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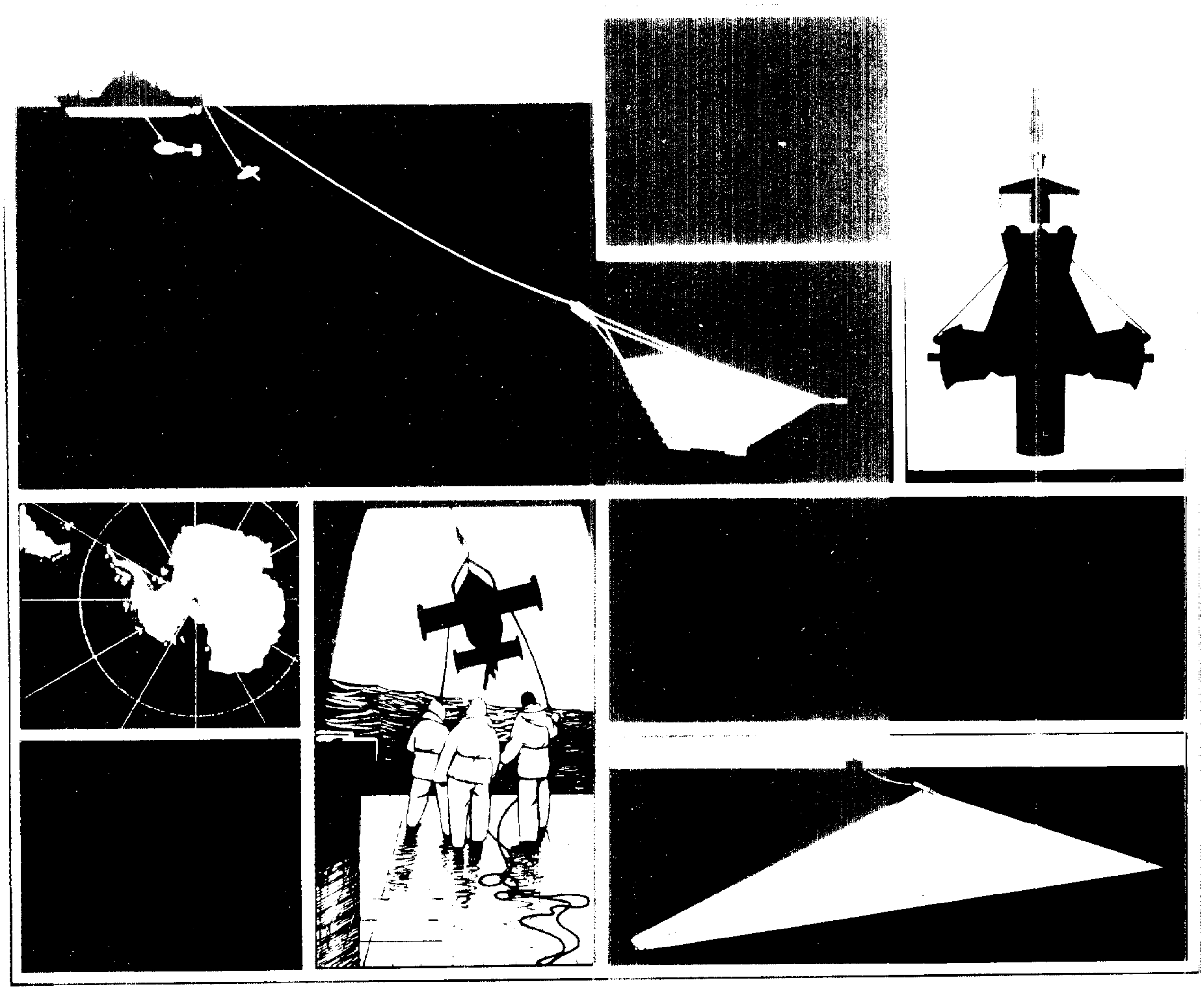
SeaSoar data from the western equatorial Pacific Ocean

B A King, M Allison, S G Alderson, J F Read, J Smithers & D J Webb

Report No 291 1991



Natural Environment Research Council

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ABSTRACT

During Cruise 34A of RRS Charles Darwin, a number of sections were occupied with SeaSoar and ADCP in the western equatorial Pacific Ocean. The region of study was bounded by 7°N, 3°S, 125°E and 160°E, and included a section across the Mindanao Current at 7°N, and a 1000km section along 142°E from 7°N to the coast of Papua New Guinea. This report contains contoured vertical sections of the SeaSoar data only, which typically describe the upper 250m. The contour plots are of data that have been gridded into bins with 4km horizontal and 8db vertical resolution.

KEYWORDS

ACOUSTIC DOPPLER CURRENT PROFILER(ADCP)
"*CHARLES DARWIN*" - cruise(1988)(34A)
CTD OBSERVATIONS
EQUATORIAL UNDERCURRENT
MINDANAO CURRENT
NEW GUINEA SUBSURFACE CURRENT
PACIFIC OCEAN (EQUATORIAL WEST)
PACTW
SEASOAR

ISSUING ORGANISATION

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INTRODUCTION

Cruise 34A of RRS Charles Darwin was in two parts. Leg 1 was principally a passage leg from Auckland, New Zealand to Cairns, Australia, although some SeaSoar trials were carried out en route. Most of the scientific party joined the ship for Leg 2, which departed from Cairns on 24 August 1988 (day 237), and arrived in Suva, Fiji on 30 September (day 274). Further details are given in the Cruise Report (Webb et al. 1989).

Figure 1 shows a ship track for Leg 2 of the Cruise. The portion of the track shown with a thicker line is the part for which SeaSoar data were collected, and for which data are shown in this report.

Shipboard Acoustic Doppler Current Profiler (ADCP) data were collected over most of the cruise track from a hull-mounted RDI 150kHz instrument; these data are reported elsewhere (King and Allison, 1991).

DATA COLLECTION

Data were collected from a Neil Brown Mk III CTD, deployed in the IOSDL SeaSoar vehicle. The vehicle cycled between the surface and approximately 250m, the depth reached depending mainly on towing speed and sea state. The different SeaSoar deployments are listed in Table 1, with the sections occupied shown in Table 2.

The main scientific programme commenced with a section eastwards on 7°N from the coast of the Philippines to 132°E, followed by the sections shown in Figure 1. The highlight of the cruise was completing the SeaSoar and ADCP section down 142°E, crossing the North Equatorial Countercurrent, Equatorial Undercurrent, South Equatorial Current and New Guinea Subsurface Current.

DATA PROCESSING AND CALIBRATION

Sampling

CTD data were passed from the CTD deck unit to a 'Level A' interface, and then to a PDP11/34 for processing using the PSTAR suite of data processing programs. The CTD data were sampled at 8Hz, and reduced to one-second averages by the Level A. The data path from the CTD to the PDP11 is described by Pollard et al. (1987a). The data were backed up at the deck unit by logging the raw 8Hz data directly onto 9-track tape. During one period of several hours after a Level A failure, data were read onto the PDP11 from these backup tapes, using the PSTAR programme PDIGIN.

At the start of the cruise, the CTD was fitted with a brand new Beckman dissolved oxygen sensor. However, it was not possible to choose parameters for the oxygen calibration algorithm that gave sensible values while the CTD was profiling in the SeaSoar; it was suspected that the SeaSoar was profiling too fast through strong temperature gradients for the sensor to give meaningful data. Other investigators from IOSDL have also found it impossible to get satisfactory oxygen data using SeaSoar. Accordingly, oxygen data are not included in this report. Although the SeaSoar can be fitted with a fluorometer, one was not used on this cruise.

Initial calibration

Programme CTDCAL was used to provide initial calibration of pressure, temperature, conductivity and oxygen, and to compute salinity. The following were used:

$$P_{cal}\ (\text{dbar}) = (0.01 * P_{raw}) - 0.4$$

$$T_{cal}\ (°C) = 1.003563 * (0.0005 * T_{raw}) + 0.09387$$

$$C_{cal}\ (\text{mmho/cm}) = 1.0020 * (0.001 * C_{raw})$$

The pressure offset was chosen as the observed deck offset, and the temperature calibration was from the most recent laboratory calibration. Prior to the start of SeaSoar work, the CTD was lowered from the midships winch to 600m, and samples collected in Niskin Bottles for salinity calibration. This provided the initial cell conductivity ratio.

Salinity was calculated from the 1983 equations of state, after speeding up the response of the platinum thermometer with a time constant of 0.7 seconds. The time constant was chosen from early SeaSoar data by overplotting down and up θ-S curves and adjusting the time constant to minimise hysteresis between them. A value of 0.7 seconds was greater than has commonly been used for SeaSoar data, but was definitely more effective at reducing hysteresis than a value of, for example, 0.6 seconds.

Editing

SeaSoar data were assembled into files of two hours duration for calibration, initial plotting and editing. Hardcopy profile plots of all parameters, also θ-S curves, were routinely produced, and examined for data errors.

The simplest kind of errors to eliminate were data spikes, which could be identified from the plots and removed from the 2-hour data files.

More subtle errors arise when the conductivity cell is fouled, giving rise to offset (low) salinity values; typical offsets are of order 0.01 to 0.05. Most of these can be identified by careful examination of θ-S curves, and one of two remedies taken. Often, there is a clear indication of both fouling and recovery, in which case a constant offset may be added to bring the θ-S curves in line with surrounding profiles. Otherwise, for example if recovery has been gradual, or at a poorly defined time in a region of strong vertical gradients of properties, suspect sections of data have to be discarded. Further details are given by Pollard et al. (1987b). This procedure maintains **relative** salinity calibration over periods of several hours. **Absolute** calibration is described below.

Gridding

For each 12 hours, the edited two-hourly files are appended, merged with navigation, gridded and contoured. Details of this procedure are given by Pollard et al. (1987b). The gridding consists of assigning data to bins 8db deep and 4km along track, followed by averaging of all data in a bin. Usually, bins contain 15 or more one-second averages. Potential density (gamma0) and dynamic height are computed for the gridded files; these files are then regridded with potential density as the vertical coordinate. Since the sections were run along lines of constant longitude or latitude, the data presented in this report have been gridded by latitude or longitude, with a bin size of 0.036°, rather than using distance run.

The navigation file produced while at sea included a period when no underway log data was available, the ship's EM log having been damaged by a passing tree (Webb et al., 1989). The navigation file was reworked after the cruise by combining shipboard ADCP measurements with transit satellite and GPS position fixes (King and Allison, 1991), to produce a master navigation file that has been used for all processing of cruise data. All SeaSoar data have been merged with this revised navigation file.

Final temperature calibration

Early on day 254, the salinity values were observed to show dramatic offsets, leading to recovery of the SeaSoar. Inspection of the CTD showed that the platinum resistance thermometer (PRT) had been corroded, and required replacement. There was therefore no satisfactory temperature calibration available at the time for data collected subsequently on the cruise, although a working calibration was estimated from reversing thermometers on a single vertical cast; this working calibration was used for the remainder of the cruise. With the replacement PRT, a time constant of 0.2 seconds was found to minimise down-upcast hysteresis in θ-S relation. Upon return to IOSDL, a laboratory calibration was performed, yielding:

$$T_{cal}\ (°C) = 0.9969274 * (0.0005 * T_{raw}) - .137479\ .$$

Since this calibration was significantly different from the working calibration used, the decision was taken to recalibrate from ungridded data, all SeaSoar data after the replacement of the PRT. In order to avoid having to repeat by hand all the editing of two-hourly files, a program was produced which went through the following steps:

a) compute 'unedited' salinity from T and C values in a two-hour file

b) compare 'unedited' salinity with 'edited' salinity already in file and note corrections (offsets or deleted salinity spikes)

c) apply corrections to T and C for revised calibrations

d) compute new salinity

e) apply corrections noted in step (b) to new salinity

Note that in step (c) a new 'initial' calibration for conductivity was introduced as well as that for temperature. This was because examination of salinities from Niskin Bottles on the vertical cast suggested that

$$C_{cal}\ (mmho/cm) = 0.99953 * (0.001 * C_{raw})$$

would be an improvement on the previous equation.

Final salinity calibration

Final salinity calibration was achieved following the technique of Pollard et al. (1987b). Samples were drawn from the ship's non-toxic seawater supply once per hour (561 samples during the whole cruise) and analysed using a Guildline Autosal. The salinity value from the corresponding near-surface bin of gridded SeaSoar data was extracted and a comparison undertaken. The resulting file of differences was fitted by eye with a piecewise linear function of time, which was then merged with gridded SeaSoar data to produce final salinities. The residuals of Bottle-SeaSoar salinities, after this correction procedure, are shown in Figure 2, along with the surface salinity from bottle samples; 78% of residuals have magnitude no greater than 0.01, and 88% no greater than 0.015. It is our belief that this represents the absolute accuracy of the salinity calibration.

DATA PLOTS

For completeness, a time series of near-surface temperature, as recorded by the thermosalinograph, is shown in Figure 3.

There are two sets of data plots in this report, each divided according to the sections defined in Table 2. The first set of plots (pp. 18-71) are detailed but unshaded contoured sections of potential temperature, salinity and potential density (gamma0) against pressure, together with sections of potential temperature and salinity against density as the vertical coordinate. Each panel covers two degrees of latitude or longitude.

The second set of plots (pp. 72-89) have been compressed to fit a complete section on each page, and groups of contours have been shaded to enable the eye to identify features of interest.

In order to produce tidier contour plots, small gaps in the CTD data have been eliminated by linear interpolation in the horizontal. The majority of SeaSoar failures did not give rise to gaps in sections, because the repaired vehicle was redeployed in such a position as to provide a small amount of overlap. Notable exceptions were on Section 1, when the decision was taken not to wait for repairs and get too far behind schedule so early in the cruise, and Section 9, when pressure of time again meant that it was not possible to await repairs. In the latter case, a segment of approximately 35 km has been interpolated.

Contour intervals

The contour intervals for the large scale plots are as follows:

potemp:	1°C, but 2°C from 14°C to 26°C
salin:	0.1
gamma0:	0.5 kg/m^3

For the shaded plots, contours are as indicated on the side bar.

ACKNOWLEDGEMENTS

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Table 1. Start and end times and positions of SeaSoar runs, with corresponding Section numbers.

Start time day/hhmm	Start lat. °N	Start lon. °E	Section	Stop time day/hhmm	Stop lat. °N	Stop lon. °E
245/1457	7.00	126.53	1	245/2300	6.99	127.42
246/0332	6.99	127.42	1	246/0351	6.99	127.44
246/0431	6.96	127.44	1	246/1033	7.00	128.07
246/1613	7.00	128.72	1	246/1710	7.01	128.82
247/0128	6.98	130.14	1,2	248/1033	4.77	131.98
249/0210	2.99	132.50	3	249/0233	2.99	132.52
249/0250	2.99	132.52	3	249/2302	3.02	135.03
250/0044	3.01	135.04	3	250/1712	2.99	137.02
250/1718	2.98	137.01	4,5,6	253/2213	6.10	142.01
254/1519	5.86	142.00	6,7	259/0855	-3.00	146.03
260/0904	-2.25	150.18	8	261/0715	0.55	150.01
261/1015	0.54	149.97	8	261/2231	1.92	149.98
264/2207	6.96	159.99	9	265/1432	5.04	160.00
265/1900	4.72	160.06	9	267/1355	-0.13	160.02

Table 2. Definition of Section numbers of data displayed in contour plots.

Section	Start lat. °N	Start lon. °E	Stop lat. °N	Stop lon. °E
Section1	7	126.5	7	132
Section2	7	132	3	132
Section3	3	132	3	137
Section4	3	137	7	137
Section5	7	137	7	142
Section6	7	142	-3	142
Section7	-3	142	-3	146
Passage	-3	146	-2.25	150
Section8	-2.25	150	2	150
Passage	2	150	7	160
Section9	7	160	-0.13	160

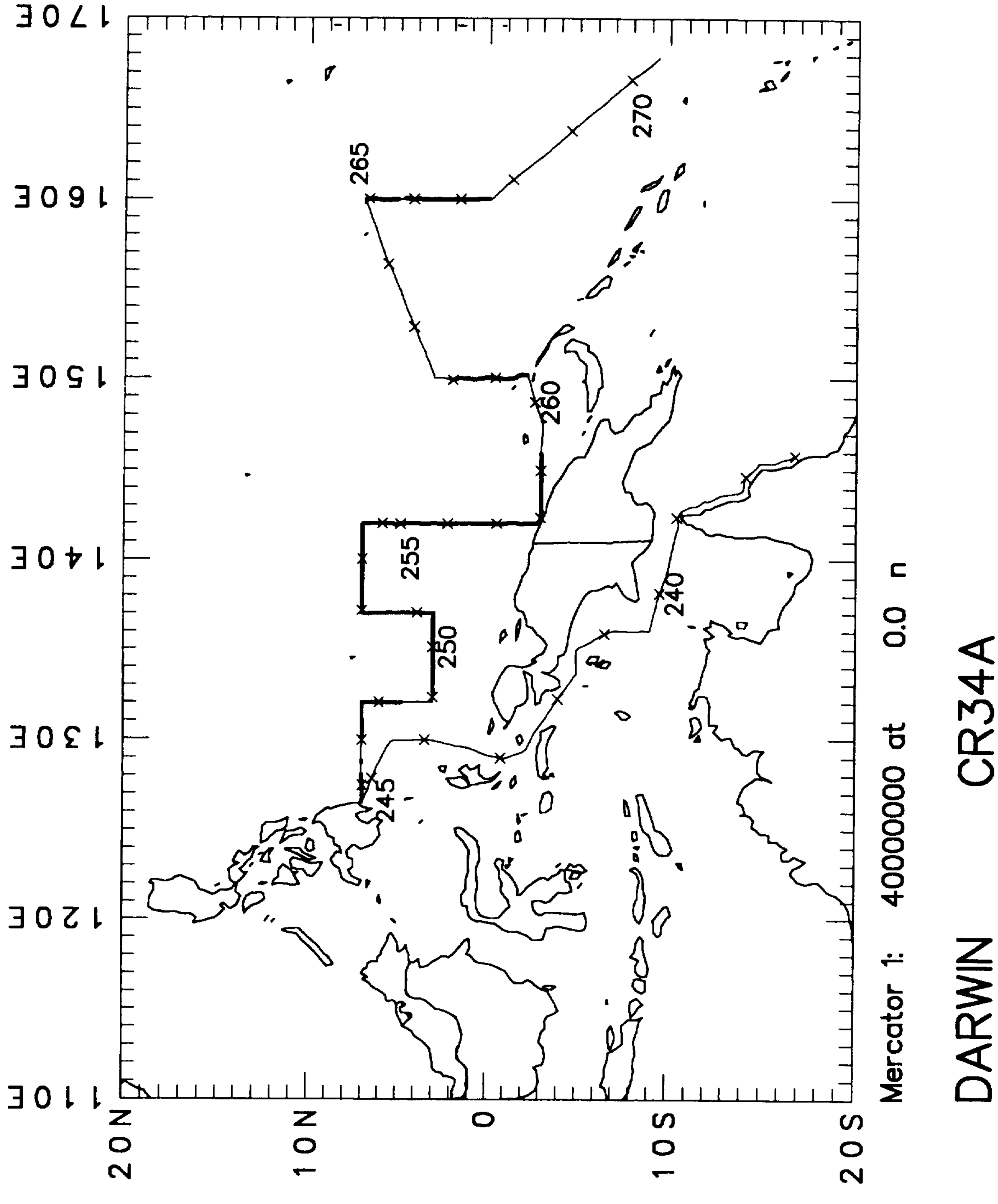

Figure 1. Cruise Track for Leg 2 of RRS Charles Darwin Cruise 34A, 24 August - 30 September 1988. The crosses show the ship's position at 0000Z on the days indicated. Day 237 = 24 August. The thicker portions of the track denote sections of SeaSoar data.

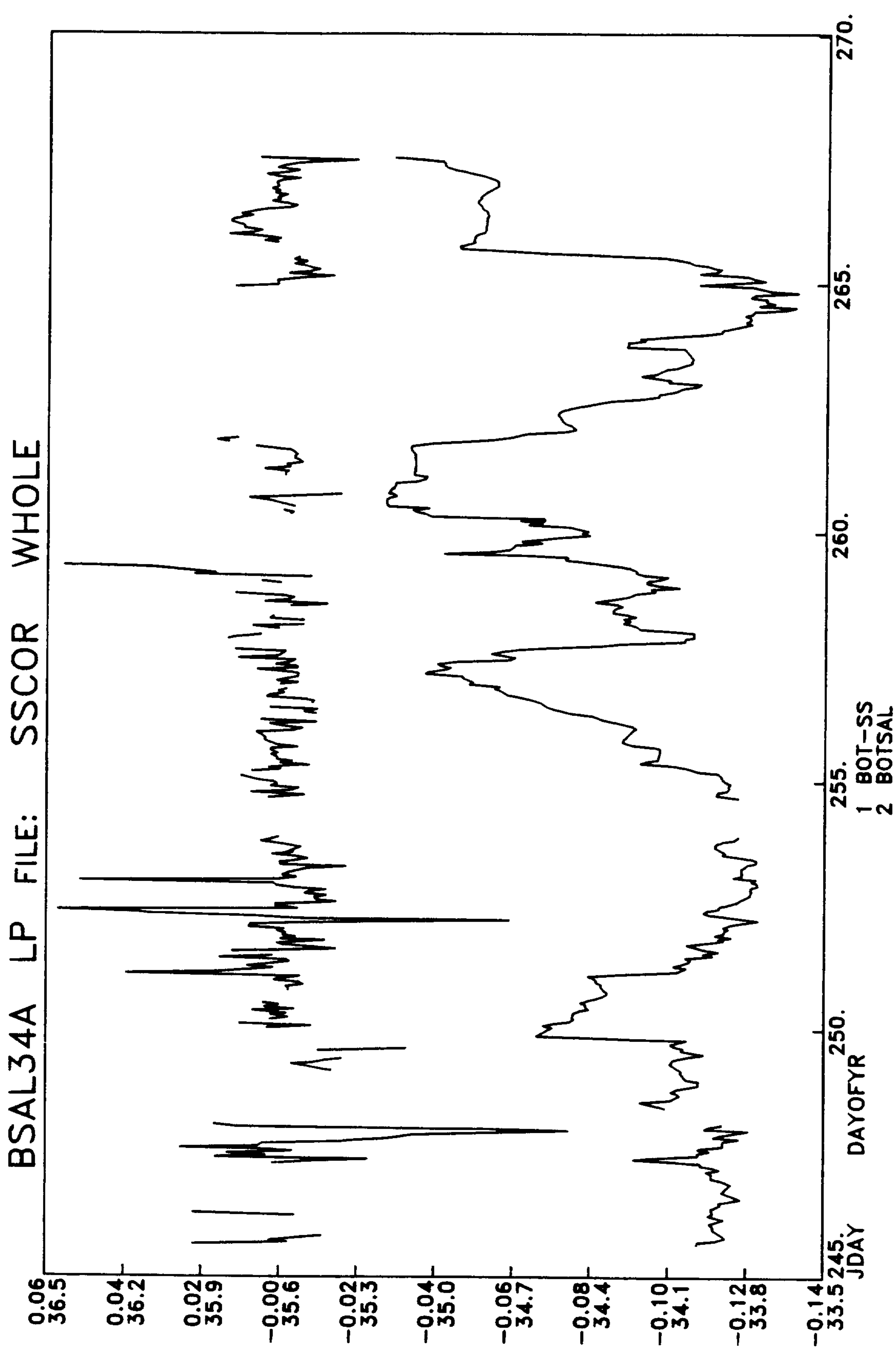

Figure 2. Time series of sea surface salinity (lower curve, bottle samples from pumped non-toxic supply), and residuals between bottle samples and near-surface SeaSoar samples after final salinity correction has been applied (upper curve).

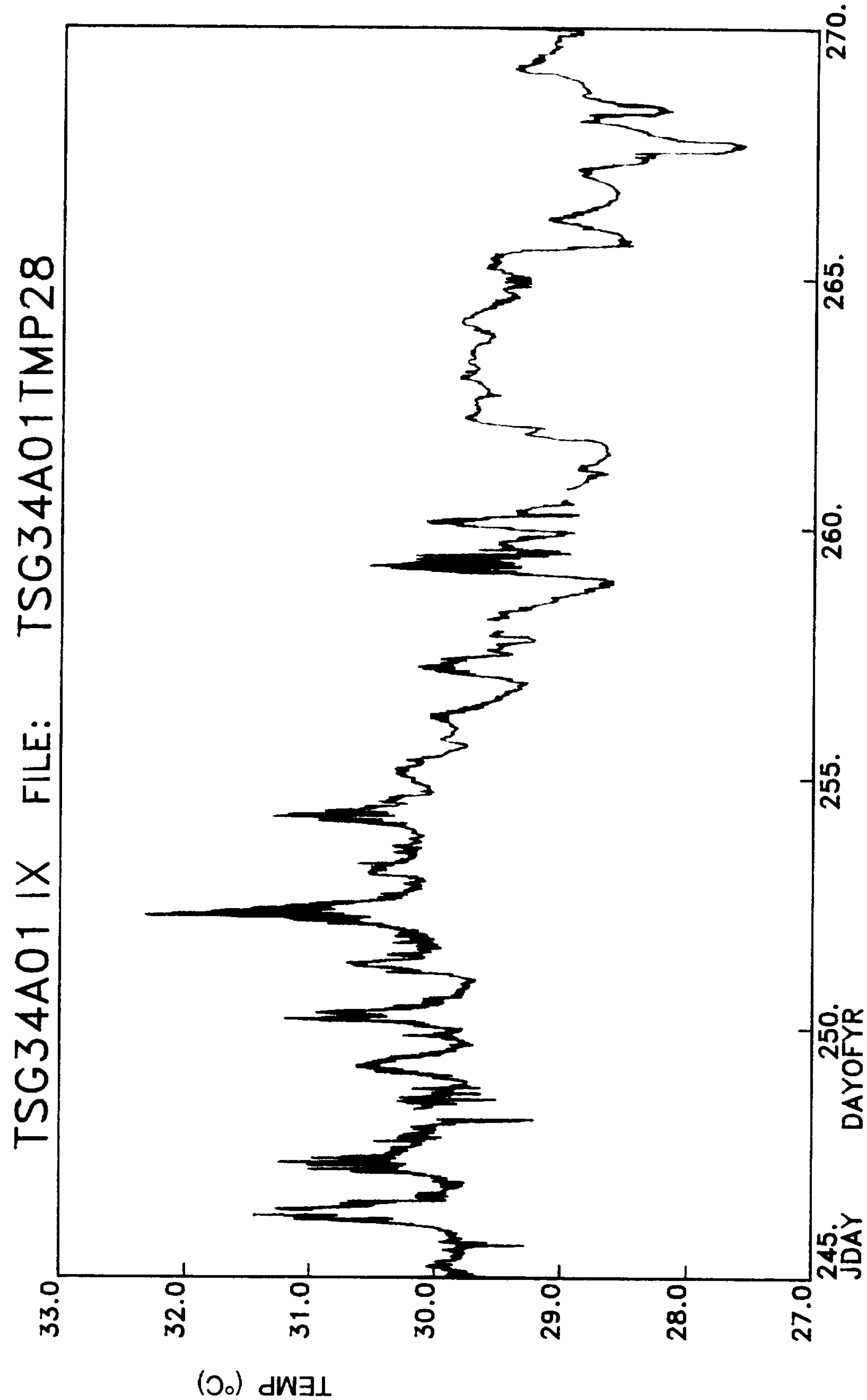

Figure 3. Time series of sea surface temperature, from thermosalinograph.

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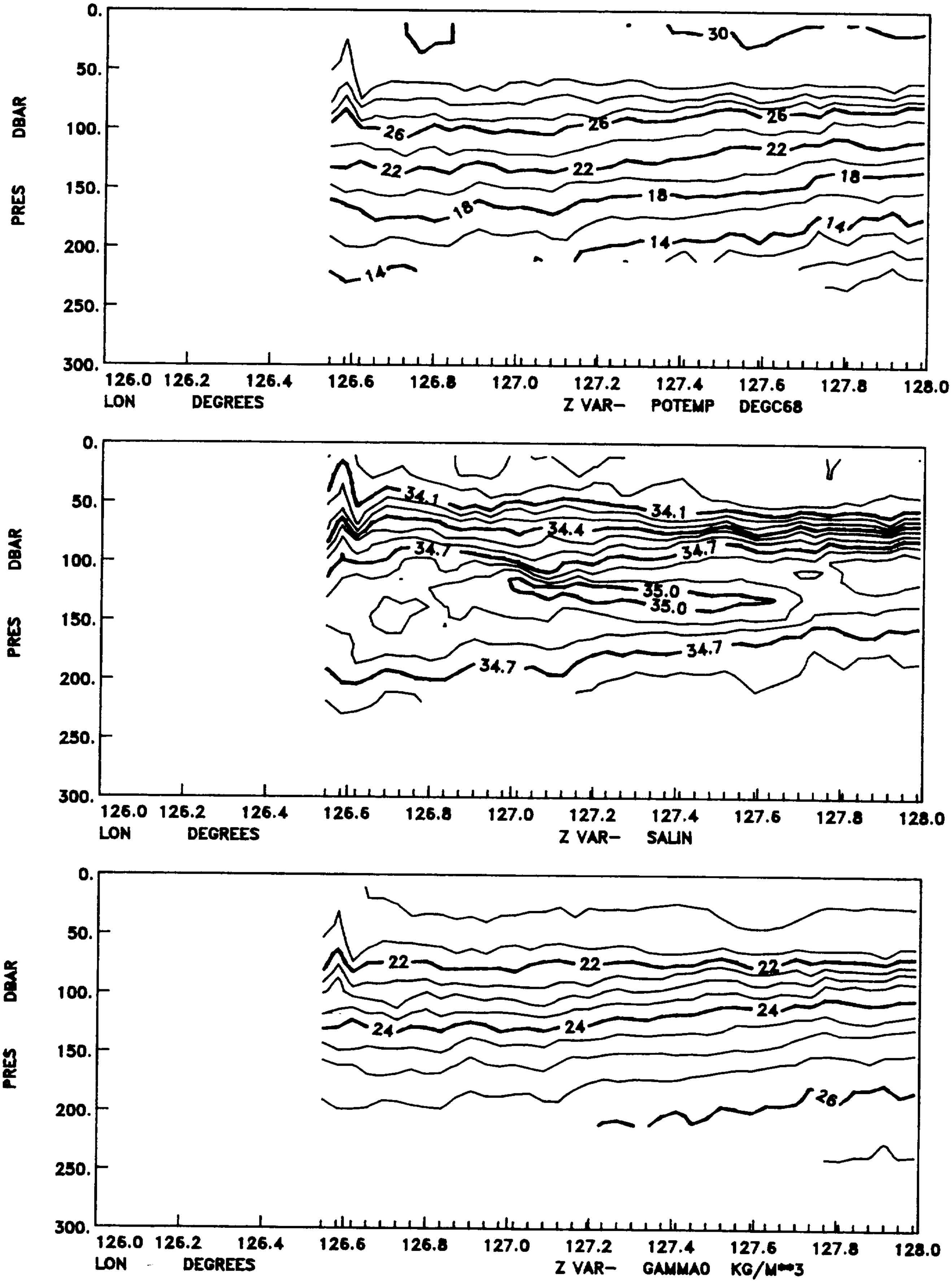

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0.
50.
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126.0 126.2 126.4 126.6 126.8 127.0 127.2 127.4 127.6 127.8 128.0
LON DEGREES
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34.1
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Z VAR- SALIN
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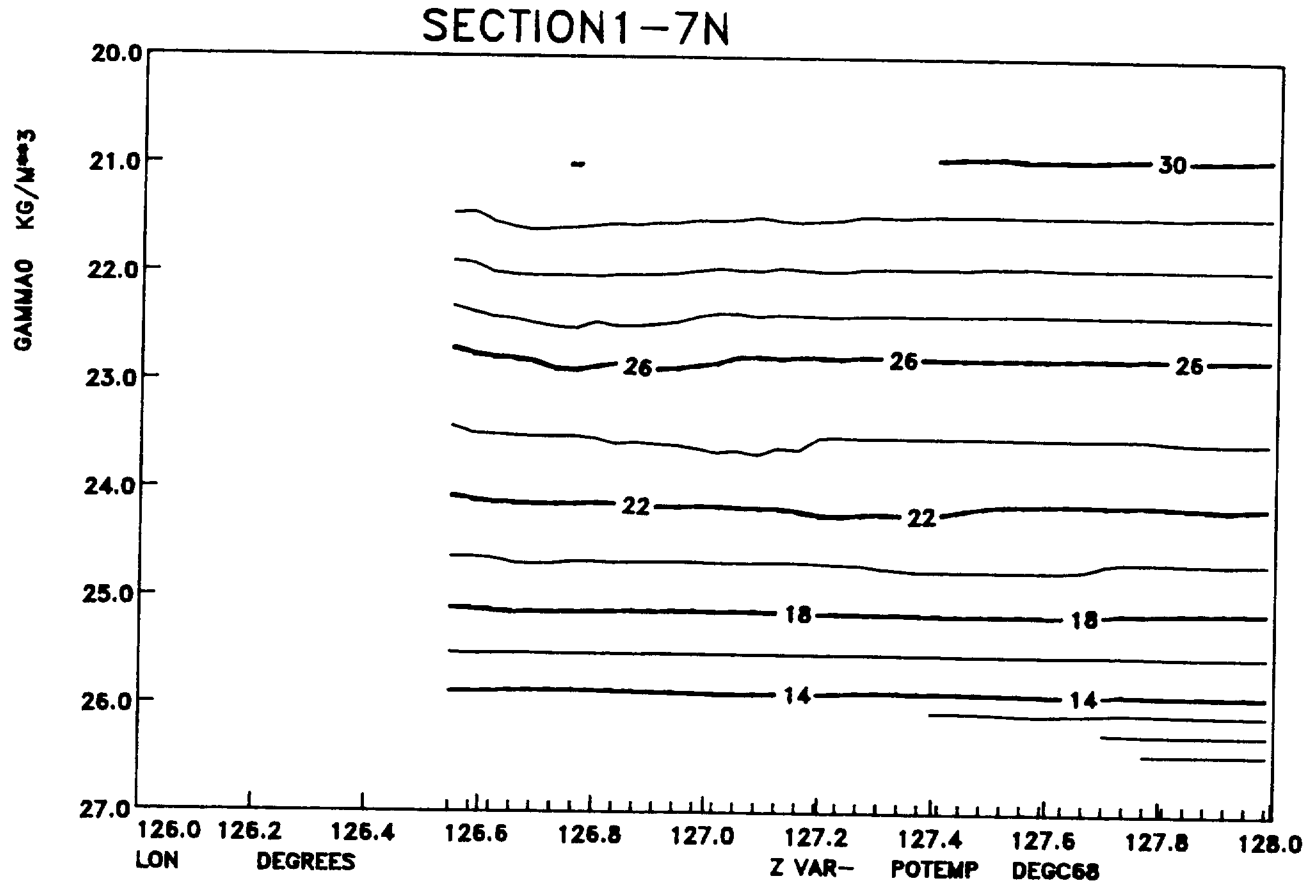
Z VAR- GAMMA0 KG/M**3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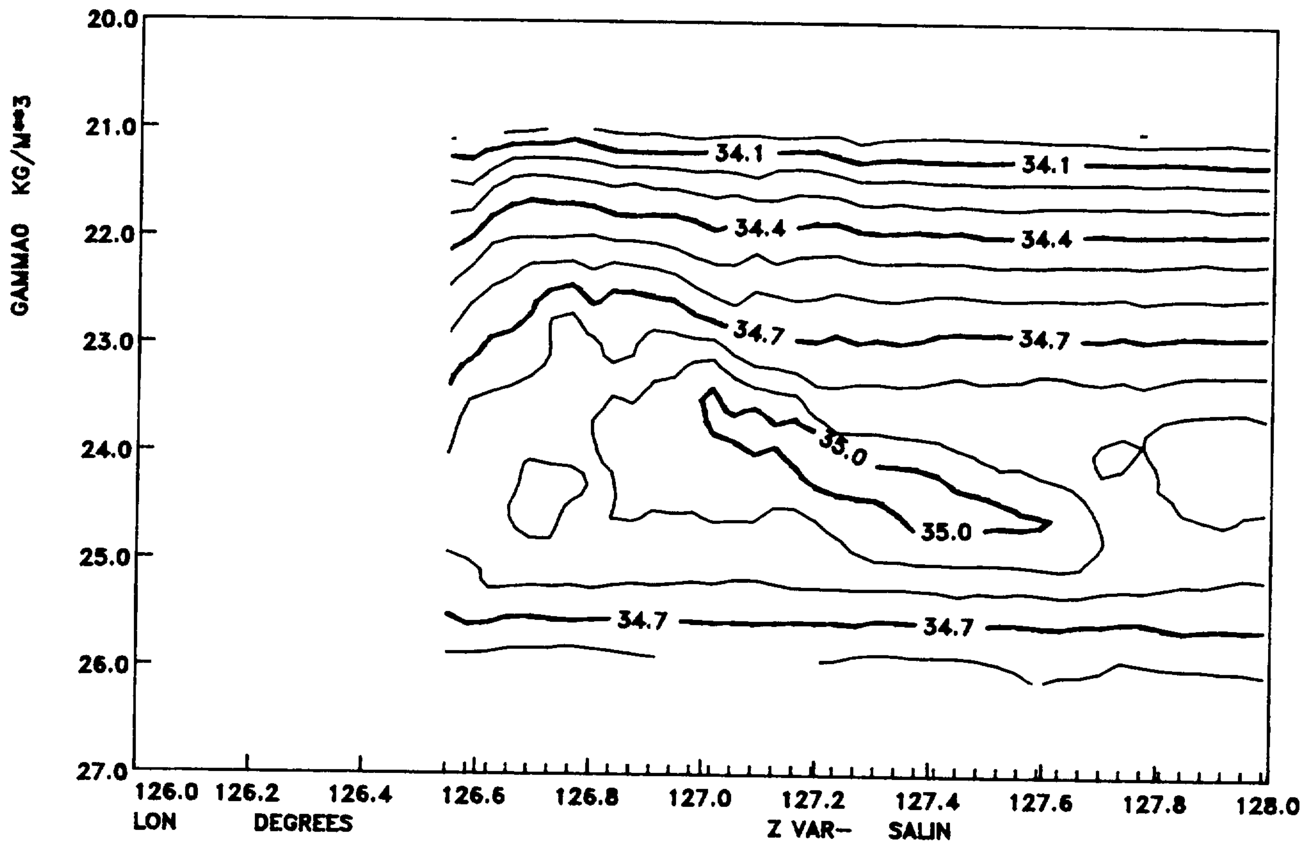
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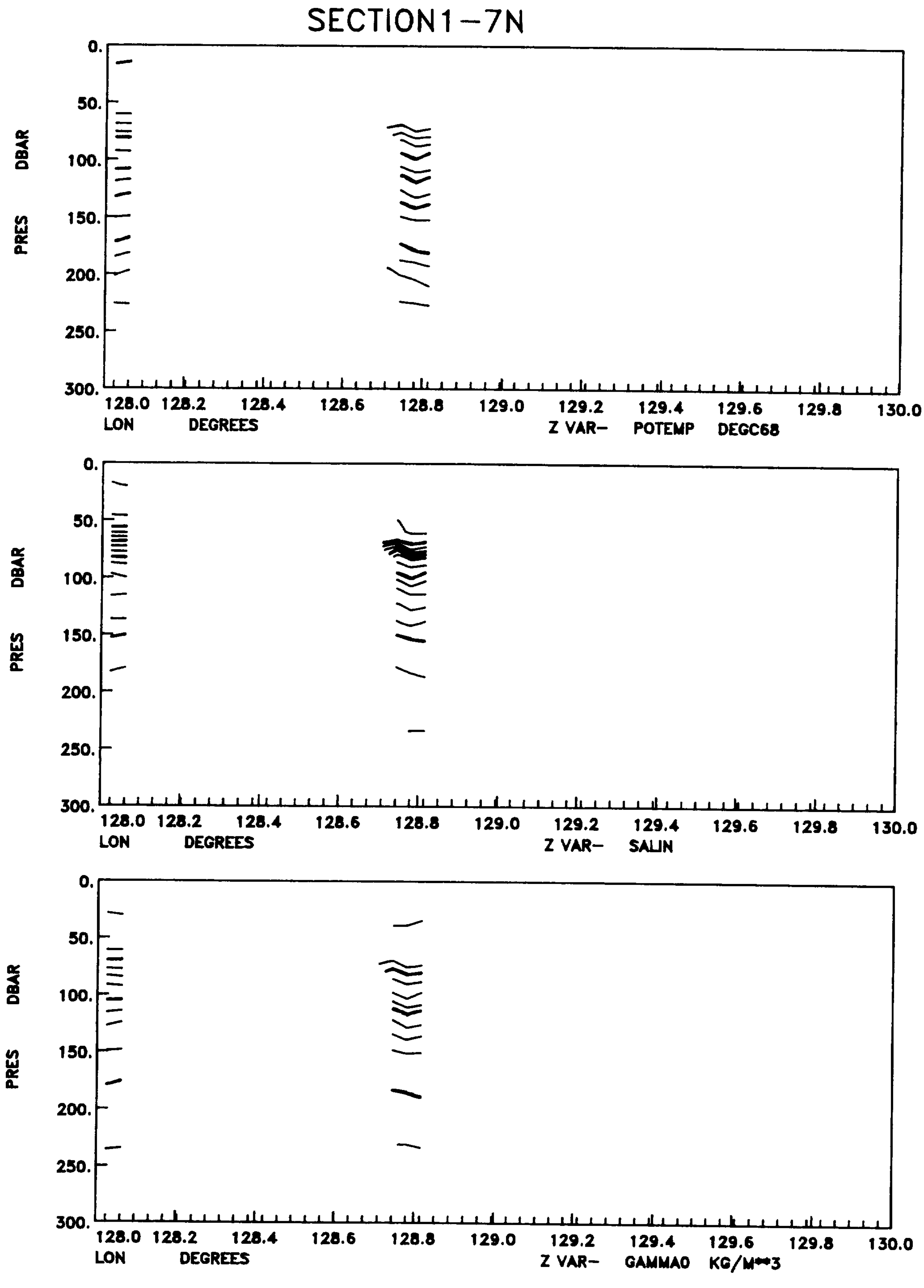
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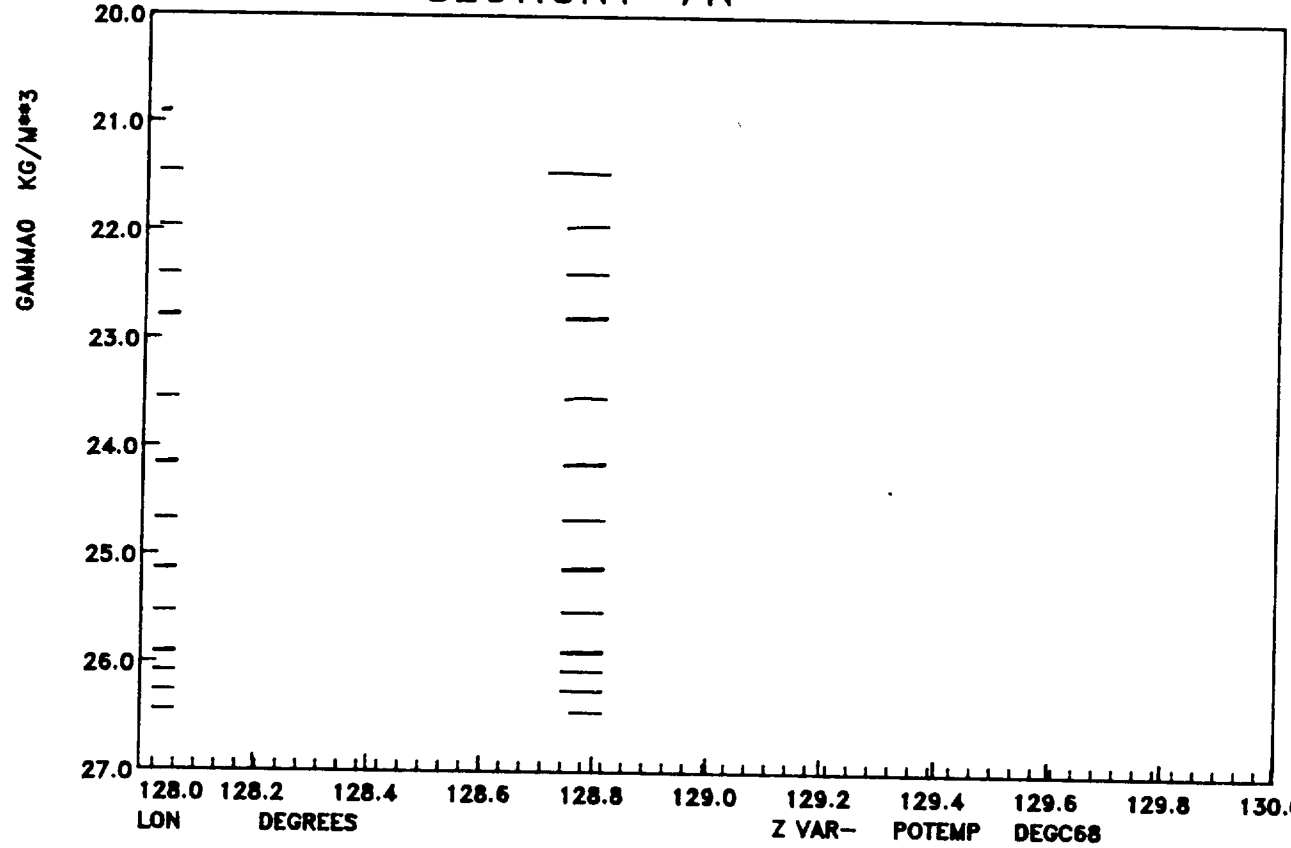
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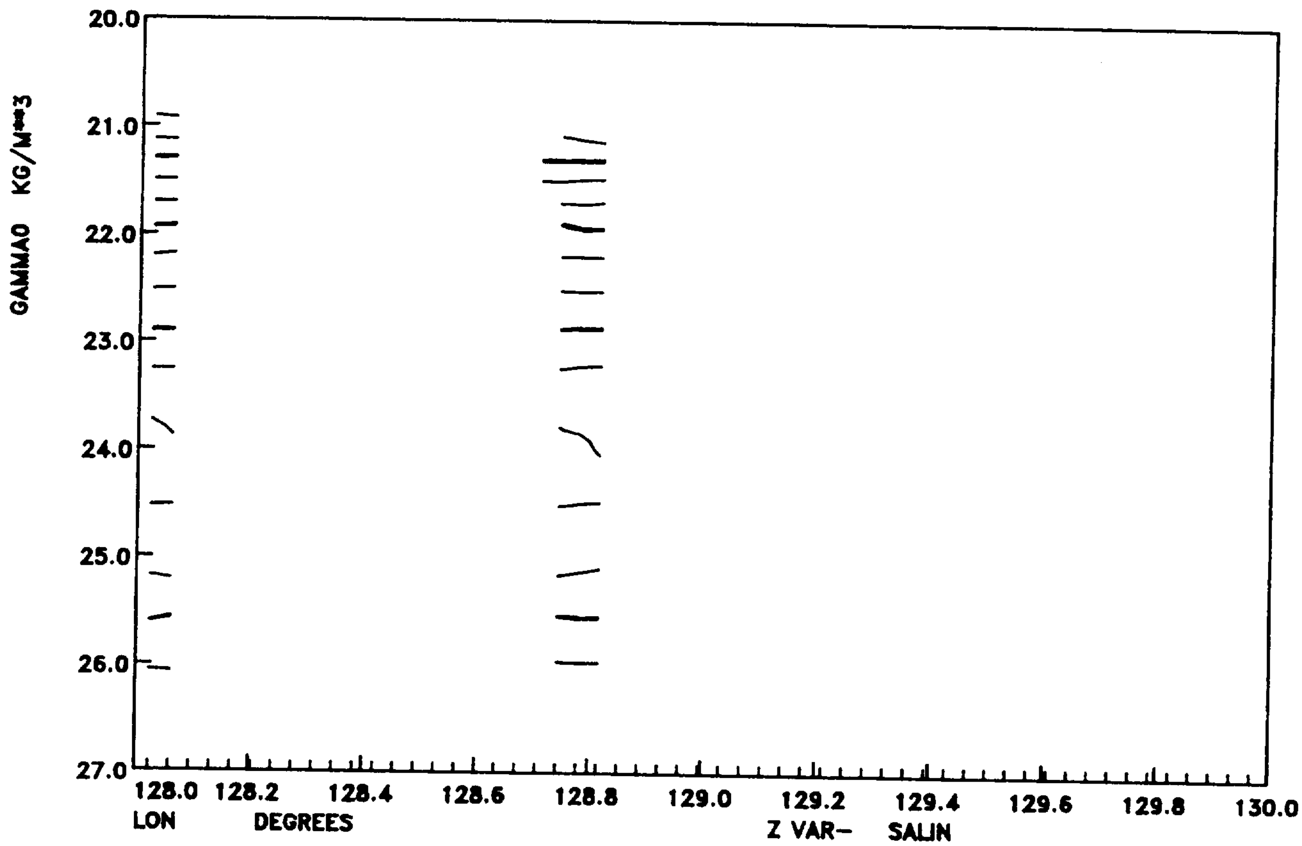
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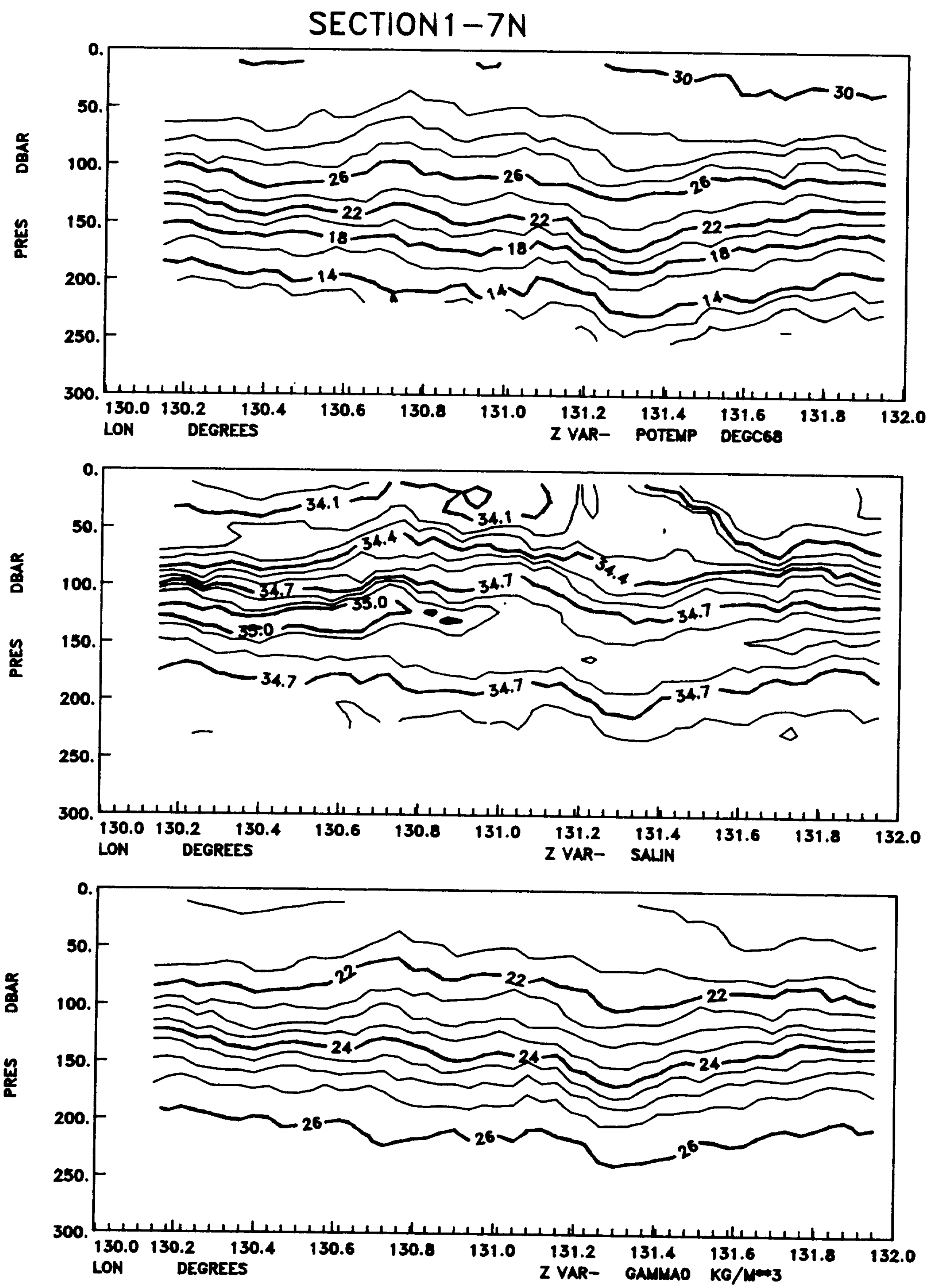
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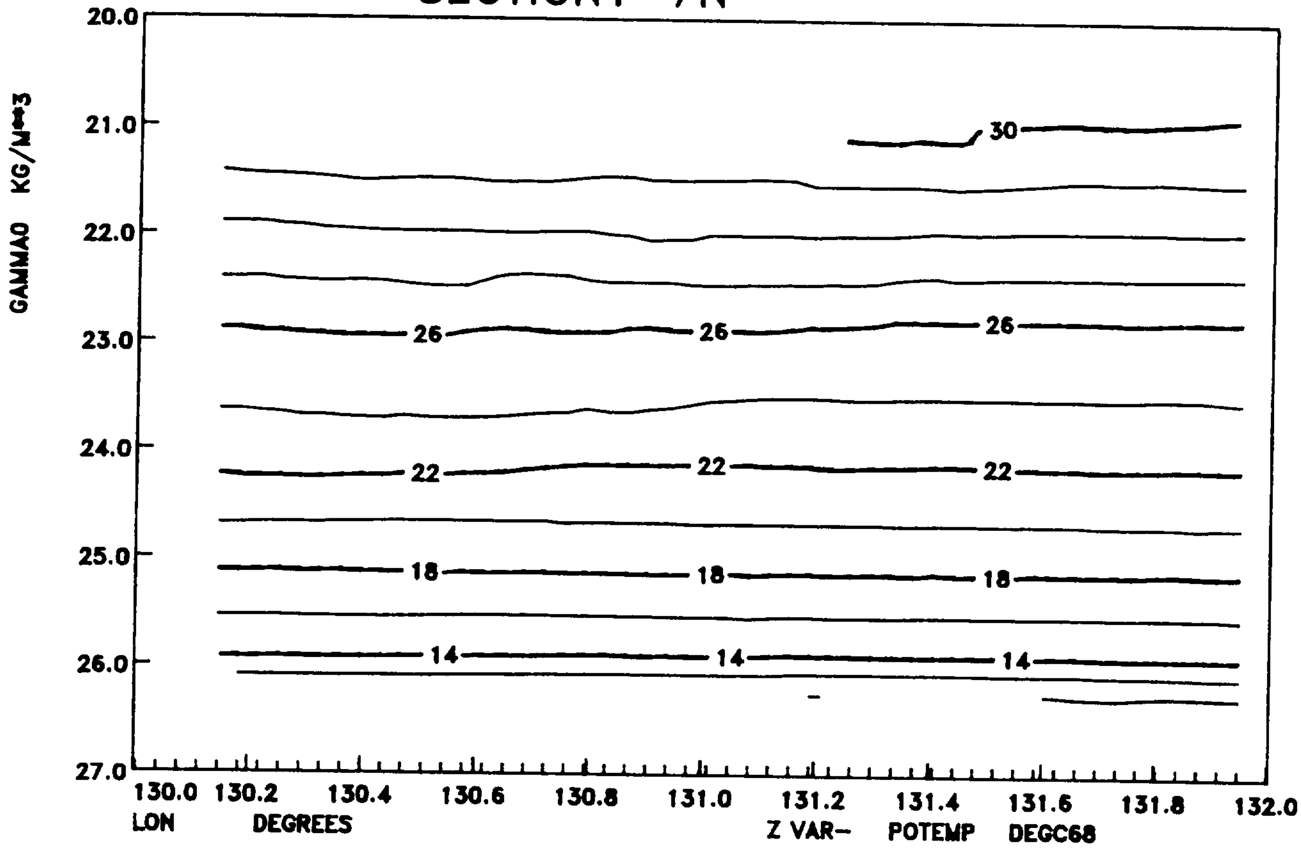

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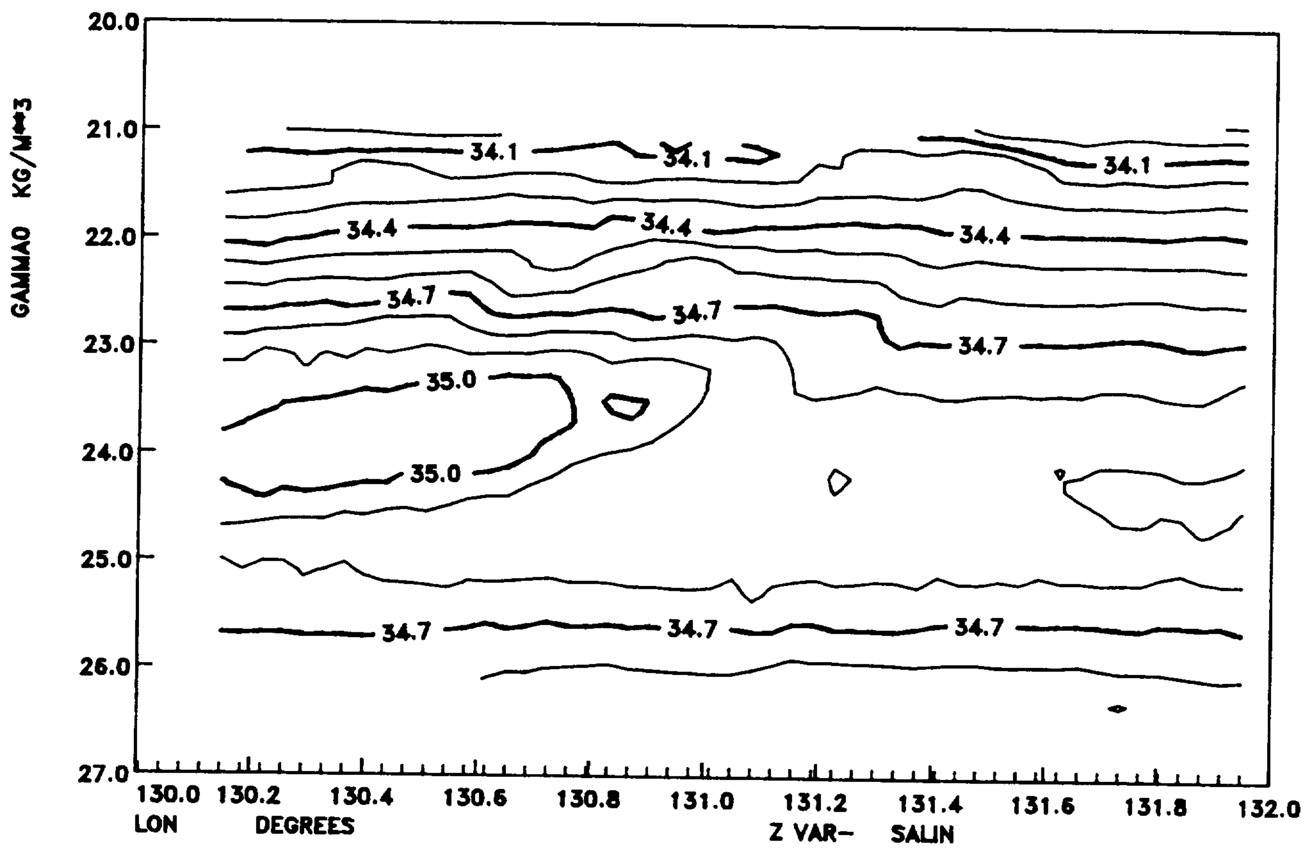

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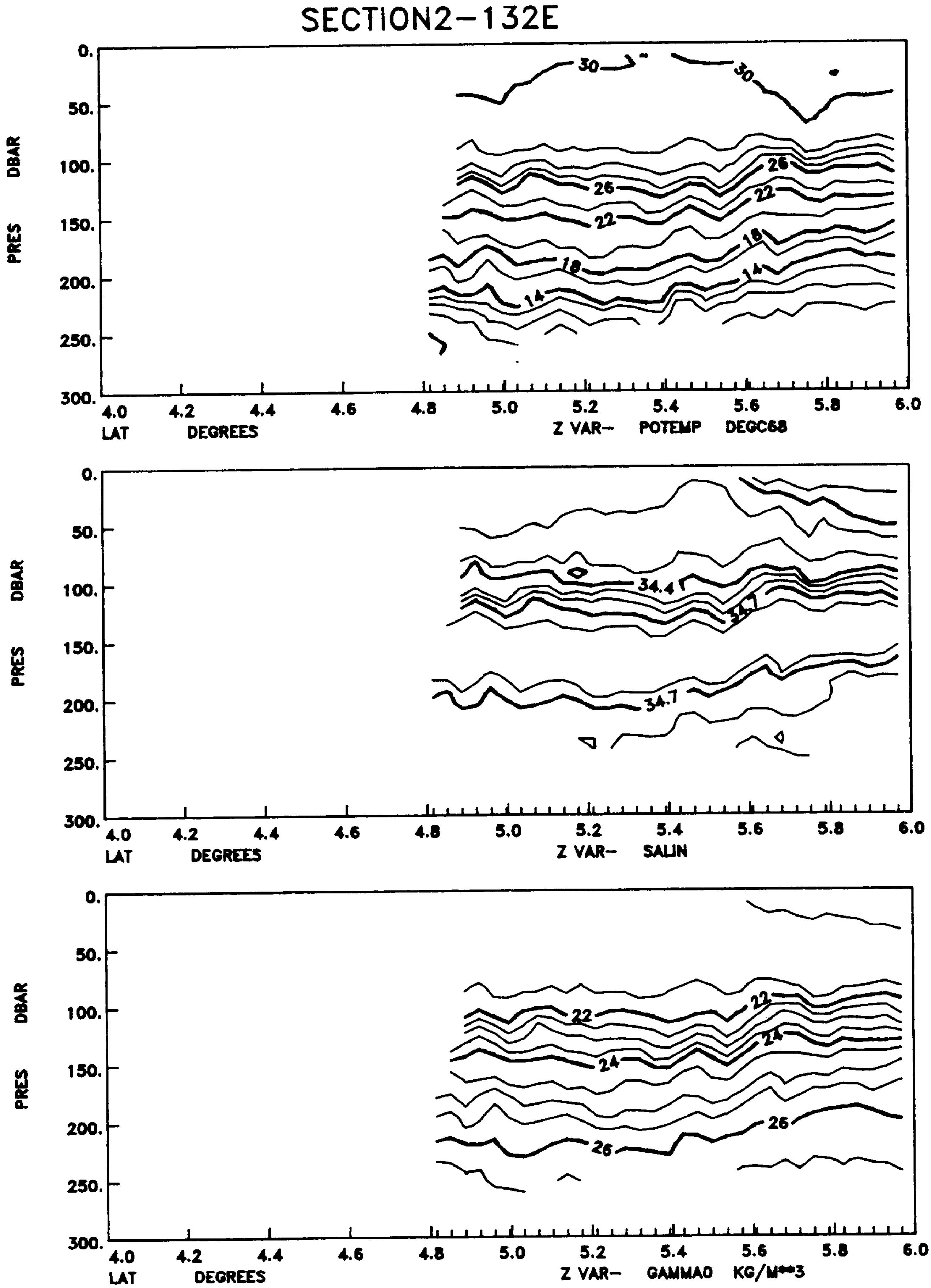
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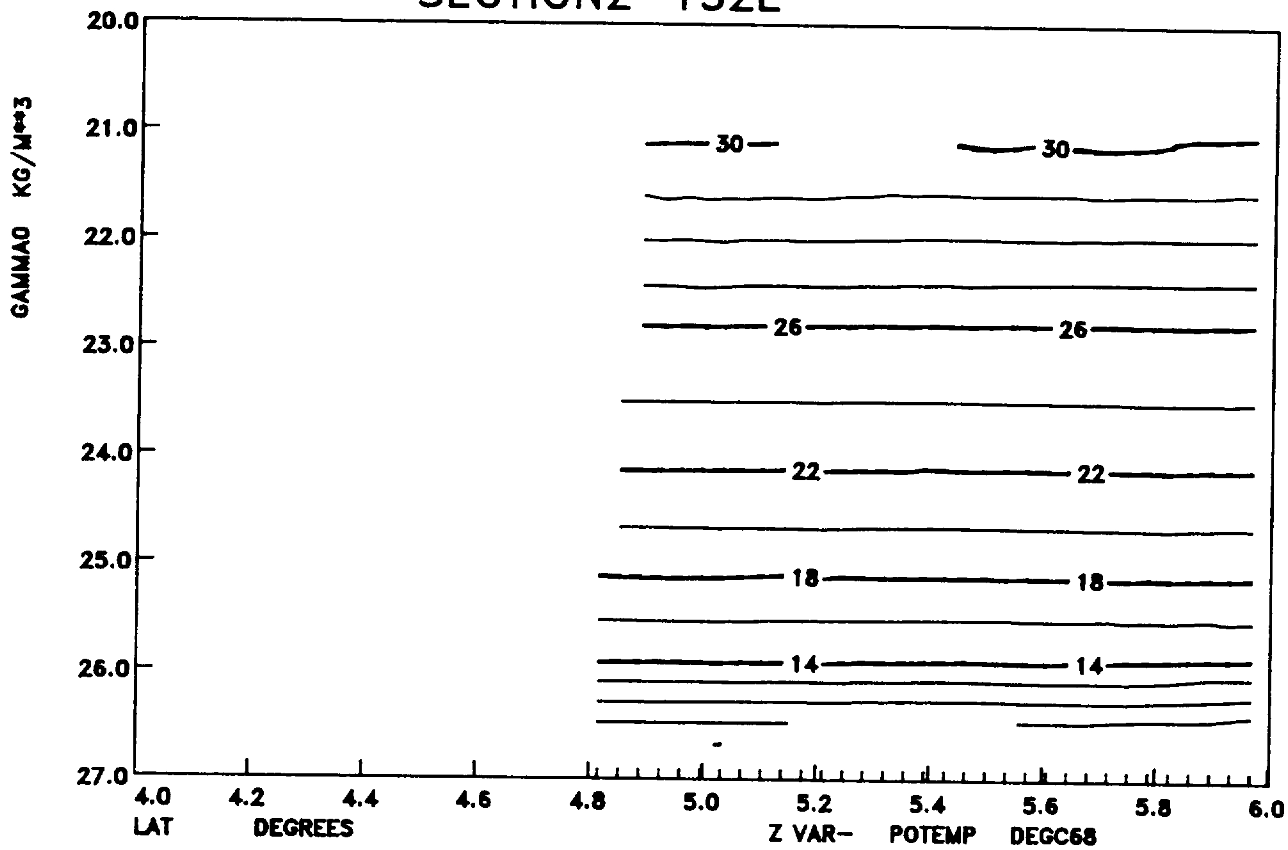

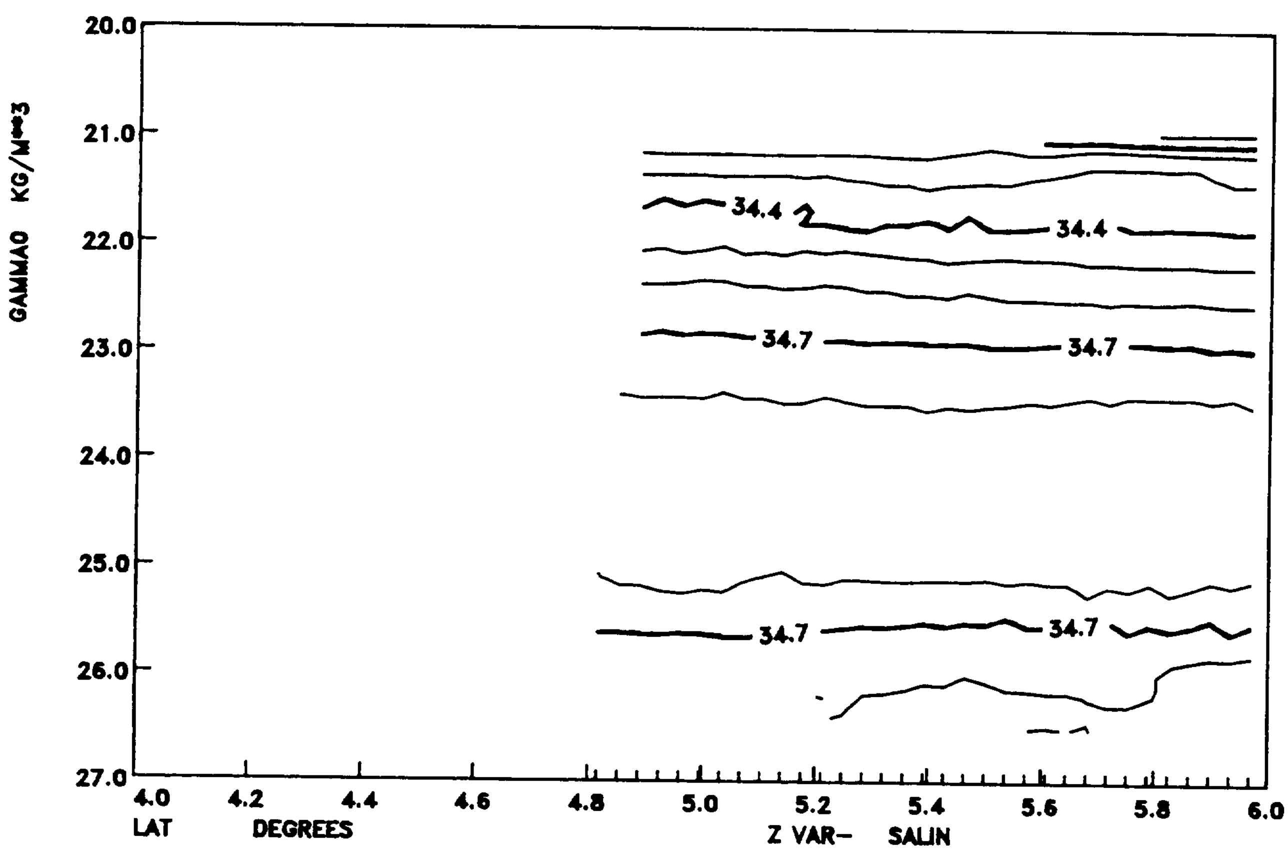

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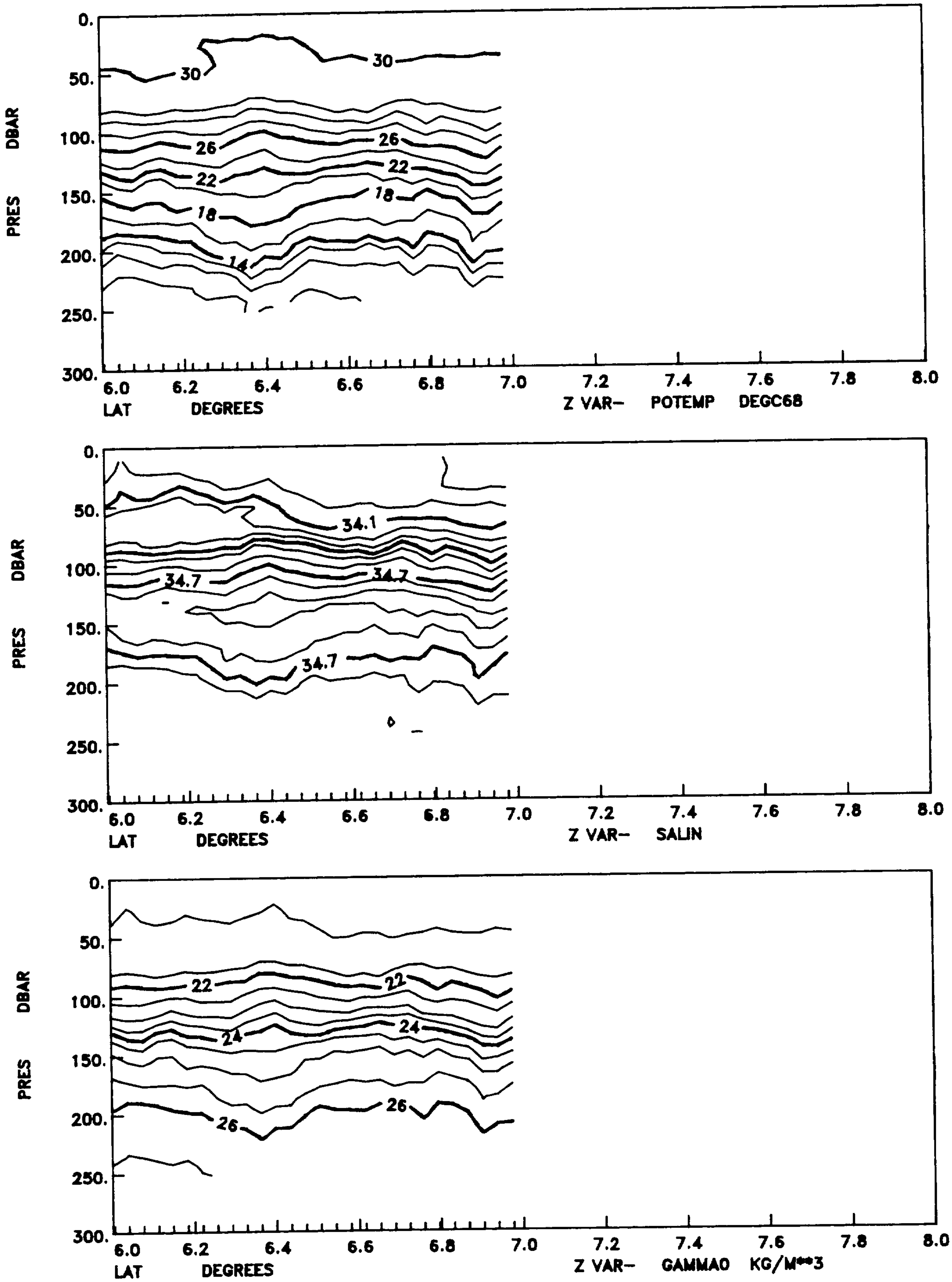

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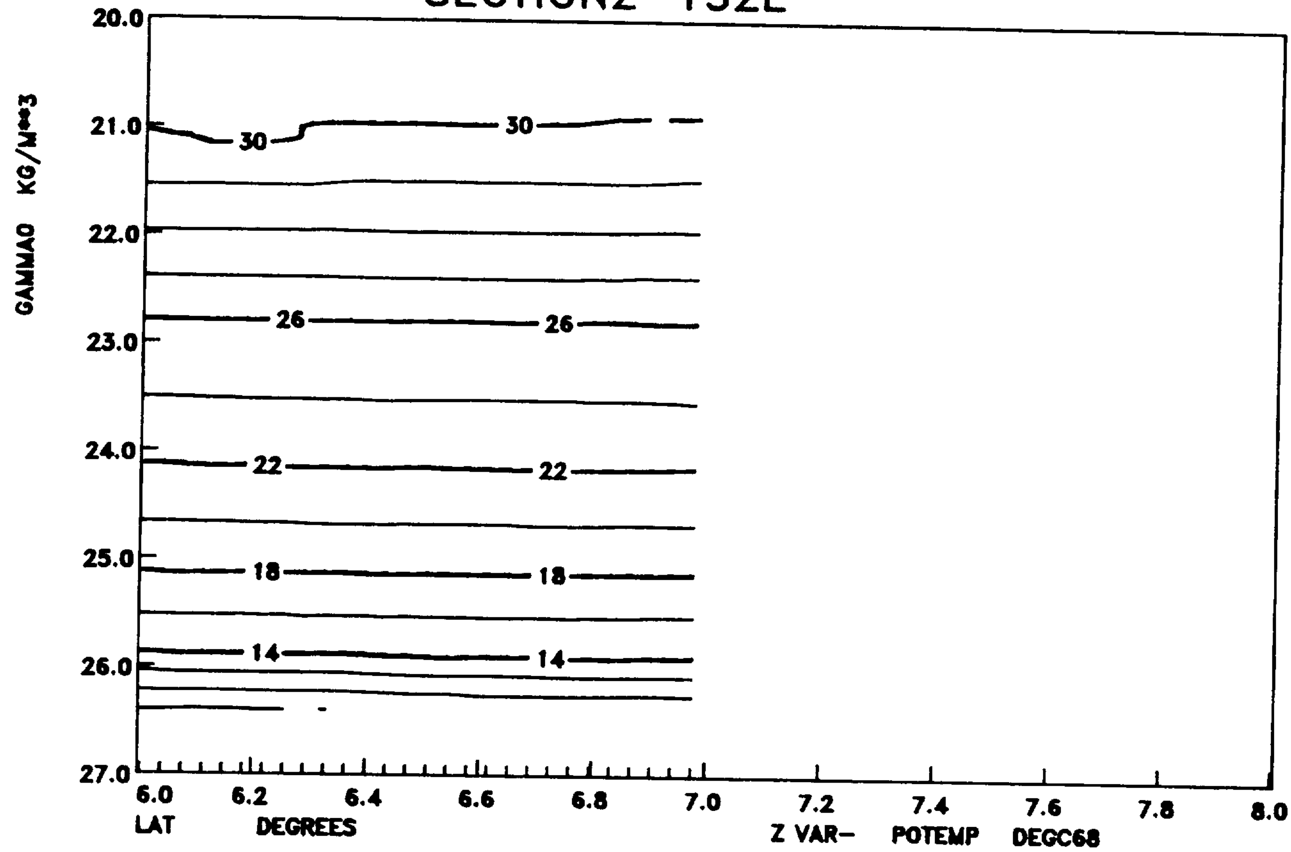

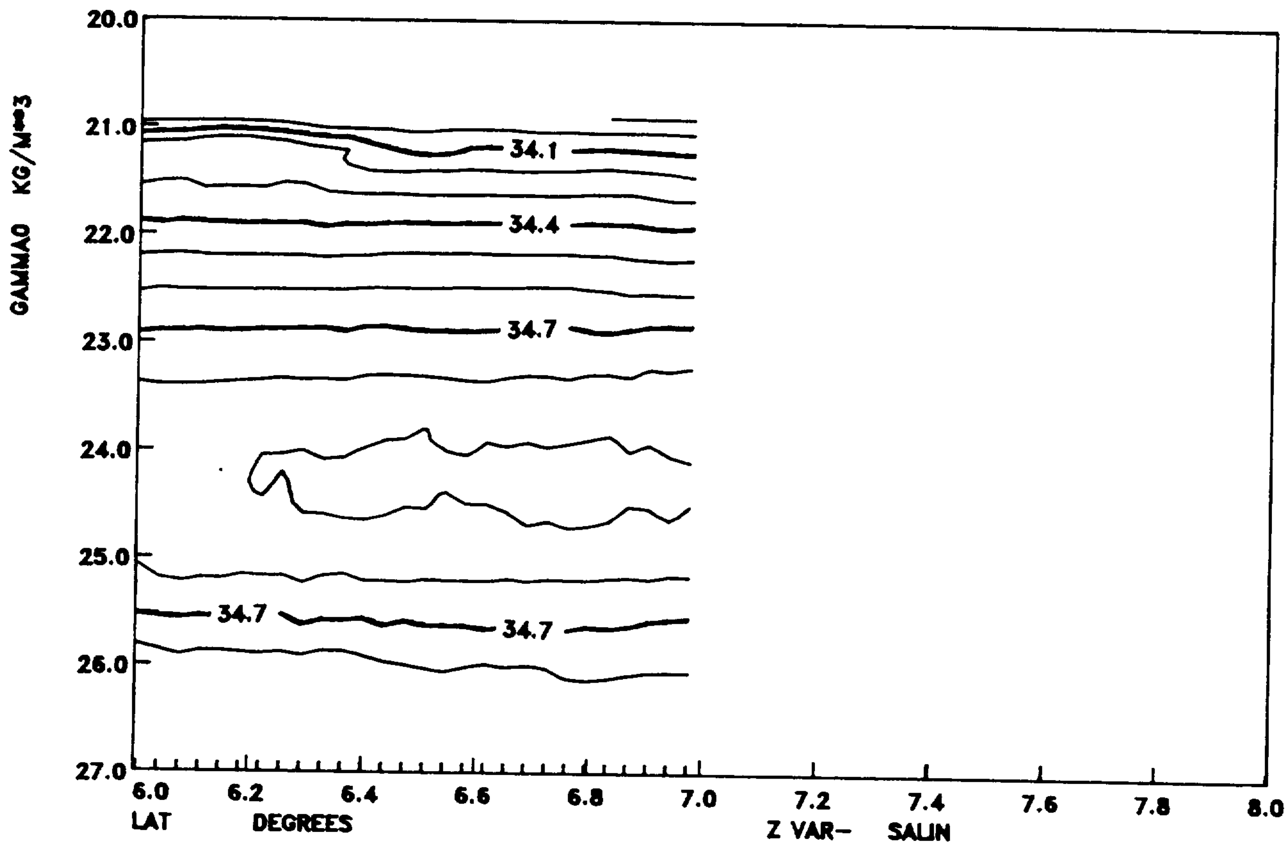

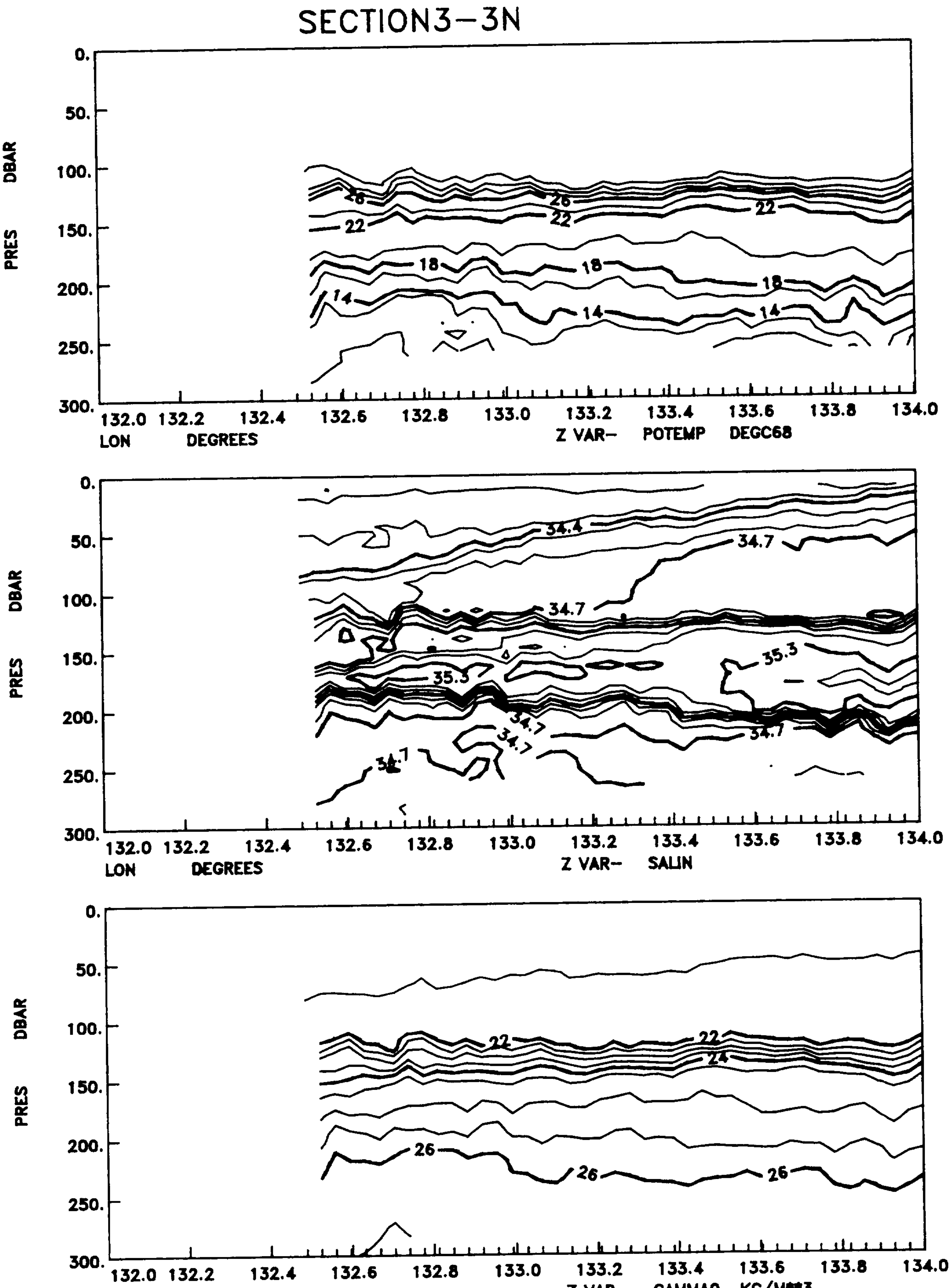
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LON DEGREES
Z VAR- POTEMP DEGC68
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132.0 132.2 132.4 132.6 132.8 133.0 133.2 133.4 133.6 133.8 134.0
LON DEGREES
Z VAR- SALIN
34.4
34.7
35.3
PRES DBAR
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132.0 132.2 132.4 132.6 132.8 133.0 133.2 133.4 133.6 133.8 134.0
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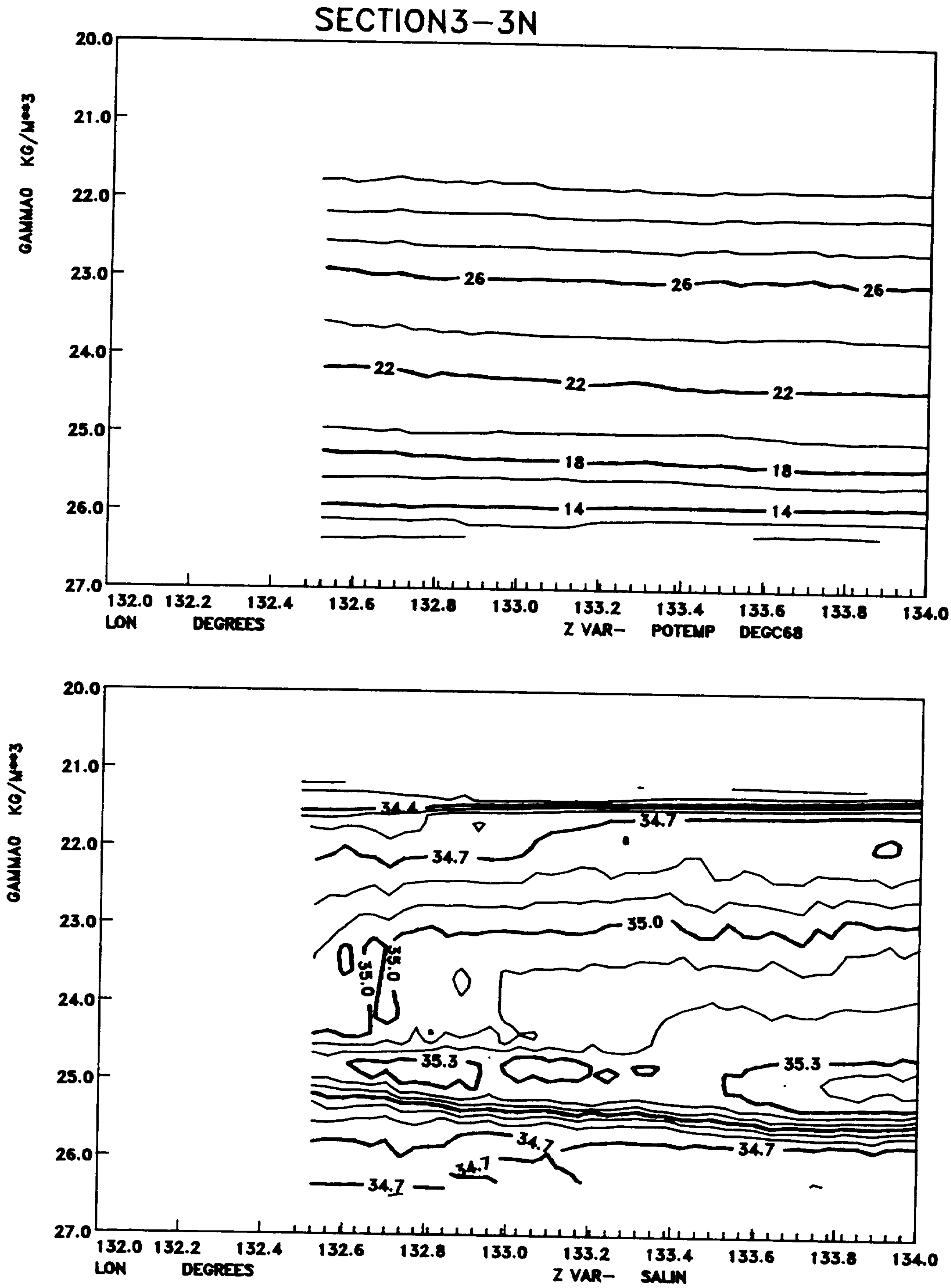
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LON DEGREES
Z VAR- POTEMP DEGC68
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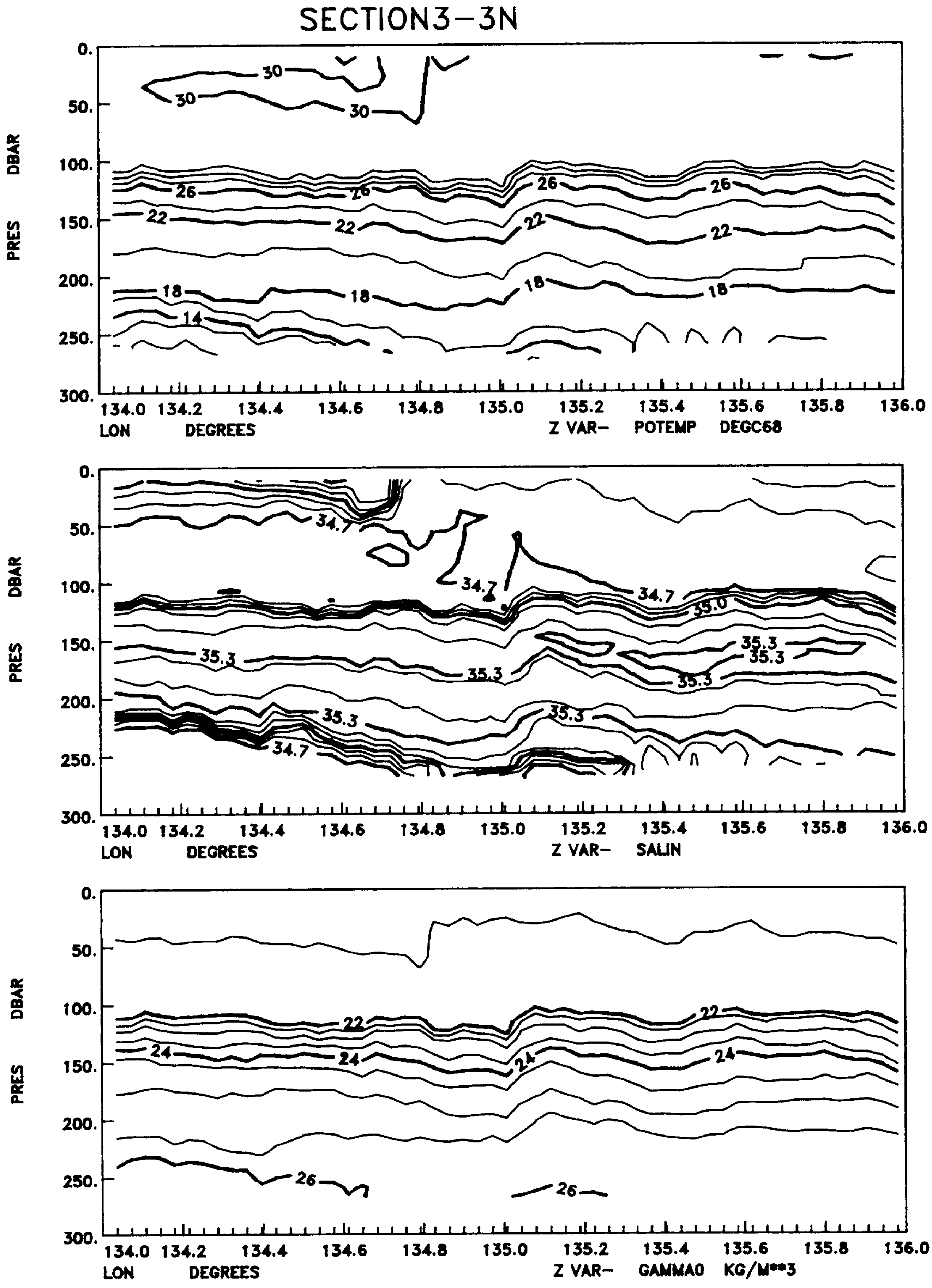
Z VAR- SALIN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LON DEGREES
Z VAR- POTEMP DEGC68
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Z VAR- SALIN
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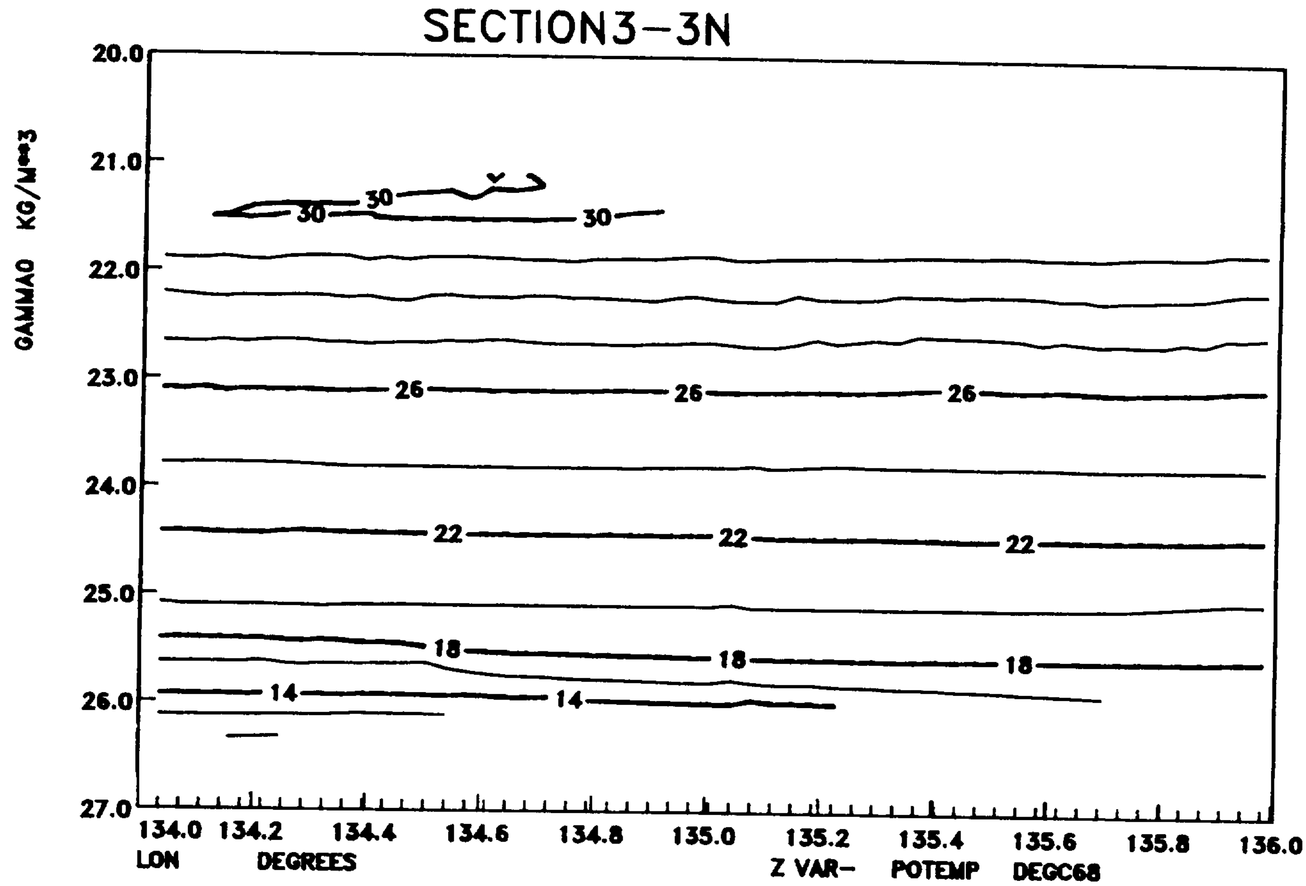
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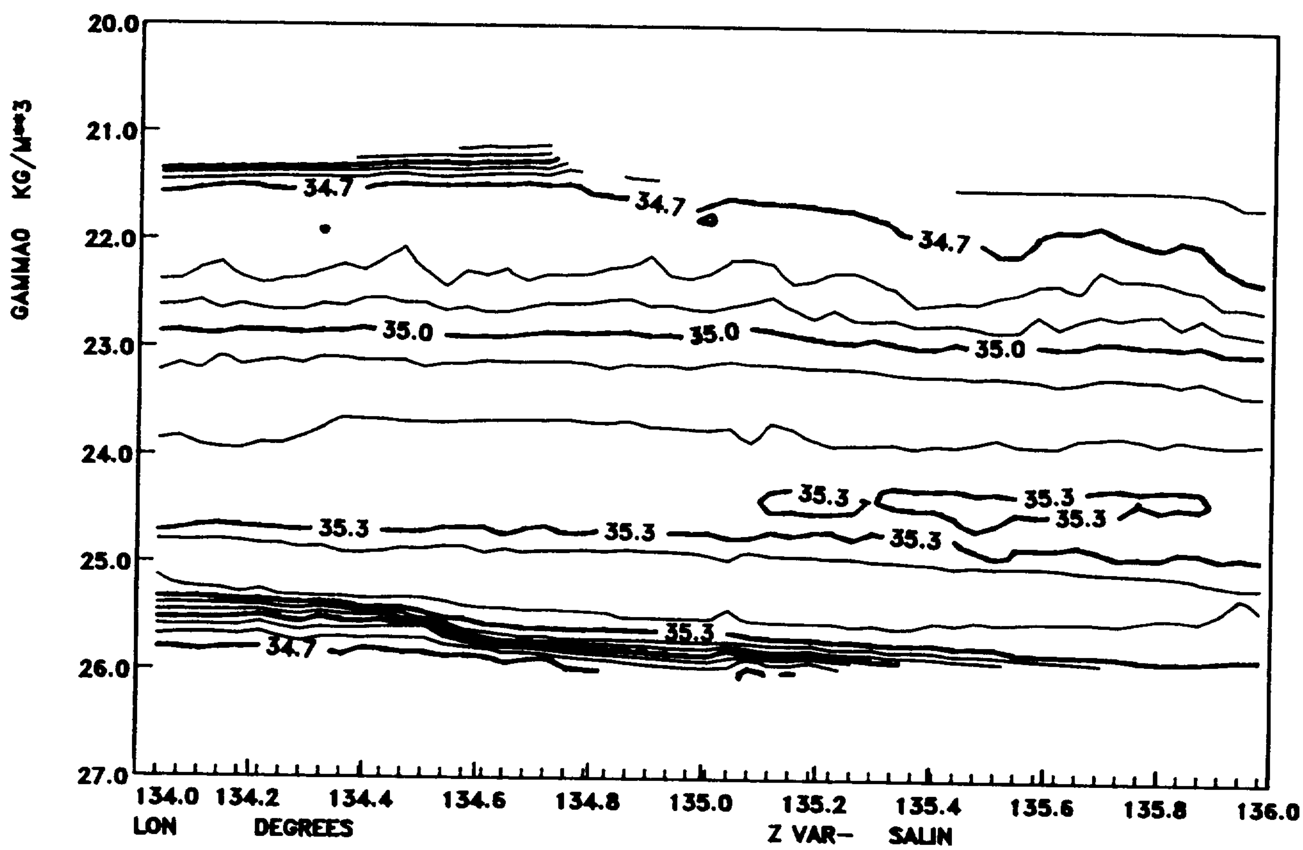
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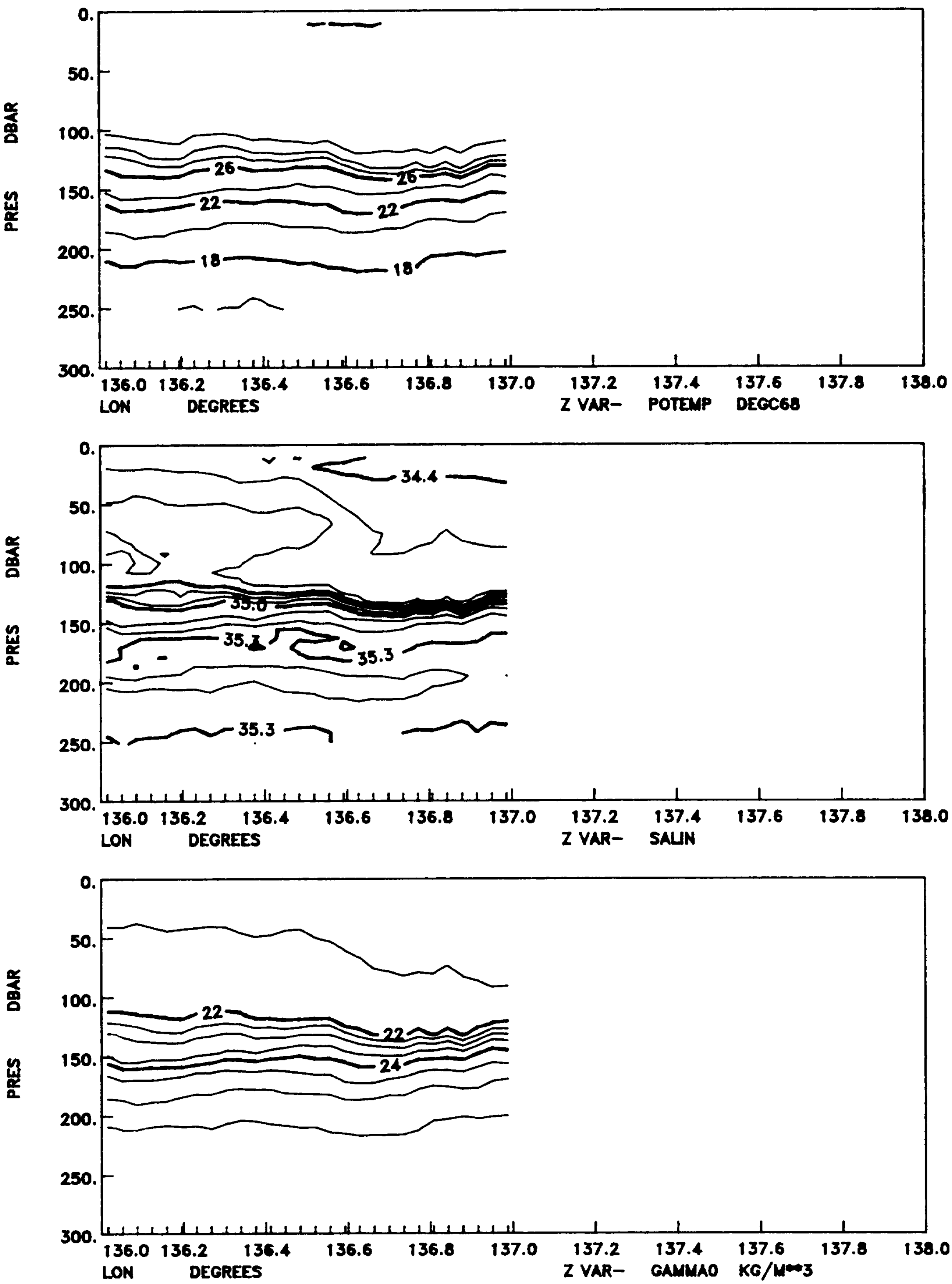
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LON DEGREES
Z VAR- POTEMP DEGC68
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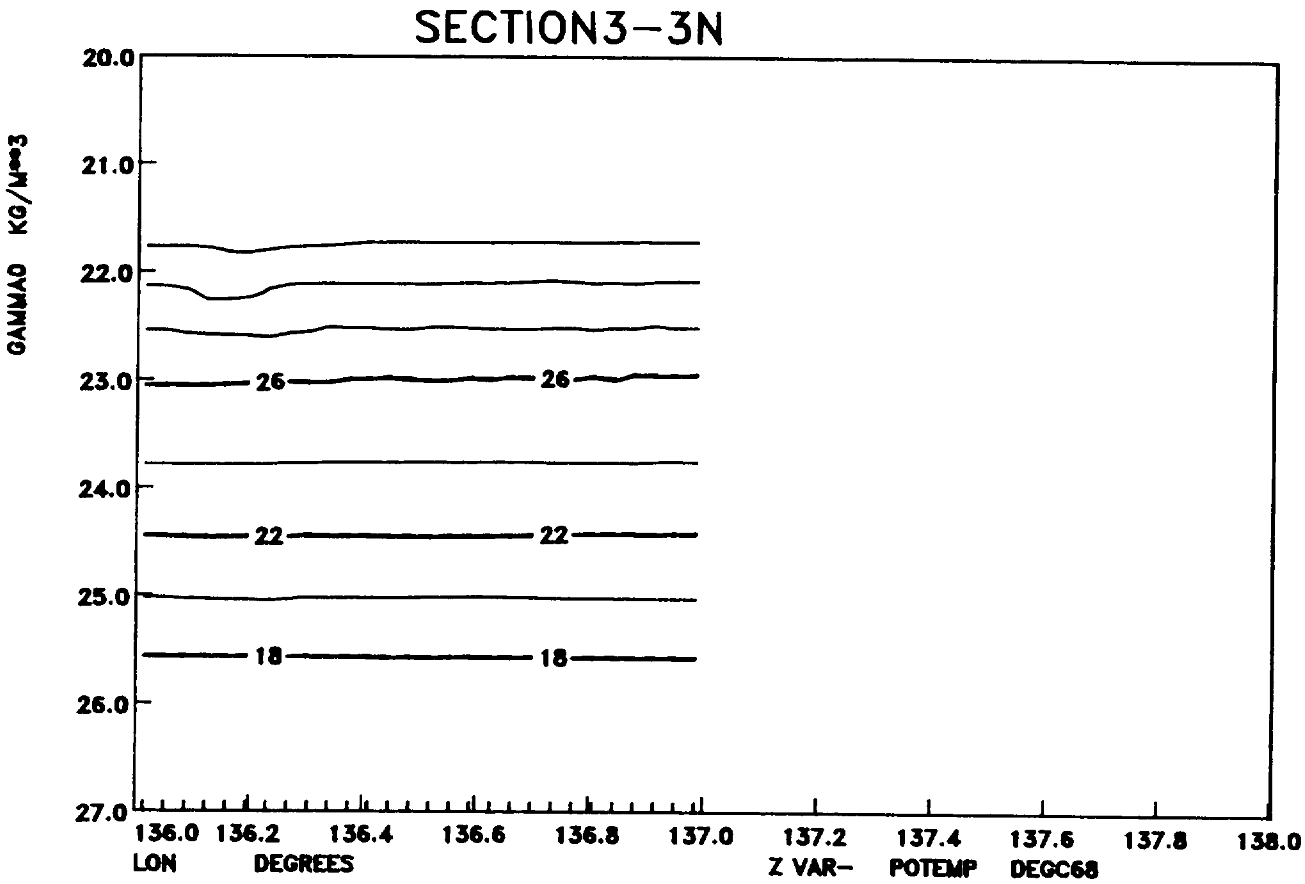
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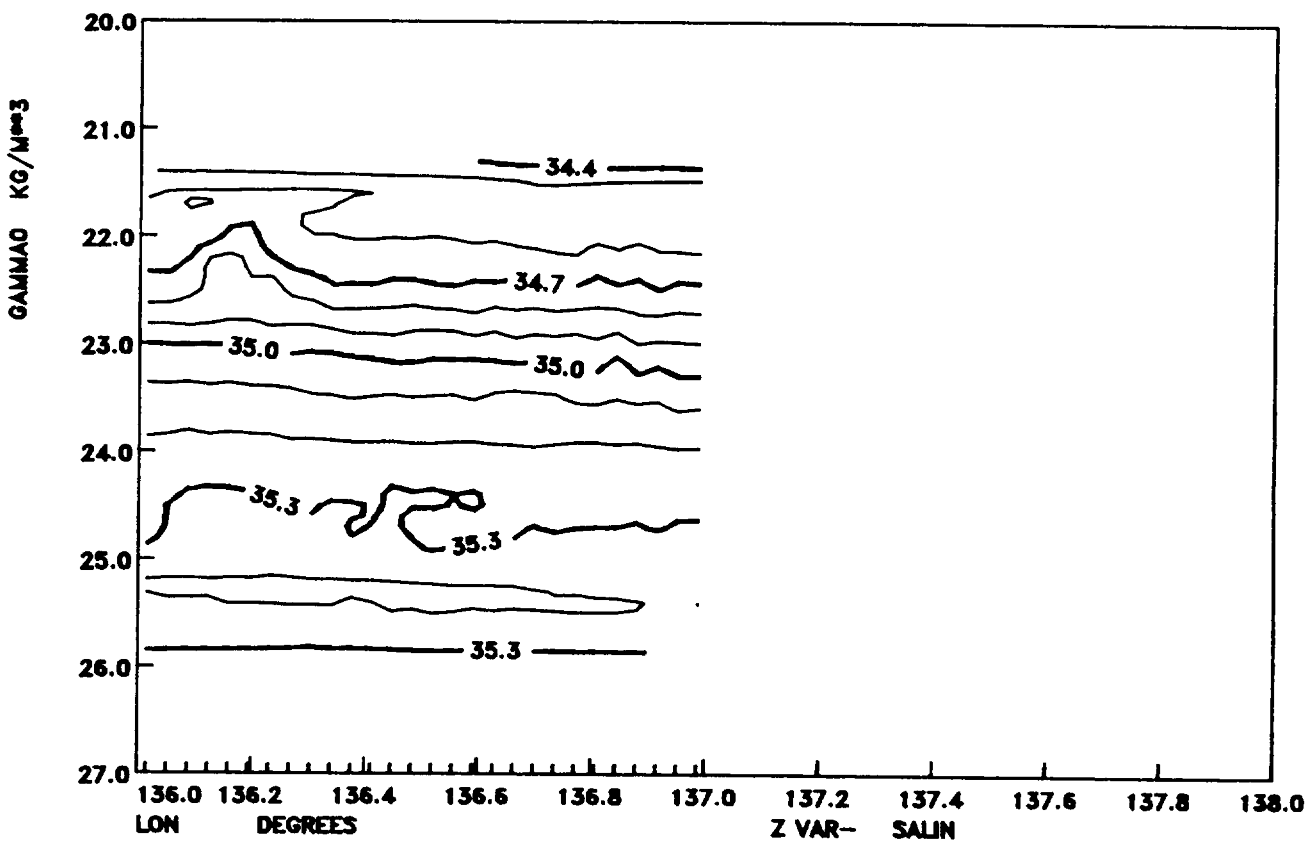
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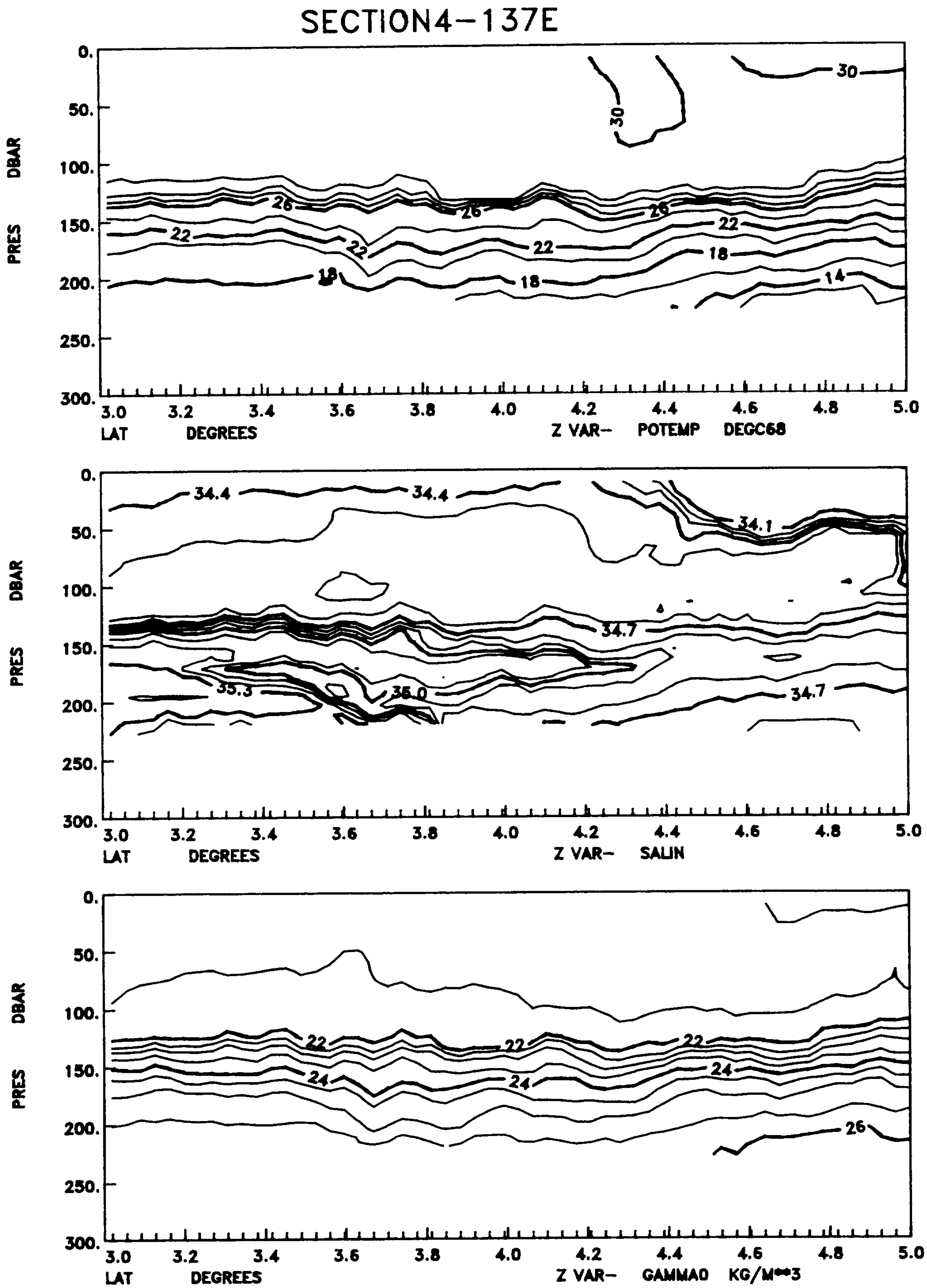
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4.6
4.8
5.0
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Z VAR- POTEMP DEGC68
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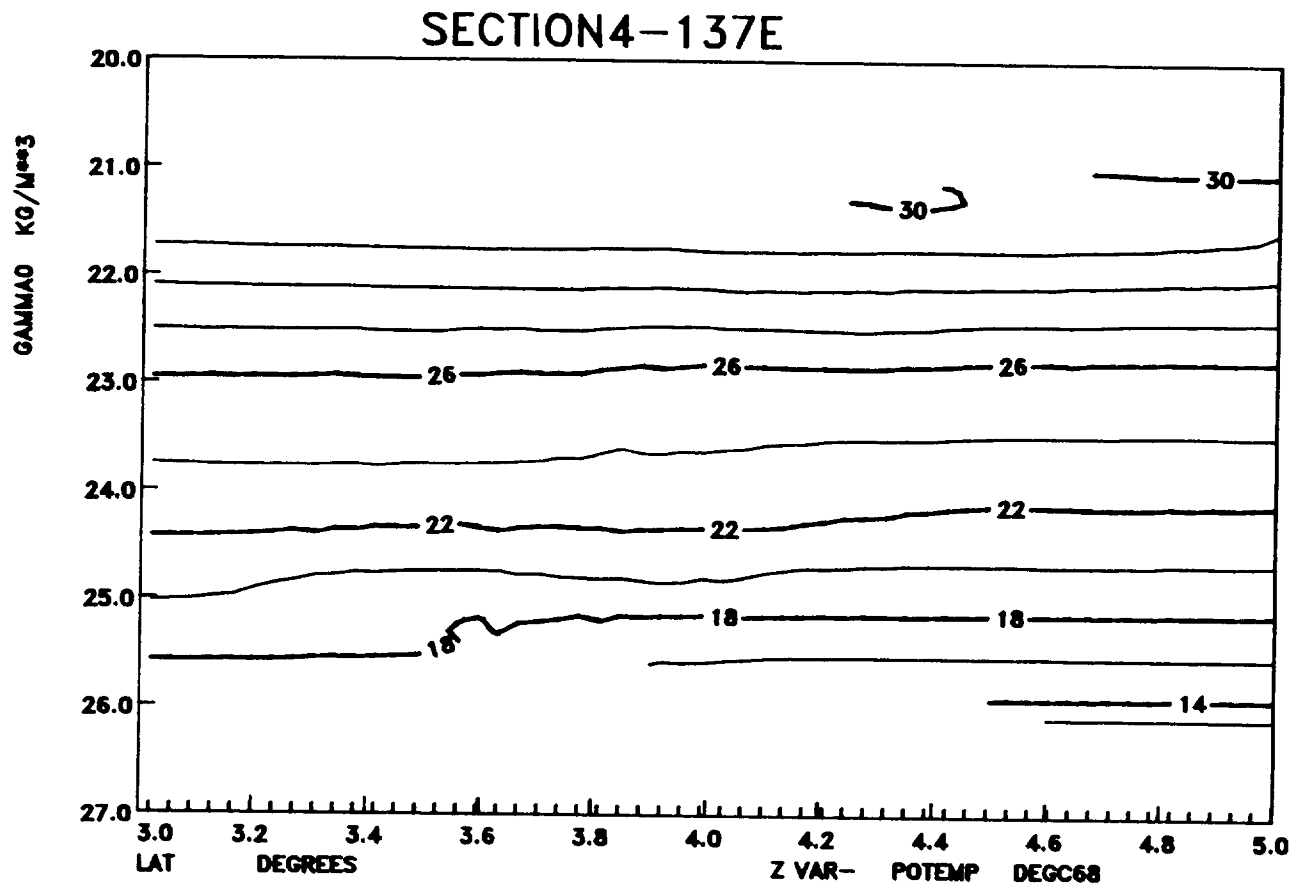
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3.4
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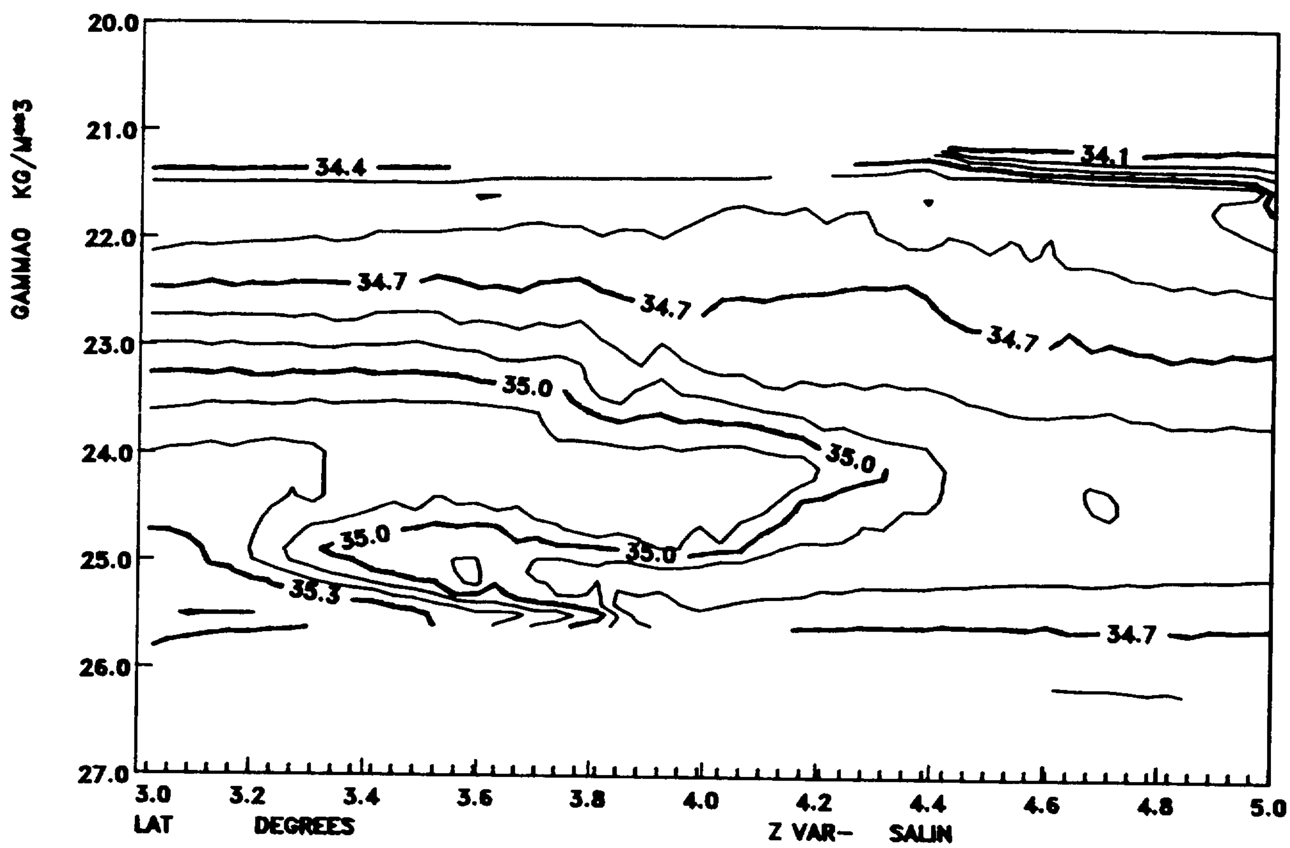
Z VAR- POTEMP DEGC68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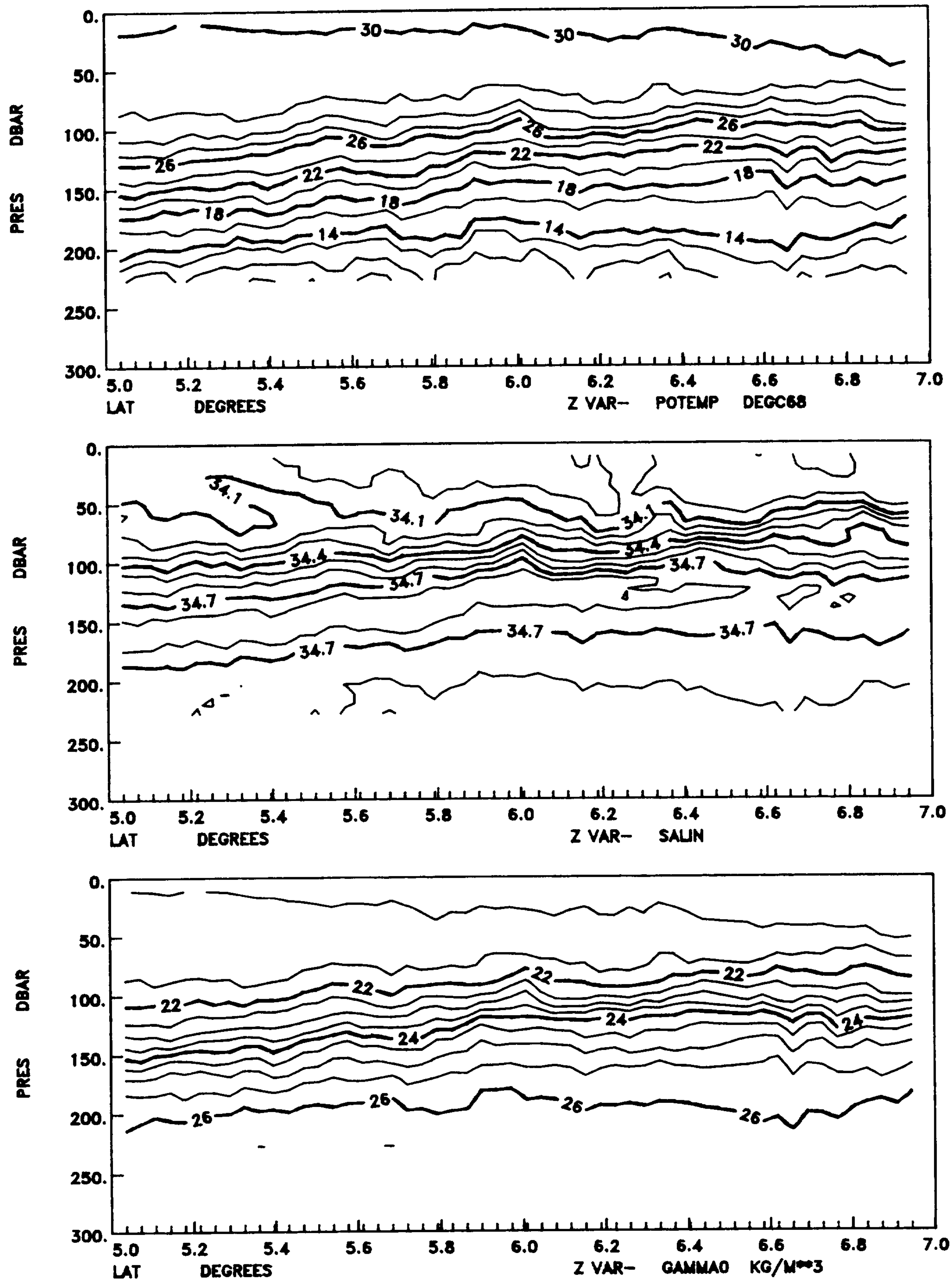
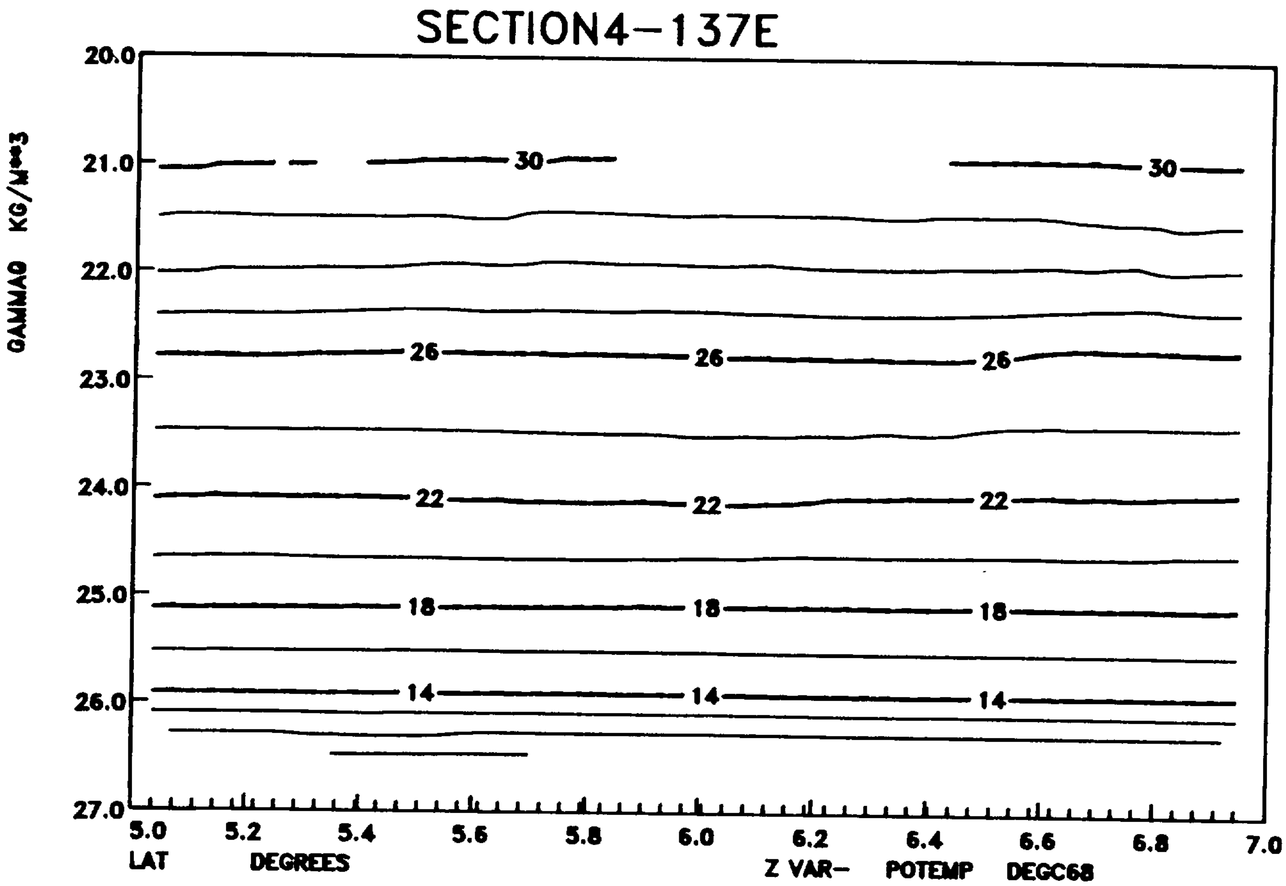
Z VAR- SALIN

SECTION4−137E

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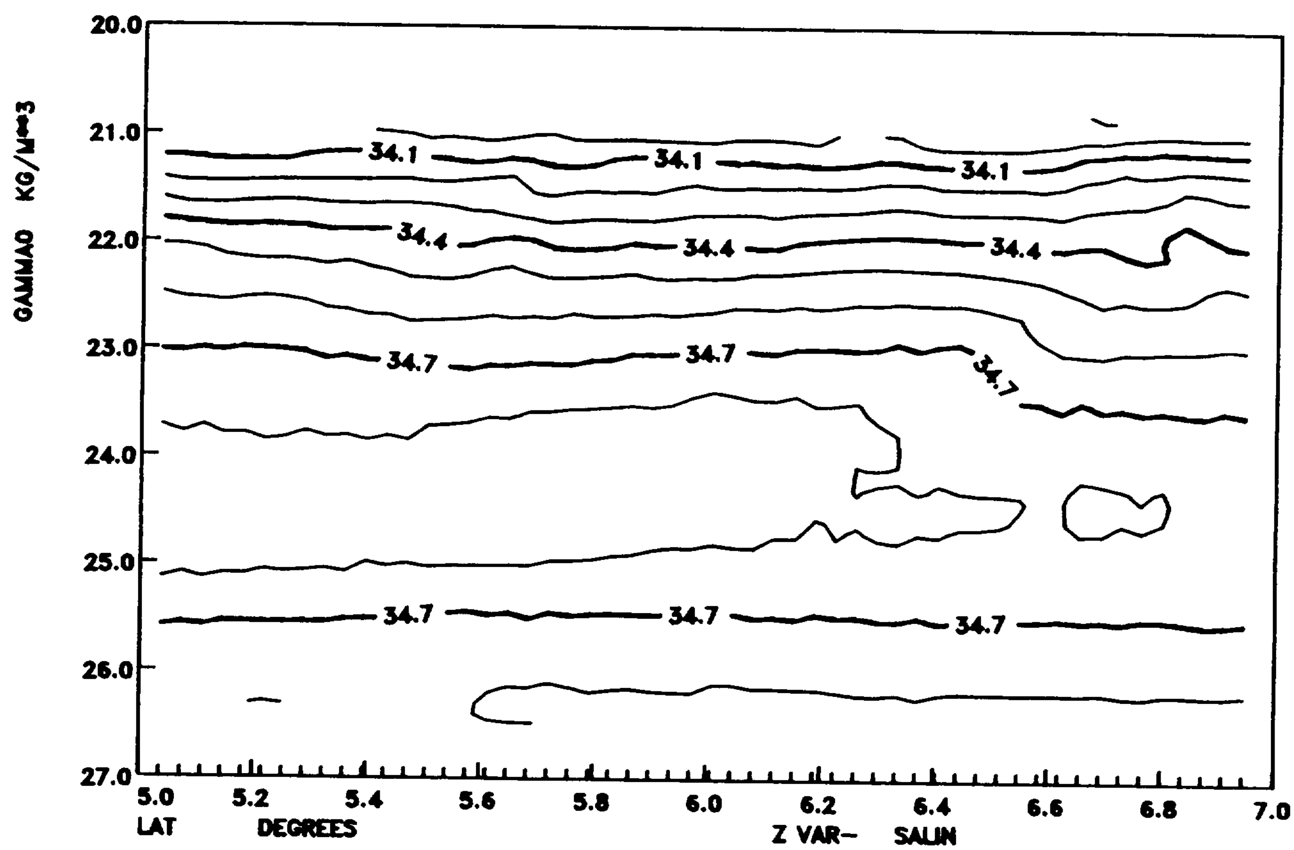
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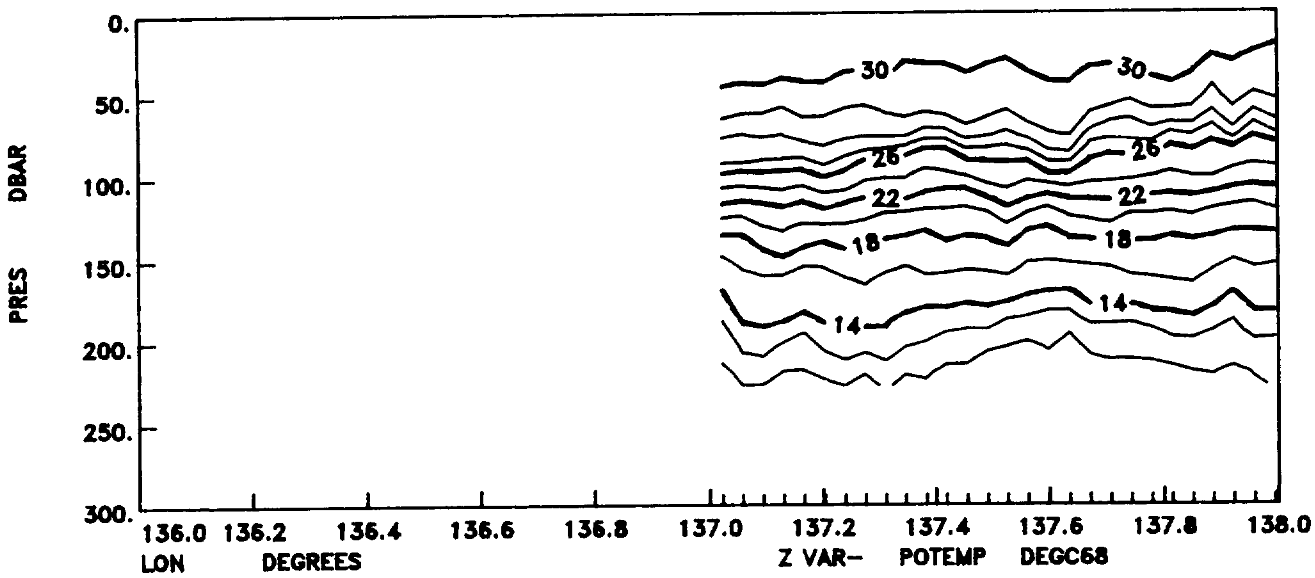
LAT DEGREES
Z VAR- SALIN

SECTION5-7N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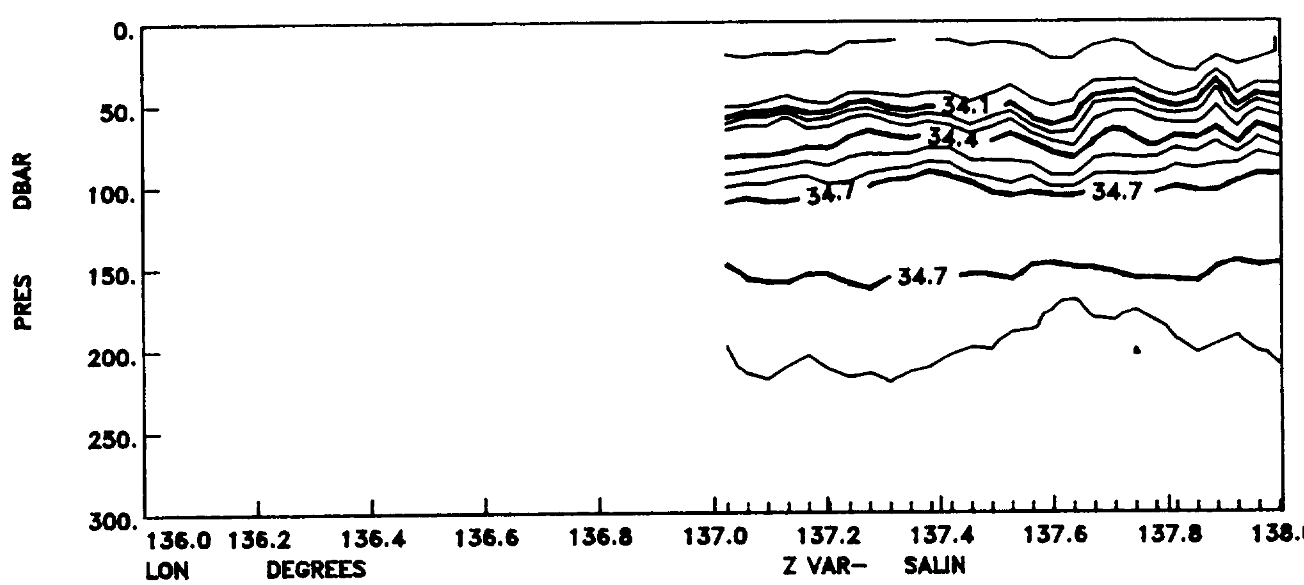
Z VAR- POTEMP DEGC68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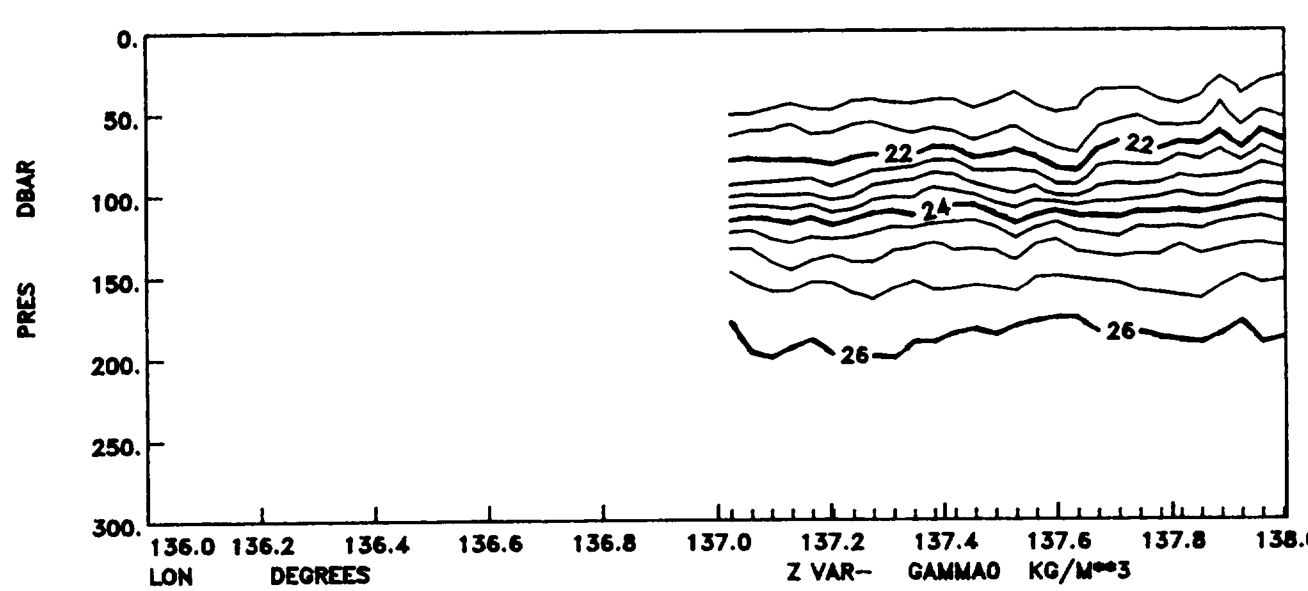
Z VAR- SALIN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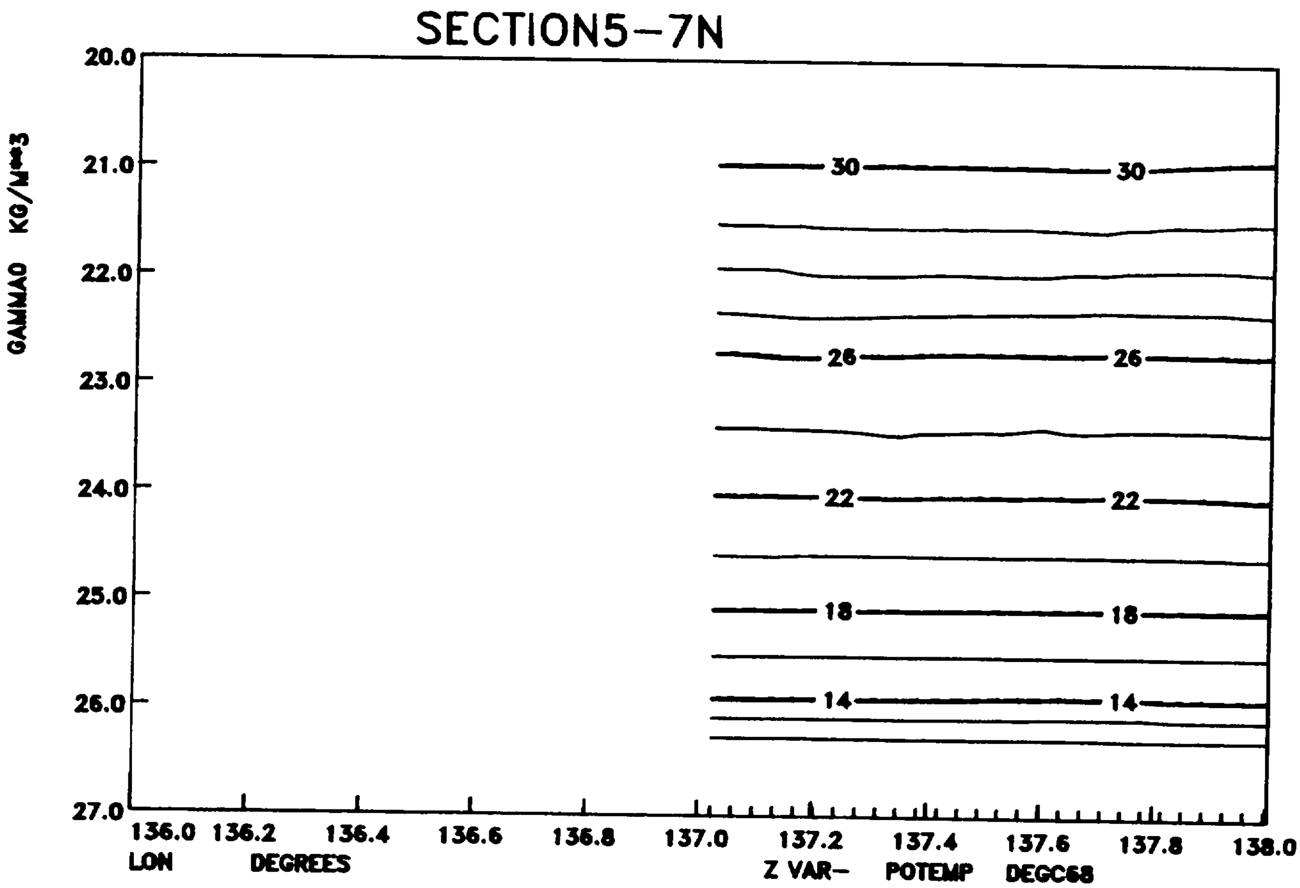
Z VAR- GAMMA0 KG/M**3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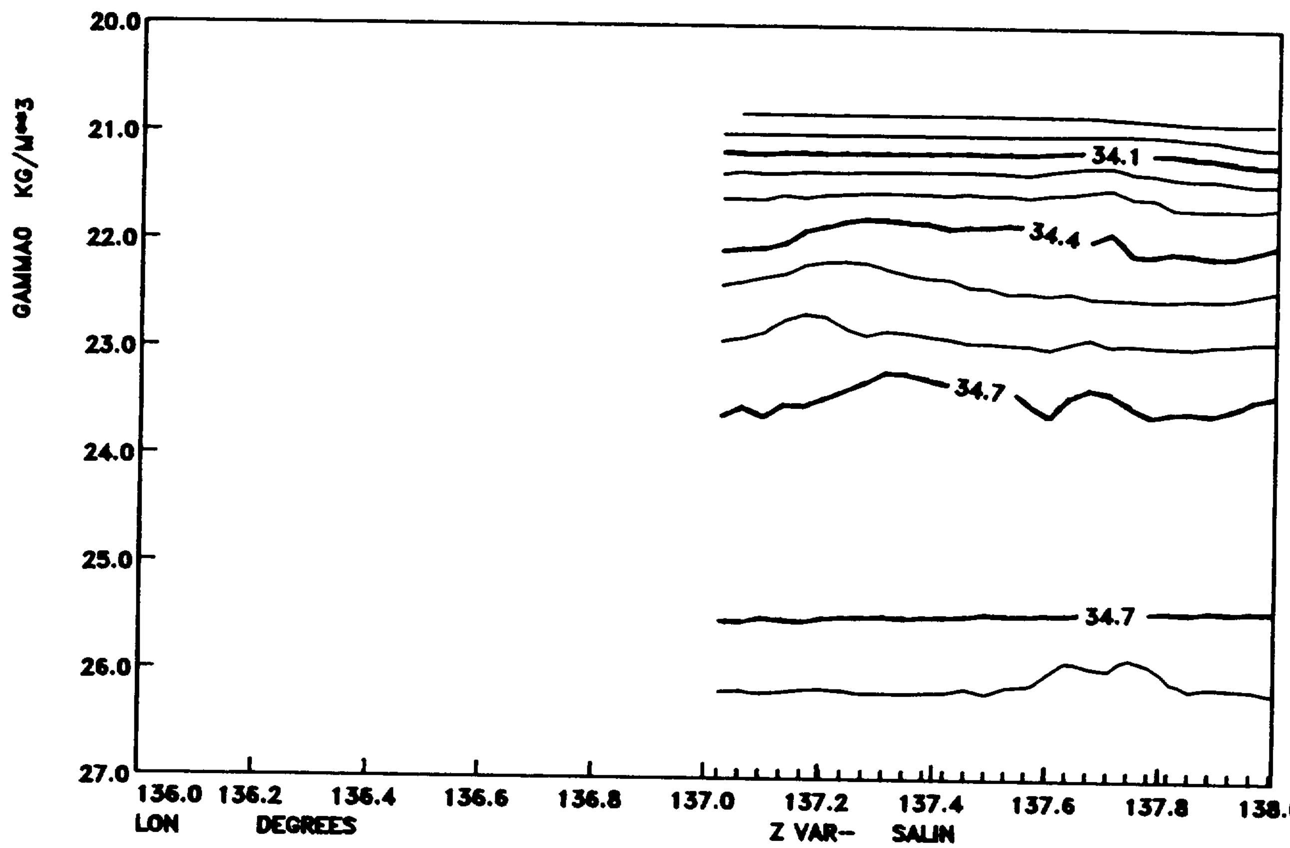
Z VAR- POTEMP DEGC68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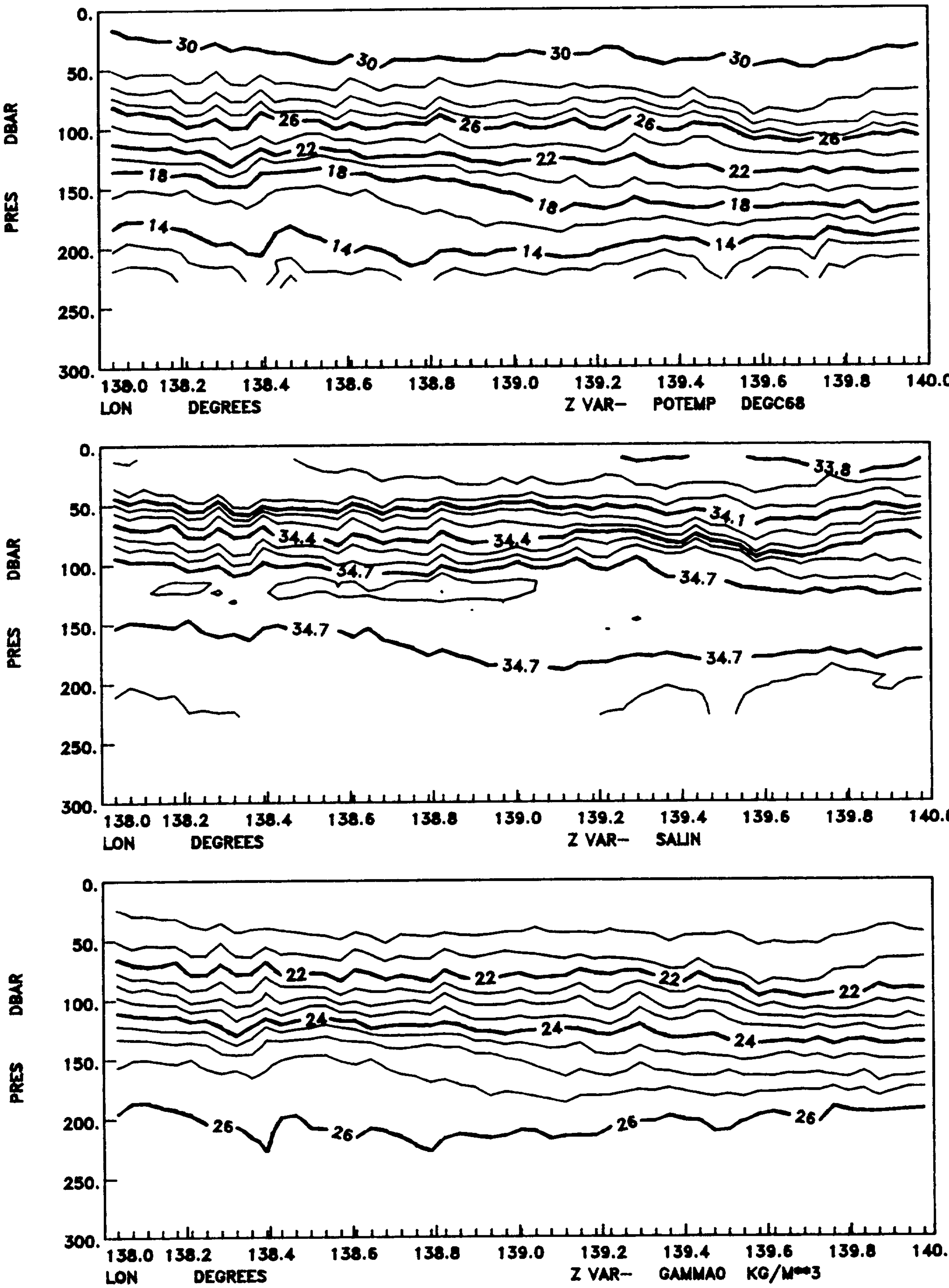
SECTION5-7N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LON DEGREES
Z VAR-- POTEMP DEGC68
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Z VAR-- SALIN
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PRES DBAR
Z VAR-- GAMMA0 KG/M**3
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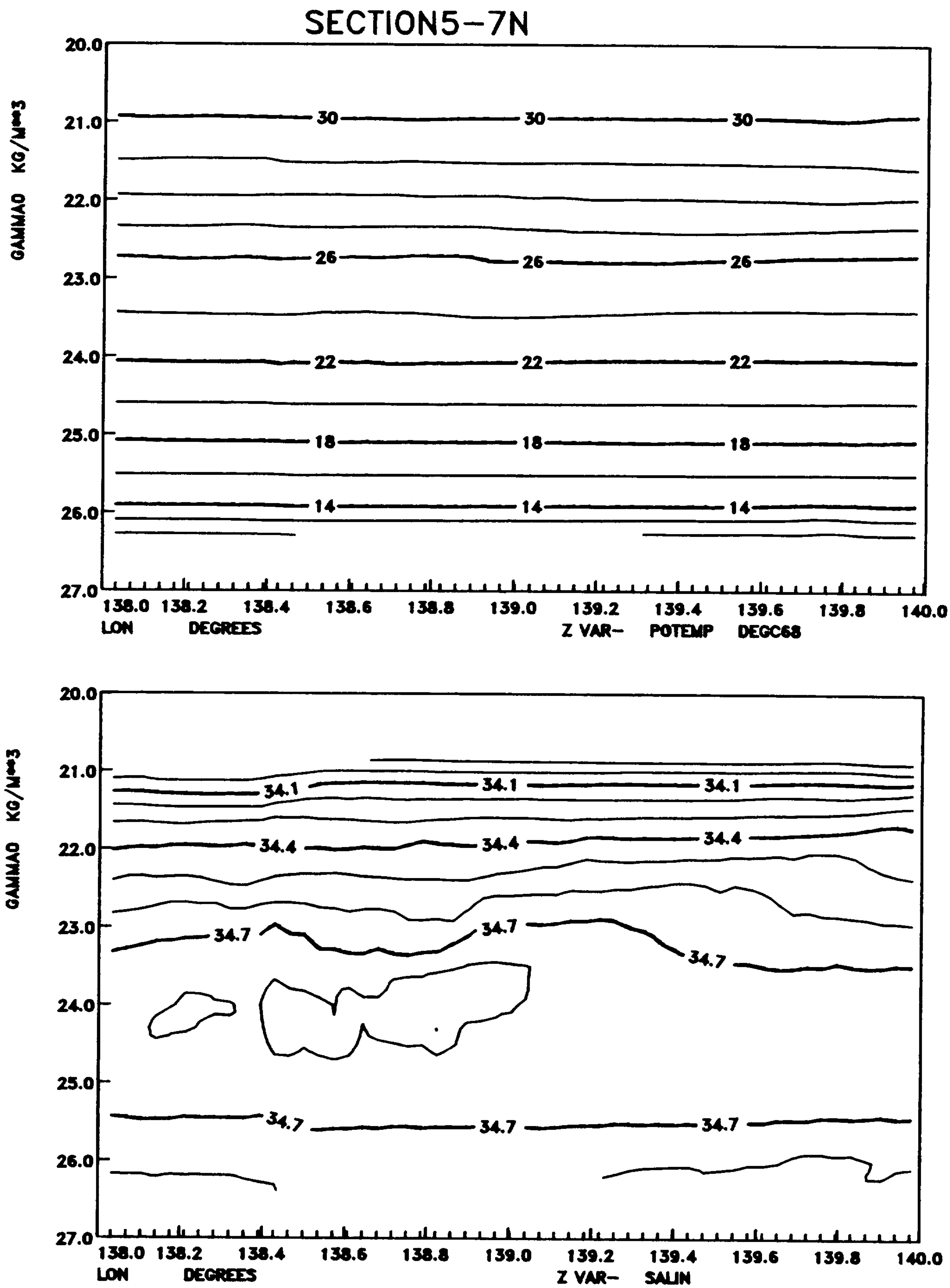
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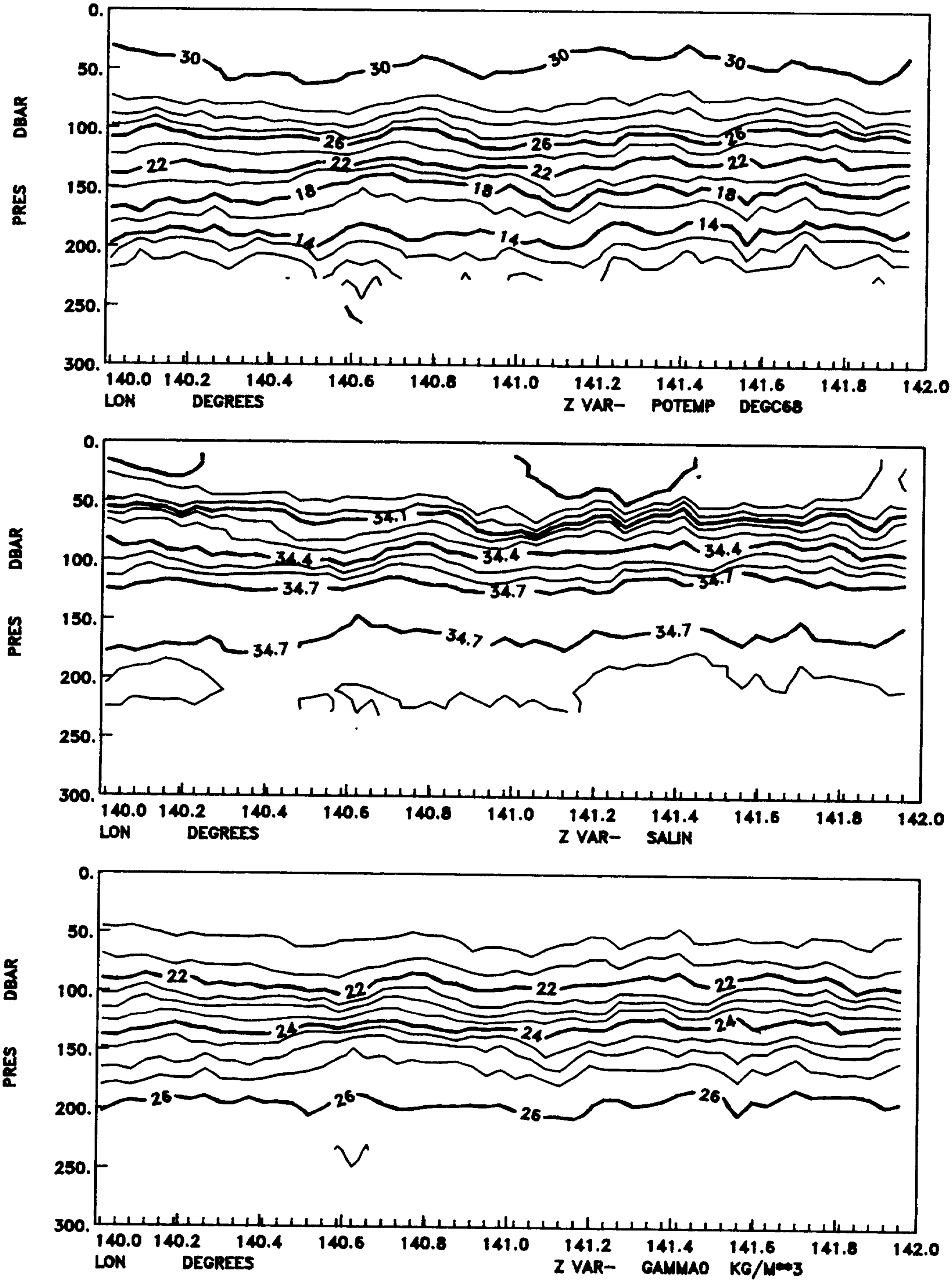
SECTION5-7N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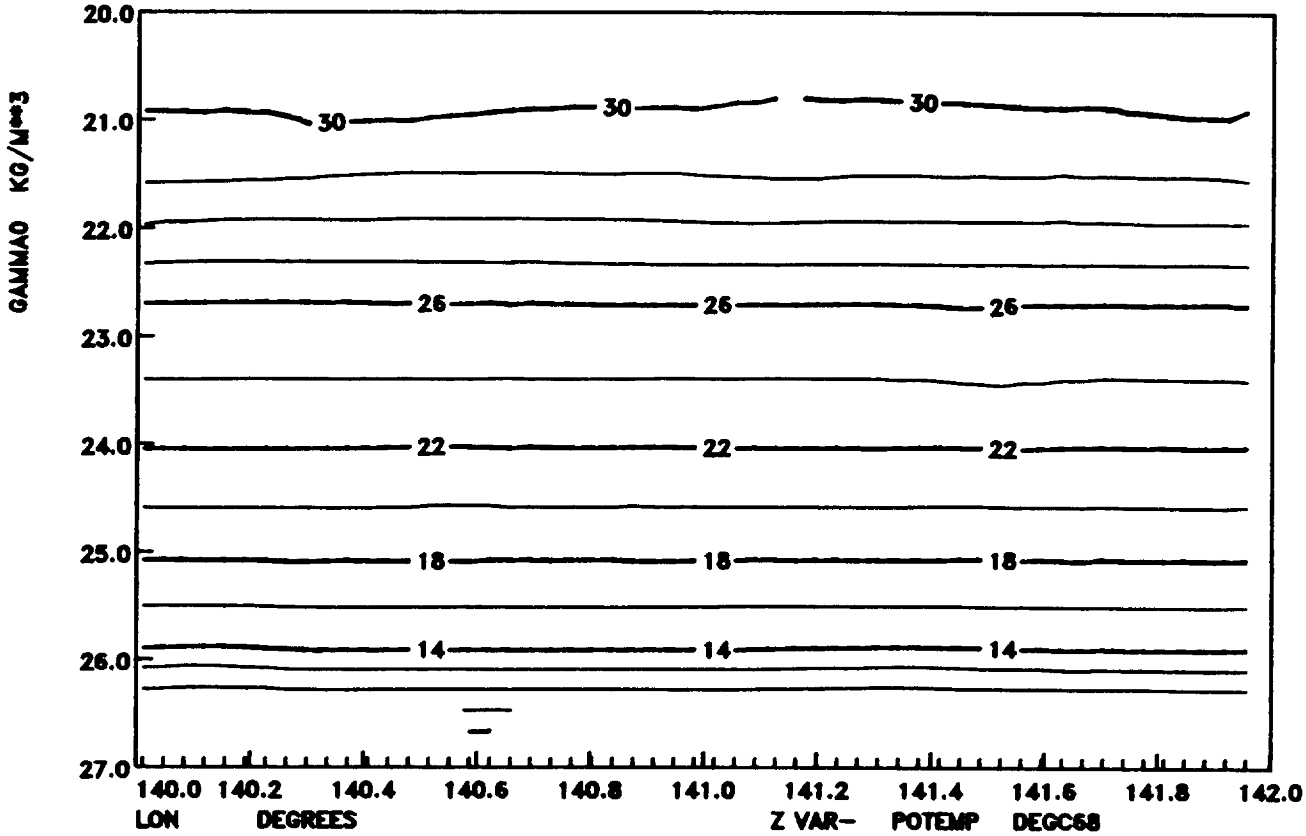

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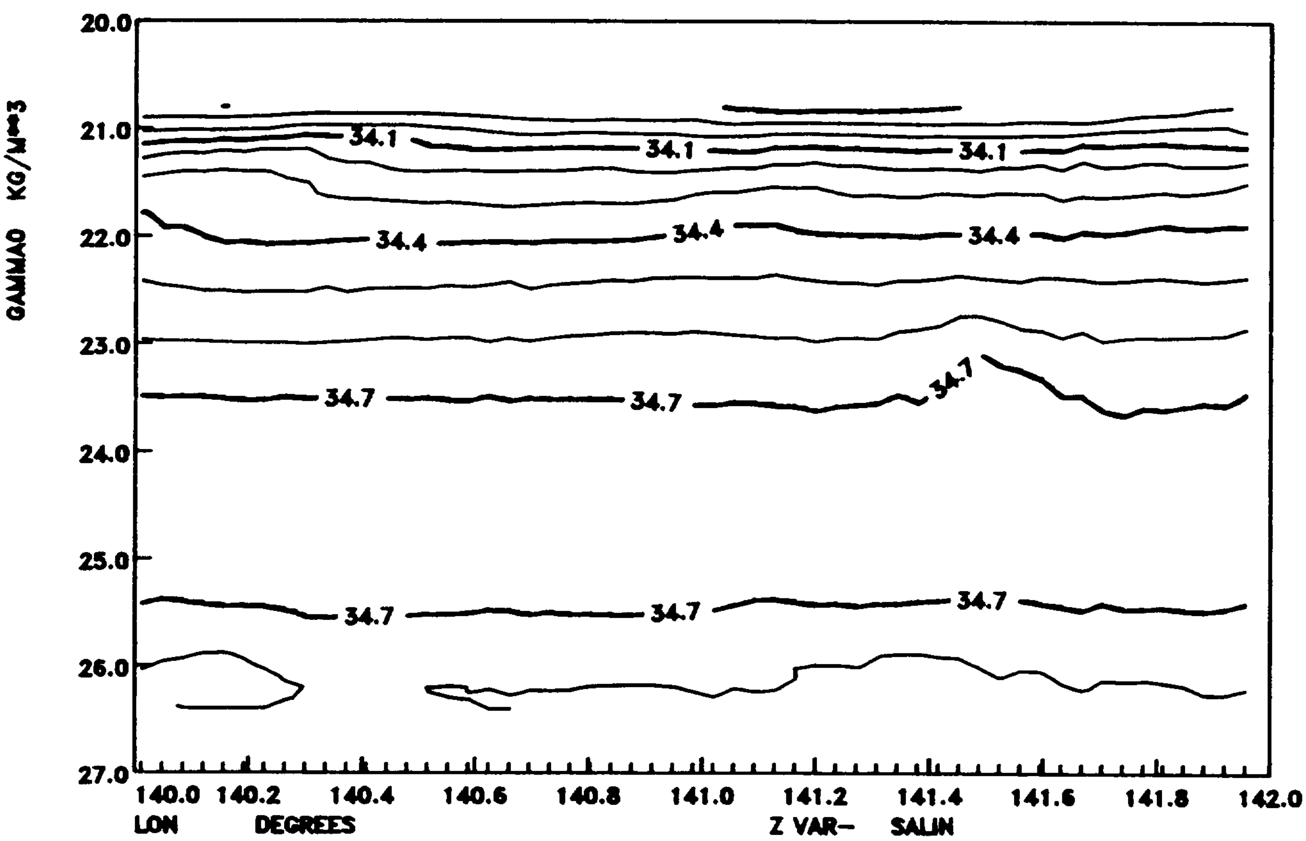

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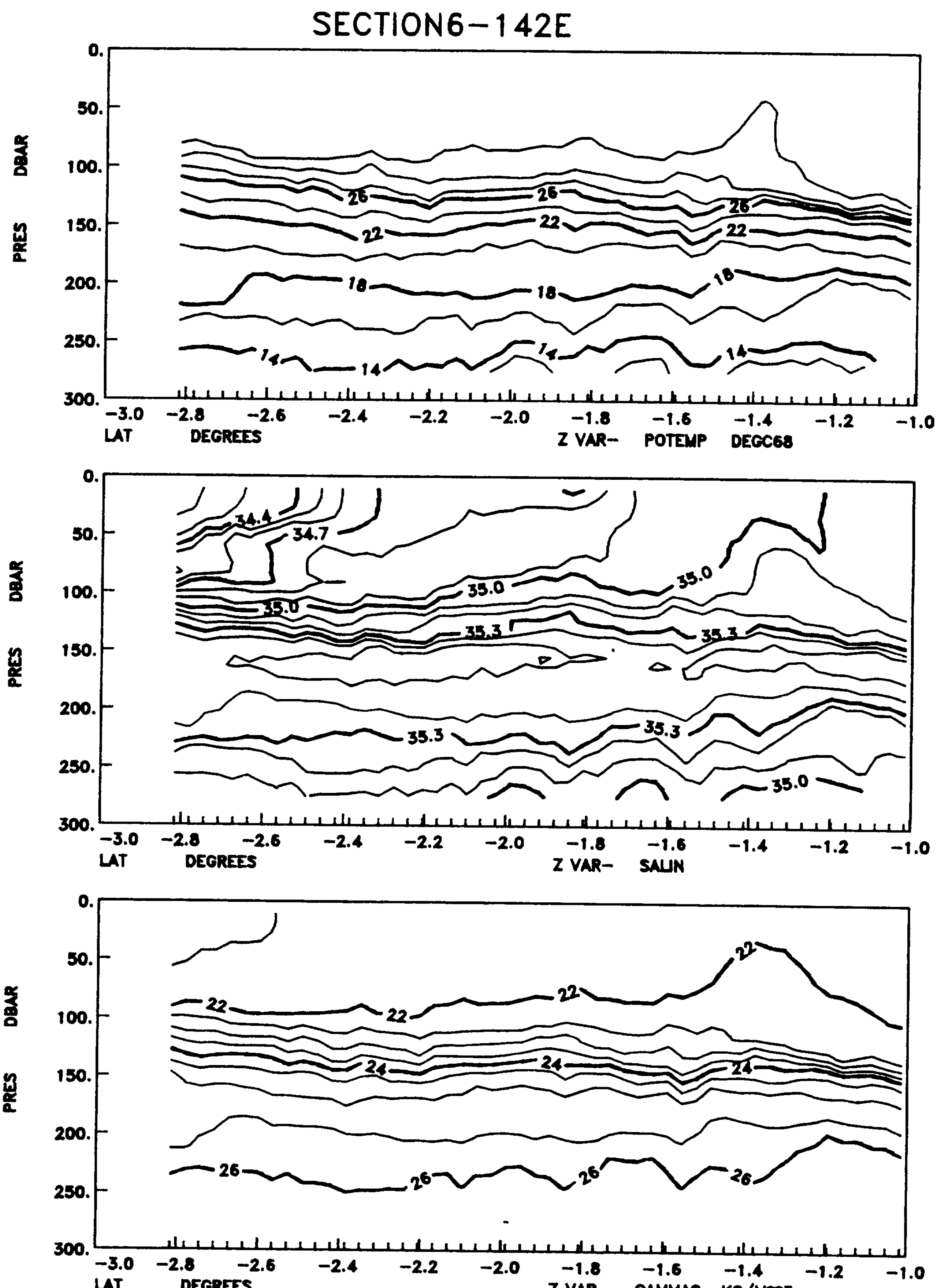
Z VAR- SALIN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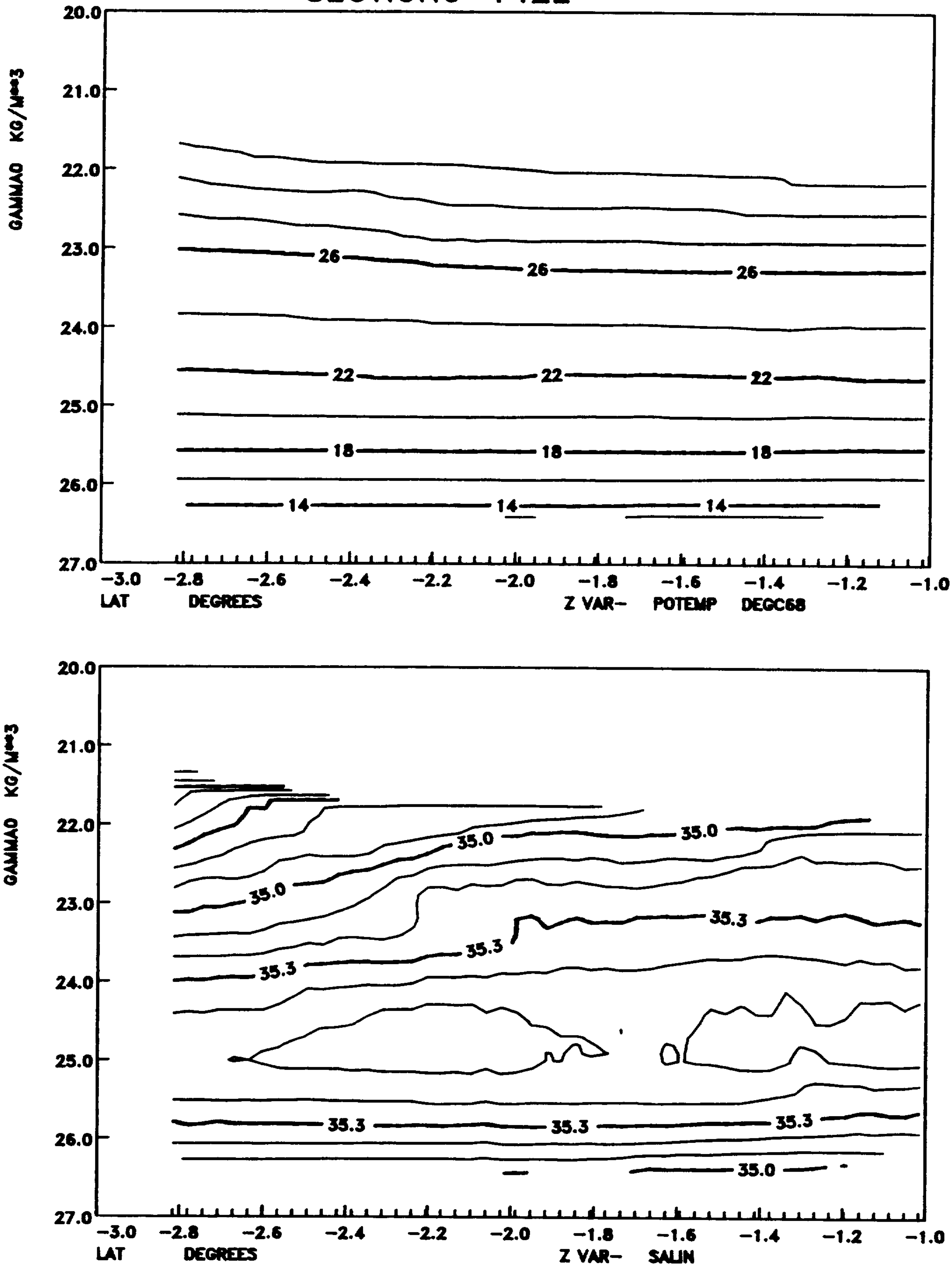

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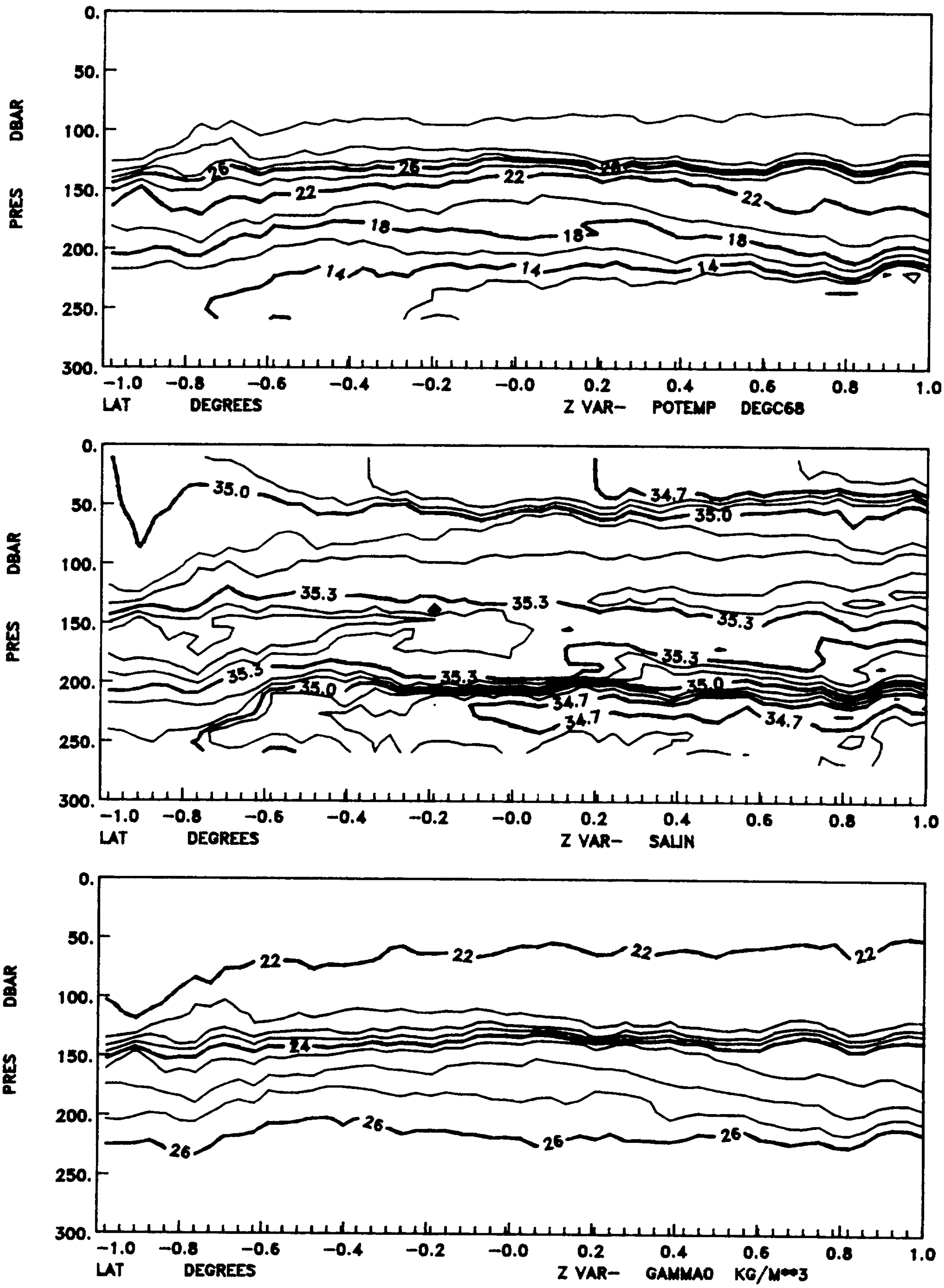

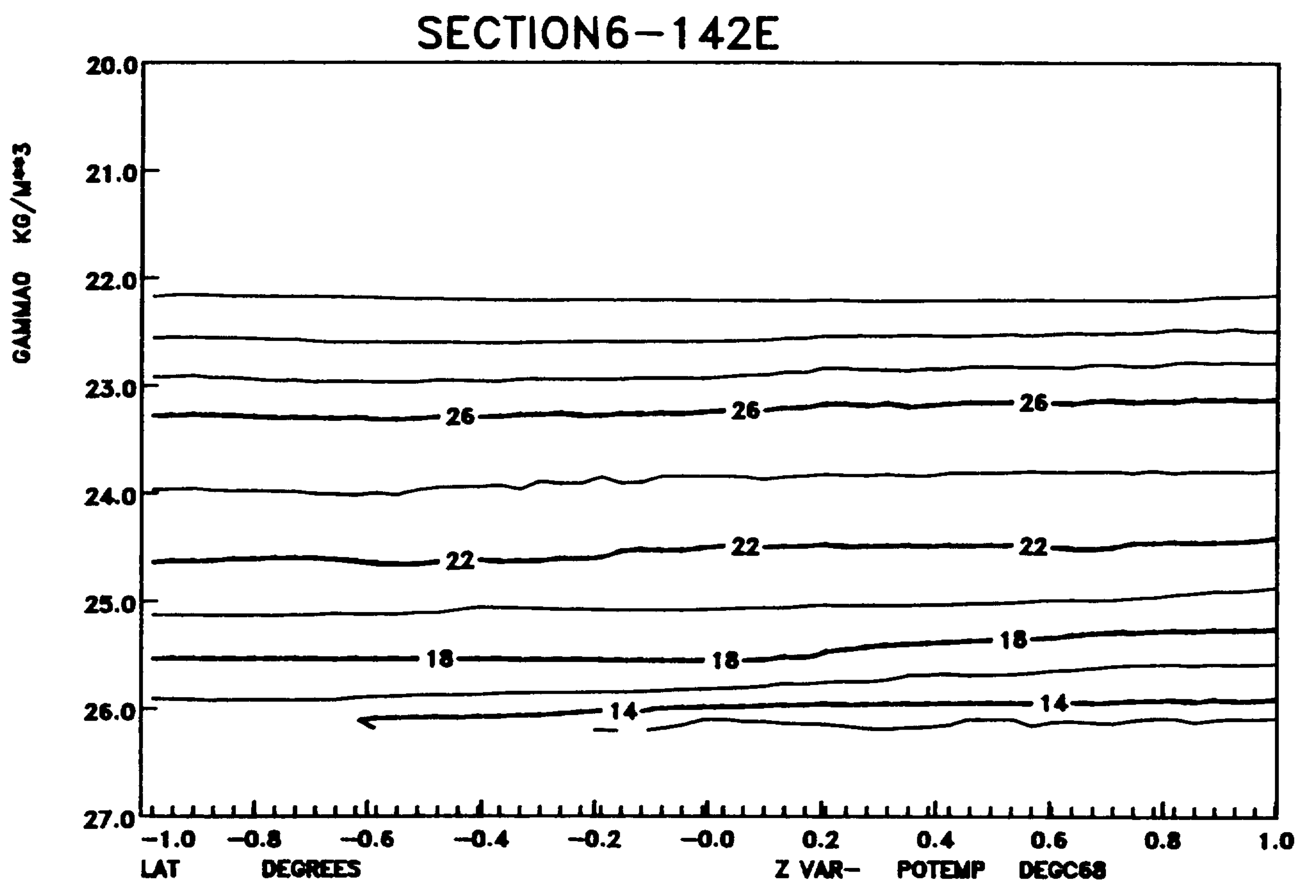
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18
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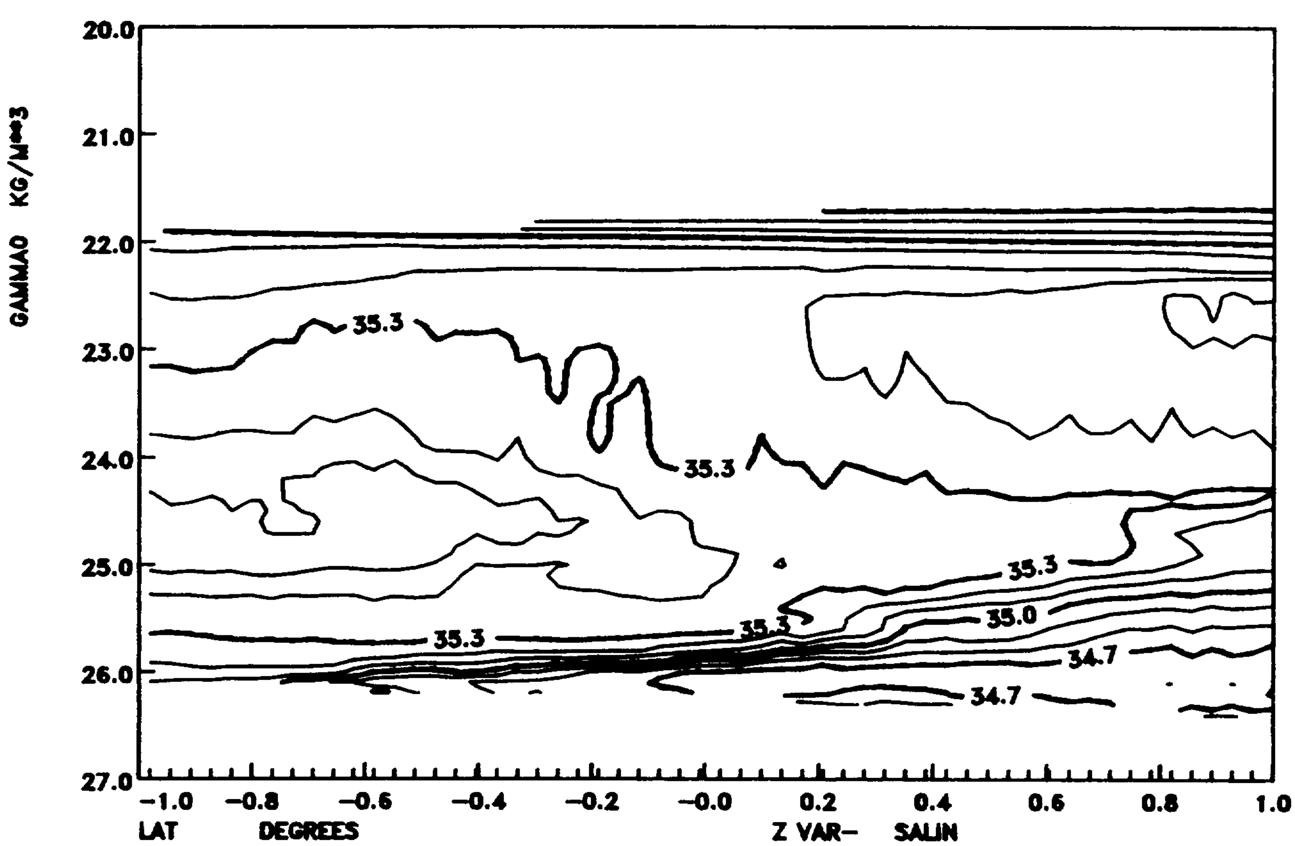
Z VAR- POTEMP DEGC68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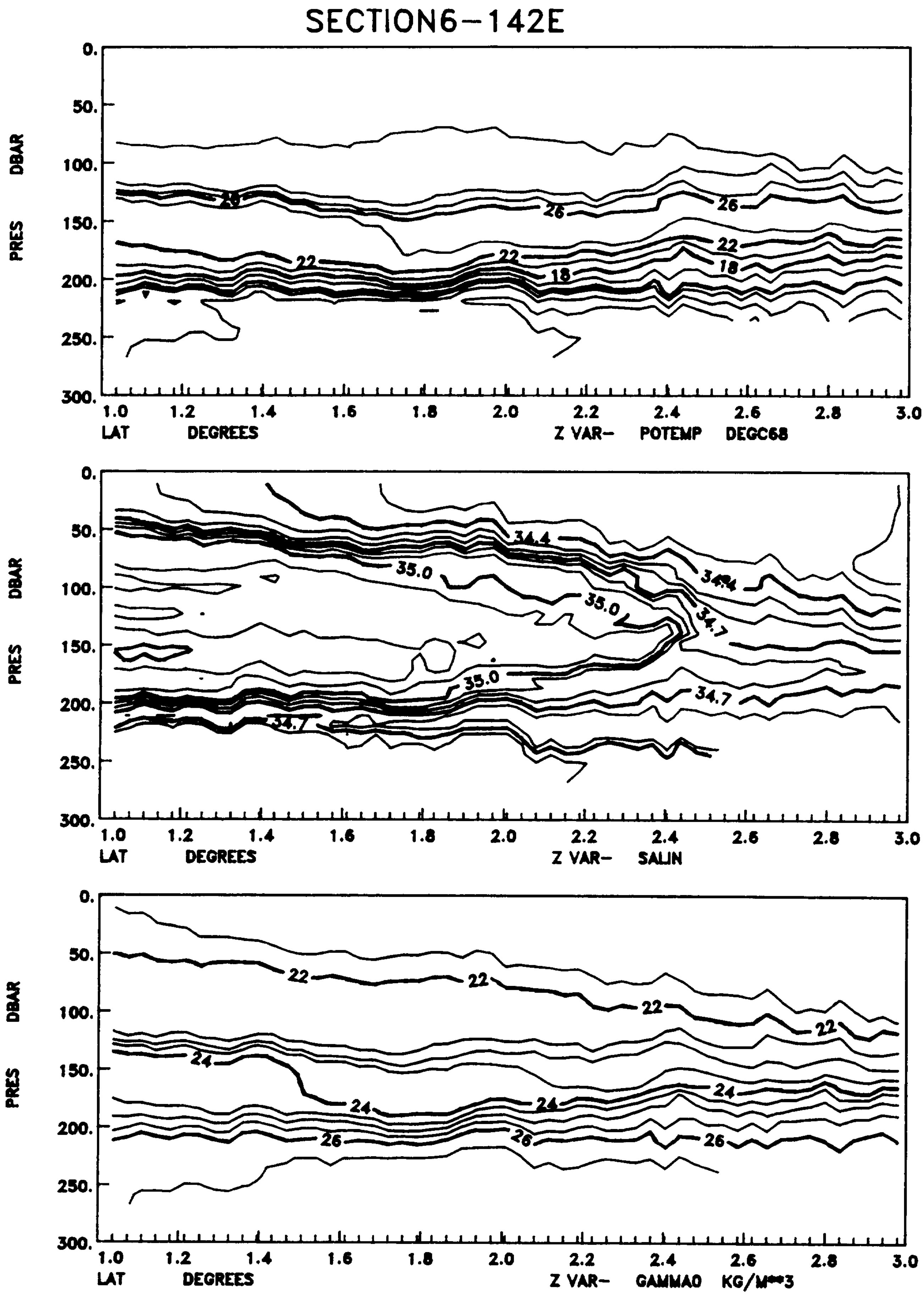
Z VAR- SALIN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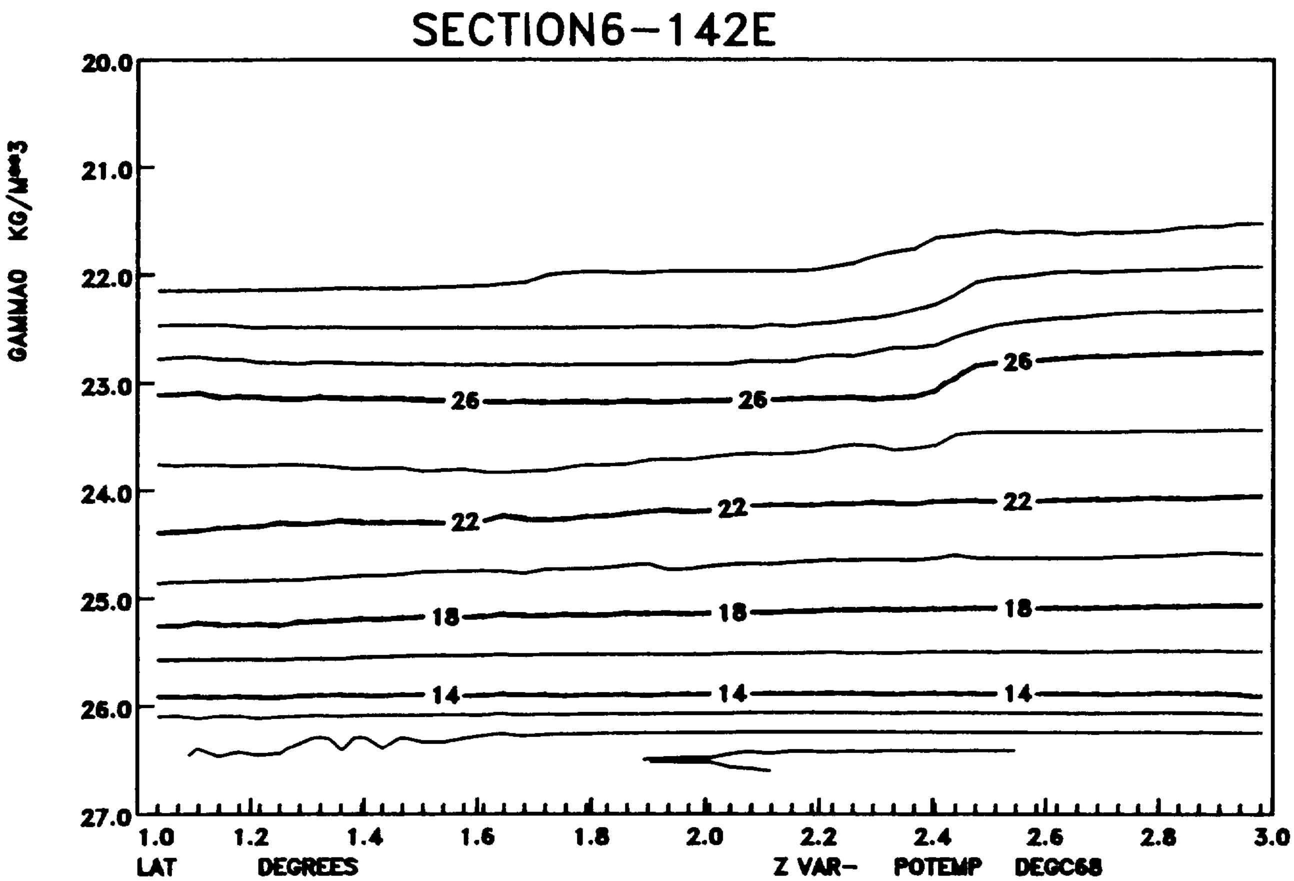
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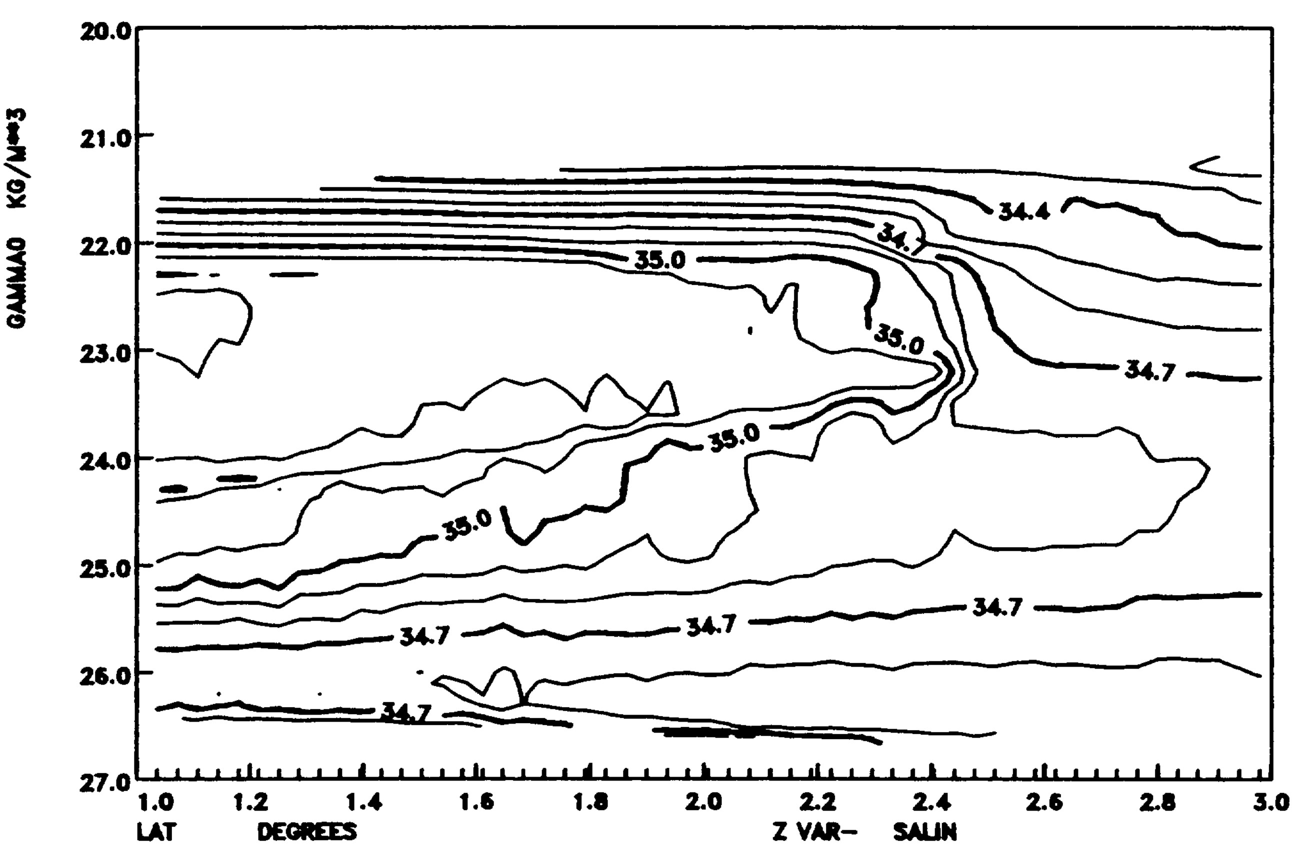
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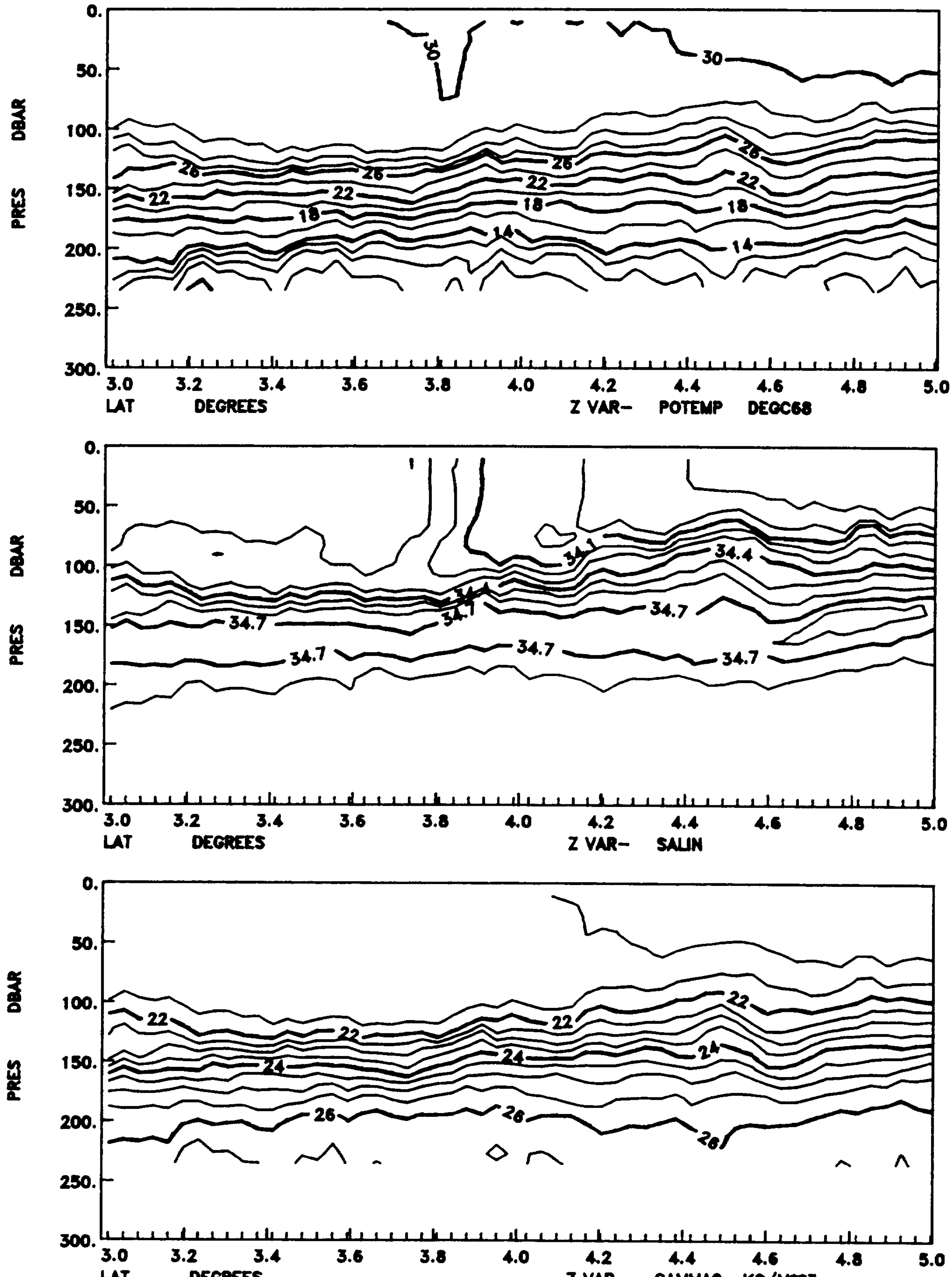
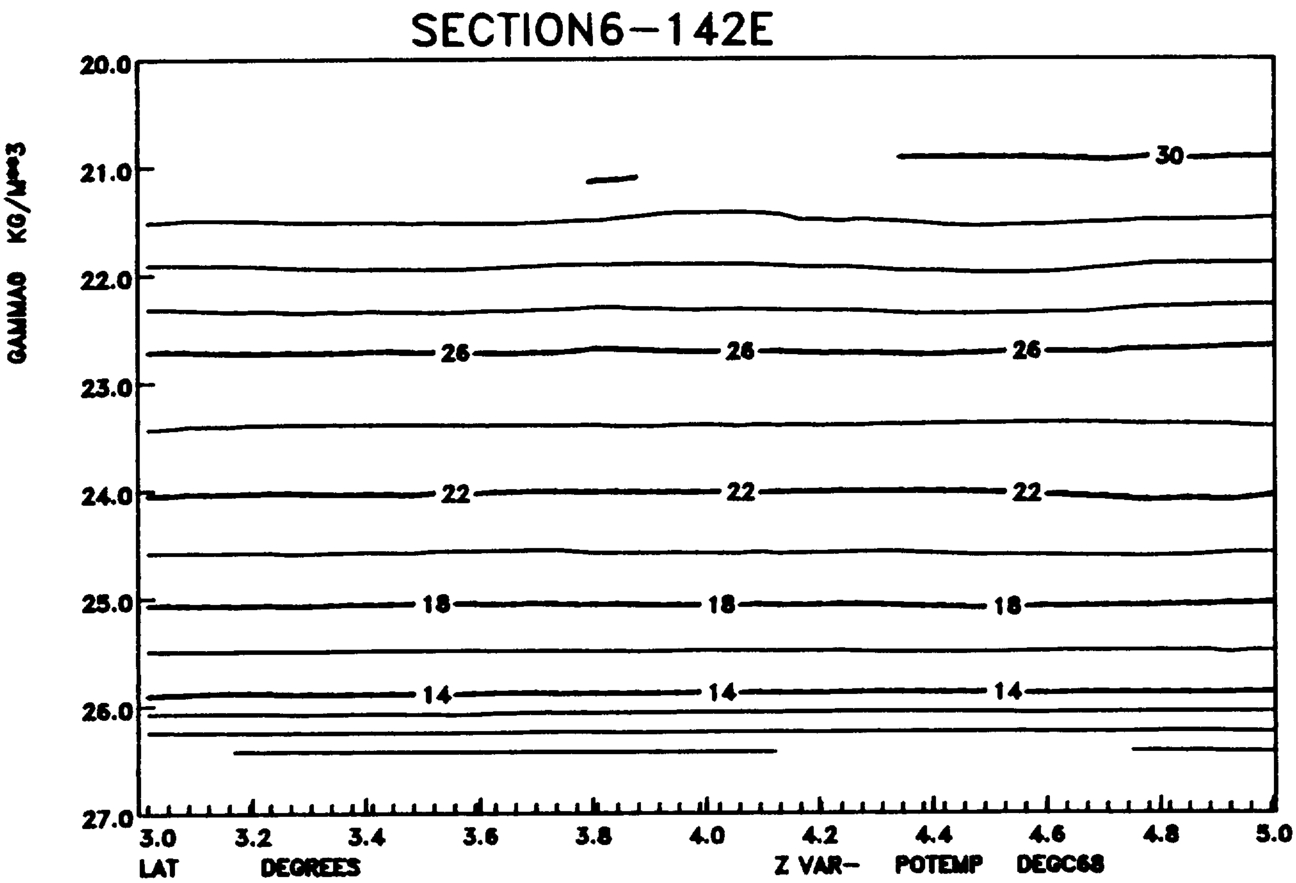
Z VAR- SALIN

SECTION6-142E

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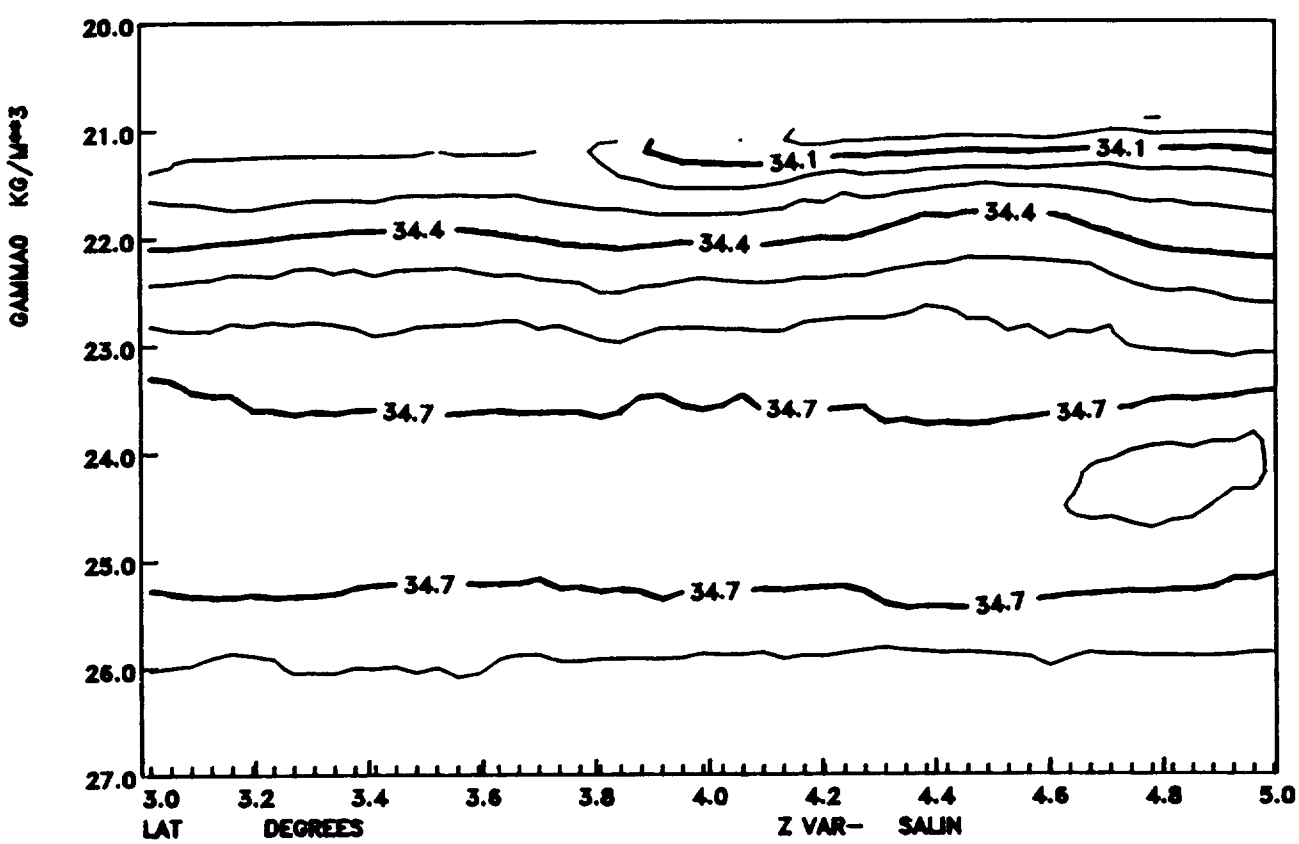
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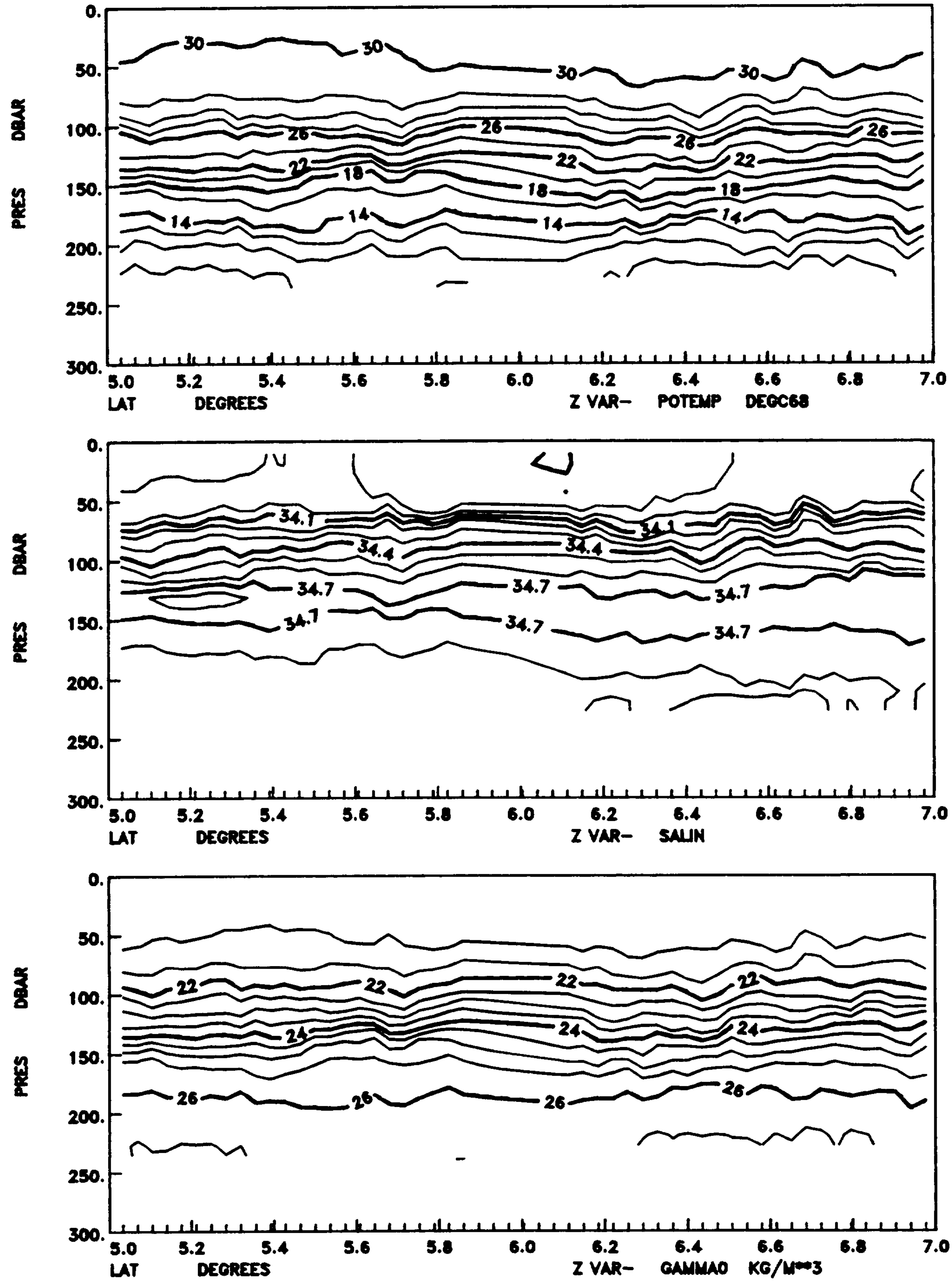
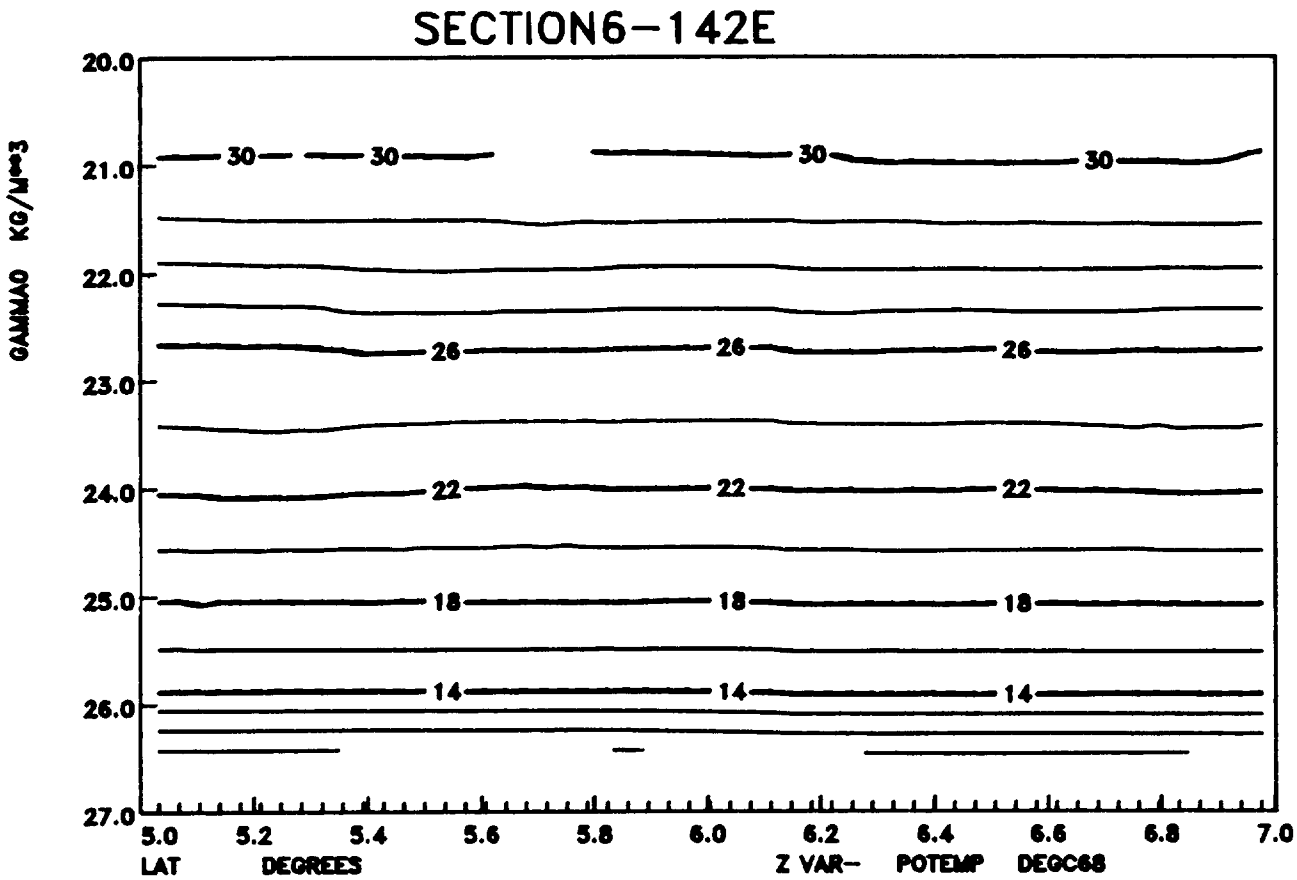
Z VAR- SALIN

SECTION6-142E

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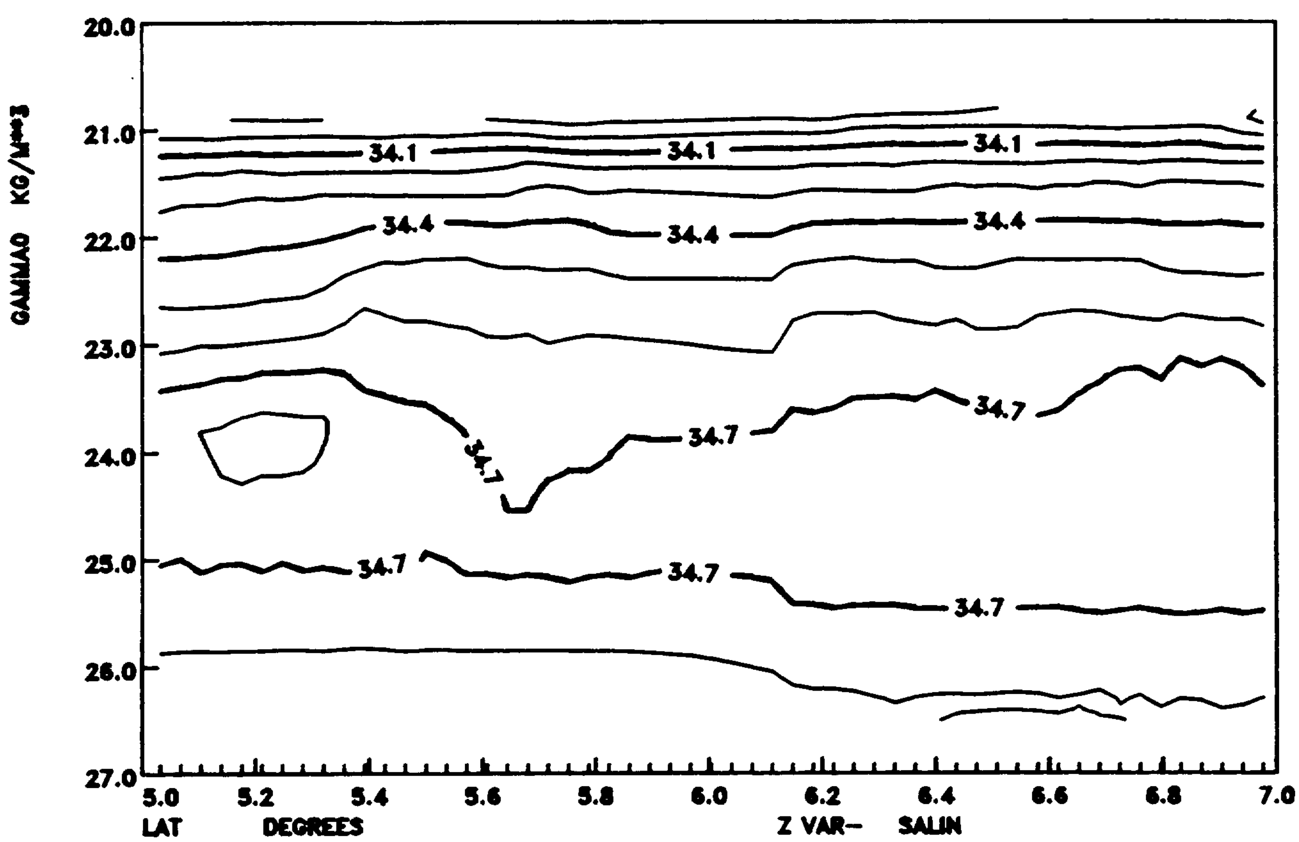
21.0
22.0
23.0
24.0
25.0
26.0
27.0
GAMMA0 KG/M**3
30
26
22
18
14
5.0 5.2 5.4 5.6 5.8 6.0 6.2 6.4 6.6 6.8 7.0
LAT DEGREES
Z VAR-- POTEMP DEGC68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21.0
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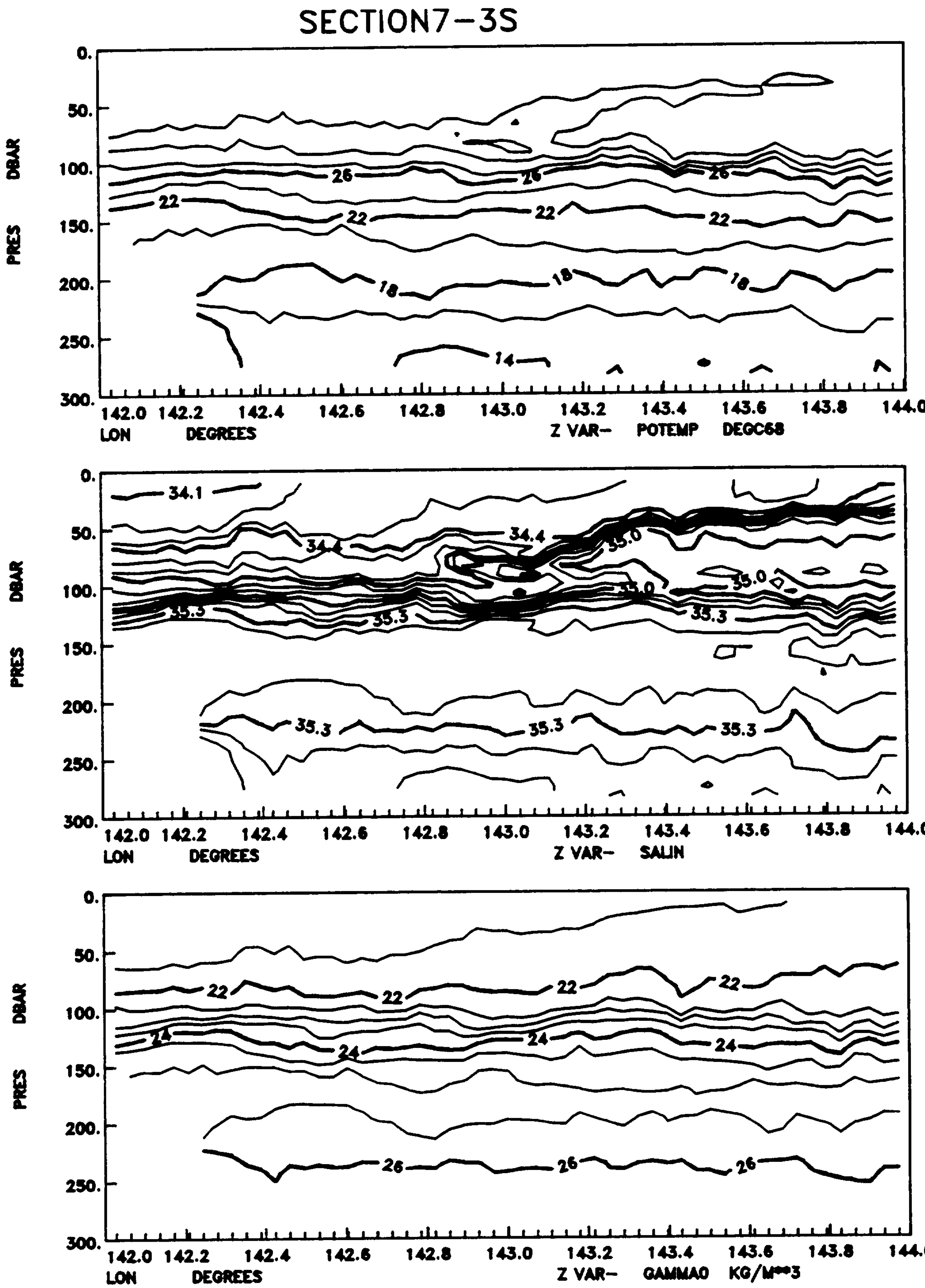
24.0
25.0
26.0
27.0
GAMMA0 KG/M**3
34.1
34.4
34.7
5.0 5.2 5.4 5.6 5.8 6.0 6.2 6.4 6.6 6.8 7.0
LAT DEGREES
Z VAR-- SALIN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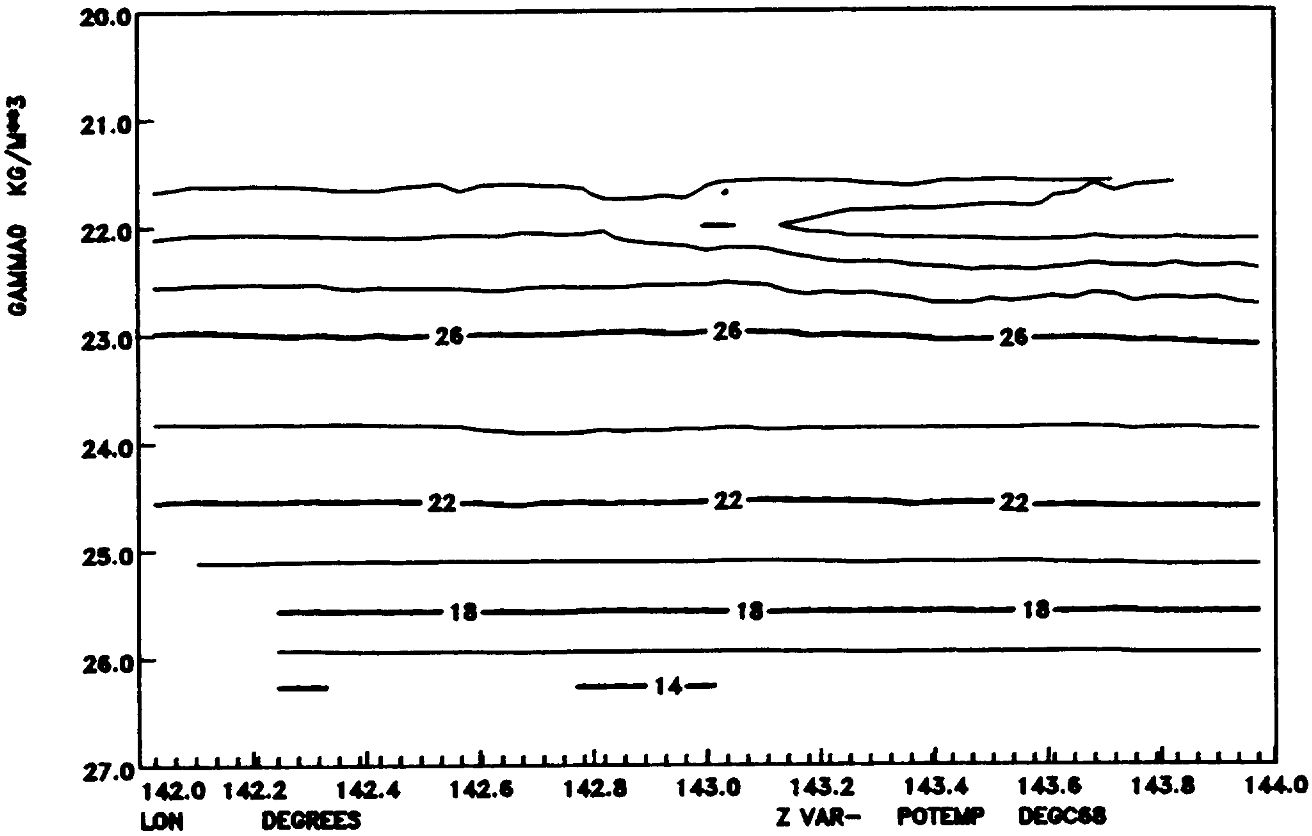
PRES DBAR
0.
50.
100.
150.
200.
250.
300.
26
22
18
14
142.0 142.2 142.4 142.6 142.8 143.0 143.2 143.4 143.6 143.8 144.0
LON DEGREES
Z VAR- POTEMP DEGC68
34.1
34.4
35.0
35.3
Z VAR- SALIN
22
24
26
Z VAR- GAMMA0 KG/M**3

SECTION7-3S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24.0
25.0
26.0
27.0
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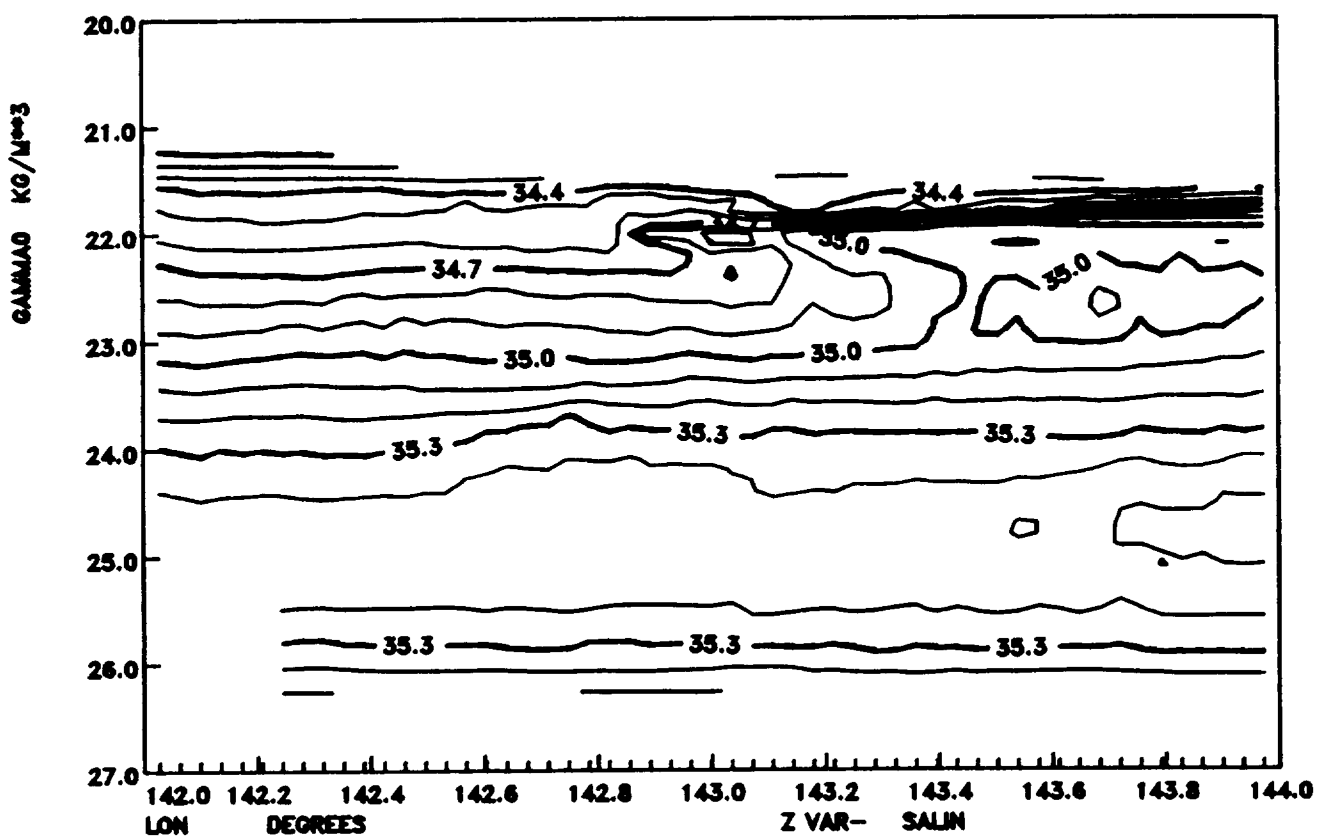
26
22
18
14
142.0 142.2 142.4 142.6 142.8 143.0 143.2 143.4 143.6 143.8 144.0
LON DEGREES
Z VAR- POTEMP DEGC68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23.0
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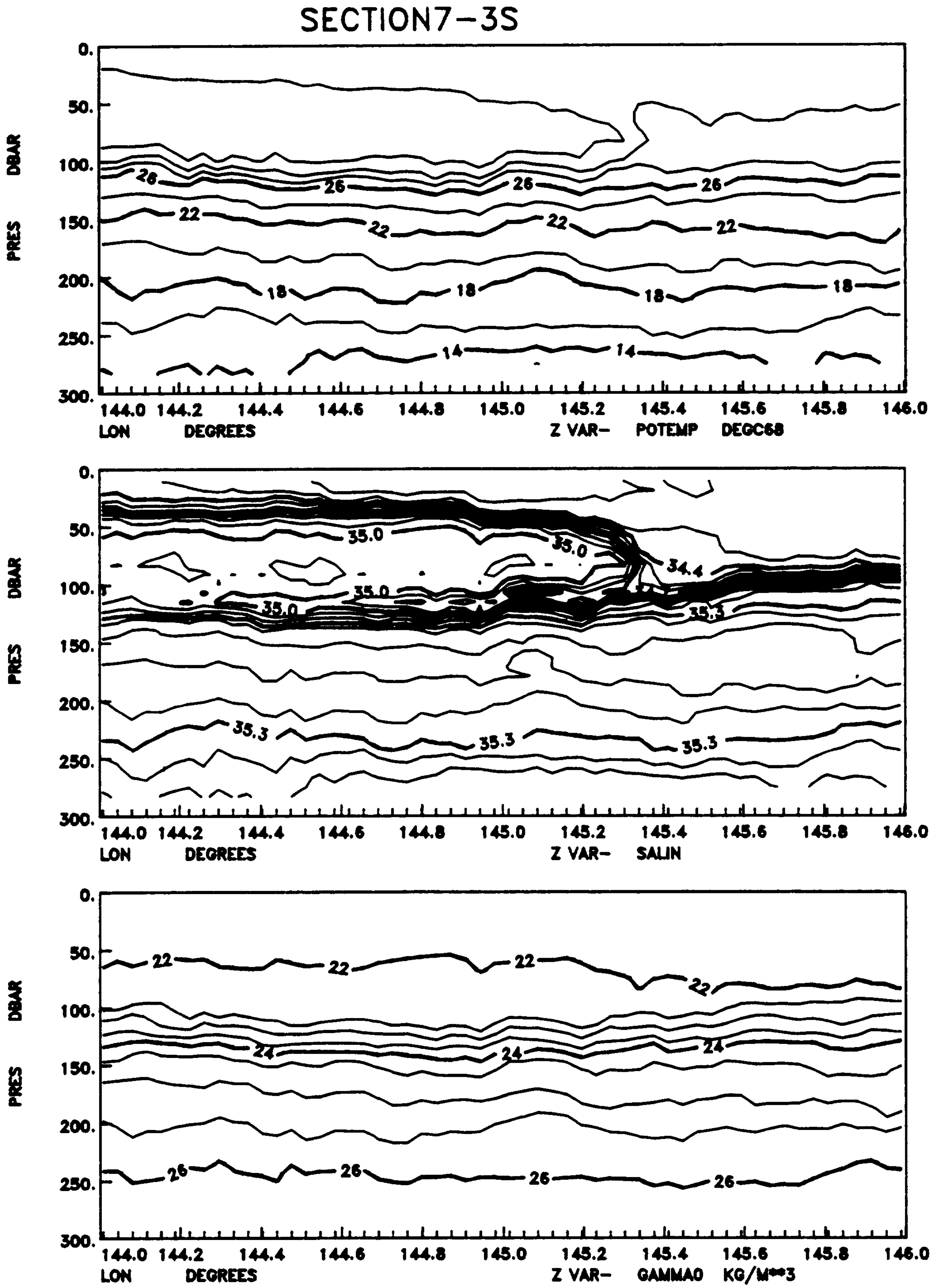
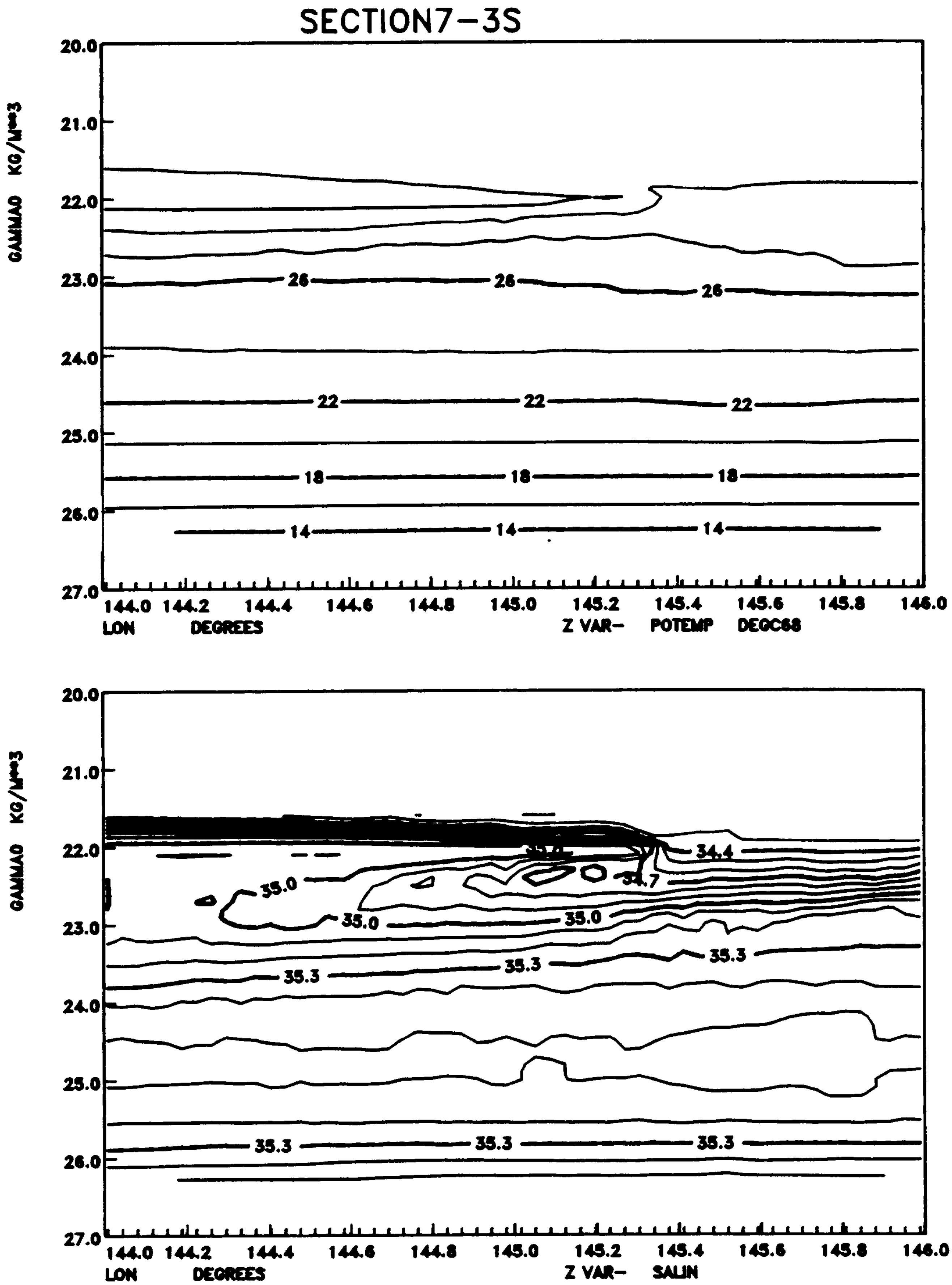
25.0
26.0
27.0
GAMMA0 KG/M**3
34.4
34.7
35.0
35.3
142.0 142.2 142.4 142.6 142.8 143.0 143.2 143.4 143.6 143.8 144.0
LON DEGREES
Z VAR- SALIN


SECTION7-3S
PRES DBAR
0.
50.
100.
150.
200.
250.
300.
144.0 144.2 144.4 144.6 144.8 145.0 145.2 145.4 145.6 145.8 146.0
LON DEGREES
Z VAR- POTEMP DEGC68
28
26
22
18
14
35.0
34.4
35.3
Z VAR- SALIN
22
24
26
Z VAR- GAMMA0 KG/M**3


SECTION7-3S
GAMMA0 KG/M**3
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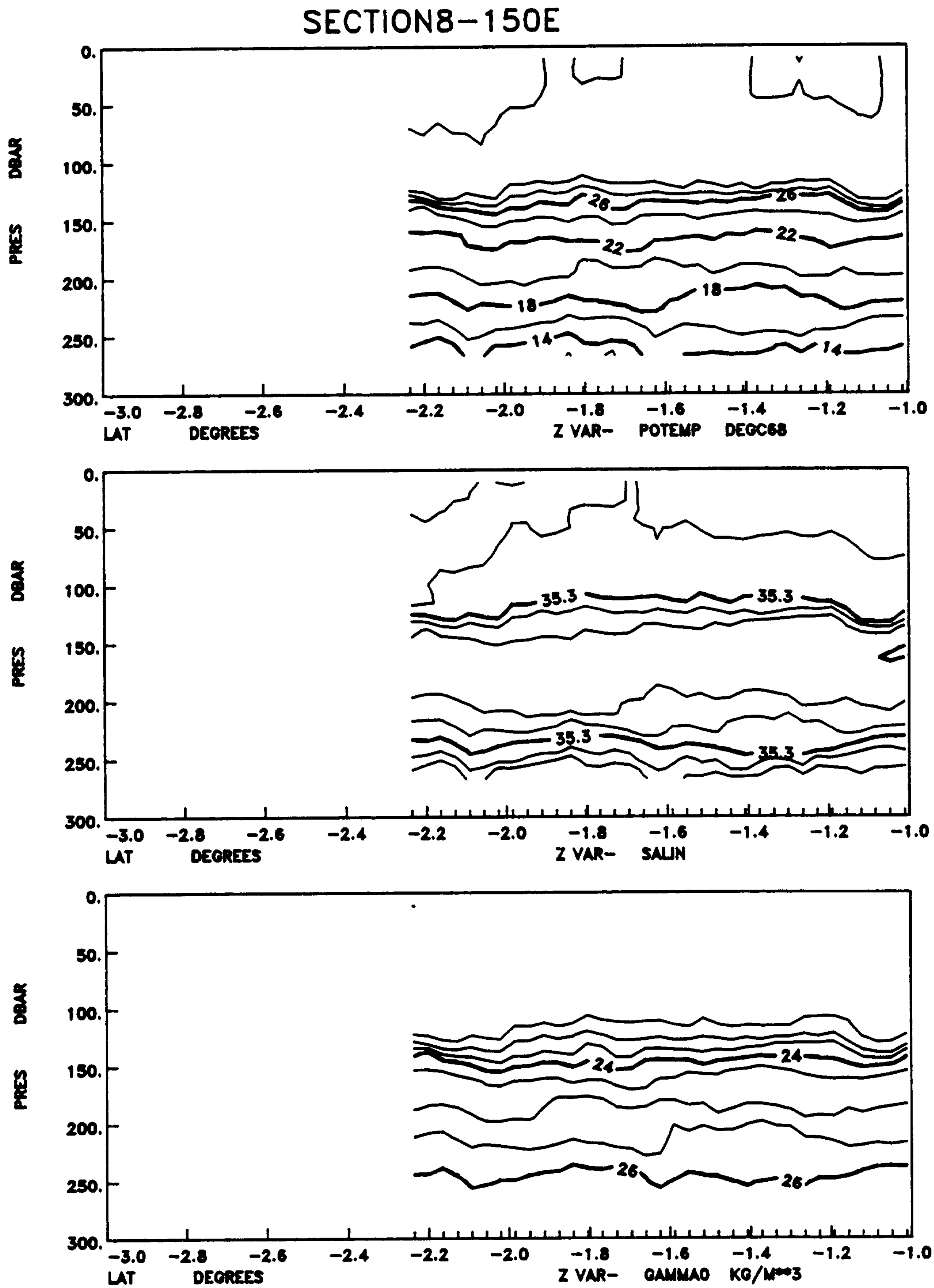
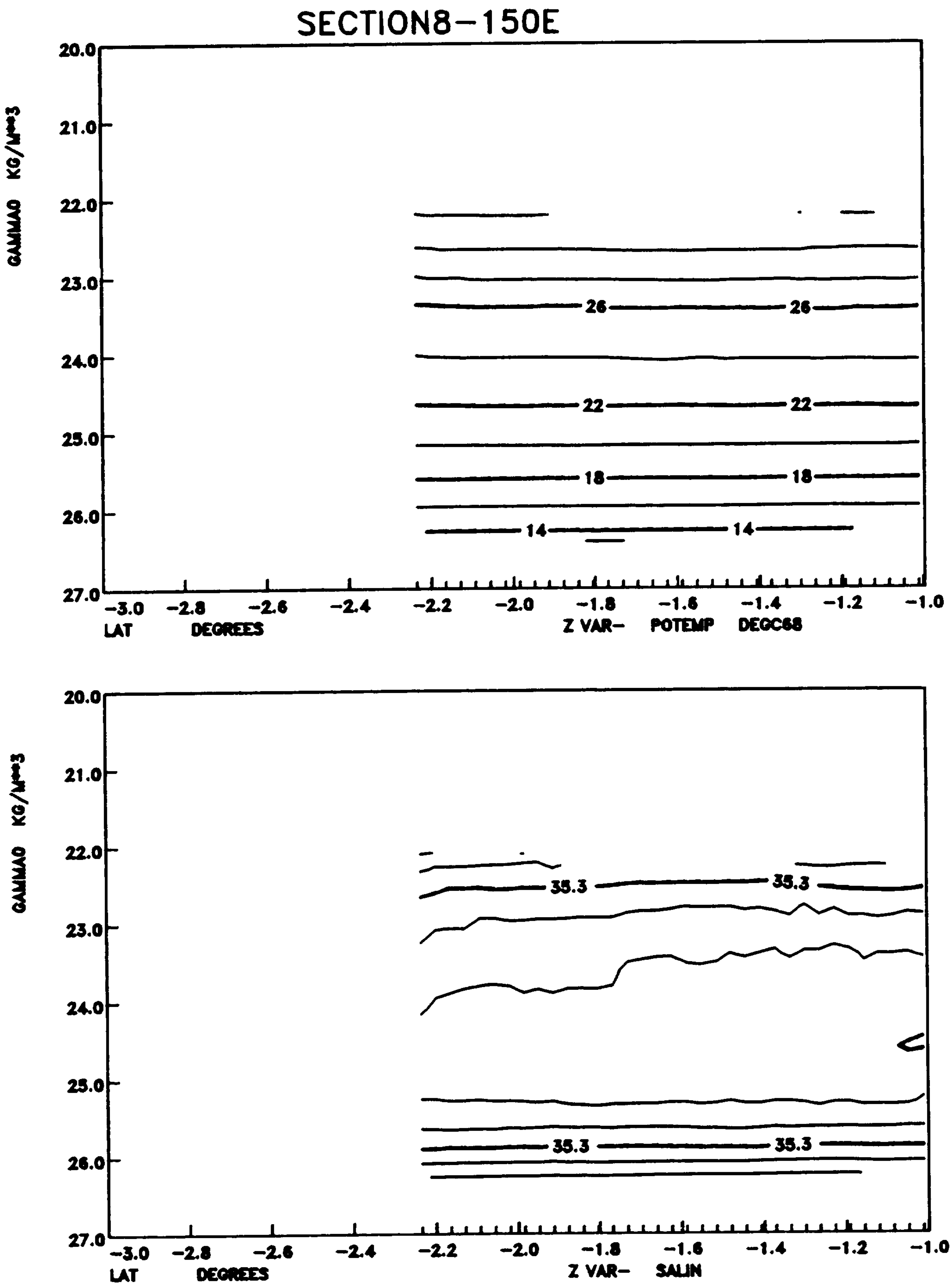
21.0
22.0
23.0
24.0
25.0
26.0
27.0
26
22
18
14
144.0 144.2 144.4 144.6 144.8 145.0 145.2 145.4 145.6 145.8 146.0
LON DEGREES
Z VAR- POTEMP DEGC68
GAMMA0 KG/M**3
34.4
35.0
34.7
35.3
LON DEGREES
Z VAR- SALIN


SECTION8-150E
PRES DBAR
0.
50.
100.
150.
200.
250.
300.
26
22
18
14
-3.0 -2.8 -2.6 -2.4 -2.2 -2.0 -1.8 -1.6 -1.4 -1.2 -1.0
LAT DEGREES
Z VAR- POTEMP DEGC68
35.3
Z VAR- SALIN
24
26
Z VAR- GAMMA0 KG/M**3


SECTION8-150E
GAMMA0 KG/M**3
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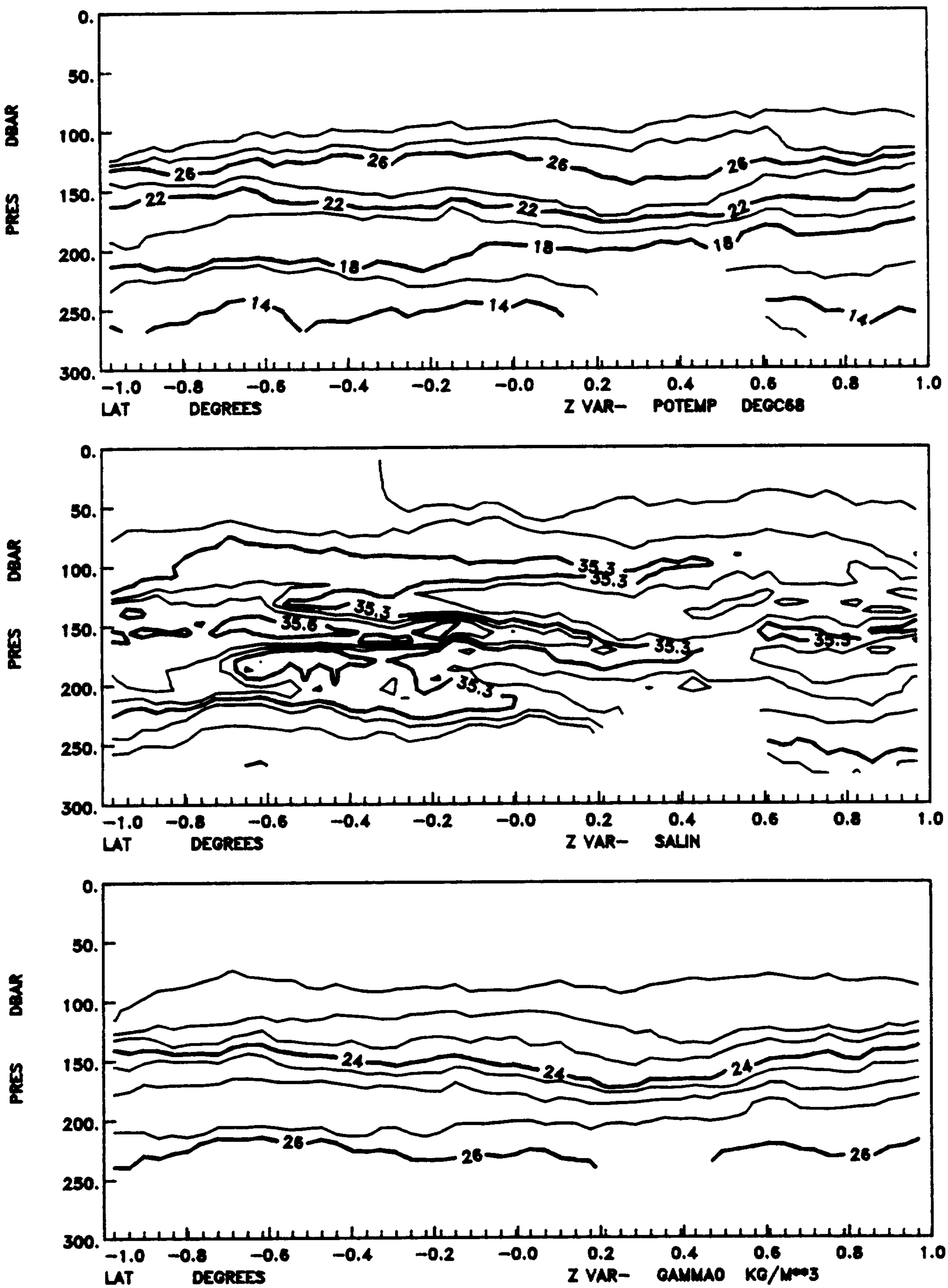
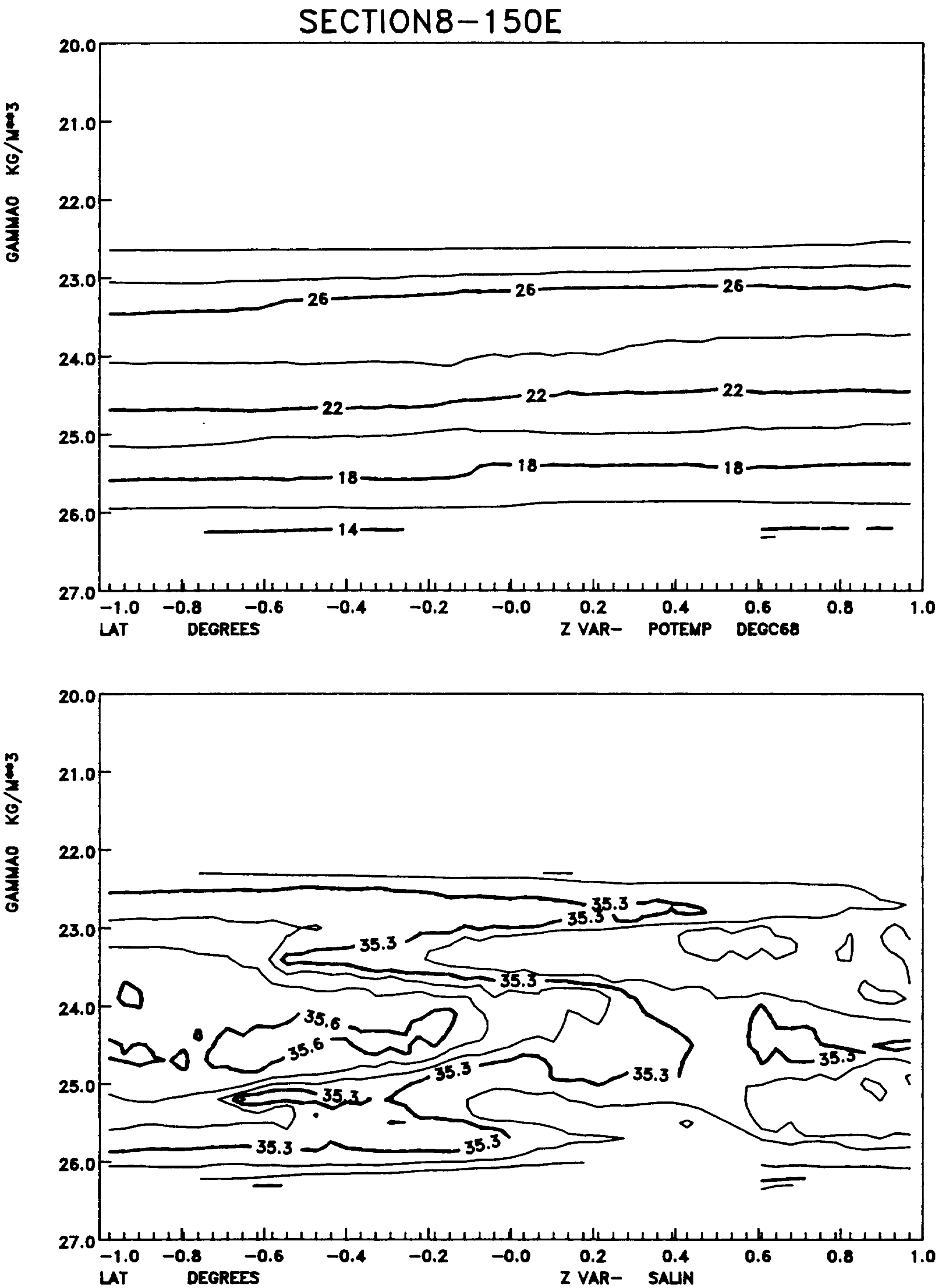
21.0
22.0
23.0
24.0
25.0
26.0
27.0
26
22
18
14
-3.0 -2.8 -2.6 -2.4 -2.2 -2.0 -1.8 -1.6 -1.4 -1.2 -1.0
LAT DEGREES
Z VAR- POTEMP DEGC68
GAMMA0 KG/M**3
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
35.3
-3.0 -2.8 -2.6 -2.4 -2.2 -2.0 -1.8 -1.6 -1.4 -1.2 -1.0
LAT DEGREES
Z VAR- SALIN

SECTION8-150E

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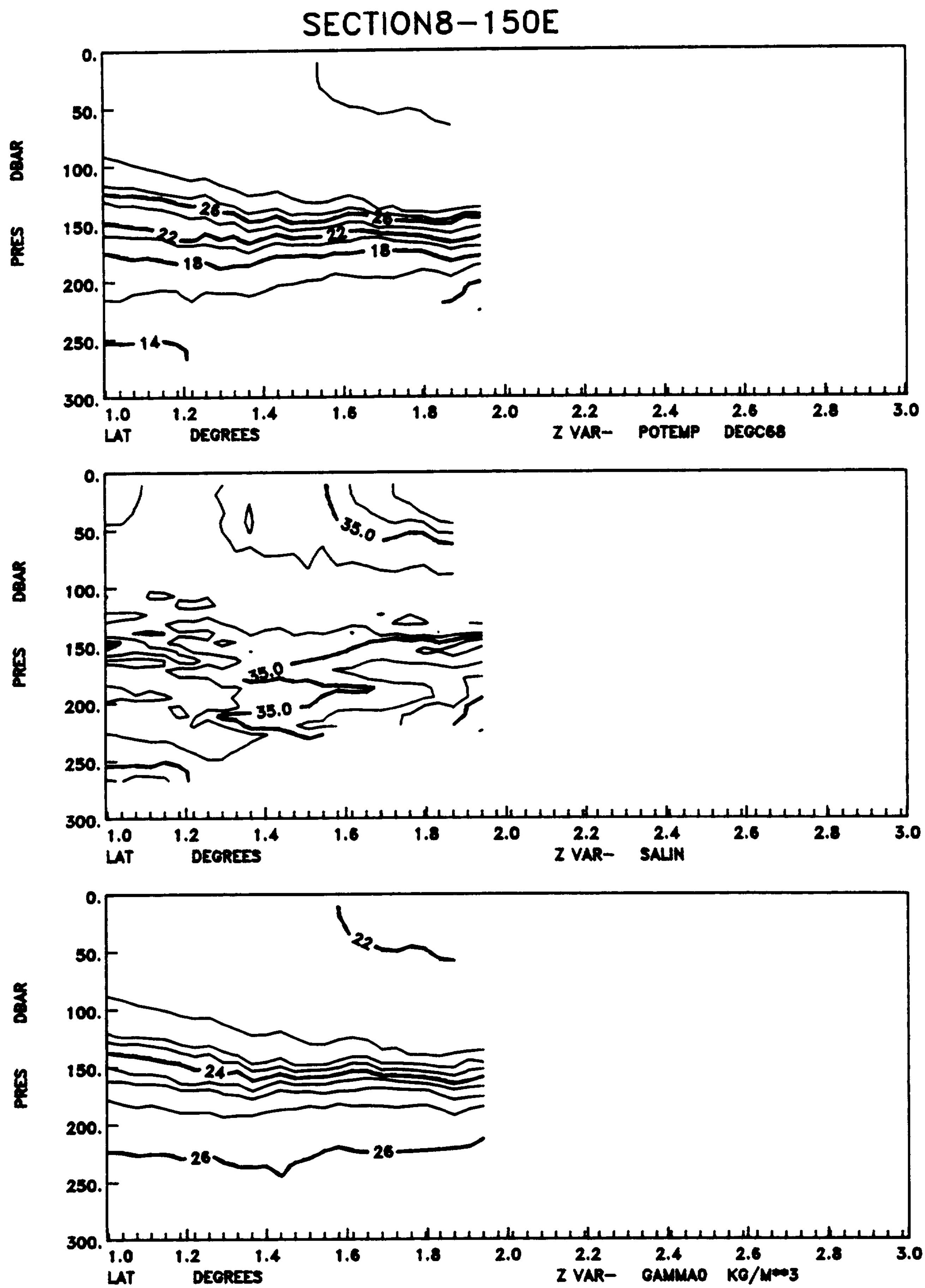
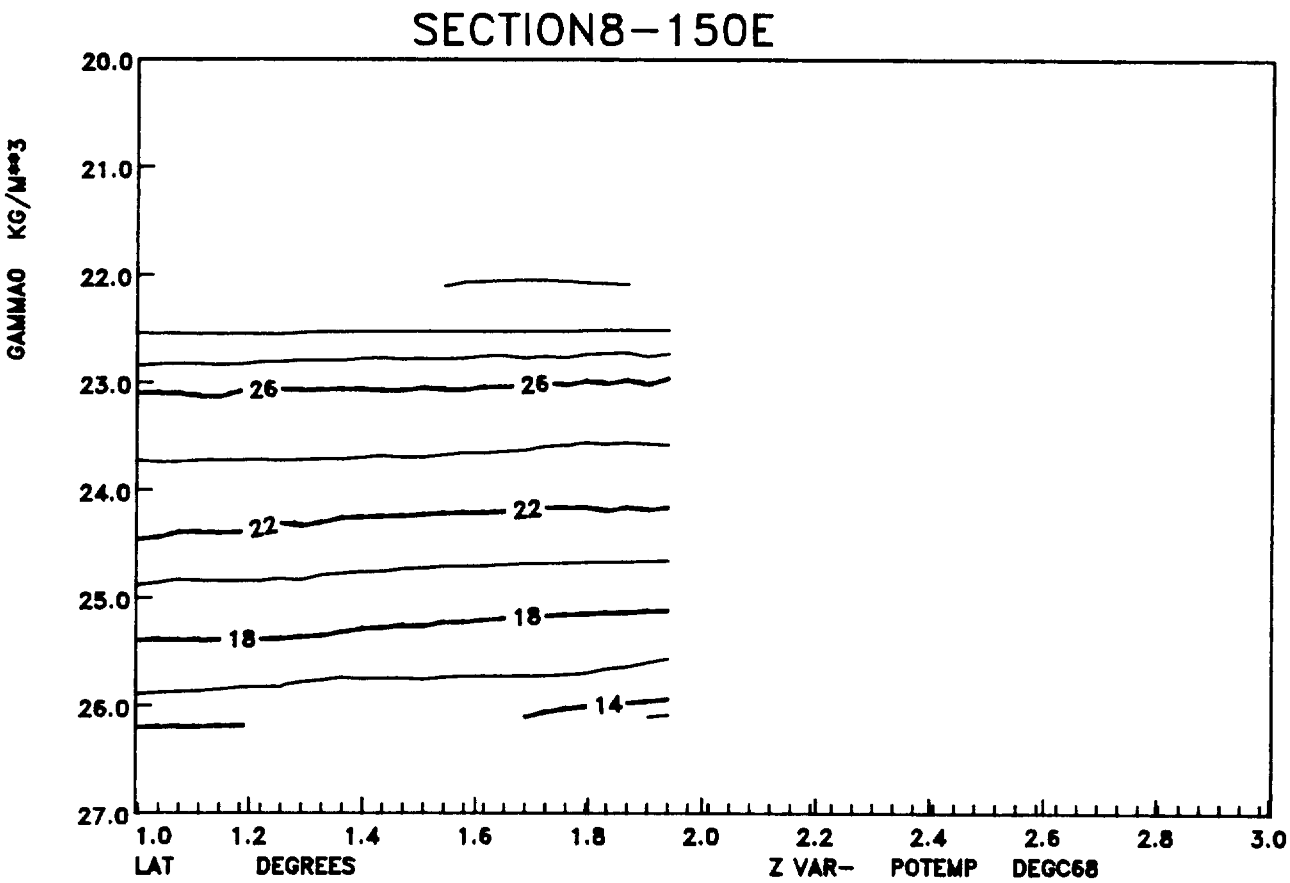
21.0
22.0
23.0
24.0
25.0
26.0
27.0
GAMMAO KG/M**3
26
22
18
14
-1.0 -0.8 -0.6 -0.4 -0.2 -0.0 0.2 0.4 0.6 0.8 1.0
LAT DEGREES
Z VAR- POTEMP DEGC68
35.3
35.6
Z VAR- SALIN


SECTION8-150E
PRES DBAR
0.
50.
100.
150.
200.
250.
300.
26
22
18
14
1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0
LAT DEGREES
Z VAR- POTEMP DEGC68
35.0
Z VAR- SALIN
22
24
26
Z VAR- GAMMA0 KG/M**3


SECTION8-150E
GAMMA0 KG/M**3
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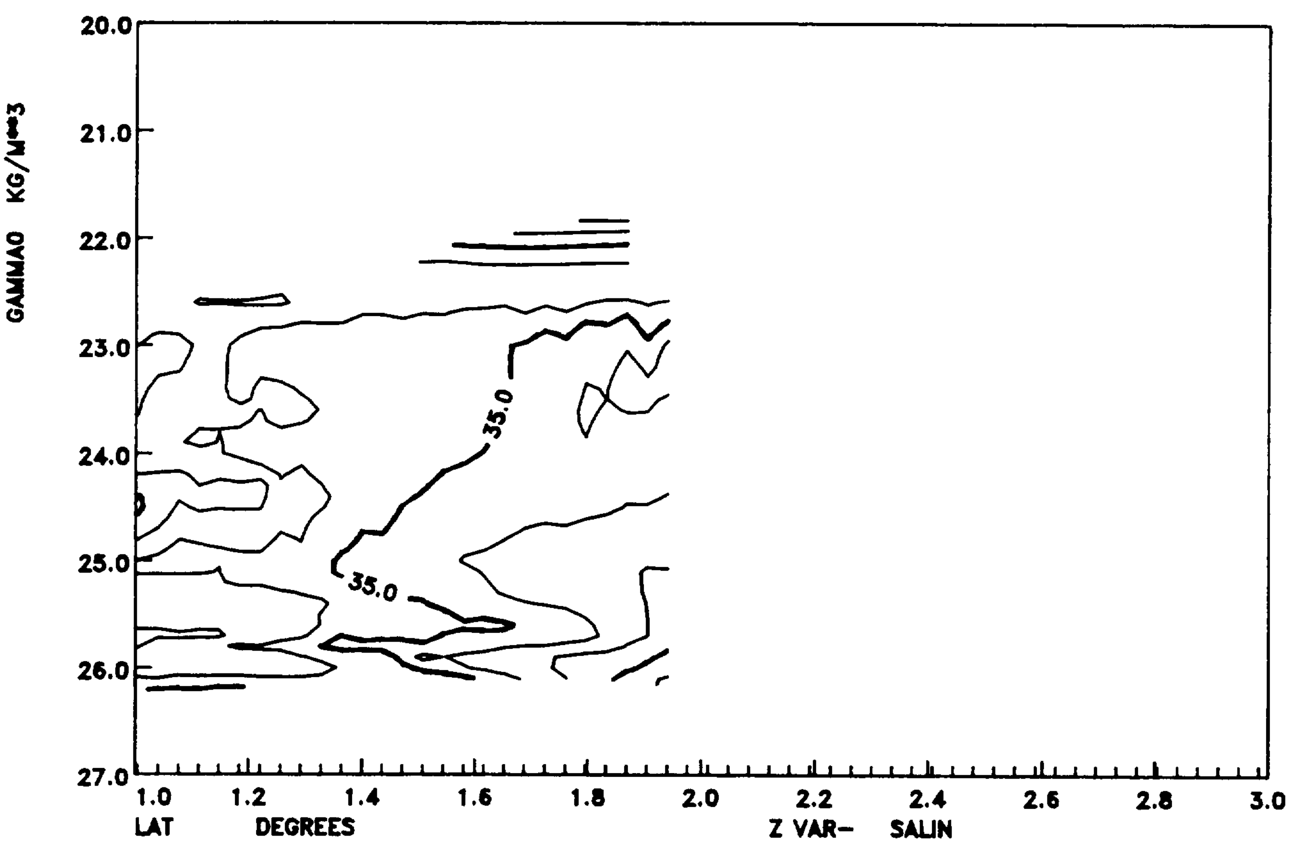
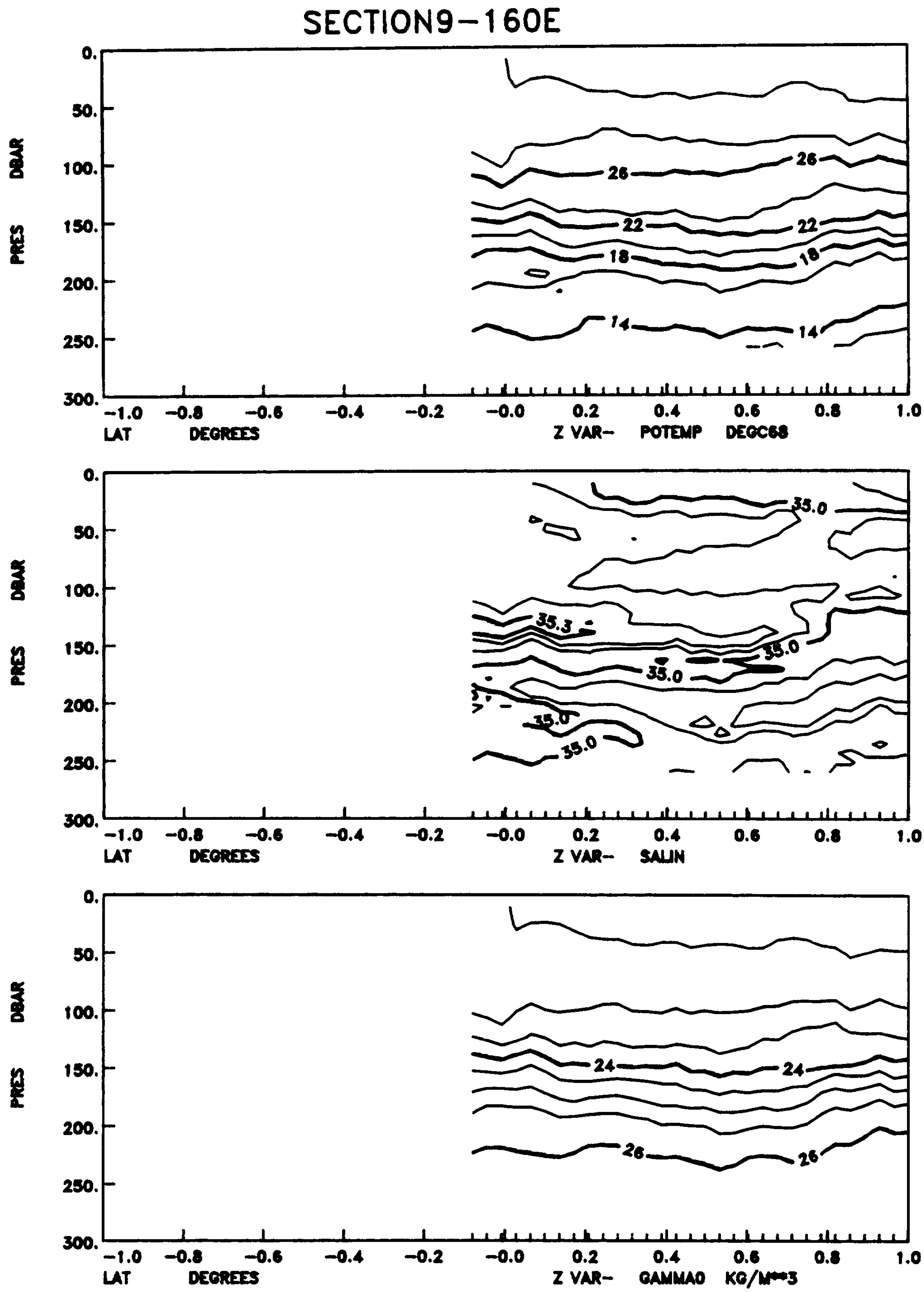
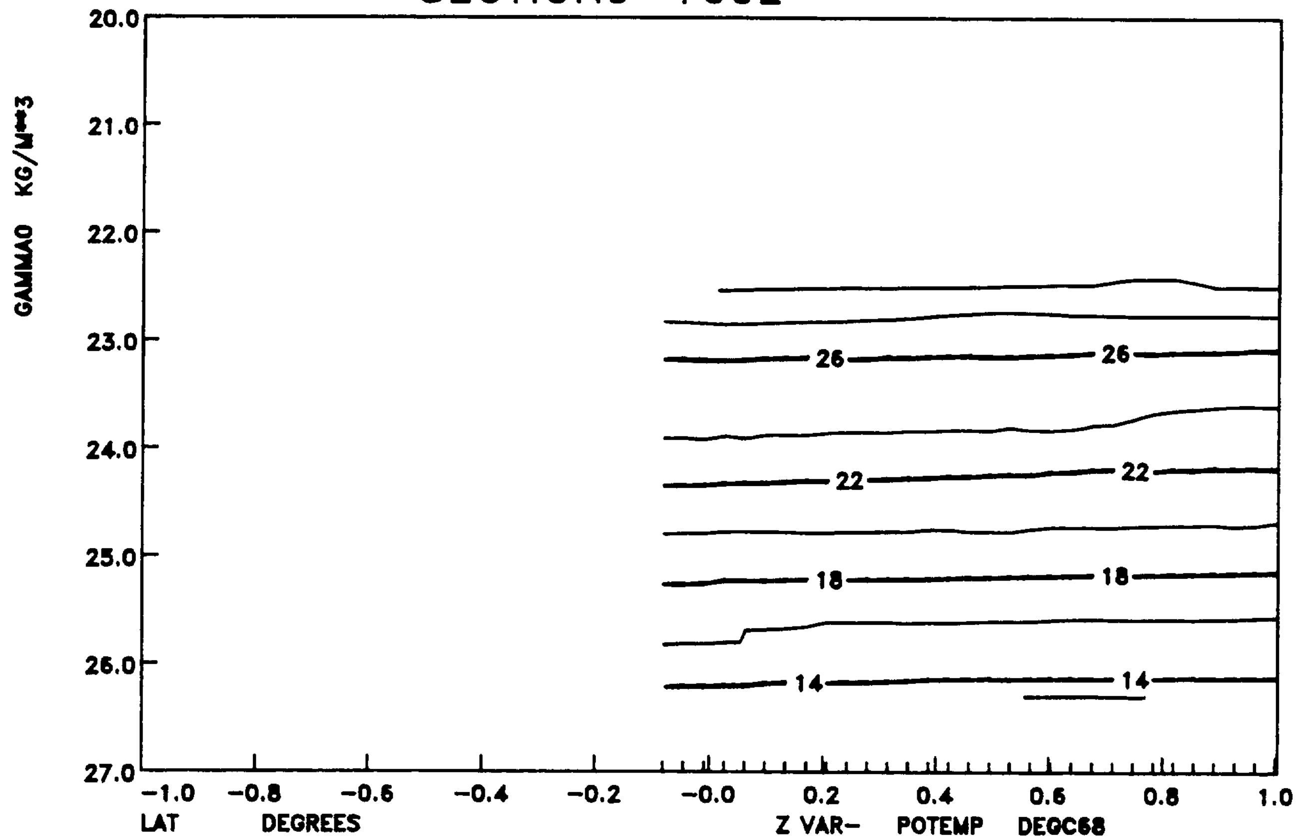
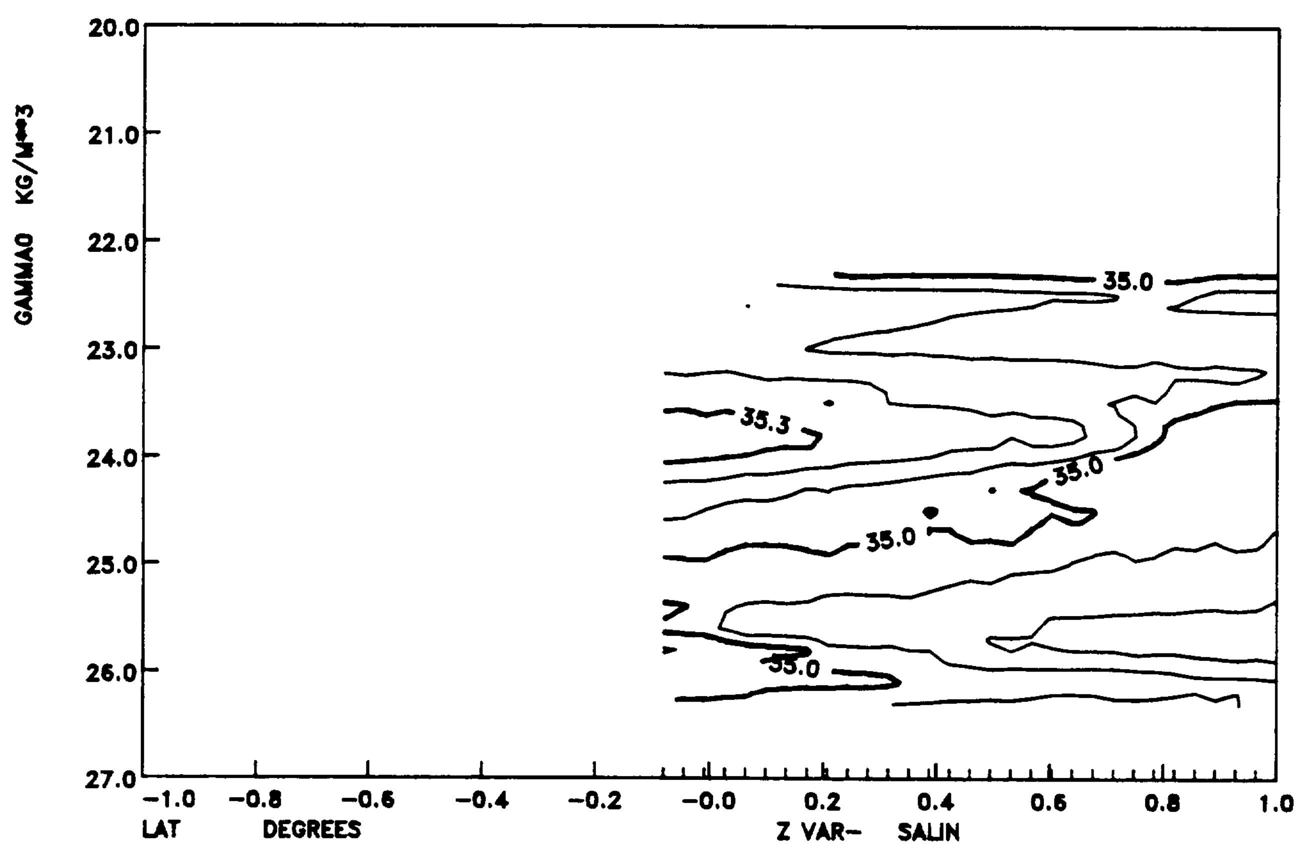
21.0
22.0
23.0
24.0
25.0
26.0
27.0
26
26
22
22
18
18
14
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
LAT DEGREES
Z VAR- POTEMP DEGC68


GAMMA0 KG/M**3
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
35.0
35.0
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
LAT DEGREES
Z VAR- SALIN

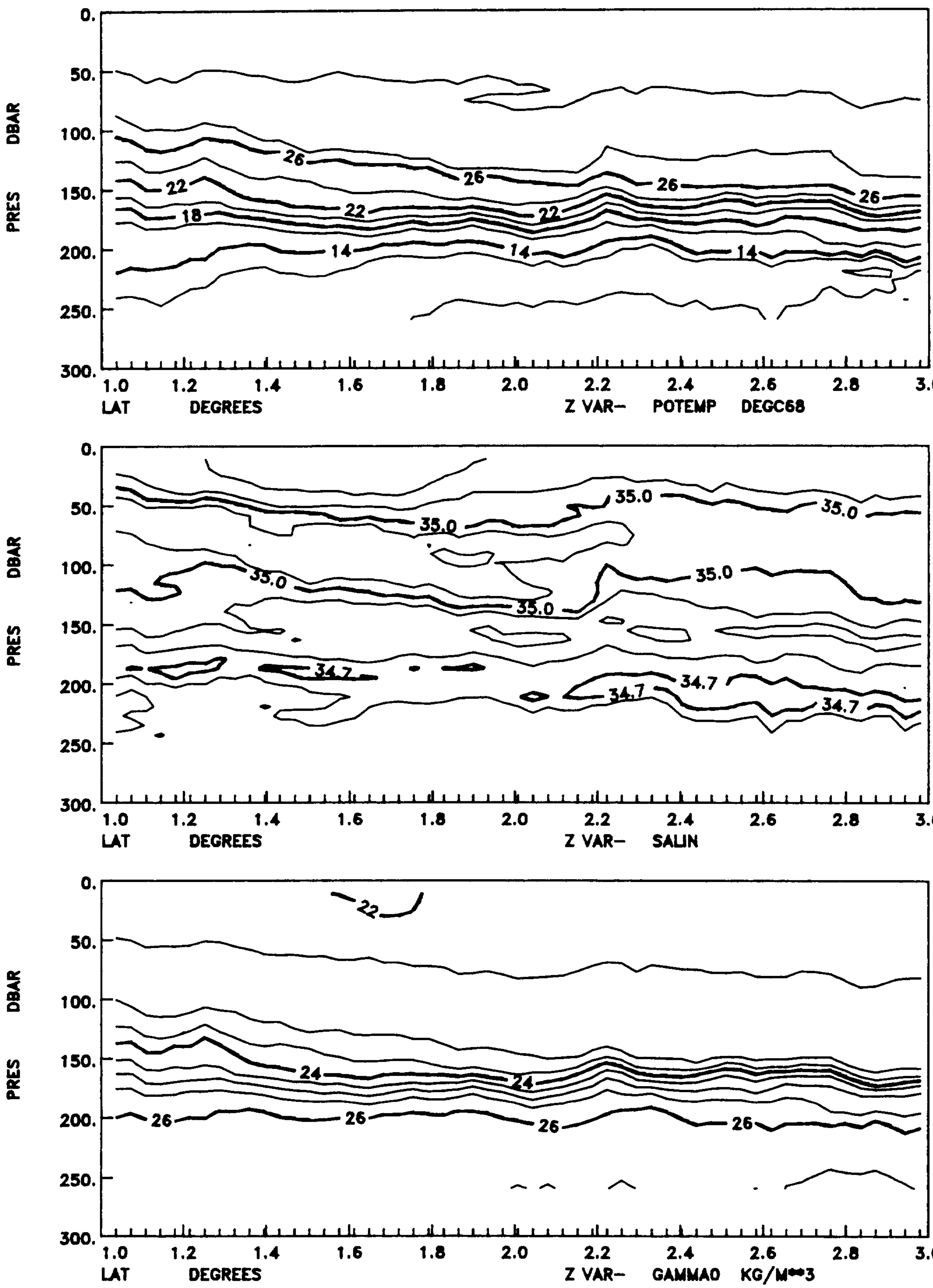

SECTION9-160E
PRES DBAR
0. 50. 100. 150. 200. 250. 300.
26 26 22 22 18 18 14 14
-1.0 -0.8 -0.6 -0.4 -0.2 -0.0 0.2 0.4 0.6 0.8 1.0
LAT DEGREES
Z VAR- POTEMP DEGC68
PRES DBAR
0. 50. 100. 150. 200. 250. 300.
35.0 35.3 35.0 35.0 35.0 35.0
-1.0 -0.8 -0.6 -0.4 -0.2 -0.0 0.2 0.4 0.6 0.8 1.0
LAT DEGREES
Z VAR- SALIN
PRES DBAR
0. 50. 100. 150. 200. 250. 300.
24 24 26 26
-1.0 -0.8 -0.6 -0.4 -0.2 -0.0 0.2 0.4 0.6 0.8 1.0
LAT DEGREES
Z VAR- GAMMA0 KG/M**3

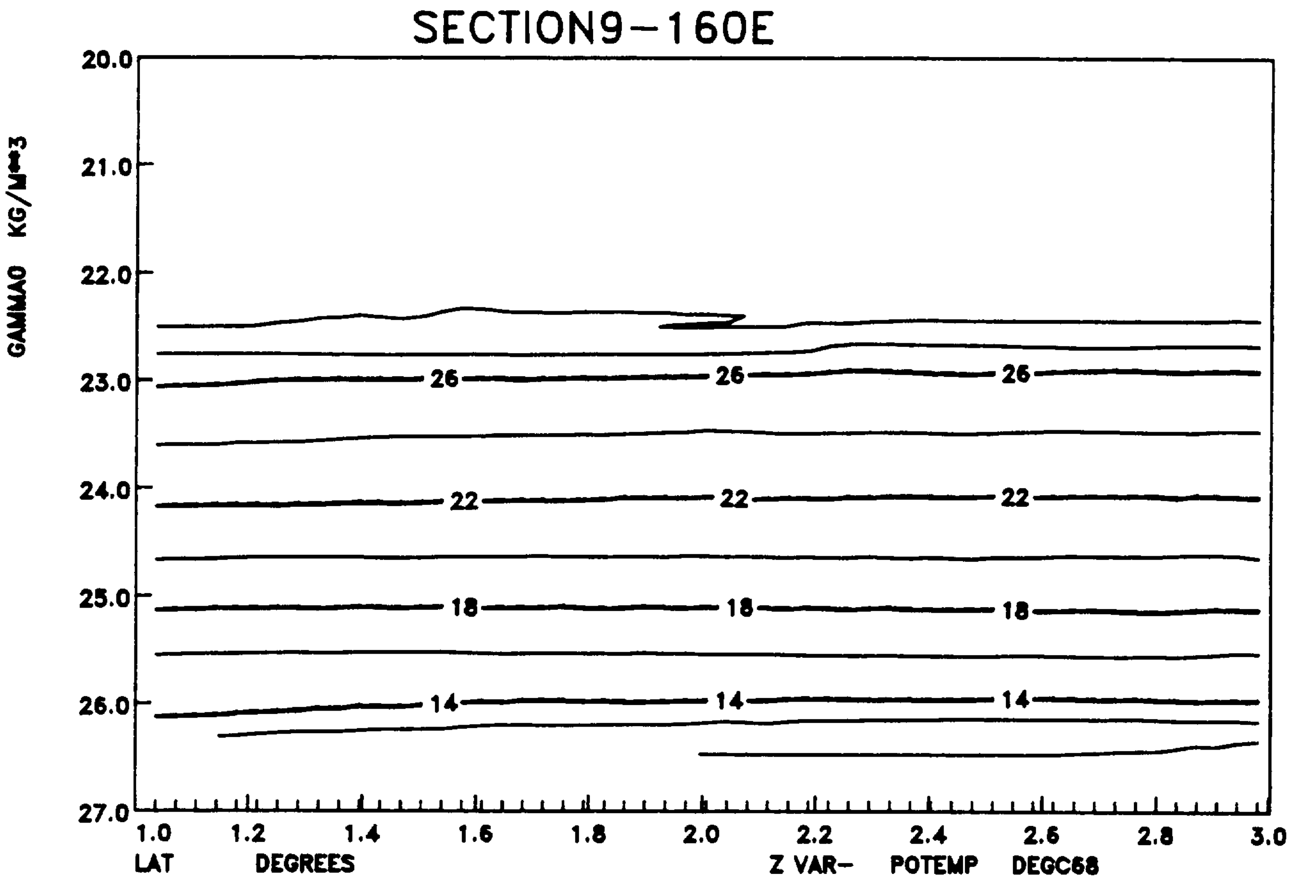
SECTION9-160E





SECTION9-160E




SECTION9-160E
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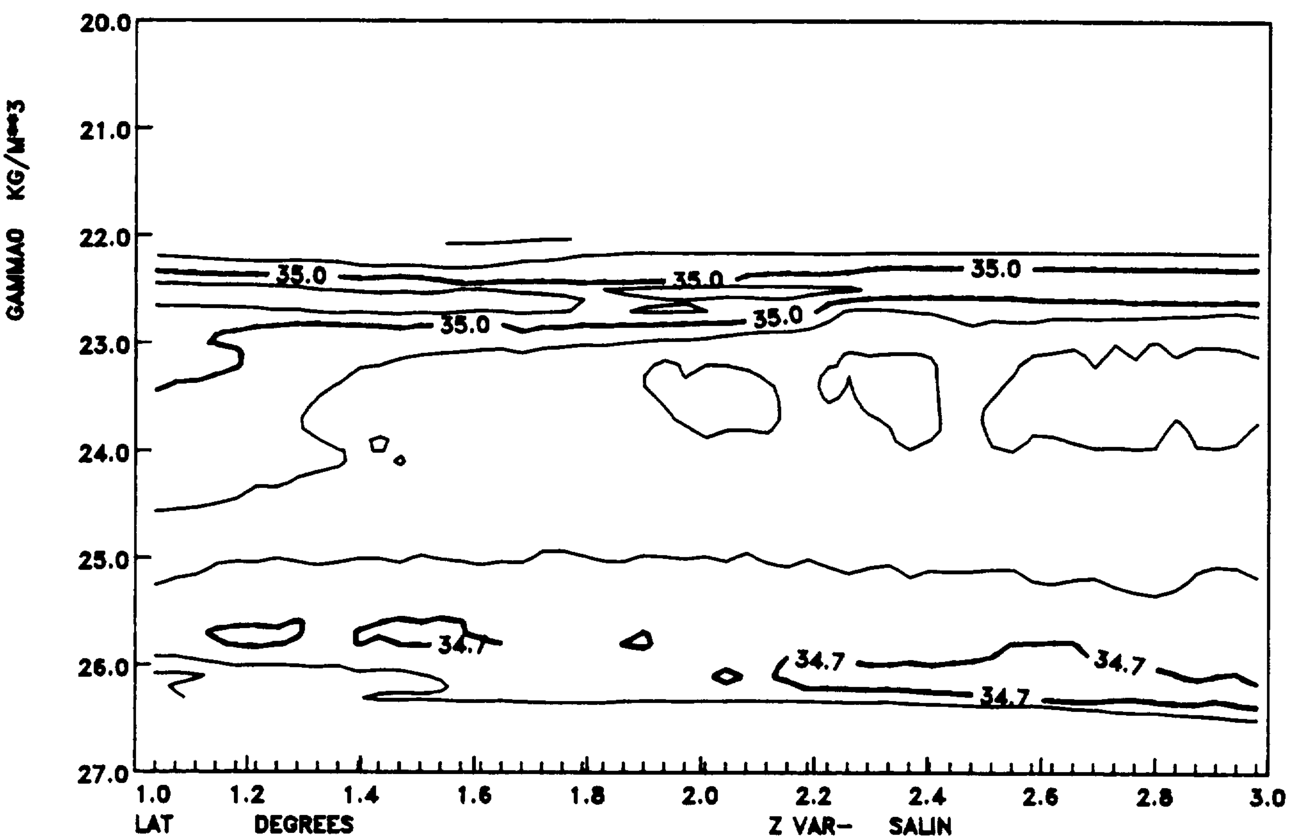
21.0
22.0
23.0
24.0
25.0
26.0
27.0
26
22
18
14
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
LAT DEGREES
Z VAR- POTEMP DEGC68


GAMMA0 KG/M**3
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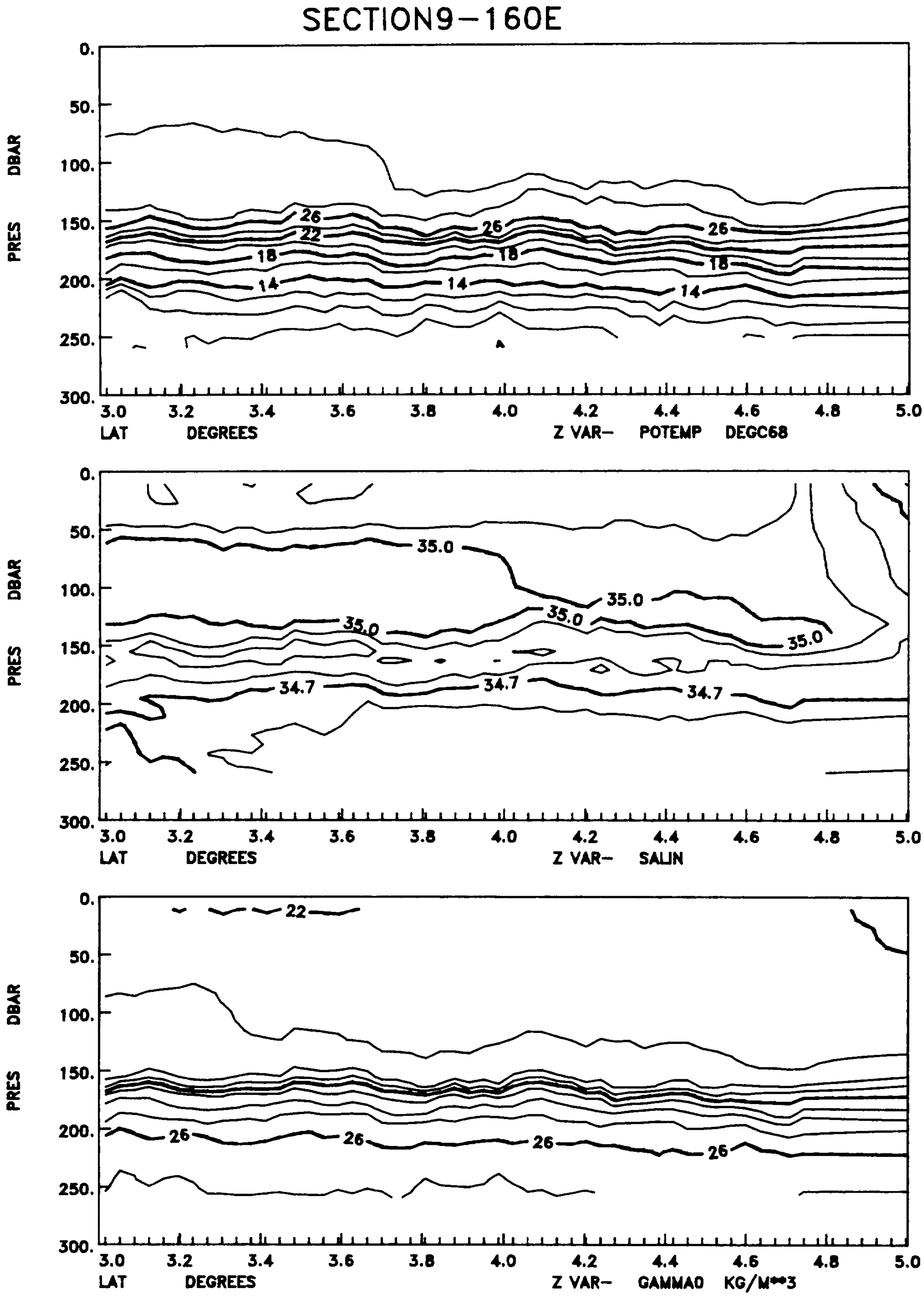
22.0
23.0
24.0
25.0
26.0
27.0
35.0
34.7
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
LAT DEGREES
Z VAR- SALIN


SECTION9-160E
0.
50.
100.
150.
200.
250.
300.
PRES DBAR
26
22
26
26
18
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18
14
14
14
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
4.8
5.0
LAT DEGREES
Z VAR- POTEMP DEGC68
35.0
35.0
35.0
35.0
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34.7
34.7
Z VAR- SALIN
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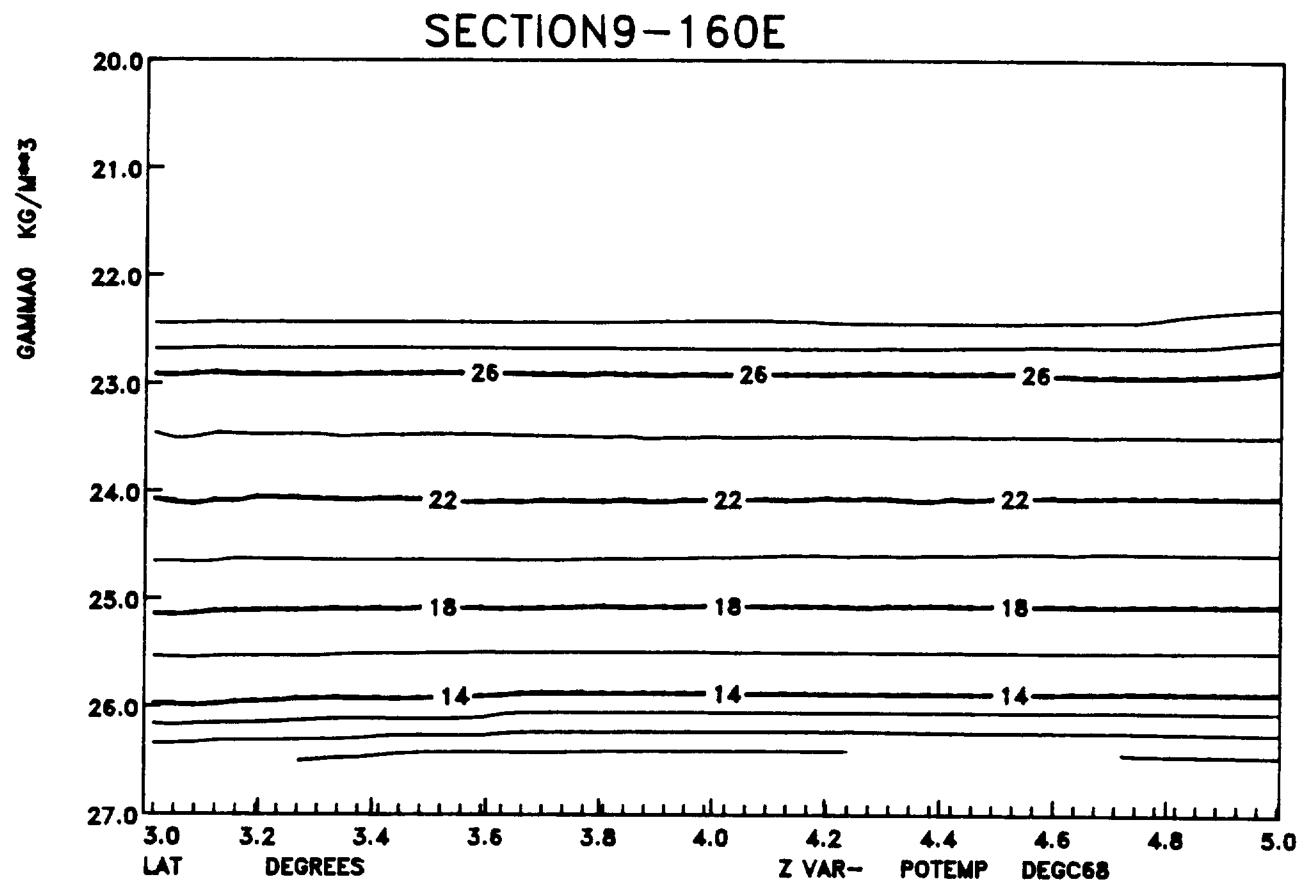
26
26
26
Z VAR- GAMMA0 KG/M**3


SECTION9-160E
GAMMA0 KG/M**3
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22.0
23.0
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25.0
26.0
27.0
26
22
18
14
3.0
3.2
3.4
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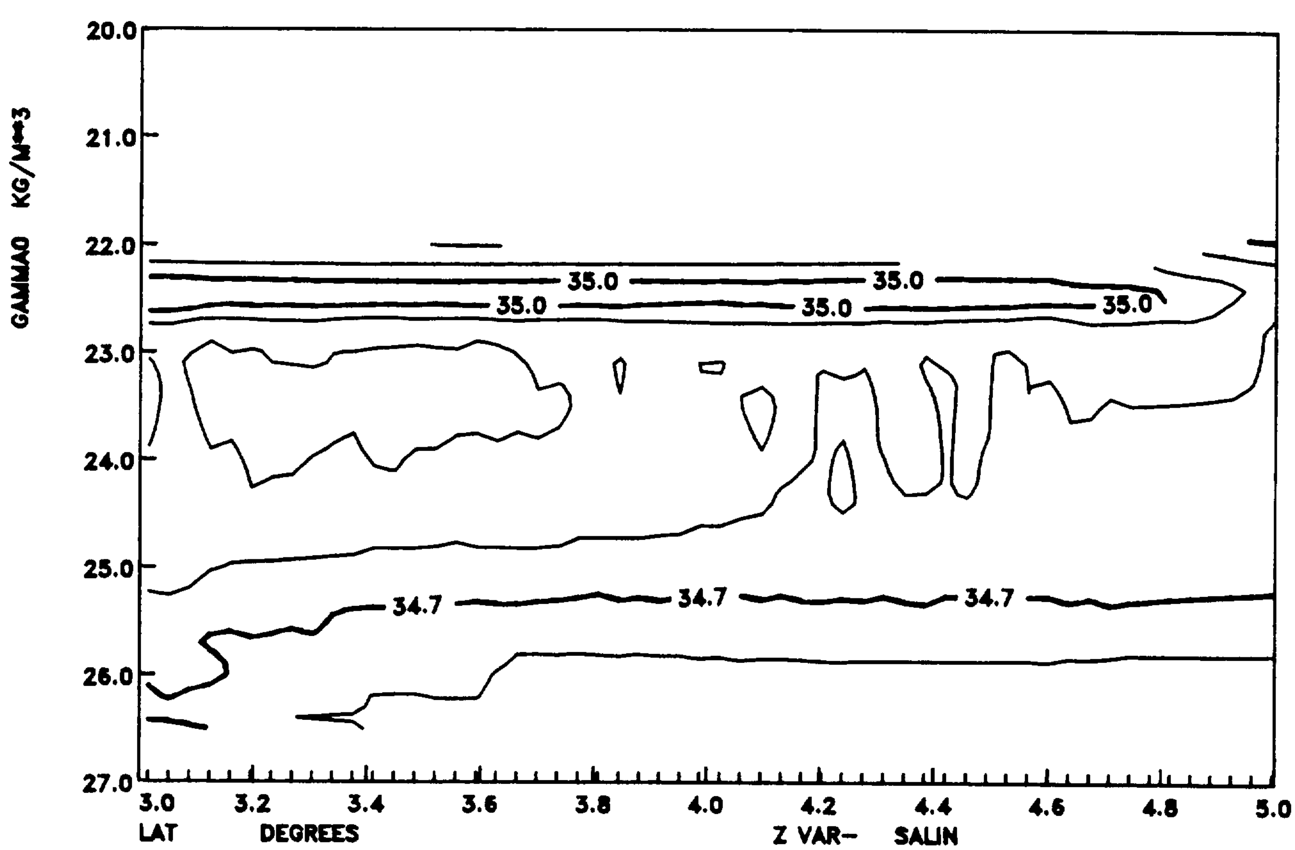
3.8
4.0
4.2
4.4
4.6
4.8
5.0
LAT DEGREES
Z VAR- POTEMP DEGC68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27.0
35.0
34.7
3.0
3.2
3.4
3.6
3.8
4.0
4.2
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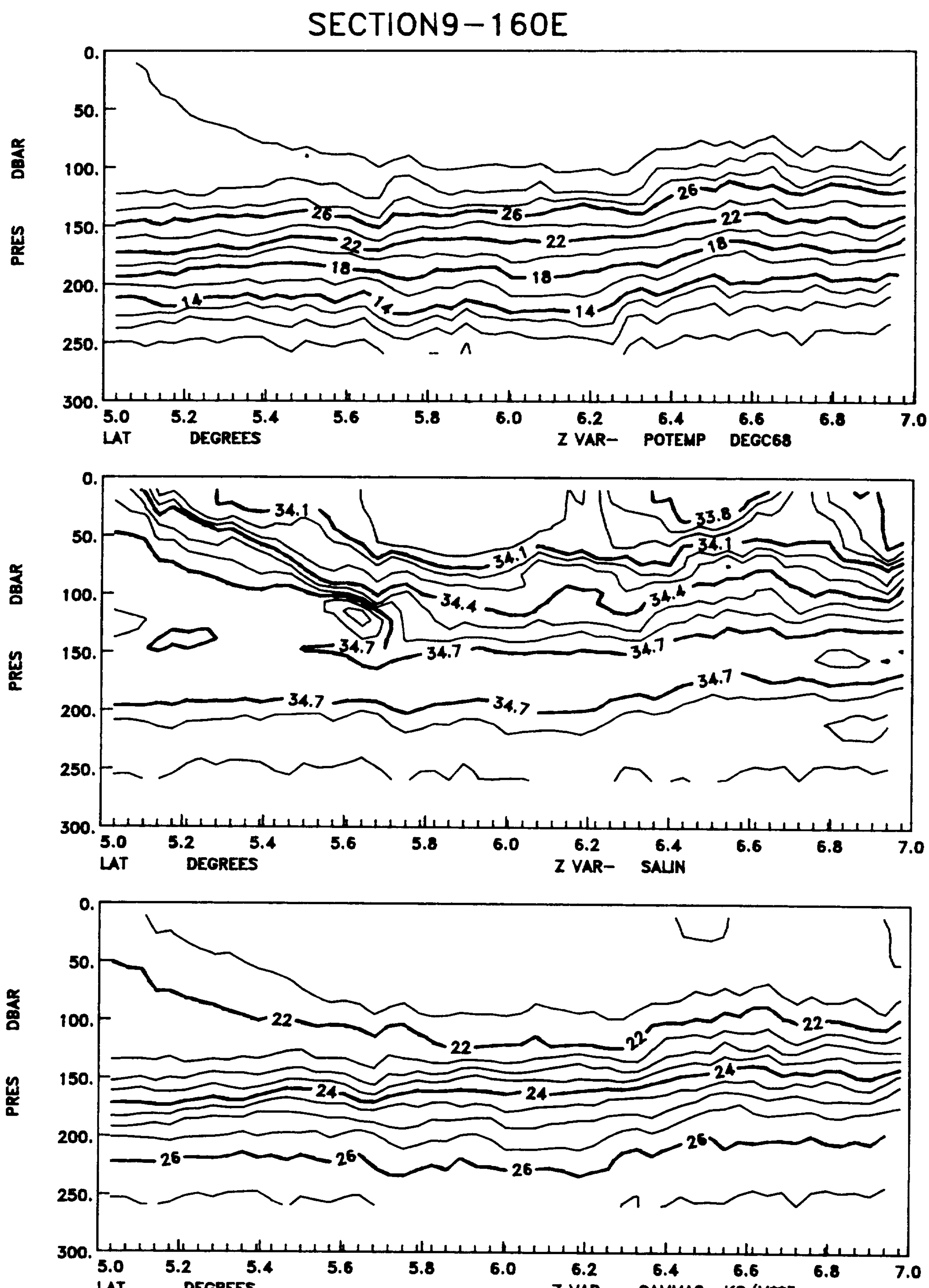
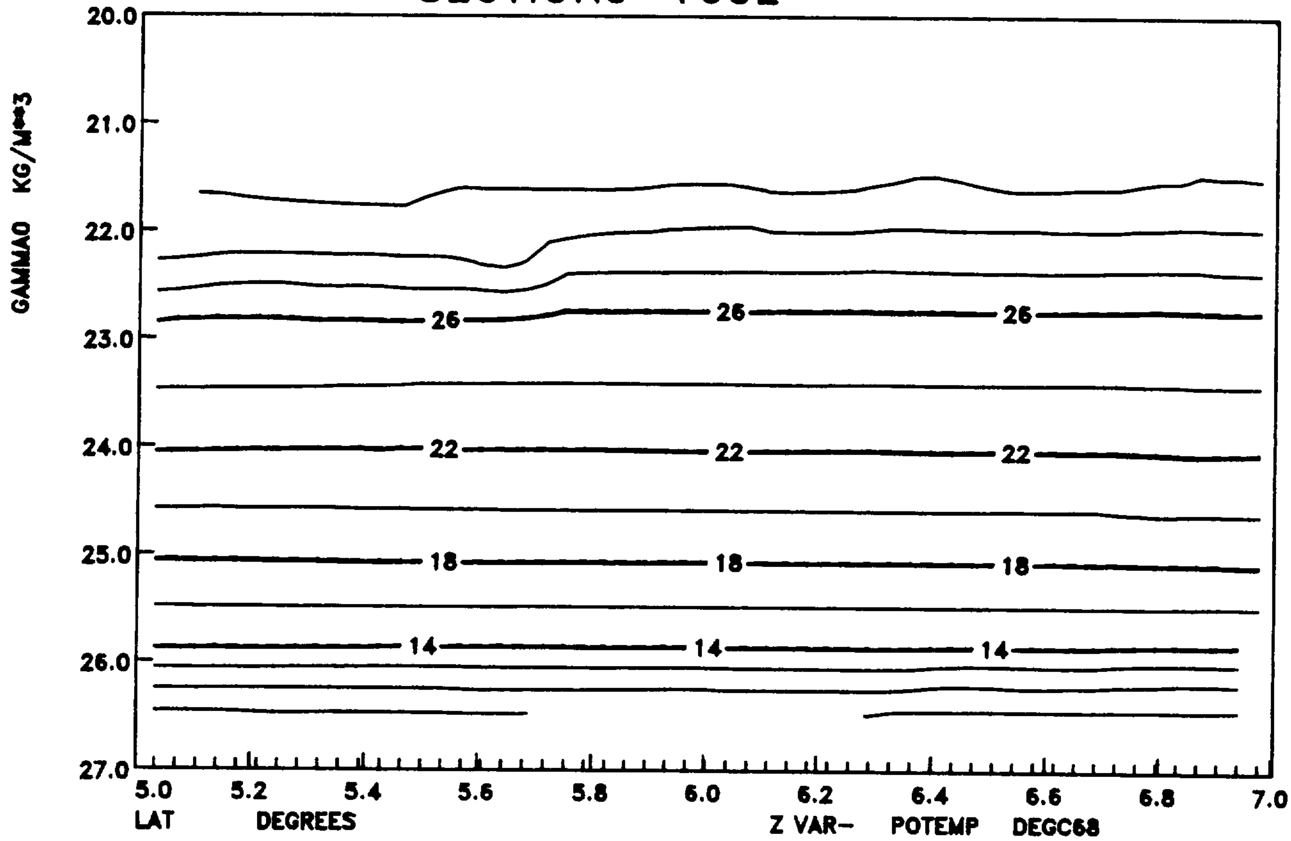
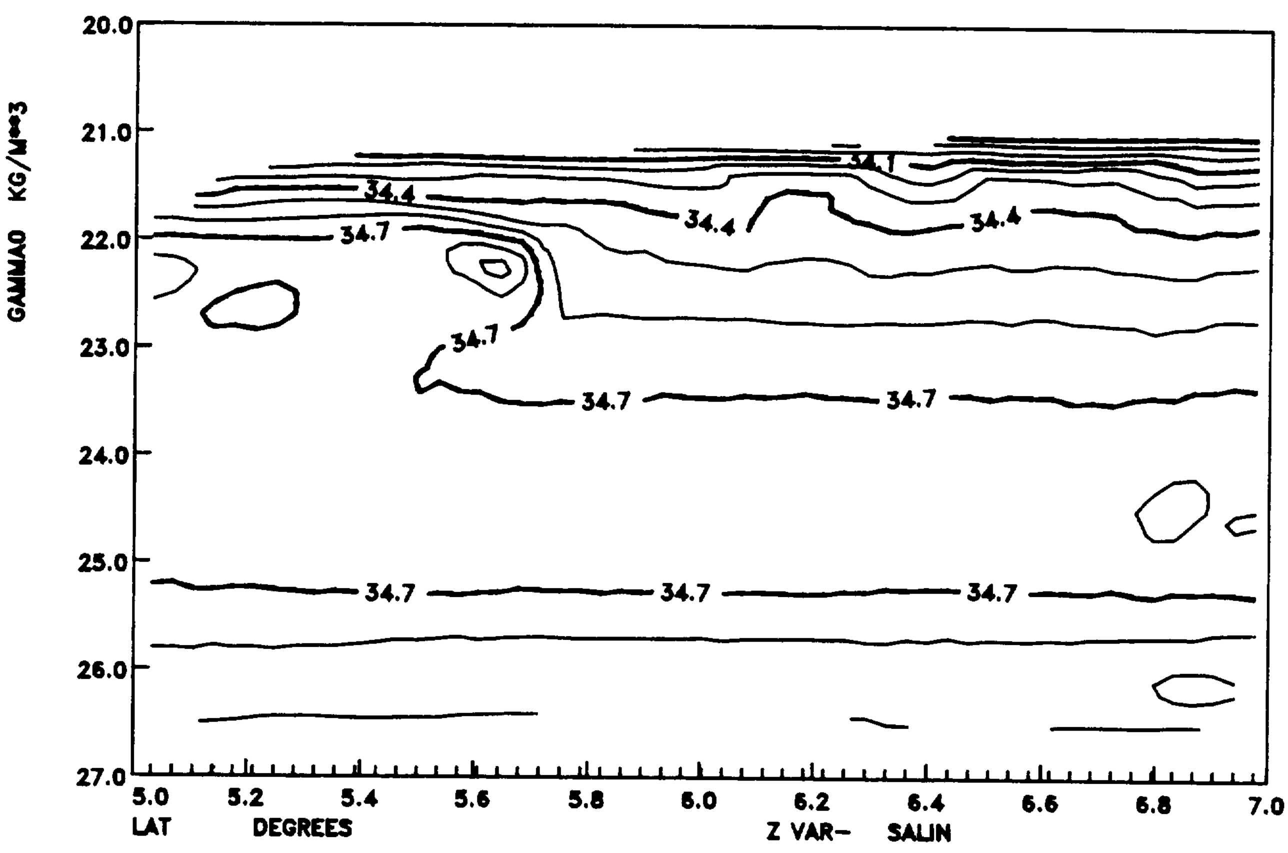
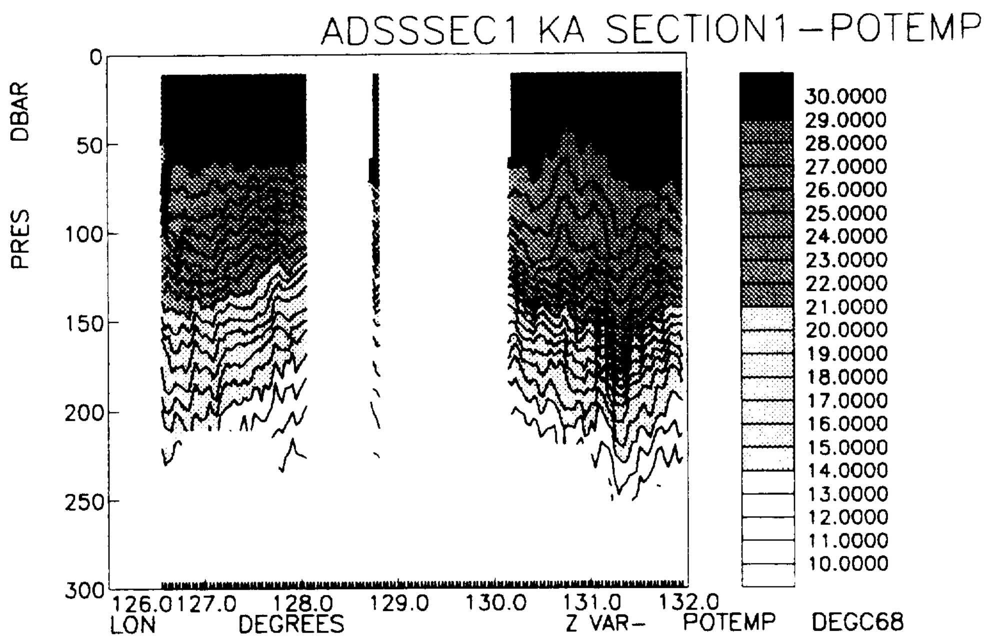
4.8
5.0
LAT DEGREES
Z VAR- SALIN


SECTION9-160E
PRES DBAR
LAT DEGREES
Z VAR- POTEMP DEGC68
26
22
18
14
34.1
33.8
34.4
34.7
Z VAR- SALIN
22
24
26
Z VAR- GAMMA0 KG/M**3

SECTION9-160E



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PRES DBAR
0
50
100
150
200
250
300
126.0 127.0 128.0 129.0 130.0 131.0 132.0
LON DEGREES
Z VAR- POTEMP DEGC68
30.0000
29.0000
28.0000
27.0000
26.0000
25.0000
24.0000
23.0000
22.0000
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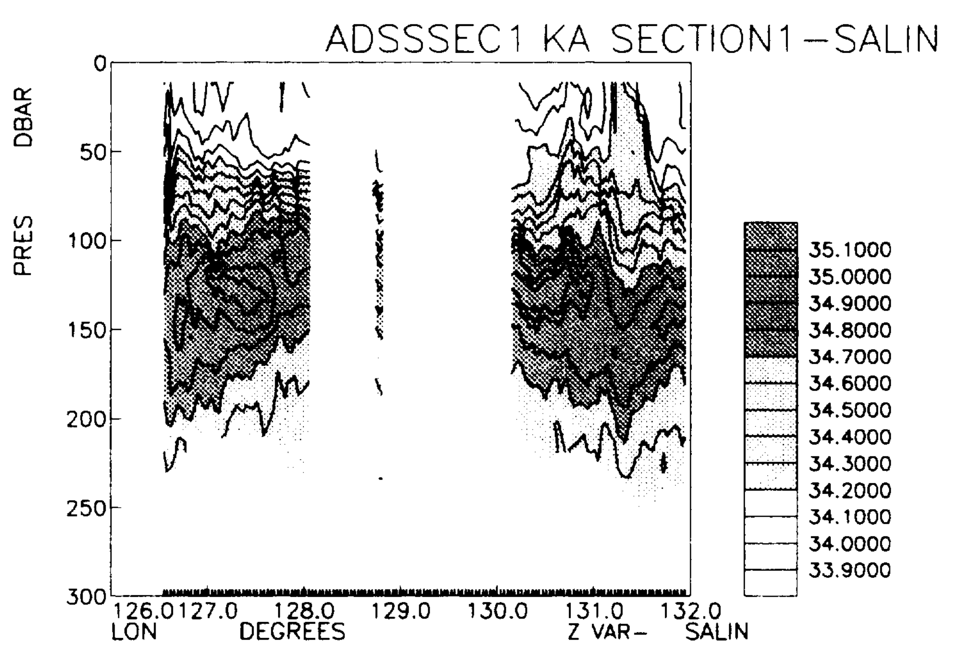
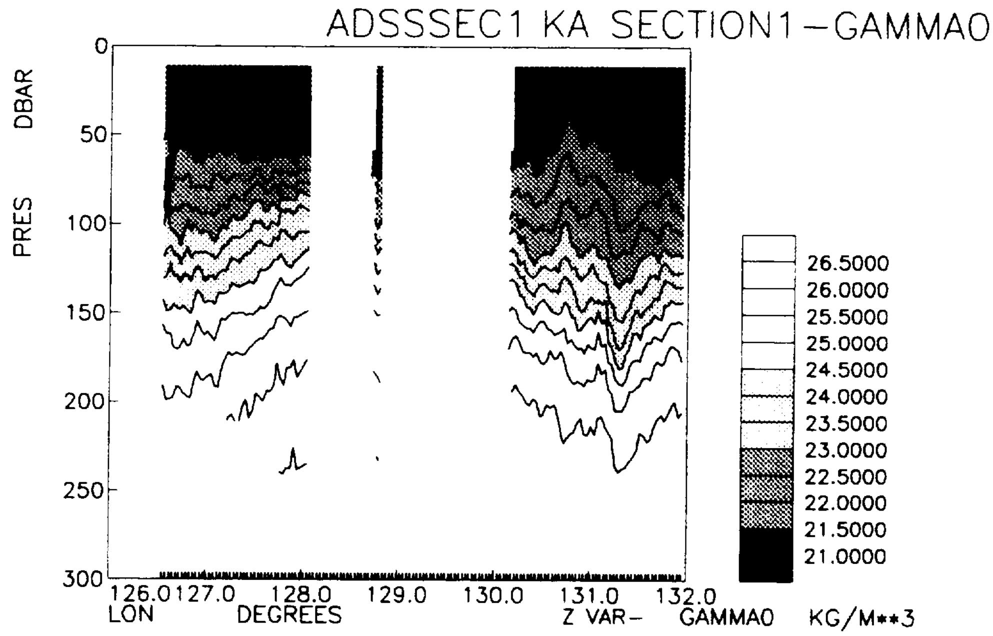
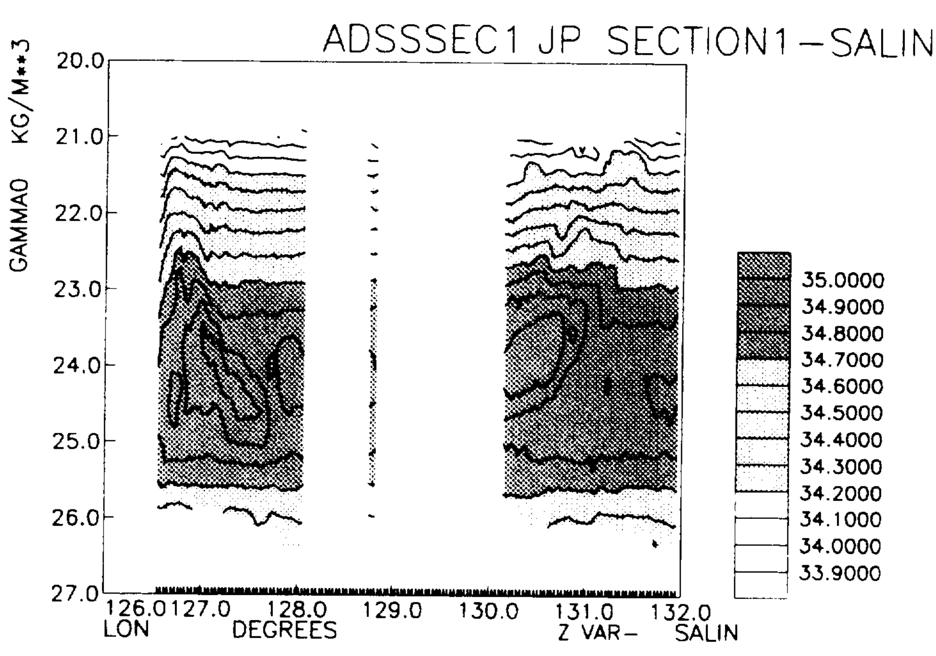
12.0000
11.0000
10.0000


ADSSSEC1 KA SECTION1-SALIN
PRES DBAR
0
50
100
150
200
250
300
126.0 127.0 128.0 129.0 130.0 131.0 132.0
LON DEGREES
Z VAR- SALIN
35.1000
35.0000
34.9000
34.8000
34.7000
34.6000
34.5000
34.4000
34.3000
34.2000
34.1000
34.0000
33.9000


ADSSSEC1 KA SECTION1-GAMMA0
PRES DBAR
0
50
100
150
200
250
300
126.0 127.0 128.0 129.0 130.0 131.0 132.0
LON DEGREES
Z VAR- GAMMA0 KG/M**3
26.5000
26.0000
25.5000
25.0000
24.5000
24.0000
23.5000
23.0000
22.5000
22.0000
21.5000
21.0000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GAMMA0 KG/M**3
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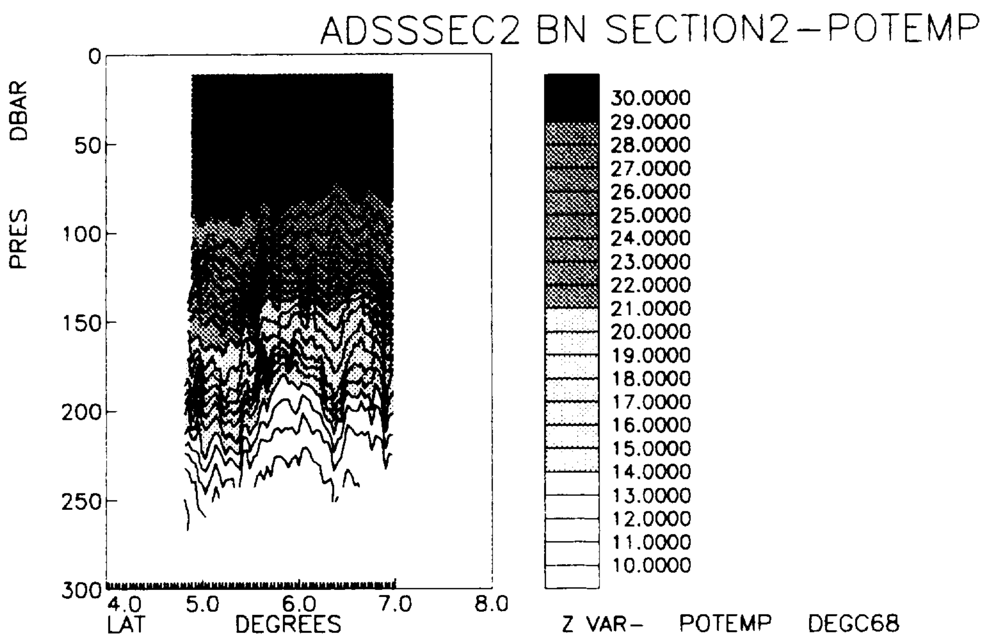
21.0
22.0
23.0
24.0
25.0
26.0
27.0
126.0 127.0 128.0 129.0 130.0 131.0 132.0
LON DEGREES
Z VAR- SALIN
35.0000
34.9000
34.8000
34.7000
34.6000
34.5000
34.4000
34.3000
34.2000
34.1000
34.0000
33.9000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PRES DBAR
0
50
100
150
200
250
300
4.0
5.0
6.0
7.0
8.0
LAT DEGREES
30.0000
29.0000
28.0000
27.0000
26.0000
25.0000
24.0000
23.0000
22.0000
21.0000
20.0000
19.0000
18.0000
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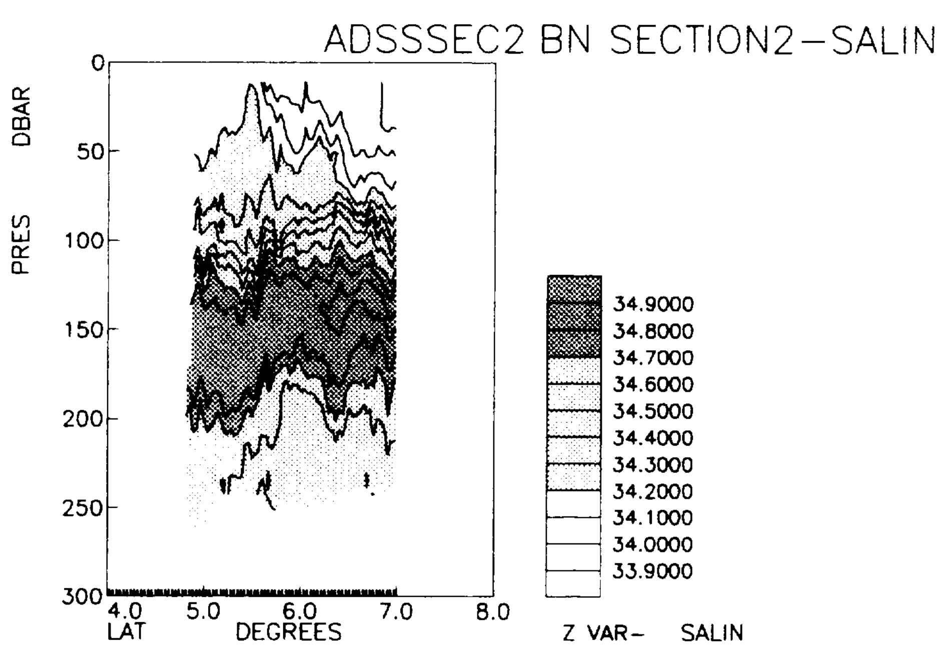
16.0000
15.0000
14.0000
13.0000
12.0000
11.0000
10.0000
Z VAR- POTEMP DEGC68


ADSSSEC2 BN SECTION2-SALIN
PRES DBAR
0
50
100
150
200
250
300
4.0
5.0
6.0
7.0
8.0
LAT DEGREES
34.9000
34.8000
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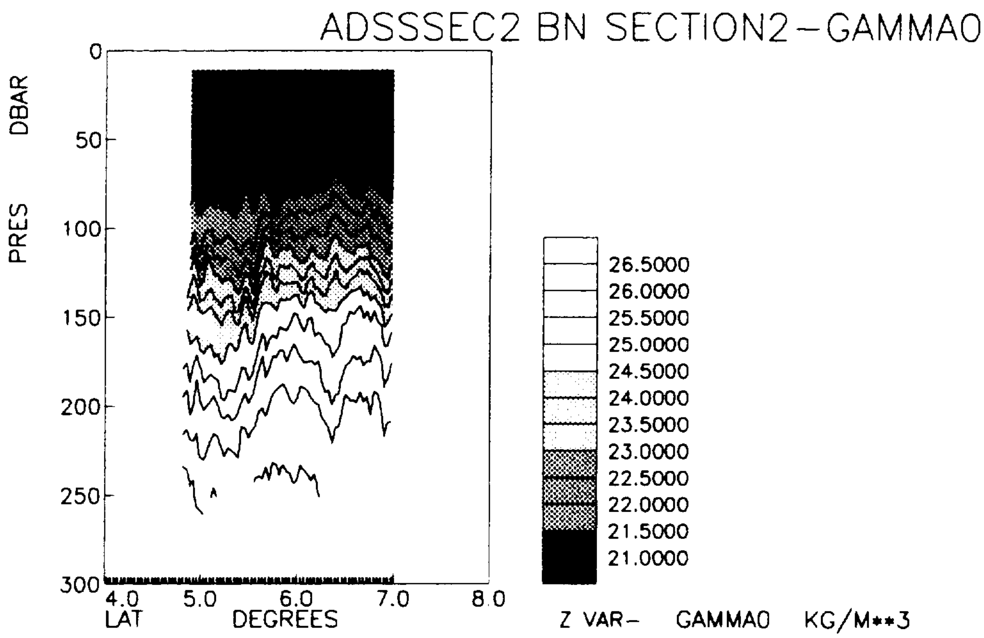
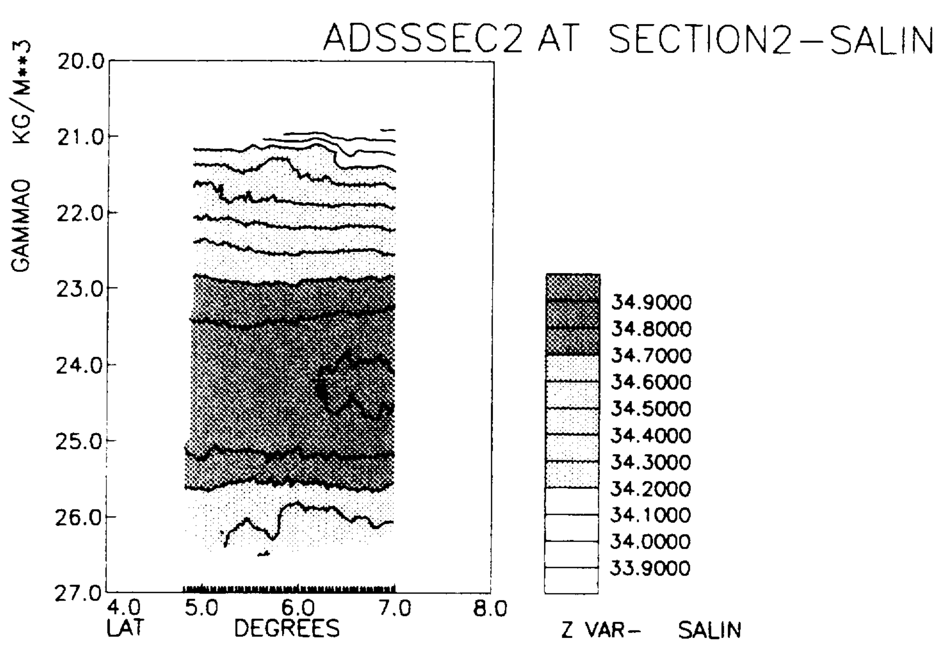
34.6000
34.5000
34.4000
34.3000
34.2000
34.1000
34.0000
33.9000
Z VAR- SALIN


ADSSSEC2 BN SECTION2-GAMMA0
PRES DBAR
0
50
100
150
200
250
300
4.0 5.0 6.0 7.0 8.0
LAT DEGREES
26.5000
26.0000
25.5000
25.0000
24.5000
24.0000
23.5000
23.0000
22.5000
22.0000
21.5000
21.0000
Z VAR- GAMMA0 KG/M**3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GAMMA0 KG/M**3
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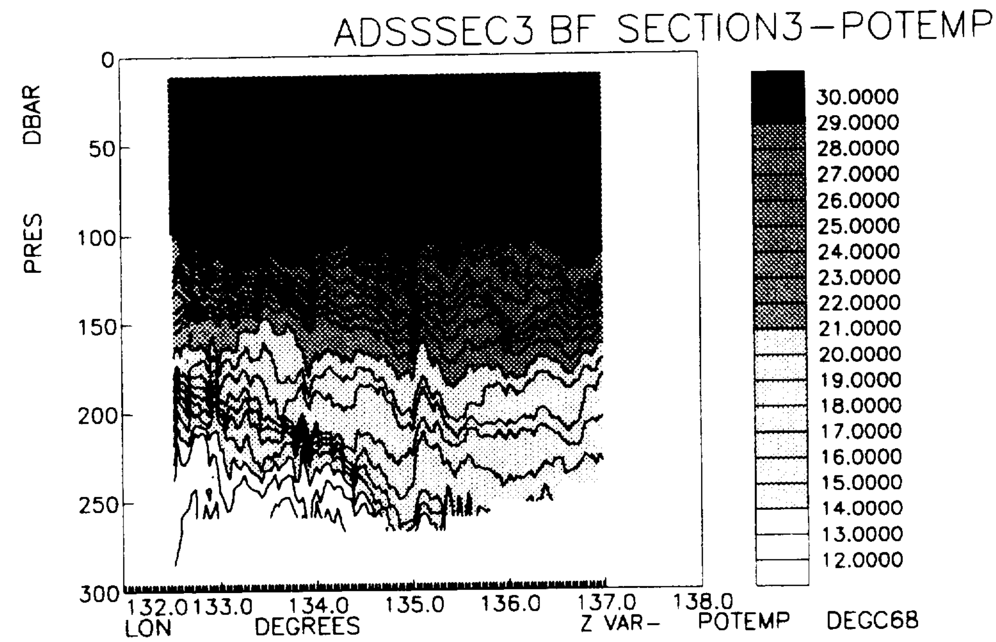
21.0
22.0
23.0
24.0
25.0
26.0
27.0
4.0 5.0 6.0 7.0 8.0
LAT DEGREES
34.9000
34.8000
34.7000
34.6000
34.5000
34.4000
34.3000
34.2000
34.1000
34.0000
33.9000
Z VAR- SALIN


ADSSSEC3 BF SECTION3-POTEMP
PRES DBAR
0
50
100
150
200
250
300
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LON DEGREES
Z VAR- POTEMP DEGC68
30.0000
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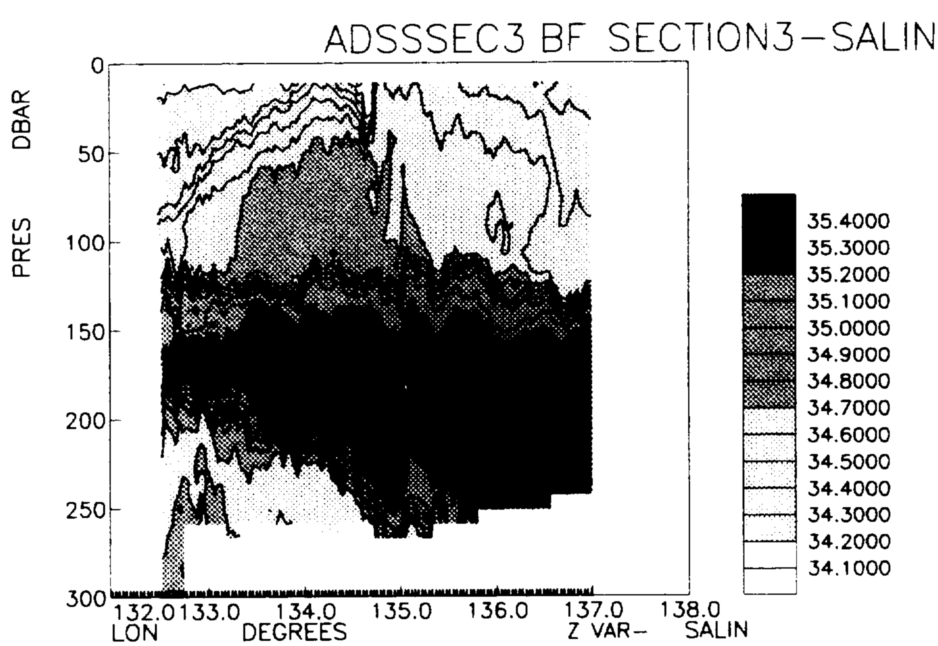
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Z VAR- SALIN
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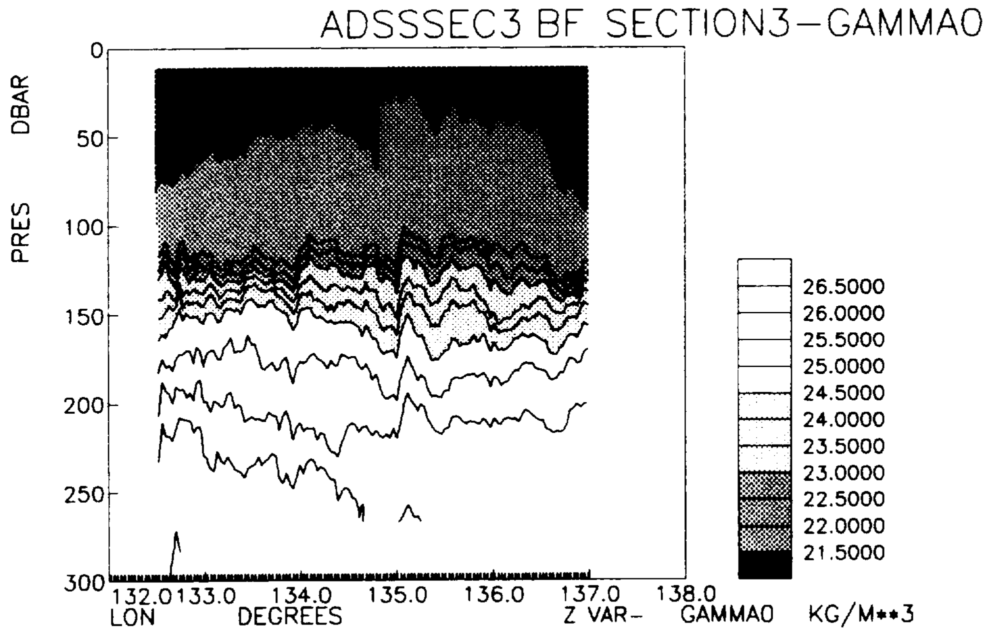
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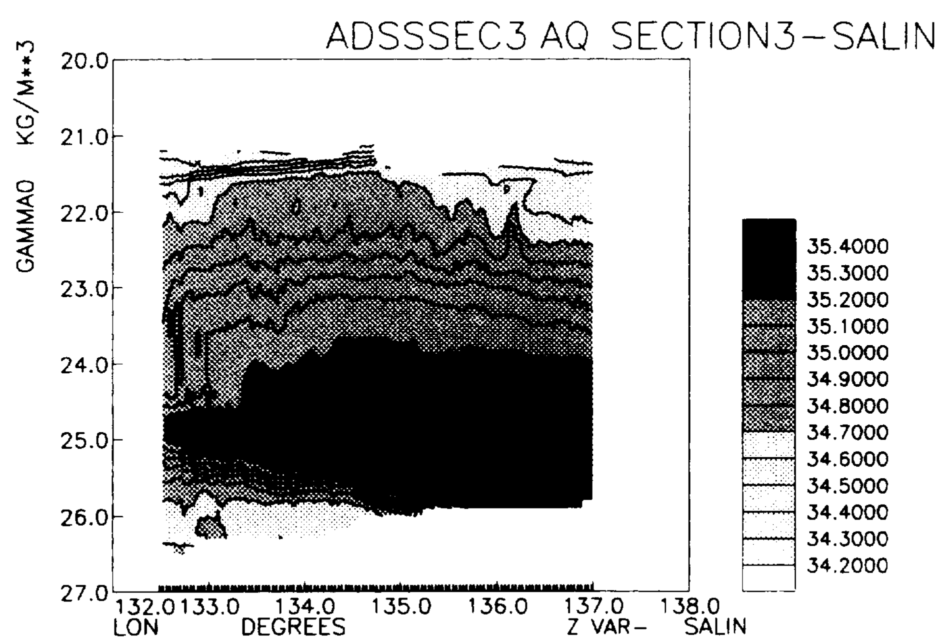
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LON DEGREES
Z VAR- SALIN
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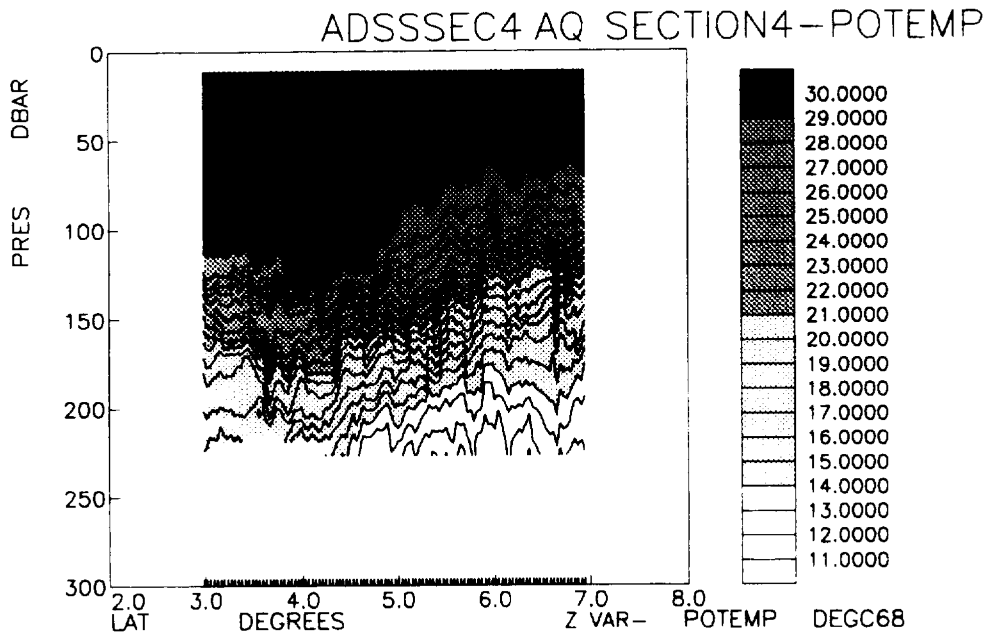
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Z VAR- POTEMP DEGC68
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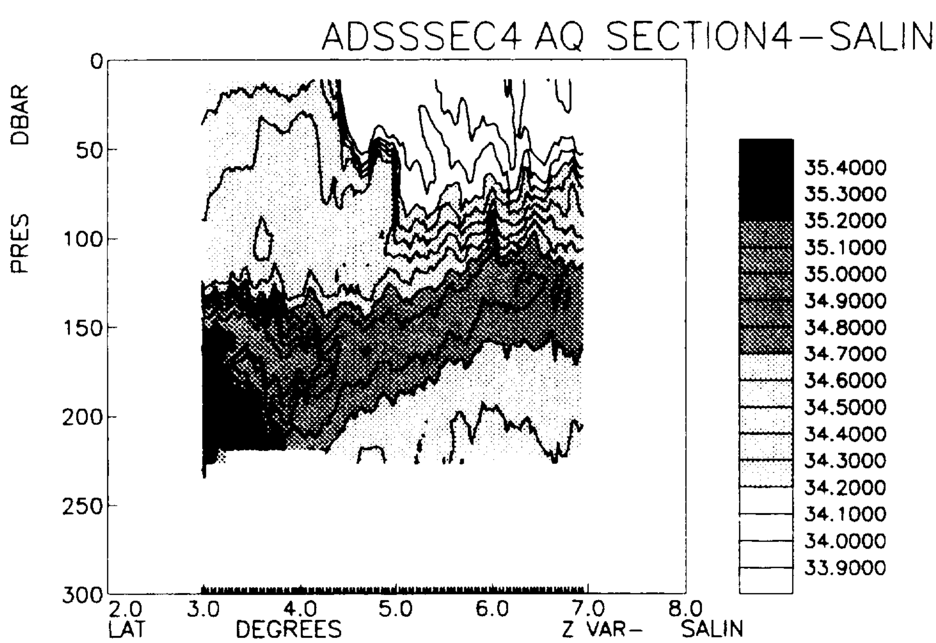
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8.0
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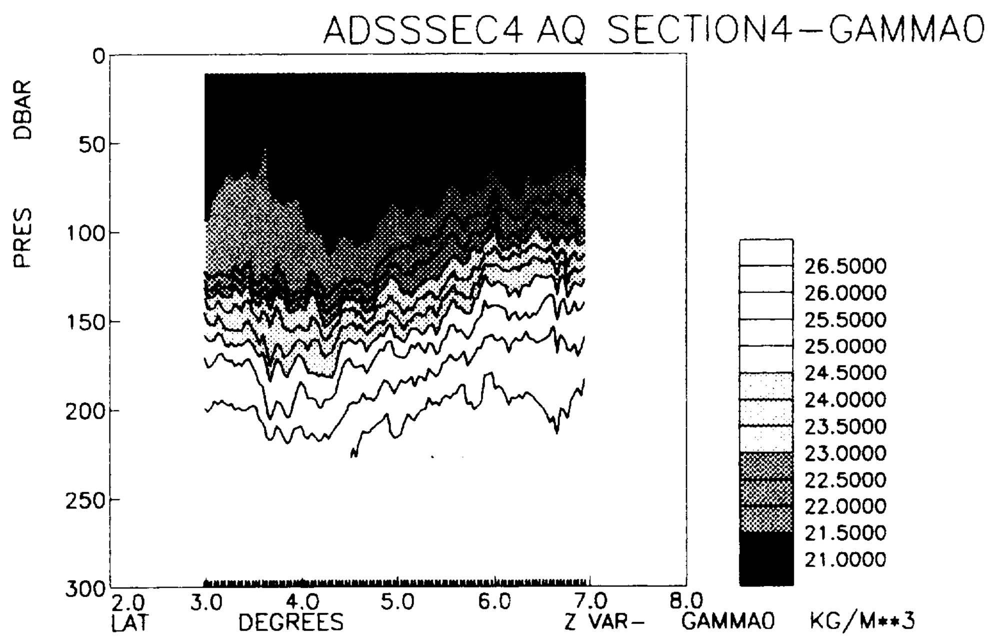
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8.0
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Z VAR- GAMMAO KG/M**3
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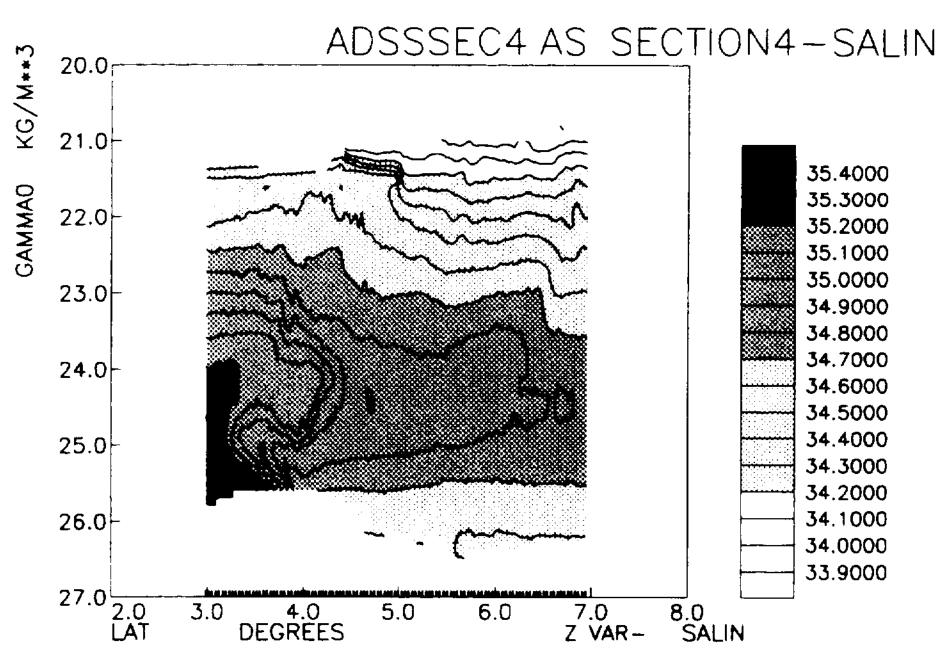
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4.0
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6.0
7.0
8.0
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Z VAR- SALIN
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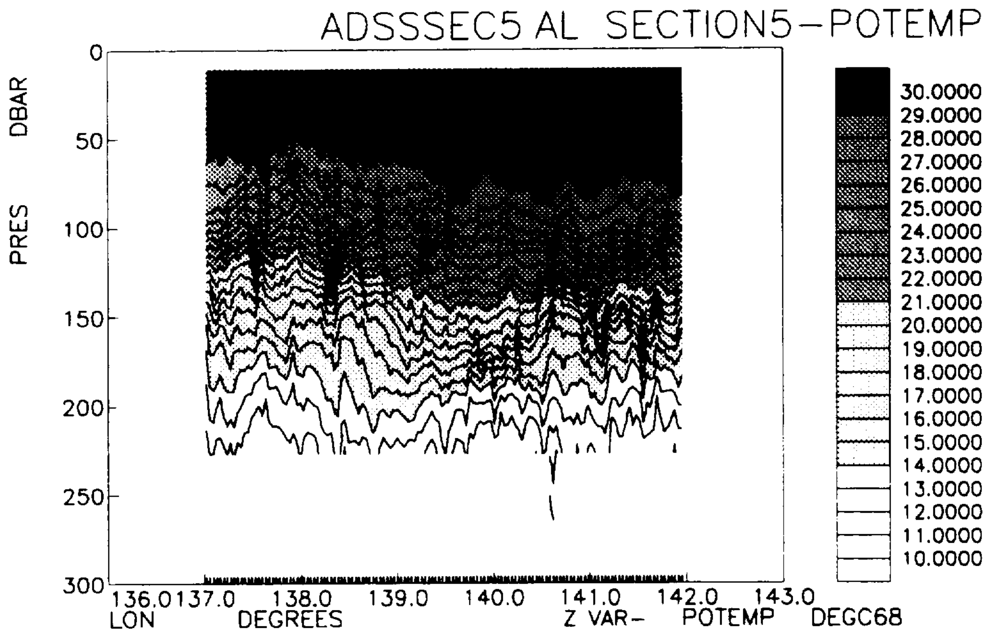
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LON DEGREES
Z VAR– POTEMP DEGC68
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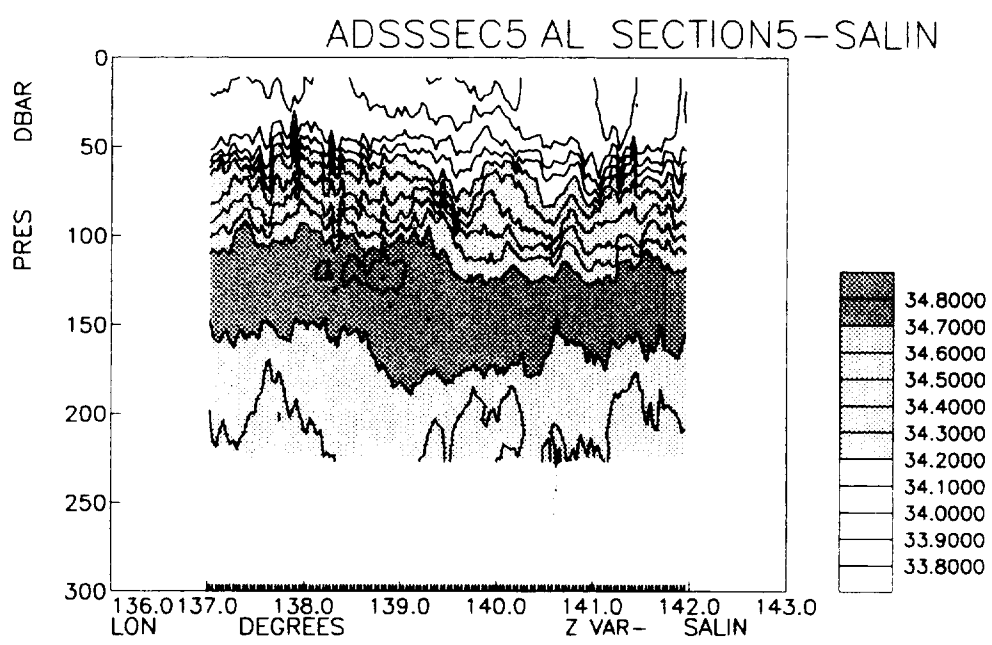
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PRES DBAR
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LON DEGREES
Z VAR– SALIN
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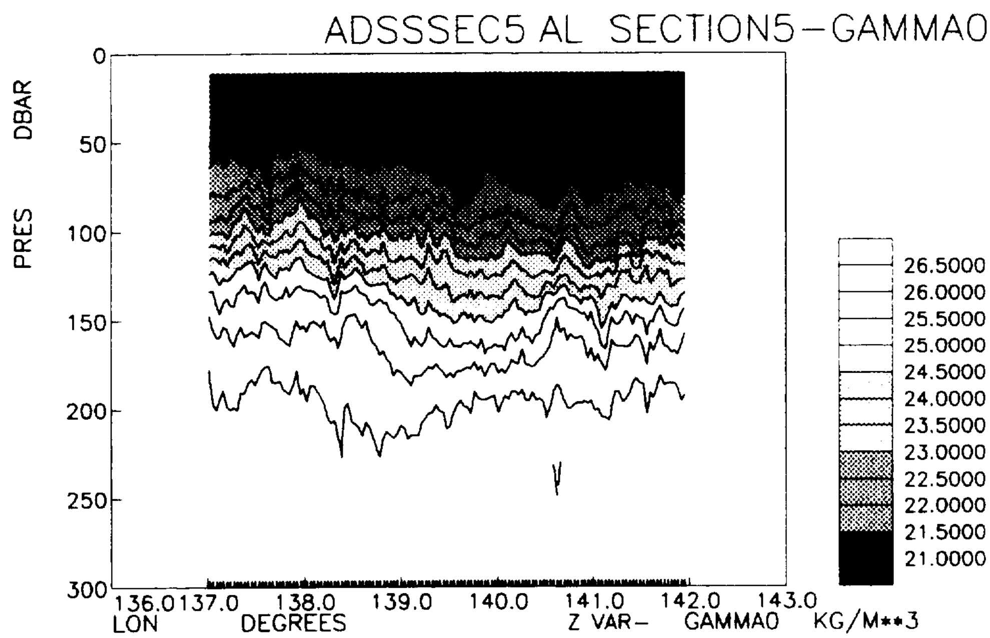
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Z VAR- GAMMA0 KG/M**3
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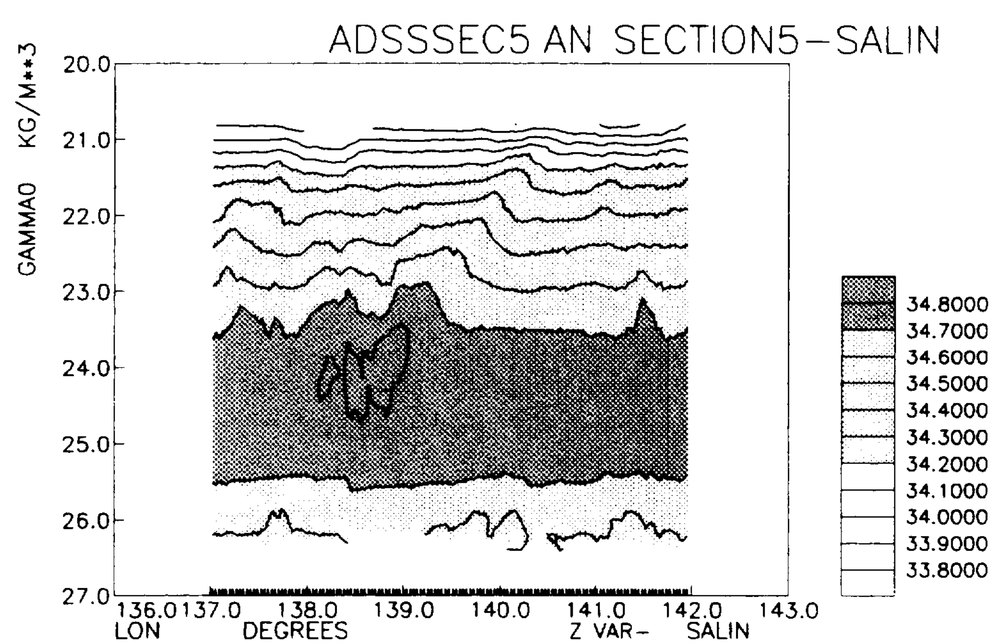
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LON DEGREES
Z VAR- SALIN
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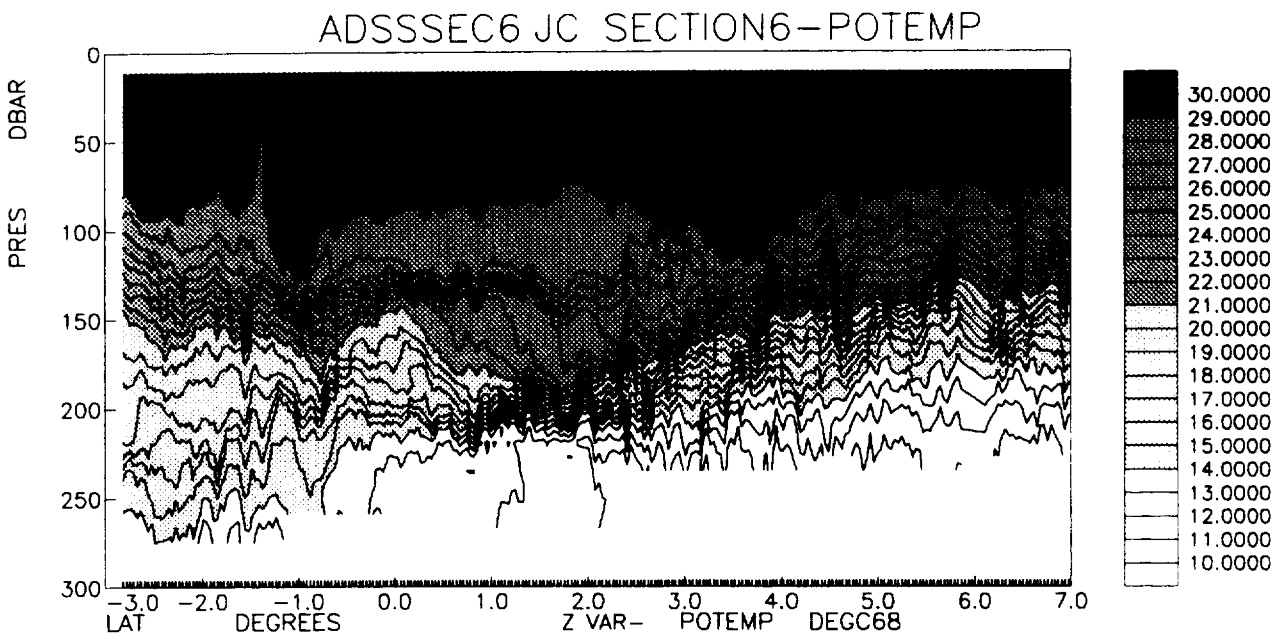
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LAT DEGREES
Z VAR- POTEMP DEGC68
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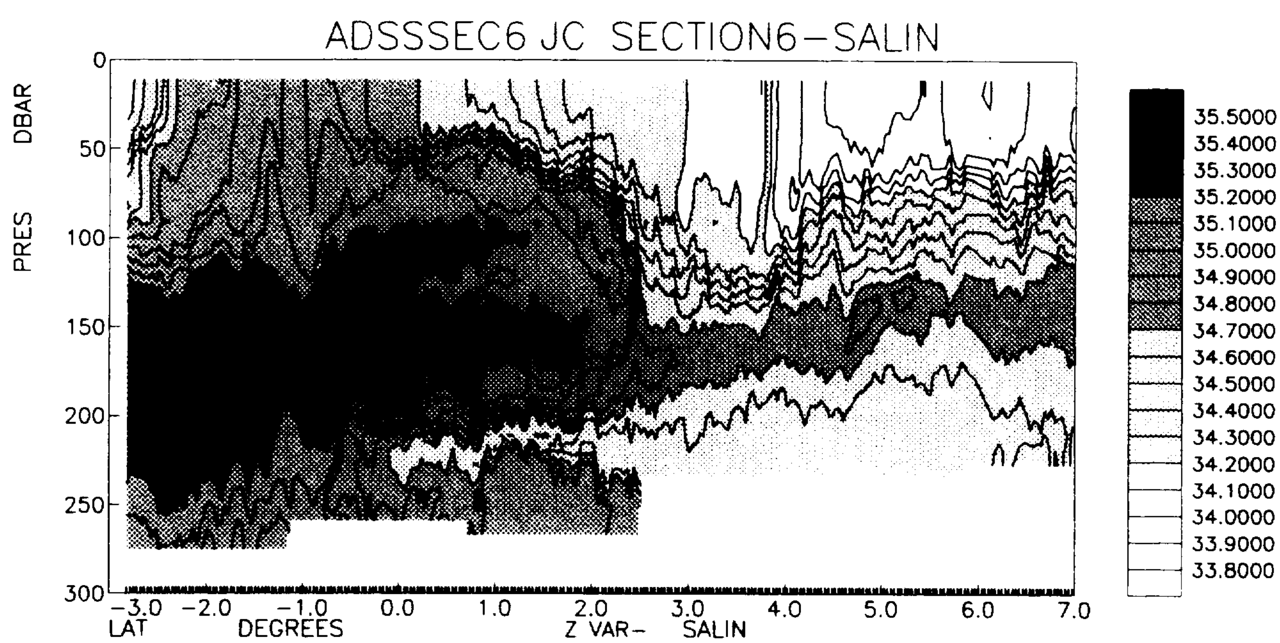
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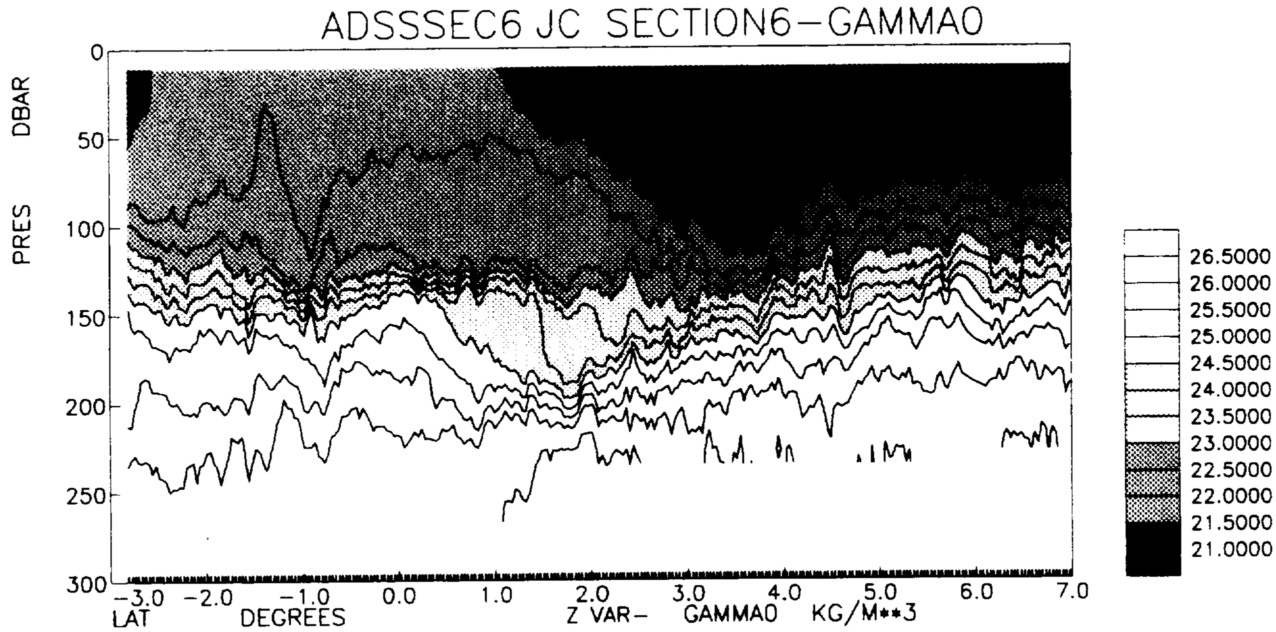
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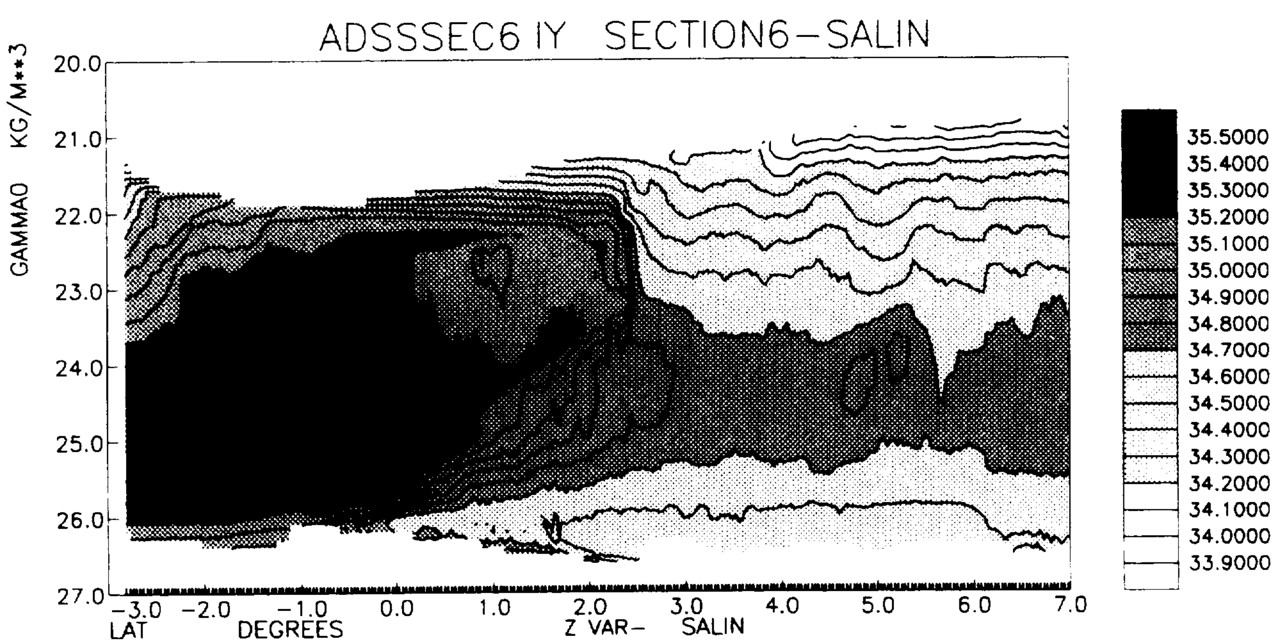
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Z VAR– SALIN
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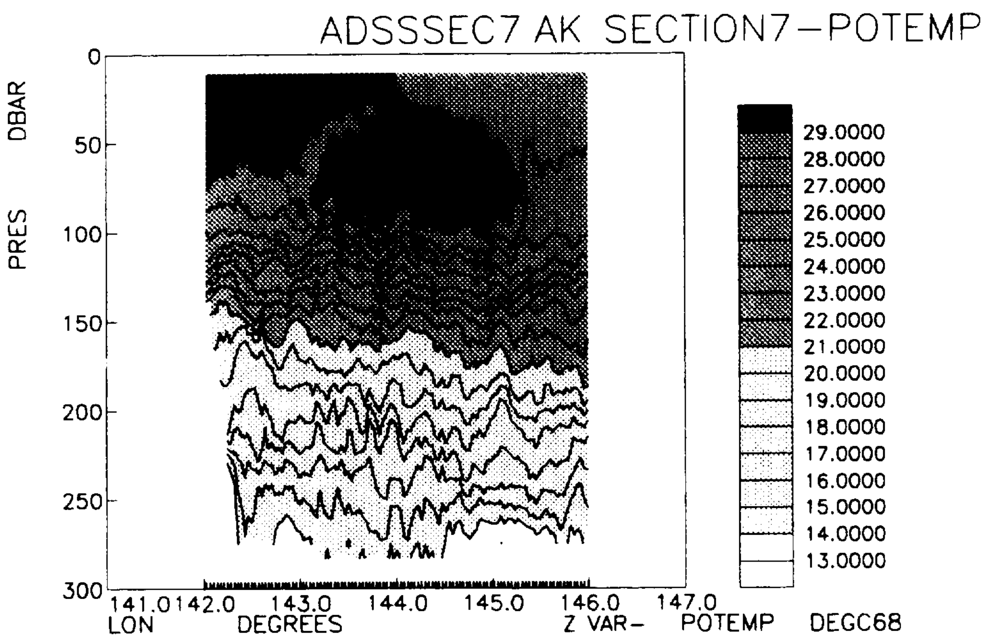
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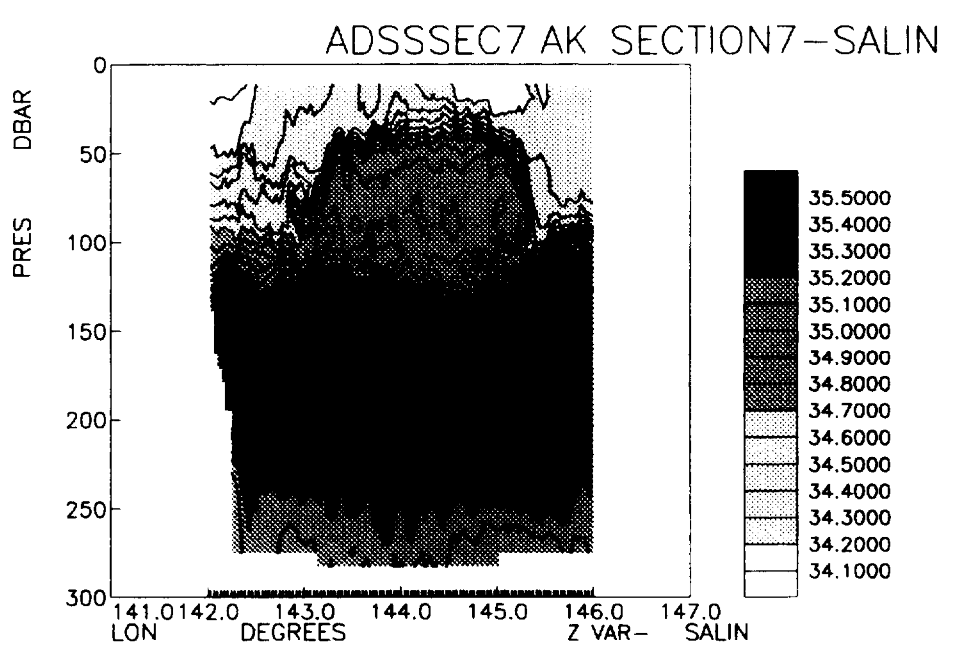
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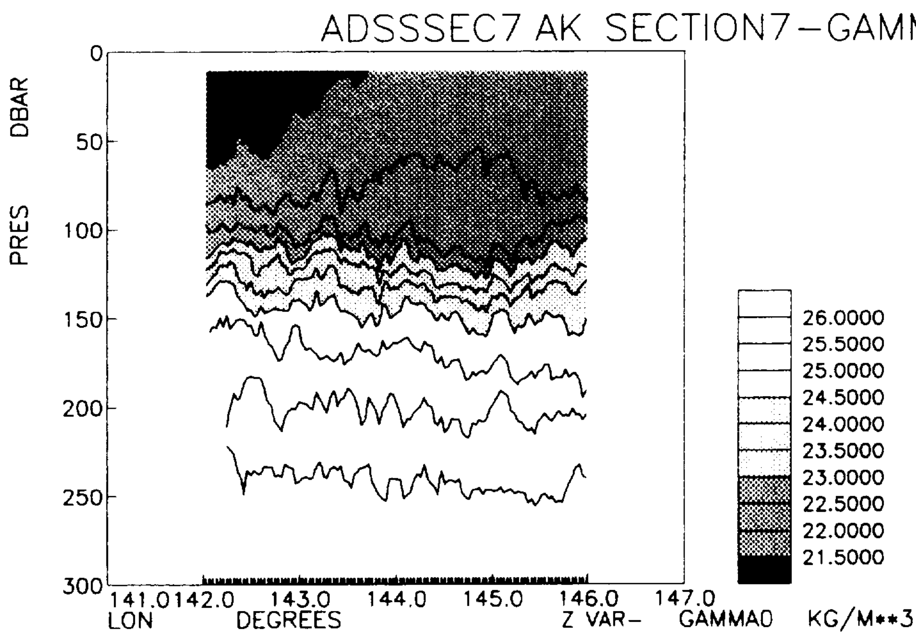
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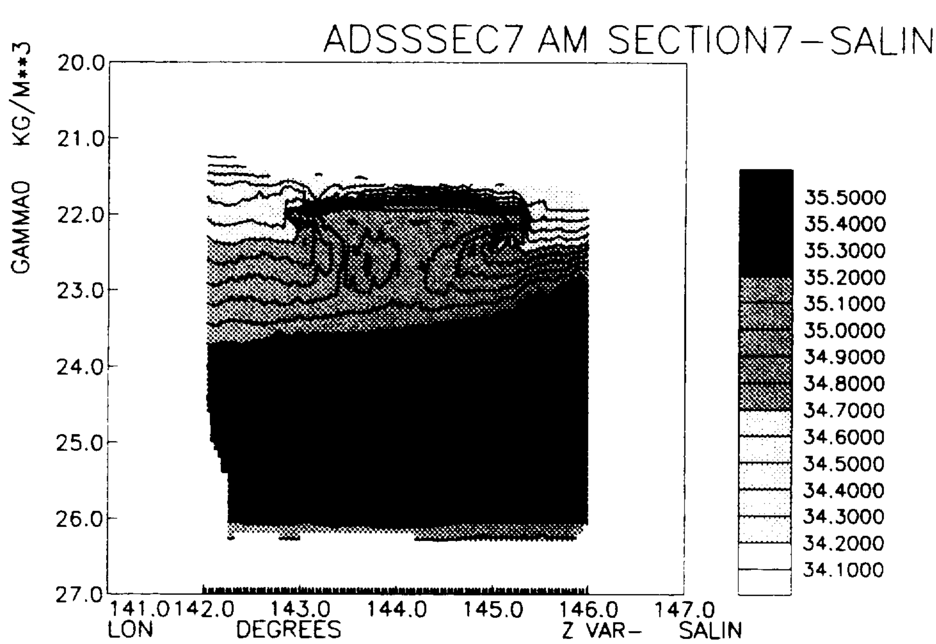
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LON DEGREES
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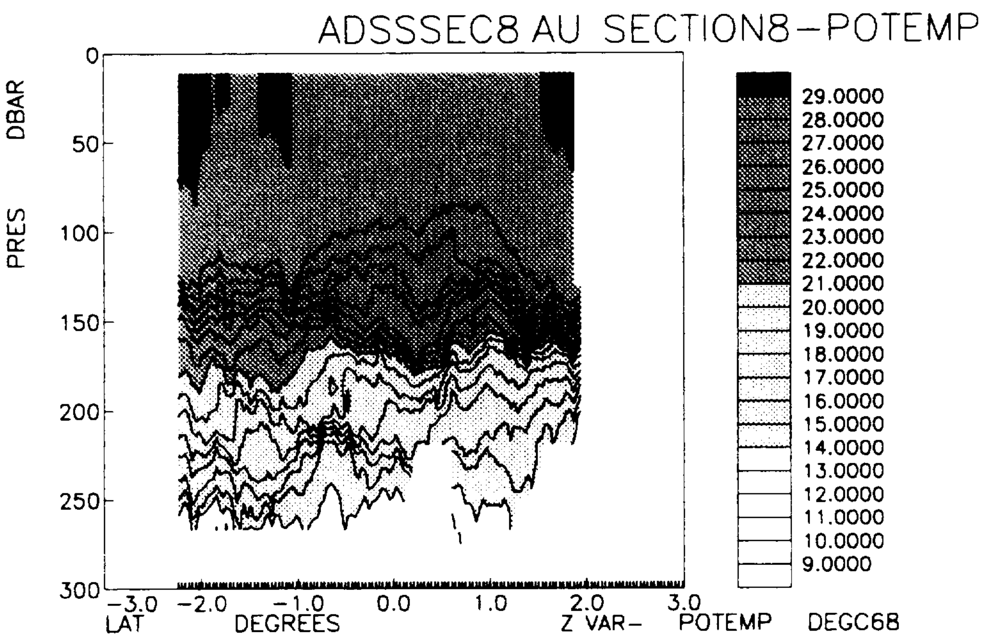
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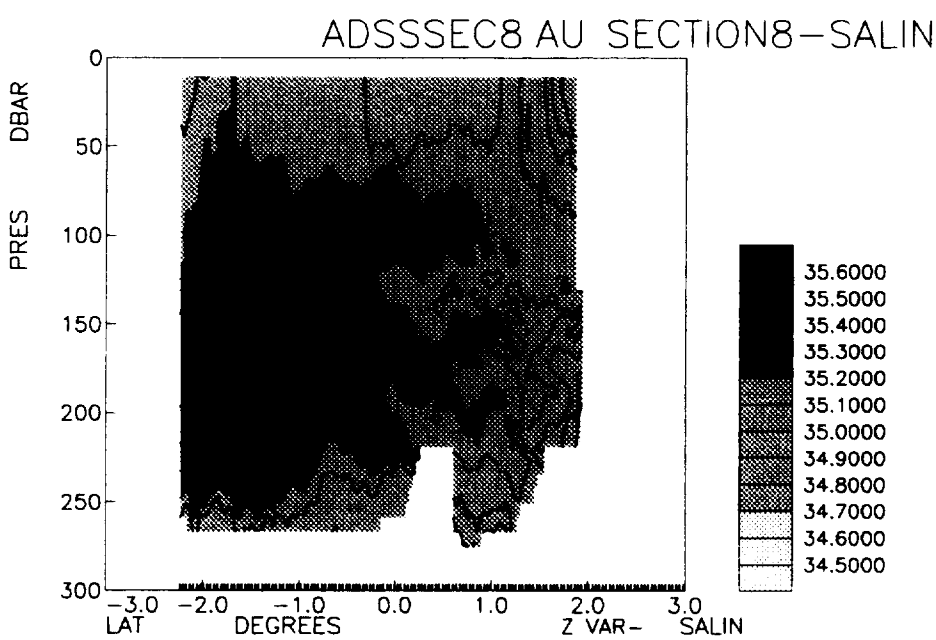
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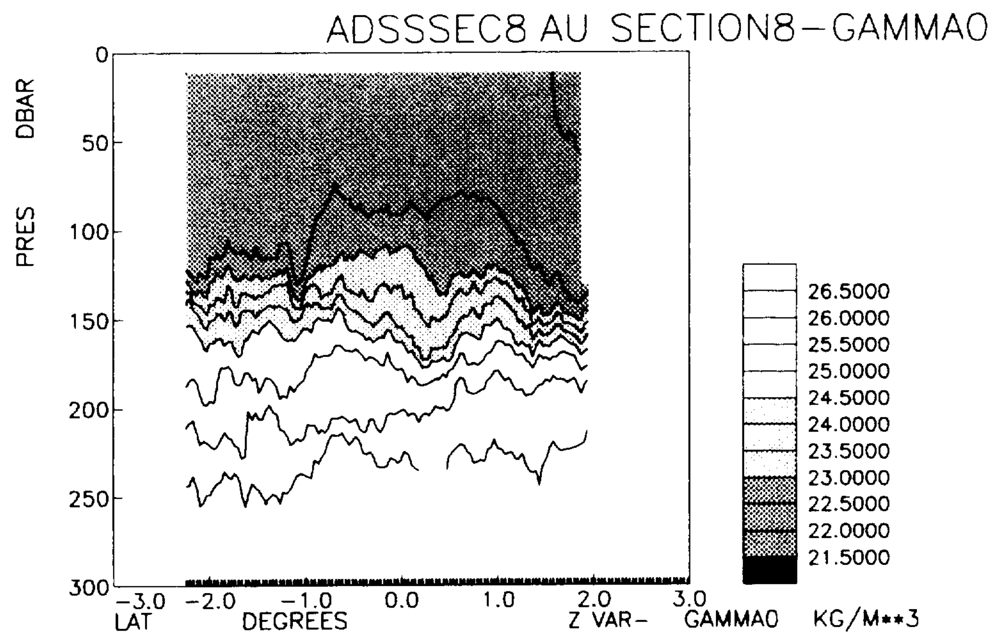
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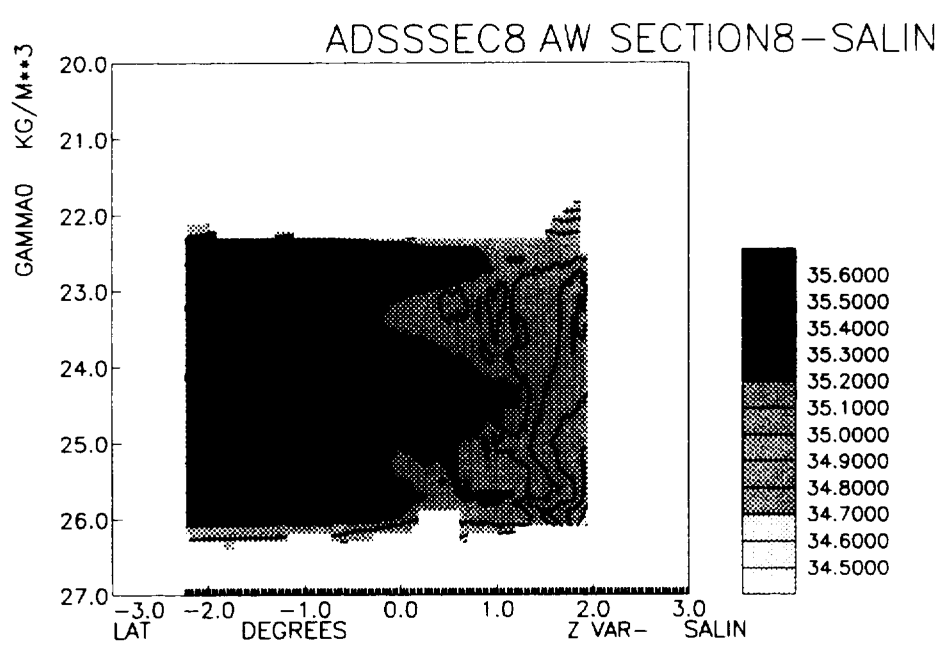
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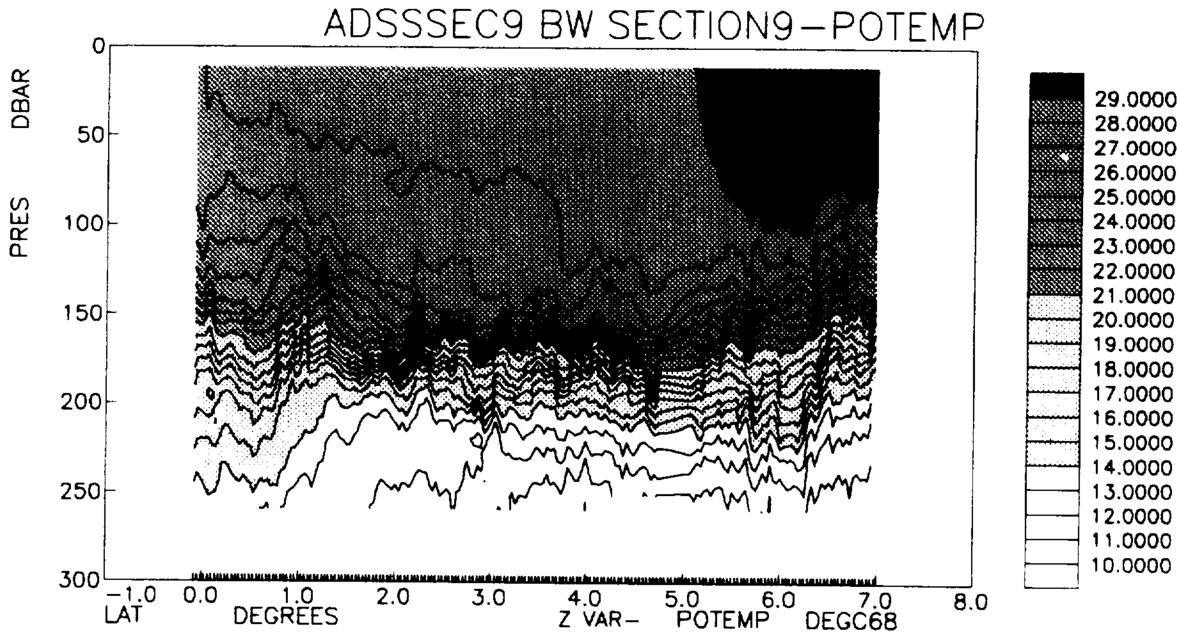
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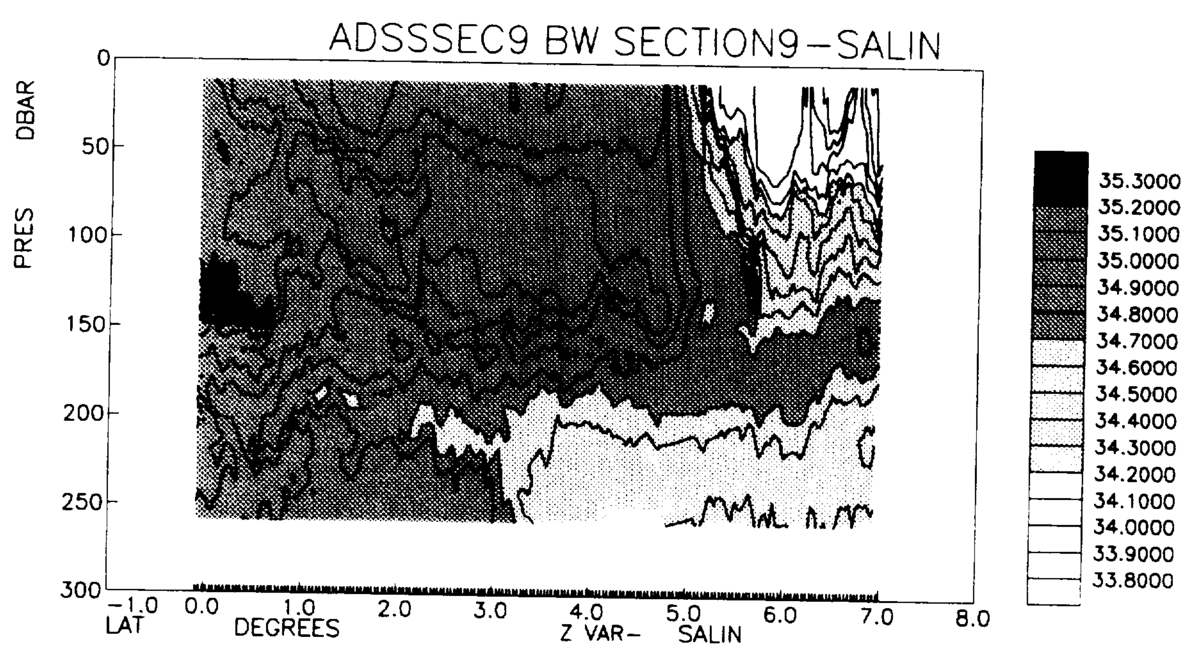
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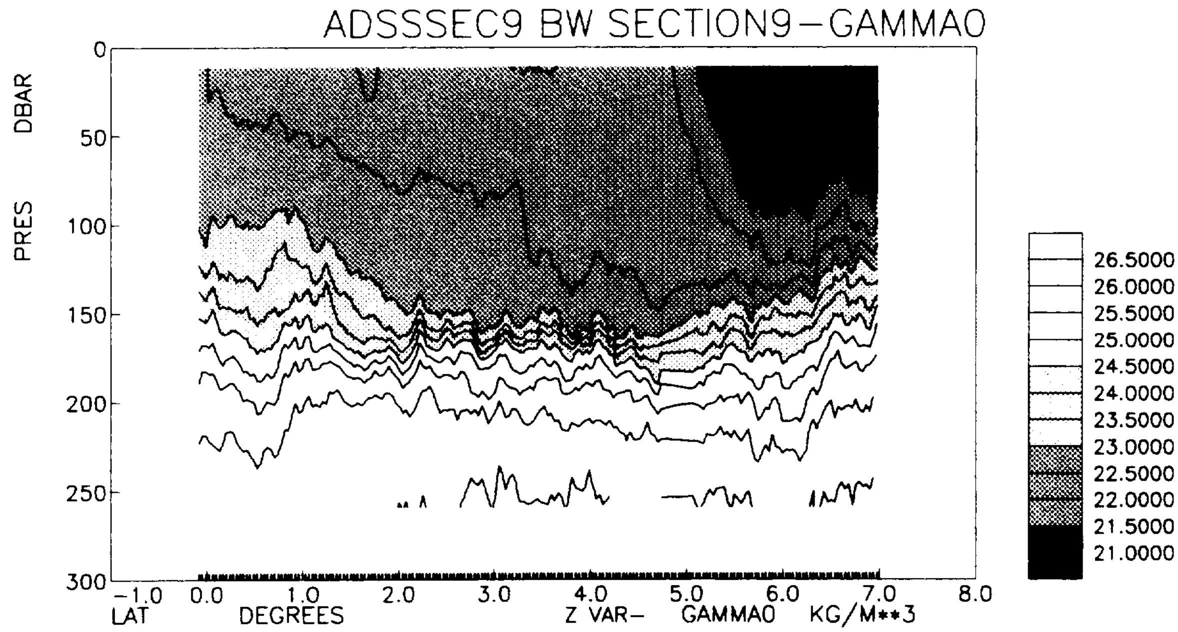
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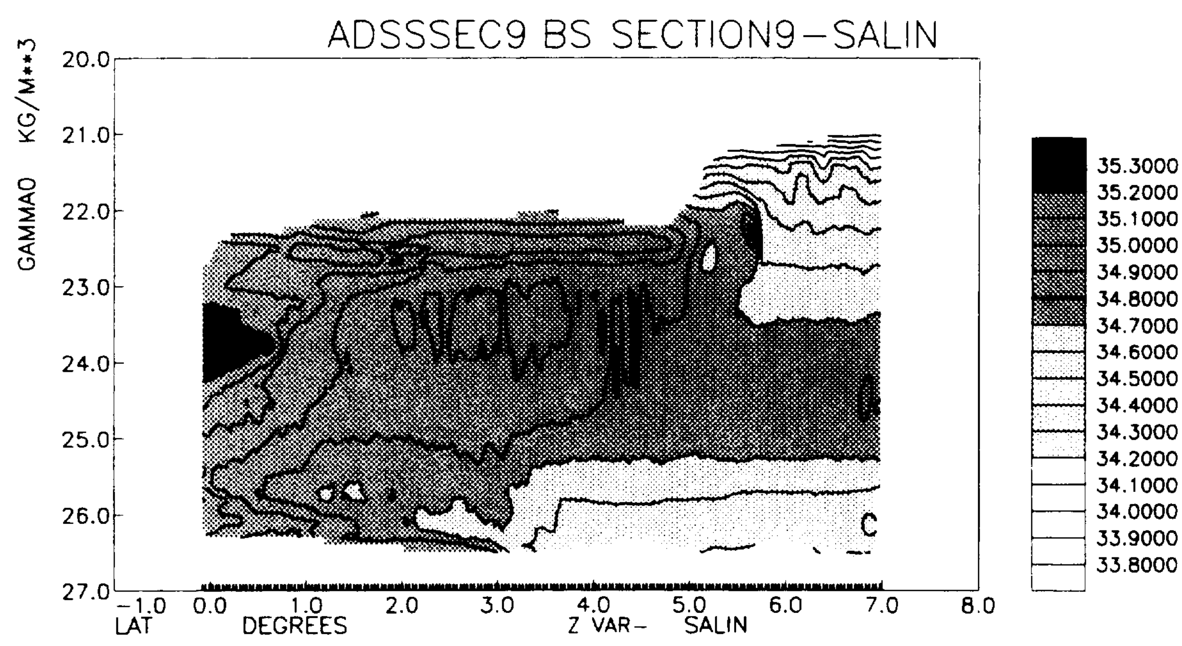
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