



Hydrographic Observations during the Joint Air-Sea Monsoon Interaction Experiment (JASMINE) Pilot Study

Data Report

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1 Introduction.

This report documents and describes oceanographic observations made during the Joint Air-Sea Monsoon Interaction Experiment (JASMINE) pilot study in the Indian Ocean during the summer of 1999.

JASMINE is the first comprehensive study of the coupled ocean-atmosphere system in the eastern Indian Ocean and the southern Bay of Bengal. Observations made during the field phase of JASMINE sampled both prolonged break and active phases of the monsoon resulting in an unprecedented amount of research quality data defining the atmospheric and ocean state during intraseasonal transitions of the monsoon. The design of the JASMINE pilot study was based on the observation that the intraseasonal variability of the monsoon, as it sways back and forth from active to inactive (or break) phases, is an important component of the monsoon system and one that is poorly sampled and simulated.

The scientific objectives of the JASMINE pilot study were to:

- (i) Document the atmospheric boundary layer and surface fluxes through the transition from the active to the break periods of the monsoon.
- (ii) Document components of the upper ocean heat, salt and momentum budgets as well as equatorial upper ocean current structure during active and break periods of the monsoon.
- (iii) Acquire statistics of surface turbulent and radiative fluxes to enable a comparison with previous tropical western Pacific field programs.
- (iv) Acquire statistics and documentation of convection in order to understand the nature and organization of cloud systems during active and break periods of the monsoon and to compare these statistics with earlier observational studies in the tropics.

Two research vessels were used to gather data: the NOAA research vessel *Ronald H. Brown* and the Australian Research Vessel *Franklin*. There were three components of the pilot study with cruises during April and during May-June aboard the *Ronald H. Brown*, and during September aboard the *Franklin*. The cruise tracks were made up of a combination of transects and on-station periods. Overall, 388 CTD (conductivity, temperature and depth) casts, and 272 radiosonde ascents were made. In addition, both ships carried identical air-sea flux systems to accurately measure the fluxes that couple the ocean and the atmosphere. The *Ronald H. Brown* was equipped with five separate radar systems and profilers including a cloud radar and a C-band rain radar. All radars operated continually throughout JASMINE. During JASMINE, the METEOSAT-5 satellite was re-positioned over the central Indian Ocean providing, for the first time, near real-time accessible high-frequency geostationary imagery. Real-time images from NOAA polar-orbiting satellites were received on board the *Brown*.

Here we report the hydrographic observations acquired on board the R/V *Ronald H. Brown*. A Sea-Bird CTD instrument with duplicate temperature and conductivity sensors was used during the May-June cruise. The sensors were calibrated before and after the cruise. Measurements were made to better than 0.01°C in temperature and 0.01 for salinity below 5 m. In addition, the *Ronald H. Brown* came equipped with a thermosalinograph, which provided a continuous, high-resolution depiction of temperature and salinity of the surface layer. Horizontal currents over the depth range of 20-300 m were measured from the shipboard acoustic Doppler current profiler (ADCP) with a vertical resolution of 8 m.

2 Description of cruises.

The University of Hawaii group had responsibility for the oceanographic observations on the two JASMINE legs aboard the NOAA Ship *Ronald H. Brown*. We refer to the two cruise legs as the pre-JASMINE and main JASMINE cruises. The pre-JASMINE cruise, 7-22 April 1999, went from Male, Maldives to Singapore (Fig. 2.1). After departing Male, the ship transited to the first CTD station at 5°S, 88°E. The underway sampling systems began data acquisition once outside the territorial waters of the Maldives. A total of 44 CTD stations were completed along a survey line from 5°S to near 16.5°N along 88°E. A 45th shallow CTD test station was done near 8.1°N, 88°E prior to transiting to Singapore (data not used). Acoustic Doppler current profiler (ADCP) and near-surface thermosalinograph data were obtained continuously from the shipboard systems. Seven surface drifters (provided by P. Niiler, UCSD) were deployed as part of the global drifter array to measure near-surface currents and temperatures. In addition, 23 radiosondes were deployed along 88°E during 10-17 April 1999. The radiosonde data are not described in this report. At the north end of the 88°E section, a deep current meter mooring was recovered for Prof. Detlef Quadfasel, Niels Bohr Institute for Astronomy, Physics and Geophysics, Copenhagen, Denmark. The mooring was part of a study of sediment transport in a narrow channel on the Ganges Fan. The pre-JASMINE data were obtained during an active period (westerly wind burst) of the early southwest monsoon season, with strong southwesterly winds driving eastward currents and forming deep near-surface mixed layers in the near-equatorial band.

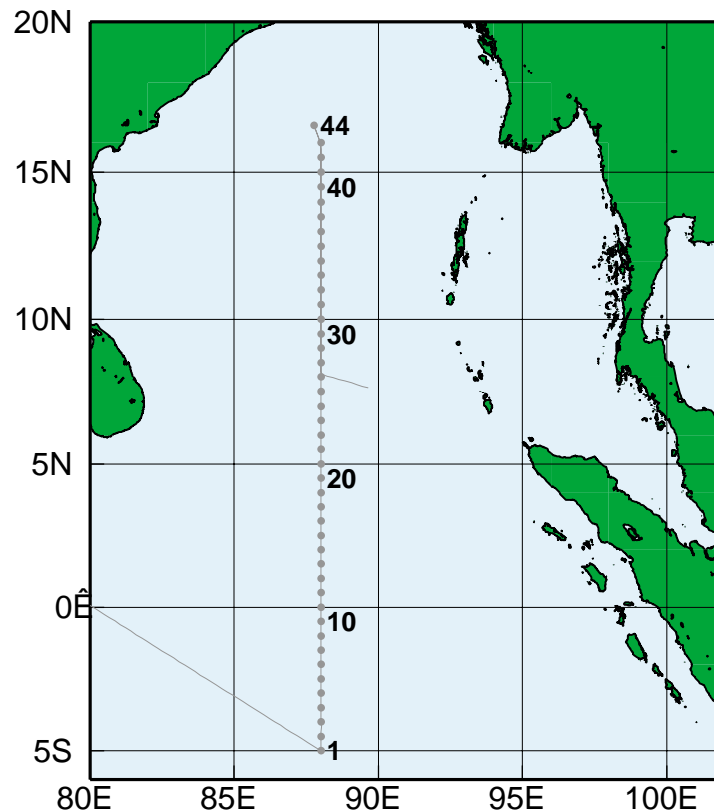


Figure 2.1. Cruise track map of the pre-JASMINE cruise (7-22 April 1999) on the R/V Ronald H. Brown. The solid circles indicate the location of CTD stations, which are sequentially numbered.

During the main JASMINE cruise, 30 April to 8 June 1999 from Singapore to Darwin, Australia, the primary survey period extended from 4 May to 31 May and began and ended at 5°S, 94°E ([Fig. 2.2](#)). Data acquired include 317 CTD stations (stations 001 and 002 were test stations taken prior to arrival at the survey domain), continuous ADCP and thermosalinograph measurements. In addition, 18 surface drifters (UCSD) and 2 SOLO profiling temperature and salinity floats (courtesy of R. Davis, UCSD) were deployed. The observations were conducted between 5°S and 13.5°N and between 88°E and 94°E within the Bay of Bengal sector of the Indian Ocean. The survey included four near-meridional sections plus two separate five-day surveys conducted in a star pattern near the north end of the survey domain.

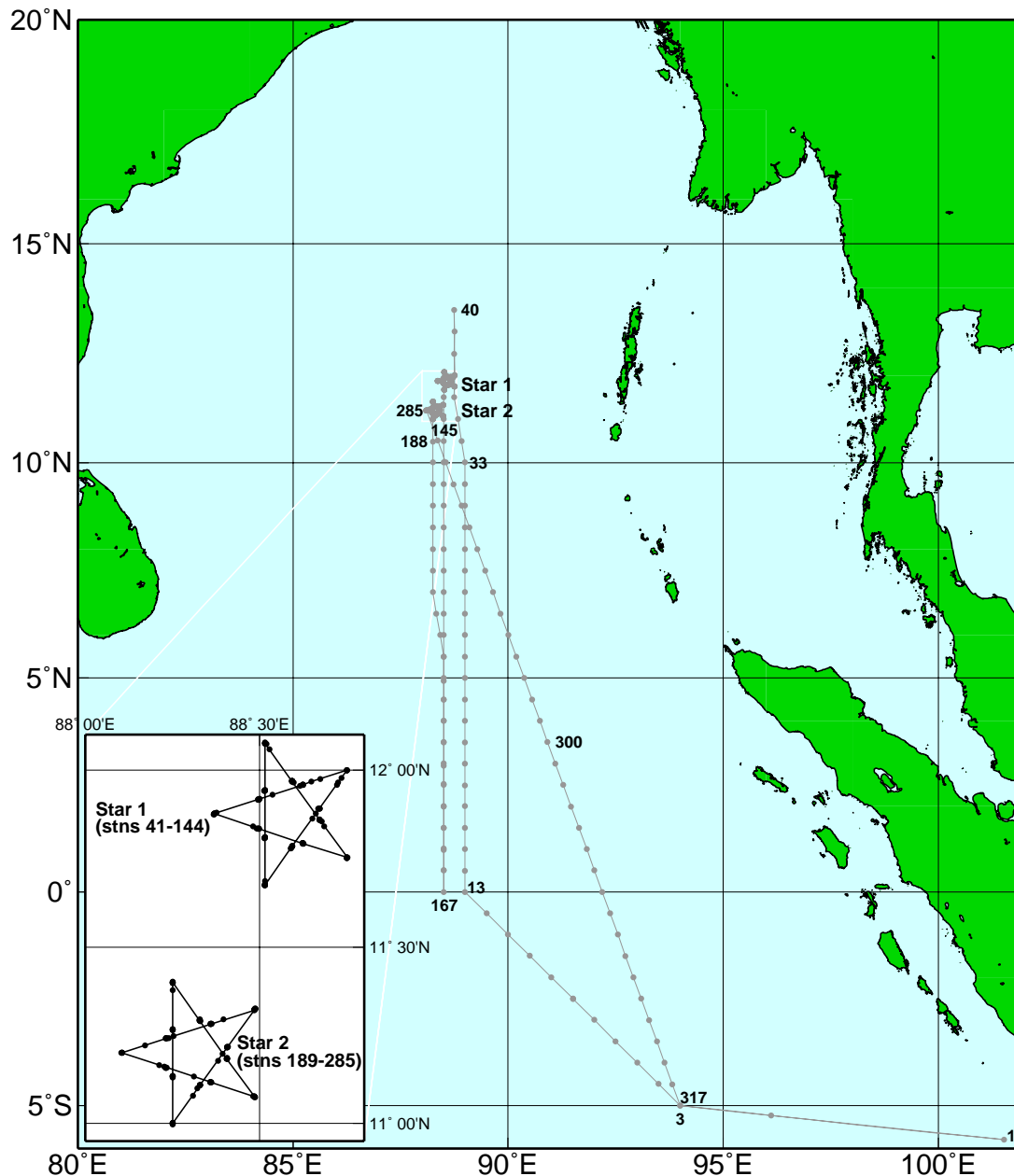


Figure 2.2. Cruise track map of the JASMINE cruise (30 April – 8 June 1999) on the R/V Ronald H. Brown. The solid circles indicate the location of CTD stations, which are sequentially numbered.

During the main JASMINE cruise, the four meridional surveys include the stations in [Table 2.1](#). CTD stations 001 and 002 were instrument test stations enroute to the survey domain. CTD stations were made to 1080 dbar (1000 m nominal) every whole degree in latitude (5°S, 4°S, 3°S, etc.) with 6 water samples for conductivity calibration, and 550 dbar (nominal) every intervening half degree in latitude (4.5°S, 3.5°S, 2.5°S, etc.) with 4 water samples for calibration ([Fig. 2.2](#)).

Table 2.1

Section 1, south to north, CTD stations 003-040

Start (CTD 003): 04 May 1999;	18:32:43z;	05° 00.00'S, 94° 00.00'E.
End (CTD 040): 10 May 1999;	02:44:50z;	13° 30.00'N, 88° 44.92'E.

Section 2, north to south, CTD stations 140-167.

Start (CTD 140): 15 May 1999;	08:19:44z;	12° 04.58'N, 88° 30.89'E.
End (CTD 167): 18 May 1999;	12:17:34z;	00° 00.00'N, 88° 30.00'E.

Section 3, south to north, CTD stations 167-189.

Start (CTD 167): 18 May 1999;	12:17:34z;	00° 00.00'N, 88° 30.00'E.
End (CTD 189): 21 May 1999;	11:51:35z;	11° 00.00'N, 88° 15.00'E.

Section 4, north to south, CTD stations 285-317.

Start (CTD 285): 26 May 1999;	13:02:05z;	11° 12.00'N, 88° 06.28'E.
End (CTD 317): 30 May 1999;	23:39:10z;	05° 00.00'S, 94° 00.00'E.

The two 5-day surveys include the stations and time periods in [Table 2.2](#). For STAR-1, a total of 6 complete cycles plus 4 additional legs were completed in 5 days; for STAR-2, 6 complete cycles plus 2 additional legs were completed in 5 days. Note that some stations overlap with the meridional sections. The star surveys were made up of 5 outer points, 10 inner points, and 5 cross-star legs including a total of 15 waypoints (see the insert of [Fig. 2.2](#)). The distance between CTD stations along each leg was 8 nautical miles; the length of each leg was 24 nautical miles. Each complete cycle around the star (15 stations) required about 18 hours. CTD stations at waypoint 1 were to 1080 dbar with 6 water samples for calibrations. CTD stations at waypoints 4, 7, 10, and 13 (the other outer waypoints) were to 550 dbar with 4 water samples for calibration. CTD stations at waypoints 2, 3, 5, 6, 8, 9, 11, 12, 14, and 15 (the inner waypoints) were to 380 dbar with 3 water samples for calibration.

Table 2.2

STAR-1, stations 041-143.

Start (CTD 041): 10 May 1999;	11:12:45z;	12° 00.00'N, 88° 45.00'E.
End (CTD 143): 15 May 1999;	11:52:30z;	11° 40.58'N, 88° 30.89'E.

STAR-2, stations 189-285.

Start (CTD 189): 21 May 1999;	11:51:35z;	11° 00.00'N, 88° 15.00'E.
End (CTD 285): 26 May 1999;	13:02:05z;	11° 12.00'N, 88° 06.28'E.

The thermosalinograph data were acquired by the ship's underway system, which samples at a nominal depth of 5.6 meters with a sampling interval of 30 seconds. The data were acquired continuously during the JASMINE surveys except for a five day period close to the end of the main JASMINE cruise when the ship was in transit through Indonesian waters. Salinity samples were taken 6 times per day for calibration during the main JASMINE cruise, and in addition, the temperature and salinity records were checked against the CTD station data. Only the thermosalinograph data obtained during the main JASMINE cruise are reported here.

The ADCP data were acquired using the ship's RDI 150 kHz system, P-code navigation, and Ring-LASER gyro. The transducers were located at a depth of 5.6 meters; blanking interval, pulse length and bin length were 4 meters, 8 meters and 8 meters, respectively. The system operated nearly continuously during the JASMINE cruises using a 2-minute ensemble for averaging. Bottom tracking was enabled during the beginning and end of the cruise to assist with calibration. Thus, the basic data set has velocity sampled at 8-meter depth intervals (nominal) over a depth range from 17 meters to typically 400 meters, with a velocity profile every 2 minutes along the track. The ADCP also yields an along-track temperature record, sampled every 2 minutes, at a depth of 5.6 meters.

The scientific personnel that participated during the JASMINE cruises are listed in [Table 2.3](#).

Table 2.3 Scientific personnel on R/V Ronald H. Brown during the JASMINE cruise.

Cruise	Name	Title or function	Affiliation
pre-JASMINE	Shaun Johnston	Graduate Student	Univ. of Hawaii
	Kamran Sahami	Graduate Student	Univ. of Colorado
	Nikolaus Classen	Graduate Student	Univ. of Hamburg
Main JASMINE	Christopher Fairall	Chief Scientist	ETL
	Scott Abbott	Technician	ETL
	Catherine Russell	Technician	ETL
	Michelle Ryan	Technician	ETL
	Edward Frank Bradley	Senior Scientist / P.I.	CSIRO
	Grant Gray	Technician	Univ. of Washington
	Yolande Serra	Scientist	Univ. of Washington
	Catherine Spooner	Technician	Univ. of Washington
	Dana Greeley	Technician	PMEL
	Peter Hacker	Principal Investigator	Univ. of Hawaii
	Roger Lukas	Principal Investigator	Univ. of Hawaii
	Julia Hummon	Research Associate	Univ. of Hawaii
	Hans Ramm	Electronics Technician	Univ. of Hawaii
	Donald Wright	Research Associate	Univ. of Hawaii
	Mark Croxford	Graduate Student	Univ. of Hawaii
	Wei Shi	Graduate Student	Univ. of North Carolina
	Peter Webster	Principal Investigator	Univ. of Colorado
	David Lawrence	Graduate Student	Univ. of Colorado
	Javier Zavala-Garay	Graduate Student	Univ. of Colorado
	Paquita Zuidema	Post-Doctorate	Univ. of Colorado

3 Sampling procedures and data processing.

The sampling and processing procedures for the CTD data from the main JASMINE cruise are described in section 3.1. Section 3.2 includes the procedures followed for the pre-JASMINE cruise CTD data. Sampling and processing procedures for the thermosalinograph data from the main JASMINE cruise are included in section 3.3. Section 3.4 includes sampling and processing procedures for the ADCP data. The description of surface drifters and SOLO floats deployments are included in sections 3.5 and 3.6 respectively.

3.1 Main JASMINE cruise conductivity, temperature and depth (CTD) profiling

Continuous measurements of temperature, conductivity and pressure were made at CTD stations with a Sea-Bird SBE-911 *plus* CTD package (SN 92859) with an internal Digiquartz pressure sensor and two pairs of external temperature and conductivity sensors. Each of the temperature-conductivity (T-C) sensor pairs used a Sea-Bird T-C duct, which circulated seawater through independent pump and plumbing installations. The CTD was mounted in a vertical position in the lower part of a 12-place Rosette sampler, with the sensors' water intakes located at the bottom of the Rosette. The package was deployed on a conducting cable, which allowed for real-time data acquisition and display. The deployment procedure consisted of lowering the package to 10-15 dbar and waiting until the CTD pumps started operating. The rosette was then raised until the sensors were close to the surface to begin the CTD cast. The time of each cast was corrected for drift in the acquisition computer clock. This correction was not larger than 27 seconds. The position of each cast was obtained by matching the beginning time of the cast with the time in a GPS navigation file obtained at 10-sec intervals. Between two and six 5-liter Niskin bottles were closed on each cast in order to provide salinity samples for calibration of the conductivity sensors.

3.1.1 Data acquisition and processing.

CTD data were acquired at 24 samples per second. Digital data were stored on a personal computer, and for redundancy the analog signals were recorded on VHS video tapes.

[Figure 3.1](#) shows a flowchart of the CTD data processing procedures. The raw CTD data were first converted from frequencies to engineering units using nominal sensor calibrations and then screened for spikes or missing data using a 9-point median filter. After screening, the correct alignment of temperature and conductivity time-series was computed to compensate for any spatial misalignment of the sensors. Both T-C pairs were aligned with each other by aligning the two temperature sensors. Conductivity was corrected for thermal inertia of the glass conductivity cell as explained below (Sect 3.1.2.3), and the data were averaged to half-second values; salinity was then computed. Details of these procedures are described in the following sections. Spikes in the data occur when the CTD samples the disturbed water of its wake, therefore, samples from the downcast were rejected when the CTD was moving upward or when its acceleration exceeded 0.5 m s^{-2} in magnitude. Some of the casts were conducted under rough sea conditions, with heavy ship rolling, causing large vertical velocity fluctuation of the CTD package. The acceleration cutoff value was increased to between 0.55 and 0.70 m s^{-2} to avoid the elimination of an excessive number of data in these casts. The data were subsequently averaged into 2-dbar pressure bins after calibrating the CTD conductivities with the bottle salinities (Sect. 3.1.2.3)

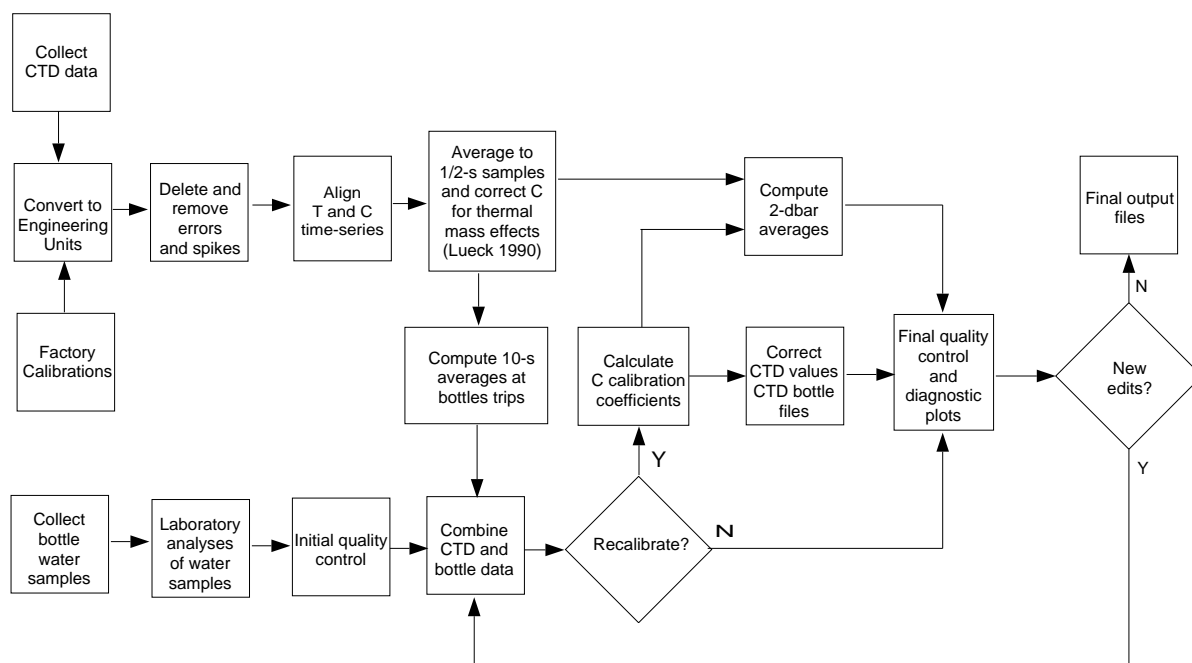


Figure 3.1. Flowchart of CTD data processing.

The data were additionally screened by comparing the temperature and conductivity sensor pairs. These differences permitted identification of various isolated problems with the sensors. Only the data from one temperature-conductivity sensors pair, whichever was deemed most reliable, are reported here. Only data from the downcast are reported, as upcast data are contaminated by wake effects.

Temperature is reported in the ITS-90 scale. Salinity and all derived units were calculated using the UNESCO (1981) routines; salinity is reported in the practical salinity scale (PSS-78).

3.1.2 CTD sensor corrections and calibration

3.1.2.1 Pressure

The pressure calibration strategy employed a high-quality quartz pressure transducer as a laboratory transfer standard. Periodic recalibrations of this standard were performed with a primary pressure standard. The transfer standard was used to check the CTD pressure transducer before and after the JASMINE cruise. The corrections applied to the measured CTD pressures were a constant offset determined at the time that the CTD first enters the water on each cast, and a span correction determined from bench tests on the sensor against the transfer standard.

Transfer Standard Calibration

The transfer standard is a Paroscientific Model 760 pressure gauge equipped with a 10,000-PSI transducer. This instrument was purchased in March 1988, and was originally calibrated against a primary standard. Subsequent recalibrations have been performed every 2.5 years on average at the Northwest Regional Calibration Center and at the Scripps Institution of Oceanography (Santiago-Mandujano et al., 1999).

CTD Pressure Transducer Calibration

CTD pressure transducer calibrations were done using an Ametek T-100 pump and a manifold to apply pressure simultaneously to the CTD pressure transducer and to the transfer standard. All calibrations consisted of two measurements at six pressure levels between 0 and 4500 dbar while both increasing and decreasing pressure. Pressure sensor SN 51412 was used during the JASMINE cruise. The results of the calibrations conducted on this sensor from 1994 through June 1999 (after the cruise) are shown in [Table 3.1](#). Those before September 1998 do not include the 0 dbar offset because problems in the experimental setup during those tests made the data unreliable. The 0 dbar offset has remained relatively constant at about 1 dbar. No correction was applied for this offset during the cruise. (A more accurate offset was later determined at the time that the CTD first enters the water on each cast). The 0-4500 dbar span has also remained relatively constant; a span correction of 0.47 dbar/4500 dbar was applied for all the casts during the JASMINE cruise. The sensor hysteresis has remained small and relatively stable.

Table 3.1 CTD pressure sensor SN 51412 calibrations against the transfer standard

Calibration date	Offset at 0 dbar	0-4500 dbar span	Hysteresis
12/16/94	NA	0.45	0.05
8/21/95	NA	0.45	0.05
12/05/95	NA	0.65	0.07
8/30/96	NA	0.45	0.10
1/31/97	NA	0.50	0.08
6/12/97	NA	0.65	0.05
9/14/98	1.25	0.55	0.05
1/26/99	0.95	0.55	0.05
6/25/99	1.00	0.47	0.05

3.1.2.2 Temperature

One Sea-Bird SBE-3-Plus temperature transducer (SN 2700), and two SBE-3-02/F transducers (SN 741 and SN 1416) were used during the main JASMINE cruise and were calibrated at Sea-Bird Electronics, Inc. before and after the cruise to an accuracy better than $0.5 \times 10^{-3} ^\circ\text{C}$.

Calibration coefficients obtained at Sea-Bird are presented in [Table 3.2](#). These coefficients were used in the following formula that gives temperature (in $^\circ\text{C}$) as a function of the frequency signal (f):

$$\text{Temperature} = 1/\{a+b[\ln(f_0/f)]+c[\ln^2(f_0/f)+d[\ln^3(f_0/f)]]\}-273.15$$

For each sensor, the 0-30 $^\circ\text{C}$ average offset was calculated for each calibration relative to the oldest one, and a linear fit was made to these offsets. A single baseline calibration was chosen and a temperature-independent offset relative to the baseline calibration was applied to the data to remove the temporal trend due to the sensor drift. The maximum drift correction during JASMINE was less than $0.2 \times 10^{-3} ^\circ\text{C}$. The baseline calibration was selected as the one for which the trend-corrected average from 0-5 $^\circ\text{C}$ was nearest to the ensemble mean of these averages.

Table 3.2. Calibration coefficients for Sea-Bird temperature transducers determined at Sea-Bird Electronics Inc. RMS residuals from calibration give an indication of calibration quality.

SN	YYMMDD	f_0	$a (1 \times 10^{-3})$	$b (1 \times 10^{-4})$	$c (1 \times 10^{-5})$	$d (1 \times 10^{-6})$	RMS (m°C)
2700	990616	2978.33	3.6800209	6.04743710	1.65403727	2.37364236	0.07
2700	990320	2978.10	3.68006558	6.04745468	1.65444413	2.38427160	0.07
1416	990617	6231.95	3.68148157	6.01819441	1.50032823	2.10174374	0.20
1416	990326	6231.76	3.68150110	6.01783217	1.49376432	2.05537765	0.18
1416	990227	6231.74	3.68151034	6.01815238	1.49800821	2.07233030	0.18
1416	990126	6232.18	3.68146341	6.01818861	1.50237823	2.11362758	0.18
1416	981229	6232.24	3.68145690	6.01800604	1.49753799	2.08073387	0.16
1416	981125	6231.56	3.68151895	6.01762087	1.48864384	2.03319618	0.19
1416	981027	6231.98	3.68148529	6.01794517	1.49358504	2.04291623	0.18
1416	981006	6231.93	3.68148972	6.01792357	1.49143589	2.02040207	0.20
1416	980822	6231.76	3.68150889	6.01806098	1.49466509	2.04654707	0.17
1416	980727	6231.76	3.68150663	6.01801069	1.49837213	2.10659367	0.18
1416	980627	6231.36	3.68154474	6.01758119	1.48445421	1.99238010	0.19
1416	980507	6231.24	3.68156290	6.01831419	1.50667887	2.16816206	0.17
1416	980331	6231.78	3.68150557	6.01791441	1.49641821	2.08469333	0.18
1416	980227	6231.35	3.68155533	6.01819740	1.50117434	2.11346853	0.19
1416	980120	6231.51	3.68152843	6.01783122	1.49889428	2.12875994	0.16
1416	971219	6231.08	3.68157721	6.01762309	1.48775151	2.03100076	0.19
1416	971011	6231.00	3.68158587	6.01772444	1.49377973	2.08917906	0.19
1416	970814	6231.23	3.68157235	6.01853380	1.51359673	2.21983366	0.16
1416	970719	6231.25	3.68156775	6.01841466	1.51167227	2.20814394	0.17
1416	970618	6230.65	3.68162649	6.01835345	1.50897597	2.18854432	0.18
1416	970422	6231.04	3.68158040	6.01796620	1.50123091	2.13406444	0.18
1416	970327	6230.55	3.68163150	6.01765744	1.49244541	2.07898363	0.17
1416	970225	6231.13	3.68157972	6.01817353	1.50793324	2.19439688	0.14
1416	970123	6230.98	3.68159846	6.01858312	1.51837195	2.27180519	0.16
1416	961224	6230.88	3.68160976	6.01816996	1.50392461	2.14219483	0.18
1416	961121	6230.92	3.68160594	6.01799370	1.49774932	2.08956931	0.18
1416	961016	6230.64	3.68163057	6.01825030	1.50579381	2.15885092	0.17
1416	960907	6230.68	3.68163004	6.01845292	1.51322492	2.22208158	0.17
1416	960803	6230.74	3.68162483	6.01843946	1.51556537	2.25677588	0.14
1416	960709	6231.07	3.68159136	6.01825172	1.51173387	2.22430594	0.15
1416	960604	6230.86	3.68161411	6.01833092	1.51365466	2.23954346	0.14
1416	960511	6230.72	3.68163329	6.01860751	1.52088782	2.29691843	0.15
1416	960409	6230.81	3.68162241	6.01855548	1.52212389	2.31455094	0.15
741	000104	5939.52	3.68134988	6.01953874	1.55498171	2.07567258	0.03
741	991125	5939.07	3.68139925	6.01967560	1.55664716	2.08195020	0.04
741	991023	5938.70	3.68144231	6.01975413	1.55729700	2.09104046	0.04
741	990824	5938.36	3.68146993	6.01977413	1.55765163	2.09582157	0.04
741	990727	5938.88	3.68141681	6.01963436	1.55564543	2.08327953	0.04
741	990617	5938.31	3.68148017	6.01985366	1.55961846	2.11388176	0.03
741	990326	5938.17	3.68150087	6.01974625	1.55324158	2.04263989	0.04
741	990227	5938.07	3.68150918	6.01983456	1.55633477	2.06836660	0.04
741	990126	5938.50	3.68146204	6.01965237	1.55235885	2.03843948	0.05
741	981229	5938.55	3.68145574	6.01963508	1.55260599	2.04749385	0.03
741	981125	5937.97	3.68152031	6.01988032	1.55794866	2.08805635	0.03
741	981027	5938.33	3.68148431	6.01969116	1.55261709	2.04262958	0.05
741	981006	5938.28	3.68148849	6.01977884	1.55521895	2.06557060	0.03
741	980822	5938.08	3.68150766	6.01979670	1.55435431	2.05683602	0.03
741	980727	5938.13	3.68150775	6.01999228	1.56025466	2.10738400	0.05
741	980627	5937.75	3.68154596	6.01989322	1.55610913	2.07106315	0.03
741	980529	5937.67	3.68155023	6.01980837	1.55864404	2.11163461	0.04
741	980331	5938.09	3.68150436	6.01970298	1.55702514	2.09927114	0.04
741	980227	5937.67	3.68155355	6.01994040	1.56127096	2.13185525	0.04
741	980120	5937.88	3.68152817	6.01978087	1.55848283	2.11141726	0.03

A small residual pressure effect on the temperature sensors documented in Tupas et al. (1997) has been removed from measurements obtained with our sensors. The correction factors obtained at Sea-Bird for sensors SN 2700, SN 741 and SN 1416 are $k = 1.6 \times 10^{-3} \text{ }^{\circ}\text{C} / 7000 \text{ dbar}$, $k = -0.28 \times 10^{-3} \text{ }^{\circ}\text{C} / 5000 \text{ dbar}$ and $k = 1.17 \times 10^{-3} \text{ }^{\circ}\text{C} / 5000 \text{ dbar}$. The corrected temperature (T_c) was calculated from the sensor temperature (T) and the pressure (P) as: $T_c = T - kP$.

Another correction made to our temperature measurements was for the viscous heating of the sensor tip due to the water flow (Larson and Pederson, 1996). This correction is thoroughly documented in Tupas et al. (1997).

Dual sensors were used during all casts of the main JASMINE cruise. Sensors SN 2700 and SN 1416 were paired during the first 285 stations, after which sensor SN 2700 was replaced with SN 741 for the rest of the cruise. This replacement was made to try to identify the source of relatively large sensor differences observed near 100 dbar (see below). The temperature differences between sensor pairs were calculated for each cast to evaluate the quality of the data, and to identify possible problems with the sensors. Except for minor glitches in some casts apparently caused by fouling, the sensors performed correctly during the cruise, showing temperature differences within expected values. The mean temperature difference in the water column was typically less than $2 \times 10^{-3} \text{ }^{\circ}\text{C}$ in the 1000-m casts, with a standard deviation of less than $0.5 \times 10^{-3} \text{ }^{\circ}\text{C}$ below 300 dbar. The largest differences of up to $8 \times 10^{-3} \text{ }^{\circ}\text{C}$ were observed near 100 dbar in the first 285 stations, decreasing to less than $2 \times 10^{-3} \text{ }^{\circ}\text{C}$ below 300 dbar. These differences are due to a residual temperature effect in the sensor's circuit board that appears when the sensor passes through steep temperature gradients such as the thermocline (conductivity sensors have a similar effect; N. Larson, personal communication, 1999). Sensor SN 2700 is designed to have a much smaller effect than the other two sensors, thus large differences were observed when paired with sensor SN 1416. The differences decreased when sensors SN 741 and SN 1416 were used because their temperature effect is of the same magnitude and canceled each other.

The largest variability in temperature differences between sensor pairs (as indicated by the standard deviation) was observed in the thermocline, where the standard deviation reached nearly $1 \times 10^{-2} \text{ }^{\circ}\text{C}$. These differences are not unexpected; because each sensor has independent water intakes it is possible that when the CTD passes through this steep gradient region each sensor measures water from slightly different levels, yielding significant temperature differences. Tilting of the rosette frame enhances this source of noise in the sensor differences.

Sensor SN 2700

This was a new sensor acquired in March 1999 and was used as part of the dual-sensor configuration during the first 285 stations of the cruise. The calibrations from March 20 and June 16, 1999 were used to calculate the sensor drift. A linear fit to the 0-30°C average offset from these two calibrations gave a drift of $-1.94 \times 10^{-6} \text{ }^{\circ}\text{C} \text{ day}^{-1}$. Using the March 20 calibration as a baseline, a drift correction to the midpoint of the cruise dates (May 15) was obtained ([Table 3.3](#)).

Sensor SN 1416

This sensor was used as part of the dual-sensor configuration during the whole cruise. The calibrations from April 1996 throughout June 1999 were used to calculate the sensor drift and the drift corrections. A linear fit to the 0-30 °C average offset from each calibration relative to 27 October 1998 gave an intercept of 1.15×10^{-4} °C with a slope of 2.57×10^{-6} °C day⁻¹. The RMS deviation of the offsets from this fit was 1.6×10^{-4} °C. The 26 March 1999 calibration showed a small deviation from the 0-5 °C ensemble mean of all the calibrations (all corrected for linear drift to May 15, midpoint of the cruise dates) and was used as a baseline. A drift correction was obtained using this baseline calibration ([Table 3.3](#)).

Sensor SN 741

The calibrations from January 1998 through January 2000 were used to calculate a sensor drift of 8.4×10^{-7} °C day⁻¹ with a -1.7×10^{-4} °C intercept and 1.3×10^{-4} °C RMS residual. This drift rate was used to obtain the correction for stations 286 through 317. The 26 January 1999 calibration was used as a baseline for the cruise. When corrected for linear drift to 28 May 1999 (the midpoint of the dates when the sensor was used), this calibration gave the smallest deviation in the 0-5°C temperature range from the set of calibrations (also corrected for linear drift to 28 May 1999). Using this calibration as a baseline, a drift correction was obtained ([Table 3.3](#)).

Table 3.3. Temperature (T) and Conductivity (C) sensors used during JASMINE including temperature drift correction and the thermal inertia parameter (α). Dual temperature and conductivity sensors were used in all stations.

Stations	T-sensor SN	T-correction (°C)	C-sensor SN	α	Data reported
1-285	2700	-0.000110	679	0.028	All stations except 11, 107, 259, 304
286-317	741	0.000102	2218	0.028	All stations except 11, 107, 259, 304
1-317	1416	0.000129	1336	0.037	Stations 11, 107, 259, 304

3.1.2.3 Conductivity

One Sea-Bird SBE 4C conductivity sensor (SN 2218), and two SBE 4-02/0 sensors (SN 679, SN 1336) were used during JASMINE. Dual sensors were used during all the cruise casts. Sensor SN 679 was used during the first 285 stations and was replaced by sensor SN 2218 for the rest of the cruise. Sensor SN 1336 was used throughout the cruise. As mentioned earlier, only the data from the most reliable sensor (and its corresponding temperature sensor pair, as shown in [Table 3.3](#)) are reported here.

Sensor SN 2218 is a new sensor acquired in March 1999. This sensor model is designed to have a much smaller residual temperature effect than previous models (see Sect. 3.1.2.2). Sensor SN 1336 was calibrated at Sea-Bird in January 1999, and sensor SN 679 was calibrated in July 1998. The nominal conductivity calibrations were used for data acquisition. Final calibration was determined empirically from measured salinities of discrete water samples acquired during each cast (see Sec. 3.1.3). Prior to empirical calibration, conductivity was corrected for thermal inertia of the glass conductivity cell using the recursive filter given by Lueck (1990) and Lueck and Picklo (1990). Sensor-specific filter parameters α and β , which characterize the initial magnitude

of the thermal effect and its relaxation time, are needed for this correction. As recommended by Lueck (personal communication, 1990), β was set to 0.1 s^{-1} , but α was calculated for each sensor (Table 3.3) to close the spread between the down- and up-cast T - S curves.

Water samples were collected at selected depths for each cast and their salinity measured during the cruise (Sect. 3.1.3). The nominally-calibrated CTD salinity trace was used to identify questionable samples. Salinity samples were later quality-controlled and flagged by comparing them against the empirically-calibrated CTD salinities.

Calibration of each conductivity sensor was performed empirically by comparing its nominally calibrated output against the calculated conductivity values obtained from the water sample salinities, using the pressure and temperature of the CTD at the time of bottle closure. An initial estimate of bias (b_0) and slope (b_1) corrections to the nominal calibration were determined from a linear least squares fit to the ensemble of CTD-bottle conductivity differences as a function of conductivity, from all casts during the sensor use. This calibration was then used to identify suspect water samples. A second iteration allowed for the possible addition of a quadratic term (b_2) in the correction to conductivity, as well as a revised estimate of slope and bias. Conductivity calibration coefficients for the three sensors used during the cruise are given in Table 3.4.

Table 3.4. CTD Conductivity calibration coefficients obtained from comparison against bottle salinities.

Sensor SN	b_0	b_1	b_2
679	-0.009227	0.004795	-0.000594
2218	-0.004708	0.002759	-0.000357
1336	-0.009983	0.005066	-0.000637

The final step of the calibration was to perform a profile-dependent bias correction, to allow for a drift of the conductivity cell with time during each cruise, or for sudden offsets due to fouling. This offset was determined by taking the median value of CTD-bottle salinity differences for each profile. A plot of the individual offsets against time revealed an obvious drift pattern shown in Figure 3.2. A 7-point running mean was applied to these data and the resulting offsets were used to correct each cast. The maximum value of this offset correction was 2×10^{-4} Siemens m^{-1} (equivalent to about 0.002 in salinity).

The quality of the conductivity calibration is illustrated by Figure 3.3, which shows the differences between the corrected CTD salinities and the bottle salinities as a function of pressure for the JASMINE cruise. Table 3.5 gives the mean and standard deviations for the final calibrated CTD minus water sample salinities.

Table 3.5. CTD-Bottle salinity comparison for each sensor.

Sensor SN	0 to 1200 dbar		500 to 1200 dbar	
	Mean	Standard Deviation	Mean	Standard Deviation
679	-0.0001	0.0015	-0.0003	0.0011
2218	0.0000	0.0008	0.0000	0.0008
1336	-0.0001	0.0015	-0.0002	0.0010

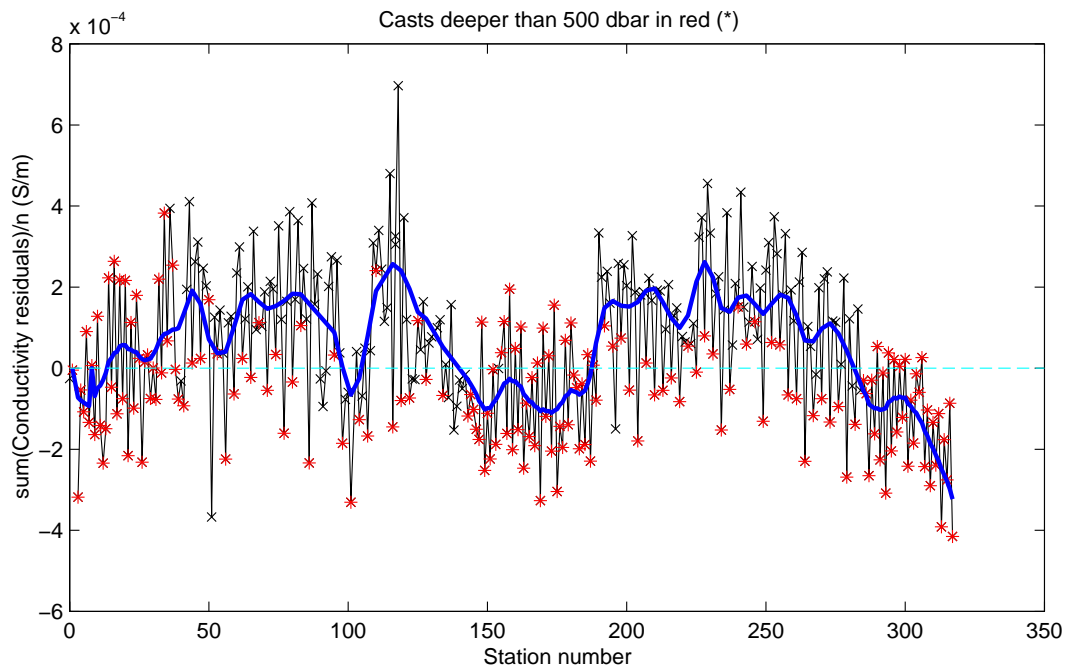


Figure 3.2. Running mean on the median CTD-bottle salinities from all the JASMINE-1 casts.

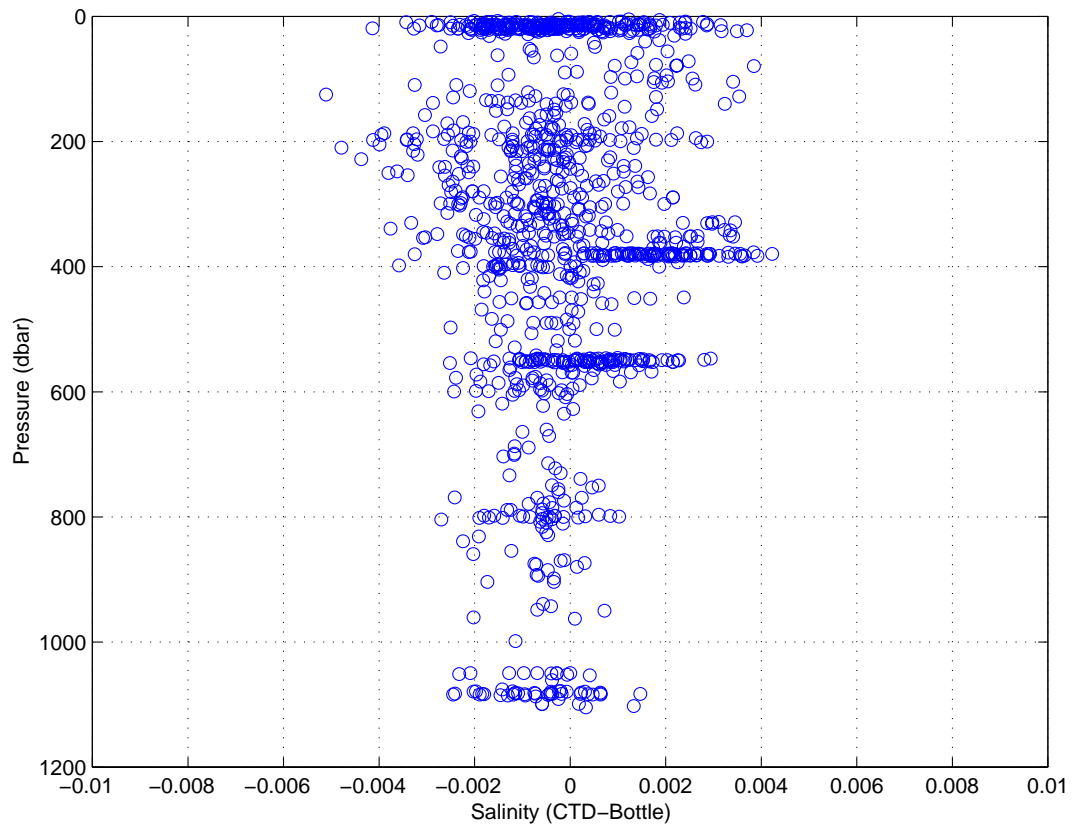


Figure 3.3. Difference between calibrated CTD salinities and bottle salinities for all the casts during the JASMINE cruise.

Salinity differences between sensors sets were calculated the same way as for the temperature in order to identify problems with any of the sensors (section 3.1.2.2). These differences show a behavior similar to the temperature differences in the thermocline region. Maximum absolute salinity differences of about 9×10^{-3} were observed at 100 dbar, decreasing to less than 2×10^{-3} below 200 dbar. This behavior is due to a combination of the residual temperature effect on the temperature sensors described in section 3.1.2.2, and an additional residual temperature effect on the conductivity sensors (N. Larson personal communication, 1999). The temperature effect on the conductivity sensors is similar to that described for the temperature sensors, and affects the conductivity measurements when the sensor passes through intense temperature gradients. This effect has been reduced in the design of the SBE 4C sensors (SN 2218) in comparison to the SBE 4-02/0 sensors (SN 679, SN 1336).

The largest variability in the salinity difference between sensors was observed in the halocline, with standard deviations of up to 1×10^{-2} between 50 and 100 dbar.

The final step for quality control consisted in flagging the data with a stability editing criteria. The data were flagged suspect when the stability was less than -1×10^{-6} (approximately 0.001 kg m^{-3} per decibar).

3.1.3 Salinity water samples

Salinity samples were collected in 250 ml glass or plastic bottles and measured during the cruise using a Guildline Autosol 8400B (SN 60.843) on the R/V *Ronald H. Brown*. With the large number of samples measured during the cruise (1395 samples), it was not feasible to frequently use IAPSO standard seawater ampules to monitor the Autosol. Thus, batches of laboratory “substandard” water were made for this purpose. The substandard water was collected far enough from shore to be considered open ocean water (with no effects from land). The ten 5-liter Niskin bottles from the Rosette were used to collect water from 1000 m and were drained into a 50-liter Nalgene carboy, after retrieval. The water was then thoroughly mixed in the carboy for 20 minutes, after which a 2-inch protective layer of white oil was added on top to deter evaporation. The substandard water was allowed to stand undisturbed for approximately 3 days in the same temperature controlled room as the Autosol before it was used. Three substandard water batches were made during the cruise, and several substandard samples were measured against IAPSO standards at the beginning of each new batch to obtain its initial salinity value. Substandard water measurements were made after every 10-20 salinity samples. IAPSO ampules of batch P134 ($S = 34.996$, $K15 = 0.99989$) were run at least three times per each batch of substandard water (at the beginning, middle, and end of the use of each batch) and also whenever there was an apparent drift in the substandard measurements.

Analysis of the IAPSO samples indicated a drift in the Autosol throughout the cruise. This drift was determined by least-square fitting a second degree polynomial to the IAPSO readings. After removing the Autosol drift from the substandard measurements it was discovered that the three substandard batches became saltier with time, probably due to evaporation in the plastic carboy. This substandard drift was confirmed by the fact that samples from the substandard stored in well-sealed glass bottles for cross referencing did not show any significant change in salinity. A salinity increase rate of $1.53 \times 10^{-5} \text{ day}^{-1}$ due to evaporation was computed from the ensemble of the three substandard batches and subtracted from the substandard measurements. After

corrections, the substandard and IAPSO samples residuals had a standard deviation of 3×10^{-4} in salinity.

3.2 Pre-JASMINE cruise conductivity, temperature and depth (CTD) profiling

The CTD data on the pre-JASMINE leg were collected using the shipboard equipment provided by the NOAA Ship *Ronald H. Brown* under the direction of NOAA technician CST Jonathan Shannahoff. A total of 44 CTD stations to a depth of 500 meters were made from 5°S to near 16.5°N at half-degree intervals along 88°E during 10-16 April 1999. A shallow test station (#45) was done on 18 April 1999 near 8.1°N, 88°E (data not processed). The depth of casts and station spacing were chosen in light of the overall time constraints for the Male-to-Singapore leg. At each station two water samples were taken at depths near 500 m and 10 m for calibration of the conductivity sensor.

The NOAA shipboard CTD system utilized a SBE-911 *plus* (SN 9852-0382) with a pressure sensor (SN 58955), single temperature sensor (SN 031713) and single conductivity sensor (SN 041473). Pre and post cruise calibrations for the temperature sensor were performed on 5 March 1998 and 25 September 1999, and for the conductivity sensor on 13 March 1998 and 28 September 1999 at Sea-Bird Electronics, Inc. The average temperature drift between calibrations was 0.00254 °C/year; average conductivity drift between calibrations was 0.00040 PSU/month measured at 3.0 Siemens m^{-1} .

The conductivity calibration water samples were run on the shipboard Autosol (SN 60.843) and CTD conductivity calibration was conducted as explained in section 3.1.2.3. As a result of the calibration, CTD salinities were about 0.005 low at 500 m, and about 0.012 low at 10 m. Corrections were applied to the CTD conductivity readings to minimize the differences. A linear correction with coefficients $b_0 = 0.000123$ and $b_1 = -0.000653$ was applied, yielding a mean CTD-bottle salinity difference of 3×10^{-6} with a standard deviation of 0.001 from all the samples.

The shipboard CTD system worked according to specifications for stations 1-32 and 40-44. For stations 33-39 (at latitudes 11°N-14°N) the CTD had pump problems on the downcast between depths of 0-50 dbar. The problem caused incorrectly high salinity values within that depth range. Thus, for stations 33-39 we have used the upcast data for each cast.

3.3 Main JASMINE cruise thermosalinograph

3.3.1 Data acquisition and processing

Thermosalinograph (TSG) data were acquired aboard the R/V *Ronald H. Brown* during the main JASMINE cruise using a SBE-21 Seacat TSG SN 843 installed in a sea chest located in the bow of the ship (in the bow thruster room). The pumped water intake was about 5.6 m deep, just below the sensors. The estimated water pressure at the pump downstream from the sensors was 24.13 dbar. The system included one temperature sensor and one conductivity sensor that were calibrated on June 11, 1998 and December 28, 1999. Data were acquired at 30-second intervals throughout the duration of the cruise, except during the period between June 1, 1999 (00:00) and June 5, 1999 (17:00) when the ship was in transit through Indonesian waters and the system was

turned off. Bottle samples for calibration were taken 6 times per day from an intake located downstream from the sensors. The time required for the water to travel from the thermosalinograph sensors to the water intake was 2 minutes, as determined by dye tests.

3.3.1.1 Temperature Calibration

Sea-Bird temperature sensor SN 843 was calibrated at Sea-Bird on June 18, 1998 and December 28, 1999. The second calibration indicated a sensor drift of 0.00053 °C/year, which yielded an insignificant drift offset on the cruise dates and was not applied. All temperature data from the thermosalinograph were obtained with coefficients from the first calibration.

3.3.1.2 Conductivity Nominal Calibration

Sea-Bird conductivity sensor SN 843 was calibrated at Sea-Bird on June 18, 1998 and December 28, 1999. The second calibration indicated a sensor drift of 0.0017 PSU/month measured at 3.0 Siemens m⁻¹. All conductivity data from the TSG were obtained with coefficients from the first calibration. However, all the final salinity data reported here were calibrated against bottle data as explained below.

3.3.1.3 Data processing

The TSG data were screened for gross errors with upper and lower bounds of 40 °C and 20 °C for temperature and 7 Siemens m⁻¹ and 4 Siemens m⁻¹ for conductivity. There were no gross errors detected.

A 5-point running median filter was used to detect one- or two-point temperature and conductivity glitches in the TSG data. Glitches in temperature and conductivity detected by the 5-point median filter were immediately replaced by the median. Threshold values of 0.3 °C for temperature and 0.1 Siemens m⁻¹ for conductivity were used for the median filter. Only one temperature and one conductivity point were replaced after running the median filter for the entire cruise. A 3-point triangular running mean filter was used to smooth the temperature and conductivity data after passing the glitch detection.

3.3.1.4 Empirical conductivity calibration

The TSG salinity was calibrated empirically by comparing it to the salinity of water samples drawn from a tap located downstream from the TSG. 157 samples were collected and analyzed as described in Section 3.1.3. Some of the samples were collected in glass bottles with plastic thimble inserts while others were collected in plastic bottles with a wrap of parafilm to prevent evaporation. All samples were stored in a temperature-controlled room.

The time interval between the water passing through the TSG and it reaching the bottle sampling area was determined by dye tests to be 2 minutes. The TSG data were extracted within 30 seconds around the sample time minus the 2 minutes delay for the comparison with the bottle data. The TSG temperature and pump pressure were used to compute conductivity from the water sample salinity for calibration of the TSG conductivity.

A cubic spline was fit to the time series of the differences between the bottle and TSG conductivity and a time-varying correction was obtained for the TSG conductivities. Salinity was calculated using these corrected conductivities, the TSG temperatures and the water pressure (17.13 dbar, obtained from the water pump pressure, 24.13 dbar minus the pressure head [~ 7 dbar] due to water in the plumbing from the TSG to the outflow). After correction, the mean

difference between the bottle and the TSG salinities was -1.6×10^{-5} with a RMS difference of 6.5×10^{-3} .

3.3.2 Comparison with CTD data

The processed TSG temperature and salinity data were compared with the downcast CTD data at 6 dbar for the purpose of checking the quality of the data. The thermosalinograph data were averaged using data sampled one minute after the CTD start time (the estimated time of when the CTD was at 6 dbar). The mean difference (CTD-TSG) from 317 casts was -0.02°C in temperature, and -0.0017 in salinity.

3.4 Shipboard ADCP data

The ADCP data were acquired using the ship's RDI 150 kHz narrowband system, P-code navigation, and a Ring Laser gyro compass. The transducers were located at a depth of 5.6 m. Nominal values for the blanking interval, pulse length and bin length were 4 m, 8 m and 8 m, respectively. The system operated nearly continuously during the two JASMINE cruise legs using a 2-minute ensemble for averaging. Bottom tracking was enabled during the beginning and end of the main JASMINE cruise to assist with calibration. Thus, the basic data set has velocity sampled at 8 m depth intervals (nominal) over a depth range from 17 m to typically 400 m, with a velocity profile every 2 minutes along the track. The ADCP also yields an along-track temperature record, also sampled every 2 minutes, at a depth of 5.6 m.

Primary navigation was supplied by a military P(Y)-code GPS receiver with an accuracy (95% confidence radius) of about 10 m. This results in an accuracy of better than 1 cm/s for 20-minute averages of the horizontal velocity components.

The largest source of error for the horizontal velocity estimates usually comes from heading error. Heading information for each acoustic ping was supplied by the ship's Sperry Marine MK-39 Ring Laser Gyrocompass (RLG). A comparison test between the RLG and an Ashtech 4-element GPS receiver performed during an earlier cruise of the *Ronald H. Brown* suggests that the accuracy of the RLG is better than 0.3° (95%), although unexplained periods of several hours may have errors of 0.6° (Doug Wilson, NOAA/AOML, personal communication). On the main JASMINE cruise, we compared the RLG to a Seatex GPS antenna pair during the second STAR survey. The comparison suggests typical differences of about 0.1 - 0.15° with occasional larger differences due to unknown causes. A 0.3° heading error results in a cross-track velocity error of 3.5 cm/s at a ship's speed of 7 m/s (full speed). Averaging over track segments which include CTD stations (ship nearly at rest) results in proportionally lower errors.

The ADCP data were processed as described in Firing (1991) and Firing et al. (1995) using Coda software. Both JASMINE legs were processed using the same procedures and parameters, except the pre-JASMINE leg saved 50 bins of data whereas the main JASMINE leg saved 60 bins. The speed of sound was corrected along the cruise track using the ADCP temperature and thermosalinograph salinity (both roughly calibrated). The sound speed correction results in a small correction to the ocean velocity estimates. All ADCP data were subjected to standard Coda editing procedures. Both water-track and bottom-track navigation procedures were used to identify and correct for misalignment errors. The amplitude correction is accurate to within about 0.1%; the angle (phase) correction is accurate to within 0.1° with a standard deviation of 0.3° .

Details of the data processing are documented in several files in the ADCP database (Section 8). As overall error estimates for the ADCP velocity data, we estimate that the bias error over periods of a day is less than 1 cm/s; the errors in 20-minute averages should be less than 3 cm/s (95% confidence).

3.5 Surface Drifters

Surface drifters were deployed on both JASMINE cruise legs as part of the global drifter array to measure near-surface currents and temperatures. The investigator responsible for the drifter program is Prof. P. Niiler at UCSD. [Table 3.6](#) shows the launch information for the 25 drifters deployed as part of JASMINE. The sea surface temperature (SST) shown in the table is the 0-meter value from the nearest CTD station taken just prior to drifter launch.

Table 3.6. Drifter launch information for the JASMINE cruises

Drifter #				date/time (UTC)		lat.	lon.	SST (°C)	CTD station #
Pre JASMINE									
11628	99	4	10	123400	4 ° 52.00'S	88 ° 00.50'E	28.63	1	
16003	99	4	11	201400	0 ° 00.40'N	88 ° 00.10'E	29.11	11	
12199	99	4	12	154600	3 ° 00.75'N	88 ° 00.34'E	29.03	17	
11627	99	4	13	105200	6 ° 00.46'N	88 ° 00.20'E	28.56	23	
11626	99	4	14	41100	8 ° 59.70'N	88 ° 00.00'E	29.66	29	
16004	99	4	14	233200	12 ° 00.35'N	87 ° 59.96'E	29.35	35	
10797	99	4	16	4200	16 ° 00.92'N	87 ° 59.67'E	30.34	43	
JASMINE transit 1									
10599	99	5	5	115600	2 ° 59.86'S	91 ° 59.91'E	29.54	7	
10586	99	5	6	124800	0 ° 00.01'S	89 ° 00.01'E	30.72	13	
10605	99	5	7	83600	3 ° 00.16'N	88 ° 59.91'E	29.93	19	
10648	99	5	8	42600	6 ° 00.03'N	89 ° 00.50'E	28.94	25	
20961	99	5	8	232900	9 ° 00.17'N	89 ° 00.05'E	29.06	31	
11773	99	5	10	32100	13 ° 29.60'N	88 ° 44.90'E	29.81	40	
JASMINE transit 2									
11613	99	5	15	85200	12 ° 04.48'N	88 ° 30.90'E	30.51	140	
11633	99	5	16	53400	8 ° 59.98'N	88 ° 29.98'E	29.33	149	
11635	99	5	17	4400	5 ° 56.19'N	88 ° 30.30'E	29.41	155	
11634	99	5	17	184500	2 ° 59.68'N	88 ° 29.83'E	29.43	161	
11492	99	5	18	131200	0 ° 00.10'S	88 ° 29.89'E	29.61	167	
JASMINE transit 3									
None									
JASMINE transit 4									
11493	99	5	27	130600	7 ° 59.88'N	89 ° 16.95'E	28.67	291	
11532	99	5	28	23500	6 ° 00.08'N	90 ° 00.46'E	28.69	295	
11491	99	5	29	15700	2 ° 29.85'N	91 ° 17.02'E	28.71	302	
10798	99	5	29	173500	0 ° 00.10'S	92 ° 11.26'E	29.36	307	
10799	99	5	30	115800	3 ° 00.20'S	93 ° 16.51'E	29.46	313	
JASMINE transit to Darwin									
8129	99	6	1	0	6 ° 18.98'S	98 ° 47.35'E	28.93		
8130	99	6	6	72000	12 ° 40.88'S	123 ° 46.67'E			

3.6 SOLO Floats

Two SOLO floats were launched on the main JASMINE cruise leg. (The SOLO floats are the UCSD version of the ARGO floats.) Profs. R. Davis and D. Rudnick kindly provided the two floats for testing in the Bay of Bengal environment, which has a shallow freshwater lens near the surface. The two floats were programmed to have a parking depth near 200 meters. The shallow parking depth was necessitated by the large near-surface density change in the Bay of Bengal and the design limitations of the buoyancy package. The floats had temperature, conductivity and pressure sensors in order to provide temperature and salinity profiles for each depth-to-surface cycle. The floats were programmed to cycle every 5 days for the first 10 cycles, and every 25 days thereafter. Float 1115 stopped reporting data near the end of 1999; float 1062 was still operating in May 2000 (our latest information). [Table 3.7](#) shows the launch information for the two SOLO floats.

Table 3.7. SOLO float launch information for the main JASMINE cruise

S/N	Date	JD99	Time (UTC)	Position		SST	SSS	Self-test time	CTD sta#
				lat.	lon.				
1062	19990510	130	326	13° 29.60'N	88° 44.90E	29.8084(0m)	32.8628(0m)	15	40
						29.8088(2m)	32.8638(2m)		
1115	19990515	135	1653	10° 59.87'N	88° 30.04E	29.8430(0m)	32.8978(0m)	1425	145
						29.8205(2m)	32.8975(2m)		

4 Results.

For the first half of the main JASMINE cruise, conditions were consistent with a break period of the pre-southwest monsoon season. The remarkable difference between the pre-JASMINE meridional section and the first JASMINE section was the reversal of the equatorial currents, with the currents flowing strongly to the west in the equatorial band during the latter period. This condition substantially continued for the second and third meridional sections. The first half of the main JASMINE cruise was generally characterized as a warming period with relatively light winds and little rainfall. These conditions held for the first meridional section, the STAR-1 budget survey, and most of the second meridional section. During the second half of the main JASMINE cruise, active conditions prevailed with strong south-westerly winds, propagating mesoscale convective systems, substantial rainfall, and upper ocean cooling. These conditions began during the latter part of the second meridional section, and continued during the third section, the STAR-2 budget survey, and the first (northern) half of the fourth meridional section. The velocity field during the fourth section differs substantially from the first, second and third sections with surface flow strongly to the east between the Equator and 4°N and to the west between 4°N and 7°N, the opposite of sections 2, 3 and 4. In all four sections, the Bay of Bengal fresher-water front occurred at about 8-10°N. Thus, the STAR surveys were conducted to the north of this front.

4.1 CTD Profiling Data

Profiles of temperature, salinity and potential density (σ_θ) from the casts obtained during the pre-JASMINE and main JASMINE cruises are presented in [Figure 8.1](#), together with the results of bottle determination of salinity. Gaps in some of the profiles (e.g. station 254, [Fig. 8.1.149](#)), are caused by data flagged suspect by the stability quality control criteria (Sect. 3.1.2.3).

The hydrographic data collected during the cruises are presented in a series of contour plots along the main transects ([Figures 8.2.1-5](#)). The hydrographic data collected during the STAR surveys are contoured as a function of time for the duration of the surveys ([Figures 8.2.6-7](#)).

4.2 Thermosalinograph data

Underway measurements of near surface temperature (NST) and near surface salinity (NSS) data from the TSG are included in [Figures 8.2.2-5](#) along the main JASMINE cruise transects. Time series of the TSG data as well as navigation are presented in [Figures 8.3.1-2](#). TSG data obtained during the STAR surveys are contoured in [Figures 8.3.3-4](#). Since each complete cycle throughout the star ship track took about 18 hours, the NST contours do not give a synoptic representation of the temperature field, consequently the diurnal variability is apparent in some of these contours (e.g. [Fig. 8.3.3](#)).

4.3 Shipboard ADCP data

Contour plots of zonal and meridional currents along the main cruise transects obtained with the ADCP are presented for the pre-JASMINE and main JASMINE cruises ([Figures 8.2.1-5](#)). The data were averaged over 10 minutes and then over 0.1° of latitude. The currents during the STAR surveys are contoured as a function of time ([Figures 8.2.6-7](#)), the data in these plots were averaged over 10 minutes.

Vector plots of the ocean currents averaged over the depth range 17-41 m (nominal, including the top 4 data bins) and along the cruise track (over 1-hour intervals) during the JASMINE cruises are presented in [Figures 8.4.1-2](#).

5 Data Availability and Distribution.

5.1 World Wide Web

JASMINE-related information and updates to this data report are available over the Internet on the World Wide Web. The address is <http://www.soest.hawaii.edu/JASMINE>. This data report in the form of an Adobe Acrobat® *pdf* file is available for downloading and printing.

5.2. File Transfer Protocol (FTP)

The hydrographic data set, including 2-dbar averaged CTD data, are available from an anonymous ftp site at the University of Hawaii. These data can also be downloaded via browser.

In order to maximize ease of access, the data are in ASCII files. File names are chosen so that they may be copied to DOS machines without ambiguity.

The data are in subdirectory */pub/jasmine*. More information about the database is given in several files with the extension *.txt* at this level. The file *readme.txt* gives general information on the database; we encourage users to read it first.

The following is an example of how to use ftp to obtain JASMINE hydrographic data. The user's commands are denoted by bold italicized text. The workstation's Internet address is *mana.soest.hawaii.edu*, or *128.171.154.9* (either address should work).

1. At the Prompt >, type ***ftp 128.171.154.9*** or ***ftp mana.soest.hawaii.edu***.
2. When asked for your login name, type ***anonymous***.
3. When asked for a password, type your email address.
4. To change to the JASMINE database, type ***cd /pub/jasmine***. To view files type ***ls***. A directory of files and subdirectories will appear.
- 5a. To obtain information about the database type ***get readme.txt***. This will transfer an ASCII file to your system. Use any text editor to view it. You may also want to transfer ***format.ctd, format.sea, format.sum, format.tsg*** and ***methods.txt***.
- 5b. To obtain CTD data, type ***cd ctd/jas-#***, where # is the JASMINE cruise of interest (0: pre-JASMINE, 1: main JASMINE), then type ***mget *.ctd*** to transfer all the cruise CTD files to your system.
- 5c. To obtain water column data, type ***cd water***, then ***get jas#.sea*** where # is the JASMINE cruise of interest (0: pre-JASMINE, 1: main JASMINE).
- 5d. To obtain station positions and times information, type ***get jas#.sum*** where # is the JASMINE cruise of interest (0: pre-JASMINE, 1: main JASMINE).
- 5e. To obtain thermosalinograph data from the main JASMINE, type ***cd tsg***, then ***get jas1.tsg***.
6. To exit type ***bye***

6 References.

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7 Acknowledgments.

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8 Figures.

8.1 Hydrography profiles

[Figures 8.1.1-181](#): Profiles of CTD temperature, salinity and potential density (σ_θ), including discrete bottle salinities at each station for the pre-JASMINE ([Fig 8.1.1-8.1.22](#)) and main JASMINE ([Fig 8.1.23-8.1.181](#)) cruises.

8.2 Contour sections

[Figures 8.2.1-5](#): Contour plots of potential temperature (θ), salinity and potential density (σ_θ), along the cruise sections for the pre-JASMINE and main JASMINE cruises. Near surface temperature and salinity data from the thermosalinograph are also included above each of the 0-200 dbar contour plots during the main JASMINE cruise. Also included are contour plots of zonal and meridional current speeds obtained with the ADCP.

[Figures 8.2.6-7](#): Same as [Fig 8.2.1](#) but for the data obtained during the STAR surveys during the main JASMINE cruise.

8.3 Thermosalinograph

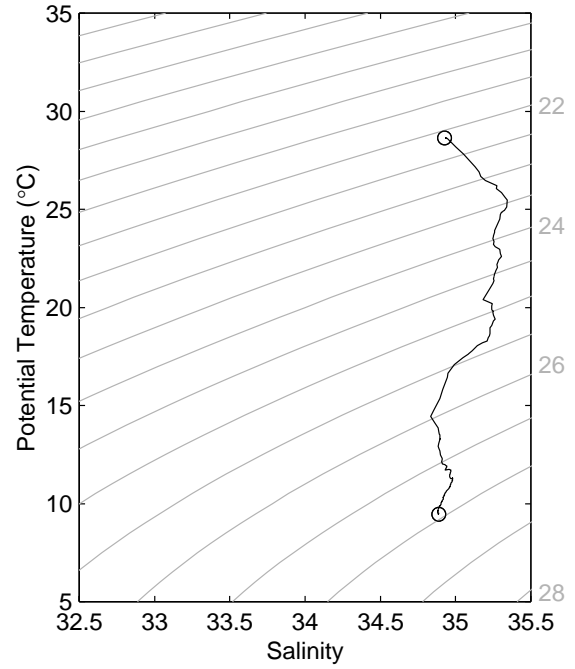
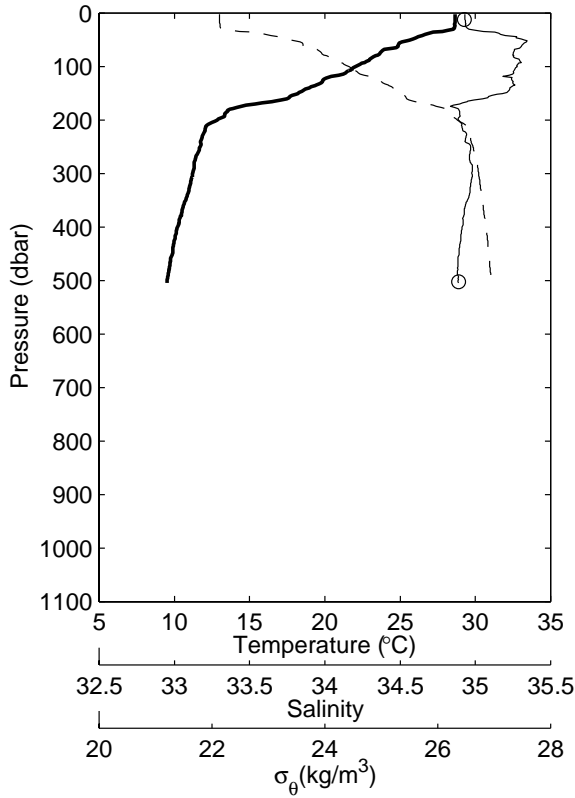
[Figure 8.3.1-2](#): Time series plots of thermosalinograph near surface temperature, salinity, potential density and navigation (latitude, longitude) obtained during the main JASMINE cruise.

[Figure 8.3.3-4](#): Contours of thermosalinograph near surface temperature and salinity in the area covered during the various legs of the two STAR surveys during the main JASMINE cruise.

8.4 ADCP vector plots

[Figures 8.4.1-2](#): Vector plots of the ocean currents obtained with the ADCP averaged over the top 4 data bins (17-41 m nominal) along the cruise track (averaged over 1-hour intervals) during the pre-JASMINE and main JASMINE cruises.

Pre-JASMINE Stn-1 Cast-1 5.00°S 88.00°E 11:22Z 10 Apr 1999



Pre-JASMINE Stn-2 Cast-1 4.50°S 88.00°E 14:28Z 10 Apr 1999

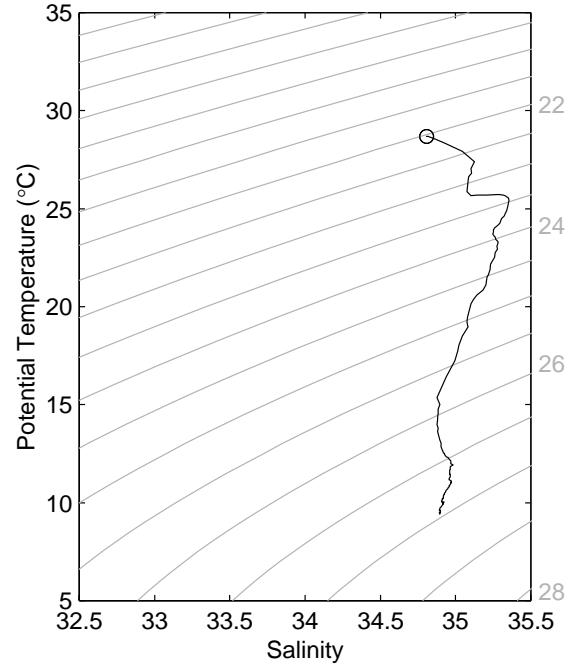
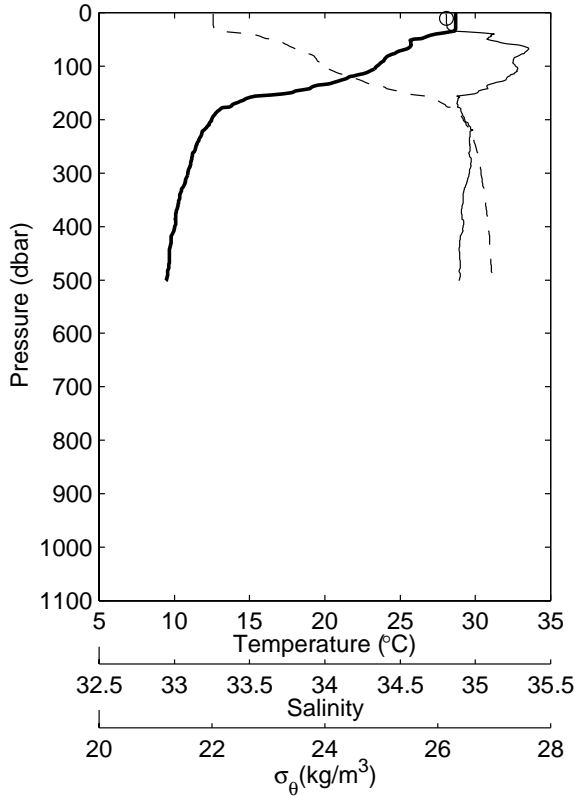
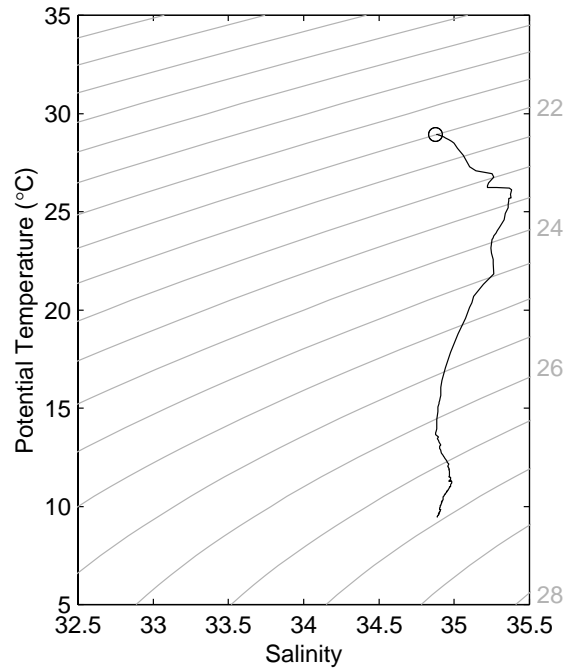
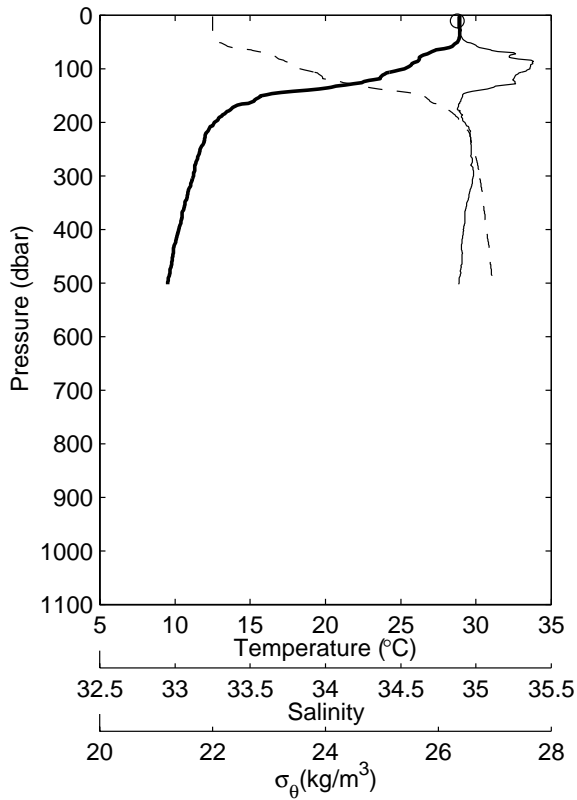


Figure 8.1.1: [Upper left] CTD profiles of temperature (thick line), salinity (thin line), and potential density (σ_θ dashed line) as a function of pressure, including salinity from water samples (circles) for station 1 cast 1 of the Pre-JASMINE cruise. [Upper right]: CTD salinity and water samples plotted as a function of potential temperature, gray lines are isopycnal surfaces (σ_θ). [Lower panel]: Same as upper panel but for station 2 cast 1.

Pre-JASMINE Stn-3 Cast-1 4.00°S 88.00°E 18:35Z 10 Apr 1999



Pre-JASMINE Stn-4 Cast-1 3.50°S 88.00°E 21:35Z 10 Apr 1999

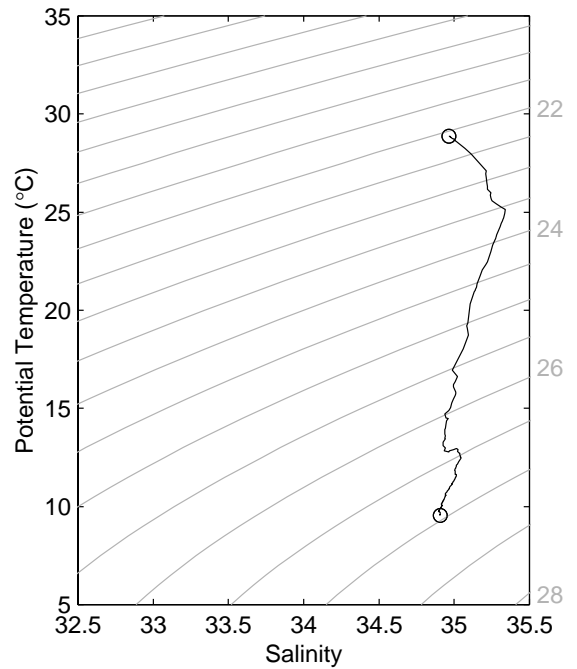
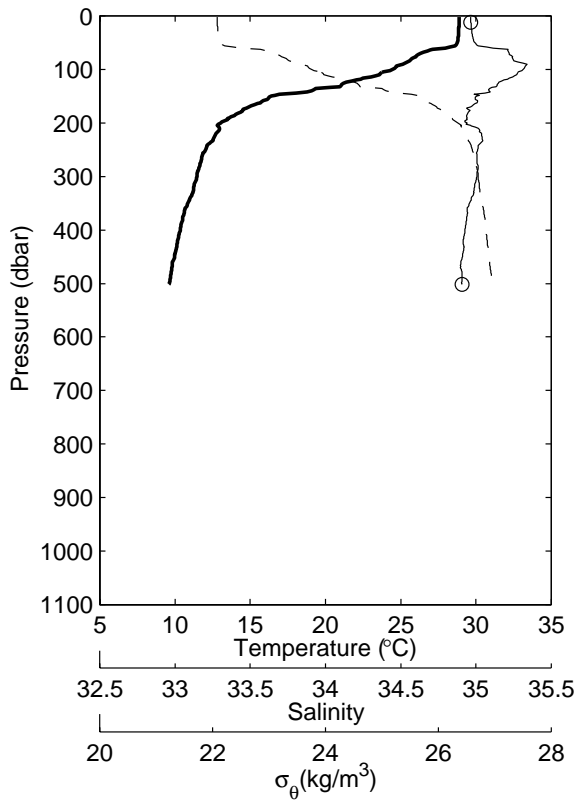
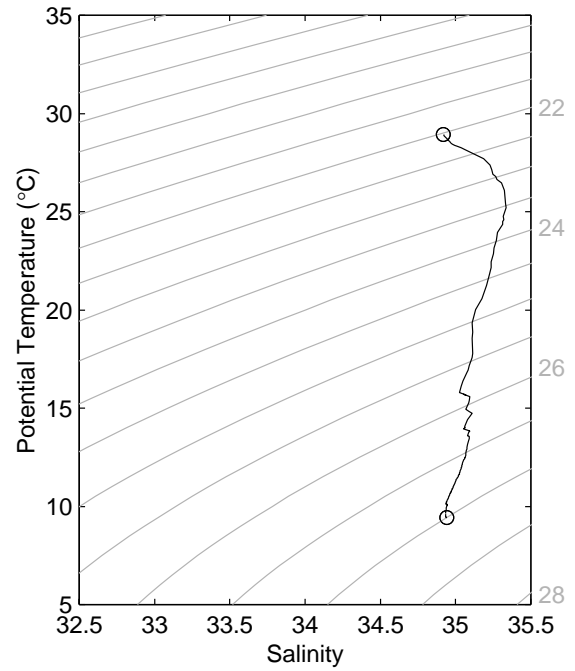
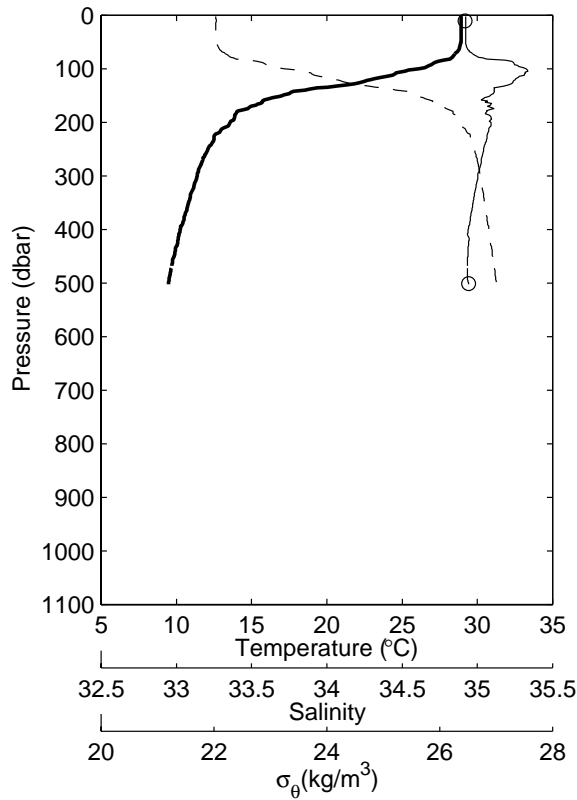


Figure 8.1.2. Same as Fig. 8.1.1 but for station 3 cast 1 and station 4 cast 1.

Pre-JASMINE Stn-5 Cast-1 3.00°S 88.00°E 01:07Z 11 Apr 1999



Pre-JASMINE Stn-6 Cast-1 2.50°S 88.00°E 04:09Z 11 Apr 1999

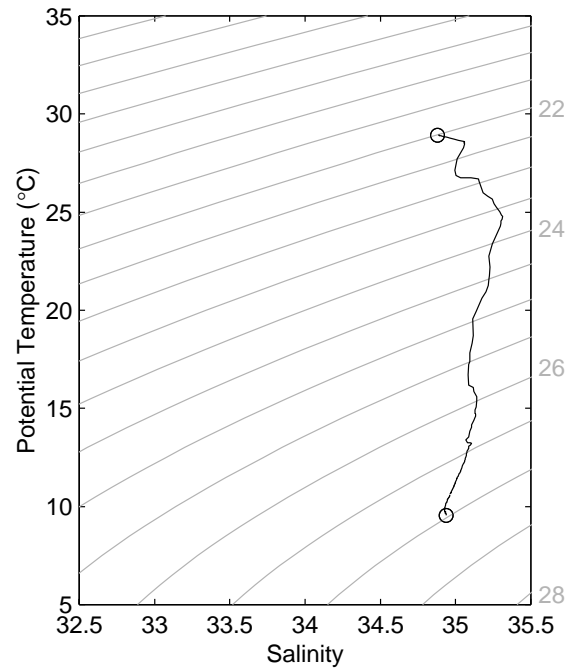
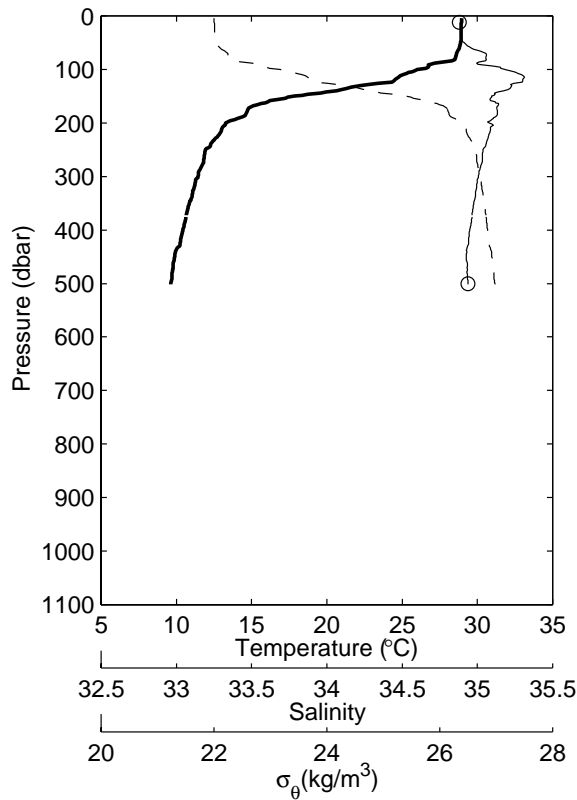
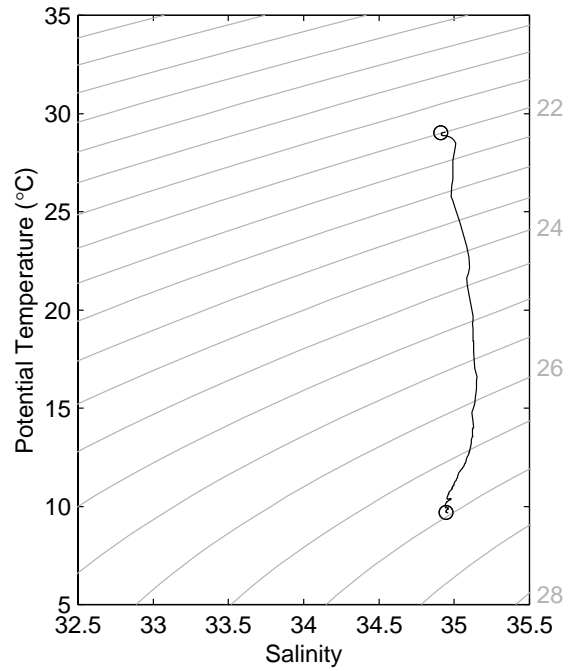
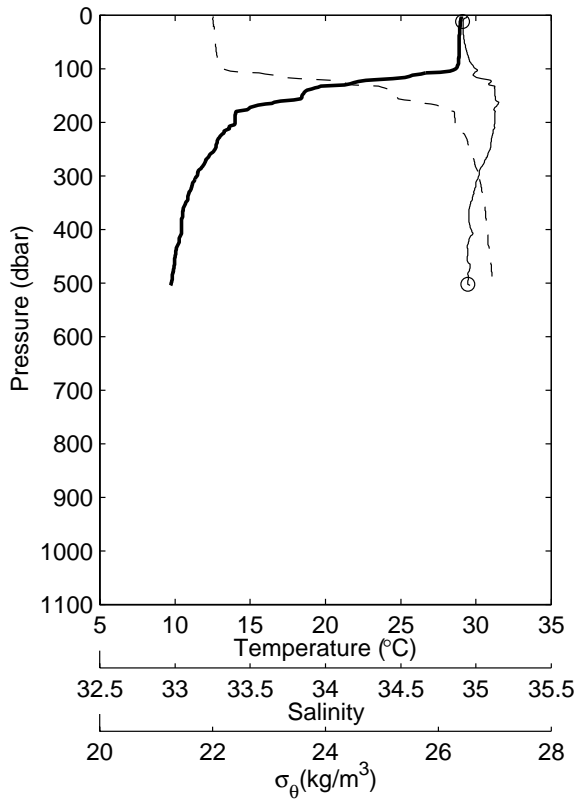


Figure 8.1.3. Same as Fig. 8.1.1 but for station 5 cast 1 and station 6 cast 1.

Pre-JASMINE Stn-7 Cast-1 2.00°S 88.00°E 07:10Z 11 Apr 1999



Pre-JASMINE Stn-8 Cast-1 1.50°S 88.00°E 10:07Z 11 Apr 1999

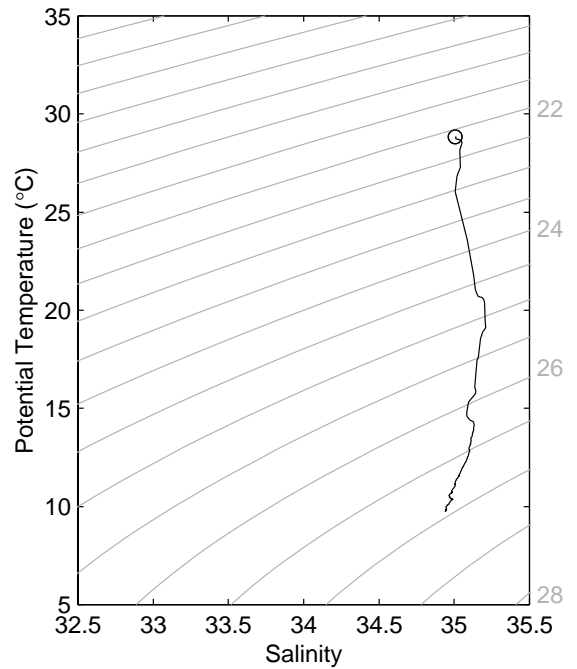
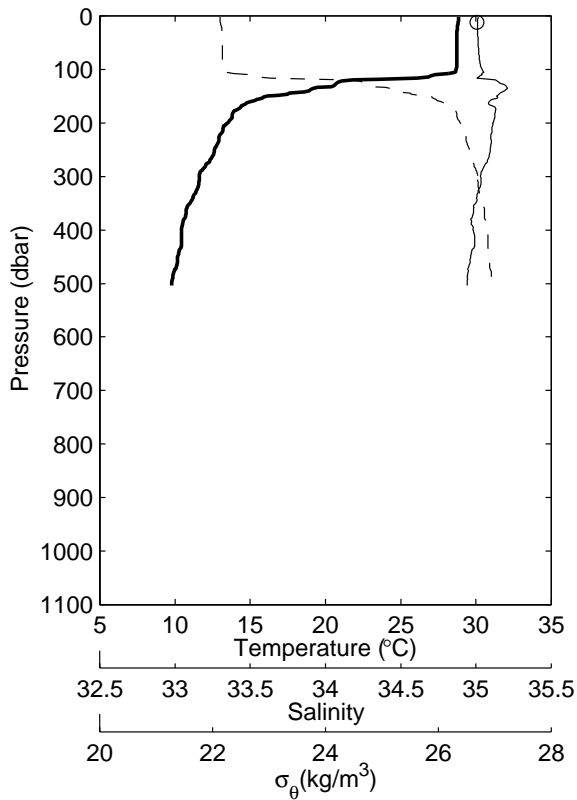
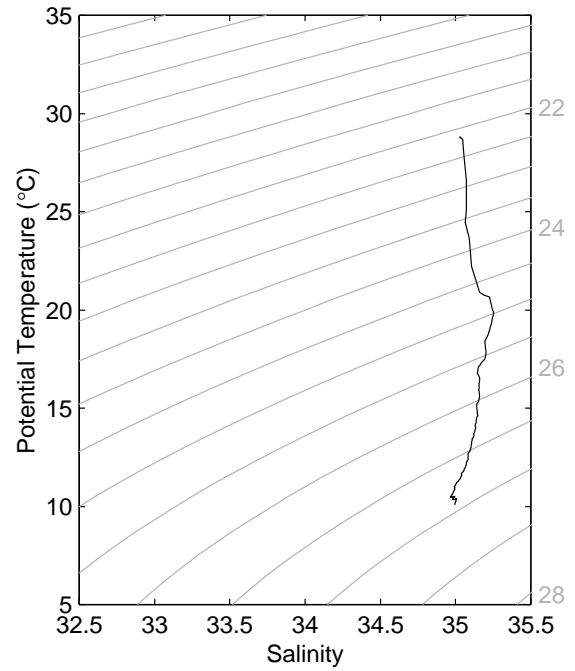
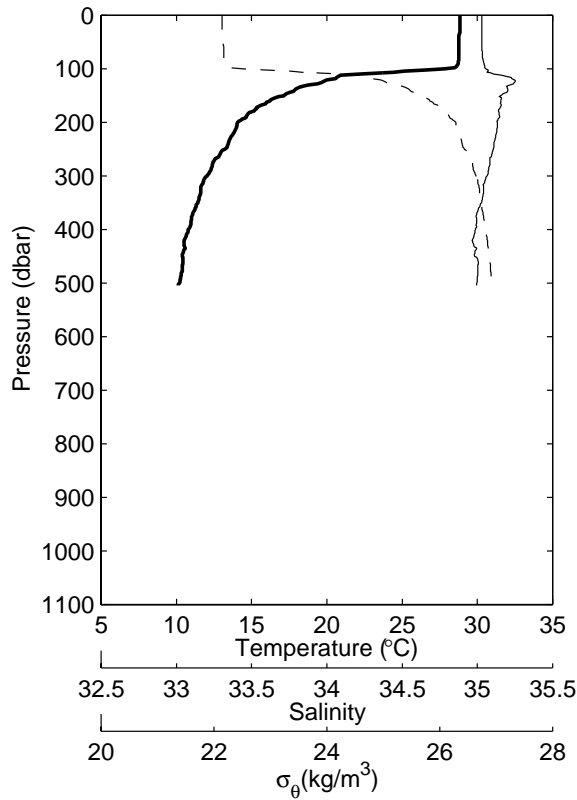


Figure 8.1.4. Same as Fig. 8.1.1 but for station 7 cast 1 and station 8 cast 1.

Pre-JASMINE Stn-9 Cast-1 1.00°S 88.00°E 13:09Z 11 Apr 1999



Pre-JASMINE Stn-10 Cast-1 0.50°S 88.00°E 16:23Z 11 Apr 1999

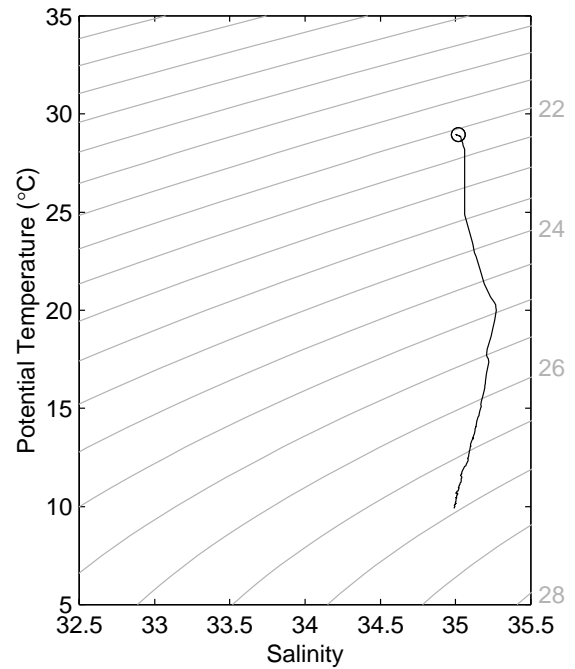
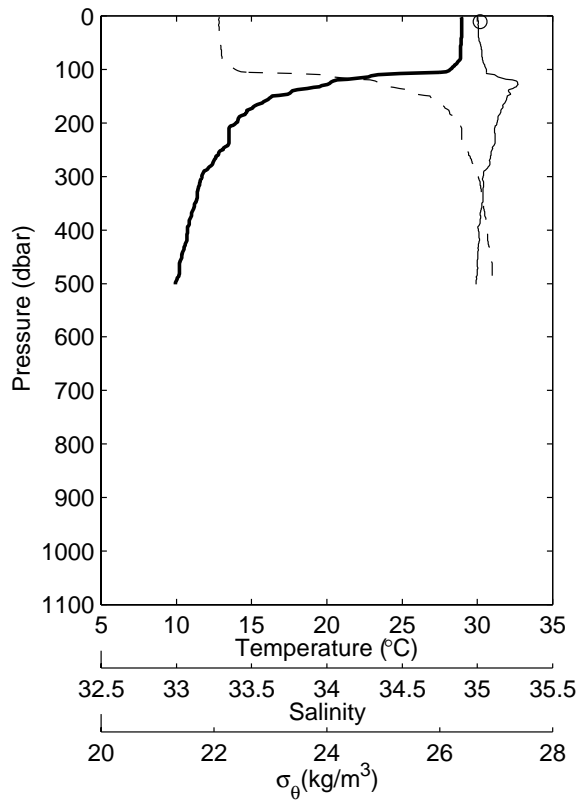
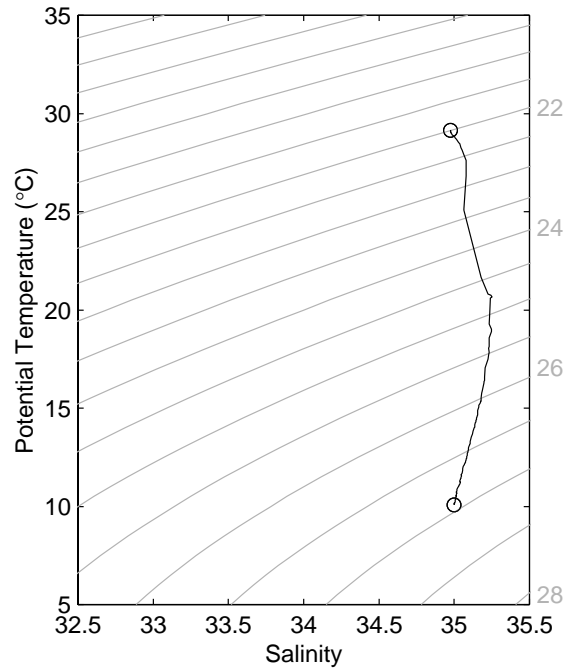
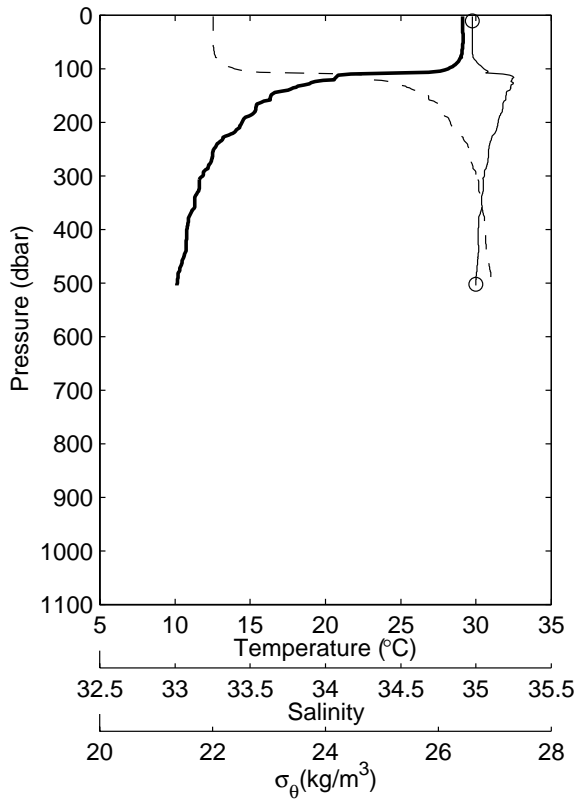


Figure 8.1.5. Same as Fig. 8.1.1 but for station 9 cast 1 and station 10 cast 1.

Pre-JASMINE Stn-11 Cast-1 0.00°S 88.00°E 19:38Z 11 Apr 1999



Pre-JASMINE Stn-12 Cast-1 0.50°N 88.00°E 22:55Z 11 Apr 1999

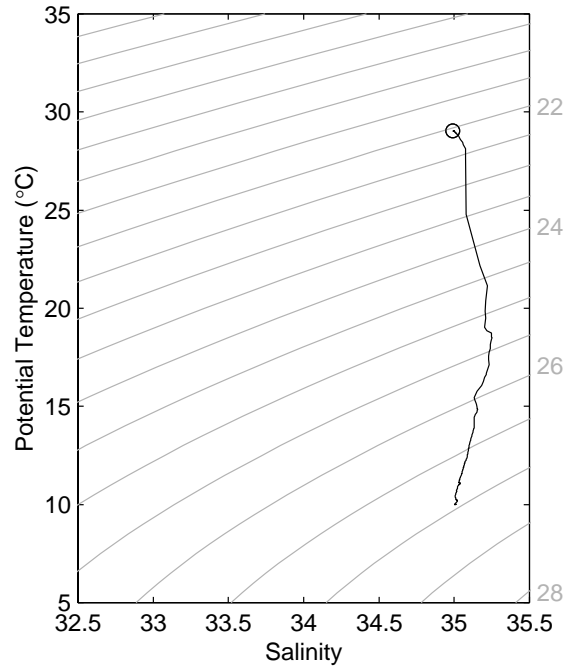
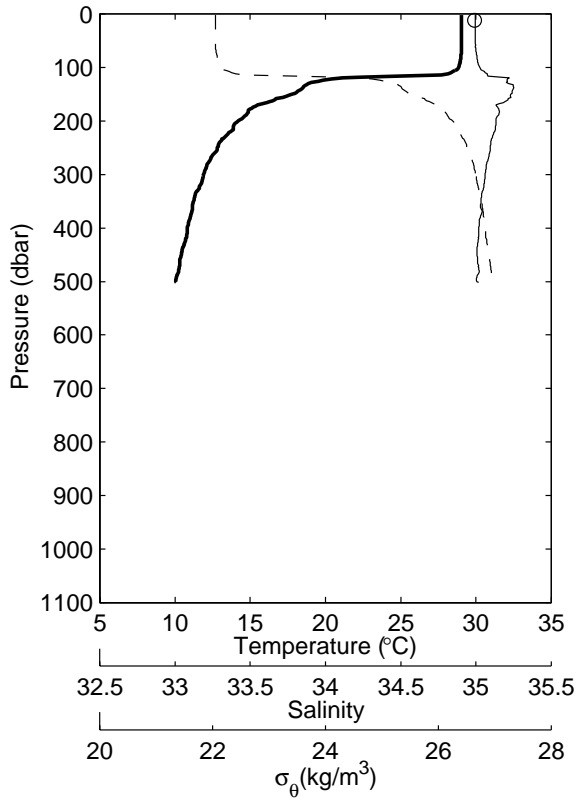
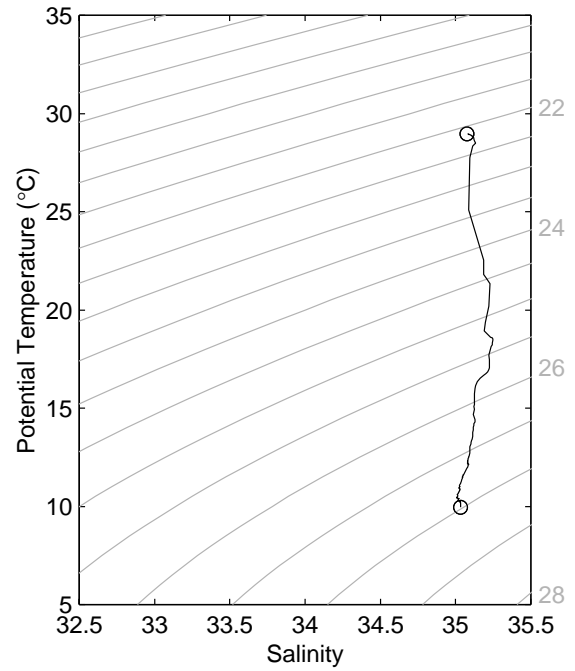
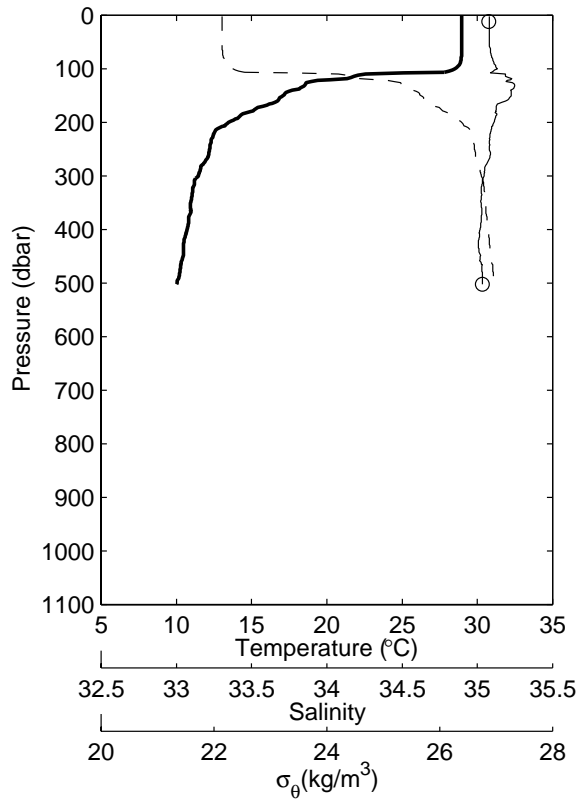


Figure 8.1.6. Same as Fig. 8.1.1 but for station 11 cast 1 and station 12 cast 1.

Pre-JASMINE Stn-13 Cast-1 1.00°N 88.00°E 02:10Z 12 Apr 1999



Pre-JASMINE Stn-14 Cast-1 1.50°N 88.00°E 05:25Z 12 Apr 1999

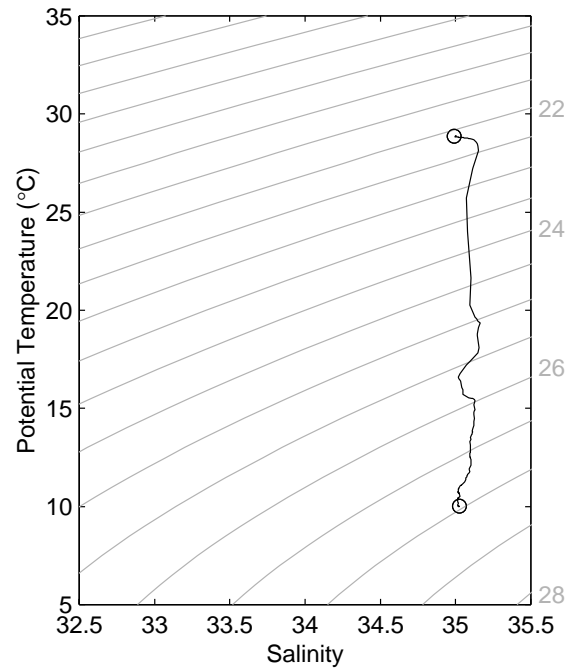
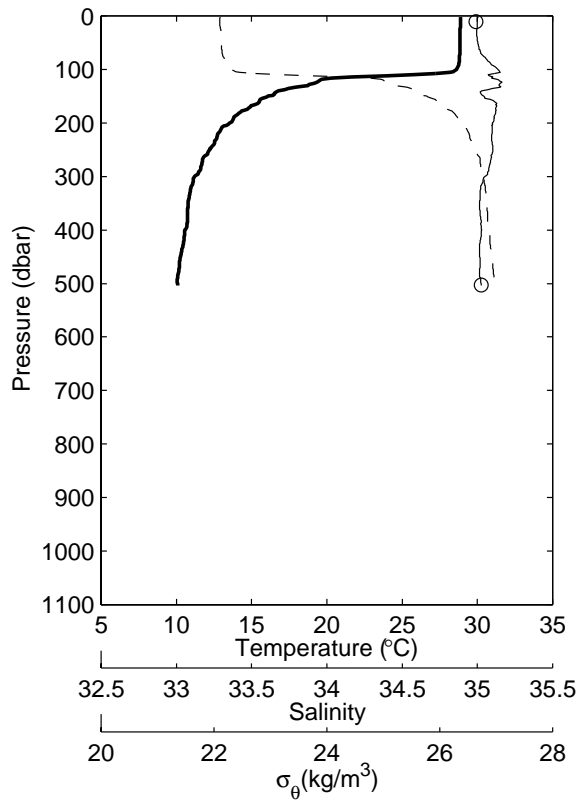
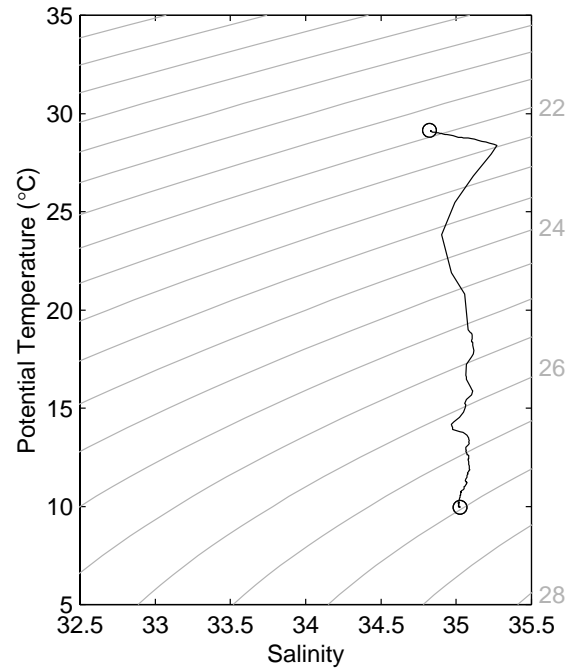
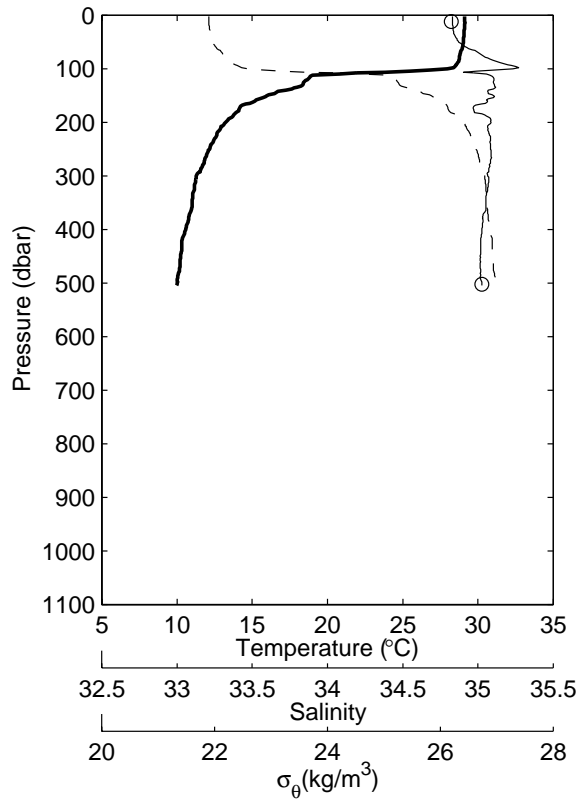


Figure 8.1.7. Same as Fig. 8.1.1 but for station 13 cast 1 and station 14 cast 1.

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Pre-JASMINE Stn-16 Cast-1 2.50°N 88.00°E 11:48Z 12 Apr 1999

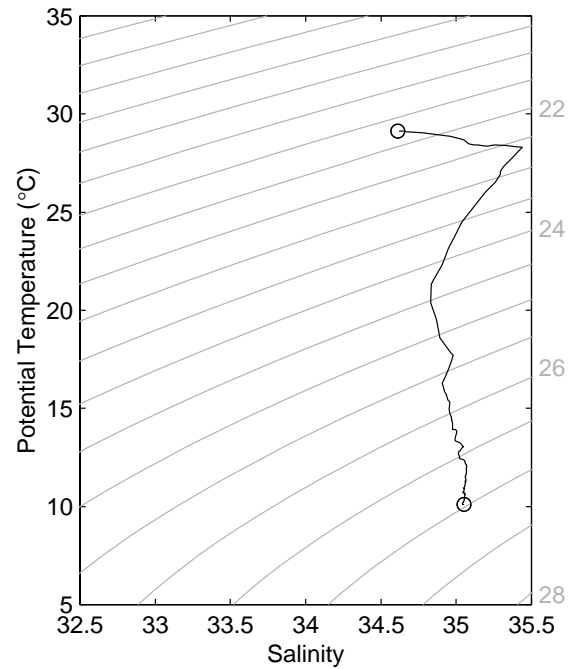
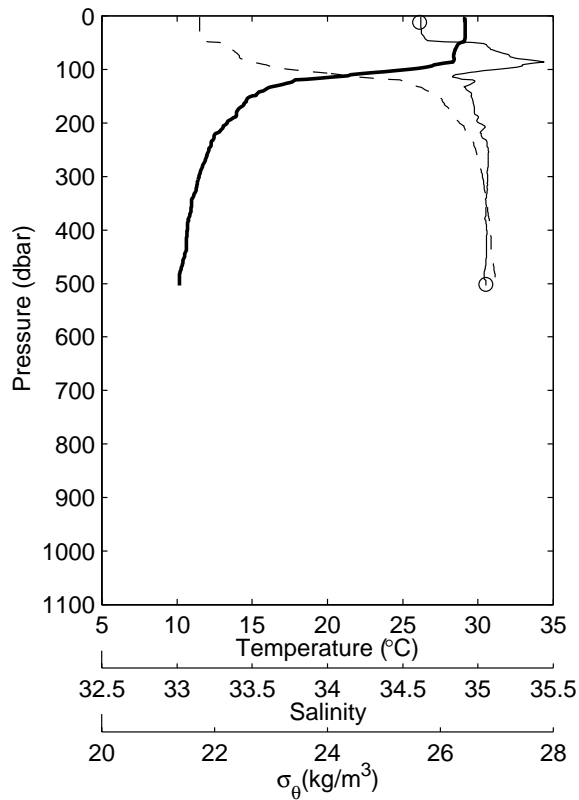
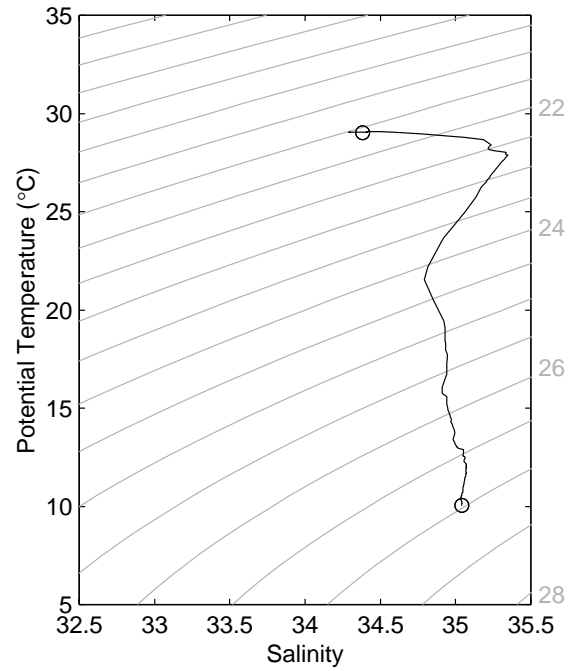
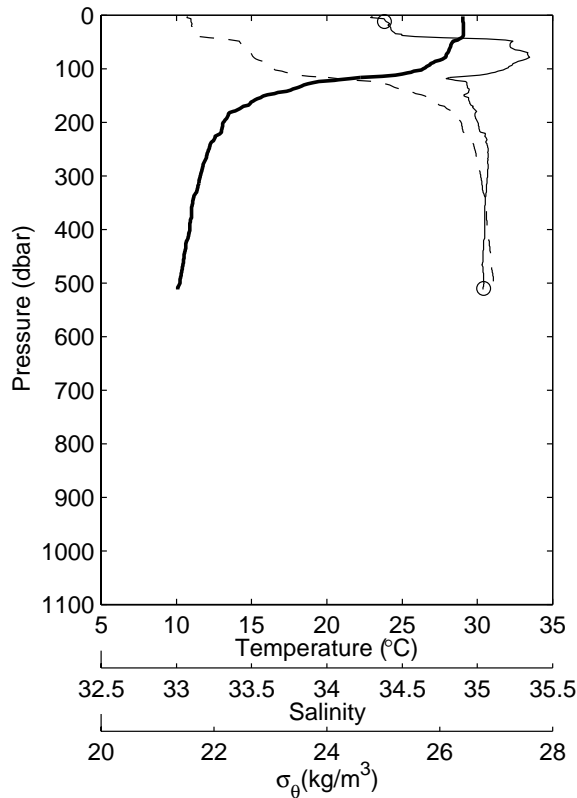


Figure 8.1.8. Same as Fig. 8.1.1 but for station 15 cast 1 and station 16 cast 1.

Pre-JASMINE Stn-17 Cast-1 3.00°N 88.00°E 15:07Z 12 Apr 1999



Pre-JASMINE Stn-18 Cast-1 3.50°N 88.00°E 18:20Z 12 Apr 1999

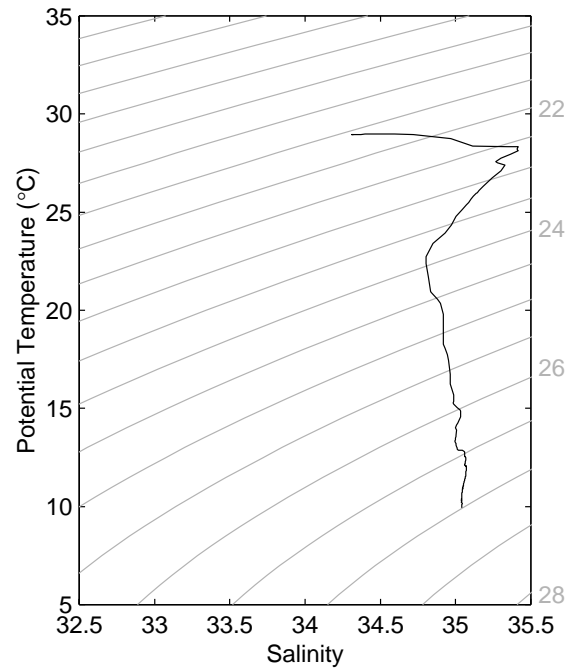
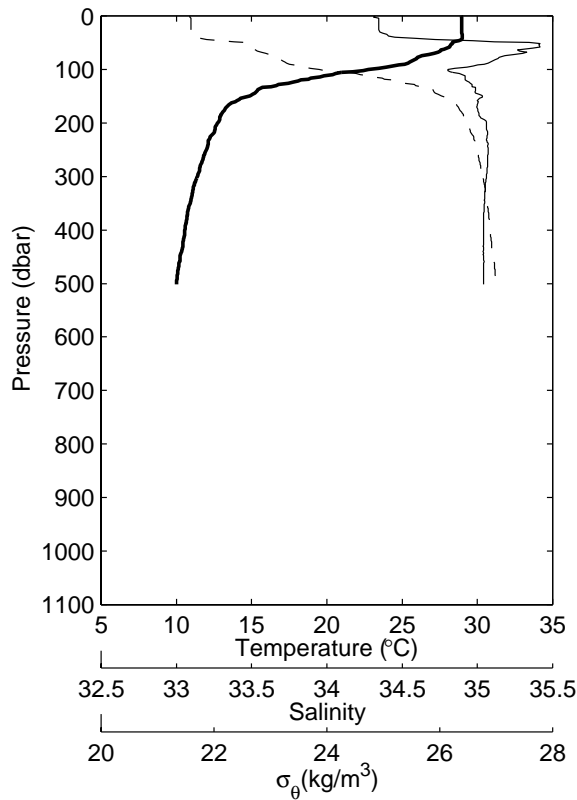
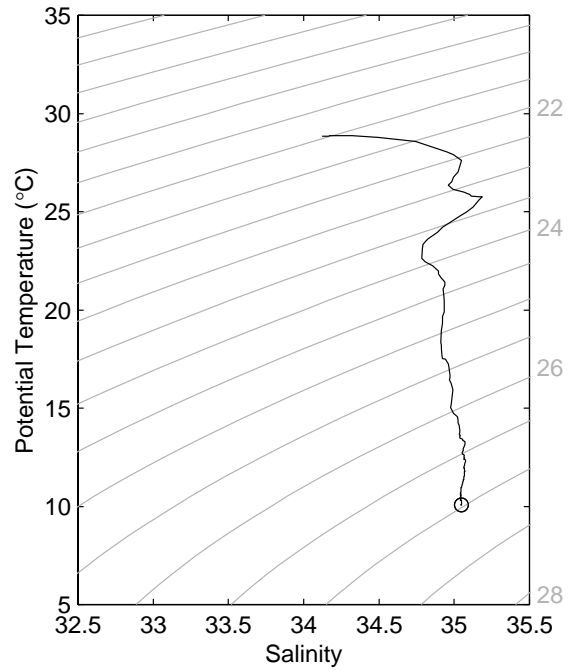
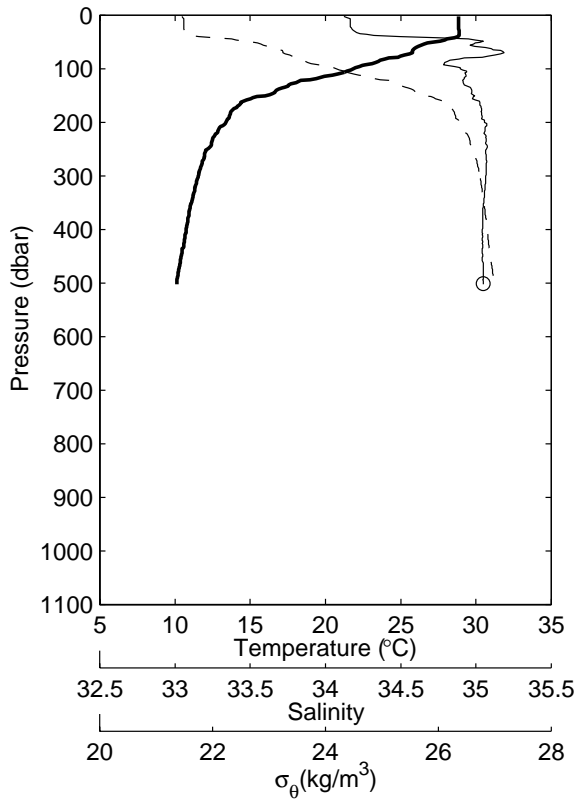


Figure 8.1.9. Same as Fig. 8.1.1 but for station 17 cast 1 and station 18 cast 1.

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Pre-JASMINE Stn-20 Cast-1 4.50°N 88.00°E 00:41Z 13 Apr 1999

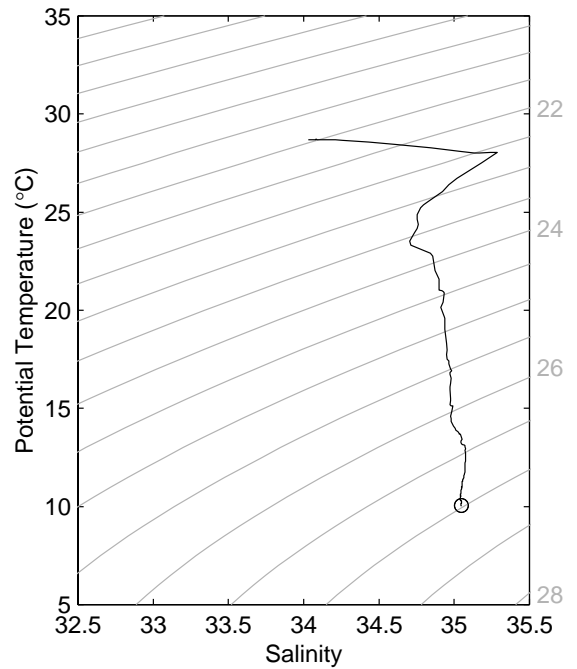
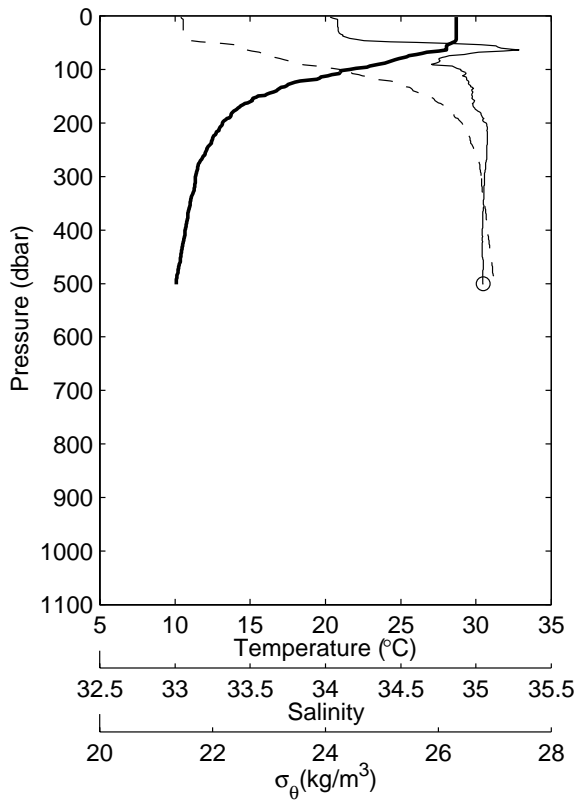
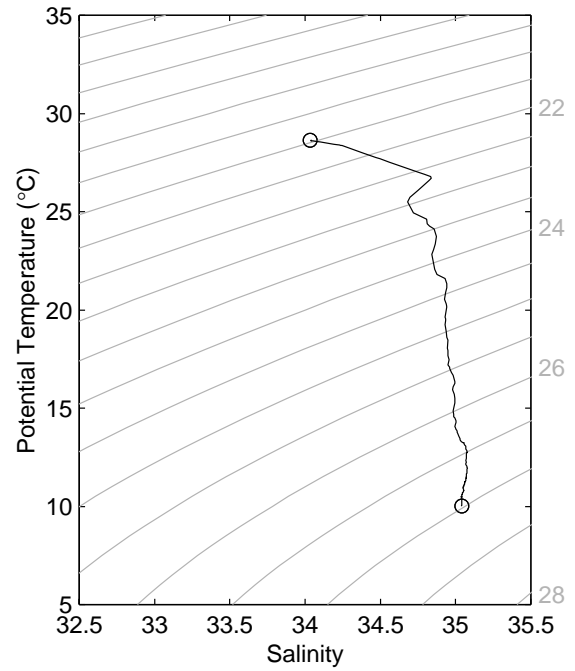
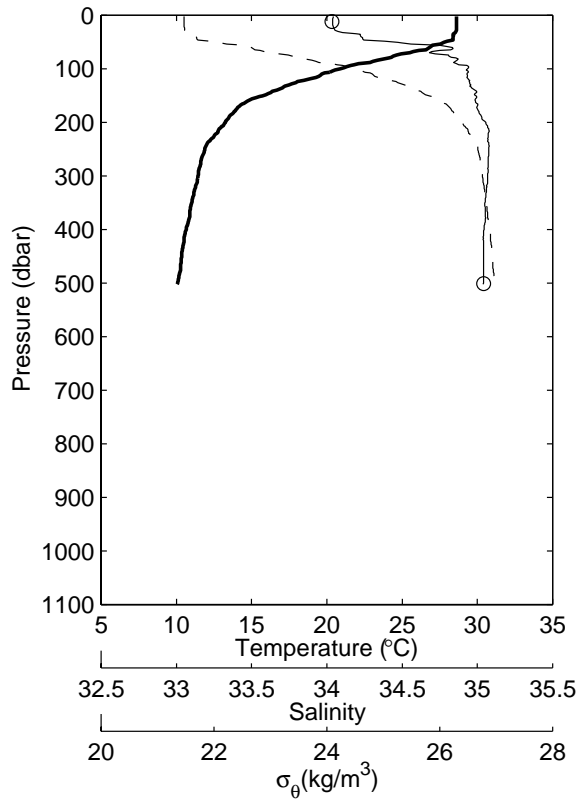


Figure 8.1.10. Same as Fig. 8.1.1 but for station 19 cast 1 and station 20 cast 1.

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Pre-JASMINE Stn-22 Cast-1 5.50°N 88.00°E 06:57Z 13 Apr 1999

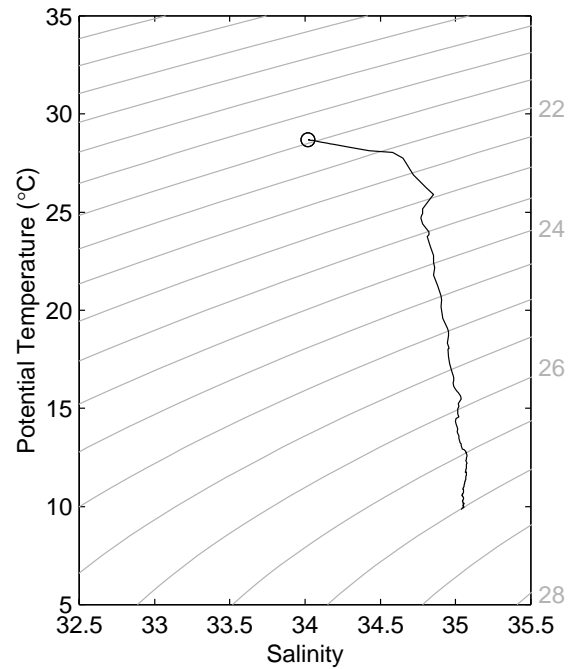
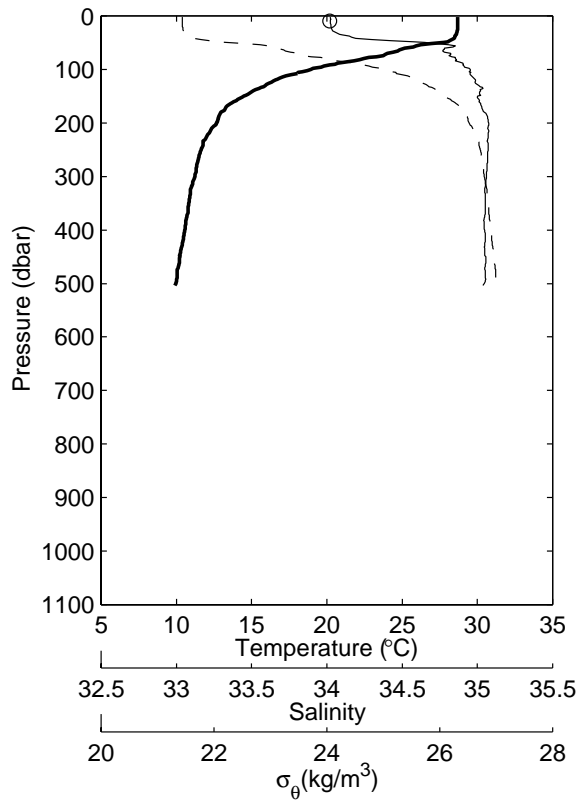
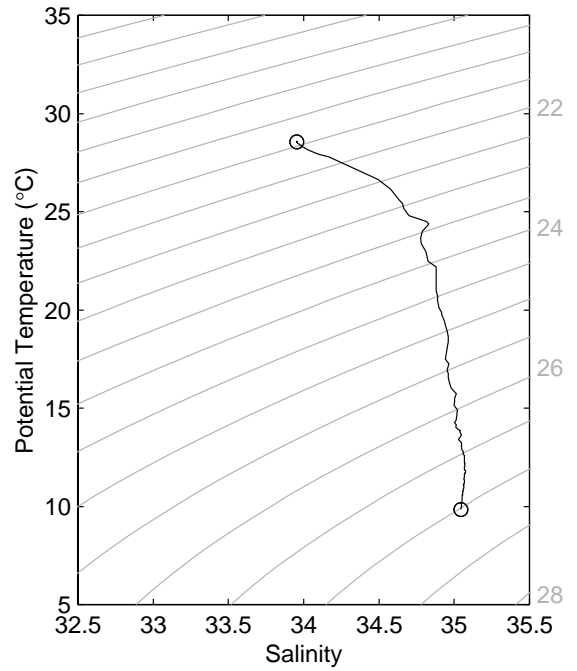
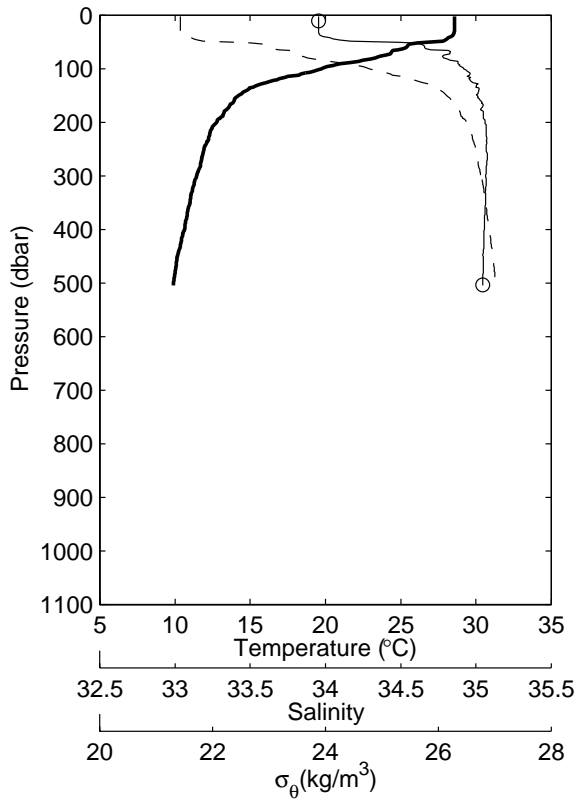


Figure 8.1.11. Same as Fig. 8.1.1 but for station 21 cast 1 and station 22 cast 1.

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Pre-JASMINE Stn-24 Cast-1 6.50°N 88.00°E 13:24Z 13 Apr 1999

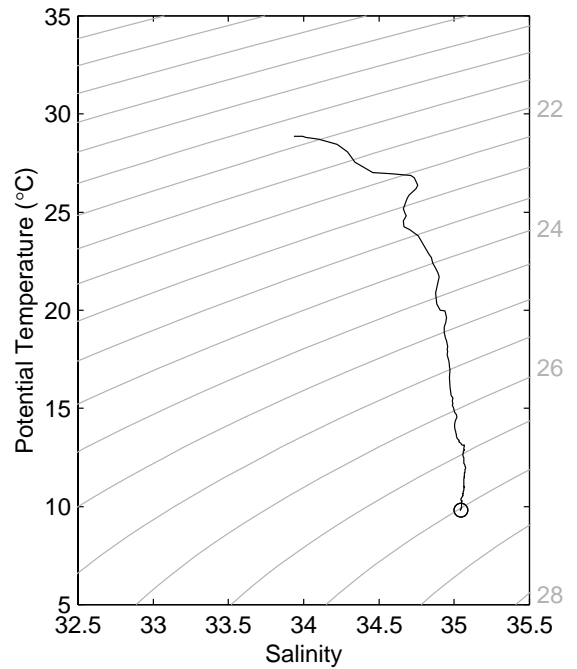
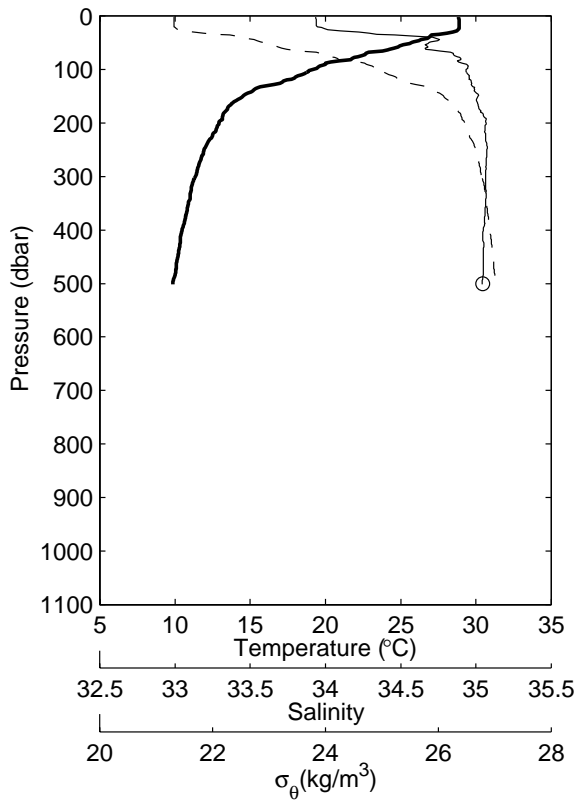
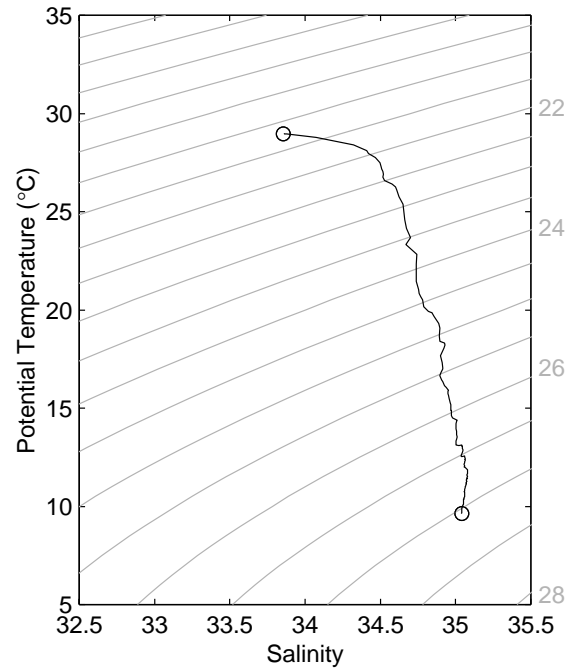
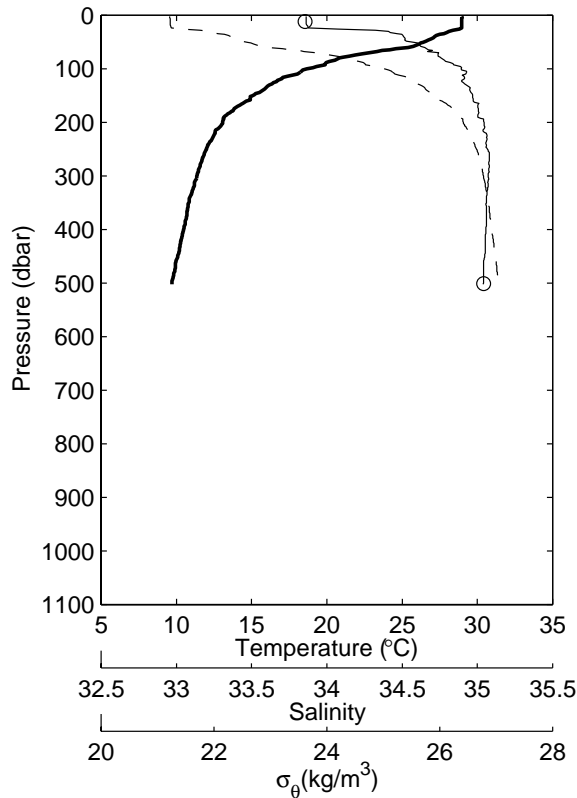


Figure 8.1.12. Same as Fig. 8.1.1 but for station 23 cast 1 and station 24 cast 1.

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Pre-JASMINE Stn-26 Cast-1 7.50°N 88.00°E 19:24Z 13 Apr 1999

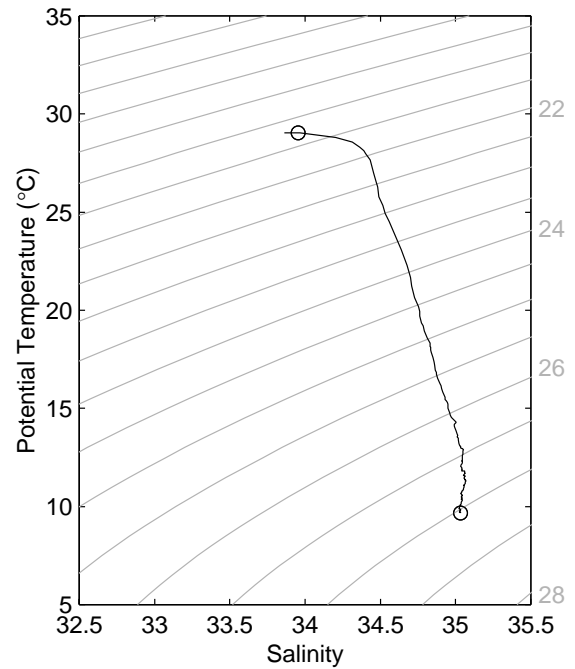
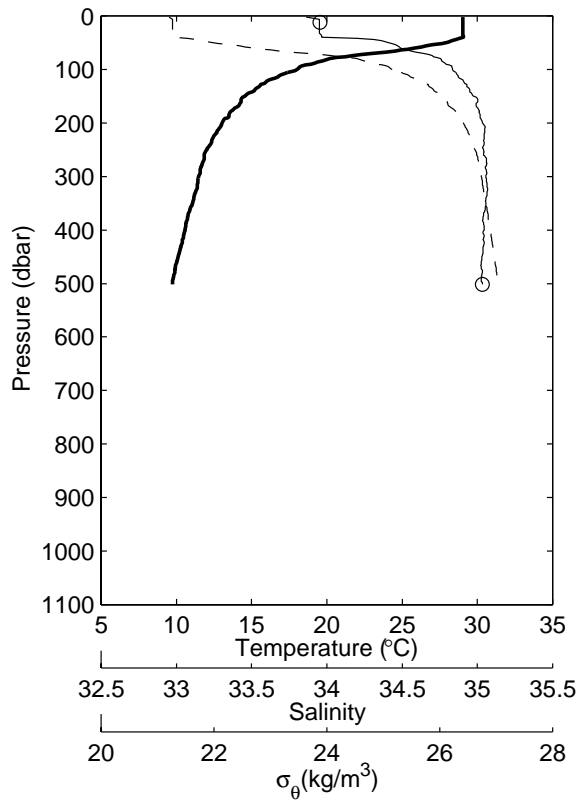
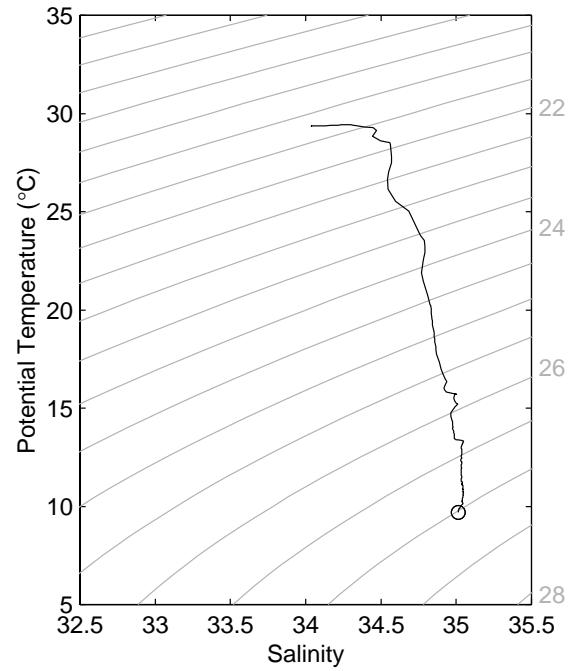
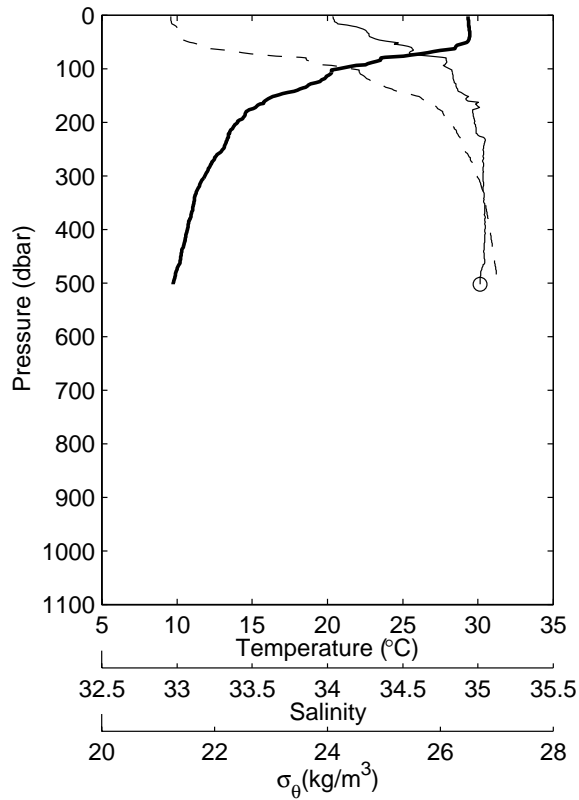


Figure 8.1.13. Same as Fig. 8.1.1 but for station 25 cast 1 and station 26 cast 1.

Pre-JASMINE Stn-27 Cast-1 8.00°N 88.00°E 22:22Z 13 Apr 1999



Pre-JASMINE Stn-28 Cast-1 8.50°N 88.00°E 01:20Z 14 Apr 1999

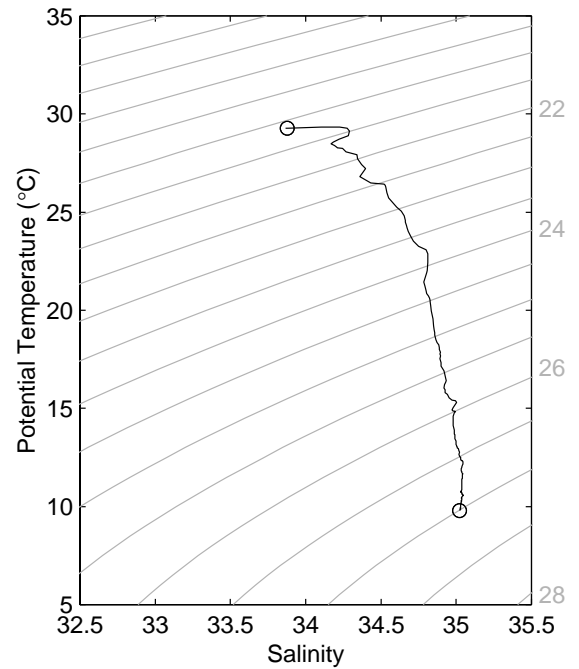
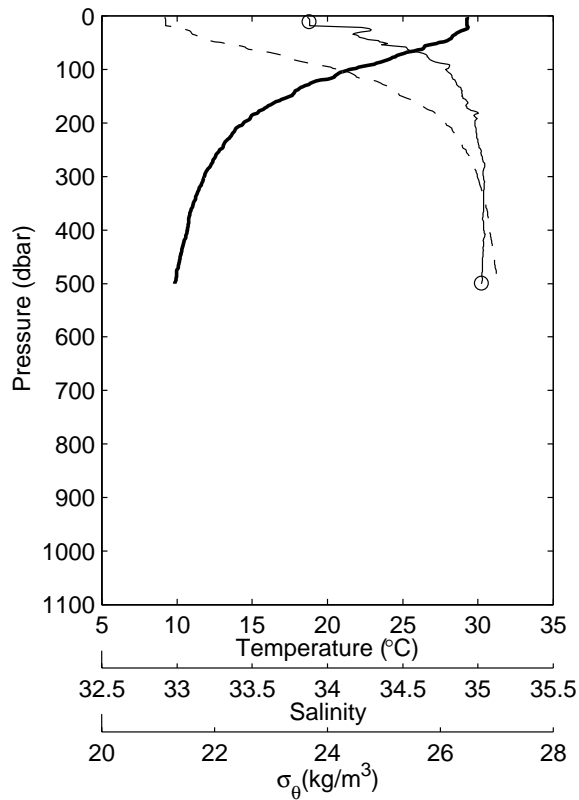
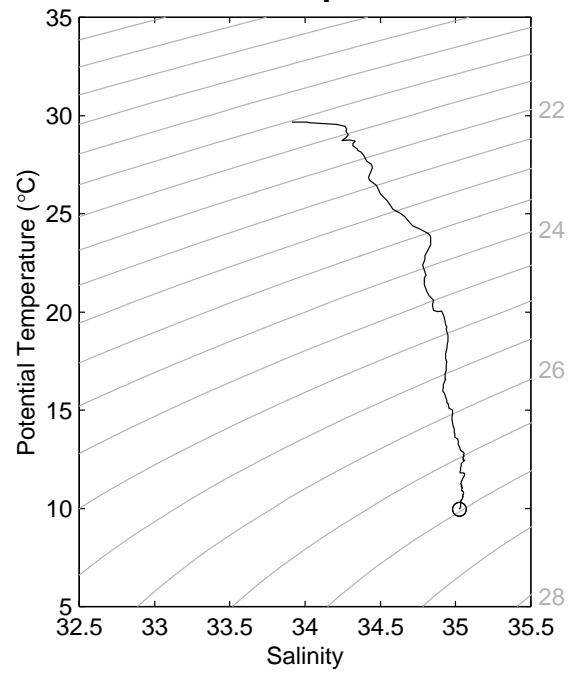
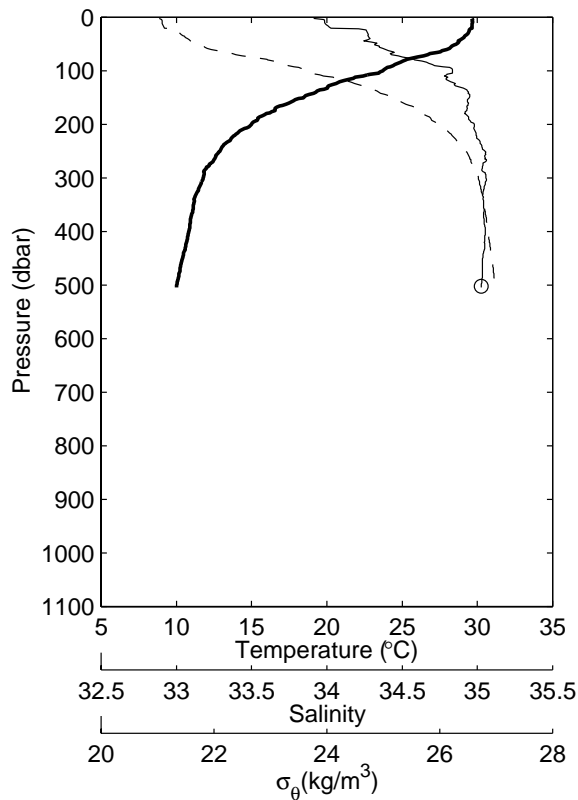


Figure 8.1.14. Same as Fig. 8.1.1 but for station 27 cast 1 and station 28 cast 1.

Pre-JASMINE Stn-29 Cast-1 9.00°N 88.00°E 04:19Z 14 Apr 1999



Pre-JASMINE Stn-30 Cast-1 9.50°N 88.00°E 07:21Z 14 Apr 1999

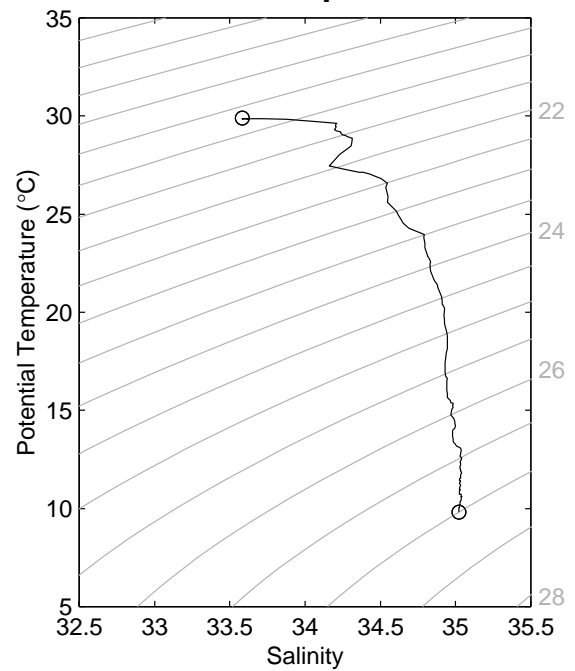
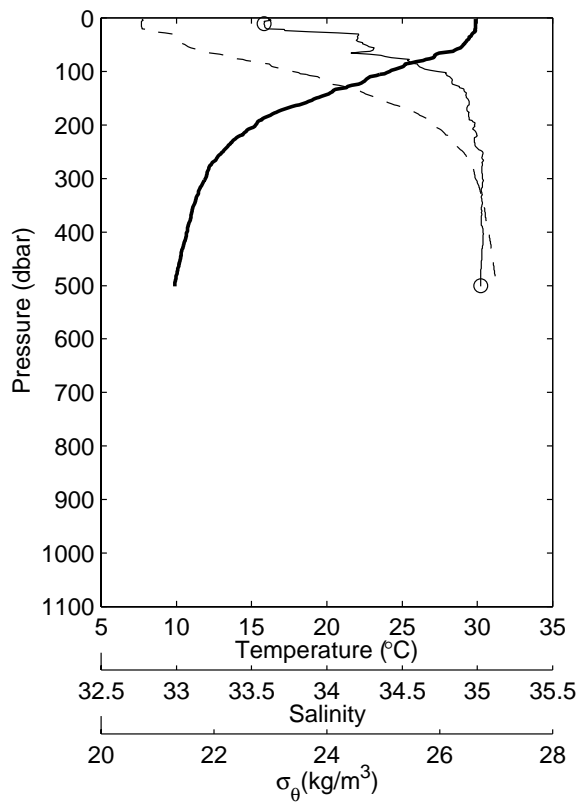
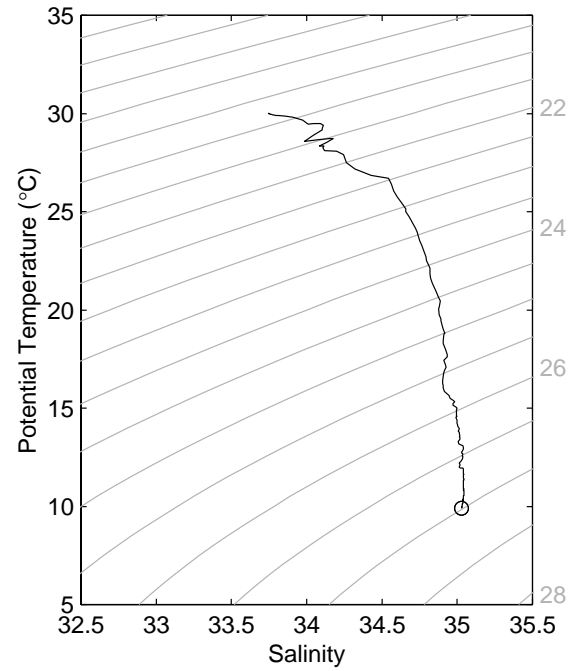
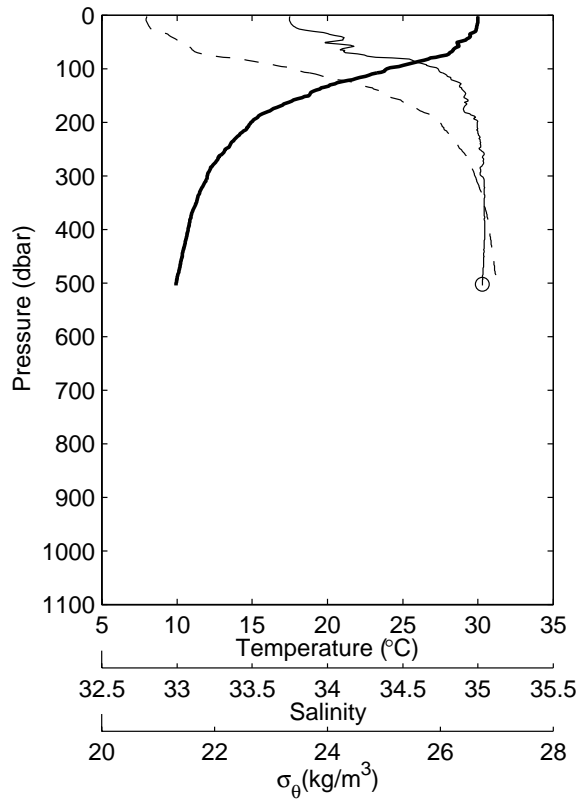


Figure 8.1.15. Same as Fig. 8.1.1 but for station 29 cast 1 and station 30 cast 1.

Pre-JASMINE Stn-31 Cast-1 10.00°N 88.00°E 10:25Z 14 Apr 1999



Pre-JASMINE Stn-32 Cast-1 10.50°N 88.00°E 13:34Z 14 Apr 1999

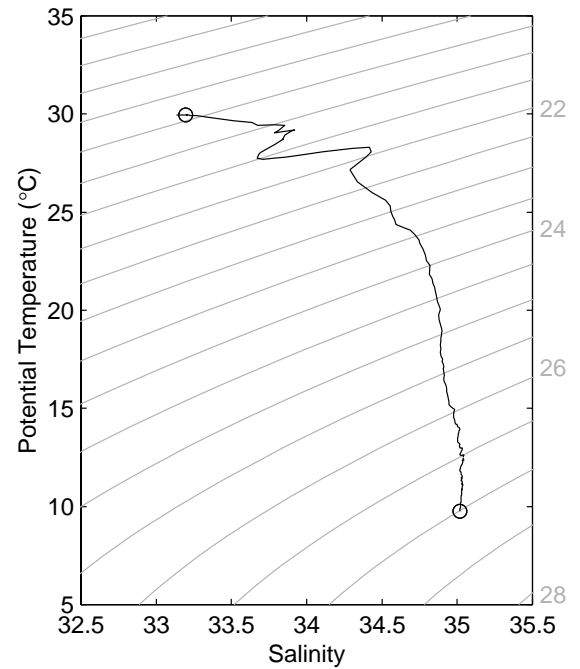
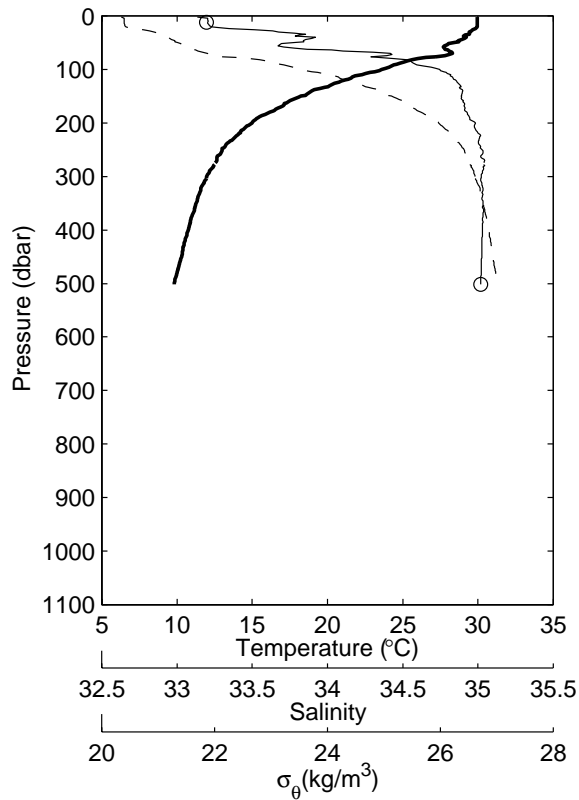
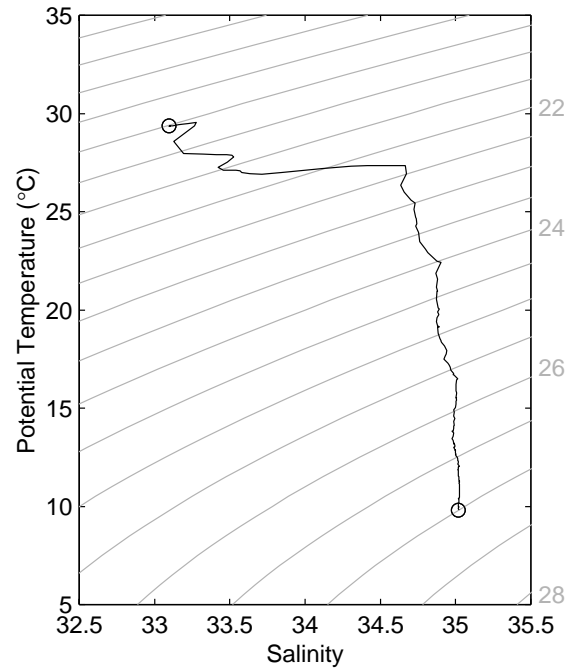
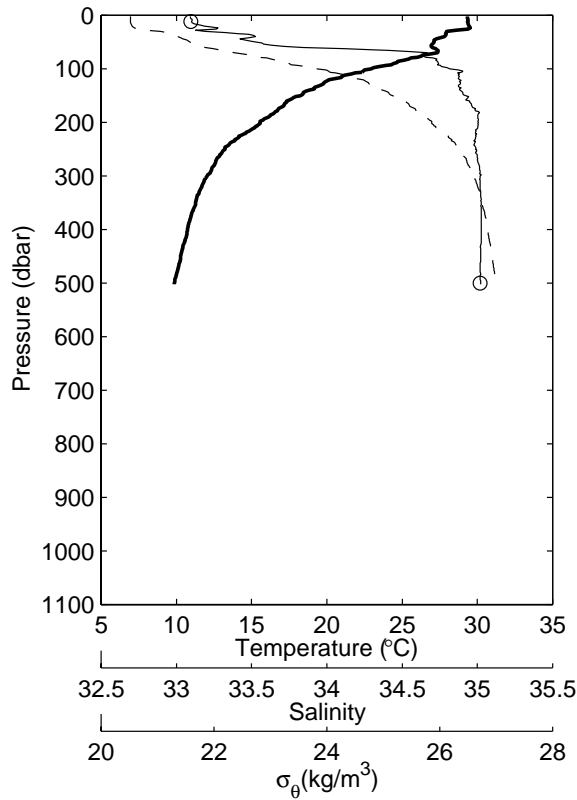


Figure 8.1.16. Same as Fig. 8.1.1 but for station 31 cast 1 and station 32 cast 1.

Pre-JASMINE Stn-33 Cast-1 88.00°N 11.00°E 16:45Z 14 Apr 1999



Pre-JASMINE Stn-34 Cast-1 88.00°N 11.50°E 19:50Z 14 Apr 1999

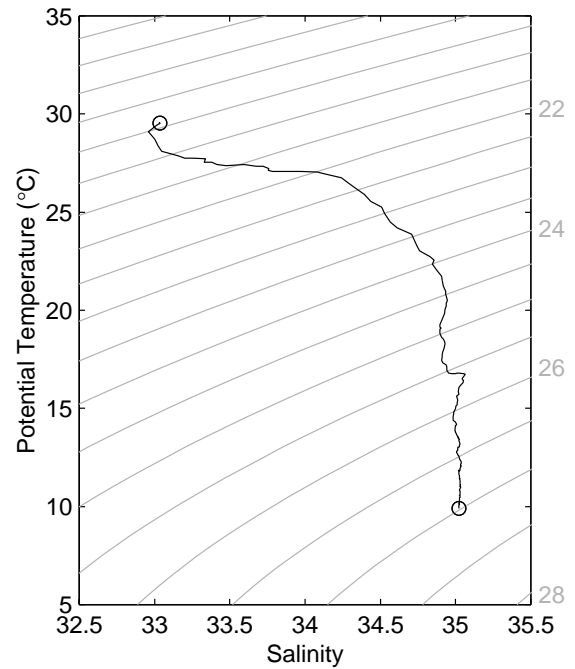
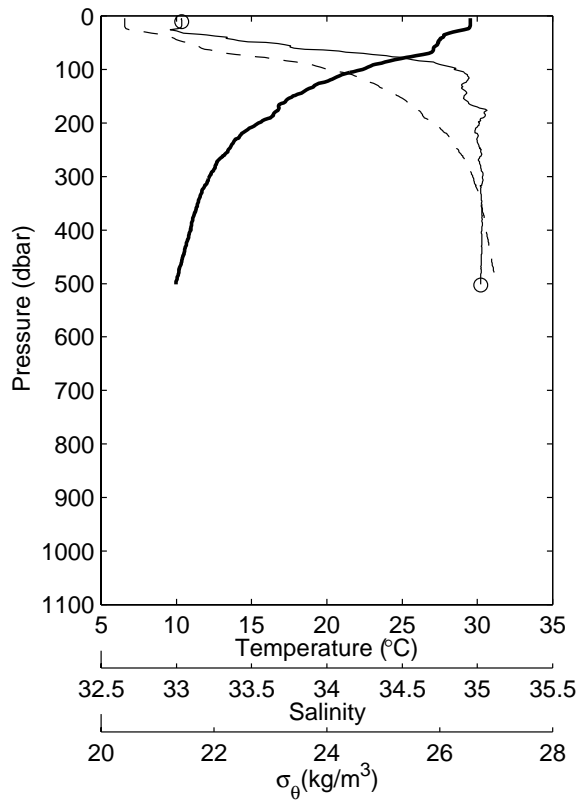
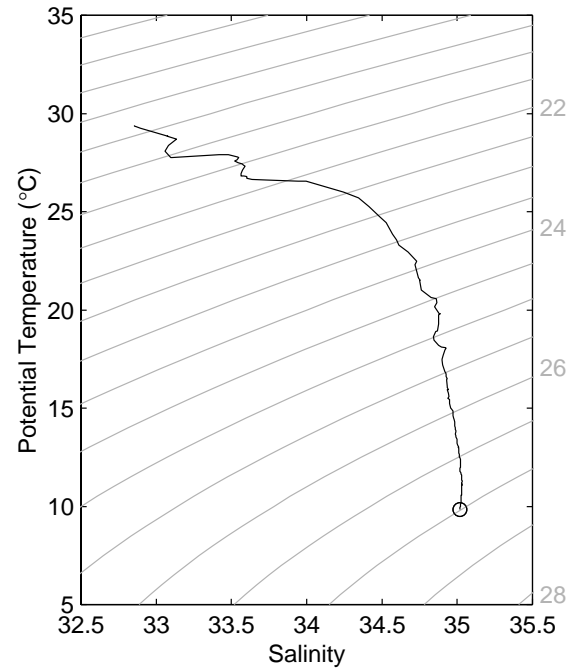
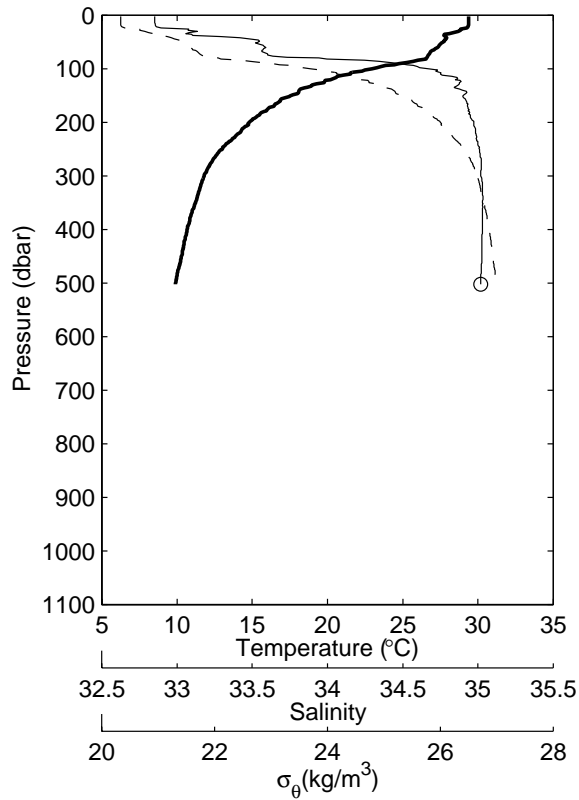


Figure 8.1.17. Same as Fig. 8.1.1 but for station 33 cast 1 and station 34 cast 1.

Pre-JASMINE Stn-35 Cast-1 88.00°N 12.00°E 22:56Z 14 Apr 1999



Pre-JASMINE Stn-36 Cast-1 88.00°N 12.50°E 01:59Z 15 Apr 1999

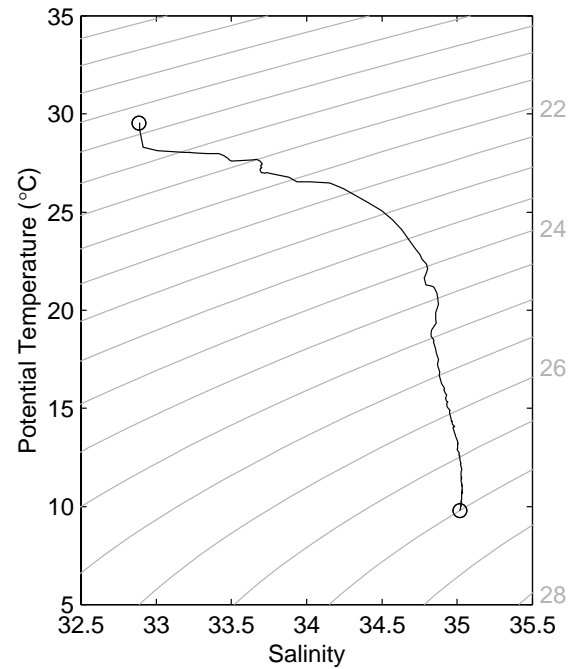
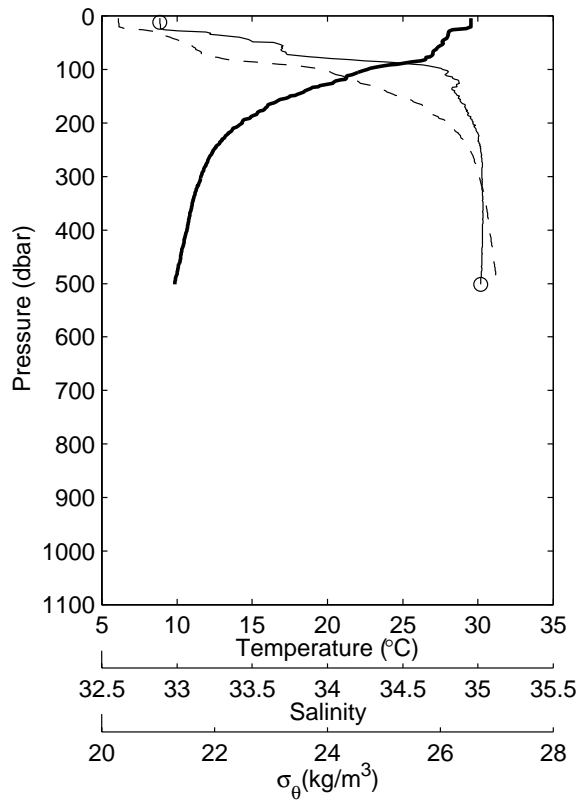
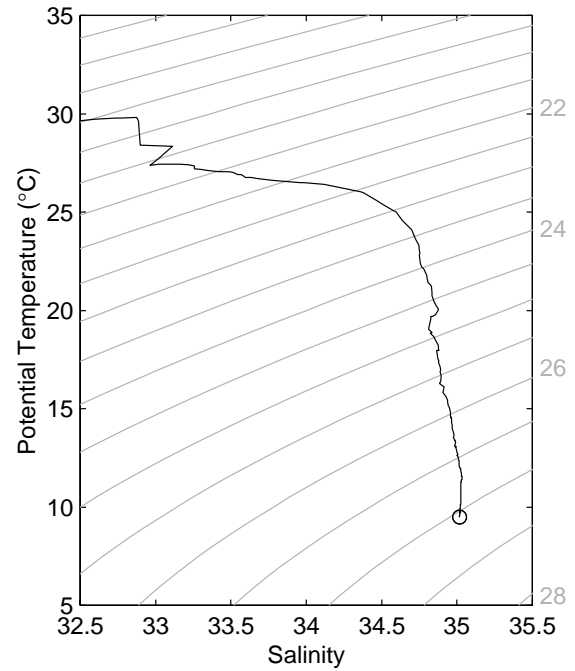
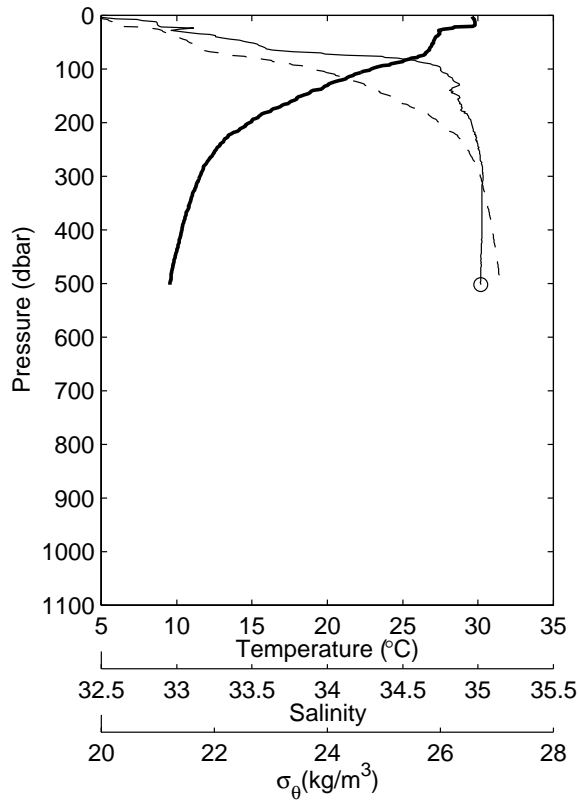


Figure 8.1.18. Same as Fig. 8.1.1 but for station 35 cast 1 and station 36 cast 1.

Pre-JASMINE Stn-37 Cast-1 88.00°N 13.00°E 05:12Z 15 Apr 1999



Pre-JASMINE Stn-38 Cast-1 88.00°N 13.50°E 08:27Z 15 Apr 1999

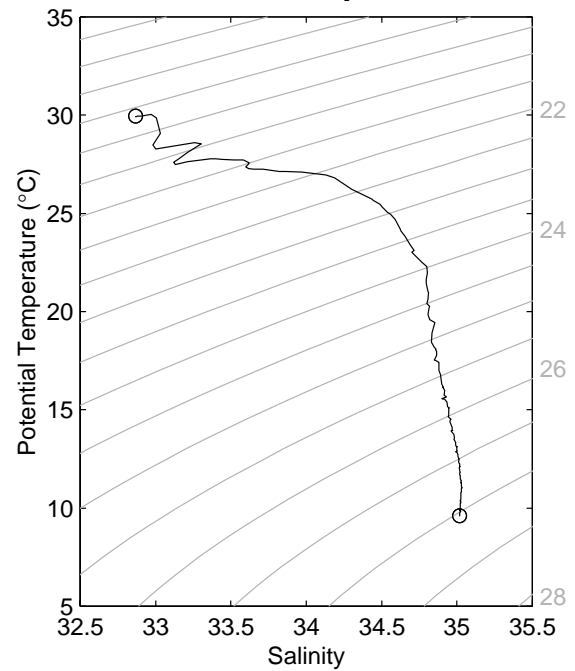
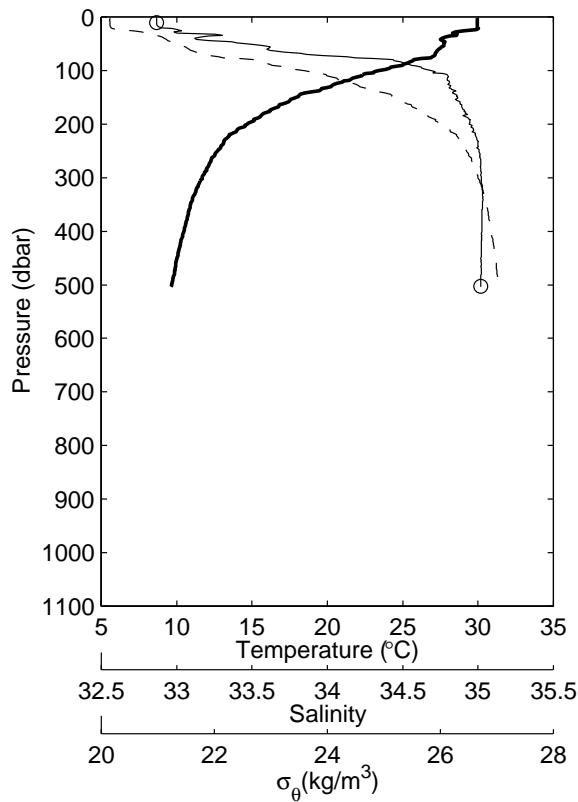
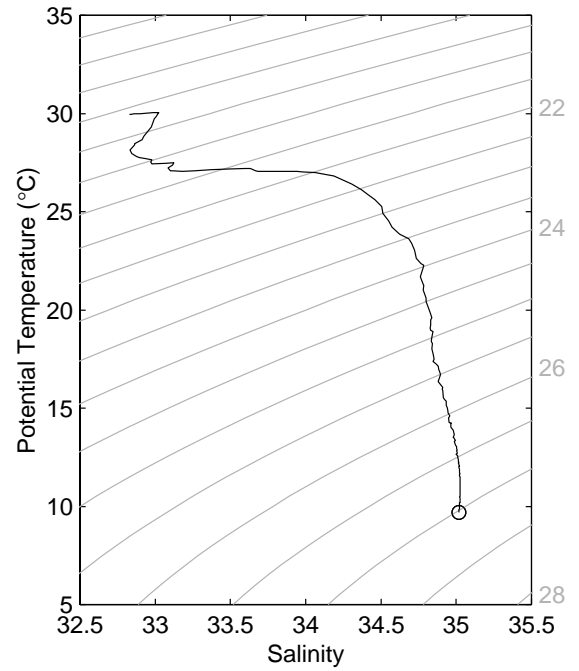
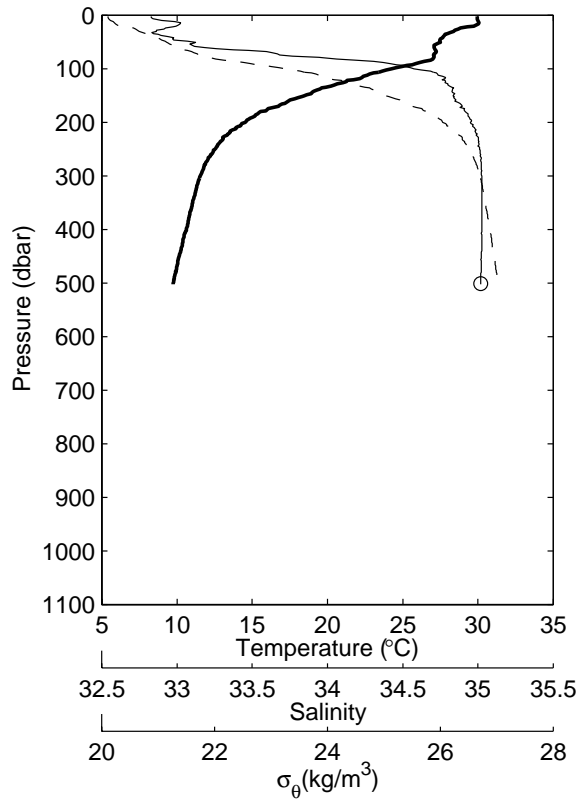


Figure 8.1.19. Same as Fig. 8.1.1 but for station 37 cast 1 and station 38 cast 1.

Pre-JASMINE Stn-39 Cast-1 88.00°N 14.00°E 11:29Z 15 Apr 1999



Pre-JASMINE Stn-40 Cast-1 14.50°N 88.00°E 14:31Z 15 Apr 1999

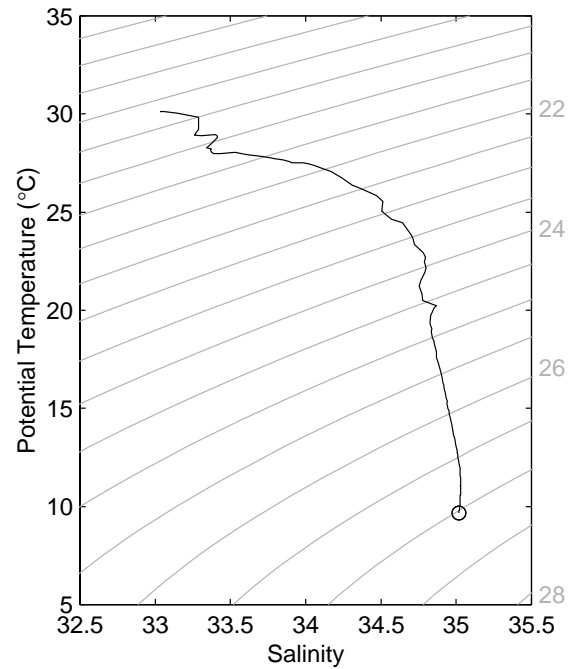
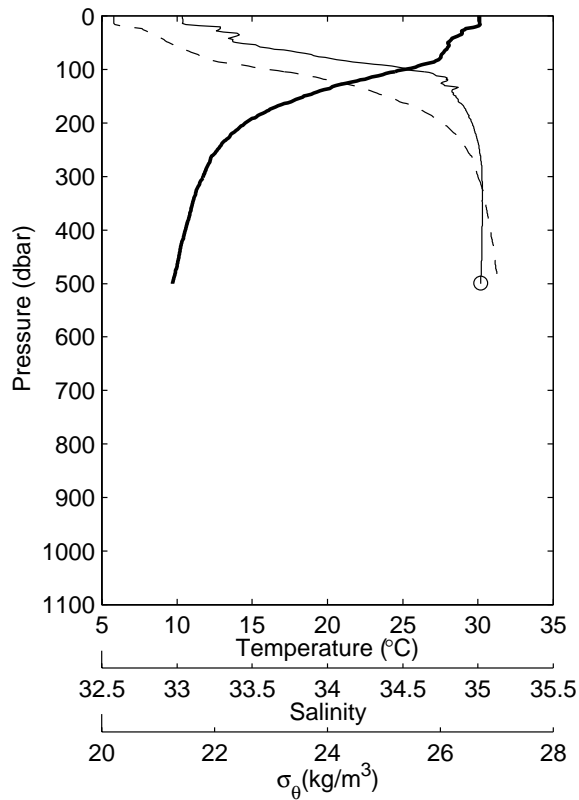
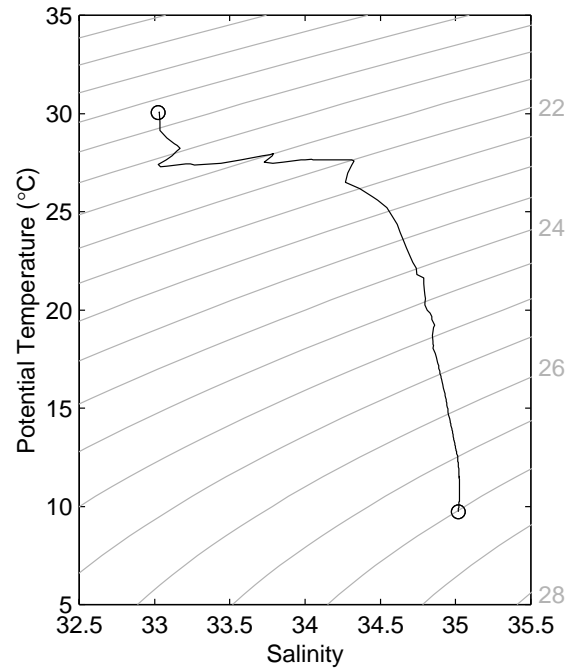
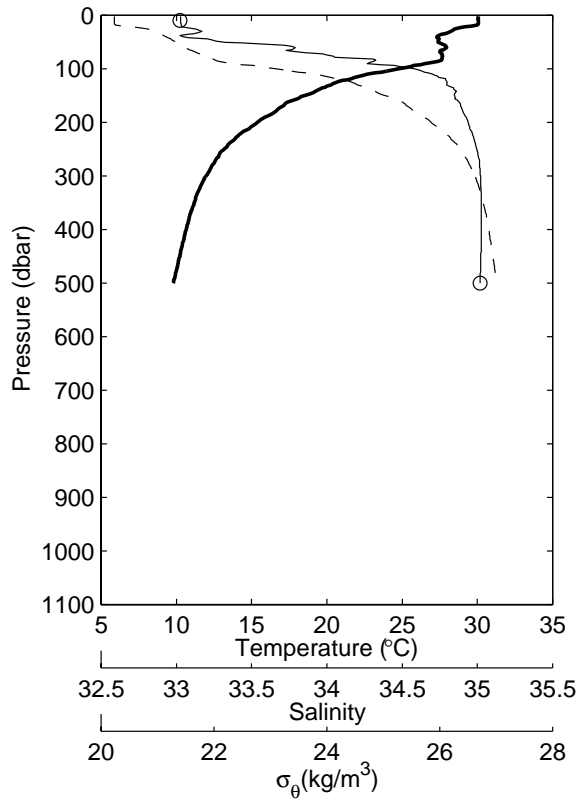


Figure 8.1.20. Same as Fig. 8.1.1 but for station 39 cast 1 and station 40 cast 1.

Pre-JASMINE Stn-41 Cast-1 15.00°N 88.00°E 17:39Z 15 Apr 1999



Pre-JASMINE Stn-42 Cast-1 15.50°N 88.00°E 21:12Z 15 Apr 1999

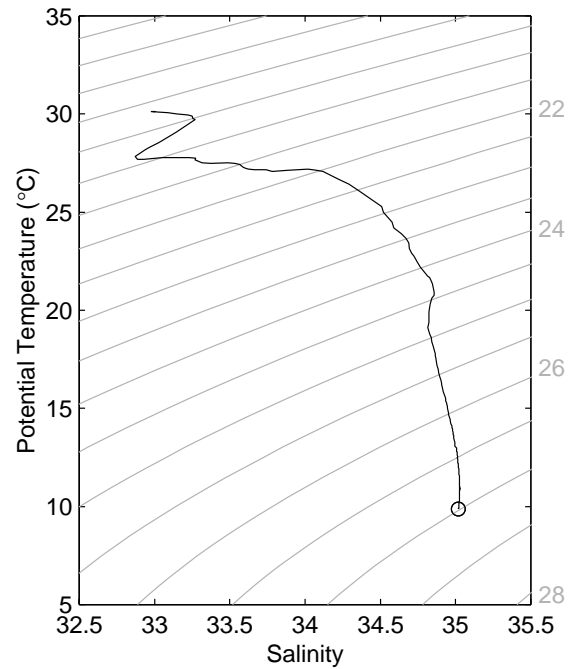
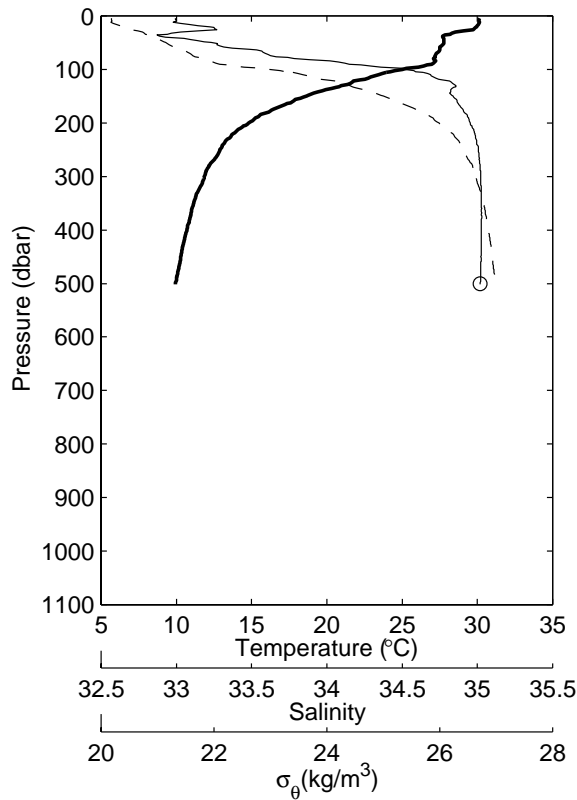
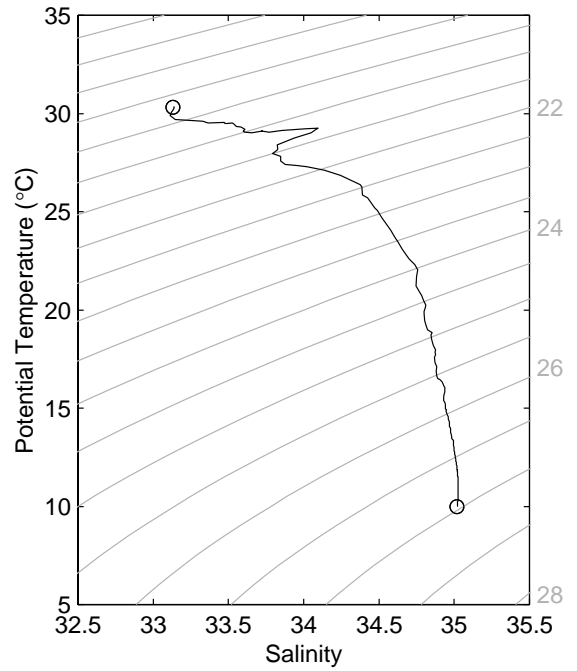
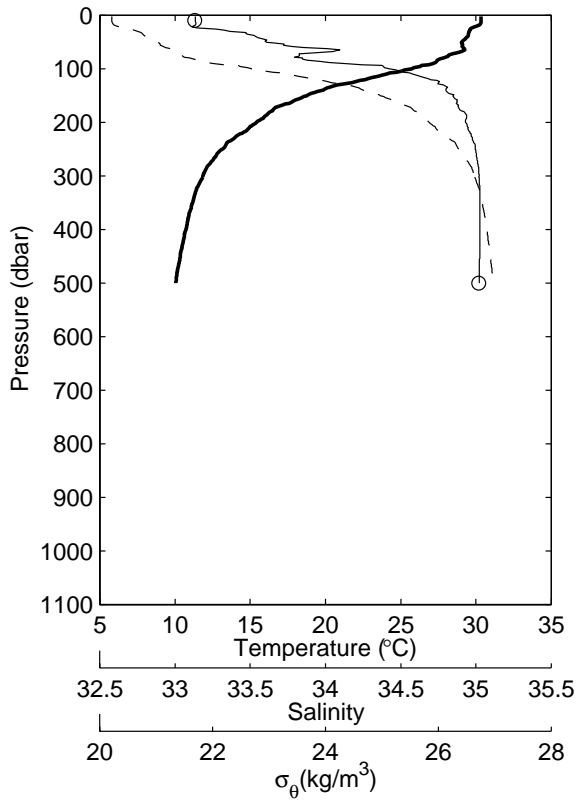


Figure 8.1.21. Same as Fig. 8.1.1 but for station 41 cast 1 and station 42 cast 1.

Pre-JASMINE Stn-43 Cast-1 16.00°N 88.00°E 00:12Z 16 Apr 1999



Pre-JASMINE Stn-44 Cast-1 16.57°N 87.77°E 06:01Z 16 Apr 1999

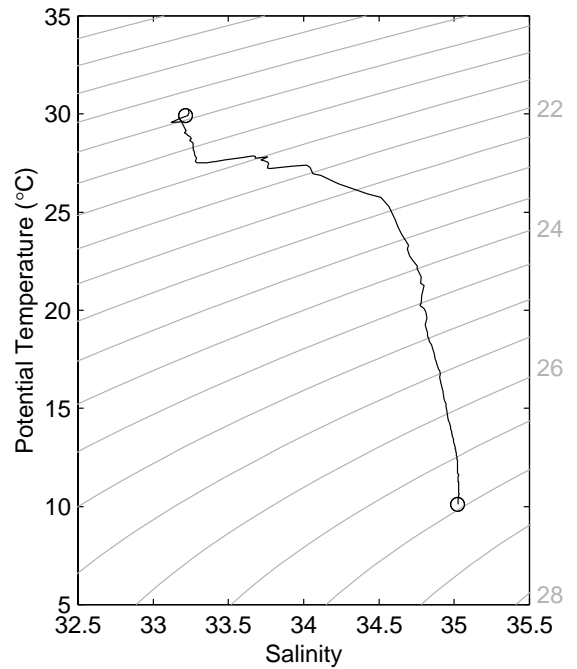
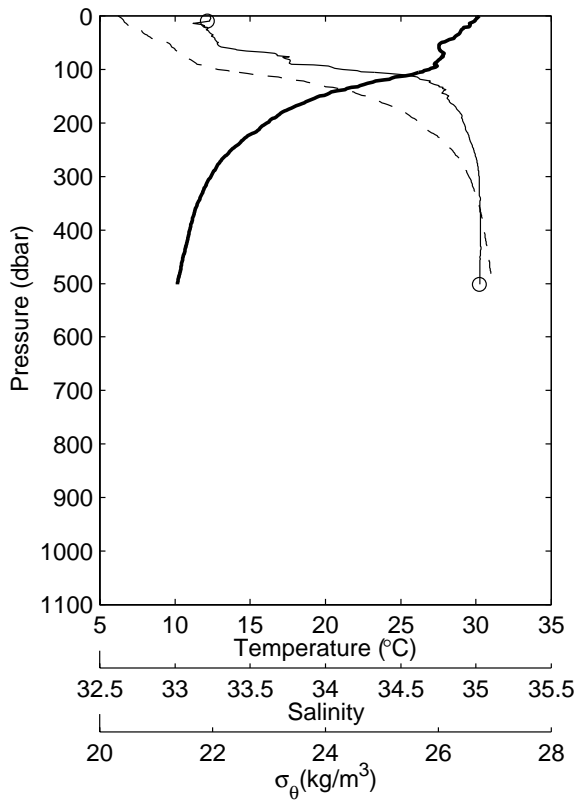
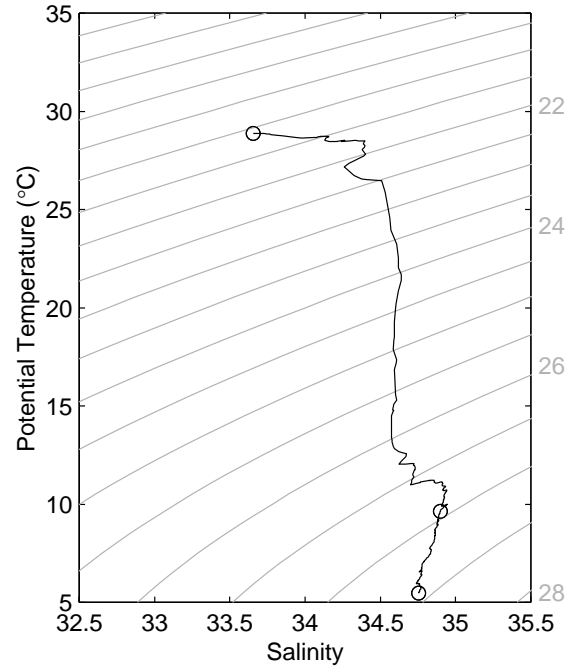
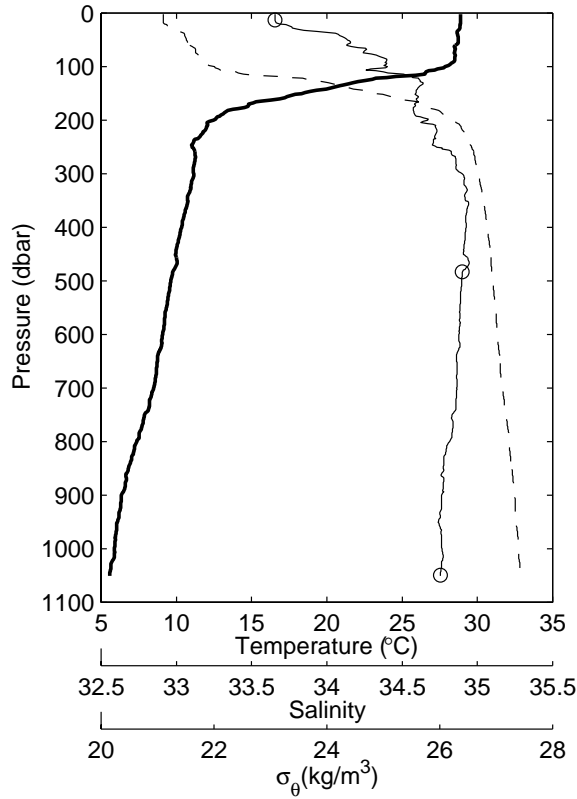


Figure 8.1.22. Same as Fig. 8.1.1 but for station 43 cast 1 and station 44 cast 1.

JASMINE Stn-1 Cast-1 5.79°S 101.53°E 05:12Z 3 May 1999



JASMINE Stn-2 Cast-1 5.23°S 96.11°E 08:04Z 4 May 1999

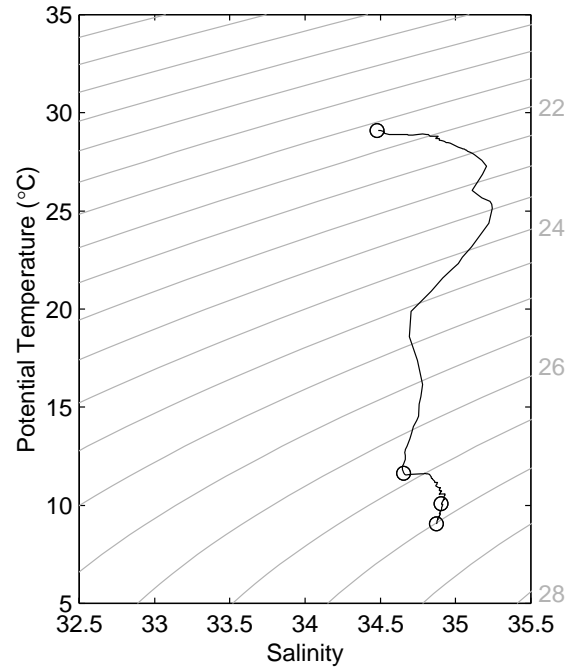
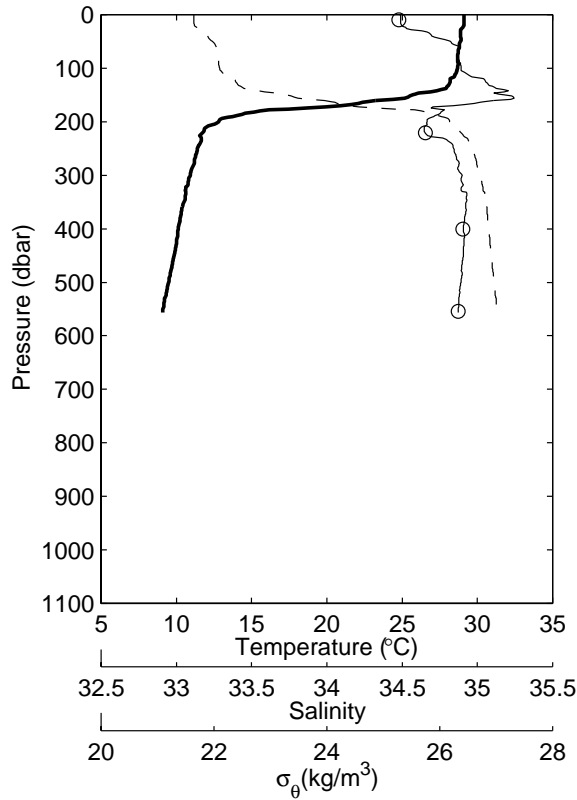
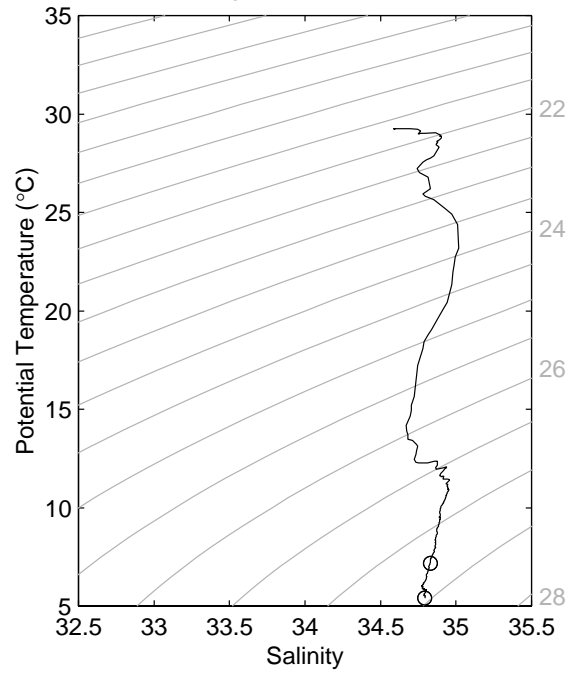
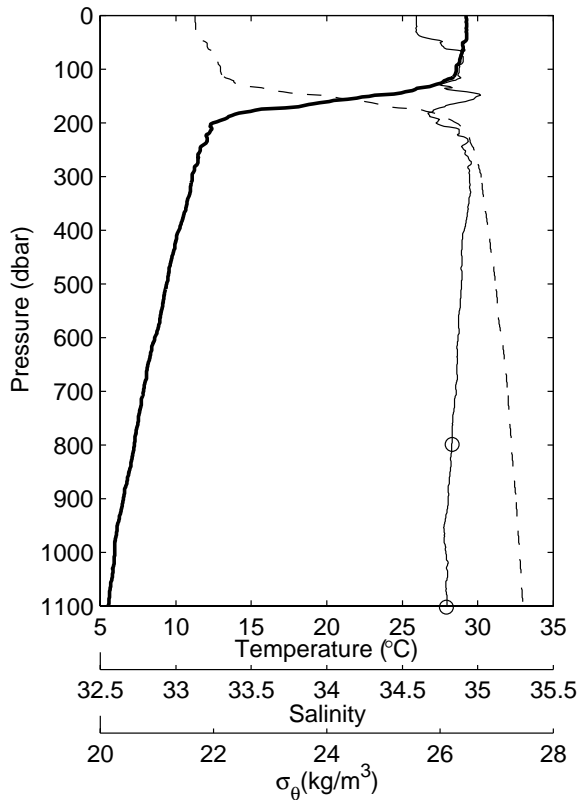


Figure 8.1.23. Same as Fig. 8.1.1 but for JASMINE station 1 cast 1 and station 2 cast 1.

JASMINE Stn-3 Cast-1 5.00°S 94.00°E 18:34Z 4 May 1999



JASMINE Stn-4 Cast-1 4.50°S 93.50°E 23:04Z 4 May 1999

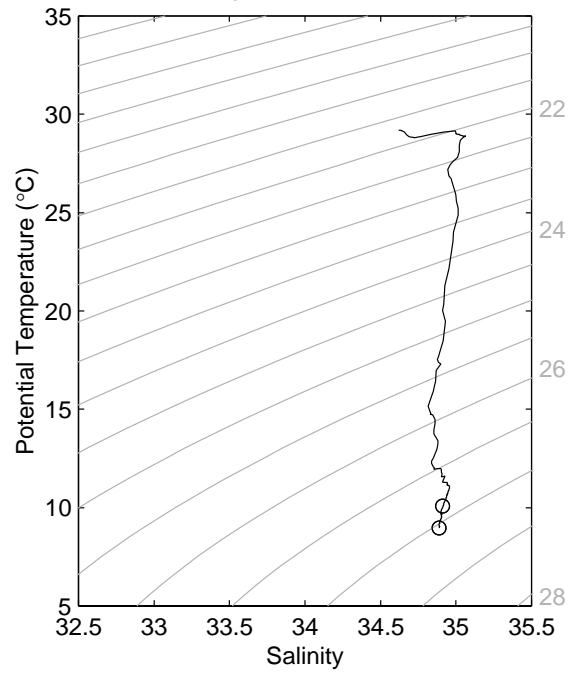
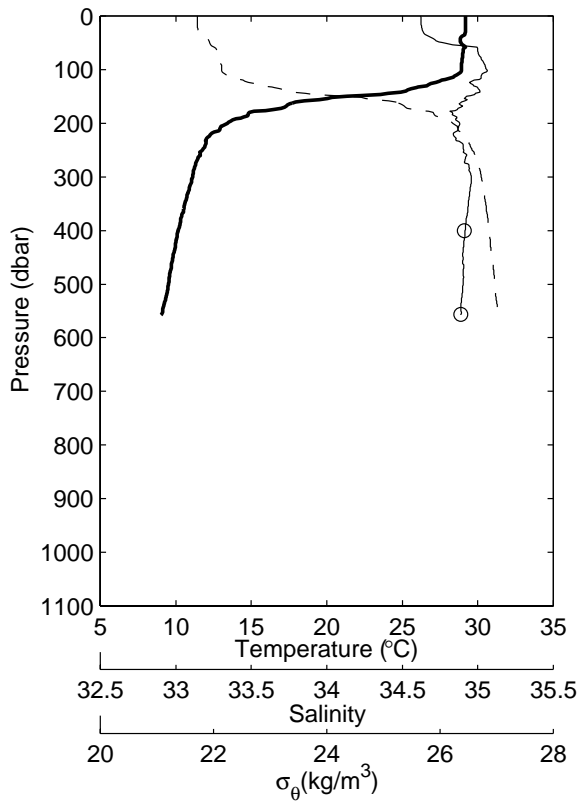
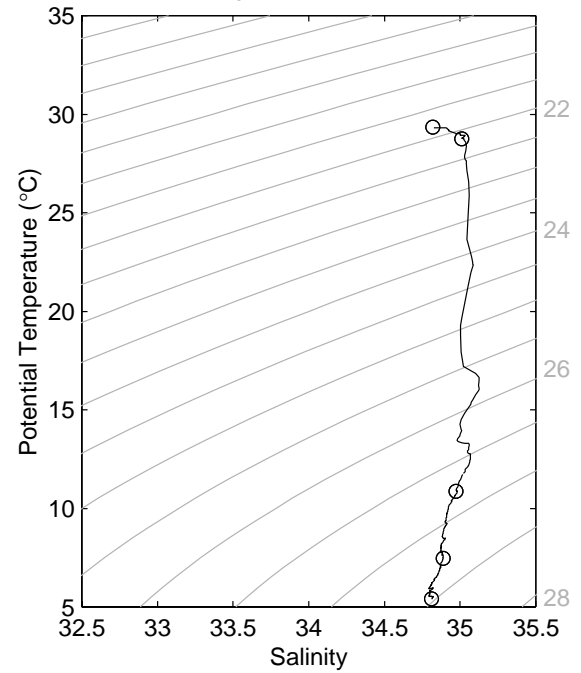
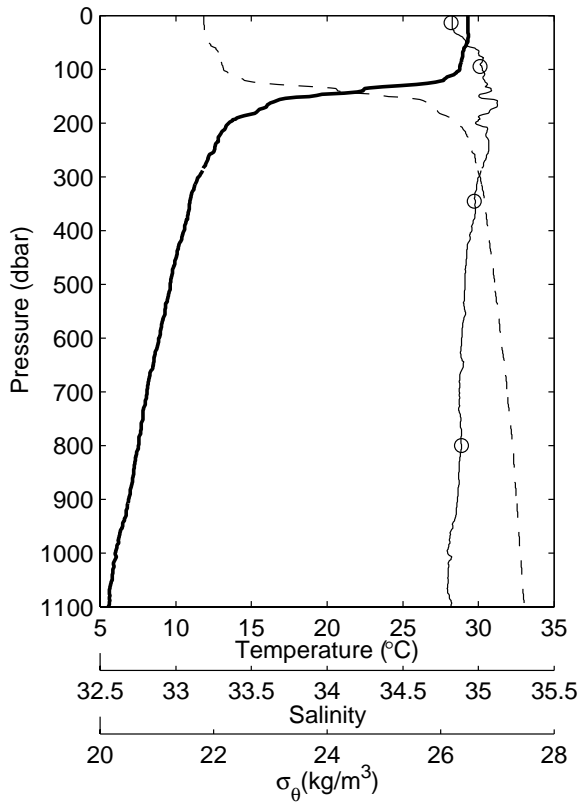


Figure 8.1.24. Same as Fig. 8.1.23 but for station 3 cast 1 and station 4 cast 1.

JASMINE Stn-5 Cast-1 4.00°S 93.00°E 03:01Z 5 May 1999



JASMINE Stn-6 Cast-1 3.50°S 92.50°E 07:11Z 5 May 1999

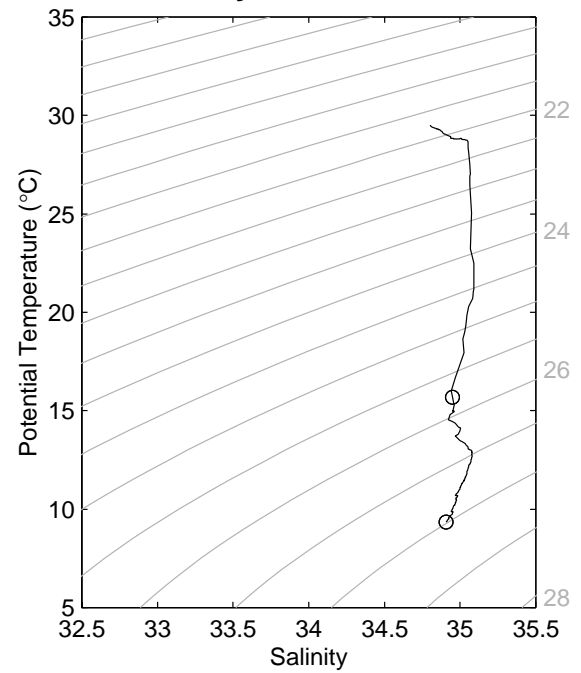
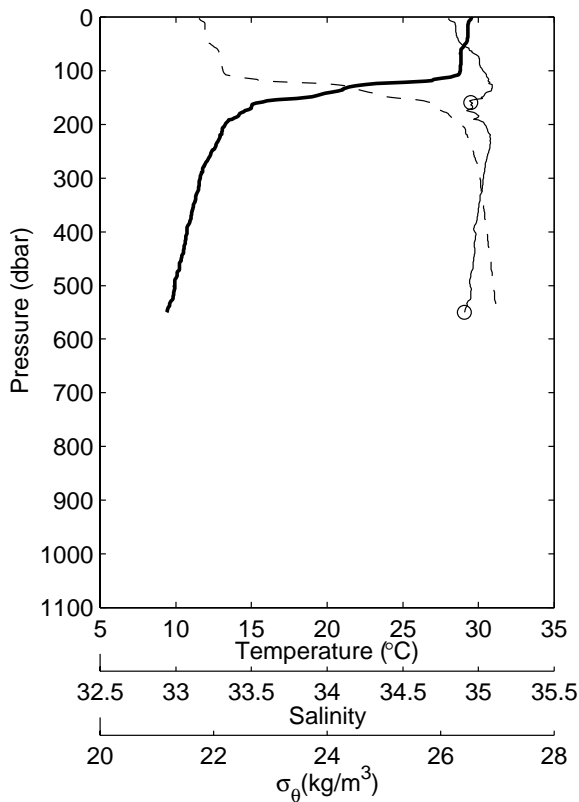
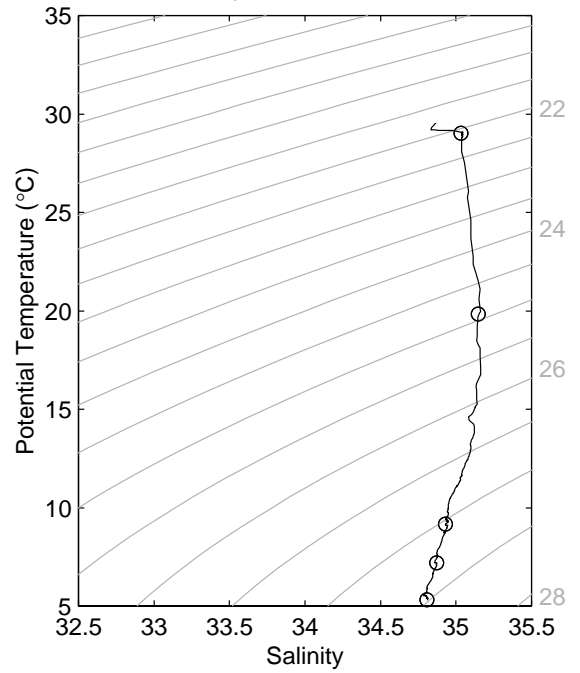
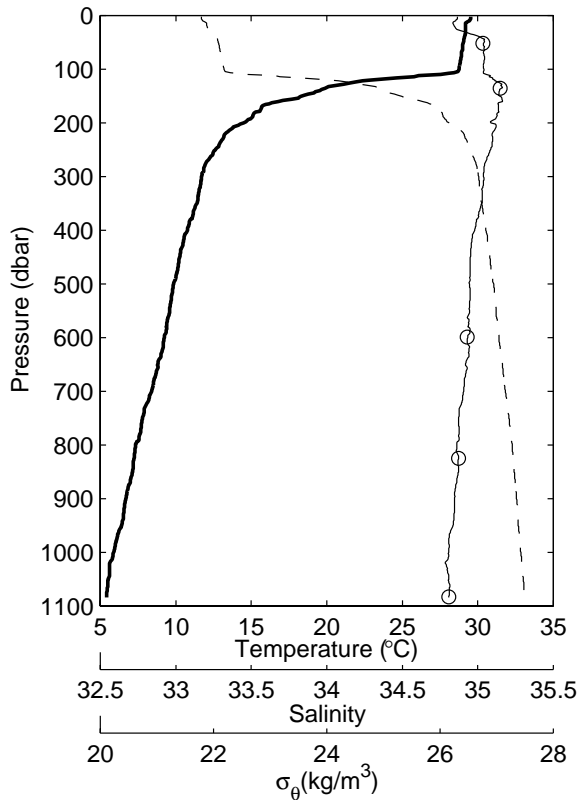


Figure 8.1.25. Same as Fig. 8.1.23 but for station 5 cast 1 and station 6 cast 1.

JASMINE Stn-7 Cast-1 3.00°S 92.00°E 11:00Z 5 May 1999



JASMINE Stn-8 Cast-2 2.50°S 91.50°E 15:25Z 5 May 1999

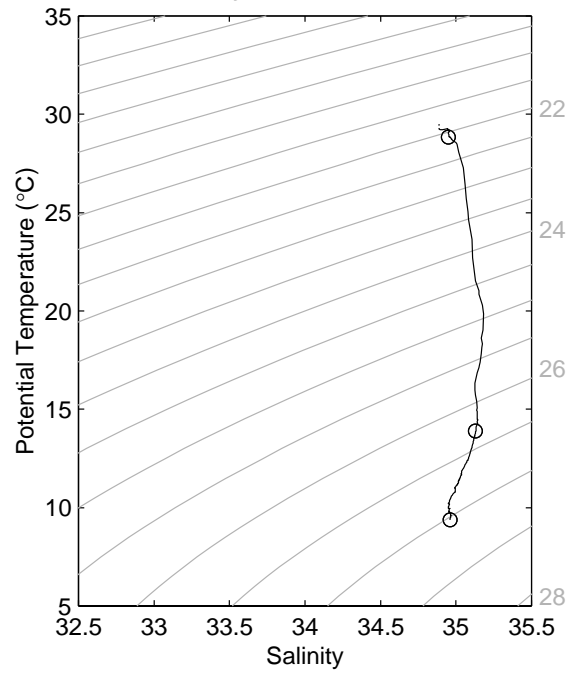
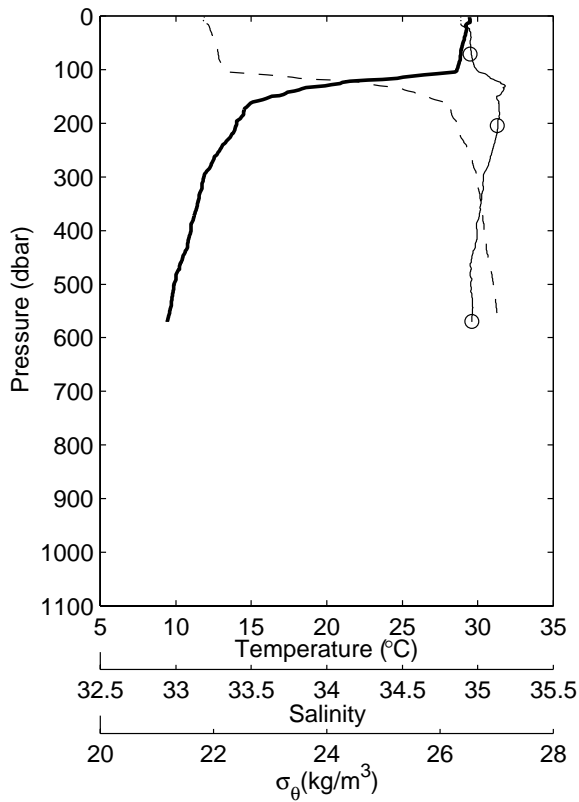
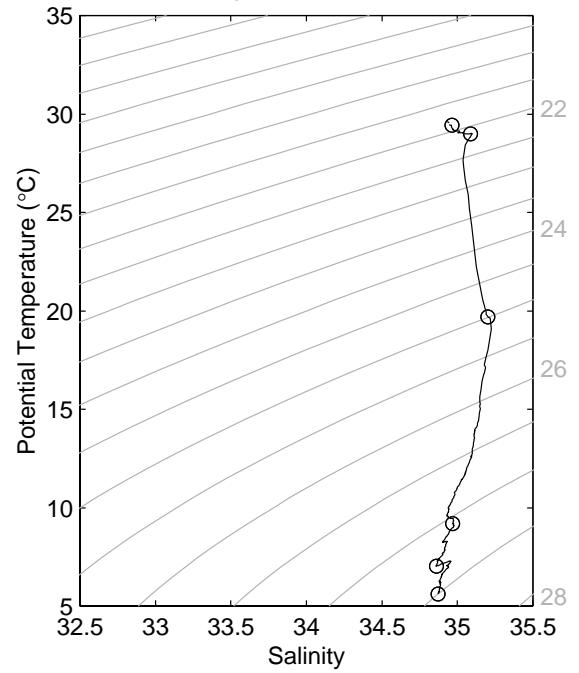
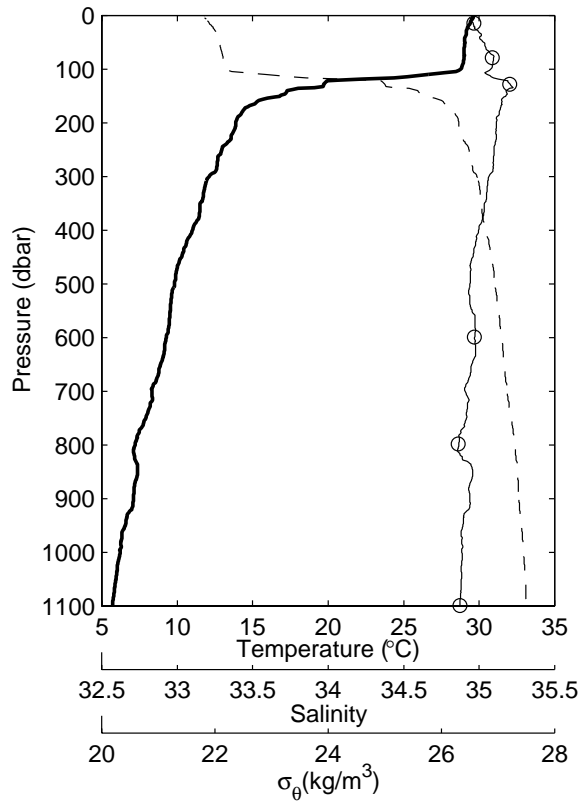


Figure 8.1.26. Same as Fig. 8.1.23 but for station 7 cast 1 and station 8 cast 1.

JASMINE Stn-9 Cast-1 2.00°S 91.00°E 19:26Z 5 May 1999



JASMINE Stn-10 Cast-1 1.50°S 90.50°E 23:44Z 5 May 1999

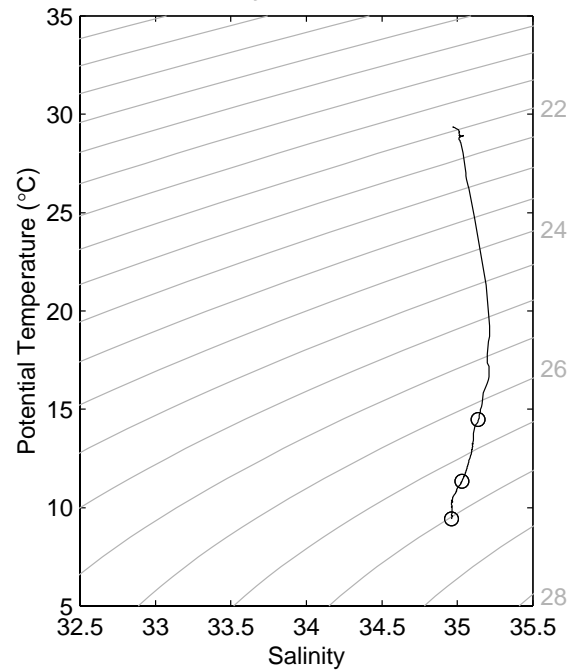
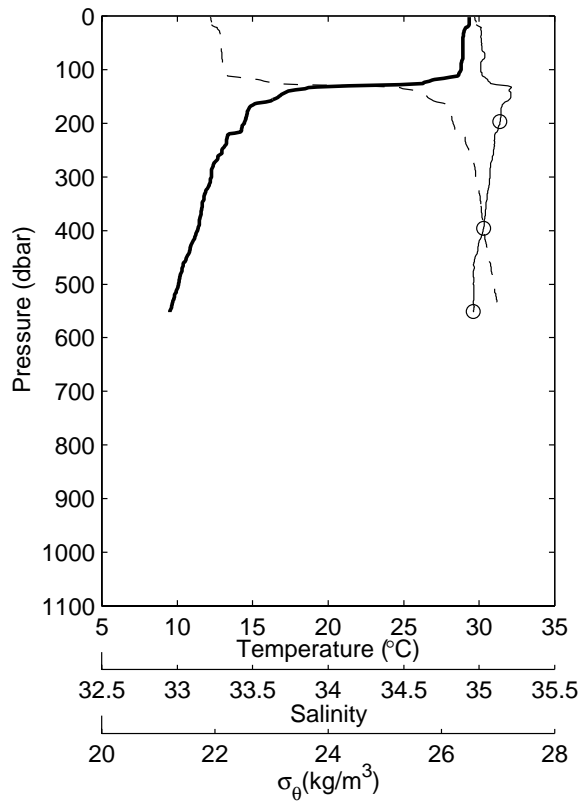
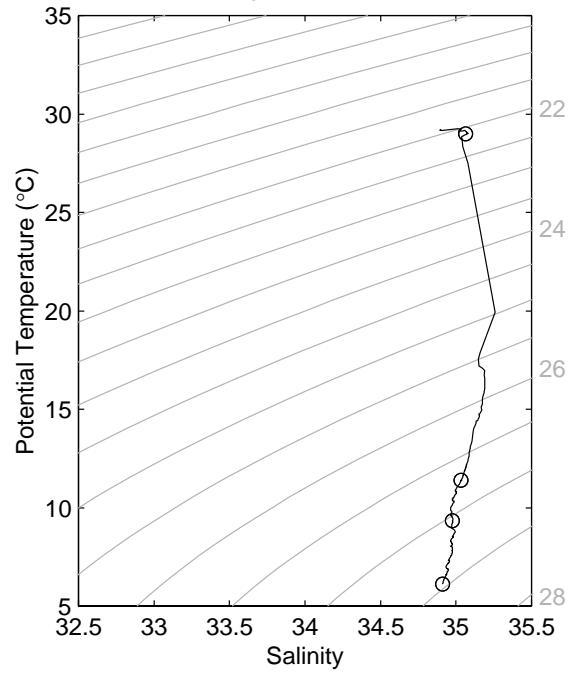
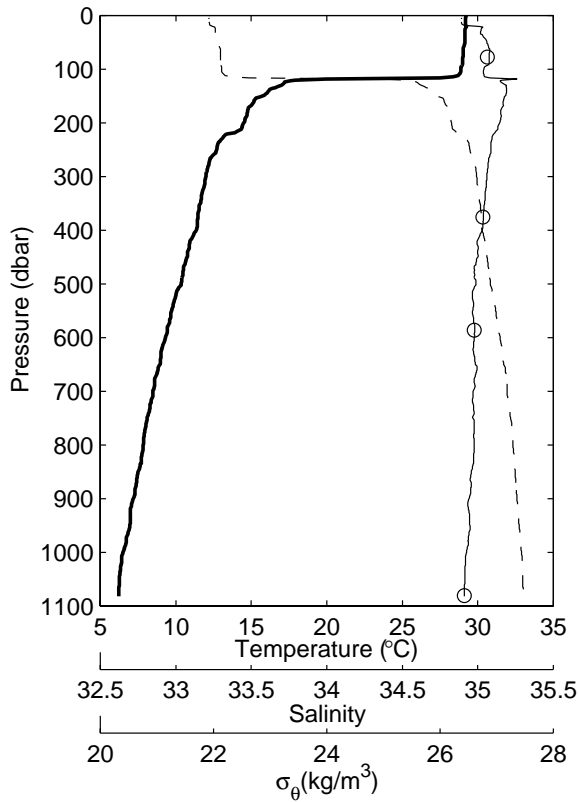


Figure 8.1.27. Same as Fig. 8.1.23 but for station 9 cast 1 and station 10 cast 1.

JASMINE Stn-11 Cast-1 1.00°S 90.00°E 03:33Z 6 May 1999



JASMINE Stn-12 Cast-1 0.50°S 89.50°E 08:00Z 6 May 1999

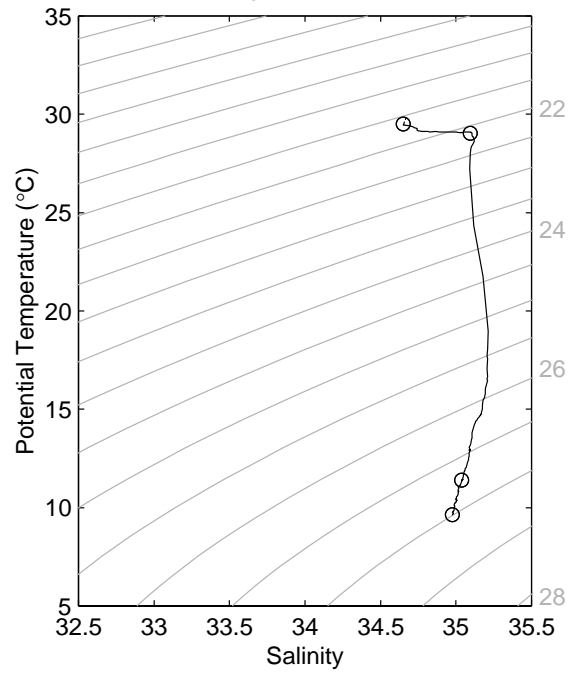
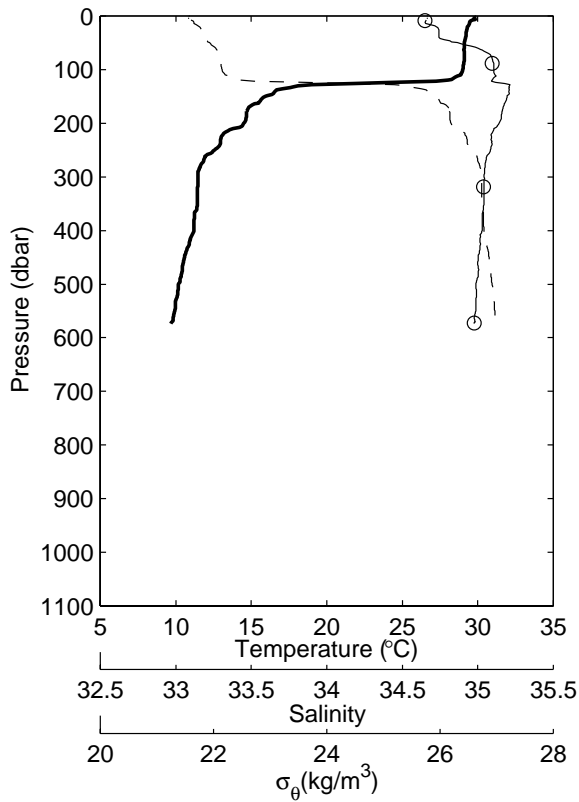
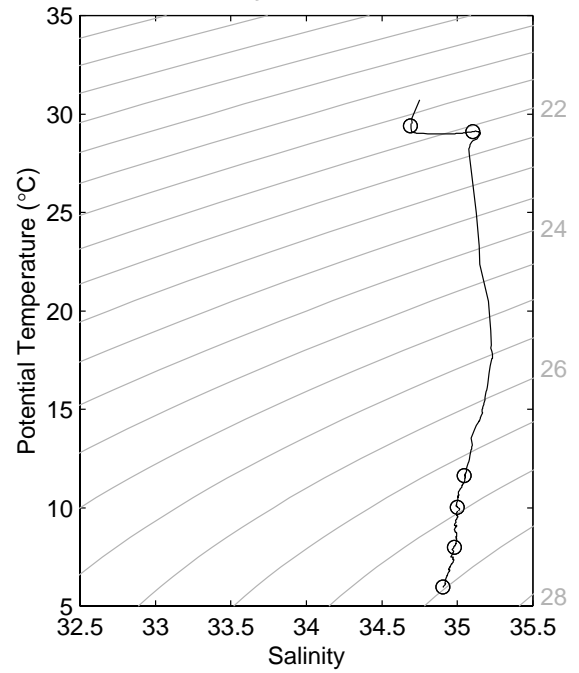
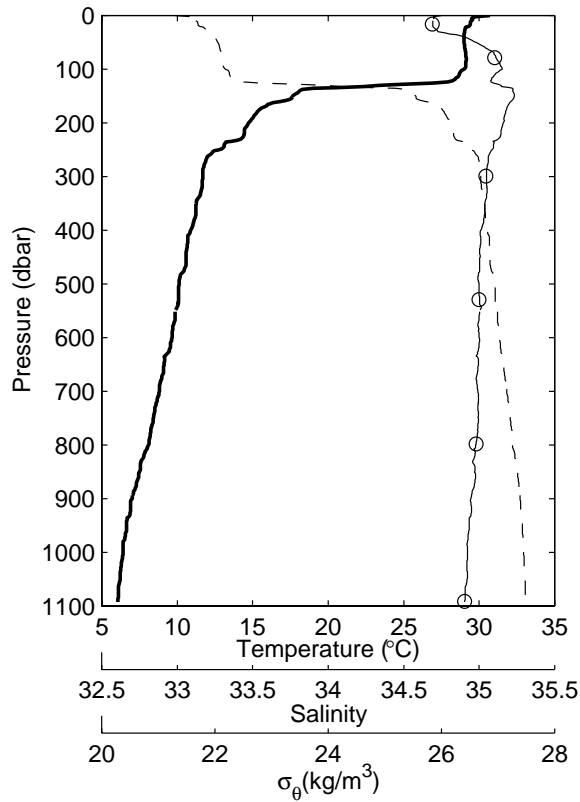


Figure 8.1.28. Same as Fig. 8.1.23 but for station 11 cast 1 and station 12 cast 1.

JASMINE Stn-13 Cast-1 0.00°N 89.00°E 11:54Z 6 May 1999



JASMINE Stn-14 Cast-1 0.50°N 89.00°E 15:24Z 6 May 1999

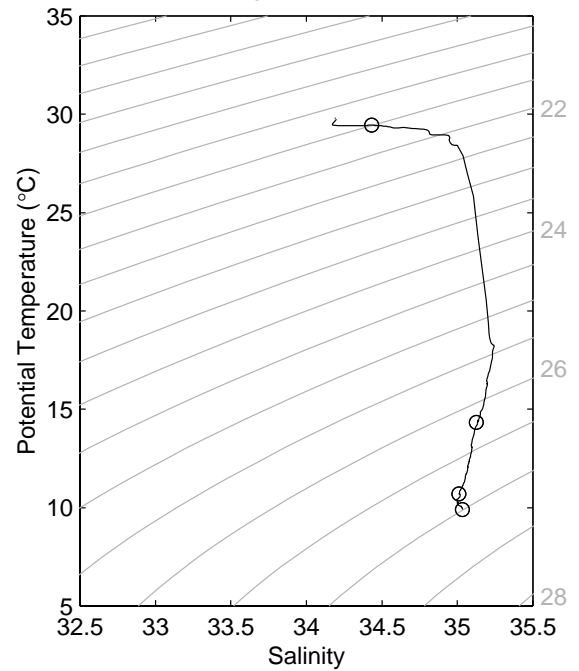
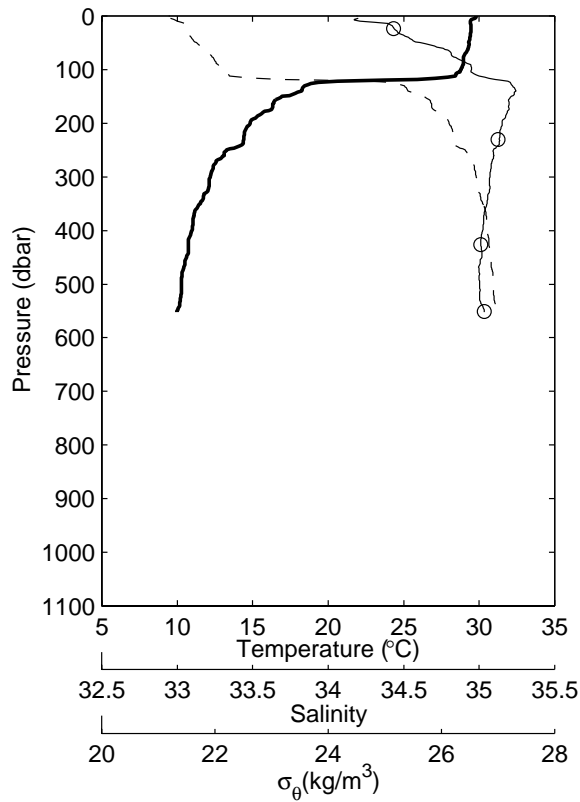
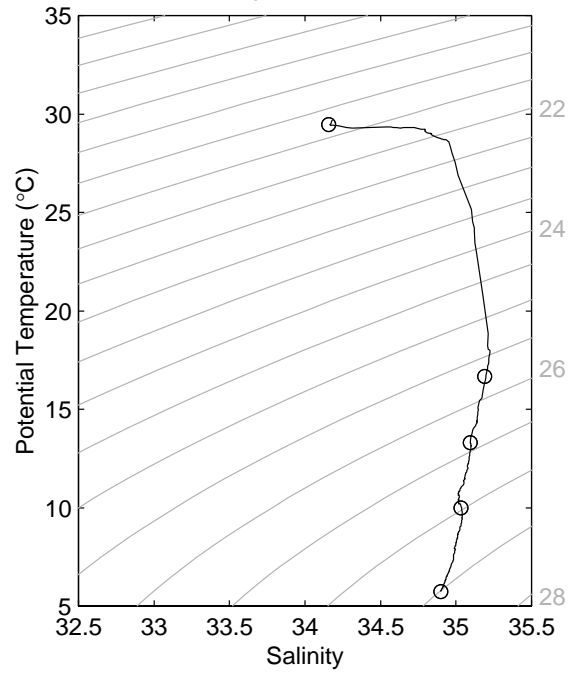
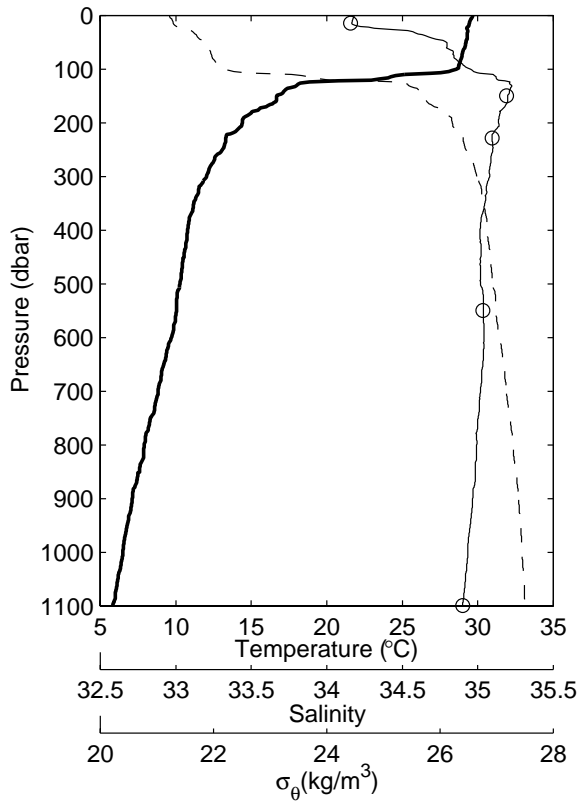


Figure 8.1.29. Same as Fig. 8.1.23 but for station 13 cast 1 and station 14 cast 1.

JASMINE Stn-15 Cast-1 1.00°N 89.00°E 18:35Z 6 May 1999



JASMINE Stn-16 Cast-1 1.50°N 89.00°E 21:57Z 6 May 1999

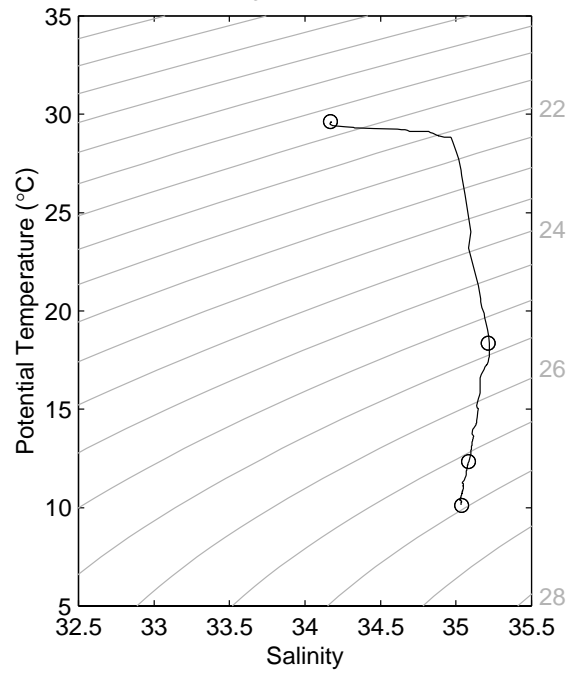
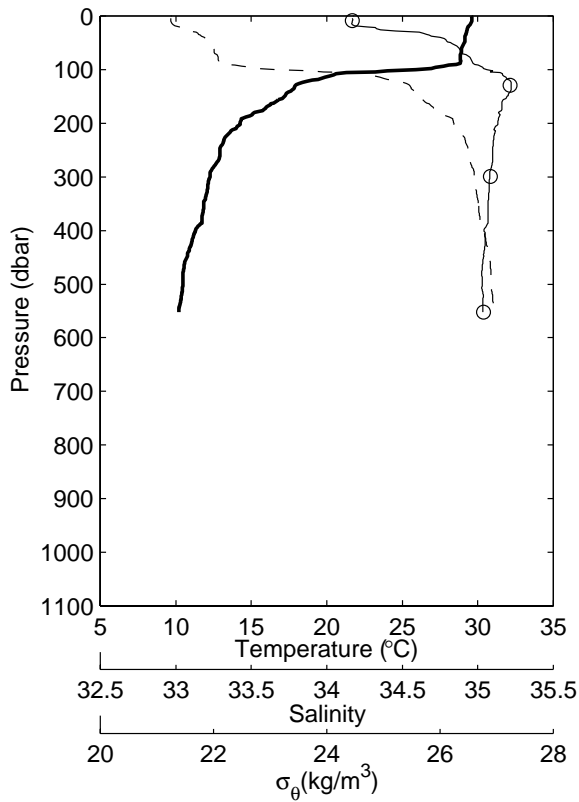
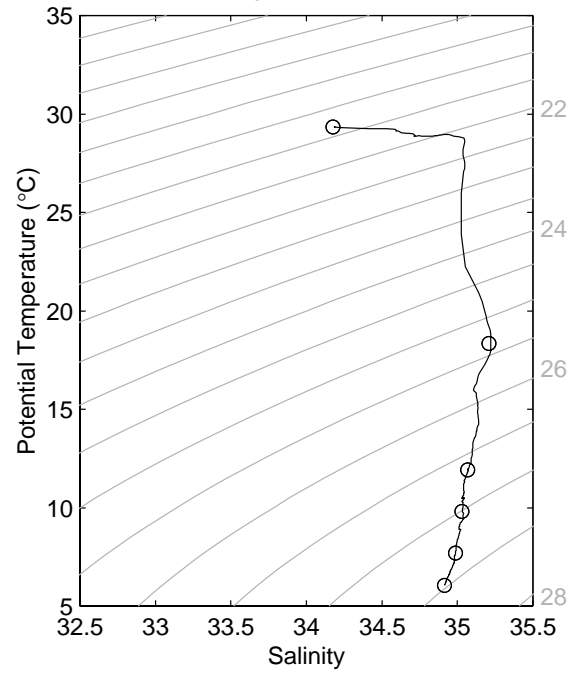
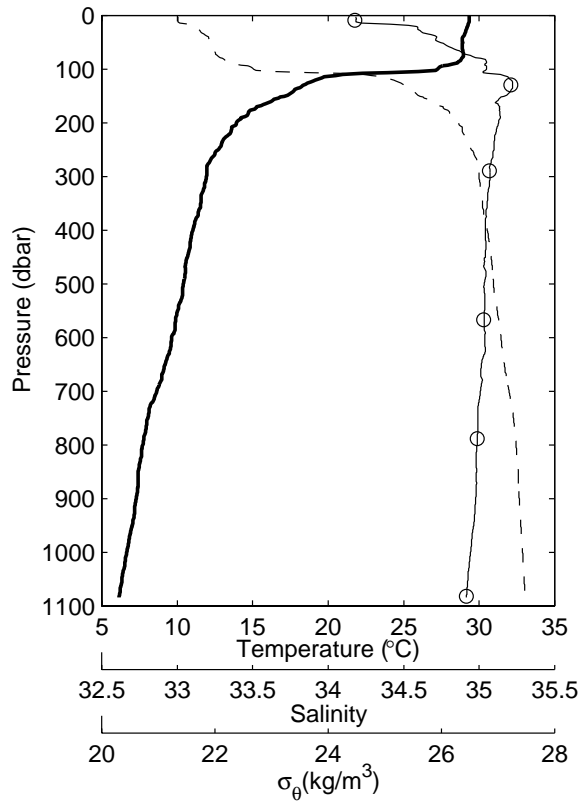


Figure 8.1.30. Same as Fig. 8.1.23 but for station 15 cast 1 and station 16 cast 1.

JASMINE Stn-17 Cast-1 2.00°N 89.00°E 00:59Z 7 May 1999



JASMINE Stn-18 Cast-1 2.50°N 89.00°E 04:12Z 7 May 1999

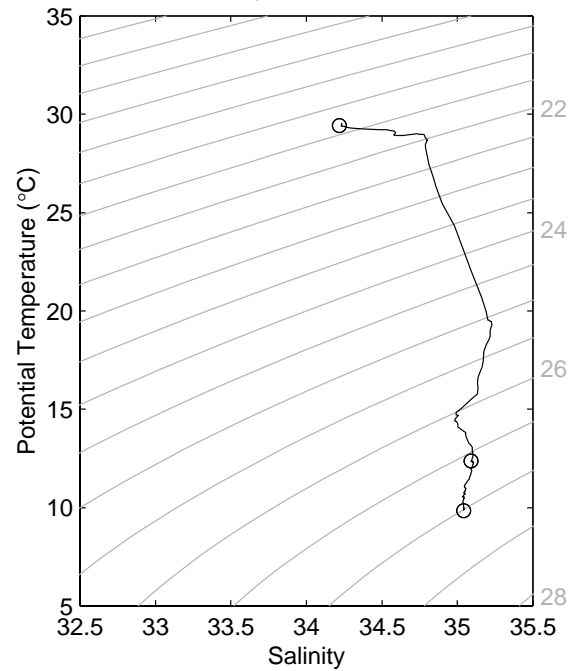
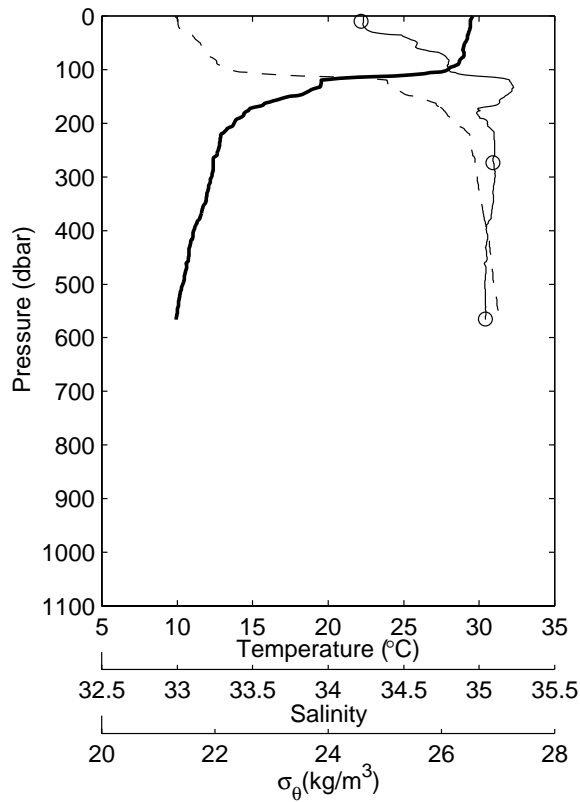
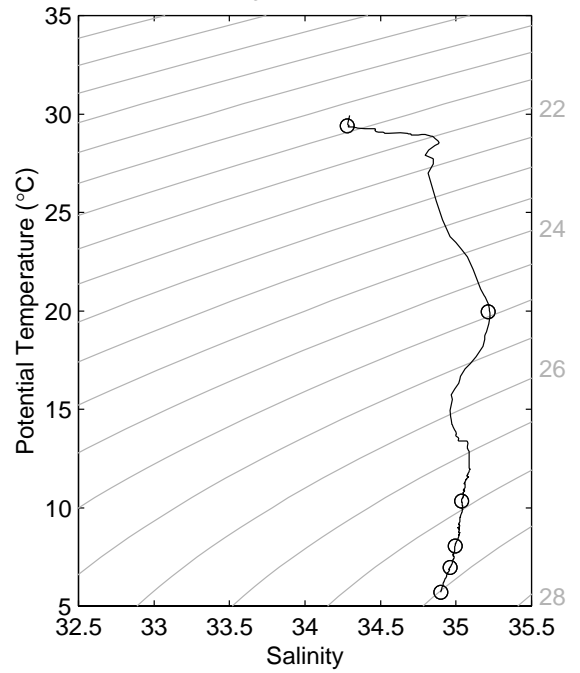
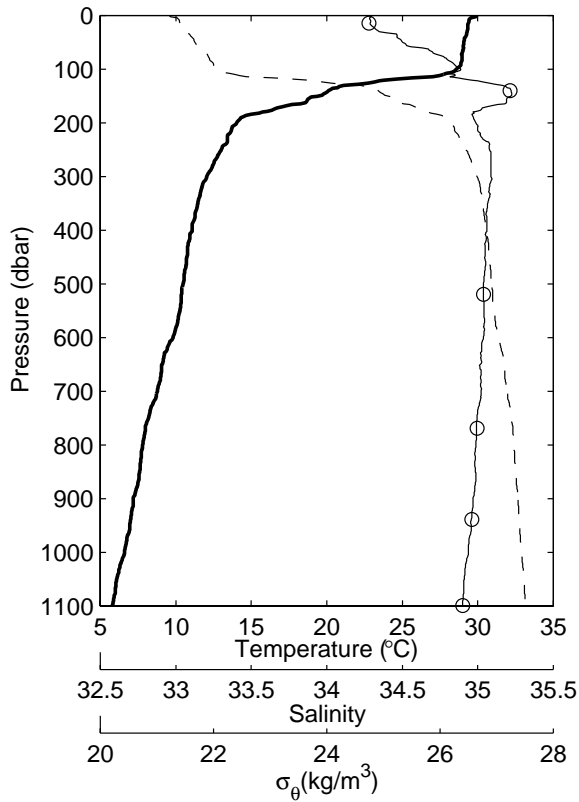


Figure 8.1.31. Same as Fig. 8.1.23 but for station 17 cast 1 and station 18 cast 1.

JASMINE Stn-19 Cast-1 3.00°N 89.00°E 07:37Z 7 May 1999



JASMINE Stn-20 Cast-1 3.50°N 89.00°E 11:10Z 7 May 1999

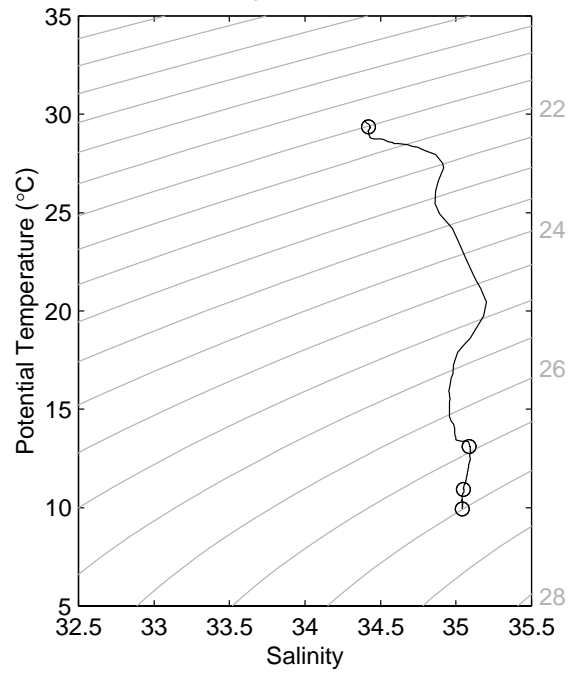
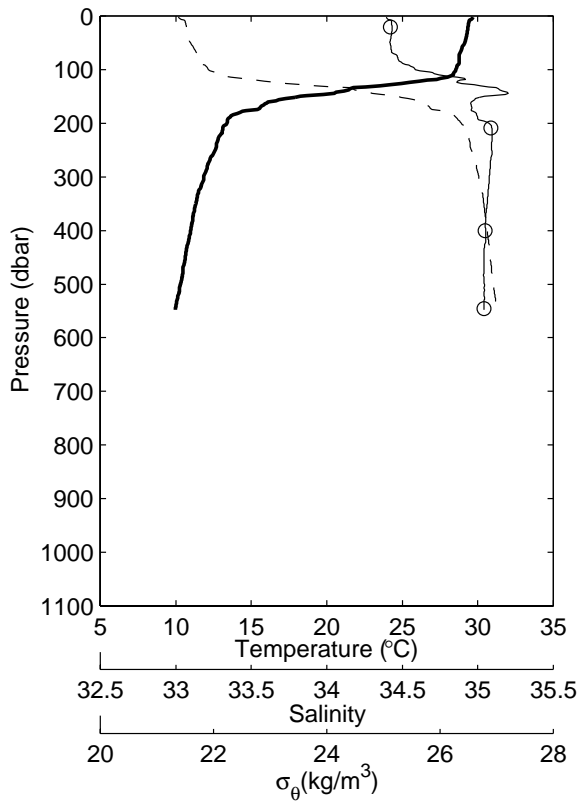
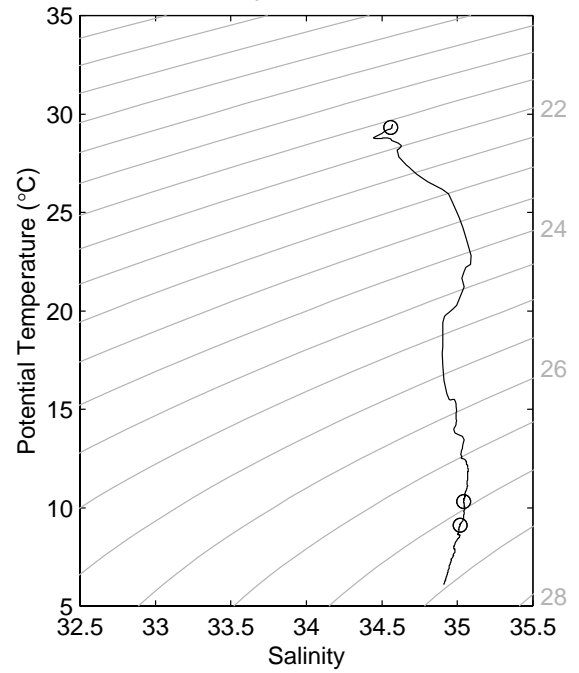
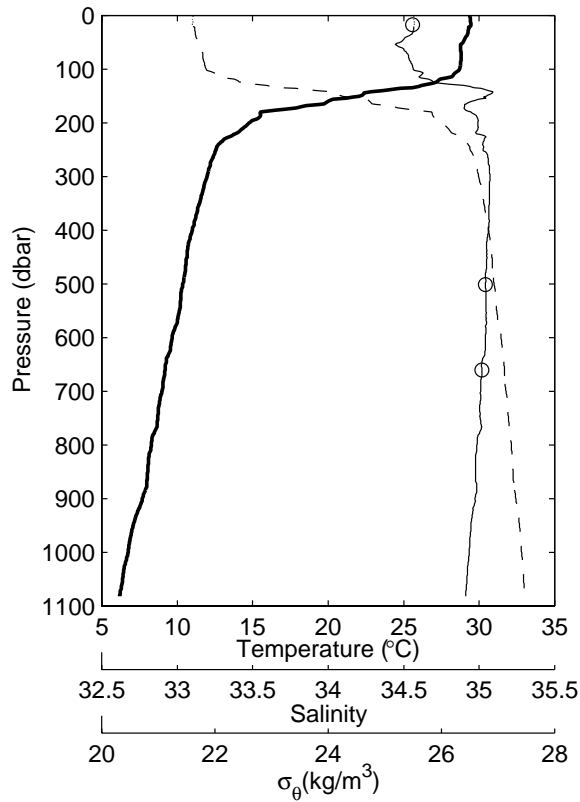


Figure 8.1.32. Same as Fig. 8.1.23 but for station 19 cast 1 and station 20 cast 1.

JASMINE Stn-21 Cast-1 4.00°N 89.00°E 14:19Z 7 May 1999



JASMINE Stn-22 Cast-1 4.50°N 89.00°E 17:52Z 7 May 1999

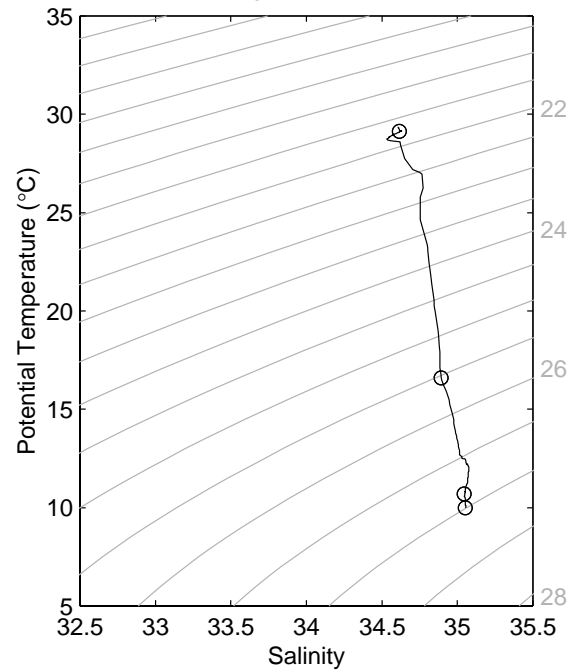
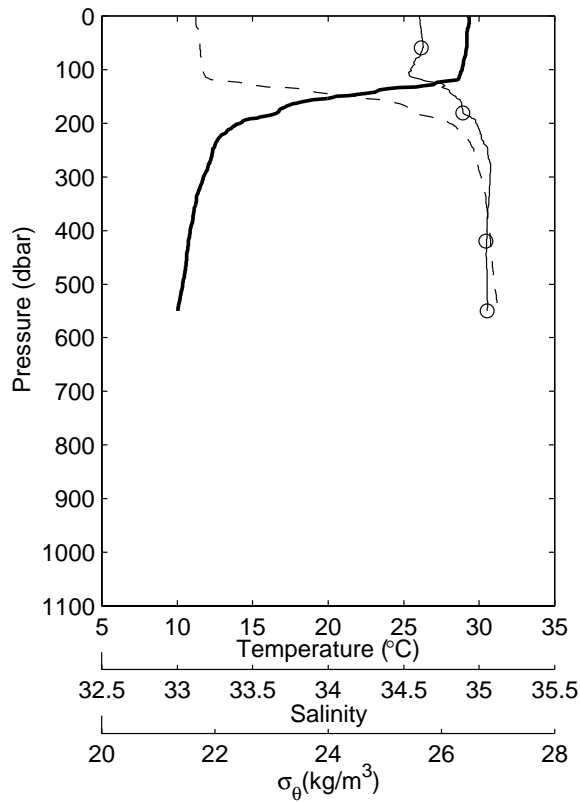
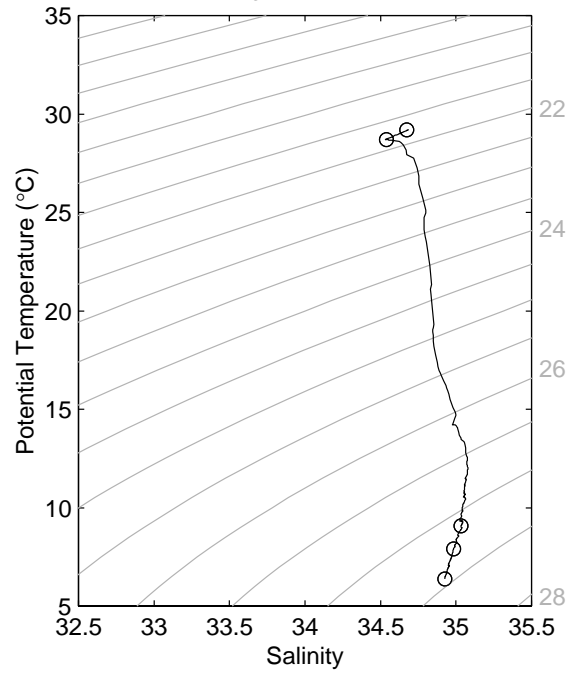
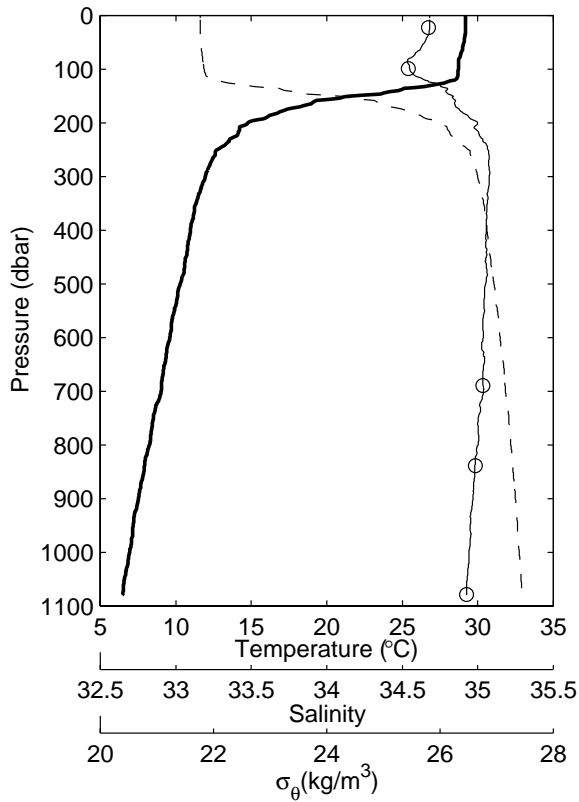


Figure 8.1.33. Same as Fig. 8.1.23 but for station 21 cast 1 and station 22 cast 1.

JASMINE Stn-23 Cast-1 5.00°N 89.00°E 21:01Z 7 May 1999



JASMINE Stn-24 Cast-1 5.50°N 89.00°E 00:28Z 8 May 1999

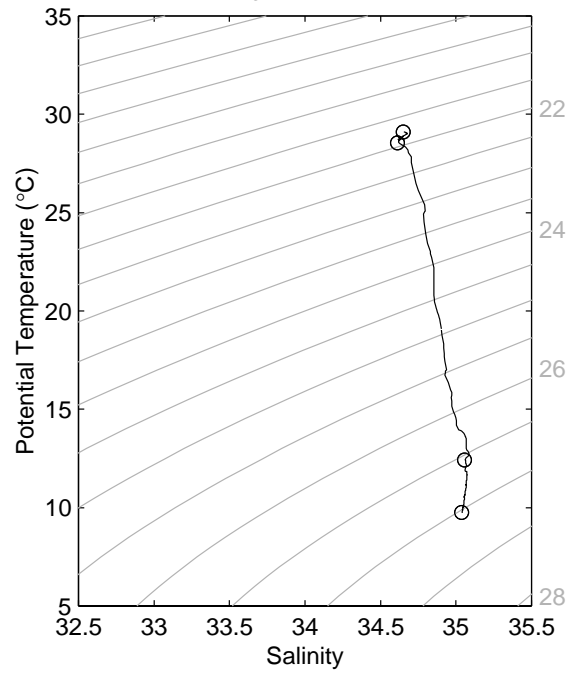
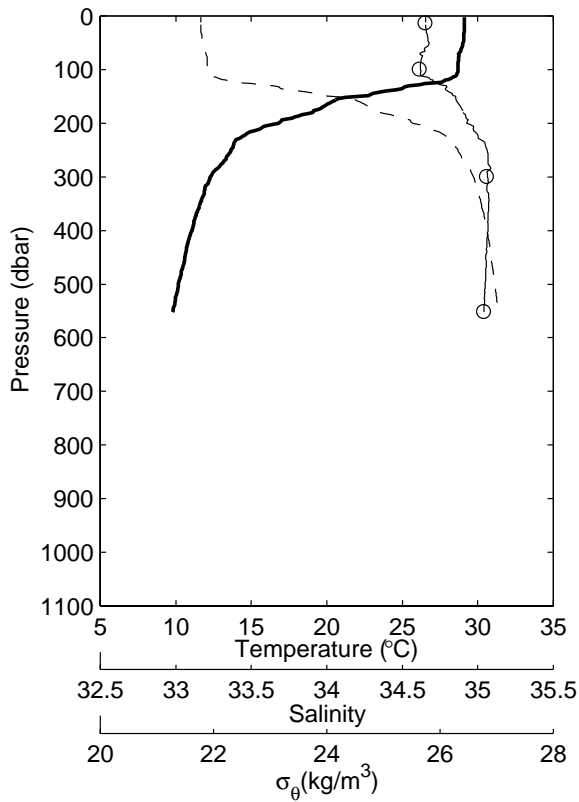
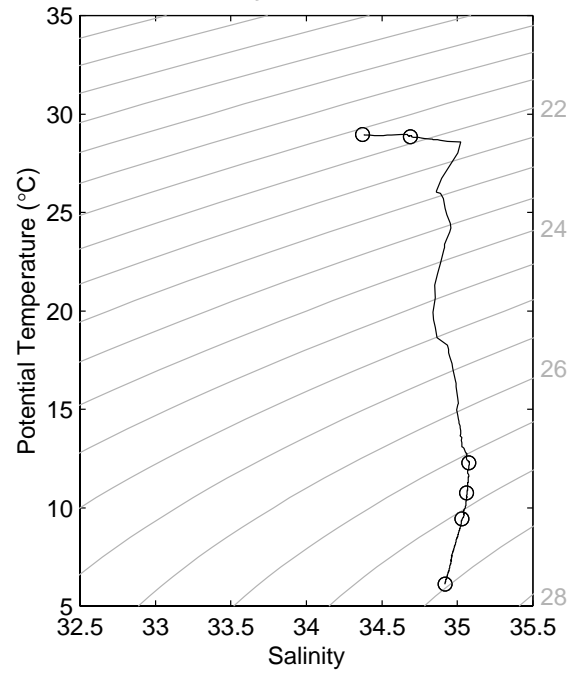
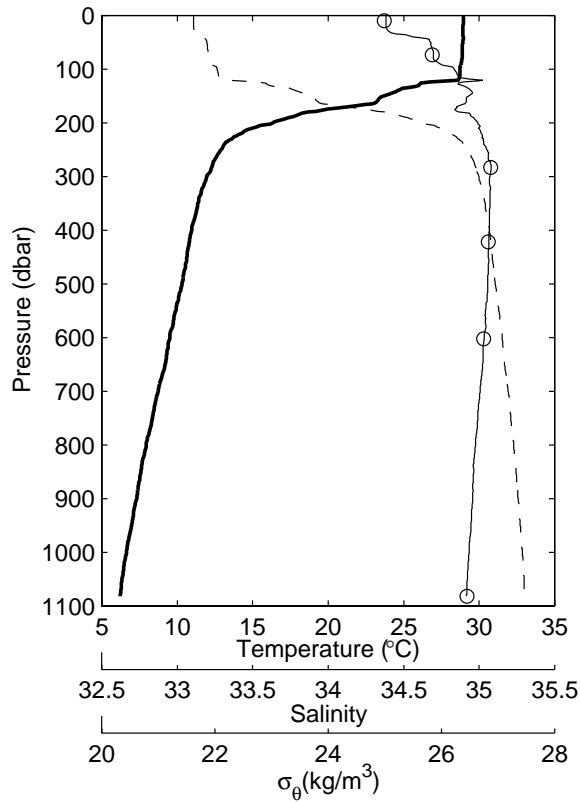


Figure 8.1.34. Same as Fig. 8.1.23 but for station 23 cast 1 and station 24 cast 1.

JASMINE Stn-25 Cast-1 6.00°N 89.00°E 03:29Z 8 May 1999



JASMINE Stn-26 Cast-1 6.50°N 89.00°E 06:57Z 8 May 1999

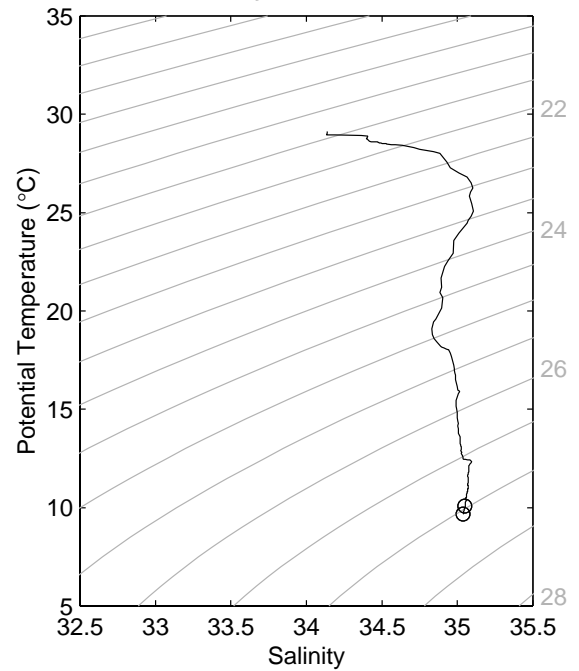
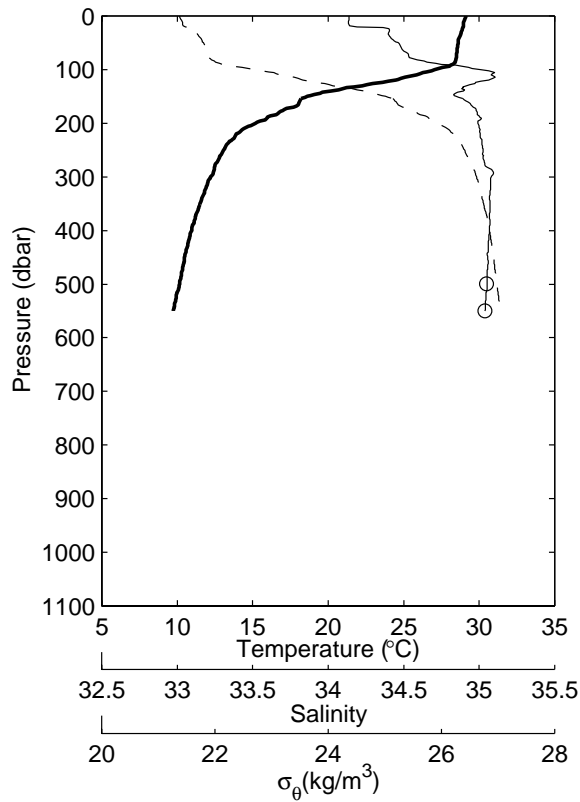
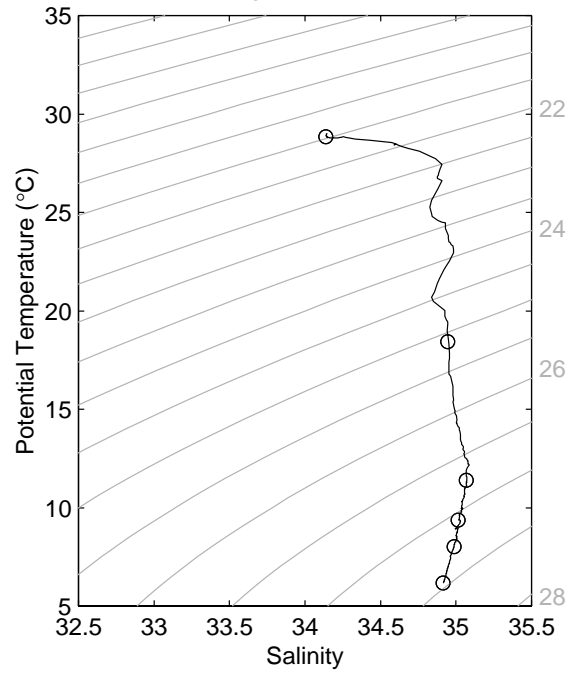
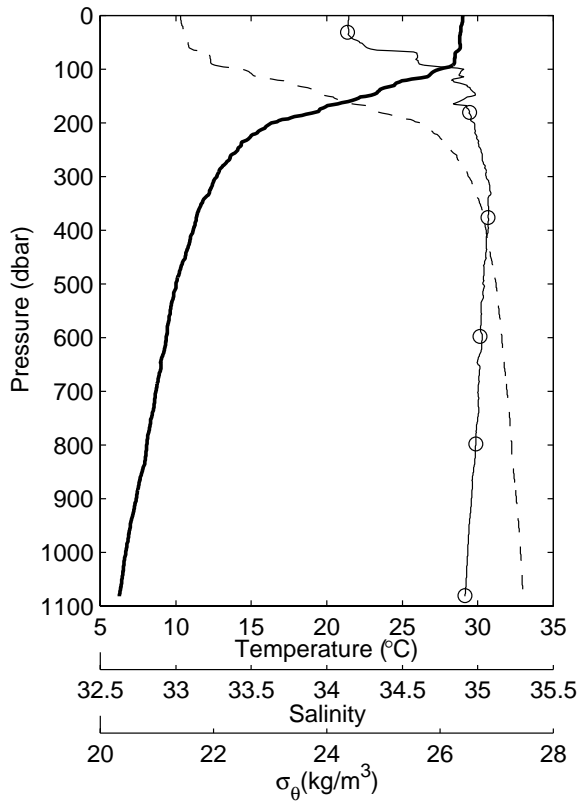


Figure 8.1.35. Same as Fig. 8.1.23 but for station 25 cast 1 and station 26 cast 1.

JASMINE Stn-27 Cast-1 7.00°N 89.00°E 09:58Z 8 May 1999



JASMINE Stn-28 Cast-1 7.50°N 89.00°E 13:11Z 8 May 1999

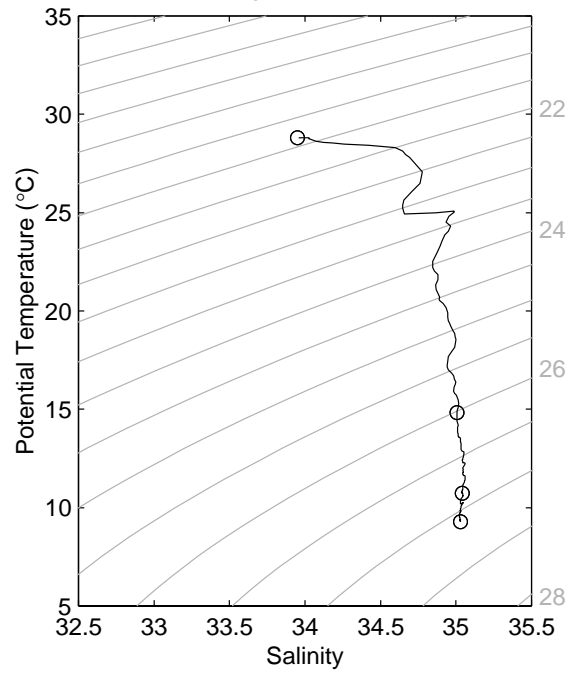
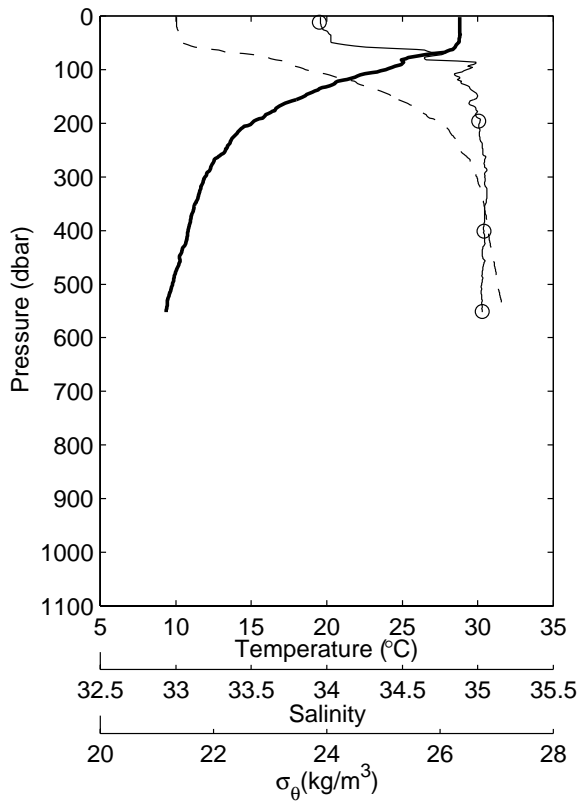
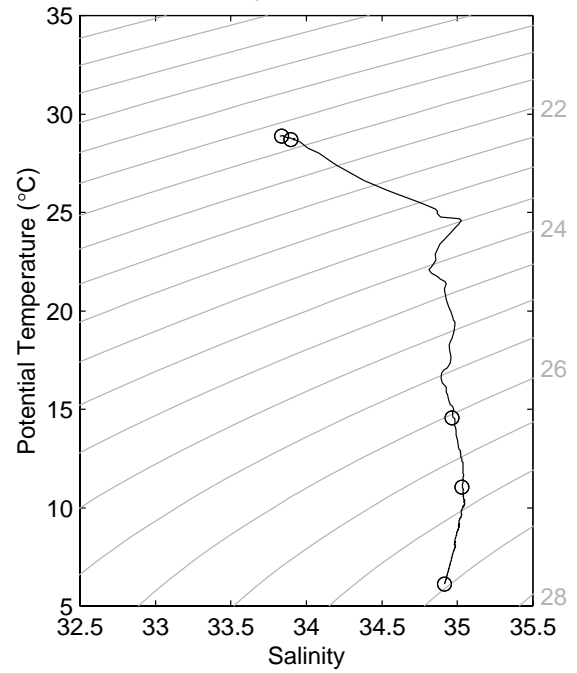
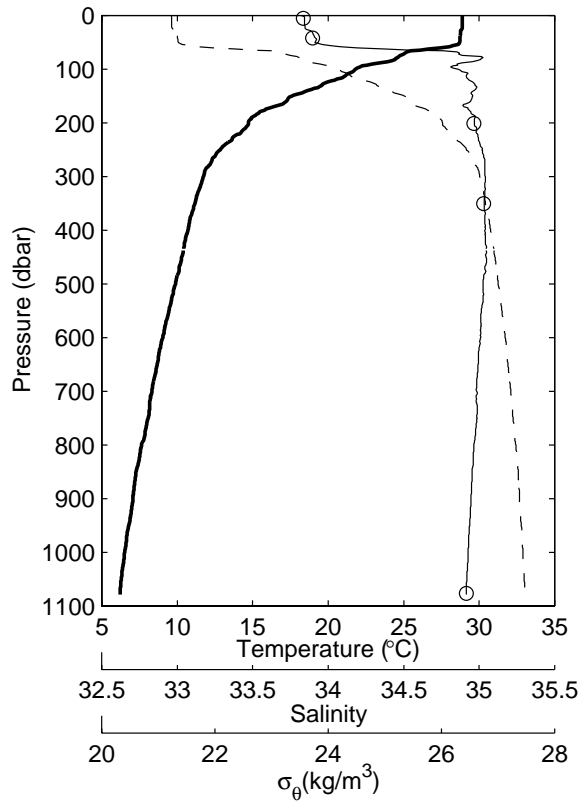


Figure 8.1.36. Same as Fig. 8.1.23 but for station 27 cast 1 and station 28 cast 1.

JASMINE Stn-29 Cast-1 8.00°N 89.00°E 16:06Z 8 May 1999



JASMINE Stn-30 Cast-1 8.50°N 89.00°E 19:35Z 8 May 1999

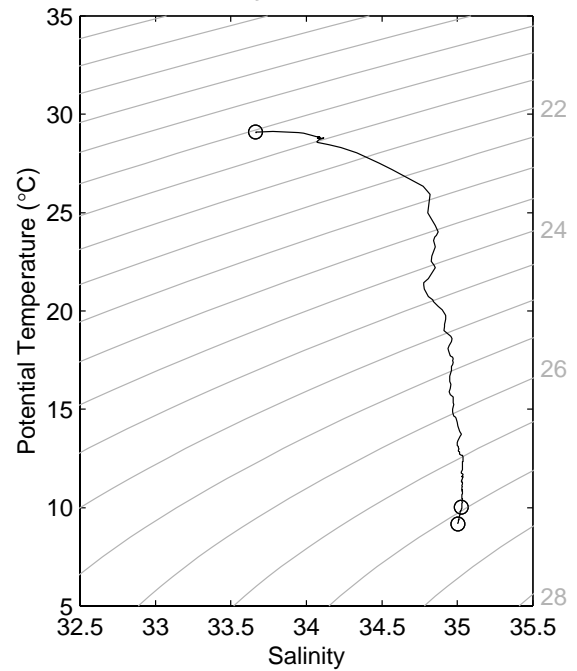
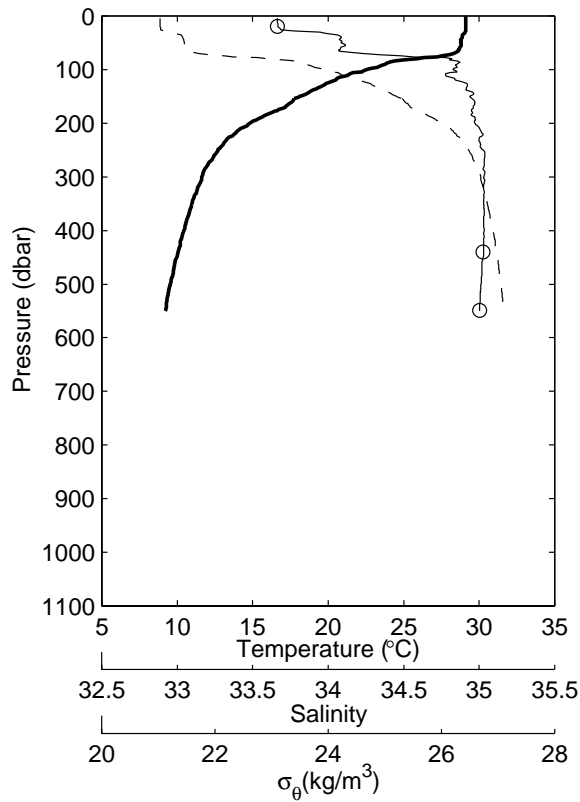
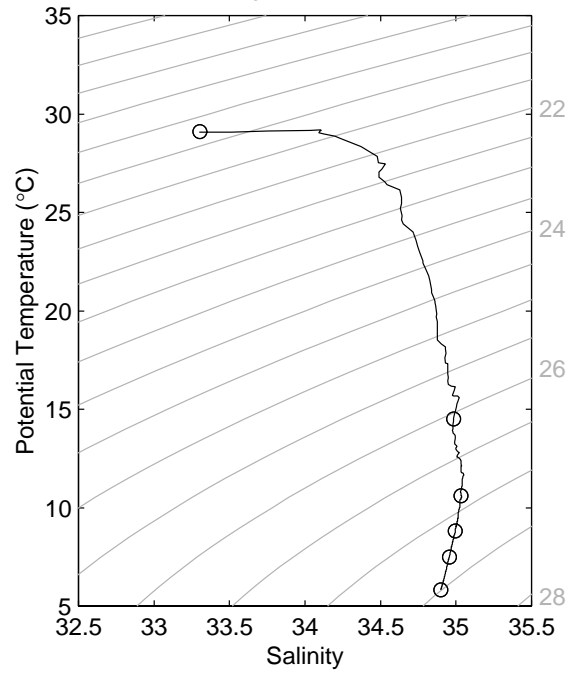
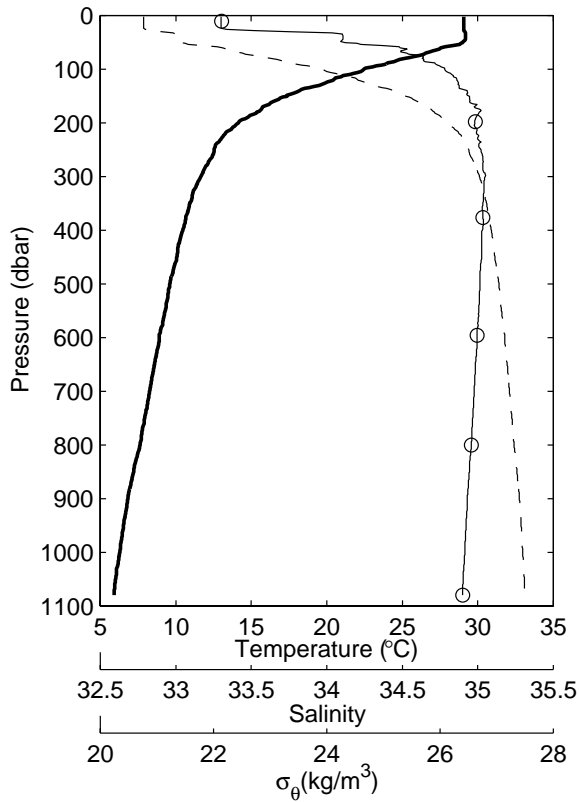


Figure 8.1.37. Same as Fig. 8.1.23 but for station 29 cast 1 and station 30 cast 1.

JASMINE Stn-31 Cast-1 9.00°N 89.00°E 22:37Z 8 May 1999



JASMINE Stn-32 Cast-1 9.50°N 89.00°E 01:59Z 9 May 1999

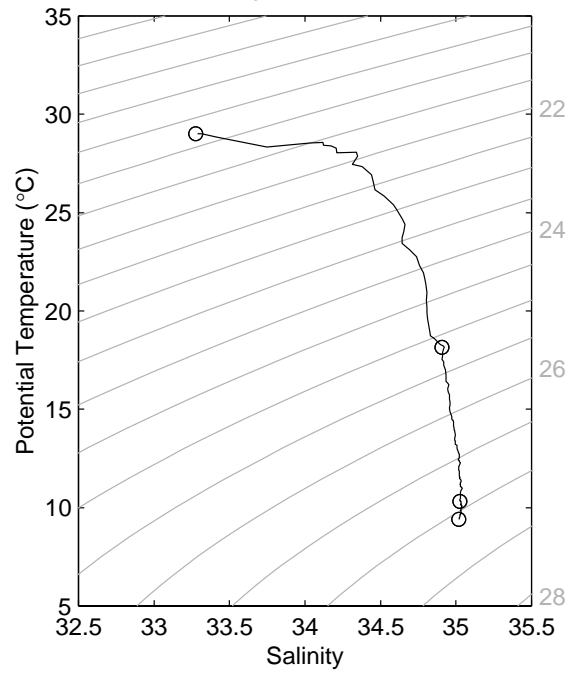
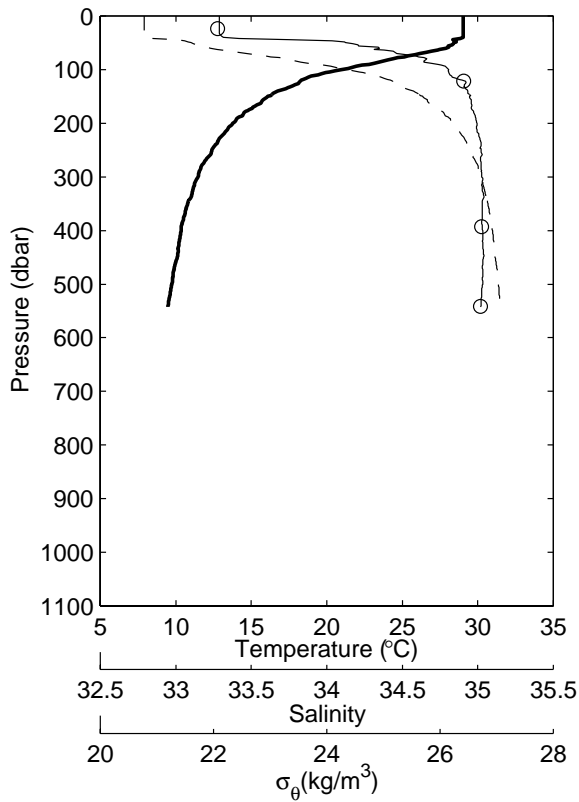
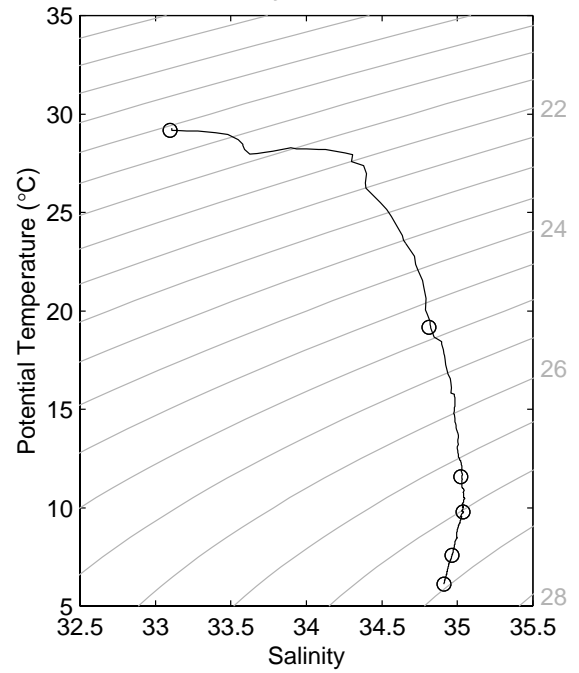
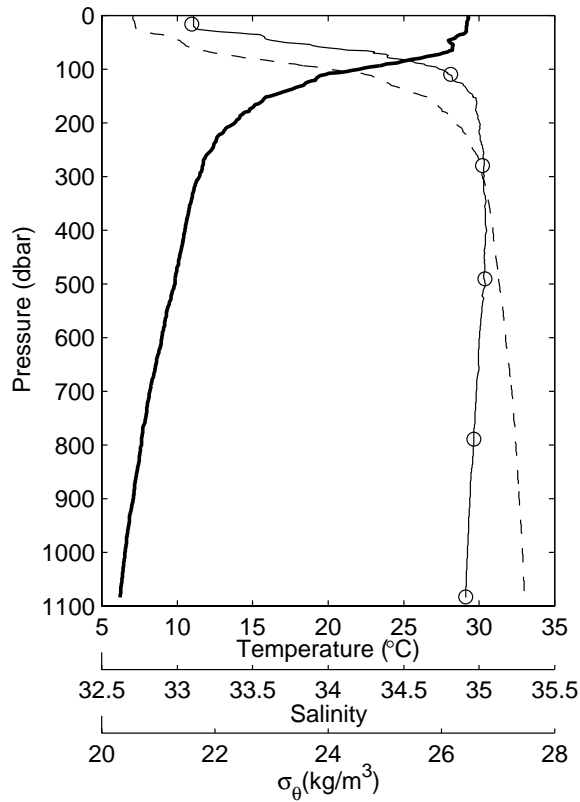


Figure 8.1.38. Same as Fig. 8.1.23 but for station 31 cast 1 and station 32 cast 1.

JASMINE Stn-33 Cast-1 10.00°N 89.00°E 05:07Z 9 May 1999



JASMINE Stn-34 Cast-1 10.50°N 88.91°E 08:29Z 9 May 1999

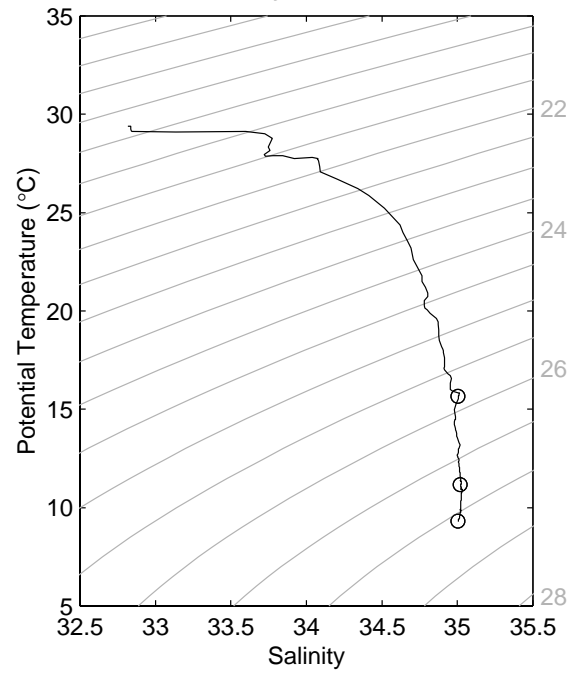
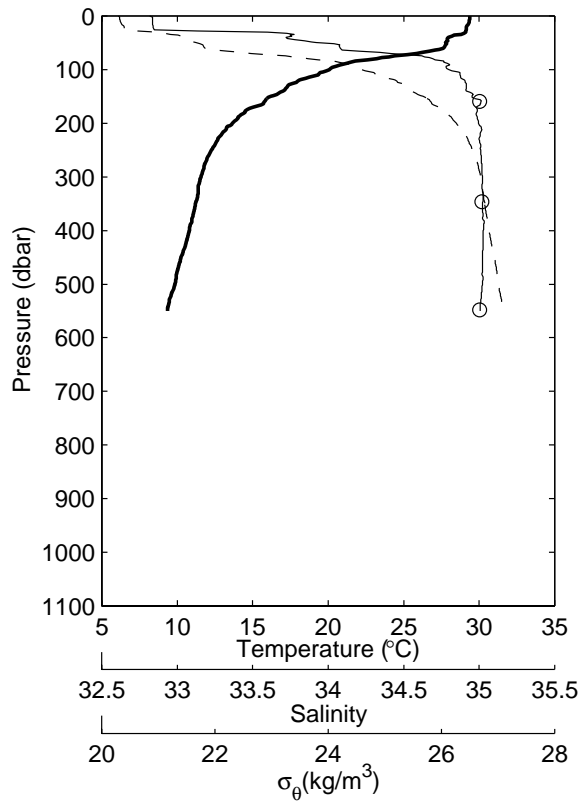
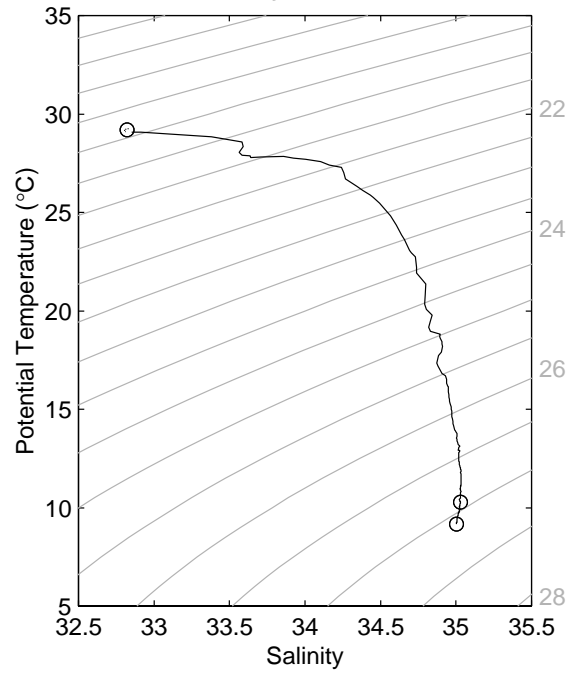
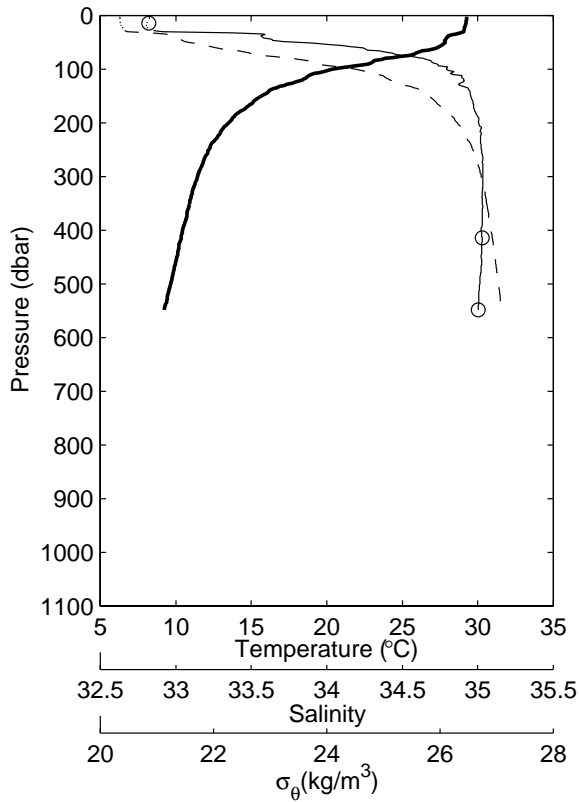


Figure 8.1.39. Same as Fig. 8.1.23 but for station 33 cast 1 and station 34 cast 1.

JASMINE Stn-35 Cast-1 11.00°N 88.83°E 11:22Z 9 May 1999



JASMINE Stn-36 Cast-1 11.50°N 88.75°E 14:26Z 9 May 1999

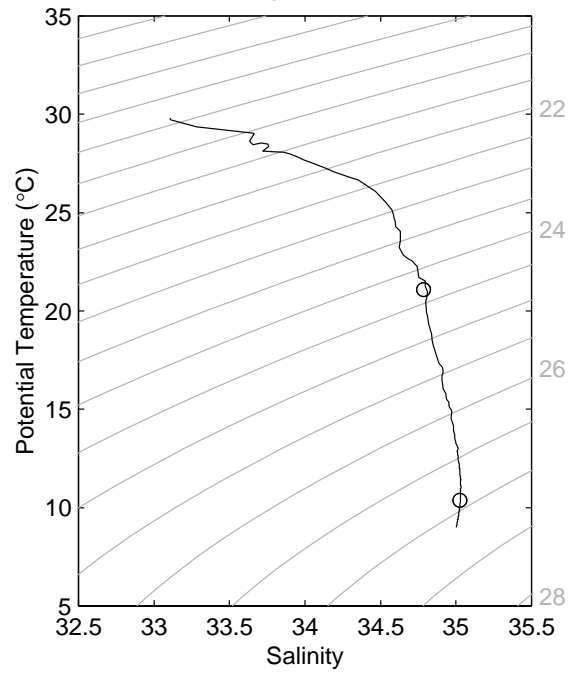
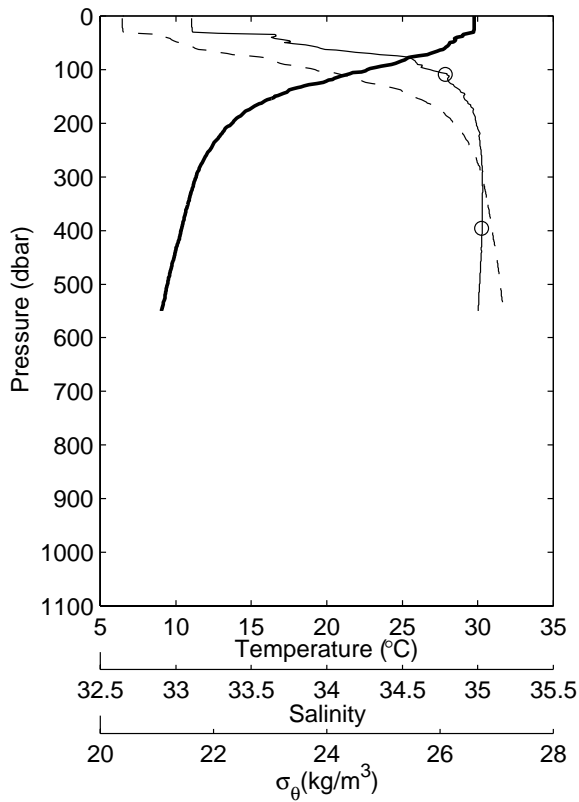
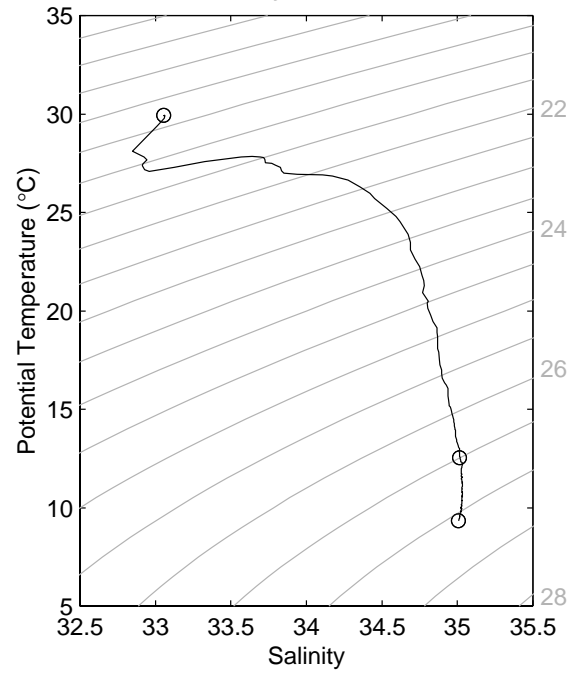
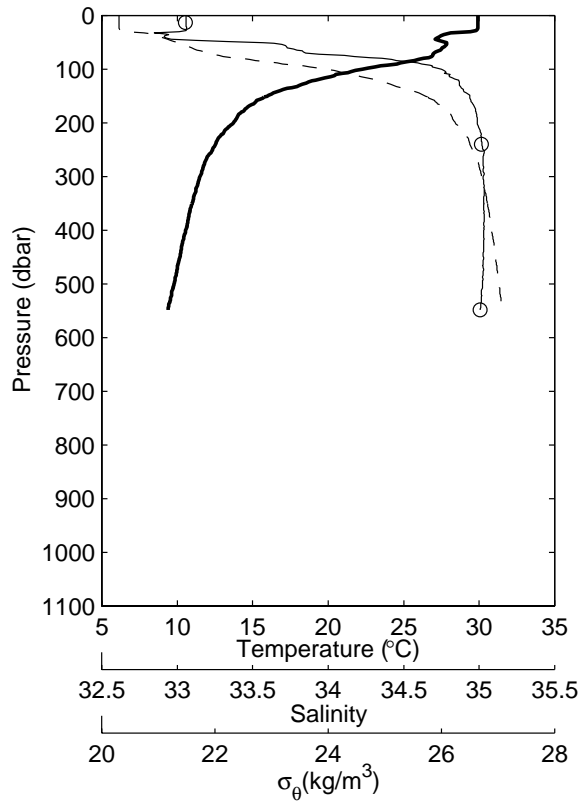


Figure 8.1.40. Same as Fig. 8.1.23 but for station 35 cast 1 and station 36 cast 1.

JASMINE Stn-37 Cast-1 12.00°N 88.75°E 17:39Z 9 May 1999



JASMINE Stn-38 Cast-1 12.50°N 88.75°E 20:42Z 9 May 1999

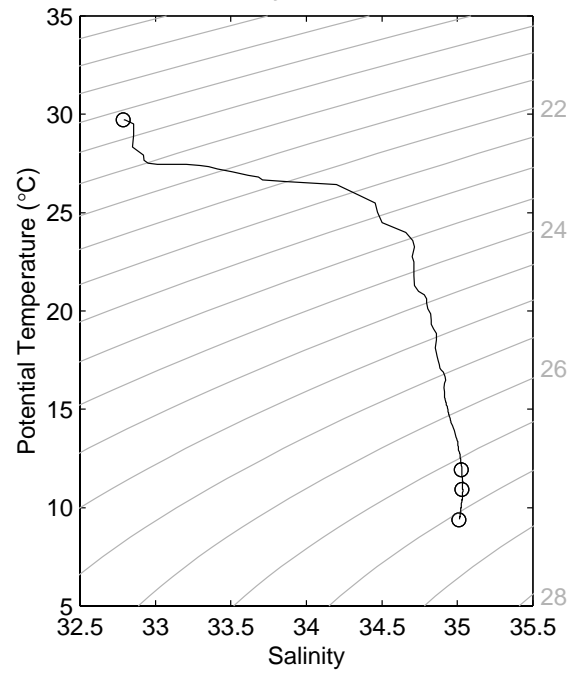
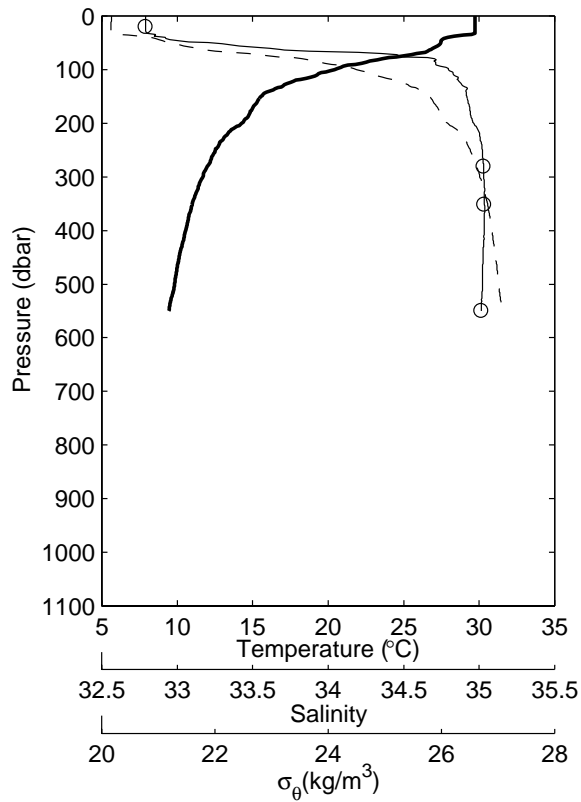
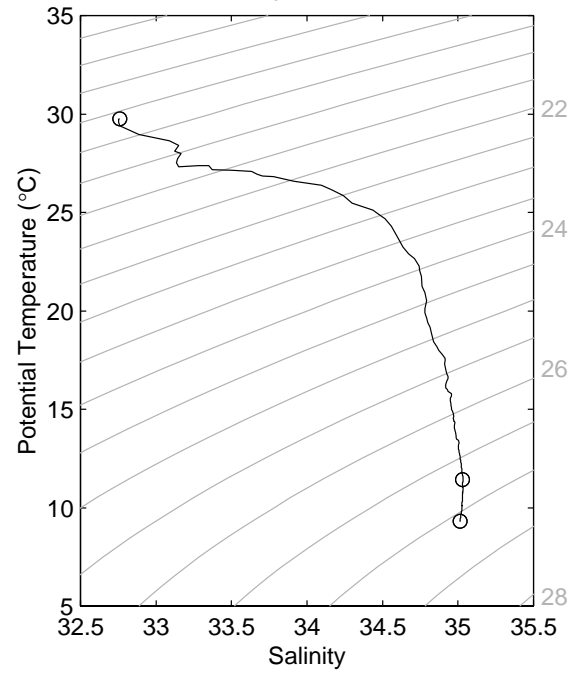
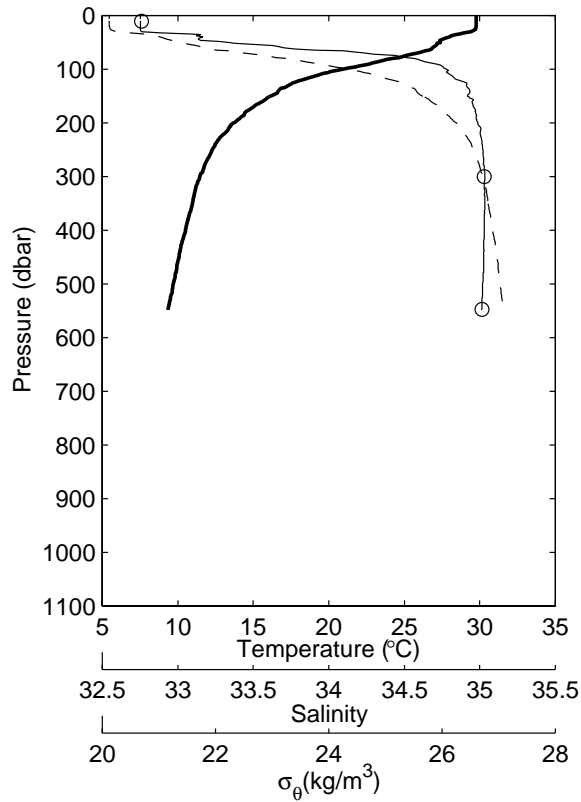


Figure 8.1.41. Same as Fig. 8.1.23 but for station 37 cast 1 and station 38 cast 1.

JASMINE Stn-39 Cast-1 13.00°N 88.75°E 23:43Z 9 May 1999



JASMINE Stn-40 Cast-1 13.50°N 88.75°E 02:45Z 10 May 1999

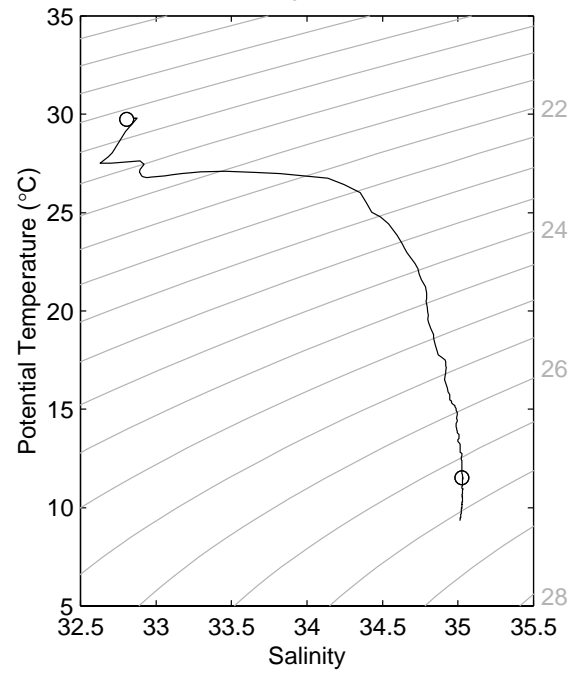
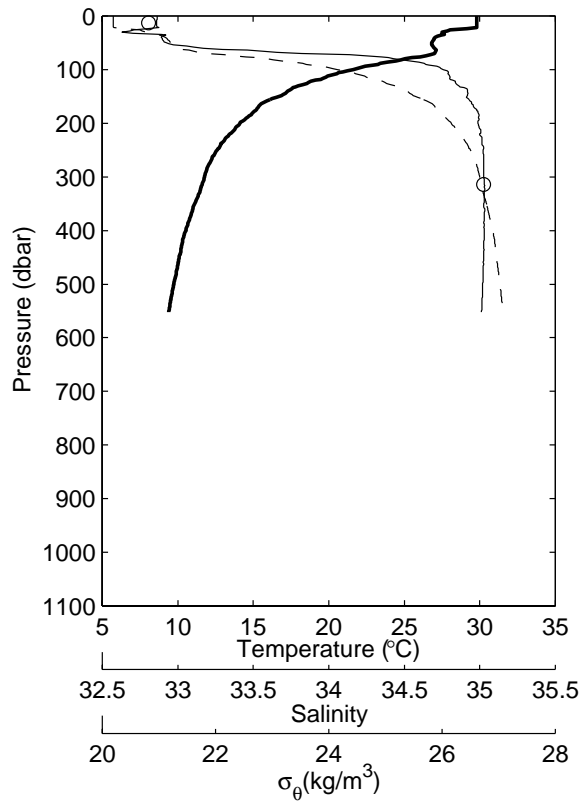
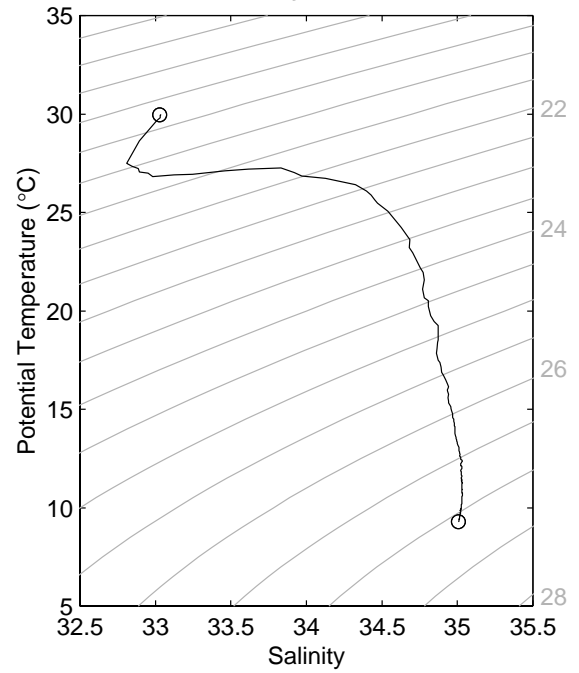
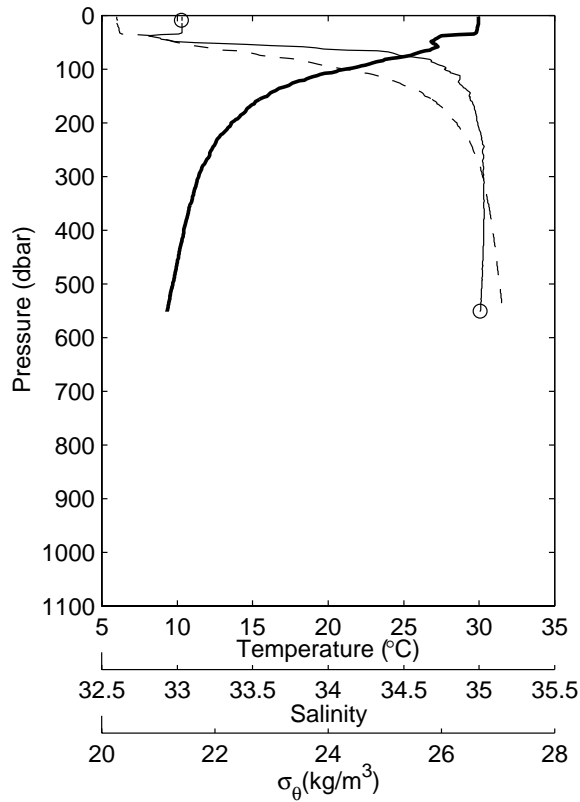


Figure 8.1.42. Same as Fig. 8.1.23 but for station 39 cast 1 and station 40 cast 1.

JASMINE Stn-41 Cast-1 12.00°N 88.75°E 11:14Z 10 May 1999



JASMINE Stn-42 Cast-1 11.96°N 88.62°E 12:32Z 10 May 1999

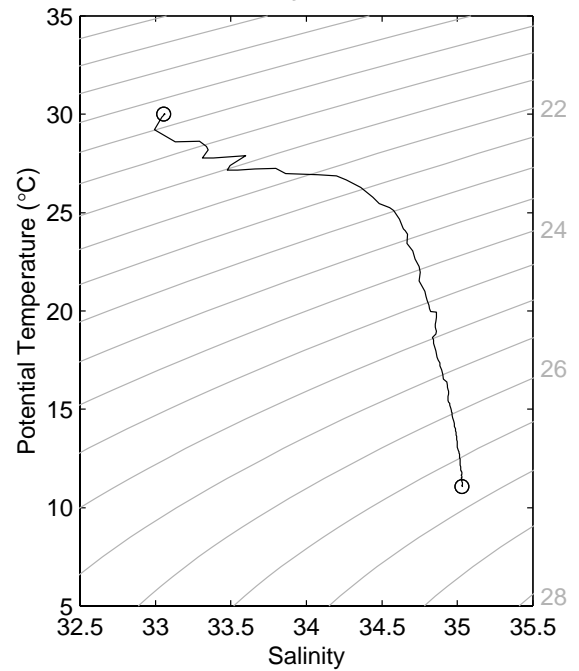
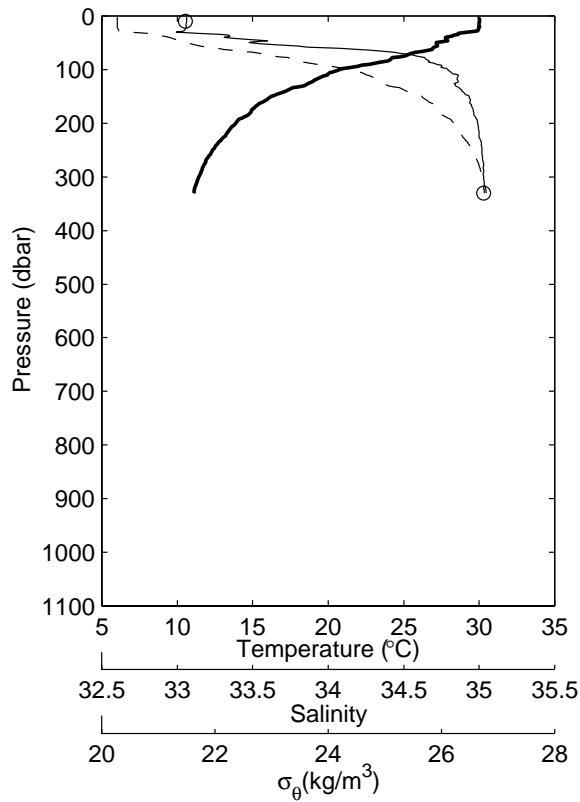
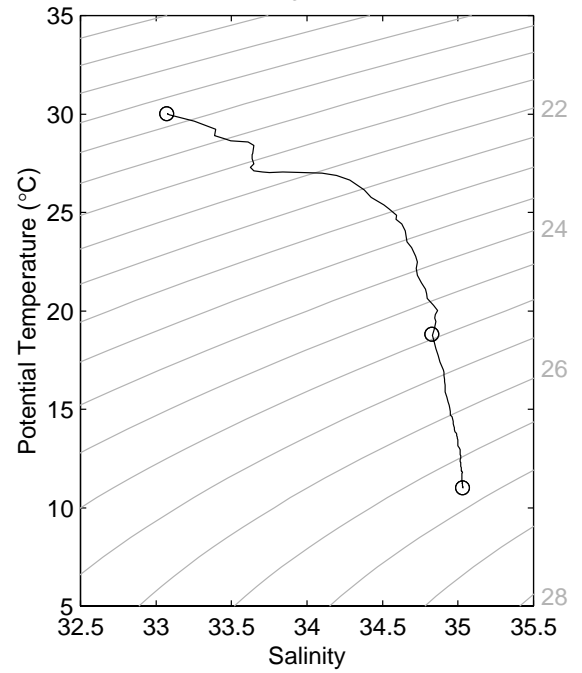
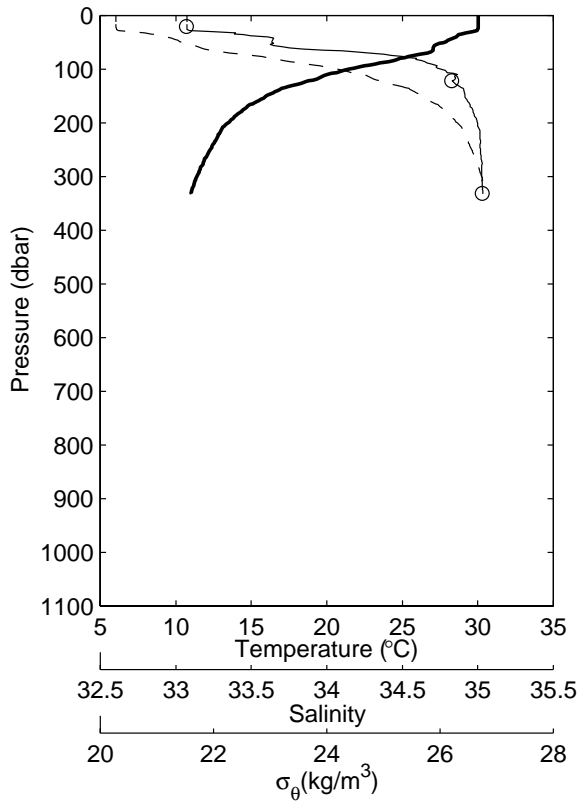


Figure 8.1.43. Same as Fig. 8.1.23 but for station 41 cast 1 and station 42 cast 1.

JASMINE Stn-43 Cast-1 11.92°N 88.50°E 13:36Z 10 May 1999



JASMINE Stn-44 Cast-1 11.88°N 88.37°E 14:41Z 10 May 1999

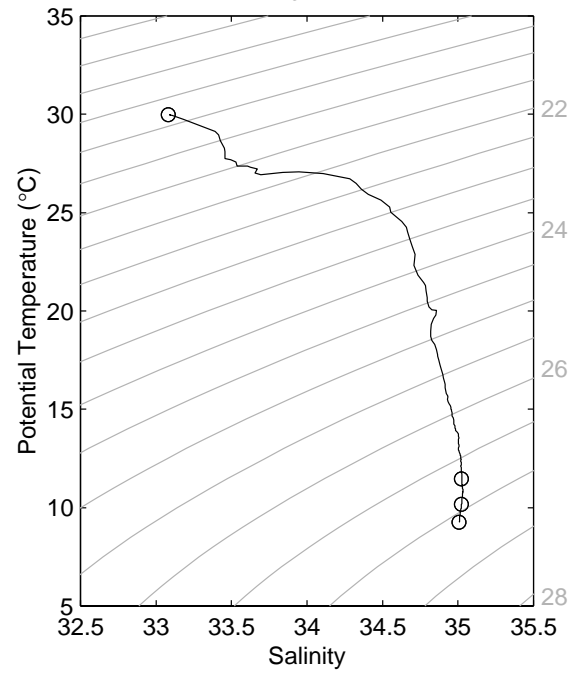
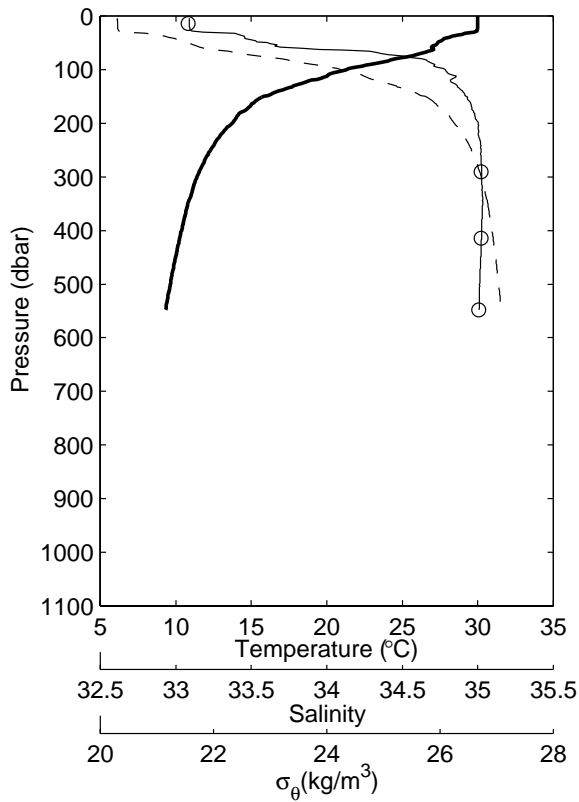
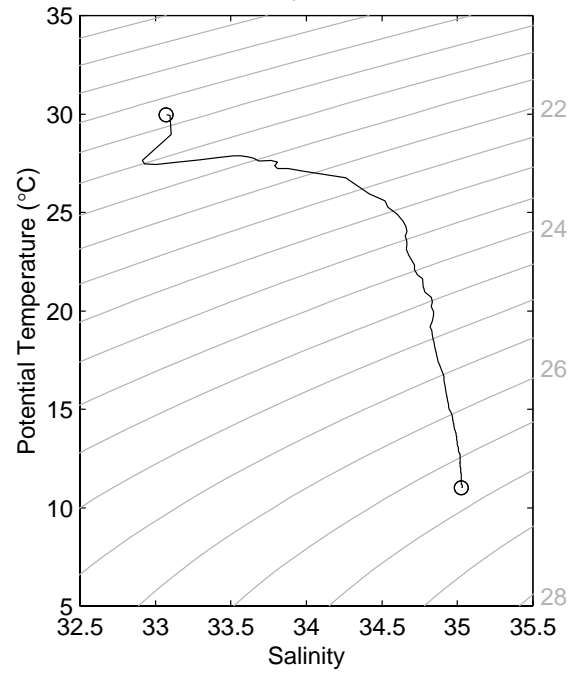
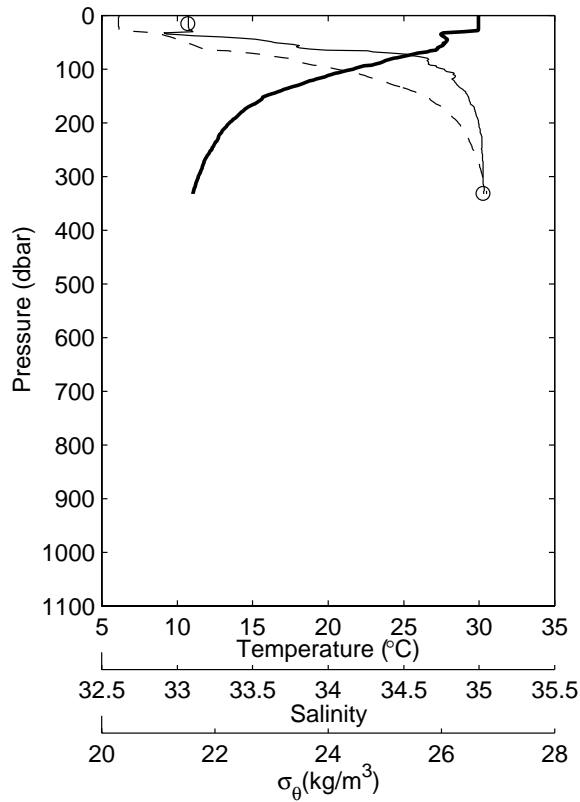


Figure 8.1.44. Same as Fig. 8.1.23 but for station 43 cast 1 and station 44 cast 1.

JASMINE Stn-45 Cast-1 11.83°N 88.50°E 15:54Z 10 May 1999



JASMINE Stn-46 Cast-1 11.79°N 88.63°E 16:54Z 10 May 1999

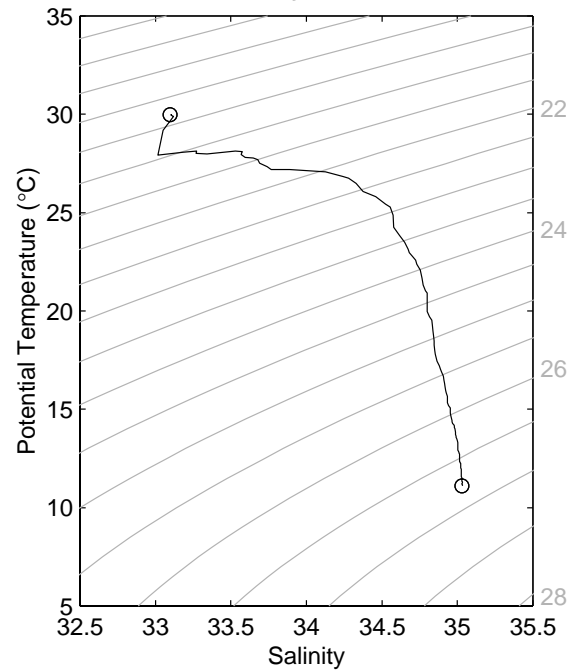
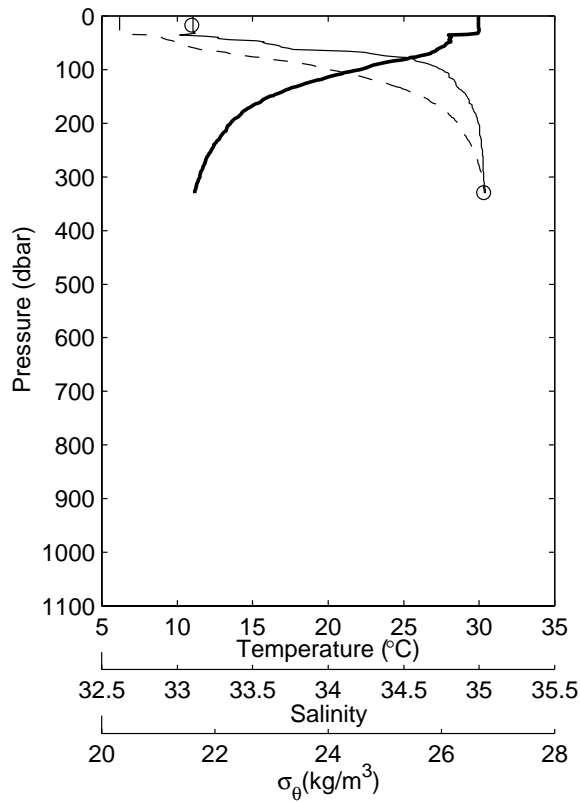
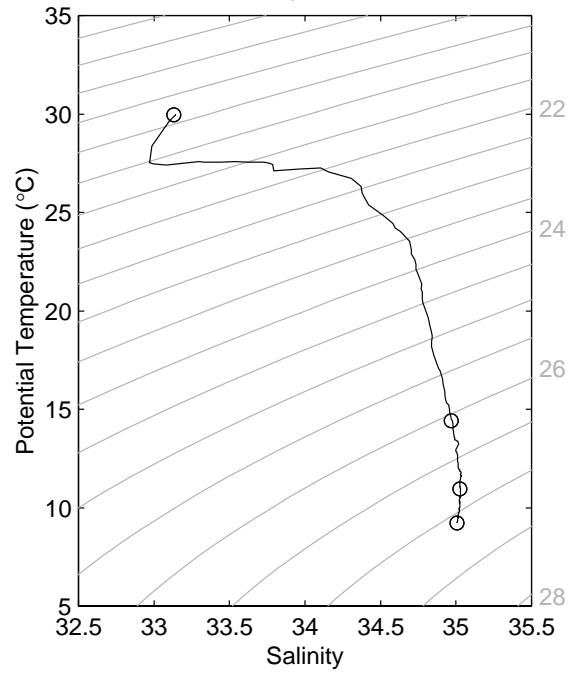
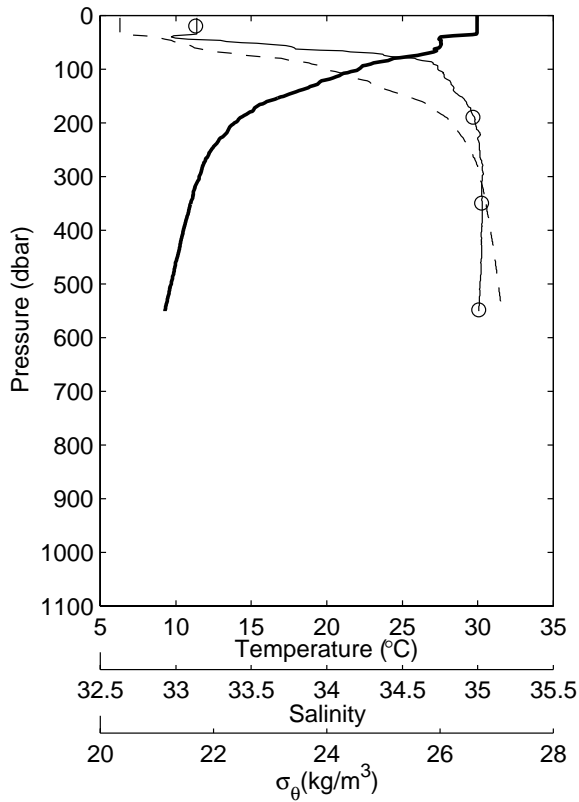


Figure 8.1.45. Same as Fig. 8.1.23 but for station 45 cast 1 and station 46 cast 1.

JASMINE Stn-47 Cast-1 11.75°N 88.75°E 17:59Z 10 May 1999



JASMINE Stn-48 Cast-1 11.86°N 88.67°E 19:13Z 10 May 1999

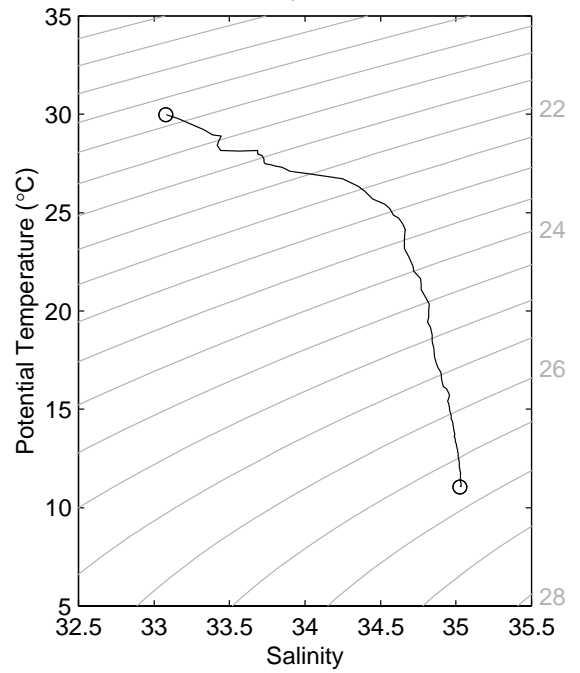
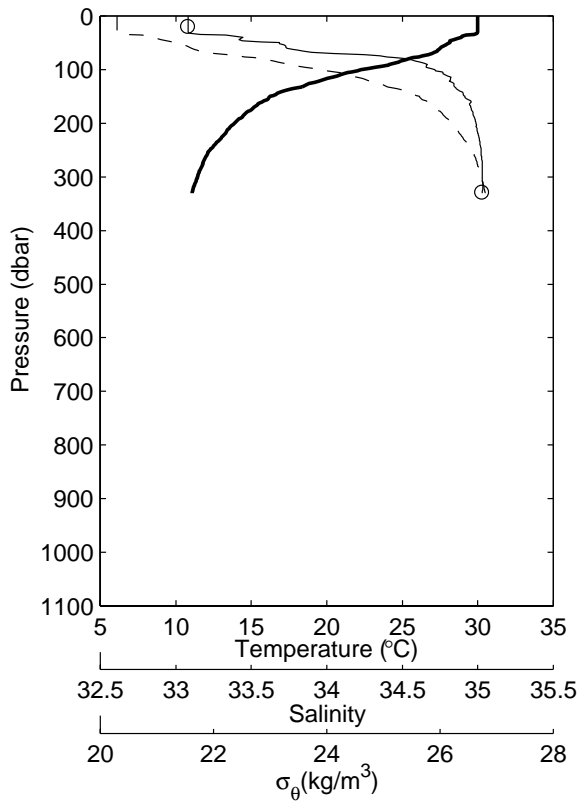
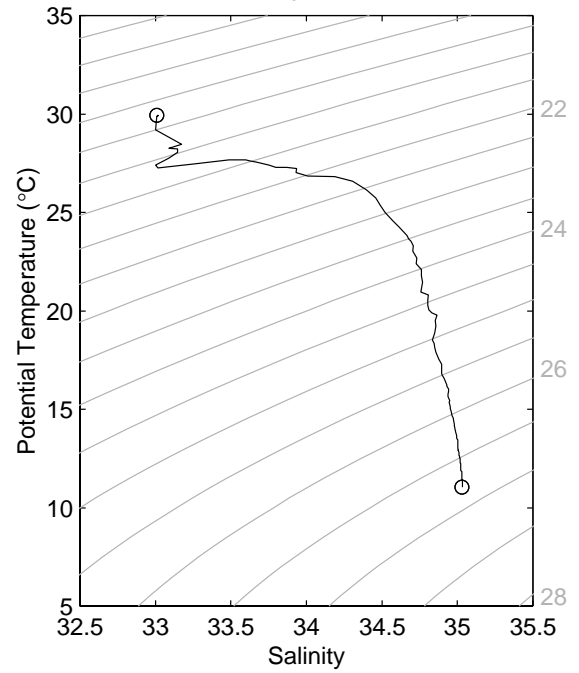
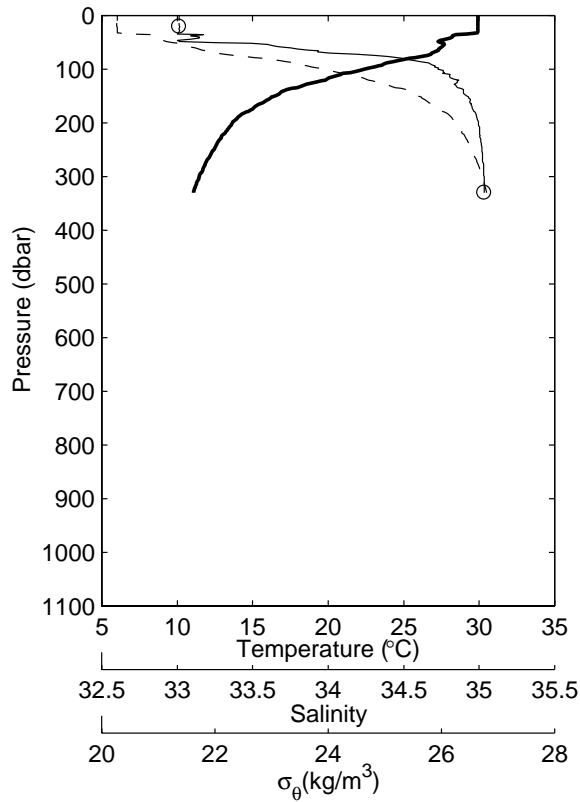


Figure 8.1.46. Same as Fig. 8.1.23 but for station 47 cast 1 and station 48 cast 1.

JASMINE Stn-49 Cast-1 11.97°N 88.59°E 20:24Z 10 May 1999



JASMINE Stn-50 Cast-1 12.08°N 88.52°E 21:32Z 10 May 1999

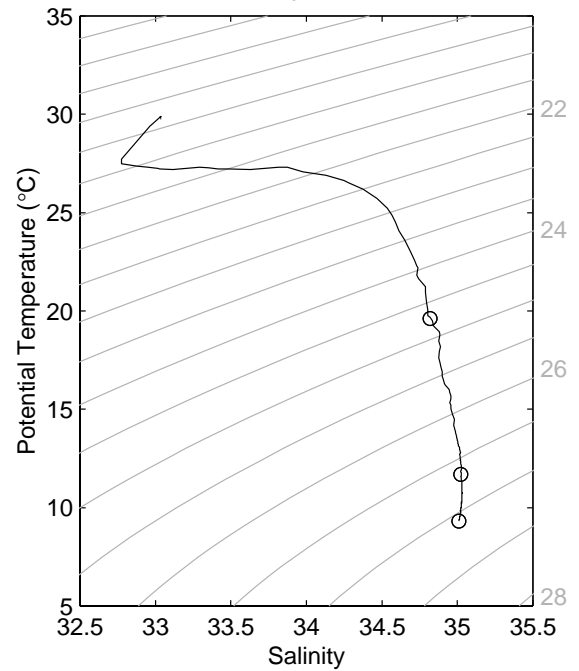
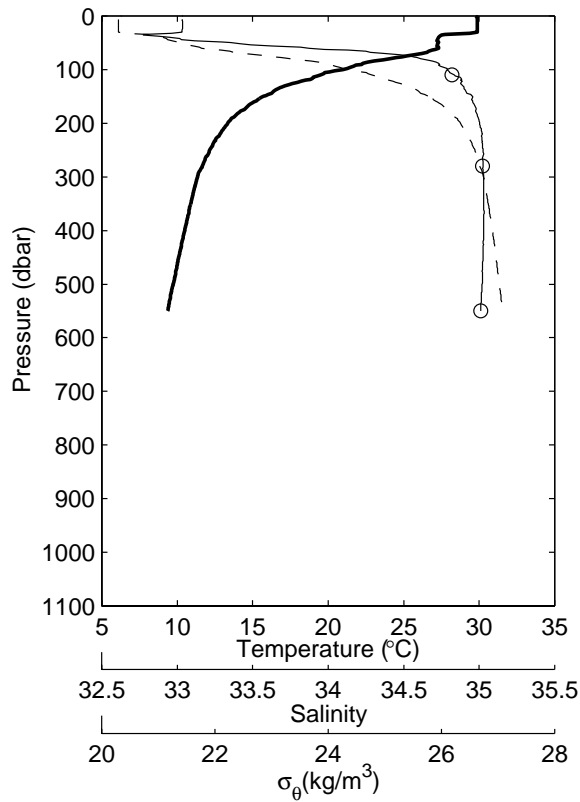
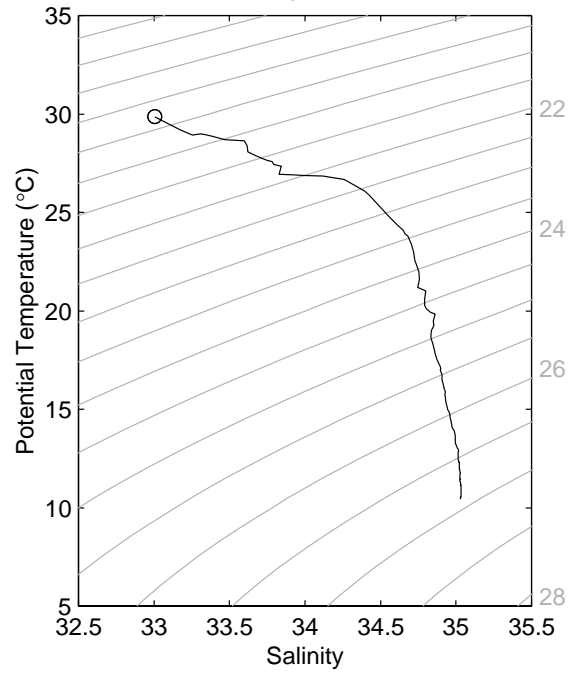
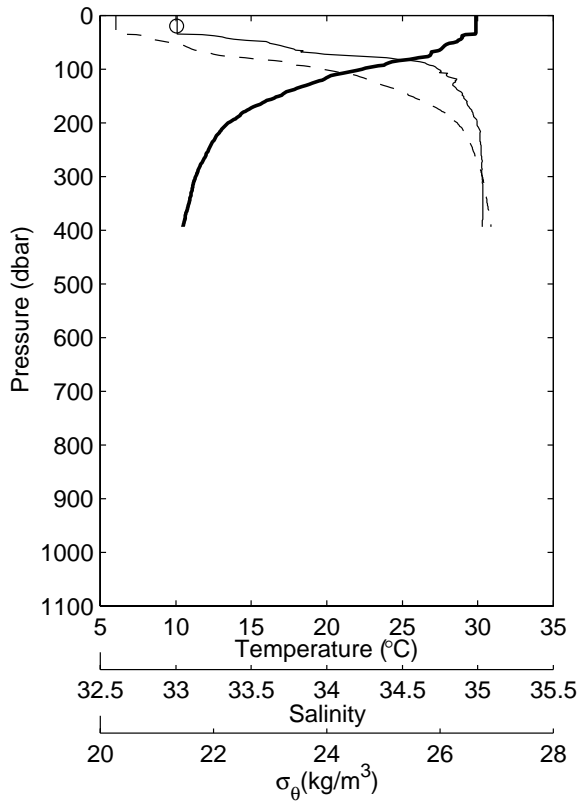


Figure 8.1.47. Same as Fig. 8.1.23 but for station 49 cast 1 and station 50 cast 1.

JASMINE Stn-51 Cast-1 11.94°N 88.51°E 22:48Z 10 May 1999



JASMINE Stn-52 Cast-1 11.81°N 88.51°E 23:55Z 10 May 1999

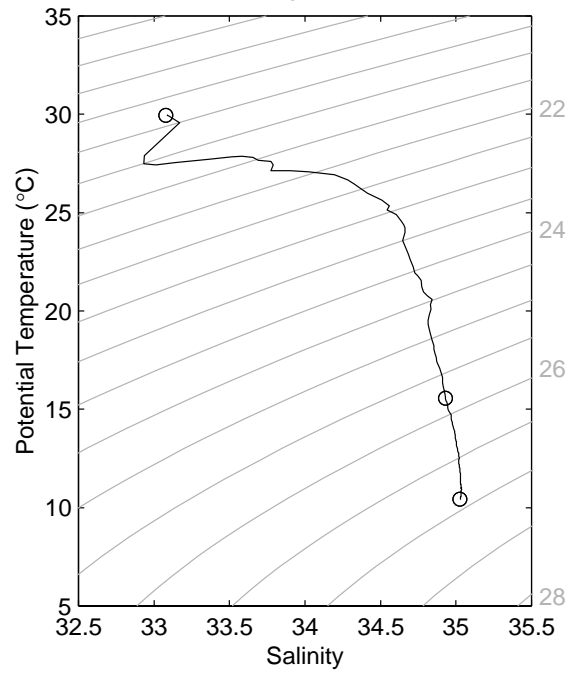
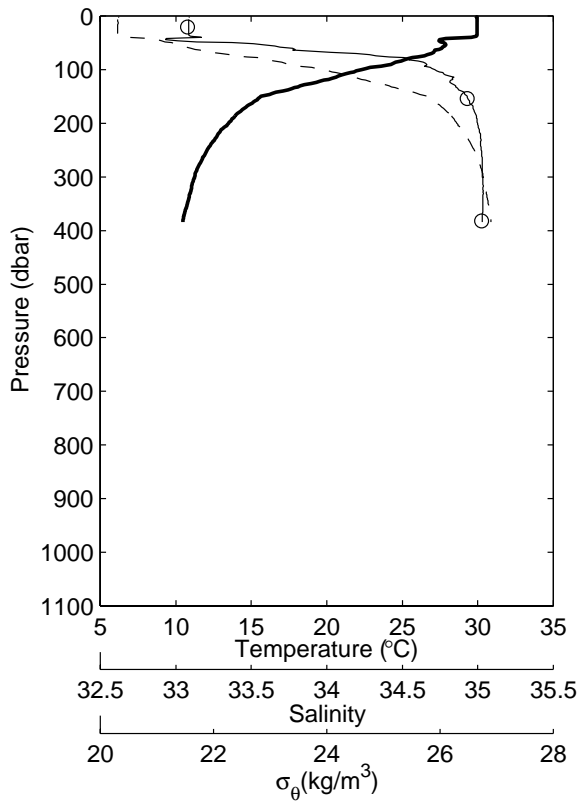
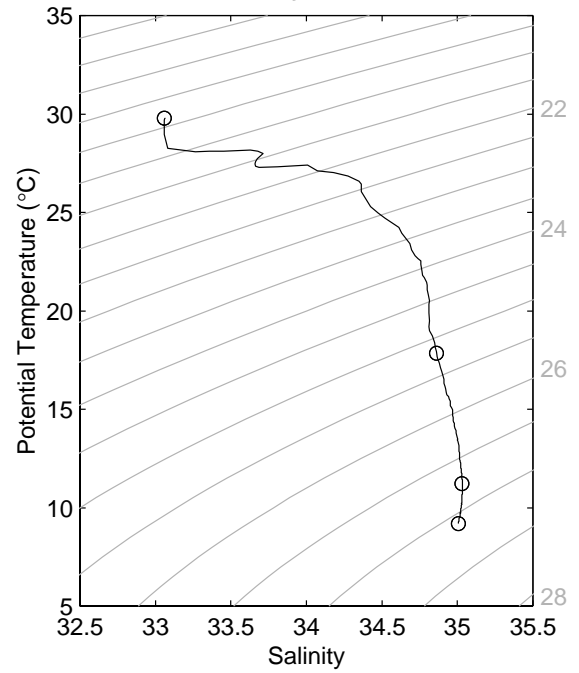
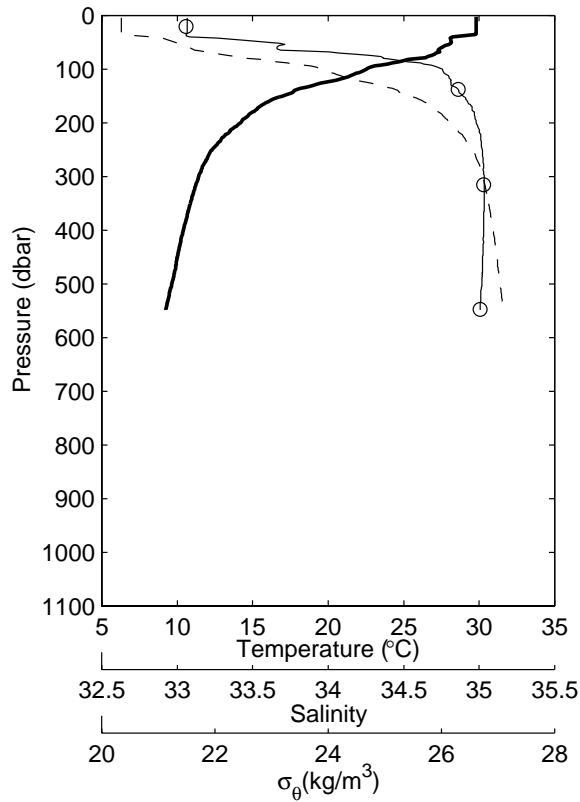


Figure 8.1.48. Same as Fig. 8.1.23 but for station 51 cast 1 and station 52 cast 1.

JASMINE Stn-53 Cast-1 11.68°N 88.51°E 01:00Z 11 May 1999



JASMINE Stn-54 Cast-1 11.78°N 88.59°E 02:07Z 11 May 1999

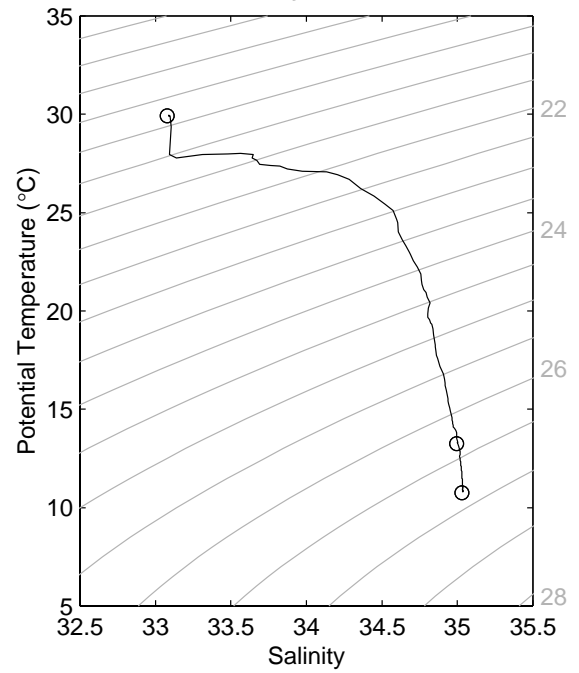
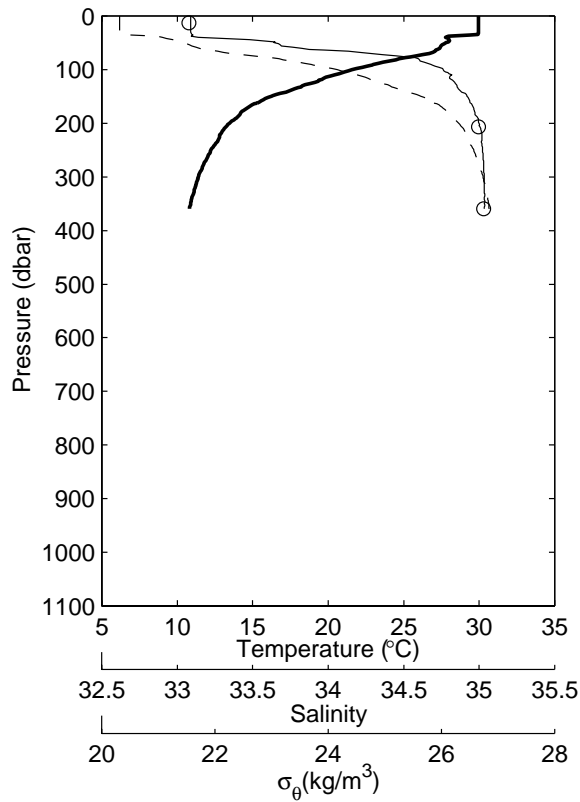
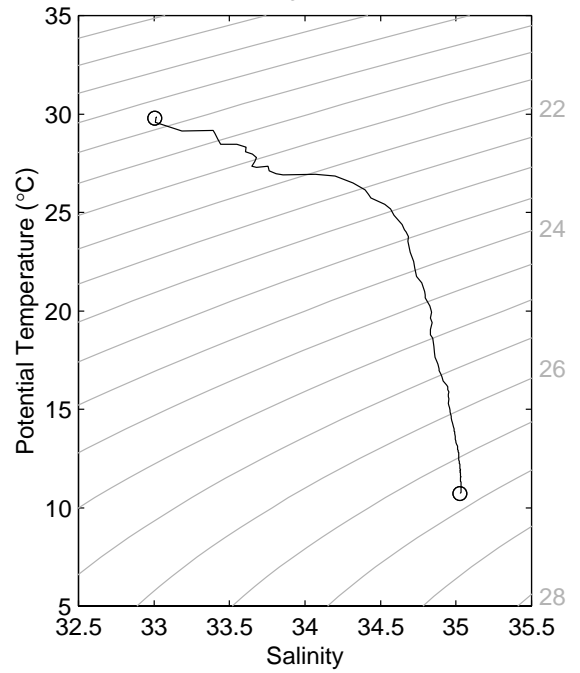
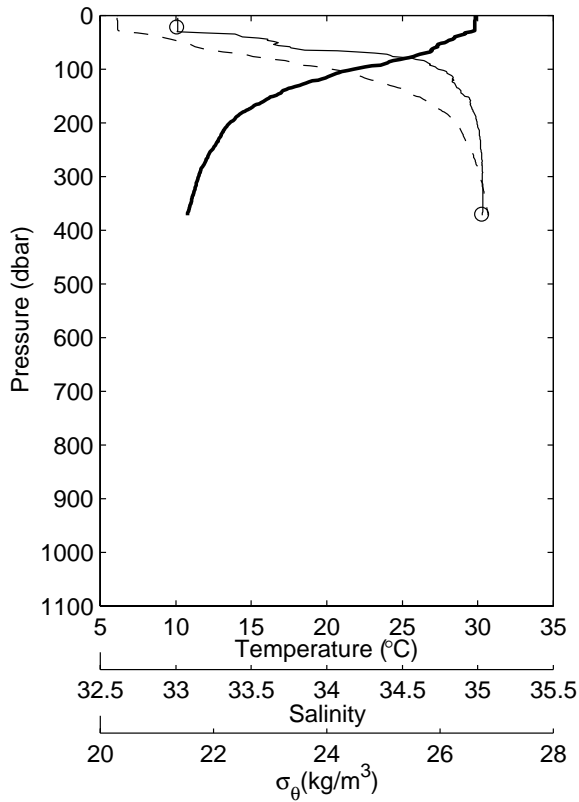


Figure 8.1.49. Same as Fig. 8.1.23 but for station 53 cast 1 and station 54 cast 1.

JASMINE Stn-55 Cast-1 11.88°N 88.66°E 03:11Z 11 May 1999



JASMINE Stn-56 Cast-1 11.96°N 88.72°E 04:15Z 11 May 1999

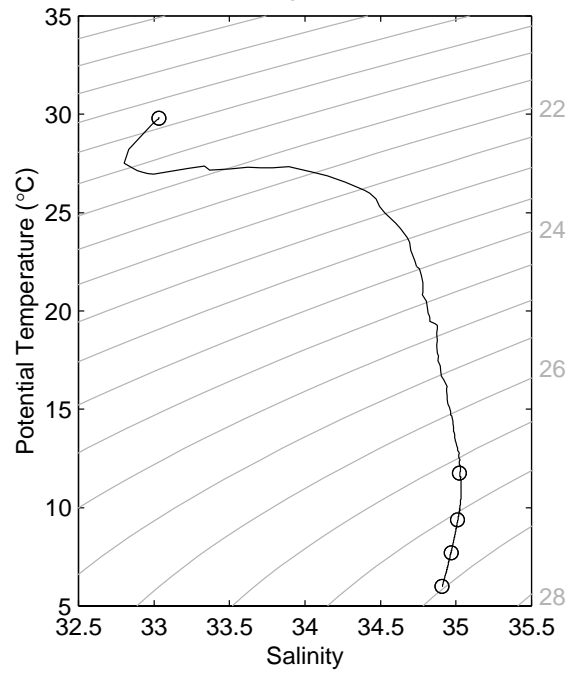
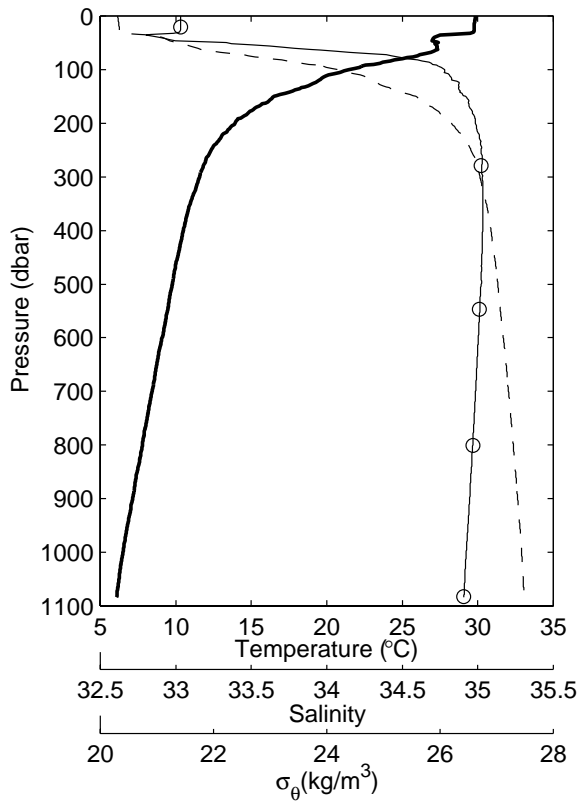
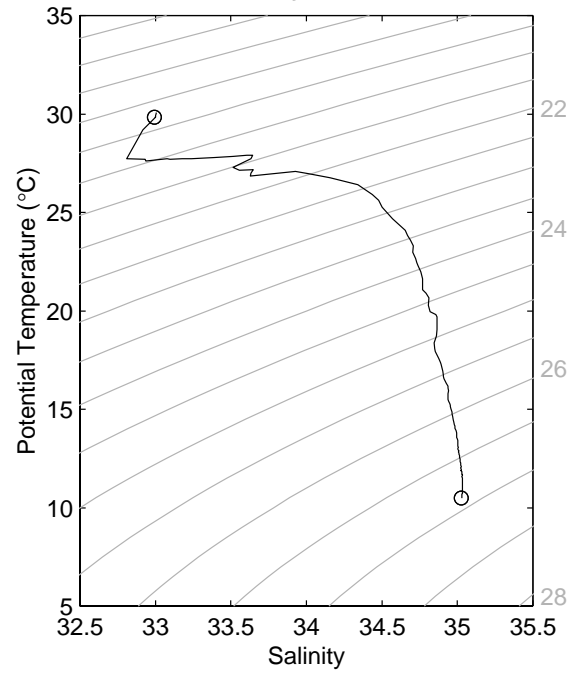
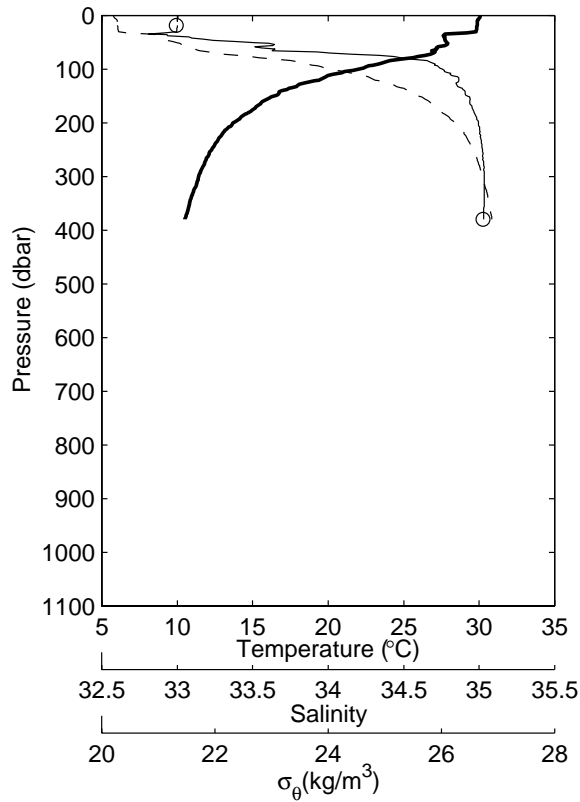


Figure 8.1.50. Same as Fig. 8.1.23 but for station 55 cast 1 and station 56 cast 1.

JASMINE Stn-57 Cast-1 11.96°N 88.62°E 06:09Z 11 May 1999



JASMINE Stn-58 Cast-1 11.92°N 88.50°E 07:15Z 11 May 1999

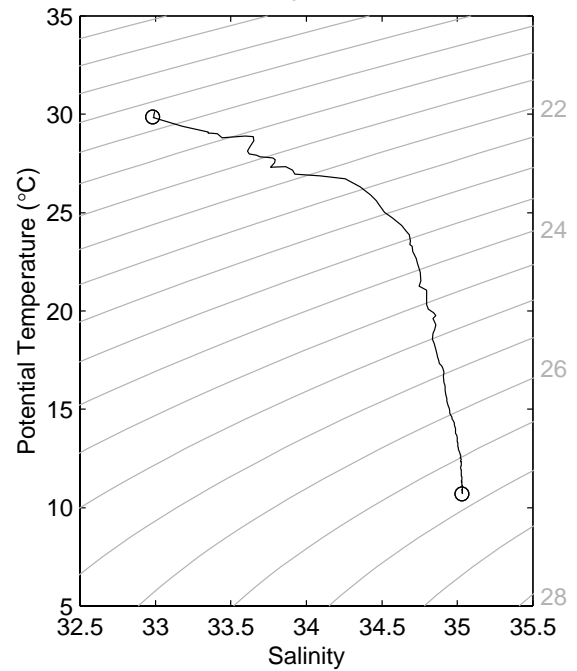
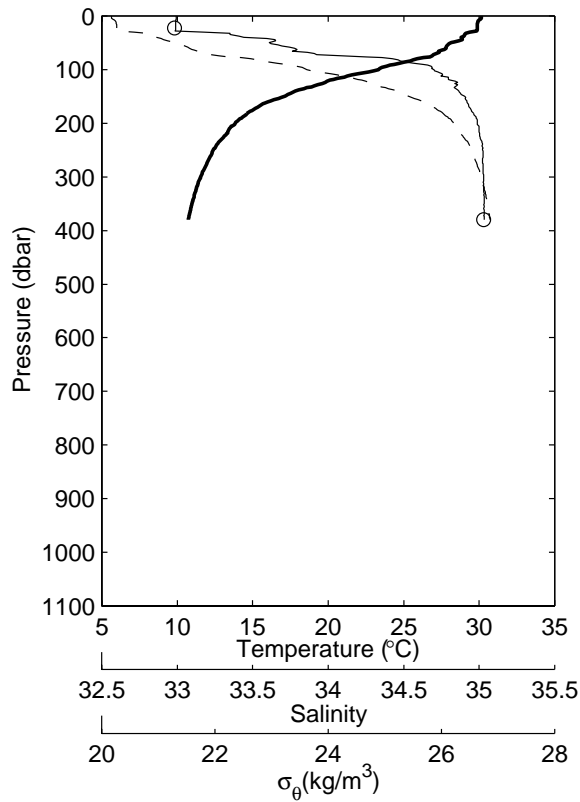
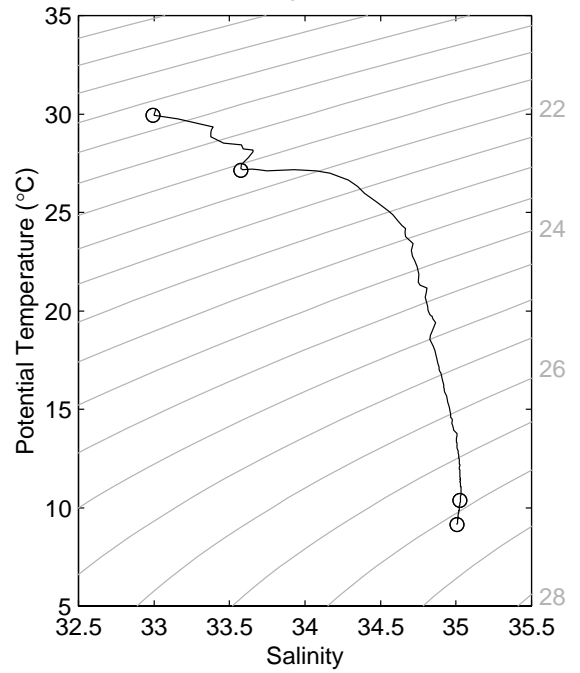
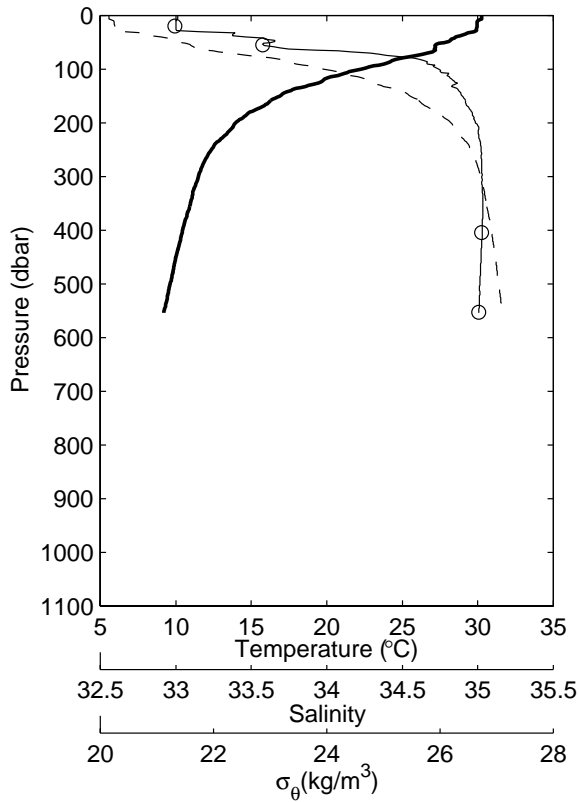


Figure 8.1.51. Same as Fig. 8.1.23 but for station 57 cast 1 and station 58 cast 1.

JASMINE Stn-59 Cast-1 11.88°N 88.37°E 08:22Z 11 May 1999



JASMINE Stn-60 Cast-1 11.83°N 88.50°E 09:32Z 11 May 1999

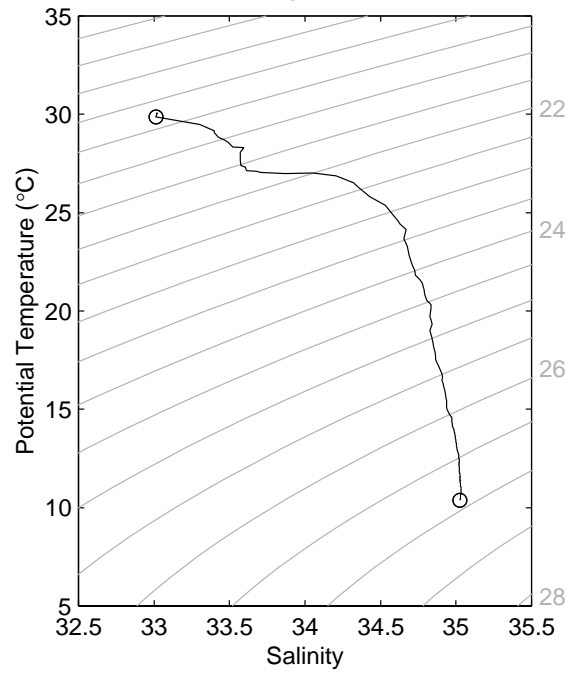
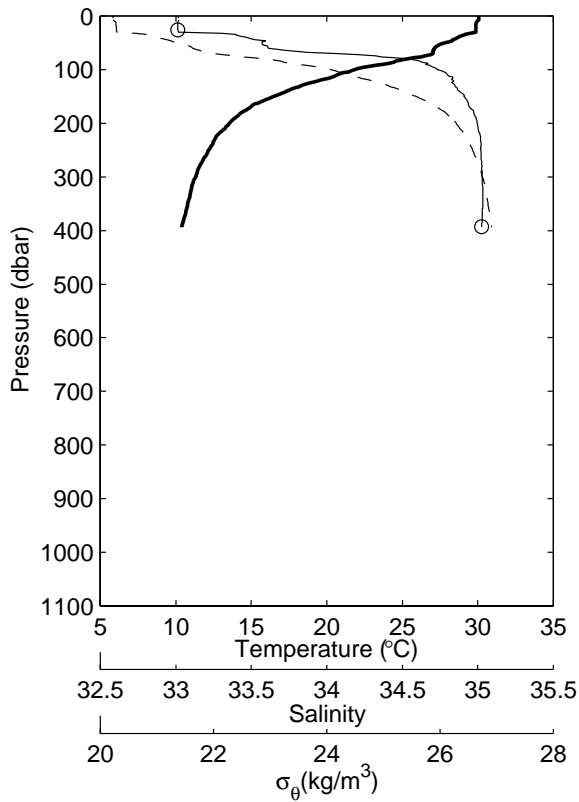
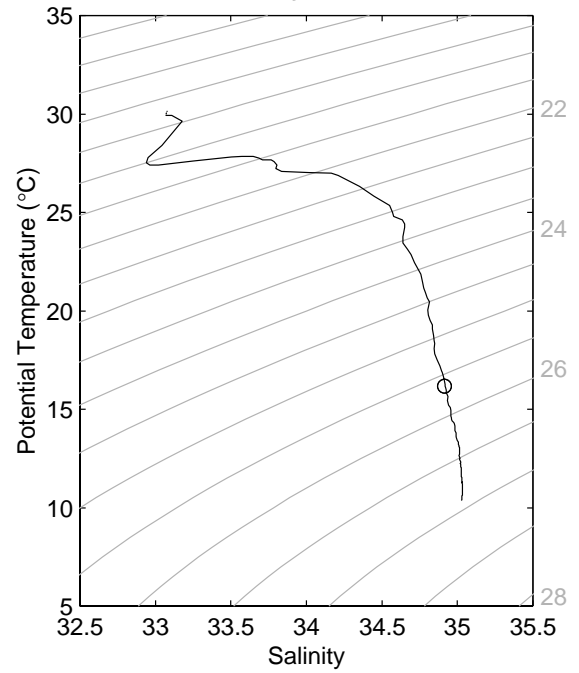
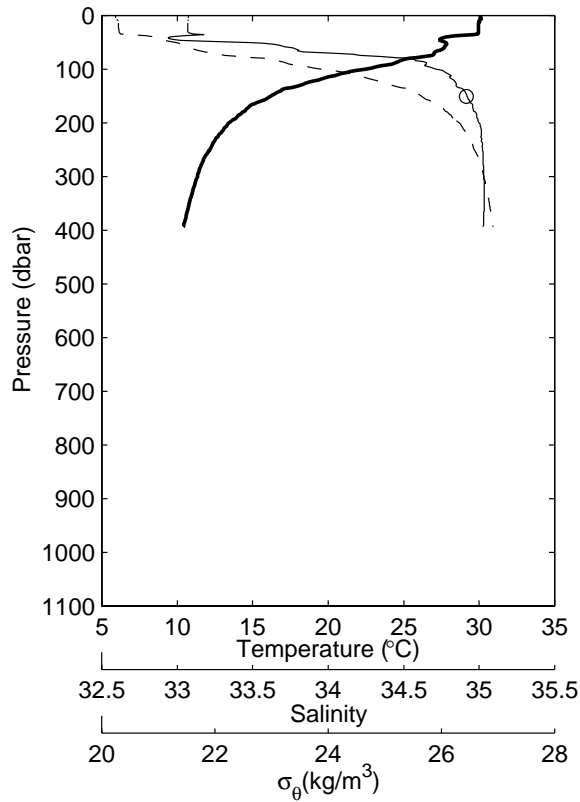


Figure 8.1.52. Same as Fig. 8.1.23 but for station 59 cast 1 and station 60 cast 1.

JASMINE Stn-61 Cast-1 11.79°N 88.62°E 10:42Z 11 May 1999



JASMINE Stn-62 Cast-1 11.75°N 88.75°E 11:50Z 11 May 1999

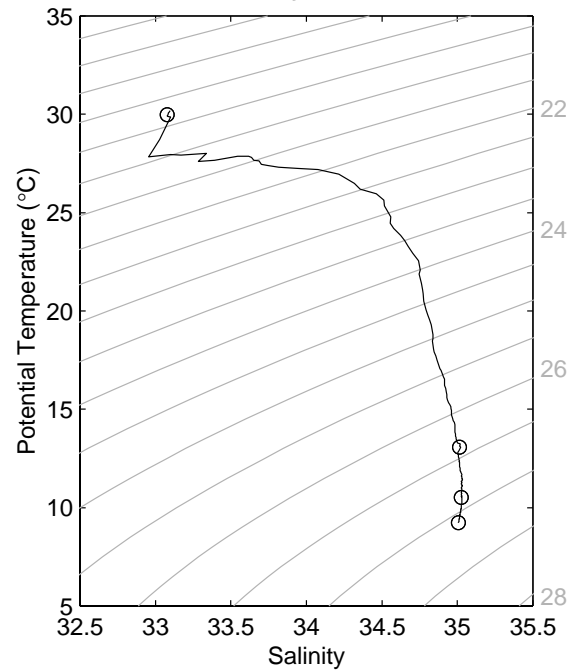
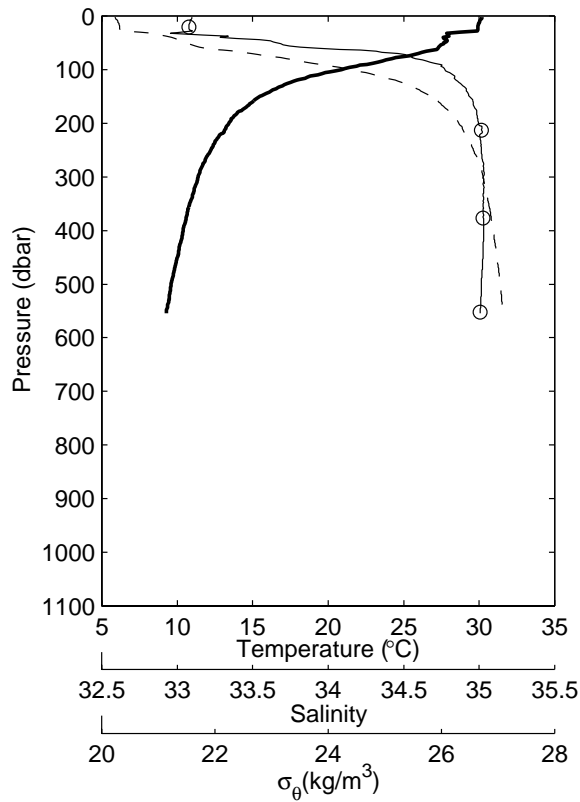
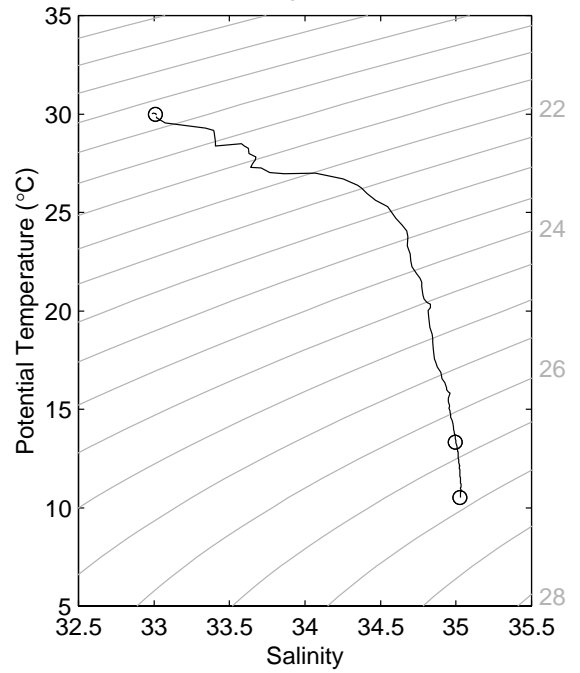
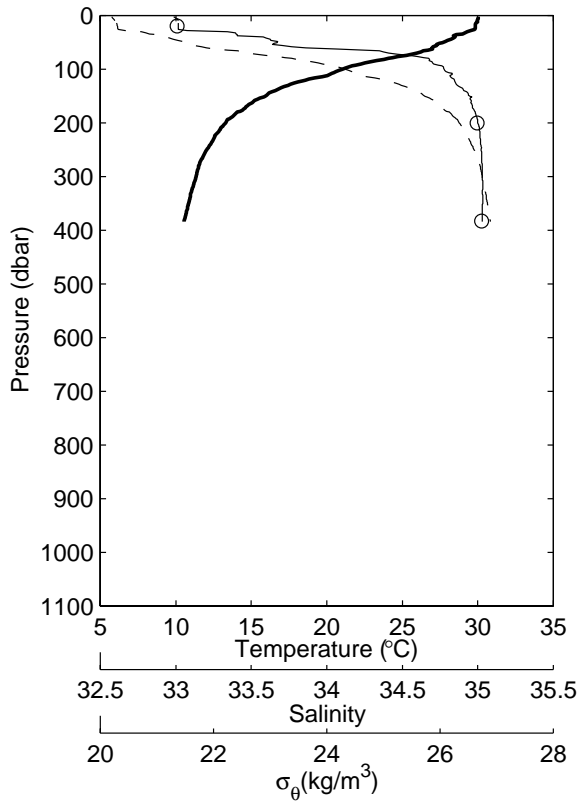


Figure 8.1.53. Same as Fig. 8.1.23 but for station 61 cast 1 and station 62 cast 1.

JASMINE Stn-63 Cast-1 11.86°N 88.67°E 13:04Z 11 May 1999



JASMINE Stn-64 Cast-1 11.97°N 88.59°E 14:14Z 11 May 1999

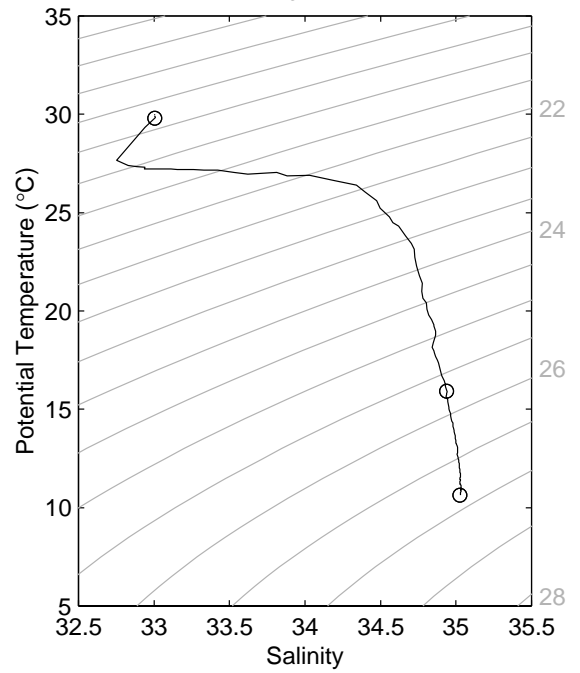
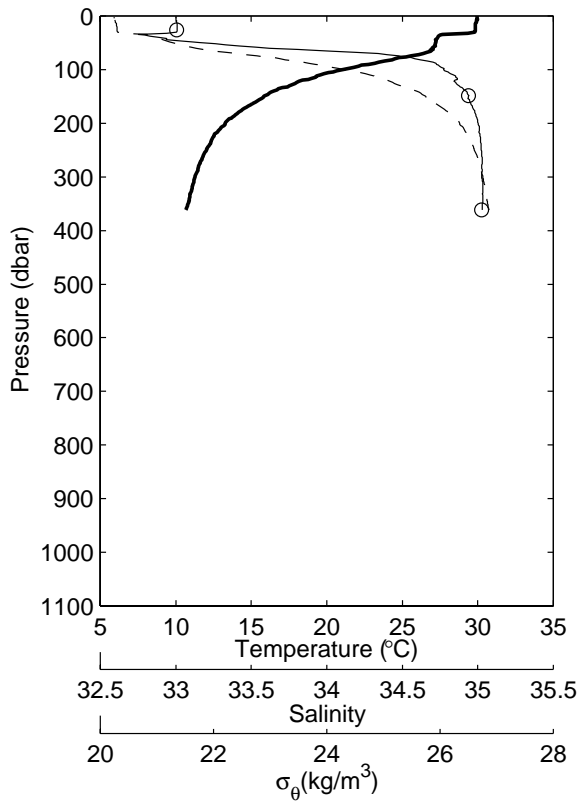
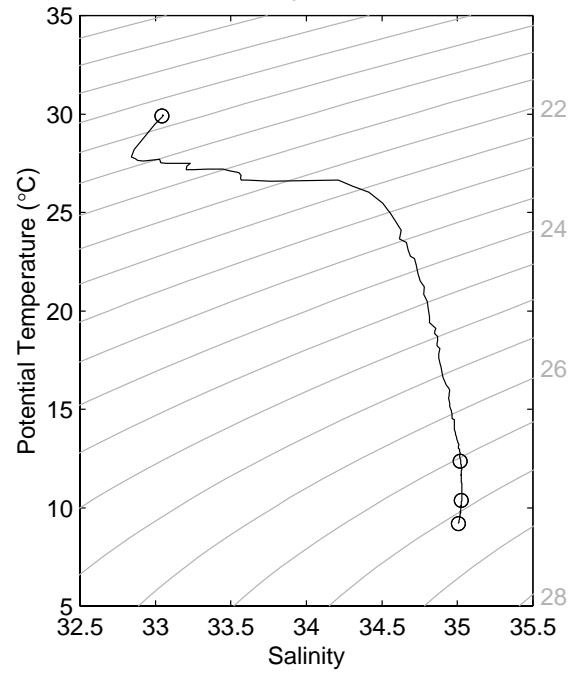
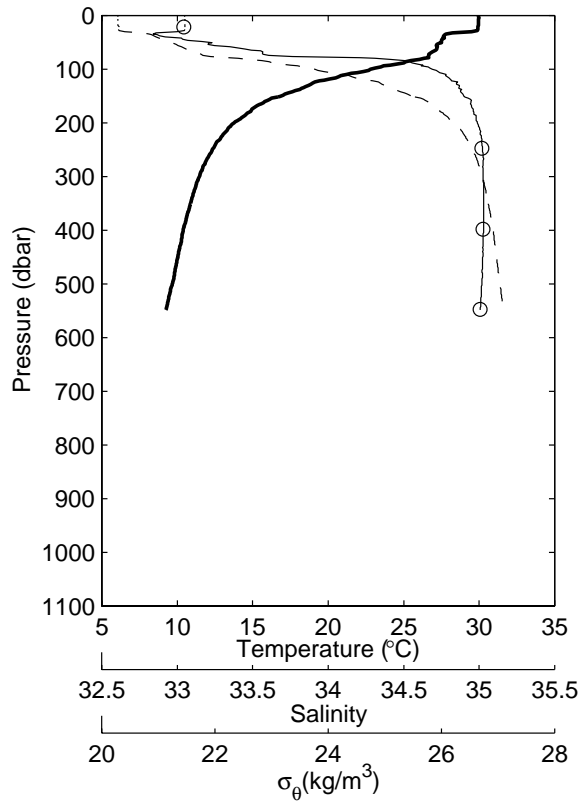


Figure 8.1.54. Same as Fig. 8.1.23 but for station 63 cast 1 and station 64 cast 1.

JASMINE Stn-65 Cast-1 12.08°N 88.52°E 15:21Z 11 May 1999



JASMINE Stn-66 Cast-1 11.94°N 88.51°E 16:35Z 11 May 1999

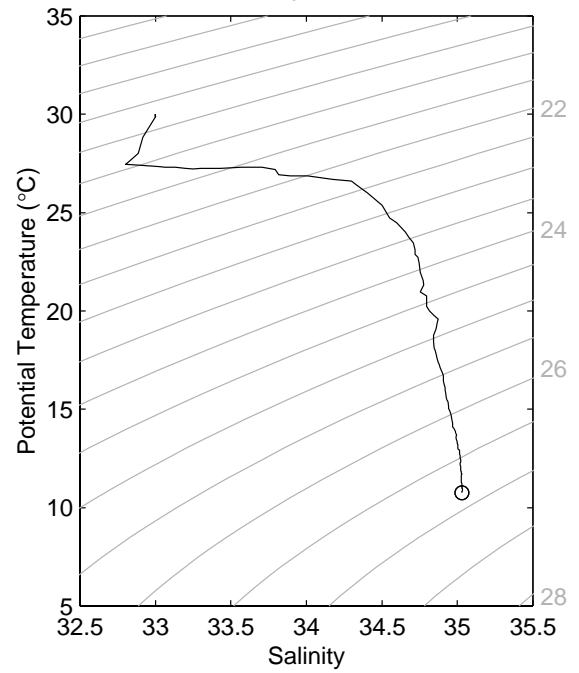
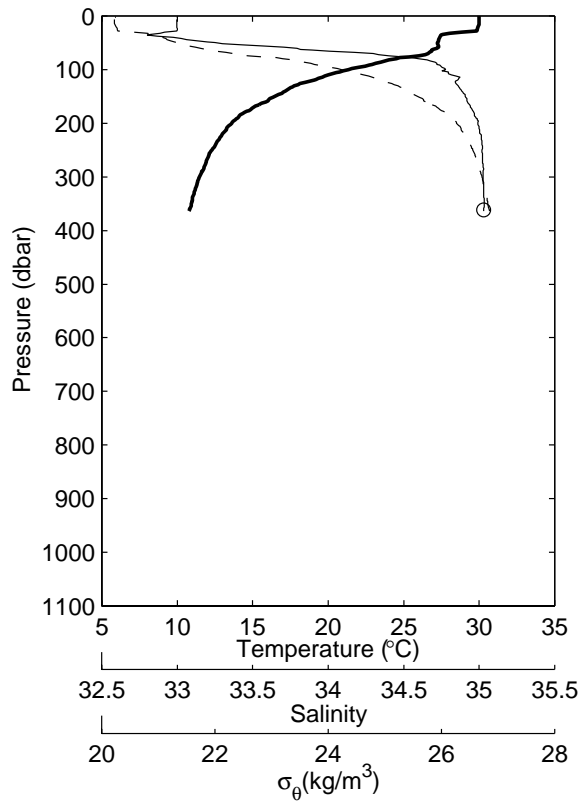
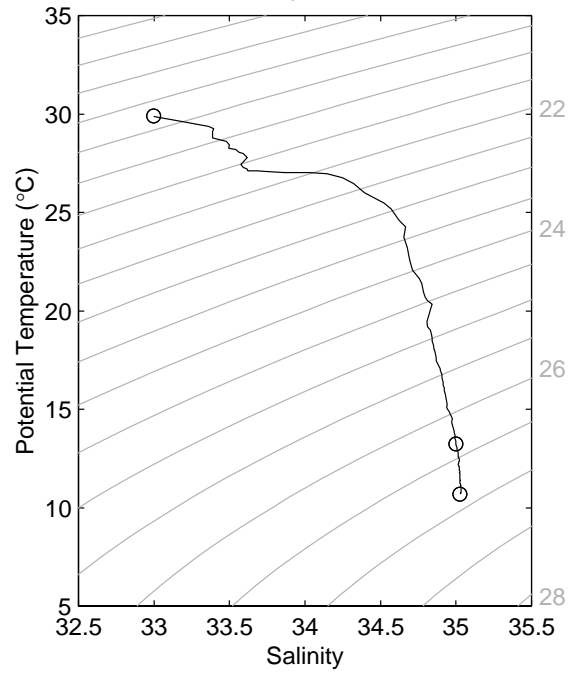
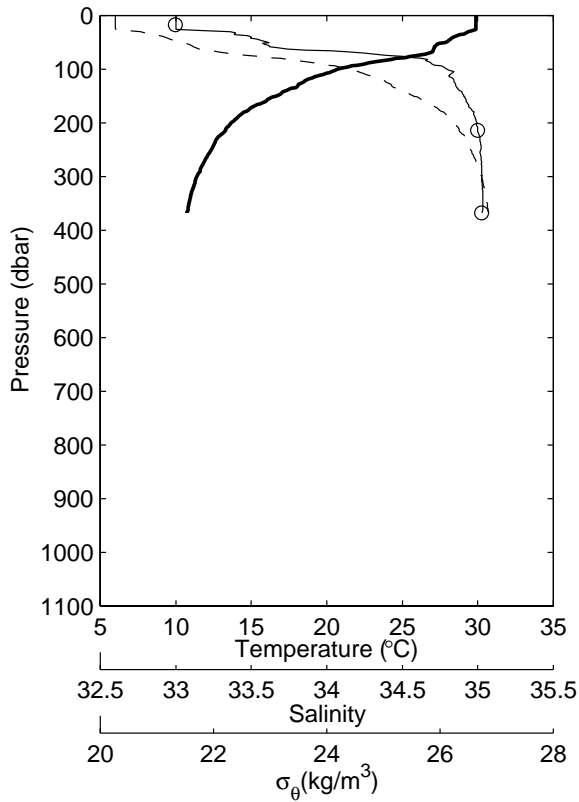


Figure 8.1.55. Same as Fig. 8.1.23 but for station 65 cast 1 and station 66 cast 1.

JASMINE Stn-67 Cast-1 11.81°N 88.51°E 17:43Z 11 May 1999



JASMINE Stn-68 Cast-1 11.69°N 88.52°E 18:44Z 11 May 1999

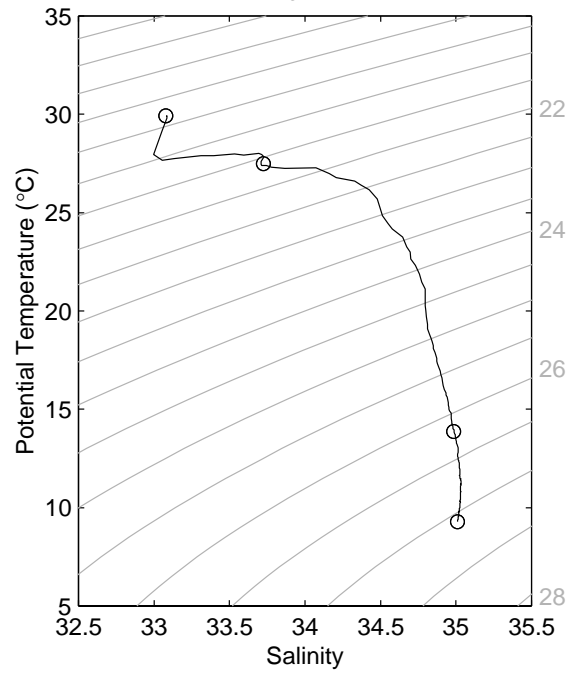
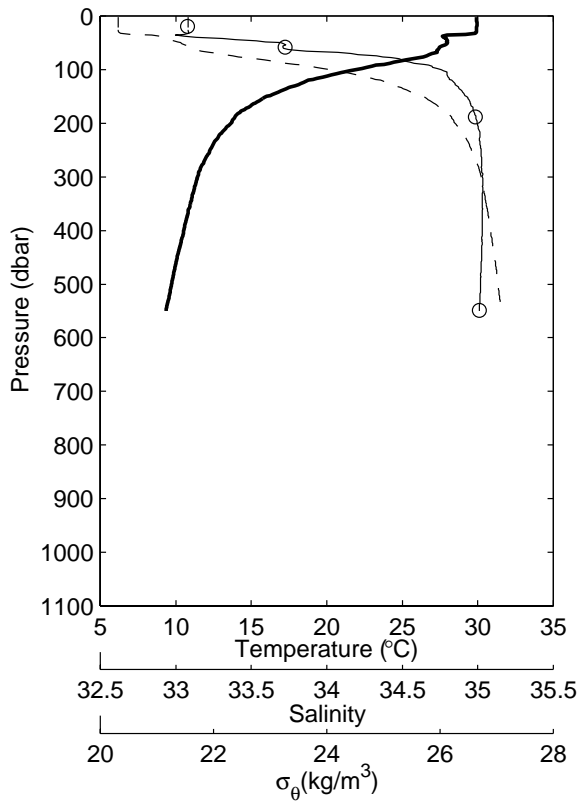
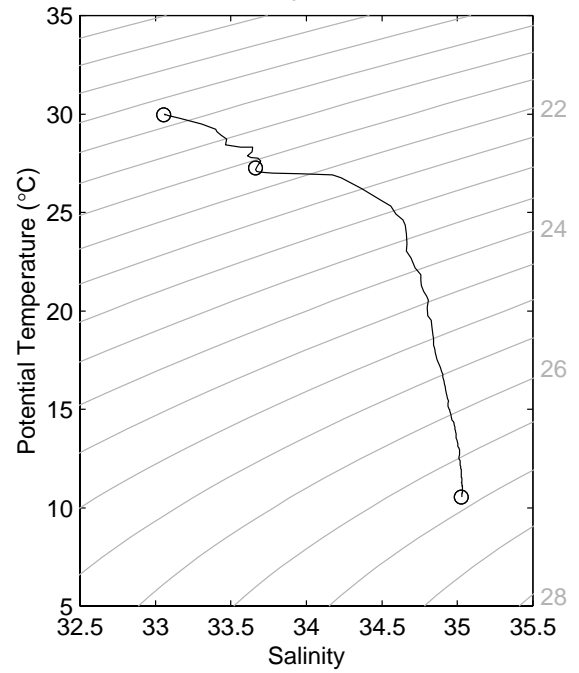
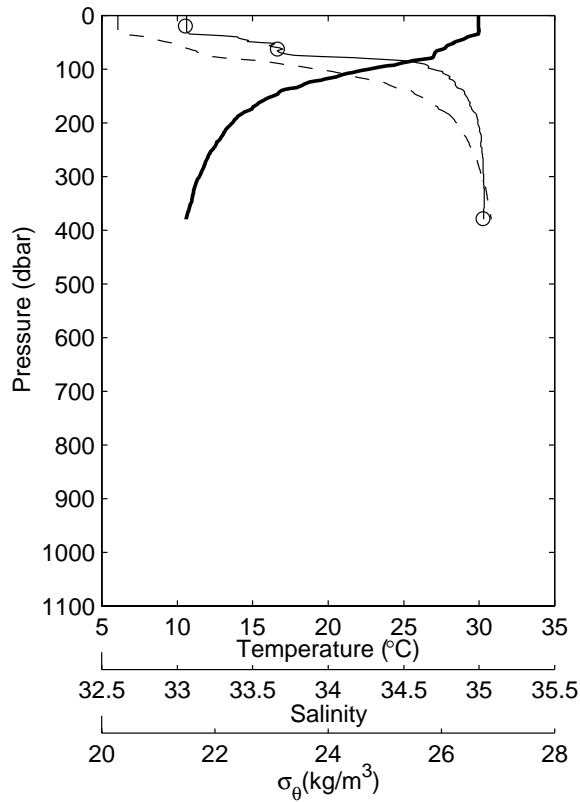


Figure 8.1.56. Same as Fig. 8.1.23 but for station 67 cast 1 and station 68 cast 1.

JASMINE Stn-69 Cast-1 11.78°N 88.59°E 19:60Z 11 May 1999



JASMINE Stn-70 Cast-1 11.89°N 88.67°E 21:09Z 11 May 1999

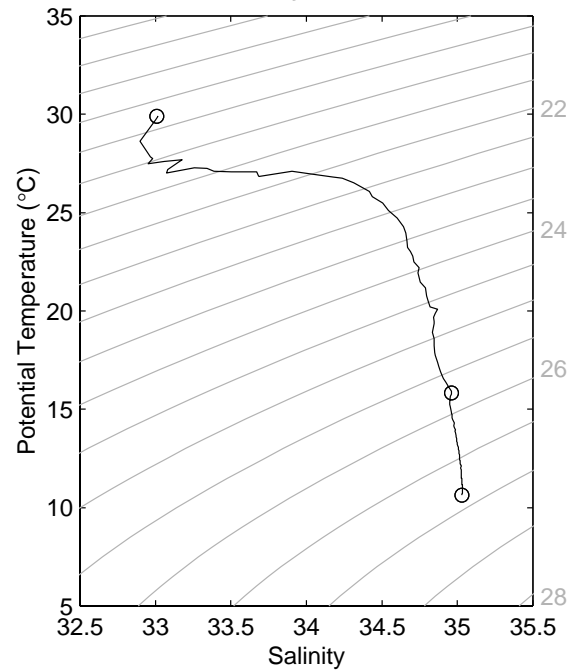
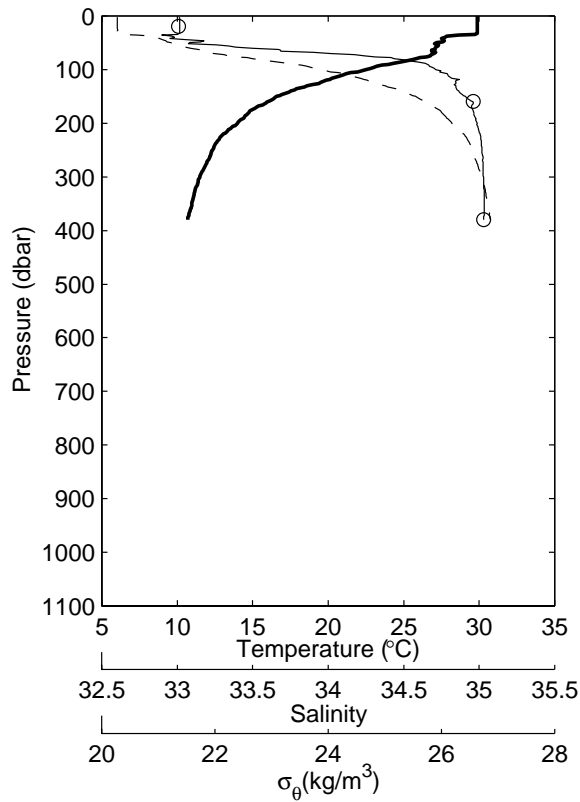
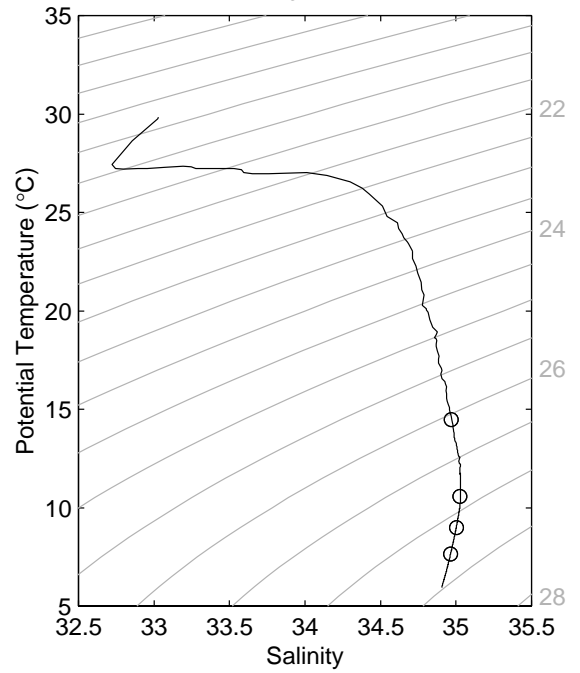
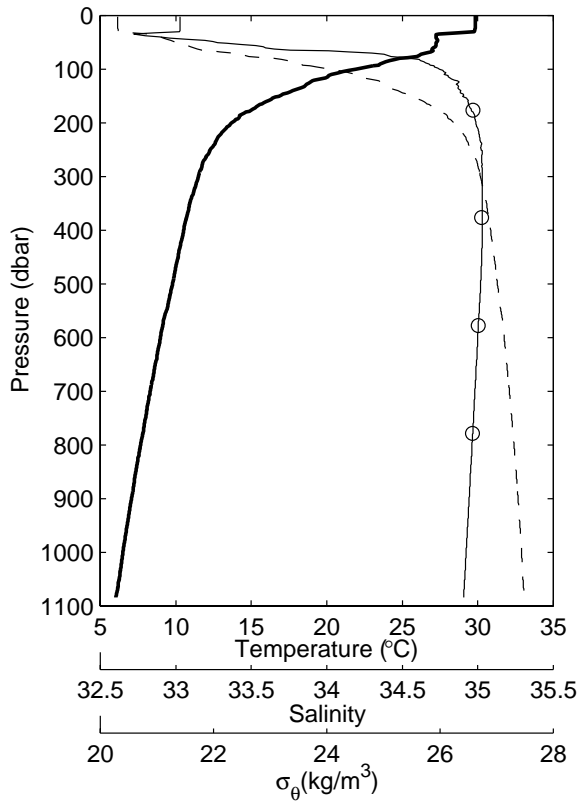


Figure 8.1.57. Same as Fig. 8.1.23 but for station 69 cast 1 and station 70 cast 1.

JASMINE Stn-71 Cast-1 12.00°N 88.75°E 22:19Z 11 May 1999



JASMINE Stn-72 Cast-1 11.96°N 88.62°E 23:54Z 11 May 1999

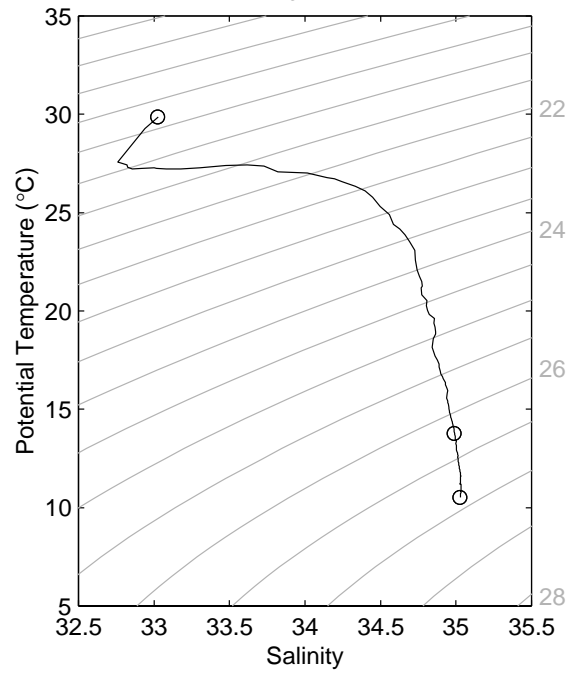
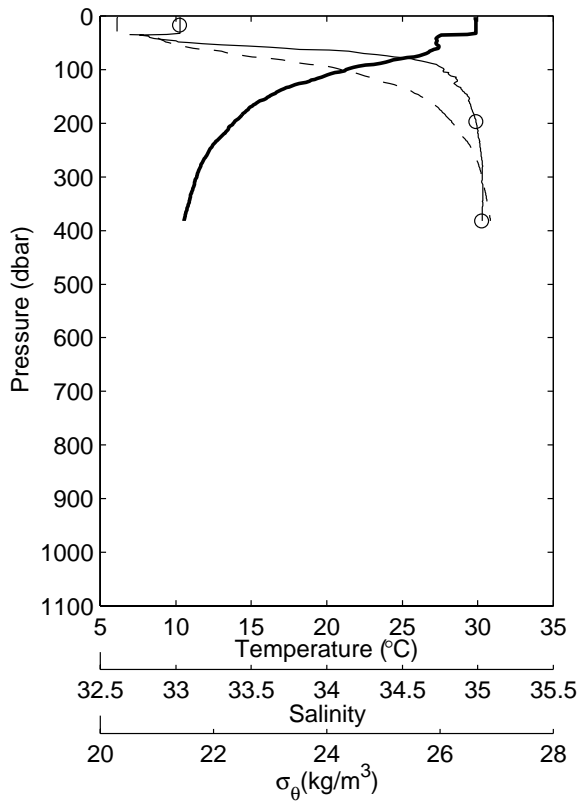
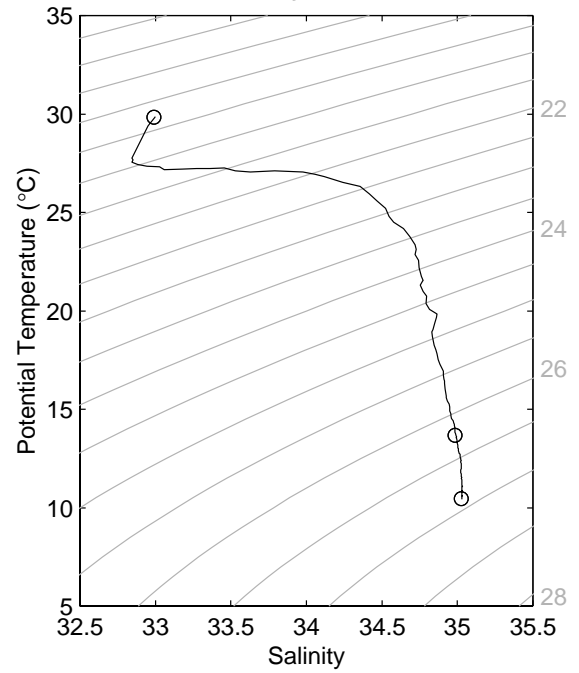
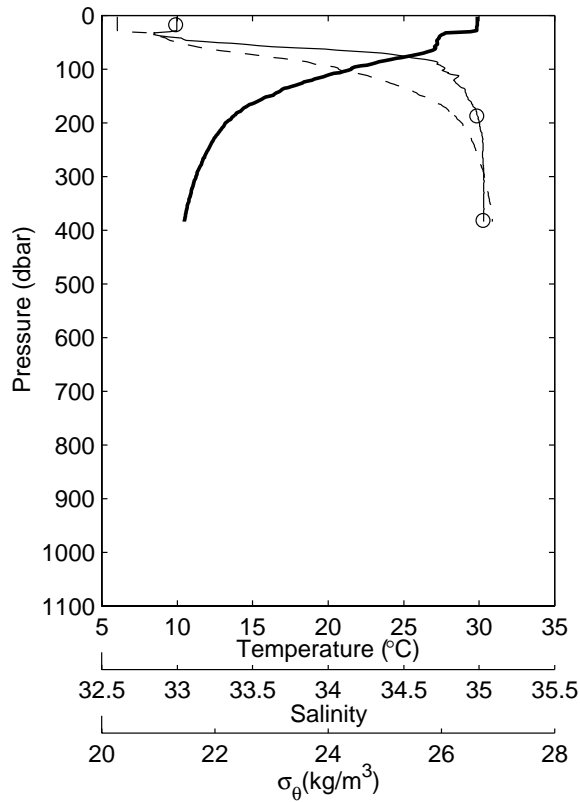


Figure 8.1.58. Same as Fig. 8.1.23 but for station 71 cast 1 and station 72 cast 1.

JASMINE Stn-73 Cast-1 11.92°N 88.50°E 00:59Z 12 May 1999



JASMINE Stn-74 Cast-1 11.88°N 88.37°E 02:08Z 12 May 1999

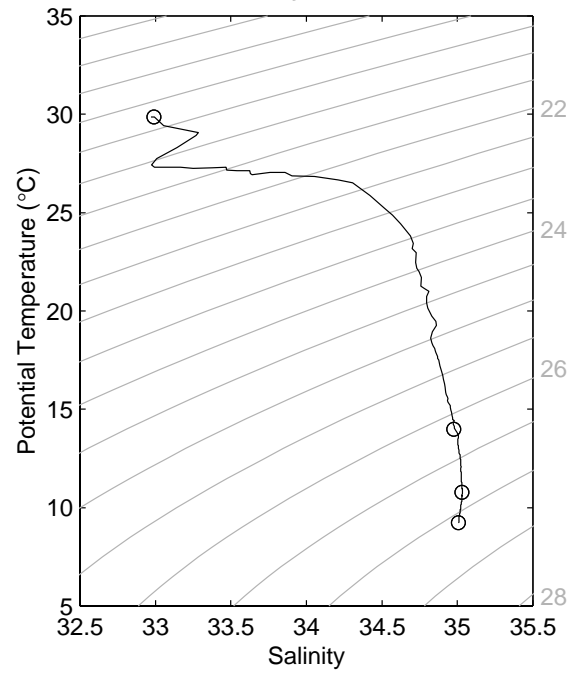
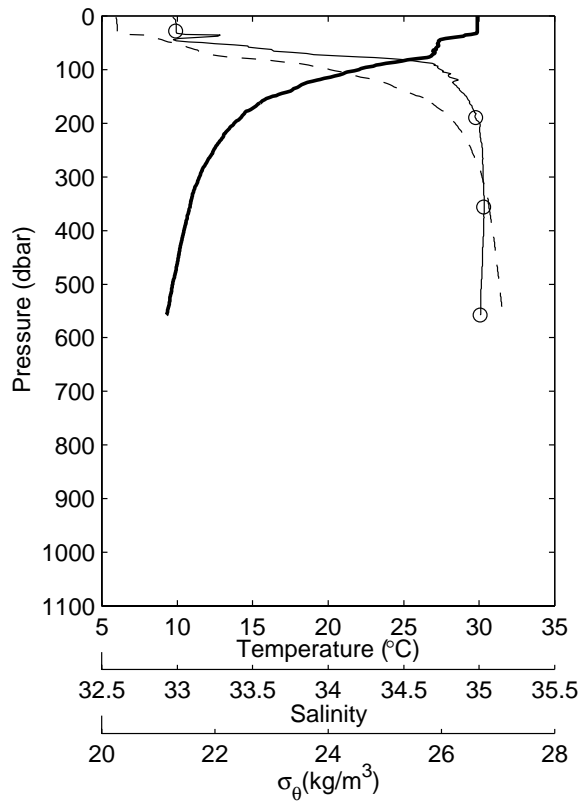
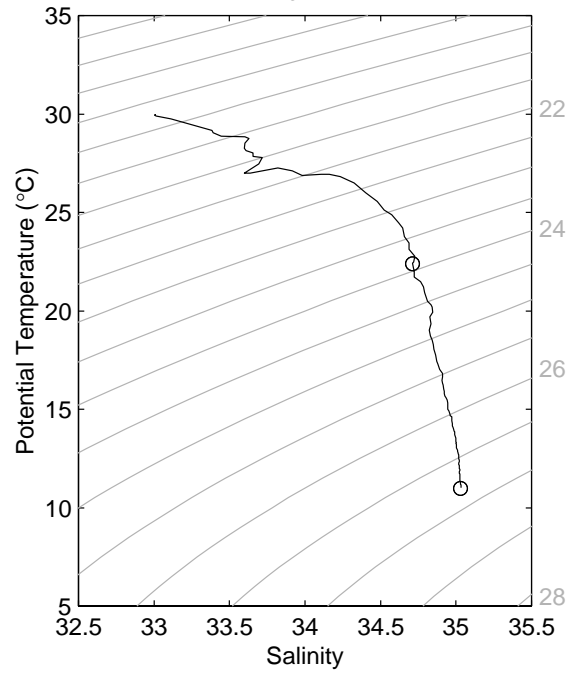
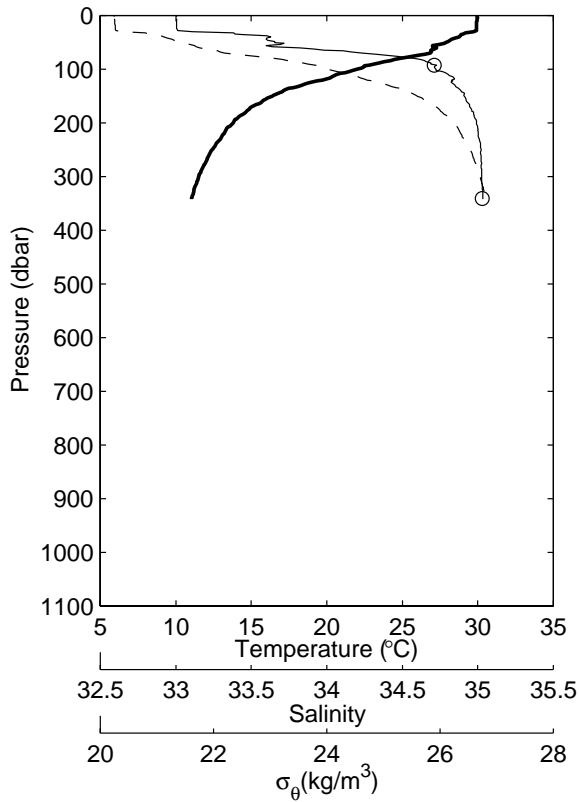


Figure 8.1.59. Same as Fig. 8.1.23 but for station 73 cast 1 and station 74 cast 1.

JASMINE Stn-75 Cast-1 11.84°N 88.50°E 03:24Z 12 May 1999



JASMINE Stn-76 Cast-1 11.79°N 88.62°E 04:26Z 12 May 1999

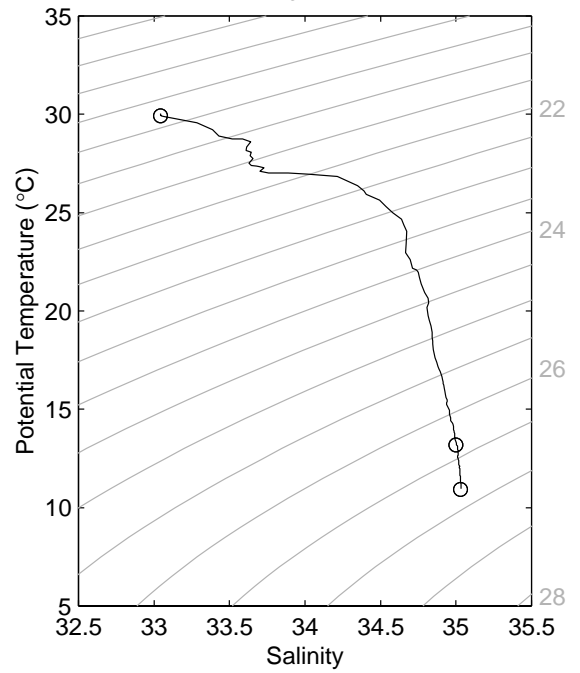
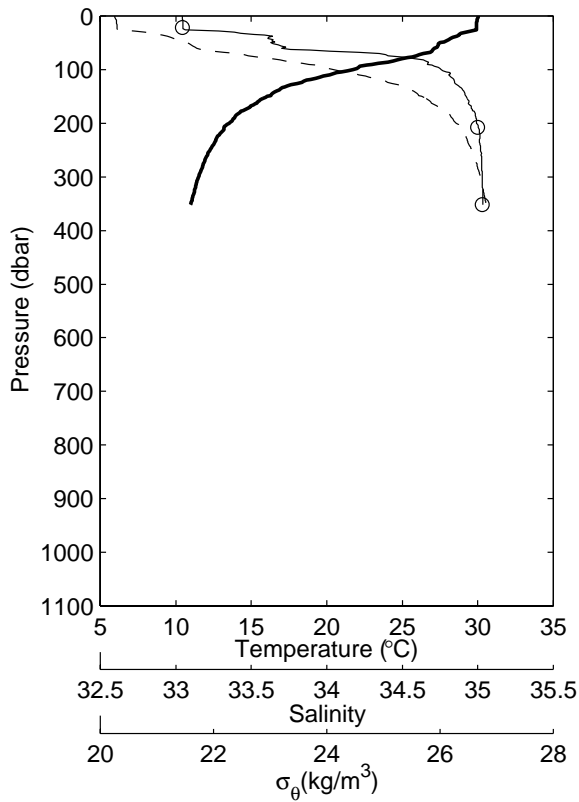
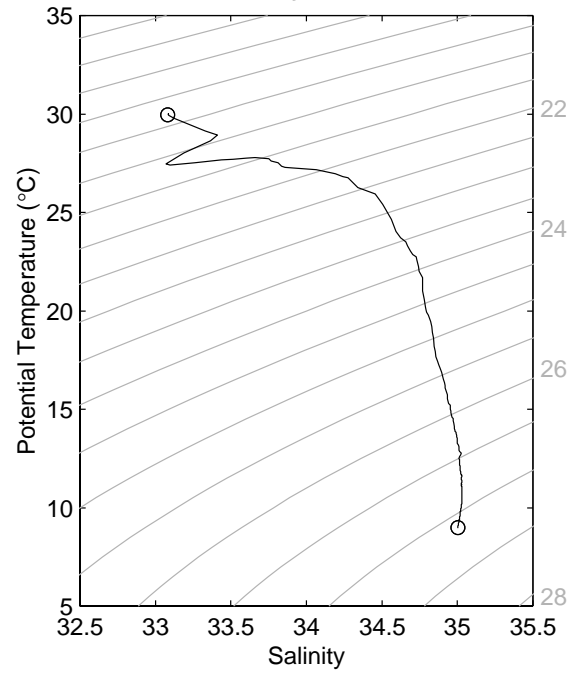
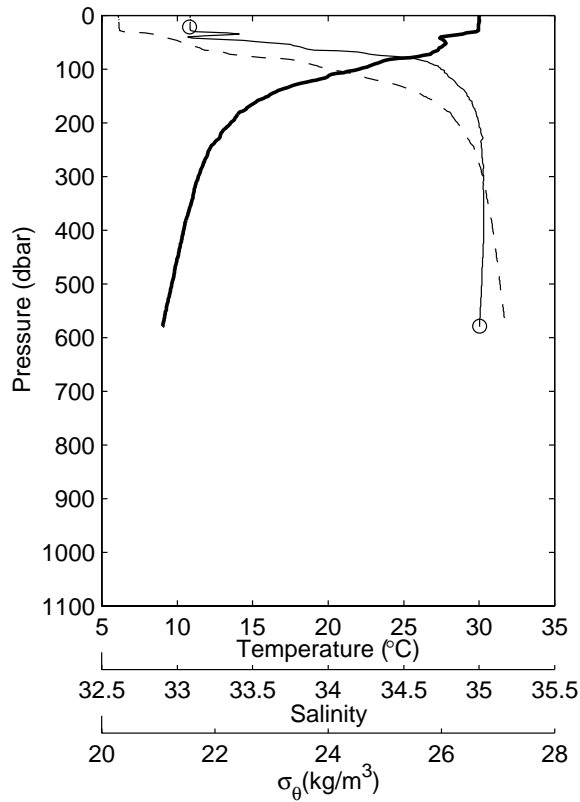


Figure 8.1.60. Same as Fig. 8.1.23 but for station 75 cast 1 and station 76 cast 1.

JASMINE Stn-77 Cast-1 11.75°N 88.75°E 05:33Z 12 May 1999



JASMINE Stn-78 Cast-1 11.84°N 88.69°E 06:39Z 12 May 1999

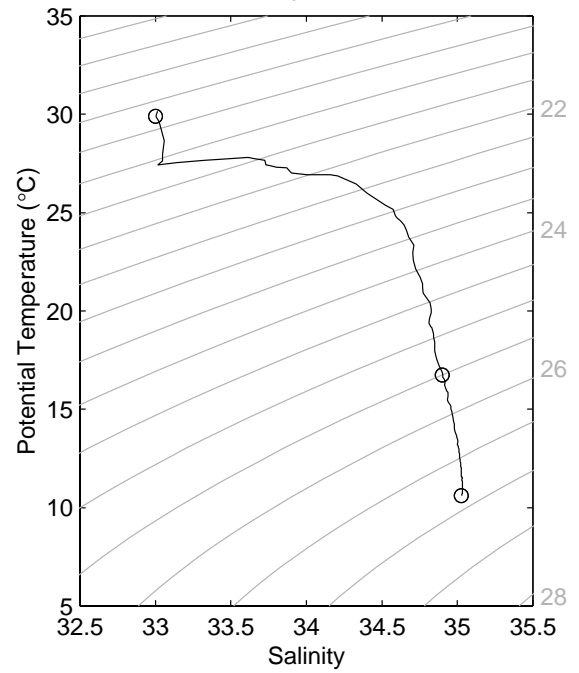
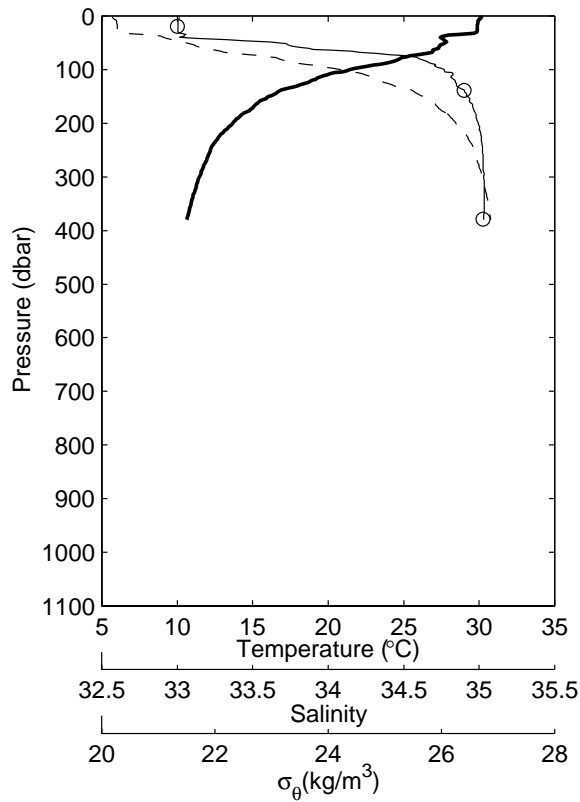
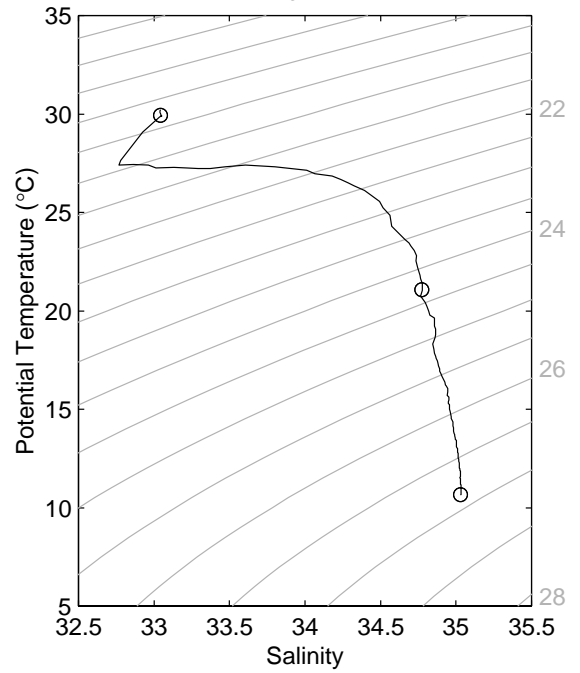
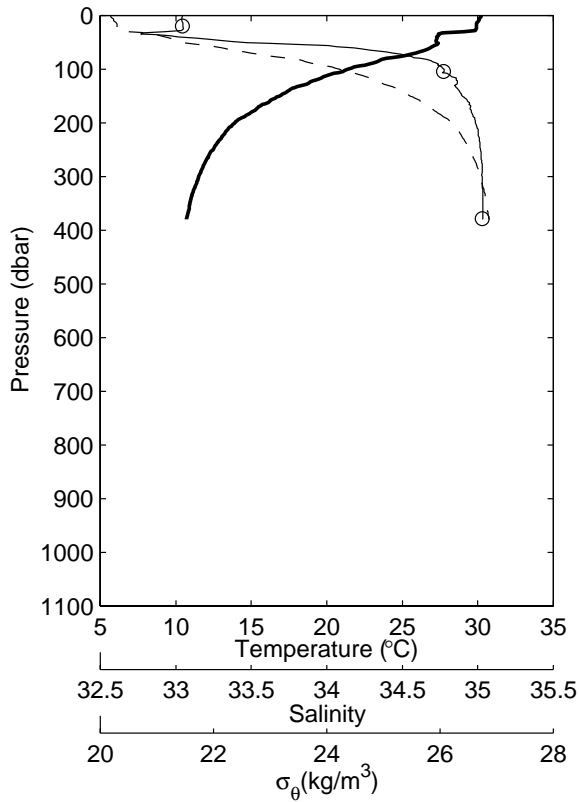


Figure 8.1.61. Same as Fig. 8.1.23 but for station 77 cast 1 and station 78 cast 1.

JASMINE Stn-79 Cast-1 11.97°N 88.59°E 07:53Z 12 May 1999



JASMINE Stn-80 Cast-1 12.07°N 88.52°E 08:58Z 12 May 1999

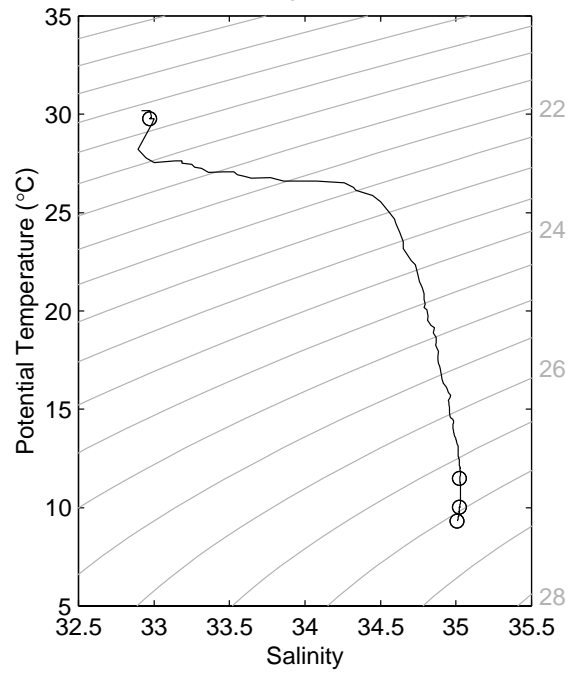
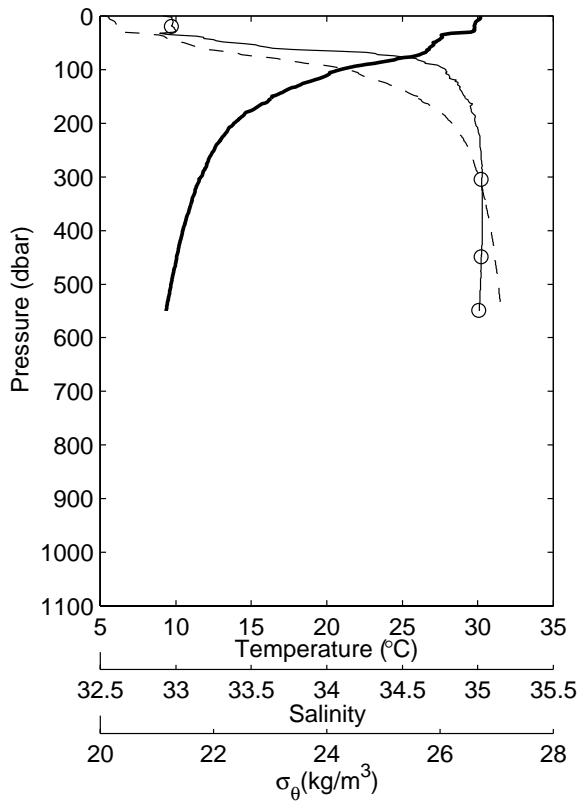
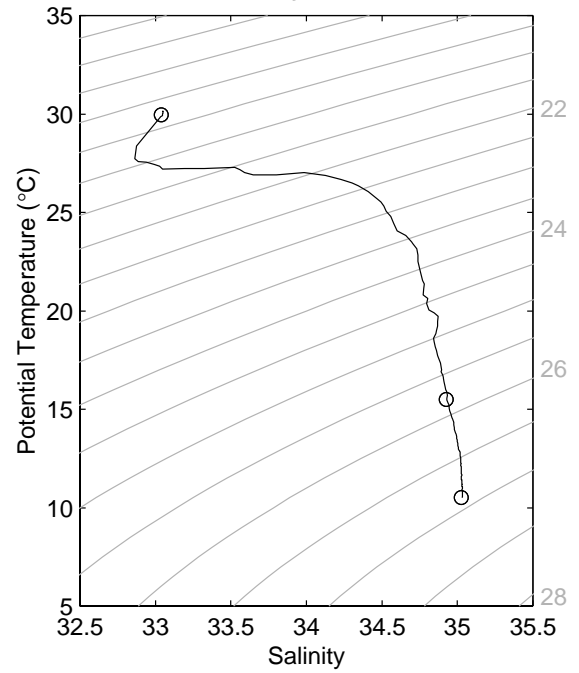
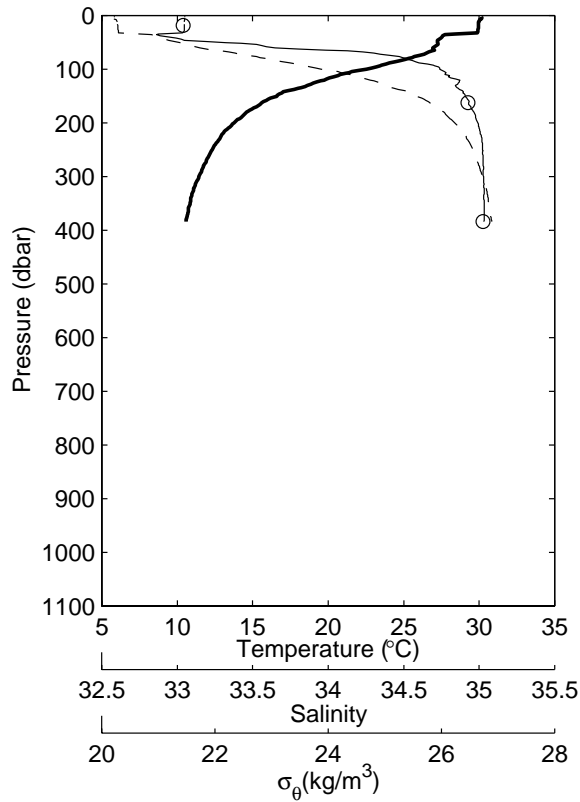


Figure 8.1.62. Same as Fig. 8.1.23 but for station 79 cast 1 and station 80 cast 1.

JASMINE Stn-81 Cast-1 11.94°N 88.52°E 10:14Z 12 May 1999



JASMINE Stn-82 Cast-1 11.81°N 88.51°E 11:23Z 12 May 1999

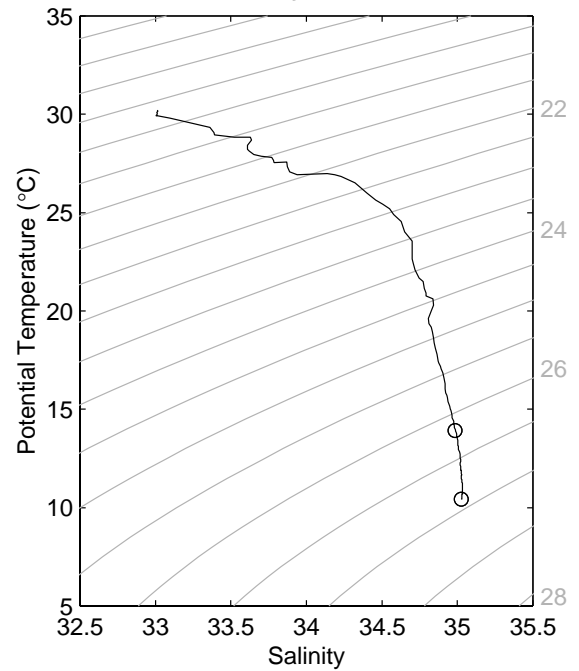
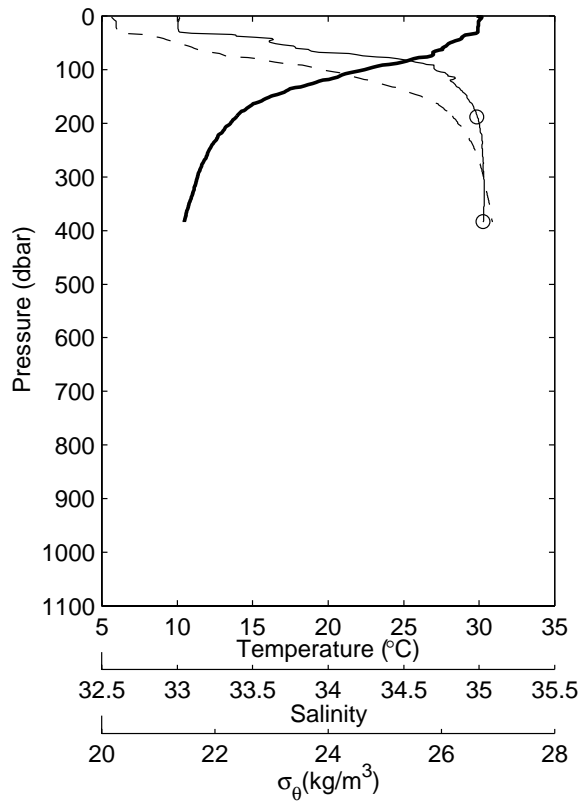
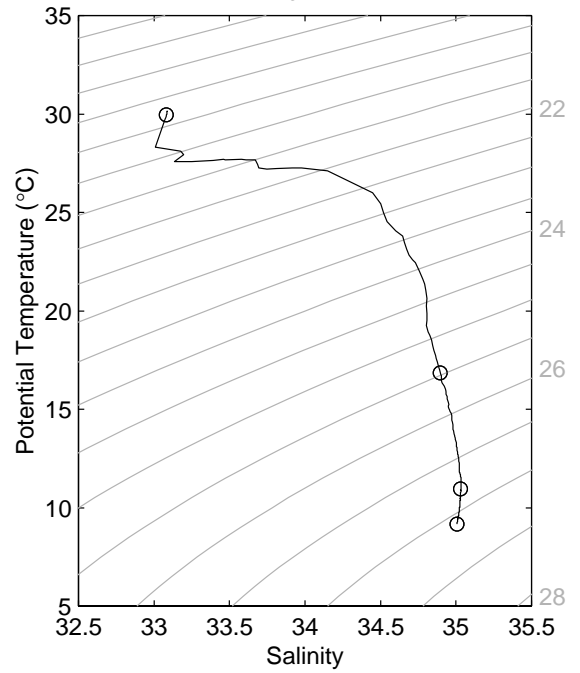
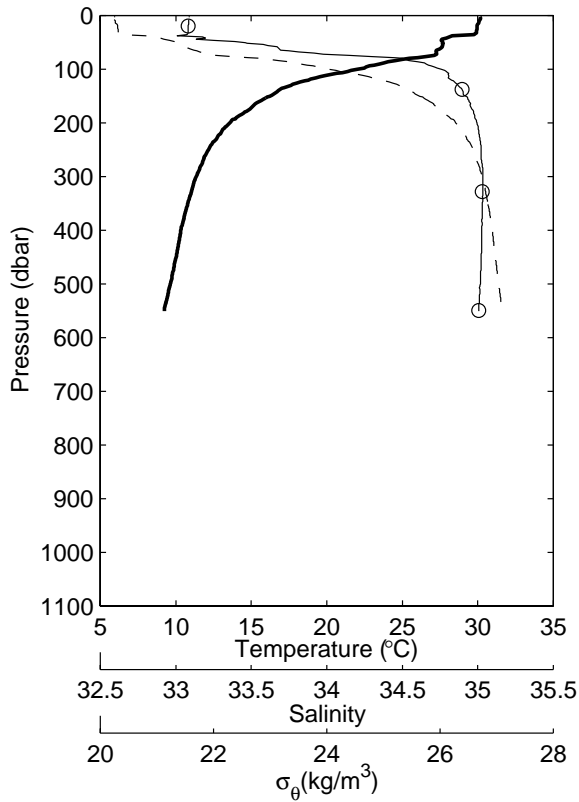


Figure 8.1.63. Same as Fig. 8.1.23 but for station 81 cast 1 and station 82 cast 1.

JASMINE Stn-83 Cast-1 11.68°N 88.52°E 12:28Z 12 May 1999



JASMINE Stn-84 Cast-1 11.78°N 88.59°E 13:43Z 12 May 1999

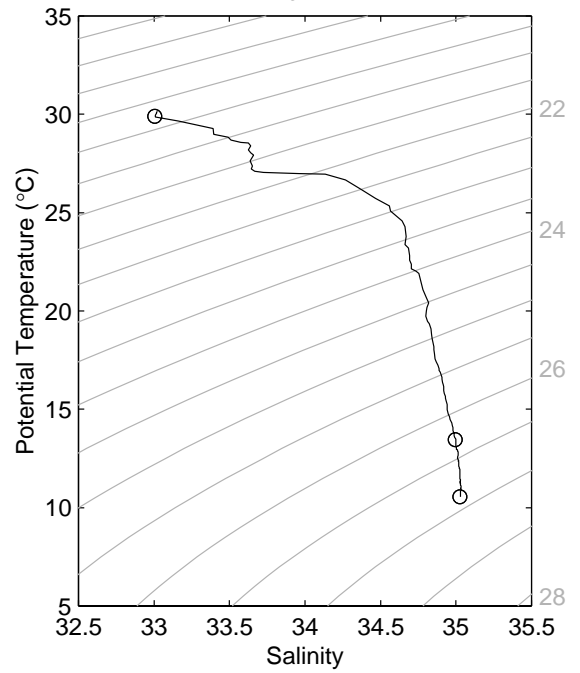
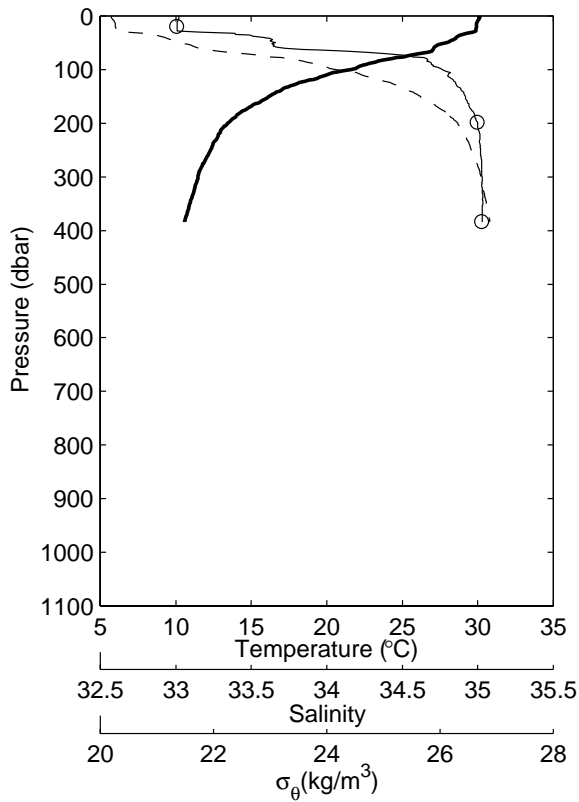
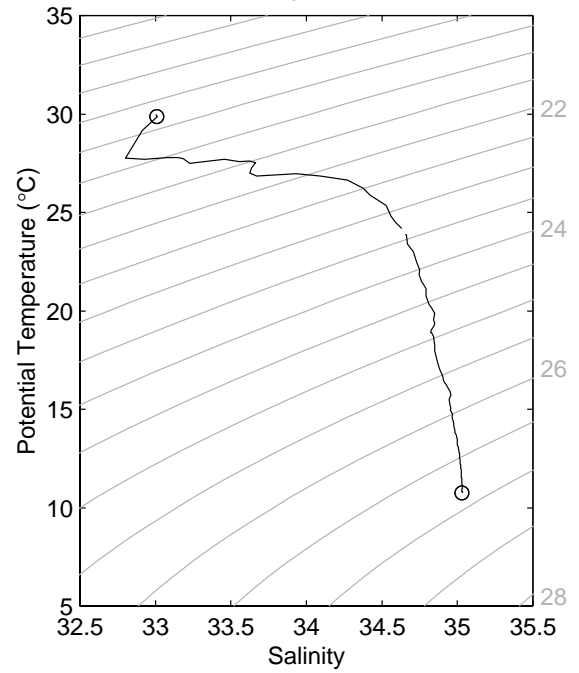
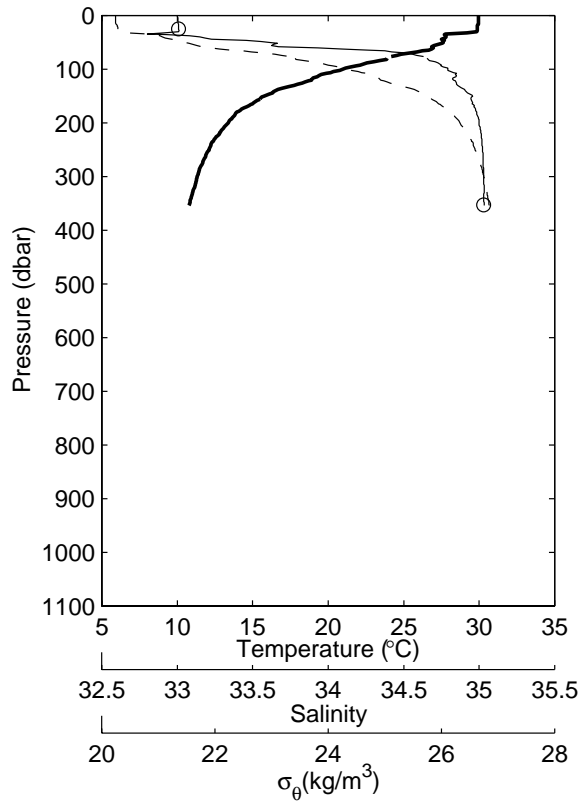


Figure 8.1.64. Same as Fig. 8.1.23 but for station 83 cast 1 and station 84 cast 1.

JASMINE Stn-85 Cast-1 11.86°N 88.65°E 14:33Z 12 May 1999



JASMINE Stn-86 Cast-1 11.98°N 88.73°E 15:38Z 12 May 1999

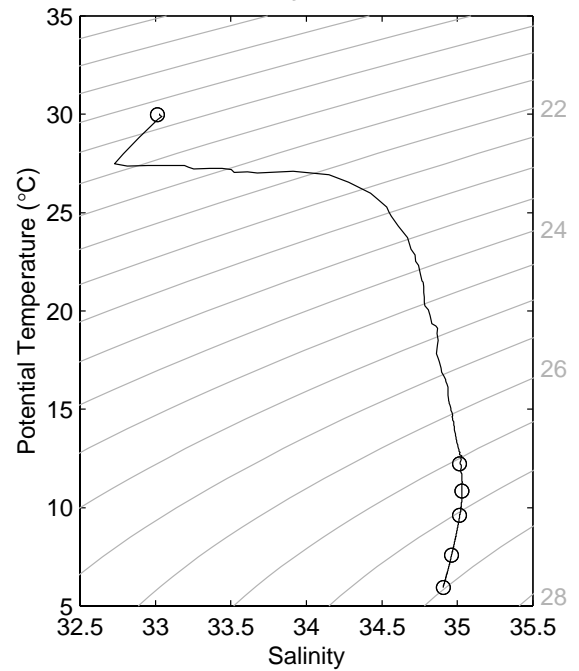
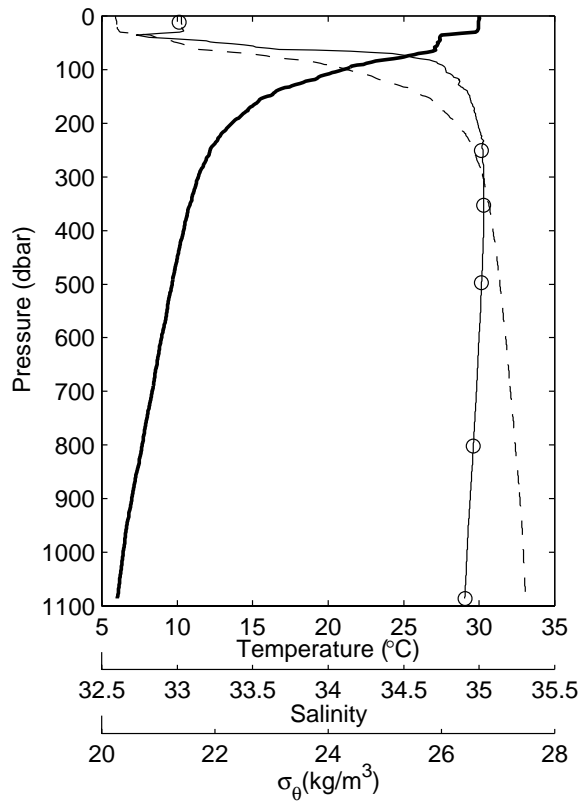
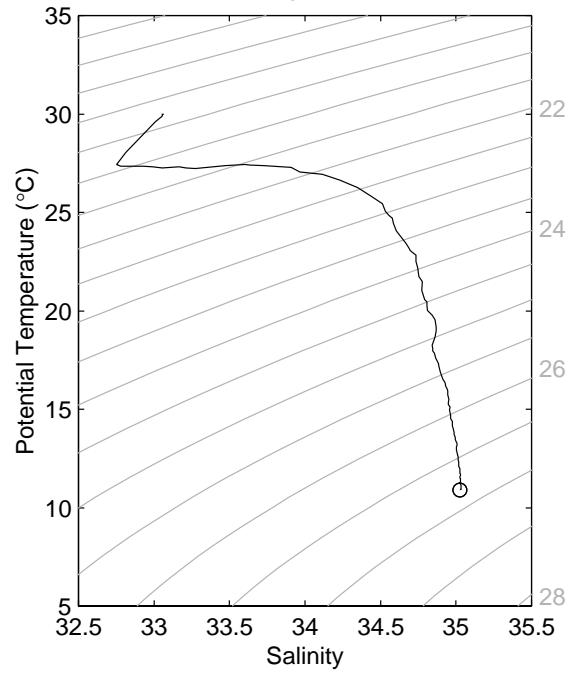
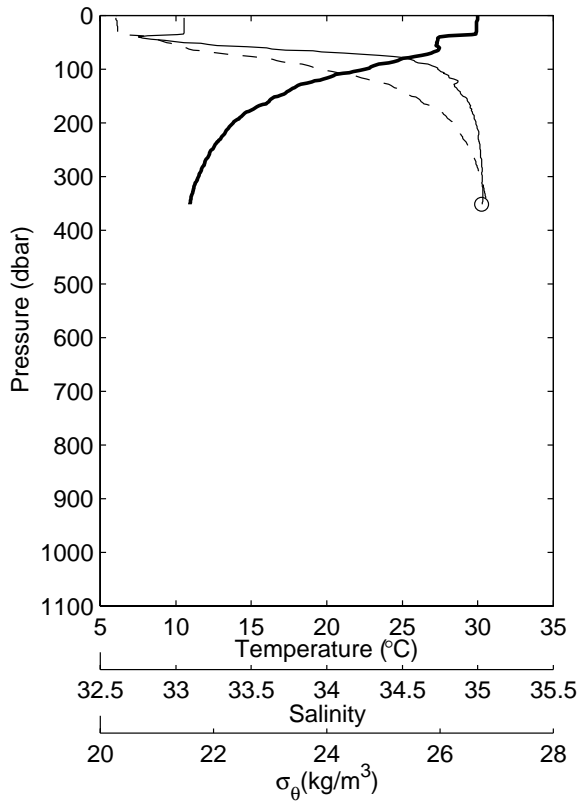


Figure 8.1.65. Same as Fig. 8.1.23 but for station 85 cast 1 and station 86 cast 1.

JASMINE Stn-87 Cast-1 11.96°N 88.62°E 17:22Z 12 May 1999



JASMINE Stn-88 Cast-1 11.92°N 88.50°E 18:25Z 12 May 1999

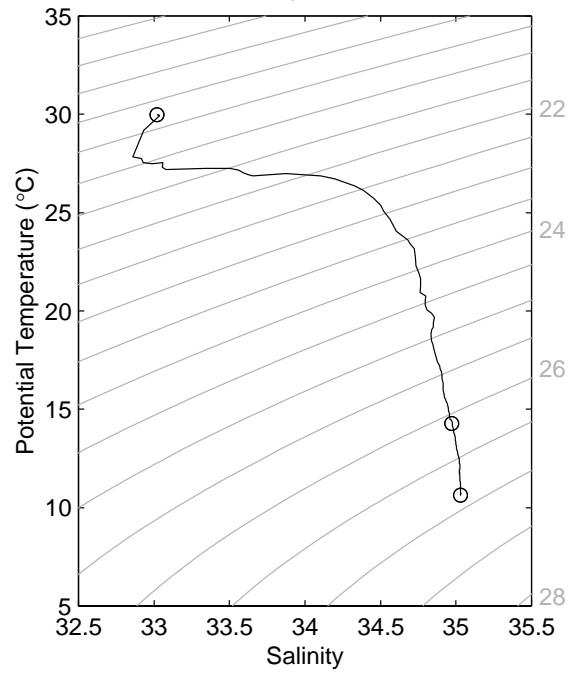
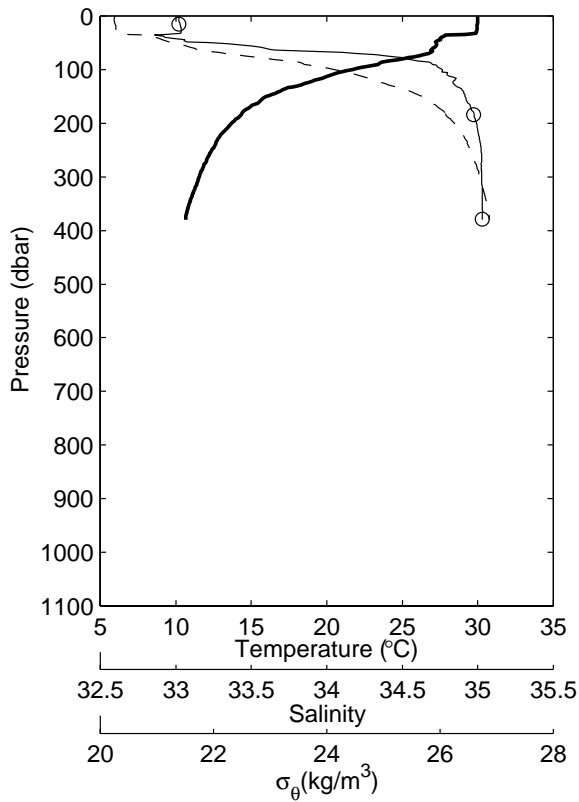
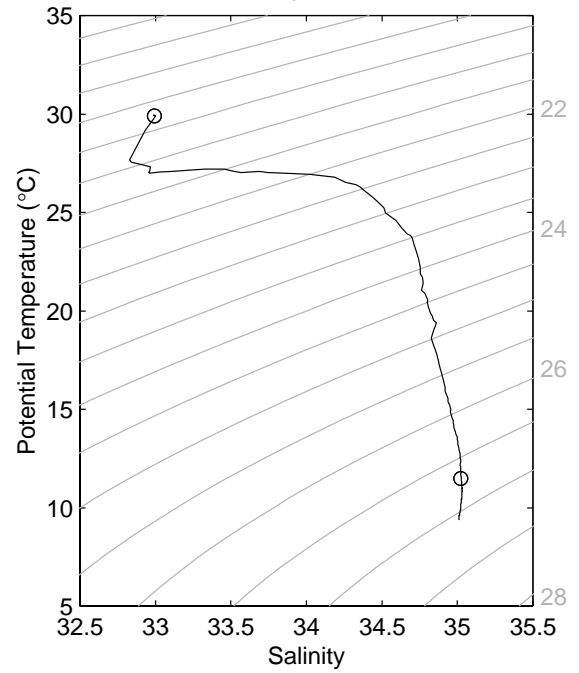
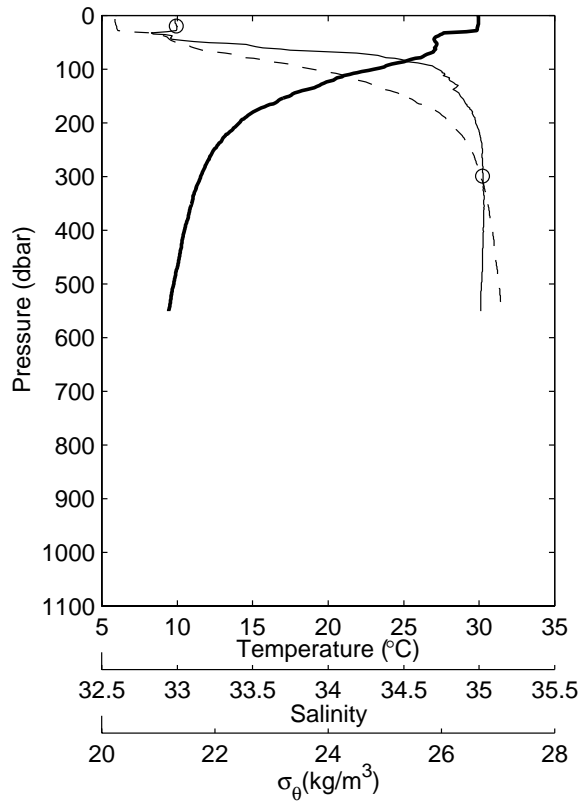


Figure 8.1.66. Same as Fig. 8.1.23 but for station 87 cast 1 and station 88 cast 1.

JASMINE Stn-89 Cast-1 11.88°N 88.37°E 19:36Z 12 May 1999



JASMINE Stn-90 Cast-1 11.84°N 88.48°E 20:42Z 12 May 1999

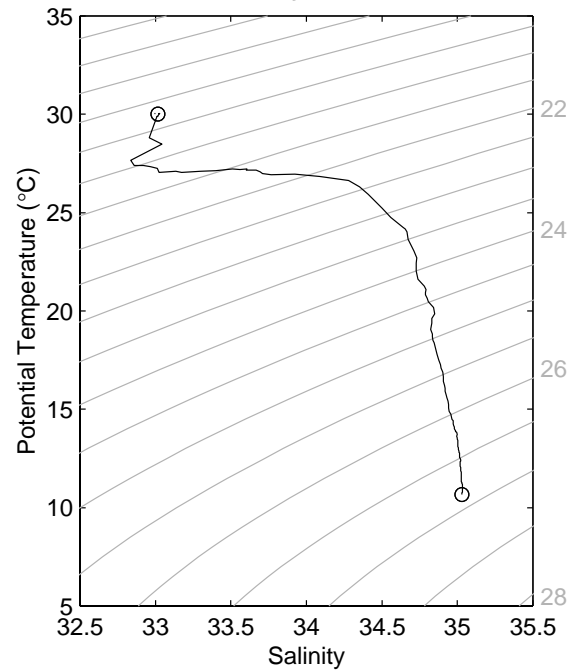
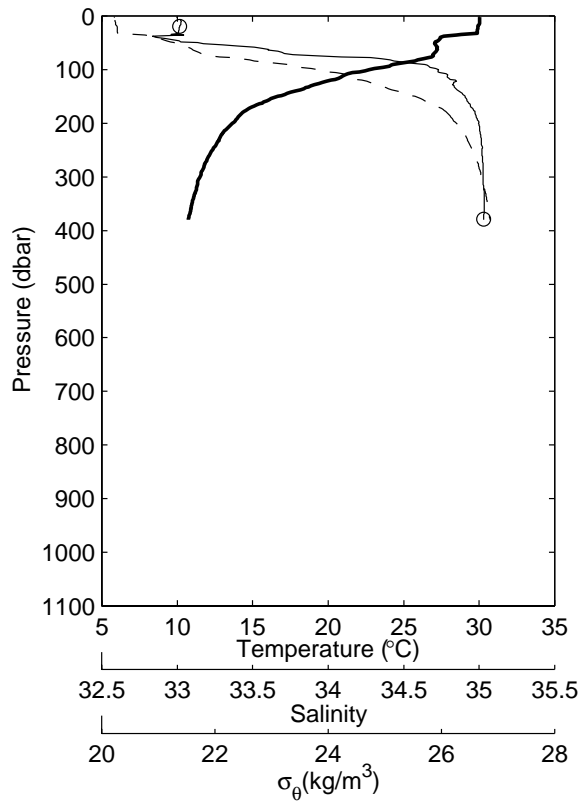
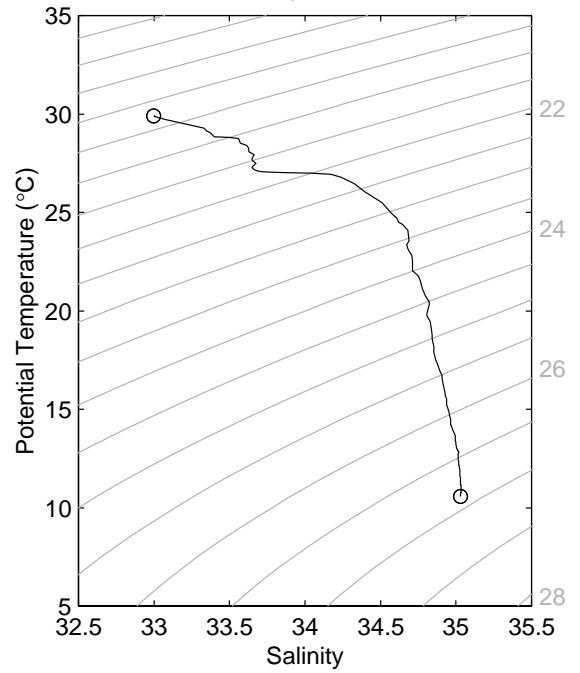
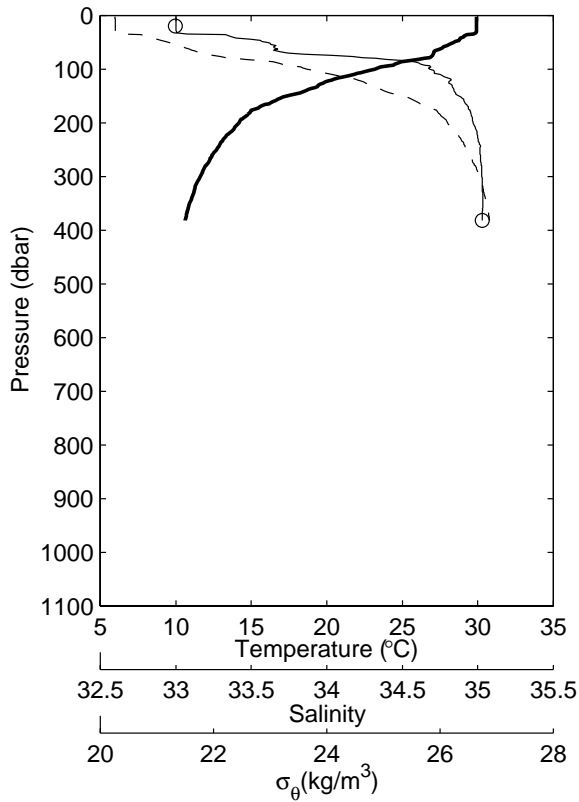


Figure 8.1.67. Same as Fig. 8.1.23 but for station 89 cast 1 and station 90 cast 1.

JASMINE Stn-91 Cast-1 11.79°N 88.62°E 22:09Z 12 May 1999



JASMINE Stn-92 Cast-1 11.75°N 88.75°E 23:17Z 12 May 1999

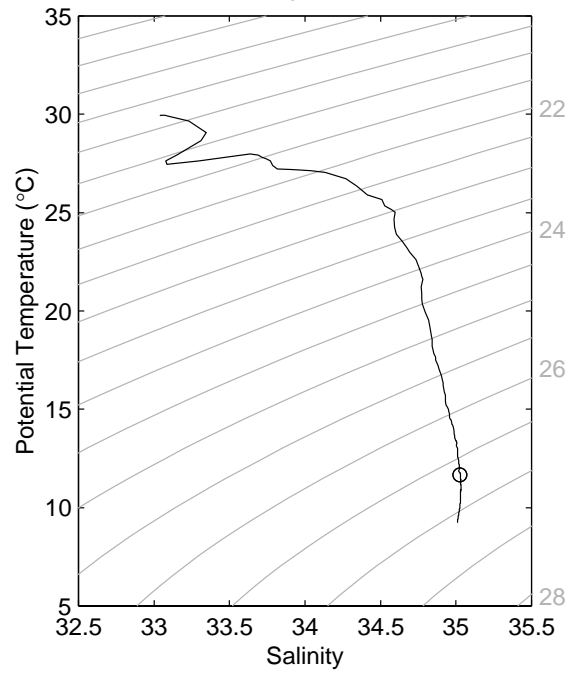
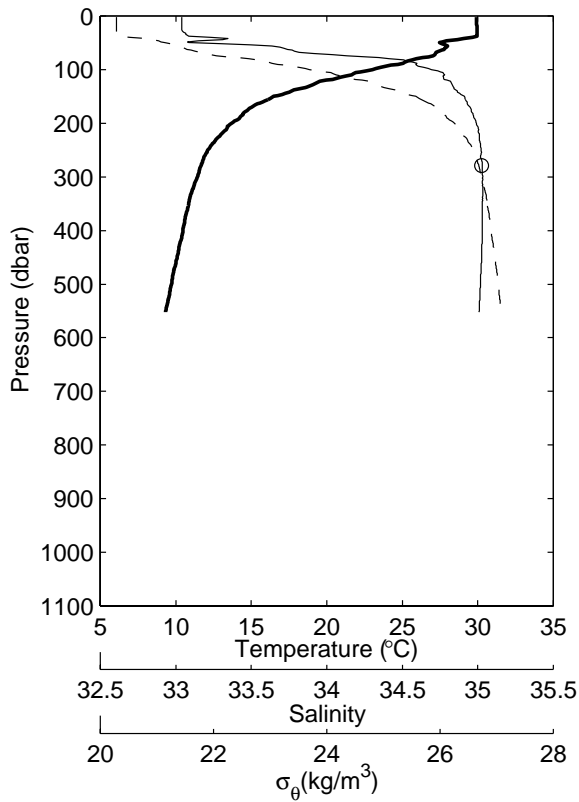
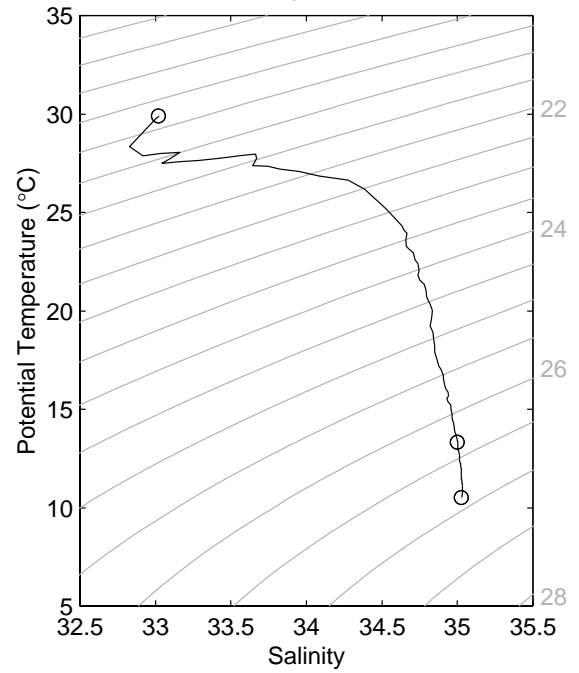
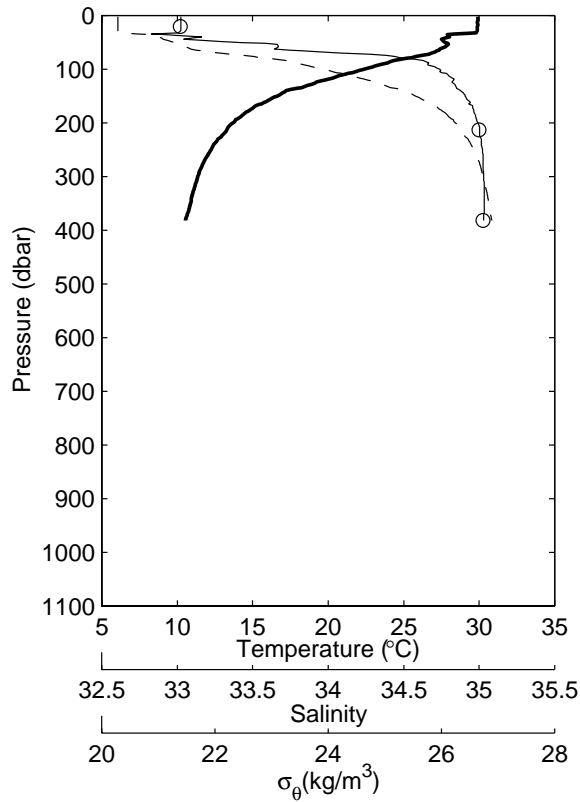


Figure 8.1.68. Same as Fig. 8.1.23 but for station 91 cast 1 and station 92 cast 1.

JASMINE Stn-93 Cast-1 11.86°N 88.67°E 00:32Z 13 May 1999



JASMINE Stn-94 Cast-1 11.97°N 88.59°E 01:38Z 13 May 1999

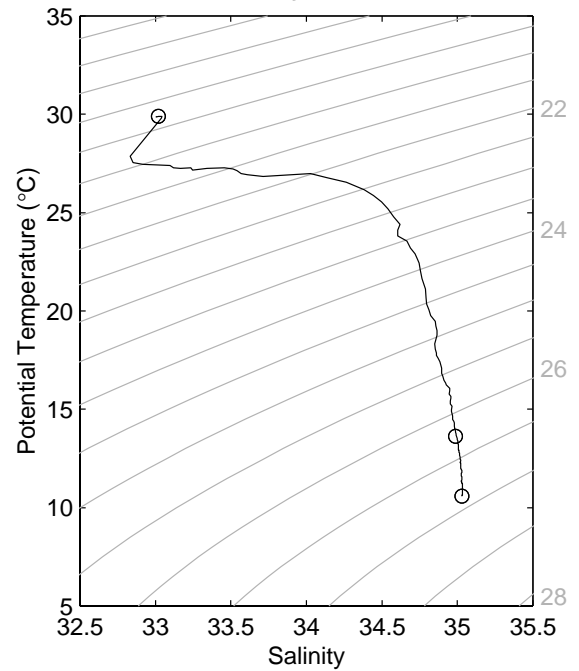
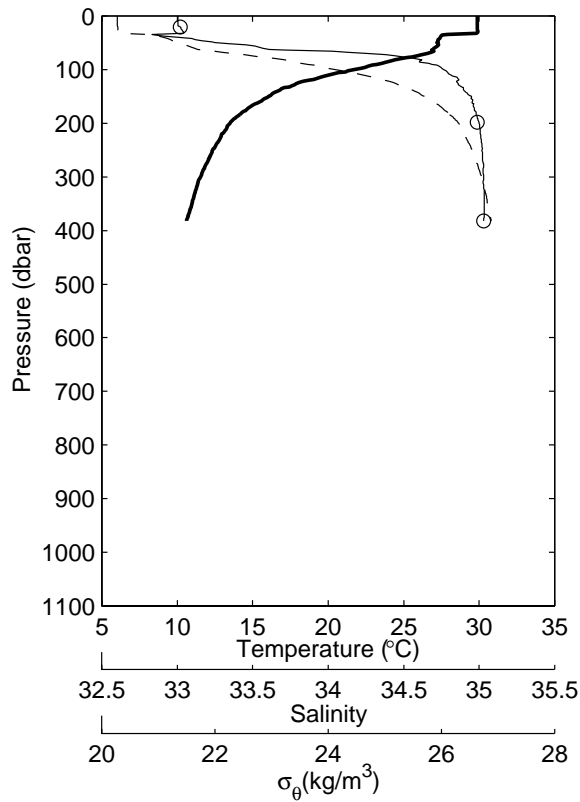
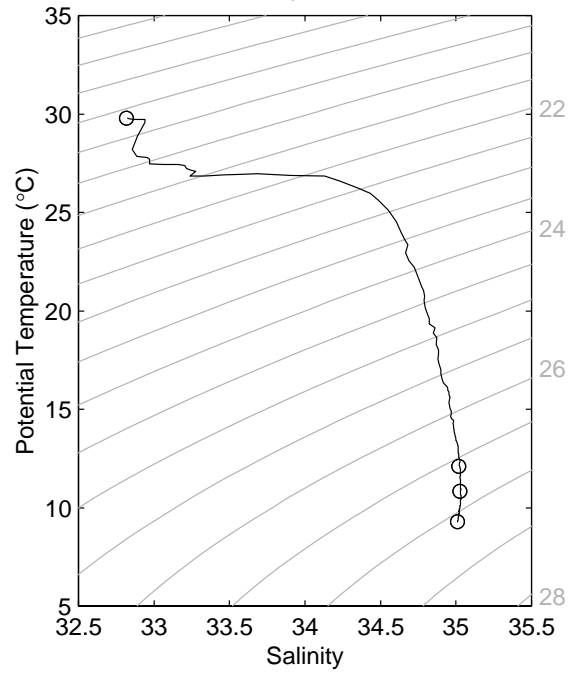
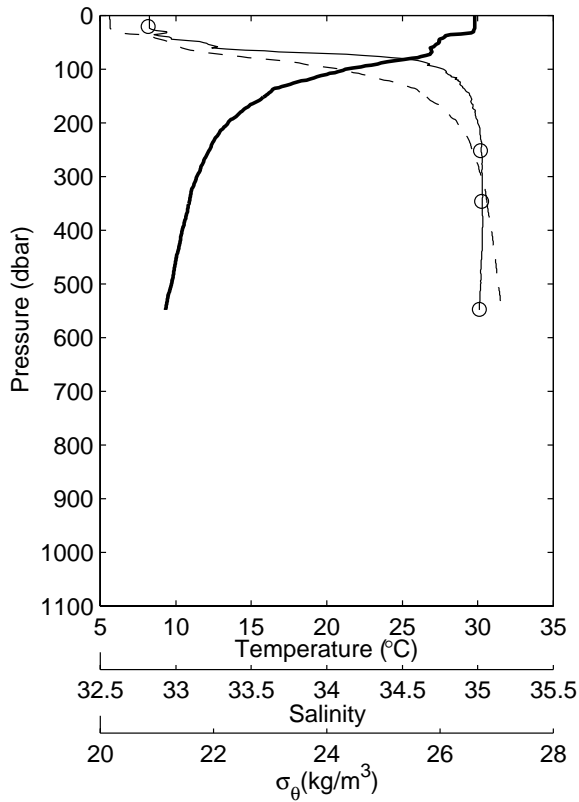


Figure 8.1.69. Same as Fig. 8.1.23 but for station 93 cast 1 and station 94 cast 1.

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JASMINE Stn-96 Cast-1 11.94°N 88.52°E 04:05Z 13 May 1999

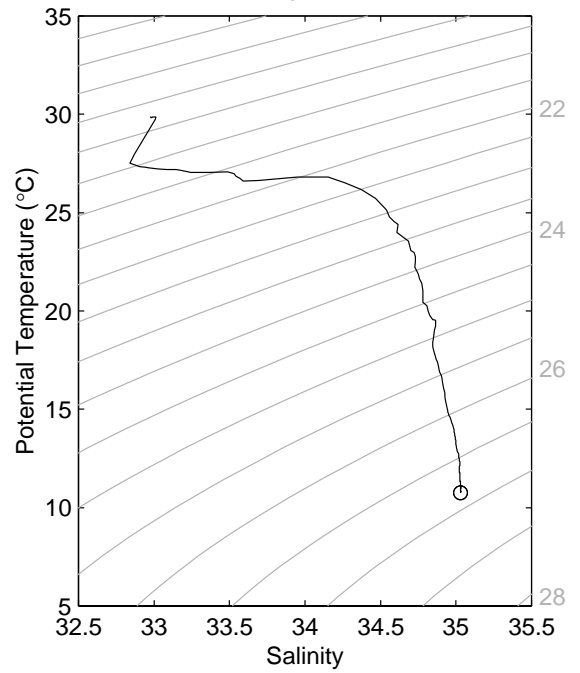
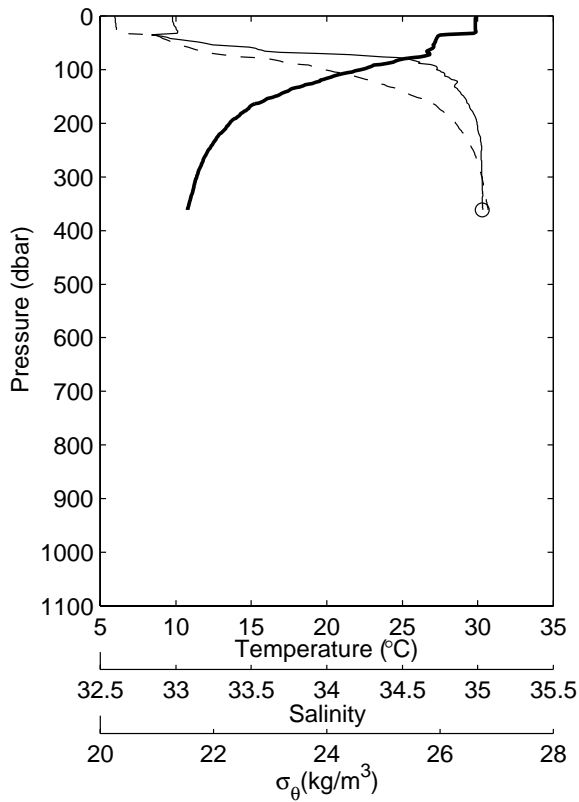
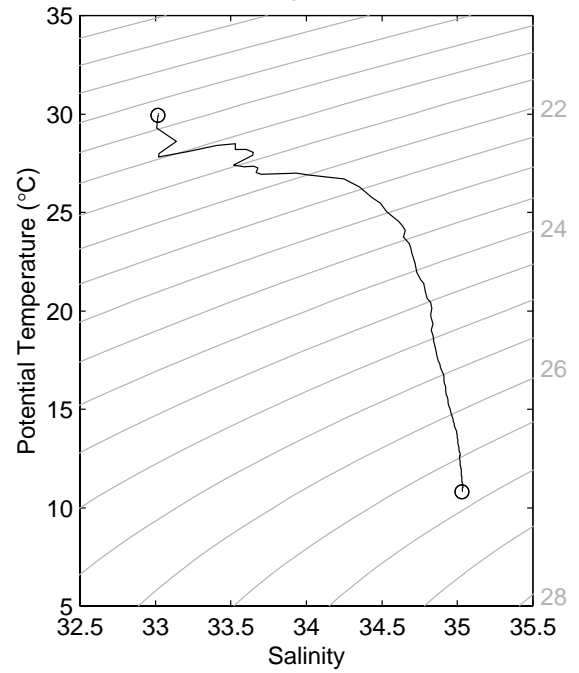
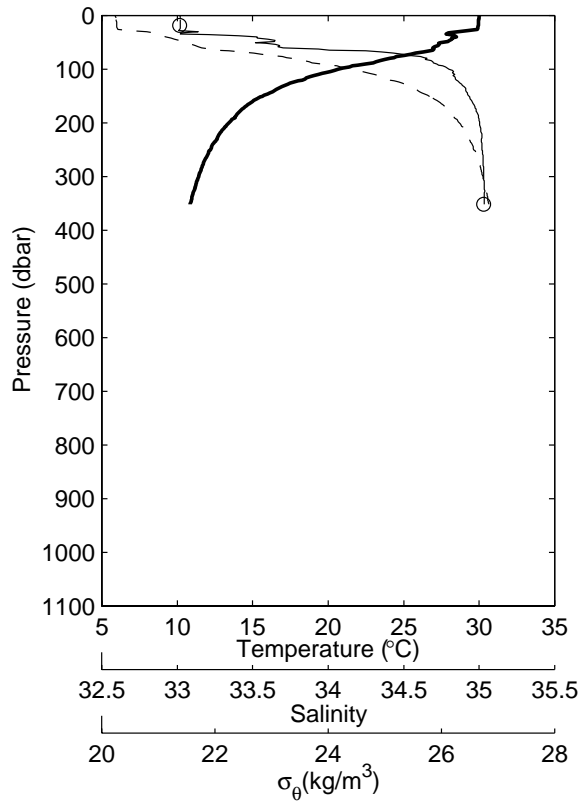


Figure 8.1.70. Same as Fig. 8.1.23 but for station 95 cast 1 and station 96 cast 1.

JASMINE Stn-97 Cast-1 11.81°N 88.52°E 05:13Z 13 May 1999



JASMINE Stn-98 Cast-1 11.68°N 88.52°E 06:16Z 13 May 1999

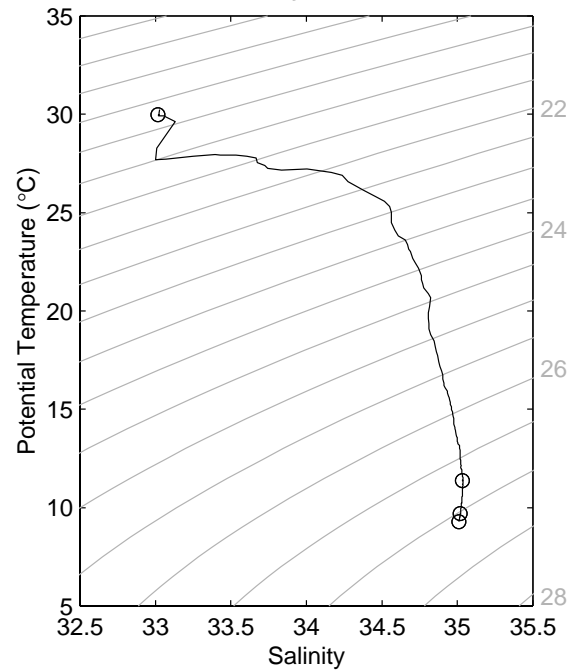
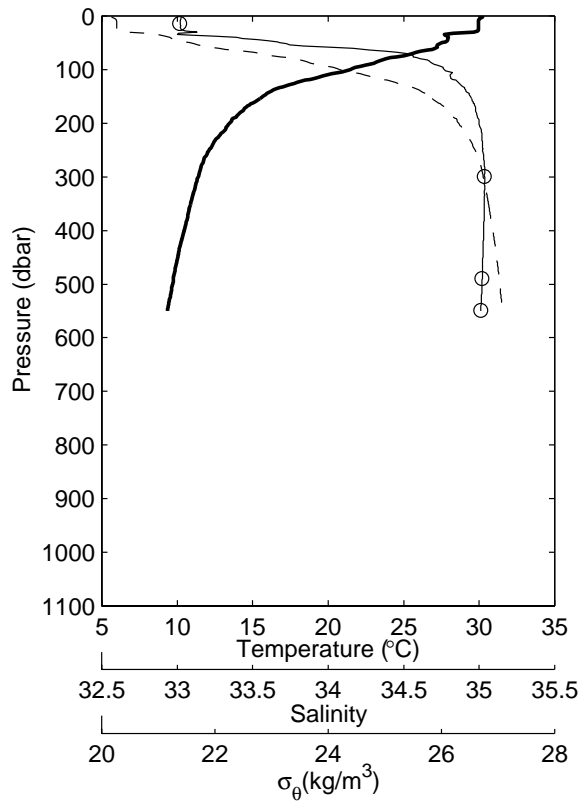
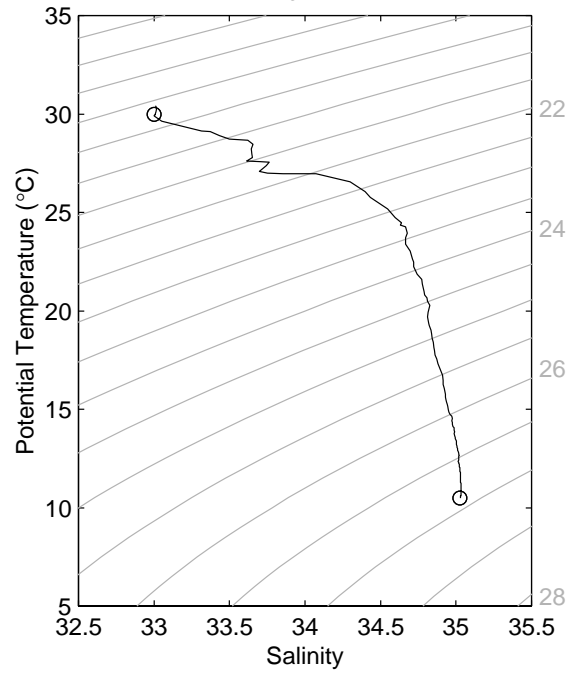
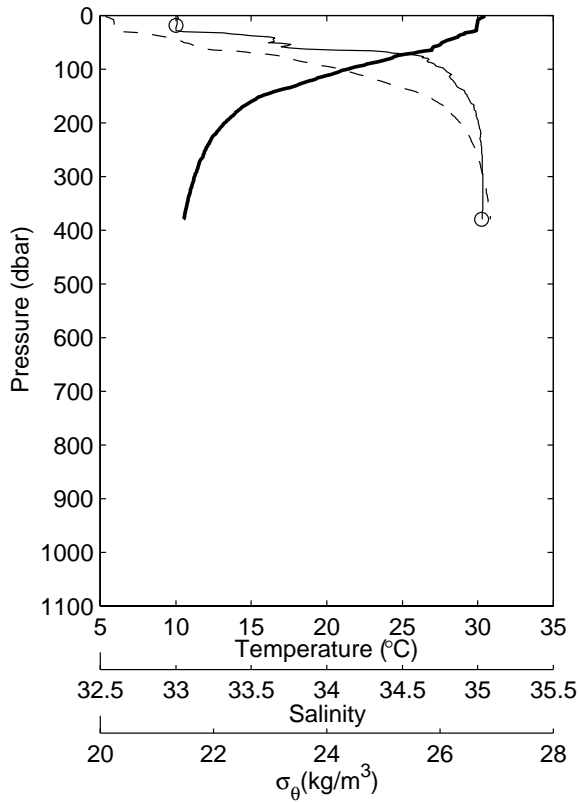


Figure 8.1.71. Same as Fig. 8.1.23 but for station 97 cast 1 and station 98 cast 1.

JASMINE Stn-99 Cast-1 11.78°N 88.59°E 07:33Z 13 May 1999



JASMINE Stn-100 Cast-1 11.89°N 88.67°E 08:33Z 13 May 1999

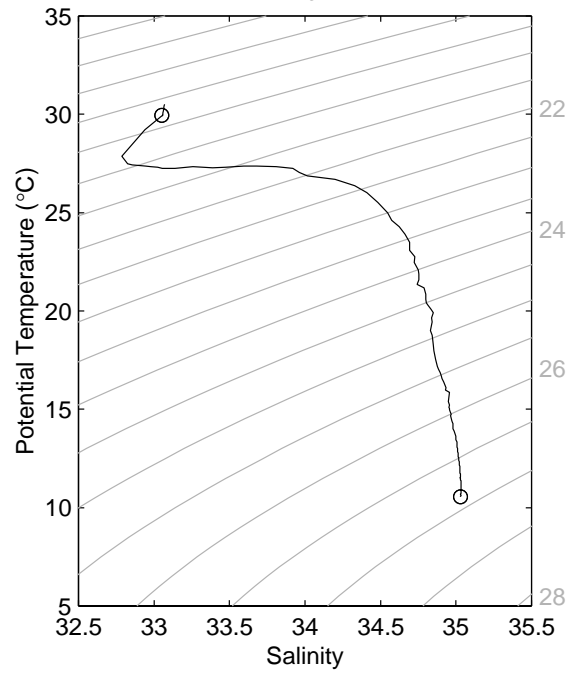
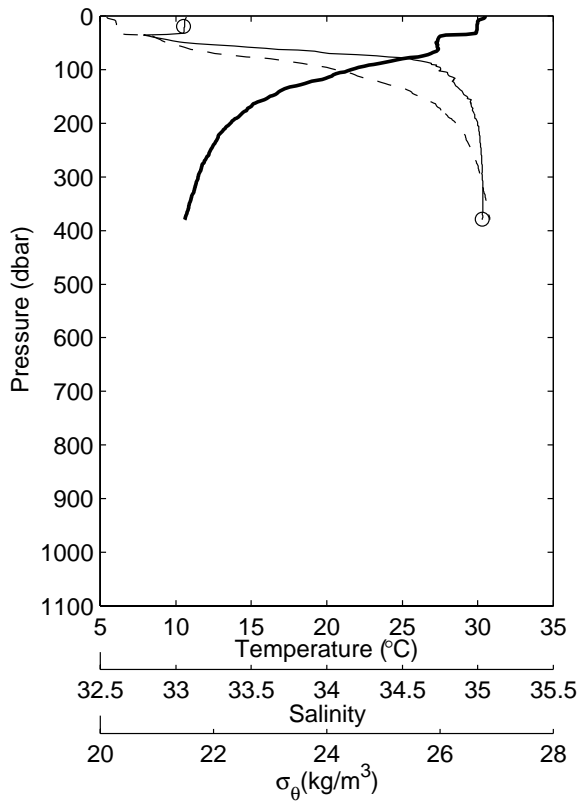
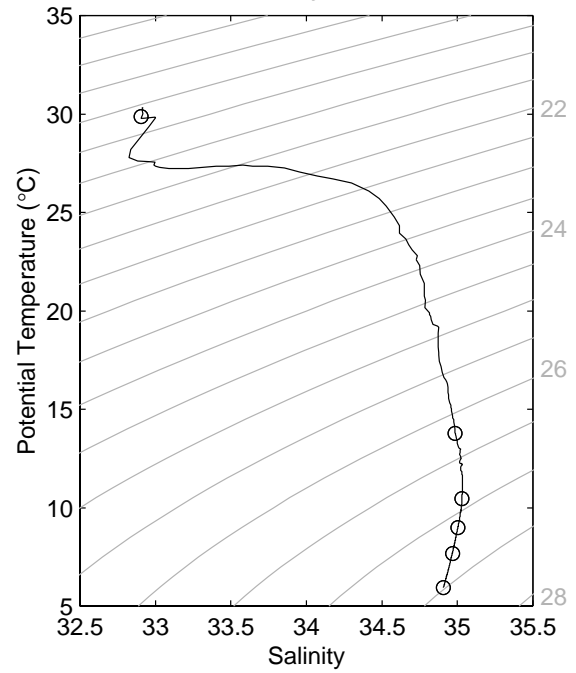
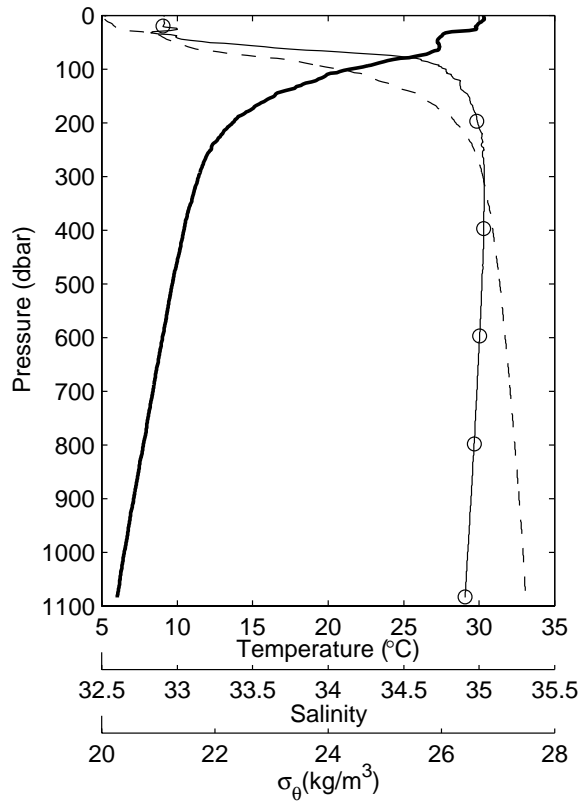


Figure 8.1.72. Same as Fig. 8.1.23 but for station 99 cast 1 and station 100 cast 1.

JASMINE Stn-101 Cast-1 11.96°N 88.72°E 09:22Z 13 May 1999



JASMINE Stn-102 Cast-1 11.98°N 88.67°E 10:53Z 13 May 1999

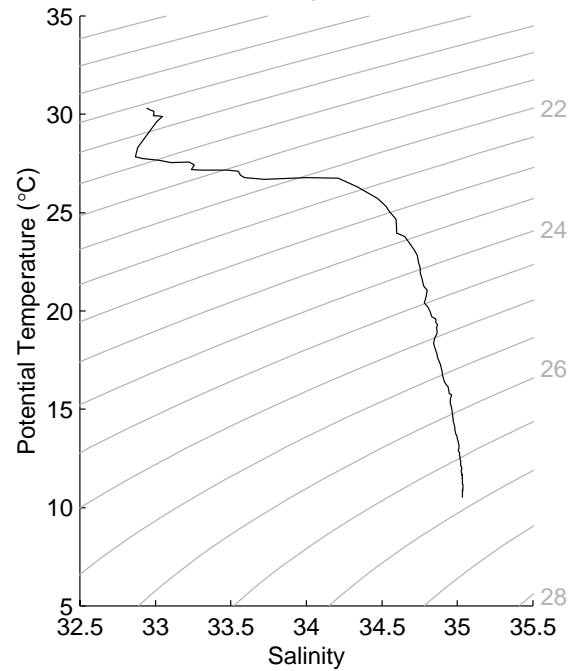
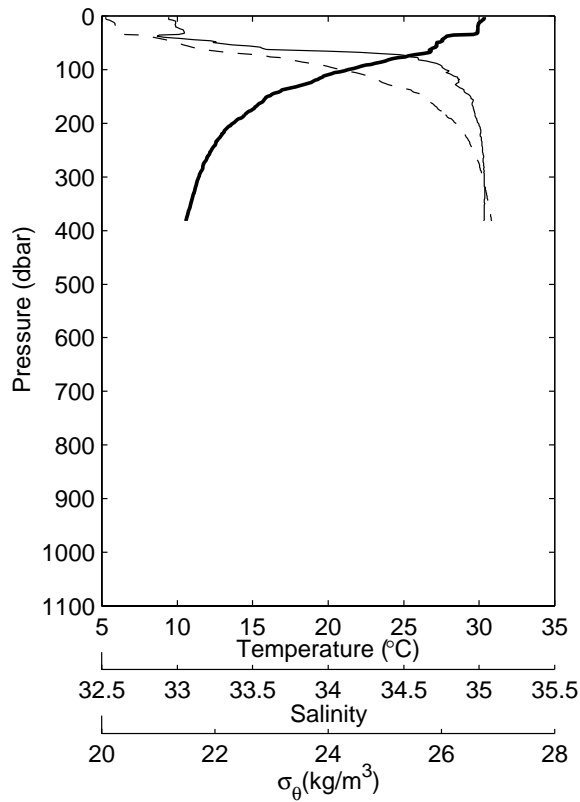
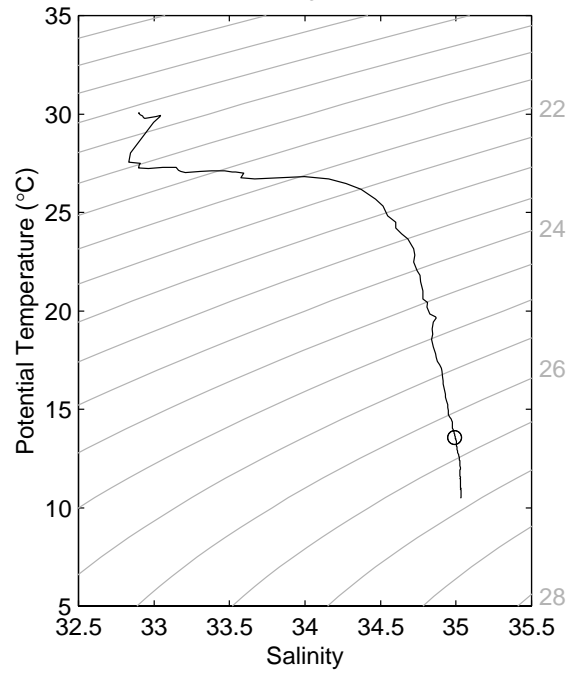
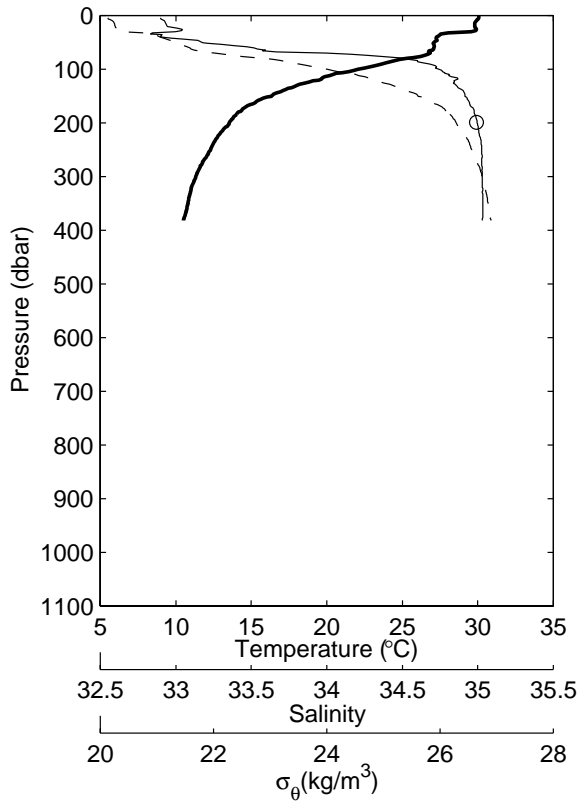


Figure 8.1.73. Same as Fig. 8.1.23 but for station 101 cast 1 and station 102 cast 1.

JASMINE Stn-103 Cast-1 11.92°N 88.50°E 12:18Z 13 May 1999



JASMINE Stn-104 Cast-1 11.88°N 88.37°E 13:25Z 13 May 1999

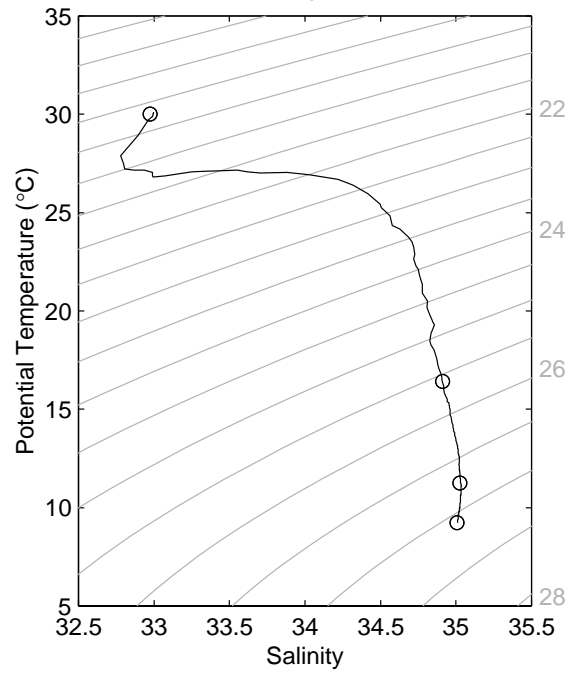
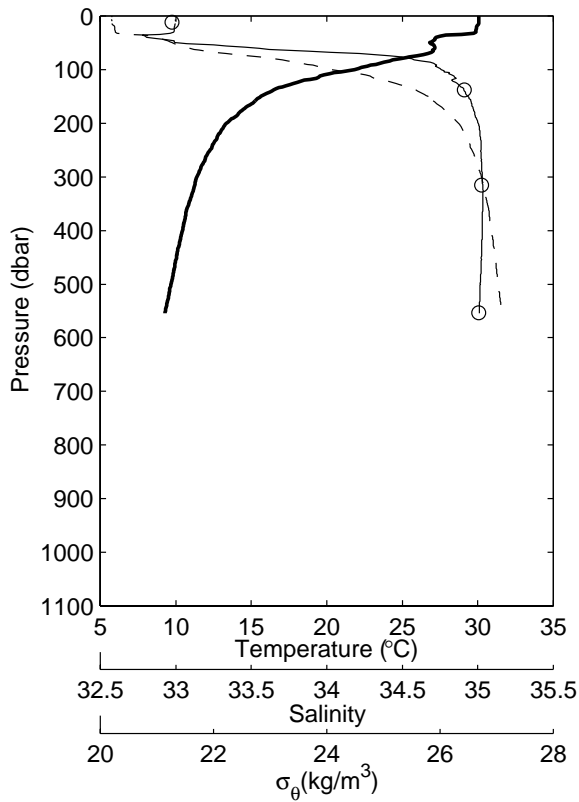
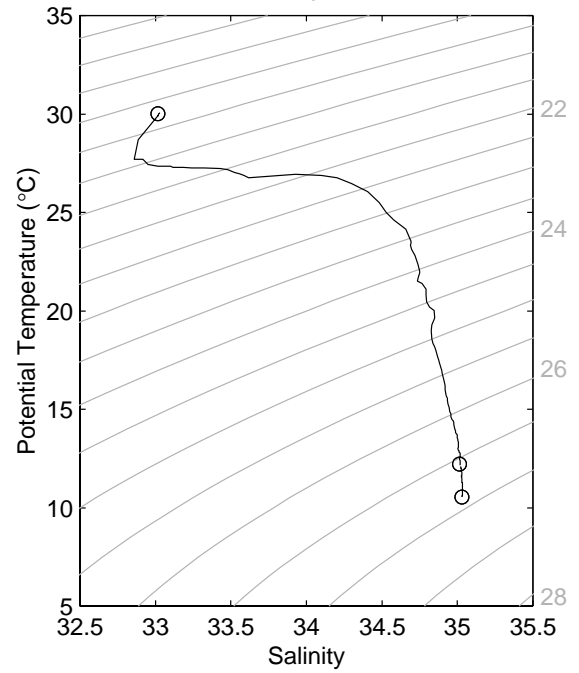
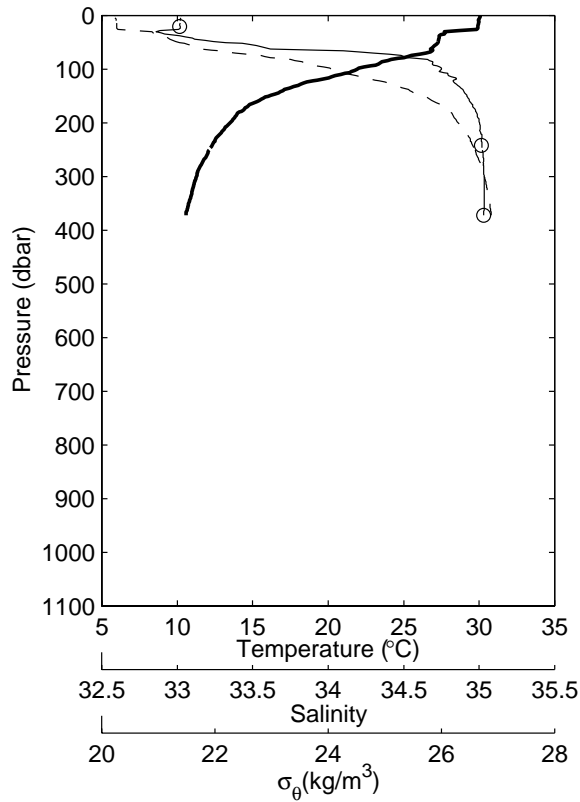


Figure 8.1.74. Same as Fig. 8.1.23 but for station 103 cast 1 and station 104 cast 1.

JASMINE Stn-105 Cast-1 11.84°N 88.50°E 14:38Z 13 May 1999



JASMINE Stn-106 Cast-1 11.79°N 88.62°E 15:42Z 13 May 1999

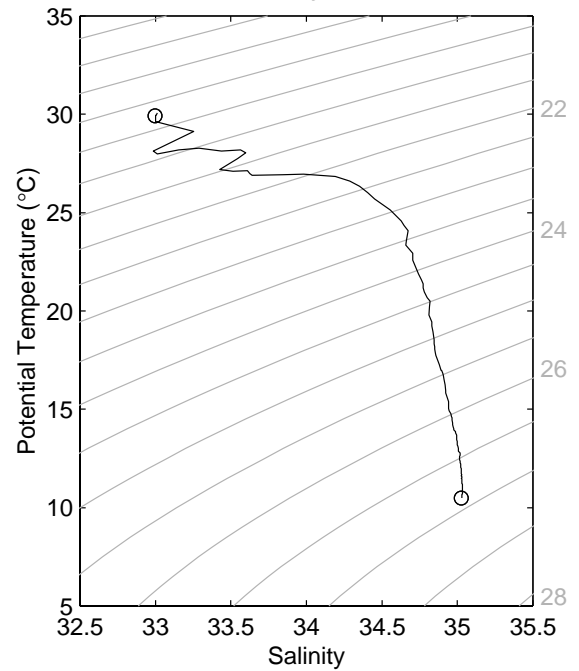
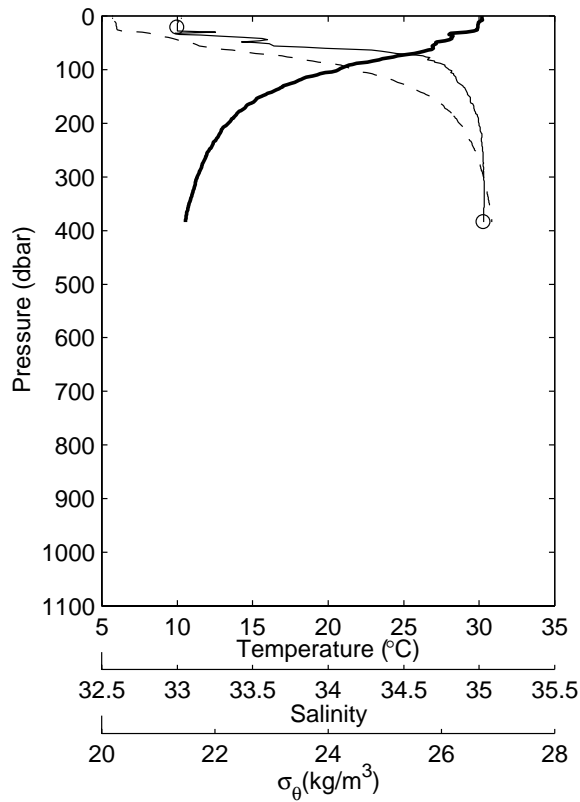
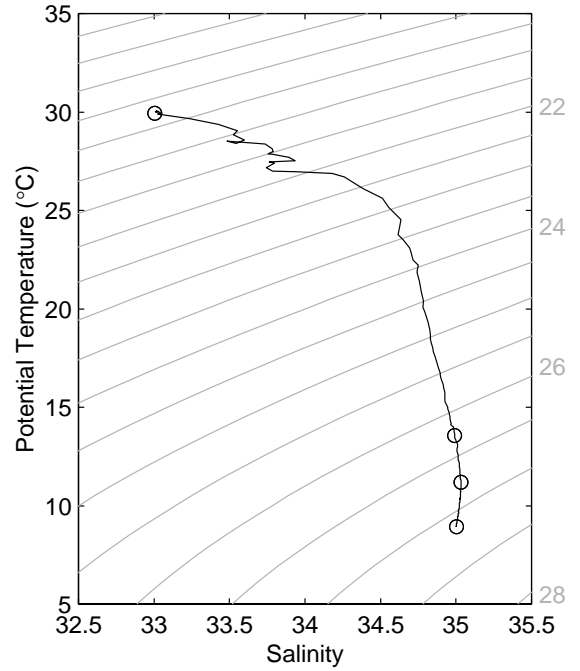
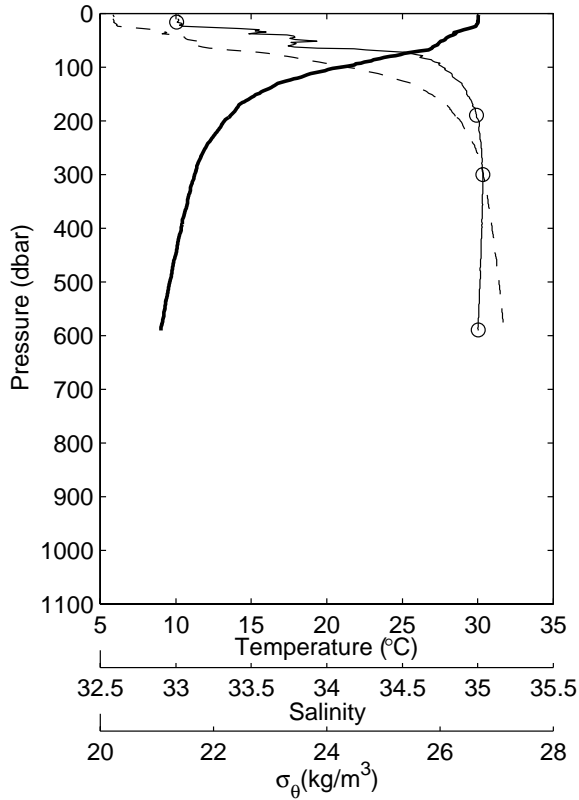


Figure 8.1.75. Same as Fig. 8.1.23 but for station 105 cast 1 and station 106 cast 1.

JASMINE Stn-107 Cast-1 11.75°N 88.75°E 16:44Z 13 May 1999



JASMINE Stn-108 Cast-1 11.86°N 88.68°E 17:55Z 13 May 1999

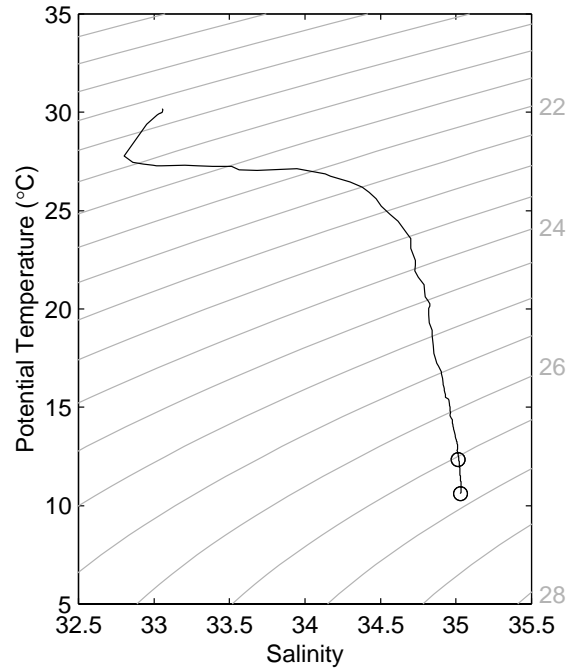
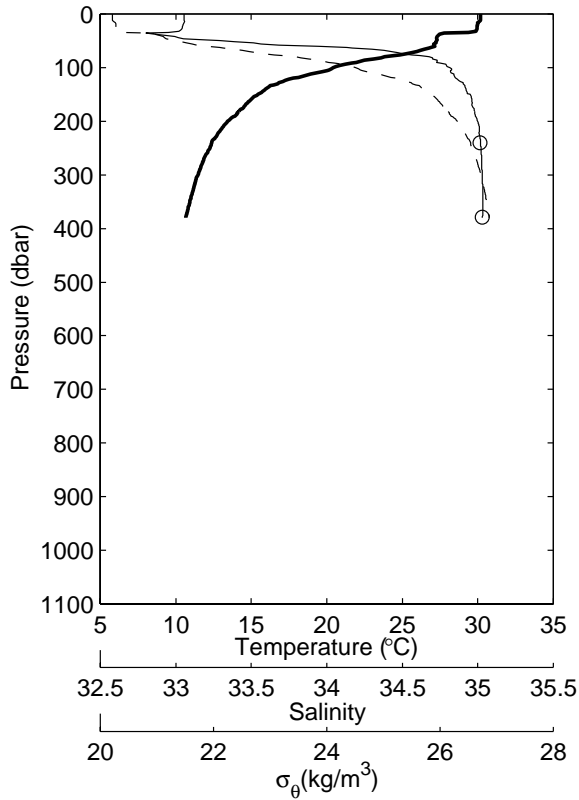
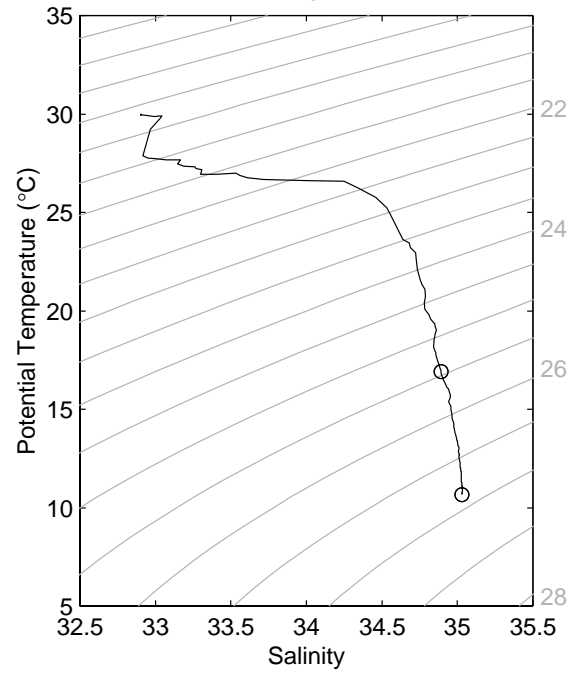
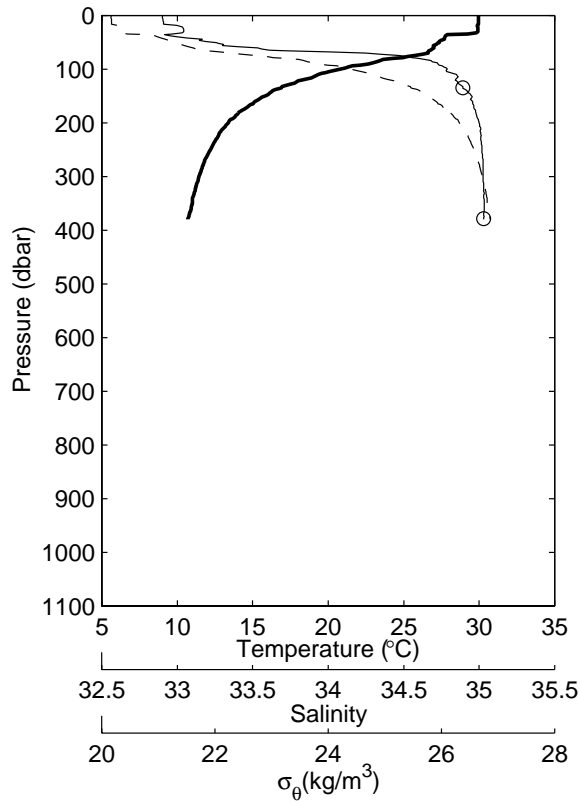


Figure 8.1.76. Same as Fig. 8.1.23 but for station 107 cast 1 and station 108 cast 1.

JASMINE Stn-109 Cast-1 11.96°N 88.60°E 19:02Z 13 May 1999



JASMINE Stn-110 Cast-1 12.08°N 88.51°E 20:15Z 13 May 1999

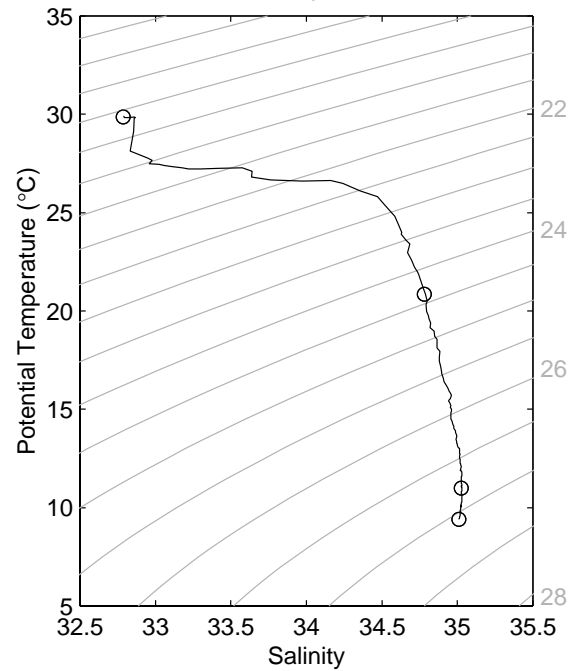
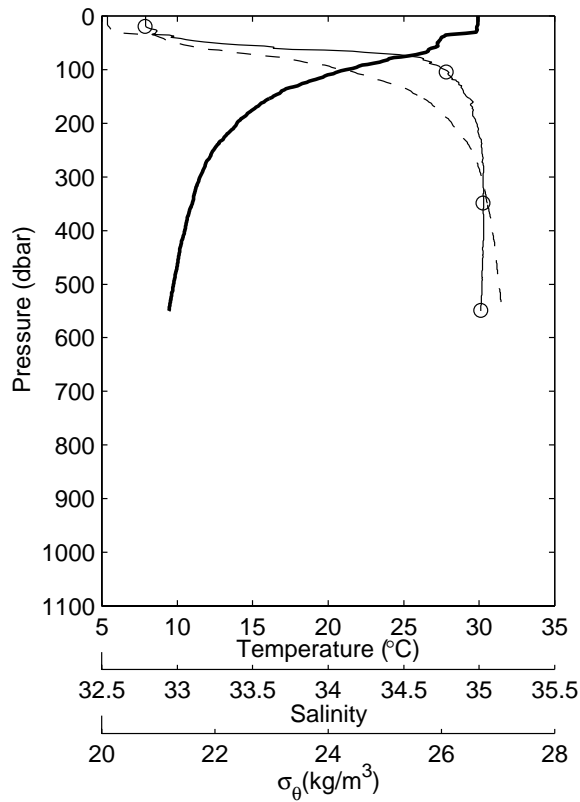
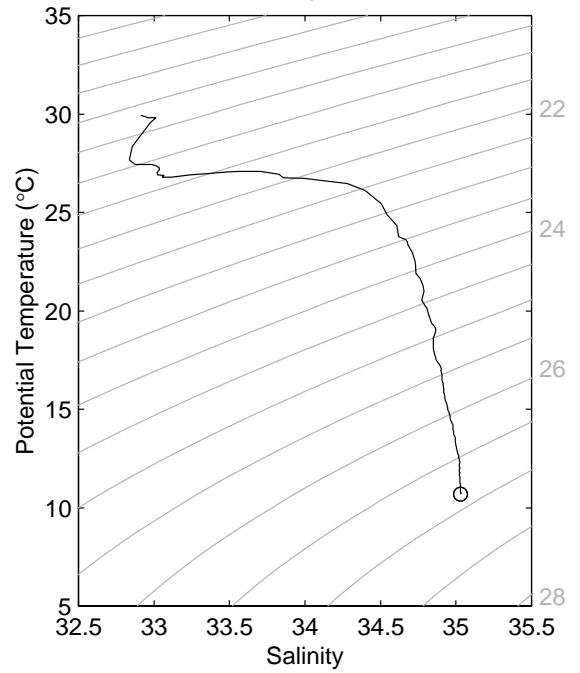
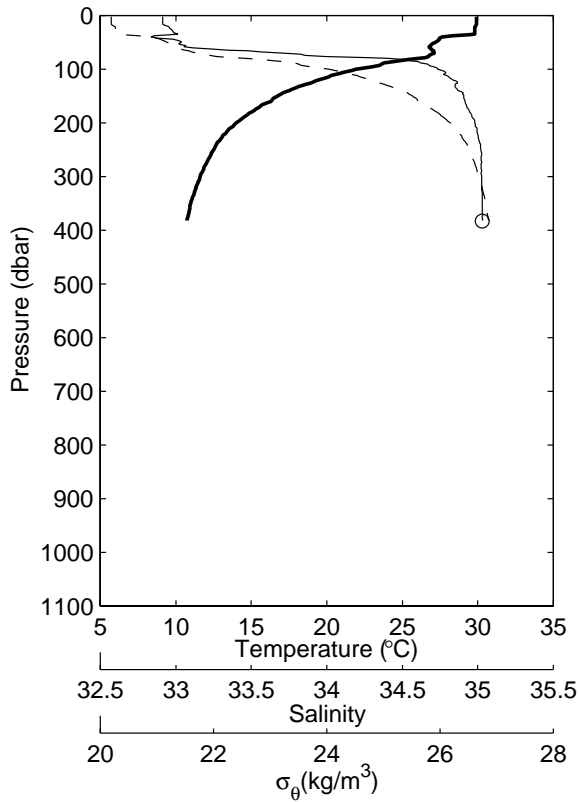


Figure 8.1.77. Same as Fig. 8.1.23 but for station 109 cast 1 and station 110 cast 1.

JASMINE Stn-111 Cast-1 11.94°N 88.51°E 21:27Z 13 May 1999



JASMINE Stn-112 Cast-1 11.81°N 88.52°E 22:35Z 13 May 1999

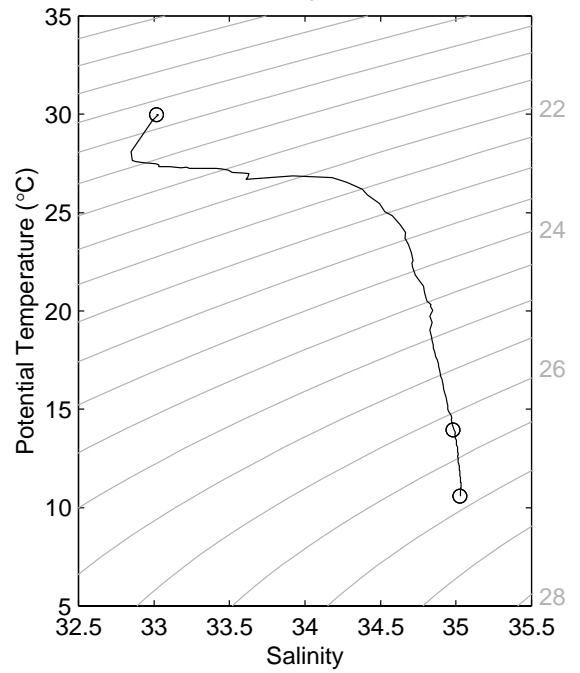
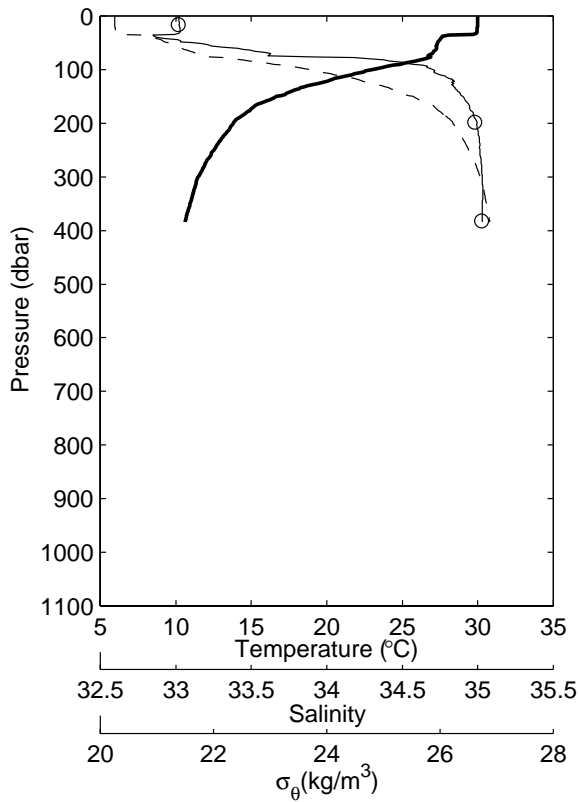
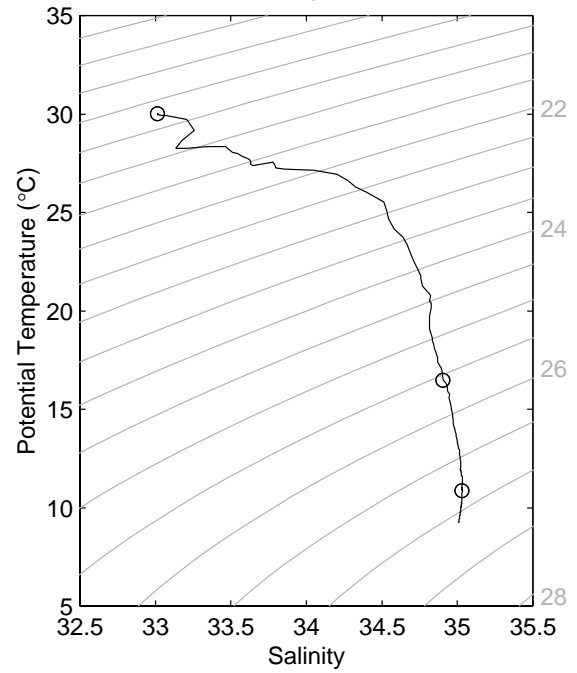
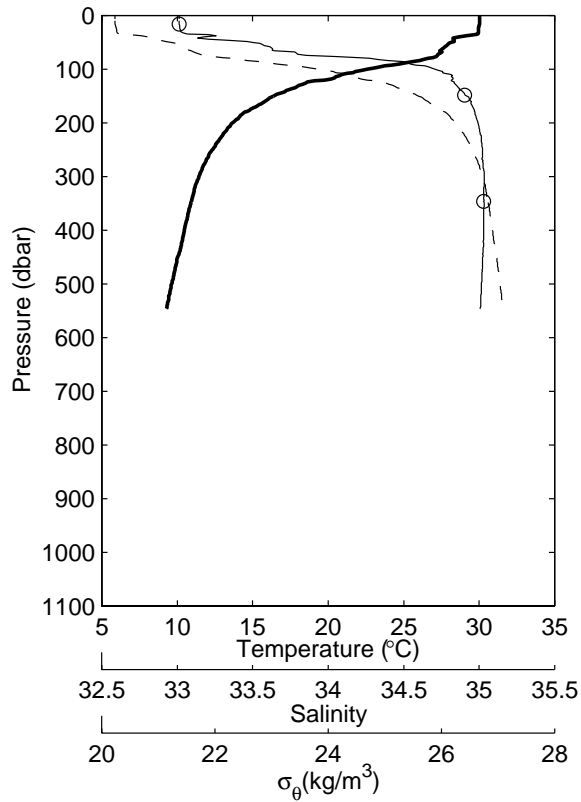


Figure 8.1.78. Same as Fig. 8.1.23 but for station 111 cast 1 and station 112 cast 1.

JASMINE Stn-113 Cast-1 11.68°N 88.51°E 23:43Z 13 May 1999



JASMINE Stn-114 Cast-1 11.78°N 88.59°E 00:56Z 14 May 1999

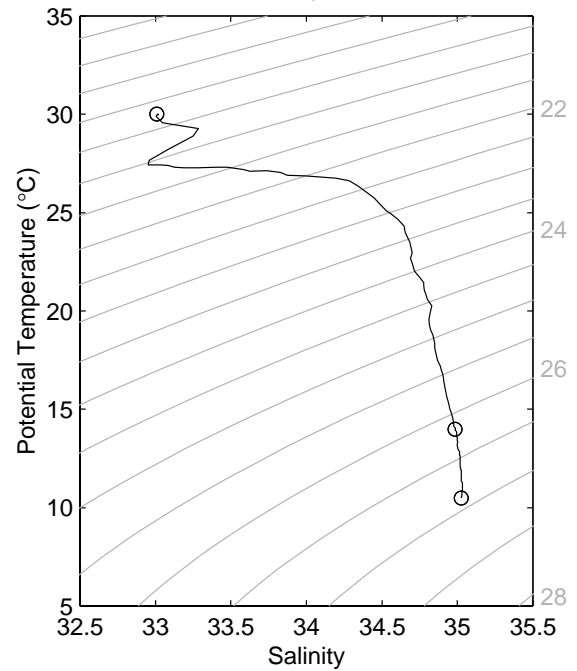
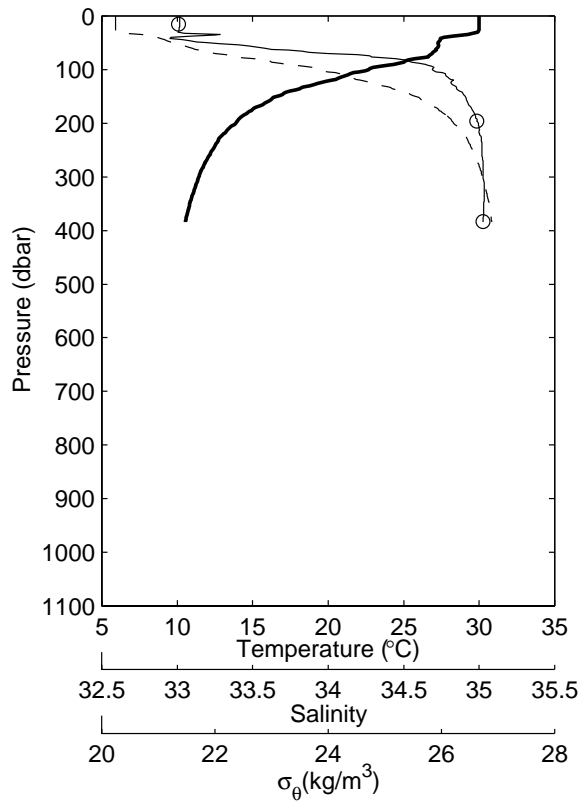
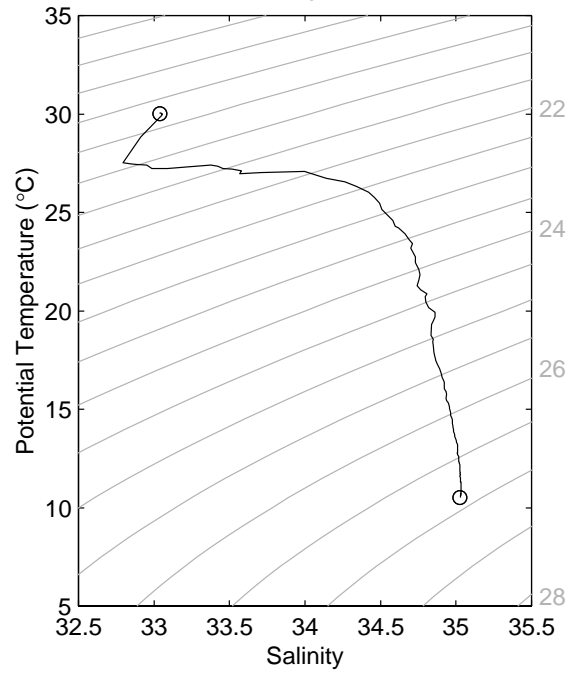
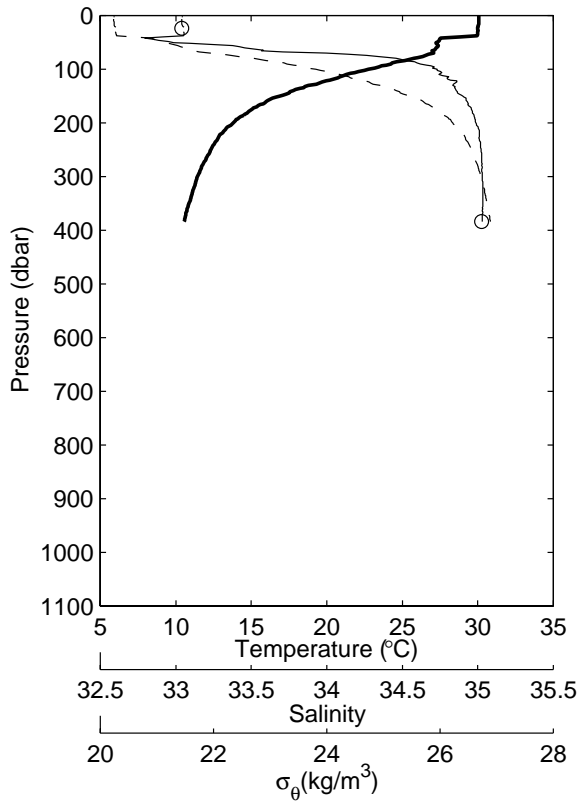


Figure 8.1.79. Same as Fig. 8.1.23 but for station 113 cast 1 and station 114 cast 1.

JASMINE Stn-115 Cast-1 11.89°N 88.67°E 01:58Z 14 May 1999



JASMINE Stn-116 Cast-1 12.00°N 88.75°E 03:11Z 14 May 1999

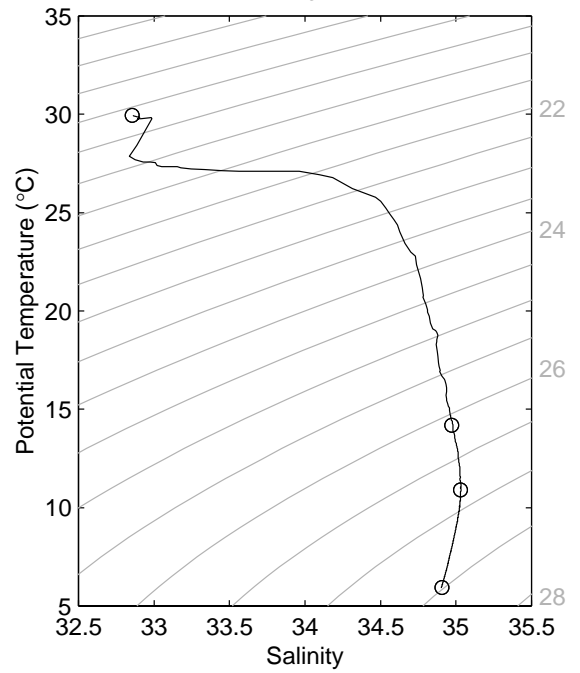
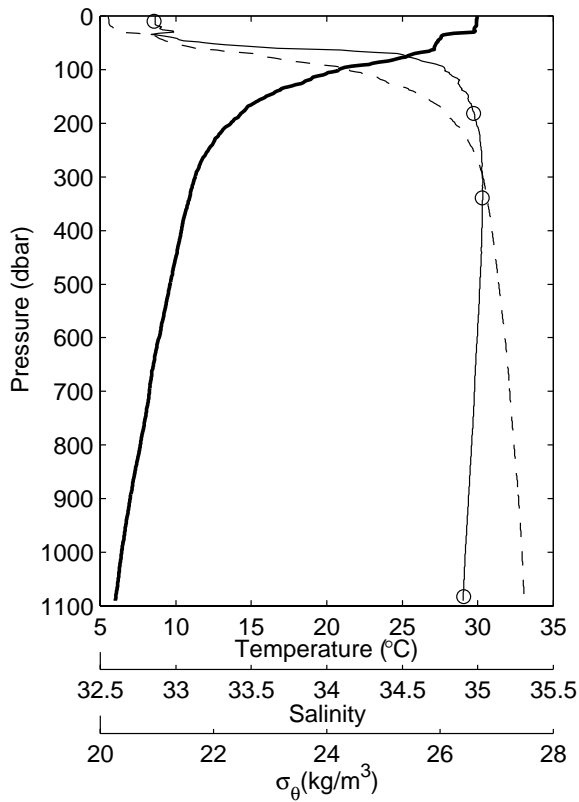
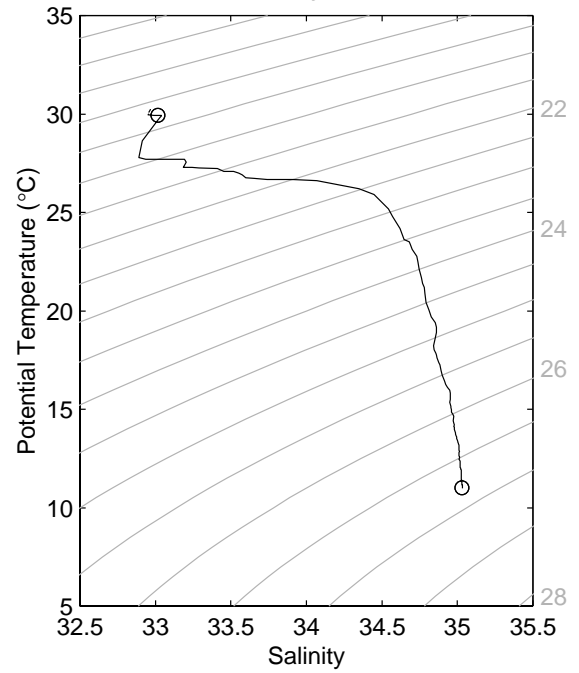
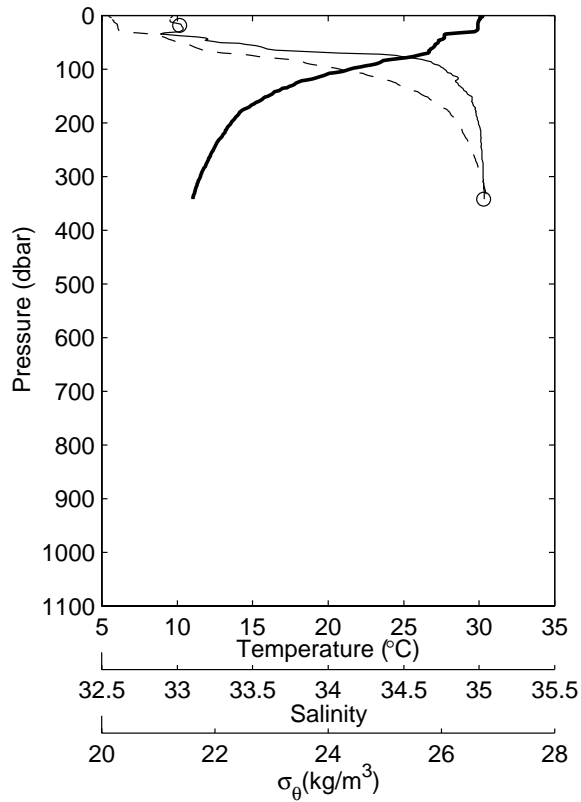


Figure 8.1.80. Same as Fig. 8.1.23 but for station 115 cast 1 and station 116 cast 1.

JASMINE Stn-117 Cast-2 11.96°N 88.62°E 05:34Z 14 May 1999



JASMINE Stn-118 Cast-1 11.93°N 88.54°E 06:22Z 14 May 1999

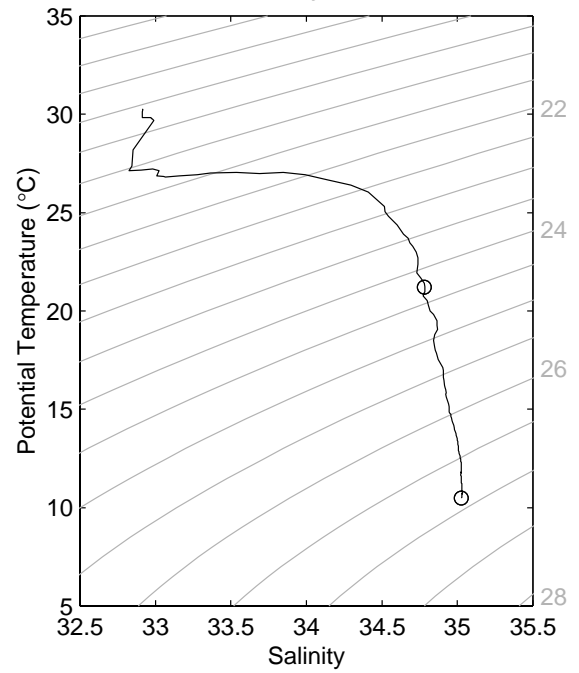
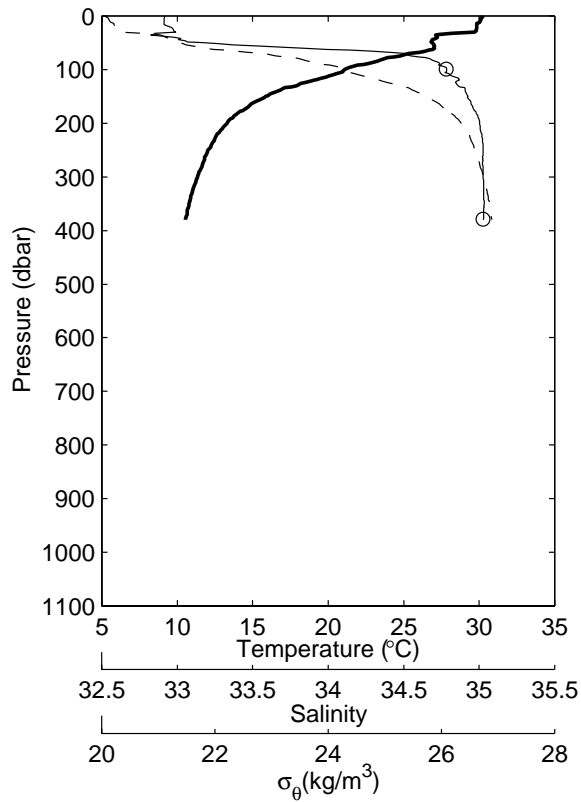
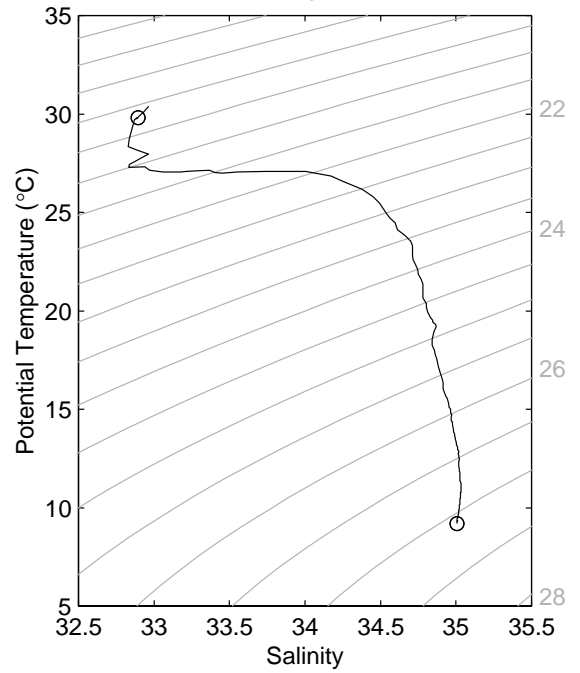
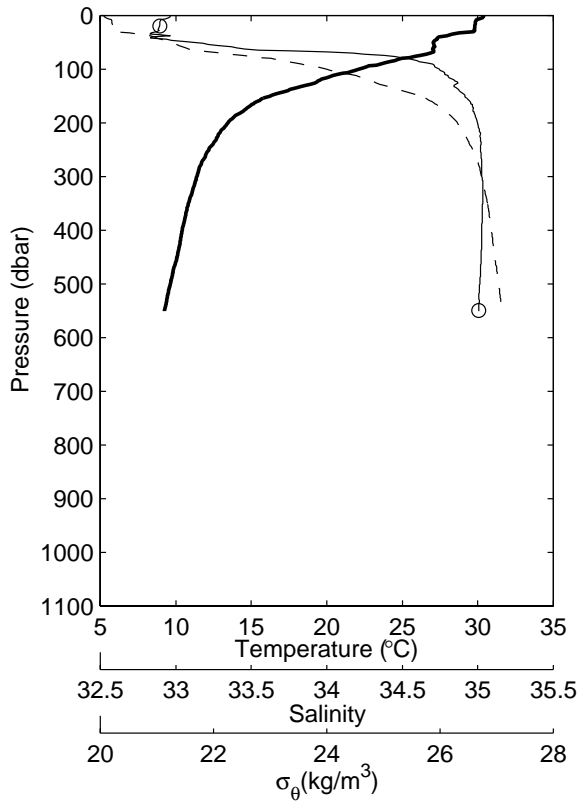


Figure 8.1.81. Same as Fig. 8.1.23 but for station 117 cast 1 and station 118 cast 1.

JASMINE Stn-119 Cast-1 11.88°N 88.38°E 07:38Z 14 May 1999



JASMINE Stn-120 Cast-1 11.83°N 88.50°E 08:53Z 14 May 1999

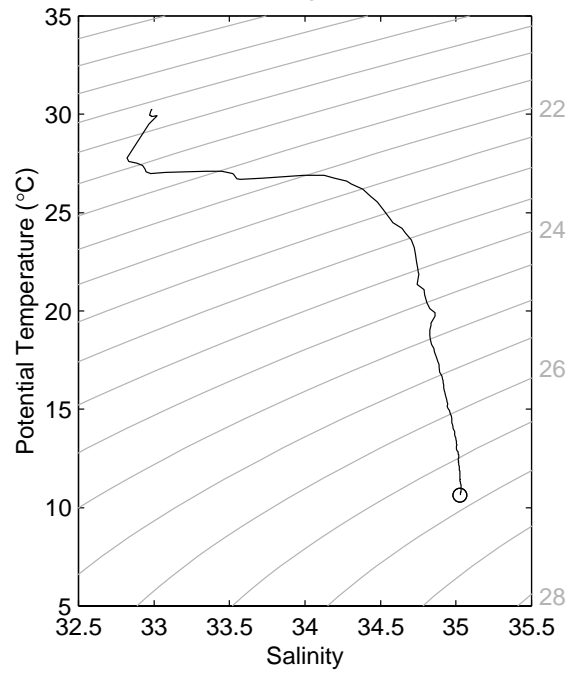
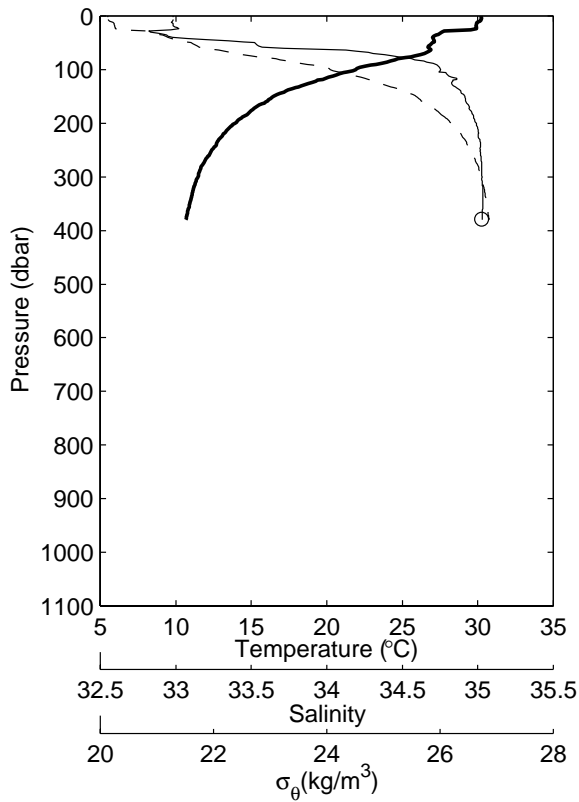
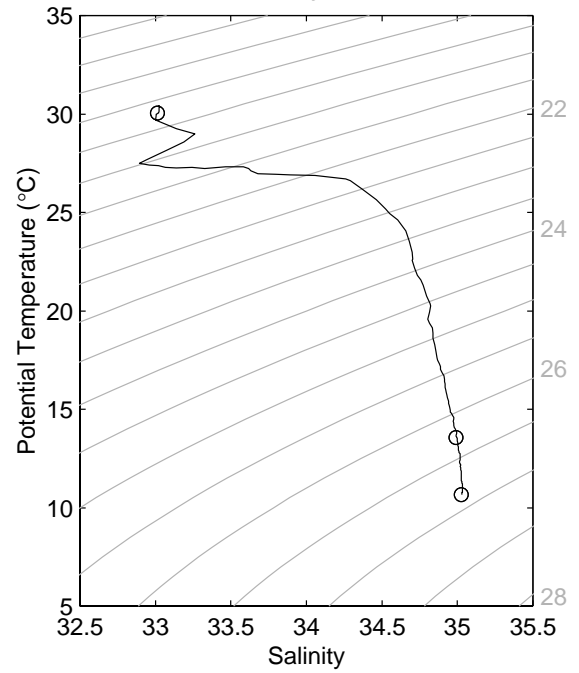
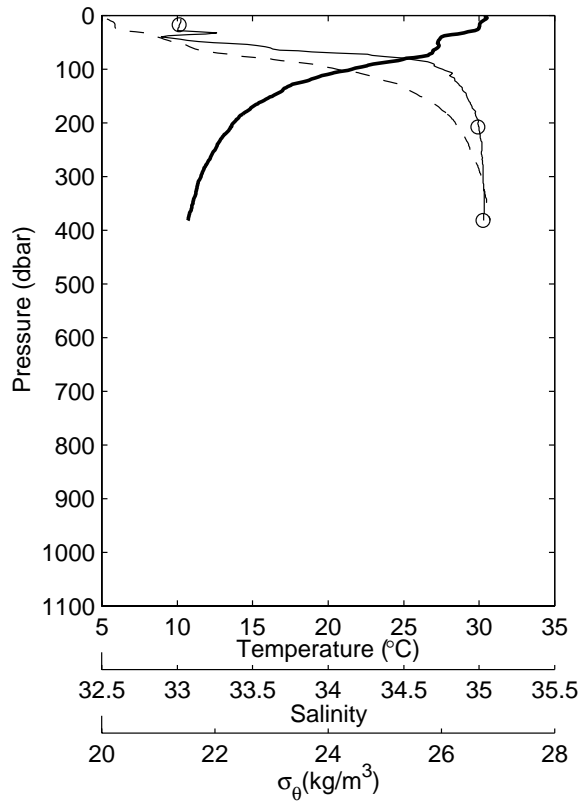


Figure 8.1.82. Same as Fig. 8.1.23 but for station 119 cast 1 and station 120 cast 1.

JASMINE Stn-121 Cast-1 11.79°N 88.62°E 09:57Z 14 May 1999



JASMINE Stn-122 Cast-1 11.75°N 88.75°E 11:02Z 14 May 1999

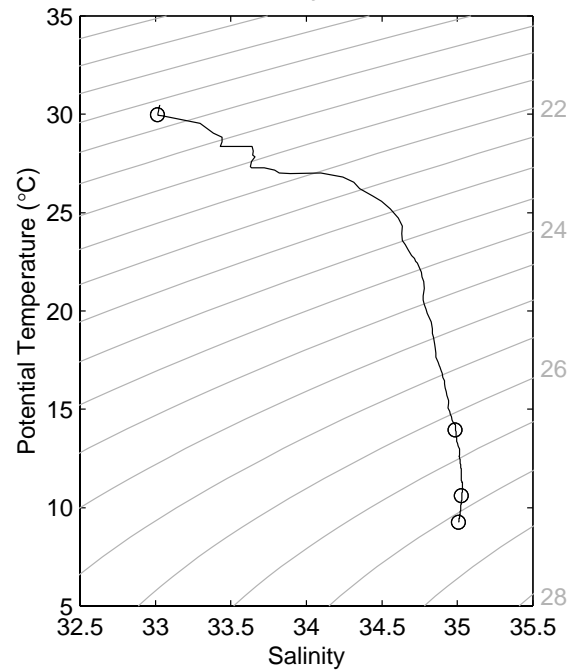
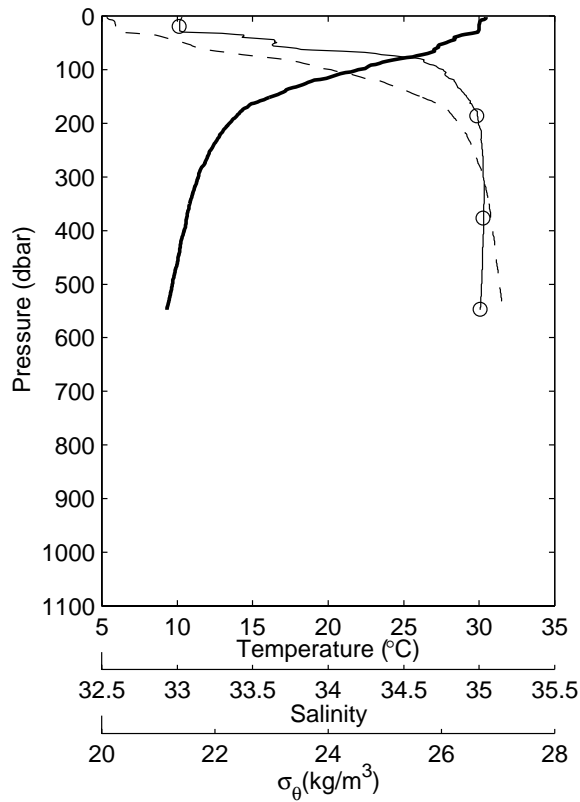
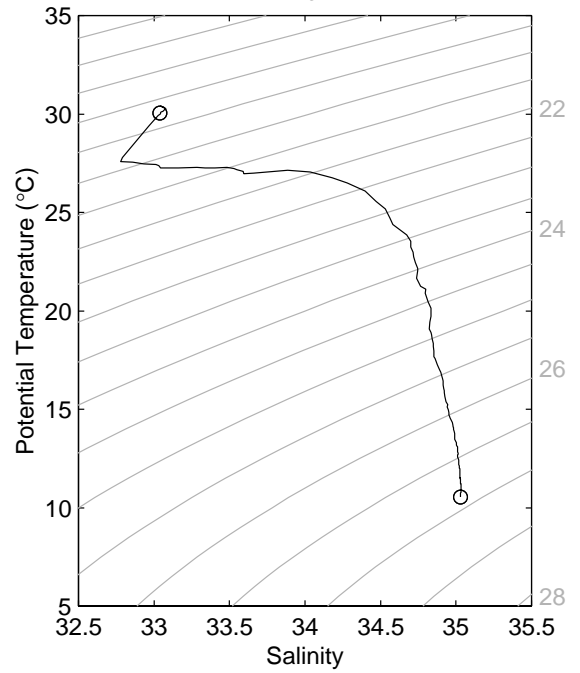
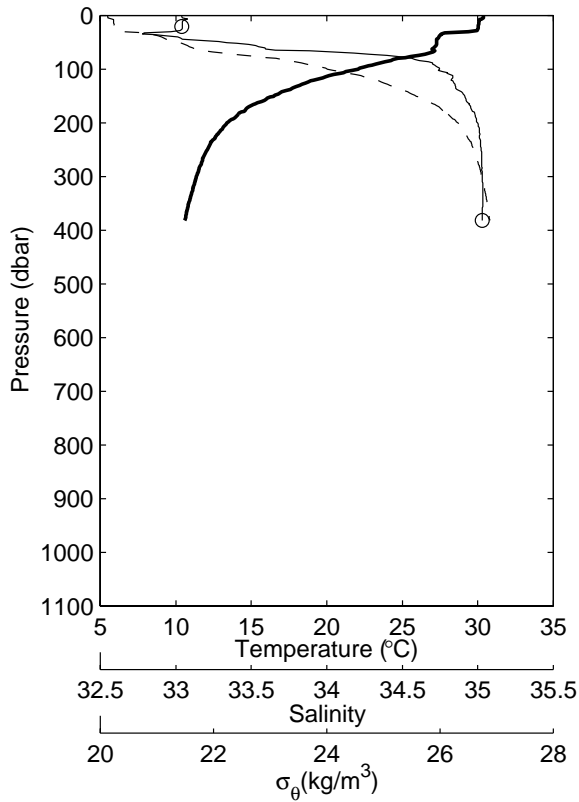


Figure 8.1.83. Same as Fig. 8.1.23 but for station 121 cast 1 and station 122 cast 1.

JASMINE Stn-123 Cast-1 11.86°N 88.67°E 12:17Z 14 May 1999



JASMINE Stn-124 Cast-1 11.97°N 88.59°E 13:28Z 14 May 1999

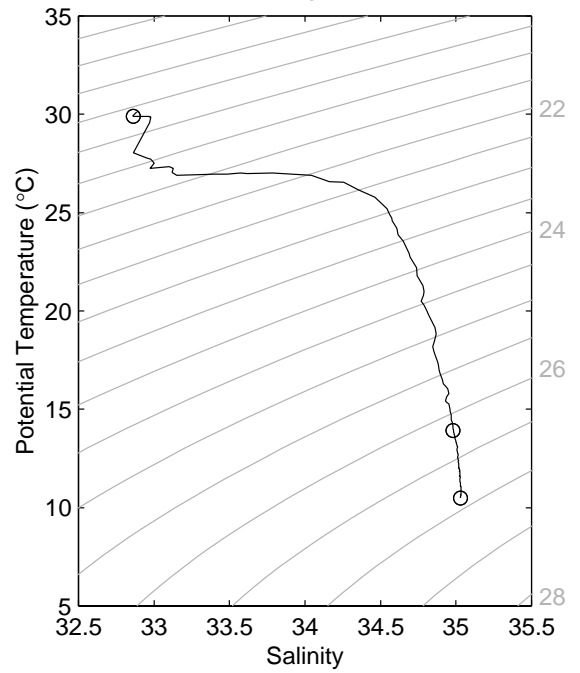
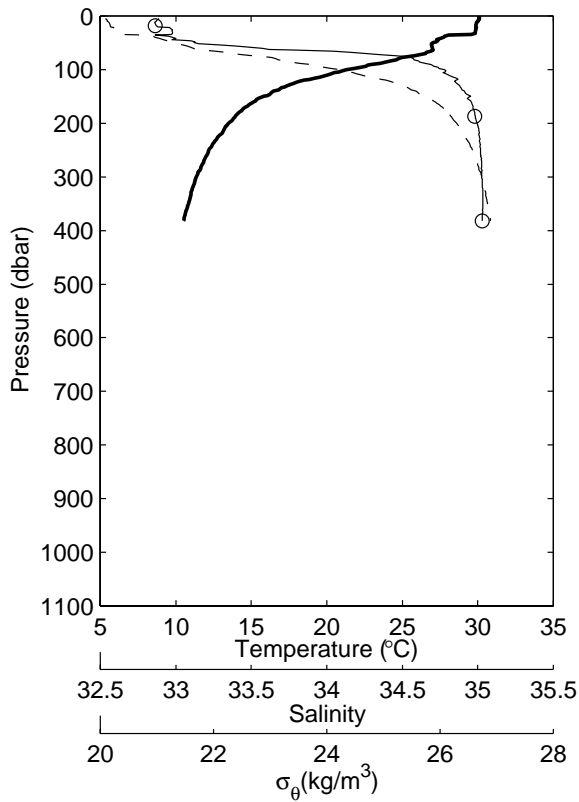
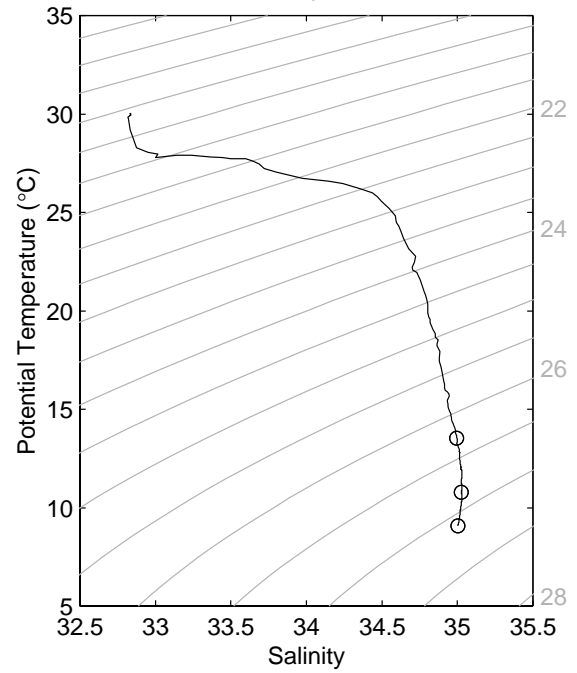
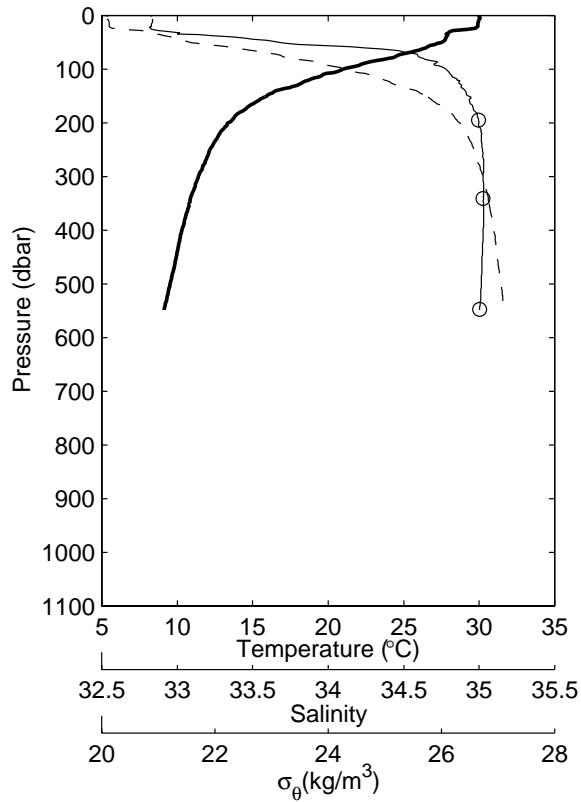


Figure 8.1.84. Same as Fig. 8.1.23 but for station 123 cast 1 and station 124 cast 1.

JASMINE Stn-125 Cast-1 12.06°N 88.53°E 14:21Z 14 May 1999



JASMINE Stn-126 Cast-1 11.94°N 88.52°E 15:41Z 14 May 1999

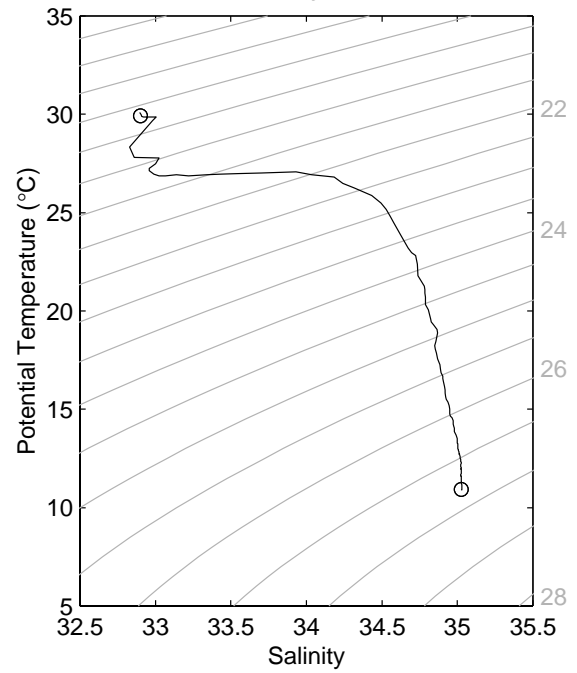
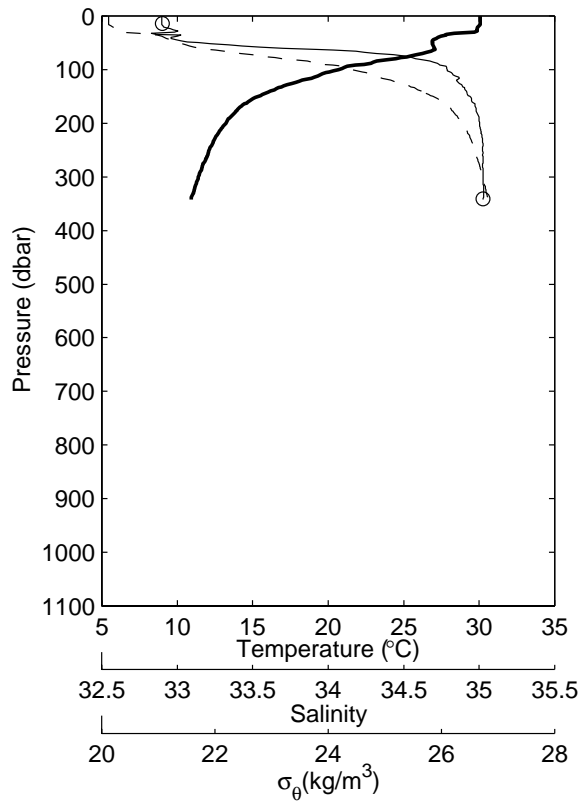
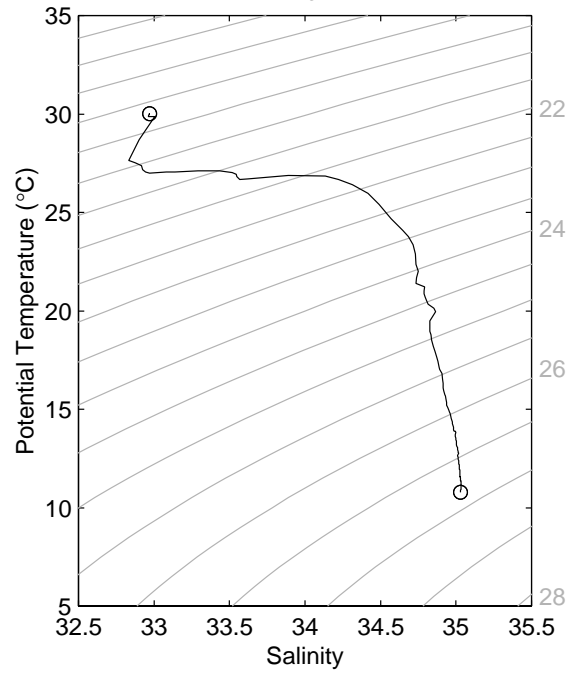
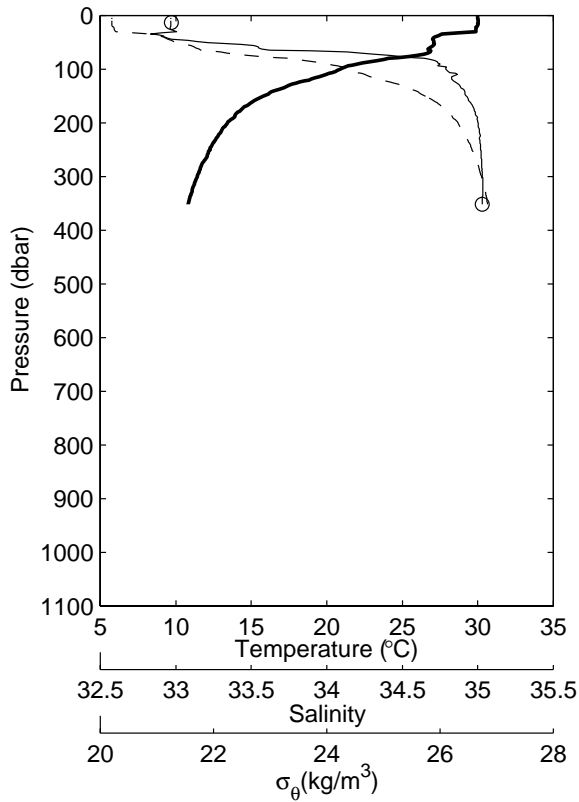


Figure 8.1.85. Same as Fig. 8.1.23 but for station 125 cast 1 and station 126 cast 1.

JASMINE Stn-127 Cast-1 11.81°N 88.52°E 16:43Z 14 May 1999



JASMINE Stn-128 Cast-1 11.68°N 88.52°E 17:46Z 14 May 1999

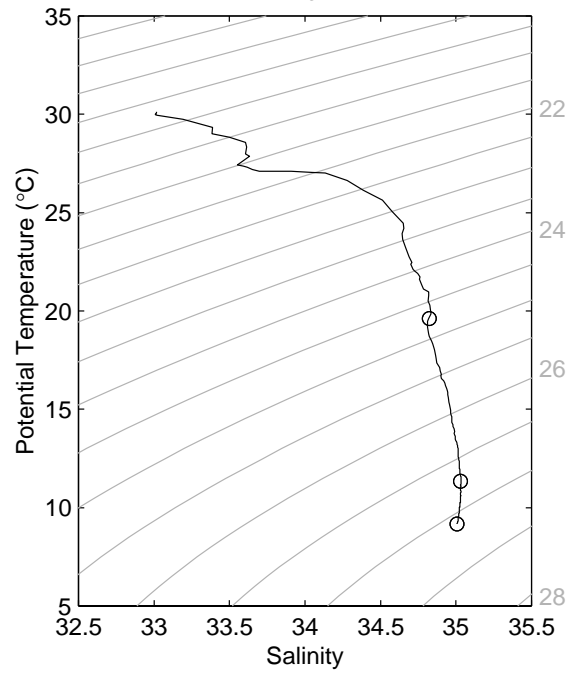
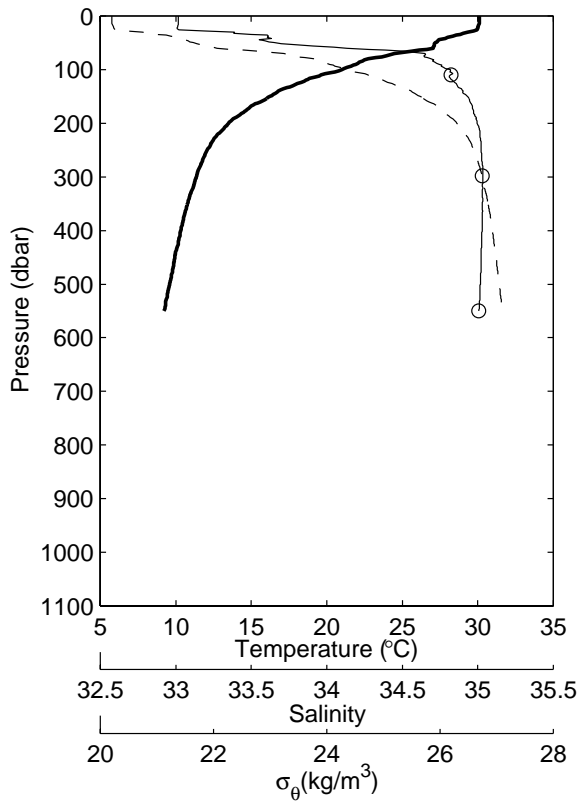
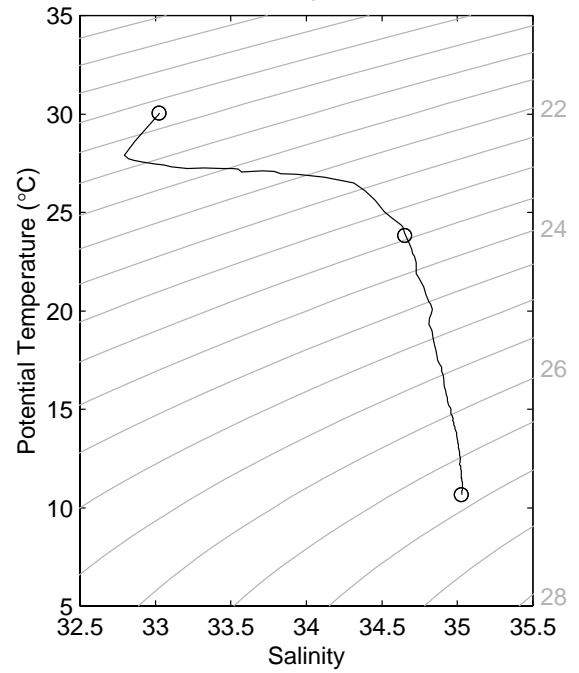
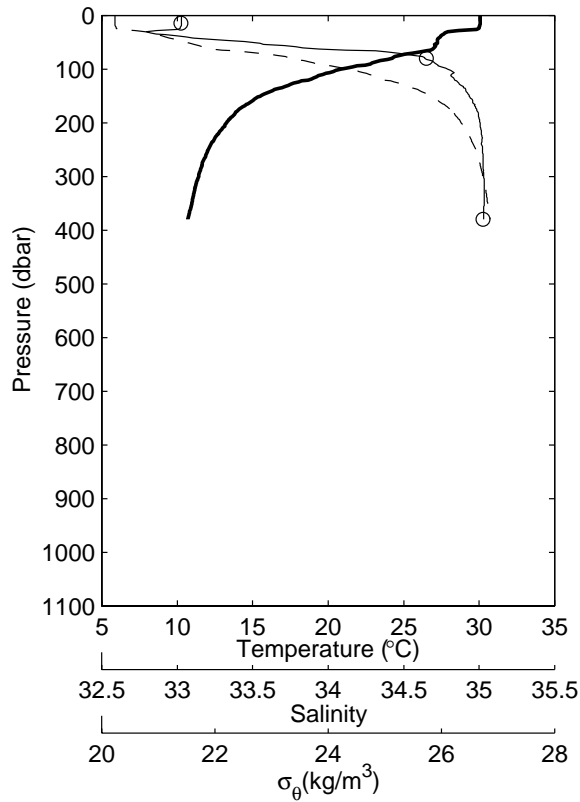


Figure 8.1.86. Same as Fig. 8.1.23 but for station 127 cast 1 and station 128 cast 1.

JASMINE Stn-129 Cast-1 11.78°N 88.59°E 19:04Z 14 May 1999



JASMINE Stn-130 Cast-1 11.89°N 88.67°E 20:08Z 14 May 1999

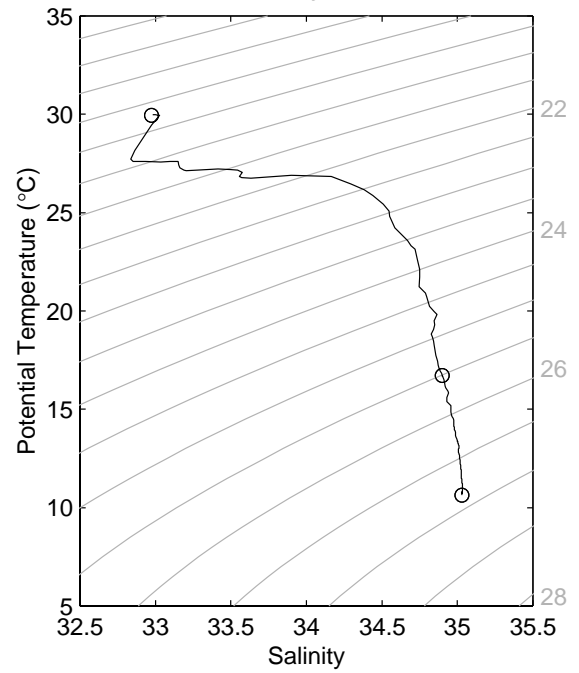
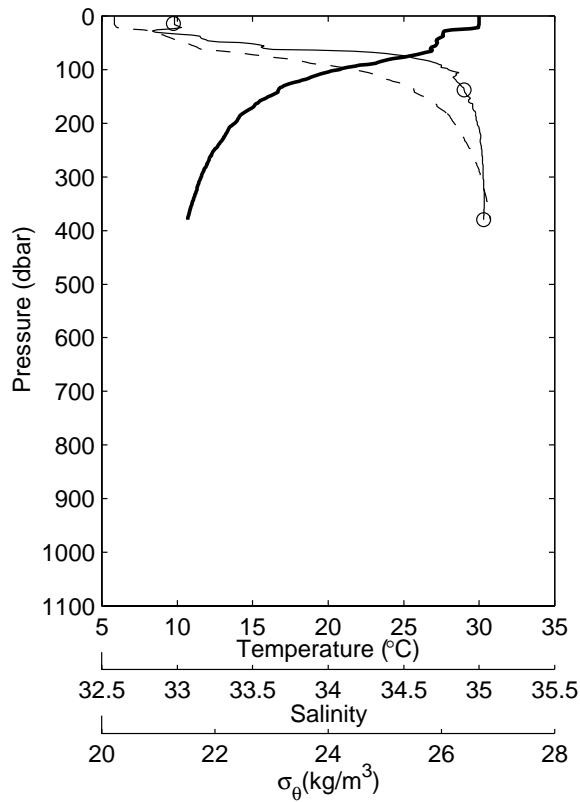
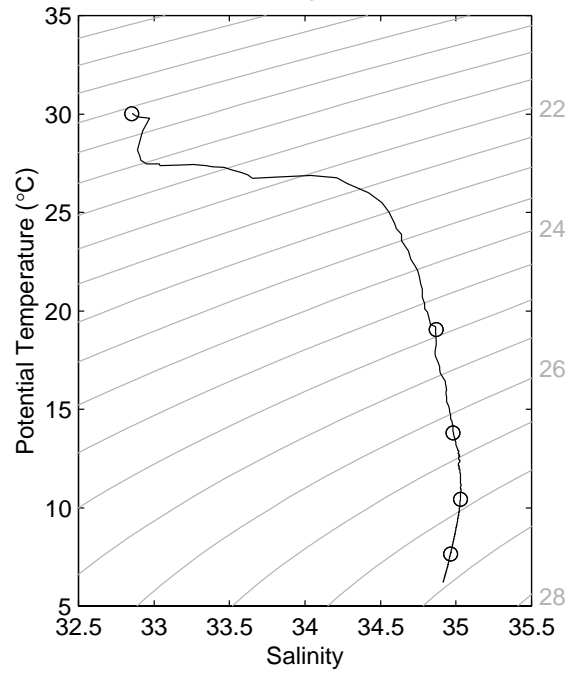
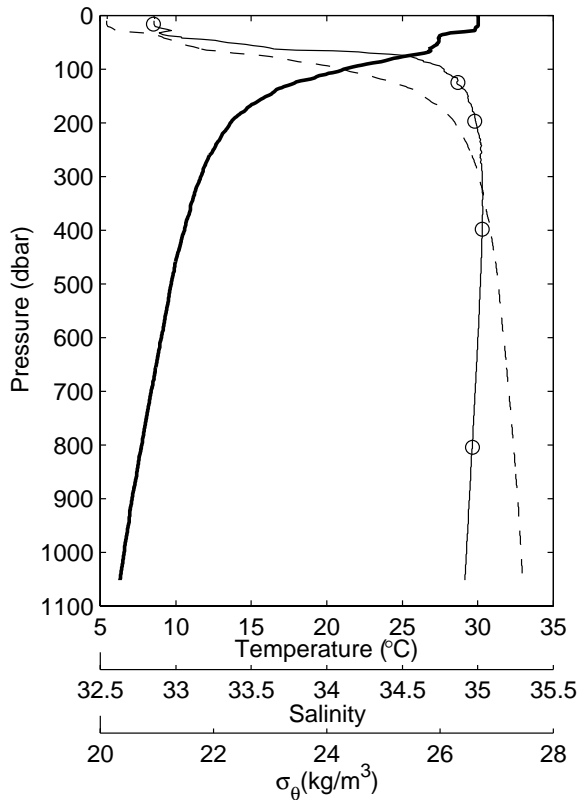


Figure 8.1.87. Same as Fig. 8.1.23 but for station 129 cast 1 and station 130 cast 1.

JASMINE Stn-131 Cast-1 12.00°N 88.75°E 21:17Z 14 May 1999



JASMINE Stn-132 Cast-1 11.96°N 88.62°E 22:59Z 14 May 1999

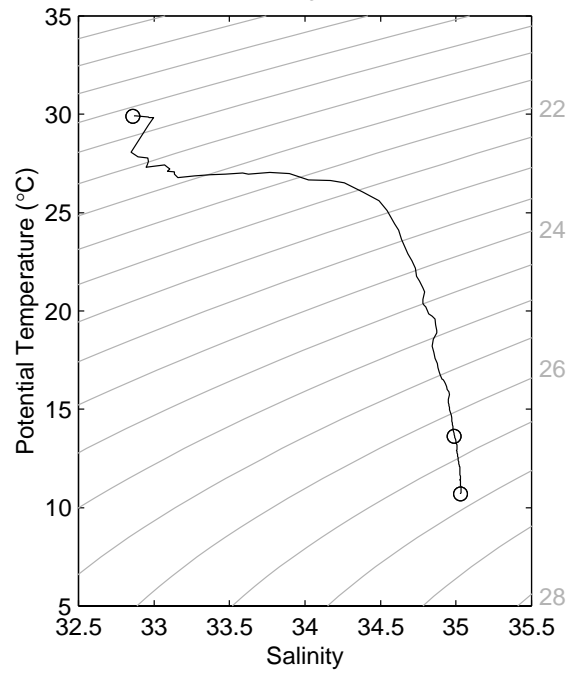
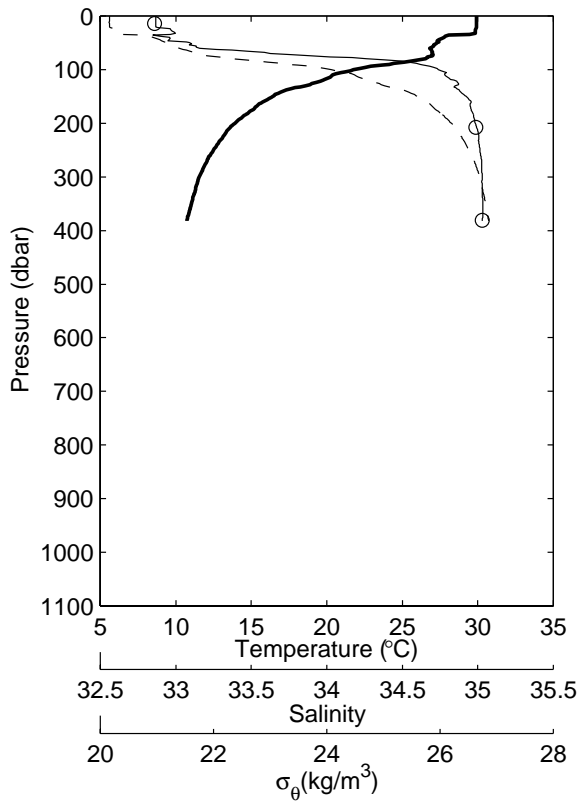
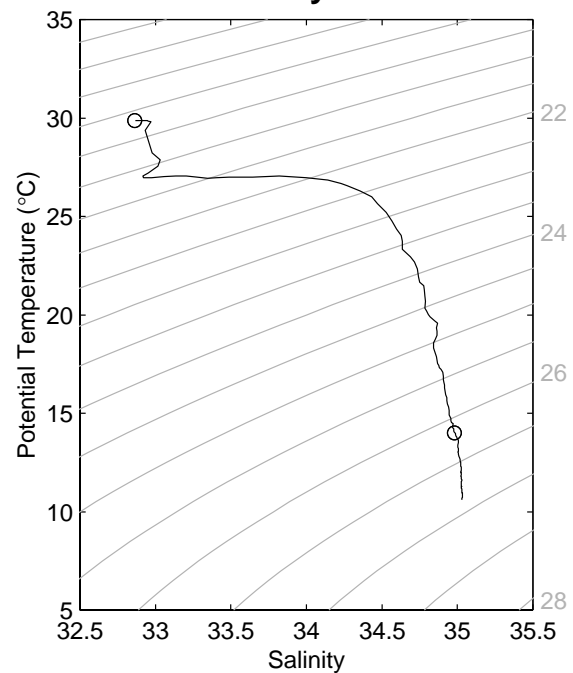
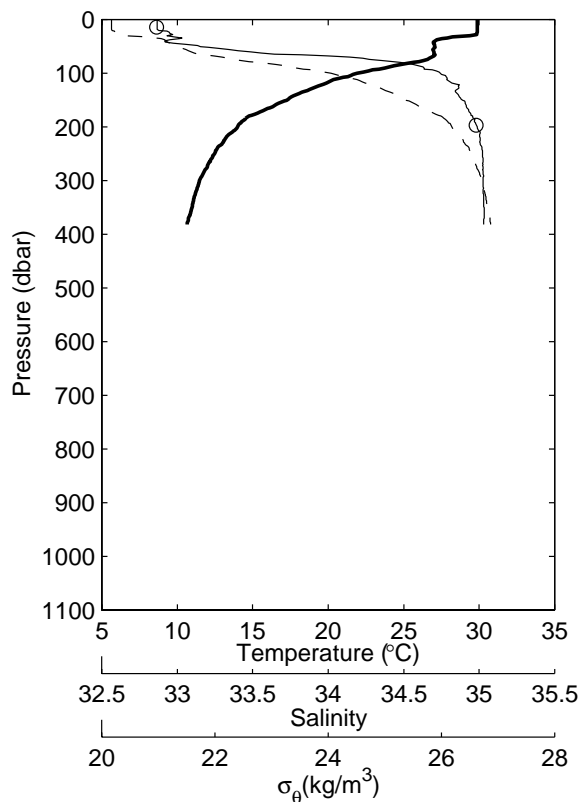


Figure 8.1.88. Same as Fig. 8.1.23 but for station 131 cast 1 and station 132 cast 1.

JASMINE Stn-133 Cast-1 11.92°N 88.50°E 00:10Z 15 May 1999



JASMINE Stn-134 Cast-1 11.88°N 88.37°E 01:21Z 15 May 1999

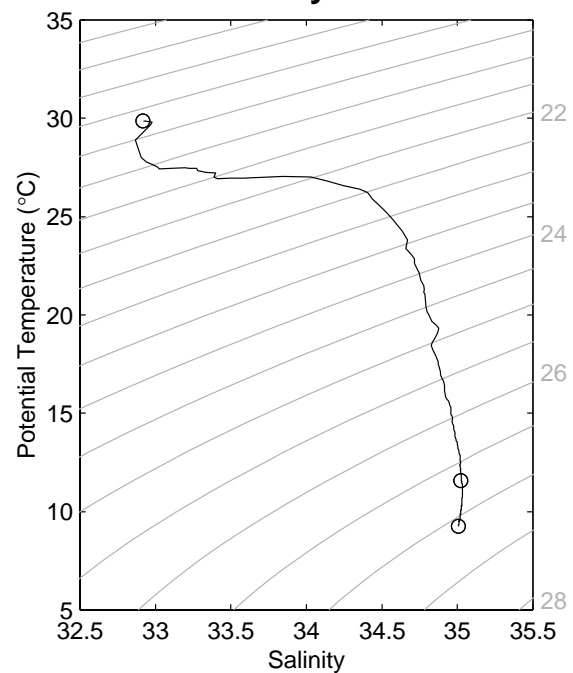
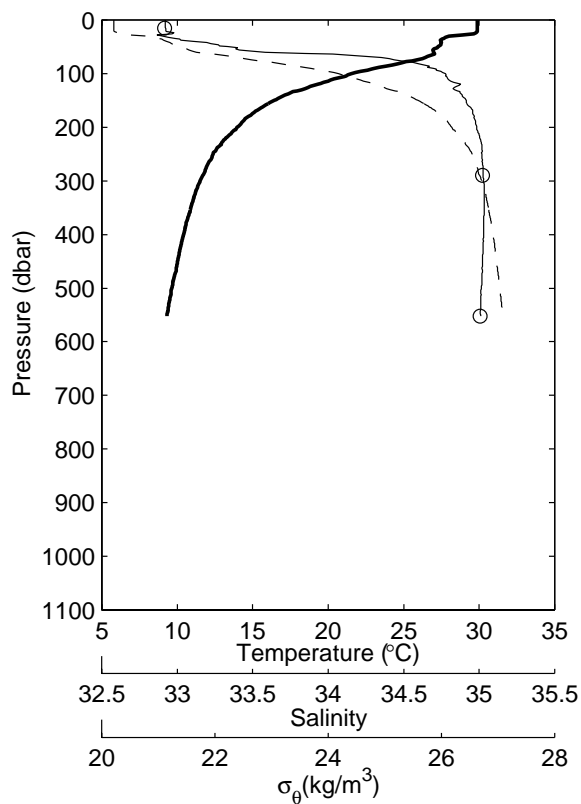
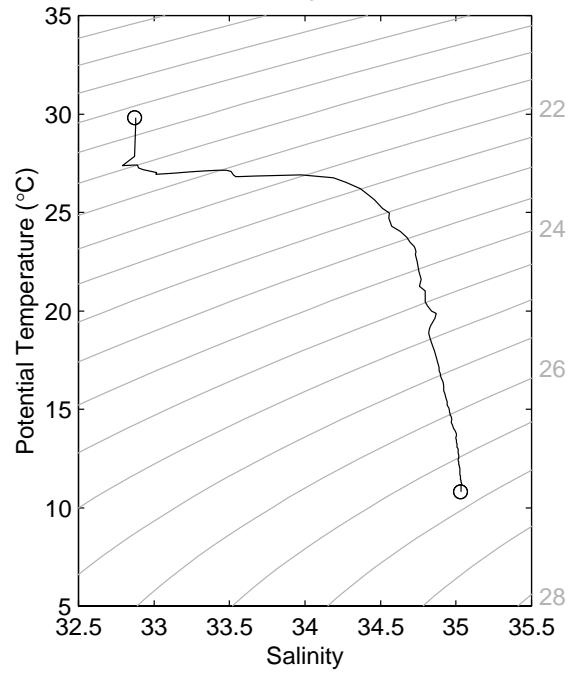
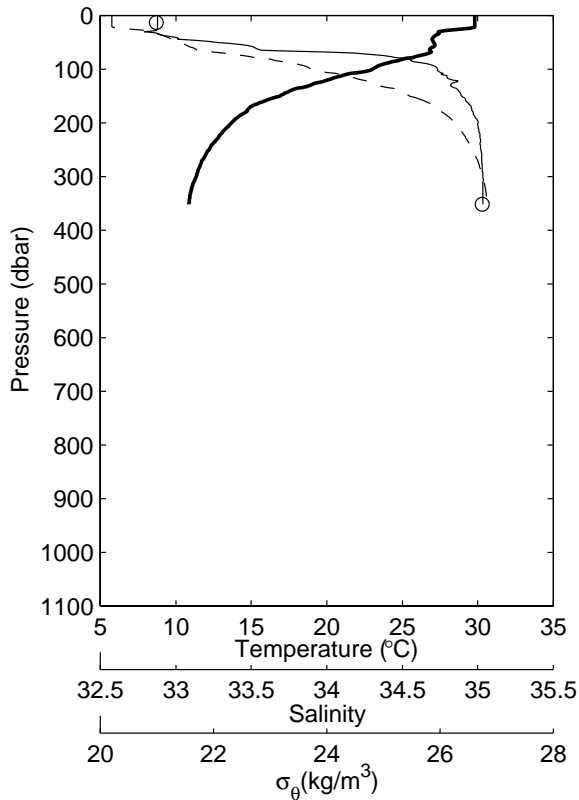


Figure 8.1.89. Same as Fig. 8.1.23 but for station 133 cast 1 and station 134 cast 1.

JASMINE Stn-135 Cast-1 11.84°N 88.49°E 02:28Z 15 May 1999



JASMINE Stn-136 Cast-1 11.79°N 88.62°E 03:42Z 15 May 1999

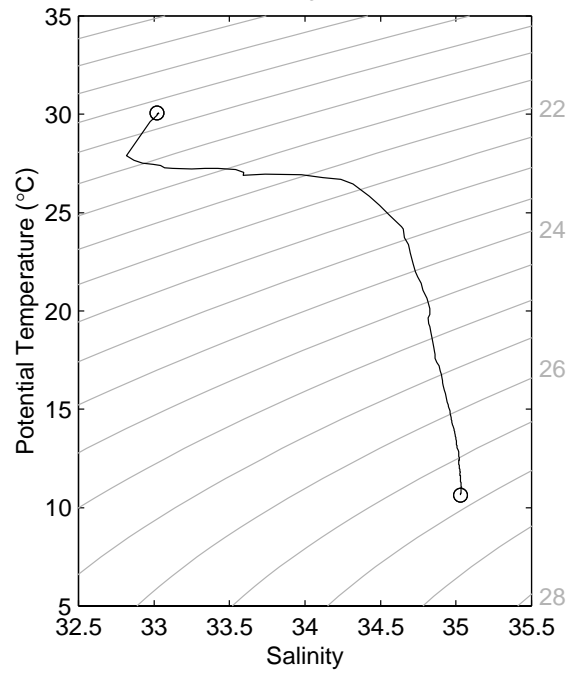
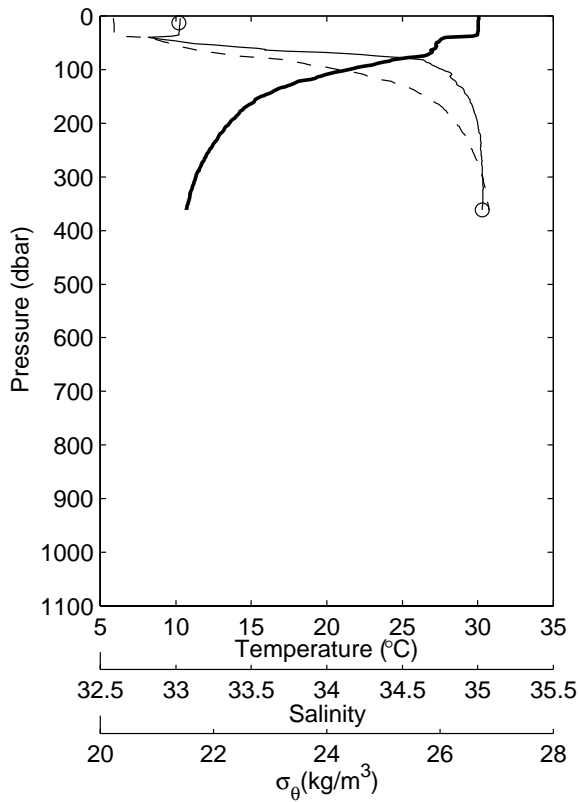
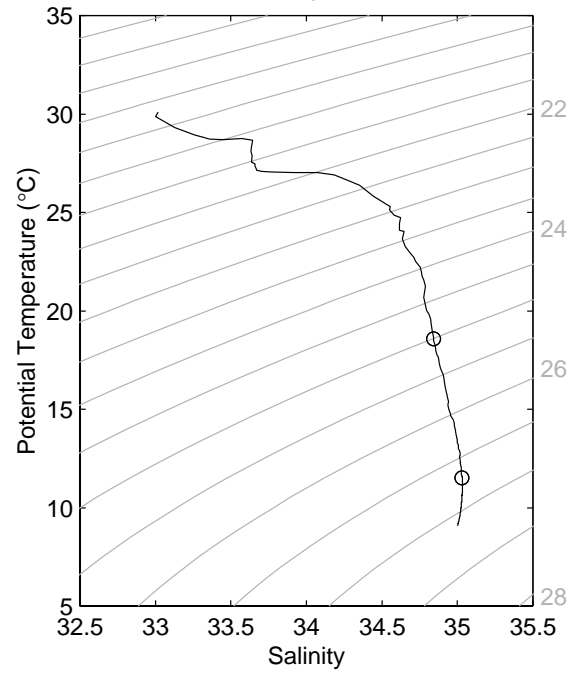
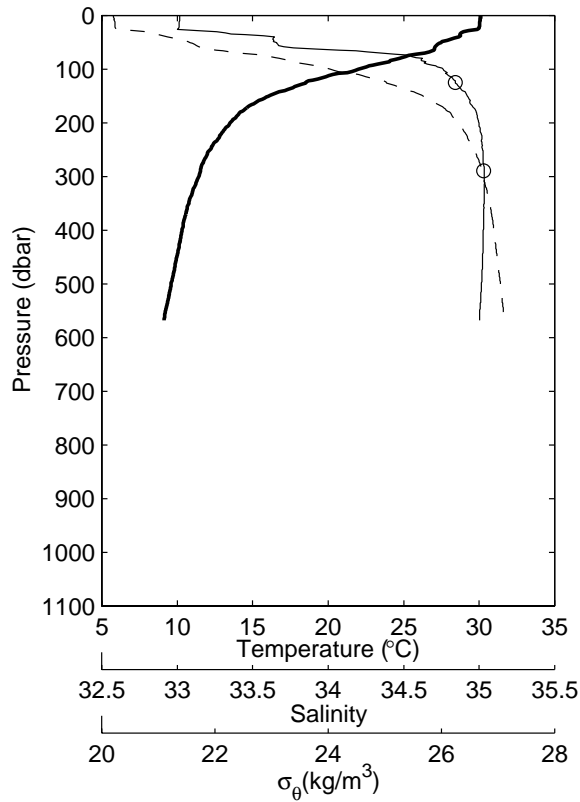


Figure 8.1.90. Same as Fig. 8.1.23 but for station 135 cast 1 and station 136 cast 1.

JASMINE Stn-137 Cast-1 11.75°N 88.75°E 04:44Z 15 May 1999



JASMINE Stn-138 Cast-1 11.86°N 88.67°E 05:59Z 15 May 1999

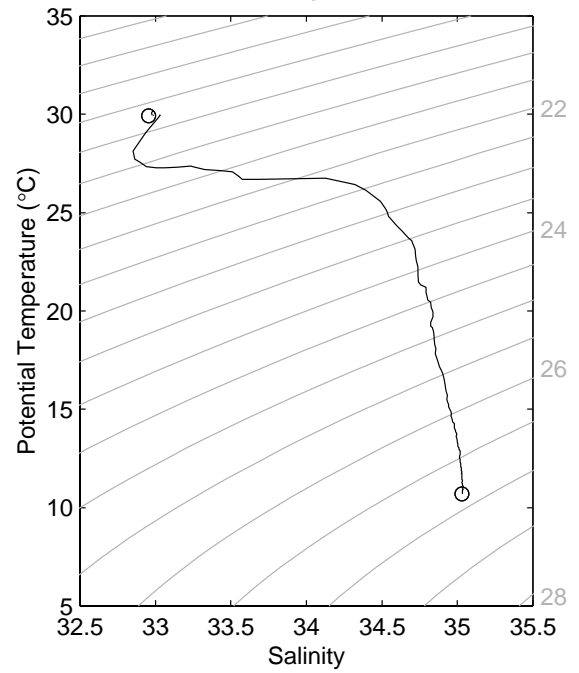
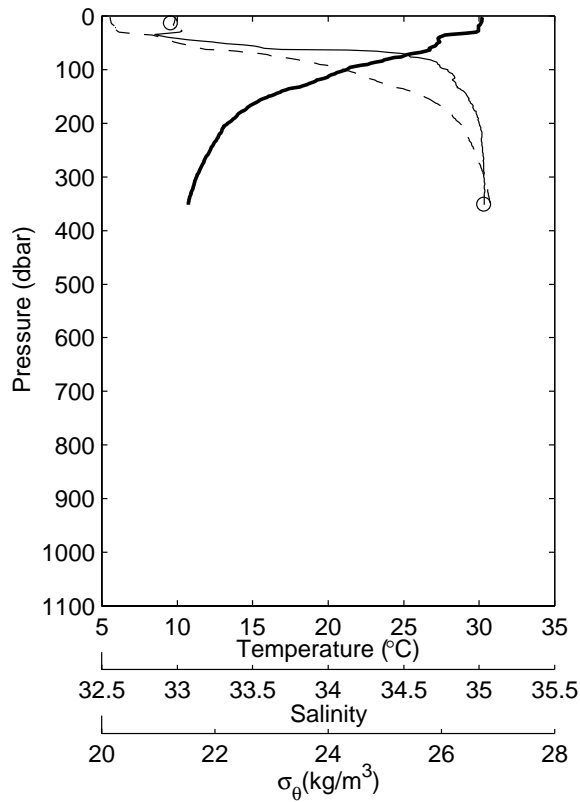
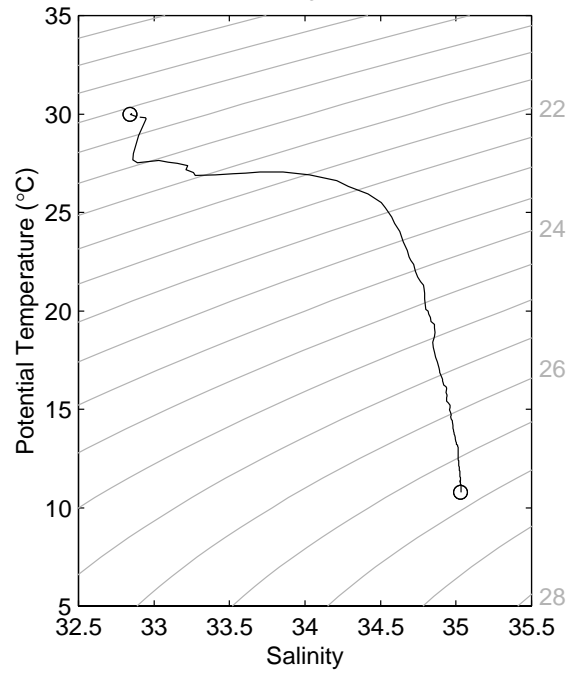
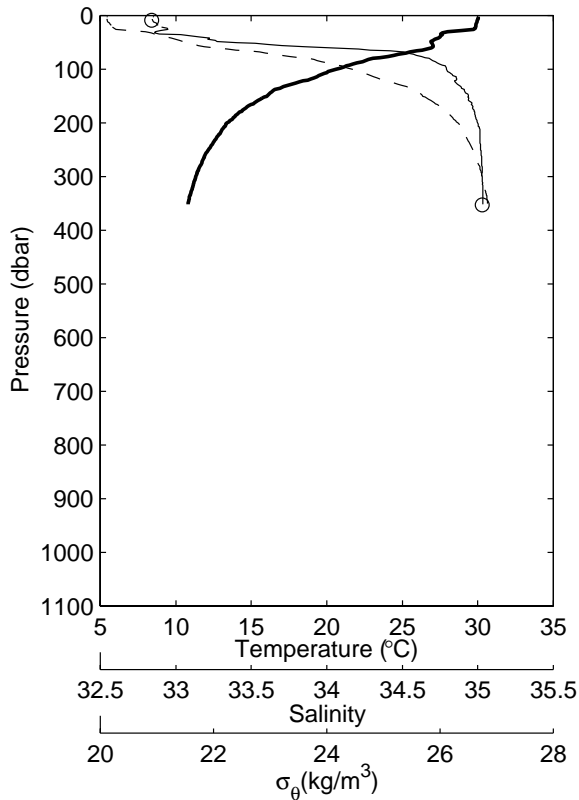


Figure 8.1.91. Same as Fig. 8.1.23 but for station 137 cast 1 and station 138 cast 1.

JASMINE Stn-139 Cast-2 11.97°N 88.59°E 07:16Z 15 May 1999



JASMINE Stn-140 Cast-1 12.08°N 88.52°E 08:20Z 15 May 1999

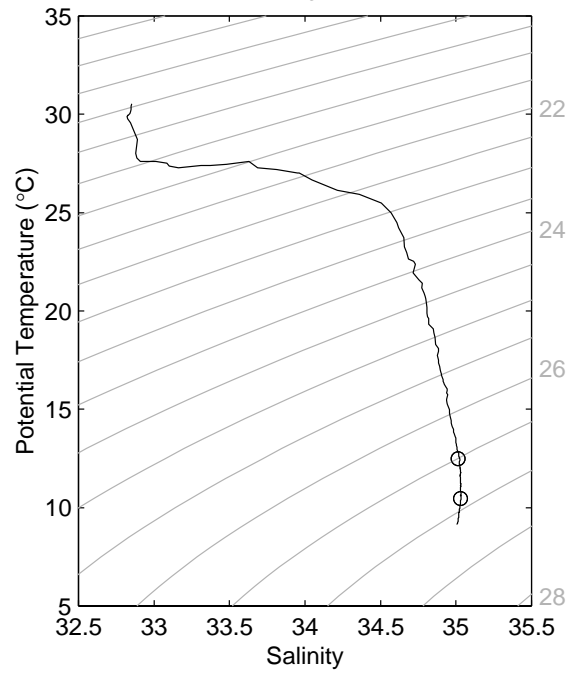
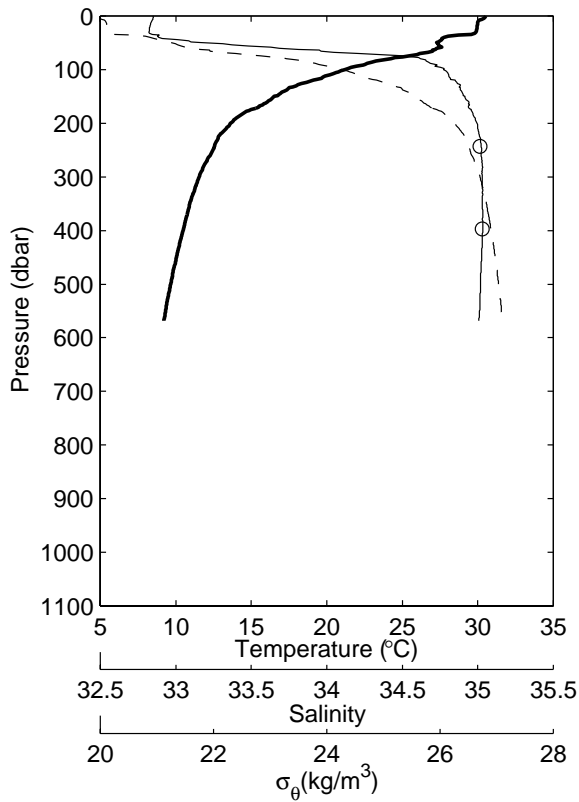
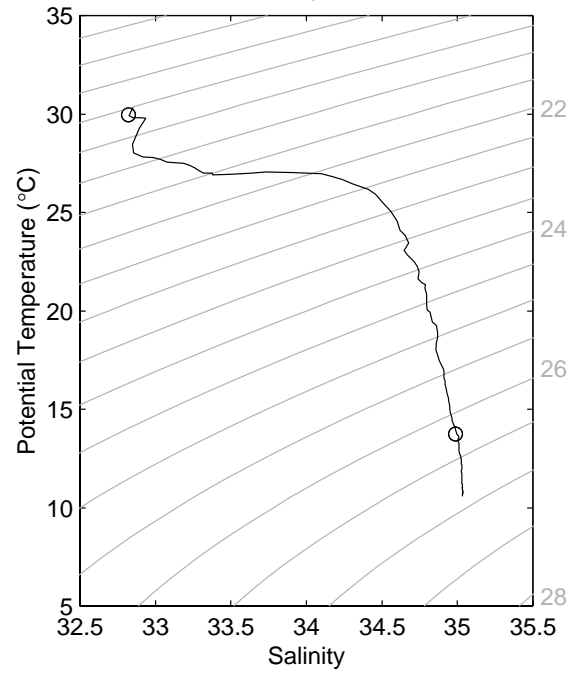
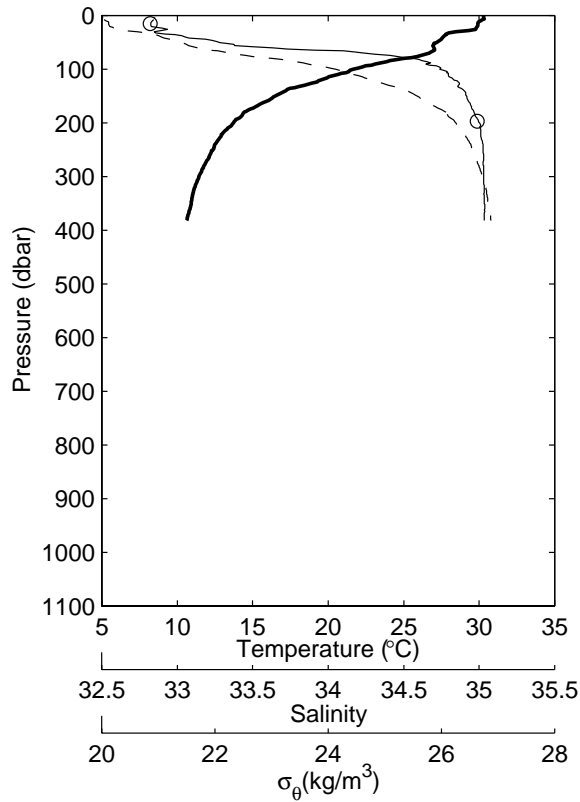


Figure 8.1.92. Same as Fig. 8.1.23 but for station 139 cast 1 and station 140 cast 1.

JASMINE Stn-141 Cast-1 11.94°N 88.52°E 09:39Z 15 May 1999



JASMINE Stn-142 Cast-1 11.81°N 88.52°E 10:44Z 15 May 1999

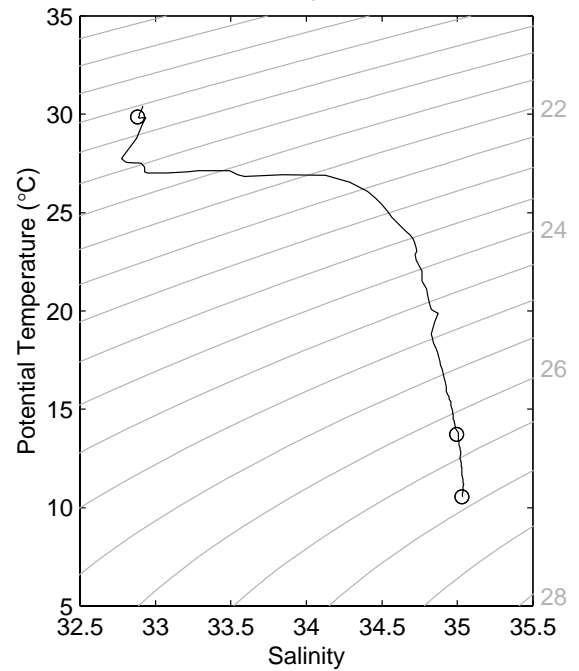
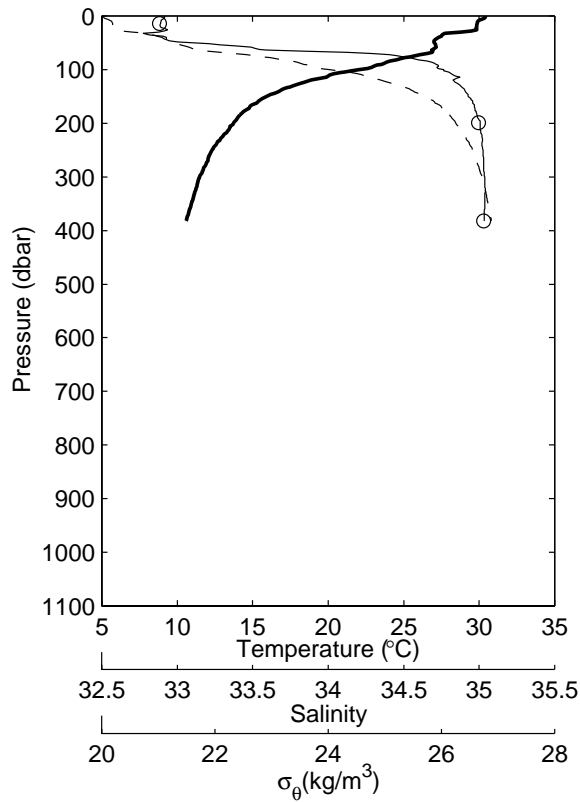
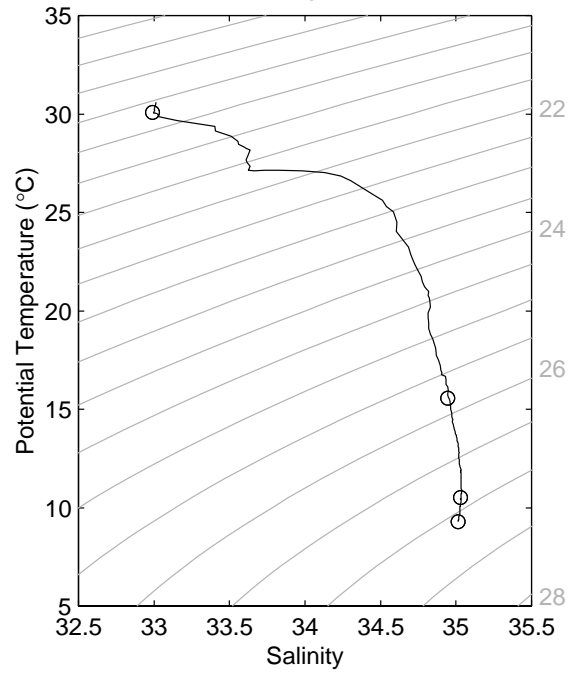
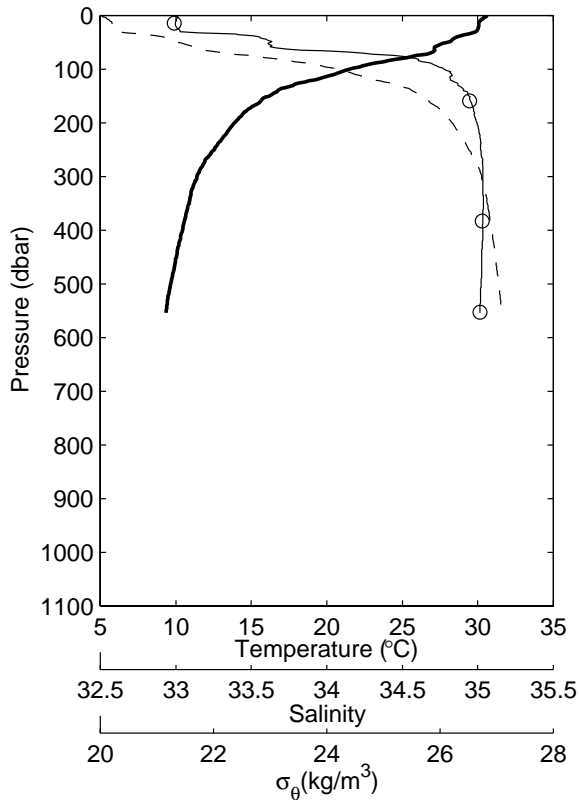


Figure 8.1.93. Same as Fig. 8.1.23 but for station 141 cast 1 and station 142 cast 1.

JASMINE Stn-143 Cast-1 11.68°N 88.51°E 11:54Z 15 May 1999



JASMINE Stn-144 Cast-1 11.50°N 88.50°E 13:19Z 15 May 1999

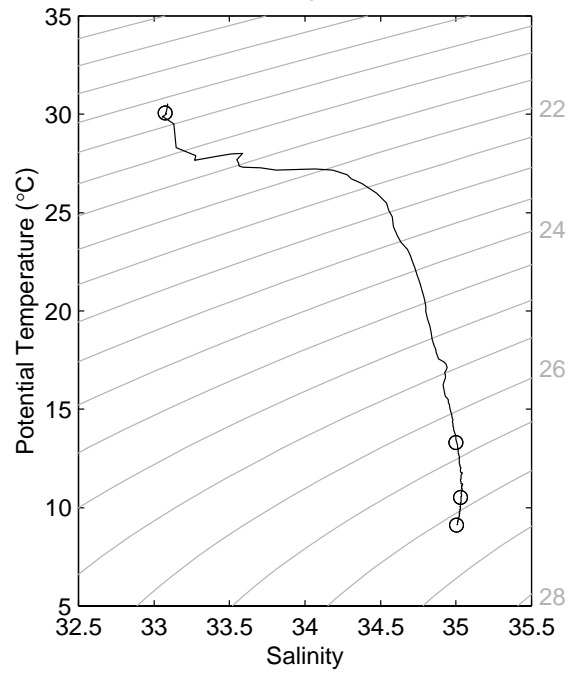
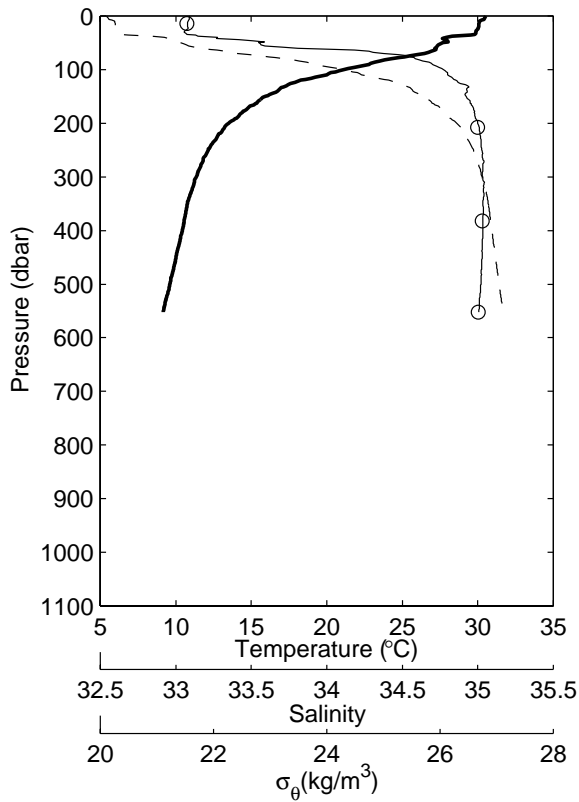
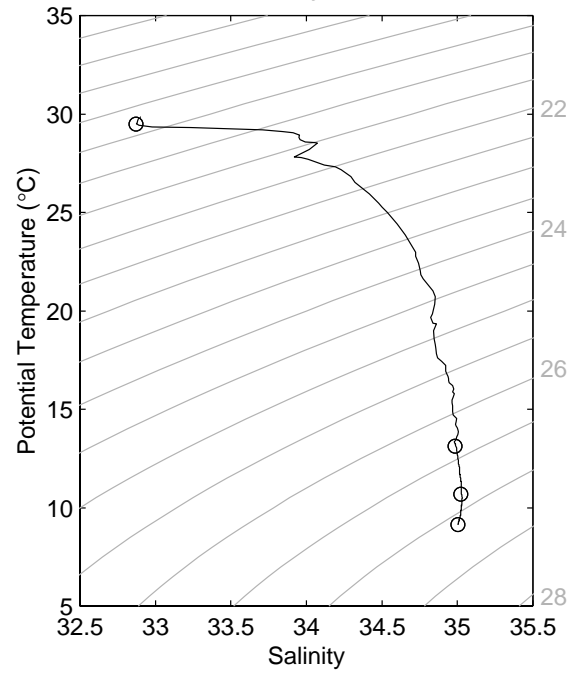
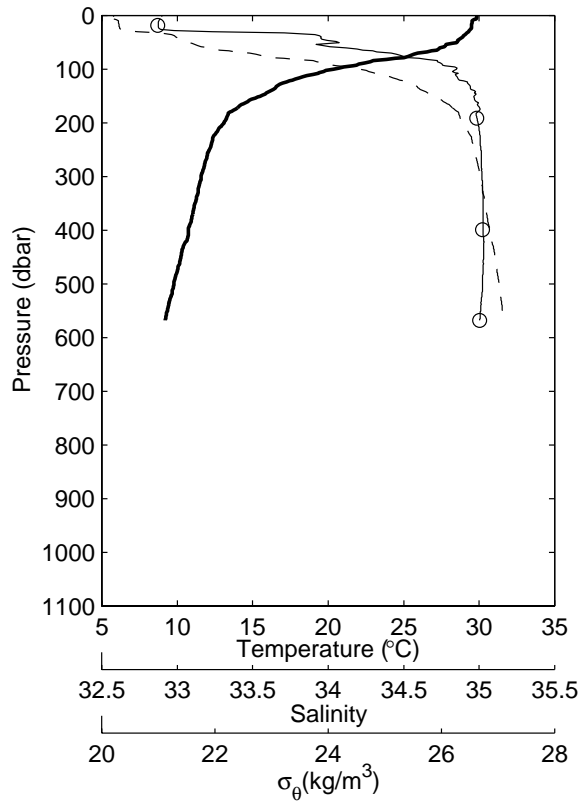


Figure 8.1.94. Same as Fig. 8.1.23 but for station 143 cast 1 and station 144 cast 1.

JASMINE Stn-145 Cast-1 11.00°N 88.50°E 16:18Z 15 May 1999



JASMINE Stn-146 Cast-1 10.50°N 88.50°E 19:28Z 15 May 1999

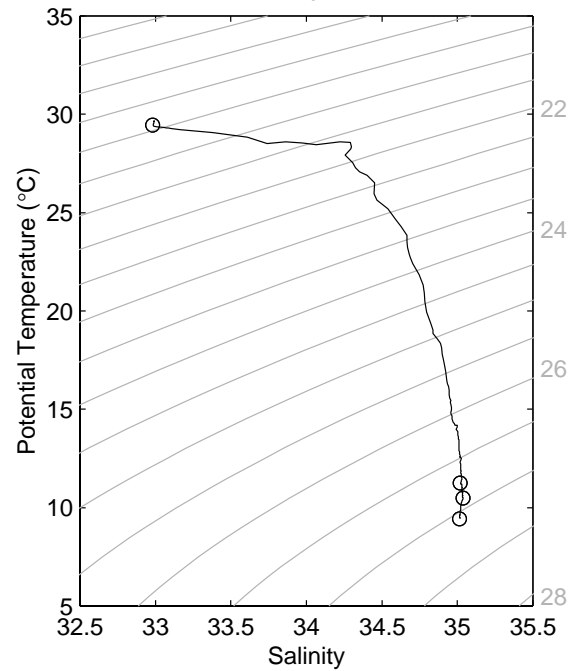
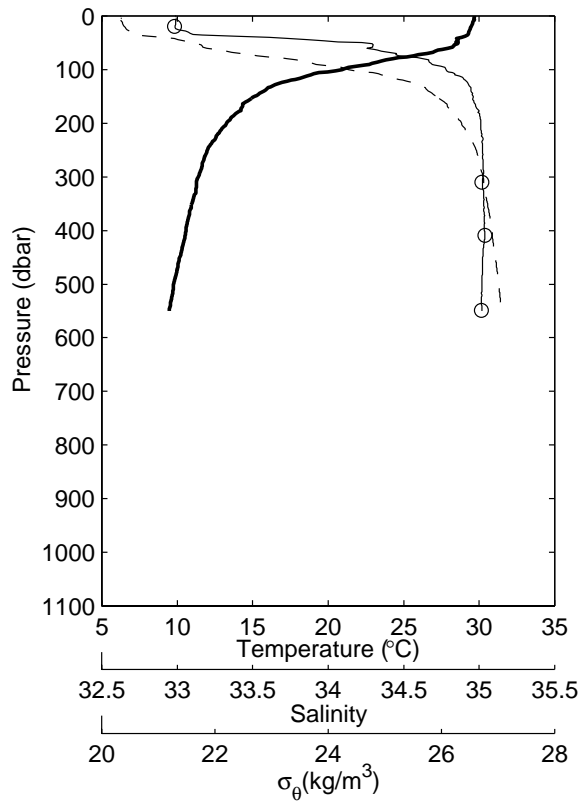
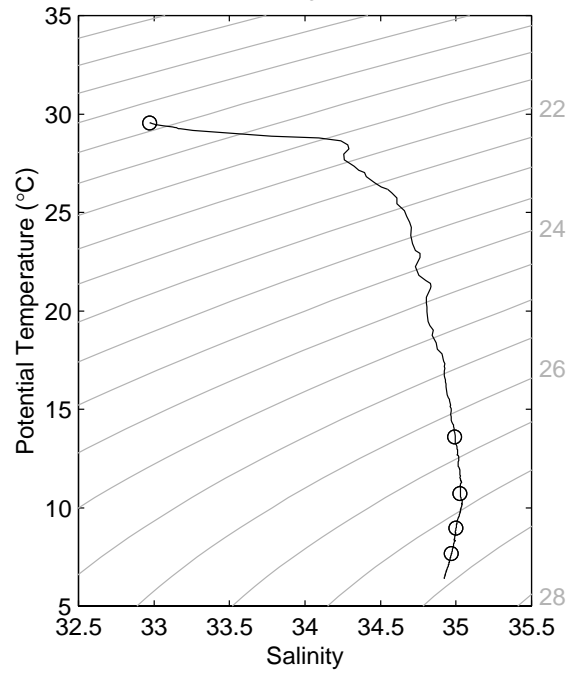
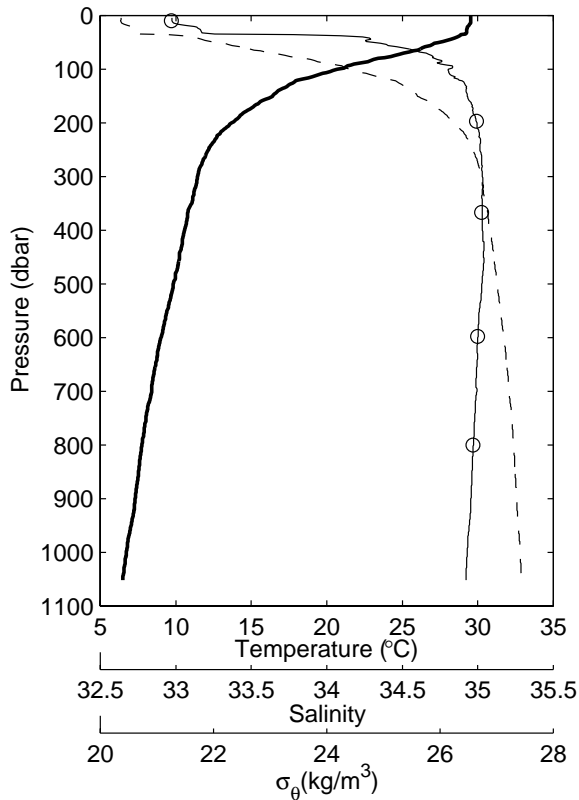


Figure 8.1.95. Same as Fig. 8.1.23 but for station 145 cast 1 and station 146 cast 1.

JASMINE Stn-147 Cast-1 10.00°N 88.50°E 22:30Z 15 May 1999



JASMINE Stn-148 Cast-1 9.50°N 88.50°E 01:51Z 16 May 1999

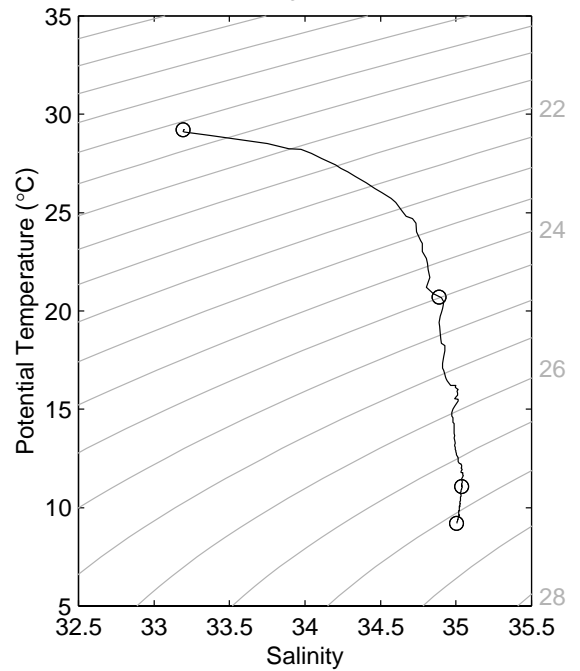
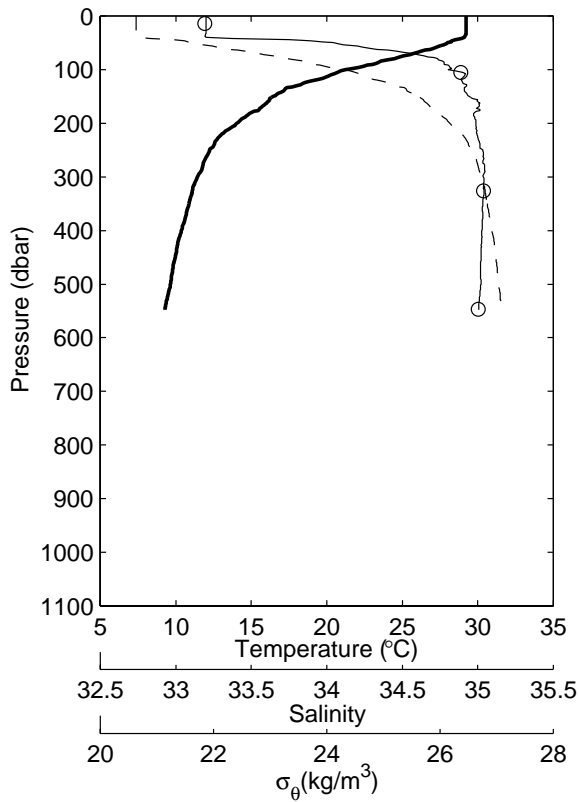
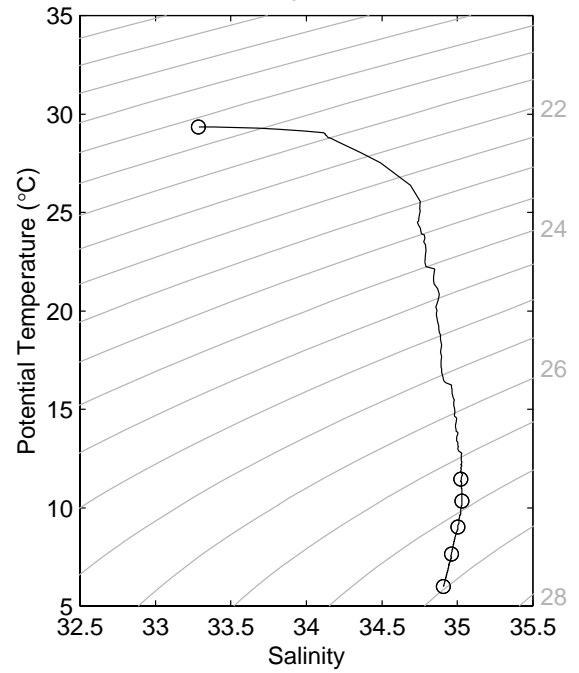
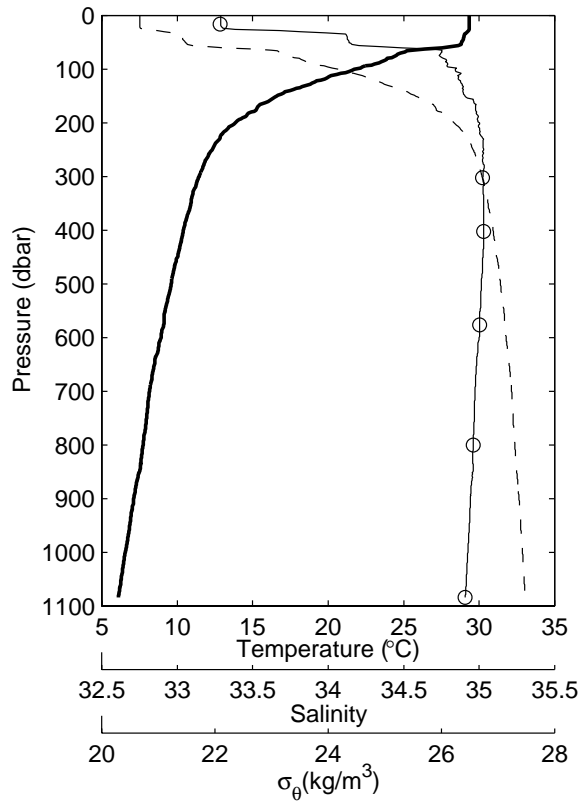


Figure 8.1.96. Same as Fig. 8.1.23 but for station 147 cast 1 and station 148 cast 1.

JASMINE Stn-149 Cast-1 9.00°N 88.50°E 04:56Z 16 May 1999



JASMINE Stn-150 Cast-1 8.50°N 88.50°E 08:11Z 16 May 1999

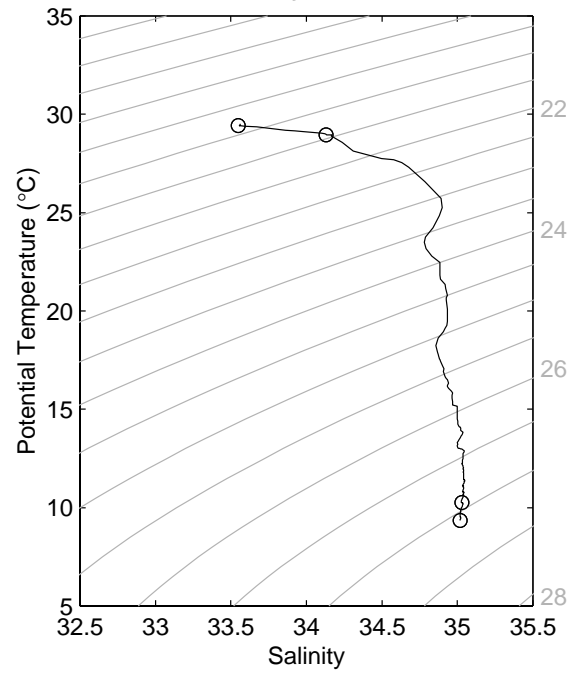
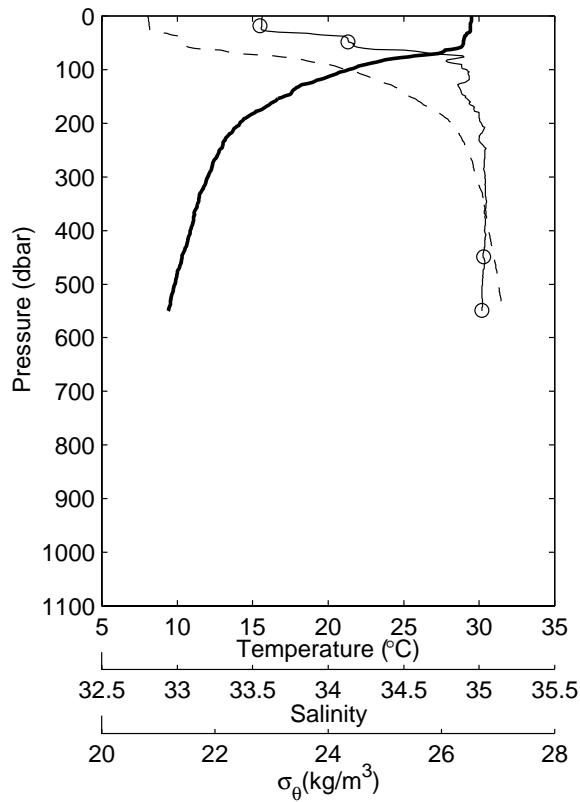
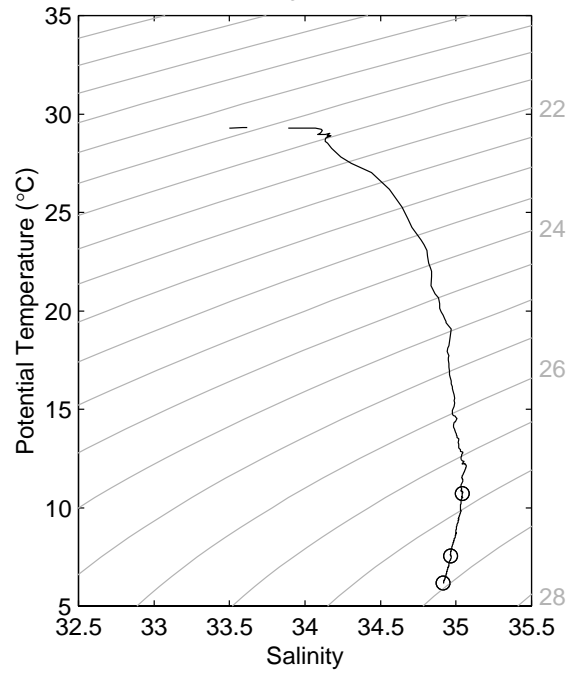
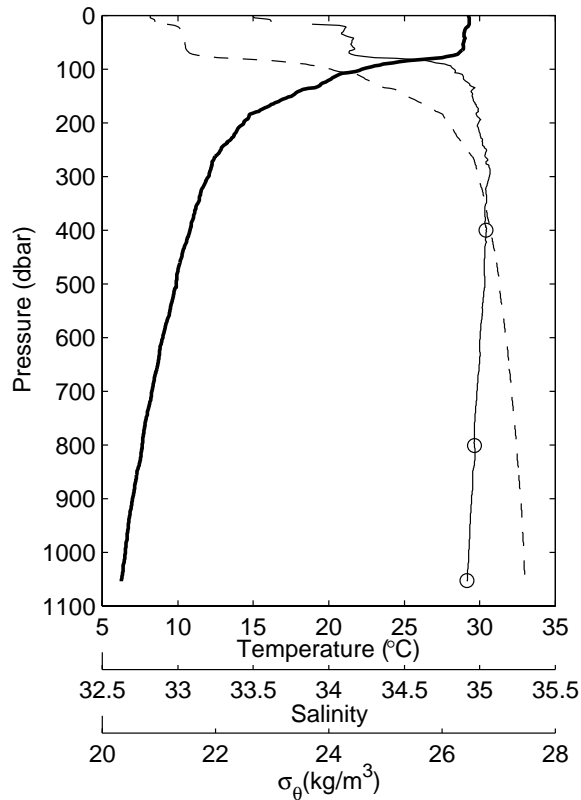


Figure 8.1.97. Same as Fig. 8.1.23 but for station 149 cast 1 and station 150 cast 1.

JASMINE Stn-151 Cast-1 8.00°N 88.50°E 11:07Z 16 May 1999



JASMINE Stn-152 Cast-1 7.50°N 88.50°E 14:25Z 16 May 1999

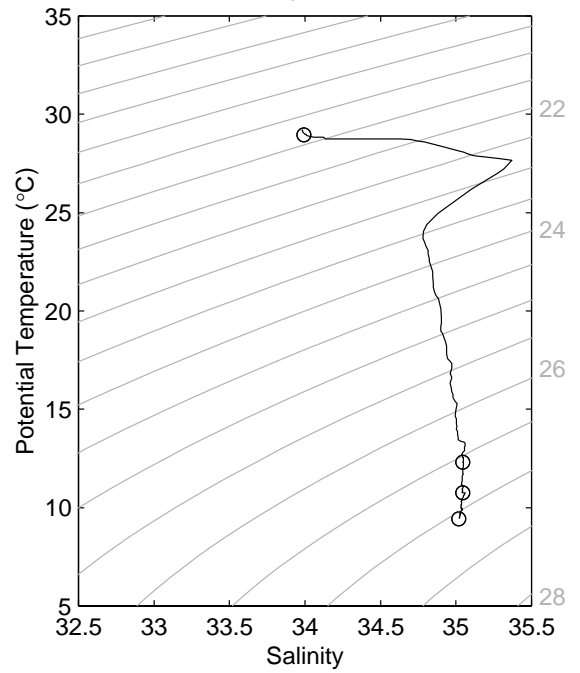
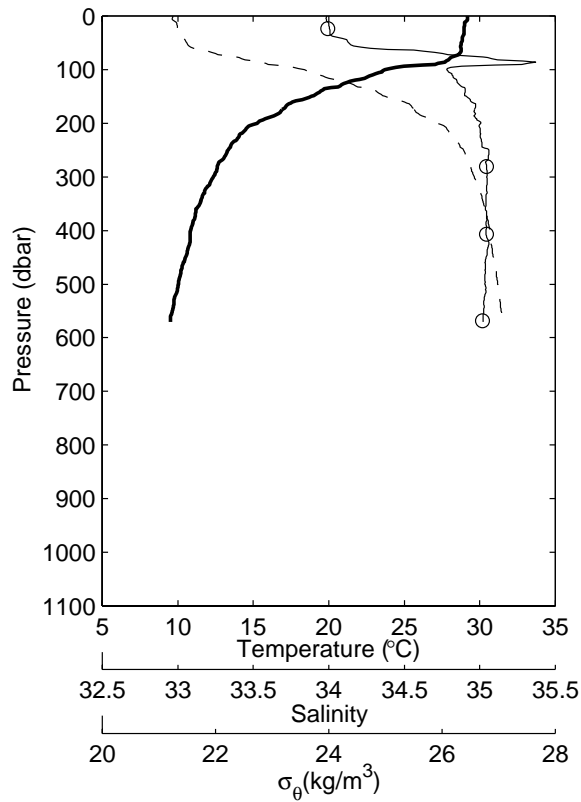
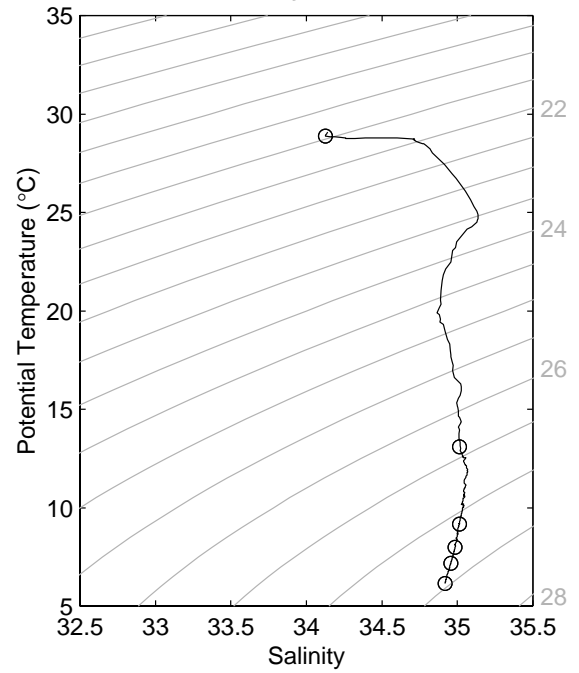
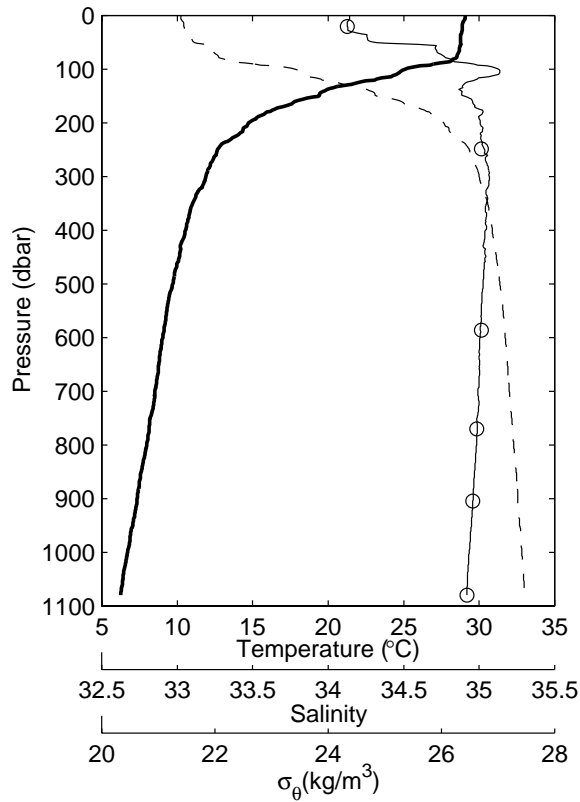


Figure 8.1.98. Same as Fig. 8.1.23 but for station 151 cast 1 and station 152 cast 1.

JASMINE Stn-153 Cast-1 7.00°N 88.50°E 17:18Z 16 May 1999



JASMINE Stn-154 Cast-1 6.50°N 88.50°E 20:35Z 16 May 1999

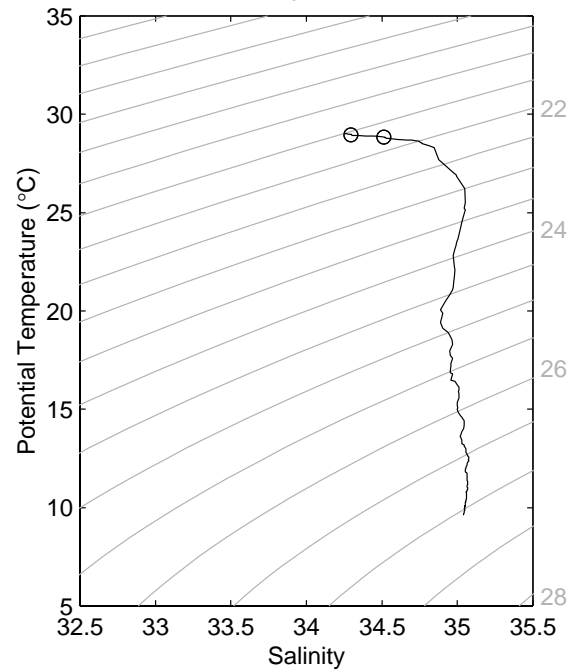
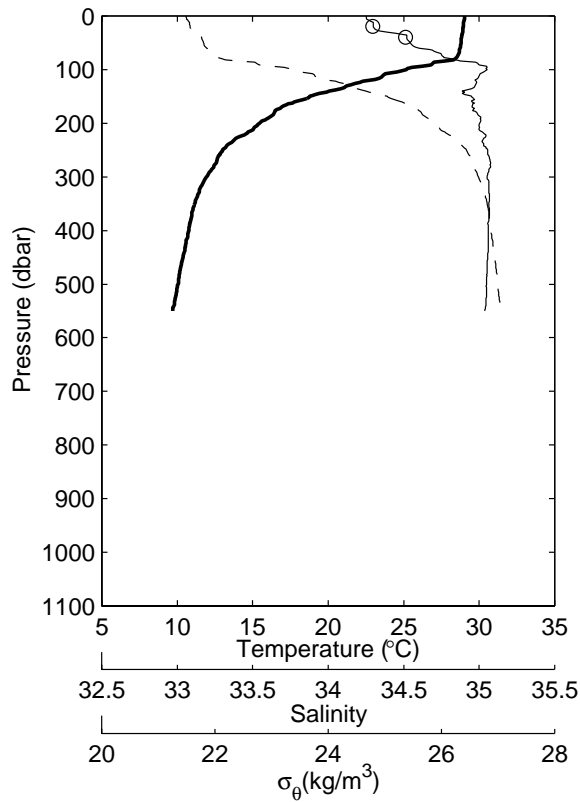
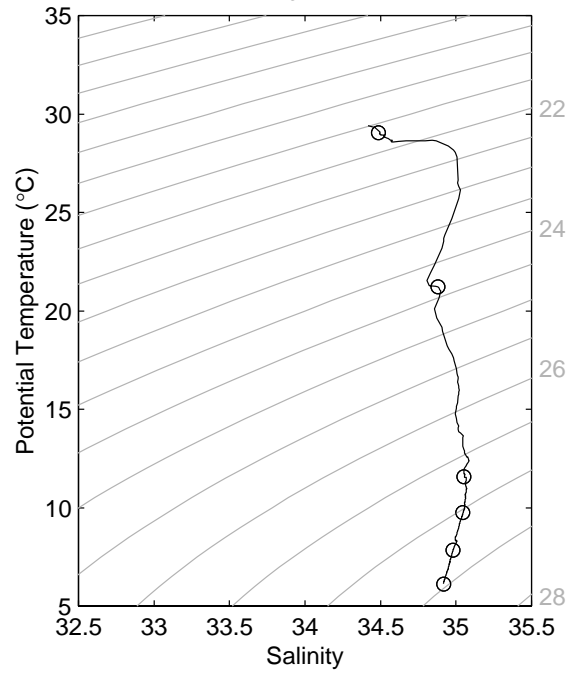
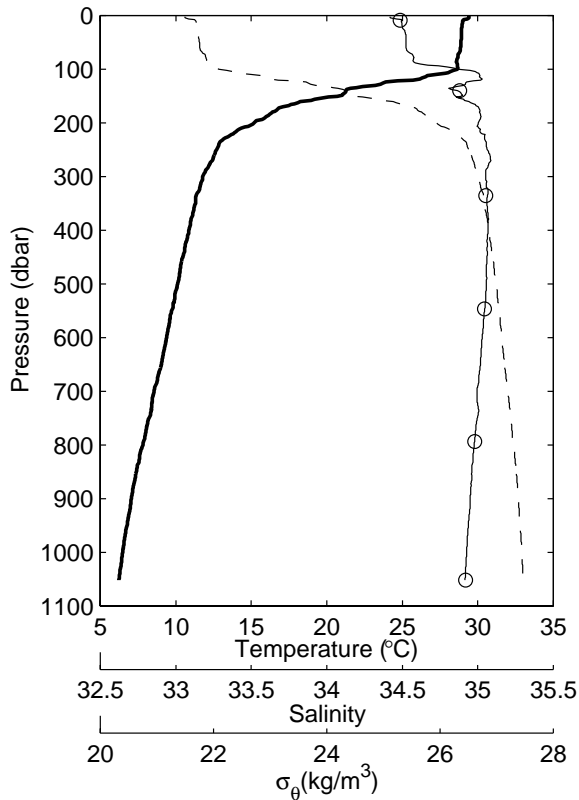


Figure 8.1.99. Same as Fig. 8.1.23 but for station 153 cast 1 and station 154 cast 1.

JASMINE Stn-155 Cast-1 6.00°N 88.50°E 23:36Z 16 May 1999



JASMINE Stn-156 Cast-1 5.50°N 88.50°E 02:54Z 17 May 1999

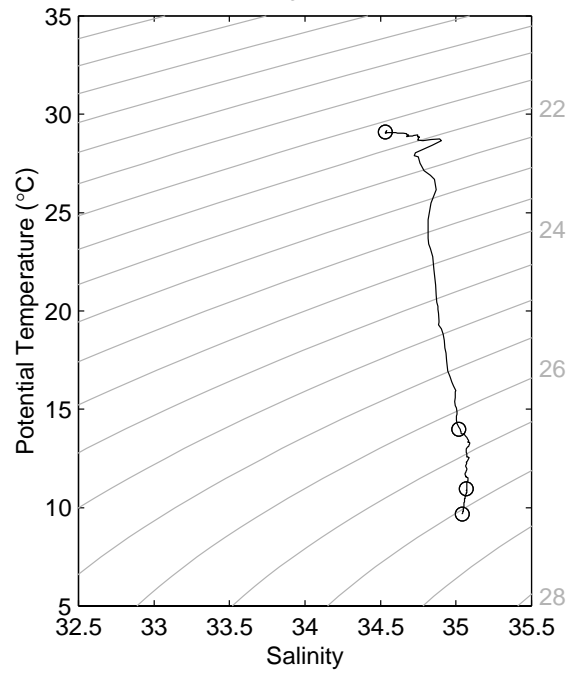
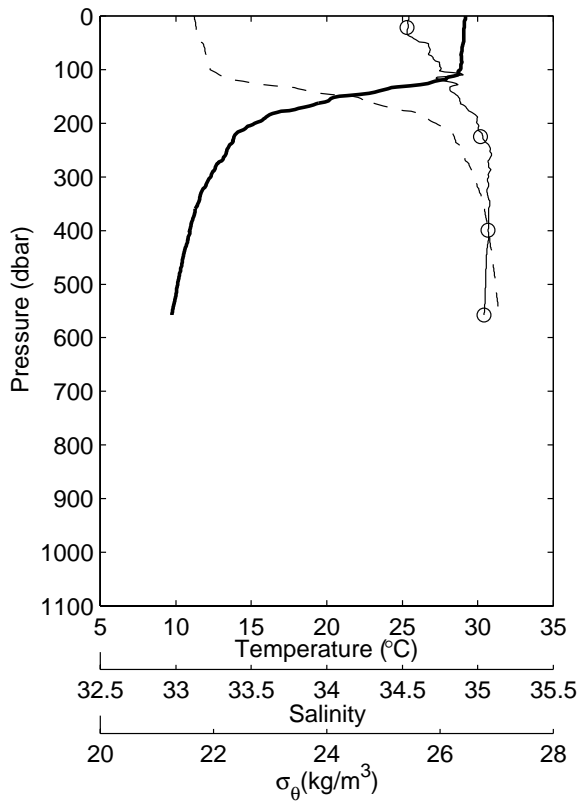
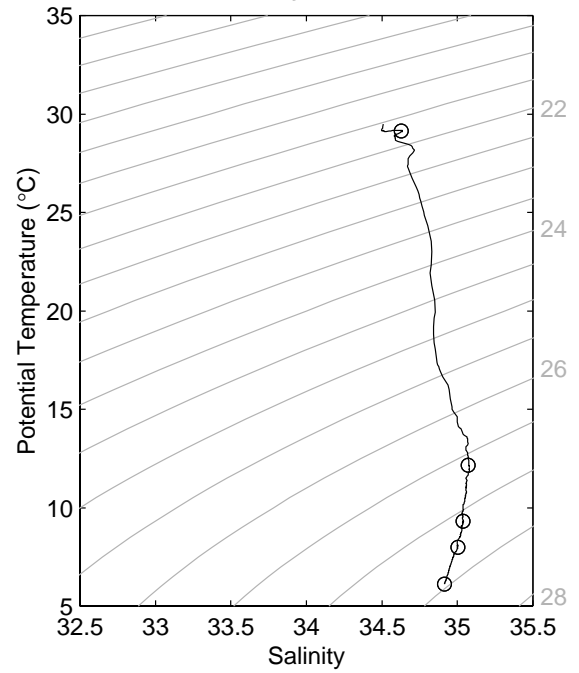
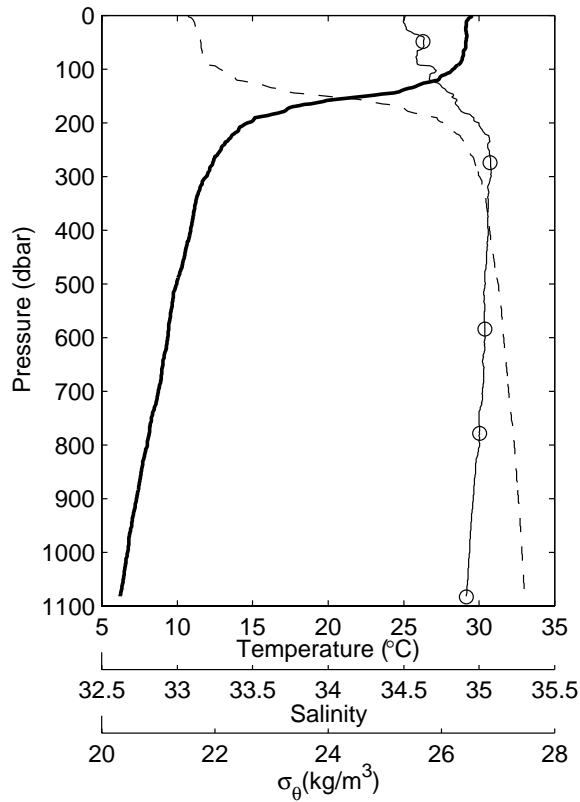


Figure 8.1.100. Same as Fig. 8.1.23 but for station 155 cast 1 and station 156 cast 1.

JASMINE Stn-157 Cast-1 5.00°N 88.50°E 05:55Z 17 May 1999



JASMINE Stn-158 Cast-1 4.50°N 88.50°E 09:06Z 17 May 1999

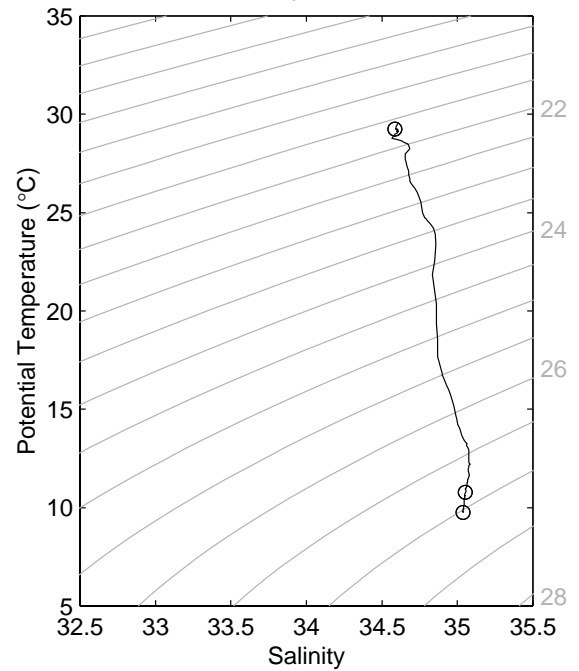
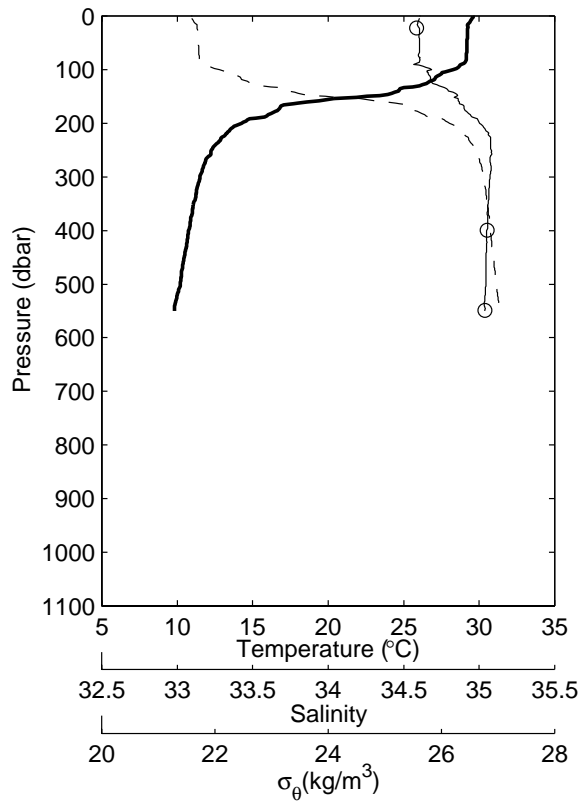
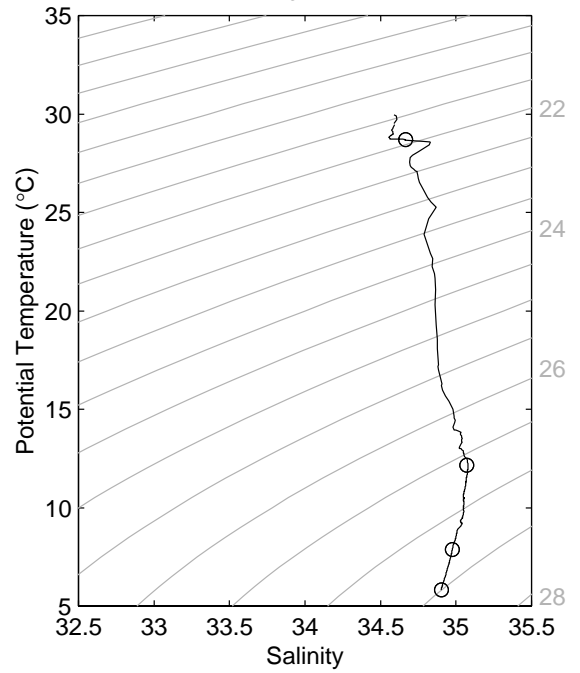
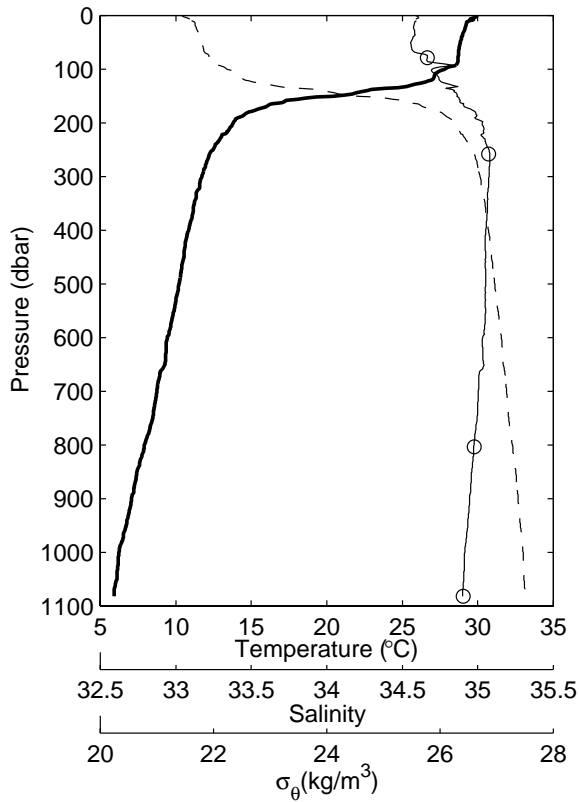


Figure 8.1.101. Same as Fig. 8.1.23 but for station 157 cast 1 and station 158 cast 1.

JASMINE Stn-159 Cast-1 4.00°N 88.50°E 11:57Z 17 May 1999



JASMINE Stn-160 Cast-1 3.50°N 88.50°E 15:09Z 17 May 1999

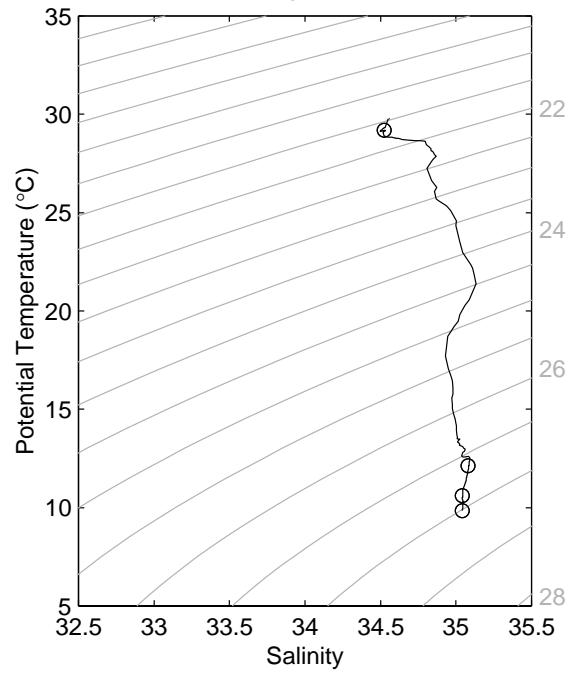
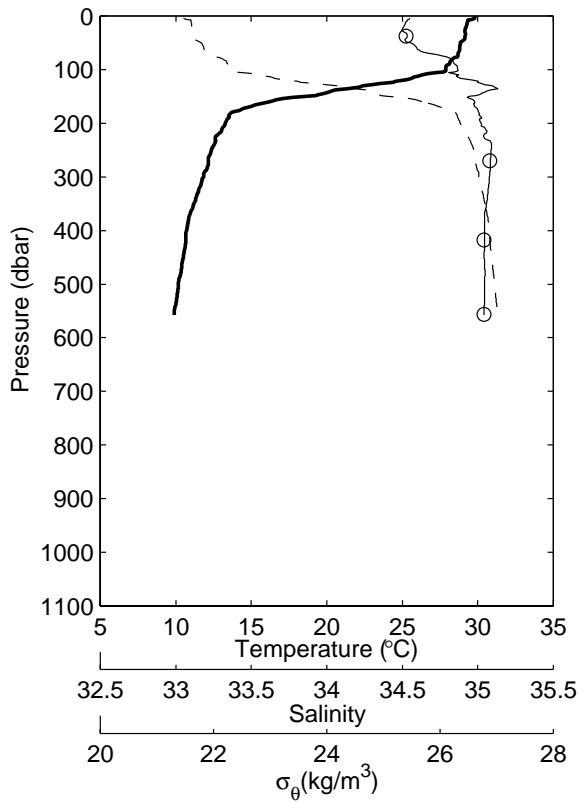
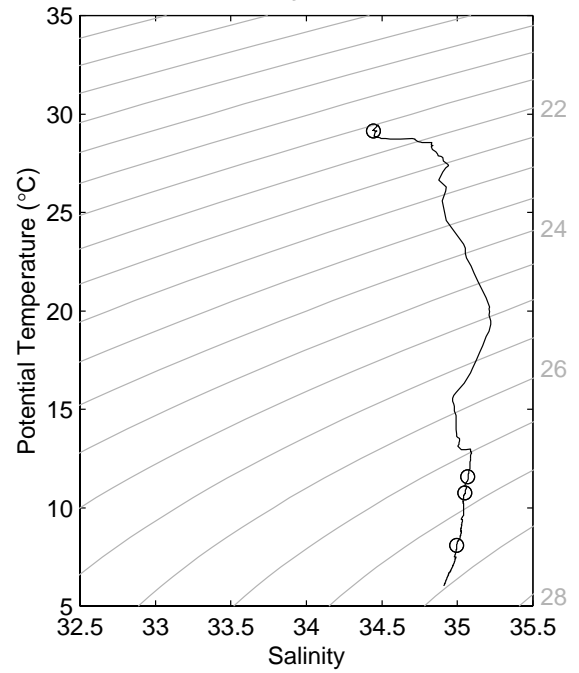
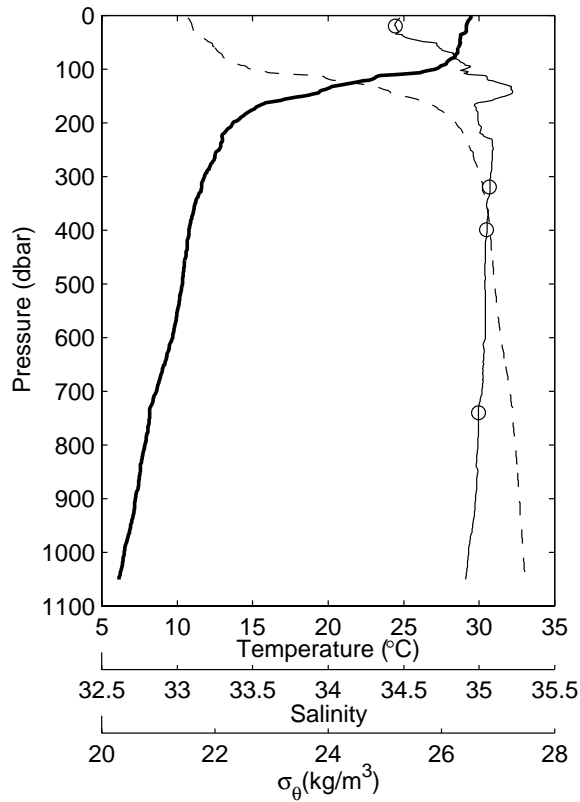


Figure 8.1.102. Same as Fig. 8.1.23 but for station 159 cast 1 and station 160 cast 1.

JASMINE Stn-161 Cast-1 3.00°N 88.50°E 17:51Z 17 May 1999



JASMINE Stn-162 Cast-1 2.53°N 88.50°E 20:57Z 17 May 1999

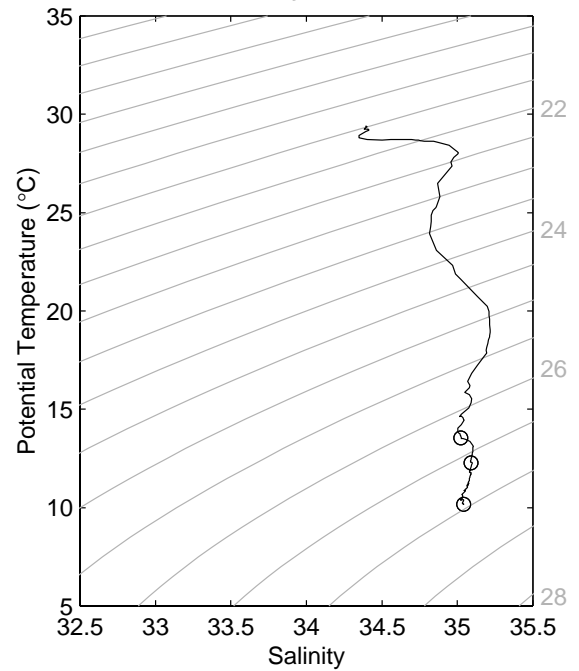
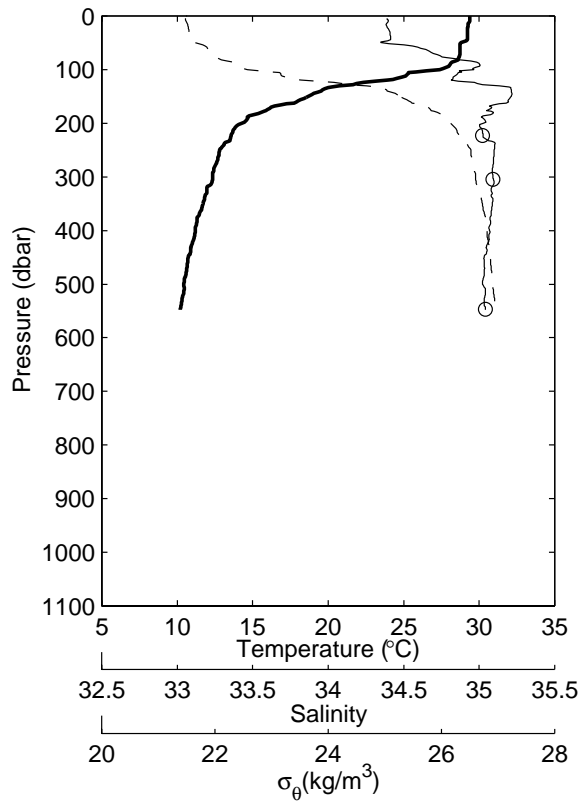
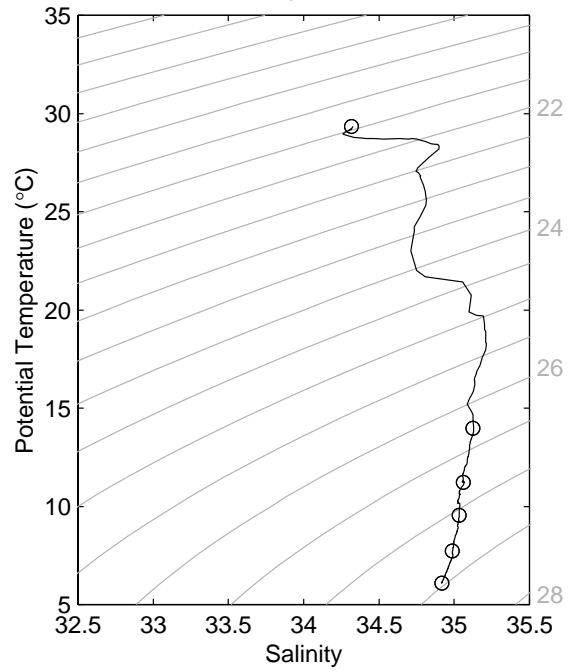
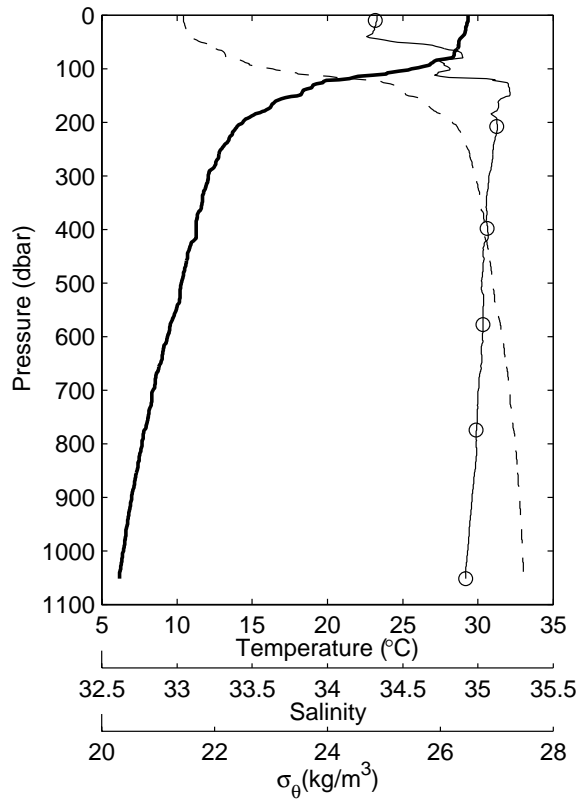


Figure 8.1.103. Same as Fig. 8.1.23 but for station 161 cast 1 and station 162 cast 1.

JASMINE Stn-163 Cast-1 2.00°N 88.50°E 00:10Z 18 May 1999



JASMINE Stn-164 Cast-1 1.50°N 88.50°E 03:18Z 18 May 1999

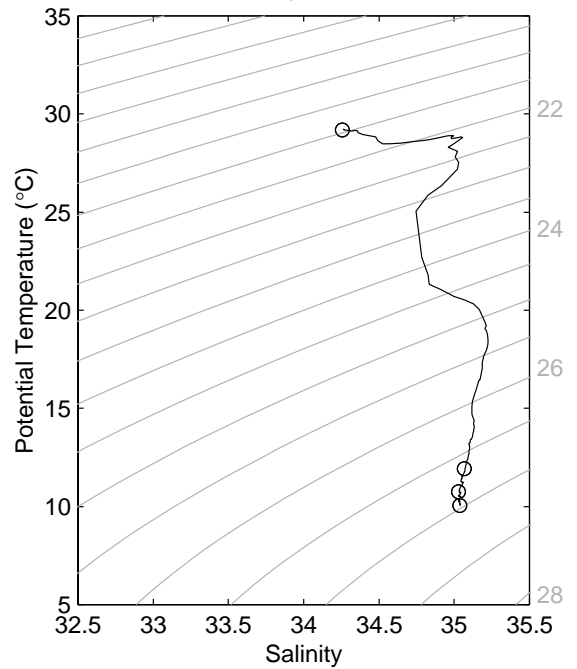
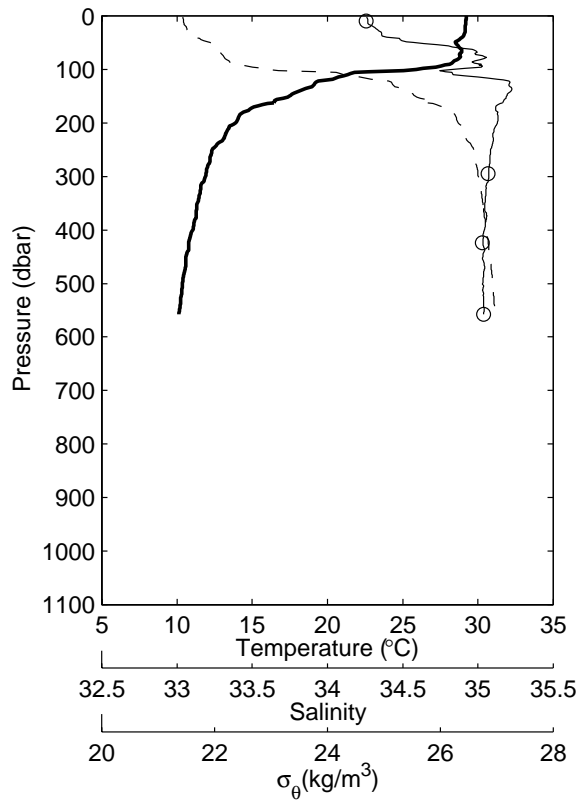
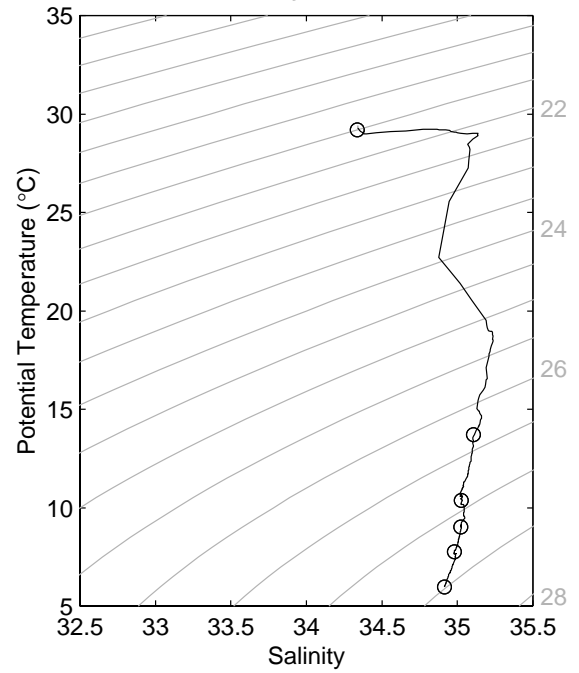
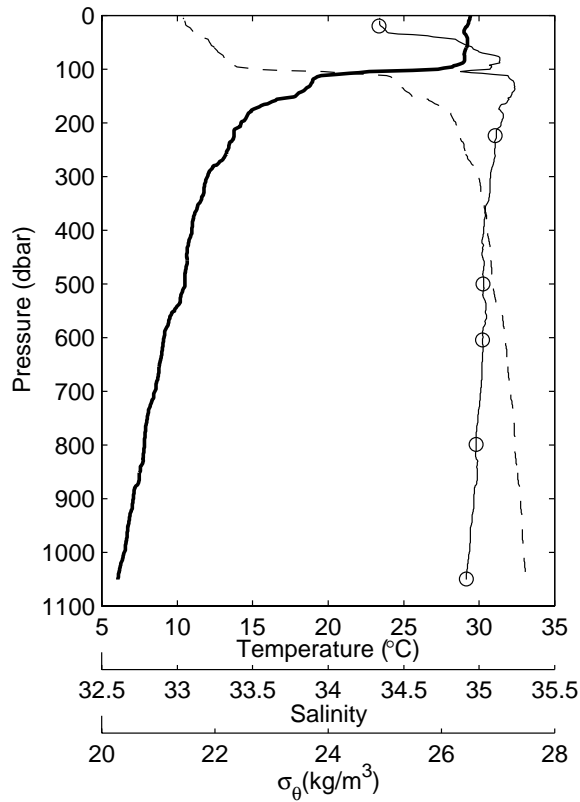


Figure 8.1.104. Same as Fig. 8.1.23 but for station 163 cast 1 and station 164 cast 1.

JASMINE Stn-165 Cast-1 1.01°N 88.50°E 06:02Z 18 May 1999



JASMINE Stn-166 Cast-1 0.50°N 88.50°E 09:24Z 18 May 1999

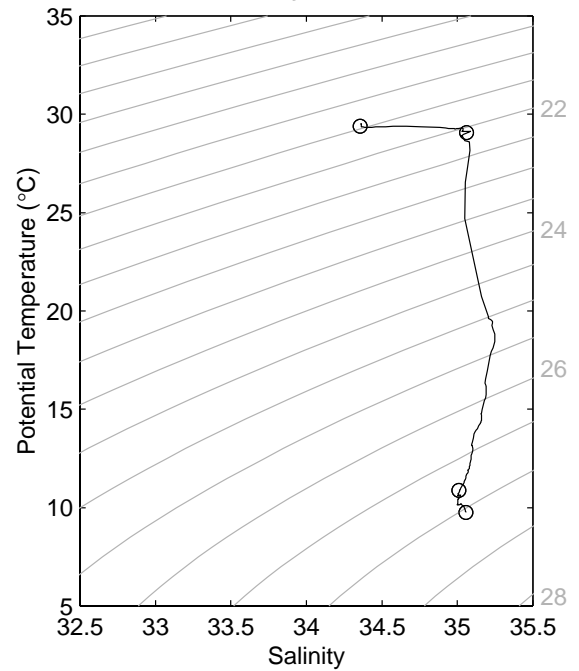
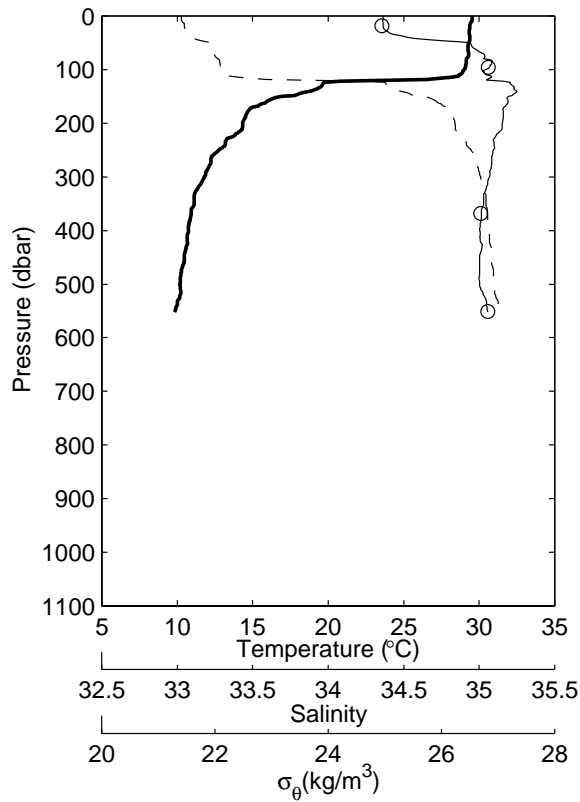
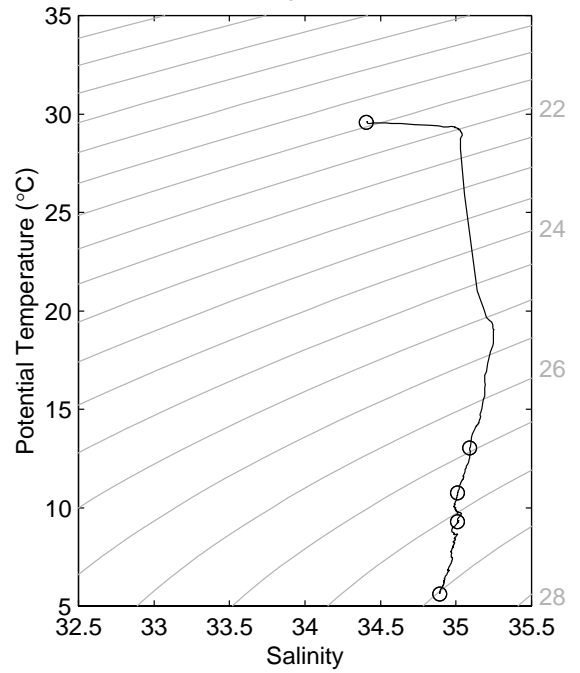
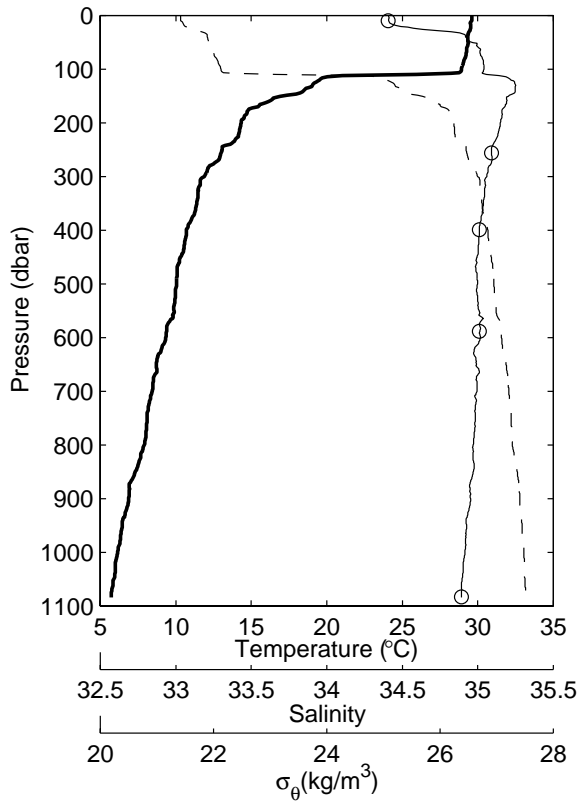


Figure 8.1.105. Same as Fig. 8.1.23 but for station 165 cast 1 and station 166 cast 1.

JASMINE Stn-167 Cast-1 0.00°S 88.50°E 12:15Z 18 May 1999



JASMINE Stn-168 Cast-1 0.50°N 88.50°E 15:54Z 18 May 1999

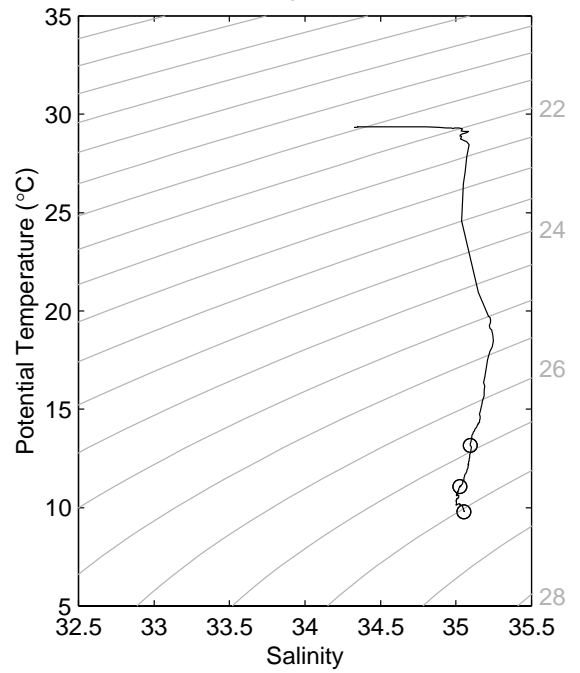
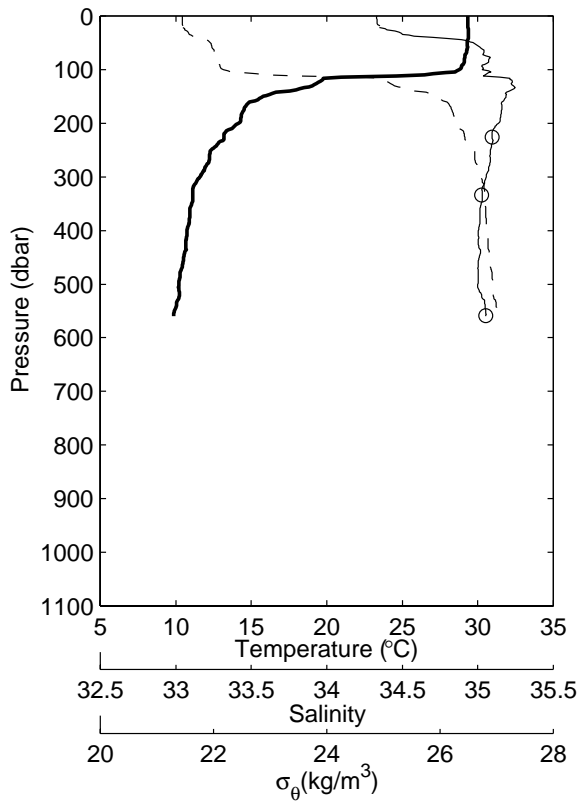
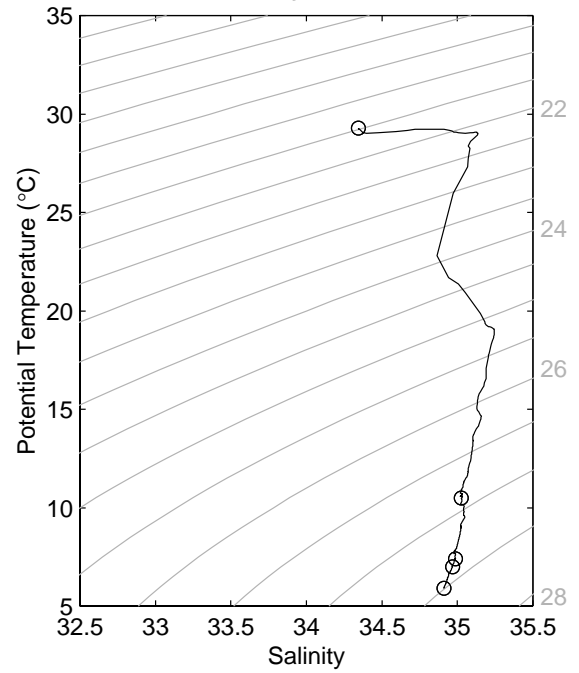
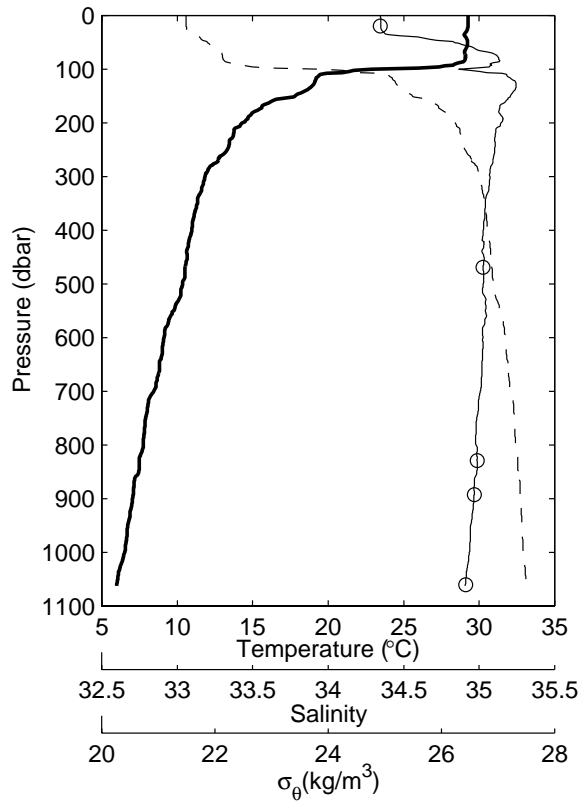


Figure 8.1.106. Same as Fig. 8.1.23 but for station 167 cast 1 and station 168 cast 1.

JASMINE Stn-169 Cast-1 0.98°N 88.50°E 18:55Z 18 May 1999



JASMINE Stn-170 Cast-1 1.50°N 88.50°E 22:38Z 18 May 1999

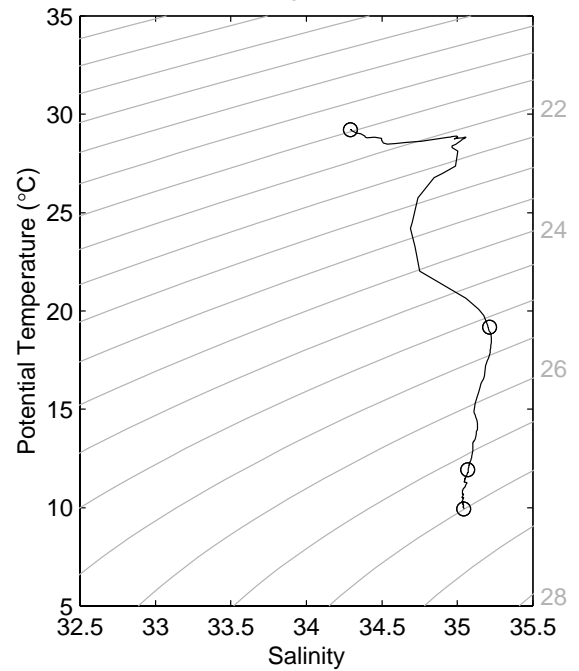
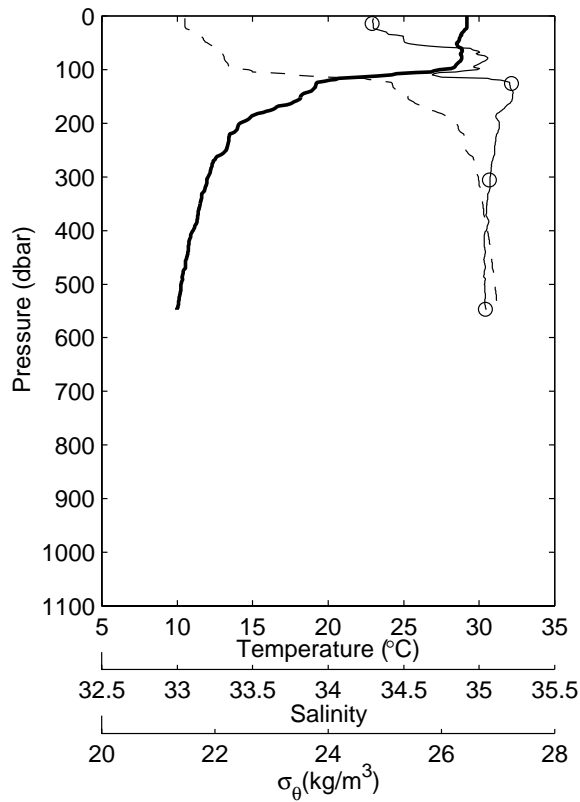
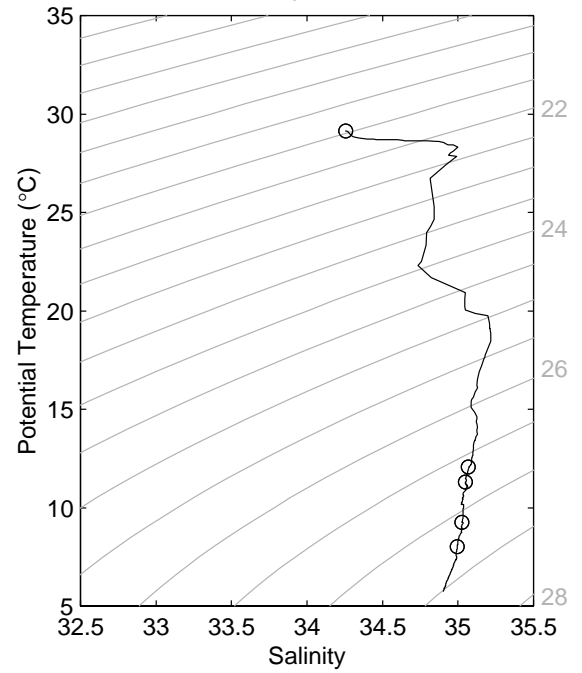
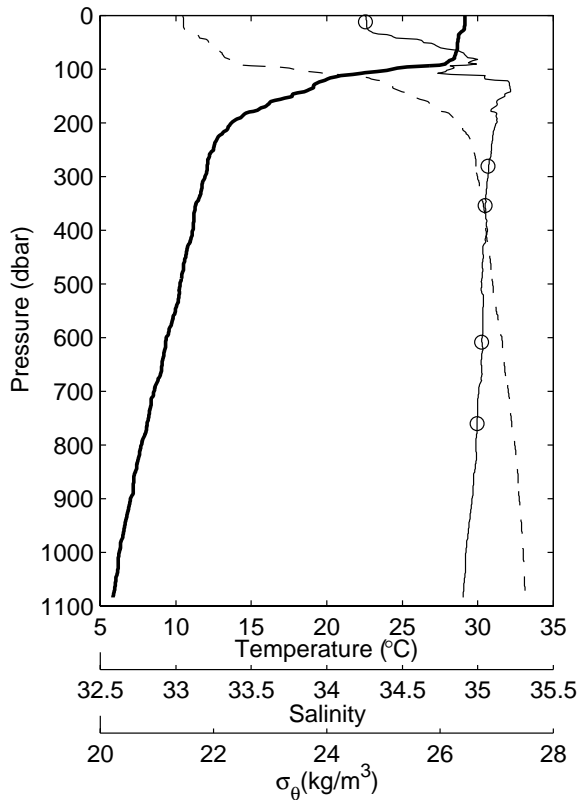


Figure 8.1.107. Same as Fig. 8.1.23 but for station 169 cast 1 and station 170 cast 1.

JASMINE Stn-171 Cast-1 2.00°N 88.50°E 01:41Z 19 May 1999



JASMINE Stn-172 Cast-1 2.50°N 88.50°E 05:04Z 19 May 1999

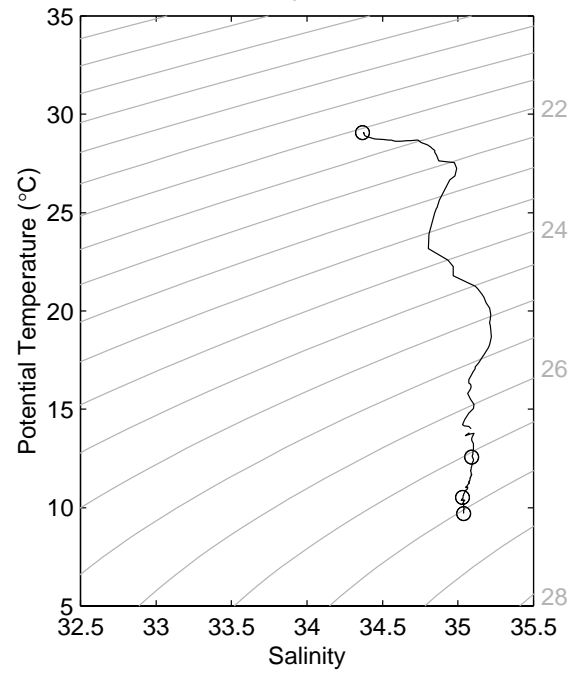
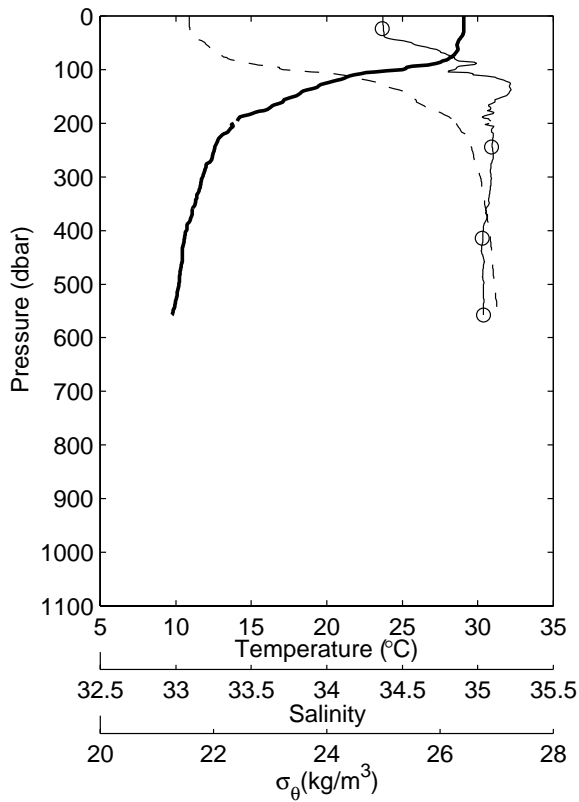
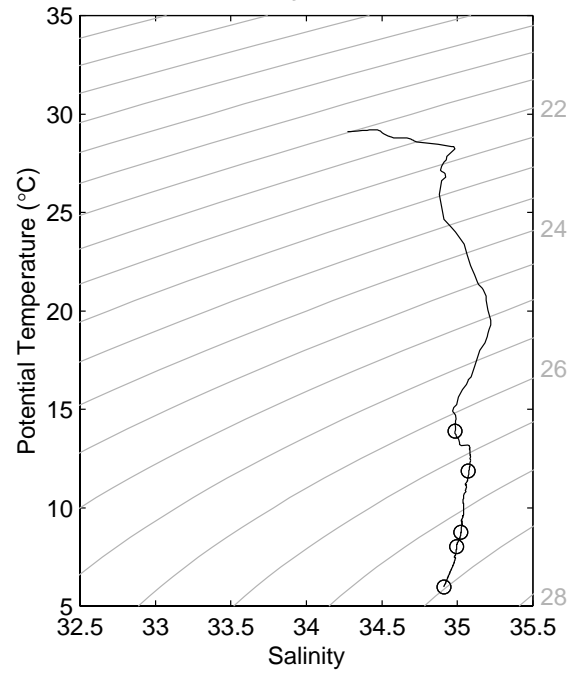
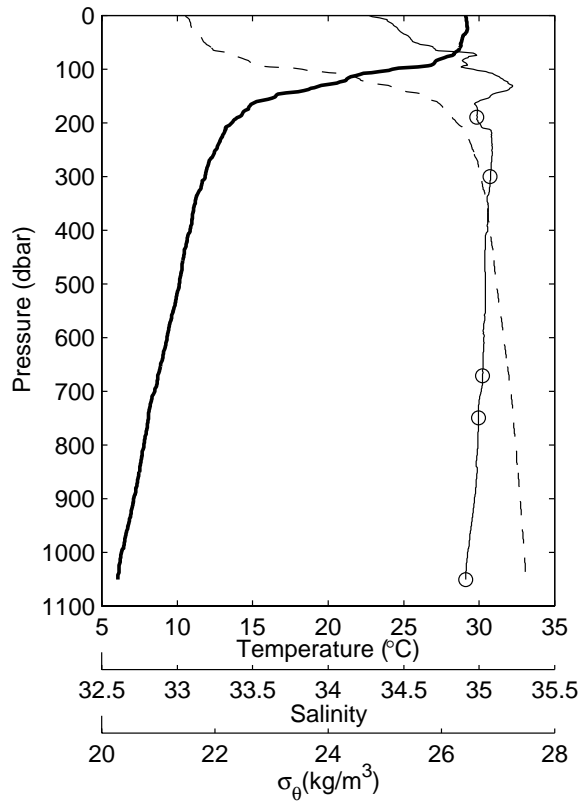


Figure 8.1.108. Same as Fig. 8.1.23 but for station 171 cast 1 and station 172 cast 1.

JASMINE Stn-173 Cast-1 2.95°N 88.50°E 07:46Z 19 May 1999



JASMINE Stn-174 Cast-1 3.51°N 88.50°E 11:27Z 19 May 1999

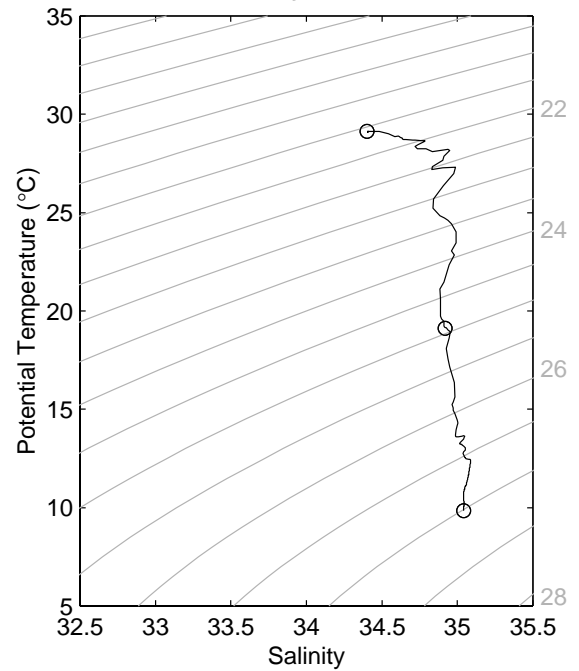
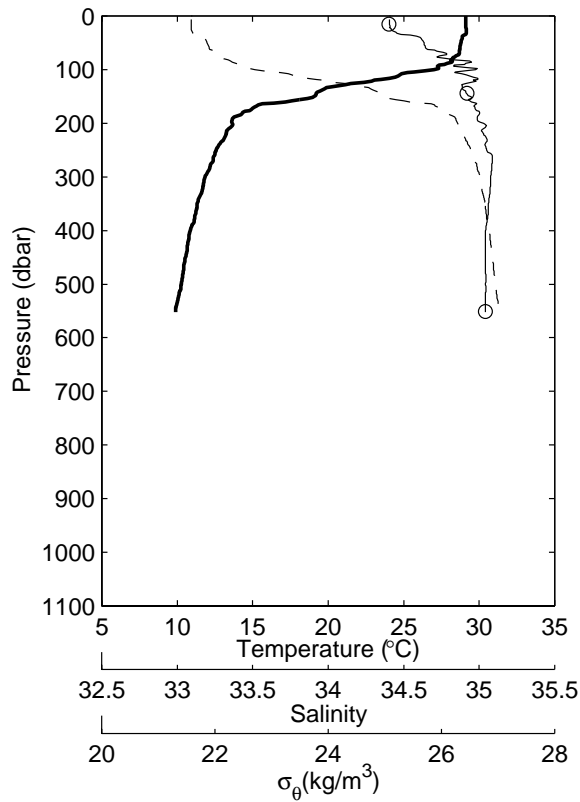
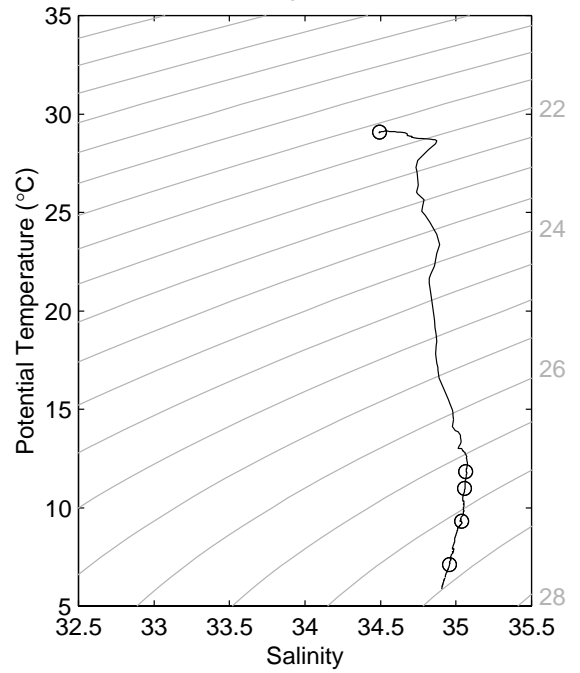
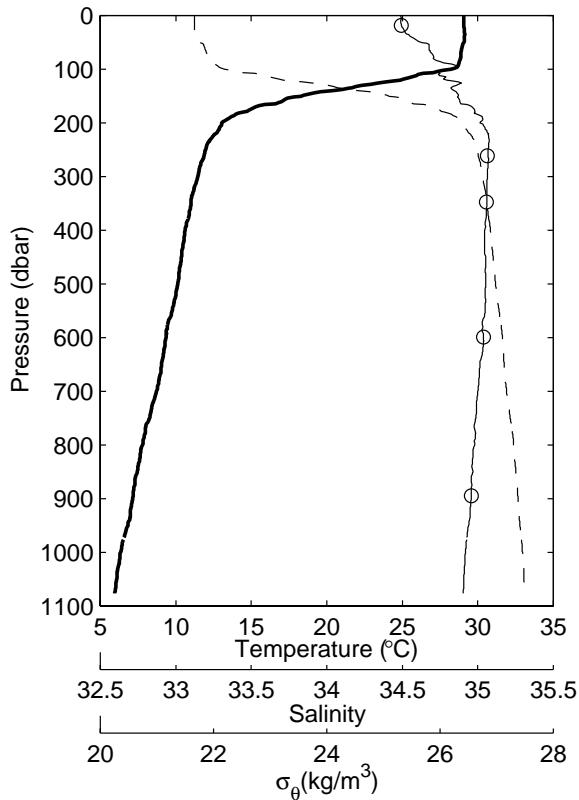


Figure 8.1.109. Same as Fig. 8.1.23 but for station 173 cast 1 and station 174 cast 1.

JASMINE Stn-175 Cast-1 4.00°N 88.50°E 14:31Z 19 May 1999



JASMINE Stn-176 Cast-1 4.50°N 88.50°E 17:55Z 19 May 1999

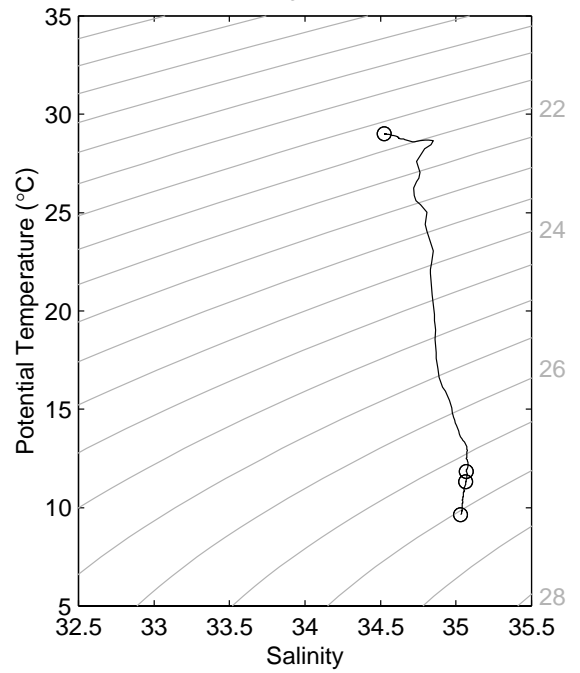
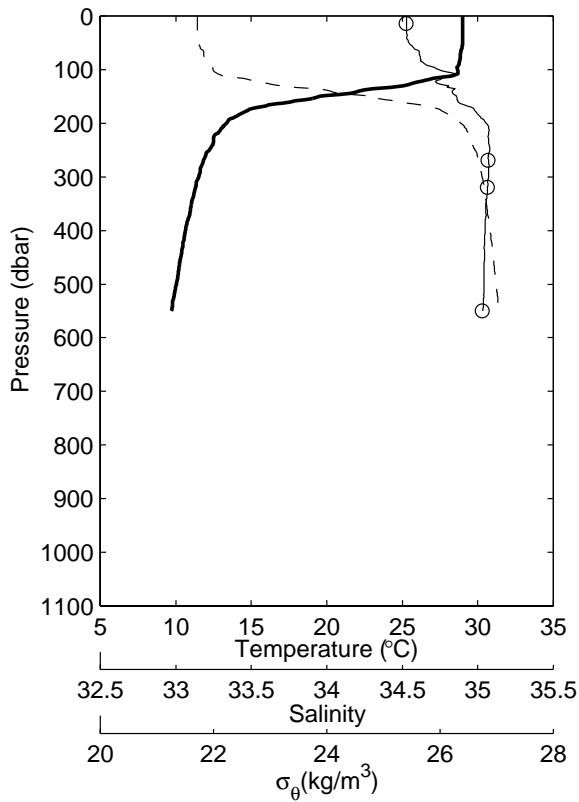
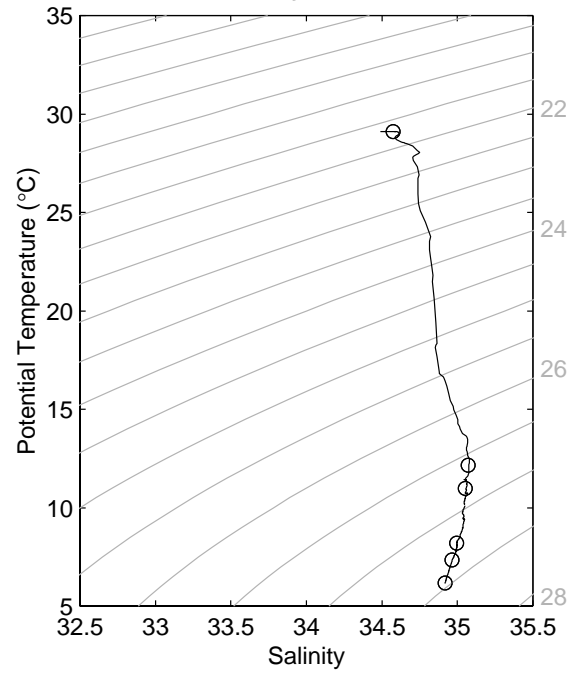
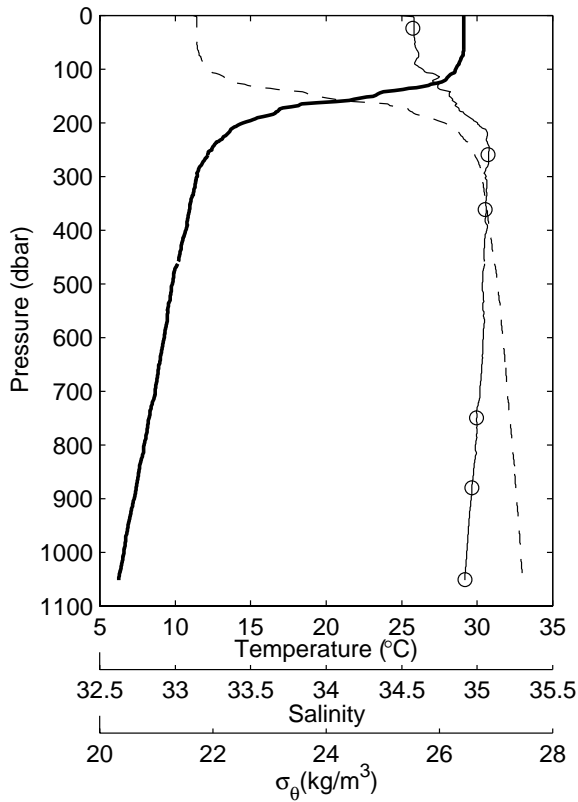


Figure 8.1.110. Same as Fig. 8.1.23 but for station 175 cast 1 and station 176 cast 1.

JASMINE Stn-177 Cast-1 4.94°N 88.50°E 20:38Z 19 May 1999



JASMINE Stn-178 Cast-1 5.50°N 88.50°E 00:21Z 20 May 1999

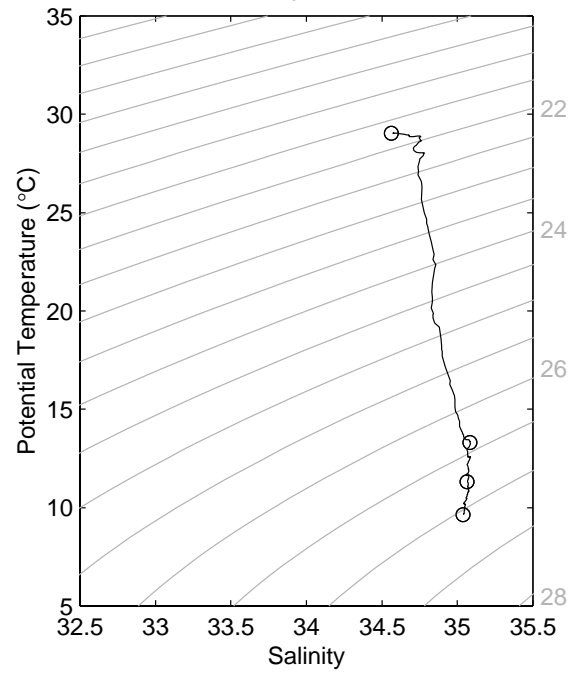
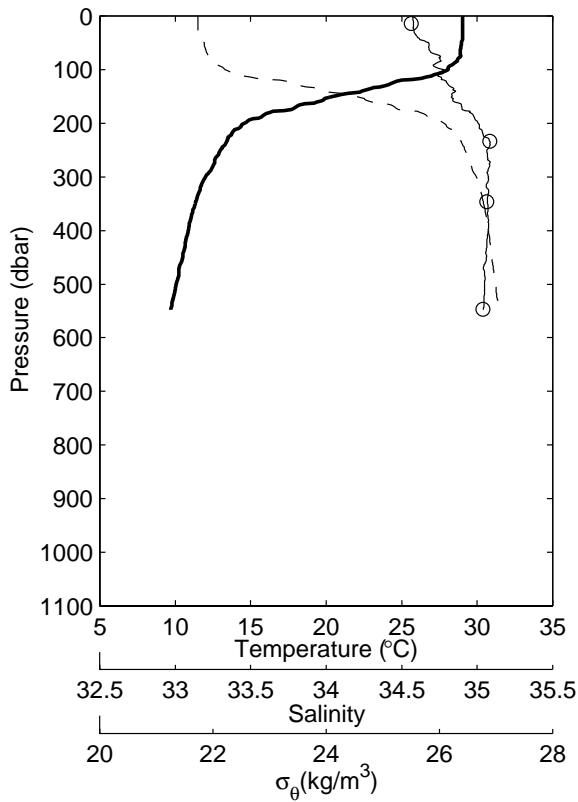
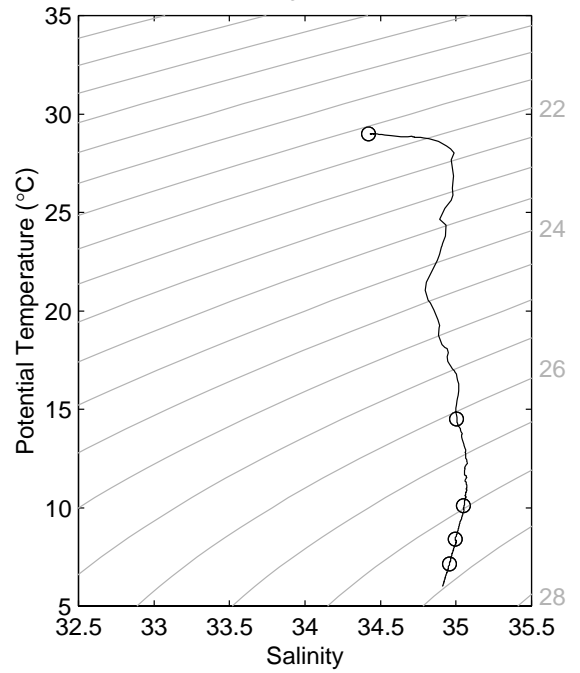
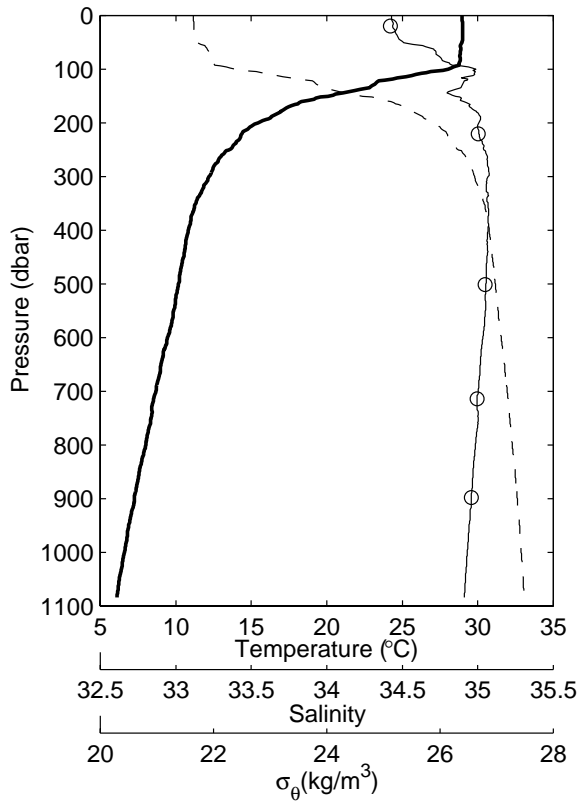


Figure 8.1.111. Same as Fig. 8.1.23 but for station 177 cast 1 and station 178 cast 1.

JASMINE Stn-179 Cast-1 6.00°N 88.42°E 03:32Z 20 May 1999



JASMINE Stn-180 Cast-1 6.50°N 88.33°E 07:05Z 20 May 1999

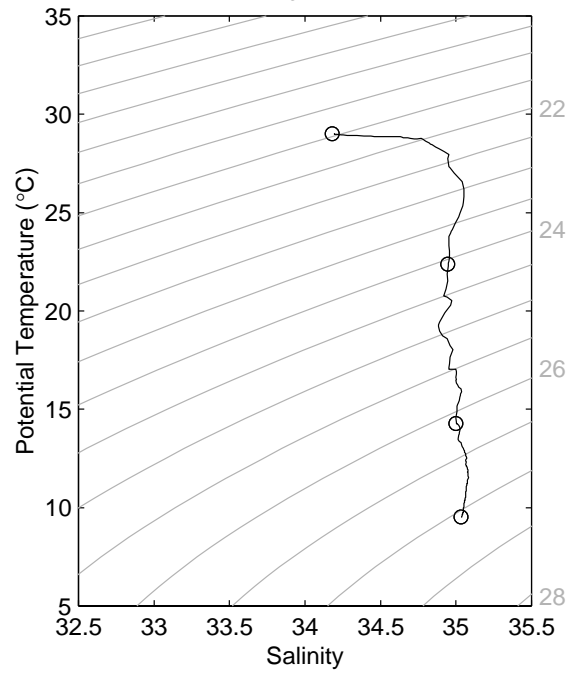
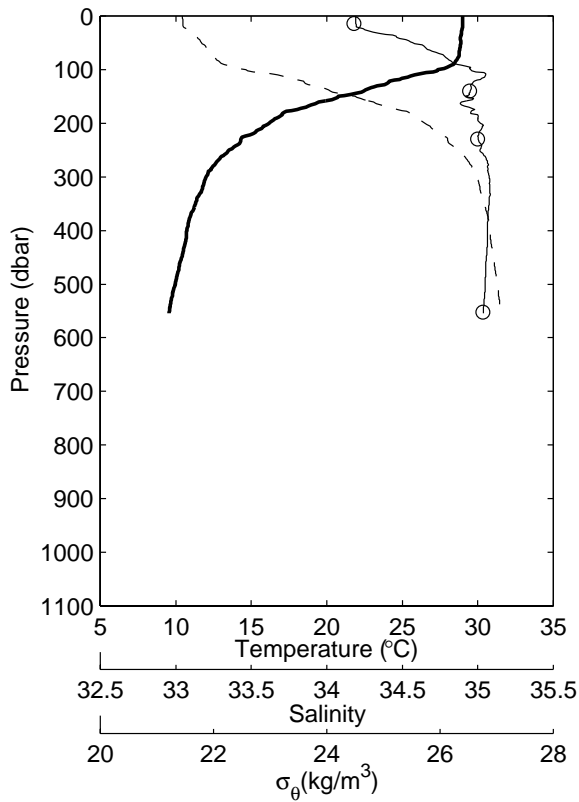
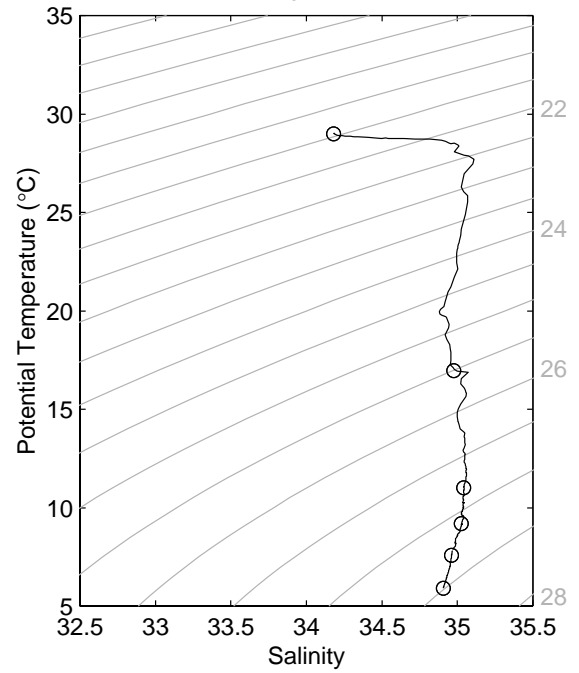
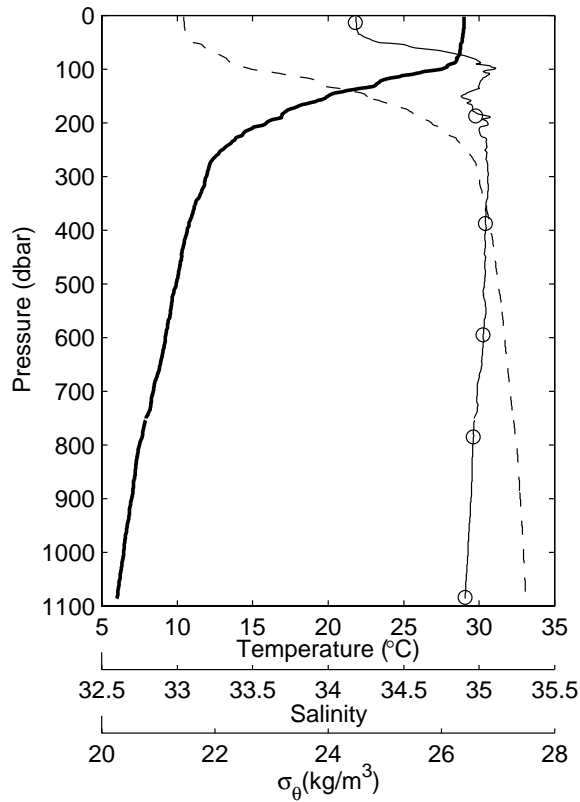


Figure 8.1.112. Same as Fig. 8.1.23 but for station 179 cast 1 and station 180 cast 1.

JASMINE Stn-181 Cast-1 7.00°N 88.25°E 10:20Z 20 May 1999



JASMINE Stn-182 Cast-1 7.50°N 88.25°E 13:56Z 20 May 1999

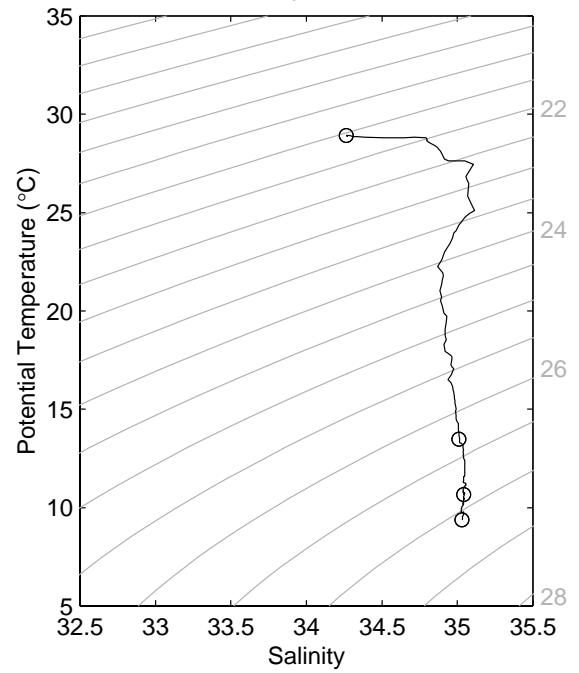
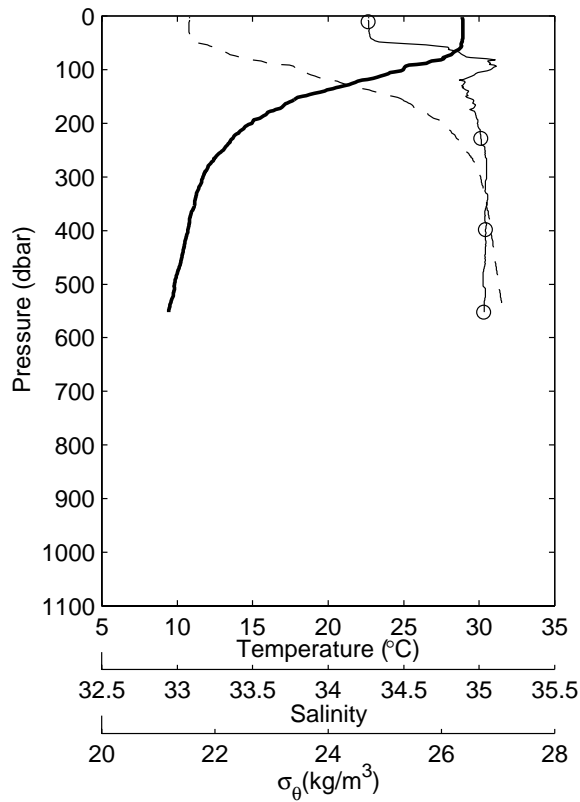
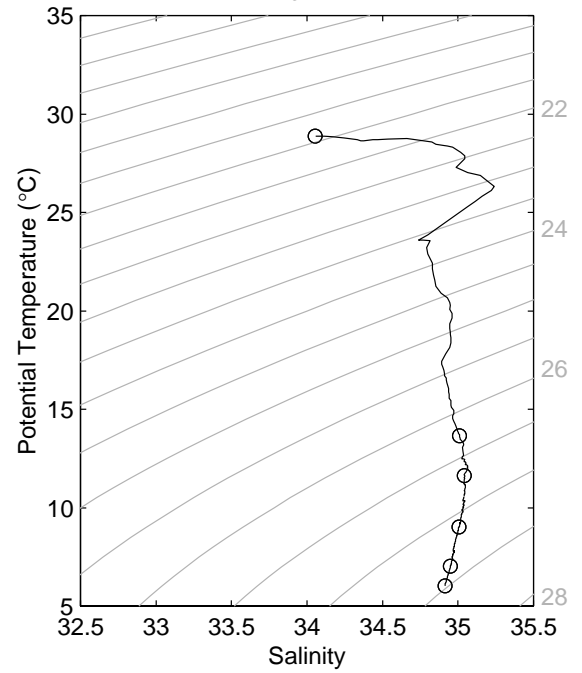
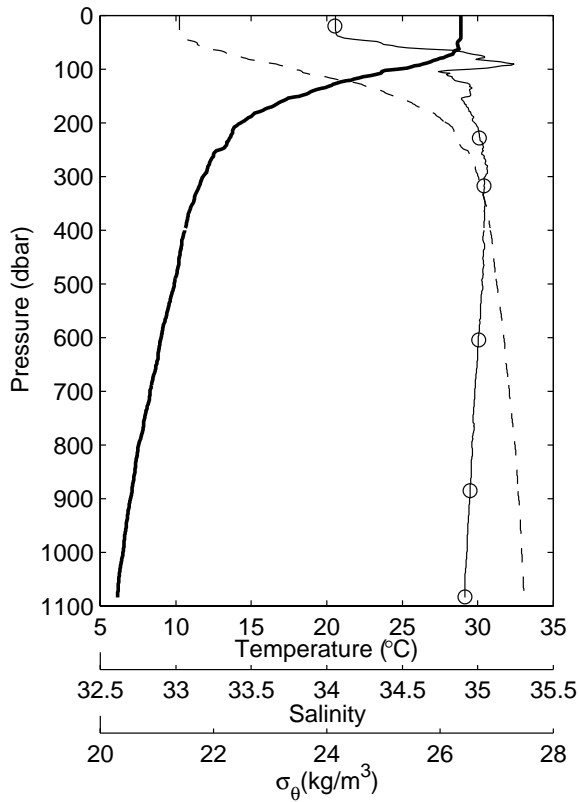


Figure 8.1.113. Same as Fig. 8.1.23 but for station 181 cast 1 and station 182 cast 1.

JASMINE Stn-183 Cast-1 8.00°N 88.25°E 17:06Z 20 May 1999



JASMINE Stn-184 Cast-1 8.50°N 88.25°E 20:23Z 20 May 1999

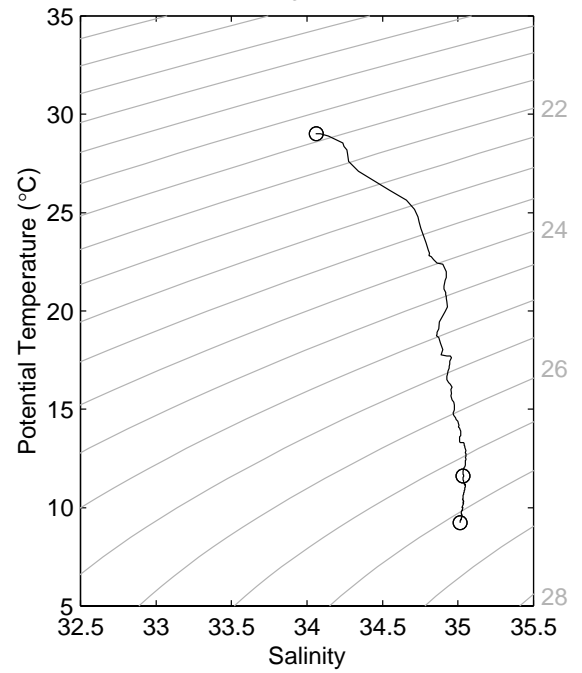
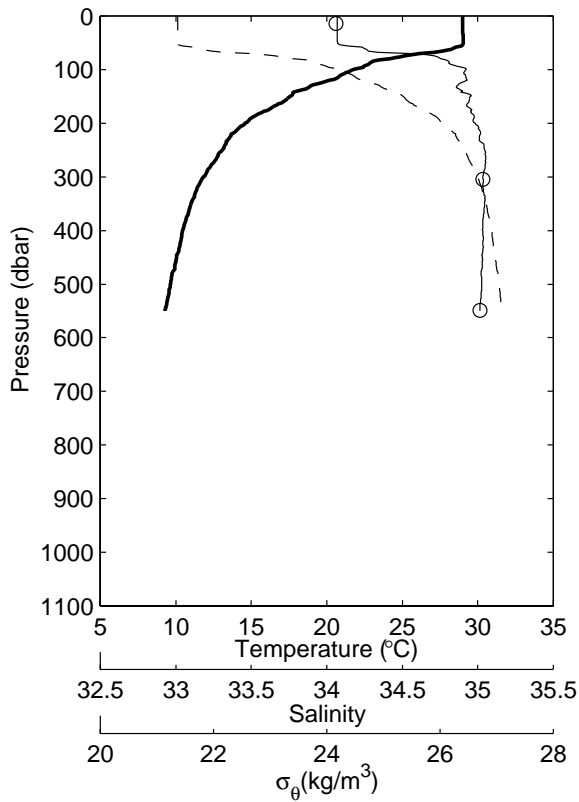
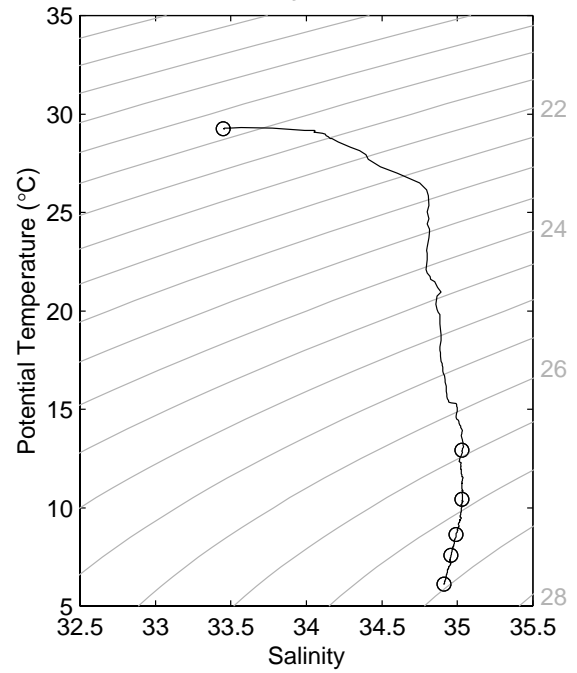
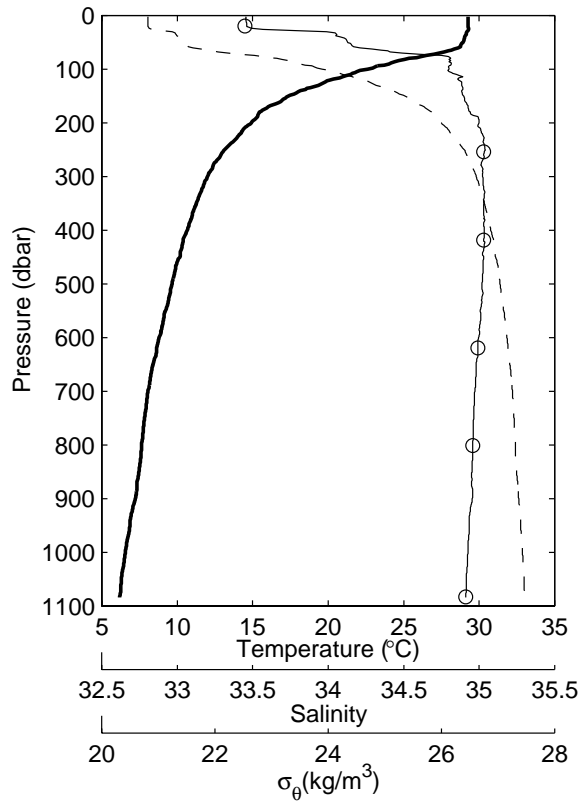


Figure 8.1.114. Same as Fig. 8.1.23 but for station 183 cast 1 and station 184 cast 1.

JASMINE Stn-185 Cast-1 9.00°N 88.25°E 23:30Z 20 May 1999



JASMINE Stn-186 Cast-1 9.50°N 88.25°E 02:48Z 21 May 1999

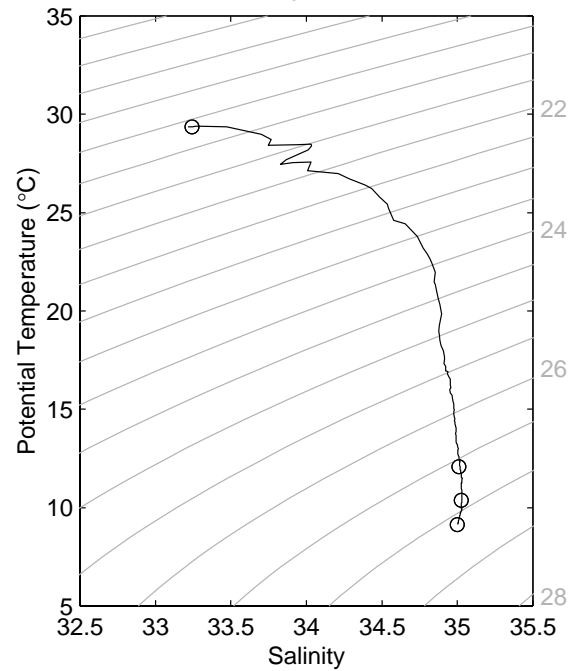
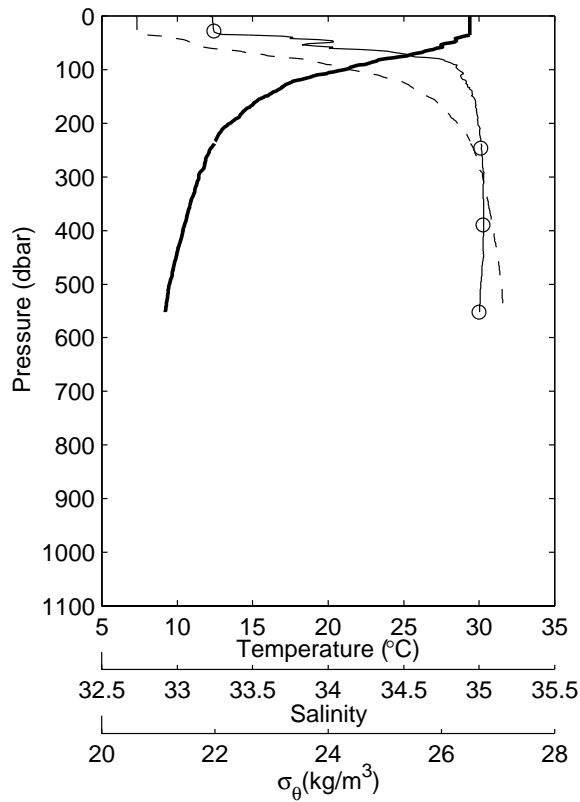
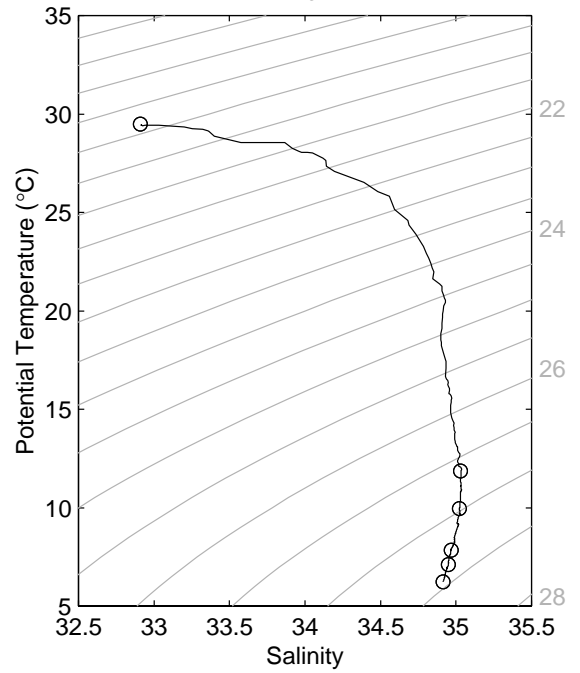
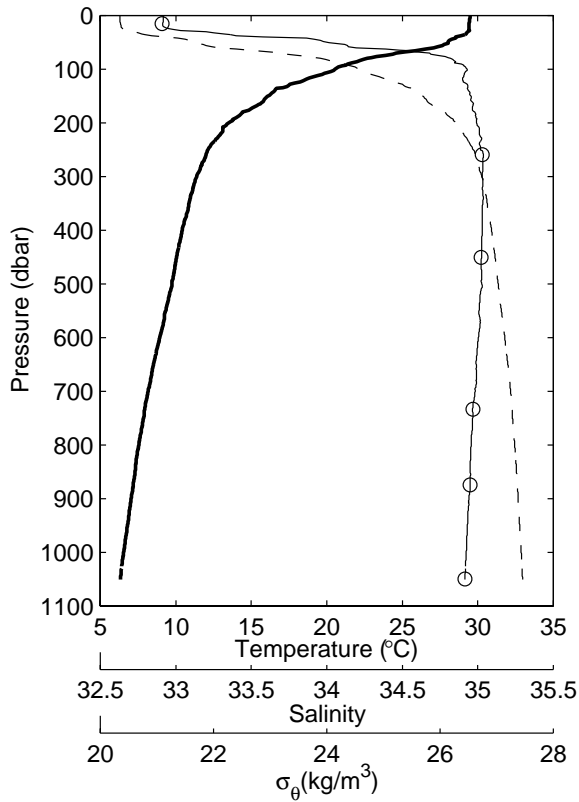


Figure 8.1.115. Same as Fig. 8.1.23 but for station 185 cast 1 and station 186 cast 1.

JASMINE Stn-187 Cast-1 10.00°N 88.25°E 05:45Z 21 May 1999



JASMINE Stn-188 Cast-1 10.49°N 88.25°E 08:49Z 21 May 1999

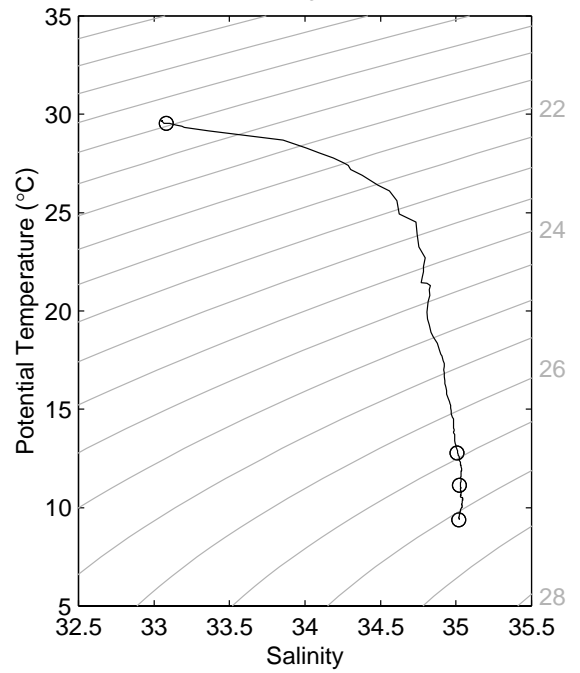
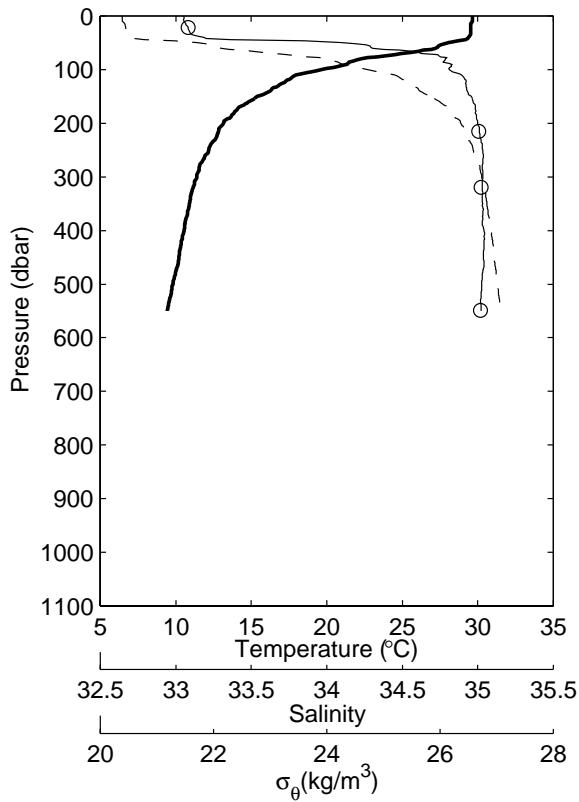
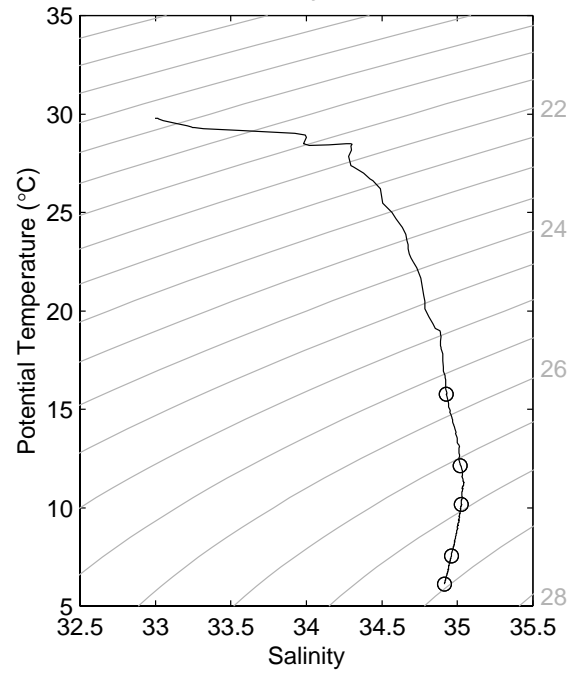
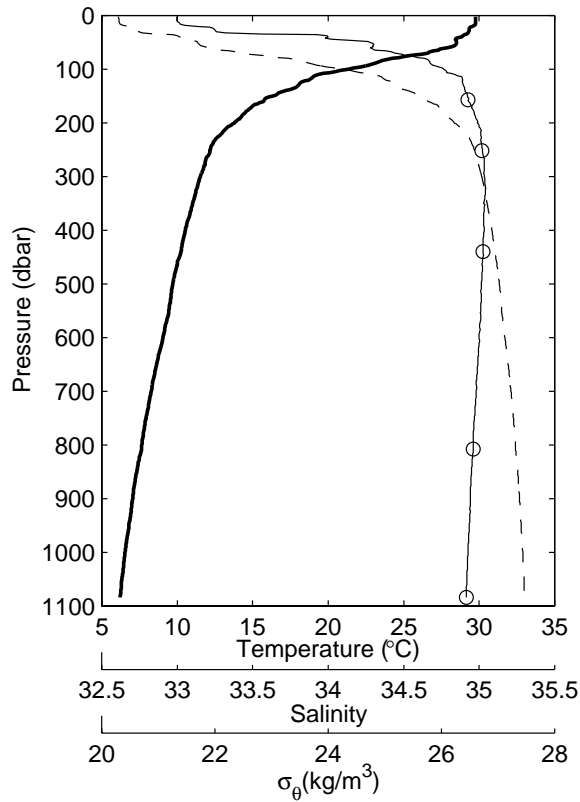


Figure 8.1.116. Same as Fig. 8.1.23 but for station 187 cast 1 and station 188 cast 1.

JASMINE Stn-189 Cast-1 11.00°N 88.25°E 11:52Z 21 May 1999



JASMINE Stn-190 Cast-1 11.11°N 88.33°E 13:26Z 21 May 1999

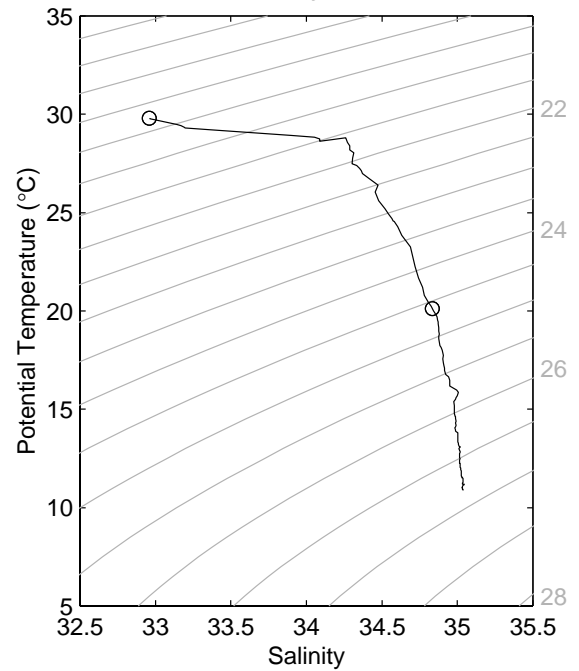
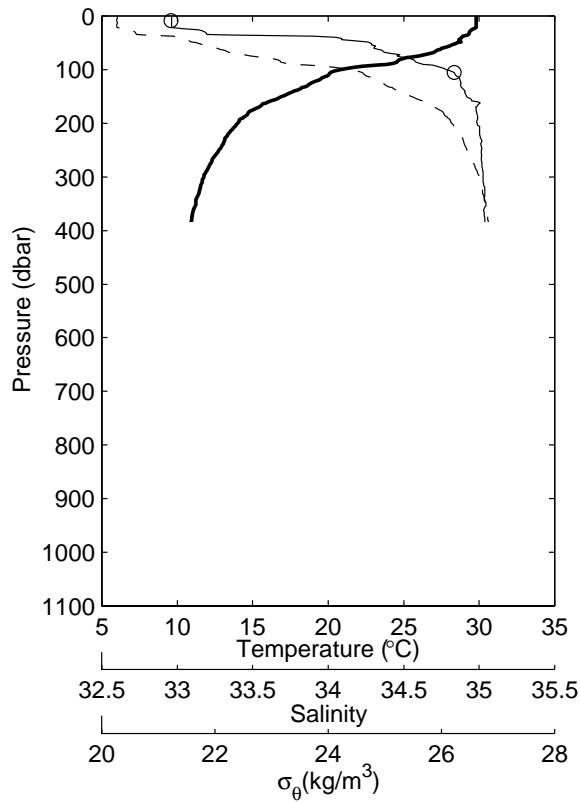
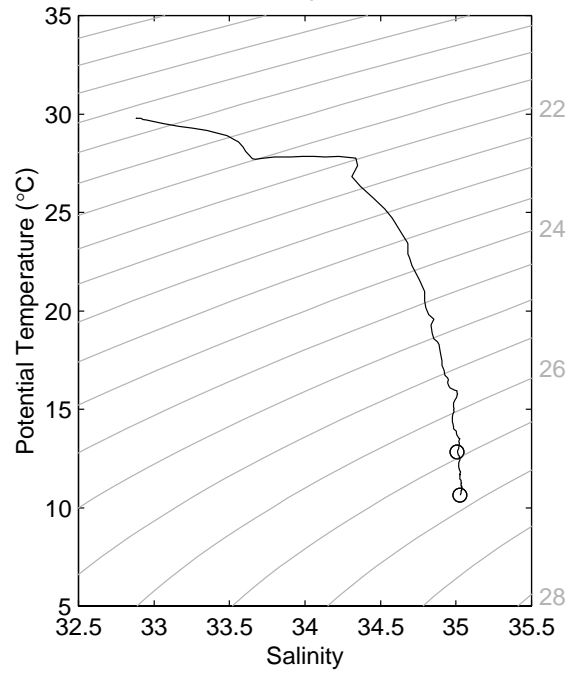
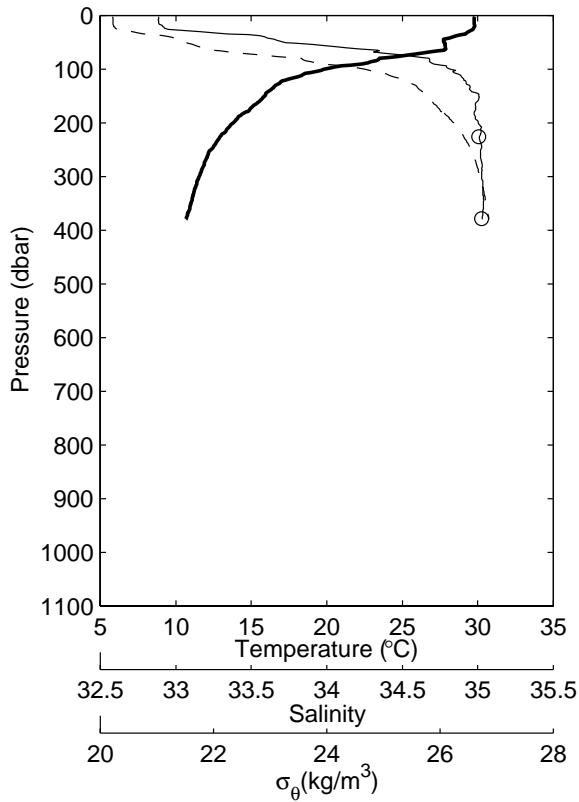


Figure 8.1.117. Same as Fig. 8.1.23 but for station 189 cast 1 and station 190 cast 1.

JASMINE Stn-191 Cast-1 11.22°N 88.41°E 14:39Z 21 May 1999



JASMINE Stn-192 Cast-1 11.32°N 88.49°E 15:52Z 21 May 1999

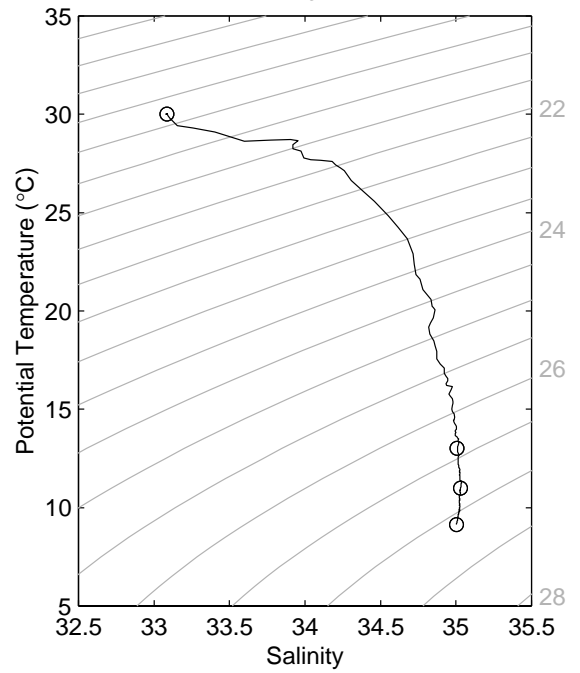
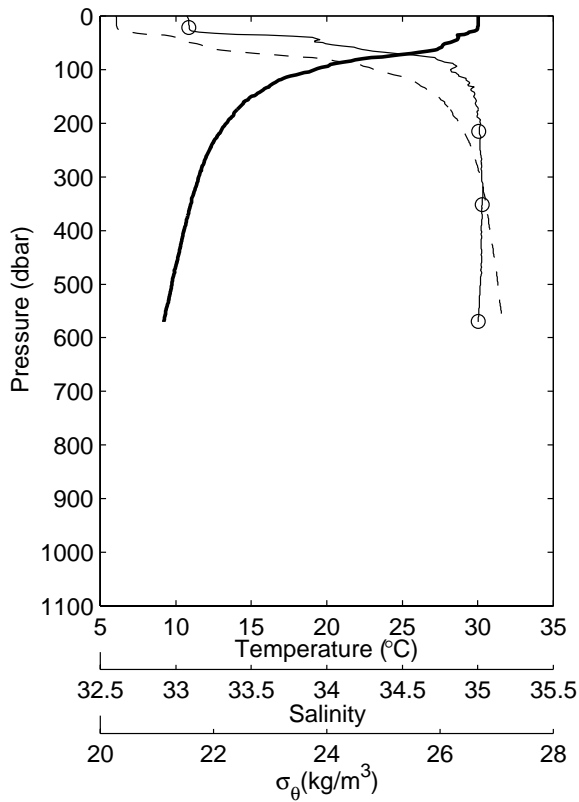
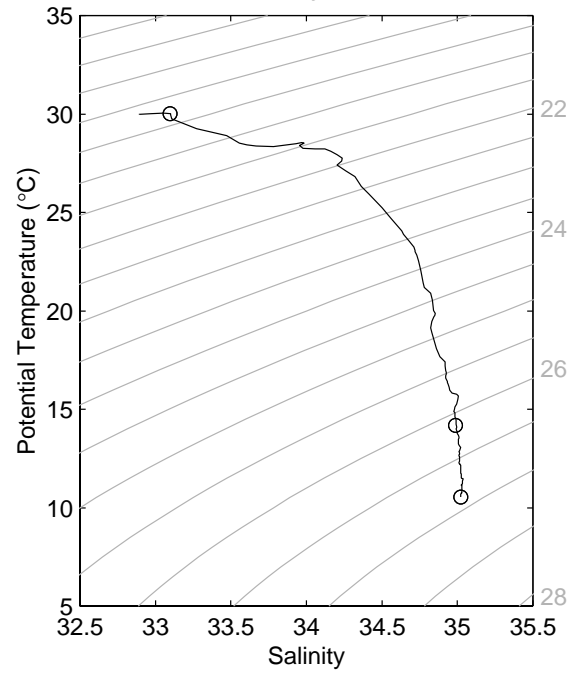
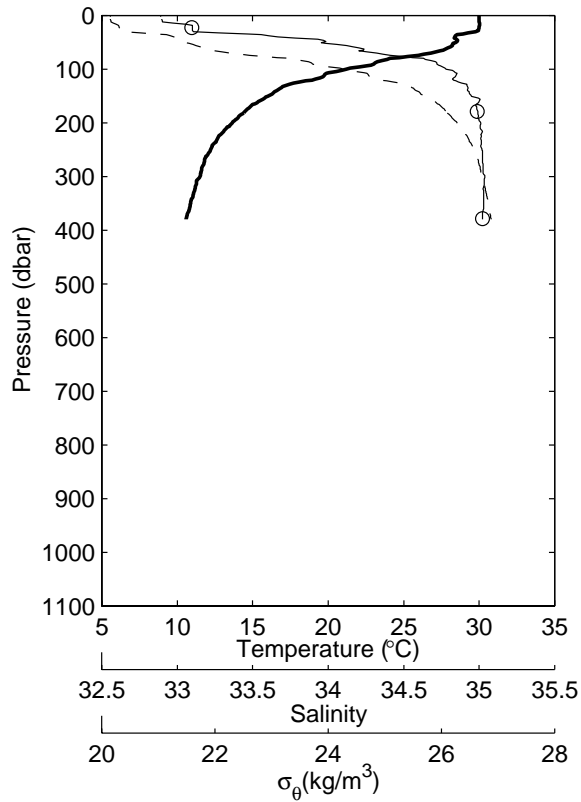


Figure 8.1.118. Same as Fig. 8.1.23 but for station 191 cast 1 and station 192 cast 1.

JASMINE Stn-193 Cast-1 11.28°N 88.36°E 17:02Z 21 May 1999



JASMINE Stn-194 Cast-1 11.24°N 88.24°E 18:10Z 21 May 1999

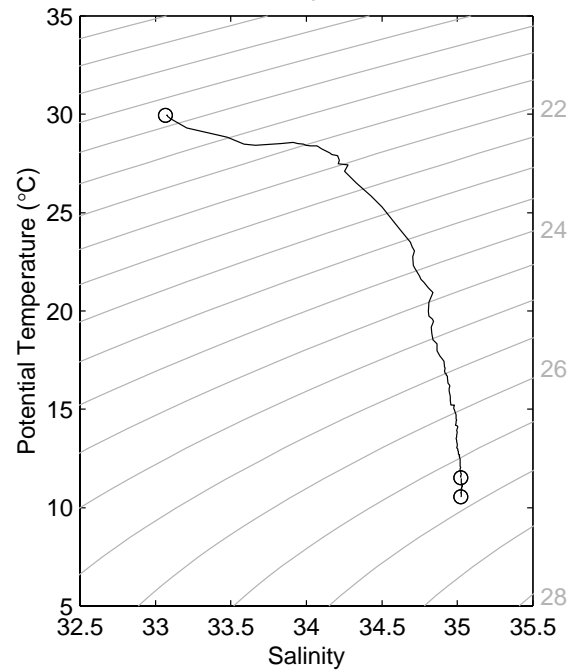
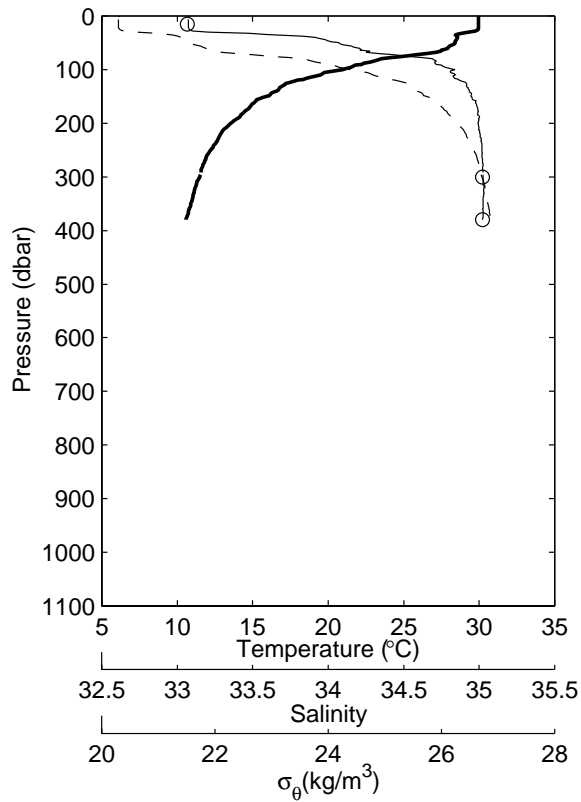
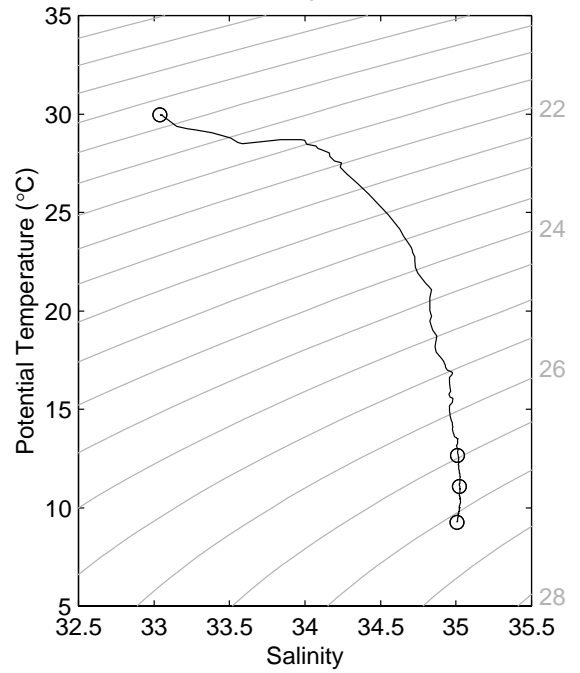
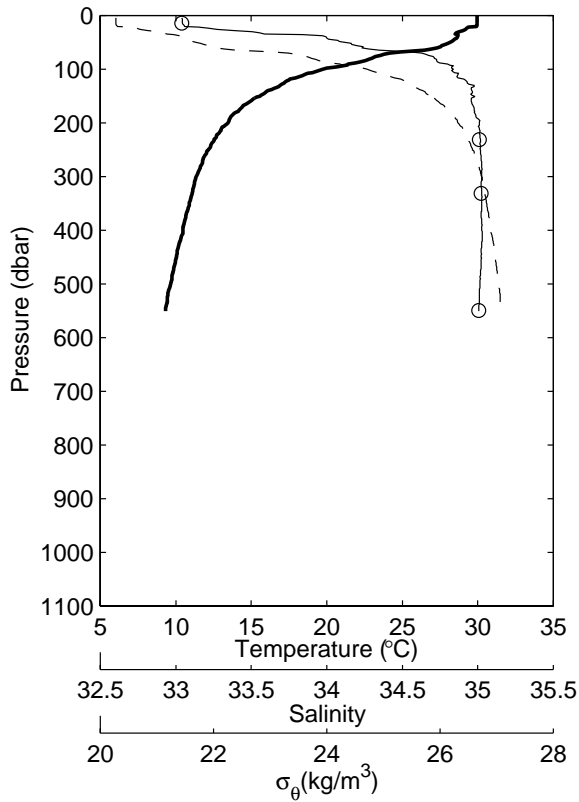


Figure 8.1.119. Same as Fig. 8.1.23 but for station 193 cast 1 and station 194 cast 1.

JASMINE Stn-195 Cast-1 11.22°N 88.17°E 19:02Z 21 May 1999



JASMINE Stn-196 Cast-1 11.16°N 88.23°E 20:41Z 21 May 1999

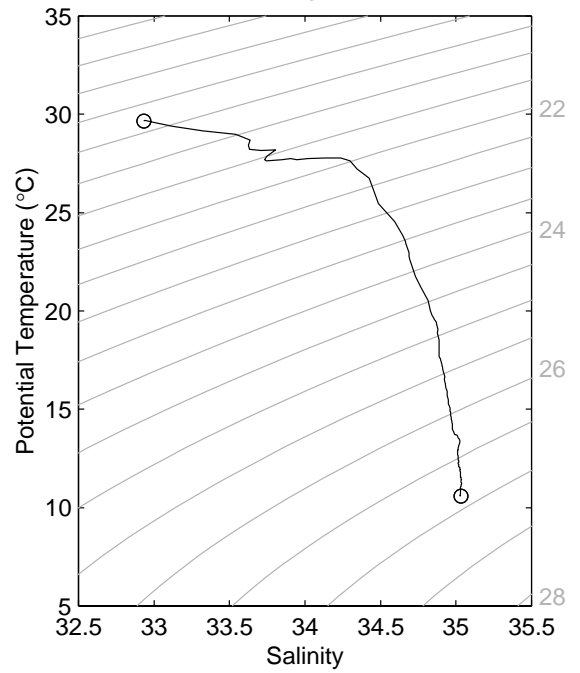
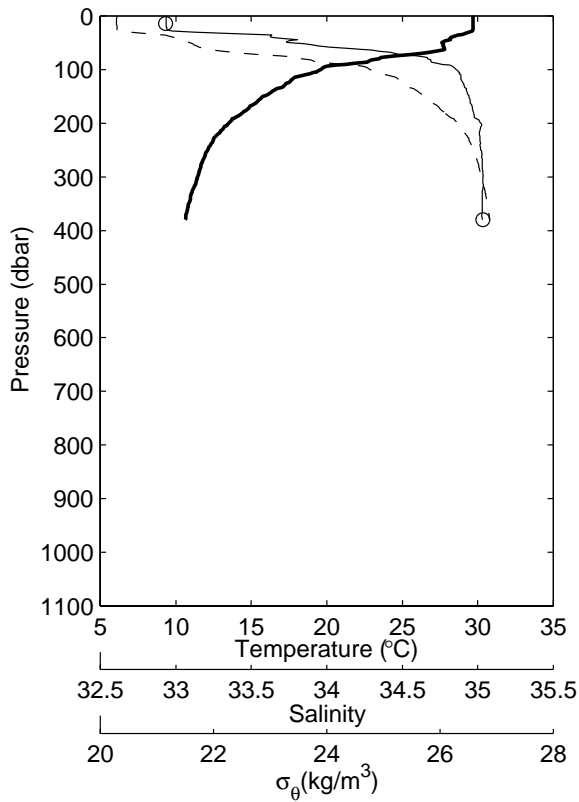
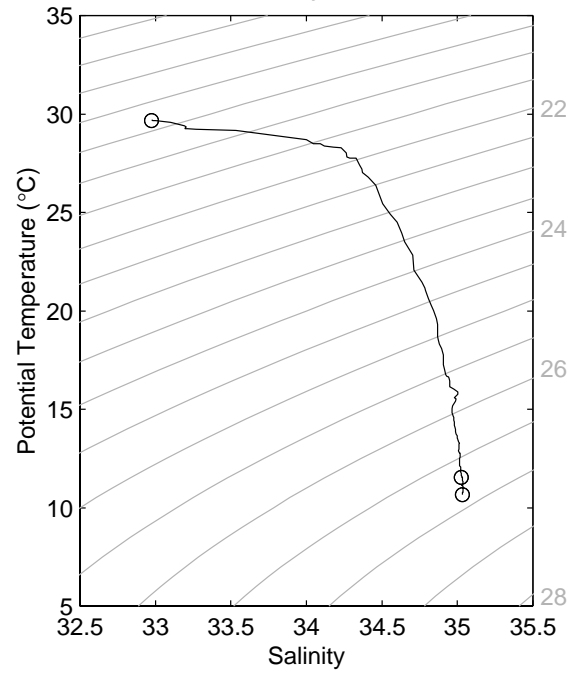
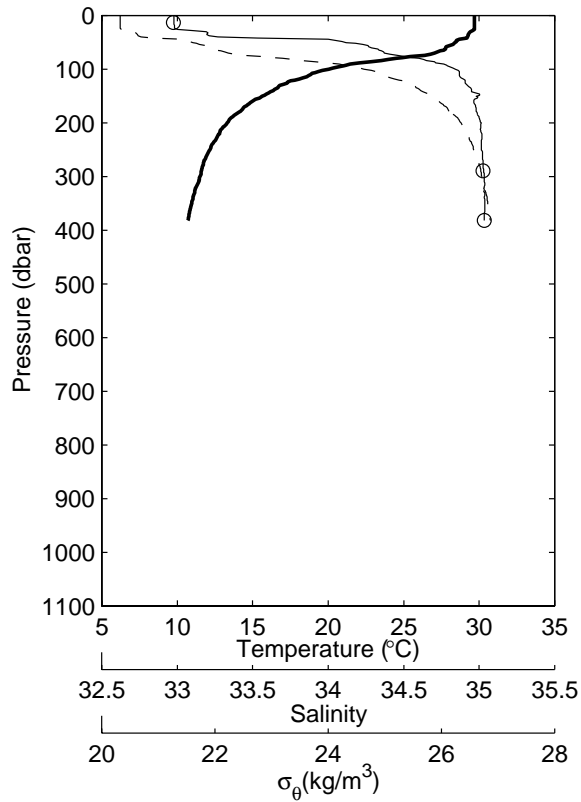


Figure 8.1.120. Same as Fig. 8.1.23 but for station 195 cast 1 and station 196 cast 1.

JASMINE Stn-197 Cast-1 11.12°N 88.36°E 21:49Z 21 May 1999



JASMINE Stn-198 Cast-1 11.08°N 88.49°E 22:59Z 21 May 1999

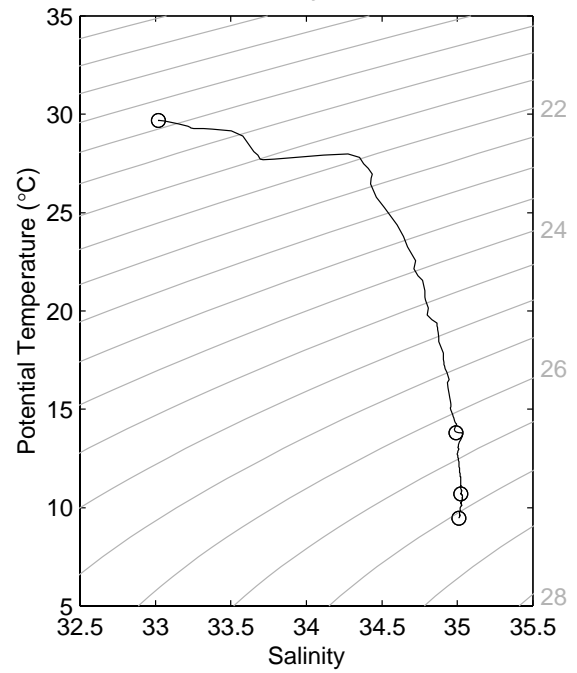
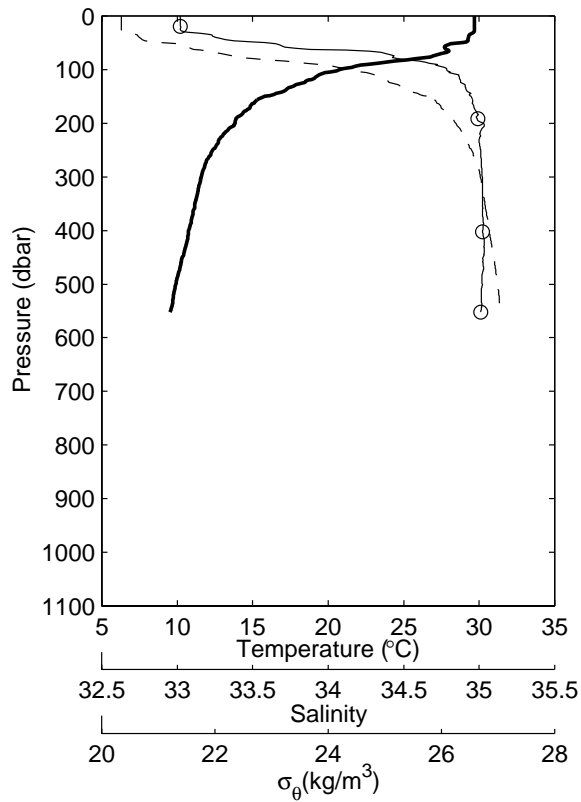
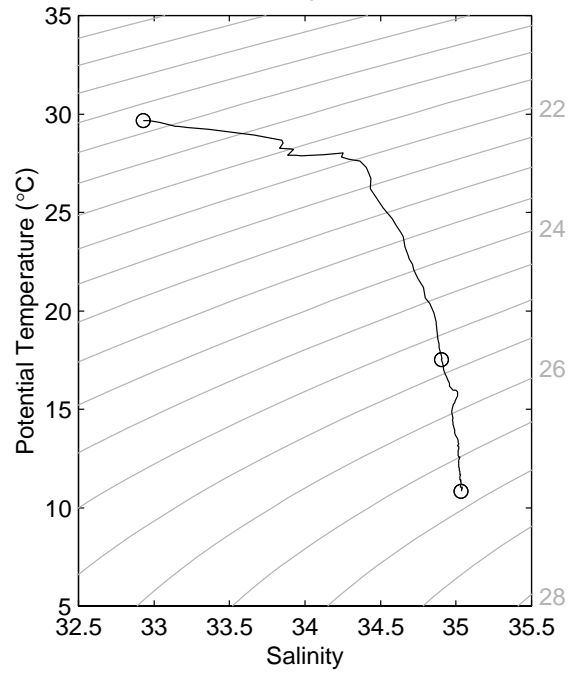
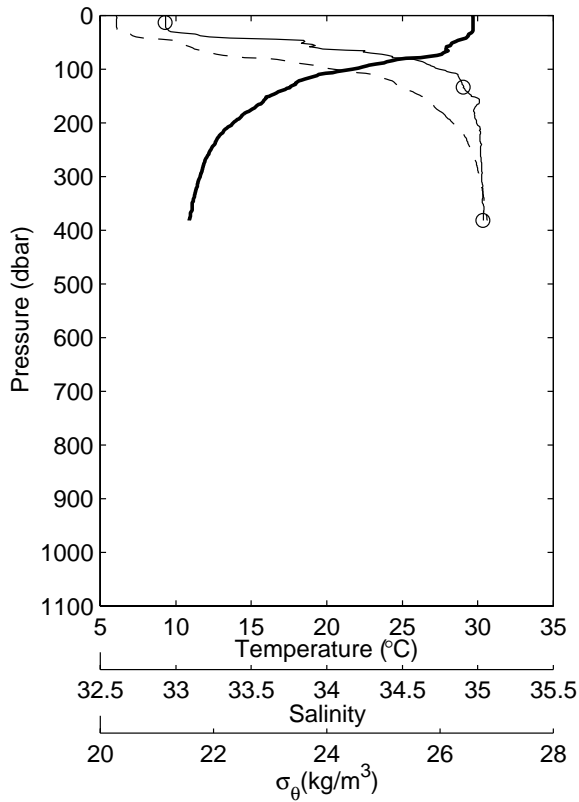


Figure 8.1.121. Same as Fig. 8.1.23 but for station 197 cast 1 and station 198 cast 1.

JASMINE Stn-199 Cast-1 11.18°N 88.41°E 00:10Z 22 May 1999



JASMINE Stn-200 Cast-1 11.29°N 88.33°E 01:20Z 22 May 1999

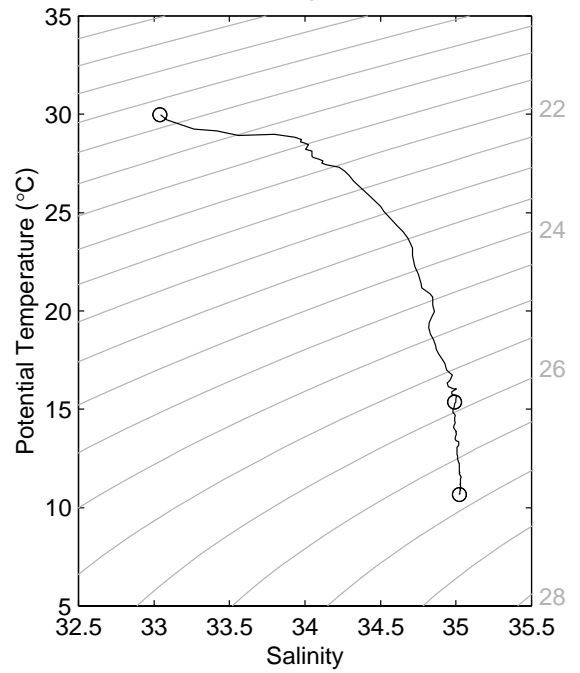
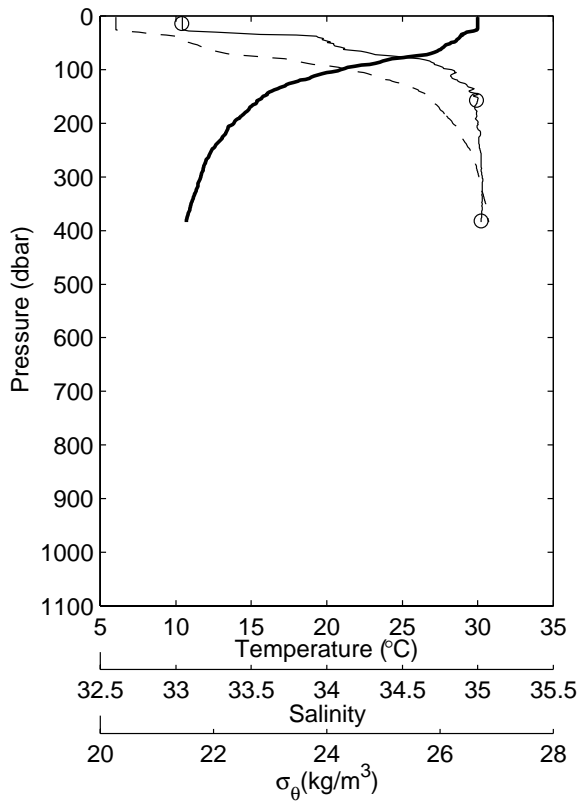
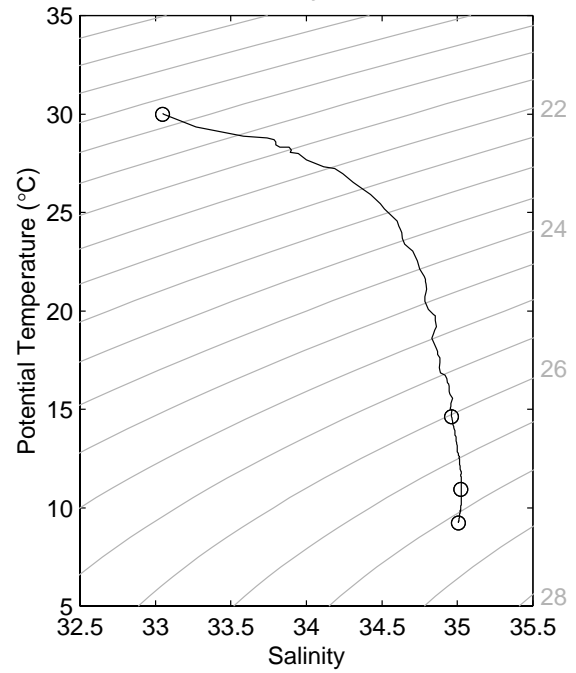
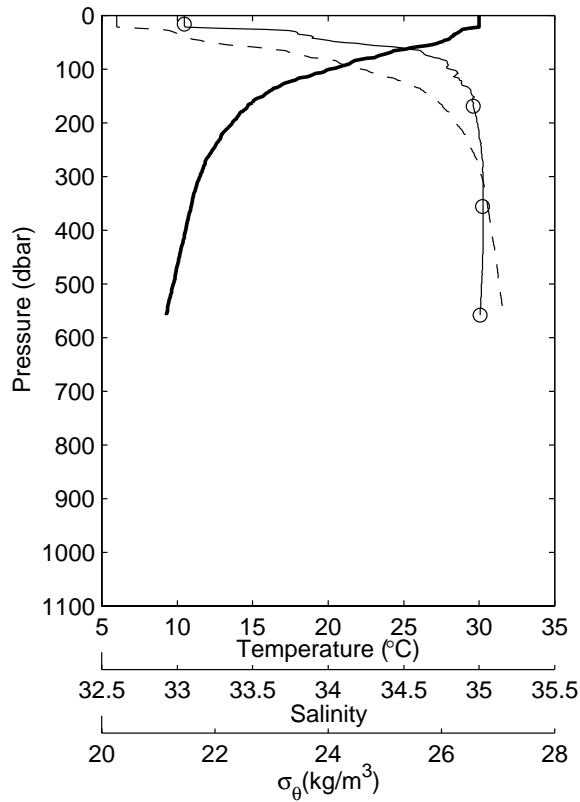


Figure 8.1.122. Same as Fig. 8.1.23 but for station 199 cast 1 and station 200 cast 1.

JASMINE Stn-201 Cast-1 11.40°N 88.25°E 02:31Z 22 May 1999



JASMINE Stn-202 Cast-1 11.27°N 88.25°E 03:43Z 22 May 1999

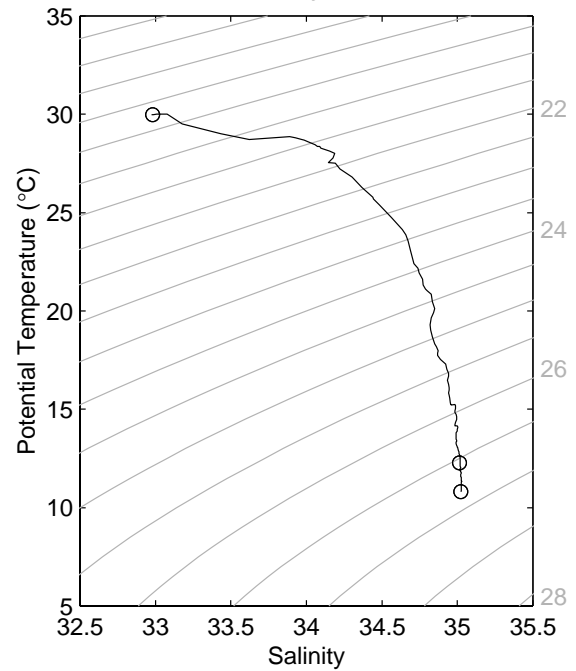
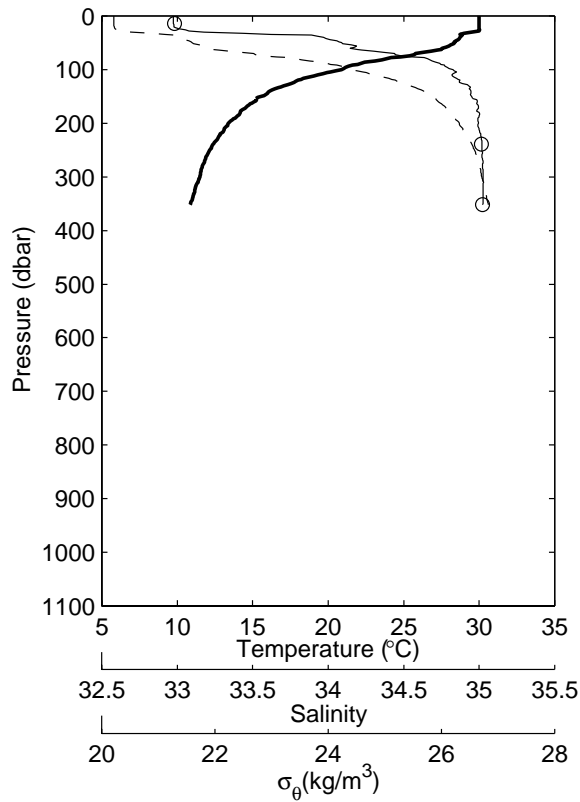
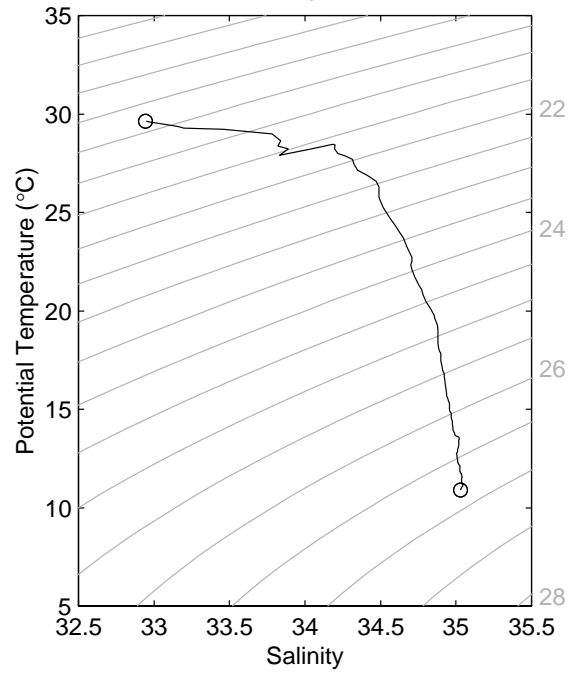
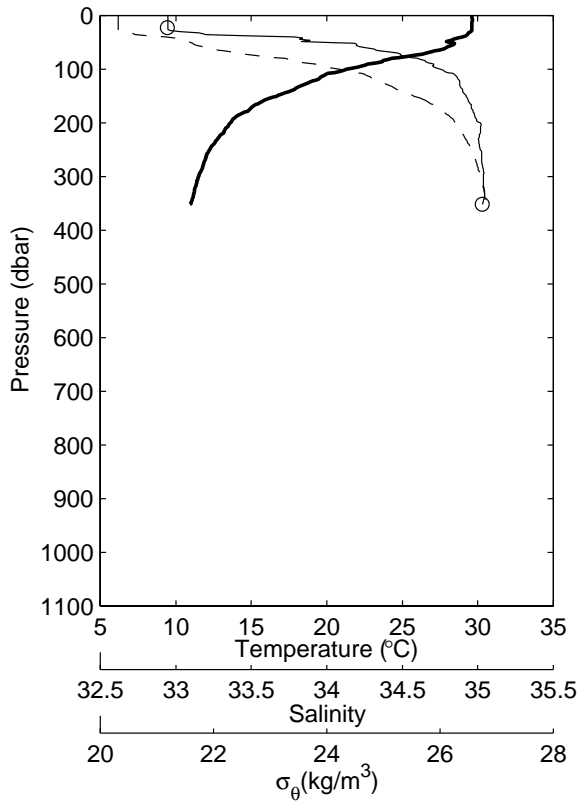


Figure 8.1.123. Same as Fig. 8.1.23 but for station 201 cast 1 and station 202 cast 1.

JASMINE Stn-203 Cast-1 11.13°N 88.25°E 04:51Z 22 May 1999



JASMINE Stn-204 Cast-1 11.00°N 88.25°E 05:57Z 22 May 1999

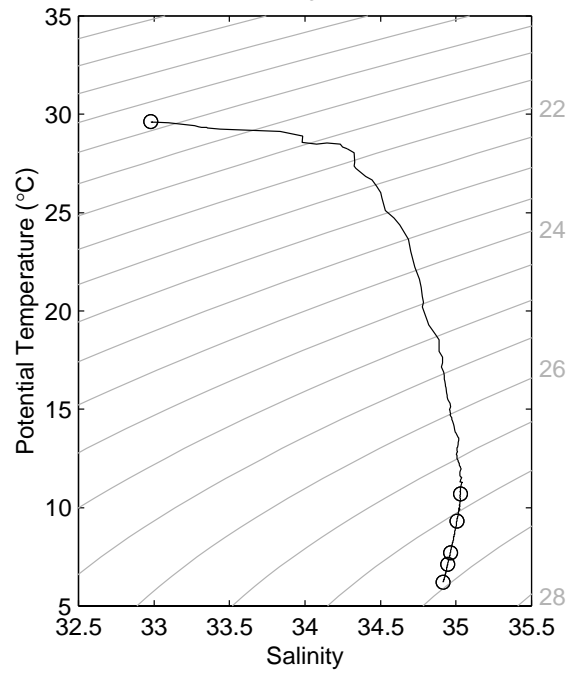
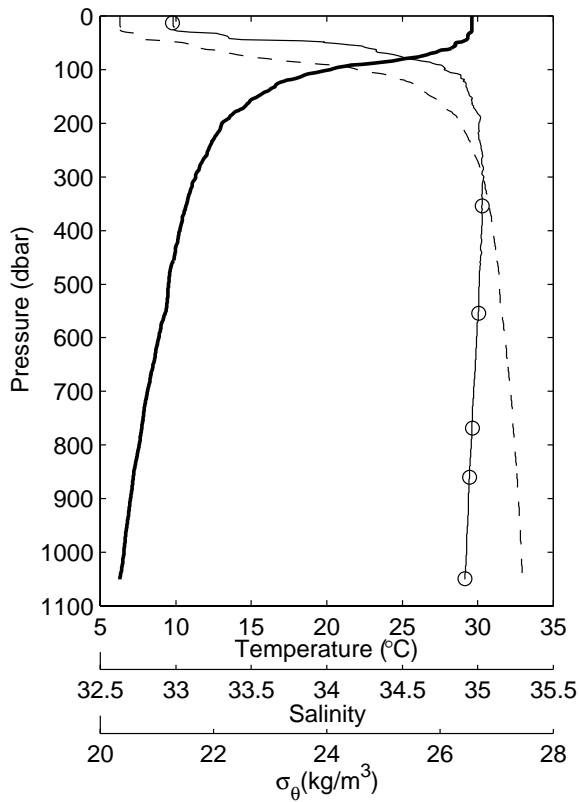
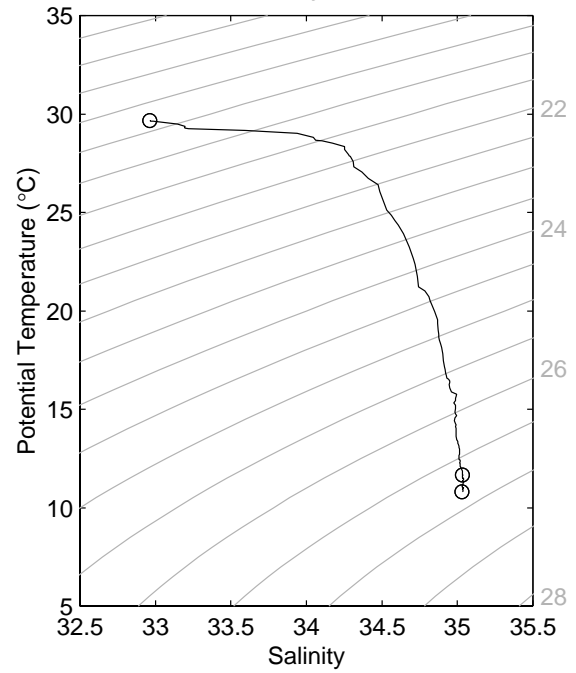
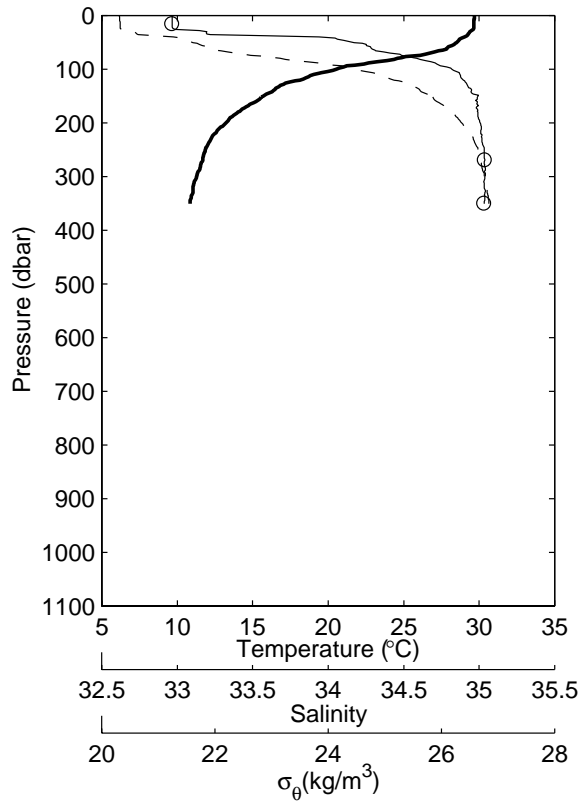


Figure 8.1.124. Same as Fig. 8.1.23 but for station 203 cast 1 and station 204 cast 1.

JASMINE Stn-205 Cast-1 11.11°N 88.33°E 07:27Z 22 May 1999



JASMINE Stn-206 Cast-1 11.20°N 88.39°E 08:21Z 22 May 1999

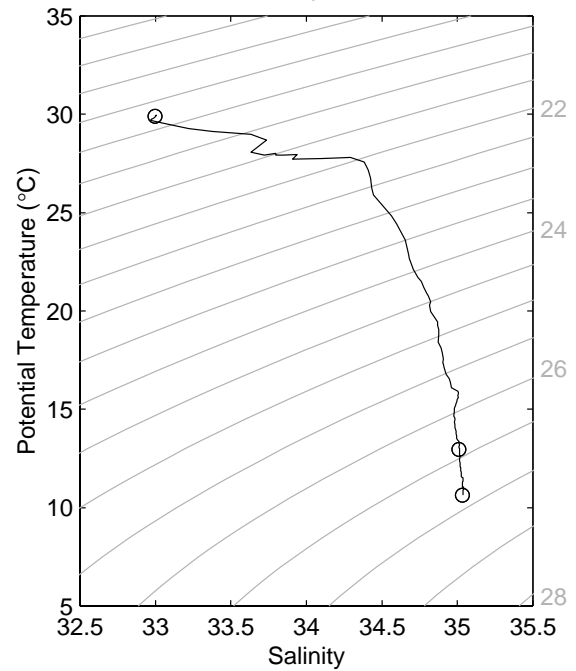
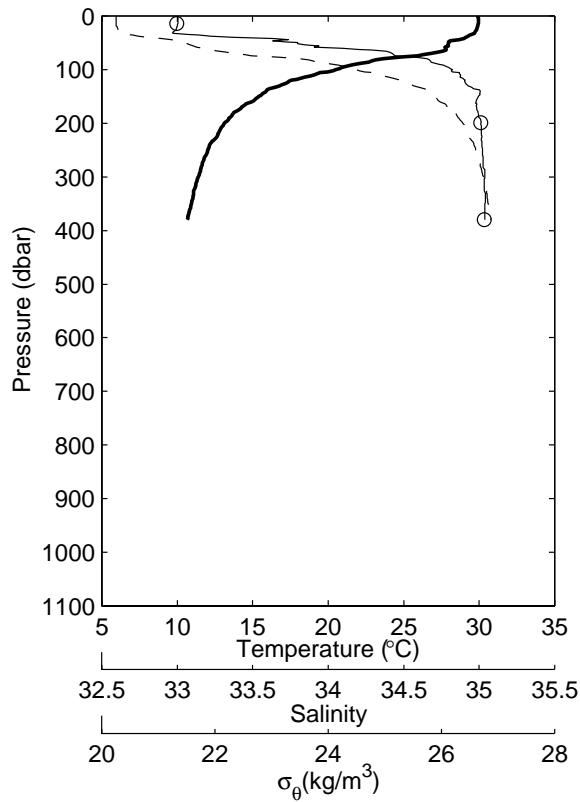
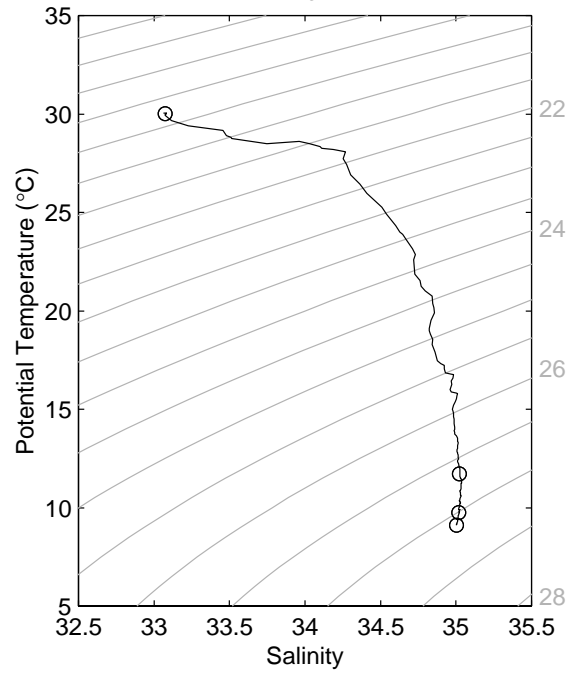
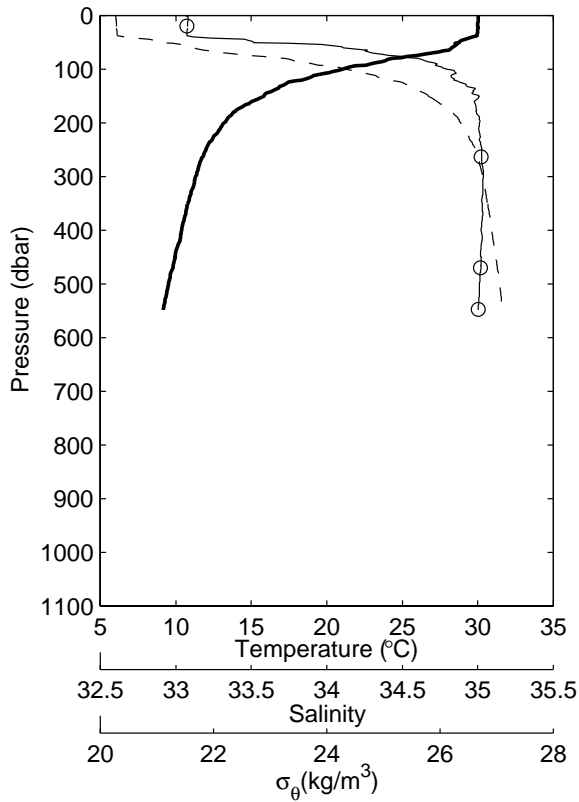


Figure 8.1.125. Same as Fig. 8.1.23 but for station 205 cast 1 and station 206 cast 1.

JASMINE Stn-207 Cast-1 11.32°N 88.49°E 09:30Z 22 May 1999



JASMINE Stn-208 Cast-1 11.28°N 88.36°E 10:46Z 22 May 1999

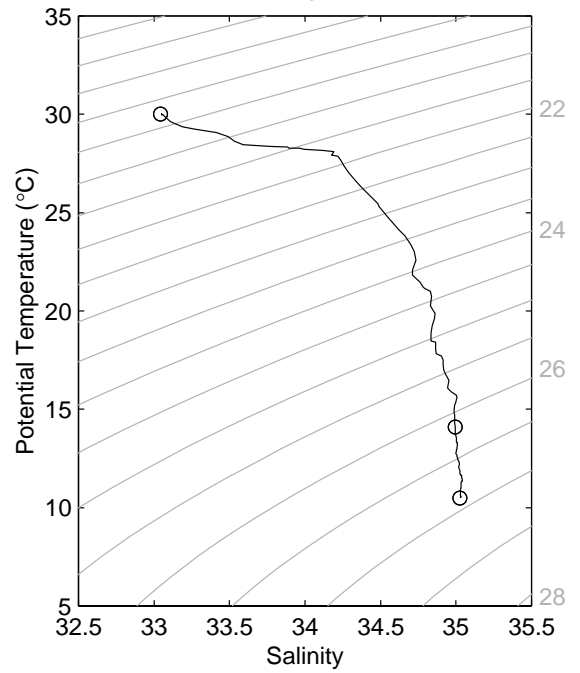
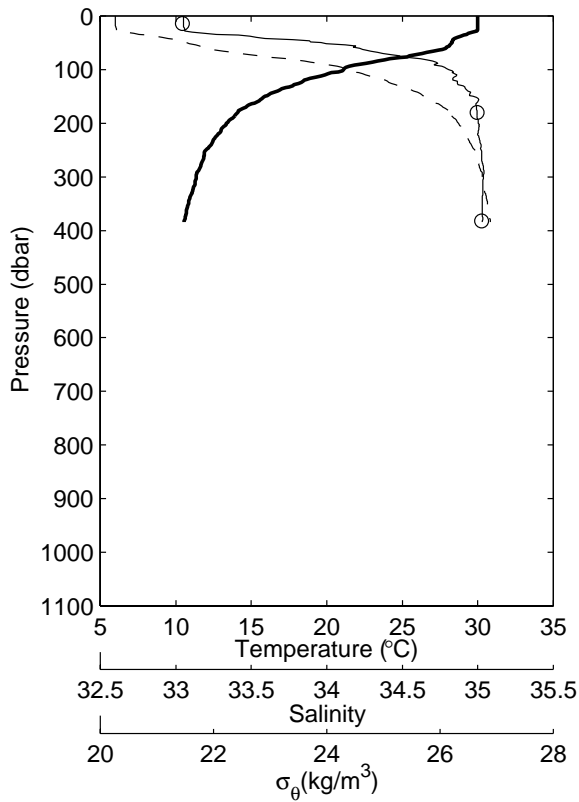
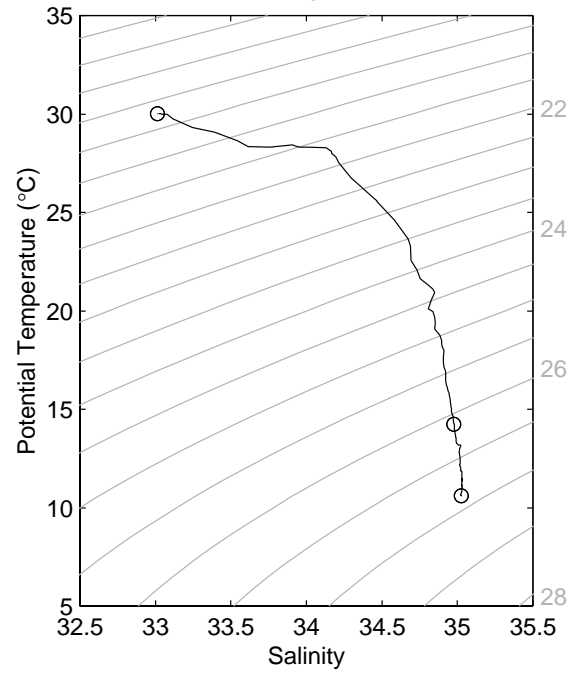
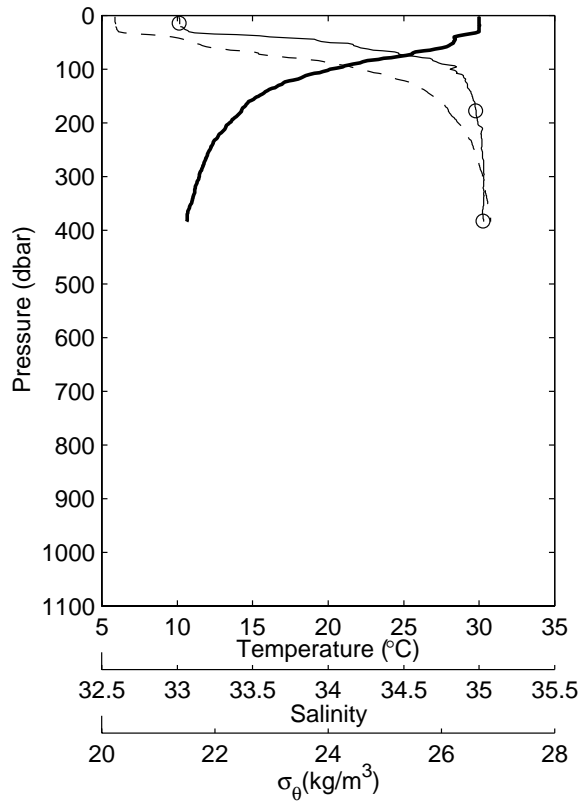


Figure 8.1.126. Same as Fig. 8.1.23 but for station 207 cast 1 and station 208 cast 1.

JASMINE Stn-209 Cast-1 11.25°N 88.25°E 11:50Z 22 May 1999



JASMINE Stn-210 Cast-1 11.20°N 88.11°E 13:10Z 22 May 1999

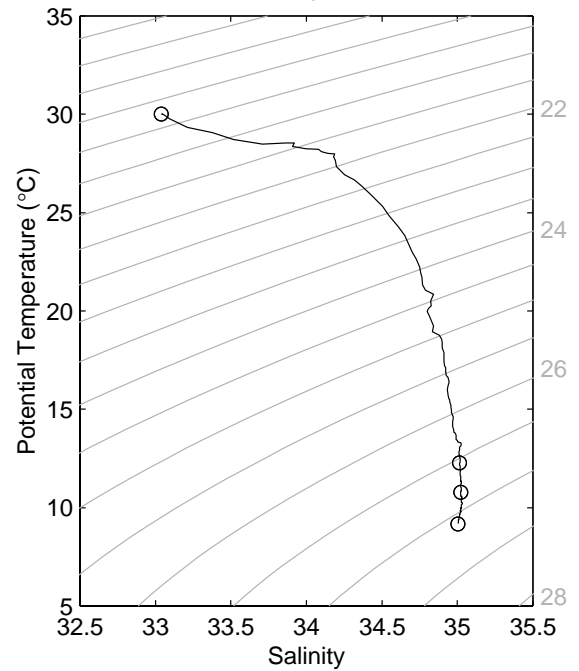
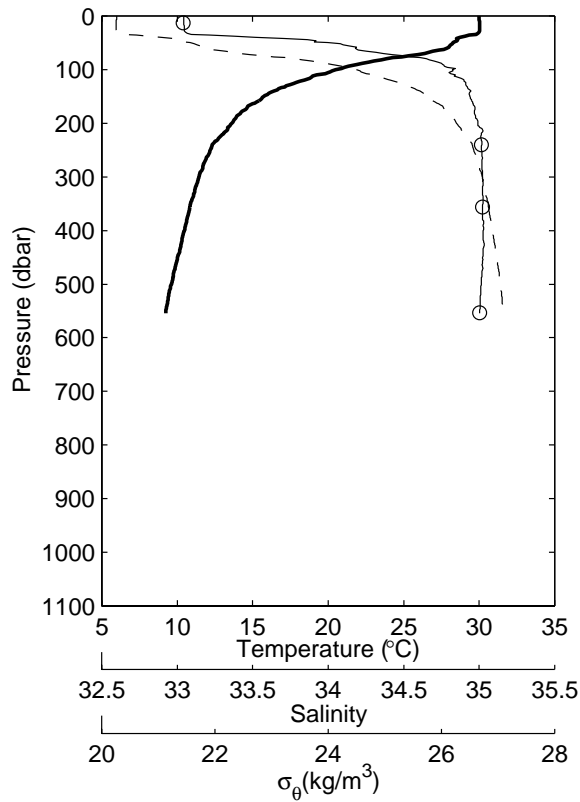
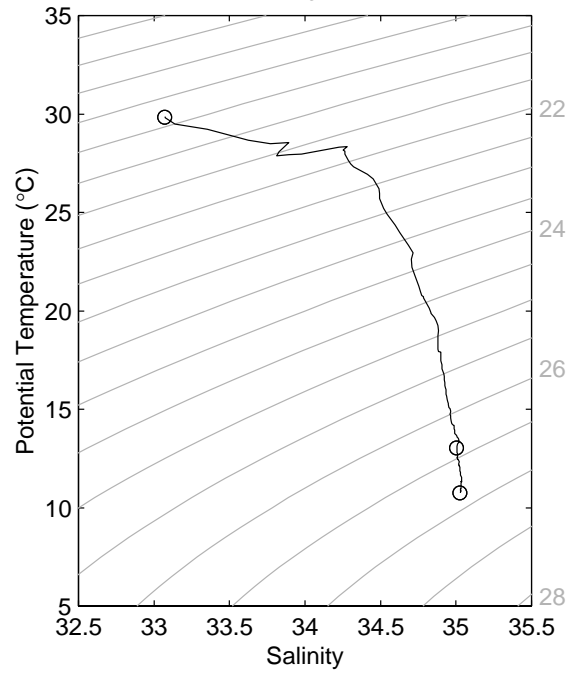
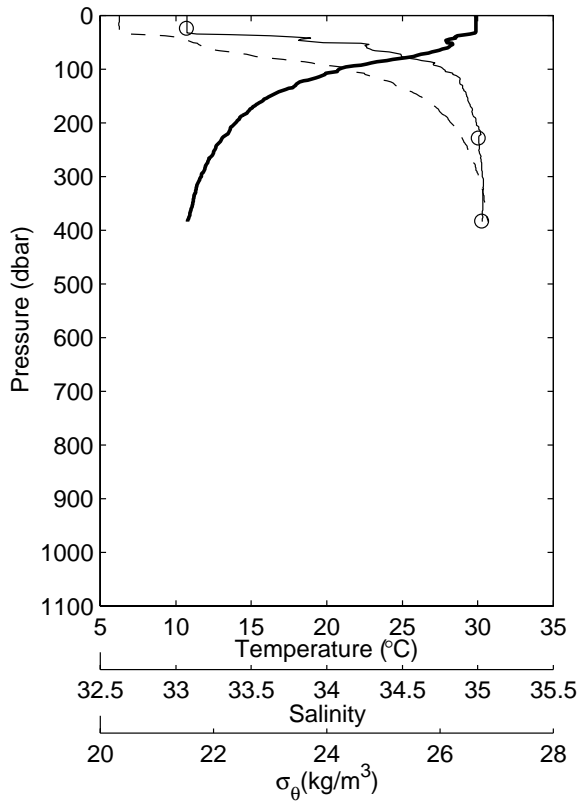


Figure 8.1.127. Same as Fig. 8.1.23 but for station 209 cast 1 and station 210 cast 1.

JASMINE Stn-211 Cast-1 11.16°N 88.23°E 14:17Z 22 May 1999



JASMINE Stn-212 Cast-1 11.12°N 88.36°E 15:34Z 22 May 1999

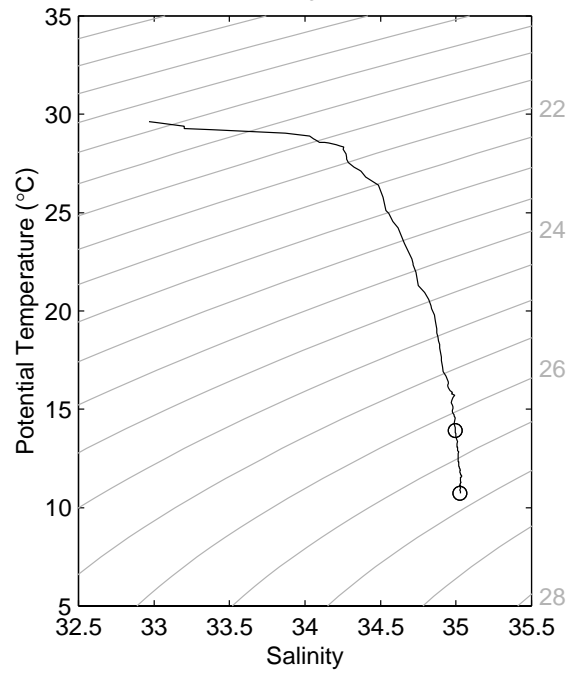
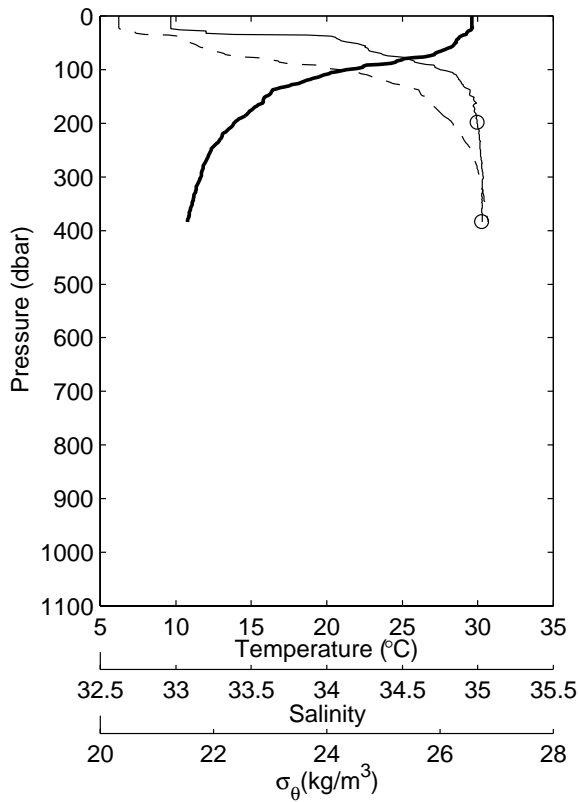
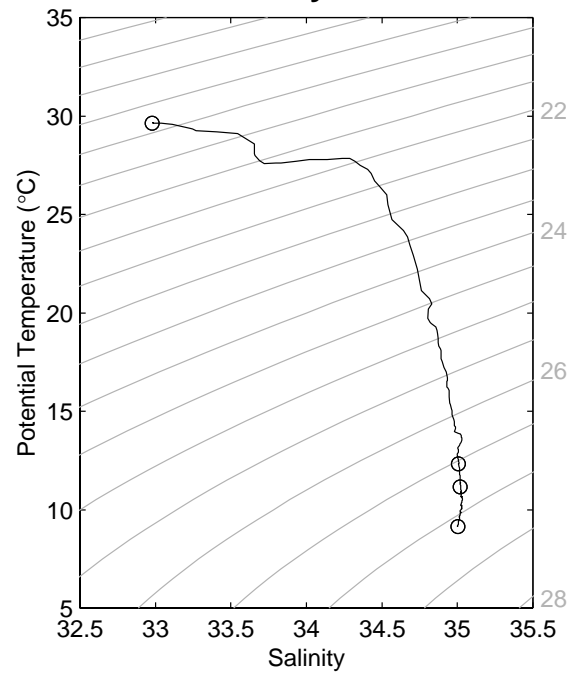
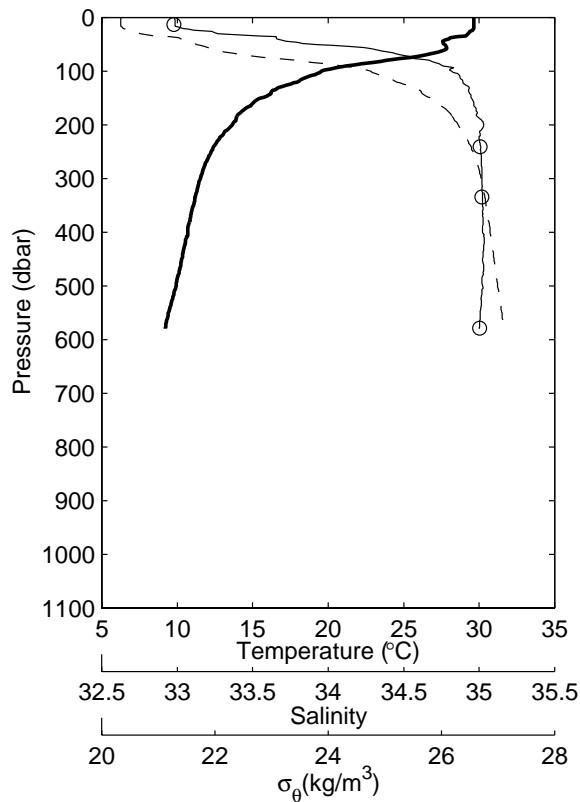


Figure 8.1.128. Same as Fig. 8.1.23 but for station 211 cast 1 and station 212 cast 1.

JASMINE Stn-213 Cast-1 11.08°N 88.49°E 16:38Z 22 May 1999



JASMINE Stn-214 Cast-1 11.18°N 88.41°E 17:51Z 22 May 1999

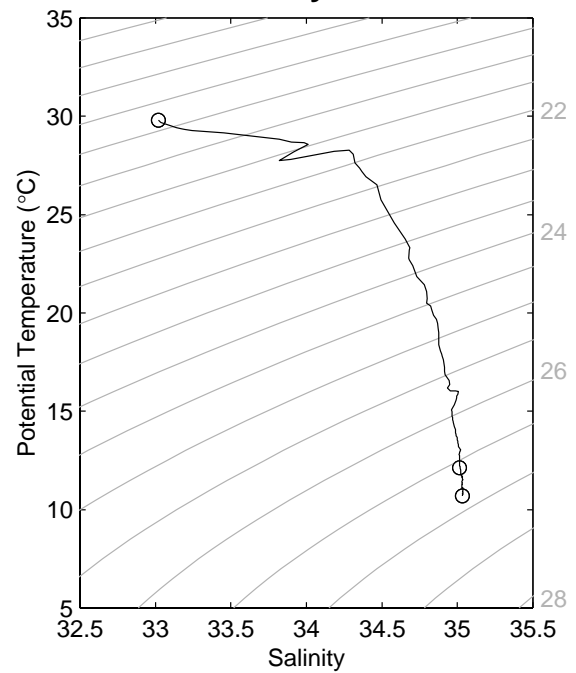
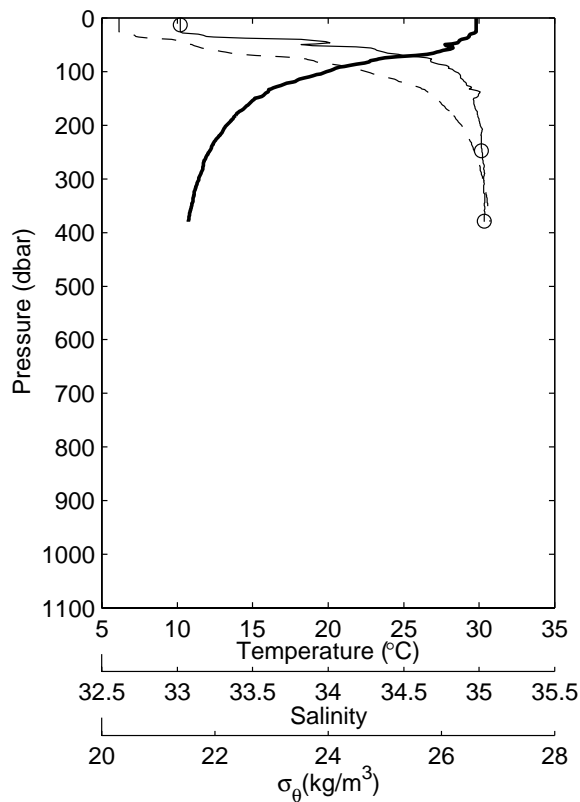
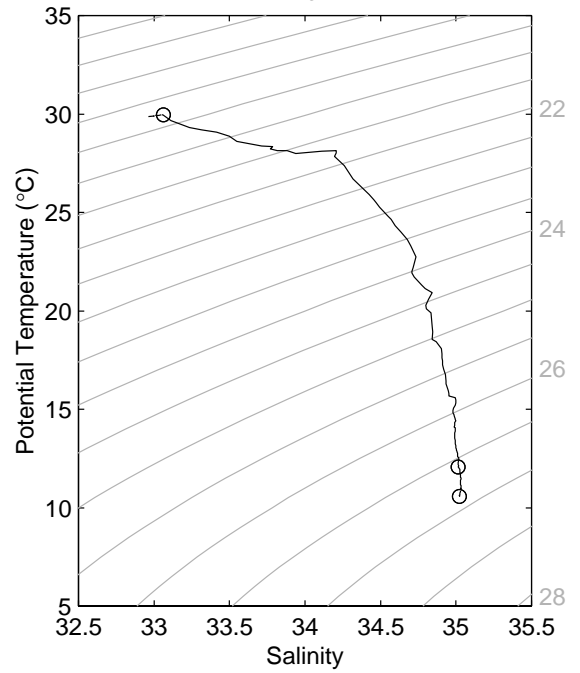
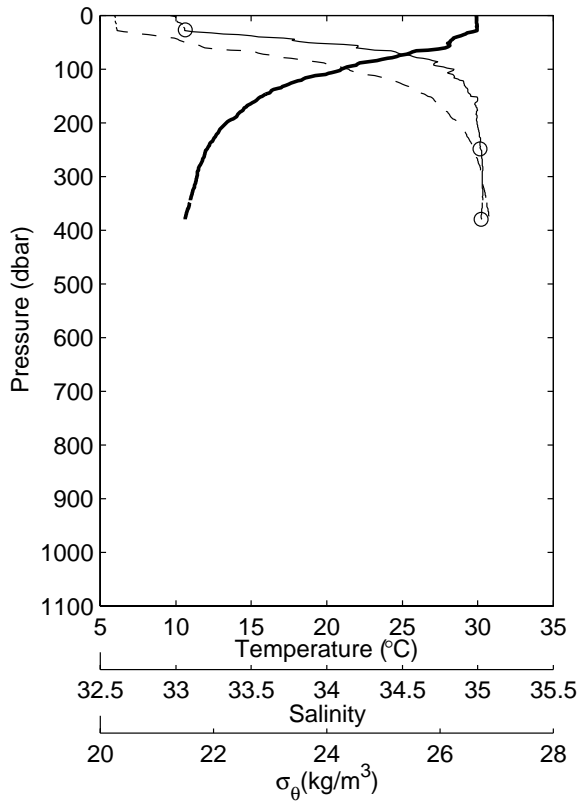


Figure 8.1.129. Same as Fig. 8.1.23 but for station 213 cast 1 and station 214 cast 1.

JASMINE Stn-215 Cast-1 11.29°N 88.33°E 19:03Z 22 May 1999



JASMINE Stn-216 Cast-1 11.40°N 88.25°E 20:18Z 22 May 1999

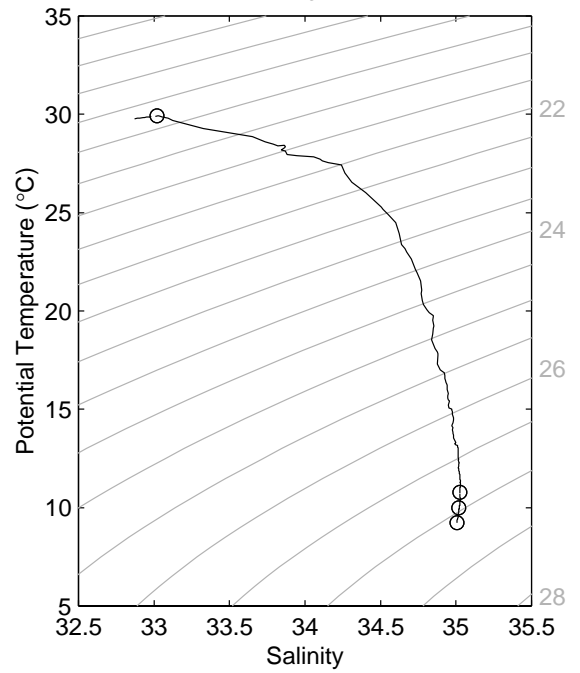
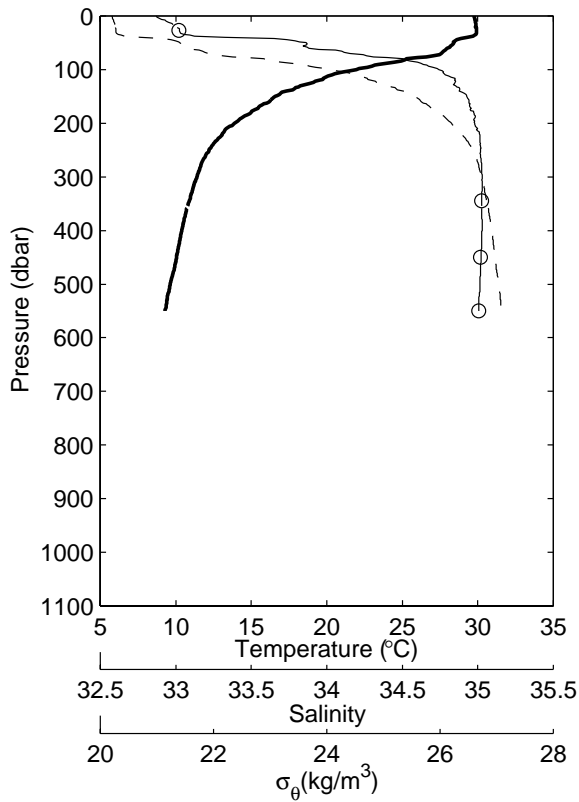
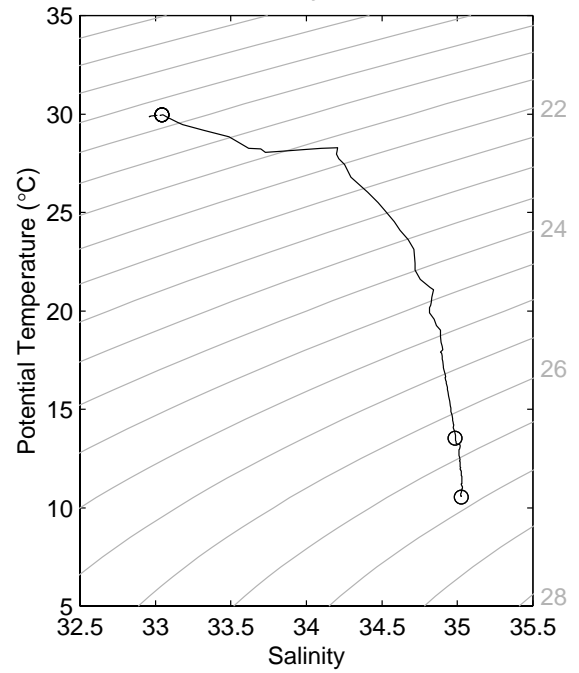
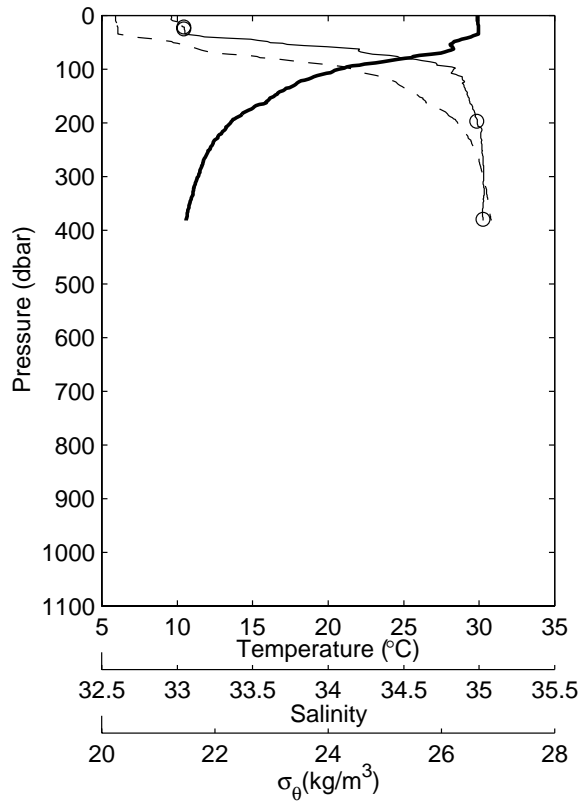


Figure 8.1.130. Same as Fig. 8.1.23 but for station 215 cast 1 and station 216 cast 1.

JASMINE Stn-217 Cast-1 11.27°N 88.25°E 21:29Z 22 May 1999



JASMINE Stn-218 Cast-1 11.13°N 88.25°E 22:39Z 22 May 1999

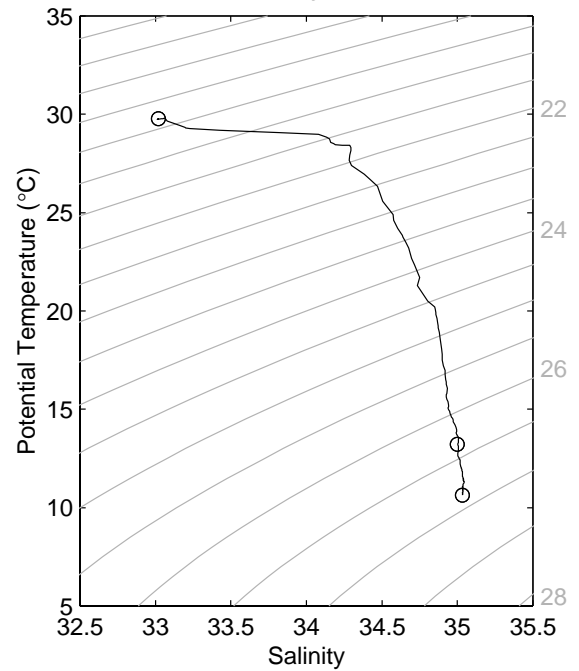
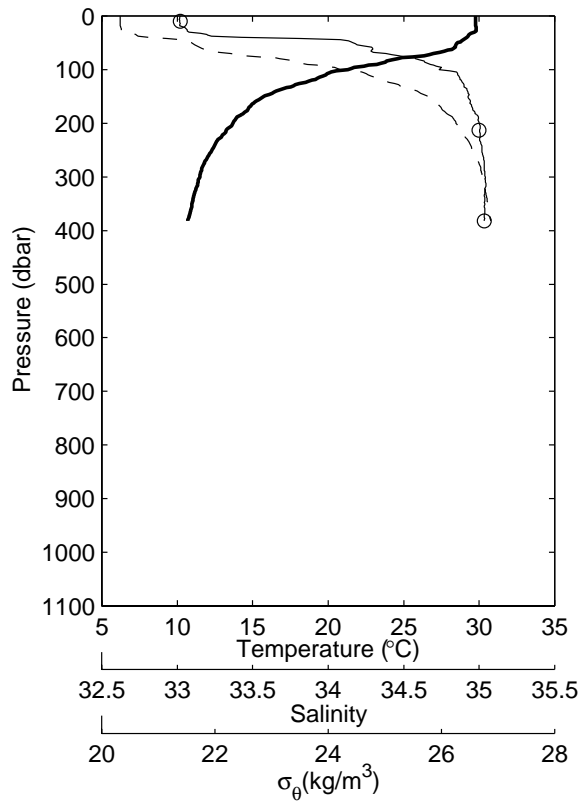
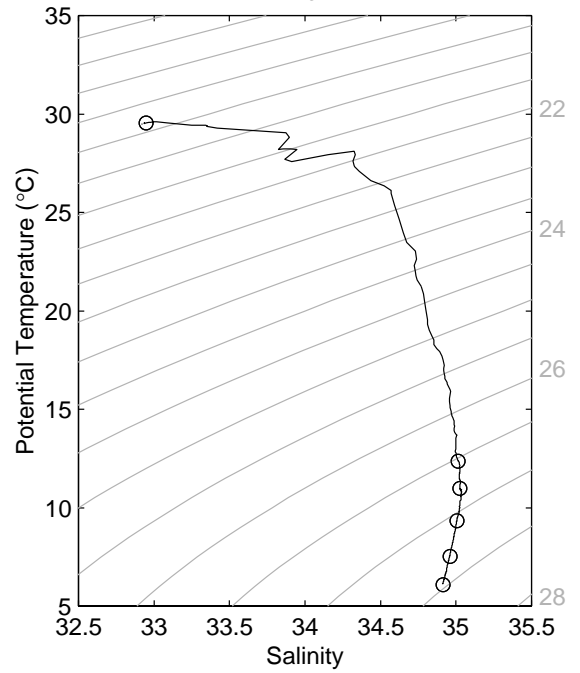
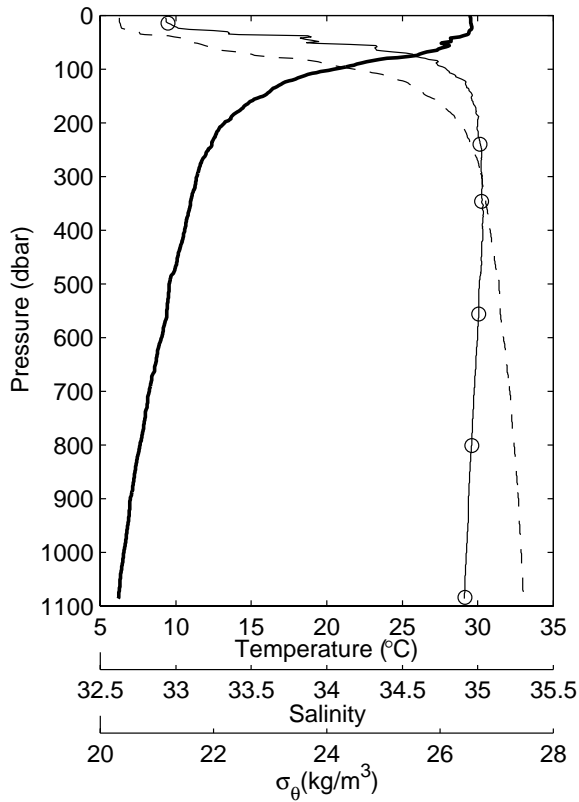


Figure 8.1.131. Same as Fig. 8.1.23 but for station 217 cast 1 and station 218 cast 1.

JASMINE Stn-219 Cast-1 11.00°N 88.25°E 23:50Z 22 May 1999



JASMINE Stn-220 Cast-1 11.11°N 88.33°E 01:30Z 23 May 1999

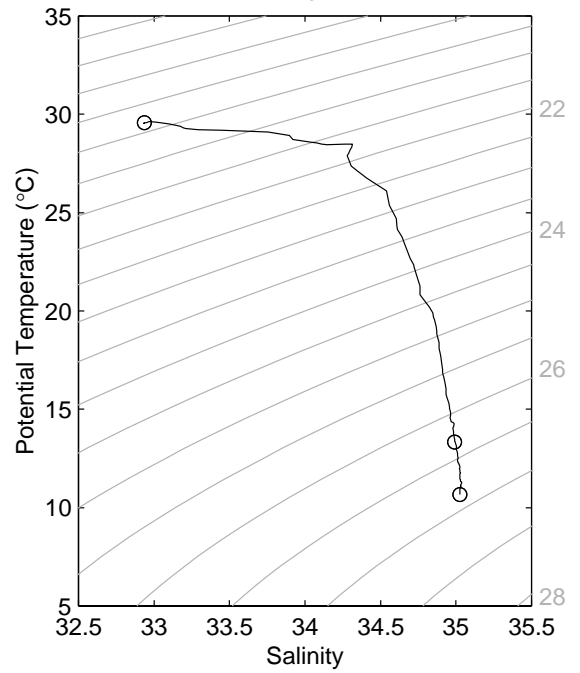
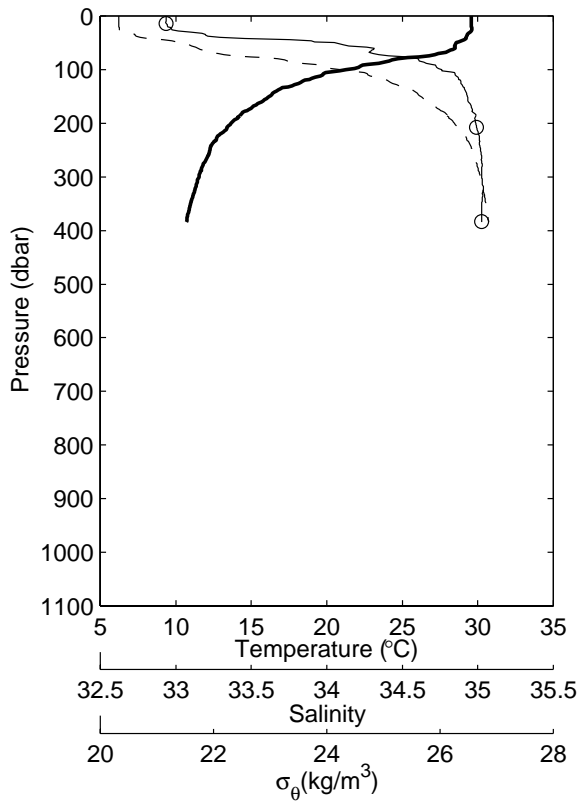
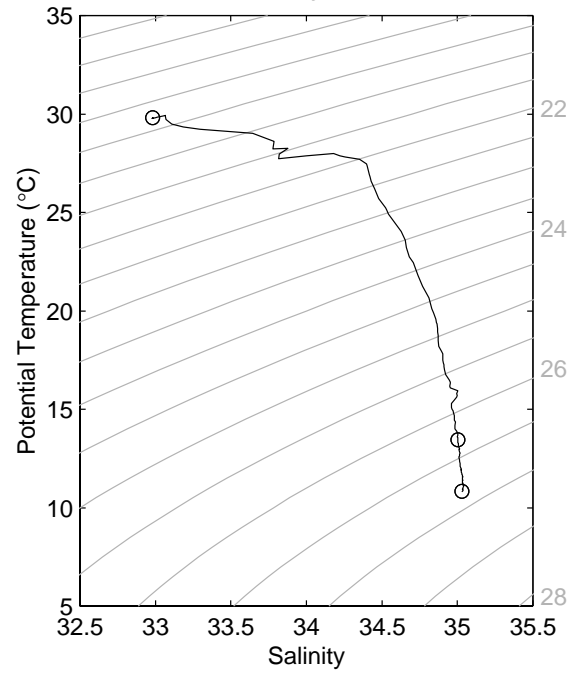
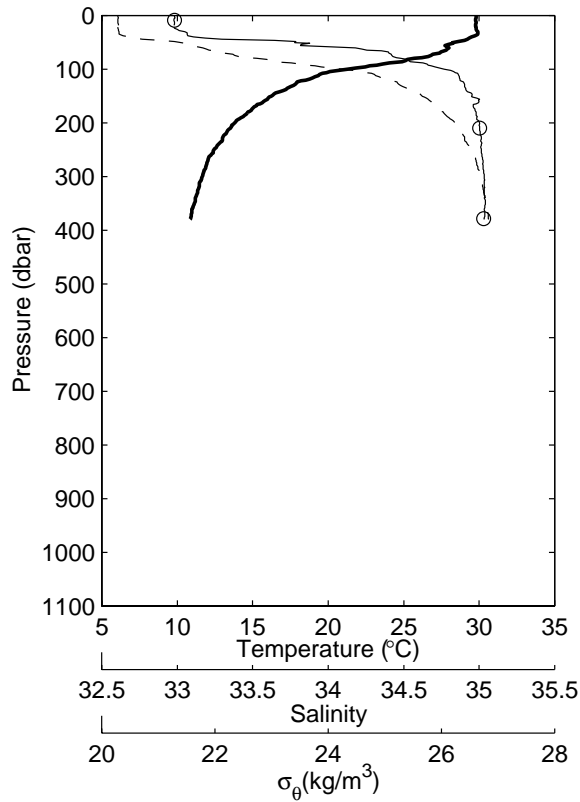


Figure 8.1.132. Same as Fig. 8.1.23 but for station 219 cast 1 and station 220 cast 1.

JASMINE Stn-221 Cast-1 11.22°N 88.41°E 02:47Z 23 May 1999



JASMINE Stn-222 Cast-1 11.32°N 88.49°E 04:03Z 23 May 1999

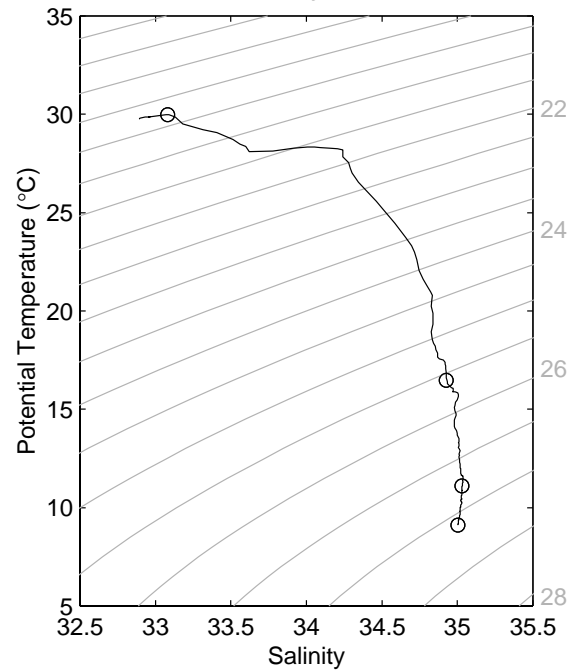
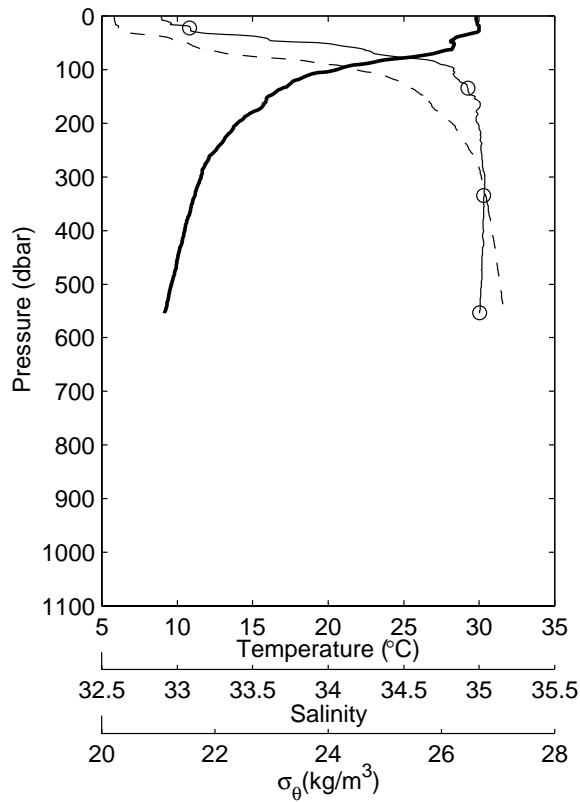
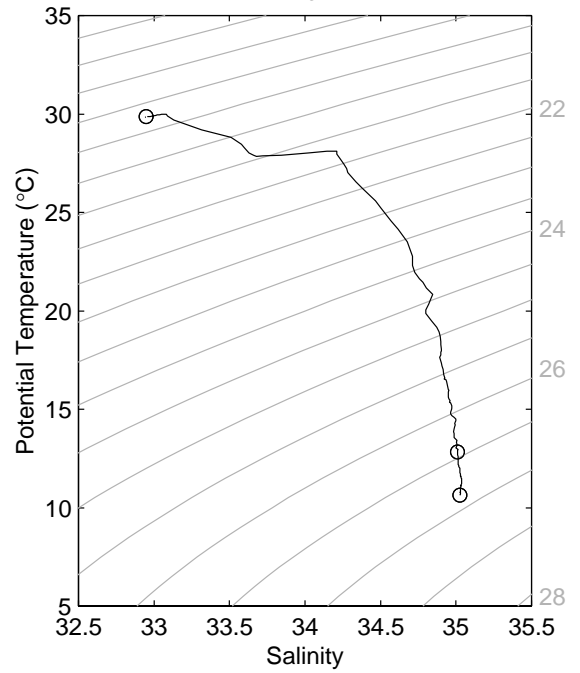
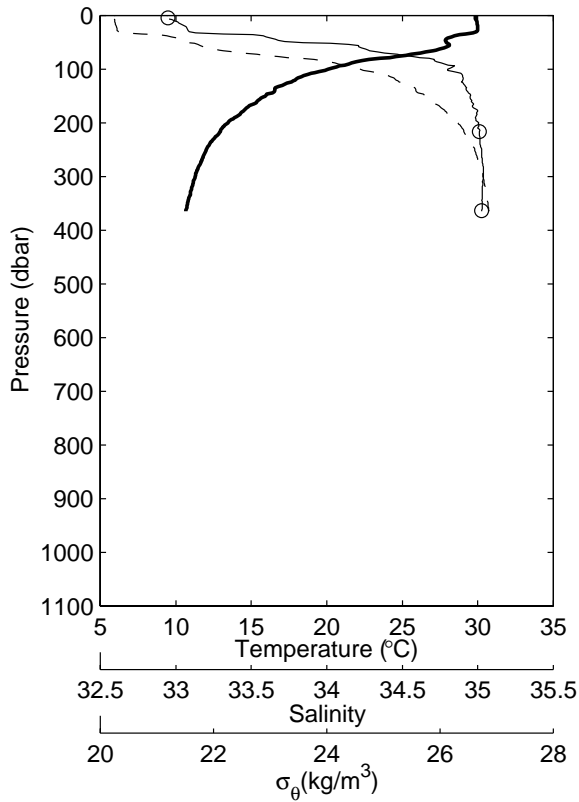


Figure 8.1.133. Same as Fig. 8.1.23 but for station 221 cast 1 and station 222 cast 1.

JASMINE Stn-223 Cast-1 11.30°N 88.40°E 05:03Z 23 May 1999



JASMINE Stn-224 Cast-1 11.24°N 88.23°E 06:23Z 23 May 1999

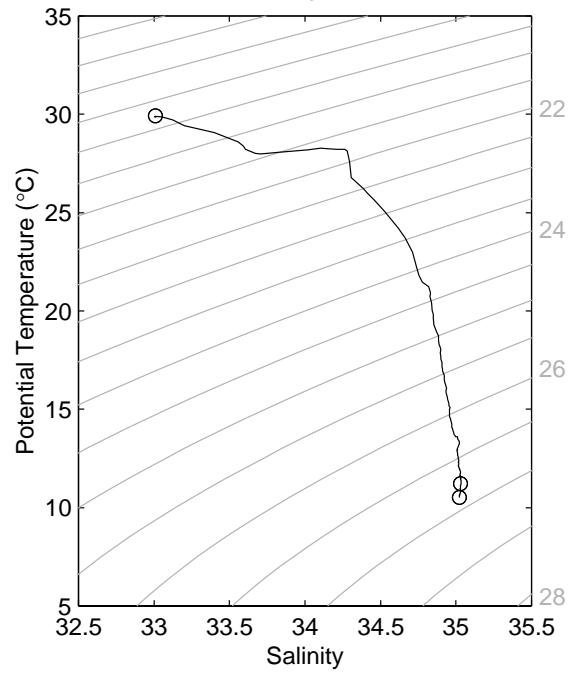
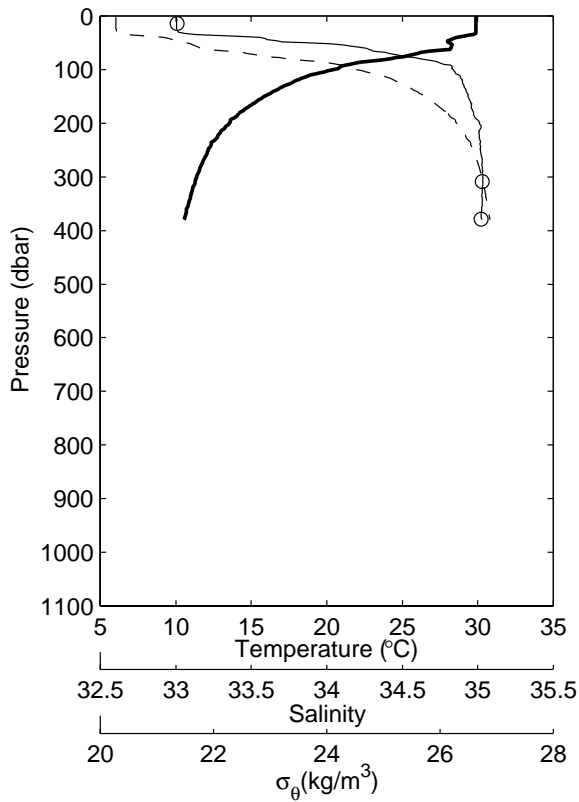
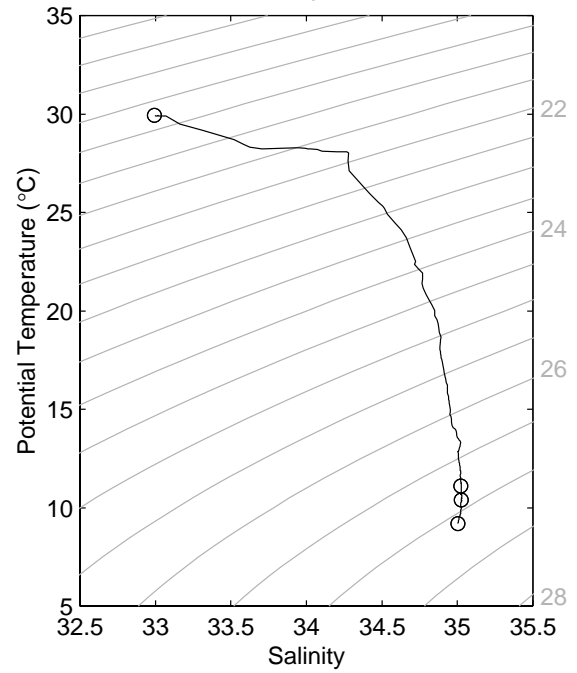
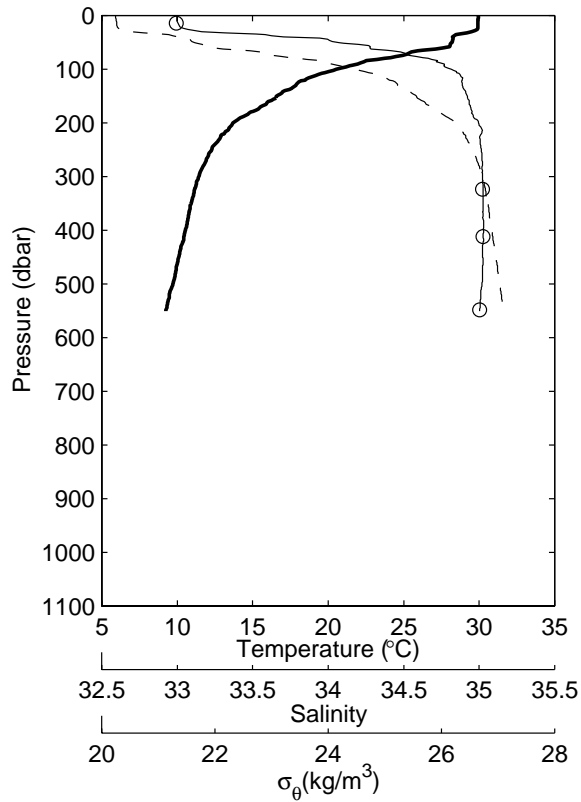


Figure 8.1.134. Same as Fig. 8.1.23 but for station 223 cast 1 and station 224 cast 1.

JASMINE Stn-225 Cast-1 11.20°N 88.10°E 07:29Z 23 May 1999



JASMINE Stn-226 Cast-1 11.16°N 88.23°E 08:46Z 23 May 1999

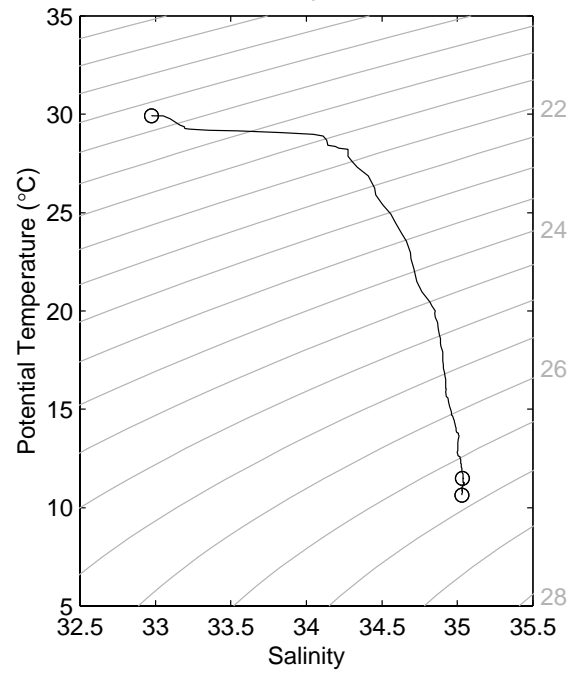
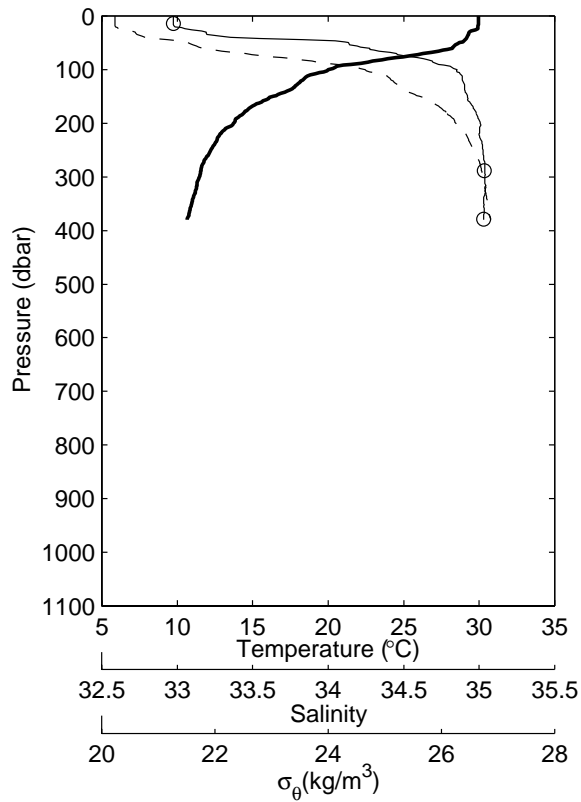
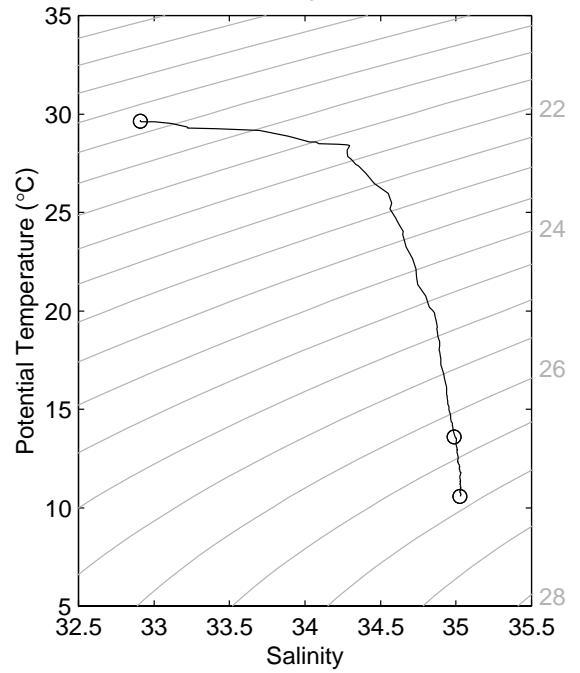
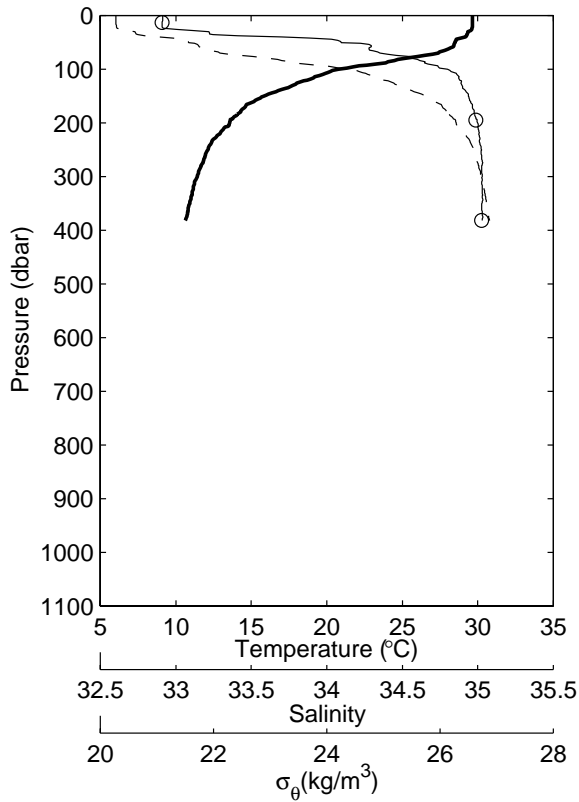


Figure 8.1.135. Same as Fig. 8.1.23 but for station 225 cast 1 and station 226 cast 1.

JASMINE Stn-227 Cast-1 11.12°N 88.36°E 09:54Z 23 May 1999



JASMINE Stn-228 Cast-1 11.07°N 88.49°E 10:57Z 23 May 1999

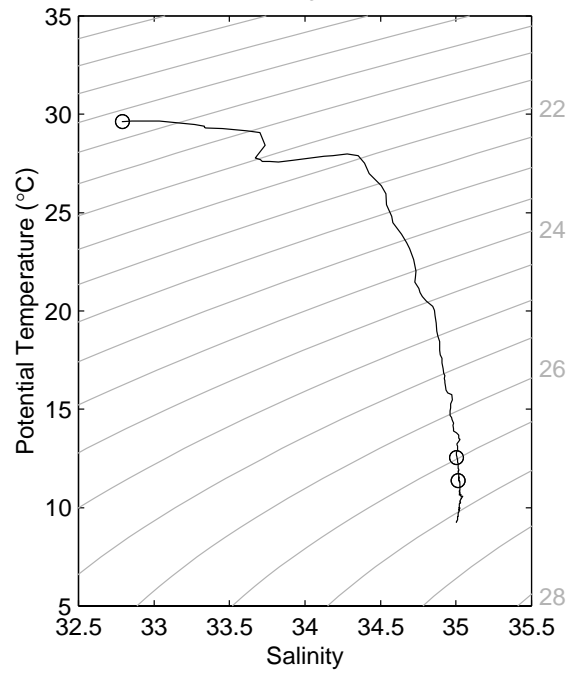
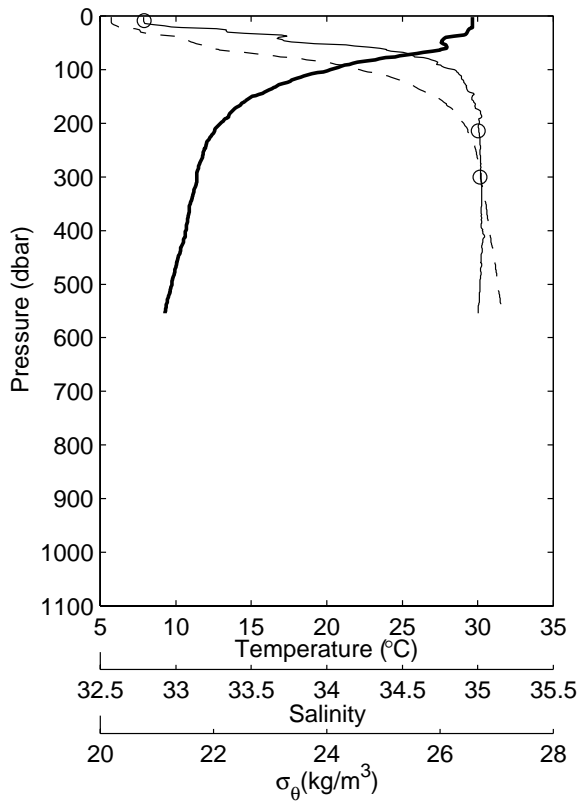
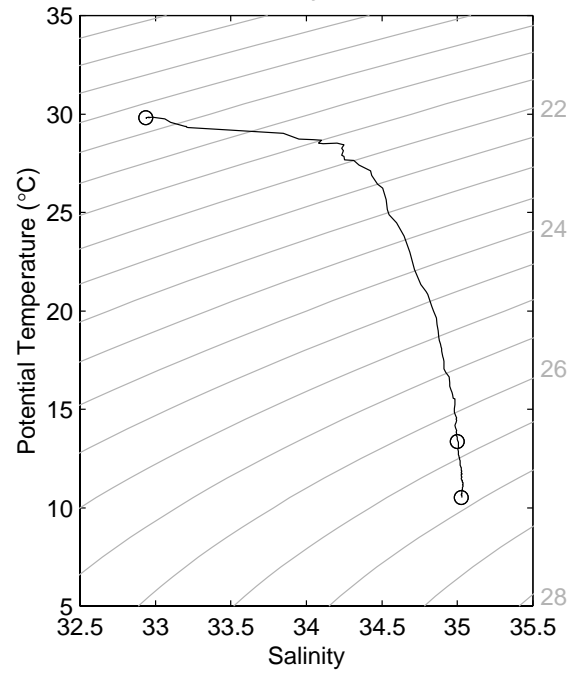
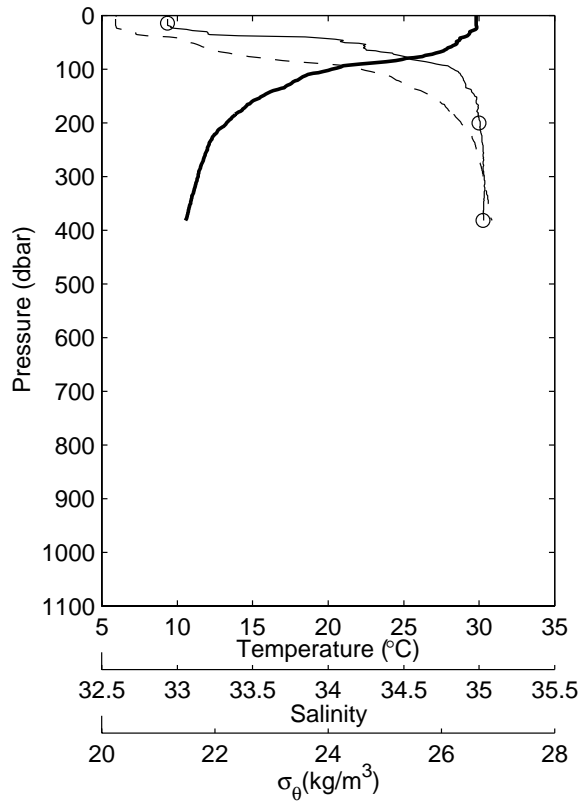


Figure 8.1.136. Same as Fig. 8.1.23 but for station 227 cast 1 and station 228 cast 1.

JASMINE Stn-229 Cast-1 11.19°N 88.41°E 12:09Z 23 May 1999



JASMINE Stn-230 Cast-1 11.29°N 88.33°E 13:12Z 23 May 1999

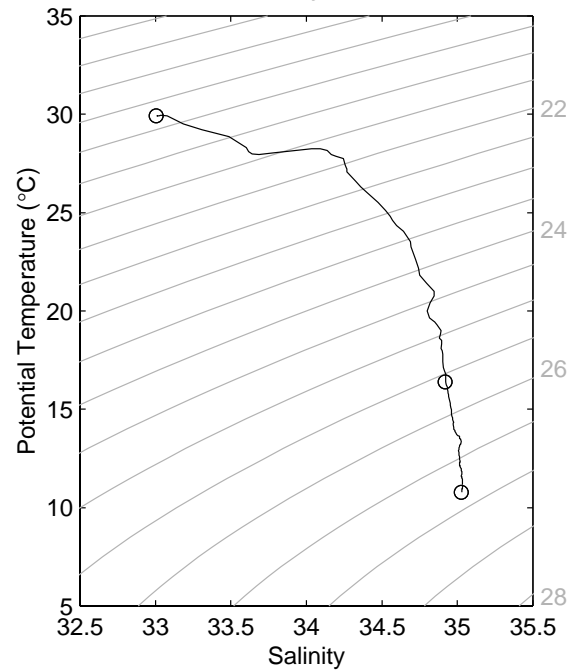
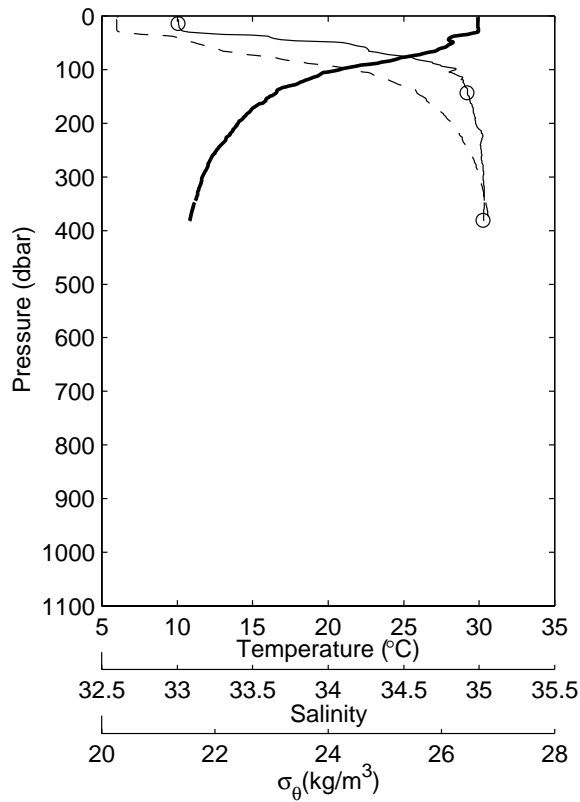
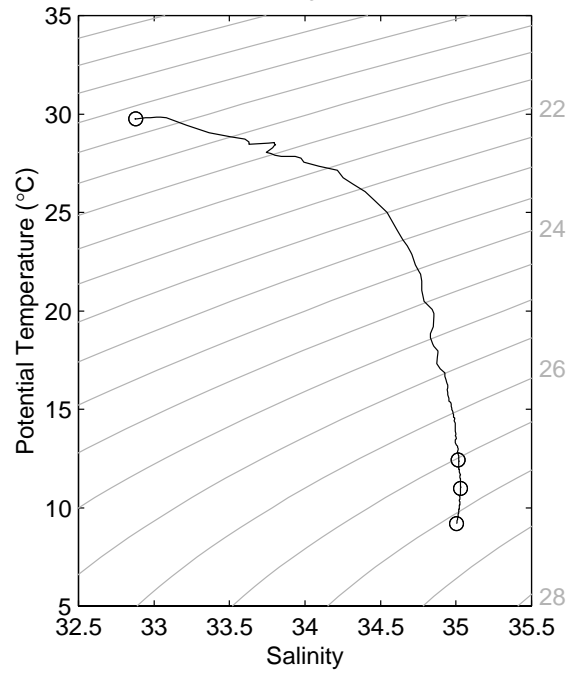
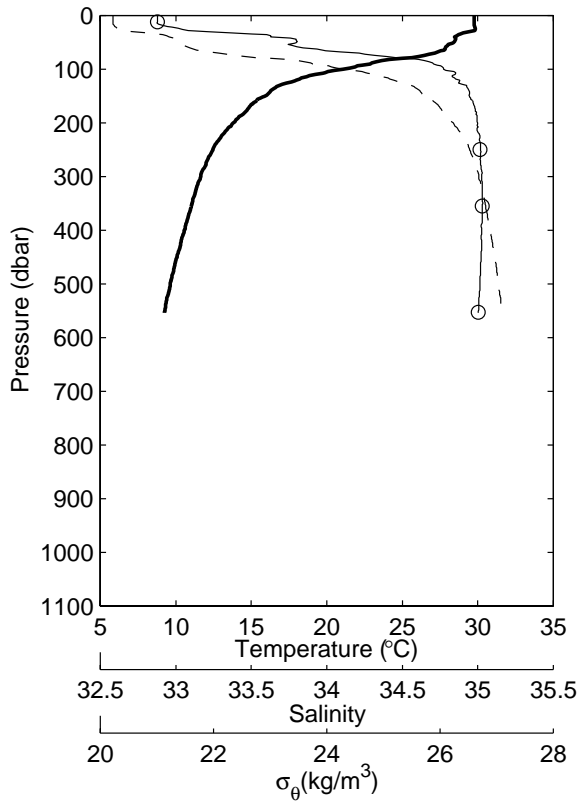


Figure 8.1.137. Same as Fig. 8.1.23 but for station 229 cast 1 and station 230 cast 1.

JASMINE Stn-231 Cast-1 11.40°N 88.25°E 14:12Z 23 May 1999



JASMINE Stn-232 Cast-1 11.27°N 88.25°E 15:35Z 23 May 1999

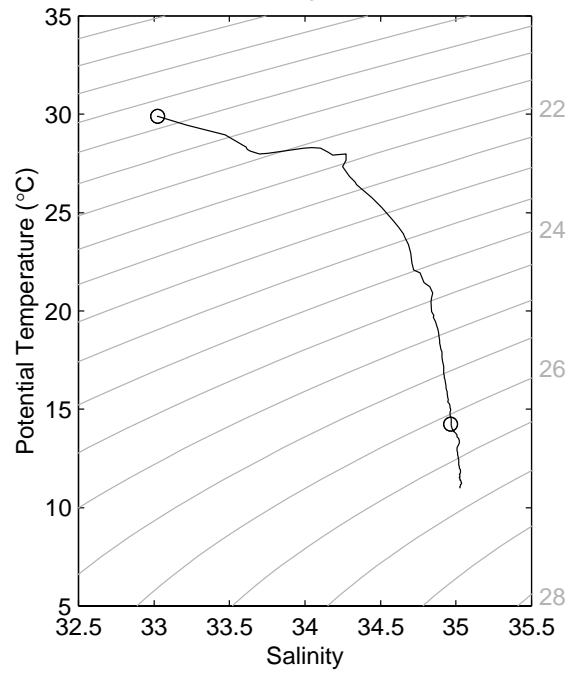
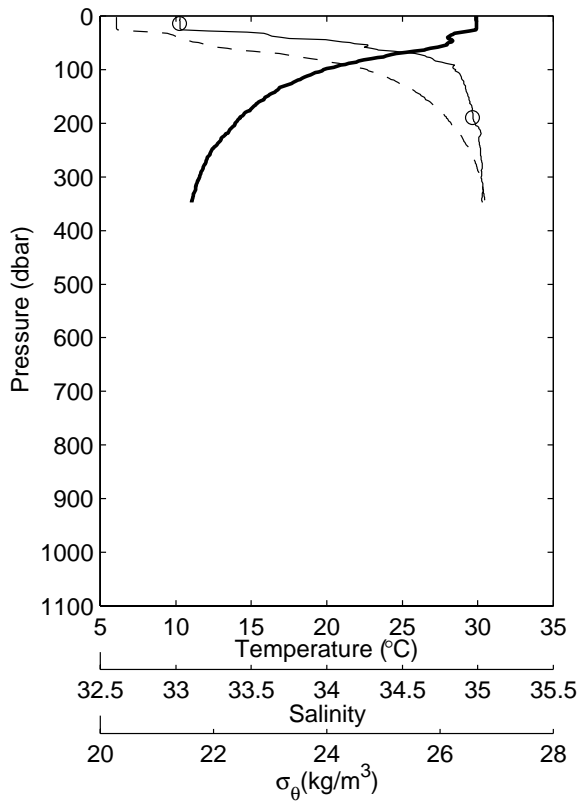
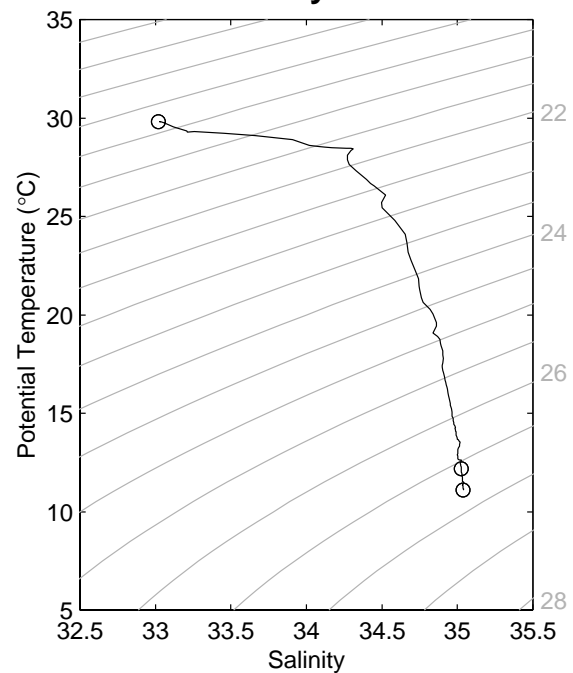
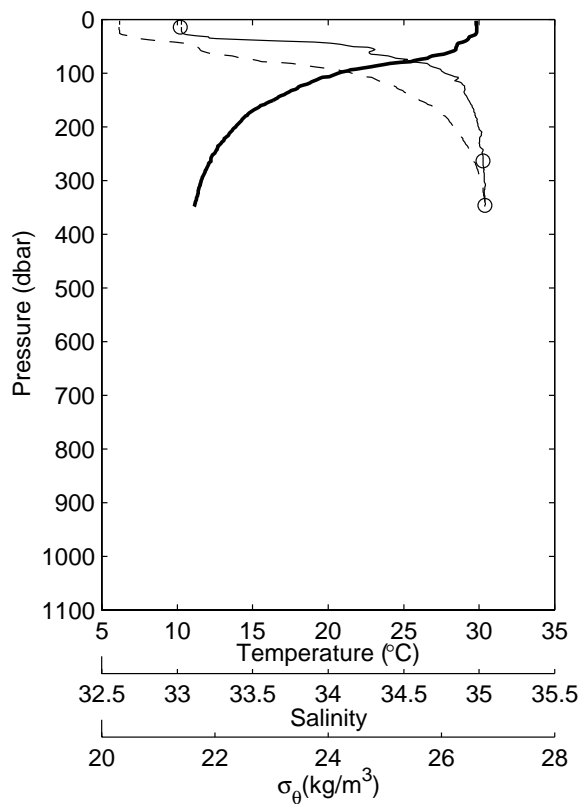


Figure 8.1.138. Same as Fig. 8.1.23 but for station 231 cast 1 and station 232 cast 1.

JASMINE Stn-233 Cast-1 11.13°N 88.25°E 16:48Z 23 May 1999



JASMINE Stn-234 Cast-1 11.00°N 88.25°E 17:54Z 23 May 1999

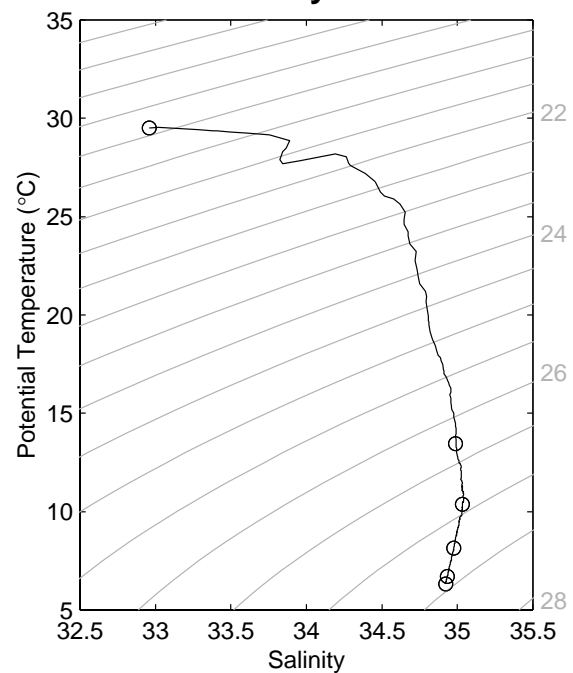
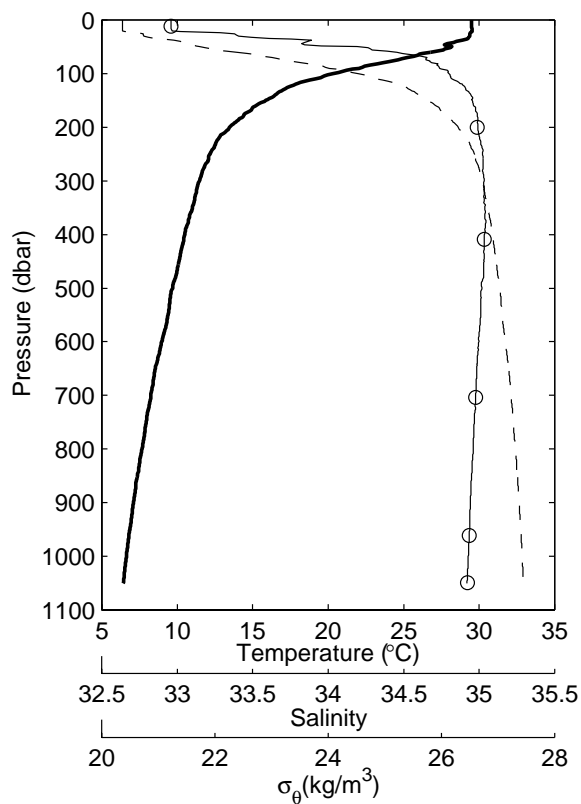
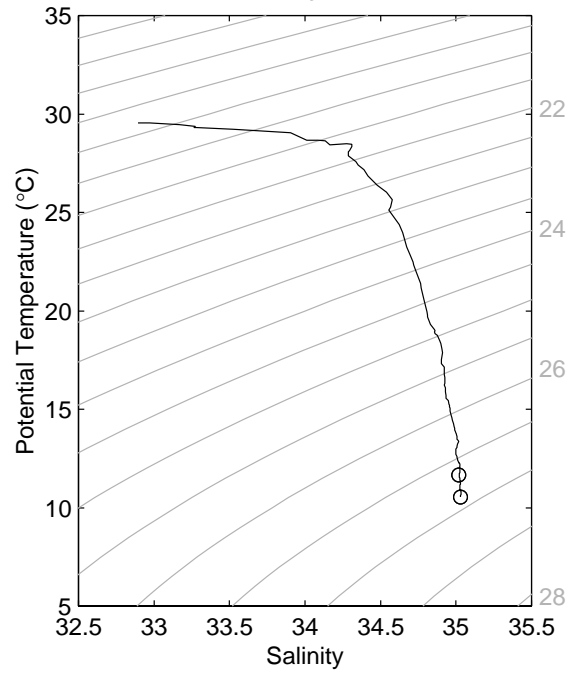
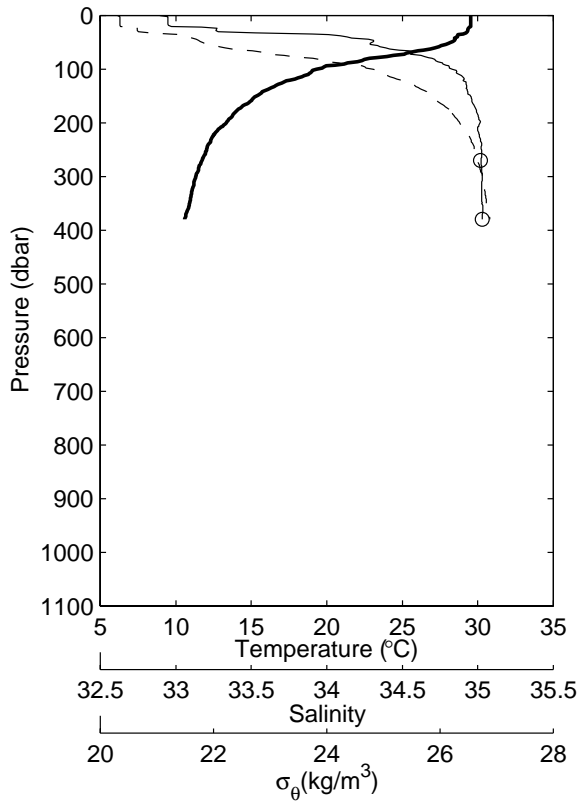


Figure 8.1.139. Same as Fig. 8.1.23 but for station 233 cast 1 and station 234 cast 1.

JASMINE Stn-235 Cast-1 11.08°N 88.31°E 19:13Z 23 May 1999



JASMINE Stn-236 Cast-1 11.22°N 88.41°E 20:33Z 23 May 1999

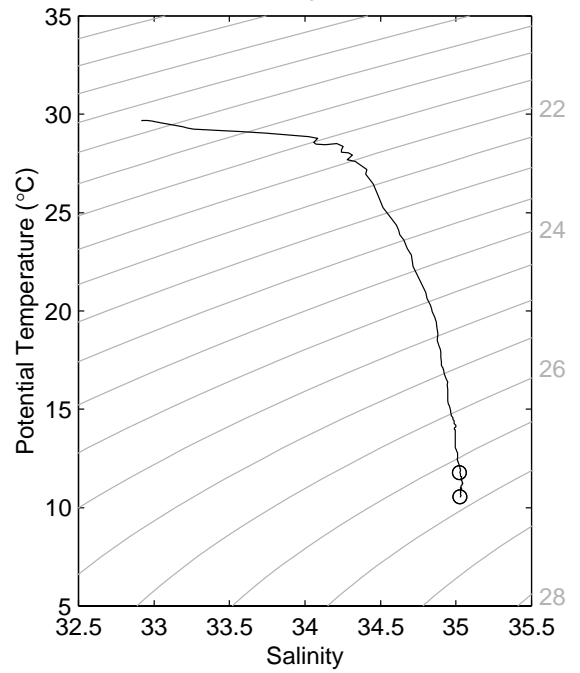
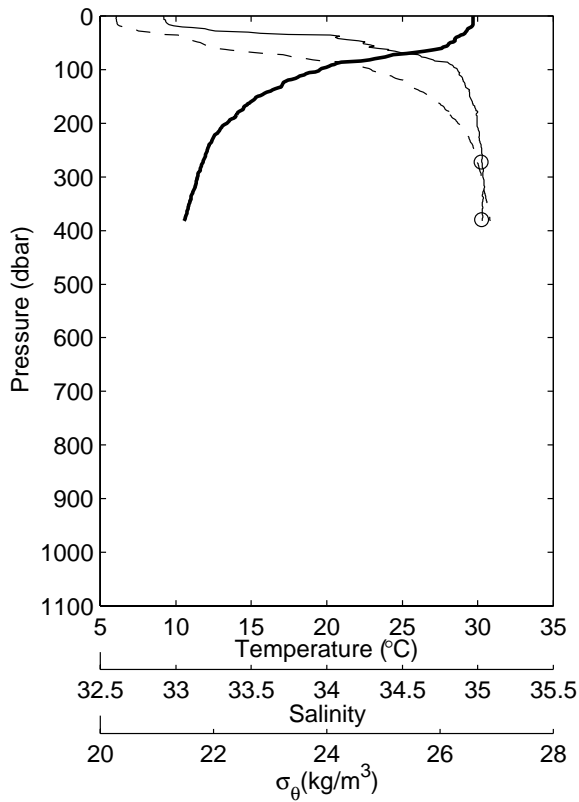
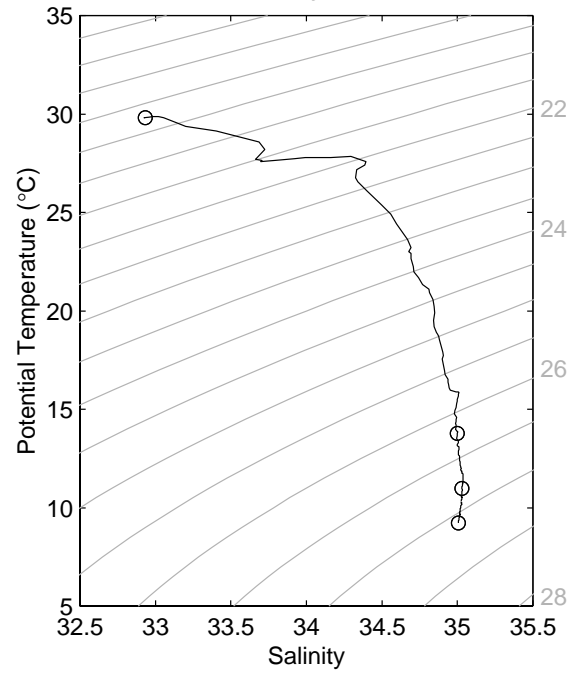
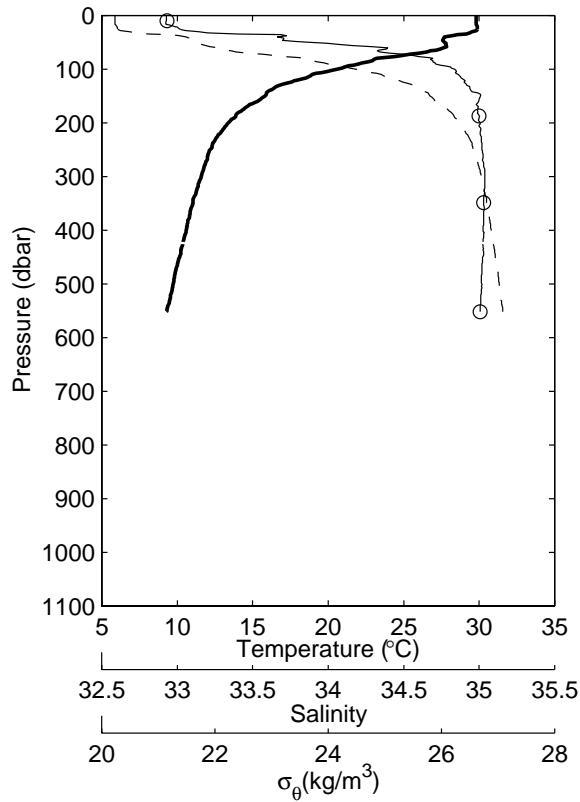


Figure 8.1.140. Same as Fig. 8.1.23 but for station 235 cast 1 and station 236 cast 1.

JASMINE Stn-237 Cast-1 11.33°N 88.49°E 21:53Z 23 May 1999



JASMINE Stn-238 Cast-1 11.28°N 88.36°E 23:19Z 23 May 1999

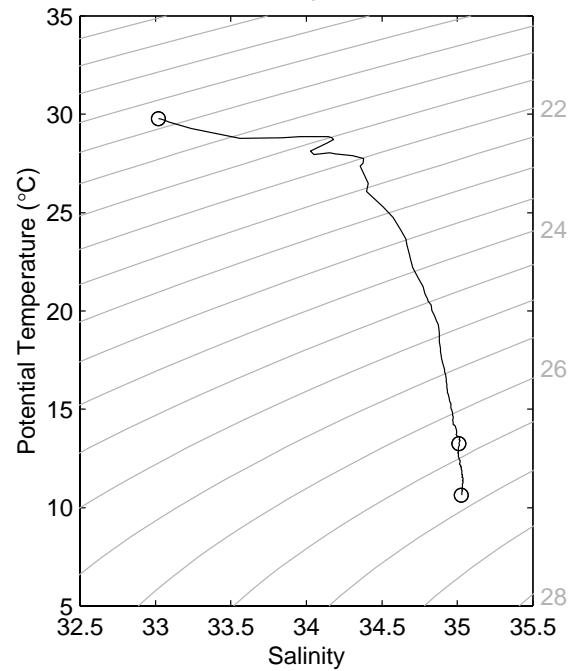
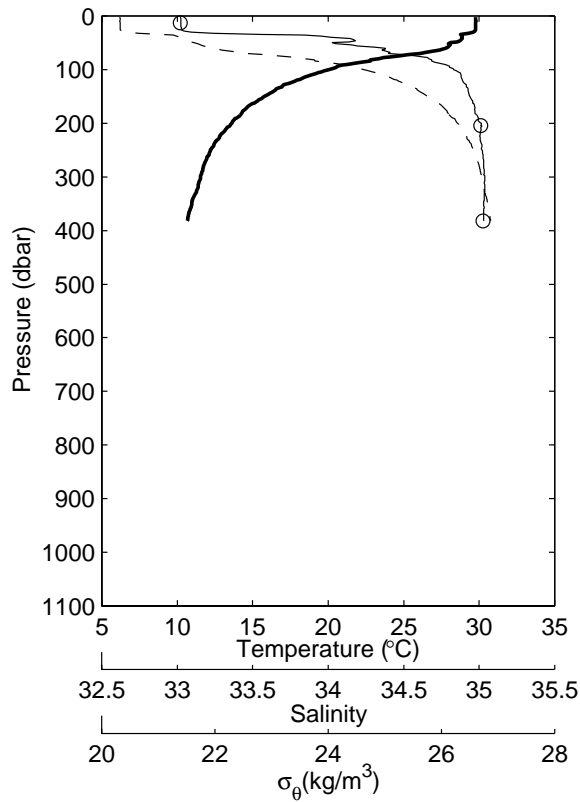
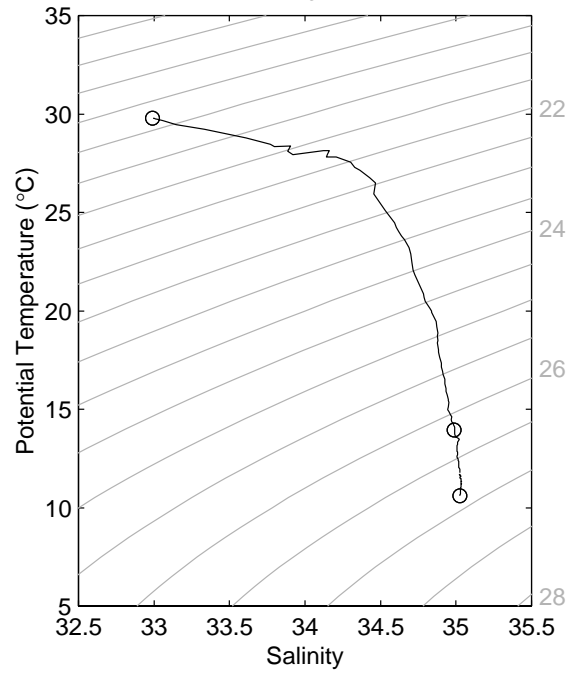
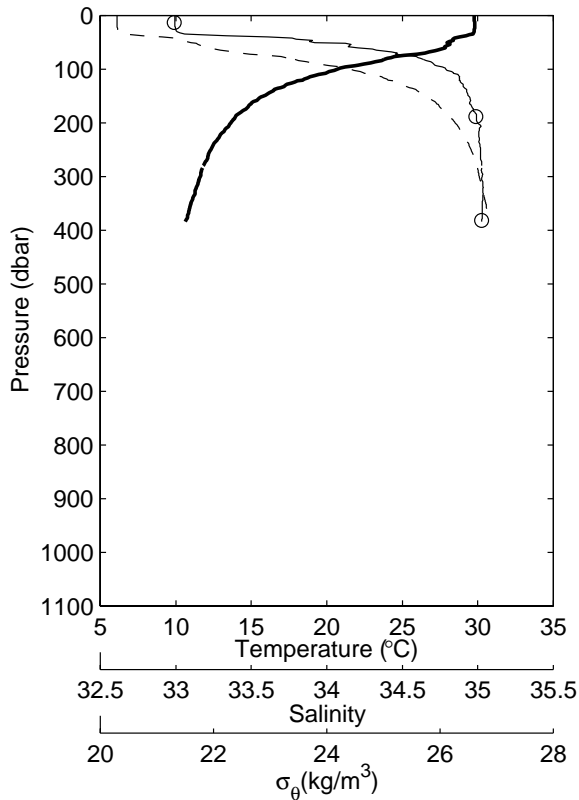


Figure 8.1.141. Same as Fig. 8.1.23 but for station 237 cast 1 and station 238 cast 1.

JASMINE Stn-239 Cast-1 11.24°N 88.23°E 00:29Z 24 May 1999



JASMINE Stn-240 Cast-1 11.20°N 88.11°E 01:40Z 24 May 1999

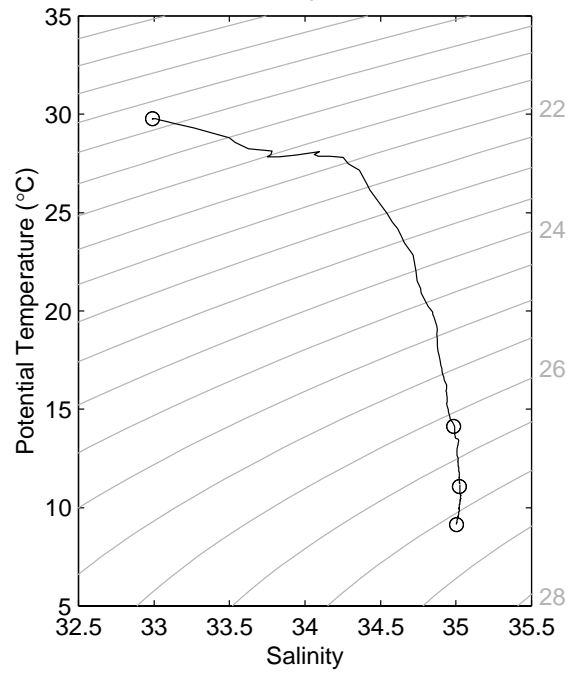
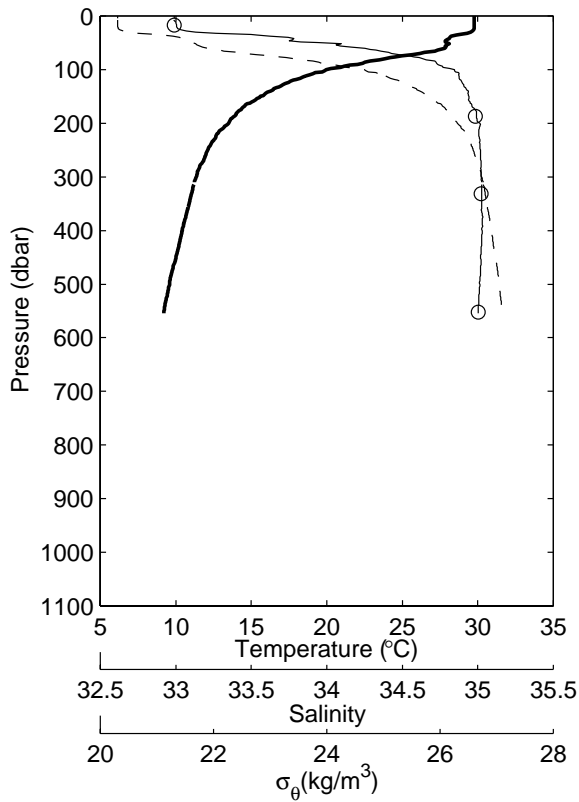
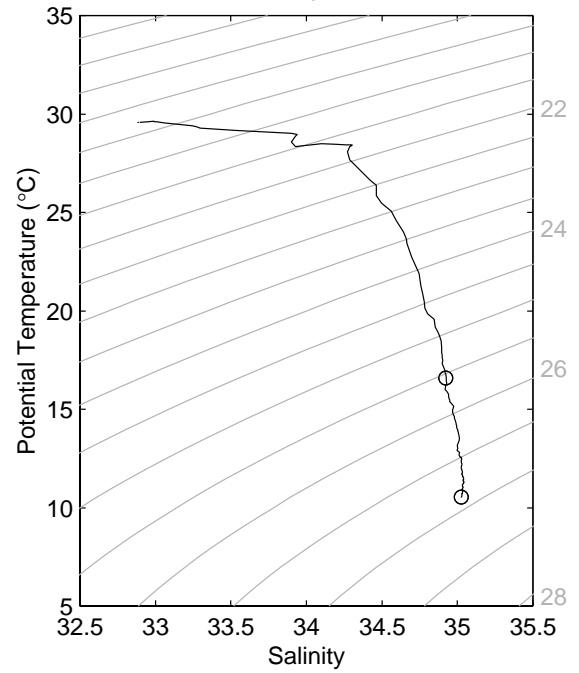
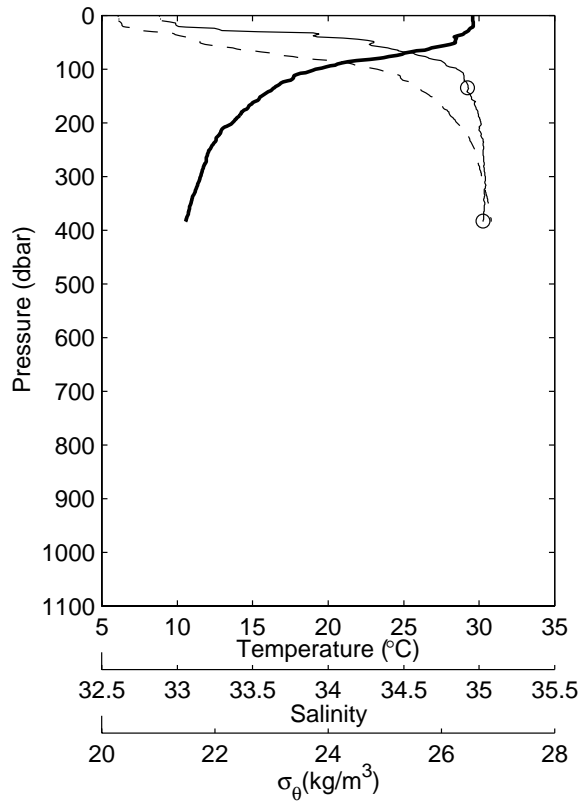


Figure 8.1.142. Same as Fig. 8.1.23 but for station 239 cast 1 and station 240 cast 1.

JASMINE Stn-241 Cast-1 11.16°N 88.23°E 02:58Z 24 May 1999



JASMINE Stn-242 Cast-1 11.13°N 88.31°E 03:47Z 24 May 1999

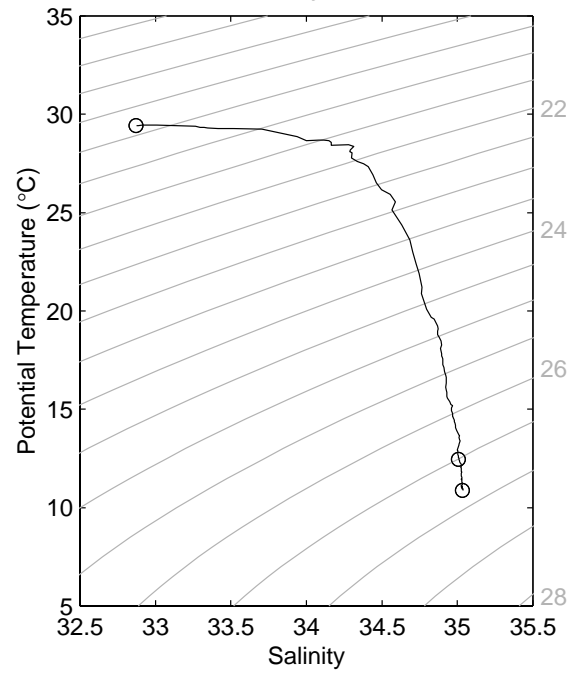
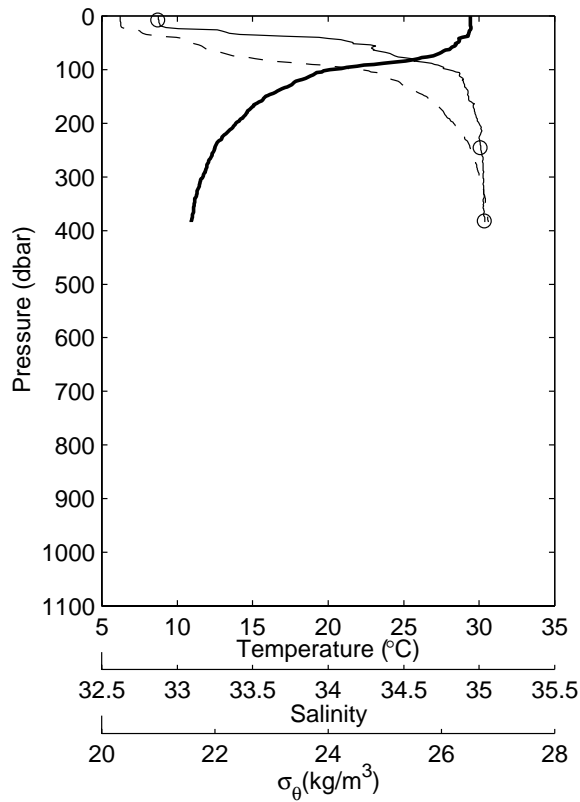
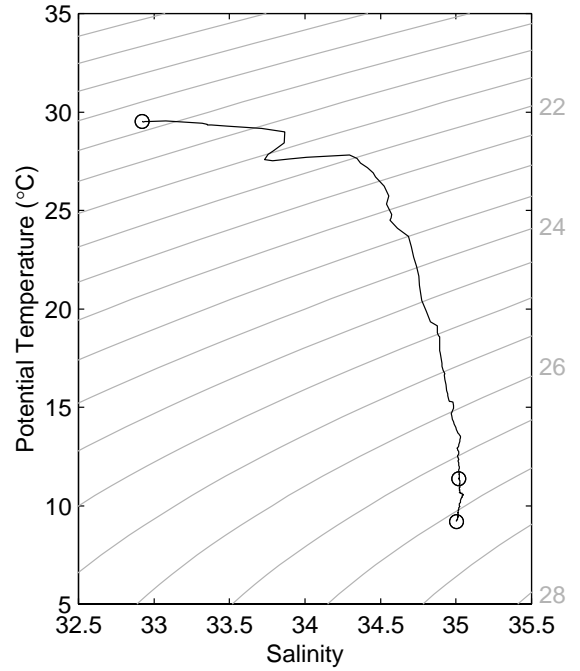
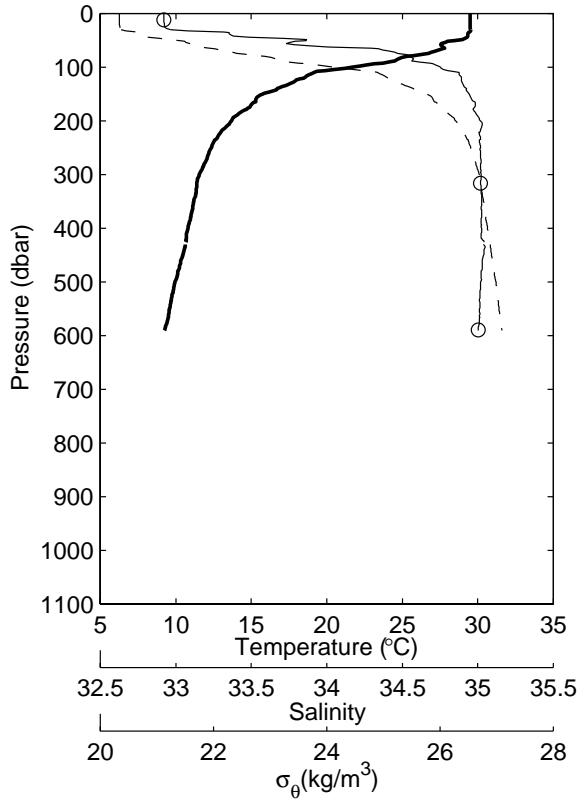


Figure 8.1.143. Same as Fig. 8.1.23 but for station 241 cast 1 and station 242 cast 1.

JASMINE Stn-243 Cast-1 11.08°N 88.48°E 05:08Z 24 May 1999



JASMINE Stn-244 Cast-1 11.18°N 88.41°E 06:34Z 24 May 1999

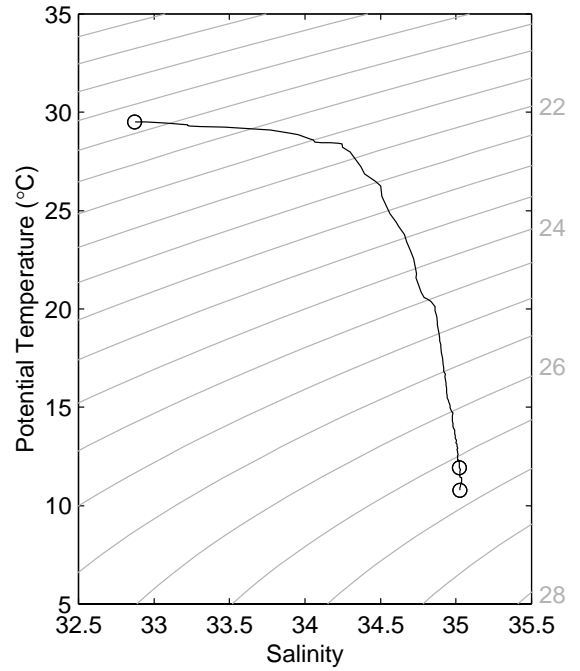
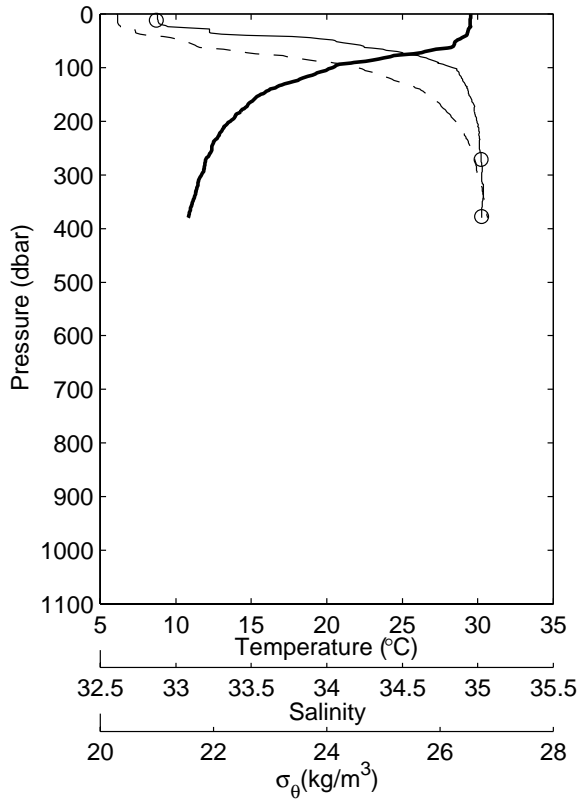
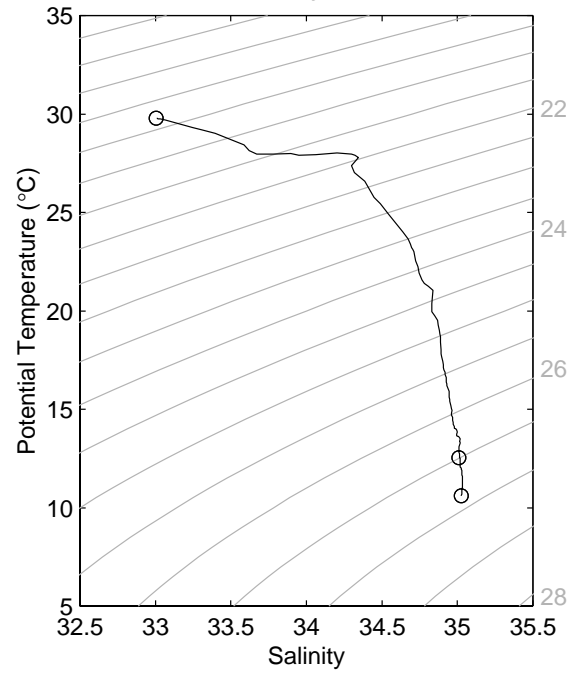
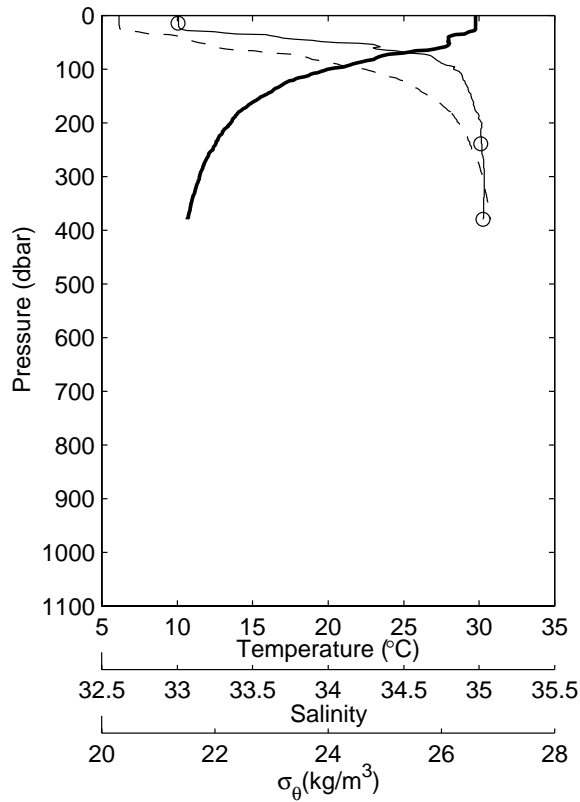


Figure 8.1.144. Same as Fig. 8.1.23 but for station 243 cast 1 and station 244 cast 1.

JASMINE Stn-245 Cast-1 11.29°N 88.33°E 07:40Z 24 May 1999



JASMINE Stn-246 Cast-1 11.40°N 88.25°E 08:53Z 24 May 1999

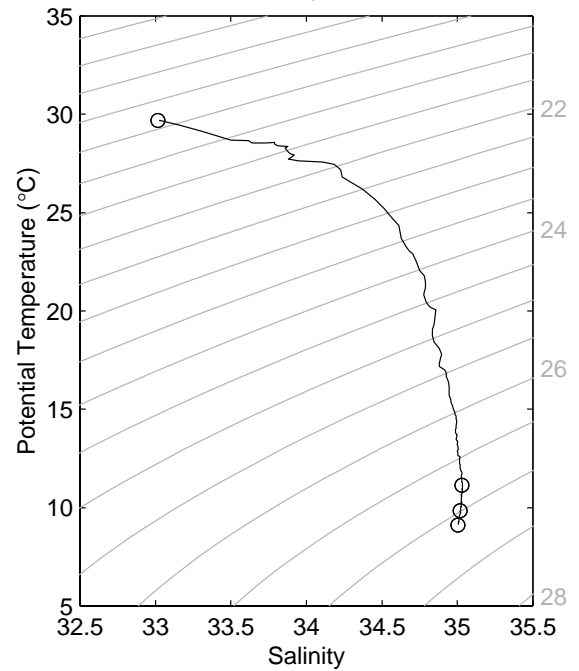
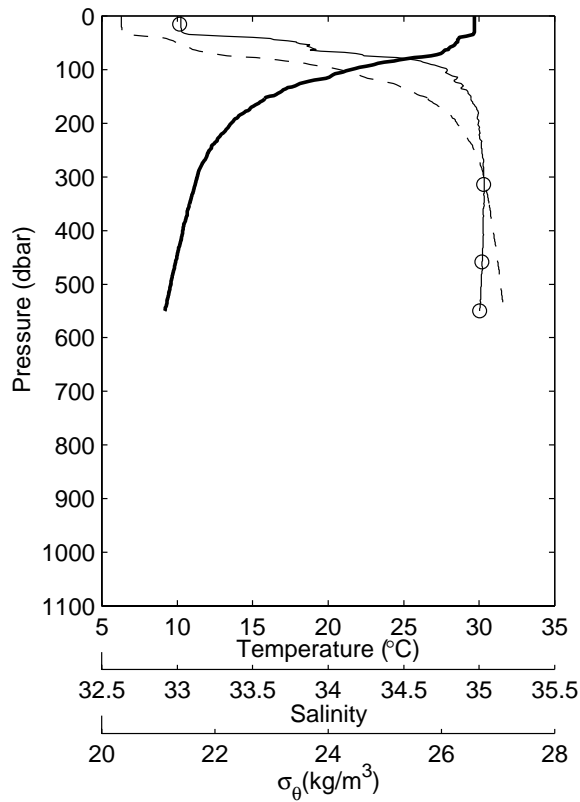
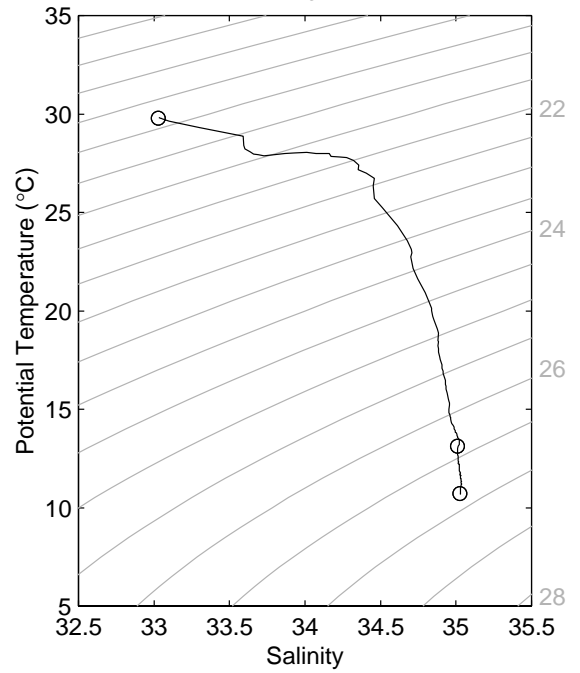
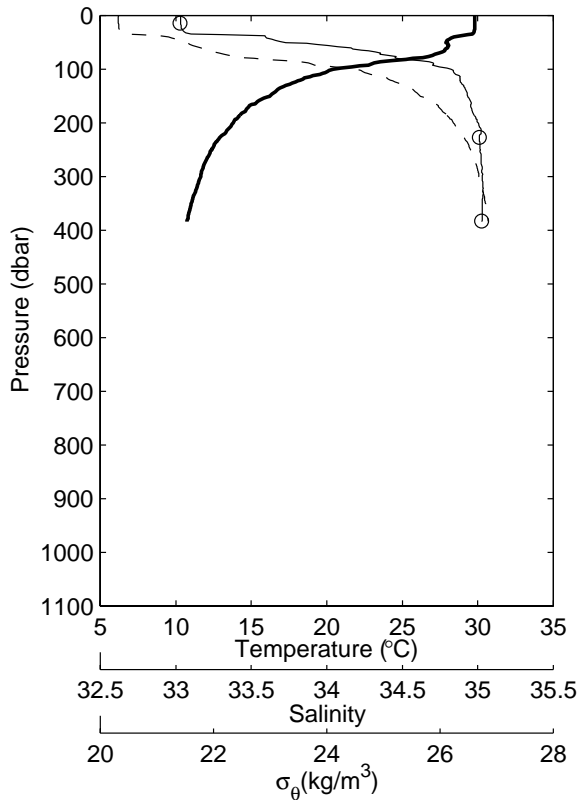


Figure 8.1.145. Same as Fig. 8.1.23 but for station 245 cast 1 and station 246 cast 1.

JASMINE Stn-247 Cast-1 11.27°N 88.25°E 10:11Z 24 May 1999



JASMINE Stn-248 Cast-1 11.13°N 88.25°E 11:21Z 24 May 1999

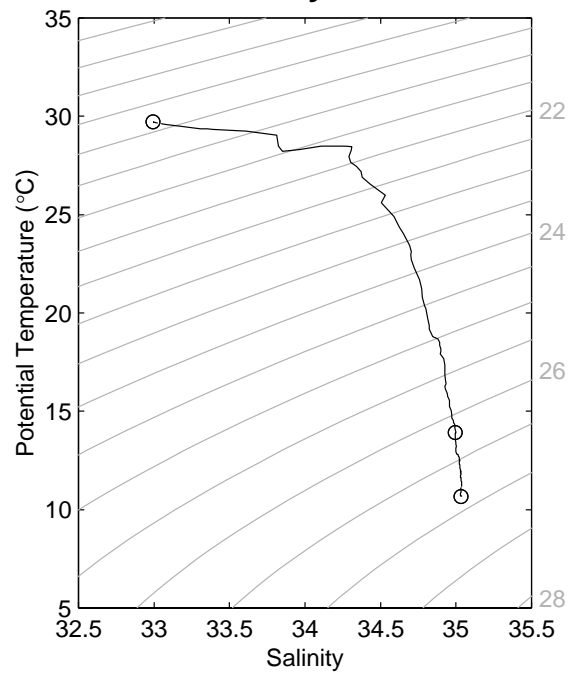
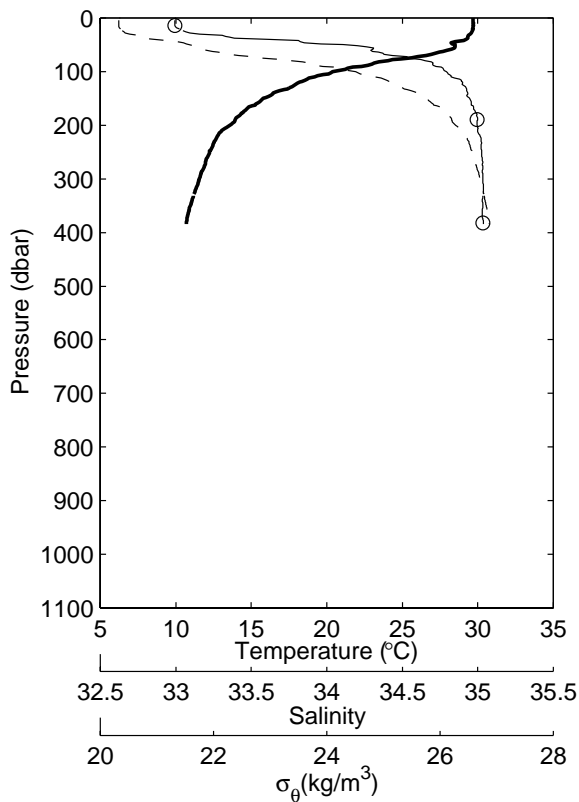
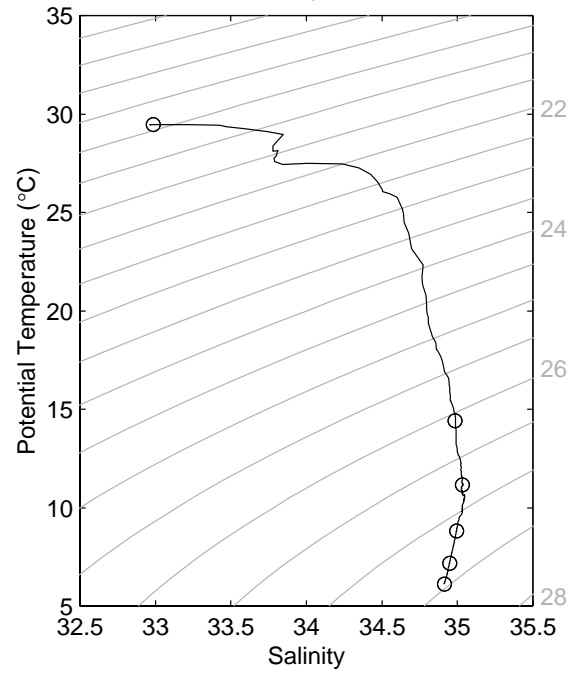
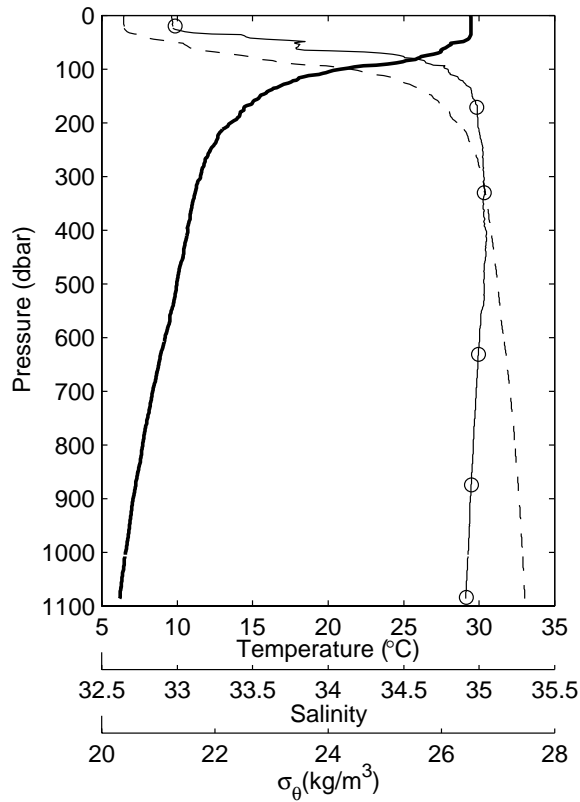


Figure 8.1.146. Same as Fig. 8.1.23 but for station 247 cast 1 and station 248 cast 1.

JASMINE Stn-249 Cast-1 11.00°N 88.25°E 12:30Z 24 May 1999



JASMINE Stn-250 Cast-1 11.10°N 88.32°E 13:53Z 24 May 1999

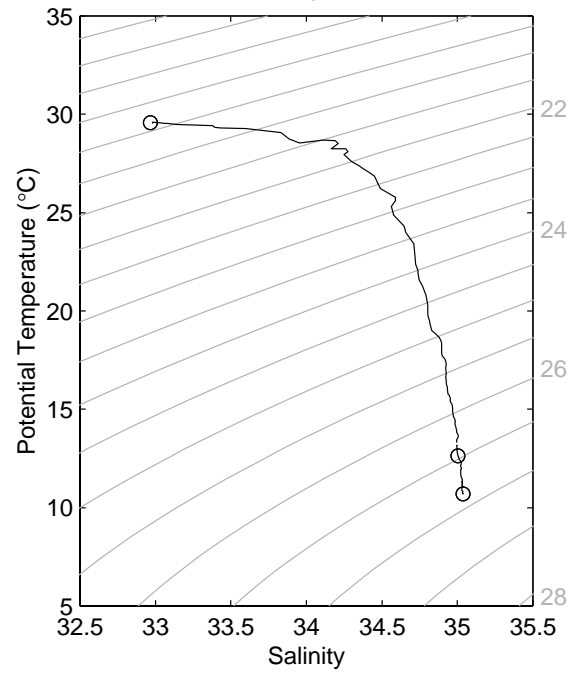
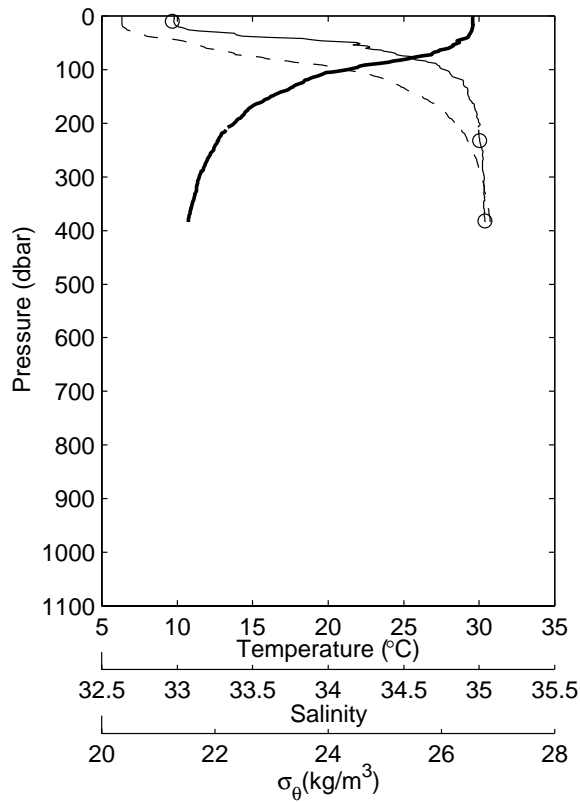
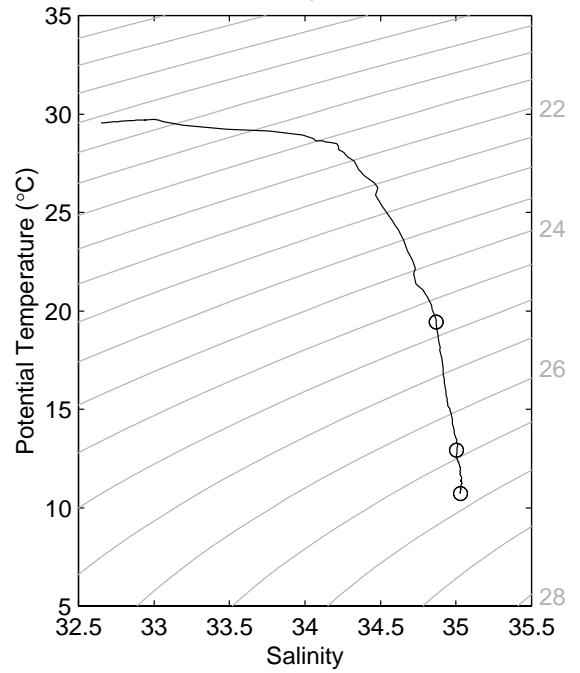
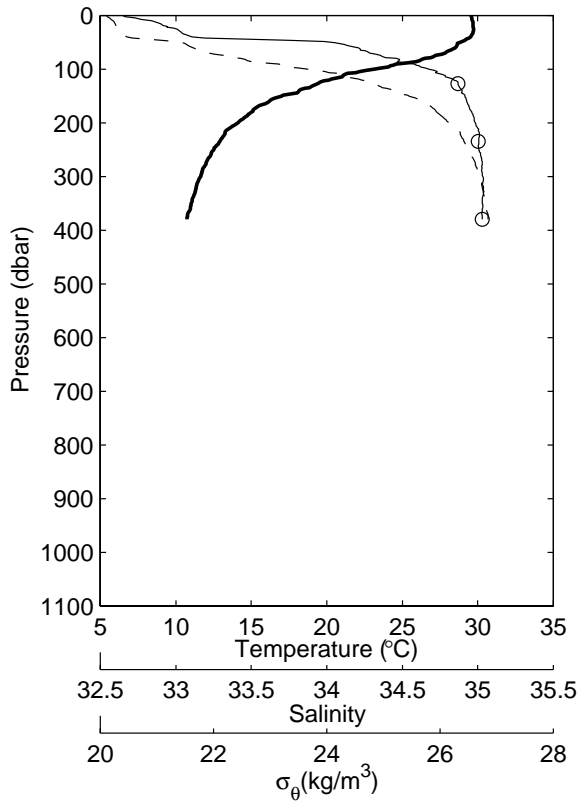


Figure 8.1.147. Same as Fig. 8.1.23 but for station 249 cast 1 and station 250 cast 1.

JASMINE Stn-251 Cast-1 11.18°N 88.38°E 14:52Z 24 May 1999



JASMINE Stn-252 Cast-1 11.32°N 88.49°E 16:19Z 24 May 1999

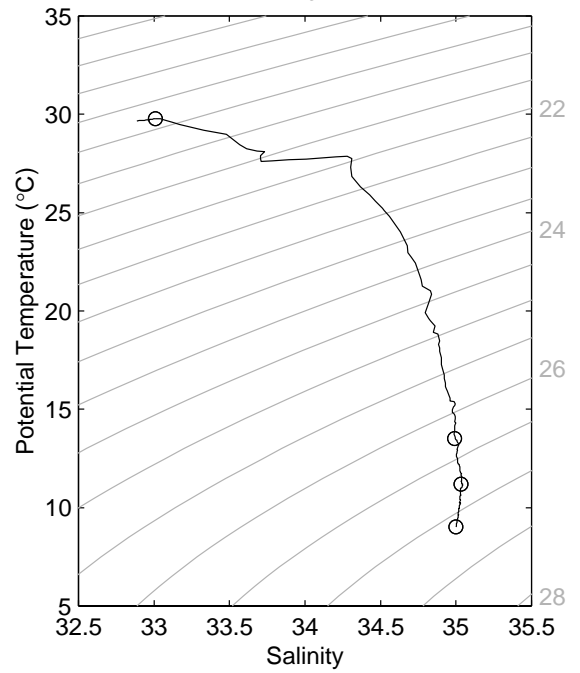
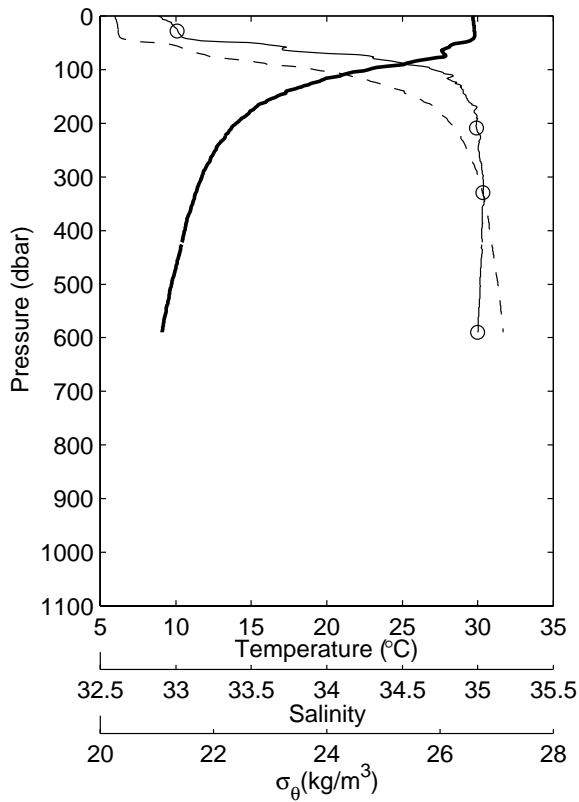
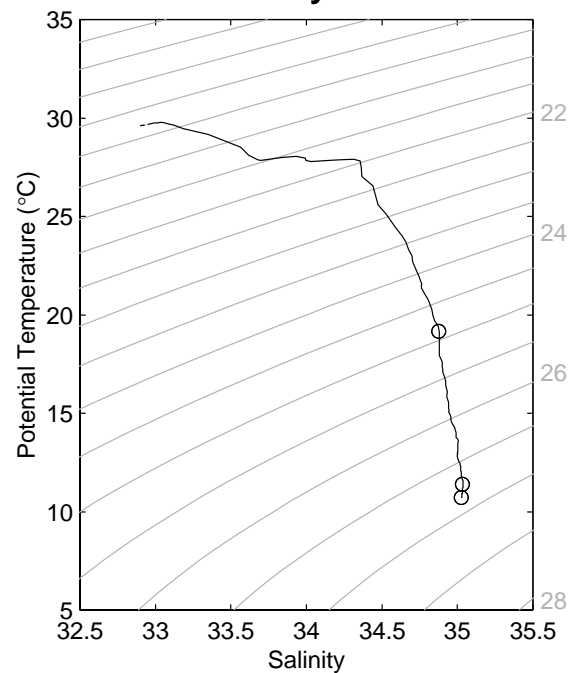
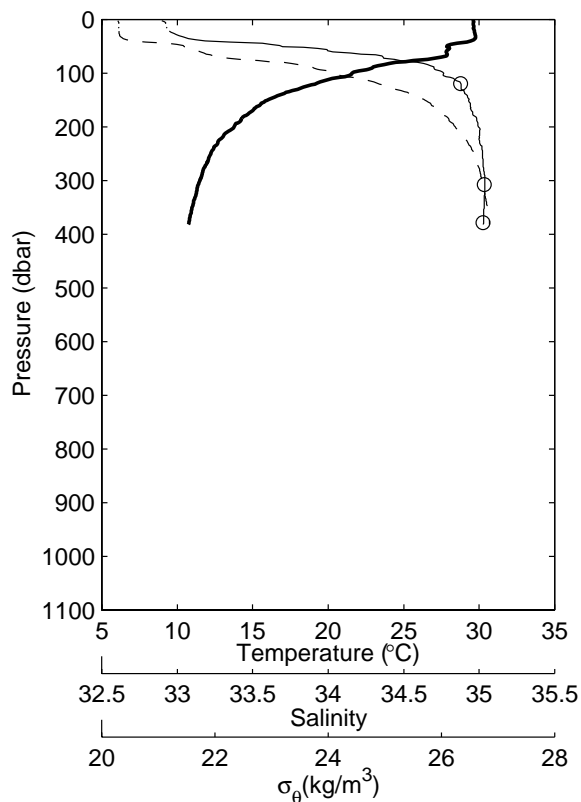


Figure 8.1.148. Same as Fig. 8.1.23 but for station 251 cast 1 and station 252 cast 1.

JASMINE Stn-253 Cast-1 11.28°N 88.36°E 17:34Z 24 May 1999



JASMINE Stn-254 Cast-1 11.24°N 88.23°E 19:06Z 24 May 1999

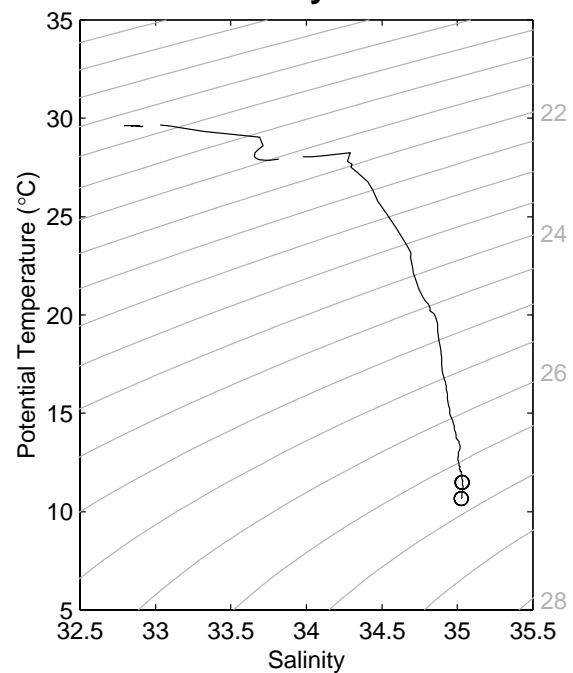
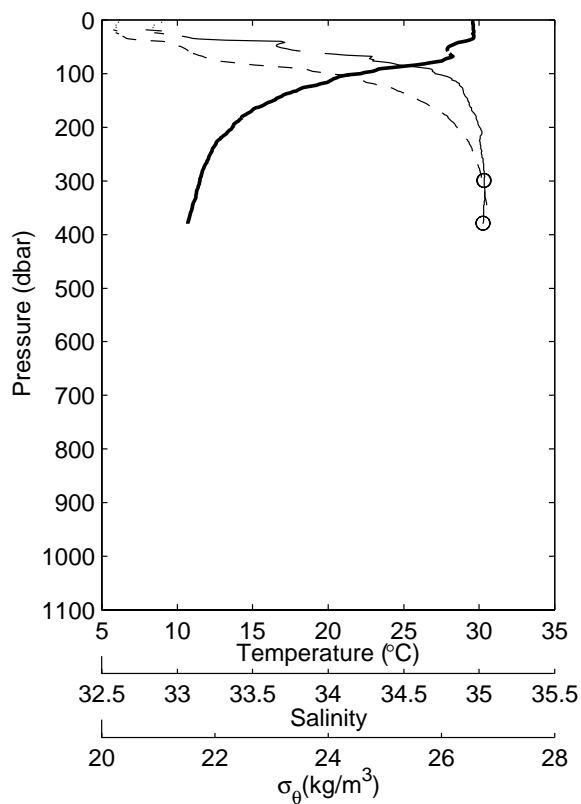
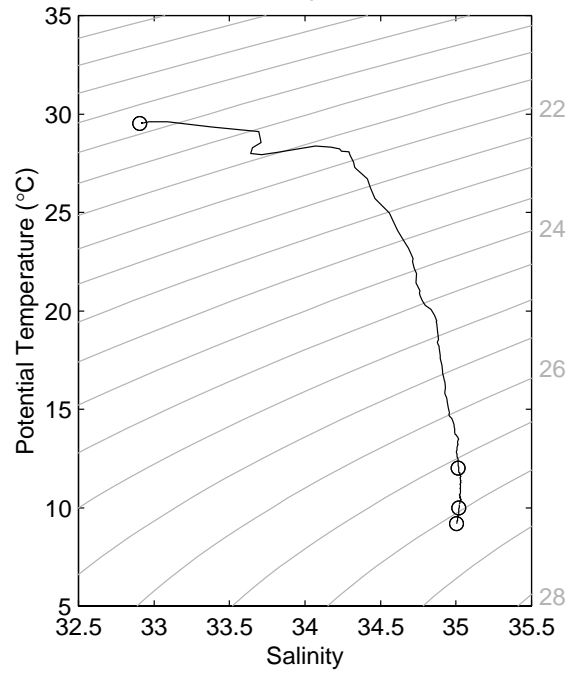
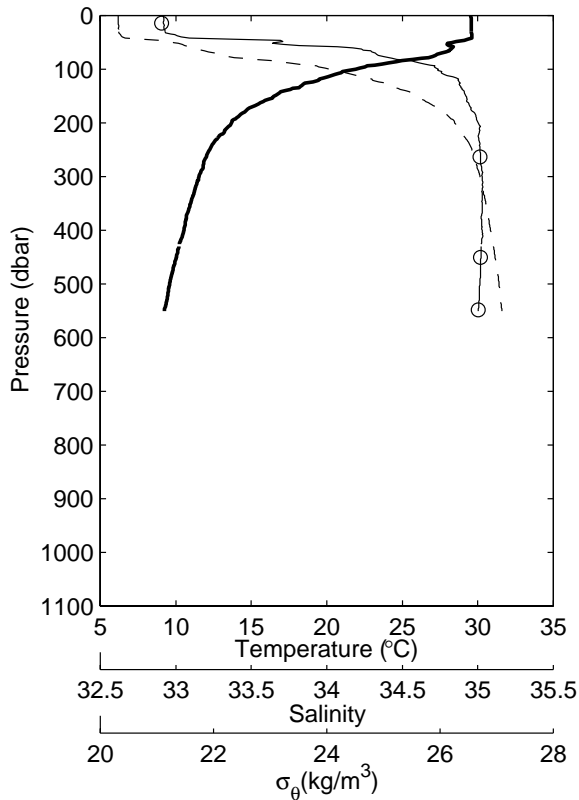


Figure 8.1.149. Same as Fig. 8.1.23 but for station 253 cast 1 and station 254 cast 1.

JASMINE Stn-255 Cast-1 11.20°N 88.11°E 20:29Z 24 May 1999



JASMINE Stn-256 Cast-1 11.16°N 88.23°E 21:45Z 24 May 1999

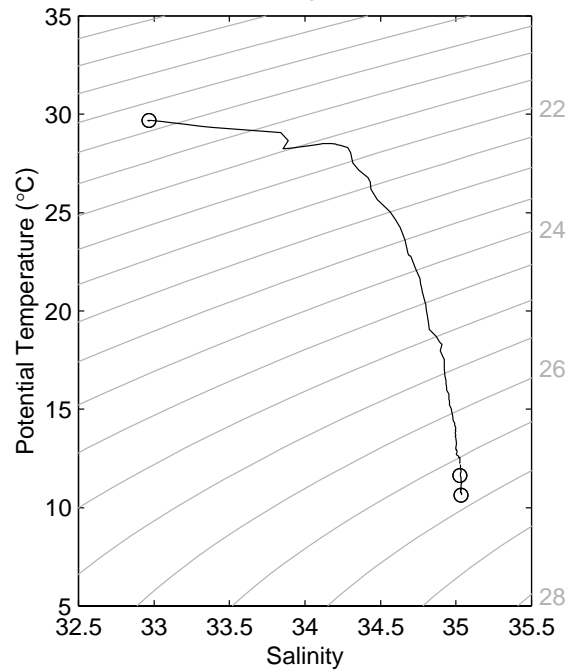
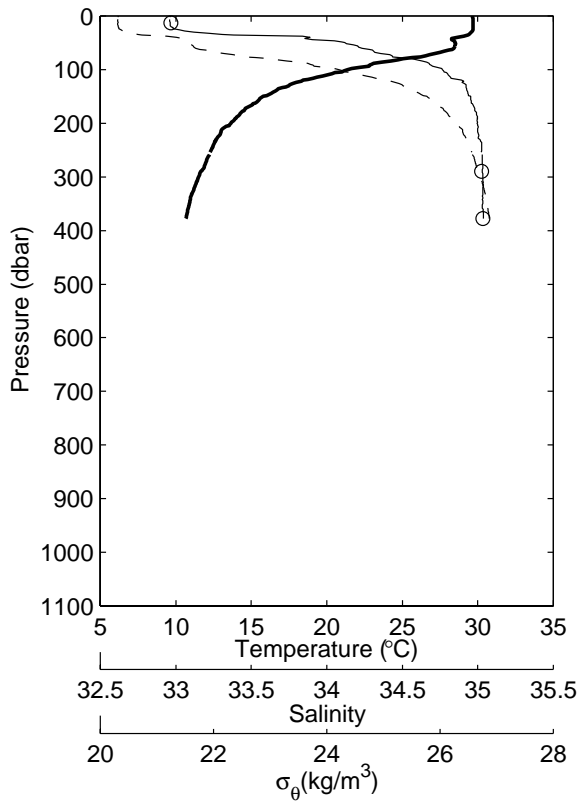
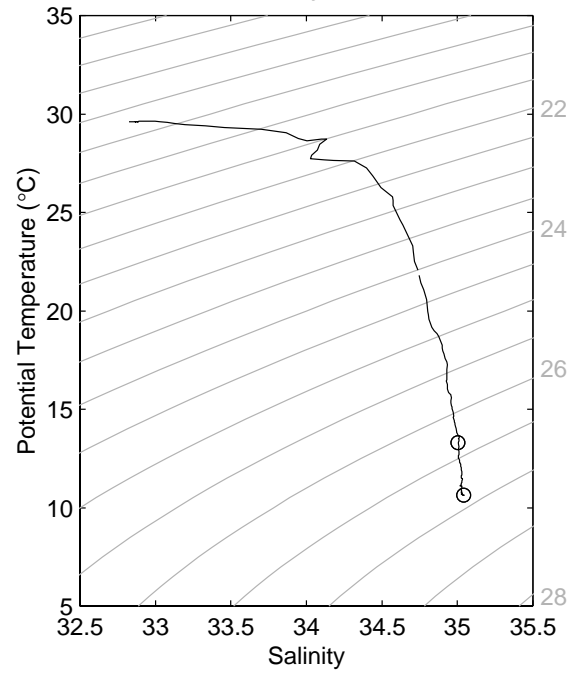
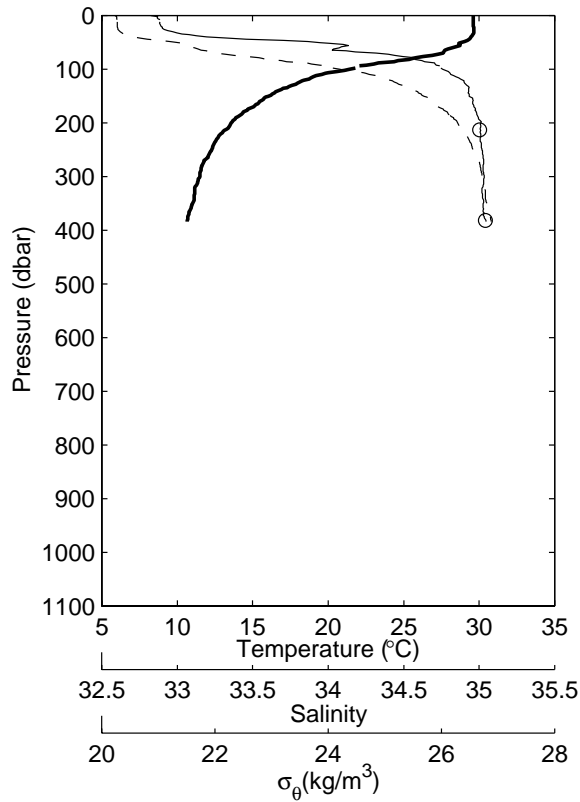


Figure 8.1.150. Same as Fig. 8.1.23 but for station 255 cast 1 and station 256 cast 1.

JASMINE Stn-257 Cast-1 11.12°N 88.36°E 22:56Z 24 May 1999



JASMINE Stn-258 Cast-1 11.07°N 88.49°E 00:07Z 25 May 1999

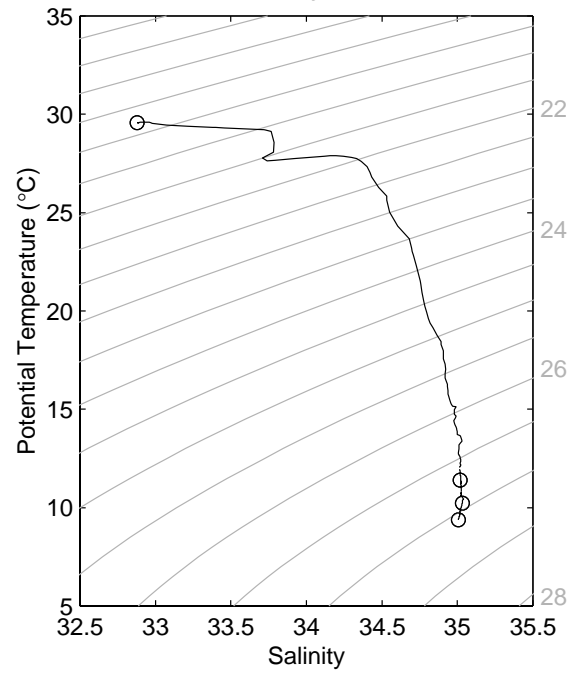
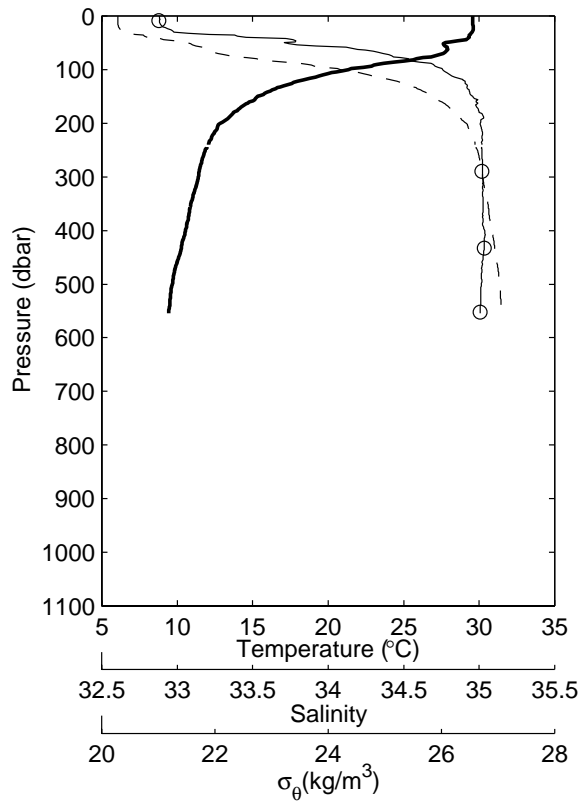
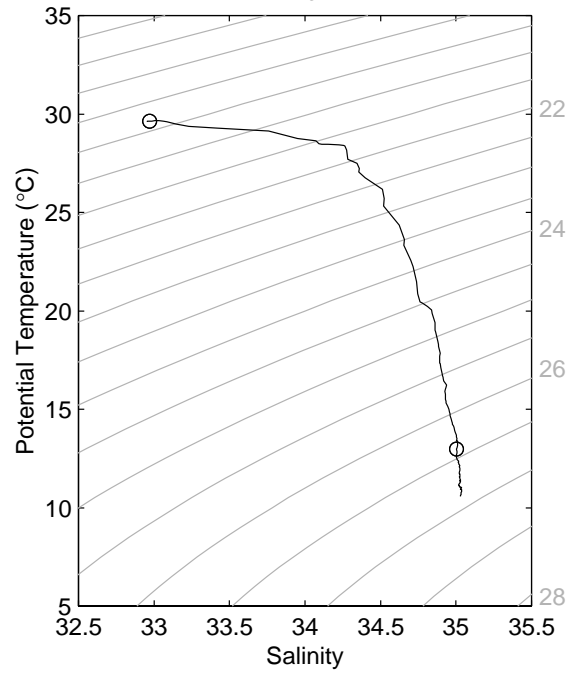
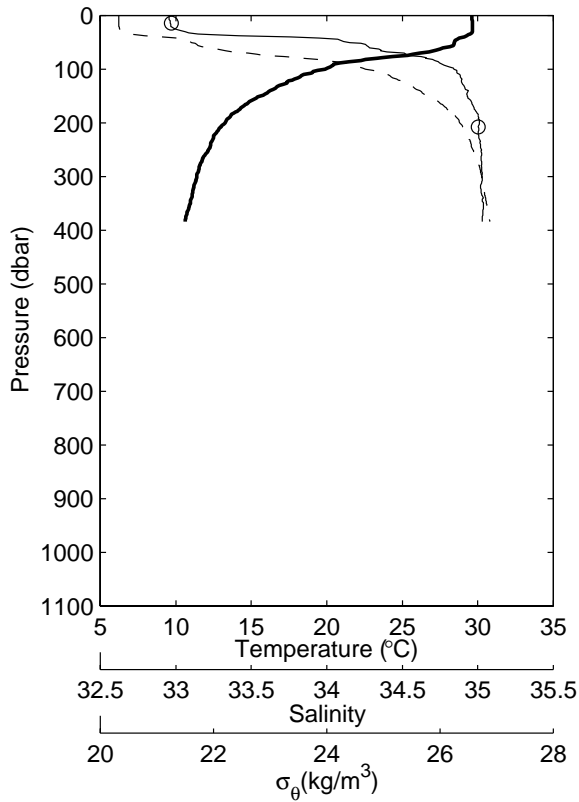


Figure 8.1.151. Same as Fig. 8.1.23 but for station 257 cast 1 and station 258 cast 1.

JASMINE Stn-259 Cast-1 11.18°N 88.41°E 01:31Z 25 May 1999



JASMINE Stn-260 Cast-1 11.29°N 88.33°E 02:45Z 25 May 1999

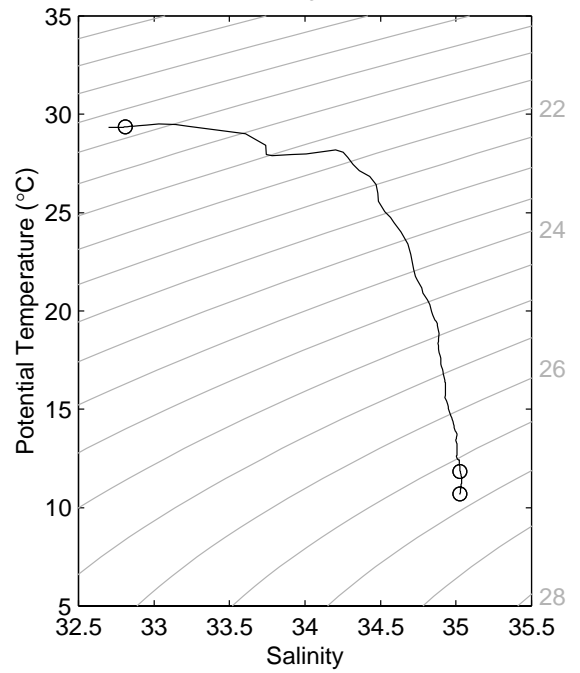
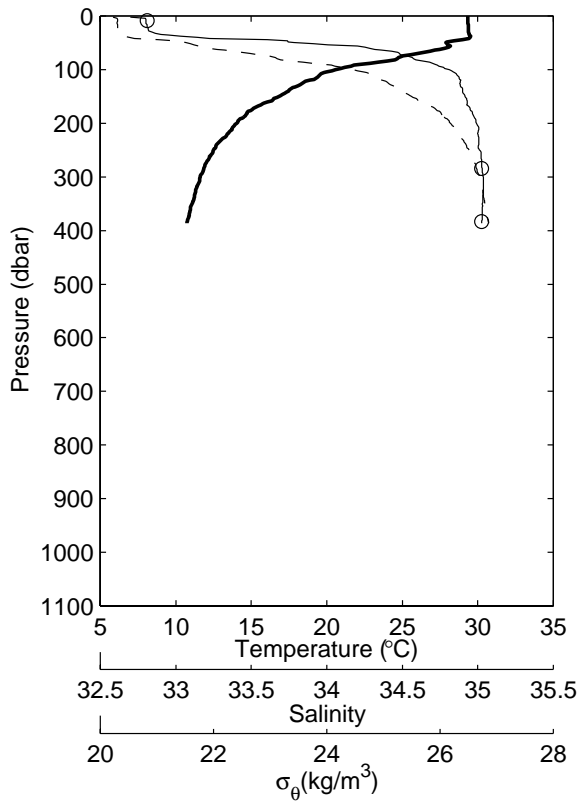
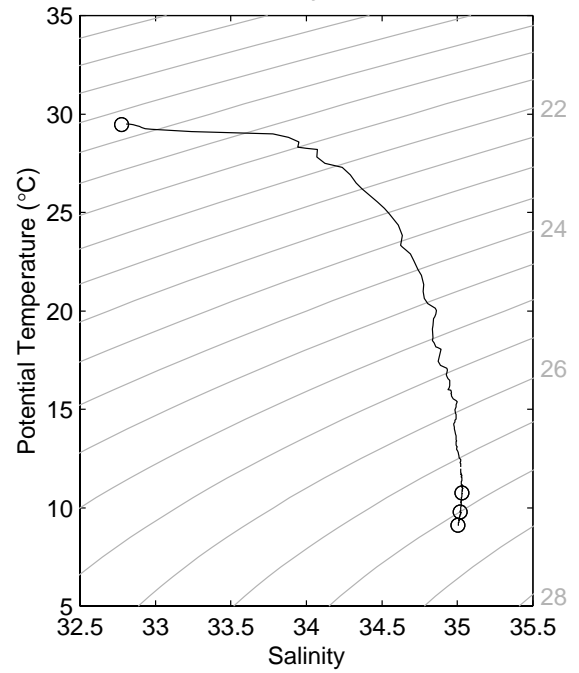
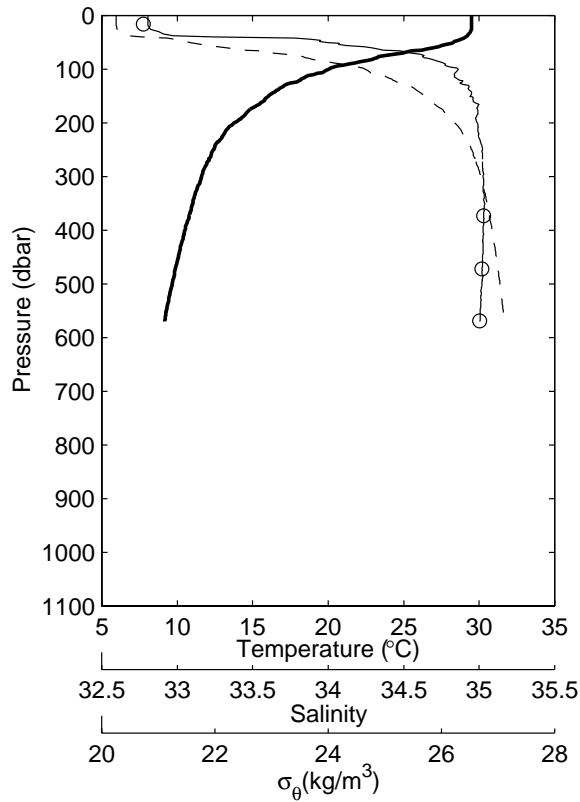


Figure 8.1.152. Same as Fig. 8.1.23 but for station 289 cast 1 and station 260 cast 1.

JASMINE Stn-261 Cast-1 11.40°N 88.25°E 03:55Z 25 May 1999



JASMINE Stn-262 Cast-1 11.38°N 88.25°E 04:40Z 25 May 1999

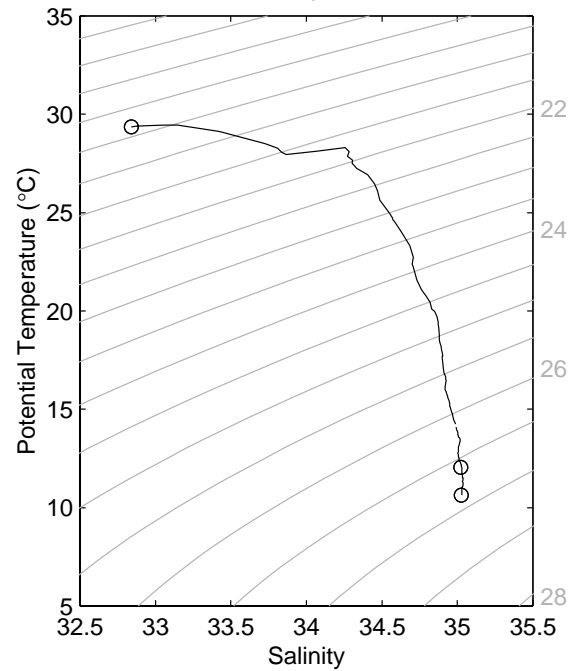
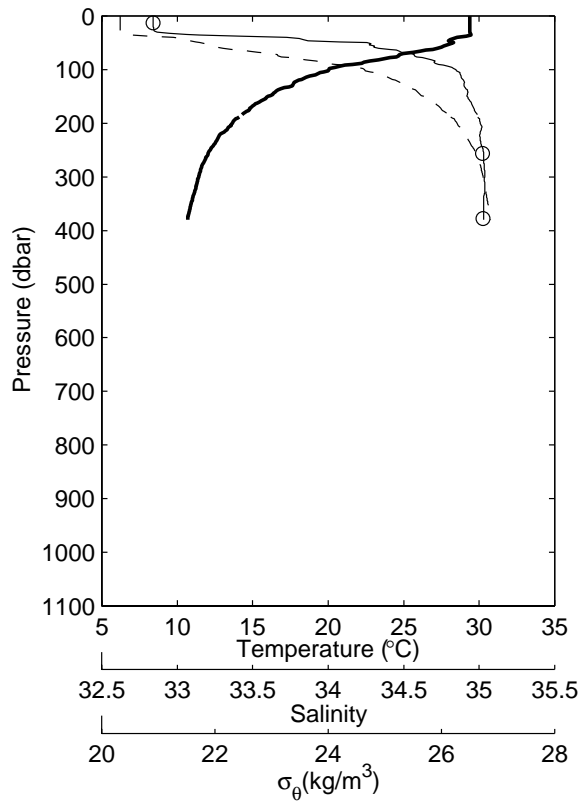
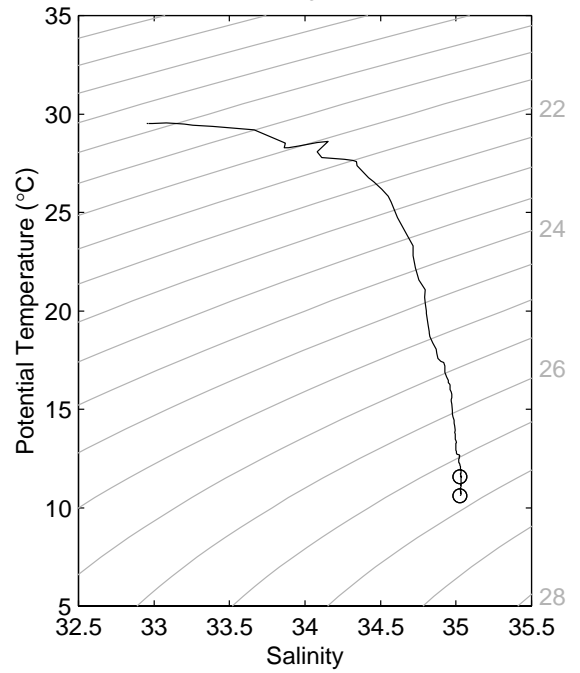
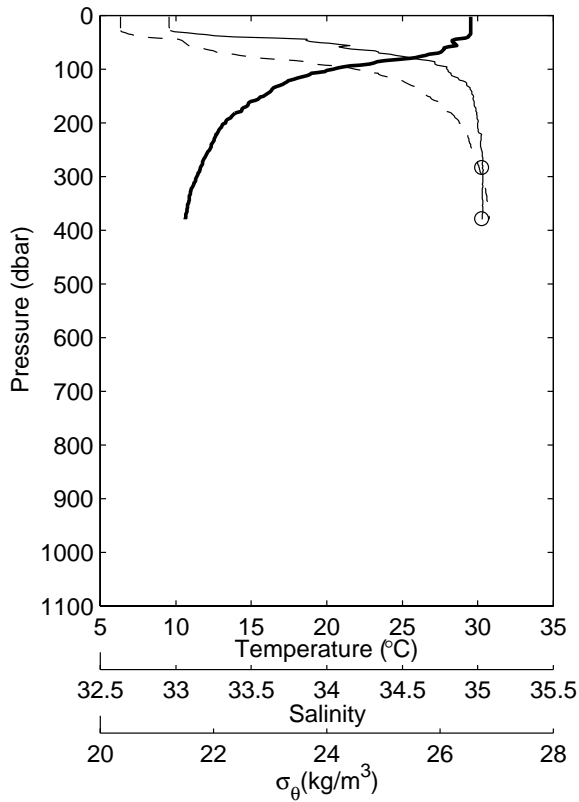


Figure 8.1.153. Same as Fig. 8.1.23 but for station 261 cast 1 and station 262 cast 1.

JASMINE Stn-263 Cast-1 11.13°N 88.25°E 06:41Z 25 May 1999



JASMINE Stn-264 Cast-1 11.00°N 88.25°E 08:03Z 25 May 1999

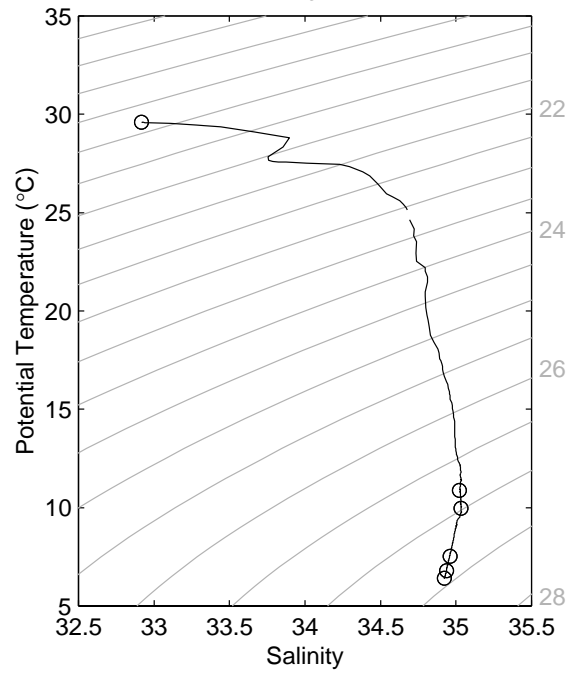
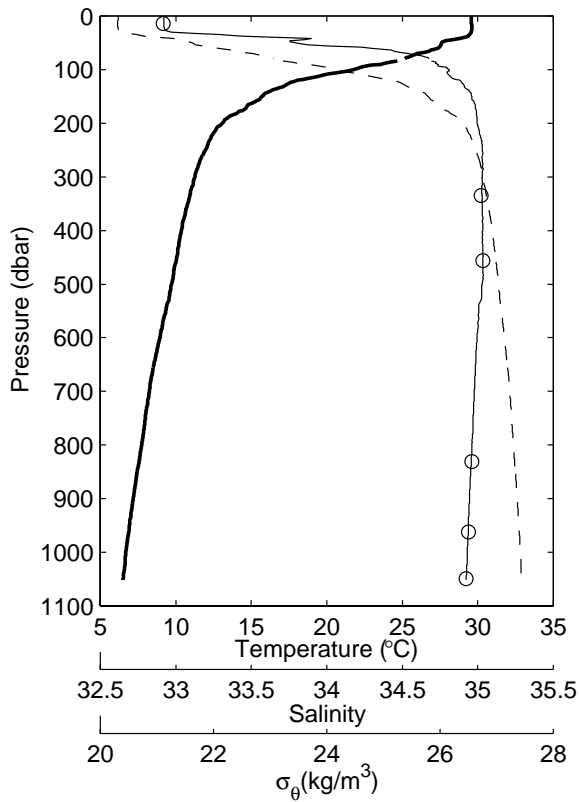
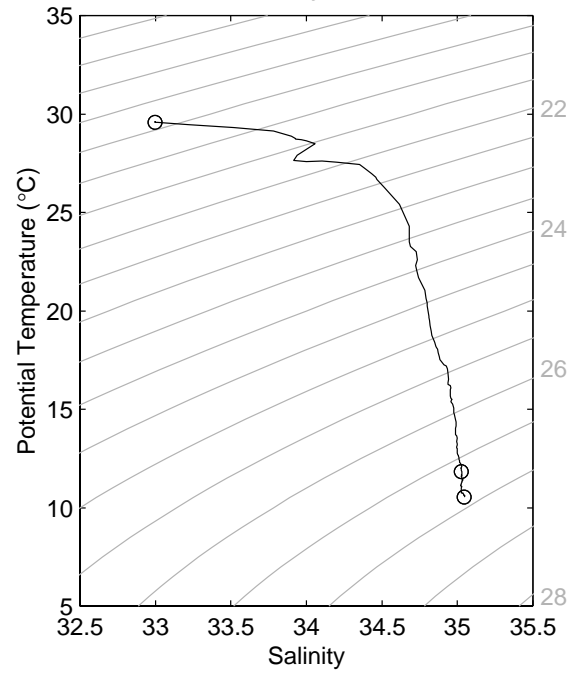
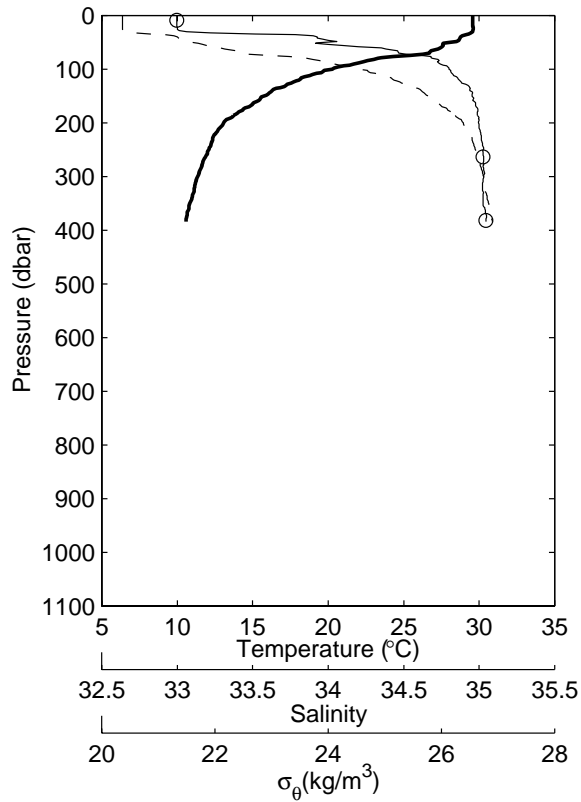


Figure 8.1.154. Same as Fig. 8.1.23 but for station 263 cast 1 and station 264 cast 1.

JASMINE Stn-265 Cast-1 11.11°N 88.33°E 09:42Z 25 May 1999



JASMINE Stn-266 Cast-1 11.22°N 88.41°E 10:47Z 25 May 1999

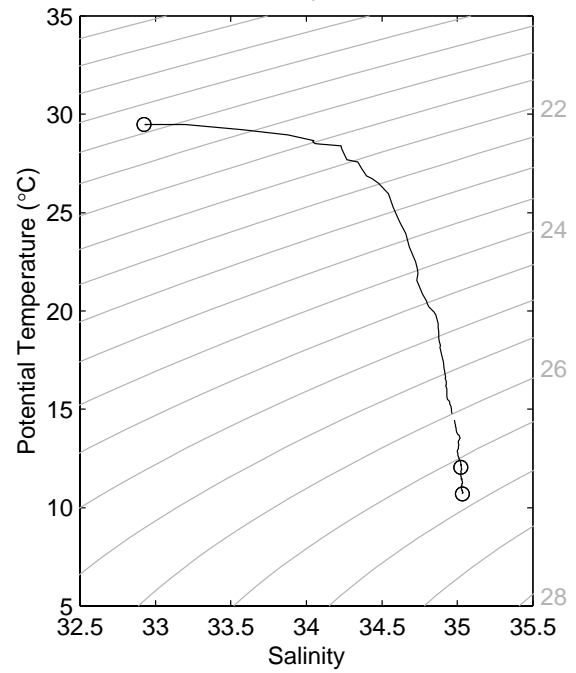
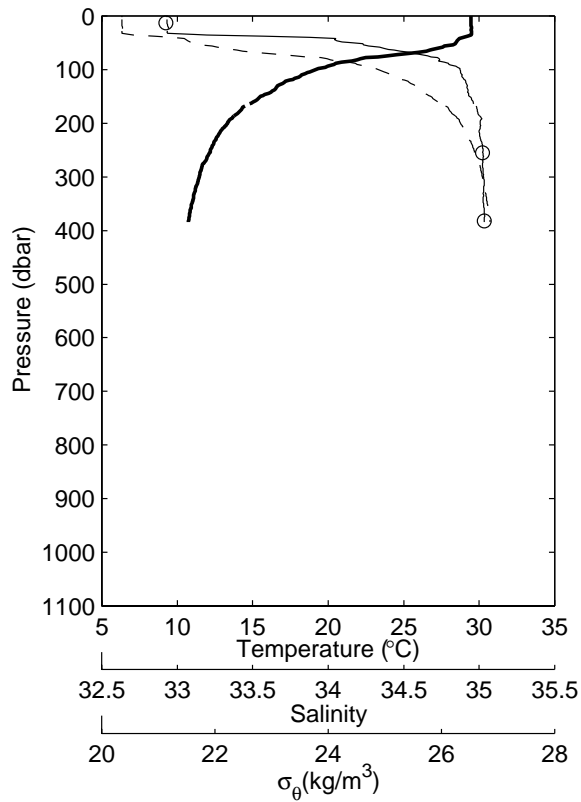
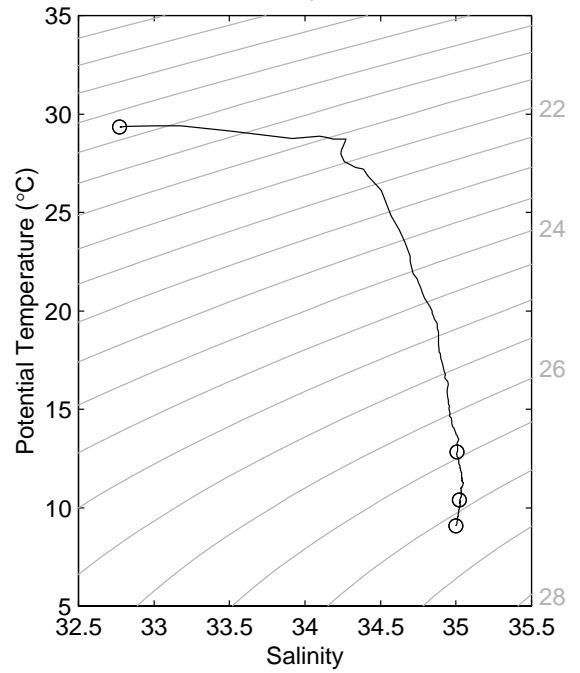
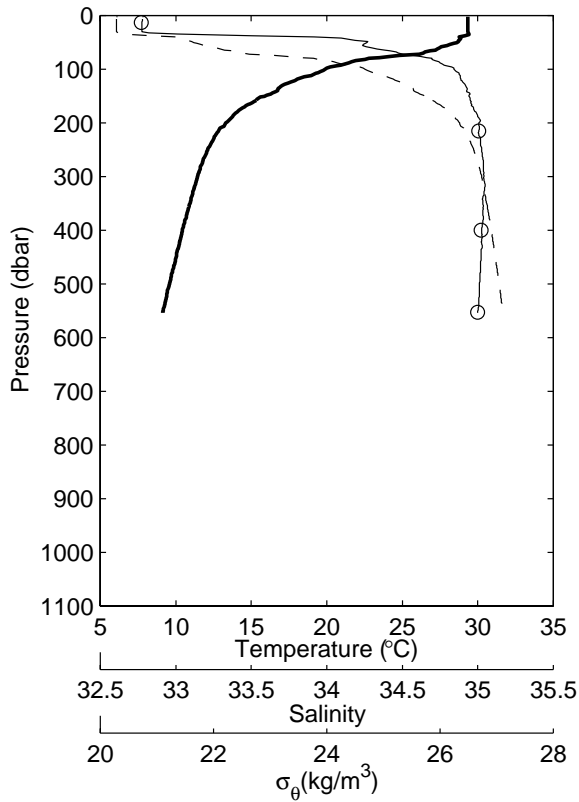


Figure 8.1.155. Same as Fig. 8.1.23 but for station 265 cast 1 and station 266 cast 1.

JASMINE Stn-267 Cast-1 11.33°N 88.49°E 12:07Z 25 May 1999



JASMINE Stn-268 Cast-1 11.28°N 88.36°E 13:36Z 25 May 1999

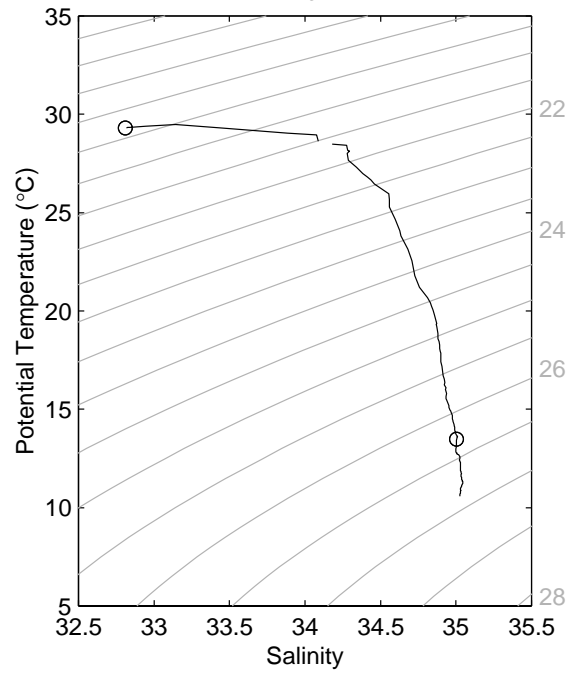
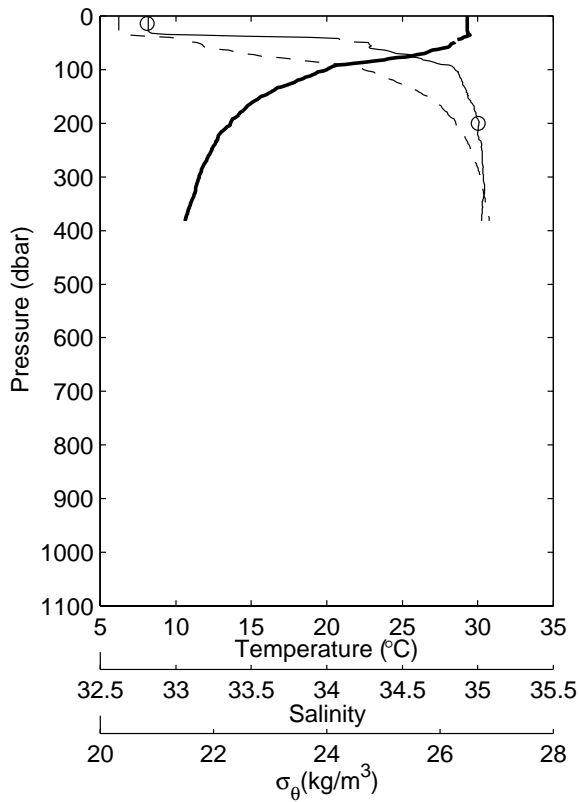
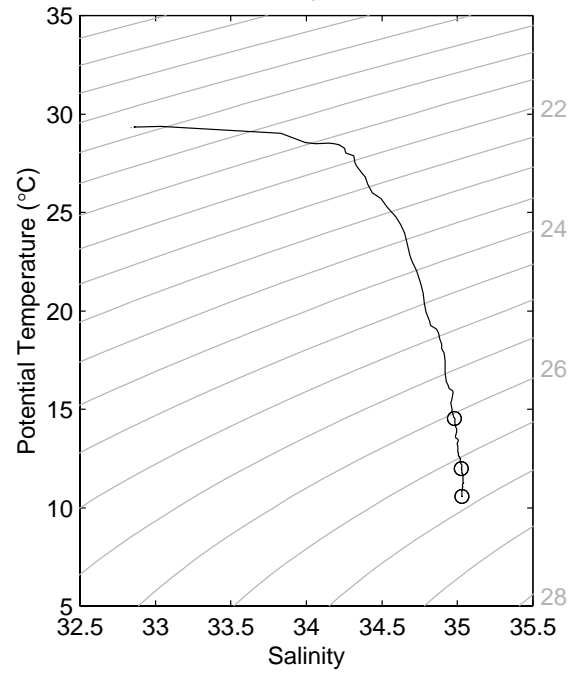
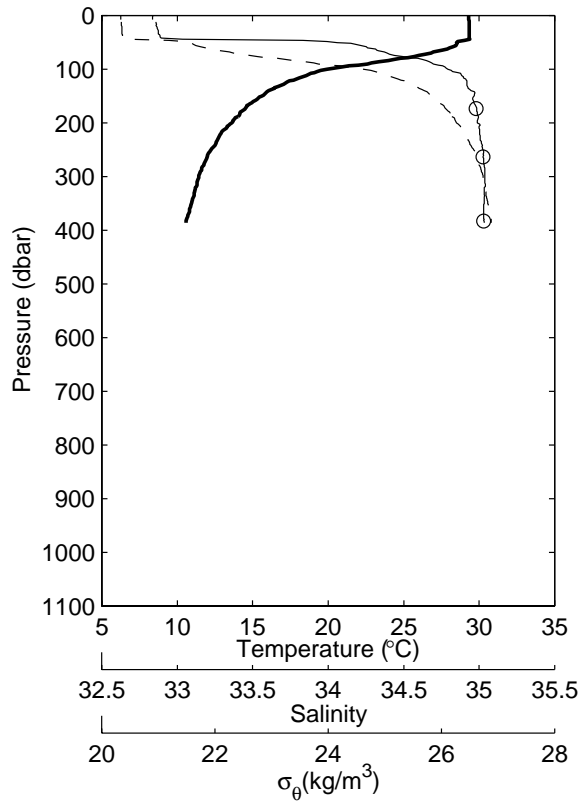


Figure 8.1.156. Same as Fig. 8.1.23 but for station 267 cast 1 and station 268 cast 1.

JASMINE Stn-269 Cast-1 11.24°N 88.23°E 15:03Z 25 May 1999



JASMINE Stn-270 Cast-1 11.20°N 88.10°E 16:16Z 25 May 1999

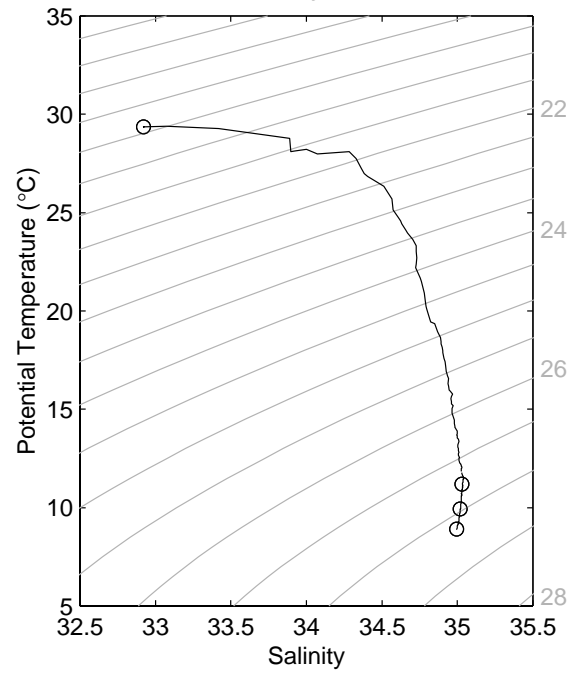
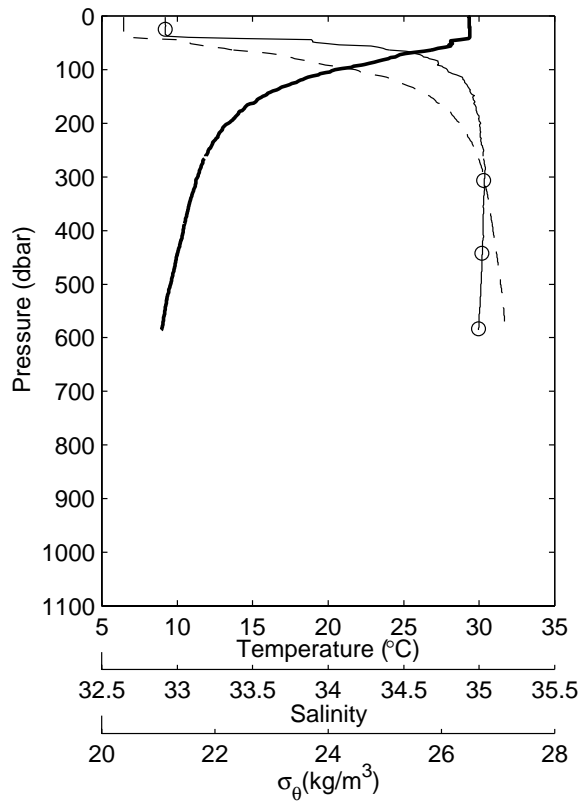
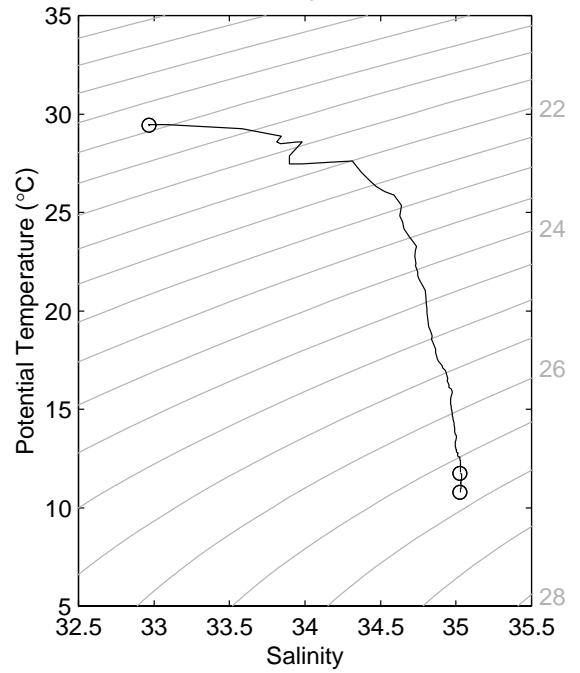
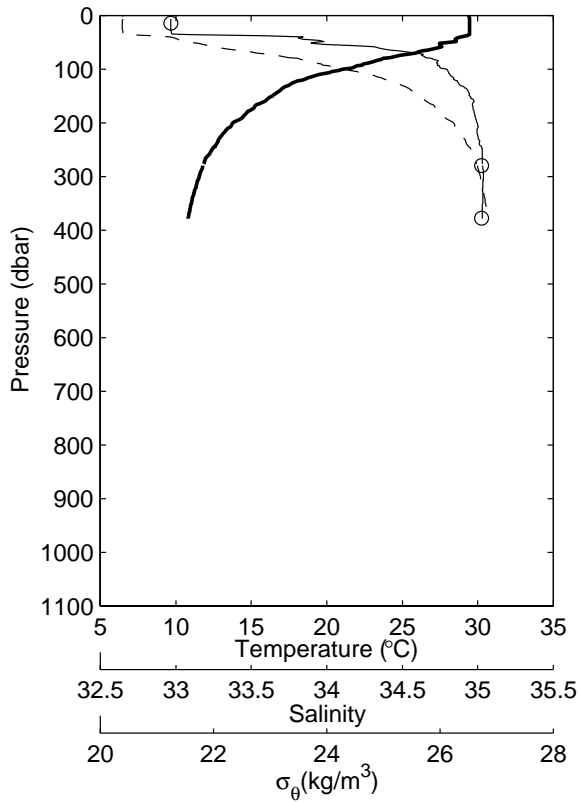


Figure 8.1.157. Same as Fig. 8.1.23 but for station 269 cast 1 and station 270 cast 1.

JASMINE Stn-271 Cast-1 11.16°N 88.21°E 17:28Z 25 May 1999



JASMINE Stn-272 Cast-1 11.12°N 88.36°E 18:53Z 25 May 1999

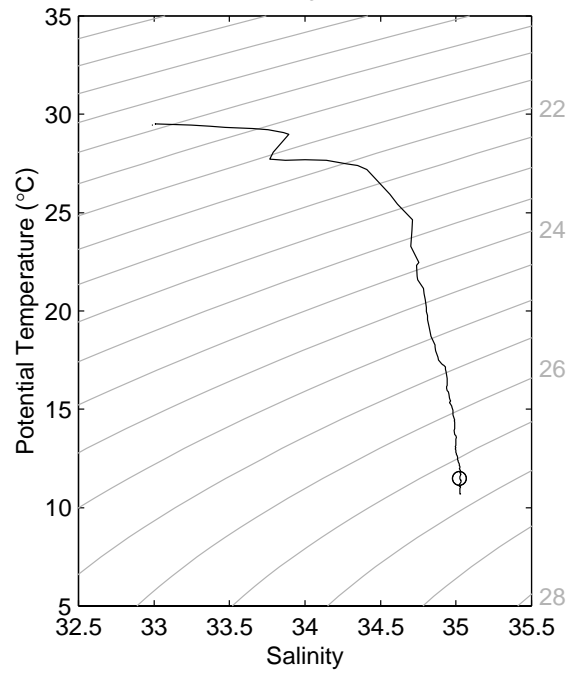
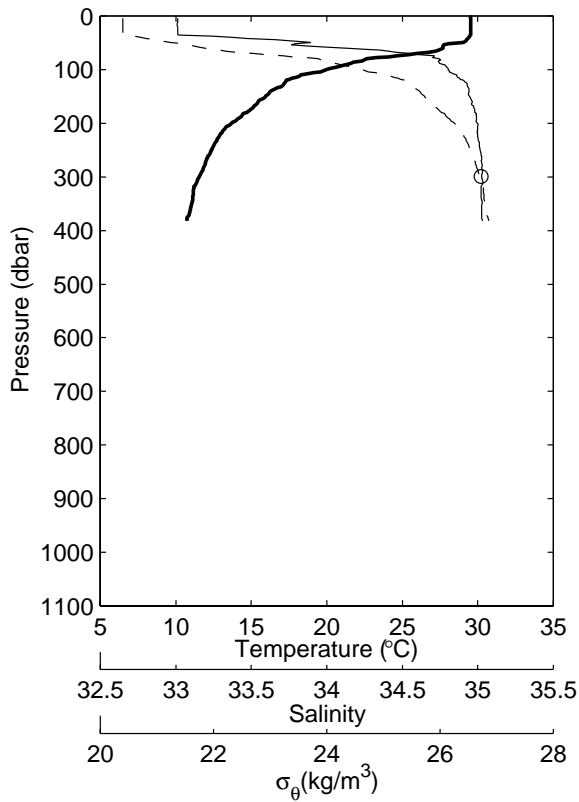
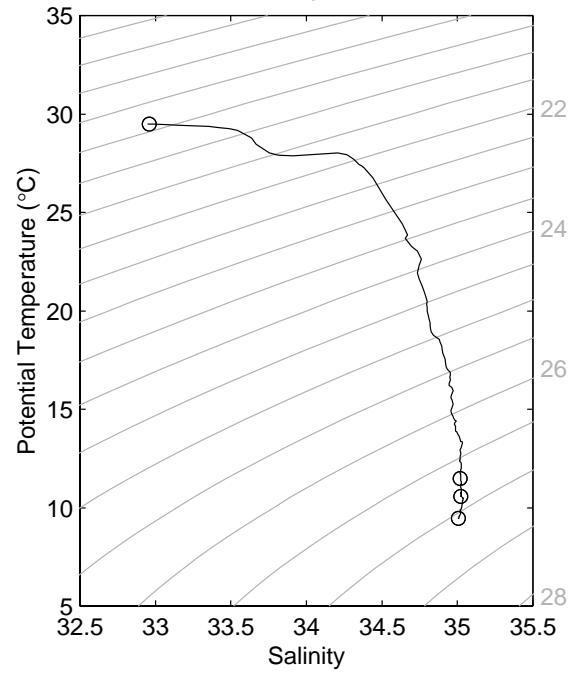
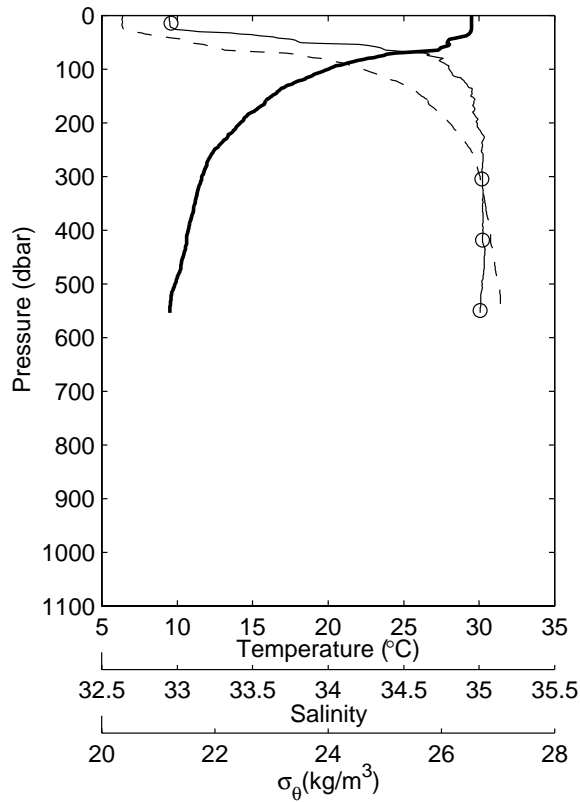


Figure 8.1.158. Same as Fig. 8.1.23 but for station 271 cast 1 and station 272 cast 1.

JASMINE Stn-273 Cast-1 11.08°N 88.49°E 20:07Z 25 May 1999



JASMINE Stn-274 Cast-1 11.18°N 88.41°E 21:24Z 25 May 1999

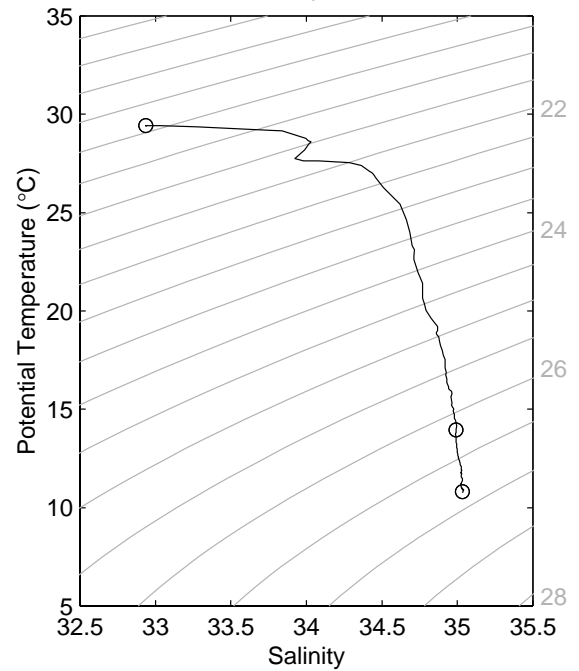
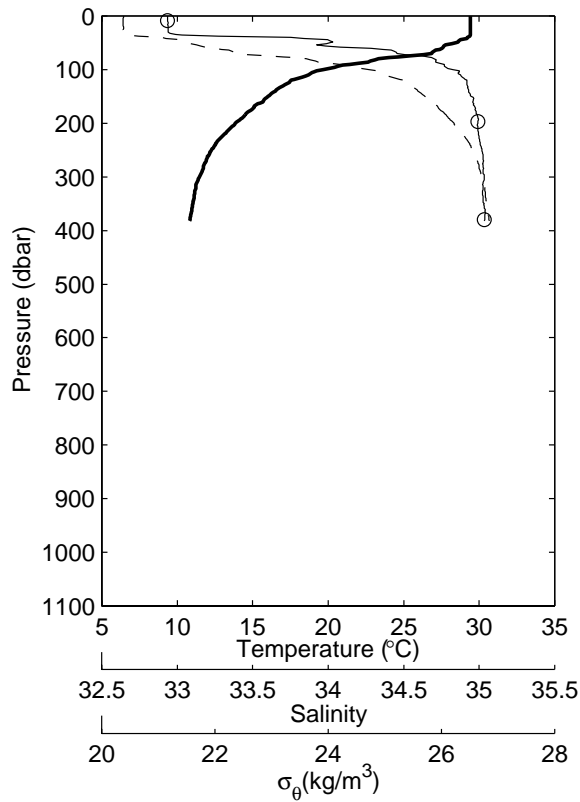
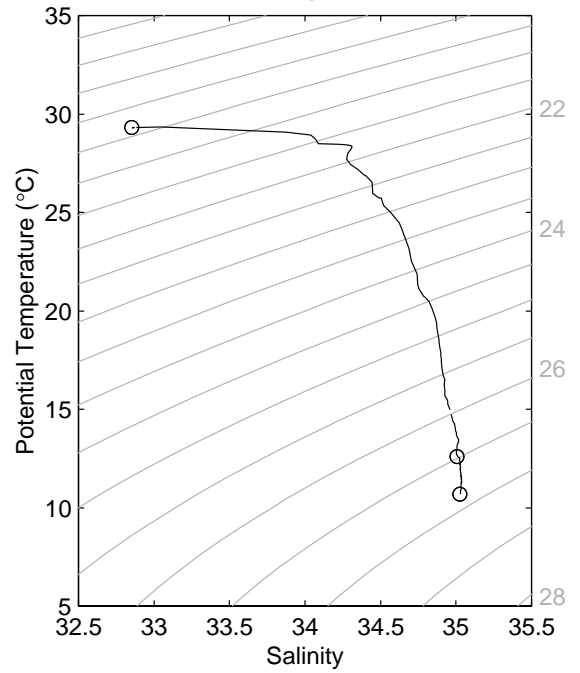
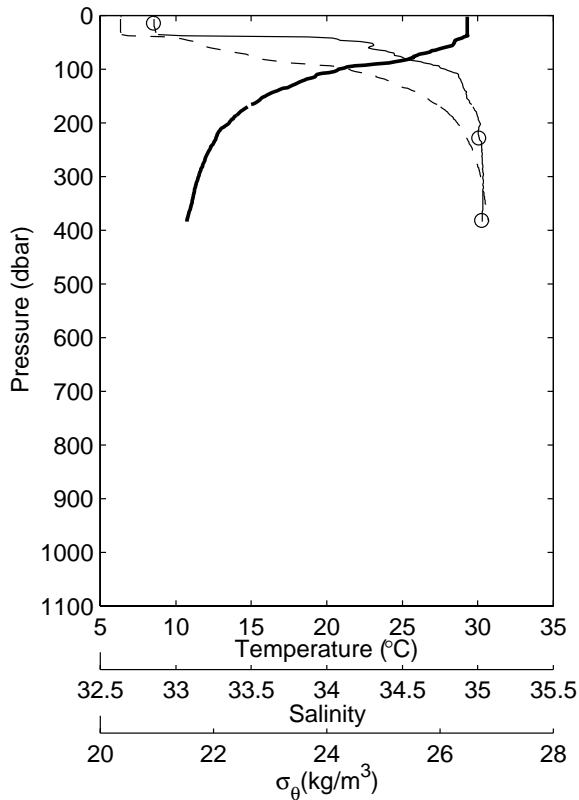


Figure 8.1.159. Same as Fig. 8.1.23 but for station 273 cast 1 and station 274 cast 1.

JASMINE Stn-275 Cast-1 11.29°N 88.33°E 22:40Z 25 May 1999



JASMINE Stn-276 Cast-1 11.40°N 88.25°E 23:55Z 25 May 1999

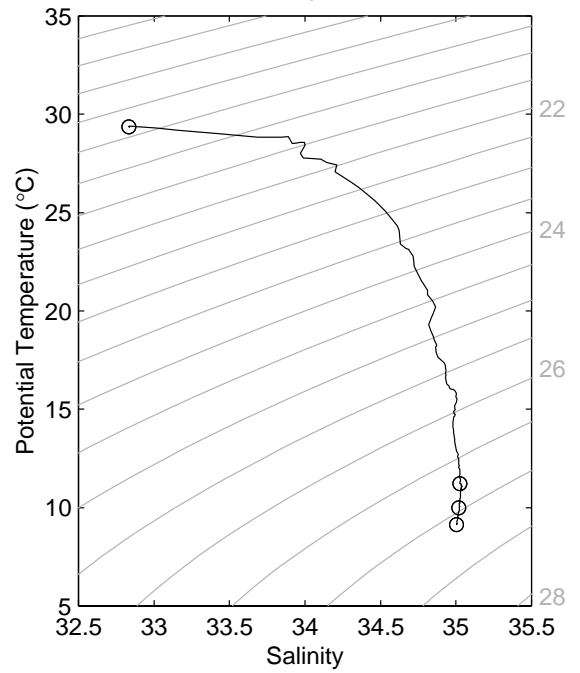
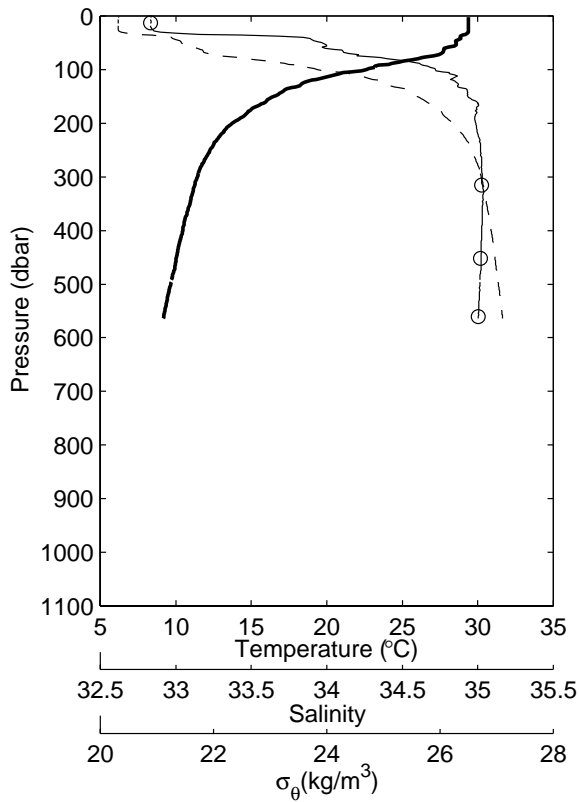
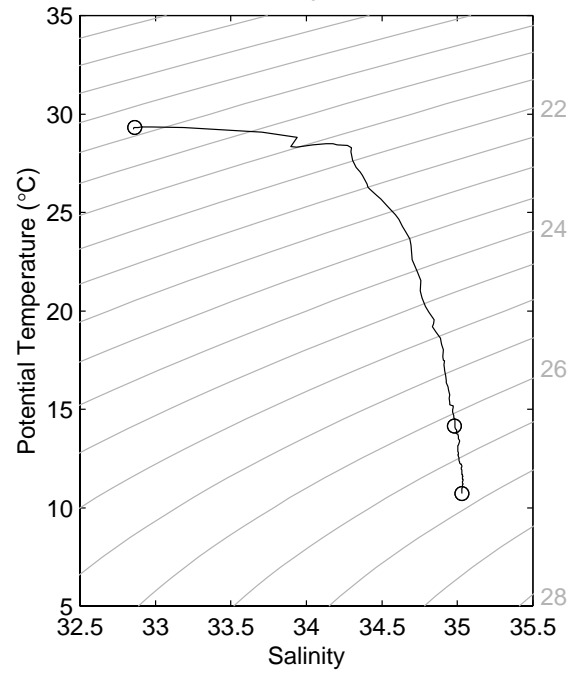
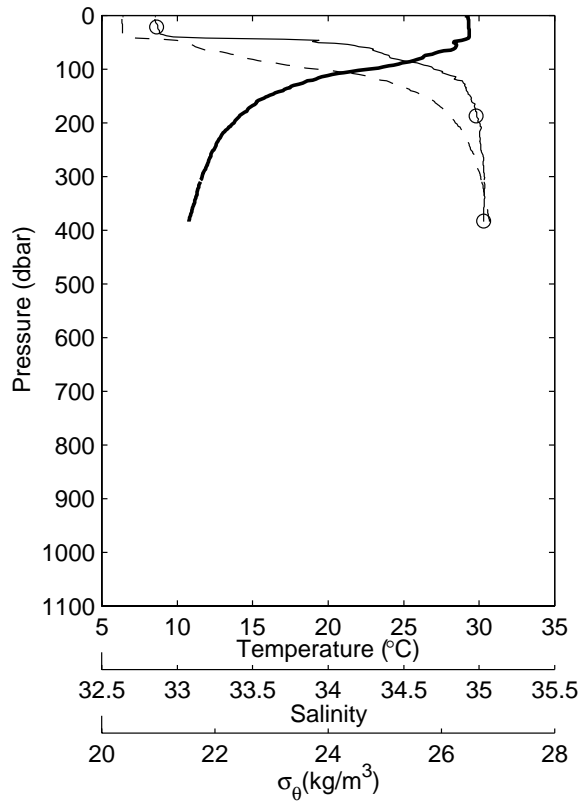


Figure 8.1.160. Same as Fig. 8.1.23 but for station 275 cast 1 and station 276 cast 1.

JASMINE Stn-277 Cast-1 11.27°N 88.25°E 01:26Z 26 May 1999



JASMINE Stn-278 Cast-1 11.13°N 88.25°E 02:56Z 26 May 1999

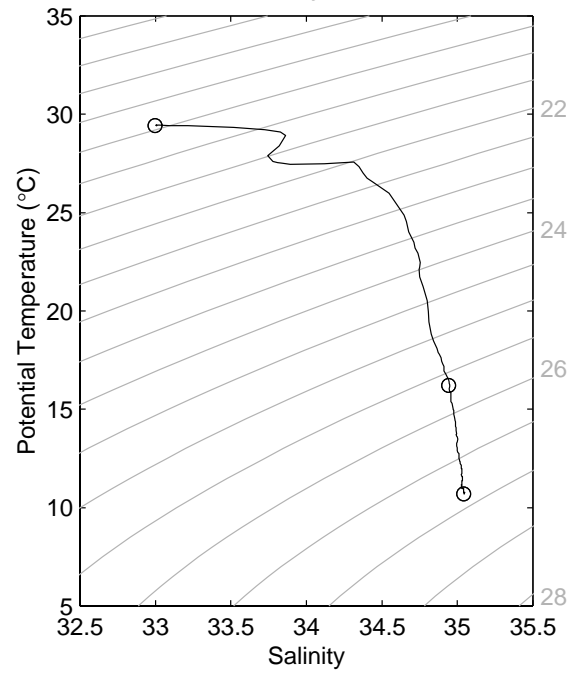
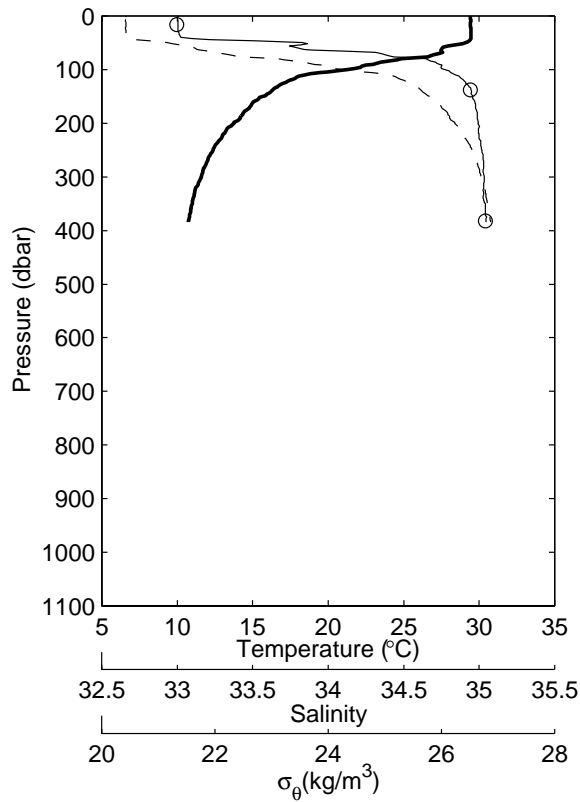
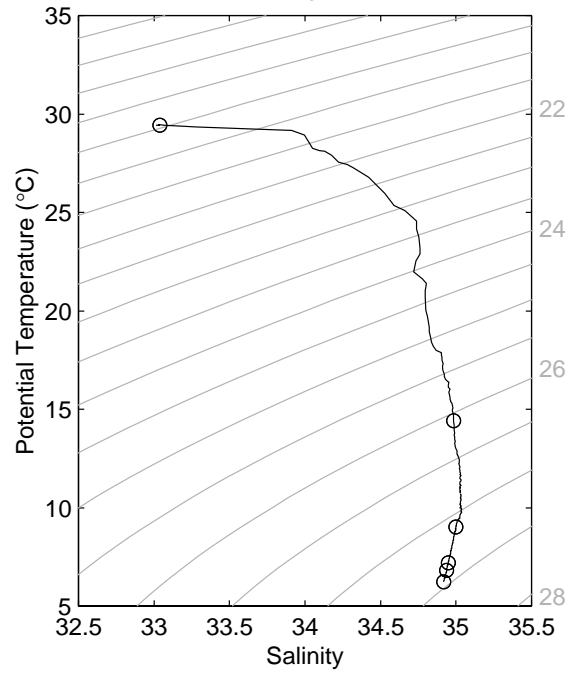
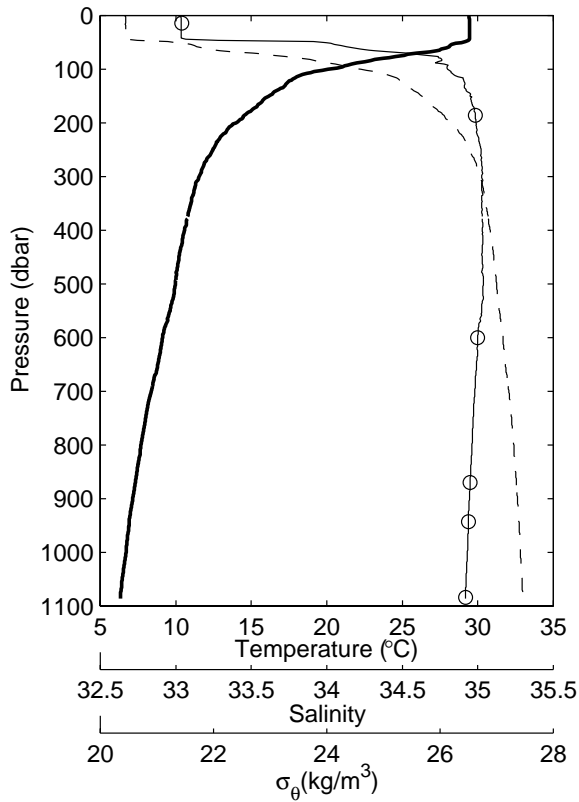


Figure 8.1.161. Same as Fig. 8.1.23 but for station 277 cast 1 and station 278 cast 1.

JASMINE Stn-279 Cast-1 11.00°N 88.25°E 04:18Z 26 May 1999



JASMINE Stn-280 Cast-1 11.11°N 88.33°E 06:01Z 26 May 1999

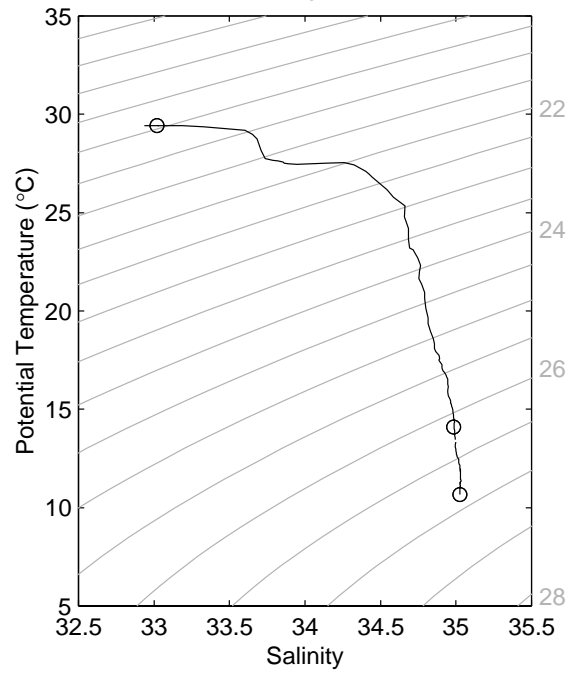
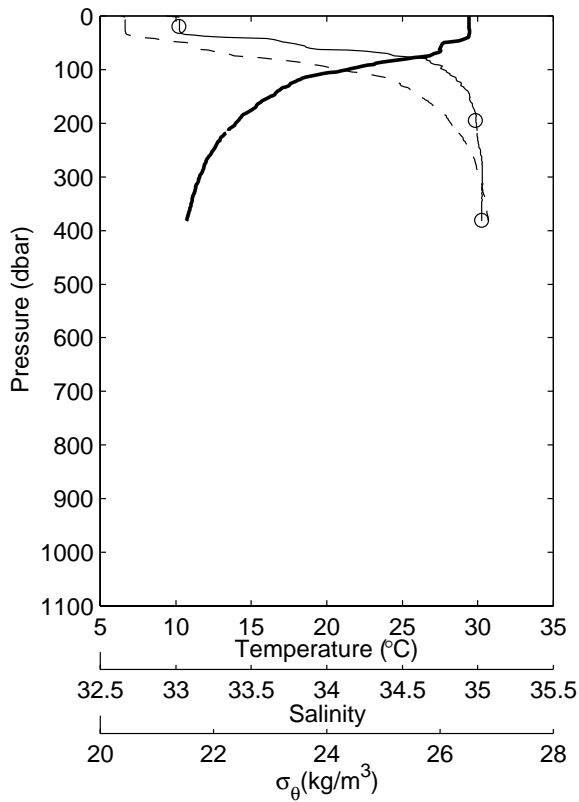
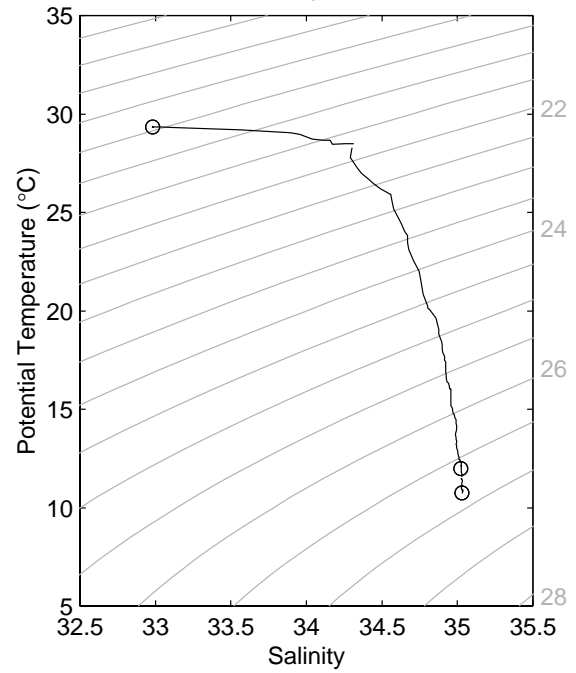
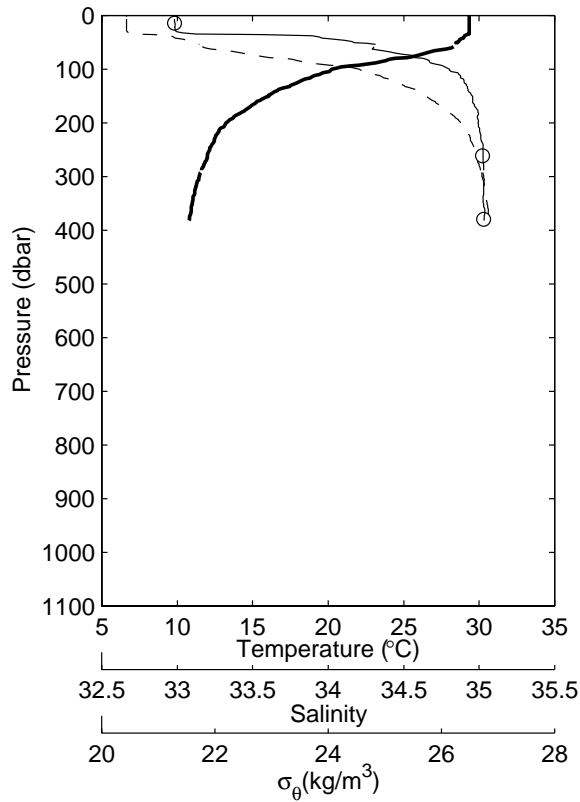


Figure 8.1.162. Same as Fig. 8.1.23 but for station 279 cast 1 and station 280 cast 1.

JASMINE Stn-281 Cast-1 11.22°N 88.41°E 07:11Z 26 May 1999



JASMINE Stn-282 Cast-1 11.32°N 88.48°E 08:20Z 26 May 1999

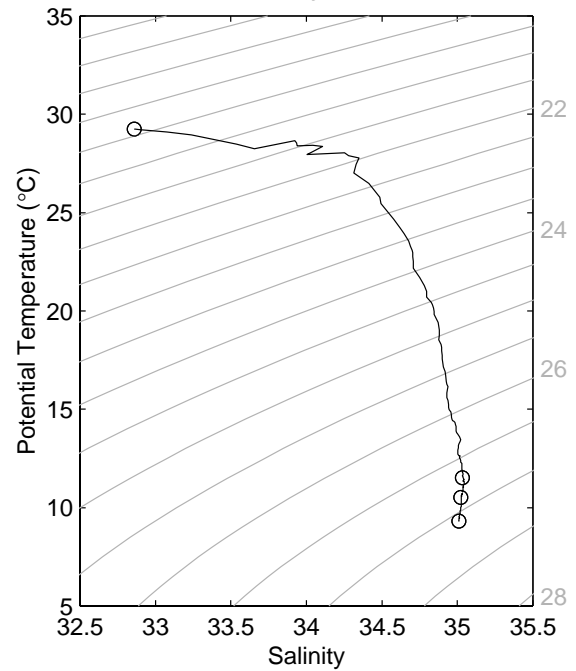
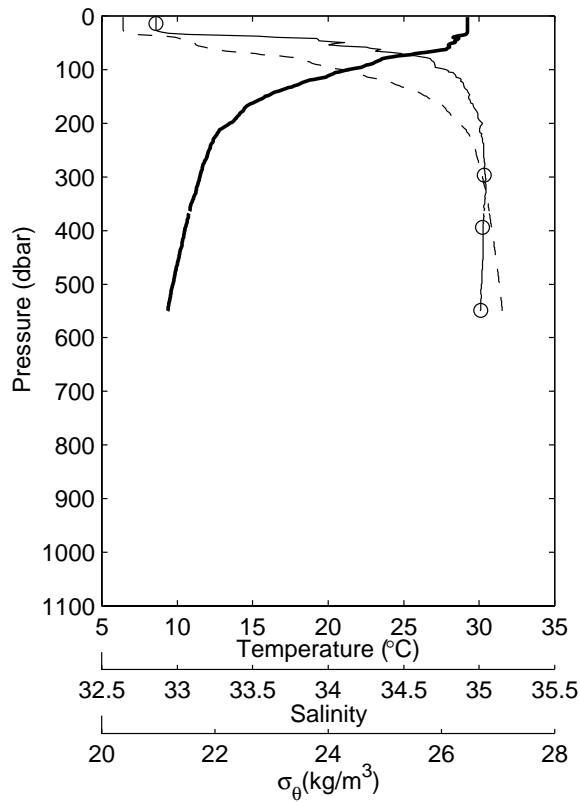
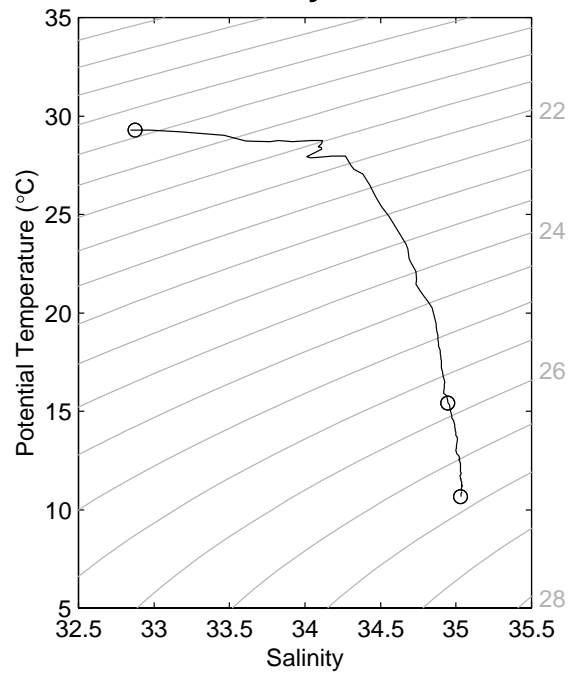
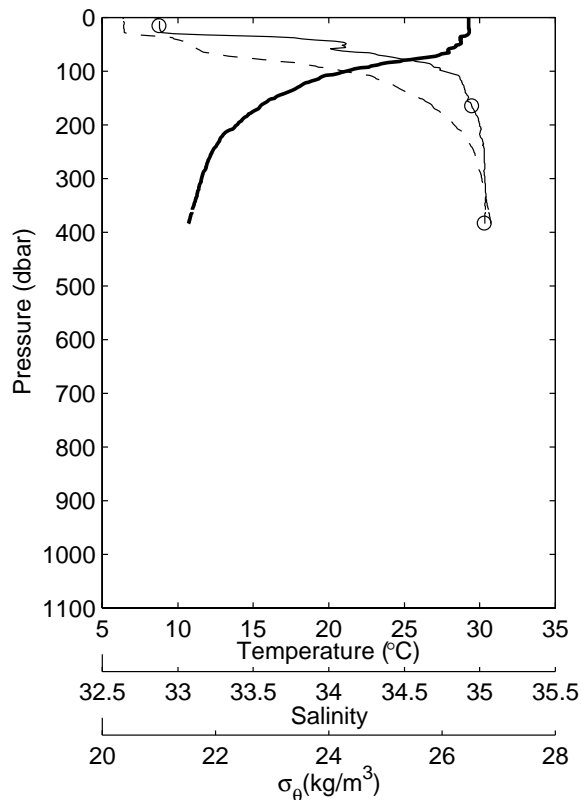


Figure 8.1.163. Same as Fig. 8.1.23 but for station 281 cast 1 and station 282 cast 1.

JASMINE Stn-283 Cast-1 11.28°N 88.36°E 09:59Z 26 May 1999



JASMINE Stn-284 Cast-1 11.24°N 88.23°E 11:27Z 26 May 1999

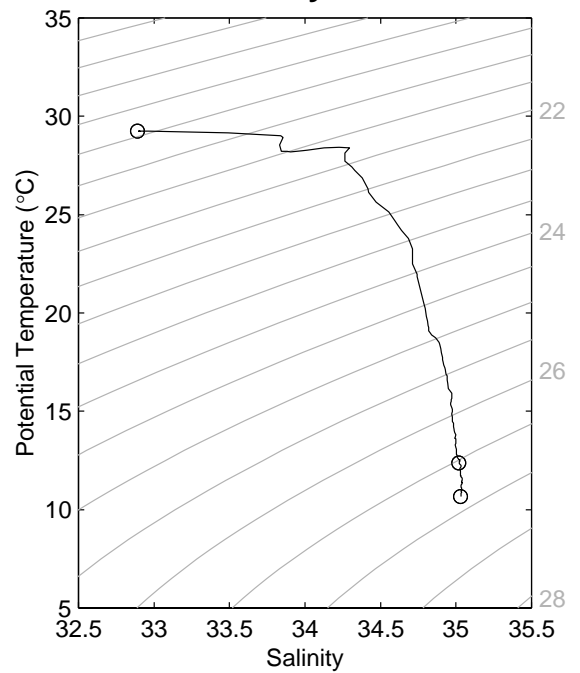
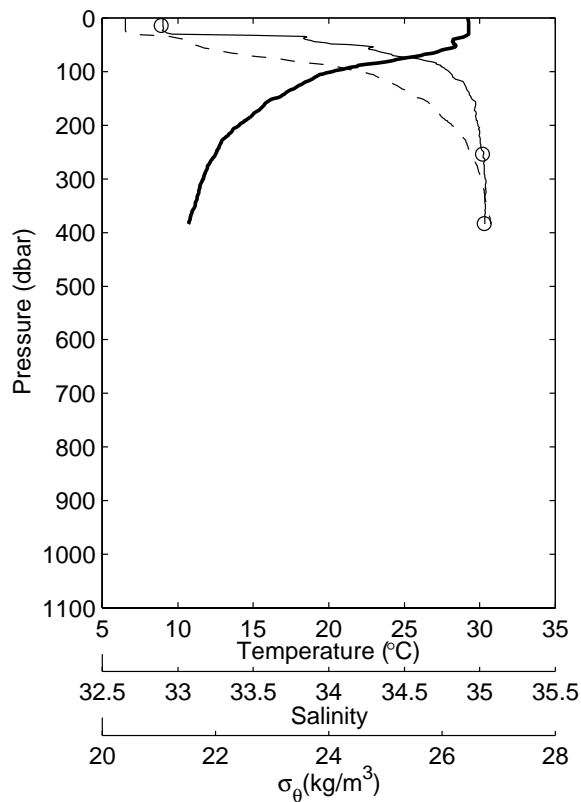
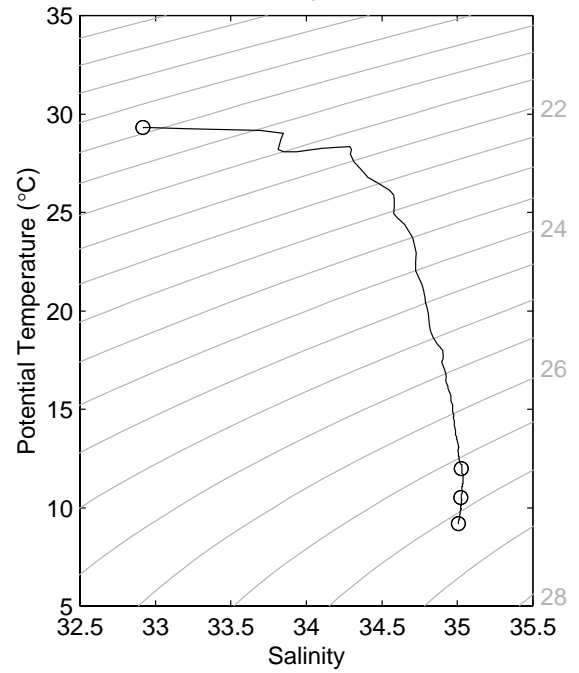
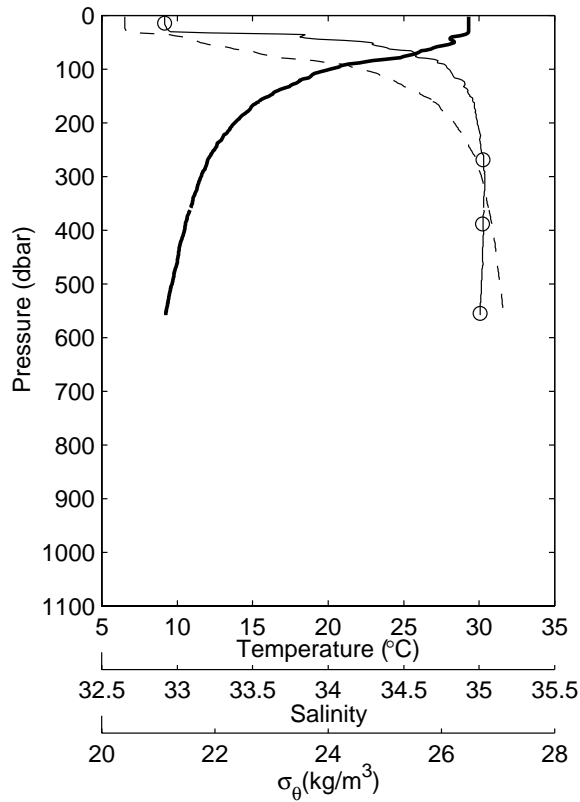


Figure 8.1.164. Same as Fig. 8.1.23 but for station 283 cast 1 and station 284 cast 1.

JASMINE Stn-285 Cast-1 11.20°N 88.11°E 13:01Z 26 May 1999



JASMINE Stn-286 Cast-1 10.50°N 88.36°E 17:58Z 26 May 1999

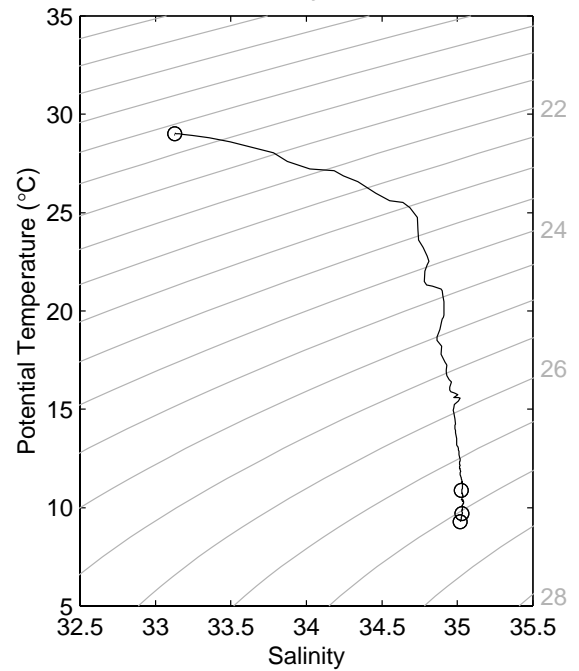
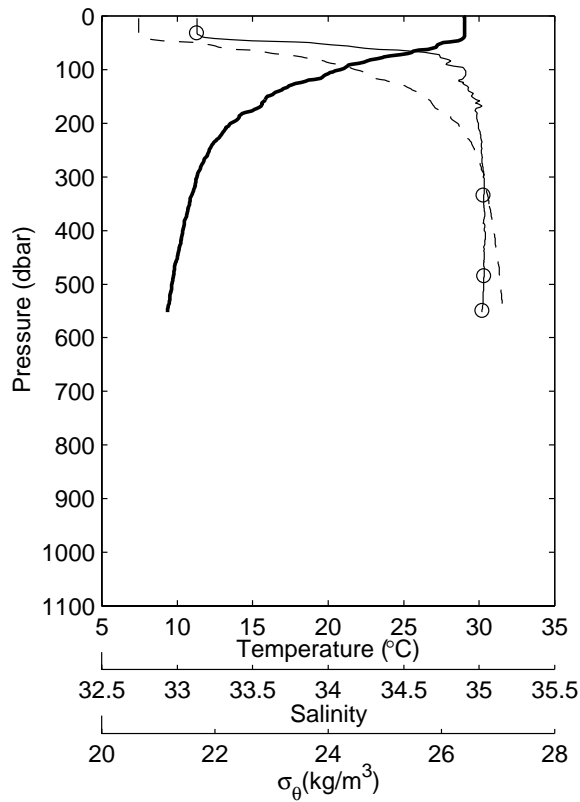
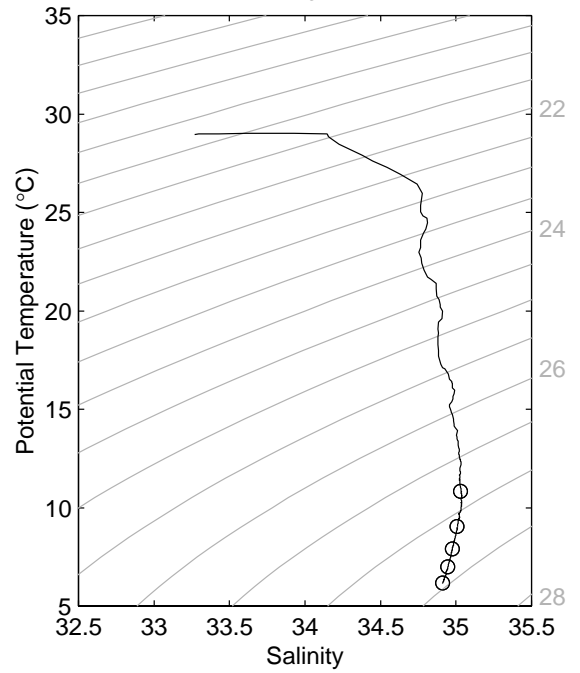
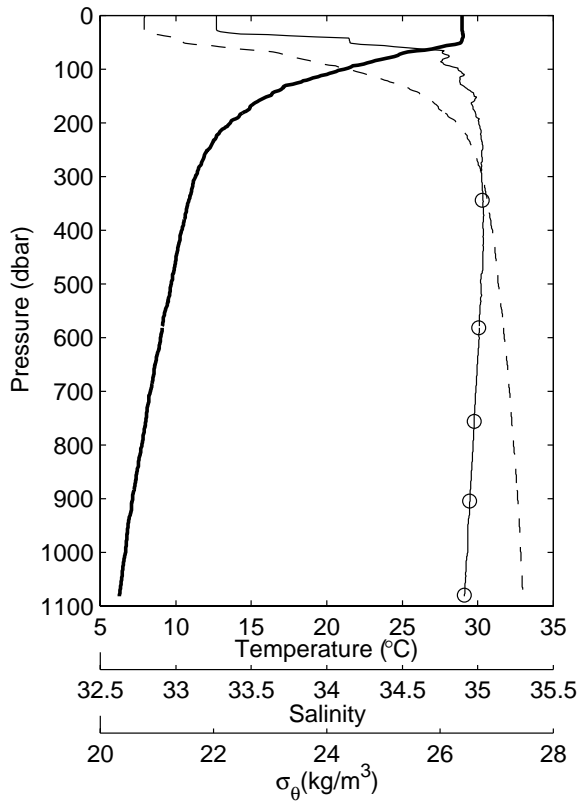


Figure 8.1.165. Same as Fig. 8.1.23 but for station 285 cast 1 and station 286 cast 1.

JASMINE Stn-287 Cast-1 10.00°N 88.55°E 21:42Z 26 May 1999



JASMINE Stn-288 Cast-1 9.50°N 88.73°E 01:38Z 27 May 1999

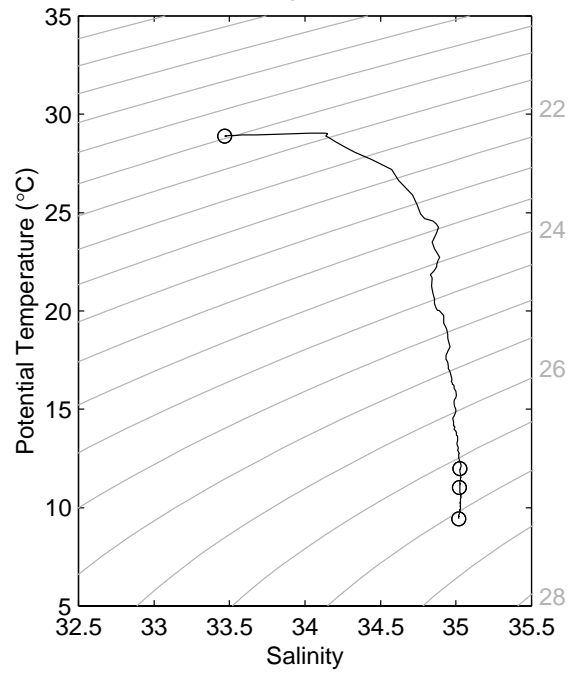
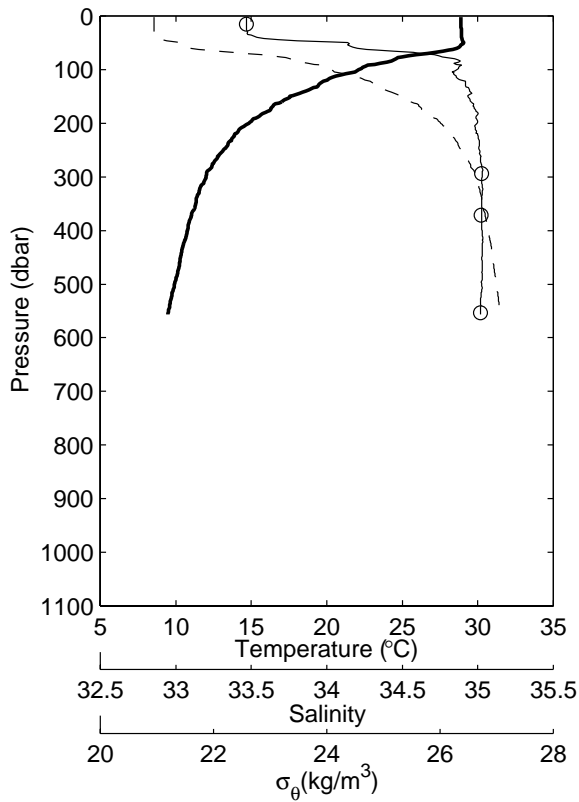
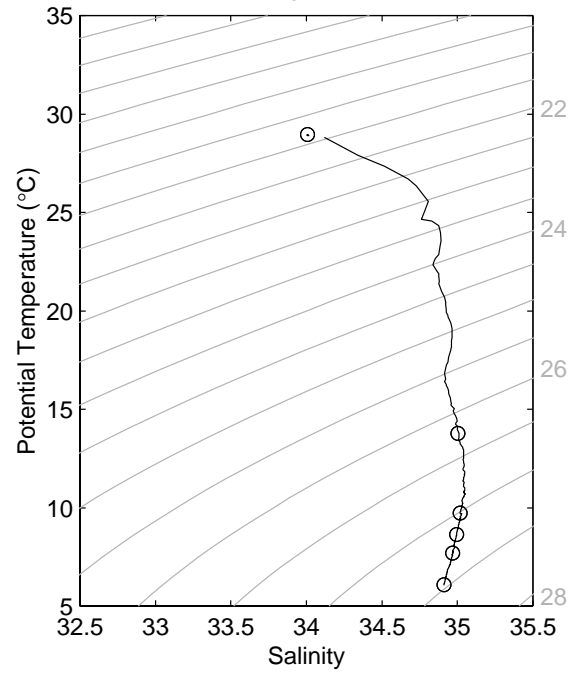
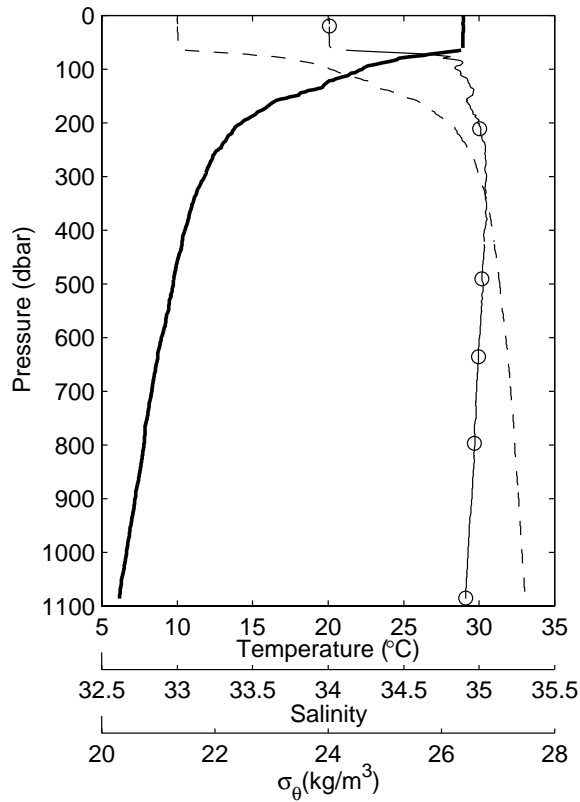


Figure 8.1.166. Same as Fig. 8.1.23 but for station 287 cast 1 and station 288 cast 1.

JASMINE Stn-289 Cast-1 9.00°N 88.91°E 05:11Z 27 May 1999



JASMINE Stn-290 Cast-1 8.50°N 89.10°E 08:58Z 27 May 1999

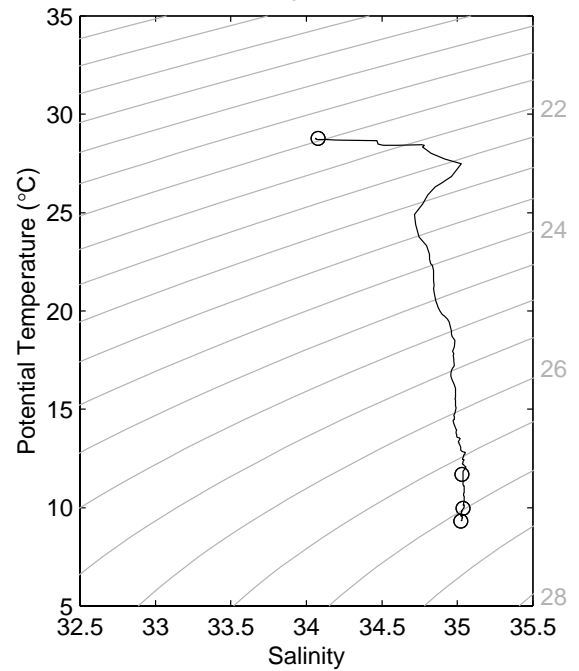
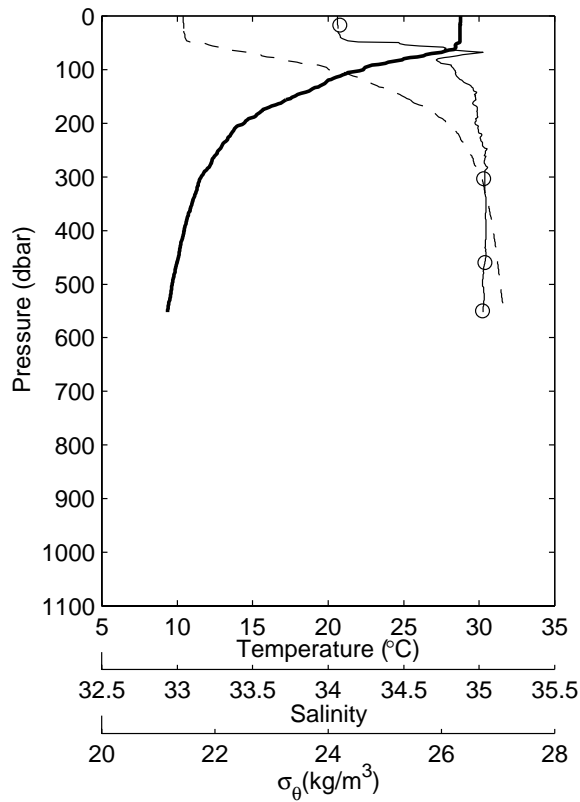
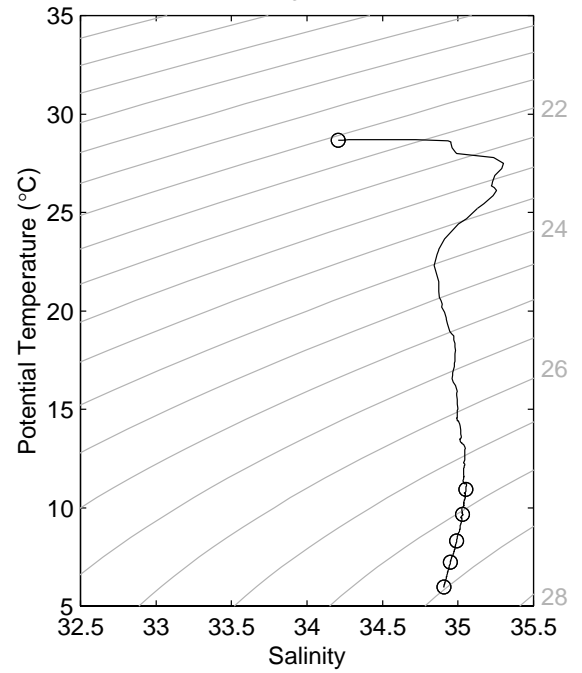
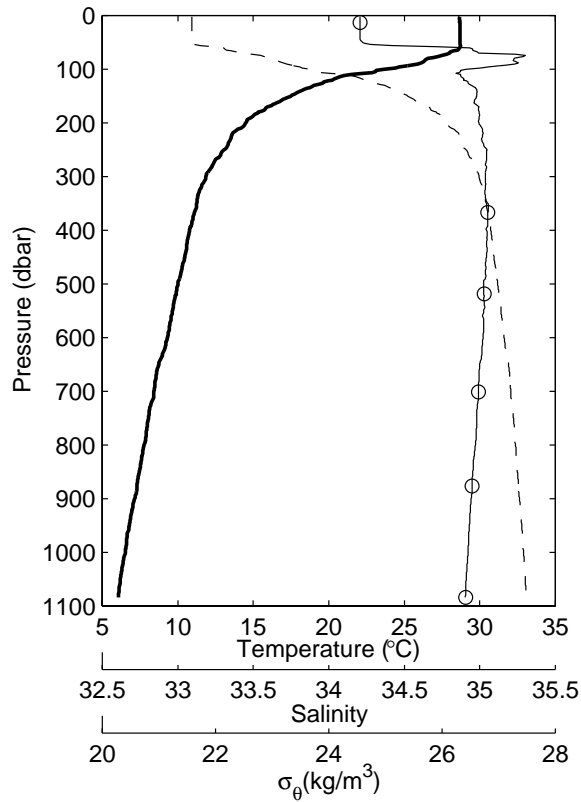


Figure 8.1.167. Same as Fig. 8.1.23 but for station 289 cast 1 and station 290 cast 1.

JASMINE Stn-291 Cast-1 8.00°N 89.28°E 12:17Z 27 May 1999



JASMINE Stn-292 Cast-1 7.50°N 89.47°E 15:45Z 27 May 1999

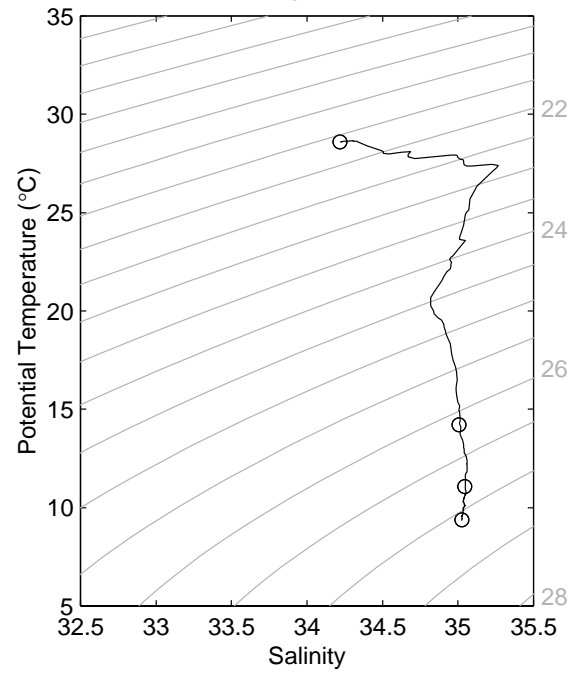
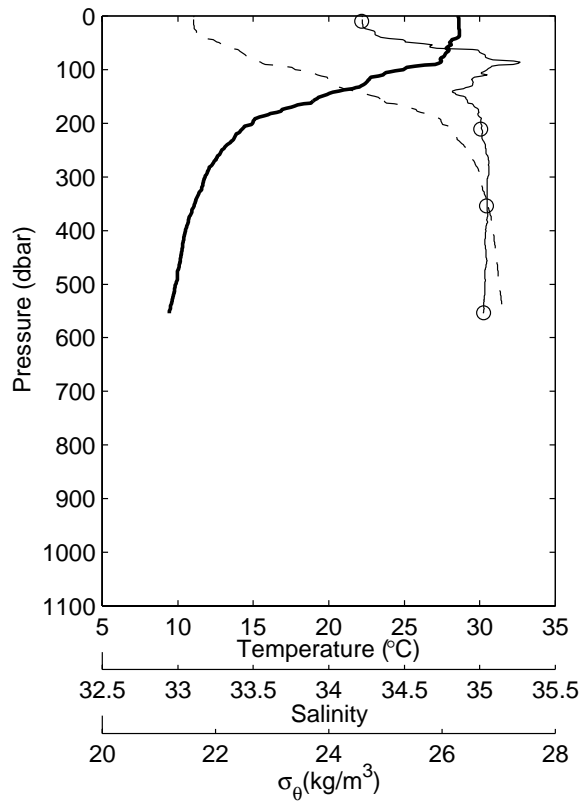
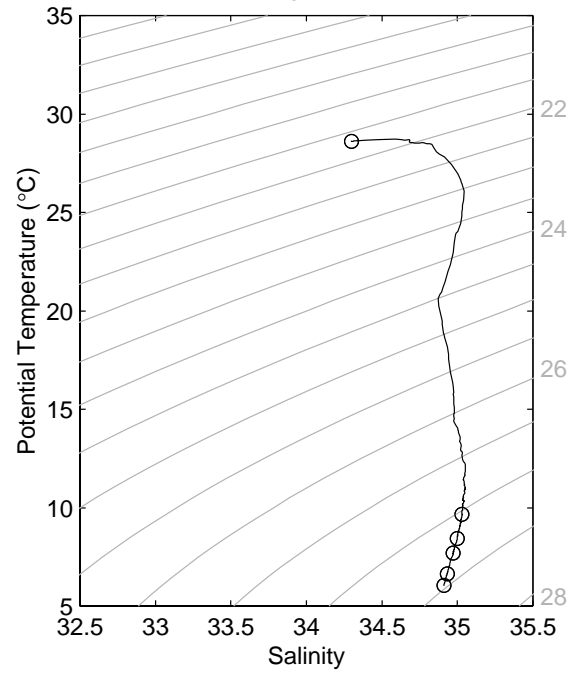
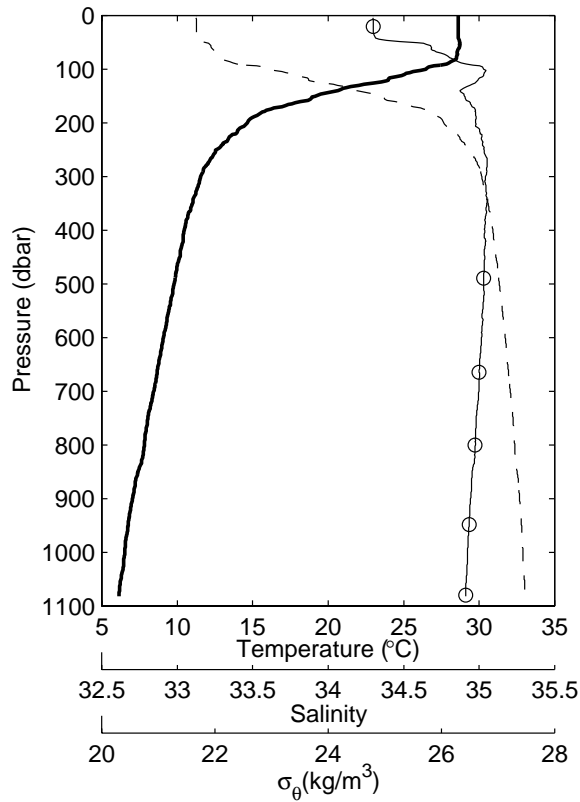


Figure 8.1.168. Same as Fig. 8.1.23 but for station 291 cast 1 and station 292 cast 1.

JASMINE Stn-293 Cast-1 7.00°N 89.65°E 18:56Z 27 May 1999



JASMINE Stn-294 Cast-1 6.50°N 89.83°E 22:30Z 27 May 1999

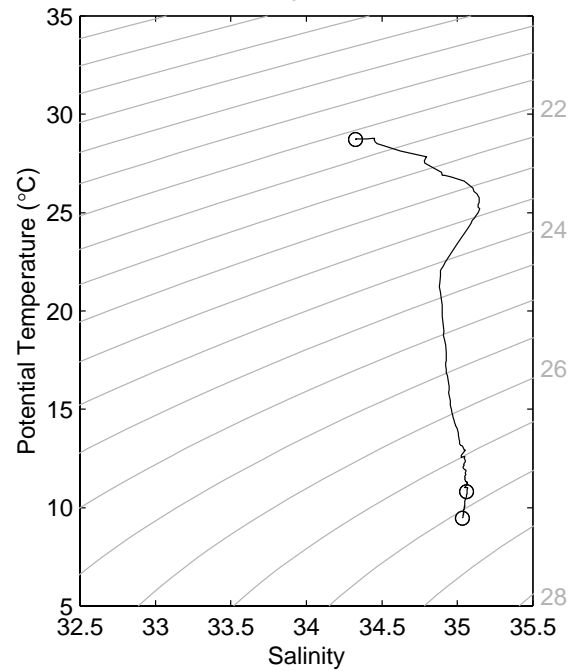
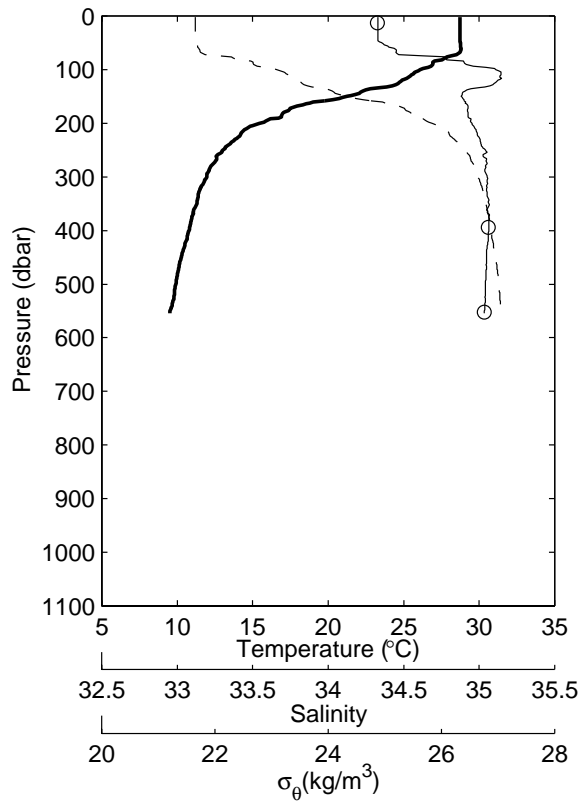
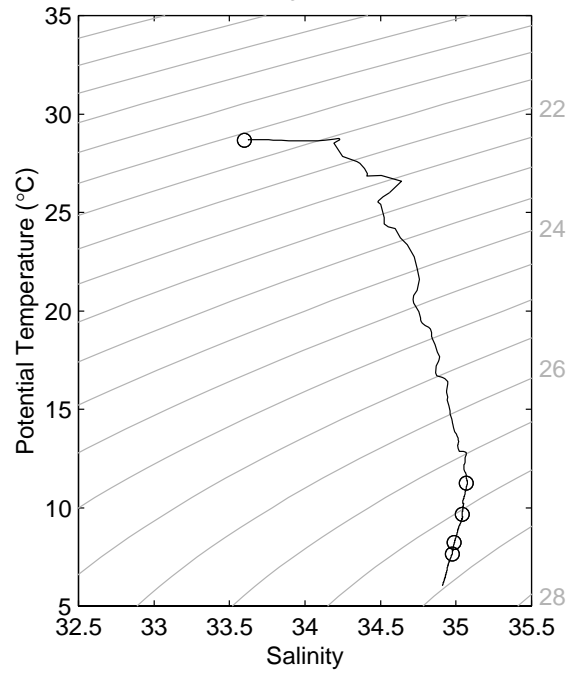
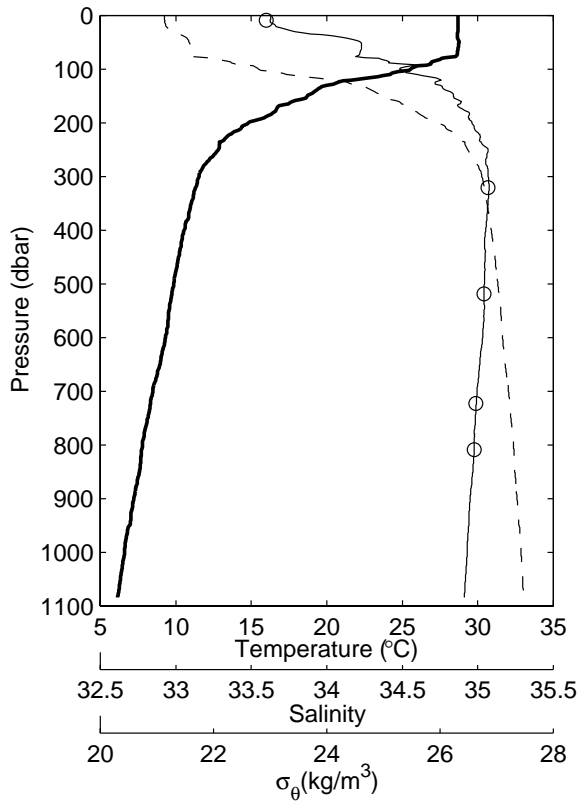


Figure 8.1.169. Same as Fig. 8.1.23 but for station 293 cast 1 and station 294 cast 1.

JASMINE Stn-295 Cast-1 6.00°N 90.01°E 01:42Z 28 May 1999



JASMINE Stn-296 Cast-1 5.50°N 90.19°E 05:16Z 28 May 1999

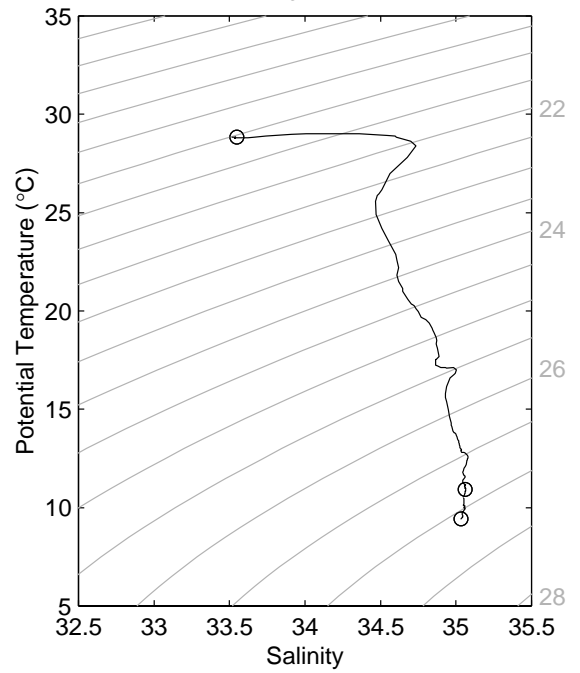
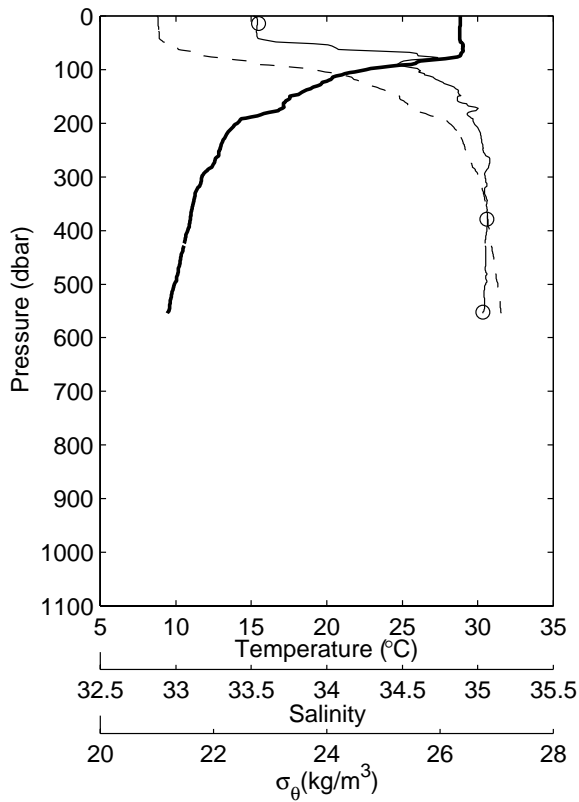
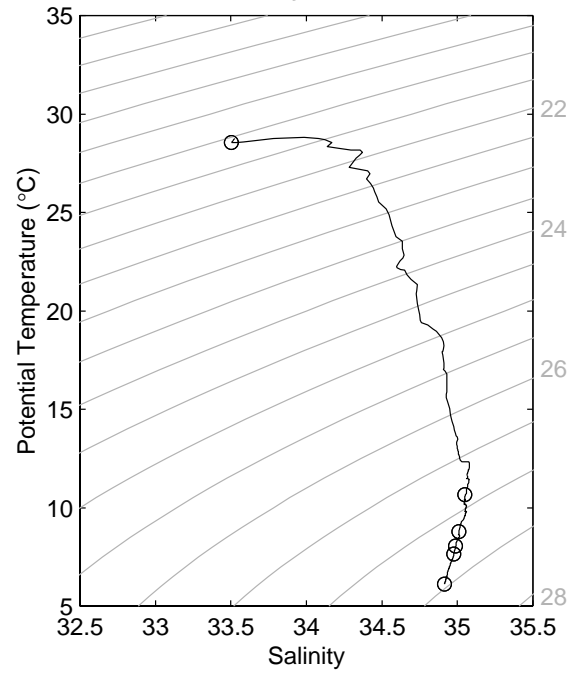
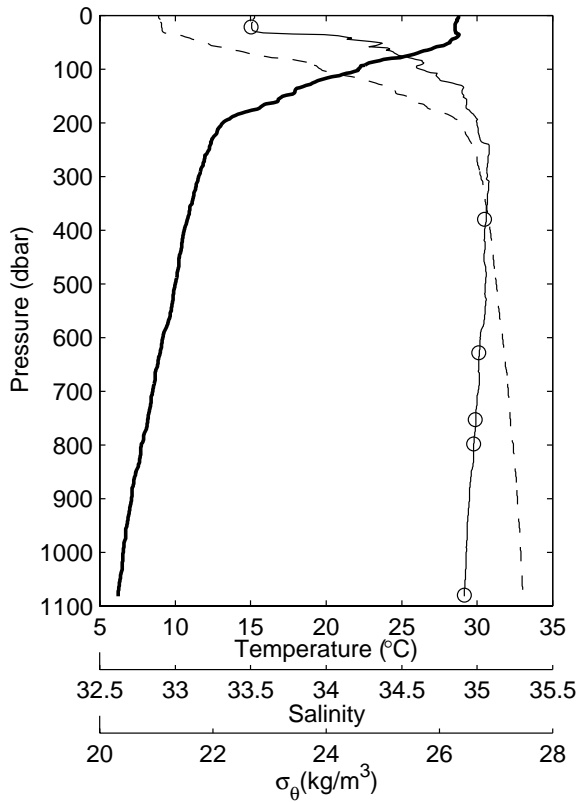


Figure 8.1.170. Same as Fig. 8.1.23 but for station 295 cast 1 and station 296 cast 1.

JASMINE Stn-297 Cast-1 5.00°N 90.37°E 08:34Z 28 May 1999



JASMINE Stn-298 Cast-1 4.50°N 90.55°E 12:08Z 28 May 1999

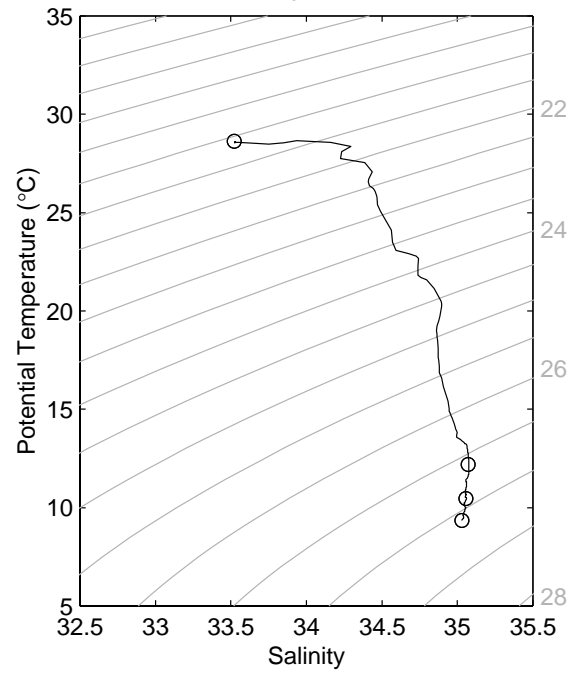
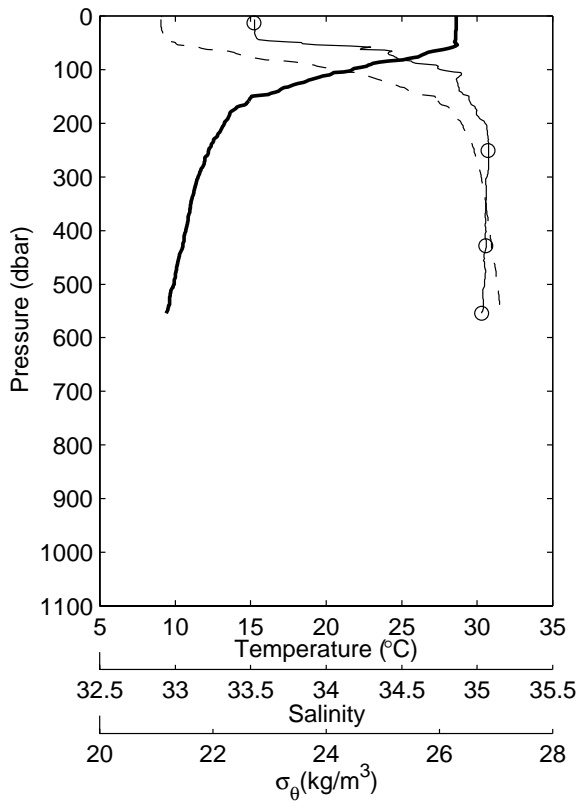
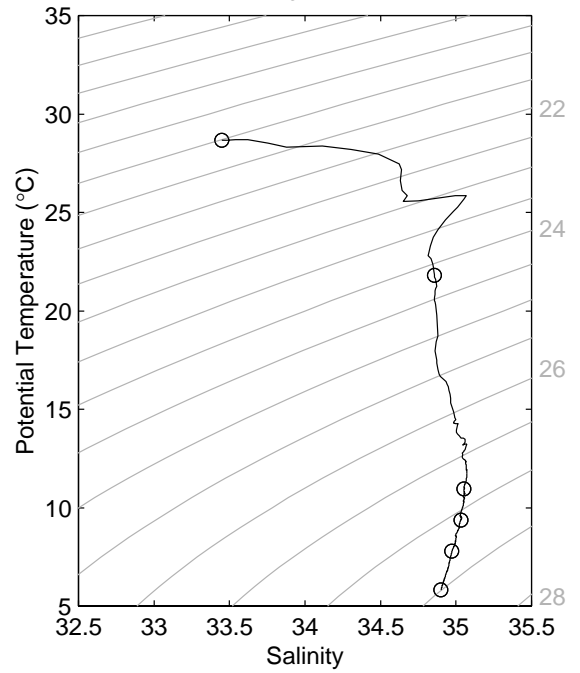
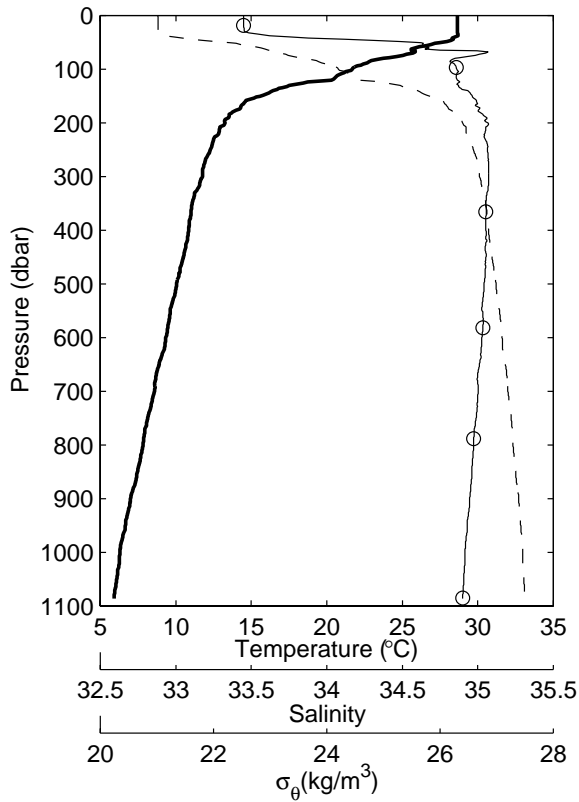


Figure 8.1.171. Same as Fig. 8.1.23 but for station 297 cast 1 and station 298 cast 1.

JASMINE Stn-299 Cast-1 4.00°N 90.74°E 15:22Z 28 May 1999



JASMINE Stn-300 Cast-1 3.50°N 90.92°E 18:49Z 28 May 1999

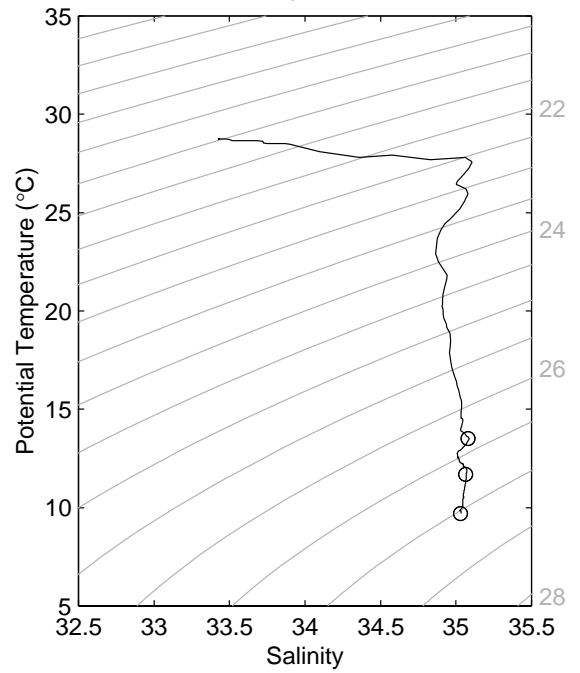
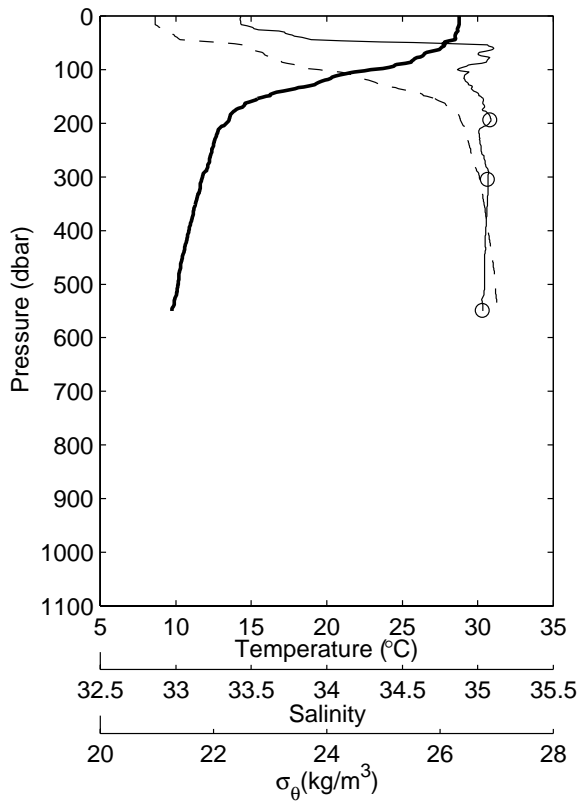
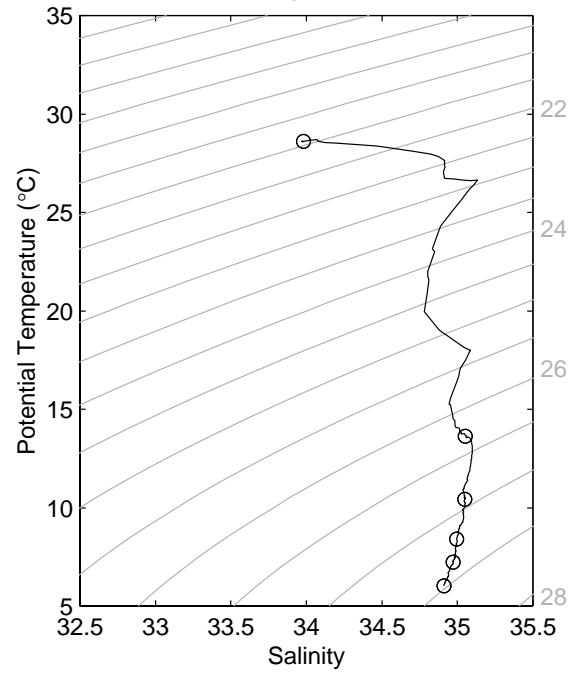
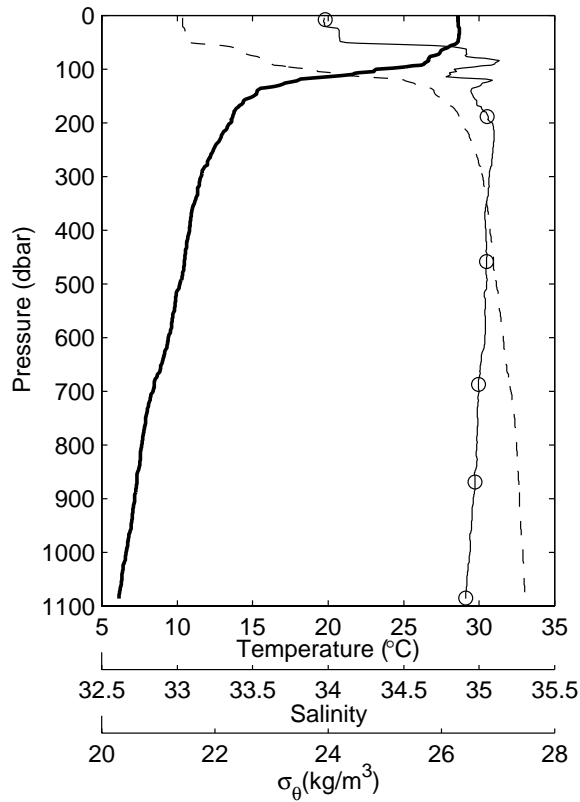


Figure 8.1.172. Same as Fig. 8.1.23 but for station 299 cast 1 and station 300 cast 1.

JASMINE Stn-301 Cast-1 3.00°N 91.10°E 22:02Z 28 May 1999



JASMINE Stn-302 Cast-1 2.50°N 91.28°E 01:26Z 29 May 1999

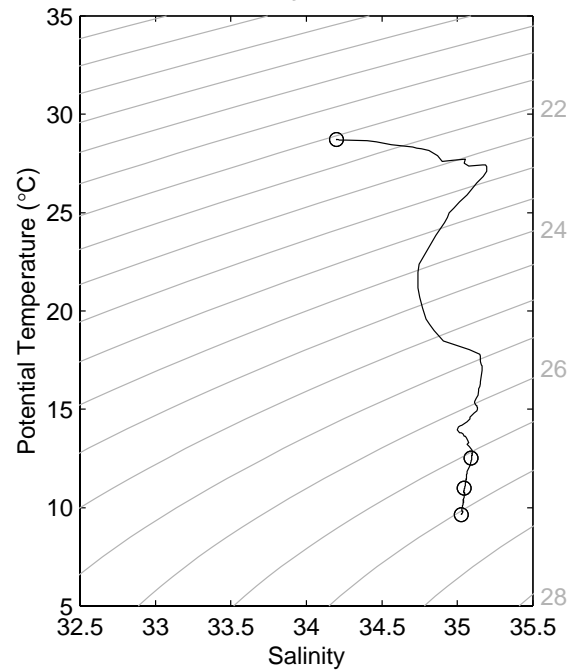
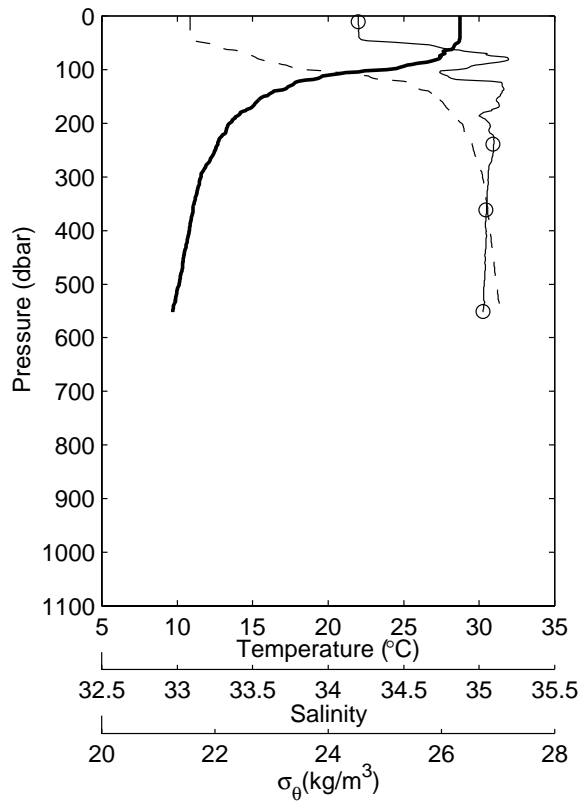
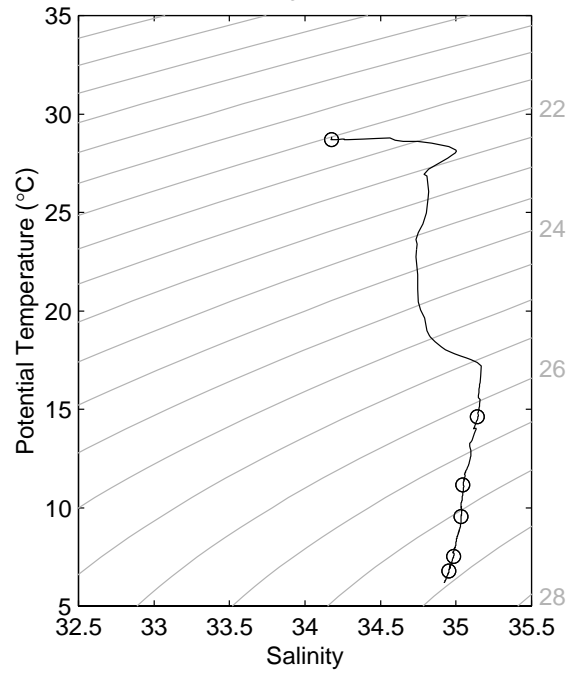
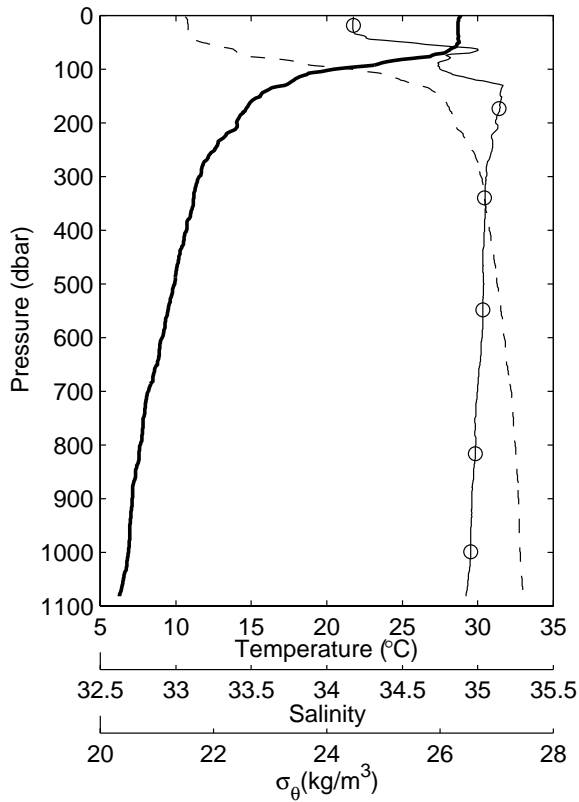


Figure 8.1.173. Same as Fig. 8.1.23 but for station 301 cast 1 and station 302 cast 1.

JASMINE Stn-303 Cast-1 2.00°N 91.46°E 04:29Z 29 May 1999



JASMINE Stn-304 Cast-1 1.50°N 91.64°E 07:46Z 29 May 1999

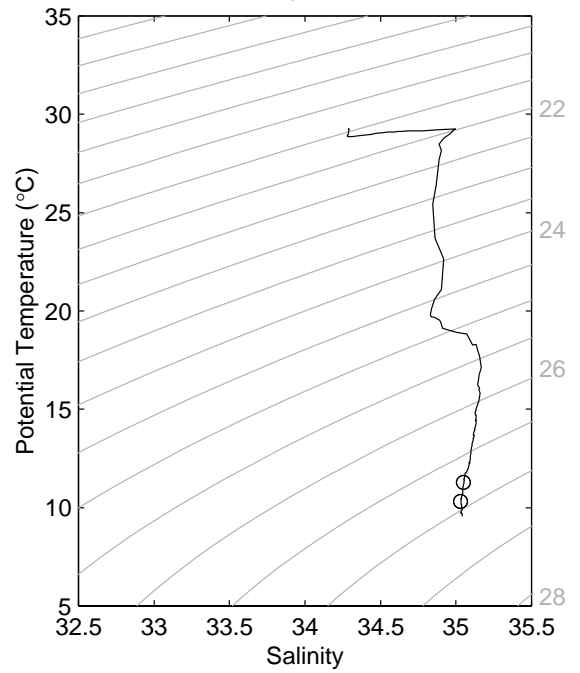
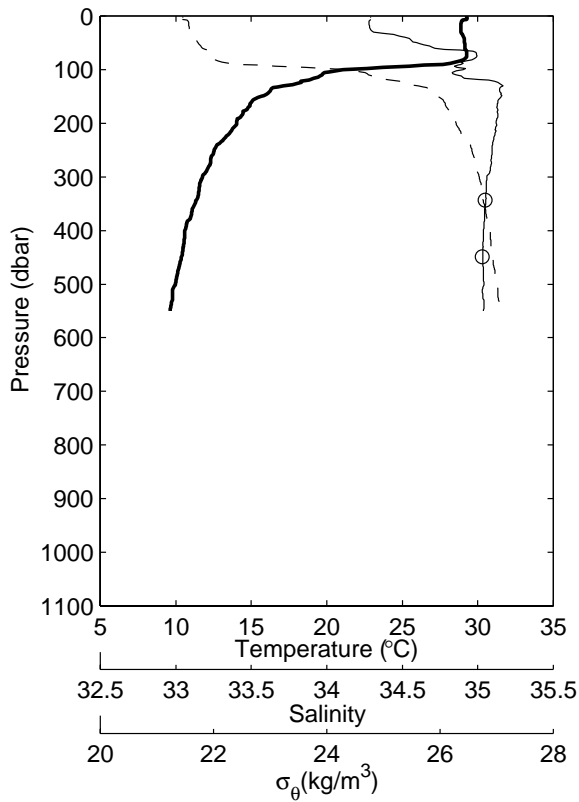
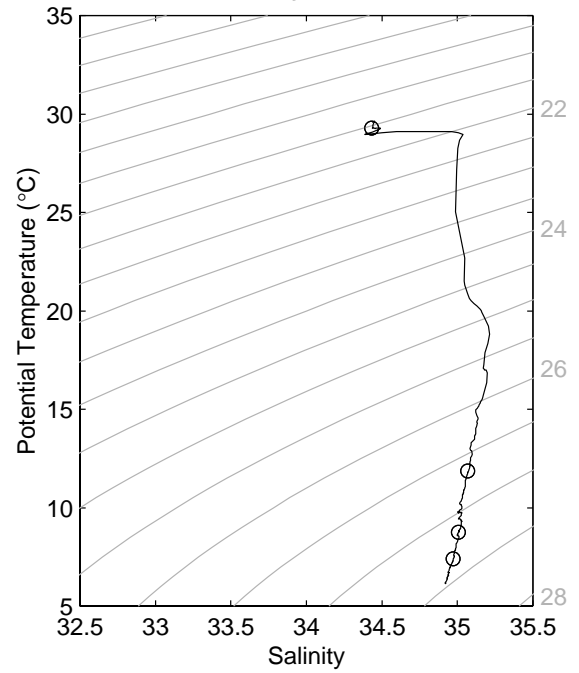
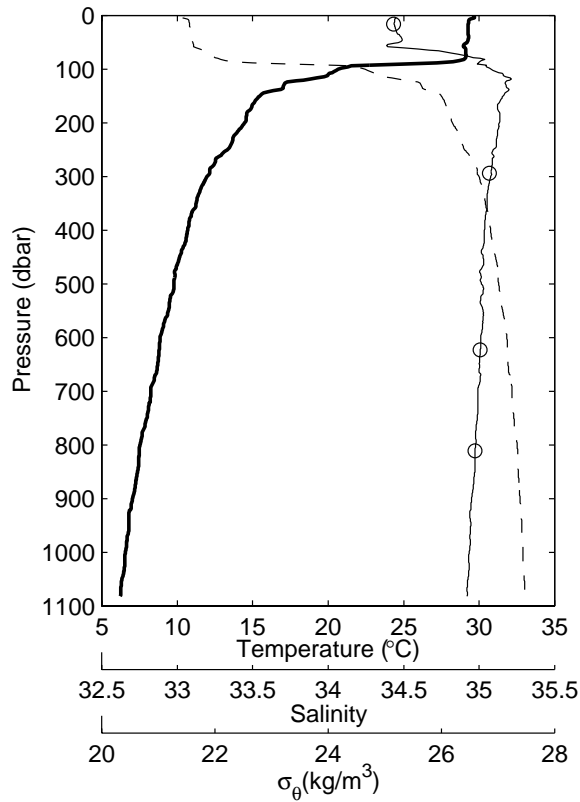


Figure 8.1.174. Same as Fig. 8.1.24 but for station 303 cast 1 and station 304 cast 1.

JASMINE Stn-305 Cast-1 1.00°N 91.83°E 10:38Z 29 May 1999



JASMINE Stn-306 Cast-1 0.50°N 92.01°E 13:52Z 29 May 1999

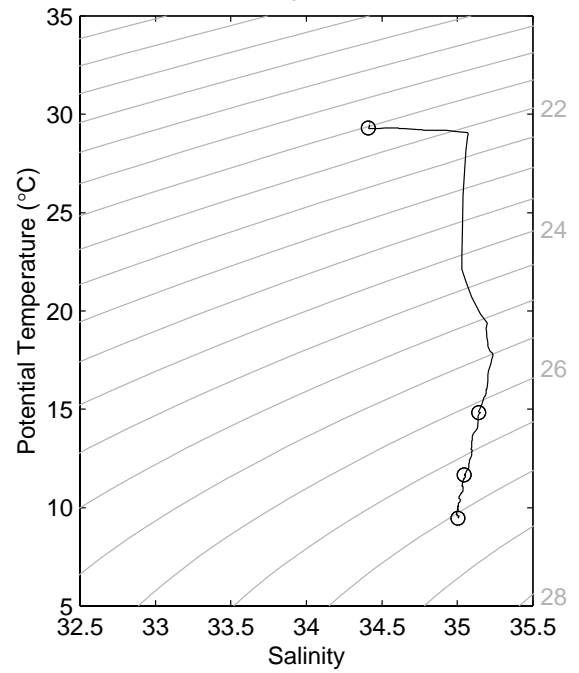
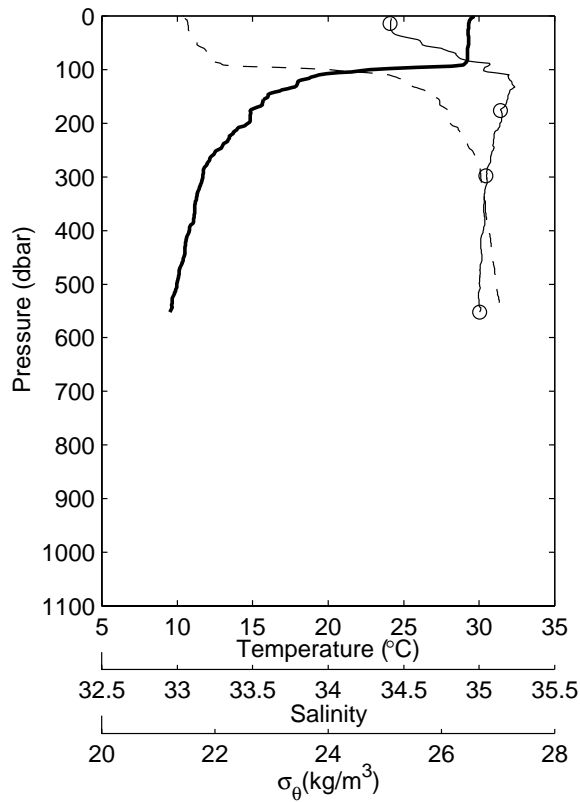
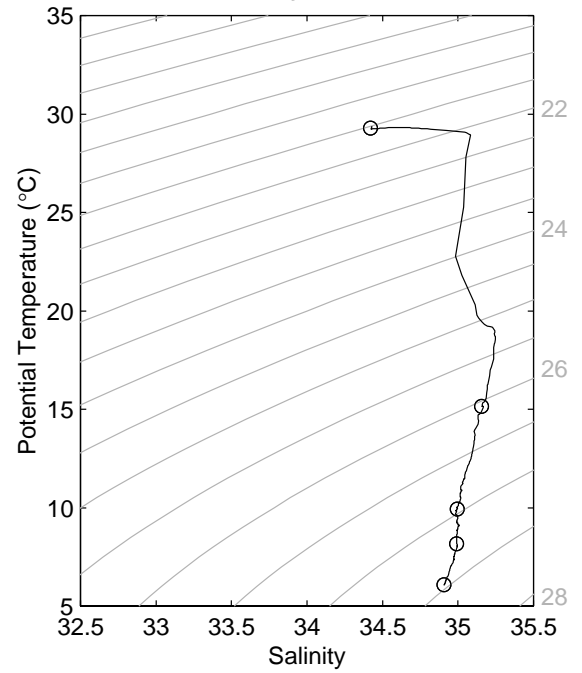
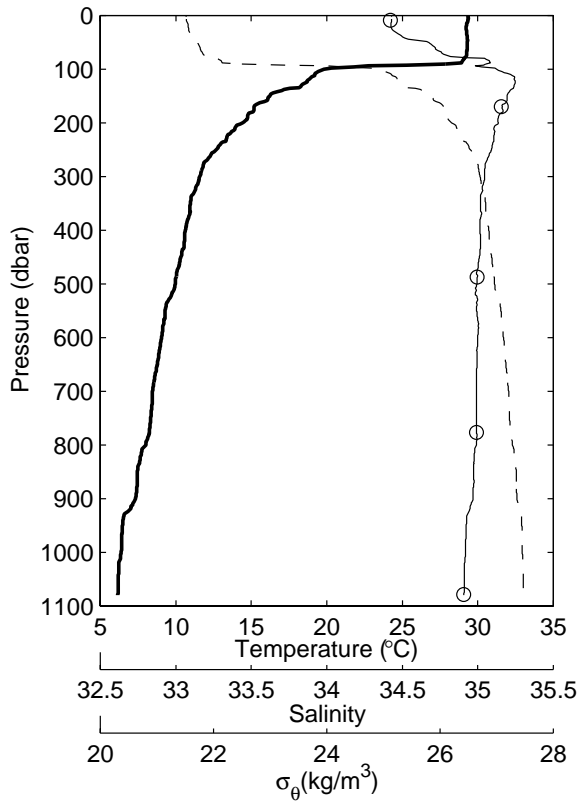


Figure 8.1.175. Same as Fig. 8.1.23 but for station 305 cast 1 and station 306 cast 1.

JASMINE Stn-307 Cast-1 0.00°S 92.19°E 16:44Z 29 May 1999



JASMINE Stn-308 Cast-1 0.50°S 92.37°E 20:03Z 29 May 1999

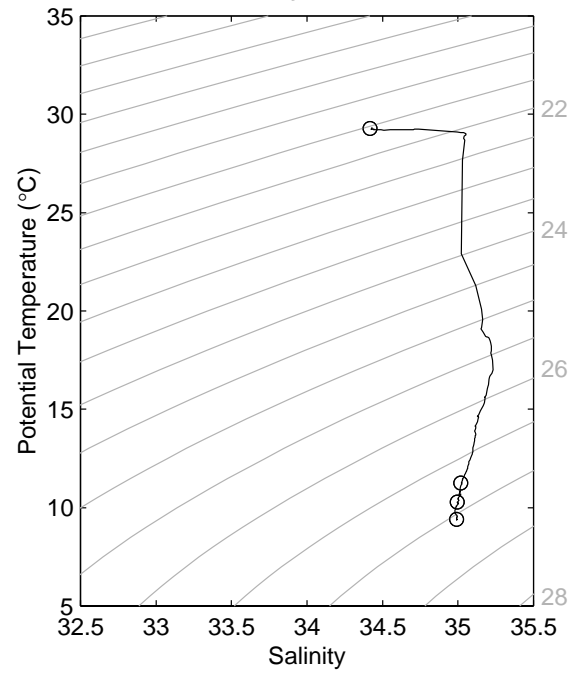
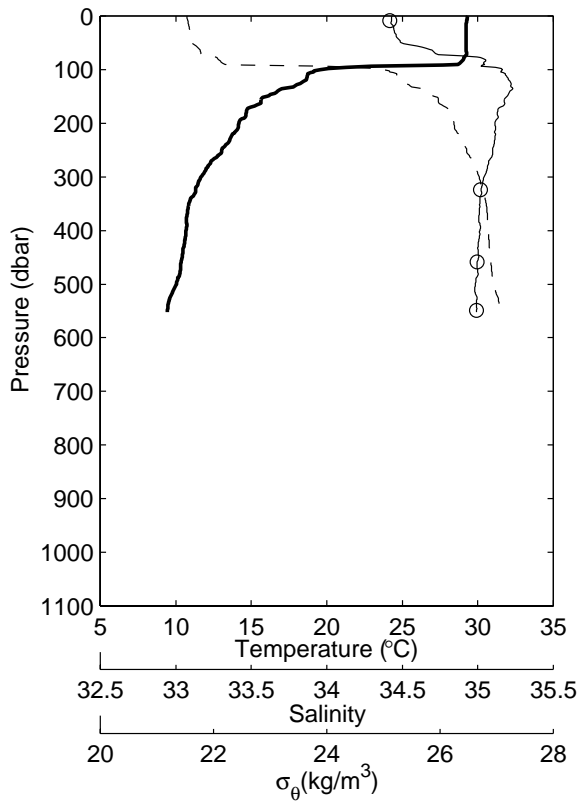
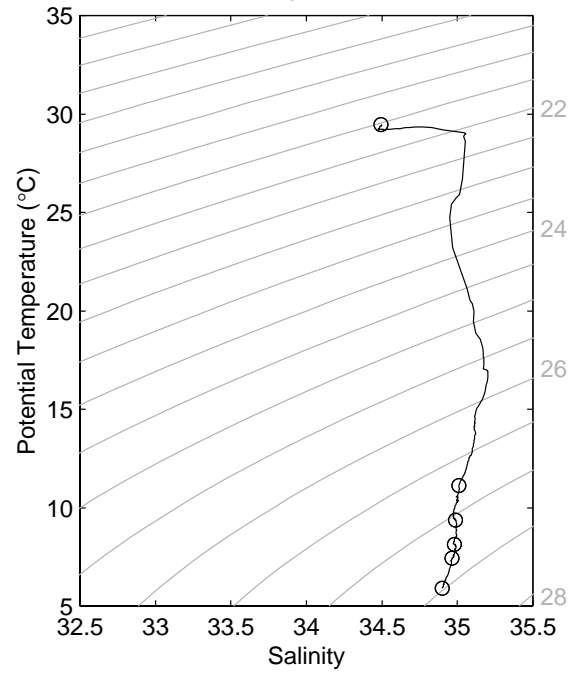
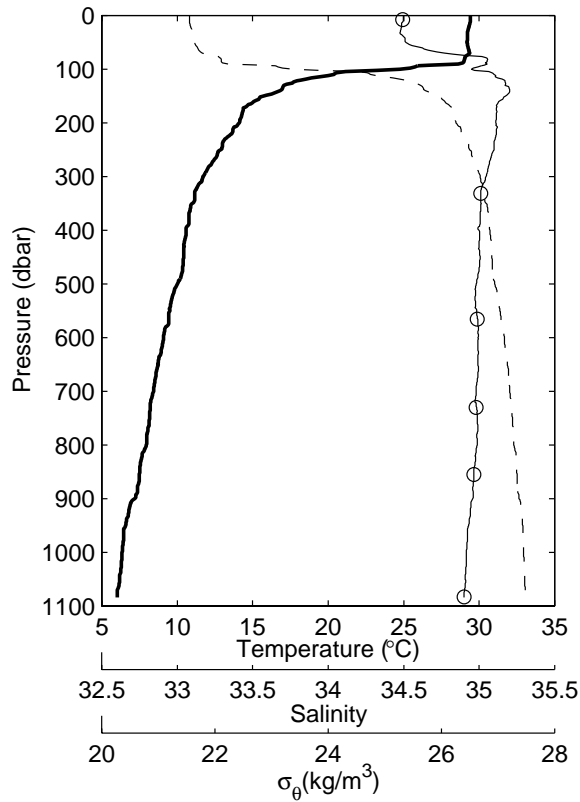


Figure 8.1.176. Same as Fig. 8.1.23 but for station 307 cast 1 and station 308 cast 1.

JASMINE Stn-309 Cast-1 1.00°S 92.55°E 22:56Z 29 May 1999



JASMINE Stn-310 Cast-1 1.50°S 92.73°E 02:09Z 30 May 1999

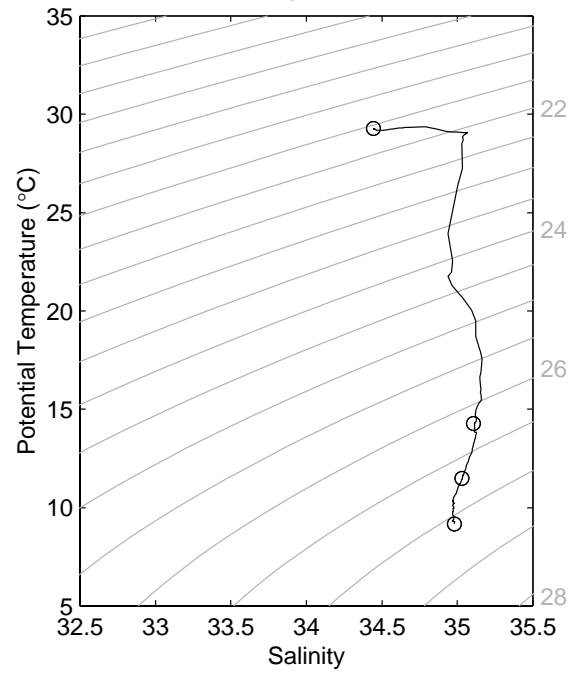
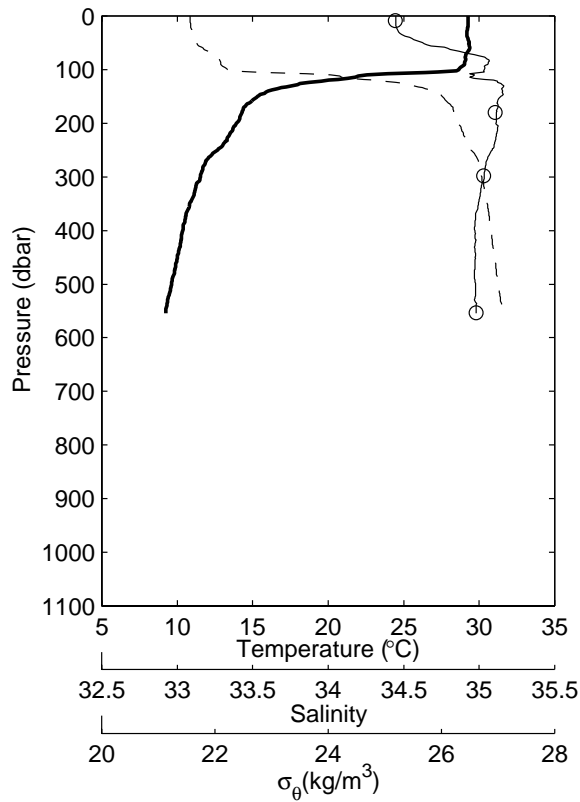
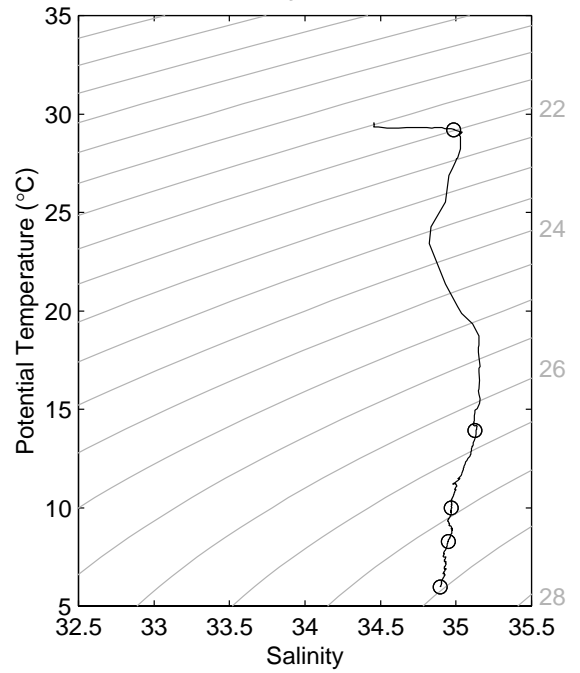
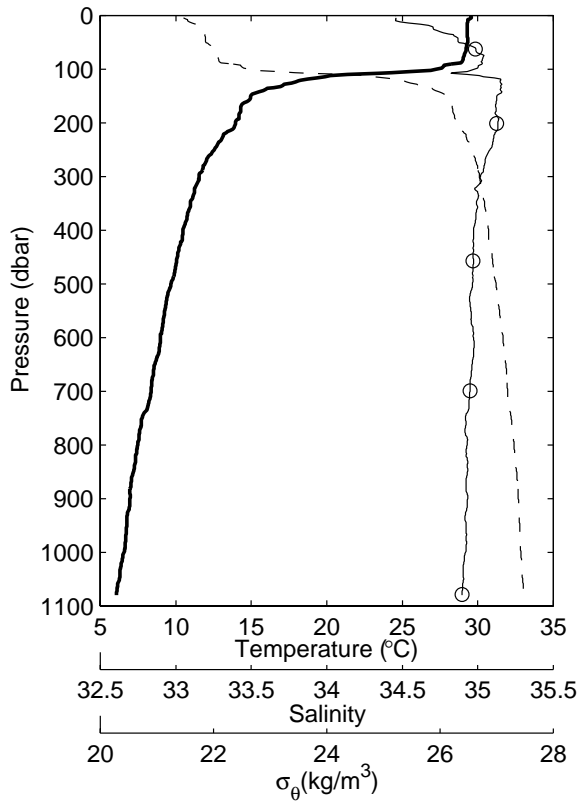


Figure 8.1.177. Same as Fig. 8.1.23 but for station 309 cast 1 and station 310 cast 1.

JASMINE Stn-311 Cast-1 2.00°S 92.91°E 05:08Z 30 May 1999



JASMINE Stn-312 Cast-1 2.50°S 93.09°E 08:21Z 30 May 1999

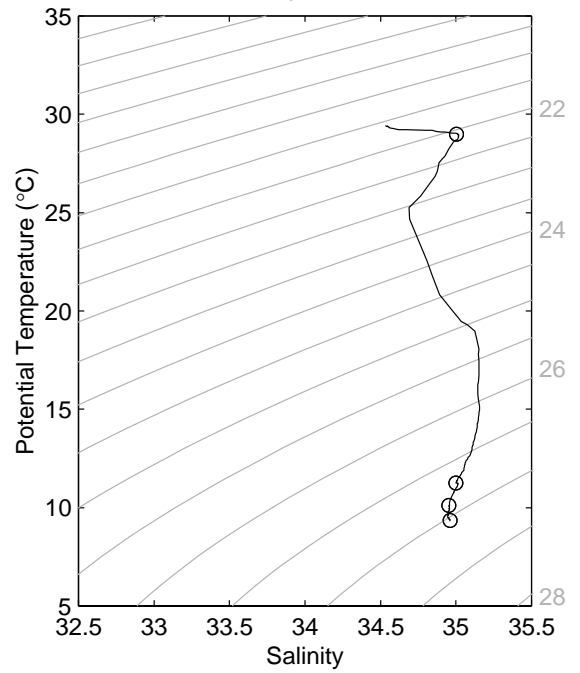
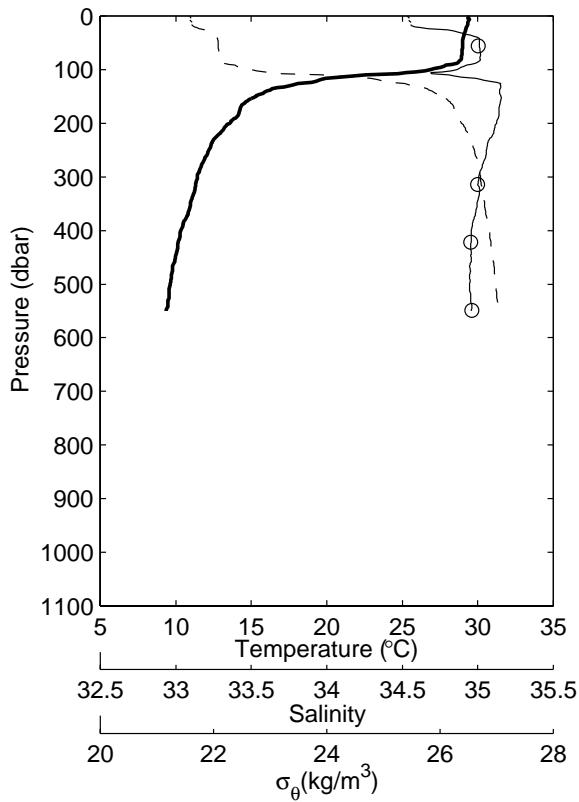
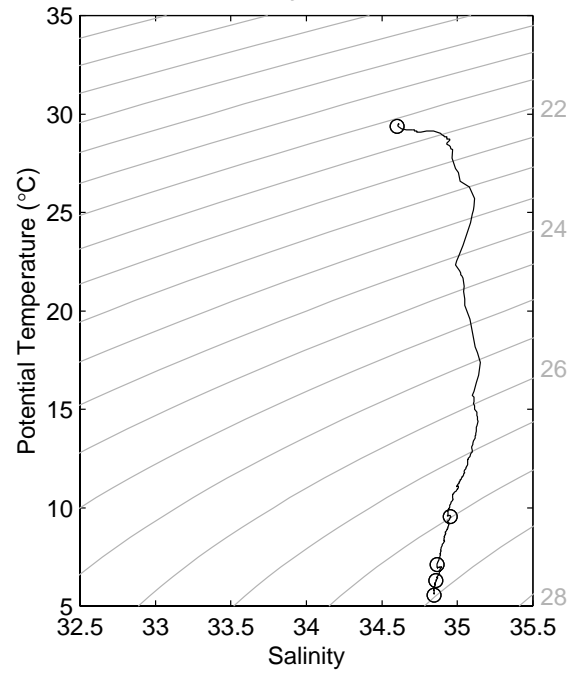
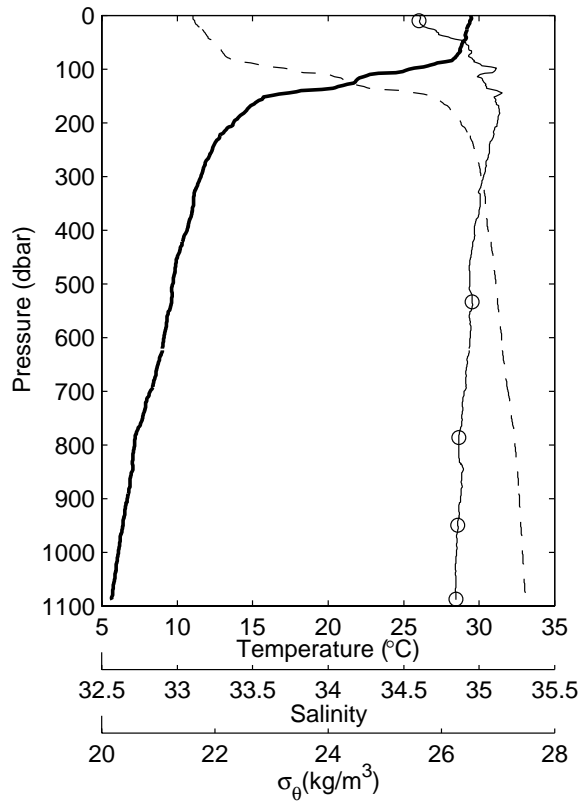


Figure 8.1.178. Same as Fig. 8.1.23 but for station 311 cast 1 and station 312 cast 1.

JASMINE Stn-313 Cast-1 3.00°S 93.27°E 11:08Z 30 May 1999



JASMINE Stn-314 Cast-1 3.50°S 93.46°E 14:23Z 30 May 1999

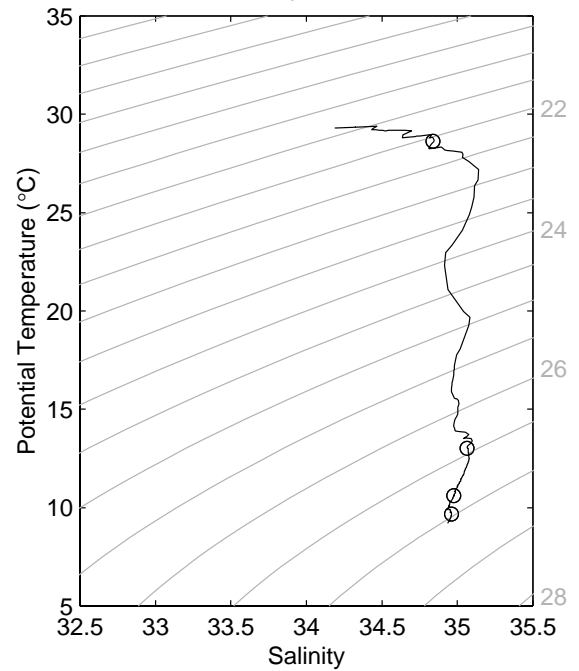
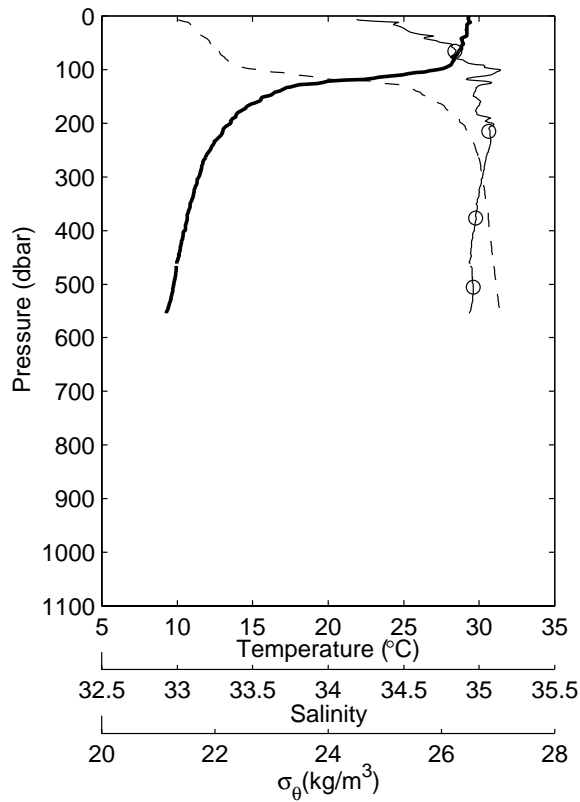
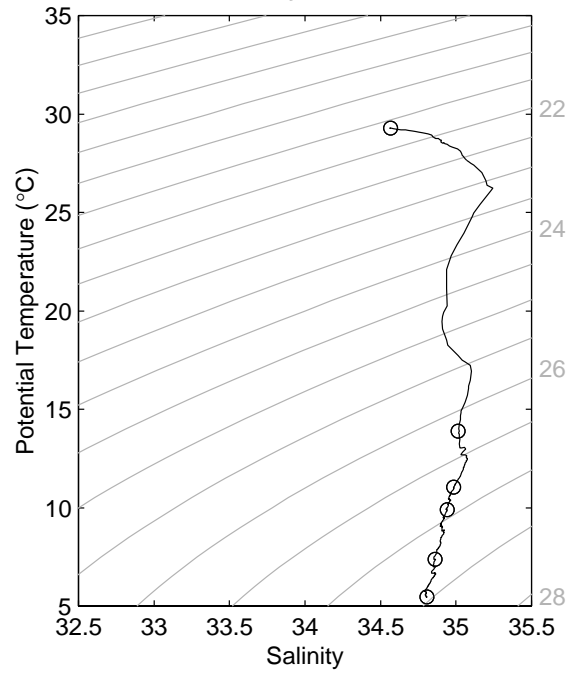
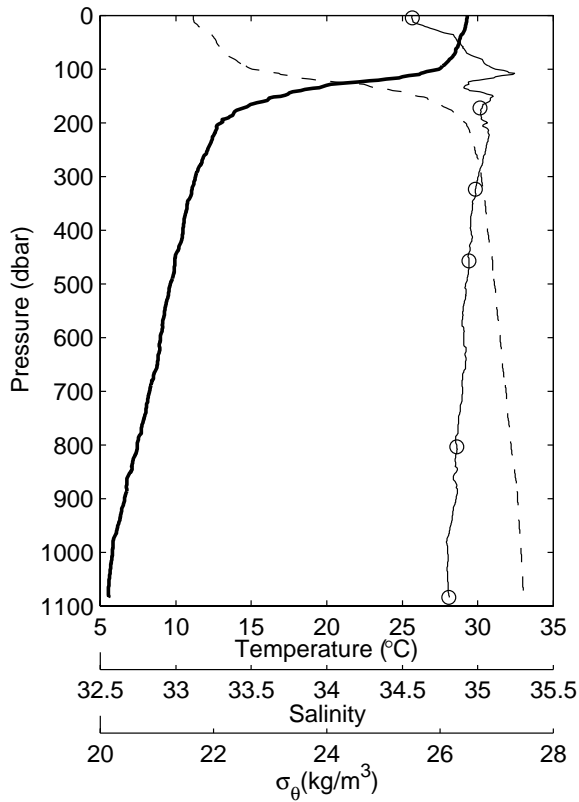


Figure 8.1.179. Same as Fig. 8.1.23 but for station 313 cast 1 and station 314 cast 1.

JASMINE Stn-315 Cast-1 4.00°S 93.64°E 17:17Z 30 May 1999



JASMINE Stn-316 Cast-1 4.50°S 93.82°E 20:37Z 30 May 1999

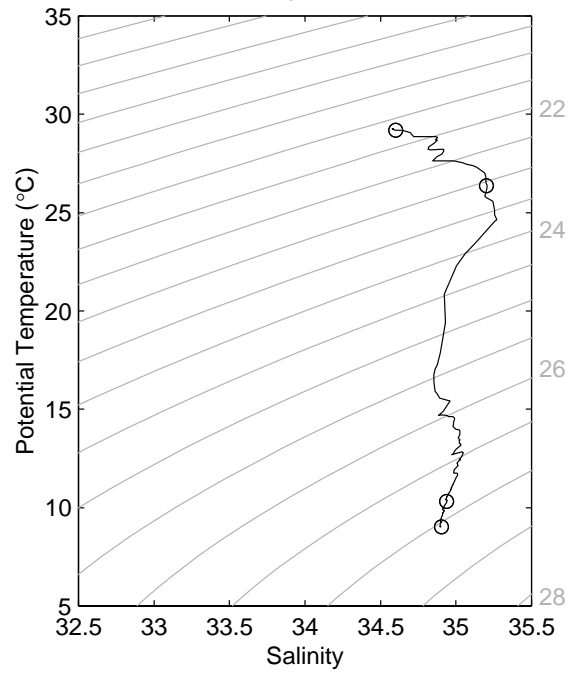
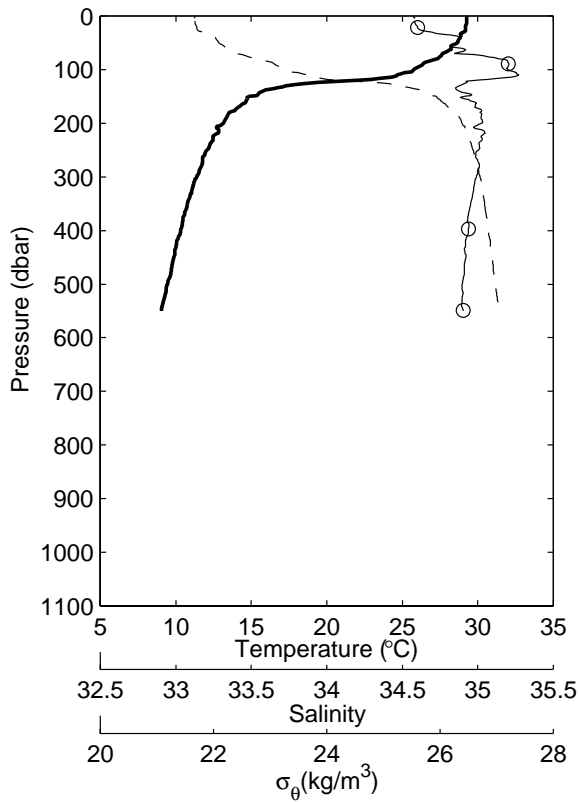


Figure 8.1.180. Same as Fig. 8.1.23 but for station 315 cast 1 and station 316 cast 1.

JASMINE Stn-317 Cast-1 5.00°S 94.00°E 23:40Z 30 May 1999

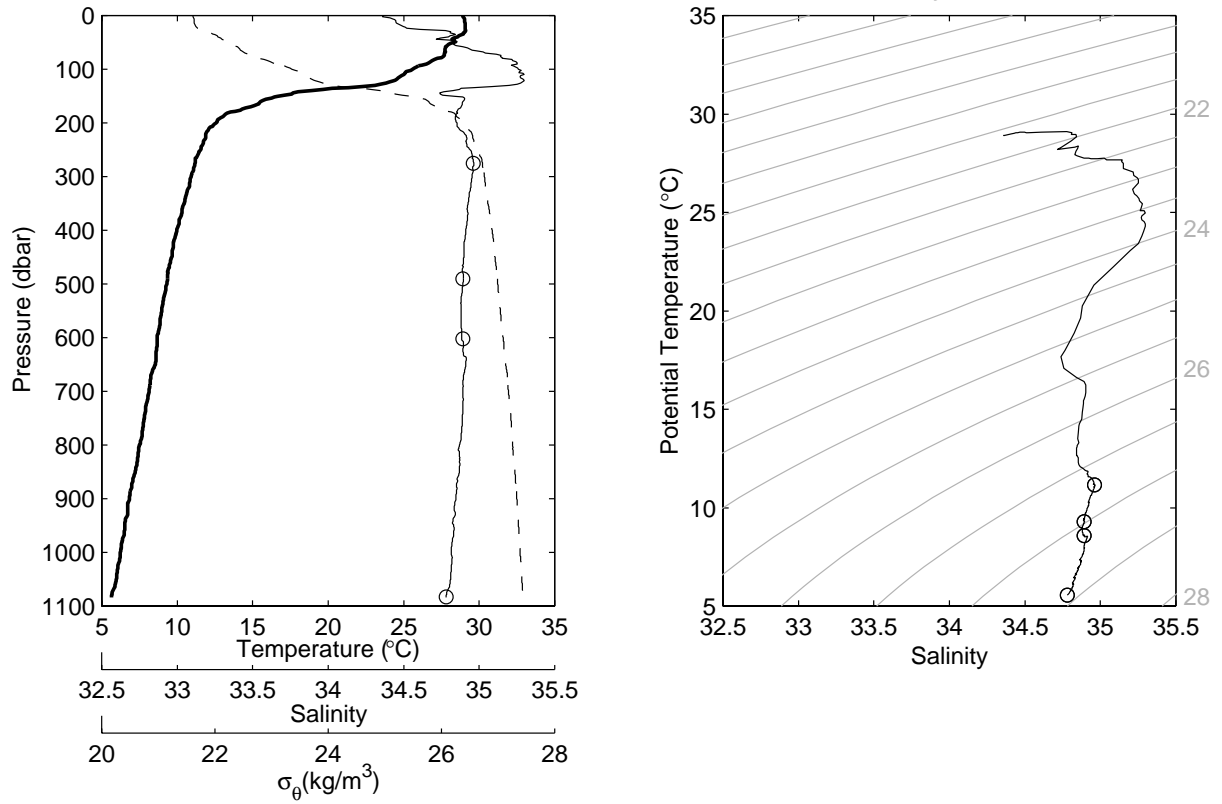


Figure 8.1.181. Same as Fig. 8.1.23 but for station 317 cast 1.

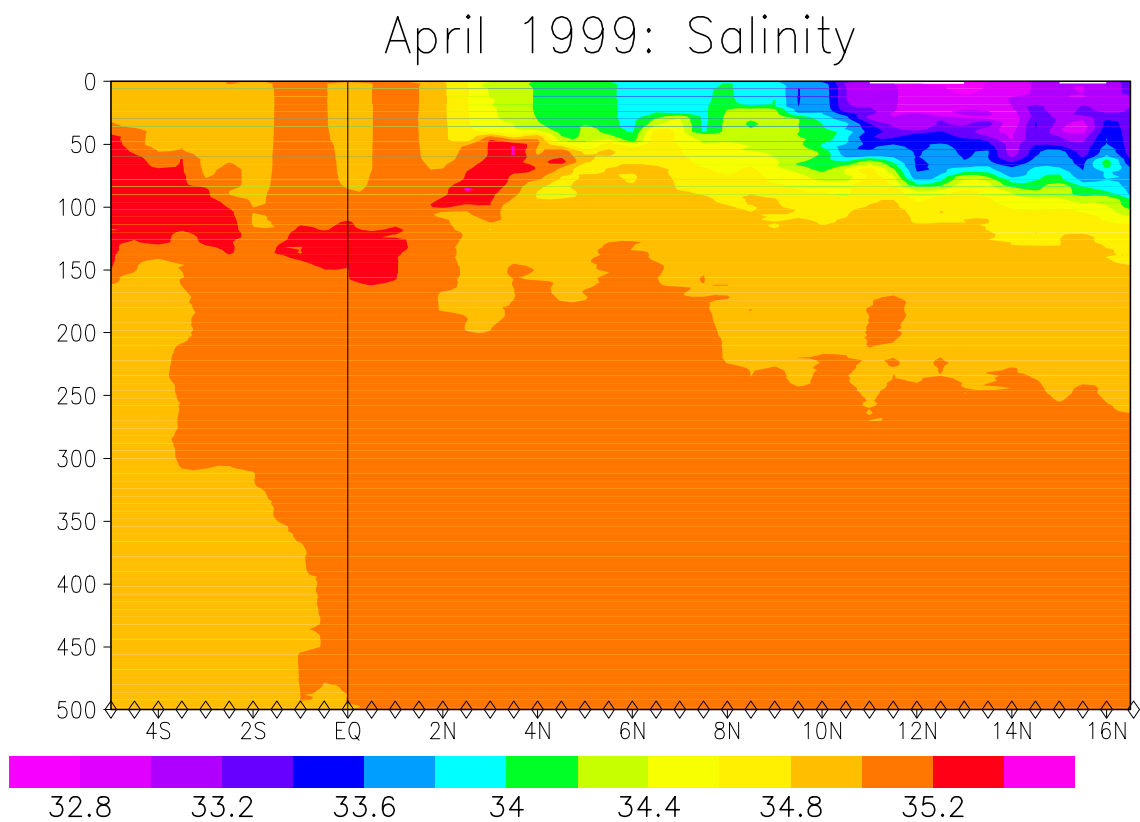
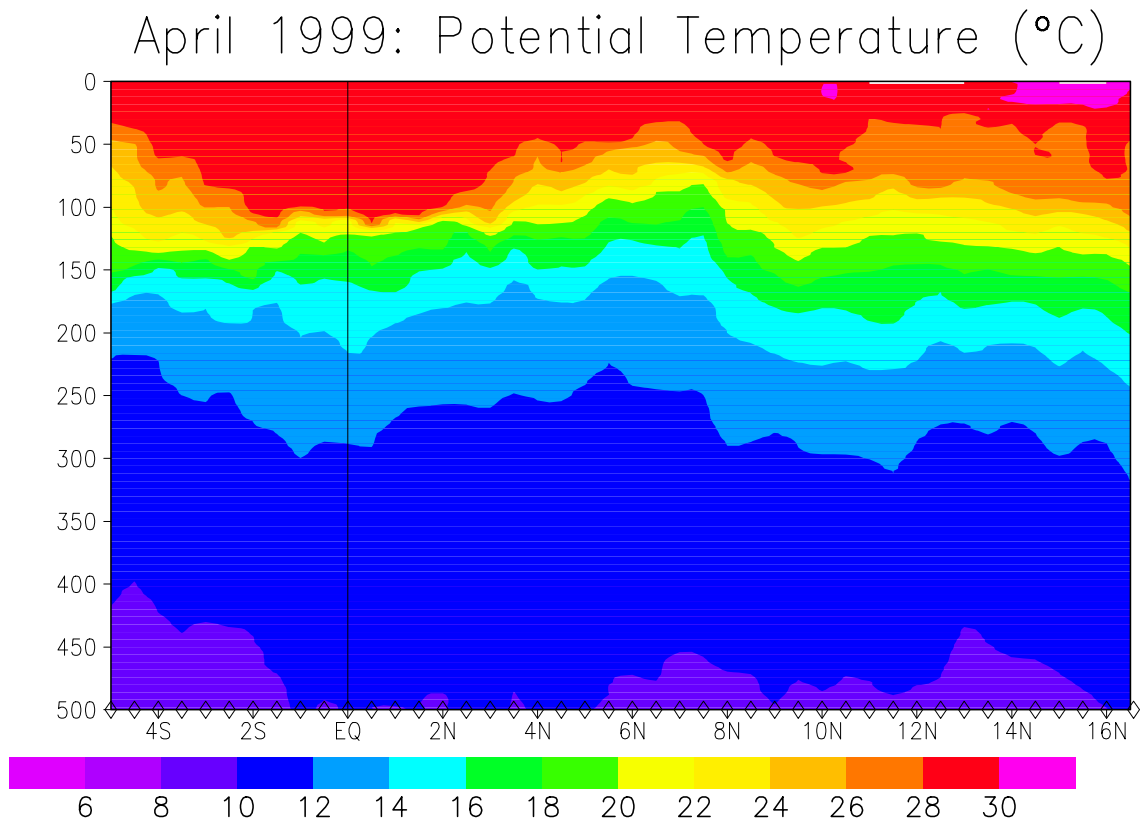
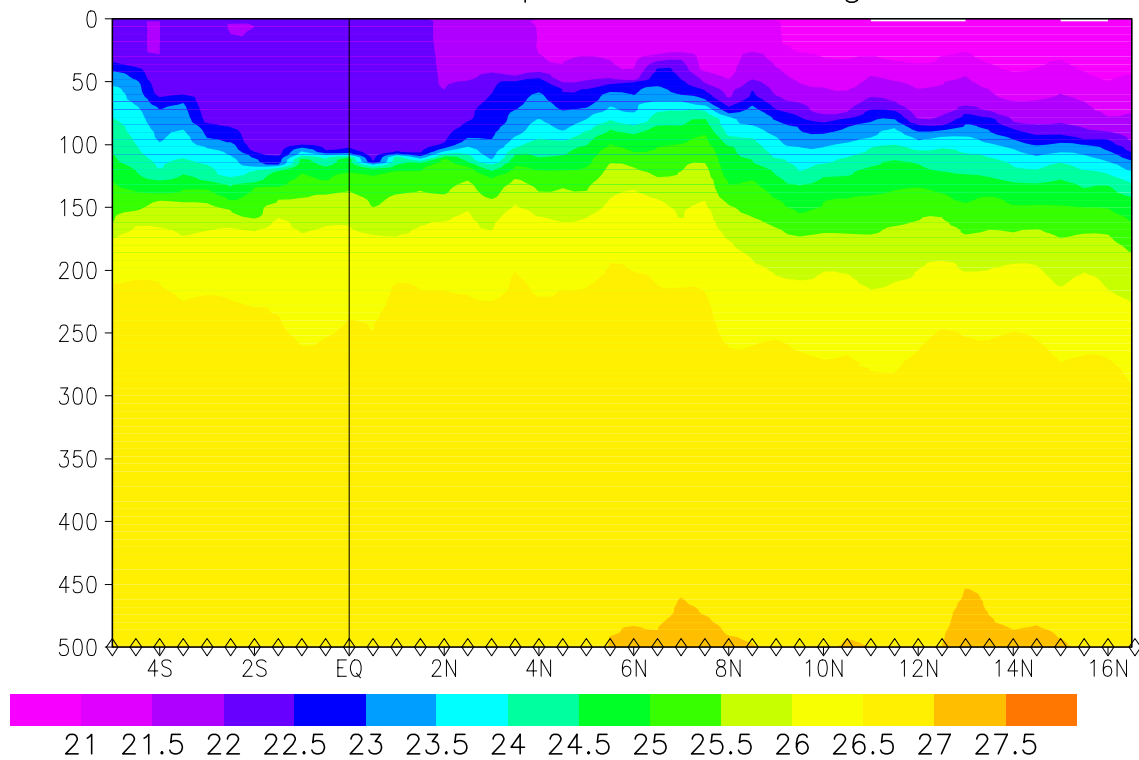


Figure 8.2.1a. Contours of CTD potential temperature (upper panel) and salinity (lower panel), plotted against pressure in the upper 500 dbar along 88°E during the pre-JASMINE cruise. CTD stations are indicated by symbols along the horizontal axis.

Pre-JASMINE April 1999: Sigma Theta



Pre-JASMINE April 1999: Salinity

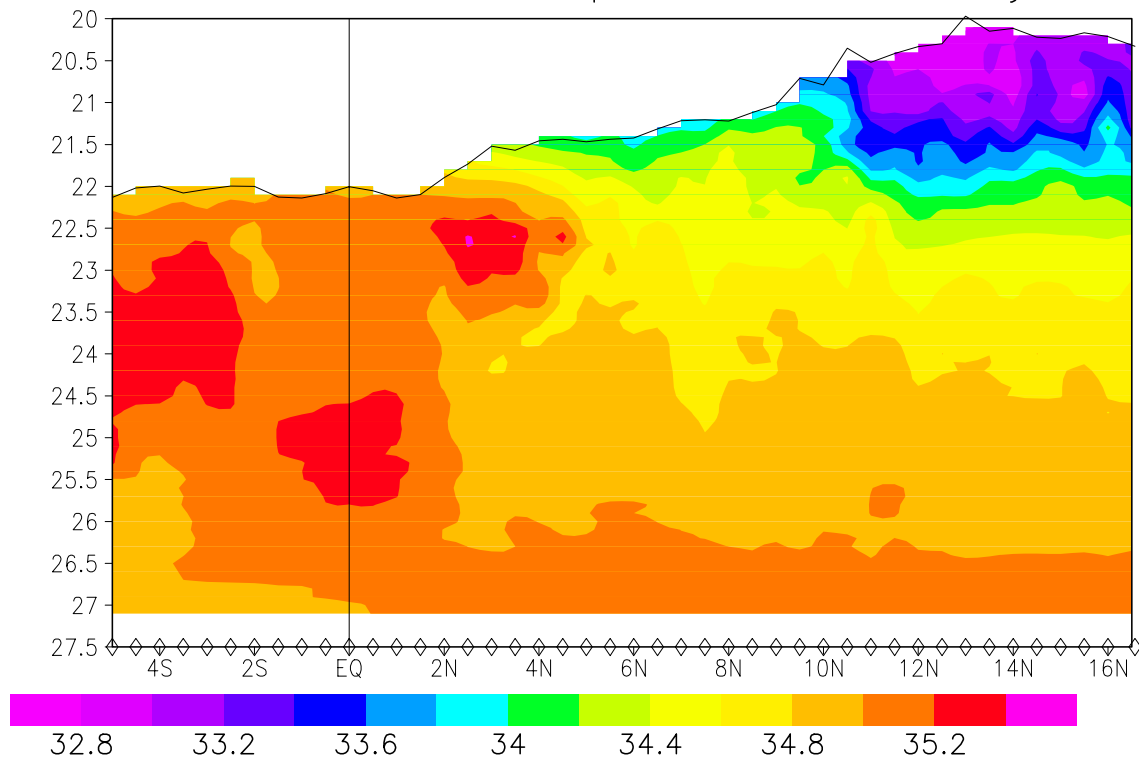


Figure 8.2.1b. Contours of CTD potential temperature plotted against pressure in the upper 500 dbar (upper panel), and of salinity plotted against potential density (lower panel) along 88°E during the pre-JASMINE cruise. CTD stations are indicated by symbols along the horizontal axis.

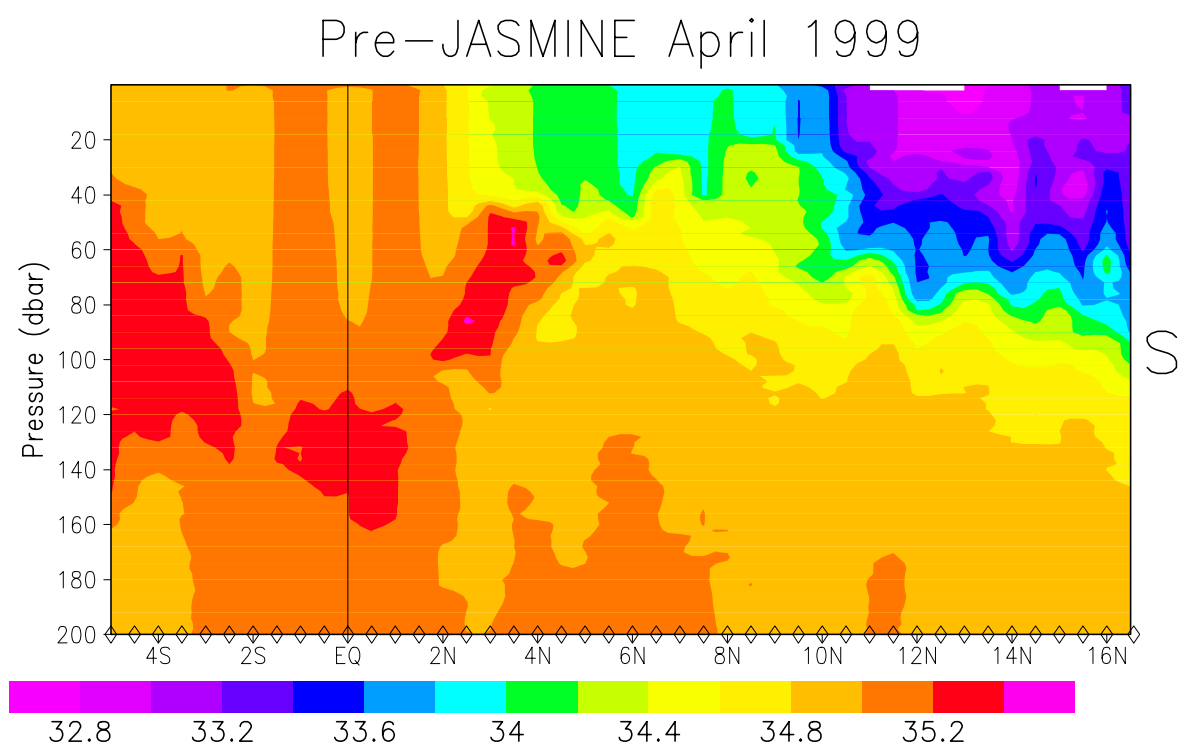
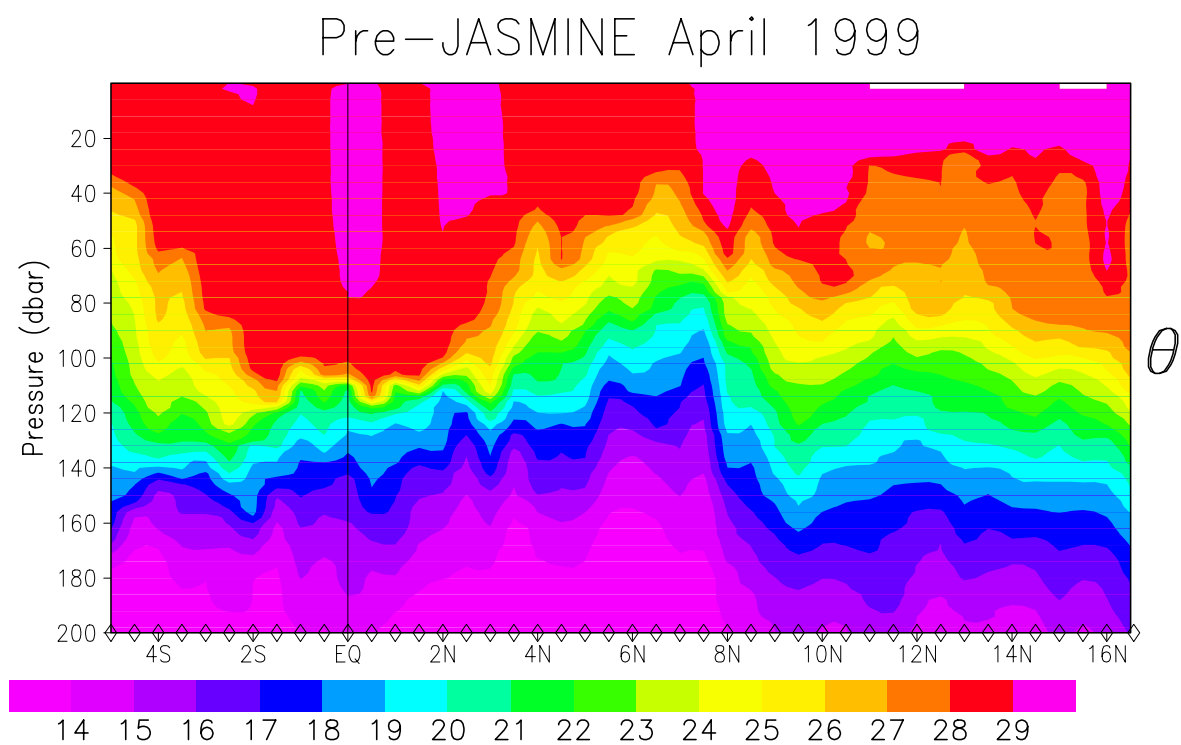


Figure 8.2.1c. Contours of CTD potential temperature (upper panel) and salinity (lower panel), plotted against pressure in the upper 200 dbar along 88°E during the pre-JASMINE cruise. CTD stations are indicated by symbols along the horizontal axis.

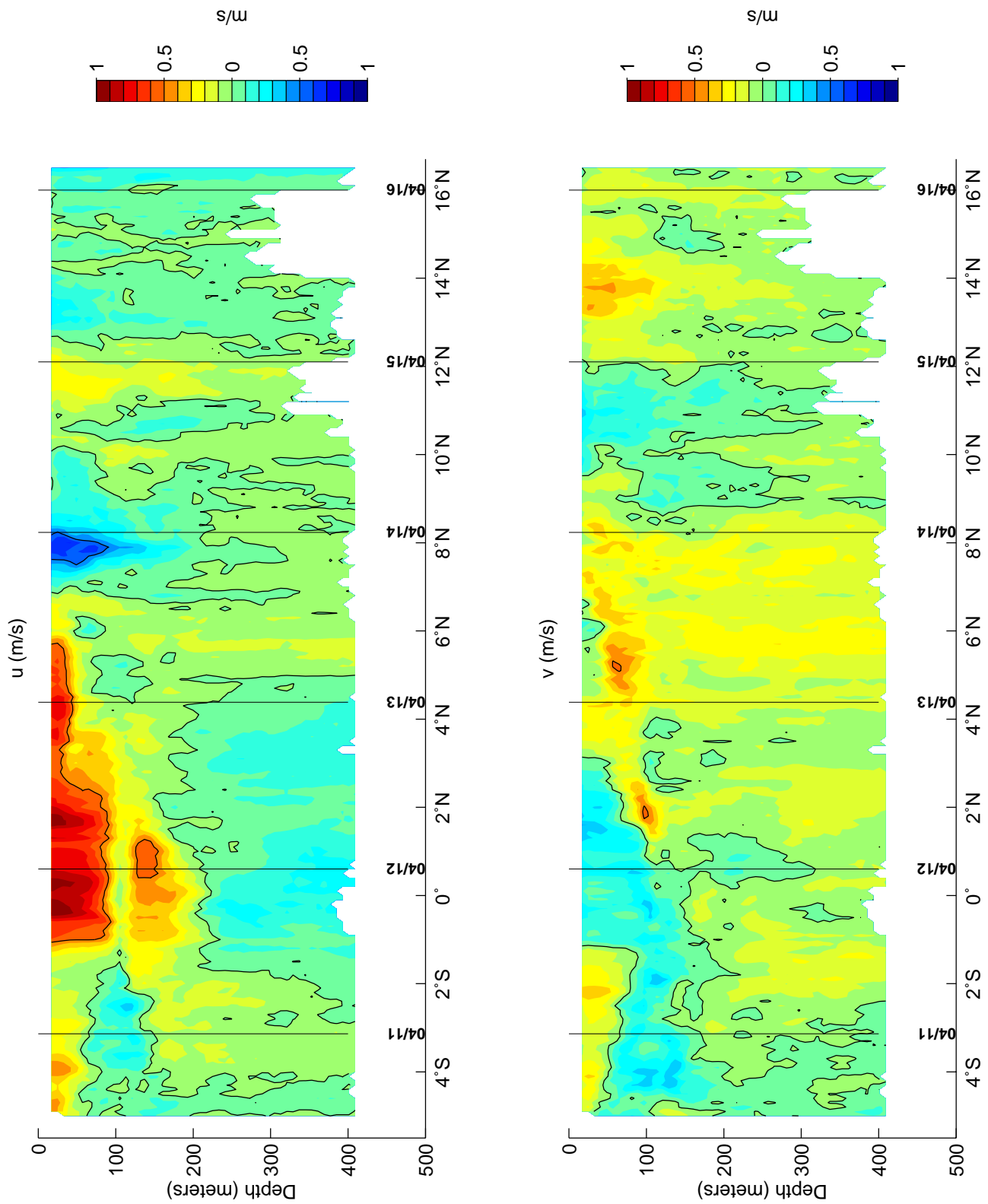
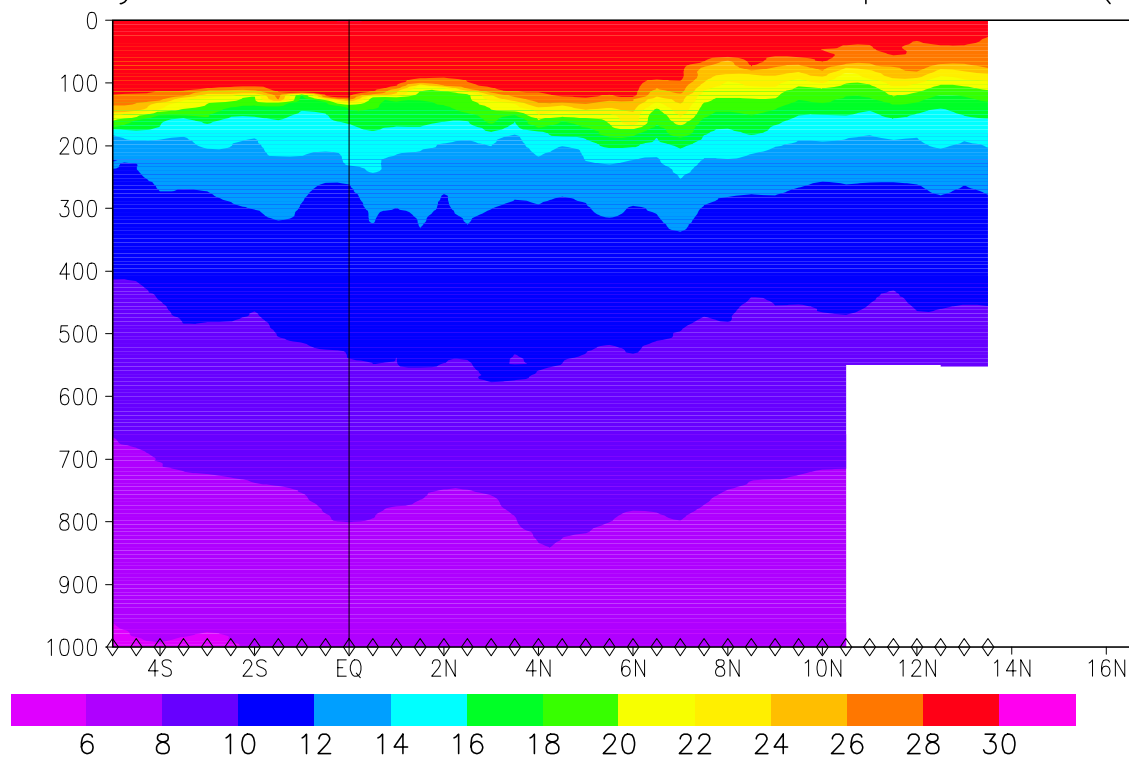


Figure 8.2.1d. Contours of zonal (left panel) and meridional (right panel) ADCP current speed, plotted against depth in the upper 500 m along 88°E during the pre-JASMINE cruise.

May 4–10, 1999: Potential Temperature ($^{\circ}\text{C}$)



May 4–10, 1999: Salinity

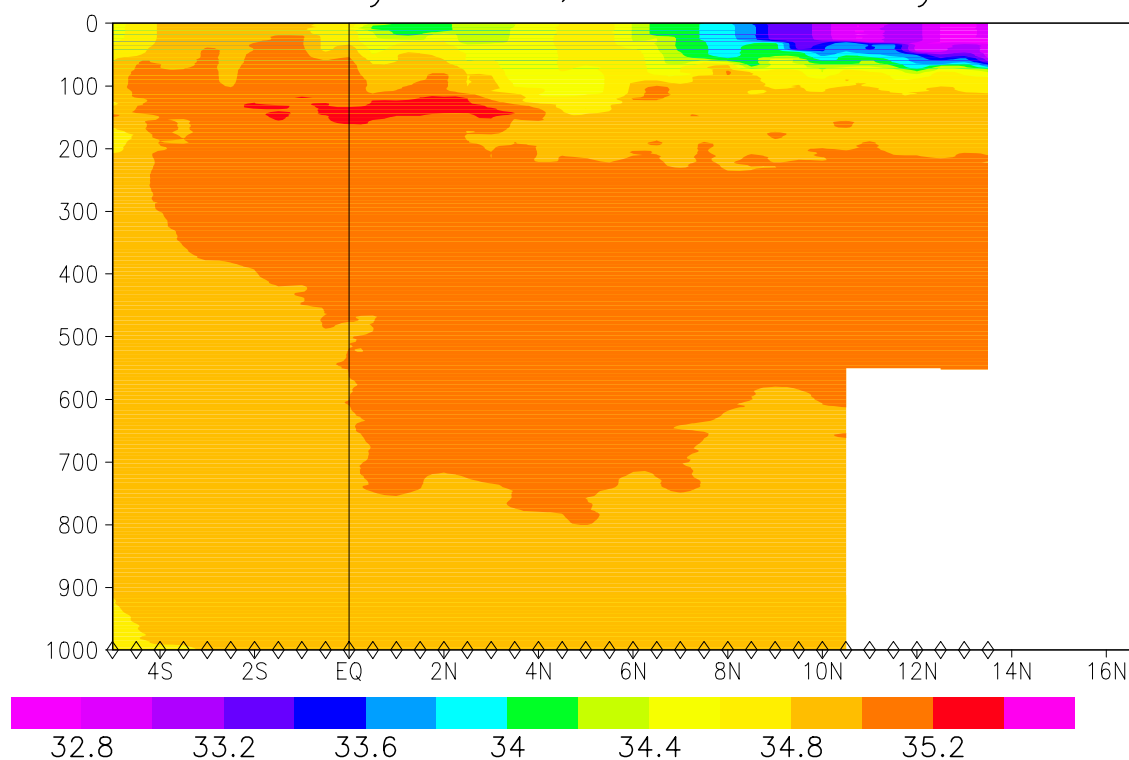
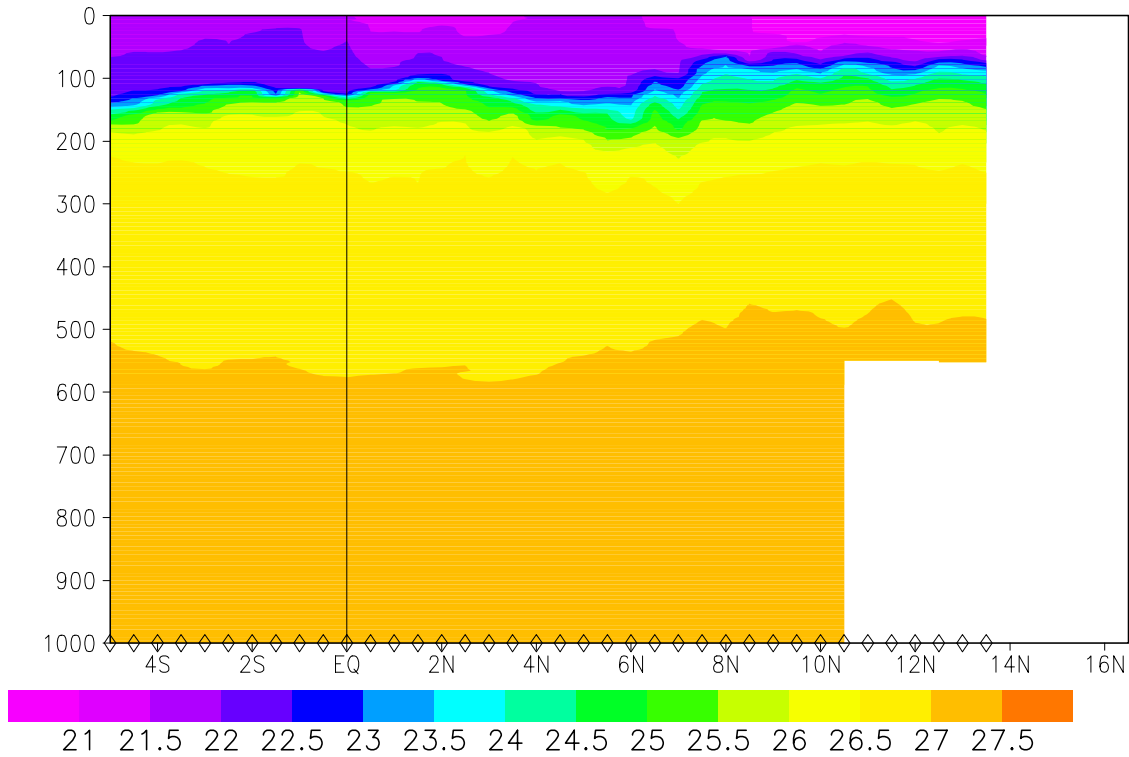


Figure 8.2.2a. Contours of CTD potential temperature (upper panel), and salinity (lower panel), plotted against pressure in the upper 1000 dbar along section 1 (see section 2 and Fig. 2.2 in the text), from 94°E through 88.5°E , during the main JASMINE cruise. CTD stations are indicated by symbols along the horizontal axis.

JASMINE May 4–10, 1999: Sigma Theta



JASMINE May 4–10, 1999: Salinity

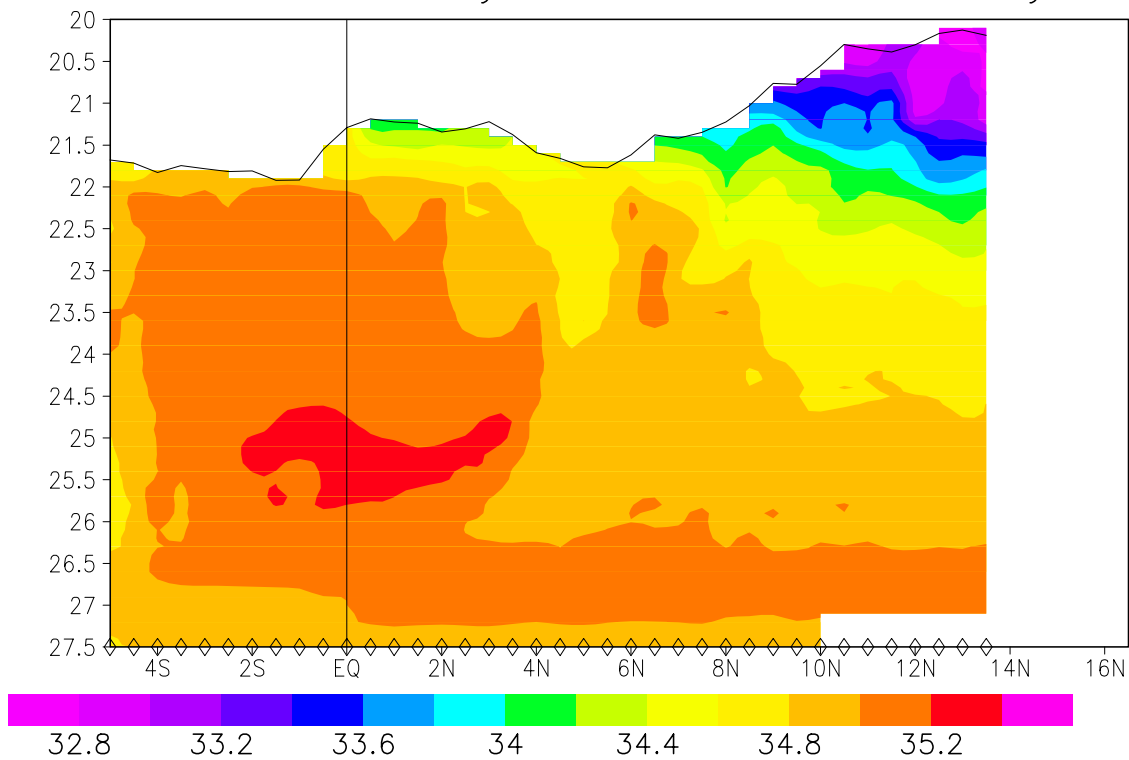


Figure 8.2.2b. Contours of CTD potential temperature plotted against pressure in the upper 1000 dbar (upper panel), and of salinity plotted against potential density (lower panel) along section 1 (see section 2 and Fig. 2.2 in the text), from 94°E through 88.5°E, during the main JASMINE cruise. CTD stations are indicated by symbols along the horizontal axis.

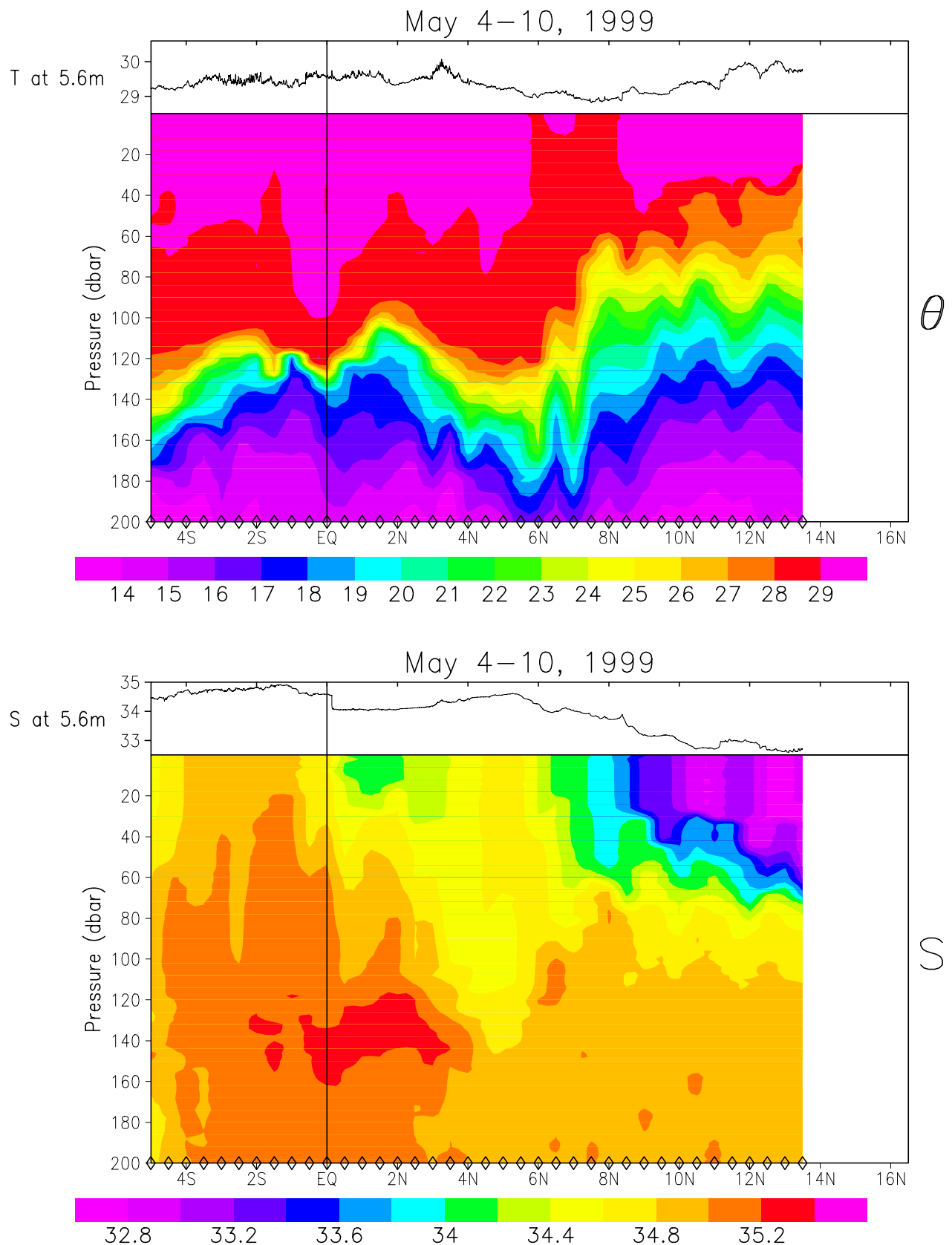


Figure 8.2.2c. Contours of CTD potential temperature (upper panel) and salinity (lower panel), plotted against pressure in the upper 200 dbar along section 1 (see section 2 and Fig. 2.2 in the text), from 94°E through 88.5°E, during the main JASMINE cruise. CTD stations are indicated by symbols along the horizontal axis. Thermosalinograph temperatures and salinities are shown in the plots above each of the panels.

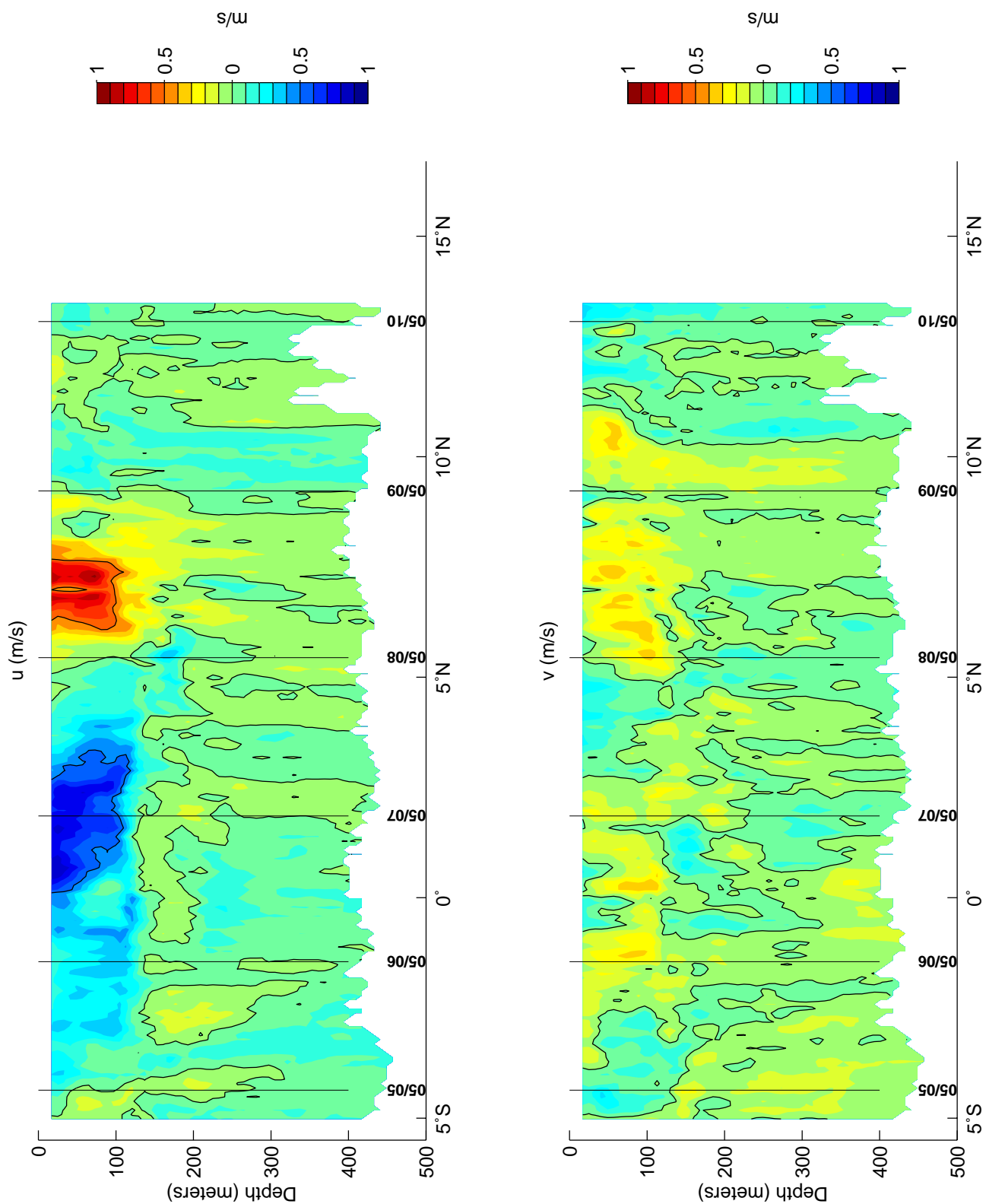
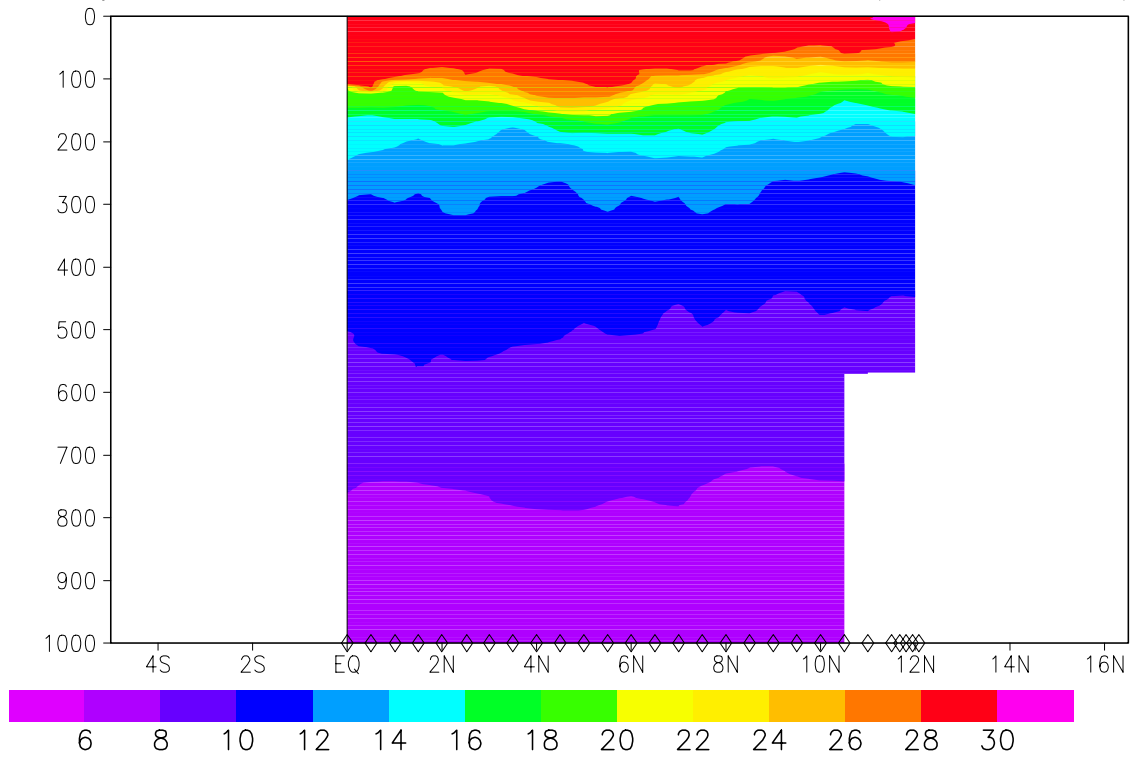


Figure 8.2.2d. Contours of zonal (left panel) and meridional (right panel) ADCP current speed, plotted against depth in the upper 500 m along section 1 (see section 2 and Fig. 2.2 in the text), from 94°E through 88.5°E, during the main JASMINE cruise.

May 15–18, 1999: Potential Temperature (°C)



May 15–18, 1999: Salinity

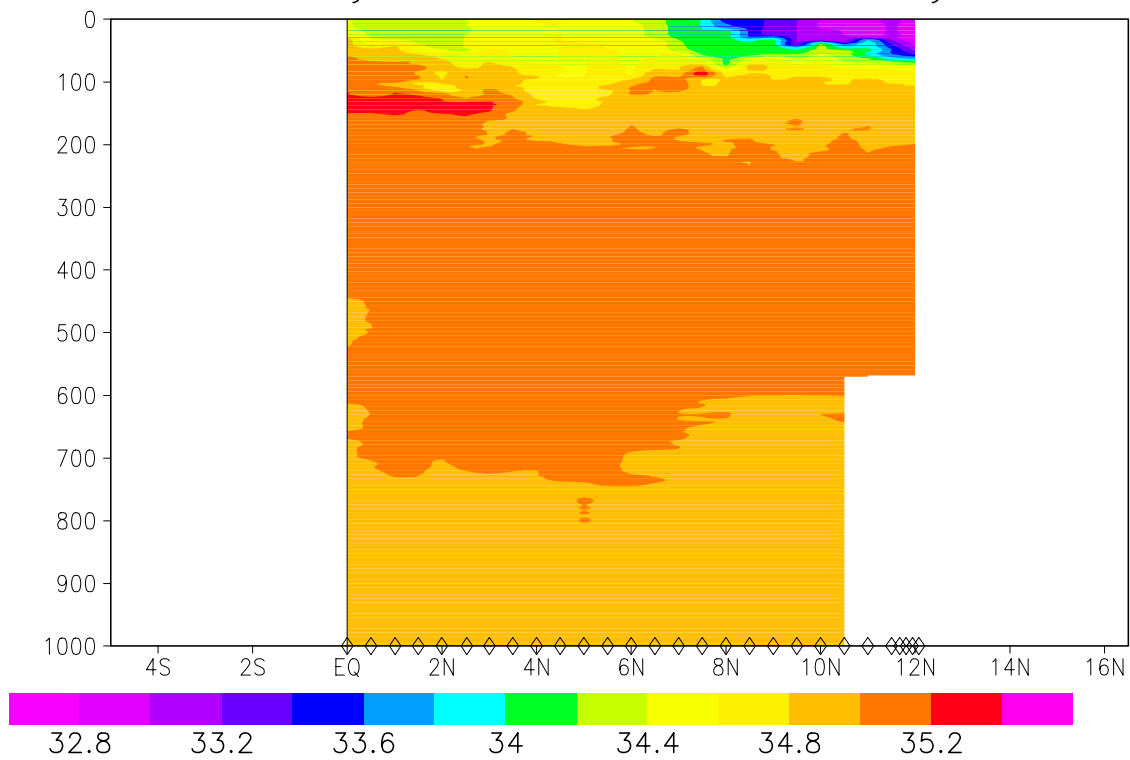
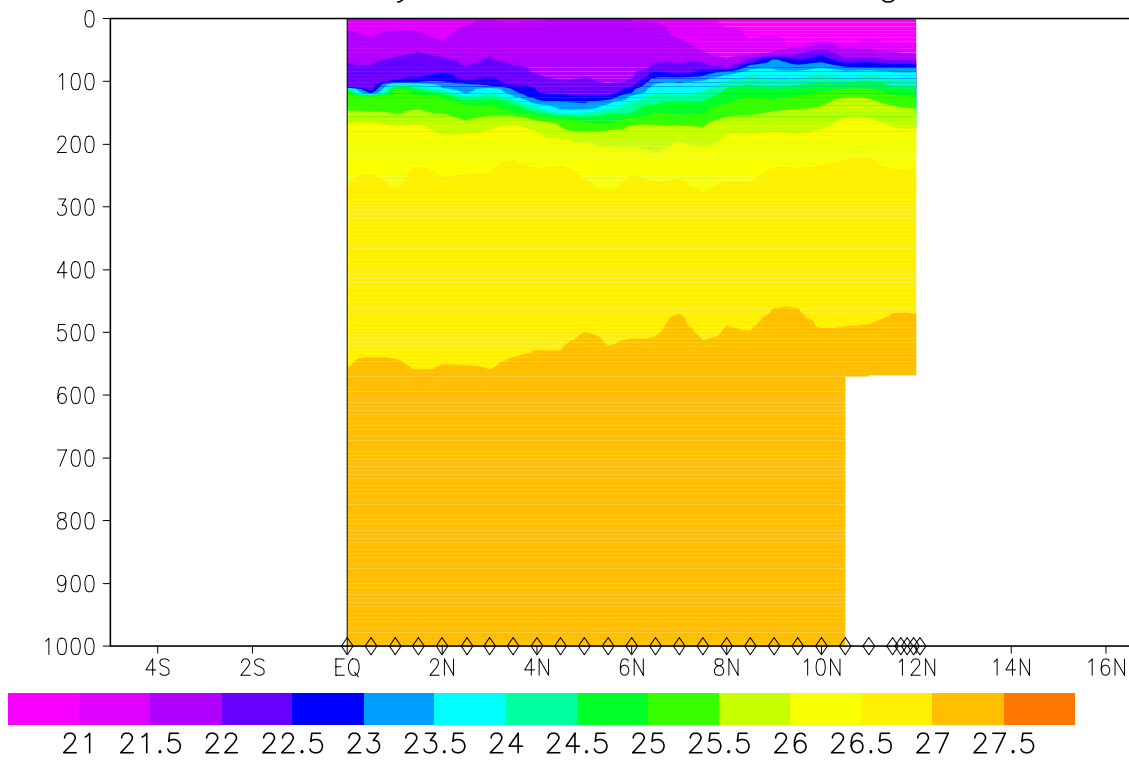


Figure 8.2.3a. Same as in Figure 8.2.2a but for section 2 (see section 2 and Fig. 2.2 in the text), along 88.5°E.

JASMINE May 15–18, 1999: Sigma Theta



JASMINE May 15–18, 1999: Salinity

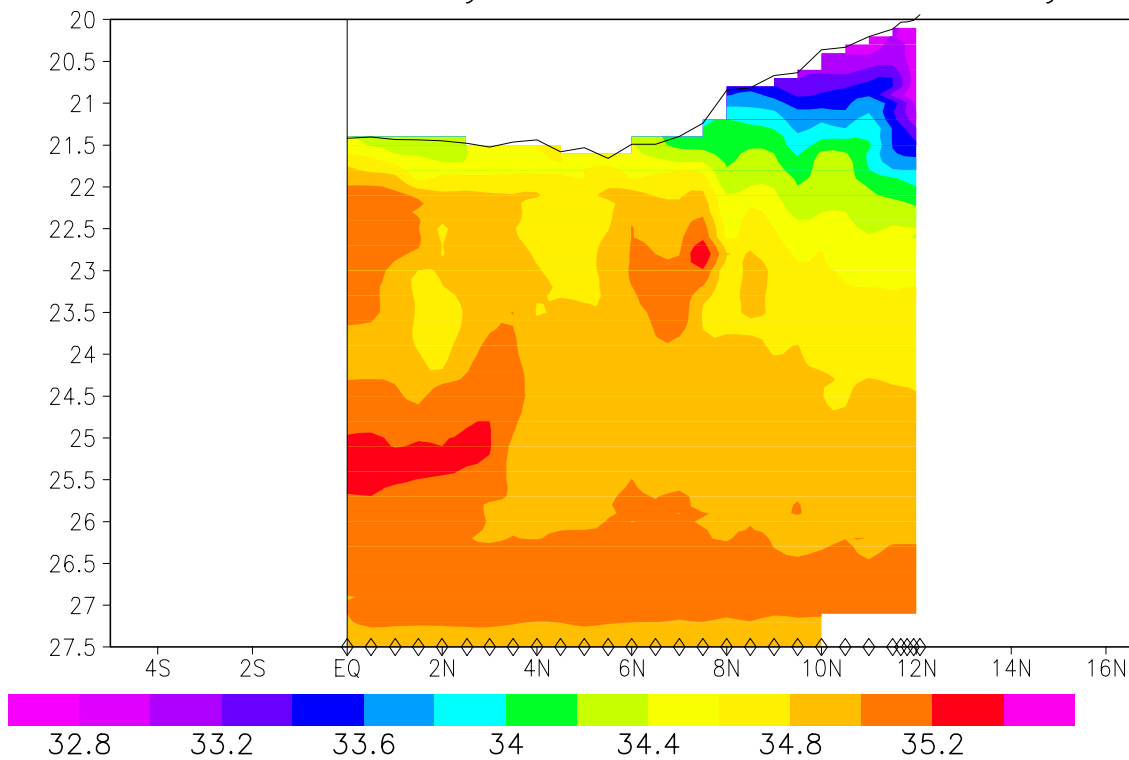


Figure 8.2.3b. Same as in Figure 8.2.2b but for section 2 (see section 2 and Fig. 2.2 in the text), along 88.5°E.

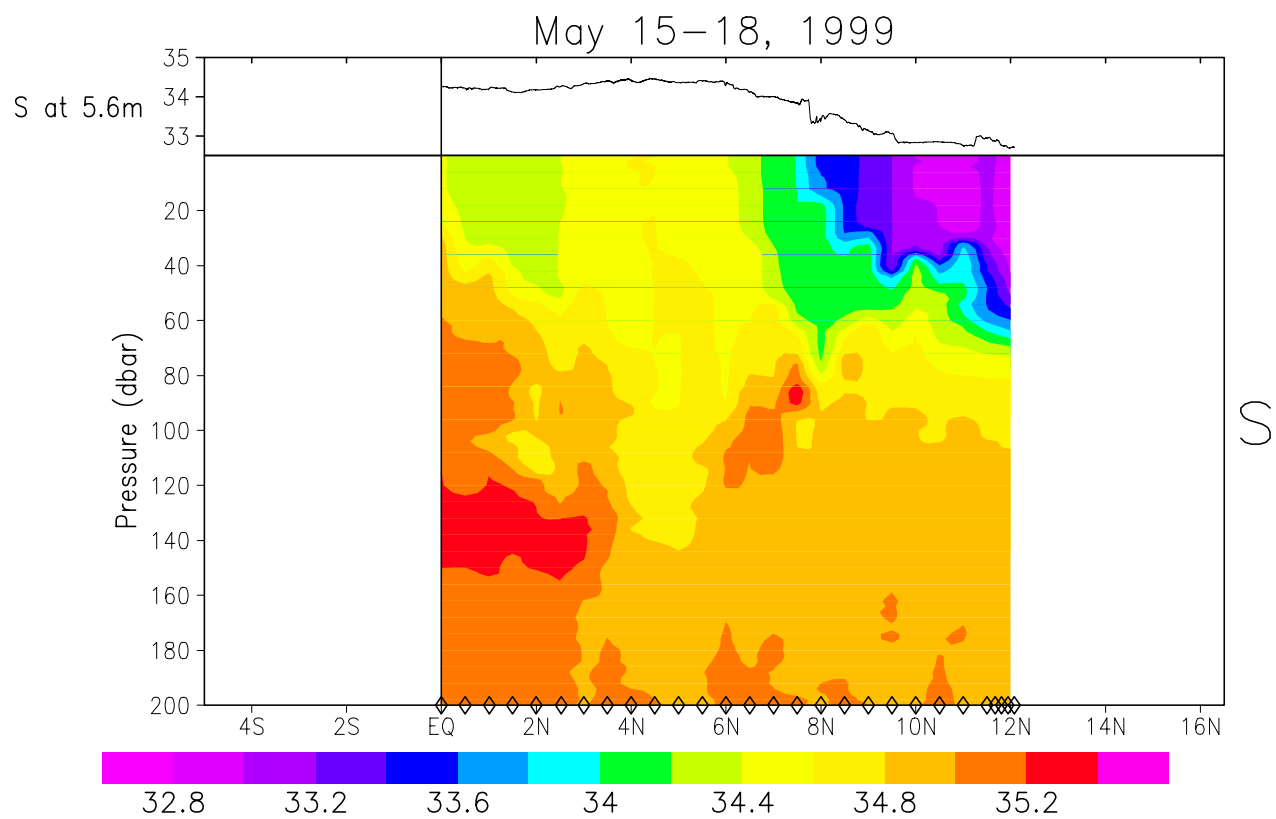
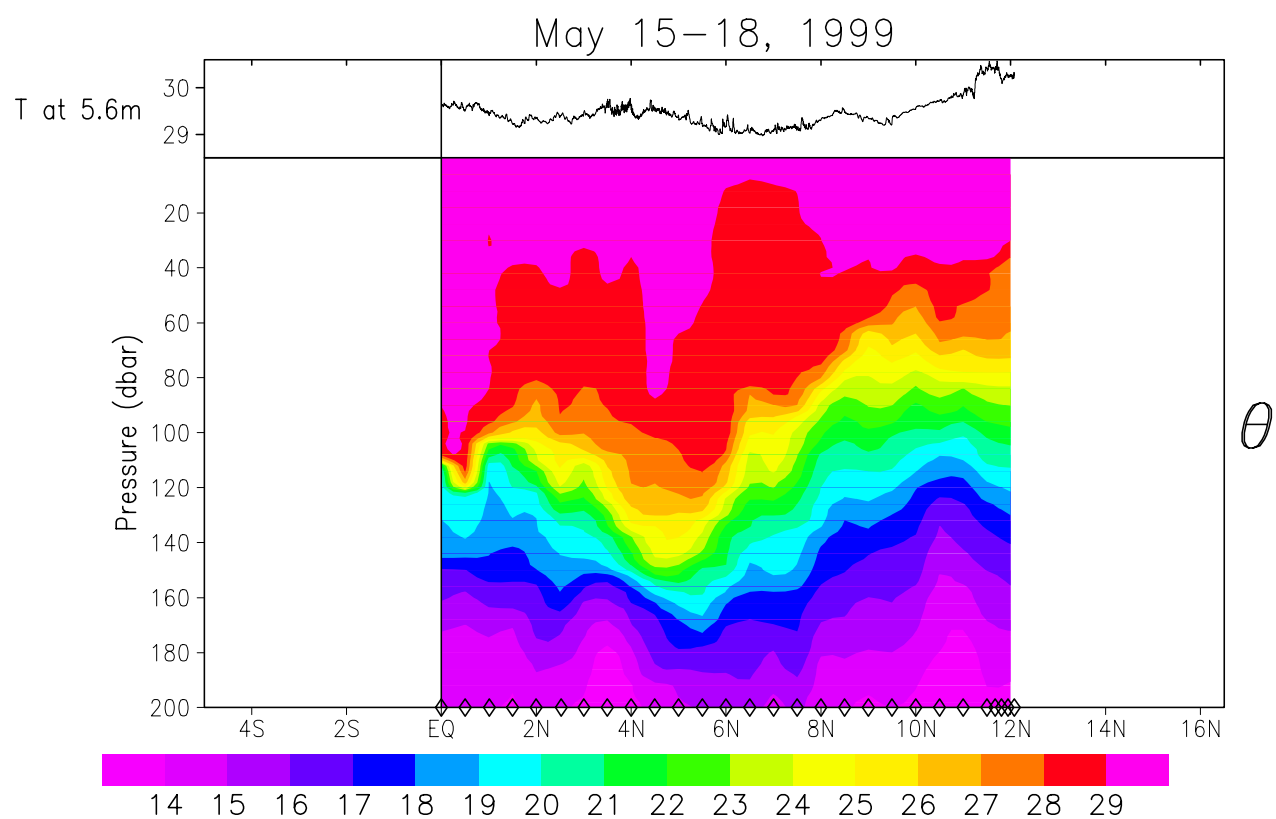


Figure 8.2.3c. Same as in Figure 8.2.2c but for section 2 (see section 2 and Fig. 2.2 in the text), along 88.5°E.

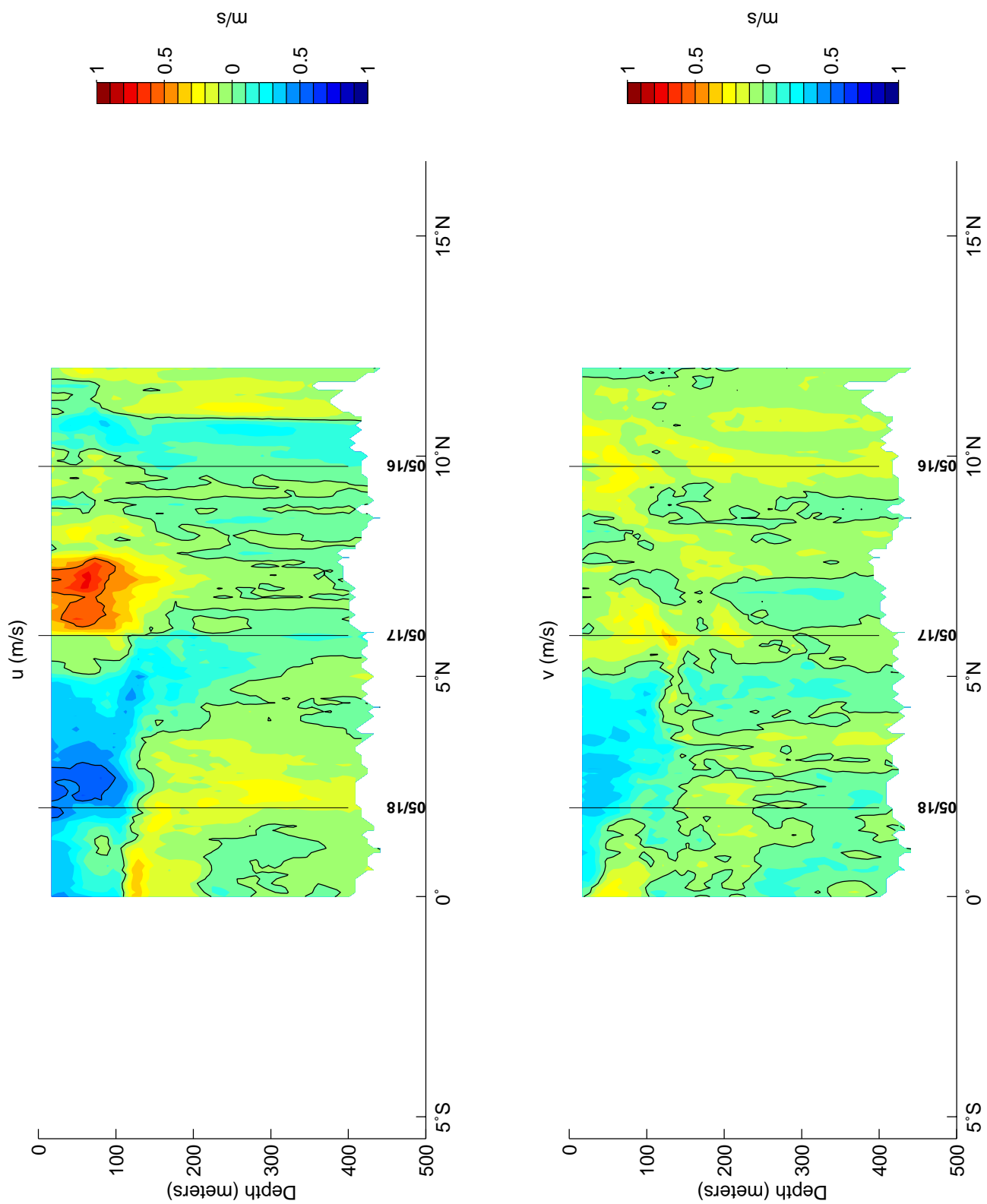
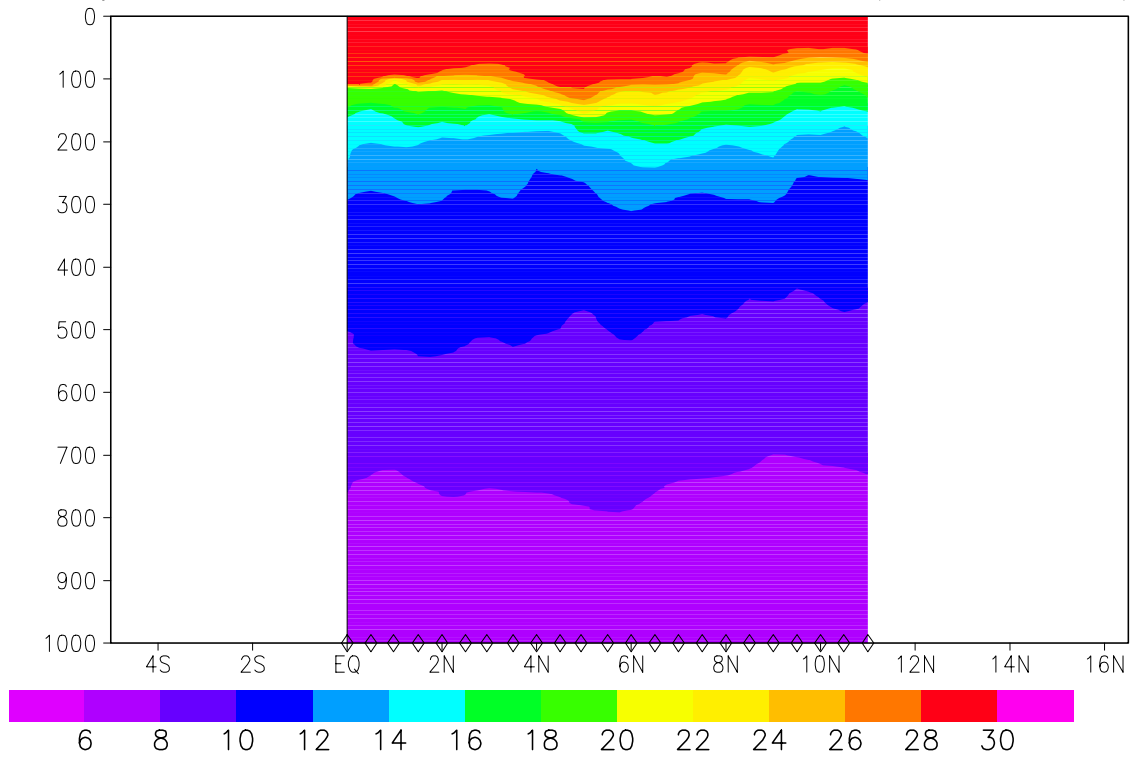


Figure 8.2.3c. Same as in Figure 8.2.2c but for section 2 (see section 2 and Fig. 2.2 in the text), along 88.5°E.

May 18–21, 1999: Potential Temperature (°C)



May 18–21, 1999: Salinity

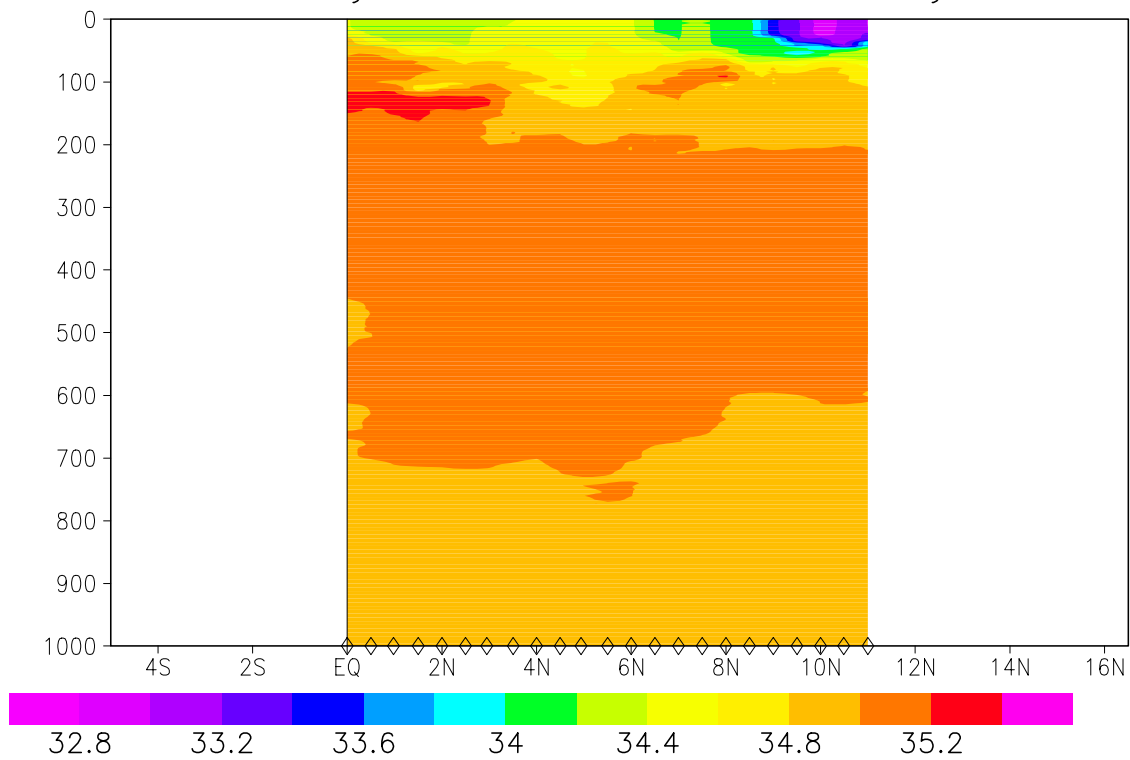
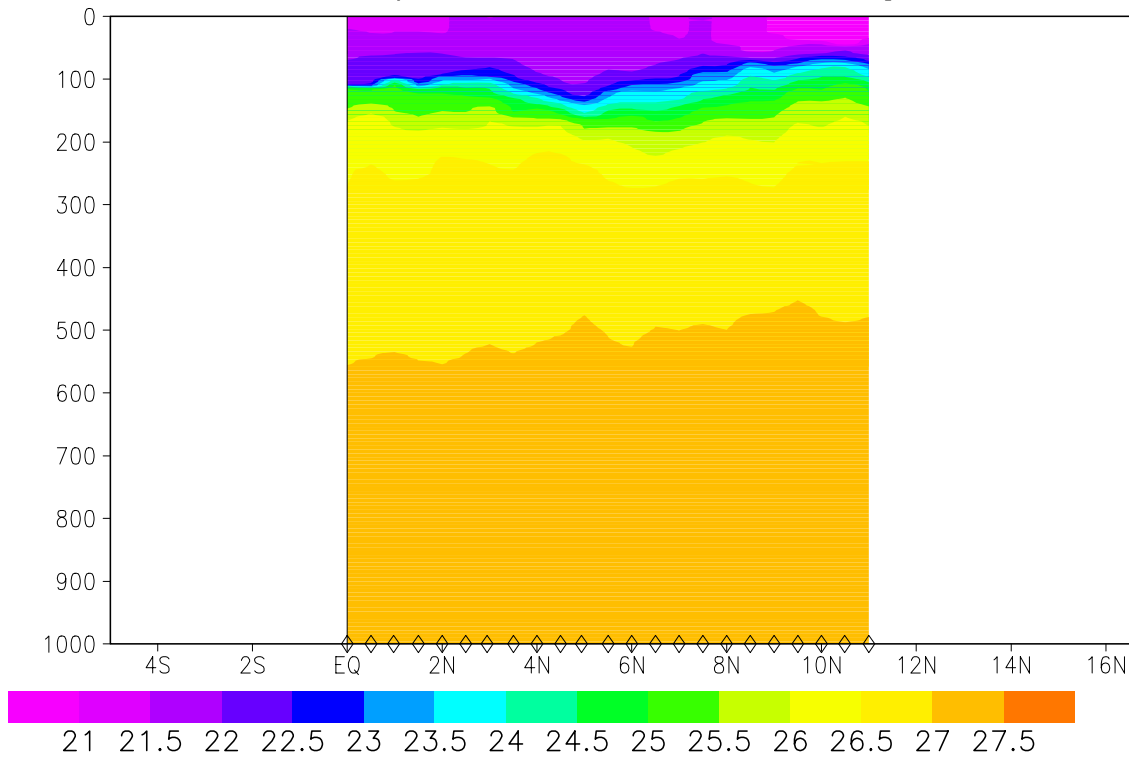


Figure 8.2.4a. Same as in Figure 8.2.2a but for section 3 (see section 2 and Fig. 2.2 in the text), along 88.5°E.

JASMINE May 18–21, 1999: Sigma Theta



JASMINE May 18–21, 1999: Salinity

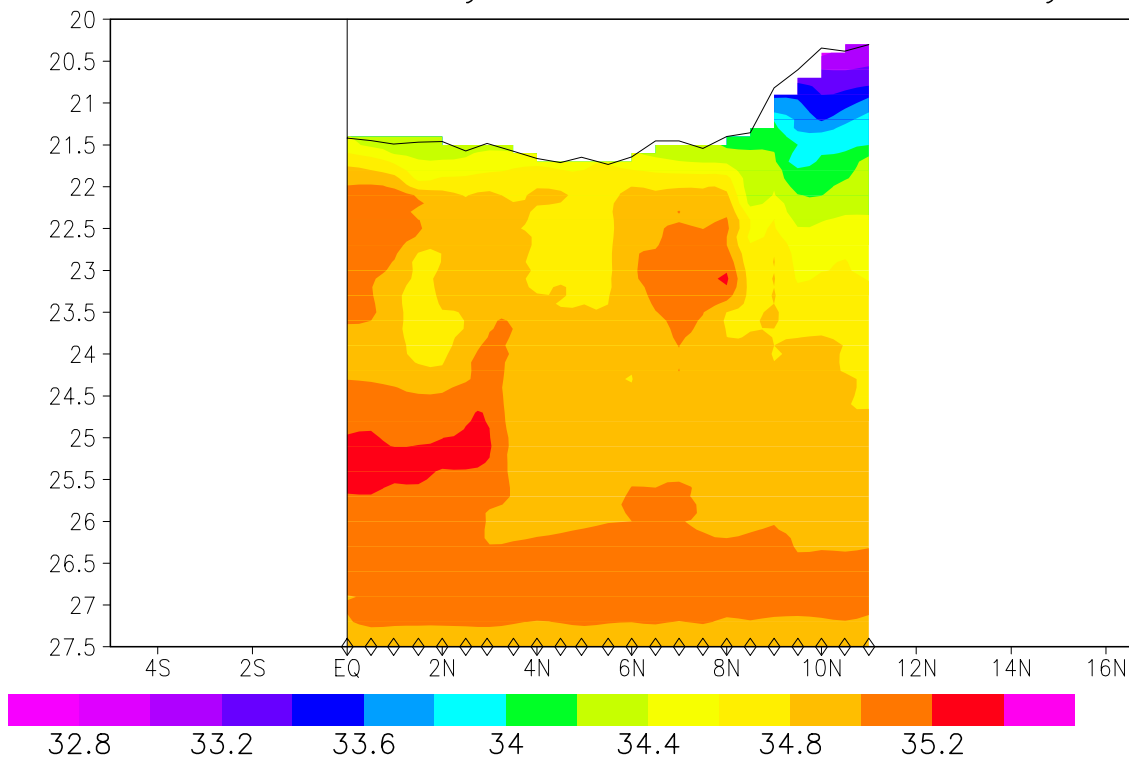


Figure 8.2.4b. Same as in Figure 8.2.2b but for section 3 (see section 2 and Fig. 2.2 in the text), along 88.5°E

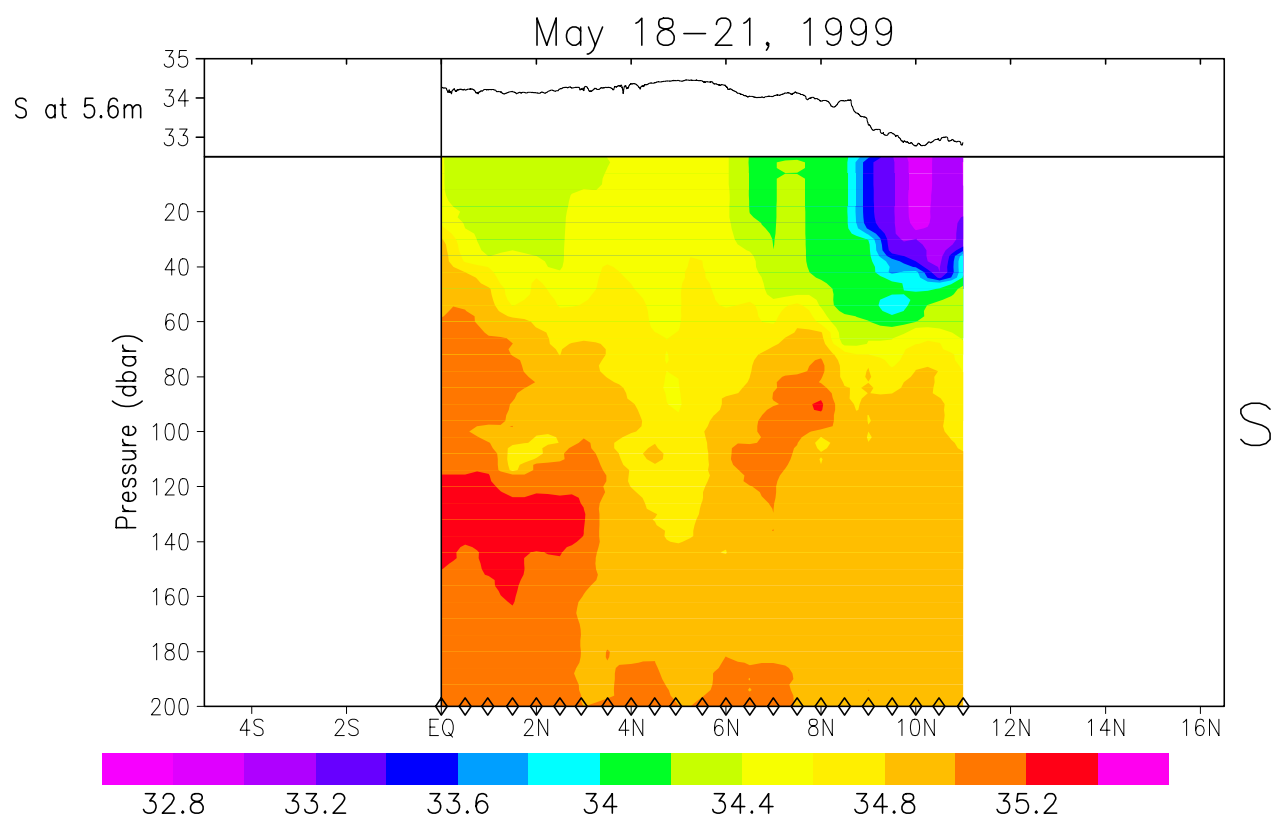
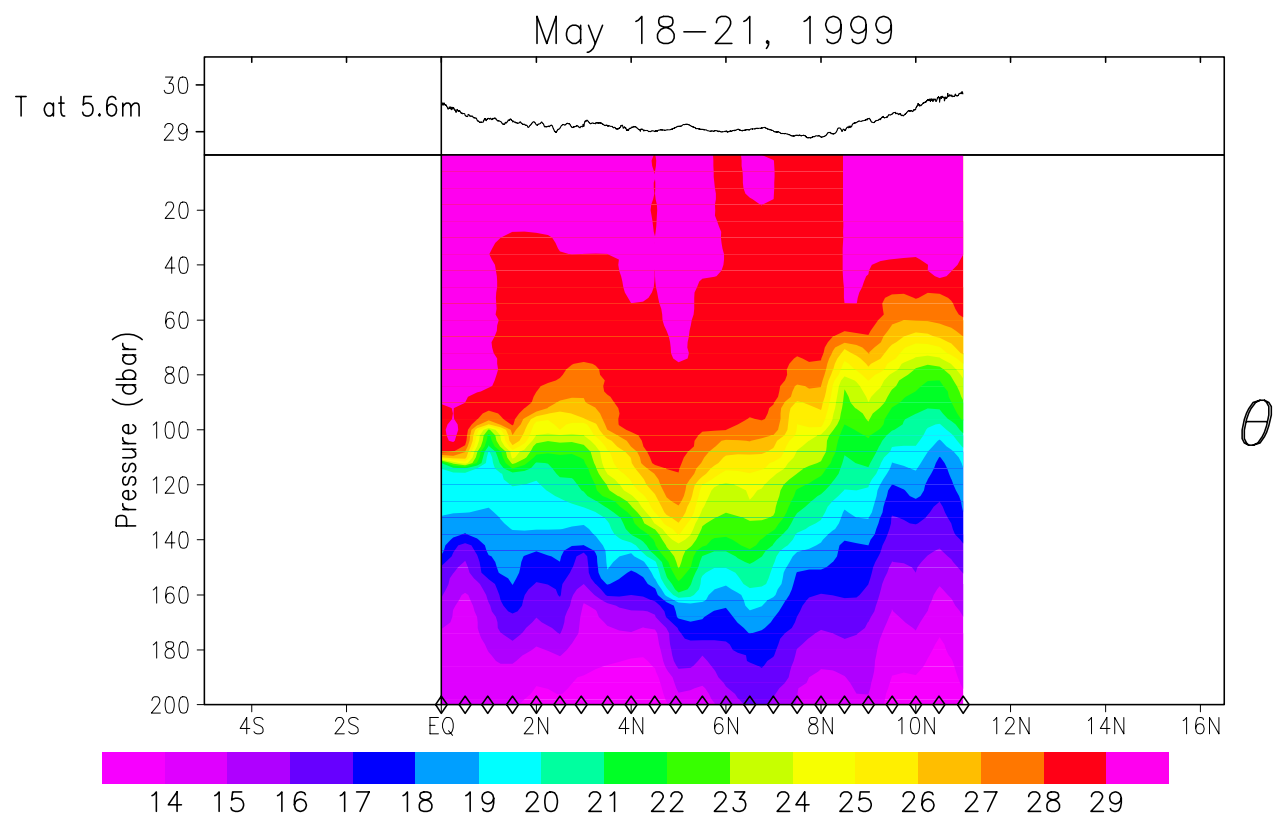


Figure 8.2.4c. Same as in Figure 8.2.2c but for section 3 (see section 2 and Fig. 2.2 in the text), along 88.5°E

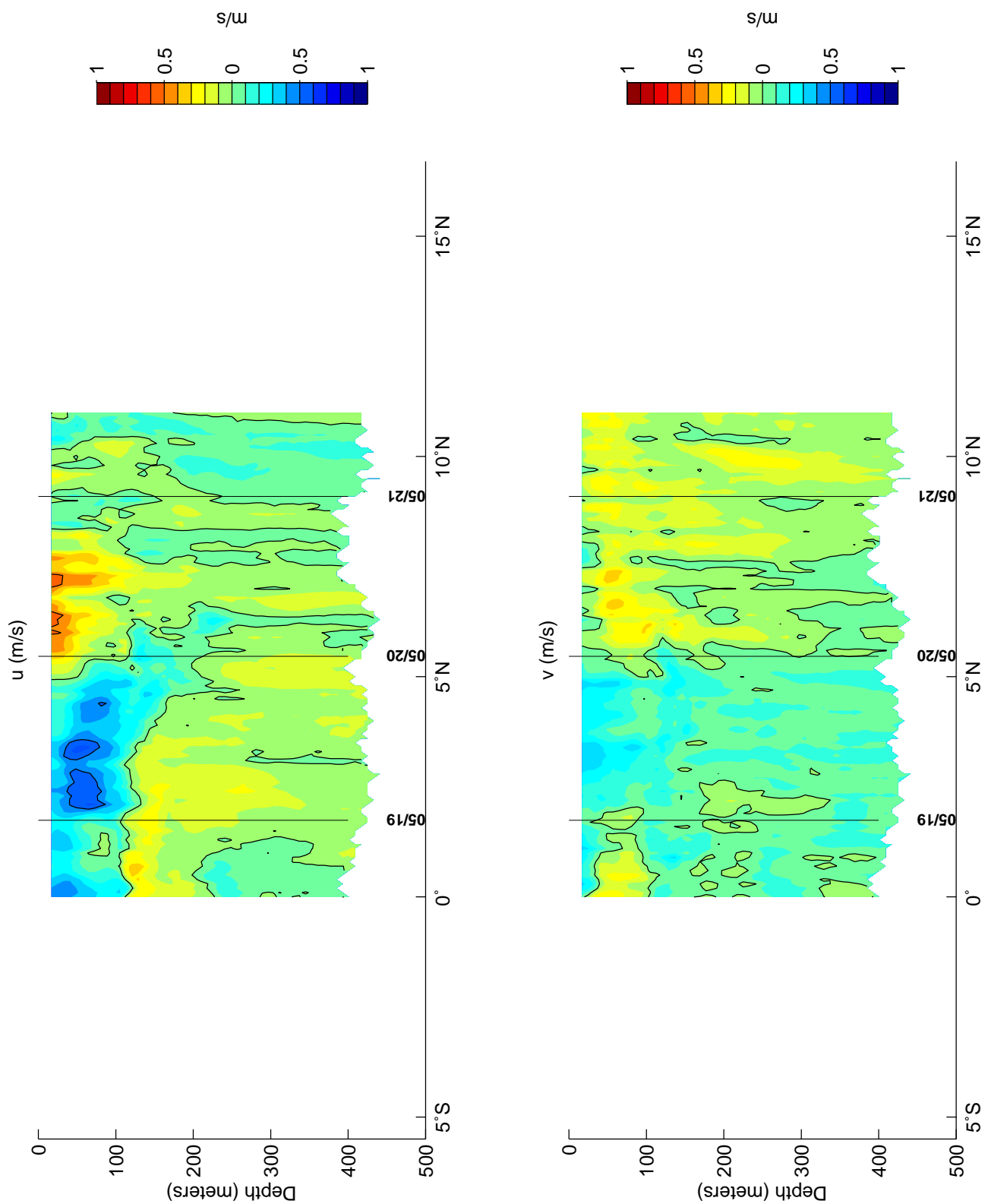
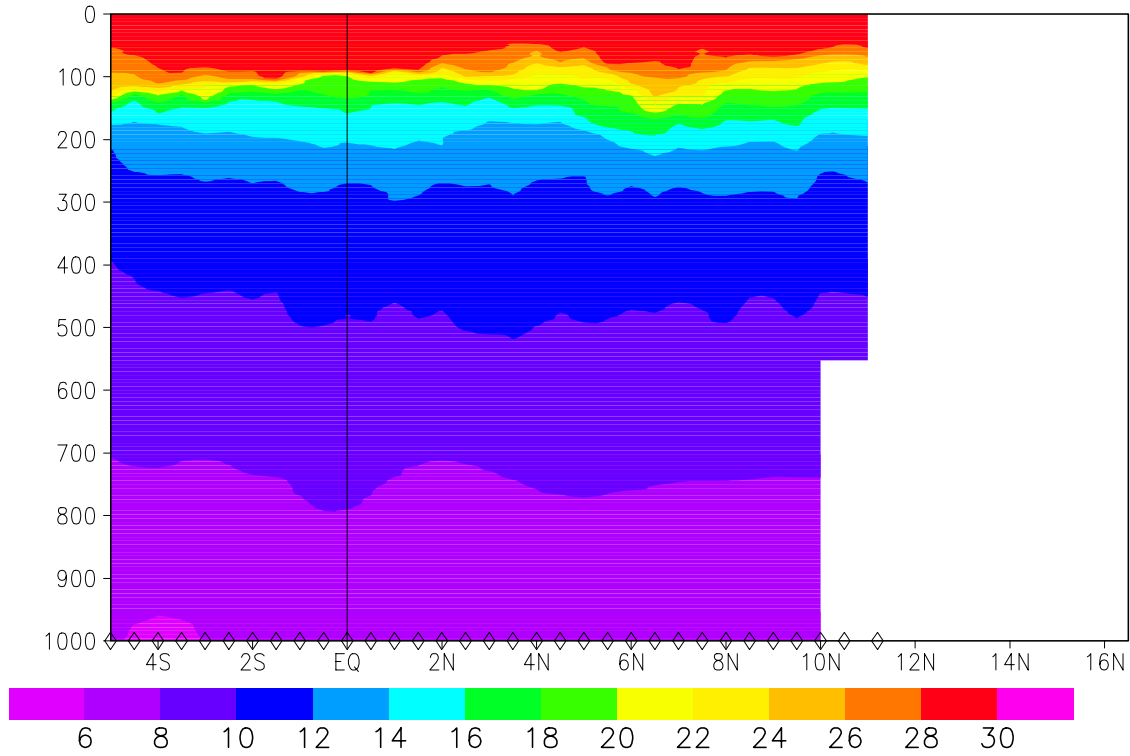


Figure 8.2.4d. Same as in Figure 8.2.2d but for section 3 (see section 2 and Fig. 2.2 in the text), along 88.5°E

May 26–30, 1999: Potential Temperature ($^{\circ}\text{C}$)



May 26–30, 1999: Salinity

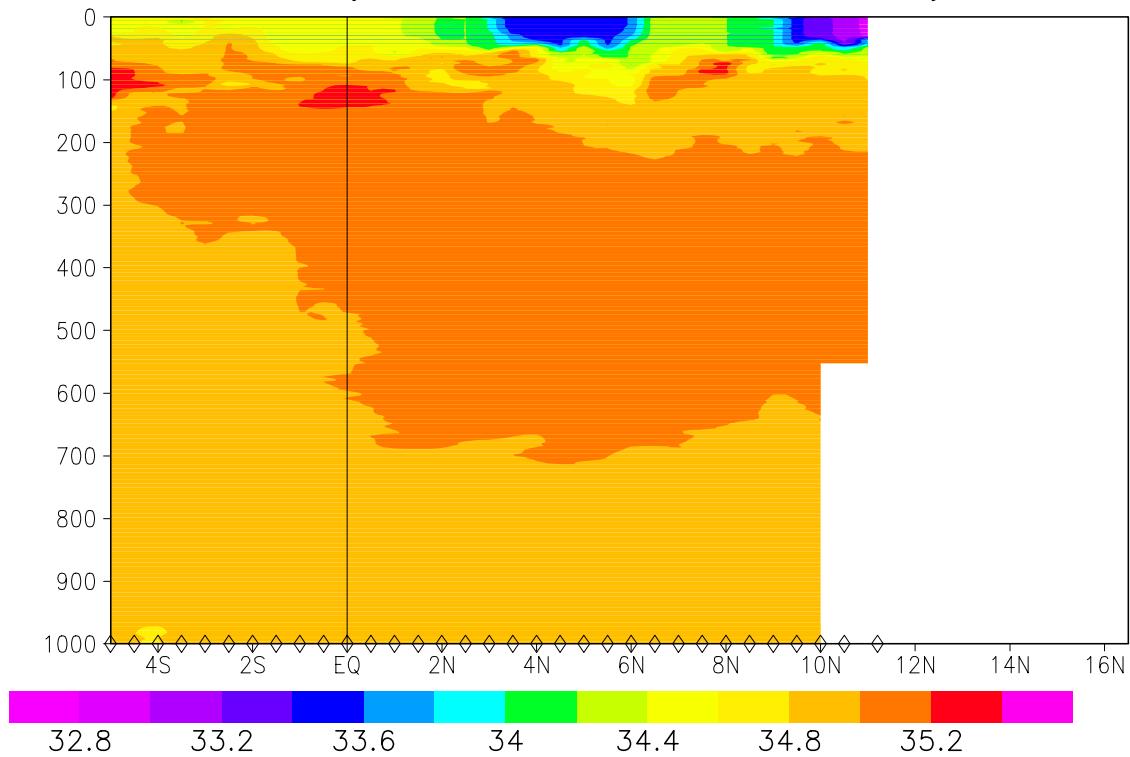
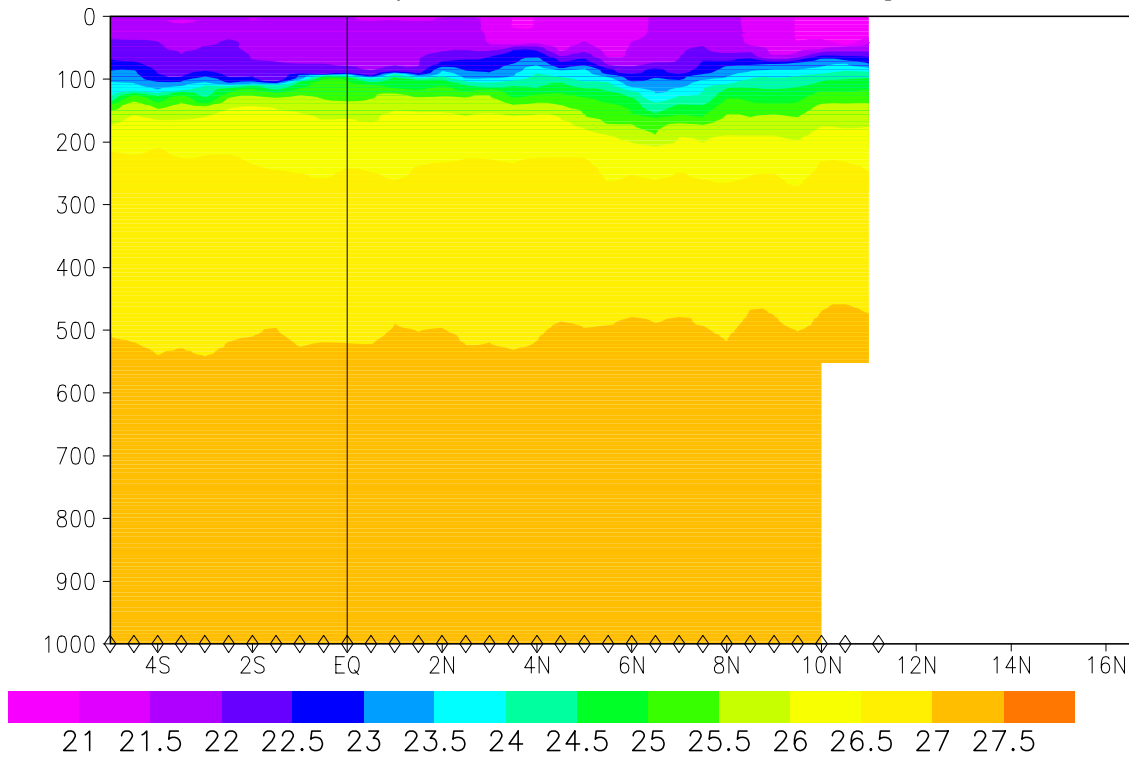


Figure 8.2.5a. Same as in Figure 8.2.2a but for section 4 (see section 2 and Fig. 2.2 in the text), from 88°E through 94°E .

JASMINE May 26–30, 1999: Sigma Theta



JASMINE May 26–30, 1999: Salinity

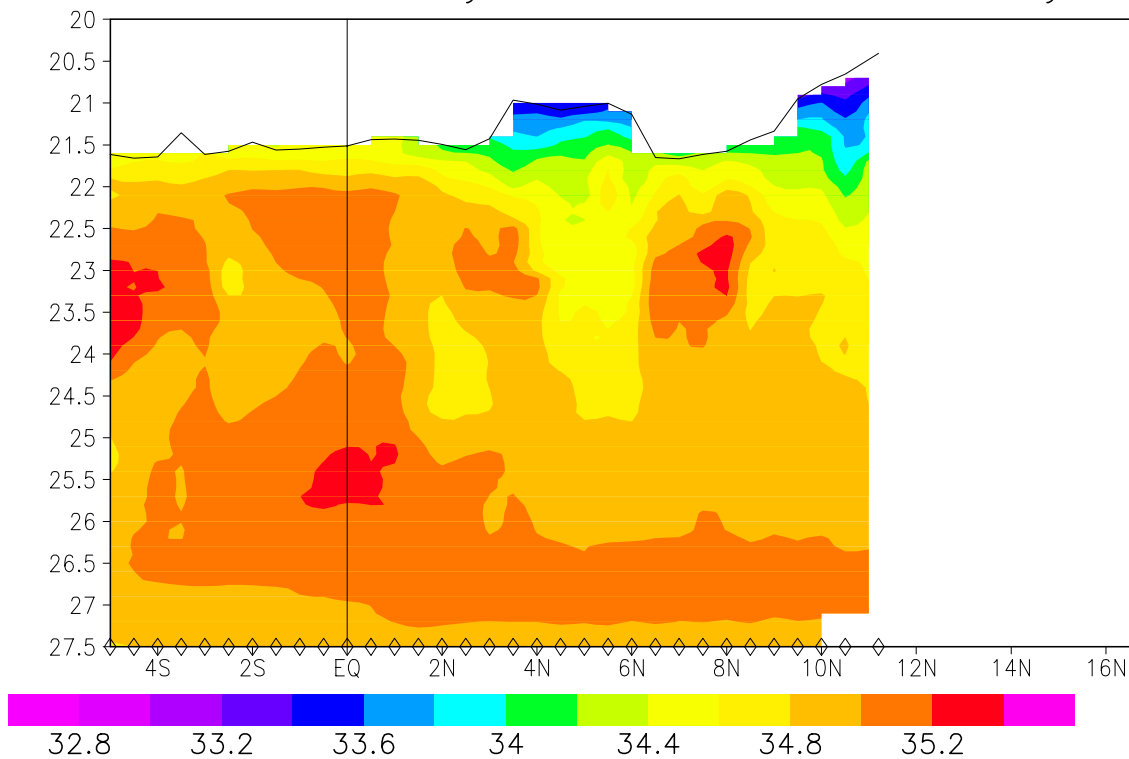


Figure 8.2.5b. Same as in Figure 8.2.2b but for section 4 (see section 2 and Fig. 2.2 in the text), from 88°E through 94°E.

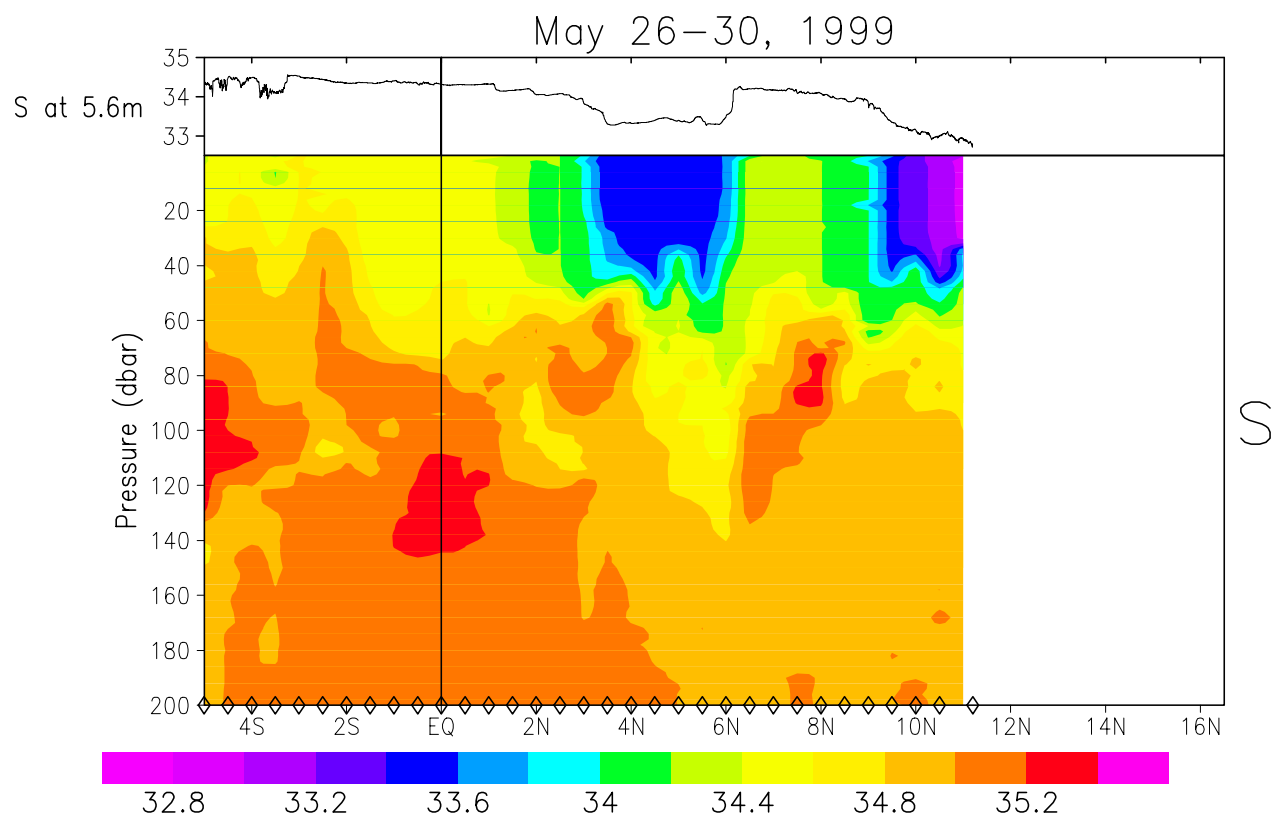
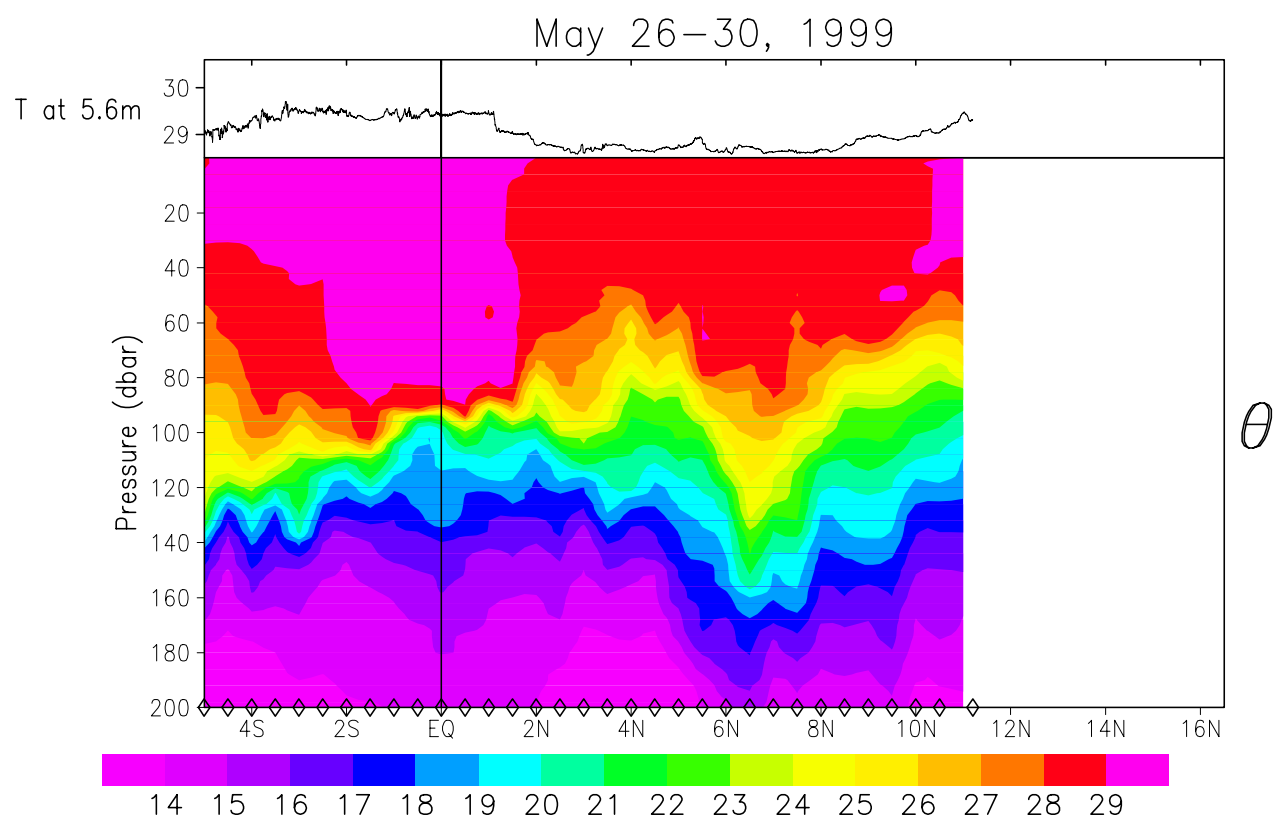


Figure 8.2.5c. Same as in Figure 8.2.2c but for section 4 (see section 2 and Fig. 2.2 in the text), from 88°E through 94°E.

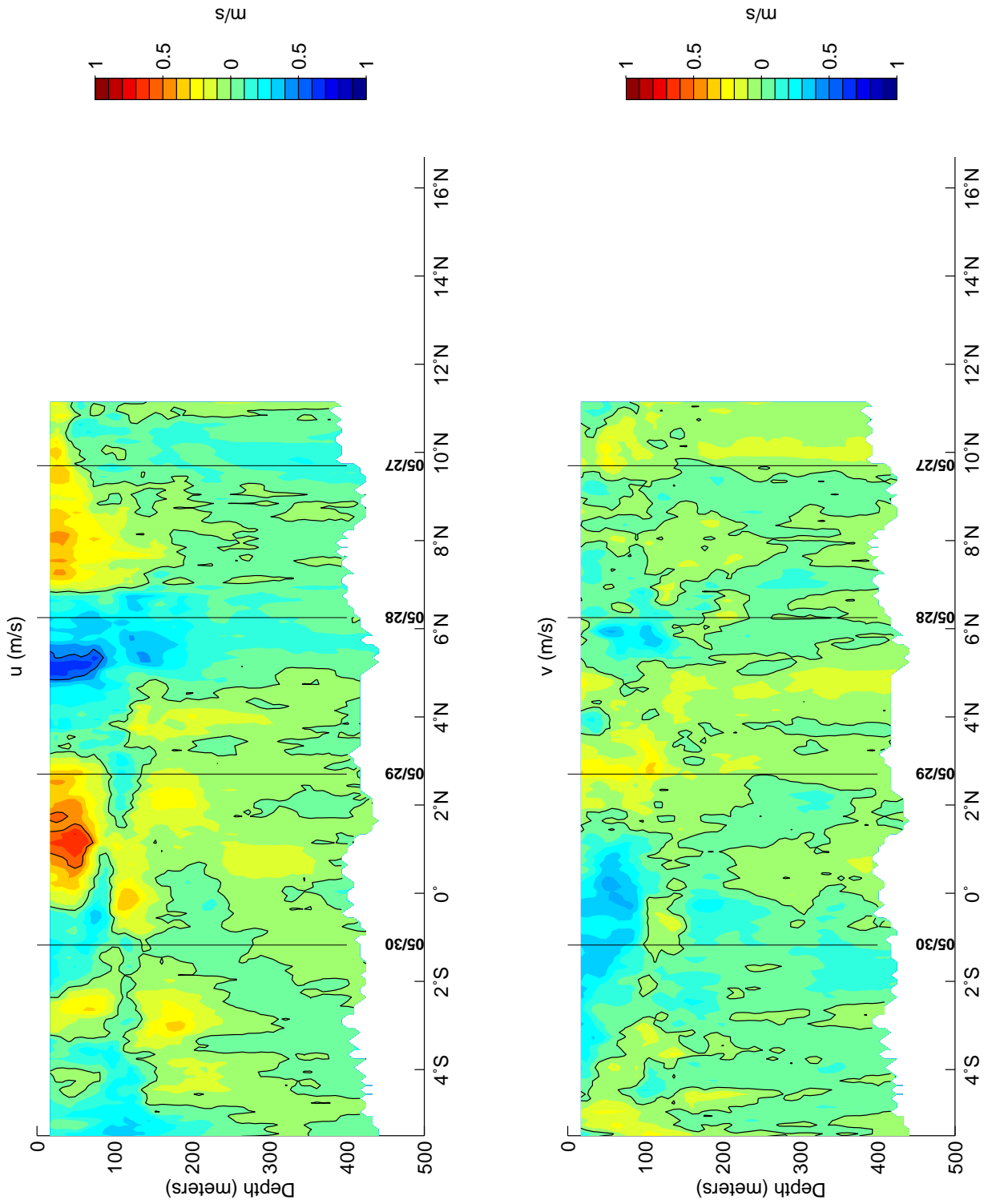


Figure 8.2.5d. Same as in Figure 8.2.2d but for section 4 (see section 2 and Fig. 2.2 in the text), from 88°E through 94°E.

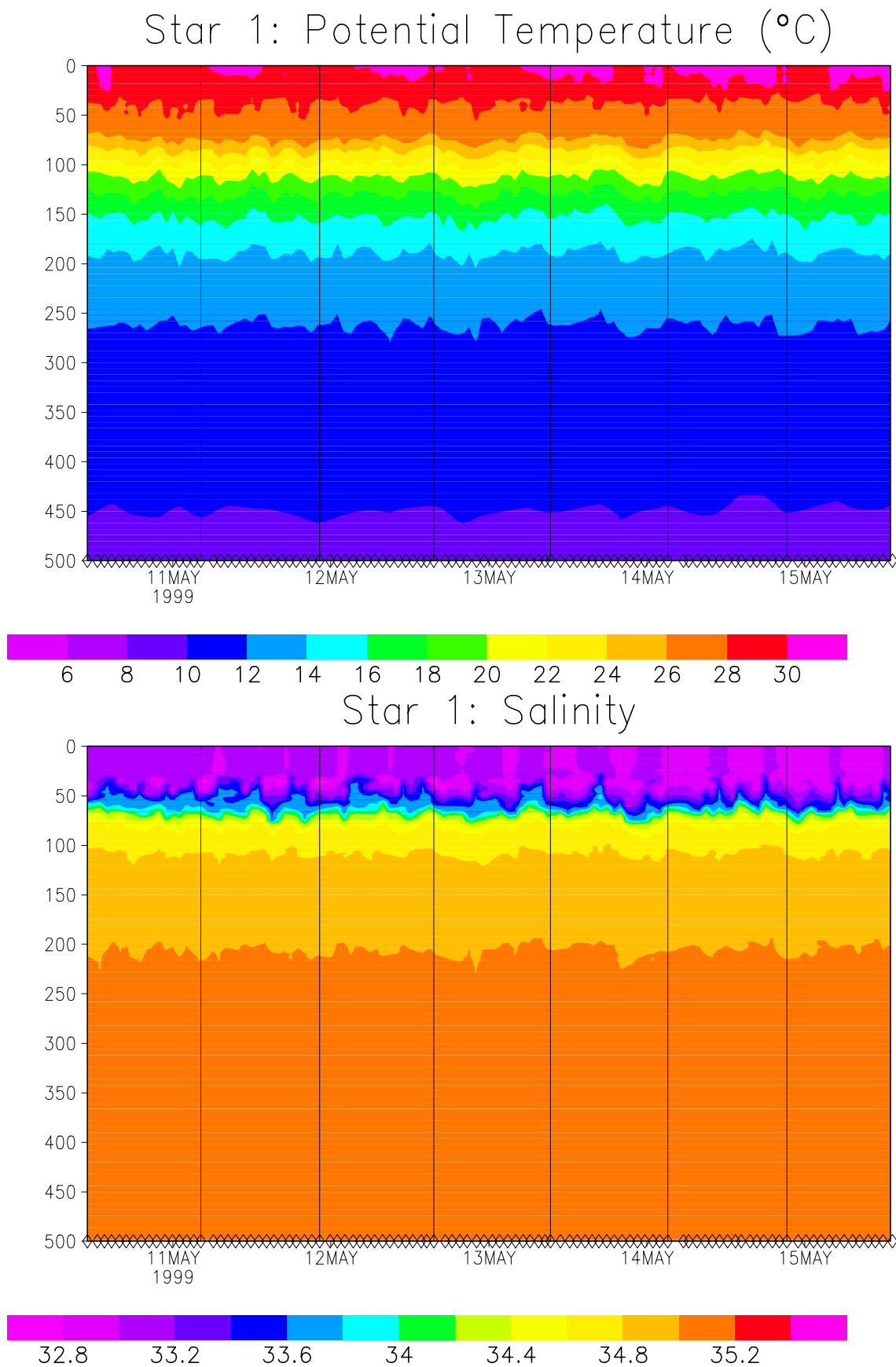
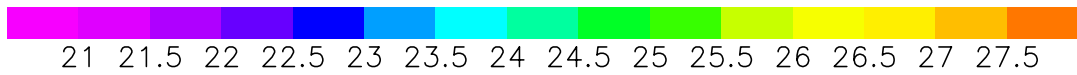
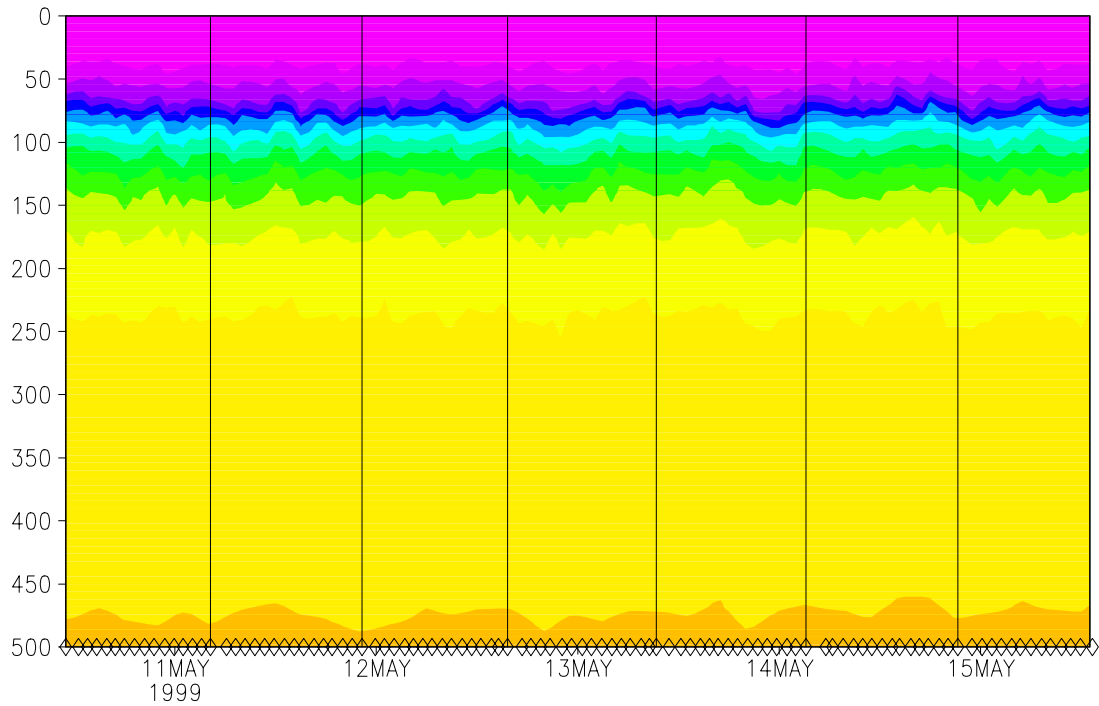


Figure 8.2.6a. Same as in Figure 8.2.1a but during the time of the first STAR survey (see section 2 and Fig. 2.2 in the text), during the main JASMINE cruise. Vertical lines denote the beginning of a star circuit.

Star 1: Sigma Theta



Star 1: Salinity

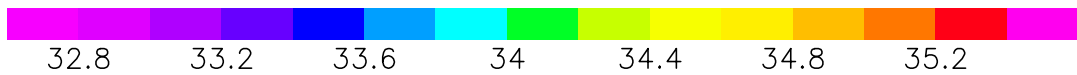
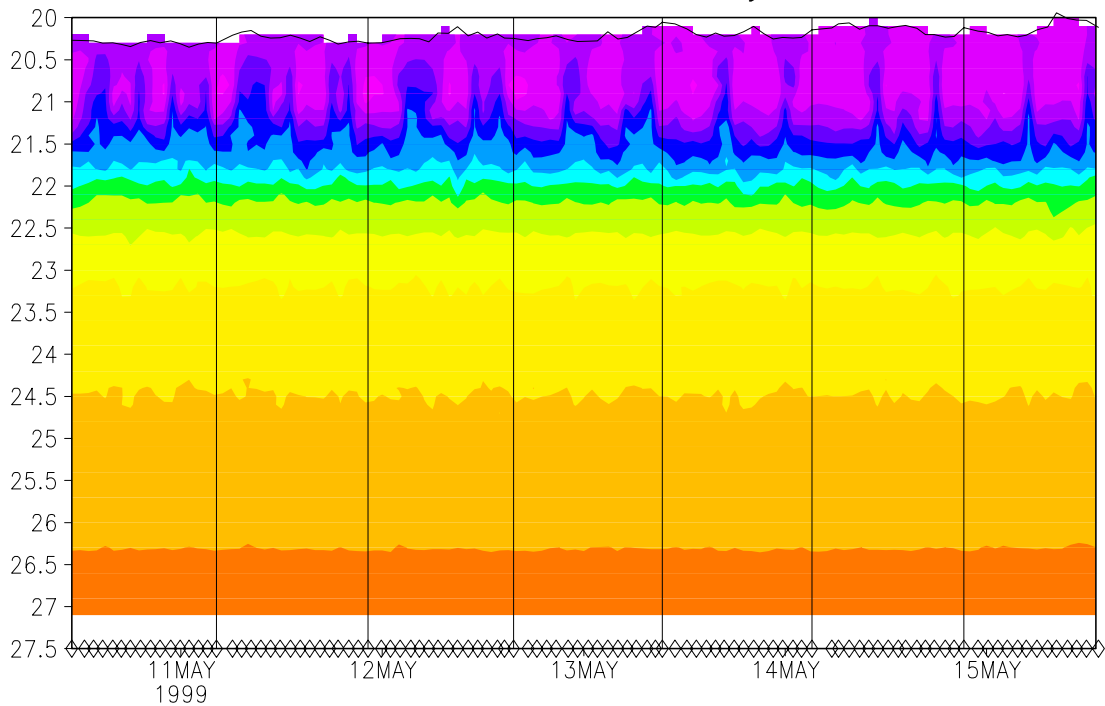


Figure 8.2.6b. Same as in Figure 8.2.1b but during the time of the first STAR survey (see section 2 and Fig. 2.2 in the text), during the main JASMINE cruise. Vertical lines denote the beginning of a star circuit.

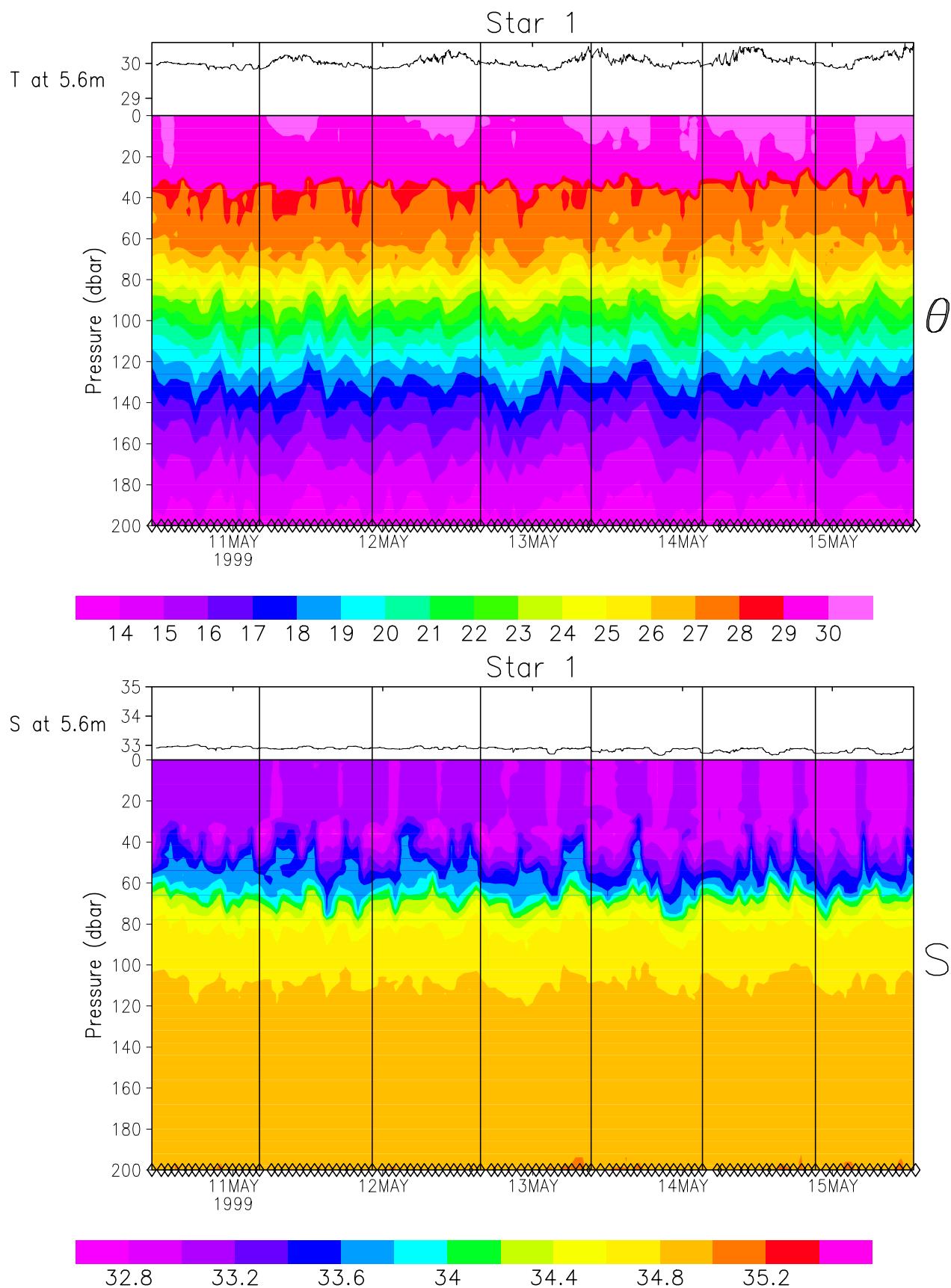


Figure 8.2.6c. Same as in Figure 8.2.1c but during the time of the first STAR survey (see section 2 and Fig. 2.2 in the text), during the main JASMINE cruise. Vertical lines denote the beginning of a star circuit.

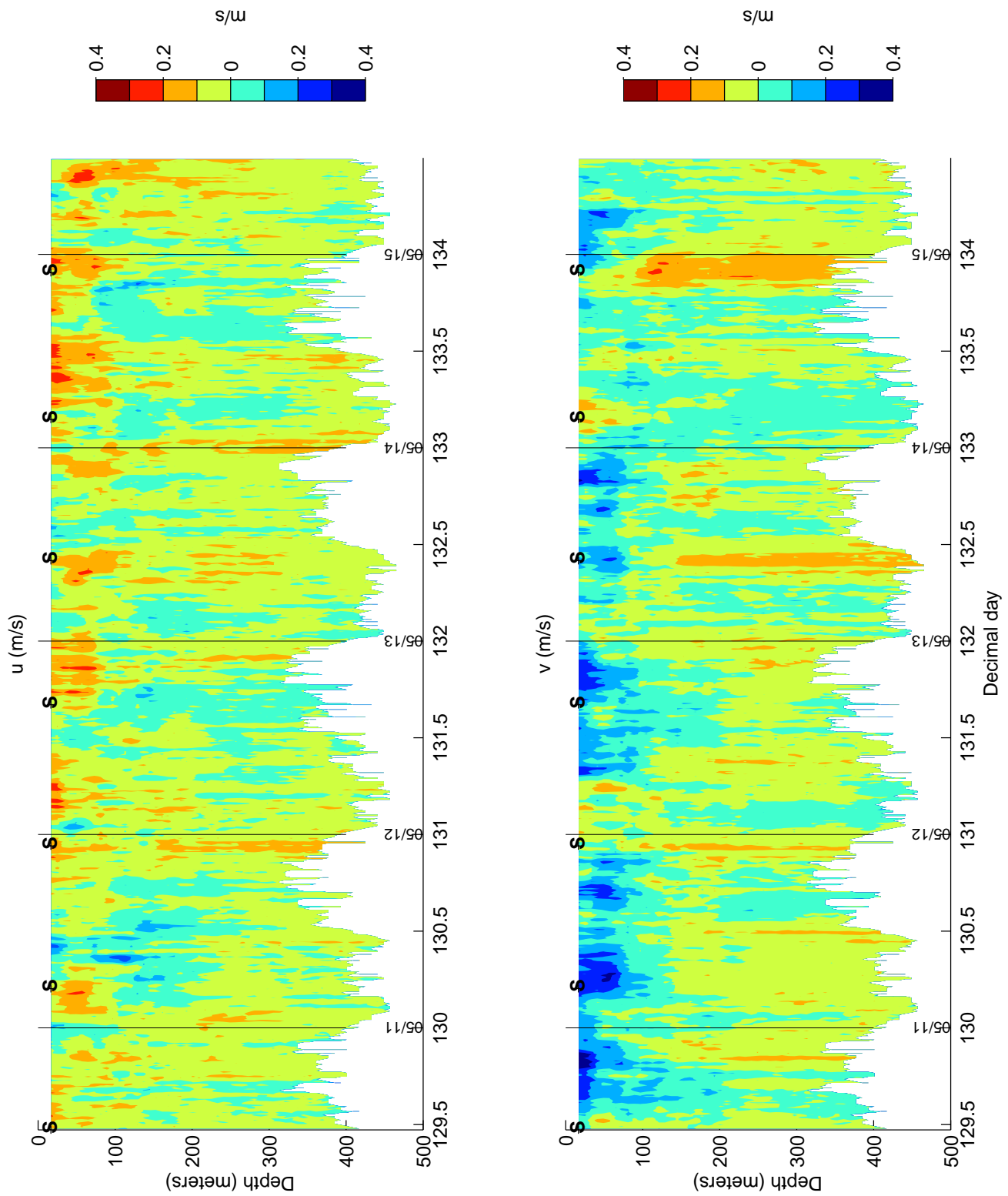


Figure 8.2.6d. Same as in Figure 8.2.1d but during the time of the first STAR survey (see section 2 and Fig. 2.2 in the text), during the main JASMINE cruise. S's denote the beginning of a star circuit.

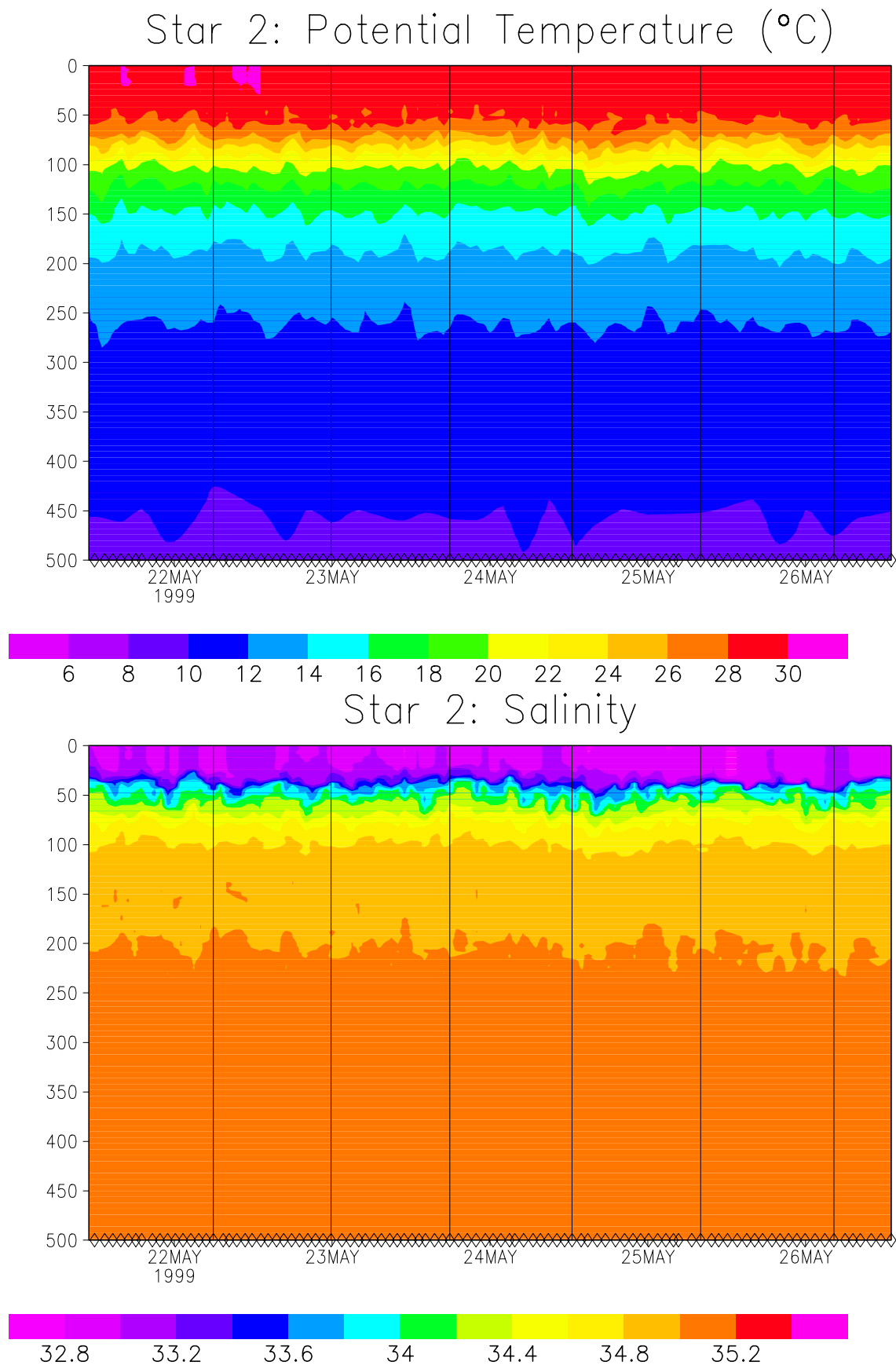
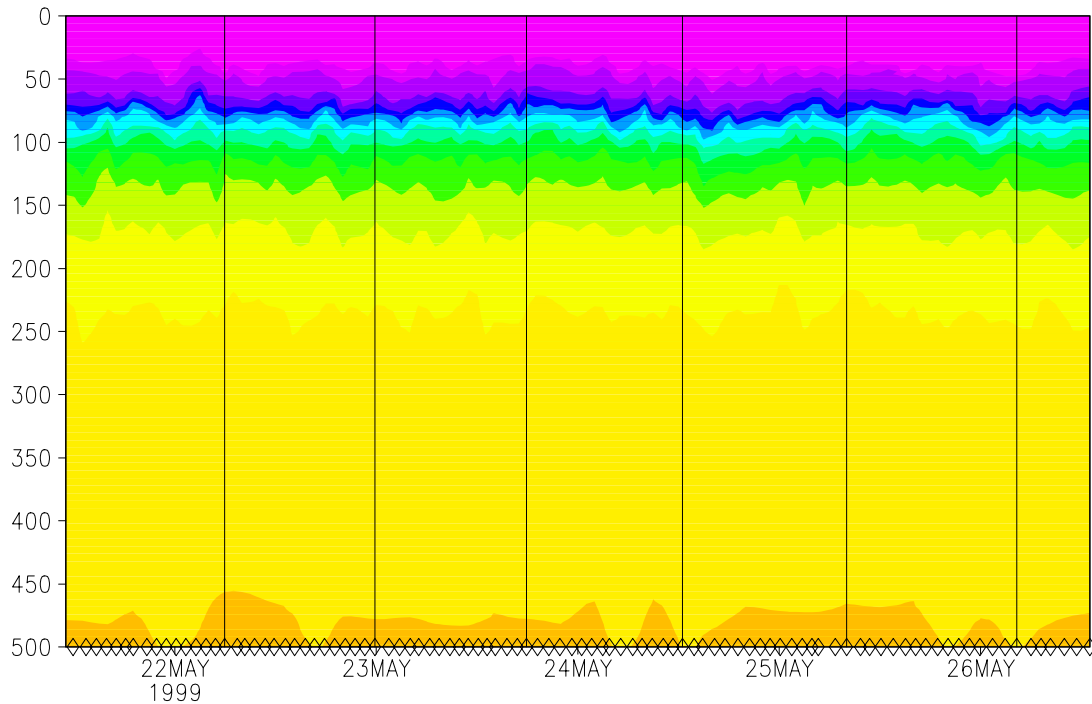


Figure 8.2.7a. Same as in Figure 8.2.6a but during the time of the second STAR survey.

Star 2: Sigma Theta



Star 2: Salinity

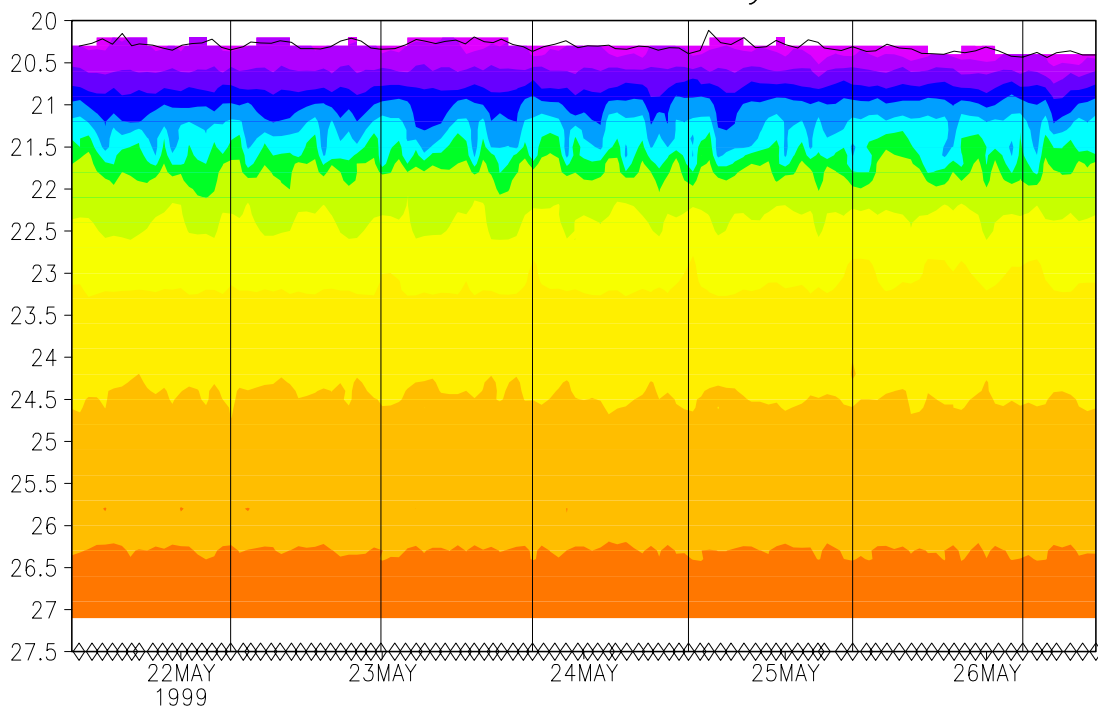


Figure 8.2.7b. Same as in Figure 8.2.6b but during the time of the second STAR survey.

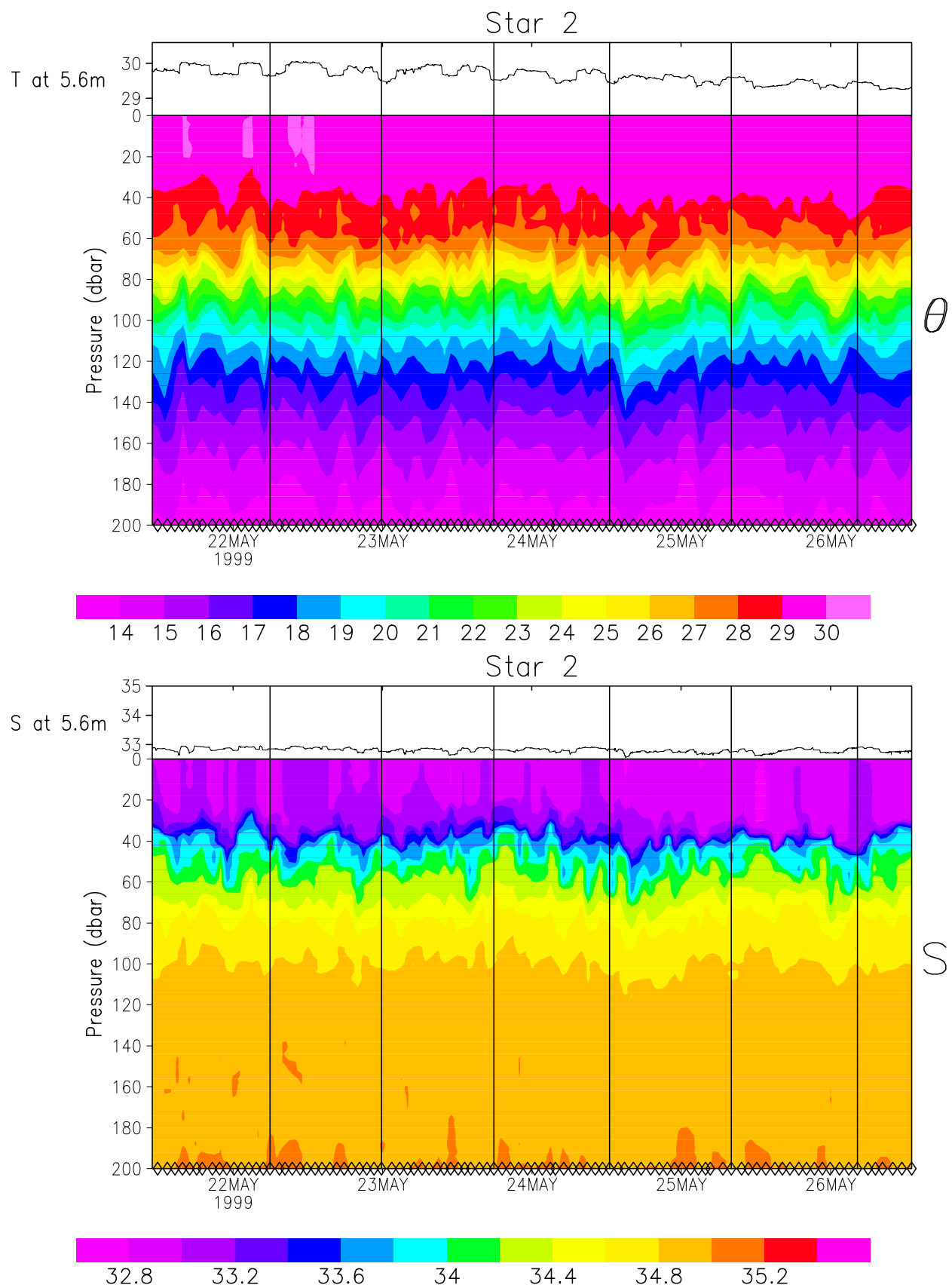


Figure 8.2.7c. Same as in Figure 8.2.6c but during the time of the second STAR survey.

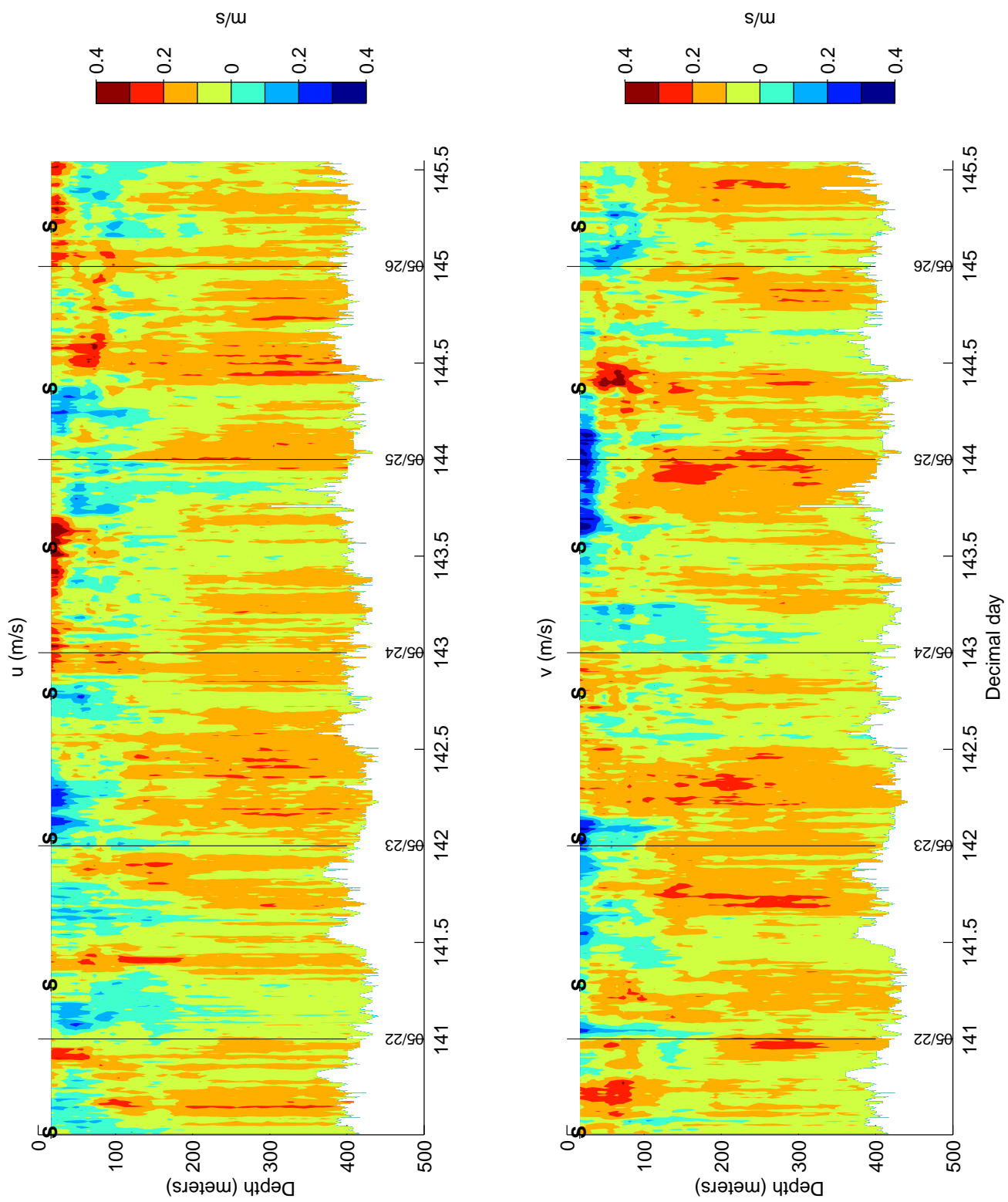


Figure 8.2.7d. Same as in Figure 8.2.6d but for the time of the second STAR survey.

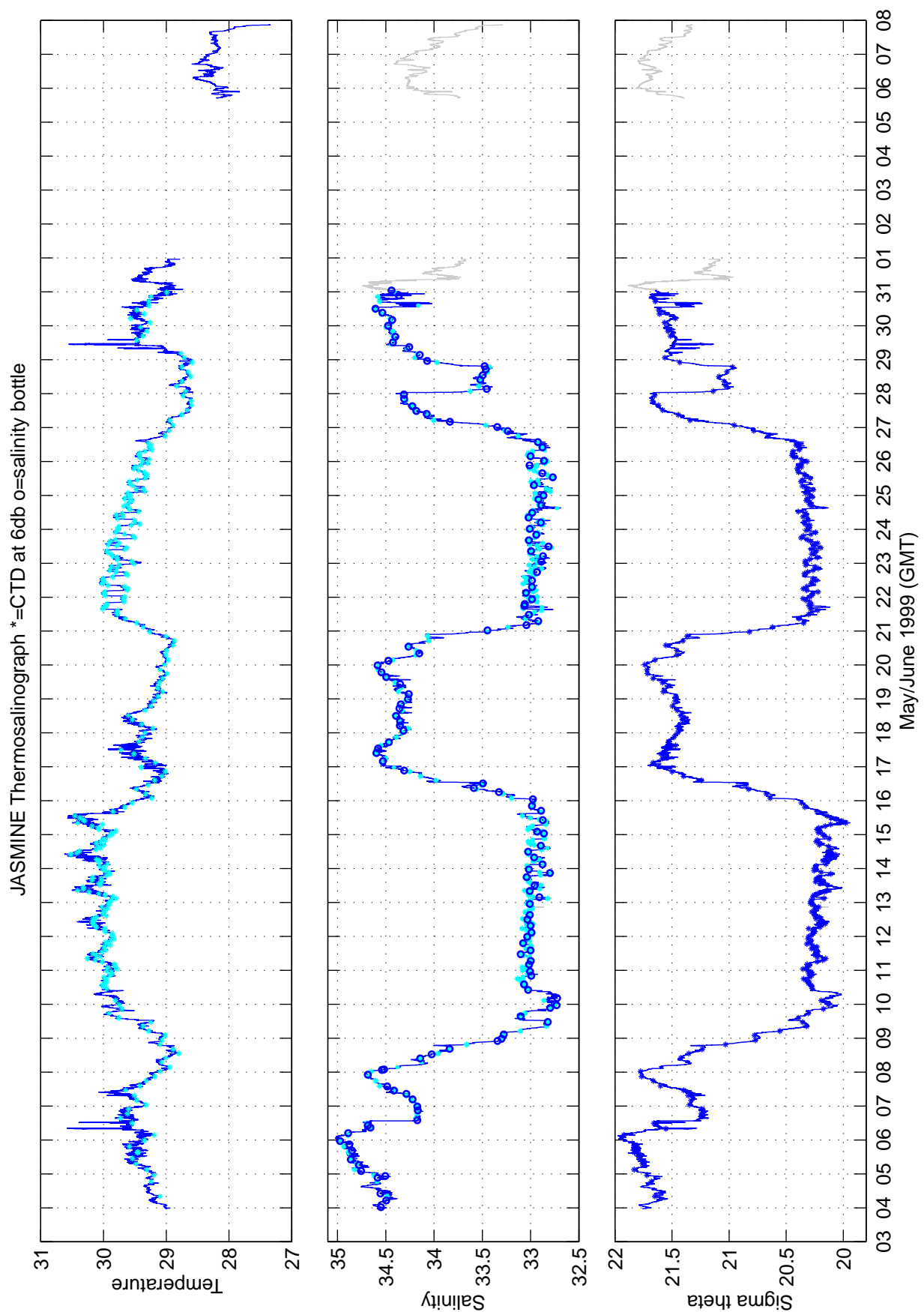


Figure 8.3.1. Time series of near surface temperature, near surface salinity and potential density measured by the thermosalinograph during the main JASMINE cruise. Asterisks indicate CTD data at 6 dbar and circles indicate the salinity from water samples. The gray shaded lines show where there were no water samples to calibrate the salinity.

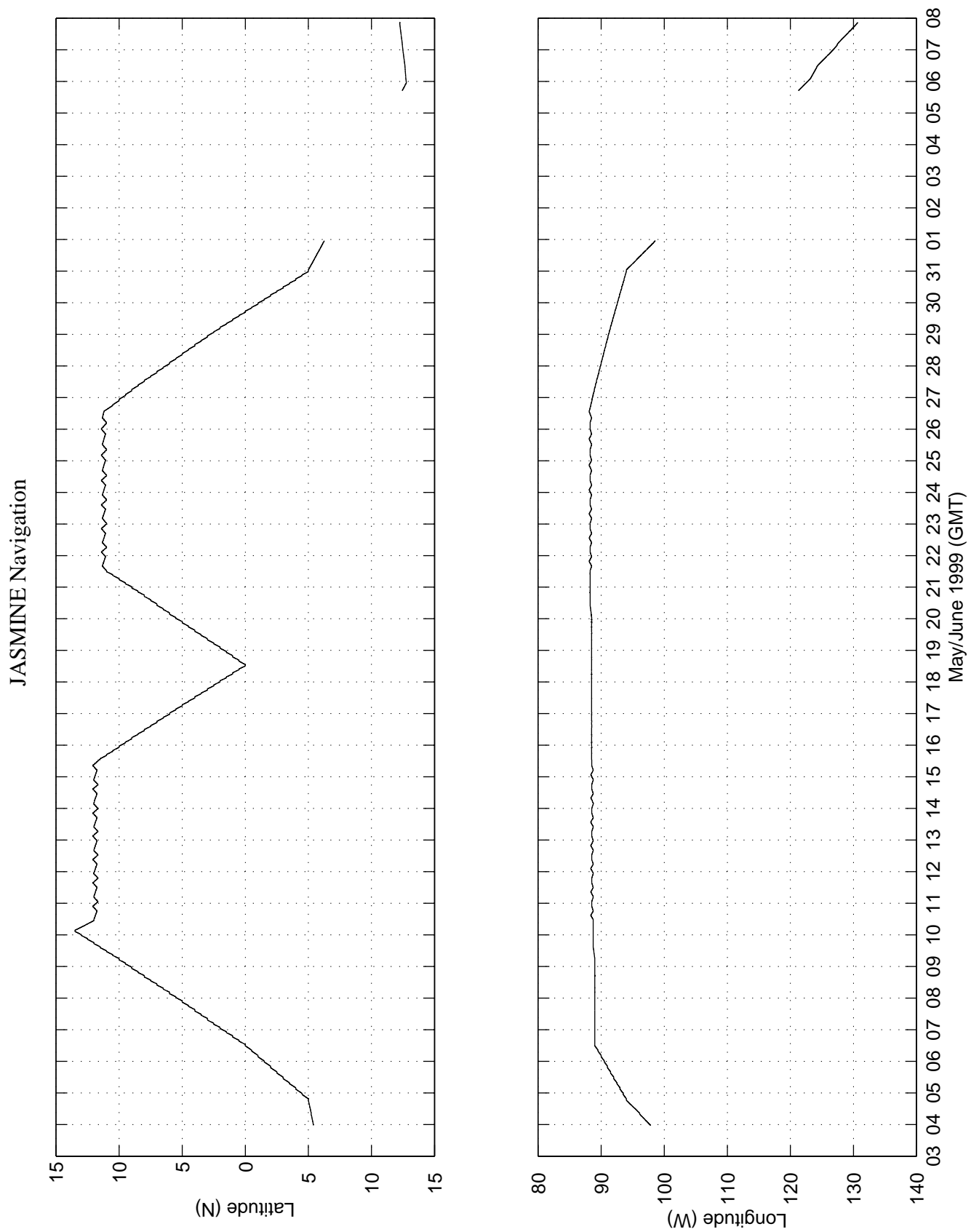


Figure 8.3.2. Time series of the ship's position from GPS during the main JASMINE cruise.

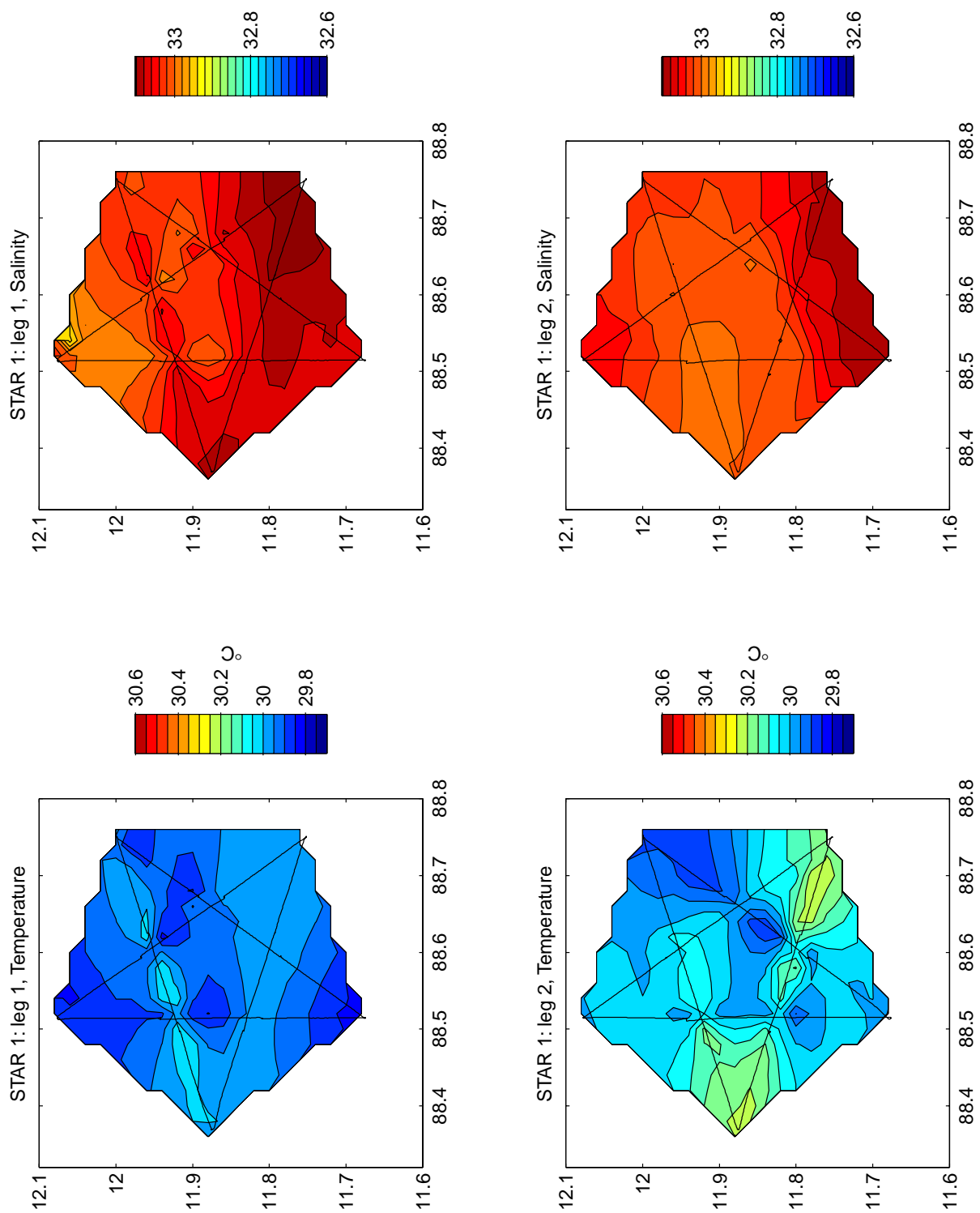


Figure 8.3.3. Contours of thermosalinograph near surface temperature and salinity in the area covered during the seven circuits of the first STAR survey.

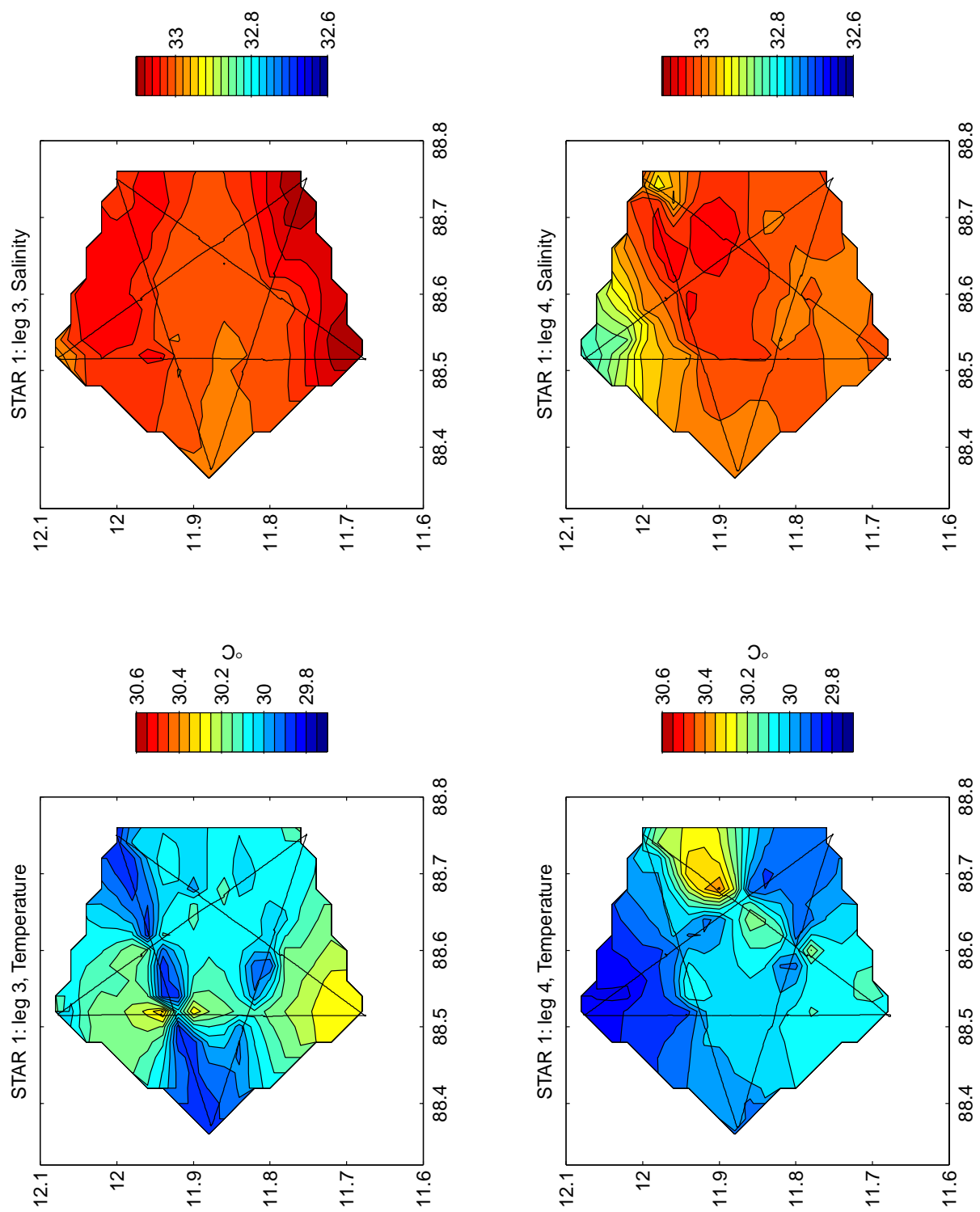


Figure 8.3.3. Continued, for circuits three and four during the first STAR survey.

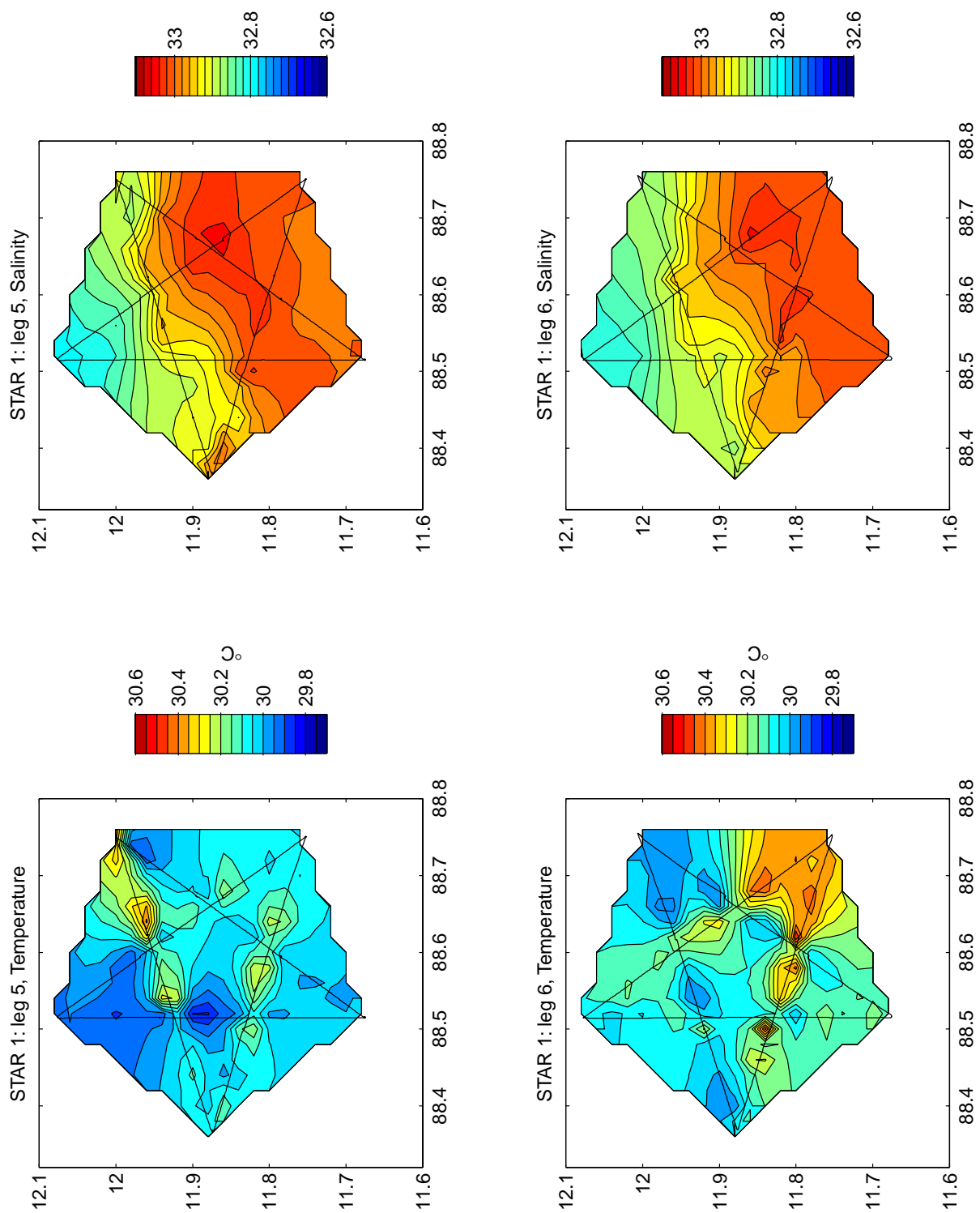


Figure 8.3.3. Continued, for circuits five and six during the first STAR survey.

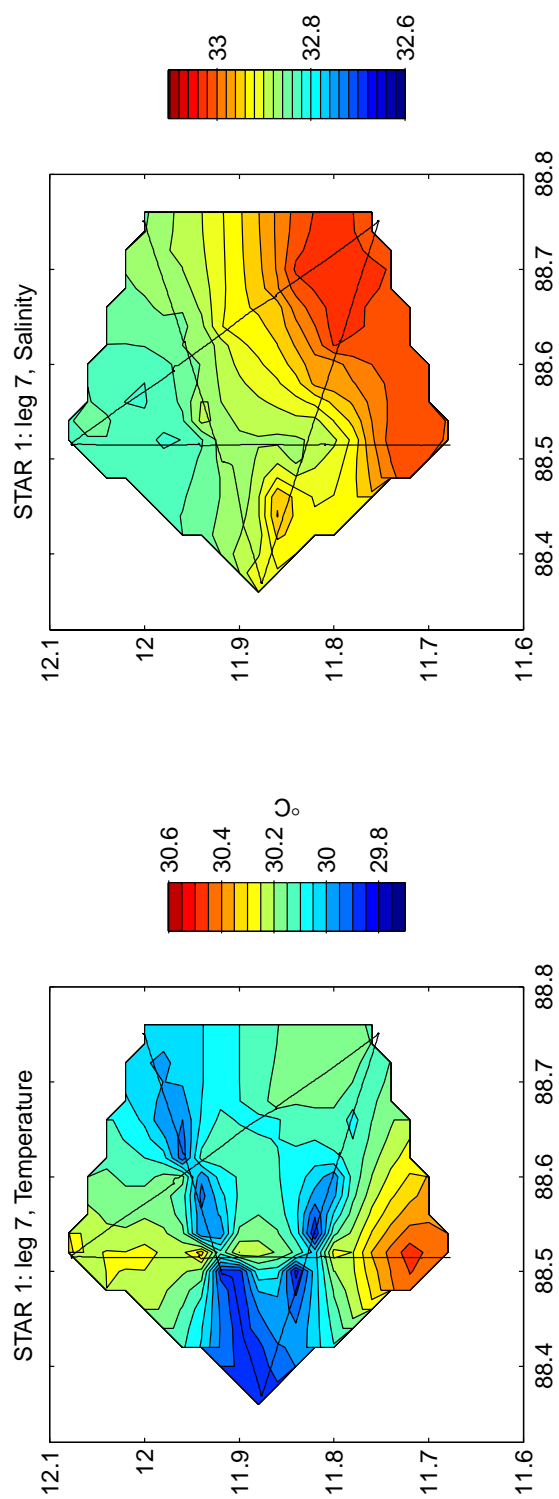


Figure 8.3.3. Continued, for circuit seven during the first STAR survey.

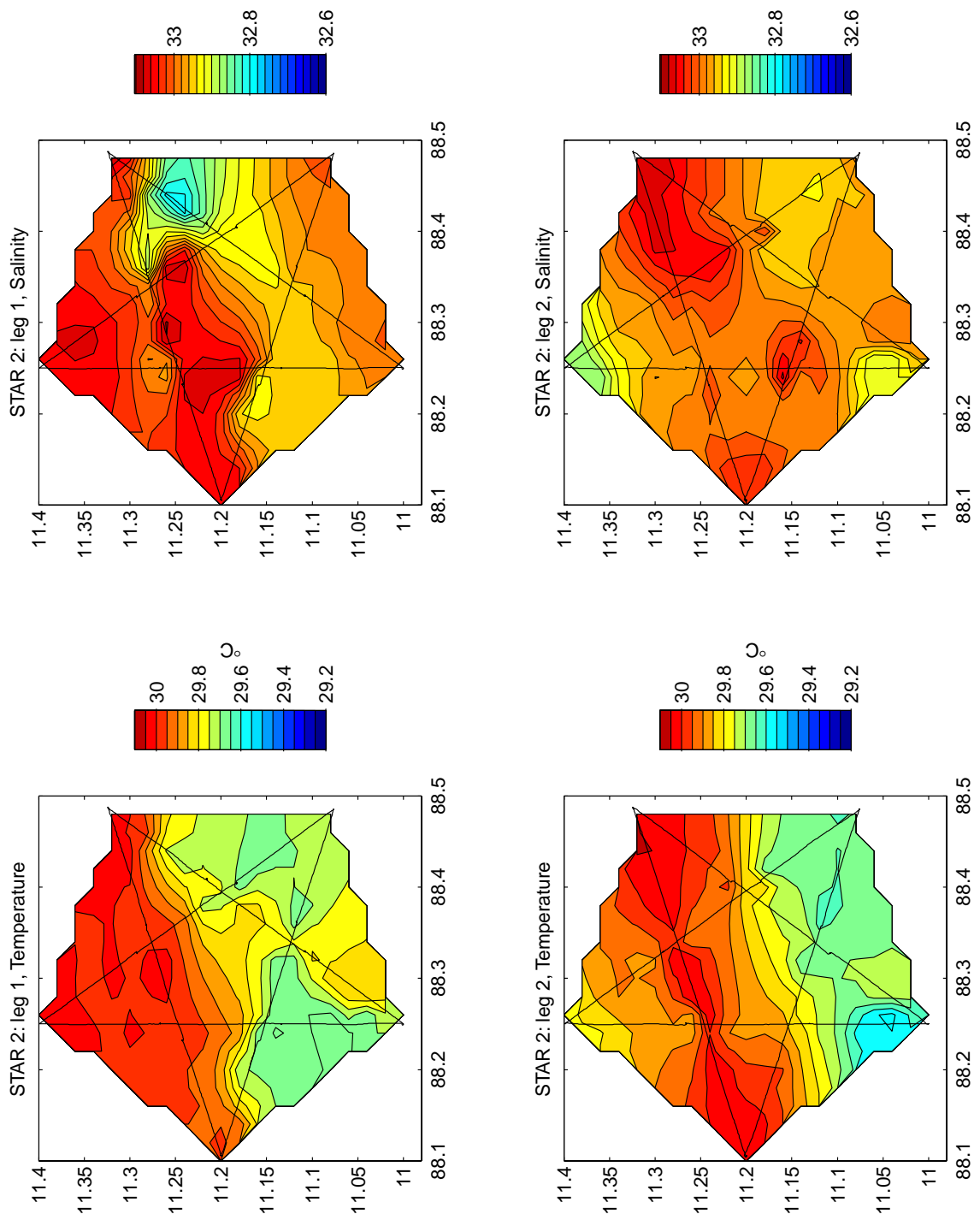


Figure 8.3.4. Same as Fig. 8.3.3 but during the second STAR survey.

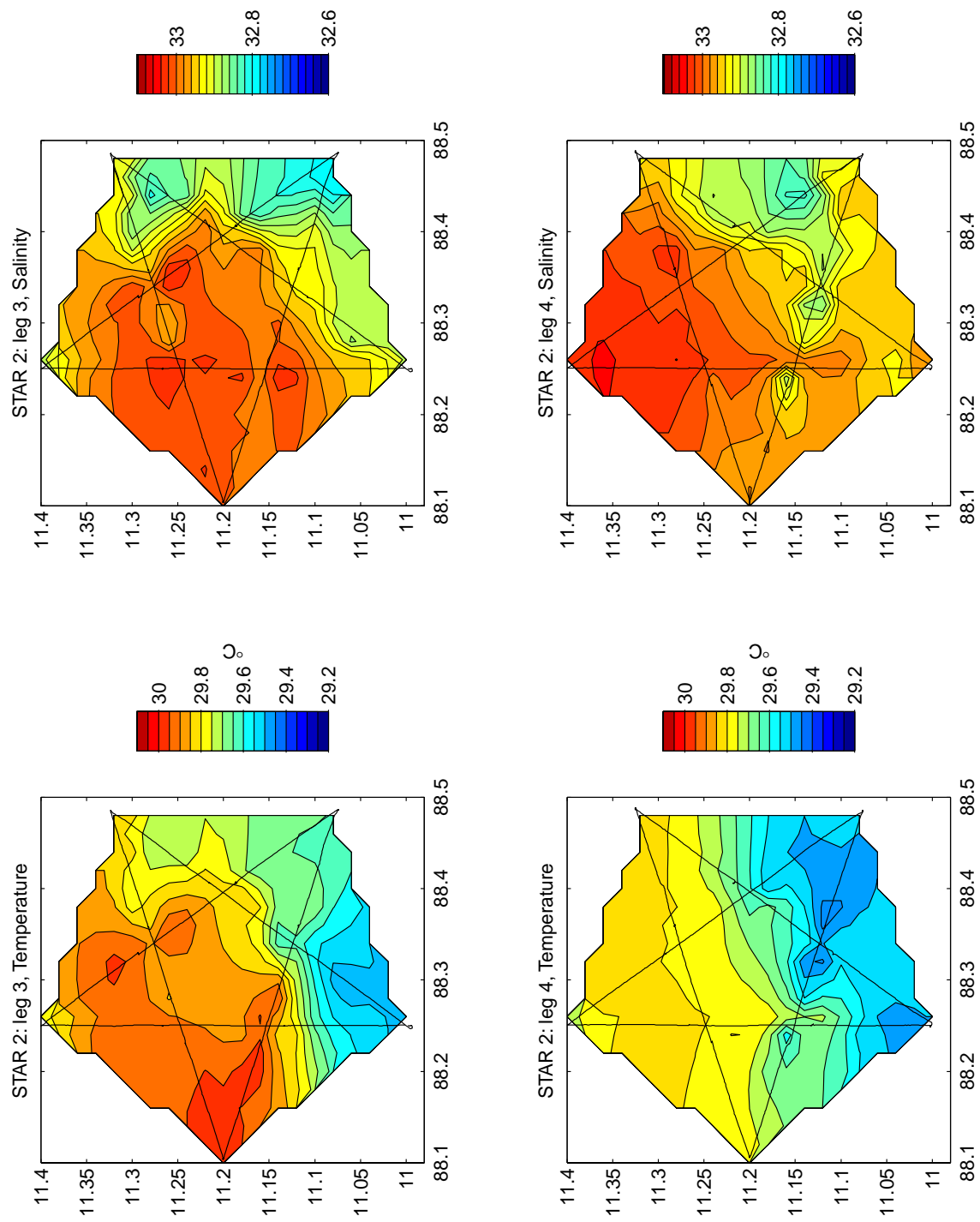


Figure 8.3.4. Continued, for circuits three and four during the second STAR survey.

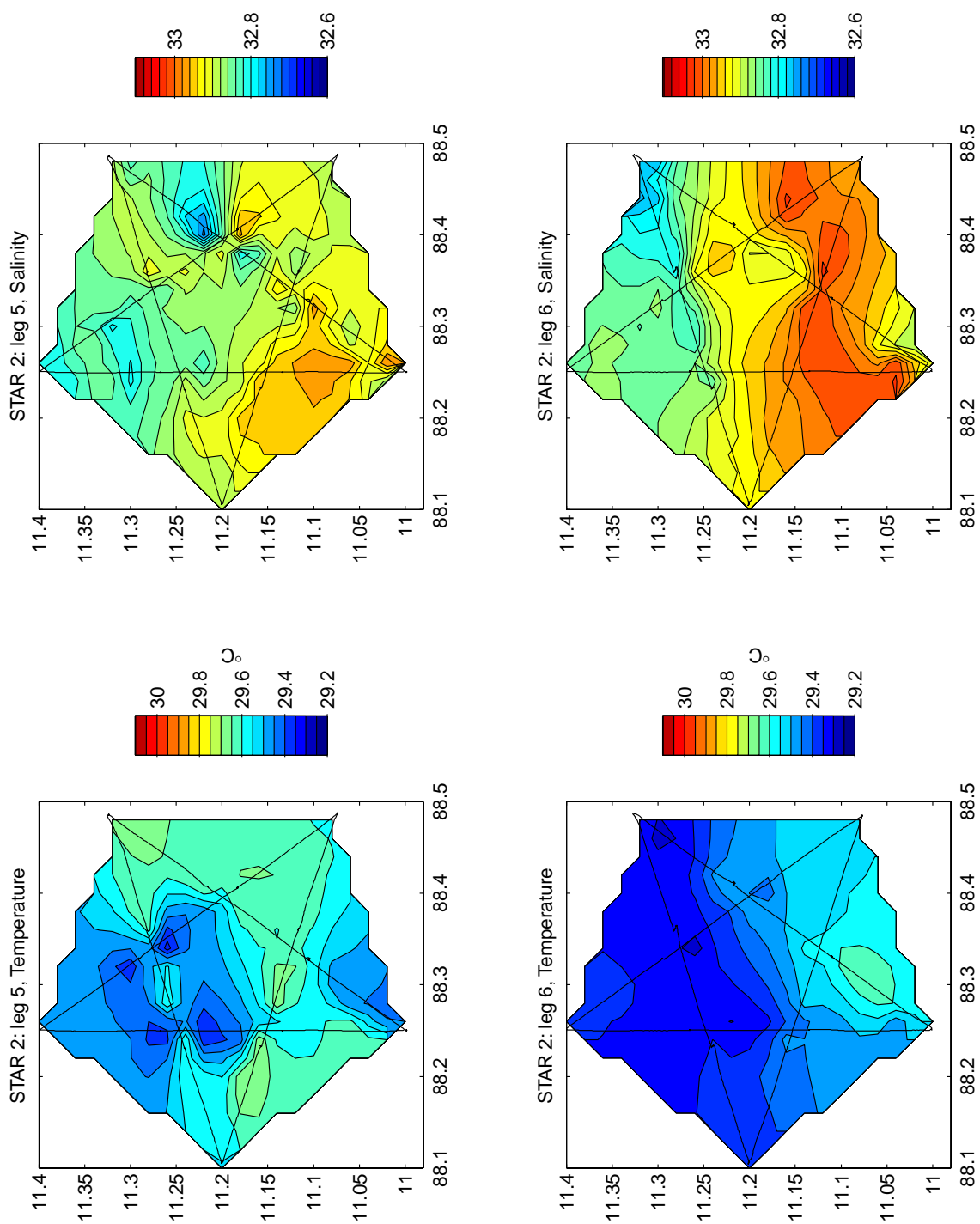


Figure 8.3.4. Continued, for circuits five and six during the second STAR survey

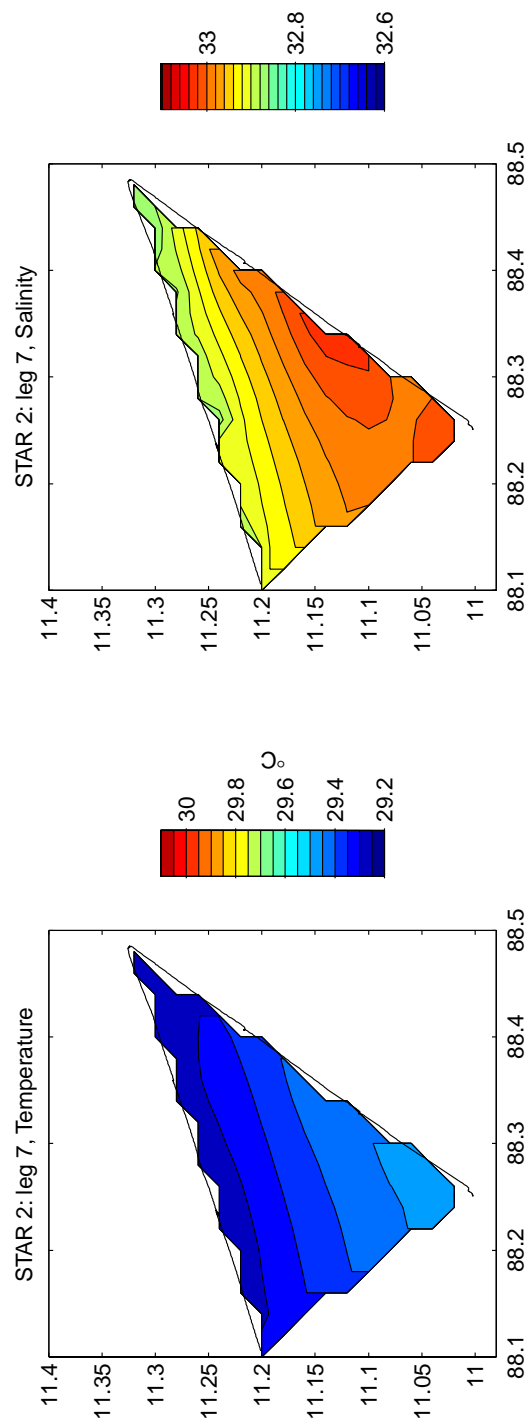


Figure 8.3.4. Continued, for circuit seven during the second STAR survey

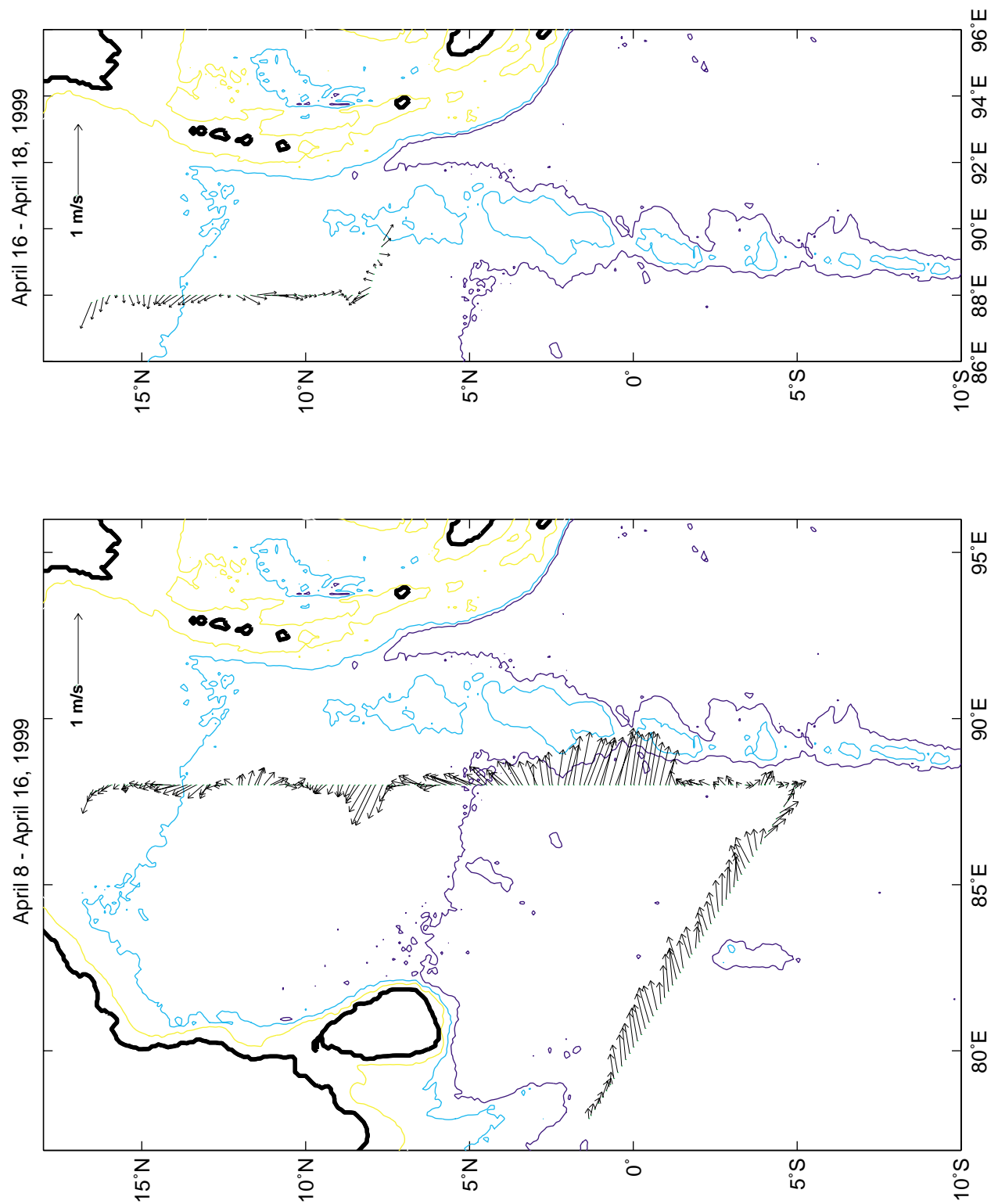


Figure 8.4.1. Vector plots of the ocean currents obtained with the ADCP averaged over the top 4 data bins (17-41 m nominal) along the cruise track (averaged over 1-hour intervals) during the pre-JASMINE cruise. The maps show coastlines as a heavy black line and bottom depth contours every 1000 meters.

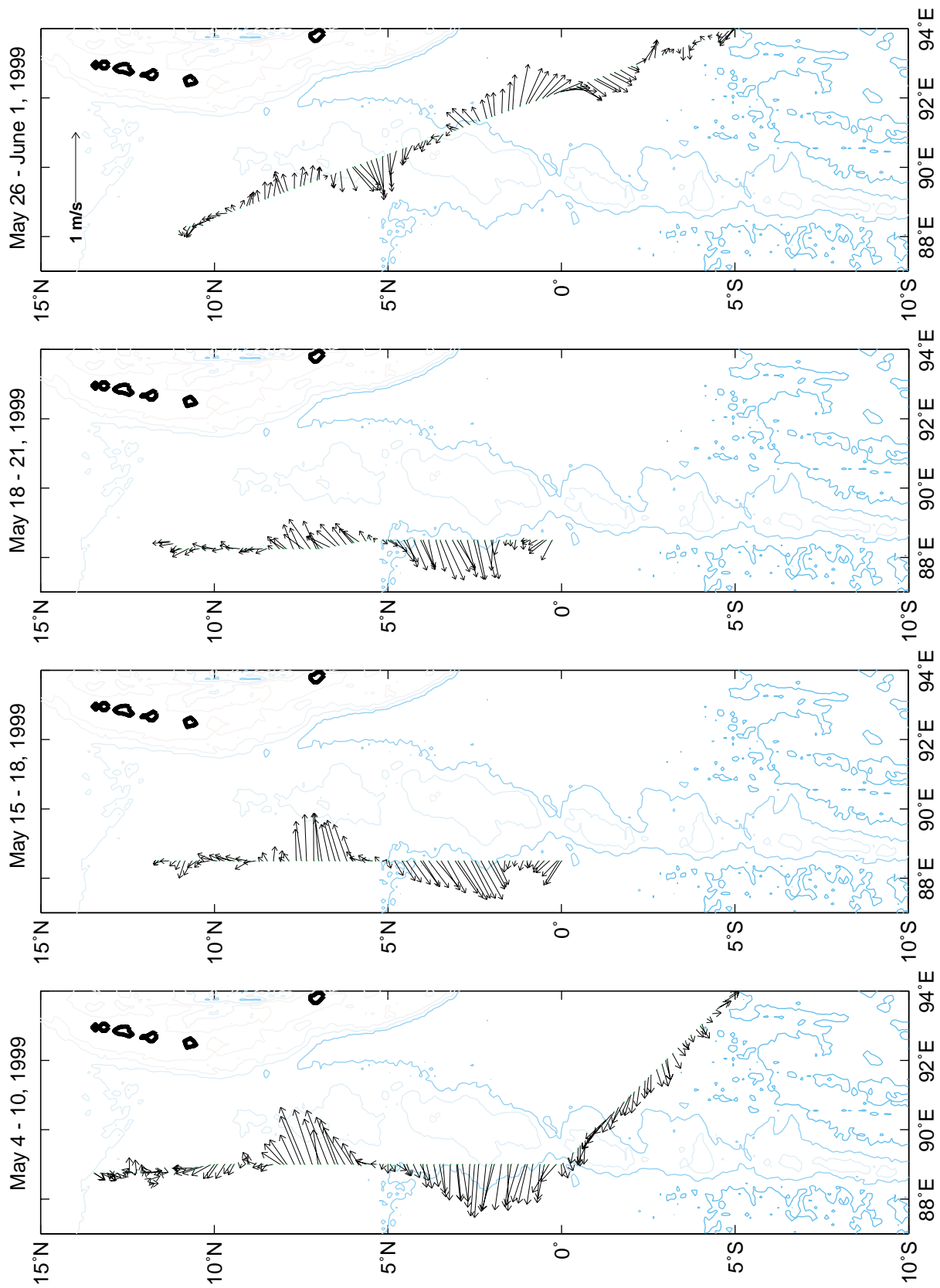


Figure 8.4.2. Same as in Figure 8.4.1 but during the main JASMINE cruise.