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CTD Measurements During 1999 and 2000 as Part of the Global Ocean-Atmosphere-Land System (GOALS)/Pan American Climate Studies (PACS)

Volume I

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CTD Measurements During 1999 and 2000 as Part of the Global Ocean-Atmosphere-Land System (GOALS)/Pan American Climate Studies (PACS)

K.E. McTaggart and G.C. Johnson

Abstract. During 1999 and 2000, CTD data were collected in the equatorial Pacific Ocean as part of the Global Ocean-Atmosphere-Land System (GOALS)/Pan American Climate Studies (PACS), follow-up programs to the Tropical Ocean-Global Atmosphere (TOGA) program and Equatorial Pacific Ocean Climate Studies (EPOCS). Summaries of Sea-Bird CTD measurements and hydrographic data acquired on 16 cruises are presented. Composite potential temperature-salinity diagrams and section plots of oceanographic variables along 95°W, 110°W, 125°W, 140°W, 155°W, 170°W, 180°, and 165°E meridians are given. Profiles including station location, meteorological conditions, and abbreviated CTD data listings are shown for each cast. Hydrographic data are listed for each cruise.

1. Introduction

The Global Ocean-Atmosphere-Land System (GOALS)/Pan American Climate Studies (PACS) Program began in 1995 with scientific objectives to understand and more realistically model (1) the seasonally varying mean climate of the Americas and adjacent ocean regions; (2) the role of boundary processes in forcing seasonal-to-interannual climate variability over the Americas; (3) the coupling between the oceanic mixed layer in the tropical Atlantic and eastern Pacific; and (4) the processes that determine the structure and evolution of the tropical sea-surface temperature field (Piotrowicz, 1995). CTD data are collected in the equatorial Pacific Ocean in conjunction with the maintenance of the Tropical Atmosphere-Ocean (TAO) array.

The TAO array is made up of ATLAS wind and thermistor chain moorings and current meter moorings that record and report data in real time using the ARGOS satellite data telemetry system. A major objective of the TAO array is to facilitate understanding, modeling, and prediction of the global interannual climate fluctuations associated with the El Niño-Southern Oscillation phenomena in the tropical Pacific Ocean. To this end, an ocean observing array has been implemented to initialize, force, and verify ocean prediction models in real time. The TAO array consists of approximately 70 ATLAS moorings and current meter moorings within 8 degrees of the equator spanning the Pacific Basin from 95°W to 137°E. The bulk of the array is being maintained by the Pacific Marine Environmental Laboratory (PMEL) TAO Project Office as part of the NOAA Ocean Climate Observing System for the Climate and Global Change Program.

The primary objective of TAO cruises is the deployment and recovery of moorings. At a minimum, CTD casts supporting the GOALS/PACS program are conducted at each mooring site to a depth of 1000 m. As time allows, additional CTD work is prioritized as follows: (1) 1000 m casts at 1-degree intervals between 12°N and 8°S along each ship trackline, (2) deep casts at mooring sites to a minimum depth of 3000 m or a maximum depth 200 m above the bottom, (3) 1000 m casts every one-half degree of latitude between 3°N and 3°S. Physical underway operations include shipboard

Acoustic Doppler Current Profiler (ADCP) measurements, sea surface temperature (SST) and salinity (SSS) measurements, routine weather observations, and upper air soundings.

CTD measurements are used to verify ATLAS temperature sensor data, calculate dynamic height, and at many sites are the only observations of the equatorial Pacific salinity field. These CTD data are quickly processed, calibrated, and distributed internationally to a wide variety of users: biological, chemical, and physical oceanographers at universities and government laboratories including NOAA/NCEP for improvement of ENSO predictions.

Summaries of CTD measurements and hydrographic data collected on 16 cruises during 1999 and 2000 are presented here. Data include meridional sections across the equator along 95°W, 110°W, 125°W, 140°W, 155°W, 170°W, 180°, and 165°E. Figures 1a–p show the cruise track and CTD station locations for each cruise. Tables 1a–p summarize CTD station information for each cruise. Cruise name notation is GPx-yy-zz, where x is the sequential GOALS/PACS cruise number during each year, yy is the year (99 or 00), and zz is the ship code (KA for the NOAA ship *Ka'imimoana,* RB for the NOAA ship *Ronald H. Brown*). Sea-Bird 911plus systems are used to acquire CTD data on all cruises. Pressure, temperature, and conductivity are sampled at a rate of 24 Hz. A prototype oxygen sensor designed by Sea-Bird was added to the primary sensor suite during GP700. Water samples are collected on the upcast using an electronically fired rosette sampler and used to calibrate CTD data (see section 6). Salinity is analyzed using an autosalinometer (see section 4). Sample oxygen concentrations during GP700 were measured using the Winkler method as specified in the WOCE Operations Manual (1994).

2. Sea-Bird 911plus CTD System

The Sea-Bird Electronics, Inc. (SBE) 911plus CTD system is a real-time data system with the CTD data from the SBE 9plus underwater unit transmitted via a conducting cable to the SBE 11plus deck unit. The serial data from the underwater unit is sent to the deck unit in RS-232 NRZ format. The deck unit decodes the serial data and sends it to a personal computer for display and storage using Sea-Bird SEASOFT software program SEASAVE. The SBE 911plus CTD system transmits data from its primary and auxiliary sensors in the form of binary number equivalents of the frequency or voltage outputs from those sensors. This is referred to as the raw data. The calculations required to convert raw data to engineering units are performed in the software, either in real time, or after the data has been stored in a disk file (Seasoft, 1994).

2.1 Conductivity

The flow-through conductivity sensing element is a glass tube (cell) with three platinum electrodes. The resistance measured between the center electrode and end electrode pair is determined by the cell geometry and the specific conductance of the fluid within the cell, and controls the output frequency of a Wien Bridge circuit. The sensor has a frequency output of approximately 3 to 12 kHz corresponding to conductivity from 0 to 7 Siemens/meter (0 to 70 mmho/cm). The SBE conductivity sensor has a typical accuracy/stability of ±0.0003 S/m/month, and resolution of 0.00004 S/m at 24 Hz.

Sensor calibrations are performed at Sea-Bird Electronics, Inc. in Bellevue, Washington on a roughly annual basis. Conductivity calibration certificates show an equation containing the appropriate pressure-dependent correction term to account for the effect of hydrostatic loading (pressure) on the conductivity cell:

$$C(\mathrm{S/m}) = (g + hf^2 + if^3 + jf^4)/[10(1 + \mathit{ctcor}\ t + \mathit{cpcor}\ p)]$$

where g, h, i, j, *ctcor*, and *cpcor* are calibration coefficients, f is the instrument frequency (kHz), t is the water temperature (°C), and p is the water pressure (dbar). SEASOFT automatically implements this equation.

2.2 Temperature

The temperature sensing element is a glass-coated thermistor bead, pressure-protected by a stainless steel tube. The sensor output frequency ranges from approximately 5 to 13 kHz corresponding to temperature from –5 to 35 degrees Celsius. The output frequency is inversely proportional to the square root of the thermistor resistance which controls the output of a patented Wien Bridge circuit. The thermistor resistance is exponentially related to temperature. The SBE thermometer has a typical accuracy/stability of ±0.004°C per year; and resolution of 0.0003°C at 24 Hz. The SBE thermometer has a fast response time of 0.070 seconds.

Sensor calibrations are performed at Sea-Bird Electronics, Inc. on a roughly annual basis. Temperature (IPTS-90) is computed according to

$$T(^\circ\mathrm{C}) = 1/\{g + h[\ln(f0/f)] + i[\ln^2(f0/f)] + j[\ln^3(f0/f)]\} - 273.15$$

where g, h, i, j, and $f0$ are calibration coefficients, and f is the instrument frequency (kHz). SEASOFT automatically implements this equation, and converts between ITS-90 and IPTS-68 temperature scales when selected.

2.3 Pressure

The Paroscientific series 4000 Digiquartz high pressure transducer uses a quartz crystal resonator whose frequency of oscillation varies with pressure induced stress measuring changes in pressure as small as 0.01 parts per million with an absolute range of 0 to 10,000 psia (0 to 6885 decibars). Also, a quartz crystal temperature signal is used to compensate for a wide range of temperature changes. Repeatability, hysteresis, and pressure conformance are 0.005% FS. The nominal pressure frequency (0 to full scale) is 34 to 38 kHz. The nominal temperature frequency is 172 kHz + 50 ppm/°C.

Periodic sensor calibrations are performed at Sea-Bird Electronics, Inc. Pressure coefficients are first formulated into

$$c = c1 + c2 * U + c3 * U^2$$
$$d = d1 + d2 * U$$
$$t0 = t1 + t2 * U + t3 * U^2 + t4 * U^3 + t5 * U^4$$

where U is temperature in degrees Celsius. Then pressure is computed according to

$$P(\text{psia}) = c * [1 - (t0^2/t^2)] * \{1 - d[1 - (t0^2/t^2)]\}$$

where t is pressure period (μs). SEASOFT automatically implements this equation.

2.4 Oxygen

The SBE-43 prototype used during GP700 uses an electrochemical cell that is constantly polarized. The sensor is temperature compensated using special temperature sensing and an internal microcomputer. The interface electronics reports voltages for oxygen current only. A linear equation of the form $I = mV + b$, where m = 1.0e-6 and b = 0.0, yields sensor current as a function of sensor output voltage. The sensor has a thermal time constant of approximately 2.5 s; and an oxygen response time constant that is temperature dependent, increasing with cooler temperatures, ranging from 2 to 12 s.

Pre-cruise sensor calibrations are performed at Sea-Bird Electronics, Inc., providing slope, bias, tcor, and pcor coefficients. SEASOFT computes dissolved oxygen according to Owens and Millard (1985).

3. Data Acquisition

The package enters the water and is held beneath the surface for 60 seconds in order to prime the system. Under ideal conditions the package should be lowered at a rate of 30 m/min to 50 m, 45 m/min to 200 m, and 60 m/min to depth. Ship heave may cause substantial variation about these mean lowering rates. Cable tension is monitored at the winch box display. The position of the package relative to the bottom during deep casts is monitored using the ship's Precision Depth Recorder (PDR). An estimated bottom depth is first obtained from bathymetric charts and then the PDR is run during the bottom 1000 m of the cast.

Nominally 12 water samples are collected during the upcast using an SBE rosette. Five- or ten-liter Niskin sample bottles are used depending on the cruise. Bottle closures are performed through the SEASOFT software.

A backup of the analog data stream is made on video cassette tape. Digitized data on the PC are backed up onto $\frac{1}{4}$" QIC-80 cartridge tapes or Zip disks.

4. Salinity Analysis

Bottle salinity analyses are performed in temperature-controlled environments using Guildline Model 8400B inductive autosalinometers standardized with IAPSO Standard Seawater. The autosalinometer is standardized before each run and either at the end of each run or after no more than 48 samples. The drift between standardizations is monitored and the individual samples are corrected for that drift by linear interpolation. Duplicate samples are taken from the deepest bottle on each cast and analyzed on a subsequent day. Bottle salinities are compared to preliminary CTD salinities at sea to aid in the identification of leaking bottles as well as to monitor the CTD conductivity cells' performance and drift. Their use in calibrating CTD conductivity on shore is detailed in section 6. The expected precision of the autosalinometer with an accomplished operator is 0.001 PSS-78, with an accuracy of 0.003.

5. SEASOFT Processing

SEASOFT consists of modular menu driven routines for acquisition, display, processing, and archiving of oceanographic data acquired with Sea-Bird equipment and is designed to work with an IBM or compatible personal computer. Raw data are acquired from the instruments and stored unmodified. The conversion module DATCNV uses instrument configuration and precruise calibration files to create a converted engineering unit data file that is operated on by all SEASOFT post processing modules. The following describes each processing module used and notes the specifications in the reduction of GOALS/PACS CTD data.

ALIGNCTD advances secondary conductivity relative to temperature by 0.73 s. This is the typical net advance of ducted temperature and conductivity sensors with a 3000-rpm pump. The SBE 11plus deck unit automatically advances primary conductivity. ALIGNCTD was also used to advance GP700 oxygen by 8 s. ROSSUM creates a summary of the bottle data. Pressure, temperature, and conductivity (and oxygen parameters for GP700) are averaged over a 2-s interval after the confirm bit in the upcast data stream. WILDEDIT marks extreme outliers in the data files. The first pass obtains an accurate estimate of the true standard deviation of the data. The data are read in blocks of 100 scans. Data greater than two standard deviations are flagged. The second pass computes a standard deviation over the same 100 scans excluding the flagged values. Values greater than 20 standard deviations are marked bad. All flagged data are excluded. FILTER performs a low-pass filter on pressure with a time constant of 0.15 s and on conductivity with a time constant of 0.03 s. In order to produce zero phase (no time shift) the filter first runs forward through the file and then runs backwards through the file. DERIVE computes selected variables such as GP700 doxc/dt. CELLTM uses a recursive filter to remove conductivity cell thermal mass effects from the measured conductivity. Nominal values are used for thermal anomaly amplitude (alpha = 0.03) and the time constant

(1/beta = 7.0). LOOPEDIT excludes scans where the minimum velocity of the package is less than 0.25 m/s or the package has reversed its direction owing to ship heave. BINAVG averages the data into 1 dbar pressure bins starting at 1 dbar (no surface bin). The center value of the first bin is set equal to the bin size. The bin minimum and maximum values are the center value plus or minus half the bin size.

6. Post-Cruise Calibrations

6.1 Conductivity

PMEL Fortran program SBECAL combines SEASOFT bottle files into one listing. PMEL Fortran program ADDSAL reads bottle salinity data received from Survey personnel and adds it to the combined listing. MATLAB functions CALCOSn are used to determine the best fit of CTD and bottle data, where n is the order of the station-dependent linear or polynomial fit. CALCOSn recursively throws out data greater than 2.8 standard deviations. CALCOSn returns a single conductivity bias and a conductivity slope for each station. A station-dependent slope coefficient best models the gradual shift in the conductivity sensor within each station grouping with time. CALCOPn additionally returns a linear pressure term (modified beta) that is multiplied by CTD pressure and added to conductivity. The order of the polynomial was chosen to keep the standard deviation of each grouping to a minimum. Table 3 lists the conductivity calibration coefficients determined for each station grouping.

PMEL Fortran program CALMSTR applies post-cruise calibrations to temperature and conductivity, and computes final salinity values. Final pressure calibrations were pre-cruise. CTD-bottle conductivity differences (Figs. 2a–h) are used to verify the success of the fit parameters.

6.2 Temperature

Adjustments were made to the bias of the thermistors using a linear fit of the sensor drift history from calibration data taken over the previous few years, projected to the midpoint of each cruise. These drift corrections are small (order 1×10^{-3} °C). Also, a uniform correction was applied for heating of the thermistor owing to viscous effects. Thermistors are biased high by this effect and were adjusted down by 0.6e–03°C. This results in errors of no more than ±0.15e-03°C from this effect for the full range of oceanographic temperature and salinity. Table 2 lists the drift and viscous heating corrections applied to temperature for these cruises.

6.3 Oxygen

In situ oxygen samples collected during GP700 and associated upcast CTD burst data were used for post-measurement calibration. Oxygen saturation values were computed according to Benson and Krause (1984) in units of μmol/kg.

The algorithm used for converting oxygen sensor current to oxygen as described by Owens and Millard (1985) requires a non-linear least squares regression technique in order to determine the best fit coefficients of the model for oxygen sensor behavior to the water sample observations. WHOI program OXFITMR uses Numerical Recipes (Press *et al.*, 1986) Fortran routines MRQMIN, MRQCOF, GAUSSJ, and COVSRT to perform non-linear least squares regression using the Levenberg-Marquardt method (McTaggart *et al.*, 1999). A Fortran subroutine FOXY describes the oxygen model with the derivatives of the model with respect to six coefficients in the following order: oxygen current slope, temperature correction, pressure correction, weight, oxygen current bias, and oxygen current lag.

Because the SBE-43 oxygen sensor is temperature compensated, weight was fixed at zero and the temperature correction was fixed at near zero. Because there were no deep titrated samples during GP700, the pressure correction was fixed at the pre-cruise value. 93% of the calibration data were used in the final fit, resulting in a standard deviation of 4.438 μmol/kg and the following coefficients:

bias	=	0.007
slope	=	0.5056e–3
pcor	=	0.1500e-3
tcor	=	–0.1000e-3
wt	=	0.000
lag	=	–1.174

CTD-bottle oxygen differences are plotted against station number and pressure to show the stability of the calibrated CTD oxygens relative to the bottle oxygens (Fig. 3).

7. Additional Processing

For 1999 cruises, SEASOFT processing modules are followed by PMEL VAX Fortran program EPSBE, which applies post-cruise calibrations to conductivity and converts the 1-dbar averaged CTD data to EPIC format (Soreide *et al.*, 1995). EPSBE creates a WOCE quality flag associated with each record of pressure, temperature, and CTD salinity. Quality flag definitions can be found in the WOCE Operations Manual (1994). EPSBE skips bad records near the surface and also any records flagged bad by SEASOFT. Measured data are copied back to 0 dbar and gaps are linearly interpolated such that a record exits every 1 dbar. WOCE flags are amended to reflect these changes. EPSBE calculates ITS-90 temperature and salinity (PSS-78), as well as potential temperature (IPTS-68), sigma-t, and sigma-theta using the 1980 equation of state algorithms described by Fofonoff and Millard (1983). Dynamic height in dynamic meters is calculated by integrating down from the sea surface.

For 2000 cruises, EPSBE was rewritten as UNIX Fortran program CNV_EPS. CNV_EPS performs the same functions as EPSBE but writes the data in NetCDF format.

PMEL VAX Fortran program EPICBOMSTR creates individual bottle files in EPIC format for each cast collected during 1999. PMEL UNIX Fortran program CLB_EPS creates individual bottle files in NetCDF format for casts collected during 2000.

8. Data Presentation

The majority of the plots that follow were produced using Plot Plus Scientific Graphics System (Denbo, 1992). Figures 4–53 are potential temperature, salinity, and sigma-theta sections for each meridian. Oxygen sections are also included for 95°W and 110°W from GP700. Figures 54–69 are composite potential temperature-salinity diagrams for each meridian. Tables 4–8 define the abbreviations and units used in the CTD data summary listings that are presented alongside 0–1000 m profiles of each cast for each cruise. Hydrographic bottle data at discrete depths are also given for each cruise.

9. Acknowledgments

The assistance of the officers, crew, and scientific parties of the NOAA ships *Ka'imimoana* and *Ronald H. Brown* are gratefully acknowledged. Salinity analyses were successfully completed by each ship's Survey Department personnel, CST Dennis Sweeney and CST Jonathan Shannahoff. Oxygen titrations were performed during GP700 by Melissa Hendricks of Princeton University. Sea-Bird is acknowledged for loan of a SBE-43 oxygen sensor prototype for GP700. Jim Carlson provided useful information on and support for the SBE-43. This research was supported by NOAA's Office of Global Programs.

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FIGURES AND TABLES

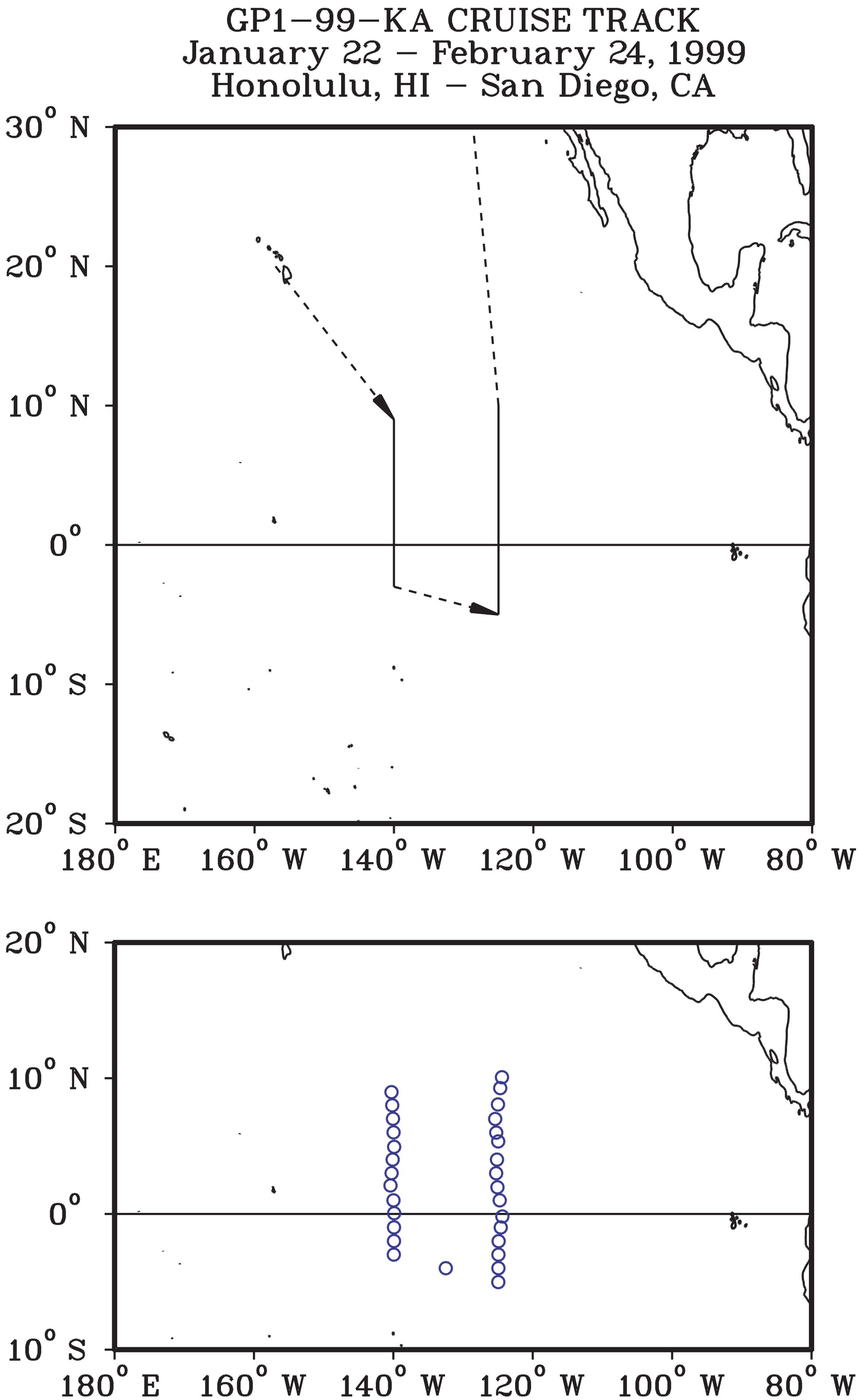

Figure 1a: GP1-99-KA cruise track and station locations.

Table 1a: GP1-99-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 58.5′N	140° 16.2′W	30 Jan 99	520	57	15	4882	1008
21	8° 0.3′N	140° 9.7′W	30 Jan 99	1327	93	10	5178	1003
31	7° 0.9′N	140° 3.4′W	30 Jan 99	2226	90	11	4973	1002
41	6° 0.6′N	139° 58.3′W	31 Jan 99	838	37	10	4834	1003
51	4° 56.5′N	139° 53.1′W	1 Feb 99	757	56	13	4496	1003
61	4° 0.3′N	140° 6.2′W	1 Feb 99	1604	56	15	4418	1004
71	3° 0.4′N	140° 15.1′W	1 Feb 99	2339	65	16	4334	1003
81	2° 5.7′N	140° 24.7′W	2 Feb 99	919	84	17	4334	4003
91	1° 0.1′N	139° 59.1′W	4 Feb 99	915	81	16	4323	1003
101	0° 3.2′N	139° 53.2′W	5 Feb 99	342	102	12	4360	1003
111	0° 59.4′S	139° 54.6′W	5 Feb 99	1158	81	15	4210	1002
121	1° 59.9′S	139° 54.7′W	5 Feb 99	2002	88	13	4100	1001
131	2° 59.9′S	139° 56.2′W	6 Feb 99	438	81	13	4309	1002
141	3° 59.9′S	132° 28.7′W	8 Feb 99	1225	110	14	4734	1002
151	5° 1.3′S	124° 56.7′W	11 Feb 99	624	59	13	4552	1003
161	3° 59.8′S	124° 55.6′W	11 Feb 99	1433	88	10	4523	1002
171	2° 59.9′S	124° 55.5′W	11 Feb 99	2221	100	14	4629	1002
181	2° 0.5′S	124° 53.7′W	12 Feb 99	637	151	11	4732	1003
191	0° 59.9′S	124° 35.5′W	12 Feb 99	1433	102	10	4668	1003
201	0° 11.3′S	124° 21.8′W	12 Feb 99	2025	93	6	4718	1003
211	1° 0.1′N	124° 44.4′W	13 Feb 99	704	88	9	4578	1003
221	1° 57.8′N	125° 4.0′W	13 Feb 99	2031	108	9	4673	1003
231	2° 59.9′N	125° 15.2′W	14 Feb 99	1131	105	7	4626	1002
241	4° 0.2′N	125° 7.9′W	14 Feb 99	1923	157	9	4493	1004
251	5° 20.7′N	124° 57.6′W	15 Feb 99	536	123	12	3927	1002
261	5° 59.6′N	125° 14.6′W	15 Feb 99	1110	148	4	4424	1003
271	7° 0.0′N	125° 23.5′W	15 Feb 99	2211	40	6	4572	1003
281	8° 4.1′N	124° 59.4′W	16 Feb 99	705	66	21	4607	1003
291	9° 16.3′N	124° 40.1′W	16 Feb 99	1747	35	19	4603	4107
301	10° 4.4′N	124° 25.0′W	17 Feb 99	201	36	21	4653	1005

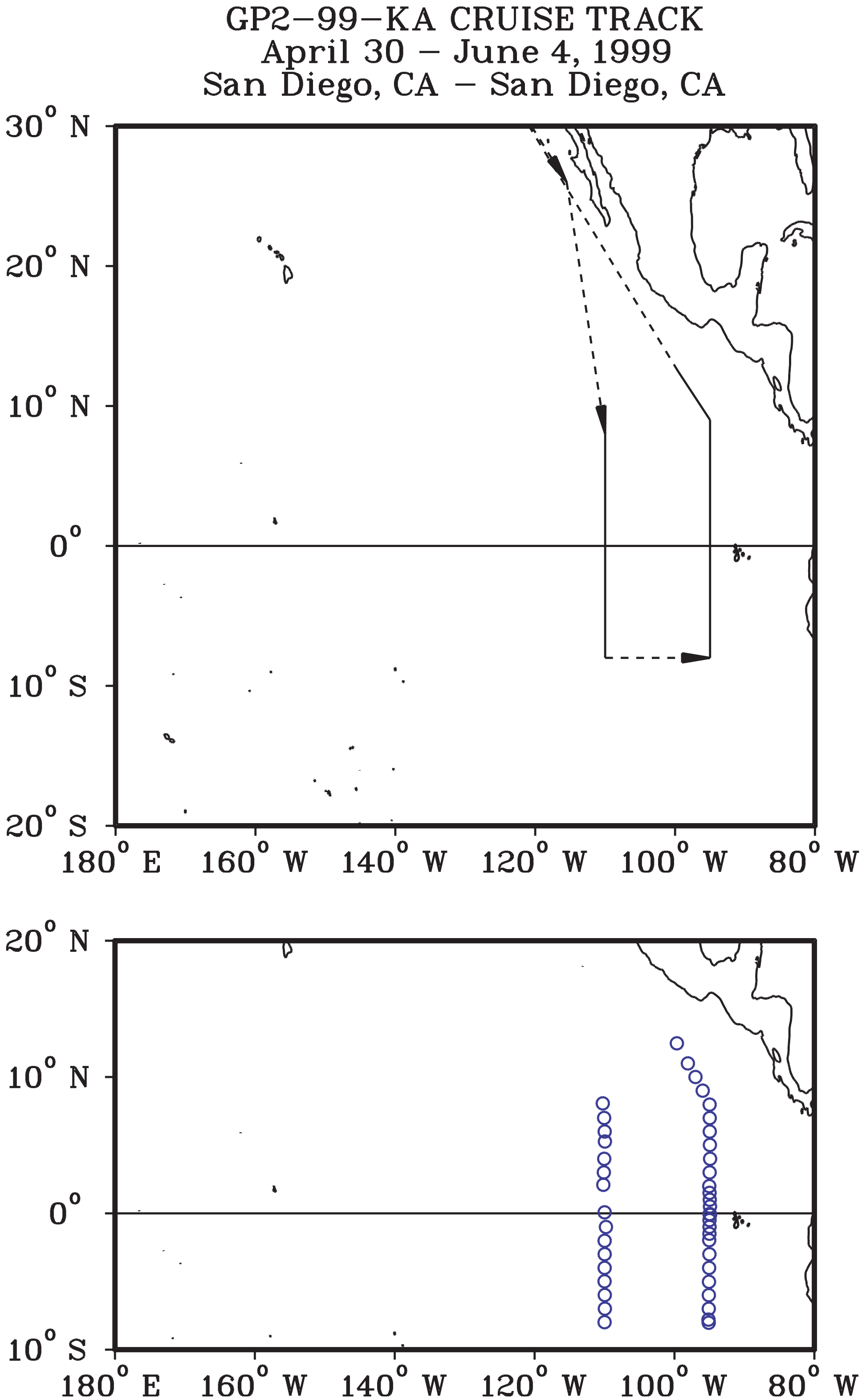

Figure 1b: GP2-99-KA cruise track and station locations.

Table 1b: GP2-99-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	26° 6.6′N	115° 27.9′W	2 May 99	529	337	13	3618	106
21	8° 4.0′N	110° 15.2′W	7 May 99	512	350	5	4084	1003
31	6° 59.9′N	110° 3.4′W	7 May 99	1253	357	4	3709	1004
41	6° 0.1′N	109° 58.9′W	7 May 99	1934	144	9	3686	1001
51	5° 16.2′N	109° 57.0′W	8 May 99	700	166	2	3874	3503
61	4° 0.0′N	110° 2.7′W	9 May 99	126	201	7	3916	1009
71	3° 0.2′N	110° 6.1′W	9 May 99	833	192	7	3905	1002
81	2° 5.6′N	110° 10.6′W	9 May 99	1553	164	6	3761	1003
101	0° 4.4′N	109° 59.2′W	10 May 99	831	144	5	3814	3504
111	1° 0.1′S	109° 48.1′W	12 May 99	610	181	6	3853	1004
121	2° 0.8′S	109° 59.2′W	12 May 99	1357	147	5	3943	1003
131	2° 59.8′S	109° 59.0′W	12 May 99	2022	161	5	3806	503
141	4° 0.0′S	109° 59.4′W	13 May 99	328	191	3	3611	1004
151	4° 59.3′S	109° 59.9′W	13 May 99	1033	174	3	3587	1002
161	5° 59.5′S	109° 58.4′W	13 May 99	1734	140	8	3787	1002
171	6° 59.6′S	109° 57.3′W	14 May 99	111	96	16	3546	1001
181	7° 59.1′S	109° 59.8′W	14 May 99	1326	91	16	3503	1003
191	8° 1.6′S	95° 6.5′W	19 May 99	910	130	13	3577	2004
192	7° 47.9′S	95° 8.2′W	19 May 99	1905	143	12	3945	202
201	6° 59.9′S	95° 5.8′W	20 May 99	22	144	9	3893	1001
211	6° 0.2′S	95° 5.2′W	20 May 99	735	142	11	3903	1002
221	5° 1.3′S	95° 4.1′W	20 May 99	2042	136	10	3824	1003
231	4° 0.1′S	95° 2.8′W	21 May 99	357	144	9	3712	1003
241	3° 0.0′S	95° 0.4′W	21 May 99	1050	176	8	3530	1001
251	1° 58.2′S	95° 1.9′W	21 May 99	1745	149	11	3355	1004
261	1° 29.9′S	95° 0.1′W	21 May 99	2140	147	9	3339	1002
271	0° 59.5′S	94° 59.2′W	22 May 99	131	145	10	3349	1007
281	0° 29.8′S	94° 59.6′W	22 May 99	502	114	7	3389	1003
291	0° 3.0′S	94° 58.4′W	23 May 99	310	123	10	3286	3002
292	0° 6.5′S	94° 54.9′W	23 May 99	1745	128	11	3379	503
301	0° 30.2′N	94° 55.5′W	23 May 99	2134	134	9	3325	1002
311	1° 0.0′N	94° 57.3′W	24 May 99	119	129	9	3512	1004
321	1° 30.2′N	94° 59.1′W	24 May 99	524	133	10	2625	1002
331	1° 59.8′N	95° 1.6′W	24 May 99	1646	142	7	3207	1005
341	3° 0.2′N	94° 58.3′W	24 May 99	2327	172	17	2726	1003
351	4° 0.1′N	94° 54.6′W	25 May 99	529	180	10	3268	1003
361	5° 1.1′N	94° 56.3′W	25 May 99	2104	213	10	3584	1003
371	6° 0.0′N	94° 57.5′W	26 May 99	344	194	10	3745	1003
381	6° 59.4′N	94° 57.7′W	26 May 99	1016	278	4	3685	1003
391	7° 58.7′N	94° 58.7′W	26 May 99	2013	217	3	3748	1003
401	9° 0.0′N	95° 57.9′W	27 May 99	705	215	50	3678	1003
411	10° 0.1′N	97° 0.0′W	27 May 99	1659	64	3	4043	1003
421	11° 0.0′N	98° 5.1′W	28 May 99	240	66	7	3695	1002
431	12° 28.4′N	99° 39.5′W	28 May 99	1508	119	4	3500	3302

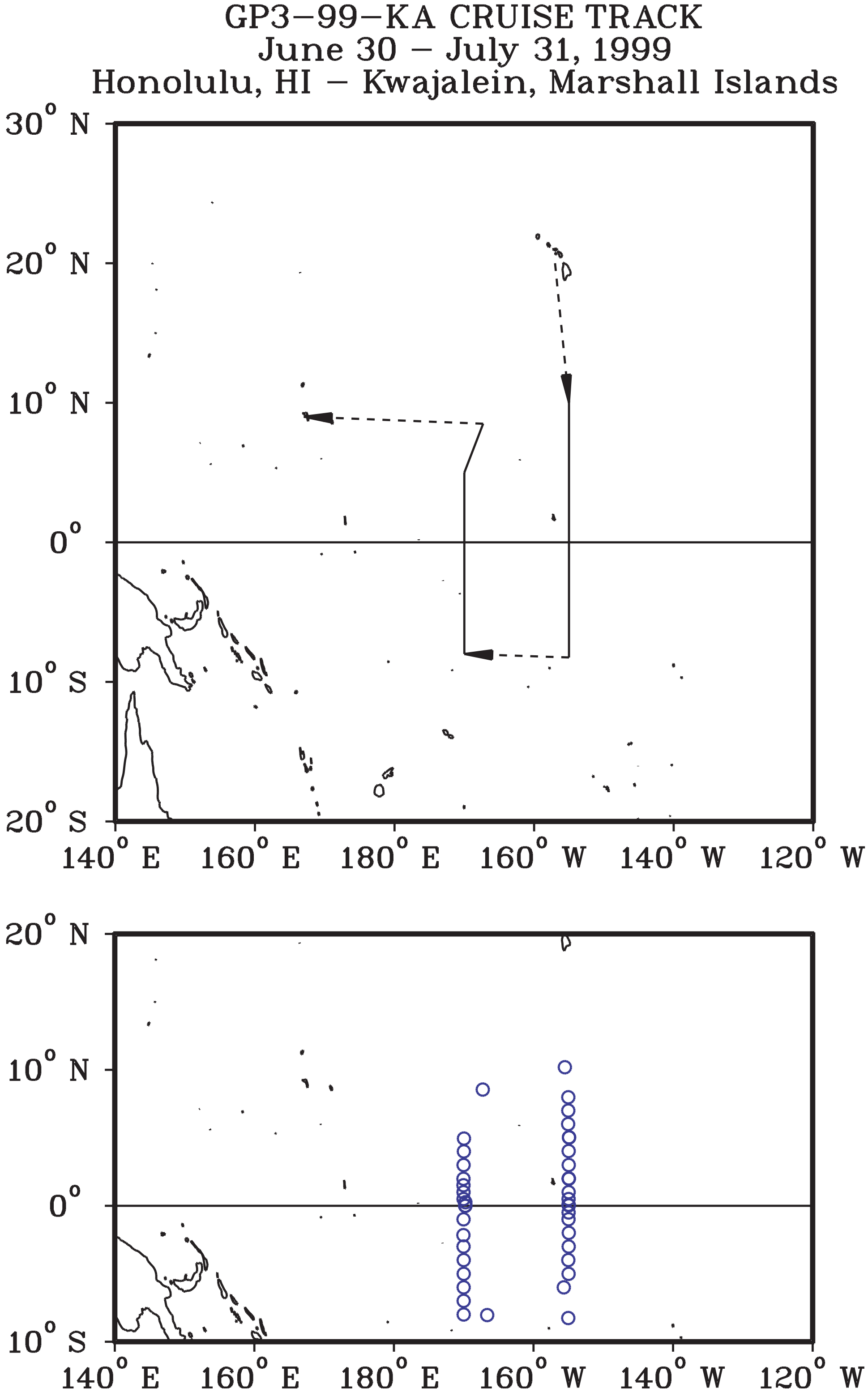

Figure 1c: GP3-99-KA cruise track and station locations.

Table 1c: GP3-99-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	10° 11.6′N	155° 30.5′W	3 Jul 99	2353	68	2	5272	503
21	7° 59.1′N	155° 0.9′W	4 Jul 99	1535	67	7	5142	1002
31	7° 0.3′N	155° 1.1′W	5 Jul 99	1004	23	10	5020	1002
41	6° 0.8′N	155° 2.3′W	5 Jul 99	1719	113	11	4883	1004
51	5° 2.3′N	154° 54.8′W	6 Jul 99	1057	122	8	4609	4011
52	5° 1.5′N	154° 54.1′W	6 Jul 99	1252	118	9	4610	202
61	4° 1.7′N	154° 57.8′W	7 Jul 99	56	109	19	4696	1003
71	3° 0.1′N	154° 57.1′W	7 Jul 99	857	97	19	4806	1004
81	1° 59.1′N	154° 56.9′W	7 Jul 99	1659	80	9	4654	1001
82	2° 0.7′N	154° 57.0′W	7 Jul 99	2251	90	16	4619	203
91	1° 0.1′N	154° 57.9′W	7 Jul 99	704	67	13	4762	1002
101	0° 29.9′N	154° 58.5′W	7 Jul 99	1122	50	11	4783	1005
111	0° 4.6′N	154° 58.9′W	8 Jul 99	1525	75	10	4647	1006
112	0° 1.8′N	154° 56.4′W	8 Jul 99	2335	77	10	4635	203
121	0° 29.7′S	154° 58.3′W	9 Jul 99	951	62	12	4888	1004
131	0° 59.5′S	154° 58.9′W	9 Jul 99	1418	100	17	4727	1014
141	1° 59.4′S	154° 56.7′W	10 Jul 99	345	87	19	3733	1003
151	2° 59.9′S	154° 57.5′W	10 Jul 99	1207	87	20	5514	1005
161	3° 59.5′S	155° 0.7′W	10 Jul 99	1910	79	21		1002
171	5° 0.4′S	154° 58.4′W	11 Jul 99	535	75	26	5023	1003
181	6° 0.1′S	154° 99.6′W	11 Jul 99	1314	100	23	5777	1003
191	8° 15.4′S	155° 1.2′W	12 Jul 99	503	97	22	5302	1003
201	8° 2.4′S	166° 38.2′W	15 Jul 99	53	76	16	4101	204
211	7° 59.9′S	170° 0.4′W	15 Jul 99	2020	87	14	5373	1002
221	6° 59.7′S	170° 0.4′W	16 Jul 99	336	92	16	4817	1002
231	6° 0.0′S	170° 0.6′W	16 Jul 99	1049	96	16	4806	1003
241	5° 0.3′S	170° 0.2′W	16 Jul 99	1755	104	17	5418	1003
251	3° 59.6′S	170° 0.1′W	17 Jul 99	1146	87	13	5745	1001
261	2° 59.8′S	170° 1.5′W	17 Jul 99	1814	110	13	4824	1003
271	2° 9.5′S	170° 2.7′W	18 Jul 99	141	92	13	5441	1003
281	0° 59.8′S	170° 1.5′W	18 Jul 99	1536	80	13	5157	1003
291	0° 0.2′S	169° 47.5′W	19 Jul 99	911	64	13	5417	4008
292	0° 0.0′N	169° 45.9′W	19 Jul 99	1521	80	13	5419	501
301	0° 15.6′N	169° 45.7′W	20 Jul 99	1313	70	16	5073	4008
311	0° 29.7′N	170° 1.4′W	21 Jul 99	642	92	14	5417	1002
321	1° 0.1′N	170° 1.6′W	21 Jul 99	1029	90	15	5457	1005
331	1° 30.6′N	170° 2.1′W	21 Jul 99	1434	120	12	5508	1001
341	1° 59.2′N	170° 2.1′W	21 Jul 99	1818	115	15	5402	1005
351	2° 59.9′N	170° 1.2′W	22 Jul 99	246	83	15	5484	1003
361	4° 0.0′N	169° 58.7′W	22 Jul 99	1000	80	14	5680	1003
371	4° 56.8′N	169° 57.9′W	22 Jul 99	1710	90	12	5809	1002
381	8° 33.0′N	167° 16.3′W	30 Jul 99	246	53	6	4579	4003

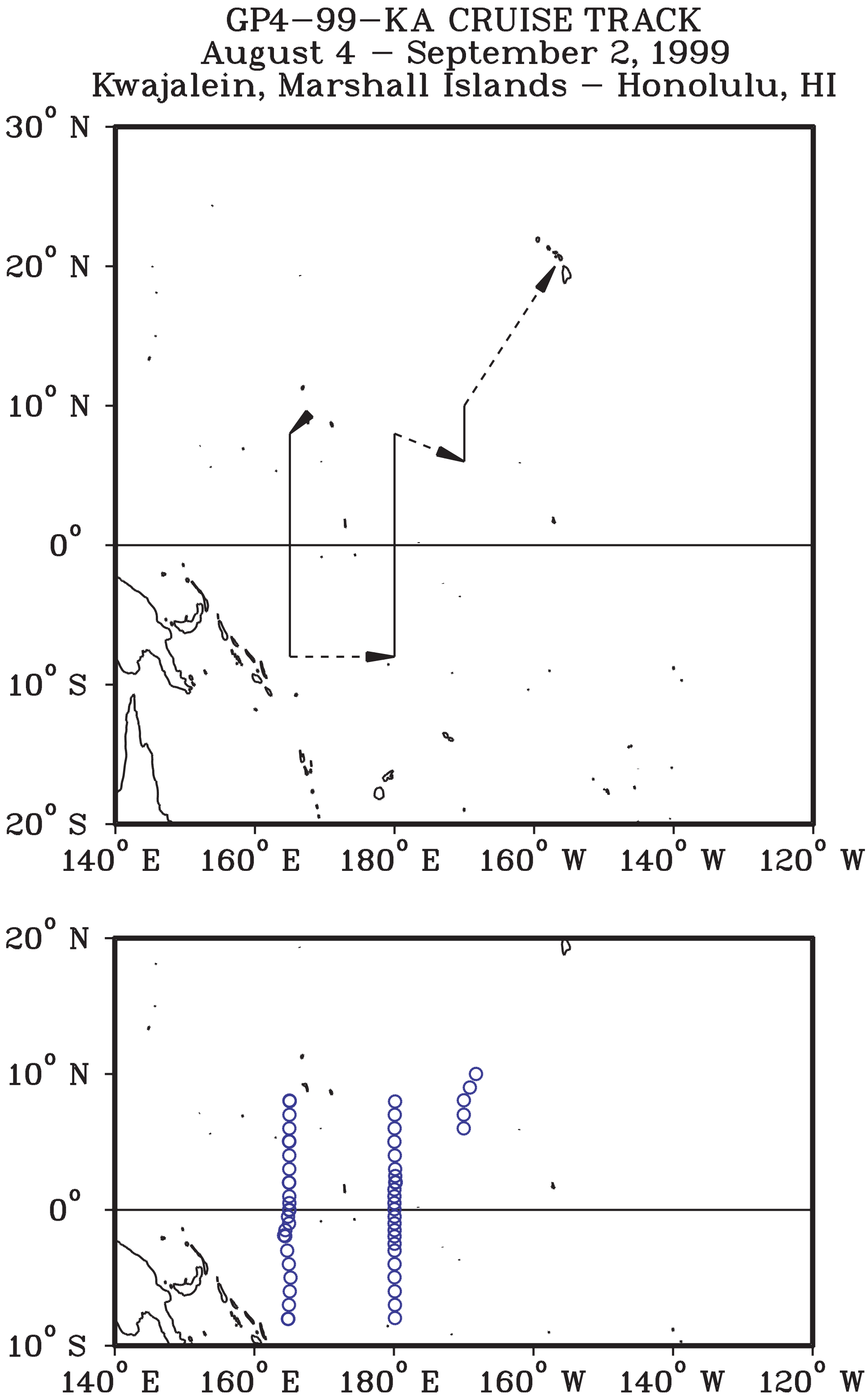

Figure 1d: GP4-99-KA cruise track and station locations.

Table 1d: GP4-99-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 2.7′N	165° 2.0′E	5 Aug 99	1801	122	13	5211	4006
12	8° 0.2′N	165° 3.7′E	6 Aug 99	337	118	9	5210	202
21	7° 0.0′N	165° 1.7′E	6 Aug 99	1029	57	4	5151	1002
31	5° 59.9′N	165° 0.6′E	6 Aug 99	1654	52	8	4999	1002
41	5° 3.3′N	164° 57.7′E	7 Aug 99	452	55	7	4784	4007
42	5° 1.8′N	165° 0.6′E	7 Aug 99	2253	58	8	4775	1005
51	4° 0.3′N	165° 0.3′E	8 Aug 99	710	55	7	4490	1003
61	3° 0.1′N	165° 0.1′E	8 Aug 99	1342	52	10	4254	1001
71	2° 0.6′N	164° 57.8′E	9 Aug 99	447	39	5	4171	4004
72	2° 0.2′N	164° 58.8′E	9 Aug 99	736	335	2	4170	207
81	0° 59.9′N	165° 0.2′E	9 Aug 99	1724	171	13	4329	1003
91	0° 30.0′N	165° 0.8′E	9 Aug 99	2131	176	12	4365	1005
101	0° 0.7′N	164° 59.9′E	10 Aug 99	621	191	6	4406	4003
111	0° 1.3′S	165° 0.7′E	11 Aug 99	43	140	26	4404	1002
121	0° 30.1′S	164° 49.3′E	11 Aug 99	452	110	8	4428	1002
131	0° 59.8′S	164° 58.2′E	11 Aug 99	850	60	10	4414	1002
141	1° 29.6′S	164° 26.5′E	11 Aug 99	1251	60	10	4438	1002
151	1° 52.9′S	164° 15.8′E	11 Aug 99	1844	51	6	4441	4004
152	1° 56.1′S	164° 25.6′E	12 Aug 99	320	27	11	4431	1002
161	2° 59.9′S	164° 42.0′E	12 Aug 99	1039	37	15	3927	1002
171	3° 59.9′S	164° 56.6′E	12 Aug 99	1733	50	14	3226	1002
181	4° 59.3′S	165° 10.8′E	13 Aug 99	252	57	12	2497	1004
191	6° 0.0′S	165° 4.3′E	13 Aug 99	938	81	10	3604	1002
201	6° 59.7′S	164° 57.2′E	13 Aug 99	1606	100	9	3716	1002
211	8° 1.5′S	164° 48.9′E	13 Aug 99	2305	122	9	3892	202
212	8° 1.3′S	164° 51.7′E	14 Aug 99	57	135	11	3895	3704
221	7° 57.8′S	179° 51.3′W	17 Aug 99	2118	80	11	5521	1002
231	6° 59.8′S	179° 51.4′W	18 Aug 99	347	84	13	5284	1003
241	5° 59.9′S	179° 52.8′W	18 Aug 99	1032	100	16	5088	1001
251	4° 57.8′S	179° 55.0′W	19 Aug 99	506	60	15	5627	4033
261	3° 59.6′S	179° 54.4′W	19 Aug 99	1325	81	12	5848	1005
271	3° 0.0′S	179° 54.4′W	19 Aug 99	2000	51	8	5272	1007
281	2° 29.7′S	179° 54.5′W	19 Aug 99	2351	86	7	5402	1006
291	1° 57.0′S	179° 54.6′W	20 Aug 99	510	62	9	5327	4005
301	1° 29.9′S	179° 54.3′W	20 Aug 99	924	65	14	5231	1005
311	0° 59.8′S	179° 54.7′W	20 Aug 99	1309	94	14	5347	1007
321	0° 29.8′S	179° 54.3′W	20 Aug 99	1706	90	15	4843	1001
331	0° 2.8′N	179° 55.2′W	20 Aug 99	2250	98	16	5384	4001
341	0° 30.1′N	179° 55.6′W	21 Aug 99	310	97	19	5757	1004
351	0° 59.9′N	179° 55.5′W	21 Aug 99	656	95	17	5803	1003
361	1° 30.0′N	179° 55.7′W	21 Aug 99	1049	93	17	5354	1002
371	2° 1.5′N	179° 44.3′W	21 Aug 99	1727	95	15	5319	4003
372	2° 1.7′N	179° 49.2′W	21 Aug 99	2210	97	22	5470	202
381	2° 29.6′N	179° 48.9′W	22 Aug 99	159	85	20	5308	1003
391	3° 0.1′N	179° 49.7′W	22 Aug 99	554	101	16	5971	1002
401	4° 0.1′N	179° 52.5′W	22 Aug 99	1239	97	15	5424	1004
411	5° 1.0′N	179° 55.7′W	23 Aug 99	605	86	16	5605	4001
421	6° 0.1′N	179° 54.2′W	23 Aug 99	1354	86	15	5502	1003
431	7° 0.0′N	179° 52.8′W	23 Aug 99	2020	85	13	5782	1001
441	7° 58.7′N	179° 50.2′W	24 Aug 99	428	83	5	5871	4001
451	6° 0.0′N	169° 59.9′W	26 Aug 99	1855	144	95	5369	1003
461	7° 0.3′N	169° 59.7′W	27 Aug 99	133	124	16	4615	1004
471	8° 4.0′N	169° 58.8′W	27 Aug 99	1613	69	11	5441	4003
481	9° 0.4′N	169° 7.2′W	28 Aug 99	350	58	17	4982	1002
491	10° 0.3′N	168° 14.6′W	28 Aug 99	1404	13	18	5254	1004

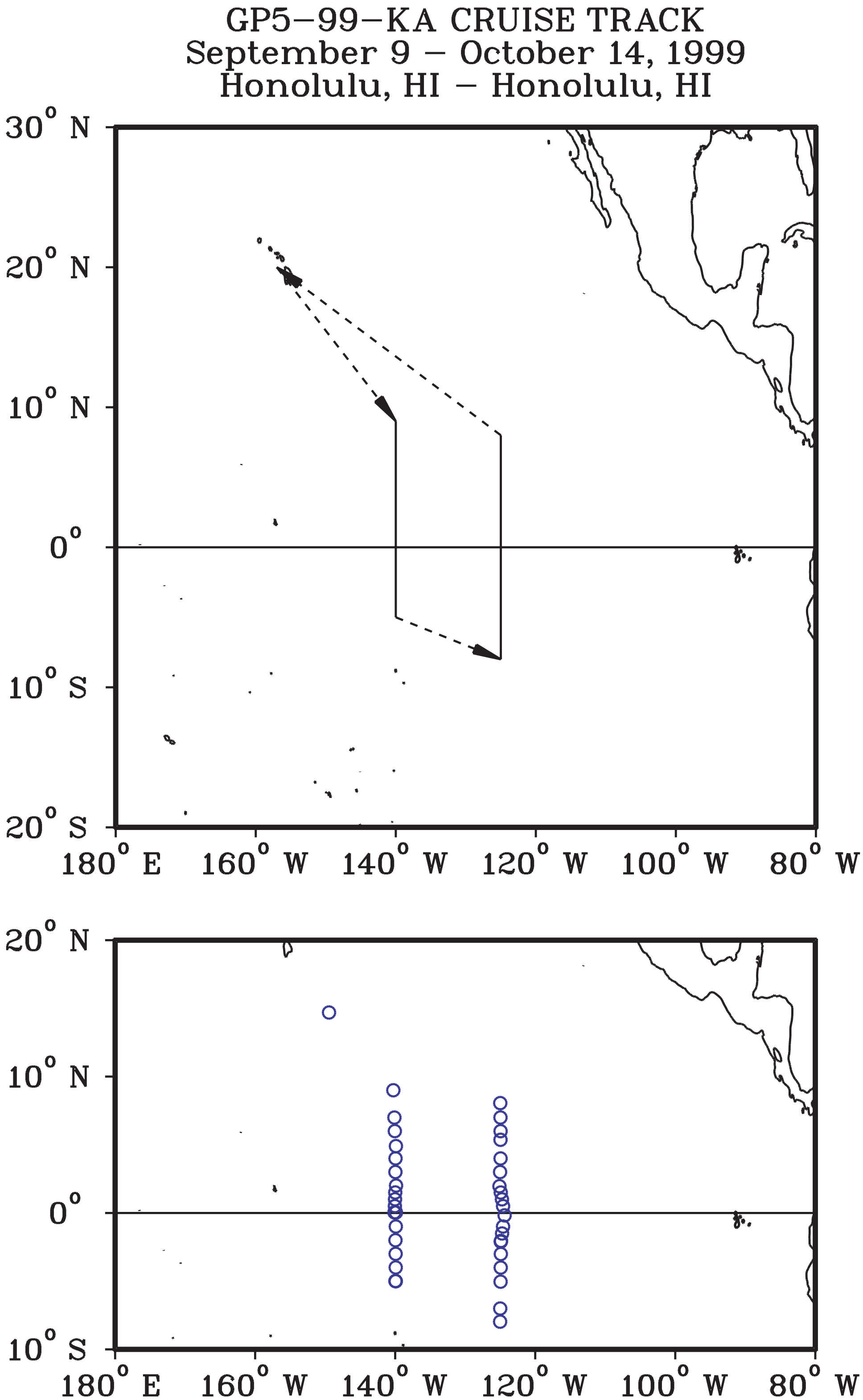

Figure 1e: GP5-99-KA cruise track and station locations.

Table 1e: GP5-99-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	14° 41.9′N	149° 27.0′W	12 Sep 99	2031	76	13		203
21	8° 59.8′N	140° 16.1′W	16 Sep 99	45	226	9	4815	1003
31	6° 59.7′N	140° 6.8′W	16 Sep 99	1315	145	9	4948	1002
41	6° 0.2′N	140° 3.2′W	16 Sep 99	1952	157	11	4797	1000
51	4° 54.1′N	139° 53.8′W	17 Sep 99	540	140	15	4481	4004
61	4° 0.0′N	139° 57.2′W	18 Sep 99	118	149	11	4309	1003
71	3° 0.2′N	139° 58.2′W	18 Sep 99	757	133	16	4291	1004
81	2° 0.5′N	139° 52.7′W	18 Sep 99	1603	120	15	4367	1003
91	1° 30.1′N	139° 59.7′W	19 Sep 99	9	145	13	4448	1001
101	1° 0.2′N	140° 1.4′W	19 Sep 99	443	116	11	4389	1003
111	0° 30.2′N	140° 2.9′W	19 Sep 99	917	121	10	4345	1003
121	0° 2.6′N	140° 6.1′W	20 Sep 99	710	71	11	4323	4005
122	0° 2.1′N	139° 53.5′W	21 Sep 99	348	94	11	4350	203
131	0° 59.6′S	139° 54.7′W	21 Sep 99	1136	80	9	4214	1003
141	1° 59.9′S	139° 57.6′W	22 Sep 99	212	89	9	4322	1003
151	2° 59.7′S	139° 56.4′W	22 Sep 99	927	70	10	4307	1003
161	3° 59.7′S	139° 55.5′W	22 Sep 99	1627	60	15	4509	1003
171	4° 59.3′S	139° 58.0′W	23 Sep 99	411	60	13	4272	4006
172	5° 0.3′S	139° 55.0′W	23 Sep 99	1905	47	16	4339	202
181	7° 58.2′S	125° 0.9′W	28 Sep 99	541	103	15	4544	1005
191	7° 0.3′S	125° 0.0′W	28 Sep 99	1317	95	15	4637	1003
201	5° 2.3′S	124° 57.0′W	29 Sep 99	349	90	11	4533	1004
211	4° 0.3′S	124° 55.8′W	29 Sep 99	1120	70	11	4529	1002
221	3° 0.4′S	124° 54.8′W	29 Sep 99	1850	84	14	4637	1003
231	2° 6.5′S	124° 55.3′W	30 Sep 99	640	92	12	4631	4007
232	2° 2.8′S	124° 53.5′W	30 Sep 99	1843	83	12	4727	203
241	1° 30.2′S	124° 44.2′W	30 Sep 99	2324	100	14	4570	394
251	0° 59.7′S	124° 35.9′W	1 Oct 99	406	100	14	4660	1003
261	0° 10.5′S	124° 22.3′W	1 Oct 99	2156	105	18	4723	1005
271	0° 30.0′N	124° 35.8′W	2 Oct 99	310	107	17	4530	1004
281	1° 0.0′N	124° 45.4′W	2 Oct 99	658	107	18	4610	1003
291	1° 30.0′N	124° 55.5′W	2 Oct 99	1053	120	18	4645	1001
301	1° 57.6′N	125° 6.6′W	2 Oct 99	1437	135	17	4731	1003
311	3° 0.1′N	125° 1.2′W	3 Oct 99	821	124	20	4450	1002
321	3° 59.9′N	124° 57.1′W	3 Oct 99	1500	135	16	4434	1003
331	5° 21.9′N	124° 57.6′W	4 Oct 99	600	125	14	4084	4007
341	5° 59.9′N	124° 57.1′W	4 Oct 99	2242	140	10	4418	1008
351	6° 59.9′N	124° 57.9′W	5 Oct 99	537	156	16	4665	1005
361	8° 3.3′N	124° 59.7′W	5 Oct 99	1450	178	17	4631	1004

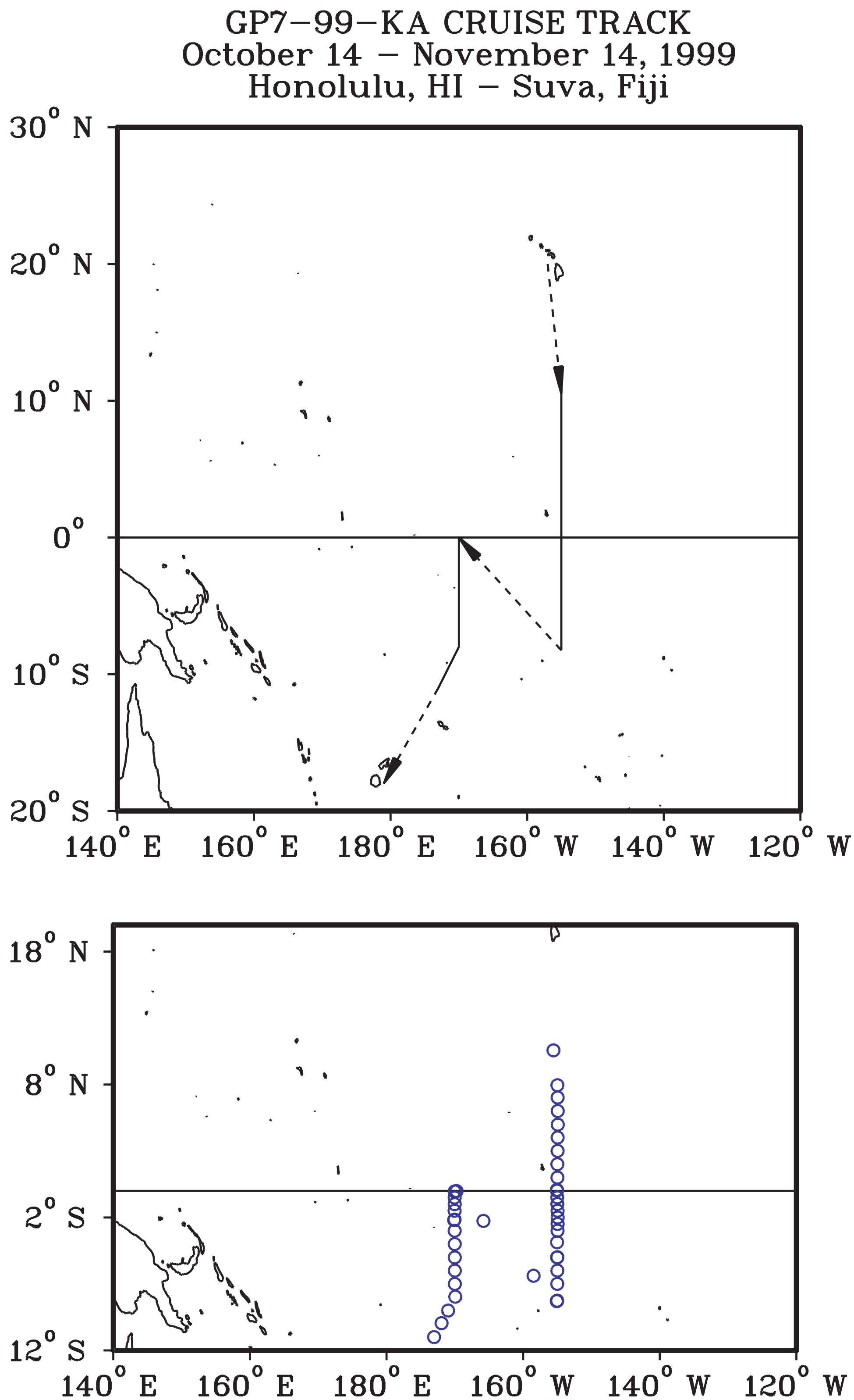

Figure 1f: GP7-99-KA cruise track and station locations.

Table 1f: GP7-99-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	10° 34.1′N	155° 33.7′W	23 Oct 99	2054	62	19	5146	1004
21	7° 56.7′N	154° 59.2′W	24 Oct 99	1506	96	14	5204	1006
31	7° 1.3′N	154° 57.0′W	24 Oct 99	2245	123	16	4833	1006
41	6° 0.4′N	154° 56.2′W	25 Oct 99	638	128	17	4770	1004
51	4° 59.0′N	154° 55.7′W	25 Oct 99	1431	90	9	4546	1005
61	4° 0.9′N	154° 57.0′W	25 Oct 99	2222	86	18	4648	1003
71	3° 0.5′N	154° 57.4′W	26 Oct 99	537	76	17	4748	1003
81	2° 0.3′N	154° 59.6′W	26 Oct 99	1339	120	12	4640	1002
91	1° 0.1′N	154° 58.9′W	26 Oct 99	2102	96	16	4707	1003
101	0° 4.6′N	155° 3.4′W	27 Oct 99	1013	72	17	4629	4006
102	0° 1.1′N	155° 2.8′W	27 Oct 99	2158	72	14	4649	205
111	0° 29.4′S	155° 0.3′W	28 Oct 99	218	70	13	4840	1003
121	0° 59.2′S	154° 59.3′W	28 Oct 99	633	68	13	4696	1006
131	1° 29.6′S	154° 57.6′W	28 Oct 99	1054	77	14	4830	1004
141	2° 0.2′S	154° 56.8′W	28 Oct 99	1509	80	15	4940	1002
151	2° 29.3′S	154° 57.1′W	28 Oct 99	1930	80	16	4888	1004
161	2° 59.5′S	154° 57.9′W	29 Oct 99	6	78	22	4852	1002
171	3° 51.9′S	155° 2.2′W	29 Oct 99	619	76	22	3683	1003
181	5° 0.1′S	155° 1.1′W	29 Oct 99	1607	77	19	4244	4003
182	4° 59.7′S	154° 59.8′W	30 Oct 99	344	78	14	4950	202
191	5° 59.7′S	154° 59.6′W	30 Oct 99	1050	77	18	5181	1002
201	6° 59.6′S	155° 0.4′W	30 Oct 99	1812	73	25	5095	1004
211	8° 17.6′S	155° 4.6′W	31 Oct 99	834	56	8	5278	4006
212	8° 15.5′S	155° 0.7′W	31 Oct 99	2114	70	13	5271	204
221	6° 22.9′S	158° 28.5′W	1 Nov 99	2145	91	6	5194	202
231	2° 15.5′S	165° 48.7′W	3 Nov 99	2238	68	18	5795	201
241	0° 0.9′S	169° 44.9′W	5 Nov 99	111	81	18	5372	206
251	0° 2.6′S	170° 1.7′W	5 Nov 99	1021	71	23	5502	1003
261	0° 30.1′S	170° 1.4′W	5 Nov 99	1408	70	20	5628	1002
271	0° 59.9′S	170° 1.1′W	5 Nov 99	1807	55	15	5731	1007
281	1° 29.8′S	170° 2.1′W	5 Nov 99	2231	53	14	5457	1002
291	2° 11.9′S	170° 5.8′W	6 Nov 99	934	85	15	5118	4004
292	2° 9.7′S	170° 2.4′W	7 Nov 99	1	99	16	4906	202
301	3° 0.0′S	170° 1.5′W	7 Nov 99	625	73	20	5056	1003
311	4° 0.0′S	170° 1.0′W	7 Nov 99	1339	90	18	5663	1001
321	5° 0.4′S	170° 0.5′W	7 Nov 99	2115	76	18	5348	1002
331	5° 59.8′S	170° 0.0′W	8 Nov 99	456	88	18	4764	1007
341	6° 59.9′S	170° 0.1′W	8 Nov 99	1200	78	13	4702	1003
351	7° 57.6′S	169° 56.2′W	8 Nov 99	2329	66	13	5269	1001
361	9° 0.1′S	170° 59.2′W	9 Nov 99	1214	54	2	4418	1001
371	9° 57.1′S	171° 56.8′W	10 Nov 99	107	353	6	3909	3703
381	10° 59.9′S	173° 2.2′W	10 Nov 99	1226	109	7	4688	1002

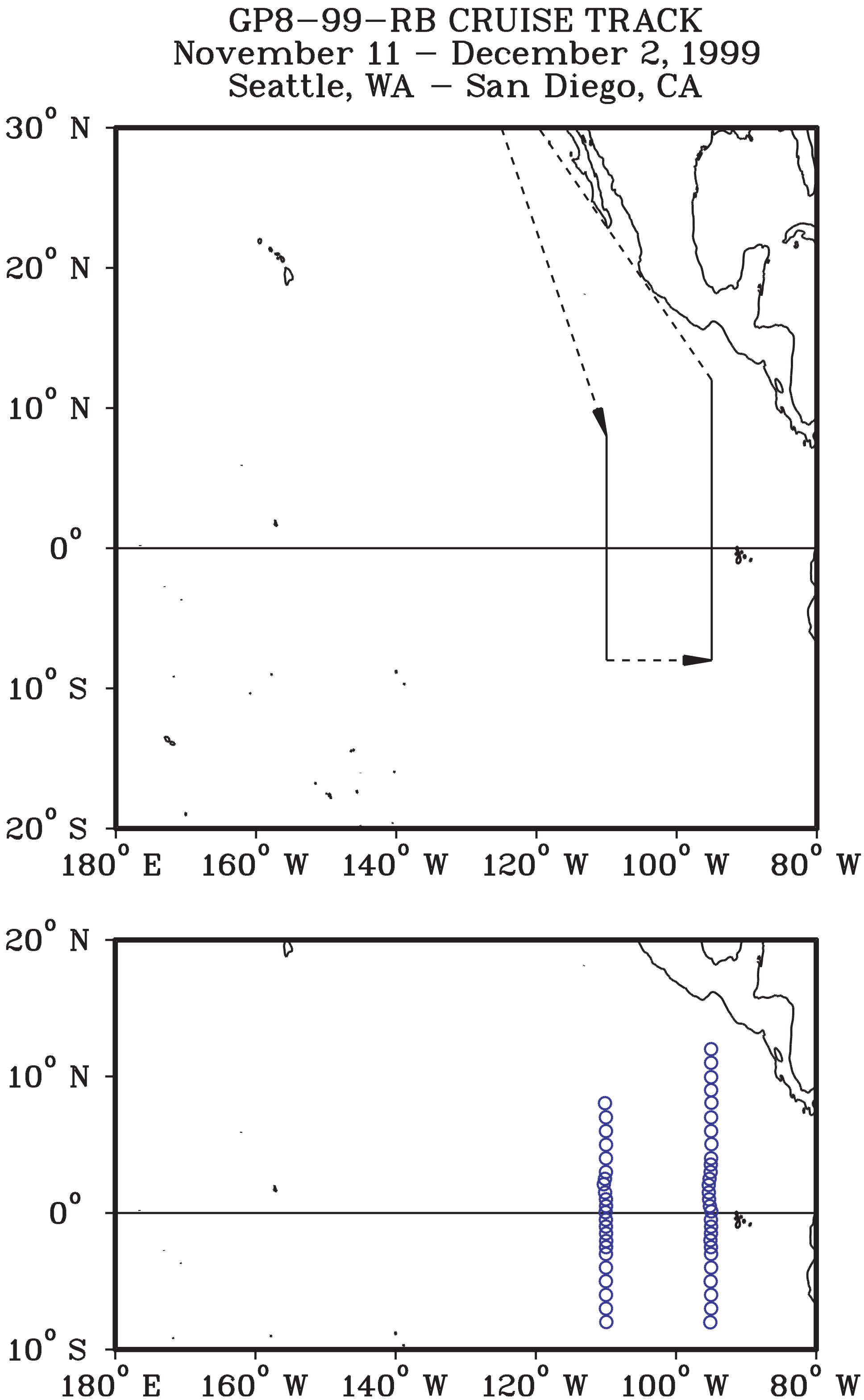

Figure 1g: GP8-99-RB cruise track and station locations.

Table 1g: GP8-99-RB CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 2.6′N	110° 8.3′W	11 Nov 99	1258	65	9	4231	1001
21	7° 0.4′N	110° 0.3′W	12 Nov 99	1157	180	10	3717	1002
31	6° 0.0′N	110° 0.0′W	12 Nov 99	1800	170	14	3685	1002
41	4° 59.9′N	109° 59.4′W	12 Nov 99	2356	160	12	3923	1002
51	4° 0.1′N	110° 0.0′W	13 Nov 99	742	164	17	3878	1003
61	3° 0.0′N	110° 0.0′W	13 Nov 99	1324	148	16	3883	1002
71	2° 30.0′N	110° 8.6′W	13 Nov 99	1720	145	15	3739	1002
81	2° 6.2′N	110° 18.5′W	14 Nov 99	454	135	9	3796	1005
91	1° 29.9′N	110° 7.3′W	14 Nov 99	1040	145	7	3756	1014
101	1° 0.1′N	110° 0.1′W	14 Nov 99	1415	120	15	3812	1003
111	0° 30.3′N	109° 59.1′W	14 Nov 99	1741	100	11	3693	1003
121	0° 3.2′N	110° 3.1′W	15 Nov 99	603	95	10	3734	3777
131	0° 29.6′S	110° 0.4′W	16 Nov 99	832	115	9	3647	1002
141	0° 59.7′S	110° 0.0′W	16 Nov 99	1223	100	7	3989	1002
151	1° 30.0′S	109° 59.0′W	16 Nov 99	1550	110	9	3874	1002
161	2° 3.0′S	109° 57.9′W	17 Nov 99	204	125	11	3929	1003
171	2° 30.0′S	109° 59.0′W	17 Nov 99	536	120	9	3904	1003
181	3° 0.1′S	110° 0.1′W	17 Nov 99	859	120	7	3750	1004
191	4° 0.0′S	110° 0.0′W	17 Nov 99	1444	120	13	3811	1002
201	4° 59.9′S	110° 0.4′W	18 Nov 99	511	110	15	3522	1002
211	6° 0.0′S	110° 0.0′W	18 Nov 99	1114	95	13	3556	1000
221	7° 0.0′S	110° 0.0′W	18 Nov 99	1713	110	15	3460	1001
231	7° 59.1′S	109° 56.8′W	19 Nov 99	739	110	14	3494	3539
241	8° 0.4′S	95° 7.0′W	23 Nov 99	650	130	10	4023	4068
251	6° 59.9′S	94° 59.9′W	24 Nov 99	752	130	17	3963	1001
261	6° 0.0′S	95° 0.0′W	24 Nov 99	1342	158	15	3818	1001
271	5° 0.6′S	95° 3.8′W	24 Nov 99	2029	165	11	3819	1003
281	4° 0.0′S	95° 0.0′W	25 Nov 99	211	160	15	3732	1004
291	3° 0.2′S	95° 0.2′W	25 Nov 99	758	160	11	3540	1006
301	2° 30.2′S	95° 1.2′W	25 Nov 99	1126	143	7	2713	1002
311	1° 59.9′S	95° 5.8′W	26 Nov 99	205	133	8	3371	1001
321	1° 30.0′S	95° 1.0′W	26 Nov 99	614	125	5	3329	1001
331	1° 0.0′S	95° 0.0′W	26 Nov 99	933	135	8	3324	1001
341	0° 30.0′S	95° 1.6′W	26 Nov 99	1245	138	7	3366	1001
351	0° 6.9′N	94° 58.3′W	27 Nov 99	357	110	5	3346	1001
361	0° 30.2′N	95° 10.7′W	27 Nov 99	726	130	6	3314	1000
371	1° 0.1′N	95° 17.2′W	27 Nov 99	1039	140	15	3287	1002
381	1° 30.0′N	95° 19.5′W	27 Nov 99	1358	148	18	2799	1001
391	2° 2.9′N	95° 20.3′W	28 Nov 99	7	150	14	2758	1002
401	2° 30.0′N	95° 13.5′W	28 Nov 99	329	150	15	2548	1002
411	3° 0.0′N	95° 3.8′W	28 Nov 99	705	170	12	3117	1001
421	3° 32.7′N	95° 2.6′W	28 Nov 99	1253	190	18	3254	1000
431	4° 0.2′N	95° 0.1′W	28 Nov 99	2157	165	13	3470	1001
441	5° 2.6′N	94° 57.1′W	29 Nov 99	504	200	10	3580	1002
451	6° 0.0′N	95° 0.0′W	29 Nov 99	1016	135	11	3212	1001
461	7° 0.0′N	95° 0.0′W	29 Nov 99	1548	145	3	3679	1002
471	8° 4.3′N	94° 57.2′W	30 Nov 99	738	48	10	3655	1001
481	8° 59.9′N	95° 0.0′W	1 Dec 99	348	36	13	3540	1002
491	9° 56.8′N	94° 59.9′W	1 Dec 99	1004	30	10	3861	1001
501	11° 0.1′N	95° 0.0′W	2 Dec 99	10	20	12	4083	1002
511	12° 0.0′N	95° 0.0′W	2 Dec 99	644	15	16	4028	1002

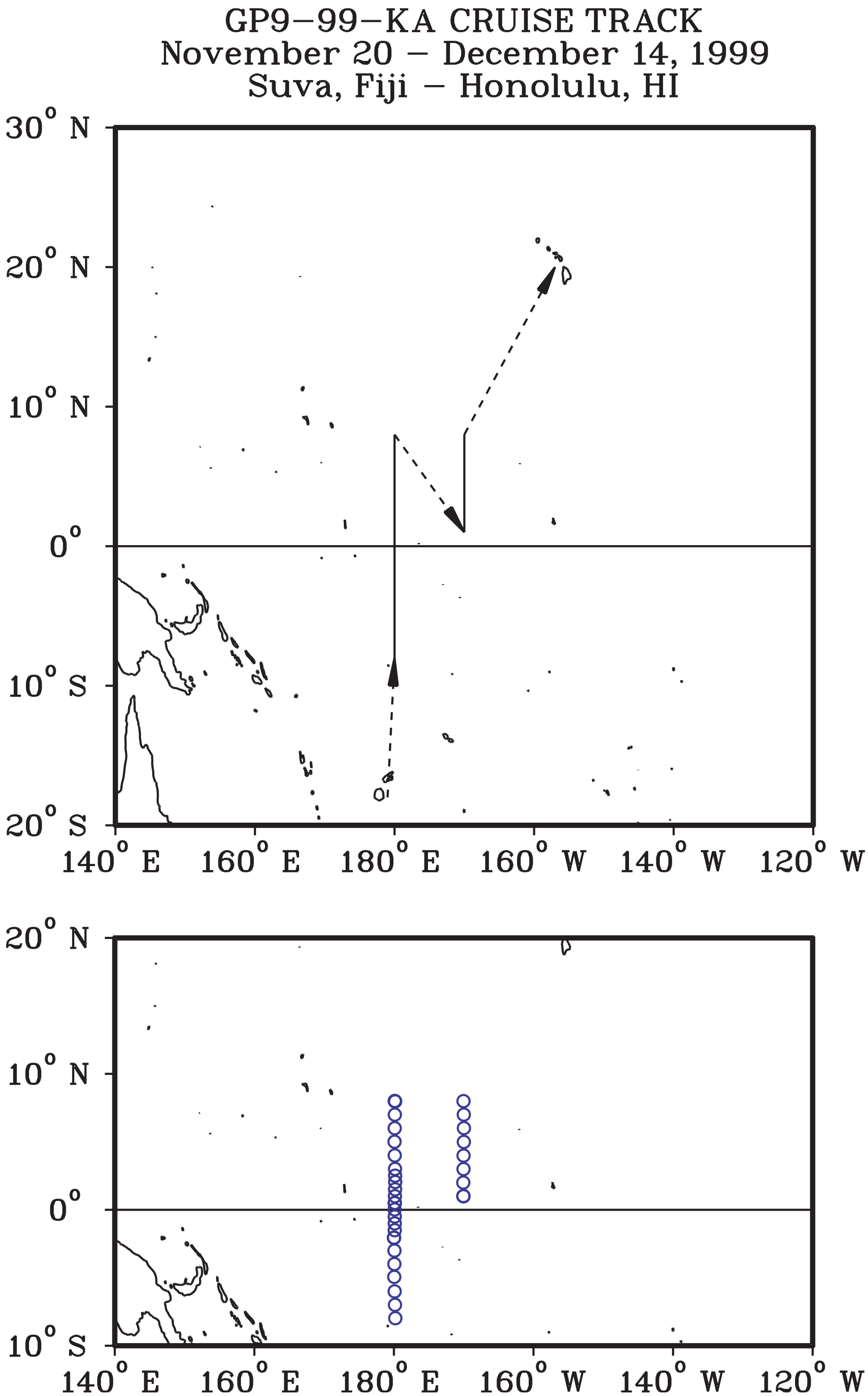

Figure 1h: GP9-99-KA cruise track and station locations.

Table 1h: GP9-99-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	7° 58.6′S	179° 48.2′W	24 Nov 99	921	27	4	5546	1003
21	6° 59.6′S	179° 51.0′W	24 Nov 99	1639	48	13	5407	1001
31	6° 0.1′S	179° 53.9′W	24 Nov 99	2333	62	13	4823	1001
41	4° 56.2′S	179° 57.2′W	25 Nov 99	702	71	11	5620	1002
51	3° 59.6′S	179° 56.2′W	25 Nov 99	1336	69	17	6090	1003
61	3° 0.2′S	179° 55.4′W	25 Nov 99	2050	68	20	5402	1002
71	2° 3.5′S	179° 59.1′W	26 Nov 99	1108	48	19	5348	4006
72	2° 3.4′S	179° 59.1′W	26 Nov 99	2257	60	17	5338	204
81	1° 30.2′S	179° 52.9′W	27 Nov 99	325	60	12	5208	1002
91	1° 0.1′S	179° 52.9′W	27 Nov 99	748	73	13	5354	1002
101	0° 29.9′S	179° 53.0′W	27 Nov 99	1211	86	13	4513	1002
111	0° 1.4′N	179° 53.7′W	27 Nov 99	1853	111	10	5375	1002
121	0° 29.9′N	179° 52.9′W	28 Nov 99	725	94	14	5723	1002
122	0° 30.2′N	179° 52.9′W	28 Nov 99	835	94	14	5768	188
131	0° 59.9′N	179° 51.5′W	28 Nov 99	1253	106	16	5815	1002
141	1° 30.2′N	179° 50.2′W	28 Nov 99	1653	102	14	5575	1002
151	2° 2.6′N	179° 49.2′W	28 Nov 99	2106	102	13	5461	1004
161	2° 30.5′N	179° 49.8′W	29 Nov 99	55	101	14	5332	1002
171	3° 0.3′N	179° 50.7′W	29 Nov 99	432	107	10	5624	1003
181	3° 59.9′N	179° 53.1′W	29 Nov 99	1052	119	16	5734	1005
191	5° 0.5′N	179° 54.8′W	29 Nov 99	1759	110	14	5653	1002
201	6° 0.1′N	179° 53.4′W	30 Nov 99	101	81	24	5405	1004
211	6° 59.8′N	179° 52.4′W	30 Nov 99	841	80	12	5698	1003
221	7° 58.4′N	179° 49.6′W	30 Nov 99	1709	63	19	5867	4004
222	8° 0.4′N	179° 53.1′W	1 Dec 99	433	62	8	5950	202
231	2° 0.2′N	170° 3.7′W	5 Dec 99	348	101	20	5403	1003
241	1° 0.1′N	170° 2.7′W	5 Dec 99	1115	77	13	5455	1002
242	1° 0.4′N	170° 2.7′W	5 Dec 99	1231	108	12	5446	164
251	2° 59.7′N	170° 1.7′W	6 Dec 99	237	111	15	5468	1002
261	3° 59.2′N	170° 1.3′W	6 Dec 99	1012	120	14	5665	1004
271	4° 59.4′N	169° 58.9′W	6 Dec 99	1747	124	13	5783	1002
281	6° 0.5′N	169° 58.4′W	7 Dec 99	302	89	13	5438	4006
291	7° 0.1′N	169° 59.2′W	7 Dec 99	1106	83	12	4884	1002
301	7° 59.7′N	170° 1.9′W	8 Dec 99	240	54	12	5545	1004

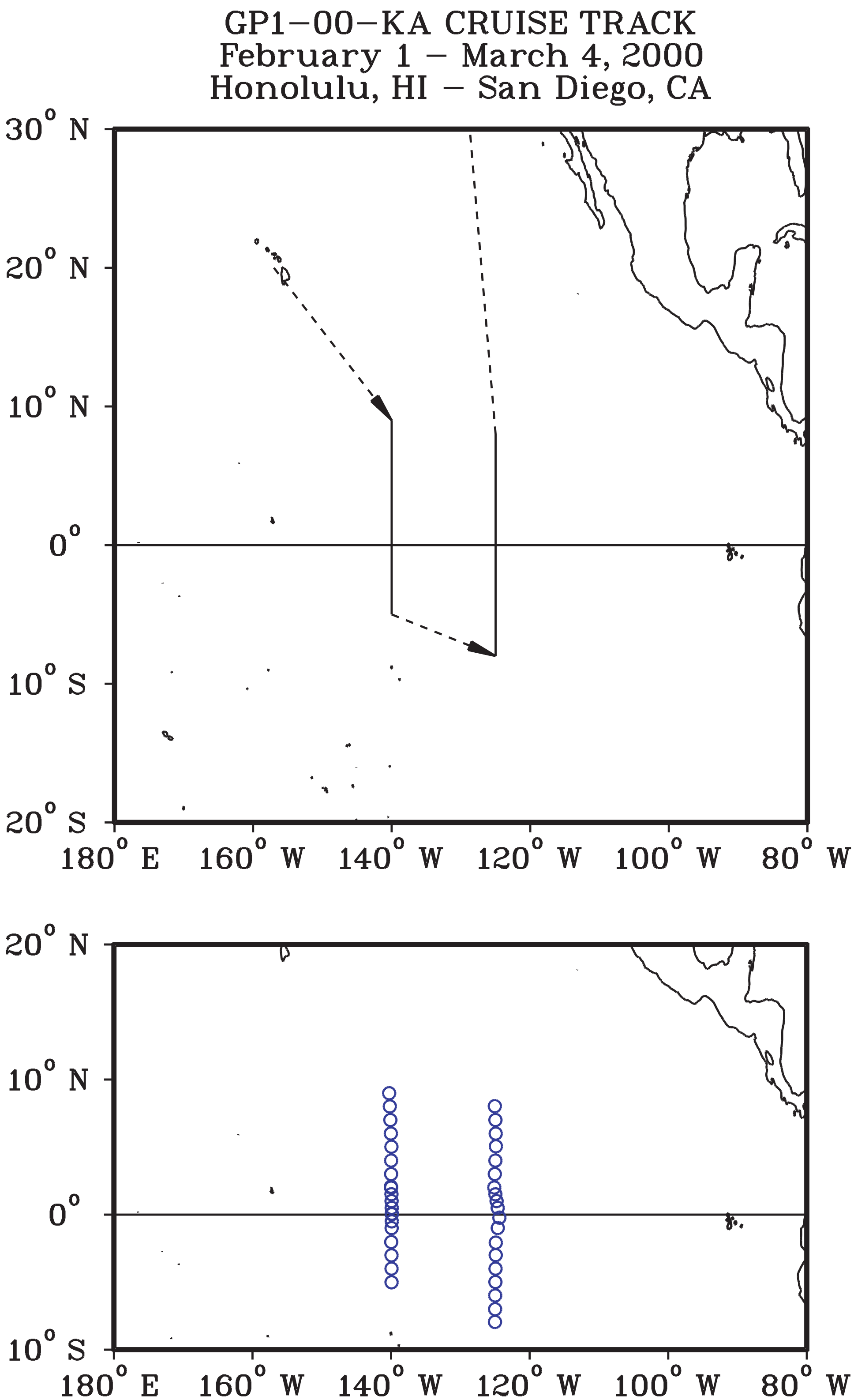

Figure 1i: GP1-00-KA cruise track and station locations.

Table 1i: GP1-00-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 59.1′N	140° 16.4′W	8 Feb 00	355	50	22	4815	1004
21	8° 0.8′N	140° 11.0′W	8 Feb 00	1136	42	21	5121	1002
31	7° 0.2′N	140° 6.4′W	8 Feb 00	1924	47	19	4948	1005
41	6° 0.3′N	140° 1.9′W	9 Feb 00	247	40	19	4789	1004
51	5° 1.6′N	139° 57.1′W	9 Feb 00	1036	75	8	4420	4007
61	4° 0.2′N	139° 59.2′W	10 Feb 00	1104	50	15	4320	1003
71	3° 0.1′N	139° 59.5′W	10 Feb 00	1959	56	6	4273	1002
81	2° 4.2′N	140° 1.0′W	11 Feb 00	843	38	7	4354	4004
82	1° 59.9′N	139° 59.7′W	11 Feb 00	1954	35	9	4345	202
91	1° 30.5′N	139° 56.9′W	12 Feb 00	42	39	10	4448	1013
101	1° 0.1′N	139° 55.7′W	12 Feb 00	515	75	11	4324	1005
111	0° 30.1′N	139° 54.4′W	12 Feb 00	938	52	8	4326	1003
121	0° 4.2′N	139° 53.4′W	12 Feb 00	1407	64	8	4313	4004
122	0° 2.0′N	139° 53.9′W	13 Feb 00	39	50	7	4331	204
131	0° 30.0′S	139° 54.0′W	13 Feb 00	435	72	9	4236	1002
141	0° 59.9′S	139° 55.2′W	13 Feb 00	821	94	5	4204	1001
151	2° 1.7′S	139° 58.6′W	13 Feb 00	1456	80	8	4380	1003
161	3° 0.9′S	139° 56.4′W	13 Feb 00	2344	97	10	4304	1002
171	3° 59.9′S	139° 56.2′W	14 Feb 00	617	95	11	4499	1003
181	5° 0.7′S	139° 55.8′W	14 Feb 00	1321	96	11	4258	1003
191	7° 56.7′S	125° 0.2′W	18 Feb 00	1836	194	9	4520	1002
201	7° 0.2′S	124° 58.9′W	19 Feb 00	225	223	7	4730	1003
211	5° 59.2′S	124° 58.4′W	19 Feb 00	910	352	12	4731	1003
221	4° 59.5′S	124° 56.7′W	19 Feb 00	2344	10	5	4515	1006
231	4° 0.0′S	124° 55.5′W	20 Feb 00	727	44	8	4426	1003
241	3° 0.0′S	124° 53.9′W	20 Feb 00	1503	48	10	4590	1005
251	2° 4.5′S	124° 53.4′W	20 Feb 00	2227	63	16	4707	1003
261	0° 59.4′S	124° 36.2′W	21 Feb 00	809	84	11	4659	1003
271	0° 13.5′S	124° 22.1′W	21 Feb 00	1435	88	17	4698	1003
281	0° 30.0′N	124° 37.0′W	22 Feb 00	540	70	13	4569	1003
291	1° 0.1′N	124° 46.4′W	22 Feb 00	1000	90	13	4571	1002
301	1° 30.1′N	124° 56.9′W	22 Feb 00	1412	80	17	4622	1005
311	2° 0.4′N	125° 6.2′W	22 Feb 00	1822	73	12	4644	1004
321	3° 0.2′N	125° 1.6′W	23 Feb 00	123	67	8	4435	1002
331	4° 0.2′N	124° 56.6′W	23 Feb 00	751	35	10	4491	1002
341	5° 3.4′N	124° 52.4′W	23 Feb 00	1504	40	15	4317	1004
351	6° 0.0′N	124° 54.0′W	23 Feb 00	2355	46	18	4401	1004
361	7° 0.2′N	124° 56.5′W	24 Feb 00	740	51	16	4599	1005
371	8° 1.7′N	125° 1.6′W	24 Feb 00	127	49	25	4617	1004

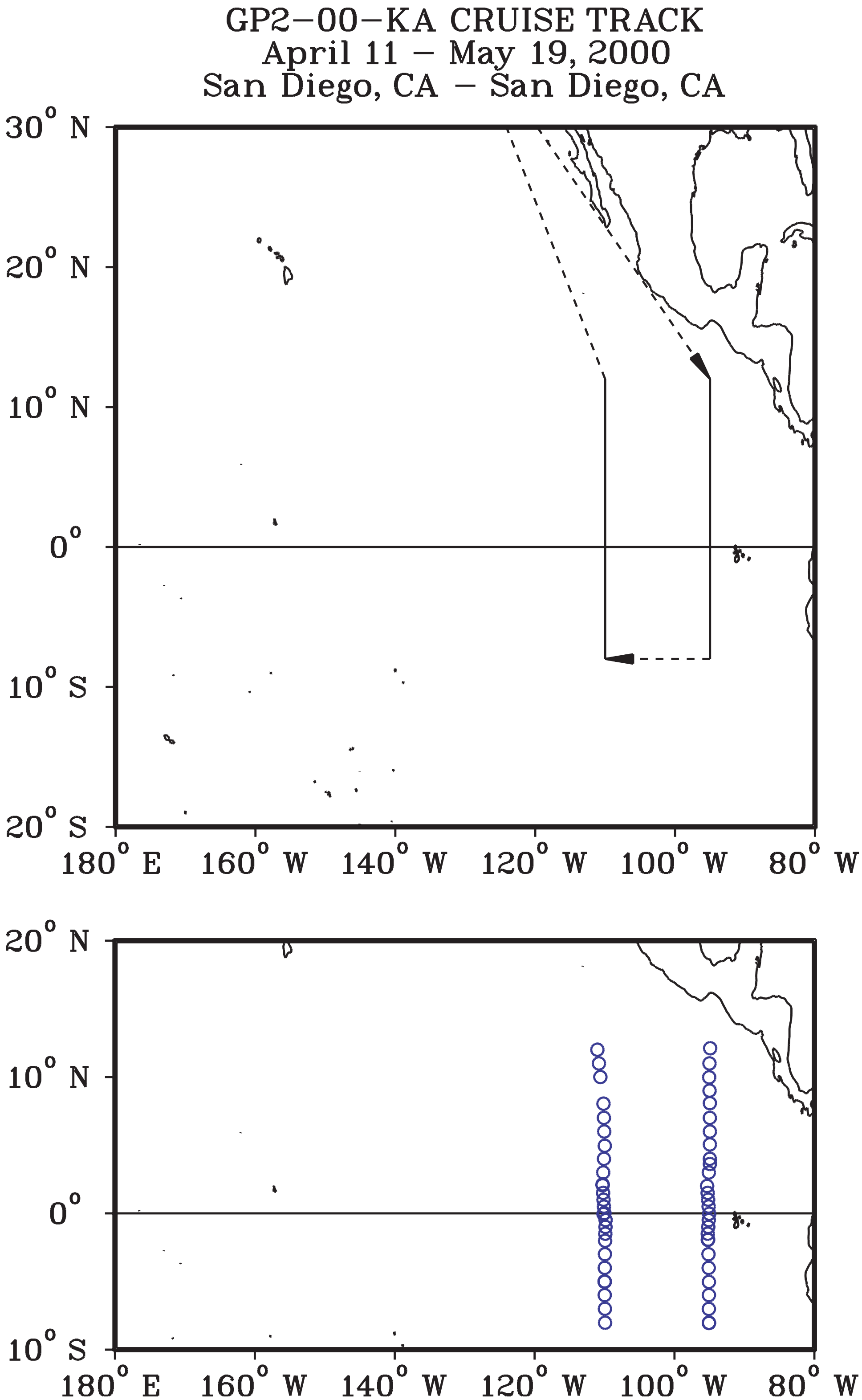

Figure 1j: GP2-00-KA cruise track and station locations.

Table 1j: GP2-00-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 6.6′N	94° 53.8′W	21 Apr 00	130	74	4	4118	1004
21	10° 59.8′N	94° 59.8′W	21 Apr 00	930	69	2	4053	1004
31	9° 58.7′N	95° 2.3′W	21 Apr 00	2339	56	11	3854	1002
41	9° 0.1′N	94° 59.2′W	22 Apr 00	621	75	11	3532	1002
51	8° 4.9′N	94° 56.5′W	22 Apr 00	1305	31	7	3115	1004
61	7° 0.2′N	94° 56.7′W	23 Apr 00	429	47	7	5001	1003
71	6° 0.1′N	94° 56.5′W	23 Apr 00	1208	48	3	5014	1003
81	5° 3.2′N	94° 56.4′W	24 Apr 00	245	247	4	3579	1005
91	4° 0.0′N	94° 56.6′W	24 Apr 00	1116	178	1	3342	1002
101	3° 37.3′N	94° 56.1′W	24 Apr 00	2156	212	10	3376	1003
111	2° 59.7′N	95° 5.5′W	25 Apr 00	746	256	4	3155	1003
121	2° 0.3′N	95° 20.2′W	25 Apr 00	2044	107	4	2879	1004
131	1° 30.2′N	95° 15.4′W	26 Apr 00	140	105	3	2966	1005
141	1° 0.3′N	95° 11.3′W	26 Apr 00	605	88	7	3491	1004
151	0° 30.1′N	95° 7.1′W	26 Apr 00	1013	124	3	3284	1001
161	0° 1.6′S	95° 2.1′W	26 Apr 00	1824	95	7	3311	1002
171	0° 29.8′S	95° 5.8′W	26 Apr 00	2223	58	7	3373	1003
181	0° 59.8′S	95° 10.3′W	27 Apr 00	234	55	12	3310	1006
191	1° 29.6′S	95° 14.3′W	27 Apr 00	639	51	4	3365	1002
201	1° 56.5′S	95° 13.8′W	27 Apr 00	1126	40	1	3386	3003
202	1° 55.7′S	95° 11.3′W	27 Apr 00	1737	83	1	2806	202
211	3° 0.1′S	95° 8.6′W	28 Apr 00	114	168	5	3419	1002
221	4° 0.1′S	95° 6.7′W	28 Apr 00	823	156	5	3624	1005
231	5° 1.9′S	95° 4.8′W	28 Apr 00	2210	156	12	3833	1004
241	5° 59.8′S	95° 4.8′W	29 Apr 00	545	134	12	3896	1005
251	7° 0.7′S	95° 5.2′W	29 Apr 00	1415	125	12	4334	1003
261	8° 1.8′S	95° 3.9′W	30 Apr 00	407	130	11	3836	3004
262	8° 2.5′S	95° 4.7′W	30 Apr 00	1542	161	3	3798	202
271	8° 1.4′S	109° 55.3′W	4 May 00	1025	123	15	3500	1005
281	7° 0.1′S	109° 56.9′W	4 May 00	1823	70	6	3582	1002
291	6° 0.0′S	109° 58.7′W	5 May 00	208	113	17	3645	1004
301	5° 1.5′S	109° 58.6′W	5 May 00	1324	118	15	3477	3005
302	4° 59.4′S	109° 59.4′W	6 May 00	144	120	12	3611	202
311	3° 59.9′S	109° 58.1′W	6 May 00	908	102	3	3888	1003
321	2° 59.9′S	109° 56.7′W	6 May 00	1639	124	7	3957	1002
331	2° 0.8′S	109° 55.2′W	7 May 00	34	112	13	3984	1004
341	1° 29.6′S	109° 53.5′W	7 May 00	434	100	8	3927	1003
351	0° 59.9′S	109° 52.1′W	7 May 00	831	86	4	3878	1004
361	0° 29.8′S	109° 50.9′W	7 May 00	1233	117	8	3858	1005
371	0° 3.1′S	110° 9.2′W	8 May 00	1327	78	7	3788	3005
372	0° 0.8′N	110° 1.1′W	8 May 00	1751	200	3	3759	201
381	0° 29.8′N	110° 5.3′W	8 May 00	2249	117	5	3730	1002
391	1° 0.0′N	110° 9.0′W	9 May 00	306	137	5	3837	1005
401	1° 30.2′N	110° 12.3′W	9 May 00	726	153	8	3810	1003
411	2° 3.5′N	110° 16.6′W	9 May 00	1329	159	8	3768	3003
412	2° 7.3′N	110° 17.1′W	9 May 00	1743	133	8	3810	202
421	2° 59.9′N	110° 11.4′W	9 May 00	2355	157	11	3767	1003
431	3° 59.9′N	110° 4.9′W	10 May 00	705	174	9	3898	1006
441	4° 57.5′N	109° 58.3′W	10 May 00	1358	179	9	3877	1003
451	6° 0.2′N	110° 2.7′W	11 May 00	931	186	9	3486	1001
461	7° 0.3′N	110° 5.6′W	11 May 00	1717	185	1	3727	1002
471	8° 2.8′N	110° 9.0′W	12 May 00	354	354	12	3623	1003
481	10° 0.0′N	110° 35.9′W	12 May 00	2042	27	12	3626	1006
491	10° 59.8′N	110° 48.3′W	13 May 00	459	19	9	3916	1002
501	12° 0.3′N	111° 1.7′W	13 May 00	1253	31	13	3813	1002

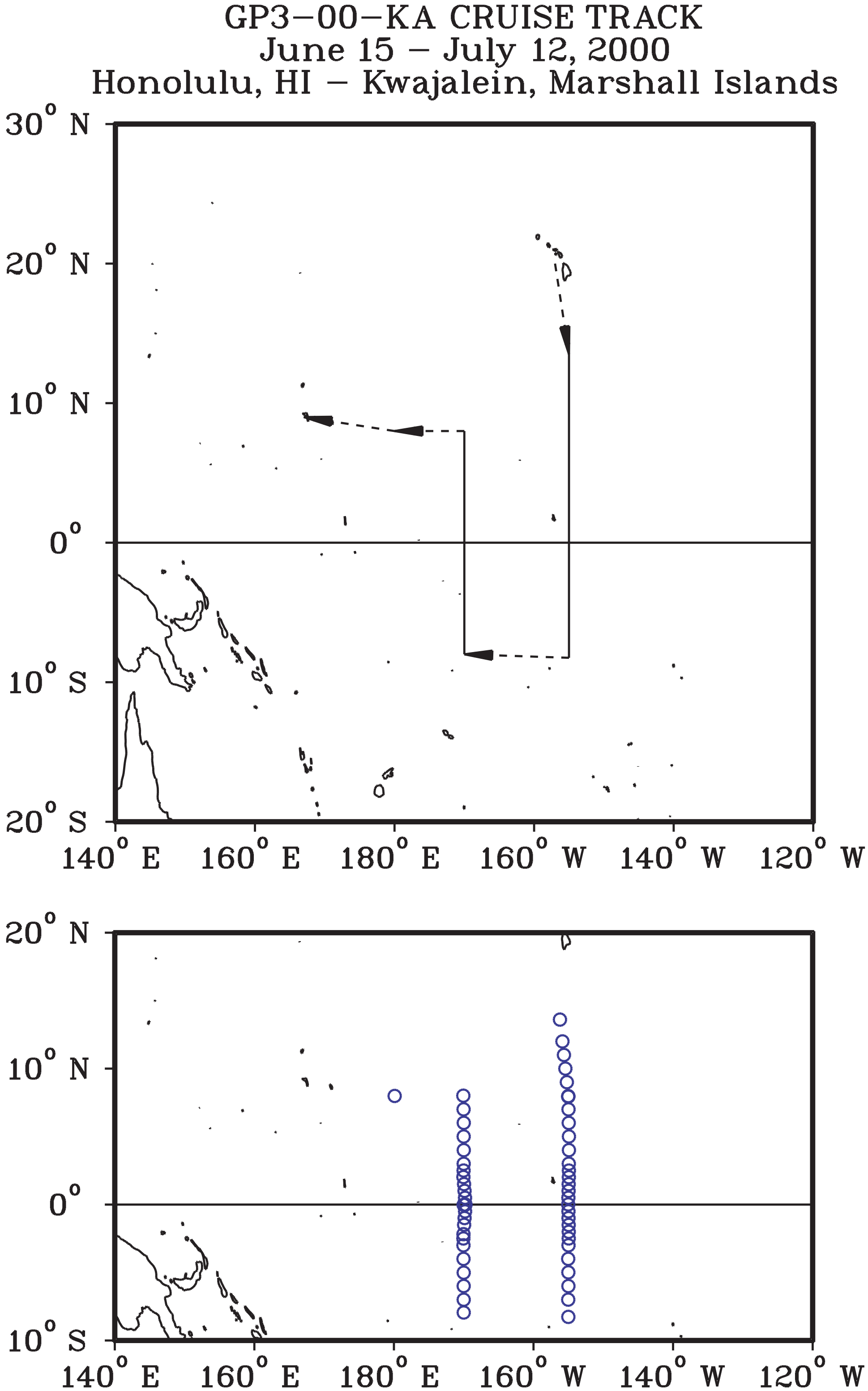

Figure 1k: GP3-00-KA cruise track and station locations.

Table 1k: GP3-00-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	13° 36.4′N	156° 12.6′W	17 Jun 00	2001	40	8		3503
21	12° 0.2′N	155° 51.3′W	18 Jun 00	808	76	10	5142	1001
31	11° 0.3′N	155° 38.4′W	18 Jun 00	1518	70	10	5224	1003
41	10° 0.1′N	155° 26.1′W	18 Jun 00	2248	334	2	5336	1002
51	9° 0.1′N	155° 13.4′W	19 Jun 00	532	43	5	5273	1002
61	7° 58.6′N	155° 0.9′W	19 Jun 00	1350	68	4	5147	3005
62	7° 56.3′N	155° 1.3′W	19 Jun 00	2338	50	4	5134	202
71	7° 0.1′N	154° 59.1′W	20 Jun 00	551	70	11	4942	1002
81	6° 0.3′N	154° 57.1′W	20 Jun 00	1230	140	10	4828	805
91	5° 0.5′N	154° 55.5′W	21 Jun 00	425	78	9	4594	1004
101	4° 0.2′N	154° 55.5′W	21 Jun 00	1117	95	7	4695	1002
111	3° 0.3′N	154° 56.7′W	21 Jun 00	1750	118	11	4803	1002
121	2° 30.0′N	154° 55.7′W	21 Jun 00	2137	124	13	4832	1004
131	2° 0.7′N	154° 56.3′W	22 Jun 00	905	131	8	4688	1004
141	1° 29.8′N	154° 57.6′W	22 Jun 00	1302	134	11	4663	1002
151	1° 0.3′N	154° 58.3′W	22 Jun 00	1649	130	10	4758	1004
161	0° 30.1′N	155° 0.2′W	22 Jun 00	2034	119	9	4789	1003
171	0° 0.5′N	155° 1.3′W	23 Jun 00	2258	96	8	4690	1004
181	0° 29.9′S	154° 59.5′W	23 Jun 00	635	80	12	4884	1004
191	0° 59.9′S	154° 58.9′W	23 Jun 00	1016	67	10	4743	1003
201	1° 30.1′S	154° 57.5′W	23 Jun 00	1345	52	10	4875	1002
211	2° 0.4′S	154° 57.0′W	24 Jun 00	201	55	11	4986	1002
221	2° 29.7′S	154° 57.2′W	24 Jun 00	555	86	13	4963	1004
231	2° 59.9′S	154° 59.1′W	24 Jun 00	949	47	8	4906	1001
241	3° 59.7′S	155° 1.6′W	24 Jun 00	1639	90	17	2397	1002
251	4° 59.3′S	155° 0.5′W	25 Jun 00	34	73	18	4769	1004
261	5° 59.9′S	155° 0.0′W	25 Jun 00	710	103	12	5305	1003
271	6° 59.7′S	155° 1.5′W	25 Jun 00	1359	90	10	5174	1002
281	8° 15.9′S	155° 0.6′W	25 Jun 00	2207	70	13	5335	1004
291	7° 56.6′S	170° 0.0′W	29 Jun 00	521	71	10	5346	4804
301	7° 0.0′S	170° 0.2′W	29 Jun 00	1236	80	15	4741	1004
311	5° 59.6′S	170° 0.3′W	29 Jun 00	1906	87	17	4806	1002
321	5° 0.6′S	170° 0.1′W	30 Jun 00	1122	87	15	5395	3004
331	3° 59.8′S	170° 1.9′W	30 Jun 00	1853	75	21	5725	5514
341	2° 59.9′S	170° 2.3′W	1 Jul 00	801	82	15	5289	1002
351	2° 29.8′S	170° 3.0′W	1 Jul 00	1151	90	13	5417	1002
361	2° 10.7′S	170° 2.2′W	1 Jul 00	1533	70	14	4968	3002
371	1° 29.6′S	169° 56.5′W	2 Jul 00	545	97	18	5202	1003
381	0° 59.6′S	169° 52.7′W	2 Jul 00	947	94	16	5630	1001
391	0° 30.3′S	169° 48.3′W	2 Jul 00	1334	90	17	5600	1008
401	0° 1.2′S	170° 0.7′W	3 Jul 00	1409	80	14	5587	4313
402	0° 0.3′S	169° 44.4′W	4 Jul 00	322	94	19	5421	5108
411	0° 30.0′N	169° 48.8′W	4 Jul 00	1111	92	17	5433	1002
421	1° 0.5′N	169° 53.0′W	4 Jul 00	1504	90	15	5559	1004
431	1° 30.3′N	169° 57.2′W	4 Jul 00	1851	90	18	5527	1003
441	2° 1.5′N	170° 2.8′W	4 Jul 00	2318	103	24	5401	1050
451	2° 30.2′N	170° 1.1′W	5 Jul 00	314	97	18	5336	1001
461	3° 0.0′N	170° 0.3′W	5 Jul 00	654	96	17	5471	1001
471	4° 0.1′N	169° 59.7′W	5 Jul 00	1324	100	14	5414	1003
481	5° 0.3′N	170° 0.3′W	6 Jul 00	358	88	15	5753	1003
491	6° 0.7′N	169° 59.7′W	6 Jul 00	1114	55	12		1003
501	7° 0.3′N	170° 1.2′W	6 Jul 00	1742	70	13		1004
511	8° 0.5′N	170° 3.4′W	7 Jul 00	21	96	9	5545	1003
521	7° 59.4′N	179° 53.7′W	9 Jul 00	1353	0	0	5949	1002

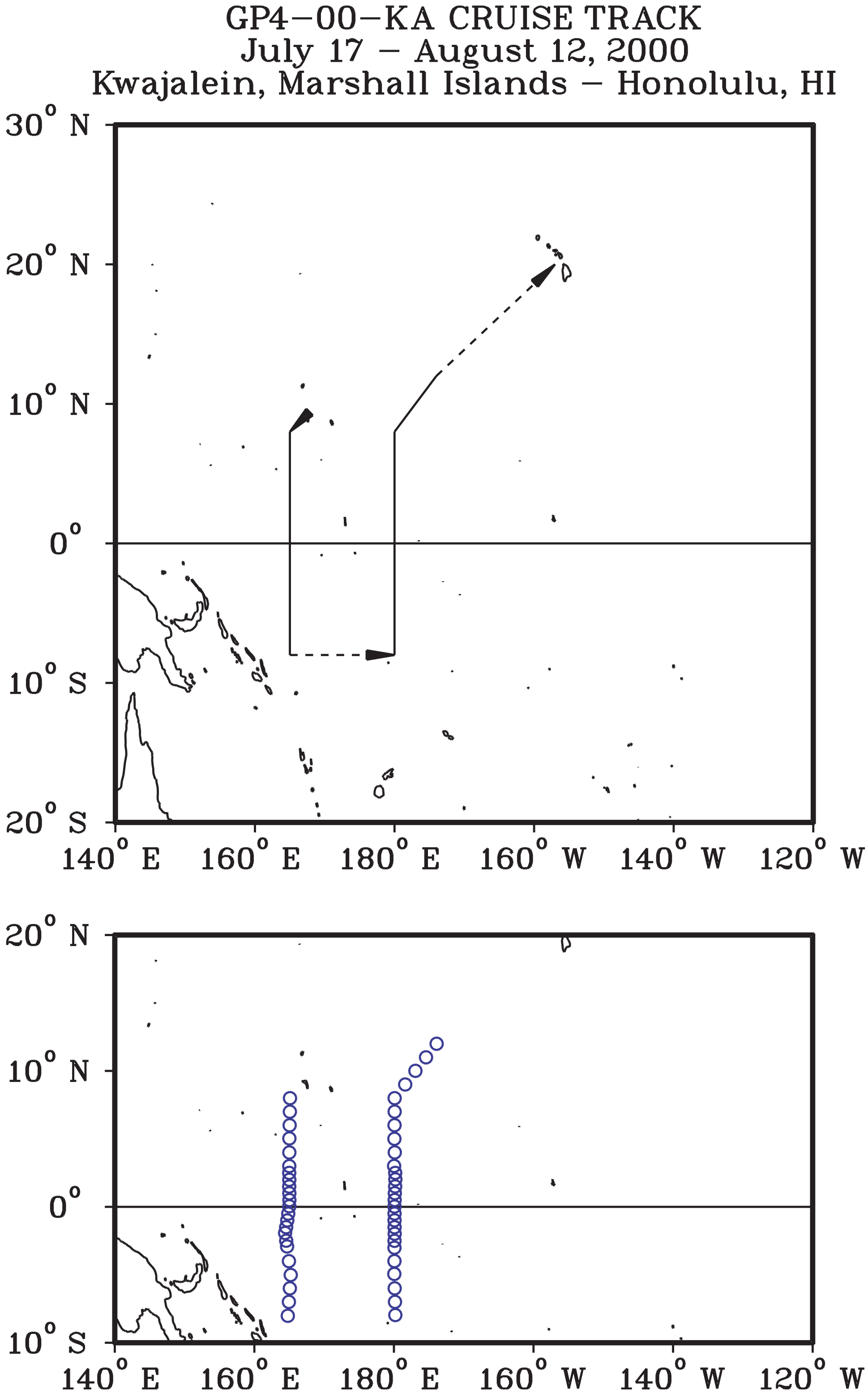

Figure 1l: GP4-00-KA cruise track and station locations.

Table 1l: GP4-00-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	7° 59.7′N	165° 6.4′E	19 Jul 00	330	137	7	5213	1002
21	7° 0.0′N	165° 5.2′E	19 Jul 00	1008	103	12	5167	1001
31	6° 0.2′N	165° 3.4′E	19 Jul 00	1628	97	11	5013	1002
41	5° 2.0′N	165° 0.9′E	20 Jul 00	520	39	14	4779	1002
51	4° 0.0′N	165° 0.7′E	21 Jul 00	528	196	0	4489	1003
61	2° 59.8′N	165° 0.3′E	21 Jul 00	1207	256	3	4252	1002
71	2° 29.9′N	164° 59.7′E	21 Jul 00	1556	157	3	4121	1003
81	1° 59.4′N	165° 0.5′E	21 Jul 00	2345	187	5	4171	1002
91	1° 29.6′N	164° 59.6′E	22 Jul 00	405	290	22	4259	1008
101	0° 59.8′N	165° 0.7′E	22 Jul 00	812	234	10	4330	1001
111	0° 29.8′N	165° 1.3′E	22 Jul 00	1227	257	8	4368	1002
121	0° 2.5′N	165° 0.5′E	23 Jul 00	504	178	2	4404	1003
131	0° 30.1′S	164° 51.3′E	23 Jul 00	922	97	3	4450	1002
141	1° 0.0′S	164° 42.9′E	23 Jul 00	1325	85	5	4417	1001
151	1° 29.9′S	164° 33.4′E	23 Jul 00	1655	70	8	4421	179
161	1° 55.4′S	164° 24.1′E	24 Jul 00	217	29	9	4435	1003
171	2° 29.6′S	164° 33.8′E	24 Jul 00	645	74	5	4466	1003
181	2° 54.9′S	164° 41.2′E	24 Jul 00	1038	76	5	3953	1002
191	3° 59.9′S	164° 57.2′E	24 Jul 00	1725	150	2	3182	1002
201	5° 0.8′S	165° 12.6′E	25 Jul 00	248	83	6	2516	1019
211	5° 59.9′S	165° 5.1′E	25 Jul 00	940	86	6	3606	1003
221	6° 59.7′S	164° 56.9′E	25 Jul 00	1641	130	7	3717	1001
231	8° 1.0′S	164° 47.5′E	26 Jul 00	607	132	9	3888	1001
241	7° 57.8′S	179° 48.0′W	30 Jul 00	441	117	11	5546	1002
251	6° 59.6′S	179° 50.9′W	30 Jul 00	1101	116	13	5519	1002
261	5° 59.9′S	179° 53.6′W	30 Jul 00	1729	116	14	5893	1002
271	4° 56.3′S	179° 56.8′W	31 Jul 00	851	74	12	5670	1001
281	3° 59.6′S	179° 55.4′W	31 Jul 00	1655	55	8	5587	1005
291	3° 0.5′S	179° 55.4′W	1 Aug 00	21	67	2	5408	1004
301	2° 30.0′S	179° 54.9′W	1 Aug 00	440	61	7	5407	1003
311	1° 58.9′S	179° 53.6′W	1 Aug 00	903	51	13	5336	1003
321	1° 30.0′S	179° 54.4′W	1 Aug 00	1300	45	14	5253	1005
331	0° 59.6′S	179° 54.8′W	1 Aug 00	1733	77	13	5351	1003
341	0° 29.8′S	179° 54.8′W	1 Aug 00	2140	72	14	4902	1004
351	0° 1.3′N	179° 54.8′W	2 Aug 00	206	67	14	5393	1002
361	0° 30.1′N	179° 53.6′W	2 Aug 00	610	80	13	5744	1004
371	1° 0.1′N	179° 52.3′W	2 Aug 00	1017	61	9	5792	1005
381	1° 30.2′N	179° 49.5′W	2 Aug 00	1437	54	16	5573	1003
391	2° 1.2′N	179° 47.8′W	3 Aug 00	305	83	10	5468	1002
401	2° 29.8′N	179° 49.0′W	3 Aug 00	716	119	8	5313	1004
411	3° 0.4′N	179° 58.5′W	3 Aug 00	1119	120	8	4695	1002
421	4° 0.3′N	179° 52.8′W	3 Aug 00	1739	99	7	5760	1002
431	5° 0.3′N	179° 55.9′W	4 Aug 00	840	29	5	5641	1001
441	6° 0.4′N	179° 54.7′W	4 Aug 00	1546	41	11	5594	1002
451	7° 0.3′N	179° 53.8′W	4 Aug 00	2207	62	11	5882	1003
461	7° 59.7′N	179° 53.8′W	5 Aug 00	535	78	14	5944	1002
471	9° 0.2′N	178° 23.1′W	5 Aug 00	1800	74	16	5954	1002
481	10° 0.4′N	176° 55.3′W	6 Aug 00	631	60	14	6068	1003
491	11° 0.0′N	175° 24.1′W	6 Aug 00	1919	70	20	5439	1002
501	12° 0.0′N	173° 52.8′W	7 Aug 00	913	67	17	5528	1003

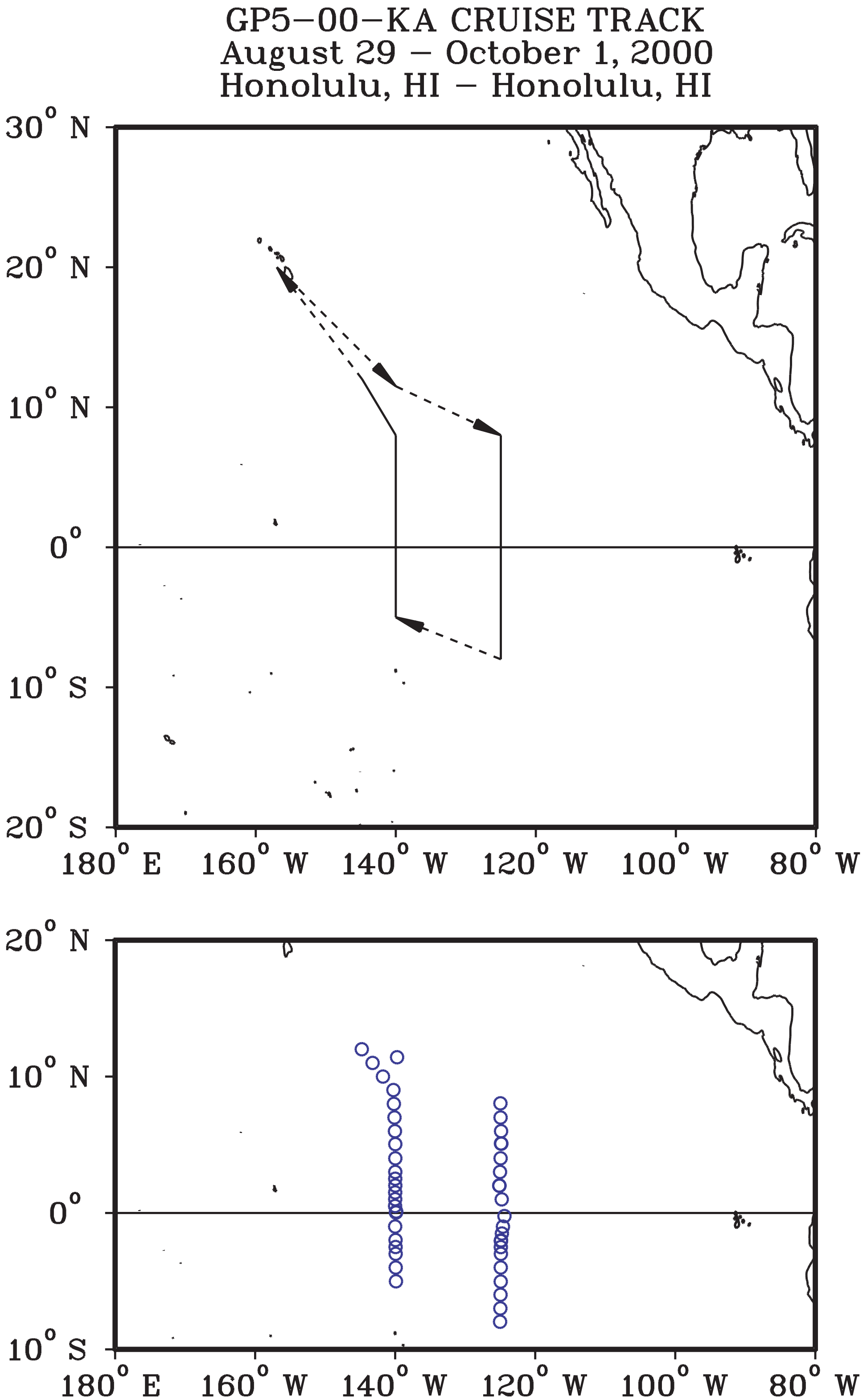

Figure 1m: GP5-00-KA cruise track and station locations.

Table 1m: GP5-00-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	11° 25.1′N	139° 44.0′W	5 Sep 00	150	229	13	5007	4004
21	8° 2.3′N	124° 58.3′W	8 Sep 00	2354	176	22	4656	1000
31	6° 59.8′N	124° 57.1′W	9 Sep 00	953	175	18	4647	1001
41	5° 59.8′N	124° 52.8′W	9 Sep 00	2010	165	2		1014
51	5° 5.0′N	124° 50.5′W	10 Sep 00	844	162	17	4360	4002
52	5° 5.9′N	124° 53.4′W	10 Sep 00	2326	160	16	4367	201
61	4° 0.5′N	124° 56.8′W	11 Sep 00	822	117	11	4500	1001
71	3° 0.5′N	125° 1.7′W	11 Sep 00	1732	187	11	4456	1003
81	1° 59.8′N	125° 6.6′W	12 Sep 00	826	132	15	4718	4003
82	2° 0.8′N	125° 8.2′W	13 Sep 00	129	140	17	4685	201
91	0° 59.8′N	124° 47.2′W	13 Sep 00	1038	134	15	4611	1002
101	0° 13.6′S	124° 23.8′W	13 Sep 00	2034	107	19	4044	1003
111	1° 0.1′S	124° 36.6′W	14 Sep 00	157	91	14	4704	1005
121	1° 30.3′S	124° 45.8′W	14 Sep 00	602	89	16	4585	1003
131	2° 0.6′S	124° 53.2′W	14 Sep 00	1034	80	12	4727	4005
132	2° 3.3′S	124° 54.4′W	14 Sep 00	2321	120	16	4825	202
141	2° 30.2′S	124° 54.9′W	15 Sep 00	306	70	8	4585	1003
151	2° 59.8′S	124° 54.4′W	15 Sep 00	651	78	17	4620	1003
161	3° 59.9′S	124° 55.5′W	15 Sep 00	1347	110	13	4518	1010
171	5° 1.8′S	124° 55.7′W	15 Sep 00	2108	96	12	4549	1000
181	5° 59.7′S	124° 57.4′W	16 Sep 00	407	94	15	4564	1001
191	6° 59.8′S	124° 58.9′W	16 Sep 00	1146	187	17	4768	1002
201	7° 58.5′S	125° 1.3′W	17 Sep 00	445	128	16	4506	1004
211	5° 0.6′S	139° 53.4′W	20 Sep 00	1542	96	12	4355	1002
221	4° 0.1′S	139° 55.6′W	21 Sep 00	657	146	14	4509	1003
231	2° 59.6′S	139° 56.1′W	21 Sep 00	1352	117	11	4438	1003
241	2° 29.7′S	139° 56.6′W	21 Sep 00	1756	91	13	4408	1003
251	1° 59.0′S	139° 57.0′W	22 Sep 00	531	108	13	4301	1002
261	0° 59.6′S	140° 0.3′W	22 Sep 00	1211	89	12	4265	1005
271	0° 6.3′N	139° 51.4′W	23 Sep 00	806	86	14	4304	4004
272	0° 1.9′N	139° 53.3′W	23 Sep 00	1856	110	14	4350	204
281	0° 30.6′N	140° 1.0′W	24 Sep 00	19	116	16	4352	1007
291	1° 0.6′N	139° 59.9′W	24 Sep 00	350	109	12	4298	1001
301	1° 30.3′N	140° 0.0′W	24 Sep 00	735	108	13	4427	1004
311	2° 0.7′N	139° 59.1′W	24 Sep 00	1111	106	12	4372	1006
321	2° 30.6′N	139° 59.7′W	24 Sep 00	1500	129	12	4377	1003
331	3° 0.4′N	139° 59.3′W	24 Sep 00	1827	114	12	4293	1004
341	4° 0.3′N	139° 59.0′W	25 Sep 00	45	94	12	4336	1002
351	5° 2.8′N	139° 59.1′W	25 Sep 00	814	158	12	4457	1004
361	5° 59.8′N	140° 2.1′W	25 Sep 00	1450	142	12	4818	1004
371	7° 0.0′N	140° 6.1′W	25 Sep 00	2216	170	10	4990	1004
381	7° 59.9′N	140° 11.4′W	26 Sep 00	549	29	4	5145	1004
391	9° 0.8′N	140° 15.1′W	26 Sep 00	1434	18	16	4826	4005
401	10° 0.0′N	141° 44.9′W	27 Sep 00	1010	83	11	5040	1004
411	11° 0.0′N	143° 13.9′W	27 Sep 00	2112	99	7	5329	1002
421	12° 0.2′N	144° 46.3′W	28 Sep 00	822	69	13	5240	1002

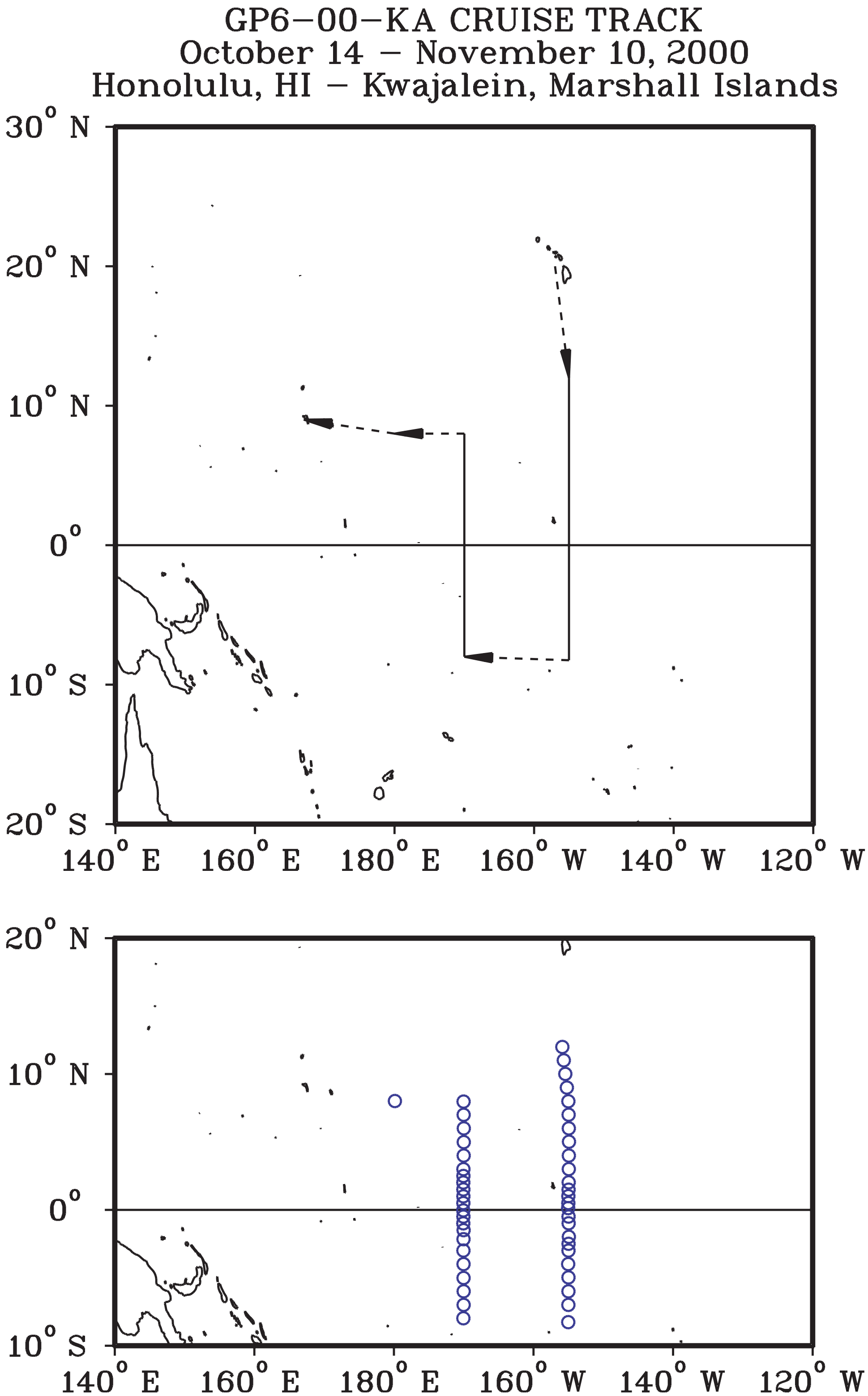

Figure 1n: GP6-00-KA cruise track and station locations.

Table 1n: GP6-00-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	11° 59.6′N	155° 52.1′W	17 Oct 00	1209	90	20	5220	1004
21	11° 0.5′N	155° 39.6′W	17 Oct 00	1934	62	15	5196	1003
31	10° 0.5′N	155° 26.7′W	18 Oct 00	326	50	13	5557	1003
41	9° 0.1′N	155° 13.3′W	18 Oct 00	1052	121	7	5278	1002
51	7° 59.6′N	155° 0.4′W	18 Oct 00	1900	102	5	5207	4203
61	7° 0.3′N	154° 58.1′W	19 Oct 00	425	124	5	5150	1004
71	6° 0.0′N	154° 56.5′W	19 Oct 00	1120	138	4	4824	1001
81	5° 1.0′N	154° 55.0′W	19 Oct 00	1817	135	14	4596	1002
91	3° 59.8′N	154° 56.3′W	20 Oct 00	201	115	18	4700	1003
101	3° 0.1′N	154° 56.5′W	20 Oct 00	845	98	24	4798	1003
111	2° 1.6′N	154° 57.4′W	20 Oct 00	1536	107	20	4879	1006
121	1° 29.2′N	154° 58.4′W	20 Oct 00	2009	104	24	4647	1003
131	1° 0.6′N	155° 0.4′W	21 Oct 00	224	101	17		1003
141	0° 30.0′N	155° 0.6′W	21 Oct 00	819	89	18	4761	1002
151	0° 7.6′N	155° 2.3′W	21 Oct 00	1407	83	19	4683	1002
161	0° 29.6′S	154° 58.8′W	22 Oct 00	612	88	15	4882	1004
171	0° 59.3′S	154° 57.9′W	22 Oct 00	1031	105	17	4736	1003
181	1° 58.9′S	154° 56.1′W	22 Oct 00	1742	91	19	5076	1003
191	2° 29.8′S	154° 58.6′W	22 Oct 00	2213	96	16	5012	1012
201	2° 59.8′S	154° 59.2′W	23 Oct 00	323	92	17	5095	1003
211	3° 59.4′S	155° 1.9′W	23 Oct 00	1023	97	14	4865	1002
221	4° 58.3′S	154° 59.4′W	23 Oct 00	1713	69	13	5356	1004
231	5° 59.9′S	154° 59.7′W	24 Oct 00	853	76	17	5266	1002
241	6° 59.7′S	155° 0.4′W	24 Oct 00	1527	62	12	5261	1004
251	8° 15.9′S	155° 1.3′W	25 Oct 00	721	92	17	5344	1002
261	7° 58.8′S	170° 3.0′W	29 Oct 00	239	83	10	5375	1003
271	6° 59.7′S	170° 0.7′W	29 Oct 00	938	87	13	4731	1004
281	5° 59.6′S	170° 0.6′W	29 Oct 00	1624	65	13	4928	1002
291	5° 0.8′S	170° 1.4′W	29 Oct 00	2331	66	10	5426	1004
301	3° 59.5′S	170° 1.6′W	30 Oct 00	638	59	7	5757	1003
311	2° 59.7′S	170° 2.5′W	30 Oct 00	1314	72	8	5682	1003
321	2° 9.4′S	170° 1.9′W	31 Oct 00	323	79	11	4951	1004
331	1° 29.7′S	170° 1.0′W	31 Oct 00	825	53	10	5590	1004
341	0° 59.6′S	170° 3.7′W	31 Oct 00	1219	44	10	5368	1004
351	0° 29.7′S	170° 2.8′W	31 Oct 00	1600	101	7	5609	1002
361	0° 2.2′S	170° 3.7′W	1 Nov 00	615	106	9	5566	601
371	0° 30.0′N	170° 3.1′W	1 Nov 00	945	113	12	5598	1003
381	0° 59.9′N	170° 3.0′W	1 Nov 00	1330	129	9	5469	1004
391	1° 30.1′N	170° 3.1′W	1 Nov 00	1707	129	11	5503	1002
401	2° 0.9′N	170° 3.5′W	2 Nov 00	611	110	11	5400	1003
411	2° 29.8′N	170° 2.9′W	2 Nov 00	1015	126	15	5325	1003
421	2° 59.8′N	170° 2.7′W	2 Nov 00	1416	137	18	5451	1003
431	3° 59.9′N	170° 0.3′W	2 Nov 00	2101	128	17	5672	1002
441	4° 59.3′N	169° 59.6′W	3 Nov 00	356	183	11	5312	1002
451	6° 0.0′N	169° 59.2′W	3 Nov 00	1035	67	12	5410	1003
461	6° 59.9′N	170° 0.6′W	3 Nov 00	1707	38	13	5921	1002
471	7° 58.4′N	170° 1.2′W	4 Nov 00	819	73	14	5530	1002
481	8° 0.7′N	179° 51.7′W	6 Nov 00	2310	55	11	5927	4102

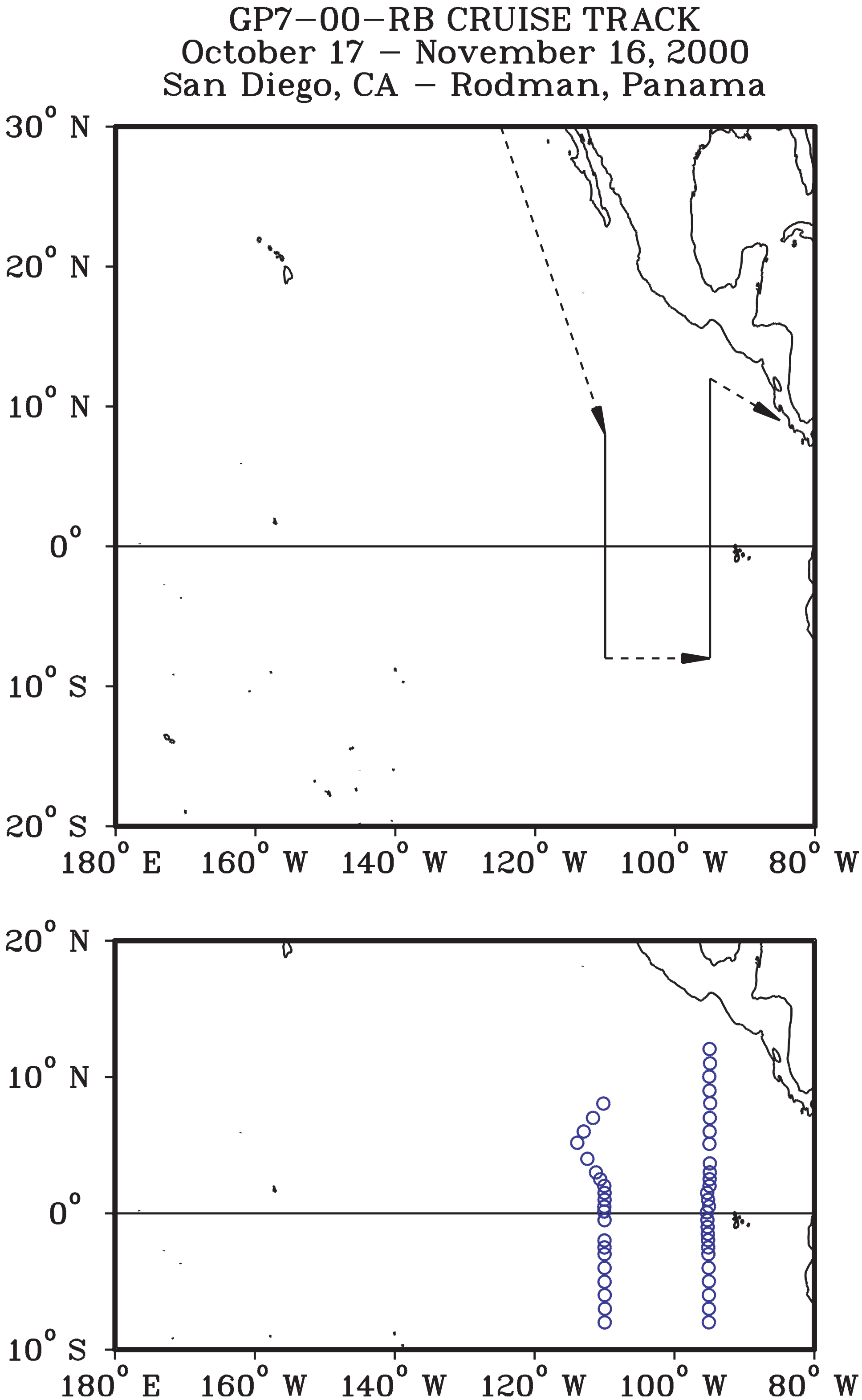

Figure 1o: GP7-00-RB cruise track and station locations.

Table 1o: GP7-00-RB CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 3.2′N	110° 10.2′W	22 Oct 00	806	250	8	4280	4002
21	7° 0.0′N	111° 38.9′W	23 Oct 00	416	190	13	4285	1002
31	6° 0.0′N	112° 59.0′W	23 Oct 00	1327	180	16	4007	1002
41	5° 10.6′N	113° 54.3′W	23 Oct 00	2325	166	6	3914	1001
51	4° 0.0′N	112° 27.4′W	24 Oct 00	916	160	12	3922	1002
61	3° 0.0′N	111° 13.6′W	24 Oct 00	1801	165	18	3790	1003
71	2° 29.8′N	110° 37.2′W	24 Oct 00	2311	150	18	3726	1000
81	2° 0.9′N	110° 2.2′W	25 Oct 00	1049	140	16	3718	3002
91	1° 30.0′N	110° 0.0′W	25 Oct 00	1505	140	17	3778	1001
101	1° 0.1′N	110° 0.0′W	25 Oct 00	1840	150	16	3811	1008
111	0° 29.6′N	110° 2.0′W	25 Oct 00	2210	160	15	3807	1002
121	0° 8.0′N	110° 3.5′W	26 Oct 00	714	130	8	3815	3252
131	0° 30.0′S	110° 0.2′W	27 Oct 00	544	105	9	3801	1002
141	1° 59.4′S	110° 0.8′W	28 Oct 00	137	120	12	3964	3252
151	2° 30.0′S	110° 0.4′W	28 Oct 00	541	115	14	3930	1003
161	2° 59.9′S	110° 0.2′W	28 Oct 00	909	105	13	3783	1004
171	4° 0.0′S	110° 0.1′W	28 Oct 00	1458	90	12	3824	1002
181	5° 1.2′S	109° 59.9′W	28 Oct 00	2152	115	15	3578	3251
191	6° 0.0′S	109° 58.6′W	29 Oct 00	349	125	15	3801	1000
201	7° 0.0′S	109° 57.0′W	29 Oct 00	929	125	12	3512	1001
211	8° 0.0′S	109° 58.8′W	30 Oct 00	630	125	15	3422	3154
221	7° 59.6′S	95° 5.2′W	3 Nov 00	1023	110	13	3810	3252
231	6° 59.9′S	95° 4.9′W	3 Nov 00	1640	100	13	3921	1005
241	5° 59.9′S	95° 5.0′W	3 Nov 00	2259	125	12	3899	1003
251	4° 59.4′S	95° 5.1′W	4 Nov 00	500	135	12	3783	3254
261	3° 59.9′S	95° 7.3′W	4 Nov 00	1107	130	10	3596	1003
271	3° 0.0′S	95° 9.6′W	4 Nov 00	1640	135	11	3570	1002
281	2° 30.0′S	95° 10.7′W	4 Nov 00	2001	130	13	3445	1003
291	1° 58.1′S	95° 11.7′W	5 Nov 00	726	155	8	3398	3253
301	1° 30.0′S	95° 13.7′W	5 Nov 00	1319	155	9	3372	1000
311	1° 0.0′S	95° 15.6′W	5 Nov 00	1641	165	8	2942	1002
321	0° 29.9′S	95° 17.5′W	5 Nov 00	2001	160	13	3309	1002
331	0° 4.2′N	95° 21.8′W	6 Nov 00	350	160	13	3278	3252
341	0° 30.3′N	95° 4.0′W	7 Nov 00	127	145	13	3304	1002
351	1° 0.0′N	95° 11.8′W	7 Nov 00	456	150	15	3122	1002
361	1° 30.0′N	95° 19.5′W	7 Nov 00	821	160	10	2869	1002
371	2° 0.5′N	94° 59.4′W	8 Nov 00	326	170	11	3044	2902
381	2° 30.1′N	94° 58.4′W	8 Nov 00	722	175	9	2617	1003
391	3° 0.0′N	94° 57.5′W	8 Nov 00	1042	195	7	2758	1001
401	3° 39.7′N	94° 56.8′W	8 Nov 00	1612	205	12	3222	3052
411	5° 5.9′N	95° 0.0′W	9 Nov 00	517	210	13	3524	3102
421	6° 0.0′N	94° 58.7′W	9 Nov 00	1255	230	13	3238	1001
431	7° 0.0′N	94° 57.2′W	9 Nov 00	1821	240	14	3706	1001
441	8° 4.4′N	94° 53.6′W	10 Nov 00	412	285	12	3639	3077
451	9° 0.1′N	94° 59.6′W	11 Nov 00	230	285	5	3554	1001
461	10° 2.0′N	95° 1.7′W	11 Nov 00	846	270	3	3857	3002
471	11° 0.0′N	94° 54.8′W	12 Nov 00	335	0	0	3976	1000
482	12° 3.3′N	94° 58.8′W	12 Nov 00	2300	0	0	4094	3563

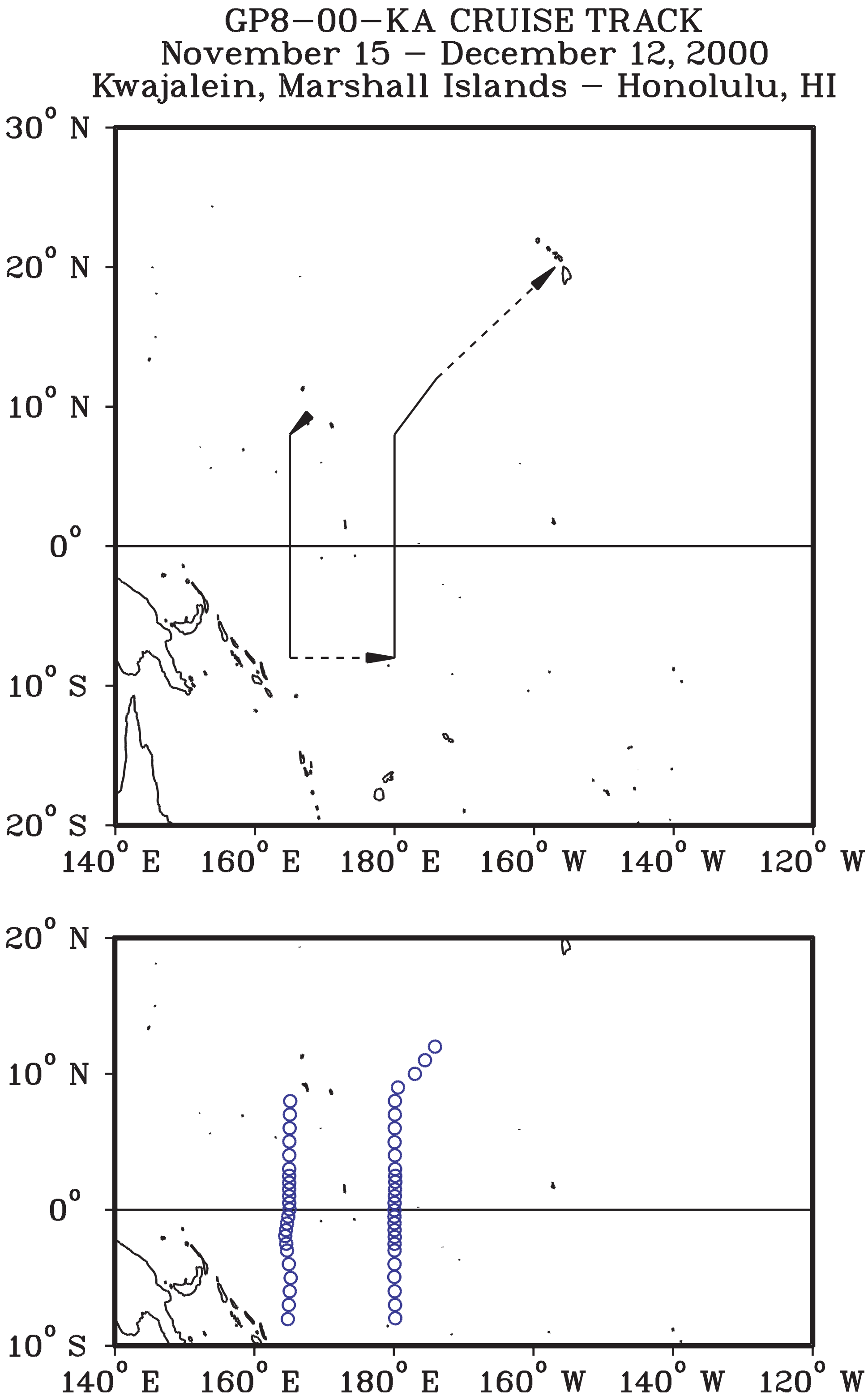

Figure 1p: GP8-00-KA cruise track and station locations.

Table 1p: GP8-00-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	7° 59.5′N	165° 8.3′E	16 Nov 00	2357	61	15	5212	1001
21	7° 0.3′N	165° 5.3′E	17 Nov 00	727	77	20	5168	1002
31	6° 0.1′N	165° 3.2′E	17 Nov 00	1431	124	13	5257	1001
41	5° 1.4′N	165° 1.1′E	18 Nov 00	352	126	18	4774	1004
51	4° 0.6′N	165° 0.5′E	18 Nov 00	1204	74	12	4495	1003
61	3° 0.4′N	164° 59.6′E	18 Nov 00	1957	73	9	4227	1003
71	2° 30.0′N	164° 59.6′E	19 Nov 00	15	71	70	4120	1001
81	1° 59.7′N	164° 59.8′E	19 Nov 00	455	62	4	4171	1004
91	1° 30.0′N	164° 59.6′E	19 Nov 00	857	76	3	4258	1003
101	1° 0.0′N	164° 59.6′E	19 Nov 00	1257	54	2	4328	1001
111	0° 29.9′N	165° 0.0′E	19 Nov 00	1649	86	1	4365	1004
121	0° 1.9′N	165° 2.3′E	20 Nov 00	933	359	4	4407	1004
131	0° 30.0′S	164° 51.5′E	20 Nov 00	1348	327	5	4434	1002
141	1° 0.5′S	164° 41.2′E	20 Nov 00	1736	300	4	4417	1002
151	1° 30.0′S	164° 32.4′E	20 Nov 00	2136	328	2	4420	1003
161	1° 56.1′S	164° 25.4′E	21 Nov 00	114	998	3	4432	1003
171	2° 29.6′S	164° 34.2′E	21 Nov 00	530	169	6	4465	1003
181	3° 0.0′S	164° 40.7′E	21 Nov 00	919	159	8	4073	1002
191	3° 59.9′S	164° 56.5′E	21 Nov 00	1608	55	3	4449	1003
201	5° 0.7′S	165° 12.3′E	22 Nov 00	332	84	6	2556	1002
211	5° 59.9′S	165° 3.8′E	22 Nov 00	1021	157	10	3600	1003
221	6° 59.9′S	164° 56.0′E	22 Nov 00	1701	116	5	3739	1004
231	8° 2.4′S	164° 47.9′E	23 Nov 00	37	169	4	3892	1001
241	7° 58.8′S	179° 48.6′W	27 Nov 00	618	61	11	5550	1003
251	7° 0.0′S	179° 50.5′W	27 Nov 00	1321	44	14	5440	1002
261	5° 59.7′S	179° 53.4′W	27 Nov 00	2009	11	20	5076	1004
271	4° 56.5′S	179° 56.8′W	28 Nov 00	326	49	18	5614	1002
281	4° 0.0′S	179° 55.1′W	28 Nov 00	1037	69	12	5614	1005
291	2° 59.6′S	179° 54.7′W	28 Nov 00	1741	76	19	5456	1003
301	2° 30.0′S	179° 54.4′W	28 Nov 00	2131	78	18		1003
311	1° 59.7′S	179° 53.1′W	29 Nov 00	923	58	18	5332	1002
321	1° 29.9′S	179° 54.4′W	29 Nov 00	1347	76	19	5239	1003
331	0° 59.6′S	179° 55.1′W	29 Nov 00	1741	80	16	5756	1004
341	0° 30.0′S	179° 55.7′W	29 Nov 00	2141	69	21		1004
351	0° 2.0′S	179° 55.7′W	30 Nov 00	858	79	18		1004
361	0° 30.1′N	179° 54.4′W	30 Nov 00	1304	94	16	5739	1002
371	1° 0.2′N	179° 52.1′W	30 Nov 00	1659	105	19	5562	1003
381	1° 29.9′N	179° 50.4′W	30 Nov 00	2057	99	18		1001
391	2° 3.1′N	179° 48.4′W	1 Dec 00	208	90	13	5463	4005
401	2° 30.0′N	179° 49.3′W	1 Dec 00	629	77	15	5332	1003
411	2° 59.9′N	179° 50.2′W	1 Dec 00	1014	108	15		1002
421	4° 0.3′N	179° 51.8′W	1 Dec 00	1658	108	20		1004
431	4° 58.4′N	179° 54.1′W	1 Dec 00	2334	115	17		1003
441	5° 59.9′N	179° 53.2′W	2 Dec 00	727	132	16	5382	1006
451	7° 0.1′N	179° 52.2′W	2 Dec 00	1440	107	15	5754	1016
461	8° 0.1′N	179° 51.5′W	2 Dec 00	2124	100	6	5948	1003
471	8° 59.9′N	179° 25.2′W	3 Dec 00	843	76	21	5792	1007
481	10° 0.0′N	176° 59.7′W	3 Dec 00	2203	67	23	6001	1002
491	11° 0.1′N	175° 33.0′W	4 Dec 00	1109	60	14	5485	1007
501	12° 0.1′N	174° 6.7′W	4 Dec 00	2338	52	21	5654	1004

Table 2: Drift and viscous heating corrections for CTD temperature calibrations.

Cruise	Temp. Sensor S/N	Drift Correction °C	Viscous Heat Correction °C
GP199	2026	0.0009	–0.0006
GP299	2026	–0.0007	–0.0006
GP399	2026	–0.0004	–0.0006
GP499	2027	0.0009	–0.0006
GP599	2027	0.0010	–0.0006
GP799	2027	0.0011	–0.0006
GP899	1455	0.0000	–0.0006
GP999	2027	0.0012	–0.0006
GP100	2027	0.0014	–0.0006
GP200	2027	0.0004	–0.0006
GP300	2027	0.0001	–0.0006
GP400	2027	0.0002	–0.0006
GP500	2027	0.0003	–0.0006
GP600	2027	0.0004	–0.0006
GP700	1370	0.0003	–0.0006
GP800	2027	0.0005	–0.0006

Table 3: Station groupings for CTD conductivity calibrations.

Cruise	Stations	Sensor S/N	Standard Seawater	Fitting Routine	Points Used	Total Points	Percent Points Used	Fit Standard Deviation (mS/cm)	Conductivity Fit Bias (mS/cm)	Pressure Correction Beta	Minimum Fit Slope	Maximum Fit Slope
GP199	1–30	1536	P127	Calcop1	274	338	81.07	0.001412	–0.008628812	8.2780992e-007	0.9999816	0.9999999
GP299	1–43	1536	P135	Calcop3	374	498	75.10	0.001527	–0.006724099	2.5925486e-007	1.0001957	1.0003050
GP399	1–38	1536	P135	Calcop2	305	369	82.66	0.001390	–0.003068633	1.1992992e-007	1.0001623	1.0003073
GP499	1–49	1537	P135	Calcop1	430	549	78.32	0.001436	0.003561386	–2.6771197e-007	0.9999669	0.9999738
GP599	1–36	1537	P135	Calcop3	330	390	84.62	0.001580	0.001005201	–1.7860936e-007	1.0000516	1.0001378
GP799	1–38	1537	P135	Calcop1	335	410	81.71	0.001278	0.002128502	–3.7248645e-007	1.0000966	1.0001150
GP899	1–51	1180	P134	Calcos0	490	584	83.90	0.002210	–0.016829929		1.0004461	1.0004461
GP999	1–30	1537	P136	Calcop0	300	351	85.47	0.002366	0.004221180	–8.4050609e-007	1.0000982	1.0000982
GP100	1–37	1537	P136	Calcop3	238	272	87.50	0.001127	0.002796845	–1.5340907e-007	0.9999914	1.0001391
GP200	1–50	1537	P136	Calcop1	399	565	70.62	0.001343	–0.000313624	9.1652413e-008	0.9999819	1.0000325
GP300	1–52	1537	P136	Calcop4	502	600	83.67	0.001465	0.001940049	–2.7787074e-007	0.9999421	1.0000580
GP400	1–50	1537	P136	Calcos2	395	521	75.82	0.001569	–0.001417831		1.0000798	1.0001711
GP500	7–42	1537	P136	Calcop1	334	402	83.08	0.001246	0.000073378	–4.1260679e-007	1.0000684	1.0000788
GP600	1–48	1537	P136	Calcos0	375	528	71.02	0.002432	–0.001821845		1.0001078	1.0001078
GP700	1–48	1180	P136	Calcop0	322	393	81.93	0.001516	0.011184738	7.2296087e-007	1.0004229	1.0004229
GP800	1–50	1537	P136	Calcos2	456	552	82.61	0.003373	–0.000890204		1.0000930	1.0001995

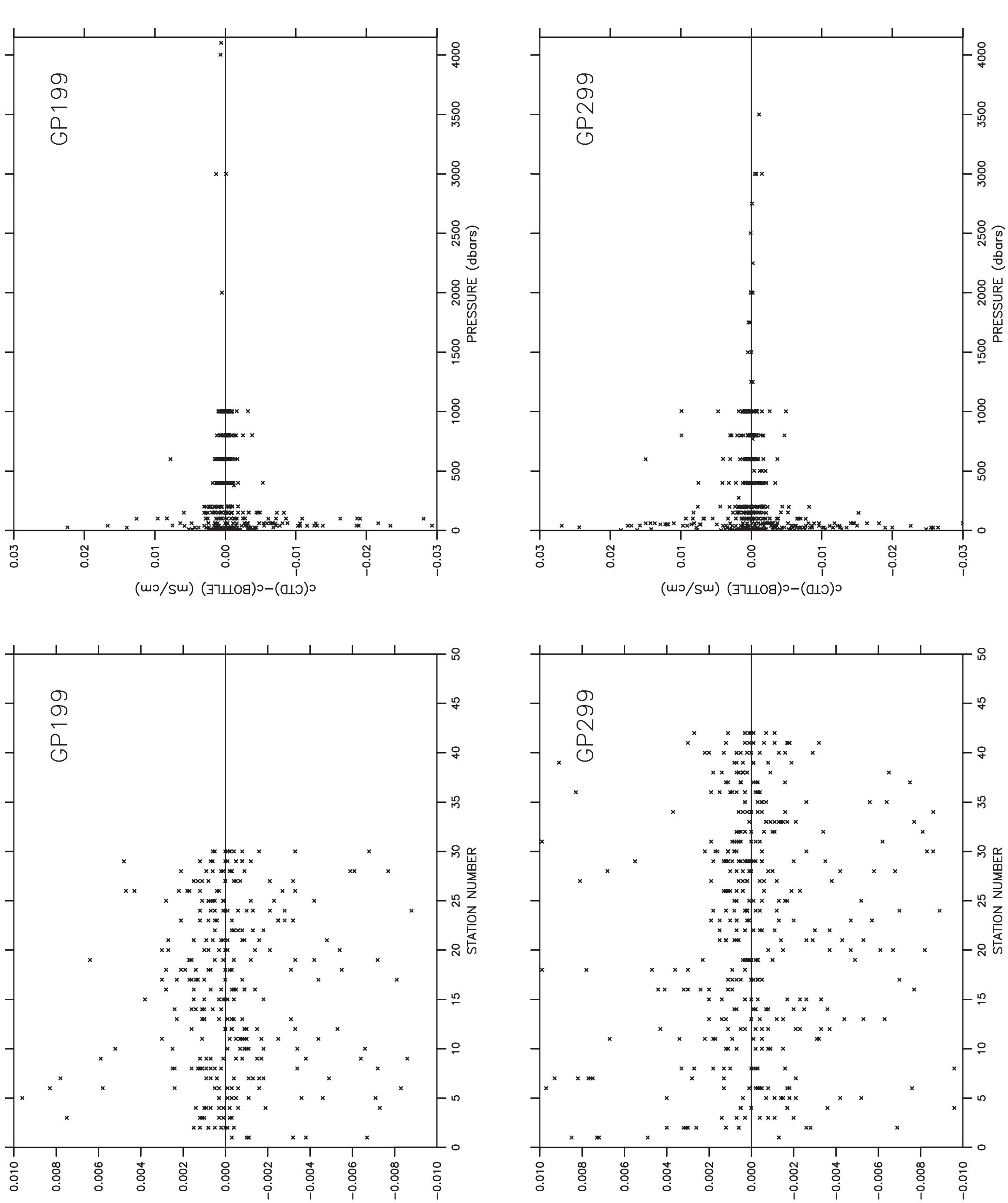

Figure 2a: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP199 (upper panels) and GP299 (lower panels).

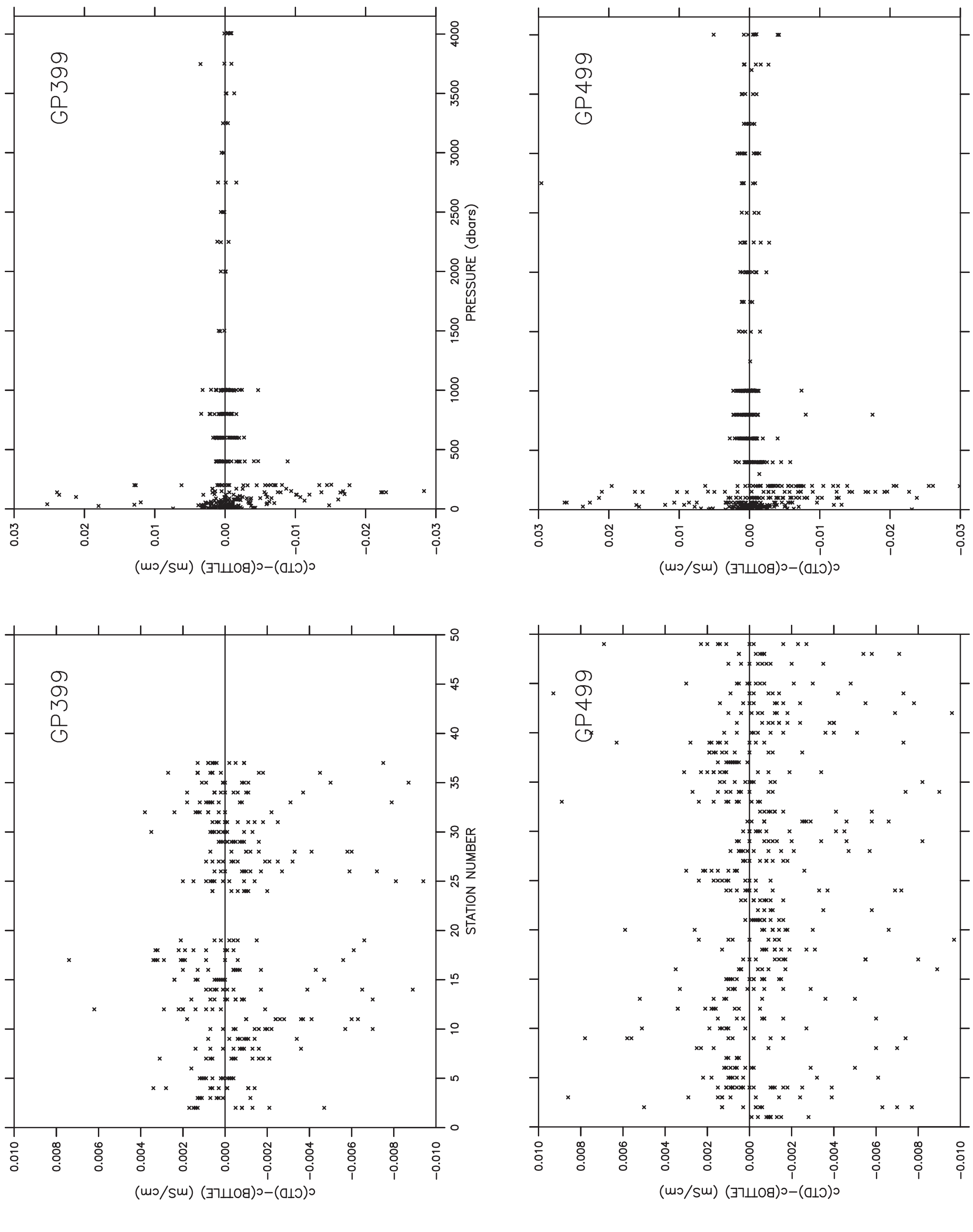

Figure 2b: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP399 (upper panels) and GP499 (lower panels).

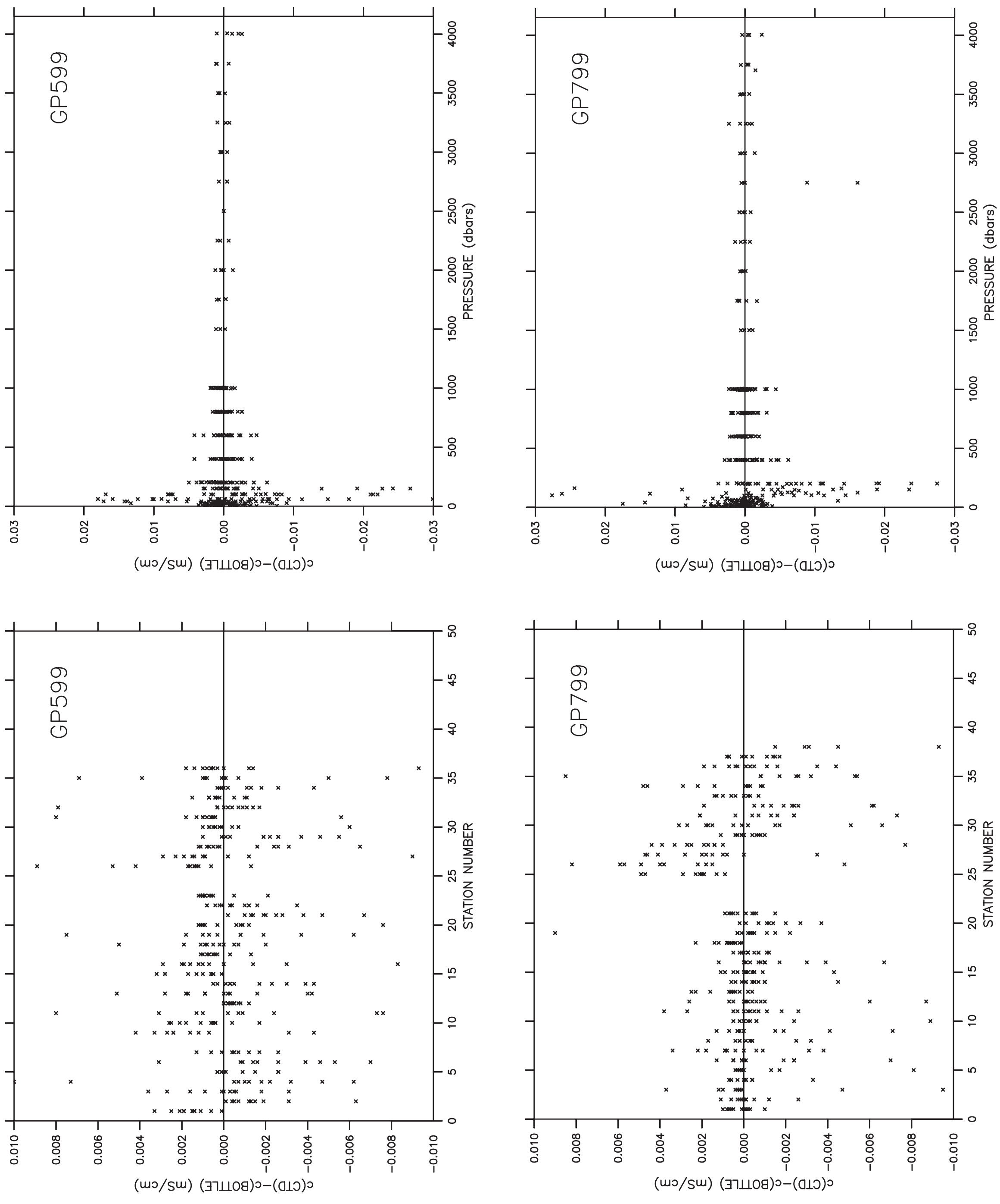

Figure 2c: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP599 (upper panels) and GP799 (lower panels).

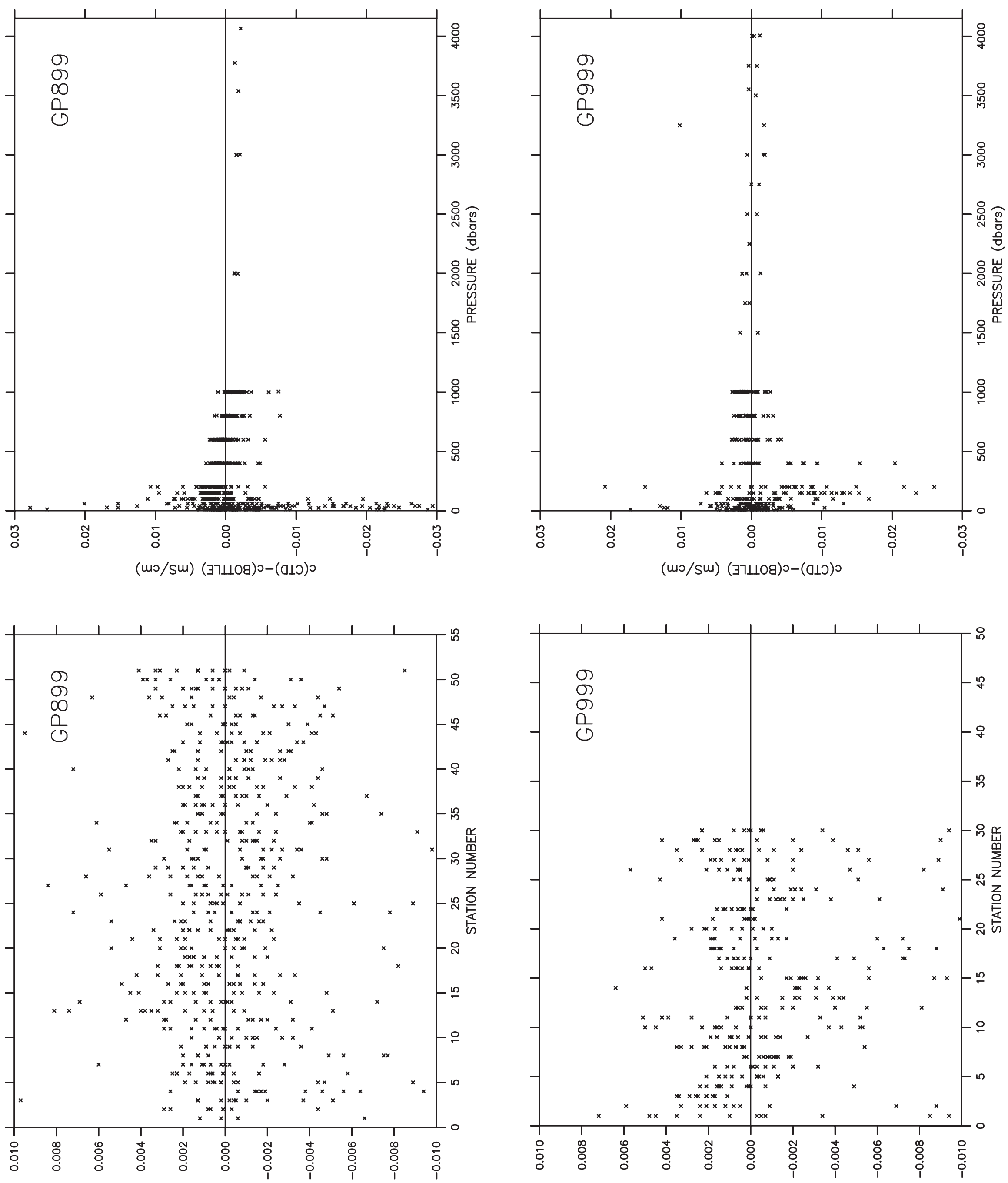

Figure 2d: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP899 (upper panels) and GP999 (lower panels).

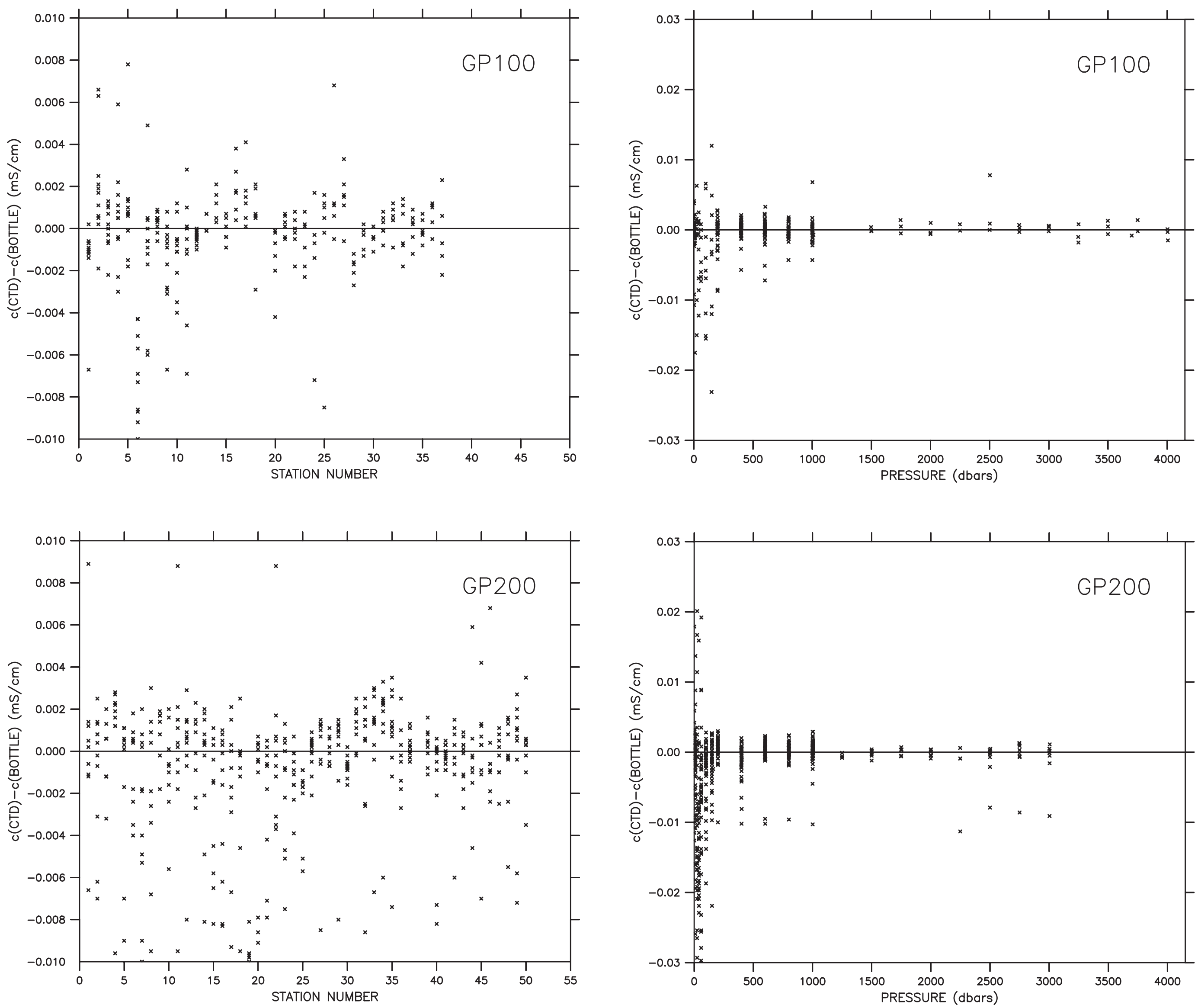

Figure 2e: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP100 (upper panels) and GP200 (lower panels).

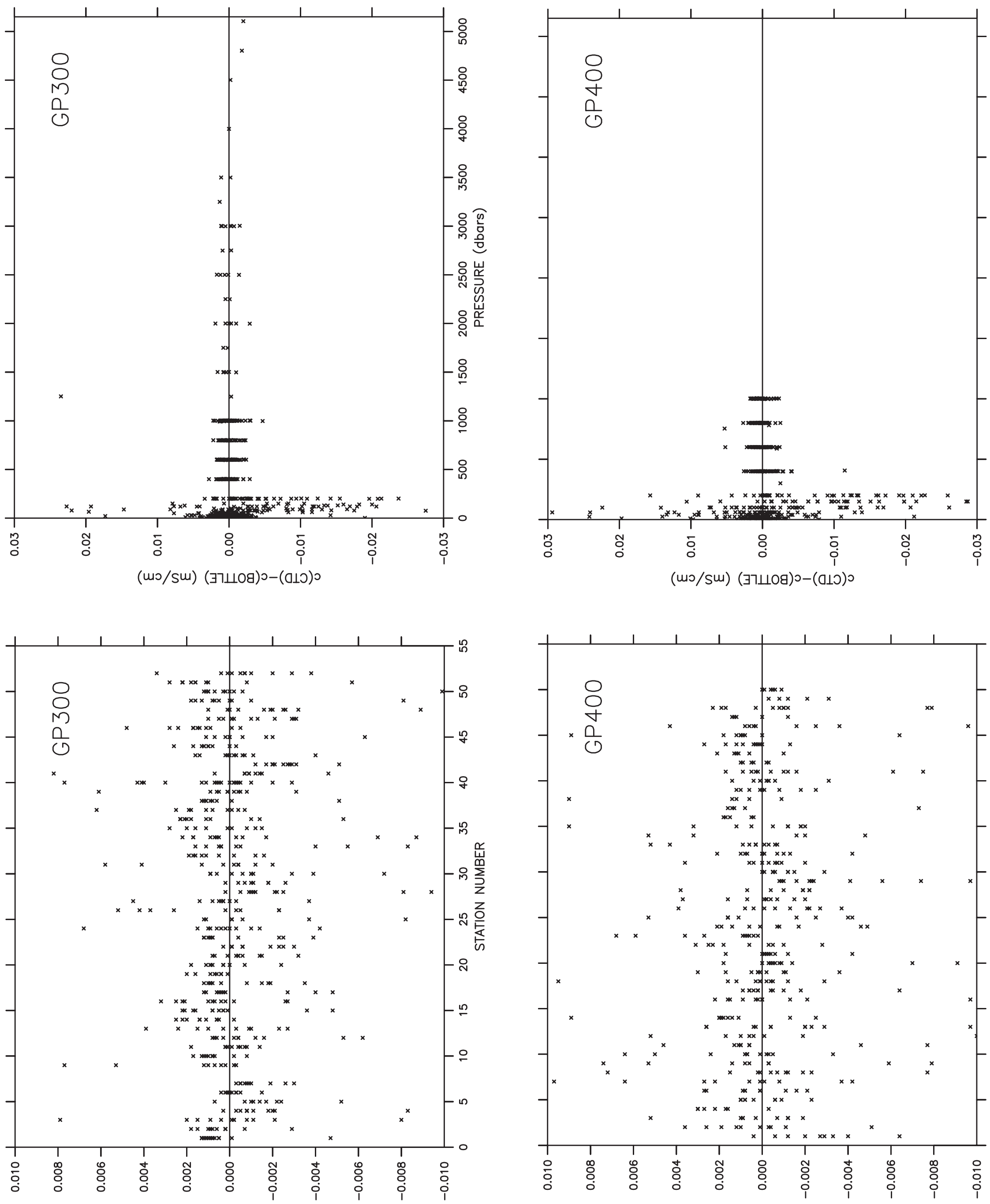

Figure 2f: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP300 (upper panels) and GP400 (lower panels).

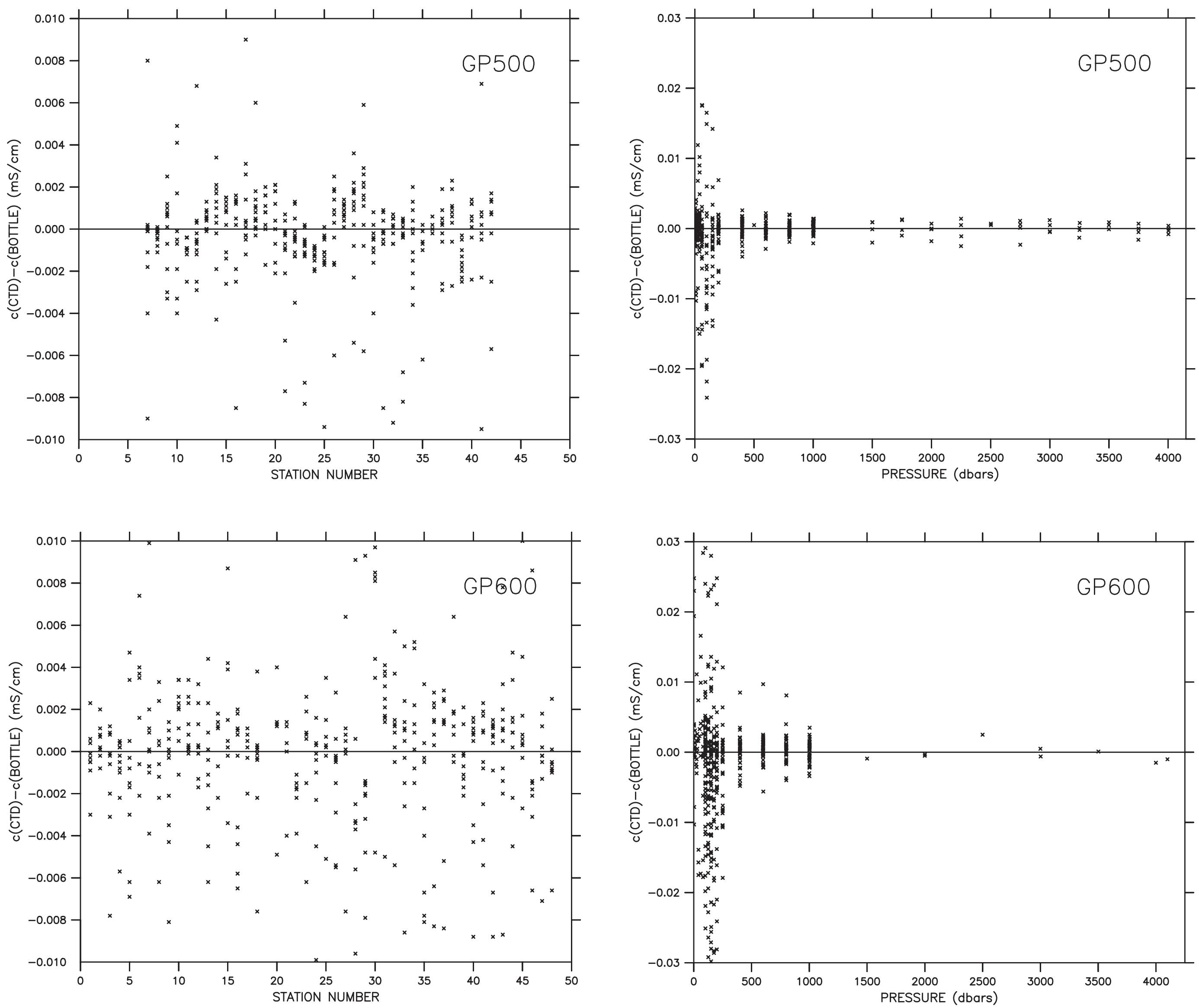

Figure 2g: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP500 (upper panels) and GP600 (lower panels).

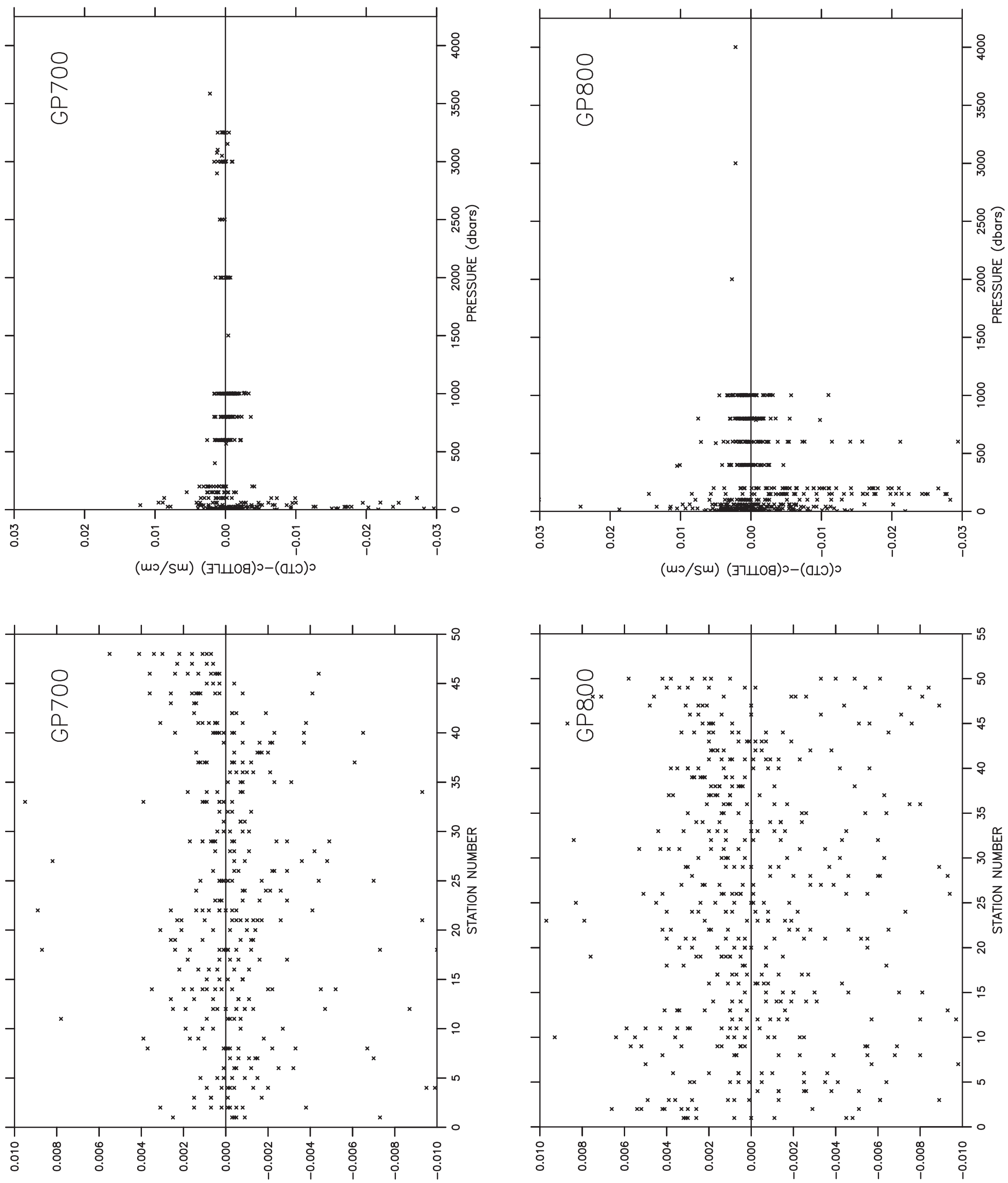

Figure 2h: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP700 (upper panels) and GP800 (lower panels).

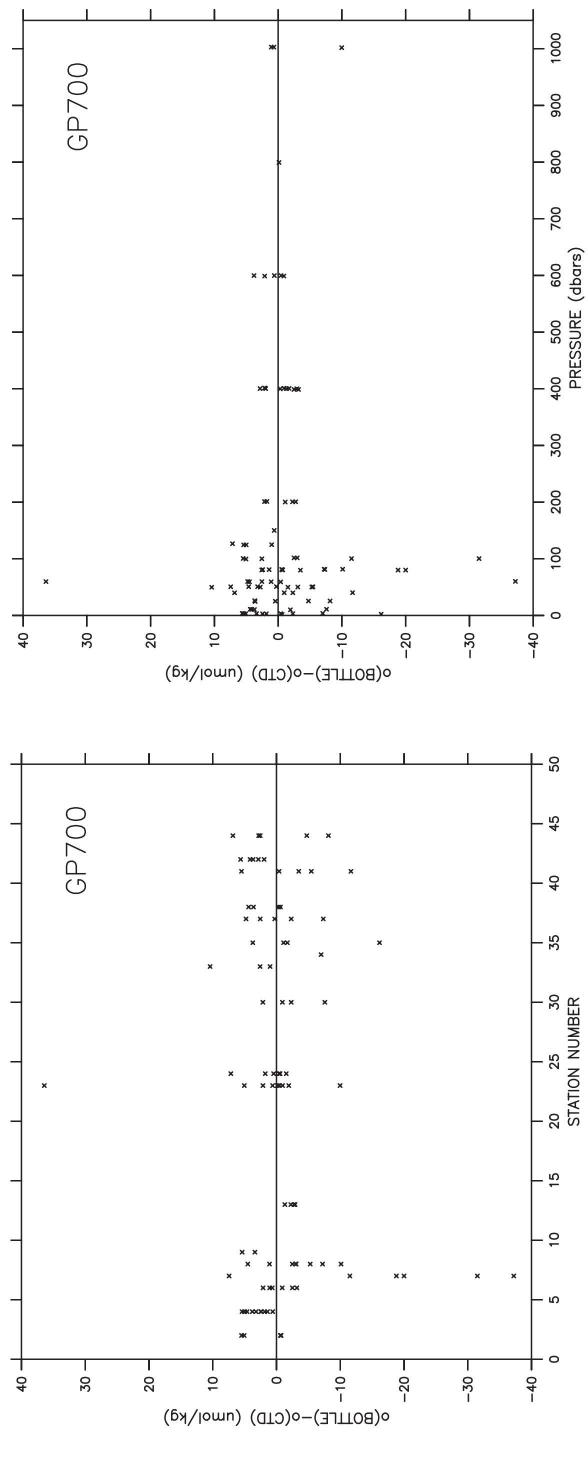

Figure 3: Calibrated CTD-bottle oxygen differences plotted against station number and pressure for cruise GP700.

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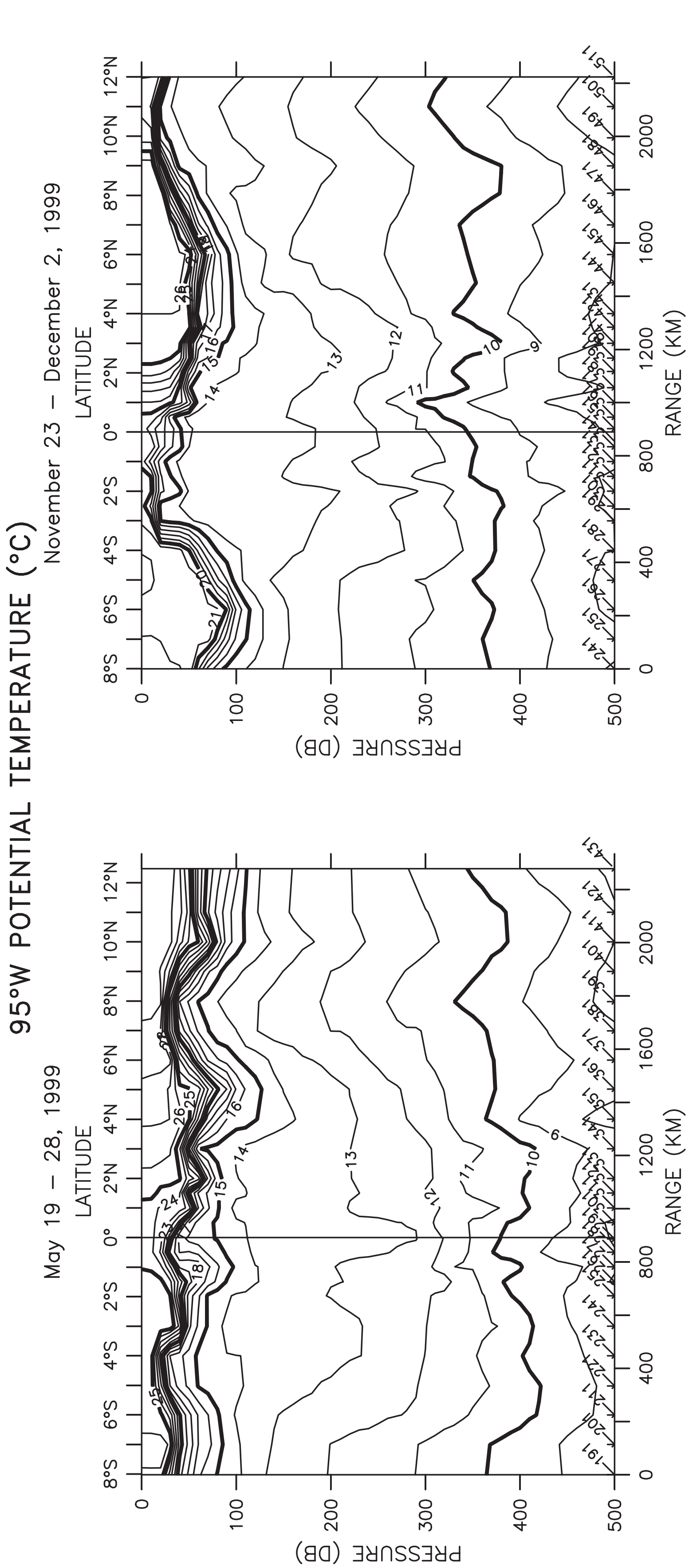

Figure 4: GP2-99-KA spring and GP8-99-RB fall potential temperature (°C) sections along 95°W. Contour intervals are 1°C.

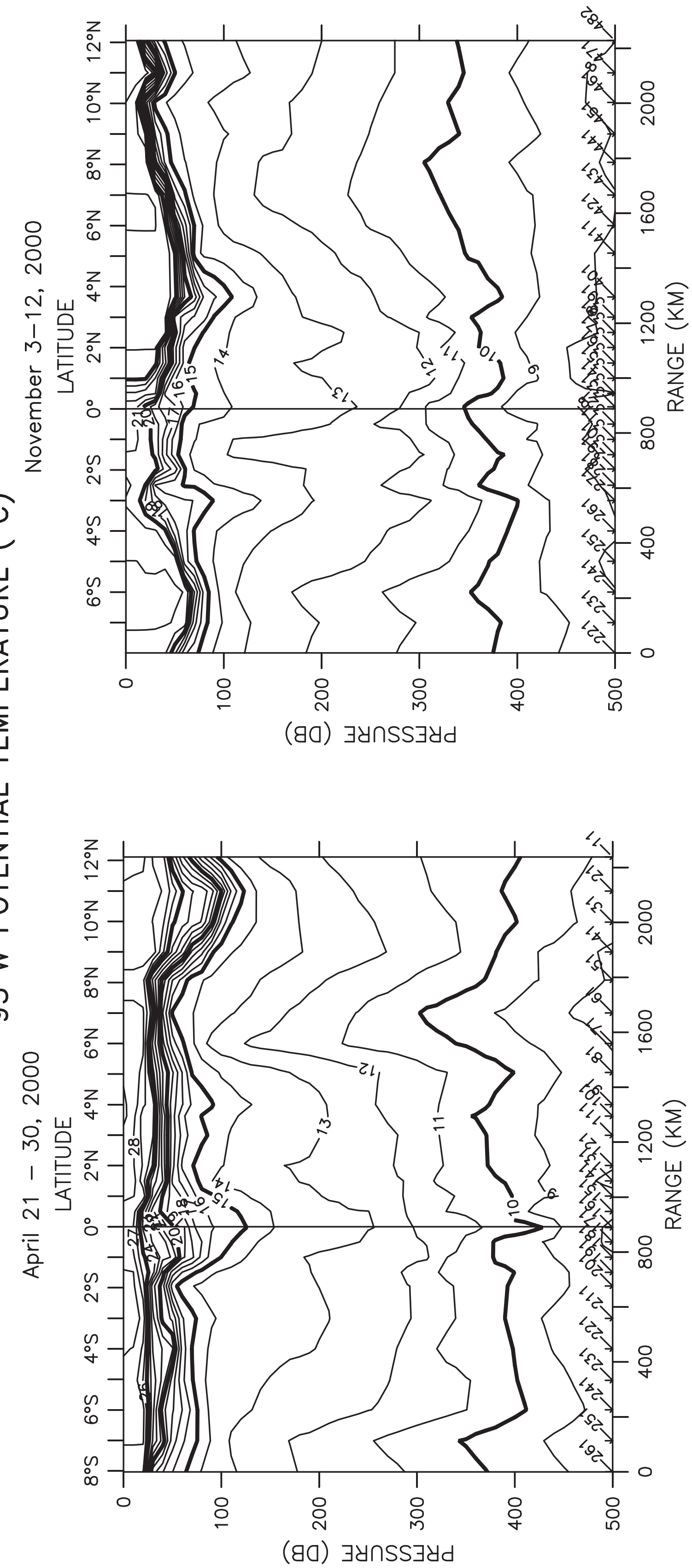

Figure 5: GP2-00-KA spring and GP7-00-RB fall potential temperature (°C) sections along 95°W. Contour intervals are 1°C.

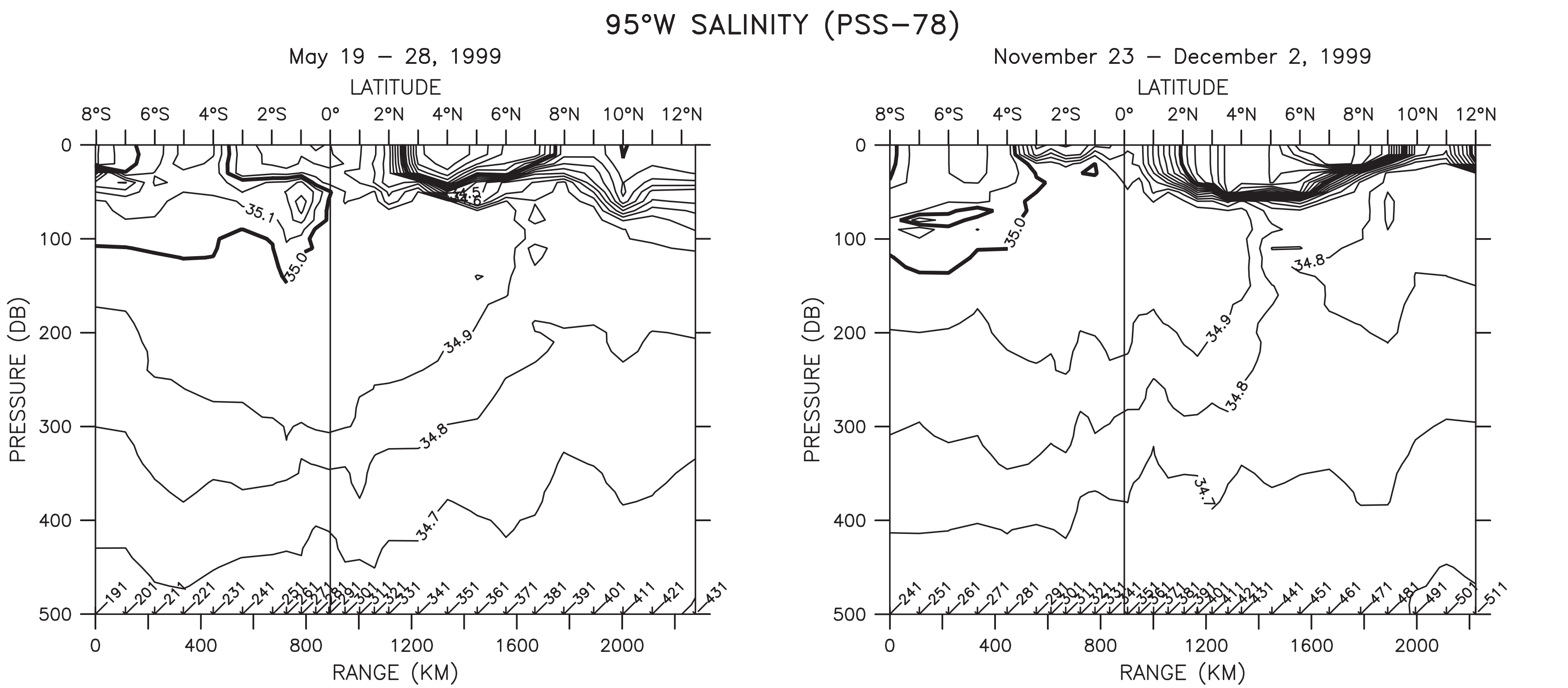

Figure 6: GP2-99-KA spring and GP8-99-RB fall salinity (PSS-78) sections along 95°W. Contour intervals are 0.1 PSS.

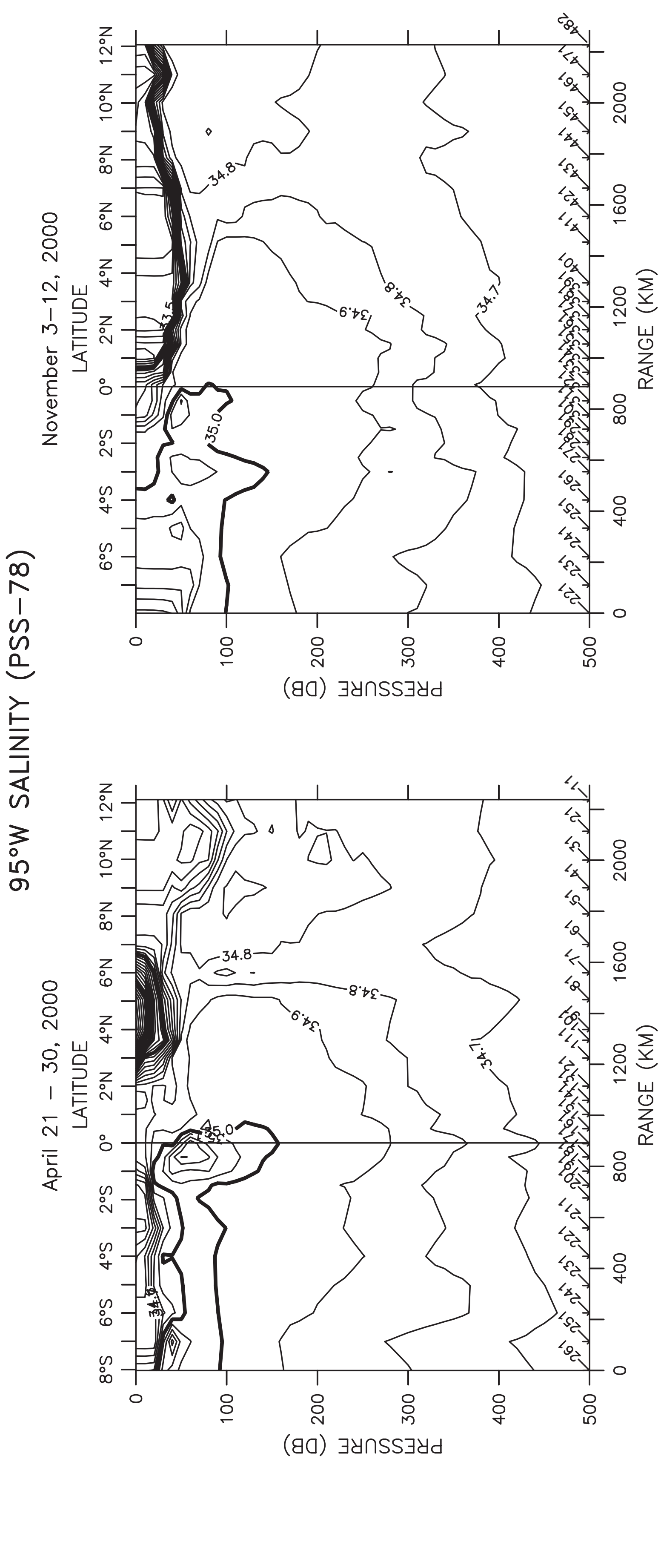

Figure 7: GP2-00-KA spring and GP7-00-RB fall salinity (PSS-78) sections along 95°W. Contour intervals are 0.1 PSS.

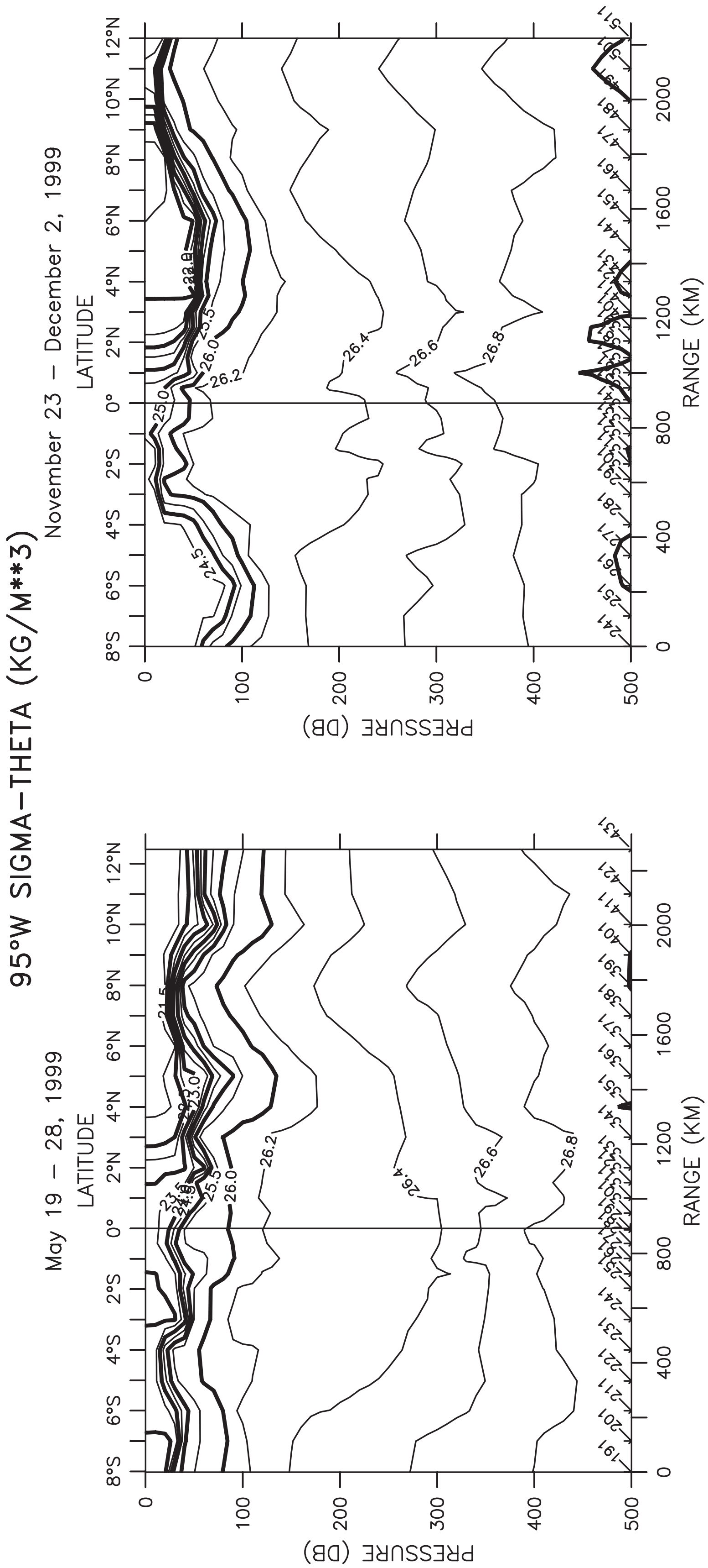

Figure 8: GP2-99-KA spring and GP8-99-RB fall potential density (kg/m^3) sections along 95°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

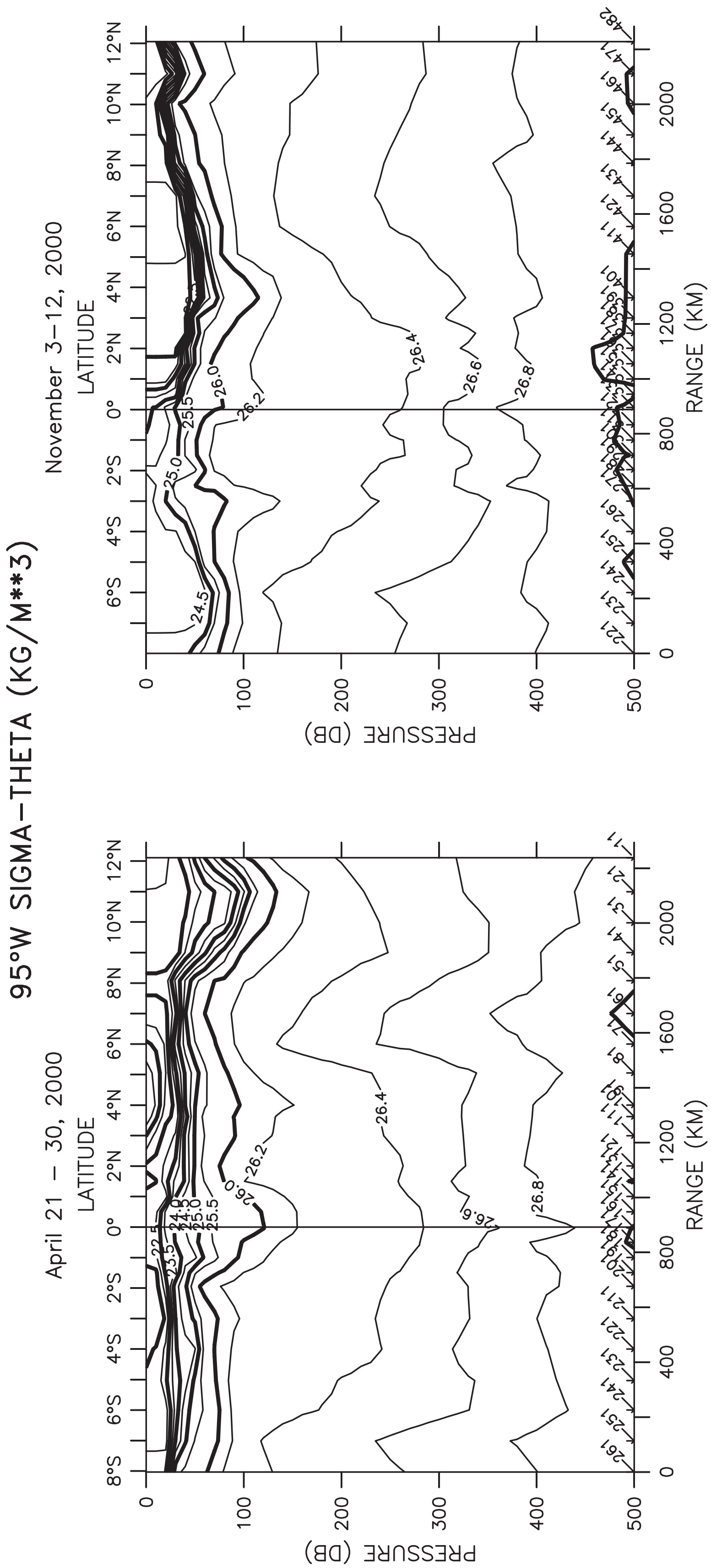

Figure 9: GP2-00-KA spring and GP7-00-RB fall potential density (kg/m^3) sections along 95°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

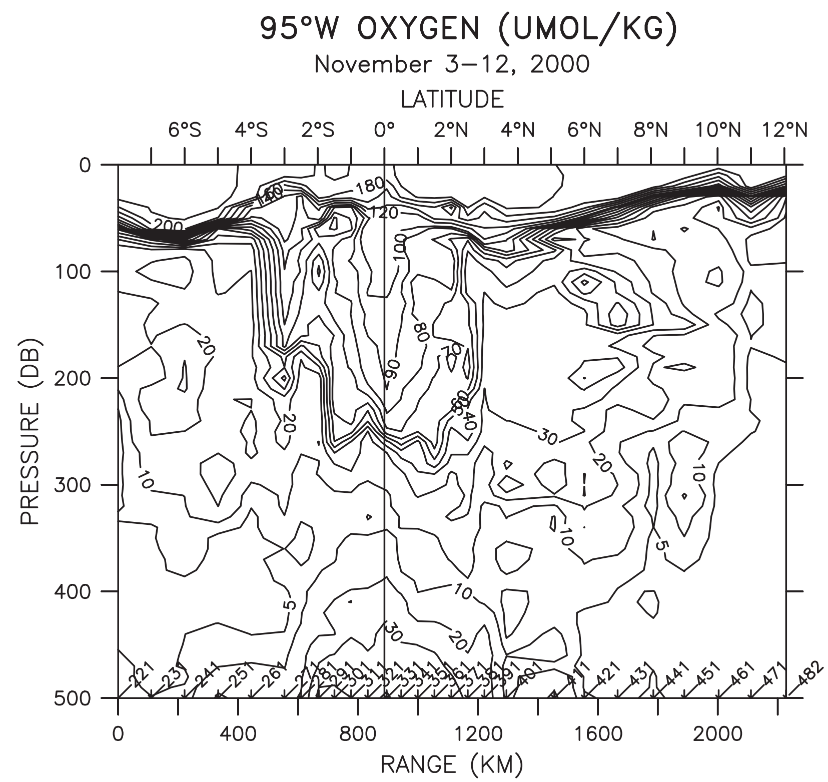

Figure 10: GP7-00-RB fall CTD oxygen (μmol/kg) section along 95°W. Contour intervals are 5 from 0–10 μmol/kg, 10 from 10–100 μmol/kg, and 20 from 100–300 μmol/kg.

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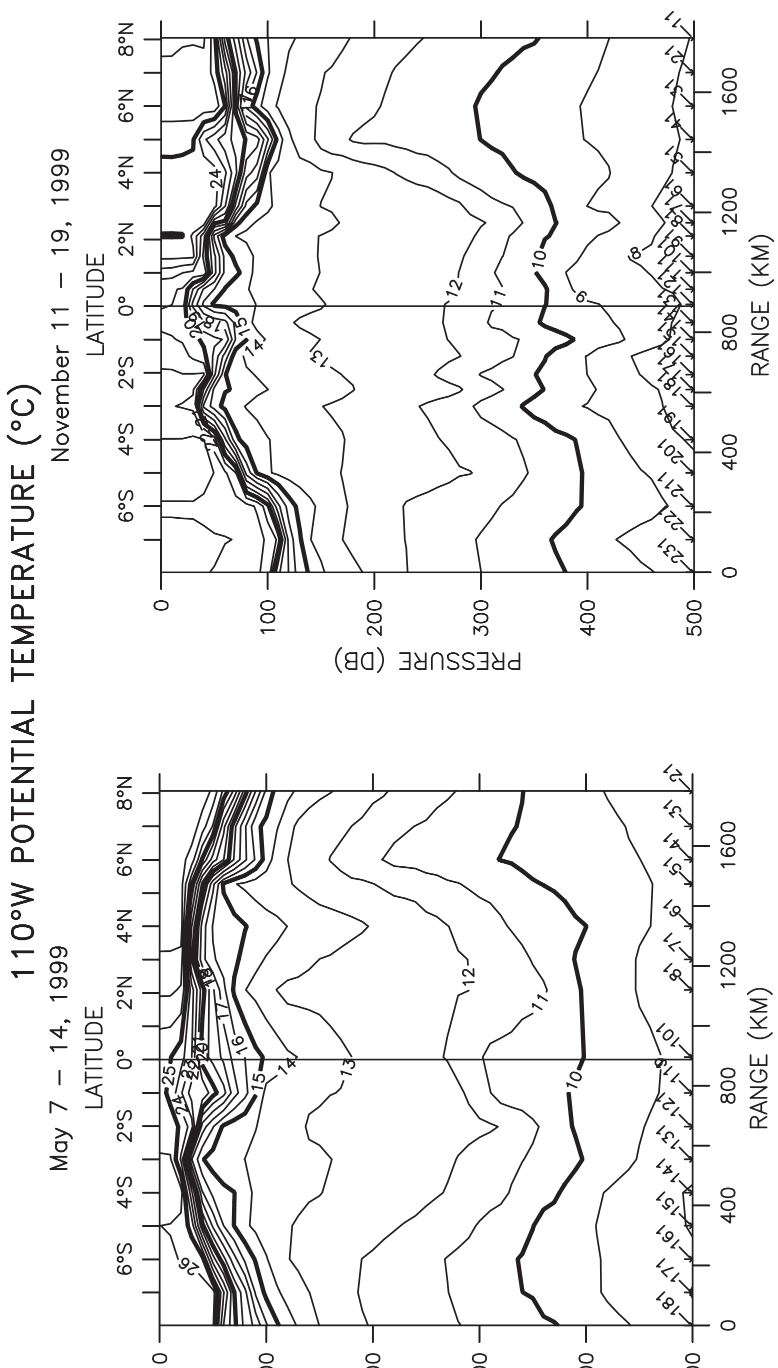

Figure 11: GP2-99-KA spring and GP8-99-RB fall potential temperature (°C) sections along 110°W. Contour intervals are 1°C.

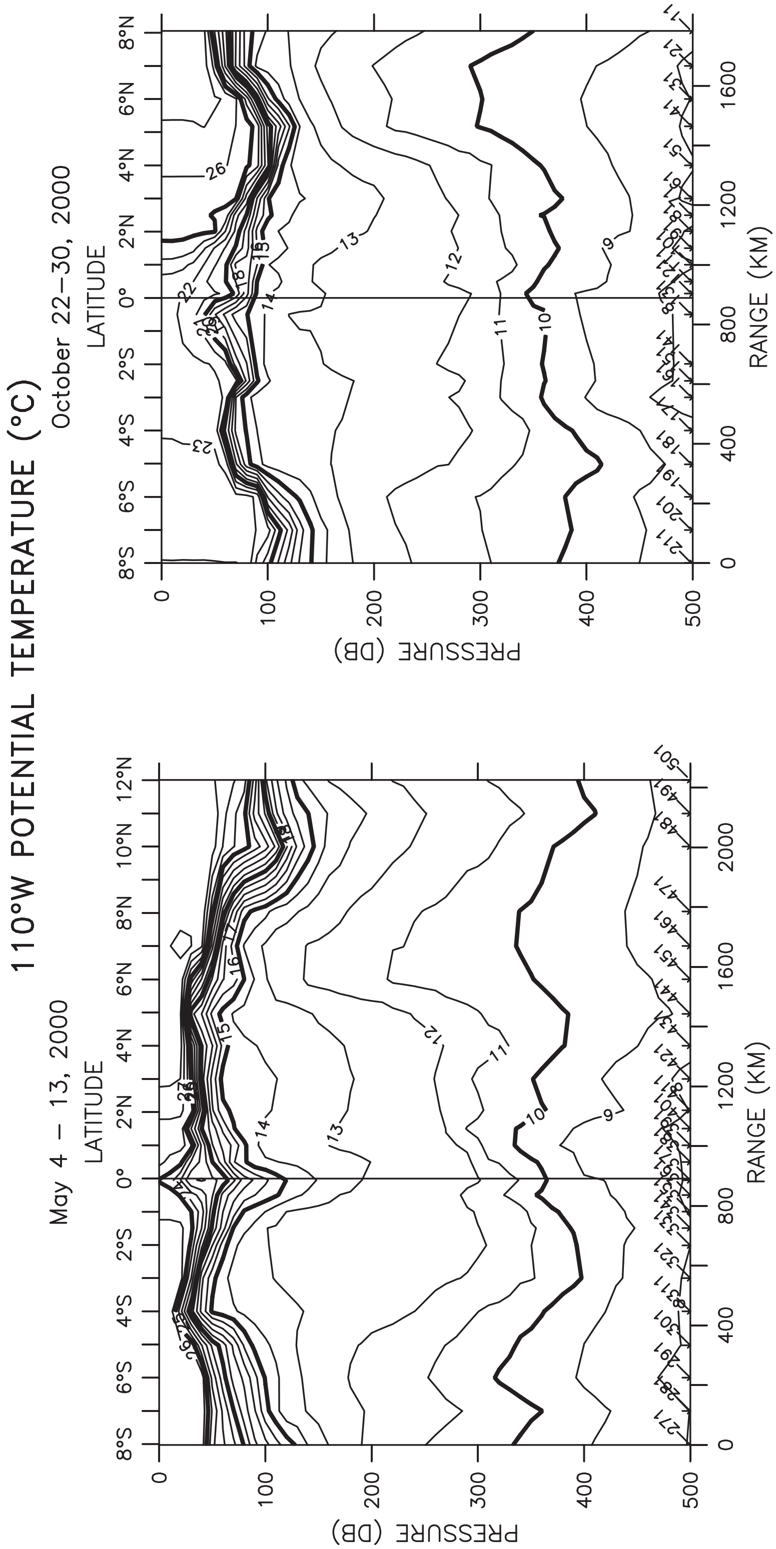

Figure 12: GP2-00-KA spring and GP7-00-RB fall potential temperature (°C) sections along 110°W. Contour intervals are 1°C.

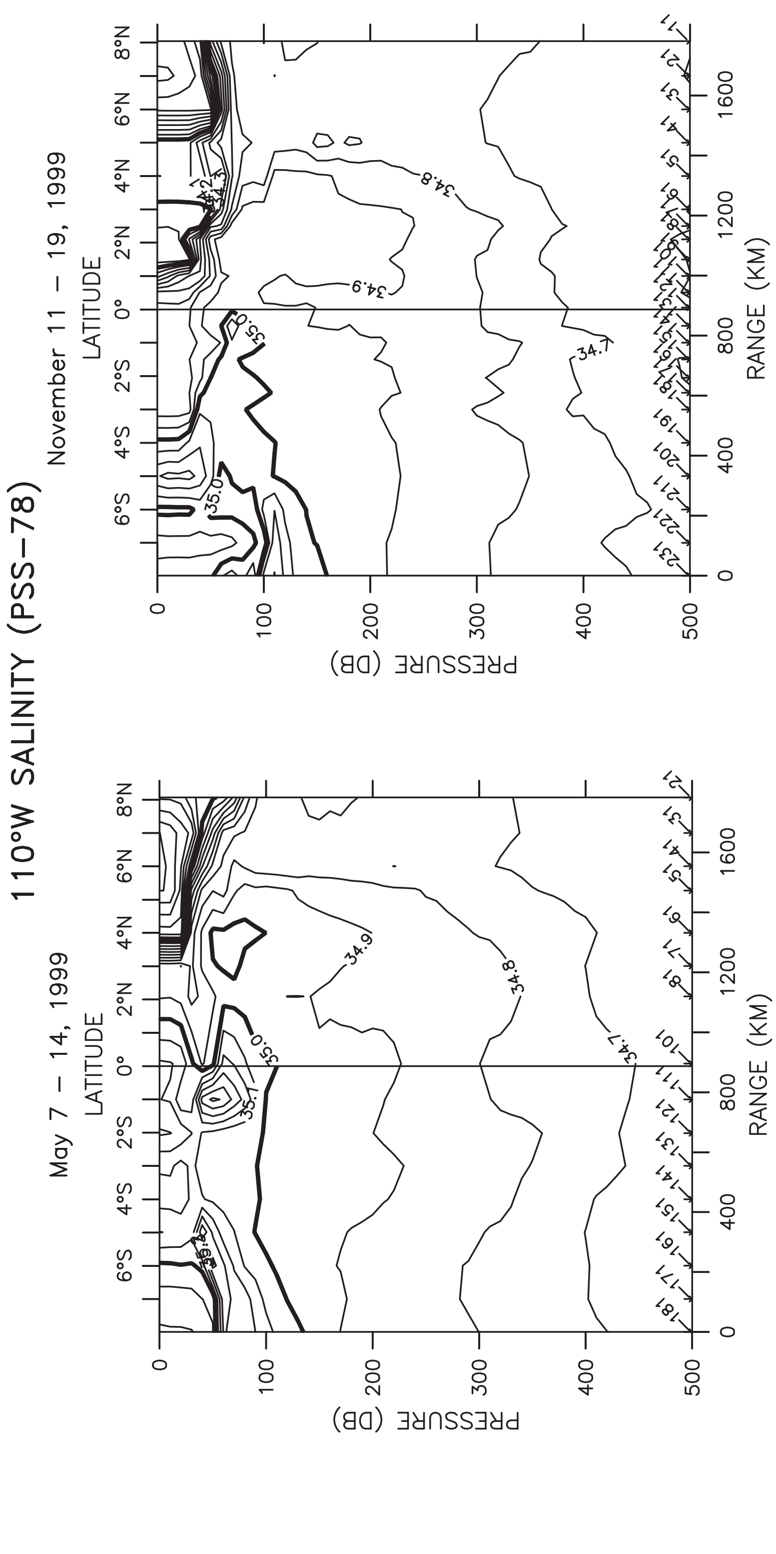

Figure 13: GP2-99-KA spring and GP8-99-RB fall salinity (PSS-78) sections along 110°W. Contour intervals are 0.1 PSS.

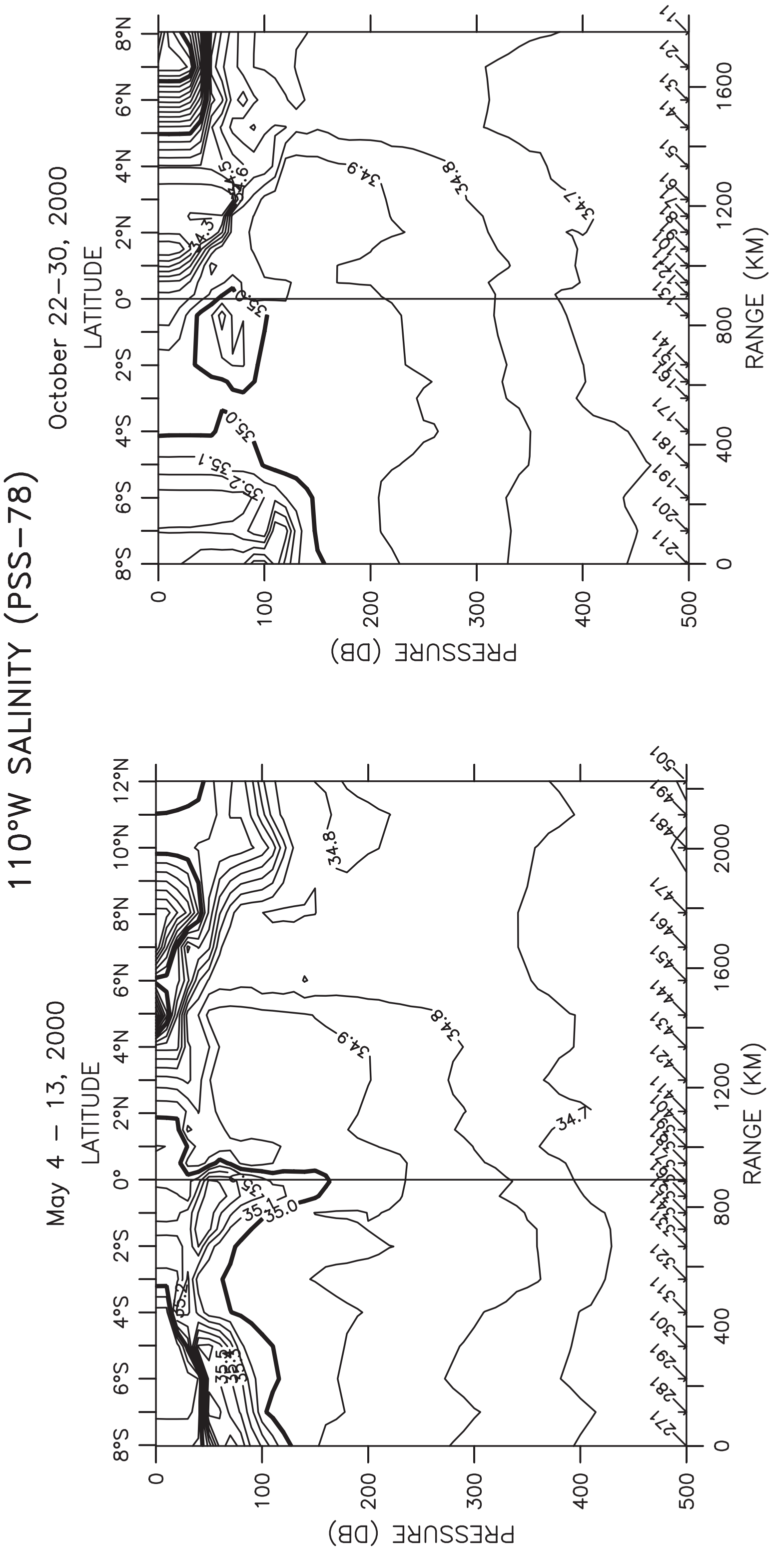

Figure 14: GP2-00-KA spring and GP7-00-RB fall salinity (PSS-78) sections along 110°W. Contour intervals are 0.1 PSS.

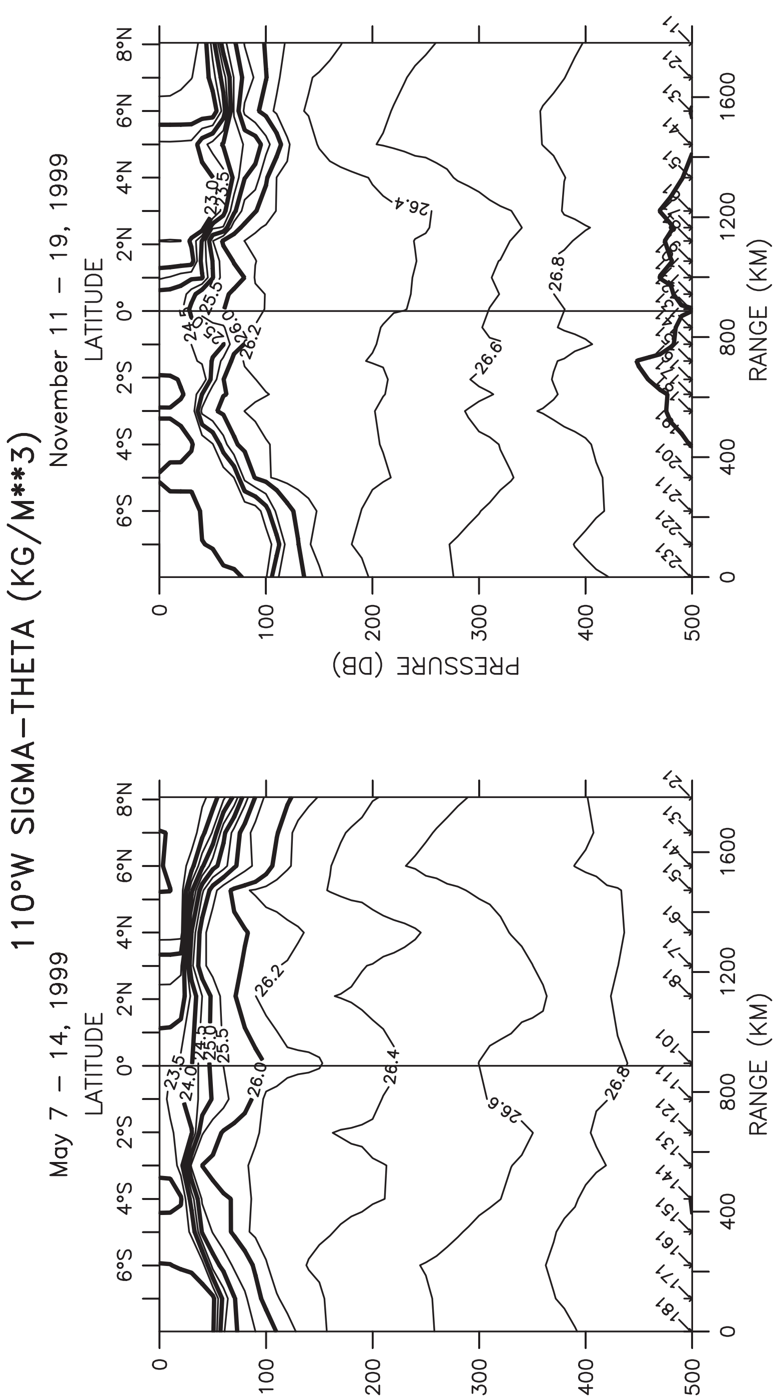

Figure 15: GP2-99-KA spring and GP8-99-RB fall potential density (kg/m^3) sections along 110°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

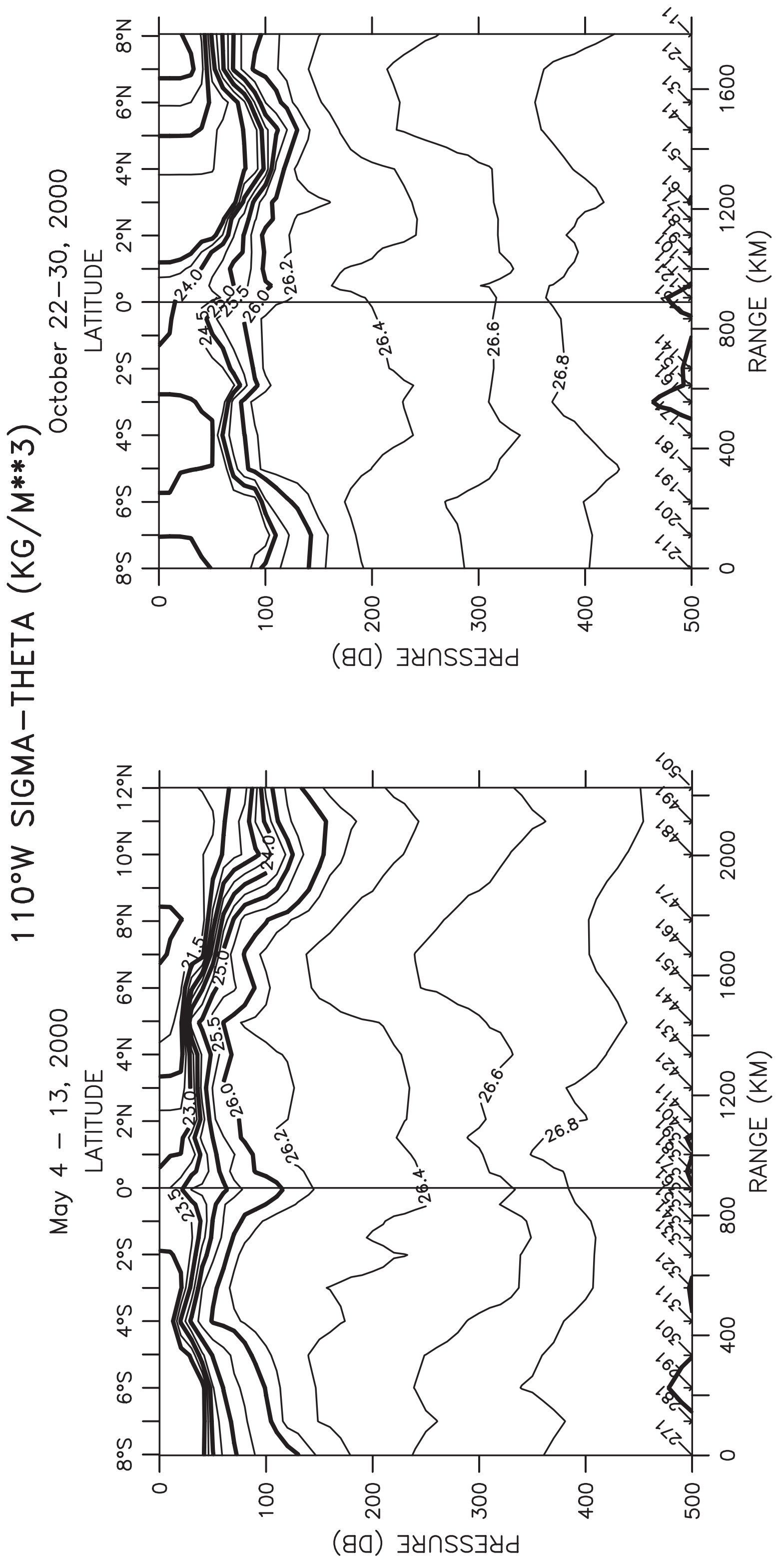

Figure 16: GP2-00-KA spring and GP7-00-RB fall potential density (kg/m^3) sections along 110°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

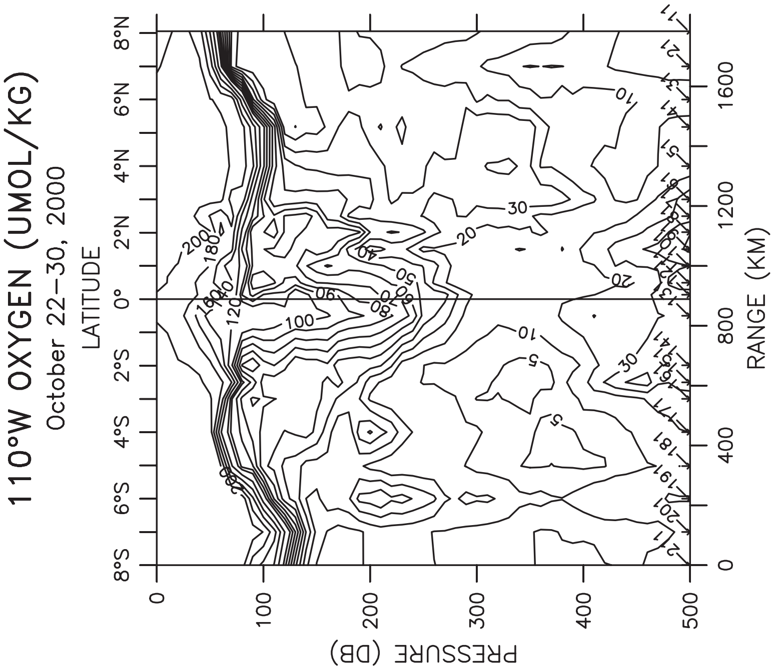

Figure 17: GP7-00-RB fall CTD oxygen (μmol/kg) section along 110°W. Contour intervals are 5 from 0–10 μmol/kg, 10 from 10–100 μmol/kg, and 20 from 100–300 μmol/kg.

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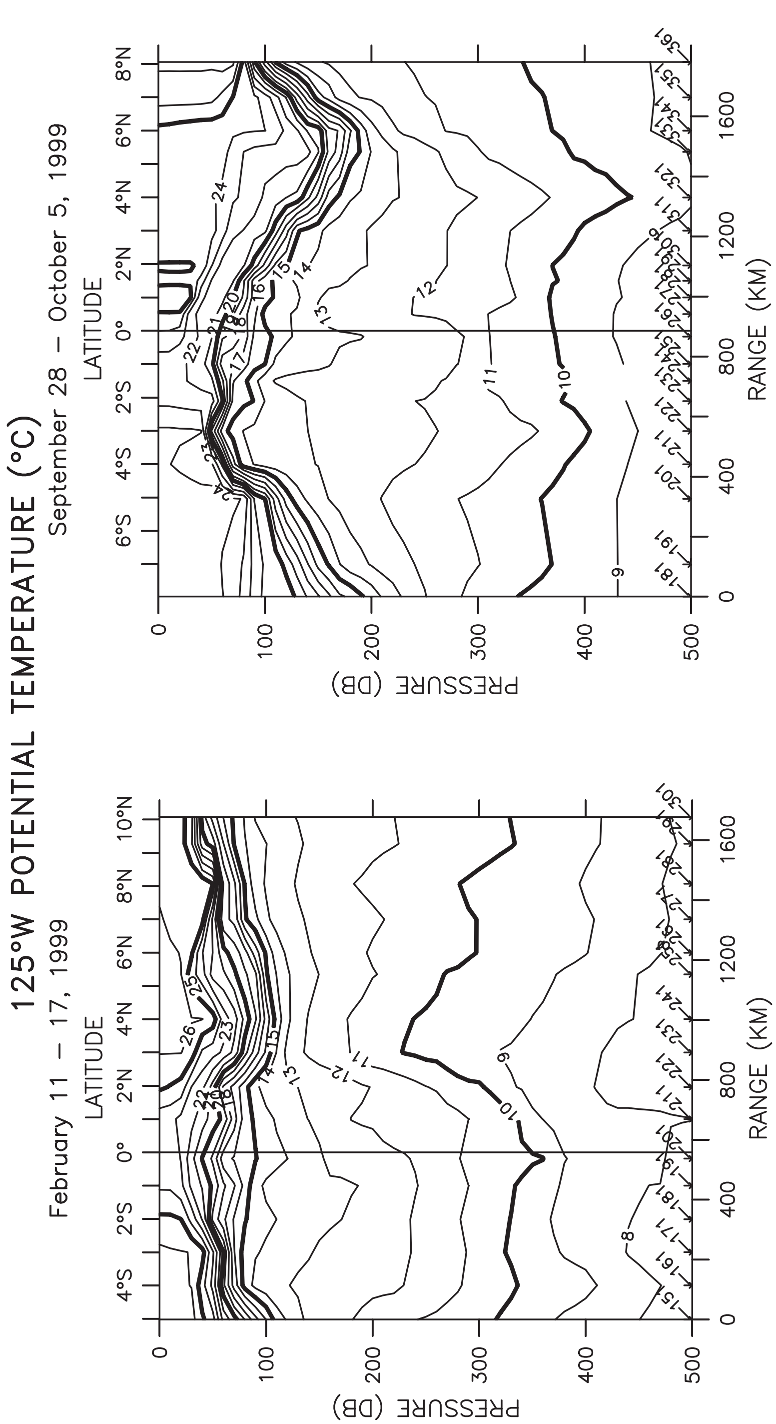

Figure 18: GP1-99-KA winter and GP5-99-KA fall potential temperature (°C) sections along 125°W. Contour intervals are 1°C.

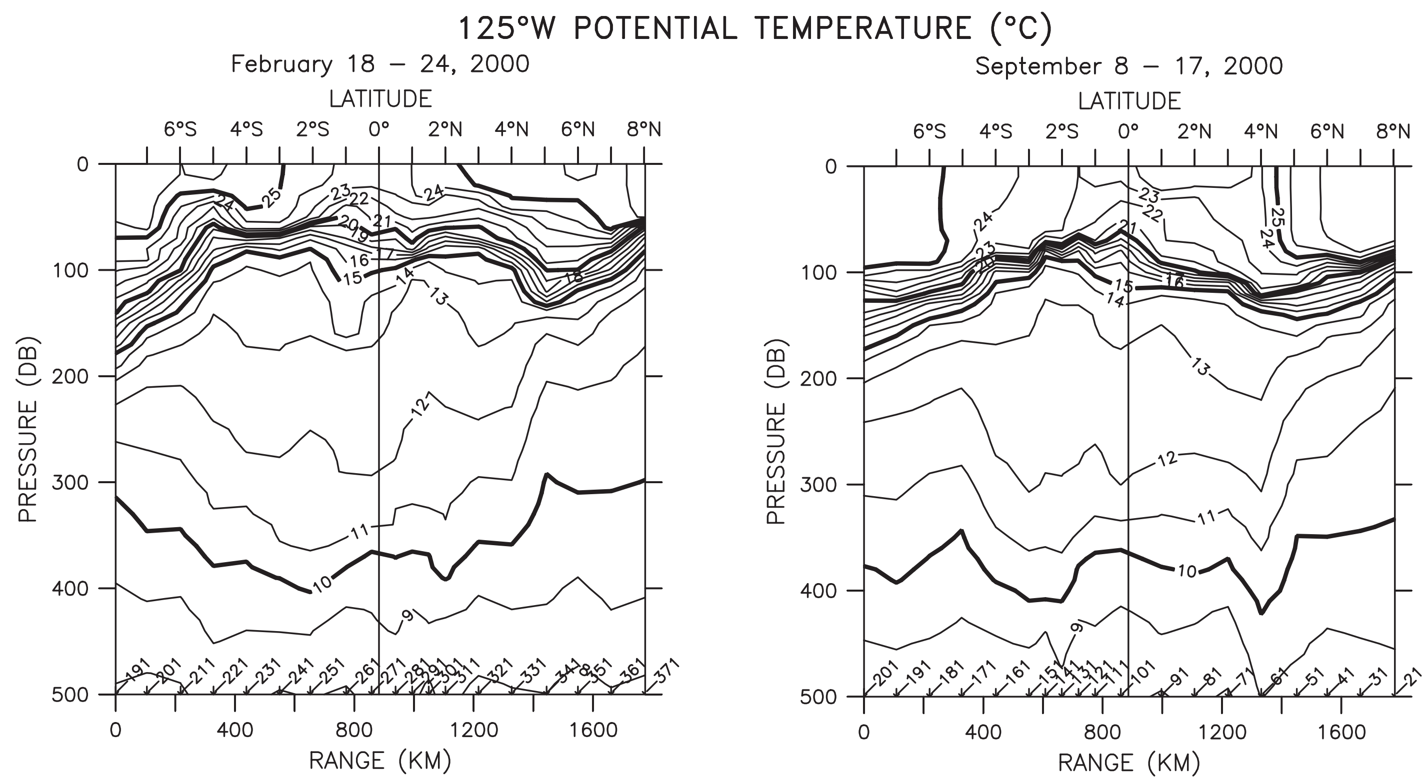

Figure 19: GP1-00-KA winter and GP5-00-KA fall potential temperature (°C) sections along 125°W. Contour intervals are 1°C.

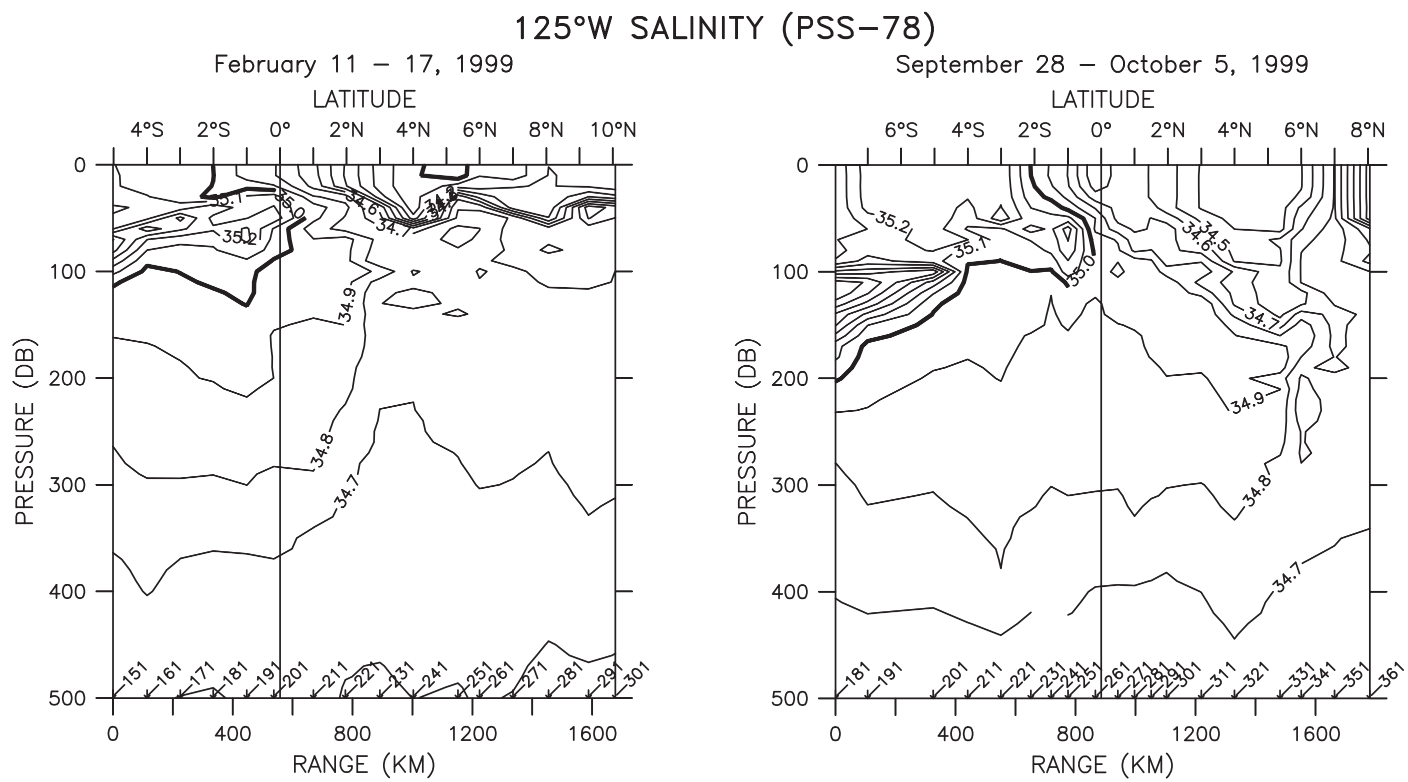

Figure 20: GP1-99-KA winter and GP5-99-KA fall salinity (PSS-78) sections along 125°W. Contour intervals are 0.1 PSS.

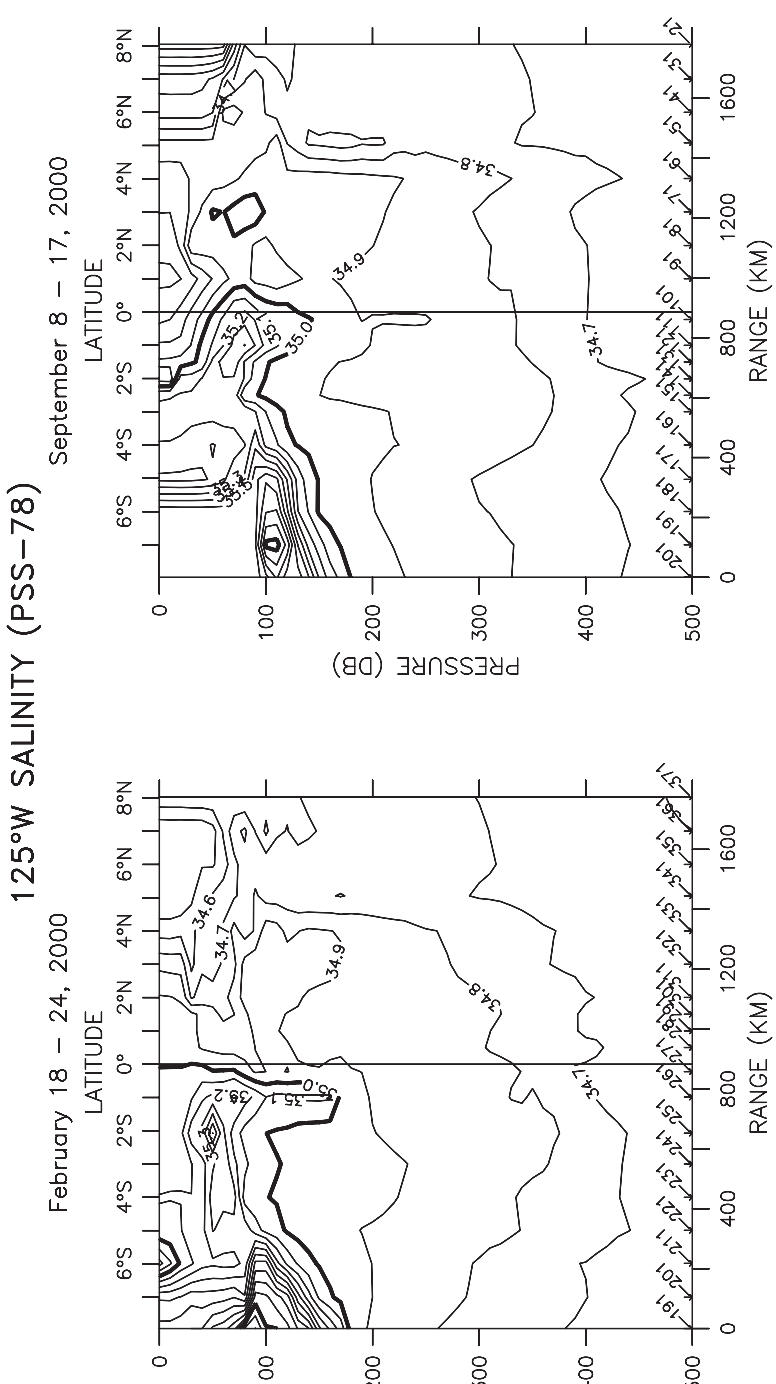

Figure 21: GP1-00-KA winter and GP5-00-KA fall salinity (PSS-78) sections along 125°W. Contour intervals are 0.1 PSS.

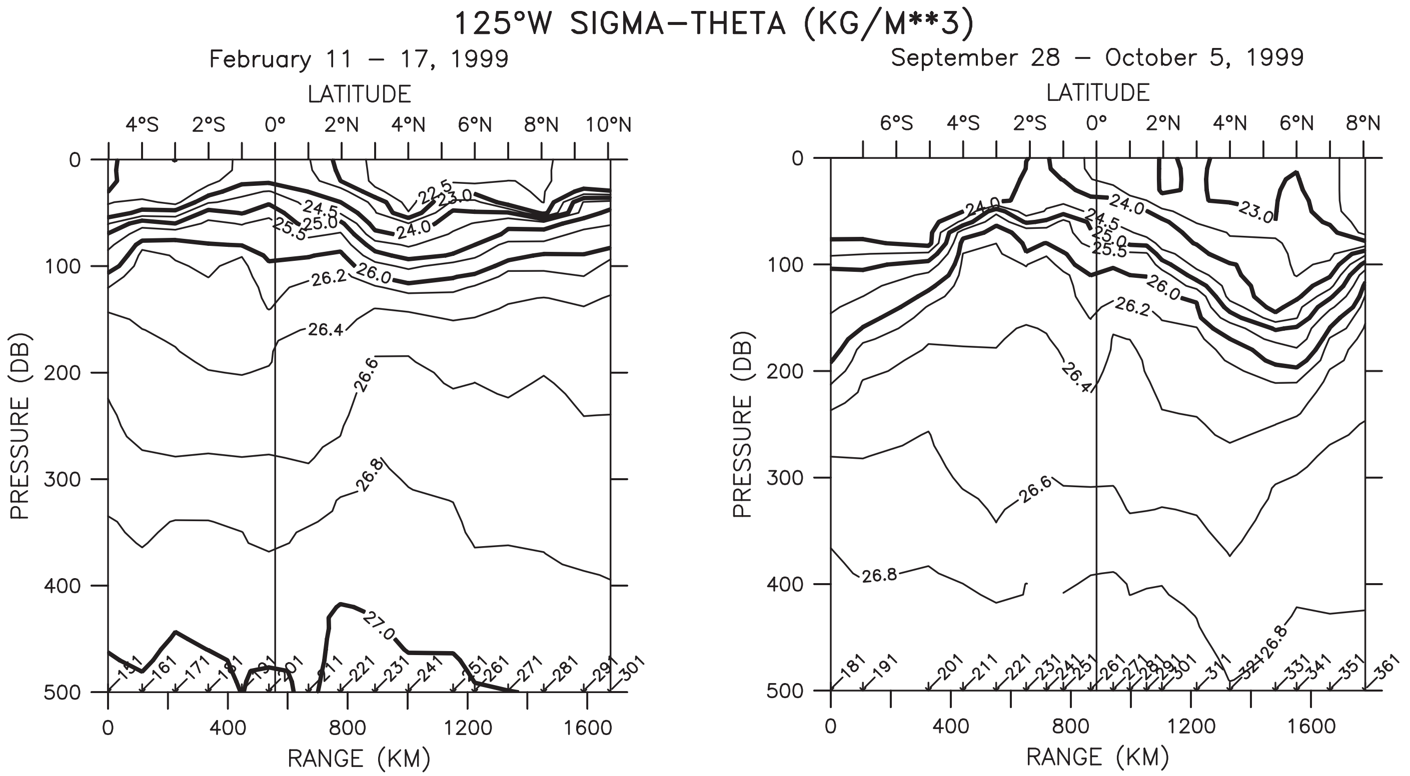

Figure 22: GP1-99-KA winter and GP5-99-KA fall potential density (kg/m^3) sections along 125°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

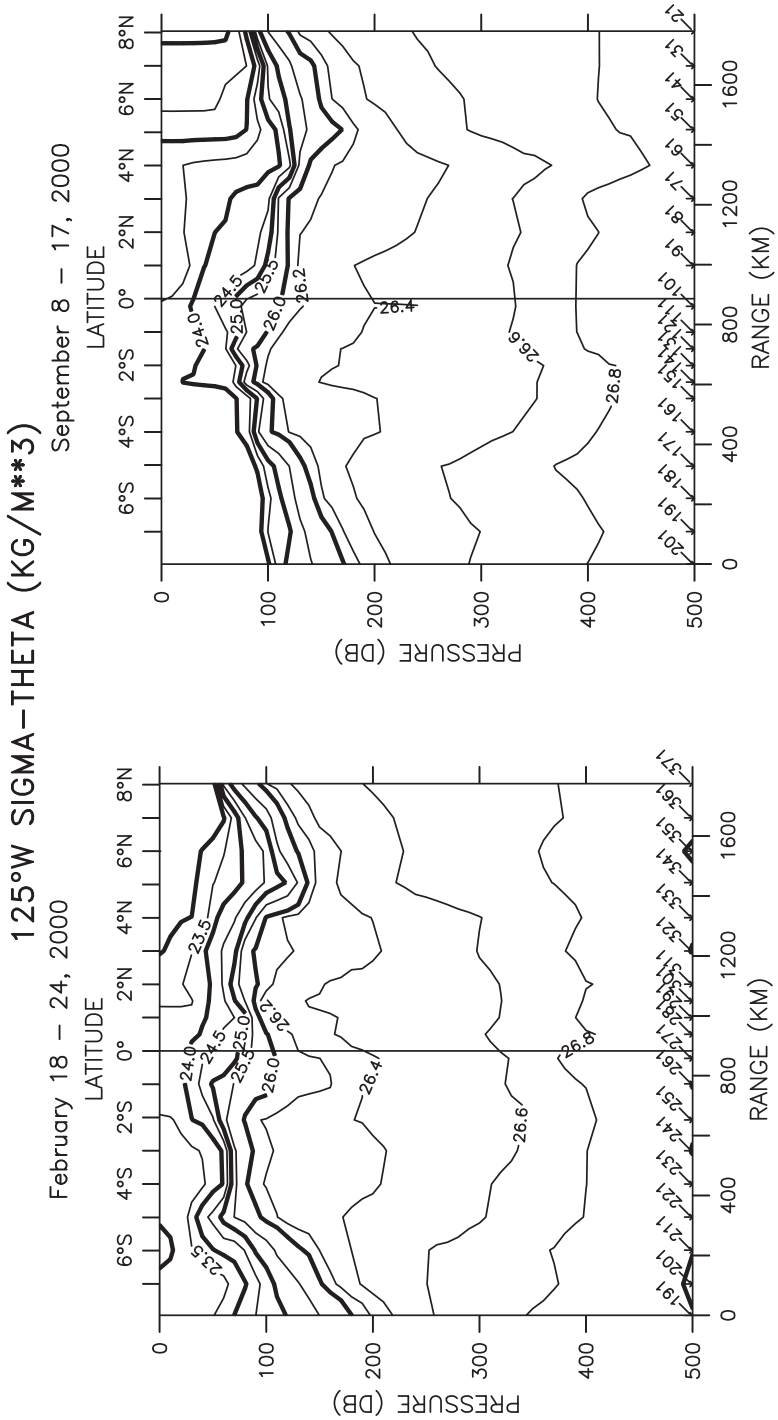

Figure 23: GP1-00-KA winter and GP5-00-KA fall potential density (kg/m^3) sections along 125°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

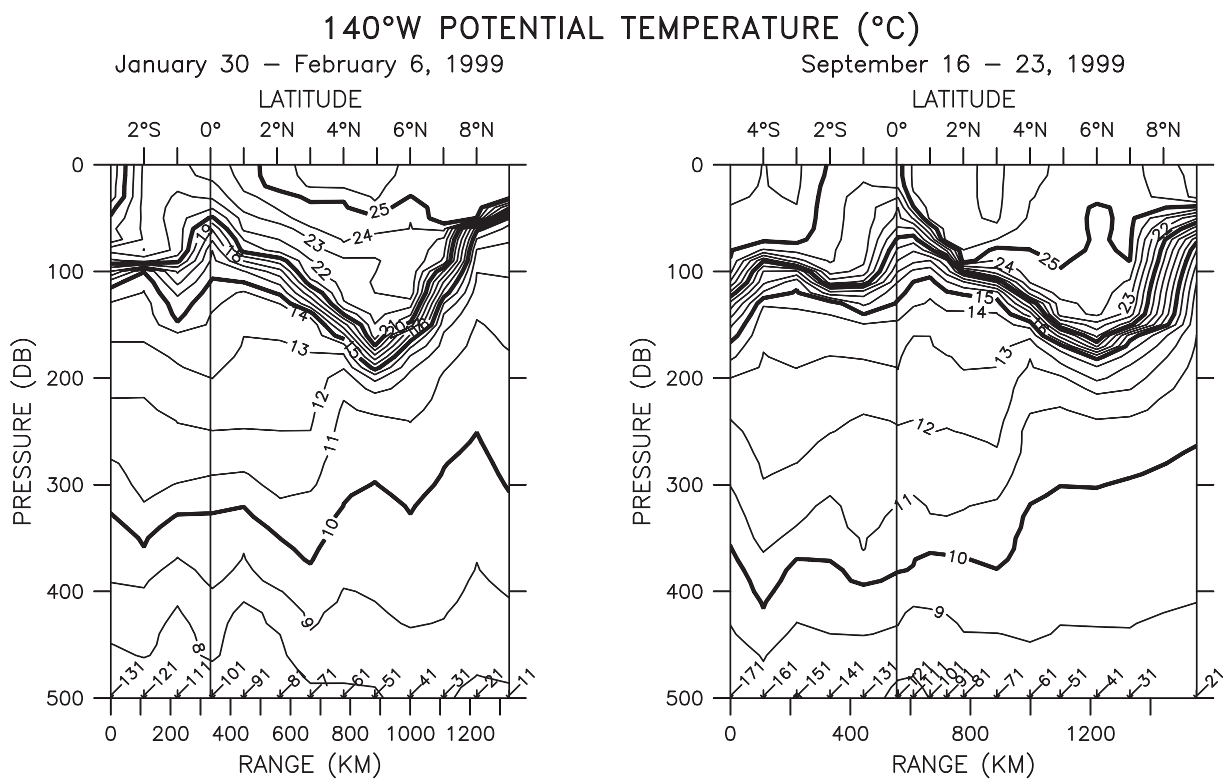

Figure 24: GP1-99-KA winter and GP5-99-KA fall potential temperature (°C) sections along 140°W. Contour intervals are 1°C.

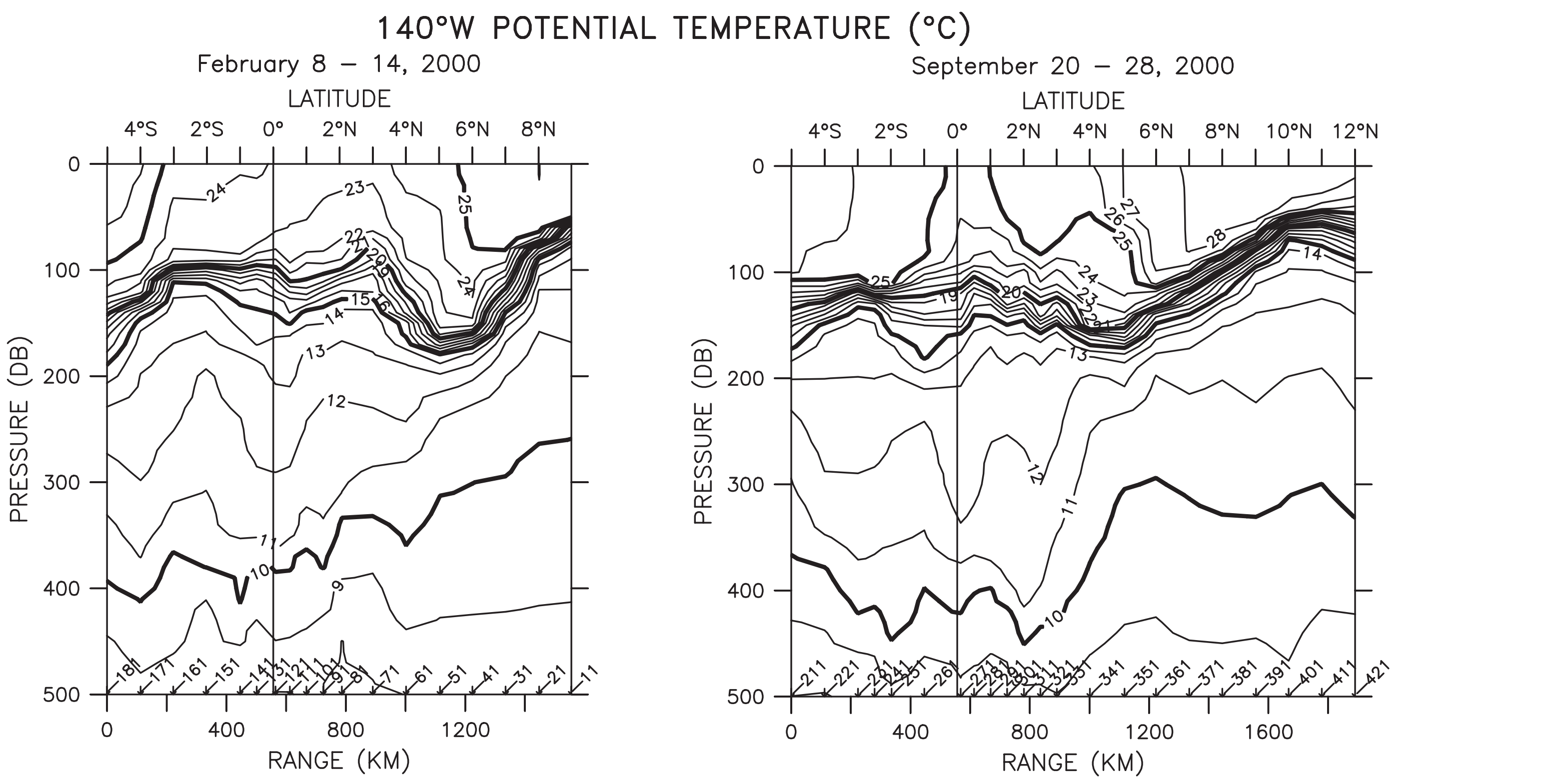

Figure 25: GP1-00-KA winter and GP5-00-KA fall potential temperature (°C) sections along 140°W. Contour intervals are 1°C.

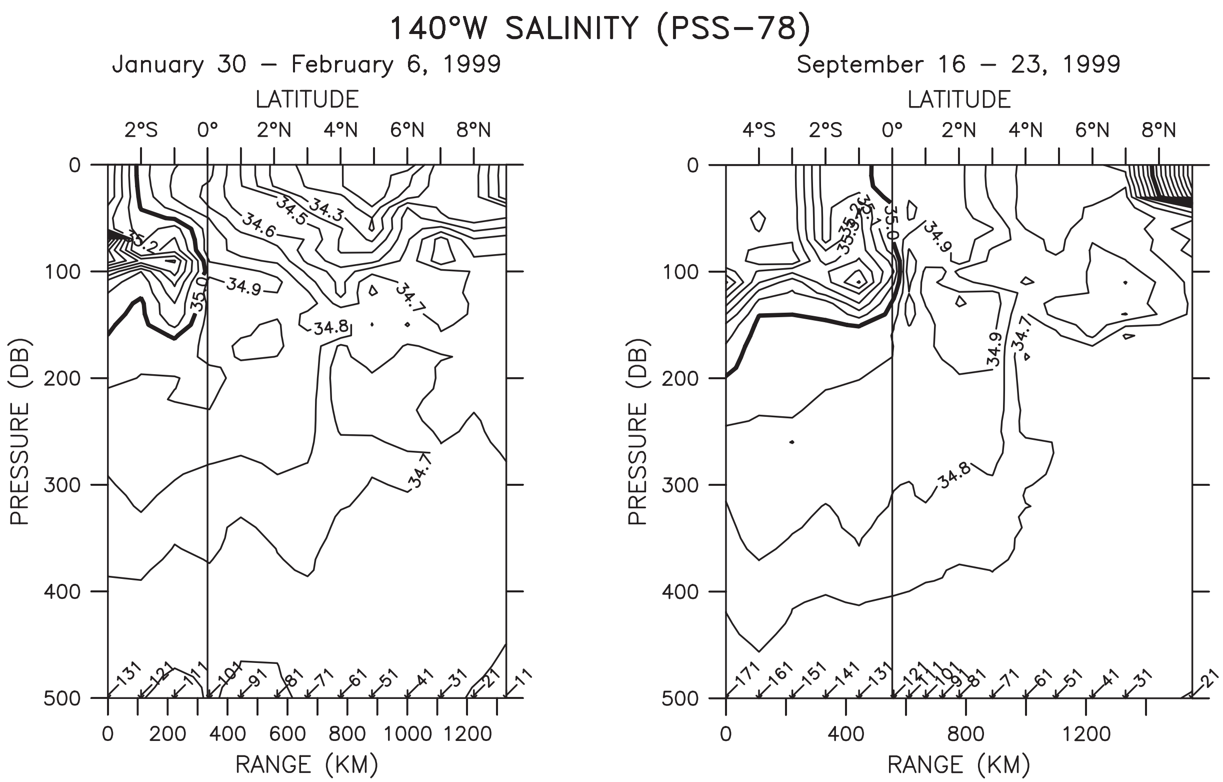

Figure 26: GP1-99-KA winter and GP5-99-KA fall salinity (PSS-78) sections along 140°W. Contour intervals are 0.1 PSS.

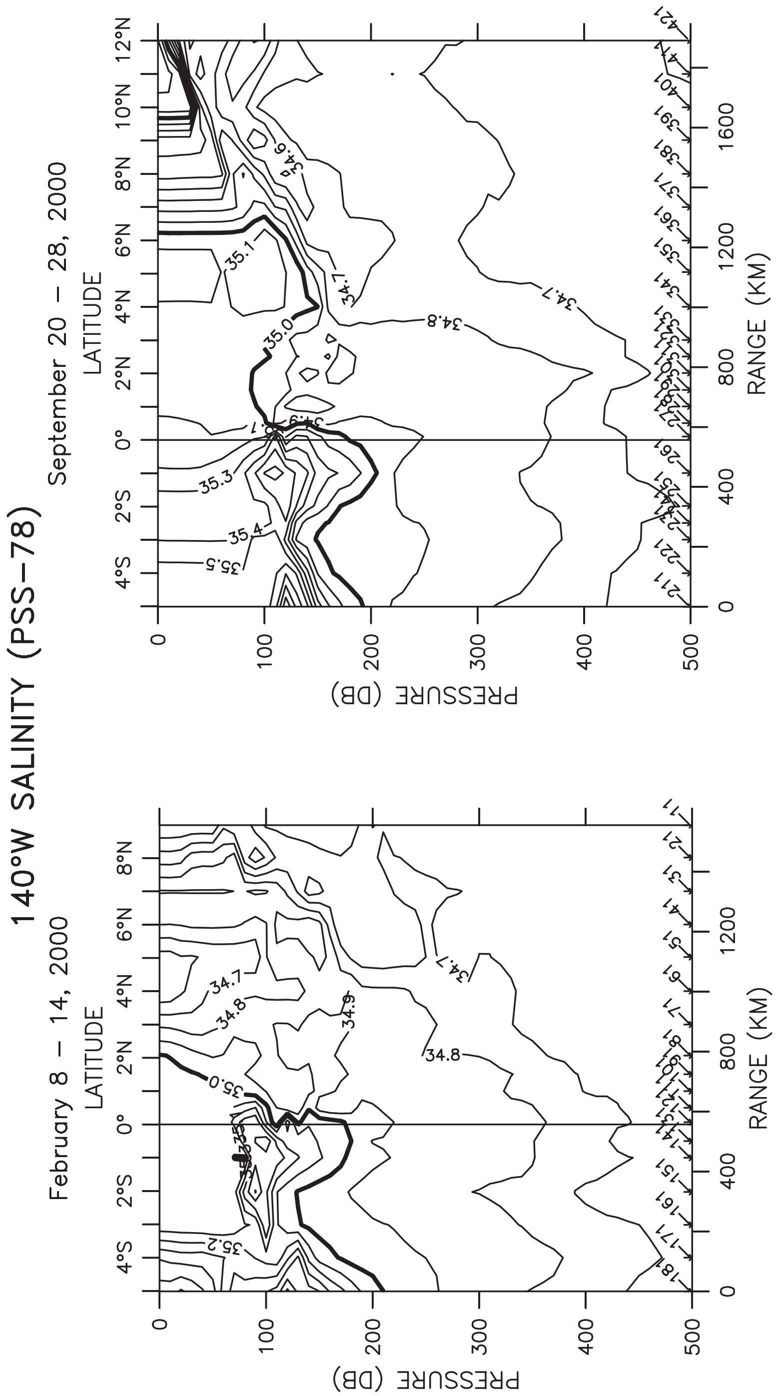

Figure 27: GP1-00-KA winter and GP5-00-KA fall salinity (PSS-78) sections along 140°W. Contour intervals are 0.1 PSS.

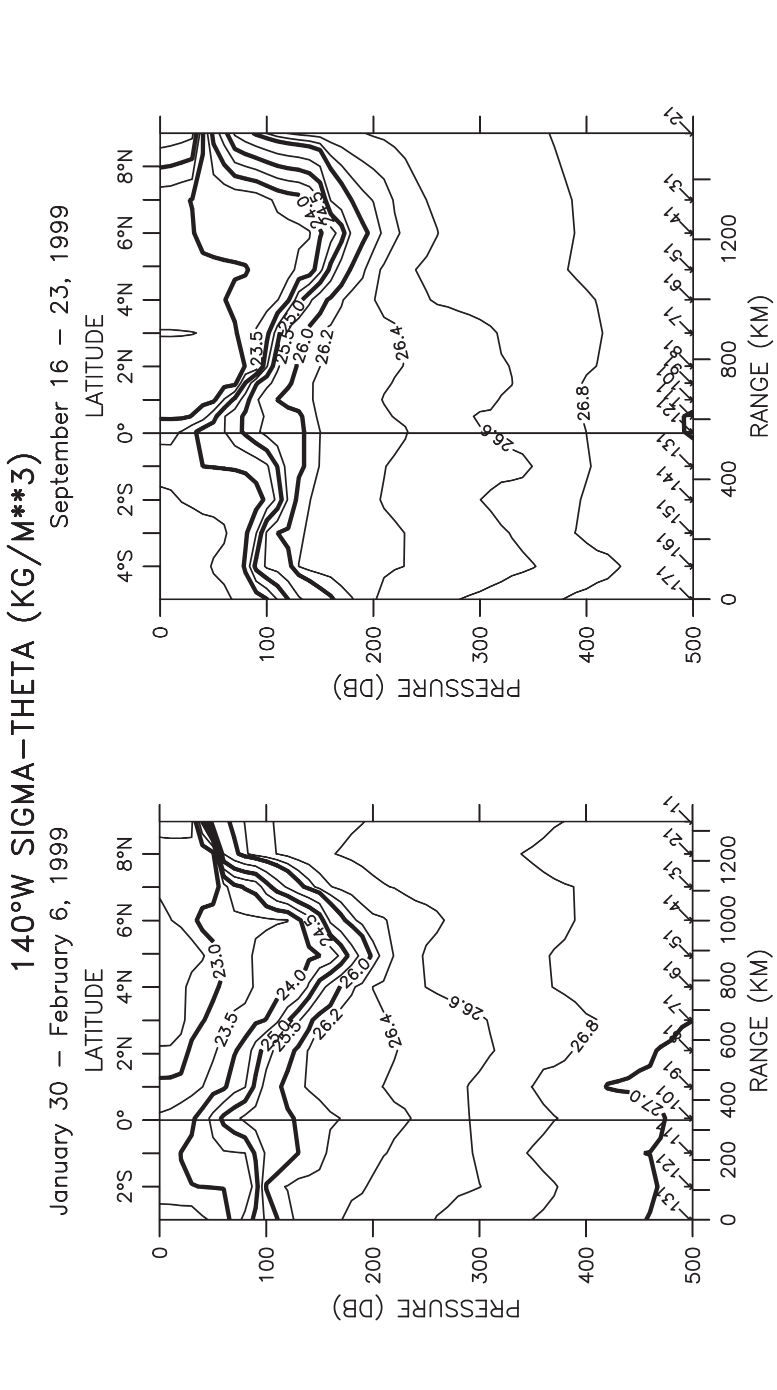

Figure 28: GP1-99-KA winter and GP5-99-KA fall potential density (kg/m^3) sections along 140°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

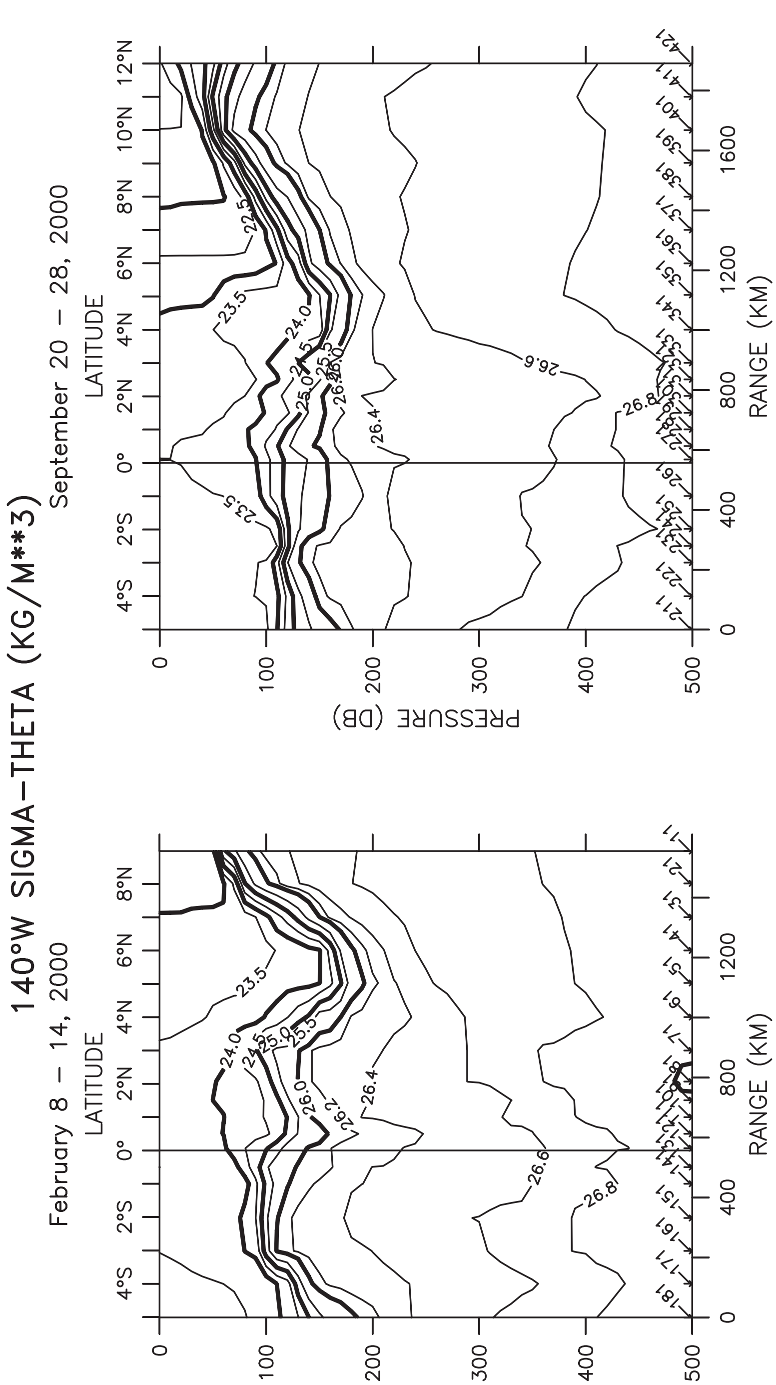

Figure 29: GP1-00-KA winter and GP5-00-KA fall potential density (kg/m^3) sections along 140°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

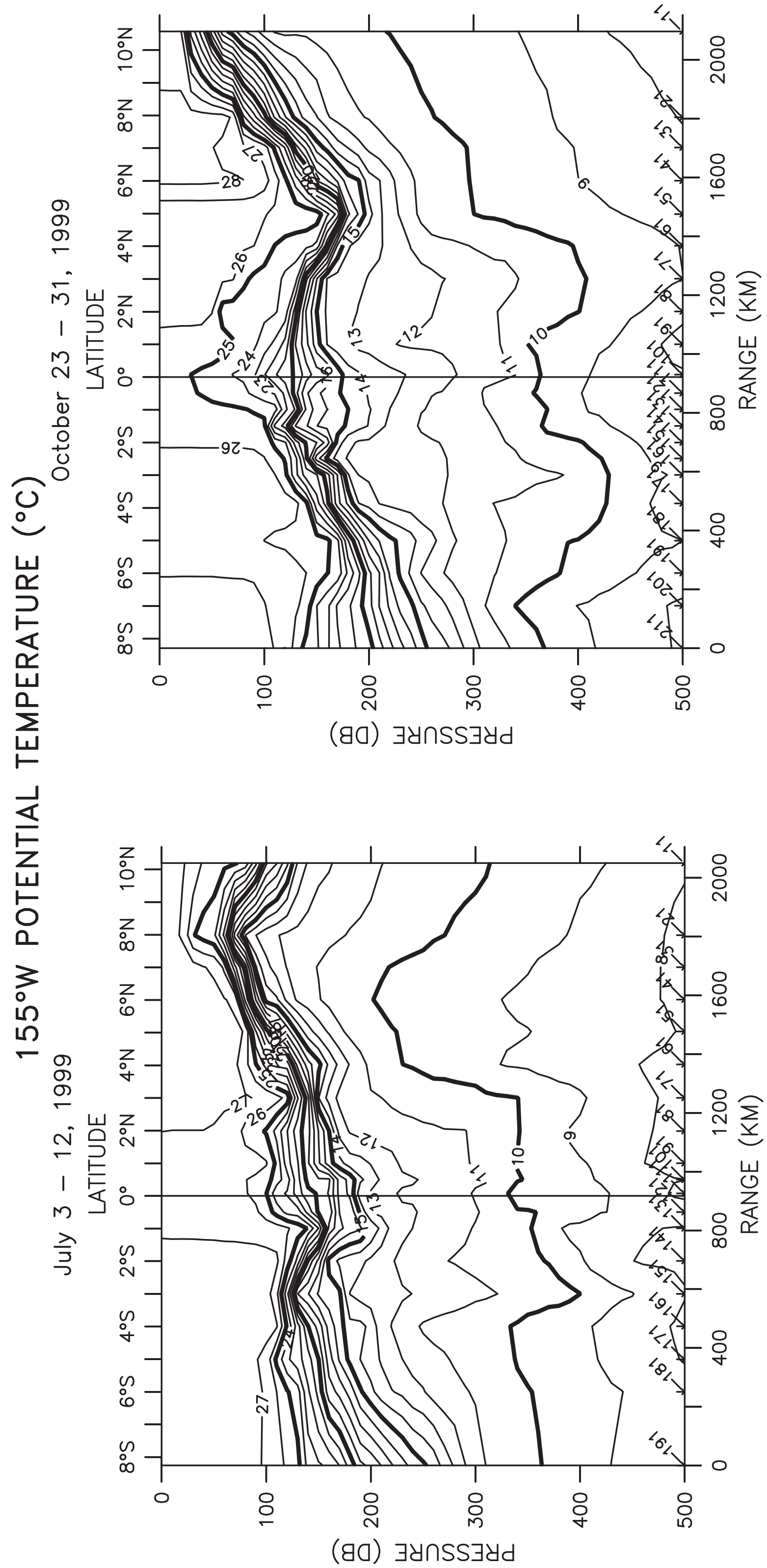

Figure 30: GP3-99-KA summer and GP7-99-KA fall potential temperature (°C) sections along 155°W. Contour intervals are 1°C.

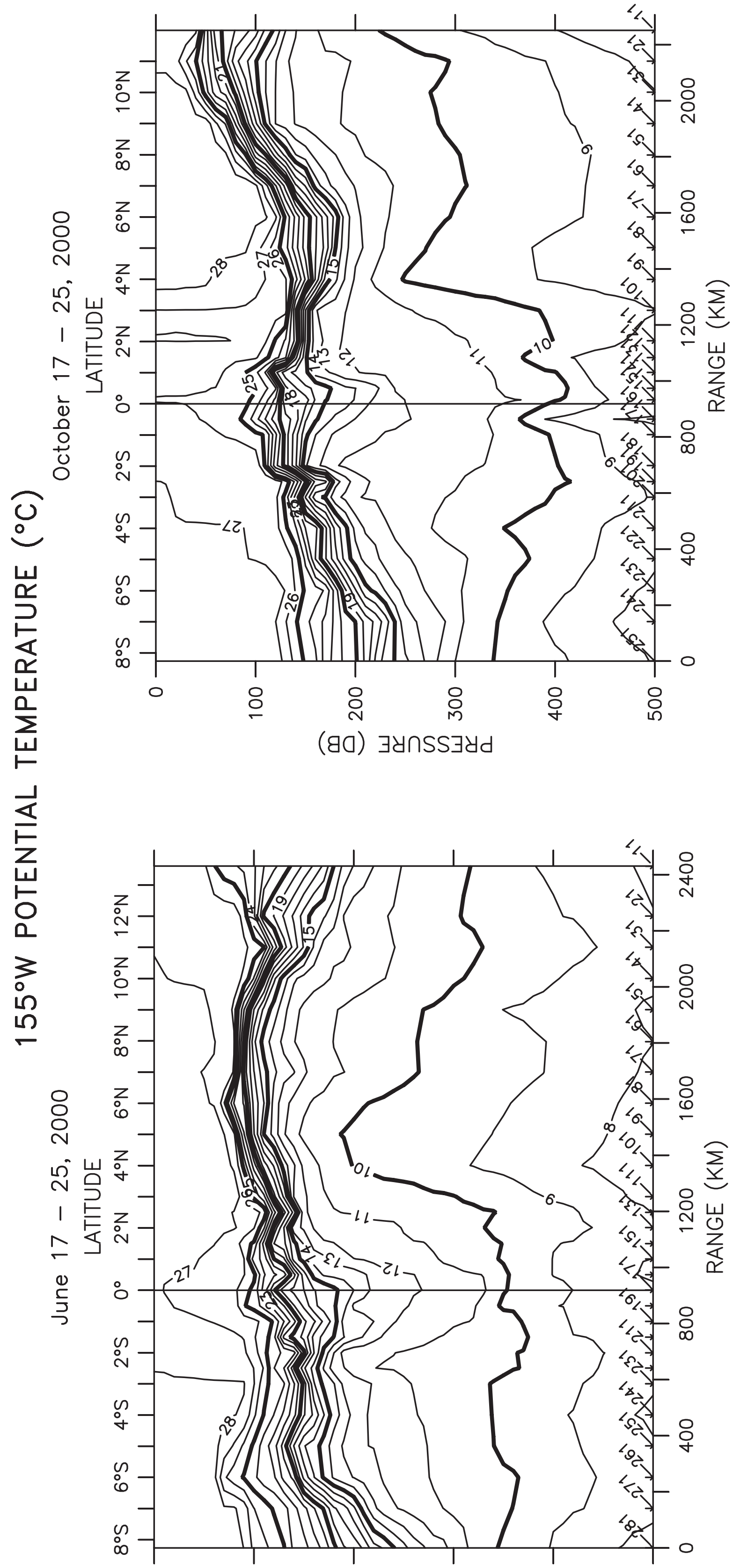

Figure 31: GP3-00-KA summer and GP6-00-KA fall potential temperature (°C) sections along 155°W. Contour intervals are 1°C.

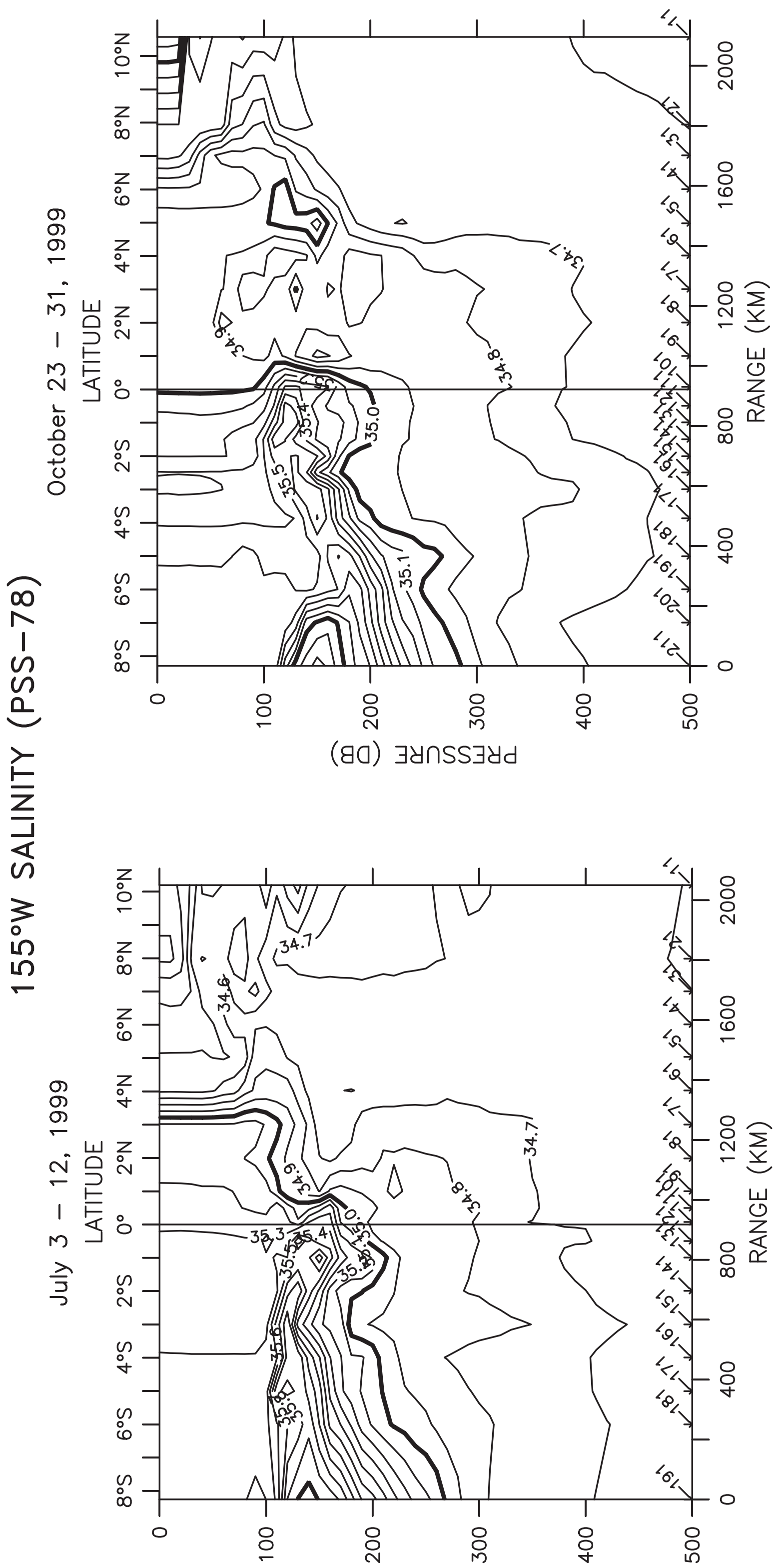

Figure 32: GP3-99-KA summer and GP7-99-KA fall salinity (PSS-78) sections along 155°W. Contour intervals are 0.1 PSS.

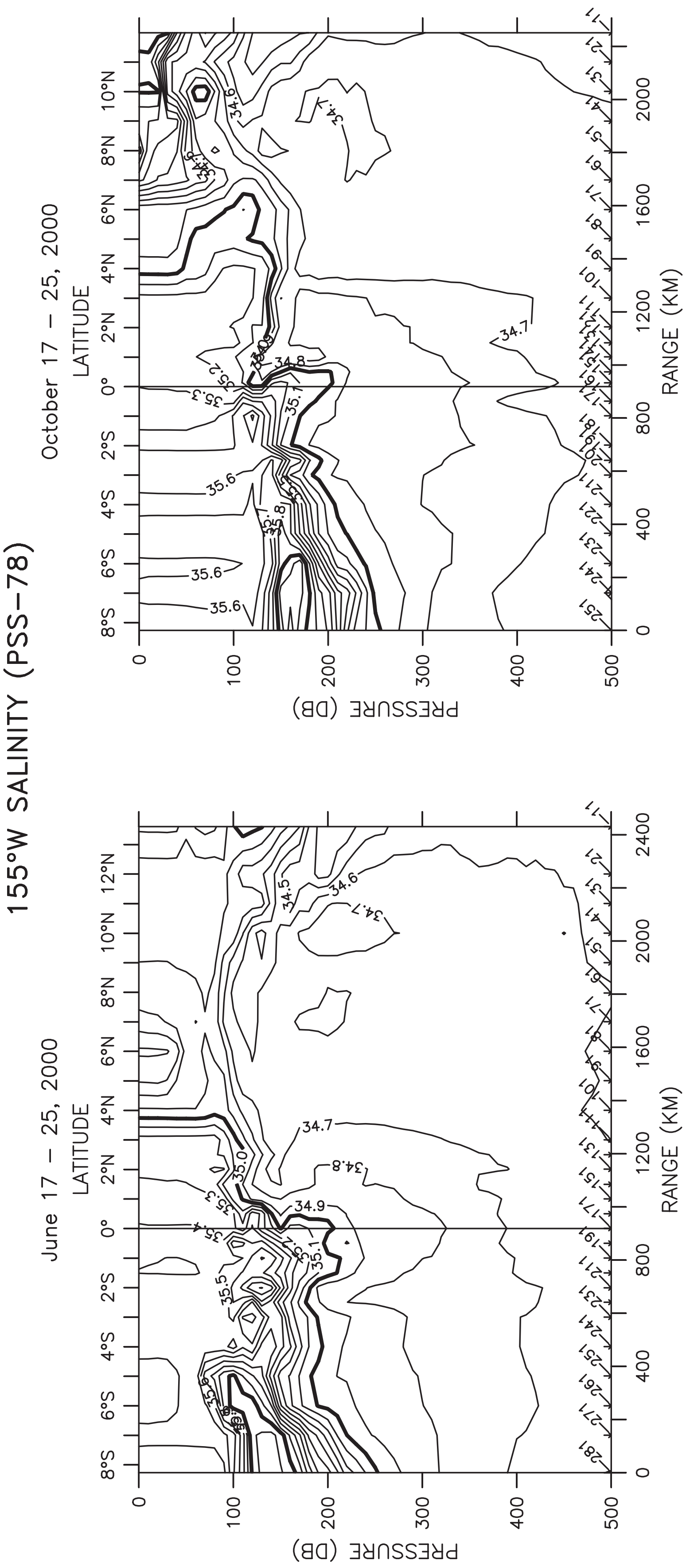

Figure 33: GP3-00-KA summer and GP6-00-KA fall salinity (PSS-78) sections along 155°W. Contour intervals are 0.1 PSS.

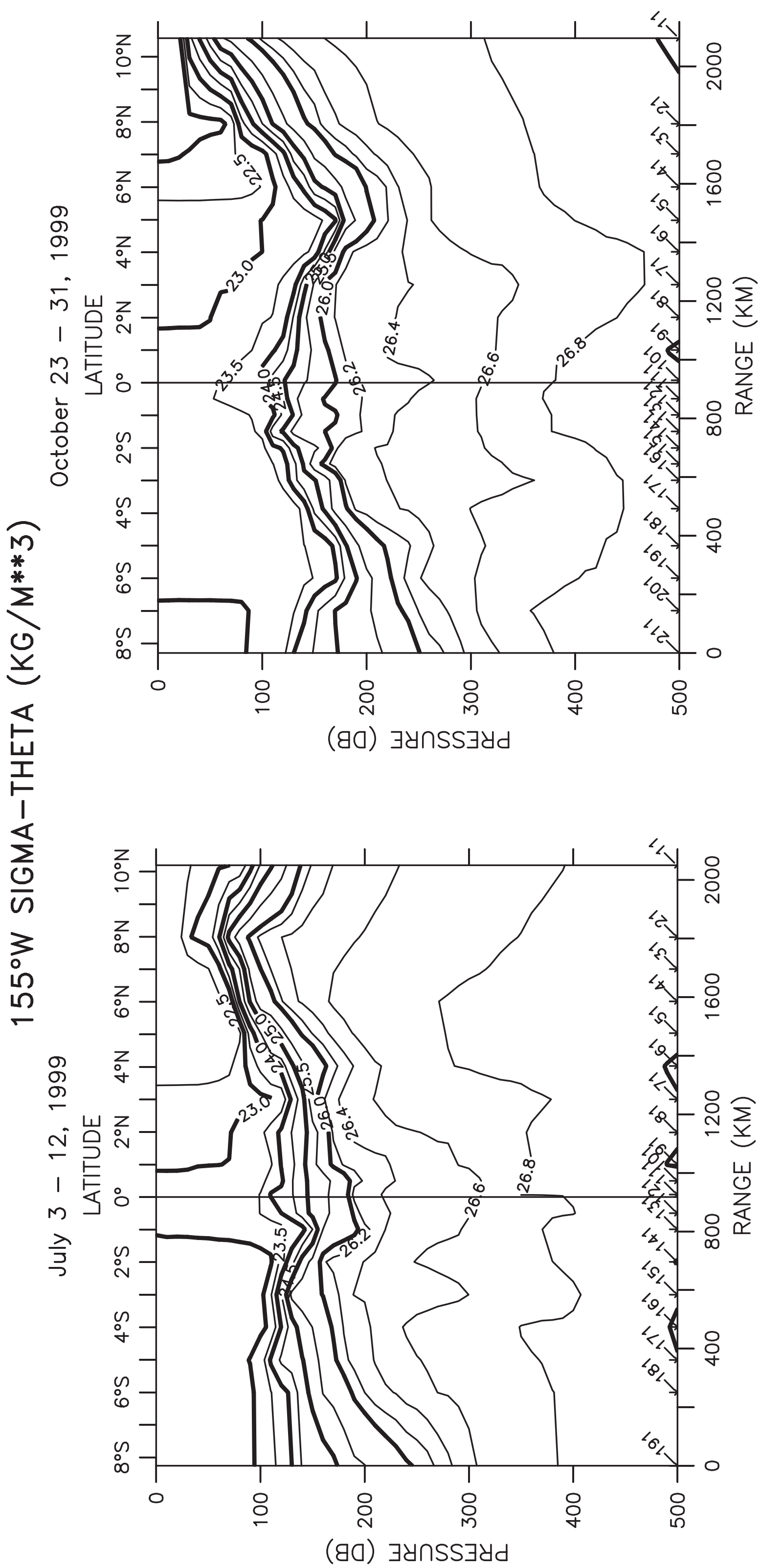

Figure 34: GP3-99-KA summer and GP7-99-KA fall potential density (kg/m^3) sections along 155°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

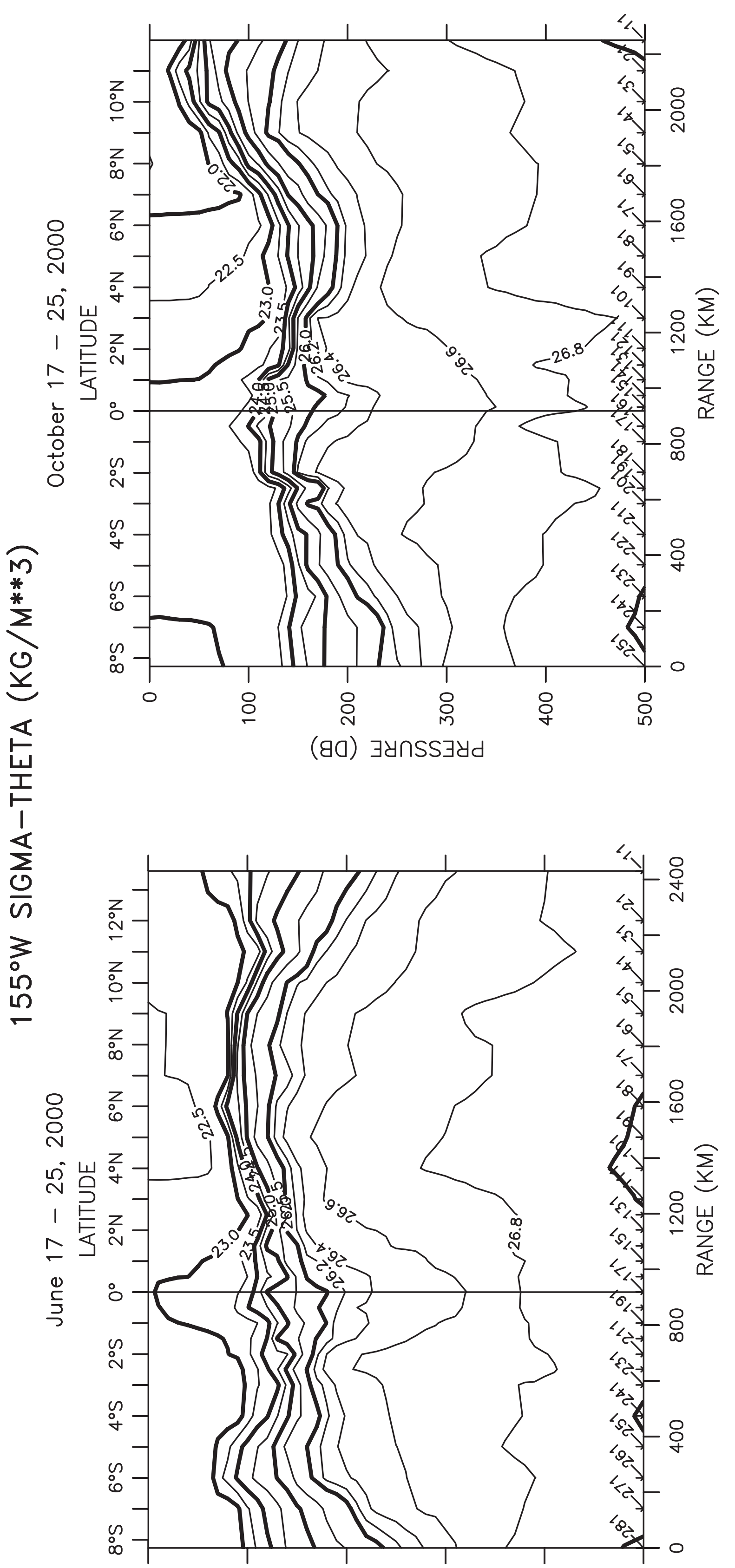

Figure 35: GP3-00-KA summer and GP6-00-KA fall potential density (kg/m^3) sections along 155°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

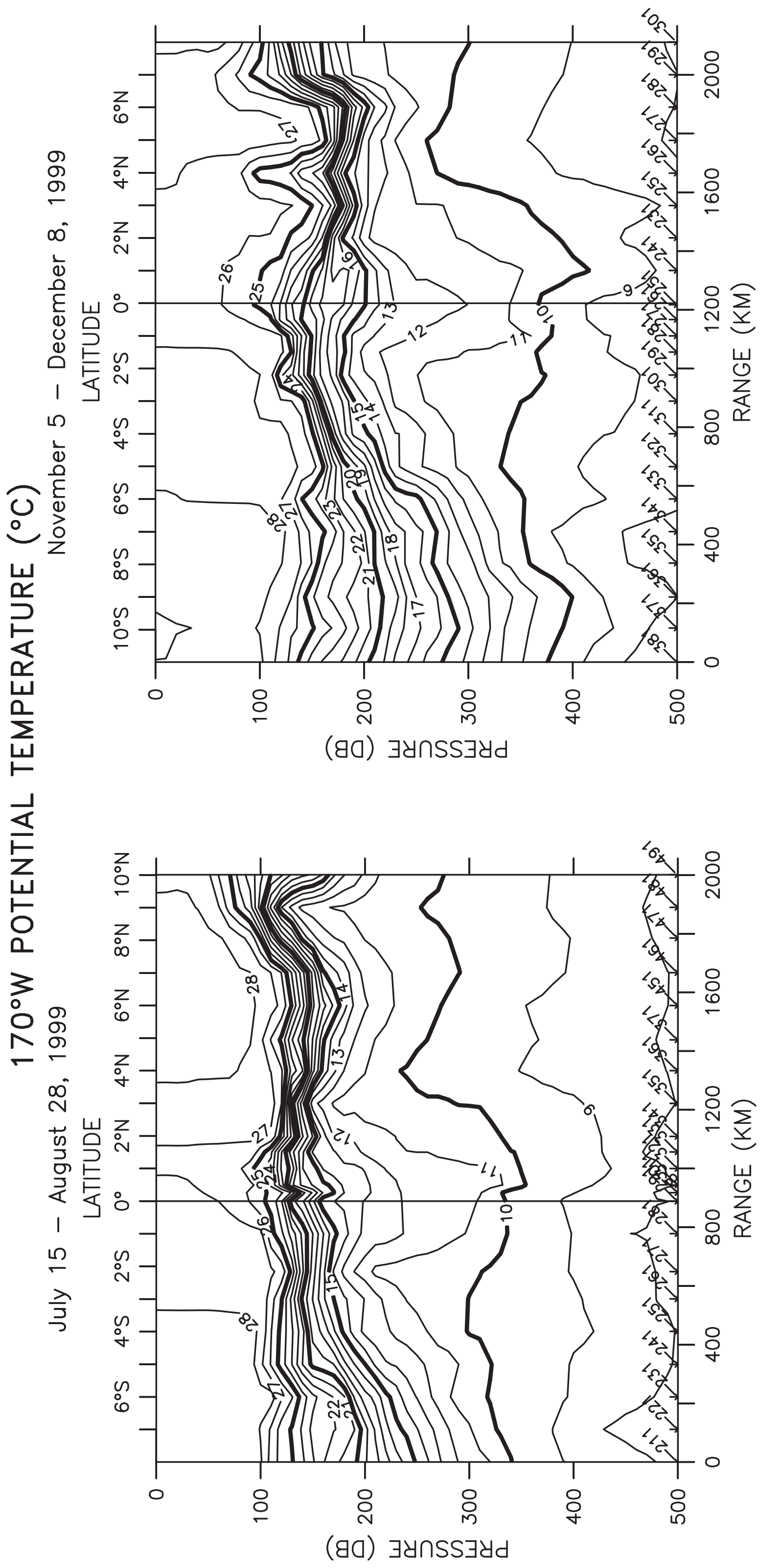

Figure 36: GP3-99-KA summer and GP7/9-99-KA fall potential temperature (°C) sections along 170°W. Contour intervals are 1°C.

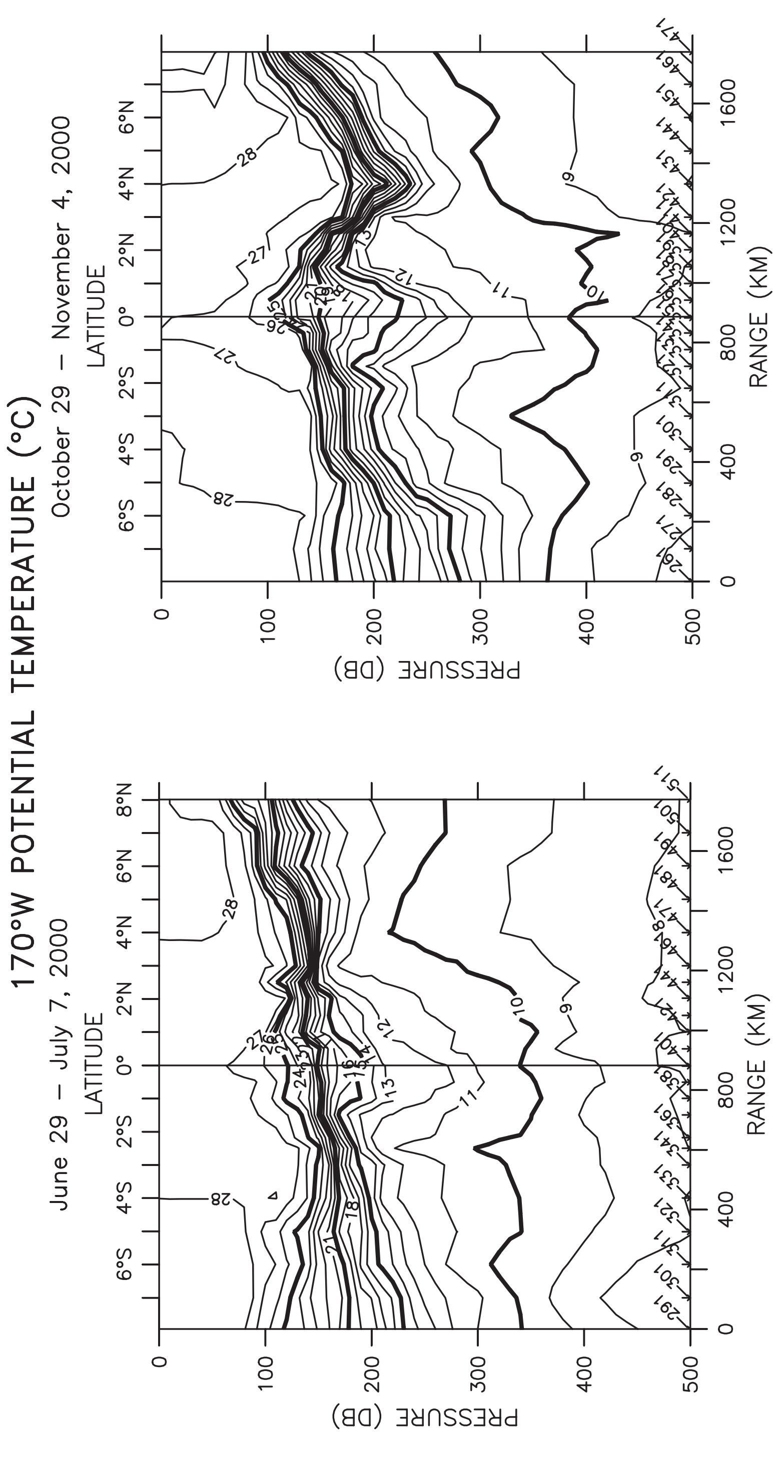

Figure 37: GP3-00-KA summer and GP6-00-KA fall potential temperature (°C) sections along 170°W. Contour intervals are 1°C.

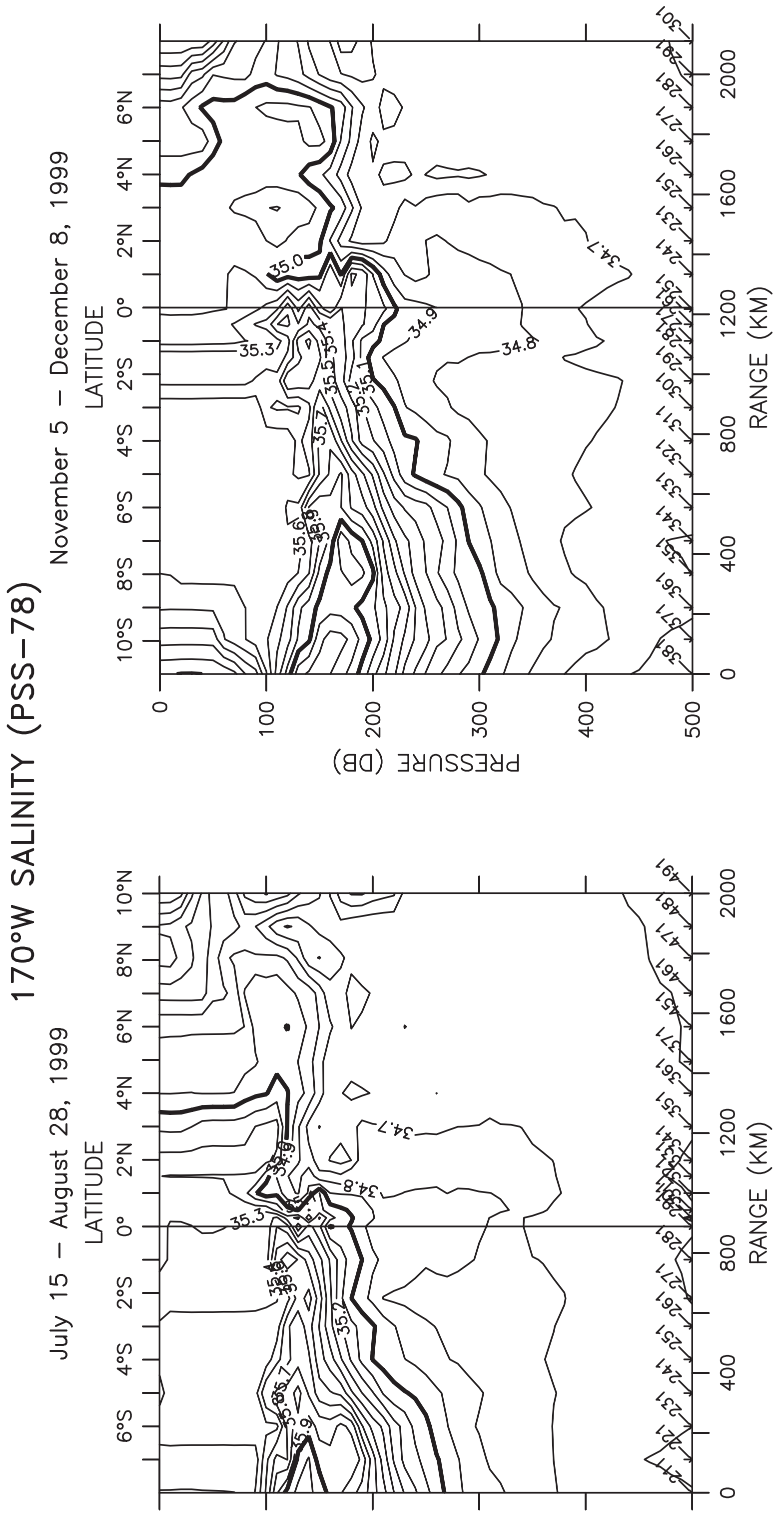

Figure 38: GP3-99-KA summer and GP7/9-99-KA fall salinity (PSS-78) sections along 170°W. Contour intervals are 0.1 PSS.

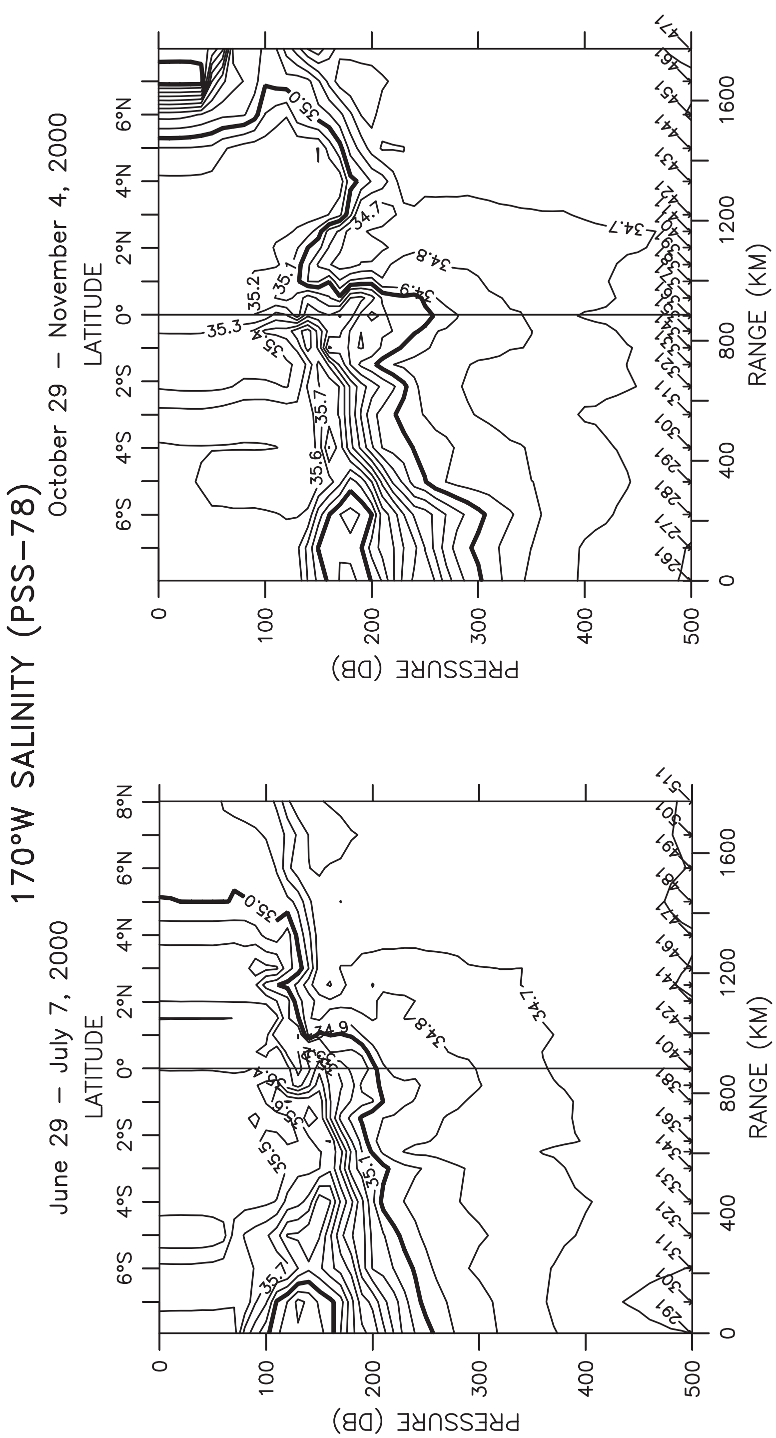

Figure 39: GP3-00-KA summer and GP6-00-KA fall salinity (PSS-78) sections along 170°W. Contour intervals are 0.1 PSS.

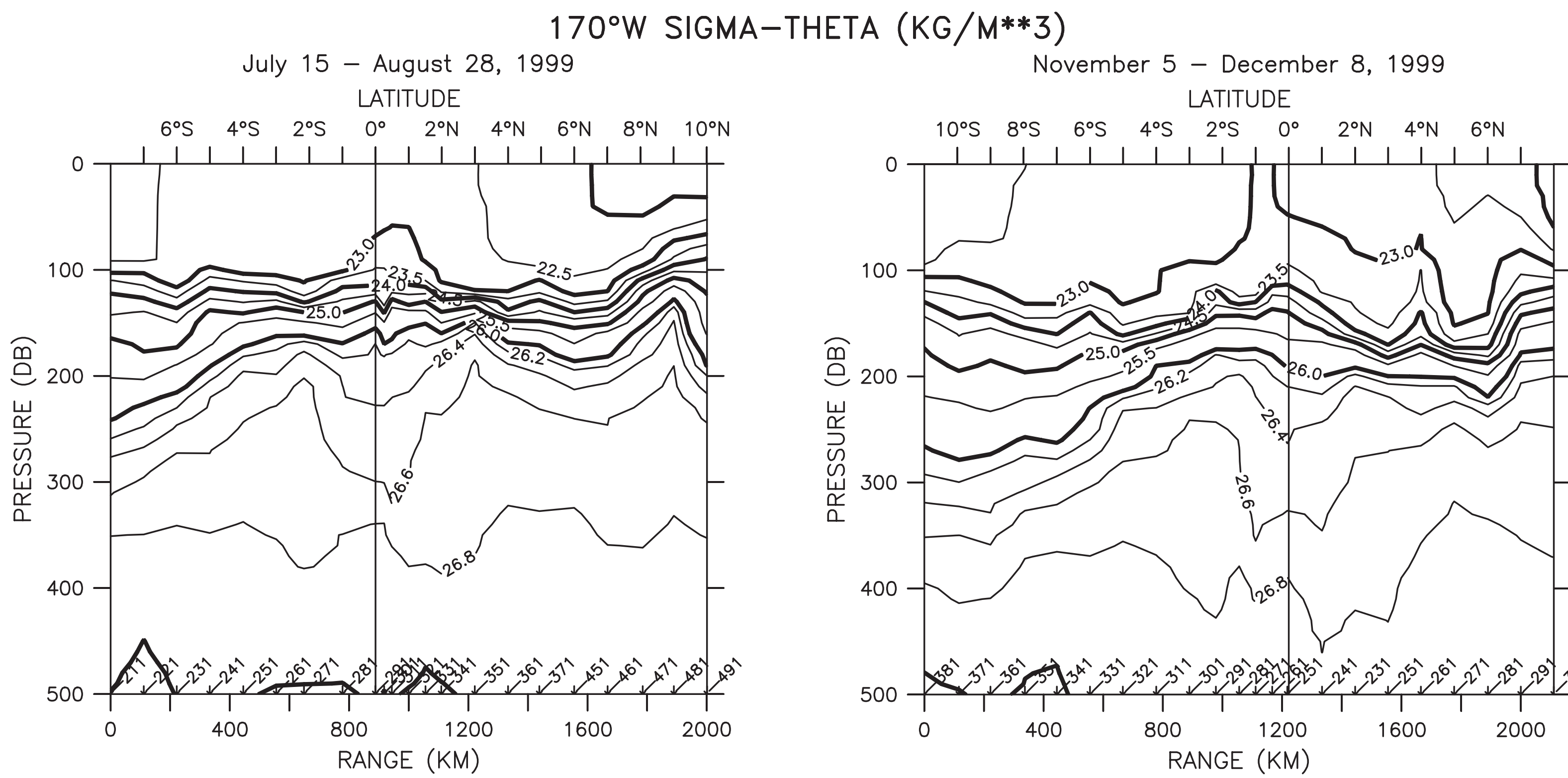

Figure 40: GP3-99-KA summer and GP7/9-99-KA fall potential density (kg/m^3) sections along 170°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

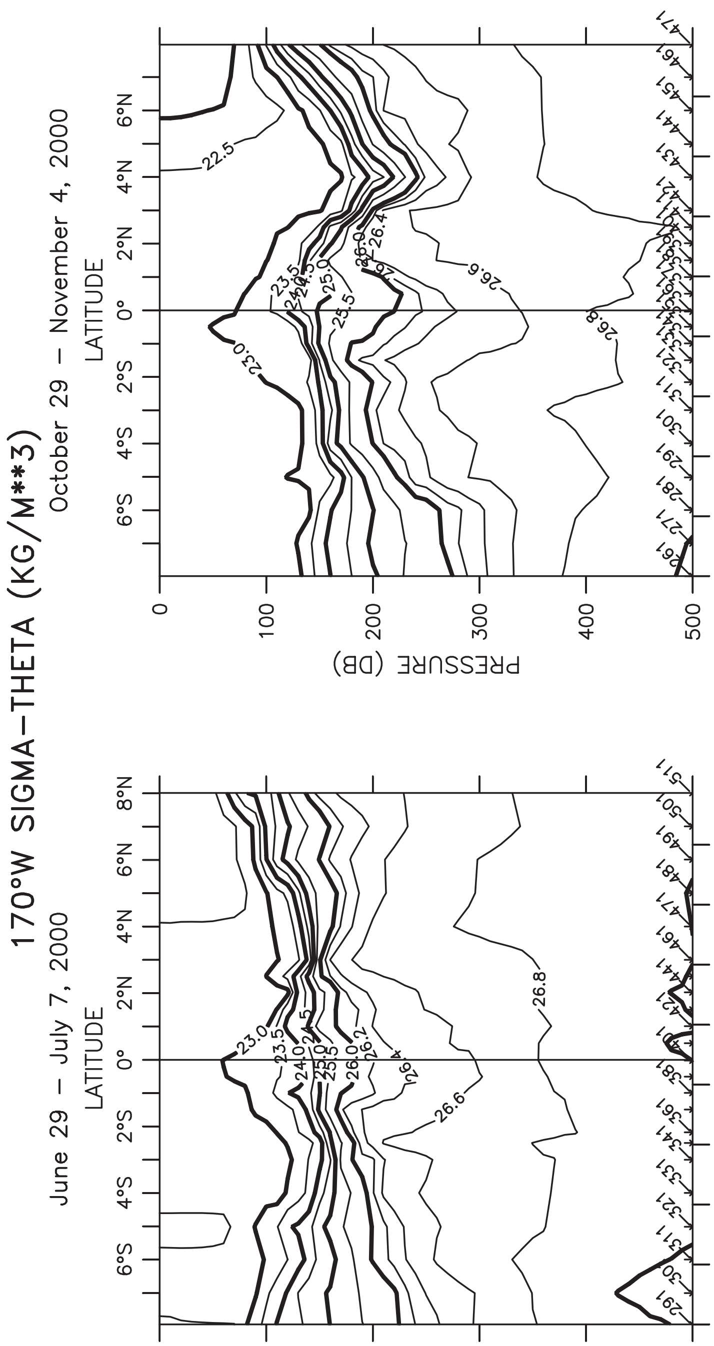

Figure 41: GP3-00-KA summer and GP6-00-KA fall potential density (kg/m^3) sections along 170°W. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

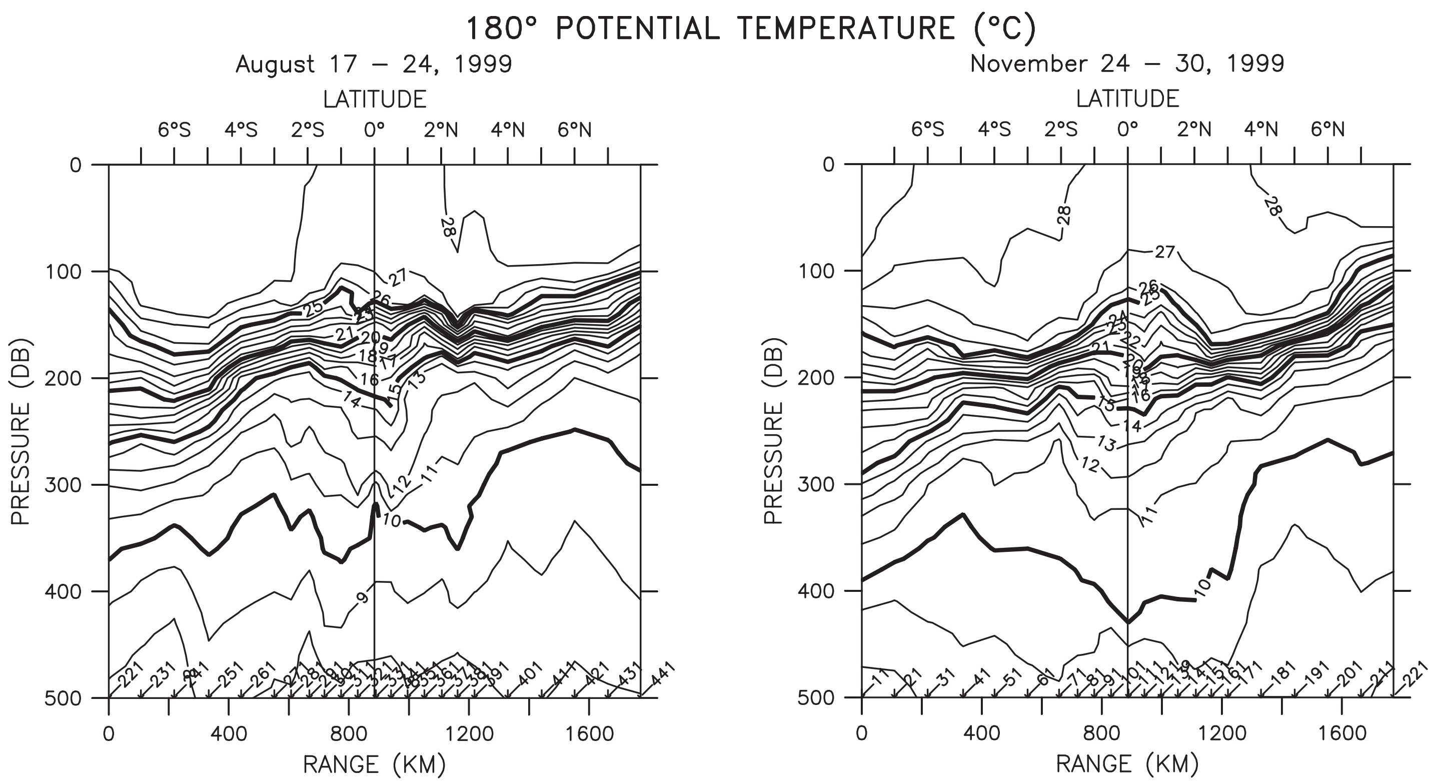

Figure 42: GP4-99-KA summer and GP9-99-KA fall potential temperature (°C) sections along 180°. Contour intervals are 1°C.

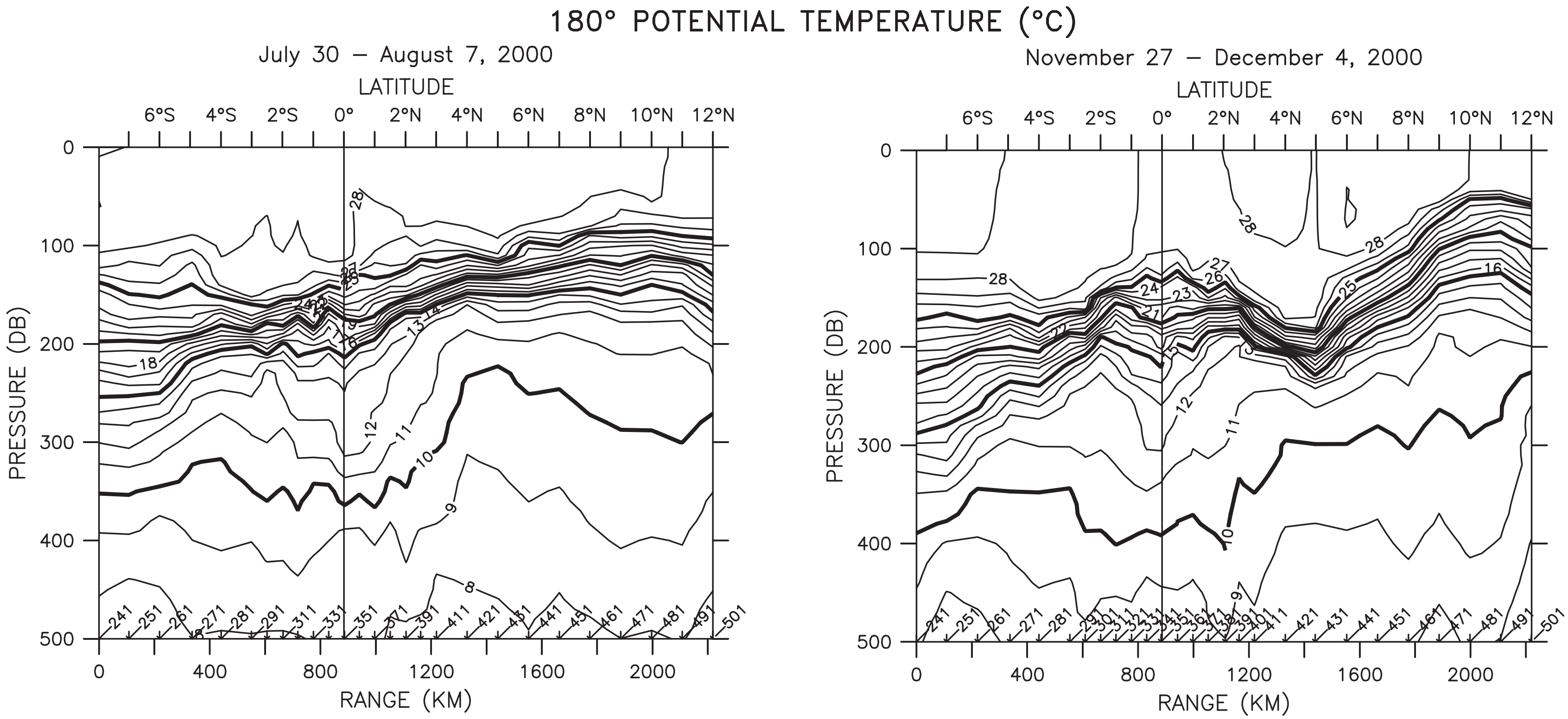

Figure 43: GP4-00-KA summer and GP8-00-KA fall potential temperature (°C) sections along 180°. Contour intervals are 1°C.

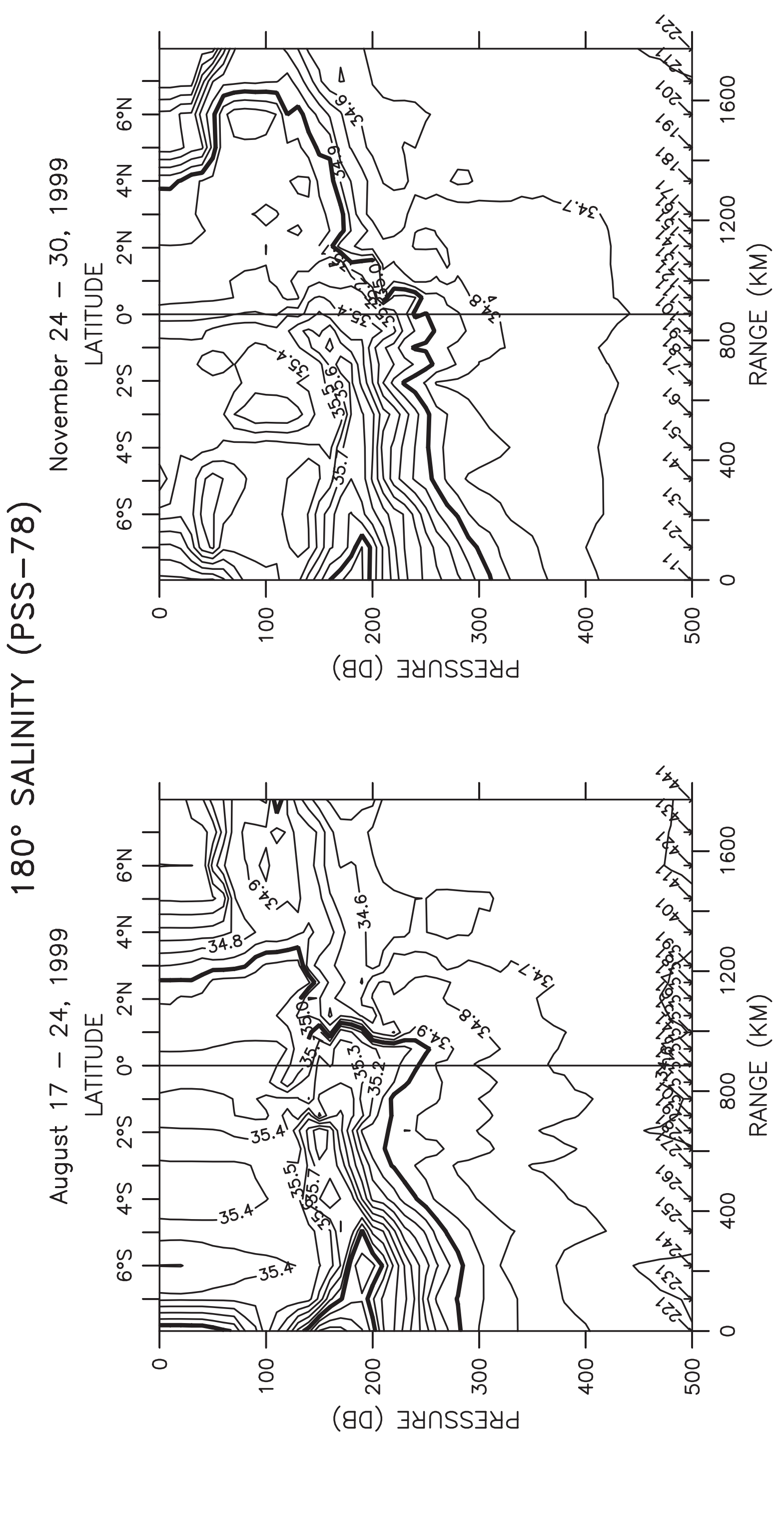

Figure 44: GP4-99-KA summer and GP9-99-KA fall salinity (PSS-78) sections along 180°. Contour intervals are 0.1 PSS.

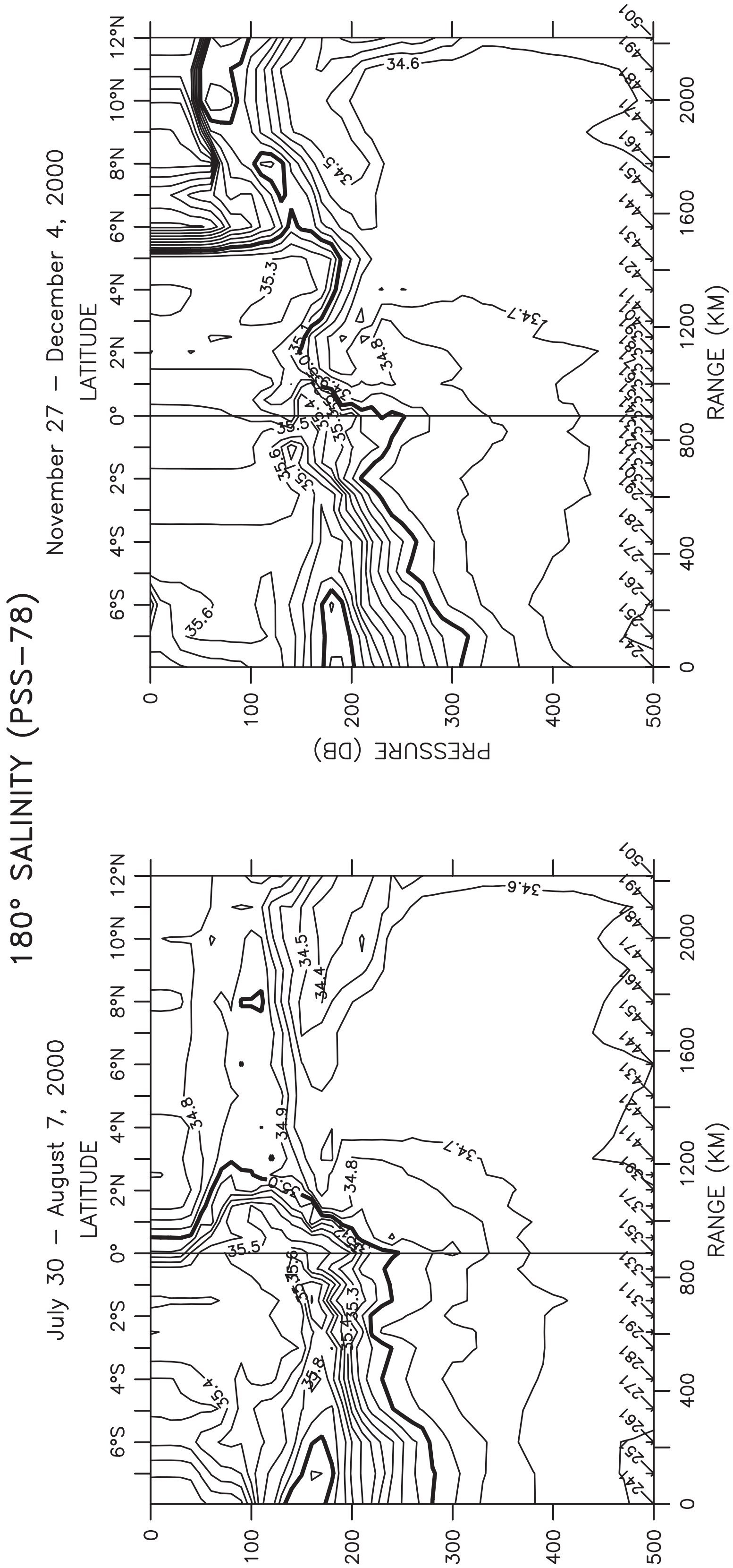

Figure 45: GP4-00-KA summer and GP8-00-KA fall salinity (PSS-78) sections along 180°. Contour intervals are 0.1 PSS.

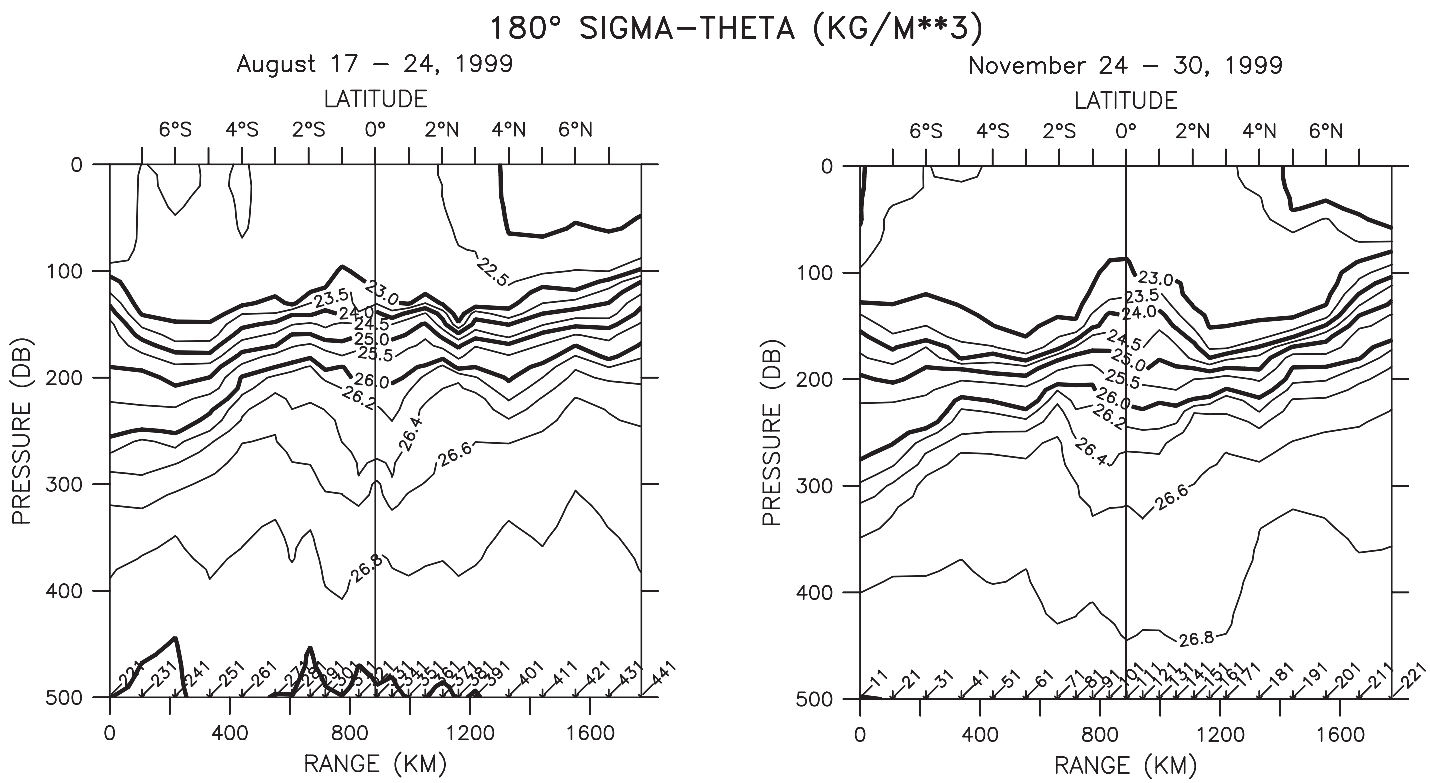

Figure 46: GP4-99-KA summer and GP9-99-KA fall potential density (kg/m^3) sections along 180°. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

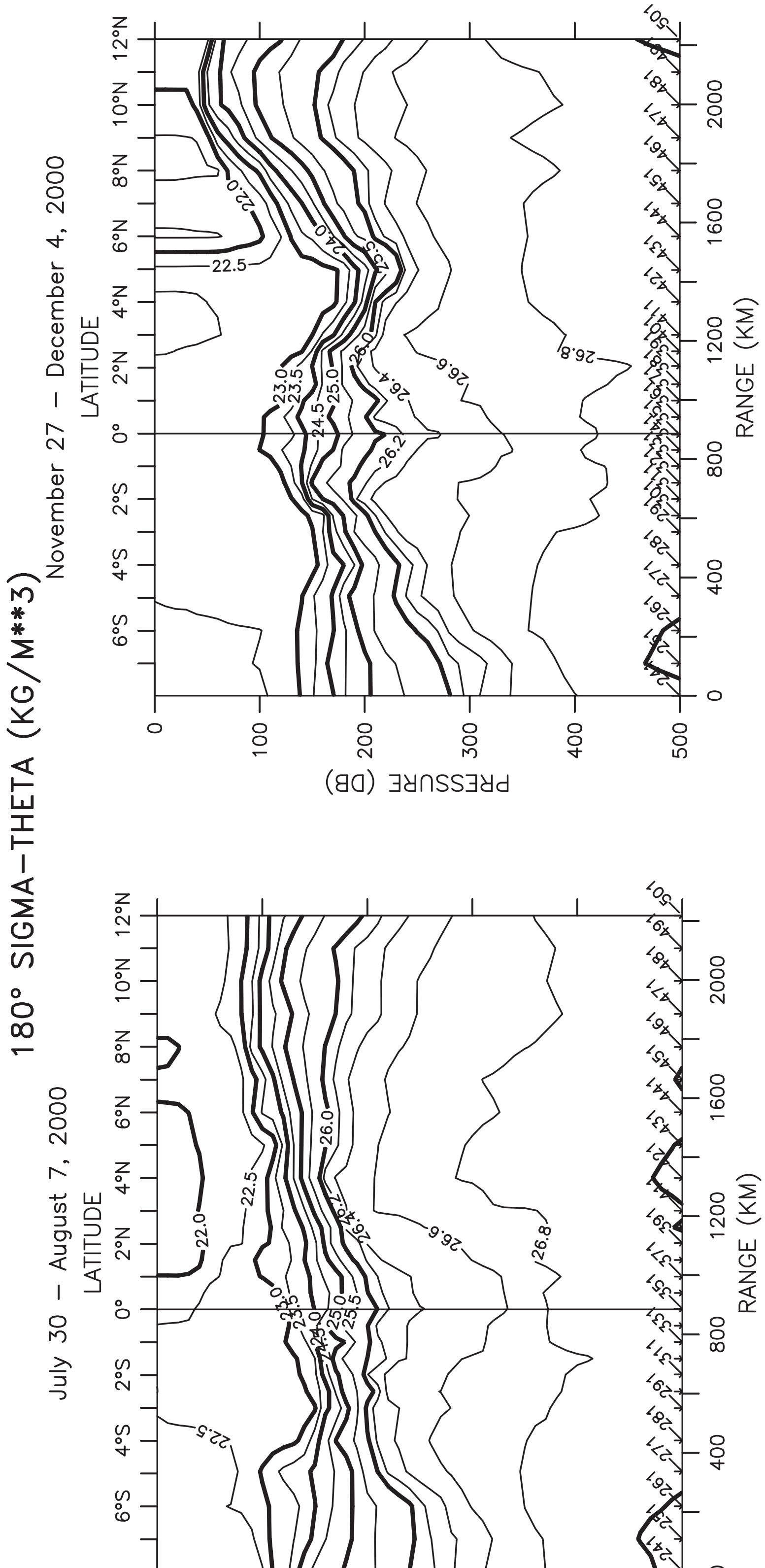

Figure 47: GP4-00-KA summer and GP8-00-KA fall potential density (kg/m^3) sections along 180°. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

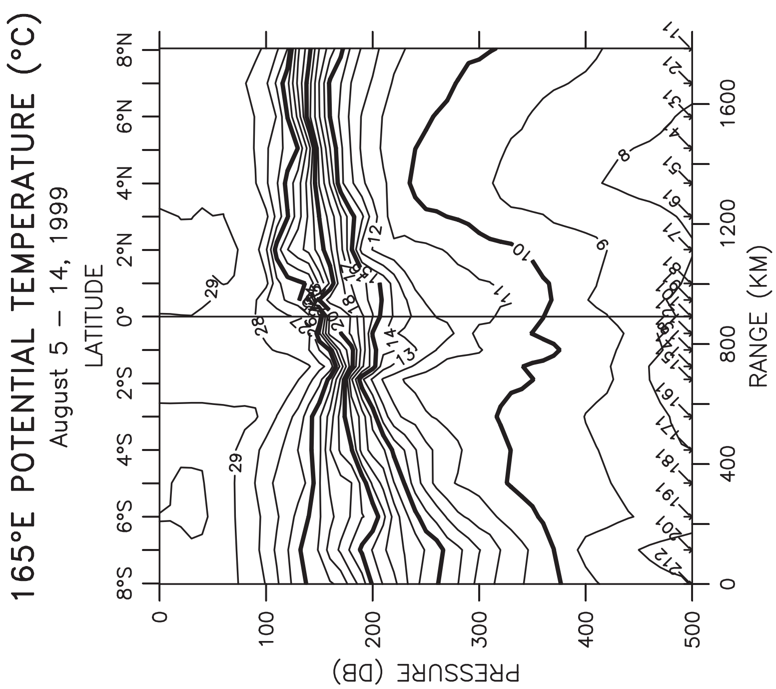

Figure 48: GP4-99-KA summer potential temperature (°C) section along 165°E. Contour intervals are 1°C.

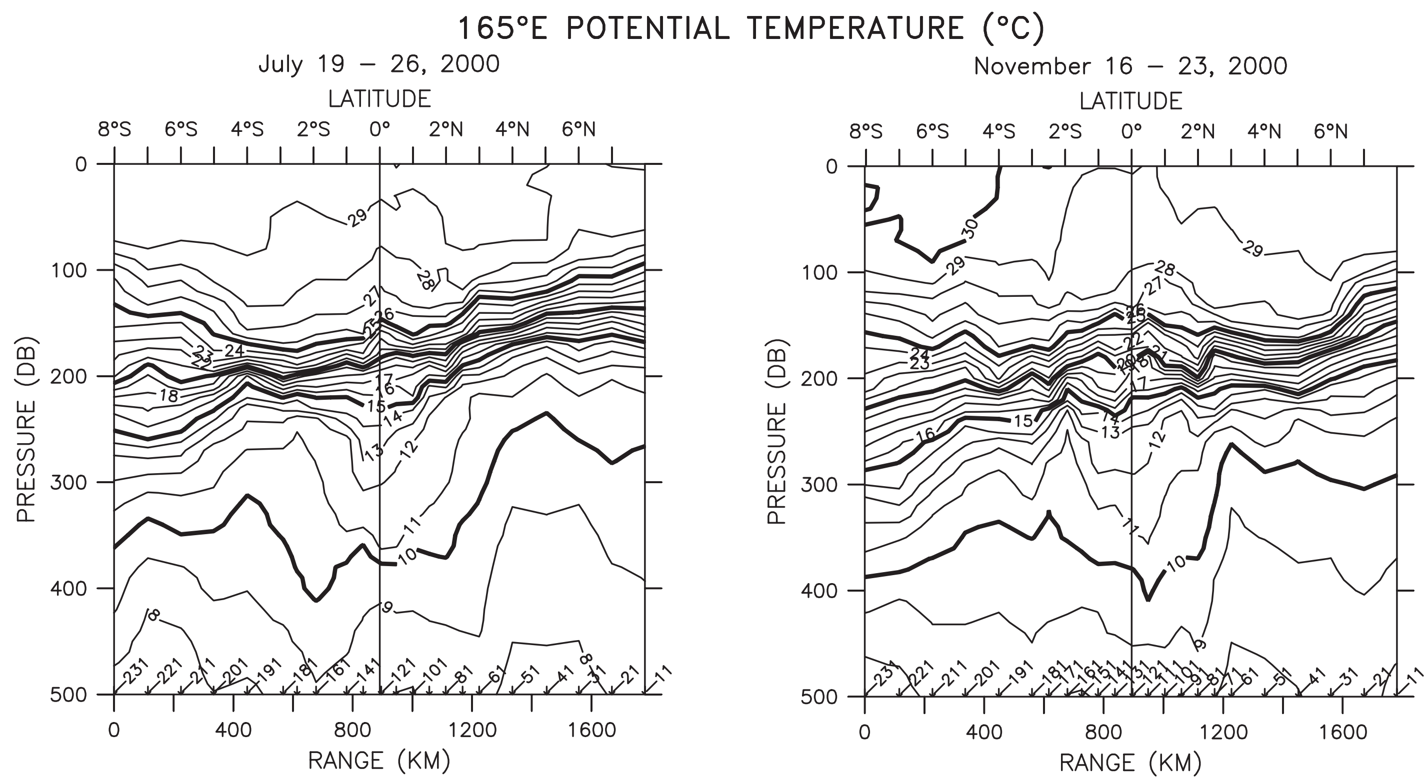

Figure 49: GP4-00-KA summer and GP8-00-KA fall potential temperature (°C) sections along 165°E. Contour intervals are 1°C.

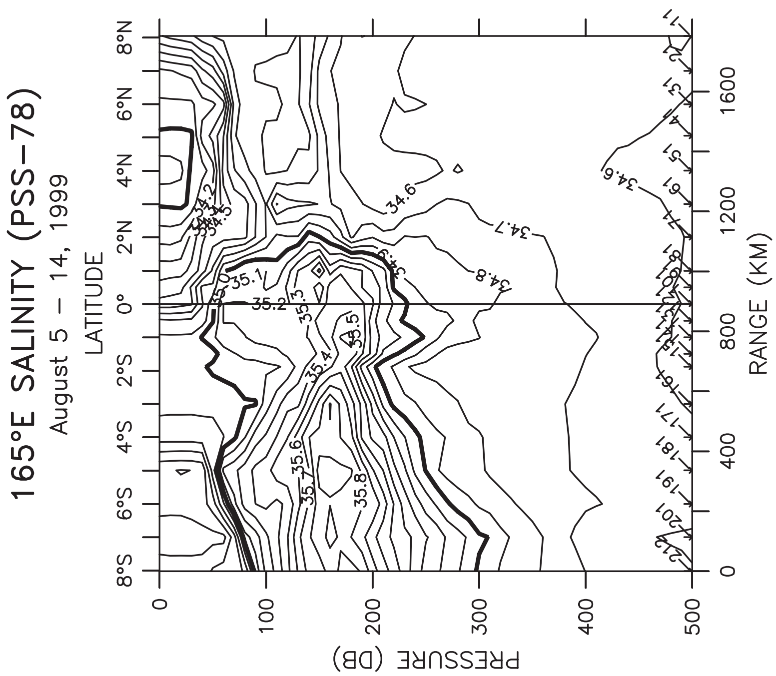

Figure 50: GP4-99-KA summer salinity (PSS-78) sections along 165°E. Contour intervals are 0.1 PSS.

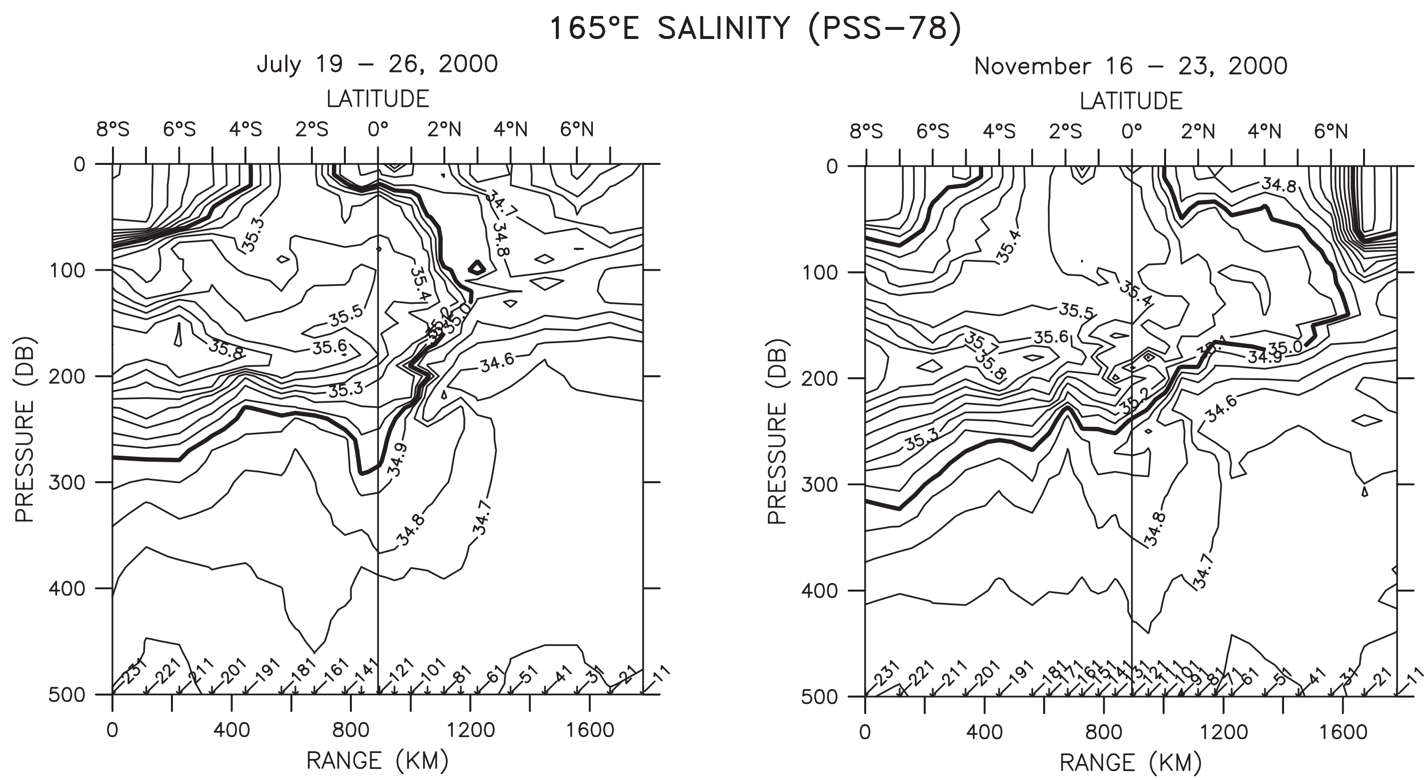

Figure 51: GP4-00-KA summer and GP8-00-KA fall salinity (PSS-78) sections along 165°E. Contour intervals are 0.1 PSS.

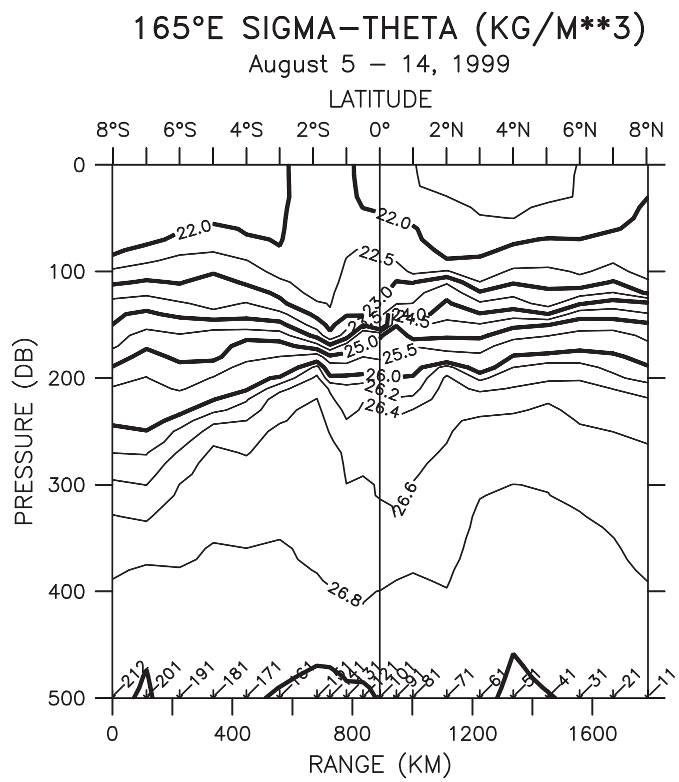

Figure 52: GP4-99-KA summer potential density (kg/m^3) section along 165°E. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

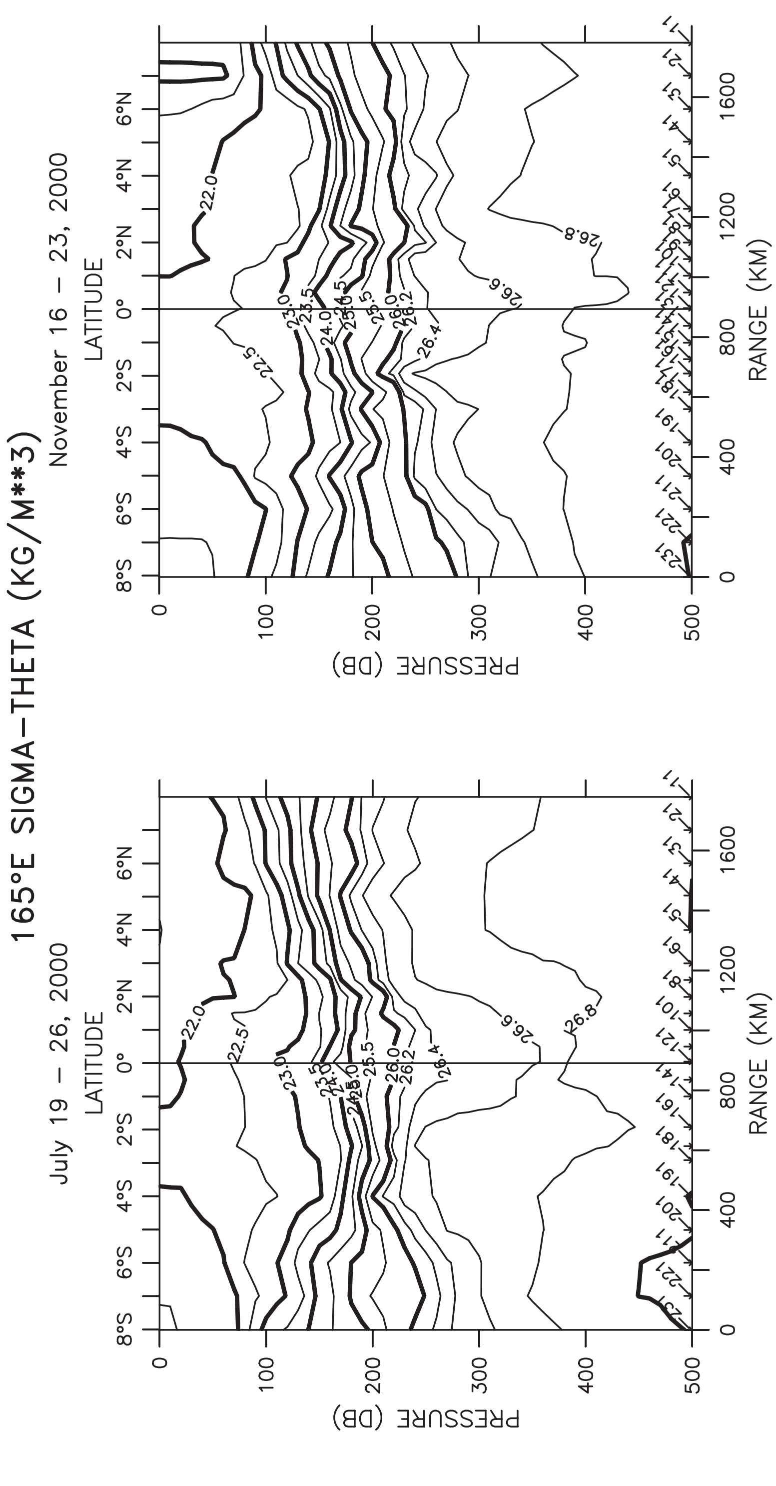

Figure 53: GP4-00-KA summer and GP8-00-KA fall potential density (kg/m^3) sections along 165°E. Contour intervals are 0.5 less than 26.0 and 0.2 greater than 26.0.

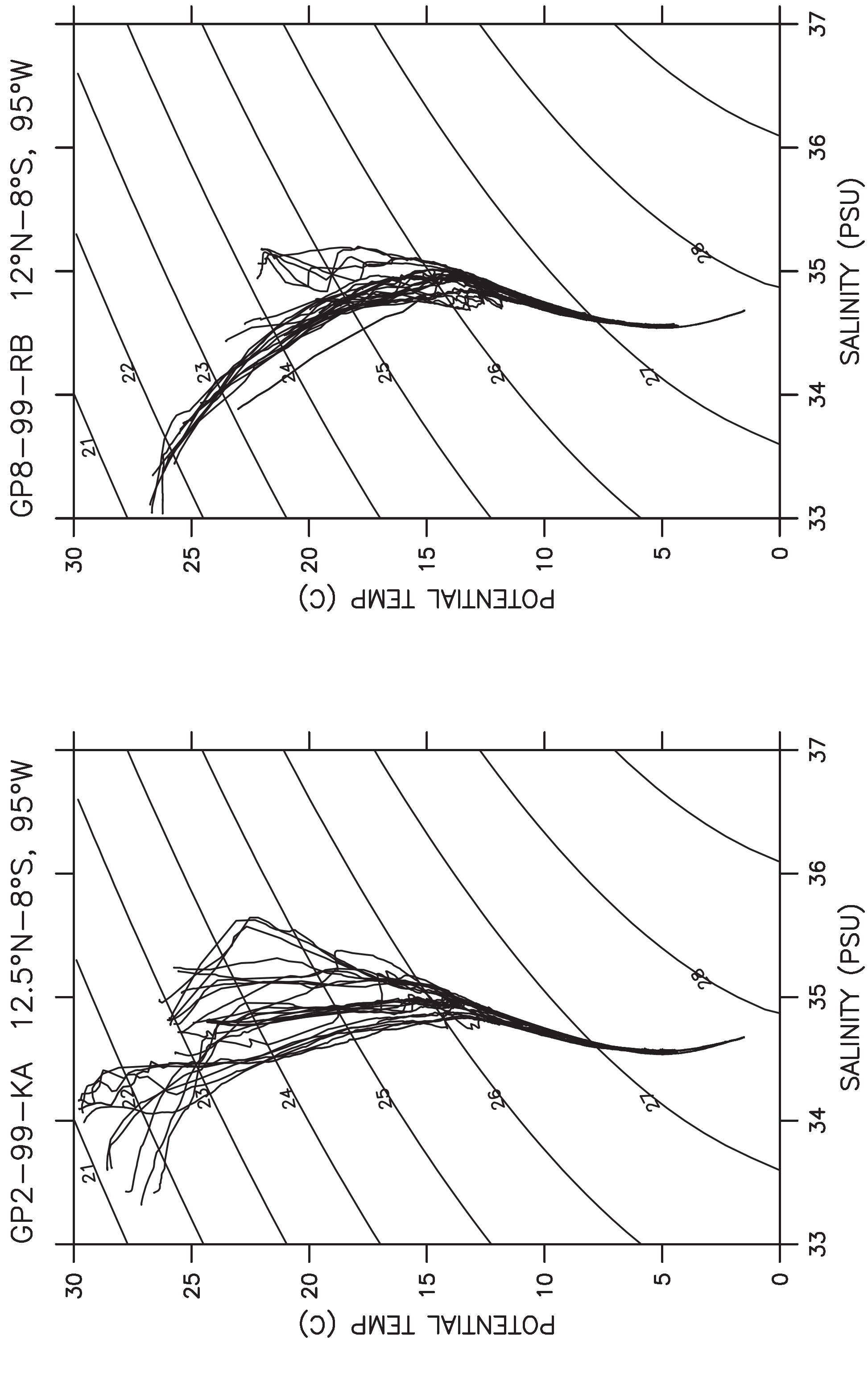

Figure 54: GP2-99-KA spring (May 19–28, 1999) and GP8-99-RB fall (November 23–December 2, 1999) composite TS diagrams along 95°W.

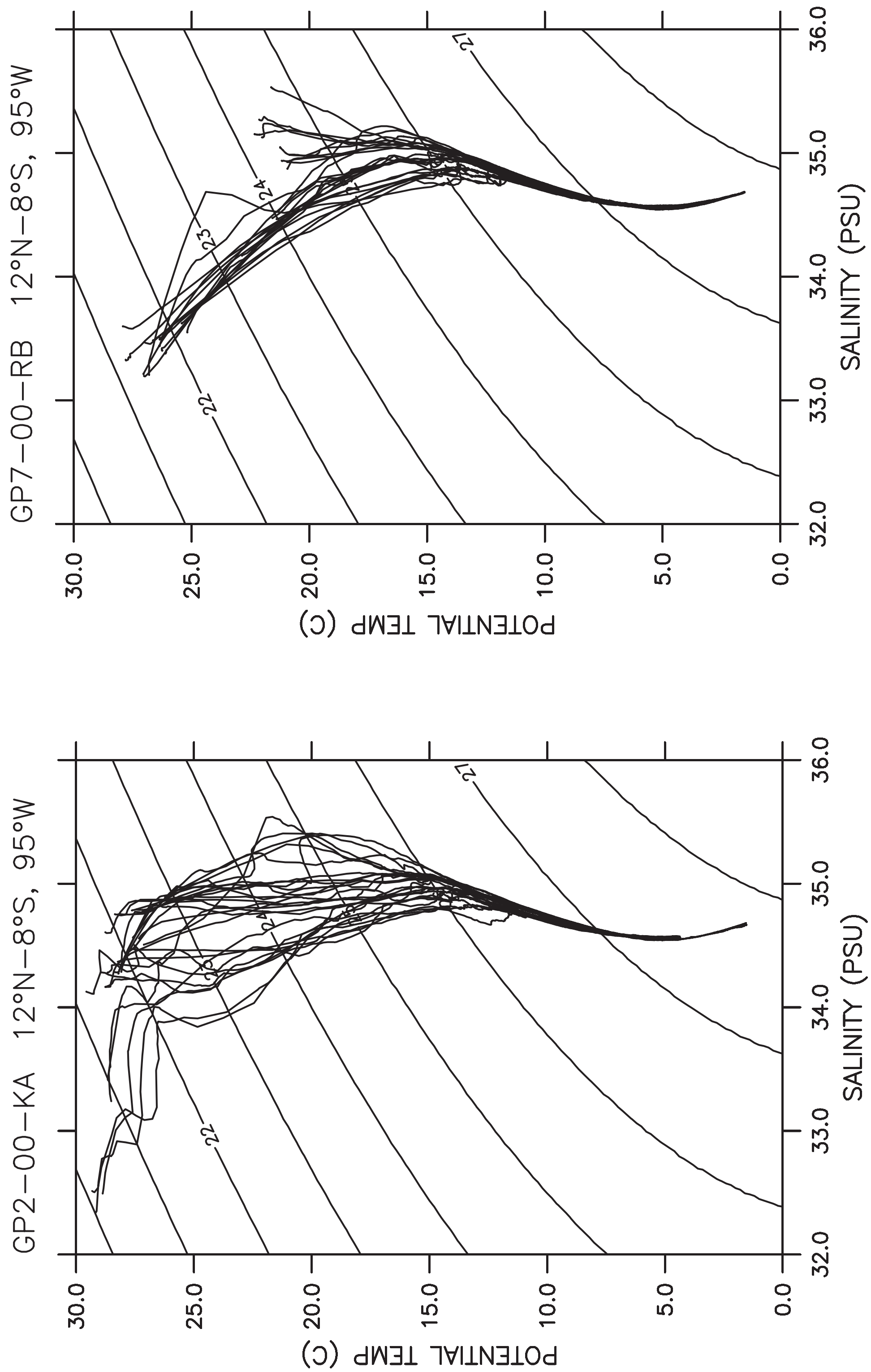

Figure 55: GP2-00-KA spring (April 21–30, 2000) and GP7-00-RB fall (November 3–12, 2000) composite TS diagrams along 95°W.

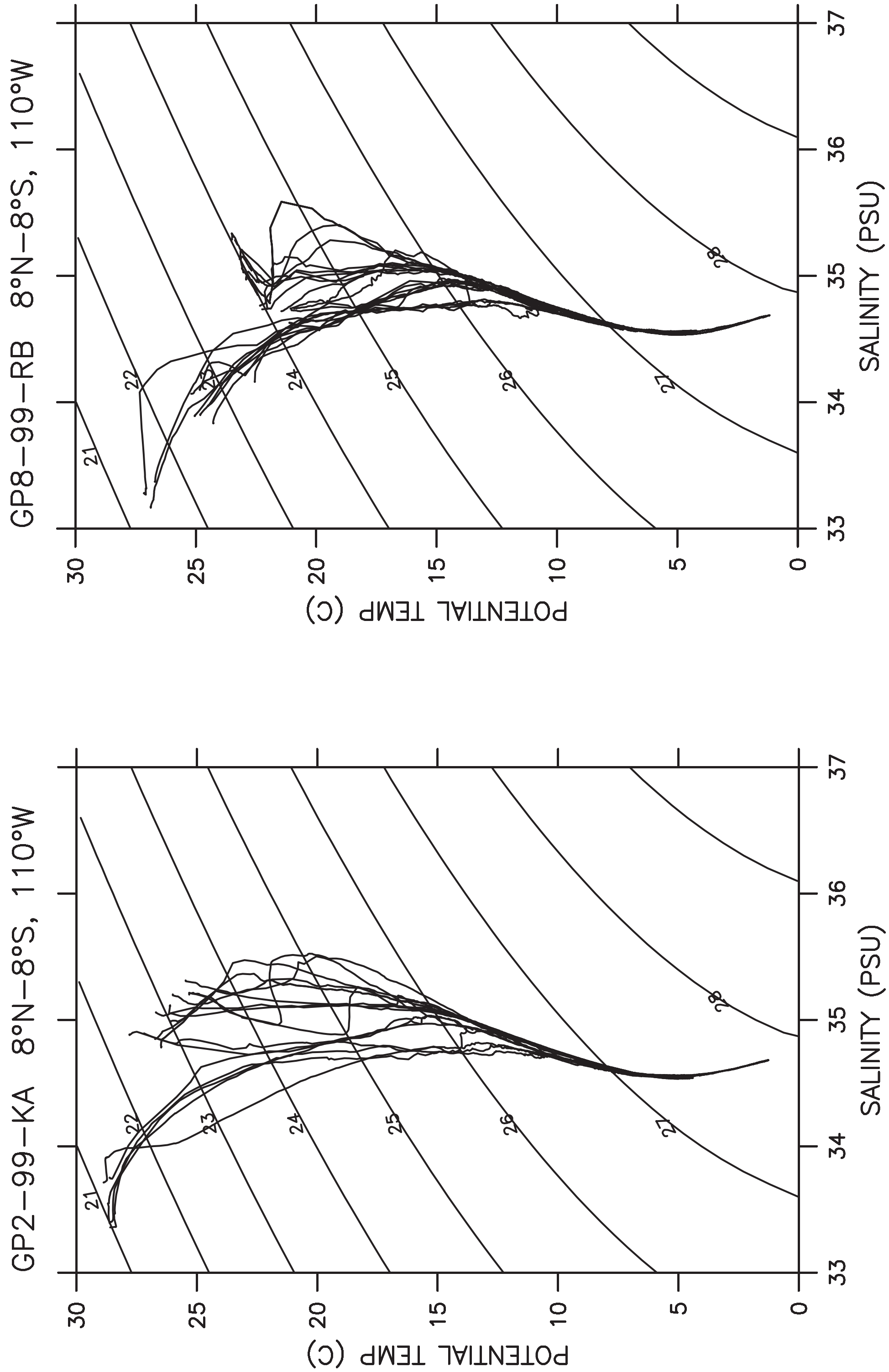

Figure 56: GP2-99-KA spring (May 7–14, 1999) and GP8-99-RB fall (November 11–19, 1999) composite TS diagrams along 110°W.

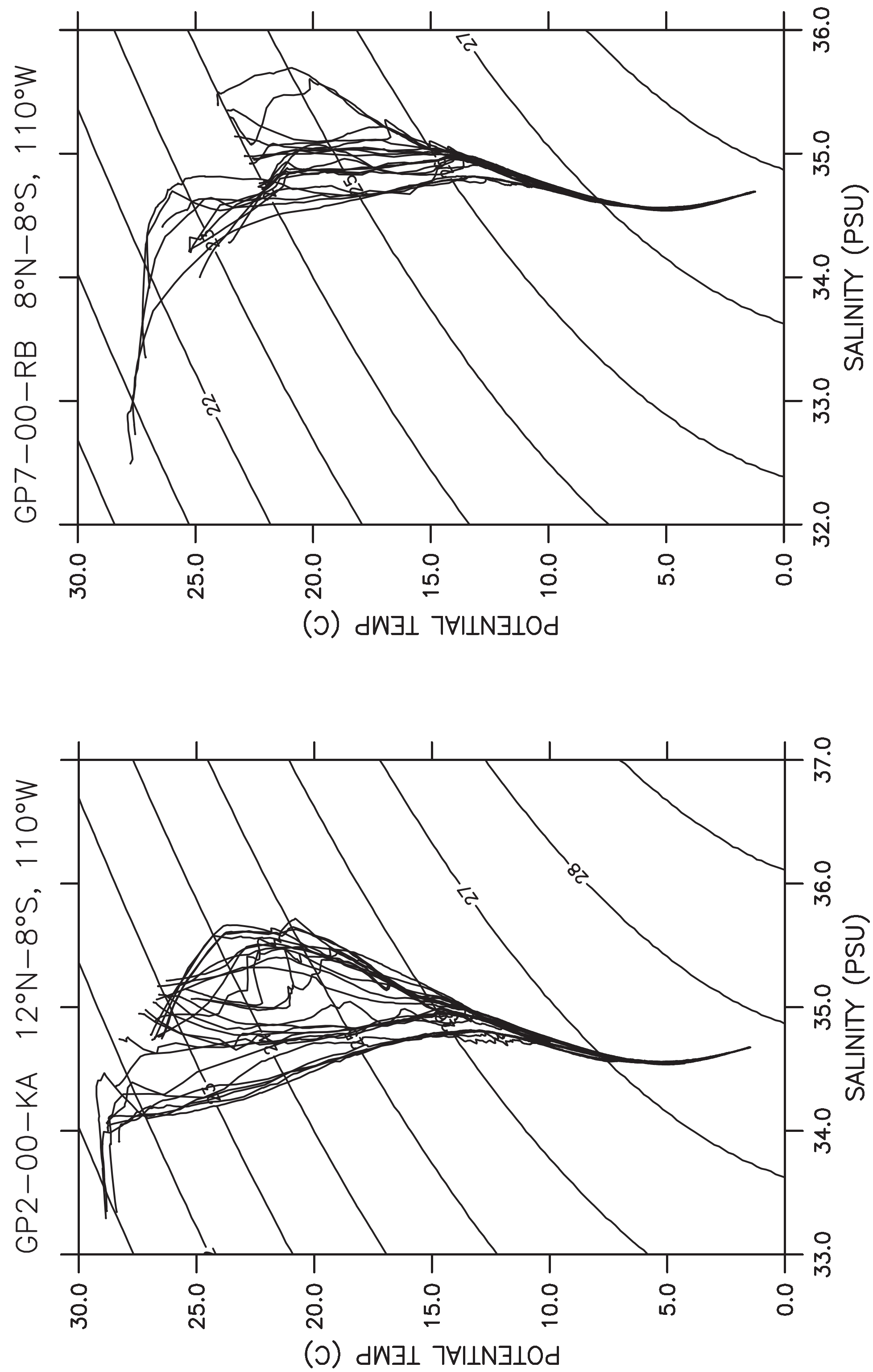

Figure 57: GP2-00-KA spring (May 4–13, 2000) and GP7-00-RB fall (October 22–30, 2000) composite TS diagrams along 110°W.

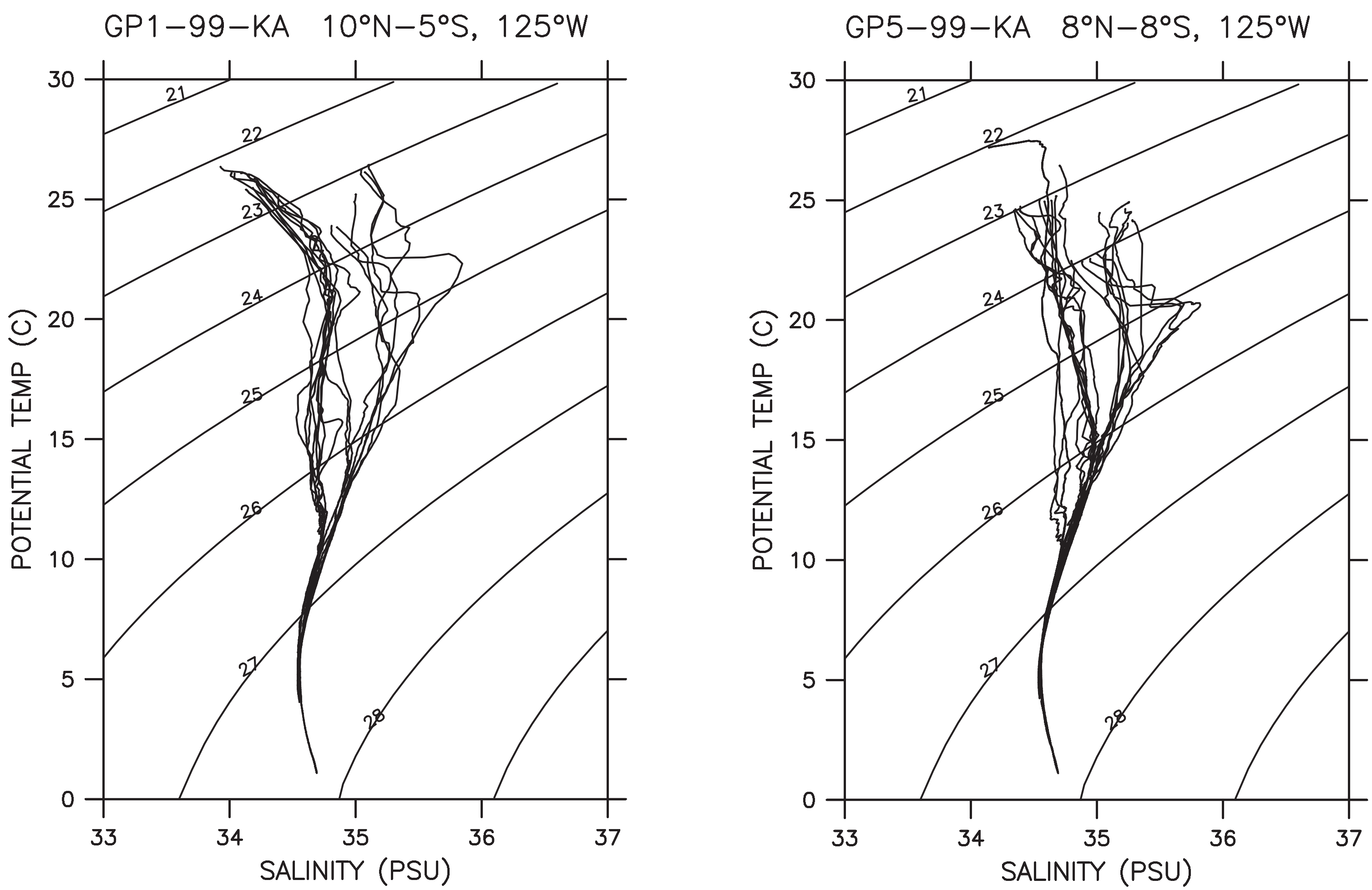

Figure 58: GP1-99-KA winter (February 11–17, 1999) and GP5-99-KA fall (September 28–October 5, 1999) composite TS diagrams along 125°W.

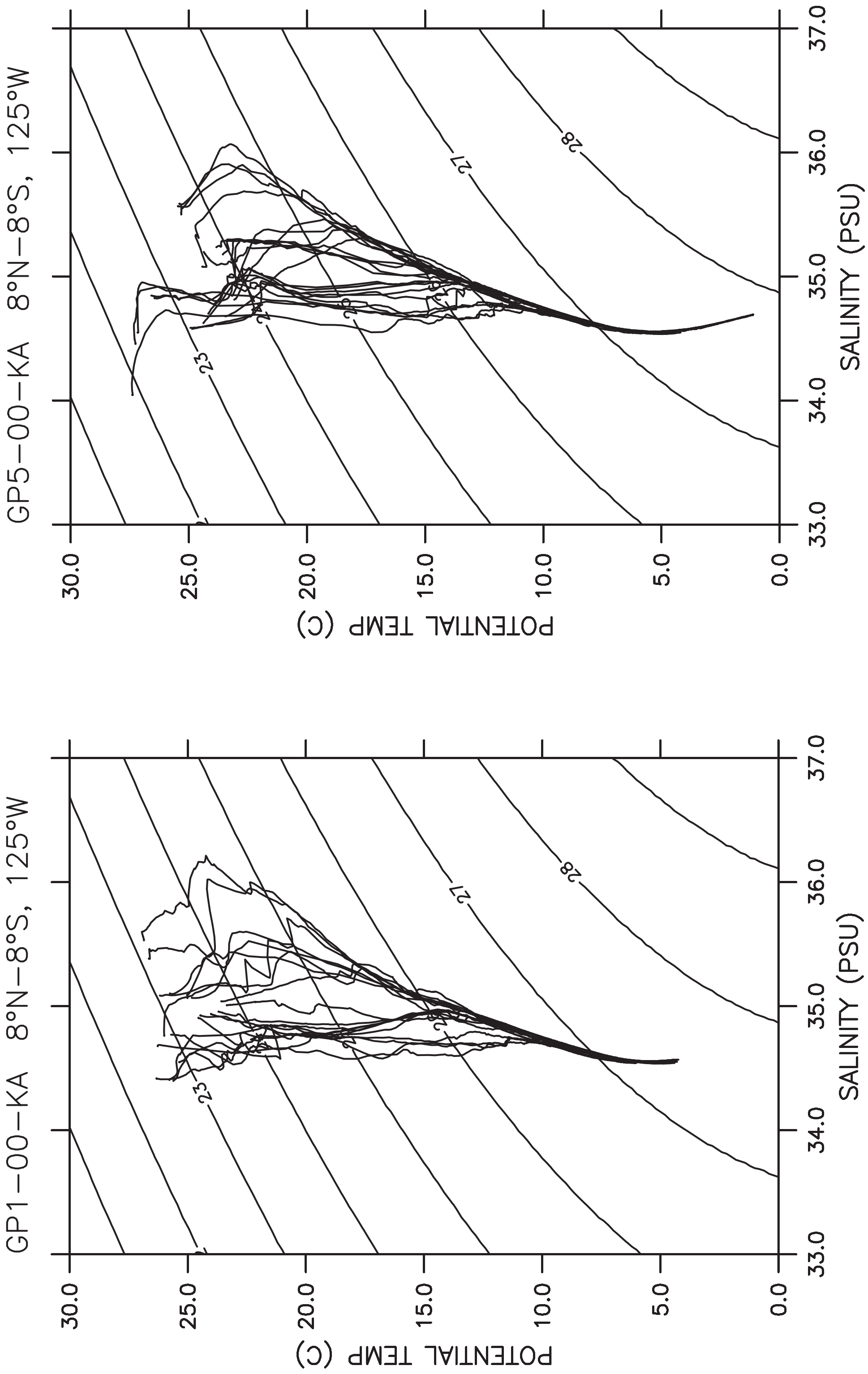

Figure 59: GP1-00-KA winter (February 18–24, 2000) and GP5-00-KA fall (September 8–17, 2000) composite TS diagrams along 125°W.

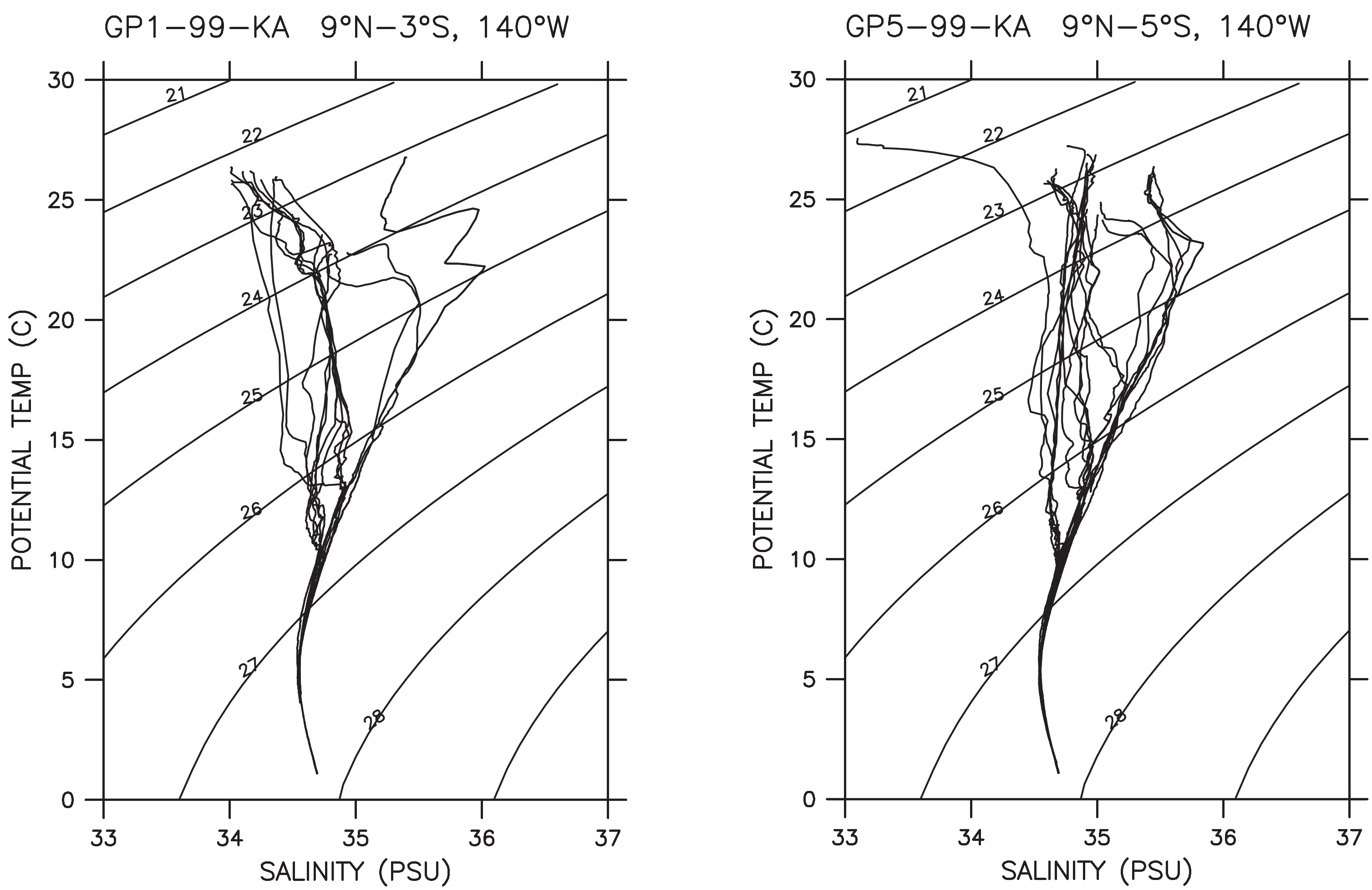

Figure 60: GP1-99-KA winter (January 30–February 6, 1999) and GP5-99-KA fall (September 16–23, 1999) composite TS diagrams along 140°W.

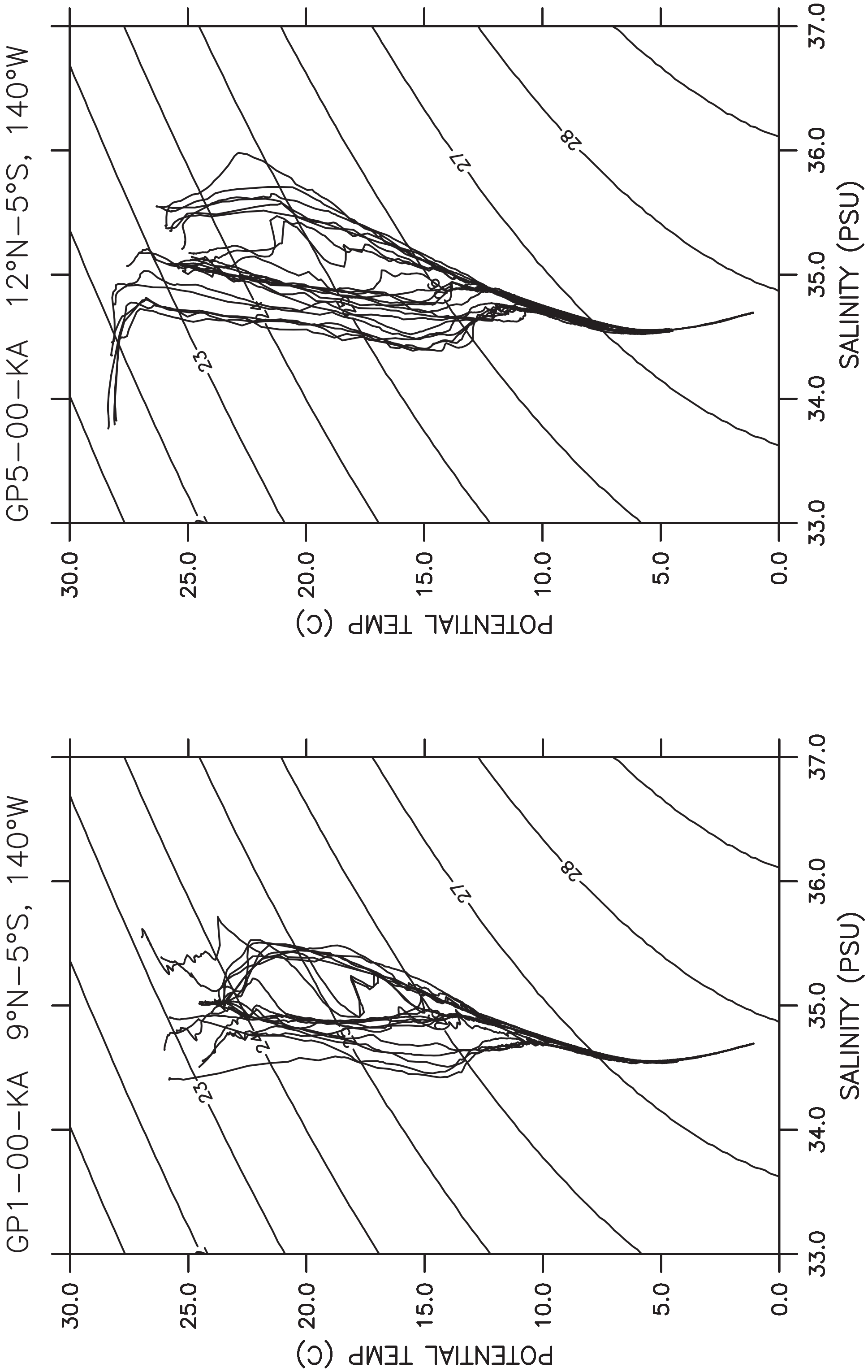

Figure 61: GP1-00-KA winter (February 8–14, 2000) and GP5-00-KA fall (September 20–28, 2000) composite TS diagrams along 140°W.

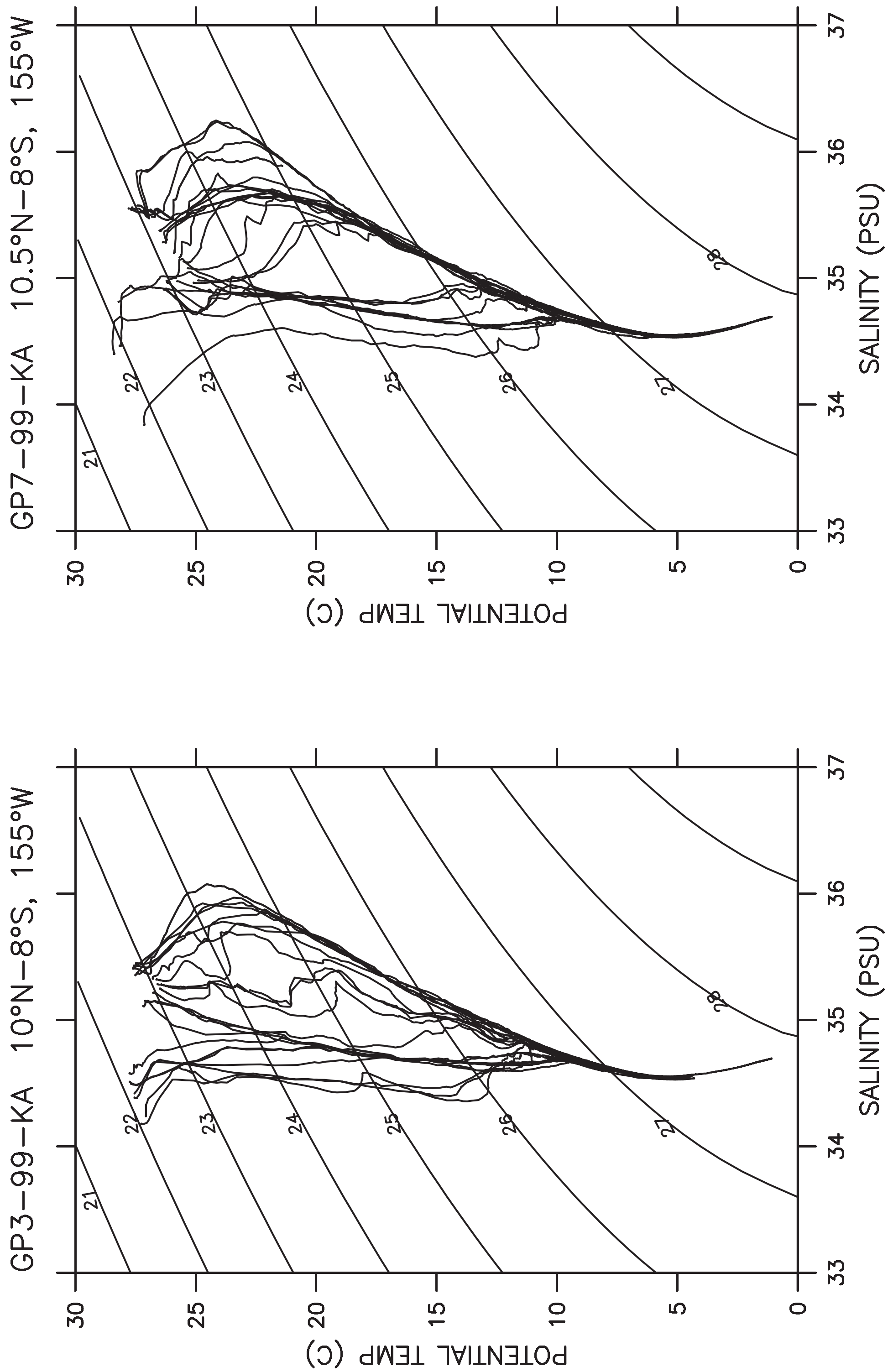

Figure 62: GP3-99-KA summer (July 3–12, 1999) and GP7-99-KA fall (October 23–31, 1999) composite TS diagrams along 155°W.

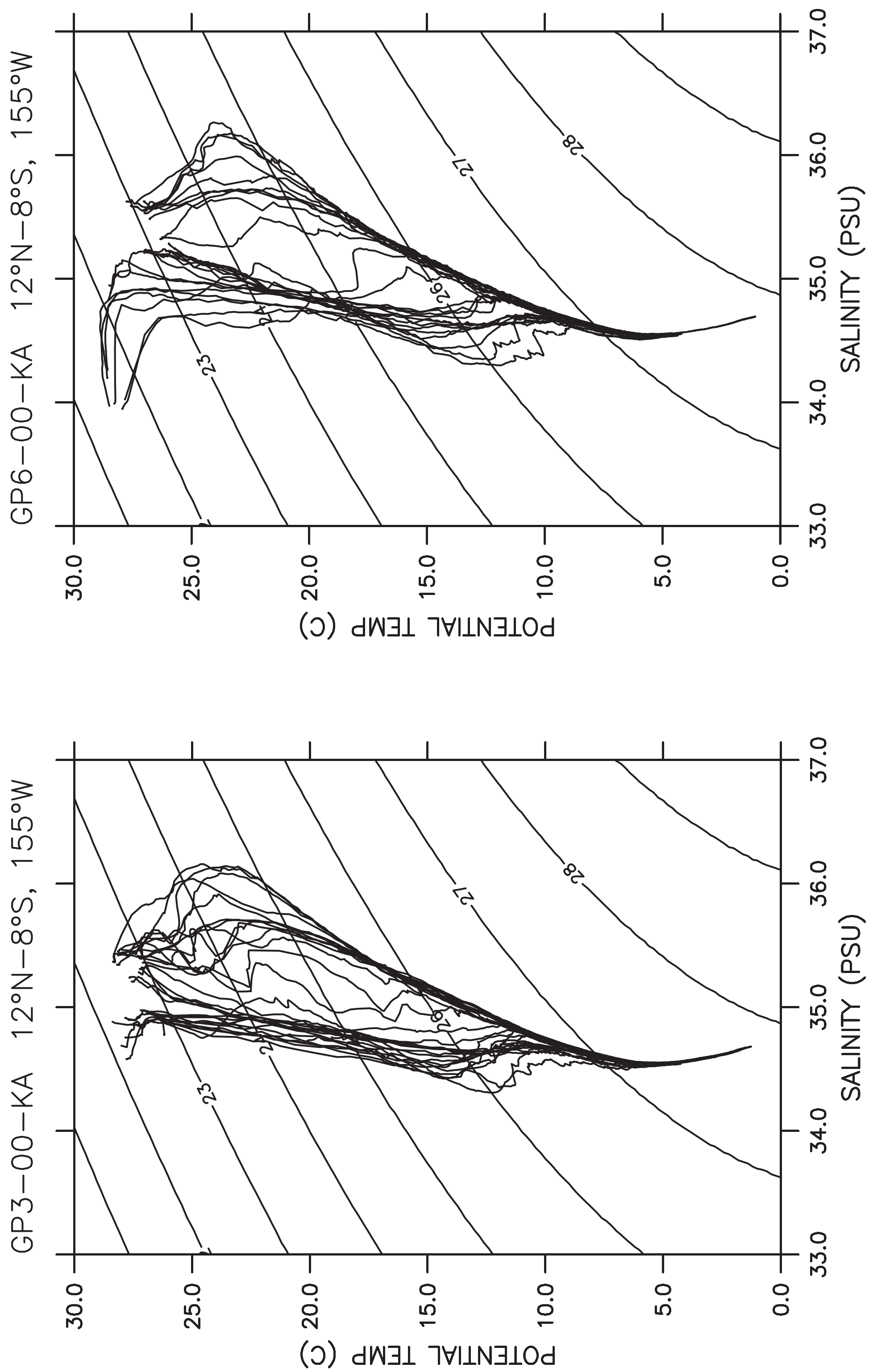

Figure 63: GP3-00-KA summer (June 17–25, 2000) and GP6-00-KA fall (October 17–25, 2000) composite TS diagrams along 155°W.

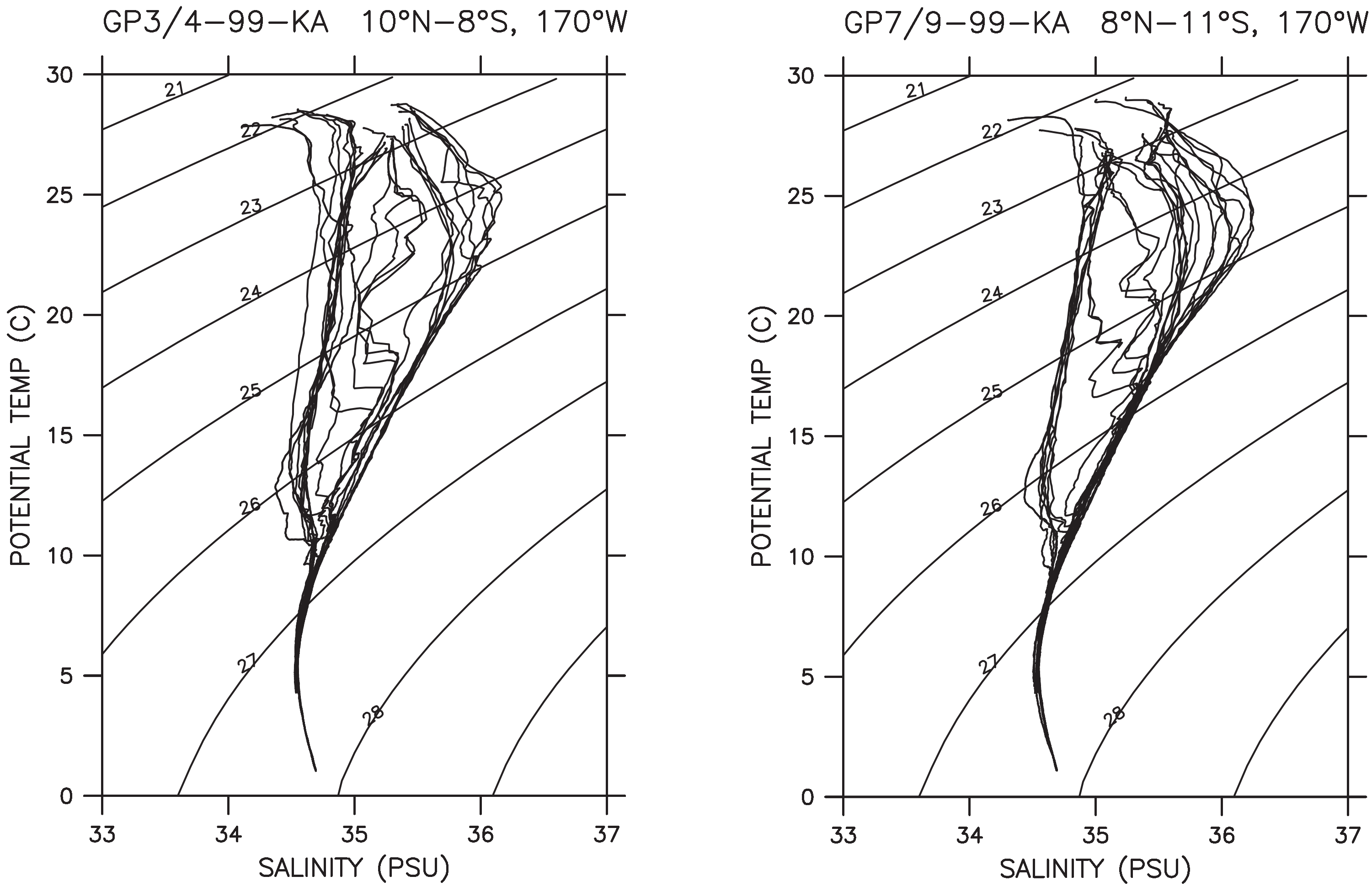

Figure 64: GP3-99-KA summer (July 15–August 28, 1999) and GP7/9-99-KA fall (November 5–December 8, 1999) composite TS diagrams along 170°W.

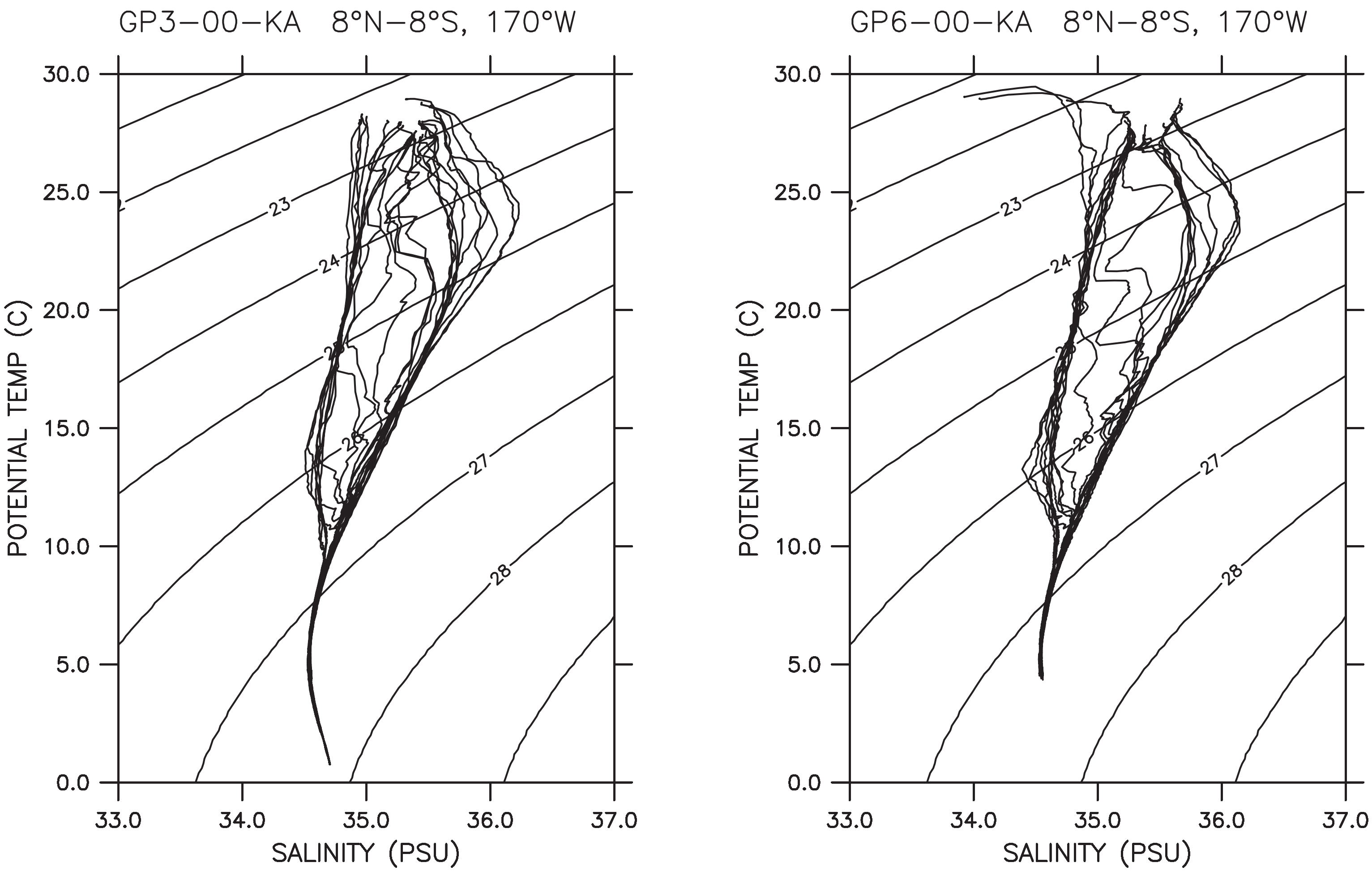

Figure 65: GP3-00-KA summer (June 29–July 7, 2000) and GP6-00-KA fall (October 29–November 4, 2000) composite TS diagrams along 170°W.

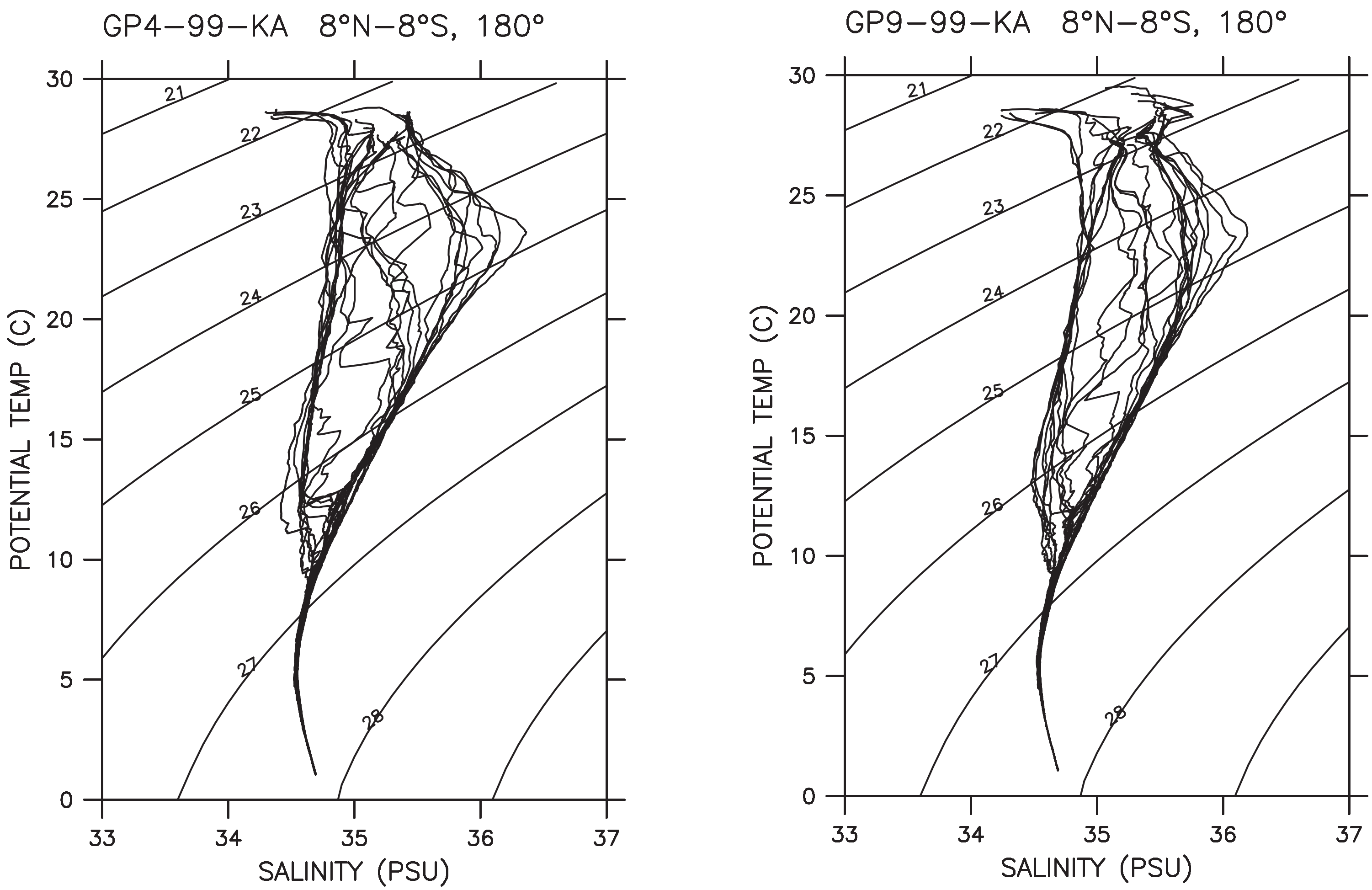

Figure 66: GP4-99-KA summer (August 17–24, 1999) and GP9-99-KA fall (November 24–30, 1999) composite TS diagrams along 180°.

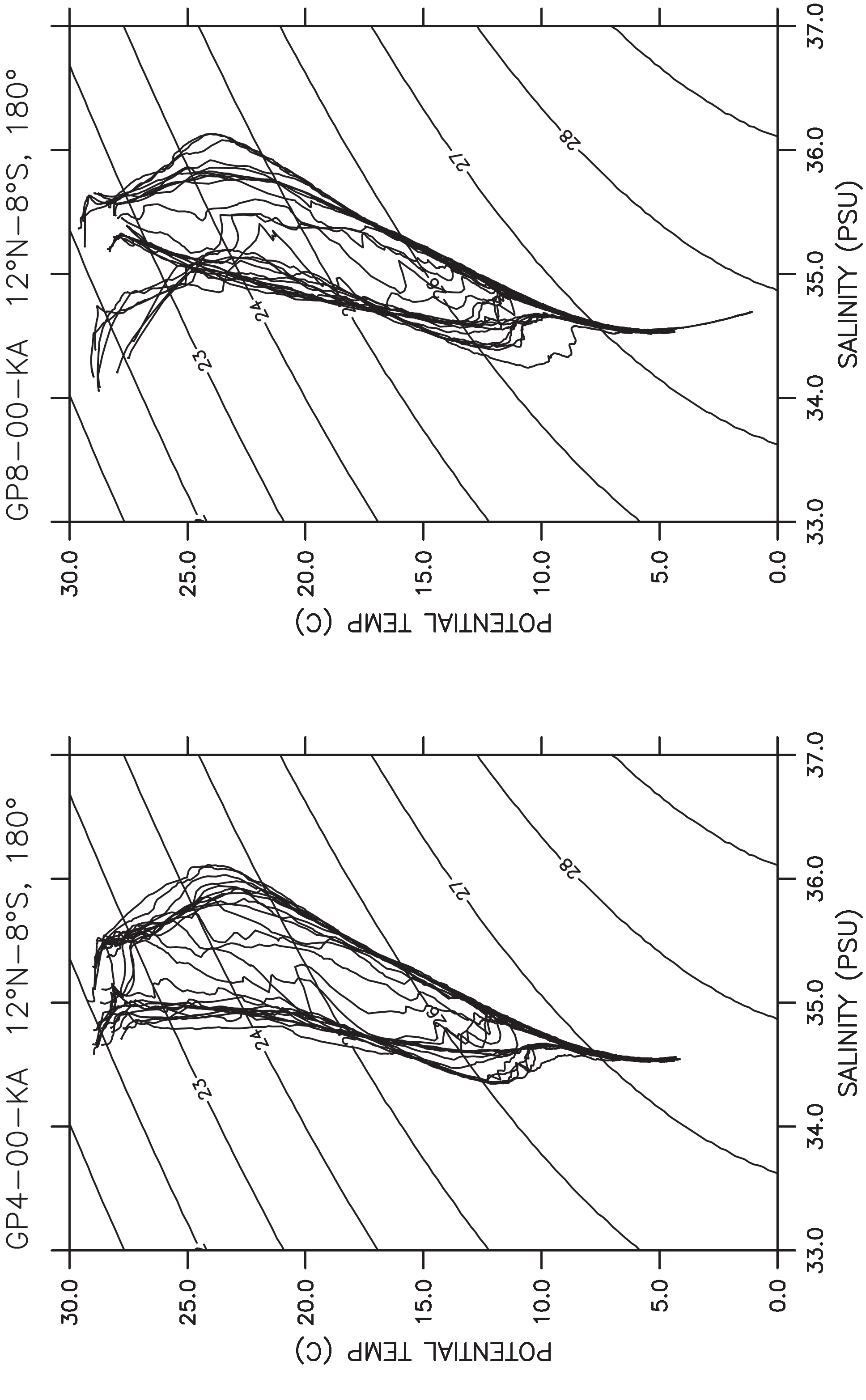

Figure 67: GP4-00-KA summer (July 30–August 7, 2000) and GP8-00-KA fall (November 27–December 4, 2000) composite TS diagrams along 180°.

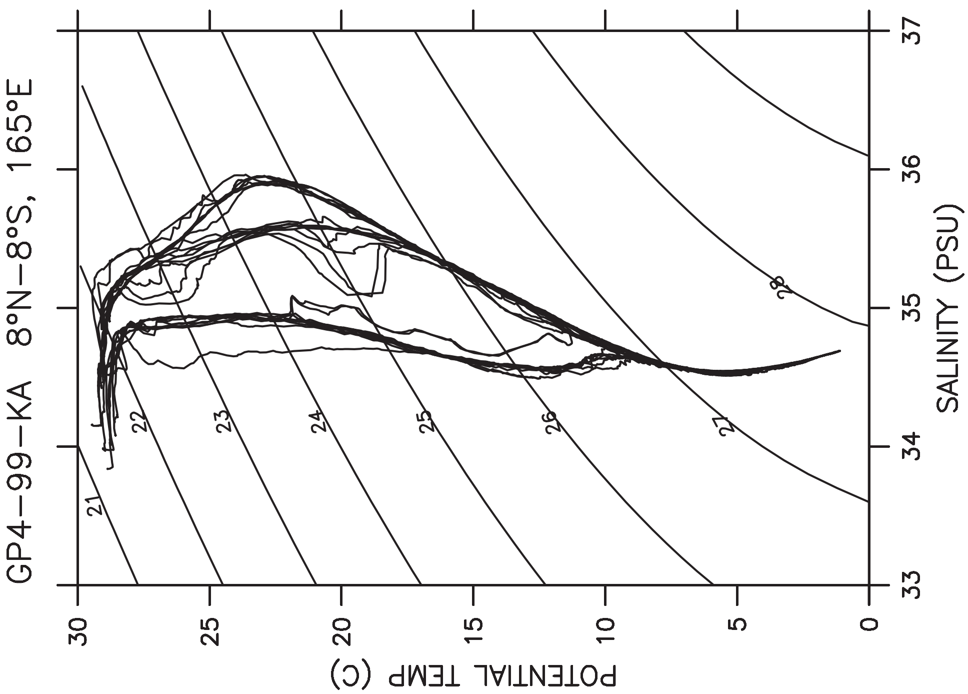

Figure 68: GP4-99-KA summer (August 5–14, 1999) composite TS diagram along 165°E.

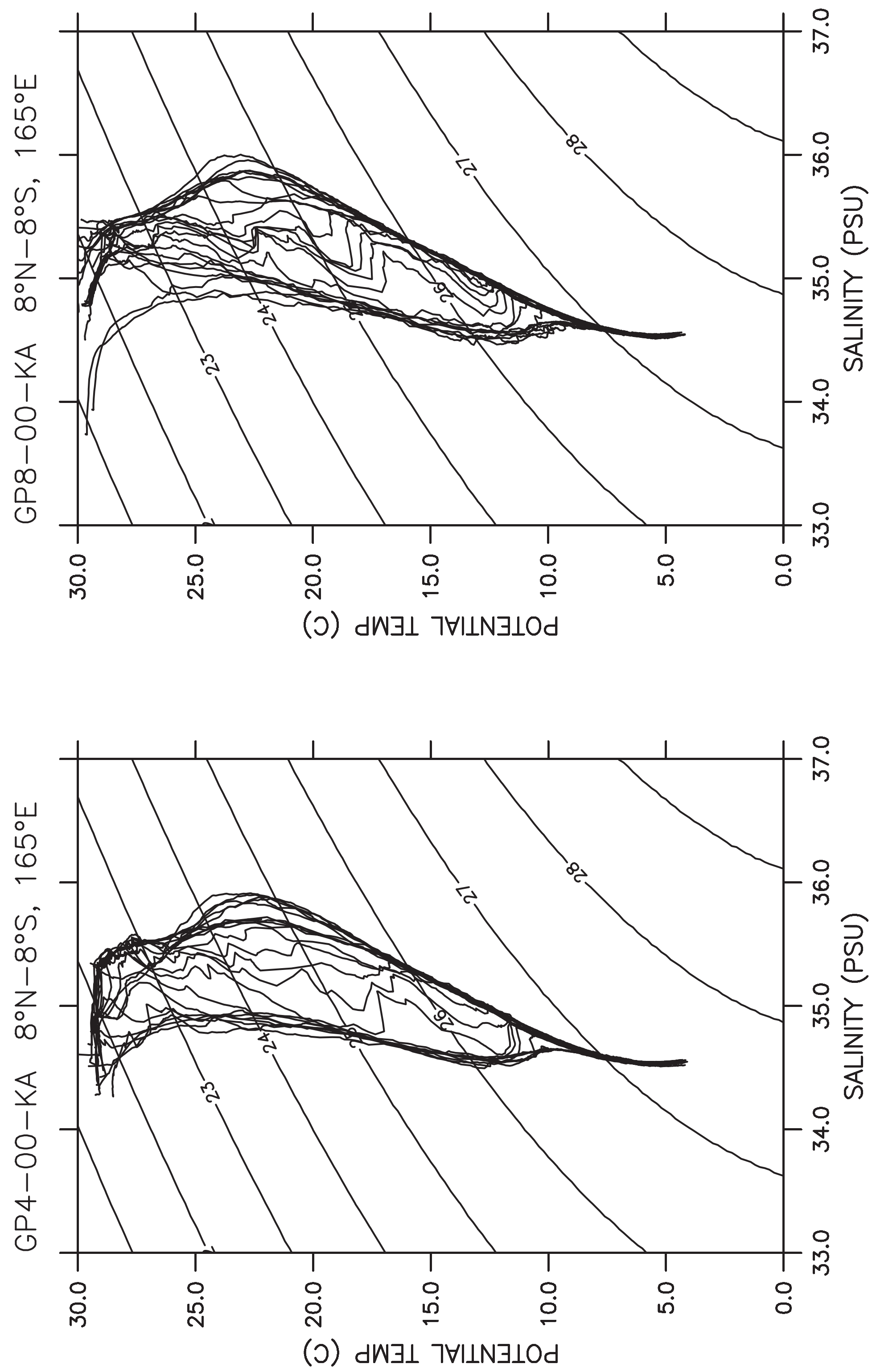

Figure 69: GP4-00-KA summer (July 19–26, 2000) and GP8-00-KA fall (November 16–23, 2000) composite TS diagrams along 165°E.

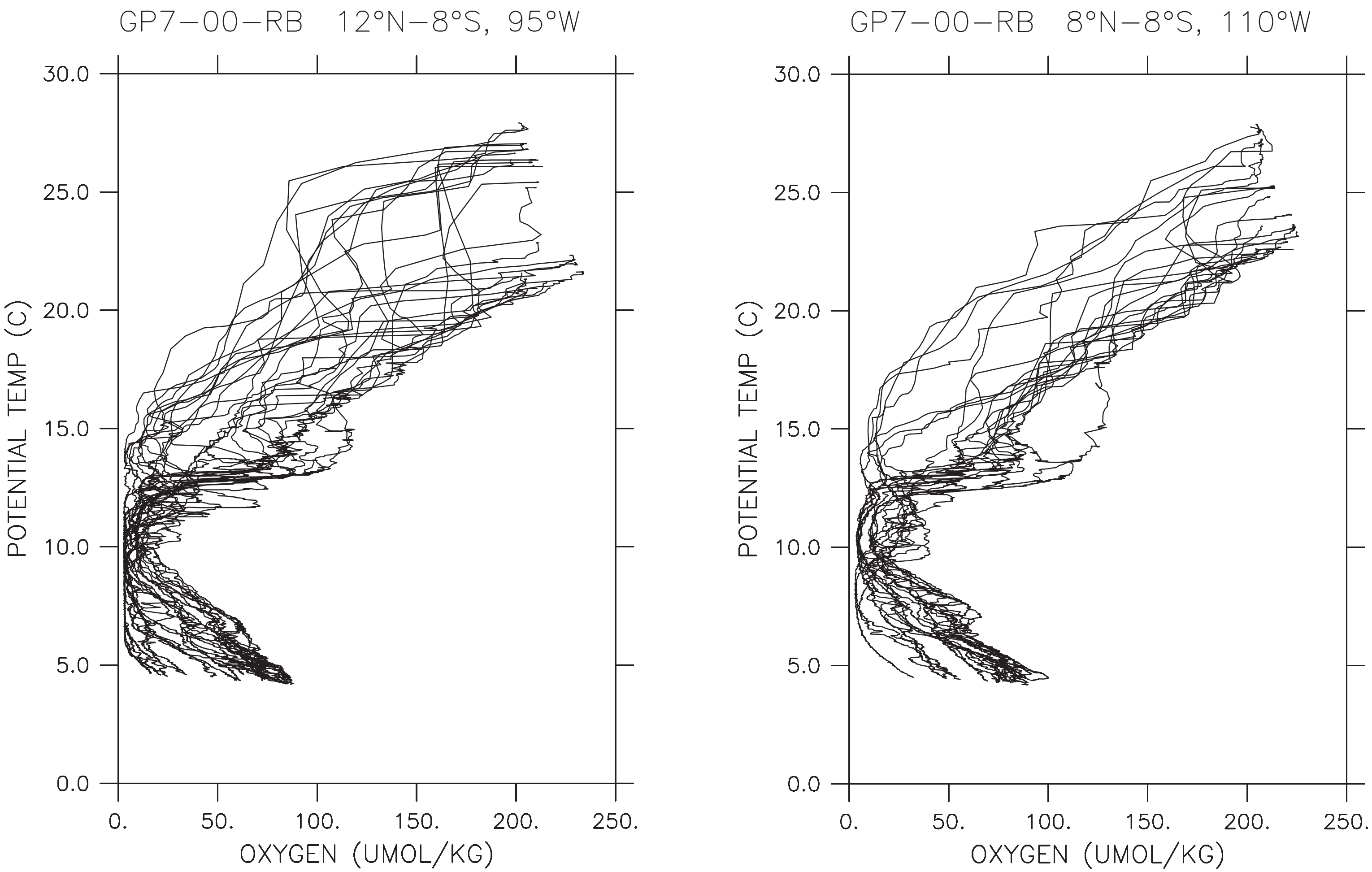

Figure 70: GP7-00-RB fall (October 22–November 3, 2000) composite TO diagrams along 95°W and 110°W.

Table 4: Weather condition code used to describe each set of CTD measurements.

Code	Weather Condition
0	Clear (no cloud)
1	Partly cloudy
2	Continuous layer(s) of cloud(s)
3	Sandstorm, dust storm, or blowing snow
4	Fog, thick dust or haze
5	Drizzle
6	Rain
7	Snow, or rain and snow mixed
8	Shower(s)
9	Thunderstorms

Table 5: Sea state code used to describe each set of CTD measurements.

Code	Height (meters)	Description
0	0	Calm-glassy
1	0–0.1	Calm-rippled
2	0.1–0.5	Smooth-wavelet
3	0.5–1.25	Slight
4	1.25–2.5	Moderate
5	2.5–4	Rough
6	4–6	Very rough
7	6–9	High
8	9–14	Very high
9	>14	Phenomenal

Table 6: Visibility code used to describe each set of CTD measurements.

Code	Visibility
0	<50 meters
1	50–200 meters
2	200–500 meters
3	500–1,000 meters
4	1–2 km
5	2–4 km
6	4–10 km
7	10–20 km
8	20–50 km
9	50 km or more

Table 7: Cloud type.

Code	**Cloud Types**
0	Cirrus
1	Cirrocumulus
2	Cirrostratus
3	Altocumulus
4	Altostratus
5	Nimbostratus
6	Stratocumulus
7	Stratus
8	Cumulus
9	Cumulonimbus
X	Clouds not visible

Table 8: Cloud amount.

Code	**Cloud Amount**
0	0
1	1/10 or less but not zero
2	2/10–3/10
3	4/10
4	5/10
5	6/10
6	7/10–8/10
7	9/10
8	10/10
9	Sky obscured or not determined

All CTD and Hydrographic Data can be obtained by contacting K.E. McTaggart at kem@pmel.noaa.gov.