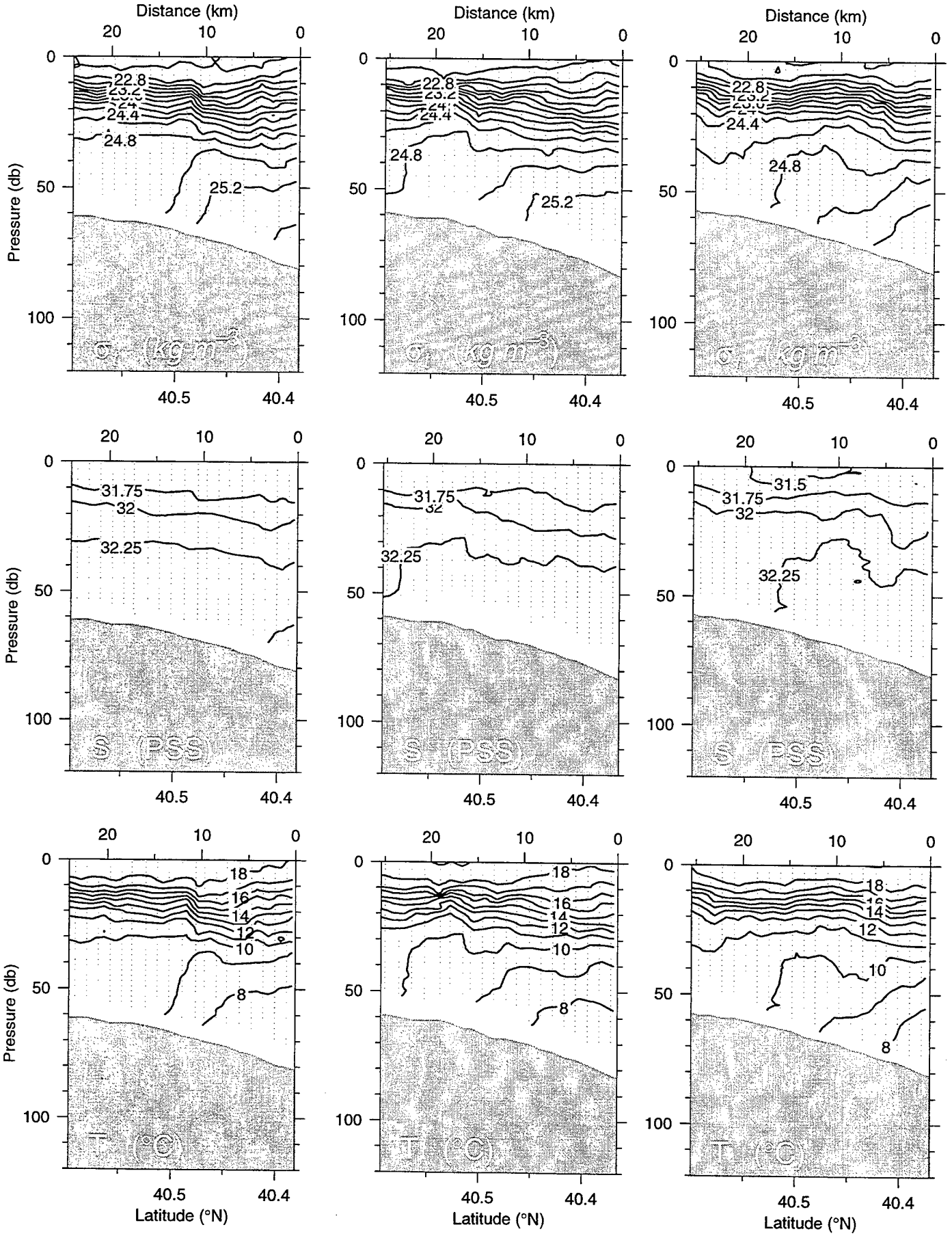


E9608 Small Box 2

18-Aug-96 18:03 - 18-Aug-96 19:42
Line 4

18-Aug-96 21:08 - 18-Aug-96 23:11
Line 5

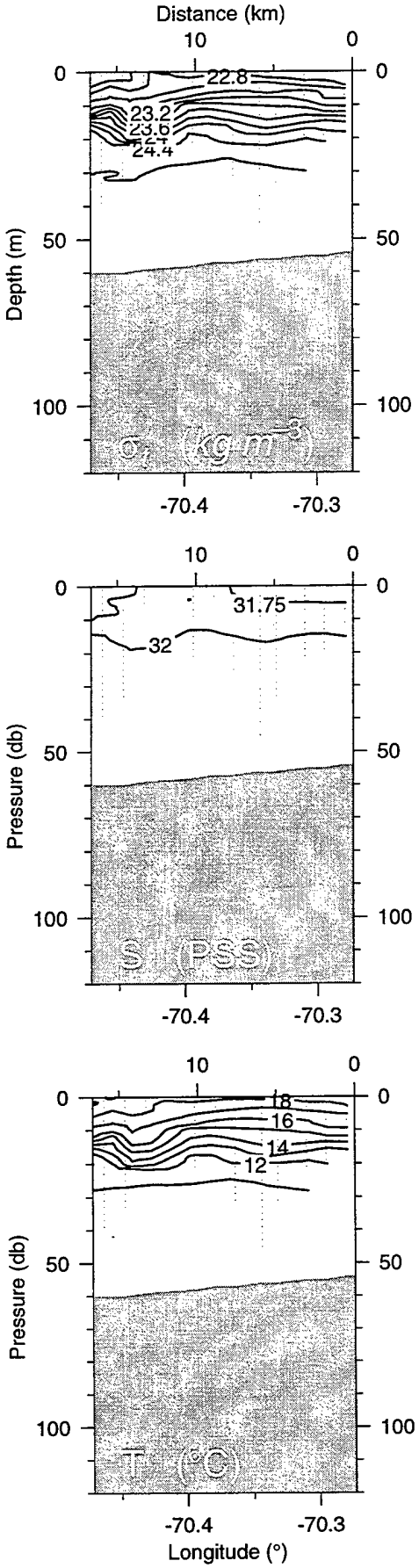
18-Aug-96 23:48 - 19-Aug-96 01:36
Line 6



E9608 Small Box 3

19-Aug-96 01:49:13 - 19-Aug-96 03:08:27

Line sb2_sb3

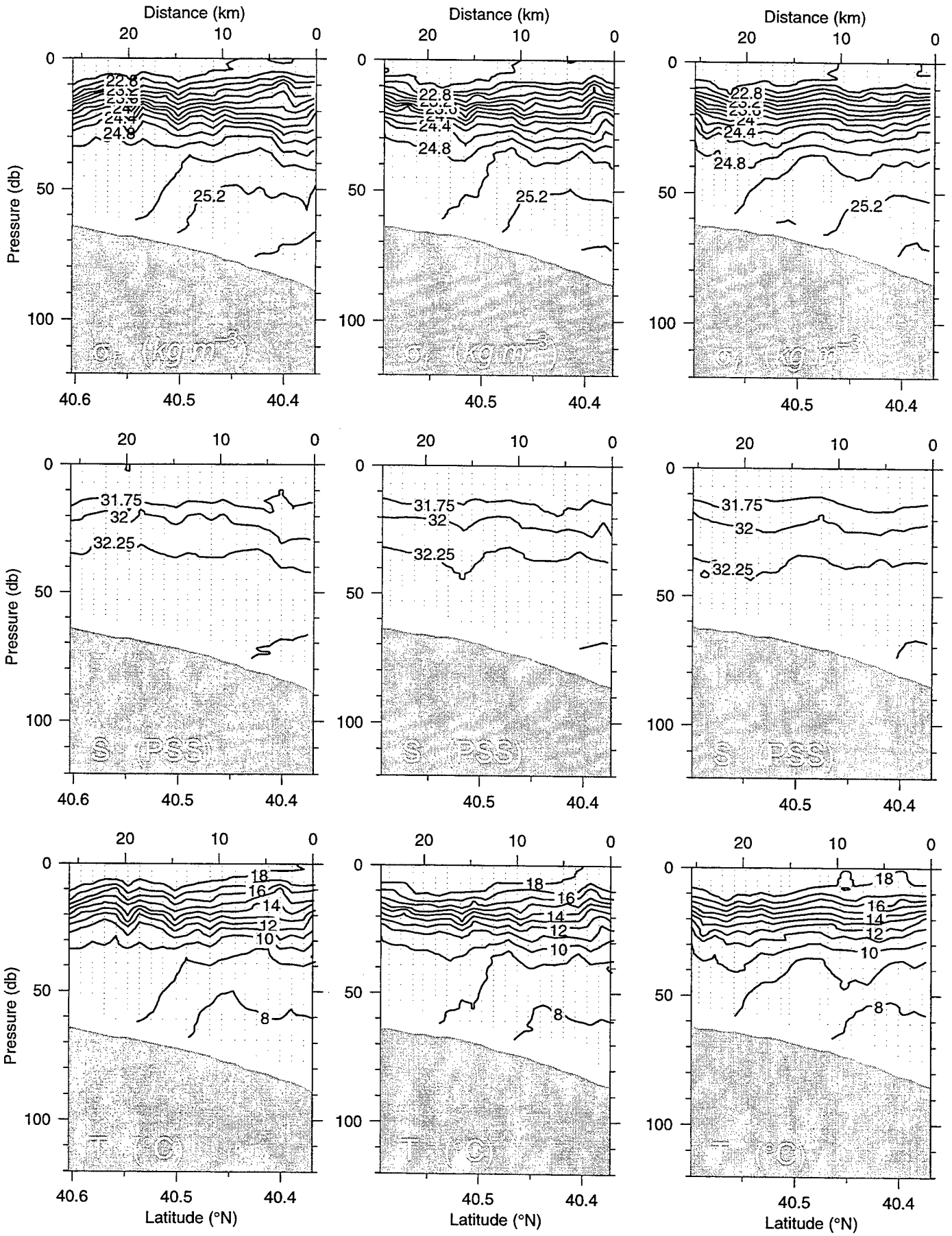


E9608 Small Box 3

20-Aug-96 12:49 - 20-Aug-96 14:37
Line 1

20-Aug-96 10:31 - 20-Aug-96 12:11
Line 2

20-Aug-96 08:18 - 20-Aug-96 10:04
Line 3

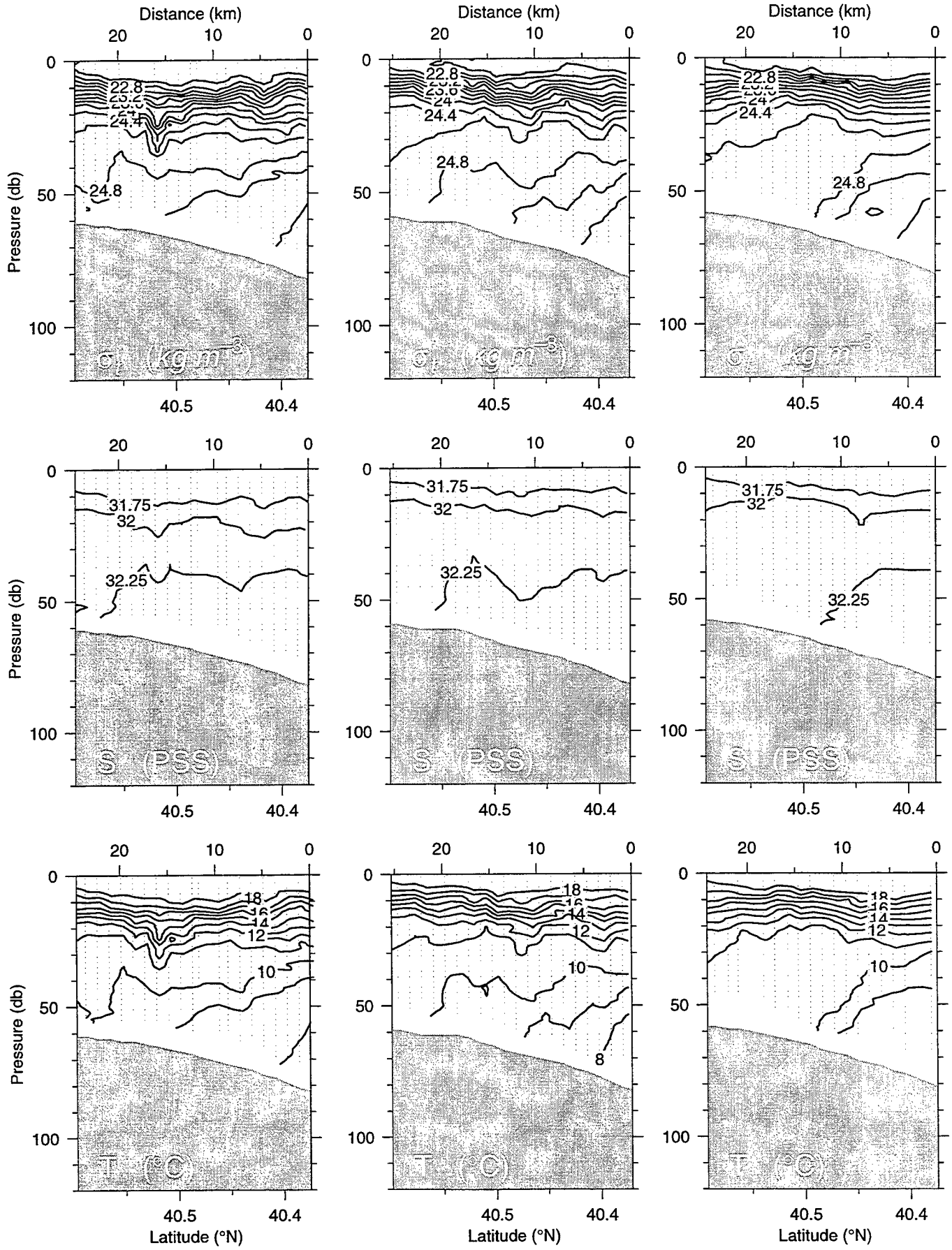


E9608 Small Box 3

20-Aug-96 06:05 - 20-Aug-96 07:49
Line 4

20-Aug-96 03:57 - 20-Aug-96 05:40
Line 5

20-Aug-96 01:41 - 20-Aug-96 03:26
Line 6

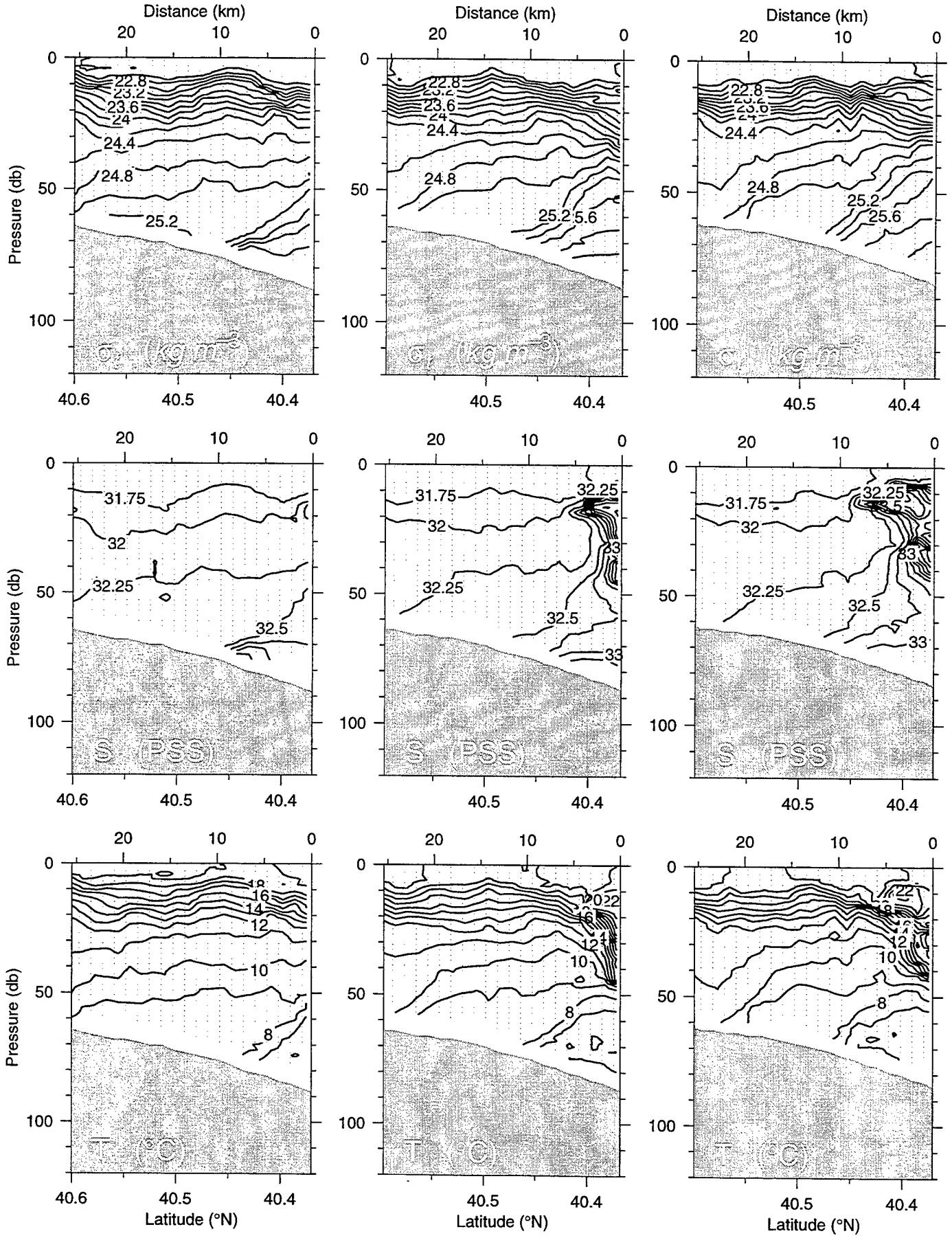


E9608 Small Box 4

25-Aug-96 07:31 - 25-Aug-96 09:20
Line 1

25-Aug-96 05:20 - 25-Aug-96 07:06
Line 2

25-Aug-96 03:02 - 25-Aug-96 04:55
Line 3

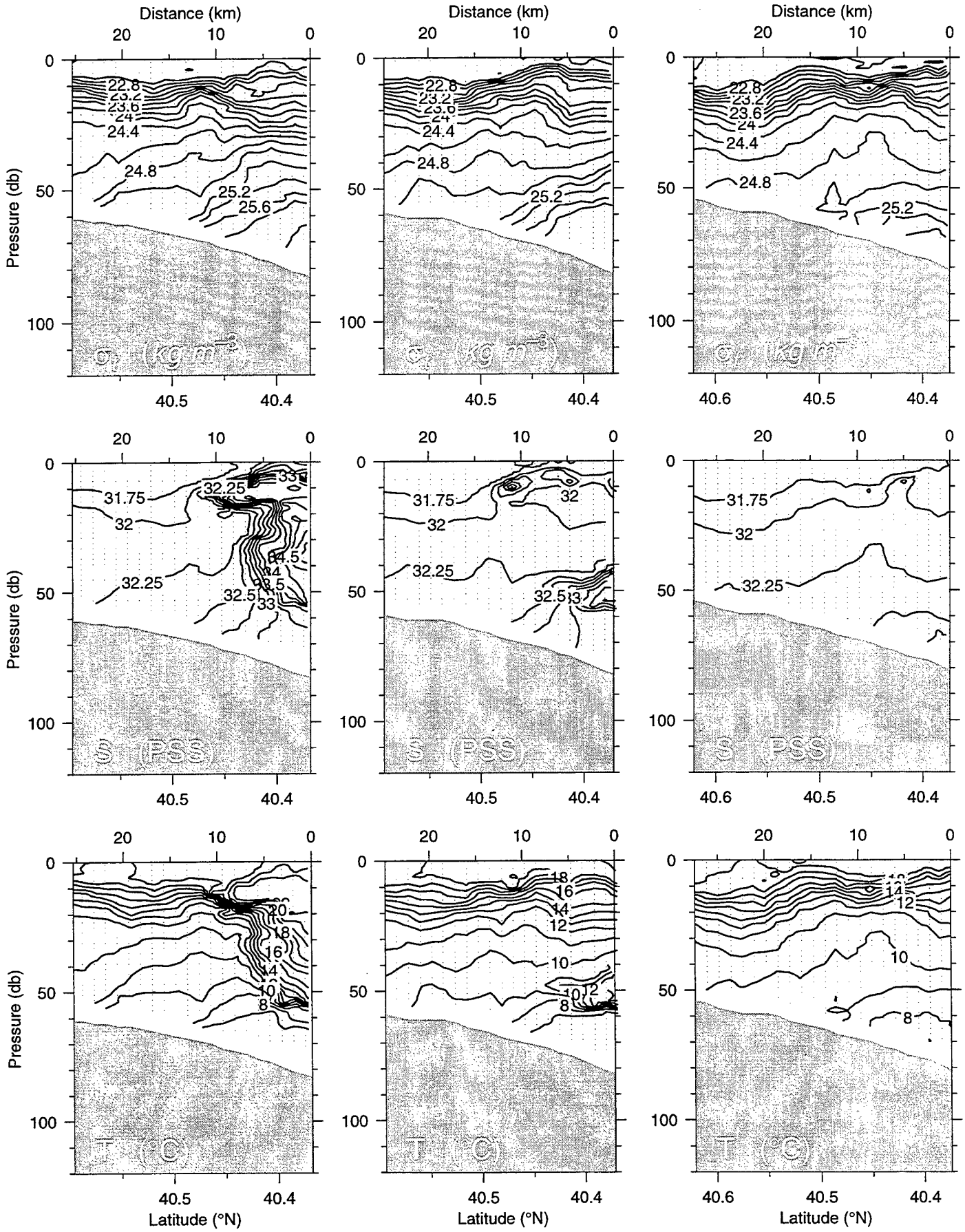


E9608 Small Box 4

25-Aug-96 00:53 - 25-Aug-96 02:37
Line 4

24-Aug-96 22:43 - 25-Aug-96 00:25
Line 5

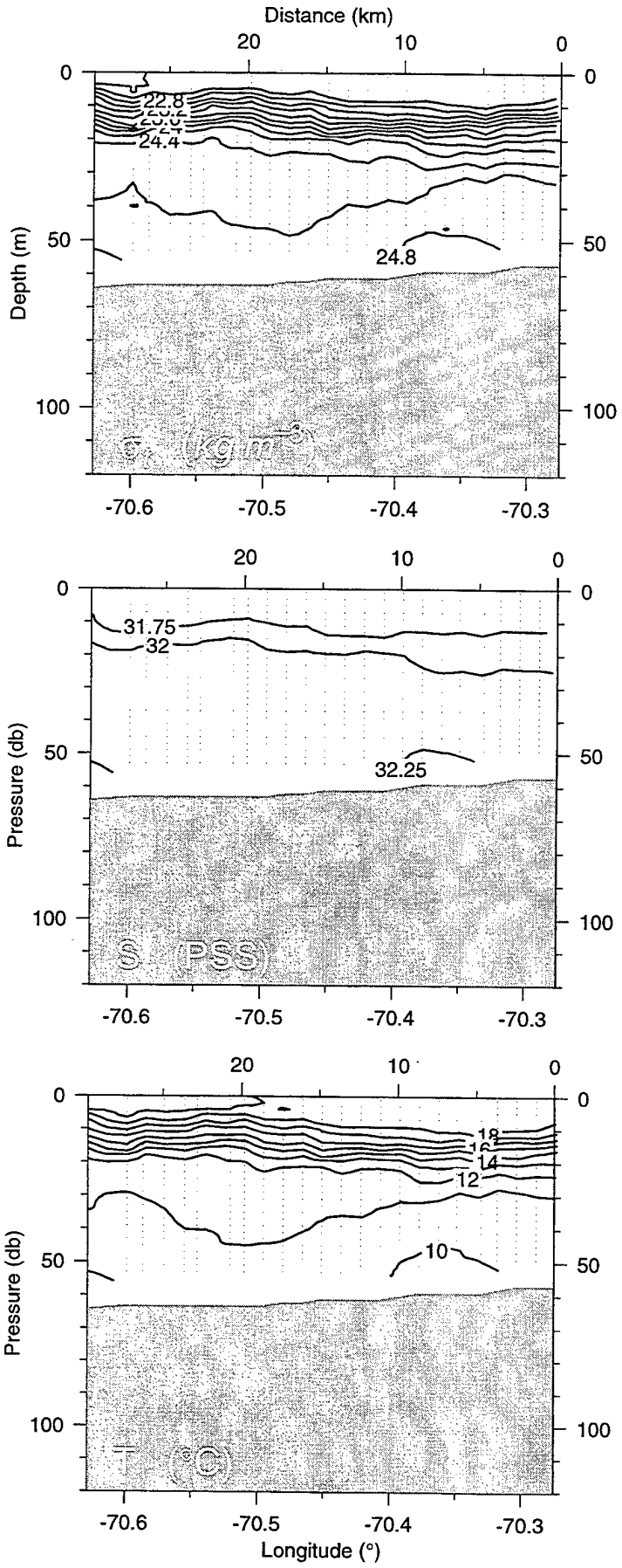
24-Aug-96 20:07 - 24-Aug-96 22:12
Line 6



E9608 Small Box 5

25-Aug-96 09:21:39 - 25-Aug-96 11:32:38

Line sb4_sb5

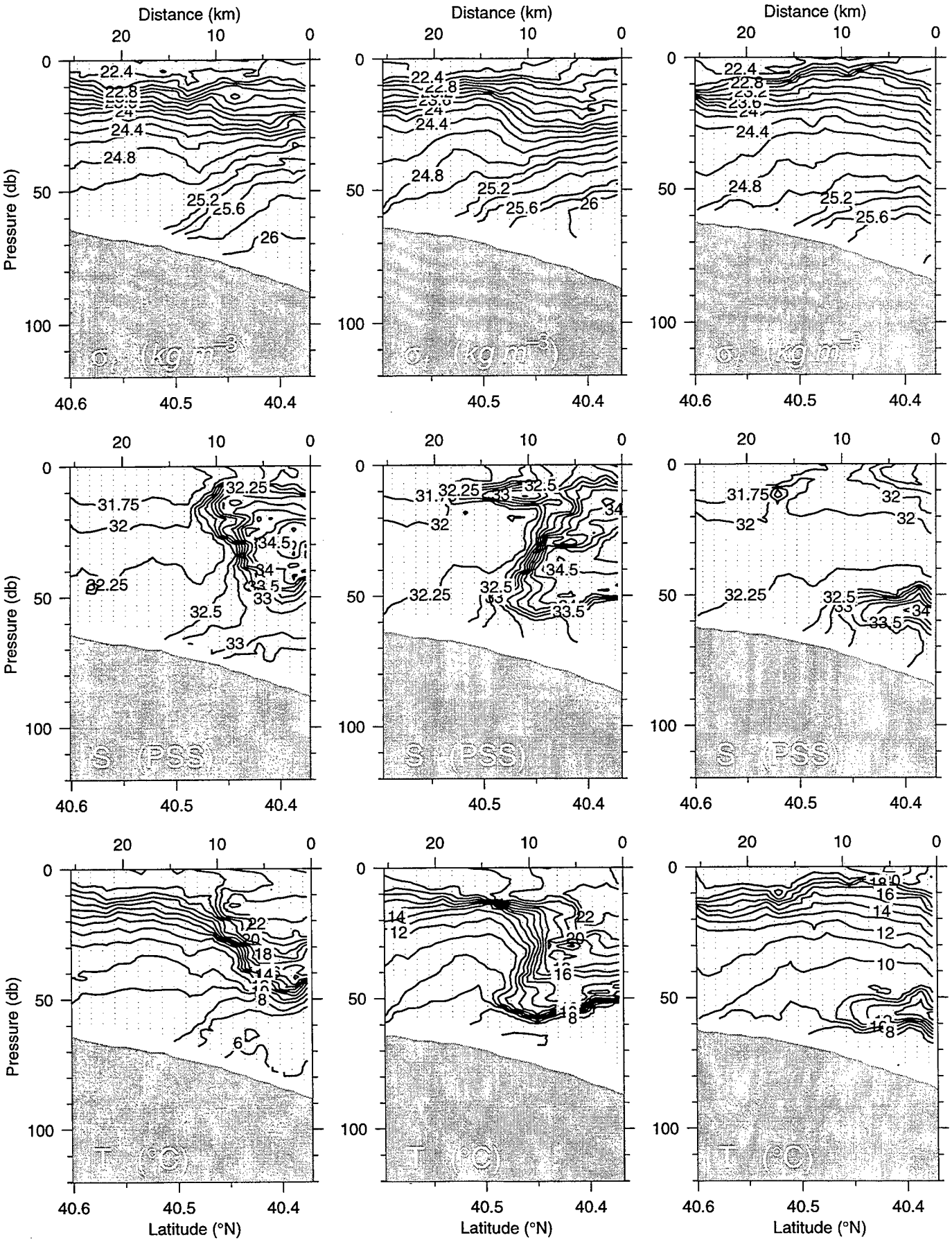


E9608 Small Box 5

25-Aug-96 23:16 - 26-Aug-96 01:04
Line 1

25-Aug-96 20:52 - 25-Aug-96 22:48
Line 2

25-Aug-96 18:39 - 25-Aug-96 20:23
Line 3

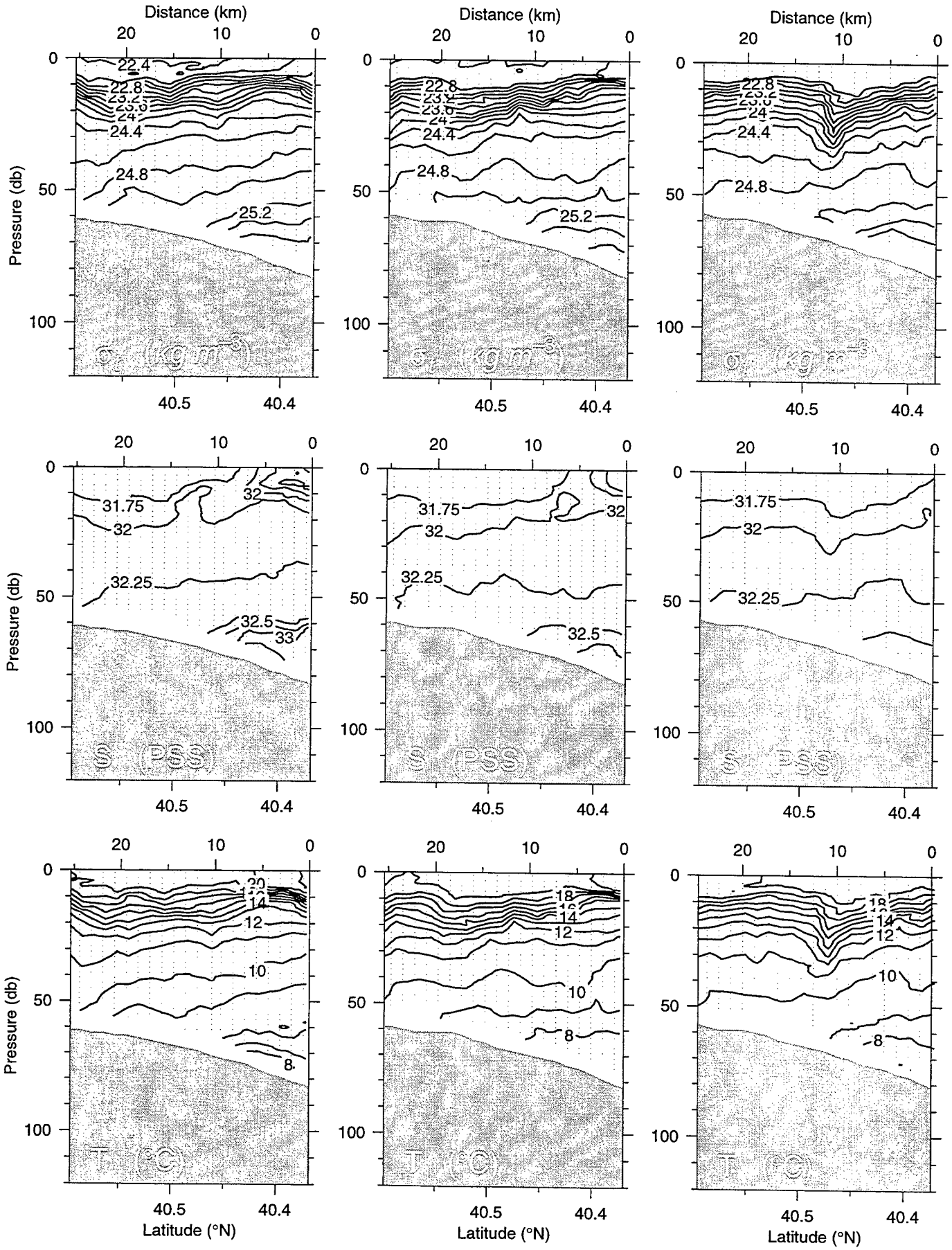


E9608 Small Box 5

25-Aug-96 16:18 - 25-Aug-96 18:14
Line 4

25-Aug-96 14:00 - 25-Aug-96 15:52
Line 5

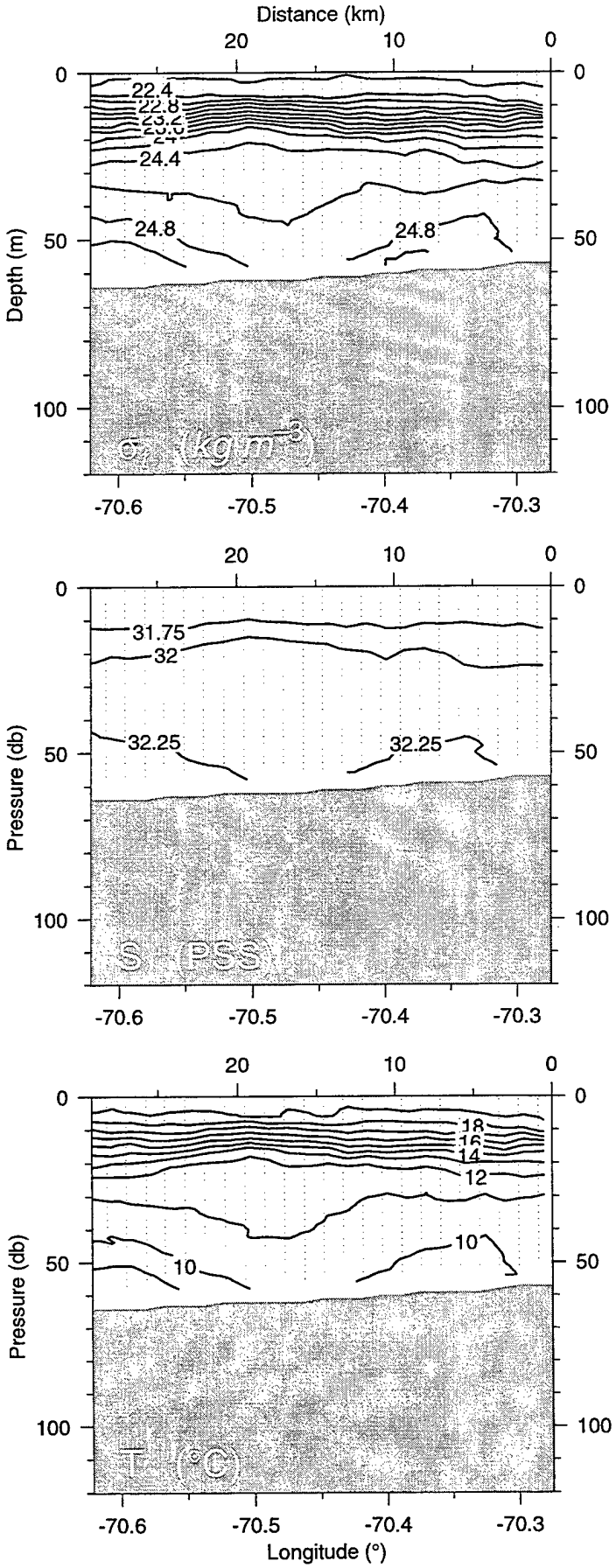
25-Aug-96 11:36 - 25-Aug-96 13:28
Line 6



E9608 Small Box 6

26-Aug-96 01:07:24 - 26-Aug-96 03:10:31

Line sb5_sb6

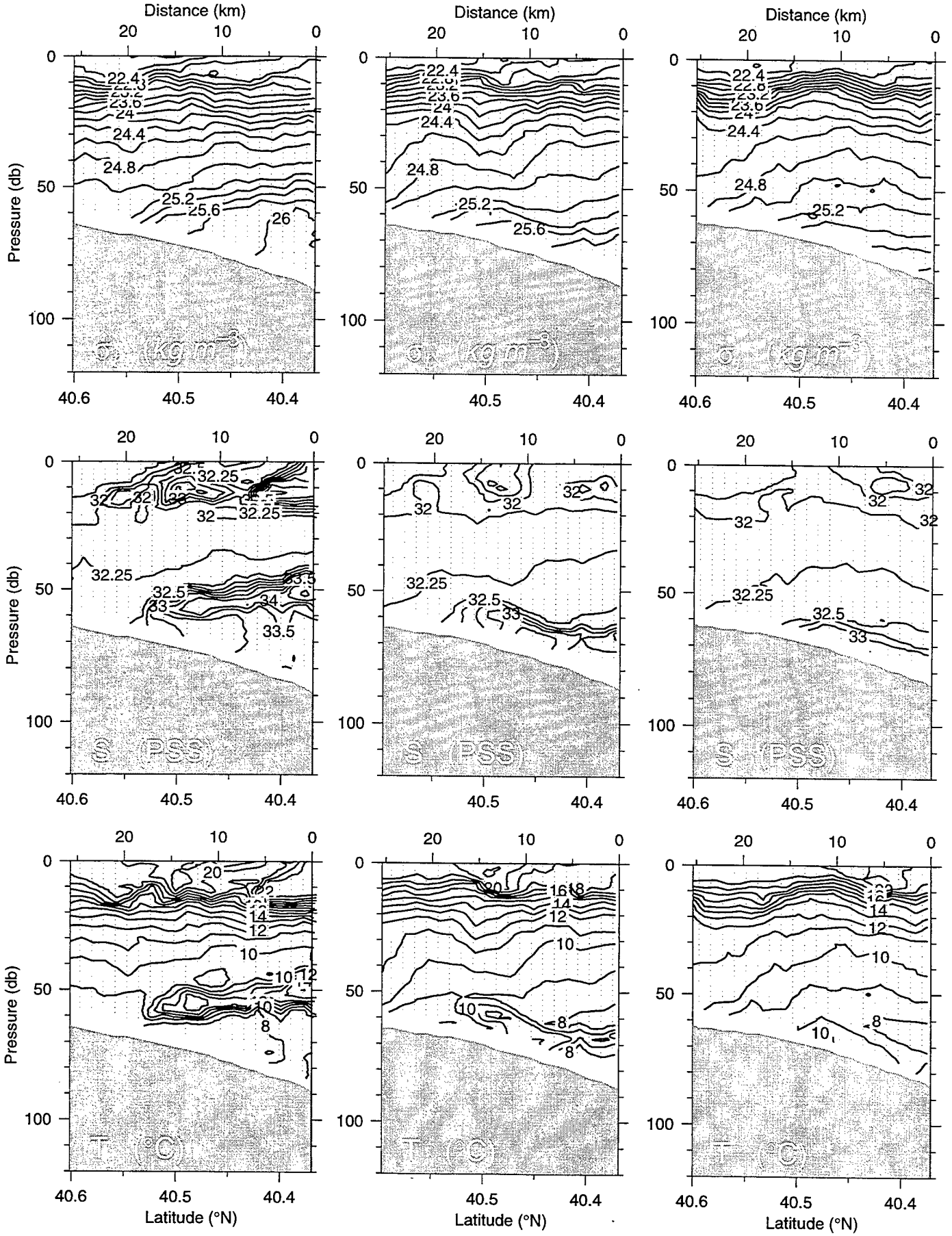


E9608 Small Box 6

26-Aug-96 14:49 - 26-Aug-96 16:51
Line 1

26-Aug-96 12:15 - 26-Aug-96 14:21
Line 2

26-Aug-96 09:58 - 26-Aug-96 11:48
Line 3

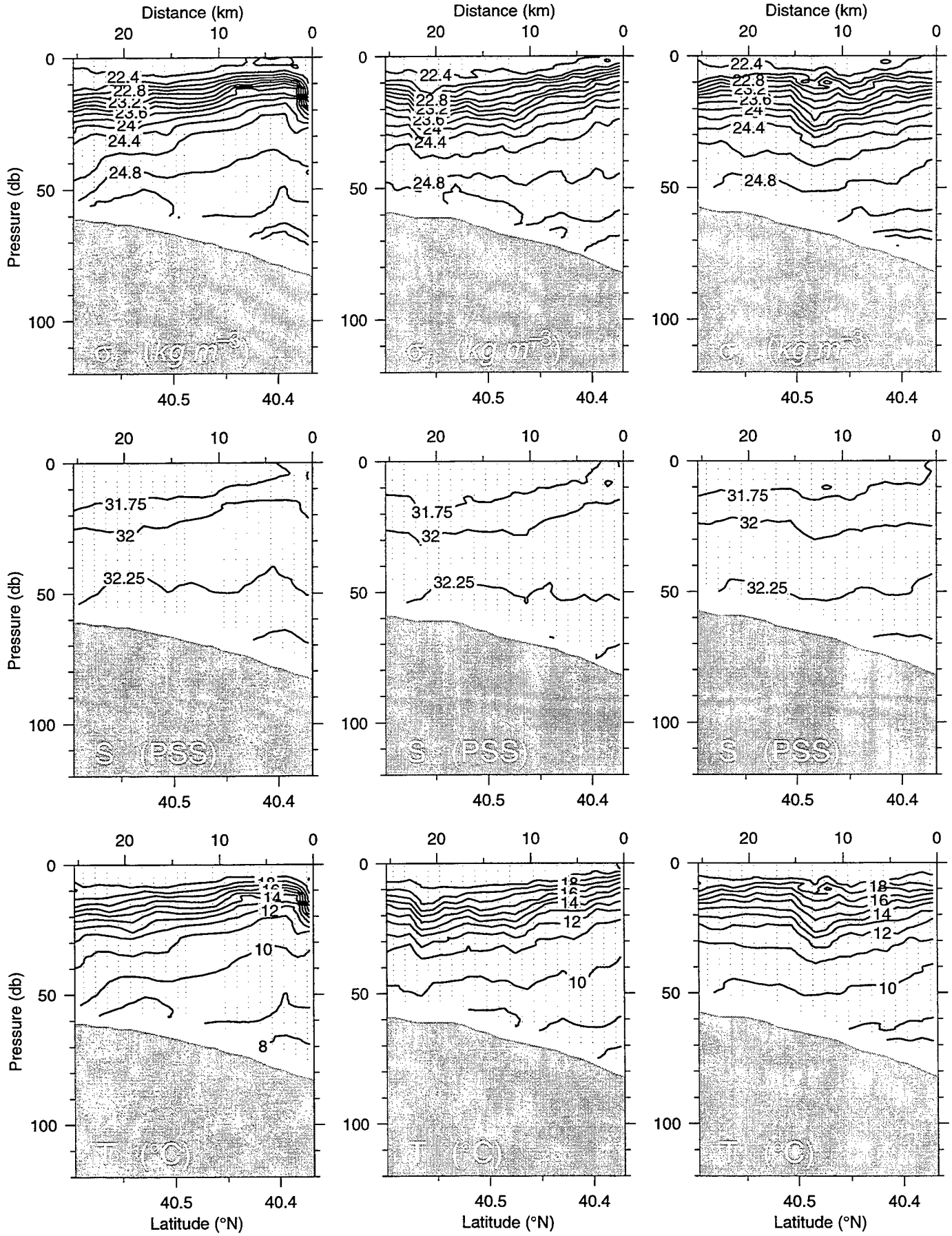


E9608 Small Box 6

26-Aug-96 07:32 - 26-Aug-96 09:30
Line 4

26-Aug-96 05:21 - 26-Aug-96 07:08
Line 5

26-Aug-96 03:12 - 26-Aug-96 04:55
Line 6

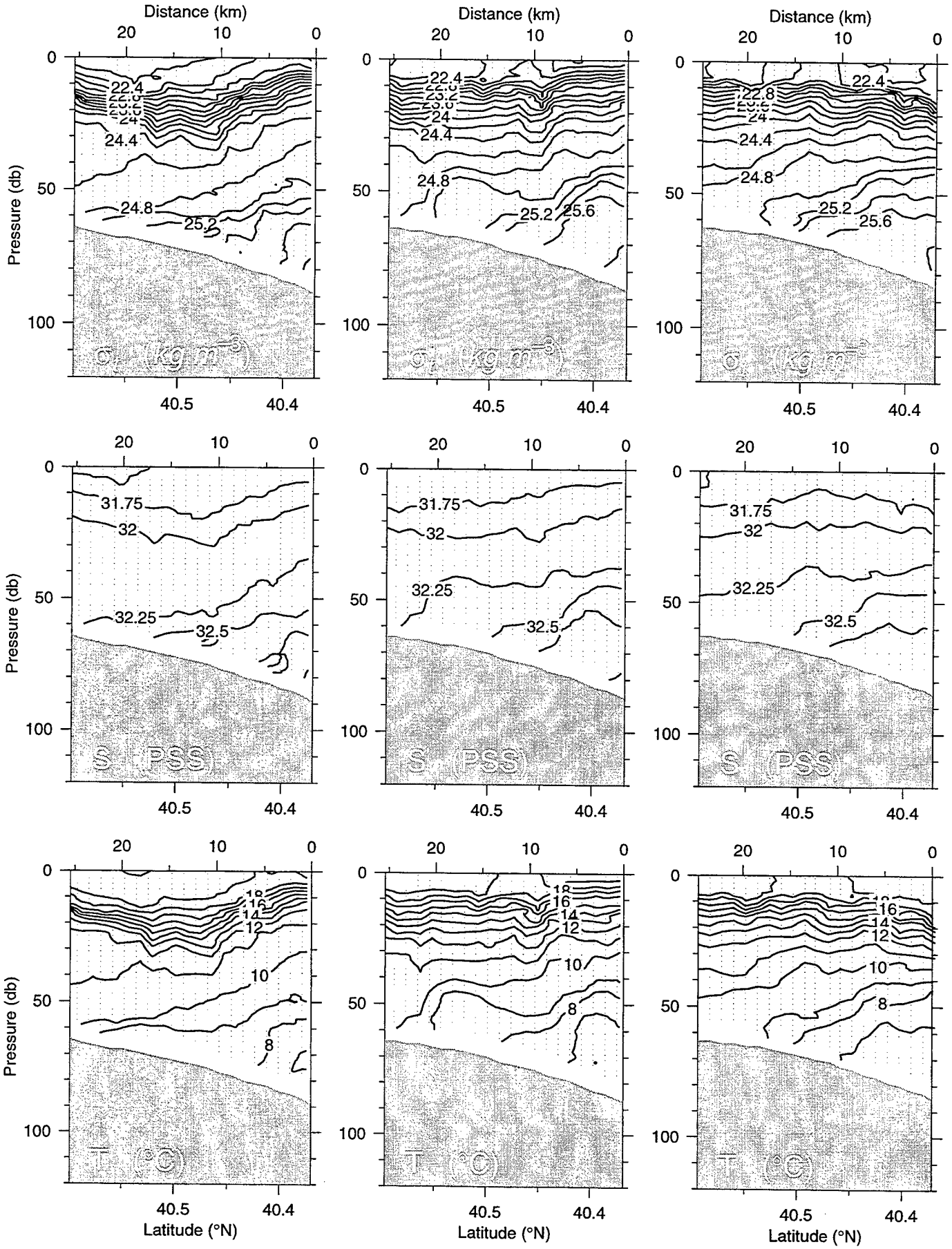


E9608 Small Box 7

29-Aug-96 16:43 - 29-Aug-96 18:49
Line 1

29-Aug-96 14:20 - 29-Aug-96 16:14
Line 2

29-Aug-96 12:01 - 29-Aug-96 13:49
Line 3

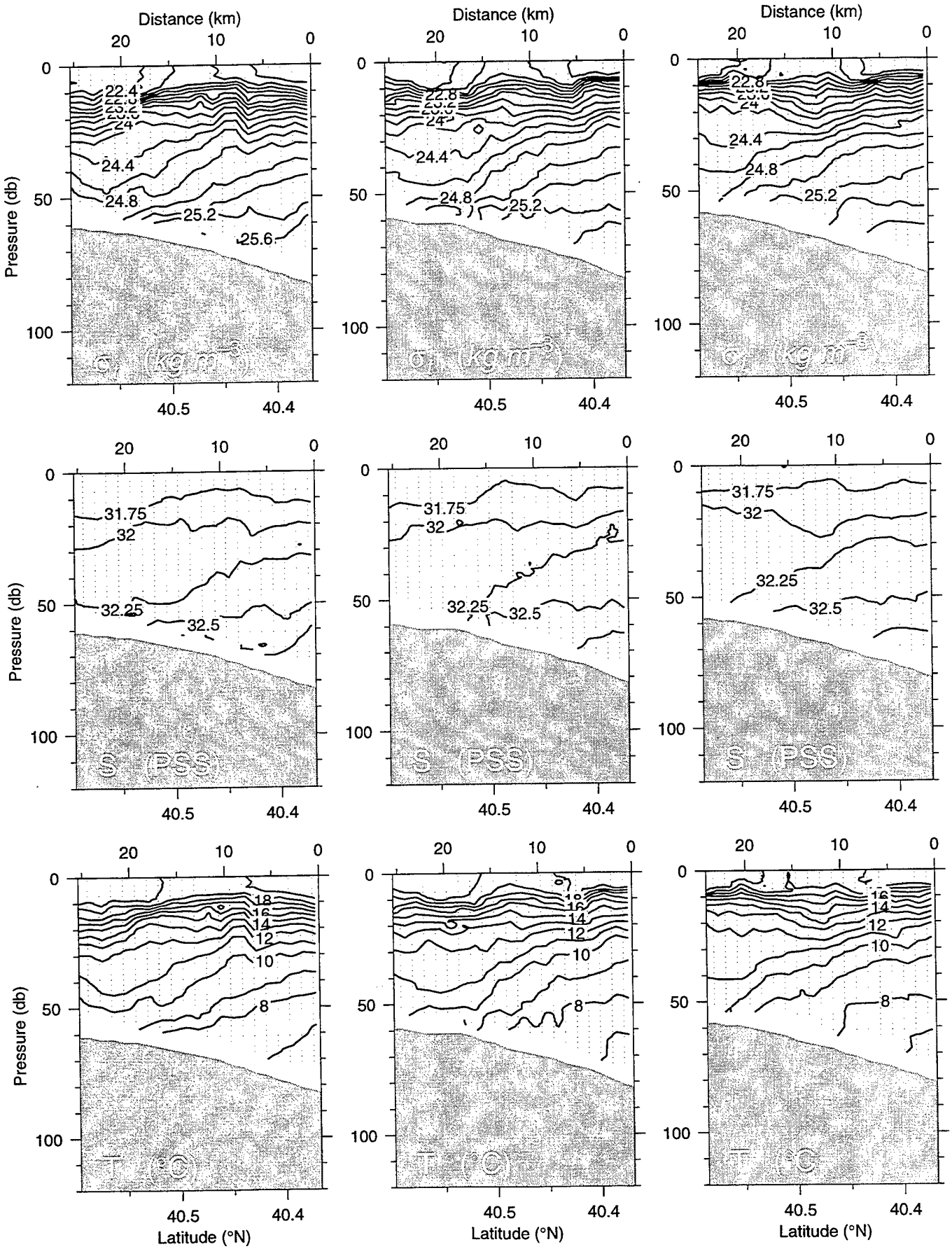


E9608 Small Box 7

29-Aug-96 09:29 - 29-Aug-96 11:32
Line 4

29-Aug-96 06:56 - 29-Aug-96 09:03
Line 5

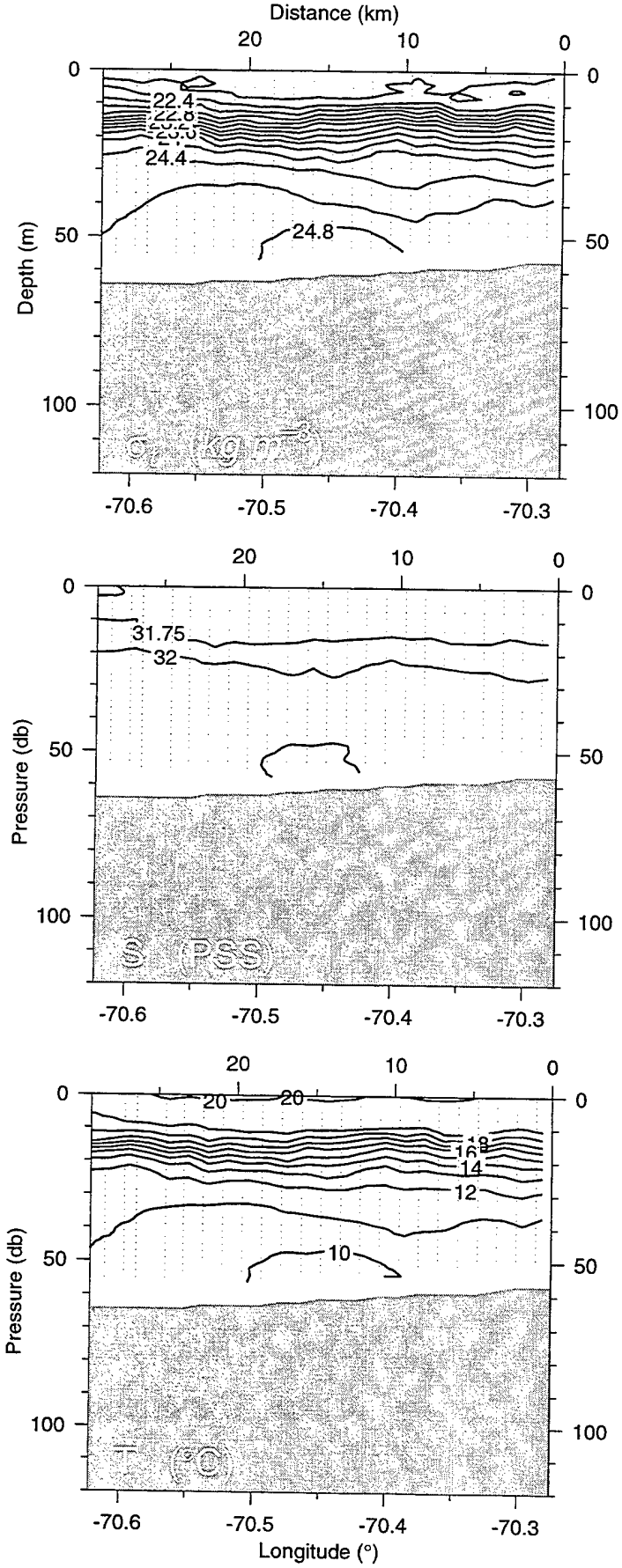
29-Aug-96 04:02 - 29-Aug-96 05:52
Line 6



E9608 Small Box 8

29-Aug-96 18:52:09 - 29-Aug-96 21:15:46

Line sb7_sb8

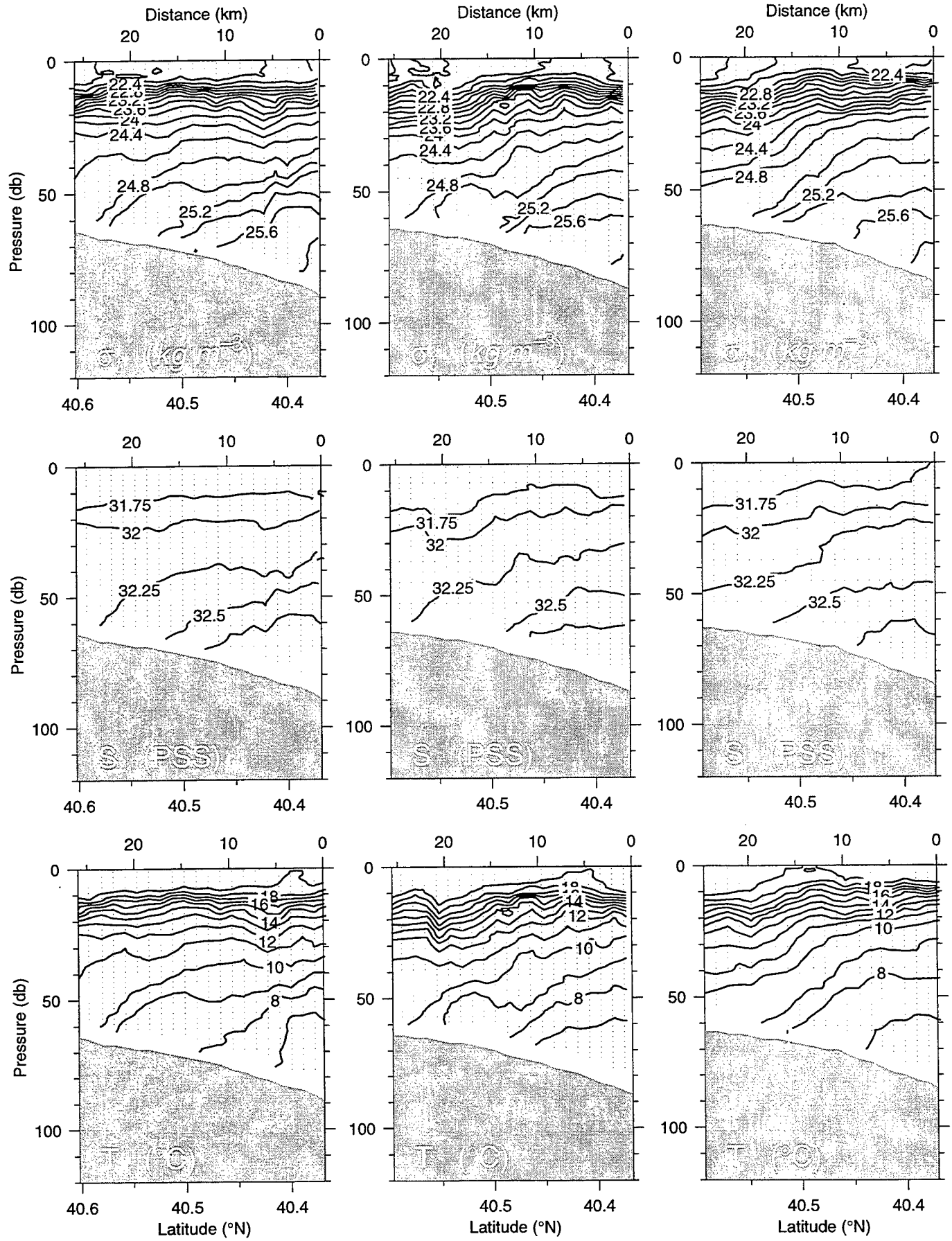


E9608 Small Box 8

30-Aug-96 10:07 - 30-Aug-96 12:10
Line 1

30-Aug-96 07:21 - 30-Aug-96 09:15
Line 2

30-Aug-96 04:39 - 30-Aug-96 06:49
Line 3

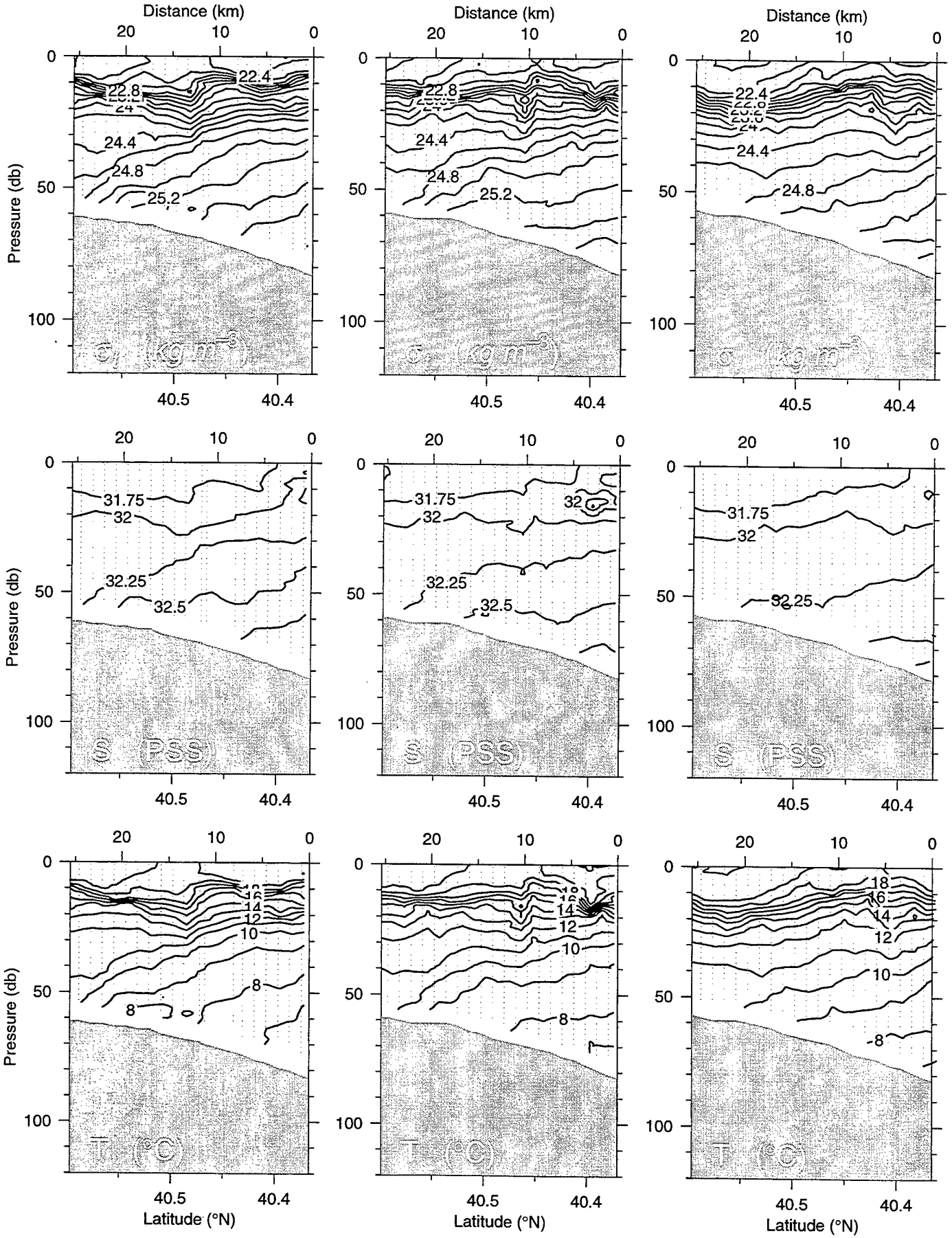


E9608 Small Box 8

30-Aug-96 02:11 - 30-Aug-96 04:09
Line 4

29-Aug-96 23:54 - 30-Aug-96 01:43
Line 5

29-Aug-96 21:19 - 29-Aug-96 23:22
Line 6

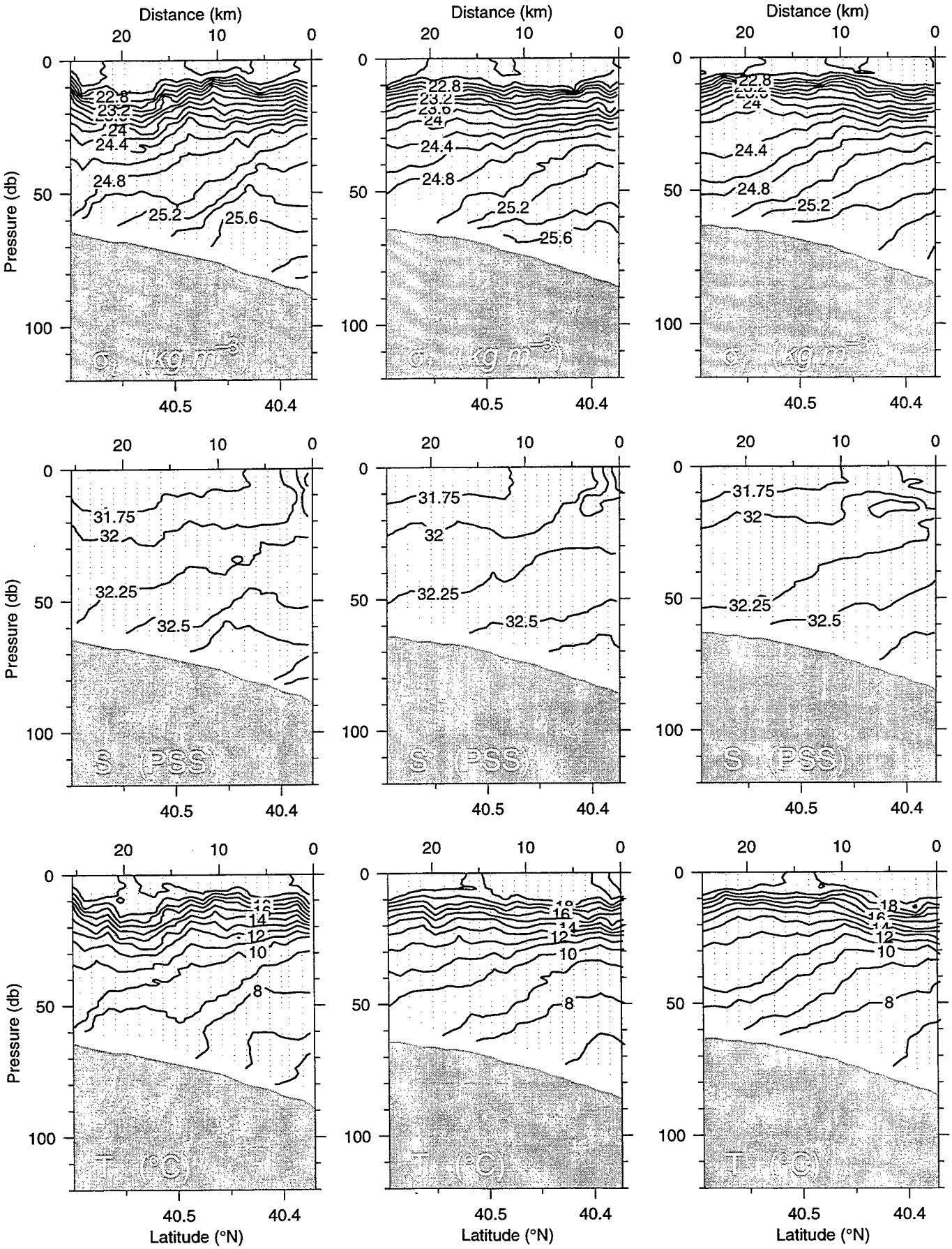


E9608 Small Box 9

31-Aug-96 02:58 - 31-Aug-96 04:53
Line 1

31-Aug-96 00:27 - 31-Aug-96 02:26
Line 2

30-Aug-96 22:10 - 30-Aug-96 23:56
Line 3

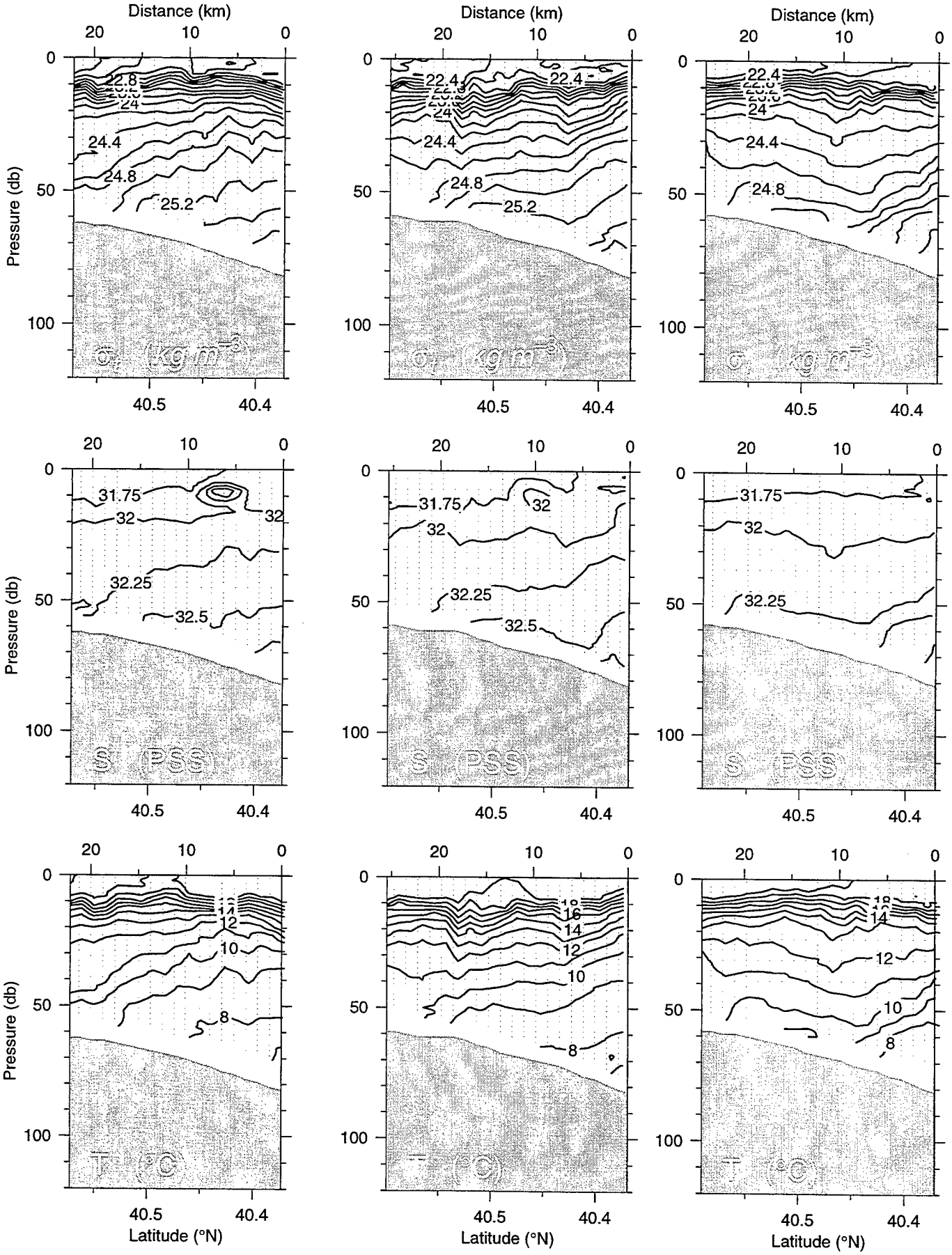


E9608 Small Box 9

30-Aug-96 19:54 - 30-Aug-96 21:42
Line 4

30-Aug-96 17:20 - 30-Aug-96 19:22
Line 5

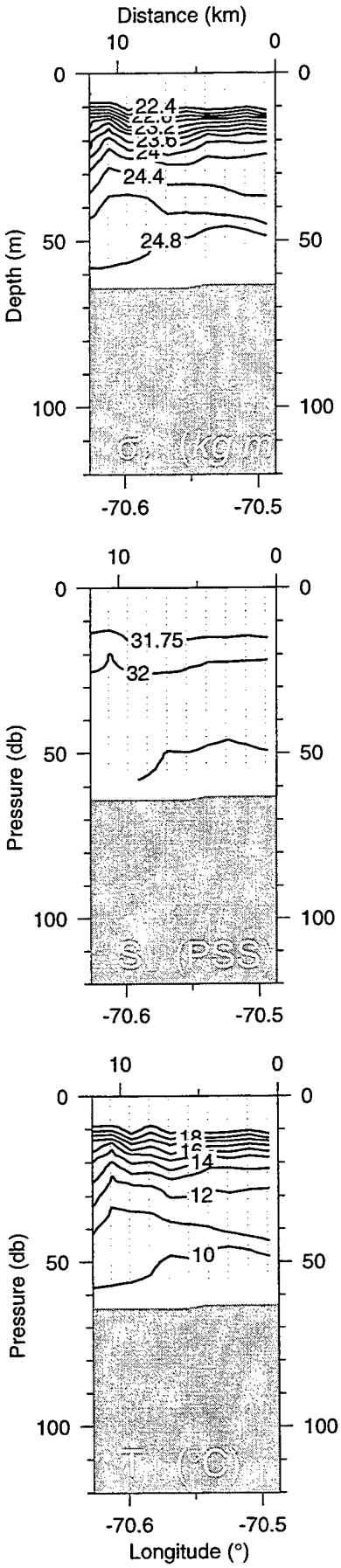
30-Aug-96 14:53 - 30-Aug-96 16:49
Line 6



E9608 Big Box 3

31-Aug-96 04:54:18 - 31-Aug-96 05:48:35

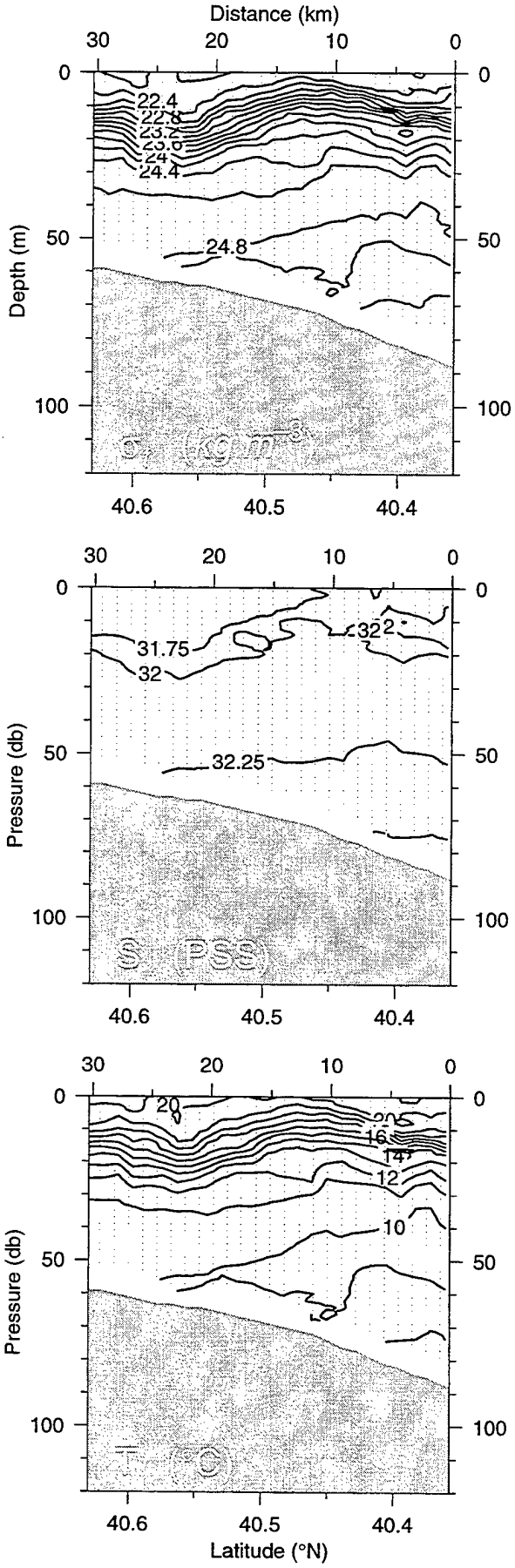
Line sb9_bb3



E9608 Butterfly 1

27-Aug-96 07:17:33 - 27-Aug-96 09:45:10

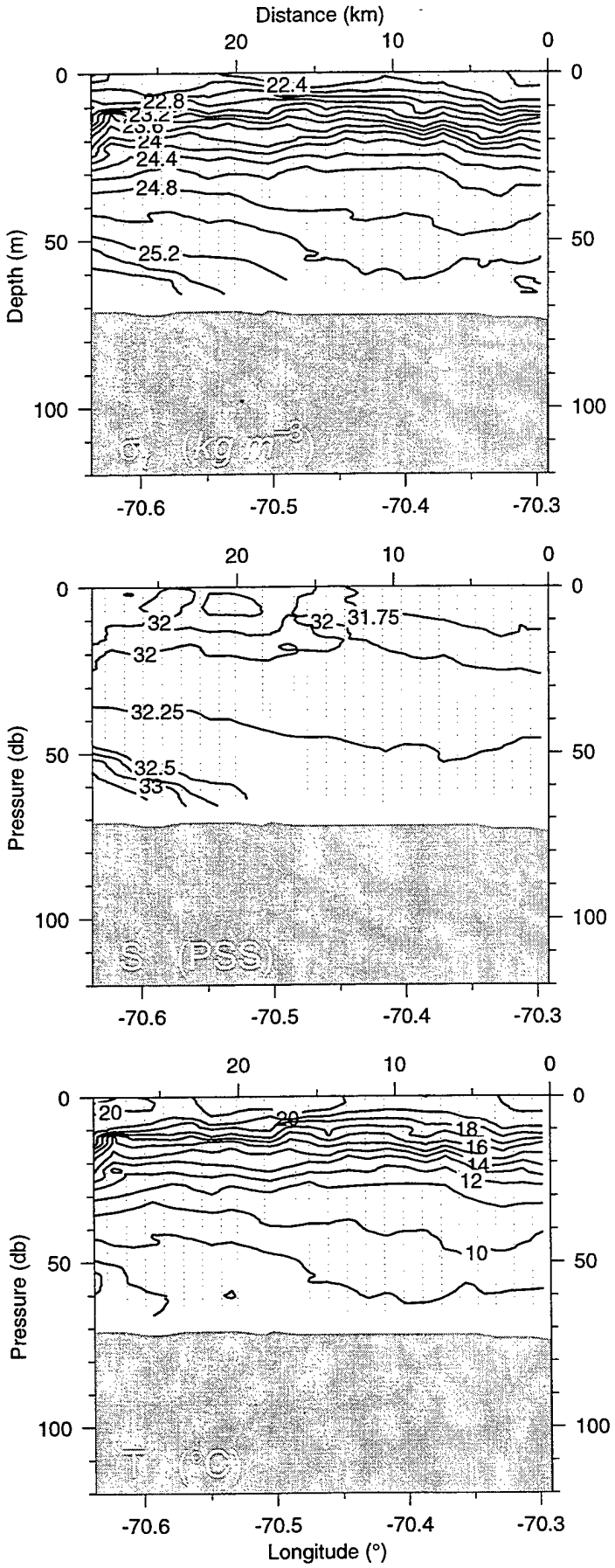
Line bf1ns



E9608 Butterfly 1

27-Aug-96 00:01:44 - 27-Aug-96 05:22:31

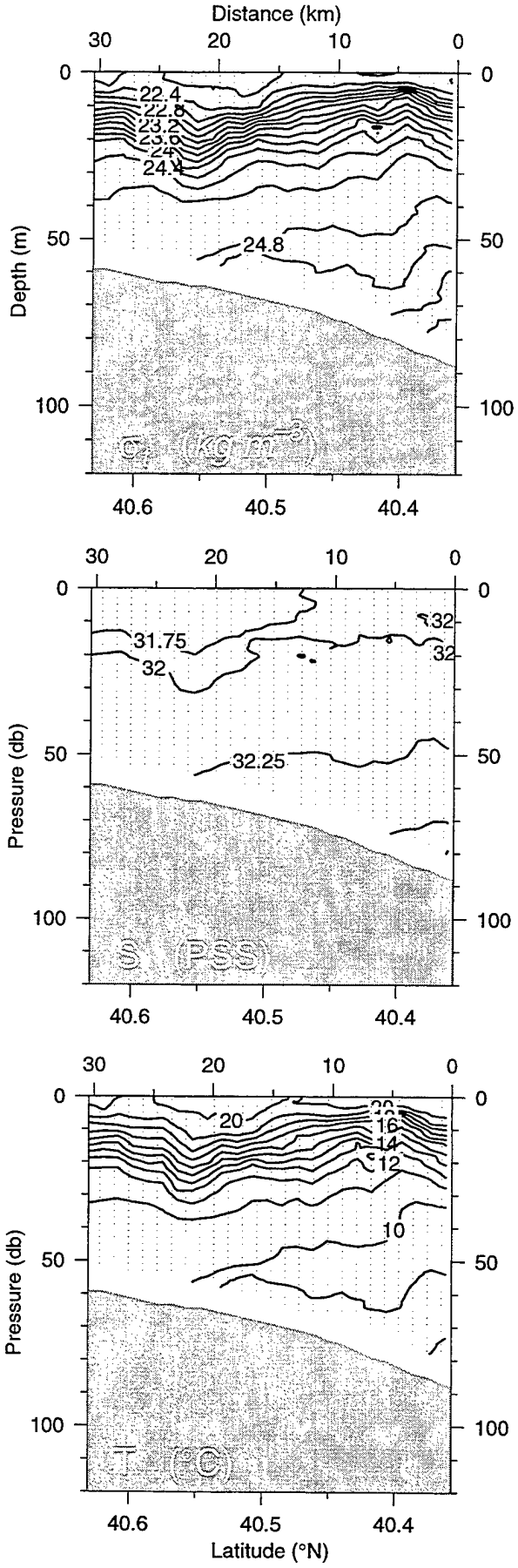
Line bf1we



E9608 Butterfly 2

27-Aug-96 17:32:31 - 27-Aug-96 19:58:19

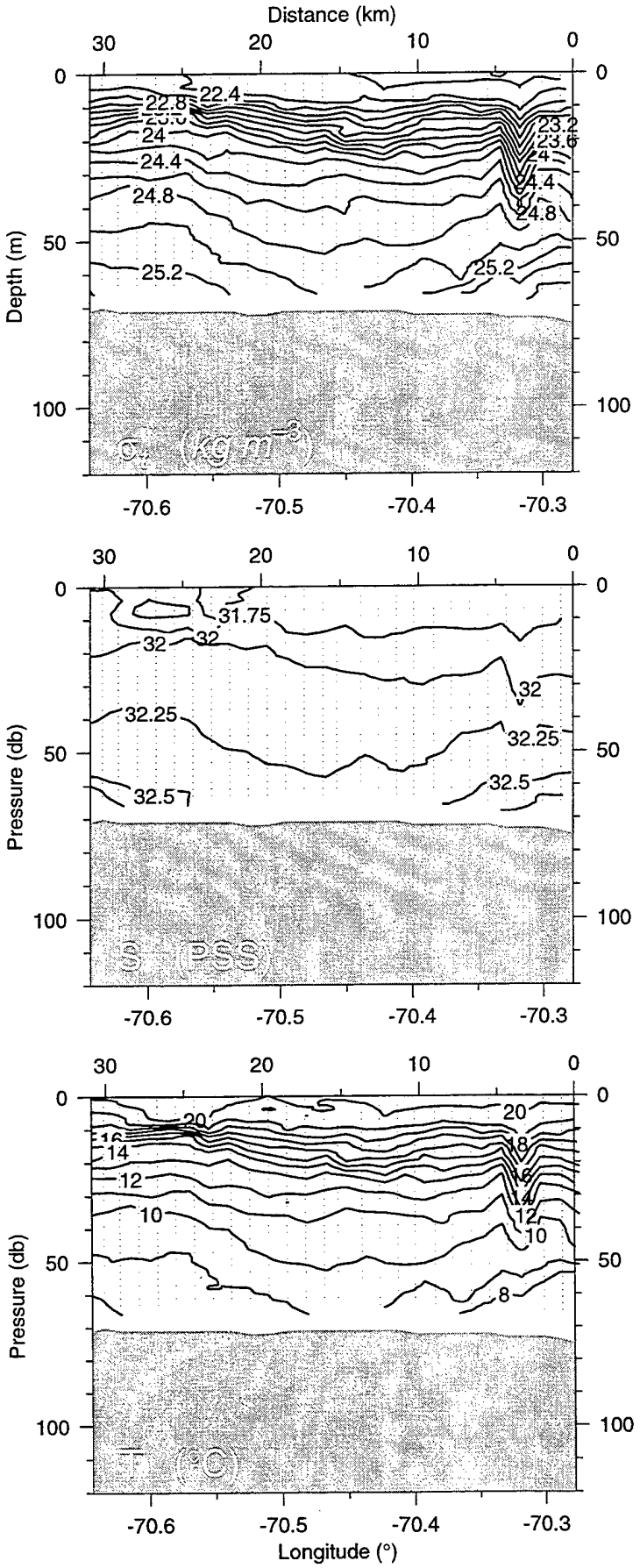
Line bf2ns



E9608 Butterfly 2

27-Aug-96 11:13:48 - 27-Aug-96 14:13:28

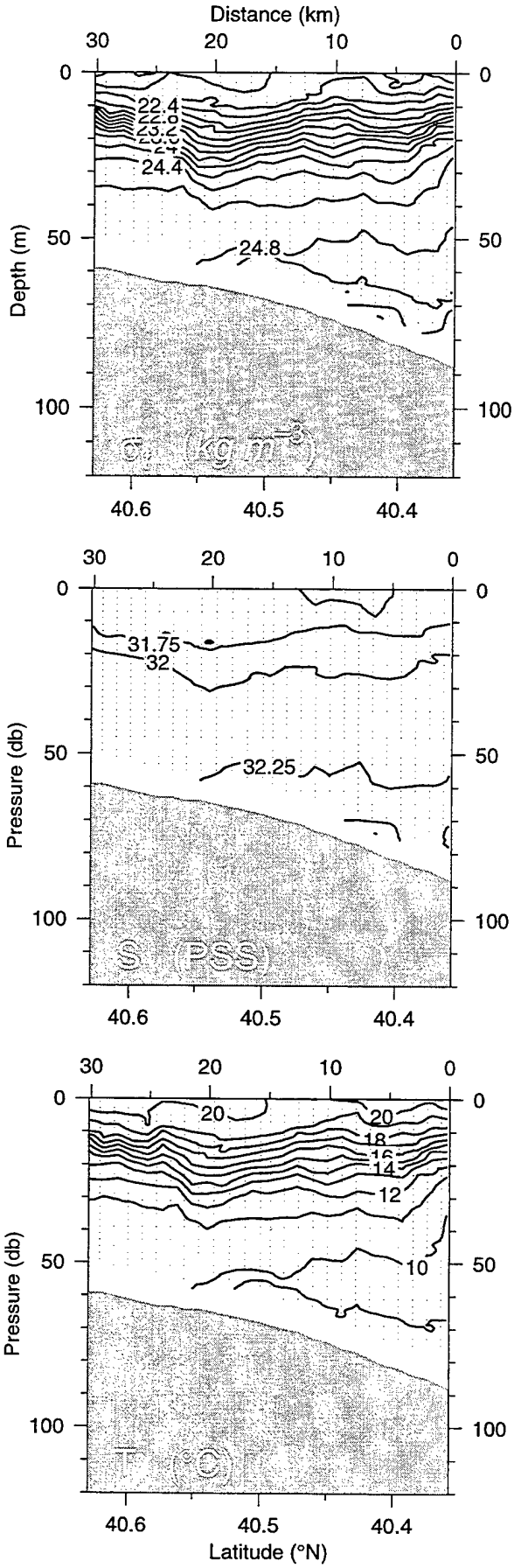
Line bf2we



E9608 Butterfly 3

28-Aug-96 04:50:18 - 28-Aug-96 07:18:24

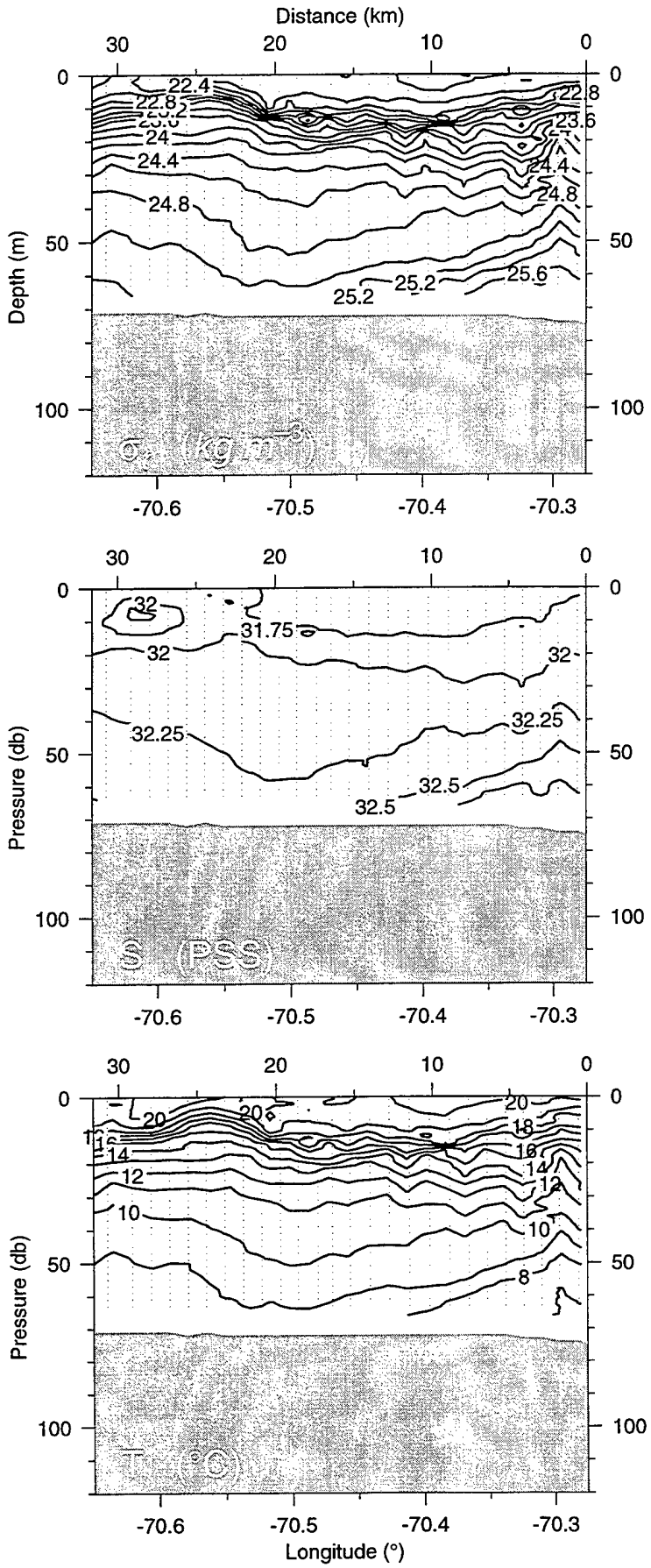
Line bf3ns



E9608 Butterfly 3

27-Aug-96 23:53:50 - 28-Aug-96 02:35:29

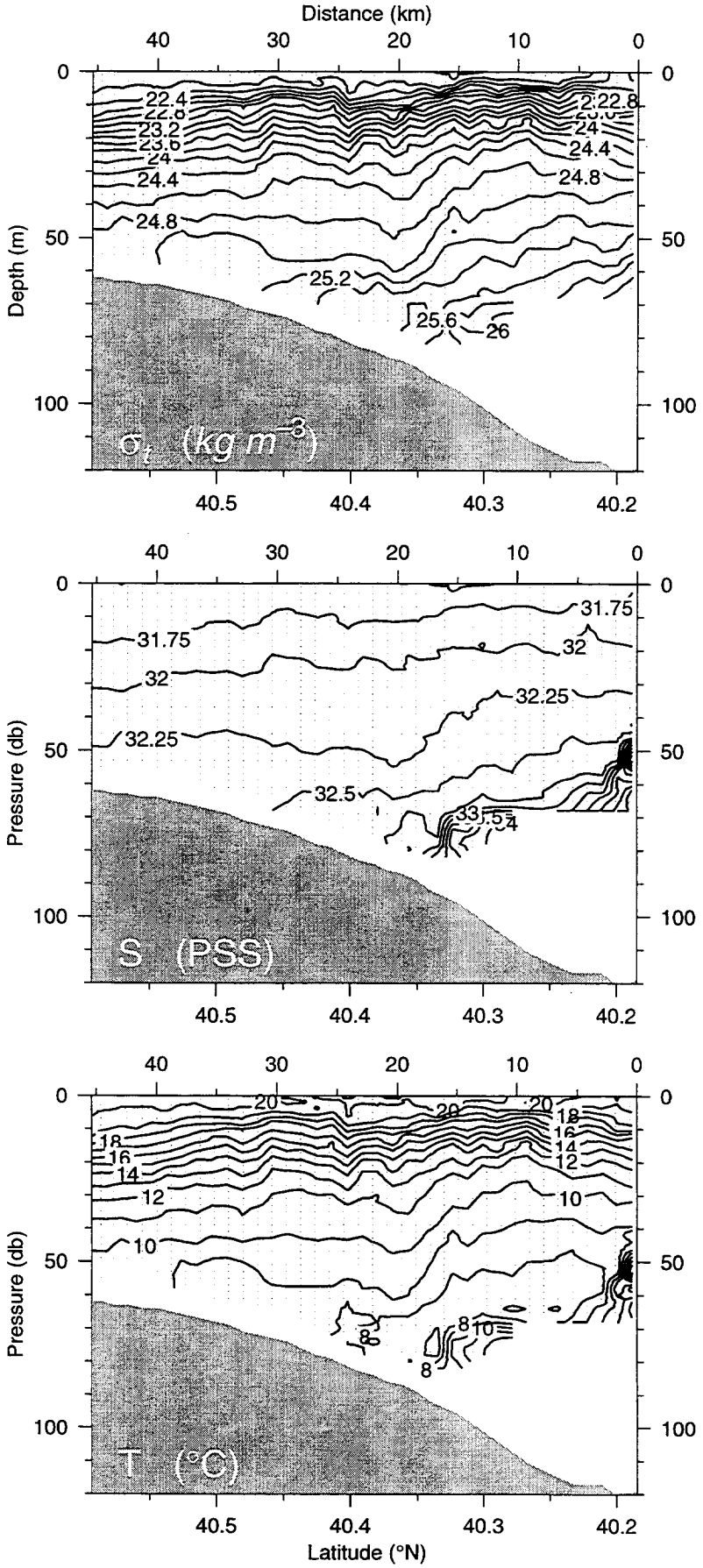
Line bf3we



E9608 Butterfly 4

28-Aug-96 11:10:57 - 28-Aug-96 14:51:52

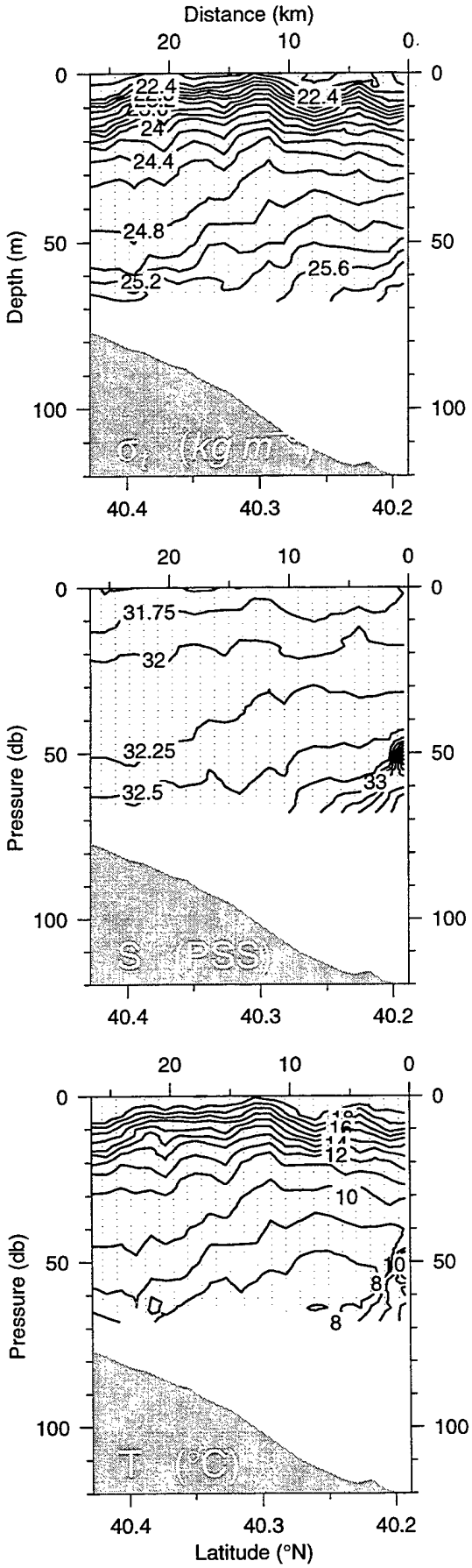
Line bf4ns



E9608 Butterfly 4

28-Aug-96 14:54:34 - 28-Aug-96 17:08:22

Line bf4sn



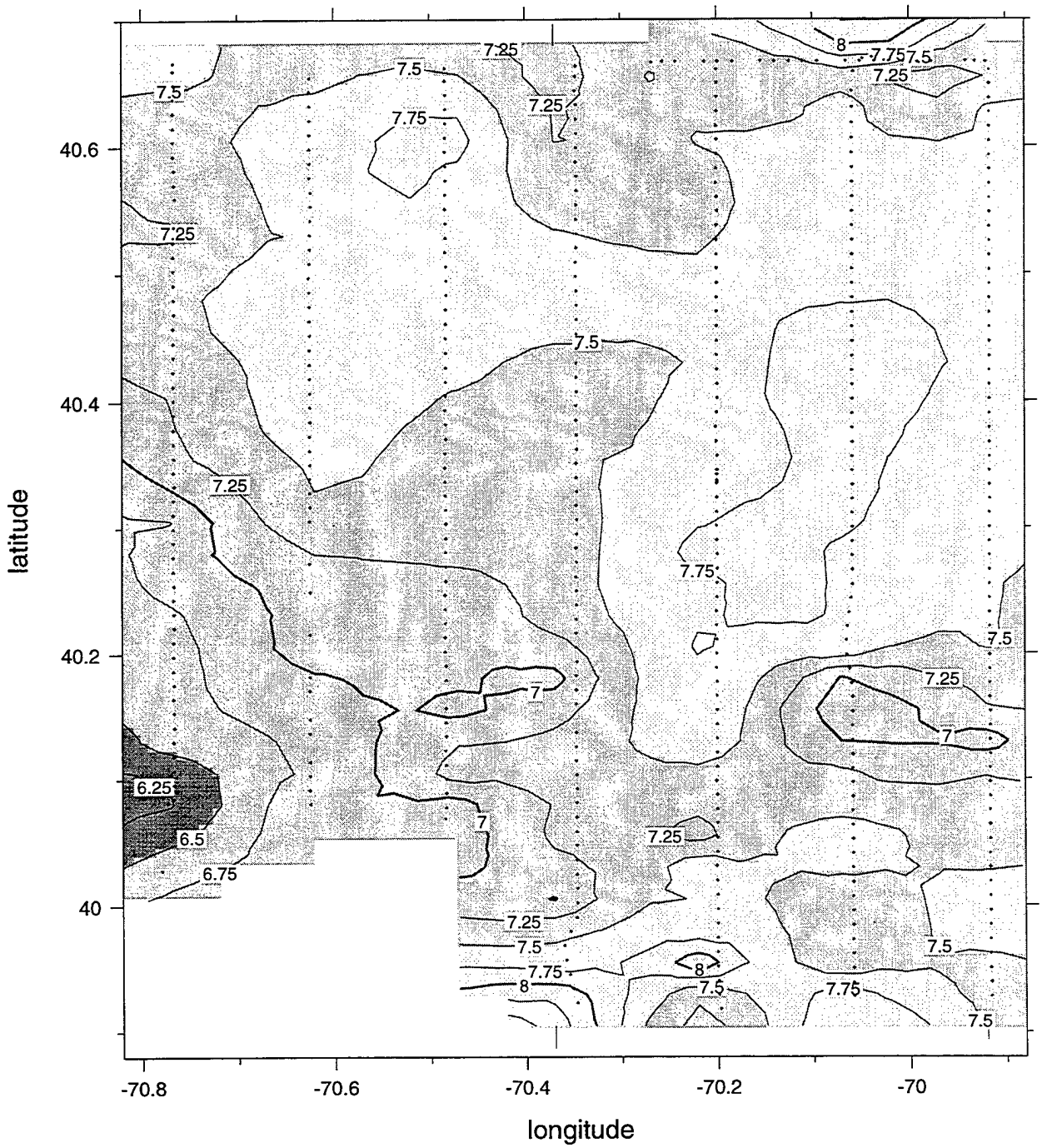
E9704 Big Box Maps of Temperature, Salinity and σ_t

E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 5 dbar

Temperature (°C)

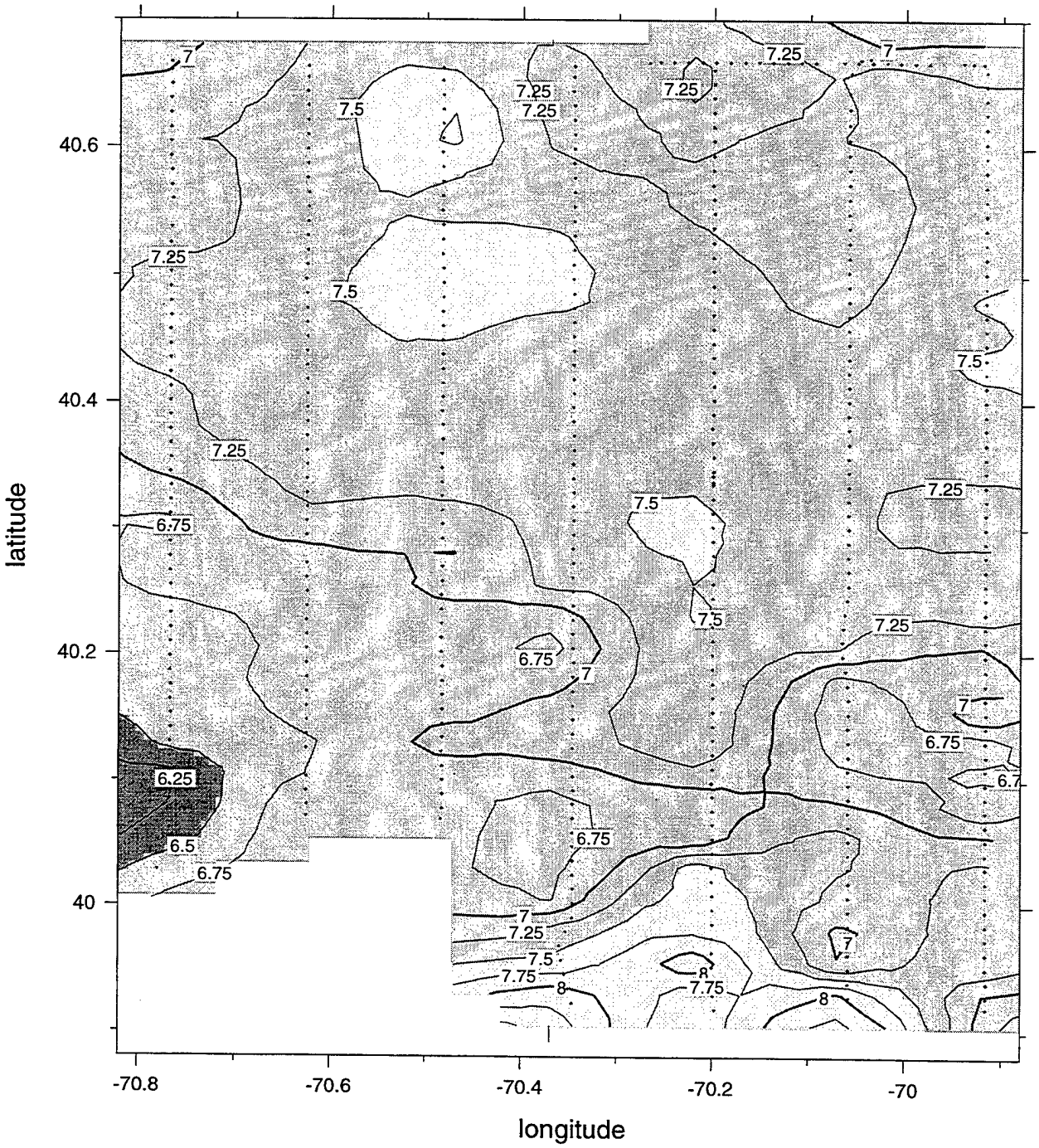


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 15 dbar

Temperature (°C)

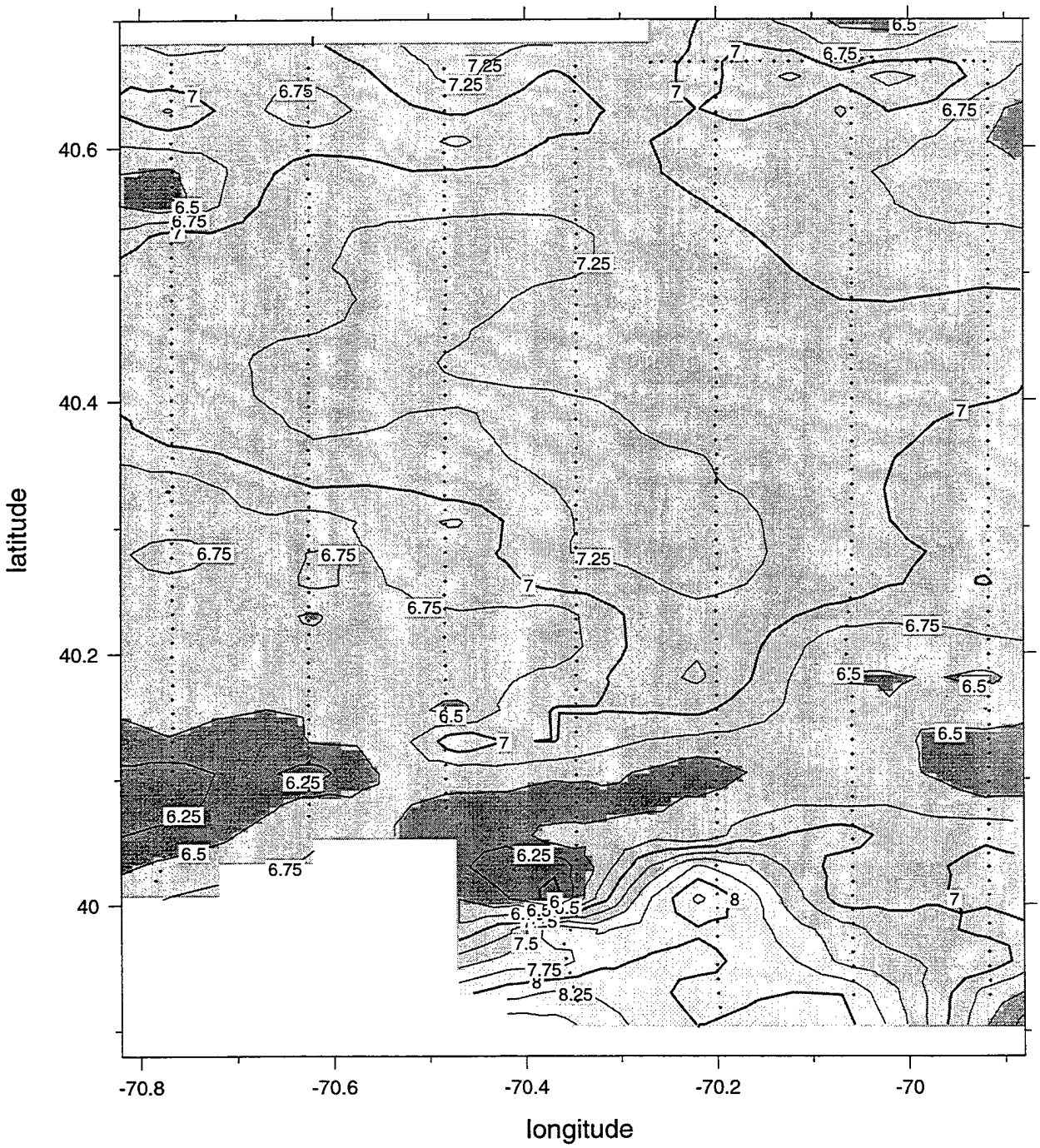


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 25 dbar

Temperature (°C)

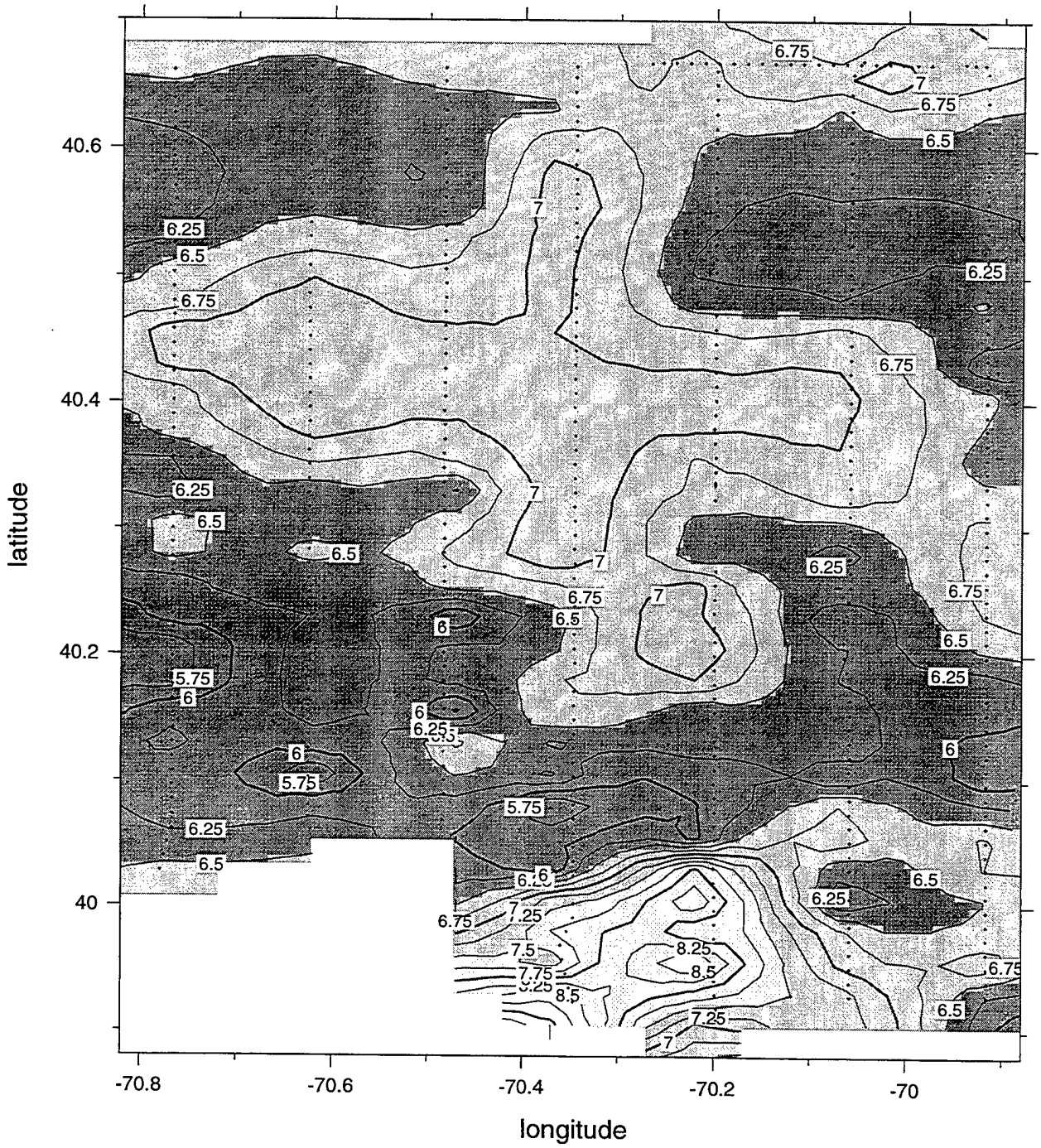


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 35 dbar

Temperature (°C)

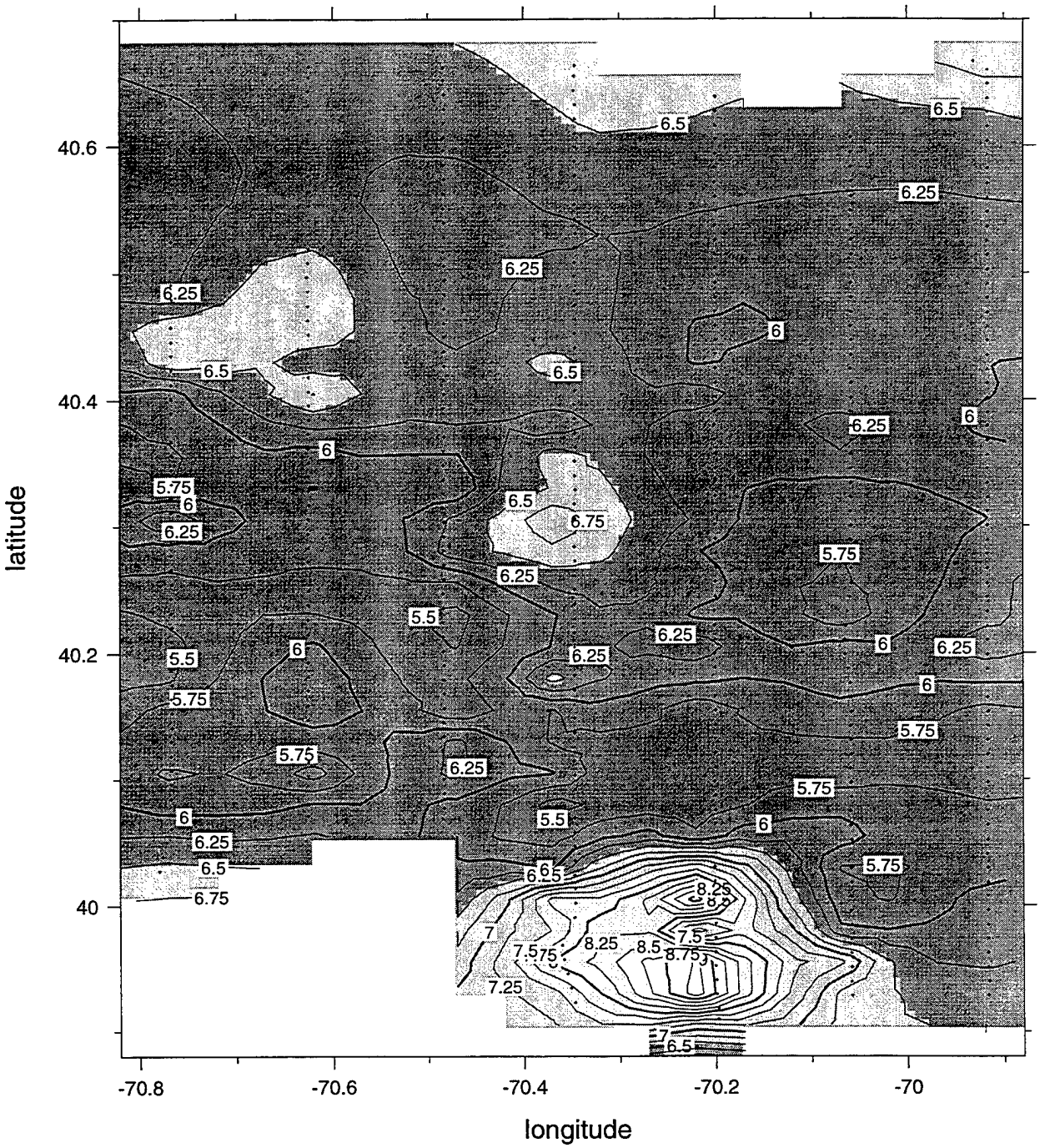


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 45 dbar

Temperature (°C)

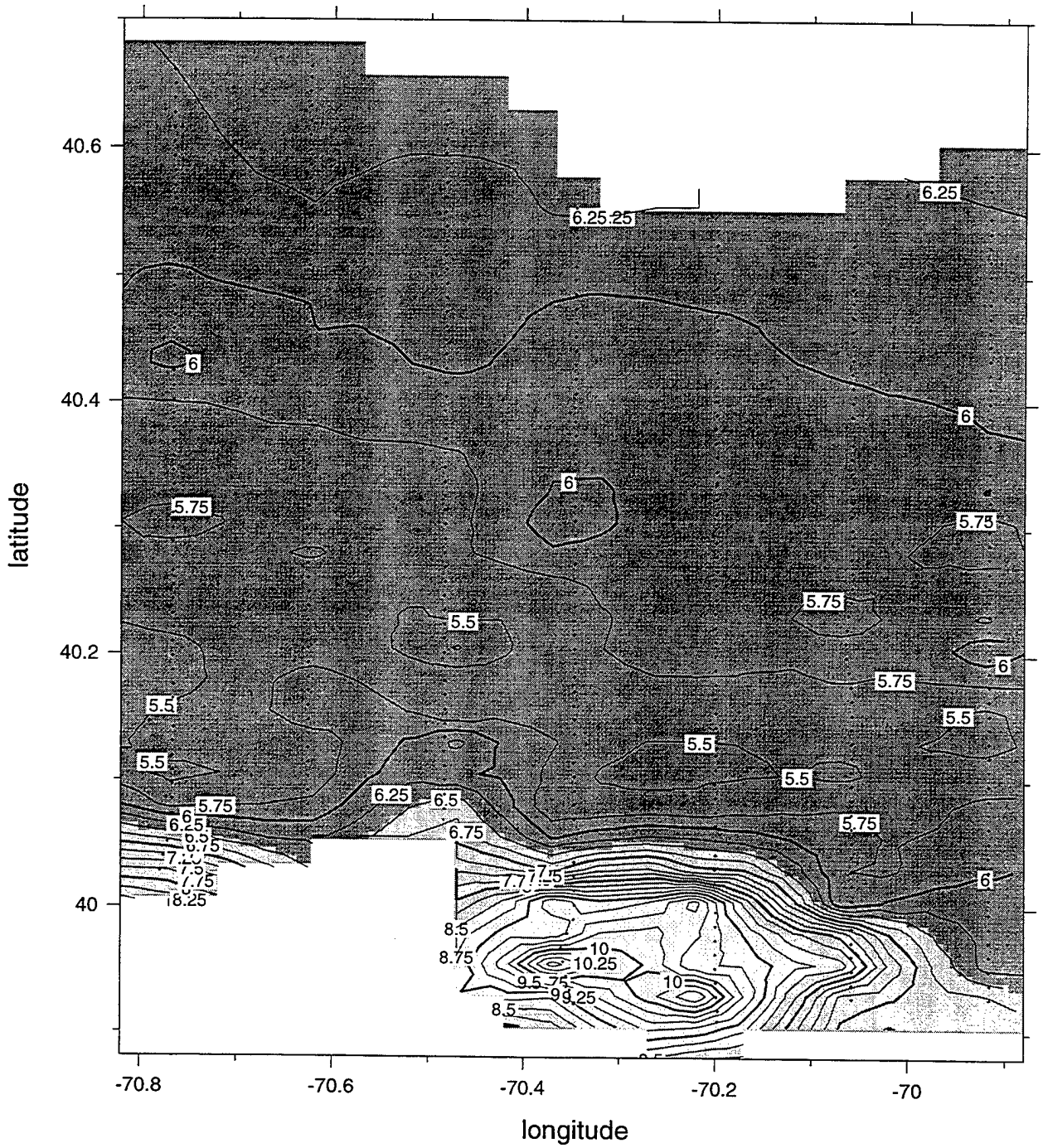


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 55 dbar

Temperature (°C)

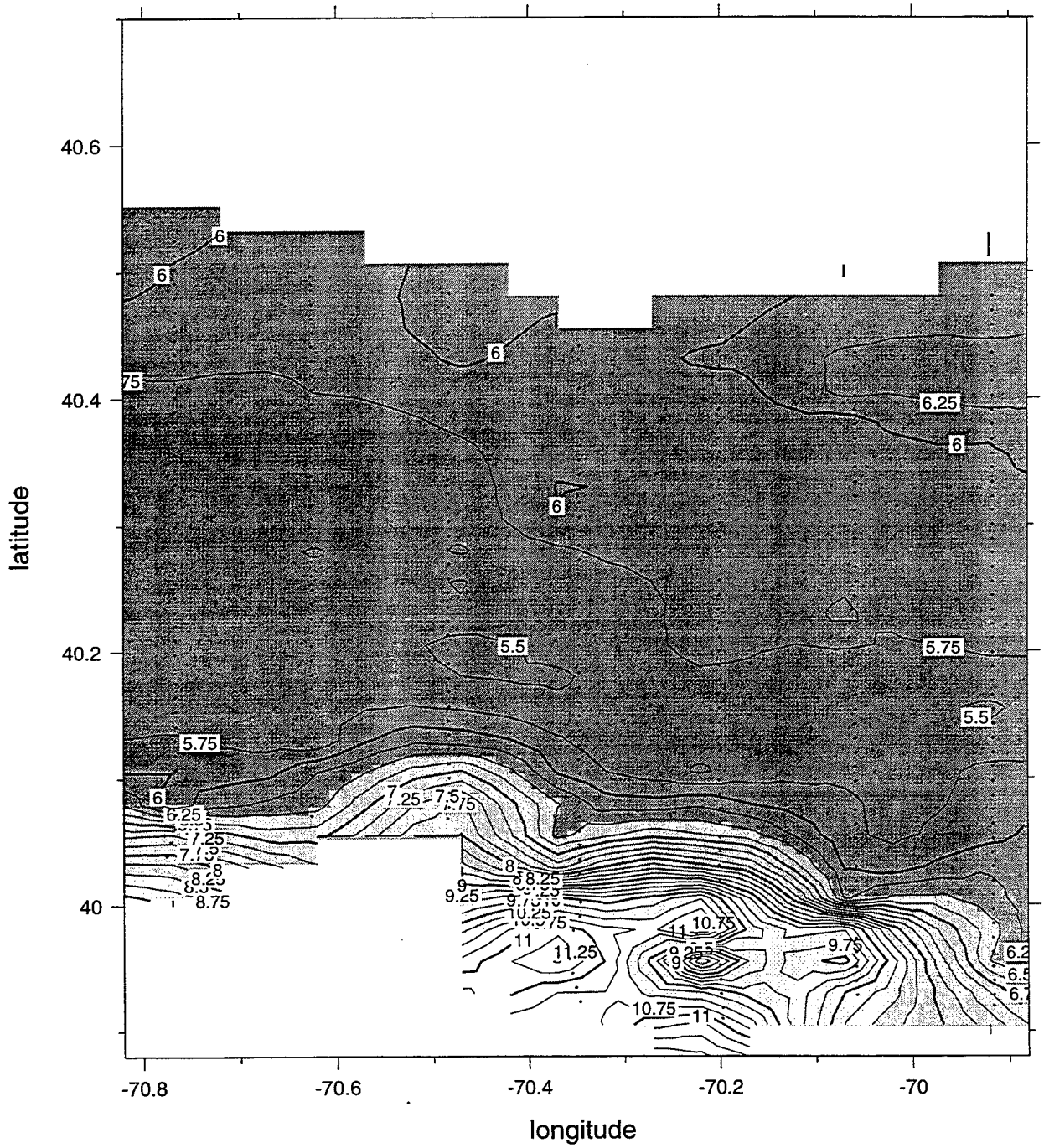


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 65 dbar

Temperature (°C)

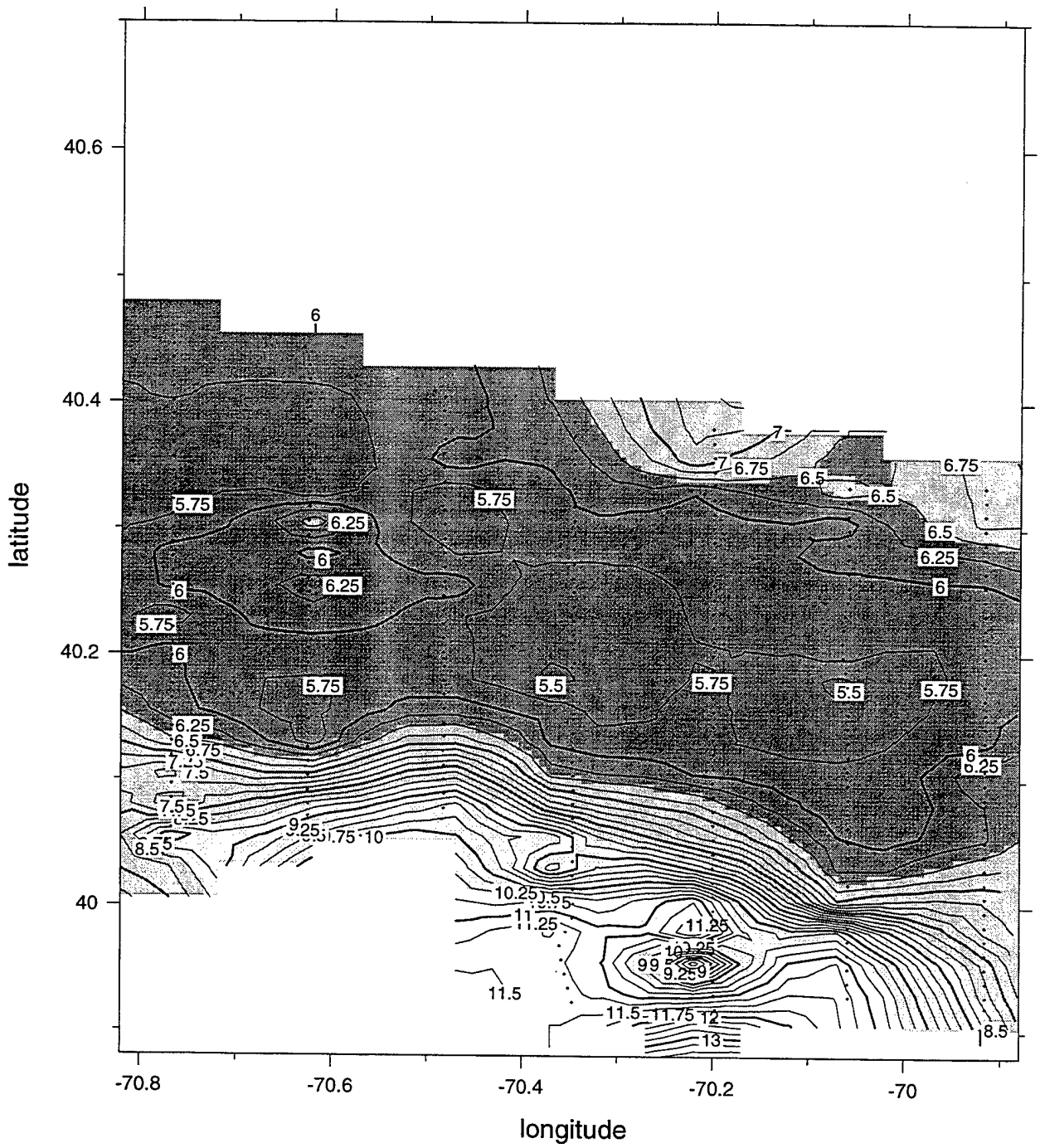


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 75 dbar

Temperature (°C)

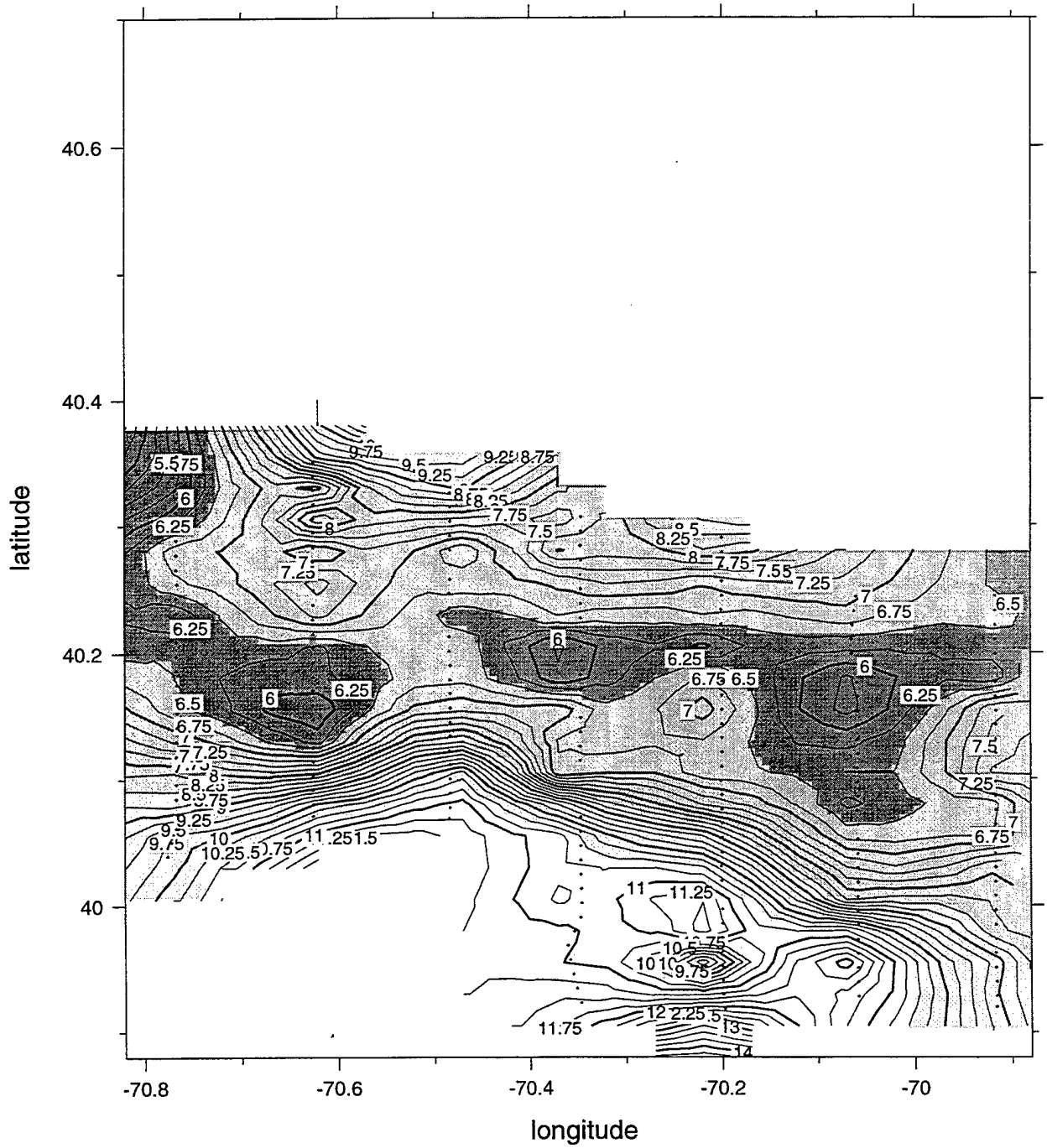


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 85 dbar

Temperature (°C)

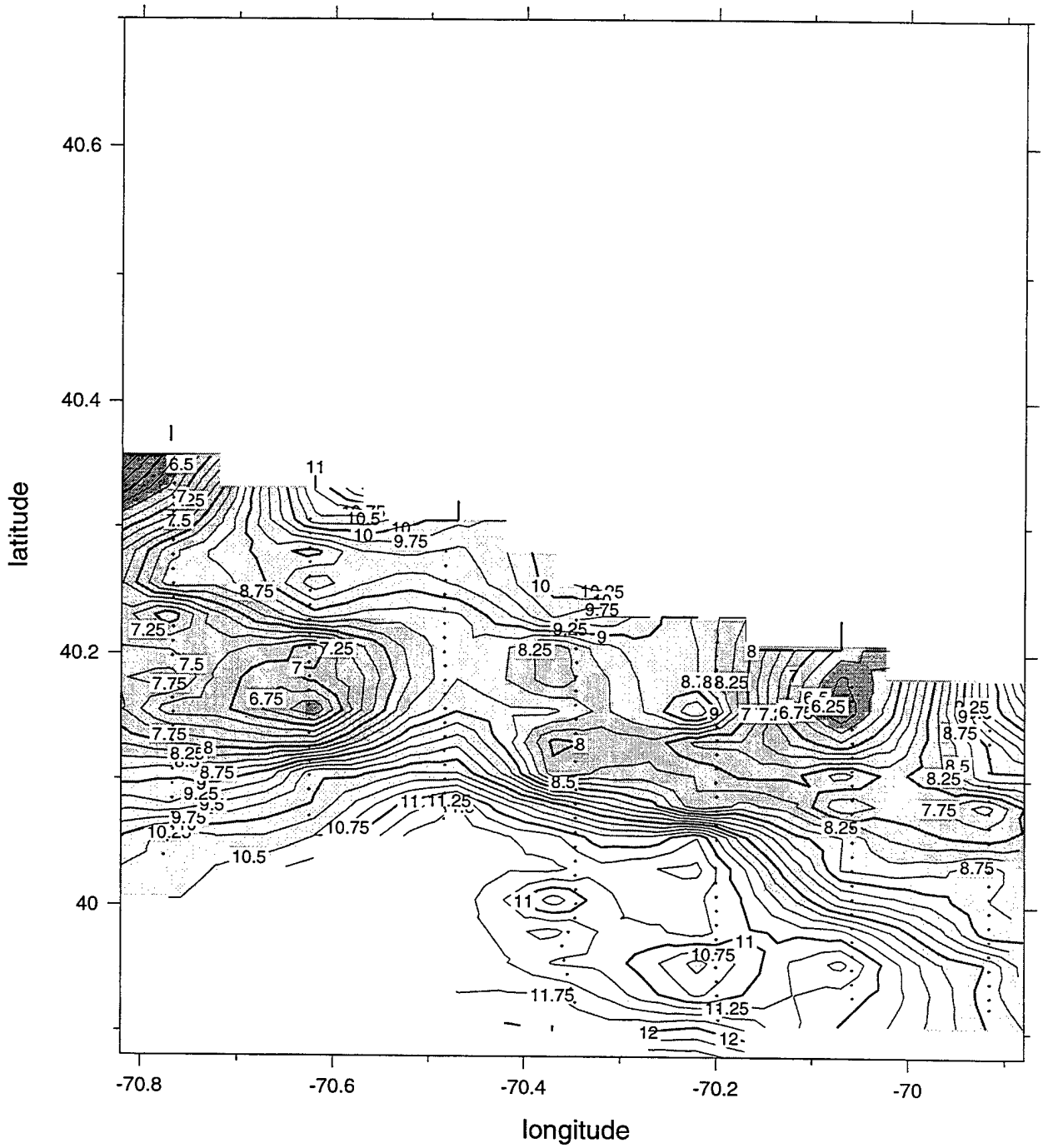


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 95 dbar

Temperature (°C)

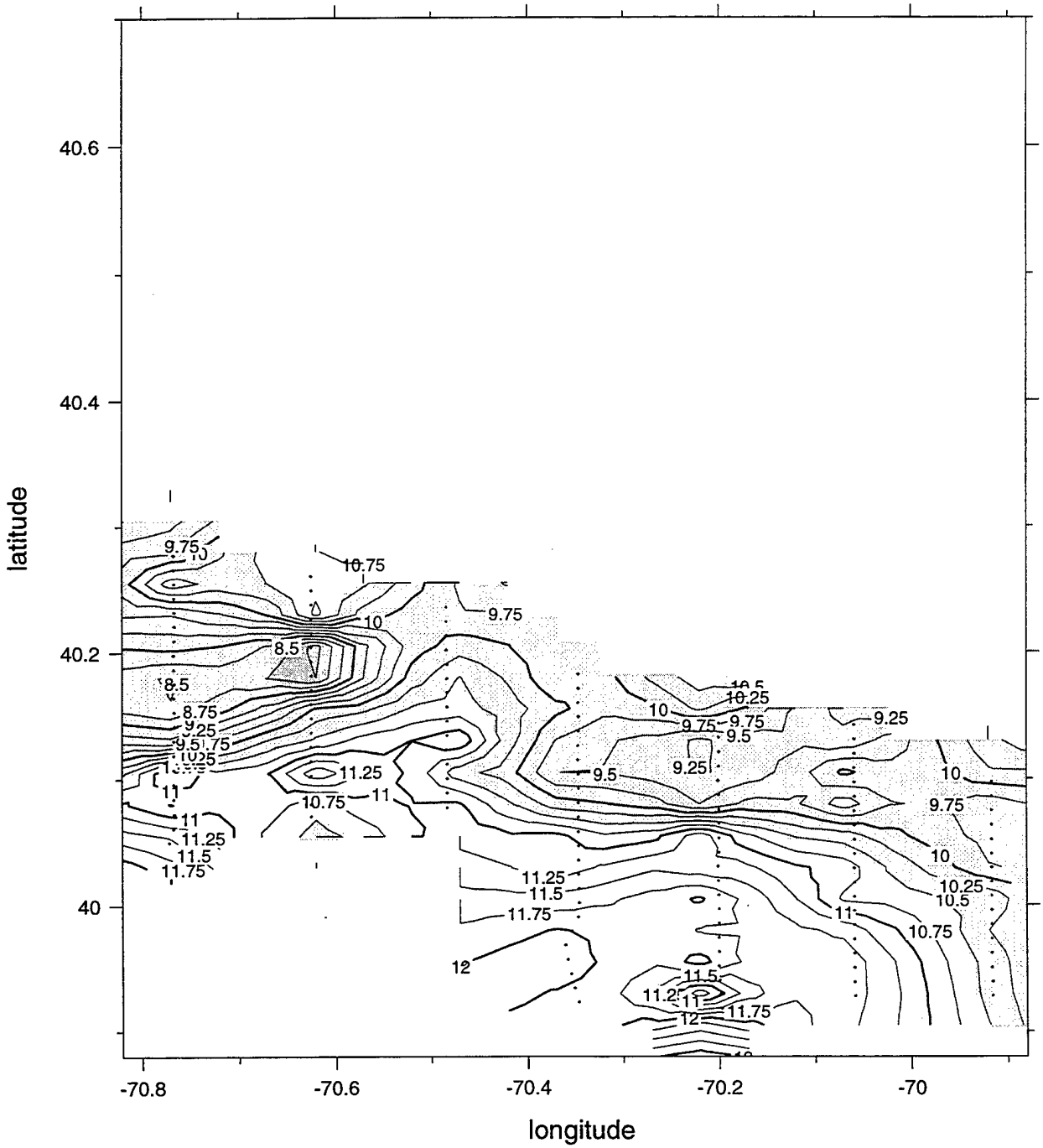


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 105 dbar

Temperature (°C)

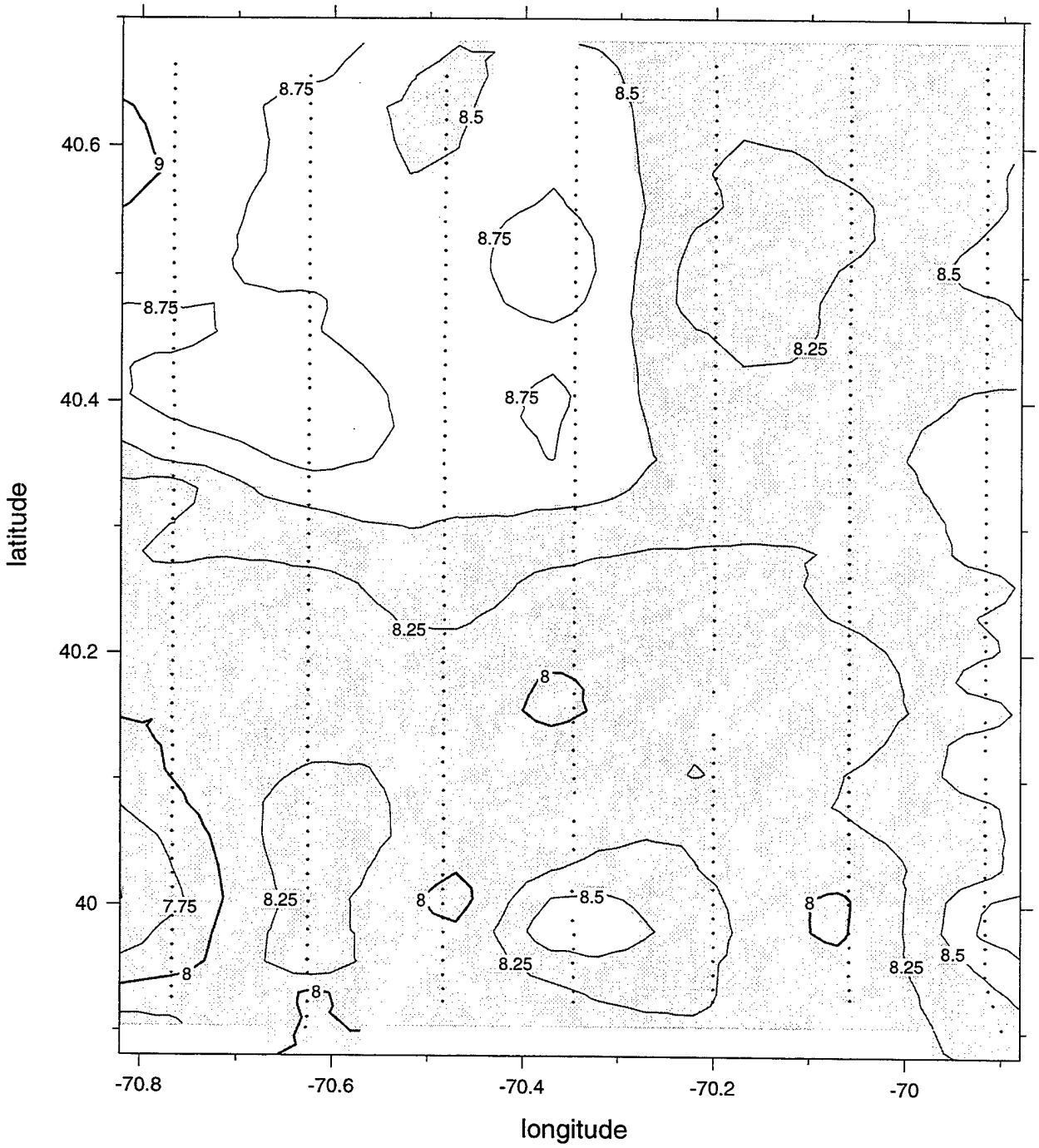


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 5 dbar

Temperature (°C)

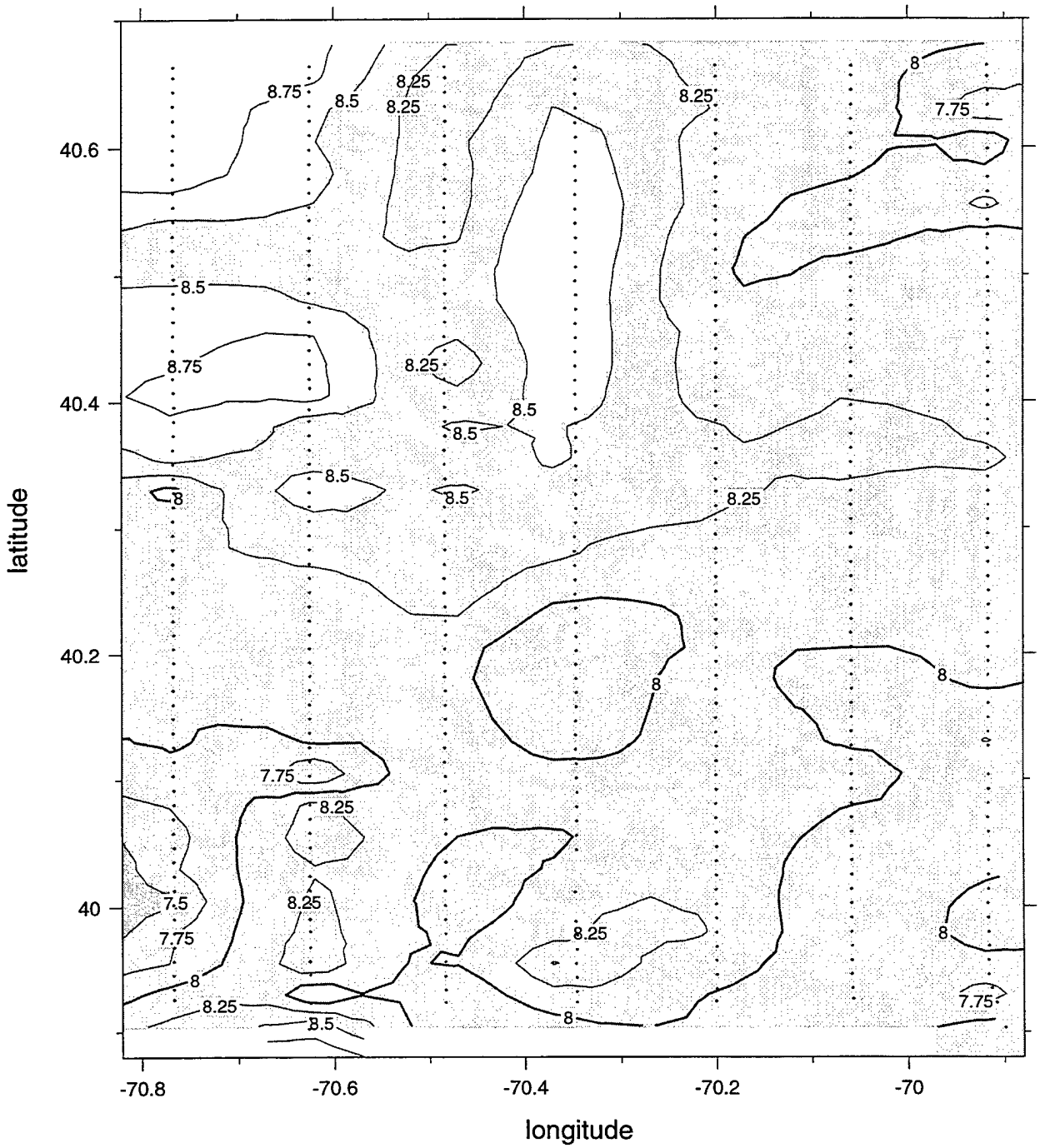


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 15 dbar

Temperature (°C)

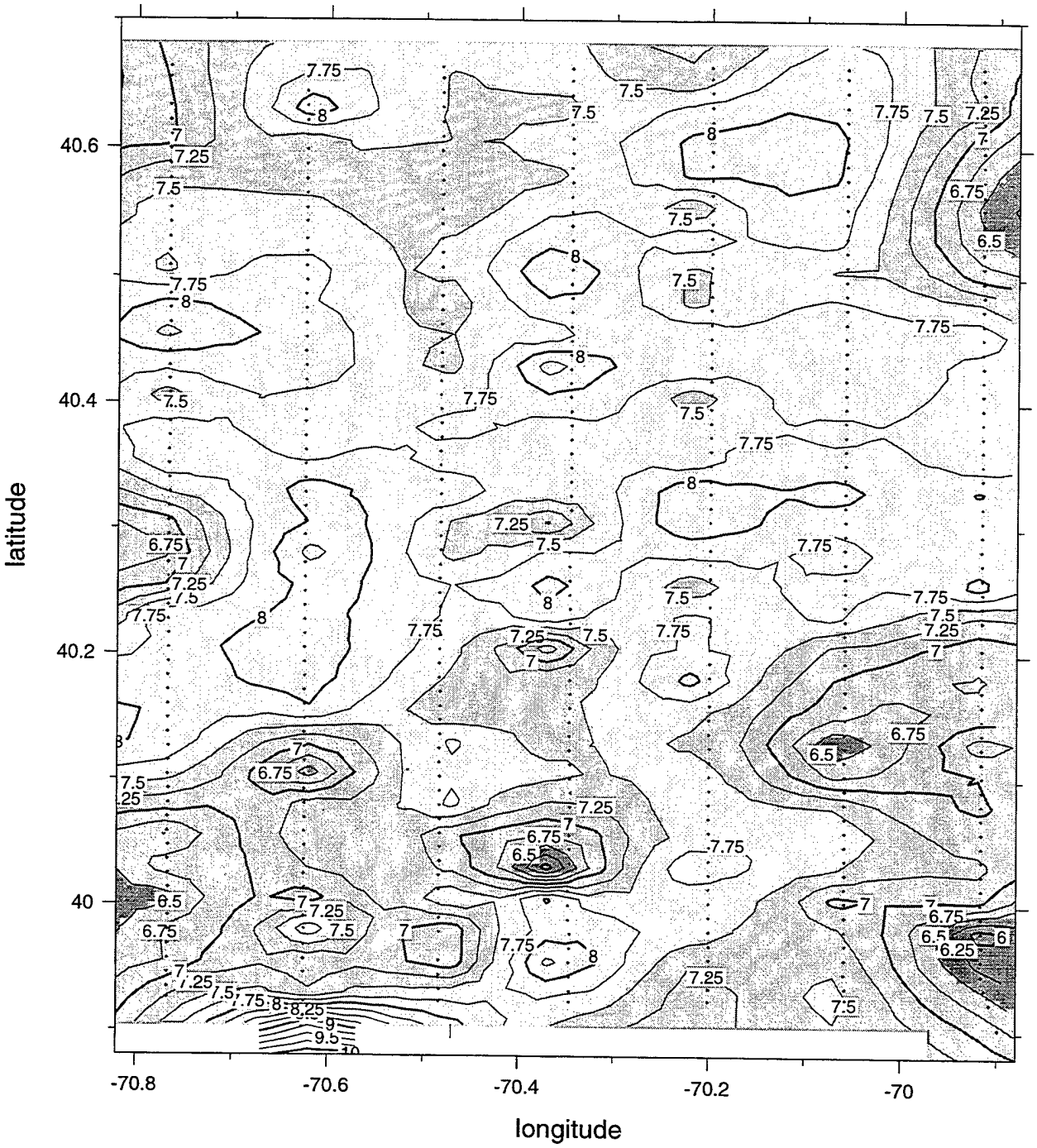


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 25 dbar

Temperature (°C)

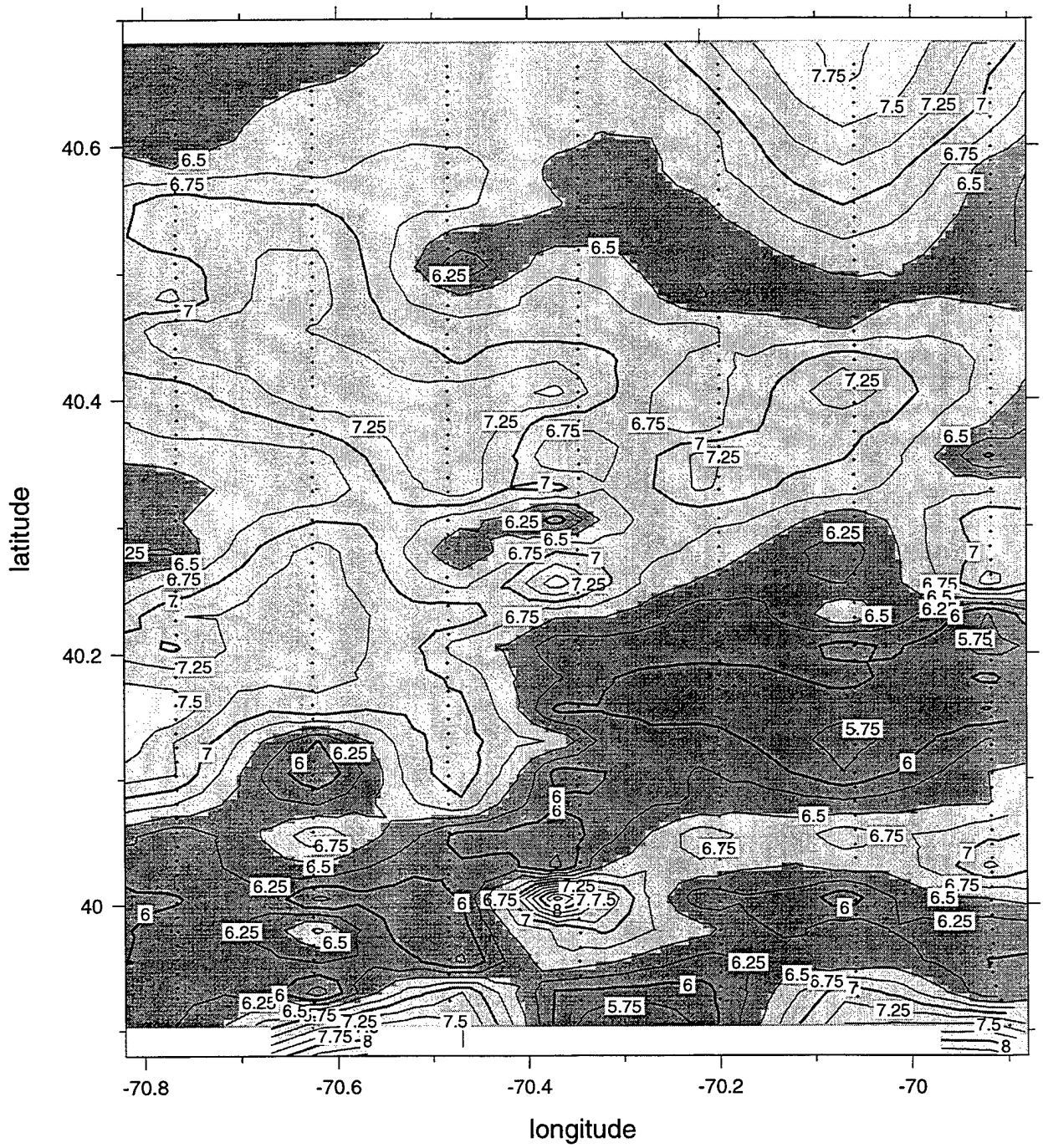


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 35 dbar

Temperature (°C)

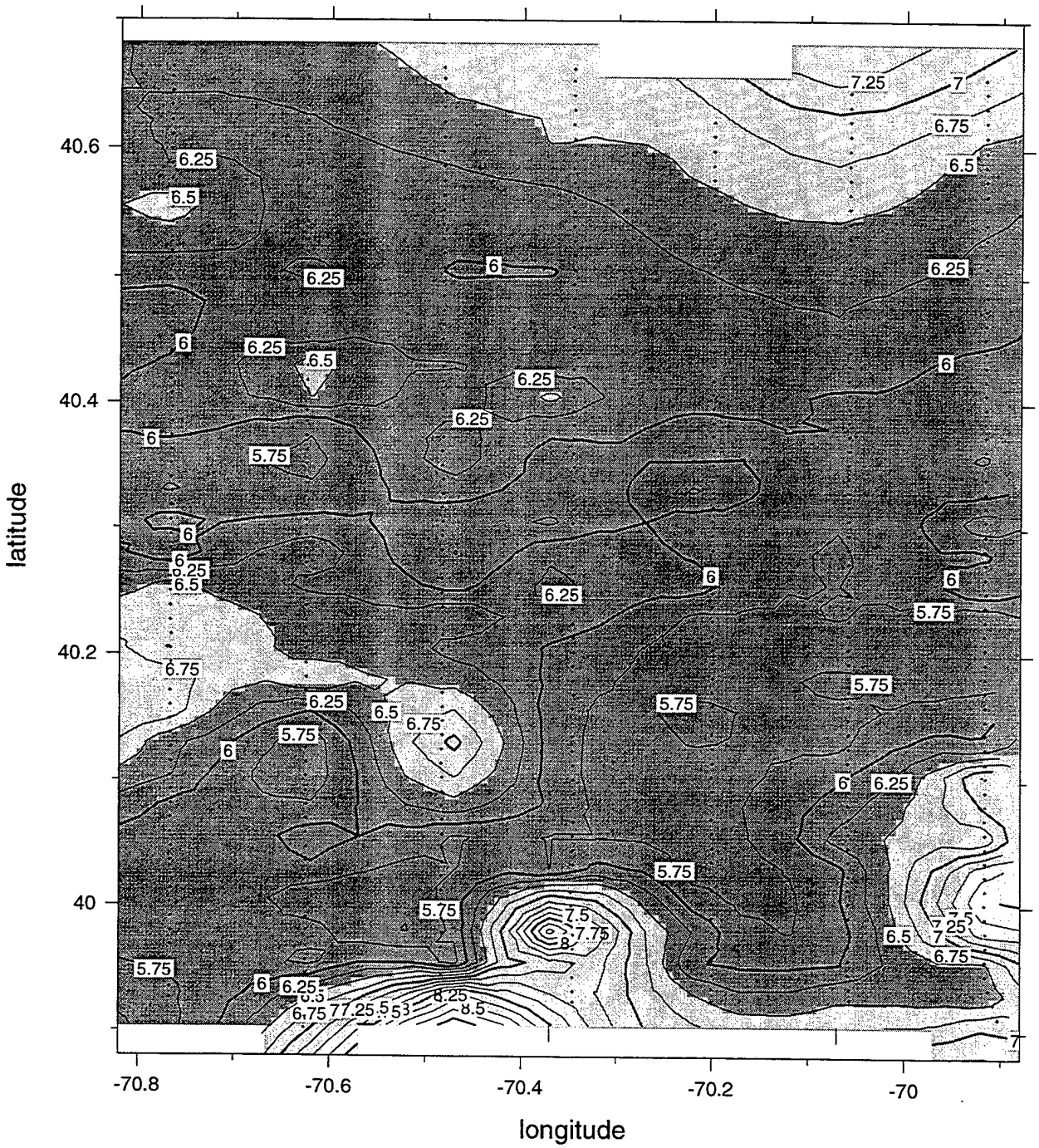


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 45 dbar

Temperature (°C)

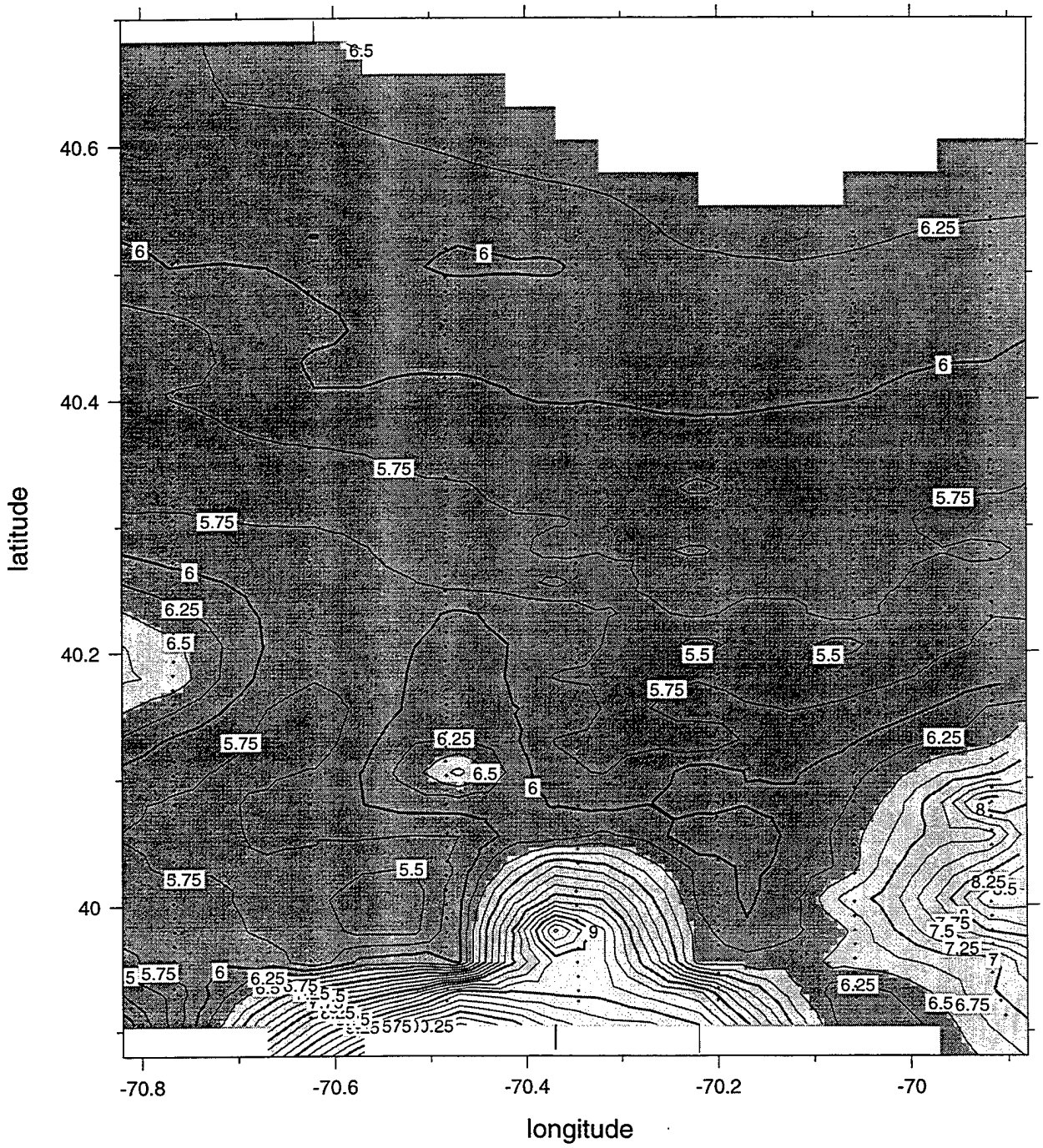


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 55 dbar

Temperature (°C)

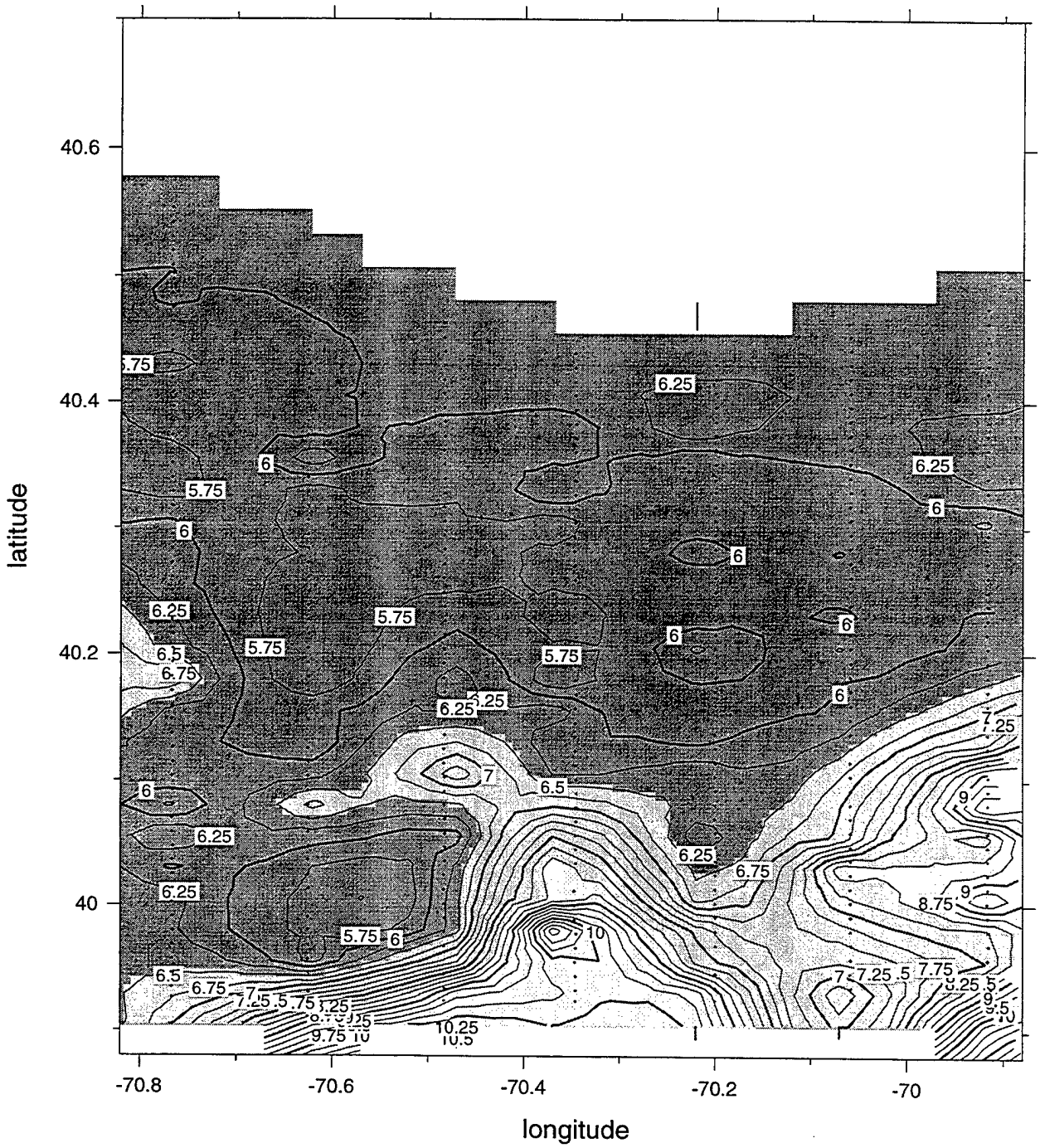


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 65 dbar

Temperature (°C)

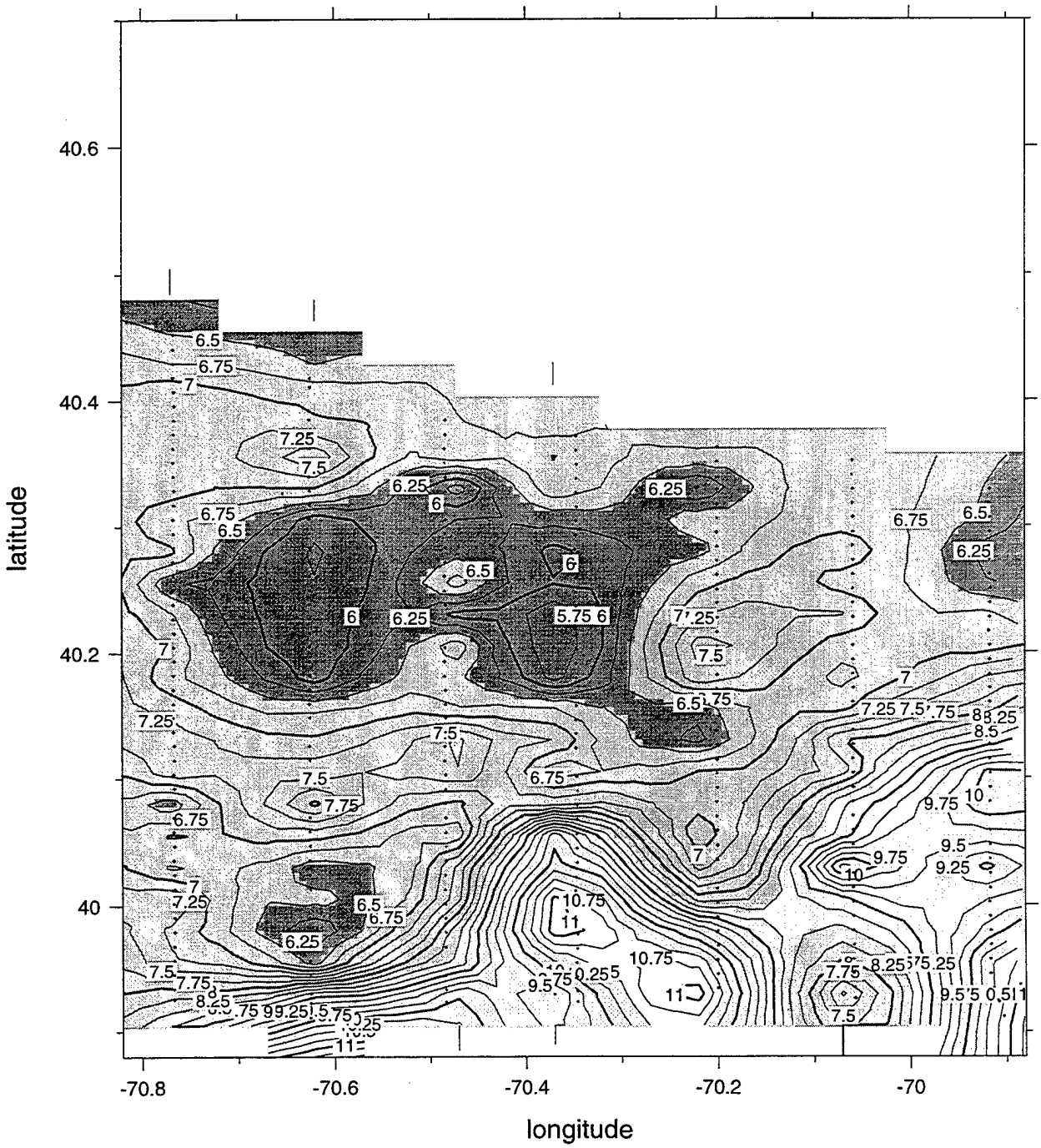


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 75 dbar

Temperature (°C)

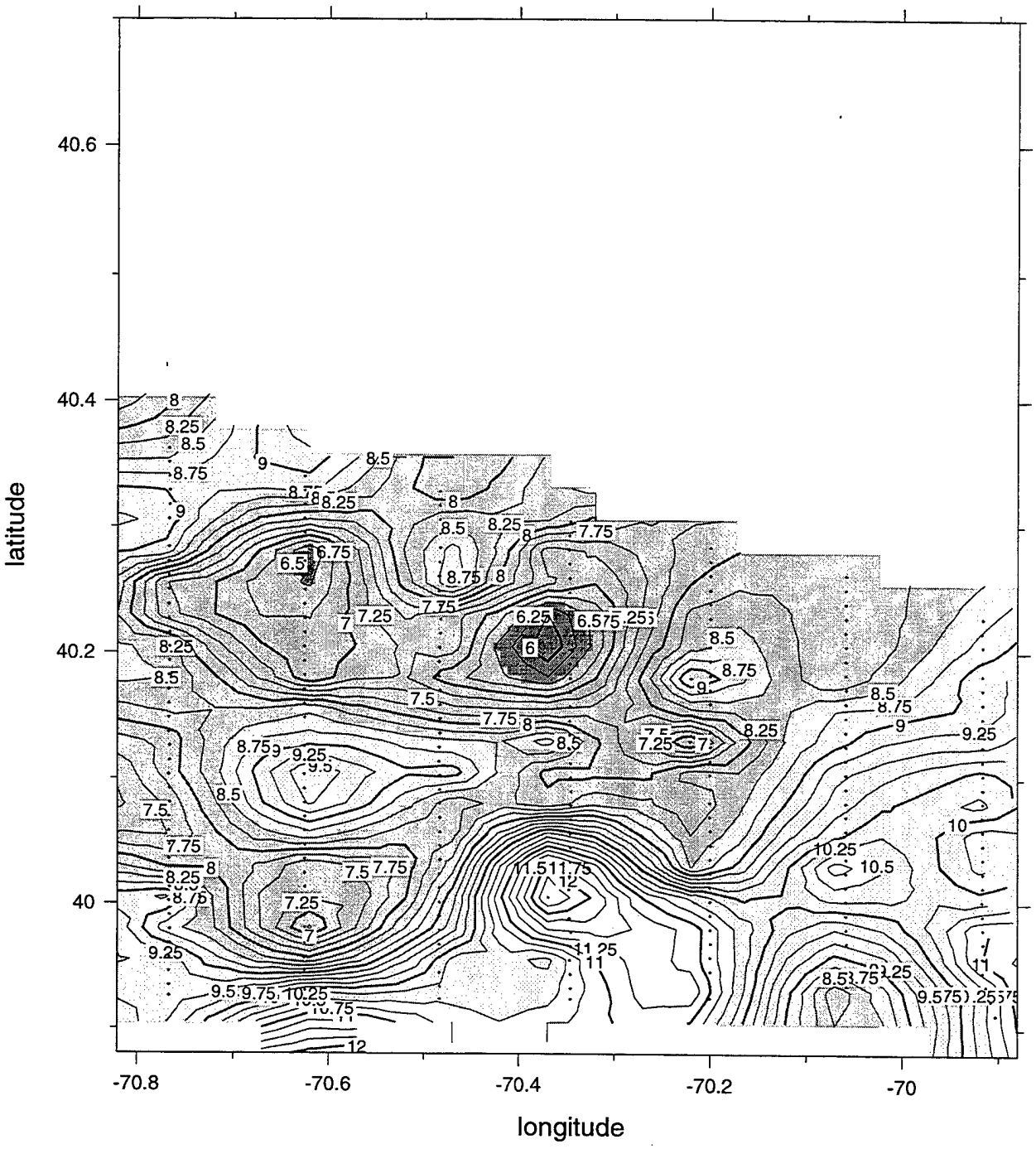


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 85 dbar

Temperature (°C)

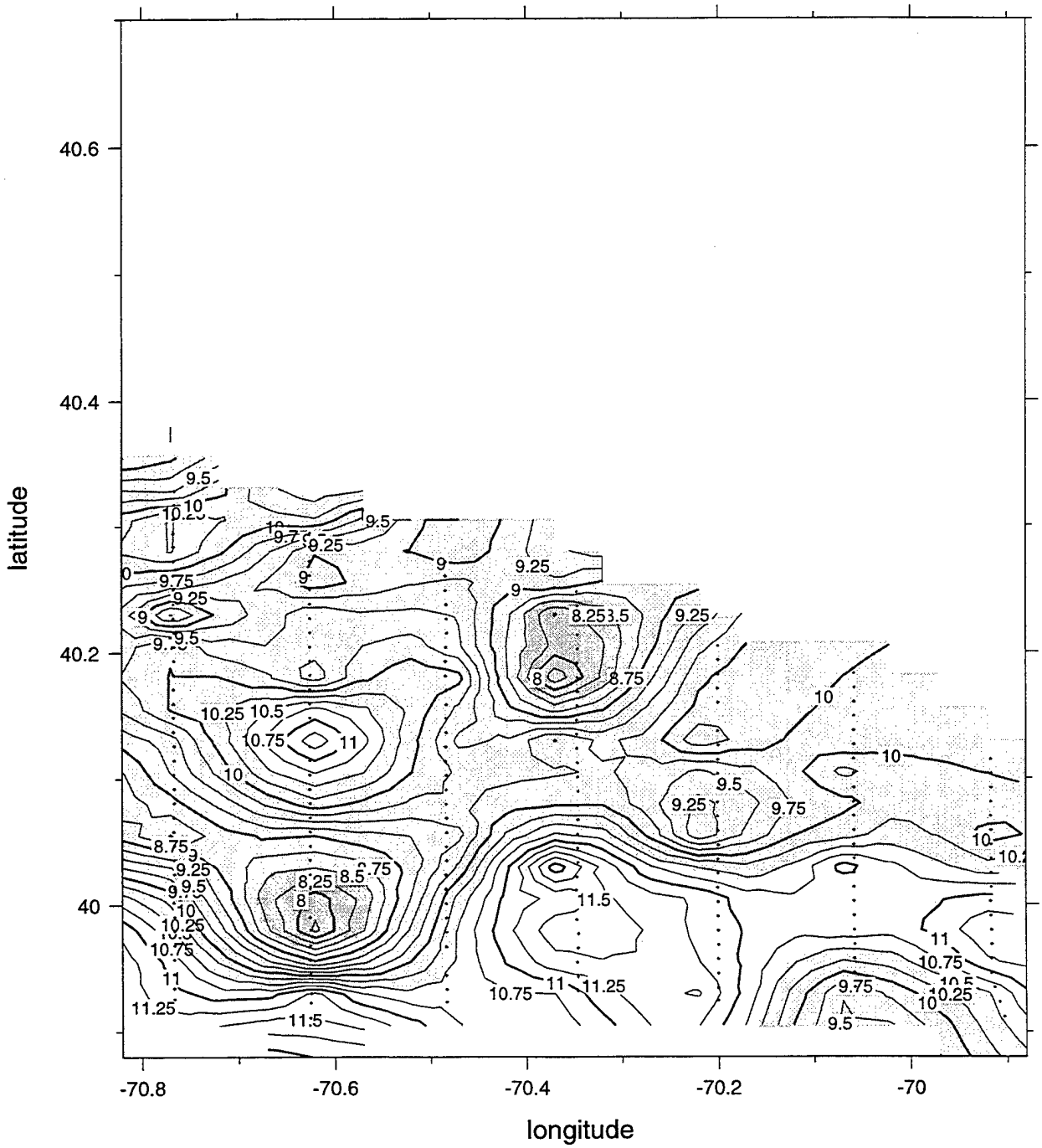


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 95 dbar

Temperature (°C)

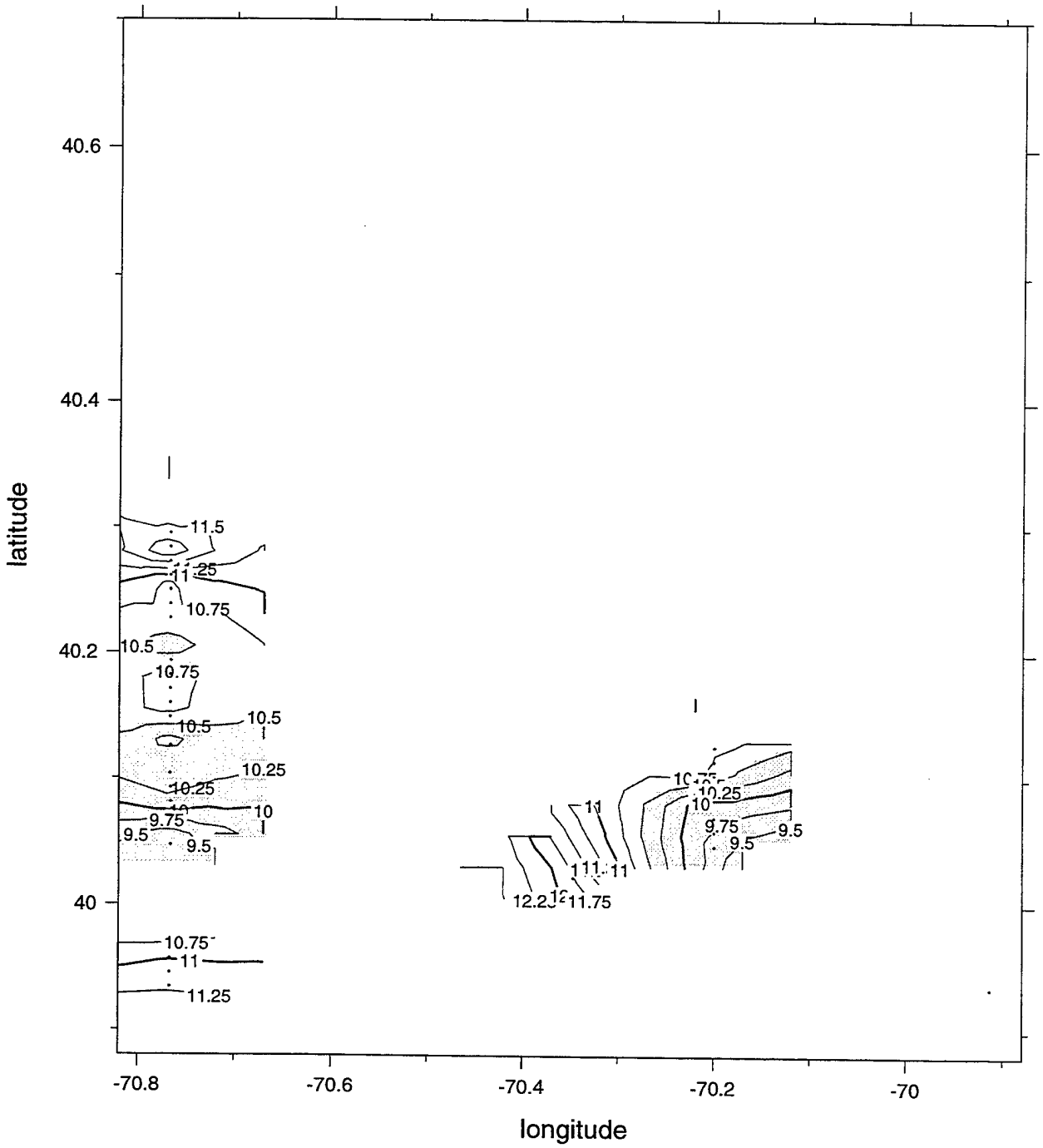


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 105 dbar

Temperature (°C)

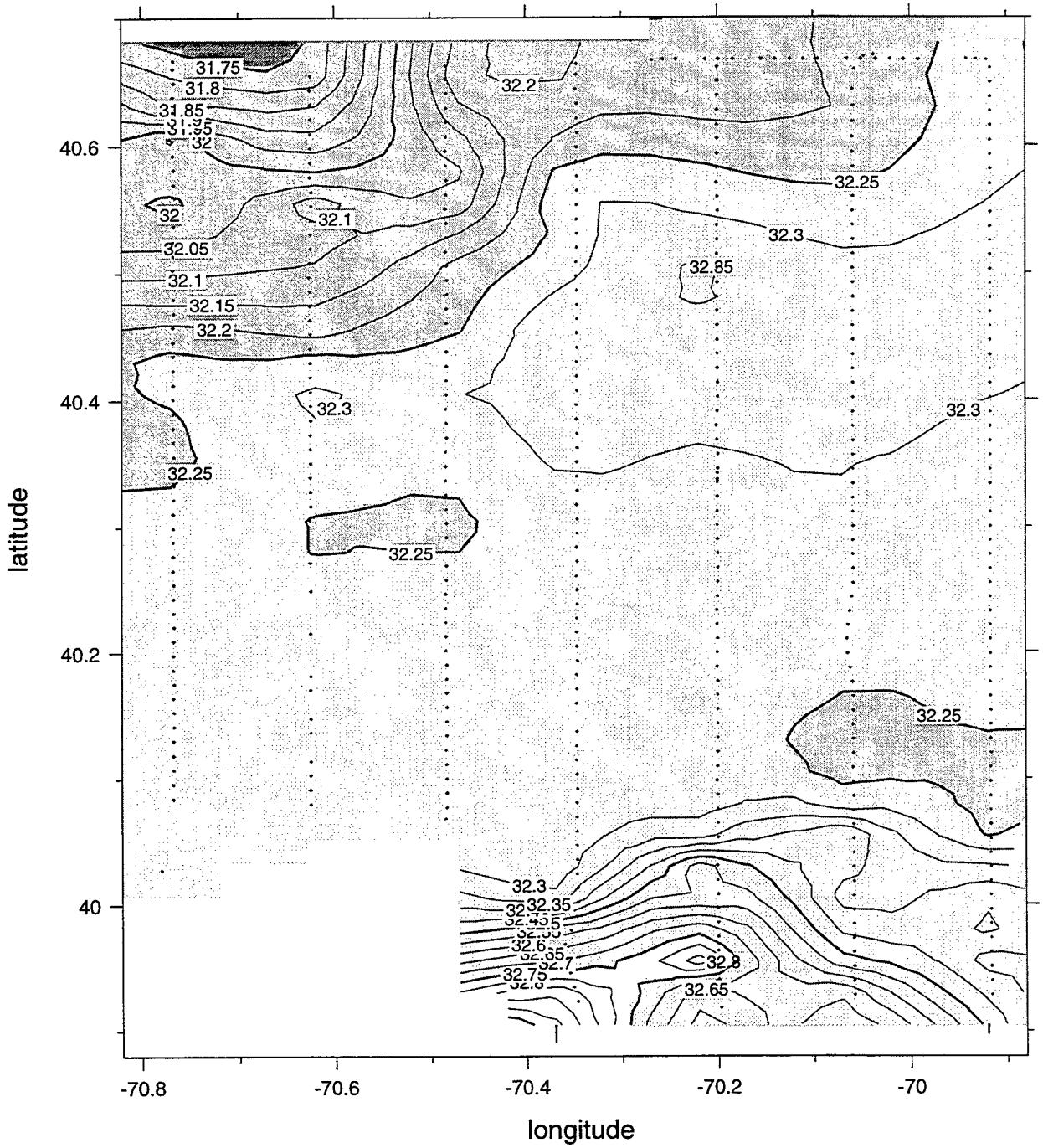


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 5 dbar

Salinity (PSS)

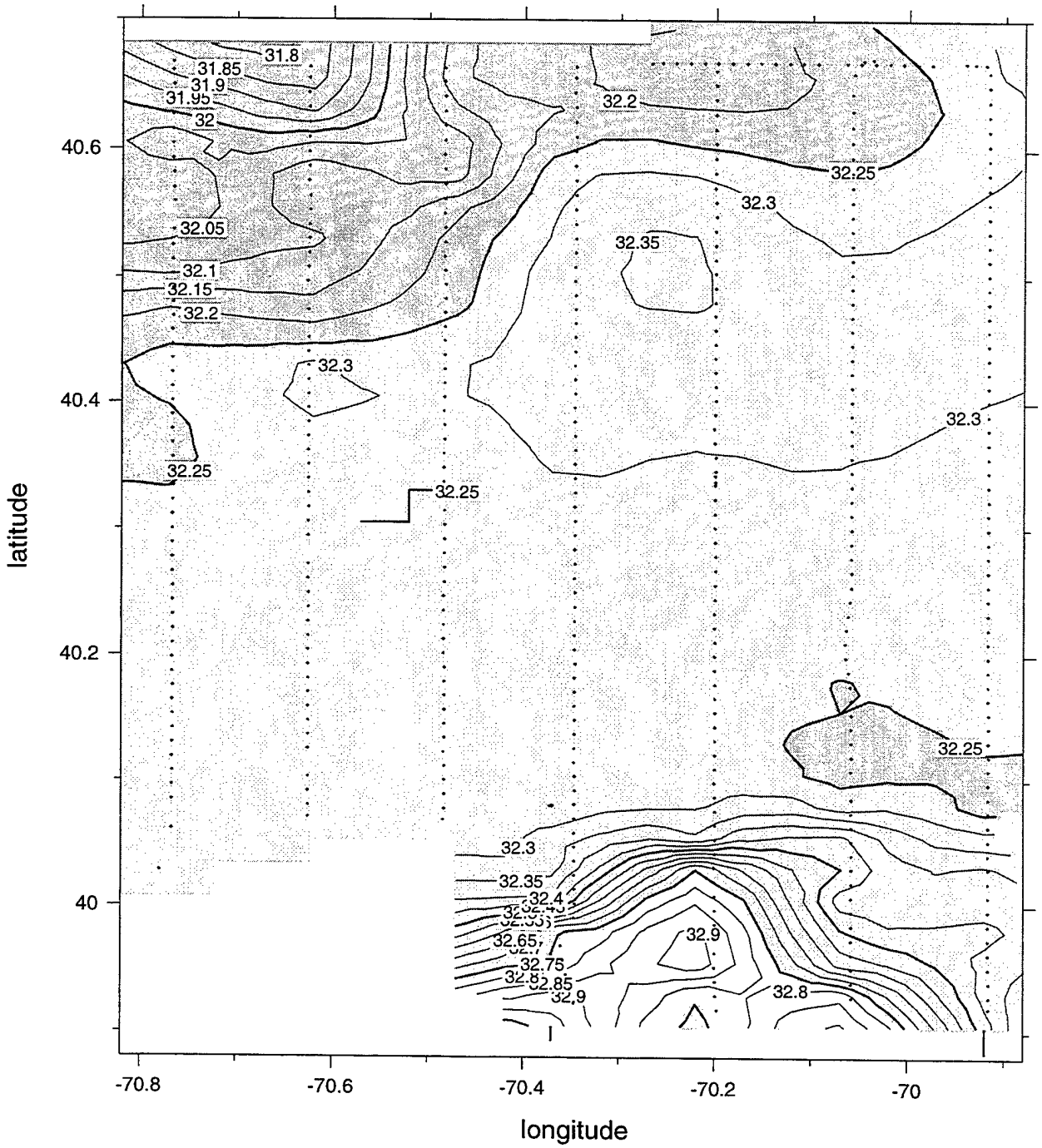


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 15 dbar

Salinity (PSS)

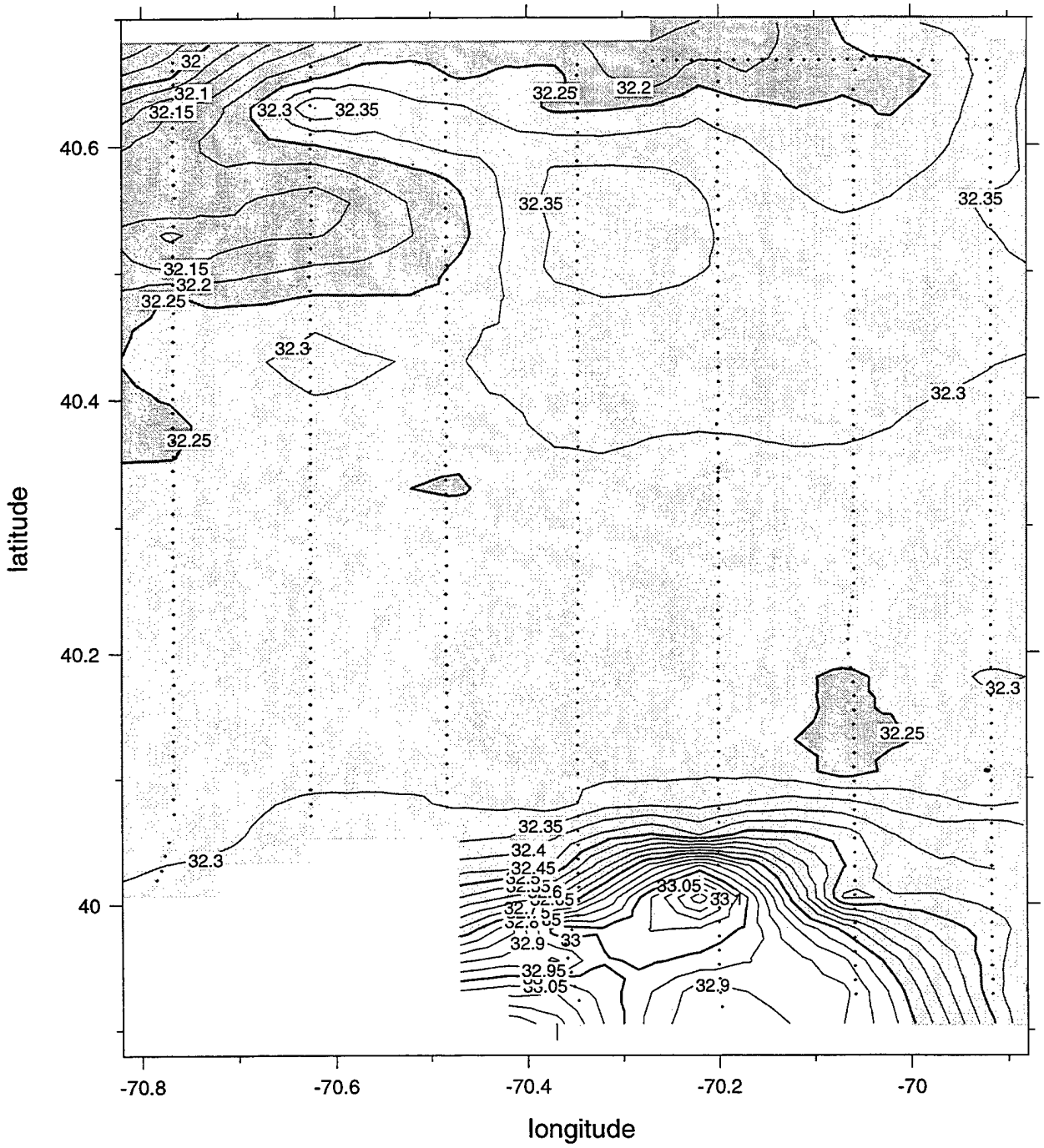


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 25 dbar

Salinity (PSS)

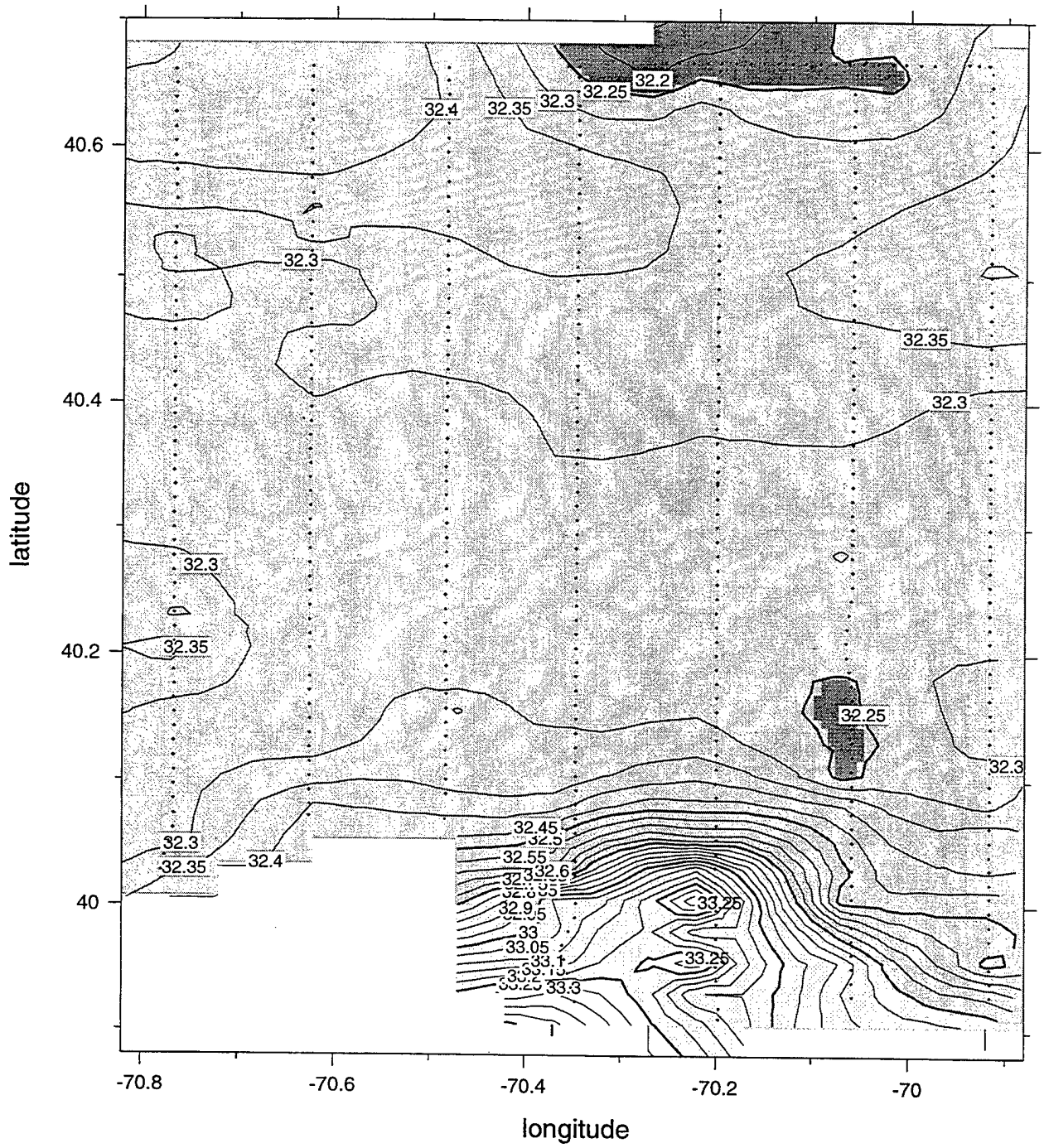


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 35 dbar

Salinity (PSS)

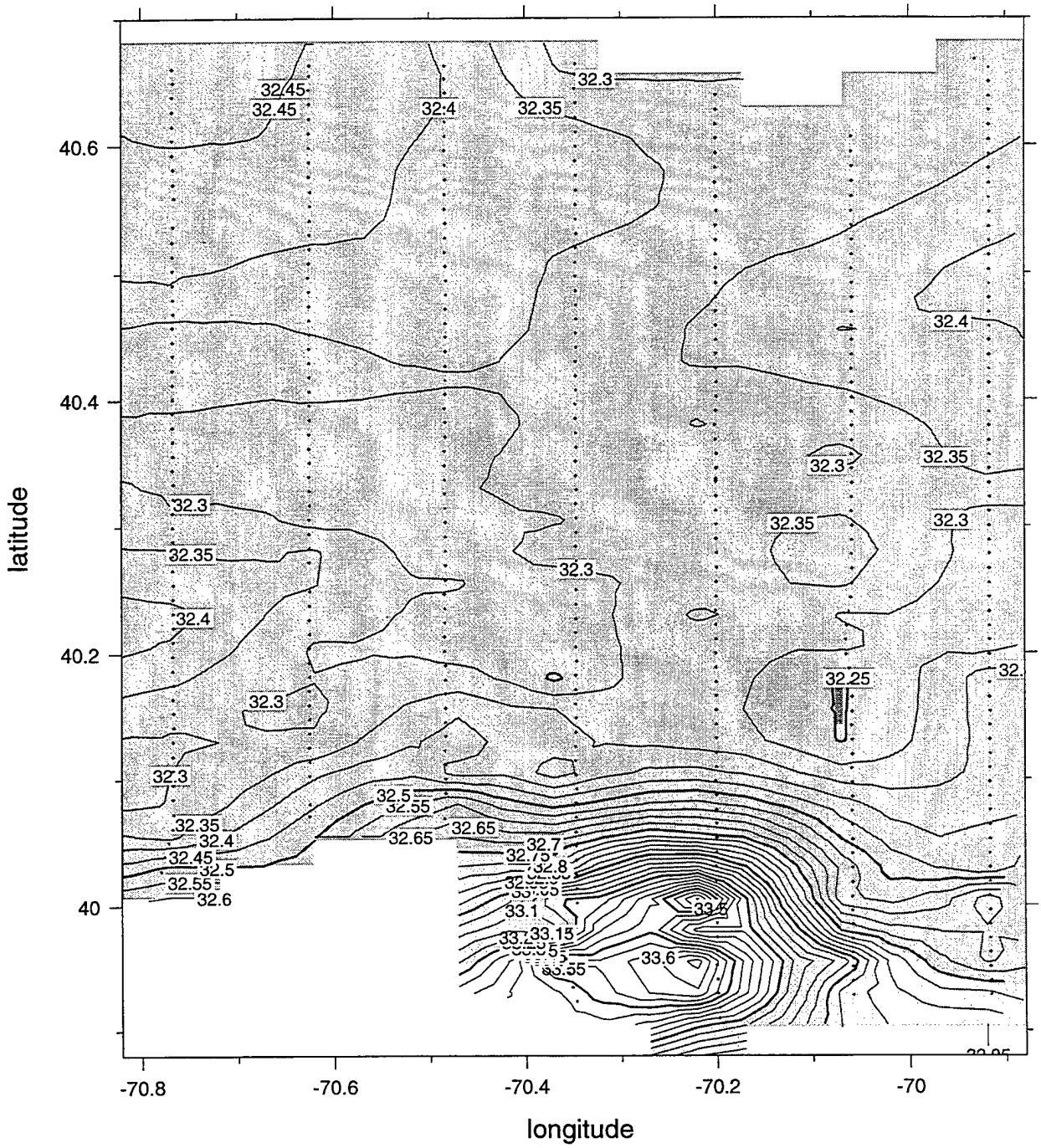


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 45 dbar

Salinity (PSS)

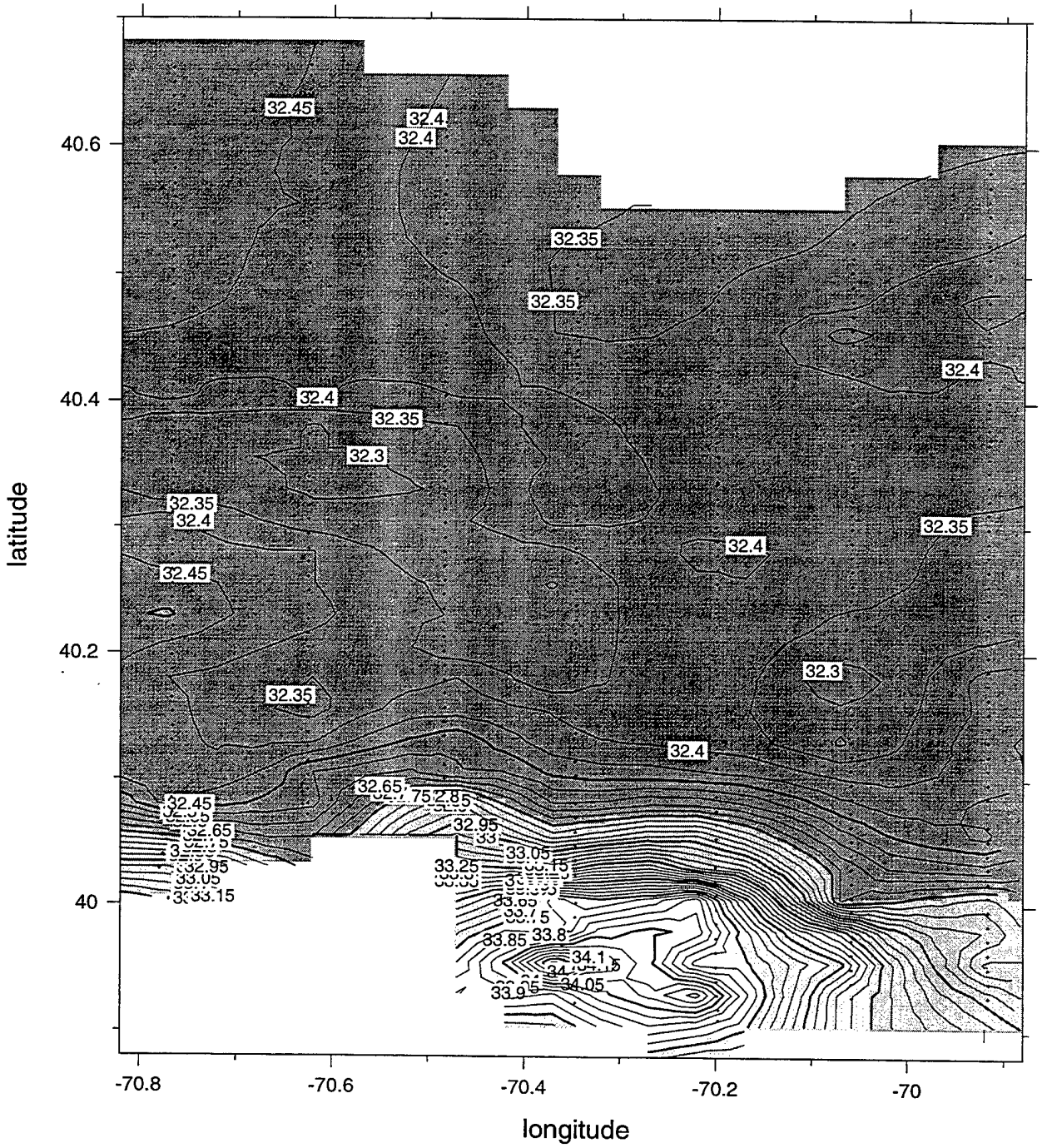


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 55 dbar

Salinity (PSS)

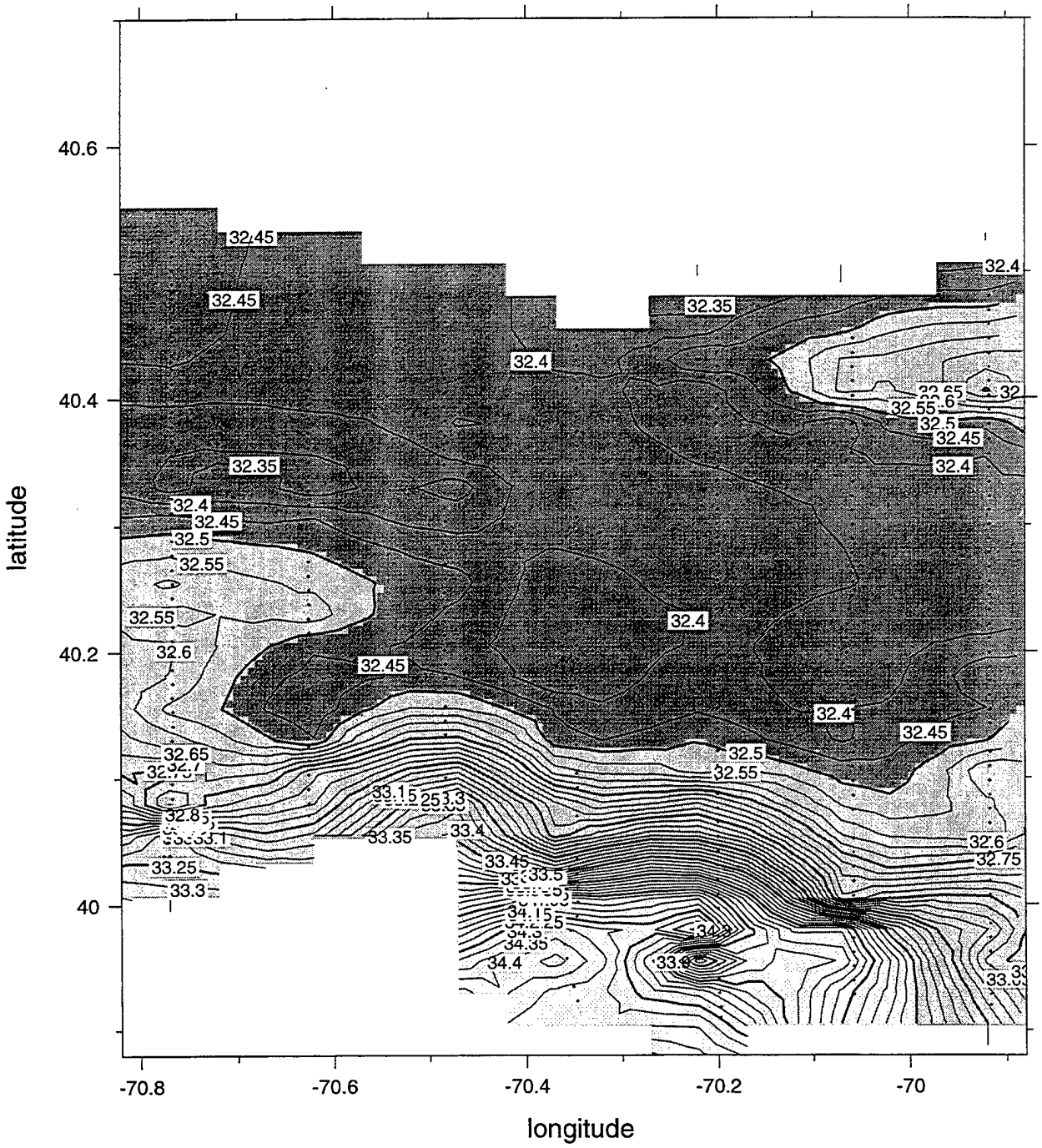


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 65 dbar

Salinity (PSS)

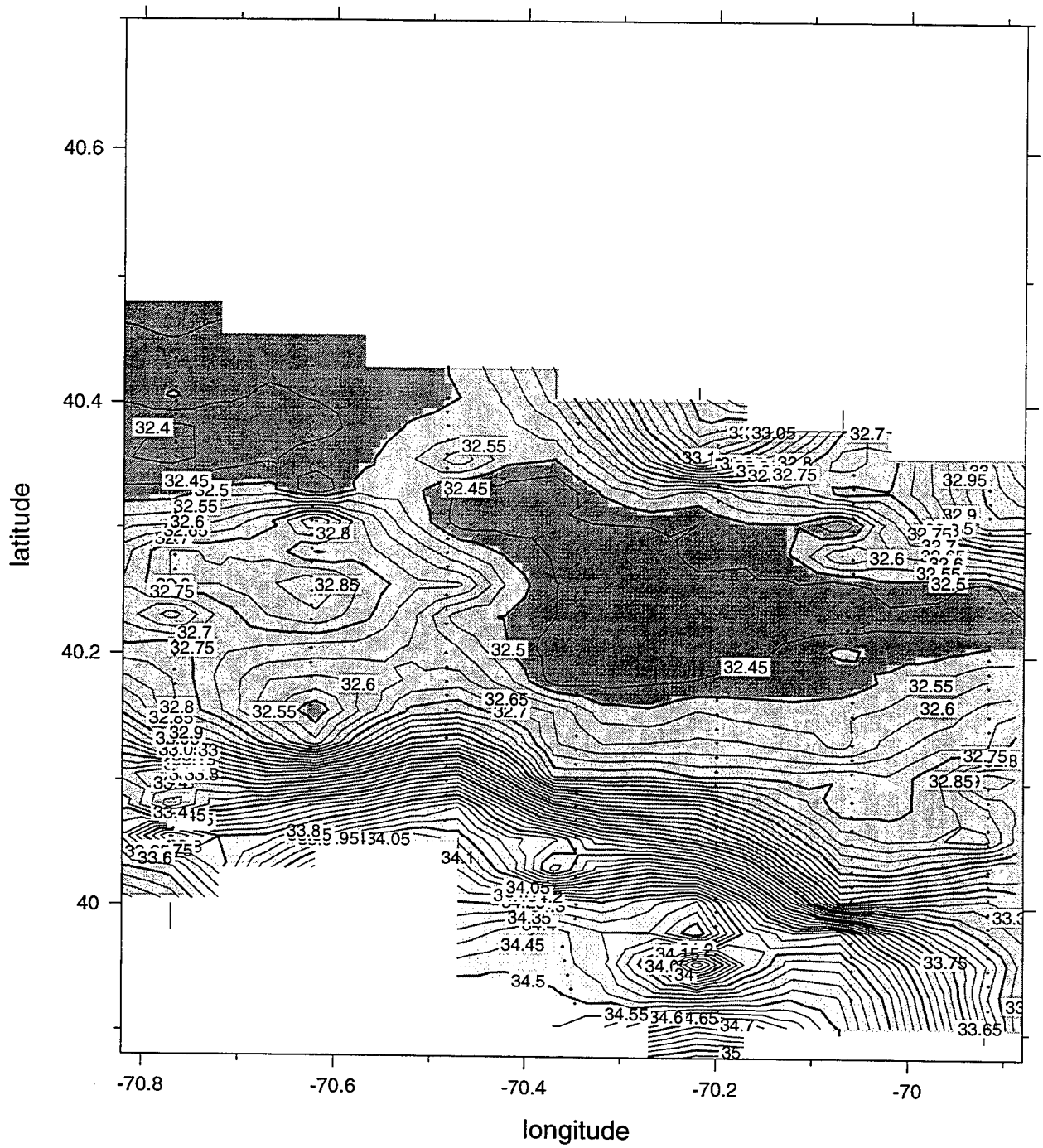


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 75 dbar

Salinity (PSS)

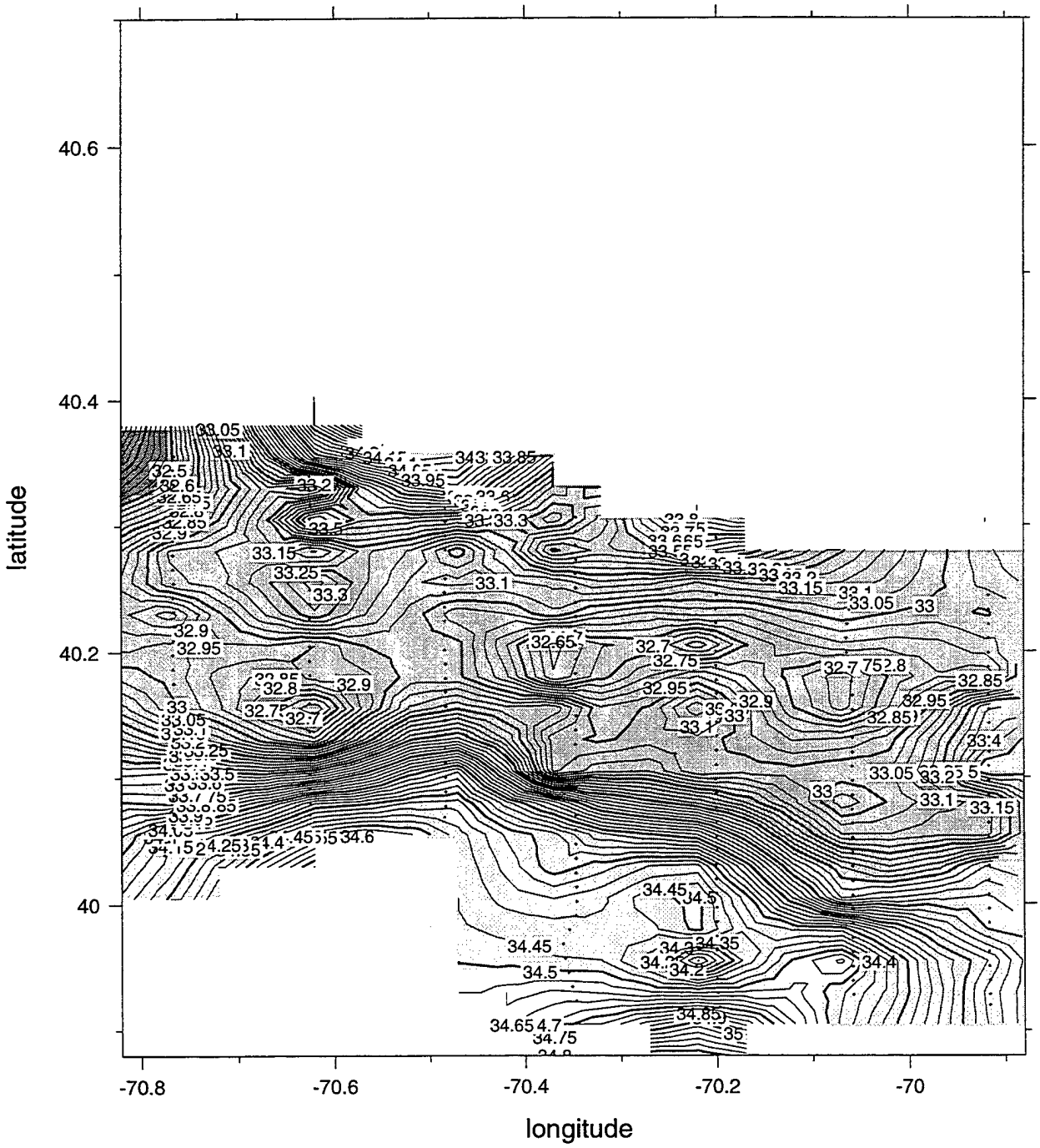


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 85 dbar

Salinity (PSS)

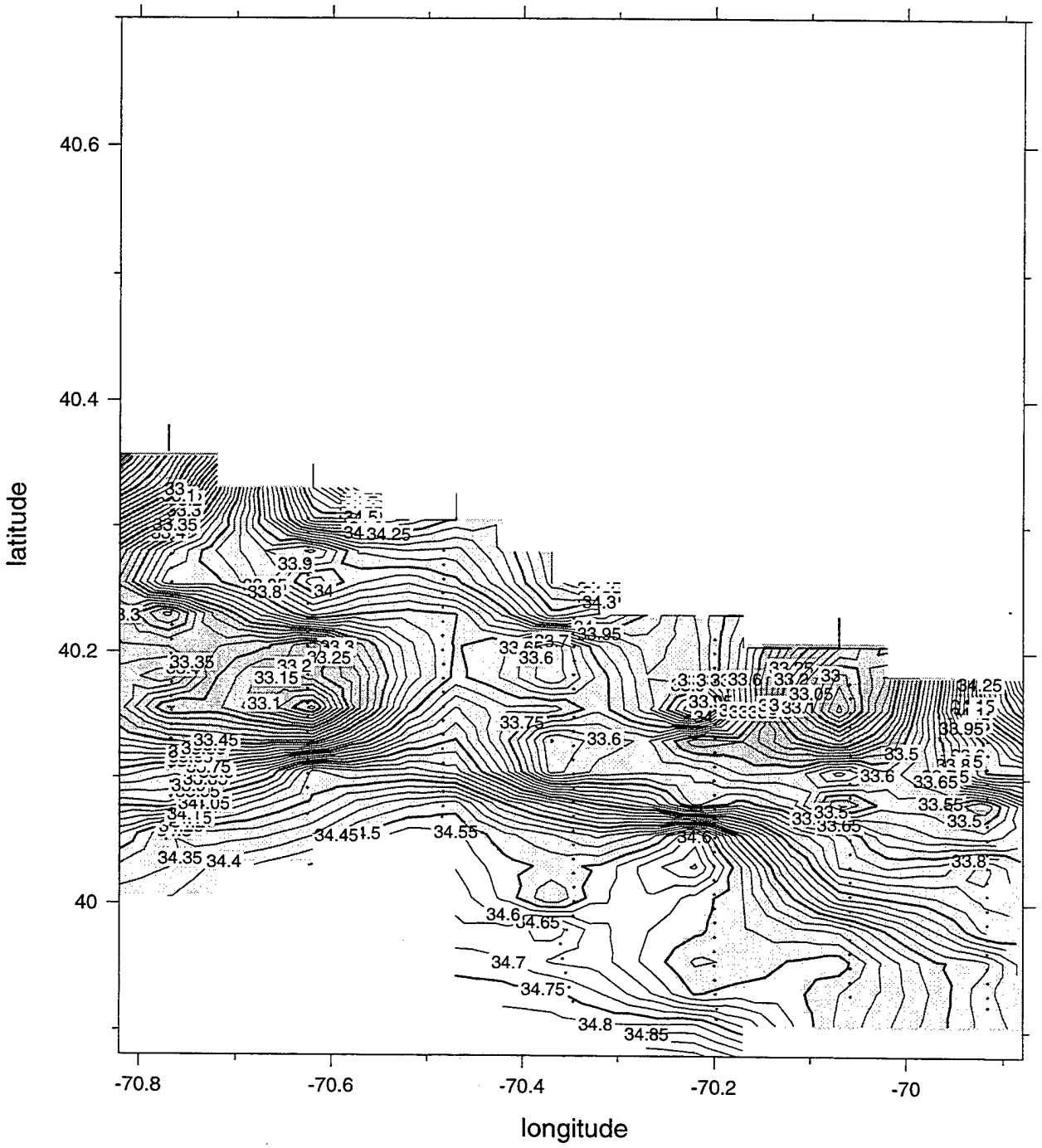


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 95 dbar

Salinity (PSS)

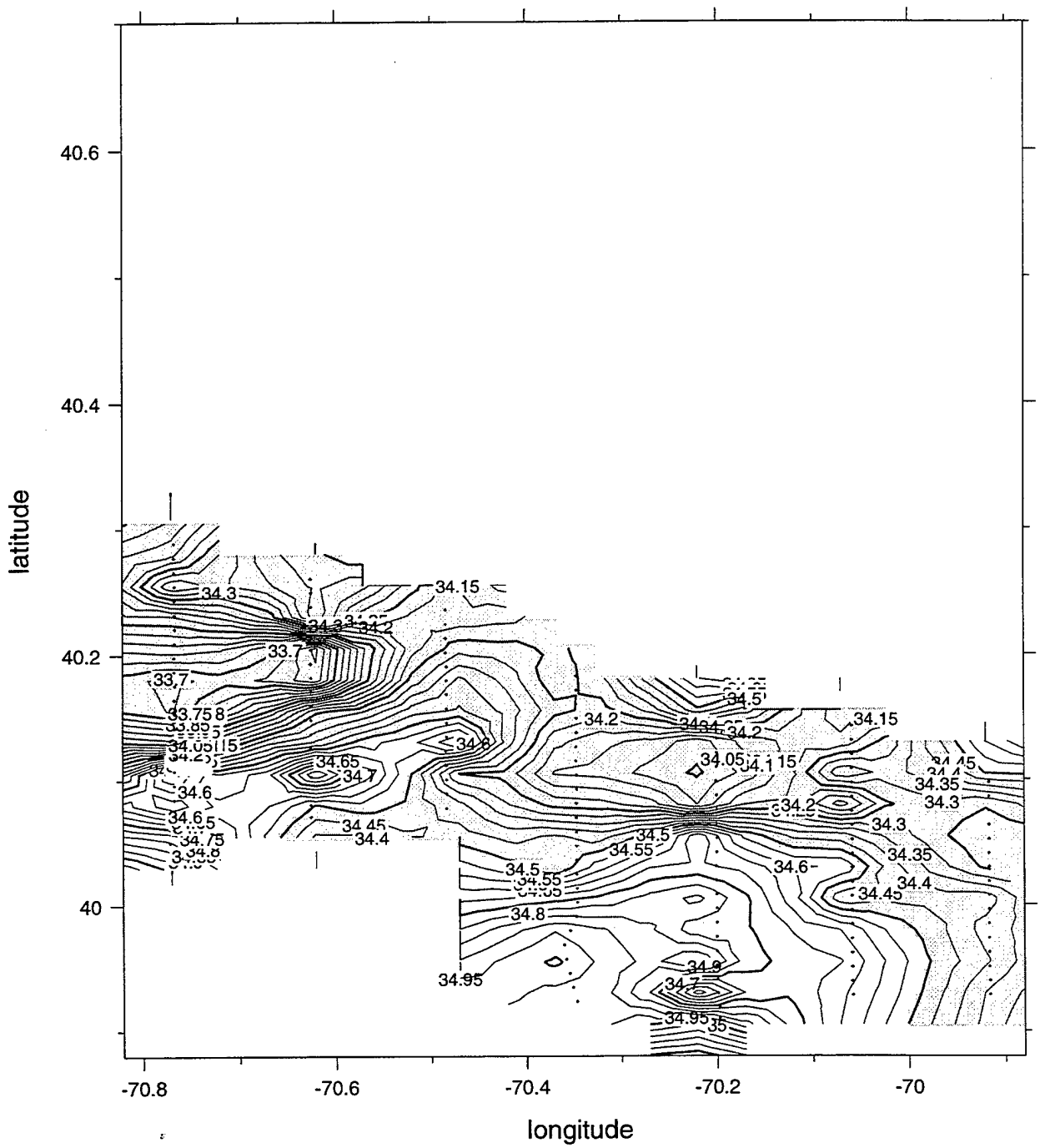


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 105 dbar

Salinity (PSS)

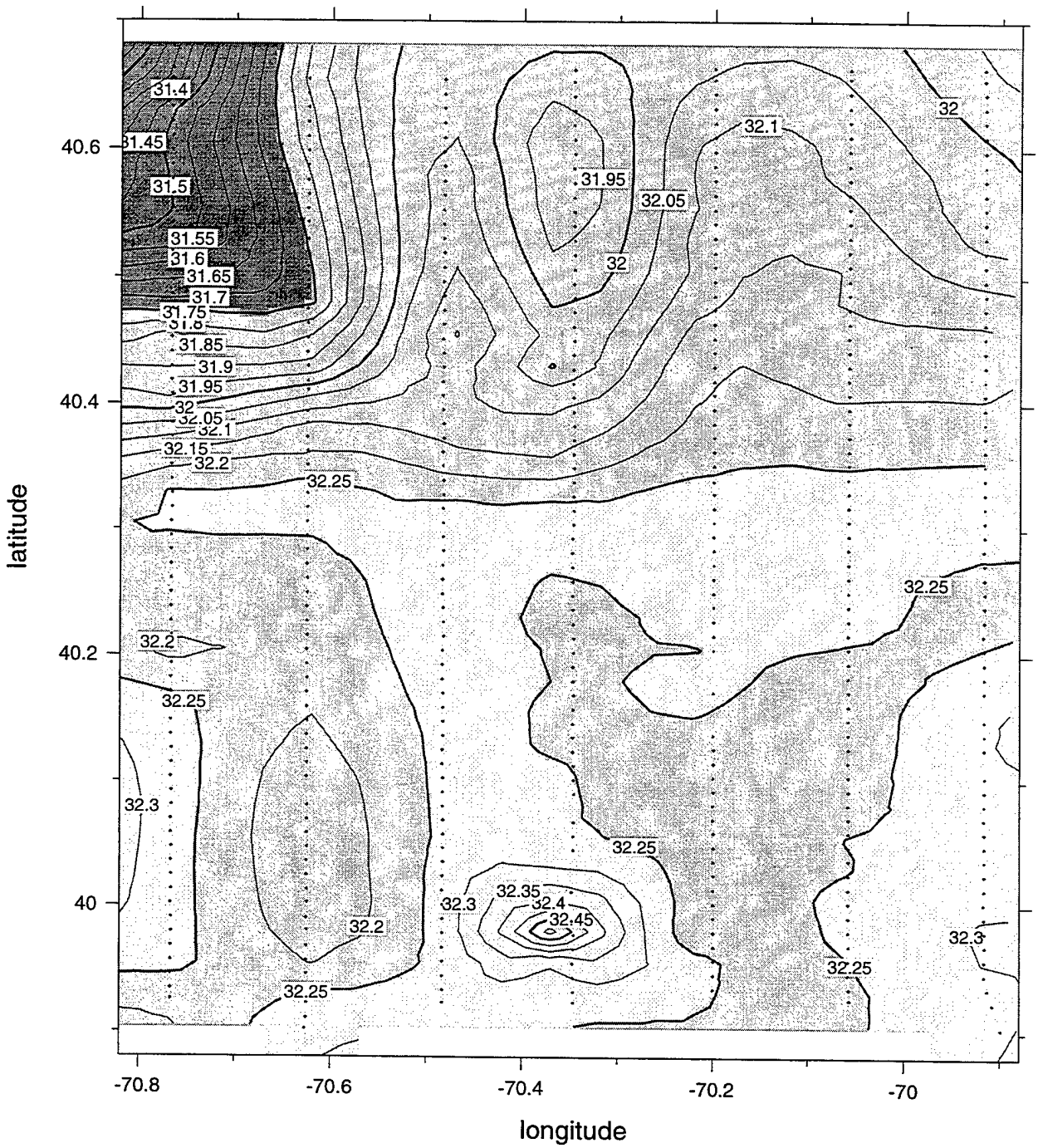


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 5 dbar

Salinity (PSS)

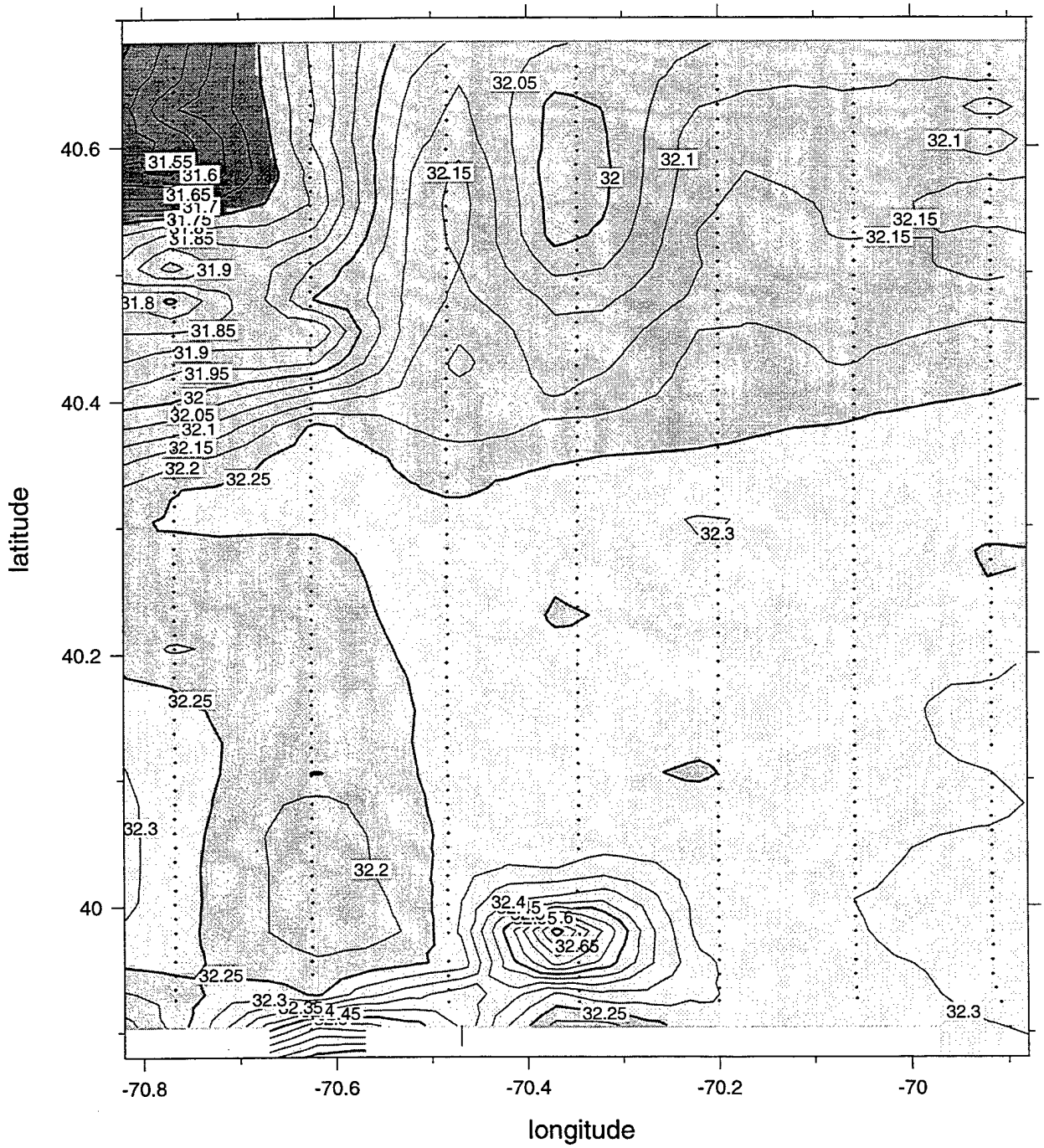


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 15 dbar

Salinity (PSS)

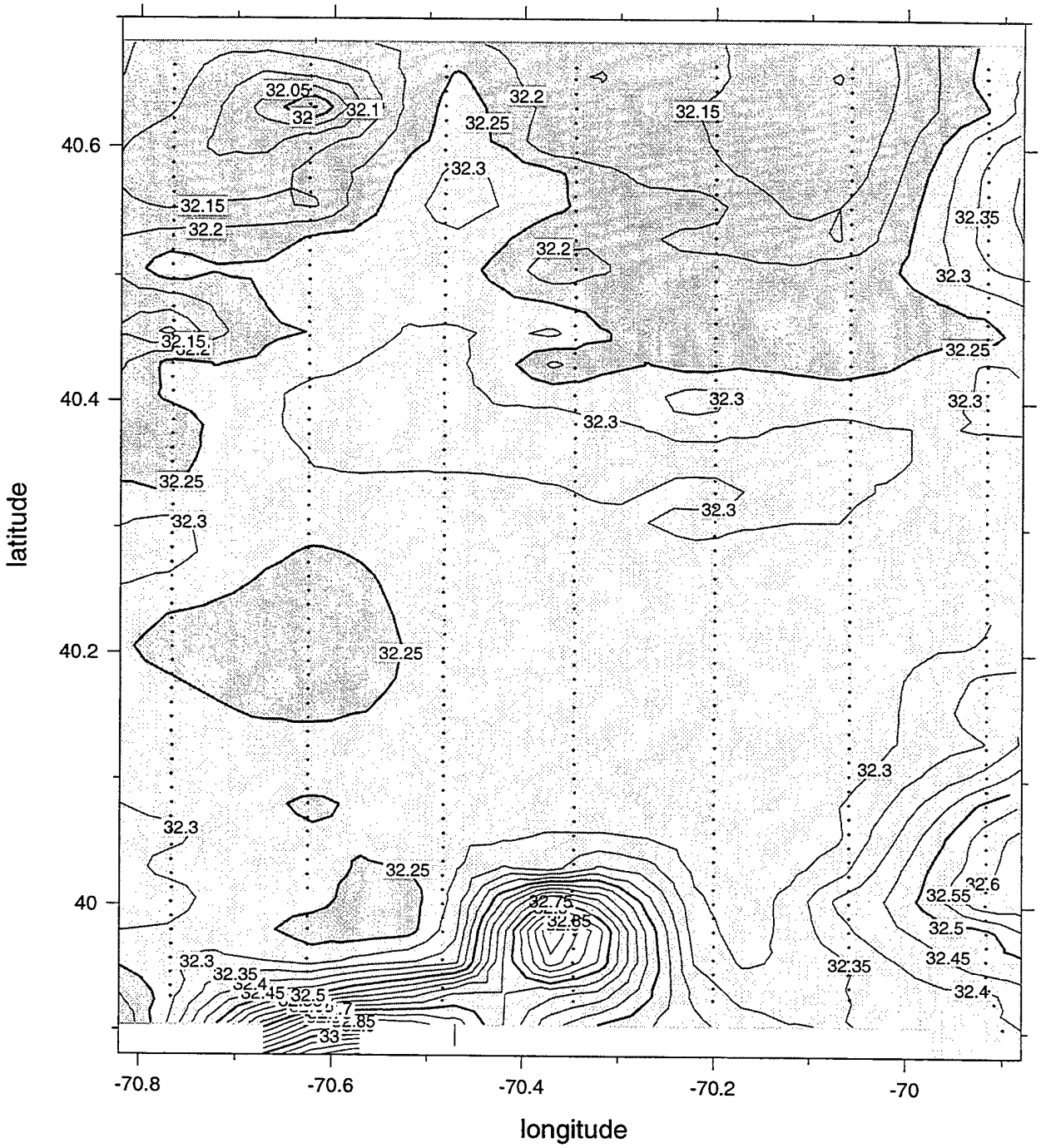


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 25 dbar

Salinity (PSS)

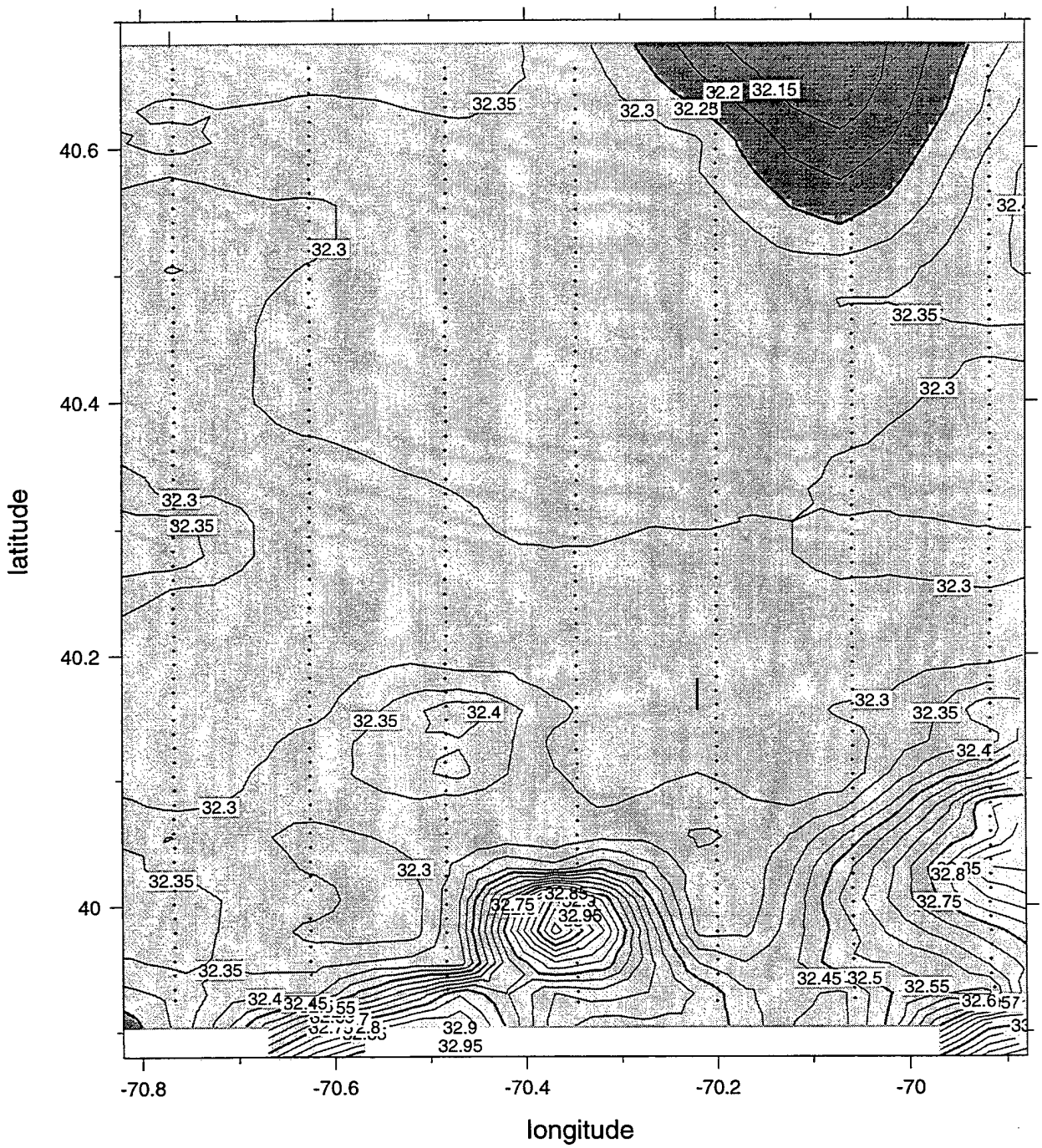


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 35 dbar

Salinity (PSS)

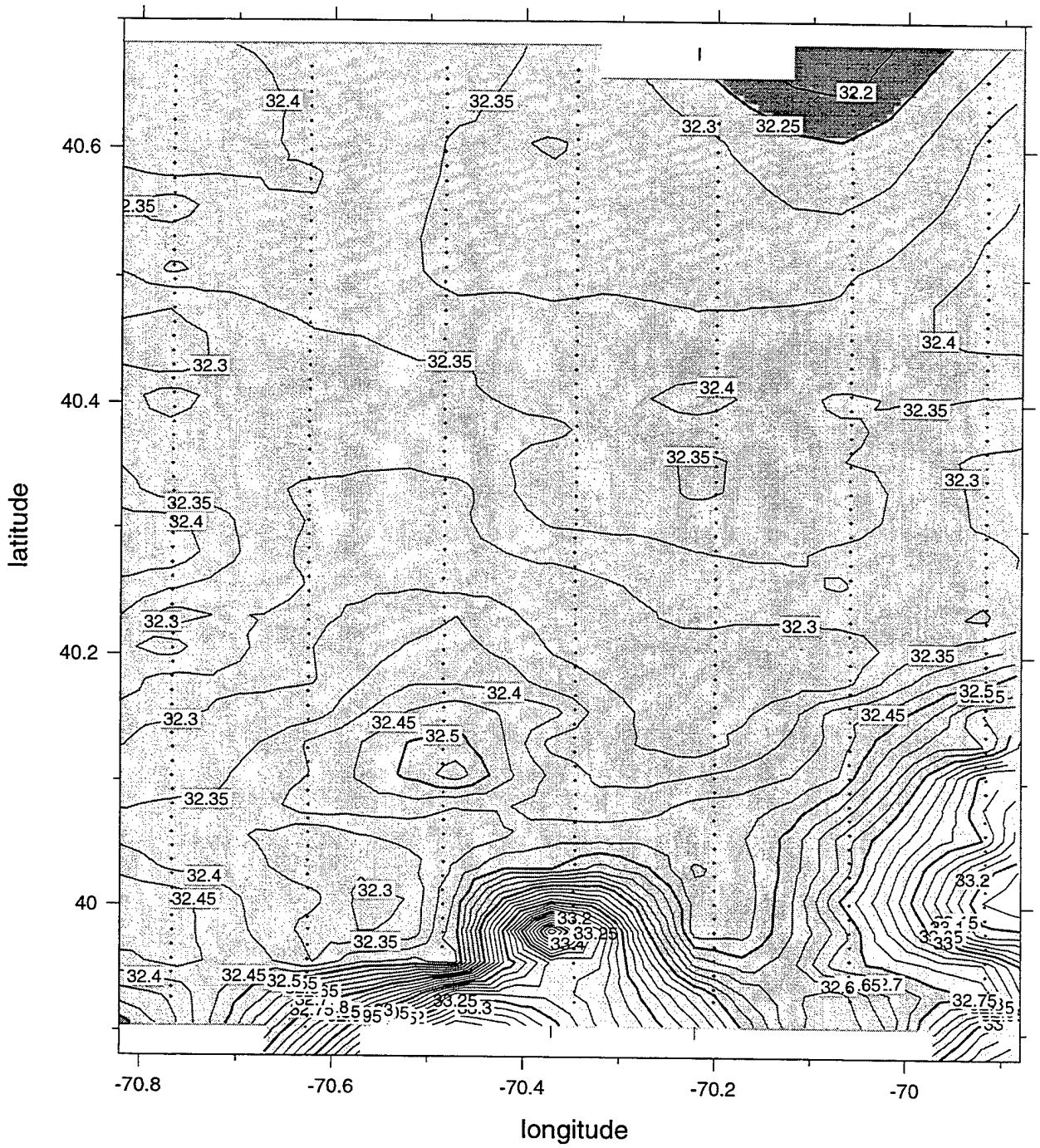


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 45 dbar

Salinity (PSS)

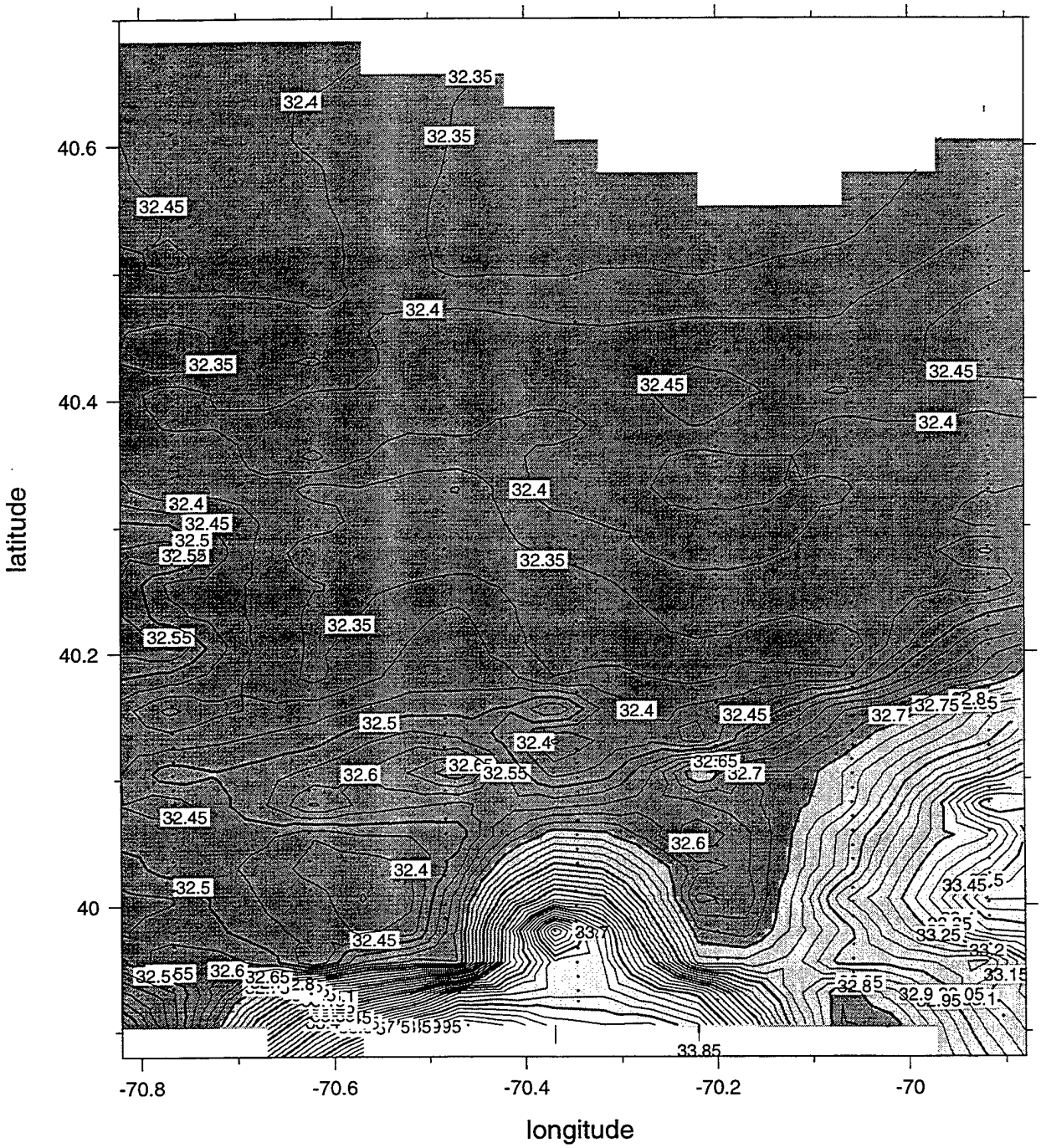


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 55 dbar

Salinity (PSS)

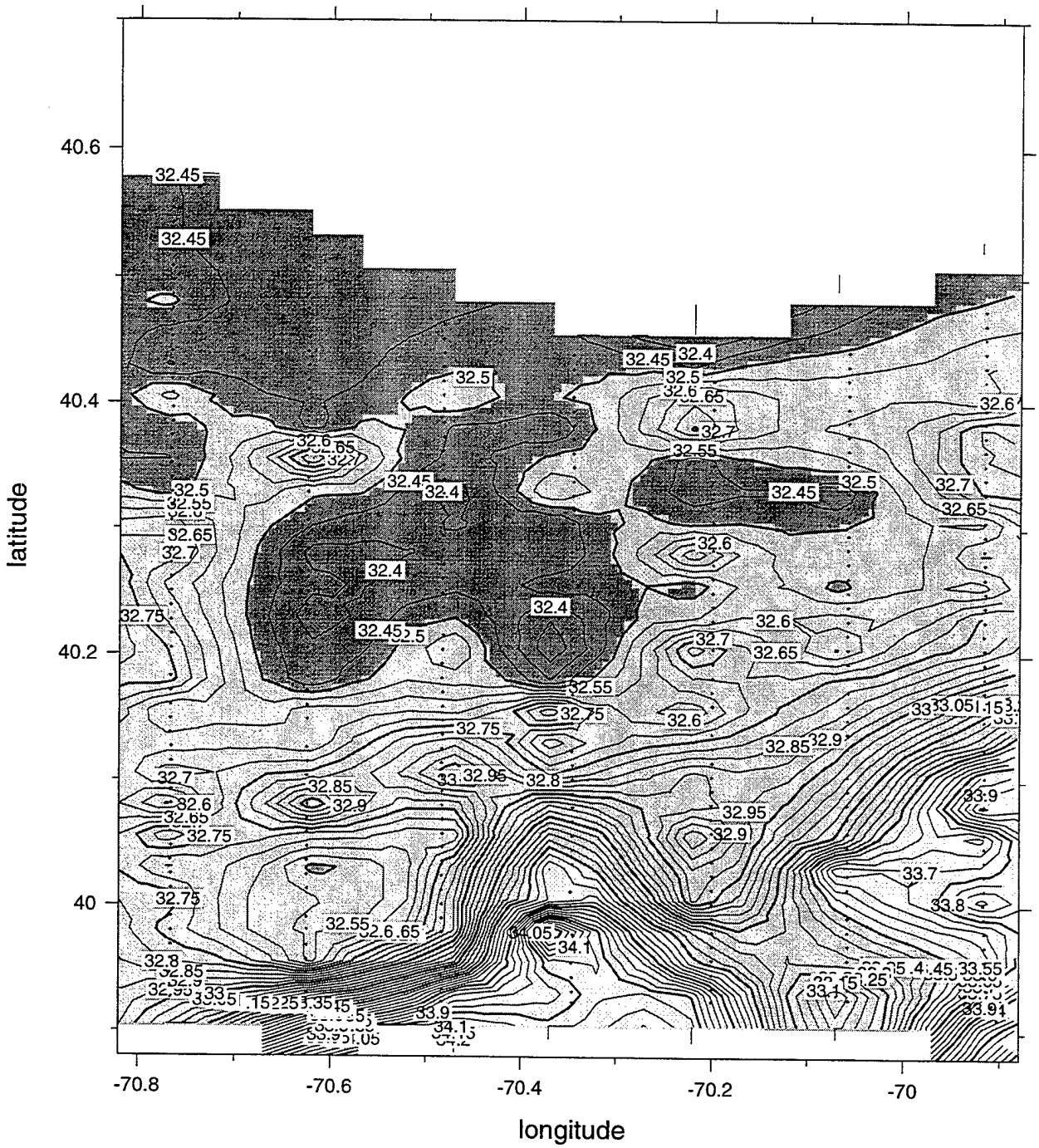


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 65 dbar

Salinity (PSS)

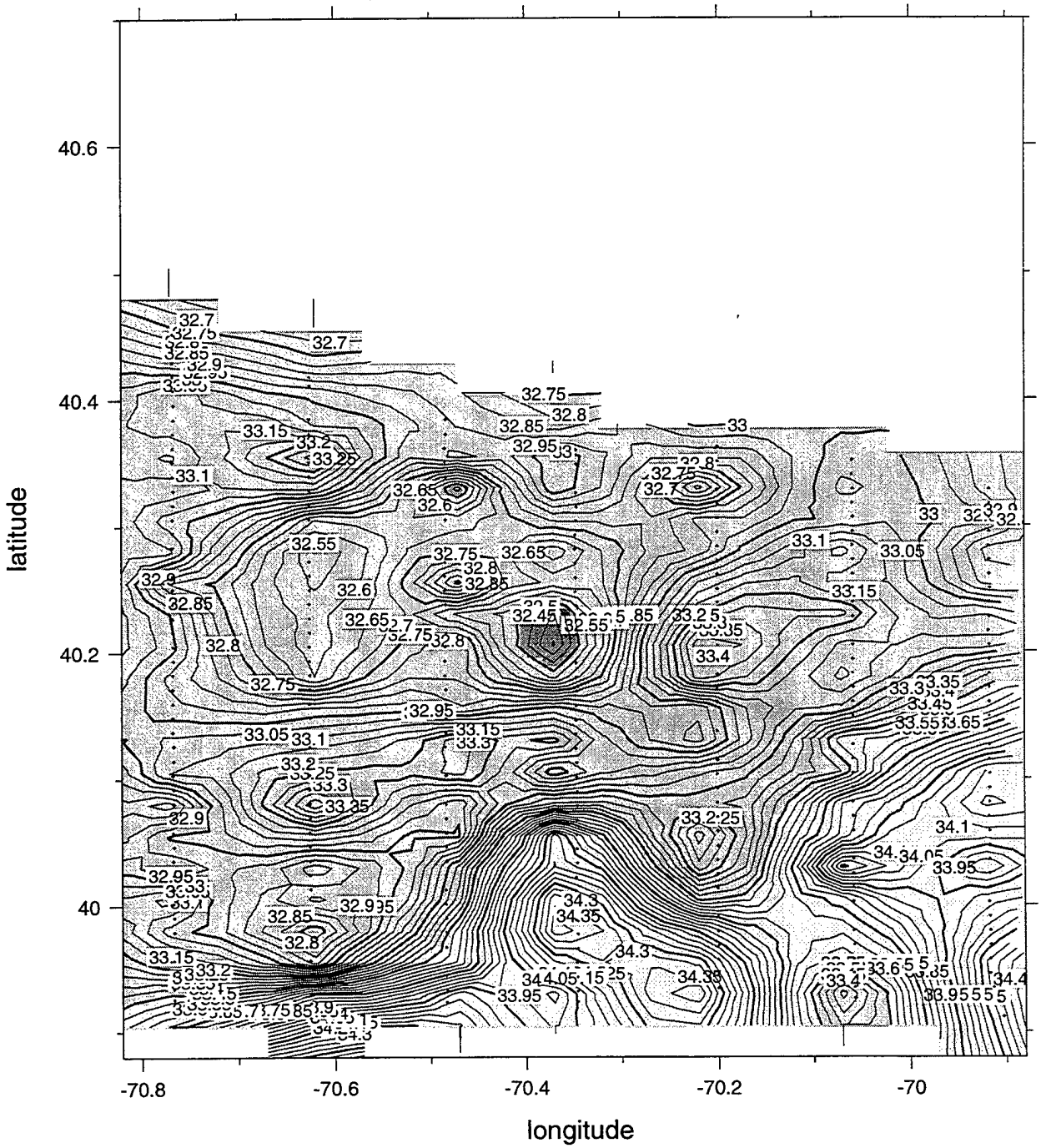


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 75 dbar

Salinity (PSS)

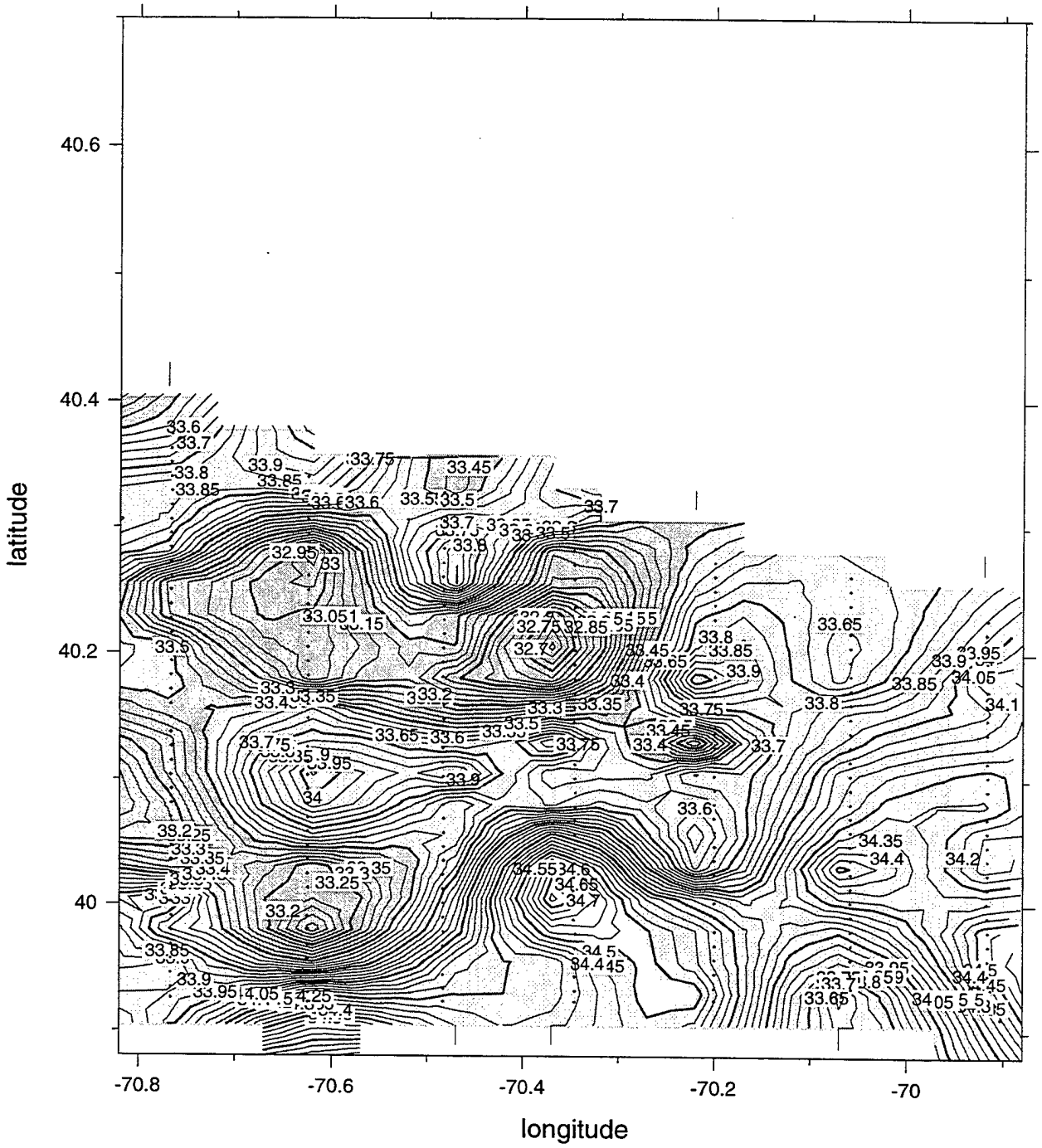


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 85 dbar

Salinity (PSS)

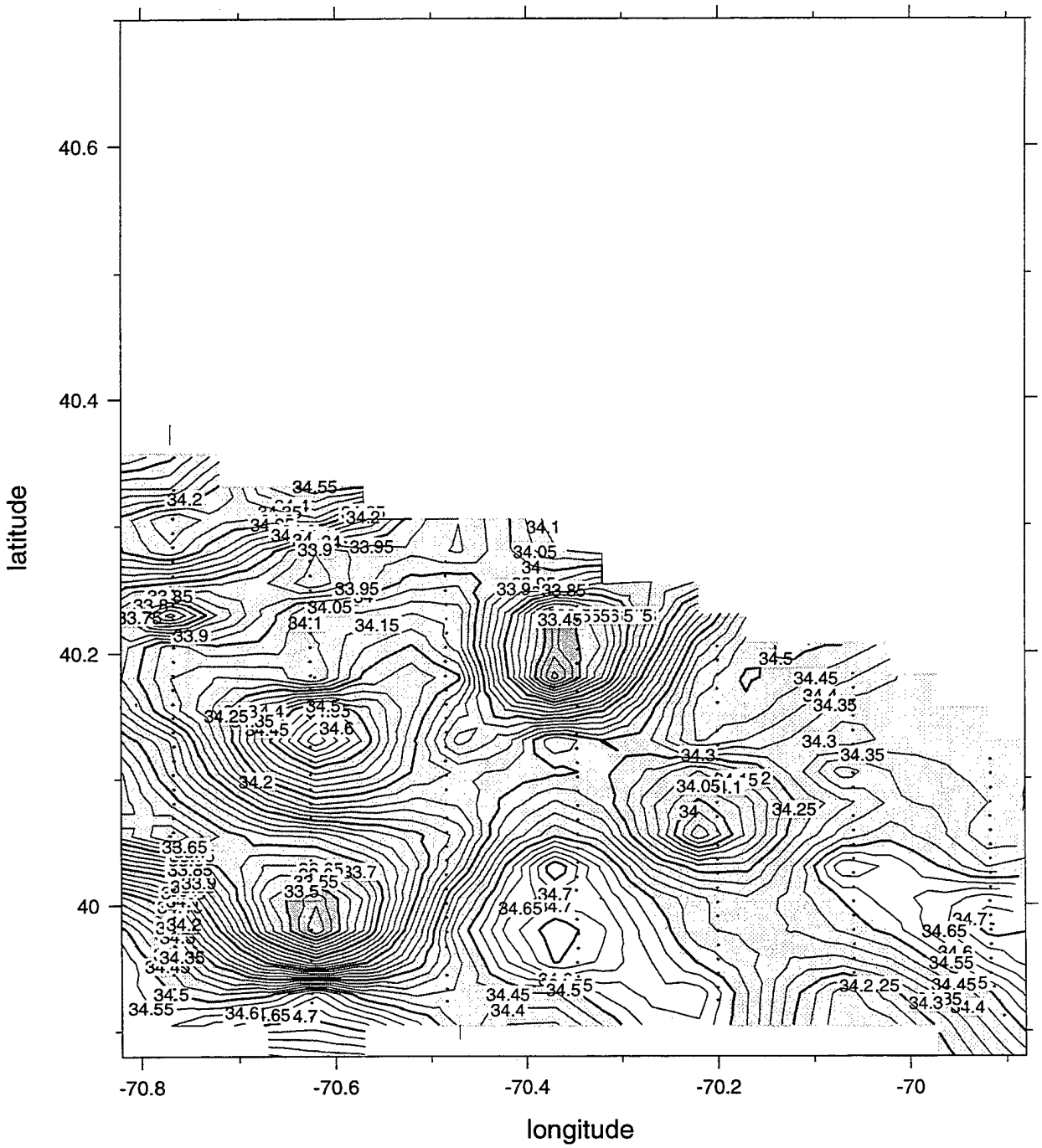


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 95 dbar

Salinity (PSS)

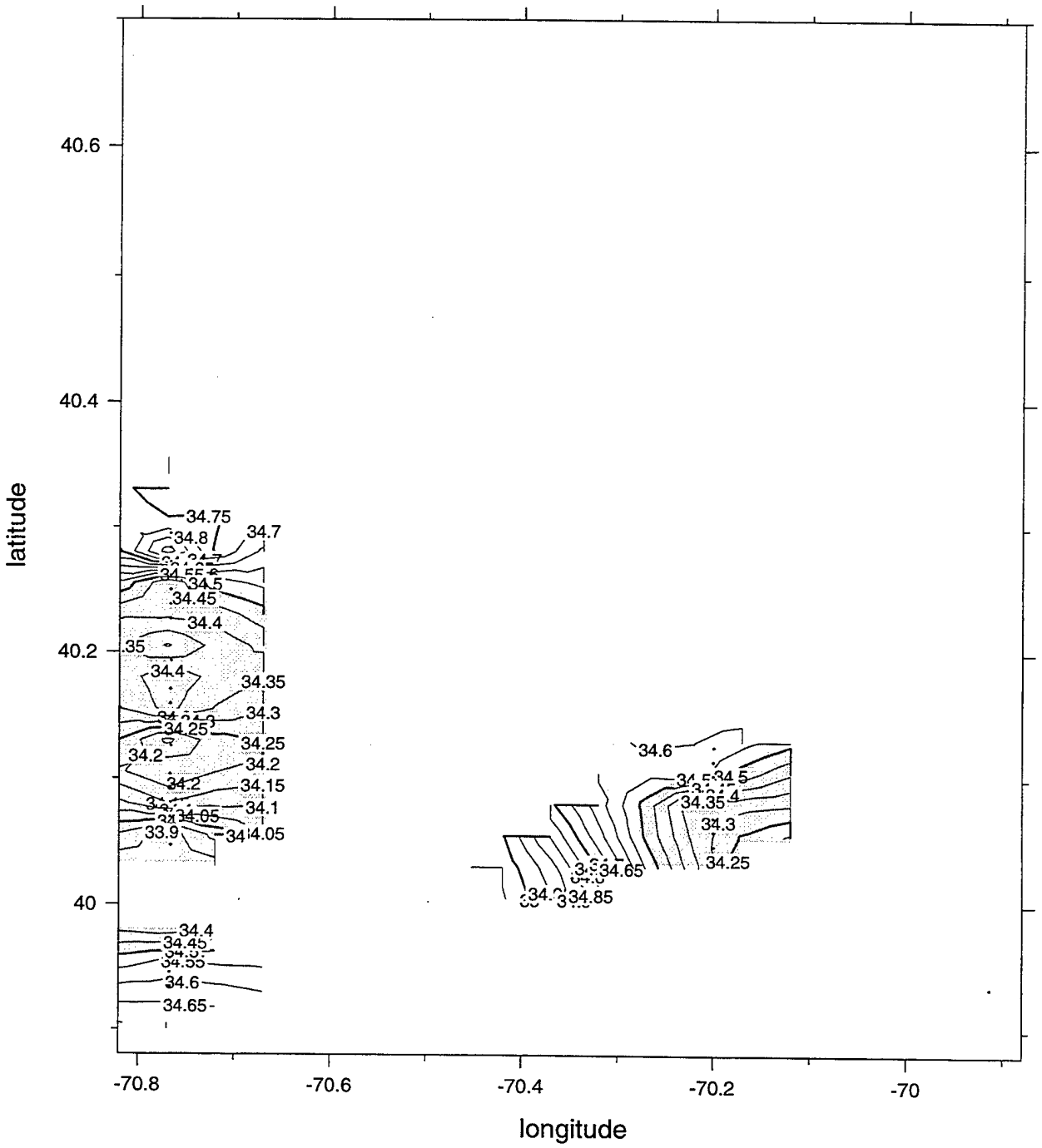


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 105 dbar

Salinity (PSS)

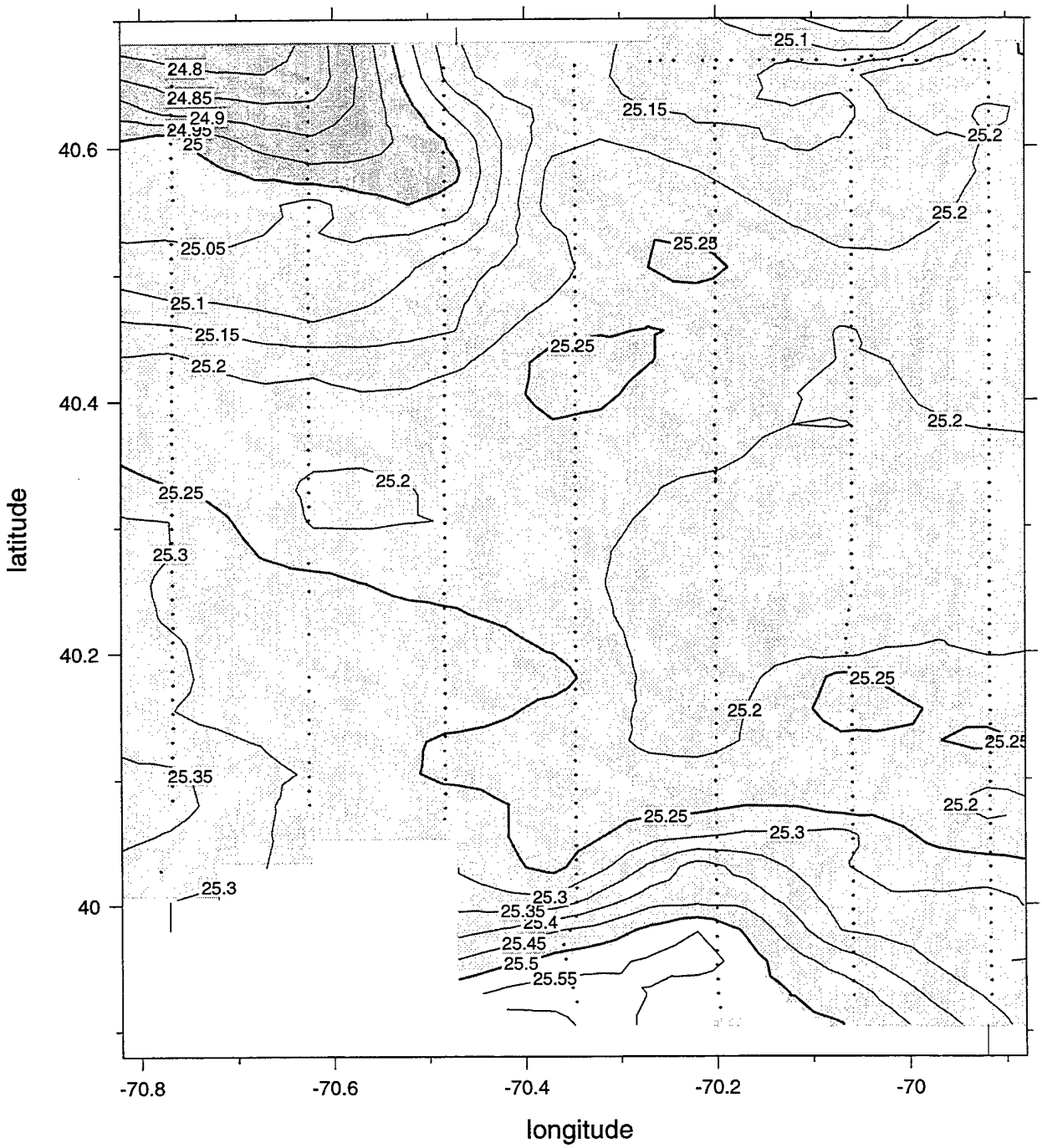


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 5 dbar

σ_t $(kg\ m^{-3})$

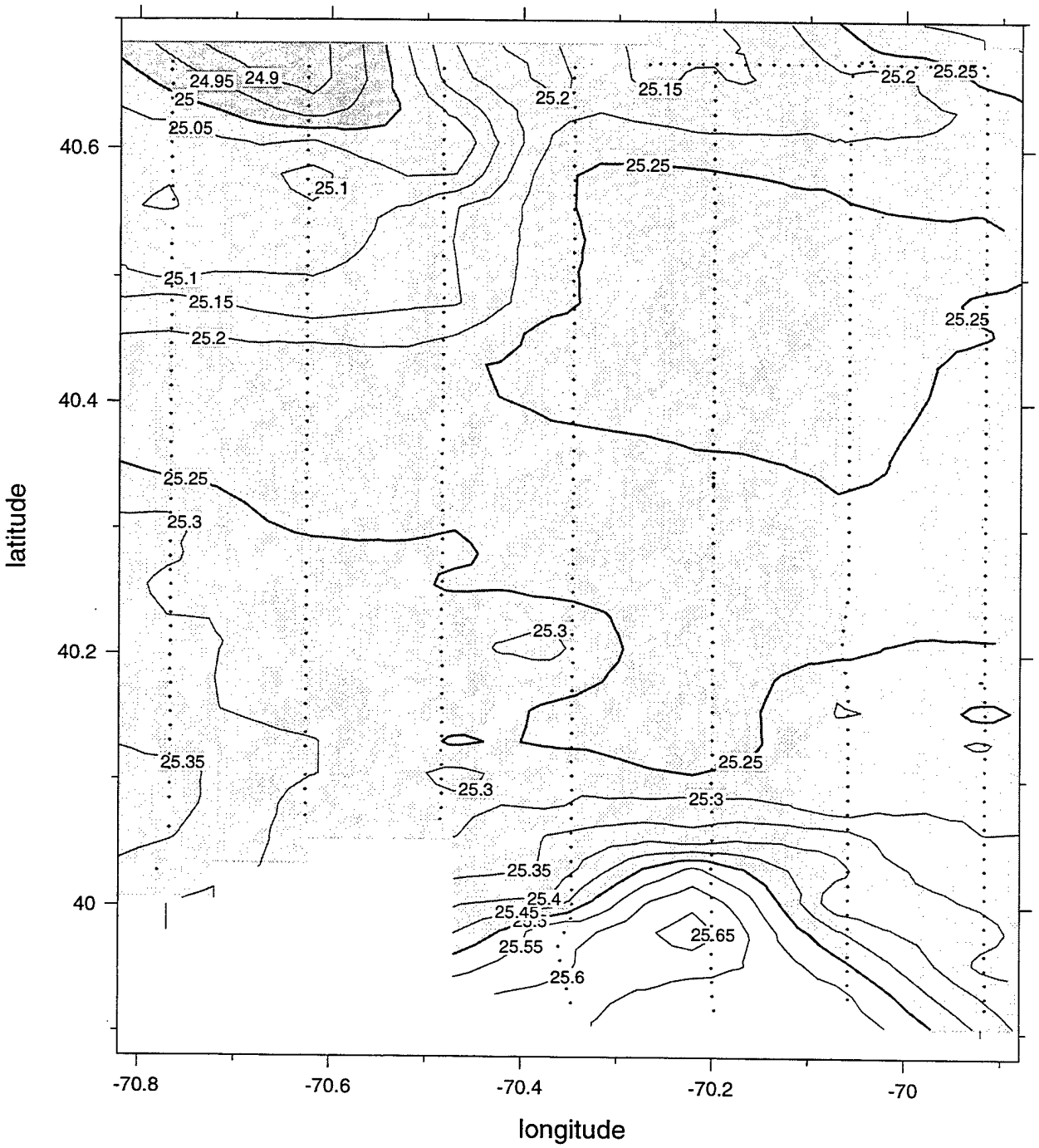


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 15 dbar

σ_t $(kg\ m^{-3})$

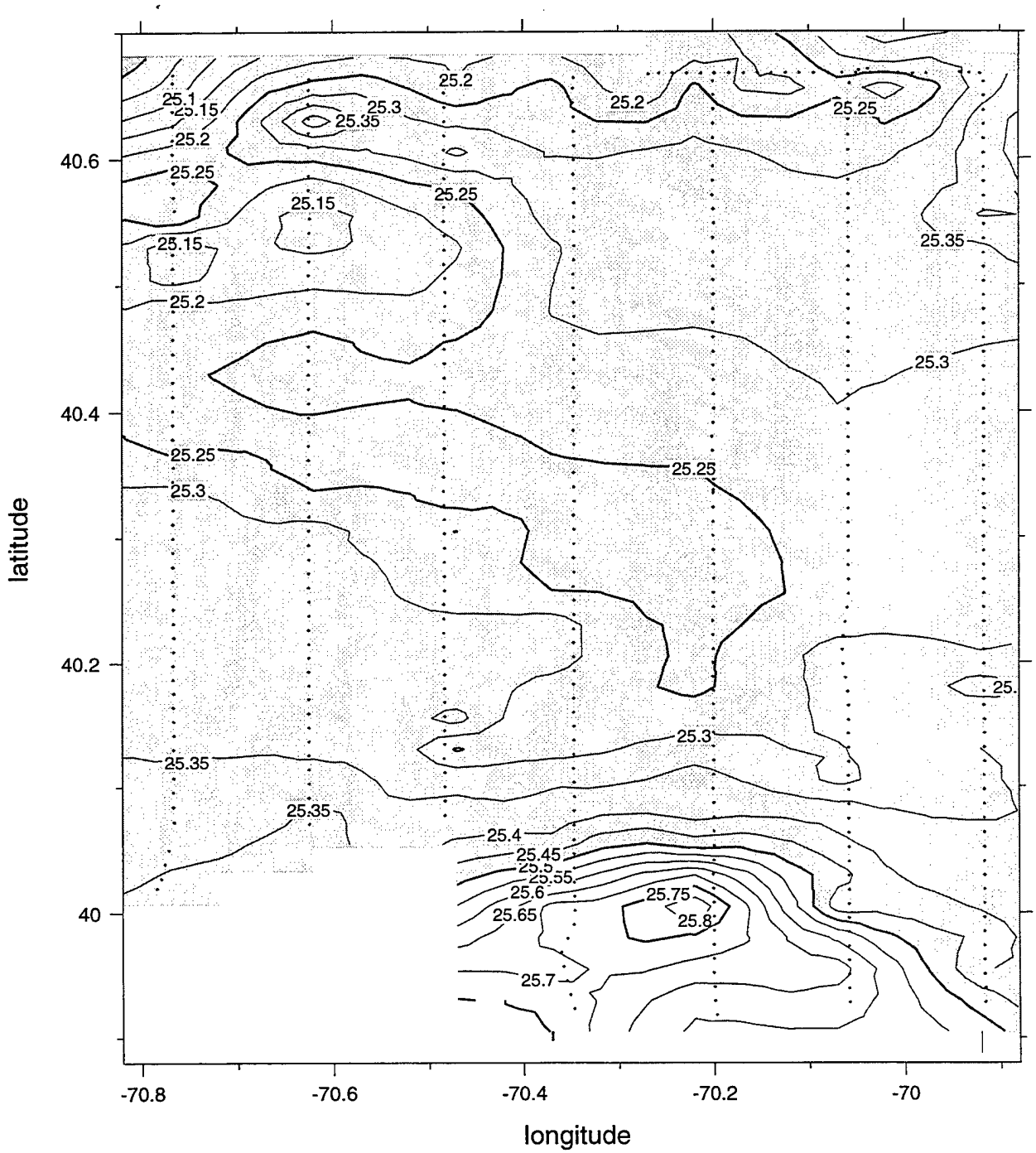


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 25 dbar

σ_t $(kg\ m^{-3})$

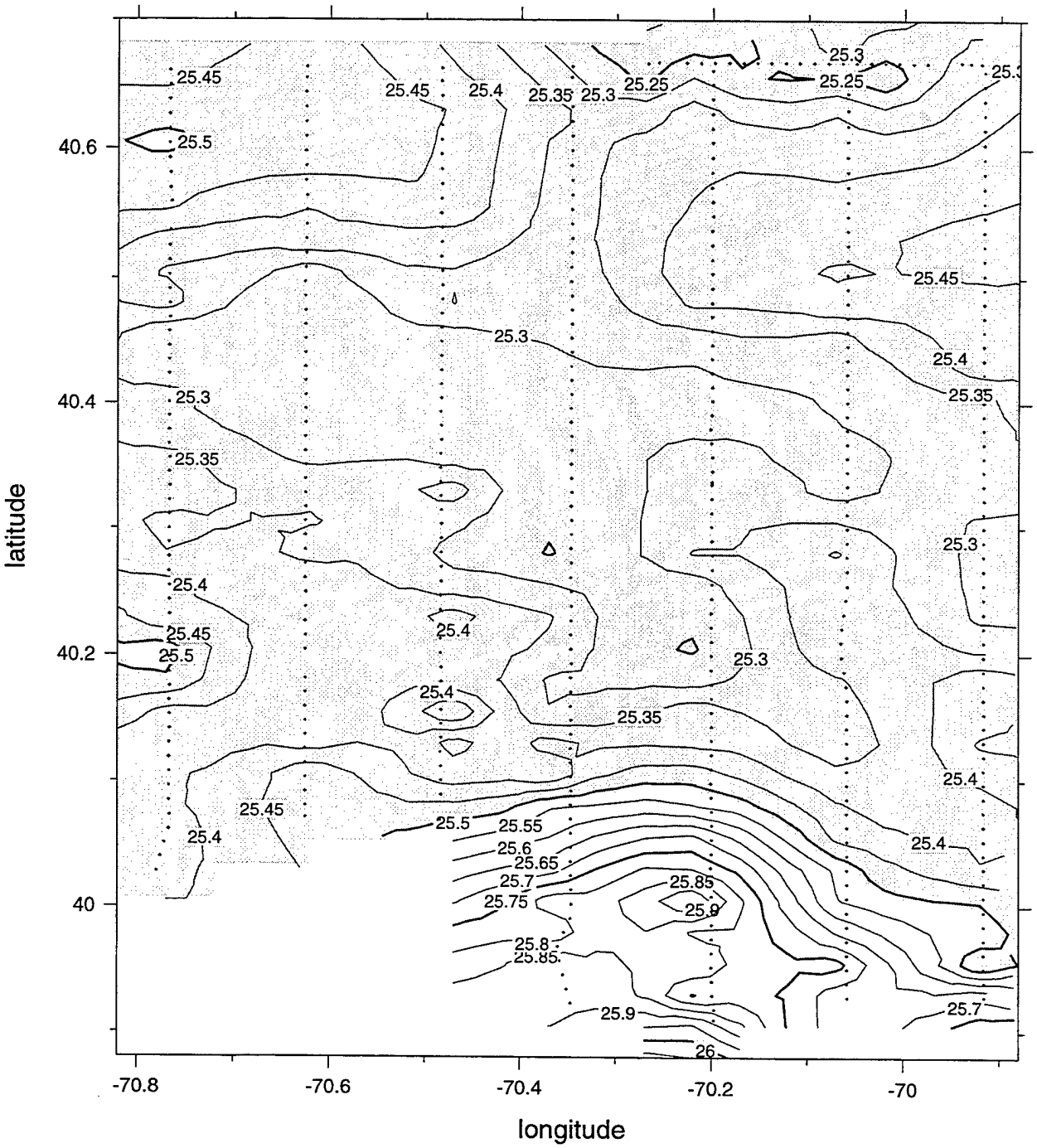


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 35 dbar

σ_t $(kg\ m^{-3})$

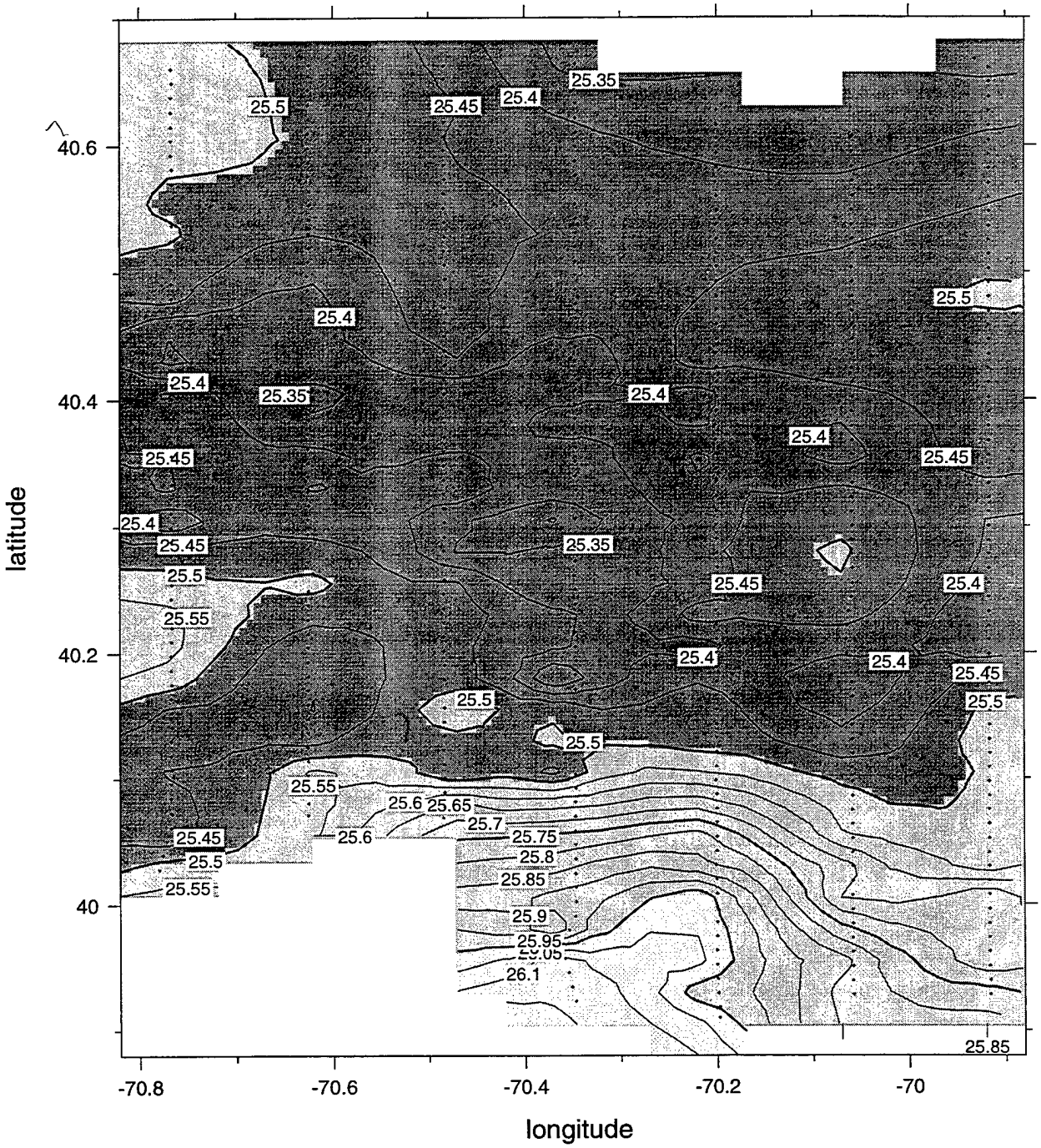


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 45 dbar

σ_t $(kg\ m^{-3})$

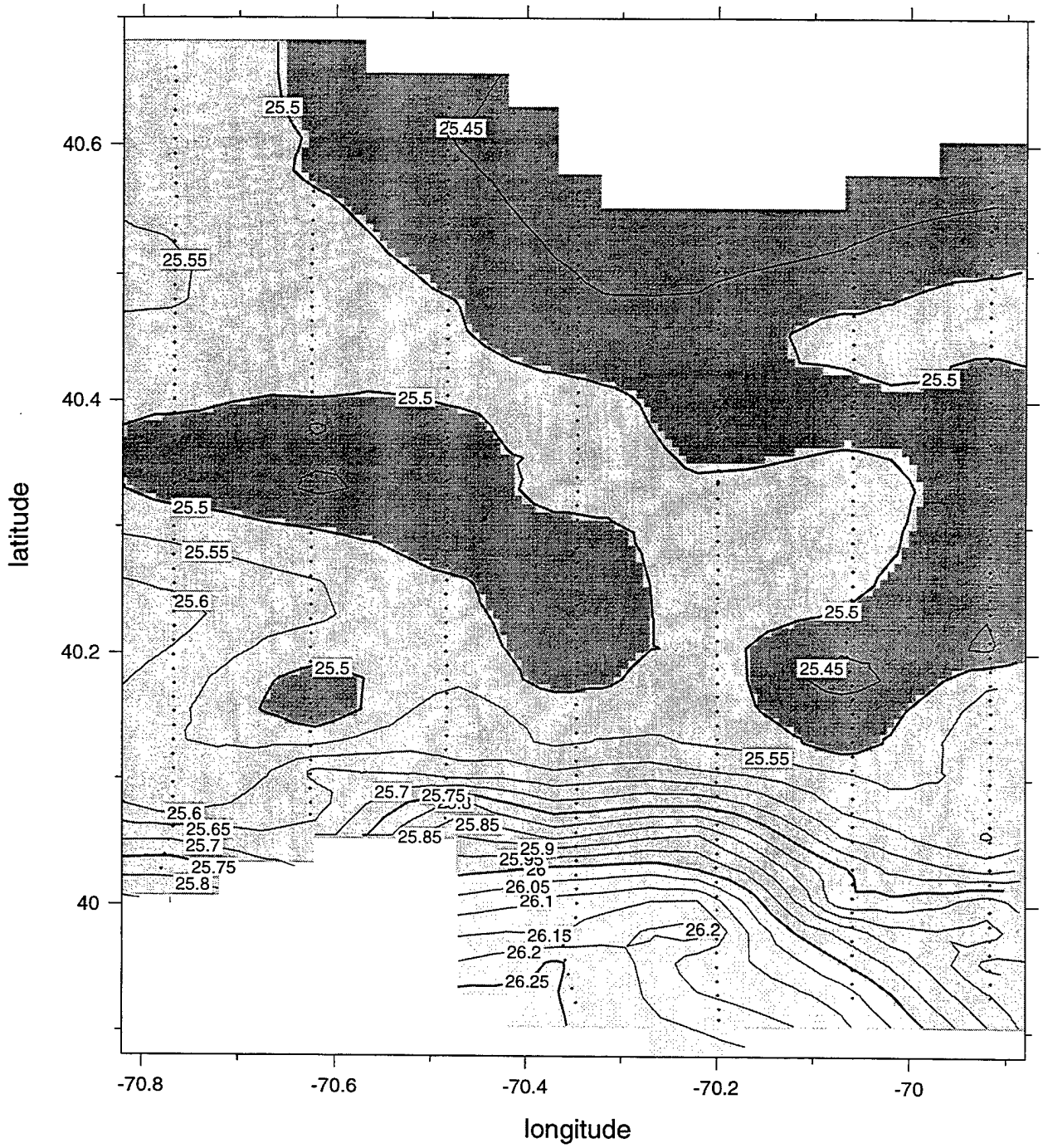


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 55 dbar

σ_t $(kg\ m^{-3})$

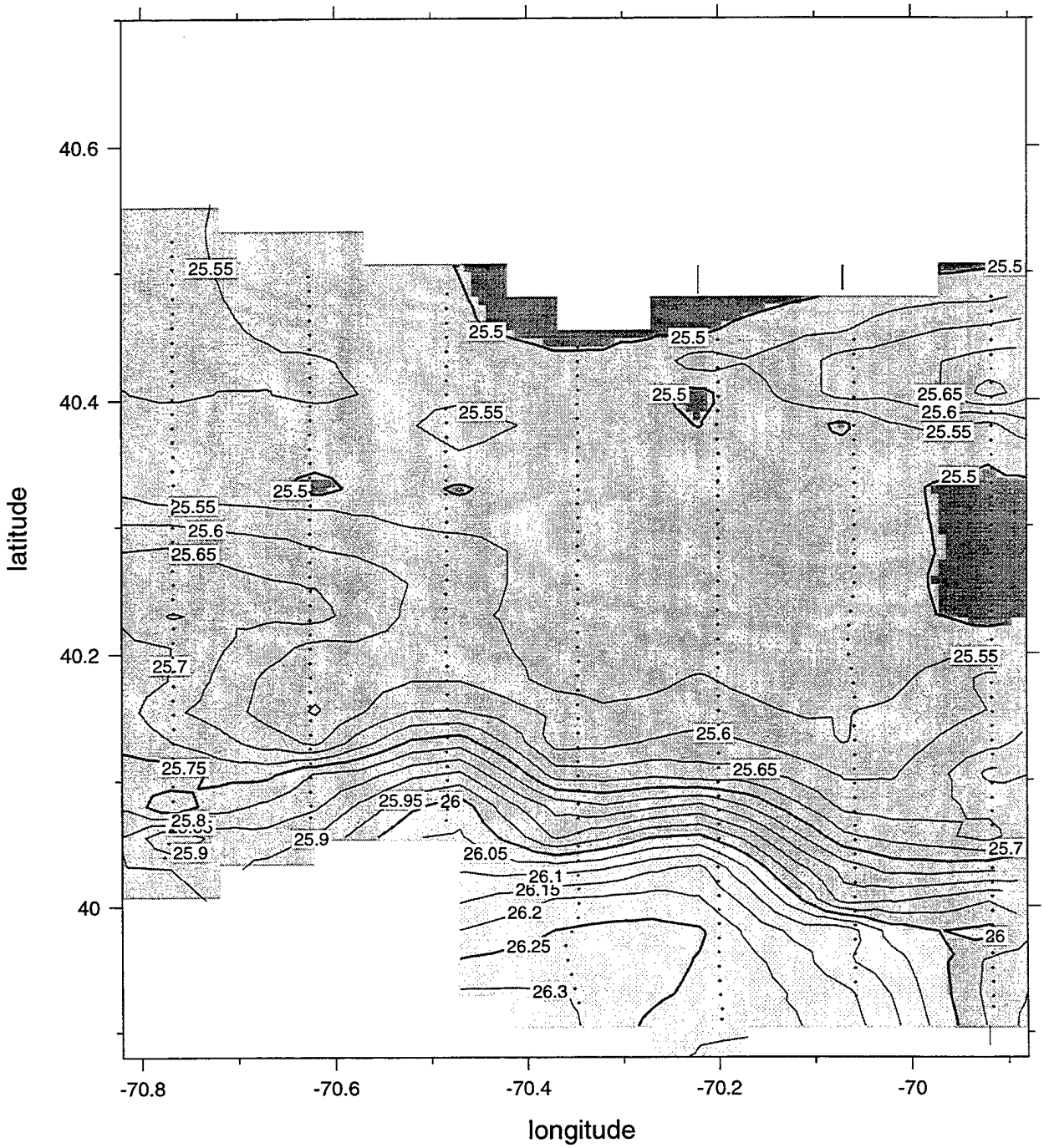


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 65 dbar

σ_t $(kg\ m^{-3})$

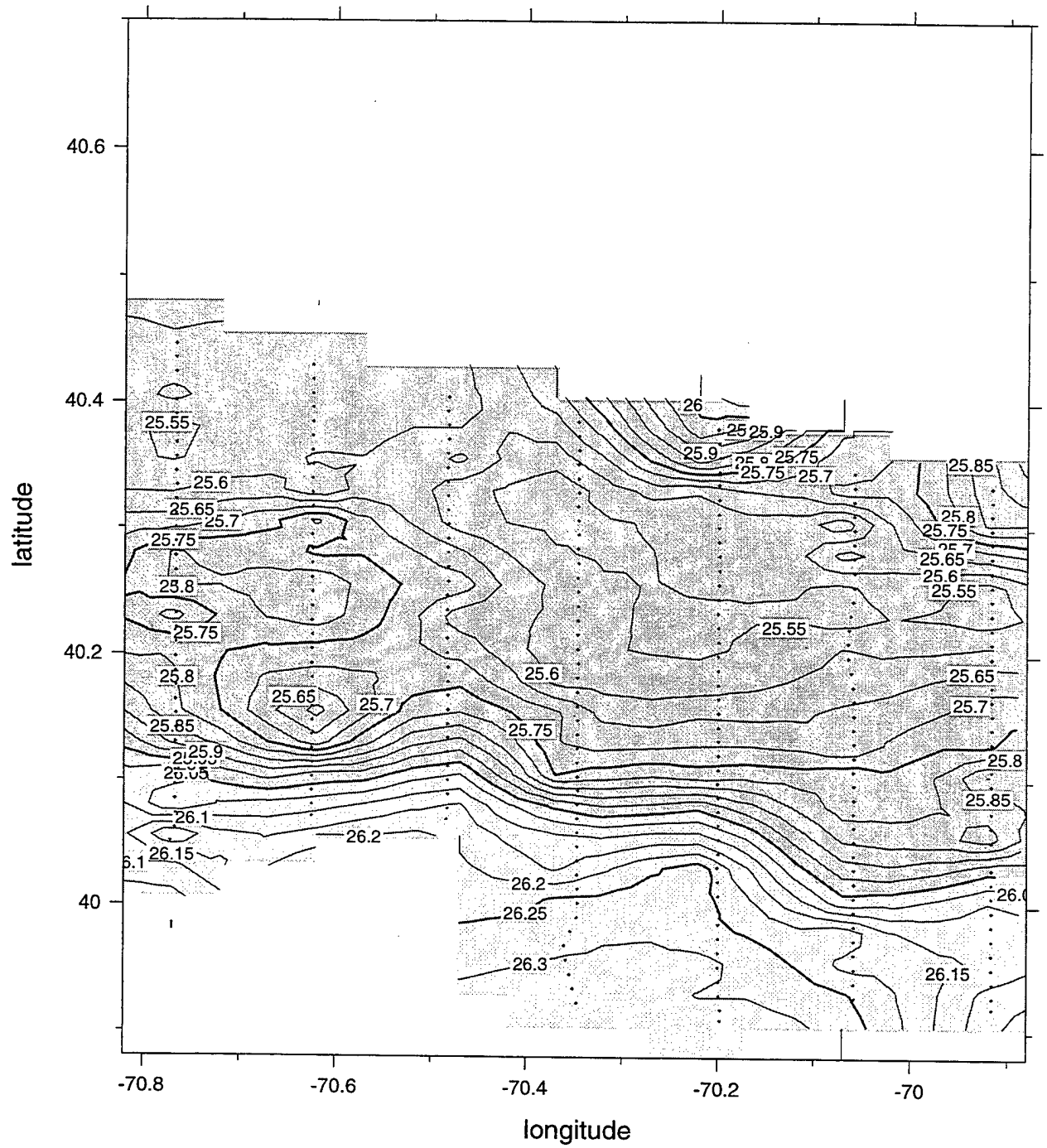


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 75 dbar

σ_t $(kg\ m^{-3})$

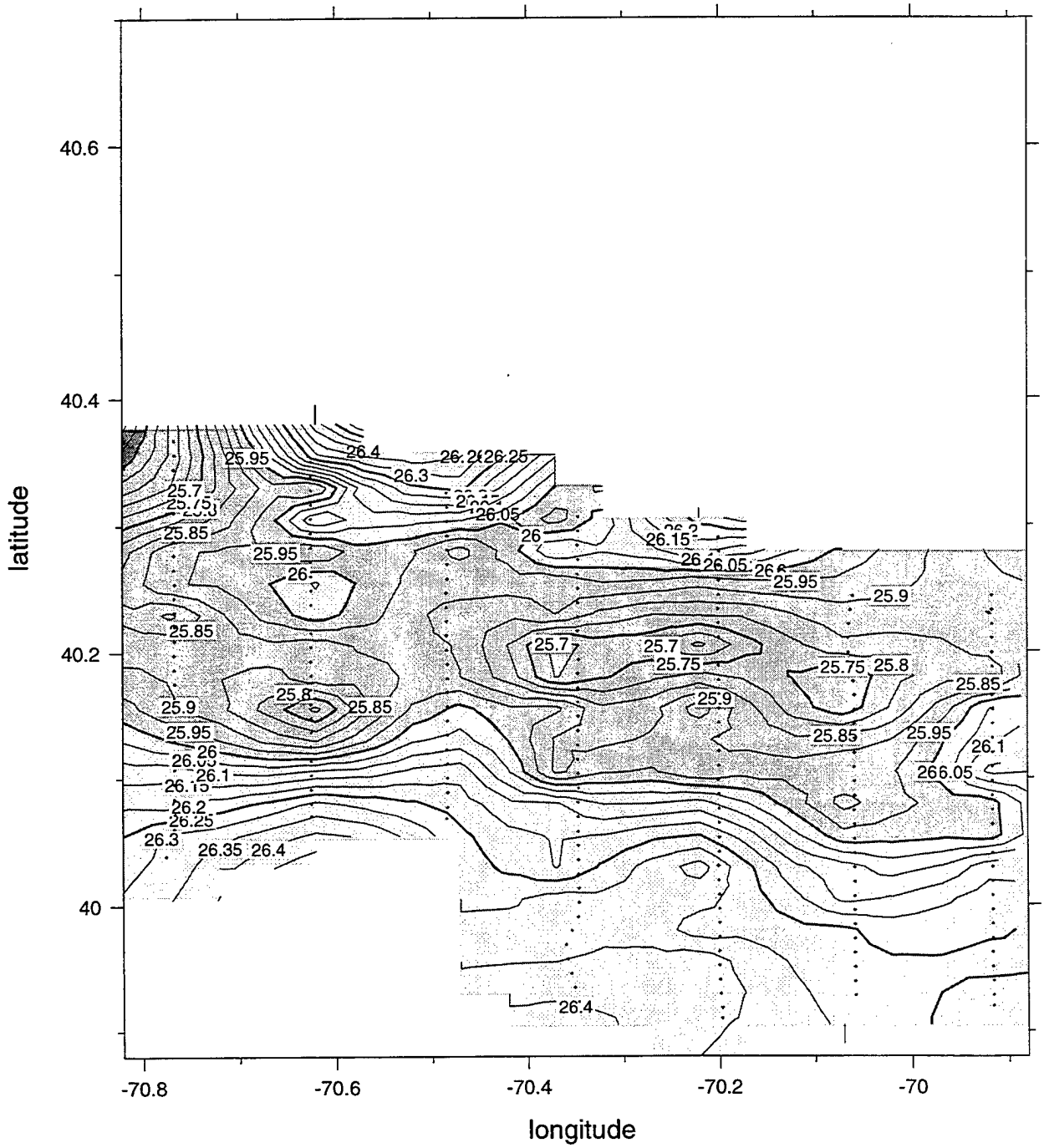


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 85 dbar

σ_t $(kg\ m^{-3})$

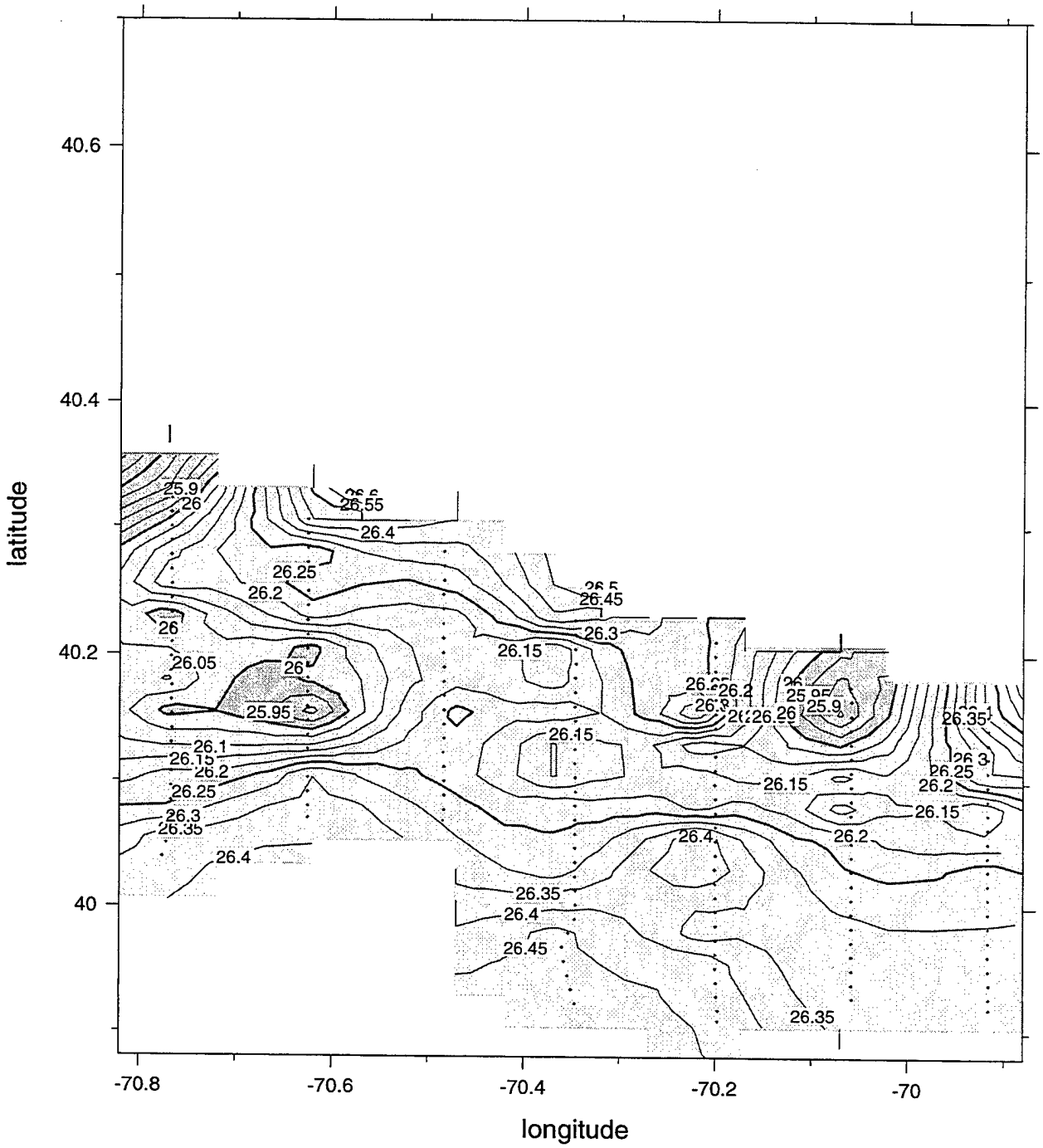


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 95 dbar

σ_t $(kg\ m^{-3})$

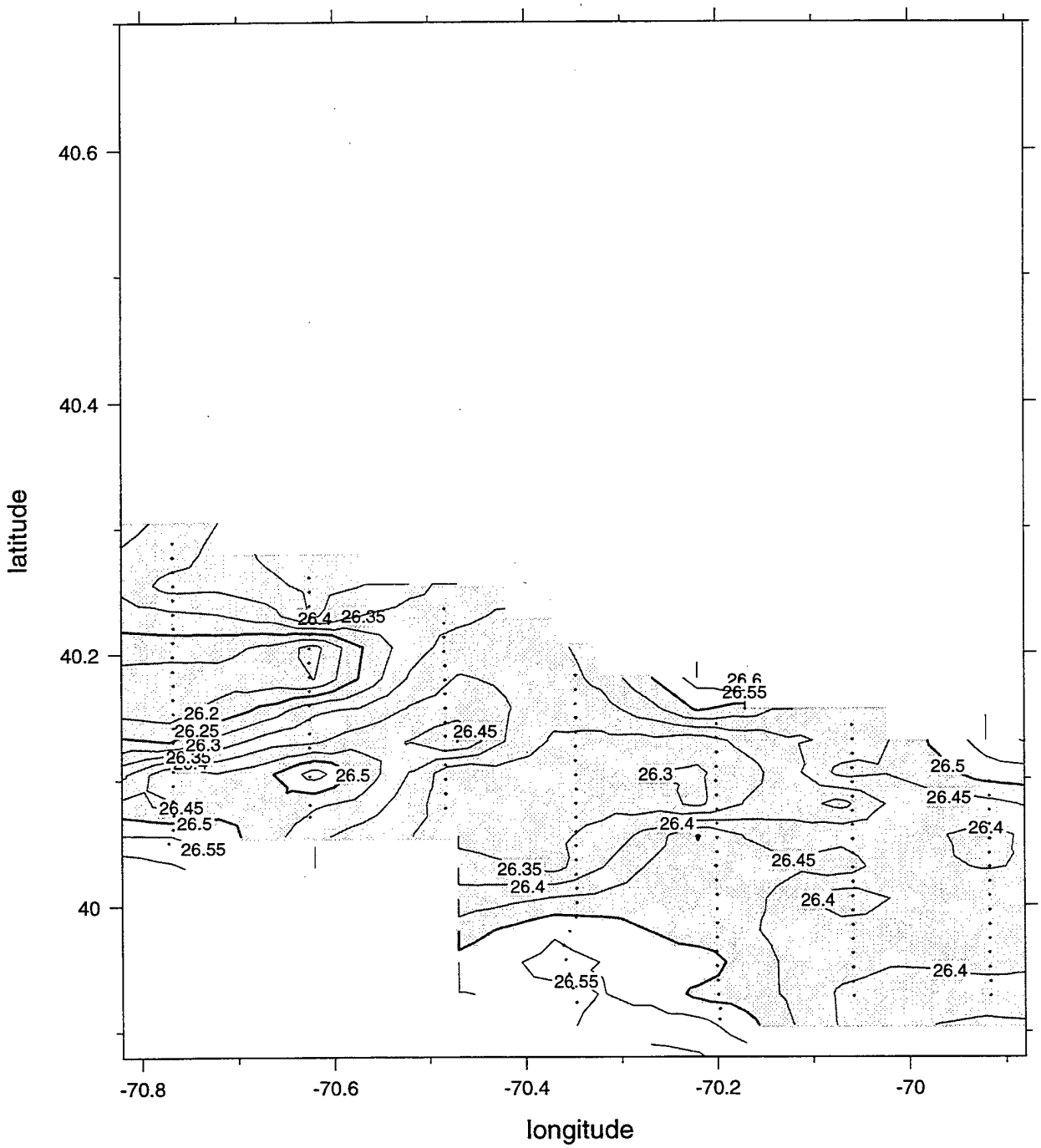


E9704 Big Box 1

04-May-97 12:38:22 - 06-May-97 19:56:01

Map View at 105 dbar

σ_t $(kg\ m^{-3})$

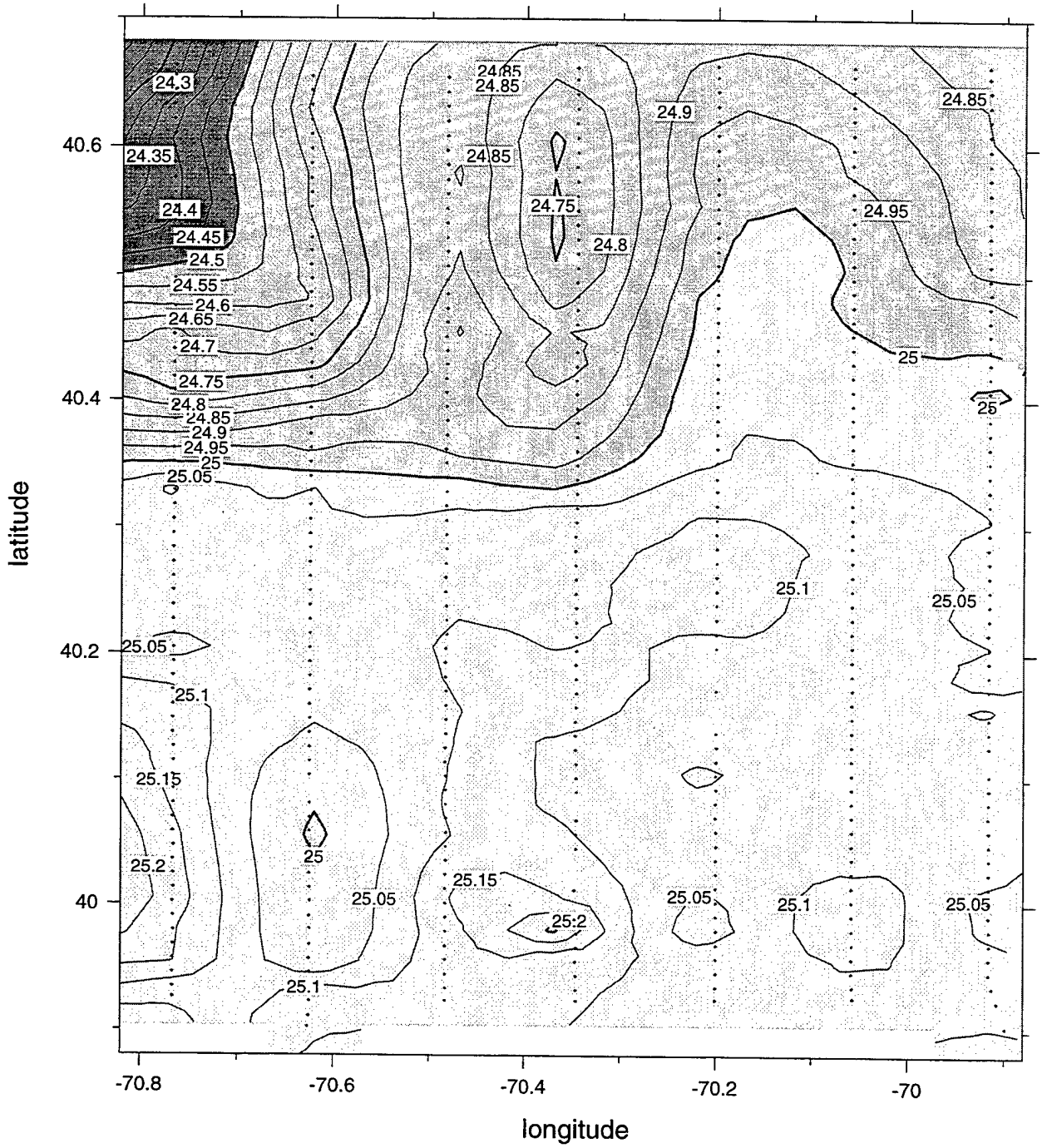


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 5 dbar

σ_t $(kg\ m^{-3})$

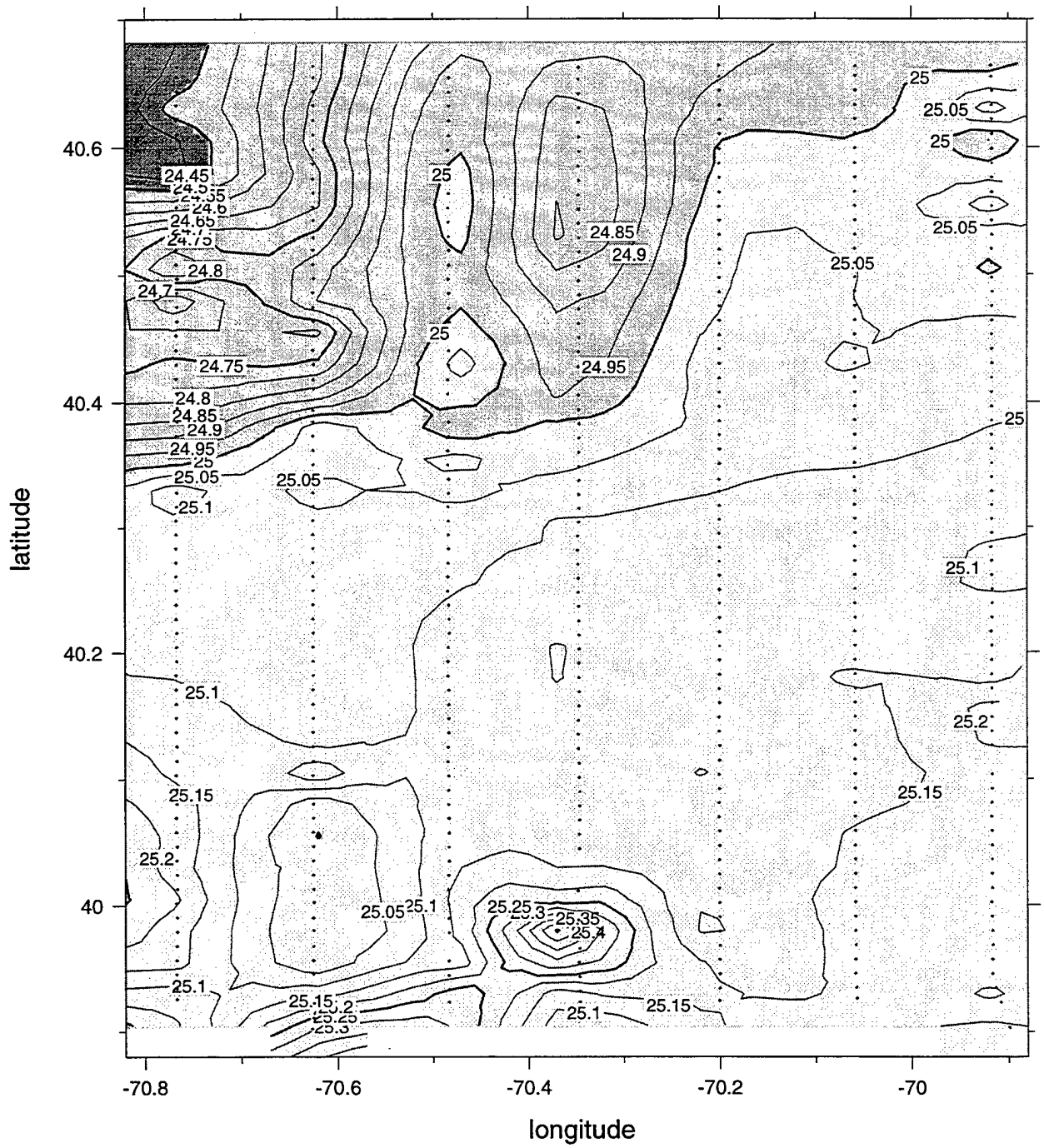


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 15 dbar

σ_t $(kg\ m^{-3})$

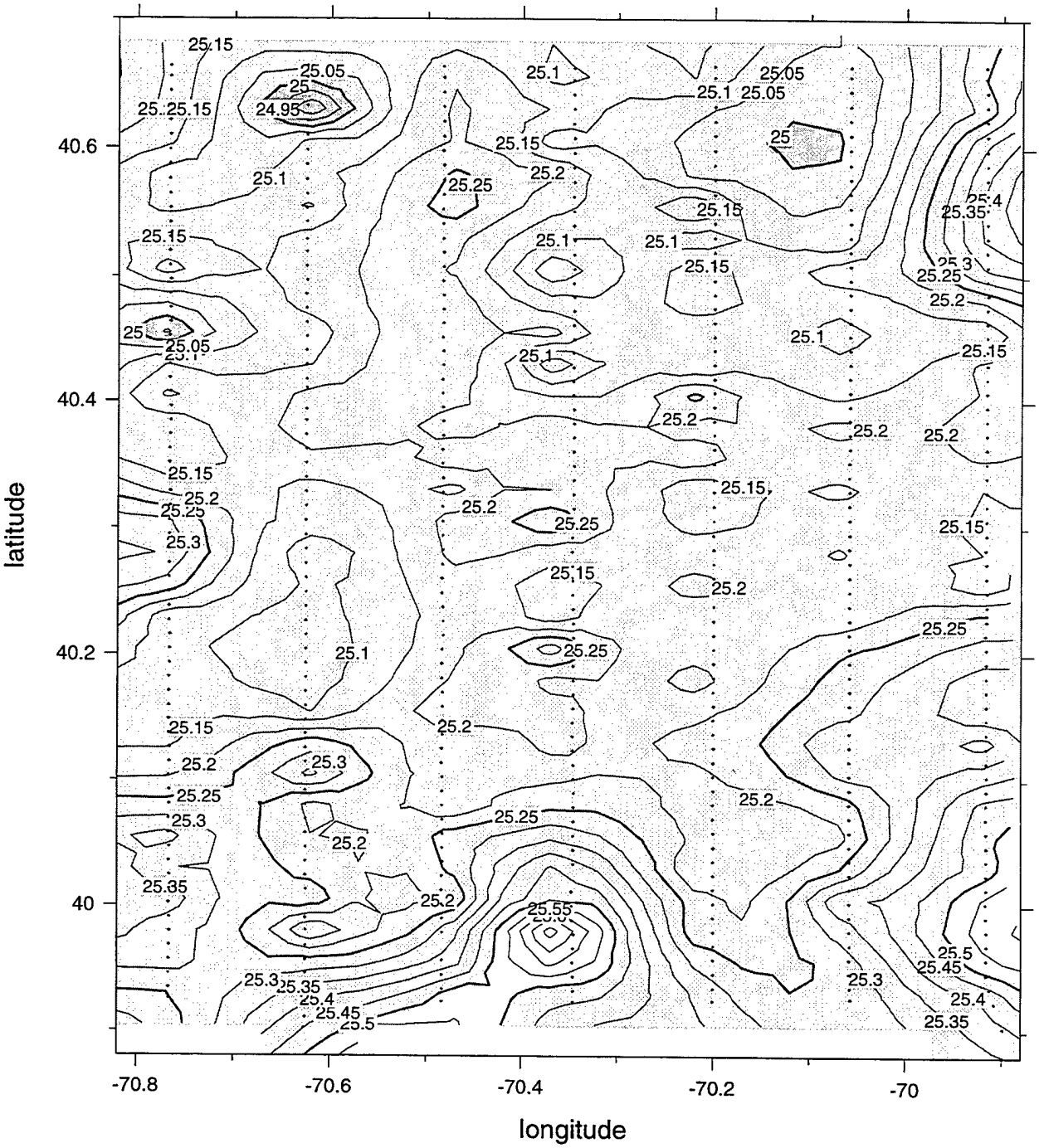


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 25 dbar

σ_t $(kg\ m^{-3})$

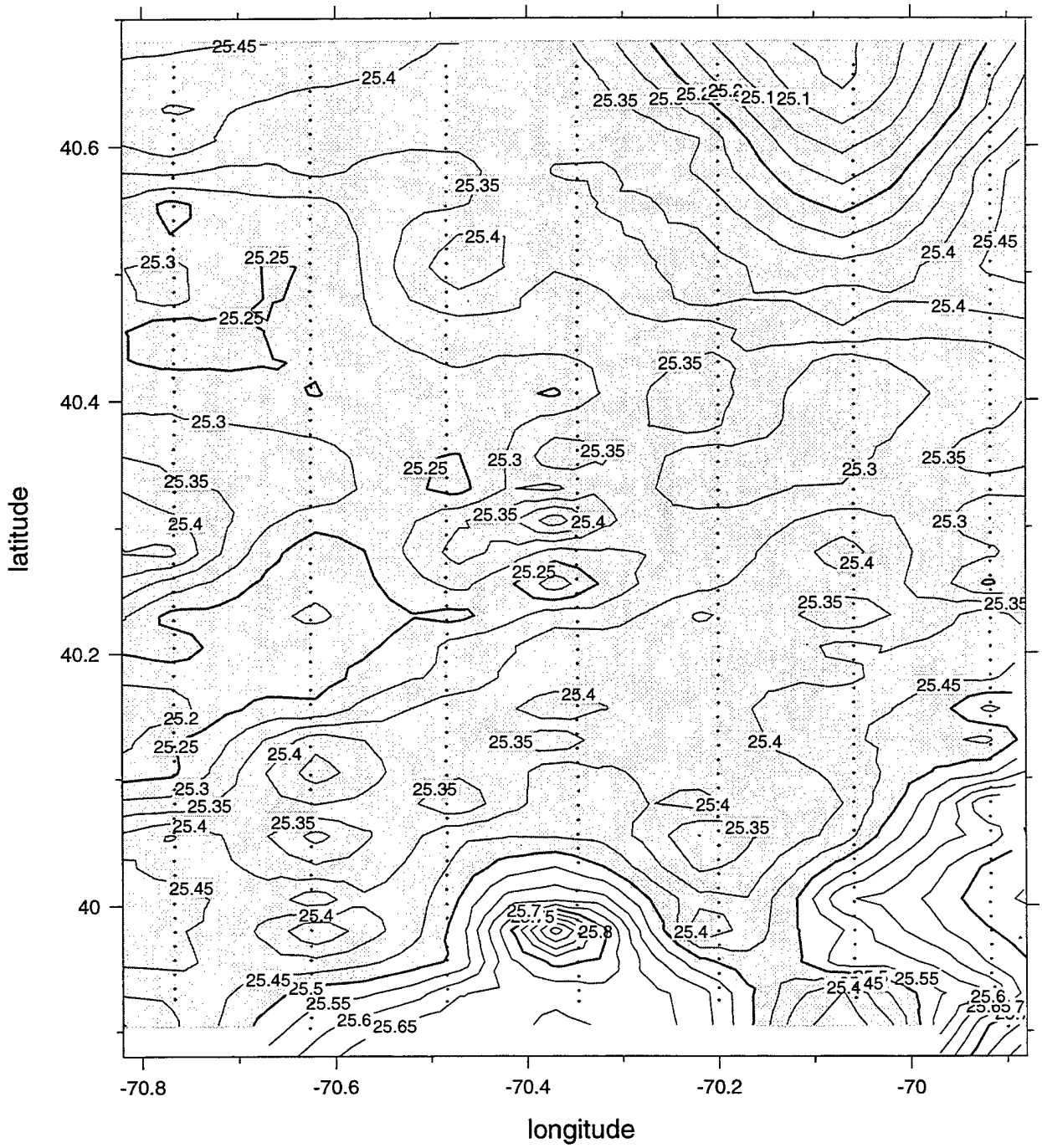


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 35 dbar

σ_t $(kg\ m^{-3})$

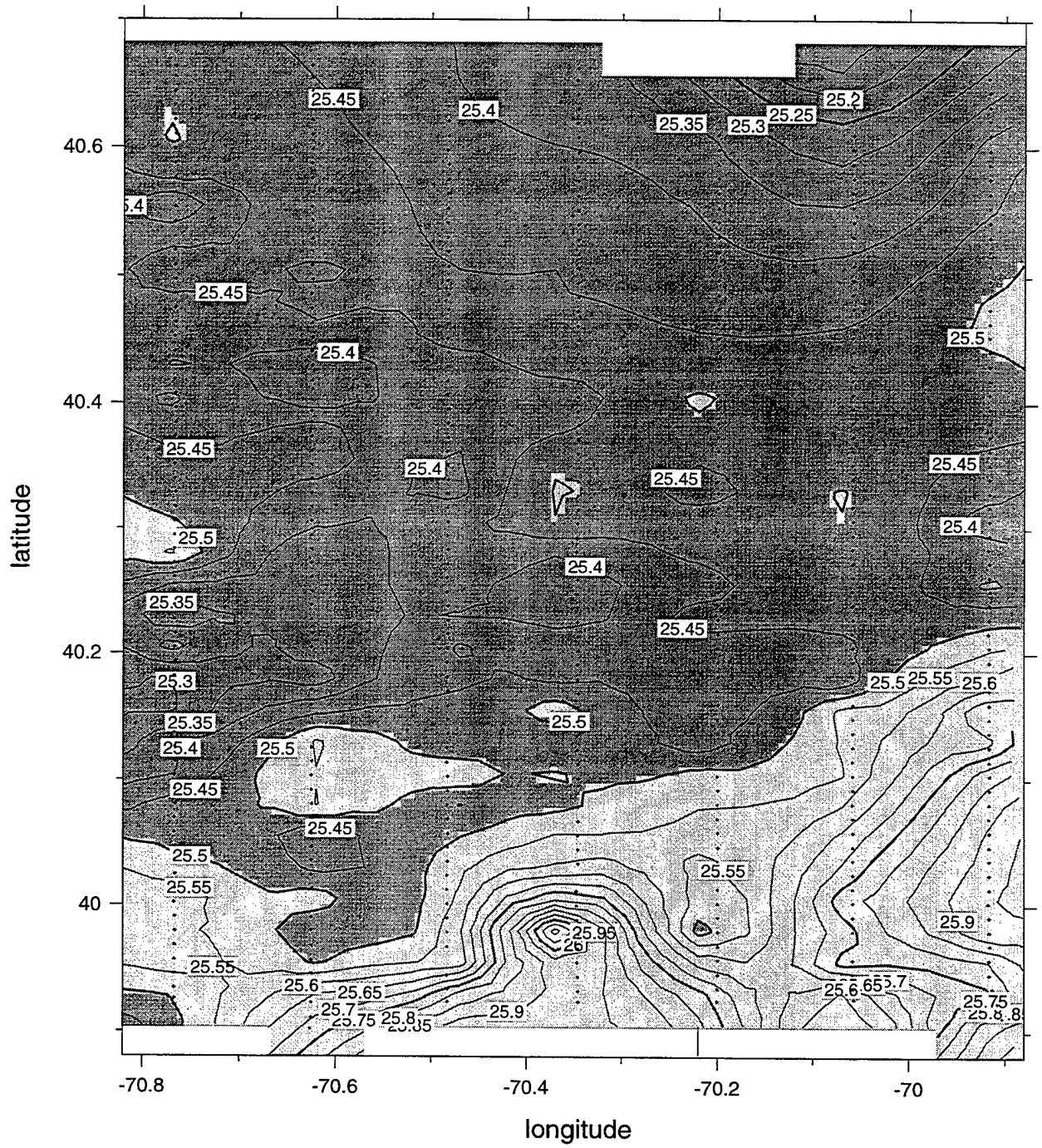


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 45 dbar

σ_t $(kg\ m^{-3})$

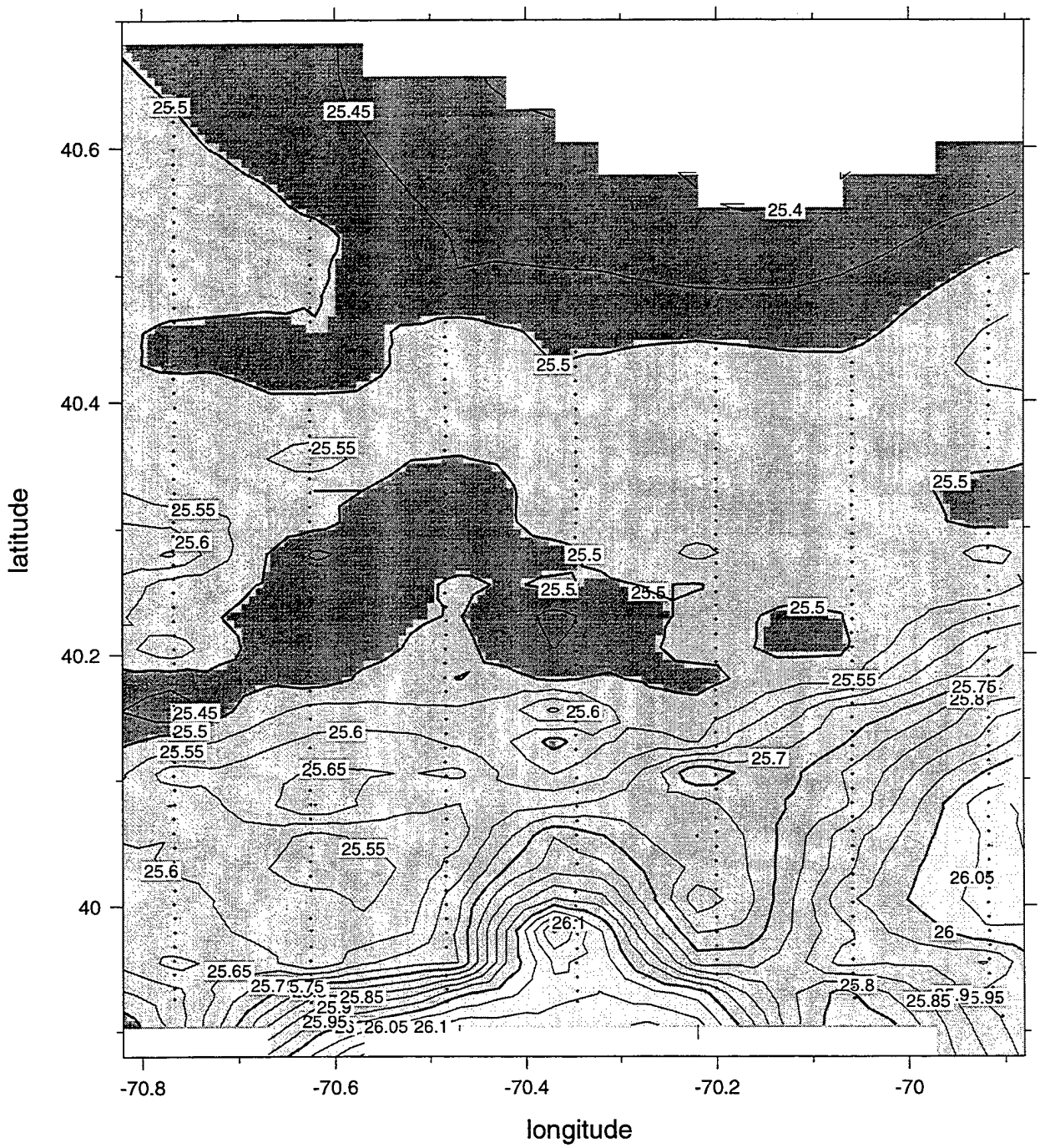


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 55 dbar

σ_t $(kg\ m^{-3})$

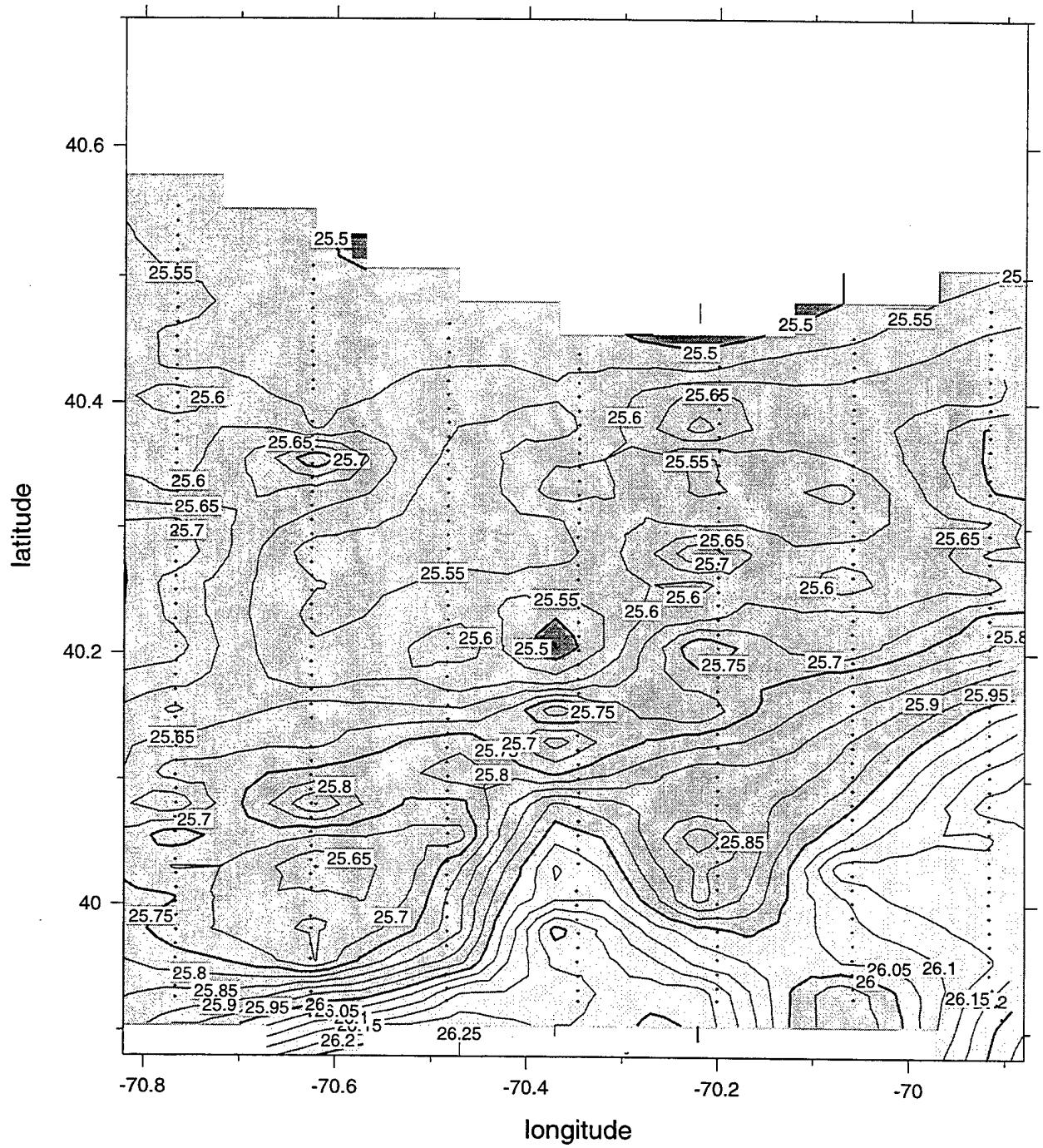


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 65 dbar

σ_t $(kg\ m^{-3})$

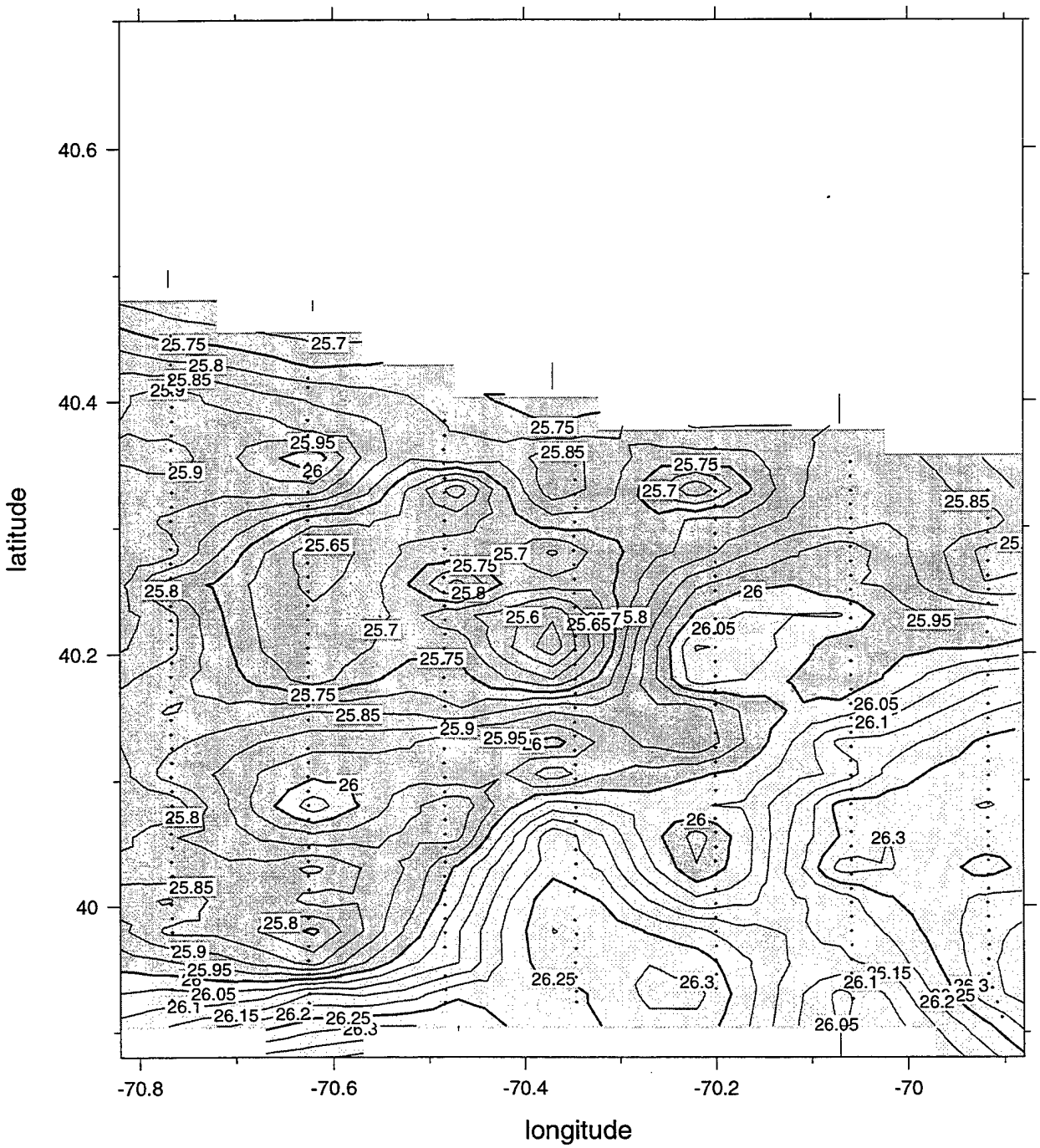


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 75 dbar

σ_t $(kg\ m^{-3})$

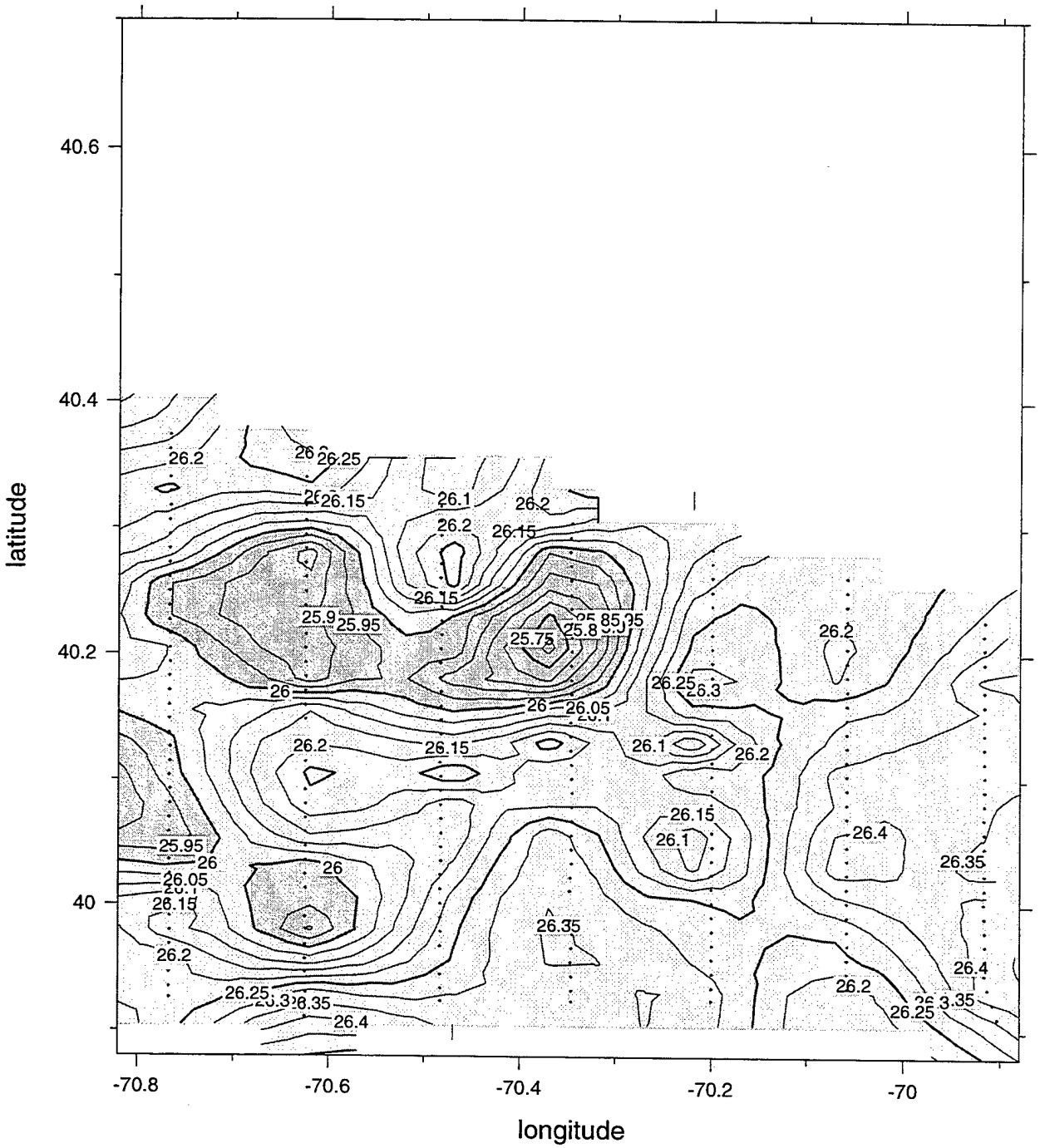


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 85 dbar

σ_t $(kg\ m^{-3})$

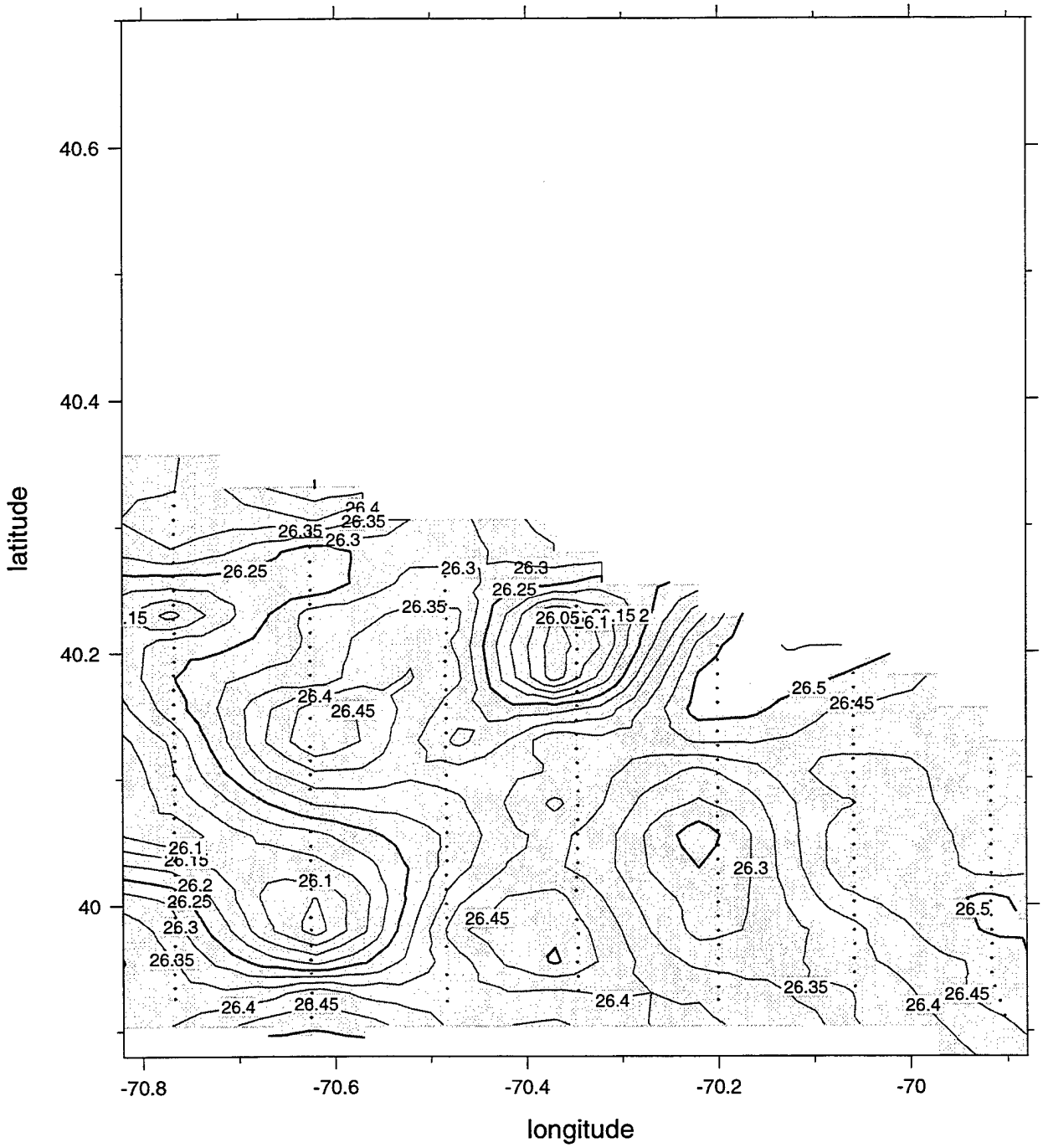


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 95 dbar

σ_t $(kg\ m^{-3})$

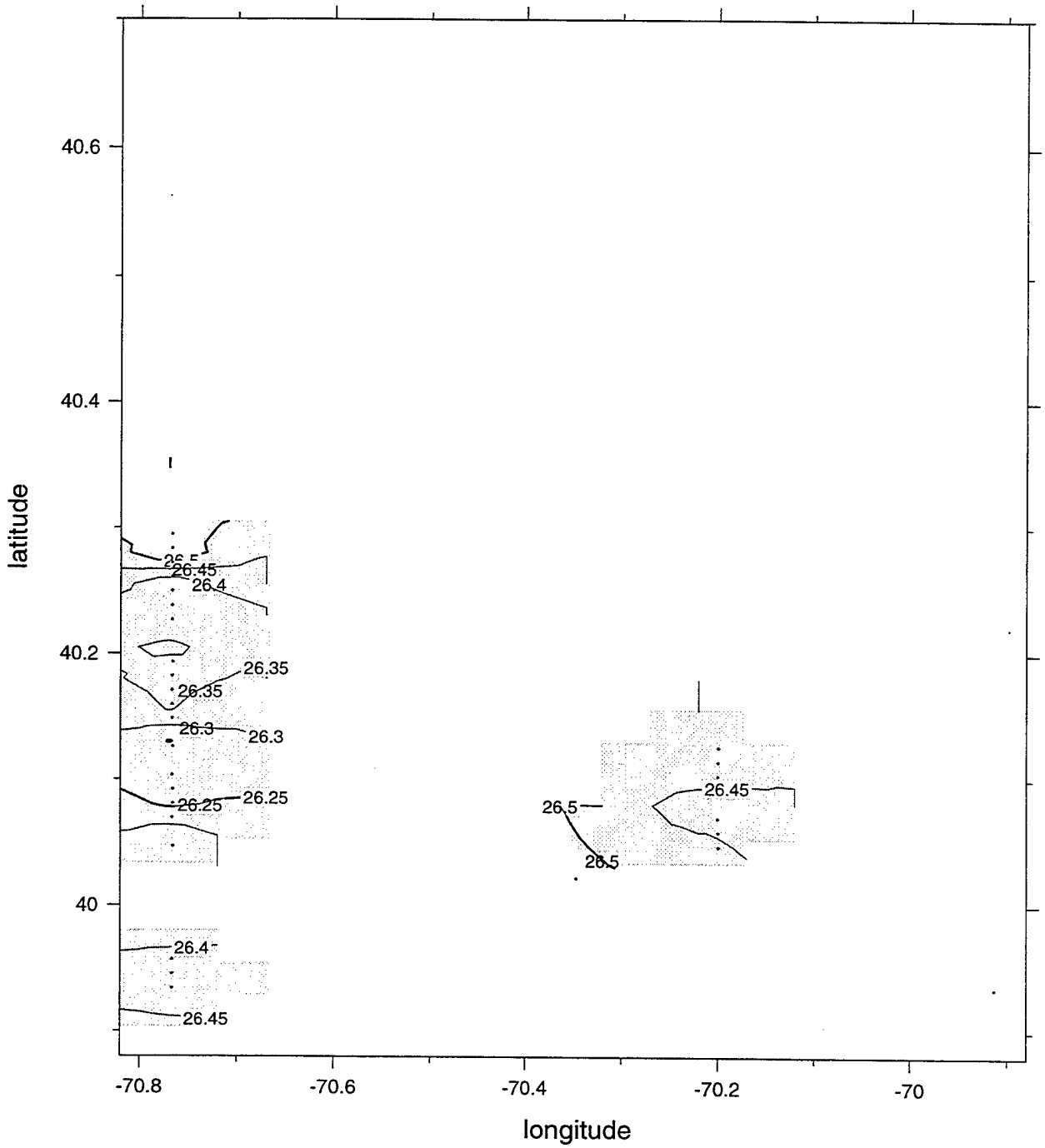


E9704 Big Box 2

12-May-97 16:01:45 - 14-May-97 23:03:38

Map View at 105 dbar

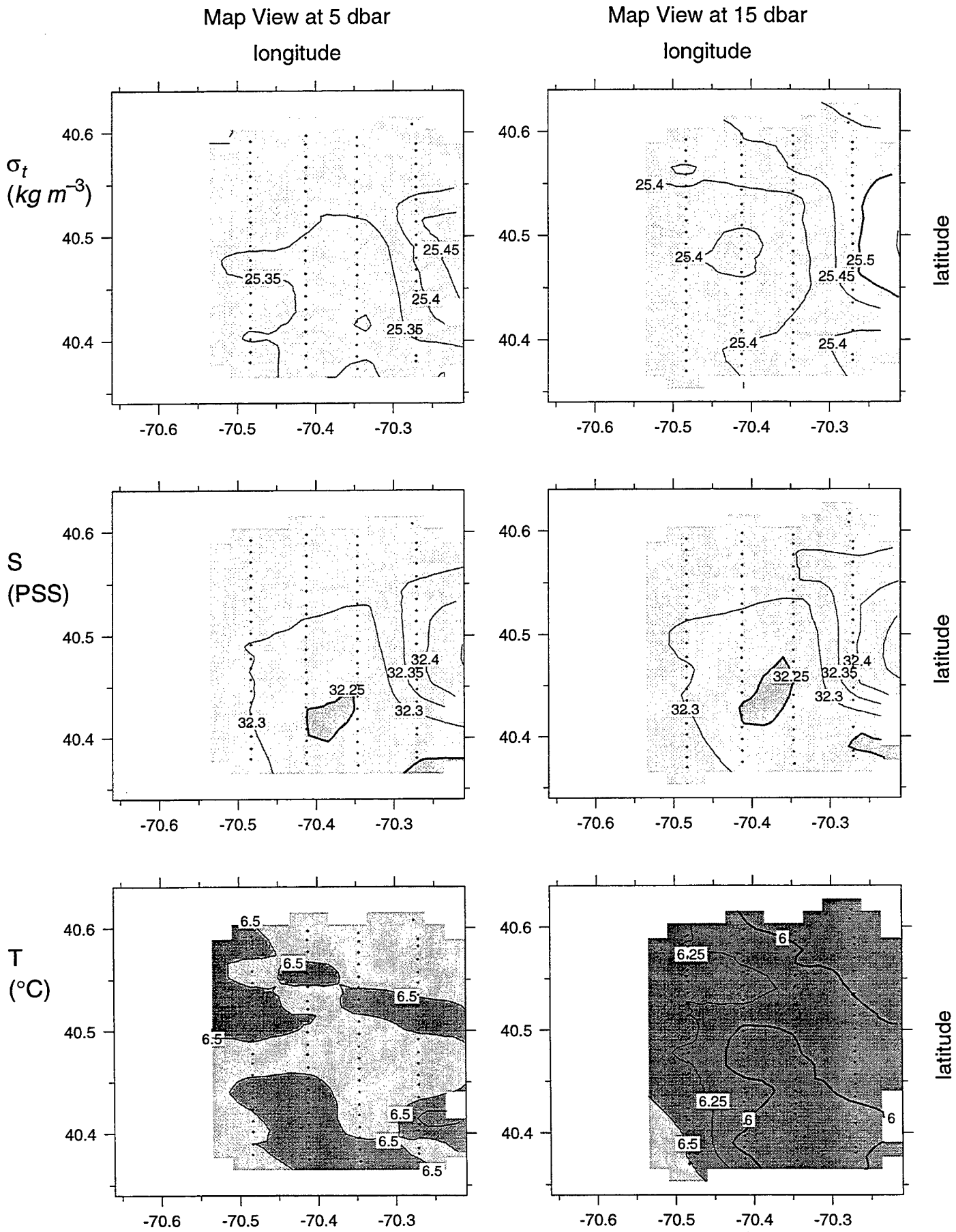
σ_t $(kg\ m^{-3})$



E9704 Small Box Maps of Temperature, Salinity and σ_t

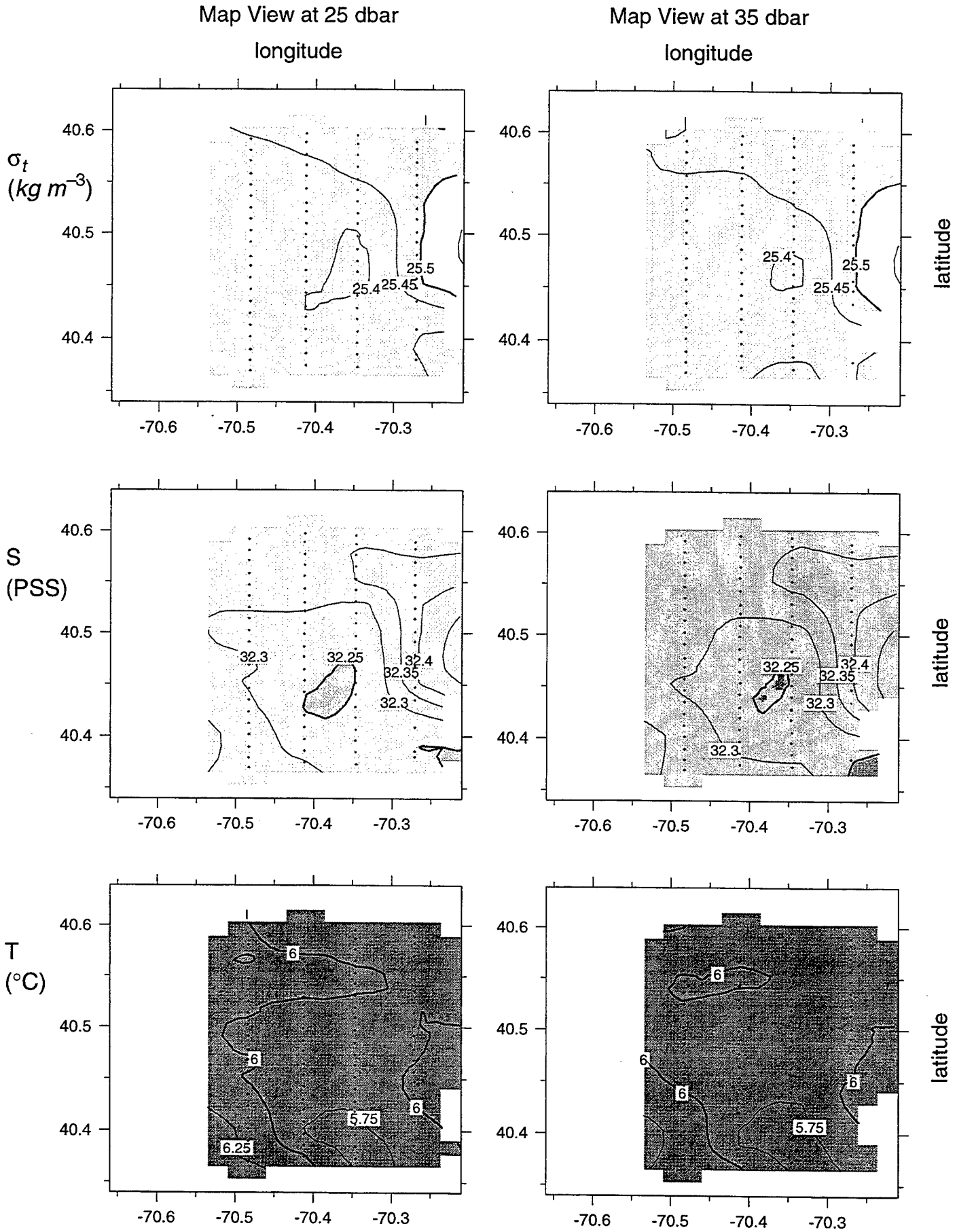
E9704 Small Box 1

27-Apr-97 00:49:39 - 27-Apr-97 12:29:04



E9704 Small Box 1

27-Apr-97 00:49:39 - 27-Apr-97 12:29:04

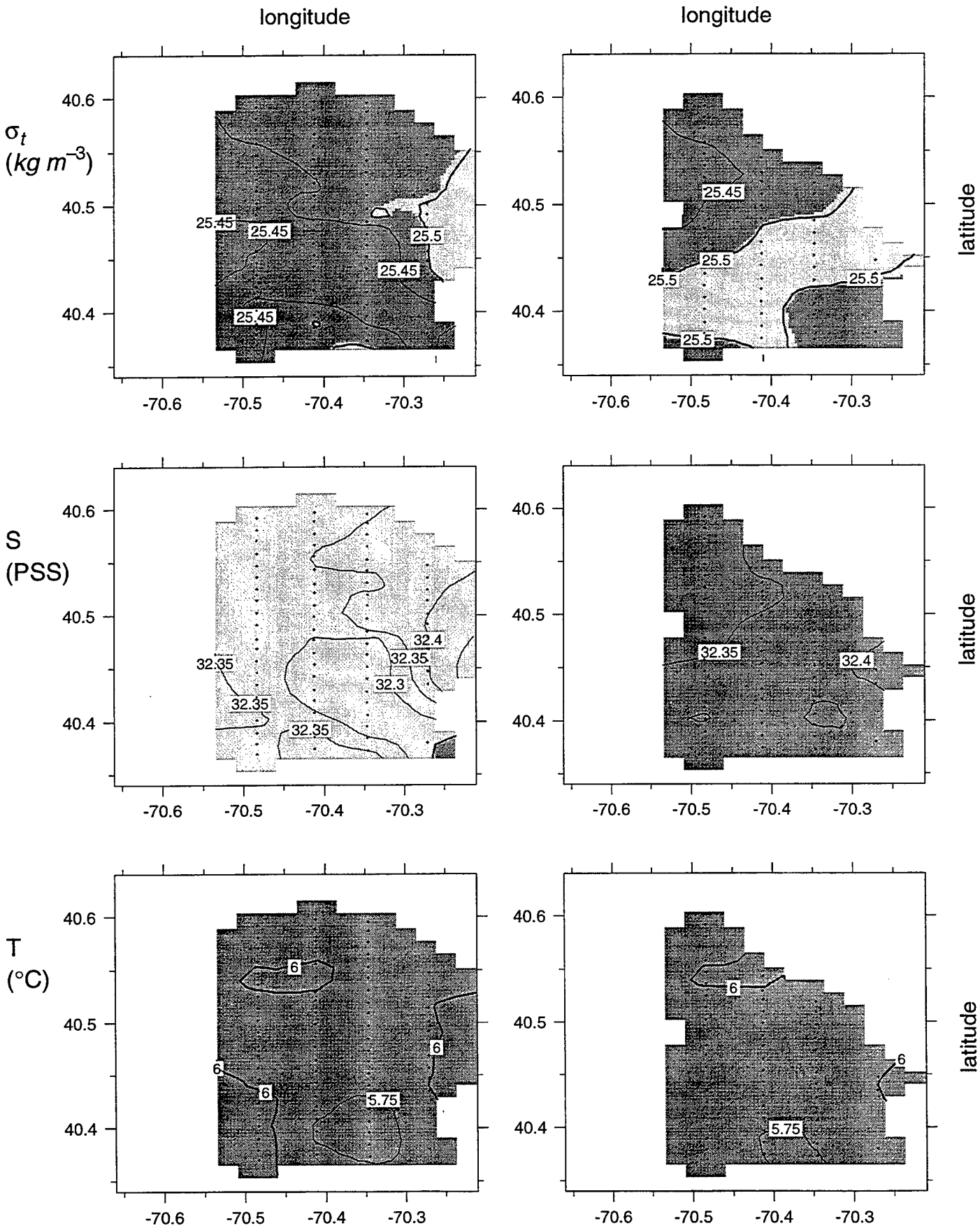


E9704 Small Box 1

27-Apr-97 00:49:39 - 27-Apr-97 12:29:04

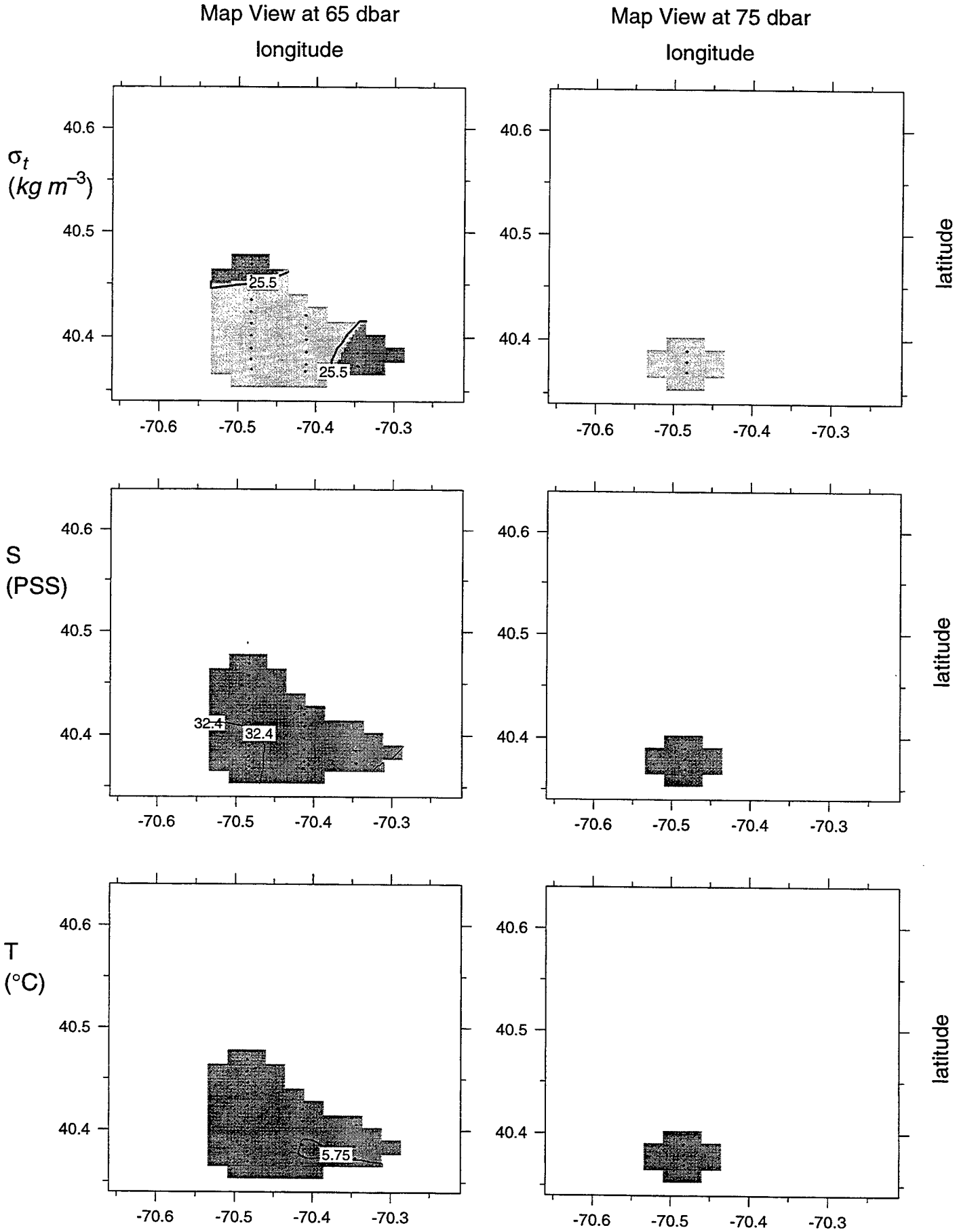
Map View at 45 dbar

Map View at 55 dbar



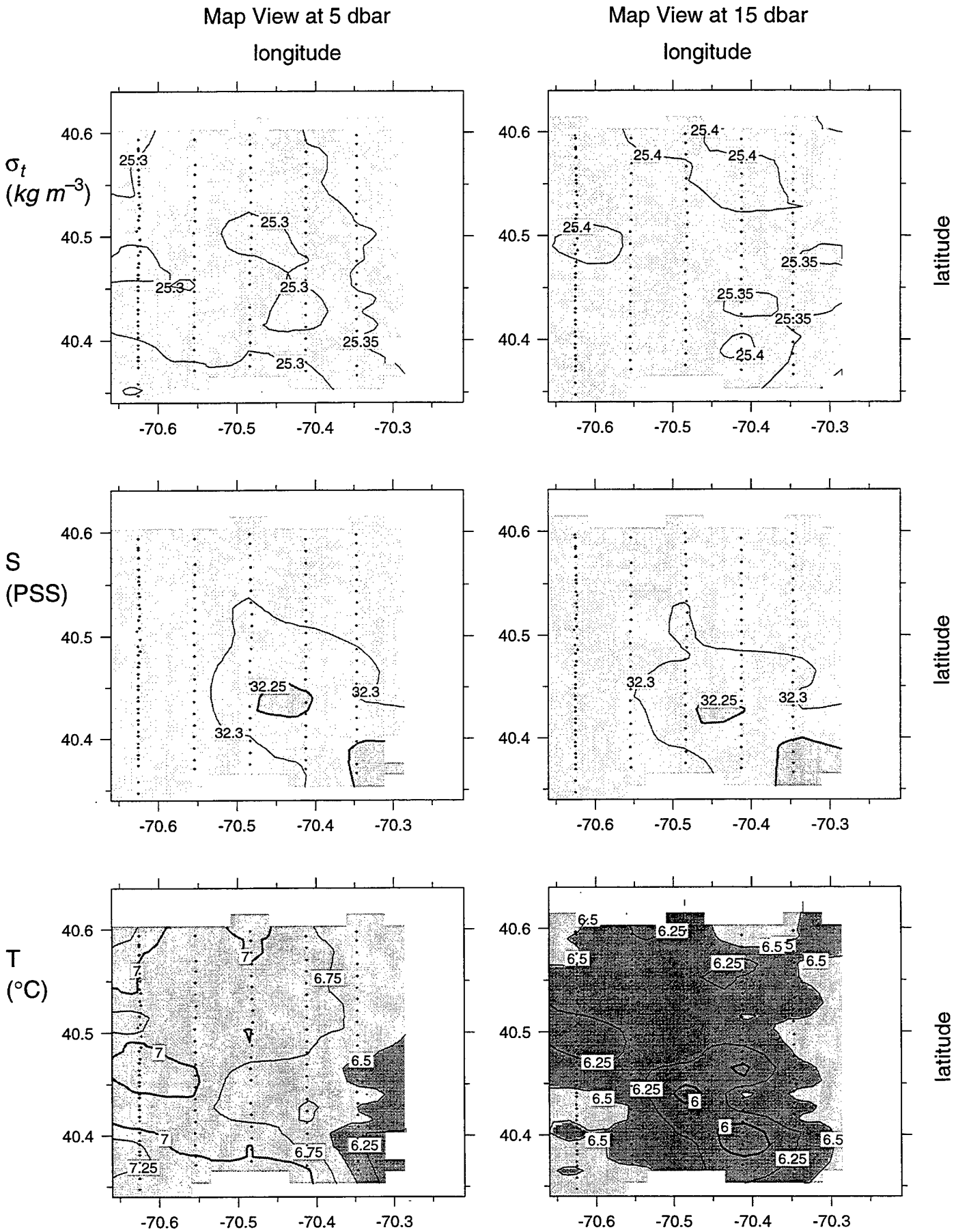
E9704 Small Box 1

27-Apr-97 00:49:39 - 27-Apr-97 12:29:04



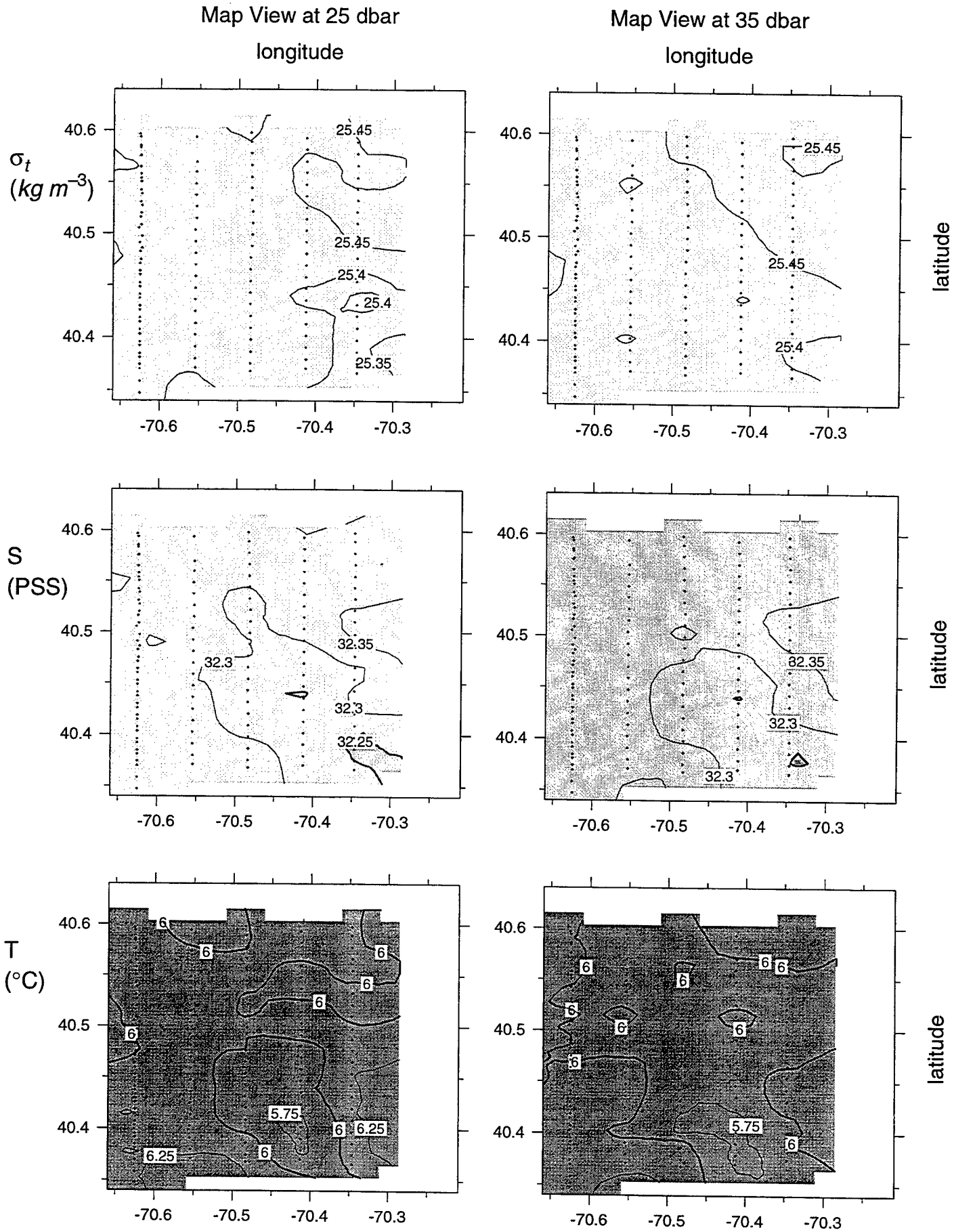
E9704 Small Box 2

27-Apr-97 22:29:09 - 28-Apr-97 14:34:51



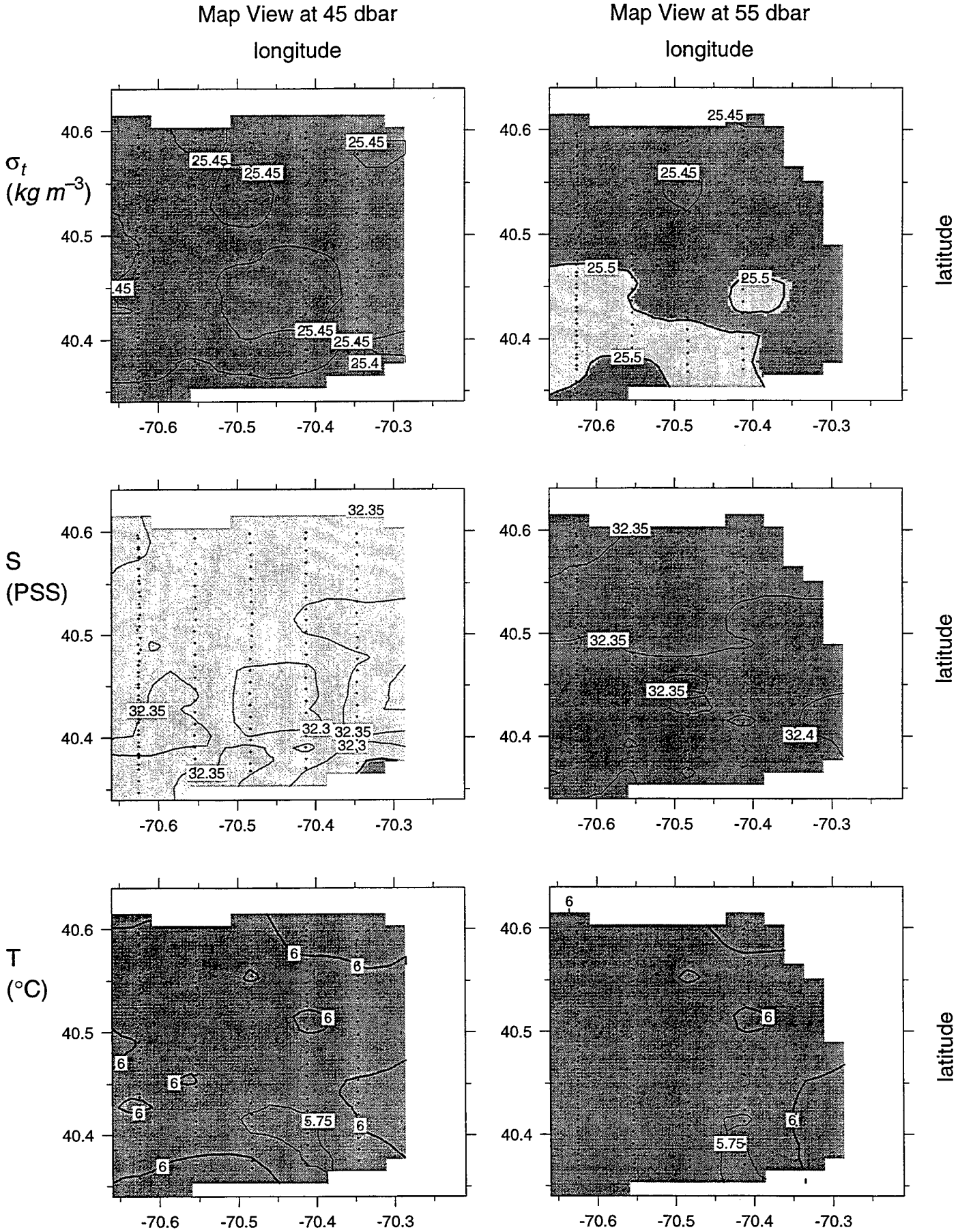
E9704 Small Box 2

27-Apr-97 22:29:09 - 28-Apr-97 14:34:51



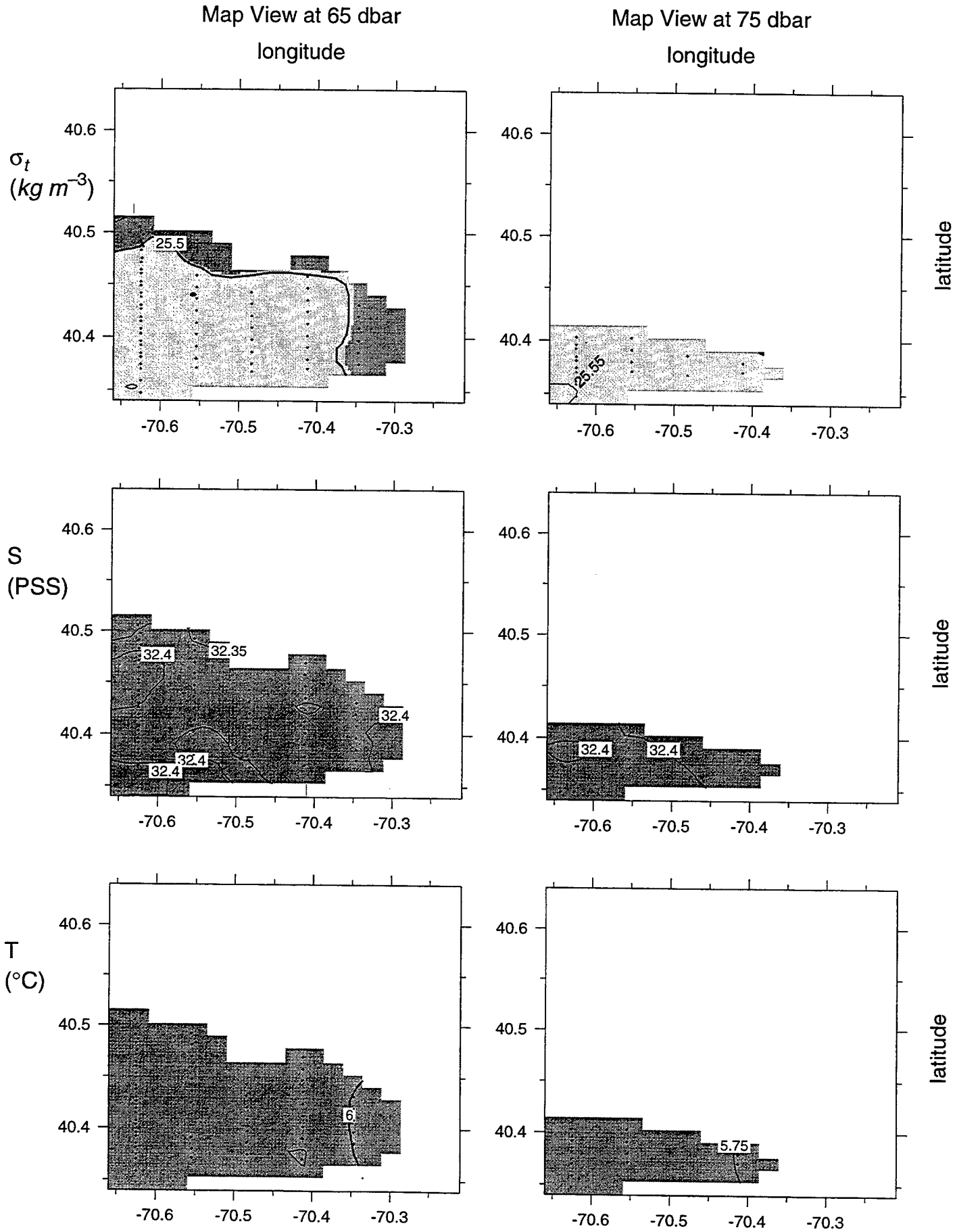
E9704 Small Box 2

27-Apr-97 22:29:09 - 28-Apr-97 14:34:51



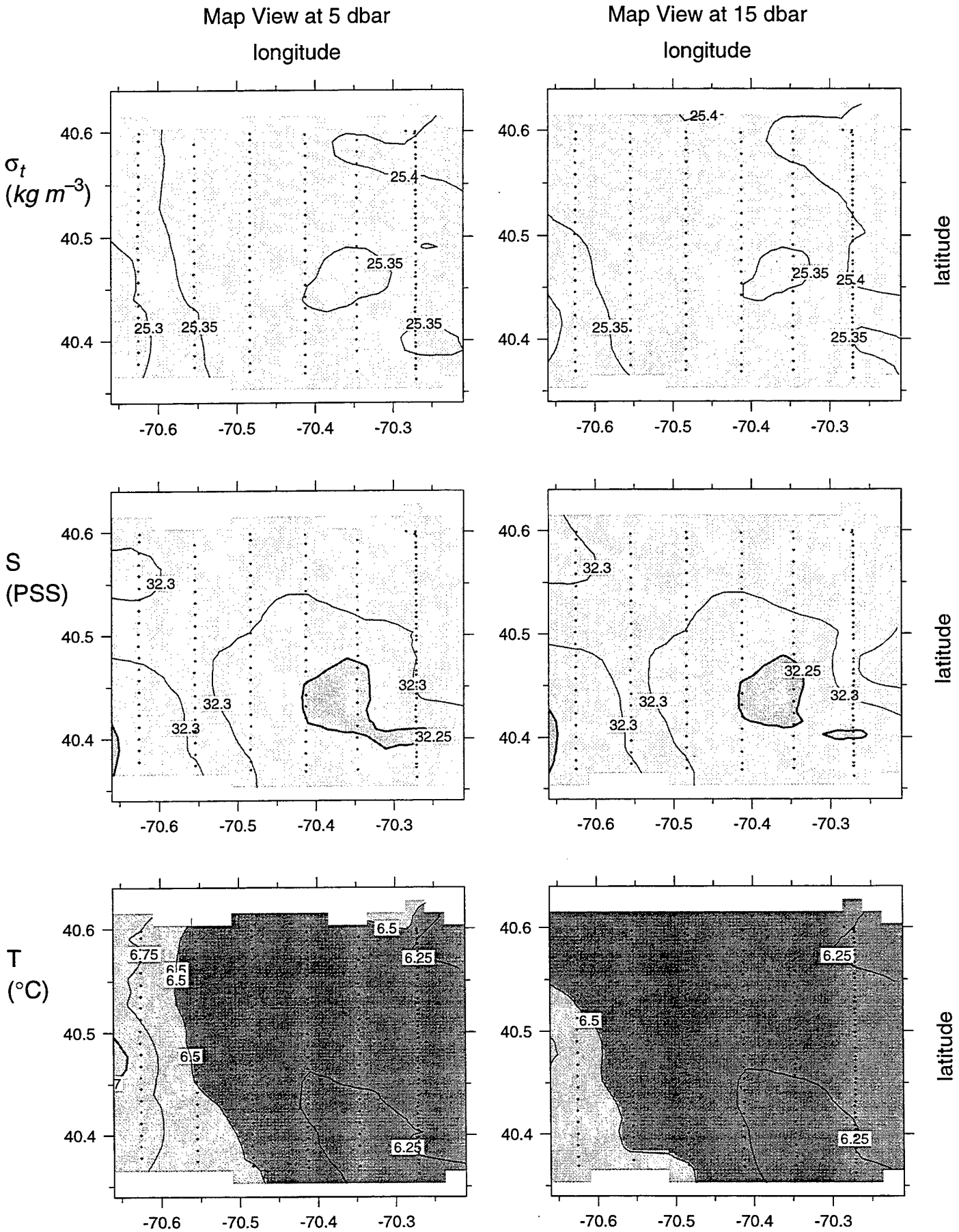
E9704 Small Box 2

27-Apr-97 22:29:09 - 28-Apr-97 14:34:51



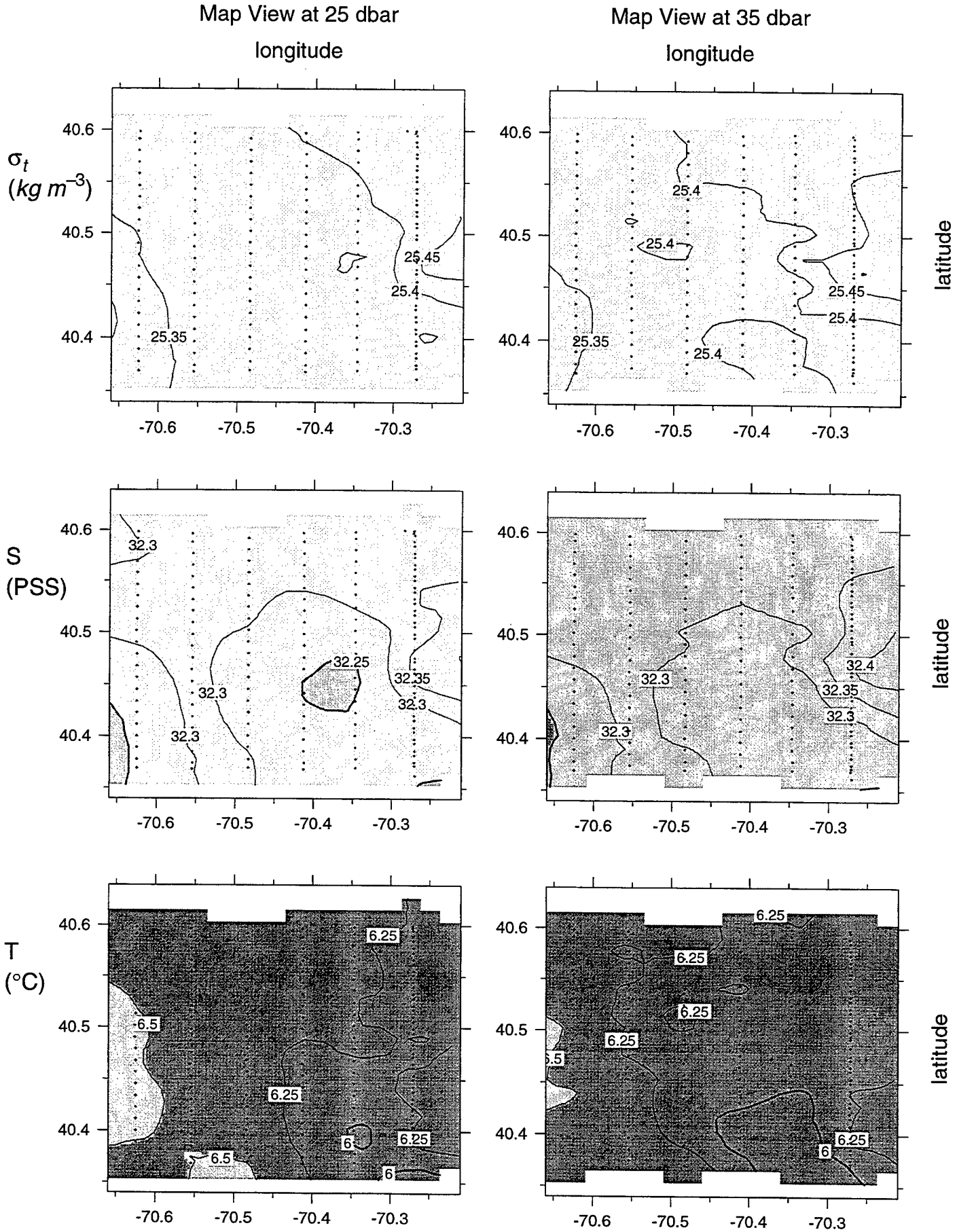
E9704 Small Box 3

29-Apr-97 01:15:53 - 29-Apr-97 20:53:16



E9704 Small Box 3

29-Apr-97 01:15:53 - 29-Apr-97 20:53:16

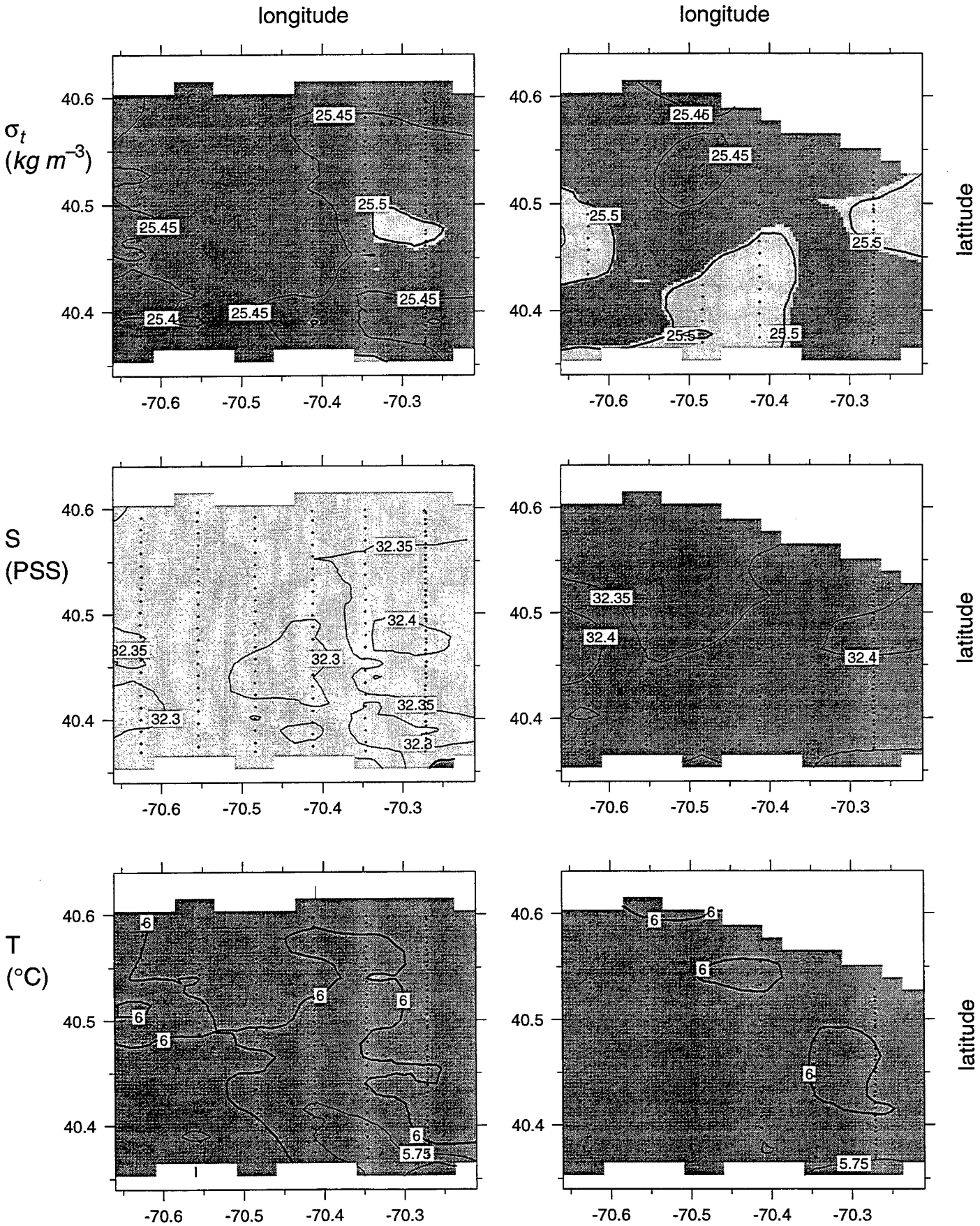


E9704 Small Box 3

29-Apr-97 01:15:53 - 29-Apr-97 20:53:16

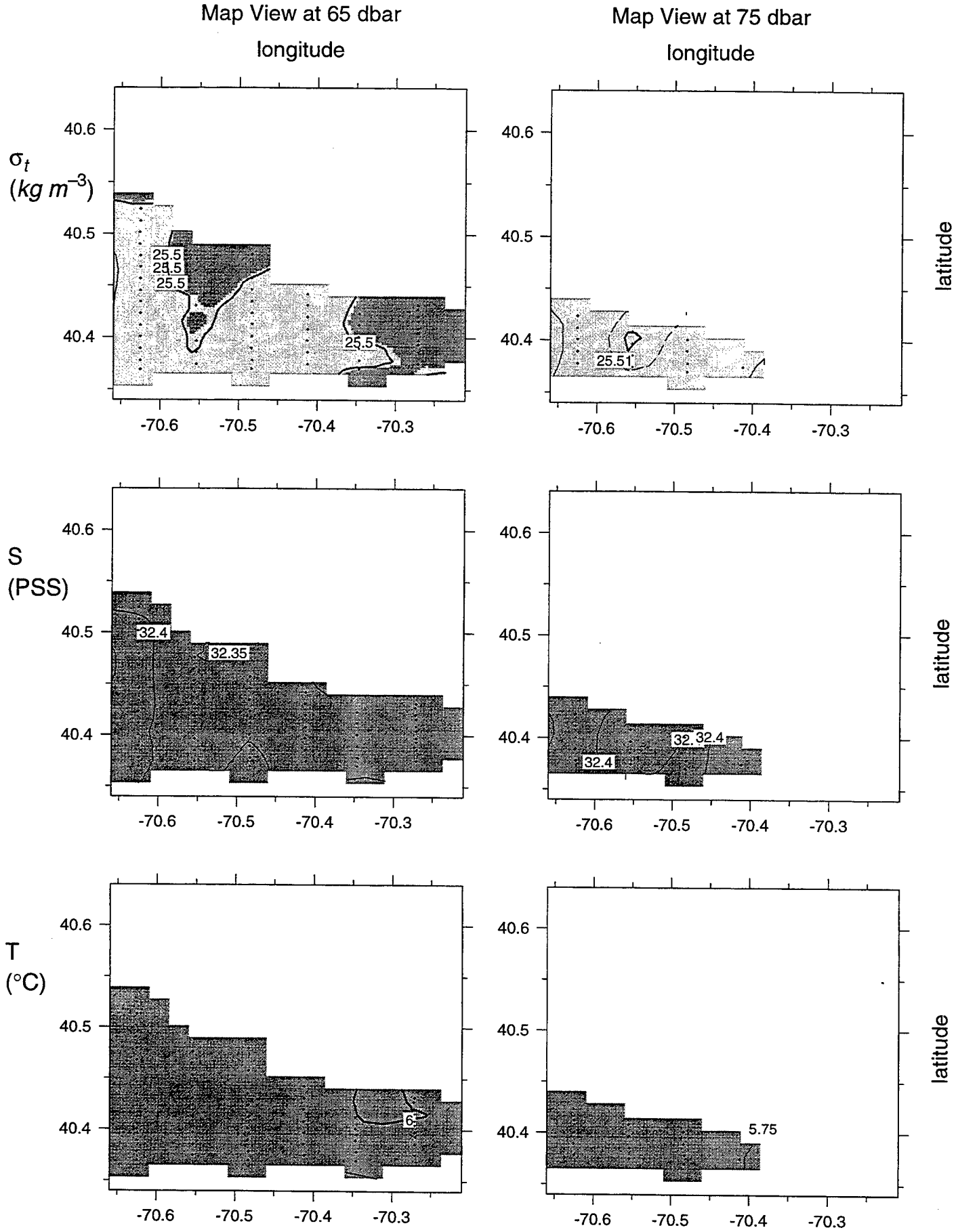
Map View at 45 dbar

Map View at 55 dbar



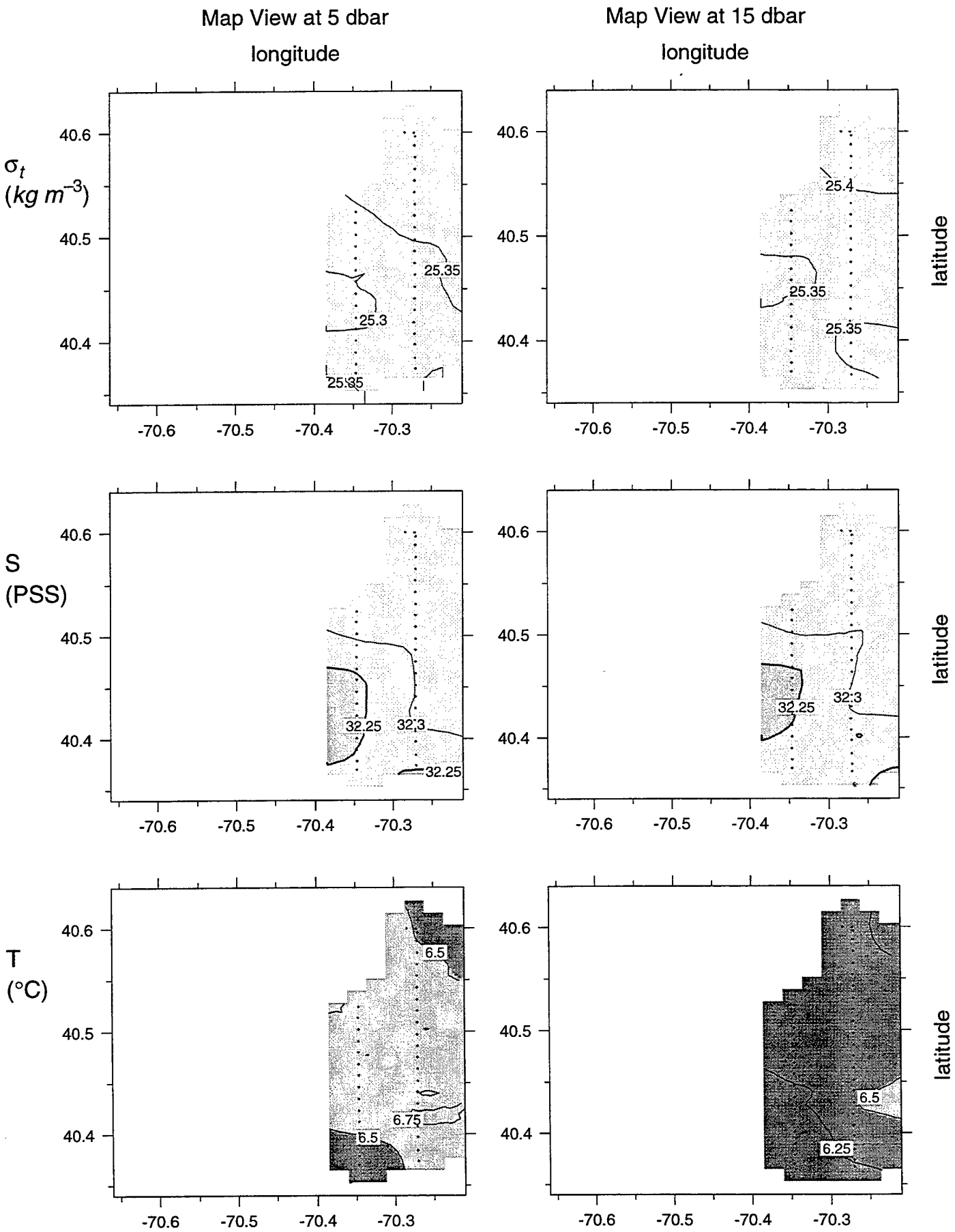
E9704 Small Box 3

29-Apr-97 01:15:53 - 29-Apr-97 20:53:16



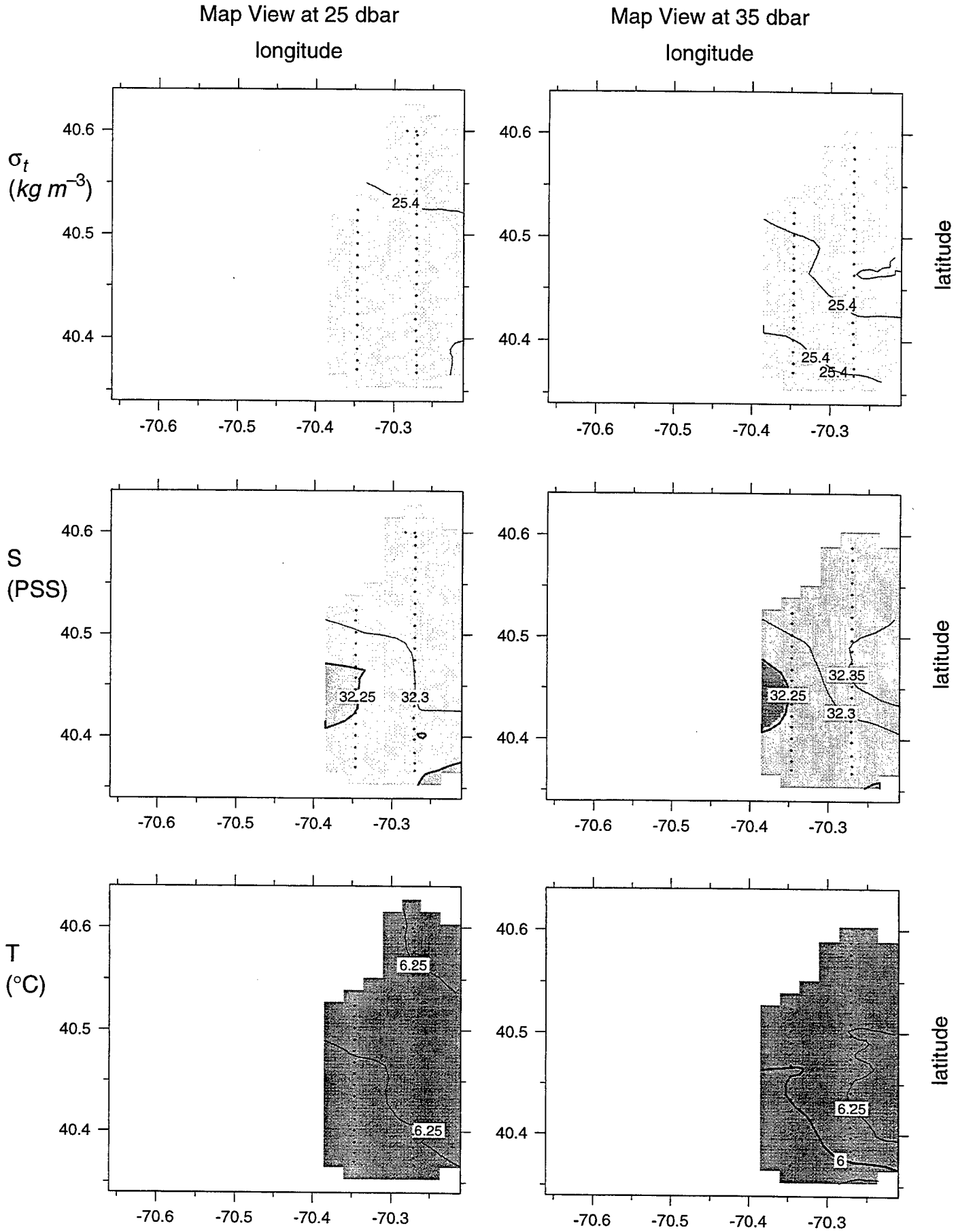
E9704 Small Box 4

29-Apr-97 18:40:54 - 30-Apr-97 00:52:26



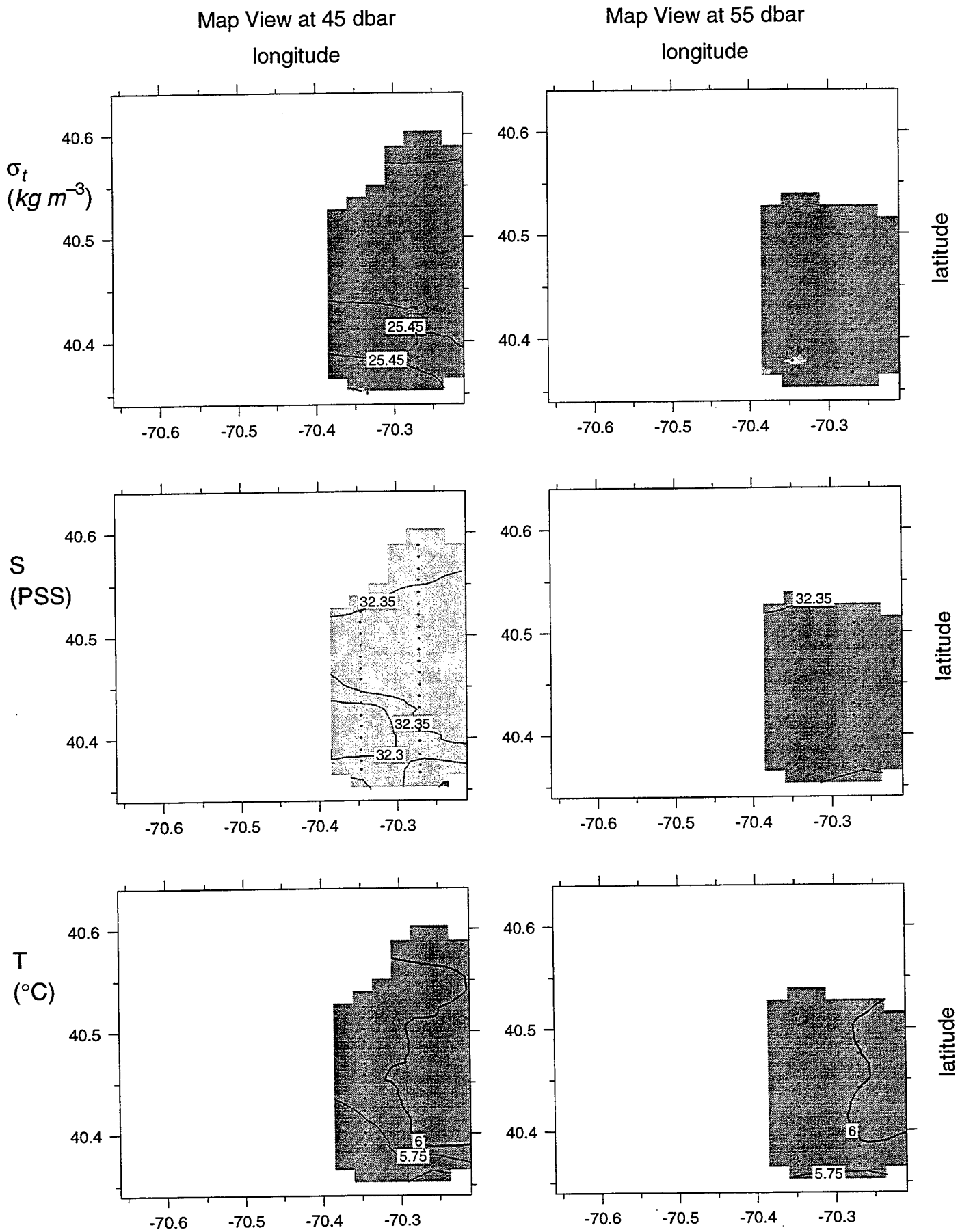
E9704 Small Box 4

29-Apr-97 18:40:54 - 30-Apr-97 00:52:26



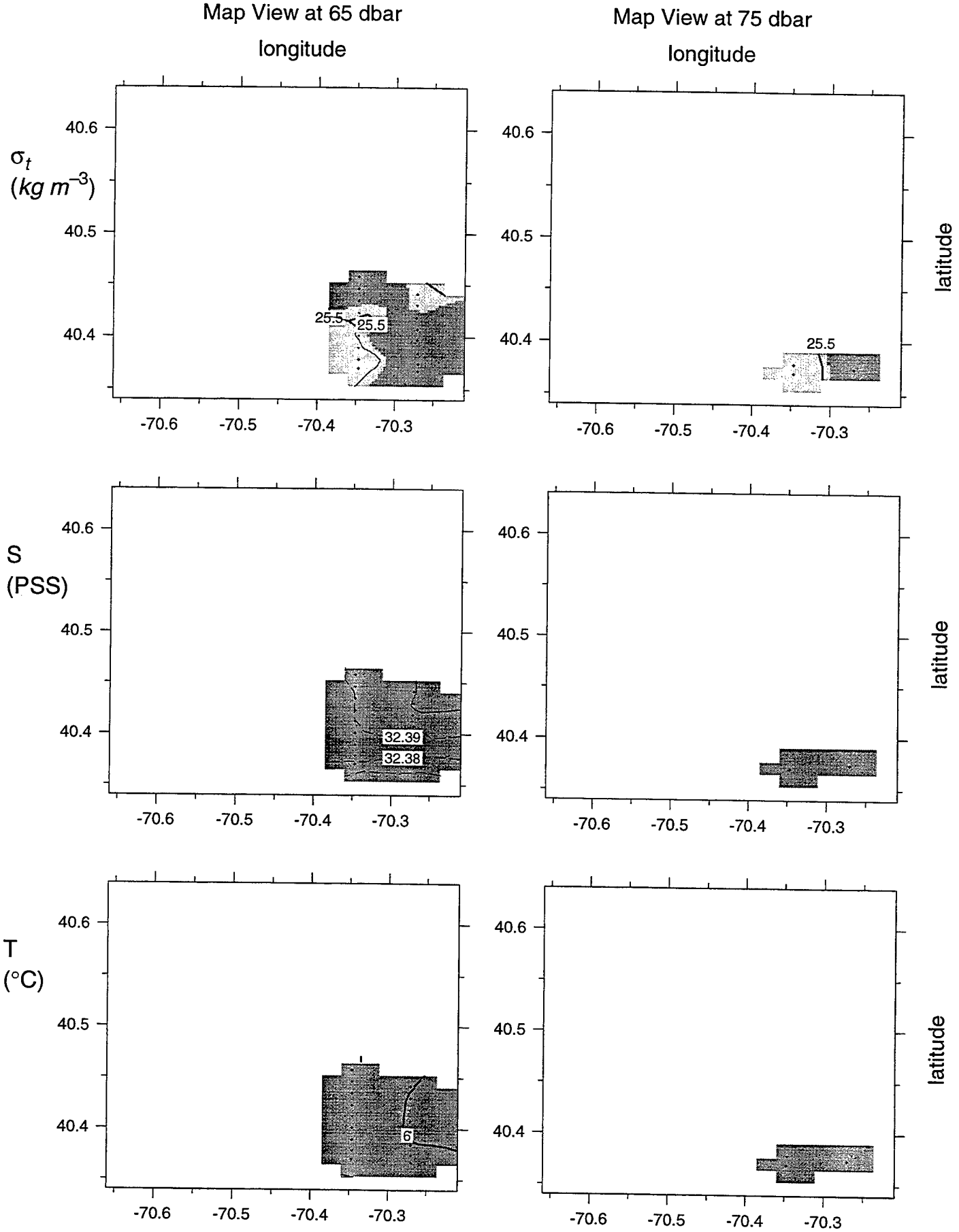
E9704 Small Box 4

29-Apr-97 18:40:54 - 30-Apr-97 00:52:26



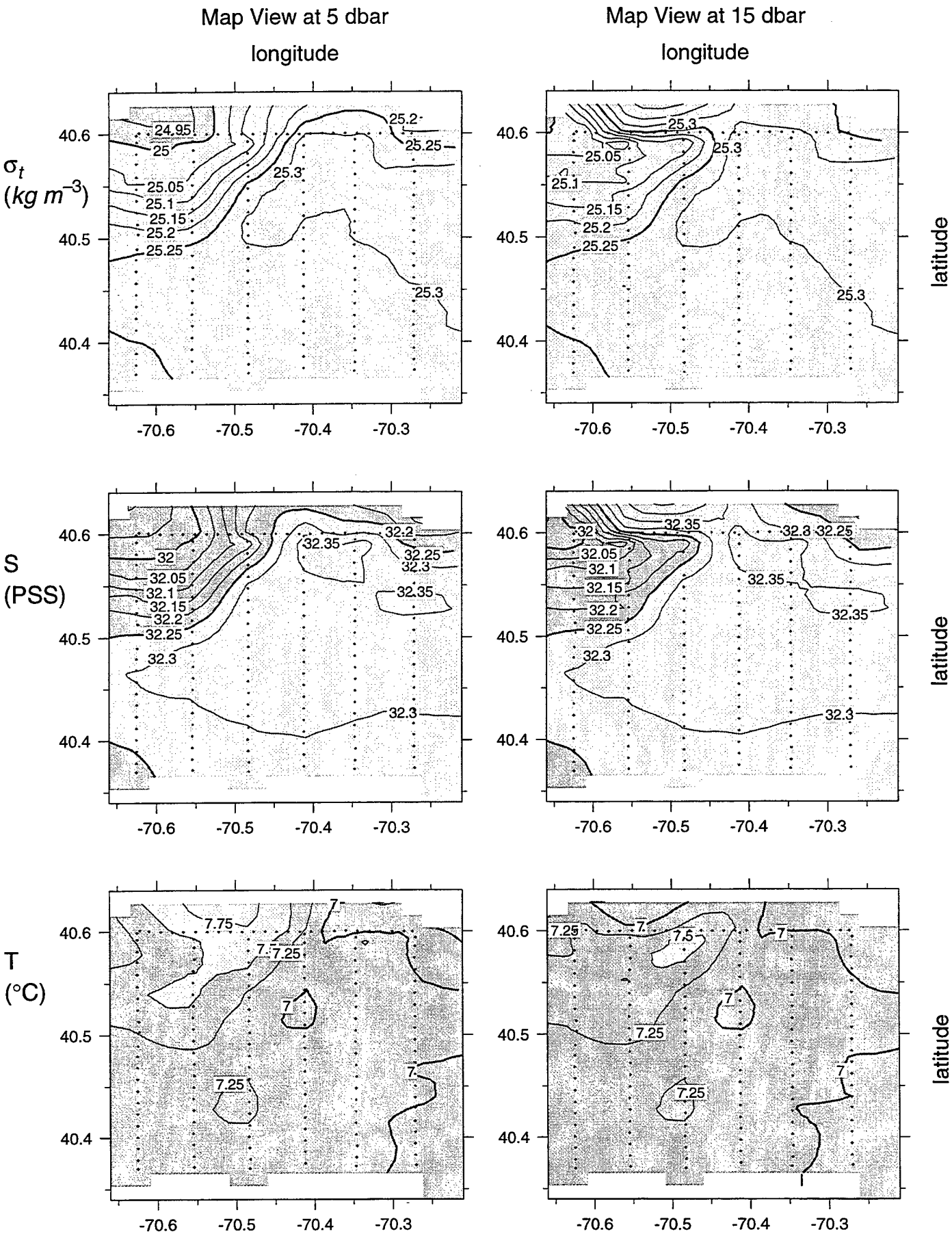
E9704 Small Box 4

29-Apr-97 18:40:54 - 30-Apr-97 00:52:26



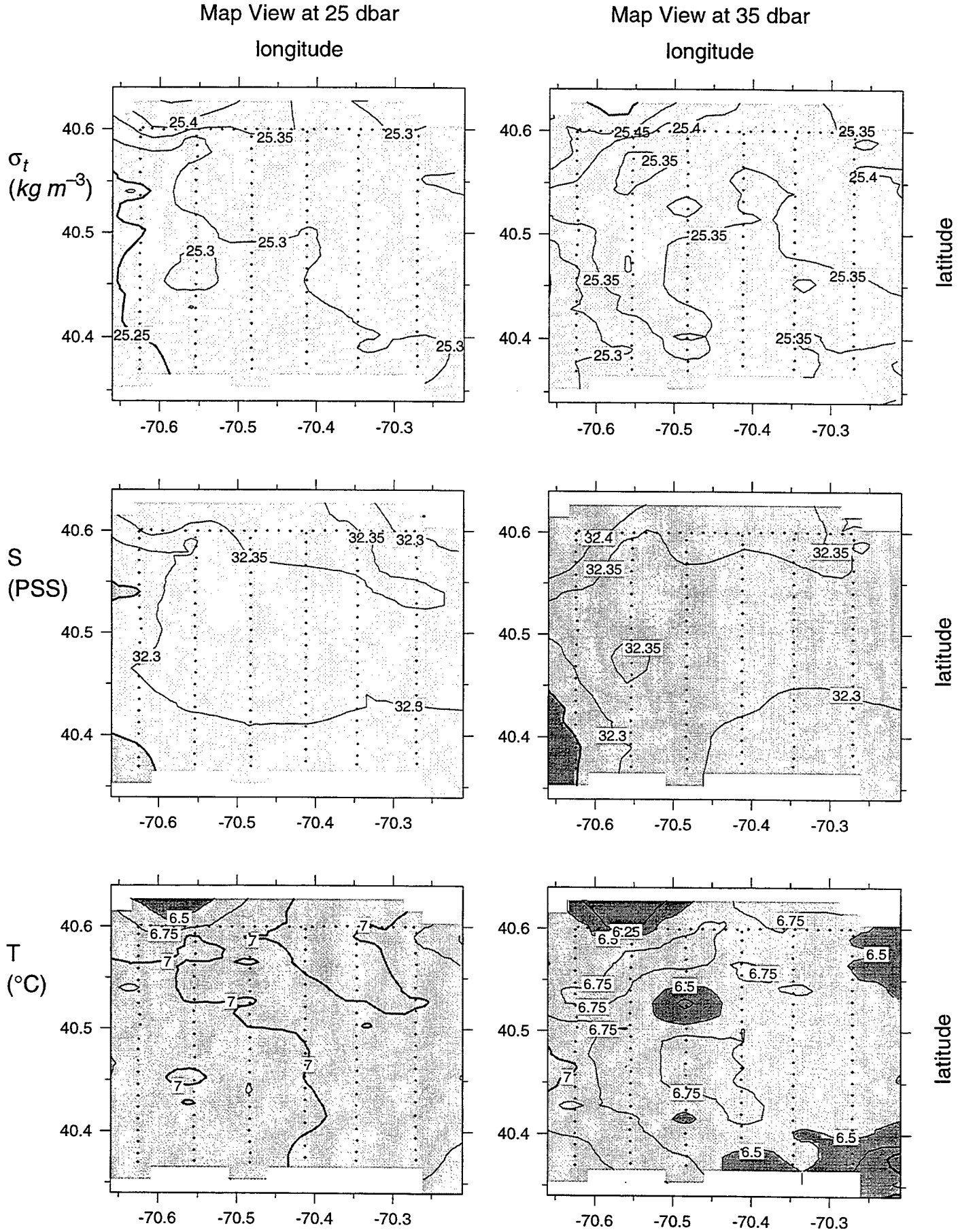
E9704 Small Box 5

02-May-97 12:40:29 - 03-May-97 11:44:16



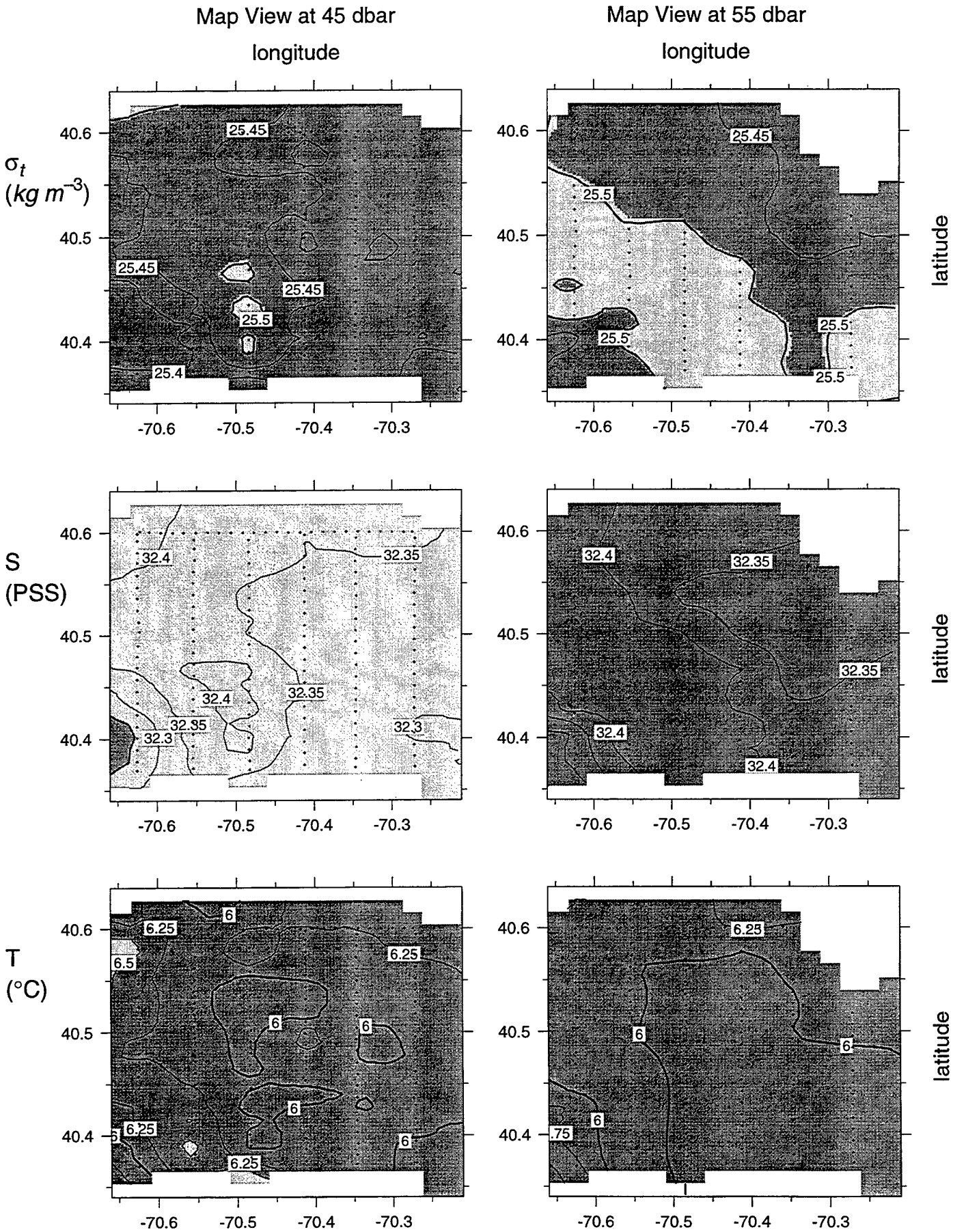
E9704 Small Box 5

02-May-97 12:40:29 - 03-May-97 11:44:16



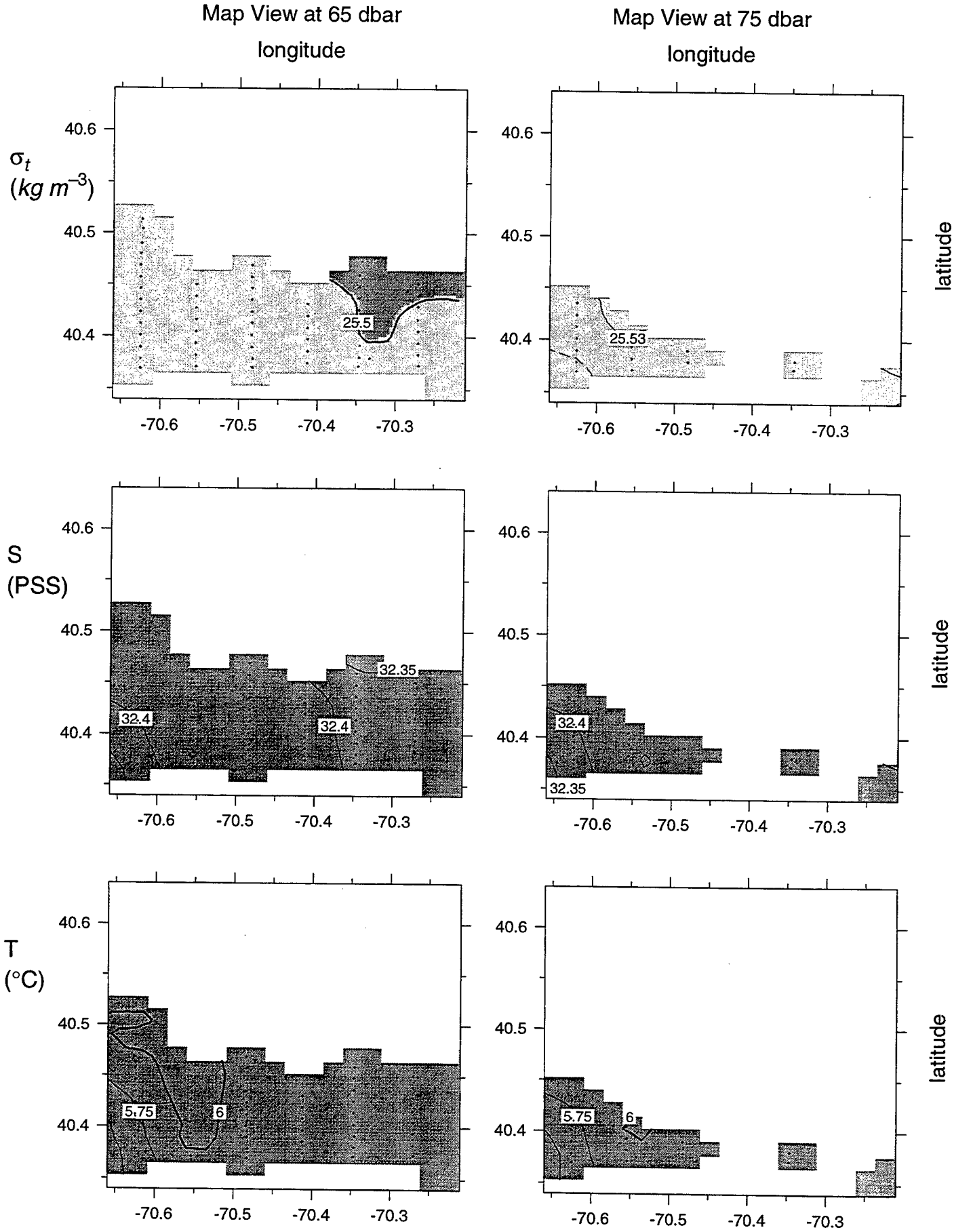
E9704 Small Box 5

02-May-97 12:40:29 - 03-May-97 11:44:16



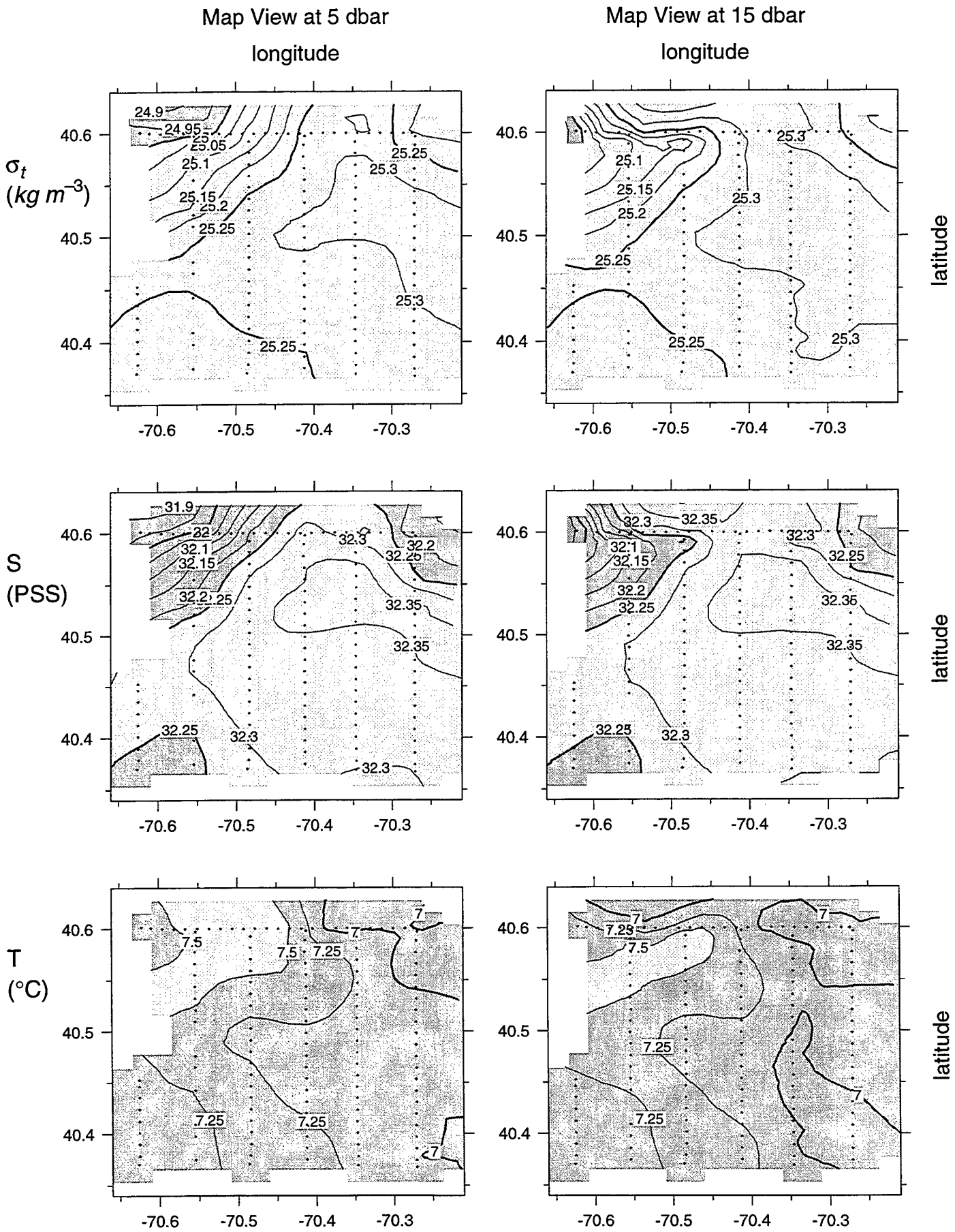
E9704 Small Box 5

02-May-97 12:40:29 - 03-May-97 11:44:16



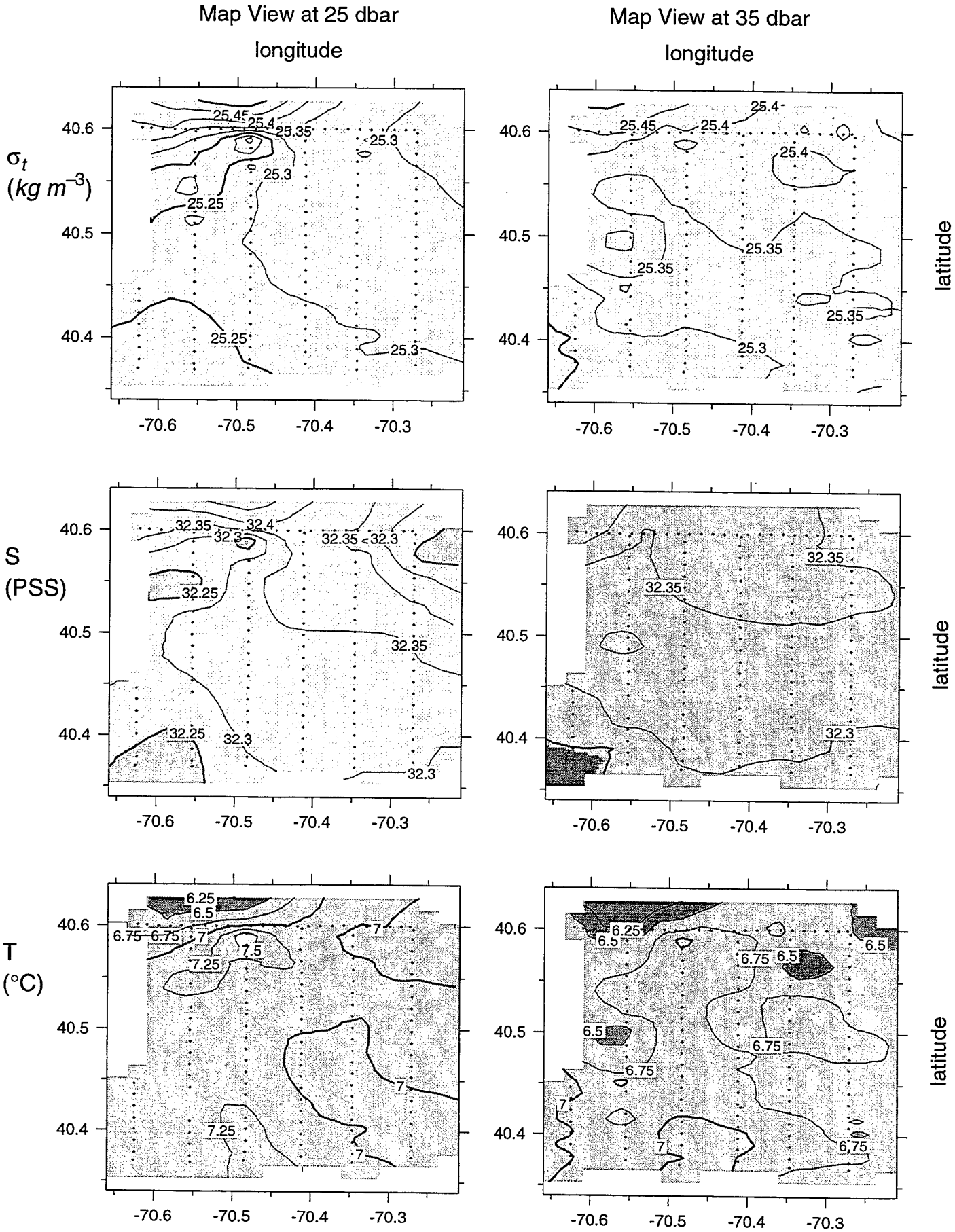
E9704 Small Box 6

03-May-97 09:25:15 - 04-May-97 02:09:07



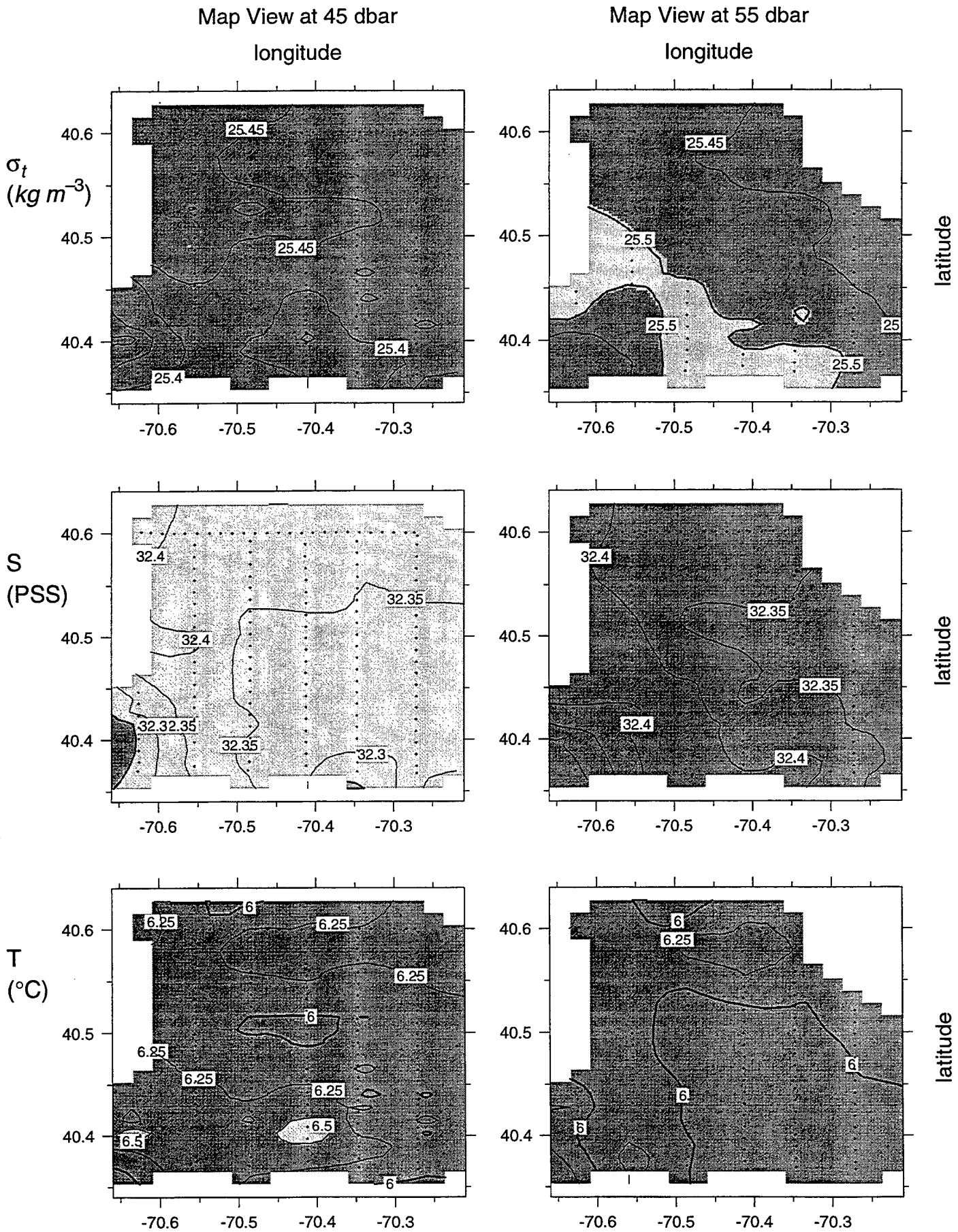
E9704 Small Box 6

03-May-97 09:25:15 - 04-May-97 02:09:07



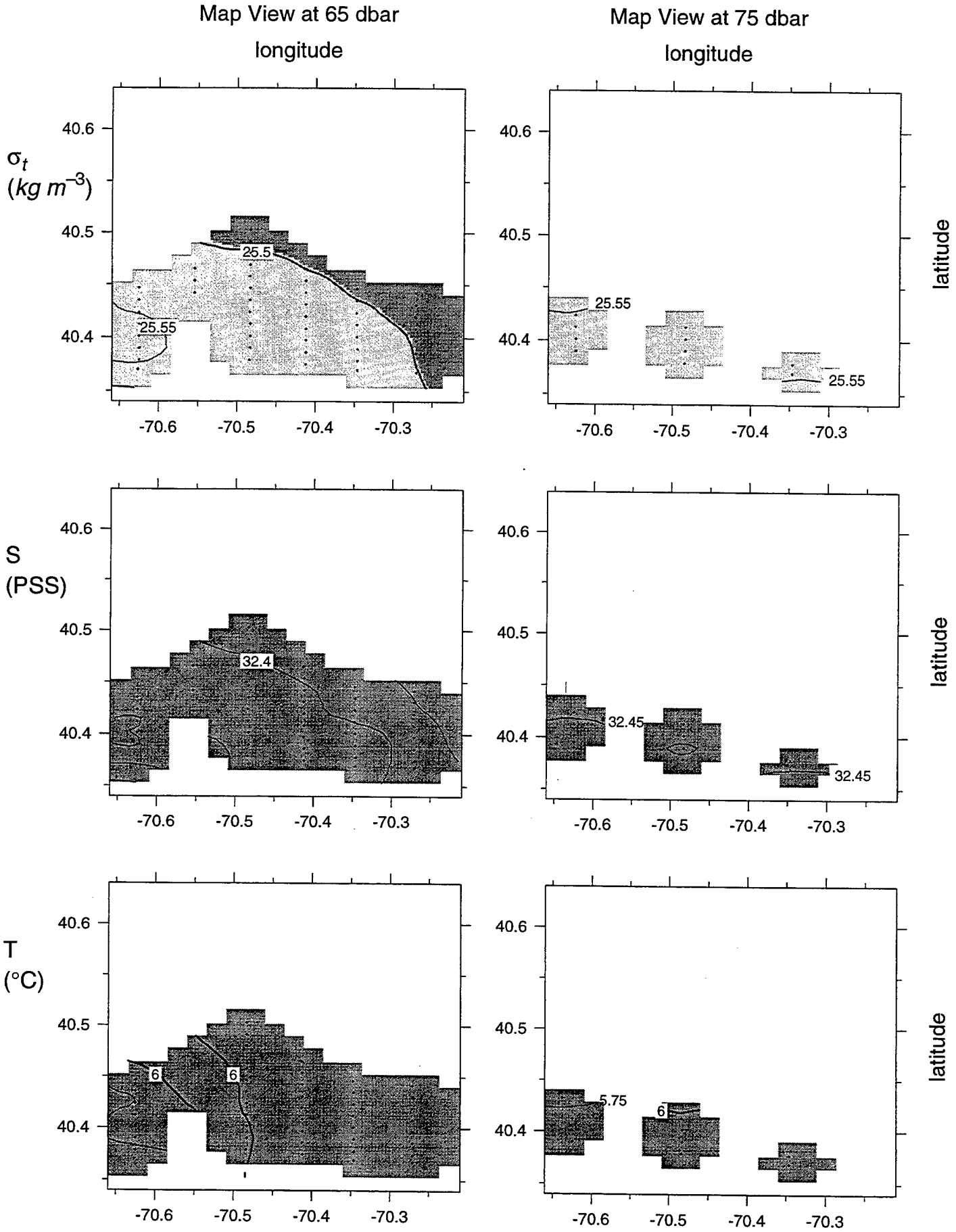
E9704 Small Box 6

03-May-97 09:25:15 - 04-May-97 02:09:07



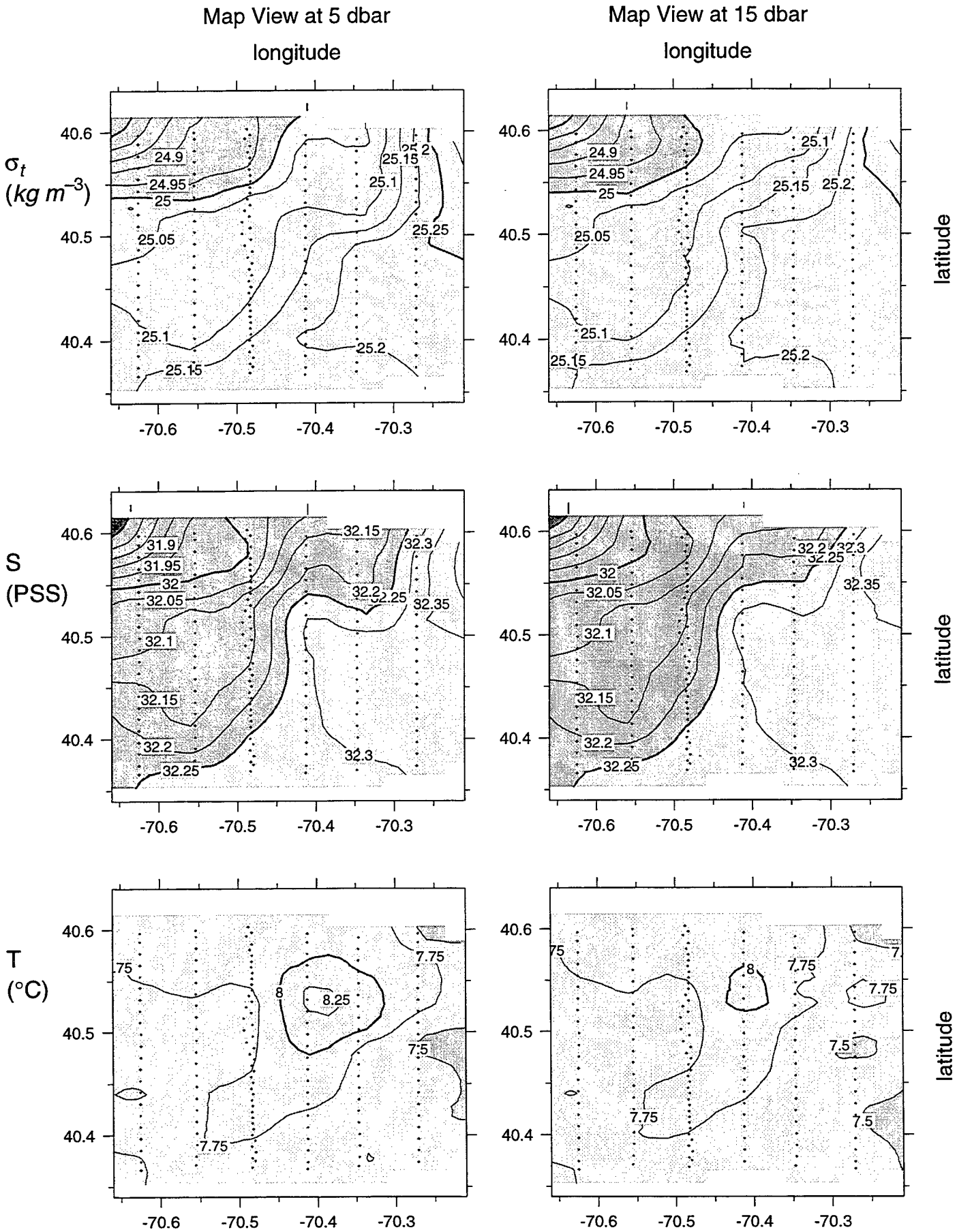
E9704 Small Box 6

03-May-97 09:25:15 - 04-May-97 02:09:07



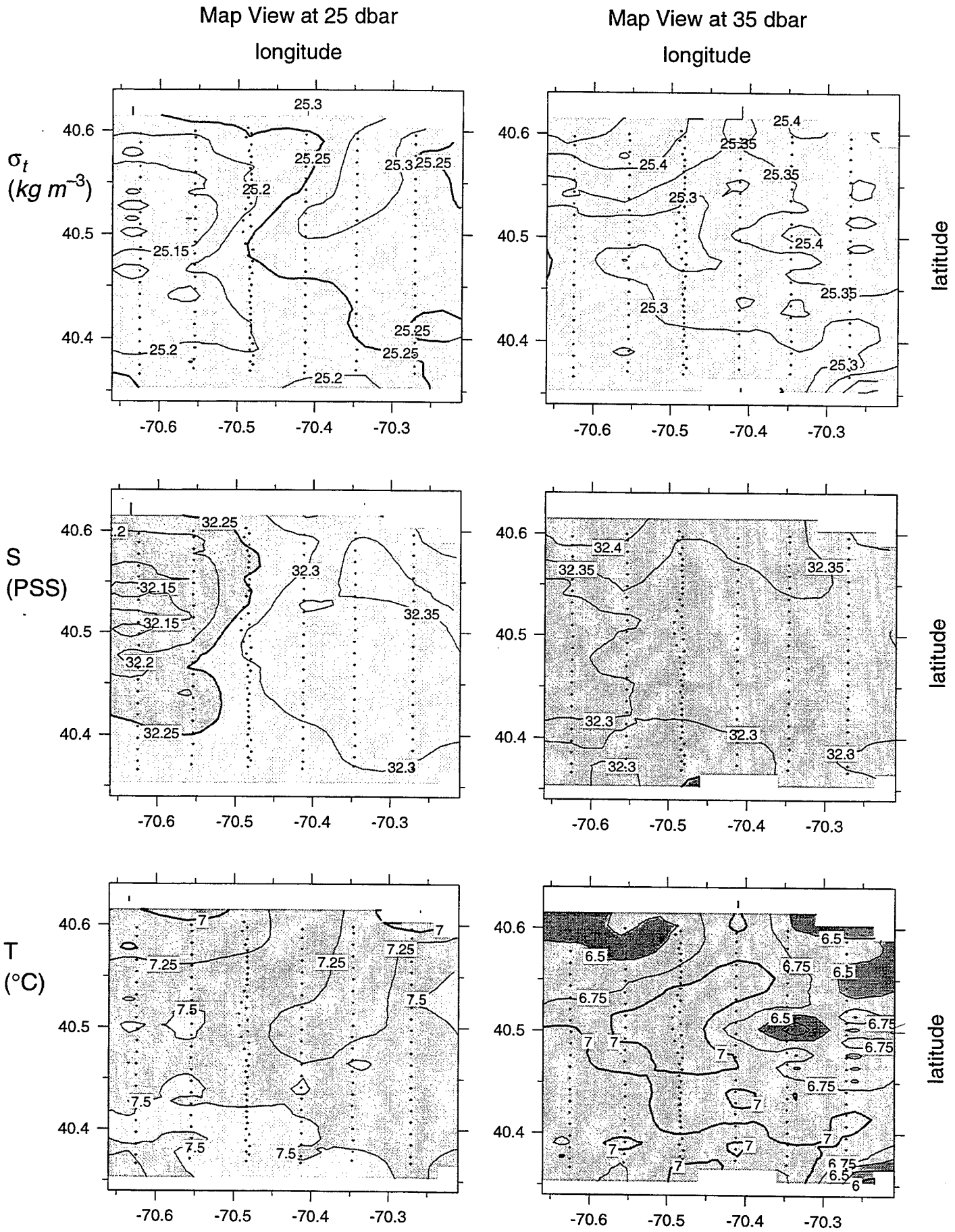
E9704 Small Box 7

06-May-97 17:34:07 - 07-May-97 13:49:24



E9704 Small Box 7

06-May-97 17:34:07 - 07-May-97 13:49:24

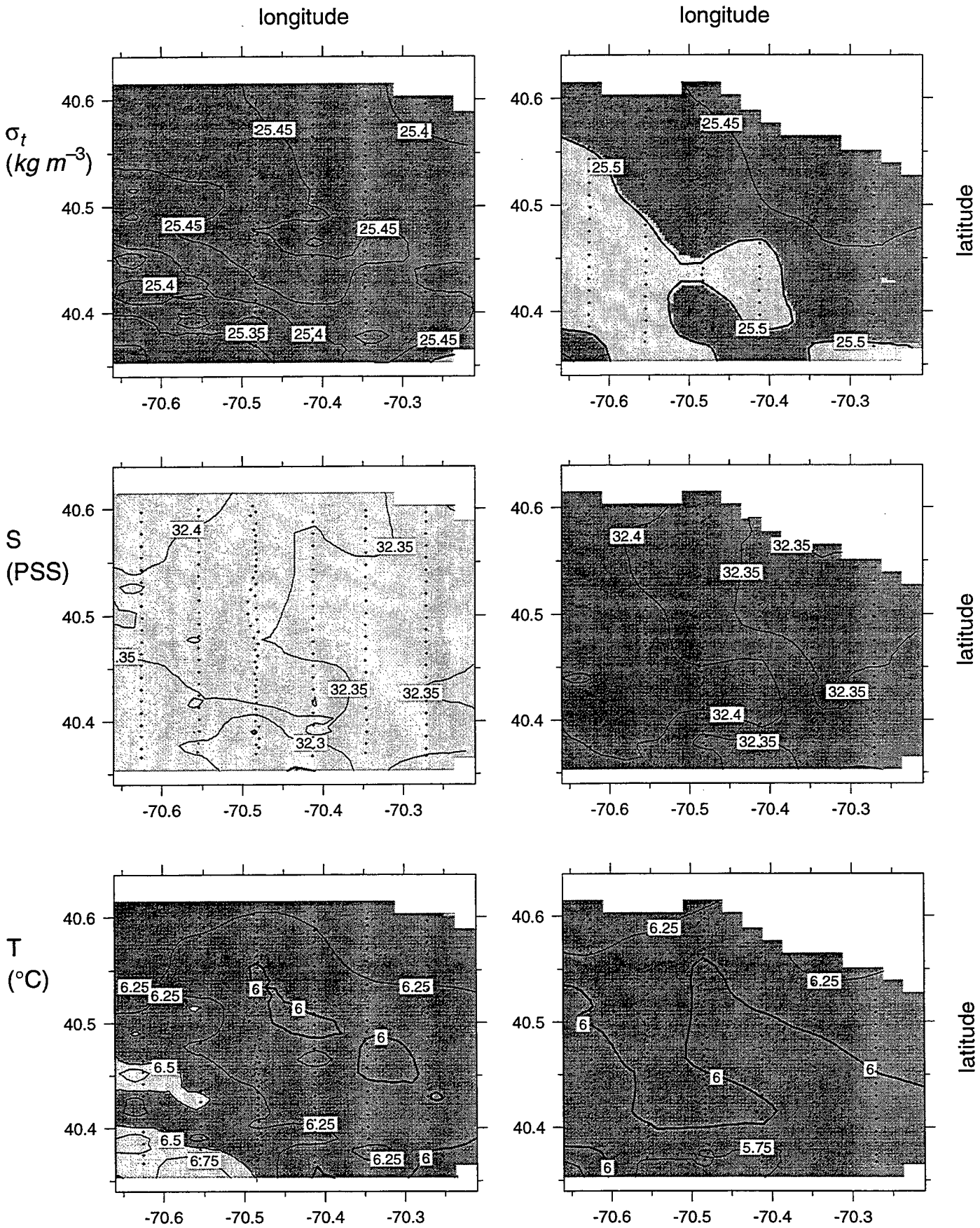


E9704 Small Box 7

06-May-97 17:34:07 - 07-May-97 13:49:24

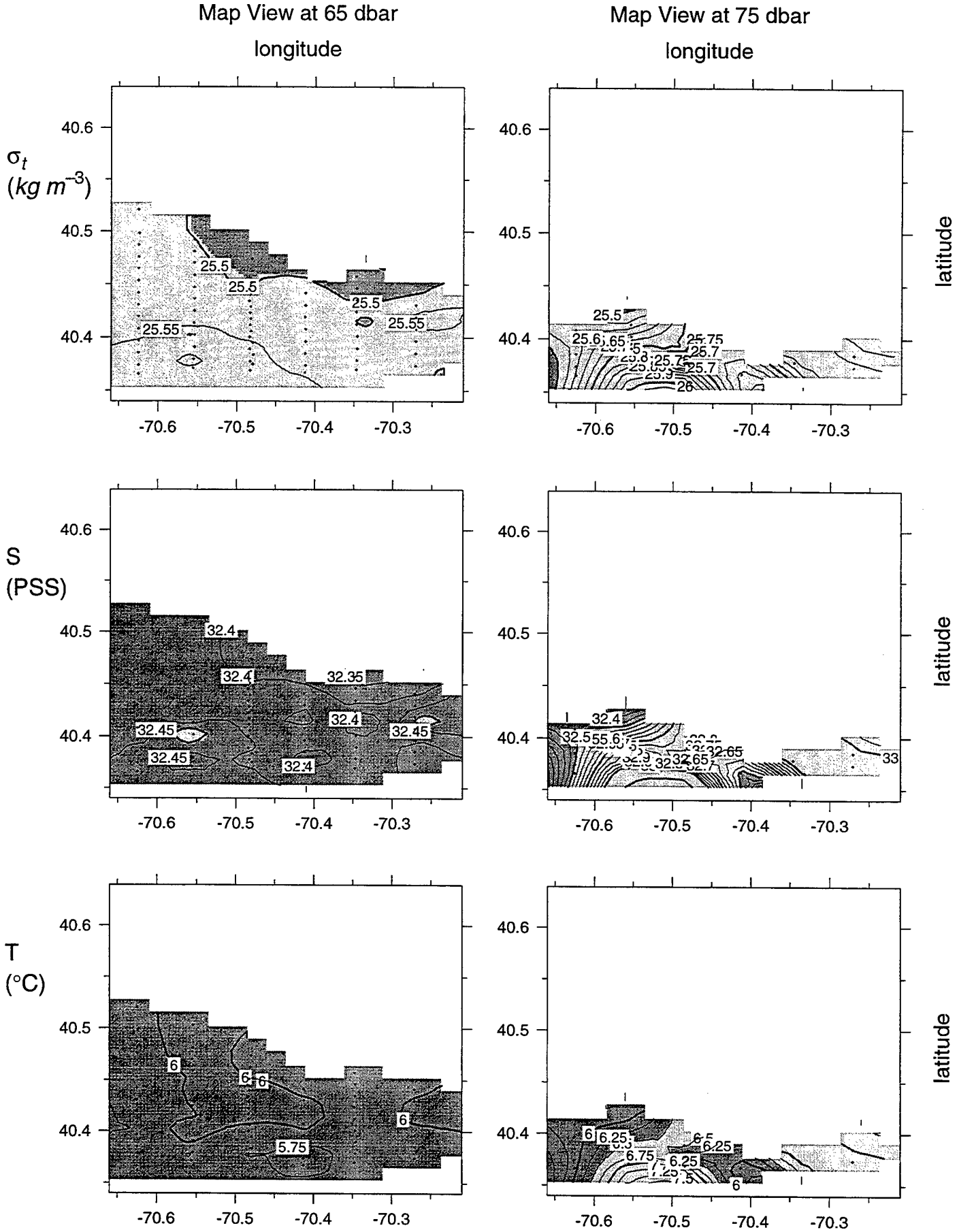
Map View at 45 dbar

Map View at 55 dbar



E9704 Small Box 7

06-May-97 17:34:07 - 07-May-97 13:49:24

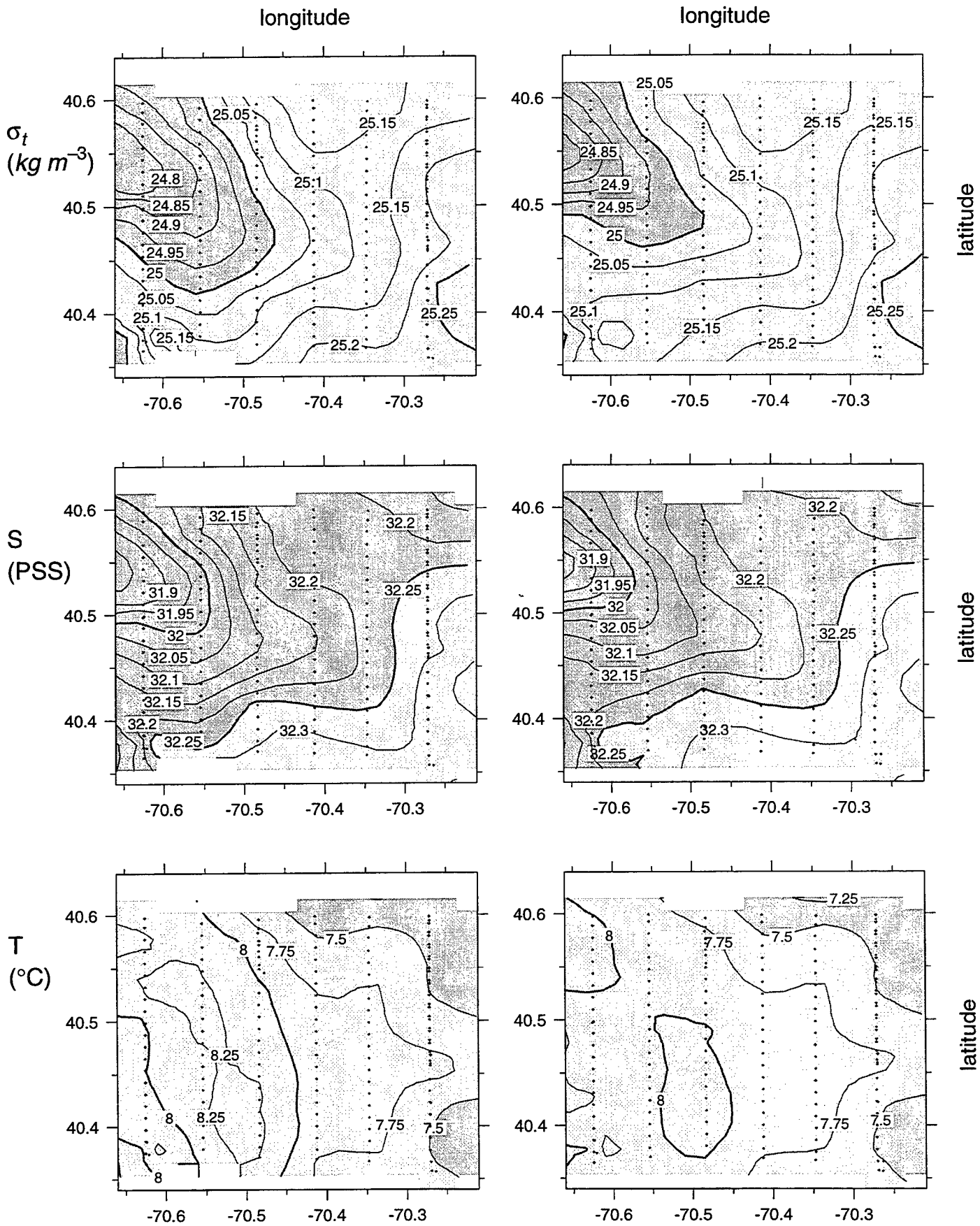


E9704 Small Box 8

07-May-97 13:53:21 - 09-May-97 01:54:54

Map View at 5 dbar

Map View at 15 dbar

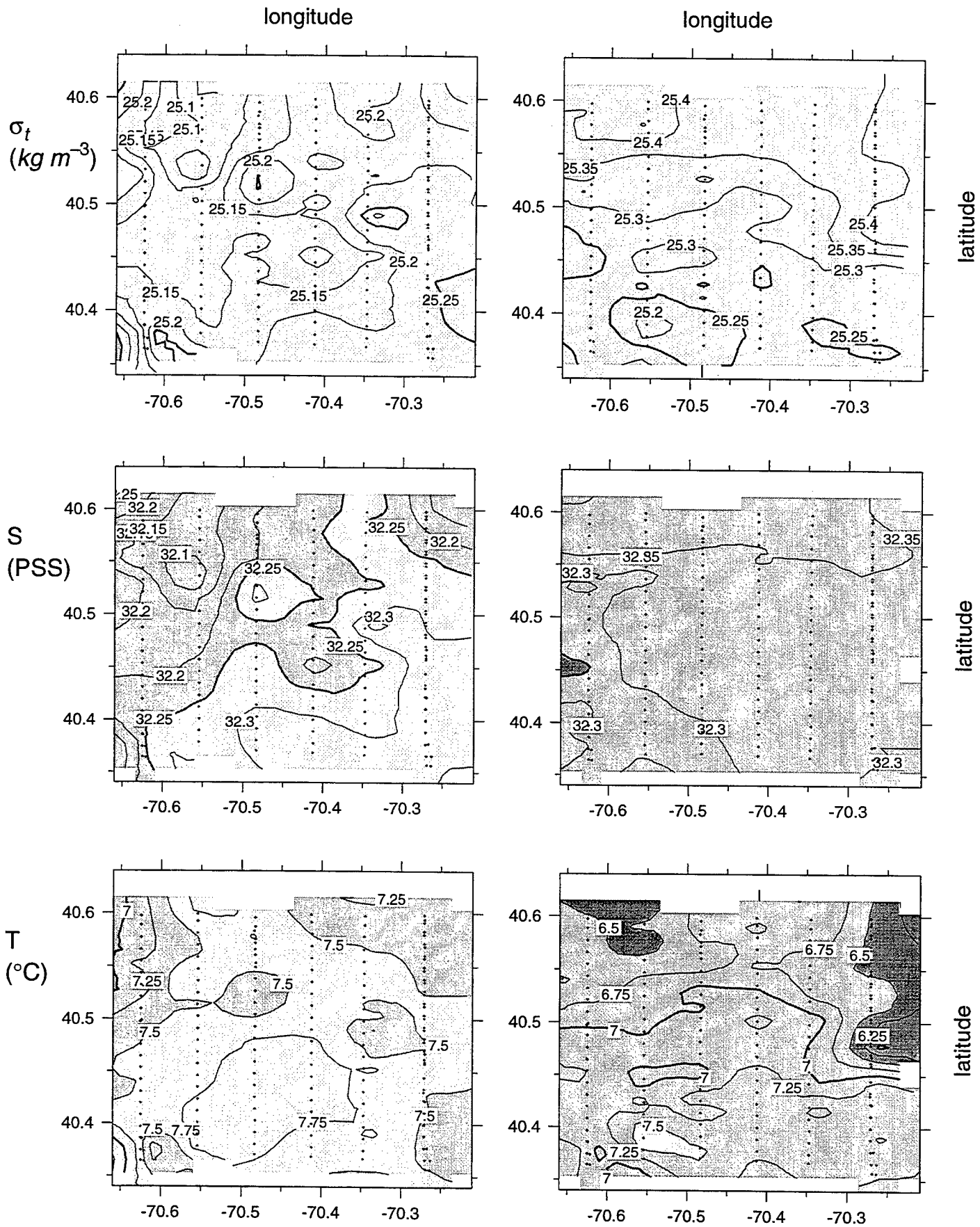


E9704 Small Box 8

07-May-97 13:53:21 - 09-May-97 01:54:54

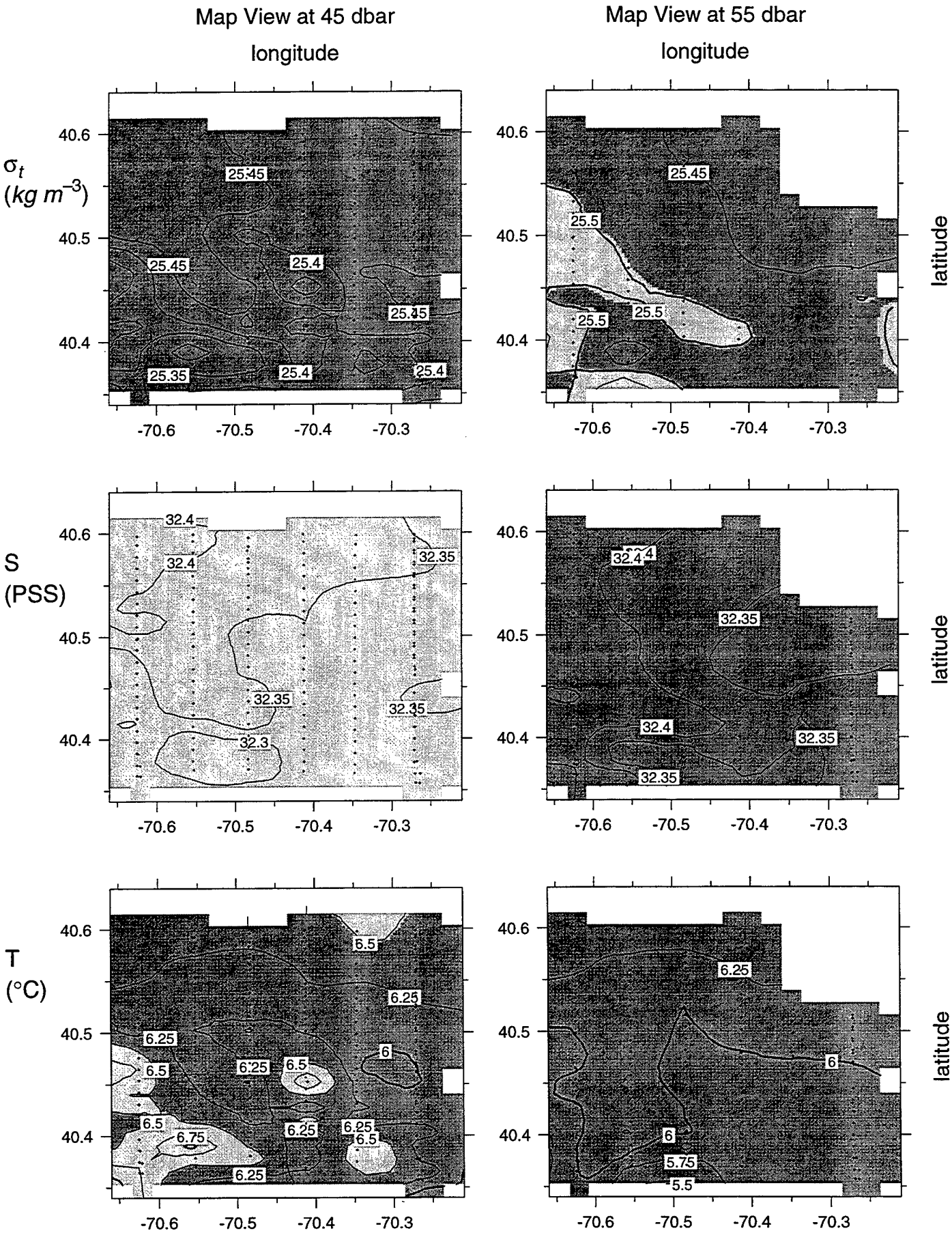
Map View at 25 dbar

Map View at 35 dbar



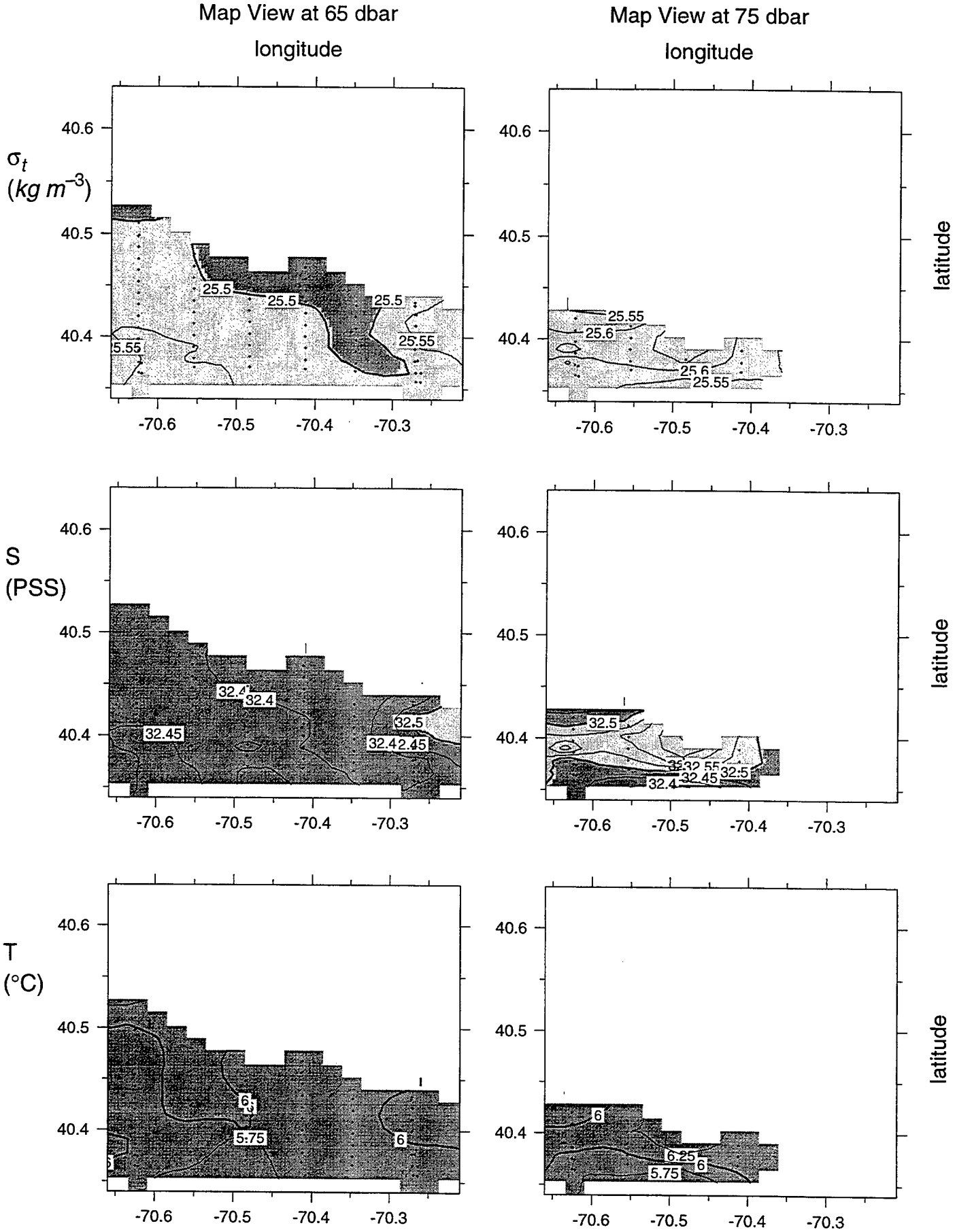
E9704 Small Box 8

07-May-97 13:53:21 - 09-May-97 01:54:54



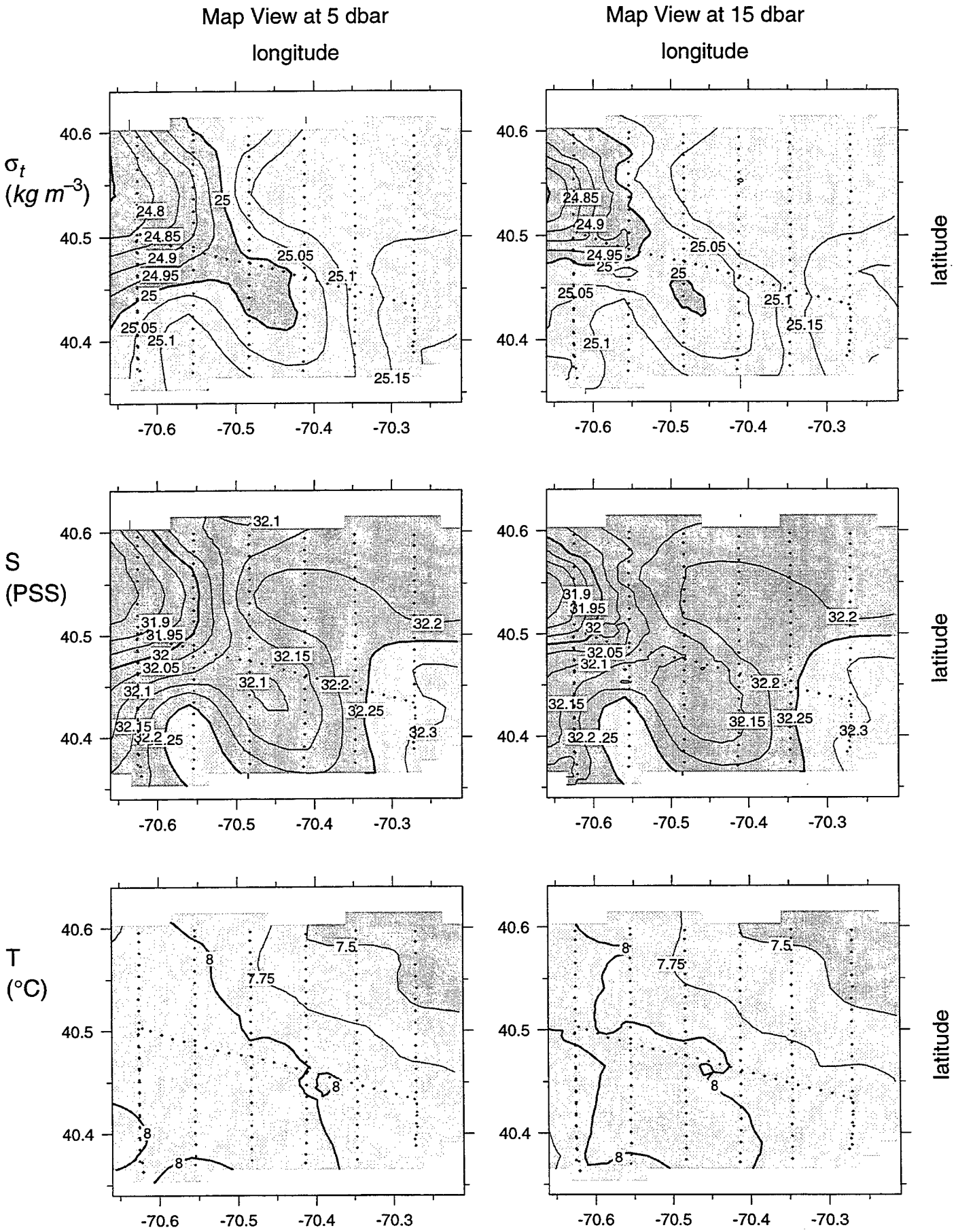
E9704 Small Box 8

07-May-97 13:53:21 - 09-May-97 01:54:54



E9704 Small Box 9

09-May-97 01:59:04 - 09-May-97 21:11:00

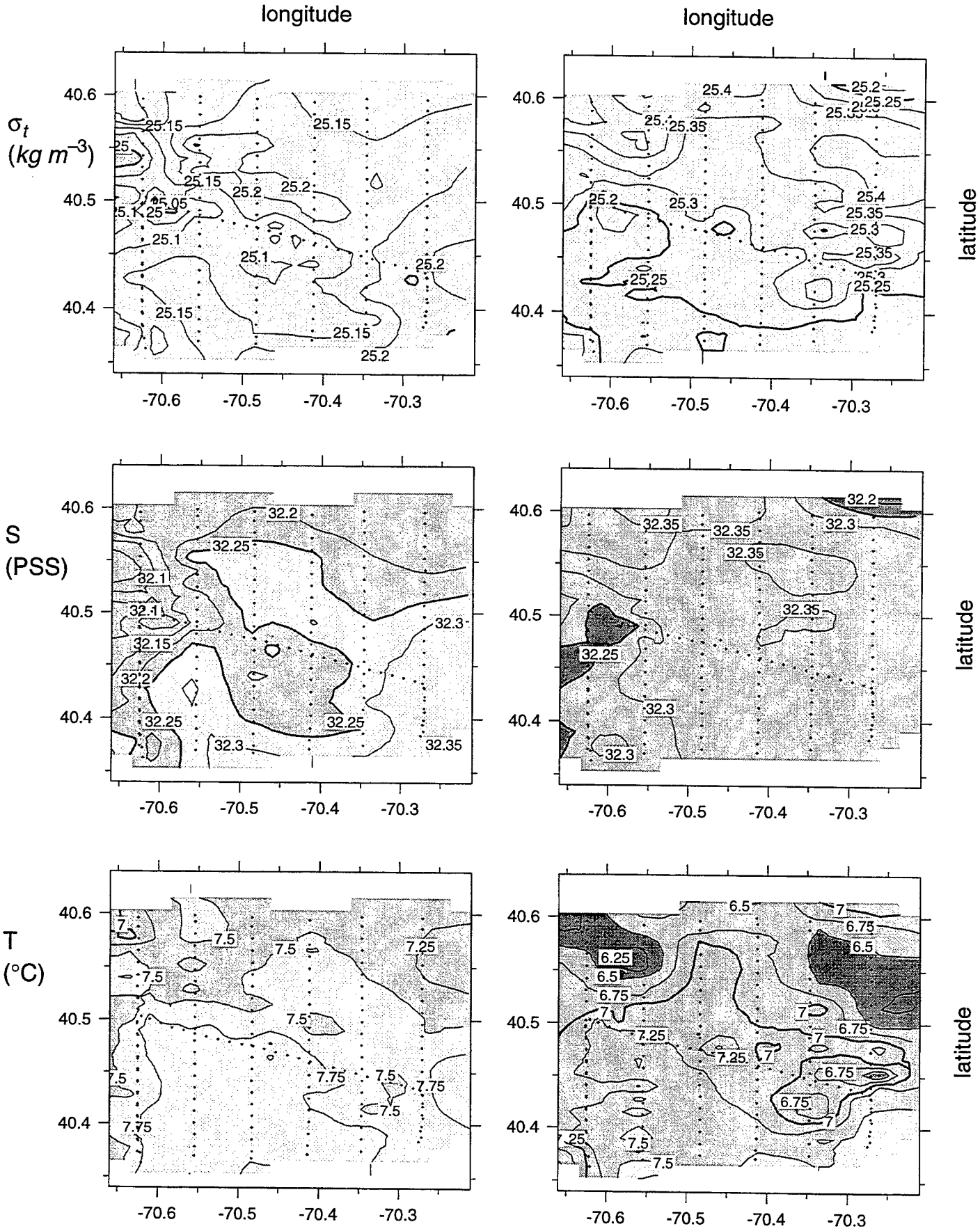


E9704 Small Box 9

09-May-97 01:59:04 - 09-May-97 21:11:00

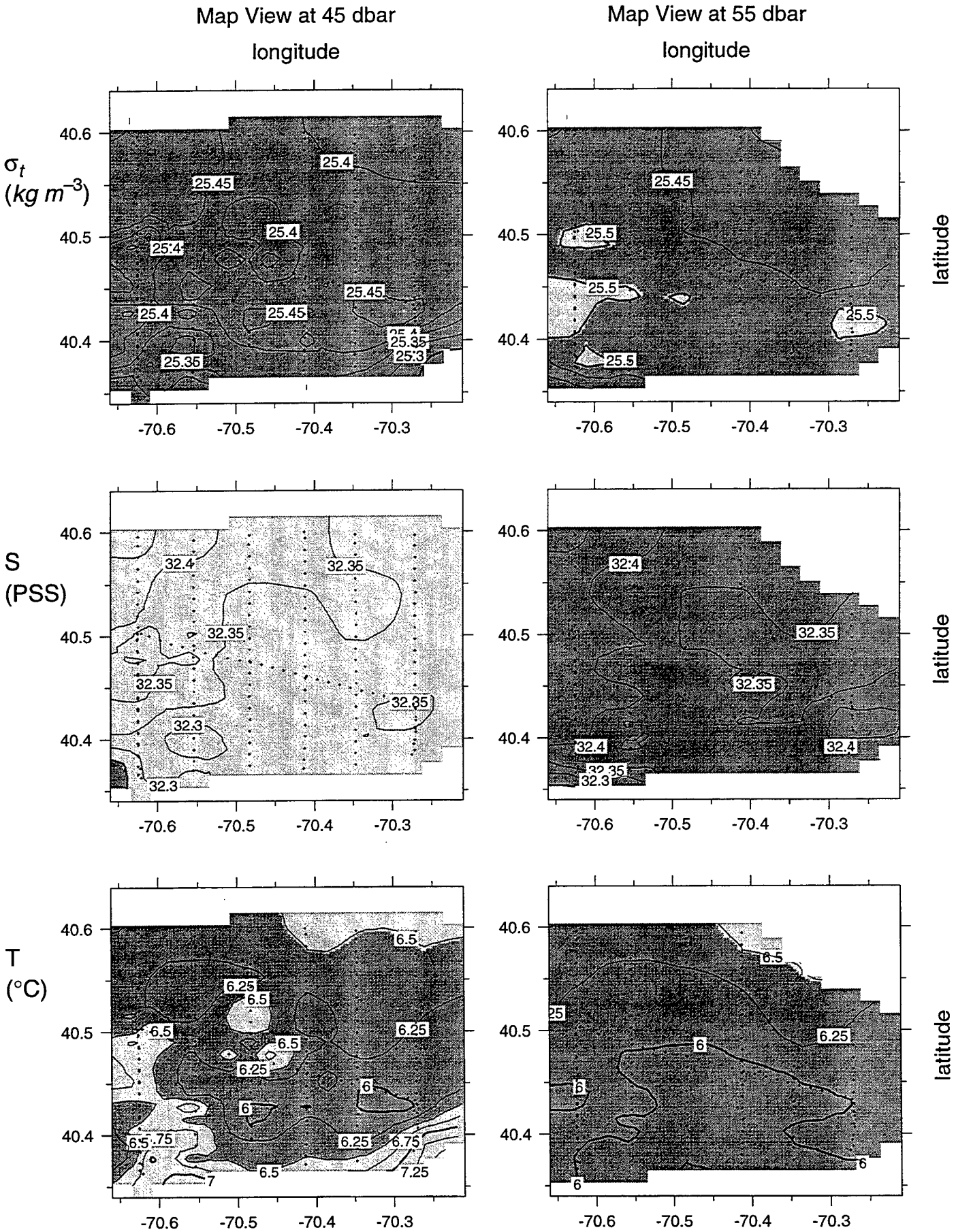
Map View at 25 dbar

Map View at 35 dbar



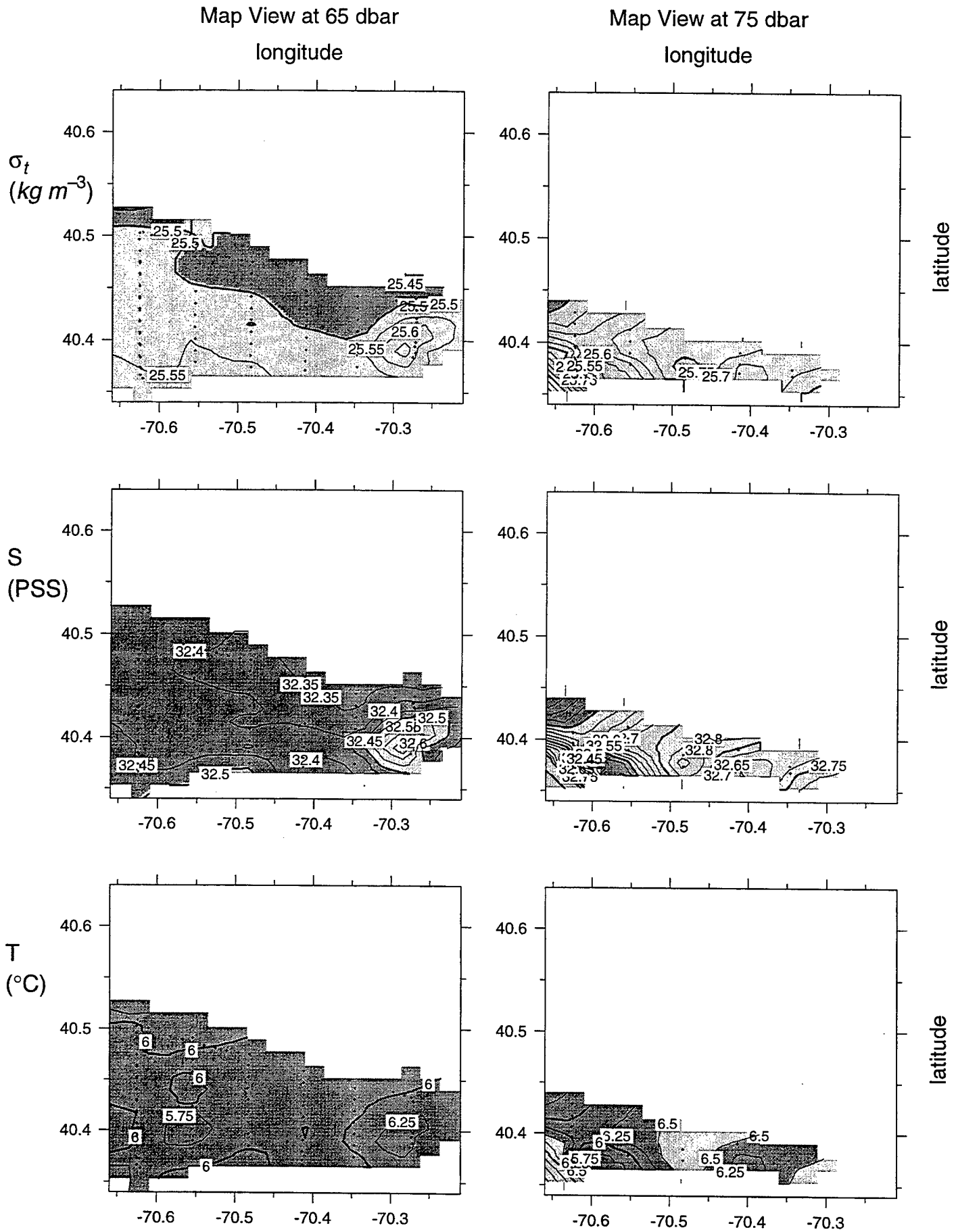
E9704 Small Box 9

09-May-97 01:59:04 - 09-May-97 21:11:00



E9704 Small Box 9

09-May-97 01:59:04 - 09-May-97 21:11:00

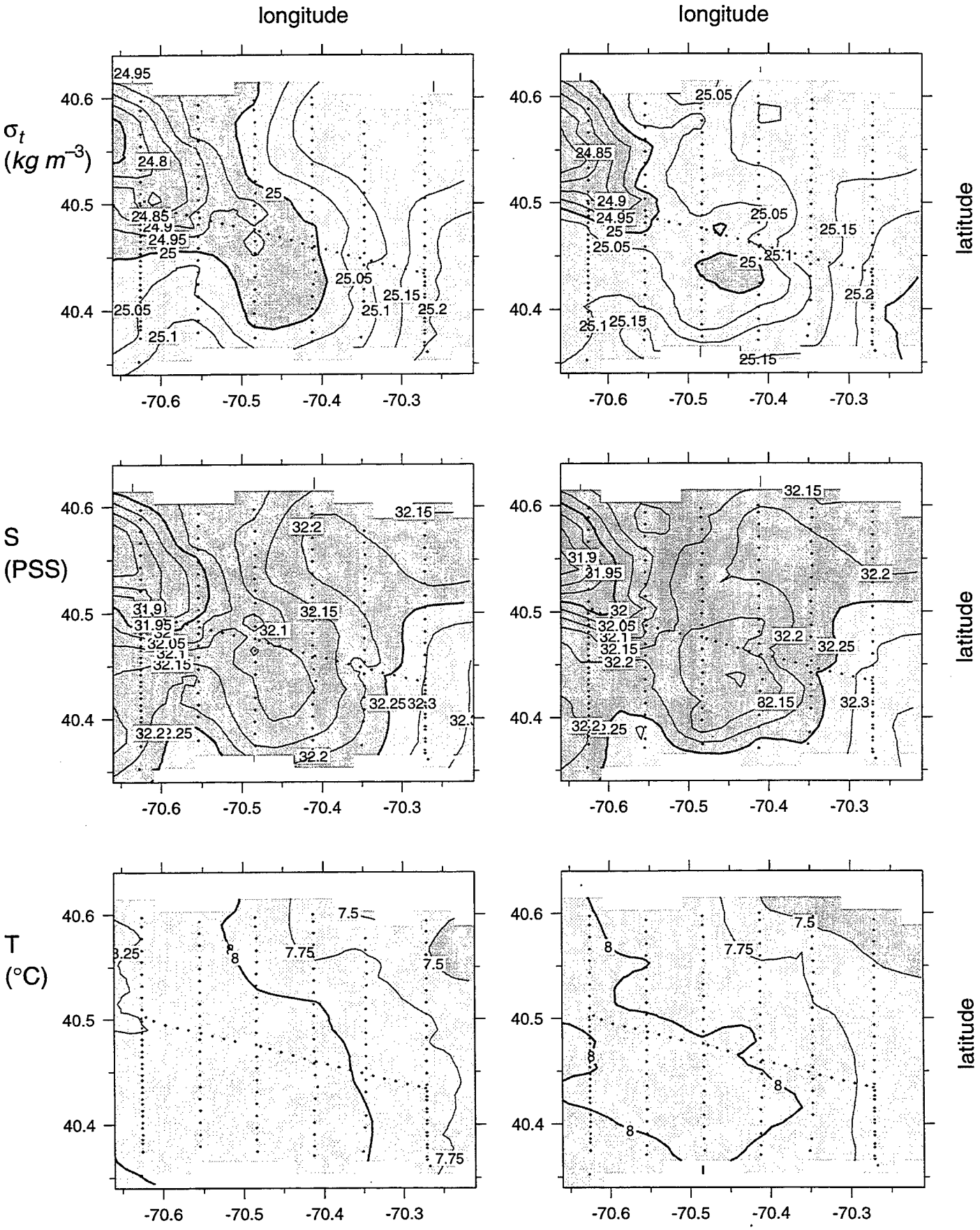


E9704 Small Box 10

09-May-97 21:42:31 - 10-May-97 16:59:49

Map View at 5 dbar

Map View at 15 dbar

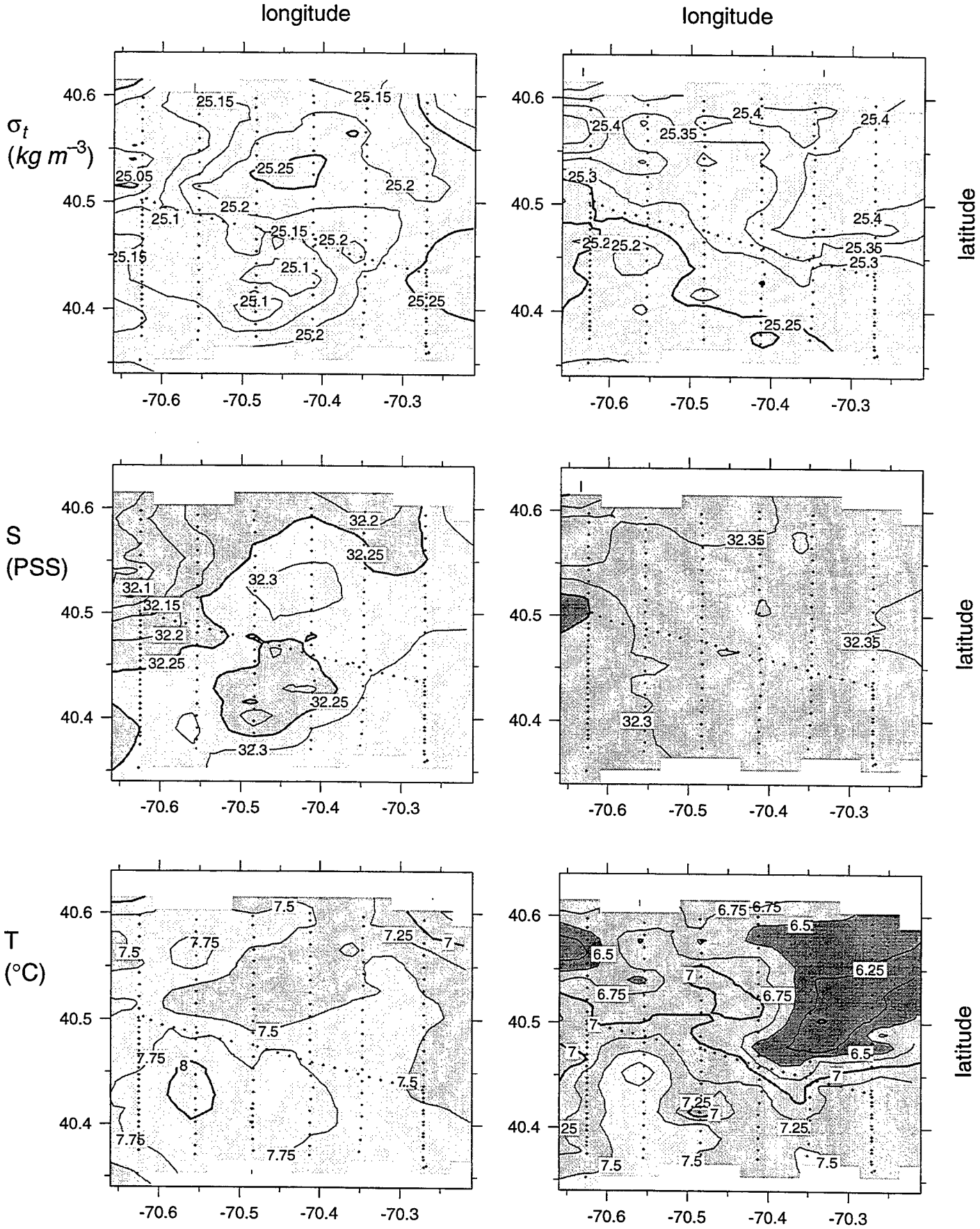


E9704 Small Box 10

09-May-97 21:42:31 - 10-May-97 16:59:49

Map View at 25 dbar

Map View at 35 dbar

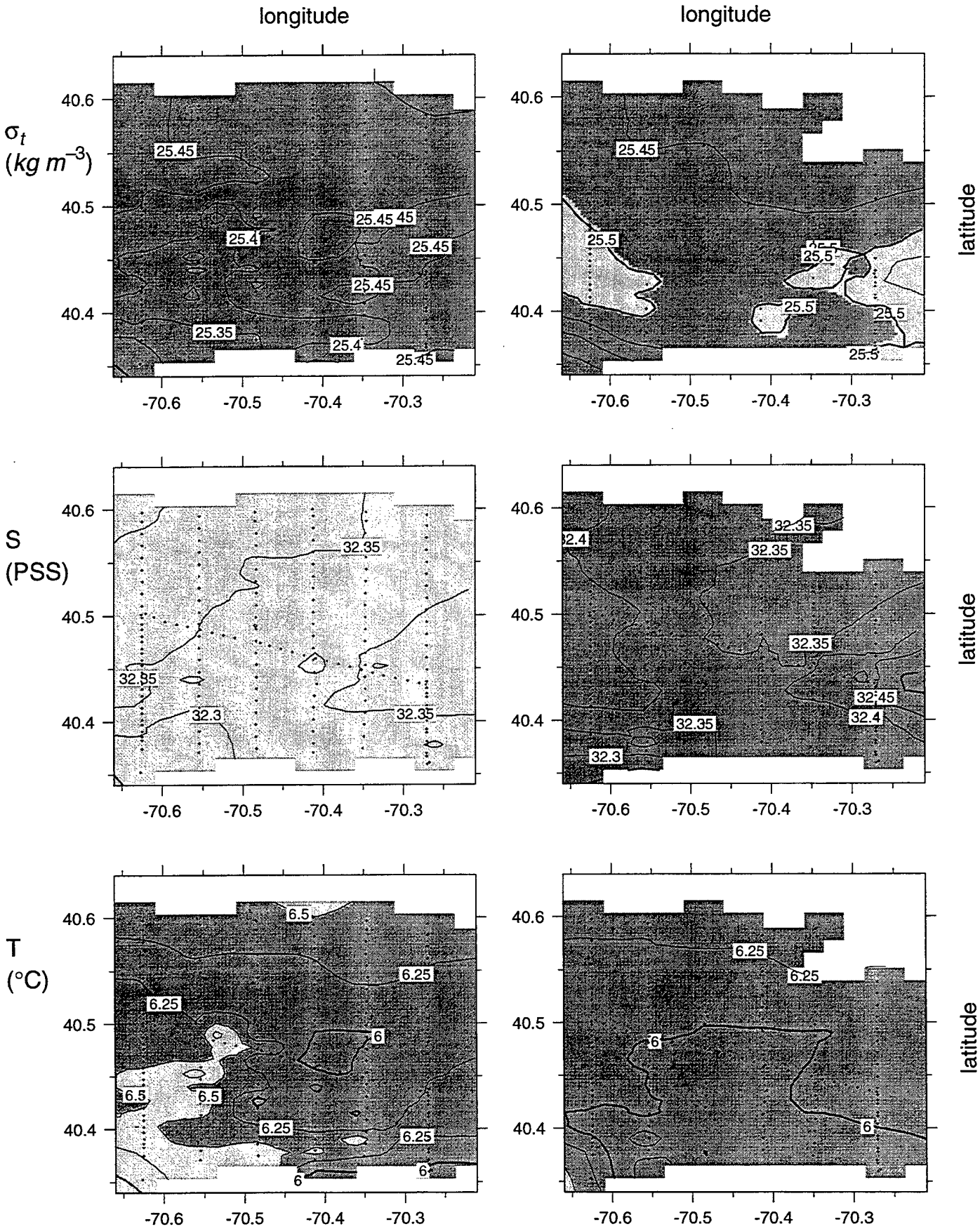


E9704 Small Box 10

09-May-97 21:42:31 - 10-May-97 16:59:49

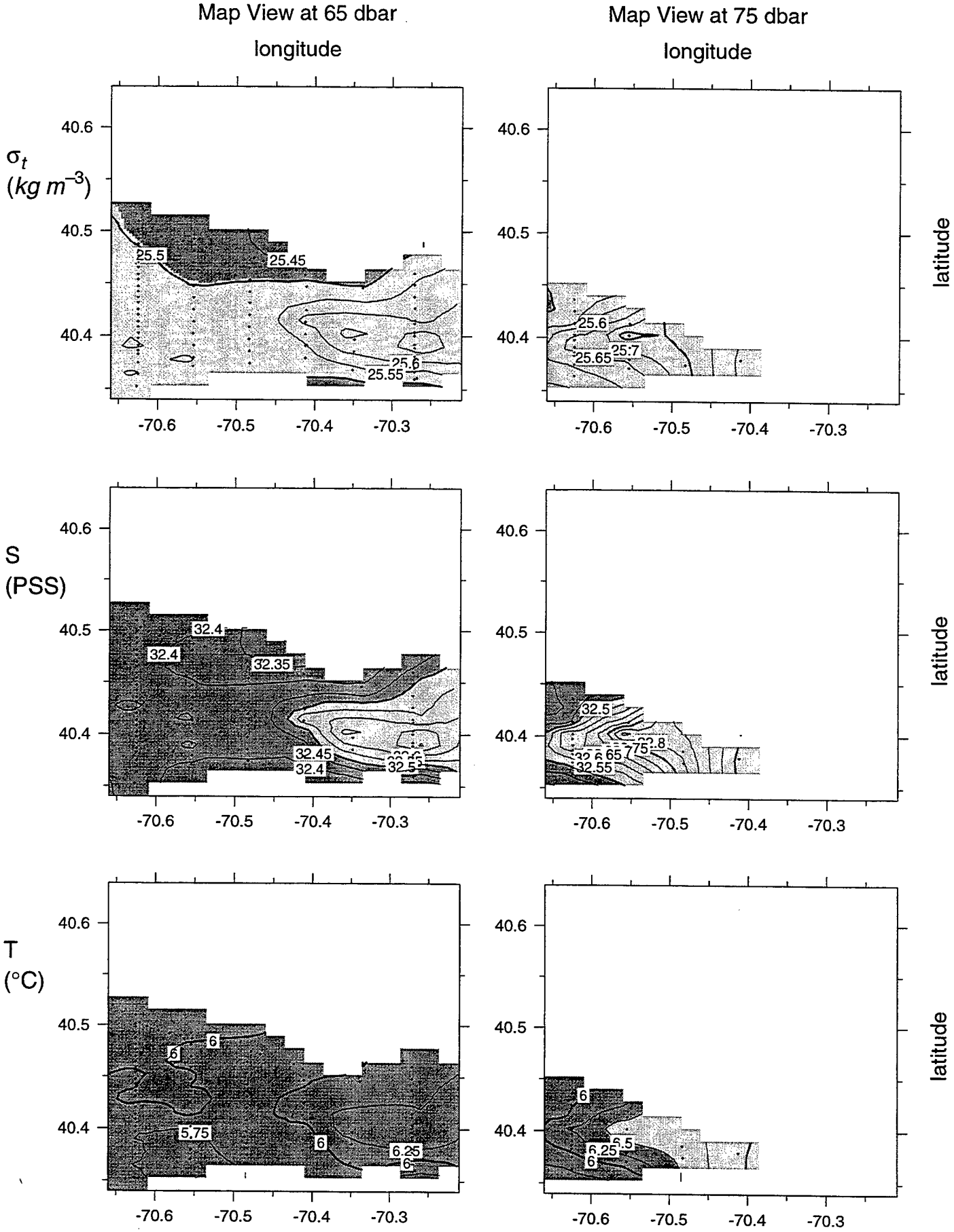
Map View at 45 dbar

Map View at 55 dbar



E9704 Small Box 10

09-May-97 21:42:31 - 10-May-97 16:59:49

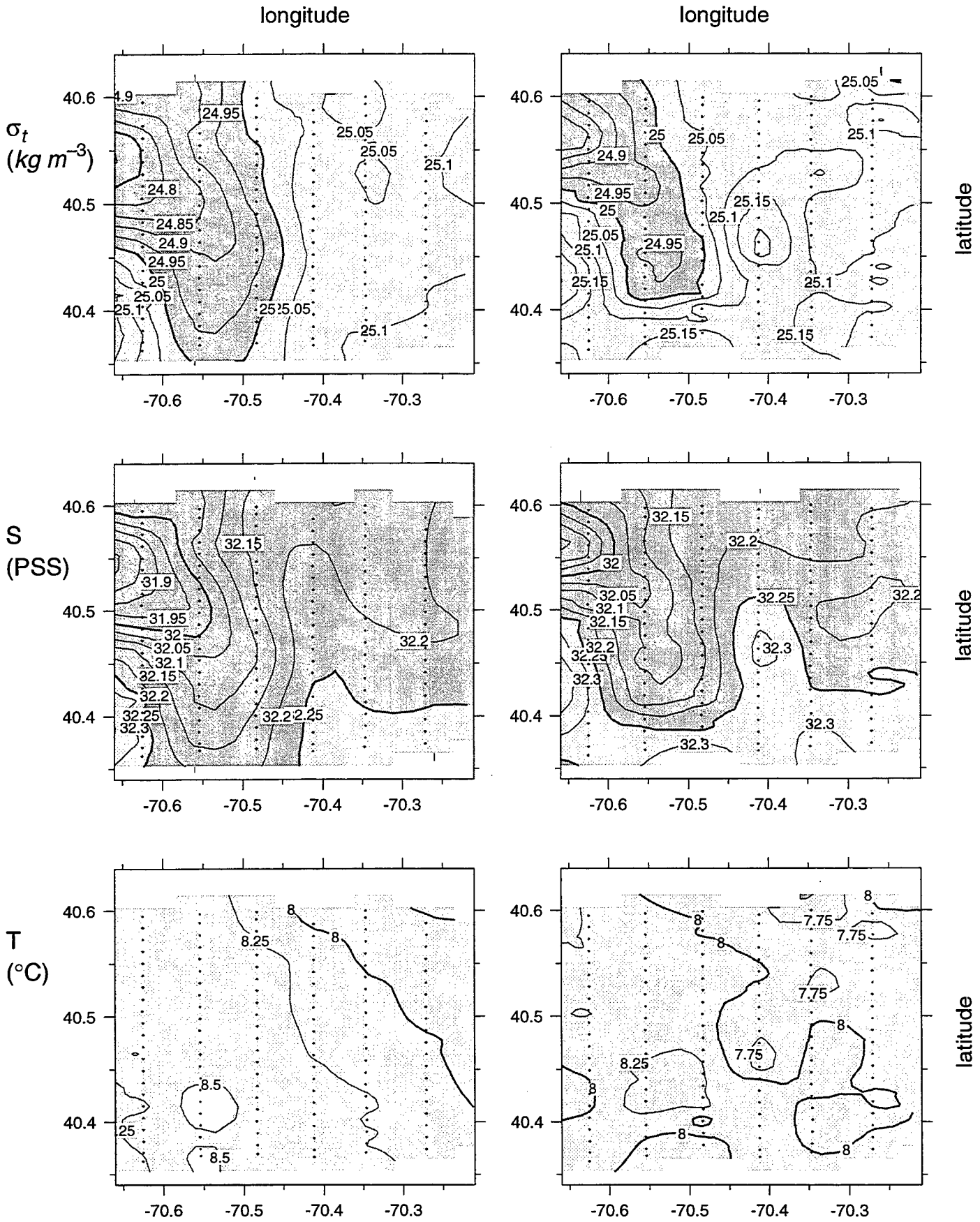


E9704 Small Box 11

11-May-97 11:24:37 - 12-May-97 02:08:15

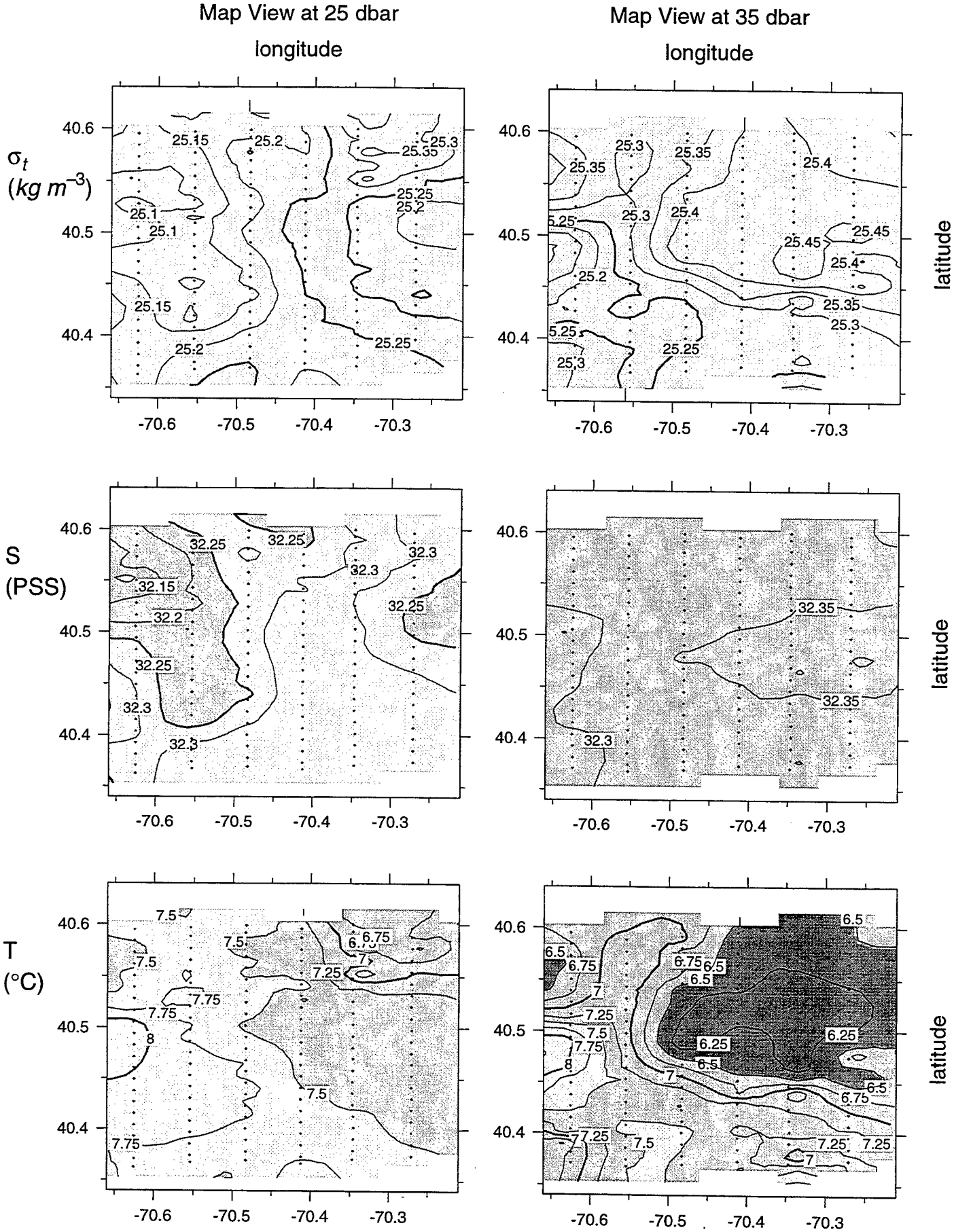
Map View at 5 dbar

Map View at 15 dbar



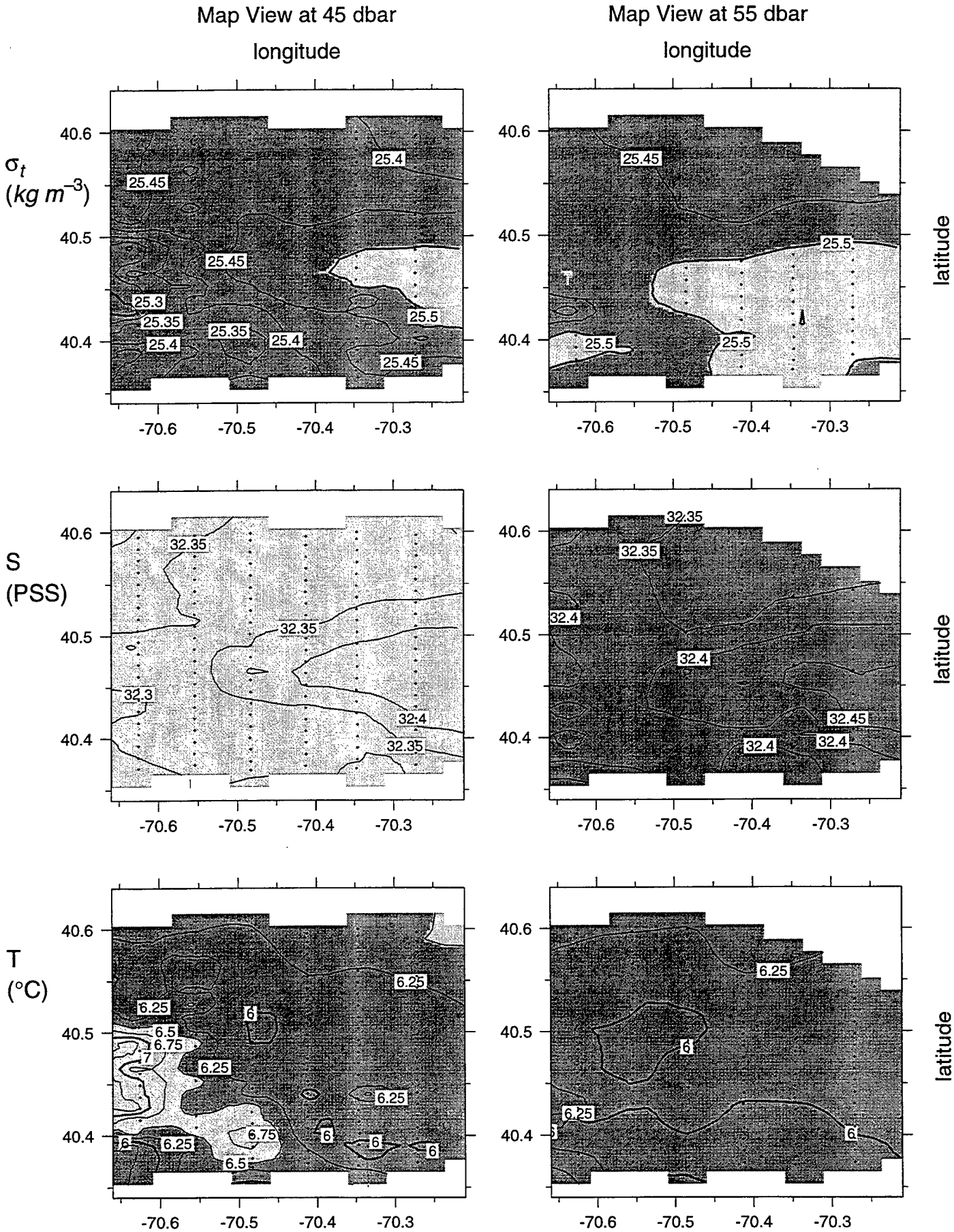
E9704 Small Box 11

11-May-97 11:24:37 - 12-May-97 02:08:15



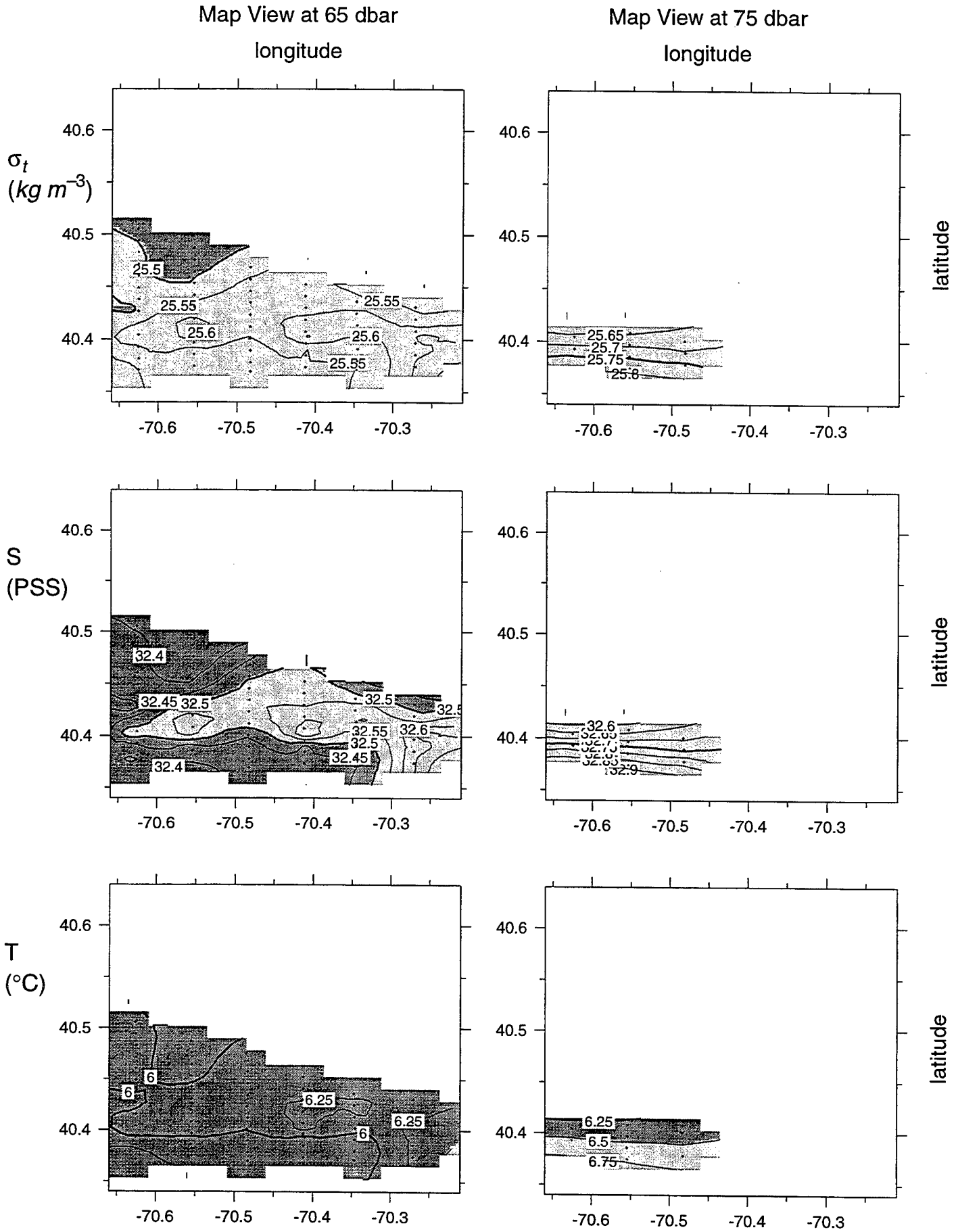
E9704 Small Box 11

11-May-97 11:24:37 - 12-May-97 02:08:15



E9704 Small Box 11

11-May-97 11:24:37 - 12-May-97 02:08:15

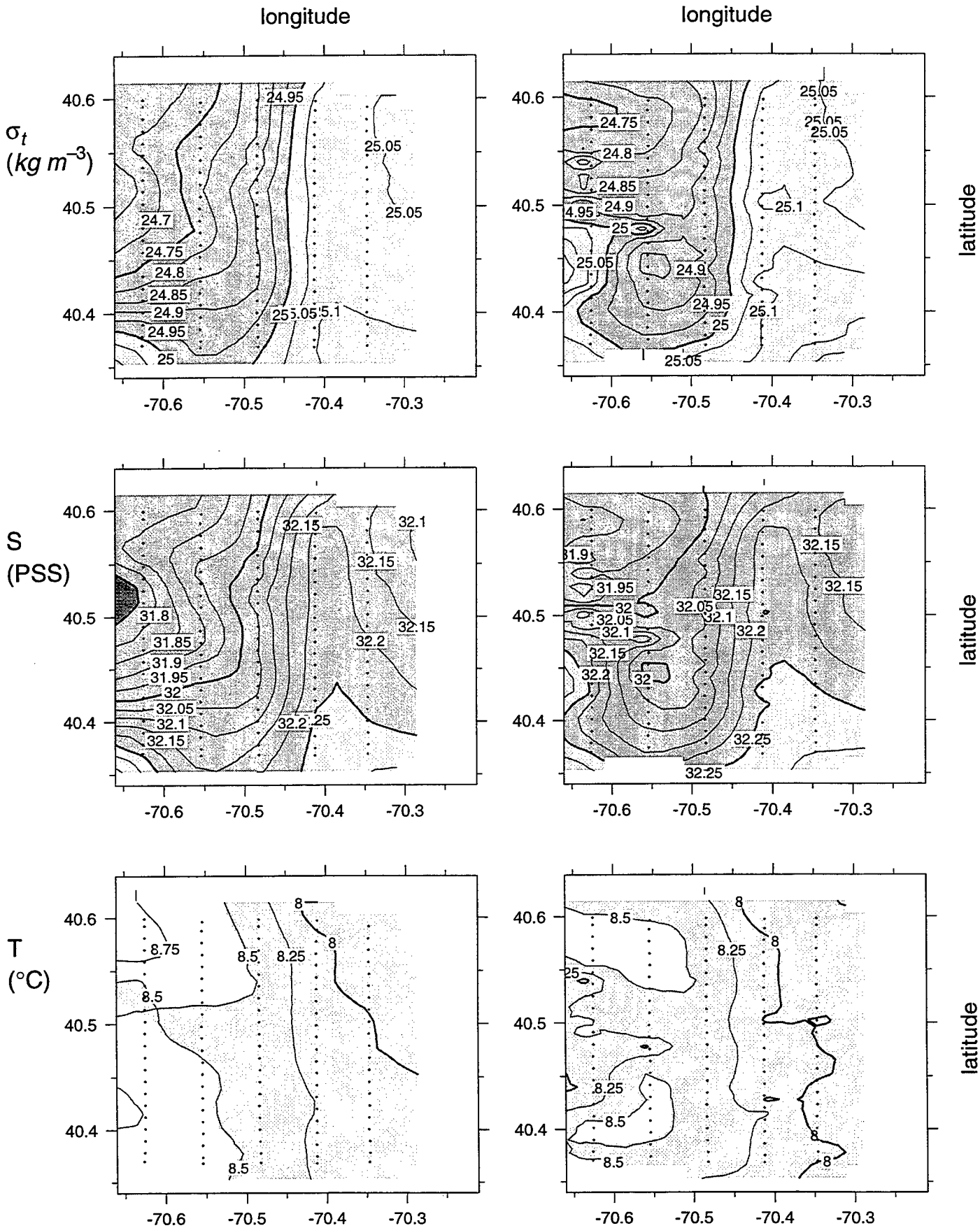


E9704 Small Box 12

12-May-97 02:44:31 - 12-May-97 14:52:34

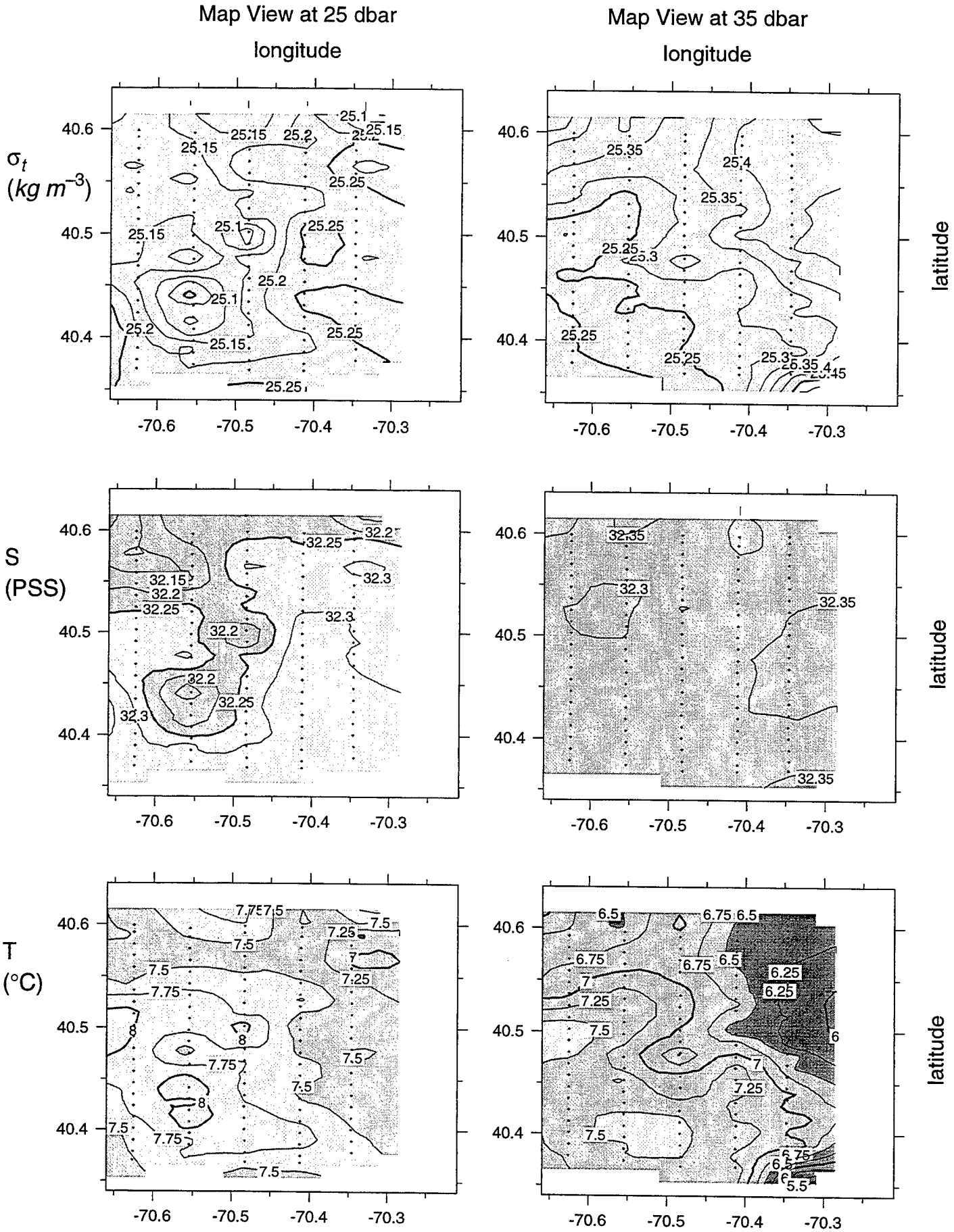
Map View at 5 dbar

Map View at 15 dbar



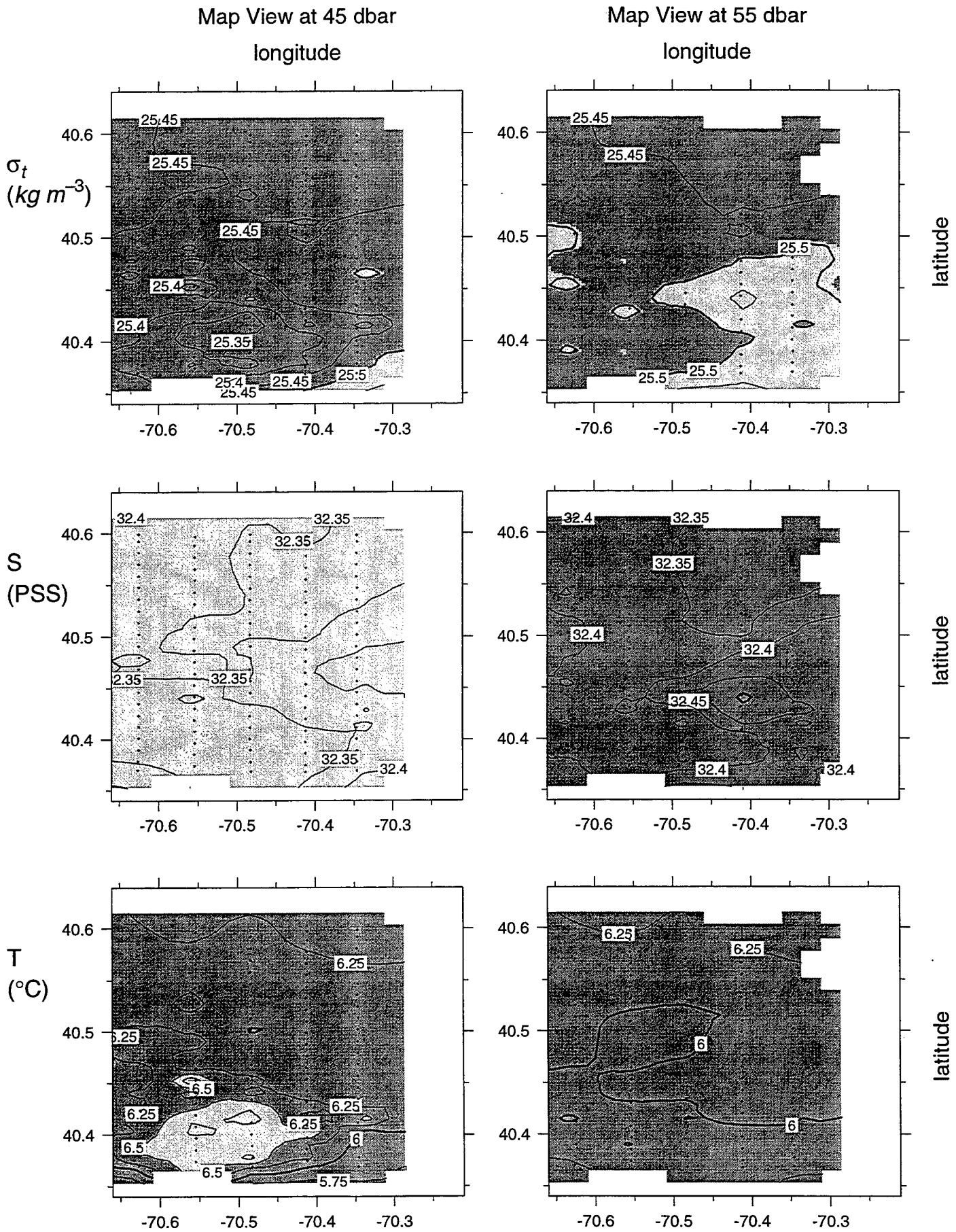
E9704 Small Box 12

12-May-97 02:44:31 - 12-May-97 14:52:34



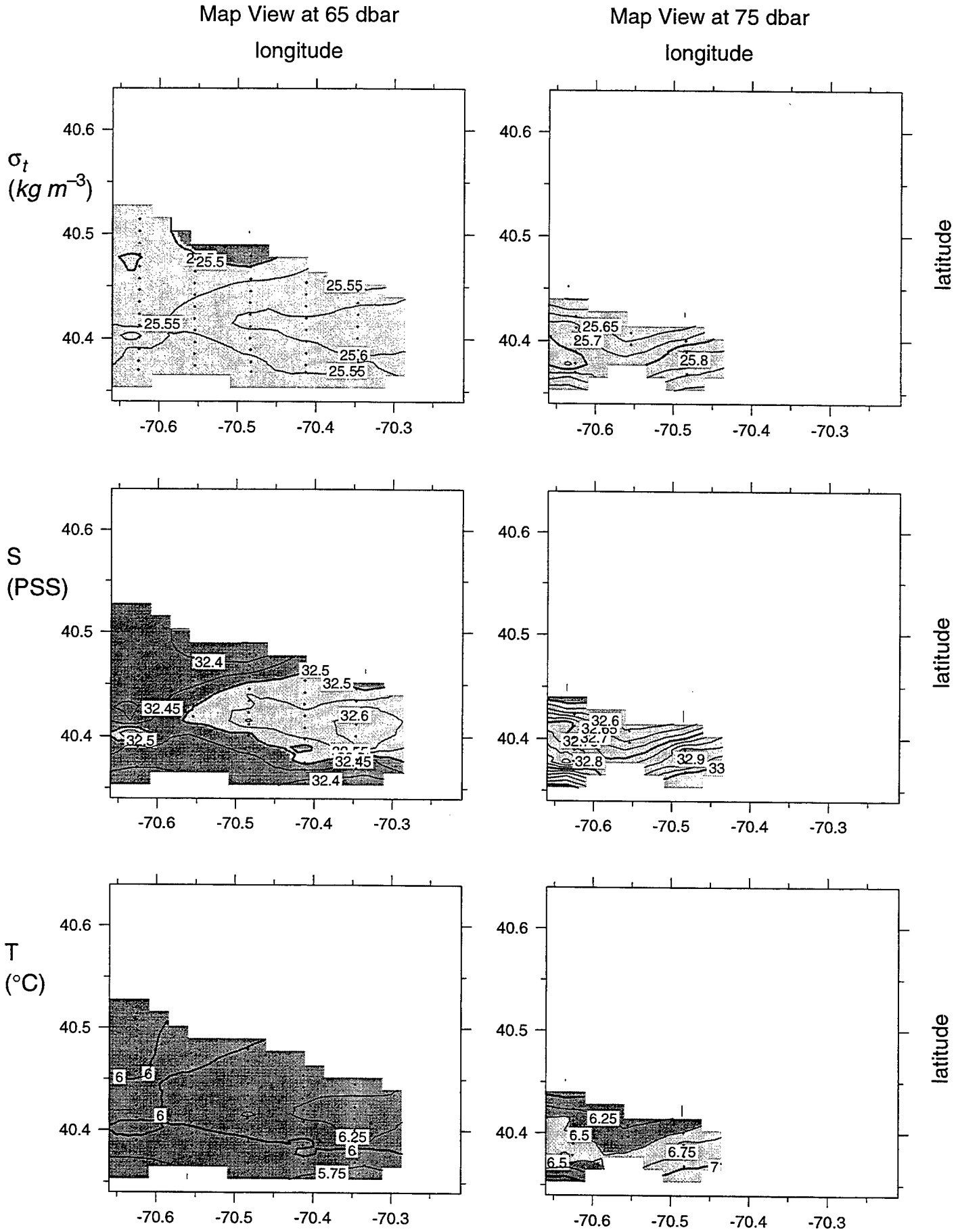
E9704 Small Box 12

12-May-97 02:44:31 - 12-May-97 14:52:34



E9704 Small Box 12

12-May-97 02:44:31 - 12-May-97 14:52:34

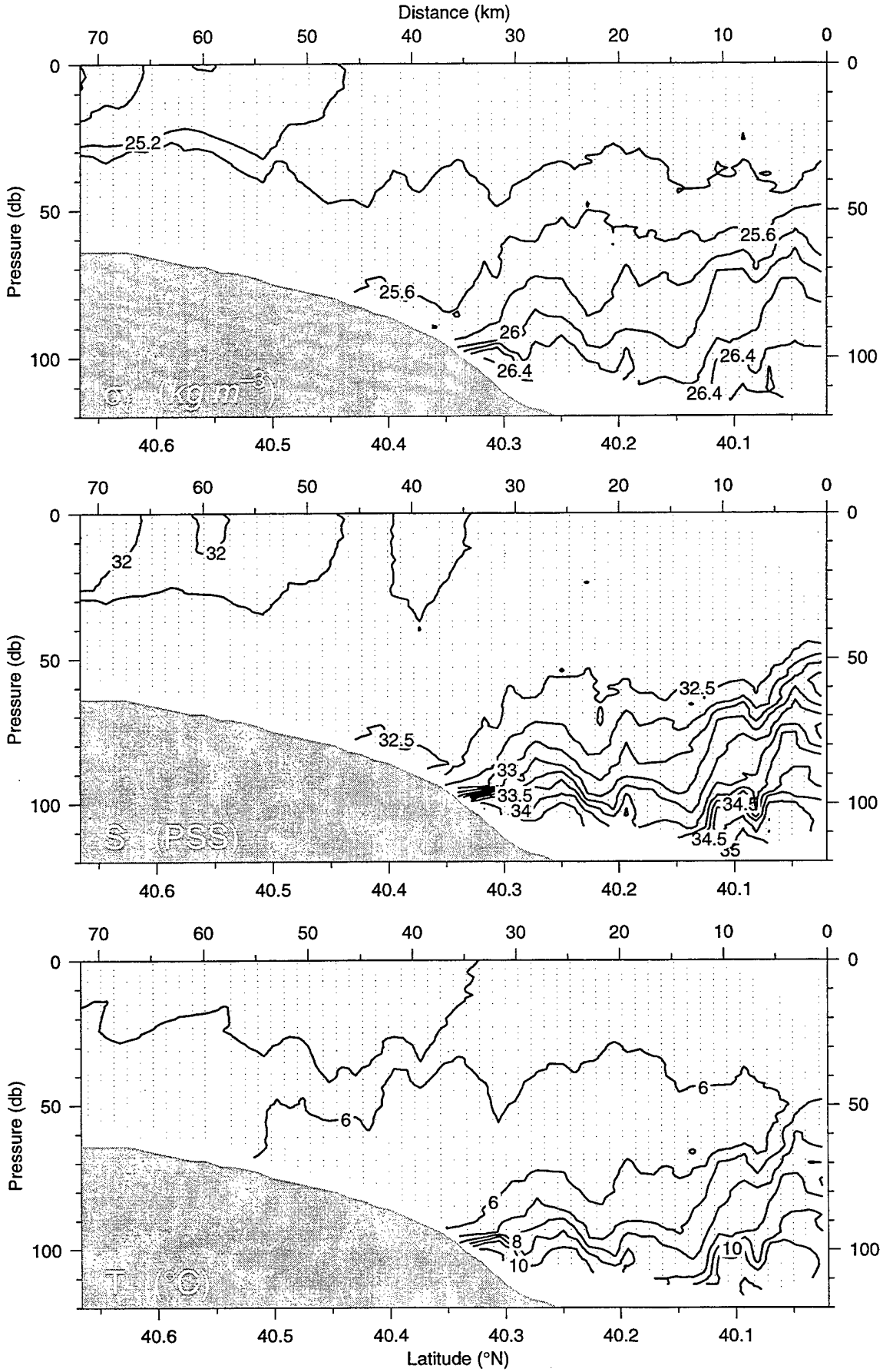


E9704 Vertical Sections of Temperature, Salinity and σ_t

E9704 Big Box 1

04-May-97 12:38:22 - 04-May-97 19:04:20

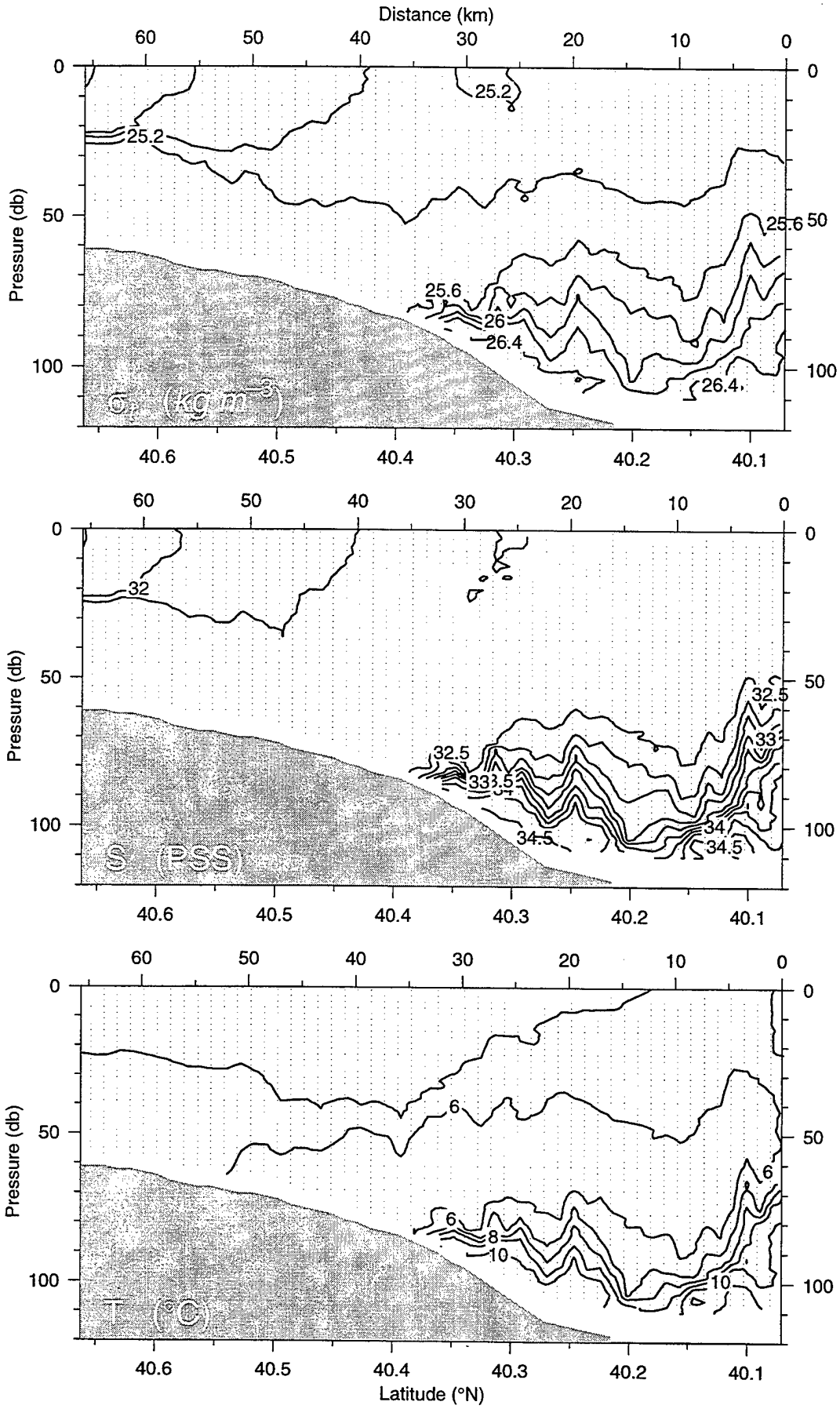
Line A



E9704 Big Box 1

04-May-97 20:06:22 - 05-May-97 01:40:14

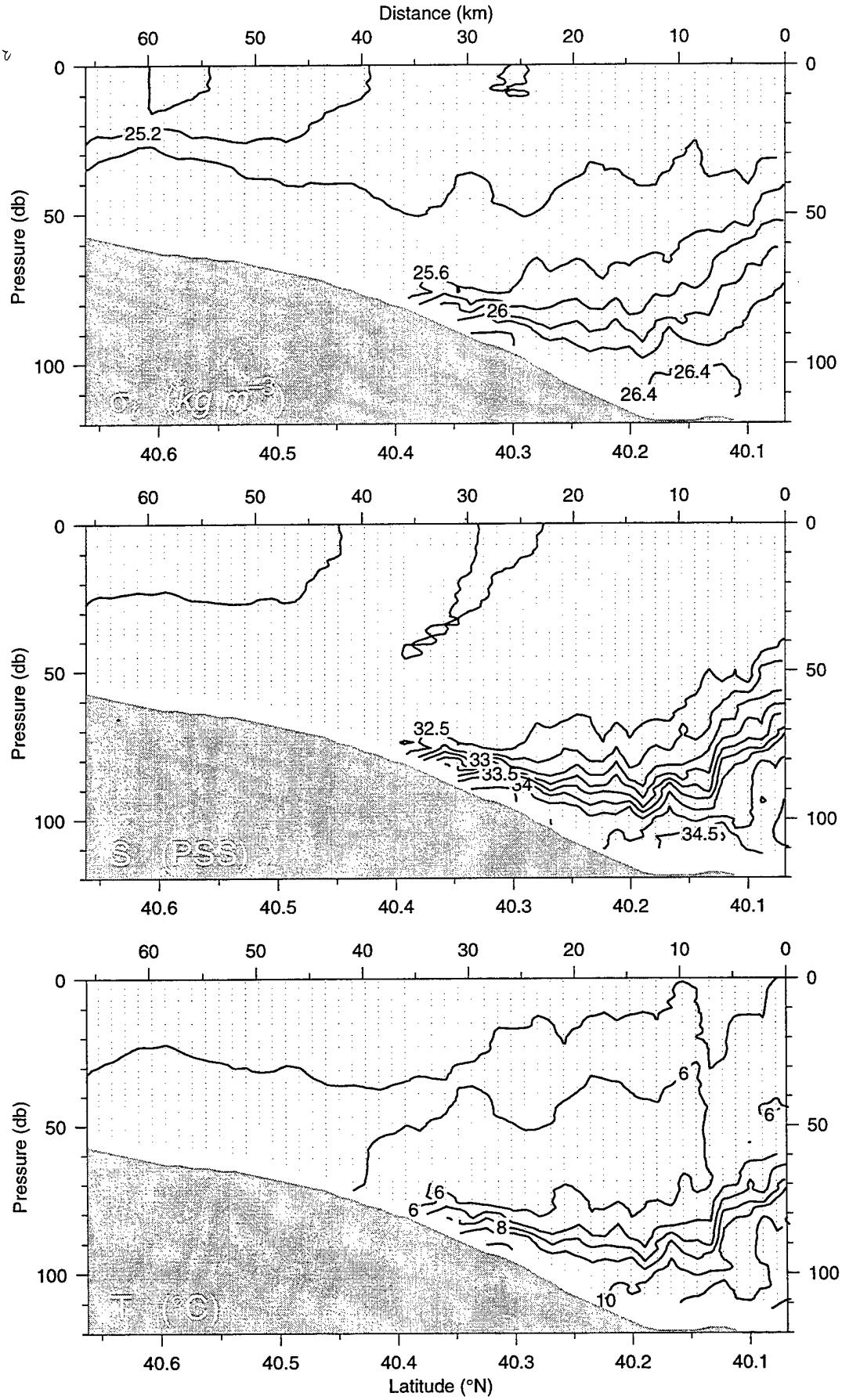
Line B



E9704 Big Box 1

05-May-97 02:45:26 - 05-May-97 08:13:58

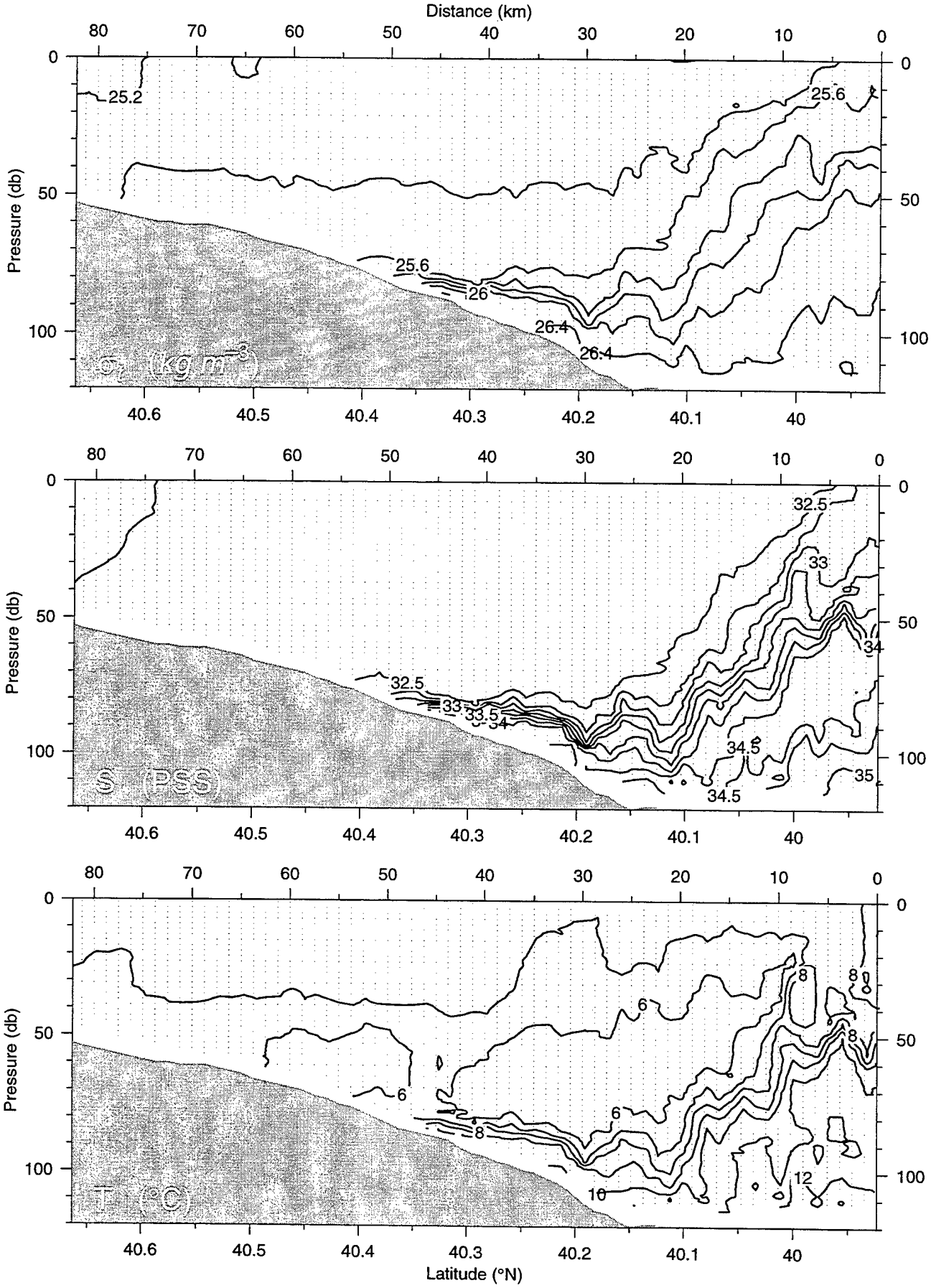
Line C



E9704 Big Box 1

05-May-97 09:18:48 - 05-May-97 16:01:08

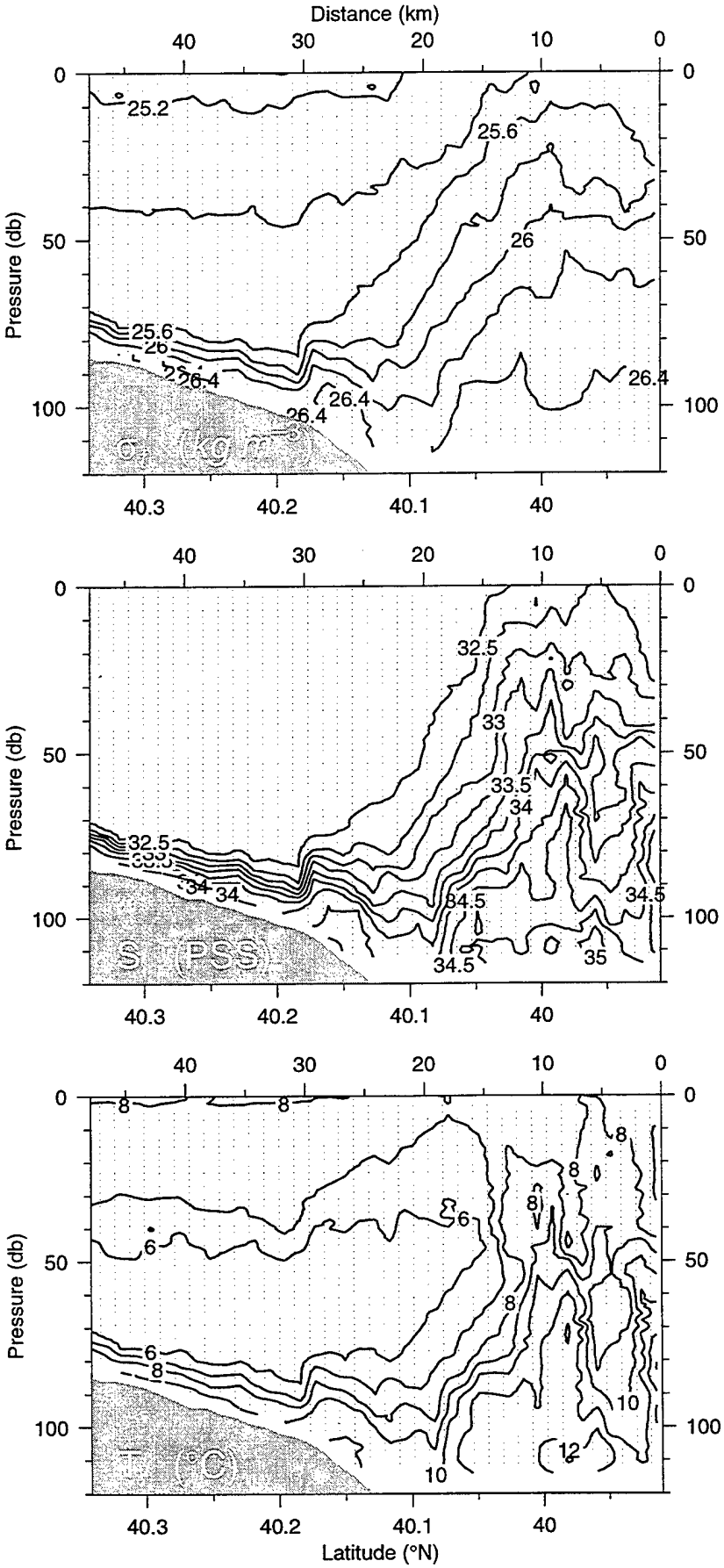
Line D



E9704 Big Box 1

05-May-97 17:07:38 - 05-May-97 20:44:14

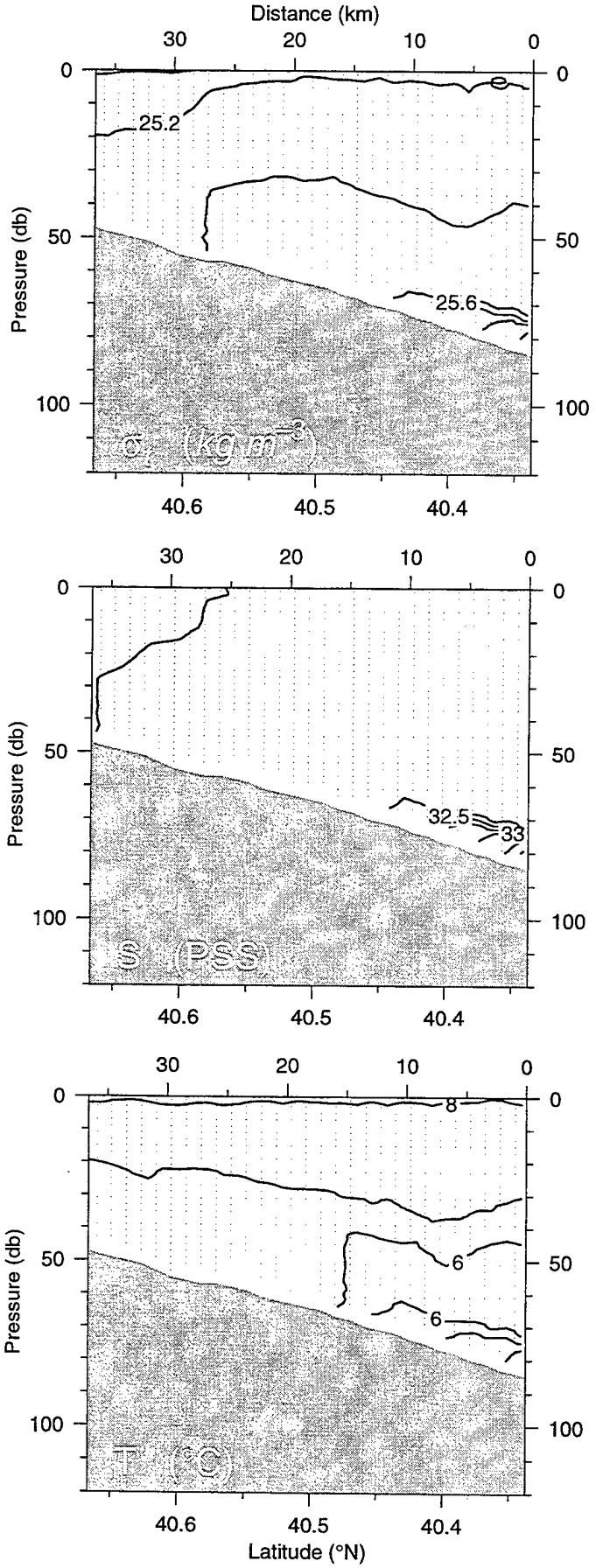
Line E1



E9704 Big Box 1

05-May-97 21:50:34 - 06-May-97 00:32:36

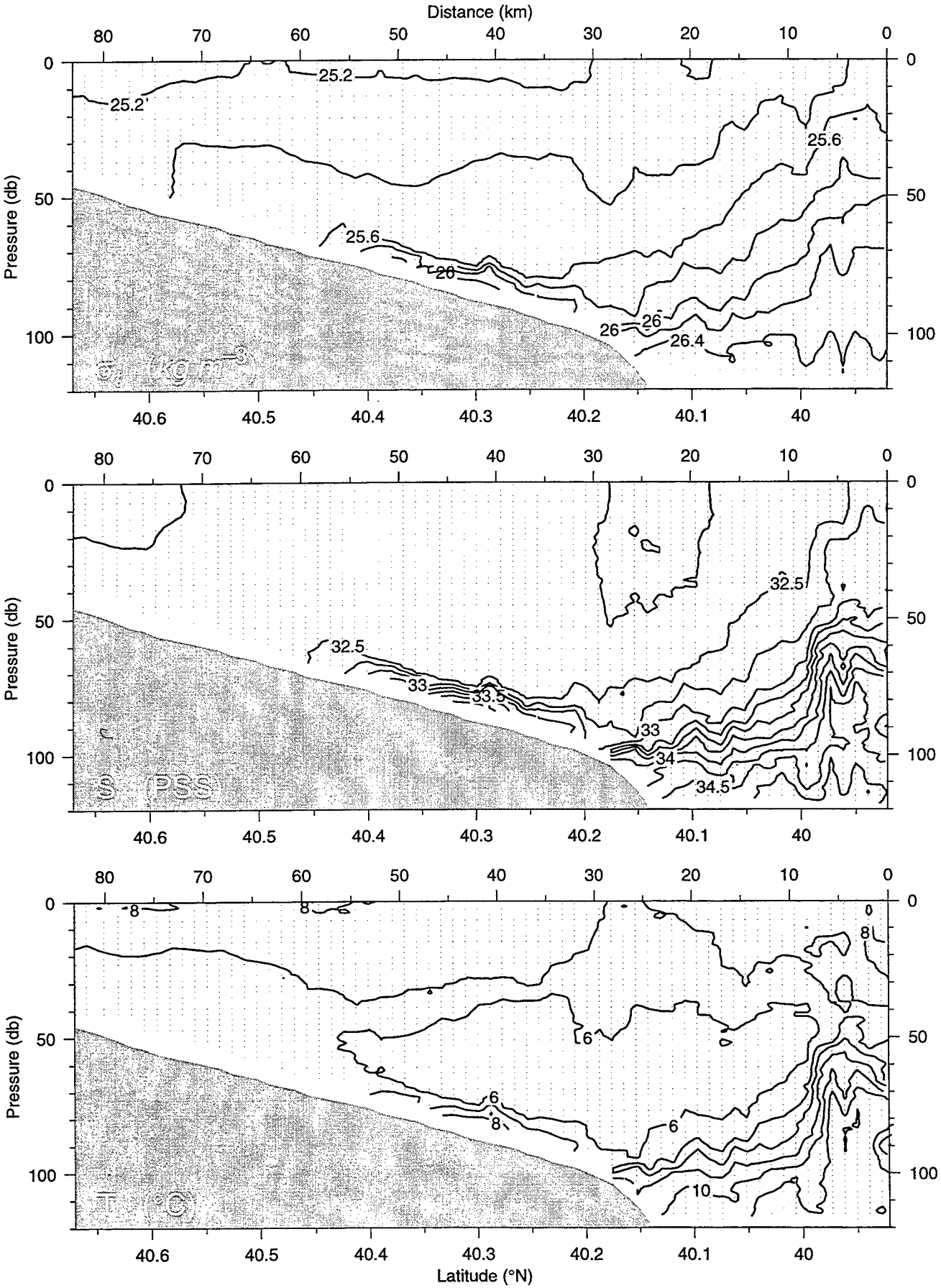
Line E2



E9704 Big Box 1

06-May-97 03:39:23 - 06-May-97 10:14:46

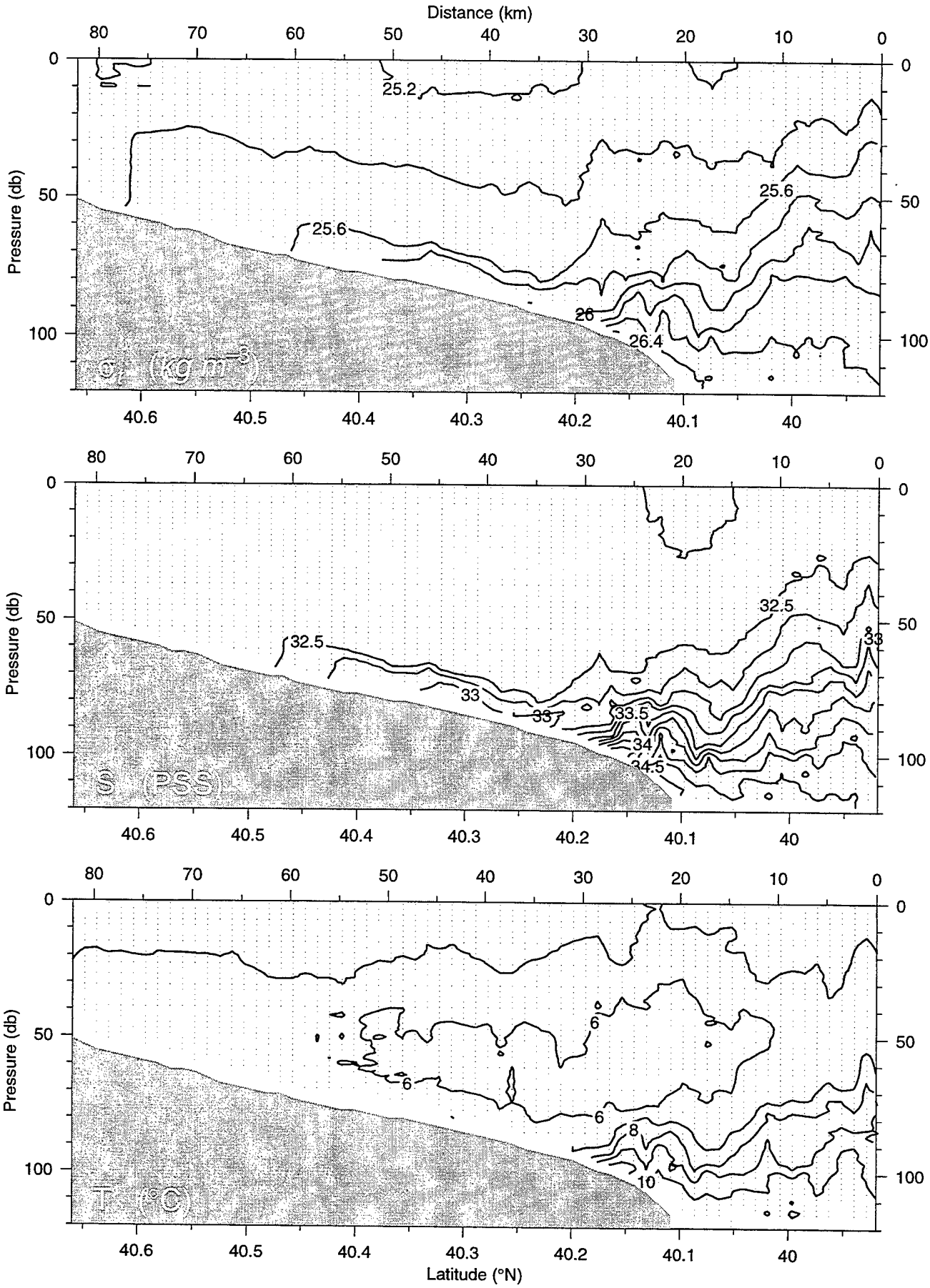
Line F



E9704 Big Box 1

06-May-97 11:12:01 - 06-May-97 17:29:08

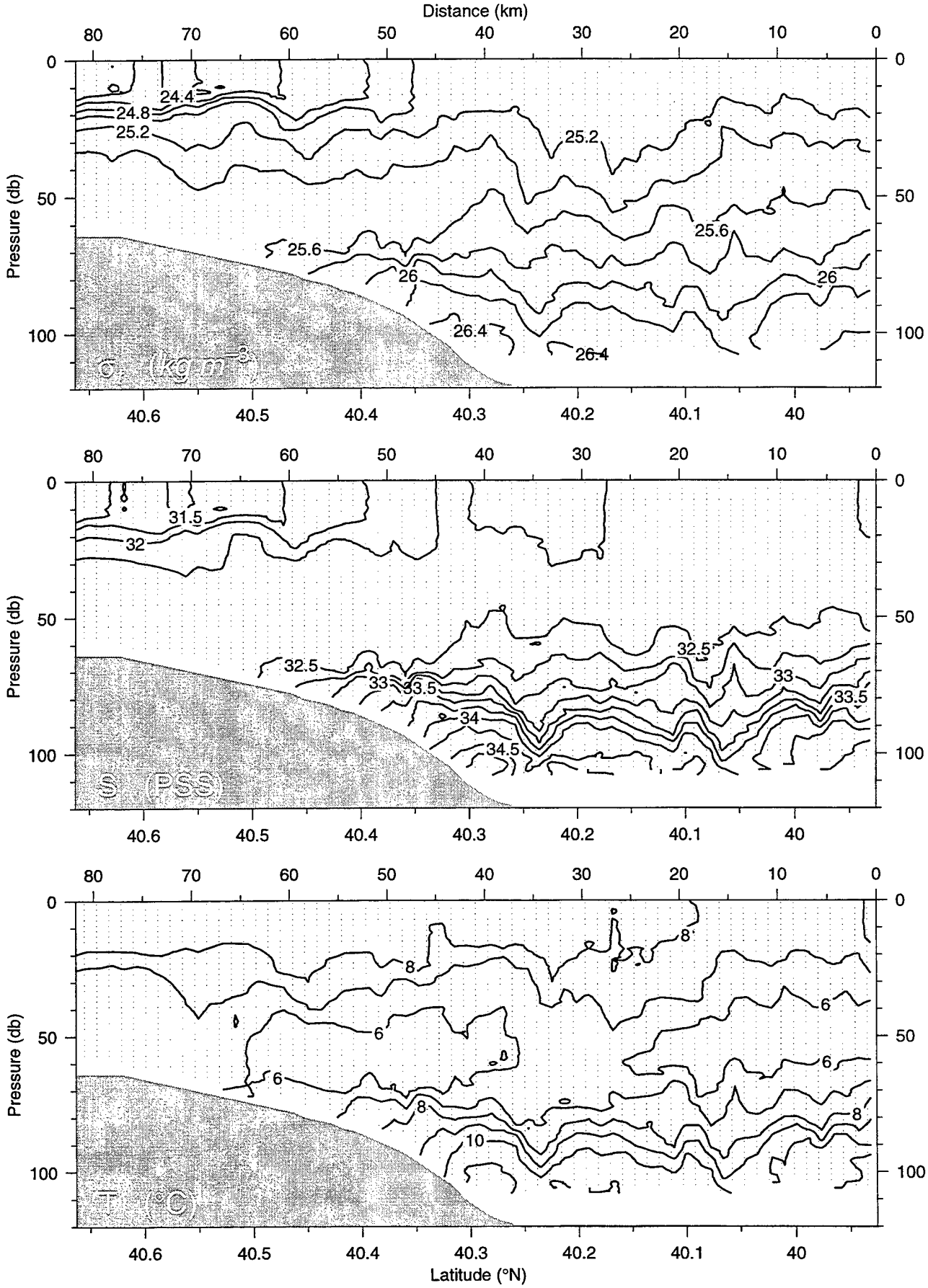
Line G



E9704 Big Box 2

13-May-97 00:27:41 - 13-May-97 06:50:59

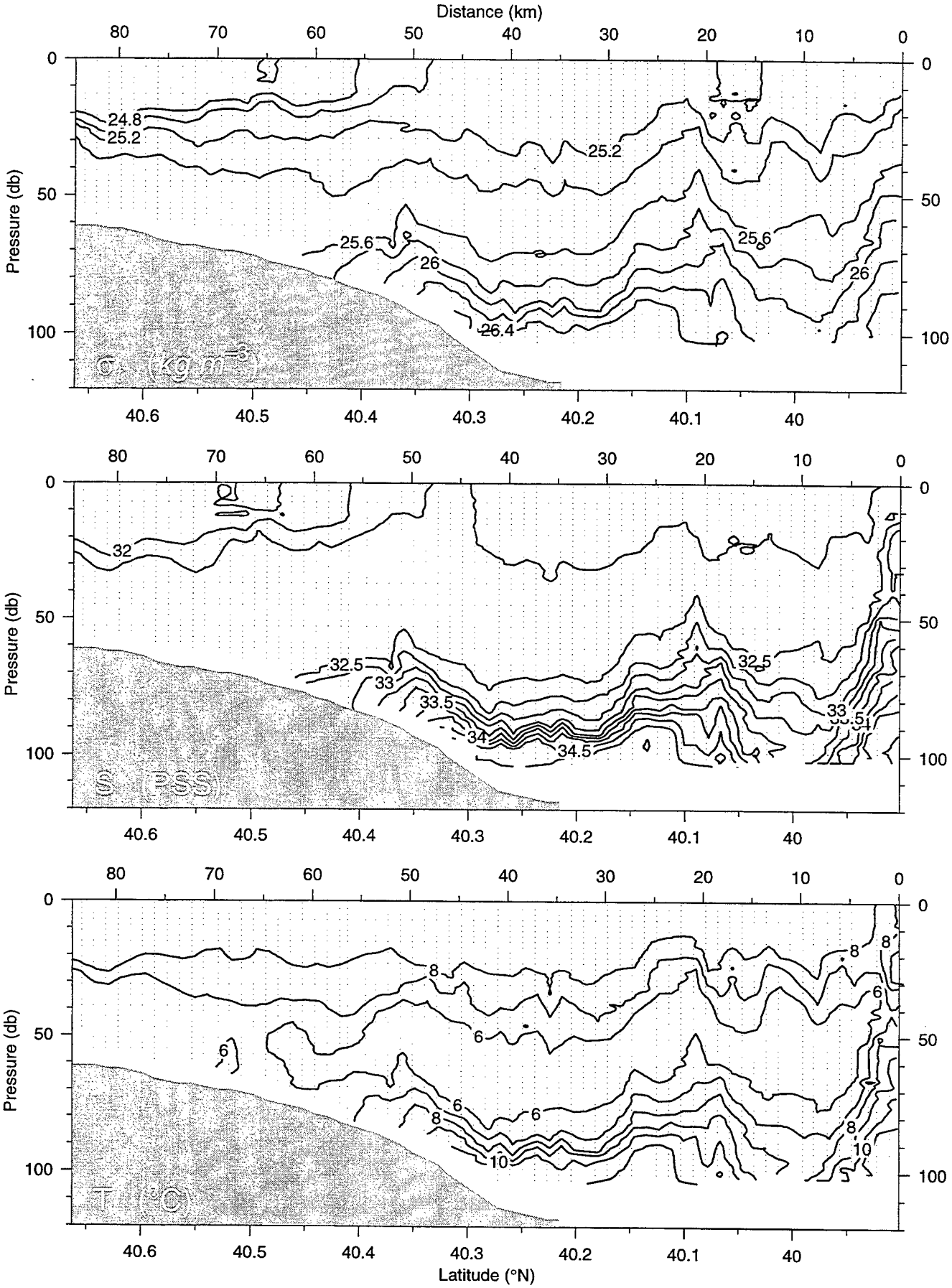
Line A



E9704 Big Box 2

13-May-97 07:50:05 - 13-May-97 14:17:48

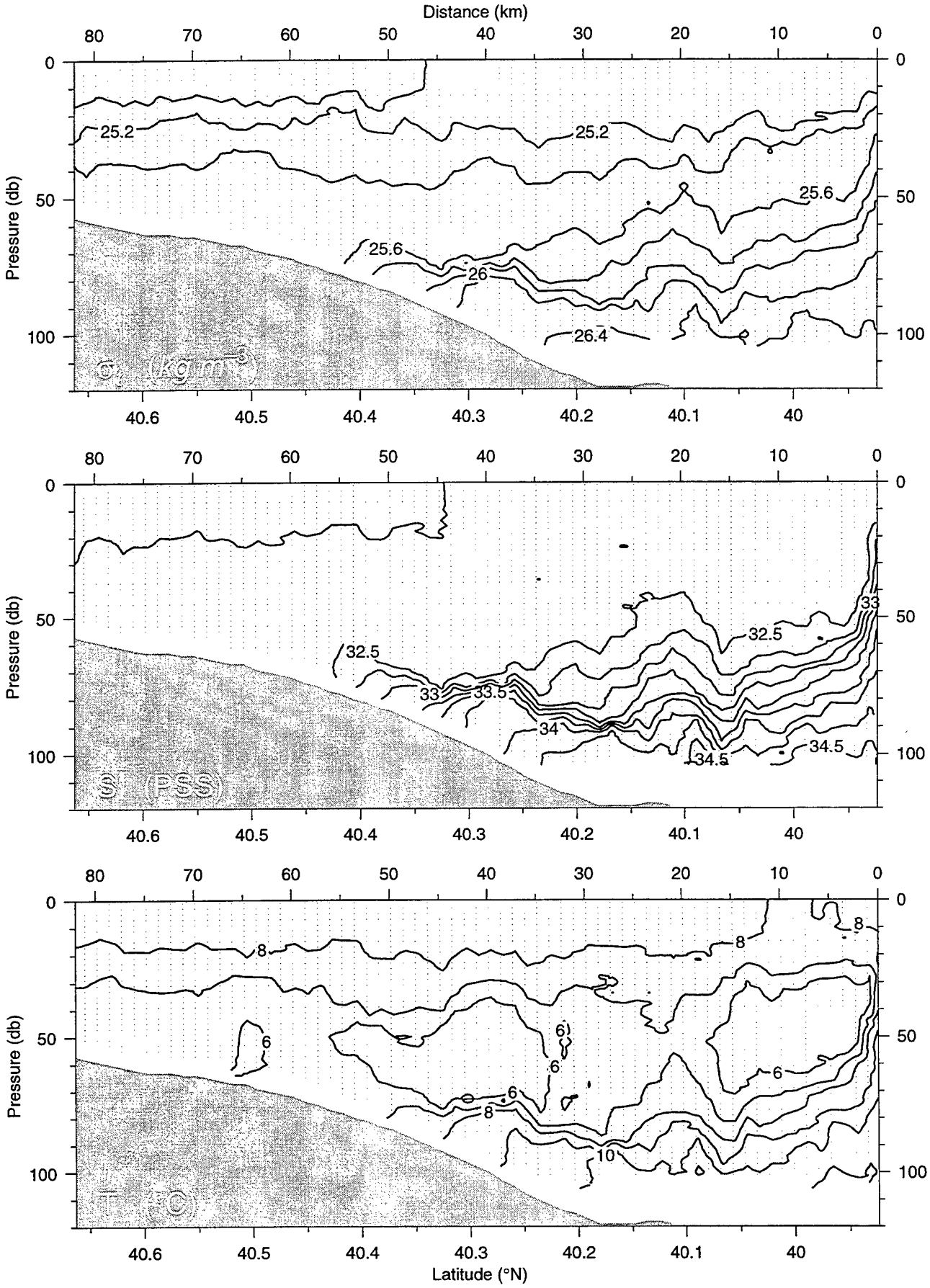
Line B



E9704 Big Box 2

12-May-97 16:01:45 - 12-May-97 22:33:52

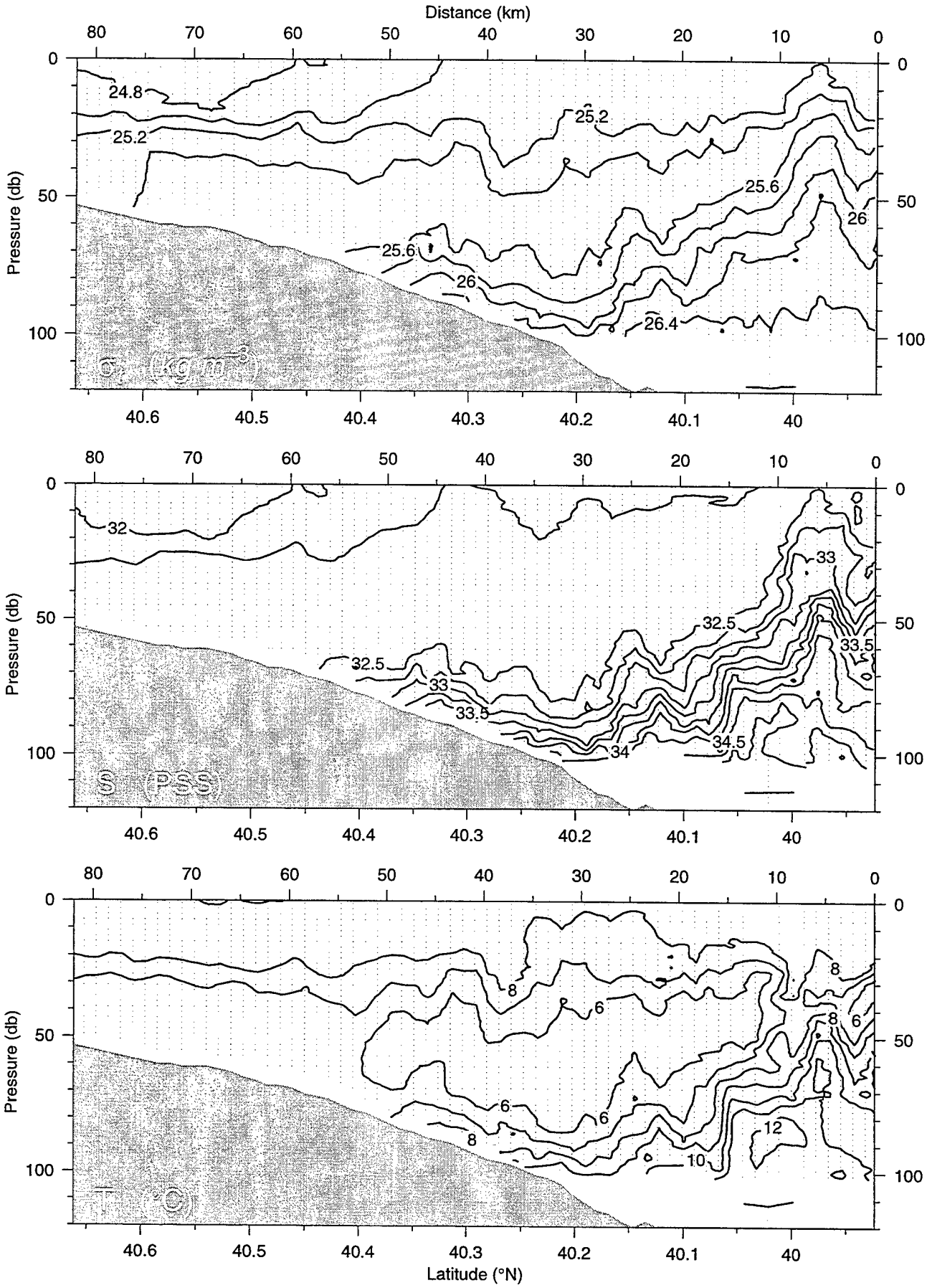
Line C



E9704 Big Box 2

13-May-97 19:00:44 - 14-May-97 01:32:10

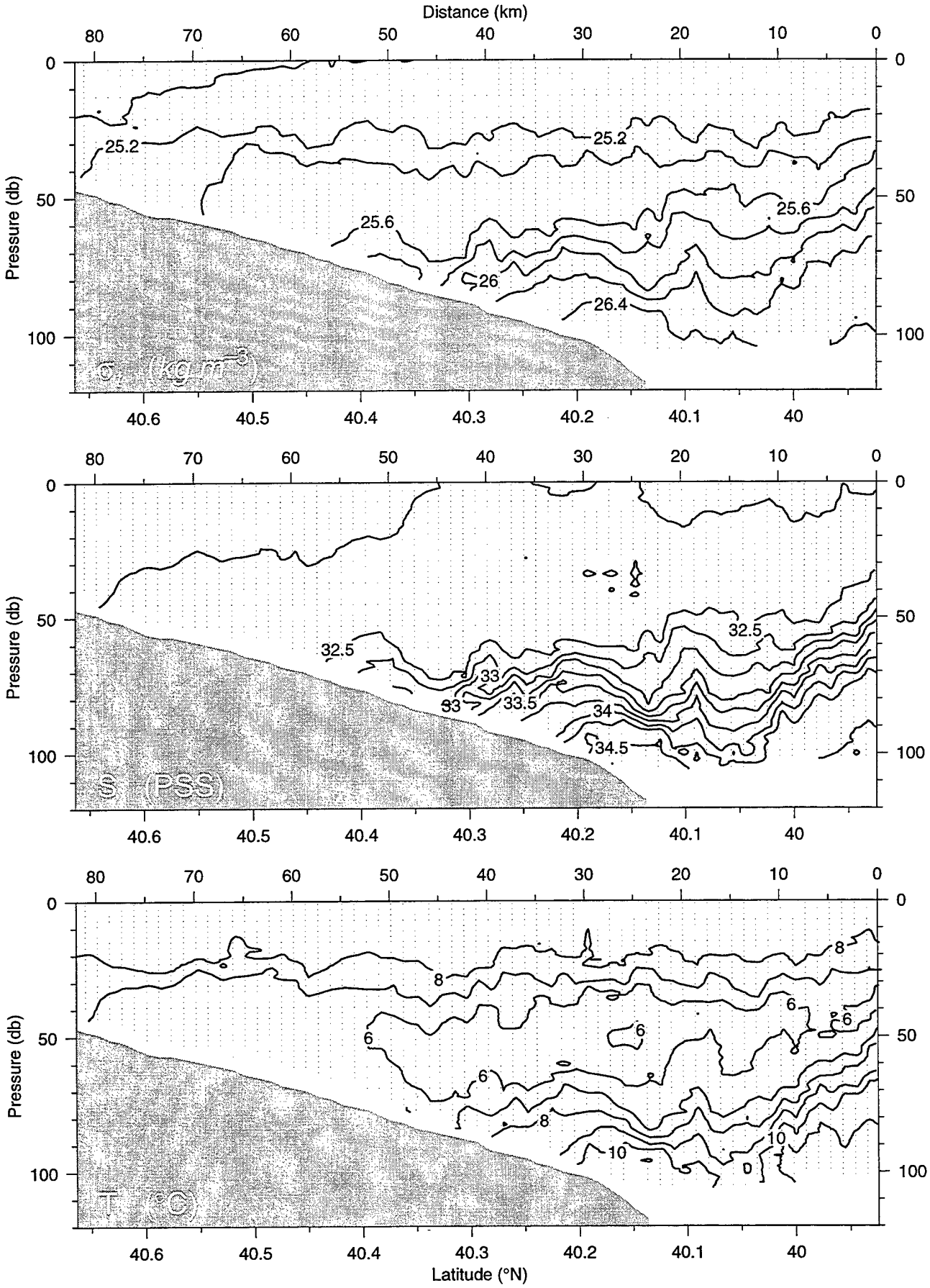
Line D



E9704 Big Box 2

14-May-97 02:32:32 - 14-May-97 08:49:01

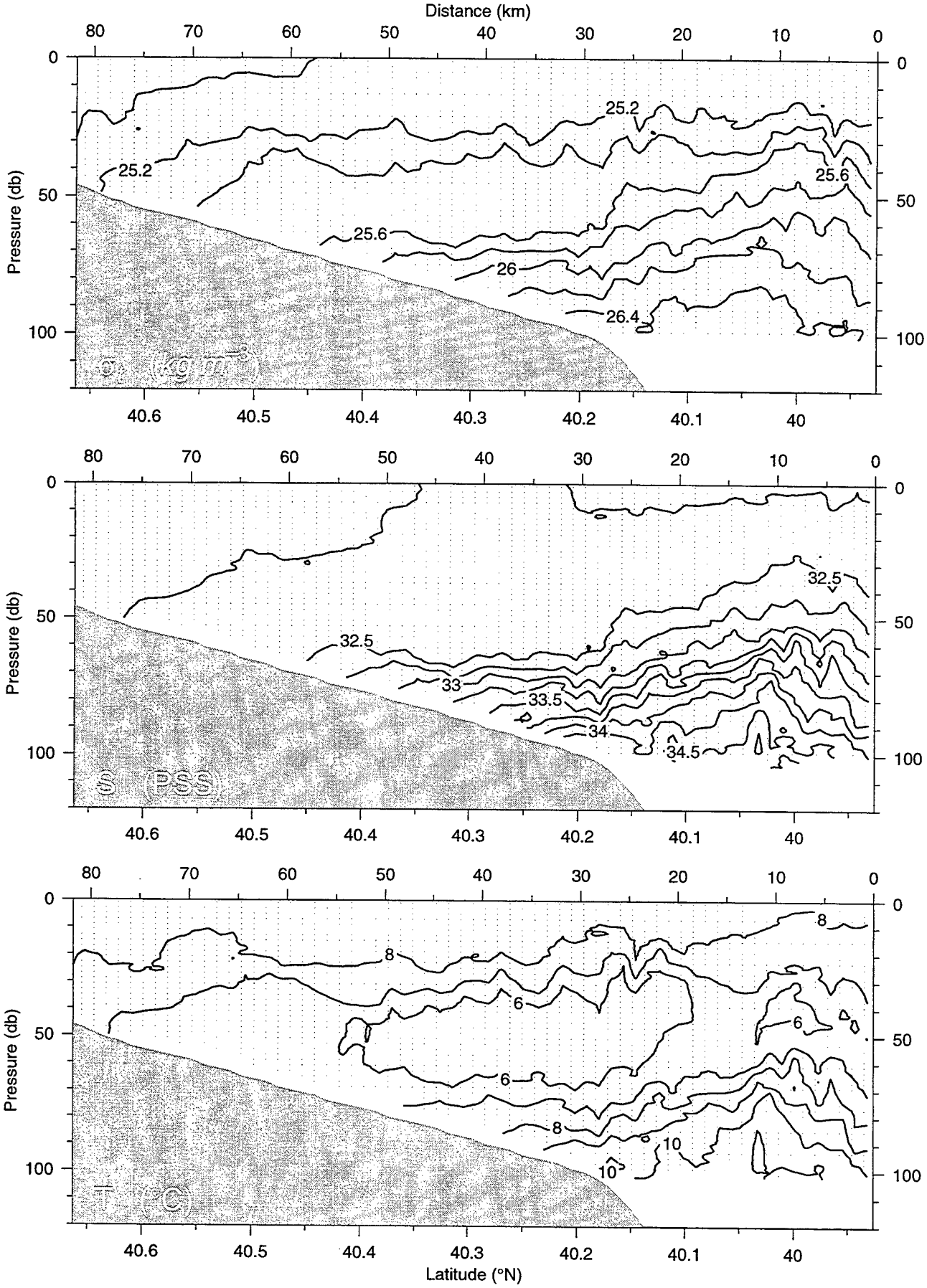
Line E



E9704 Big Box 2

14-May-97 09:46:45 - 14-May-97 15:30:32

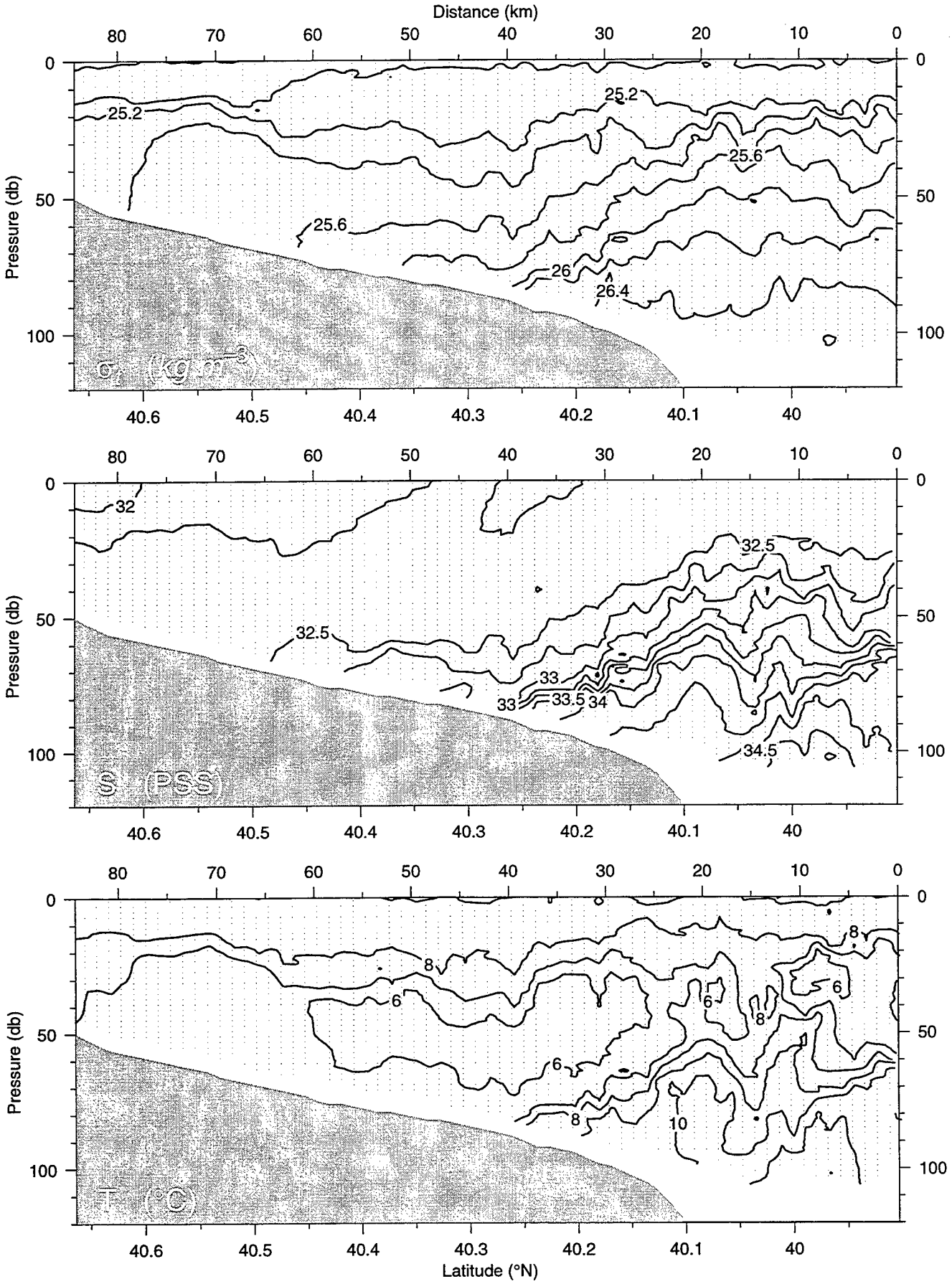
Line F



E9704 Big Box 2

14-May-97 16:30:40 - 14-May-97 23:03:38

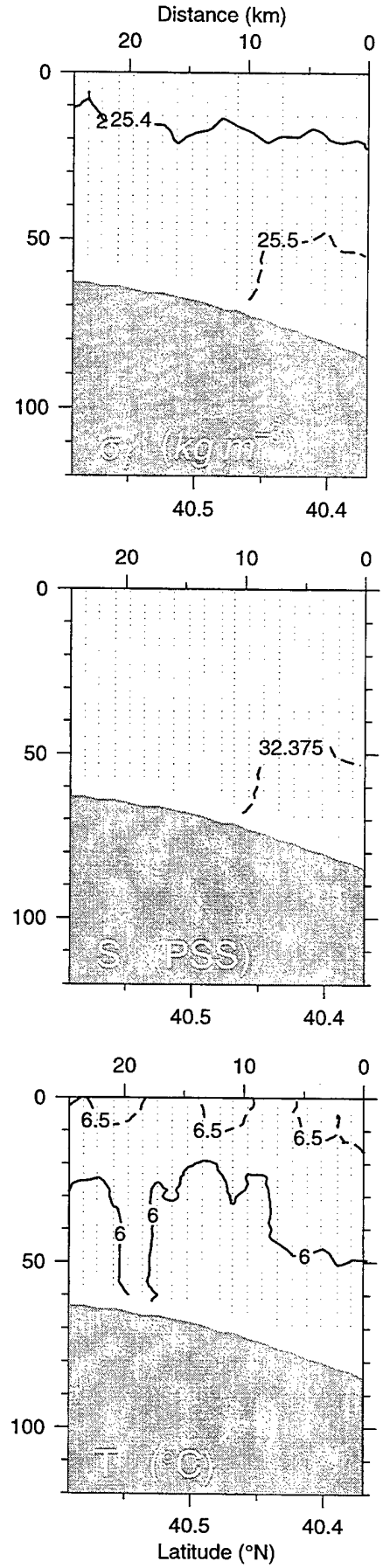
Line G



E9704 Small Box 1

27-Apr-97 10:02 - 27-Apr-97 12:29

Line 3

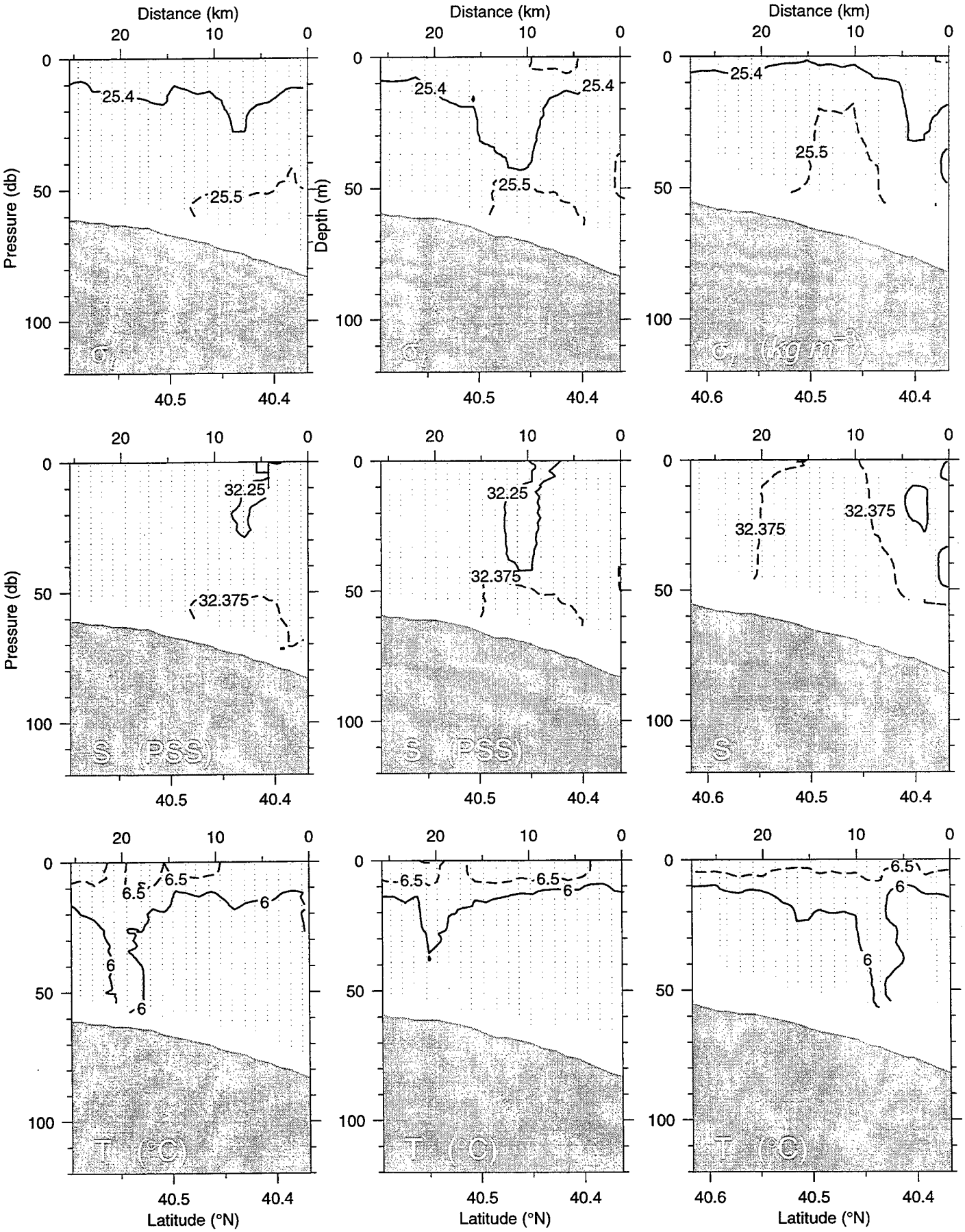


E9704 Small Box 1

27-Apr-97 07:46 - 27-Apr-97 09:34
Line 4

27-Apr-97 04:18 - 27-Apr-97 07:16
Line 5

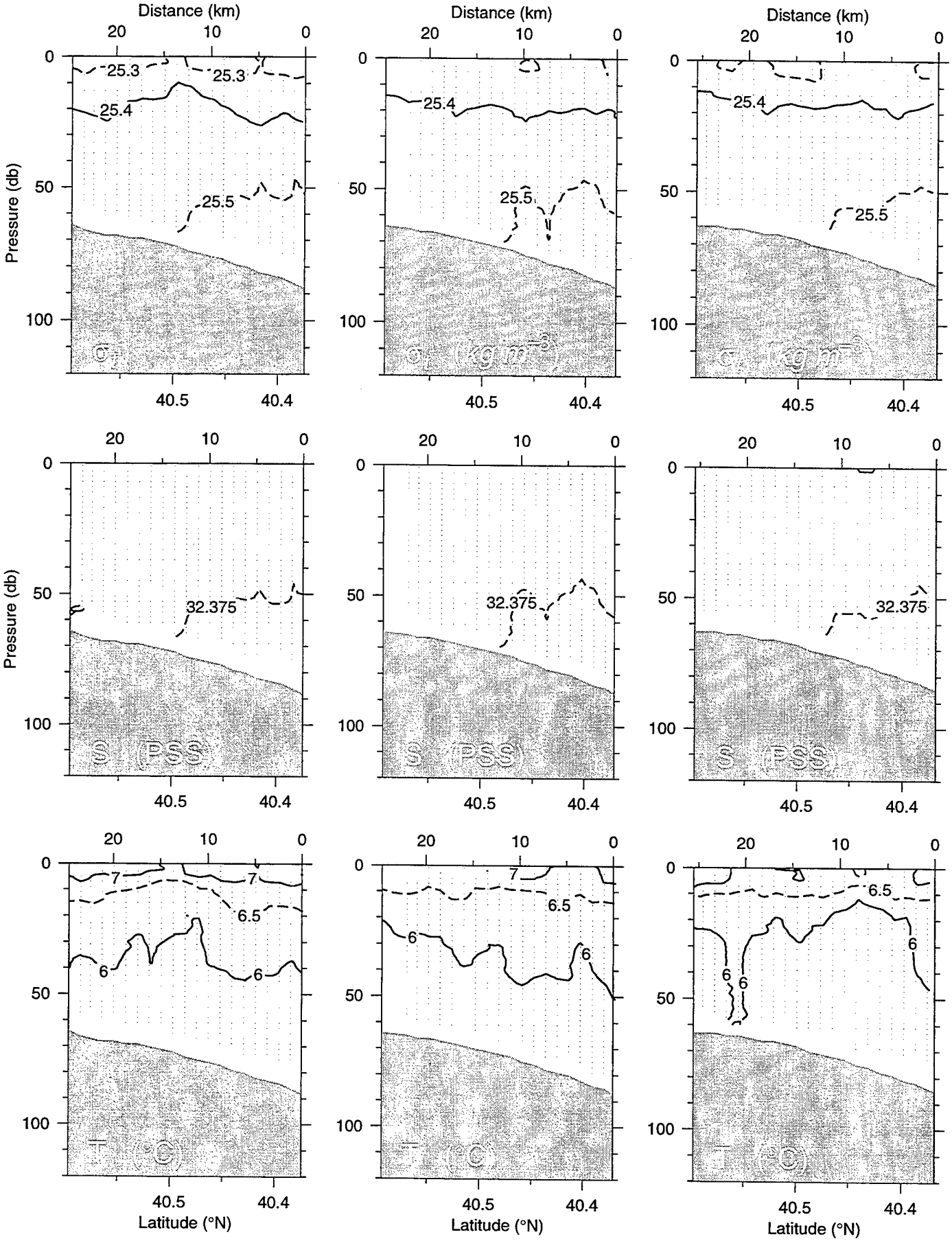
27-Apr-97 00:49 - 27-Apr-97 03:34
Line 6



E9704 Small Box 2

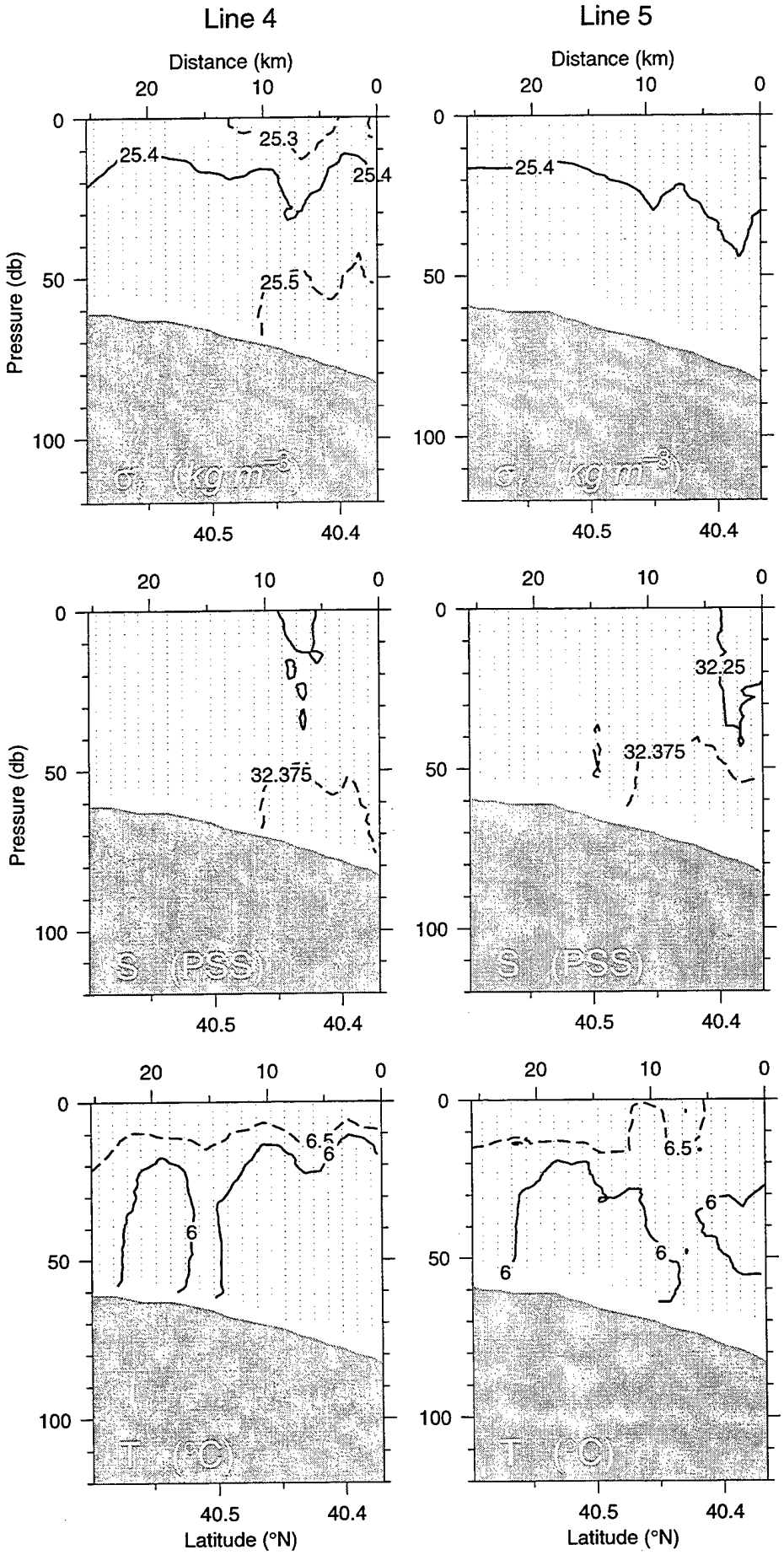
28-Apr-97 01:47 - 28-Apr-97 03:47 | 28-Apr-97 04:20 - 28-Apr-97 06:21 | 28-Apr-97 06:55 - 28-Apr-97 09:28

Line 1 | Line 2 | Line 3



E9704 Small Box 2

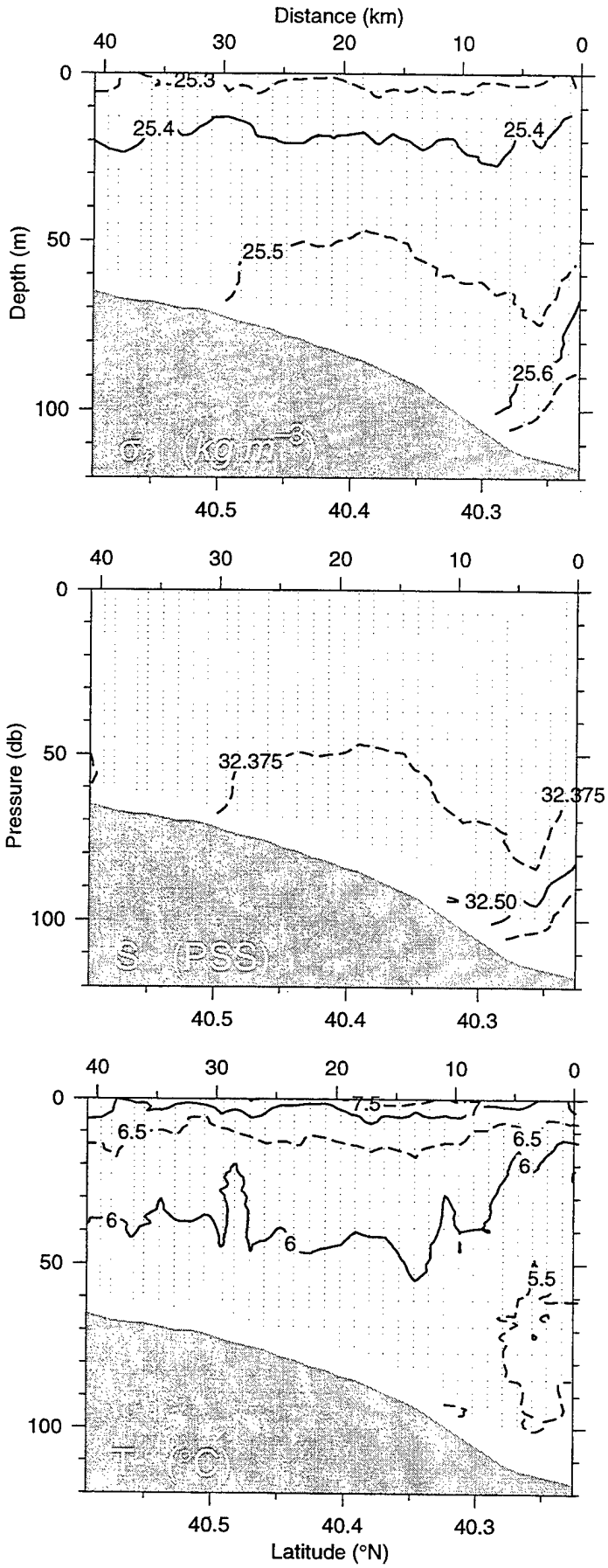
28-Apr-97 09:58 - 28-Apr-97 11:52 | 28-Apr-97 12:22 - 28-Apr-97 14:34



E9704 Small Box 2

27-Apr-97 22:29 - 28-Apr-97 01:35

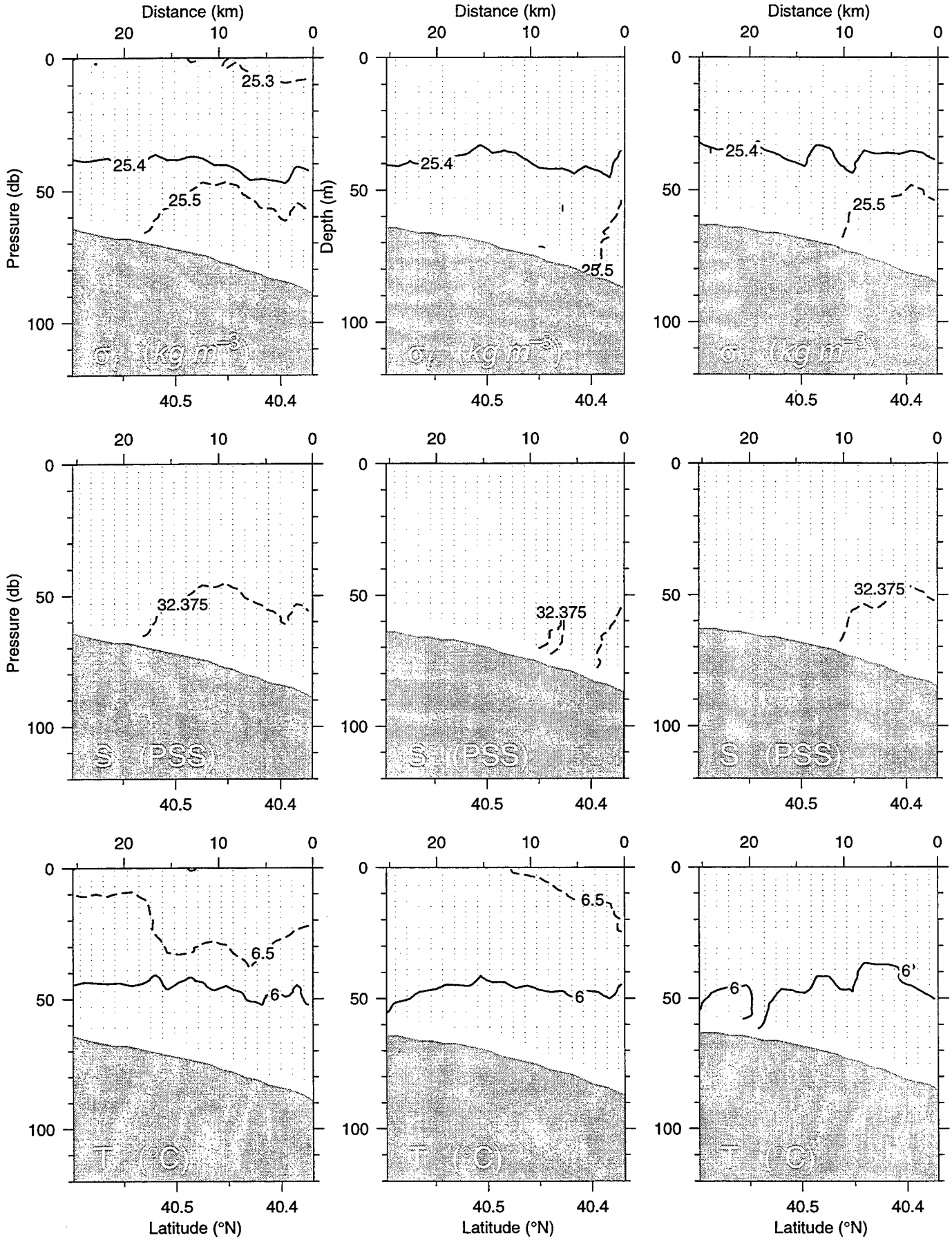
Line B



E9704 Small Box 3

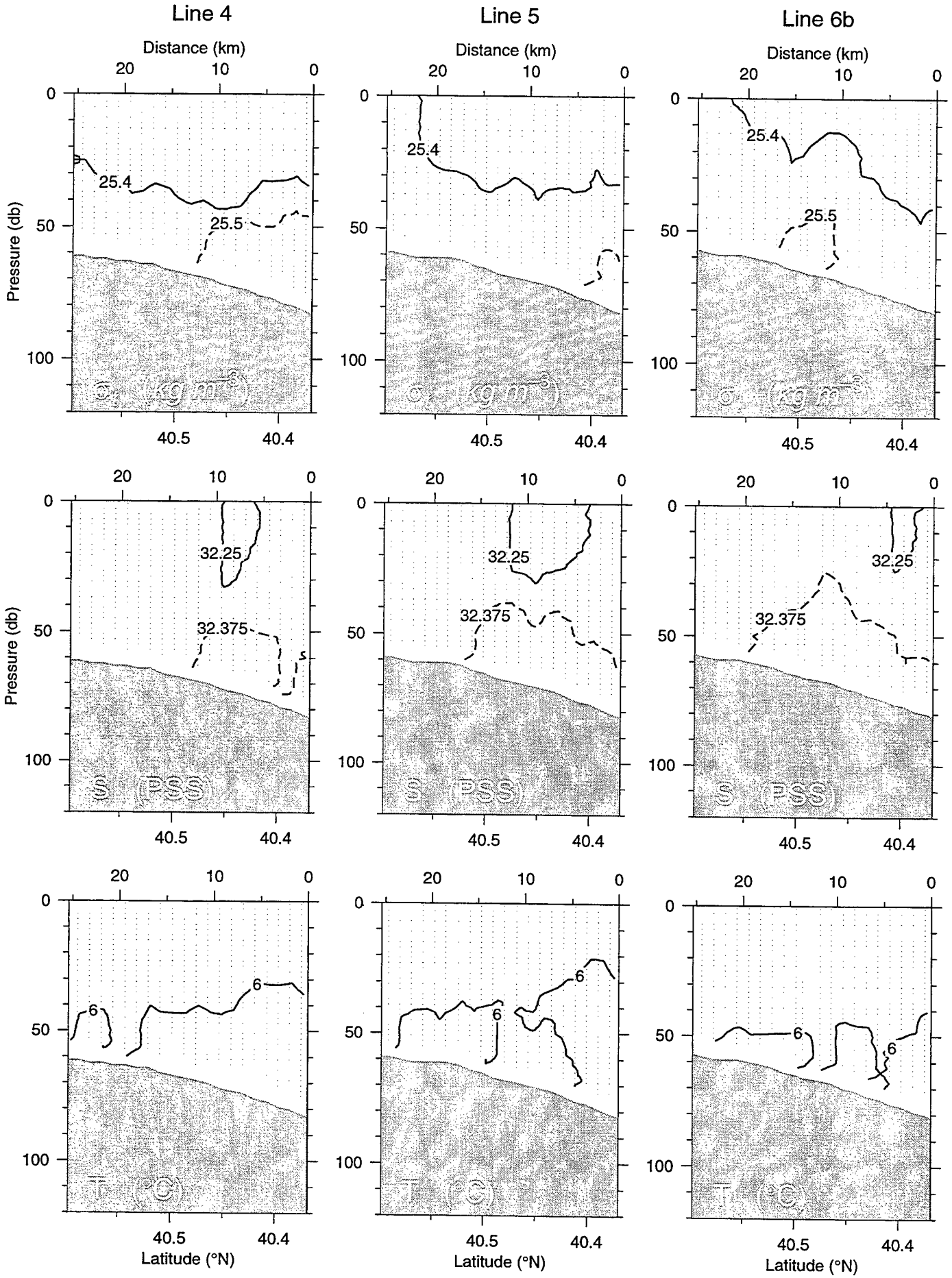
29-Apr-97 16:38 - 29-Apr-97 18:39 | 29-Apr-97 13:57 - 29-Apr-97 16:06 | 29-Apr-97 11:22 - 29-Apr-97 13:27

Line 1 | Line 2 | Line 3



E9704 Small Box 3

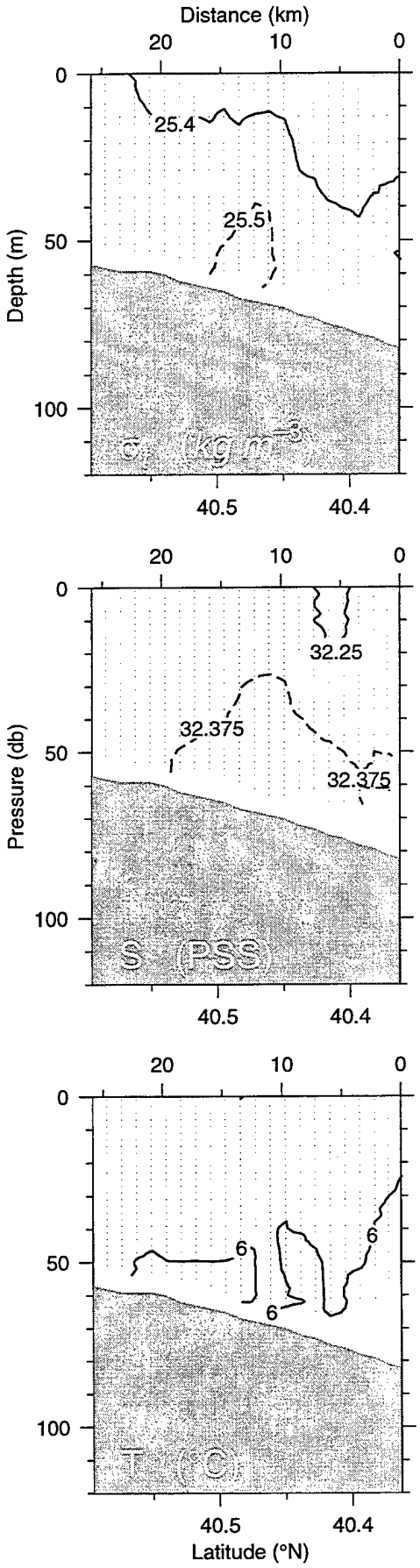
29-Apr-97 08:53 - 29-Apr-97 10:51 | 29-Apr-97 06:18 - 29-Apr-97 08:22 | 29-Apr-97 03:37 - 29-Apr-97 05:45



E9704 Small Box 3

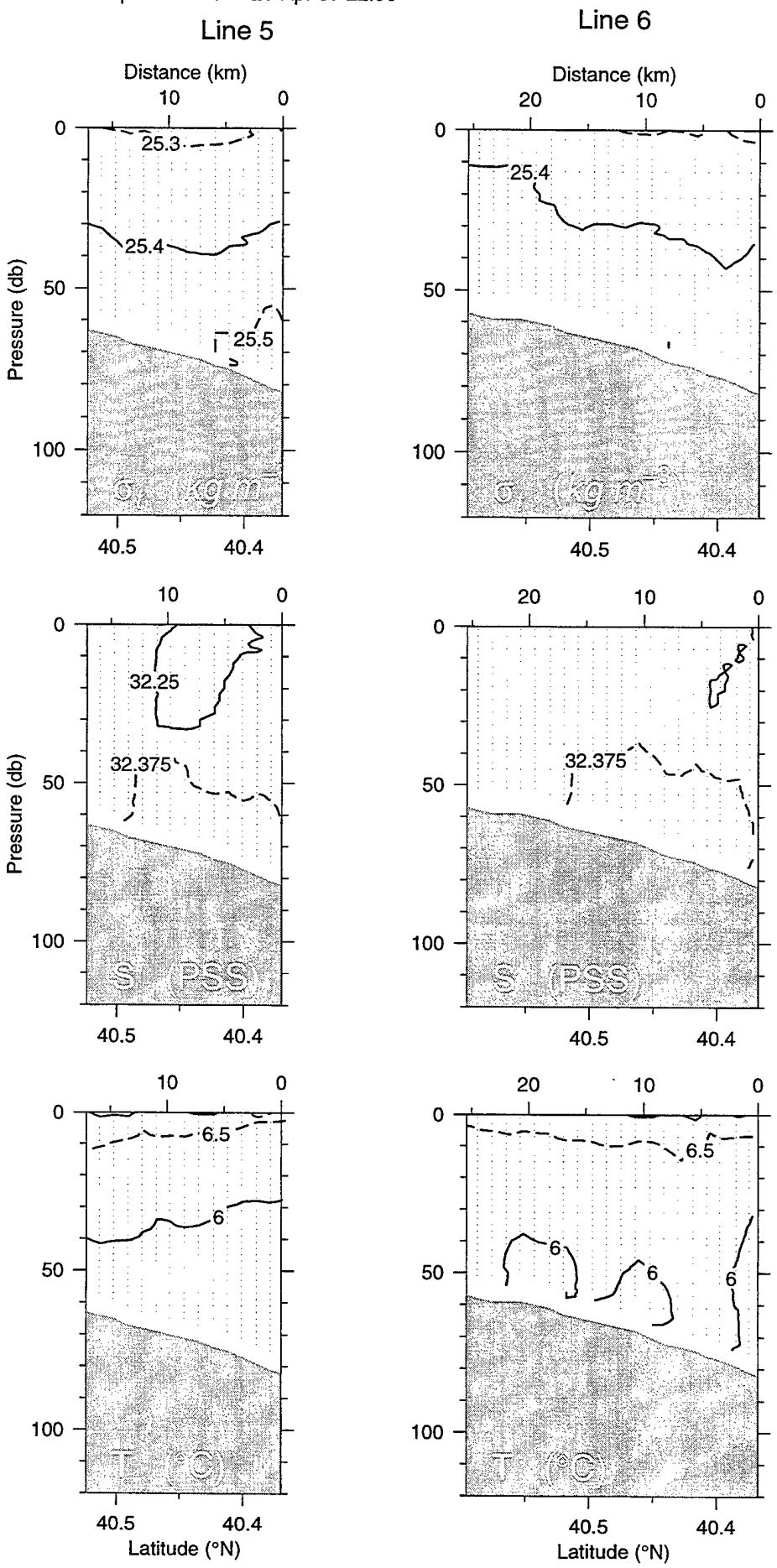
29-Apr-97 01:15 - 29-Apr-97 03:24

Line 6a



E9704 Small Box 4

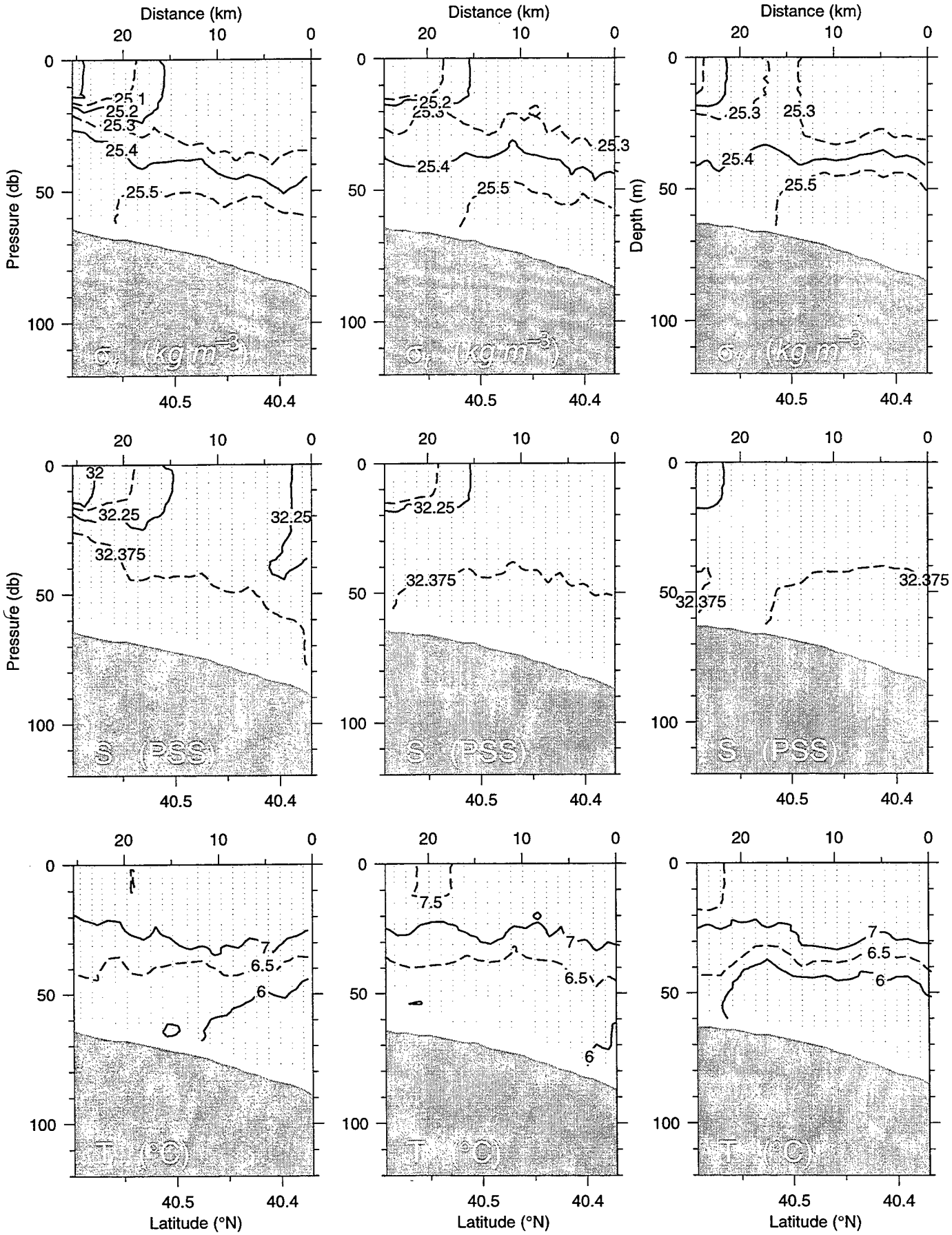
29-Apr-97 23:29 - 30-Apr-97 00:52 29-Apr-97 20:55 - 29-Apr-97 22:56



E9704 Small Box 5

03-May-97 07:19 - 03-May-97 09:22 | 03-May-97 04:45 - 03-May-97 06:44 | 03-May-97 01:47 - 03-May-97 04:05

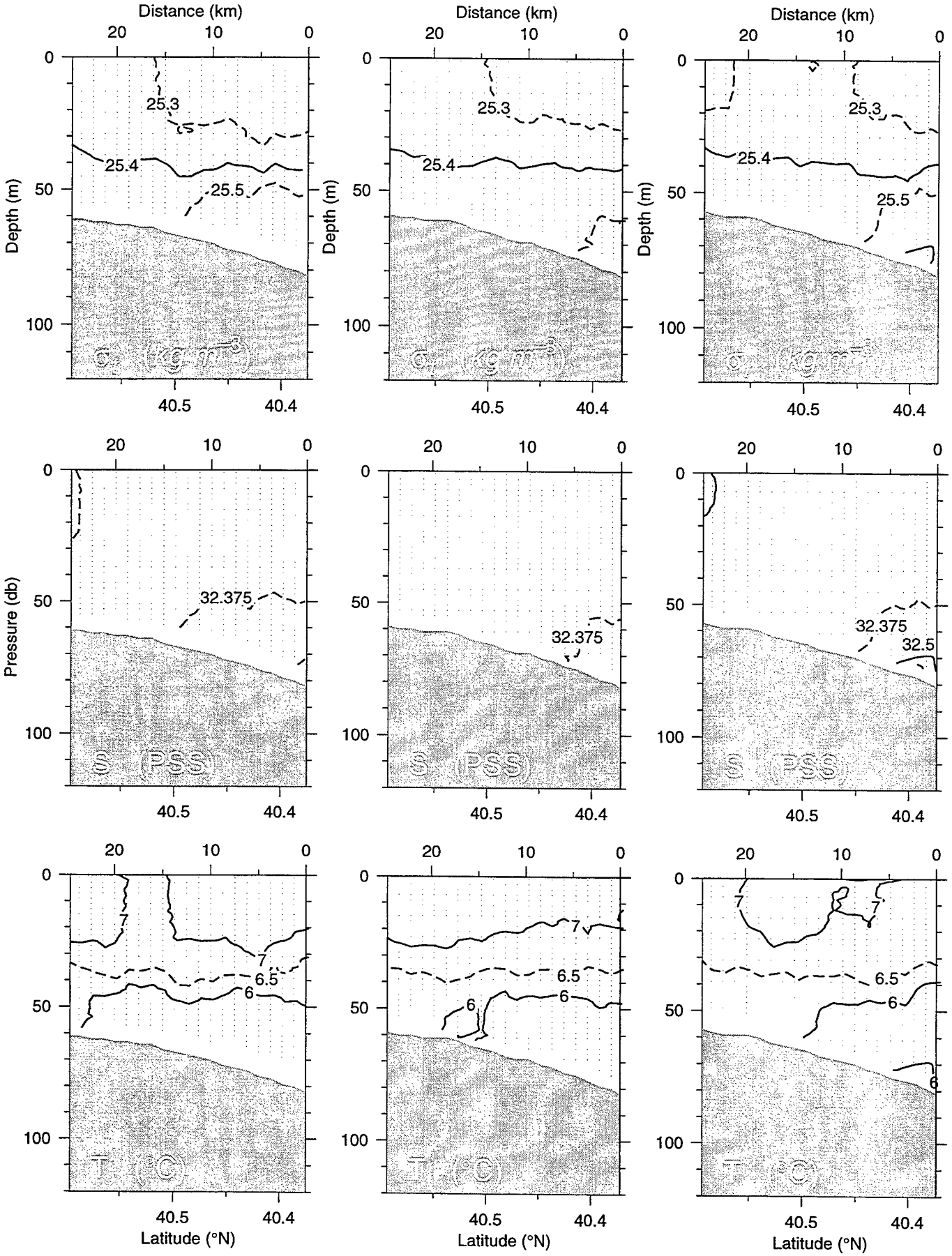
Line 1 | Line 2 | Line 3



E9704 Small Box 5

02-May-97 23:20 - 03-May-97 01:10 | 02-May-97 20:56 - 02-May-97 22:43 | 02-May-97 18:07 - 02-May-97 20:14

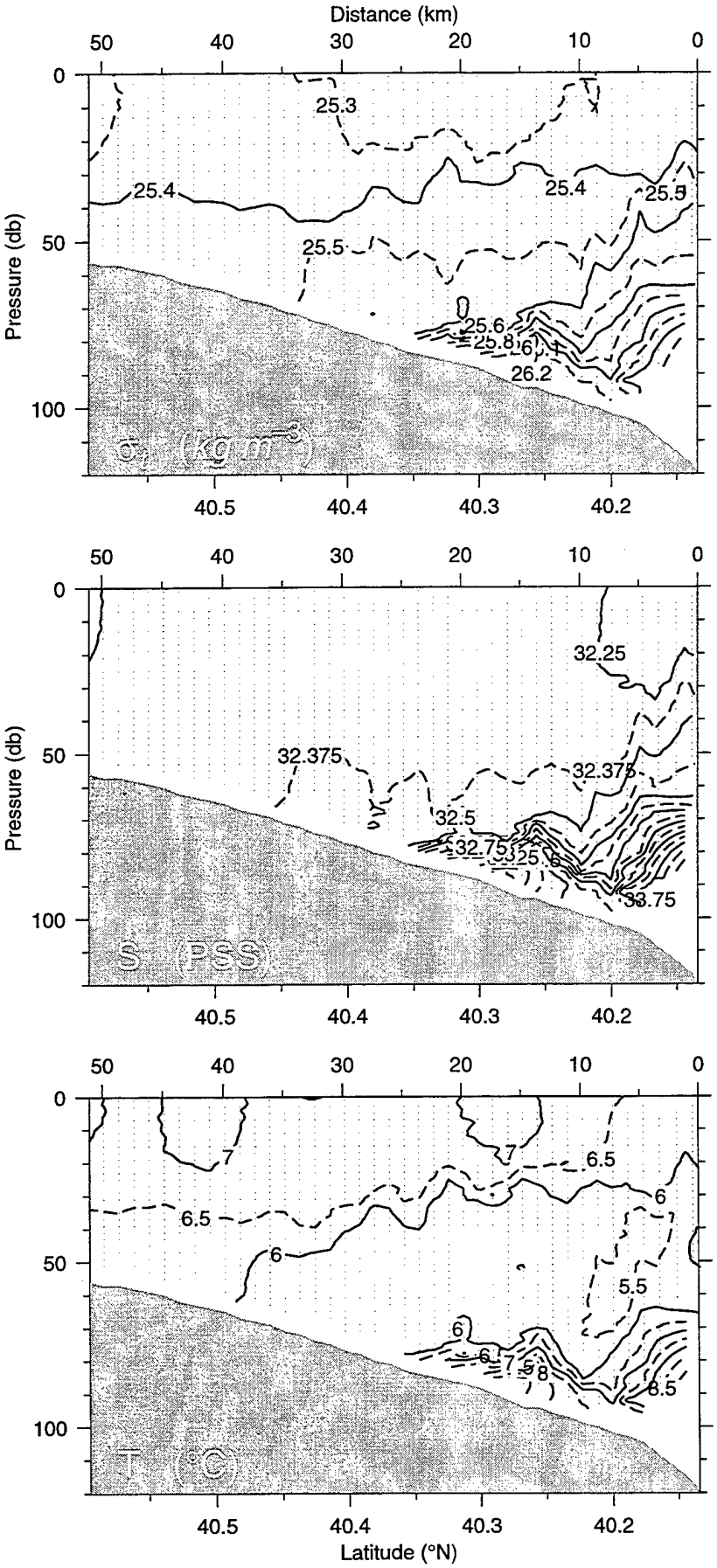
Line 4 | Line 5 | Line 6



E9704 Small Box 5

02-May-97 12:40 - 02-May-97 17:31

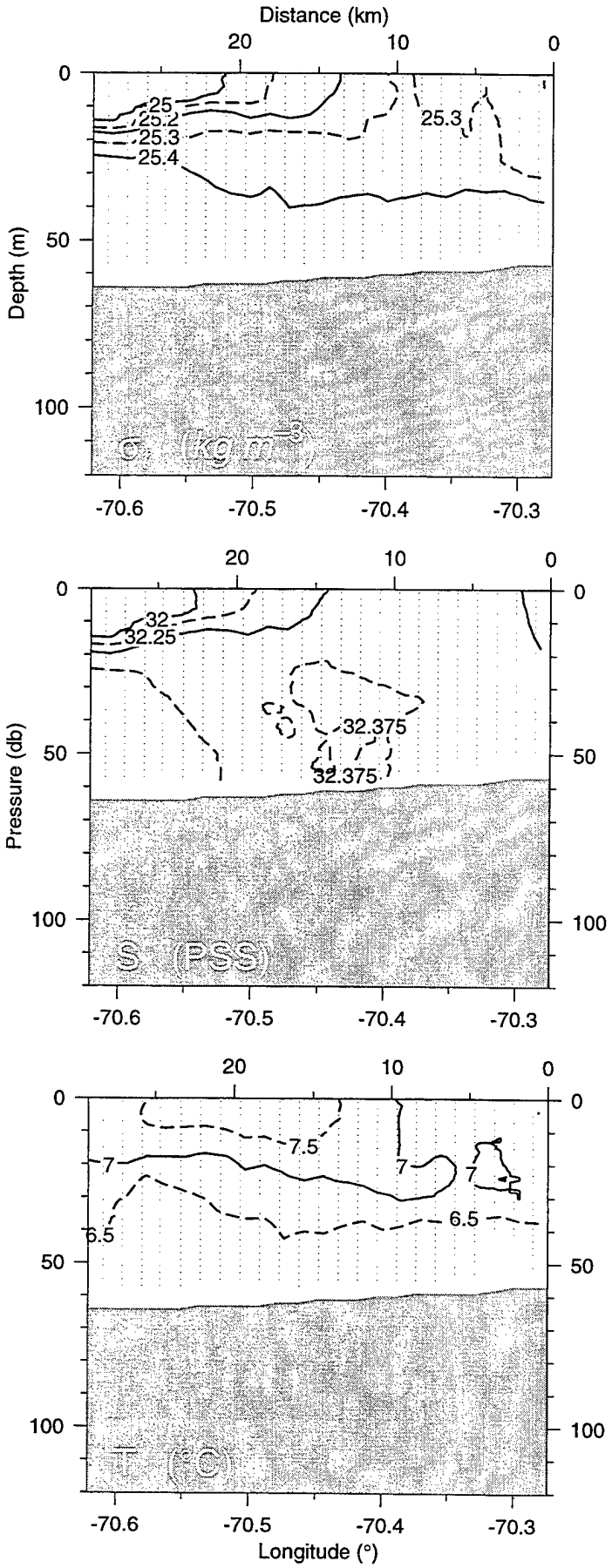
Line E



E9704 Small Box 6

03-May-97 09:25:15 - 03-May-97 11:44:16

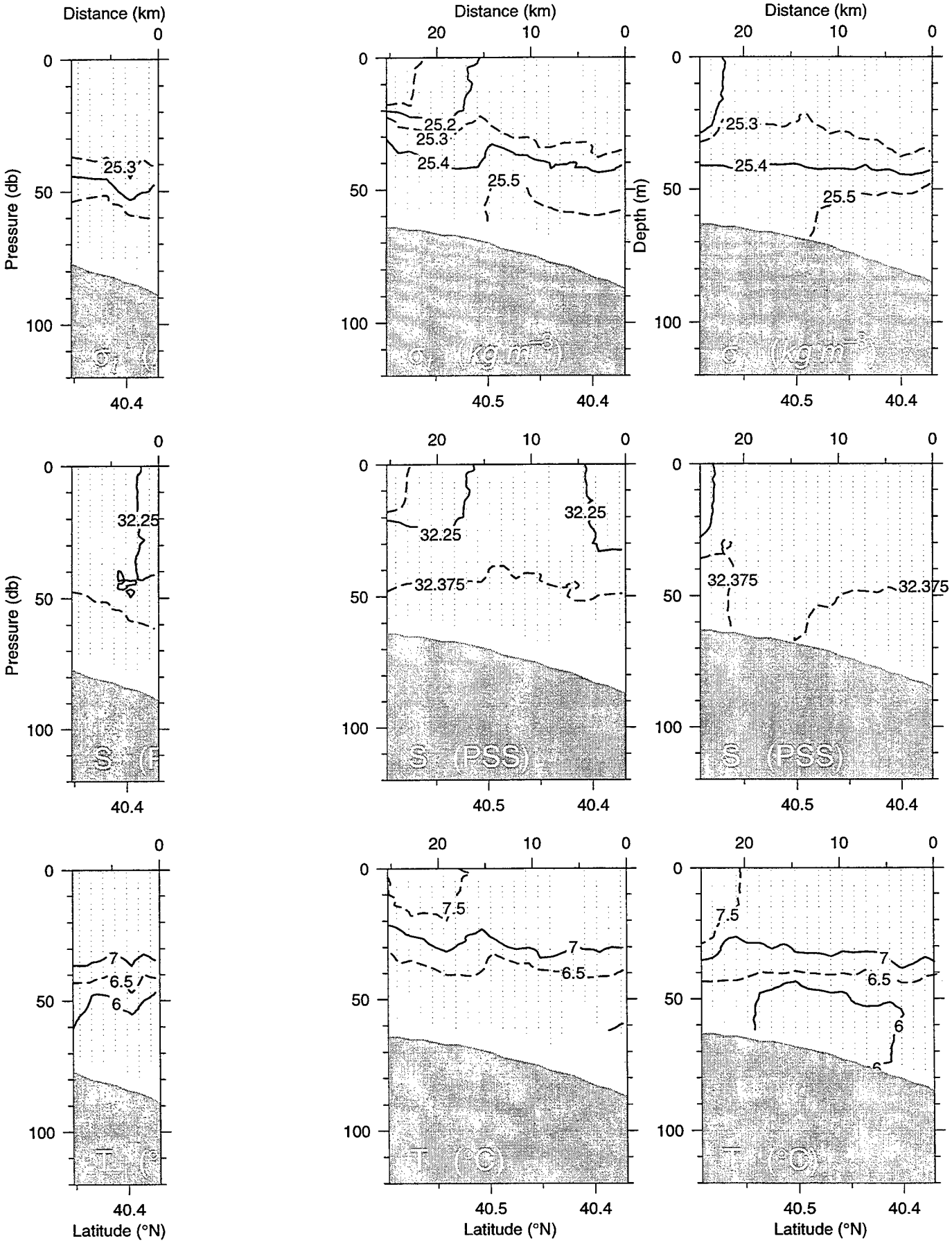
Line sb5-sb6



E9704 Small Box 6

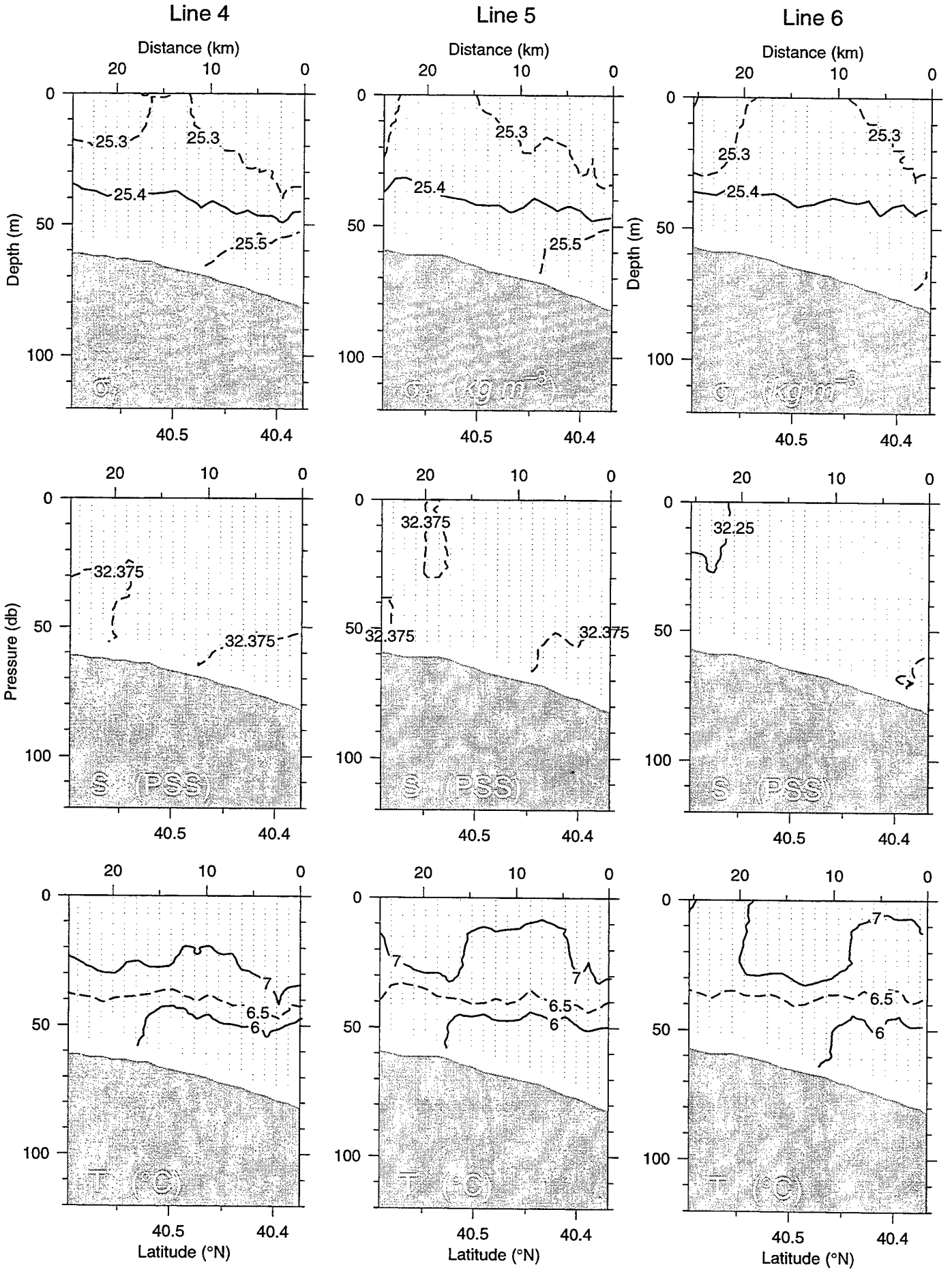
04-May-97 01:24 - 04-May-97 02:09 | 03-May-97 22:09 - 04-May-97 00:49 | 03-May-97 19:43 - 03-May-97 21:32

Line 1 | Line 2 | Line 3



E9704 Small Box 6

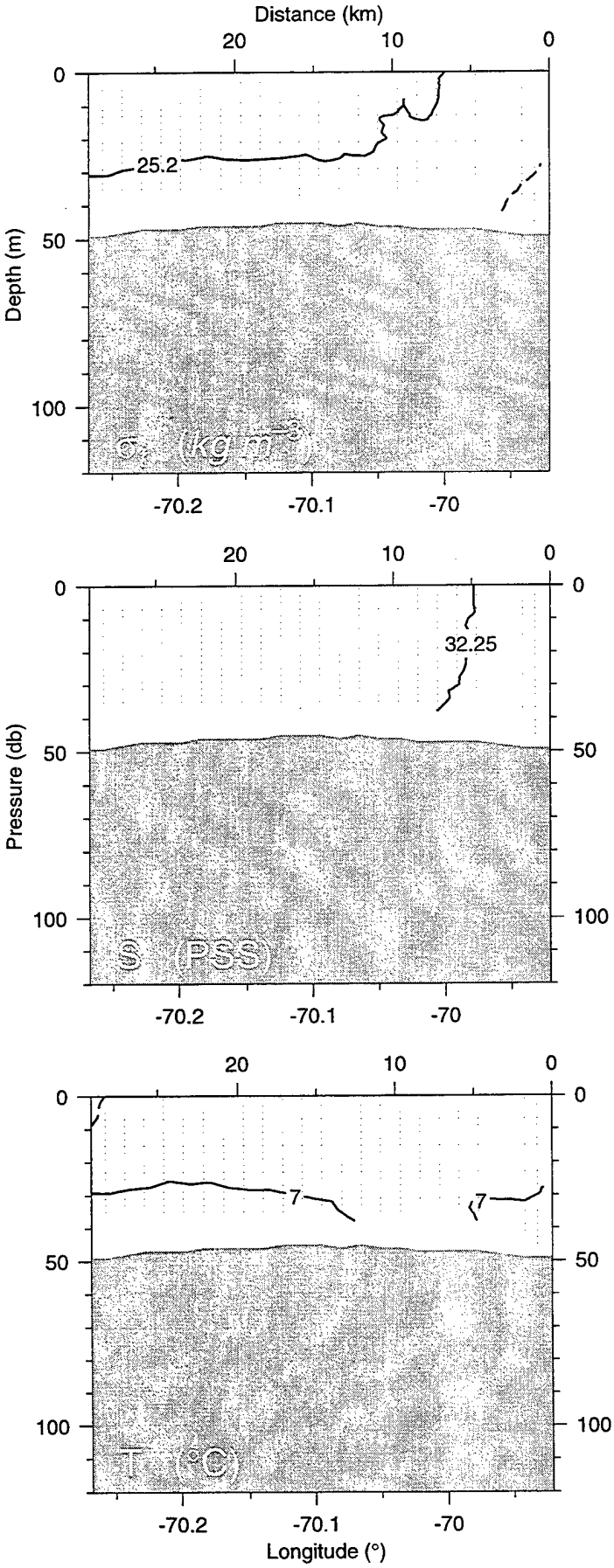
03-May-97 16:55 - 03-May-97 19:05 | 03-May-97 14:22 - 03-May-97 16:23 | 03-May-97 11:47 - 03-May-97 13:49



E9704 Small Box 7

06-May-97 17:34:07 - 06-May-97 19:56:01

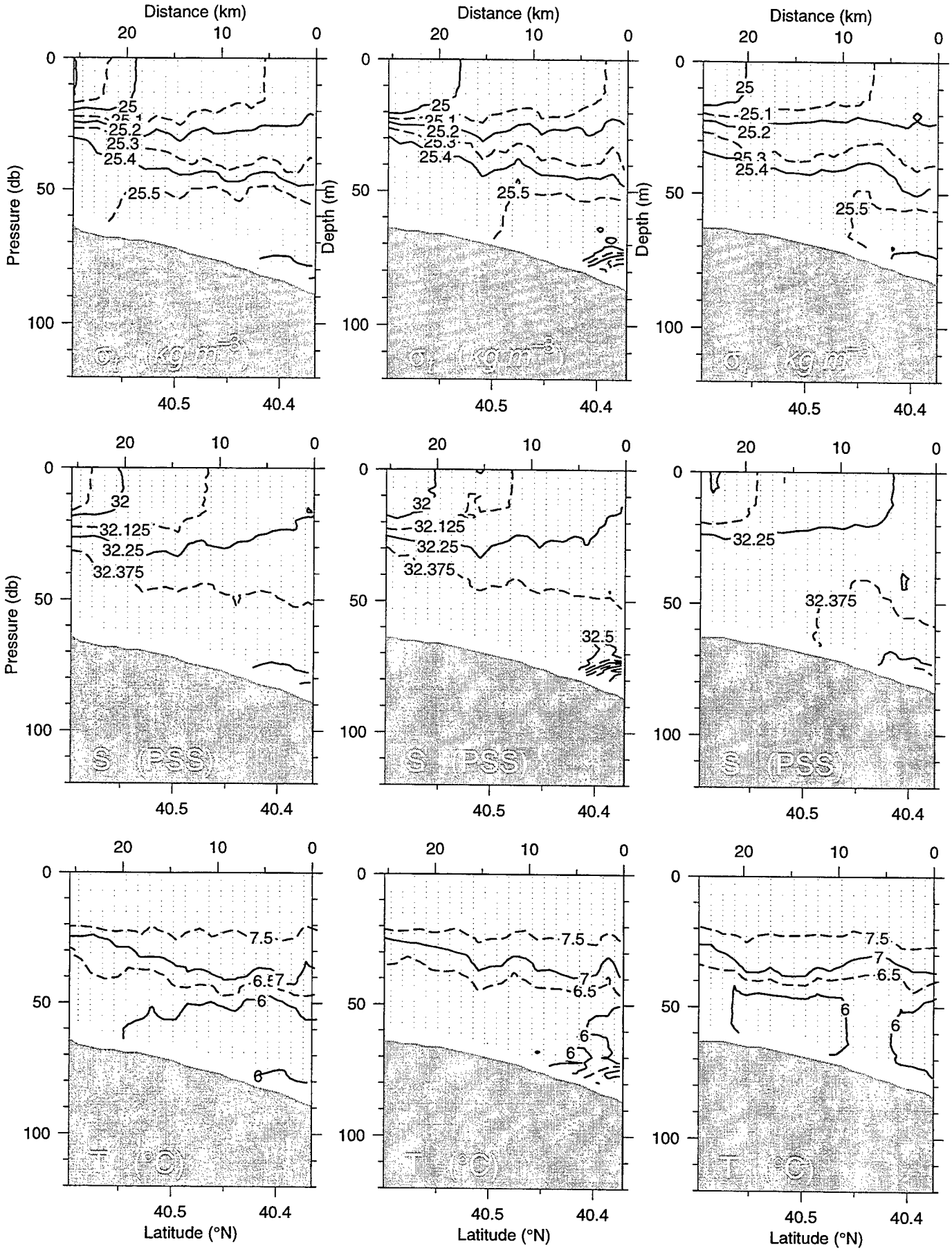
Line bb1-sb7a



E9704 Small Box 7

07-May-97 11:38 - 07-May-97 13:49 | 07-May-97 09:10 - 07-May-97 11:06 | 07-May-97 04:17 - 07-May-97 06:33

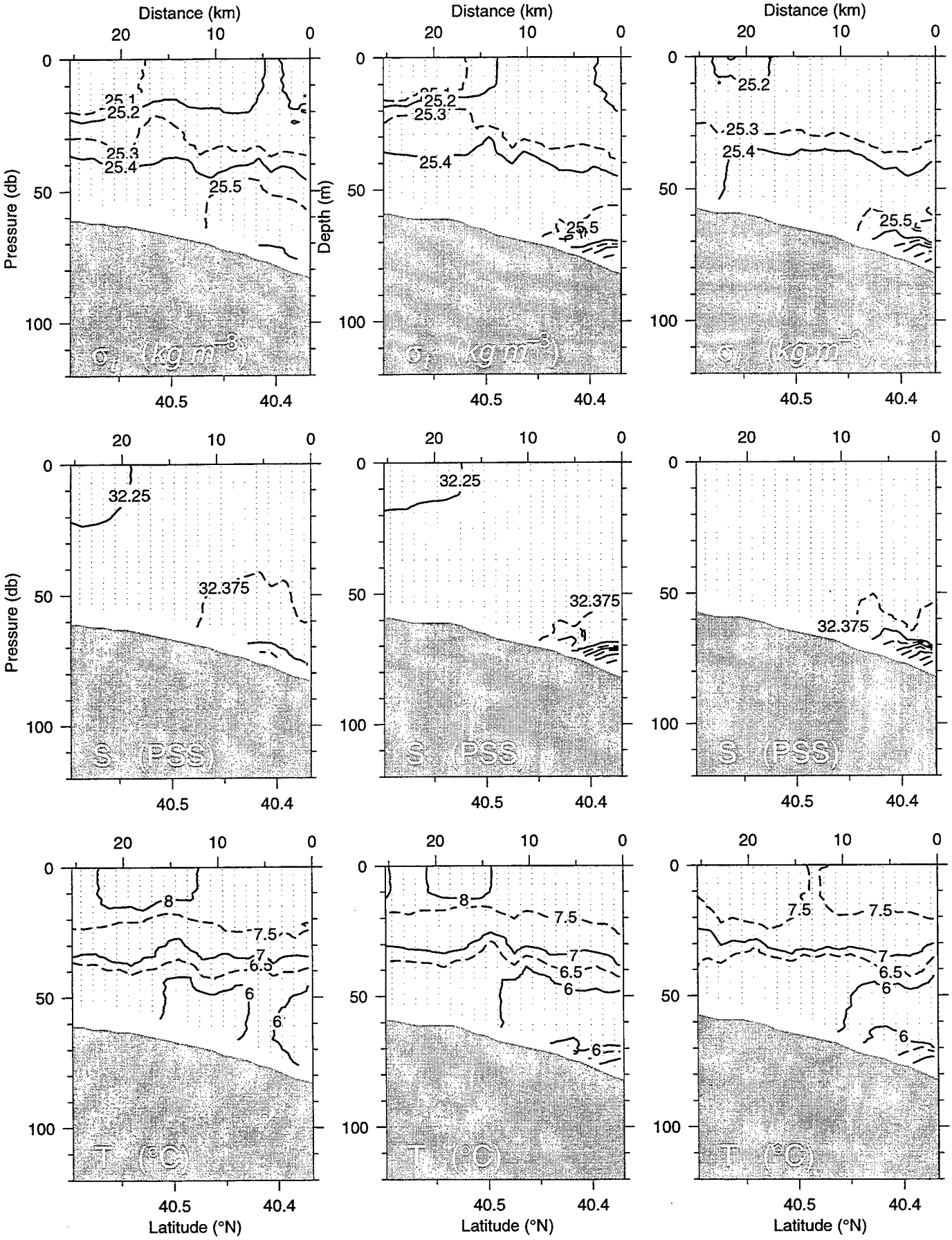
Line 1 | Line 2 | Line 3a



E9704 Small Box 7

07-May-97 01:41 - 07-May-97 03:43 | 06-May-97 23:11 - 07-May-97 01:09 | 06-May-97 20:34 - 06-May-97 22:38

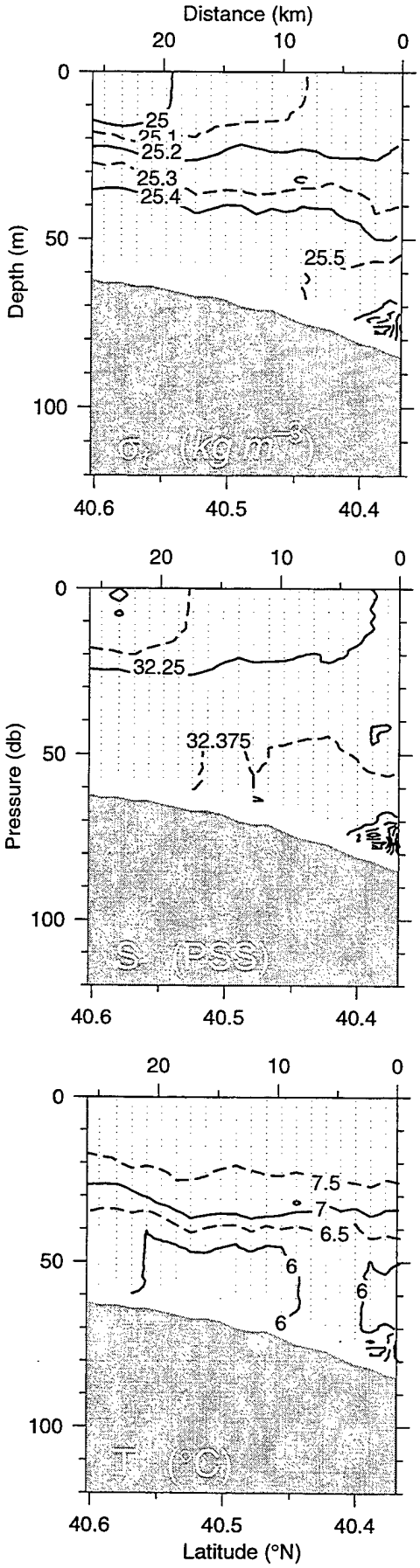
Line 4 | Line 5 | Line 6



E9704 Small Box 7

07-May-97 06:38 - 07-May-97 08:39

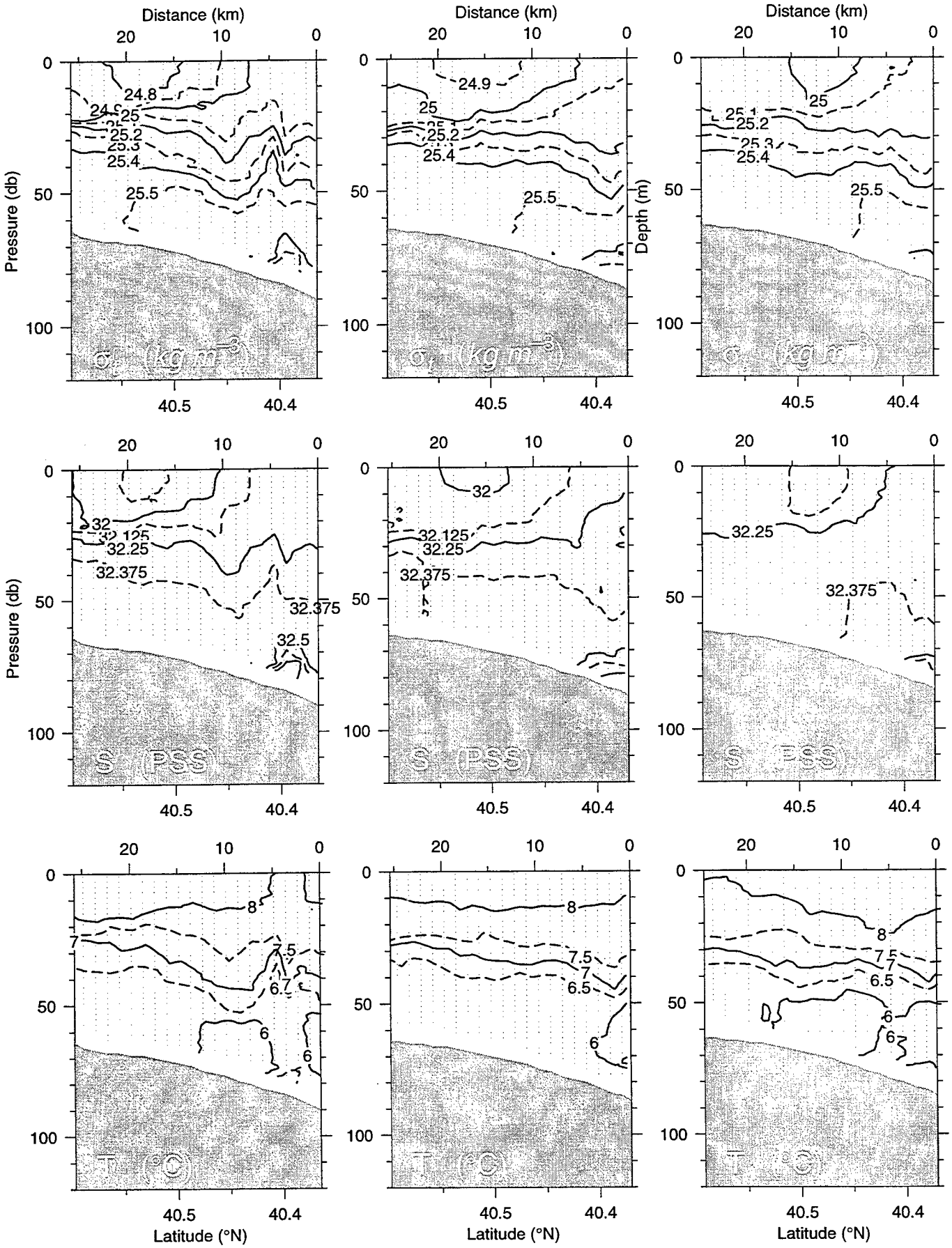
Line 3b



E9704 Small Box 8

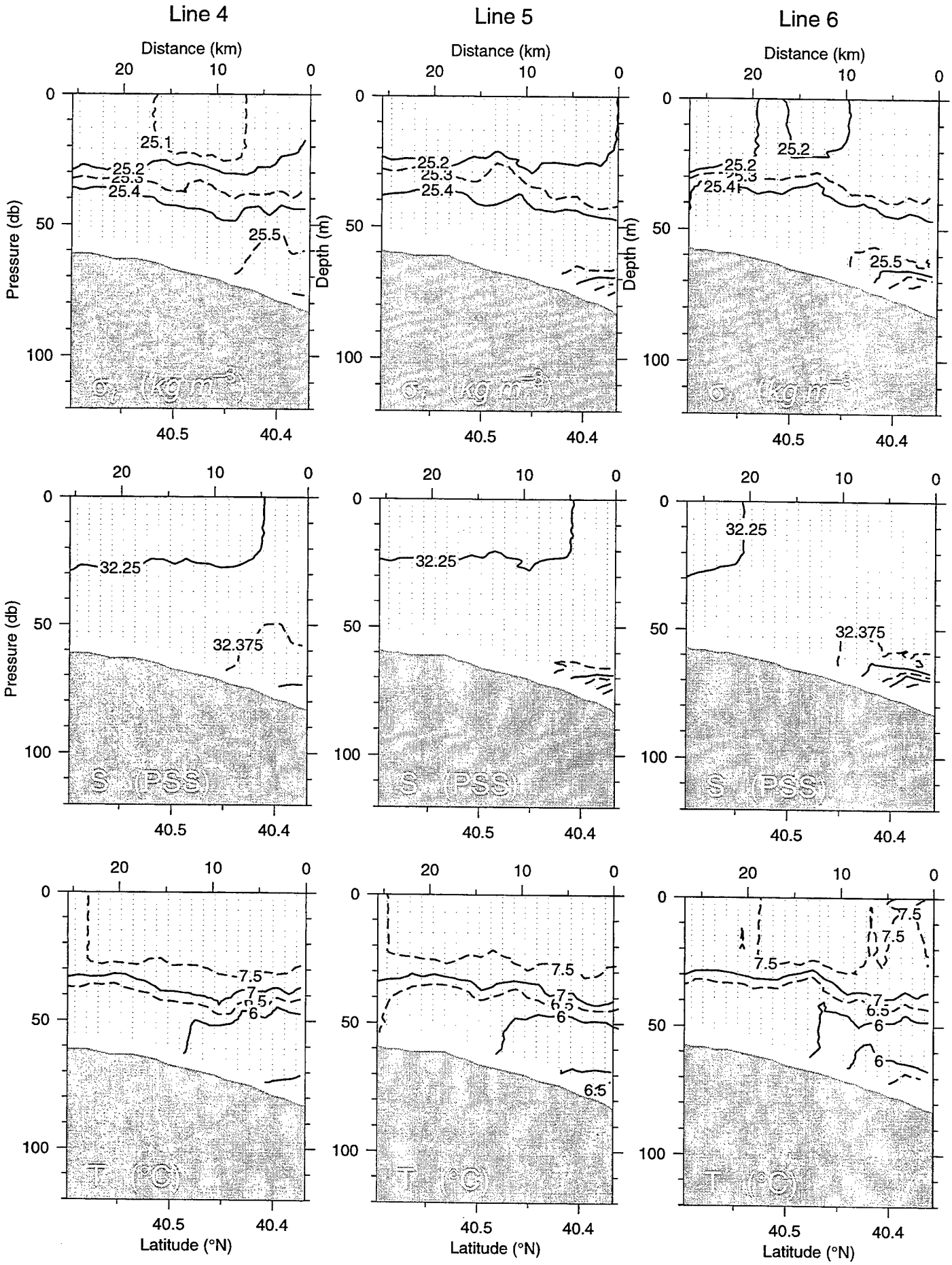
08-May-97 23:43 - 09-May-97 01:54 | 08-May-97 21:17 - 08-May-97 23:14 | 08-May-97 18:58 - 08-May-97 20:46

Line 1 | Line 2 | Line 3



E9704 Small Box 8

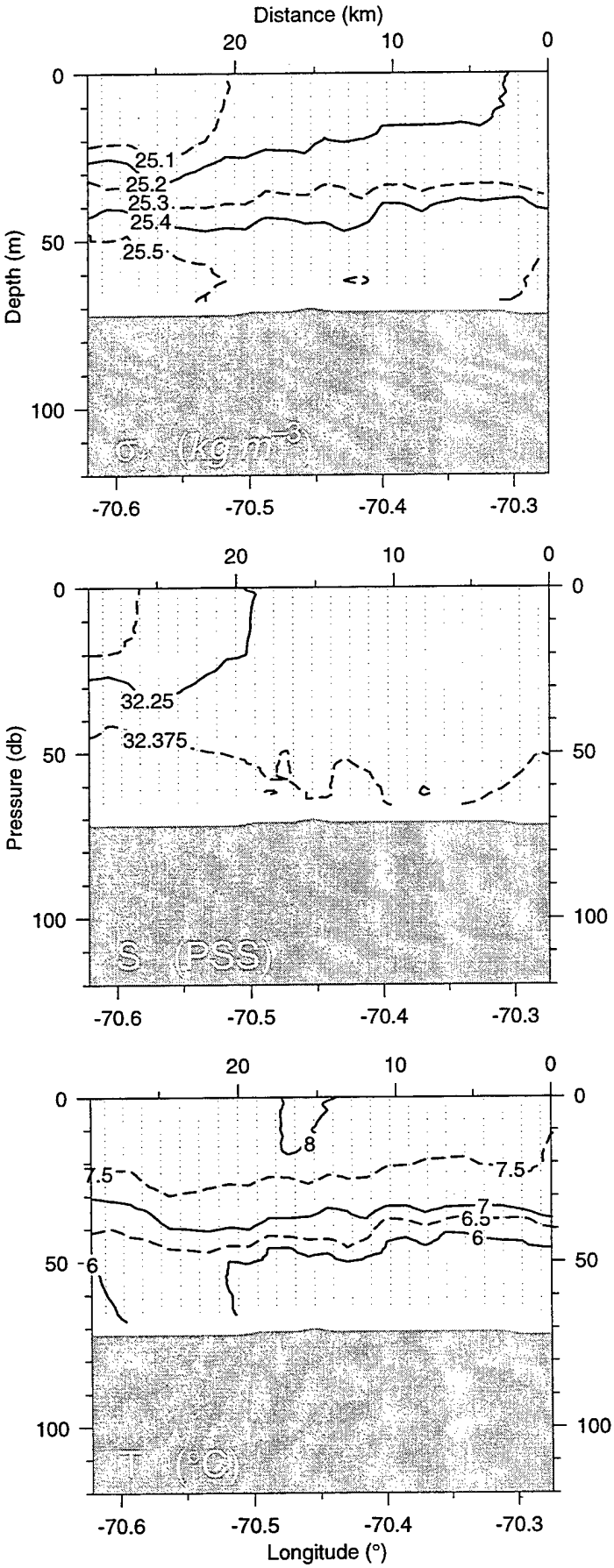
08-May-97 09:59 - 08-May-97 11:56 | 08-May-97 07:35 - 08-May-97 09:31 | 07-May-97 18:18 - 08-May-97 07:01



E9704 Small Box 8

07-May-97 15:08:45 - 07-May-97 17:29:36

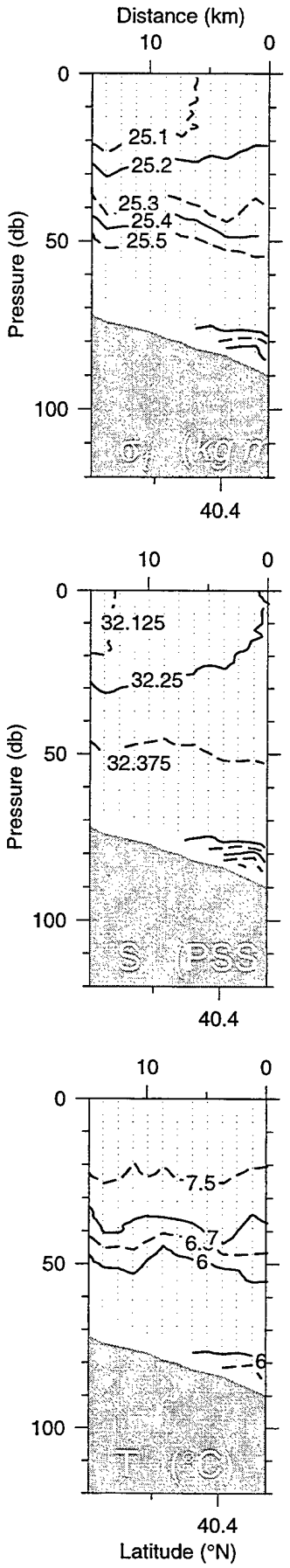
Line bf1lineWE



E9704 Small Box 8

07-May-97 13:53 - 07-May-97 15:04

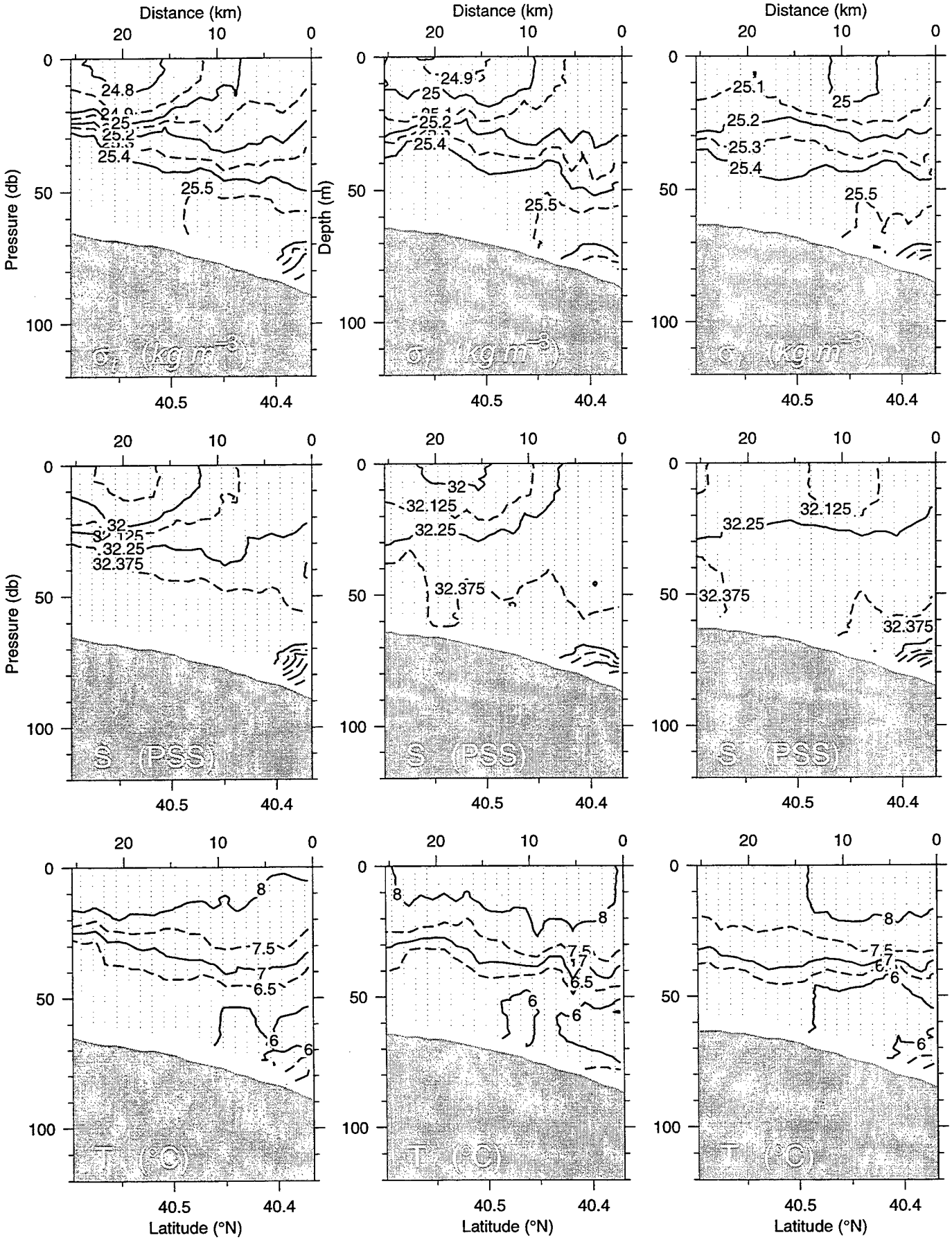
Line 1a



E9704 Small Box 9

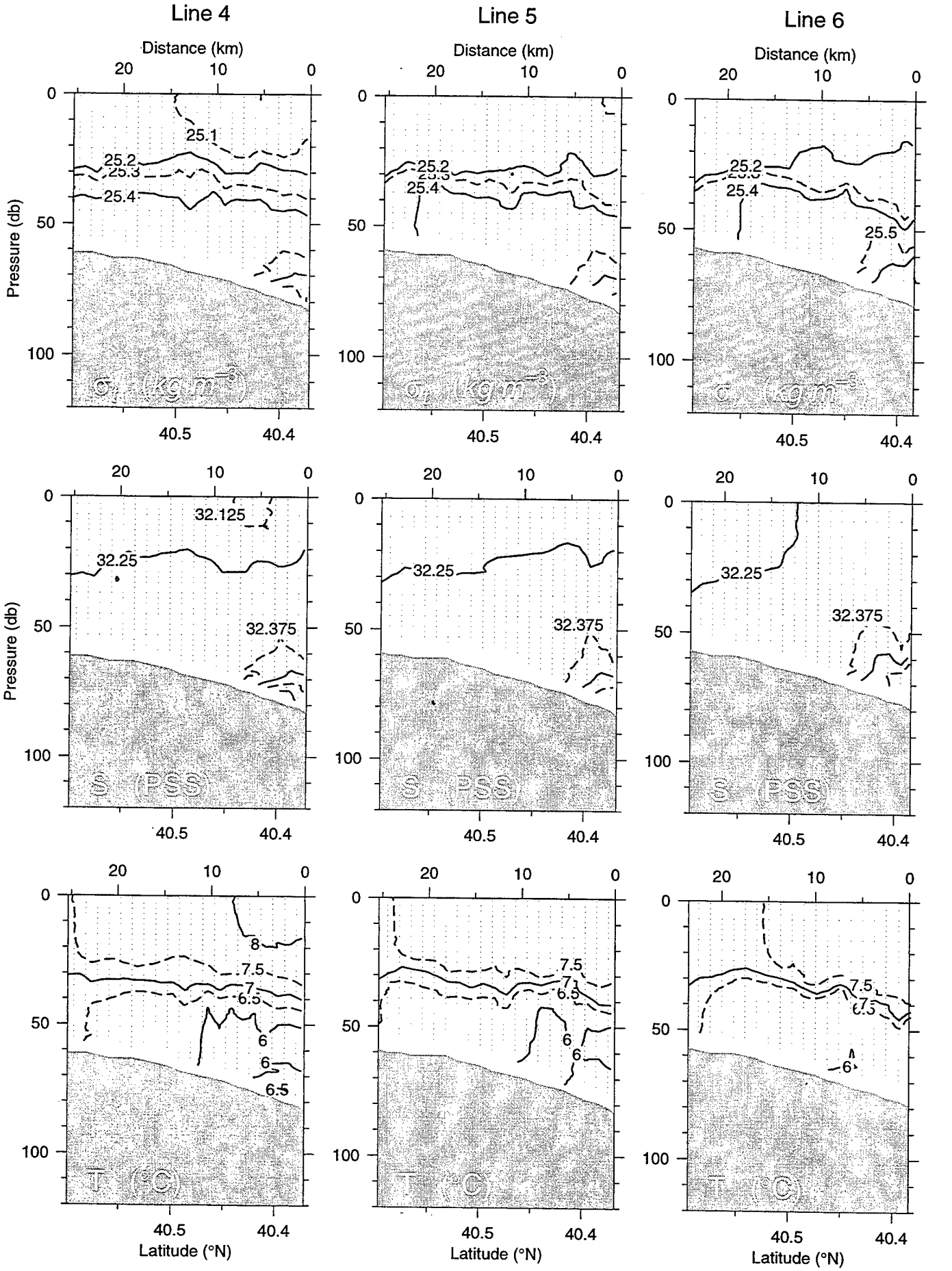
09-May-97 19:04 - 09-May-97 21:11 | 09-May-97 16:46 - 09-May-97 18:32 | 09-May-97 14:01 - 09-May-97 16:16

Line 1 | Line 2 | Line 3



E9704 Small Box 9

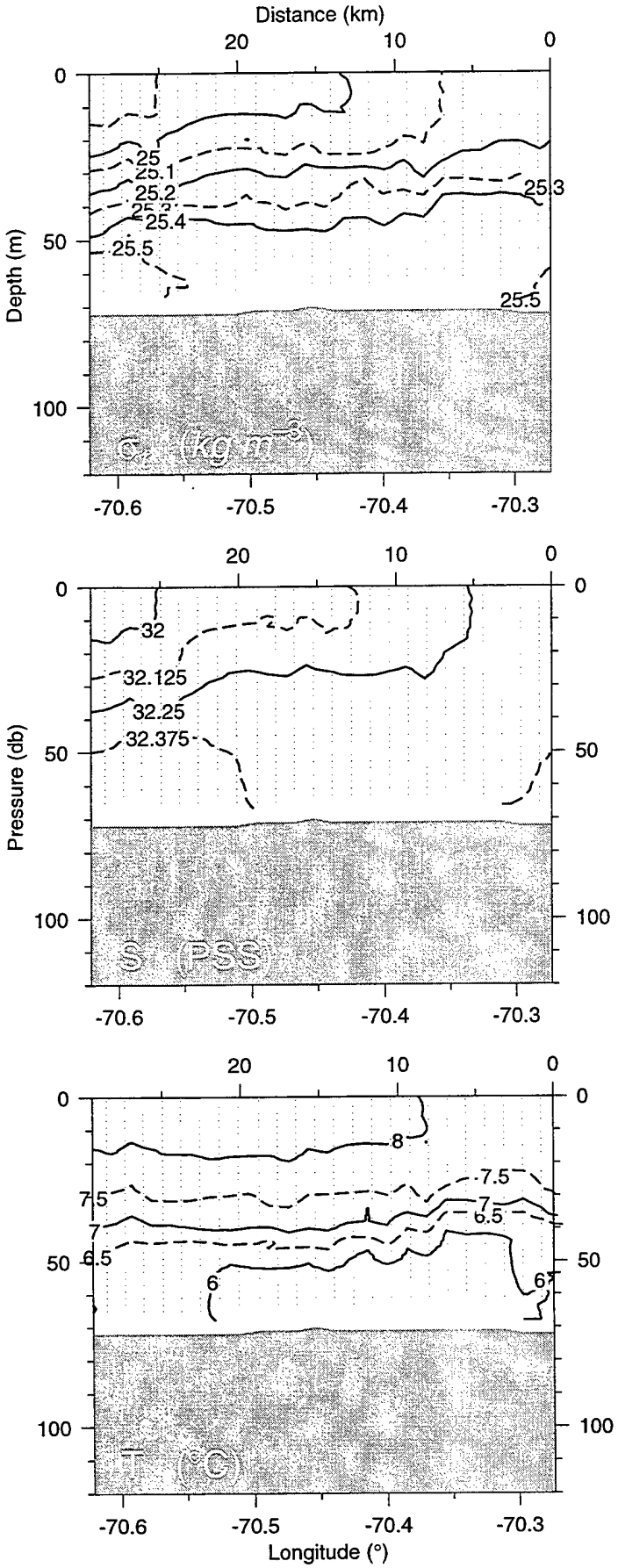
09-May-97 11:36 - 09-May-97 13:33 | 09-May-97 09:09 - 09-May-97 11:08 | 09-May-97 06:05 - 09-May-97 08:12



E9704 Small Box 9

09-May-97 03:13:23 - 09-May-97 05:33:20

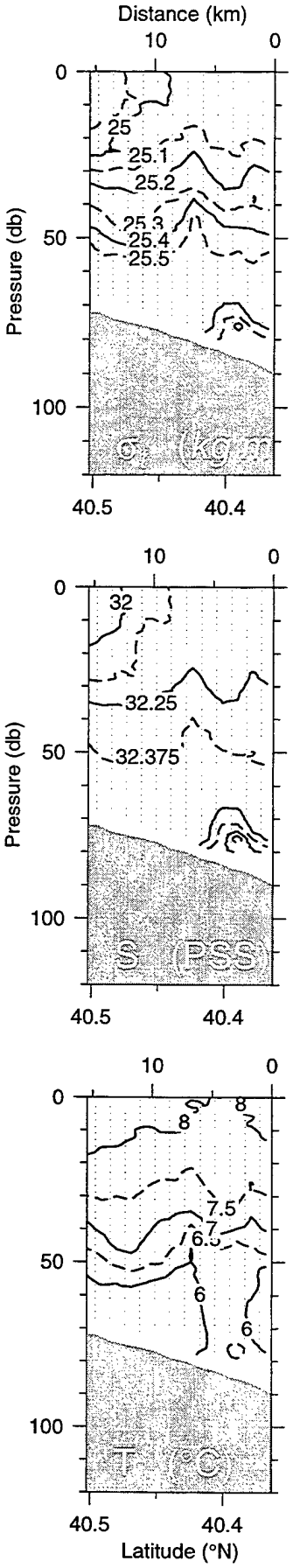
Line bf2lineWE



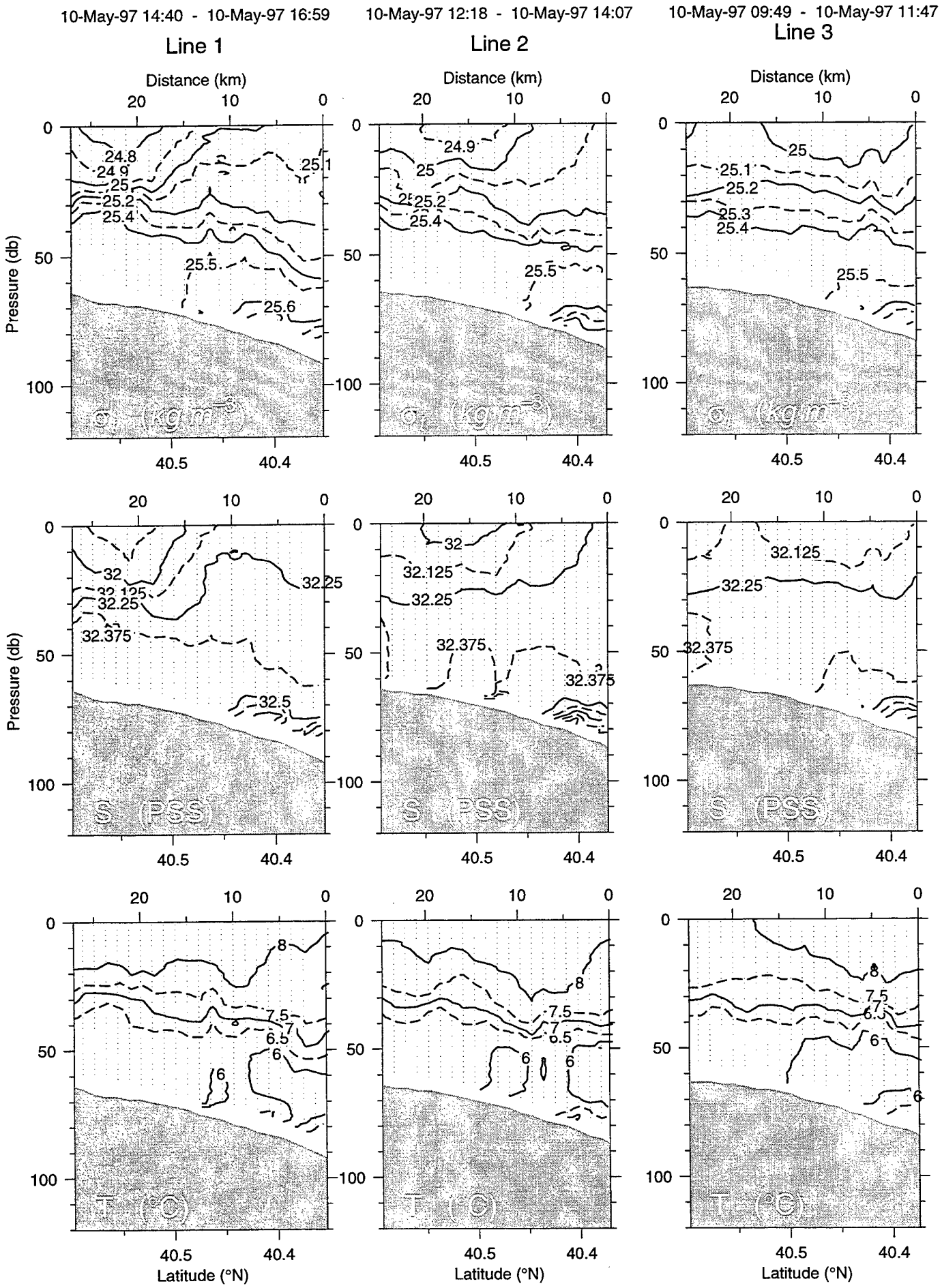
E9704 Small Box 9

09-May-97 01:59 - 09-May-97 03:11

Line 1a



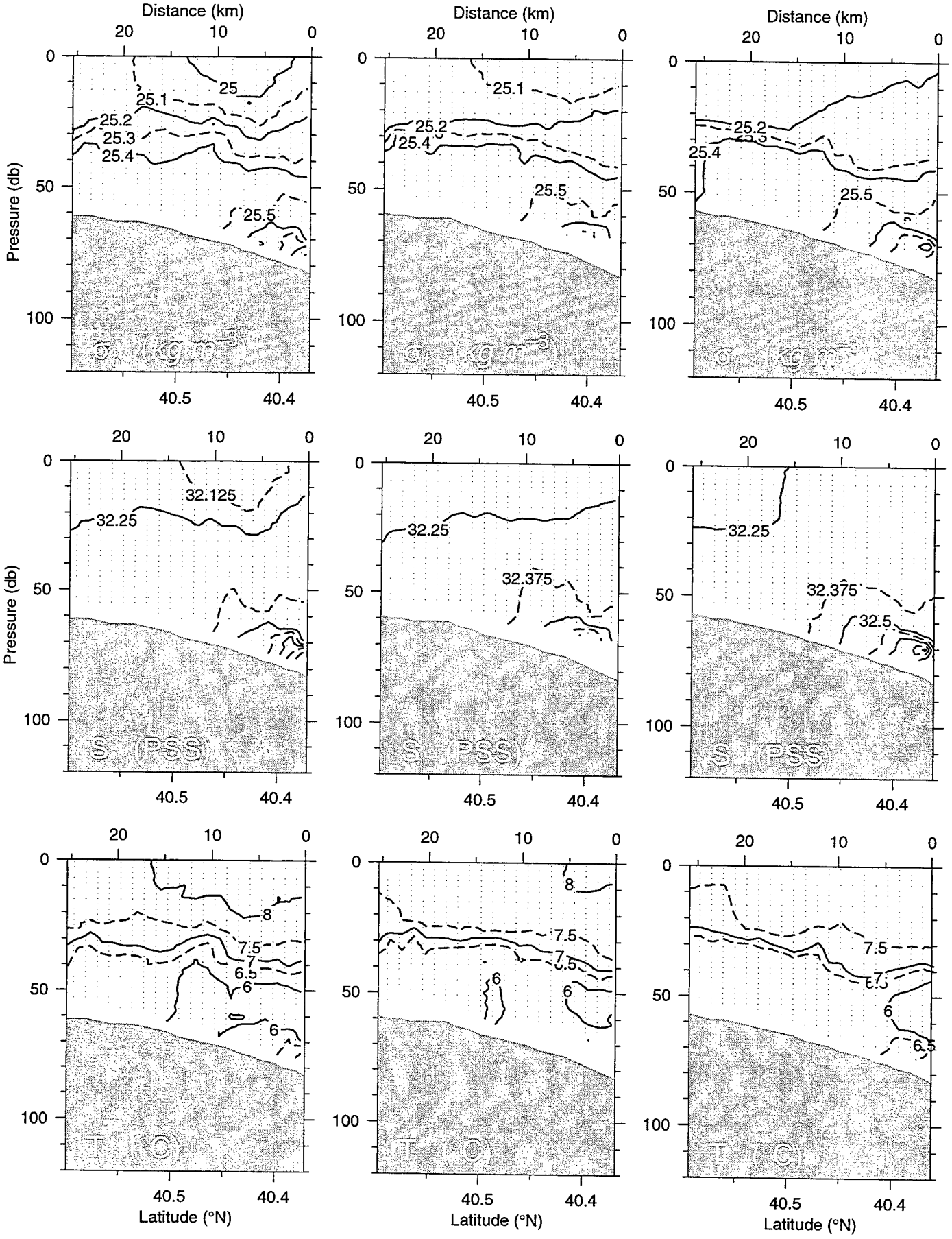
E9704 Small Box 10



E9704 Small Box 10

10-May-97 07:15 - 10-May-97 09:22 | 10-May-97 04:38 - 10-May-97 06:45 | 10-May-97 01:56 - 10-May-97 04:01

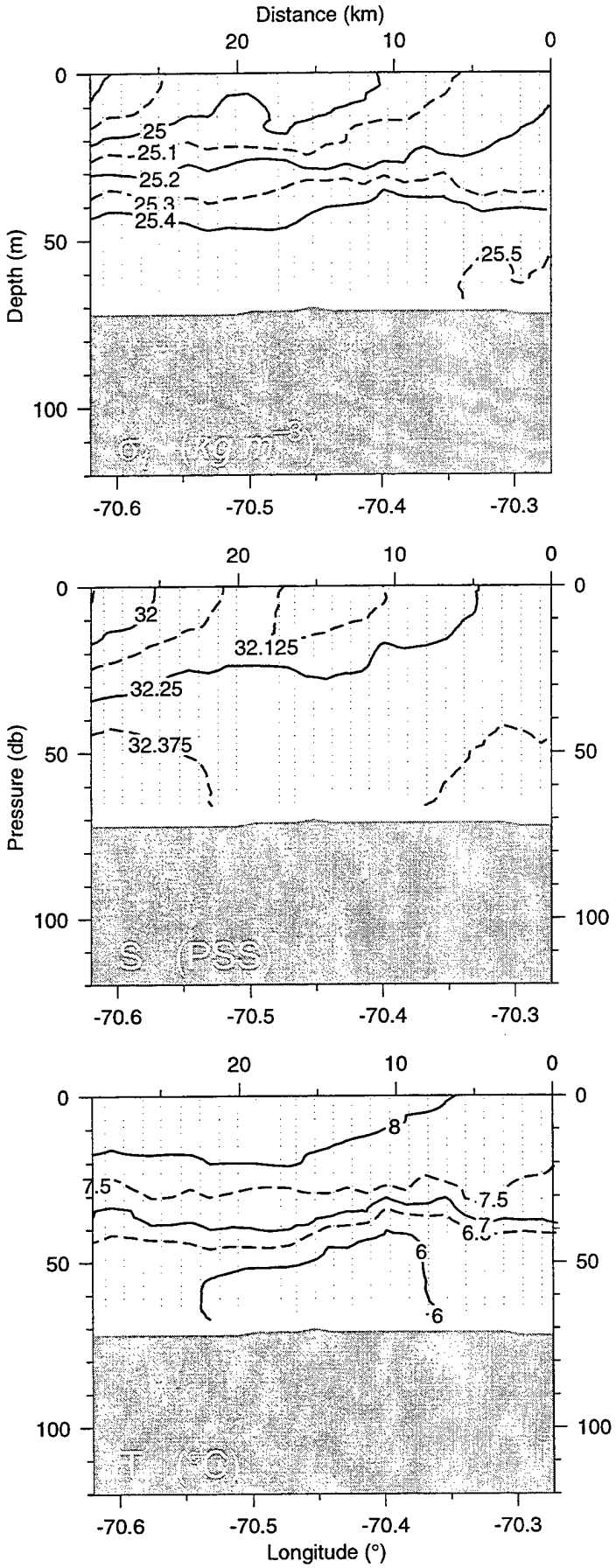
Line 4 | Line 5 | Line 6



E9704 Small Box 10

09-May-97 22:45:14 - 10-May-97 01:00:47

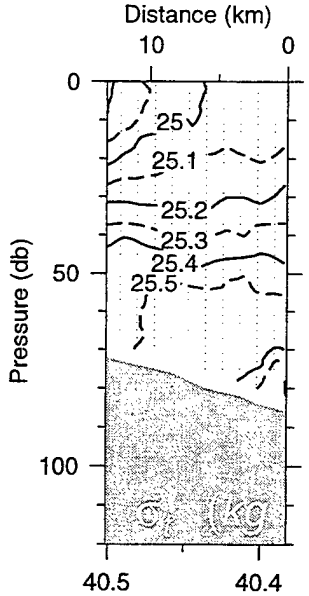
Line bf3lineWE

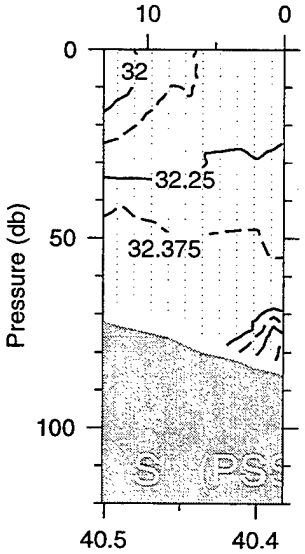


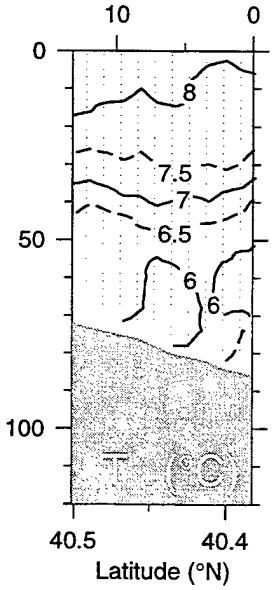
E9704 Small Box 10

09-May-97 21:42 - 09-May-97 22:42

Line 1a

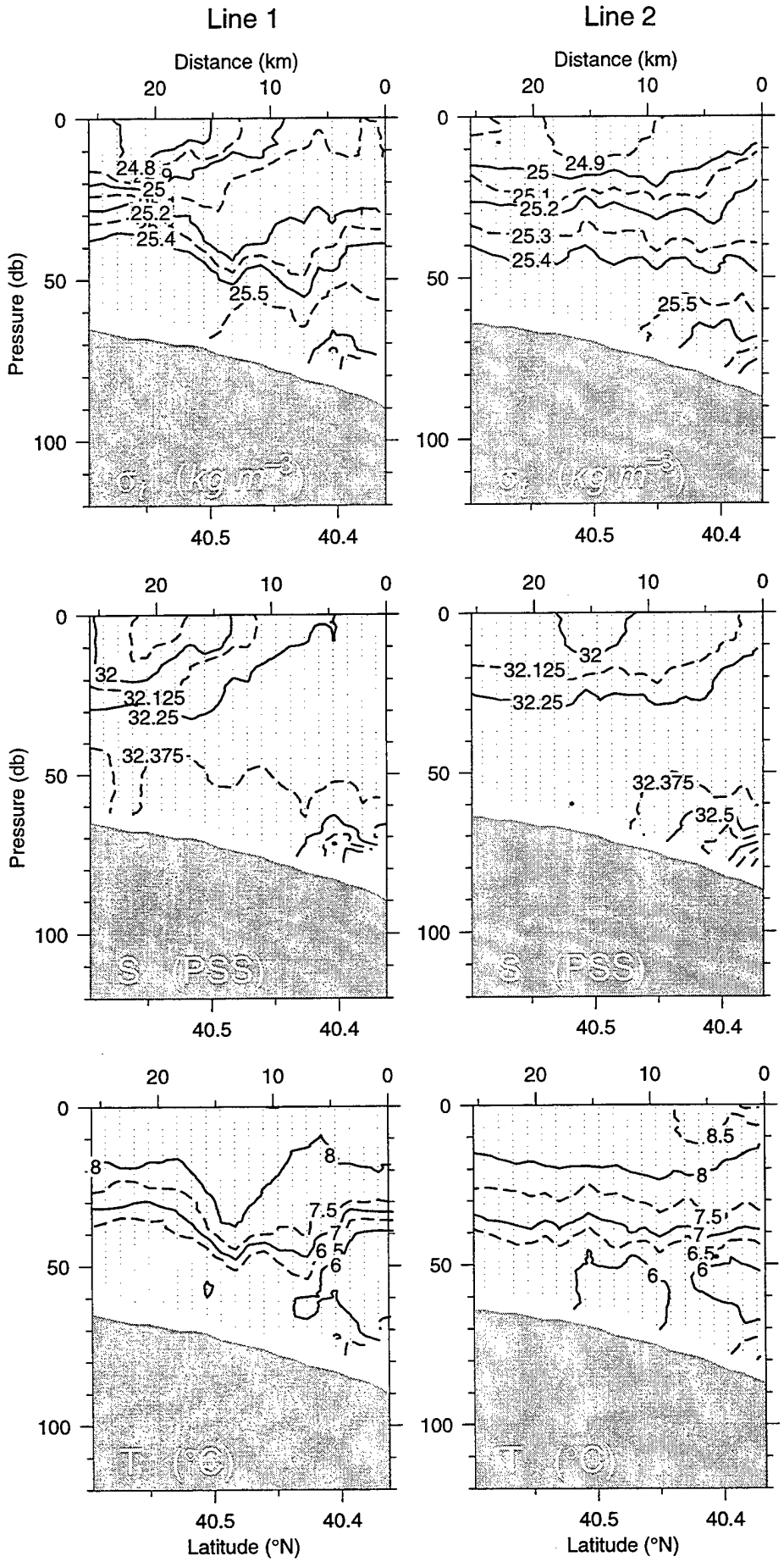






E9704 Small Box 11

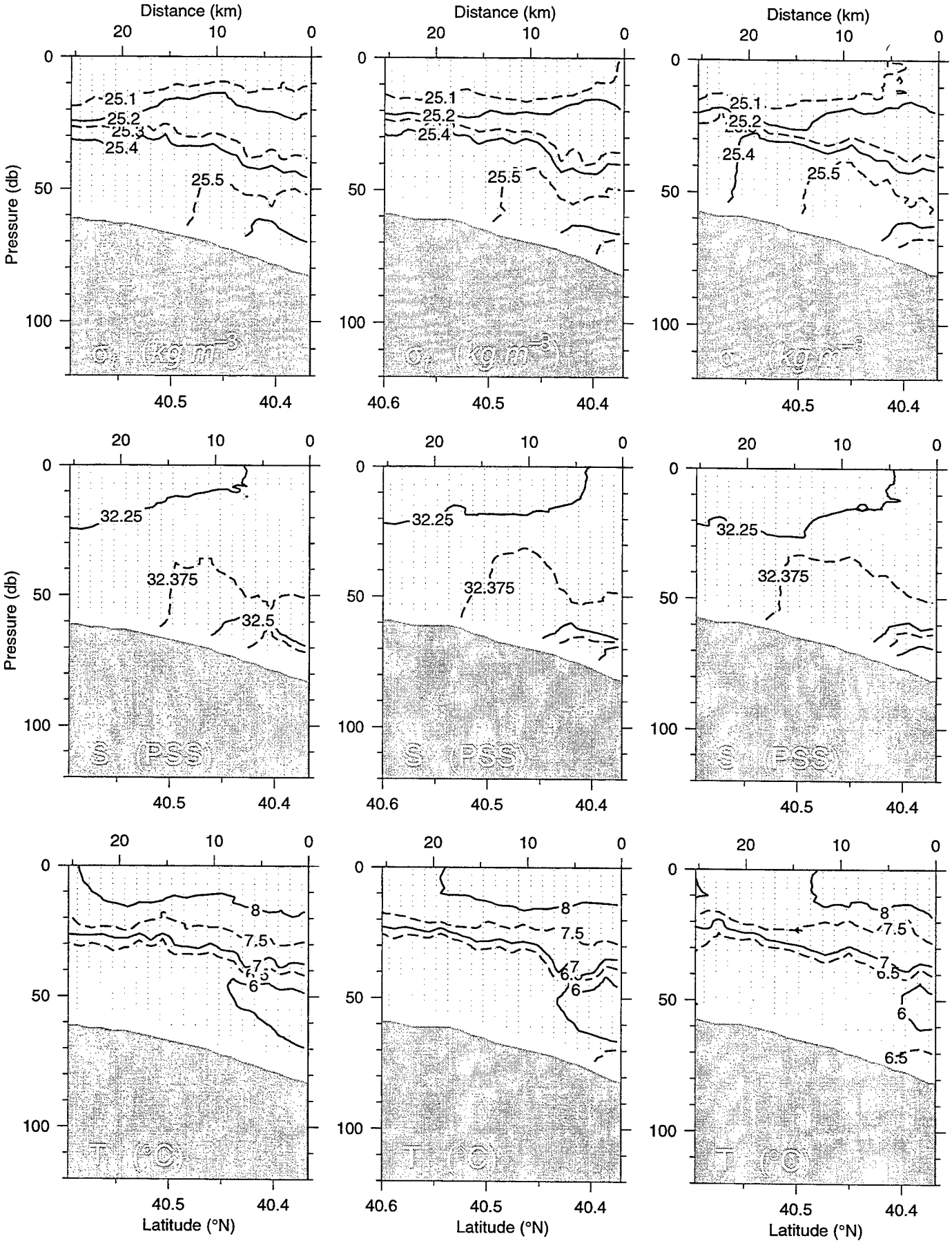
11-May-97 11:24 - 11-May-97 13:27 | 11-May-97 14:00 - 11-May-97 16:02



E9704 Small Box 11

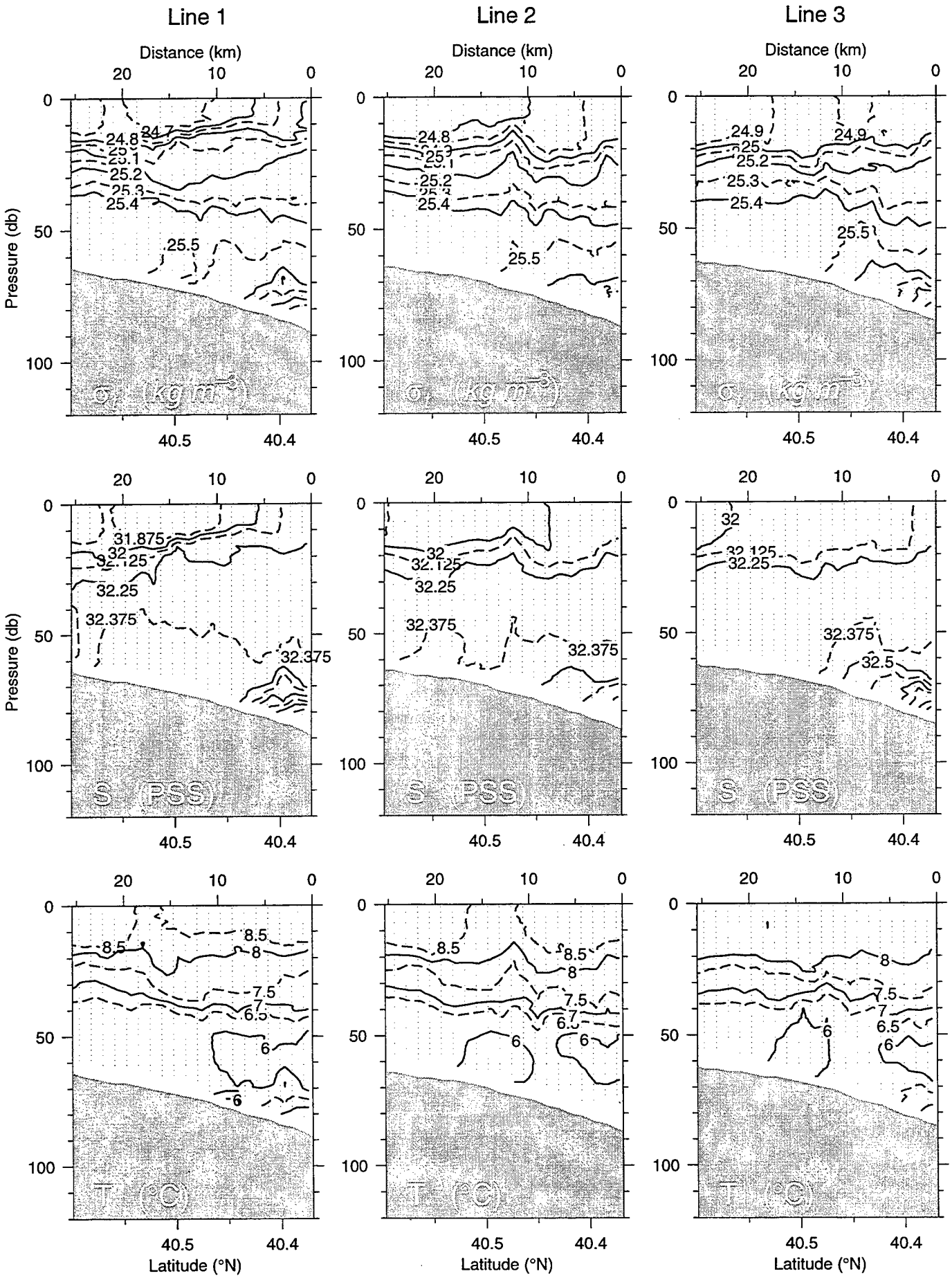
11-May-97 18:59 - 11-May-97 20:58 | 11-May-97 21:25 - 11-May-97 23:27 | 12-May-97 00:00 - 12-May-97 02:08

Line 4 | Line 5 | Line 6



E9704 Small Box 12

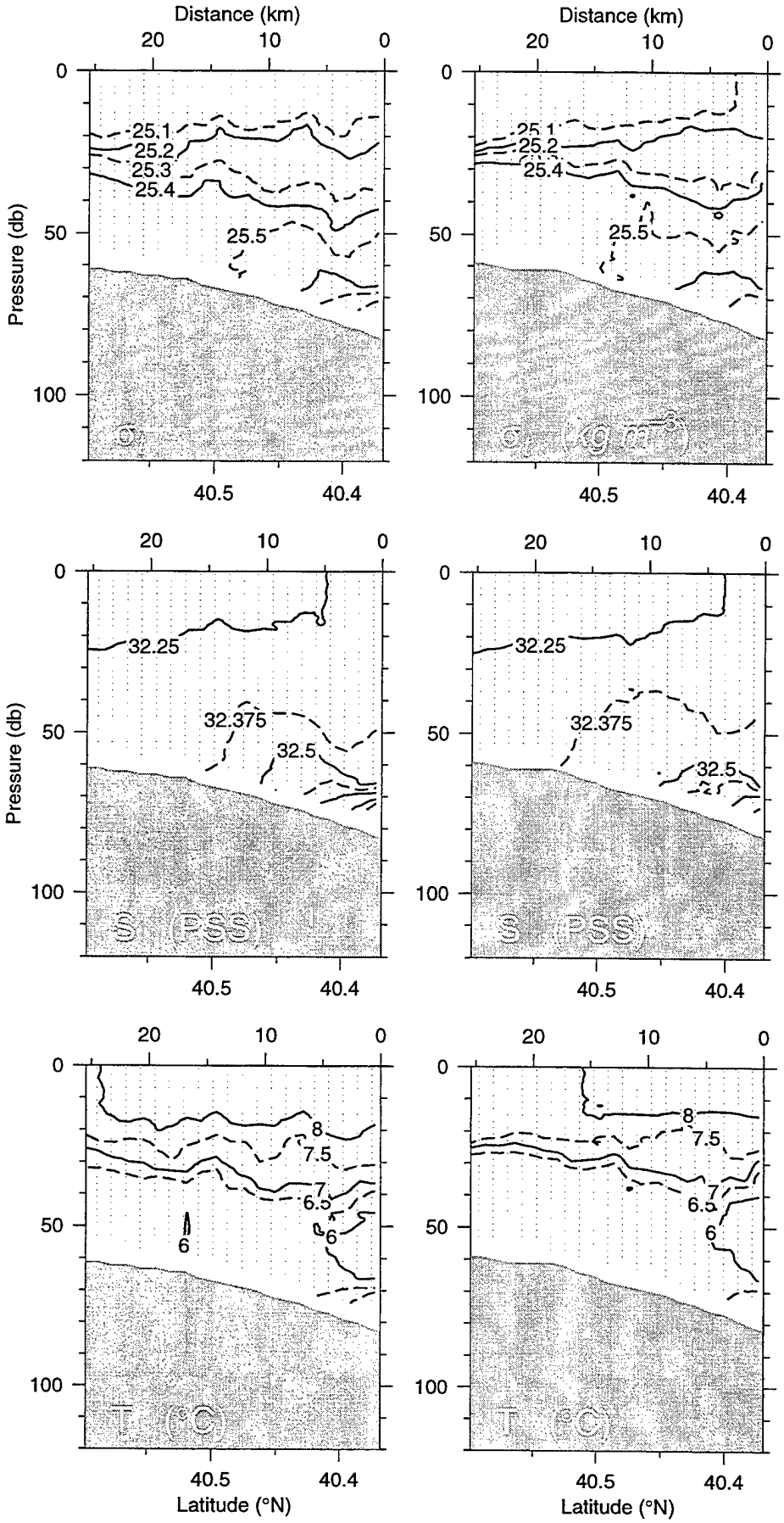
12-May-97 12:53 - 12-May-97 14:52 | 12-May-97 10:31 - 12-May-97 12:25 | 12-May-97 07:56 - 12-May-97 10:00



E9704 Small Box 12

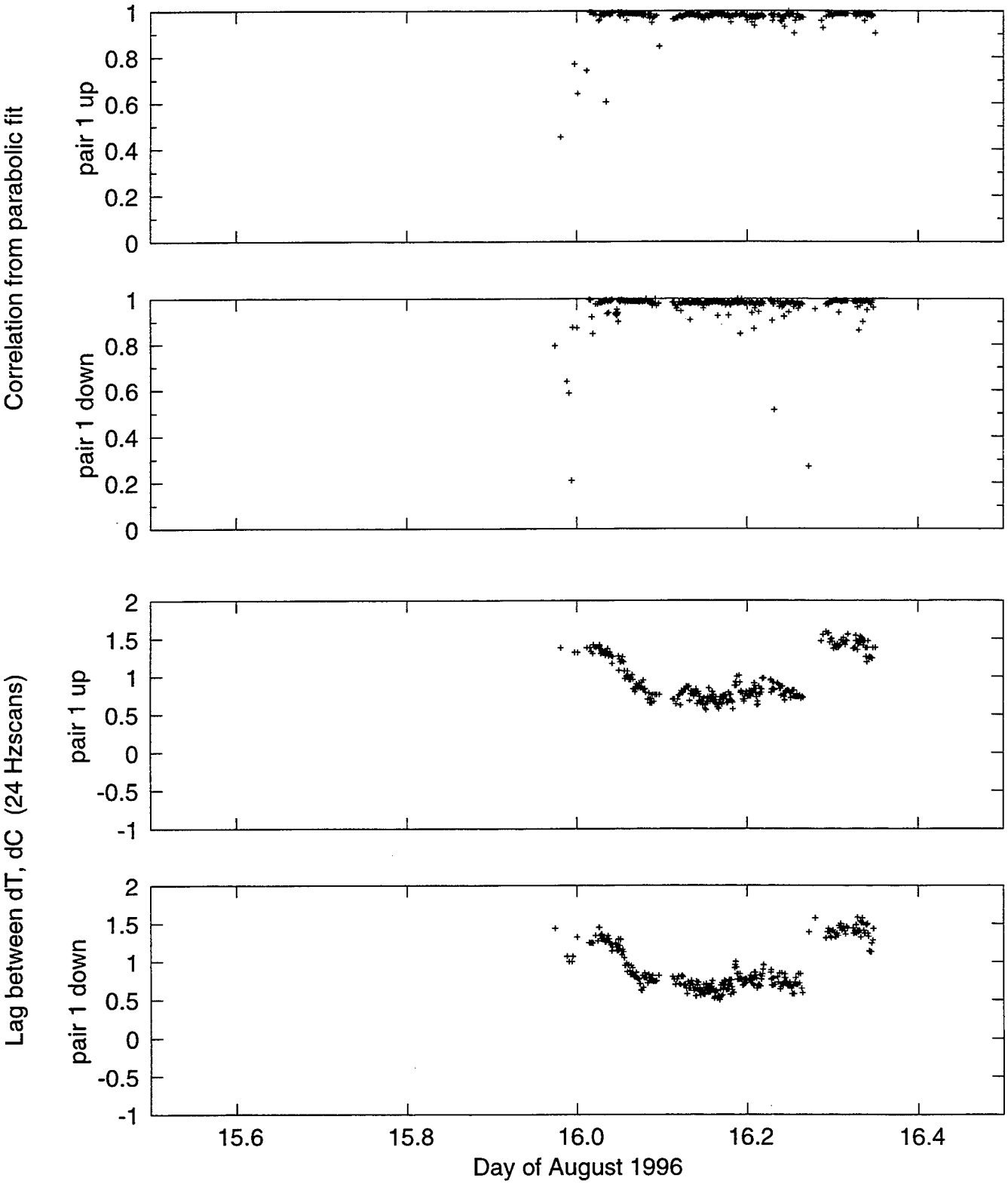
12-May-97 05:18 - 12-May-97 07:23 | 12-May-97 02:44 - 12-May-97 04:43

Line 4 | Line 5



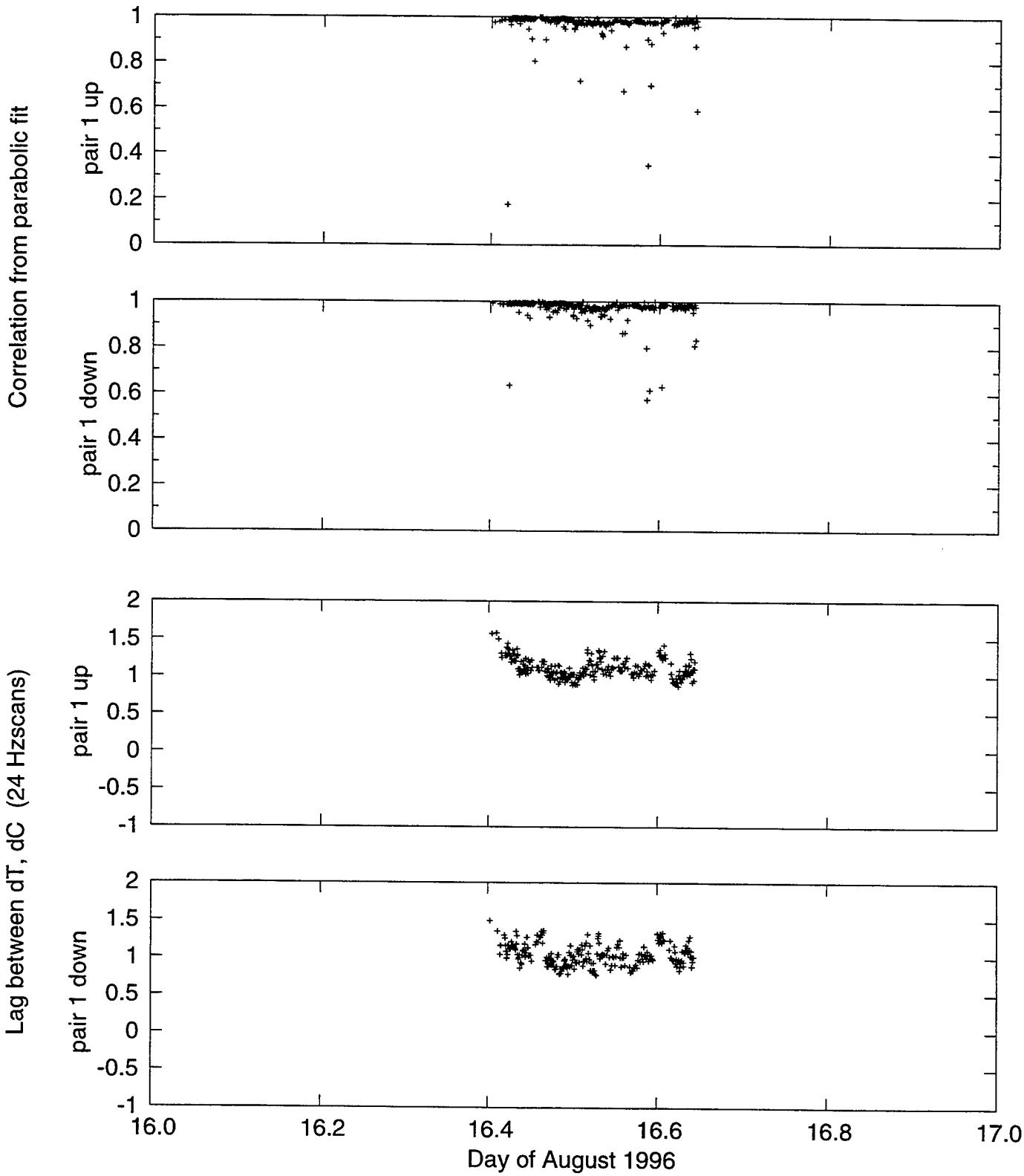
Appendix: Time Series of Maximum T/C Correlations and Lags

E9608 Tow 1



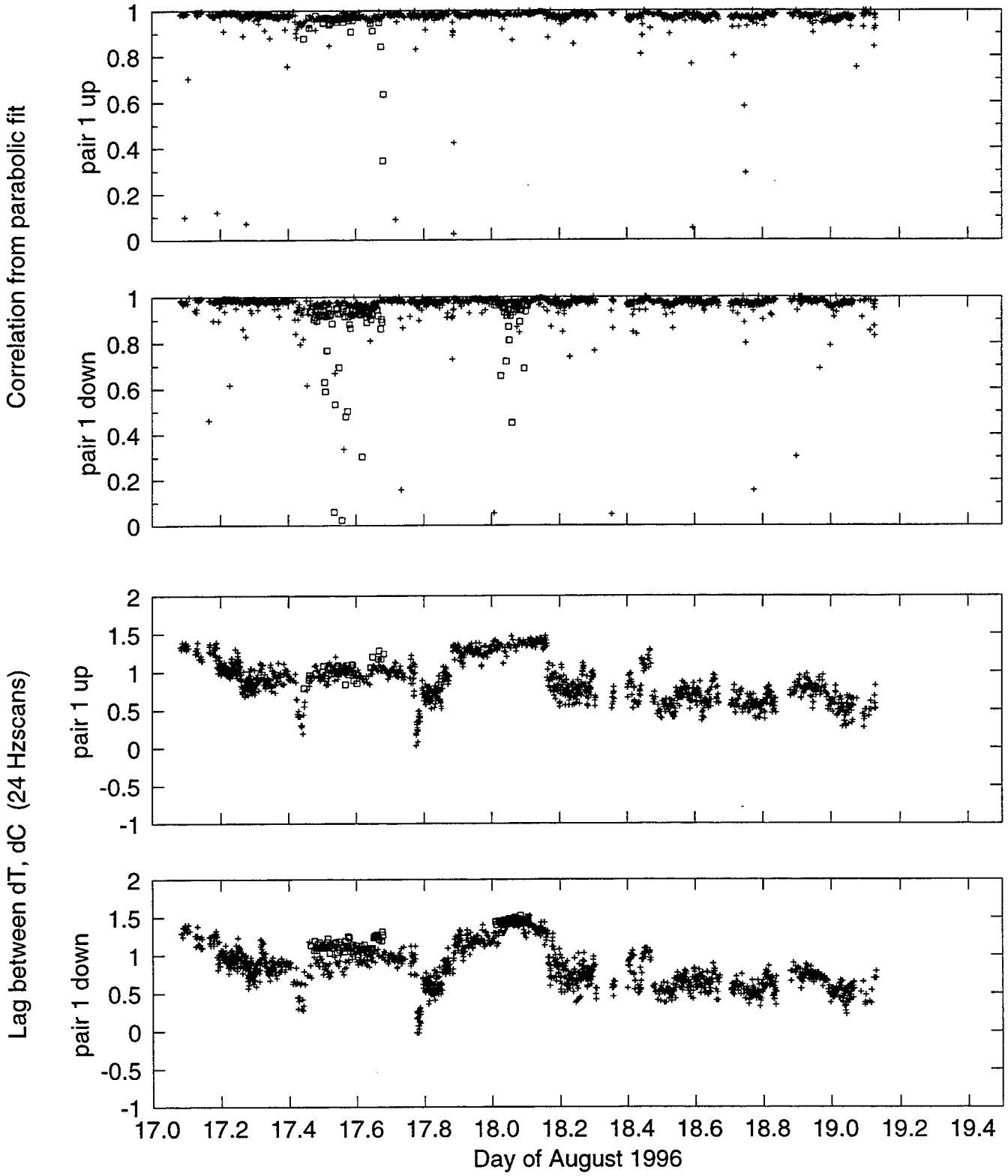
E9608 Tow 1, 10-90 db (plus), > 90 db (square)

E9608 Tow 2



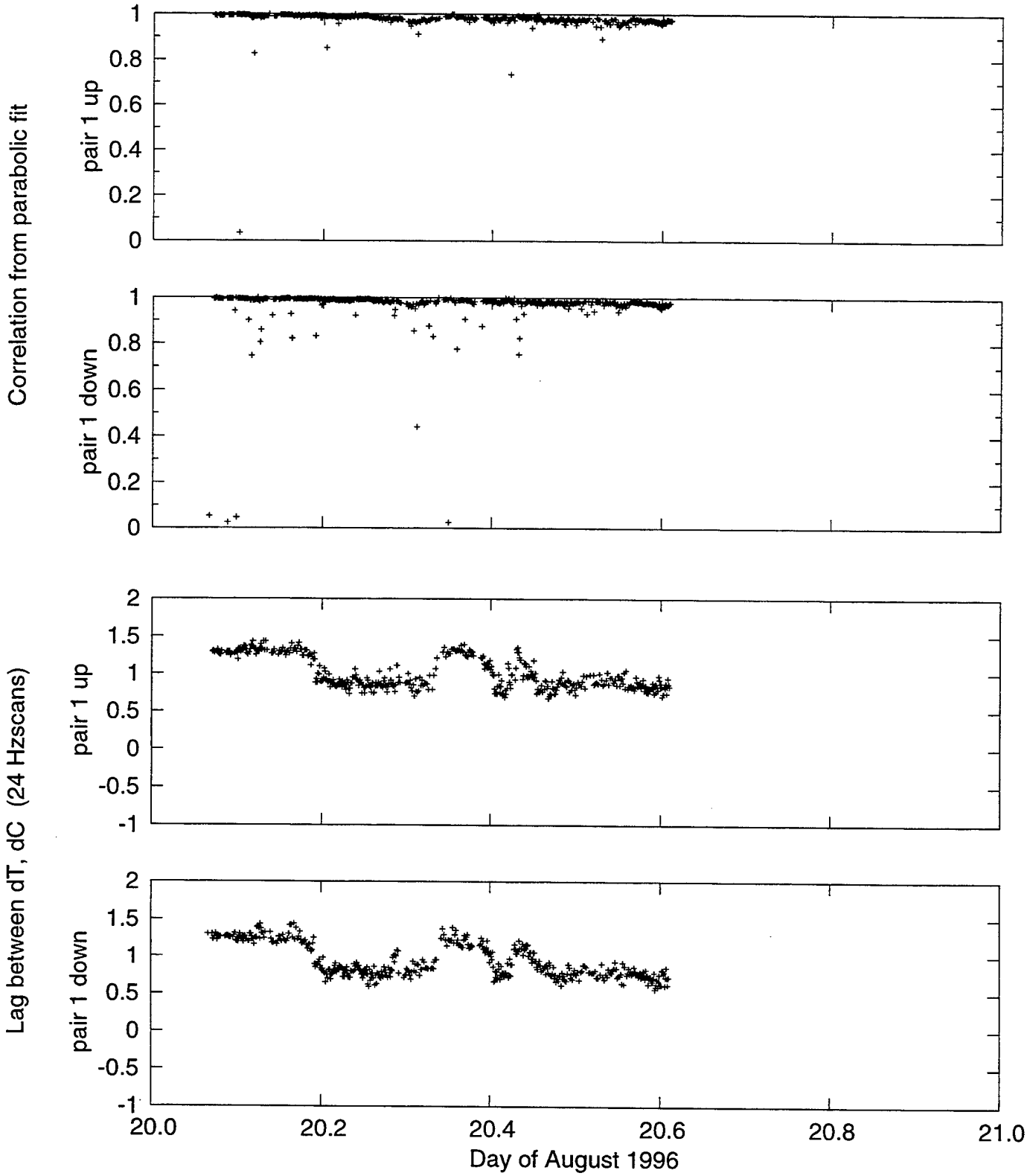
E9608 Tow 2, 10-90 db (plus), > 90 db (square)

E9608 Tow 3



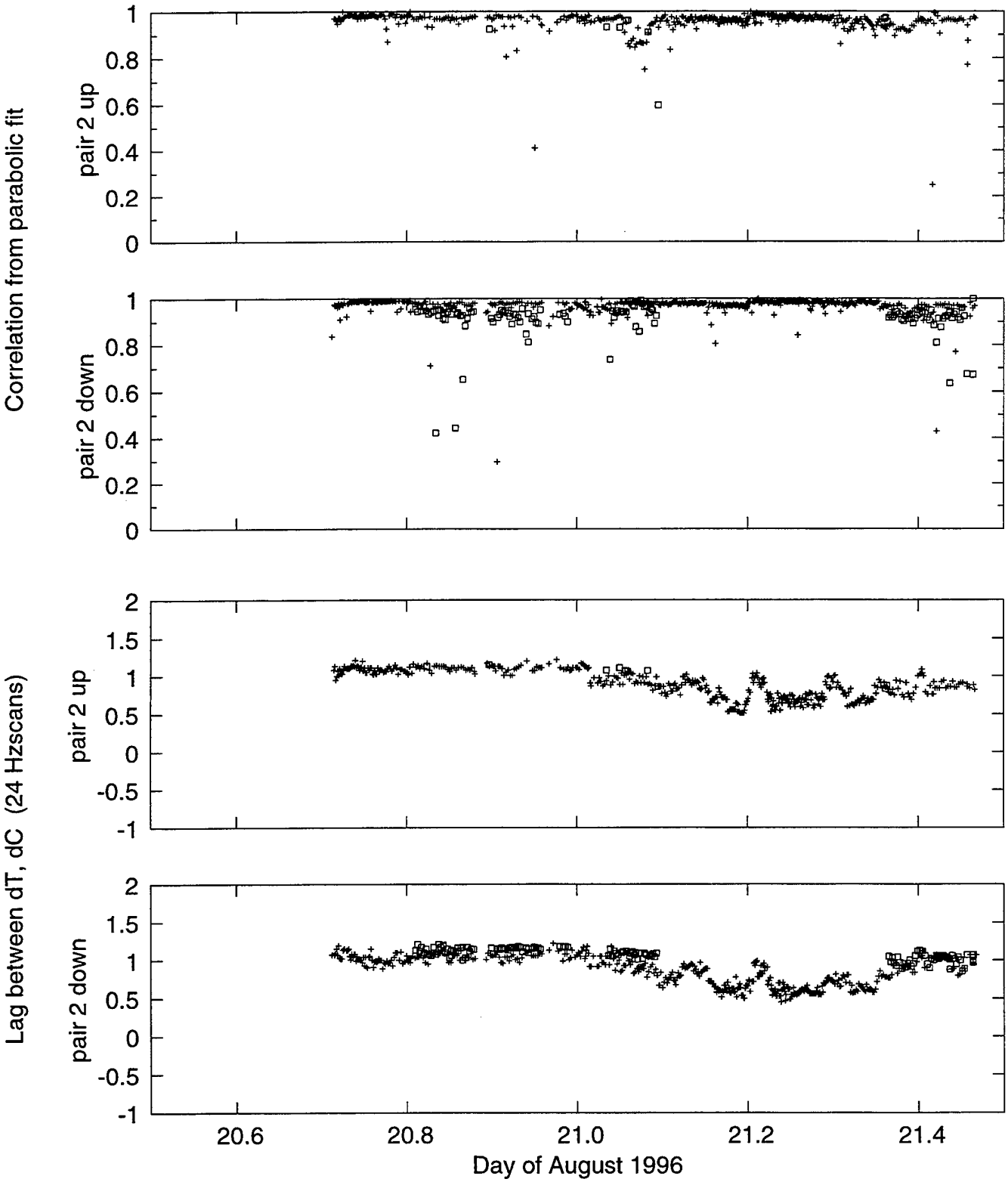
E9608 Tow 3, 10-90 db (plus), > 90 db (square)

E9608 Tow 4



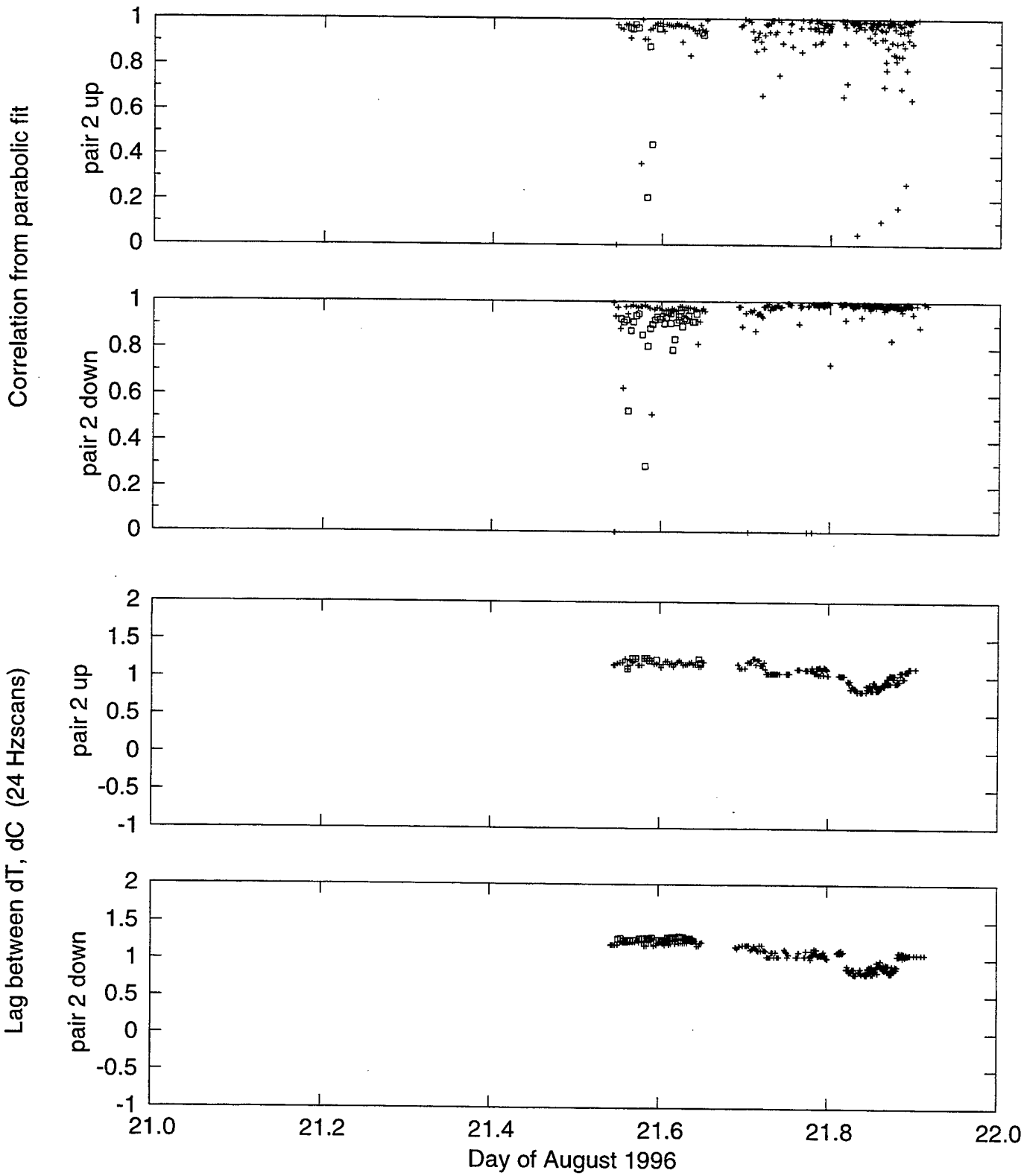
E9608 Tow 4, 10-90 db (plus), > 90 db (square)

E9608 Tow 5



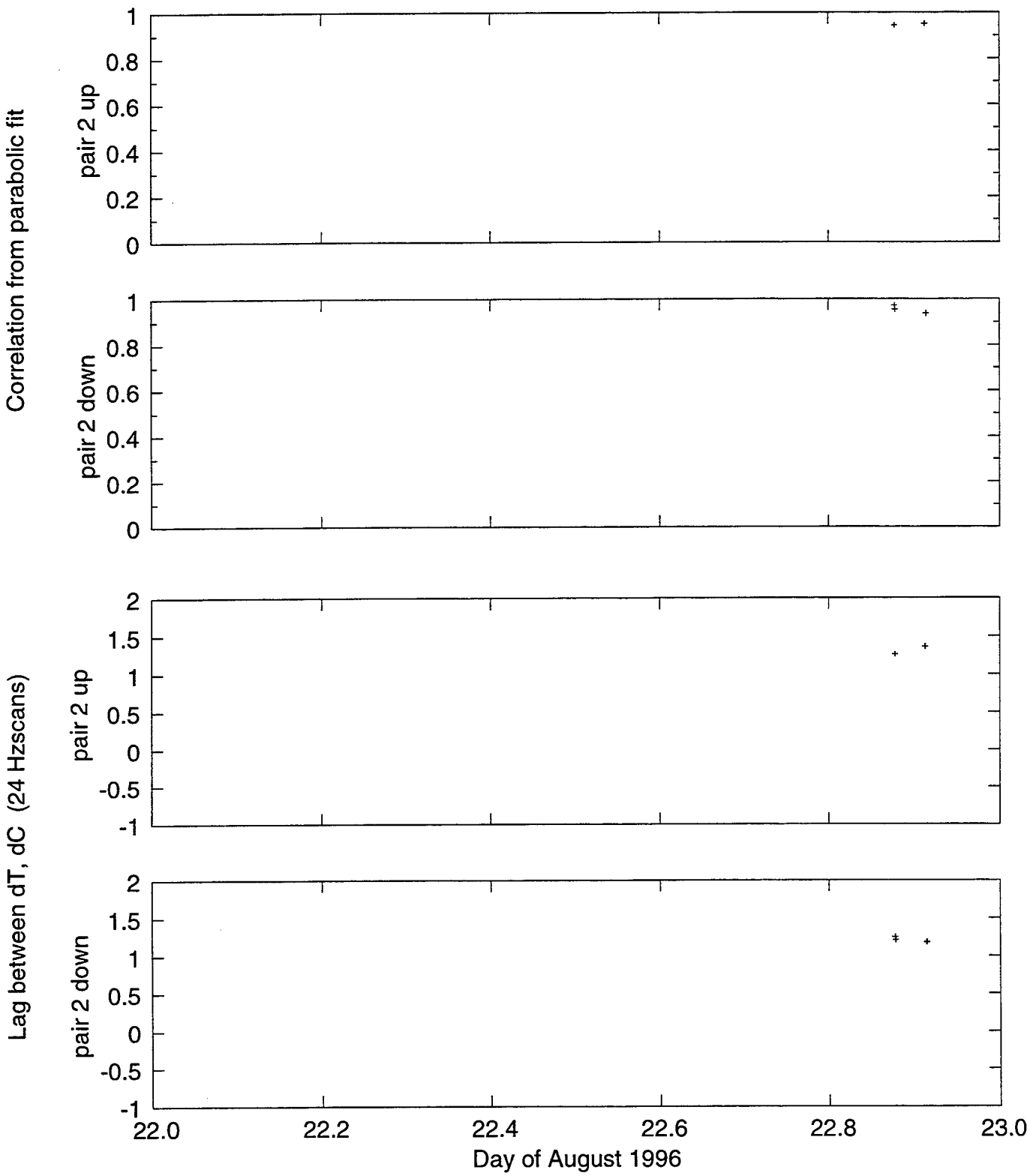
E9608 Tow 5, 10-90 db (plus), > 90 db (square)

E9608 Tow 6



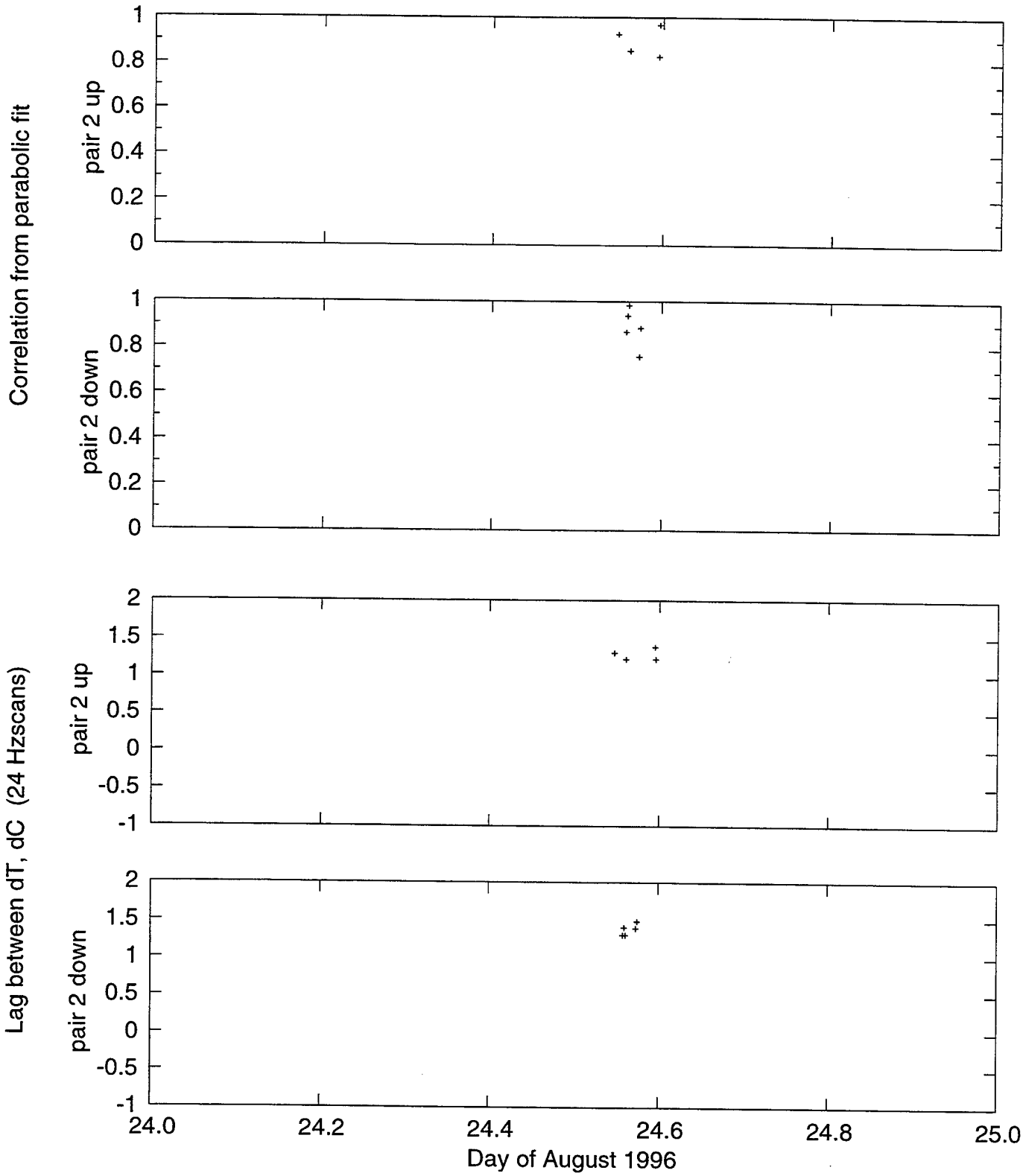
E9608 Tow 6, 10-90 db (plus), > 90 db (square)

E9608 Tow 7



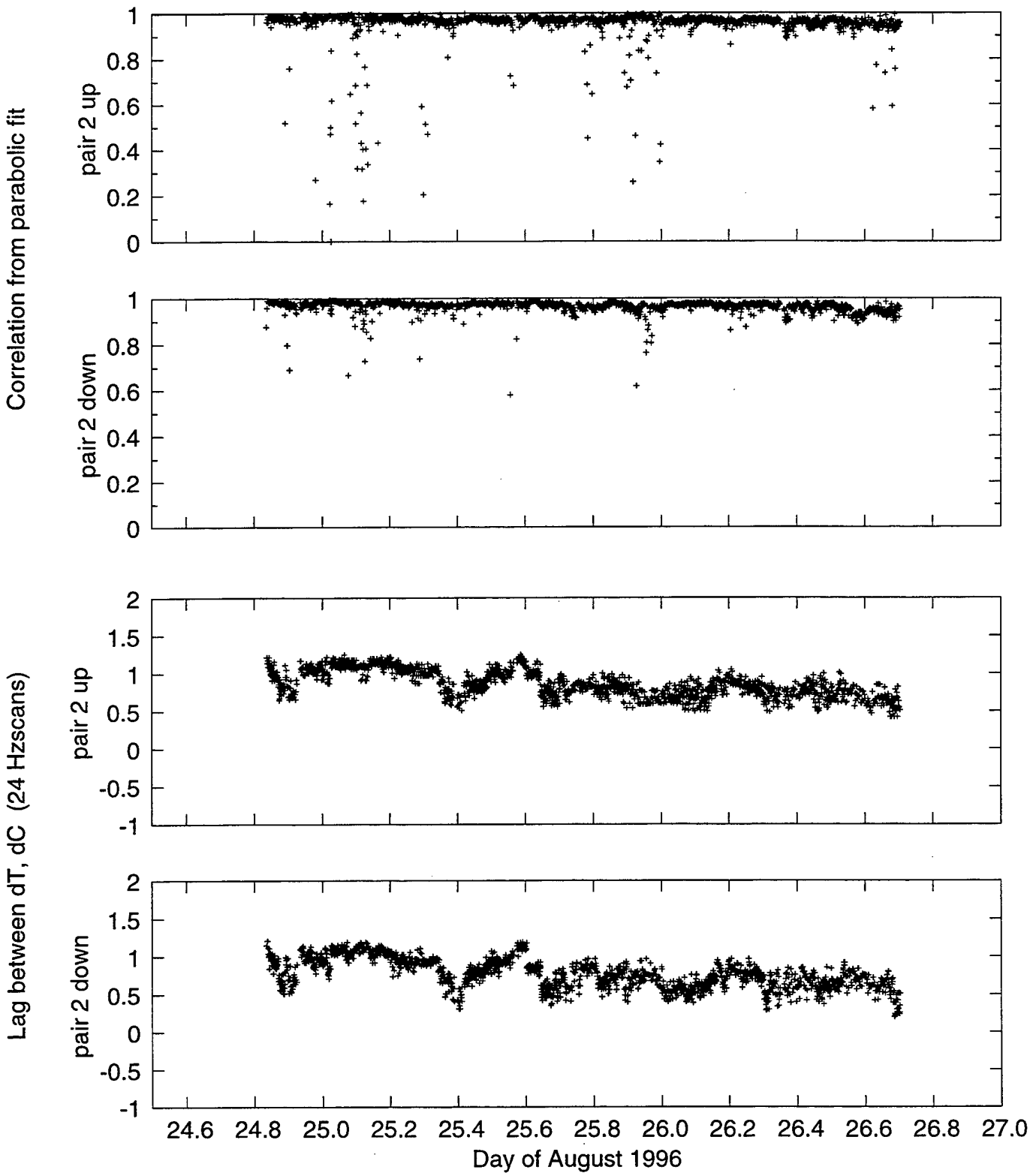
E9608 Tow 7, 10-90 db (plus), > 90 db (square)

E9608 Tow 8



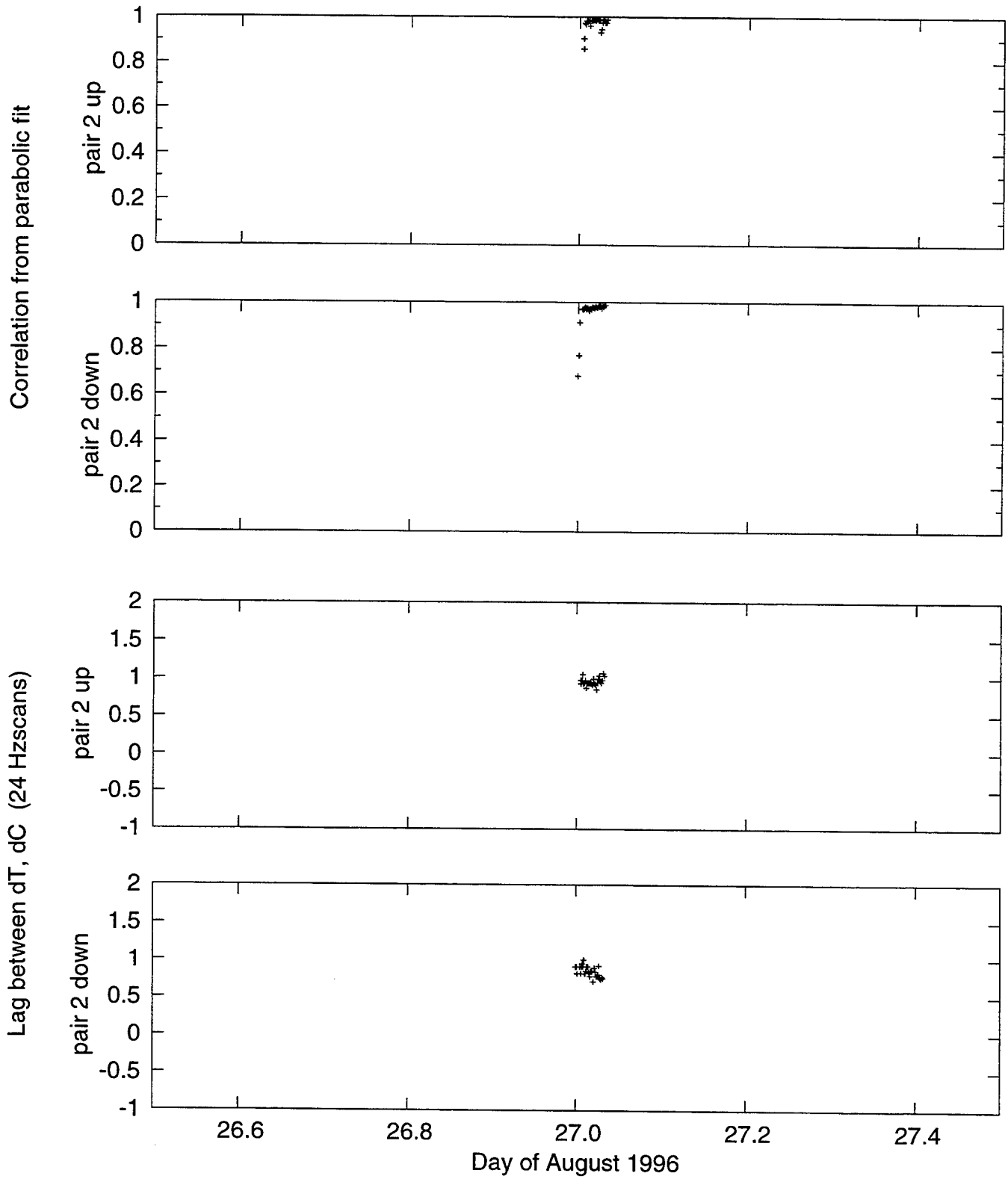
E9608 Tow 8, 10-90 db (plus), > 90 db (square)

E9608 Tow 9



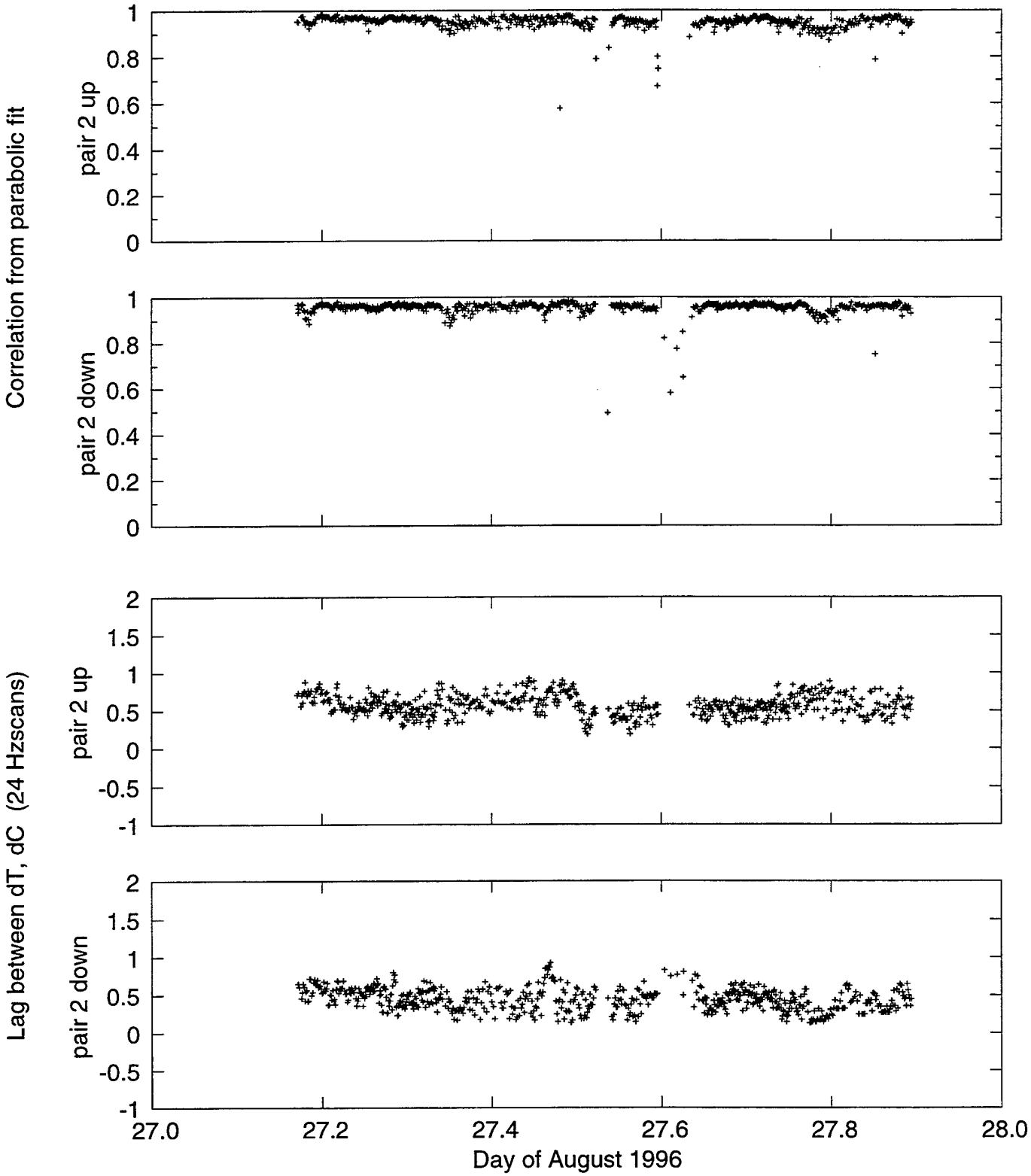
E9608 Tow 9, 10-90 db (plus), > 90 db (square)

E9608 Tow 10



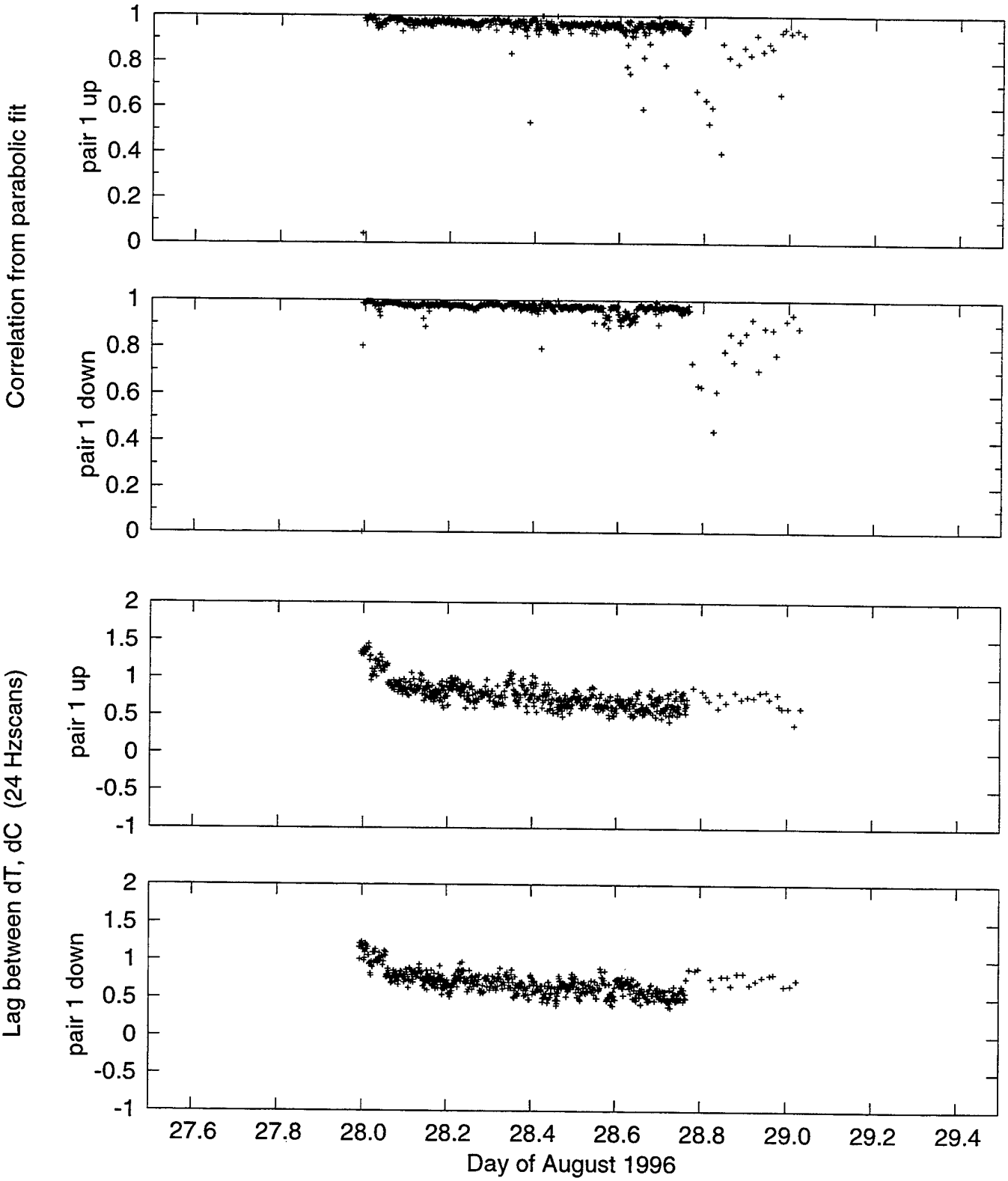
E9608 Tow 10, 10-90 db (plus), > 90 db (square)

E9608 Tow 11



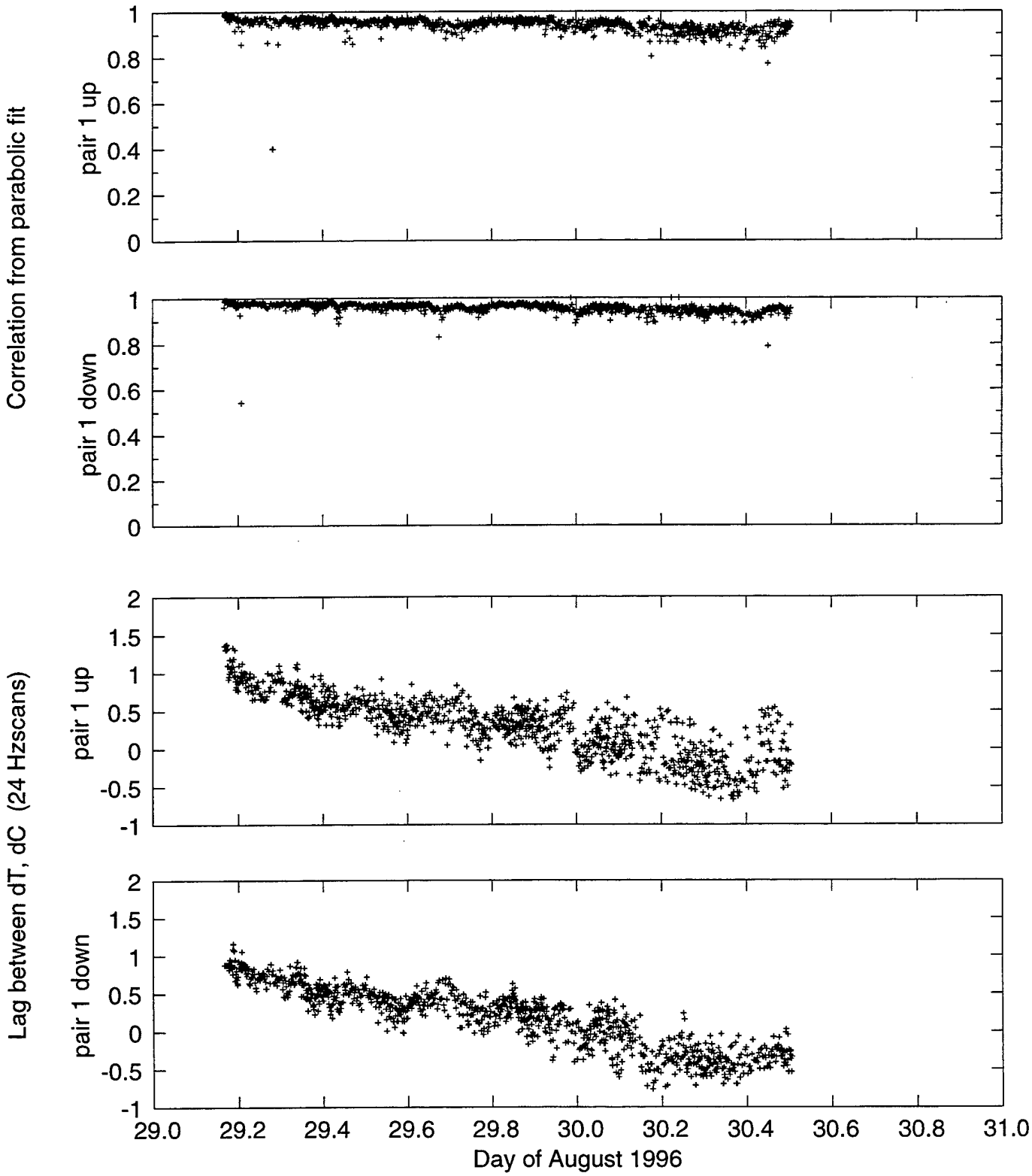
E9608 Tow 11, 10-90 db (plus), > 90 db (square)

E9608 Tow 12



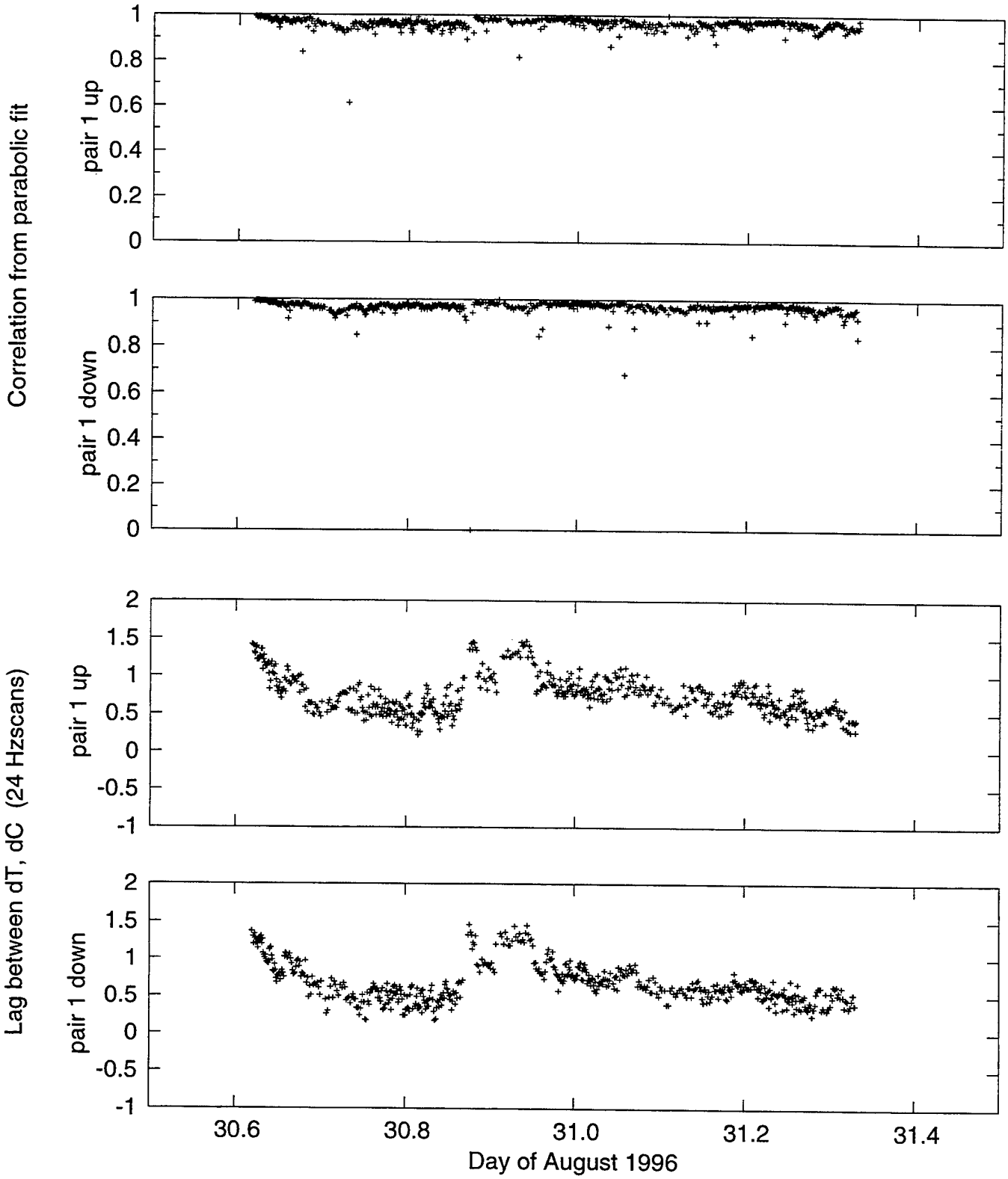
E9608 Tow 12, 10-90 db (plus), > 90 db (square)

E9608 Tow 13



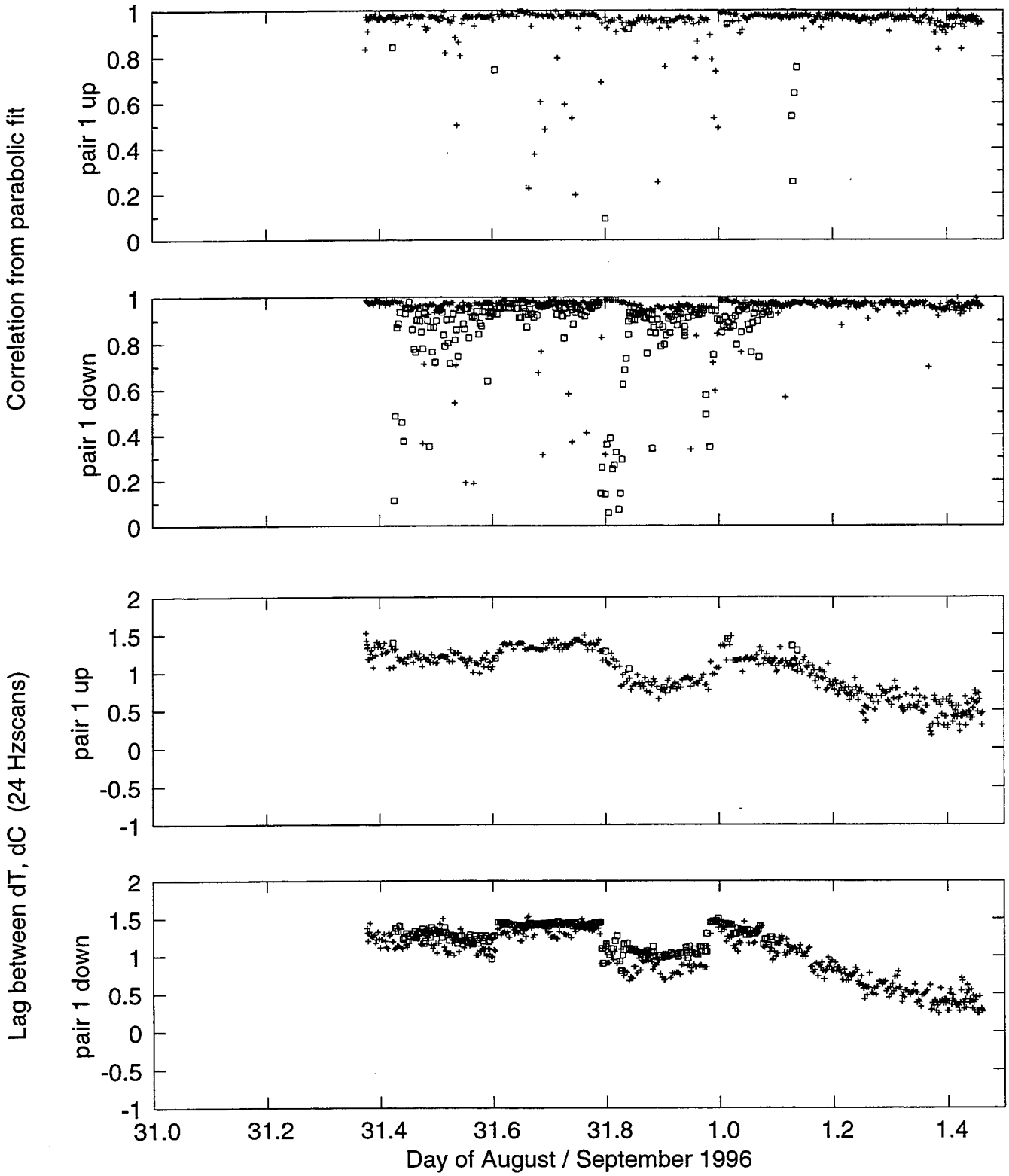
E9608 Tow 13, 10-90 db (plus), > 90 db (square)

E9608 Tow 14



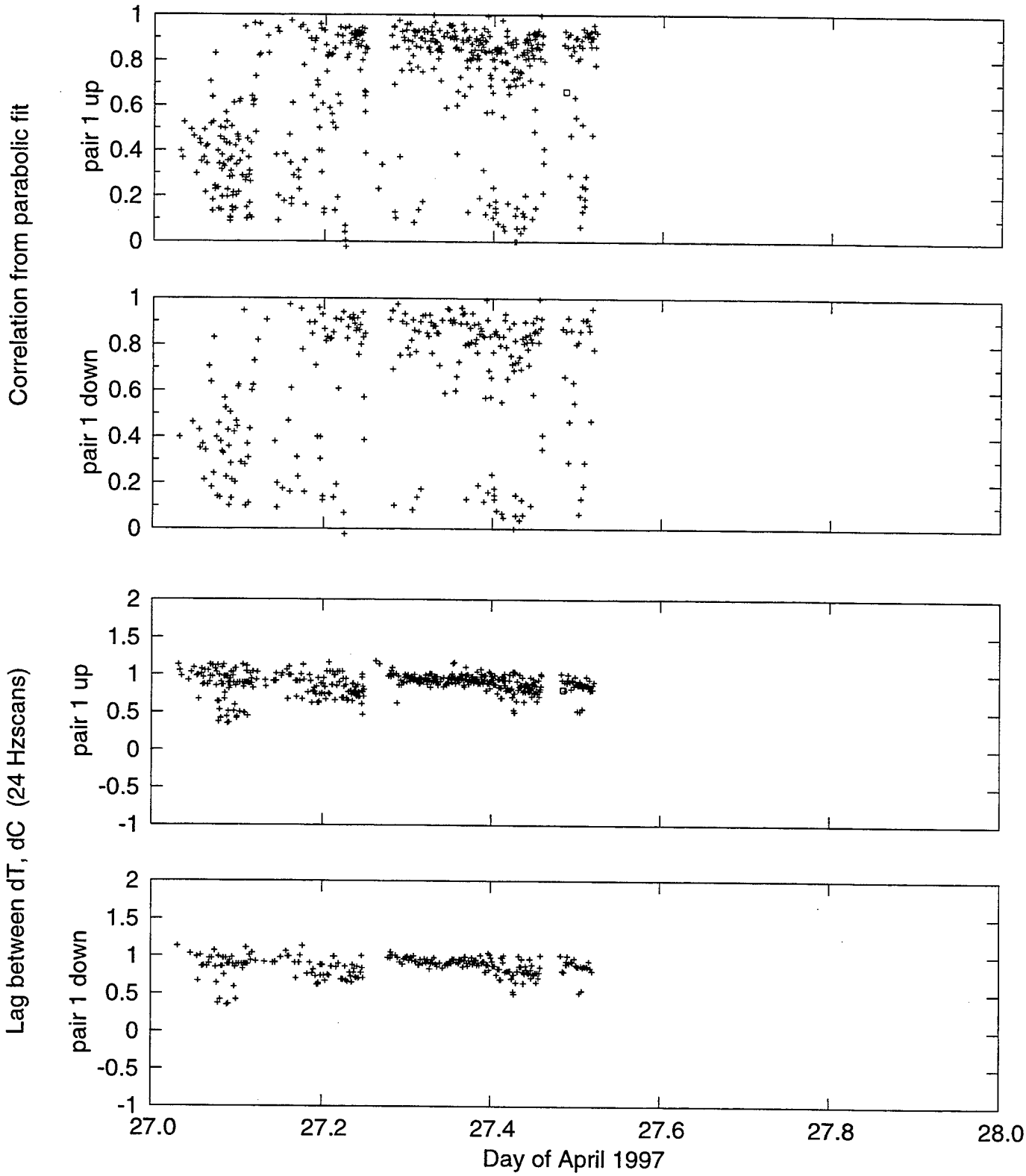
E9608 Tow 14, 10-90 db (plus), > 90 db (square)

E9608 Tow 15



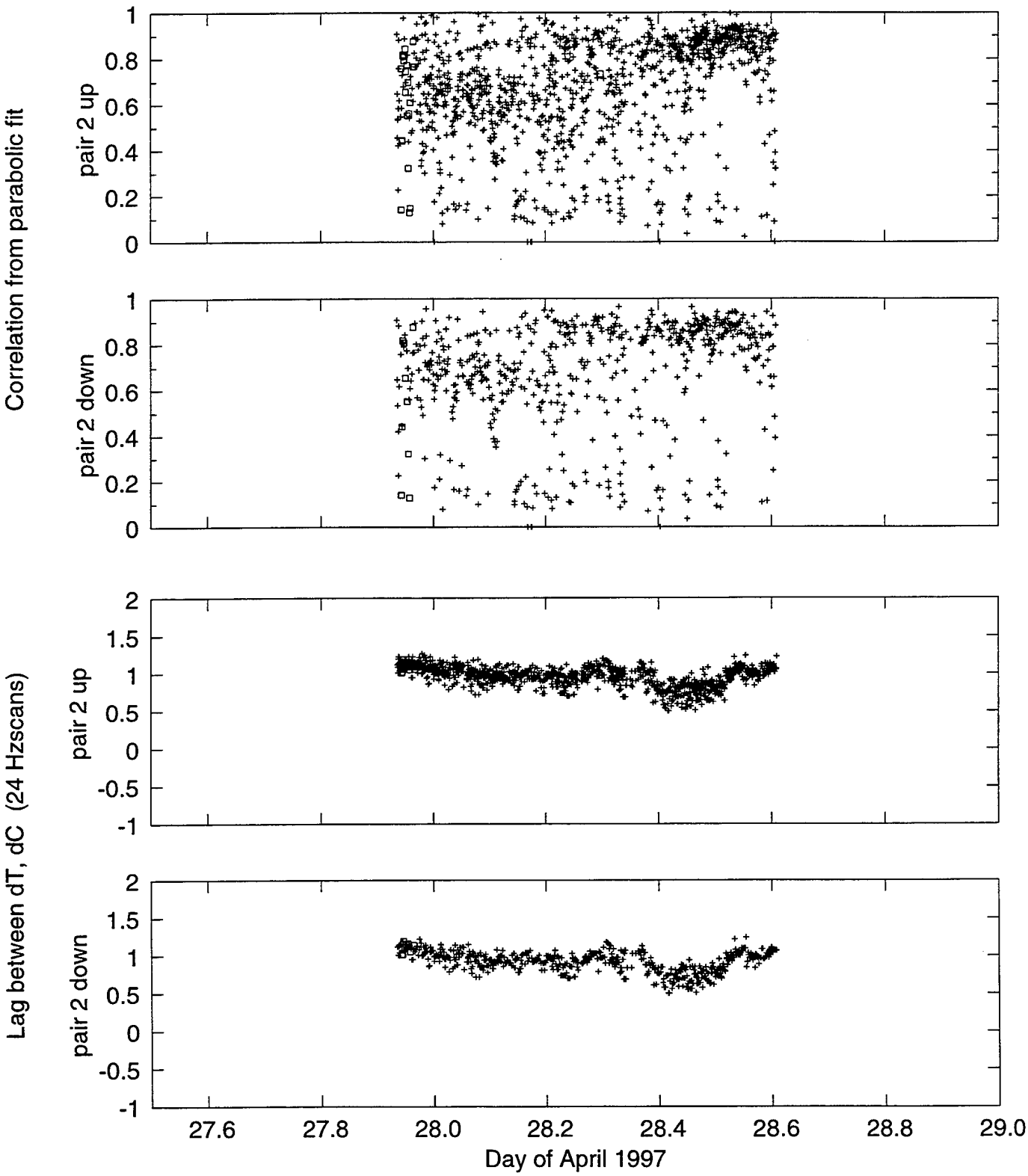
E9608 Tow 15, 10-90 db (plus), > 90 db (square)

E9704 Tow 1



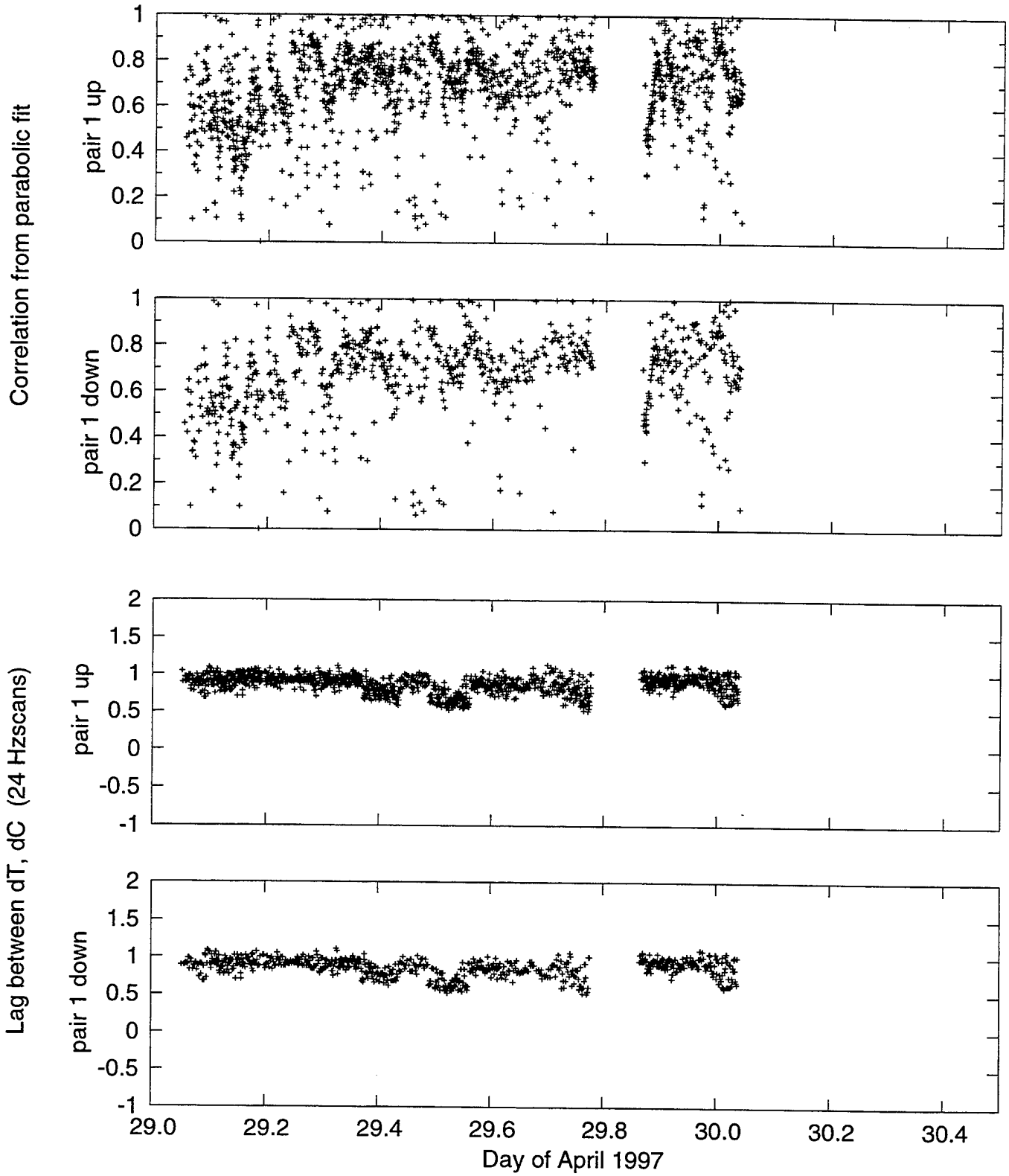
E9704 Tow 1, 10-90 db (plus), > 90 db (square)

E9704 Tow 2



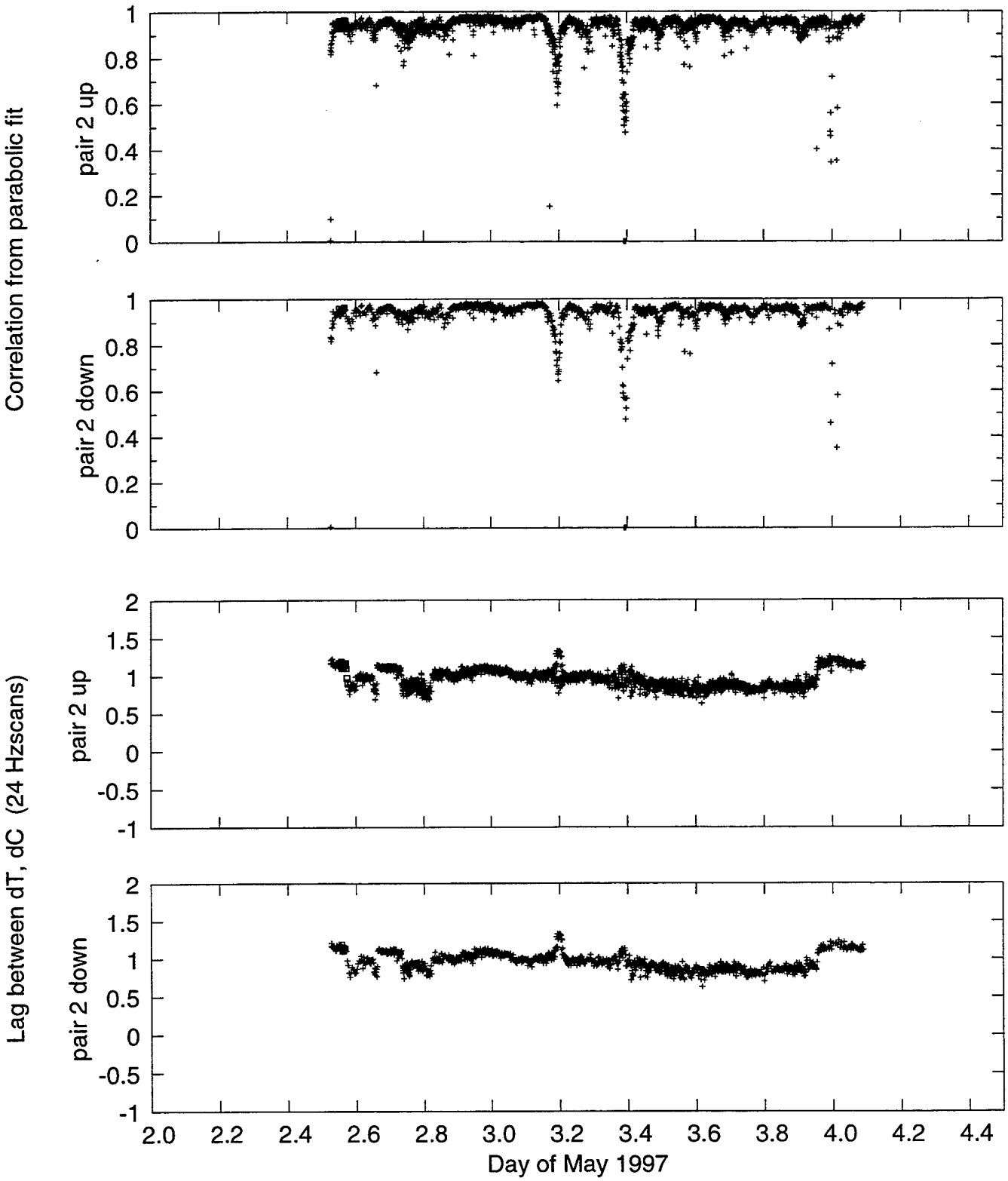
E9704 Tow 2, 10-90 db (plus), > 90 db (square)

E9704 Tow 3



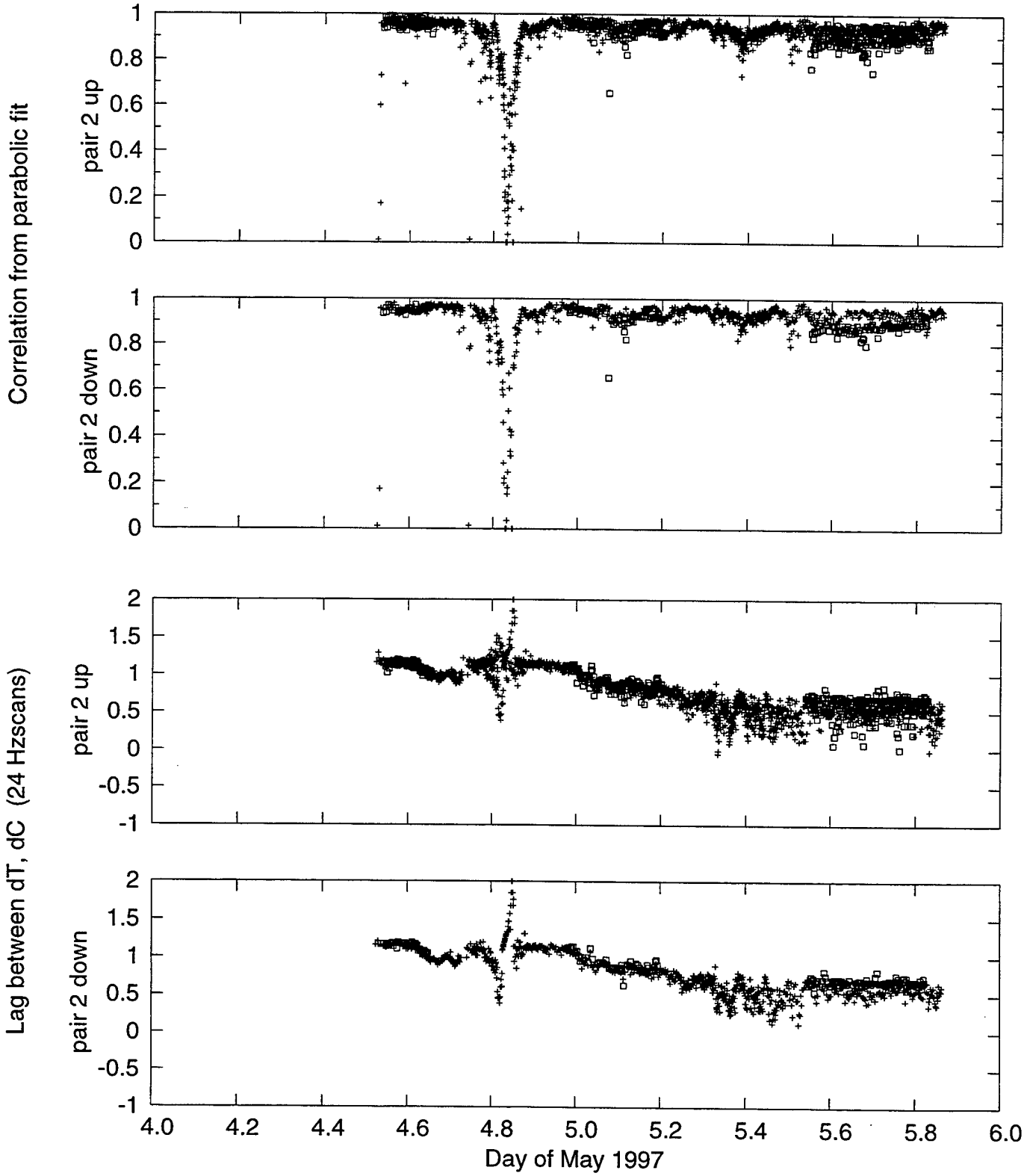
E9704 Tow 3, 10-90 db (plus), > 90 db (square)

E9704 Tow 4



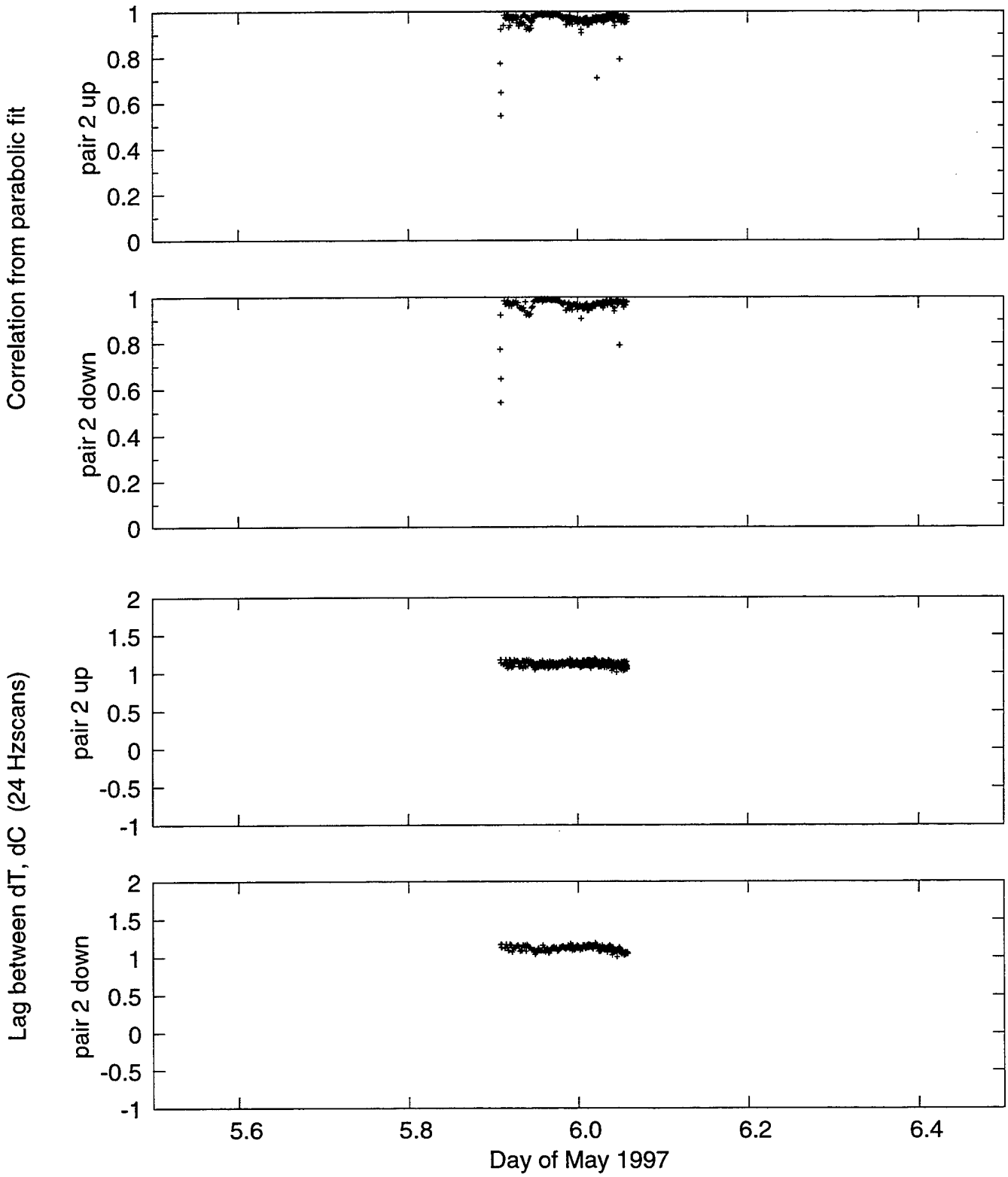
E9704 Tow 4, 10-90 db (plus), > 90 db (square)

E9704 Tow 5



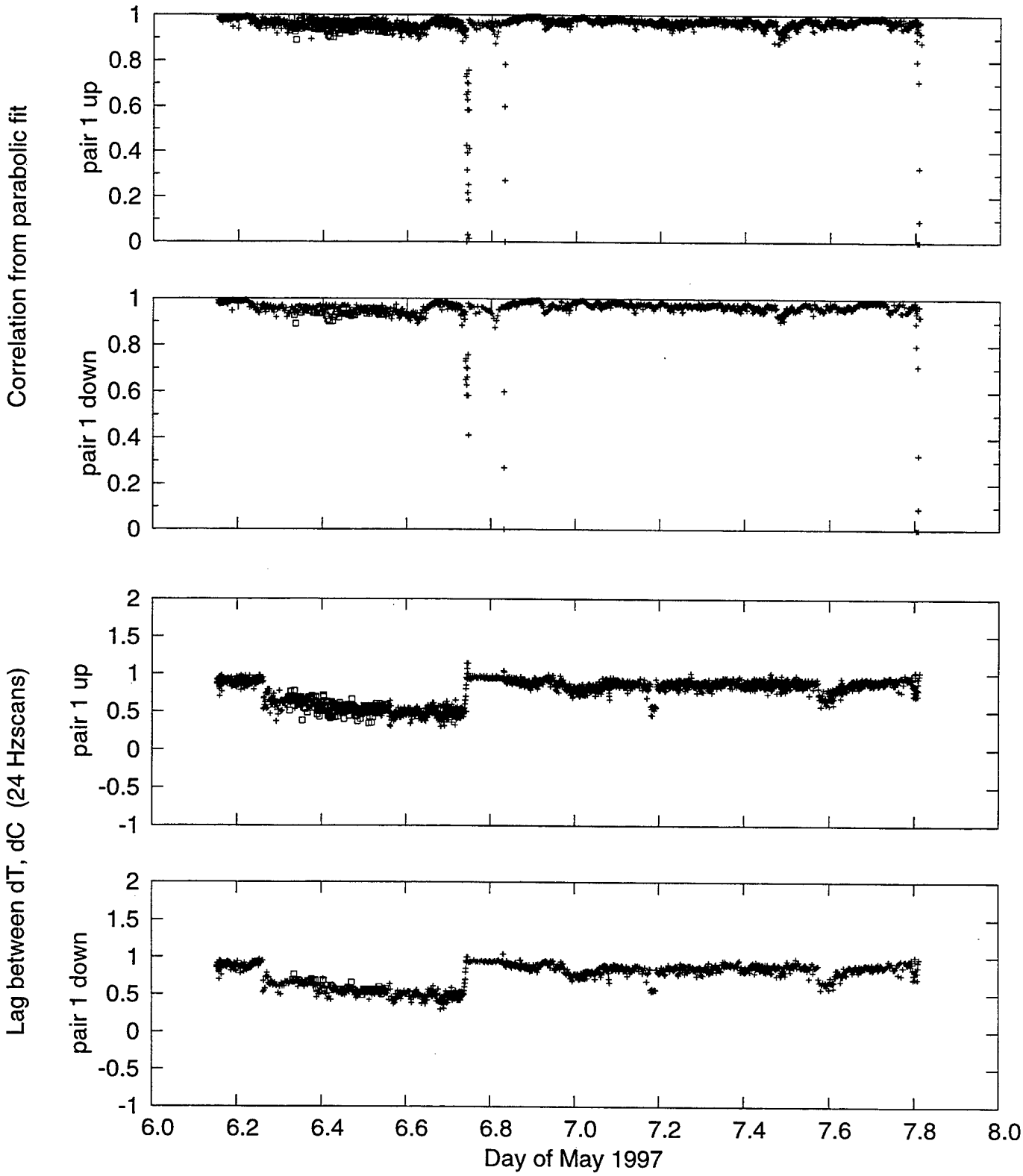
E9704 Tow 5, 10-90 db (plus), > 90 db (square)

E9704 Tow 6



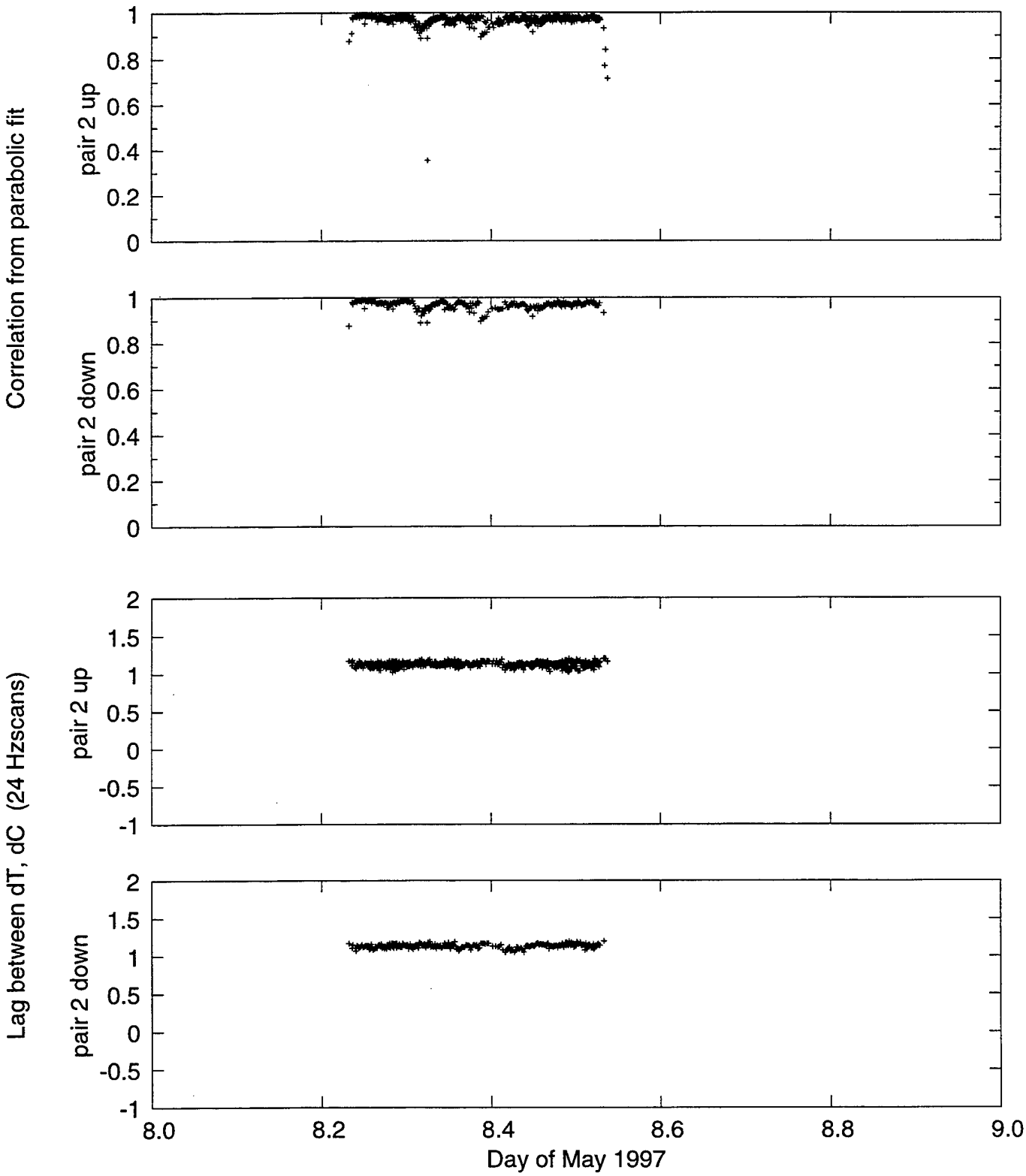
E9704 Tow 6, 10-90 db (plus), > 90 db (square)

E9704 Tow 7



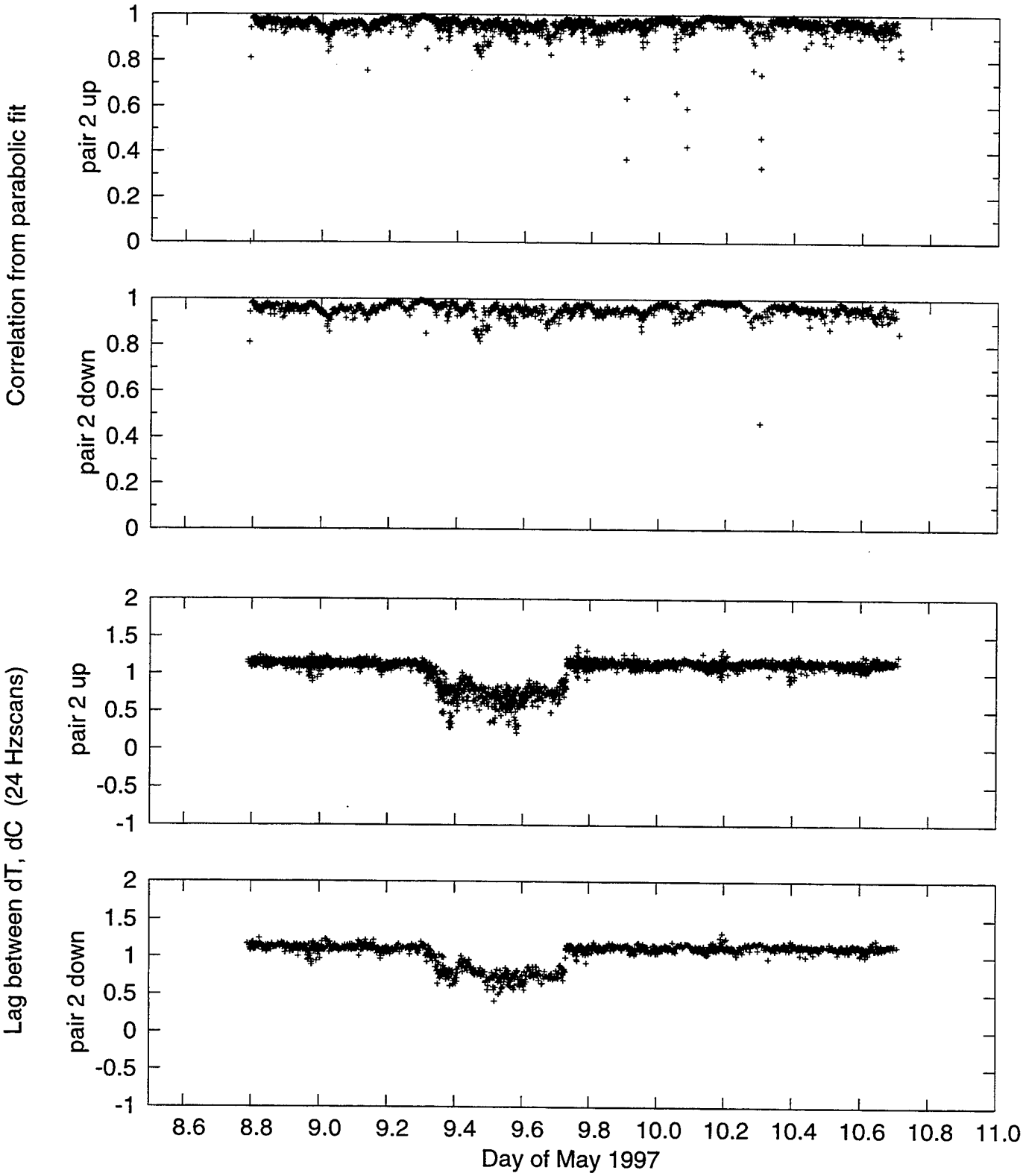
E9704 Tow 7, 10-90 db (plus), > 90 db (square)

E9704 Tow 8



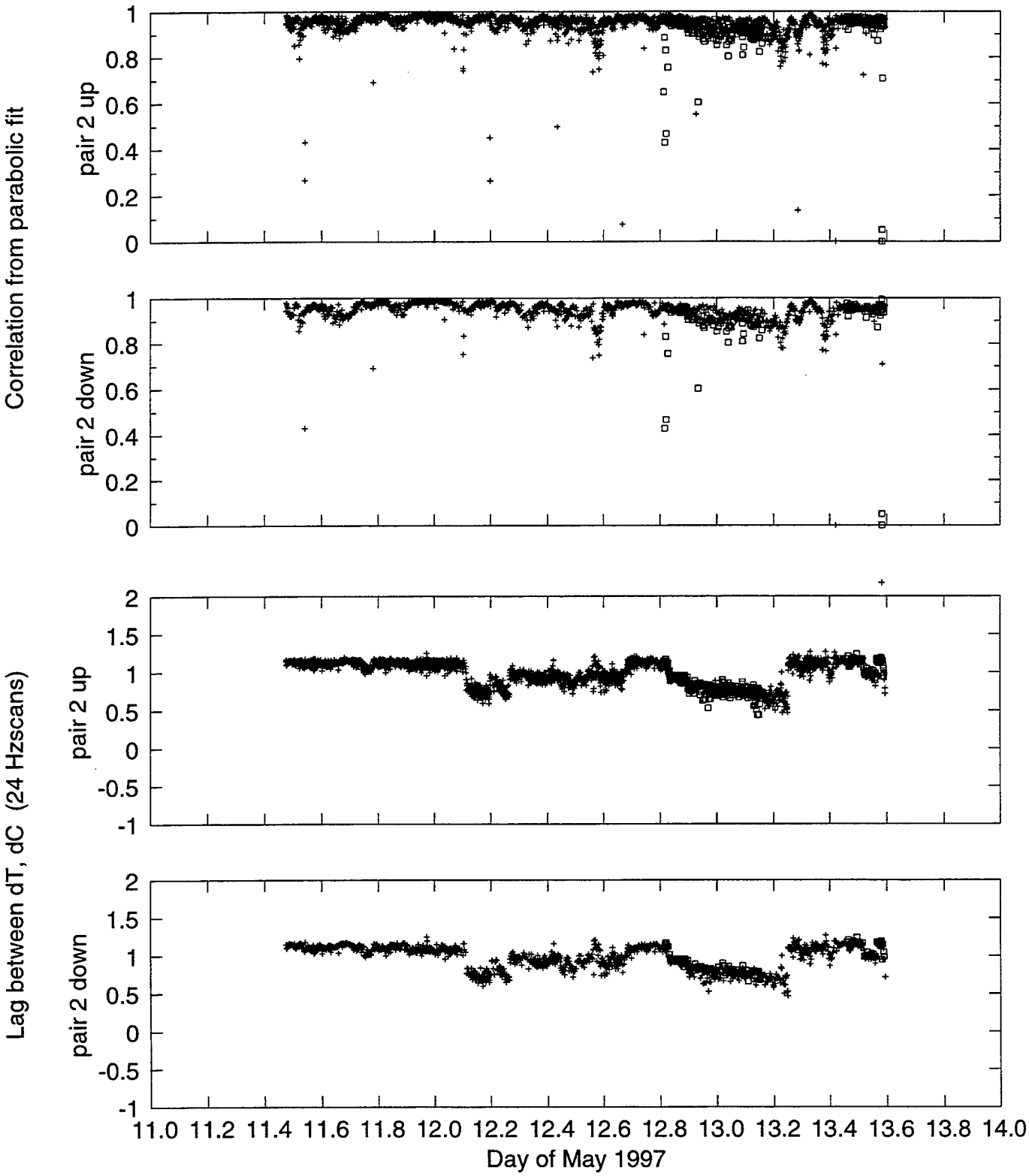
E9704 Tow 8, 10-90 db (plus), > 90 db (square)

E9704 Tow 9



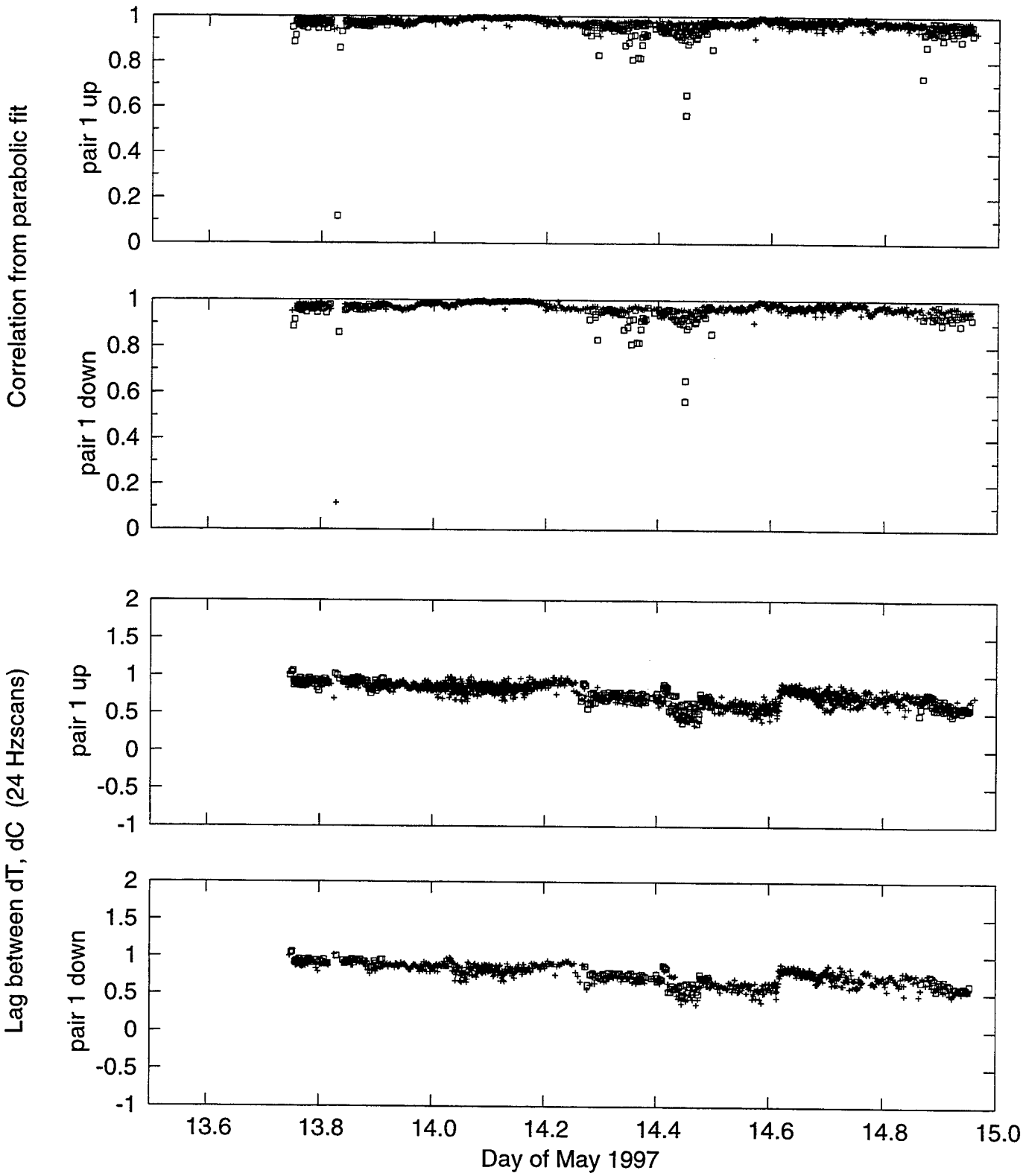
E9704 Tow 9, 10-90 db (plus), > 90 db (square)

E9704 Tow 10



E9704 Tow 10, 10-90 db (plus), > 90 db (square)

E9704 Tow 11



E9704 Tow 11, 10-90 db (plus), > 90 db (square)