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CTD MEASUREMENTS DURING 2001 AND 2002 AS PART OF THE TAO/TRITON PROGRAM

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Abstract. During 2001 and 2002, CTD data were collected in the equatorial Pacific Ocean during cruises to service the TAO/TRITON array, a network of deep ocean moored buoys deployed to support ENSO research and forecasting. 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 on the report CD for each cast. Hydrographic data are listed for each cruise on the report CD.

1. Introduction

CTD data are collected in the equatorial Pacific Ocean in conjunction with the maintenance of the Tropical Atmosphere Ocean (TAO)/TRITON array. TAO/TRITON servicing cruises (and the shipboard measurements that are an integral part of them) are support for NOAA strategic plan element to Implement Seasonal-to-Interannual Climate Forecasts, and support of the International Climate Variability and Predictability (CLIVAR) program, the El Niño/Southern Oscillation (ENSO) Observing System, the Global Ocean Observing System (GOOS), and the Global Climate Observing System (GCOS).

The TAO/TRITON array, completed in 1994, consists of approximately 70 deep ocean moorings within 8 degrees of the equator spanning the Pacific Basin from 95°W to 137°E. Moorings west of 165°E are maintained by the Japan Science and Technology Center (JAMSTEC). High quality oceanographic and surface meteorological data are recorded and reported in real time using the Argos satellite data telemetry system. These data are used to improve understanding, modeling, and prediction of the global interannual climate fluctuations associated with the El Niño-Southern Oscillation phenomena in the tropical Pacific Ocean.

The primary objective of TAO/TRITON cruises is the recovery and deployment of moorings. Each mooring line is occupied twice a year, once during the first half of the year, and again approximately 4–7 months later. Figures 1a and b show the CTD station locations for each half-yearly occupation during 2001–2002. The second occupation of 125°W during 2002 was cancelled owing to ship's engine problems. At a minimum, CTD casts supporting the TAO/TRITON 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 the 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. Although there are no TAO/TRITON moorings north of 8°N, CTD profiles are collected to 12°N along the ship's trackline whenever possible to measure across the

North Equatorial Counter Current. Physical underway operations include shipboard Acoustic Doppler Current Profiler (ADCP) measurements, sea surface temperature (SST) and salinity (SSS) measurements, and routine weather observations.

CTD measurements are used to verify moored temperature sensor data, calculate dynamic height, and at many sites, are the only observations of the equatorial Pacific salinity field. CTD measurements are also used to aid in the calibration of moored conductivity sensor data. 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 2001 and 2002 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 2a–p show the cruise track and CTD station locations for each cruise. Tables 1a–p summarizes CTD station information for each cruise. Cruise name notation is GPx-yy-zz, where x is the sequential cruise number during each year, yy is the year (01 or 02), 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. 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).

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 are 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. These are 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 have 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:

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

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

$$
\begin{aligned}
c &= c1 + c2 * U + c3 * U^2 \\
d &= d1 + d2 * U \\
t0 &= t1 + t2 * U + t3 * U^2 + t4 * U^3 + t5 * U^4
\end{aligned}
$$

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.

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. Maximum cast depth is 200 m from the bottom as reported by the ship's fathometer.

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 VHS tape. Digitized data on the PC are backed up onto Zip disks and CD-ROM.

CTD data acquired during GP901 were especially problematic owing to faulty sea cable and slip ring terminations. Salinity data were unrecoverable for stations 0071 0-238 dbar, 0081 0-149 dbar, 0091 0-284 dbar, 0101 0-362 dbar, all of 0151, all of 0181, all of 0191, all of 0201, and 0221 0-200 dbar. Also, GP402 station 0091 data exist from 275-818 dbar only.

4. Salinity Analysis

Bottle salinity analyses are performed in temperature-controlled environments using Guildline Model 8400B inductive autosalinometers equipped with Ocean Scientific International, Ltd. ACI2000 computer interface and standardized with IAPSO Standard Seawater. The autosalinometer is standardized before each run and the correction is applied in the software. Ten scans of data are averaged for each reading. Three readings are taken per sample and averaged for one sample salinity value. 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 0.002.

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 TAO CTD data.

ALIGNCTD advances secondary conductivity relative to temperature by 0.073 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. ROSSUM creates a summary of the bottle data. Pressure, temperature, and conductivity 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. In order to produce a zero phase (no time shift) the filter first runs forward through the file and then runs backwards through the file. 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. DERIVE computes selected variables such as salinity, potential temperature, and potential density.

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 a specified number of standard deviations (usually 2.8). CALCOSn returns a single conductivity bias and a conductivity slope for each station. A station-dependent slope coef-

ficient 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 while avoiding fitting to fluctuations due to noise in standardizations of salinity sample runs.

Table 3 lists the conductivity calibration coefficients determined for each station grouping. In many cases, the standard deviation of the fit is higher than in recent years and is the result of a decrease in the overall quality of salinity analyses performed by less experienced, augmenting survey technicians on the *Ka'imimoana*. Salinity data were generally saltier than the CTD data possibly owing to poor sampling technique, contamination, evaporation, etc. Salinity data were so poor during GP401, GP701, GP901, and GP102 that the standard deviation beyond which to reject outliers had to be lowered to 2.2 or 2.3. Calibrated profiles were compared to historical deep theta-salinity profiles, and an additional offset had to be applied to CTD salinity in order to bring the profiles from these cruises into agreement with the historical envelope of deep profiles. The salinity offset applied to stations 1–18 of GP402 may be due to the samples sitting 4 weeks before analysis.

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. 3a–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.

7. Additional Processing

SEASOFT processing modules are followed by PMEL Fortran program CNV_EPS. CNV_EPS applies post-cruise calibrations to conductivity and converts the 1-dbar averaged CTD data to NetCDF format. CNV_EPS 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). CNV_EPS 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 ammended to reflect these changes. CNV_EPS 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.

PMEL Fortran program CLB_EPS creates individual bottle files in NetCDF format for each cast.

8. Data Presentation

The majority of plots in this report were produced using Plot Plus Scientific Graphics System (Denbo, 1992). Figures 4–51 are potential temperature, salinity, and sigma-theta sections for each meridian. Figures 52–67 are composite potential temperature-salinity (θ-S) 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

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FIGURES AND TABLES

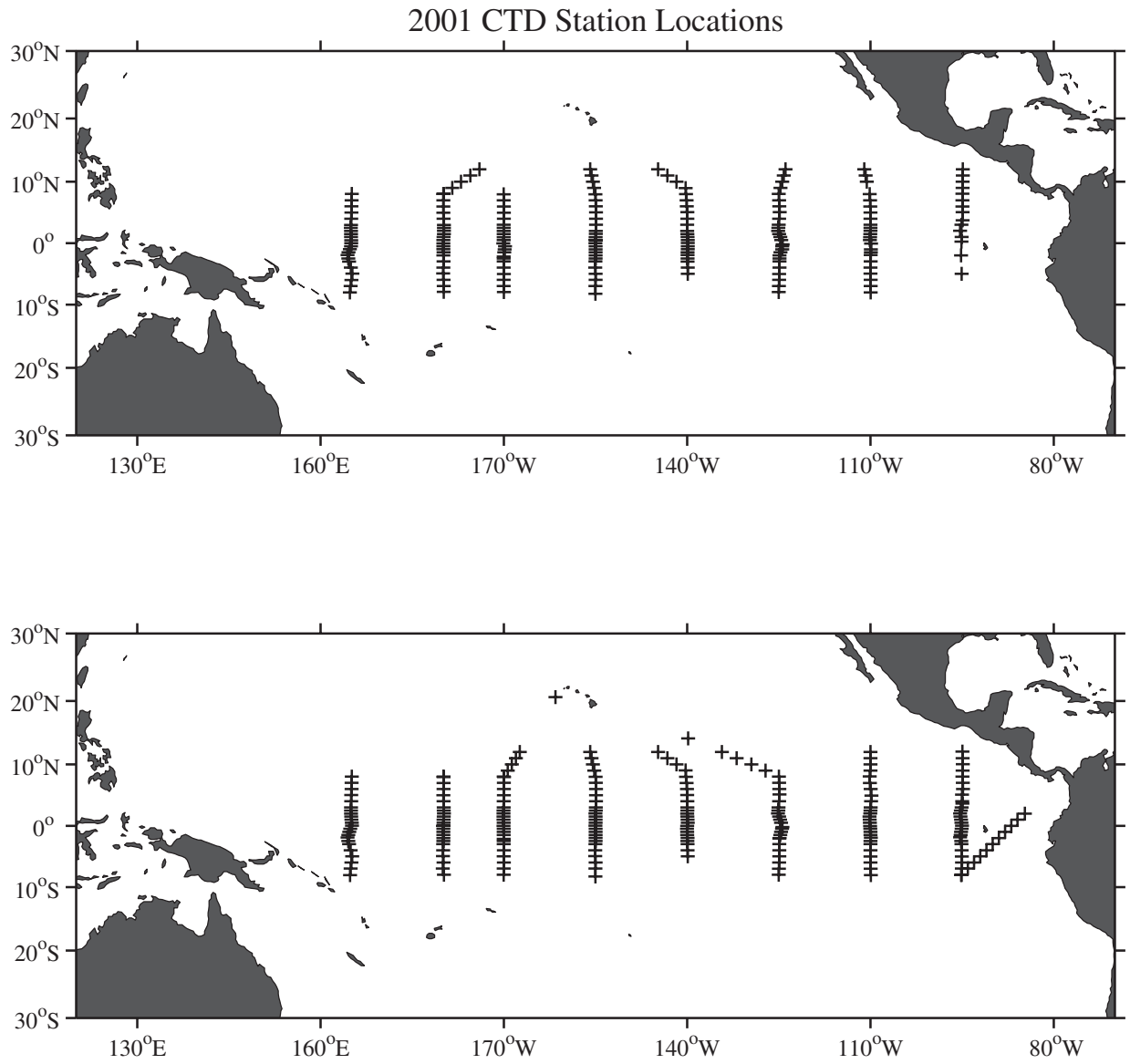

Figure 1a: 2001 CTD station locations for the first half of the year (upper panel) and the second half of the year (lower panel).

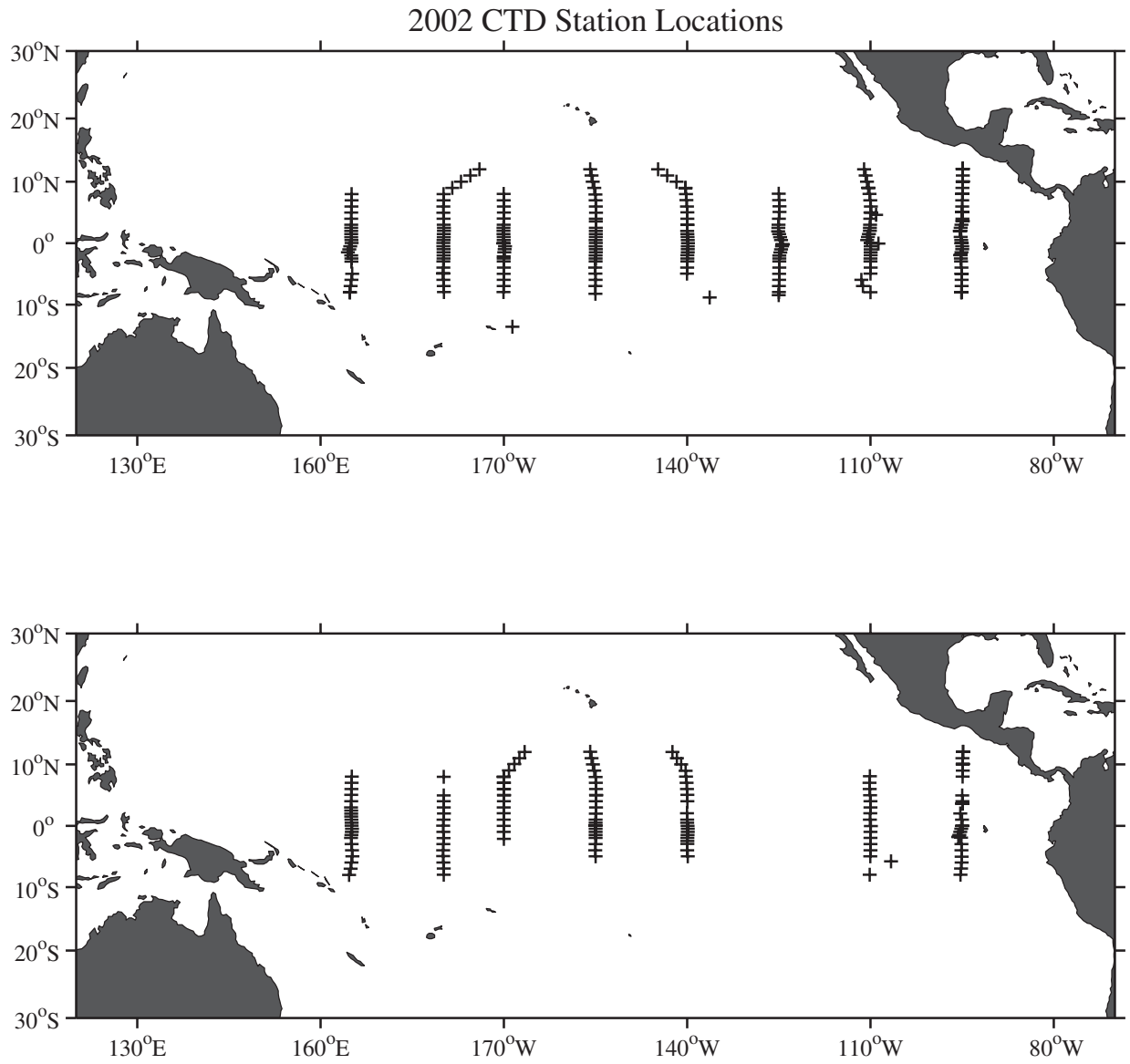

Figure 1b: 2002 CTD station locations for the first half of the year (upper panel) and the second half of the year (lower panel).

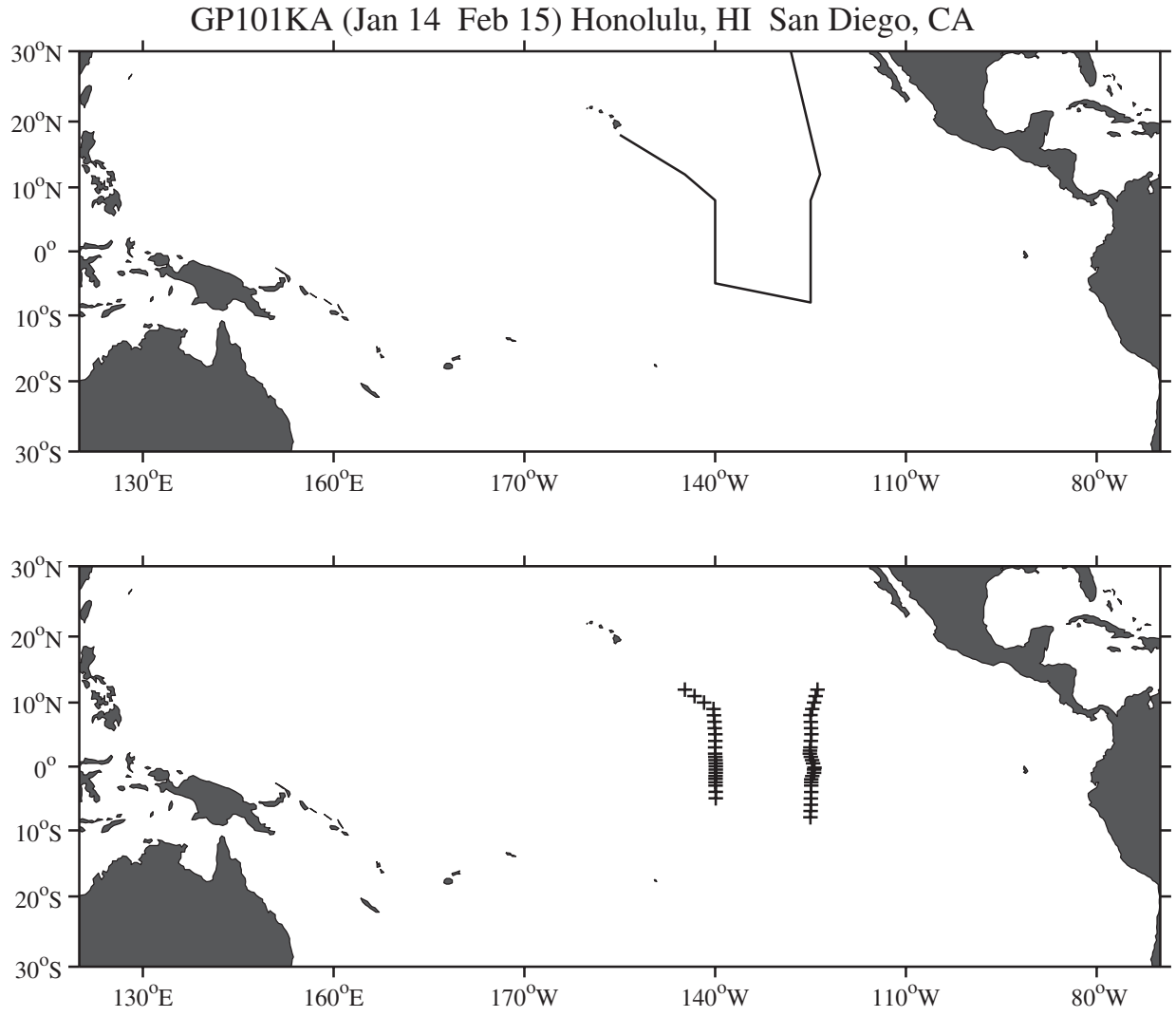

Figure 2a: GP1-01-KA cruise track and station locations.

Table 1a: GP1-01-KA CTD Cast Summary

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 0.2′N	144° 45.4′W	19 Jan 01	1057	62	20	5249	1003
21	11° 0.1′N	143° 14.4′W	19 Jan 01	2348	30	21	5316	1003
31	10° 0.5′N	141° 44.8′W	20 Jan 01	1241	44	17	5052	1002
41	8° 59.5′N	140° 15.6′W	21 Jan 01	145	63	18	4832	1003
51	8° 0.8′N	140° 10.8′W	21 Jan 01	950	109	14	5116	1002
61	7° 0.3′N	140° 6.1′W	21 Jan 01	1857	182	19	4996	4004
71	6° 0.3′N	140° 3.0′W	22 Jan 01	509	88	14		1003
81	5° 3.8′N	139° 58.7′W	22 Jan 01	1318	61	14	4470	3003
91	4° 0.3′N	139° 59.0′W	23 Jan 01	659	98	13	4340	1003
101	3° 0.3′N	139° 59.1′W	23 Jan 01	1408	111	15	4297	1003
111	2° 0.5′N	139° 59.4′W	24 Jan 01	534	96	18	4376	1004
121	1° 30.3′N	139° 57.3′W	24 Jan 01	1013	94	15	4372	1004
131	1° 0.1′N	139° 55.8′W	24 Jan 01	1431	101	20	4343	1004
141	0° 29.8′N	139° 54.3′W	24 Jan 01	1842	112	17	4346	1003
151	0° 1.6′N	139° 53.4′W	25 Jan 01	453	89	16	4352	4006
161	0° 30.1′S	139° 53.9′W	26 Jan 01	46	119	12	4228	1002
171	0° 59.9′S	139° 54.9′W	26 Jan 01	448	111	10	4224	1004
181	1° 29.9′S	139° 55.9′W	26 Jan 01	843	94	13	4346	1003
191	1° 57.0′S	139° 56.8′W	26 Jan 01	1307	83	8	4175	3003
201	2° 29.8′S	139° 56.8′W	27 Jan 01	404	71	13	4394	1003
211	3° 0.0′S	139° 56.2′W	27 Jan 01	802	85	11	4289	1003
221	3° 59.6′S	139° 55.1′W	27 Jan 01	1447	73	13	4513	1002
231	5° 0.1′S	139° 54.1′W	27 Jan 01	2259	53	11	4356	1002
241	7° 57.7′S	125° 0.6′W	1 Feb 01	732	103	11	4576	1004
251	6° 59.8′S	124° 59.6′W	1 Feb 01	1412	111	16	4751	1003
261	6° 0.0′S	124° 57.8′W	1 Feb 01	2117	103	14	4436	1002
271	5° 2.1′S	124° 56.4′W	2 Feb 01	604	80	11	4548	4007
281	3° 59.9′S	124° 53.9′W	2 Feb 01	737	91	11	4487	1003
291	2° 59.8′S	124° 53.8′W	2 Feb 01	1434	80	10	4618	1002
301	2° 30.0′S	124° 53.1′W	3 Feb 01	1830	95	12	4192	1002
311	2° 0.9′S	124° 52.7′W	3 Feb 01	2233	92	12	4654	1003
321	1° 29.9′S	124° 44.2′W	4 Feb 01	239	104	7	4566	1002
331	1° 0.1′S	124° 26.7′W	4 Feb 01	633	106	12	4687	1004
341	0° 30.1′S	124° 27.5′W	4 Feb 01	1044	130	10	4532	1004
351	0° 10.7′S	124° 23.0′W	4 Feb 01	1342	113	11	4736	1002
361	0° 30.0′N	124° 36.9′W	5 Feb 01	618	108	16	4589	1004
371	1° 0.2′N	124° 46.6′W	5 Feb 01	1014	121	14	4608	1002
381	1° 30.0′N	124° 56.9′W	5 Feb 01	1420	119	16	4635	1002
391	2° 0.9′N	125° 6.9′W	5 Feb 01	1828	122	17	4721	1004
401	2° 29.7′N	125° 4.5′W	5 Feb 01	2221	131	16	4577	1003
411	3° 0.0′N	125° 1.8′W	6 Feb 01	219	132	12	4444	1001
421	4° 0.0′N	124° 57.1′W	6 Feb 01	919	127	13	4433	1003
431	5° 3.8′N	124° 52.0′W	6 Feb 01	1649	85	12	4362	1003
441	6° 0.3′N	124° 54.5′W	6 Feb 01	2337	77	16	4395	1002
451	6° 59.9′N	124° 57.5′W	7 Feb 01	644	107	15	4635	1004
461	8° 2.7′N	125° 0.8′W	7 Feb 01	2043	69	18	4640	1003
471	9° 0.3′N	124° 44.0′W	8 Feb 01	412	50	16	4593	1005
481	10° 0.0′N	124° 27.5′W	8 Feb 01	1131	59	20	4629	1003
491	11° 0.1′N	124° 10.6′W	8 Feb 01	1855	54	20	4633	505
501	12° 0.2′N	123° 53.7′W	9 Feb 01	732	54	25	4580	1011

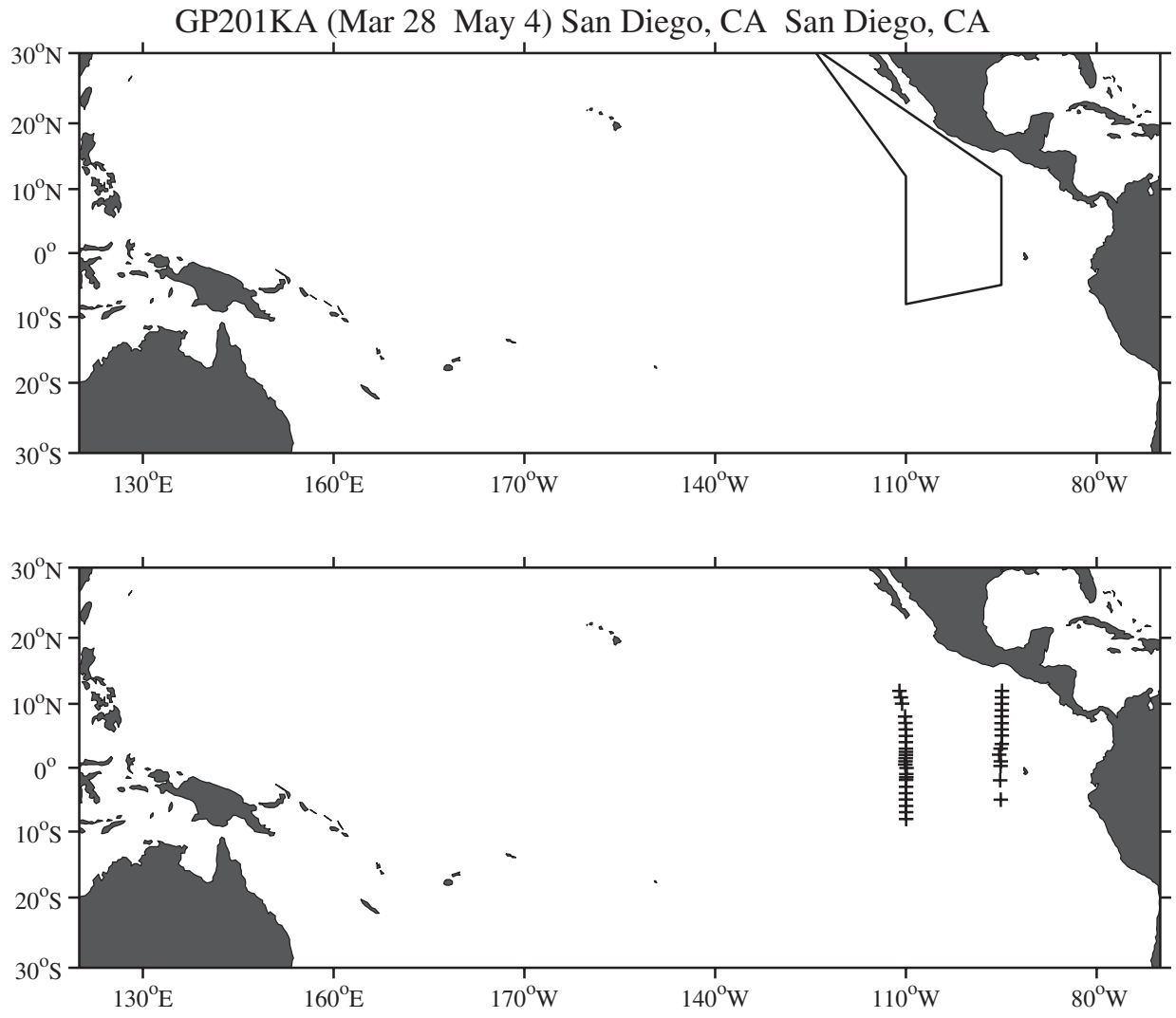

Figure 2b: GP2-01-KA cruise track and station locations.

Table 1b: GP2-01-KA CTD Cast Summary

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 0.0′N	111° 1.8′W	3 Apr 01	520	43	9	3811	1004
21	11° 0.6′N	110° 48.3′W	3 Apr 01	1236	39	15	3854	1007
31	10° 1.1′N	110° 35.6′W	3 Apr 01	2042	47	14	3655	3005
51	8° 0.6′N	110° 8.2′W	4 Apr 01	1516	77	11	4150	1004
61	7° 0.1′N	110° 4.6′W	4 Apr 01	2237	29	13	3694	1002
71	6° 0.1′N	110° 1.5′W	5 Apr 01	622	22	13	3743	1002
81	5° 0.4′N	109° 59.3′W	5 Apr 01	2126	10	4	3953	1003
91	4° 0.3′N	109° 59.4′W	6 Apr 01	445	1	9	3902	1005
101	3° 0.6′N	110° 0.6′W	6 Apr 01	1152	326	7	3876	1002
111	2° 29.9′N	110° 0.8′W	6 Apr 01	1602	340	6	3758	1003
121	2° 1.2′N	110° 0.8′W	6 Apr 01	2109	353	8	3727	1002
131	1° 30.1′N	110° 2.5′W	7 Apr 01	112	261	8	3816	1003
141	0° 59.9′N	110° 4.7′W	7 Apr 01	503	335	3	3735	1003
151	0° 30.1′N	110° 5.2′W	7 Apr 01	904	183	11	3727	1002
161	0° 3.8′S	109° 53.7′W	8 Apr 01	758	126	5	3754	3002
181	1° 0.1′S	109° 56.2′W	9 Apr 01	612	89	7	3948	1002
191	1° 30.1′S	109° 56.9′W	9 Apr 01	1007	71	8	3867	1004
201	1° 56.0′S	109° 58.0′W	9 Apr 01	1341	94	11	3952	1003
211	2° 59.8′S	109° 58.7′W	9 Apr 01	2316	125	9	3874	1002
221	4° 0.1′S	109° 59.5′W	10 Apr 01	608	136	6	3612	1004
231	4° 59.4′S	110° 0.1′W	10 Apr 01	2053	144	6	3696	1001
241	6° 0.0′S	109° 58.9′W	11 Apr 01	437	109	19	3800	1004
251	6° 59.8′S	109° 57.5′W	11 Apr 01	1245	114	18	3528	1004
261	8° 3.1′S	109° 57.5′W	12 Apr 01	218	128	12	3494	1002
271	5° 1.3′S	95° 5.2′W	20 Apr 01	1837	137	16	3815	1003
281	1° 59.2′S	95° 10.5′W	21 Apr 01	1325	142	15	3431	1003
291	0° 15.8′N	95° 5.8′W	22 Apr 01	505	143	2	3256	1002
301	1° 0.5′N	95° 4.1′W	22 Apr 01	945	120	2	3415	1004
311	2° 2.6′N	95° 20.0′W	22 Apr 01	2141	113	2	2697	1004
321	3° 0.5′N	95° 5.9′W	23 Apr 01	607	185	4	3163	1004
331	3° 43.8′N	94° 56.0′W	23 Apr 01	1127	143	4	2906	1003
341	5° 4.1′N	94° 55.9′W	24 Apr 01	455	20	7	3570	1002
351	5° 59.9′N	94° 56.9′W	24 Apr 01	1135	70	4		1003
361	6° 59.8′N	94° 56.4′W	24 Apr 01	1828	30	9	3669	1001
371	8° 3.5′N	94° 57.6′W	25 Apr 01	154	64	15	3661	1003
381	9° 0.2′N	94° 55.2′W	25 Apr 01	817	67	12	3532	1003
391	10° 0.2′N	94° 54.5′W	25 Apr 01	2041	48	14	3822	1002
401	11° 0.2′N	94° 53.3′W	26 Apr 01	313	87	14	3933	1003
411	11° 59.9′N	94° 53.7′W	26 Apr 01	948	9	7	4045	1002

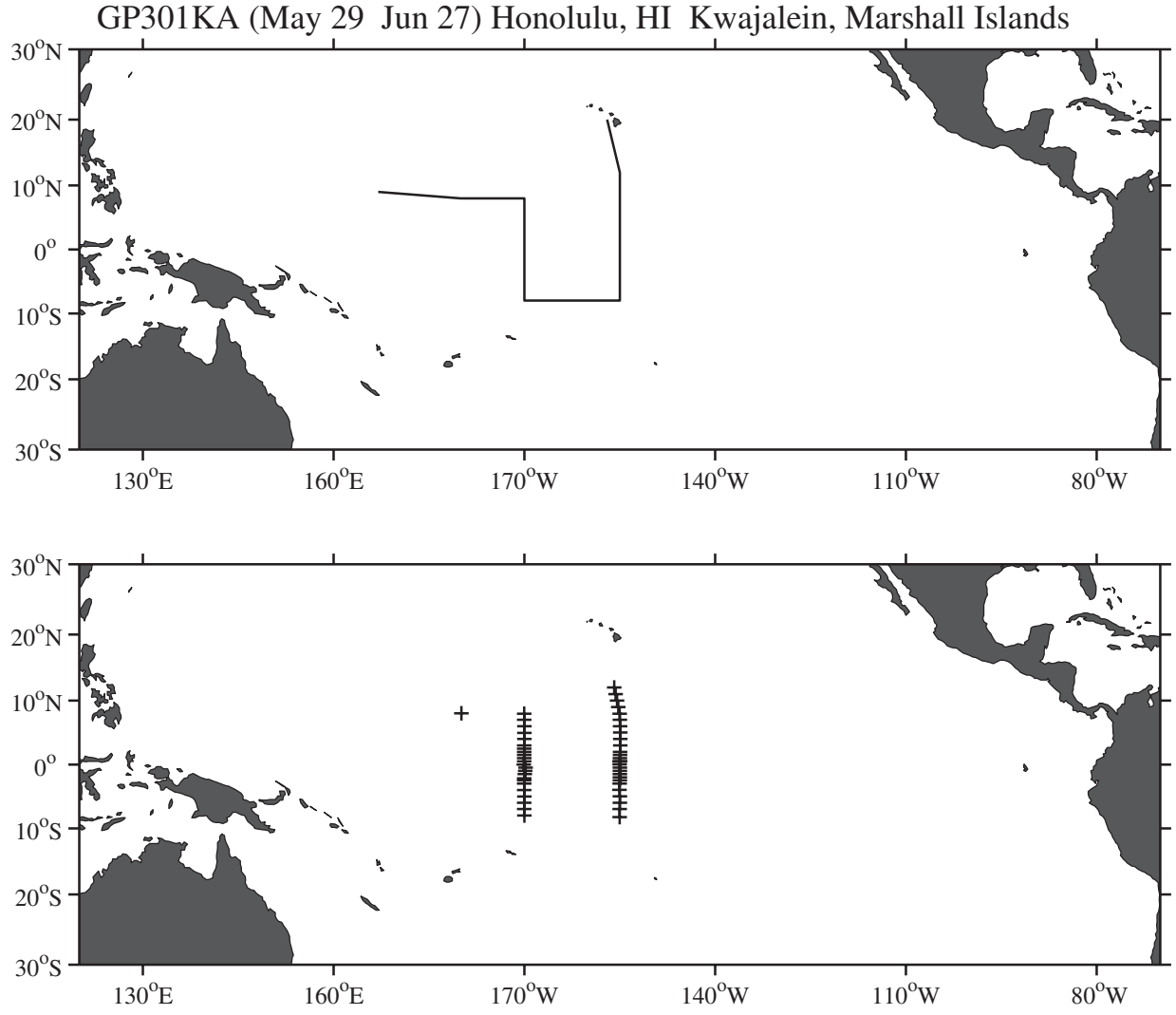

Figure 2c: GP3-01-KA cruise track and station locations.

Table 1c: GP3-01-KA CTD Cast Summary

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 0.4′N	155° 52.8′W	1 Jun 01	1512	60	9		1001
21	11° 0.1′N	155° 39.3′W	1 Jun 01	2228	68	17	5209	1003
31	10° 0.5′N	155° 26.2′W	2 Jun 01	545	58	16	5351	1002
41	9° 0.0′N	155° 13.7′W	2 Jun 01	1250	62	16	5284	1007
51	7° 57.6′N	155° 0.8′W	3 Jun 01	402	78	16	5209	1001
61	7° 0.0′N	154° 58.3′W	3 Jun 01	1046	49	15	4977	1002
71	6° 0.3′N	154° 56.9′W	2 Jun 01	1733	48	20	4828	1003
81	5° 1.9′N	154° 55.8′W	4 Jun 01	615	62	8		4045
91	4° 0.2′N	154° 55.4′W	5 Jun 01	332	75	8	4691	1002
101	3° 0.1′N	154° 55.8′W	5 Jun 01	1026	55	14	4806	1001
111	2° 29.9′N	154° 56.3′W	5 Jun 01	1428	54	13	4834	1002
121	1° 59.8′N	154° 57.3′W	6 Jun 01	226	84	11	4643	1003
131	1° 30.5′N	154° 57.0′W	6 Jun 01	639	77	11	4661	1001
141	0° 59.9′N	154° 58.6′W	6 Jun 01	1100	81	13	4763	1003
151	0° 30.1′N	154° 59.2′W	6 Jun 01	1504	75	16	4783	1002
161	0° 0.1′N	155° 0.4′W	7 Jun 01	107	83	8	4675	1005
171	0° 30.0′S	154° 59.6′W	7 Jun 01	529	80	9	4866	1003
181	1° 0.0′S	154° 58.7′W	7 Jun 01	925	76	12		1002
191	1° 30.1′S	154° 58.6′W	7 Jun 01	1322	74	13	4881	1001
201	2° 0.2′S	154° 59.4′W	8 Jun 01	155	60	10	4986	1004
211	2° 29.9′S	154° 59.1′W	8 Jun 01	547	56	14	5006	1002
221	2° 59.7′S	155° 0.2′W	8 Jun 01	936	32	13	4969	1002
231	3° 59.7′S	155° 2.0′W	8 Jun 01	1613	30	12	2667	1002
241	5° 0.0′S	154° 59.7′W	8 Jun 01	2313	17	9	4996	1003
251	5° 59.8′S	154° 59.8′W	9 Jun 01	613	30	7	5260	1002
261	6° 59.9′S	155° 0.2′W	9 Jun 01	1312	196	7	5146	1001
271	8° 14.5′S	155° 0.8′W	9 Jun 01	2139	95	2	5283	1002
281	7° 58.7′S	170° 0.8′W	14 Jun 01	1553	84	13	5367	1002
291	6° 59.6′S	170° 1.8′W	15 Jun 01	19	75	10	4635	995
301	5° 59.7′S	170° 1.0′W	15 Jun 01	705	62	14		1002
311	5° 1.9′S	170° 0.7′W	15 Jun 01	1403	60	13	5427	3002
321	3° 59.8′S	170° 1.1′W	16 Jun 01	845	80	13	5725	1002
331	2° 59.9′S	170° 1.2′W	16 Jun 01	1523	115	3	5048	1003
341	2° 29.9′S	170° 1.4′W	16 Jun 01	1918	36	6	5567	1004
351	2° 10.7′S	170° 1.1′W	16 Jun 01	2202	38	6	4976	1002
361	1° 30.1′S	169° 57.1′W	17 Jun 01	556	88	4	5187	1000
371	1° 0.0′S	169° 51.8′W	17 Jun 01	951	50	6	5817	1001
381	0° 30.3′S	169° 48.3′W	17 Jun 01	1350	62	8	5599	1001
391	0° 1.4′S	170° 5.4′W	18 Jun 01	1004	90	9	5653	4202
401	0° 29.8′N	170° 2.8′W	19 Jun 01	407	100	5	5616	1001
411	0° 59.9′N	170° 2.7′W	19 Jun 01	804	90	11	5456	1001
421	1° 30.0′N	170° 2.8′W	19 Jun 01	1156	107	13	5503	1001
431	1° 59.6′N	170° 2.5′W	19 Jun 01	1541	110	13	5387	1002
441	2° 30.2′N	170° 2.0′W	19 Jun 01	2026	100	11	5322	1002
451	3° 0.1′N	170° 1.5′W	20 Jun 01	11	60	9	5473	1001
461	4° 0.0′N	170° 0.4′W	20 Jun 01	656	120	10	5662	1000
471	4° 58.4′N	169° 59.8′W	20 Jun 01	1428	90	14	5682	4202
481	6° 0.1′N	170° 0.5′W	21 Jun 01	1013	60	20	5491	1001
491	7° 0.4′N	170° 1.2′W	21 Jun 01	1720	50	20	5994	1002
501	7° 58.1′N	170° 1.8′W	22 Jun 01	2	70	21	4989	1002
511	8° 1.5′N	179° 53.4′W	24 Jun 01	1120	45	14	5944	5204

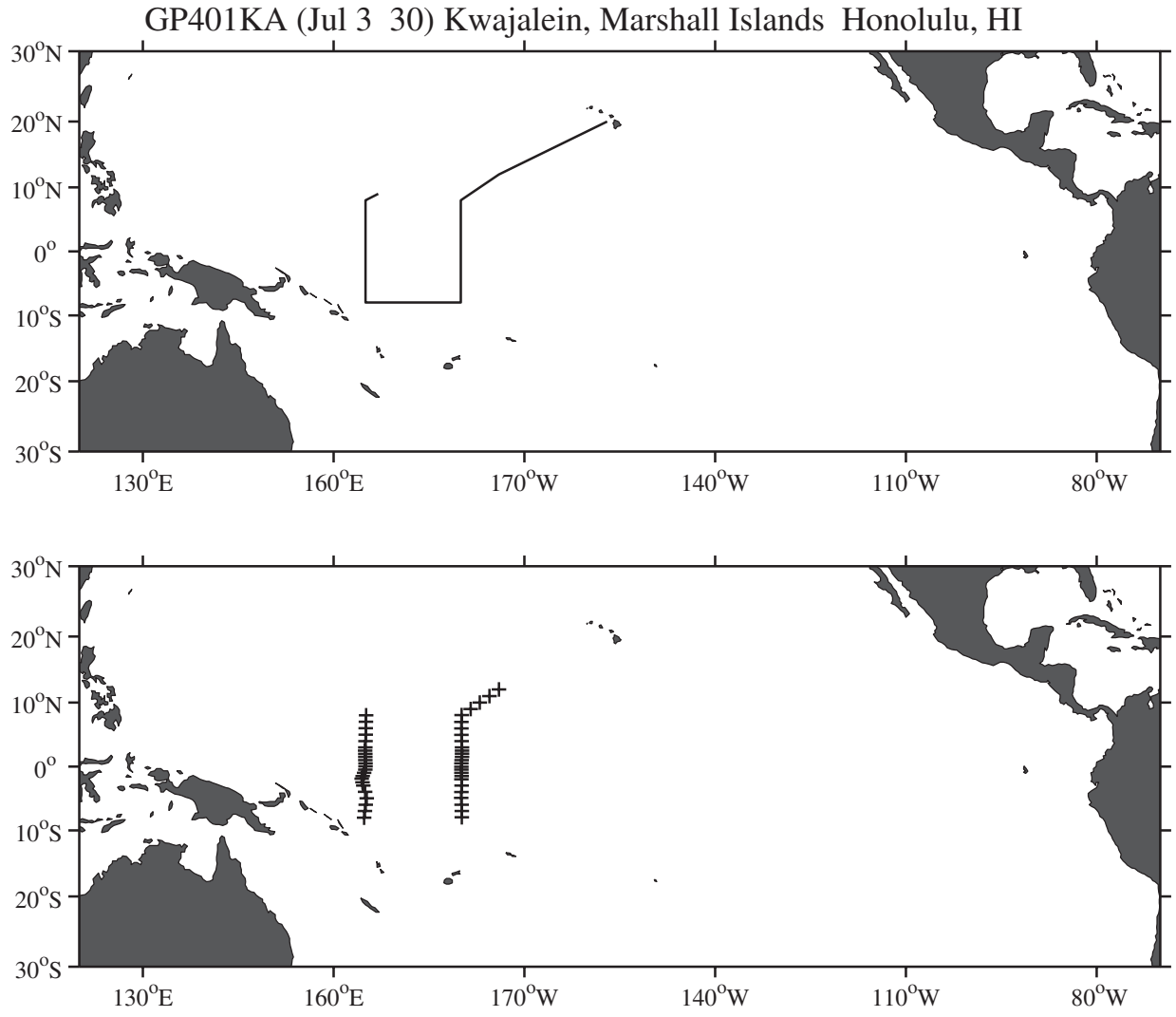

Figure 2d: GP4-01-KA cruise track and station locations.

Table 1d: GP4-01-KA CTD Cast Summary

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 1.9′N	165° 5.8′E	4 Jul 01	441	131	5	5214	4503
21	7° 0.0′N	165° 4.3′E	4 Jul 01	2223	43	12	5157	1002
31	6° 0.9′N	165° 3.0′E	5 Jul 01	530	65	21	5013	1002
41	5° 0.0′N	165° 3.0′E	5 Jul 01	1315	50	6	4766	1002
51	3° 59.4′N	165° 0.8′E	6 Jul 01	2125	210	8	4492	1001
61	2° 59.6′N	164° 59.7′E	6 Jul 01	425	217	10	4247	1003
71	2° 29.5′N	164° 57.8′E	6 Jul 01	815	265	3	4124	1001
81	1° 59.8′N	164° 59.6′E	6 Jul 01	1840	359	4	4172	1001
91	1° 30.0′N	164° 58.9′E	6 Jul 01	2253	80	3	4262	1003
101	1° 0.0′N	164° 59.7′E	7 Jul 01	259	132	8	4330	1002
111	0° 29.2′N	165° 1.3′E	7 Jul 01	646	200	5	4371	1003
121	0° 0.1′N	165° 1.8′E	8 Jul 01	2018	41	2	4385	4003
131	0° 30.4′S	164° 58.2′E	9 Jul 01	2110	357	6	4426	1001
141	0° 59.6′S	164° 47.1′E	9 Jul 01	130	348	6	4411	1003
151	1° 30.1′S	164° 34.4′E	9 Jul 01	534	253	7	4429	1002
161	1° 55.5′S	164° 24.7′E	10 Jul 01	1631	255	3	4452	1003
171	2° 29.9′S	164° 32.9′E	10 Jul 01	2102	221	6	4465	1001
181	3° 0.0′S	164° 40.7′E	10 Jul 01	15	217	8	4045	1001
191	3° 59.6′S	164° 56.9′E	10 Jul 01	810	183	7	3259	1002
201	4° 58.9′S	165° 11.5′E	10 Jul 01	1945	84	2	2512	1002
211	6° 0.5′S	165° 3.0′E	11 Jul 01	354	112	13	3603	1002
221	6° 59.8′S	164° 55.8′E	11 Jul 01	1030	121	16	3717	1003
231	8° 2.2′S	164° 47.3′E	12 Jul 01	2132	137	12	3894	3503
241	7° 56.6′S	179° 49.7′W	16 Jul 01	1046	97	15	5522	1003
251	6° 59.6′S	179° 50.2′W	17 Jul 01	1753	67	11	5449	1002
261	5° 59.9′S	179° 53.3′W	17 Jul 01	44	79	7	5084	1002
271	4° 56.7′S	179° 56.4′W	18 Jul 01	1553	124	13	5662	1001
281	3° 59.8′S	179° 54.9′W	18 Jul 01	110	112	11	5712	1002
291	2° 59.6′S	179° 53.3′W	18 Jul 01	730	96	14	5448	1002
301	2° 0.0′S	179° 54.6′W	19 Jul 01	2044	31	3	5370	1003
311	1° 29.8′S	179° 53.2′W	19 Jul 01	47	84	6	5218	1001
321	0° 59.6′S	179° 53.7′W	19 Jul 01	440	140	11	5357	1002
331	0° 30.0′S	179° 54.5′W	19 Jul 01	820	154	8	4774	1002
341	0° 2.3′S	179° 54.8′W	20 Jul 01	1250	148	8	5396	1003
351	0° 30.2′N	179° 53.5′W	20 Jul 01	1632	79	8	5711	1004
361	1° 0.3′N	179° 51.7′W	20 Jul 01	2053	145	5	5846	1002
371	1° 30.3′N	179° 49.2′W	20 Jul 01	105	90	7	5572	1001
381	2° 1.3′N	179° 48.4′W	21 Jul 01	1435	63	12	5468	1001
391	2° 30.3′N	179° 48.2′W	21 Jul 01	1852	70	12	5285	1003
401	2° 59.8′N	179° 48.8′W	21 Jul 01	2240	74	12	5656	1002
411	3° 59.7′N	179° 51.8′W	21 Jul 01	319	45	7		1002
421	4° 58.5′N	179° 54.0′W	22 Jul 01	2001	33	9	5845	1002
431	5° 59.3′N	179° 55.0′W	22 Jul 01	400	46	10	5288	1002
441	6° 59.8′N	179° 54.7′W	22 Jul 01	1113	59	10	5747	1002
451	8° 2.5′N	179° 52.4′W	22 Jul 01	1950	104	16	5913	5502
461	9° 0.4′N	178° 26.6′W	22 Jul 01	832	104	8	5786	1002
471	10° 0.0′N	177° 0.6′W	24 Jul 01	2011	71	12	5966	1002
481	11° 0.3′N	175° 30.3′W	24 Jul 01	841	85	11	5463	1002
491	12° 0.9′N	174° 0.1′W	25 Jul 01	2233	73	19	5647	1003

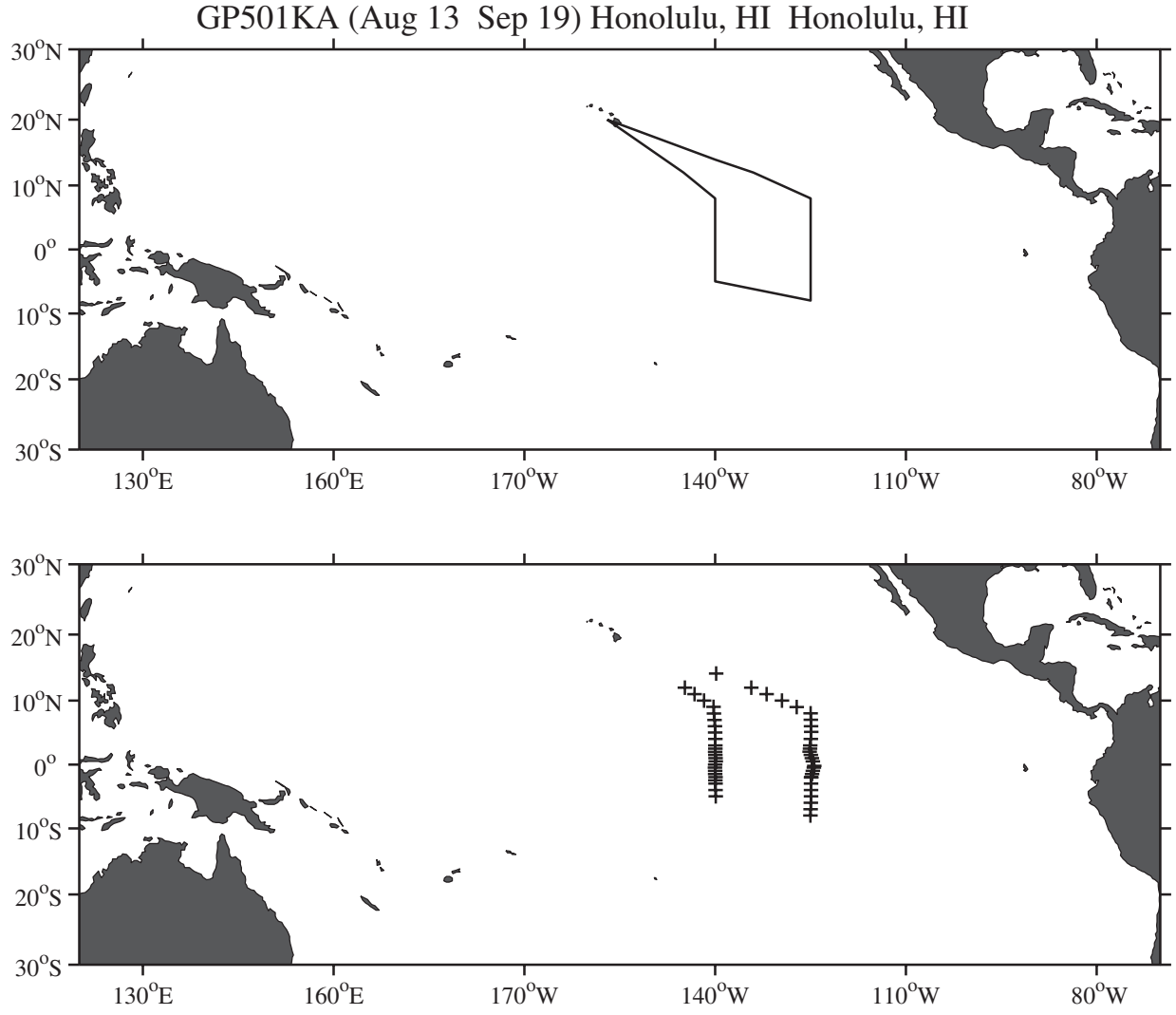

Figure 2e: GP5-01-KA cruise track and station locations.

Table 1e: GP5-01-KA CTD Cast Summary

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	14° 8.5′N	139° 50.6′W	19 Aug 01	1823	9	12	4875	501
21	11° 59.7′N	134° 19.7′W	21 Aug 01	757	200	23	4936	1002
31	11° 0.4′N	131° 54.7′W	22 Aug 01	23	211	20	4984	1003
41	10° 0.3′N	129° 30.1′W	22 Aug 01	1654	73	4	4753	1002
51	8° 59.7′N	127° 10.6′W	23 Aug 01	809	160	2	4498	1004
61	8° 1.6′N	125° 0.0′W	24 Aug 01	354	180	2	4655	4002
71	7° 0.0′N	124° 57.4′W	25 Aug 01	222	55	10	4628	1004
81	5° 59.9′N	124° 54.9′W	25 Aug 01	914	180	18	4370	1002
91	5° 7.8′N	124° 52.8′W	26 Aug 01	6	162	5	4382	1014
101	4° 0.2′N	124° 57.9′W	26 Aug 01	1022	147	16	4457	1002
111	3° 0.1′N	125° 2.4′W	26 Aug 01	1853	115	16	4458	1002
121	2° 29.9′N	125° 4.6′W	26 Aug 01	2324	140	23	4581	1001
131	2° 0.8′N	125° 8.2′W	27 Aug 01	450	122	13	4671	4004
141	1° 29.8′N	124° 57.0′W	28 Aug 01	605	119	25	4639	1001
151	0° 59.9′N	124° 47.6′W	28 Aug 01	1037	120	20	4657	1002
161	0° 30.1′N	124° 38.1′W	28 Aug 01	1505	111	15	4602	1003
171	0° 12.2′S	124° 25.1′W	28 Aug 01	2159	100	10	4662	1002
181	0° 30.0′S	124° 29.5′W	29 Aug 01	44	107	10	4625	1003
191	0° 59.9′S	124° 37.6′W	29 Aug 01	439	100	16	4664	1001
201	1° 30.0′S	124° 45.7′W	29 Aug 01	852	110	20	4621	1001
211	2° 2.2′S	124° 55.4′W	29 Aug 01	1410	120	17	4673	4003
221	2° 1.7′S	124° 54.1′W	30 Aug 01	13	116	11	4729	1001
241	2° 59.9′S	124° 54.4′W	30 Aug 01	802	135	12	4633	1003
251	3° 59.9′S	124° 54.9′W	30 Aug 01	1519	110	16	4454	1003
261	5° 0.4′S	124° 55.4′W	30 Aug 01	2254	110	17	4537	1003
271	5° 59.9′S	124° 57.0′W	31 Aug 01	906	125	17	4504	1001
281	7° 0.0′S	124° 59.2′W	31 Aug 01	1321	111	13	4752	1001
291	7° 58.8′S	125° 1.0′W	1 Sep 01	434	10	4	4529	1001
301	4° 59.7′S	139° 55.2′W	8 Sep 01	130	78	13	4333	1001
311	3° 59.9′S	139° 55.8′W	8 Sep 01	850	85	15	4510	1002
321	2° 59.9′S	139° 56.8′W	8 Sep 01	1549	110	15	4385	1003
331	2° 29.9′S	139° 57.4′W	8 Sep 01	1948	90	14	4368	1001
341	1° 59.0′S	139° 56.9′W	9 Sep 01	22	67	8	4321	1000
351	1° 30.1′S	139° 59.1′W	9 Sep 01	424	91	11	4302	1003
361	1° 0.0′S	140° 0.2′W	9 Sep 01	846	88	16	4274	1001
371	0° 29.9′S	140° 1.4′W	9 Sep 01	1303	80	14	4284	1003
381	0° 0.6′S	139° 59.6′W	10 Sep 01	805	100	15	4220	4002
391	0° 29.9′N	139° 54.0′W	11 Sep 01	138	110	18	4340	1001
401	1° 0.0′N	139° 55.7′W	11 Sep 01	554	119	23	4334	1000
411	1° 30.0′N	139° 57.4′W	11 Sep 01	1016	110	18	4533	1002
421	1° 59.9′N	139° 59.9′W	11 Sep 01	1434	100	15	4363	1004
431	2° 29.9′N	139° 59.0′W	11 Sep 01	1852	114	13	4387	1001
441	2° 59.9′N	139° 59.0′W	11 Sep 01	2305	131	16	4290	1001
451	3° 59.9′N	139° 58.4′W	12 Sep 01	641	130	20	4327	1001
461	5° 2.2′N	139° 59.4′W	12 Sep 01	1411	120	20	4452	1003
471	6° 0.1′N	140° 2.5′W	12 Sep 01	2137	104	17	4817	1010
481	6° 59.9′N	140° 6.4′W	13 Sep 01	505	135	24	4972	1018
491	8° 0.2′N	140° 11.1′W	13 Sep 01	1222	147	23	5110	1007
501	9° 0.8′N	140° 15.0′W	14 Sep 01	221	240	11	4816	1004
511	9° 59.8′N	141° 44.8′W	14 Sep 01	1535	300	3	5031	1002
521	11° 0.0′N	143° 15.0′W	15 Sep 01	421	10	7	5307	1003
531	12° 0.1′N	144° 46.0′W	15 Sep 01	1528	60	16	5211	1003

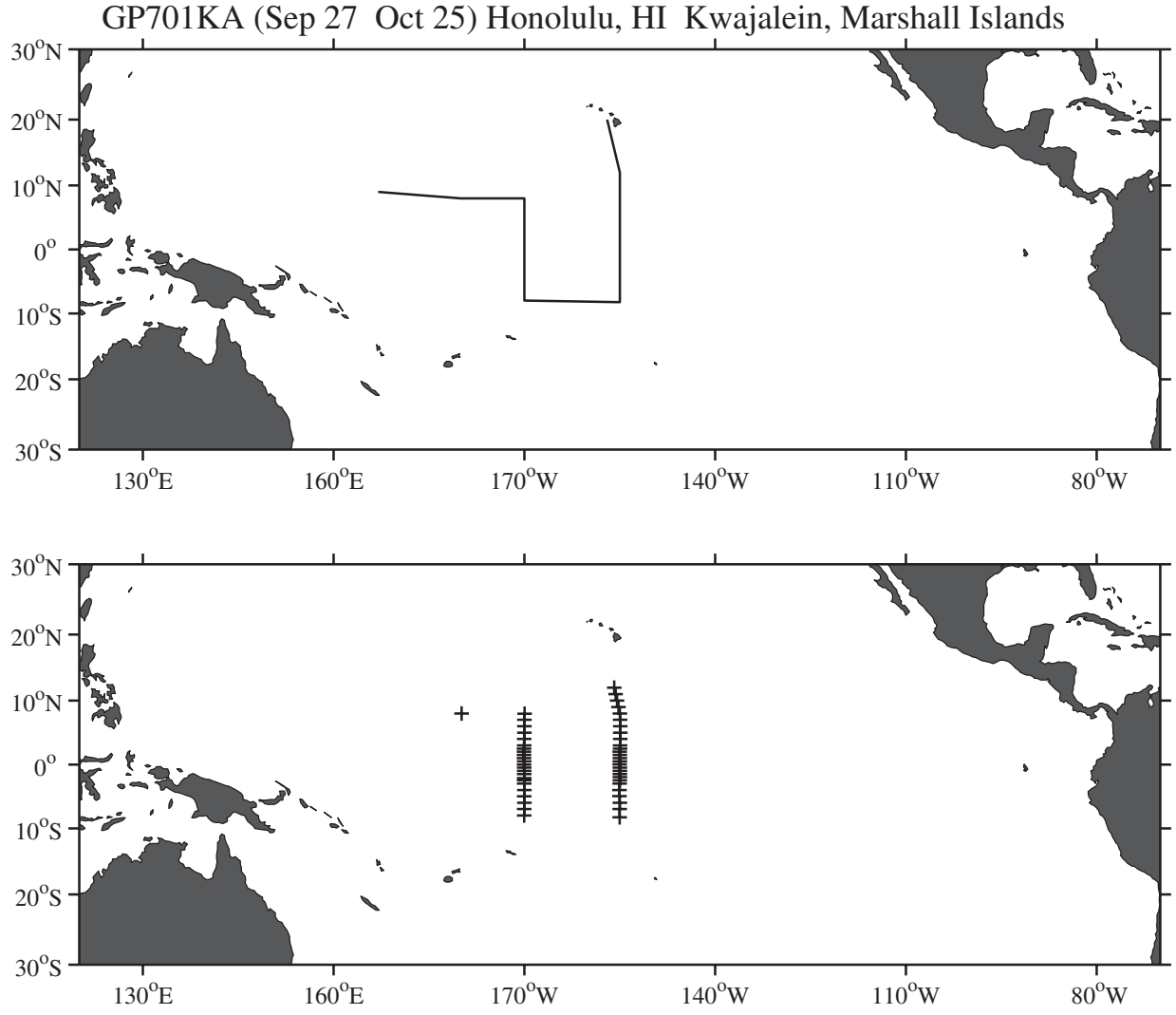

Figure 2f: GP7-01-KA cruise track and station locations.

Table 1f: GP7-01-KA CTD Cast Summary

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 0.3′N	155° 52.6′W	30 Sep 01	1623	77	9	5202	1003
21	10° 59.5′N	155° 39.1′W	30 Sep 01	2350	84	9	5193	1003
31	10° 0.0′N	155° 25.9′W	1 Oct 01	640	90	6	5332	1003
41	9° 0.4′N	155° 12.8′W	1 Oct 01	1342	315	1		1001
51	7° 58.6′N	154° 59.2′W	1 Oct 01	2114	139	8	5792	1001
61	7° 0.2′N	154° 57.4′W	2 Oct 01	543	110	18	4939	1001
71	6° 0.5′N	154° 56.0′W	2 Oct 01	1251	82	12		1003
81	4° 59.7′N	154° 54.8′W	2 Oct 01	2050	114	17	4594	1001
91	4° 0.1′N	154° 55.8′W	3 Oct 01	514	116	13		1001
101	3° 0.1′N	154° 57.3′W	3 Oct 01	1238	111	22		1002
111	2° 30.1′N	154° 57.6′W	3 Oct 01	1654	112	21		1002
121	2° 0.6′N	155° 0.2′W	3 Oct 01	2233	88	17	4709	4003
131	1° 30.3′N	154° 58.6′W	4 Oct 01	406	89	14		1002
141	1° 0.1′N	154° 59.2′W	4 Oct 01	809	25	18	4758	1003
151	0° 30.4′N	154° 59.5′W	4 Oct 01	1208	96	14	4787	1002
161	0° 1.8′N	155° 0.6′W	5 Oct 01	354	89	18	4668	1002
171	0° 29.8′S	155° 0.0′W	5 Oct 01	846	95	13	4883	1003
181	0° 59.7′S	155° 0.0′W	5 Oct 01	1254	116	15		1004
191	1° 29.9′S	154° 59.5′W	5 Oct 01	1703	114	19	4828	1003
201	1° 59.9′S	154° 58.8′W	6 Oct 01	605	111	16	4988	1003
211	2° 30.0′S	155° 0.0′W	6 Oct 01	1020	103	14	4878	1002
221	2° 59.9′S	155° 0.8′W	6 Oct 01	1421	112	13	4982	1003
231	3° 59.9′S	155° 2.0′W	6 Oct 01	2132	95	17	2443	1004
241	4° 57.2′S	155° 2.7′W	7 Oct 01	1018	66	13	4478	3804
251	5° 59.8′S	154° 59.9′W	8 Oct 01	345	67	13	5260	1002
261	6° 59.8′S	155° 0.4′W	8 Oct 01	1045	76	12	5142	1002
271	8° 15.9′S	155° 0.6′W	9 Oct 01	252	63	10	5333	1002
281	7° 59.6′S	170° 2.1′W	13 Oct 01	243	63	14	5372	1002
291	6° 59.9′S	170° 1.2′W	13 Oct 01	1010	54	10		1003
301	5° 59.5′S	170° 0.5′W	13 Oct 01	1738	43	16	4828	1003
311	4° 59.2′S	170° 1.2′W	14 Oct 01	110	53	12	5434	1002
321	3° 59.9′S	170° 0.9′W	14 Oct 01	806	87	10	5716	1002
331	2° 59.8′S	170° 1.2′W	14 Oct 01	1507	99	10	5069	1001
341	2° 29.7′S	170° 1.6′W	14 Oct 01	1902	106	10		1004
351	2° 9.3′S	170° 1.7′W	15 Oct 01	702	131	10	4937	1002
361	1° 29.9′S	170° 2.2′W	15 Oct 01	1201	121	14	5407	1002
371	1° 0.1′S	170° 2.1′W	15 Oct 01	1559	124	14		1004
381	0° 29.9′S	170° 2.4′W	15 Oct 01	2000	111	15		1002
391	0° 1.3′S	170° 3.0′W	16 Oct 01	54	126	14		1002
401	0° 30.1′N	170° 2.6′W	16 Oct 01	453	90	7		1001
411	1° 0.2′N	170° 3.1′W	16 Oct 01	839	85	7		1001
421	1° 30.1′N	170° 3.6′W	16 Oct 01	1219	88	8		1001
431	2° 1.8′N	170° 4.1′W	17 Oct 01	450	104	12		1006
441	2° 30.1′N	170° 3.1′W	17 Oct 01	841	70	8	5325	1002
451	3° 0.2′N	170° 2.6′W	17 Oct 01	1223	46	11	5447	1003
461	4° 0.3′N	170° 1.0′W	17 Oct 01	1900	42	6	5669	1004
471	4° 59.8′N	170° 0.4′W	18 Oct 01	227	195	3	5672	1002
481	6° 0.1′N	170° 0.1′W	18 Oct 01	939	230	2	5409	1002
491	7° 0.2′N	169° 59.7′W	18 Oct 01	1719	118	14	5847	1004
501	7° 57.8′N	169° 58.7′W	19 Oct 01	706	126	14	5538	5002
511	7° 59.5′N	179° 51.9′W	22 Oct 01	1508	125	14	5921	1002

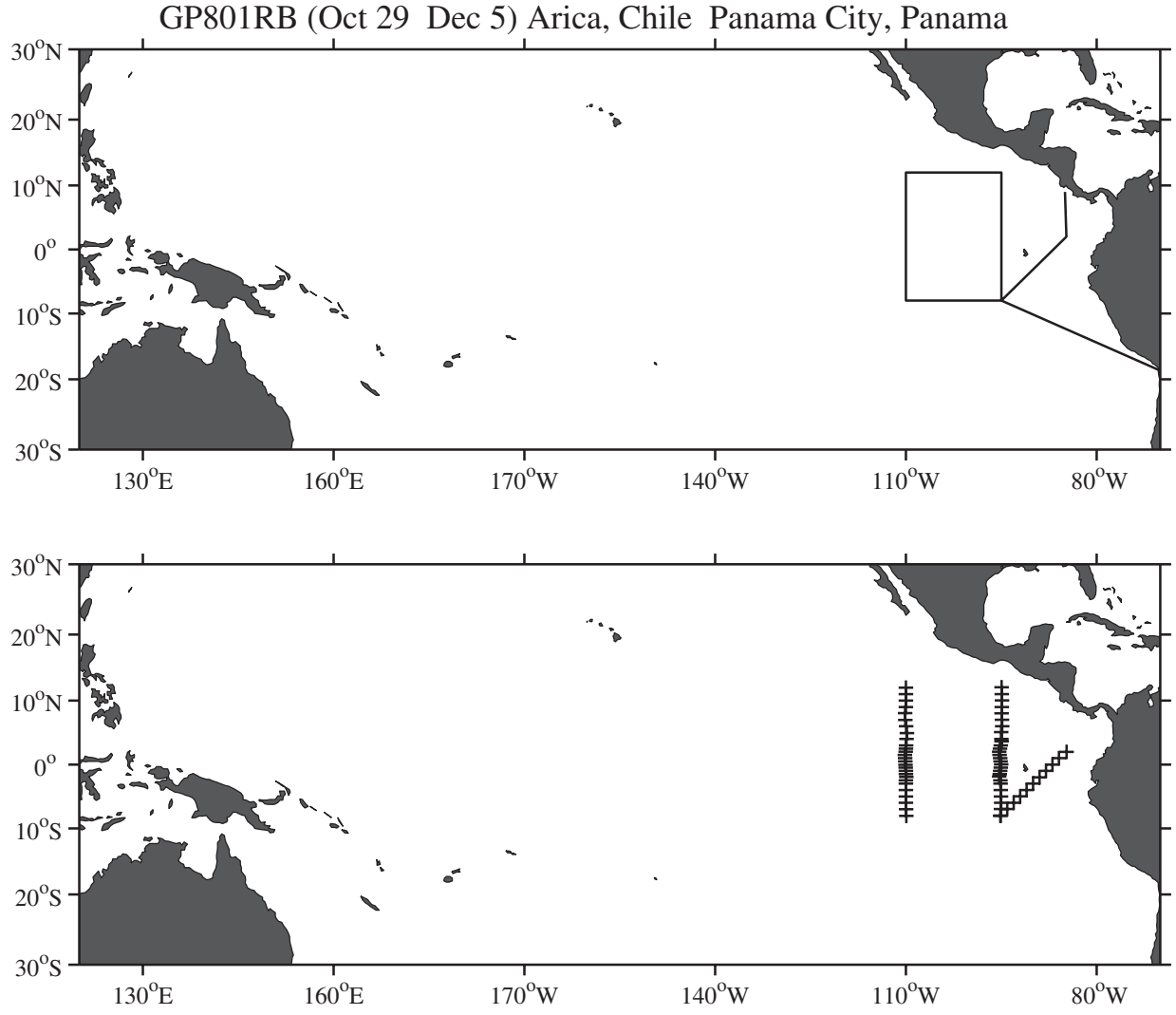

Figure 2g: GP8-01-RB cruise track and station locations.

Table 1g: GP8-01-RB CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 0.9′S	95° 7.9′W	4 Nov 01	512	130	15	3981	3002
21	8° 3.4′S	109° 56.6′W	7 Nov 01	2047	110	17	3310	1002
31	7° 0.0′S	109° 58.8′W	8 Nov 01	536	100	20	3618	1001
41	5° 59.9′S	109° 59.6′W	8 Nov 01	1132	120	16	3749	1002
51	5° 0.7′S	110° 0.0′W	8 Nov 01	1717	105	14	3625	1002
61	3° 59.9′S	110° 0.0′W	8 Nov 01	2354	115	16	3784	1001
71	3° 0.0′S	110° 0.0′W	10 Nov 01	611	110	13	3758	1002
81	2° 30.0′S	109° 59.5′W	10 Nov 01	953	125	12	3876	1001
91	1° 57.2′S	109° 55.7′W	10 Nov 01	1756	115	14	3984	1001
101	1° 30.0′S	109° 59.6′W	11 Nov 01	45	115	13	3891	1002
111	1° 0.0′S	110° 0.6′W	11 Nov 01	419	120	10	3991	1003
121	0° 30.0′S	110° 1.7′W	11 Nov 01	751	120	8	3388	1004
131	0° 3.6′S	110° 3.7′W	12 Nov 01	1659	130	14	3767	1002
141	0° 30.0′N	110° 5.0′W	13 Nov 01	715	140	14		1001
151	1° 0.0′N	110° 7.5′W	13 Nov 01	1058	130	16		1002
161	1° 30.1′N	110° 10.0′W	13 Nov 01	1434	135	14	3807	1002
171	2° 1.8′N	110° 1.3′W	14 Nov 01	400	130	12	3747	356
181	2° 30.0′N	110° 0.0′W	14 Nov 01	805	120	10	3740	1004
191	3° 0.0′N	109° 58.0′W	14 Nov 01	1134	140	11	3859	1003
201	4° 0.1′N	109° 54.1′W	14 Nov 01	1706	150	15	3228	1003
211	4° 55.7′N	109° 51.3′W	15 Nov 01	56	170	12	3873	1002
221	6° 0.0′N	109° 57.4′W	15 Nov 01	648	165	12	3673	1004
231	6° 59.9′N	110° 5.8′W	15 Nov 01	1249	130	8	3777	1002
241	8° 3.7′N	110° 7.8′W	16 Nov 01	201	115	8	4233	3002
251	9° 0.0′N	110° 0.0′W	17 Nov 01	239	90	15	4108	1002
261	10° 0.0′N	109° 59.9′W	17 Nov 01	823	100	14	3293	1003
271	10° 59.9′N	109° 59.9′W	17 Nov 01	1420	105	12	3721	1002
281	12° 0.0′N	110° 0.0′W	17 Nov 01	1947	100	12	3536	1002
291	12° 2.8′N	94° 57.8′W	20 Nov 01	2331	10	11	4061	1001
301	10° 59.9′N	94° 54.3′W	21 Nov 01	600	25	9	3964	1001
311	10° 1.2′N	94° 52.9′W	21 Nov 01	1215	25	10	3882	1001
321	9° 0.0′N	94° 55.1′W	21 Nov 01	1924	40	10	3543	1002
331	8° 2.1′N	94° 56.2′W	22 Nov 01	1146	115	8	3669	3170
341	7° 0.1′N	94° 53.5′W	23 Nov 01	207	0	0	3774	1002
351	6° 0.1′N	94° 50.9′W	23 Nov 01	753	210	16	3726	1003
361	5° 4.6′N	95° 0.8′W	23 Nov 01	2234	210	15	3586	3003
371	4° 0.0′N	95° 0.0′W	24 Nov 01	507	180	15	3437	1001
381	3° 37.4′N	94° 57.3′W	24 Nov 01	2146	200	11	3389	1001
391	3° 0.0′N	95° 5.6′W	25 Nov 01	208	200	13	3160	1001
401	2° 30.1′N	95° 13.1′W	25 Nov 01	535	190	17	2584	1002
411	2° 1.4′N	95° 20.2′W	25 Nov 01	858	190	13	2948	1002
421	1° 30.0′N	95° 15.4′W	25 Nov 01	1348	170	17	2578	1001
431	1° 0.1′N	95° 10.6′W	25 Nov 01	1717	170	18	3433	1002
441	0° 30.1′N	95° 5.8′W	25 Nov 01	2047	180	18	3280	1002
451	0° 1.5′N	95° 0.9′W	26 Nov 01	721	170	12	3308	3004
461	0° 29.9′S	95° 5.4′W	27 Nov 01	142	155	7	3369	1000
471	1° 0.0′S	95° 10.2′W	27 Nov 01	412	165	7	3343	1005
481	1° 29.9′S	95° 15.0′W	27 Nov 01	742	170	8	3386	1001
491	1° 53.3′S	95° 19.4′W	27 Nov 01	1111	150	13	3386	3001
501	2° 29.8′S	95° 8.9′W	28 Nov 01	31	160	13	3456	1001
511	3° 0.0′S	95° 7.3′W	28 Nov 01	403	125	7	3573	1002
521	3° 59.9′S	95° 3.9′W	28 Nov 01	946	140	10	3669	1002
531	5° 2.2′S	95° 3.8′W	28 Nov 01	2120	165	12	3821	3002
541	5° 59.9′S	95° 0.1′W	29 Nov 01	417	135	11	3831	1002
551	6° 59.9′S	95° 3.1′W	29 Nov 01	1004	150	11	3875	1001
561	8° 1.1′S	95° 6.3′W	29 Nov 01	1608	115	13	3970	1001
571	6° 59.9′S	94° 4.6′W	30 Nov 01	356	130	12	3925	1001

Table 1g: (continued).

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
581	6° 0.0′S	93° 3.1′W	30 Nov 01	1120	125	10	3931	1002
591	5° 0.0′S	92° 1.9′W	30 Nov 01	1839	130	10	3966	1002
601	4° 0.1′S	91° 0.9′W	1 Dec 01	201	160	11	3858	1001
611	3° 0.1′S	89° 59.8′W	1 Dec 01	930	130	8	3103	1002
621	2° 0.0′S	88° 58.8′W	1 Dec 01	1708	140	12	3098	1003
631	0° 59.9′S	87° 58.1′W	2 Dec 01	304	180	15	1208	1001
641	0° 0.0′S	86° 57.3′W	2 Dec 01	1306	160	12	2650	1001
651	1° 0.0′N	85° 56.4′W	2 Dec 01	2043	155	10	2722	1001
661	1° 59.9′N	84° 44.6′W	3 Dec 01	444	170	10	2989	2952

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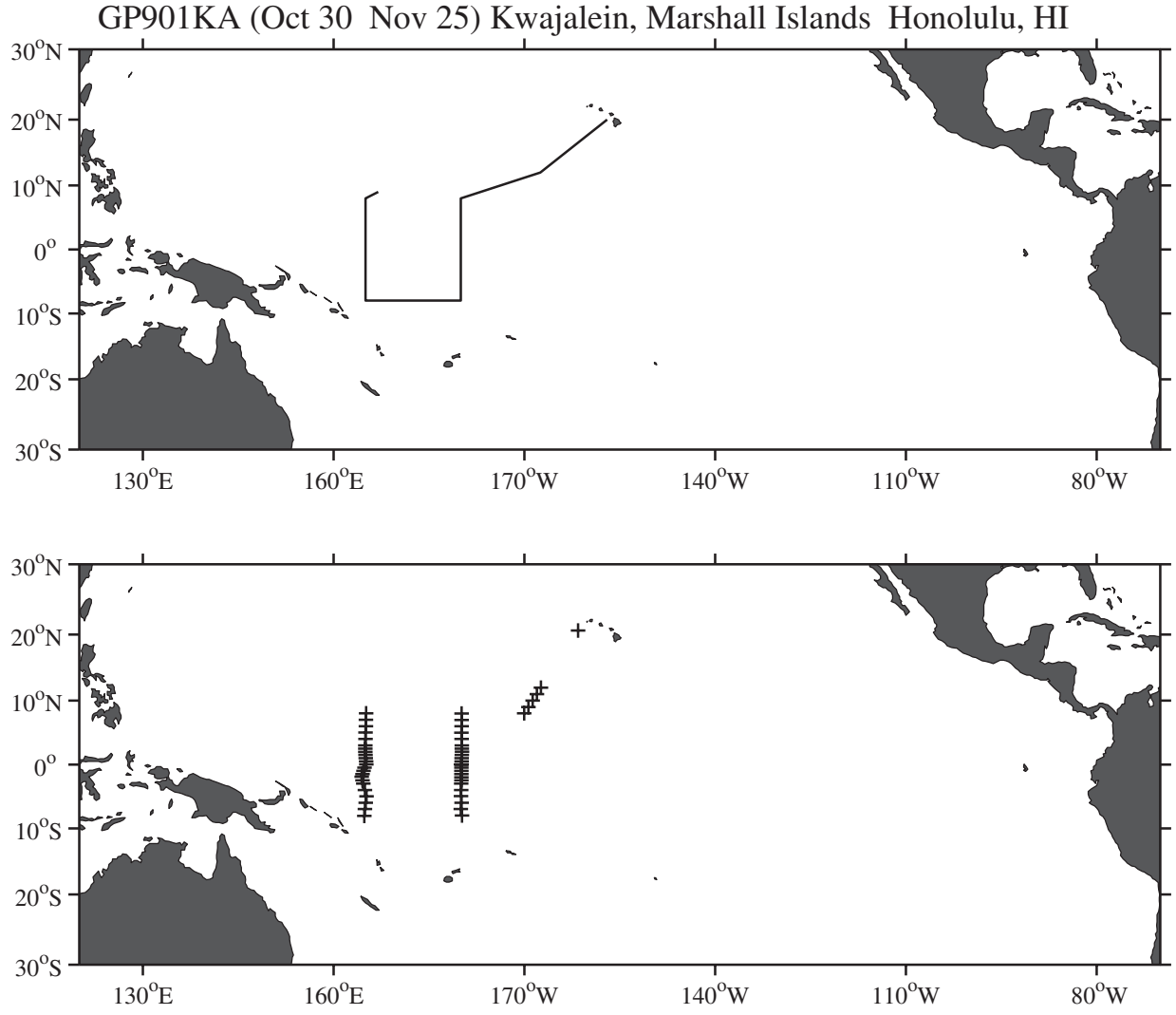

Figure 2h: GP9-01-KA cruise track and station locations.

Table 1h: GP9-01-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 1.0′N	165° 6.2′E	31 Oct 01	1922	58	16	5213	1003
21	7° 0.1′N	165° 5.1′E	1 Nov 01	319	85	8	5165	1002
31	6° 0.2′N	165° 3.9′E	1 Nov 01	1025	98	6	5012	1003
41	5° 1.7′N	165° 0.9′E	1 Nov 01	1804	342	9	4776	3503
51	4° 0.2′N	165° 0.0′E	2 Nov 01	943	350	5	4488	1036
61	3° 0.2′N	164° 59.5′E	2 Nov 01	1640	328	2	4230	1002
71	2° 30.1′N	164° 58.9′E	2 Nov 01	2037	76	4	4120	1002
81	1° 59.9′N	164° 58.3′E	3 Nov 01	57	55	4	4173	1004
91	1° 30.1′N	165° 1.5′E	3 Nov 01	510	18	5	4256	1001
101	1° 0.0′N	165° 3.6′E	3 Nov 01	907	62	5	4327	1001
111	0° 30.1′N	165° 6.3′E	3 Nov 01	1307	39	5	4368	1001
121	0° 0.1′N	165° 9.0′E	3 Nov 01	1703	53	5	4396	1001
131	0° 30.0′S	164° 51.4′E	4 Nov 01	758	90	7	4440	1002
141	0° 59.9′S	164° 42.1′E	4 Nov 01	1152	93	8	4418	1002
151	1° 29.9′S	164° 32.7′E	4 Nov 01	1545	107	10	4423	1002
161	1° 55.6′S	164° 24.6′E	4 Nov 01	1913	90	10	4437	1001
171	2° 29.6′S	164° 33.2′E	5 Nov 01	24	90	9	4462	1002
181	2° 59.8′S	164° 40.7′E	5 Nov 01	426	76	10	3859	1001
191	3° 59.8′S	164° 55.5′E	5 Nov 01	1127	106	8	3143	1001
201	4° 59.8′S	165° 11.3′E	5 Nov 01	1904	69	8	2659	1002
211	5° 59.9′S	165° 3.3′E	6 Nov 01	638	138	3	3595	1001
221	6° 59.9′S	164° 55.6′E	6 Nov 01	1325	173	6	3713	1001
231	8° 2.4′S	164° 48.9′E	6 Nov 01	2106	352	2	3894	1002
241	7° 59.8′S	179° 48.2′W	10 Nov 01	1815	81	10	5543	4503
251	6° 59.6′S	179° 59.4′W	11 Nov 01	1015	123	20	5325	1004
261	5° 59.7′S	179° 52.1′W	11 Nov 01	1652	42	8	5199	1002
271	4° 58.4′S	179° 57.7′W	11 Nov 01	2355	65	12	5601	1002
281	3° 59.8′S	179° 56.4′W	12 Nov 01	724	66	21	5870	1001
291	3° 0.2′S	179° 55.3′W	12 Nov 01	1439	78	16	5400	1002
301	2° 29.8′S	179° 54.7′W	12 Nov 01	1850	70	21		1002
311	2° 0.0′S	179° 53.9′W	12 Nov 01	2258	105	13	5336	1001
321	1° 29.9′S	179° 54.2′W	13 Nov 01	301	86	11	5232	1003
331	0° 59.9′S	179° 54.3′W	13 Nov 01	659	107	7	5348	1002
341	0° 30.0′S	179° 54.2′W	13 Nov 01	1054	96	13	4746	1002
351	0° 0.1′S	179° 54.5′W	13 Nov 01	1555	72	20	5396	4504
361	0° 1.8′N	179° 55.0′W	14 Nov 01	255	54	14	5394	1001
371	0° 30.2′N	179° 53.1′W	14 Nov 01	701	80	17	5702	1002
381	1° 0.2′N	179° 51.8′W	14 Nov 01	1051	82	18	5830	765
391	1° 30.2′N	179° 50.7′W	14 Nov 01	1446	89	16	5571	1002
401	2° 0.7′N	179° 49.3′W	14 Nov 01	1830	84	14	5469	1003
411	2° 30.1′N	179° 50.1′W	14 Nov 01	2252	96	11	5308	1002
421	2° 59.9′N	179° 50.6′W	15 Nov 01	229	93	16	5643	1001
431	4° 0.1′N	179° 51.6′W	15 Nov 01	845	70	10	5647	1003
441	5° 0.0′N	179° 54.9′W	15 Nov 01	1651	63	17	5667	4502
451	6° 0.4′N	179° 52.1′W	16 Nov 01	901	83	18	5675	1004
461	6° 59.7′N	179° 51.8′W	16 Nov 01	1611	98	13	5757	1002
471	7° 58.9′N	179° 51.6′W	17 Nov 01	559	65	11	5907	1003
481	8° 1.4′N	170° 1.6′W	19 Nov 01	2109	72	20	5496	1003
491	9° 0.4′N	169° 22.4′W	20 Nov 01	623	58	22	4855	1002
501	10° 0.5′N	168° 42.3′W	20 Nov 01	1557	23	24	5241	1003
511	10° 59.9′N	168° 2.7′W	21 Nov 01	120	35	23	5333	1003
521	12° 0.1′N	167° 23.1′W	21 Nov 01	1056	64	19	5218	1002
531	20° 36.5′N	161° 34.1′W	24 Nov 01	1616	142	5	4748	1003

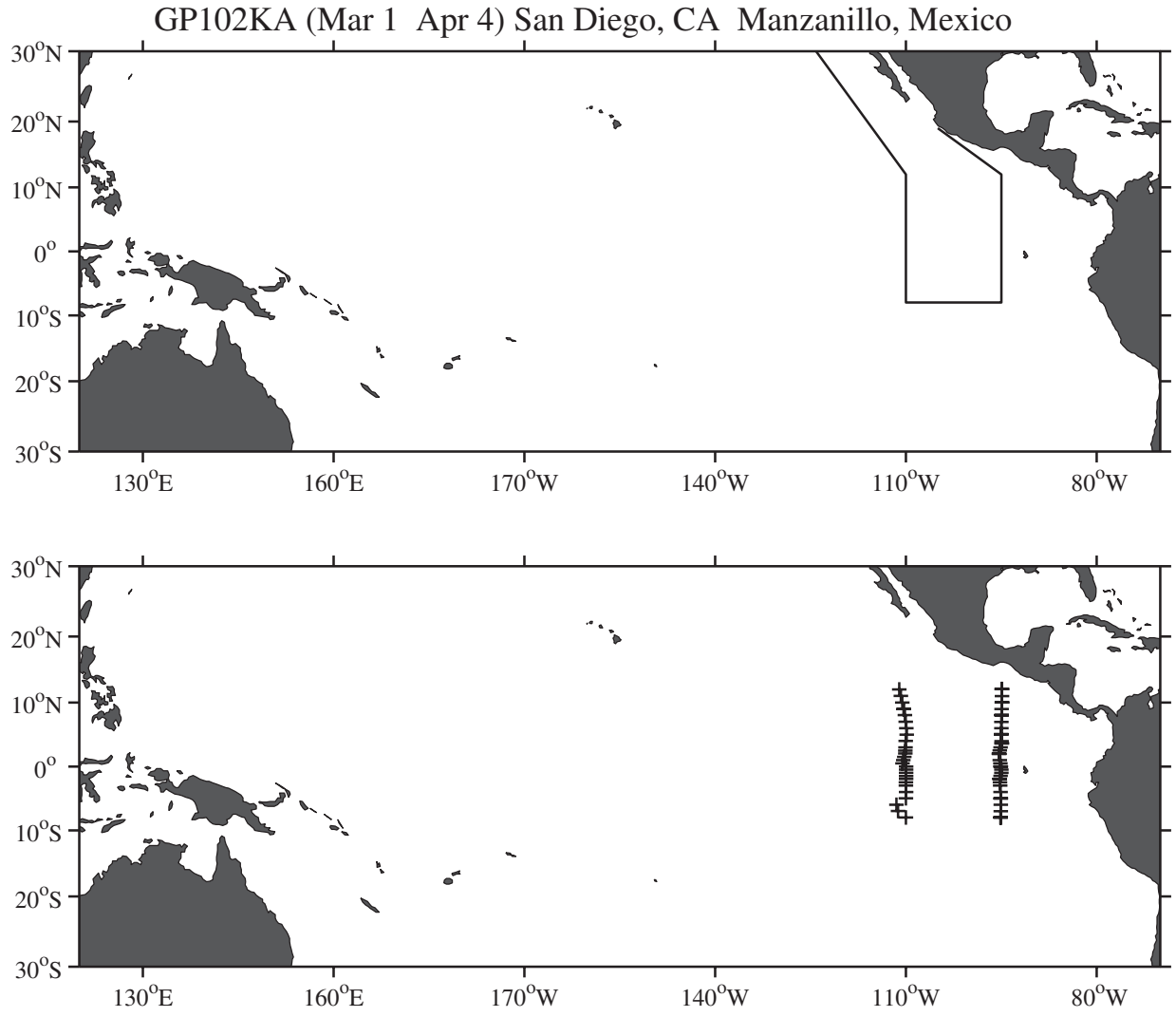

Figure 2i: GP1-02-KA cruise track and station locations.

Table 1i: GP1-02-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 0.7′N	111° 2.2′W	6 Mar 02	2043	44	17	3773	1003
21	11° 1.0′N	110° 48.0′W	7 Mar 02	416	73	16	3718	1004
31	10° 0.3′N	110° 35.0′W	7 Mar 02	1201	61	17	3656	1003
41	9° 0.0′N	110° 21.2′W	7 Mar 02	1919	90	17	3601	1007
42	9° 0.0′N	110° 21.0′W	7 Mar 02	2127	75	15	3688	208
51	8° 3.0′N	110° 9.0′W	8 Mar 02	538	70	13	4079	3802
61	7° 0.0′N	110° 2.0′W	8 Mar 02	1549	60	15	3689	1007
71	5° 59.9′N	109° 56.8′W	8 Mar 02	2222	63	17	3587	1003
81	5° 0.2′N	109° 51.6′W	9 Mar 02	1110	53	14	3787	3400
91	4° 0.2′N	110° 1.6′W	10 Mar 02	546	50	16	2671	1004
101	3° 0.0′N	110° 3.0′W	10 Mar 02	1224	44	17	3286	1002
111	2° 30.3′N	110° 4.9′W	10 Mar 02	1619	50	16	3639	1002
121	2° 2.5′N	110° 6.0′W	10 Mar 02	2139	52	16	3901	1002
131	1° 30.0′N	110° 15.0′W	11 Mar 02	143	69	18	3769	1003
141	1° 0.2′N	110° 24.6′W	11 Mar 02	530	80	14	3804	1003
151	0° 30.0′N	110° 33.1′W	11 Mar 02	1133	83	9	3839	1003
161	0° 0.2′S	109° 57.5′W	12 Mar 02	421	150	4	3818	2770
171	0° 29.8′S	109° 57.2′W	13 Mar 02	354	30	5	3942	1003
181	1° 0.0′S	109° 58.0′W	13 Mar 02	730	194	3	3938	1003
191	1° 29.8′S	109° 58.5′W	13 Mar 02	1107	243	2	3874	1003
201	1° 57.7′S	109° 59.0′W	13 Mar 02	1439	283	3	3925	1001
211	2° 29.7′S	109° 59.3′W	13 Mar 02	2217	125	9	3879	1003
221	2° 59.6′S	109° 59.6′W	14 Mar 02	207	113	13	3804	1004
231	3° 59.9′S	109° 57.5′W	14 Mar 02	847	134	12	4000	1003
241	4° 59.6′S	110° 0.4′W	14 Mar 02	1924	128	12	3652	3451
251	6° 0.0′S	111° 30.0′W	15 Mar 02	623	120	14	3696	1003
261	6° 59.5′S	111° 14.4′W	16 Mar 02	7	143	12	3708	1003
271	8° 0.2′S	110° 0.1′W	16 Mar 02	1033	136	16	3440	3202
281	7° 59.5′S	95° 7.2′W	20 Mar 02	656	90	15	3891	204
282	7° 59.5′S	95° 6.7′W	20 Mar 02	731	90	15	3875	203
283	7° 59.5′S	95° 6.2′W	20 Mar 02	820	90	15	3887	1003
291	7° 0.0′S	95° 5.6′W	20 Mar 02	1419	140	14	3911	1004
301	5° 59.8′S	95° 5.1′W	20 Mar 02	2019	139	16	3896	1004
311	5° 1.3′S	95° 4.9′W	21 Mar 02	209	138	17	3824	205
312	5° 1.5′S	95° 4.3′W	21 Mar 02	245	138	17	3833	203
313	5° 0.5′S	95° 4.6′W	21 Mar 02	334	138	17	3801	1003
321	3° 59.8′S	95° 6.8′W	21 Mar 02	934	118	9	3596	1005
331	2° 59.7′S	95° 9.8′W	21 Mar 02	1535	130	8	3560	1003
341	2° 29.8′S	95° 11.6′W	21 Mar 02	1838	103	14	3492	1002
351	1° 57.5′S	95° 13.4′W	21 Mar 02	2219	49	8	3390	204
352	1° 57.0′S	95° 14.2′W	21 Mar 02	2253	49	8	3407	202
353	1° 56.4′S	95° 13.9′W	21 Mar 02	2353	49	8	3389	1004
361	1° 29.2′S	95° 7.3′W	22 Mar 02	312	90	3	3316	1002
371	0° 59.6′S	95° 0.0′W	22 Mar 02	640	345	3	3338	1005
381	0° 30.2′S	94° 59.8′W	26 Mar 02	1518	140	6	3398	1003
391	0° 0.3′S	95° 4.9′W	26 Mar 02	1908	146	7	3229	202
392	0° 0.2′S	95° 5.6′W	26 Mar 02	1944	146	7	3255	202
393	0° 0.7′N	95° 5.2′W	26 Mar 02	2032	146	7	3156	1003
401	0° 30.1′N	95° 9.0′W	27 Mar 02	0	167	6	3281	1002
411	1° 0.2′N	95° 14.0′W	27 Mar 02	338	41	2	3340	1013
421	1° 59.8′N	95° 21.6′W	27 Mar 02	955	7	3	2983	203
422	2° 0.7′N	95° 21.9′W	27 Mar 02	1110	7	3	2922	2703
423	1° 59.8′N	95° 18.7′W	28 Mar 02	137	7	3	3112	502
431	2° 30.6′N	95° 14.6′W	28 Mar 02	457	350	10	2414	1004
441	3° 0.5′N	95° 6.6′W	28 Mar 02	841	6	14	2789	1004

Table 1i: (continued).

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
451	3° 37.1′N	94° 55.9′W	28 Mar 02	1329	24	14	3382	202
452	3° 37.9′N	94° 54.9′W	28 Mar 02	1403	24	14	3130	201
453	3° 37.5′N	94° 55.6′W	28 Mar 02	2326	24	14	3382	1003
461	3° 59.0′N	94° 56.7′W	29 Mar 02	232	0	6	3226	1002
471	5° 3.5′N	95° 0.0′W	29 Mar 02	959	41	8	3571	202
472	5° 4.4′N	95° 0.1′W	29 Mar 02	1032	41	8	3575	202
473	5° 4.1′N	95° 0.8′W	29 Mar 02	1210	41	8	3584	3302
481	5° 59.8′N	94° 59.5′W	29 Mar 02	2028	33	3	3171	1003
491	6° 59.9′N	94° 58.2′W	30 Mar 02	325	40	14	3682	1003
501	8° 2.8′N	94° 57.5′W	30 Mar 02	1003	86	9	3658	202
502	8° 3.2′N	94° 58.0′W	30 Mar 02	1035	86	9	3668	202
503	8° 3.4′N	94° 57.1′W	30 Mar 02	1203	86	9	3658	3402
511	8° 59.8′N	94° 56.3′W	30 Mar 02	2058	68	15	3519	1001
521	10° 1.2′N	94° 54.7′W	31 Mar 02	410	75	14	3860	202
522	10° 2.6′N	94° 53.0′W	31 Mar 02	606	75	14	3796	3604
523	10° 2.1′N	94° 53.8′W	31 Mar 02	1150	75	14	3819	502
541	10° 59.8′N	94° 54.1′W	1 Apr 02	536	39	9	3943	1002
551	12° 4.3′N	94° 53.9′W	1 Apr 02	1158	9	10	4113	201
552	12° 5.0′N	94° 54.1′W	1 Apr 02	1243	9	10	4106	1002
553	12° 5.0′N	94° 57.0′W	1 Apr 02	2229	9	10	4028	502

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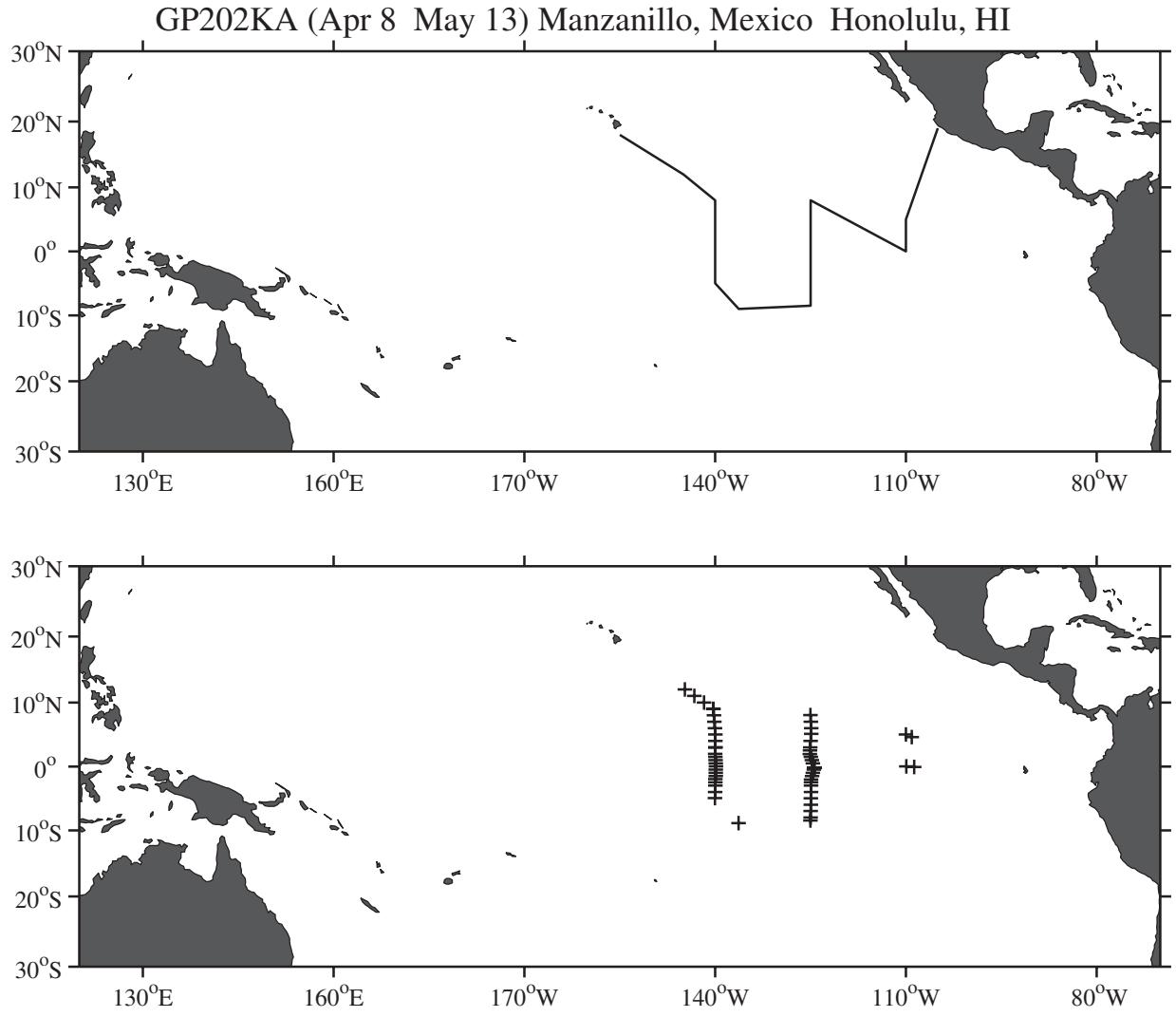

Figure 2j: GP2-02-KA cruise track and station locations.

Table 1j: GP2-02-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	4° 37.3′N	109° 4.3′W	12 Apr 02	722	112	3	3906	3802
21	5° 0.7′N	109° 59.8′W	13 Apr 02	149	100	9	3907	1001
31	0° 4.5′S	108° 41.3′W	14 Apr 02	920	130	9	3811	3616
41	0° 1.3′N	109° 56.5′W	15 Apr 02	624	140	11	3825	1009
51	8° 3.5′N	125° 1.4′W	18 Apr 02	2237	70	13	4605	1001
61	7° 0.9′N	124° 57.7′W	19 Apr 02	656	60	18	4653	1002
71	6° 0.3′N	124° 54.2′W	19 Apr 02	1402	51	17	4421	1003
81	5° 7.1′N	124° 53.6′W	20 Apr 02	508	50	12	4383	1008
91	4° 0.2′N	124° 58.7′W	20 Apr 02	1258	176	24	4459	1002
101	3° 0.4′N	125° 2.5′W	20 Apr 02	2011	29	93	4457	1002
111	2° 30.5′N	125° 4.0′W	21 Apr 02	23	110	10	4585	1004
121	1° 56.5′N	125° 6.3′W	21 Apr 02	505	110	10	4713	1002
131	1° 30.1′N	124° 57.6′W	21 Apr 02	851	88	4	4631	1002
141	0° 59.9′N	124° 47.5′W	21 Apr 02	1240	357	5	4660	1001
151	0° 29.9′N	124° 38.1′W	21 Apr 02	1627	115	7	4595	1006
161	0° 11.5′S	124° 23.9′W	22 Apr 02	338	244	11	4788	506
171	0° 10.6′S	124° 22.8′W	22 Apr 02	602	80	5	4709	4504
181	0° 30.3′S	124° 27.8′W	22 Apr 02	1105	141	3	4517	1004
191	1° 0.0′S	124° 37.5′W	22 Apr 02	1443	89	6	4660	1003
201	1° 30.6′S	124° 45.9′W	22 Apr 02	1837	30	8	4585	1004
211	2° 2.3′S	124° 54.3′W	22 Apr 02	2236	80	8	4717	1002
221	2° 29.9′S	124° 54.5′W	23 Apr 02	325	22	15	4571	1000
231	2° 59.6′S	124° 54.7′W	23 Apr 02	712	60	11	4644	1004
241	4° 0.0′S	124° 54.9′W	23 Apr 02	1330	58	9	4448	1002
251	4° 59.7′S	124° 57.0′W	24 Apr 02	222	60	12	4544	1002
261	5° 59.8′S	124° 57.7′W	24 Apr 02	844	60	15	4524	1002
271	6° 59.9′S	124° 59.9′W	24 Apr 02	1511	45	17	4698	1002
281	7° 59.0′S	124° 58.9′W	25 Apr 02	226	120	18	4505	1003
291	8° 27.9′S	125° 1.7′W	25 Apr 02	825	60	19	4507	4204
301	8° 52.0′S	136° 19.6′W	27 Apr 02	1830	90	15	4396	4103
311	4° 57.9′S	140° 2.2′W	2 May 02	1632	107	20	4223	1002
321	3° 59.9′S	140° 0.9′W	2 May 02	2241	86	18	4489	1006
331	2° 59.8′S	139° 58.9′W	3 May 02	455	83	17	4413	1004
341	2° 29.9′S	139° 57.9′W	3 May 02	842	106	15	4371	1003
351	1° 58.3′S	139° 57.3′W	3 May 02	1328	100	14	4222	4003
361	1° 29.8′S	139° 55.0′W	4 May 02	610	72	14	4352	1002
371	0° 59.5′S	139° 55.0′W	4 May 02	954	59	18	4224	1001
381	0° 30.0′S	139° 53.4′W	4 May 02	1334	72	17	4251	1001
391	0° 0.6′N	139° 53.0′W	5 May 02	300	89	13	4353	1005
401	0° 30.2′N	139° 53.8′W	5 May 02	651	79	14	4348	1004
411	1° 0.2′N	139° 56.4′W	5 May 02	1035	80	10	4333	1002
421	1° 30.3′N	139° 57.8′W	5 May 02	1412	96	11	4372	1003
431	1° 59.4′N	139° 59.3′W	5 May 02	138	68	10	4371	1002
441	2° 59.9′N	139° 58.8′W	6 May 02	547	95	11	4401	1003
451	3° 0.2′N	139° 58.8′W	6 May 02	930	80	12	4297	1003
461	4° 0.1′N	139° 58.6′W	6 May 02	1556	140	11	4337	1002
471	5° 2.3′N	139° 57.4′W	7 May 02	825	95	6	4480	4254
481	6° 0.2′N	140° 2.3′W	7 May 02	1539	50	6	4825	1002
491	7° 1.0′N	140° 6.8′W	7 May 02	2312	55	19	4980	4740
501	8° 0.4′N	140° 11.4′W	8 May 02	642	45	20	4425	1001
511	9° 0.7′N	140° 16.4′W	8 May 02	1413	37	18	4877	4604
521	8° 59.0′N	140° 16.9′W	8 May 02	26	48	19	4400	505
531	10° 0.4′N	141° 44.9′W	9 May 02	1017	55	18	5013	1007
541	11° 0.9′N	143° 15.4′W	9 May 02	2054	65	19	3297	1007
551	12° 0.4′N	144° 46.0′W	10 May 02	626	52	20	4351	1003

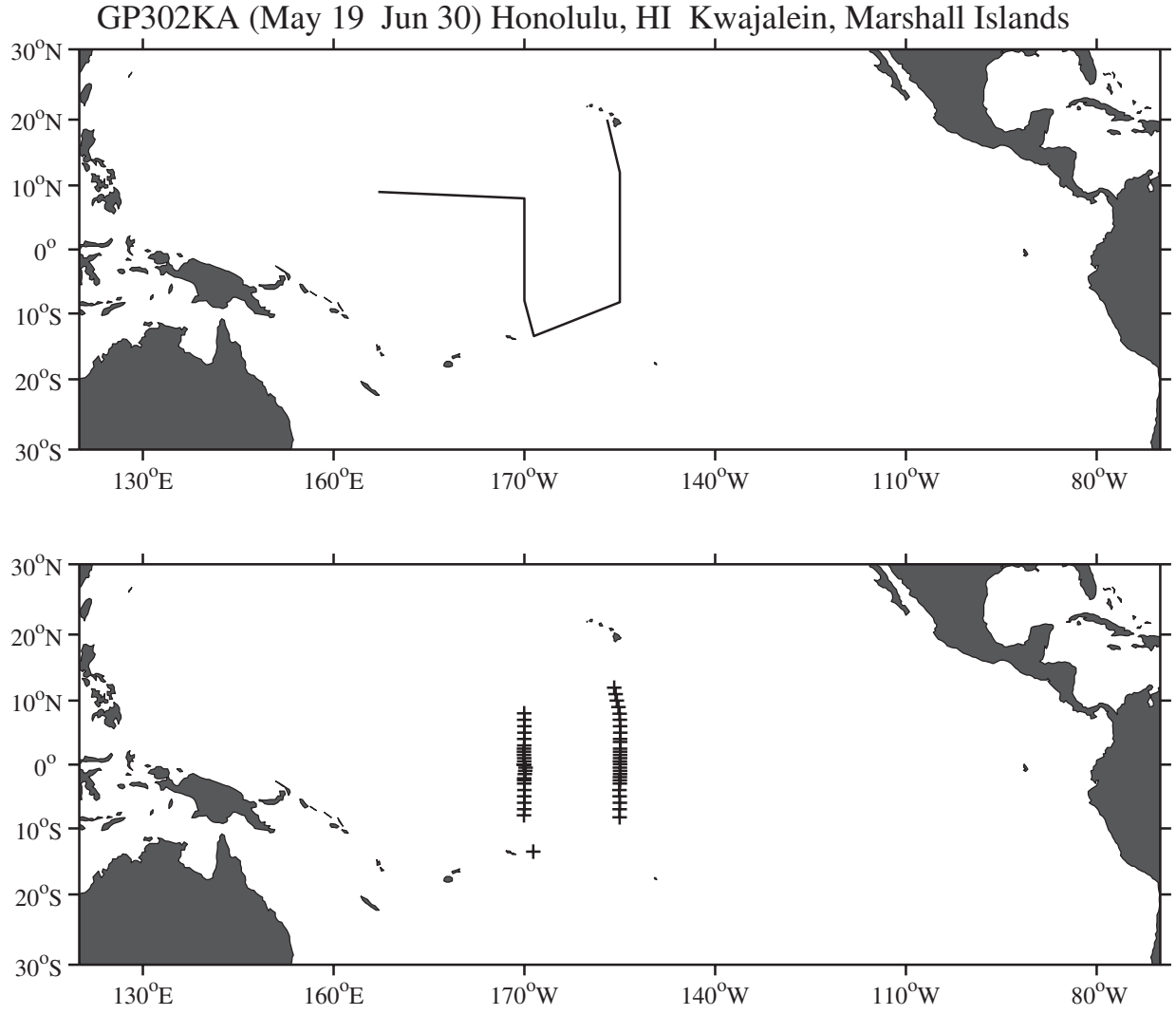

Figure 2k: GP3-02-KA cruise track and station locations.

Table 1k: GP3-02-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 0.3′N	155° 52.6′W	1 Jun 02	1230	60	16	5089	1017
21	11° 0.2′N	155° 39.4′W	1 Jun 02	1924	71	13	5105	1004
31	10° 0.5′N	155° 26.8′W	2 Jun 02	208	42	15	5220	1004
41	9° 0.2′N	155° 13.2′W	2 Jun 02	857	101	10	5187	1003
51	7° 57.2′N	155° 1.3′W	3 Jun 02	116	60	13	5200	1003
61	7° 0.2′N	154° 58.7′W	3 Jun 02	749	62	9	4977	1001
71	6° 0.1′N	154° 57.3′W	3 Jun 02	1433	55	5	4834	1004
81	4° 59.6′N	154° 55.2′W	4 Jun 02	344	29	5	4598	1001
91	4° 0.3′N	154° 56.5′W	4 Jun 02	1029	56	11	4706	1005
101	3° 33.0′N	154° 56.2′W	4 Jun 02	1650	91	6	4805	1006
111	2° 30.1′N	154° 56.2′W	4 Jun 02	2040	63	8	4836	1002
121	2° 0.0′N	154° 57.0′W	5 Jun 02	612	90	12	4642	4474
131	1° 30.2′N	154° 57.0′W	6 Jun 02	223	130	7	4676	1005
141	1° 0.2′N	154° 57.5′W	6 Jun 02	611	112	9	4755	1013
151	0° 30.3′N	154° 58.6′W	6 Jun 02	1020	123	10	4778	1001
161	0° 1.9′N	154° 57.7′W	6 Jun 02	1514	110	11	4663	4479
171	0° 30.0′S	154° 59.2′W	7 Jun 02	804	160	8	4886	1003
181	0° 59.9′S	154° 58.0′W	7 Jun 02	1155	179	4	4754	1001
191	1° 30.0′S	154° 57.4′W	7 Jun 02	1539	180	0	4880	1004
201	1° 59.2′S	154° 58.9′W	8 Jun 02	245	162	8	4970	1006
211	2° 29.9′S	155° 0.0′W	8 Jun 02	647	126	8	4999	1004
221	2° 59.8′S	154° 59.7′W	8 Jun 02	1045	96	8	4922	1003
231	3° 59.8′S	155° 2.0′W	8 Jun 02	1706	62	12	2422	1002
241	4° 59.3′S	155° 0.5′W	9 Jun 02	23	82	5	4781	1005
251	6° 0.0′S	155° 0.0′W	9 Jun 02	644	90	10	5237	1004
261	7° 0.8′S	155° 1.3′W	9 Jun 02	1305	80	0	5178	1012
271	8° 15.4′S	155° 0.8′W	9 Jun 02	2114	107	11	5329	1002
281	13° 33.7′S	168° 35.4′W	13 Jun 02	424	148	22	5143	4908
291	7° 57.6′S	170° 3.2′W	16 Jun 02	1645	85	20	5394	4081
301	7° 0.2′S	170° 2.6′W	17 Jun 02	146	112	14	4613	1004
311	6° 0.0′S	170° 1.5′W	17 Jun 02	812	98	14	4687	1003
321	5° 0.3′S	170° 1.0′W	17 Jun 02	1521	75	14	5365	3204
331	3° 59.8′S	170° 0.9′W	18 Jun 02	835	118	21	5725	1004
341	2° 59.8′S	170° 1.5′W	18 Jun 02	1516	106	20	5094	1002
351	2° 30.0′S	170° 1.8′W	18 Jun 02	1904	91	23	5570	1004
361	2° 9.8′S	170° 1.5′W	19 Jun 02	715	113	22	4953	1002
371	1° 30.0′S	169° 56.4′W	19 Jun 02	1235	91	21	5224	1001
381	0° 59.9′S	169° 52.3′W	19 Jun 02	1641	92	20	5238	1002
391	0° 29.8′S	169° 48.3′W	19 Jun 02	2035	108	20	4908	1004
401	0° 0.0′N	170° 2.9′W	20 Jun 02	1302	90	20	5590	4524
411	0° 1.5′S	170° 3.5′W	21 Jun 02	514	91	15	4868	202
421	0° 30.1′N	170° 2.4′W	21 Jun 02	938	92	10	5166	1001
431	1° 0.1′N	170° 2.8′W	21 Jun 02	1324	100	10	5471	1003
441	1° 30.2′N	170° 3.2′W	21 Jun 02	1701	110	10	5502	1003
451	2° 1.8′N	170° 3.4′W	22 Jun 02	147	24	8	5611	1006
461	2° 29.9′N	170° 3.6′W	22 Jun 02	535	48	22	5430	1001
471	3° 0.1′N	170° 2.5′W	22 Jun 02	929	97	2	5459	1003
481	4° 1.2′N	170° 1.2′W	22 Jun 02	1606	40	7	5475	1004
491	4° 59.9′N	170° 0.0′W	23 Jun 02	744	70	12	5769	1001
501	6° 0.1′N	170° 0.8′W	23 Jun 02	1444	90	19	5549	1002
511	7° 0.1′N	170° 1.2′W	23 Jun 02	2133	50	22	5976	1003
521	8° 1.8′N	170° 2.8′W	24 Jun 02	510	53	15	5531	3603

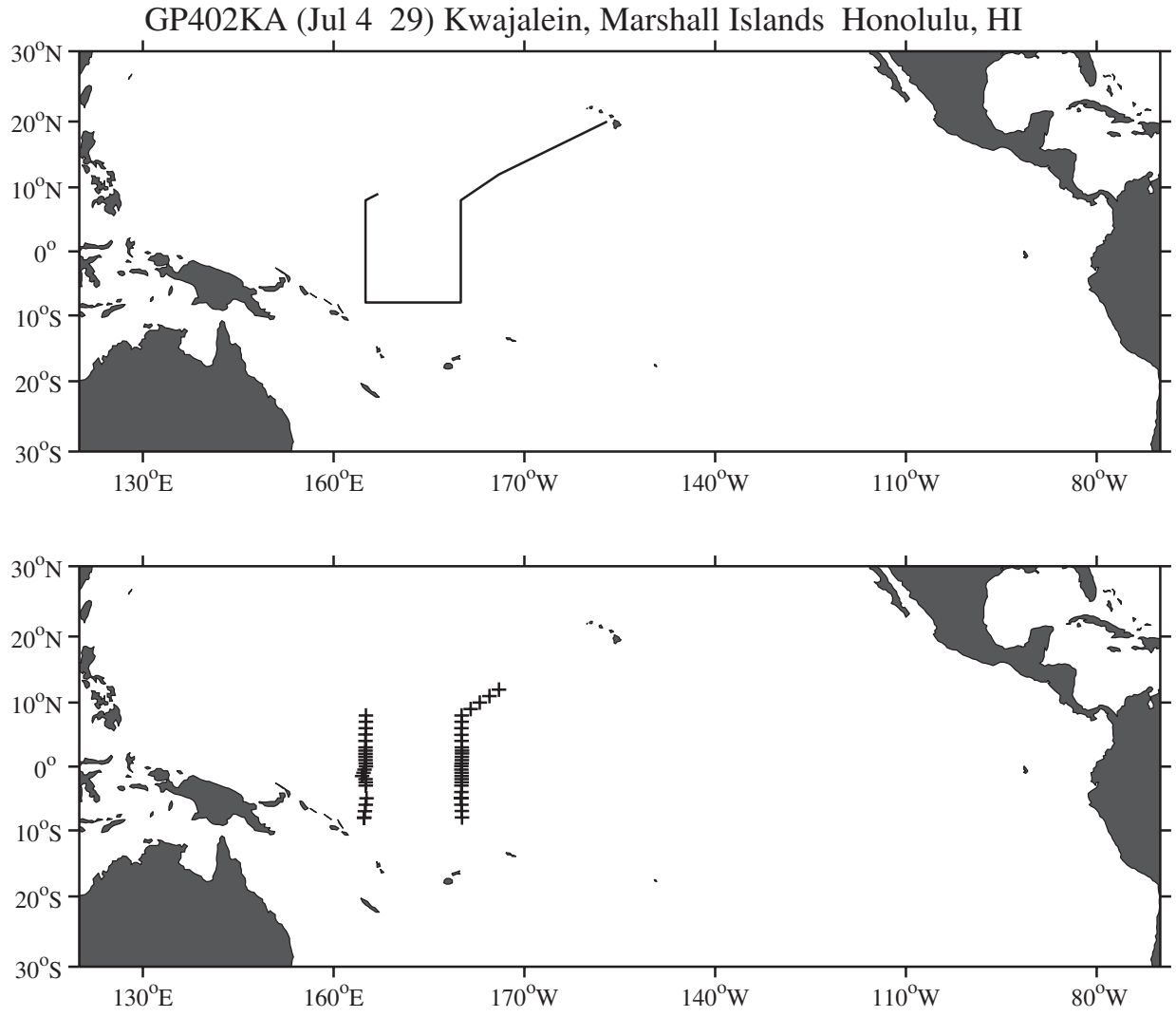

Figure 2l: GP4-02-KA cruise track and station locations.

Table 1l: GP4-02-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 0.1′N	165° 5.0′E	6 Jul 02	514	353	8	5240	1004
21	7° 0.3′N	165° 4.5′E	6 Jul 02	1206	80	6	5164	1002
31	6° 0.1′N	165° 2.6′E	6 Jul 02	1849	133	2	5013	1003
41	5° 1.5′N	165° 0.3′E	7 Jul 02	118	135	2	4783	1002
51	4° 0.3′N	165° 0.6′E	7 Jul 02	813	261	4	4495	1001
61	3° 0.1′N	165° 0.9′E	7 Jul 02	1448	331	2	4261	1004
71	2° 29.8′N	165° 0.3′E	7 Jul 02	1829	249	2	4125	1009
81	1° 59.5′N	165° 0.4′E	8 Jul 02	438	41	1	4176	1003
91	1° 29.9′N	165° 0.8′E	8 Jul 02	843	75	1	4260	818
101	0° 59.9′N	165° 1.5′E	8 Jul 02	1230	344	1	4335	1001
111	0° 29.7′N	165° 1.9′E	8 Jul 02	1607	259	3	4372	1004
121	0° 1.7′N	165° 5.5′E	9 Jul 02	548	315	1	4416	1007
131	0° 29.8′S	164° 51.4′E	9 Jul 02	1037	352	4	4443	1000
141	1° 0.0′S	164° 41.2′E	9 Jul 02	1500	277	1	4426	1003
151	1° 30.3′S	164° 29.4′E	9 Jul 02	1910	73	1	4441	1002
161	1° 59.9′S	165° 0.4′E	10 Jul 02	849	291	3	4468	4003
171	2° 29.8′S	165° 2.0′E	11 Jul 02	232	292	9	2784	1007
181	3° 0.2′S	165° 3.6′E	11 Jul 02	623	280	10	4210	1002
191	5° 0.5′S	165° 11.0′E	11 Jul 02	2210	230	6	2498	1006
201	6° 0.1′S	165° 3.8′E	12 Jul 02	435	110	5	3607	1005
211	7° 0.0′S	164° 55.8′E	12 Jul 02	1100	90	4	3719	1002
221	8° 0.7′S	164° 48.3′E	12 Jul 02	1819	150	4	3895	3025
231	8° 1.3′S	164° 47.0′E	13 Jul 02	300	260	5	3895	507
241	7° 58.9′S	179° 48.7′W	16 Jul 02	758	84	8	5544	4017
251	6° 59.9′S	179° 51.4′W	16 Jul 02	2127	128	14	5052	1004
261	6° 0.0′S	179° 54.7′W	17 Jul 02	359	133	11	4792	1004
271	4° 56.9′S	179° 55.9′W	17 Jul 02	1125	88	15	5664	4001
281	4° 57.0′S	179° 56.3′W	18 Jul 02	156	130	10	5652	500
291	3° 59.8′S	179° 54.6′W	18 Jul 02	851	100	10	5749	1000
301	2° 59.9′S	179° 53.9′W	18 Jul 02	1504	131	16	5412	1004
311	2° 29.7′S	179° 53.3′W	18 Jul 02	1838	145	11	5423	1002
321	1° 59.5′S	179° 53.1′W	19 Jul 02	503	100	8	5350	1002
331	1° 29.8′S	179° 52.8′W	19 Jul 02	847	80	9	5214	1001
341	0° 59.9′S	179° 52.9′W	19 Jul 02	1221	70	13	5364	1004
351	0° 29.8′S	179° 53.4′W	19 Jul 02	1601	75	12	4482	1004
361	0° 2.4′N	179° 54.2′W	19 Jul 02	2052	60	10	5403	4014
371	0° 29.8′N	179° 52.2′W	20 Jul 02	148	70	7	5660	1006
381	0° 59.9′N	179° 51.3′W	20 Jul 02	521	80	10	5703	1003
391	1° 30.0′N	179° 50.1′W	20 Jul 02	850	75	8	5585	1000
401	2° 2.4′N	179° 48.0′W	20 Jul 02	1332	70	6	5476	4041
411	2° 29.9′N	179° 49.0′W	21 Jul 02	554	310	5	5322	1003
421	3° 0.1′N	179° 50.5′W	21 Jul 02	926	5	5	5660	1002
431	4° 0.1′N	179° 52.3′W	21 Jul 02	1549	339	7	5636	1003
441	4° 58.6′N	179° 54.4′W	22 Jul 02	538	100	8	5672	1003
451	5° 59.9′N	179° 53.9′W	22 Jul 02	1213	47	10	5443	1002
461	7° 0.3′N	179° 52.8′W	22 Jul 02	1833	78	10	5830	1002
471	8° 0.1′N	179° 53.1′W	23 Jul 02	828	20	9	5944	1001
481	9° 0.1′N	178° 26.0′W	23 Jul 02	1954	90	10	5716	1001
491	10° 0.1′N	177° 0.2′W	24 Jul 02	823	100	10	5993	1001
501	11° 0.2′N	175° 30.3′W	24 Jul 02	1937	111	13	5471	1002
511	12° 0.3′N	174° 0.3′W	25 Jul 02	704	120	12	5642	1003

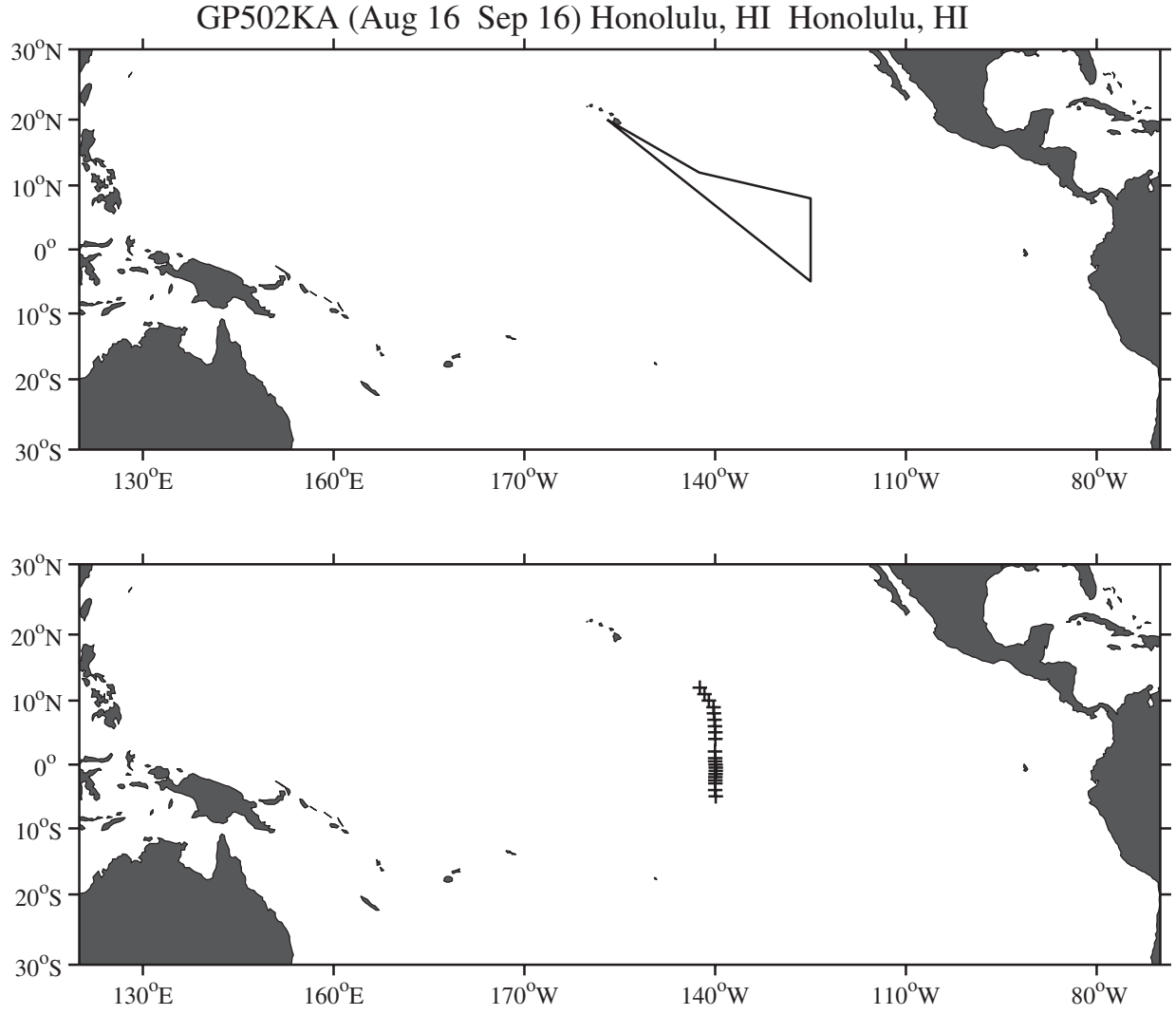

Figure 2m: GP5-02-KA cruise track and station locations.

Table 1m: GP5-02-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	11° 59.9′N	142° 24.9′W	22 Aug 02	512	200	20	5067	1005
21	11° 0.2′N	141° 41.9′W	22 Aug 02	1344	111	80	5116	1005
31	9° 59.9′N	140° 58.8′W	22 Aug 02	2201	92	0	5006	1003
41	8° 57.6′N	140° 15.2′W	23 Aug 02	634	102	35	4876	1007
51	8° 1.0′N	140° 10.8′W	23 Aug 02	1430	82	21	5110	1023
61	7° 0.2′N	140° 5.7′W	23 Aug 02	2152	122	0	4951	1015
71	6° 0.1′N	140° 2.6′W	24 Aug 02	519	72	8	4825	1009
81	5° 2.7′N	139° 58.8′W	24 Aug 02	1259	112	10	4467	4004
91	4° 1.2′N	139° 58.4′W	24 Aug 02	2236	61	93	4339	1002
111	2° 2.4′N	140° 1.3′W	26 Aug 02	348	81	23	4400	1001
121	1° 0.4′N	140° 0.4′W	26 Aug 02	1110	191	60	4309	1002
131	0° 30.1′N	140° 0.6′W	26 Aug 02	1506	171	15	4349	1002
141	0° 0.6′S	139° 55.8′W	27 Aug 02	927	91	14	4346	4005
151	0° 29.9′S	139° 53.4′W	28 Aug 02	358	121	7	4255	1002
161	1° 0.1′S	139° 54.5′W	28 Aug 02	807	180	70	4194	1003
171	1° 29.9′S	139° 55.6′W	28 Aug 02	1146	51	10	4347	1006
181	1° 59.9′S	139° 57.7′W	28 Aug 02	1632	141	10	4322	1004
191	2° 29.9′S	139° 57.6′W	29 Aug 02	113	151	10	4370	1001
201	2° 58.8′S	139° 58.6′W	29 Aug 02	511	171	10	4418	1001
211	3° 59.9′S	140° 0.7′W	29 Aug 02	1222	181	5	4491	1004
221	5° 0.2′S	139° 54.8′W	30 Aug 02	332	181	0	4356	1002

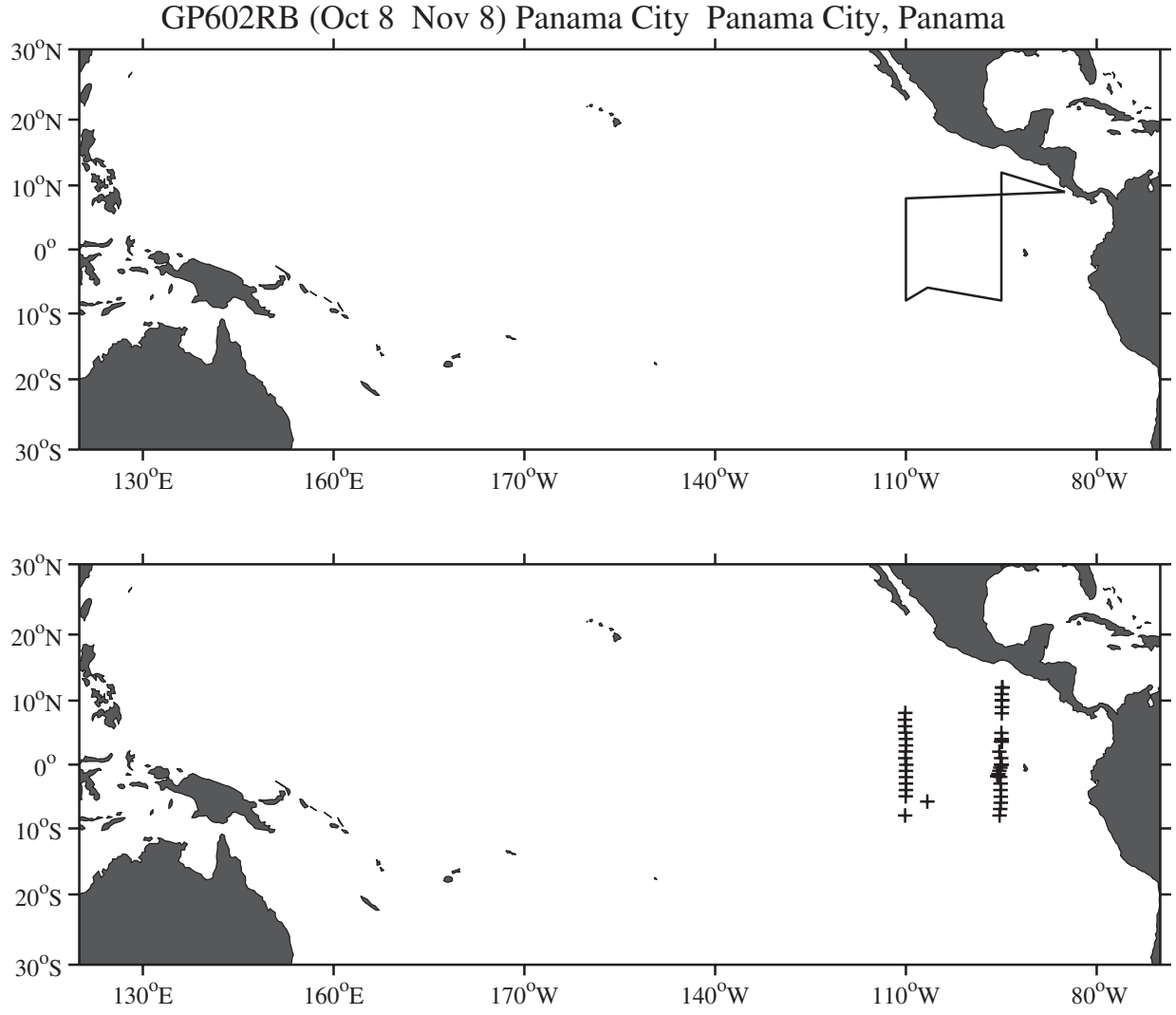

Figure 2n: GP6-02-RB cruise track and station locations.

Table 1n: GP6-02-RB CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 0.8′N	94° 49.4′W	12 Oct 02	641	0	0	4048	3001
12	12° 1.1′N	94° 50.9′W	12 Oct 02	1736	60	8	4083	1002
21	10° 59.8′N	94° 56.3′W	13 Oct 02	44	0	0	3939	1001
31	10° 3.0′N	94° 53.4′W	13 Oct 02	653	0	0	3812	402
32	10° 2.7′N	94° 53.0′W	13 Oct 02	735	0	0	3828	400
41	10° 2.5′N	94° 55.2′W	13 Oct 02	2336	0	0	3859	1004
51	9° 0.0′N	94° 53.5′W	14 Oct 02	628	60	6	3509	1003
61	8° 2.1′N	94° 56.1′W	15 Oct 02	16	340	4	3680	1002
71	4° 58.0′N	94° 59.5′W	15 Oct 02	2053	210	11	3526	1002
81	4° 0.2′N	94° 56.4′W	16 Oct 02	301	180	14	3302	1004
91	3° 37.1′N	94° 57.0′W	16 Oct 02	554	180	11	3388	301
92	3° 36.8′N	94° 57.0′W	16 Oct 02	627	180	11	3393	301
101	3° 38.3′N	94° 56.2′W	16 Oct 02	1635	190	12	3397	1002
111	2° 1.7′N	95° 18.3′W	17 Oct 02	505	170	17	3056	1002
121	1° 0.4′N	95° 0.3′W	17 Oct 02	1207	180	12	3526	1000
131	0° 0.7′S	94° 59.6′W	18 Oct 02	521	150	9	3321	3002
141	0° 0.3′S	94° 59.6′W	18 Oct 02	1603	150	9	3015	1002
151	0° 29.7′S	95° 9.5′W	18 Oct 02	2059	150	8	3321	1005
161	0° 59.8′S	95° 18.8′W	19 Oct 02	152	190	12	3376	1002
171	1° 29.9′S	95° 28.5′W	19 Oct 02	633	160	11	3304	1001
181	1° 48.7′S	95° 35.3′W	19 Oct 02	949	190	10	3307	301
182	1° 48.9′S	95° 34.7′W	19 Oct 02	1020	190	10	3318	303
183	1° 58.0′S	95° 10.1′W	19 Oct 02	2039	170	8	3432	1001
191	3° 0.0′S	95° 7.5′W	20 Oct 02	321	180	9	3564	1002
201	4° 0.0′S	95° 7.2′W	20 Oct 02	909	160	10	3597	1001
211	5° 2.8′S	95° 5.5′W	20 Oct 02	1854	130	14	3825	1004
221	6° 0.1′S	95° 4.9′W	21 Oct 02	49	140	15	3894	1001
231	6° 59.8′S	95° 11.0′W	21 Oct 02	628	140	15	4010	1001
241	7° 59.1′S	95° 16.0′W	21 Oct 02	2237	120	14	3996	1002
251	5° 49.8′S	106° 38.3′W	24 Oct 02	1517	130	16	3063	501
261	8° 0.0′S	110° 7.2′W	25 Oct 02	2010	160	13	3574	1000
271	4° 59.4′S	110° 1.2′W	27 Oct 02	2327	120	11	3459	1001
281	4° 0.2′S	110° 0.1′W	28 Oct 02	527	120	9	3705	1001
291	3° 0.1′S	110° 0.0′W	28 Oct 02	1106	130	14	3734	1001
301	1° 58.4′S	110° 0.1′W	28 Oct 02	2317	150	14	3935	1001
311	1° 0.2′S	110° 0.1′W	29 Oct 02	530	130	14	3962	1002
321	0° 3.6′S	109° 55.6′W	29 Oct 02	1611	160	13	3806	1002
331	0° 59.9′N	110° 5.7′W	30 Oct 02	1341	150	7	3728	1001
341	2° 3.7′N	110° 2.8′W	31 Oct 02	241	160	9	3726	1001
351	3° 0.0′N	110° 0.1′W	31 Oct 02	856	150	10	3883	1002
361	4° 0.0′N	109° 59.9′W	31 Oct 02	1437	180	10	3876	1001
371	5° 0.2′N	110° 3.3′W	1 Nov 02	114	220	14	3948	1000
381	5° 59.8′N	110° 7.9′W	1 Nov 02	748	200	13	3828	1001
391	7° 0.1′N	110° 8.8′W	1 Nov 02	1336	200	15	3676	1001
401	8° 5.0′N	110° 6.4′W	2 Nov 02	558	210	17	4103	3102

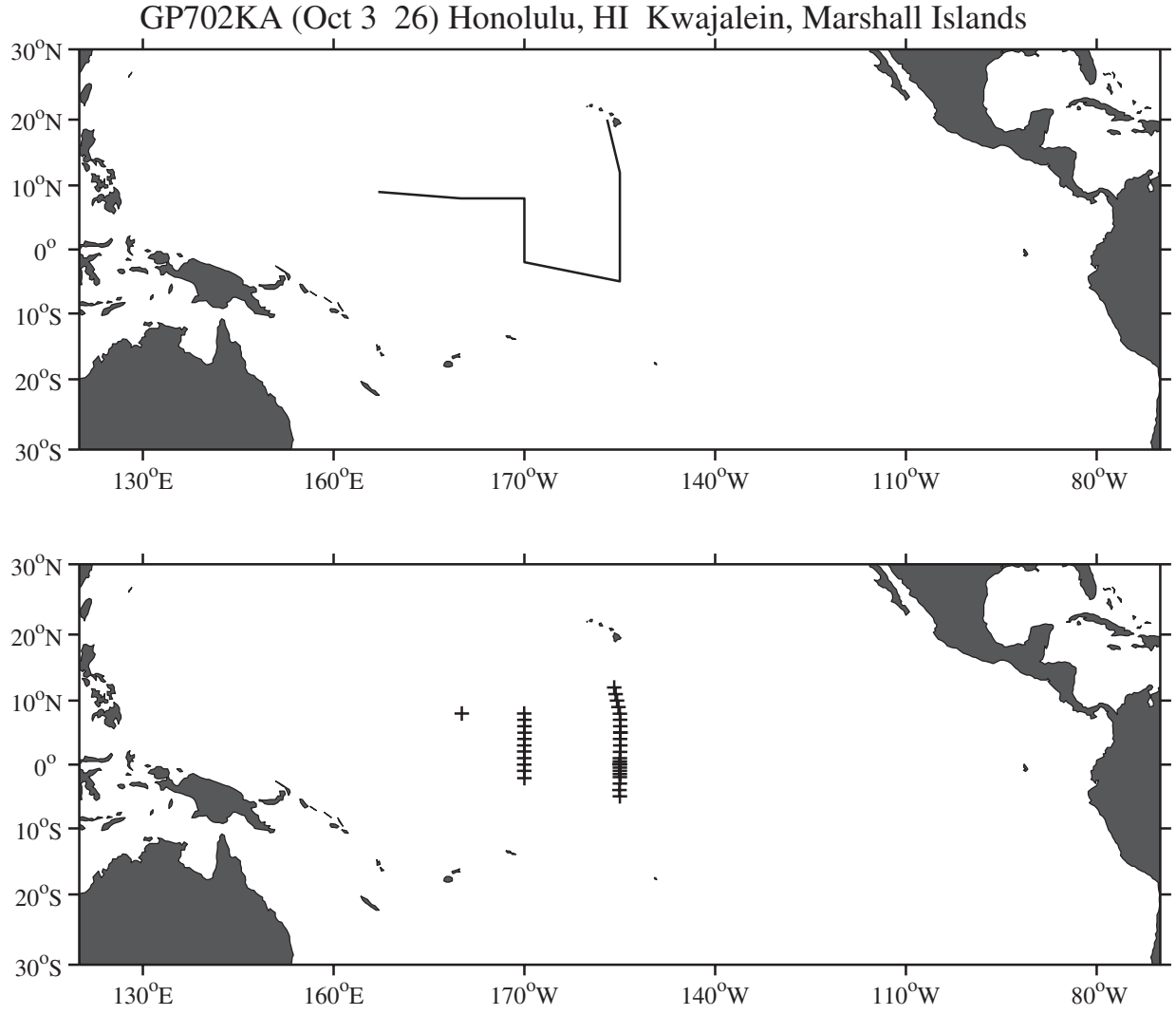

Figure 2o: GP7-02-KA cruise track and station locations.

Table 1o: GP7-02-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	12° 0.4′N	155° 52.9′W	6 Oct 02	1610	60	17	5185	1003
21	11° 0.2′N	155° 39.8′W	7 Oct 02	13	70	21	5206	1004
31	10° 0.4′N	155° 25.9′W	7 Oct 02	841	63	16	5334	1006
41	9° 0.4′N	155° 13.2′W	7 Oct 02	1703	80	22	5032	1006
51	7° 57.2′N	154° 58.9′W	8 Oct 02	200	230	5	5151	1009
61	7° 0.0′N	154° 56.7′W	8 Oct 02	957	337	7	4921	1003
71	6° 0.2′N	154° 55.8′W	8 Oct 02	1727	130	15	4787	1025
81	5° 0.1′N	154° 54.2′W	9 Oct 02	141	120	12	4603	1000
82	5° 0.8′N	154° 54.3′W	9 Oct 02	857	125	11	4630	4247
91	4° 0.1′N	154° 58.0′W	10 Oct 02	356	160	4	4665	1003
101	3° 0.3′N	154° 54.6′W	10 Oct 02	1101	0	2	4803	1003
111	1° 59.1′N	154° 57.7′W	10 Oct 02	1825	180	6	4662	1003
121	0° 59.7′N	154° 59.2′W	11 Oct 02	125	150	6	4764	1001
131	0° 30.1′N	154° 59.7′W	11 Oct 02	517	110	5	4781	1003
141	0° 0.7′N	155° 1.3′W	11 Oct 02	950	130	8	4682	3069
151	0° 1.9′N	155° 0.8′W	12 Oct 02	212	140	13	4670	1003
161	0° 30.2′S	154° 59.8′W	12 Oct 02	628	120	14	4887	1003
171	0° 59.9′S	154° 58.9′W	12 Oct 02	1015	120	11	4746	1002
181	1° 29.7′S	154° 58.7′W	12 Oct 02	1414	120	12	4870	1003
191	1° 59.9′S	154° 58.9′W	12 Oct 02	2333	90	8	4990	1004
201	3° 0.1′S	154° 59.9′W	13 Oct 02	608	80	18	4910	1004
211	3° 59.8′S	155° 2.1′W	13 Oct 02	1231	70	21	2460	1003
221	4° 58.9′S	154° 59.6′W	14 Oct 02	324	80	18	5009	1001
231	2° 8.7′S	170° 0.9′W	17 Oct 02	1621	90	9	4953	1002
241	0° 59.9′S	170° 2.2′W	18 Oct 02	351	89	1	5931	1003
251	0° 1.0′S	170° 2.3′W	18 Oct 02	1040	20	8	5353	1002
261	1° 0.0′N	170° 2.4′W	18 Oct 02	1717	50	6	5460	1014
271	2° 1.9′N	170° 2.5′W	19 Oct 02	17	70	8	5390	1002
281	3° 0.3′N	170° 1.7′W	19 Oct 02	703	50	10	5469	1003
291	3° 59.8′N	169° 59.4′W	19 Oct 02	1326	80	6	5666	1001
301	5° 0.3′N	169° 58.6′W	19 Oct 02	2029	30	12	5809	1005
311	5° 59.9′N	169° 59.6′W	20 Oct 02	333	35	10	5437	1002
321	7° 0.3′N	169° 59.3′W	20 Oct 02	1013	30	8	5911	1007
331	8° 0.1′N	170° 2.8′W	20 Oct 02	1718	60	9	5325	2515
341	8° 0.0′N	179° 50.7′W	23 Oct 02	1458	40	2	5922	5257

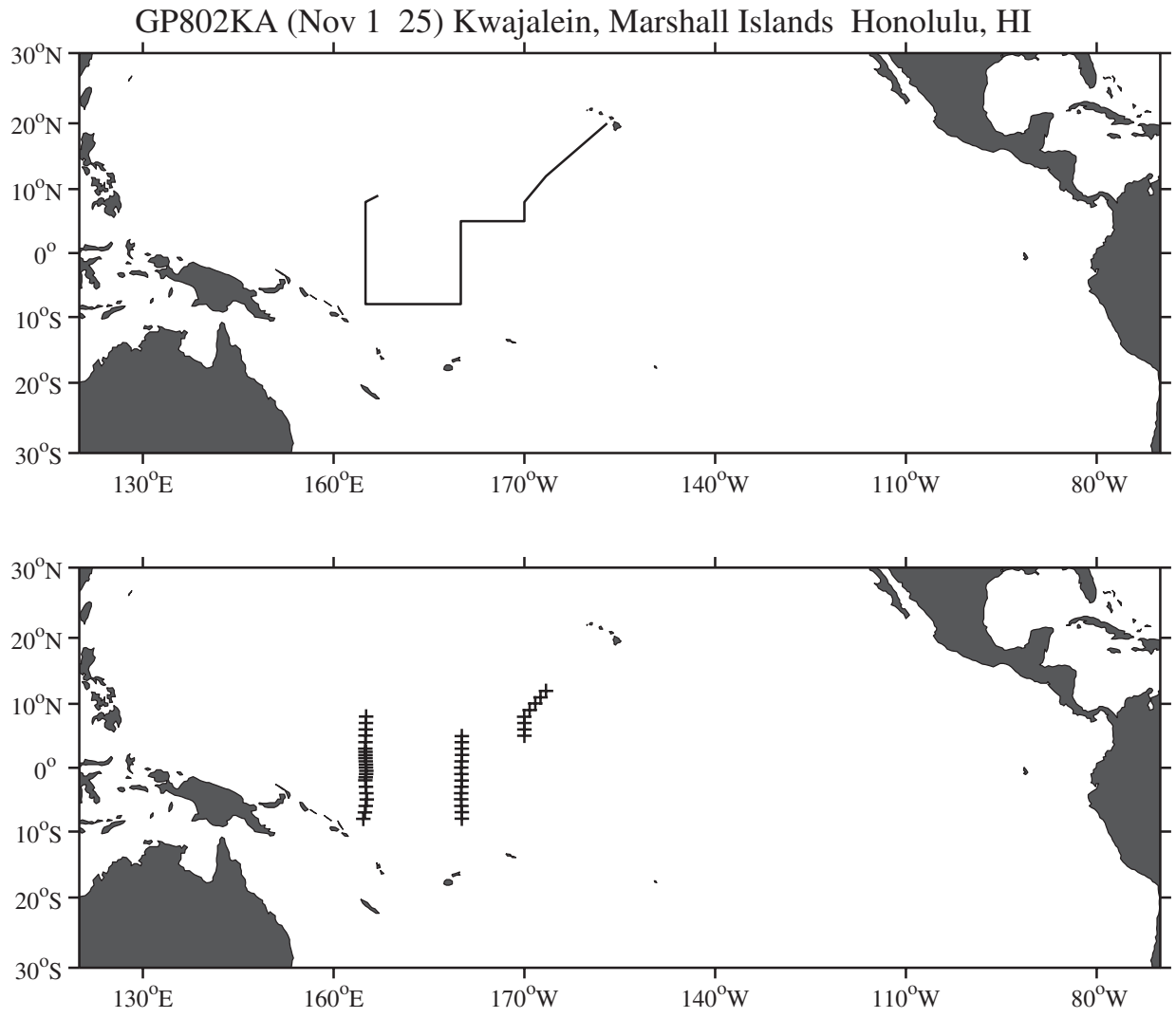

Figure 2p: GP8-02-KA cruise track and station locations.

Table 1p: GP8-02-KA CTD Cast Summary.

Cast #	Latitude	Longitude	Date	Time	W/D T	W/S (kts)	Depth (m)	Cast (db)
11	8° 0.6′N	165° 6.3′E	2 Nov 02	1817	0	0	5247	1002
21	7° 0.2′N	165° 4.7′E	3 Nov 02	156	0	0	5142	1001
31	5° 59.8′N	165° 2.6′E	3 Nov 02	854	0	0	5037	1002
41	5° 3.4′N	165° 0.9′E	3 Nov 02	1613	0	0	4807	3002
51	4° 0.1′N	165° 0.3′E	4 Nov 02	823	20	7	4491	1002
61	2° 59.9′N	164° 59.9′E	4 Nov 02	1455	40	4	4262	1001
71	2° 29.9′N	165° 0.2′E	4 Nov 02	1846	40	7	4127	1001
81	1° 59.9′N	165° 0.2′E	4 Nov 02	2249	50	10	4176	1005
91	1° 30.0′N	165° 1.2′E	5 Nov 02	236	0	0	4266	1004
101	1° 0.1′N	165° 3.0′E	5 Nov 02	618	0	0	4341	1002
111	0° 29.6′N	165° 4.7′E	5 Nov 02	1007	0	7	4382	1003
121	0° 1.5′N	165° 5.7′E	5 Nov 02	1438	40	6	4422	4103
131	0° 29.7′S	165° 8.4′E	6 Nov 02	558	0	0	4433	1002
141	1° 0.2′S	165° 6.2′E	6 Nov 02	1001	0	0	3975	1004
151	1° 30.3′S	165° 2.7′E	6 Nov 02	1403	0	0	4460	1002
161	1° 59.9′S	164° 59.7′E	6 Nov 02	1807	0	0	4472	1001
171	2° 59.8′S	165° 3.9′E	7 Nov 02	651	190	6	4300	1002
181	3° 59.9′S	165° 8.1′E	7 Nov 02	1411	220	7	3379	1002
191	4° 59.4′S	165° 11.8′E	8 Nov 02	348	0	0	2499	1001
201	5° 59.9′S	165° 3.5′E	8 Nov 02	1122	120	7	3598	1002
211	7° 0.0′S	164° 55.3′E	8 Nov 02	1757	70	7	3715	1000
221	8° 2.0′S	164° 40.5′E	9 Nov 02	46	40	9	3897	1001
231	7° 58.7′S	179° 50.0′W	13 Nov 02	308	0	0	5576	1000
241	6° 59.8′S	179° 51.3′W	13 Nov 02	945	80	13	5049	1002
251	5° 59.9′S	179° 53.9′W	13 Nov 02	1625	80	13	4926	1000
261	4° 57.7′S	179° 56.3′W	14 Nov 02	2	80	15	5683	1001
271	3° 59.8′S	179° 55.4′W	14 Nov 02	647	90	13	5447	1005
281	2° 59.8′S	179° 54.2′W	14 Nov 02	1328	60	10	5378	1005
291	2° 0.1′S	179° 52.9′W	15 Nov 02	410	70	8	5256	1001
301	0° 59.9′S	179° 54.5′W	15 Nov 02	1122	30	8	5387	1002
311	0° 1.1′N	179° 55.5′W	15 Nov 02	1814	80	8	5413	1002
321	1° 0.2′N	179° 52.4′W	16 Nov 02	1130	60	12	4943	1002
331	2° 0.4′N	179° 48.3′W	16 Nov 02	1810	90	11	5601	1002
341	3° 0.4′N	179° 49.6′W	17 Nov 02	235	50	11	5576	1009
351	4° 0.5′N	179° 50.9′W	17 Nov 02	904	40	8	5405	1005
361	4° 58.6′N	179° 51.2′W	17 Nov 02	1608	60	7	4874	3003
371	5° 0.6′N	169° 59.7′W	20 Nov 02	504	50	11	5311	1001
381	6° 0.0′N	170° 0.7′W	20 Nov 02	1144	50	11	5562	1002
391	7° 0.6′N	170° 0.6′W	20 Nov 02	1908	90	22	5949	1002
401	8° 0.3′N	170° 1.7′W	21 Nov 02	313	80	12	5154	1002
411	9° 0.9′N	169° 10.9′W	21 Nov 02	1244	40	22	5063	1002
421	10° 3.4′N	168° 17.0′W	21 Nov 02	2321	90	15	5313	1003
431	11° 0.1′N	167° 27.9′W	22 Nov 02	939	70	24	5324	1003
441	12° 0.1′N	166° 36.0′W	22 Nov 02	2029	60	22	5034	1003

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

Cruise	Temp. Sensor S/N	Drift Correction °C	Viscous Heat Correction °C
GP101	2027	0.0007	−0.0006
GP201	2027	−0.0002	−0.0006
	1710	0.0000	−0.0006
GP301	2027	0.0000	−0.0006
GP401	2026	−0.0002	−0.0006
GP501	2026	−0.0001	−0.0006
GP701	2026	0.0000	−0.0006
GP801	1455	0.0000	−0.0006
GP901	2026	0.0000	−0.0006
GP102	2026	−0.0009	−0.0006
GP202	2026	−0.0008	−0.0006
GP302	2026	−0.0007	−0.0006
GP402	2027	−0.0003	−0.0006
GP502	1460	0.0000	−0.0006
GP602	1455	0.0002	−0.0006
GP702	4211	0.0000	−0.0006
GP802	4211	0.0000	−0.0006

Table 3: Station groupings for CTD conductivity calibration.

Cruise	Stations	Sensor S/N	Standard Seawater	Fitting Routine	Reject Std Dev	Total Points	Percent Points Used	Fit Standard Deviation (mS/cm)	Conductivity Fit Bias (mS/cm)	Pressure Correction Beta	Minimum Fit Slope	Maximum Fit Slope	Salinity Offset (PSS-78)
GP101	1-23	1537	P136	Calcop0	2.8	263	81.4	0.0018	0.00195	$-5.03e{-}007$	1.0000524	1.0000524	
	24-50	1537	P136	Calcop0	2.8	304	80.9	0.0015	-0.00171	$-5.38e{-}007$	1.0001099	1.0001099	
GP201	1-17+21-41	1537	P139	Calcos0	2.8	420	84.3	0.0058	-0.00900	$-7.20e{-}007$	1.0002644	1.0002644	
	18-22	1469	P136	Calcos0	2.8	32	68.8	0.0025	-0.01877	$-7.20e{-}007$	1.0009307	1.0009307	
GP301	1-51	1537	P136	Calcop1	2.8	263	78.7	0.0022	-0.00378	$-0.88e{-}007$	1.0000599	1.0000894	
GP401	1-49	1536	P139	Calcos0	2.3	484	65.7	0.0042	-0.00667		1.0001906	1.0001906	-0.0060
GP501	1-53	1536	P139	Calcos2	2.8	580	77.2	0.0025	-0.01259		1.0001927	1.0002809	
GP701	1-51	1536	P136/9	Calcos0	2.2	517	37.3	0.0024	-0.01592		1.0004629	1.0004629	-0.0056
	1-51	1537	P136/9	Calcos0	2.2	517	38.7	0.0027	-0.00365		1.0001523	1.0001523	
GP801	1-66	1177	P139	Calcos1	2.8	347	74.6	0.0025	-0.01332		1.0003299	1.0003988	
GP901	1-53	1536	P139	Calcos0	2.3	386	68.4	0.0050	-0.01686		1.0004561	1.0004561	-0.0032
GP102	1-55	1536	P139	Calcos0	2.2	612	66.0	0.0042	-0.02032		1.0006152	1.0006152	-0.0050
GP202	1-55	1536	P139	Calcos0	2.8	497	84.9	0.0020	-0.01590		1.0004764	1.0004764	
GP302	1-52	1536	P139	Calcop1	2.8	449	85.5	0.0032	-0.01307	$-8.15e{-}007$	1.0004646	1.0005453	
GP402	1-51	1469	P139	Calcos0	2.8	202	90.6	0.0058	-0.01459		1.0006107	1.0006107	-0.0042 (1−18 only)
GP502	2-22	197	P139	Calcos1	2.8	226	82.3	0.0024	-0.00185		1.0000708	1.0001563	
GP602	1-40	1177	P139	Calcos0	2.8	240	87.9	0.0040	-0.02127		1.0006256	1.0006256	
GP702	1-34	354	P139	Calcos0	2.8	348	81.9	0.0039	-0.00328		1.0001901	1.0001901	
GP802	1-44	354	P139	Calcos1	2.8	320	76.6	0.0027	0.00118		0.9999830	1.0000584	

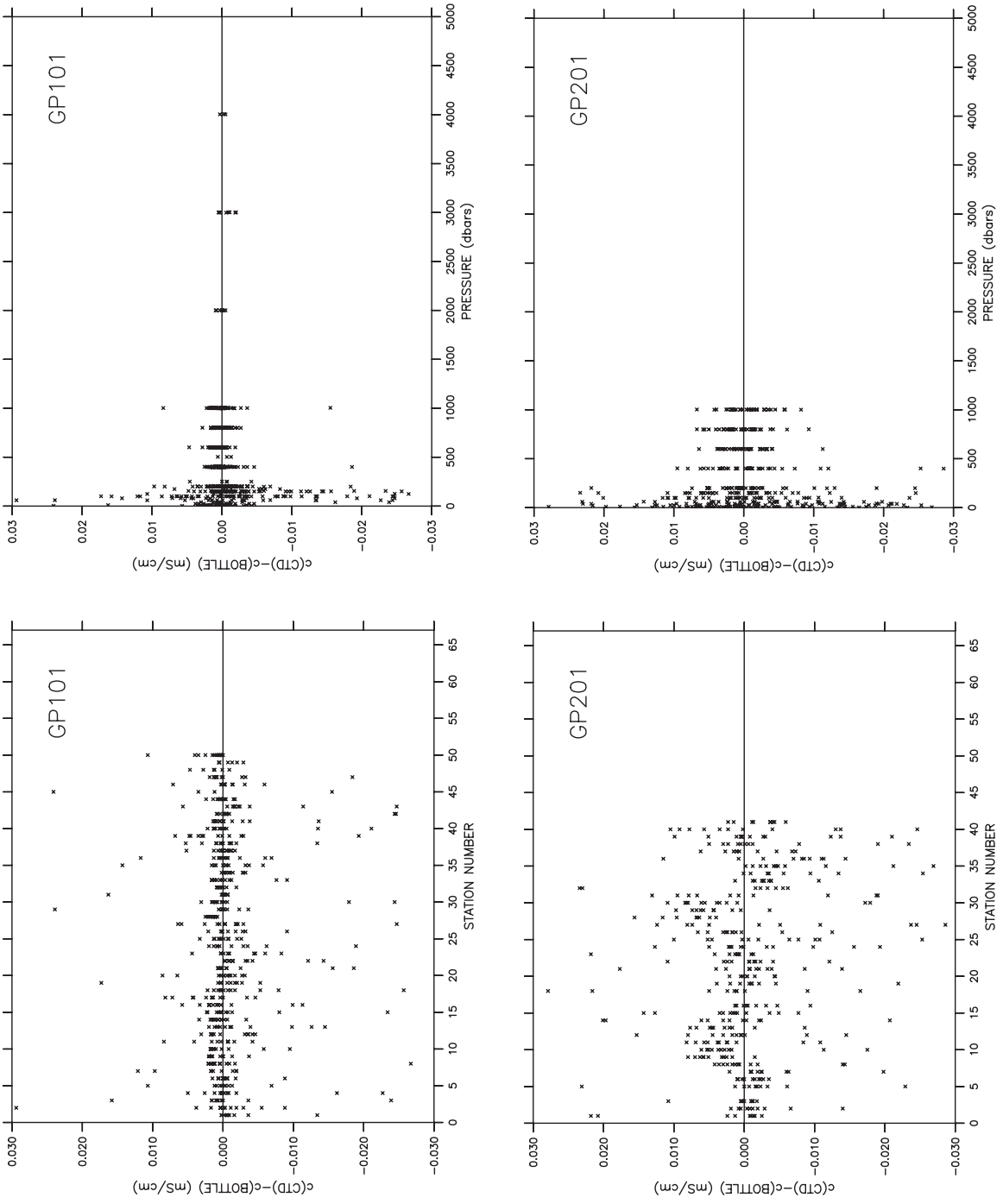

Figure 3a: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP1-01-KA (upper panels) and GP2-01-KA (lower panels).

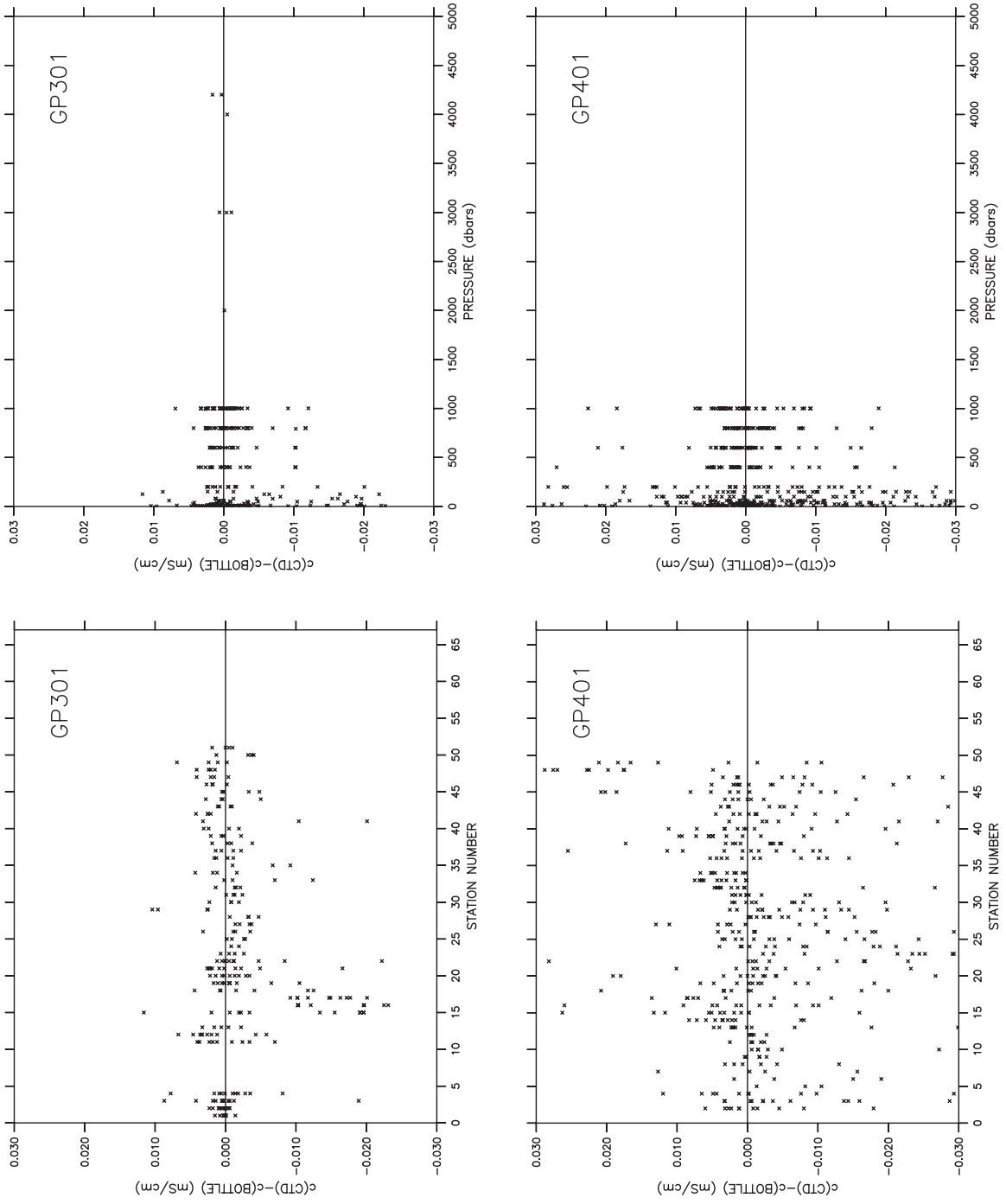

Figure 3b: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP3-01-KA (upper panels) and GP4-01-KA (lower panels).

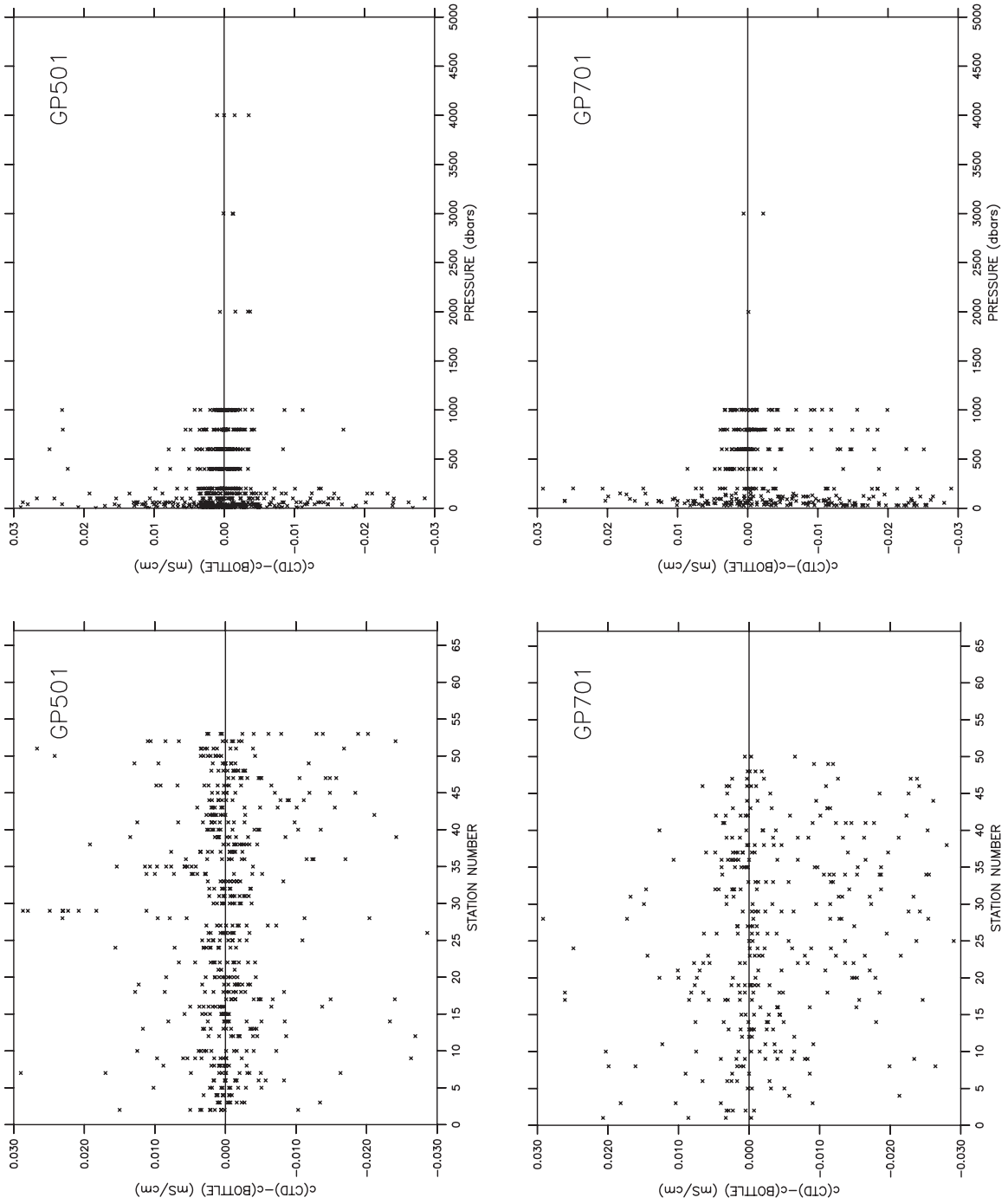

Figure 3c: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP5-01-KA (upper panels) and GP7-01-KA (lower panels).

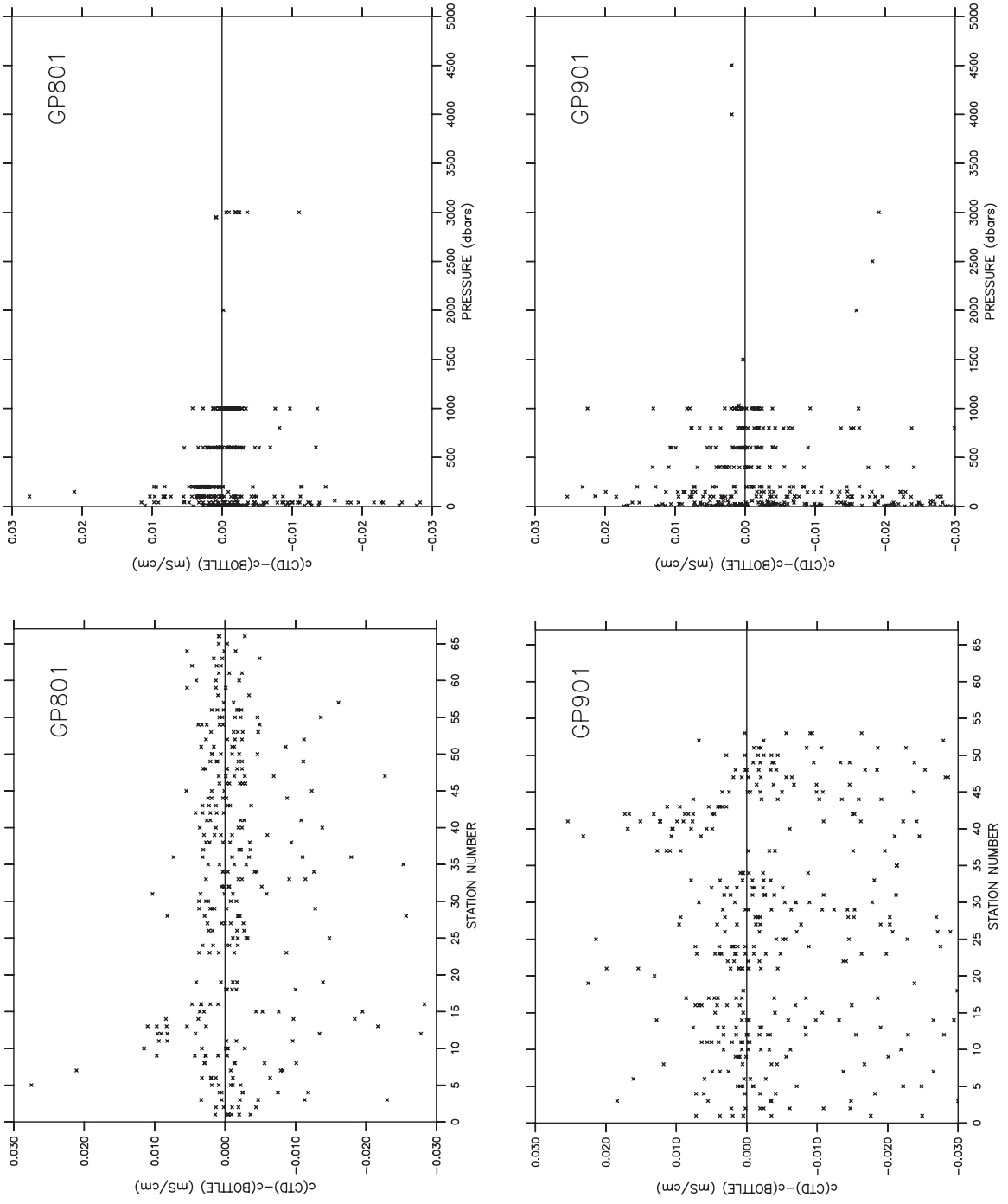

Figure 3d: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP8-01-RB (upper panels) and GP9-01-KA (lower panels).

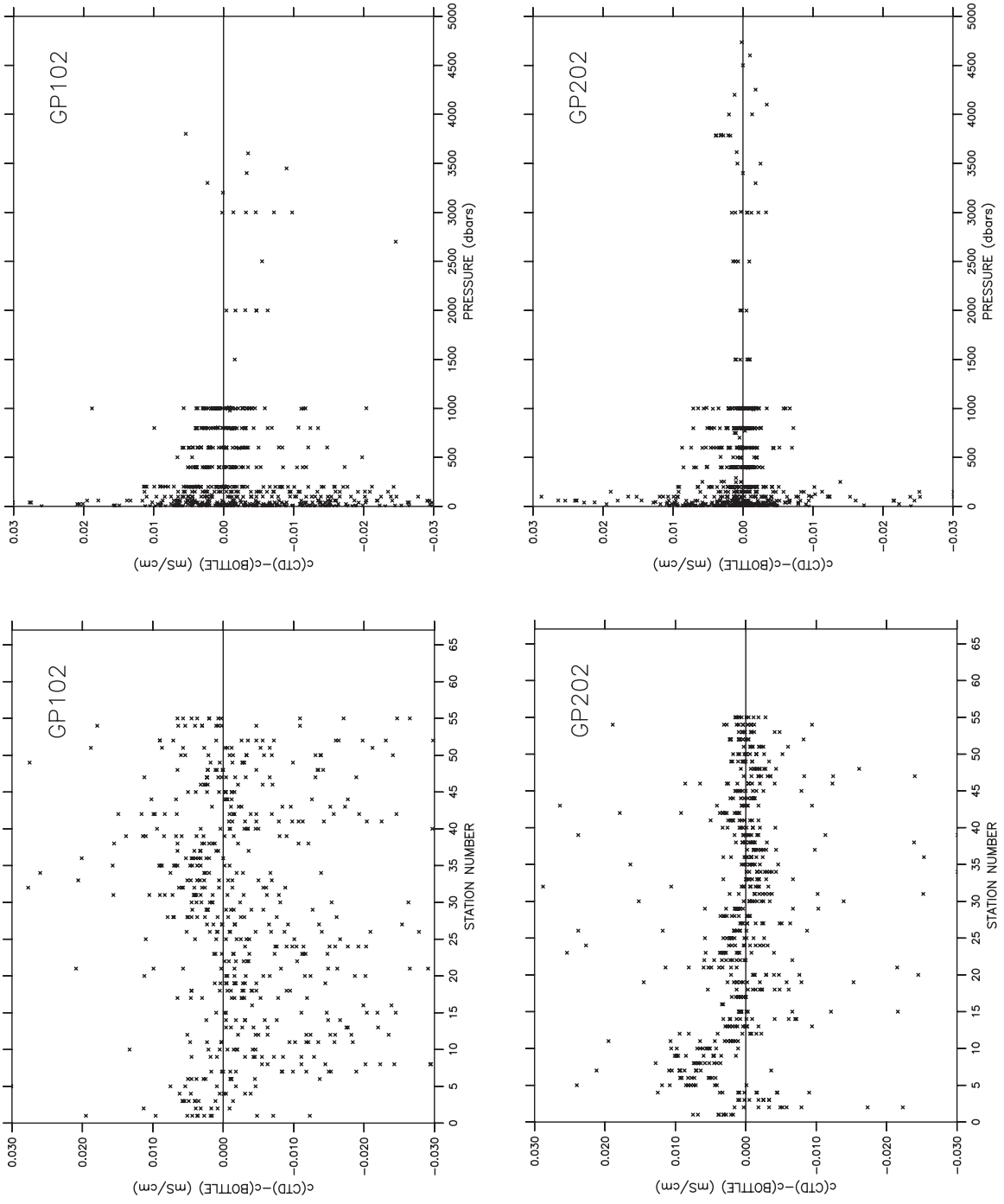

Figure 3e: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP1-02-KA (upper panels) and GP2-02-KA (lower panels).

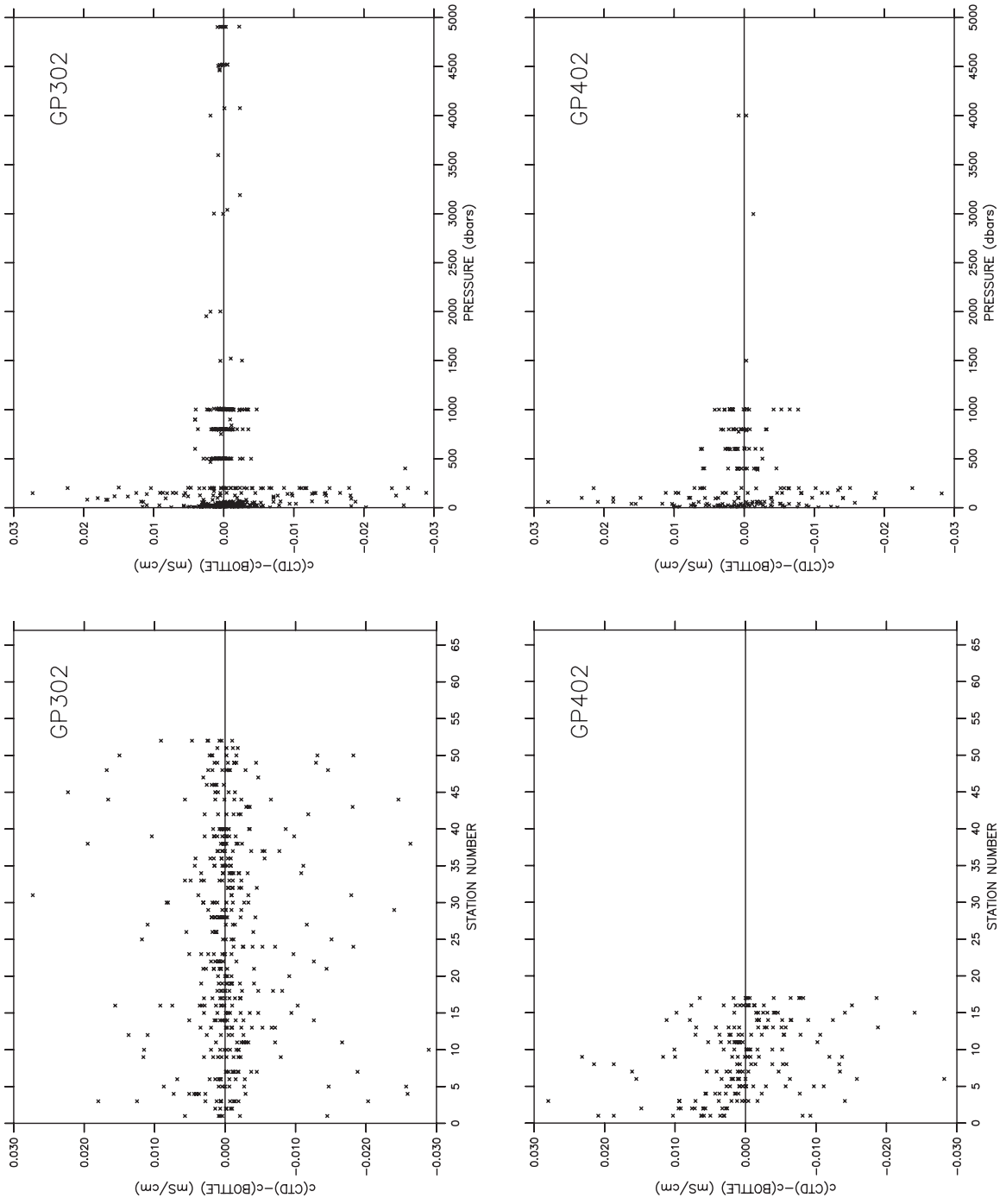

Figure 3f: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP3-02-KA (upper panels) and GP4-02-KA (lower panels).

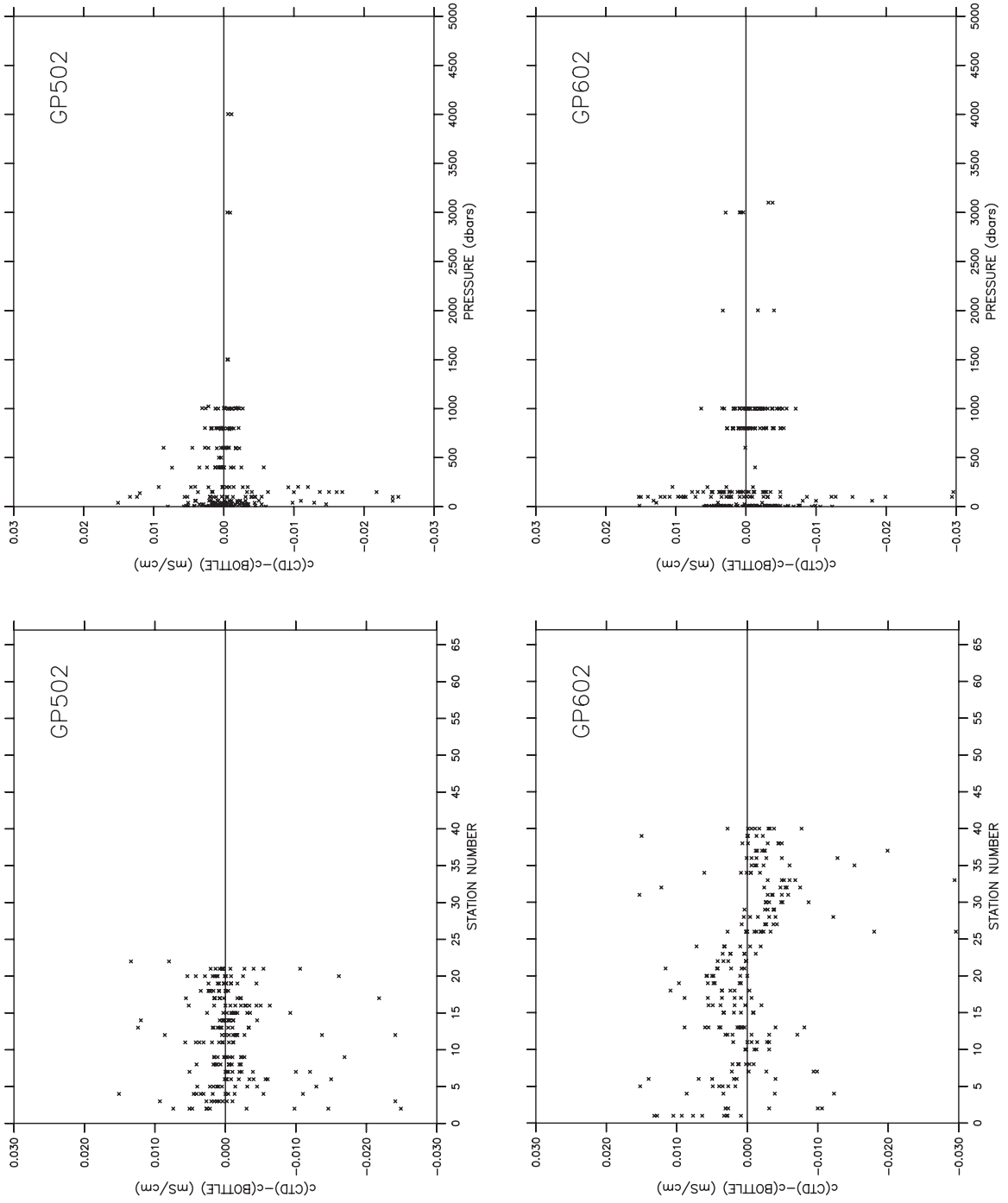

Figure 3g: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP5-02-KA (upper panels) and GP6-02-RB (lower panels).

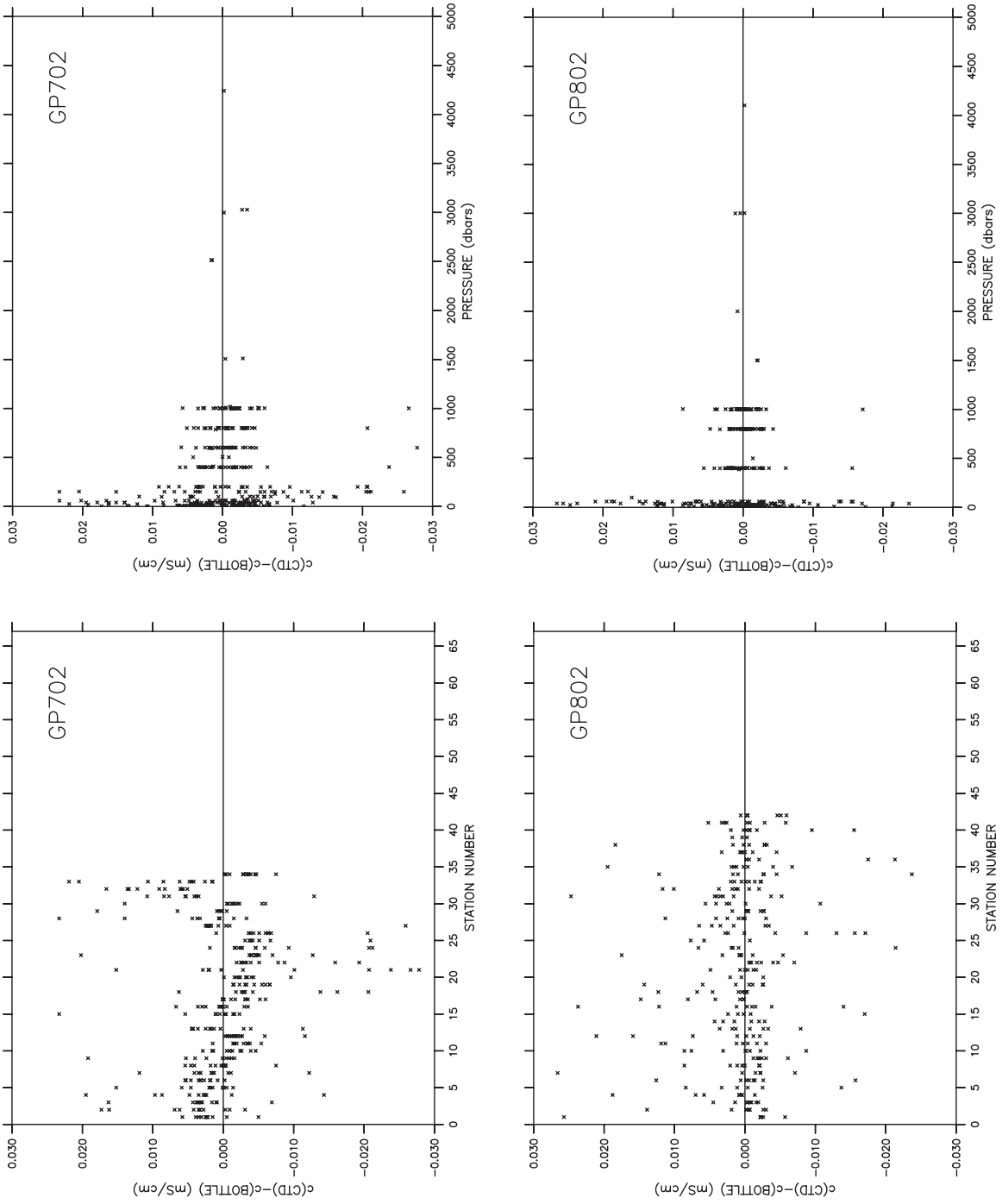

Figure 3h: Calibrated CTD-bottle conductivity differences plotted against station number and pressure for cruises GP7-02-KA (upper panels) and GP8-02-KA (lower panels).

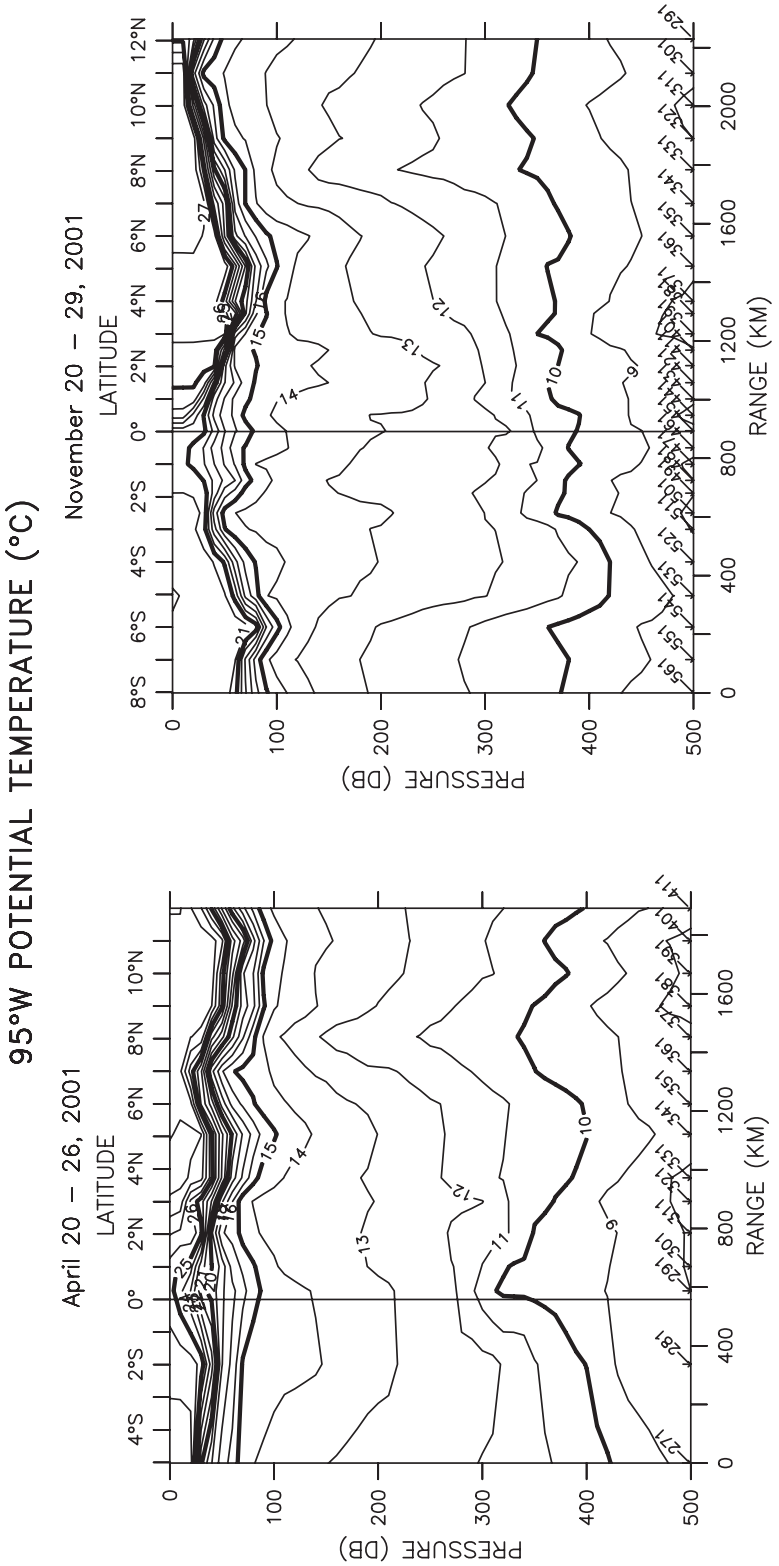

Figure 4: GP2-01-KA boreal spring and GP8-01-RB fall potential temperature (°C) sections along 95°W. Contour intervals are 1°C.

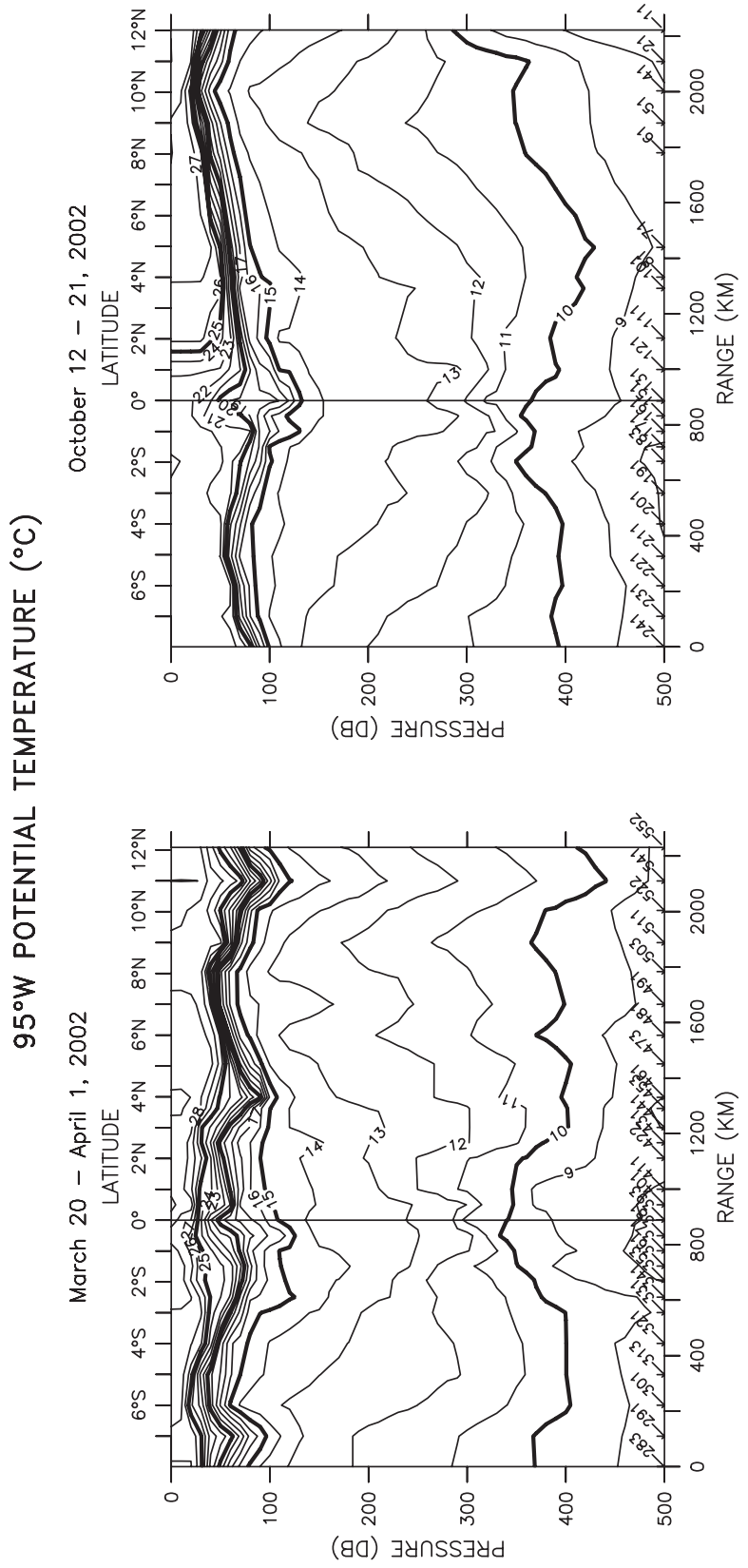

Figure 5: GP1-02-KA boreal spring and GP6-02-RB fall potential temperature (°C) sections along 95°W. Contour intervals are 1°C.

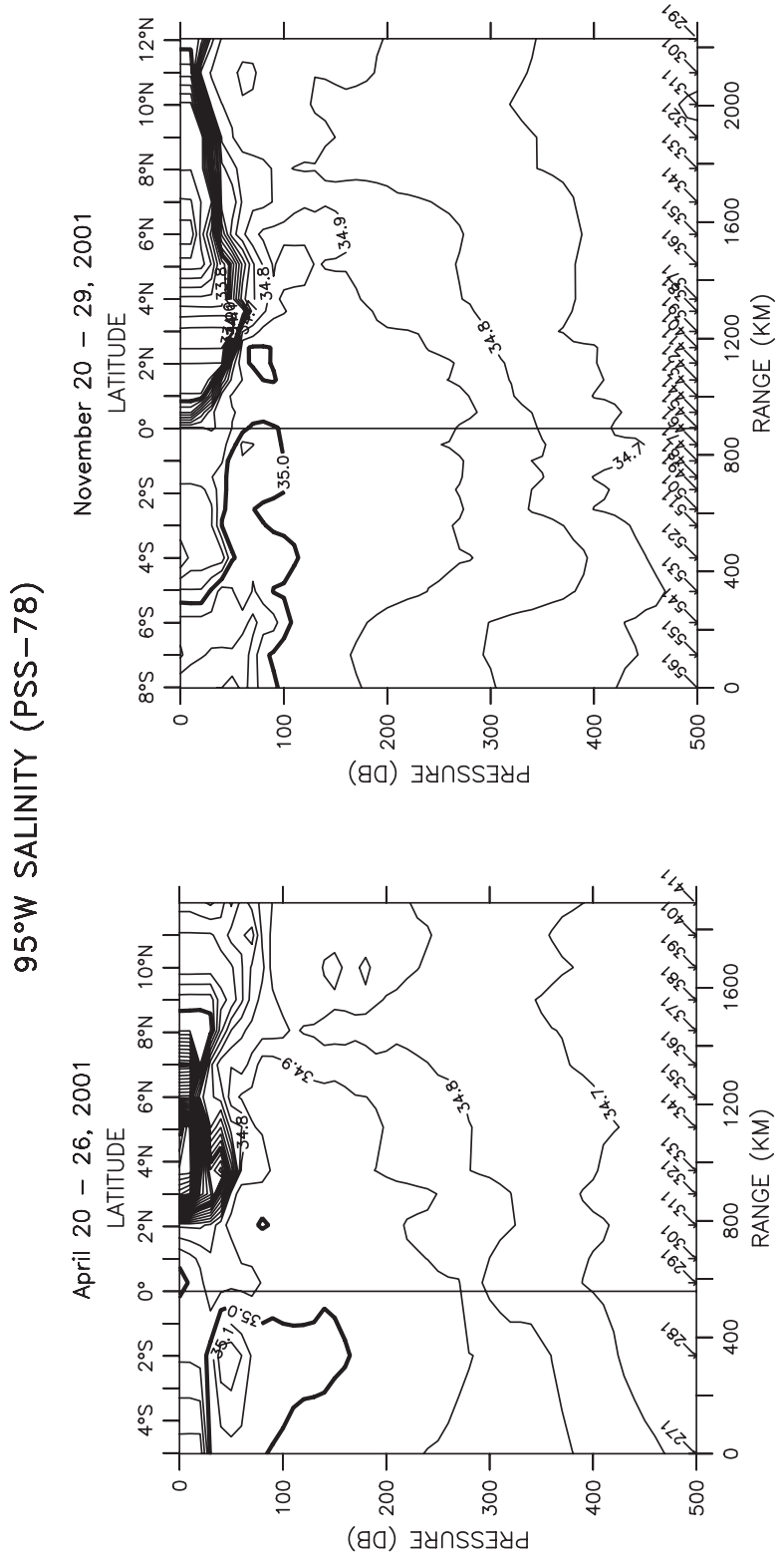

Figure 6: GP2-01-KA boreal spring and GP8-01-RB fall salinity (PSS-78) sections along 95°W. Contour intervals are 0.1 PSS-78.

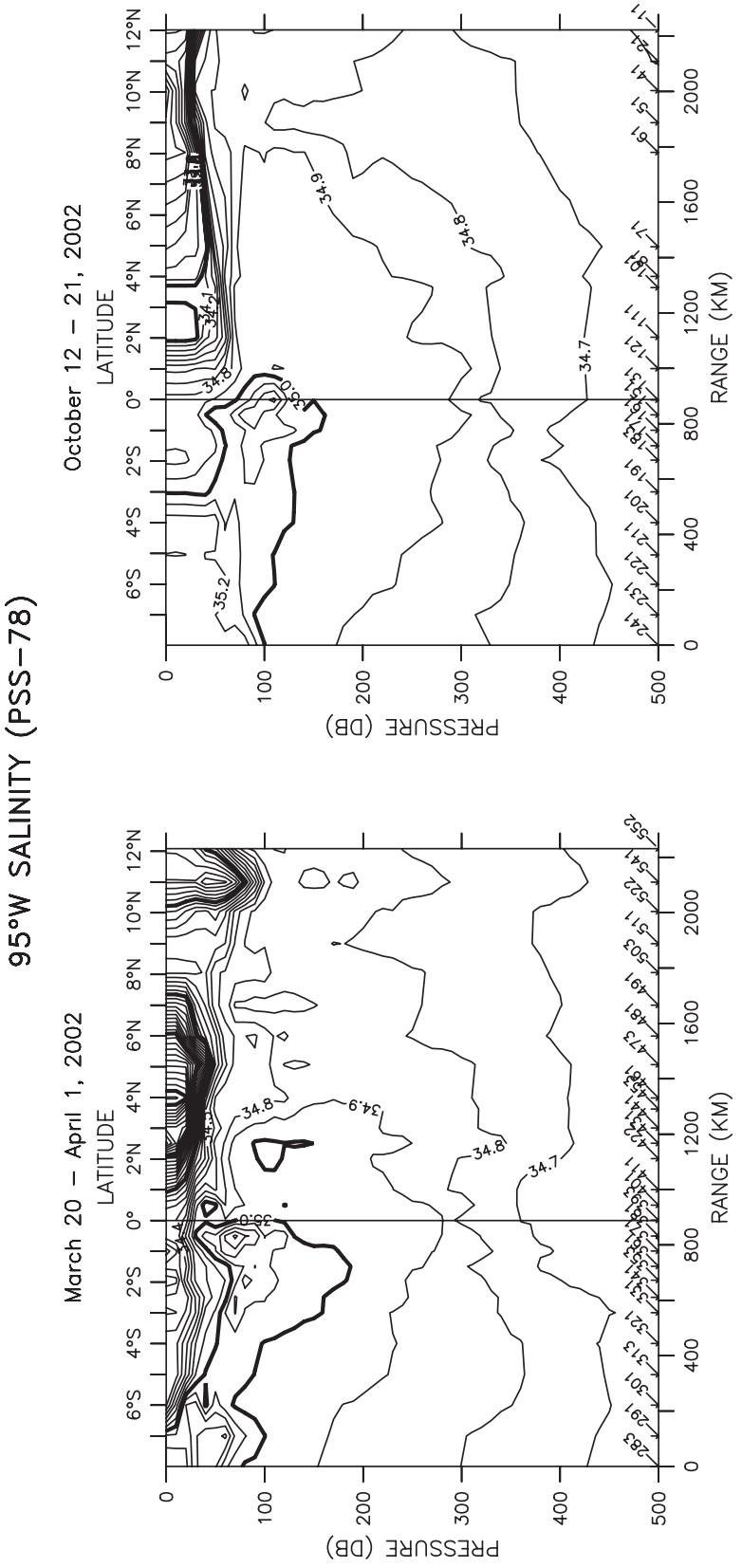

Figure 7: GP1-02-KA boreal spring and GP6-02-RB fall salinity (PSS-78) sections along 95°W. Contour intervals are 0.1 PSS-78.

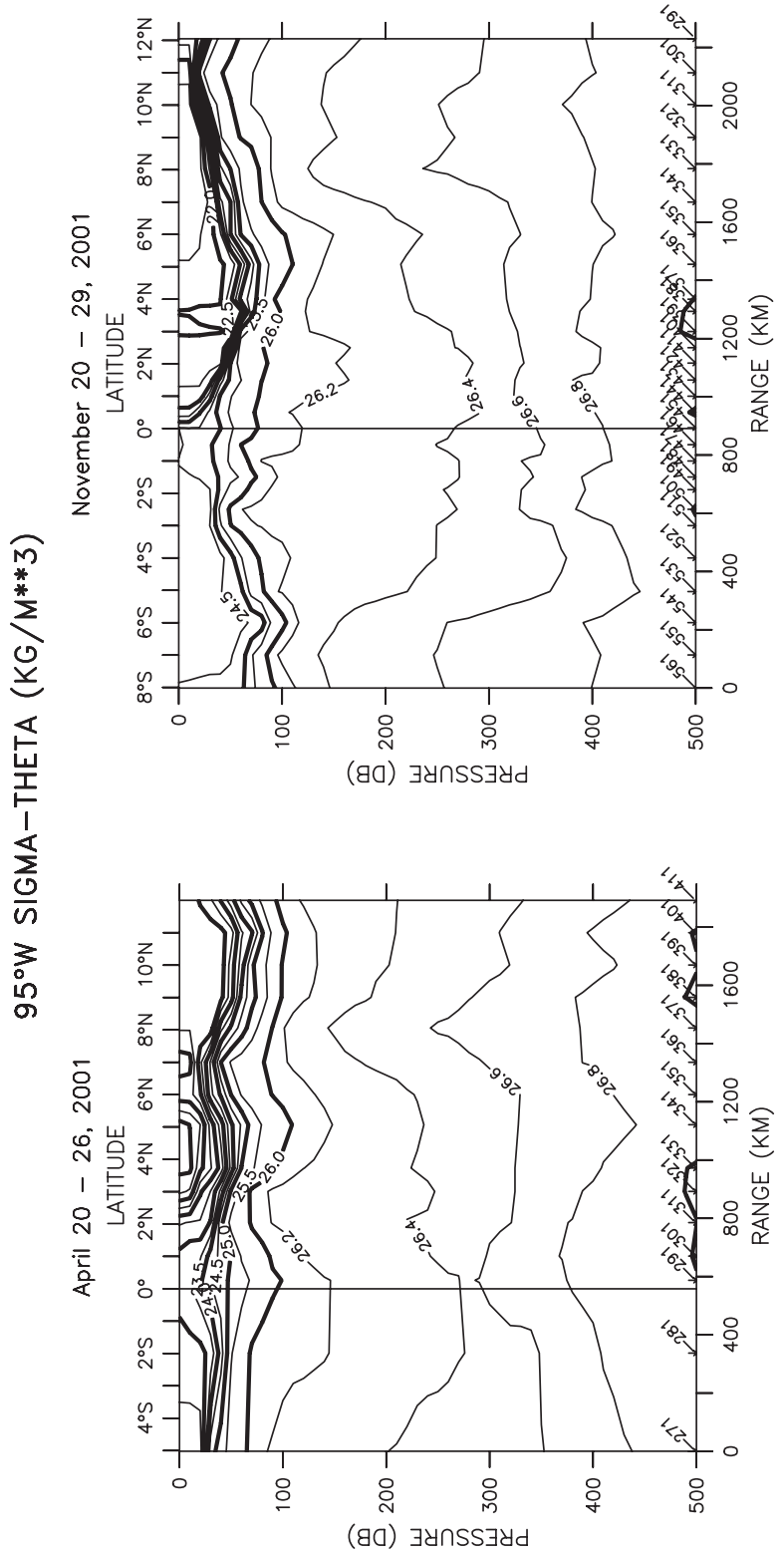

Figure 8: GP2-01-KA boreal spring and GP8-01-RB fall potential density (kg/m^3) sections along 95°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

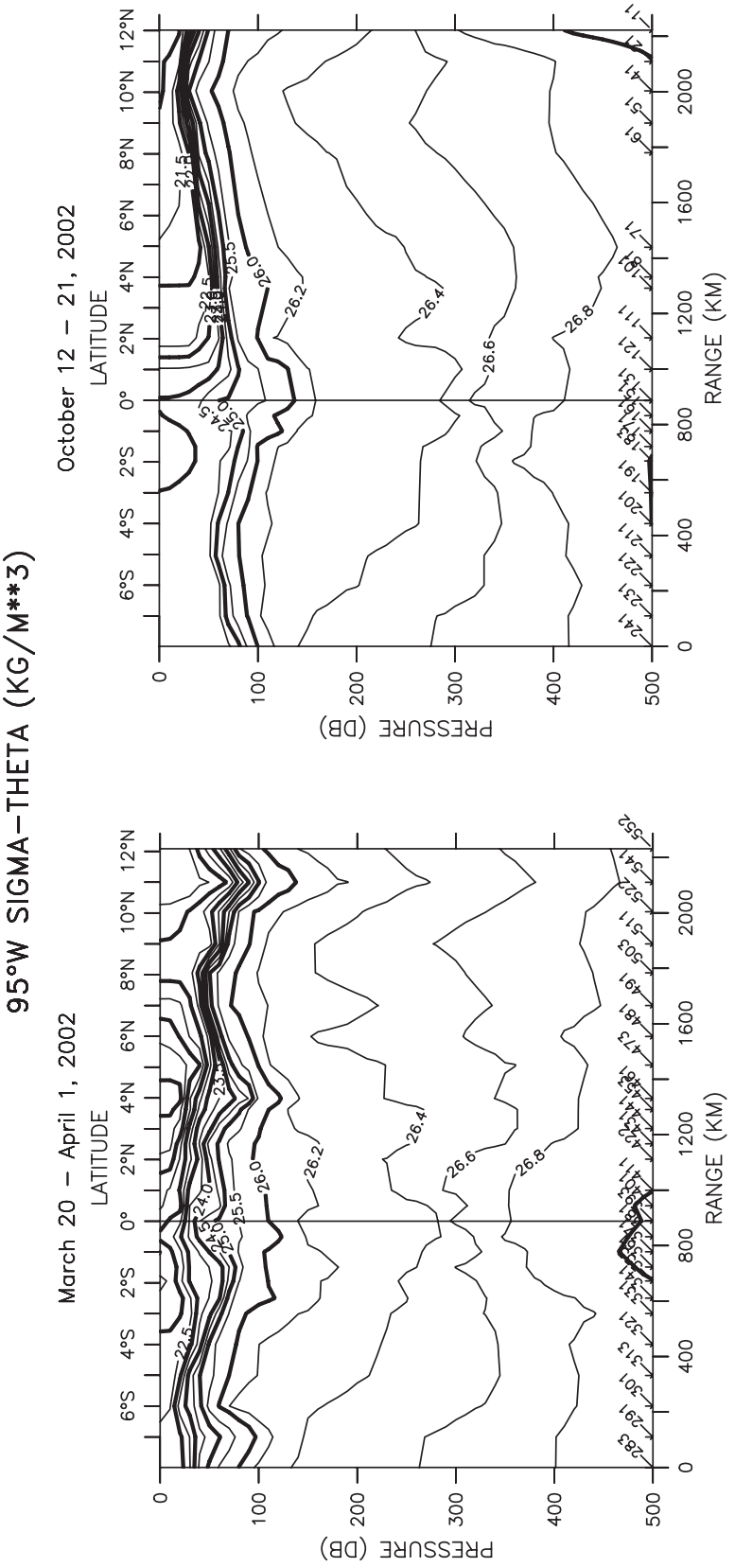

Figure 9: GP1-02-KA boreal spring and GP6-02-RB fall potential density (kg/m^3) sections along 95°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

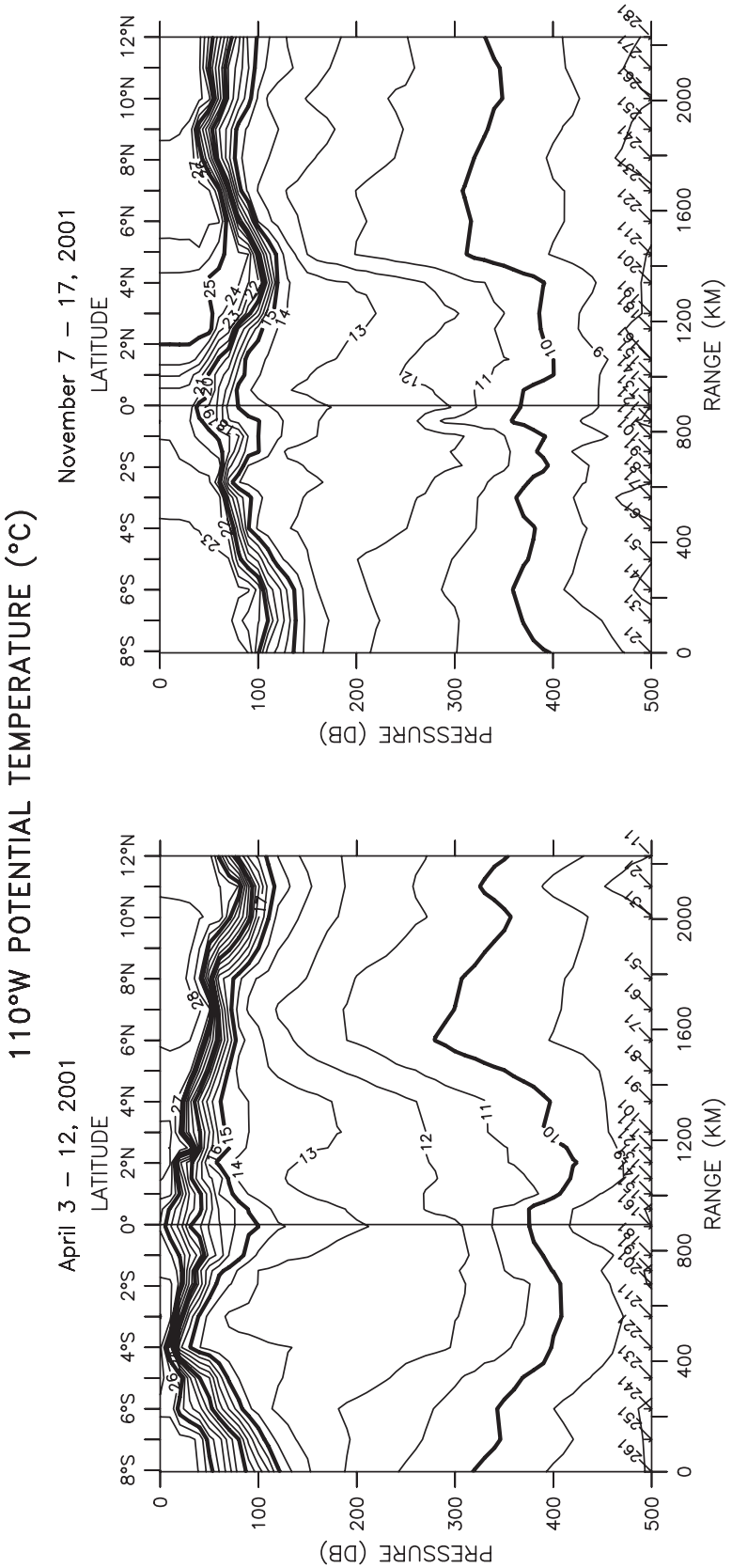

Figure 10: GP2-01-KA boreal spring and GP8-01-RB fall potential temperature (°C) sections along 110°W. Contour intervals are 1°C.

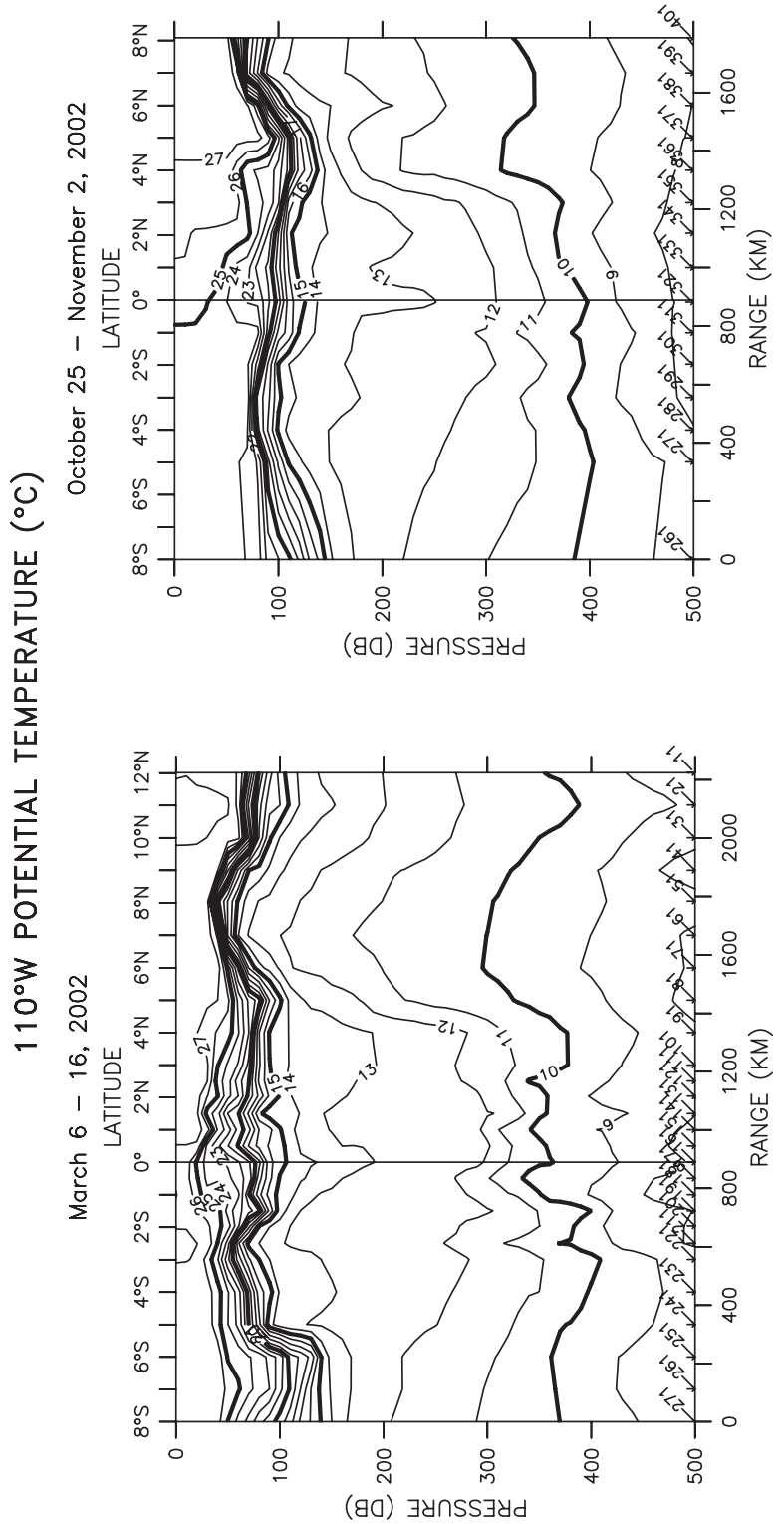

Figure 11: GP1-02-KA boreal spring and GP6-02-RB fall potential temperature (°C) sections along 110°W. Contour intervals are 1°C.

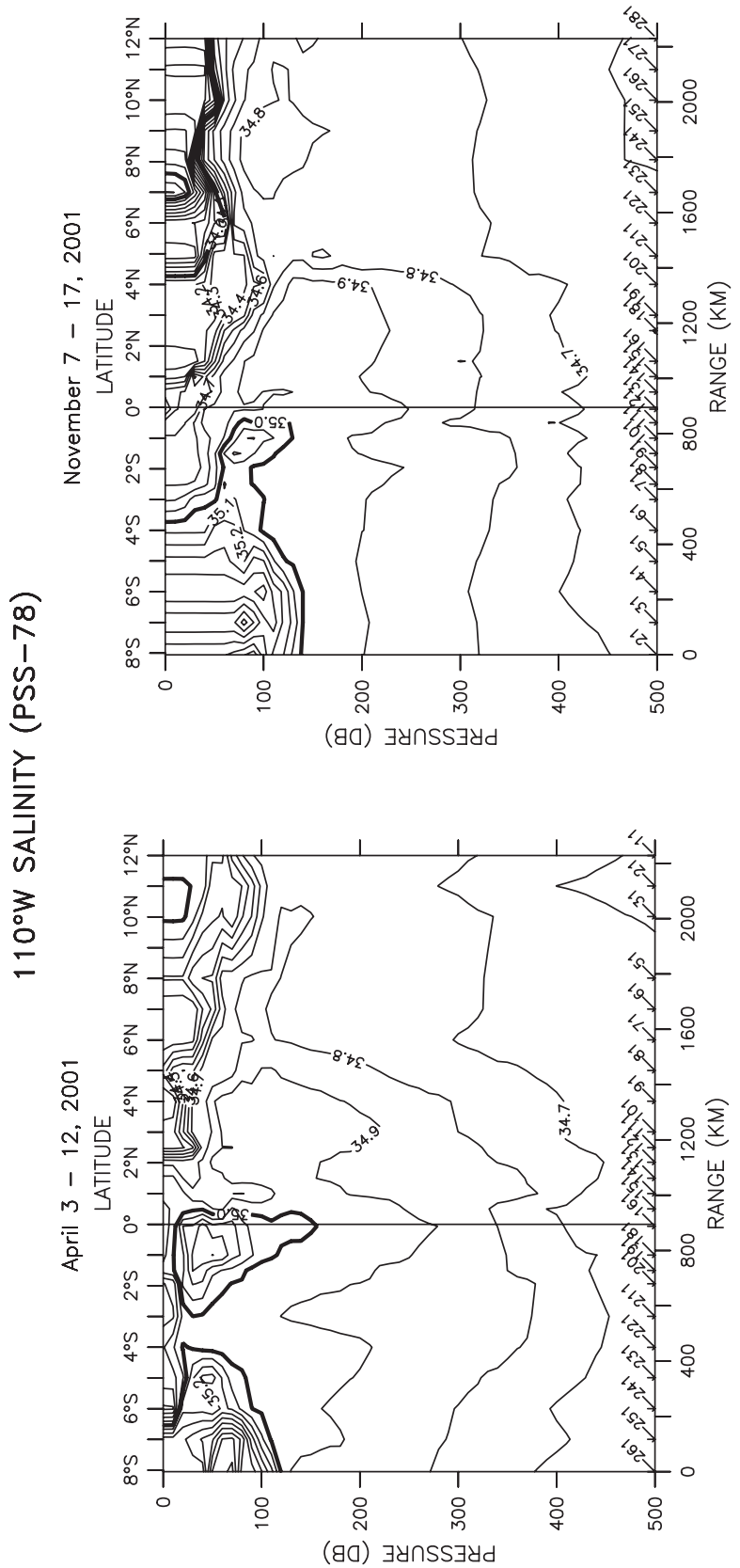

Figure 12: GP2-01-KA boreal spring and GP8-01-RB fall salinity (PSS-78) sections along 110°W. Contour intervals are 0.1 PSS-78.

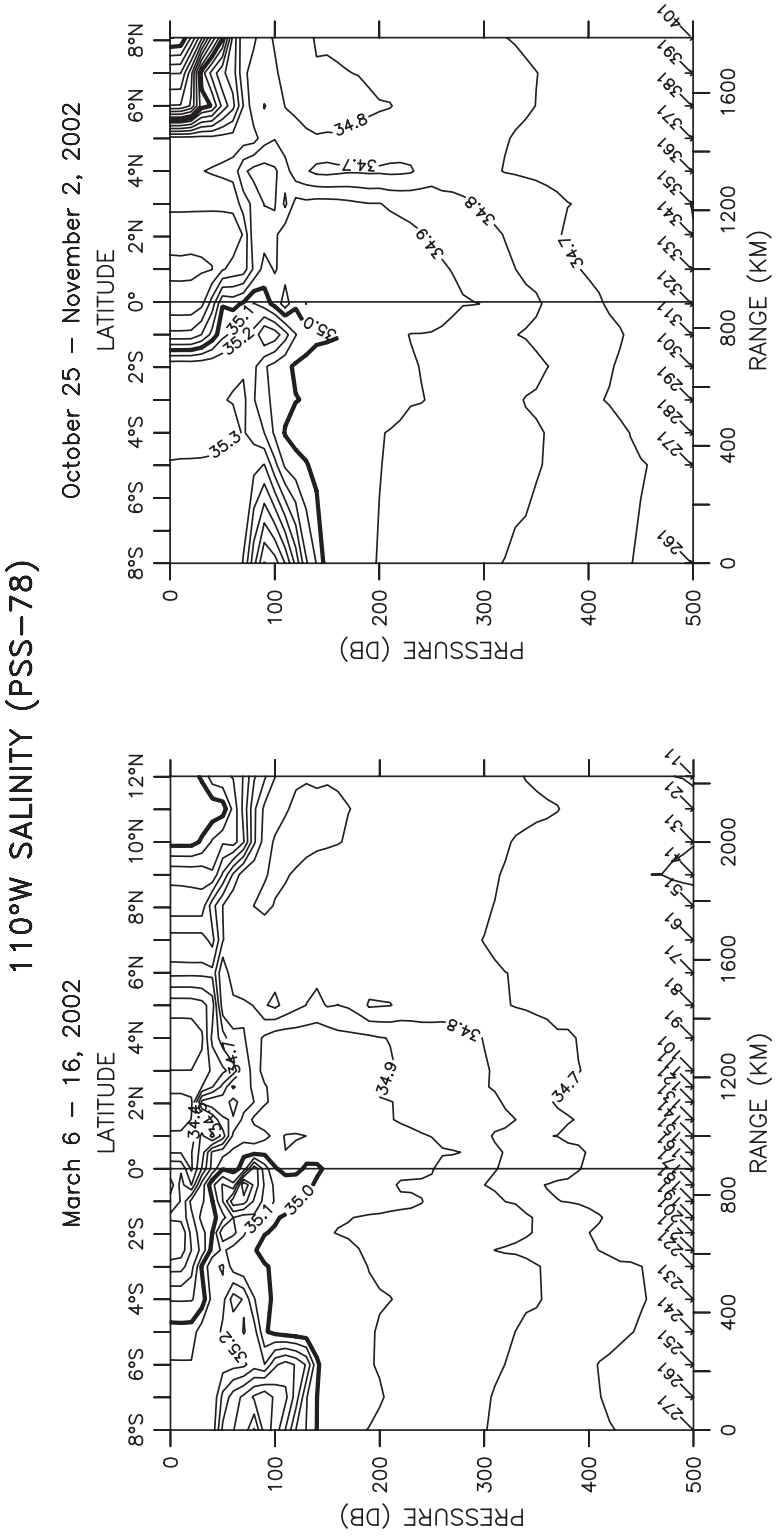

Figure 13: GP1-02-KA boreal spring and GP6-02-RB fall salinity (PSS-78) sections along 110°W. Contour intervals are 0.1 PSS-78.

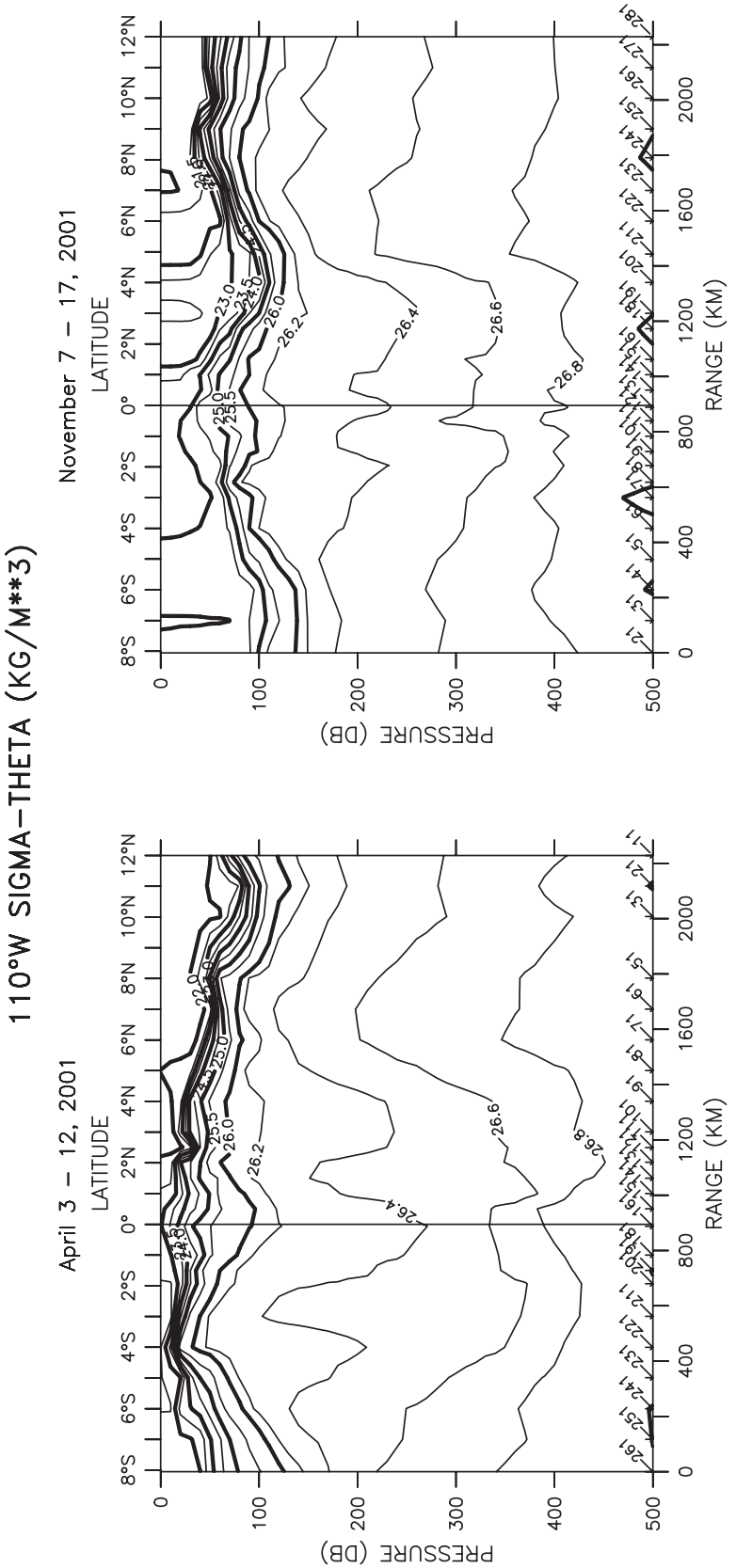

Figure 14: GP2-01-KA boreal spring and GP8-01-RB fall potential density (kg/m^3) sections along 110°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

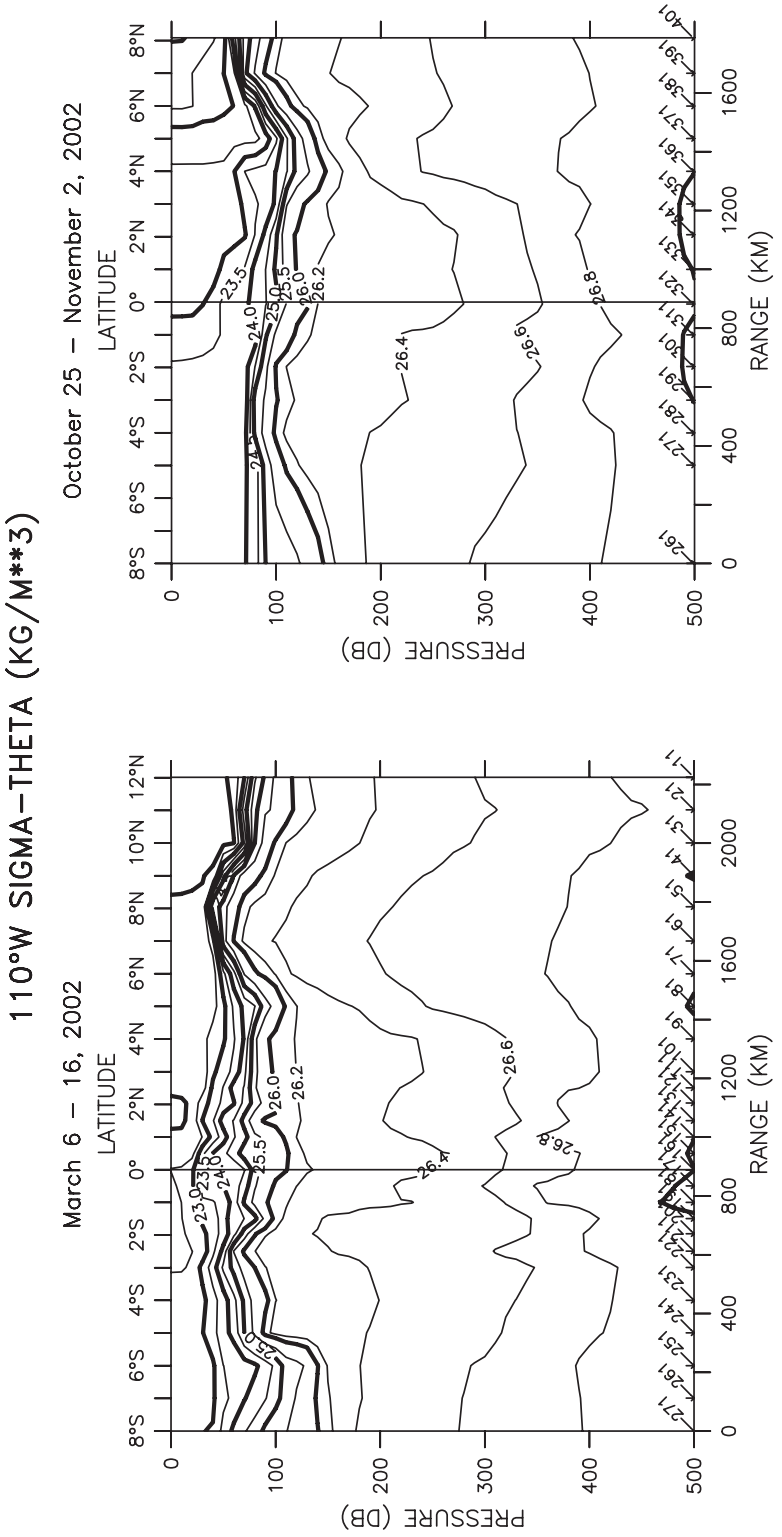

Figure 15: GP1-02-KA boreal spring and GP6-02-RB fall potential density (kg/m^3) sections along 110°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

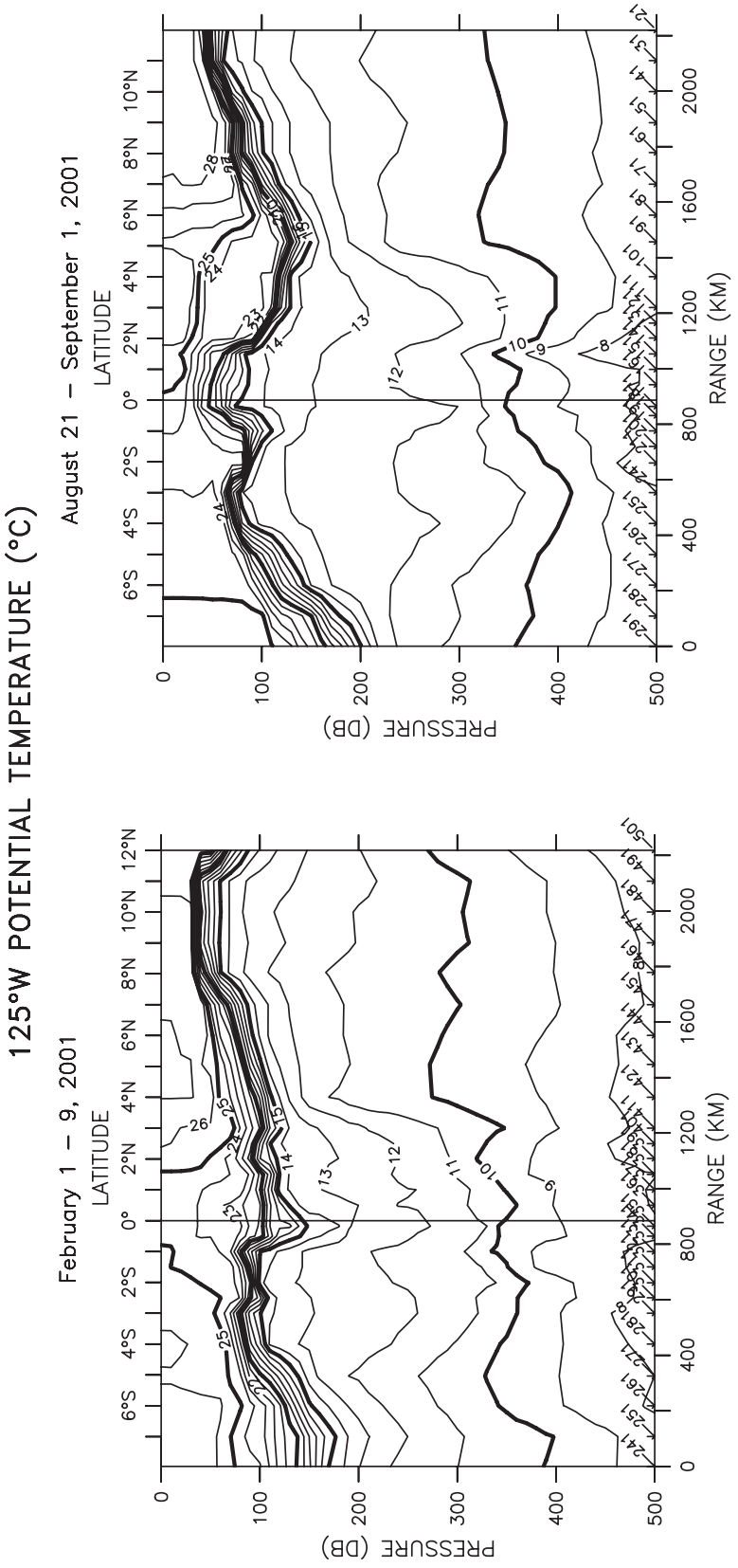

Figure 16: GP1-01-KA boreal winter and GP5-01-KA summer potential temperature (°C) sections along 125°W. Contour intervals are 1°C.

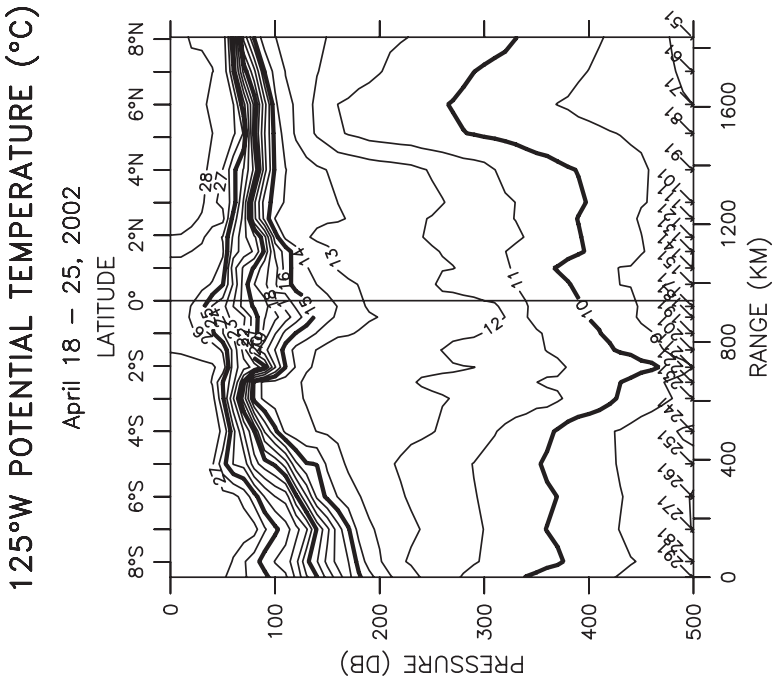

Figure 17: GP2-02-KA boreal spring potential temperature (°C) section along 125°W. Contour intervals are 1°C.

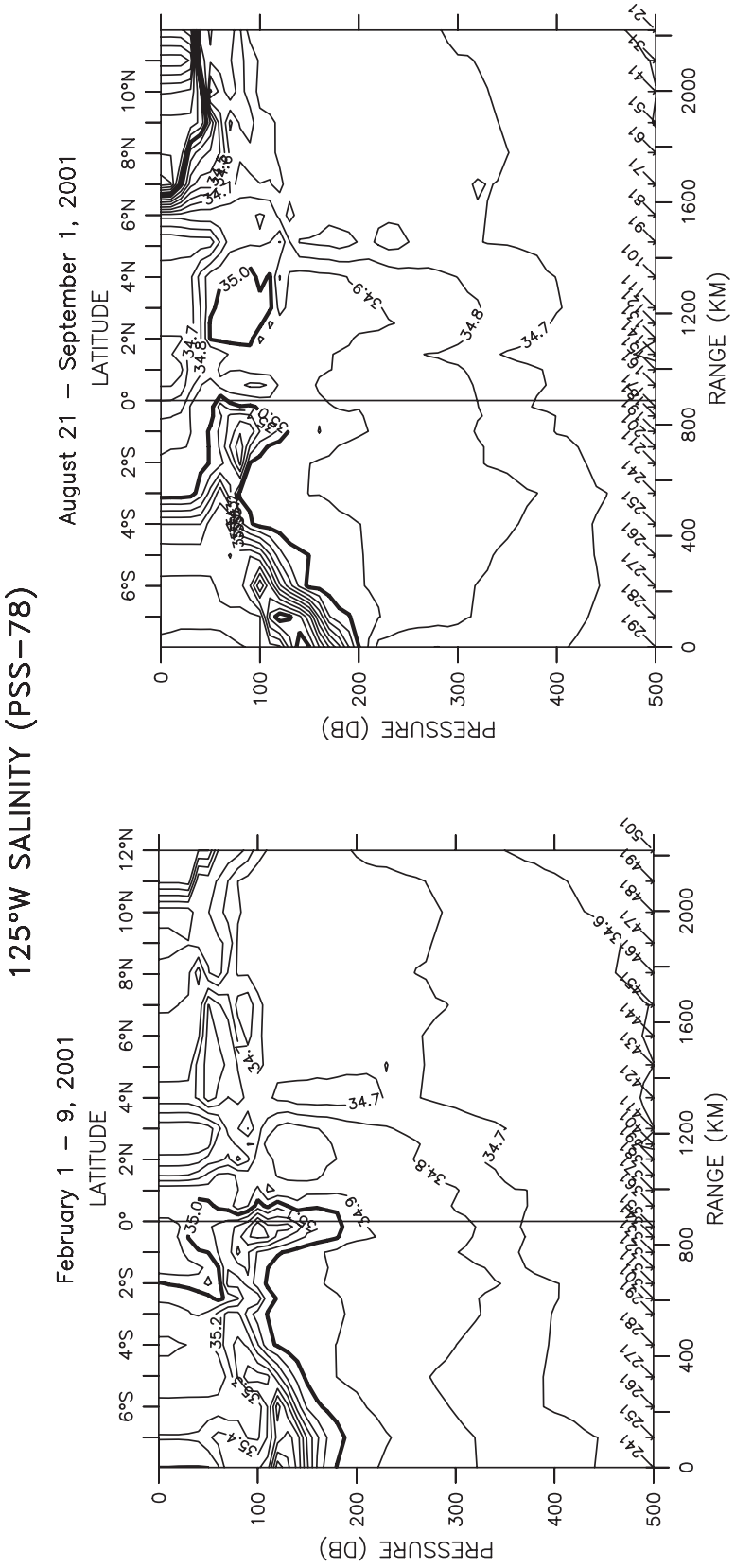

Figure 18: GP1-01-KA boreal winter and GP5-01-KA summer salinity (PSS-78) sections along 125°W. Contour intervals are 0.1 PSS-78.

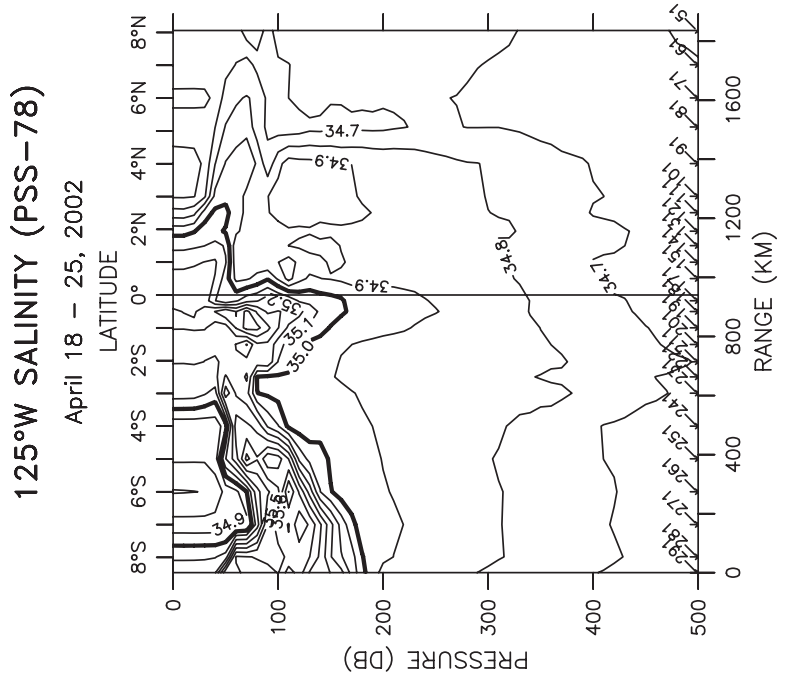

Figure 19: GP2-02-KA boreal spring salinity (PSS-78) section along 125°W. Contour intervals are 0.1 PSS-78.

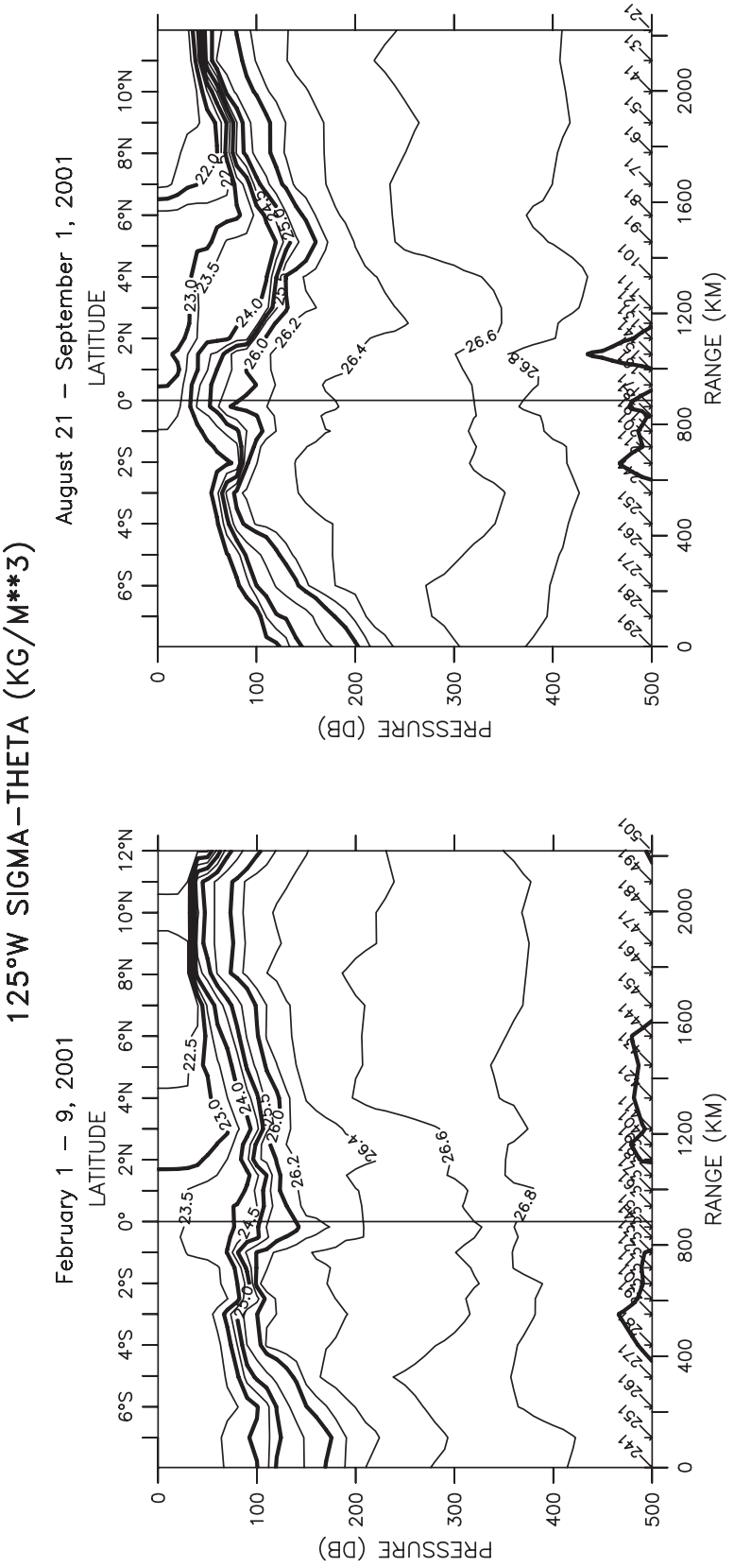

Figure 20: GP1-01-KA boreal winter and GP5-01-KA summer potential density (kg/m^3) sections along 125°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

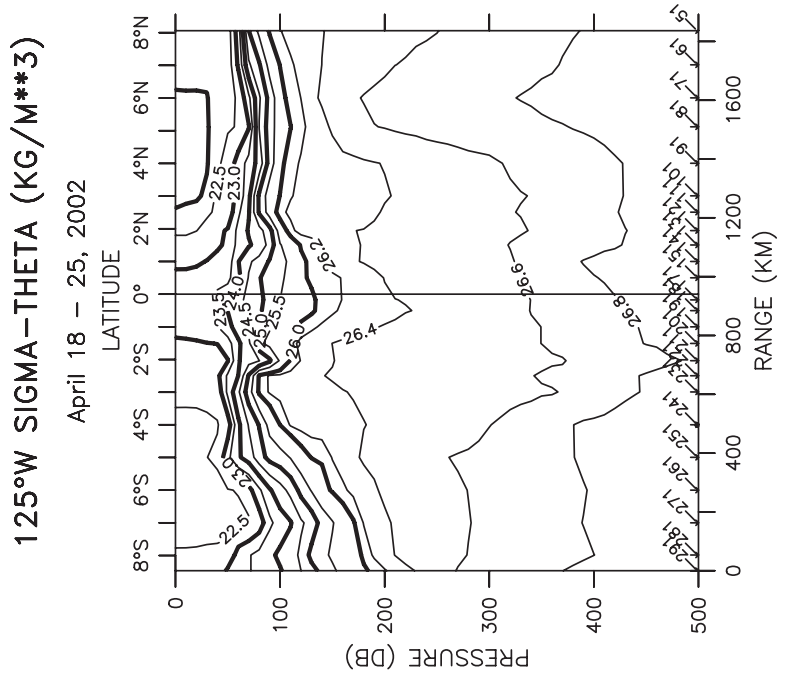

Figure 21: GP2-02-KA boreal spring potential density (kg/m^3) section along 125°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

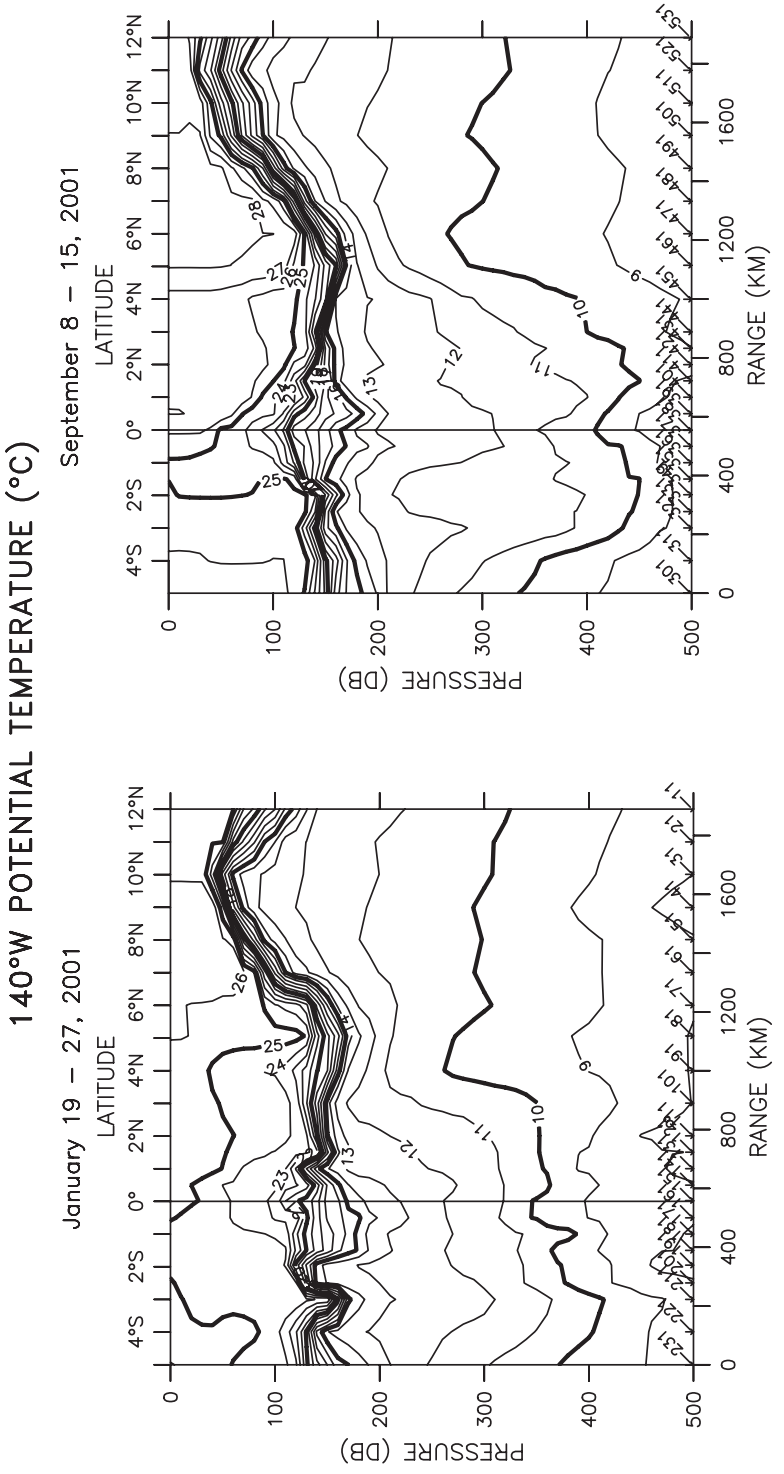

Figure 22: GP1-01-KA boreal winter and GP5-01-KA fall potential temperature (°C) sections along 140°W. Contour intervals are 1°C.

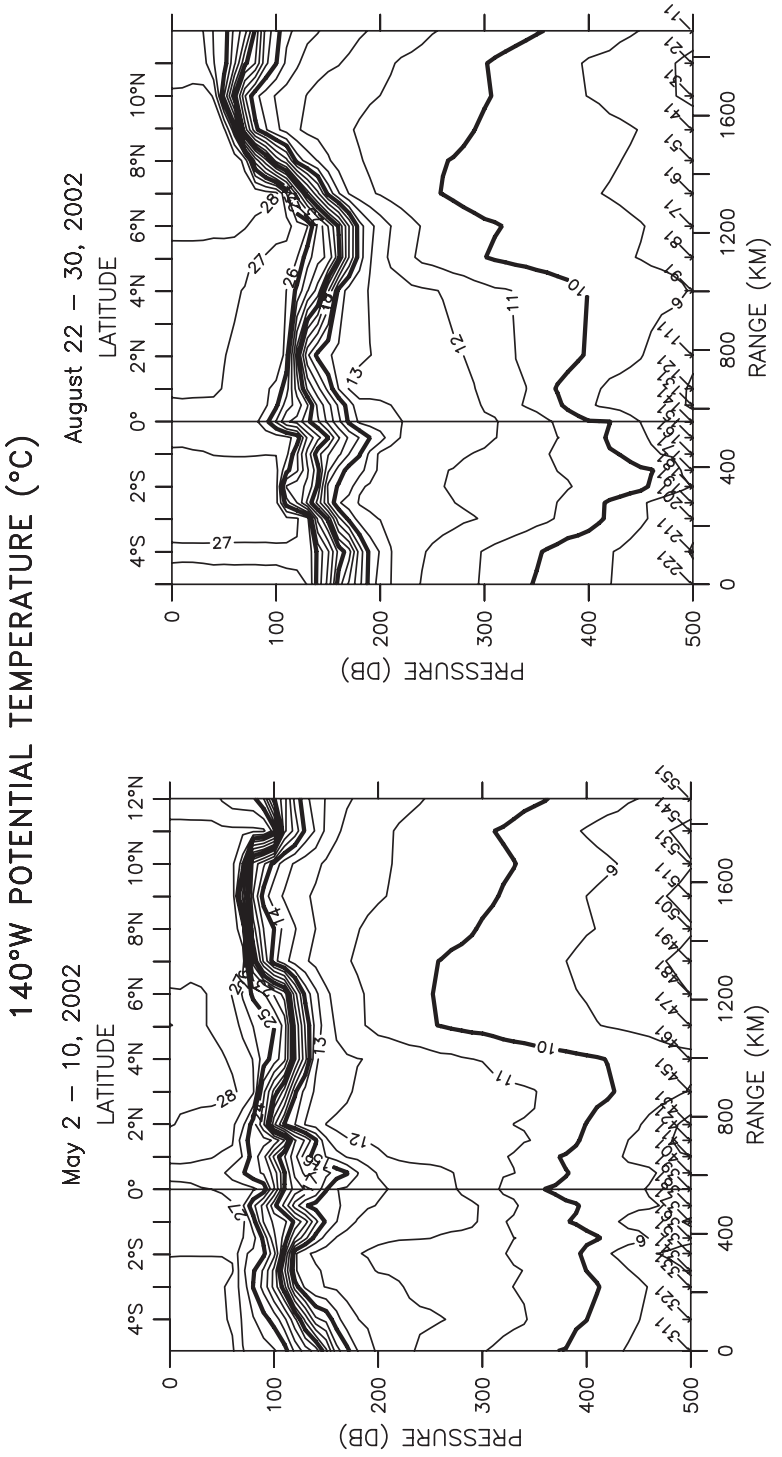

Figure 23: GP2-02-KA boreal spring and GP5-02-KA summer potential temperature (°C) sections along 140°W. Contour intervals are 1°C.

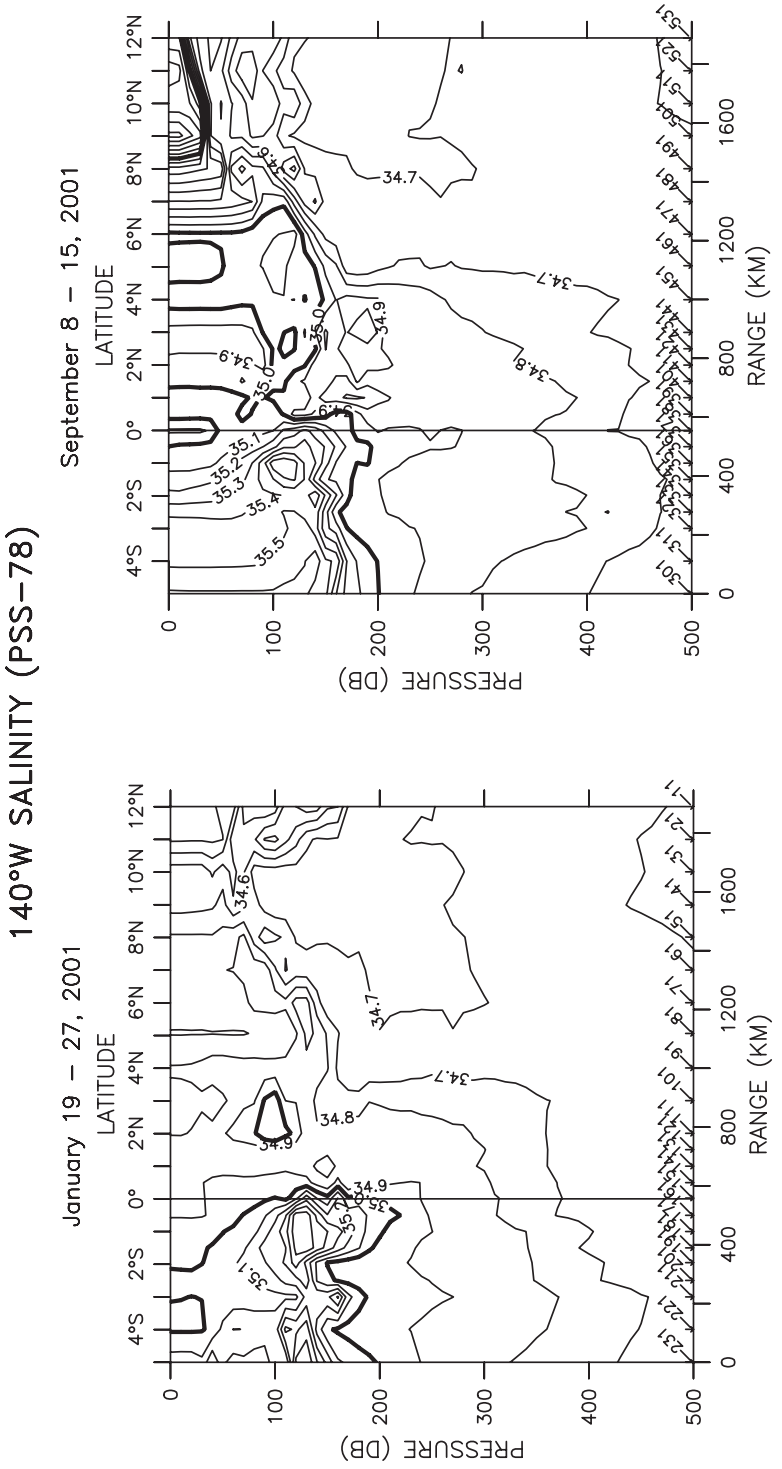

Figure 24: GP1-01-KA boreal winter and GP5-01-KA fall salinity (PSS-78) sections along 140°W. Contour intervals are 0.1 PSS-78.

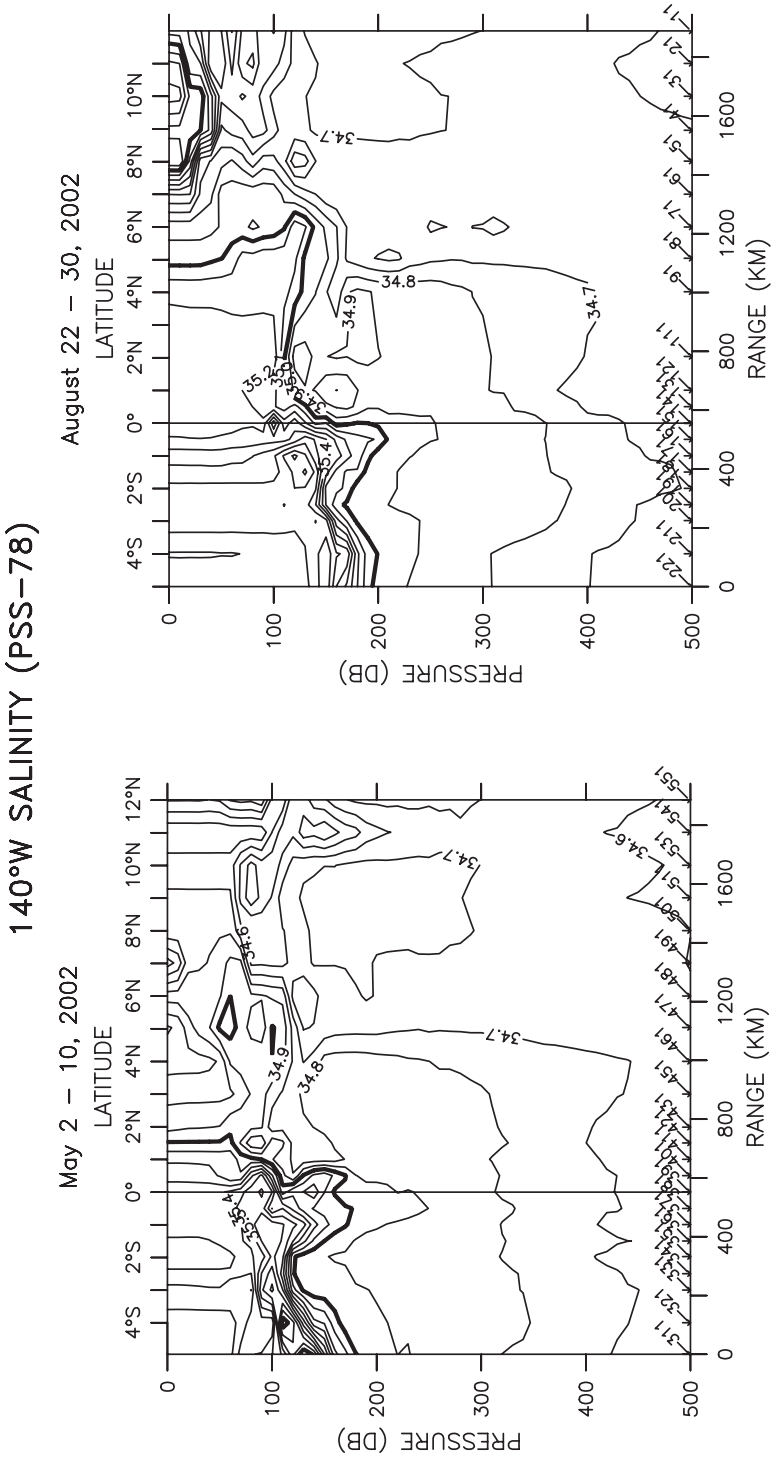

Figure 25: GP2-02-KA boreal spring and GP5-02-KA summer salinity (PSS-78) sections along 140°W. Contour intervals are 0.1 PSS-78.

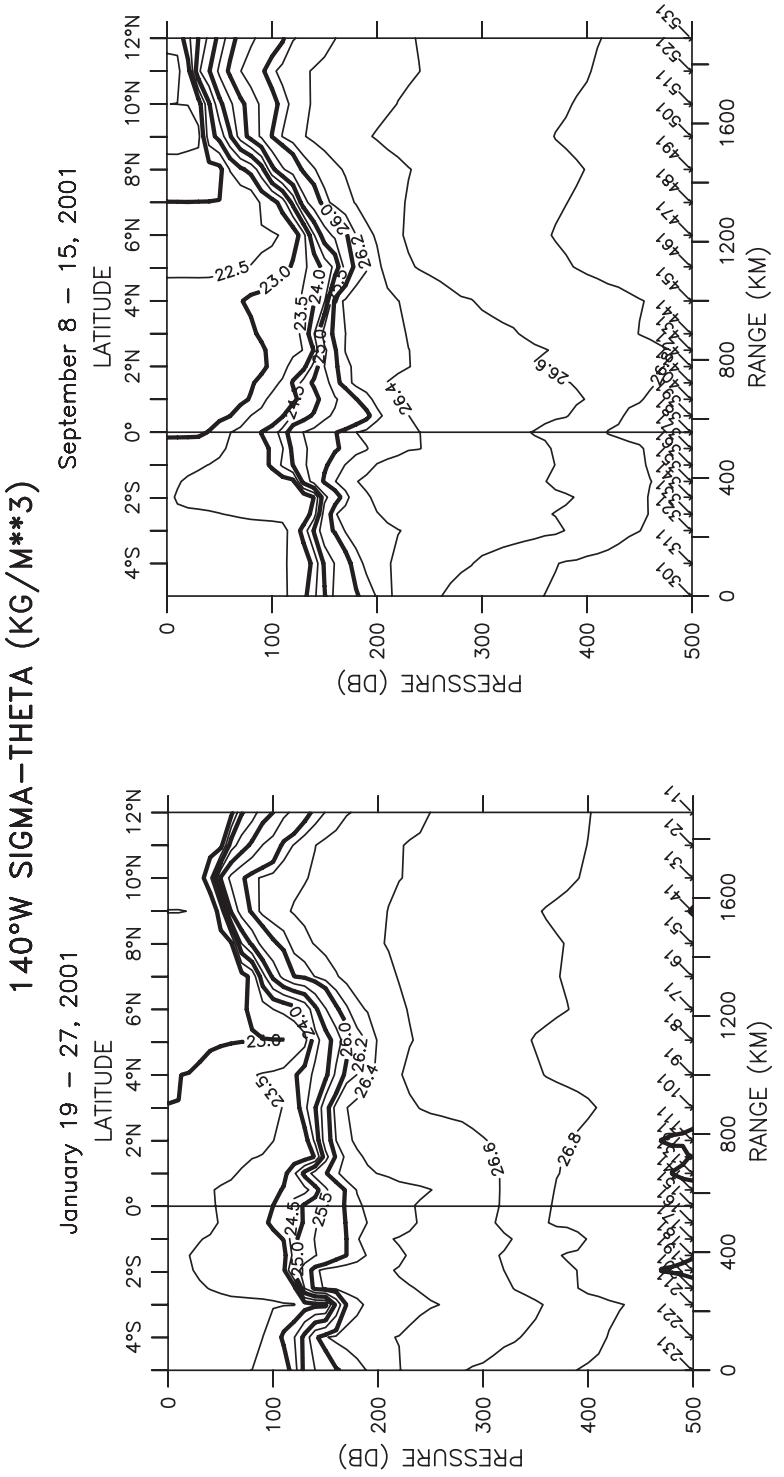

Figure 26: GP1-01-KA boreal winter and GP5-01-KA fall potential density (kg/m^3) sections along 140°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

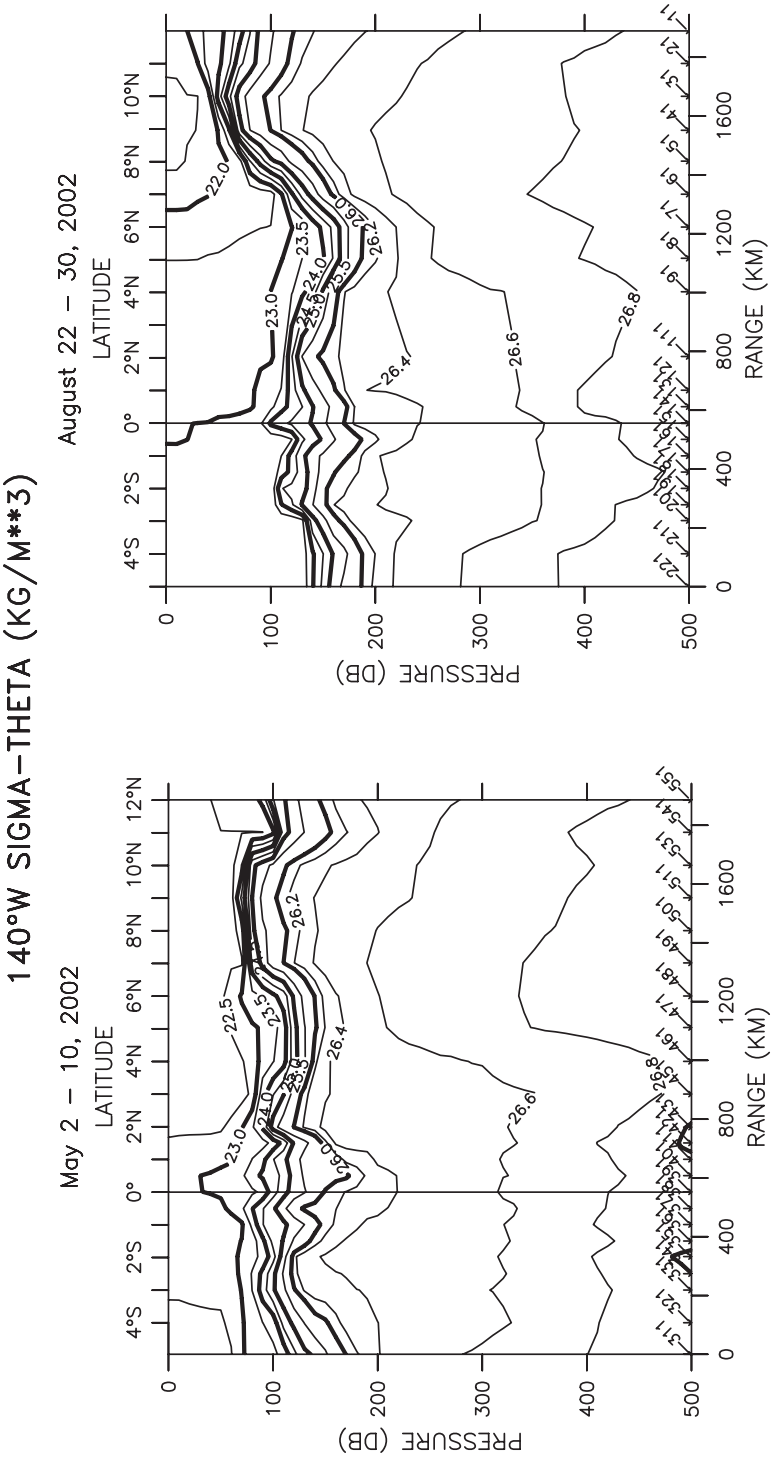

Figure 27: GP2-02-KA boreal spring and GP5-02-KA summer potential density (kg/m^3) sections along 140°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

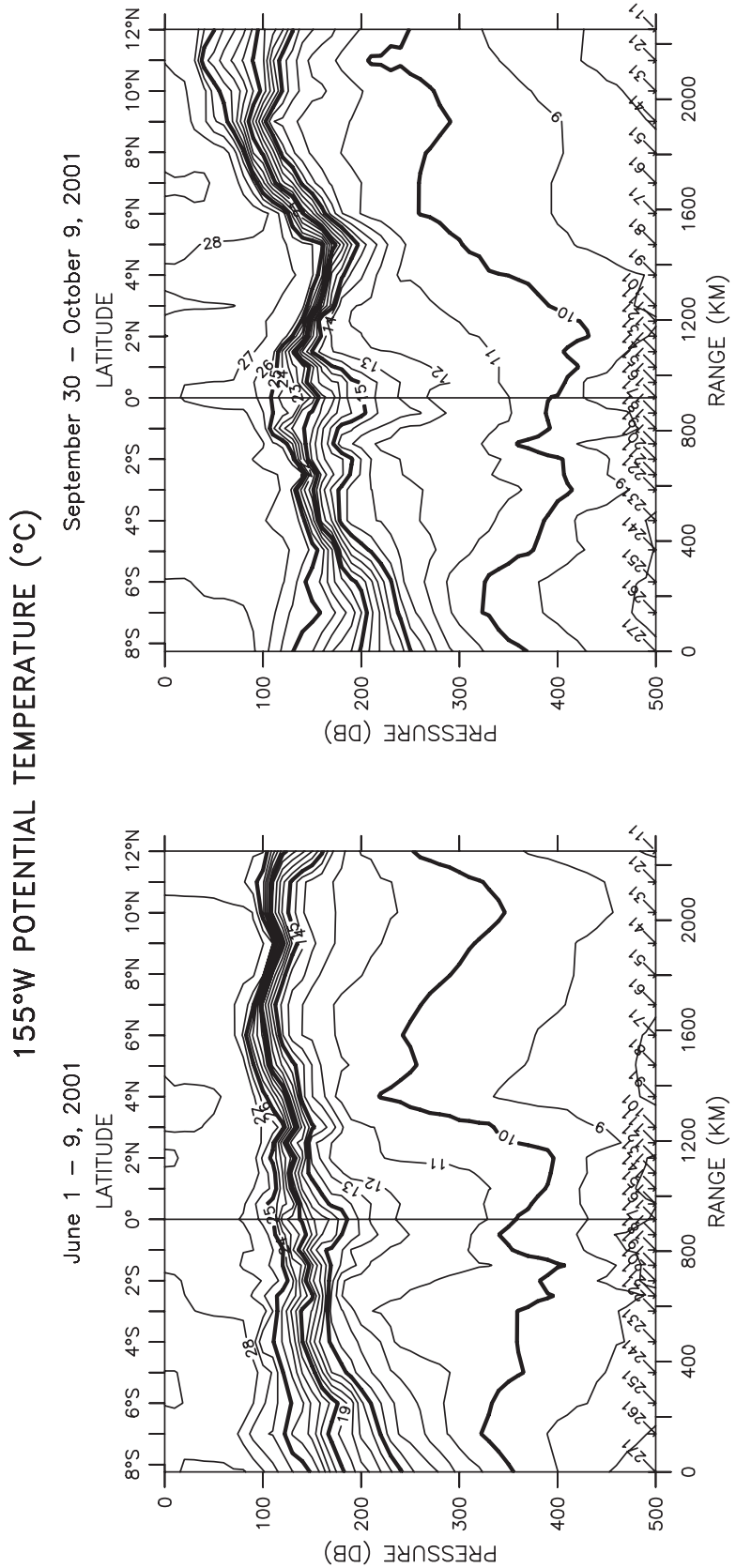

Figure 28: GP3-01-KA boreal summer and GP7-01-KA fall potential temperature (°C) sections along 155°W. Contour intervals are 1°C.

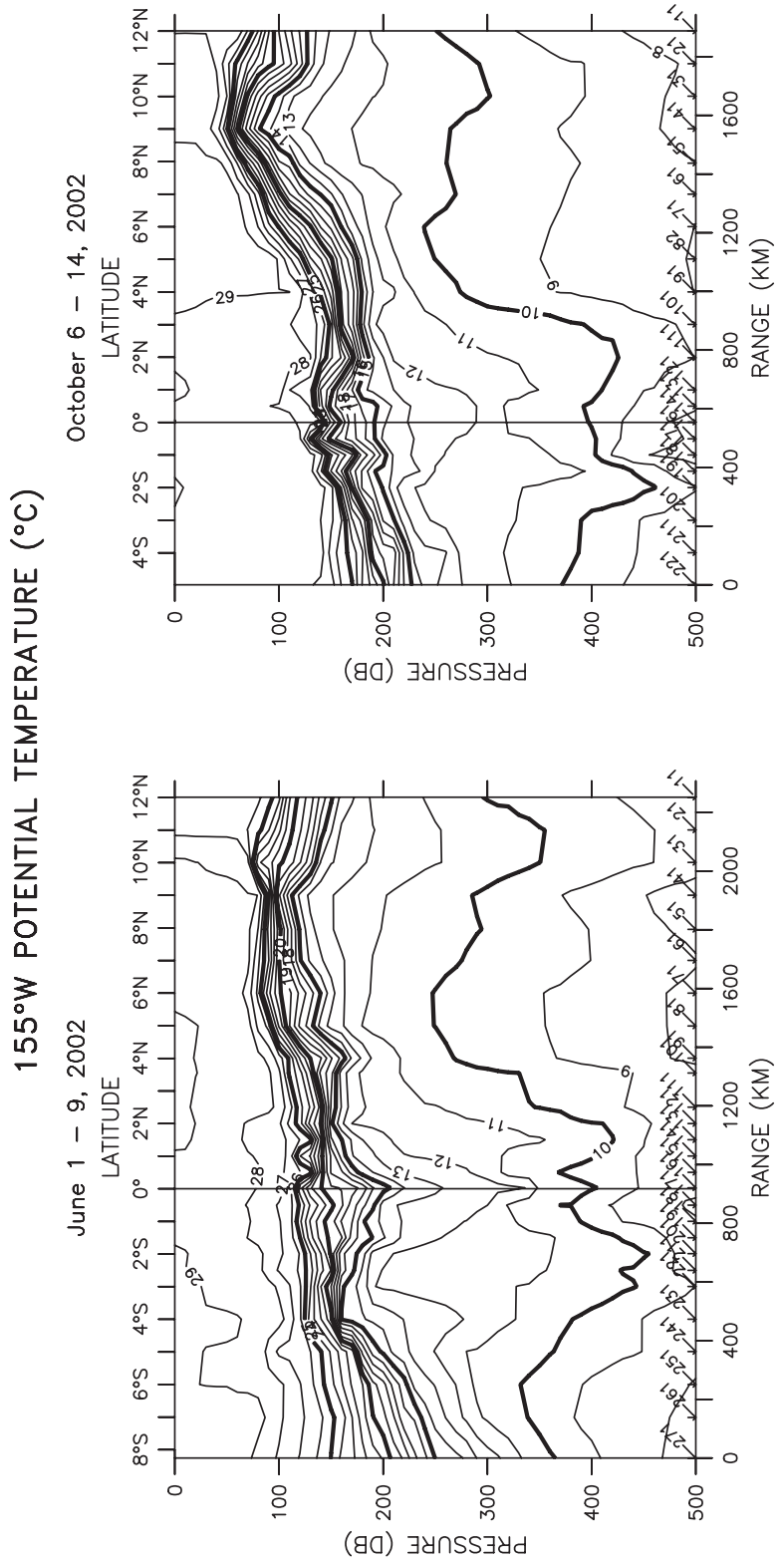

Figure 29: GP3-02-KA boreal summer and GP7-02-KA fall potential temperature (°C) sections along 155°W. Contour intervals are 1°C.

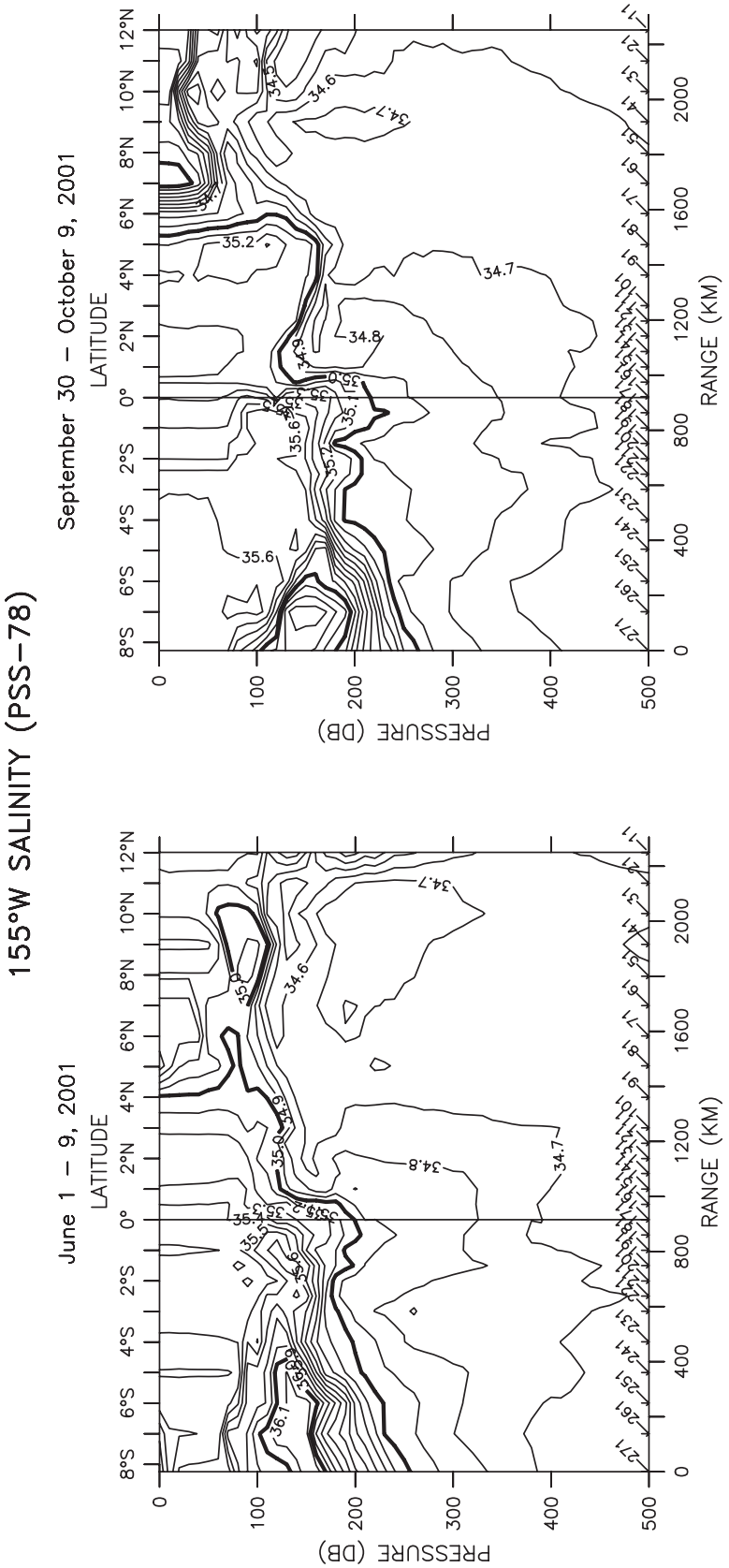

Figure 30: GP3-01-KA boreal summer and GP7-01-KA fall salinity (PSS-78) sections along 155°W. Contour intervals are 0.1 PSS-78.

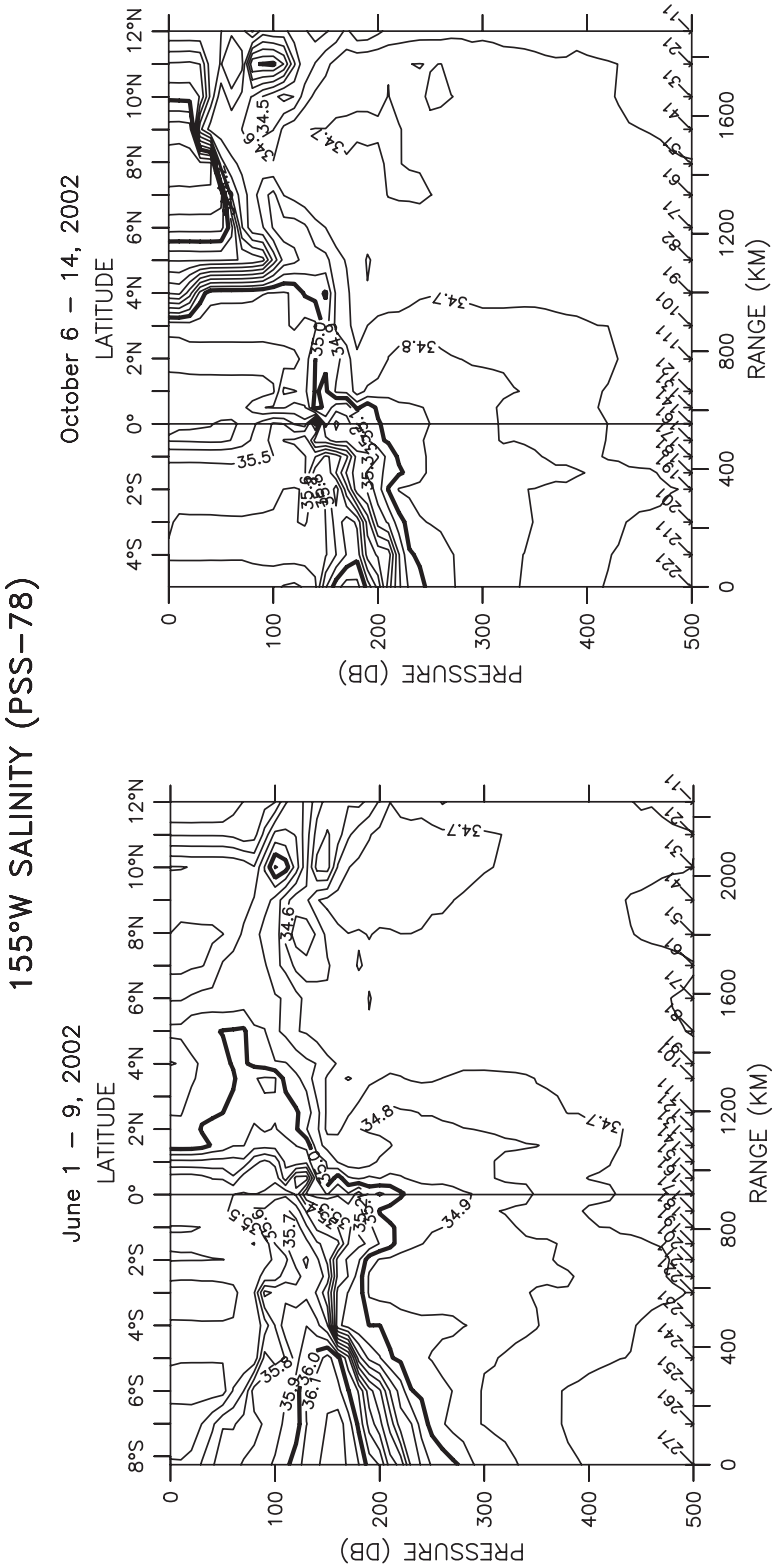

Figure 31: GP3-02-KA boreal summer and GP7-02-KA fall salinity (PSS-78) sections along 155°W. Contour intervals are 0.1 PSS-78.

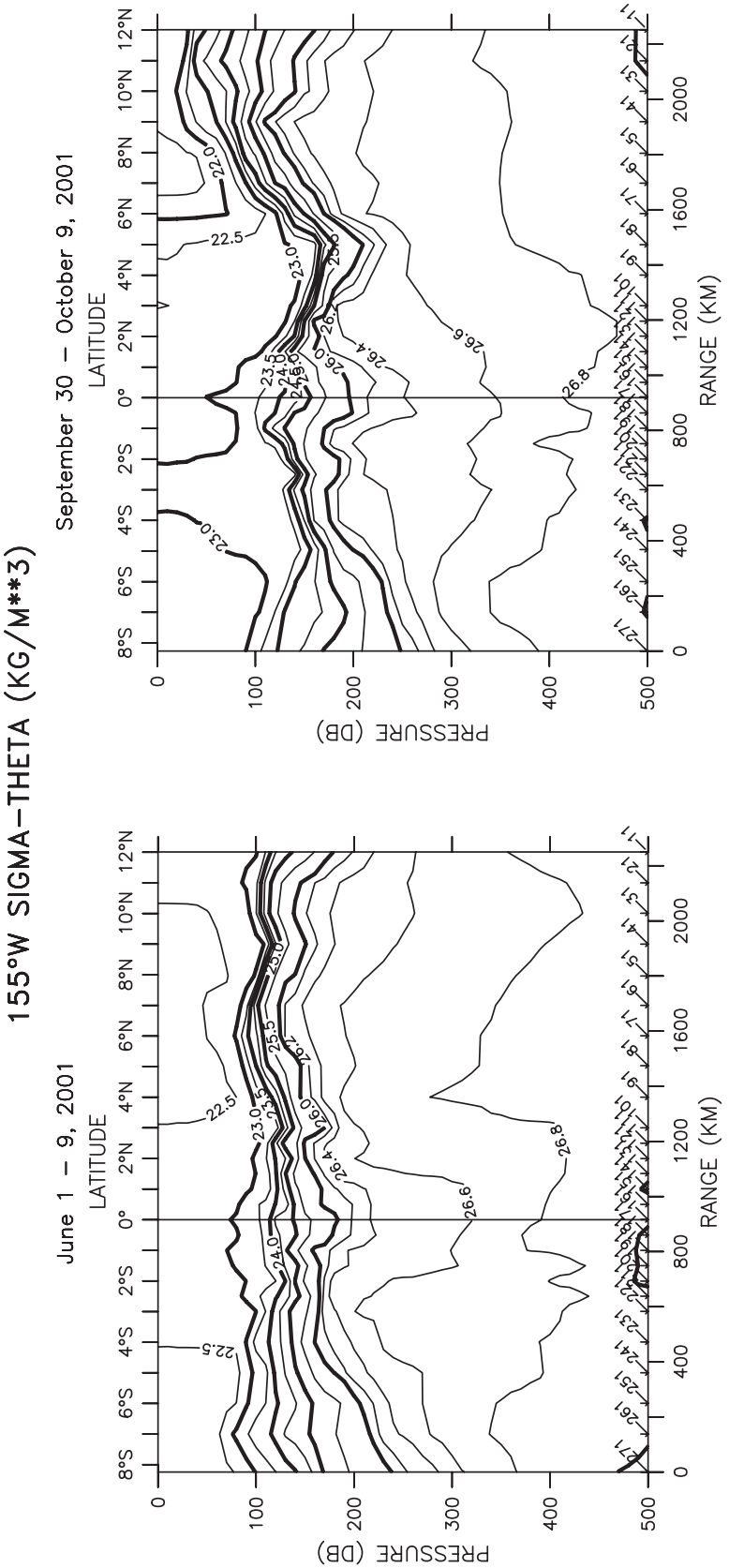

Figure 32: GP3-01-KA boreal summer and GP7-01-KA fall potential density (kg/m^3) sections along 155°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

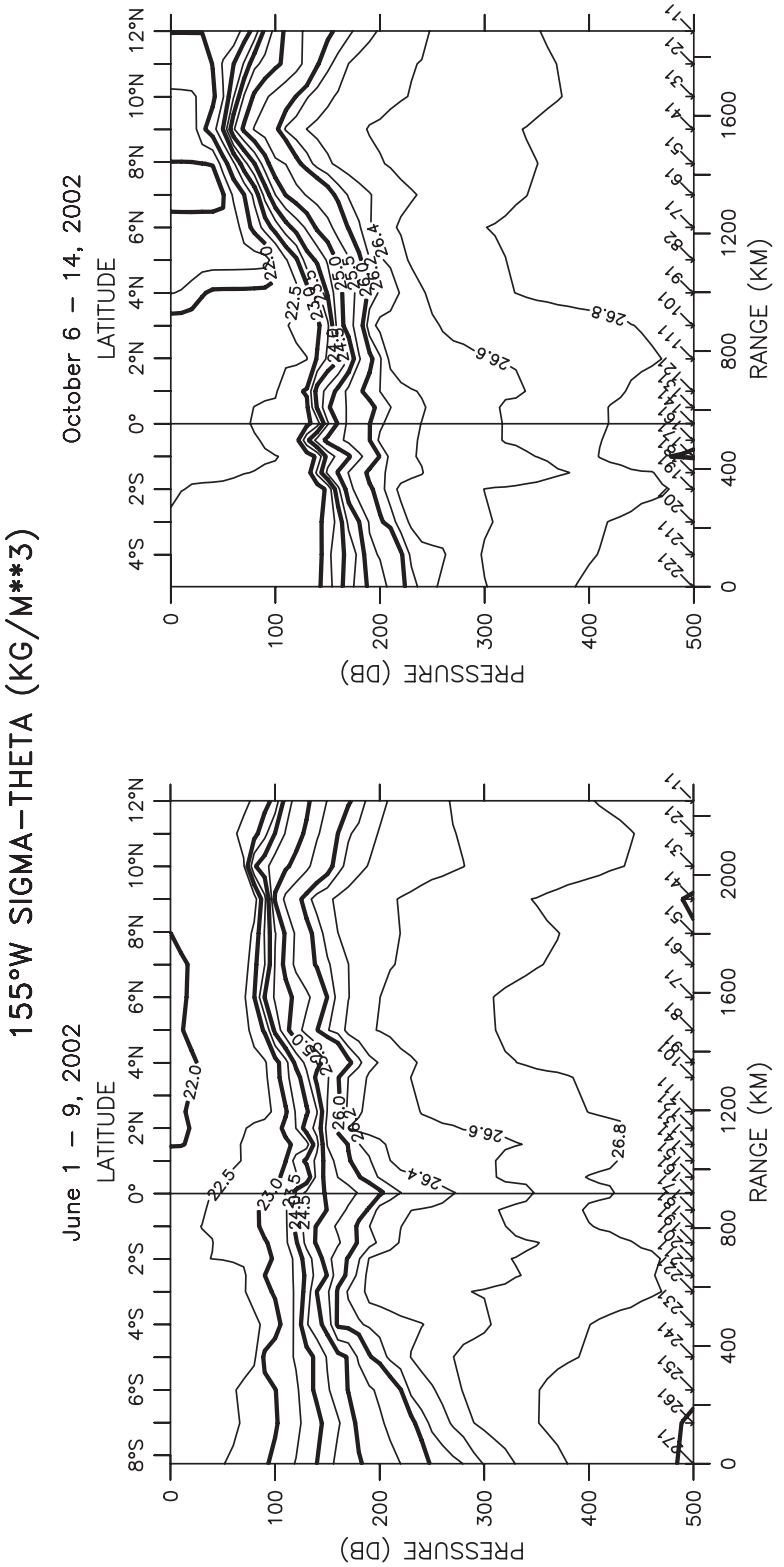

Figure 33: GP3-02-KA boreal summer and GP7-02-KA fall potential density (kg/m^3) sections along 155°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

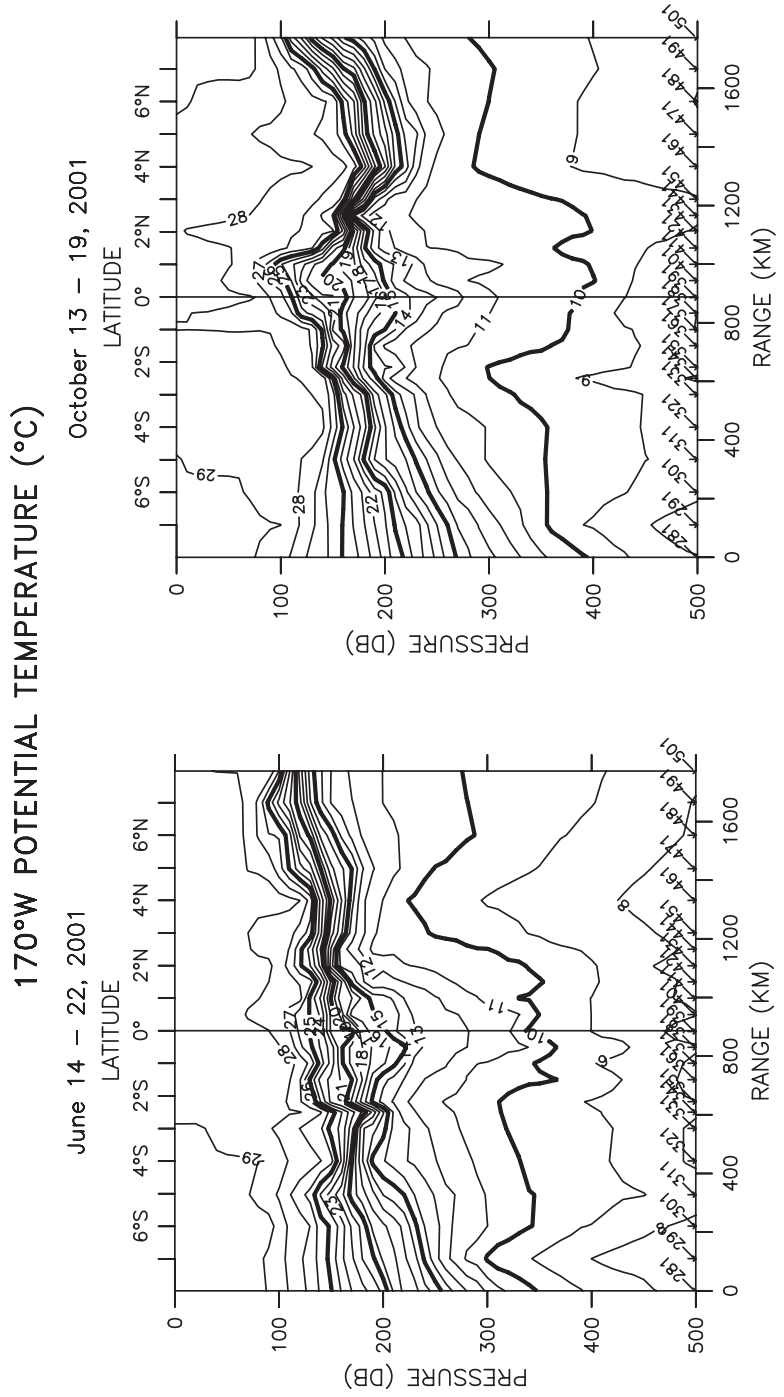

Figure 34: GP3-01-KA boreal summer and GP7-01-KA fall potential temperature (°C) sections along 170°W. Contour intervals are 1°C.

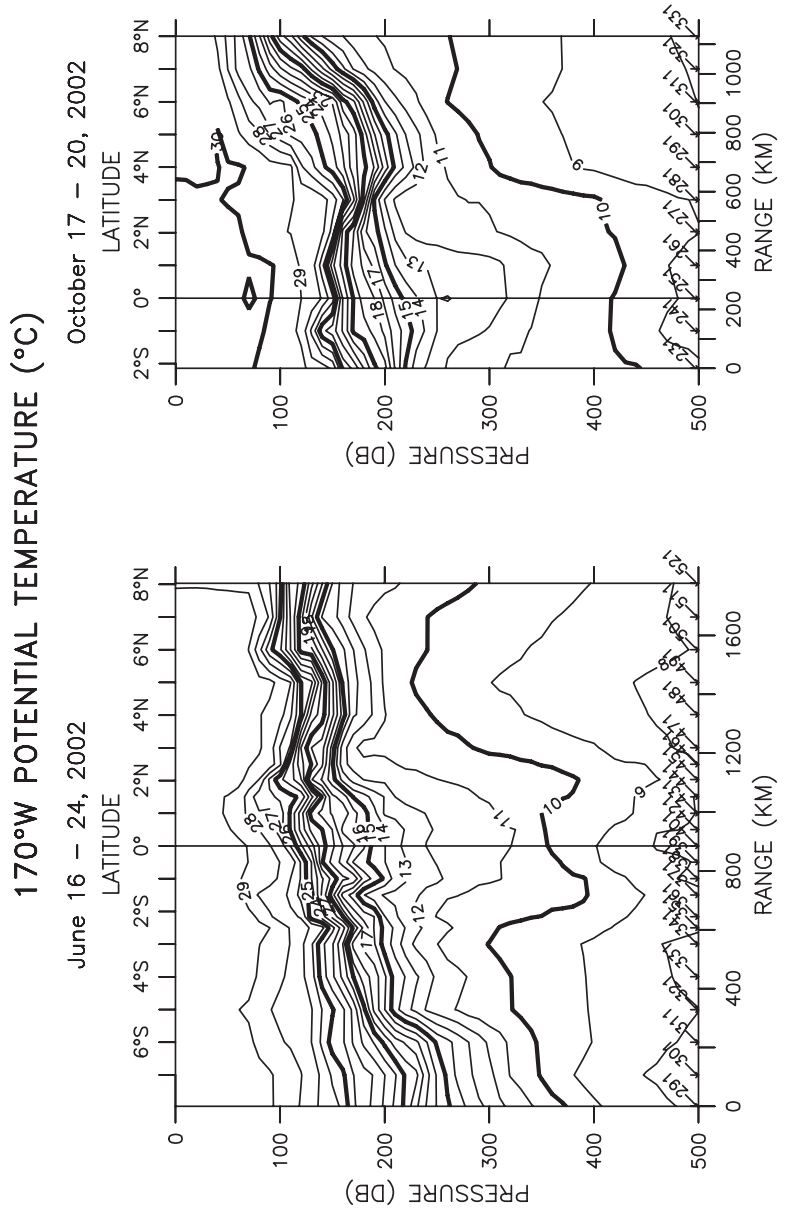

Figure 35: GP3-02-KA boreal summer and GP7-02-KA fall potential temperature (°C) sections along 170°W. Contour intervals are 1°C.

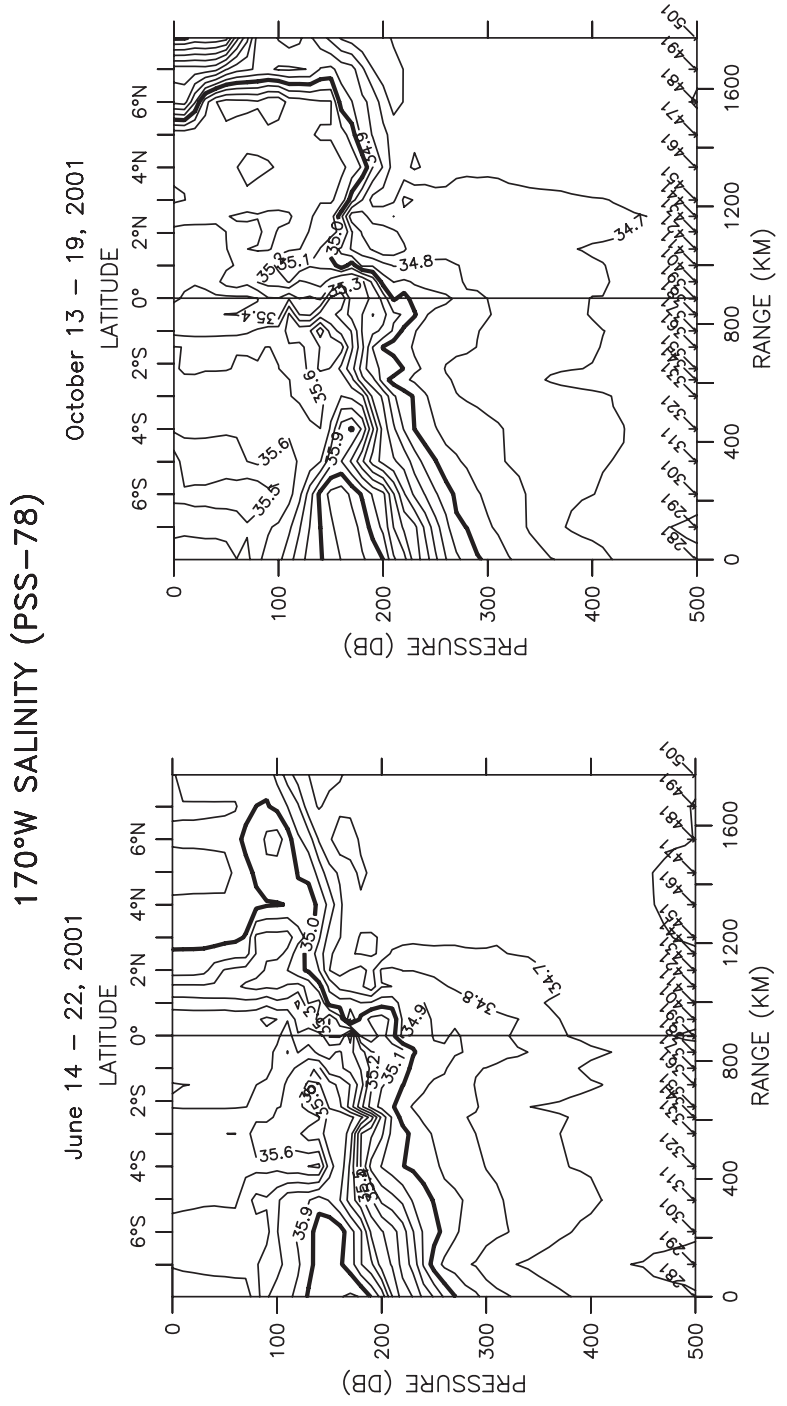

Figure 36: GP3-01-KA boreal summer and GP7-01-KA fall salinity (PSS-78) sections along 170°W. Contour intervals are 0.1 PSS-78.

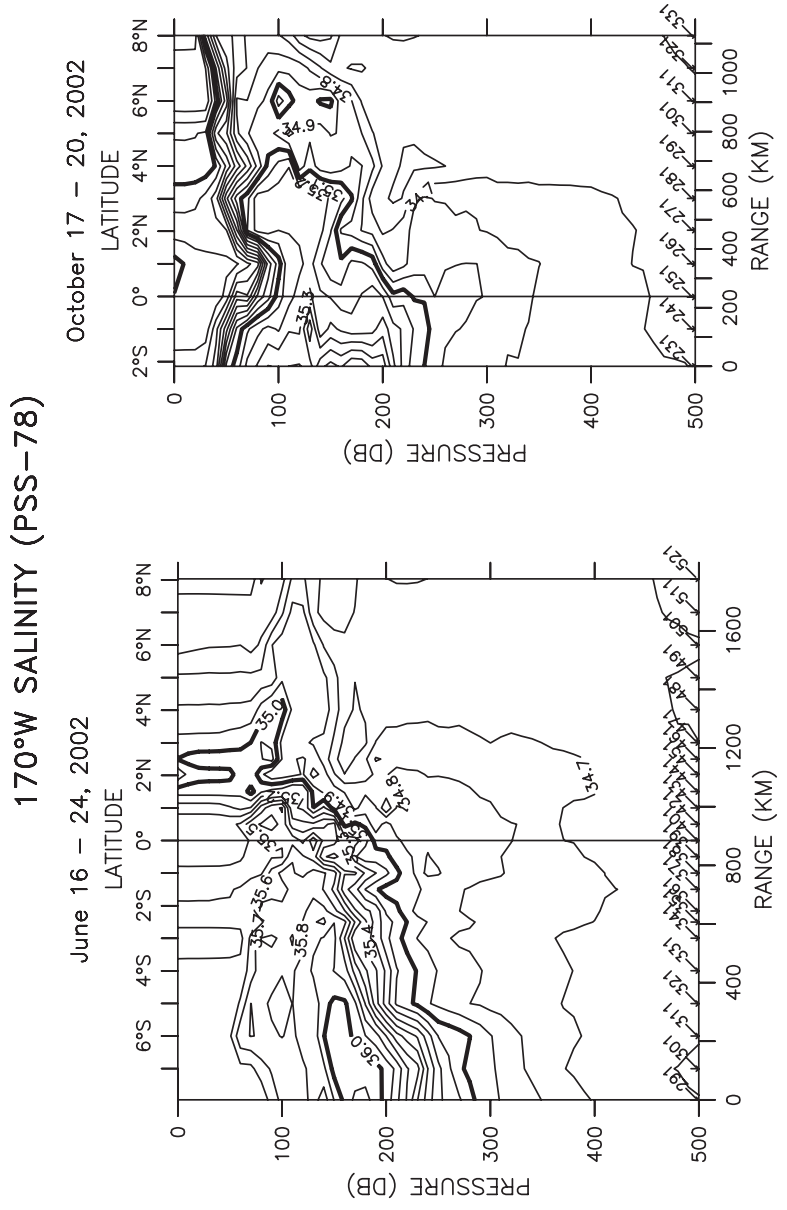

Figure 37: GP3-02-KA boreal summer and GP7-02-KA fall salinity (PSS-78) sections along 170°W. Contour intervals are 0.1 PSS-78.

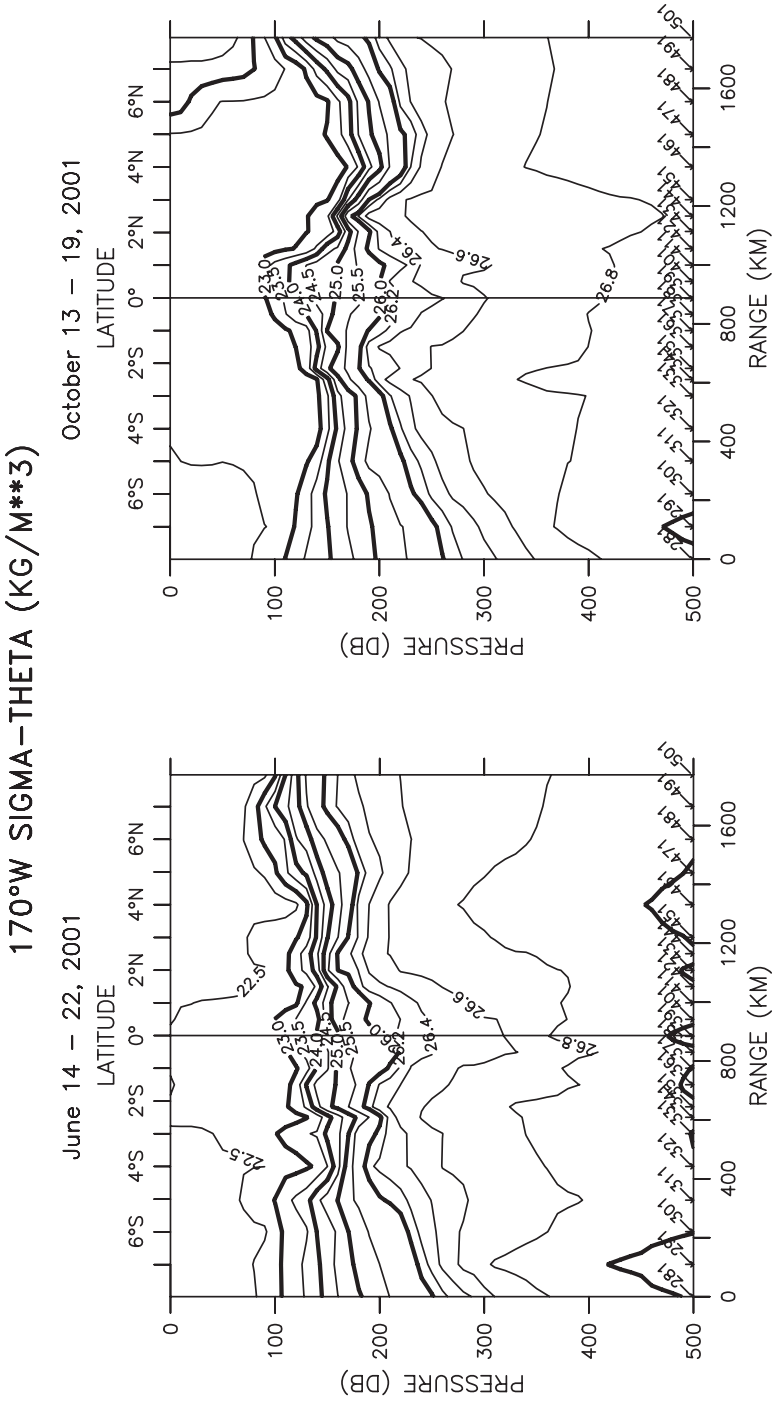

Figure 38: GP3-01-KA boreal summer and GP7-01-KA fall potential density (kg/m^3) sections along 170°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

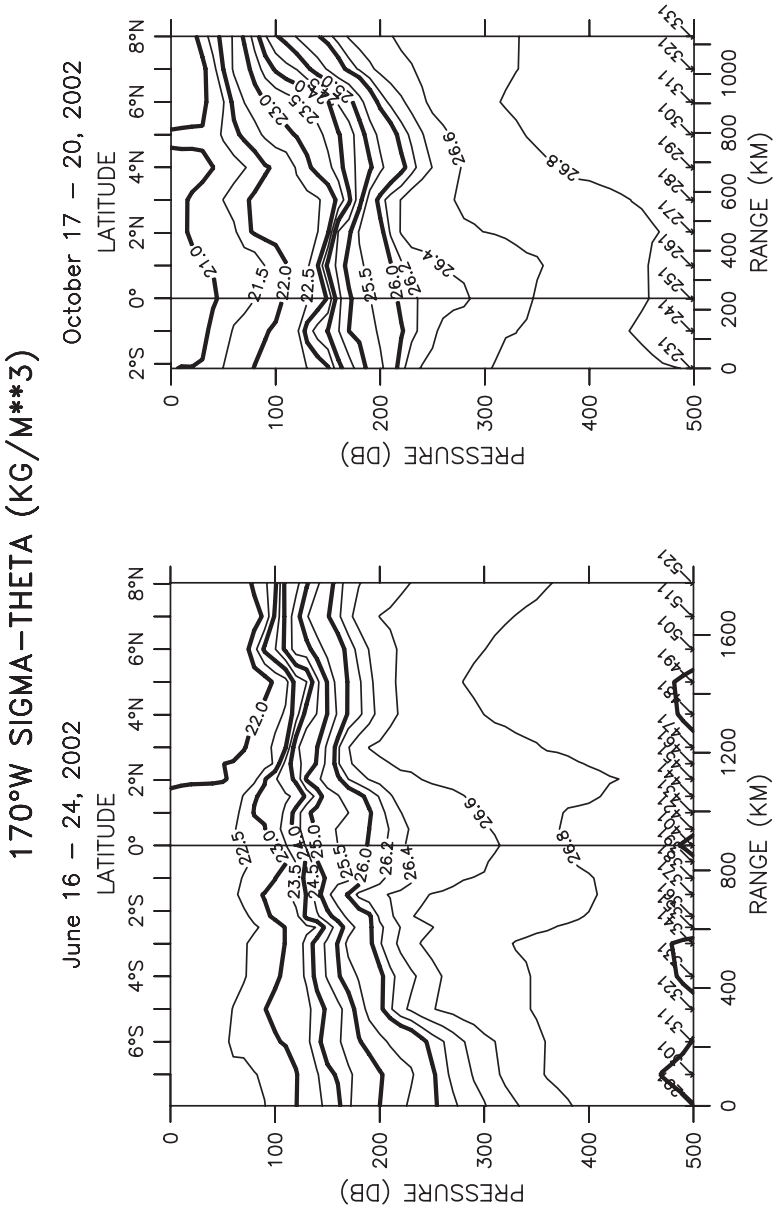

Figure 39: GP3-02-KA boreal summer and GP7-02-KA fall potential density (kg/m^3) sections along 170°W. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

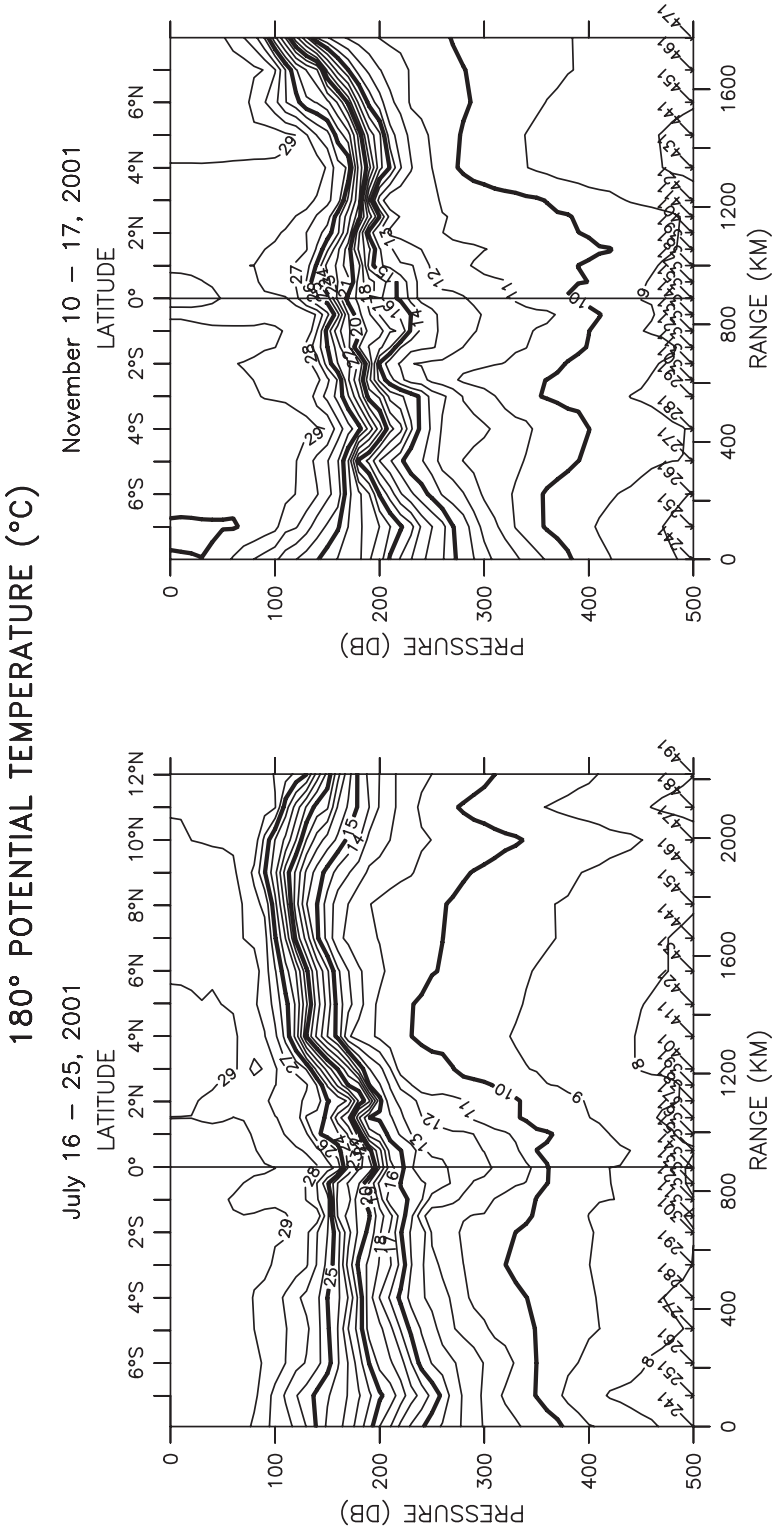

Figure 40: GP4-01-KA boreal summer and GP9-01-KA fall potential temperature (°C) sections along 180°. Contour intervals are 1°C.

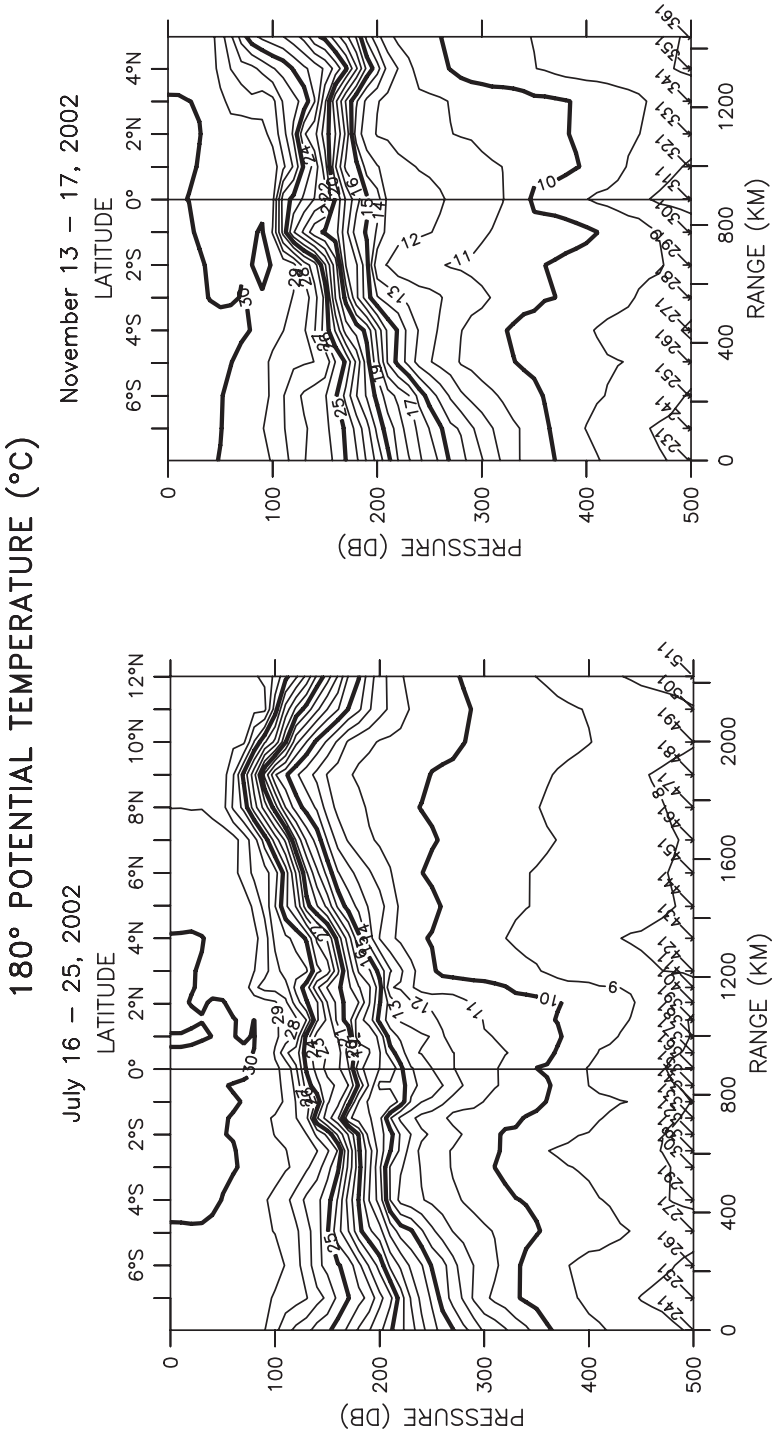

Figure 41: GP4-02-KA boreal summer and GP8-02-KA fall potential temperature (°C) sections along 180°. Contour intervals are 1°C.

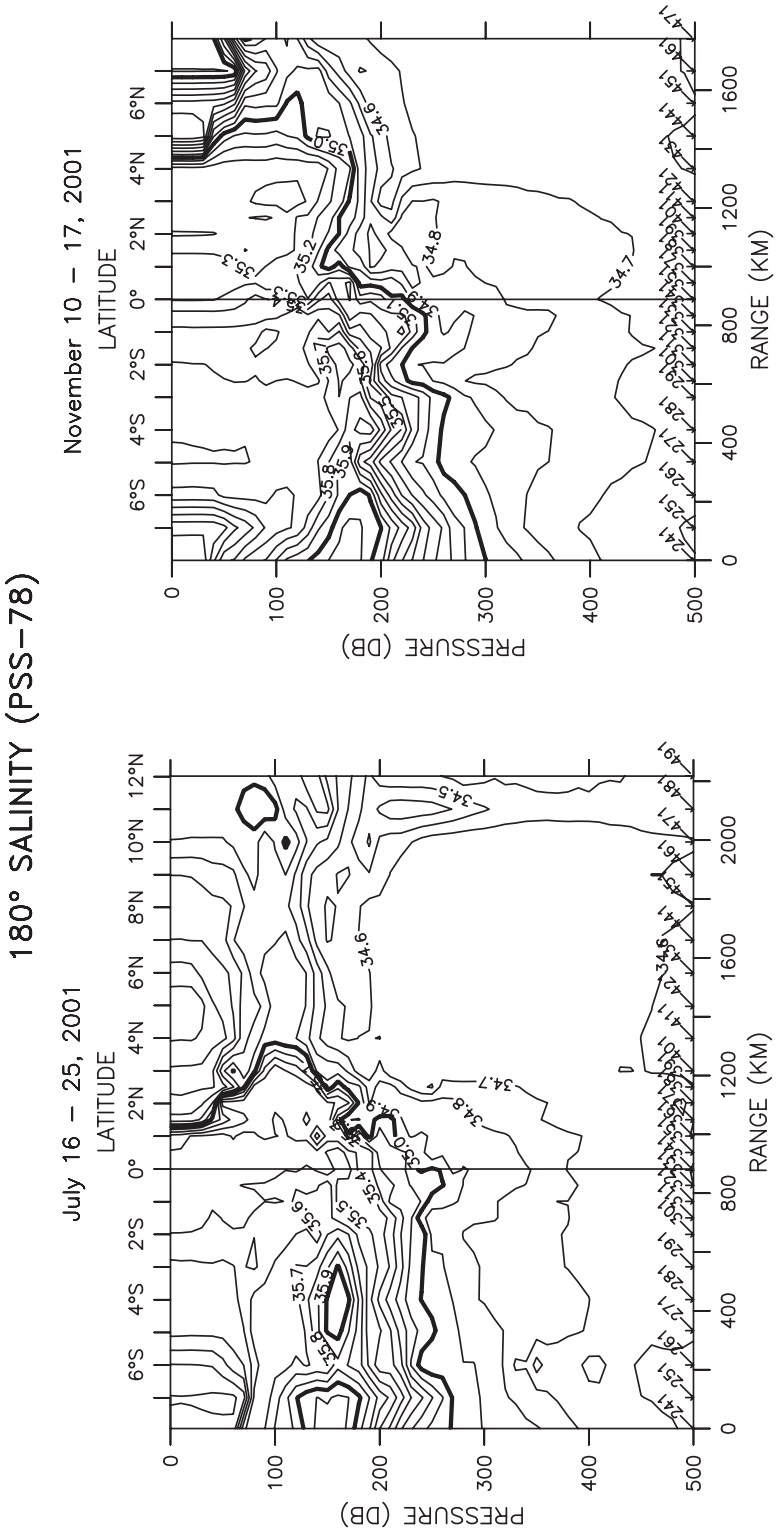

Figure 42: GP4-01-KA boreal summer and GP9-01-KA fall salinity (PSS-78) sections along 180°. Contour intervals are 0.1 PSS-78.

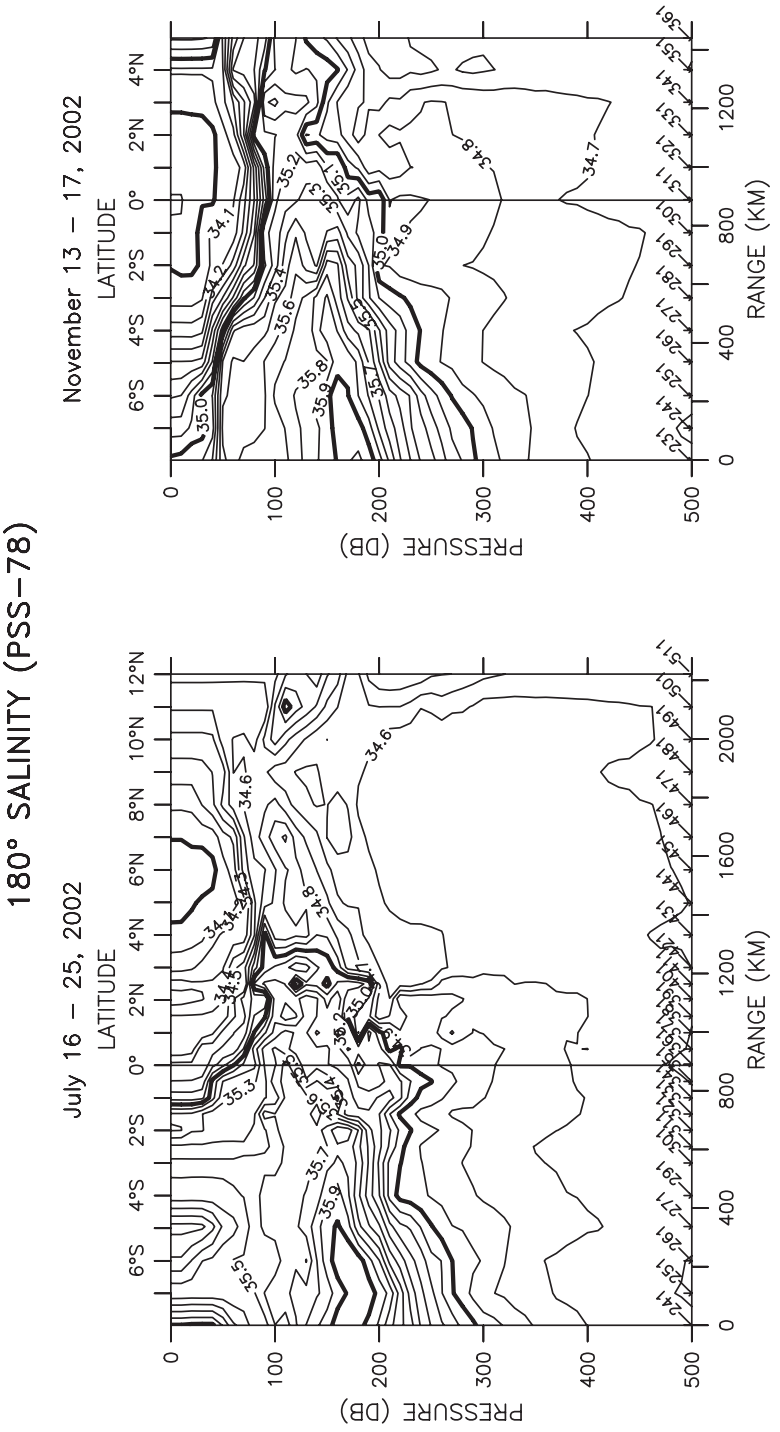

Figure 43: GP4-02-KA boreal summer and GP8-02-KA fall salinity (PSS-78) sections along 180°. Contour intervals are 0.1 PSS-78.

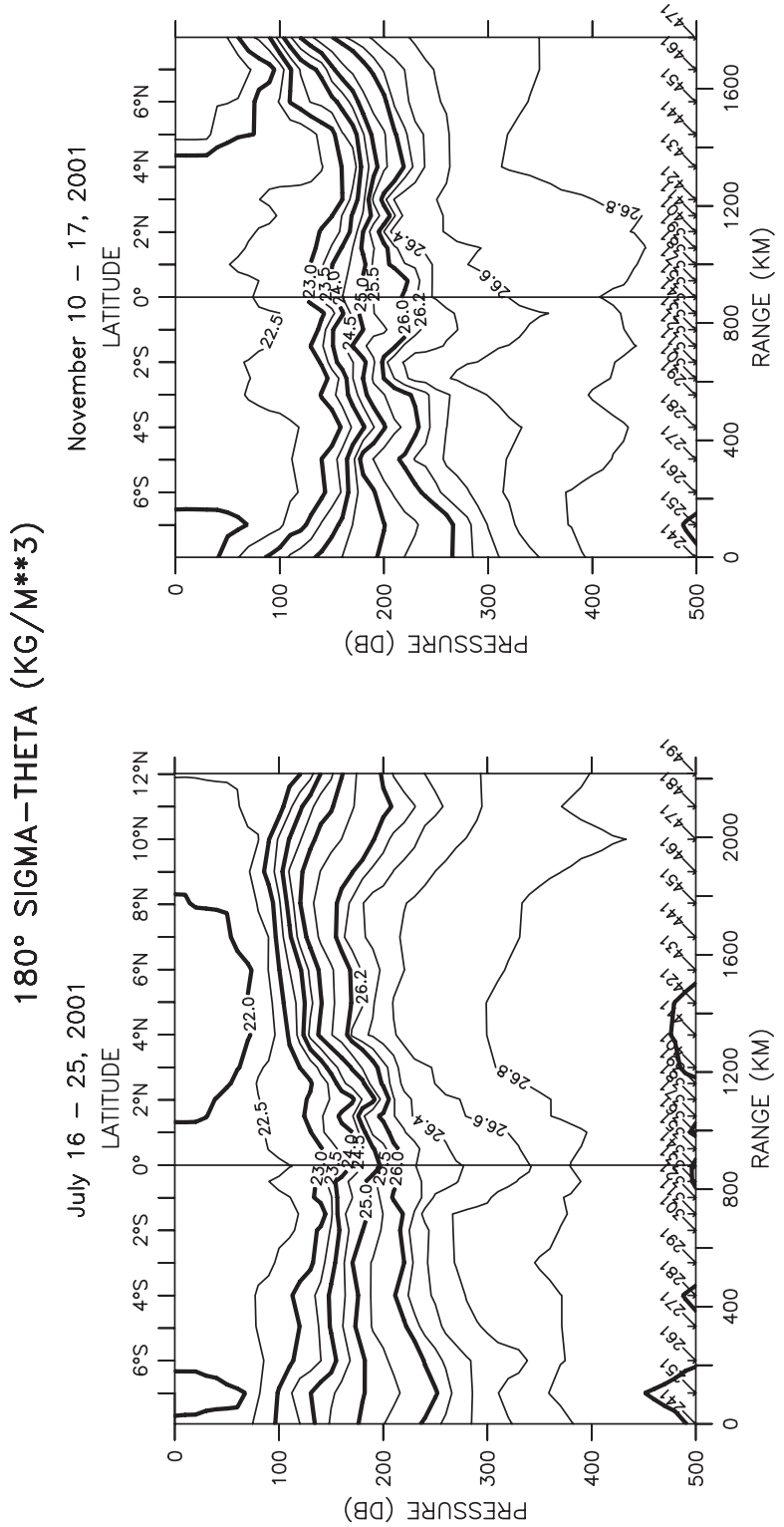

Figure 44: GP4-01-KA boreal summer and GP9-01-KA fall potential density (kg/m^3) sections along 180°. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

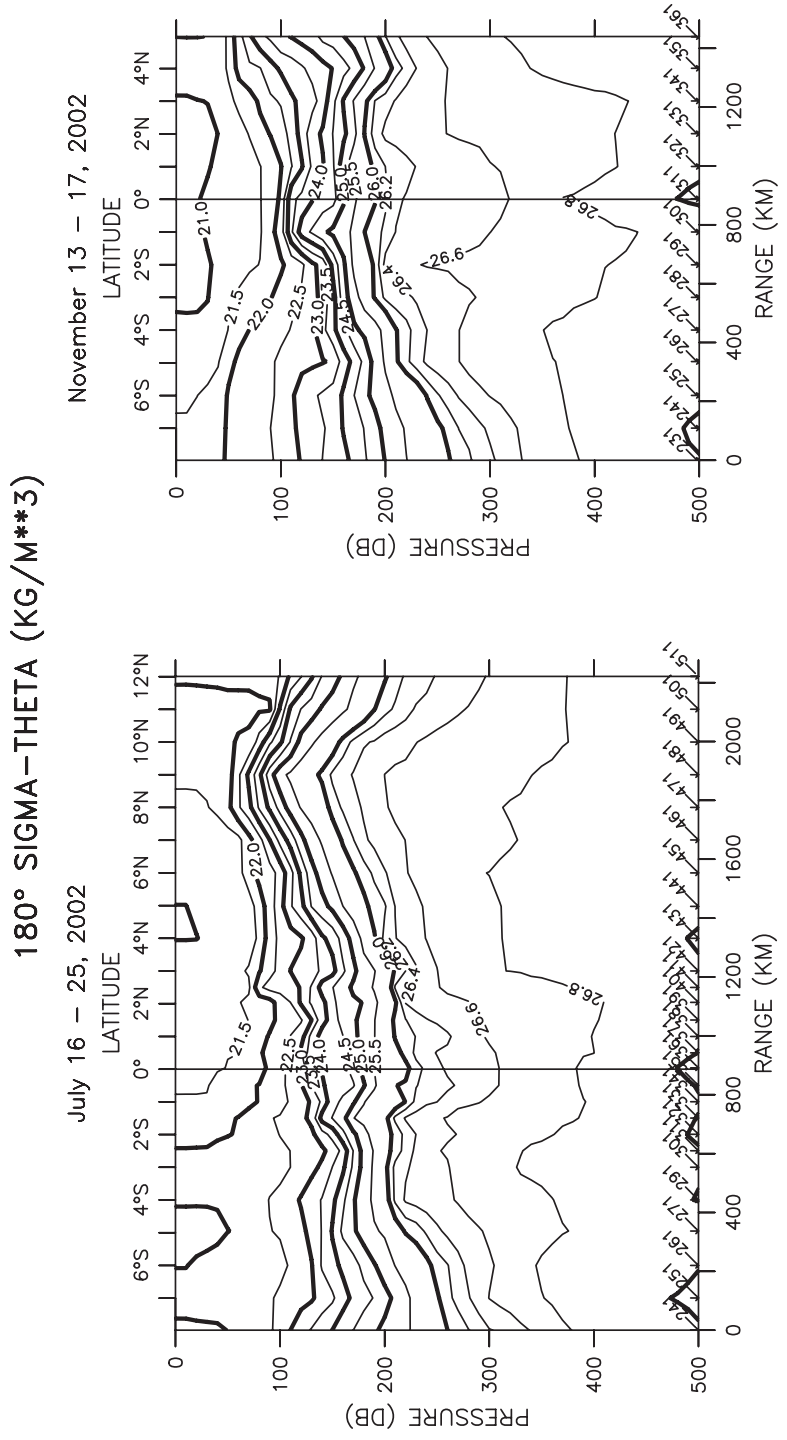

Figure 45: GP4-02-KA boreal summer and GP8-02-KA fall potential density (kg/m^3) sections along 180°. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

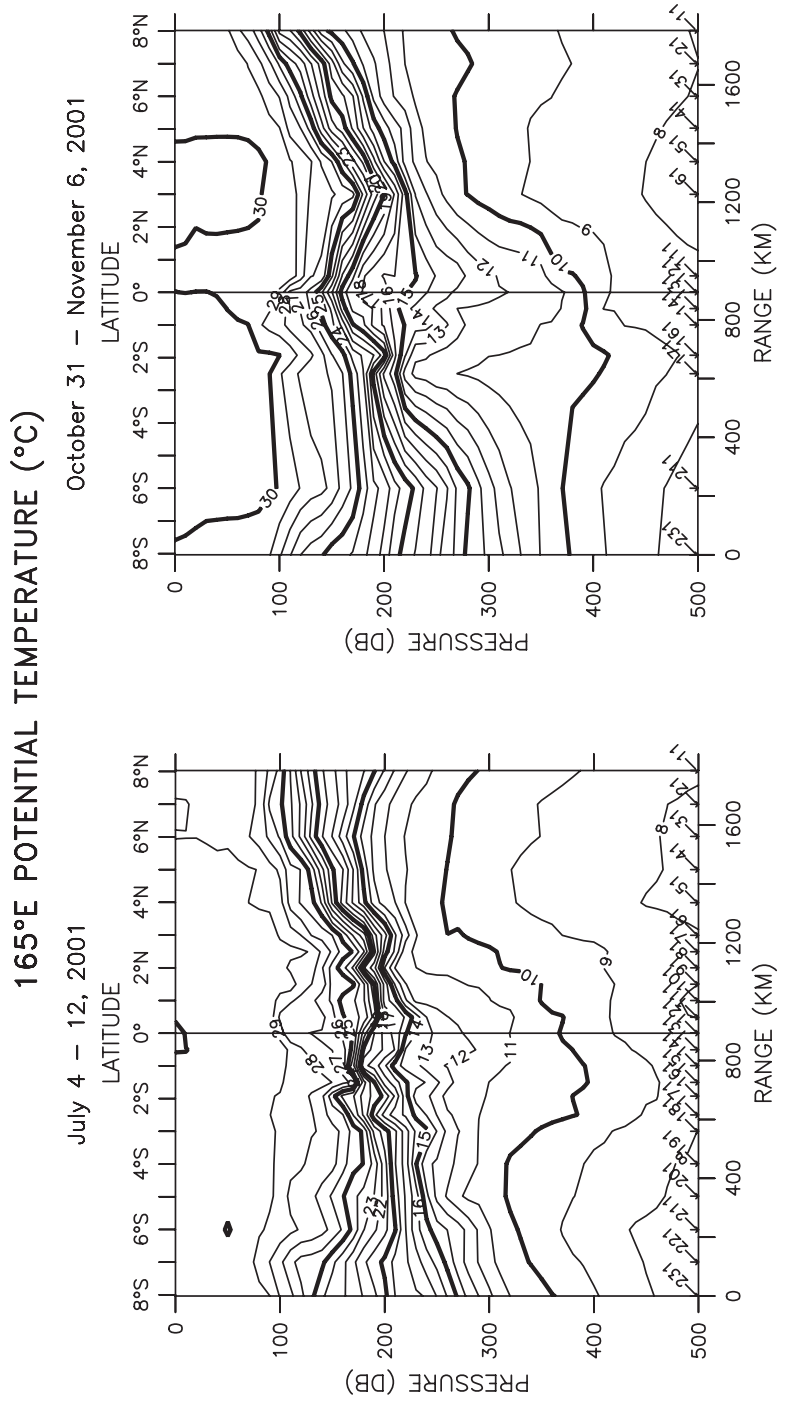

Figure 46: GP4-01-KA boreal summer and GP9-01-KA fall potential temperature (°C) sections along 165°E. Contour intervals are 1°C.

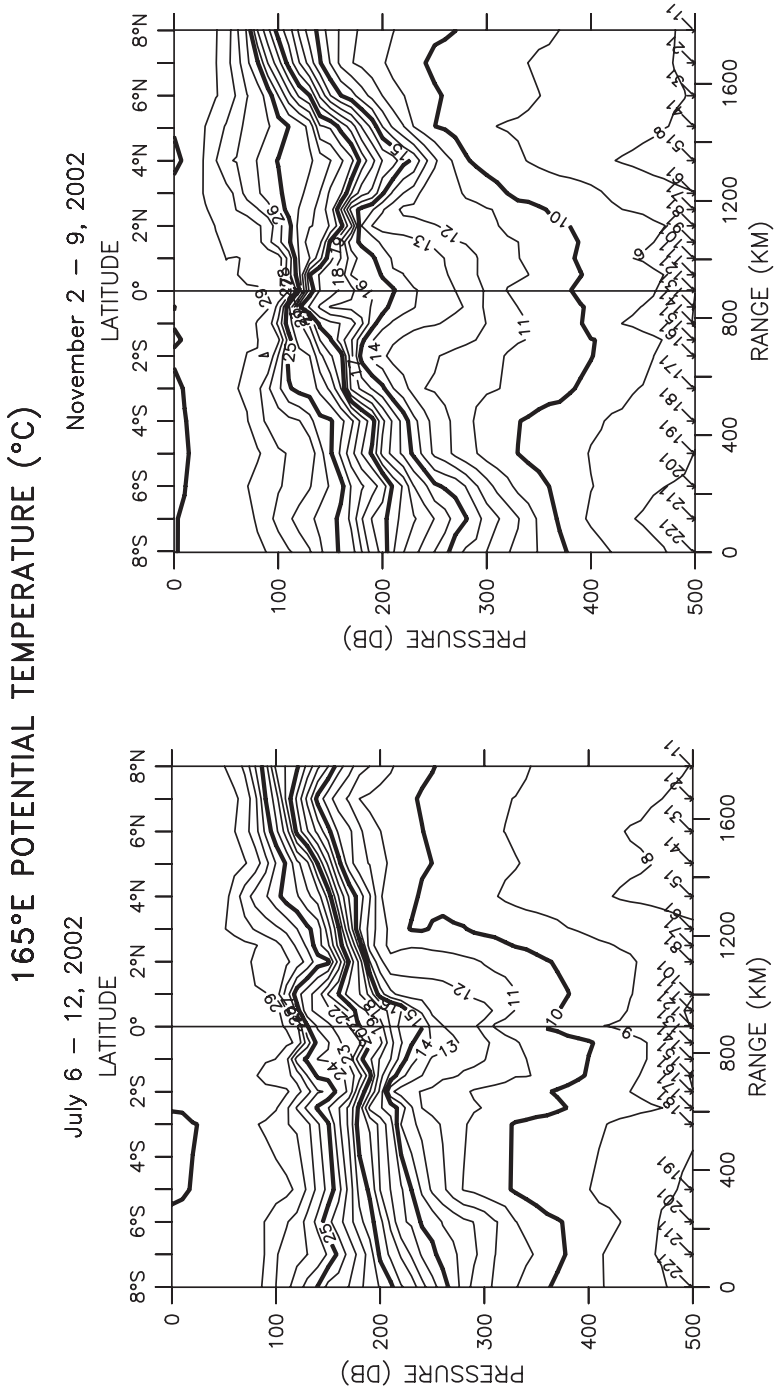

Figure 47: GP4-02-KA boreal summer and GP8-02-KA fall potential temperature (°C) sections along 165°E. Contour intervals are 1°C.

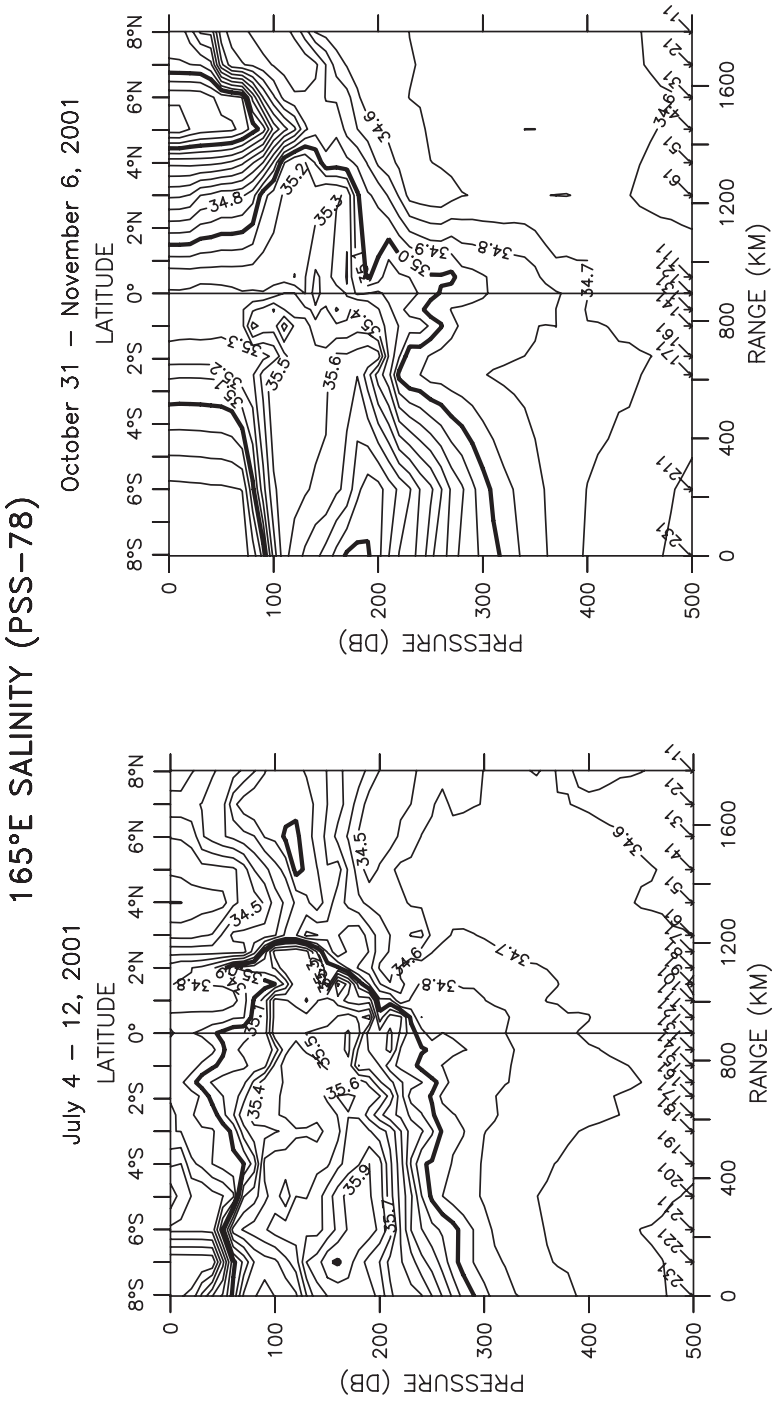

Figure 48: GP4-01-KA boreal summer and GP9-01-KA fall salinity (PSS-78) sections along 165°E. Contour intervals are 0.1 PSS-78.

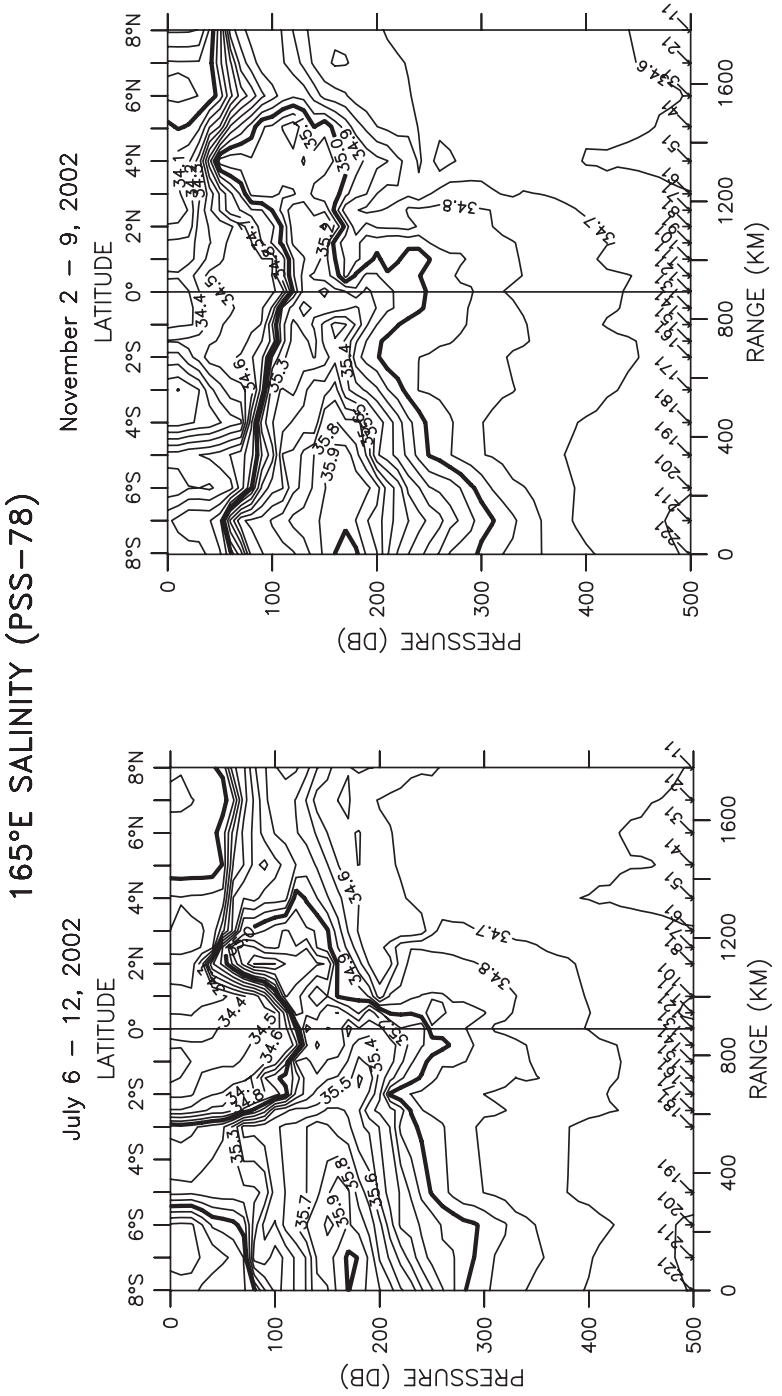

Figure 49: GP4-02-KA boreal summer and GP8-02-KA fall salinity (PSS-78) sections along 165°E. Contour intervals are 0.1 PSS-78.

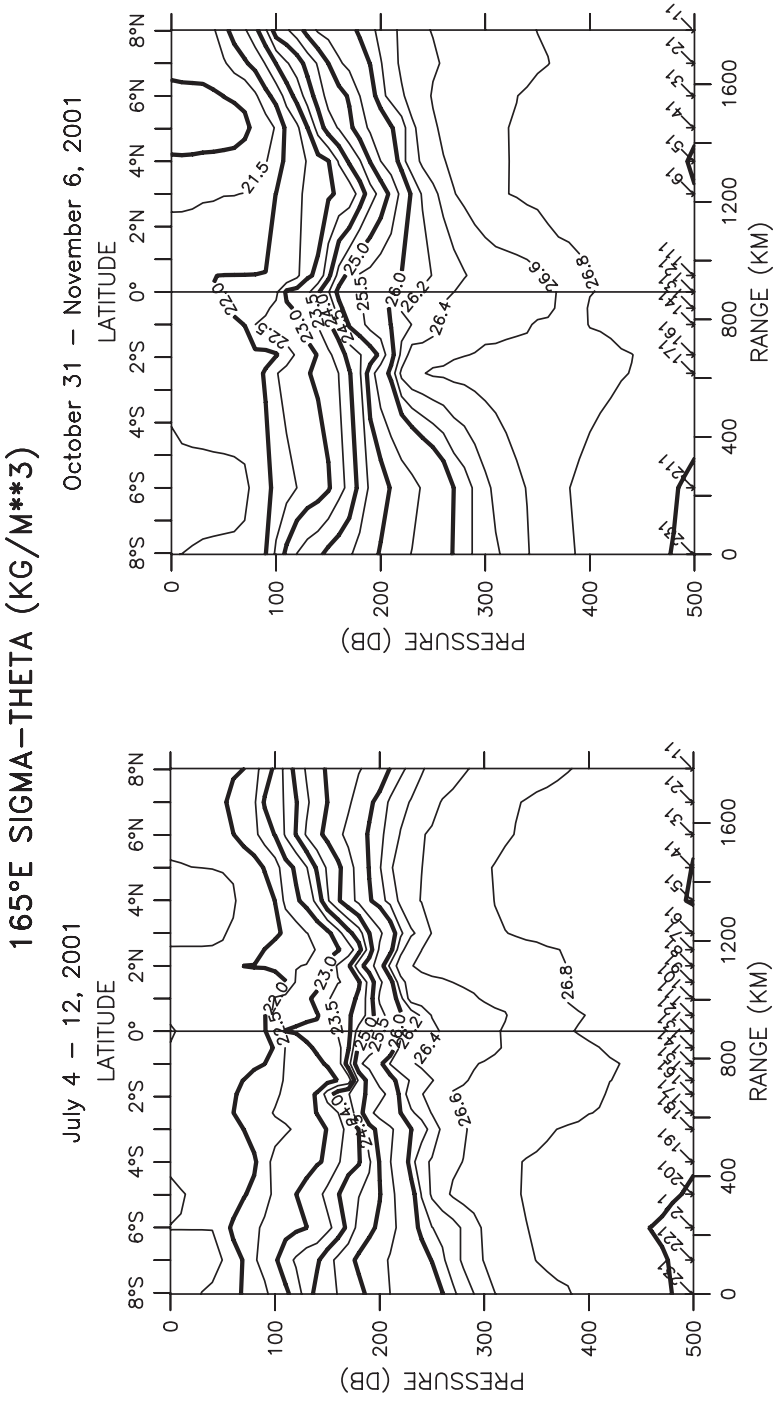

Figure 50: GP4-01-KA boreal summer and GP9-01-KA fall potential density (kg/m^3) sections along 165°E. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

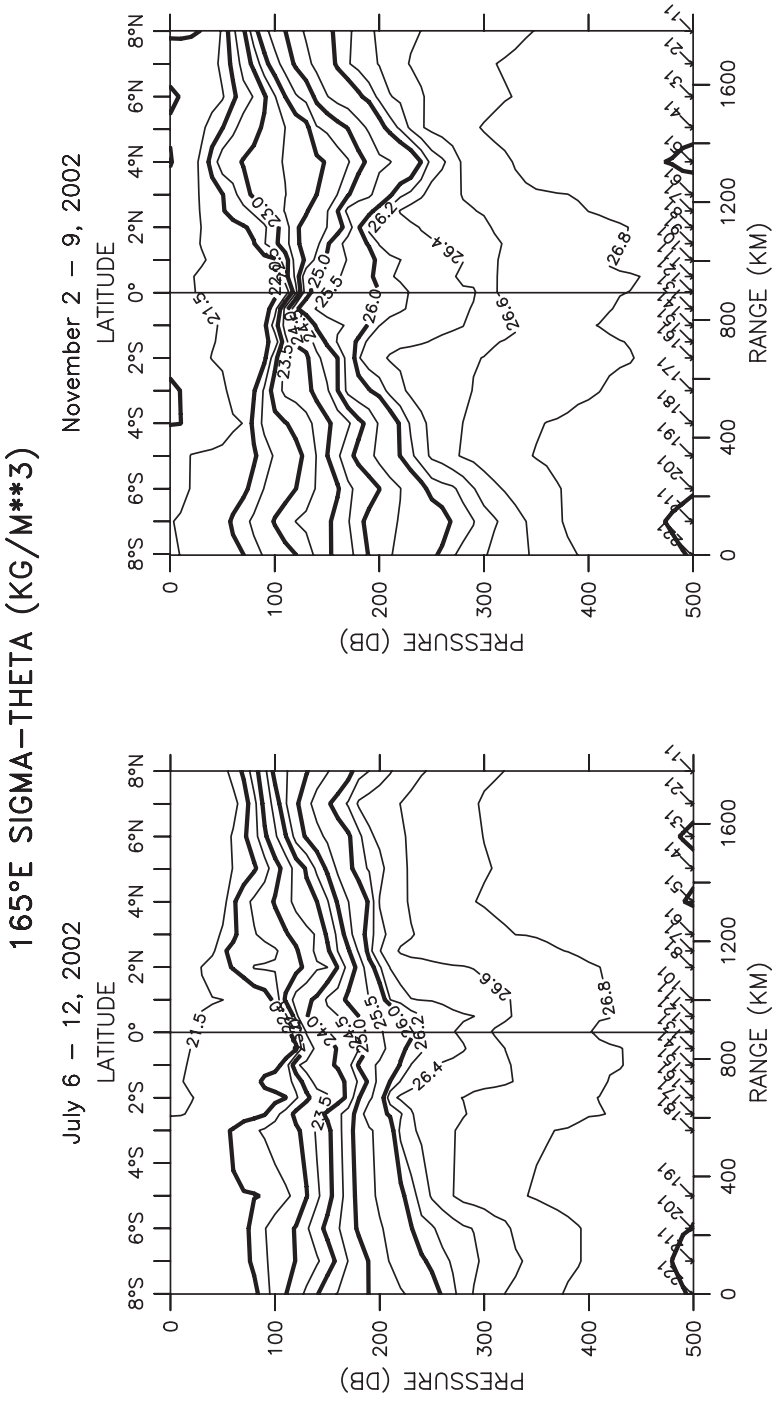

Figure 51: GP4-02-KA boreal summer and GP8-02-KA fall potential density (kg/m^3) sections along 165°E. Contour intervals are 0.5 kg m^{-3} less than 26.0 kg m^{-3} and 0.2 kg m^{-3} greater than 26.0 kg m^{-3}.

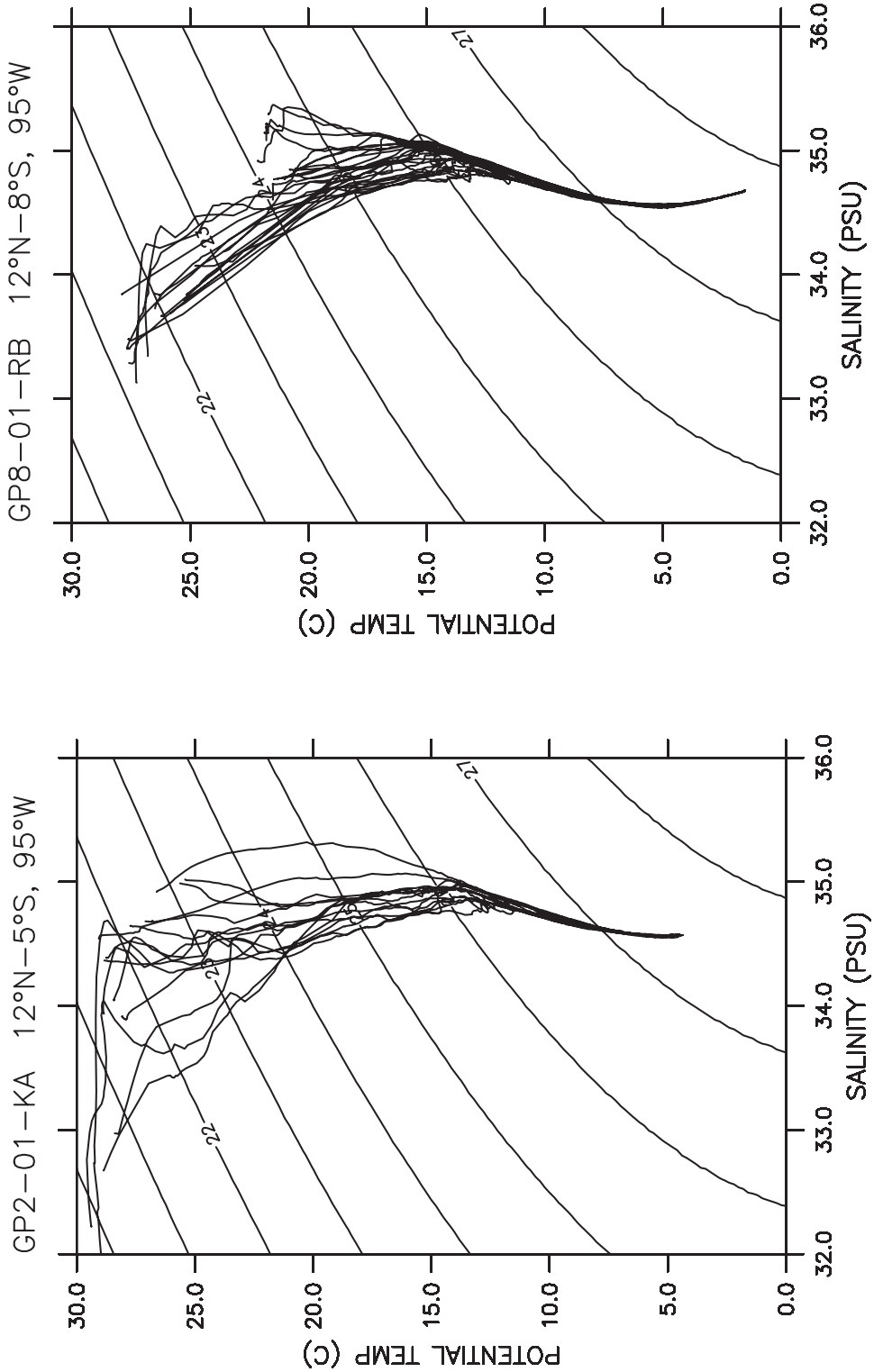

Figure 52: GP2-01-KA boreal spring (April 20–26, 2001) and GP8-01-RB fall (November 20–December 3, 2001) composite θ-S diagrams along 95°W.

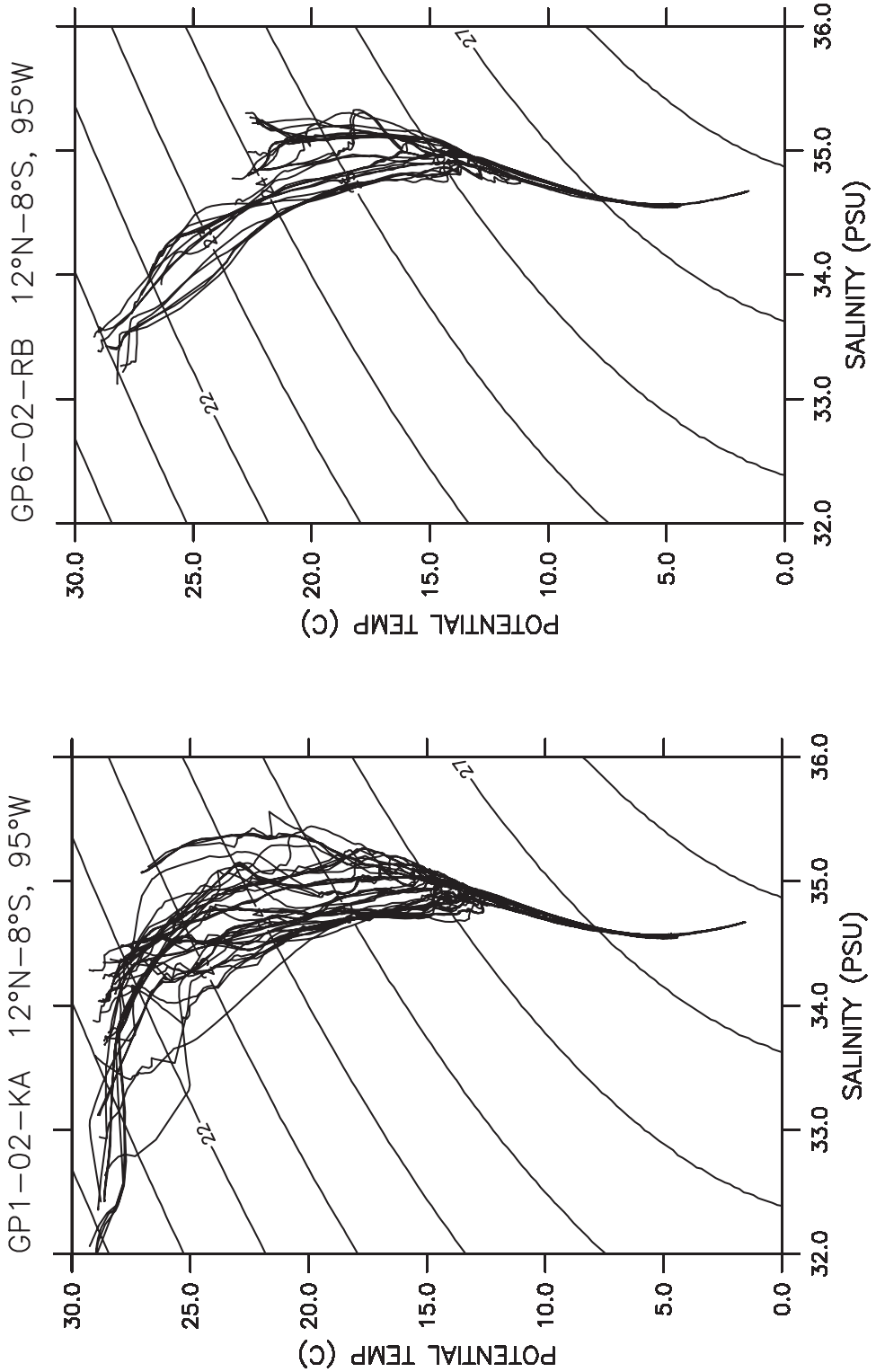

Figure 53: GP1-02-KA boreal spring (March 20–April 1, 2002) and GP6-02-RB fall (October 12–21, 2002) composite θ-S diagrams along 95°W.

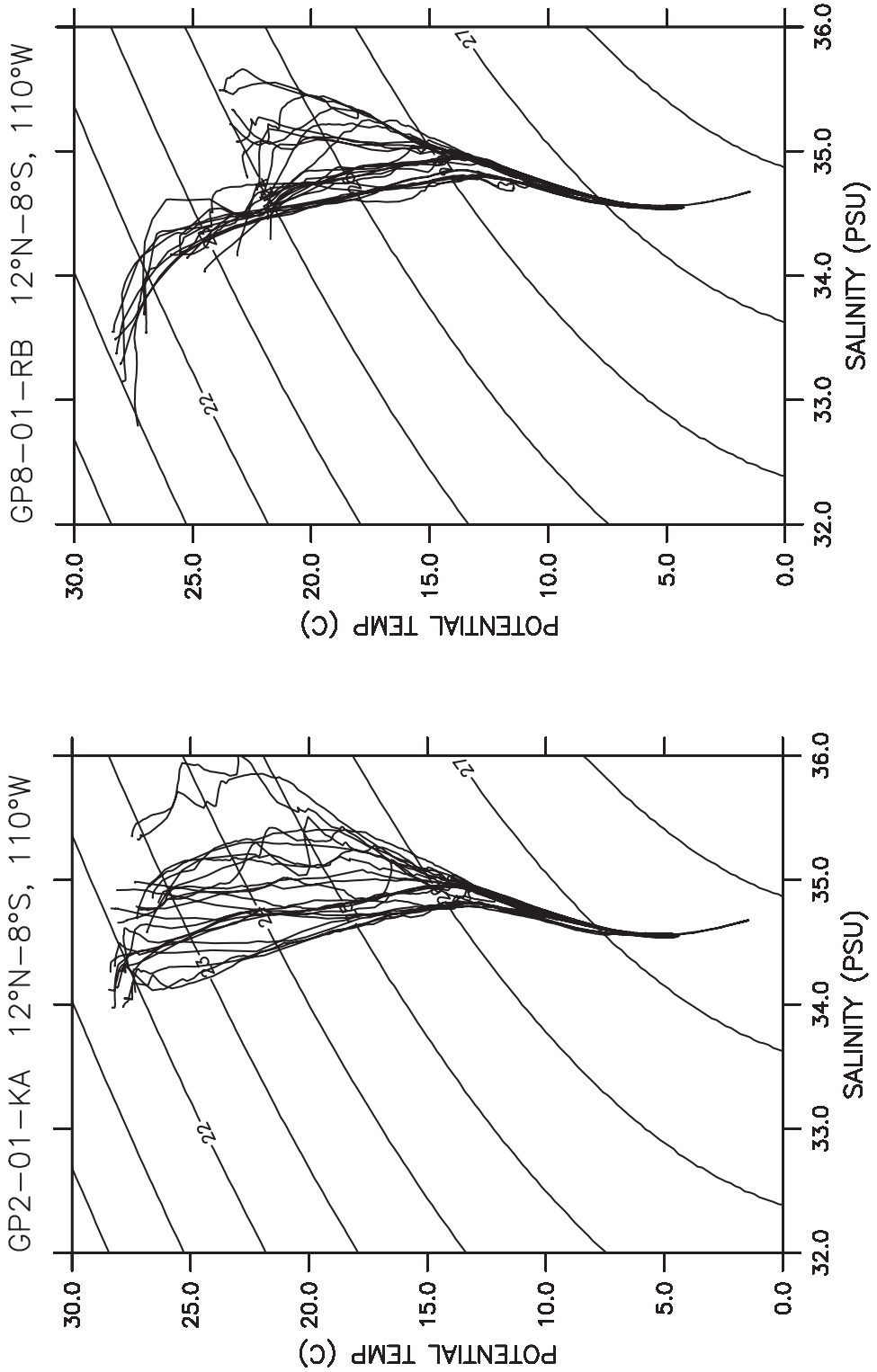

Figure 54: GP2-01-KA boreal spring (April 3–12, 2001) and GP8-01-RB fall (November 7–20, 2001) composite θ-S diagrams along 110°W.

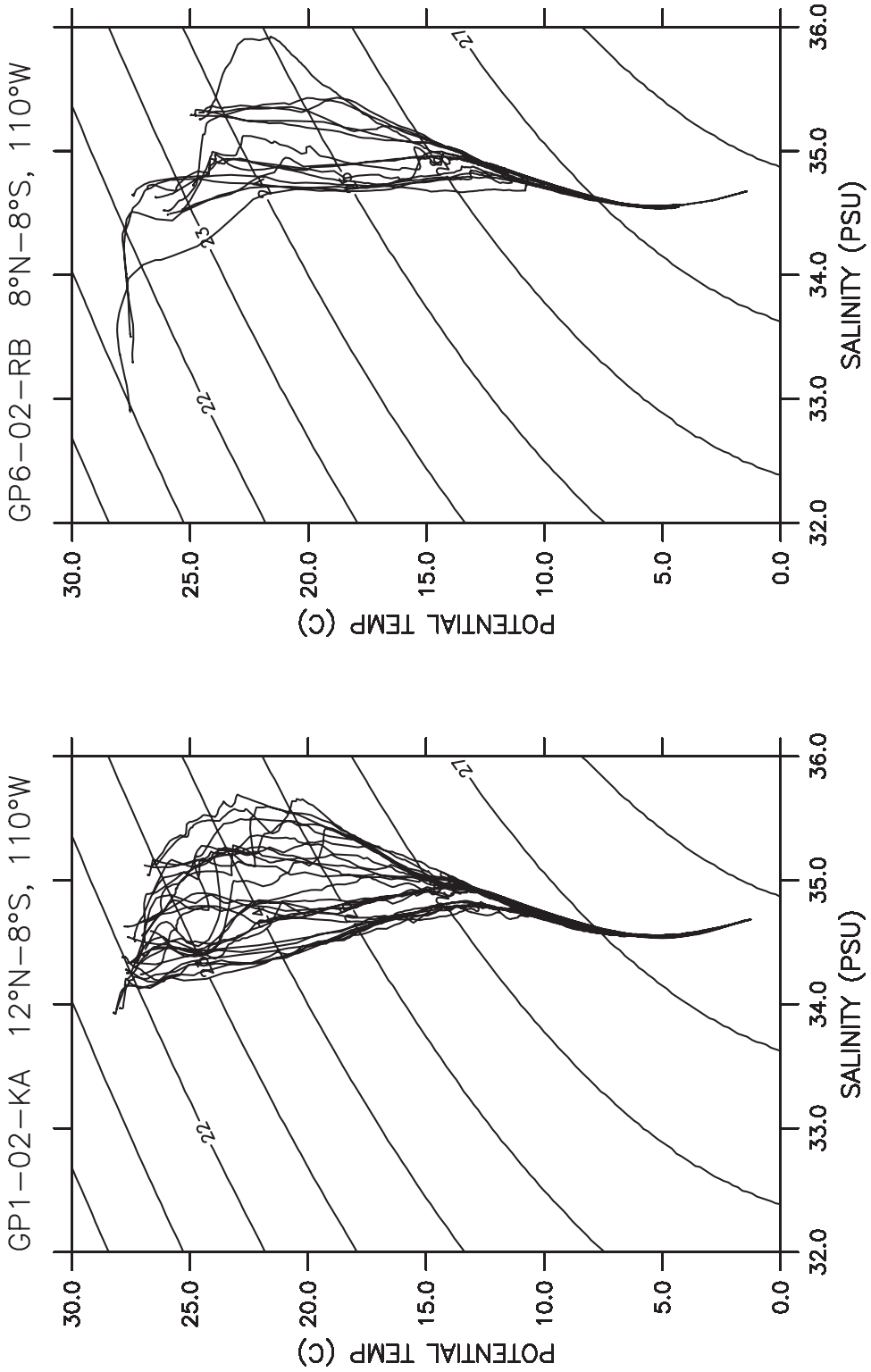

Figure 55: GP1-02-KA boreal spring (March 6–16, 2002) and GP6-02-RB fall (October 24–November 2, 2002) composite θ-S diagrams along 110°W.

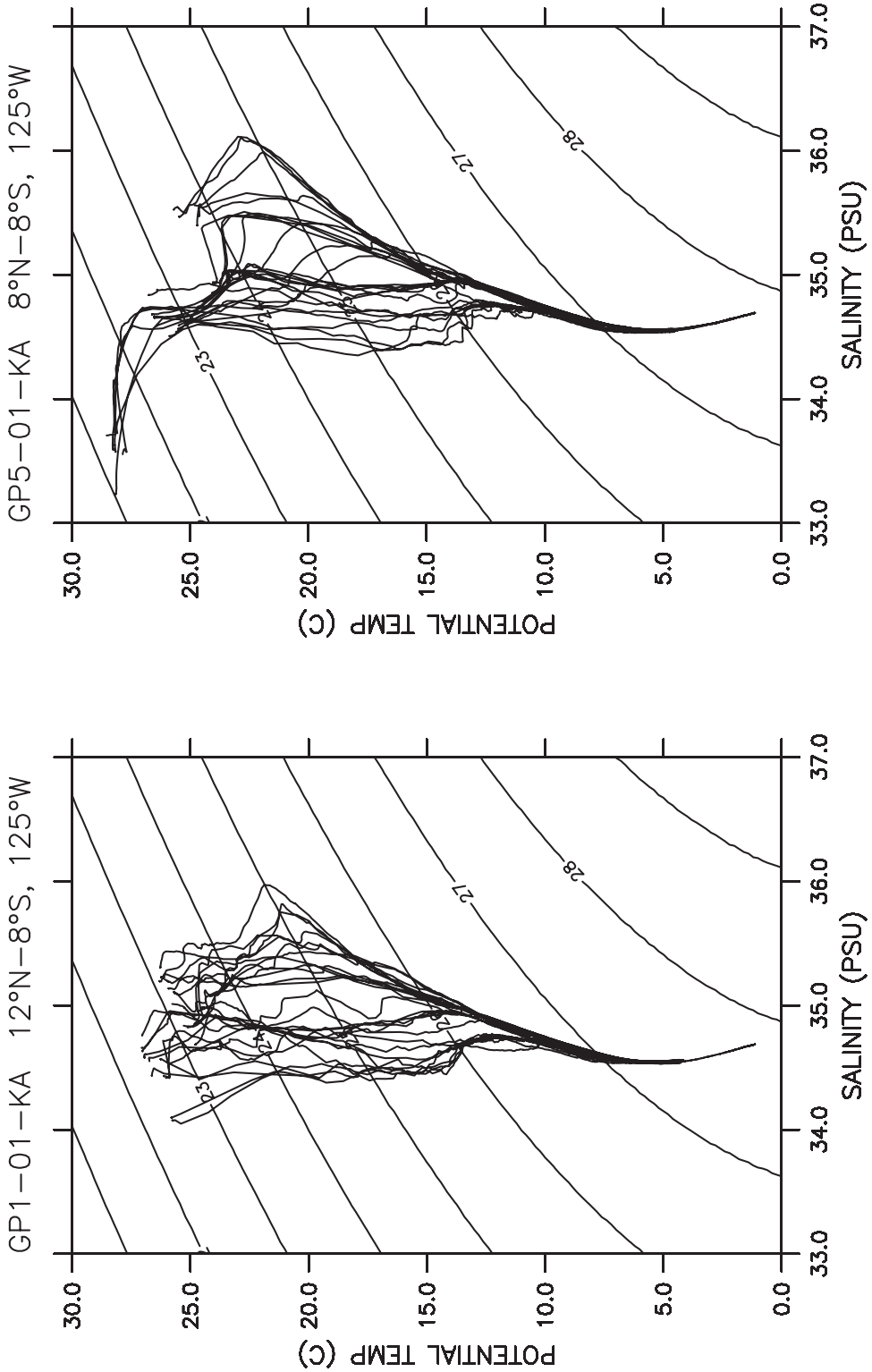

Figure 56: GP1-01-KA boreal winter (February 1–9, 2001) and GP5-01-KA summer (August 19–September 1, 2001) composite θ-S diagrams along 125°W.

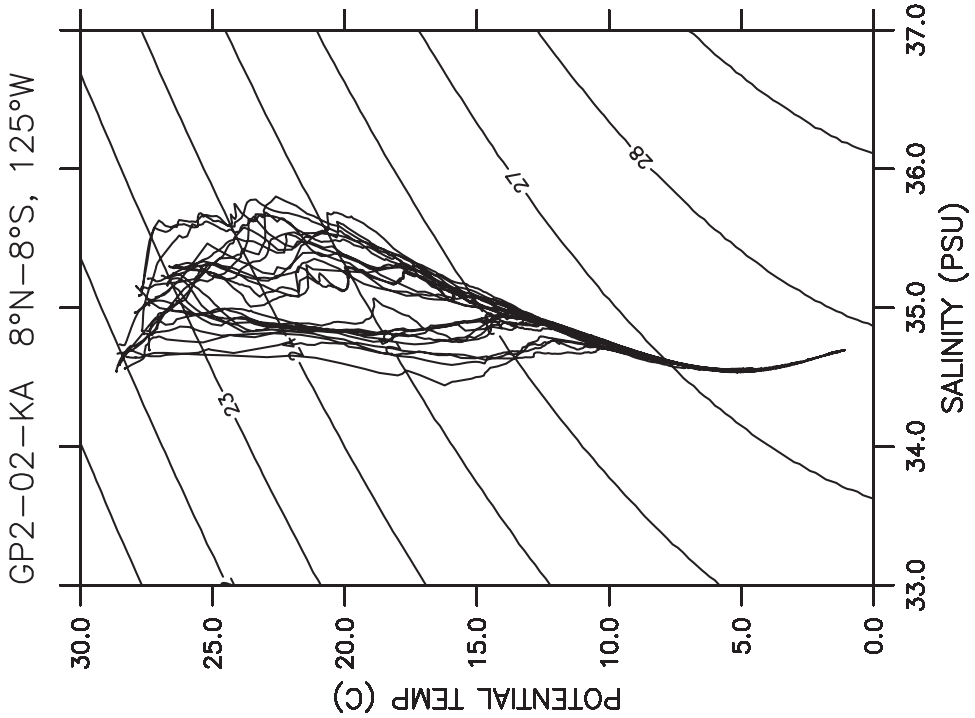

Figure 57: GP2-02-KA boreal spring (April 18–25, 2002) composite θ-S diagram along 125°W.

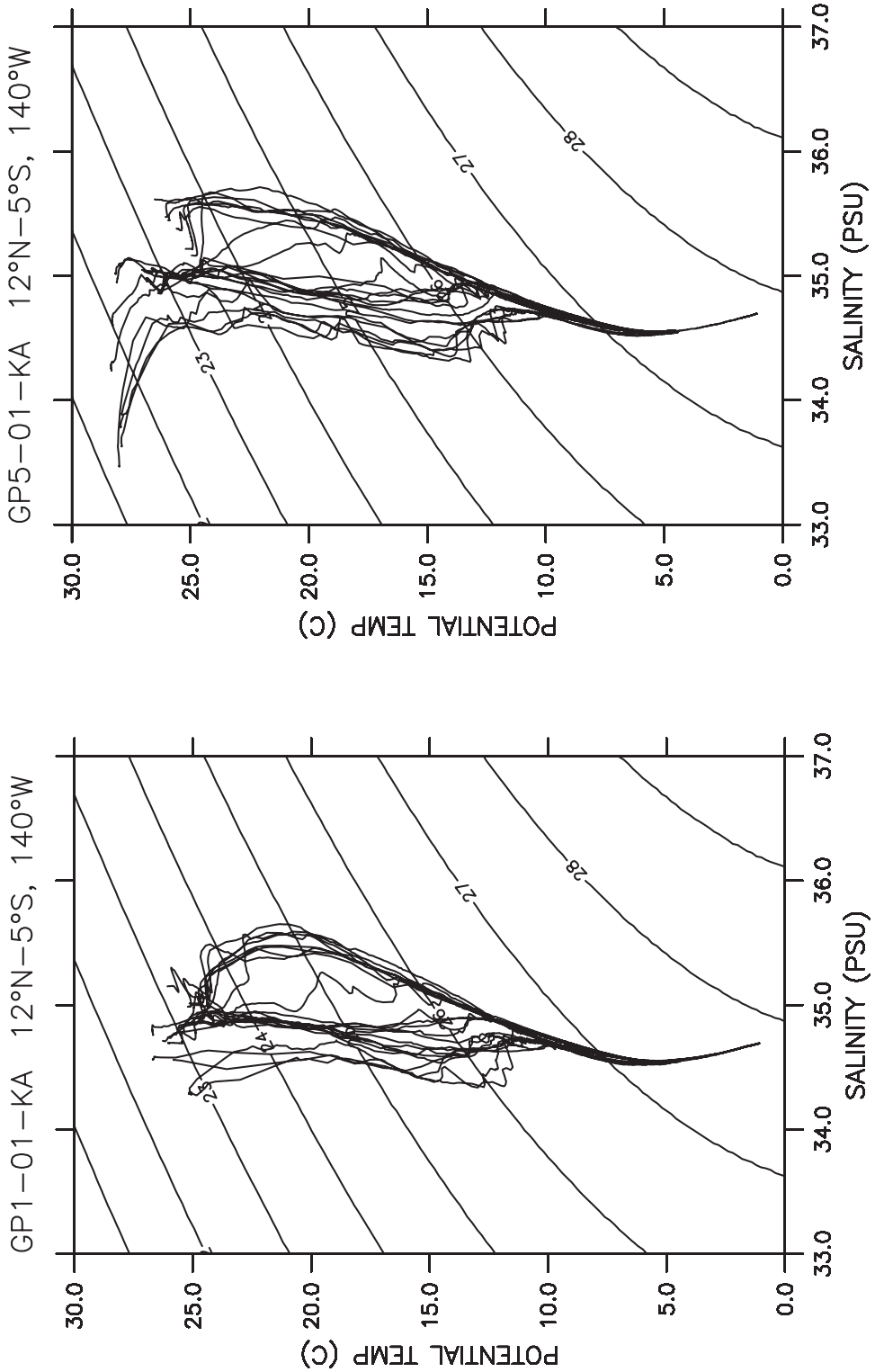

Figure 58: GP1-01-KA boreal winter (January 19–27, 2001) and GP5-01-KA fall (September 8–15, 2001) composite θ-S diagrams along 140°W.

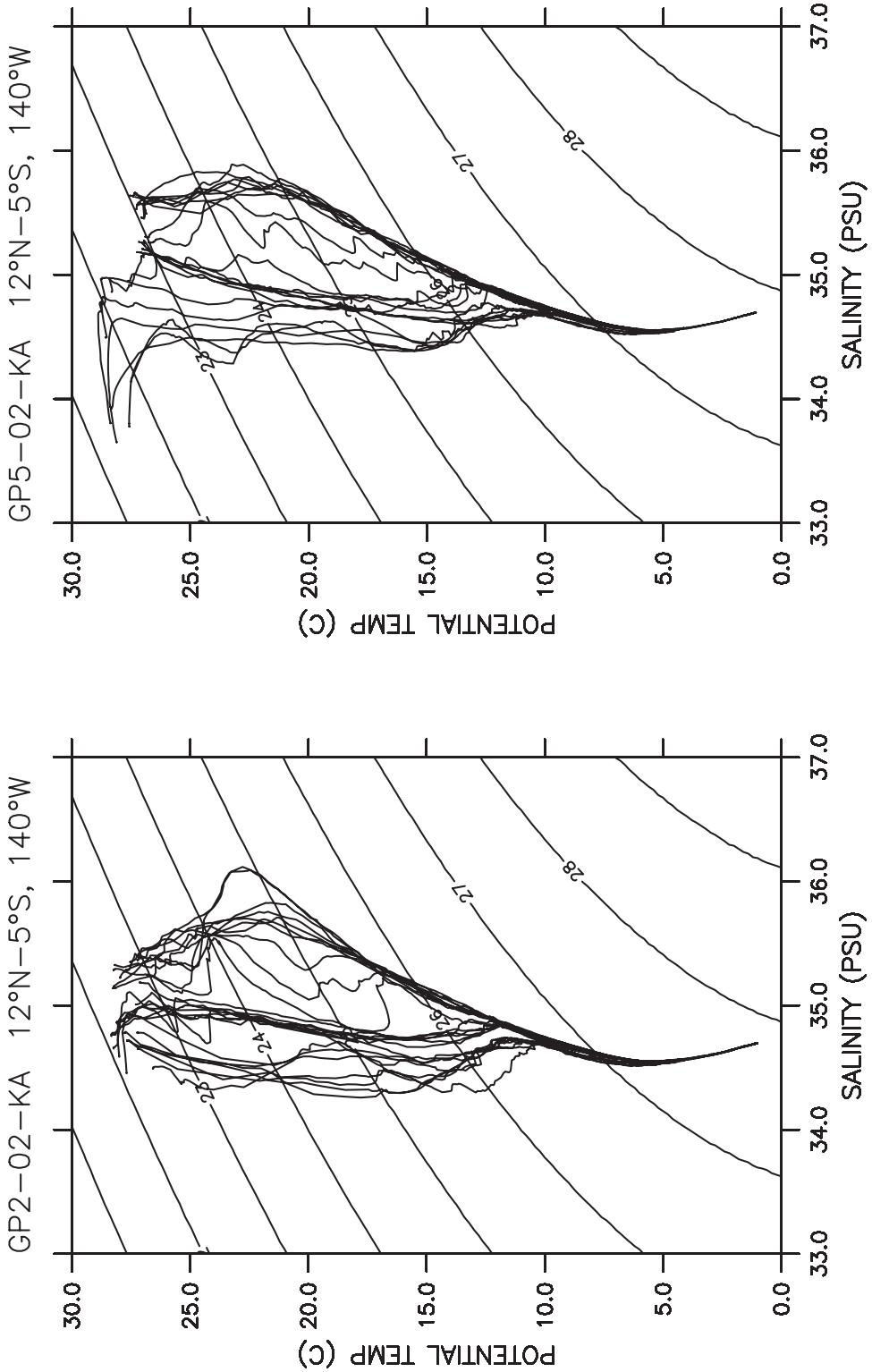

Figure 59: GP2-02-KA boreal spring (May 2–10, 2002) and GP5-02-KA summer (August 22–30, 2002) composite θ-S diagrams along 140°W.

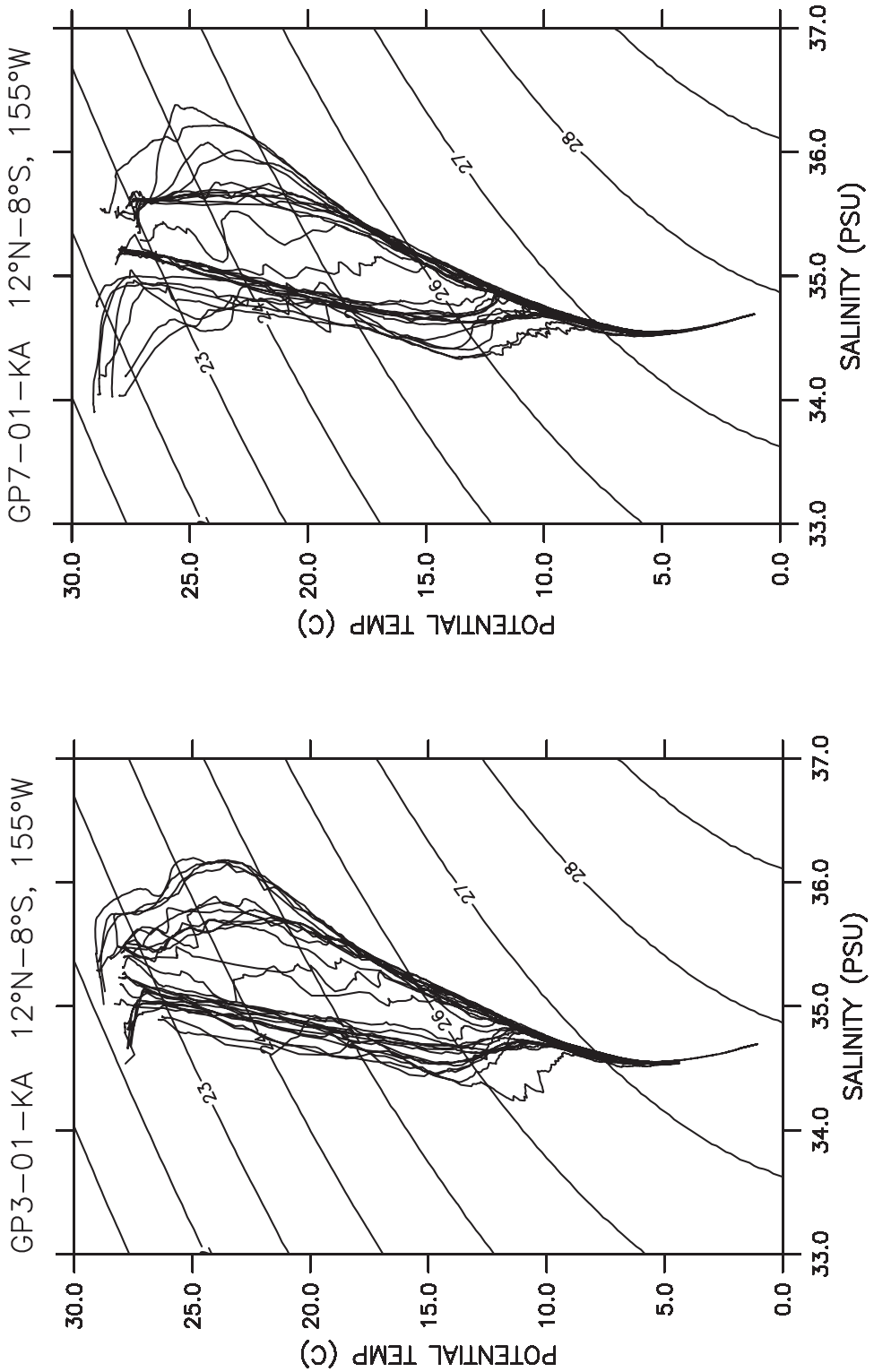

Figure 60: GP3-01-KA boreal summer (June 1–9, 2001) and GP7-01-KA fall (September 30–October 9, 2001) composite θ-S diagrams along 155°W.

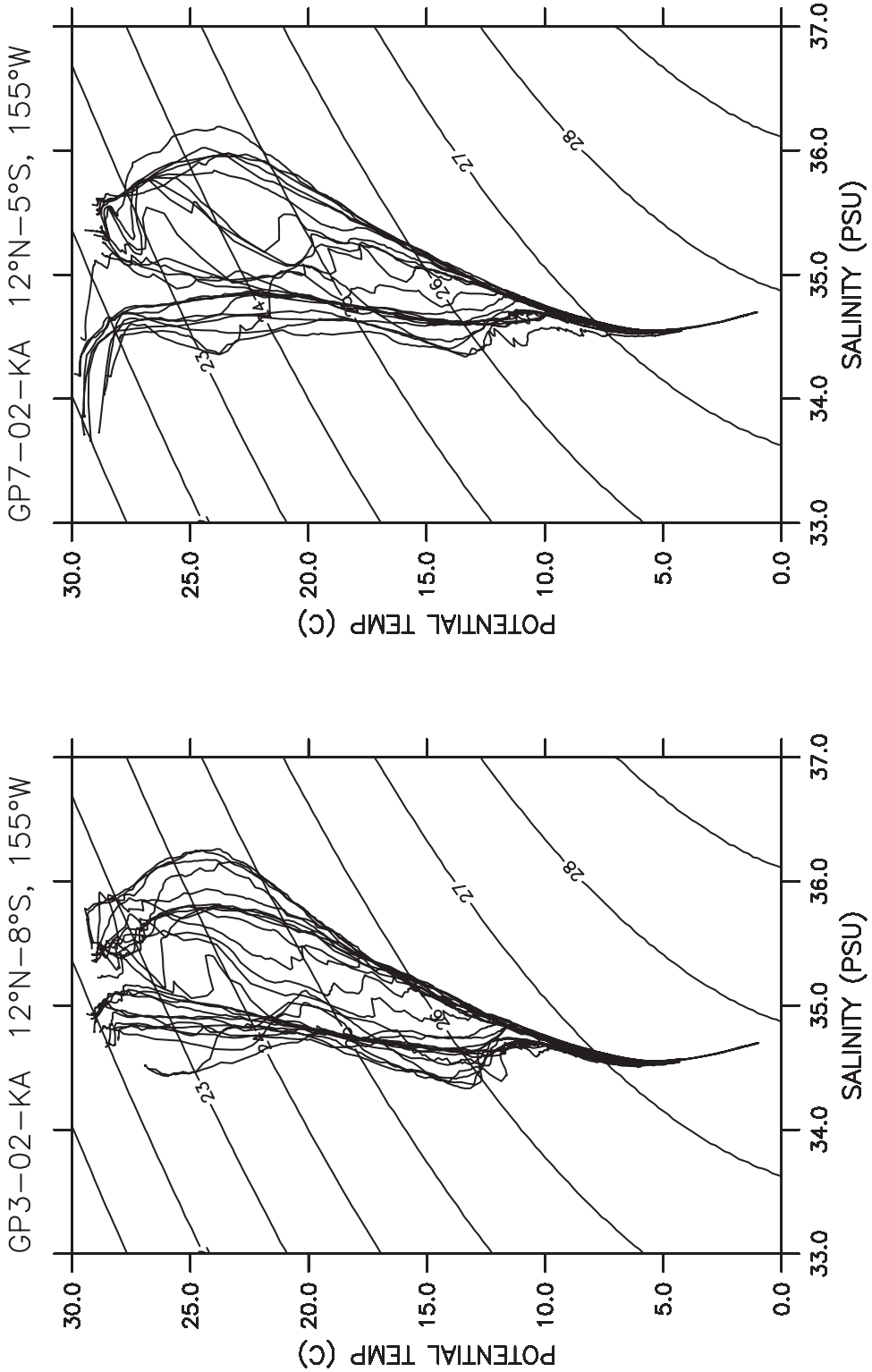

Figure 61: GP3-02-KA boreal summer (June 1–9, 2002) and GP7-02-KA fall (October 6–14, 2002) composite θ-S diagrams along 155°W.

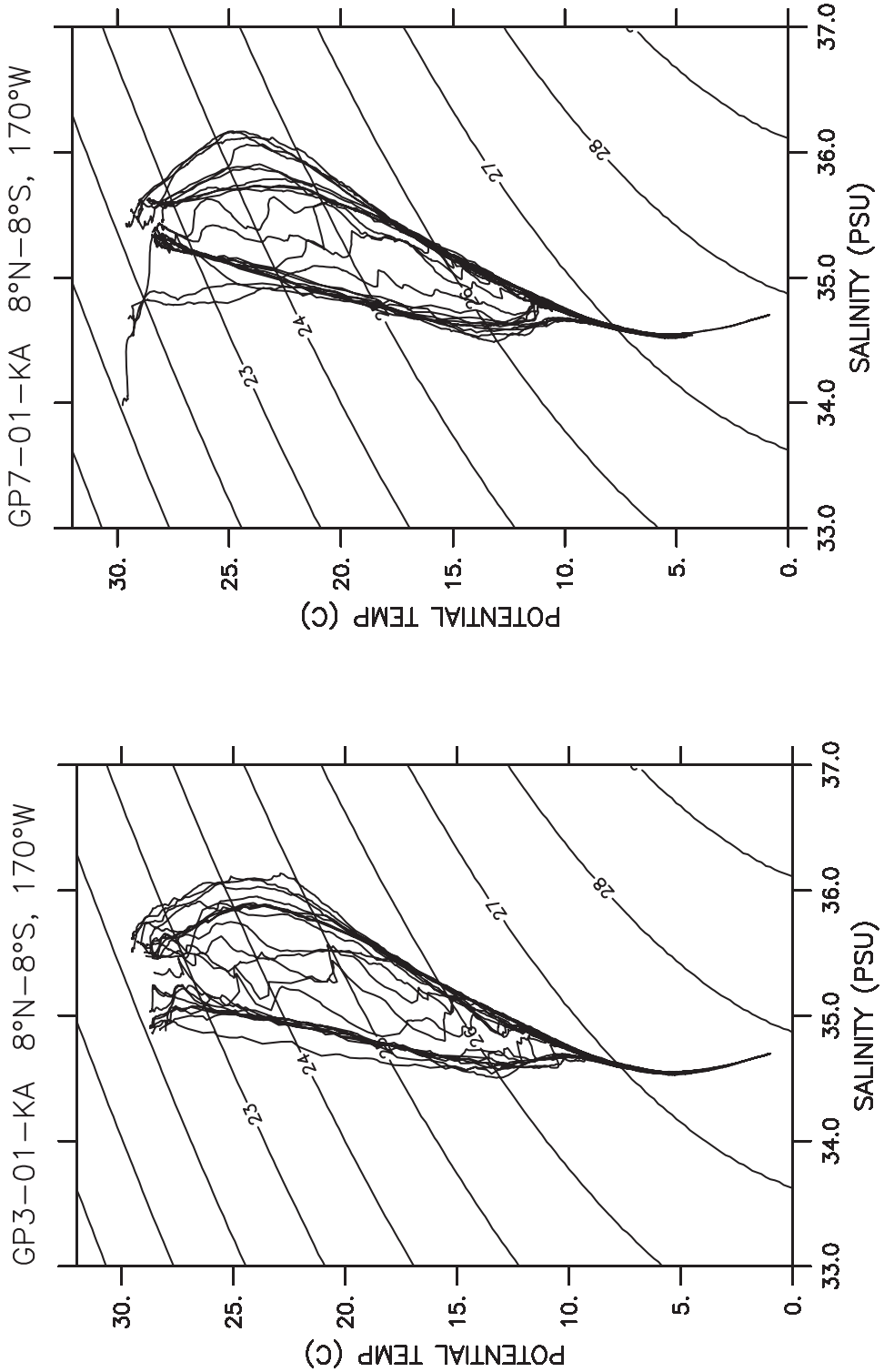

Figure 62: GP3-01-KA boreal summer (June 14–24, 2001) and GP7-01-KA fall (October 13–22, 2001) composite θ-S diagrams along 170°W.

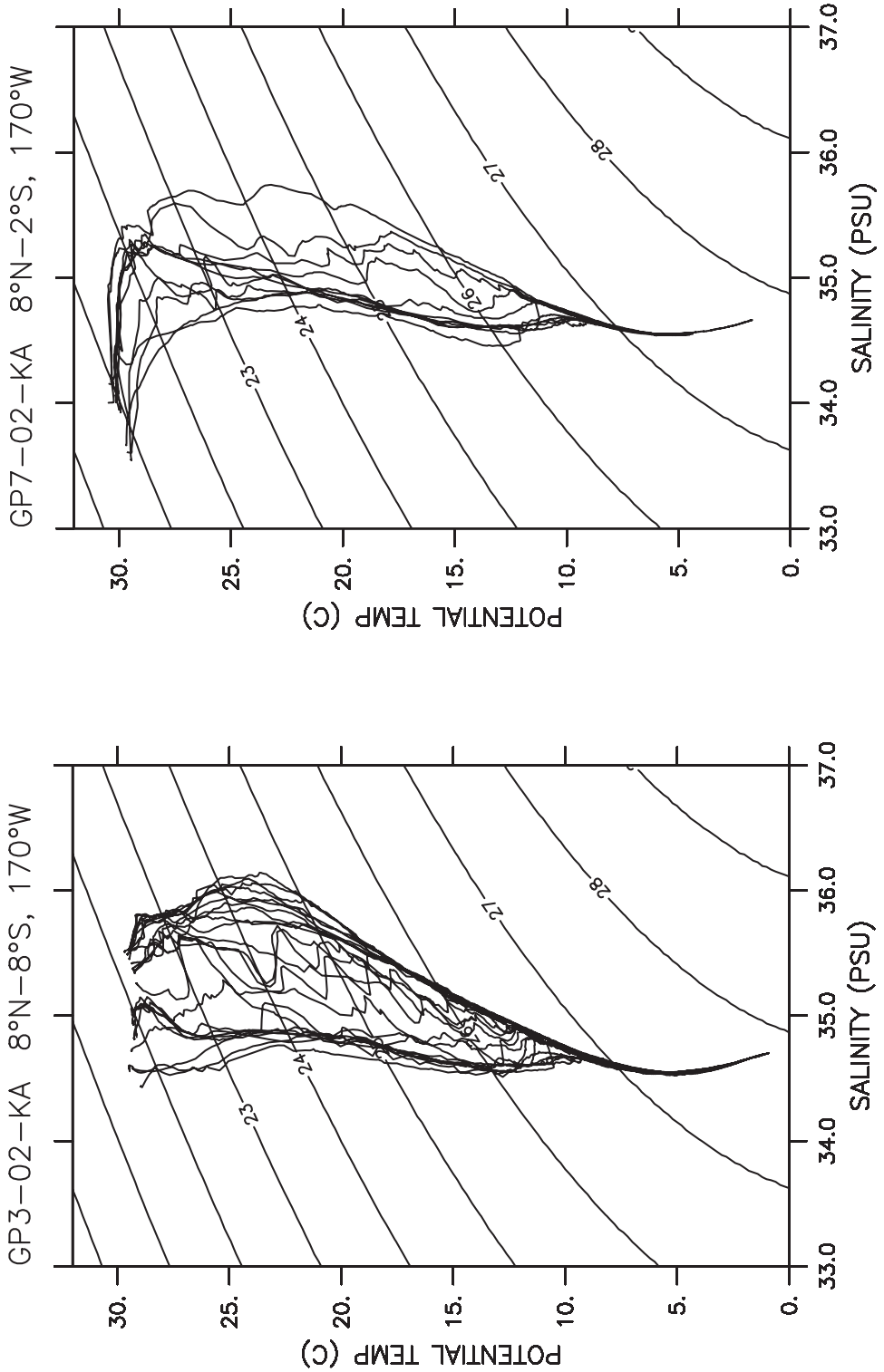

Figure 63: GP3-02-KA boreal summer (June 16–24, 2002) and GP7-02-KA fall (October 17–23, 2002) composite θ-S diagrams along 170°W.

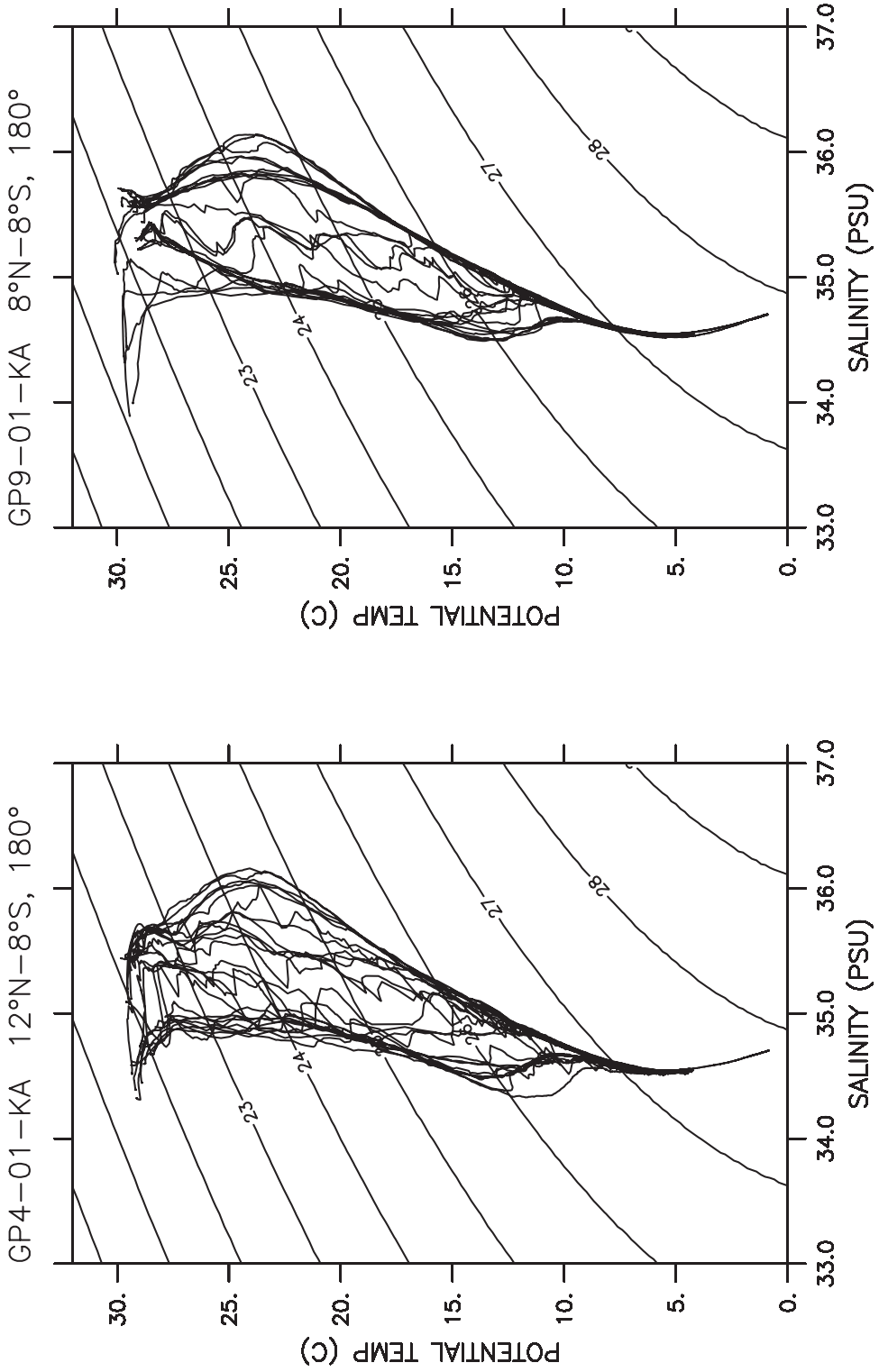

Figure 64: GP4-01-KA boreal summer (July 16–25, 2001) and GP9-01-KA fall (November 10–24, 2001) composite θ-S diagrams along 180°.

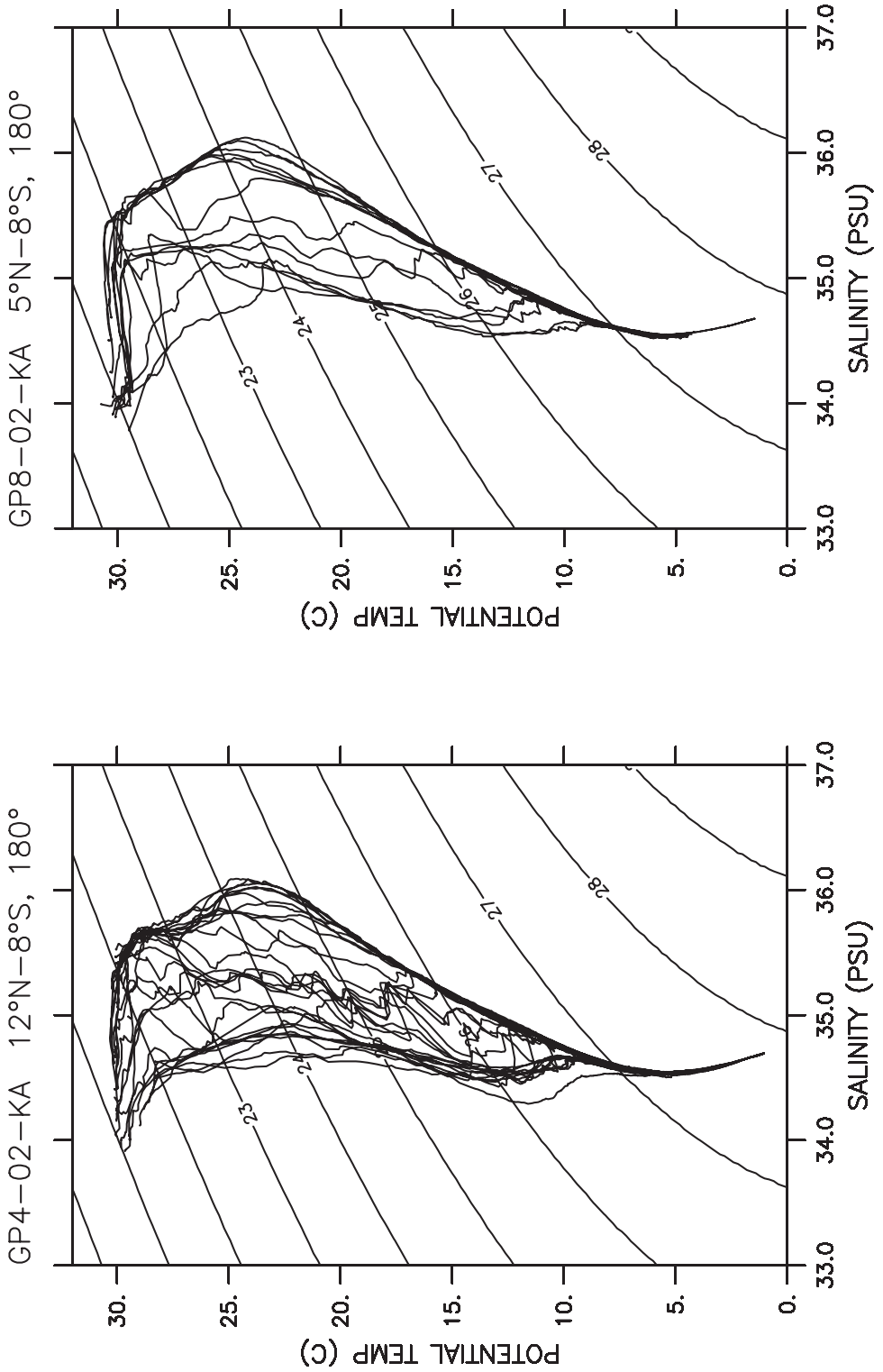

Figure 65: GP4-02-KA boreal summer (July 16–25, 2002) and GP8-02-KA fall (November 13–22, 2002) composite θ-S diagrams along 180°.

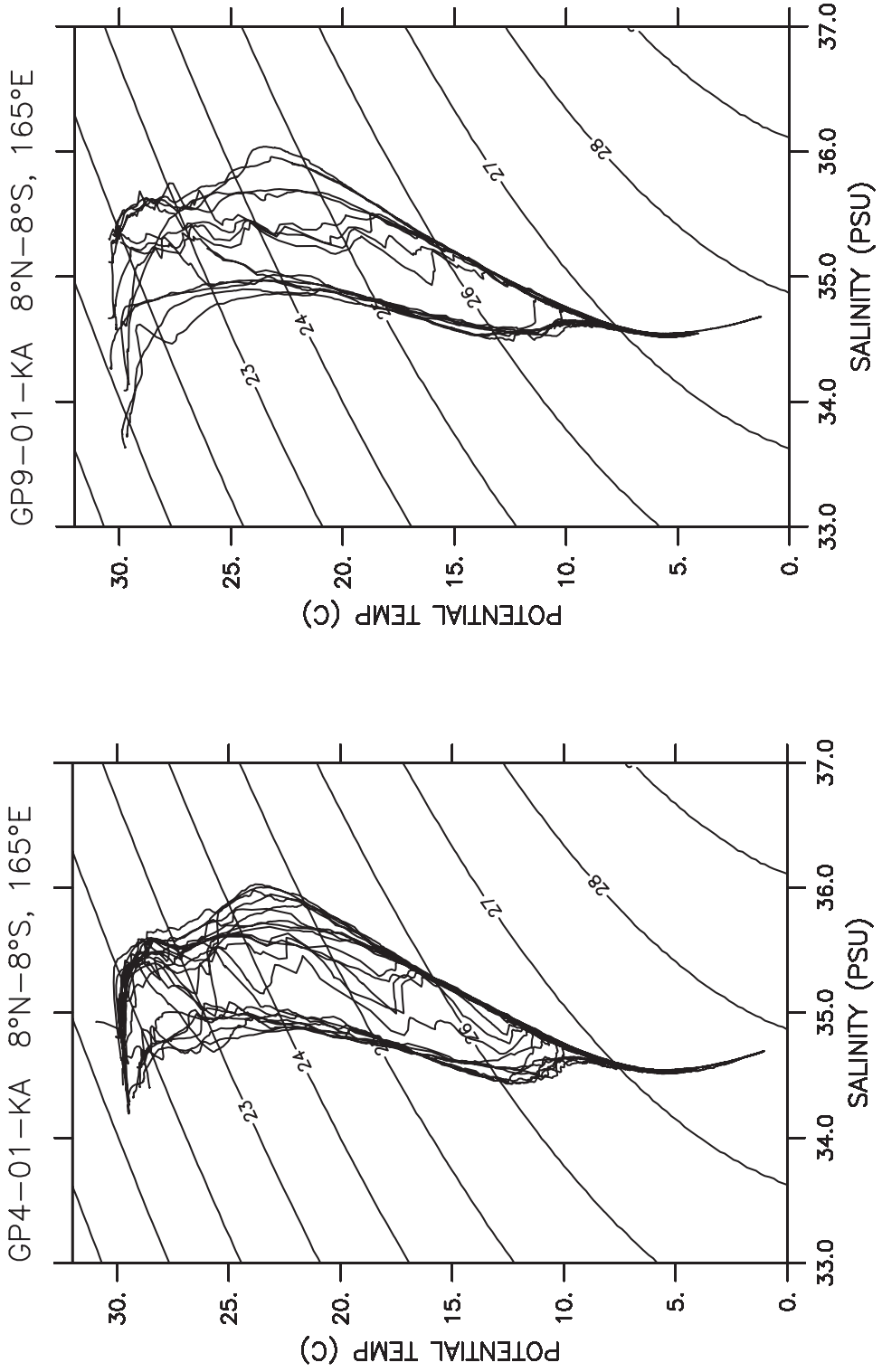

Figure 66: GP4-01-KA boreal summer (July 4–12, 2001) and GP9-01-KA fall (October 31–November 6, 2001) composite θ-S diagrams along 165°E.

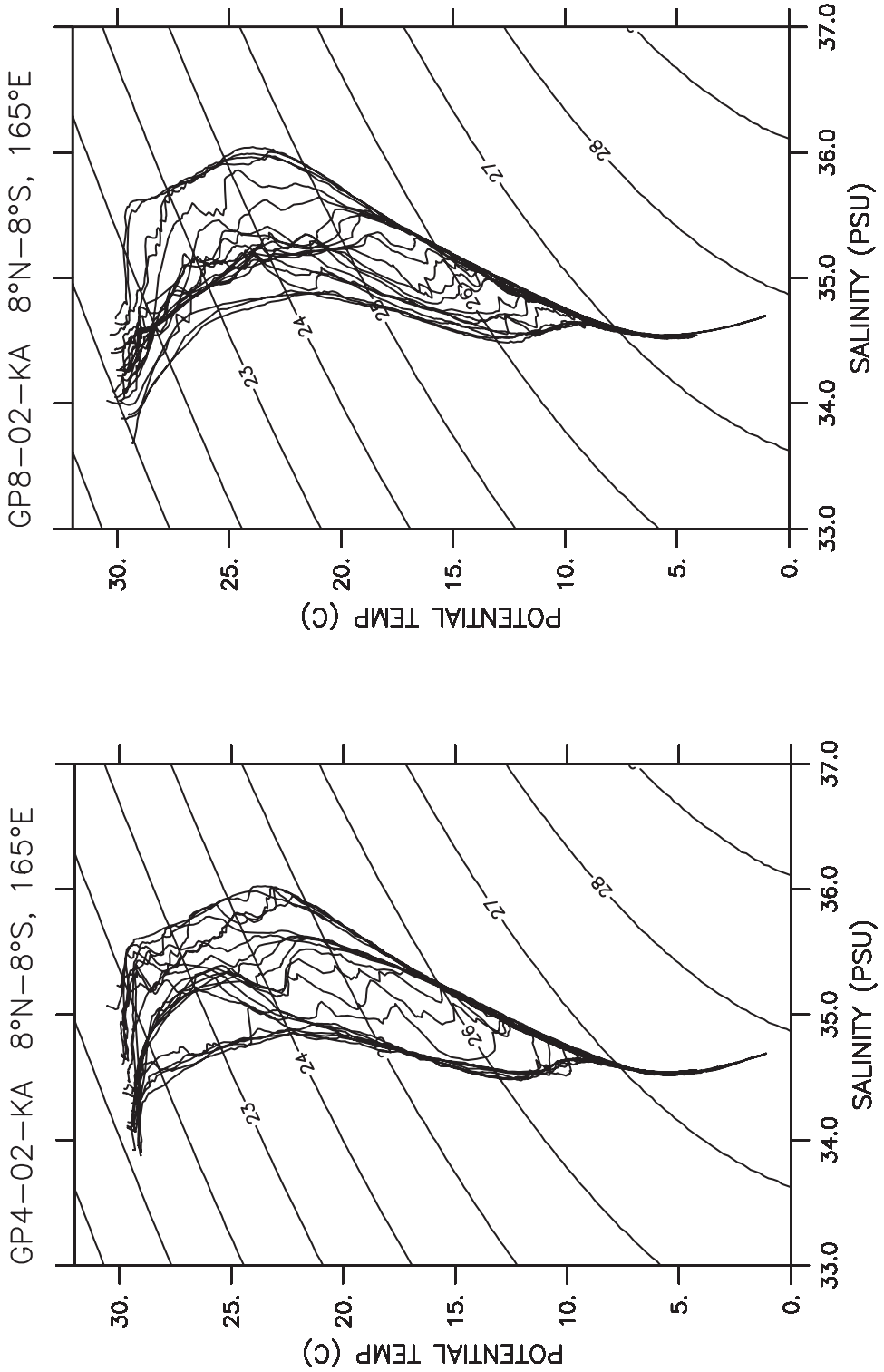

Figure 67: GP4-02-KA boreal summer (July 6–13, 2002) and GP8-02-KA fall (November 2–9, 2002) composite θ-S diagrams along 165°E.

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