KESS Deployment Cruise Report
April 25 - June 1, 2004
R/V Thomas G. Thompson

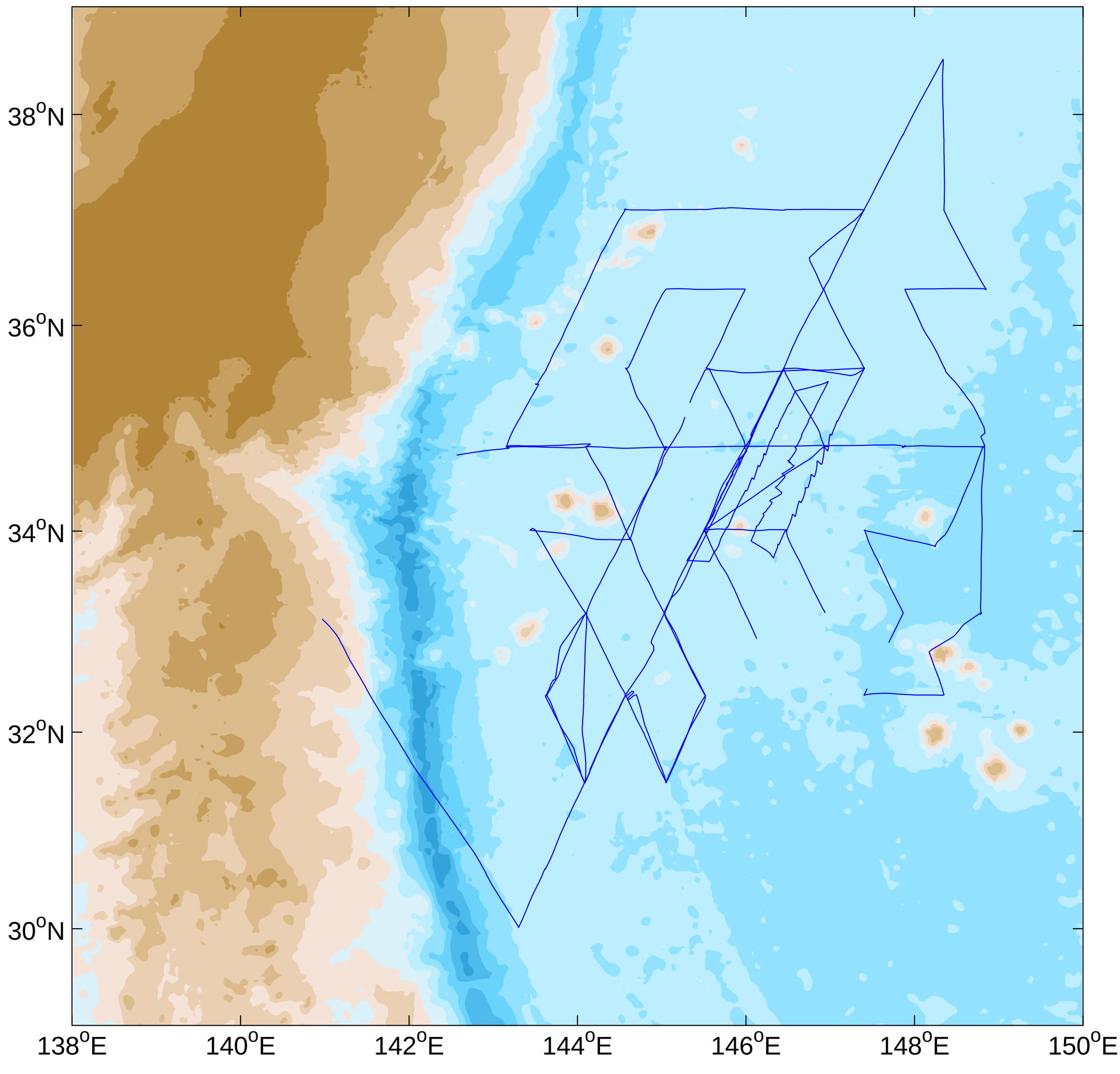


Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 KESS Cruise 1st-leg Overview

The Kuroshio Extension System Study (KESS) 2-year field program began Summer 2004 with two deployment cruises. The first leg, 24-April to 1-June 2004 (38 at-sea days), departed from and returned to Yokohama, Japan. Randy Watts served as chief scientist, with co-PI Kathy Donohue (both from Univ. Rhode Island). Our main objectives were:
1. deploy an array of 50 CPIES (Current and Pressure recording Inverted Echo Sounders) on a grid spanning from the southern recirculation region to the mixed water regime and coordinated with Jason satellite altimeter groundtracks;
2. conduct a Kuroshio meander / ring feature fine-scale synoptic survey using deep-reaching (750m) ADCP and rapid CTDs to 1200m;
3. collect calibration CTD profiles at each CPIES site; altogether there were 125 CTD casts, of which the feature survey had 58 casts; and
4. launch, on behalf of co-PIs Peter Hacker and Bo Qiu (Univ. Hawaii), four APEX/Argo profiling floats at CPIES/CTD sites in the southern recirculation.

We experienced a number of serious difficulties with the CPIES instruments during the cruise (and fixed them, as detailed elsewhere). The instruments have a new acoustic telemetry capability, which reports on the data-quality immediately after launch, and if the ship returns at a later date can also transmit all the processed data for the intervening days. It was the acoustic telemetry that both made us aware of the problems and, after they had been fixed, gave us confidence that by the cruise end the instruments were all performing properly. Three instruments were lost or destroyed early in the cruise due to seawater leaks. Testing one of the housings that had leaked by lowering it repeatedly on the CTD wire, we isolated this problem to a vacuum port o-ring, and in particular, to dimensional variability in the titanium screw which retains it. [The supplier had changed its design. Knowing what to look for, we avoided these leaks for the rest of the deployments.] The acoustic detector circuits were too sensitive to ambient noise on many of the instruments, requiring that a "squelch" level be tested on all of them and readjusted. It was necessary for us to recover and replace six instruments that had already been deployed to correct this problem.

By the end of the cruise we had deployed CPIES at 46 sites (Table 1), all of which gave good telemetry of all measured variables (tau, P, speed, direction) after they had settled onto the sea floor. In addition, on the final transit across the array enroute back to Yokohama, we were able to pass over and collect 8-to-14 days of data-telemetry from 9 of the sites. This was 100% successful — leading to good confidence that the difficulties had been solved.

The Kuroshio feature survey consisted of four transects on a meander-segment leading from a crest into a trough, where we hypothesized that mesoscale-driven cross-frontal flow would carry cold fresh waters from north of the Kuroshio across-stream to its southern side at Intermediate Water depths. The CTDs were spaced 15 km across-stream and transects were separated about 30km alongstream, seeking to observe coherent intrusions laterally and along-stream, and to relate them to the synoptic and small-scale current structure observed by the deep-reaching ADCP. The CTD (run by Scripps ODF) and ADCP (RDI Ocean Surveyor, 75kHz) systems worked very well, and initial analyses suggest that we found a strong coherent intrusion of North PacificIntermediate Water to study.

1.2 CTD Summary

A mooring deployment and hydrographic survey was carried out in the Kuroshio Extension region of the western North Pacific April to June 2004. The work consisted of CPIES mooring deployments where coincident CTD profiles were collected for calibration purposes(at all but one site), a feature survey of the inflow region to a Kuroshio meander trough in which four high-resolution CTD/ADCP sections were taken, and Argo float launches which coincided with selected CPIES sites and CTDs. The R/V T. G. Thompson departed Yokohama, Japan on 25 April 2004. The basic CTD/hydrographic measurements consisted of salinity measurements made from water samples taken on CTD casts, plus pressure, temperature and salinity from CTD profiles. The first attempt was scrubbed because of grounding problems that prevented use of the external shield as signal ground. Several hours of intensive efforts were required, reterminating the cable (more than once), replacing slip-rings, switching various parts to isolate the problem, and finally to avoid the grounding problem by using the three center-leads within the CTD cable for signal and quiet signal-ground. After these initial setup efforts, no major problems were encountered during the operation.

A total of 46 CPIES mooring sites were occupied by the end of the cruise (see the CPIES summary), 123 CTD stations were occupied, and 4 profiling ARGO floats were launched. Water samples (up to 24 bottles) and CTD data were collected from CTD casts to within 100 meters of the bottom on 44 casts, and to depths of 1200–4000 meters on the other 79 casts. Salinity was measured from every water sample collected during CTD casts. The cruise ended in Yokohama, Japan on 1 June 2004.

The CTD measurements were taken for two main purposes. First, a CTD profile at each PIES/CPIES site was used to determine the absolute depth of the instruments to calibrate the travel time(τ) measurements. There was a total of 44 deep CTD casts and 24 shallow casts at CPIES sites. The other main purpose was to obtain a high-resolution feature survey by ADCP and CTD to examine a cross-frontal exchange of water leading into a meander trough. This was accomplished by 57 CTD casts in the range of 1200–1500 meters from 1 May to 6 May. (Two CTDs of the feature survey were at CPIES sites, hence serving dual purposes in the above tally.) For more detailed information on the CTDs refer to Section 2.2, several figures, and Appendix G of this document.

1.3 ADCP Summary

A 75 kHz RD Instruments Ocean Surveyor hull-mounted acoustic Doppler current meter (ADCP) measured upper-ocean currents during the cruise. The system performed well with typical depth penetration between 600 and 700 m depth. The first bin was contaminated by acoustic ringing, however. Dr. Jules Hummon from the University of Hawaii recommended system parameter settings used during the cruise and provided two configuration files nb16 and bt (Appendix F). The major difference between these configuration files is that nb16 disables bottom tracking while bt enables bottom tracking. A separate ADCP processing report will detail the system setting and processing but it is worth pointing out a few important settings. For the duration of the cruise the system was set to narrowband single-ping profile mode. Primary heading source, length of short-term and long term averages, bin number, bin size, and bottom-track mode varied. Table 8 lists the set-up parameters corresponding to ADCP deployment numbers. For the most part changes reflect experimentation with the system prior to major field work. While working in the KESS array (deployments 6 through 14), the system set-up was consistent except for the primary heading source which began with the posMV system as the primary heading (deployments 6 through 10) and was later changed to be the ship's gyrocompass. Post-processing will apply a uniform correction to the ADCP data. Once field work ended and the ship steamed back to port and into shallower water bottom tracking was enabled (deployment 18). There are five gaps in the ADCP data longer than 1 hour (Table 9). The first three gaps in data aquisition took place while on-station because we thought the ADCP might be interfering with the burst telemetry. The largest aquisition gap of 12.5 hours occurred when the aquisition log file became quite large (121272 KB) repeating the error "NMEA [NAV]: Error writing to raw data file" every second. We are unsure what caused this problem but suspect there was a network problem. The final gap of 2.4 hours is due to testing of the ship's electrical system.

1.4 Argo Float Summary

In conjunction with the University of Hawaii's KESS component, four Autonomous Profiling Explorer(APEX)Argo floats were launched from the R/V T. G. Thompson. The four floats, numbered 1425–1428, were launched at sites G1, H2, H3, and I1 of the KESS C-PIES array. The sites for the launches had been pre-selected by the University of Hawaii. Launches occurred on April 28, April 29, and May 9, 2004. For more detailed information on the launches refer to Table 2.3 of this document.

The Argo floats will become entrained in the recirculation gyre believed to exist to the south of the Kuroshio Extension Current, where subtropical mode water (~17.5°C) is found. Over the next four years they should serve as "roving hydrographers", many of which hopefully will remain within this gyre. Each APEX Argo float was equipped with a SBE CTD profiler. The floats will periodically ascend to transmit their location and the CTD data gained during its ascension to the ARGOS satellite. Inbetween these vertical profiles, the floats will descend to a parking depth of 2000m, where the currents are expected to be weak. The Argo floats are considered expendable and no effort will be made to retrieve them.

1.5 Ancillary Data DVD Summary

An Ancillary Data DVD was produced aboard the T. G. Thompson by marine technician Mike Realander. This DVD is comprised of files containing data collected during the first leg of the KESS cruise, April 25, 2004 to June 1, 2004. This data are subdivided directories adcp, hydrosweep, winfrog, das, and winch.

The adcp file contains numerous data files of different formats. The data files are named TN168-014_######. TN168 is the name of the cruise and will be used in the naming of other data files. The last six numbers range from 000000 to 000036. The suffixes for the data files are: .ENR, .ENS, .ENX, .LTA, .N1R, .N2R, .NMS, .STA,.LOG, .VMO. The data files are all approximately 10,240 KB in size.

The hydrosweep file contains pdf, postscript, and raw data files. The data files range from TN168HS.116 to TN168HS.152. The size of these files ranges from 321 KB to 12,450 KB. Both the pdf and postscript files range from HS-116-###### to HS-152-######. In all cases the range of 116 to 152 represents the yearday of the data. The last six digits of the pdf and postscript files represent the time the file was generated (hhmmss). These pdf and postscript files are all less than 500 KB in size, with the exceptions of postscript files HS-126-230120, HS-143-151508, and HS-152-141011, which are 2,511 KB, 1,278 KB, and 3,312 KB respectively. There are pdf and postscript files named survey2.hs, survey-B4, survey-C4, survey-D4, survey-E4, survey-F3, survey-G2, survey-H2. In this case the pdf files are less than 100 KB in size, while the postscript files are less than 103,000 KB in size. These files contain figures for each of the mooring sites to be used by the following leg. Comprehensive plots of the hydrosweep data can be viewed in Section 3.7.

The winfrog file contains two word documents. Document TN168surv is a 24 KB document giving the coordinates of the surveylines taken for the WSW mooring site on May 3, 2004. Document TN168wpts is a 103 KB table that contains the waypoints used for the array, mooring survey, and ctd survey. The table consists of the name of the point, the latitude, longitude for the site, the northing and easting headings in meters, depth (which was not completed), and the ring radius.

The DAS file contains various additional variables collected during the cruise. The variables fall into the general categories of navigation, sea surface conditions, atmospheric conditions and winch usage. A table of the variables is in Section 2.6 of this report. The value of thermosalinagraph sea temperature external was added to the collected data on May 2, 2004. For this reason, all data files from April 25 (yearday 116) to May 2 (yearday 123)are called TN168DASa.(yearday). On May 29, 2004, a second change in the variables recorded occurred. The variables of wind speed relative and wind direction relative were added. All of the files corresponding to yearday 123 to 150 (May 2 to May 29) are named TN168DASb.(yearday). All files that apply to days between May 29 and the end of the cruise June 1(yearday 153) are named TN168DAS.(yearday). Note that the yeardays used to name these files start with January 1 being yearday 1. All of the data files are less than 3,500 KB in size. There are two note files that mention the variable changes that occurred and when they took place. The configuration files TN168DAS, TN168DASa, and TN168DASb list the variables for each format of data files. There are two additional configuration files, TN168TS and TN168TSb, that give the calibrations for the sensors of the different variables. A sampling of the different variables is plotted as Section 3.7 of this report.

The winch file contains data files on the winch usage during the cruise. The files are named TN168WM.(yearday). The yeardays range from 119 to 152. The files are 1 to 8 KB in size. They provide such information as maximum tension on a wire during a cast and duration of cast.

2 Tables & Plots

2.1 CPIES/PIES Sites

Site	SN #	Good/ Bad	5 min. offset	TELEM	XPND	BEA	REL	After tau repair	DCS Minutes	ACS	Telem/Tau quartile median problem	Firmware Number	Timed Released
A2	145	G		65	69	73	17	Yes	20	No	No	IESe4_5_11.APP	2006/10/19 8
B1	151	G		65	69	73	23	Yes	20	No	No	IESe4_5_11.APP	2006/10/20 16
B2	152	G		66	70	74	27	Yes	20	No	No	IESe4_5_11.APP	2006/10/20 8
B3	148	G		65	69	73	20	Yes	20	No	No	IESe4_5_11.APP	2006/10/13 8
B4	164	G		66	70	74	36	Yes	0	11.75	No	IESe4_5_12.APP	2006/10/13 16
B5	167	G		66	70	74	39	Yes	20	No	No	IESe4_5_11.APP	2006/10/19 0
C1	153	G		67	71	75	25	Yes	20	No	No	IESe4_5_11.APP	2006/10/21 0
C2	131	G		66	70	74	3	Yes	20	No	No	IESe4_5_11.APP	2006/10/09 8
C3	124	G		65	69	73	60	Yes	20	No	No	IESe4_5_11.APP	2006/10/09 16
C4	144	G		67	71	75	16	Yes	20	No	No	IESe4_5_11.APP	2006/10/13 0
C5	171	G		67	71	75	43	Yes	20	No	No	IESe4_5_11.APP	2006/10/14 0
C6	173	G		66	70	74	45	Yes	20	No	No	IESe4_5_11.APP	2006/10/18 16
D1	157	G		65	69	73	29	Yes	20	No	No	IESe4_5_11.APP	2006/10/21 16
D2	122	G		66	70	74	58	Yes	20	No	No	IESe4_5_11.APP	2006/10/09 0
D3	150	G		67	71	75	22	Yes	20	No	No	IESe4_5_11.APP	2006/10/10 0
D4	105	G		64	68	72	0	Yes	0	No	No	IESe4_5_12.APP	2006/10/12 16
D5	111	G		67	71	75	47	Yes	20	No	No	IESe4_5_11.APP	2006/10/14 8
D6	155	G		66	70	74	27	Yes	20	No	No	IESe4_5_11.APP	2006/10/18 8
E1	161	G		66	70	74	33	Yes	20	No	No	IESe4_5_11.APP	2006/10/21 16
E2	162	G		67	71	75	34	Yes	20	No	No	IESe4_5_11.APP	2006/10/22 8
E3	121	G		65	69	73	57	Yes	20	No	No	IESe4_5_9.APP	2006/10/08 8
E4	137	G		66	70	74	9	Yes	20	No	No	IESe4_5_11.APP	2006/10/10 16
E5	143	G		66	70	74	15	Yes	20	No	No	IESe4_5_11.APP	2006/10/12 8
E6	156	G	Yes	67	71	75	28	Yes	20	No	No	IESe4_5_11.APP	2006/10/14 17
E6	146	N		66	70	74	18	Yes	20	BAD	No	IESe4_5_11.APP	2006/10/14 16
E7	170	G	Yes	66	70	74	42	Yes	20	No	No	IESe4_5_11.APP	2006/10/17 17
E7	110	N		66	70	74	46	Yes	20	BAD	No	IESe4_5_11.APP	2006/10/17 16
F1	114	G		67	71	75	50	Yes	20	No	No	IESe4_5_11.APP	2006/10/22 0
F2	136	G		65	69	73	8	Yes	20	No	No	IESe4_5_9.APP	2006/10/08 0
F3	134	G	Yes	66	70	74	6	Yes	0	No	No	IESe4_5_12.APP	2006/10/10 17
F3	147	N		67	71	75	19	Yes	0	BAD	No	IES6e4_5_12.APP	2006/10/10 16
F4	142	G		65	69	73	14	Yes	20	No	No	IESe4_5_11.APP	2006/10/12 0
F5	158	G		66	70	74	30	Yes	20	No	No	IESe4_5_11.APP	2006/10/15 0
F6	174	G		67	71	75	46	Yes	20	No	No	IESe4_5_11.APP	2006/10/16 16
G1	115	G		65	69	73	51	Yes	20	No	No	IESe4_5_11.APP	2006/10/06 8
G2	119	G		66	70	74	55	Yes	20	No	No	IESe4_5_9.APP	2006/10/07 16
G3	138	G		67	71	75	10	Yes	20	No	No	IESe4_5_11.APP	2006/10/11 0
G4	109	G		65	69	73	45	Yes	20	No	No	IESe4_5_11.APP	2006/10/11 16
G5	149	G		66	70	74	21	Yes	20	No	No	IESe4_5_11.APP	2006/10/15 8
G6	107	G		66	70	74	43	Yes	20	No	No	IESe4_5_11.APP	2006/10/16 8
H2	118	G		65	69	73	54	Yes	20	No	Yes	IESe4_5_6.APP	2006/10/06/ 16
H3	112	G		65	69	73	48	No	10	11.75-12.0	Yes	IESe4_25_4.APP	2006/10/07 8
H4	132	G		67	71	75	4	Yes	20	No	No	IESe4_5_11.APP	2006/10/11 8
H5	168	G		67	71	75	40	Yes	20	No	No	IESe4_5_11.APP	2006/10/16 0
H6	166	G		65	69	73	38	Yes	20	No	No	IESe4_5_11.APP	2006/10/15 16
I1	163	G		65	69	73	35	Yes	20	No	No	IESe4_5_11.APP	2006/10/08 16
N1	160	G		65	69	73	32	Yes	20	12.0-12.25	No	IESe4_5_11.APP	2006/10/19 16
S1	101	G		66	70	74	37	No	10	No	Yes	IESe4_4_25.APP	2006/10/05 0
S2	102	G		67	71	75	38	No	10	No	Yes	IESe4_4_25.APP	2006/10/05 8

Table 1: Table of hardware and firmware information on the CPIES/PIES

Site	SN #	Good/ Bad	Date	Latit	Long	Depth (m)	Launch Time (Z)	Bottom Time (Z)	CPIES YES/NO
A2	145	G	5/27/2004	37 48.5185	147 51.9355	5689	2:20:00	3:38:00	
B1	151	G	5/18/2004	37 06.31	144 34.26	5568	4:09:00	5:26:00	
B2	152	G	5/17/2004	37 06.2538	145 30.8607	5425	21:26:00	22:40:00	
B3	148	G	5/17/2004	37 06.17	146 27.53	5596	12:40:00	13:58:00	
B4	164	G	5/17/2004	37 06.15	147 24.22	5644	5:14:00	6:24:00	NO
B5	167	G	5/25/2004	37 06.0881	148 20.9105	5722	23:02:00	0:22:00	
C1	153	G	5/18/2004	36 21.11	144 05.44	5617	11:27:00	12:45:00	
C2	131	G	5/12/2004	36 20.89	145 03.16	5695	5:36:00	6:53:00	
C3	124	G	5/12/2004	36 20.82	145 59.25	5567	11:25:00	12:37:00	
C4	144	G	5/16/2004	36 20.7883	146 55.2560	5631	21:16:00	22:34:00	
C5	171	G	5/25/2004	36 20.75	147 53.17	5846	4:48:00	6:08:00	
C6	173	G	5/25/2004	36 20.73	148 51.08	5888	12:45:00	14:06:00	
D1	157	G	5/18/2004	35 25.9928	143 31.2200	5719	20:43:00	22:02:00	
D2	122	G	5/11/2004	35 35.3033	144 34.2218	5821	23:02:00	0:23:00	
D3	150	G	5/12/2004	35 35.3240	145 31.5057	5849	22:20:00	23:40:00	
D4	105	G	5/16/2004	35 35.28	146 26.97	5969	3:47:00	5:00:00	NO
D5	111	G	5/16/2004	35 35.24	147 24.24	5845	9:27:00	10:48:00	
D6	155	G	5/24/2004	35 35.2256	148 21.5053	5968	22:02:00	23:24:00	
E1	161	G	5/19/2004	34 49.5970	143 09.1495	5315	3:10:00	4:24:00	
E2	162	G	5/19/2004	34 49.592	144 05.81	5754	9:07:00	10:27:00	
E3	121	G	5/11/2004	34 49.60	145 02.59	5885	8:38:00	9:58:00	
E4	137	G	5/13/2004	34 49.63	145 59.27	5935	4:23:00	5:44:00	
E5	143	G	5/15/2004	34 49.2570	146 55.6831	5800	21:31:00	22:50:00	
E6	156	G	5/20/2004	34 49.488	147 52.544	5943	3:41:00	5:04:00	
E6	146	N	5/20/2004	34 49.5032	147 52.5613	5943	0:58:00	2:20:00	
E7	170	G	5/24/2004	34 49.47	148 49.19	6138	9:40:00	11:04:00	
E7	110	N	5/20/2004	34 49.52	148 49.16	6110	9:42:00	11:07:00	
F1	114	G	5/29/2004	34 00.577	143 26.017	5403	22:02:00	23:17:00	
F2	136	G	5/11/2004	33 55.1509	144 37.4006	5822	1:32:00	2:52:00	
F3	134	G	5/15/2004	34 00.61	145 30.28	5796	7:07:00	8:25:00	NO
F3	147	N	5/13/2004	34 00.62	145 30.28	5815	11:14:00	12:29:00	NO
F4	142	G	5/14/2004	34 00.6411	146 28.2199	5847	23:48:00	1:09:00	
F5	158	G	5/23/2004	34 00.60	147 24.25	6034	14:08:00	15:31:00	
F6	174	G	5/24/2004	33 50.9965	148 14.6842	6196	0:45:00	2:07:00	
G1	115	G	5/29/2004	33 11.44	144 06.43	5465	12:39:00	13:55:00	
G2	119	G	5/10/2004	33 11.46	145 01.92	5800	13:07:00	14:27:00	
G3	138	G	5/13/2004	33 11.4976	145 59.2570	5733	22:59:00	0:23:00	
G4	109	G	5/14/2004	33 11.53	146 56.52	5949	12:01:00	13:23:00	
G5	149	G	5/23/2004	33 11.48	147 51.98	6233	4:22:00	5:48:00	
G6	107	G	5/21/2004	33 11.4715	148 47.3451	6281	20:18:00	21:45:00	
H2	118	G	5/9/2004	32 22.19	144 34.17	5695	12:14:00	13:33:00	
H3	112	G	4/29/2004	32 22.24	145 30.87	5845	16:53:00	18:11:00	
H4	132	G	5/14/2004	32 22.26	146 27.56	5957	5:29:00	6:49:00	
H5	168	G	5/22/2004	32 22.2467	147 24.2528	6035	21:57:00	23:20:00	
H6	166	G	5/22/2004	32 22.33	148 20.99	5744	7:24:00	8:43:00	
I1	163	G	5/28/2004	31 29.4517	144 05.2339	5869	23:33:00	0:54:00	
N1	160	G	5/26/2004	38 30.76	148 20.32	5687	13:05:00	14:24:00	
S1	101	G	4/26/2004	30 00.93	143 18.149	5872	10:48:00	12:10:00	
S2	102	G	4/27/2004	30 36.55	143 36.86	5568	2:25:00	3:44:00	

Table 2: Table of position information on the CPIES/PIES

S/N	site	CF1 S/N	FIRMWARE REV DATE	bliley s/n	pAROS s/N	ITC s/n	relocation MODULE	TELE CODE	XPND CODE	BEAC CODE	REL CODE	DCS Sensor	DCS cable
101	S1	12117	4_4_25	80244	91872	160	RF720 s/n N12-087	2	2	2	37	341	44/49
102	S2	12118	4_4_25	160244	92035	173	RF720 s/n 169	3	3	3	38	309	14/49
105	D4	12086	4_5_12	259842	92911	113	RF-720 s/n K05-010	0	0	0	0	PIES	PIES
107	G6	51084	4_4_25	380245	91509	89	RF-720 s/n 139	2	2	2	43	347	48/49
109	G4	51101	4_5_11	320245	91523	147	RF-720 s/n R05-048	1	1	1	45	173	7-May
110	E7	51086	4_5_11	420245	91854	95	RF-720 s/n 076	2	2	2	46	352	Oct-49
111	D5	51089	4_5_11	330245	91510	174	RF-720 s/n 120	3	3	3	47	344	29/49
112	H3	51090	4_4_25	520245	91502	136	RF-720 s/n 126	1	1	1	48	356	16/49
114	F1	51088	4_5_11	350245	91519	111	RF-720 s/n 105	3	3	3	50	359	42/49
115	G1	51091	4_5_11	160245	90776	168	RF-720 s/n 124	1	1	1	51	336	19/49
118	H2	51095	4_5_6	130245	92036	105	RF-720 s/n 087	1	1	1	54	343	38/49
119	G2	51096	4_5_9	240245	91144	179	RF-720 s/n 167	2	2	2	55	351	47/49
121	E3	51097	4_5_9	120245	90551	92	RF-720 s/n 143	1	1	1	57	308	37/49
122	D2	51100	4_5_11	210245	91857	43	RF-720 s/n 127	2	2	2	58	357	22/49
124	C3	51103	4_5_11	630245	91136	129	RF-720 s/n 155	1	1	1	60	354	49/49
131	C2	51114	4_5_11	470245	91856	103	RF720 s/n R05-056	2	2	2	3	501	40/49
132	H4	51113	4_5_11	720245	91508	104	RF720 s/n 080	3	3	3	4	503	39/49
134	F3	12122	4_5_12	190245	91863	171	RF720 s/n 046	2	2	2	6	PIES	PIES
136	F2	12124	4_5_9	430245	91526	143	RF720 s/n R05-079	1	1	1	8	350	32/49
137	E4	12125	4_5_11	660245	92910	76	RF720 s/n R05-074	2	2	2	9	355	41/49
138	G3	12126	4_5_11	800245	92034	162	RF720 s/n 161	3	3	3	10	358	21/49
142	F4	12130	4_5_11	510245	92964	144	RF720 s/n 119	1	1	1	14	171	17/49
143	E5	12143	4_5_11	760245	91135	152	RF720 s/n R05-072	2	2	2	15	322	27/49
144	C4	12132	4_5_11	460245	91525	159	RF720 s/n R05-043	3	3	3	16	324	34/49
145	A2	12133	4_5_11	200245	91869	154	RF720 s/n 171	1	1	1	17	318	36/49
146	E6	12134	4_5_11	170245	91505	145	RF720 s/n 147	2	2	2	18	314	Jul-49
147	F3	12135	4_5_12	490245	91518	27	RF720 s/n 165	3	3	3	19	PIES	PIES
148	B3	12136	4_5_11	850245	92040	172	RF720 s/n R05-059	1	1	1	20	337	26/49
149	G5	12137	4_5_11	640245	91500	163	RF720 s/n R05-087	2	2	2	21	342	25/49
150	D3	12138	4_5_11	690245	92958	138	RF720 s/n R05-081	3	3	3	22	335	46/49
151	B1	12139	4_5_11	360245	91512	157	RF720 s/n 157	1	1	1	23	311	Mar-49
152	B2	12140	4_5_11	20245	91498	158	RF720 s/n 103	2	2	2	24	313	18/49
153	C1	12141	4_5_11	60245	91858	100	RF720 s/n 175	3	3	3	25	316	35/49
155	D6	12144	4_5_11	250245	91520	139	RF720 s/n 128	2	2	2	27	172	13/49
156	E6	12145	4_5_11	230245	92909	176	RF720 s/n 138	3	3	3	28	306	7-Feb
157	D1	12146	4_5_11	550245	92972	82	RF720 s/n 148	1	1	1	29	310	45/49
158	F5	12147	4_5_11	10245	92966	128	RF720 s/n 146	2	2	2	30	312	7-Jul
160	N1	12149	4_5_11	750245	91524	132	RF720 s/n 200	1	1	1	32	307	Dec-49
161	E1	12150	4_5_11	110245	91860	164	RF720 s/n 170	2	2	2	33	338	28/49
162	E2	12152	4_5_11	220245	91866	90	RF720 s/n 135	3	3	3	34	339	Aug-49
163	I1	12153	4_5_11	570245	92962	83	RF720 s/n R05-055	1	1	1	35	502	31/39
164	B4	12154	4_5_12	650245	91504	161	RF720 s/n R05-083	2	2	2	36	PIES	PIES
166	H6	12156	4_5_11	340245	92042	62	RF720 s/n R05-047	1	1	1	38	323	20/49
167	B5	12160	4_5_11	610245	91511	146	RF720 s/n 152	2	2	2	39	317	Sep-49
168	H5	12162	4_5_11	710245	91868	155	RF720 s/n R05-040	3	3	3	40	340	24/49
170	E7	12164	4_5_11	770245	91521	140	RF720 s/n 153	2	2	2	42	320	7-Apr
171	C5	12165	4_5_11	440245	92915	99	RF720 s/n 029	3	3	3	43	504	7-Jan
173	C6	12167	4_5_11	880245	91506	98	RF720 s/n 034	2	2	2	45	174	7-Jun
174	F6	12168	4_5_11	390245	92968	142	RF720 s/n 154	3	3	3	46	348	Jun-49

Table 3: Tracking information for IES model 6.1 E2

Site	SN #	Lost/ Recovered	Launch Latit	Launch Long	Date Released	Released Time (Z)
H1	108	R	32 22.1623	143 38.1692	4/27/2004	23:42
G2	108	L	33 11.49	145 01.91	NA	NA
D5	117	R	35 35.21	147 24.27	5/6/2004	14:55
G1	110	R	33 11.42	144 06.40	5/8/2004	4:00
H1	109	R	32 22.176	143 38.1092	5/8/2004	12:23
I1	115	R	31 29.43	144 05.24	5/28/2004	21:53
H2	111	R	32 22.2078	144 34.1654	5/9/2004	10:26
I2	136	R	31 29.46	145 03.15	5/9/2004	23:46
F2	120	R	33 55.1244	144 37.3880	5/10/2004	23:37
F4	114	R	34 00.63	146 28.22	5/5/2004	10:28
G2	130	L	33 11.49	145 01.918	NA	NA
I1	107	R	31 29.42	144 05.21	5/8/2004	21:25
F4	141	R	34 00.645	146 28.2087	5/14/2004	23:15

Table 4: Lost & recovered instruments

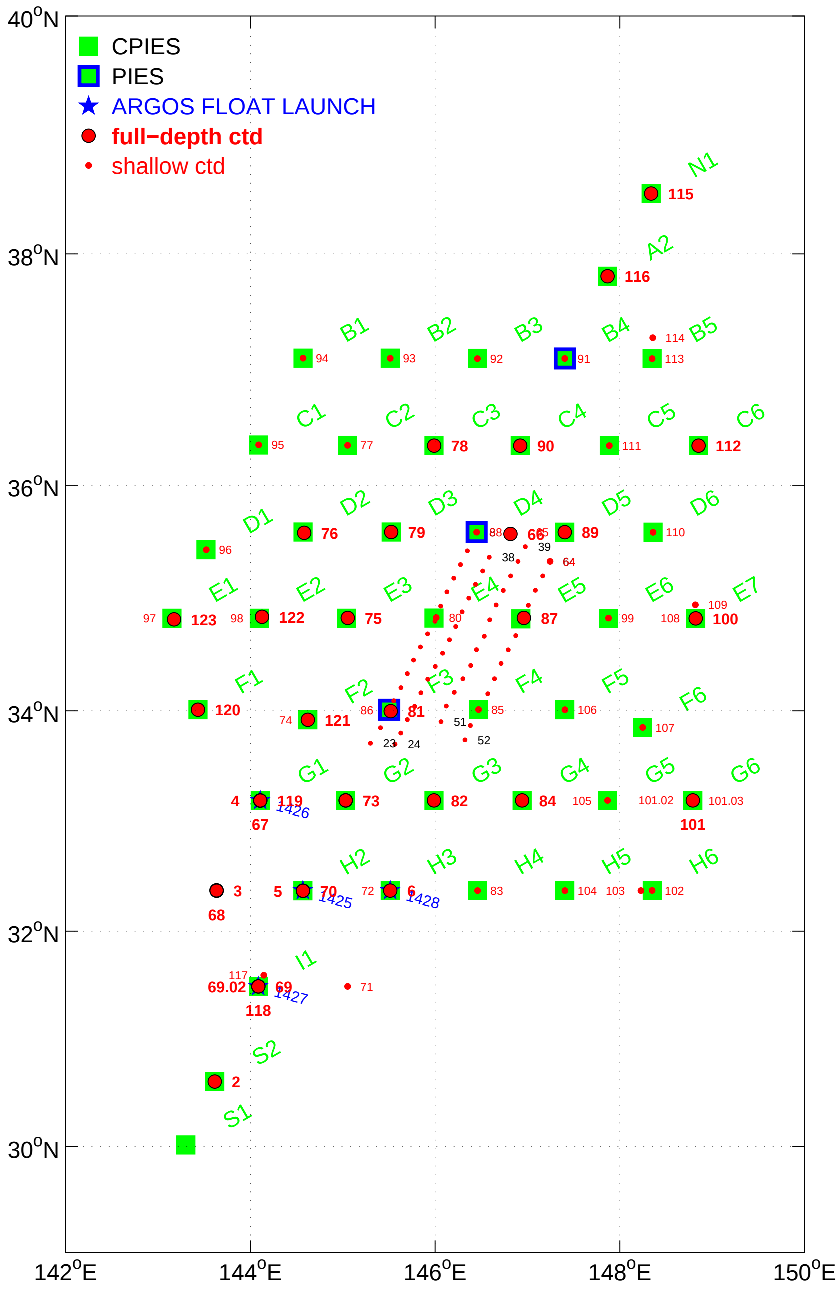


Figure 1: Watts/Donohue KESS CPIES/PIES Sites

2.2 CTD Sites

CTD Station #	CTD Cast #	Date	Start Time (Z)	Start Latit	Start Long	Pressure (db)	Comments
2	1	4/27/2004	3:30:00	30 36.53	143 36.87	5704	
6	1	4/29/2004	18:01:00	32 22.2303	145 30.8734	5930	
70	1	5/9/2004	12:56:00	32 22.21	144 34.18	5732	
72	1	5/10/2004	6:56:00	32 22.26	145 30.93	2028	
73	1	5/10/2004	14:18:00	33 11.47	145 01.94	5826	
74	1	5/10/2004	21:52:00	33 55.1345	144 37.3844	2026	
75	1	5/11/2004	9:16:00	34 49.59	145 02.57	5918	
76	1	5/11/2004	18:03:00	35 35.2818	144 34.3683	5874	
77	1	5/12/2004	6:04:00	36 20.89	145 03.16	2030	
78	1	5/12/2004	11:56:00	36 20.78	145 59.35	5620	
79	1	5/12/2004	19:14:00	35 35.3029	145 31.5551	5900	
80	1	5/13/2004	4:32:00	34 49.66	145 59.34	2012	
81	1	5/13/2004	11:31:00	34 00.61	145 30.26	5886	
82	1	5/13/2004	19:50:00	33 11.5183	145 59.0416	5826	
83	1	5/14/2004	5:44:00	32 22.31	146 27.51	2028	
84	1	5/14/2004	12:21:00	33 11.54	146 56.41	6034	
85	1	5/14/2004	20:34:00	34 00.6530	146 28.2131	2532	
86	1	5/15/2004	7:21:00	34 00.43	145 30.26	2020	
87	1	5/15/2004	17:52:00	34 49.7090	146 57.71	5548	
88	1	5/16/2004	4:01:00	35 35.26	146 26.97	2030	
89	1	5/16/2004	9:50:00	35 35.24	147 26.22	5898	
90	1	5/16/2004	18:19:00	36 20.8456	146 55.3034	5674	
91	1	5/17/2004	5:27:00	37 06.15	147 24.22	2030	
92	1	5/17/2004	12:56:00	37 06.14	146 27.58	2030	
93	1	5/17/2004	19:53:00	37 06.2720	145 30.8649	2540	
94	1	5/18/2004	4:23:00	37 06.29	144 34.21	2026	
95	1	5/18/2004	11:47:00	36 21.13	144 05.40	2028	
96	1	5/18/2004	21:05:00	35 26.0846	143 29.8422	1824	
97	1	5/19/2004	4:25:00	34 49.56	143 09.16	2002	
98	1	5/19/2004	9:25:00	34 49.59	144 05.76	3036	
99	1	5/20/2004	1:35:00	34 49.0885	147 51.4040	1980	
100	1	5/20/2004	10:22:00	34 48.96	148 48.06	6236	
101	1	5/21/2004	1:34:00	33 11.46	148 47.42	6398	Rider 170
101	2	5/21/2004	8:03:00	33 11.59	148 47.36	5228	Rider 107
101	3	5/21/2004	22:09:00	33 11.4333	148 47.2056	3052	Rider 166
102	1	5/22/2004	9:22:00	32 22.30	148 20.96	3048	Rider 168
103	1	5/22/2004	12:37:00	32 22.27	148 13.64	3050	Rider 149; 6 nm away from station
104	1	5/22/2004	20:35:00	32 22.2670	147 24.27	3052	Rider 158
105	1	5/23/2004	6:14:00	33 11.50	147 52.00	4074	Rider 160
106	1	5/23/2004	15:57:00	34 00.6008	147 24.2569	3050	Rider 174
107	1	5/23/2004	22:25:00	33 51.0450	148 14.8262	3038	Rider 167
108	1	5/24/2004	9:57:00	34 49.48	148 49.21	2044	
109	1	5/24/2004	12:26:00	34 55.59	148 47.35	3002	Rider 155; 6 nm away from station
110	1	5/24/2004	19:42:00	35 35.2017	148 21.4939	3050	Rider 171
111	1	5/25/2004	6:29:00	36 20.74	147 53.18	3050	Rider 173
112	1	5/25/2004	14:27:00	36 20.75	148 51.06	5906	Rider 163
113	1	5/25/2004	0:42:00	37 06.0244	148 20.9405	3050	Rider 160
114	1,2	5/25/2004	5:00:00	37 16.87	148 21.34	3052	Rider 145; 10nm away from station
115	1	5/26/2004	14:54:00	38 30.79	148 20.32	5726	Rider 113
116	1	5/27/2004	23:00:00	37 48.5581	147 51.9889	5680	Rider 163
117	1	5/28/2004	19:47:00	31 35.68	144 08.69	3048	Rider 113; Done several nm from station
118	1	5/28/2004	23:54:00	31 29.4430	144 05.2270	5868	
119	1	5/29/2004	13:02:00	33 11.45	144 06.45	5470	Rider 114
120	1	5/29/2004	22:23:00	34 00.5853	143 26.0453	5410	
121	1	5/30/2004	6:56:00	33 55.1514	144 37.35	5826	Rider 141
122	1	5/30/2004	15:24:00	34 49.6313	144 5.9055	5382	
123	1	5/30/2004	23:12:00	34 49.5787	143 9.1683	5170	

Table 5: CTD launch information and CTDs with Riders

Site	SN #	CTD Station #	CTD Cast #	Before/After Launch	Deep/Shallow	Good/Not Good
A2	145	116	1	Before		
B1	151	94	1		Shallow	
B2	152	93	1	Before	Shallow	
B3	148	92	1		Shallow	
B4	164	91	1		Shallow	
B5	167	113	1		Shallow	
C1	153	95	1		Shallow	
C2	131	77	1		Shallow	
C3	124	78	1			
C4	144	90	1	Before		
C5	171	111	1		Shallow	
C6	173	112	1			
D1	157	96	1		Shallow	
D2	122	76	1	Before		
D3	150	79	1	Before		
D4	105	88	1		Shallow	
D5	111	89	1			
D6	155	110	1	Before	Shallow	
E1	161	97	1		Shallow	
E1		123	1			
E2	162	98	1		Shallow	
E2		122	1			
E3	121	75	1			
E4	137	80	1	Before	Shallow	
E5	143	87	1	Before		
E6	156	99		Before	Shallow	
E7	170	108	1		Shallow	
F1	114	120	1			
F2	136	74		Before	Shallow	
F2		121	1			
F3	134	86	1		Shallow	
F4	142	85		Before	Shallow	
F5	158	106	1		Shallow	
F6	174	107	1	Before	Shallow	
G1	115	119	1			
G2	119	73	1			
G3	138	82	1	Before		
G4	109	84	1			
G5	149	105	1		Shallow	
G6		101	1	Before		
G6		101	2	Before	Shallow	
G6	107	101	3		Shallow	
H2	118	70	1			
H3	112	6	1			
H3		72	1		Shallow	
H4	132	83	1		Shallow	
H5	168	104	1	Before	Shallow	
H6	166	102	1		Shallow	
I1	163	118	1			
N1	160	115	1			
S1	101	0		NA	NA	
S2	102	2	1			
E6	146	99	1		Shallow	N
E7	110	100	1			N
F3	147	81	1			N

Table 6: Calibration CTDs taken at CPIES/PIES sites

2.3 ARGO Floats

float number	date (GMT)	time (GMT)	latitude	longitude	C-PIES site	launched by
1426	4/28/2004	14:41	33° 11.46'	144° 06.44'	G1	Jae-Hun Park and Cristin Ashmankas
1425	4/29/2004	2:08	32° 22.21'	144° 34.17'	H2	Rebecca Briggs and Kathleen Donohue
1428	4/29/2004	21:10	32° 22.22'	145° 30.88'	H3	Rebecca Briggs and Kathleen Donohue
1427	5/9/2004	4:36	31° 29.39'	144° 05.24'	I1	Cristin Ashmankas and Jae-Hun Park

Table 7: Argo Floats Launch Information

2.4 ADCP

No.	Config File	Primary Heading	Short Avg(s)	Long Avg(s)	Bin No.	Bin Size(m)	Btm Trk	StartTime
1	nb16	posMV	120	500	50	16	no	4/25, 03:13
2	nb16	gyro	120	600	50	16	no	4/25, 06:15
3	nb16	gyro	120	600	50	16	no	4/25, 07:29
4	nb16	posMV	60	600	50	16	no	4/25, 09:17
5	nb16	posMV	60	600	50	16	no	4/25, 09:18
6	nb16	posMV	60	300	50	16	no	4/25, 16:25
7	nb16	posMV	60	300	50	16	no	4/27, 23:29
8	nb16	posMV	60	300	50	16	no	4/28, 21:10
9	nb16	posMV	60	300	50	16	no	4/28, 23:04
10	nb16	posMV	60	300	50	16	no	4/29, 11:16
11	nb16	gyro	60	300	50	16	no	4/29, 21:29
12	nb16	gyro	60	300	50	16	no	5/07, 14:33
13	nb16	gyro	60	300	50	16	no	5/14, 14:40
14	nb16	gyro	60	300	50	16	no	5/23, 02:28
15	nb16	gyro	60	300	80	8	yes	5/31, 05:58
16	nb16	gyro	60	300	50	16	yes	5/31, 06:31
17	nb16	gyro	60	300	50	16	yes	5/31, 07:06
18	bt	gyro	60	300	50	16	yes	5/31, 18:07

Table 8: Summary of ADCP parameter settings and configuration files

Aquisition gap length (hours)	Start	End
1.07	04/27 22:33	04/27 23:37
1.01	04/28 20:19	04/28 21:20
1.32	04/28 21:50	04/28 23:09
12.30	05/14 02:33	05/14 14:50
2.37	05/23 00:15	05/23 02:38

Table 9: Major gaps in ADCP data aquisition

2.5 File Telemetry Data

Site E1 sn151 30-May-04 0510Z

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
149	7.0326	5420050	2.100	36.892	P--> 5420000
149	0.0323	182	2.183	39.786	T--> 7.0
148	0.0322	195	2.371	77.505	
147	0.0317	204	2.120	67.585	
146	0.0319	192	3.064	37.919	
145	0.0322	185	4.629	33.612	
144	0.0325	195	4.963	29.173	
143	0.0320	222	4.437	19.266	
142	0.0314	246	3.475	22.173	
141	0.0338	290	2.791	31.426	

Site E1 sn151 31-May-04 0010Z

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
150	7.0348	5420850	2.567	17.186	P--> 5420000
150	0.0322	164	2.613	19.880	T--> 7.0
149	0.0323	182	2.203	39.812	
148	0.0322	195	2.385	77.811	
147	0.0318	204	2.133	67.892	
146	0.0300	192	3.092	38.132	
145	0.0301	185	4.635	33.826	
144	0.0324	195	4.975	29.453	
143	0.0322	222	4.453	19.320	
142	0.0314	246	3.492	22.346	
141	0.0339	290	2.813	31.679	

Site E2 sn162 30-May-04 range<1000m speed 1.5 kt

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
149	7.5519	5834400	6.433	51.679	P--> 5834000
149	0.0521	572	6.420	54.532	T--> 7.5
148	0.0523	583	5.871	50.985	
147	0.0525	592	3.933	52.745	
146	0.0530	578	2.575	87.078	
145	0.0535	568	2.577	110.237	
144	0.0533	579	2.340	121.050	
143	0.0528	604	2.541	133.557	
142	0.0537	624	2.513	116.250	

Site E2 sn162 30-May-04 range<1900m speed 0.8 kt

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
149	7.5534	5834400	6.517	51.865	P--> 5834000
149	0.0522	572	6.447	54.772	T--> 7.5
148	0.0524	583	5.885	51.145	
147	0.0527	592	3.973	53.212	
146	0.0531	578	2.600	87.451	
145	0.0536	568	2.593	110.517	
144	0.0533	579	2.372	121.357	
143	0.0529	604	2.567	133.837	
142	0.0538	624	2.536	116.410	

Table 10: CPIES/PIES Telemetry Data

Site B4 sn164 27-May-04

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
146	7.4751	5753150	NA	NA	P--> 5752000
147	0.4762	1815	NA	NA	T--> 7.0
145	0.4765	1803	NA	NA	
142	0.4745	1838	NA	NA	
141	0.4744	1864	NA	NA	
140	0.4742	1889	NA	NA	

Site C4 sn144 27-May-04 range .6nm speed 1.5 kt 1243Z 1st session

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
144	0.4278	1891	8.509	259.820	P--> 5718000
143	0.4279	1897	8.469	254.007	>1000
142	0.4279	1920	8.296	236.247	P--> 5720000
141	0.4290	1941	7.960	226.941	<1000
140	0.4291	1971	7.206	220.568	T--> 7.0
139	0.4300	8	5.992	216.888	
138	0.4307	32	5.057	224.634	

Site C4 sn144 27-May-04 range .4nm speed .5 kt 2nd session

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
145	0.4280	1892	8.569	260.447	P--> 5718000
144	0.4282	1898	8.528	10211.331	>1000
142	0.4290	1941	7.974	227.194	P--> 5720000
141	0.4292	1972	7.234	220.821	<1000
140	0.4301	8	6.019	217.075	T--> 7.0
139	0.4308	32	5.085	224.848	

Site C4 sn144 27-May-04 3rd session

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
146	7.4268	5719150	9.442	257.940	P--> 5718000
146	0.4277	1906	9.532	260.567	>1000
145	0.4280	1891	8.562	260.433	P--> 5720000
143	0.4279	1897	8.473	254.194	<1000
143	0.4284	1921	8.402	237.341	T--> 7.0
142	0.4291	1942	7.993	227.221	
141	0.4292	1972	7.234	220.768	
140	0.4301	8	6.021	217.141	
139	0.4313	32	5.095	225.101	

Site D4 sn105 27-May-04 1732Z

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
146	7.9527	6134700	NA	NA	P--> 6134000
146	0.4523	1408	NA	NA	T--> 7.5
145	0.4526	1400	NA	NA	
144	0.4522	1412	NA	NA	
143	0.4518	1436	NA	NA	
140	0.4533	1522	NA	NA	
139	0.4535	1553	NA	NA	
138	0.4535	742	NA	NA	

Table 11: CPIES/PIES Telemetry Data

Site D4 sn105	27-May-04	1742Z	2nd telemetry		
Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
146	7.9518	6134600	NA	NA	P--> 6134000
146	0.4522	1408	NA	NA	T--> 7.5
145	0.4527	1400	NA	NA	
144	0.4522	1412	NA	NA	
142	0.4523	1455	NA	NA	
141	0.4531	1483	NA	NA	
140	0.4532	1522	NA	NA	
139	0.4535	1553	NA	NA	
138	0.4534	742	NA	NA	

Site E4 sn137	27-May-04	2220Z	range .6nm	gain = 5	
Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
146	7.8821	6083900	7.683	141.516	All Data in here
147	6.6716	120	998.591	144.823	is incorrect,
145	0.3776	109	6.389	10096.041	increase gain
3421	31.2579	30779800	1409.911	2302.676	
142	0.3725	157	7.622	117.344	
6185	0.3745	181	407.428	10067.548	
137	0.3786	241	4.353	200.168	
137	0.3804	228	2.312	187.555	
136	0.3804	218	1.811	133.370	

Site E4 sn137	27-May-04	range .4nm	gain = 6		
Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
MSB	RECORD	MISSING			P--> 6084000
145	0.3775	109	6.380	153.196	T--> 7.5
144	0.3721	117	5.403	130.290	
143	0.3706	140	7.012	116.850	
142	0.3724	157	7.601	117.117	
141	0.3745	181	5.893	130.250	
140	0.3731	213	4.431	172.222	
139	0.3743	233	4.772	194.755	
138	0.3787	241	4.365	200.315	
137	0.3804	228	2.316	187.515	
136	0.3804	218	1.807	133.263	

Site F3 sn134	28-May-04	0345Z	range<1km	gain=6	
Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
147	7.6725	5929500	NA	NA	P--> 5930000
147	0.1719	290	NA	NA	
144	0.1716	265	NA	NA	T--> 7.5
141	-0.2860	312	NA	NA	
140	-0.9695	337	NA	NA	
139	-0.1530	353	NA	NA	
138	0.1691	360	NA	NA	

Table 12: CPIES/PIES Telemetry Data

Site F3 sn134 28-May-04 0355Z range<1km gain=4

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
MSB	RECORD	MISSING			P--> 5928000
146	0.1719	268	NA	NA	
146	0.1719	256	NA	NA	T--> 7.5
145	0.1716	265	NA	NA	
143	0.1709	285	NA	NA	
142	0.1701	297	NA	NA	
141	-0.2831	312	NA	NA	
140	0.1712	11834	NA	NA	
139	-0.1501	353	NA	NA	
138	0.1691	360	NA	NA	

Site G2 sn119 28-May-04 0840Z

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
147	7.6071	5876400	2.658	138.117	P--> 5876000
147	0.1044	10	2.647	140.943	<1000
146	0.1037	1989	2.247	145.676	P--> 5874000
145	0.1038	1974	1.795	133.943	>1000
144	0.1035	1977	1.041	128.210	T-->7.5
143	0.1028	1992	0.147	4.973	
142	0.1007	1997	1.455	317.019	
141	0.1015	3	2.700	317.285	
140	0.1008	20	3.359	312.139	
139	0.1008	27	4.000	303.966	
138	0.1015	22	4.535	298.086	
137	0.1025	1998	4.259	298.673	
135	0.1023	1972	3.595	306.259	
135	0.1025	1963	3.349	312.939	
134	0.1029	1948	3.603	332.938	

Site H2 sn118 28-May-04 1340Z range<300m speed 1.4kt

Year-Day	Tau(s)	Pressure(deca Pa)	Current(cm/s)	Heading(deg.)	Comments
147	7.4675	5765100	1.117	178.116	P--> 5874000
147	0.4677	1938	1.228	180.955	
146	0.4671	1921	1.309	175.409	
145	0.4664	1909	1.617	143.996	
144	0.4659	1914	1.855	126.584	T--> 7.0
143	0.4654	1931	2.439	111.877	
142	0.4655	1937	2.604	96.078	
141	0.4671	1944	1.249	100034.576	
139	0.4676	1976	1.491	309.592	
138	0.4679	1977	1.811	2.720	
137	0.4689	1960	1.952	9.586	
136	0.4690	1946	1.501	45.546	
135	0.4698	1947	1.281	51.585	
134	0.4697	1944	0.671	13.040	
133	0.4689	1943	0.655	267.900	

Table 13: CPIES/PIES Telemetry Data

2.6 File Telemetry Plots

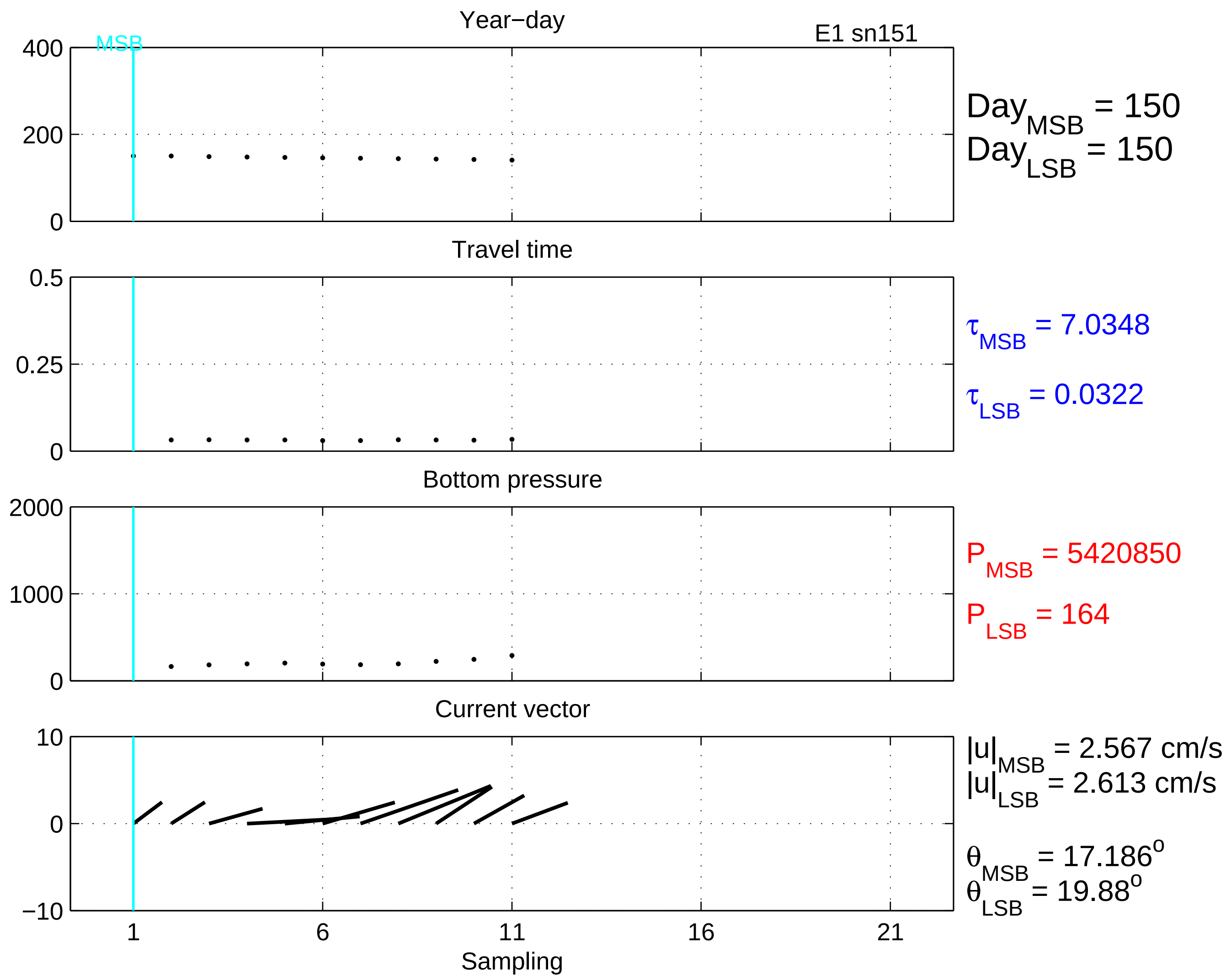


Figure 2: File telemetry data for site E1

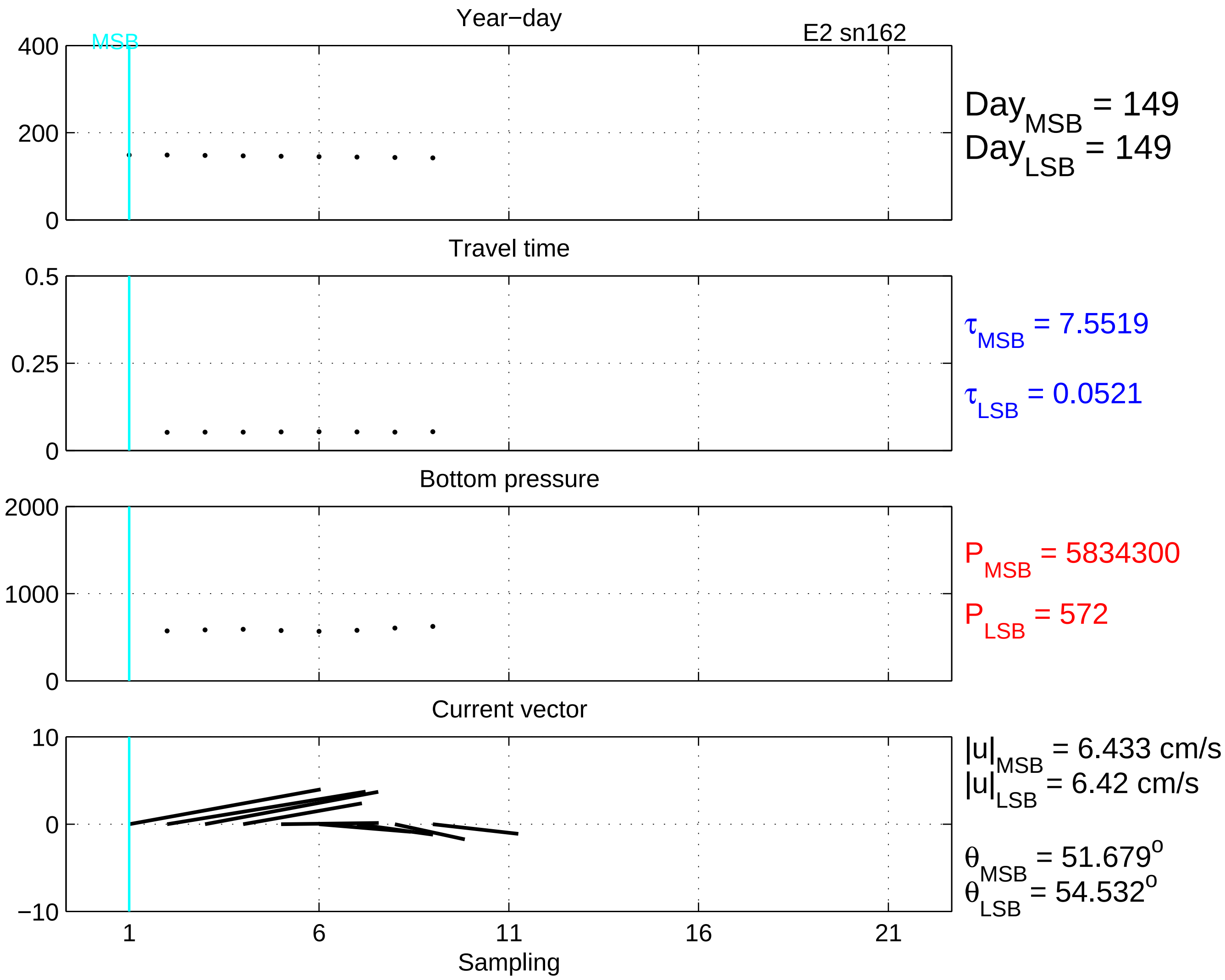


Figure 3: File telemetry data for site E2

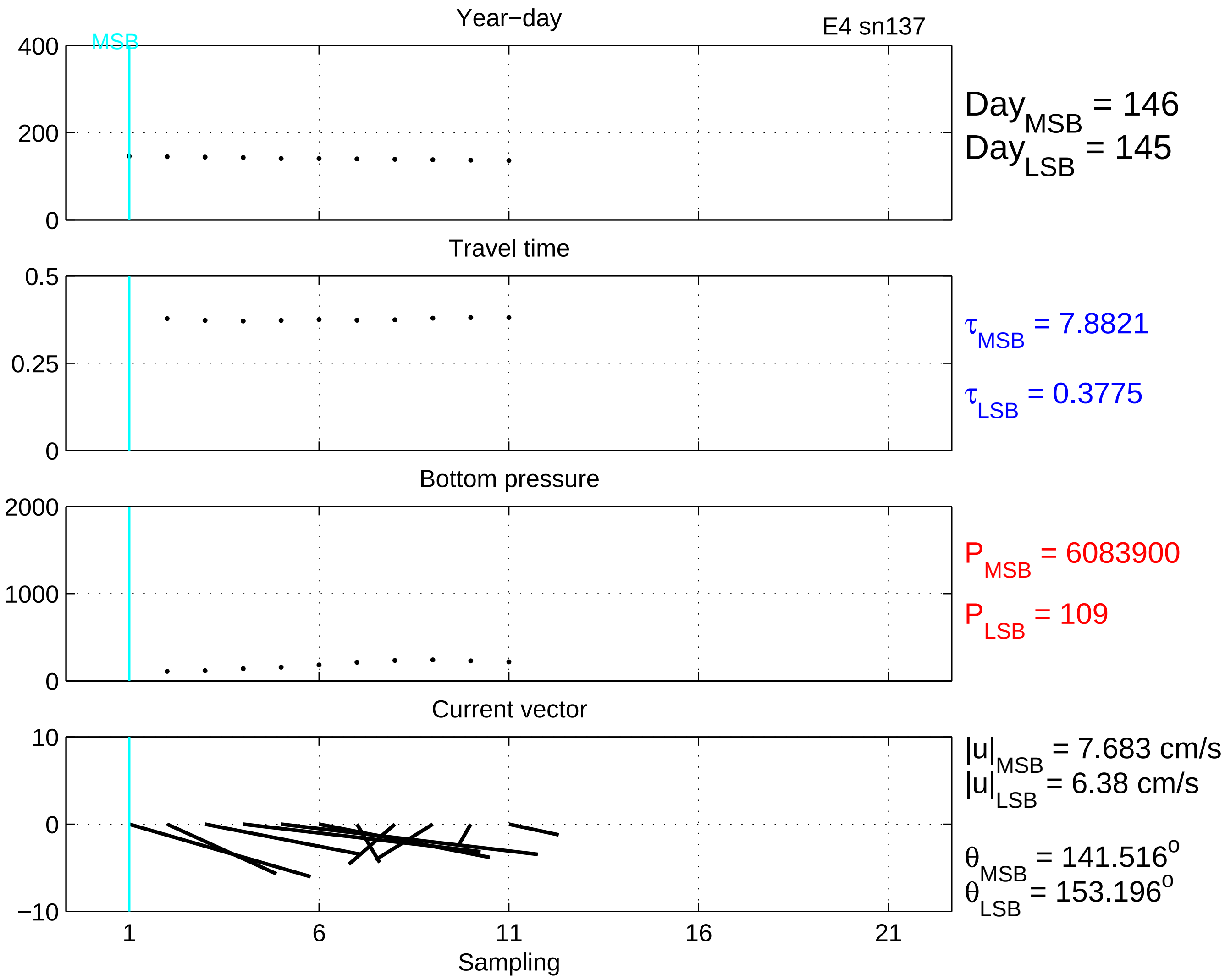
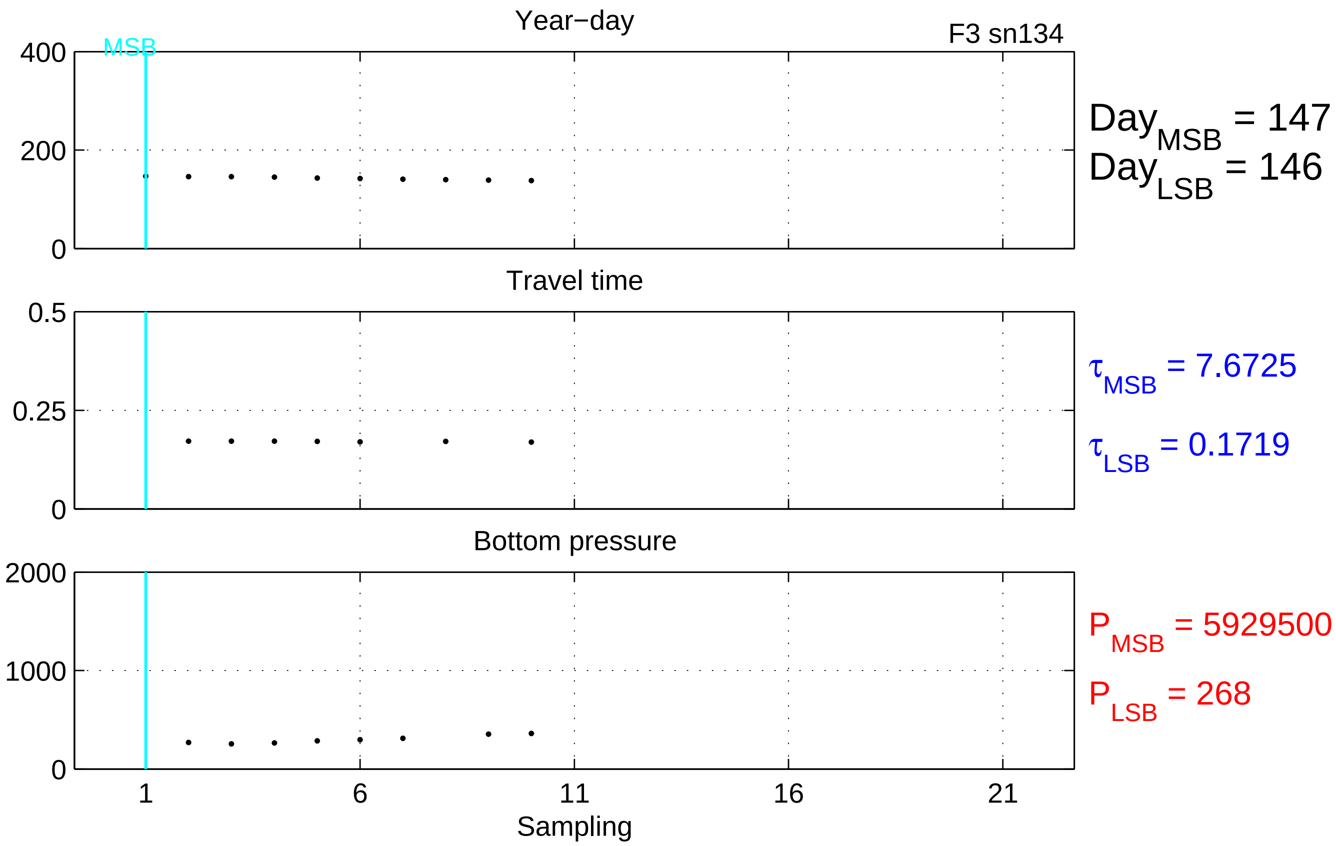


Figure 4: File telemetry data for site E4



No current data (PIES)

Figure 5: File telemetry data for site F3

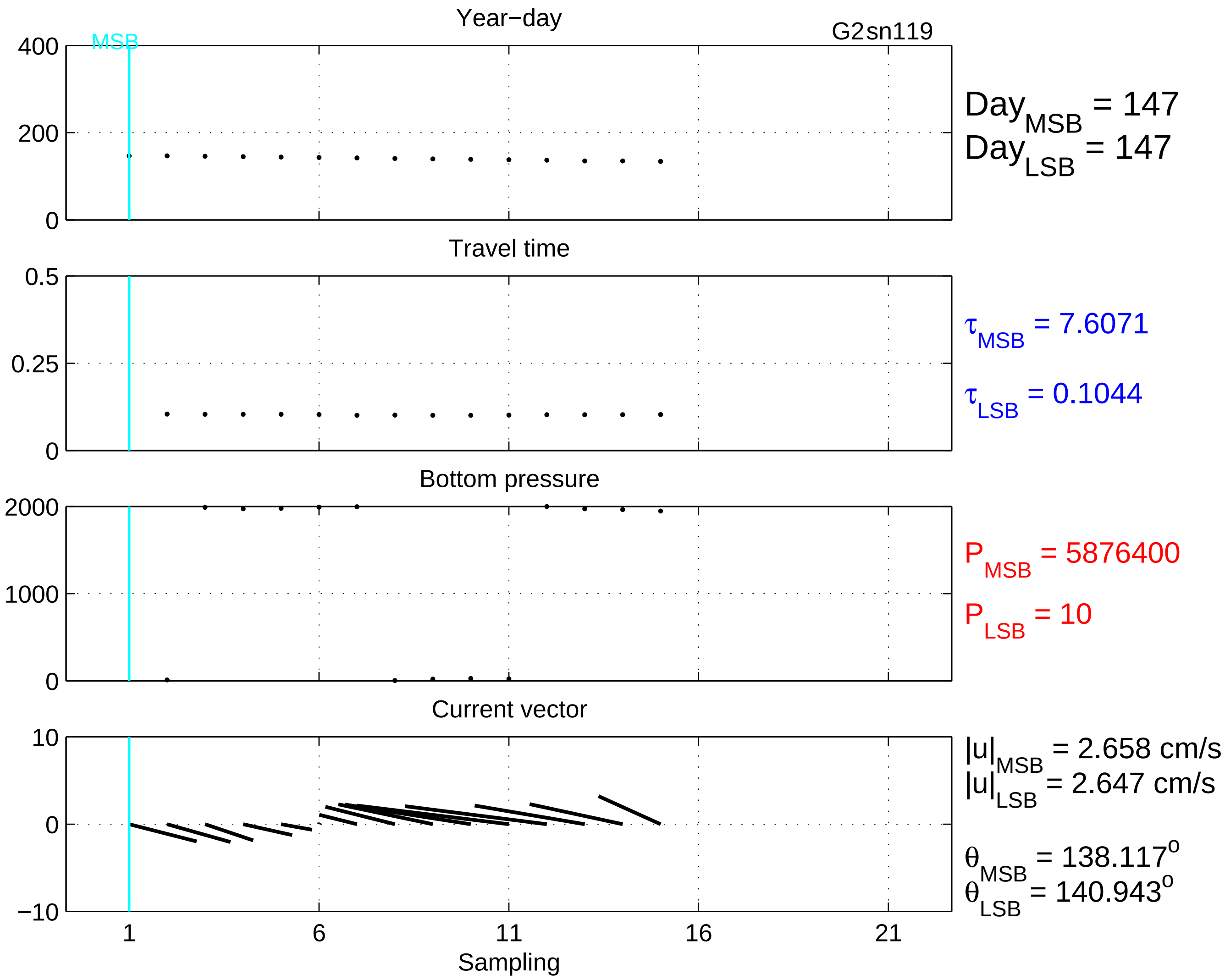


Figure 6: File telemetry data for site G2

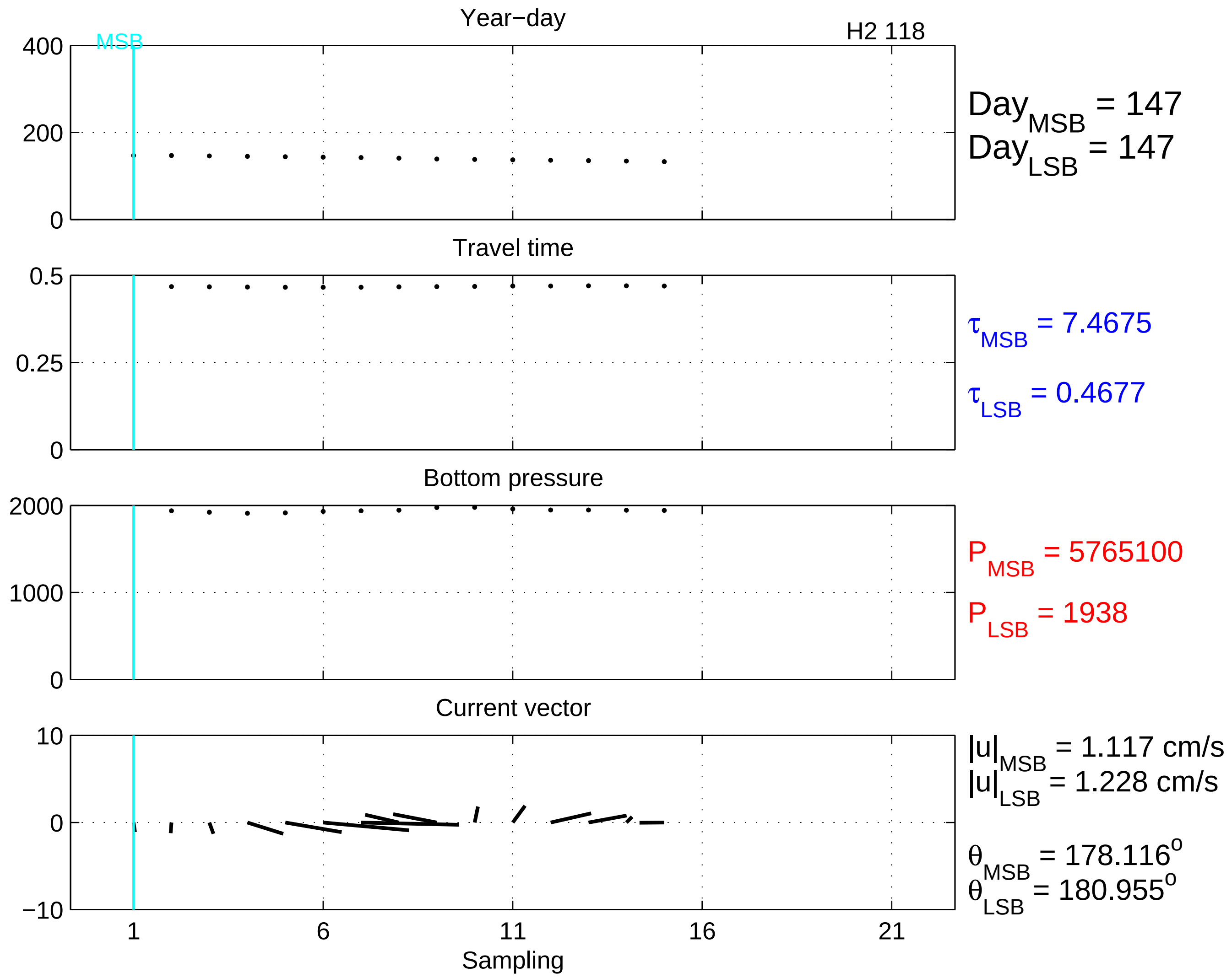


Figure 7: File telemetry data for site H2

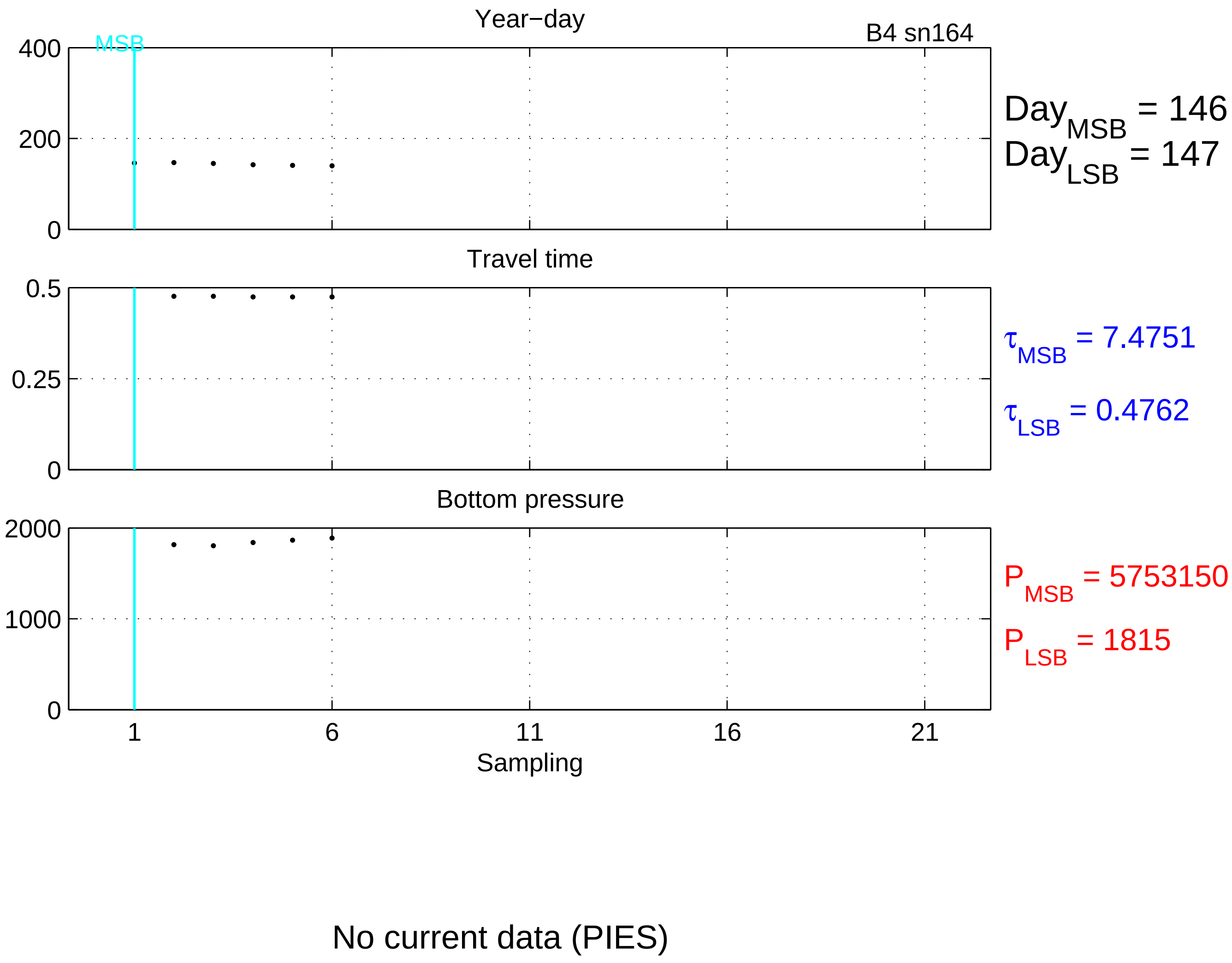


Figure 8: File telemetry data for site B4

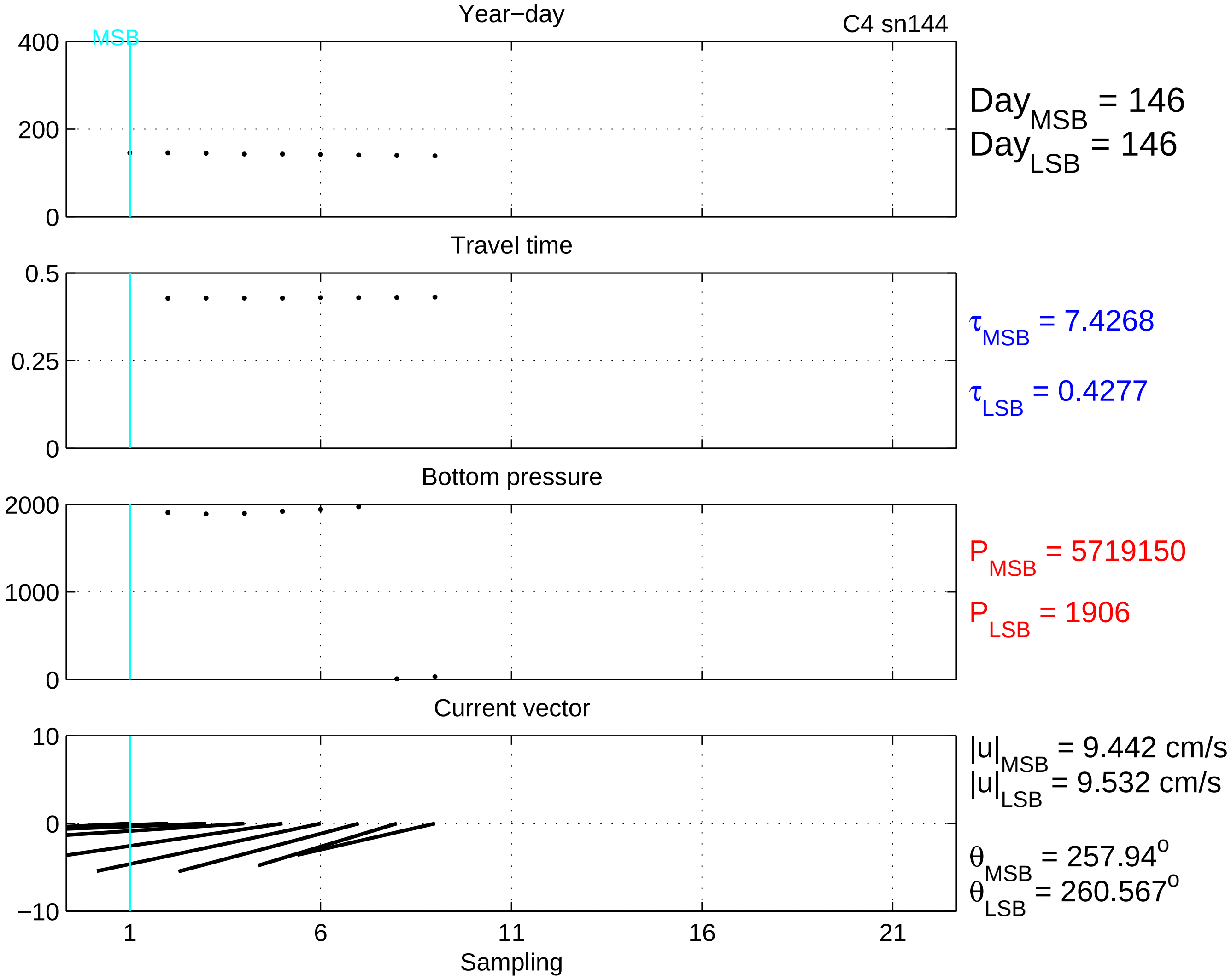


Figure 9: File telemetry data for site C4

2.7 DAS Data

The file configuration for DAS files TN168DAS.XXX follows:	
Value 1	Nav computer GMT date - (dd/mm/yyyy)
Value 2	Nav computer GMT time - (hh:mm:ss)
Value 3	Nav computer latitude - (+/-dd.dddddd)
Value 4	Nav computer longitude - (+/-ddd.dddddd)
Value 5	Gyro compass heading - (degrees true)
Value 6	Nav computer COG - (degrees true)
Value 7	Doppler speed log - (knots)
Value 8	Nav computer SOG - (knots)
Value 9	Thermosalinagraph sea temperature - (degrees C)
Value 10	Thermosalinagraph sea temperature external - (degrees C)
Value 11	Thermosalinagraph sea conductivity - (Seimens/meter)
Value 12	Thermosalinagraph sea salinity - (PSU)
Value 13	Thermosalinagraph chlorophyll - (volts)
Value 14	Thermosalinagraph light transmission - (volts)
Value 15	Water Depth - (meters)
Value 16	IMET air temperature - (degrees C)
Value 17	IMET relative humidity - (percent)
Value 18	IMET barometric pressure - (millibars)
Value 19	PAR - (microEinsteins per square meter per second)
Value 20	IMET short wave radiation - (watts/square meter)
Value 21	Wind speed true - (knots)
Value 22	Wind direction true - (degrees)
Value 23	Wind speed relative - (knots)
Value 24	Wind direction relative - (degrees)
Value 25	Average true wind speed - (knots)
Value 26	Average true wind direction - (degrees)
Value 27	Sound Velocity - (meters/second)
Value 28	Winch ID. number (see note below)
Value 29	Wire out (meters)
Value 30	Wire rate (meters/minute)
Value 31	Wire tension (lbs.)
Winch ID.	
0	Hydro Winch 1
1	Trawl Winch
2	Hydro Winch 2

Table 14: Data aquisition system,DAS,configuration file for yearday 115 through 152

3 Figures

3.1 Feature Survey

3.1.1 Potential temperature

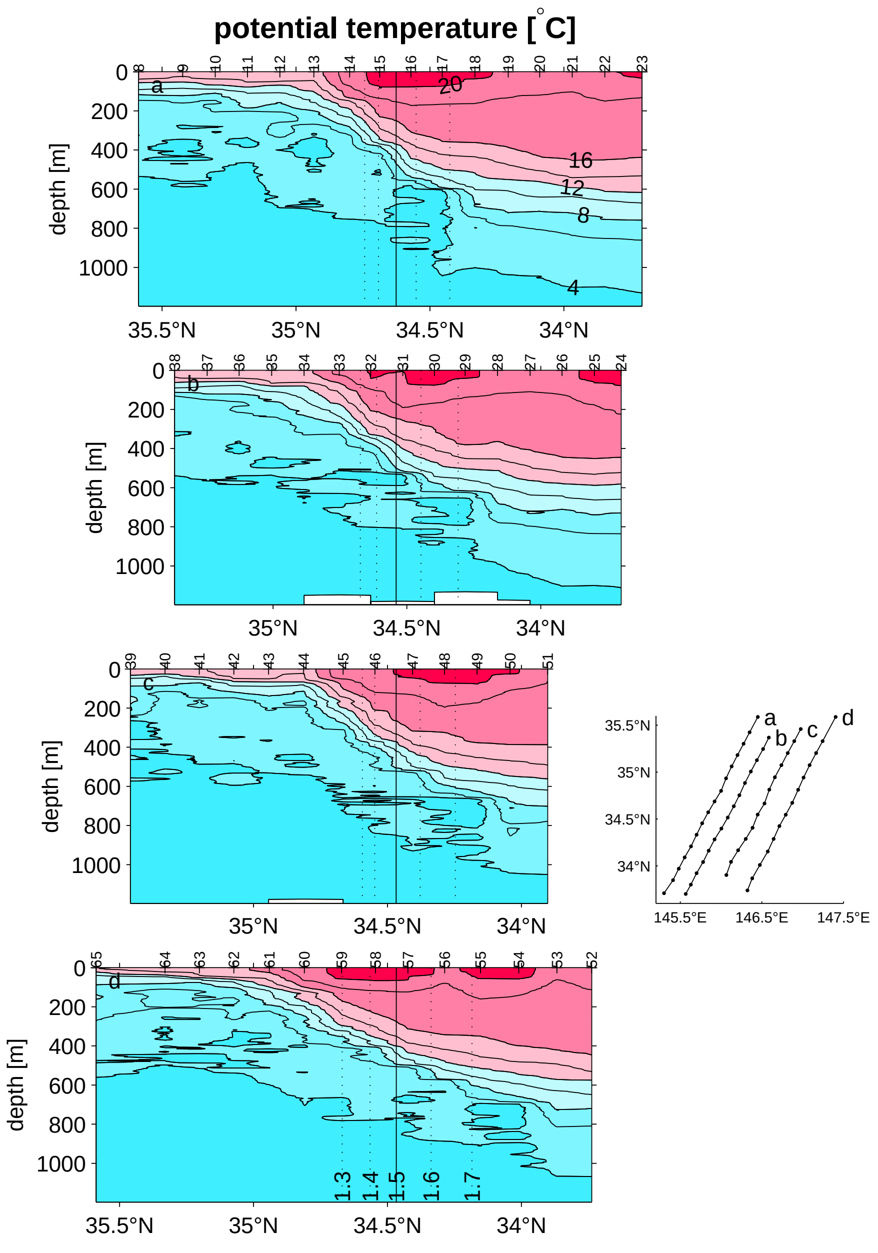


Figure 10: Potential temperature (°C) contoured against depth and latitude (left panel) for the four survey sections (a)through (d) shown in the map(right panel). Dashed and solid vertical lines superimposed on the contour plots are dynamic height values at 100m referenced to 1000m in dynamic meters.

3.1.2 Salinity

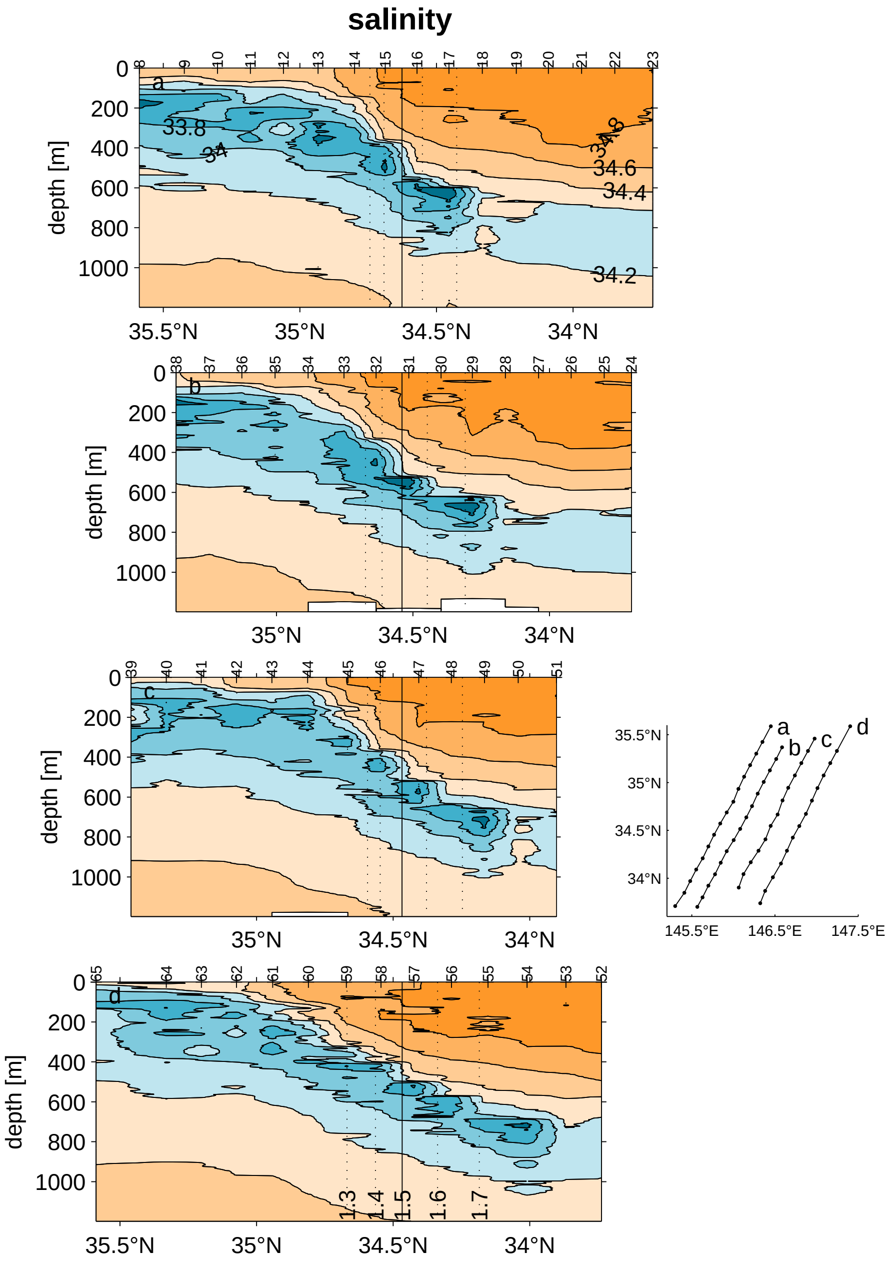


Figure 11: Salinity contoured against depth and latitude(left panel) for the four survey sections (a)through (d) shown in the map(right panel). Dashed and solid vertical lines superimposed on the contour plots are dynamic height values at 100m referenced to 1000m in dynamic meters.

3.1.3 Zonal velocity

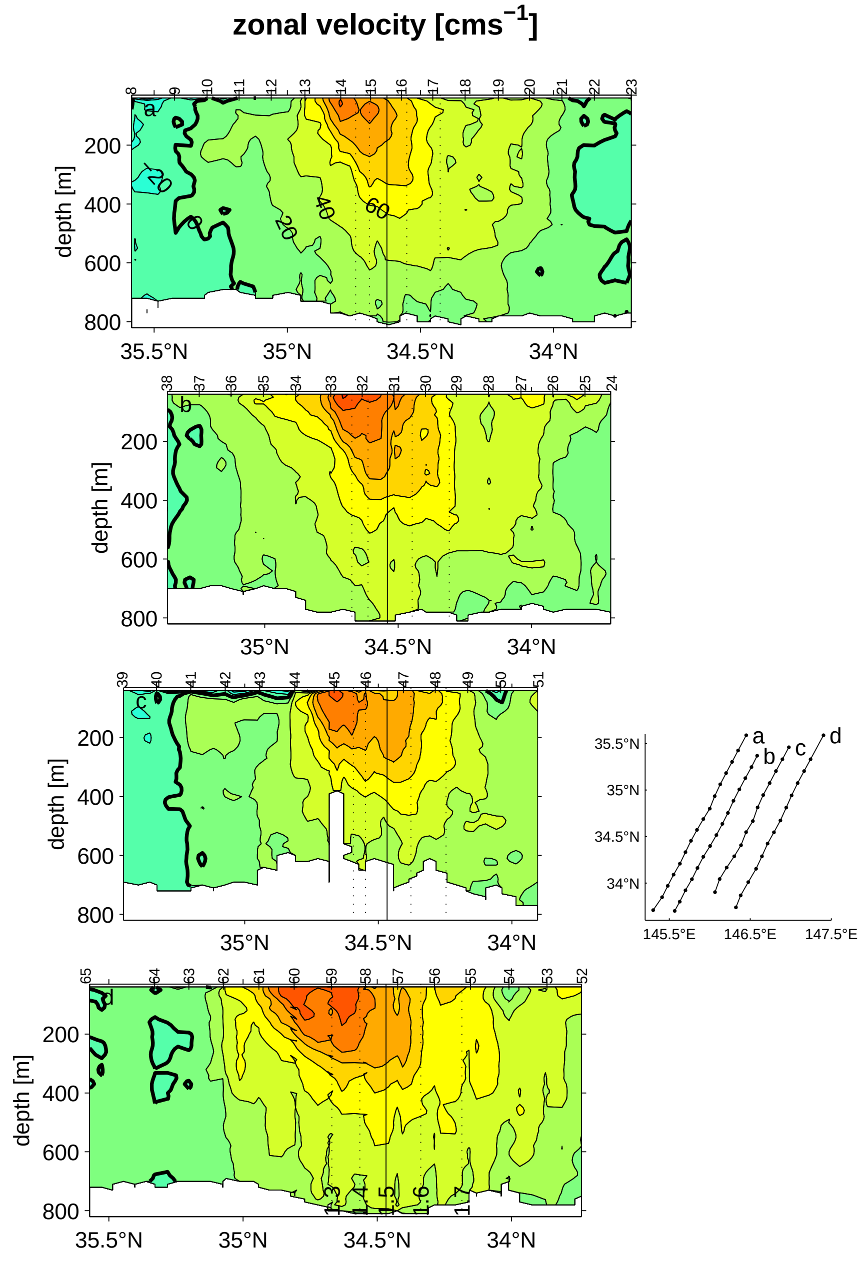


Figure 12: Zonal velocity(cms^{-1}) contoured against depth and latitude(left panel) for the four survey sections (a)through (d) shown in the map(right panel). Dashed and solid vertical lines superimposed on the contour plots are dynamic height values at 100m referenced to 1000m in dynamic meters. Note that CI=20cms^{-1}.

3.1.4 Meridional velocity

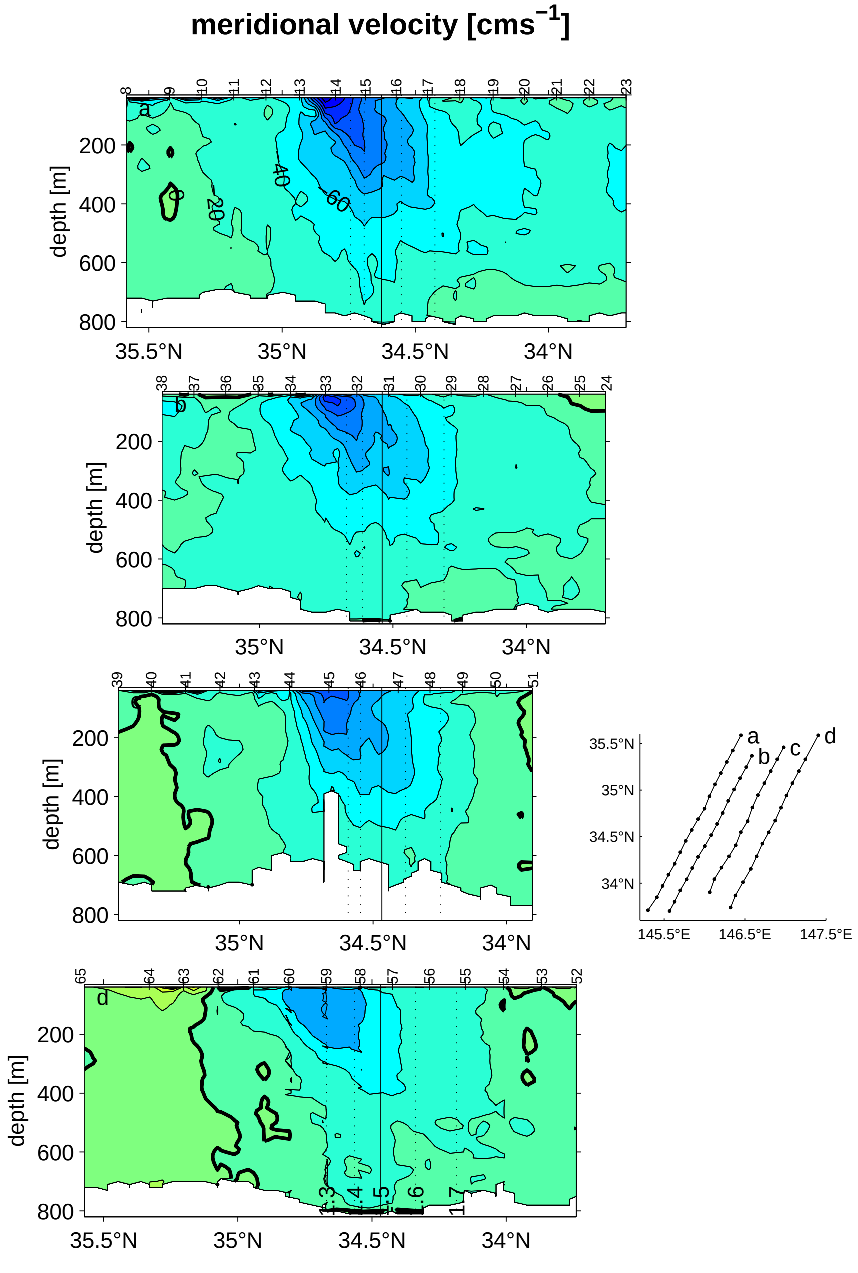


Figure 13: Meridional velocity(cms^{-1}) contoured against depth and latitude(left panel) for the four survey sections (a)through (d) shown in the map(right panel). Dashed and solid vertical lines superimposed on the contour plots are dynamicheight values at 100m referenced to 1000m in dynamic meters. Note that CI=20cms^{-1}.

3.2 External Data On Kuroshio Paths

3.2.1 Satellite SST Modis Data

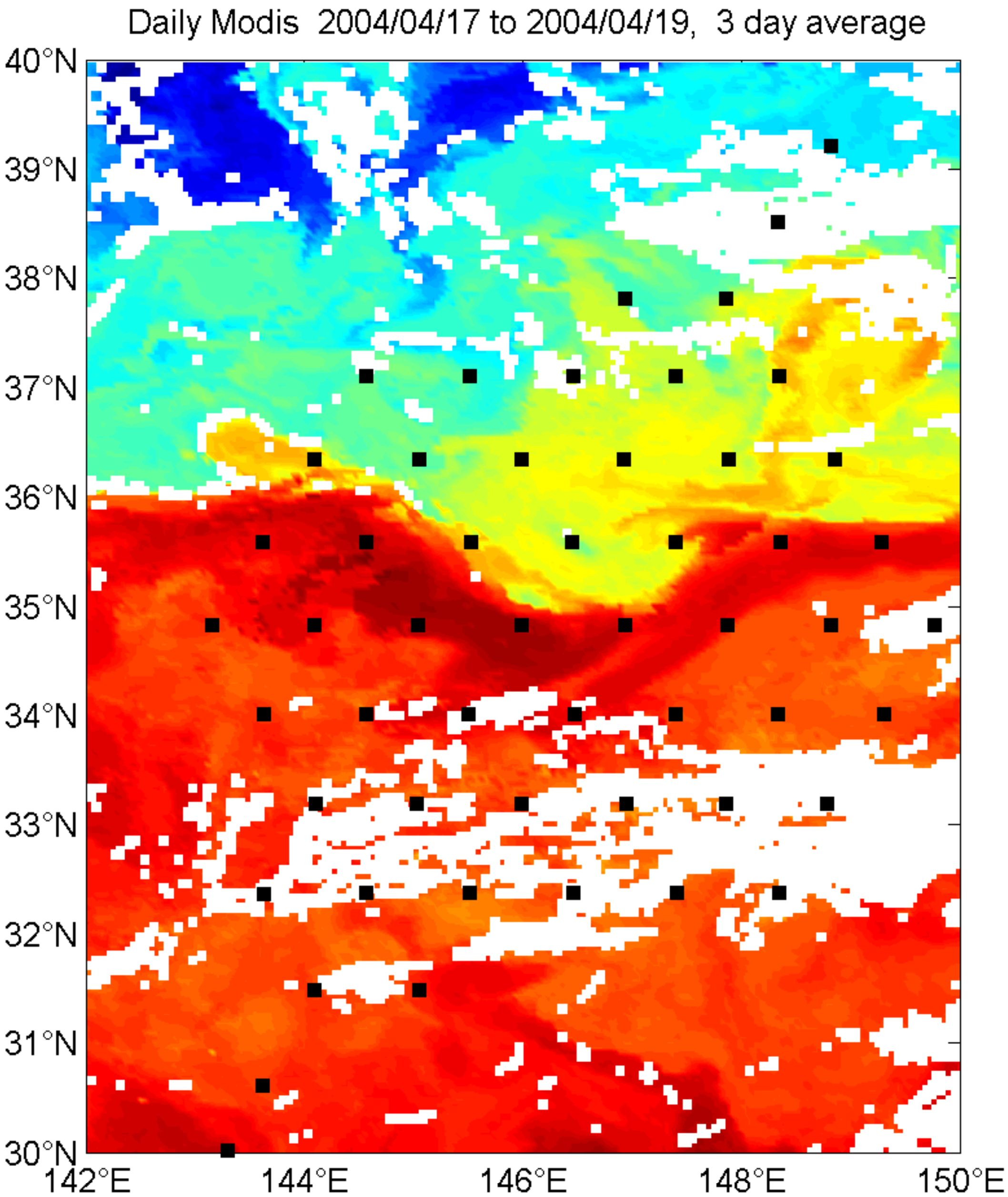


Figure 14: SST from Moderate-resolution Imaging Spectroradiometer(MODIS), http://podaac.jpl.nasa.gov

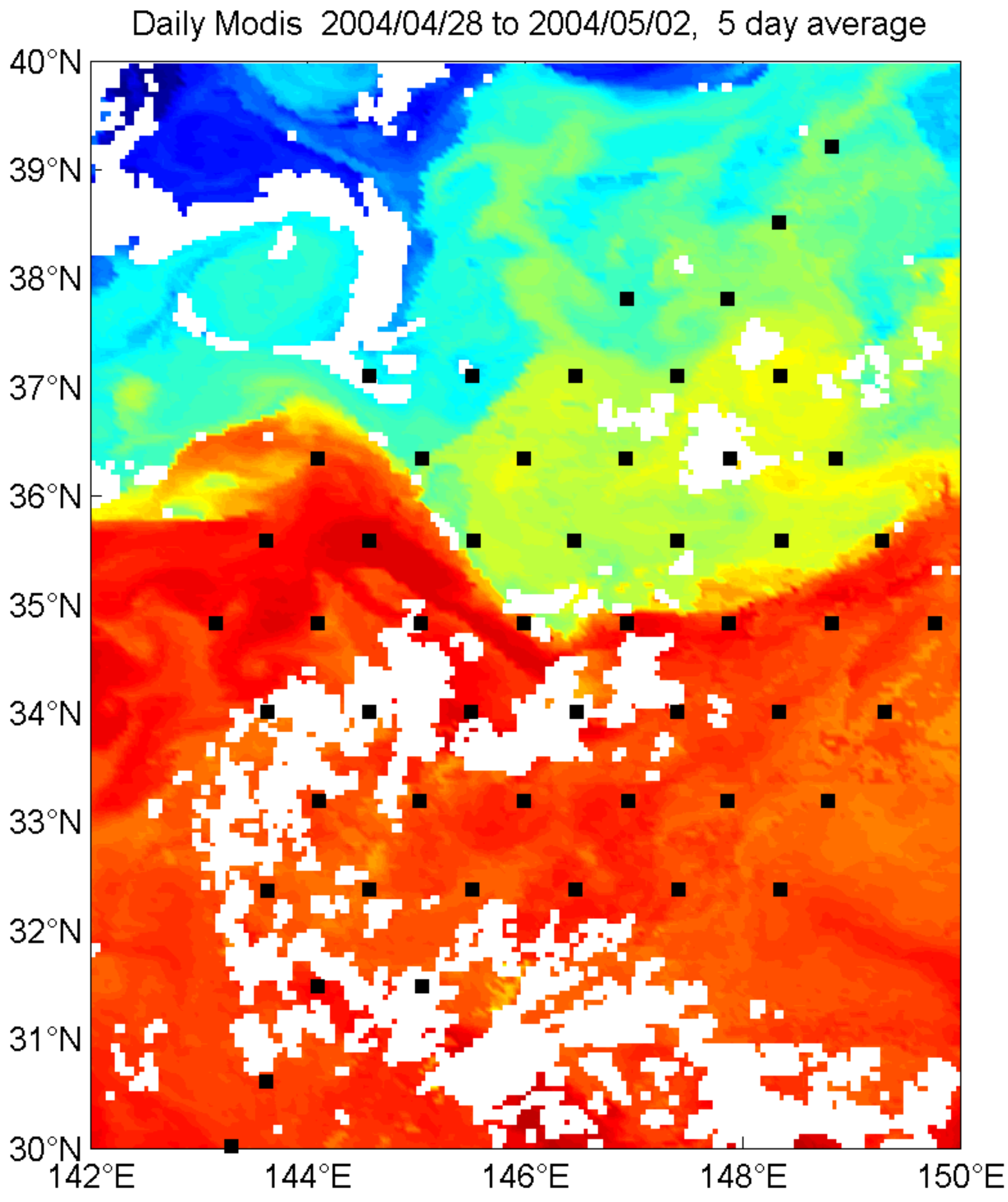


Figure 15: SST from Moderate-resolution Imaging Spectroradiometer(MODIS), http://podaac.jpl.nasa.gov

3.2.2 Satellite SST Tohoku Model

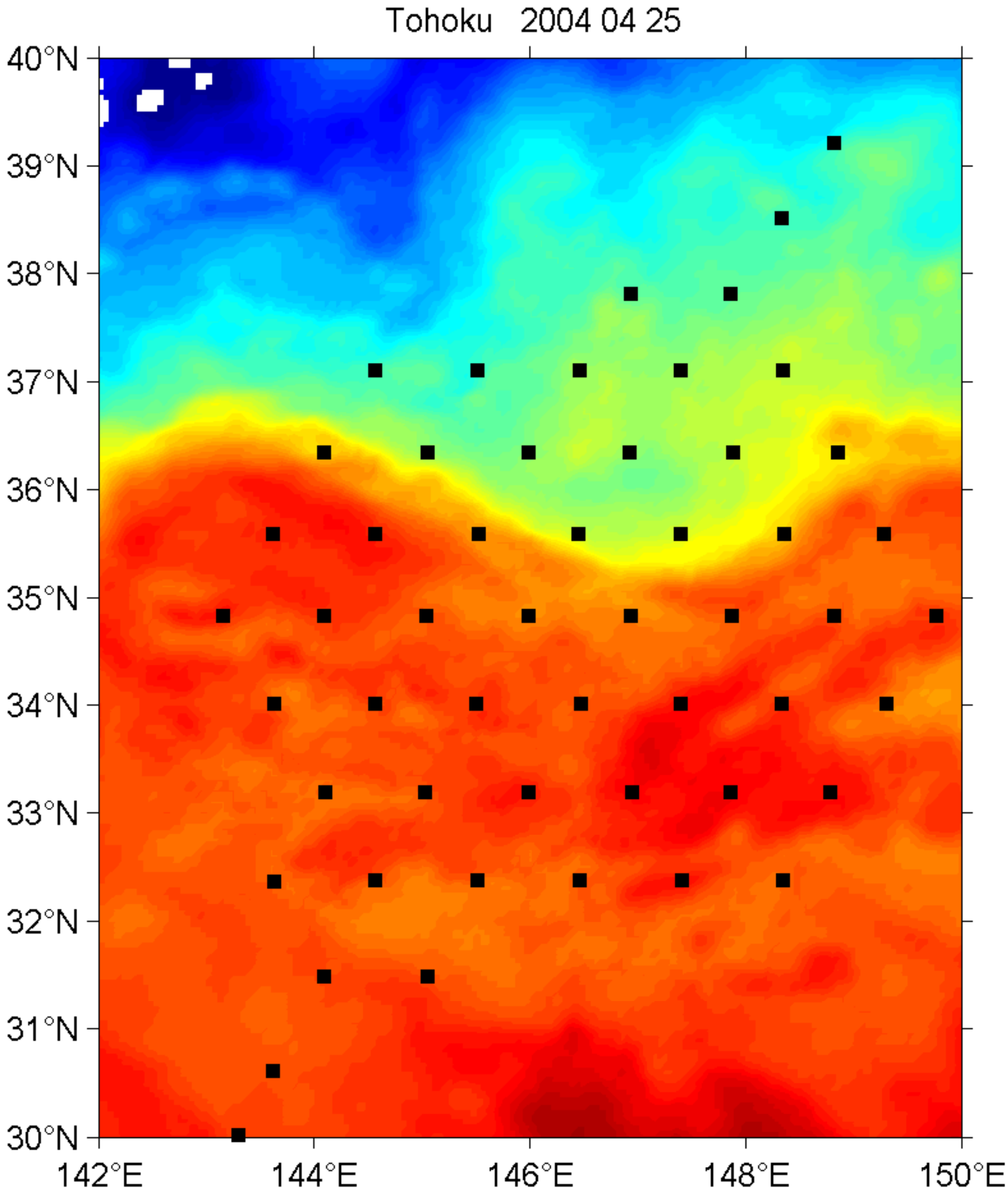


Figure 16: Merged SST(MODIS,AVHRR,and AMSR-E) generated by Tohoku University, http://www.ocean.caos.tohoku.ac.jp/ merge/sstbinary/actvalbm.cgi

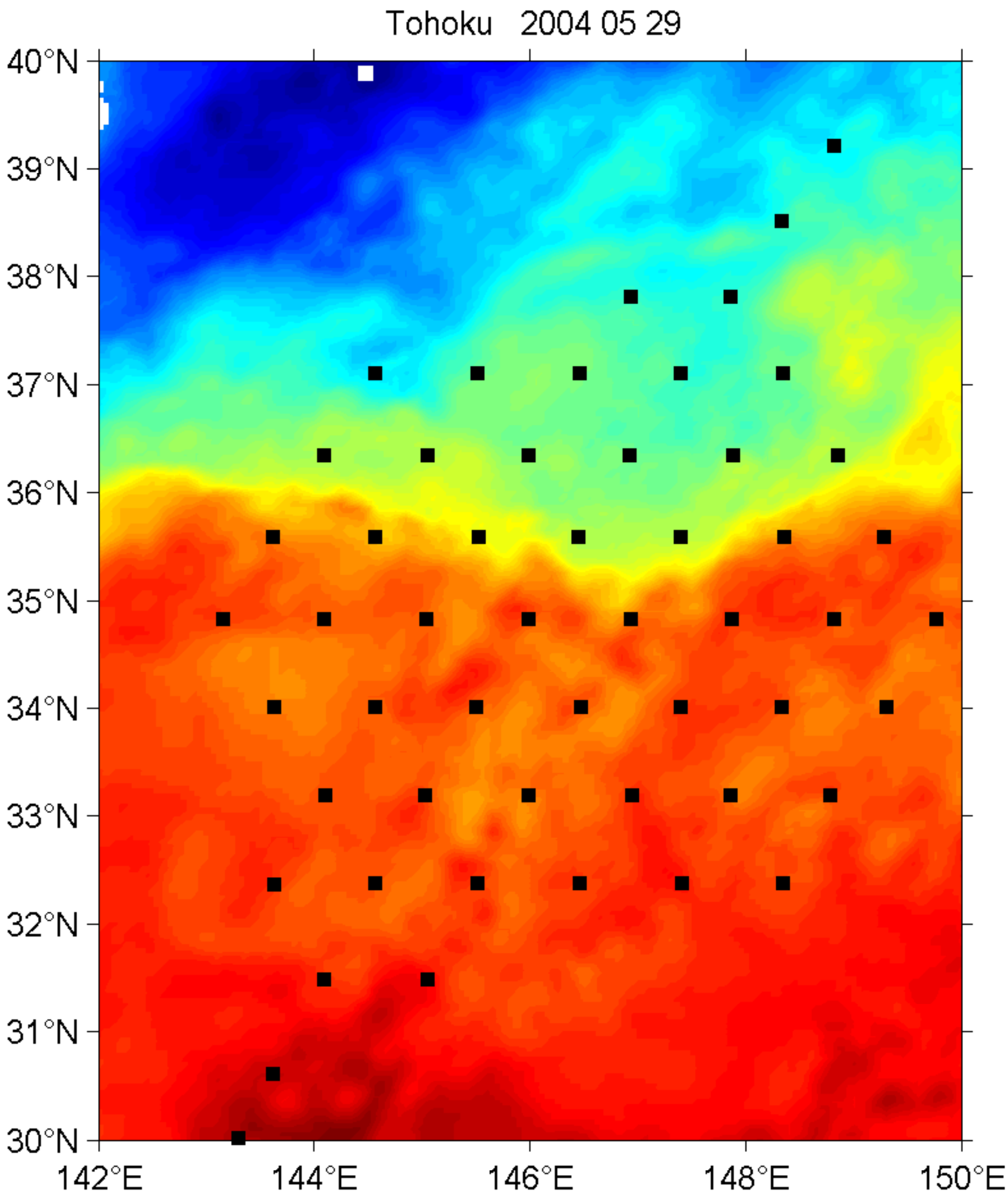


Figure 17: Merged SST(MODIS,AVHRR,and AMSR-E) generated by Tohoku University, http://www.ocean.caos.tohoku.ac.jp/ merge/sstbinary/actvalbm.cgi

3.3 Ship track segments

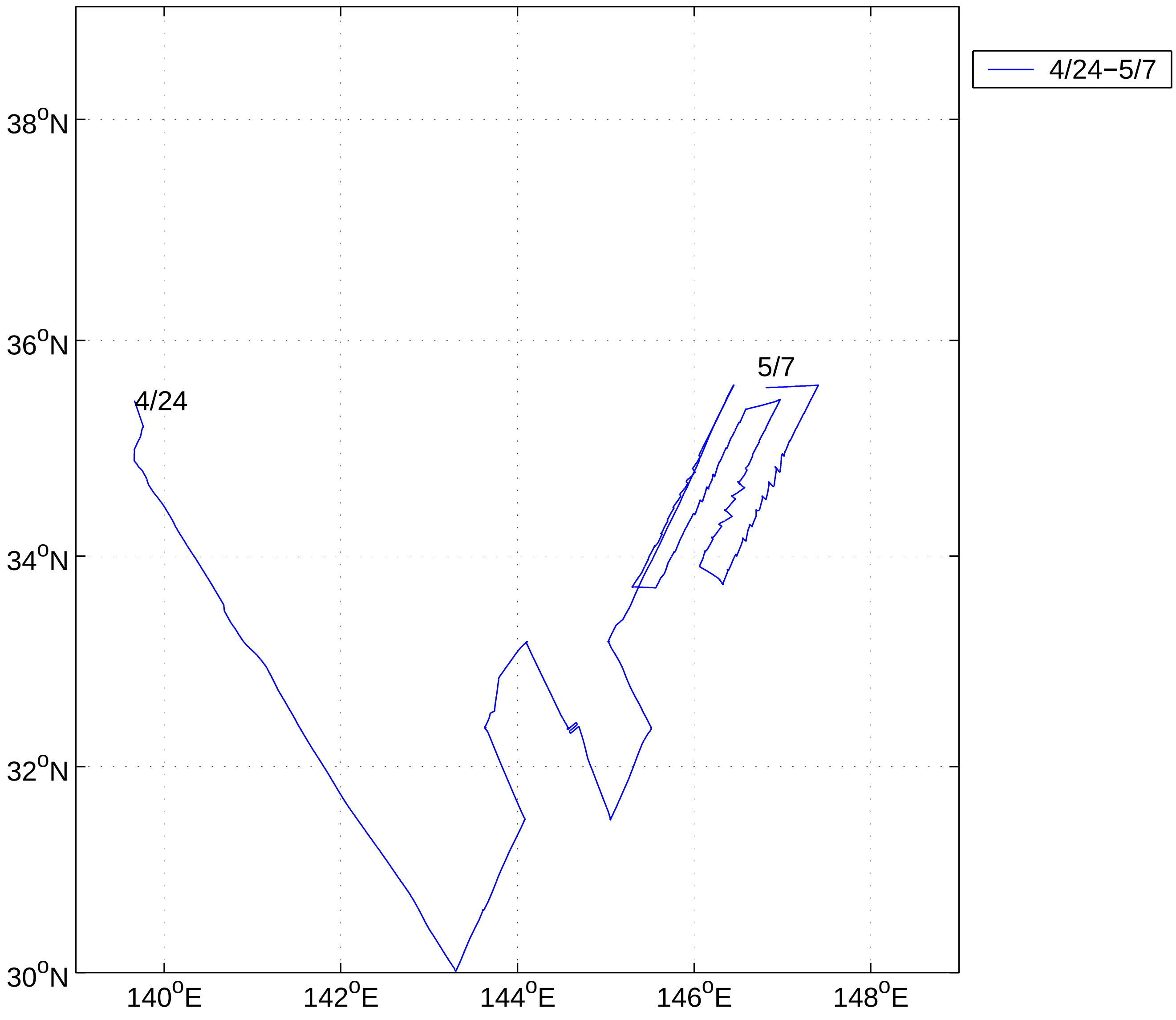


Figure 18: R/V T. G. Thompson: Watts/Donohue KESS cruise track for April 24 to May 7, 2004

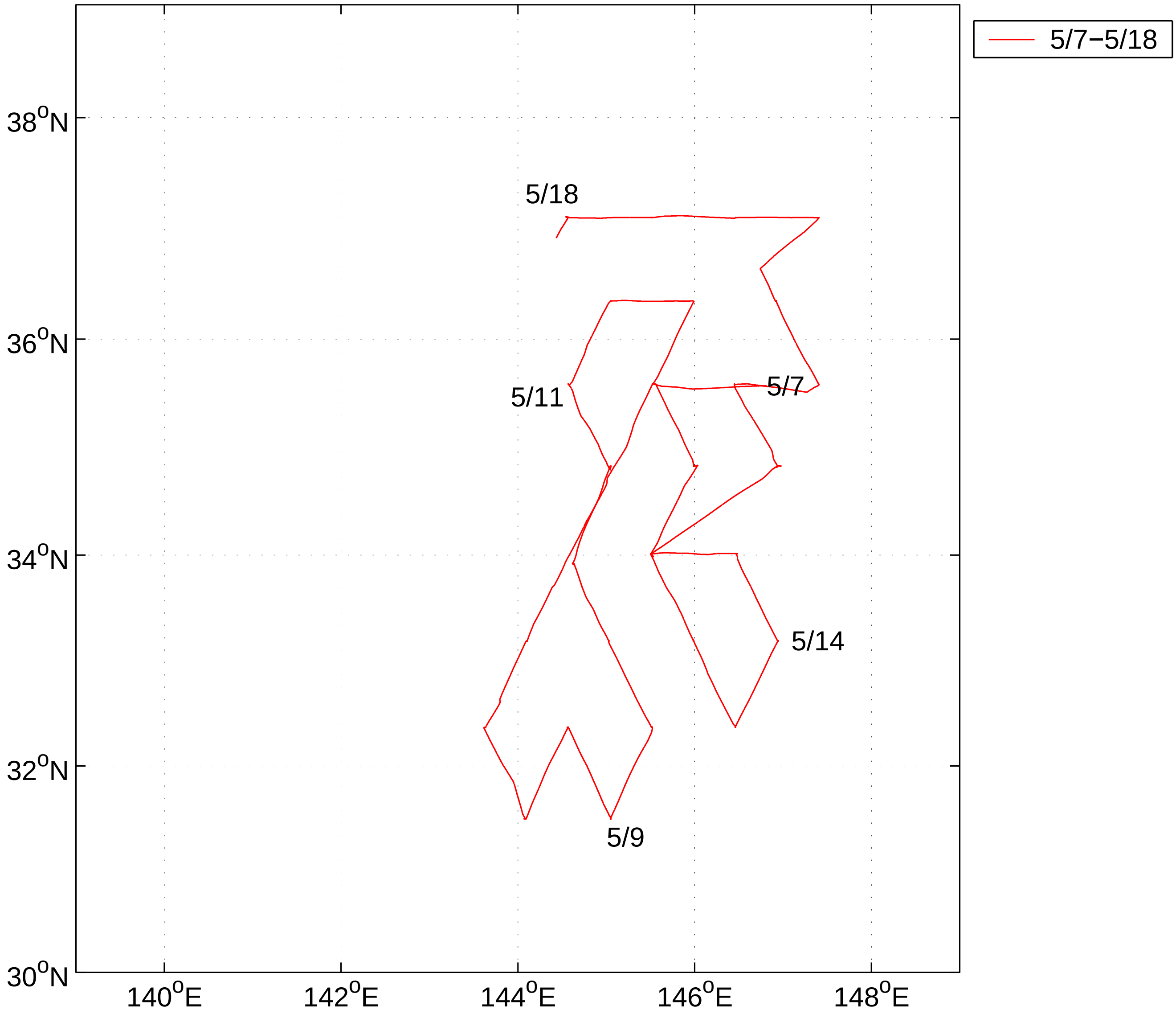


Figure 19: R/V T. G. Thompson: Watts/Donohue KESS cruise track for May 7–18, 2004

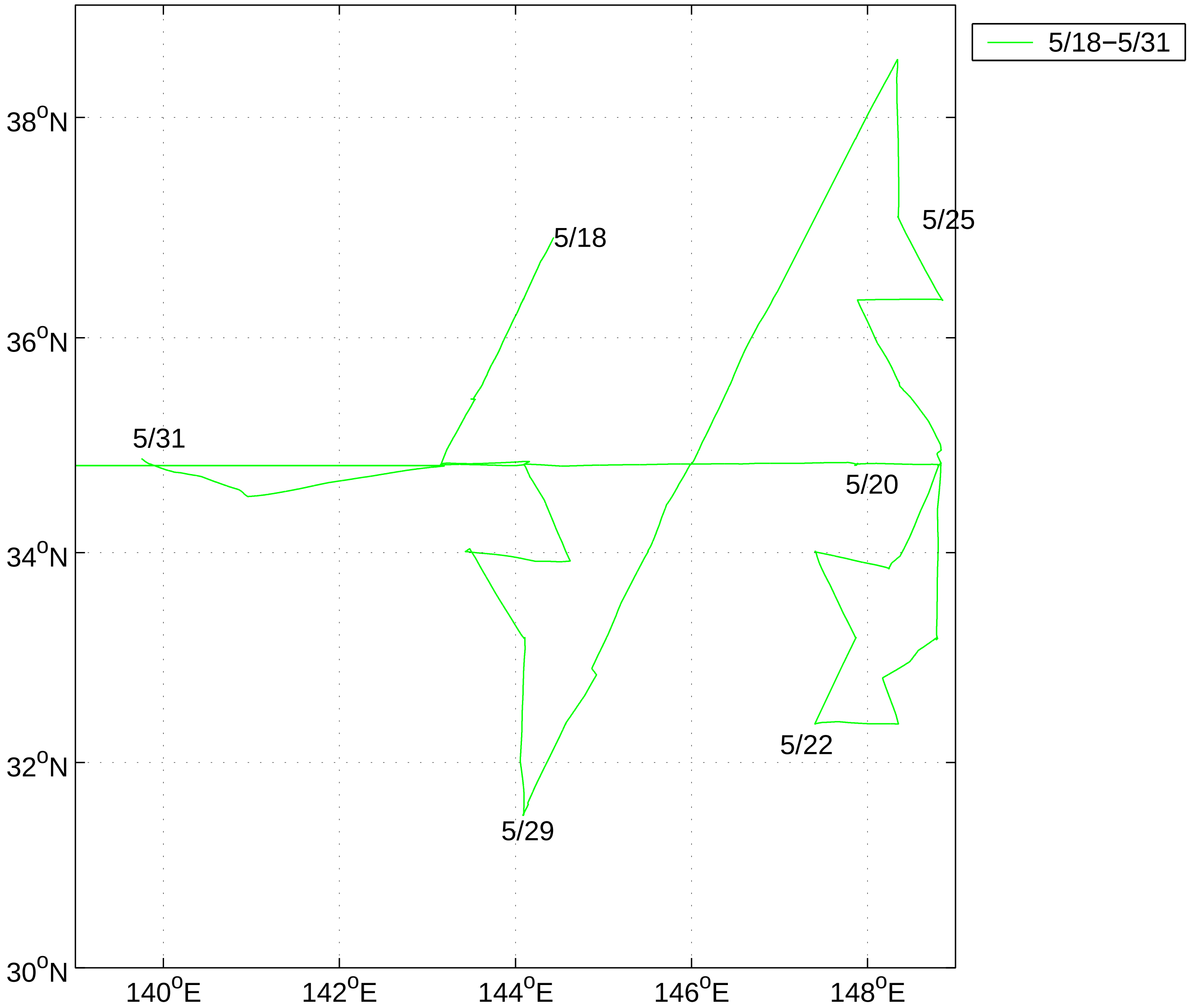


Figure 20: R/V T. G. Thompson: Watts/Donohue KESS cruise track for May 18–31, 2004

3.4 CTD Sites

3.4.1 Typical Plots of the Kuroshio region

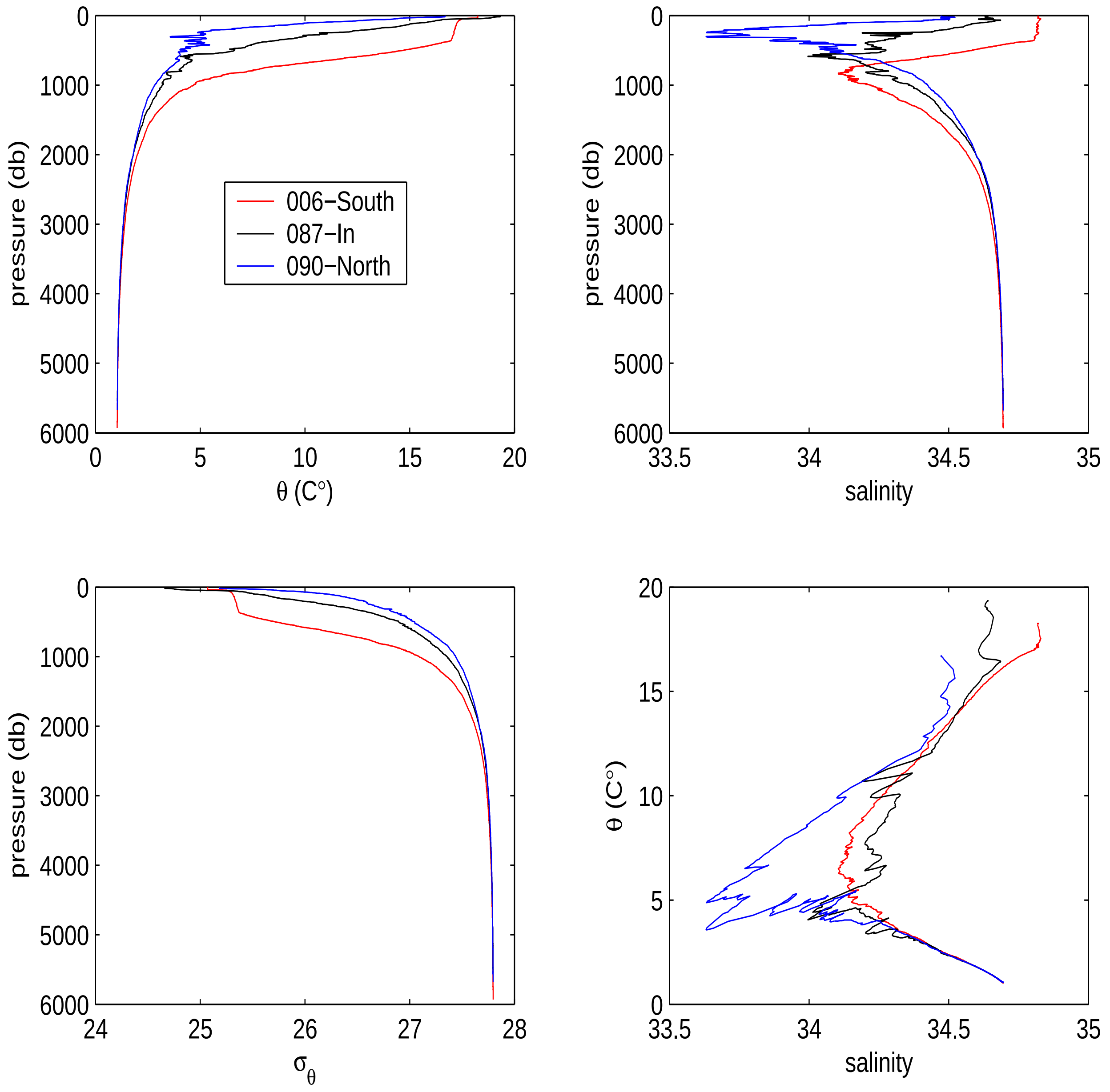


Figure 21: Potential temperature, salinity, and density profiles for regions North and South of the Kuroshio and in the Kuroshio

3.4.2 Up vs. Down Casts

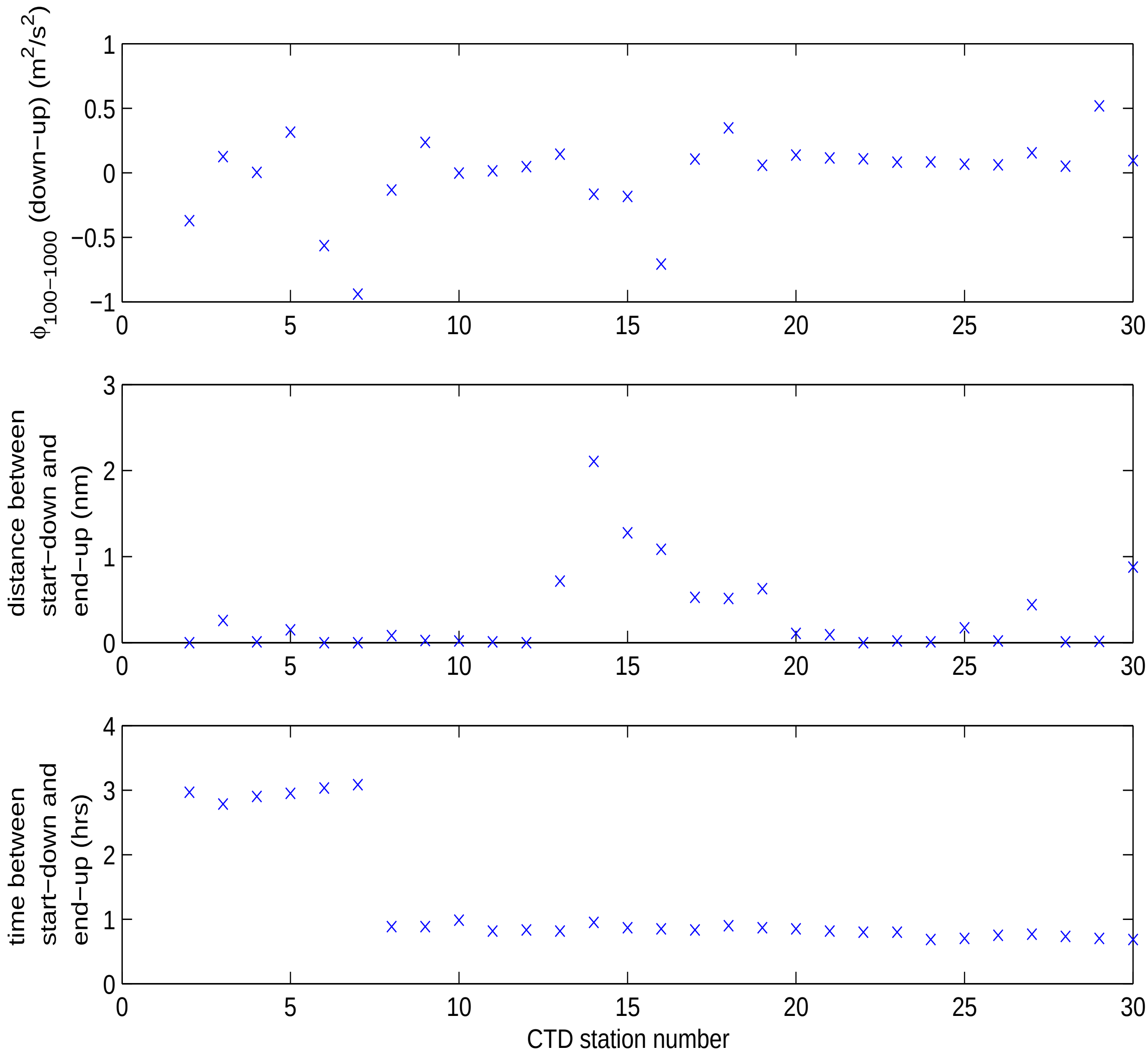


Figure 22: Comparision of geopotential anomaly, distance, and time differences between the up and down CTD stations#'s 2–30

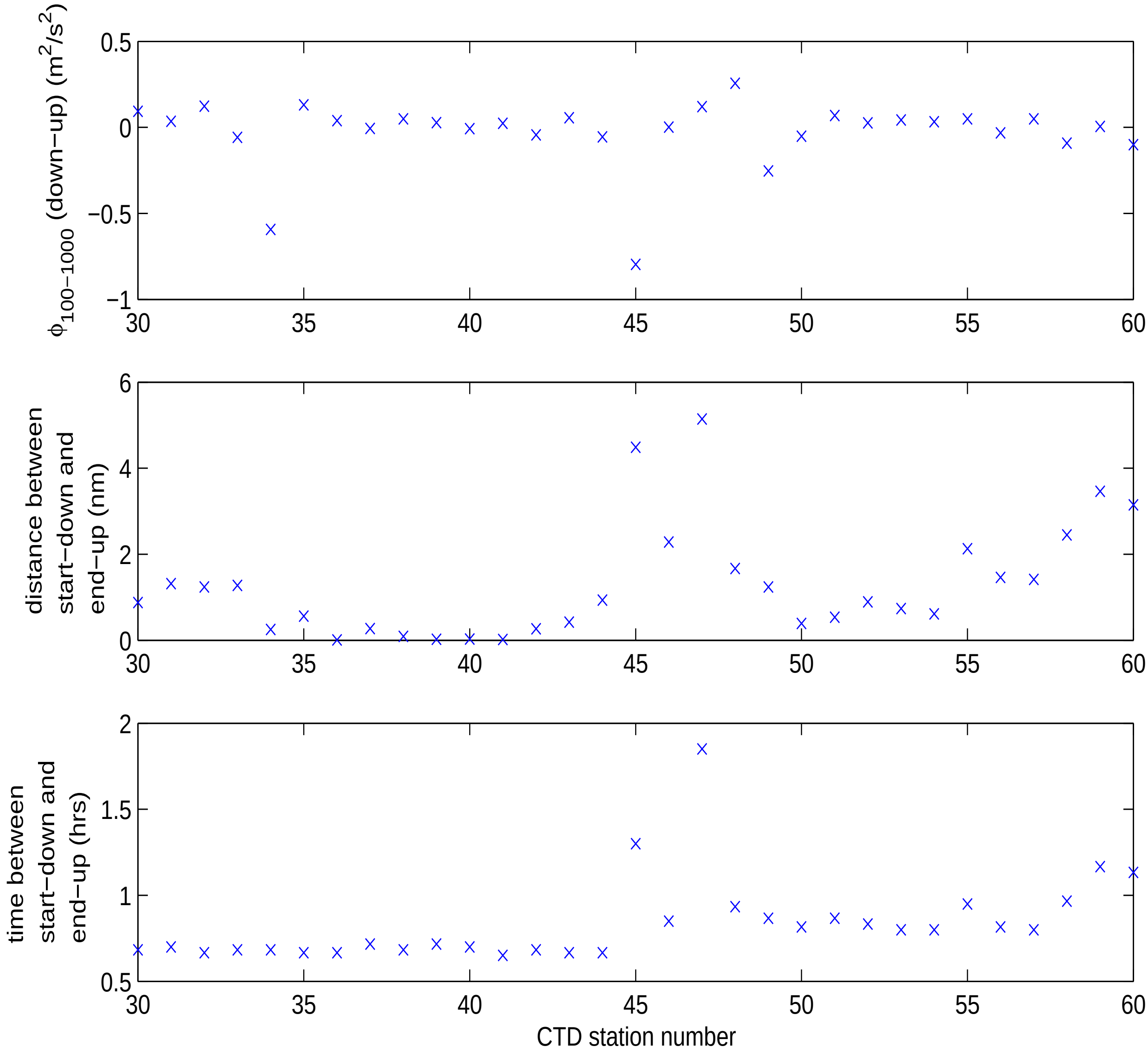


Figure 23: Comparision of geopotential anomaly, distance, and time differences between the up and down CTD stations#'s 30–60

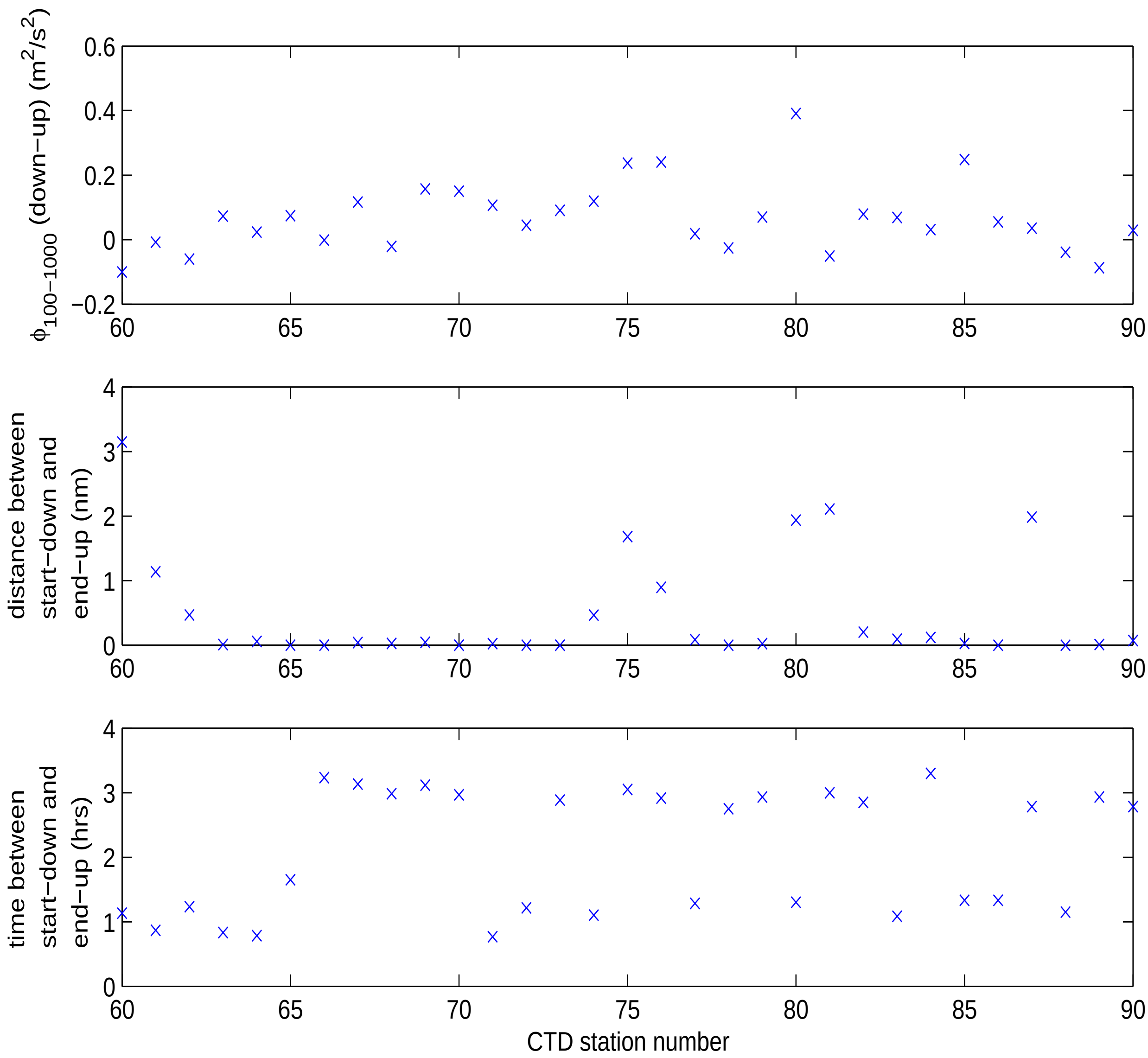


Figure 24: Comparision of geopotential anomaly, distance, and time differences between the up and down CTD stations#'s 60–90

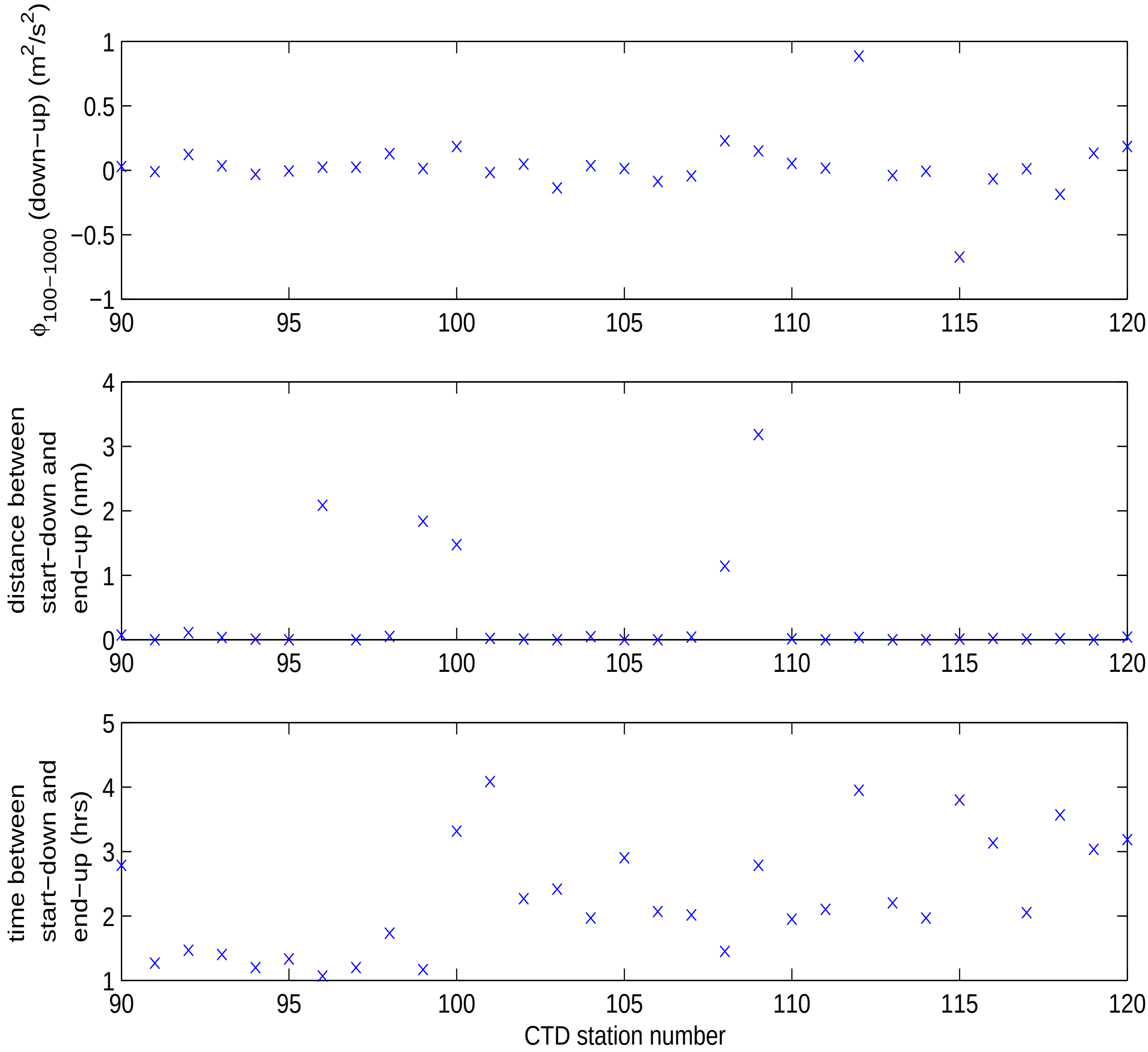


Figure 25: Comparision of geopotential anomaly, distance, and time differences between the up and down CTD stations#'s 90–120

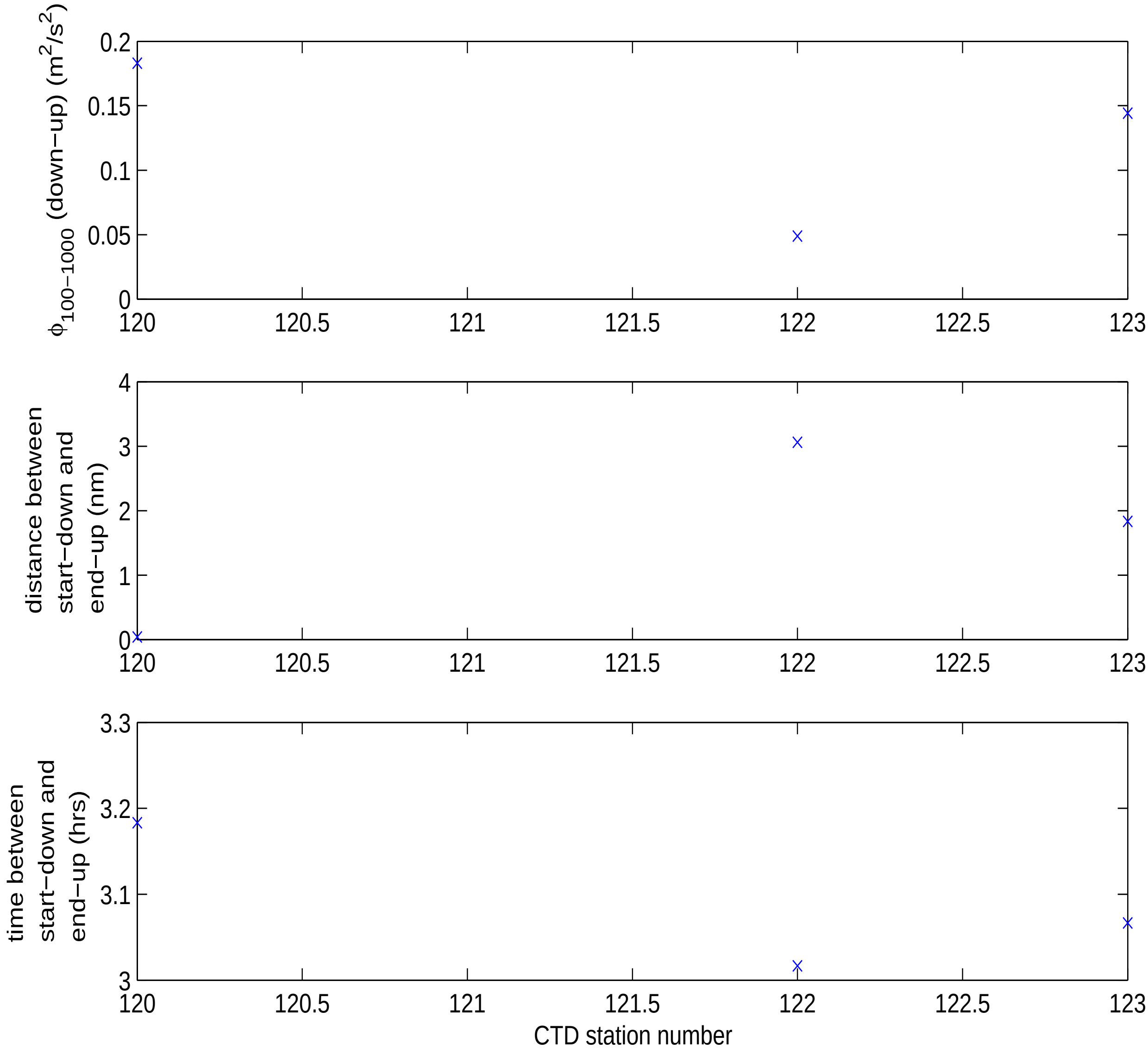


Figure 26: Comparision of geopotential anomaly, distance, and time differences between the up and down CTD stations#'s 120–123

3.4.3 Repeat Casts

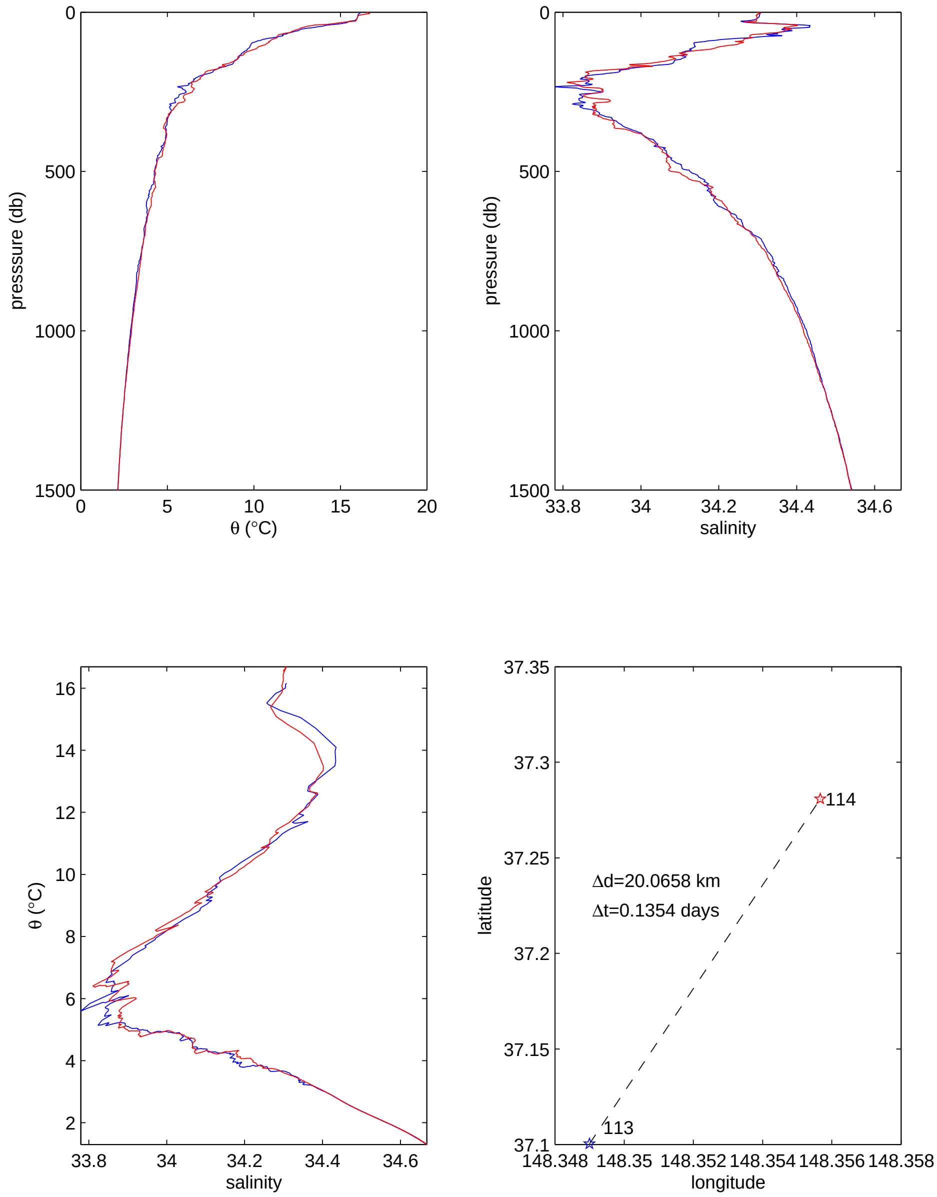


Figure 27: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

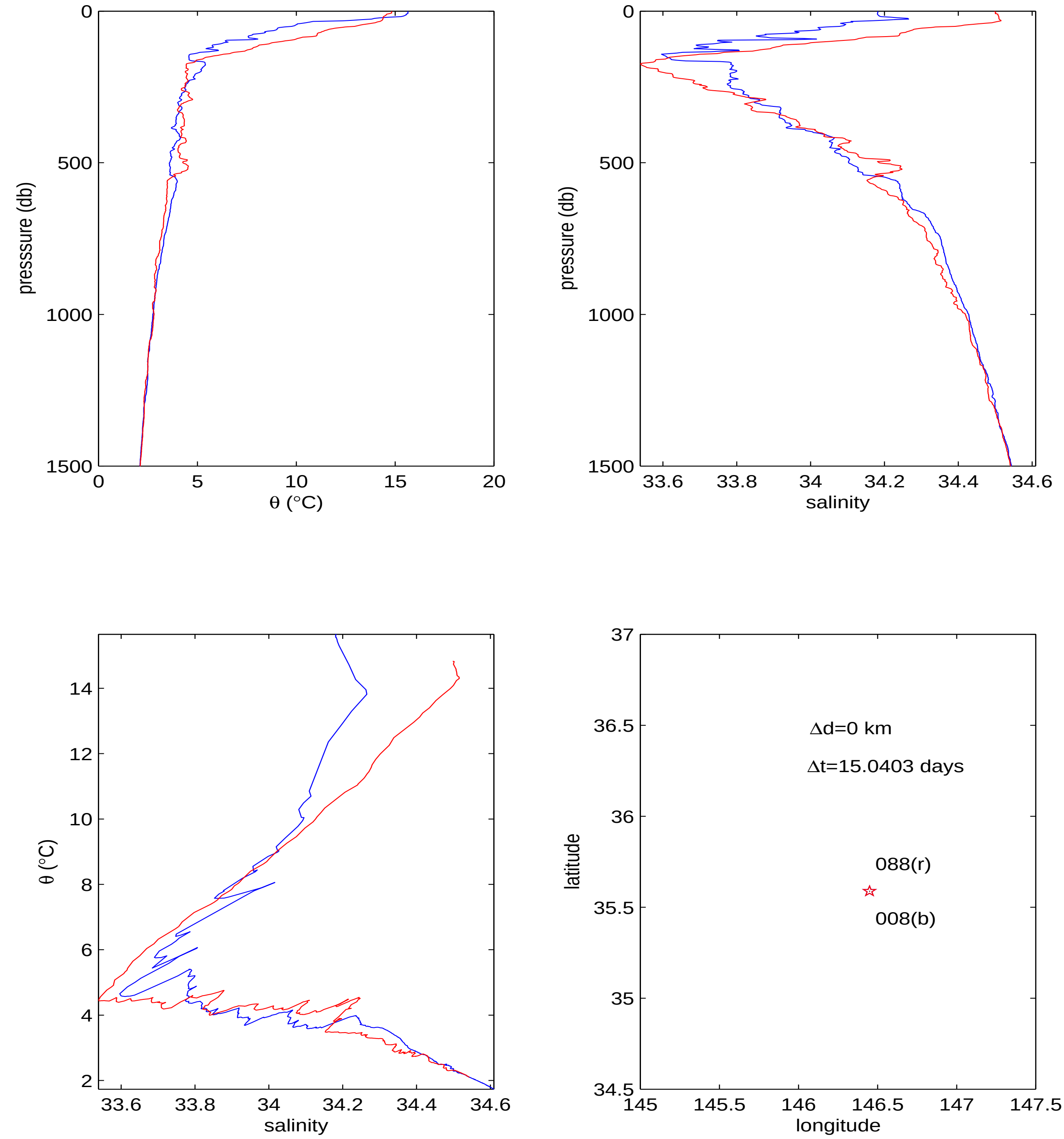


Figure 28: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

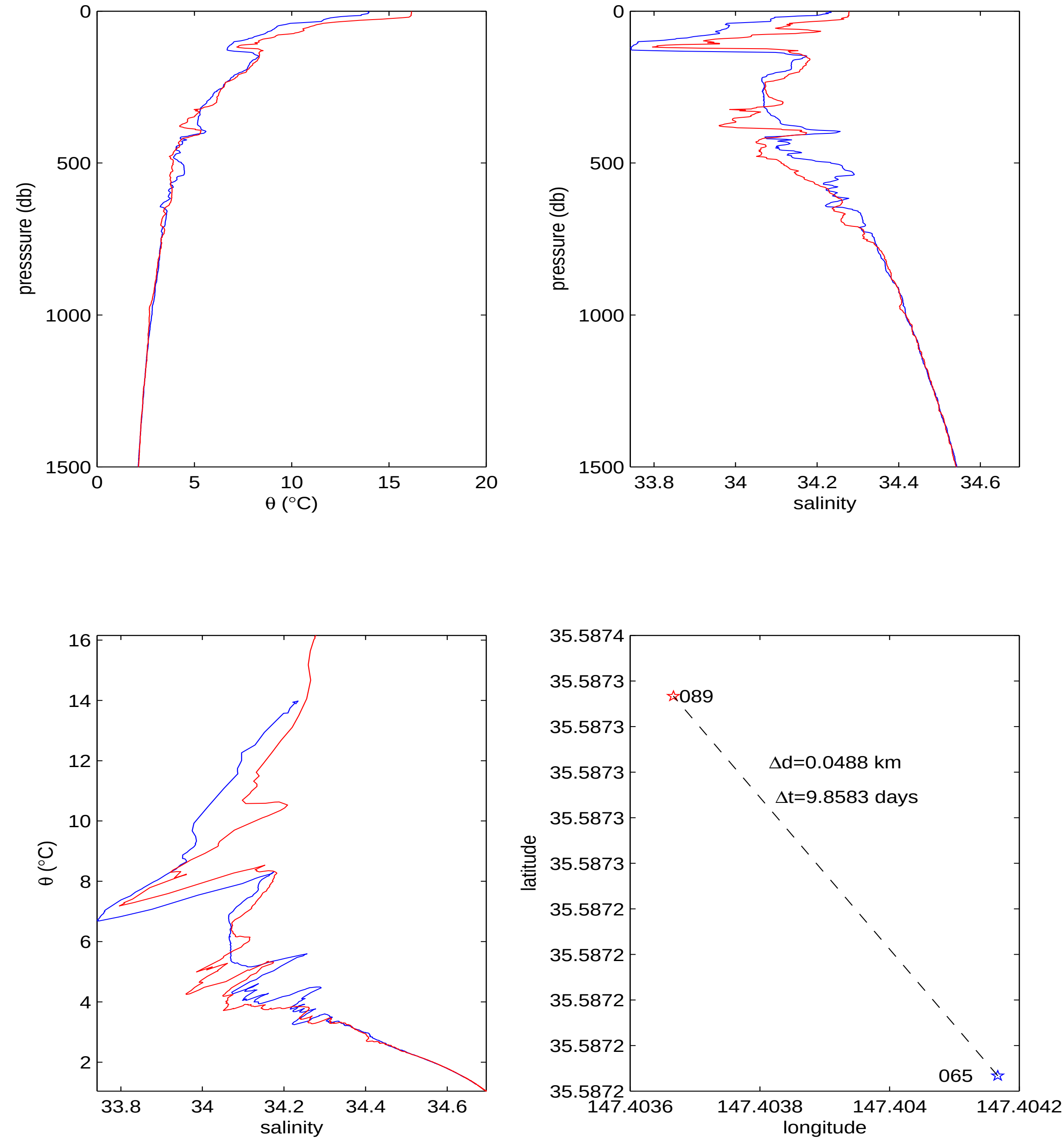


Figure 29: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

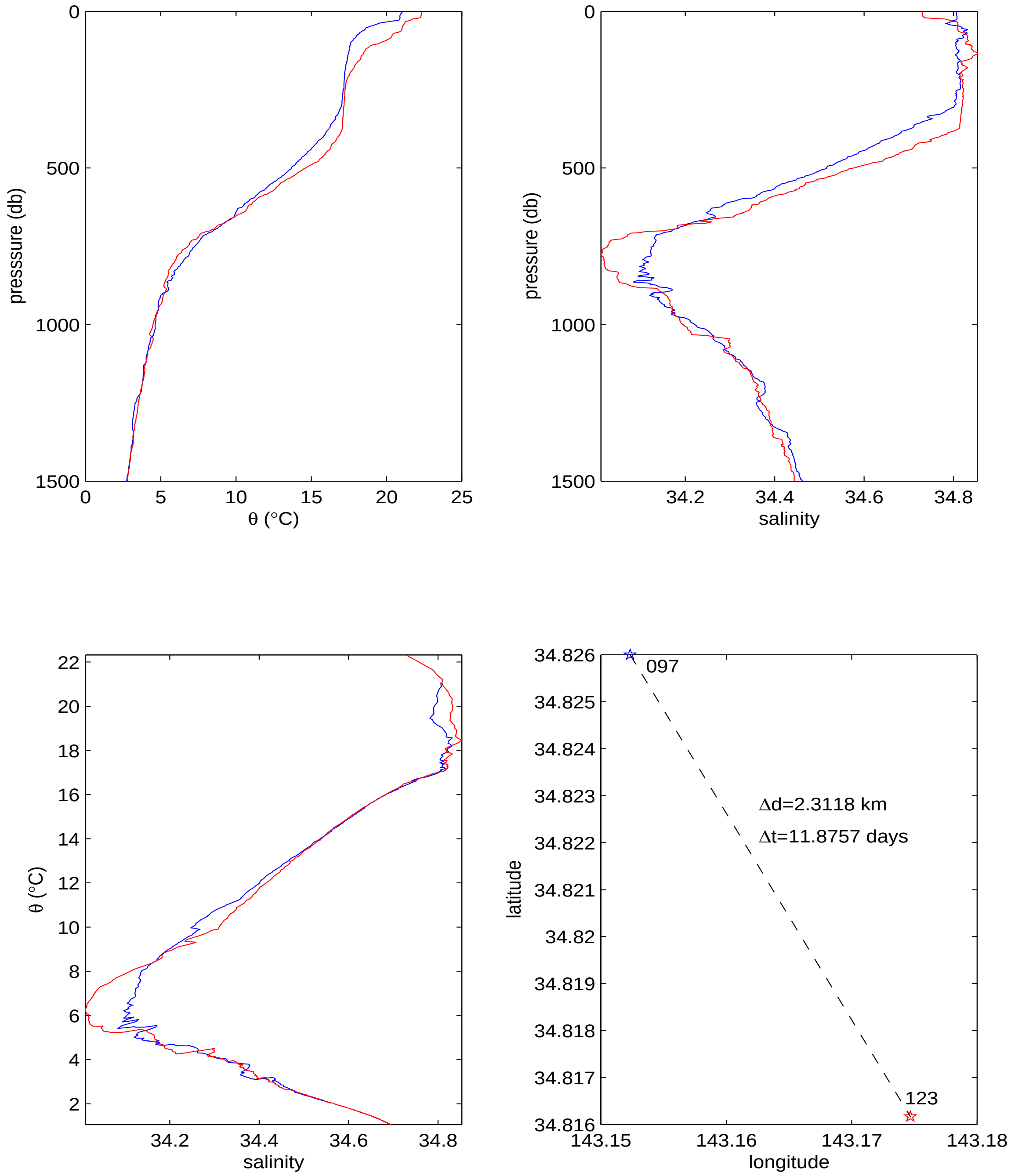


Figure 30: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

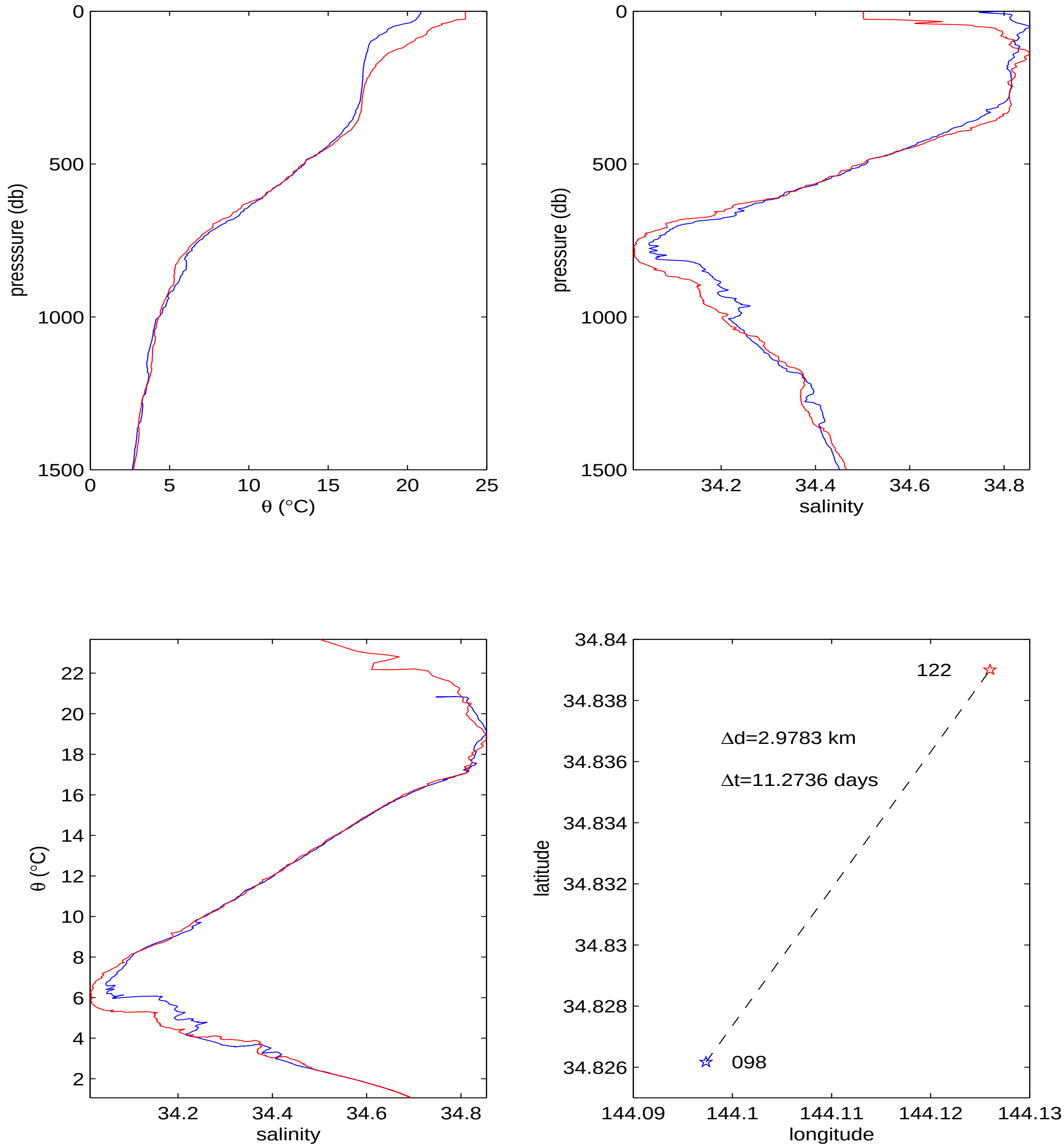


Figure 31: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

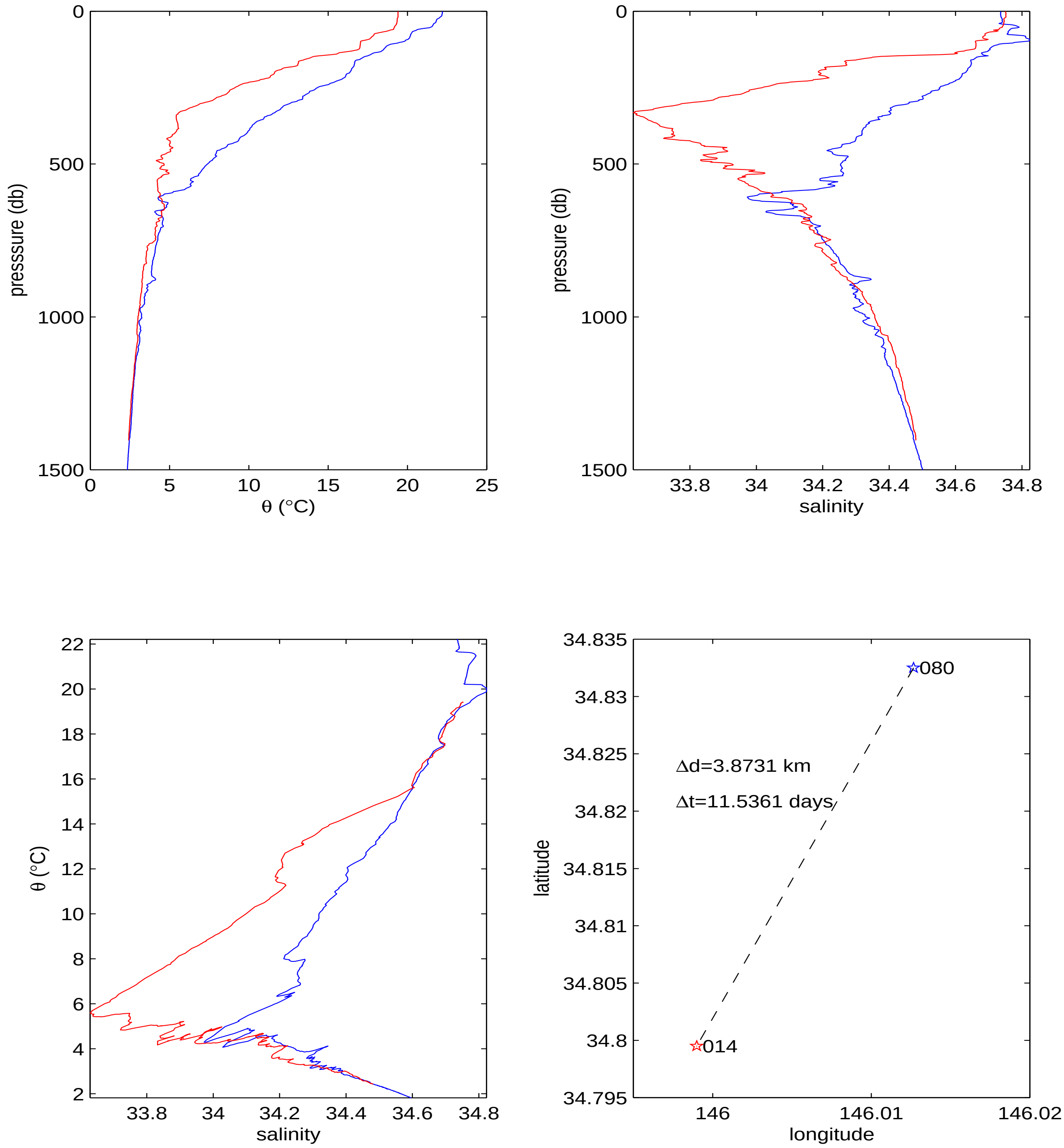


Figure 32: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

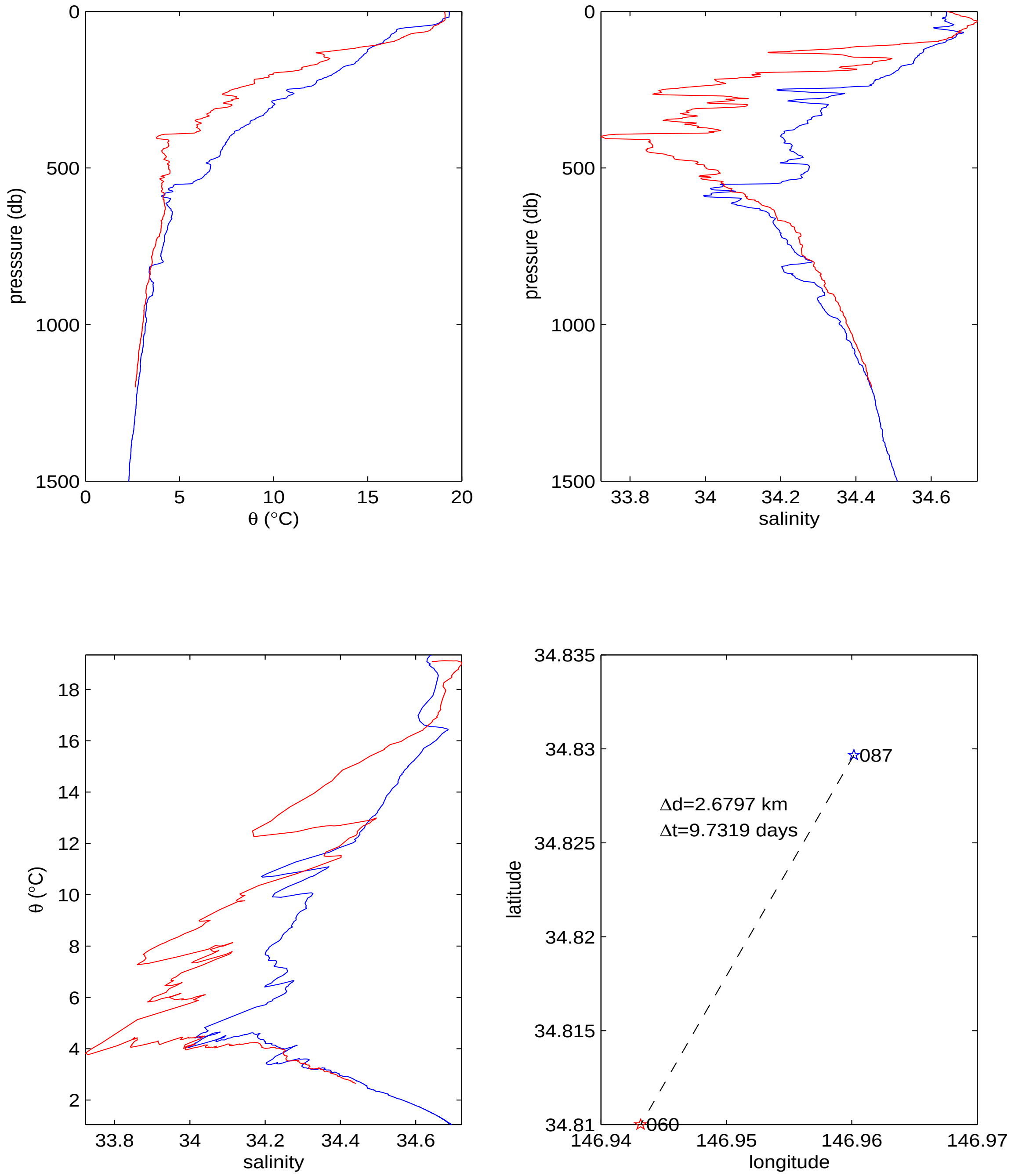


Figure 33: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

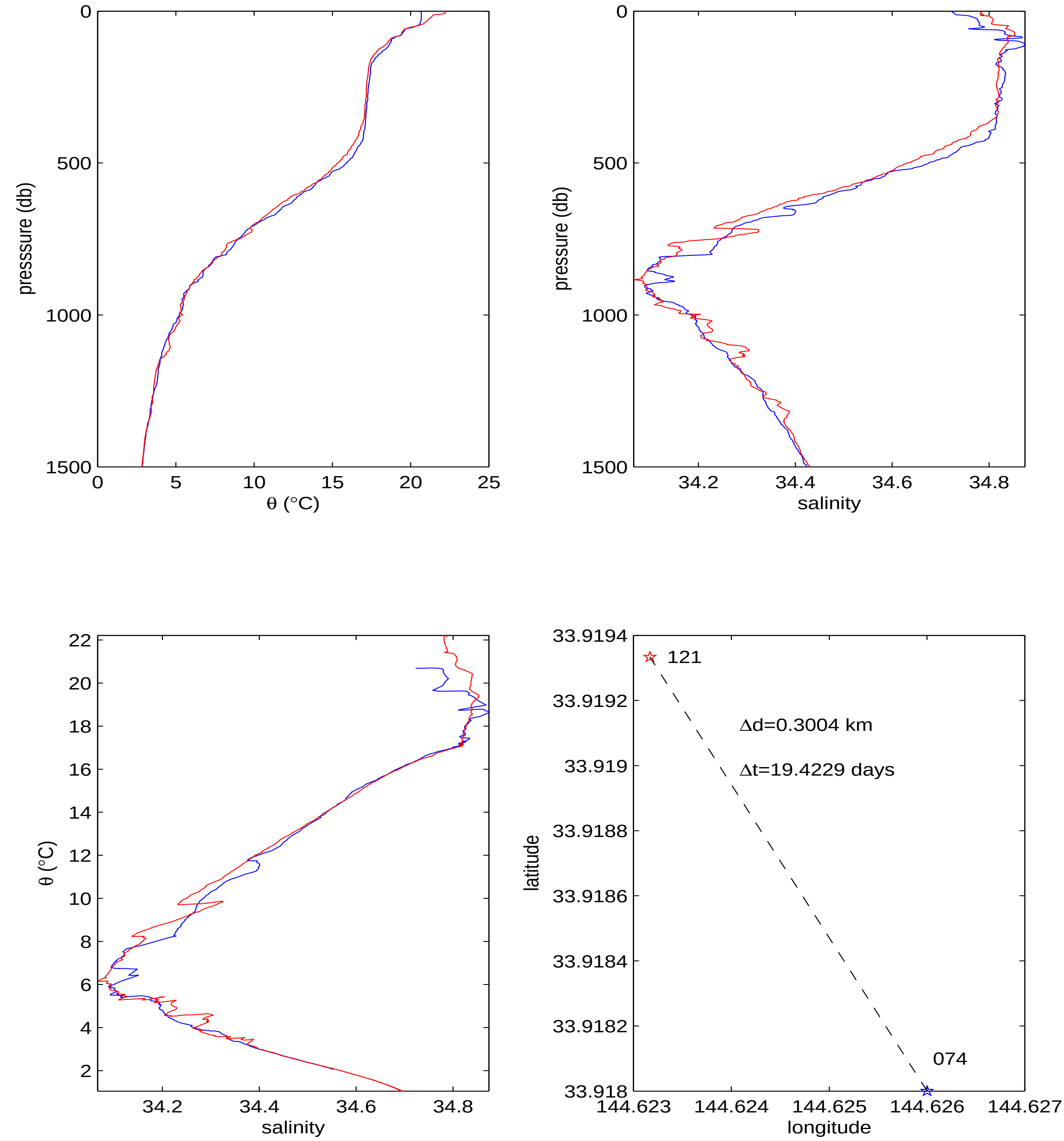


Figure 34: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

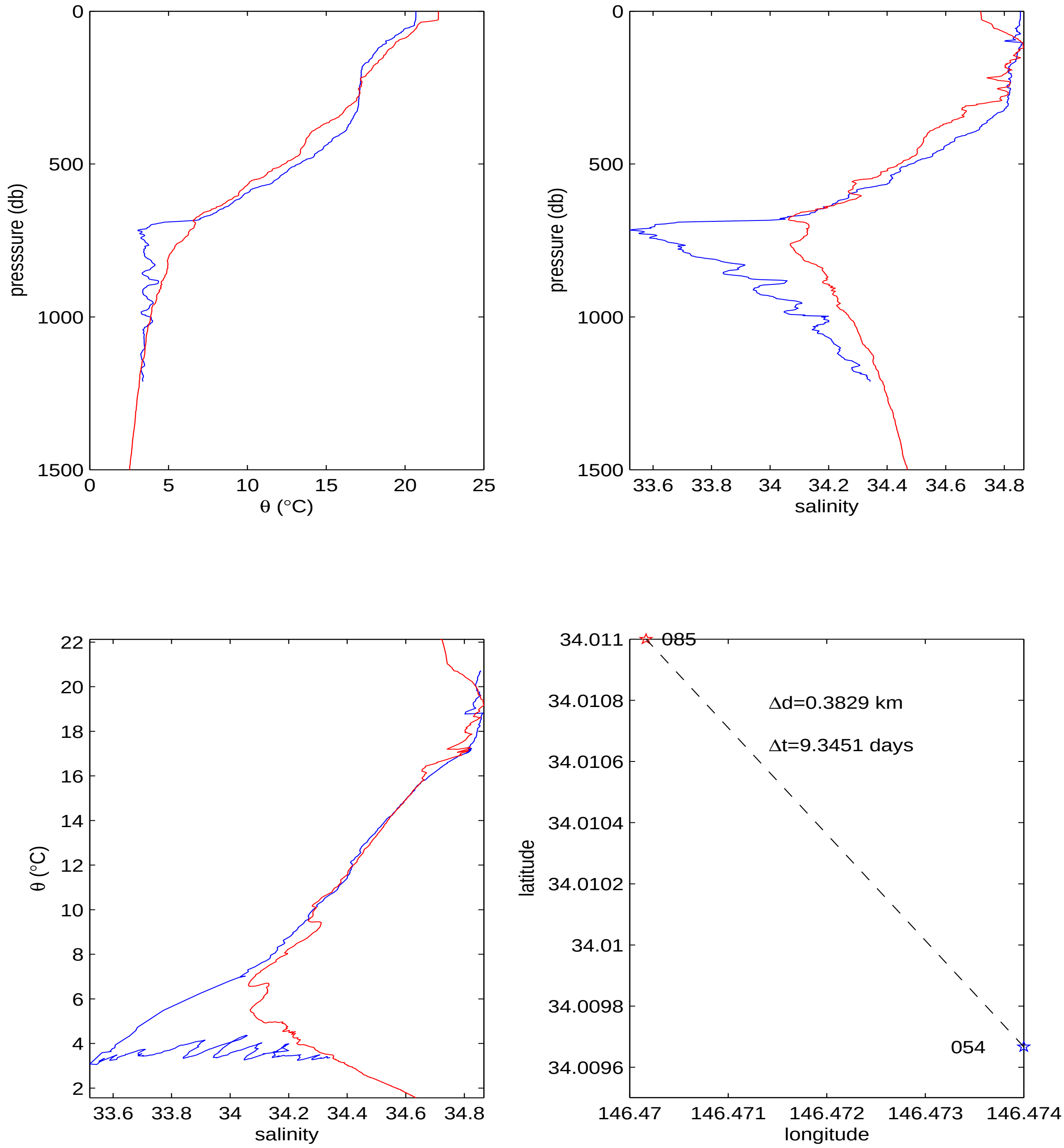


Figure 35: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

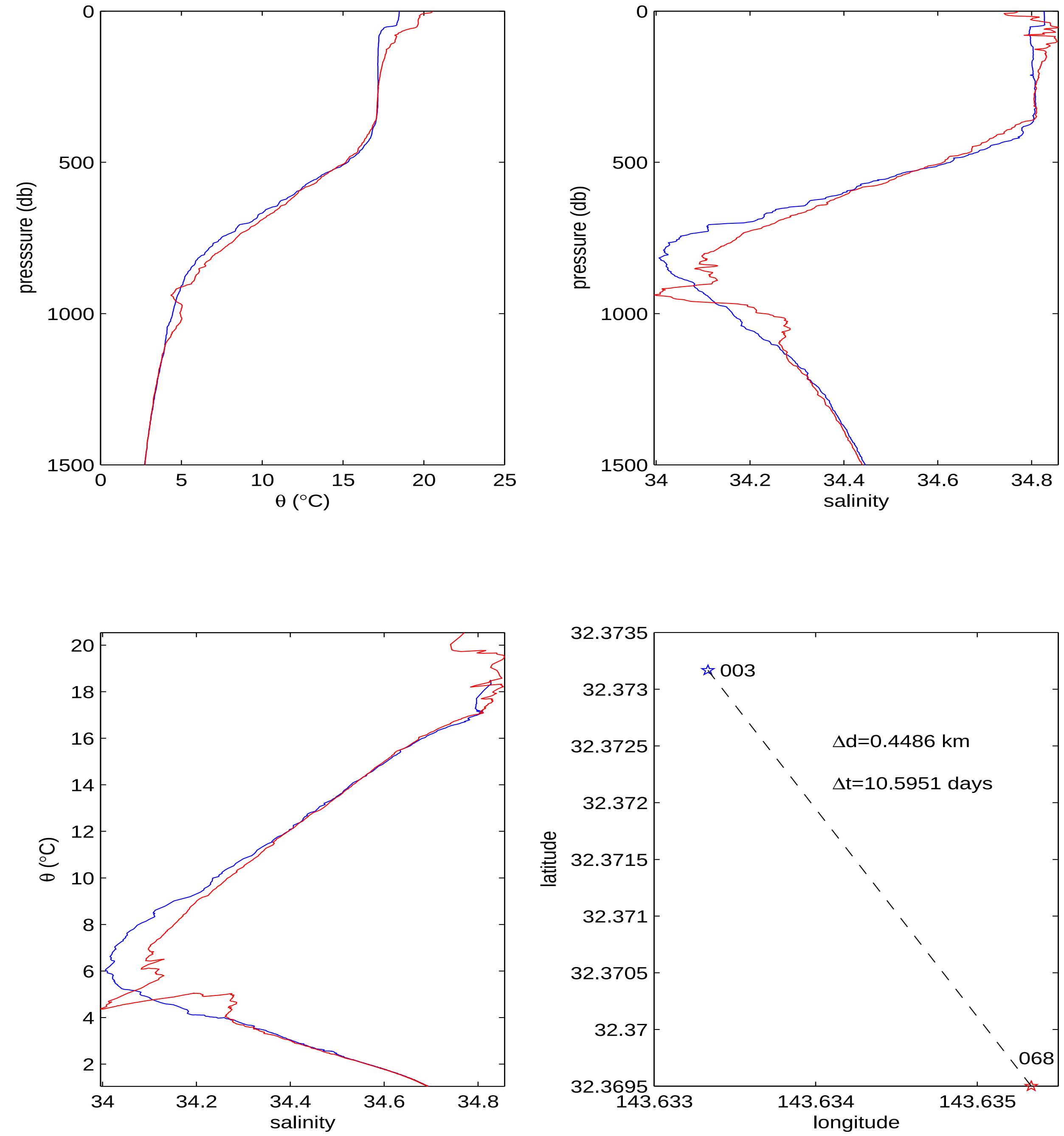


Figure 36: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

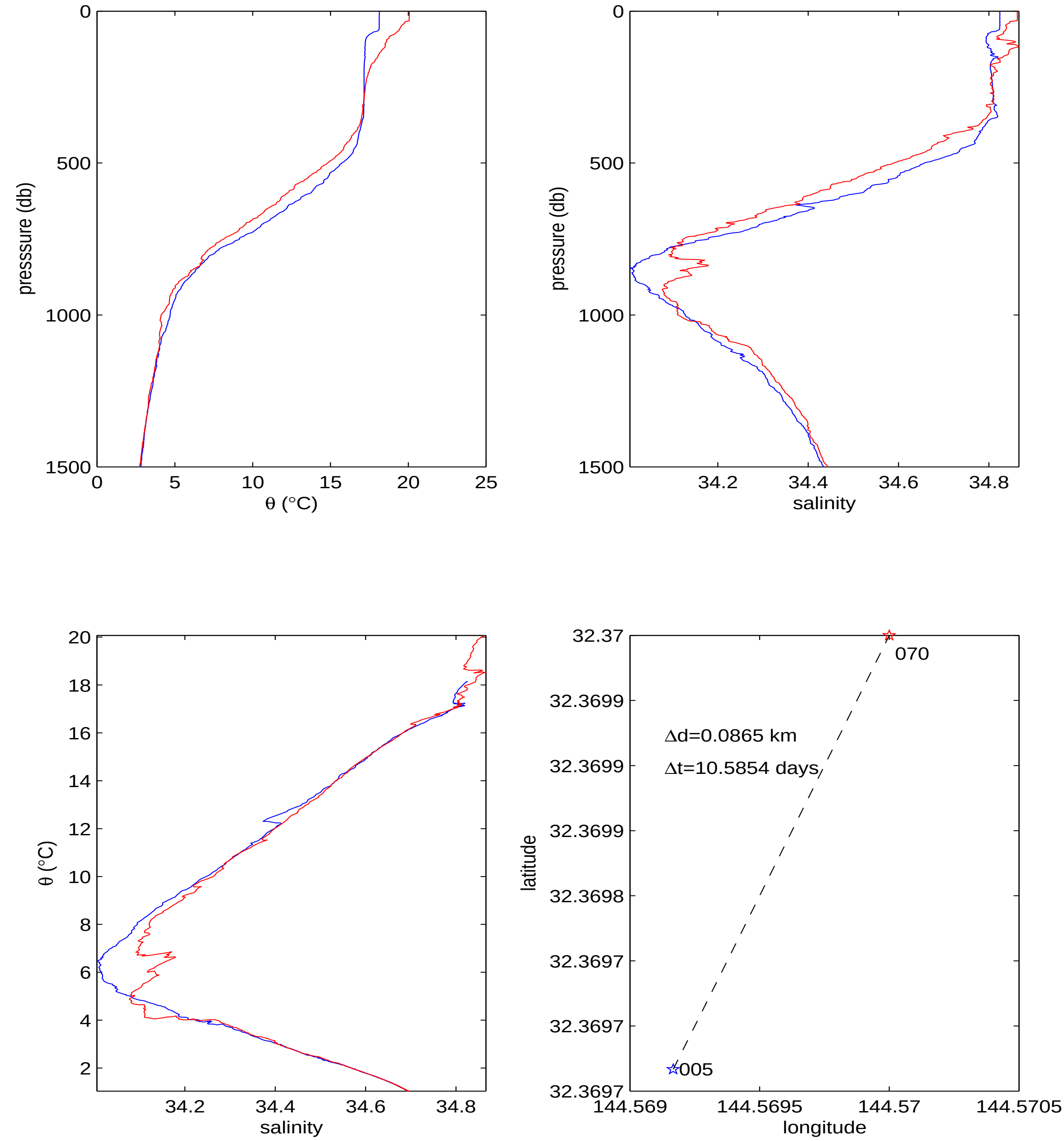


Figure 37: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

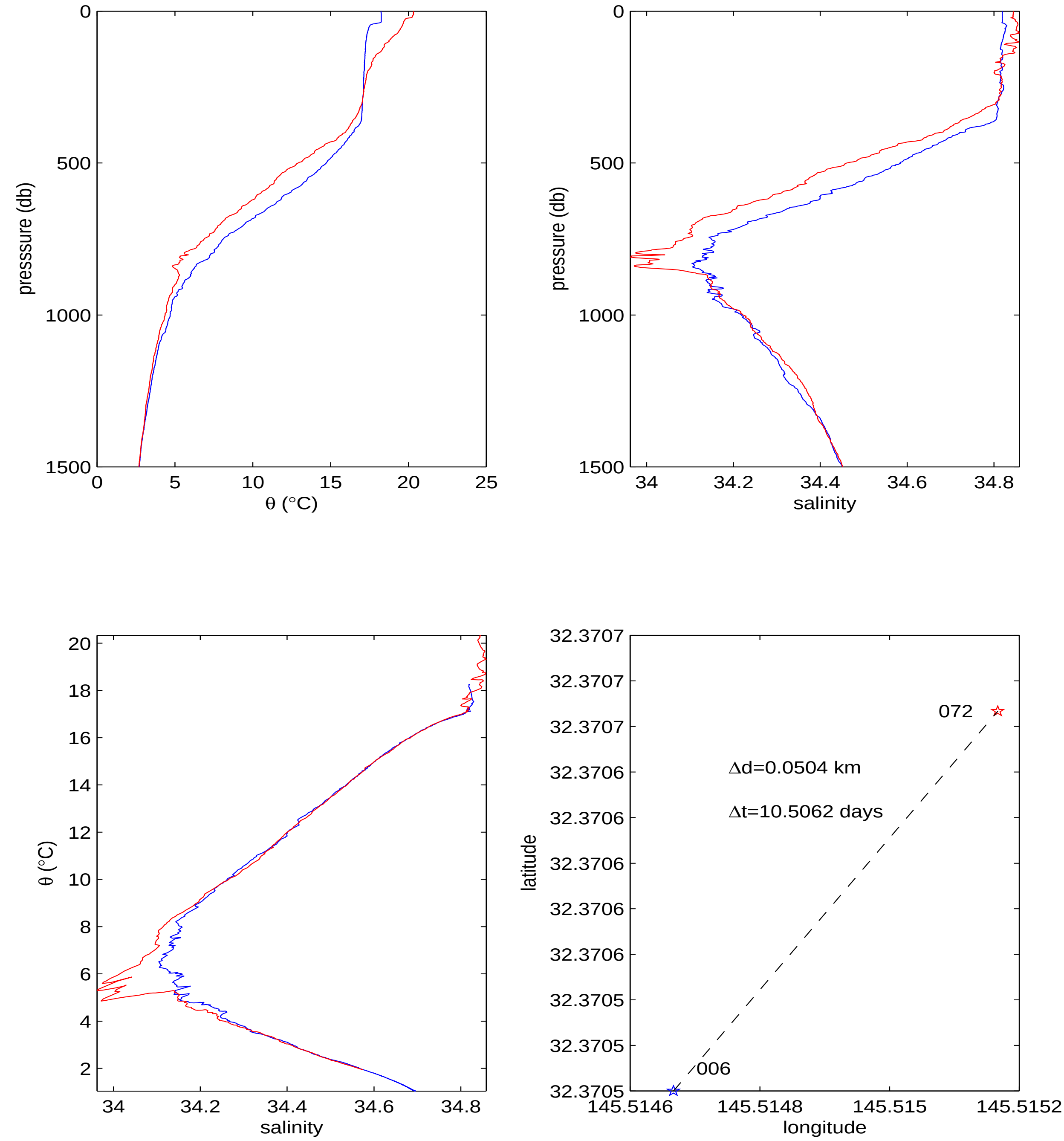


Figure 38: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

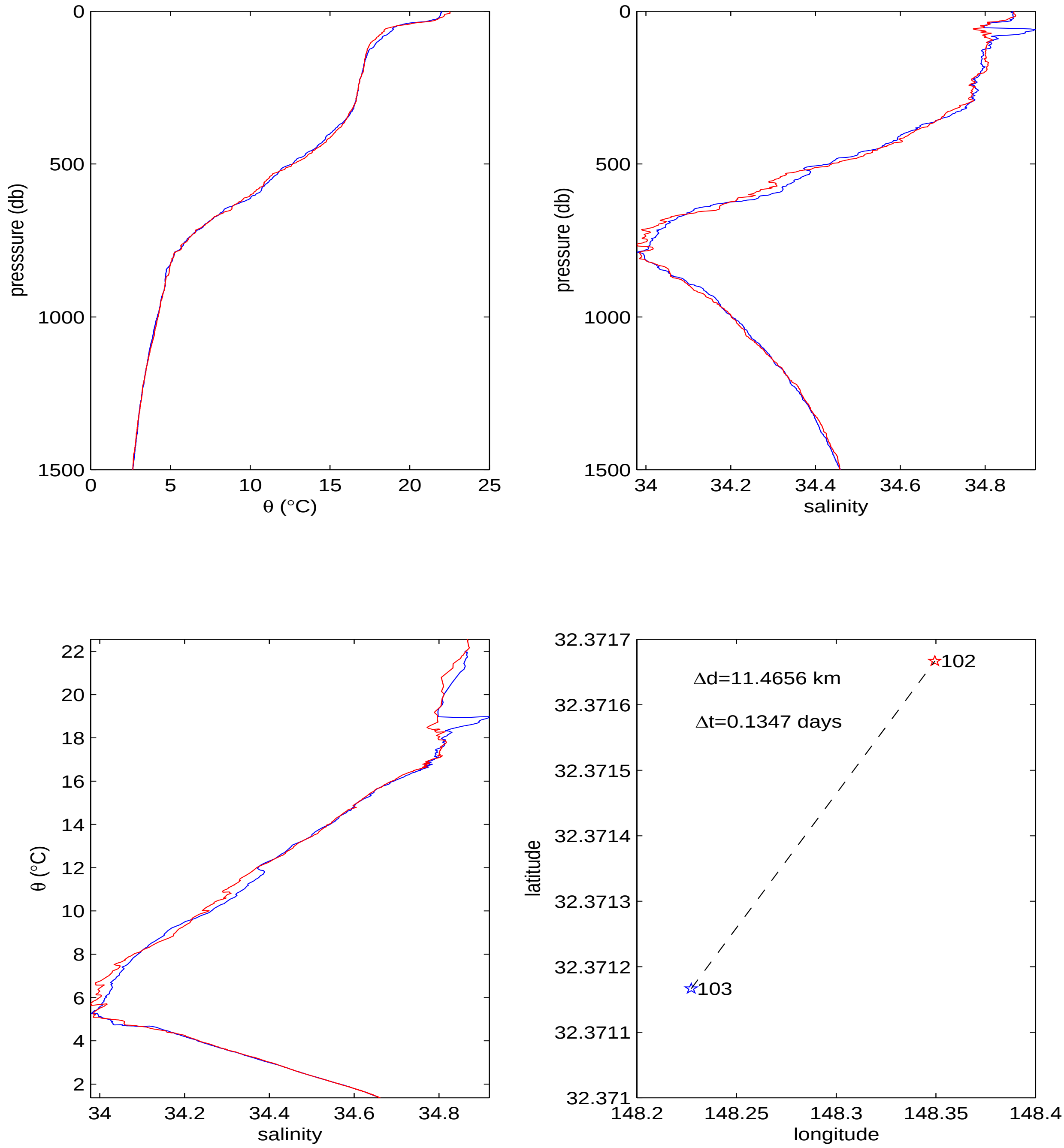


Figure 39: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

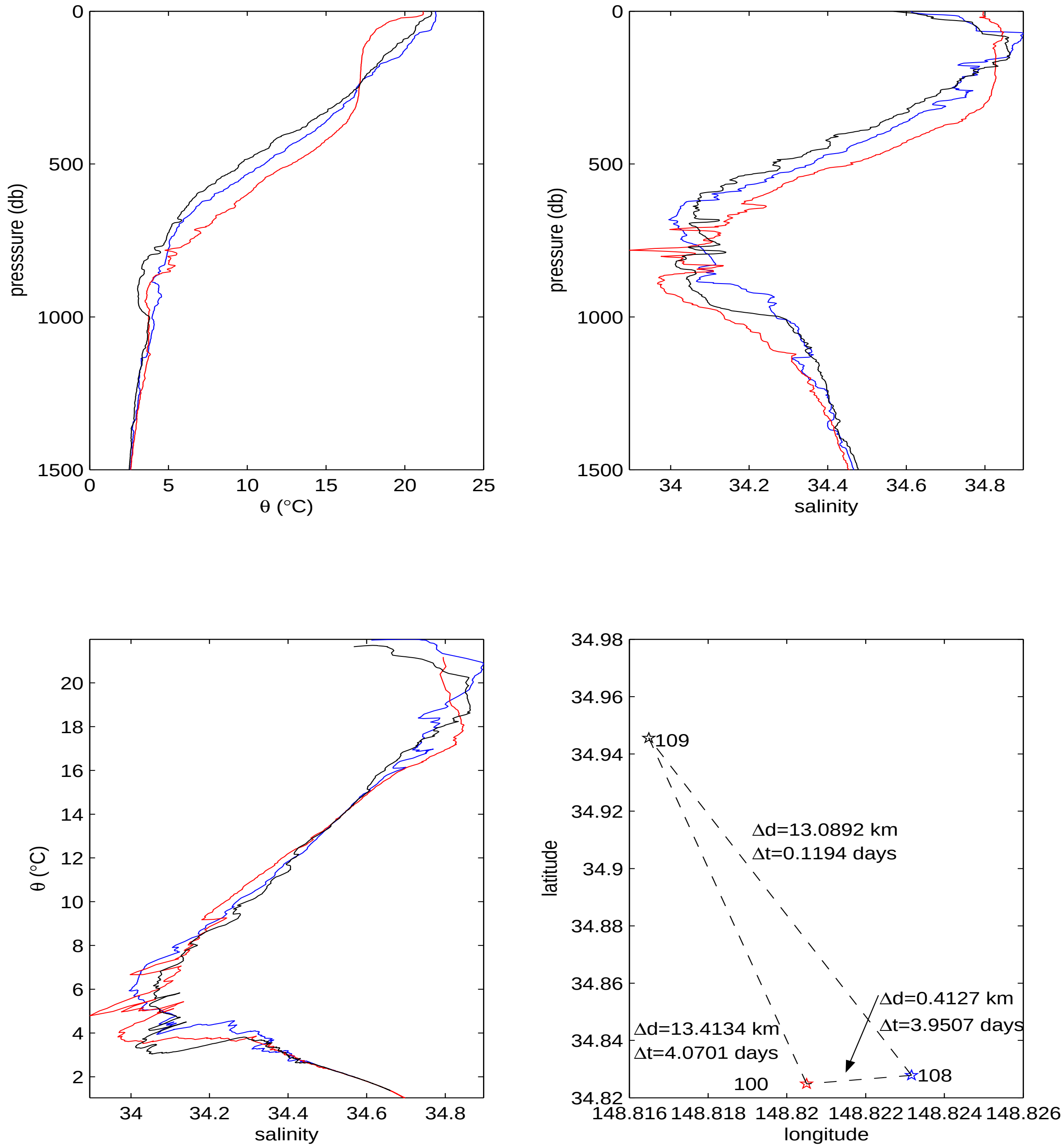


Figure 40: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

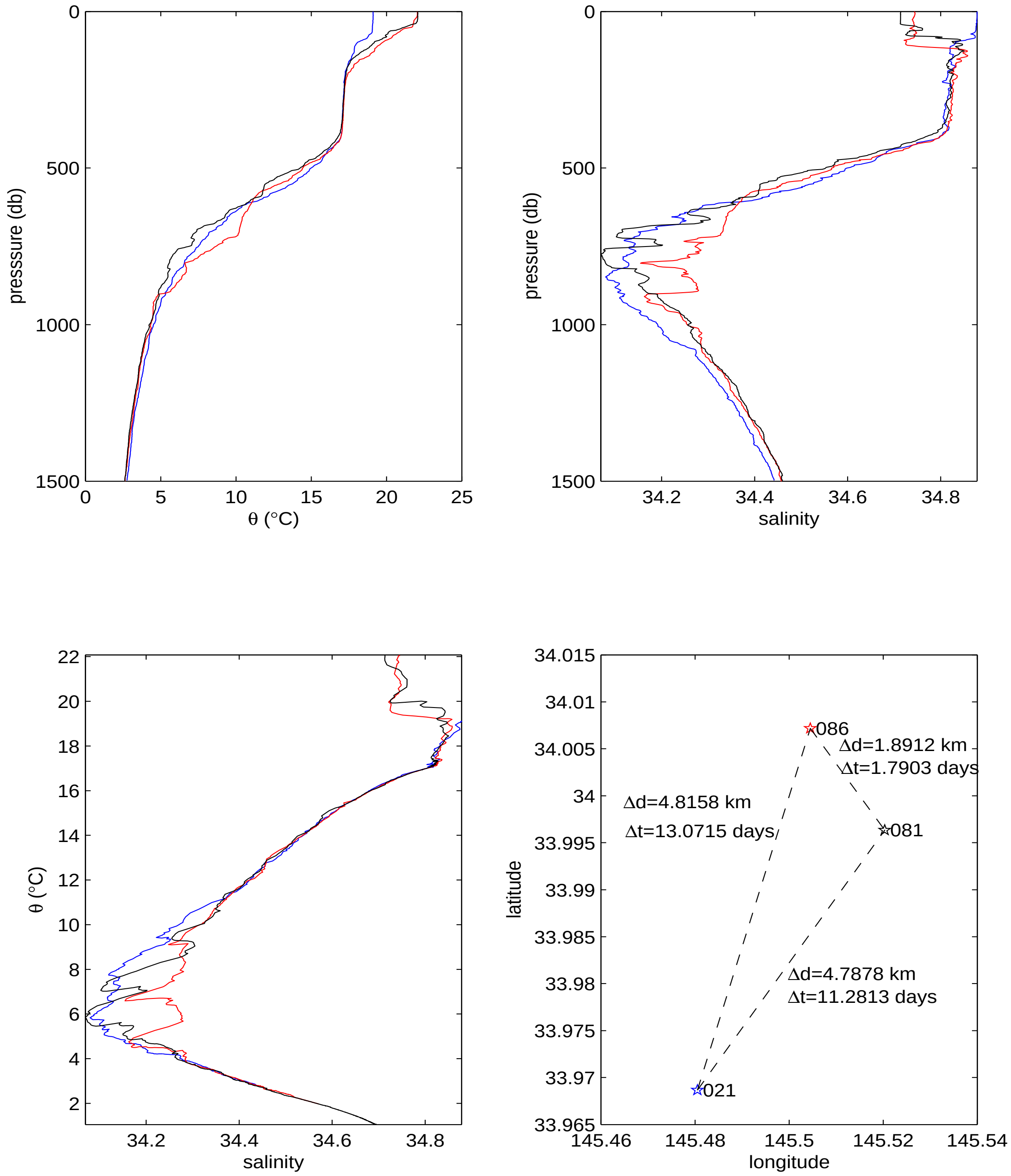


Figure 41: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

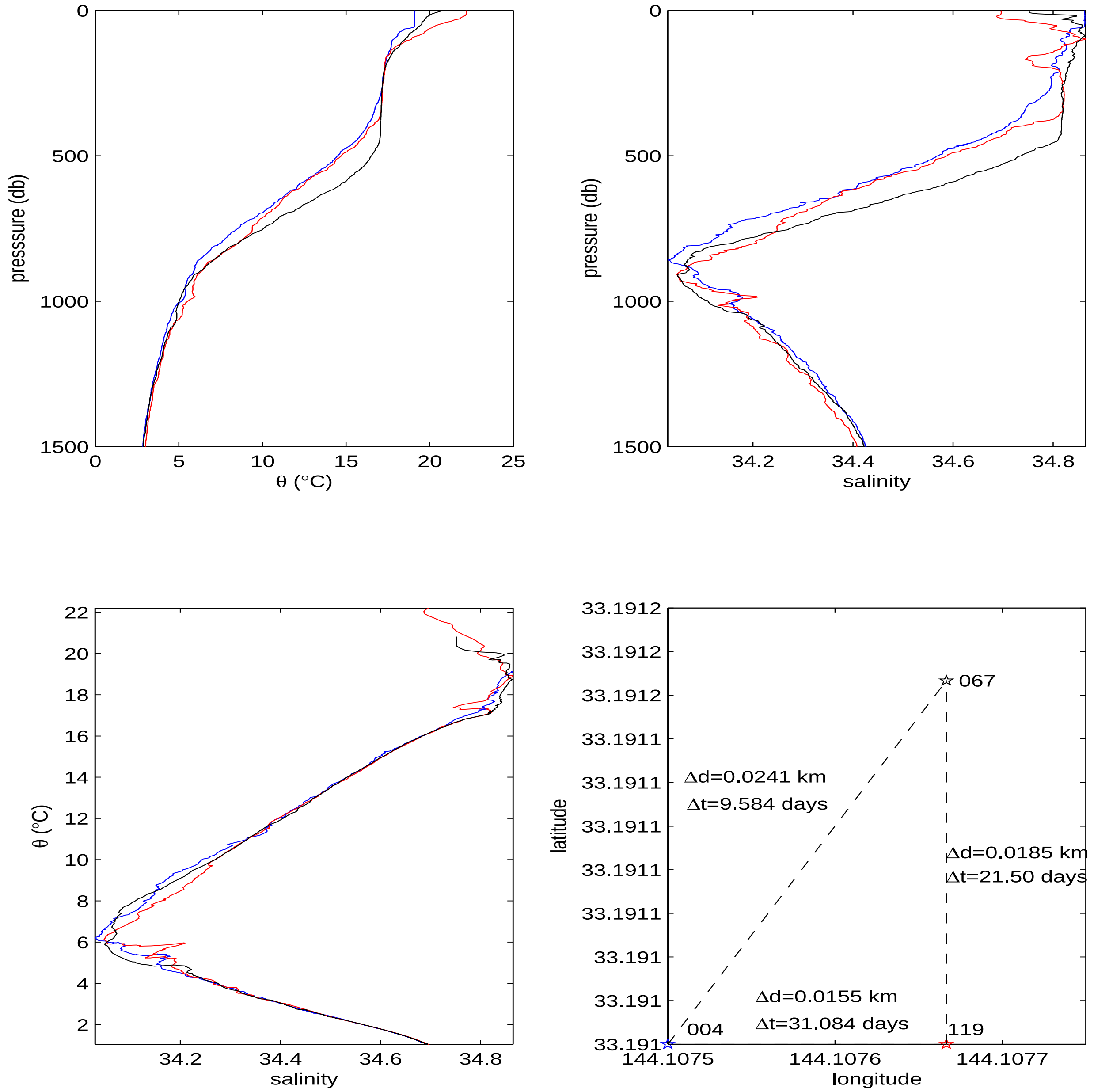


Figure 42: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

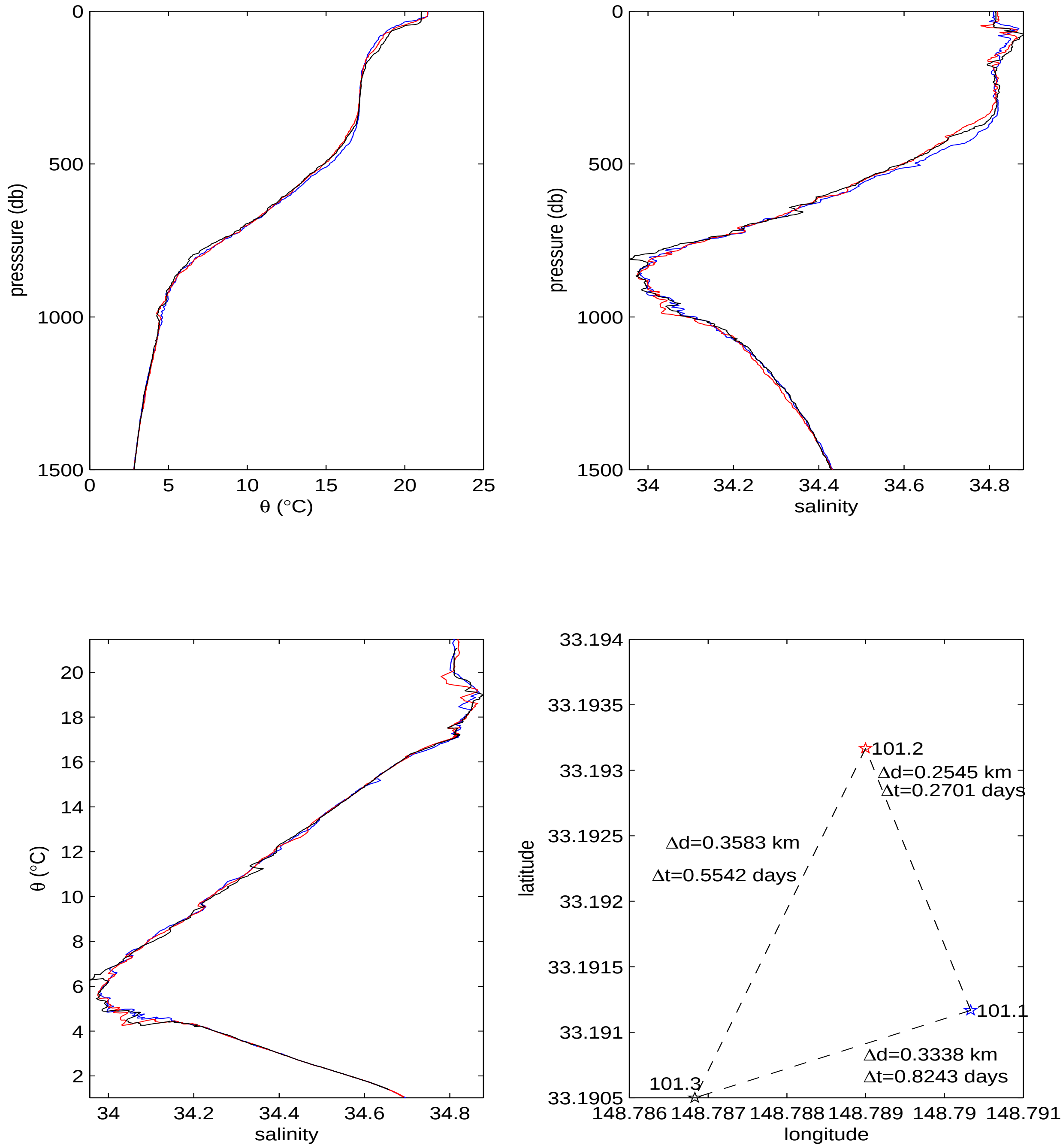


Figure 43: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

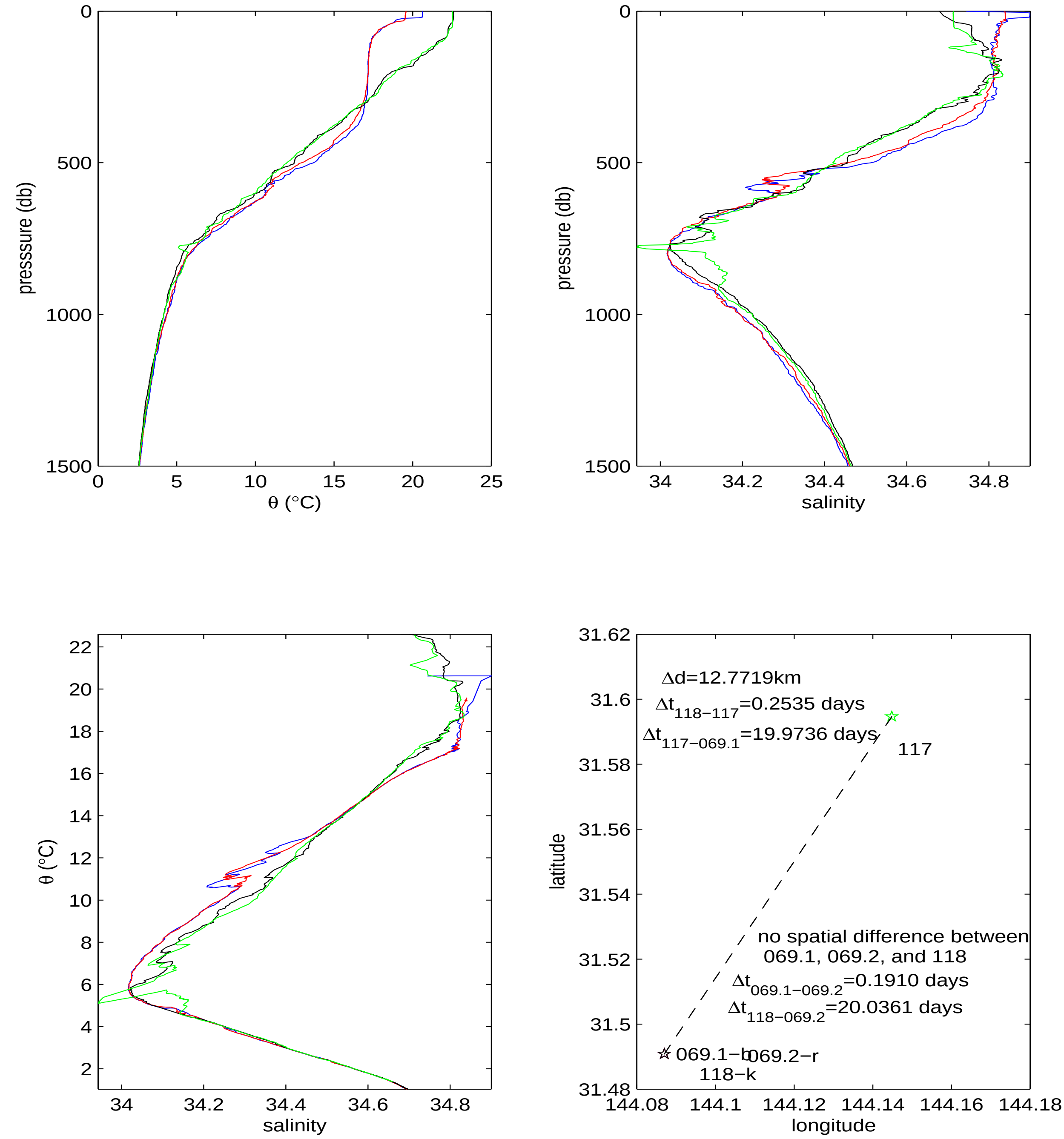


Figure 44: Graphs comparing CTD casts that were taken spatially close together. Top left graph displays potential temperature versus pressure for the top 1500db of the casts. Top right graph displays salinity versus pressure for the top 1500db of the casts. On the bottom left graph there are T-S plots for the entire CTD casts. Bottom right graph displays the locations and cast numbers of the compared CTDs.

3.5 ADCP Vector Plots

3.5.1 Along Track

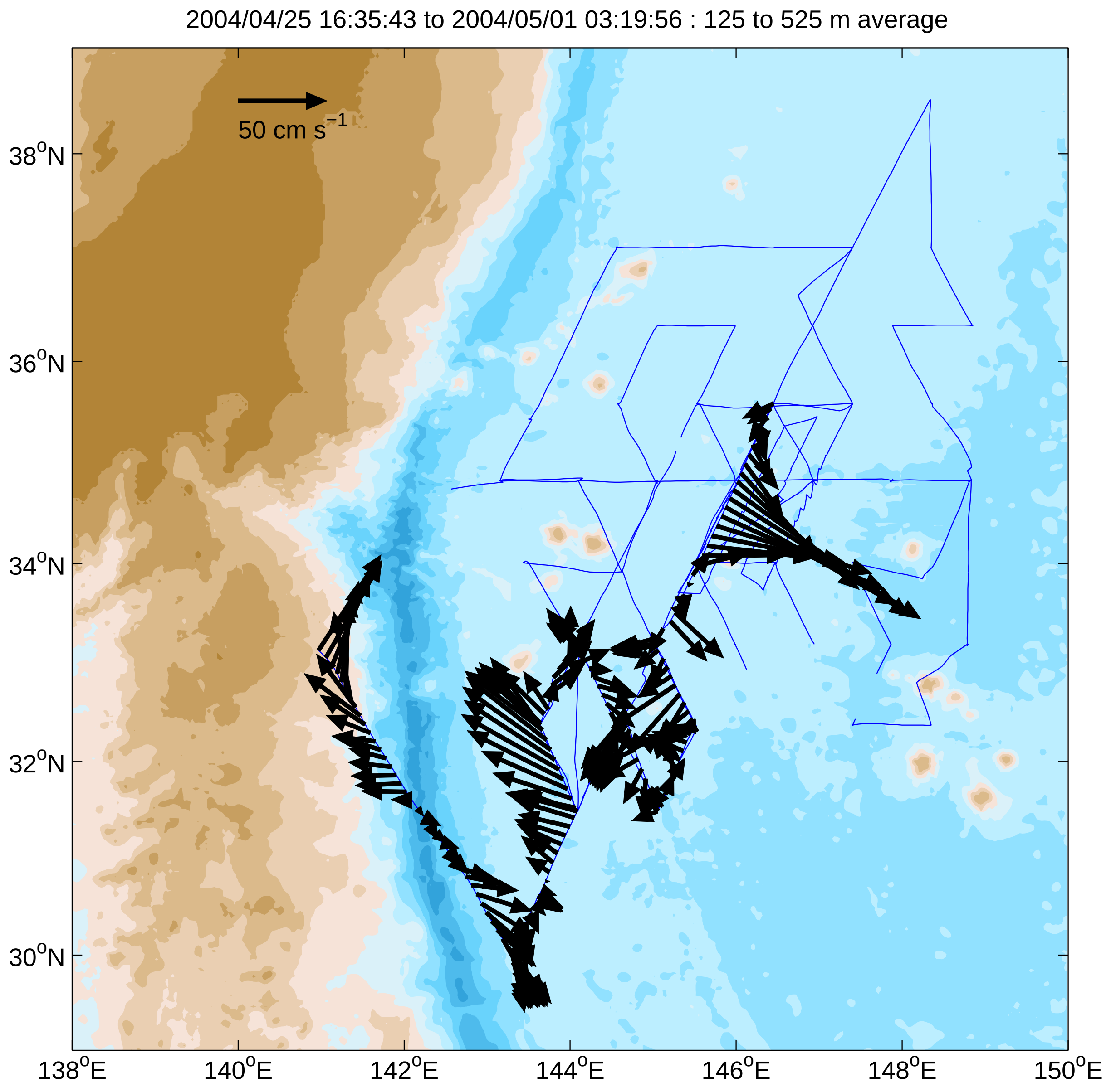


Figure 45: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

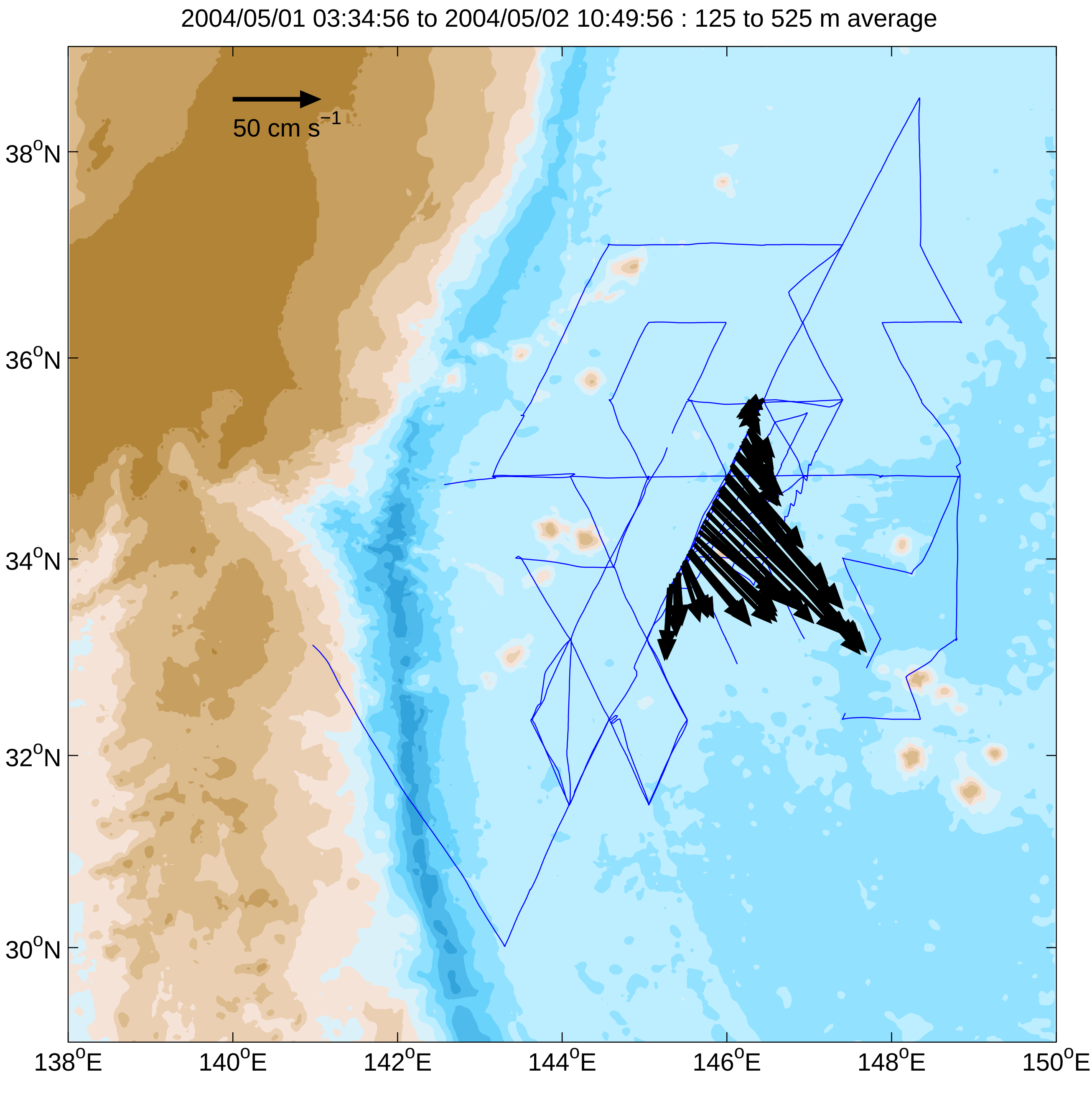


Figure 46: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

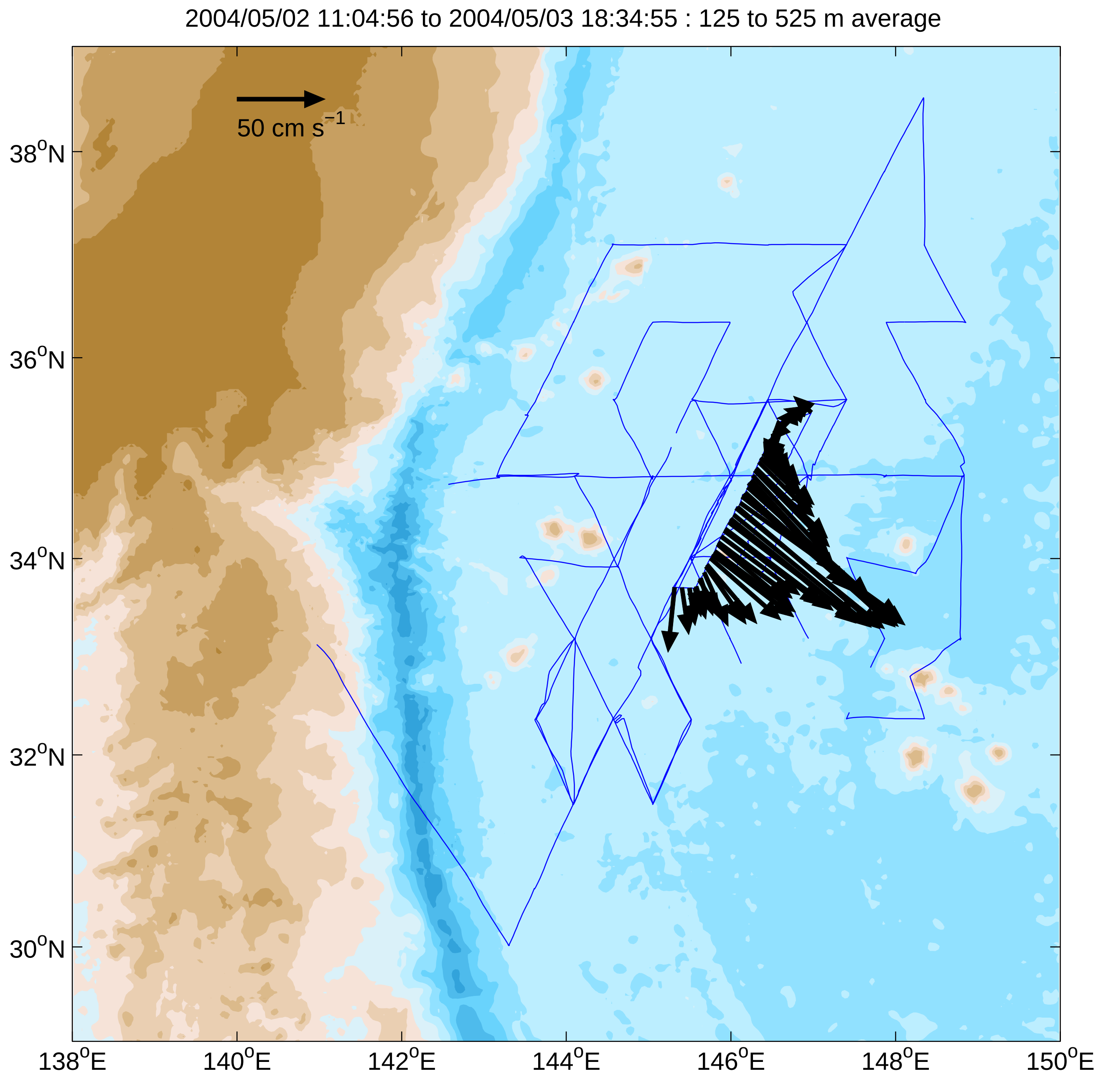


Figure 47: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

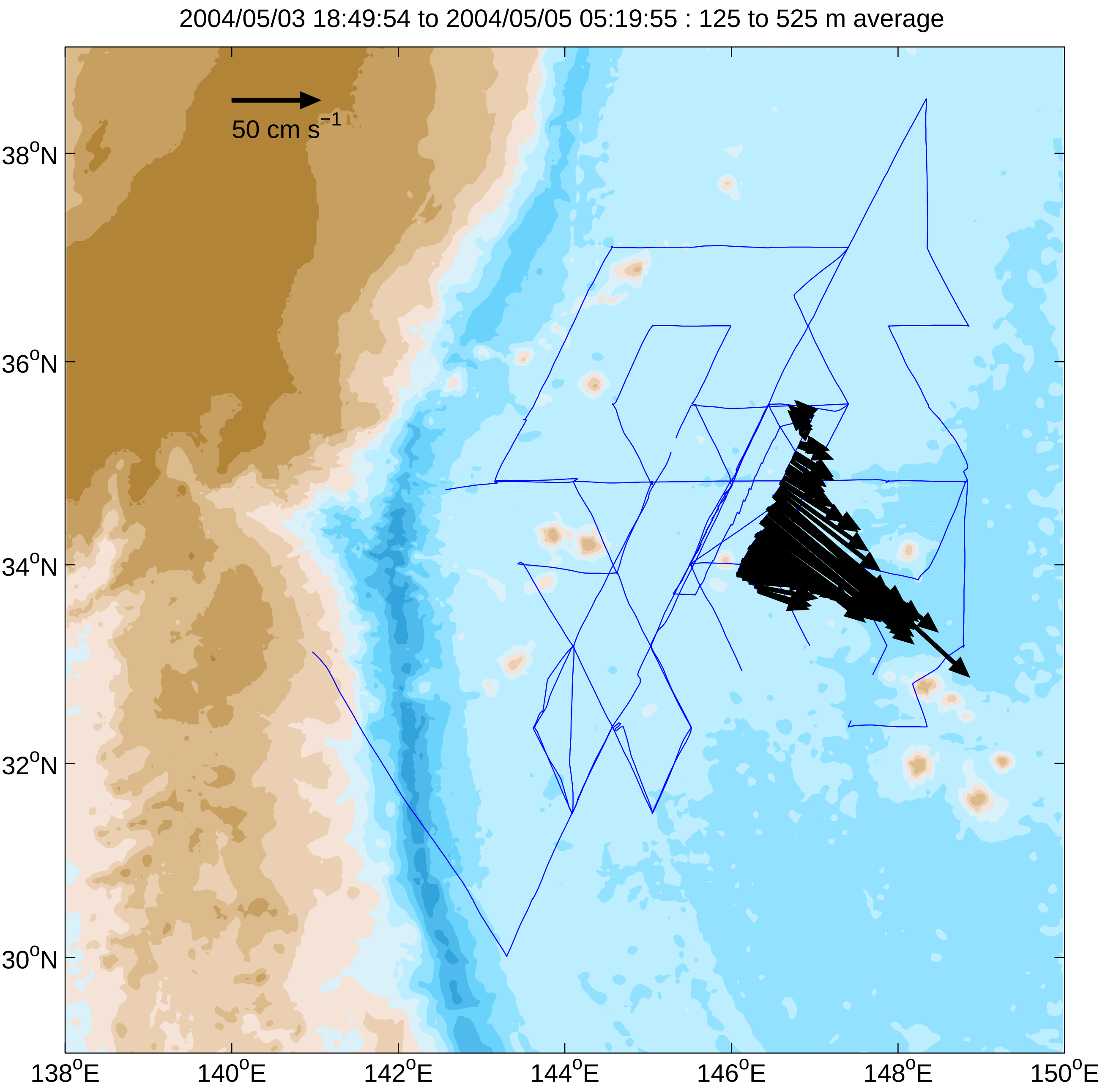


Figure 48: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

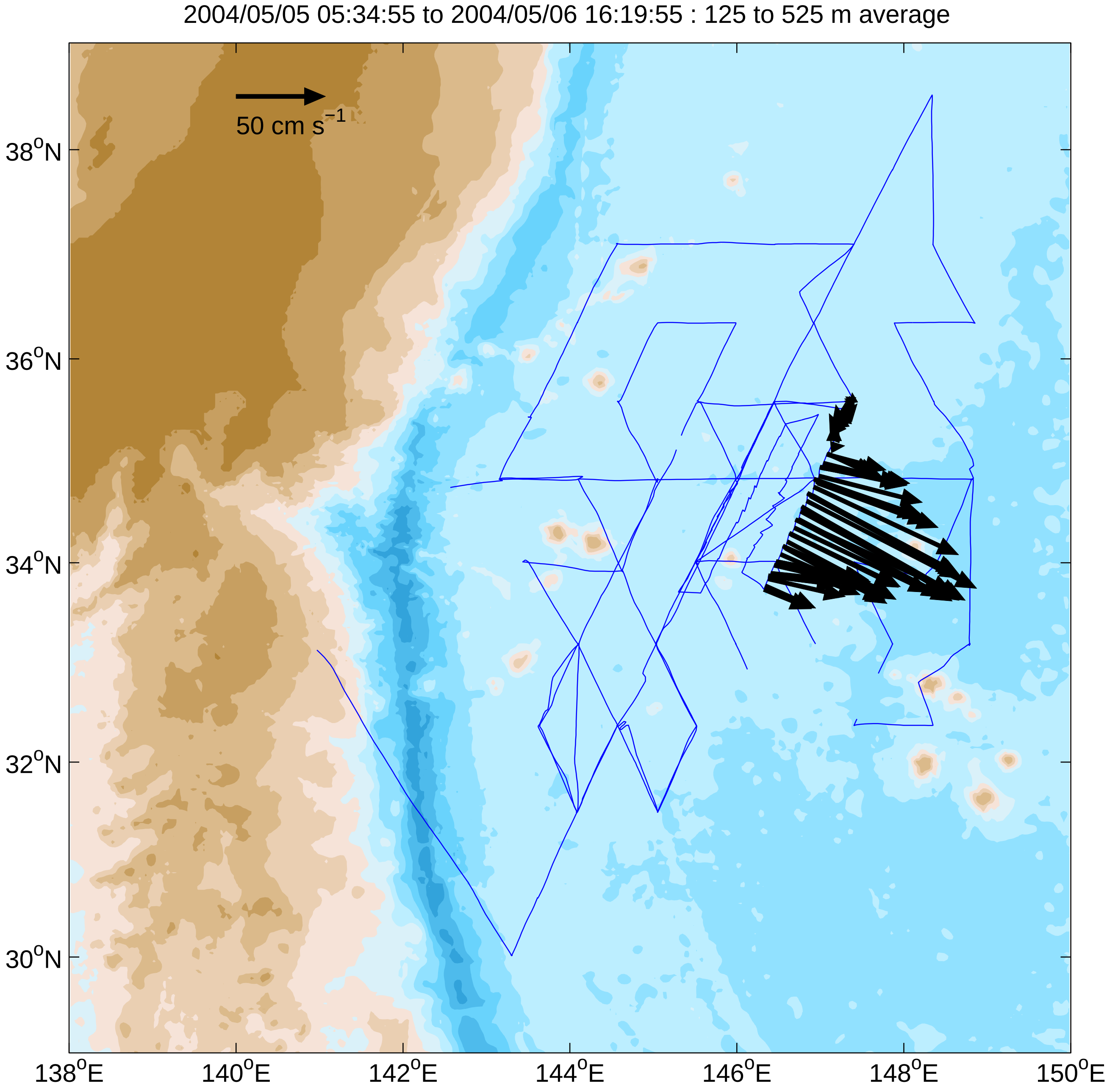


Figure 49: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

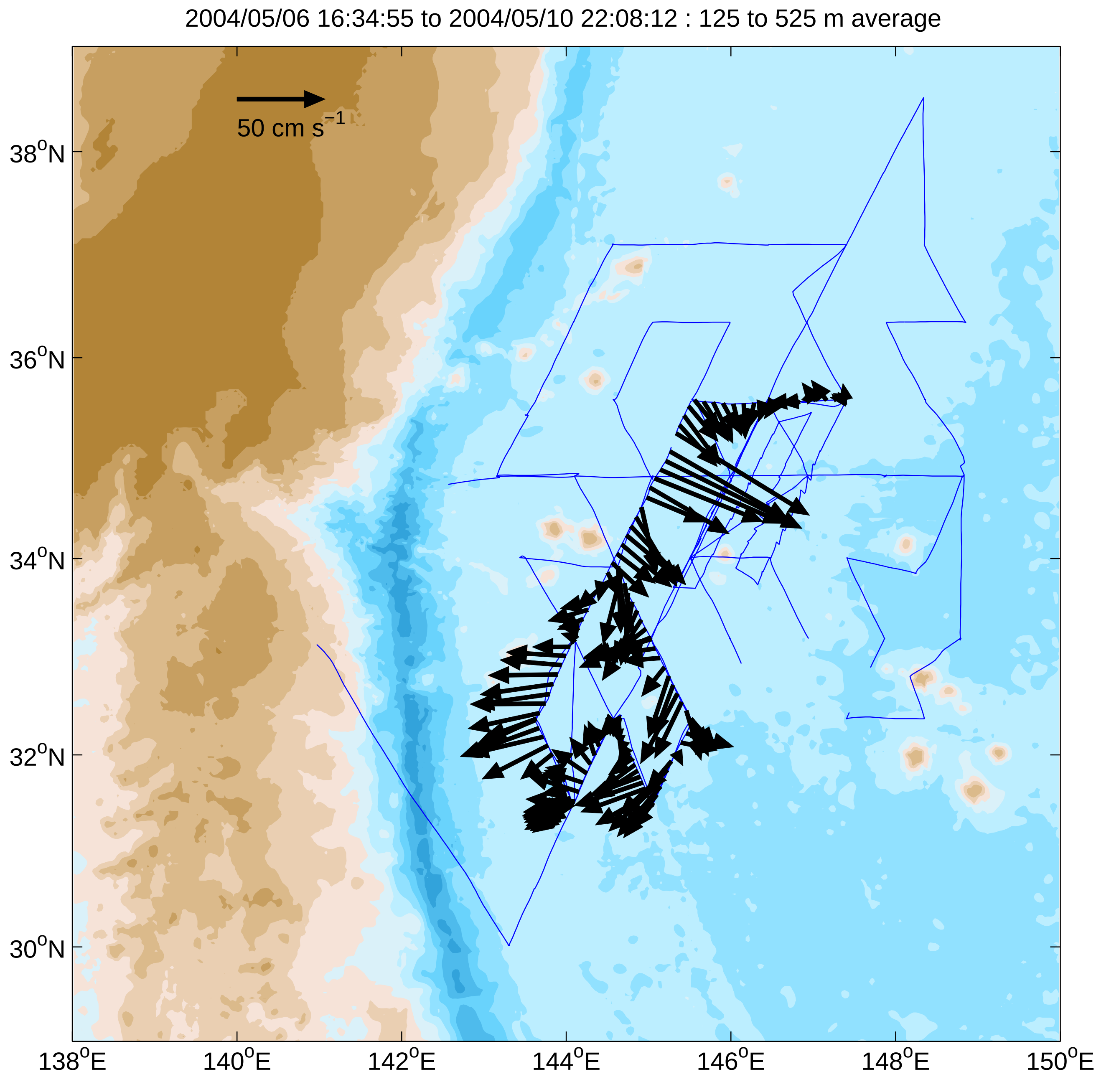


Figure 50: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

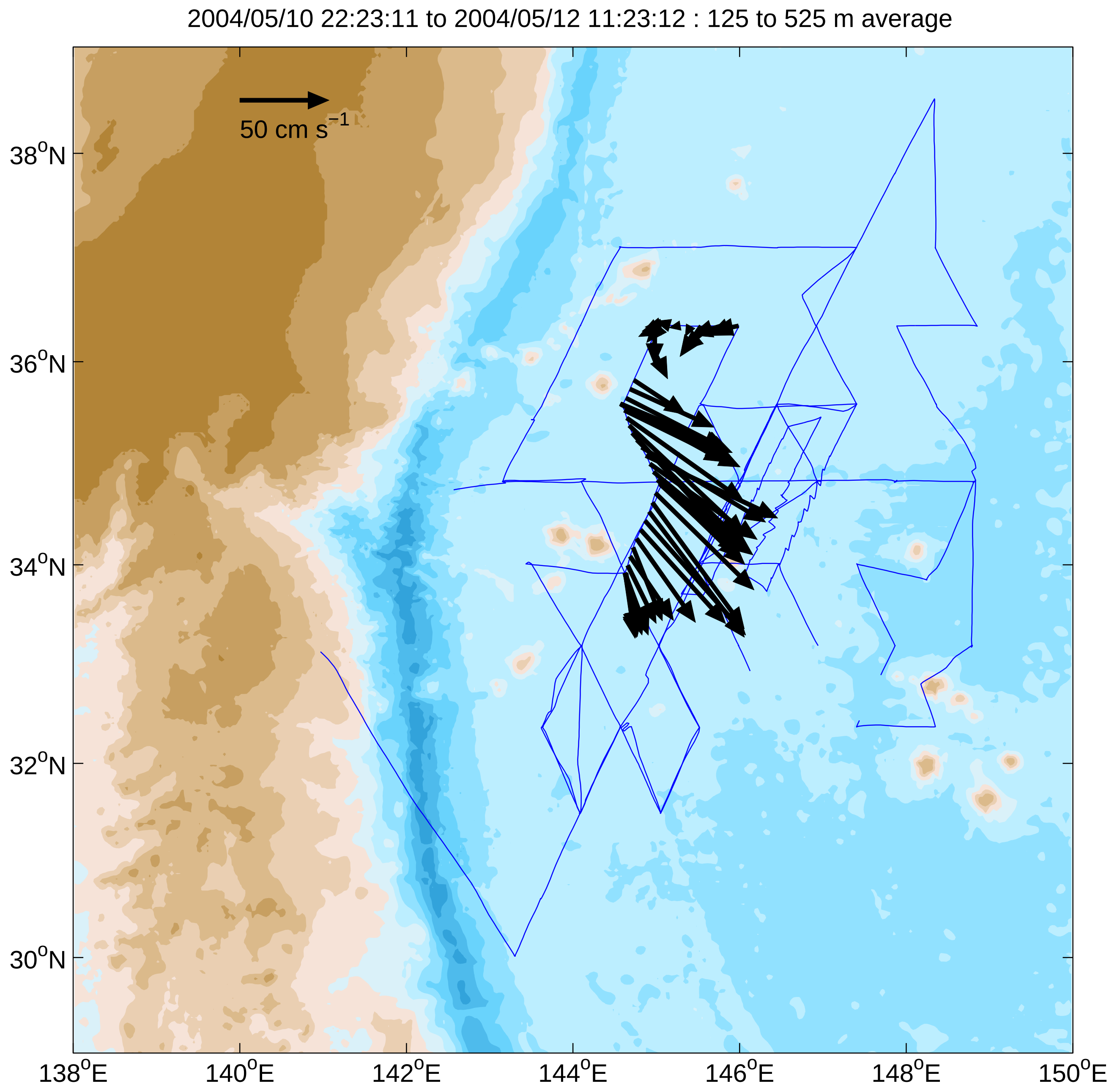


Figure 51: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

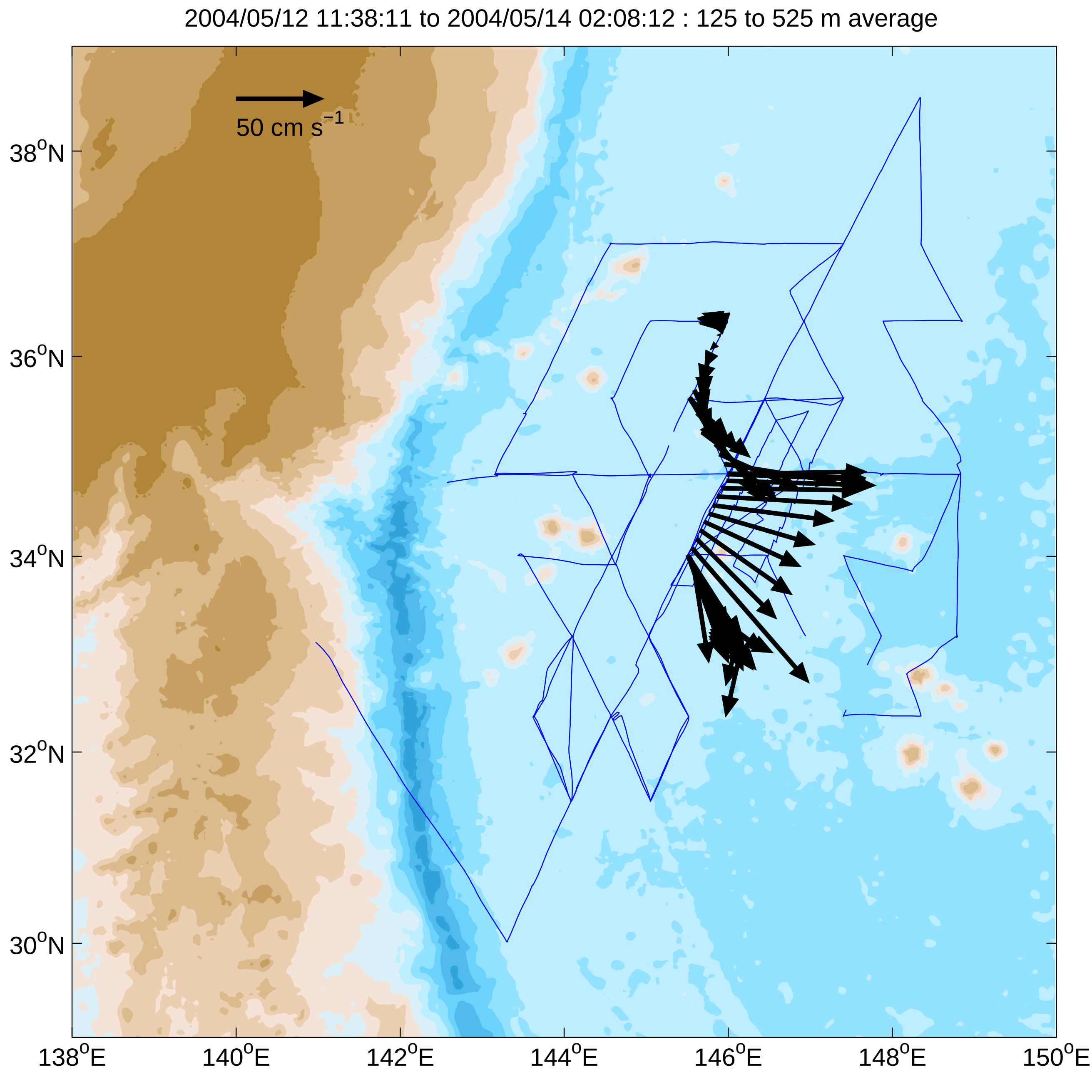


Figure 52: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

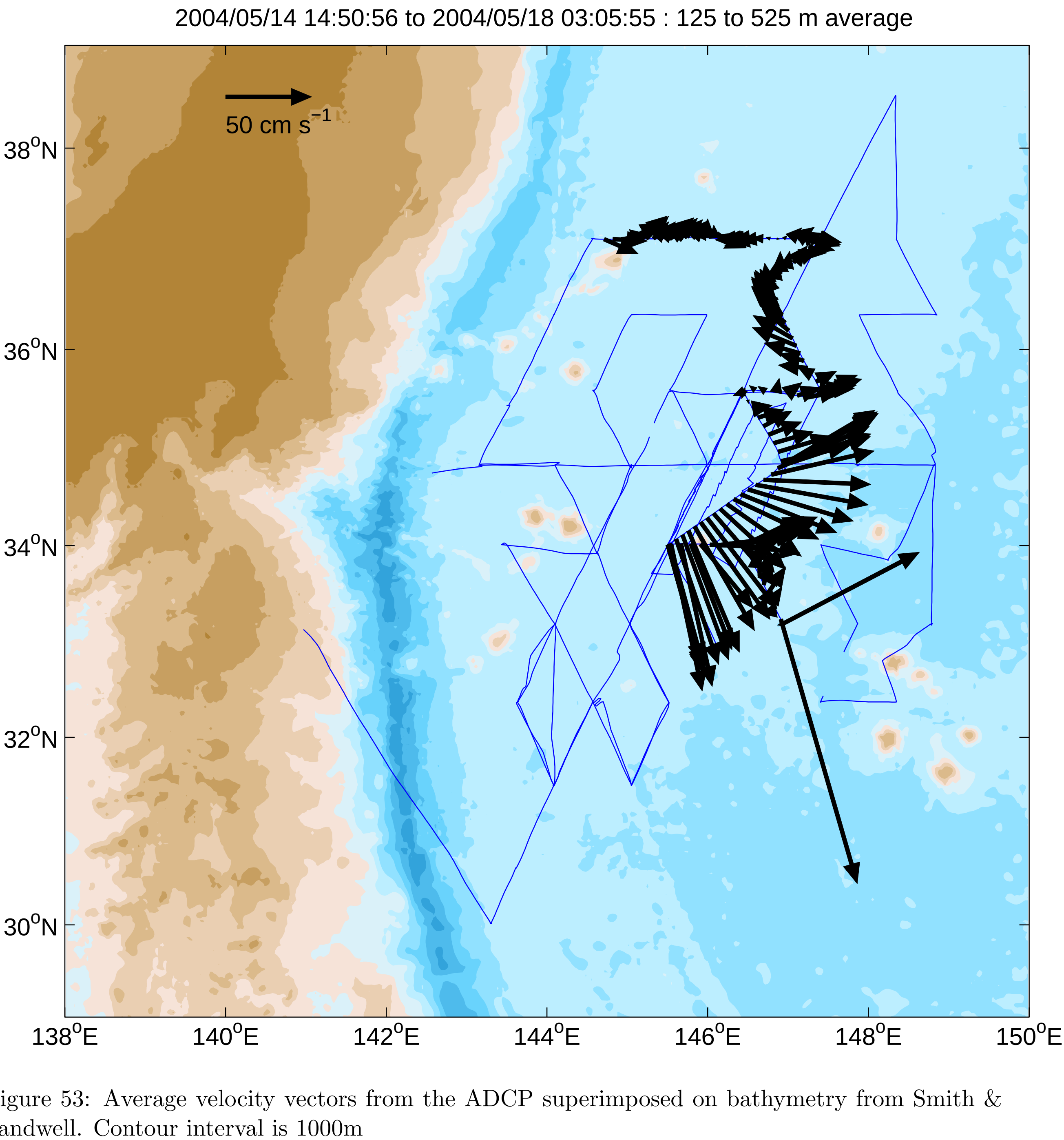


Figure 53: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

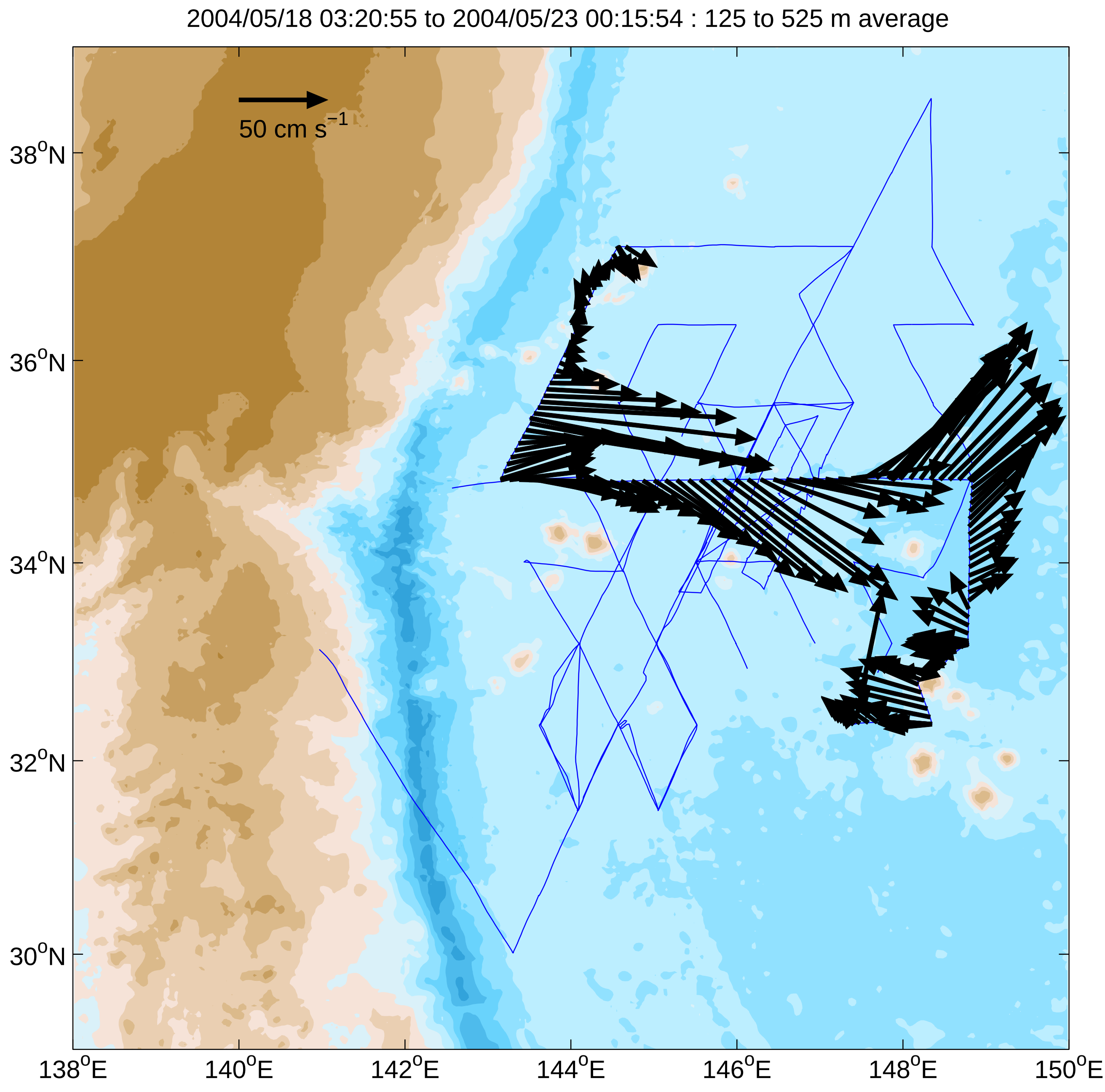


Figure 54: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

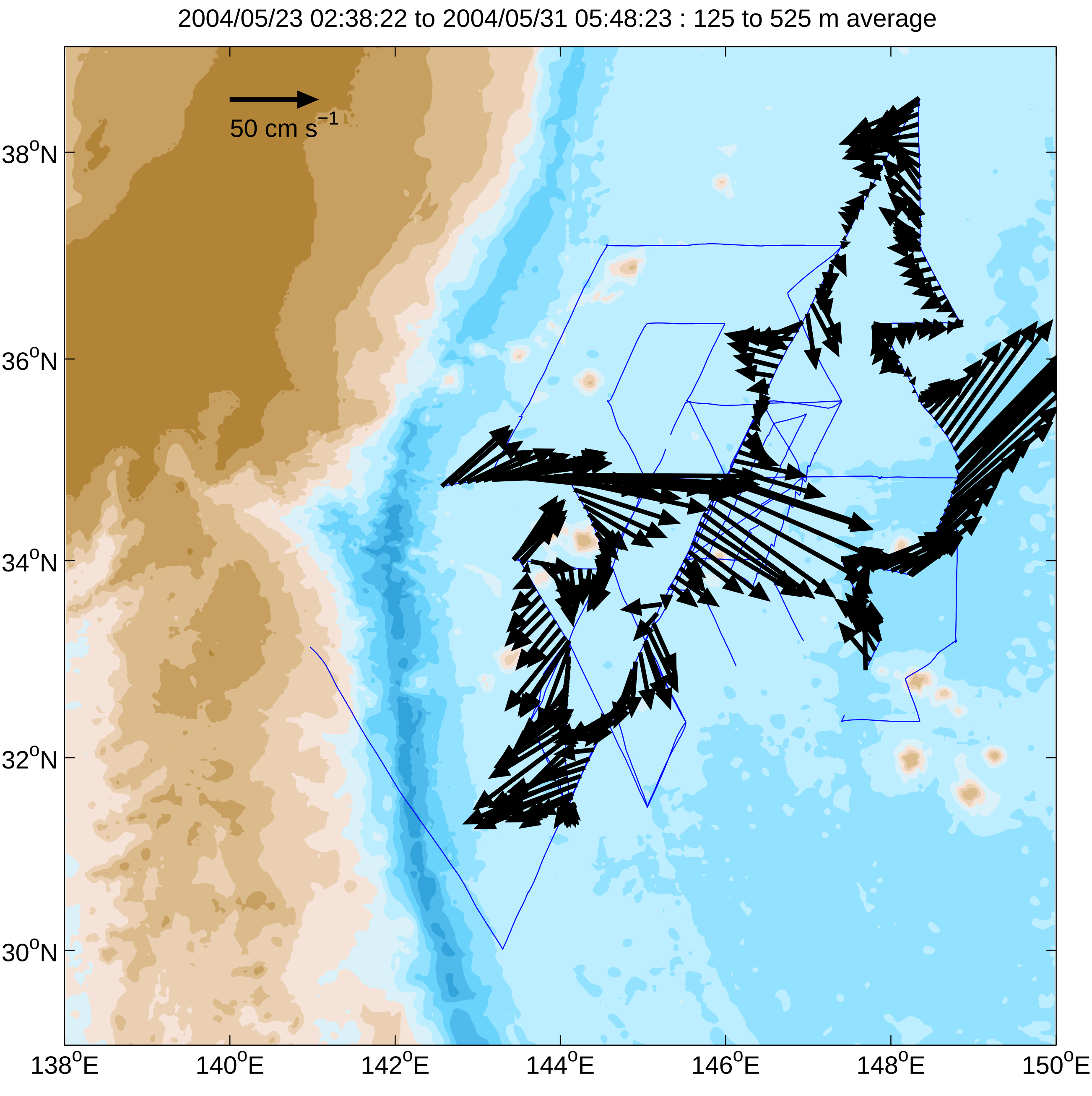


Figure 55: Average velocity vectors from the ADCP superimposed on bathymetry from Smith & Sandwell. Contour interval is 1000m

3.5.2 On Station

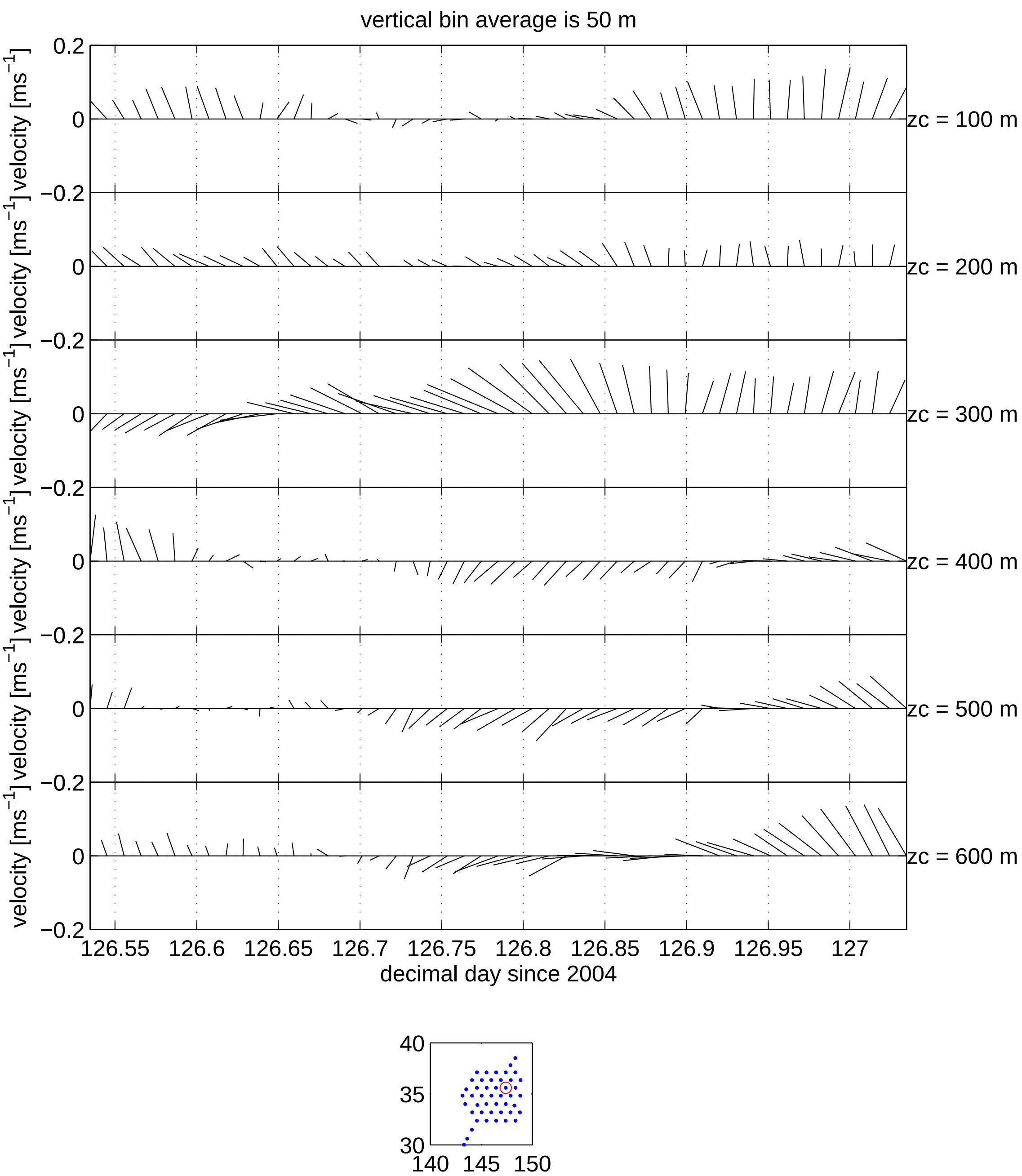


Figure 56: Average velocity vectors from the ADCP while on station. An upwards pointing vector is northward.

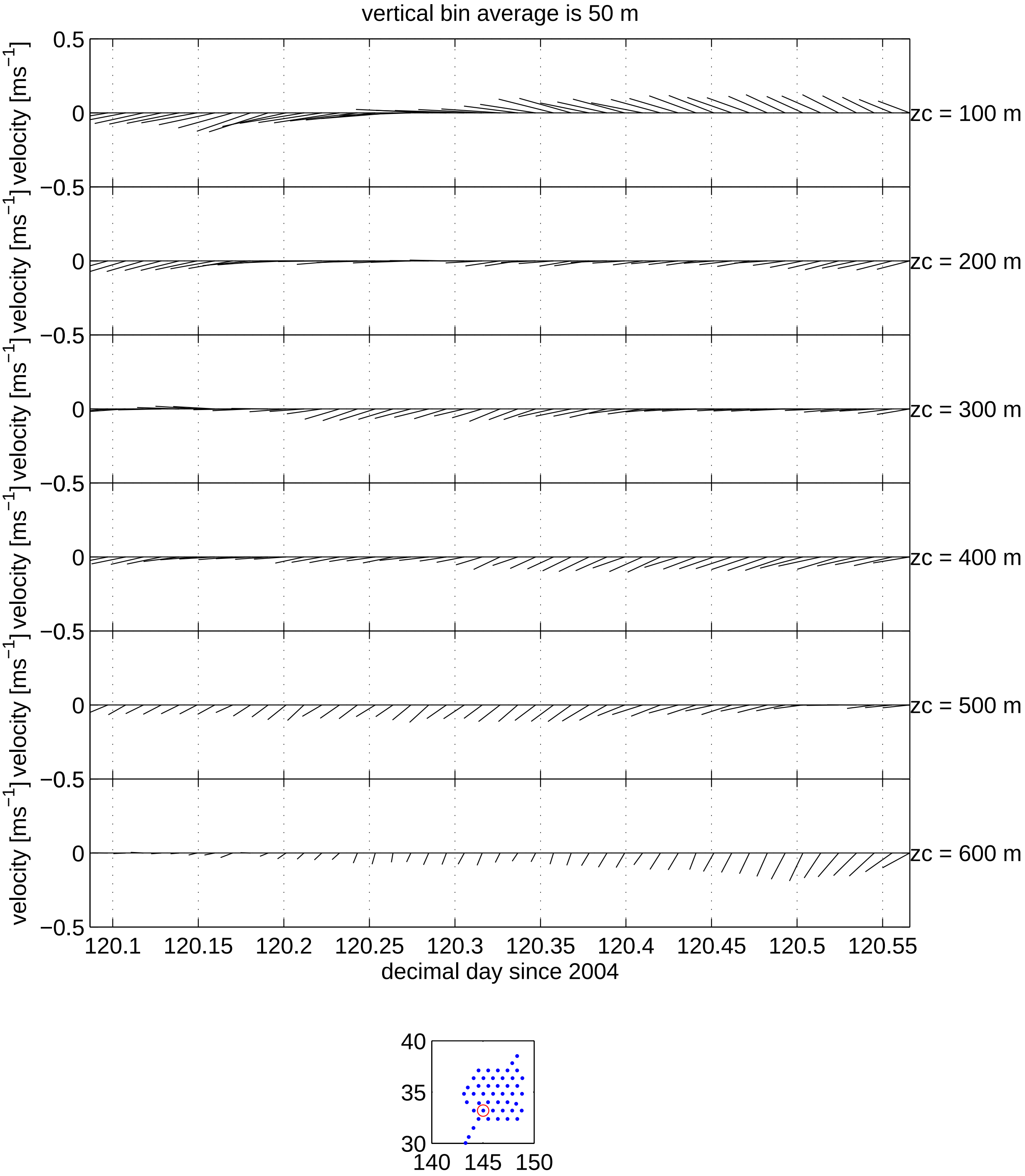


Figure 57: Average velocity vectors from the ADCP while on station. An upwards pointing vector is northward.

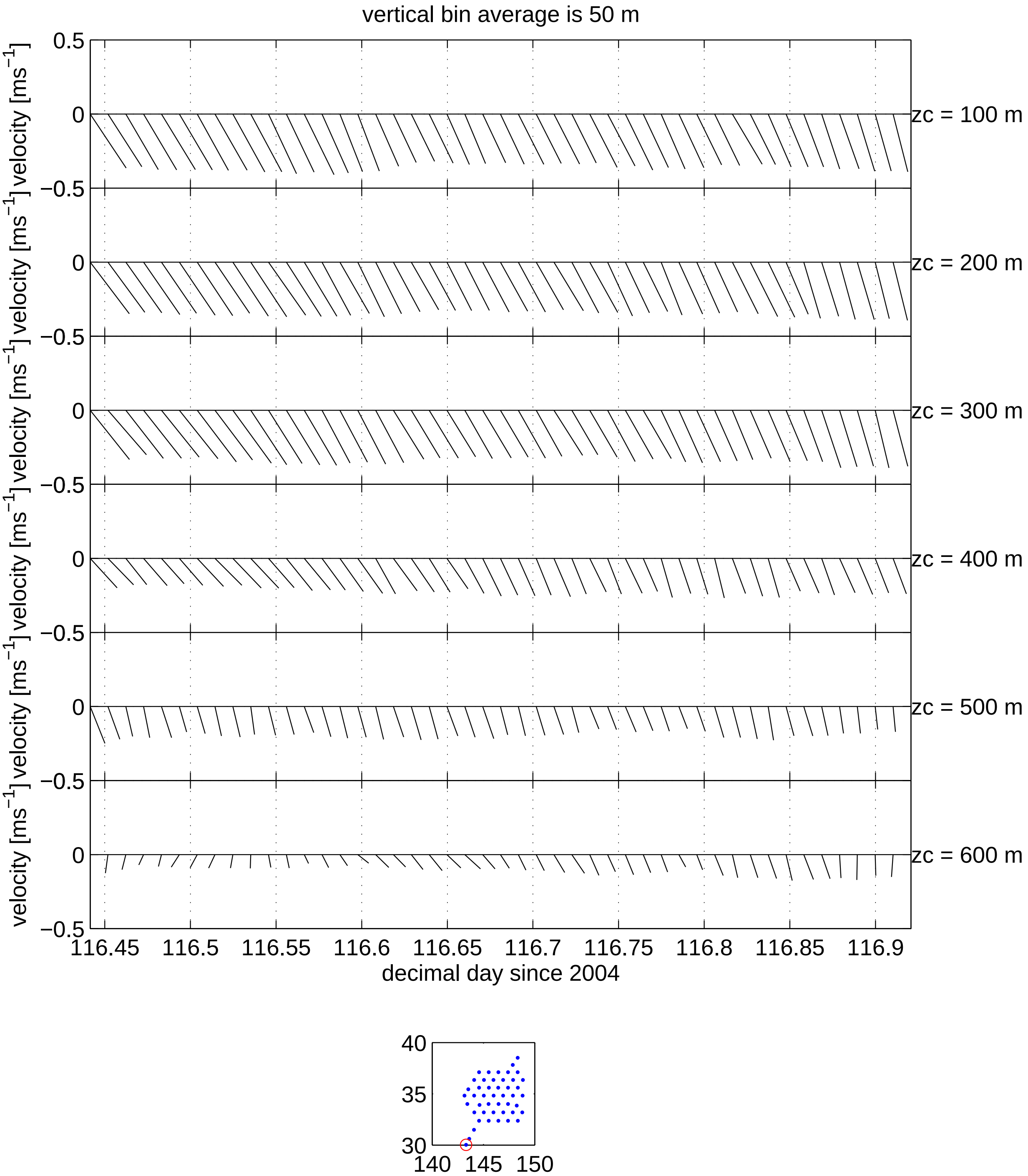


Figure 58: Average velocity vectors from the ADCP while on station. An upwards pointing vector is northward.

3.5.3 Cross Sections of the Kuroshio

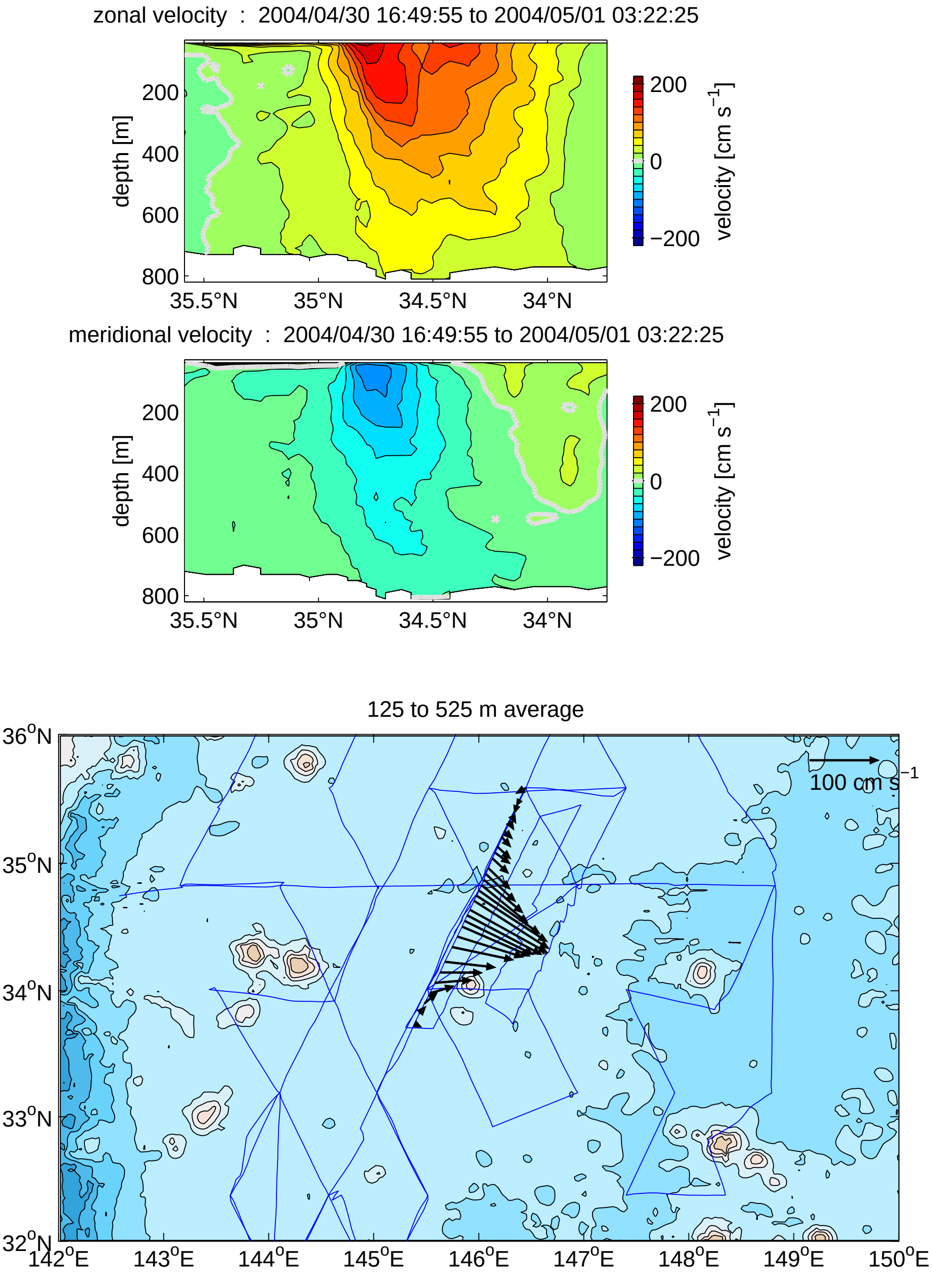


Figure 59: Upper panels: zonal(top) and meridional(middle) velocity from the ADCP. Lower panel: ADCP average velocity vectors superimposed on Smith & Sandwell bathymetry contoured every 1000m.

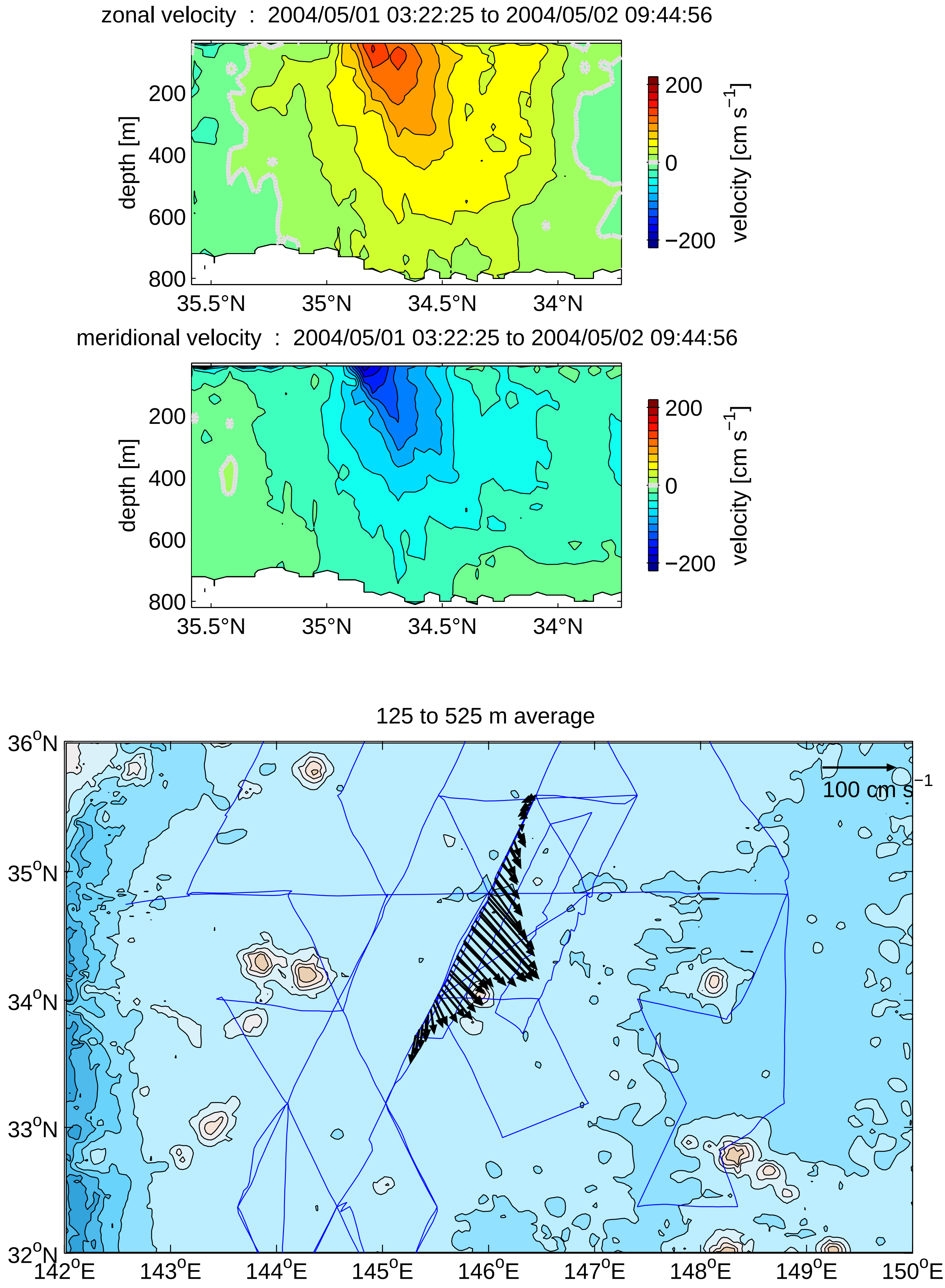


Figure 60: Upper panels: zonal(top) and meridional(middle) velocity from the ADCP. Lower panel: ADCP average velocity vectors superimposed on Smith & Sandwell bathymetry contoured every 1000m.

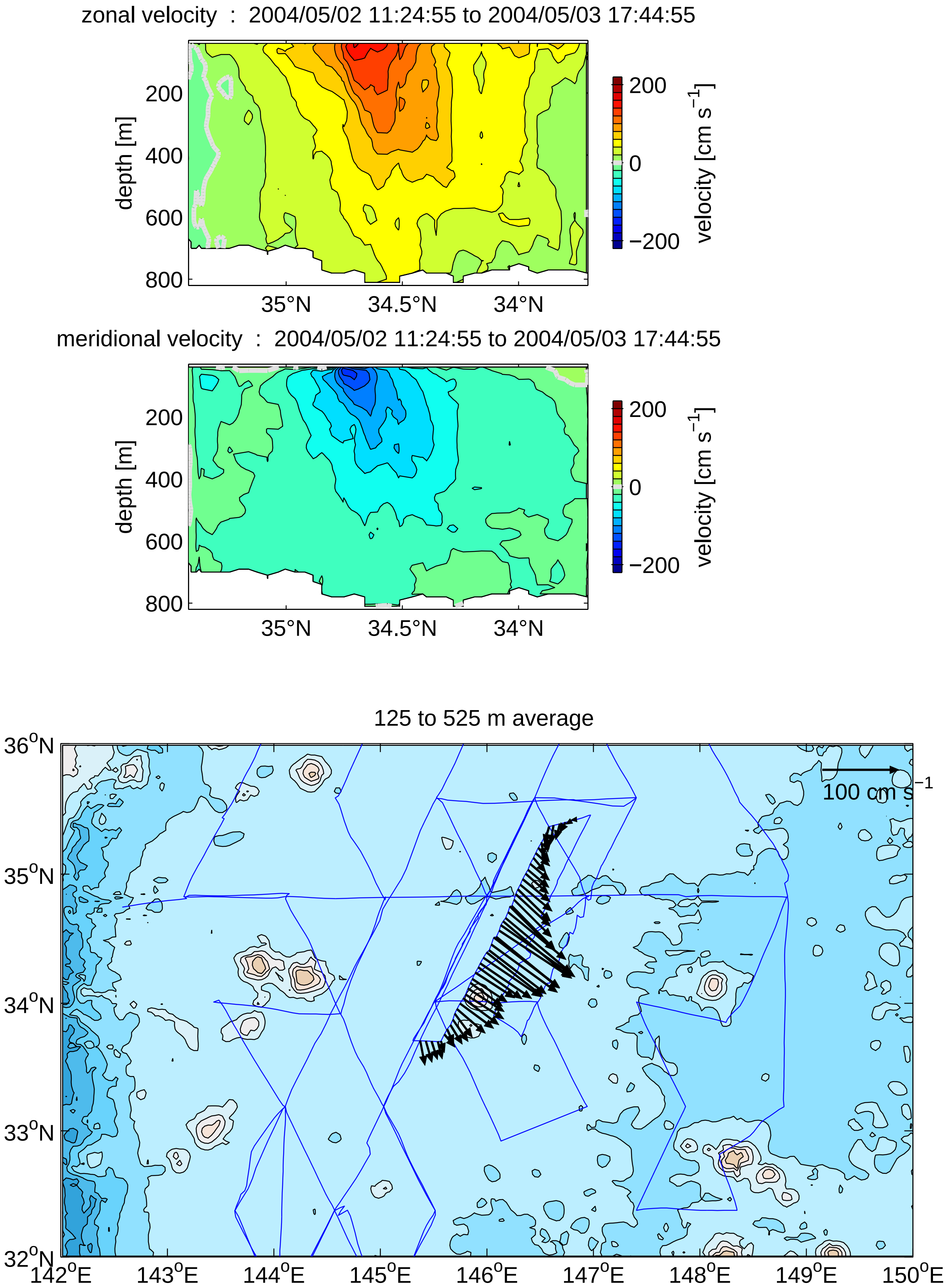


Figure 61: Upper panels: zonal(top) and meridional(middle) velocity from the ADCP. Lower panel: ADCP average velocity vectors superimposed on Smith & Sandwell bathymetry contoured every 1000m.

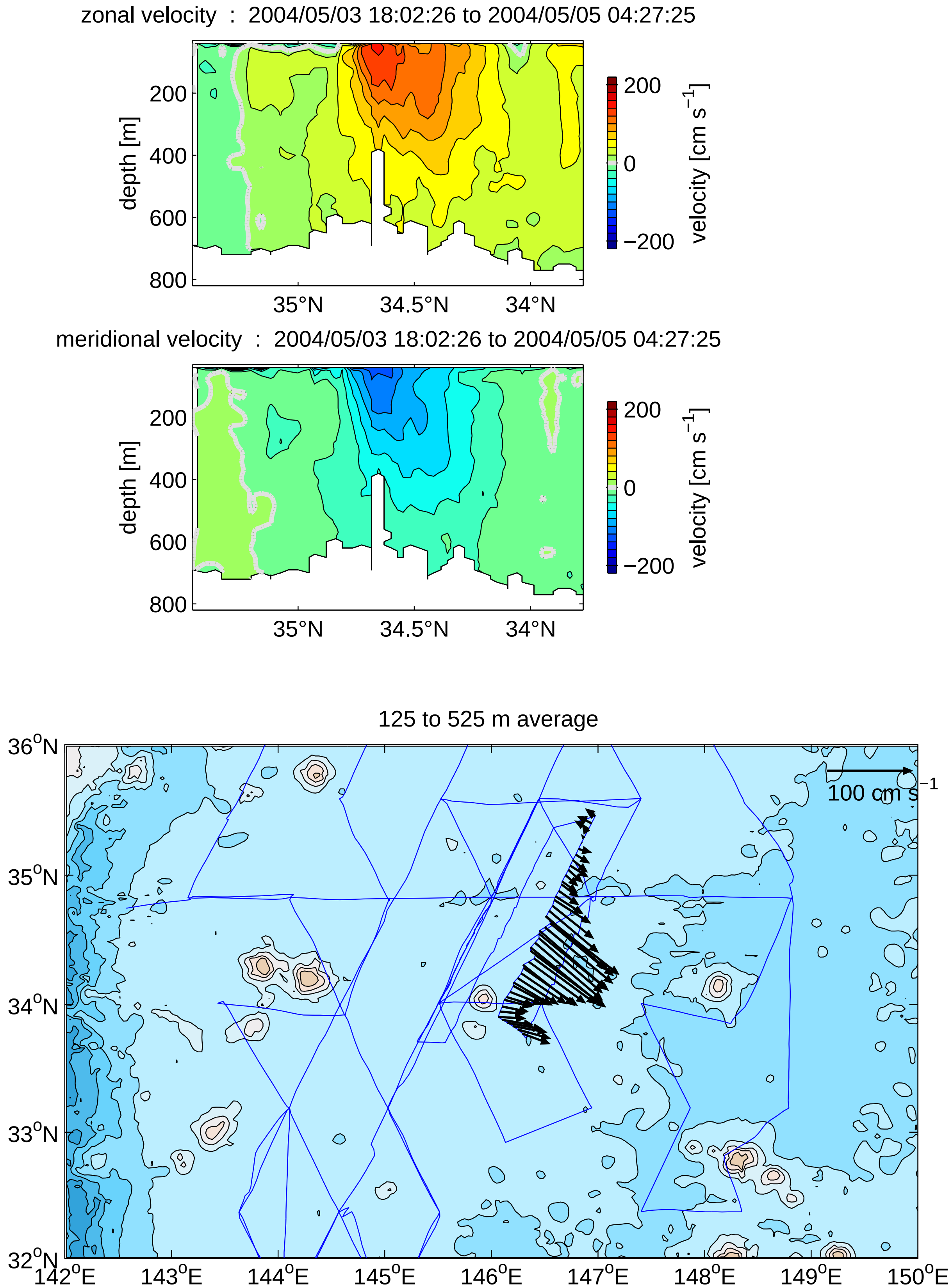


Figure 62: Upper panels: zonal(top) and meridional(middle) velocity from the ADCP. Lower panel: ADCP average velocity vectors superimposed on Smith & Sandwell bathymetry contoured every 1000m.

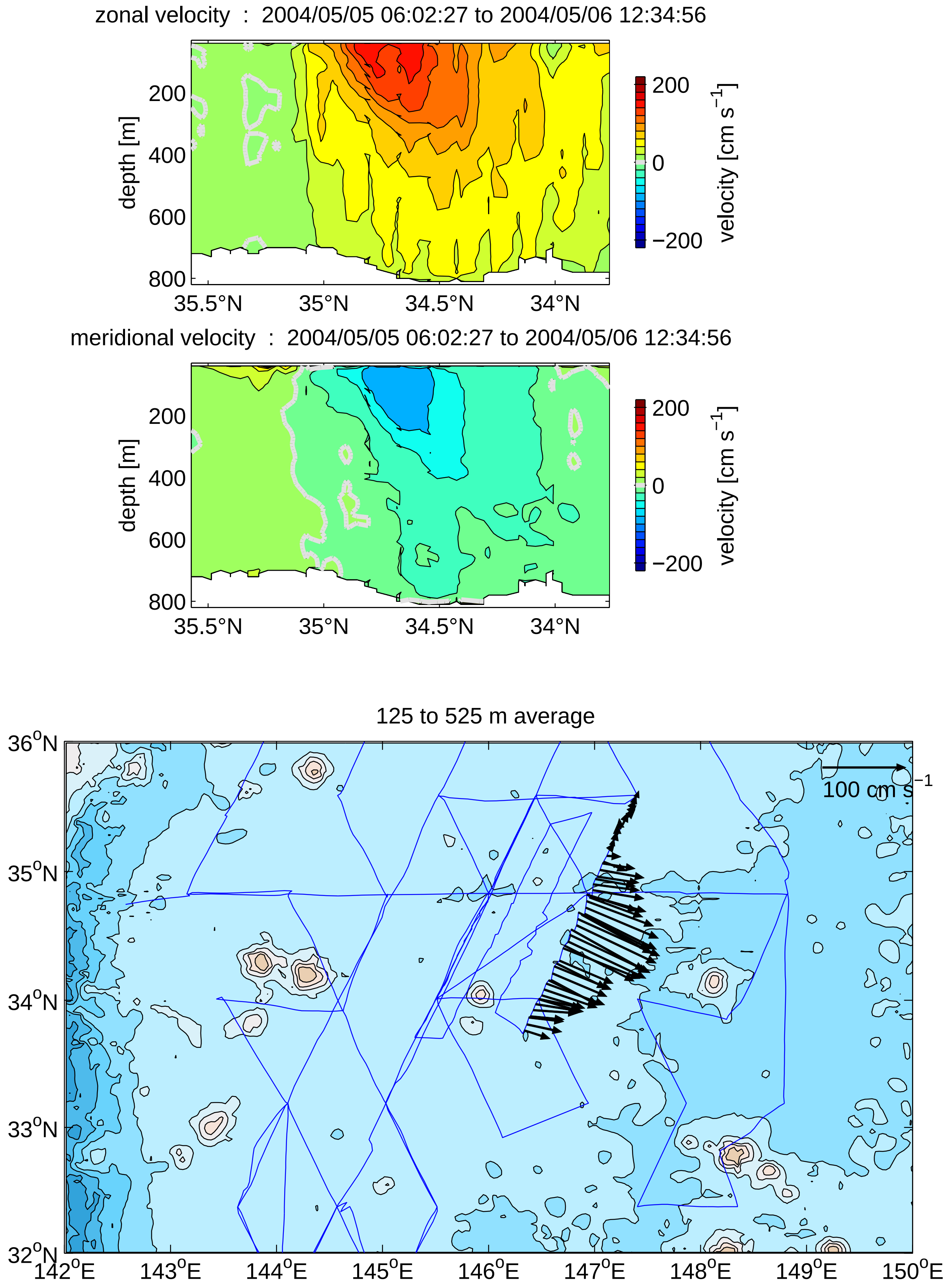


Figure 63: Upper panels: zonal(top) and meridional(middle) velocity from the ADCP. Lower panel: ADCP average velocity vectors superimposed on Smith & Sandwell bathymetry contoured every 1000m.

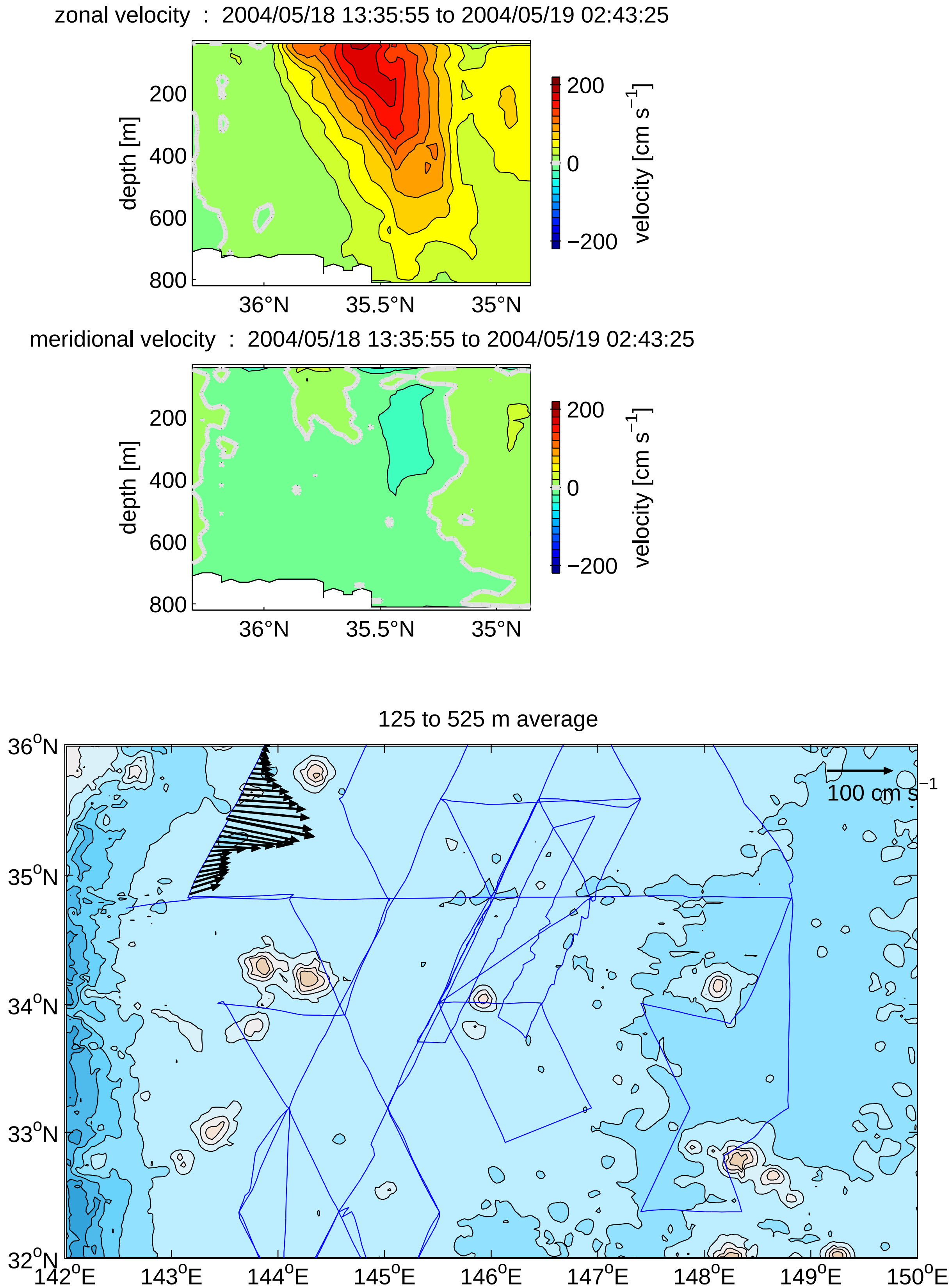


Figure 64: Upper panels: zonal(top) and meridional(middle) velocity from the ADCP. Lower panel: ADCP average velocity vectors superimposed on Smith & Sandwell bathymetry contoured every 1000m.

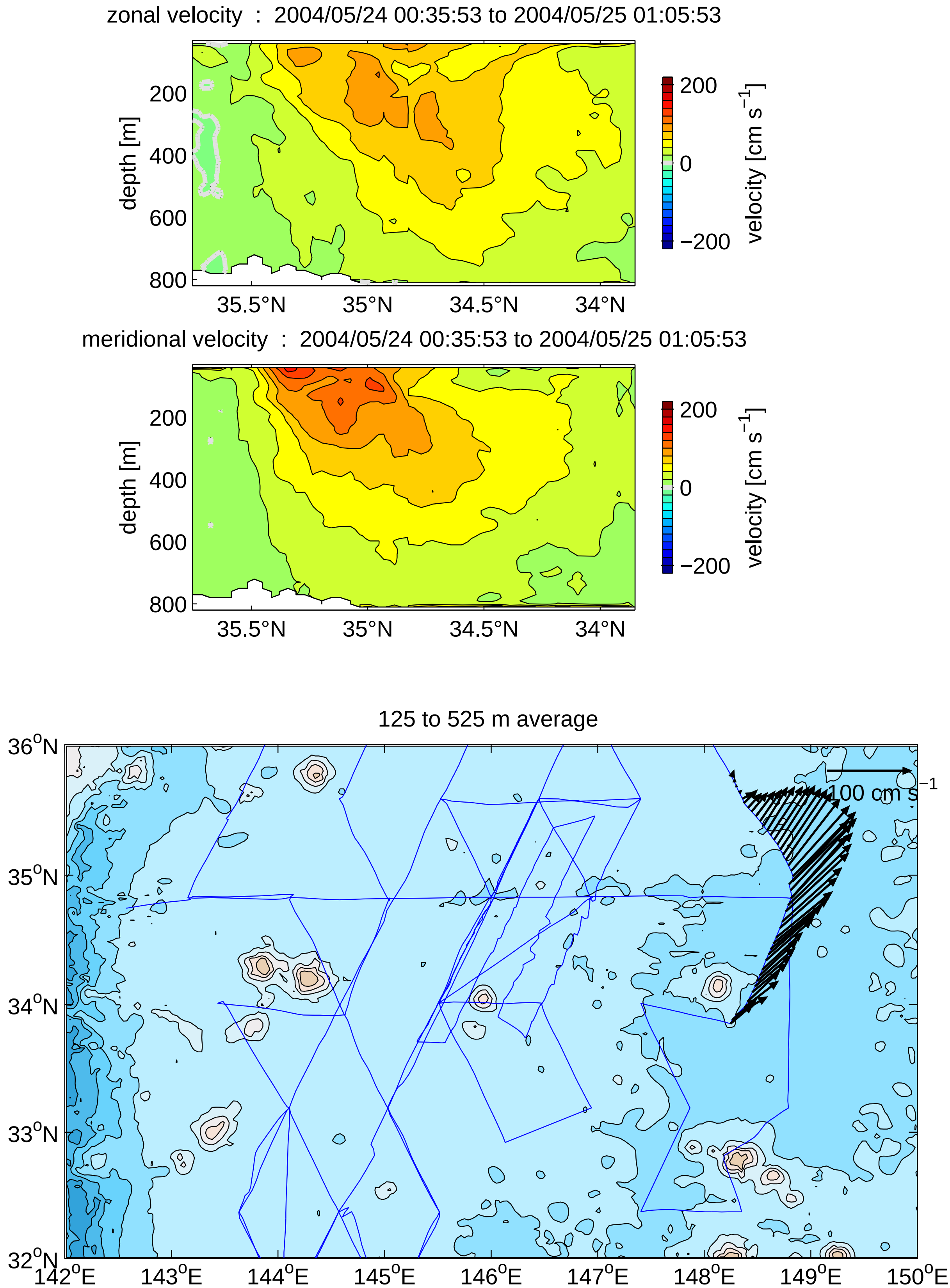


Figure 65: Upper panels: zonal(top) and meridional(middle) velocity from the ADCP. Lower panel: ADCP average velocity vectors superimposed on Smith & Sandwell bathymetry contoured every 1000m.

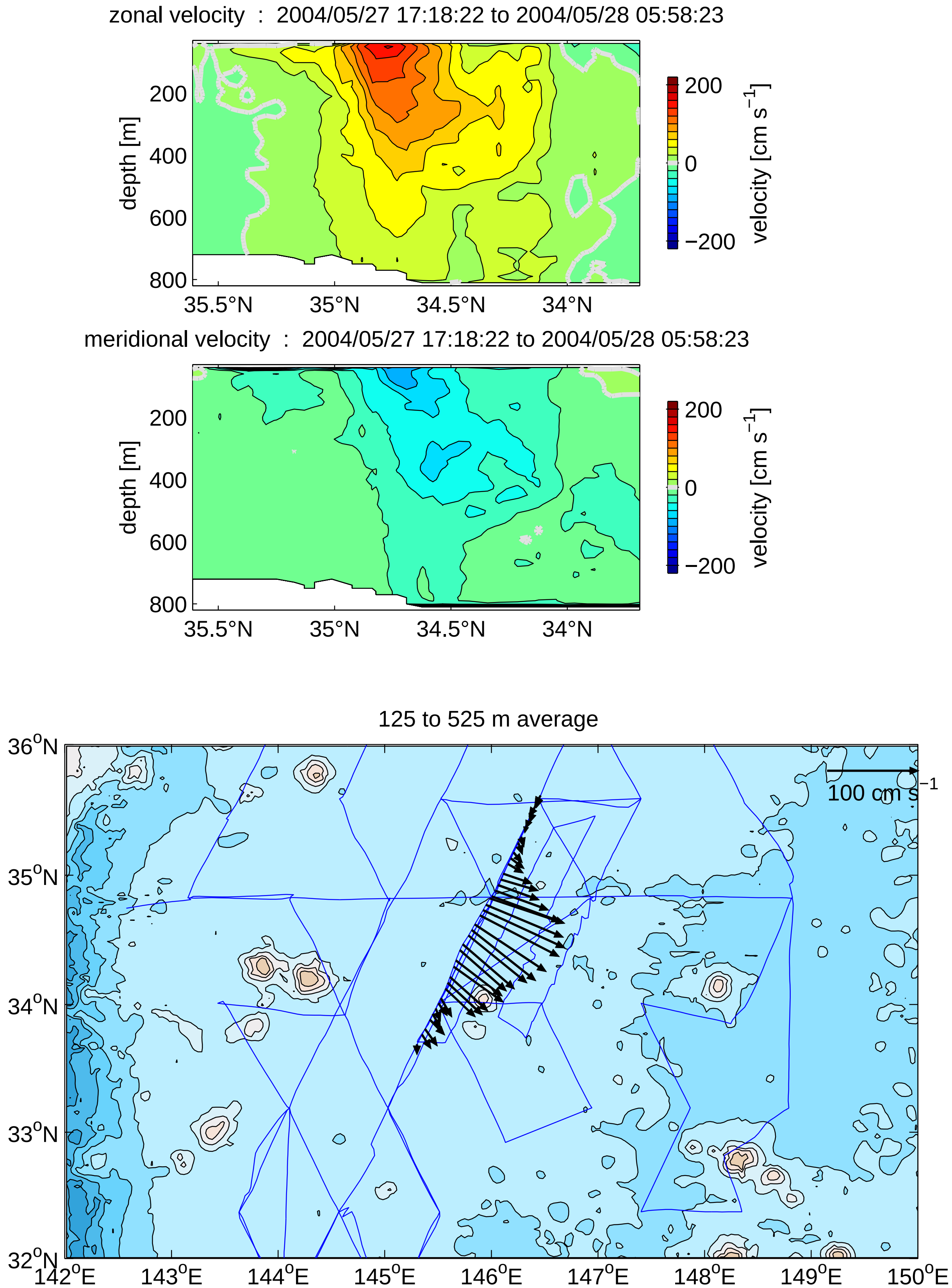


Figure 66: Upper panels: zonal(top) and meridional(middle) velocity from the ADCP. Lower panel: ADCP average velocity vectors superimposed on Smith & Sandwell bathymetry contoured every 1000m.

3.5.4 Mooring Line

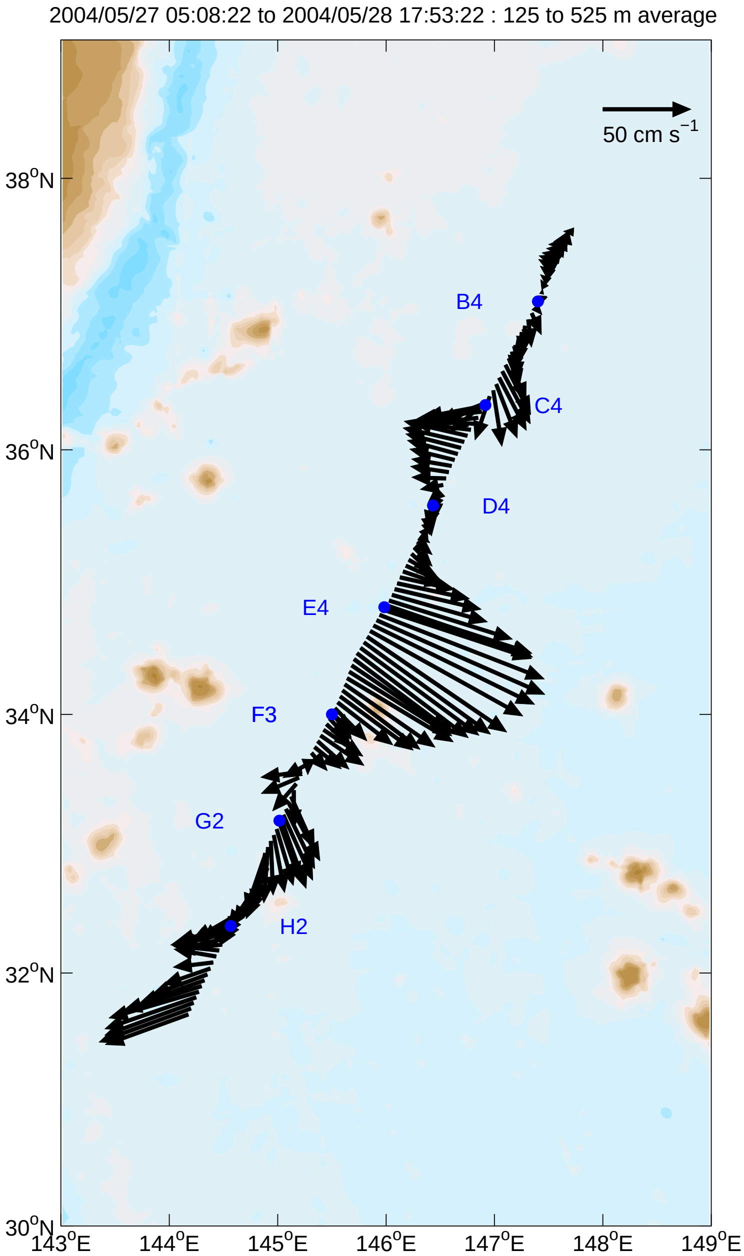


Figure 67: ADCP average velocity vectors along the CPIES/moored profiler array. Bathymetry contoured every 500m in depth.

3.6 Bathymetry

3.6.1 Large Scale Overview

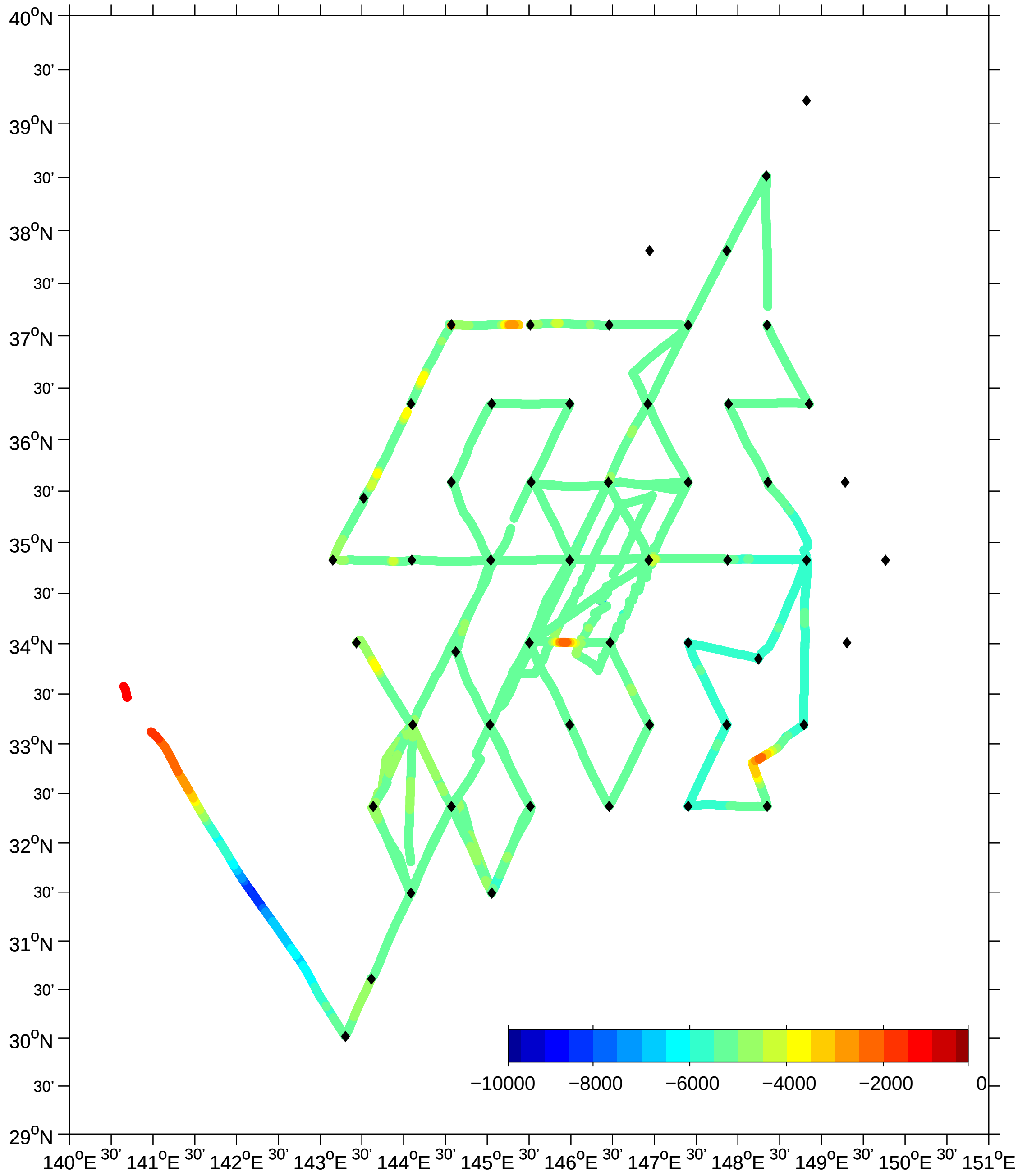


Figure 68: Hydrosweep data taken along the track TN168 Cruise.

3.6.2 Fine Scale Along Altimeter Lines and Central Mooring Lines

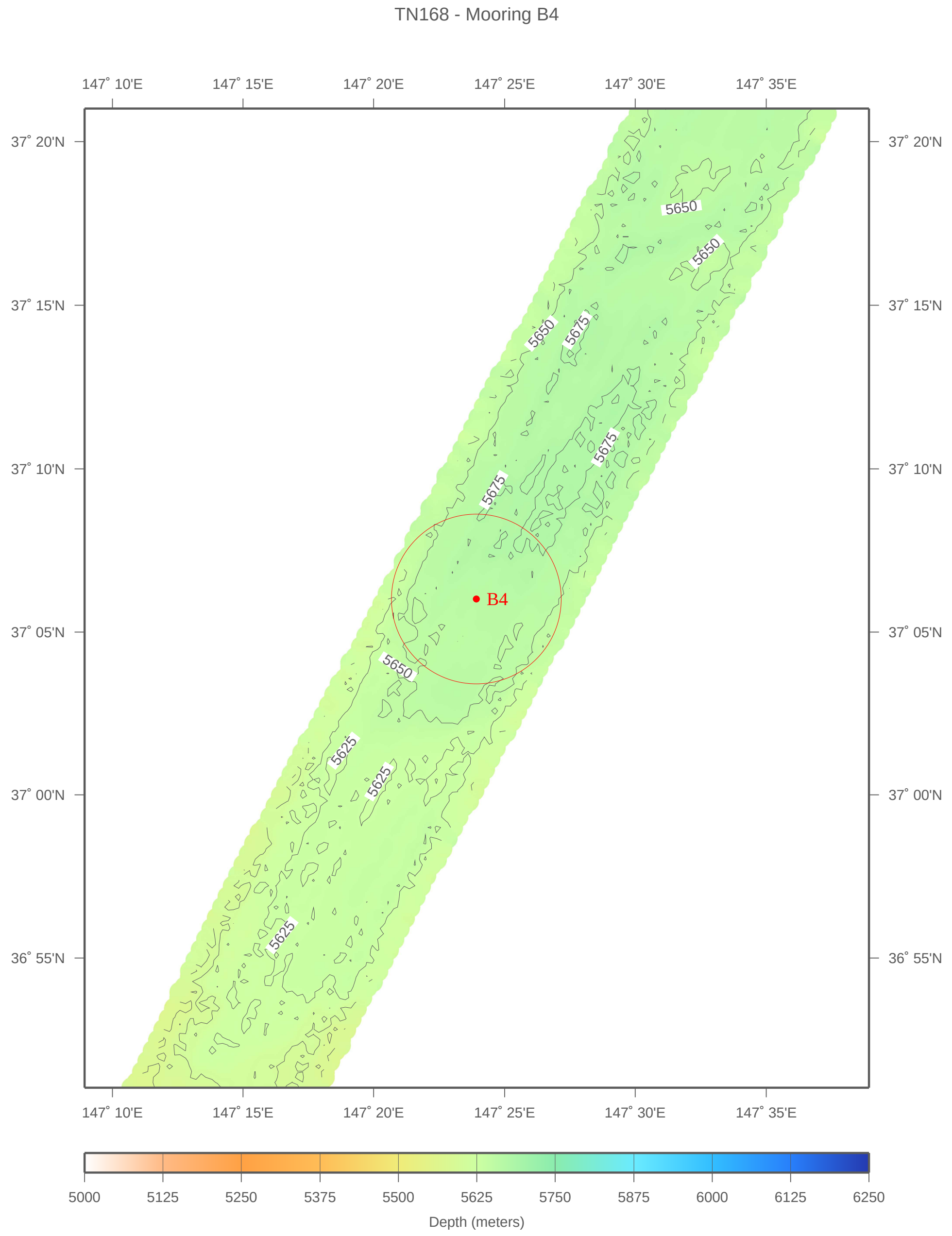


Figure 69: Bathymetric Survey B4

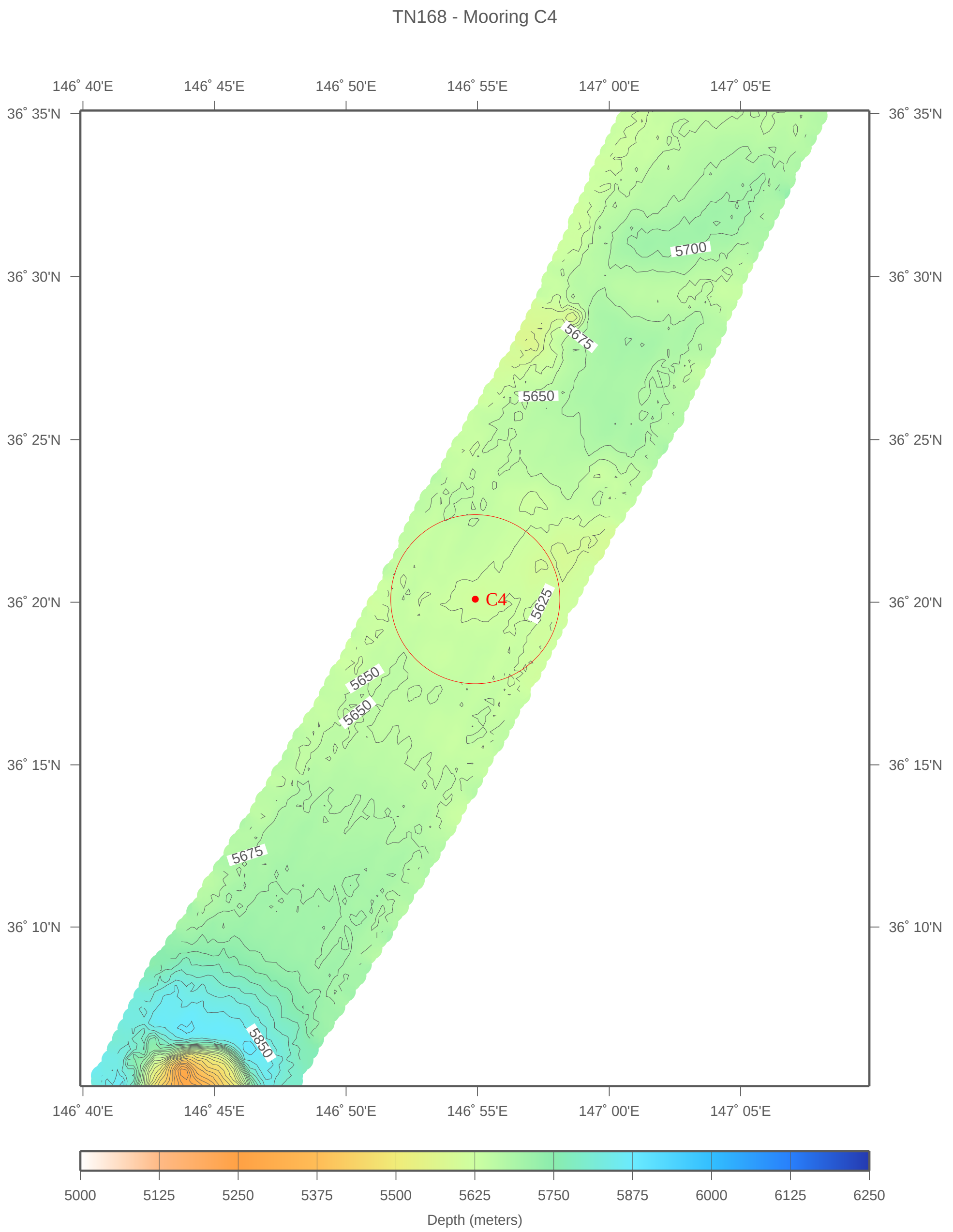


Figure 70: Bathymetric Survey C4

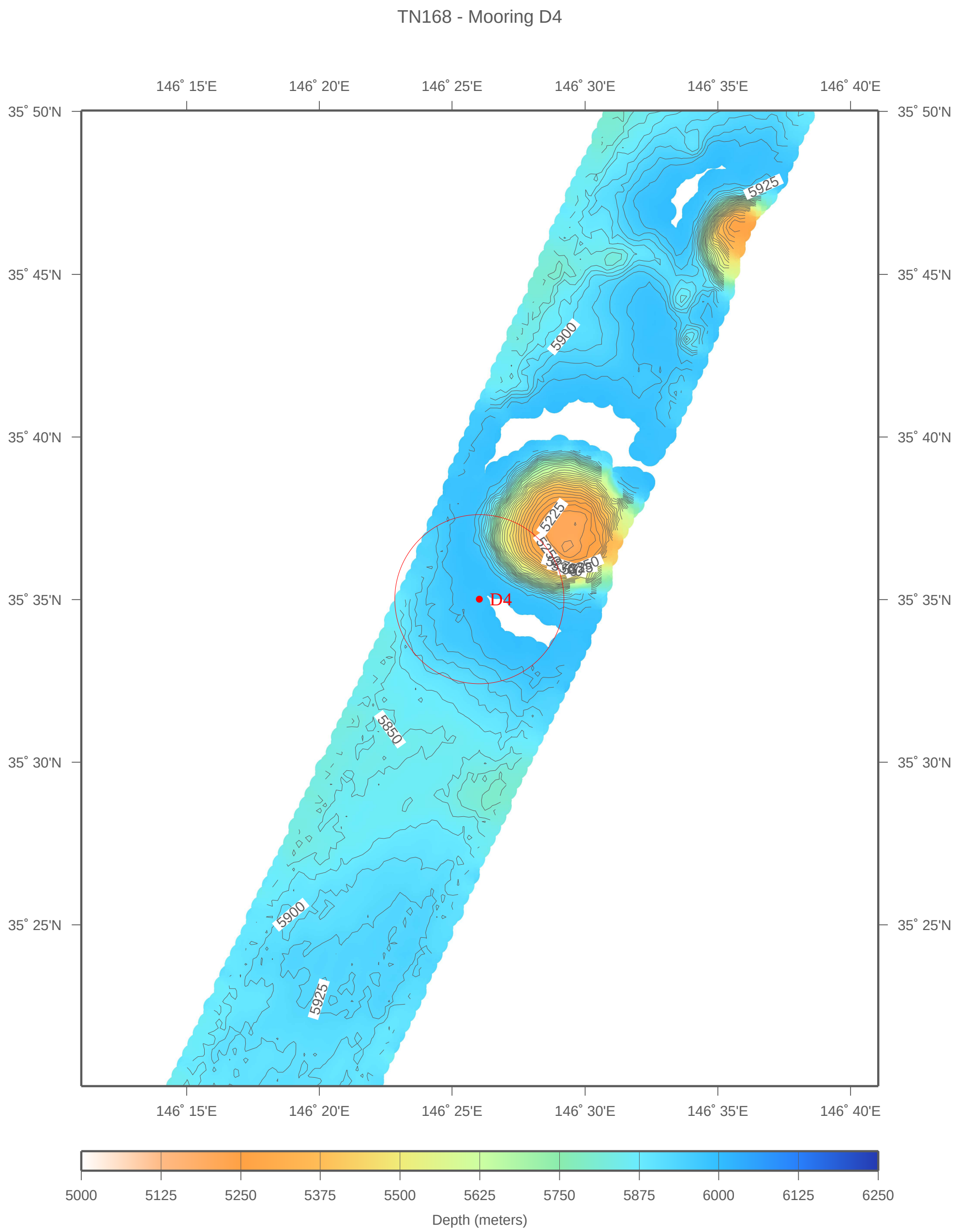


Figure 71: Bathymetric Survey D4

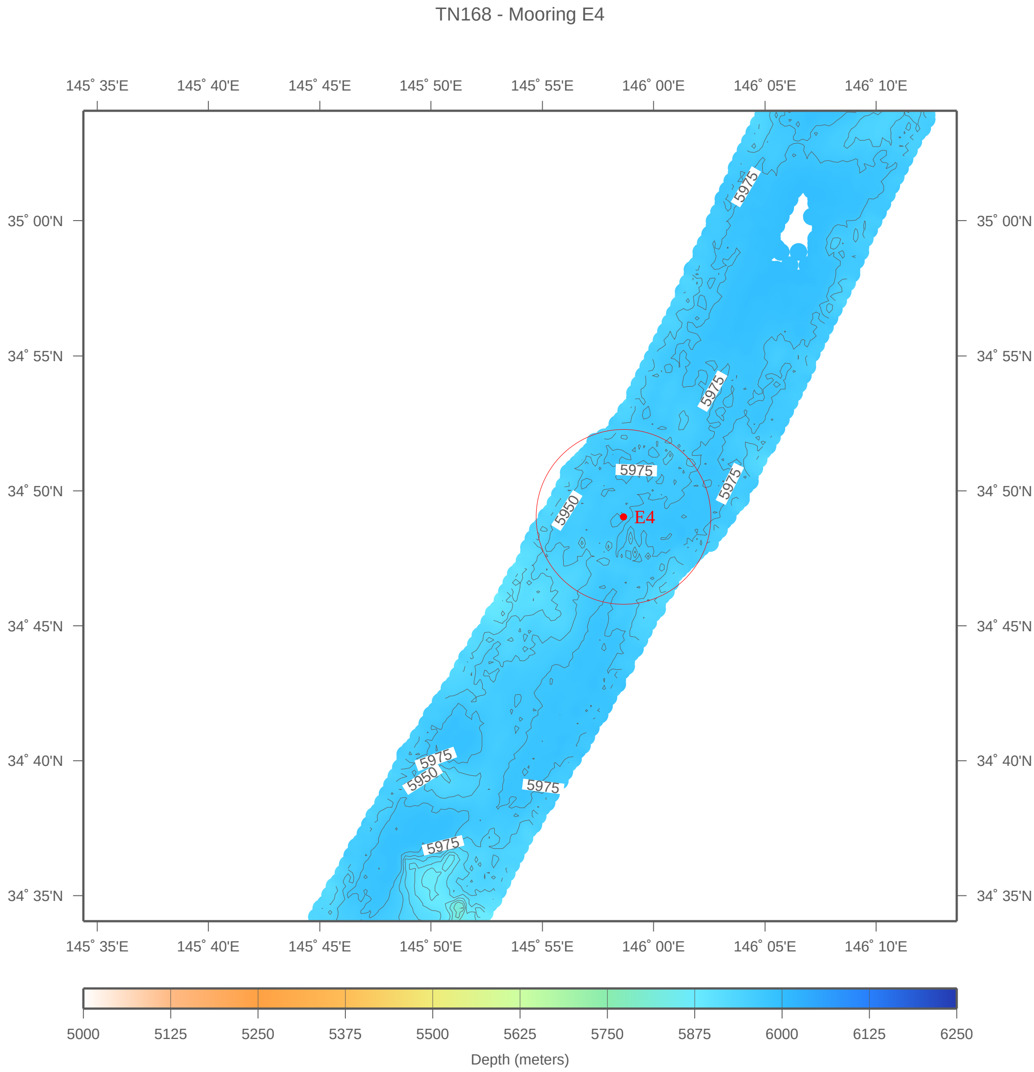


Figure 72: Bathymetric Survey E4

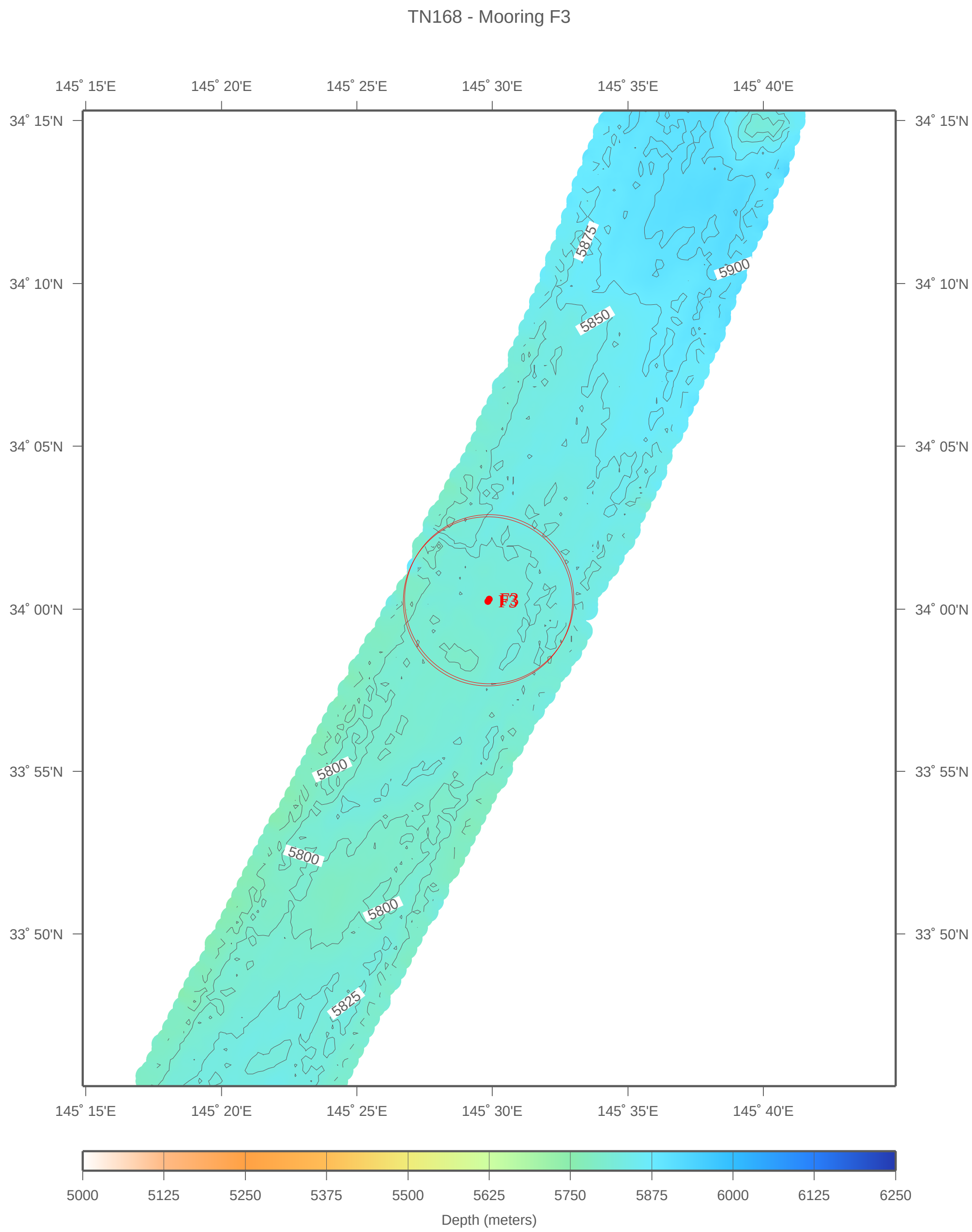


Figure 73: Bathymetric Survey F3

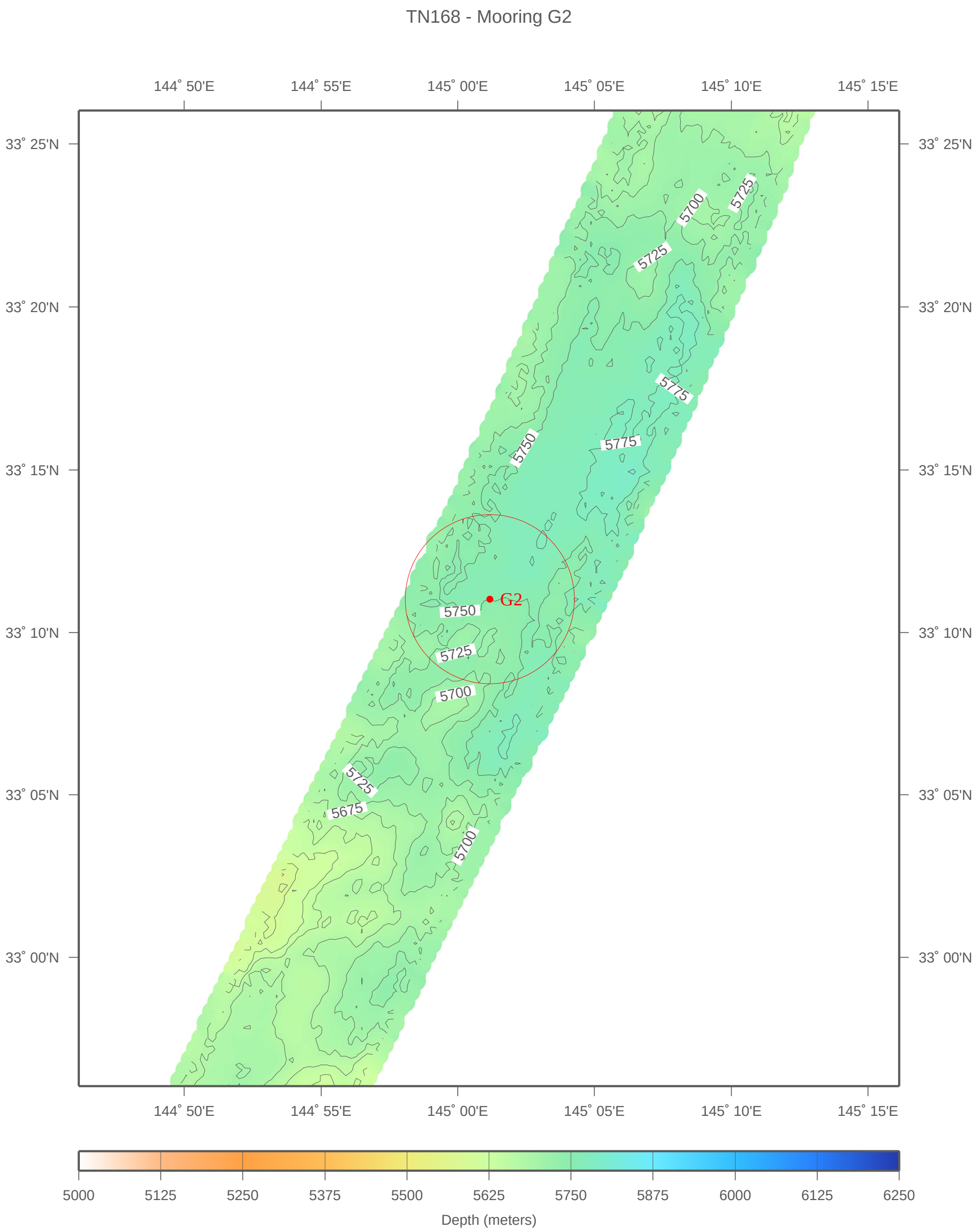


Figure 74: Bathymetric Survey G2

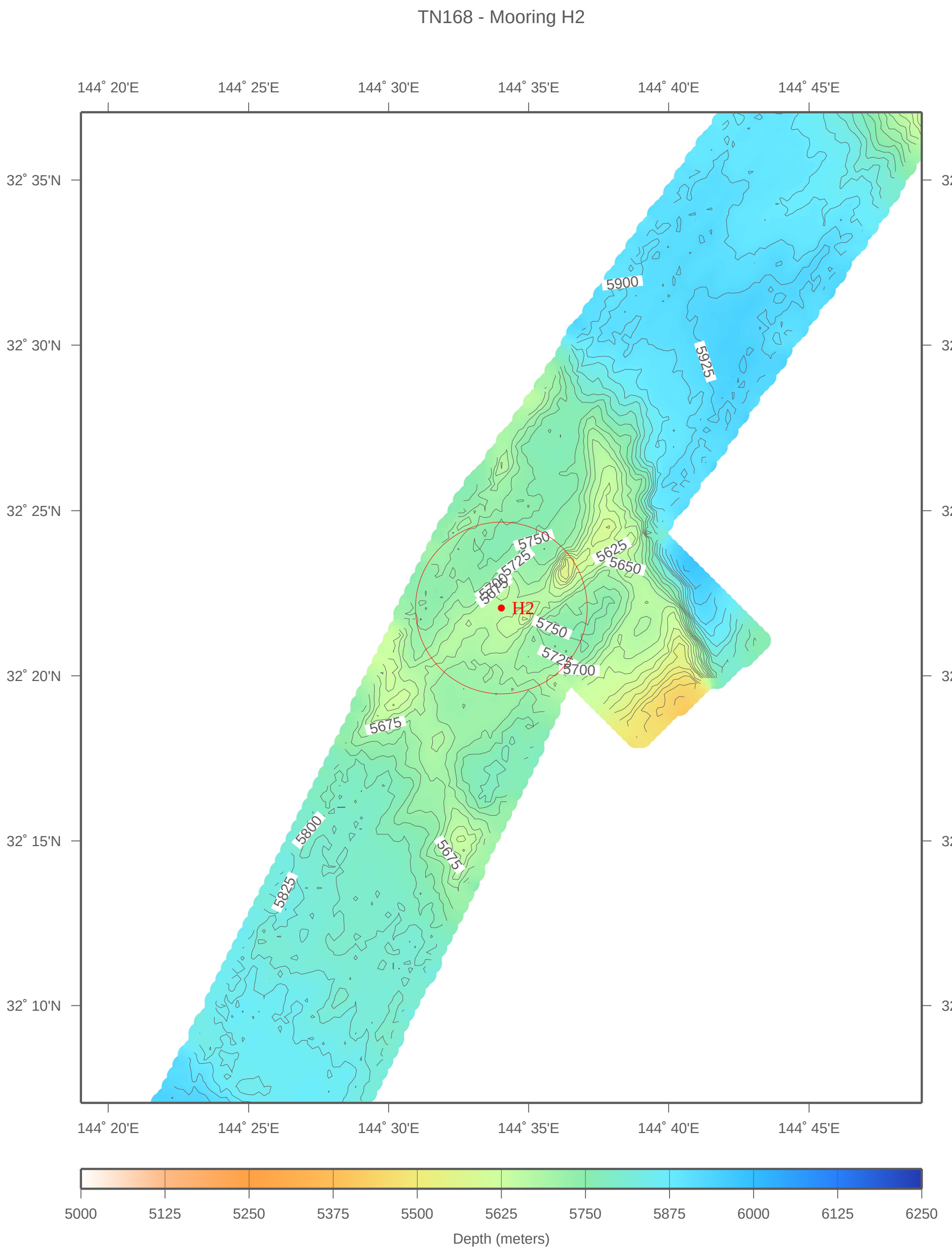


Figure 75: Bathymetric Survey H2

3.7 Time Series of MET Data

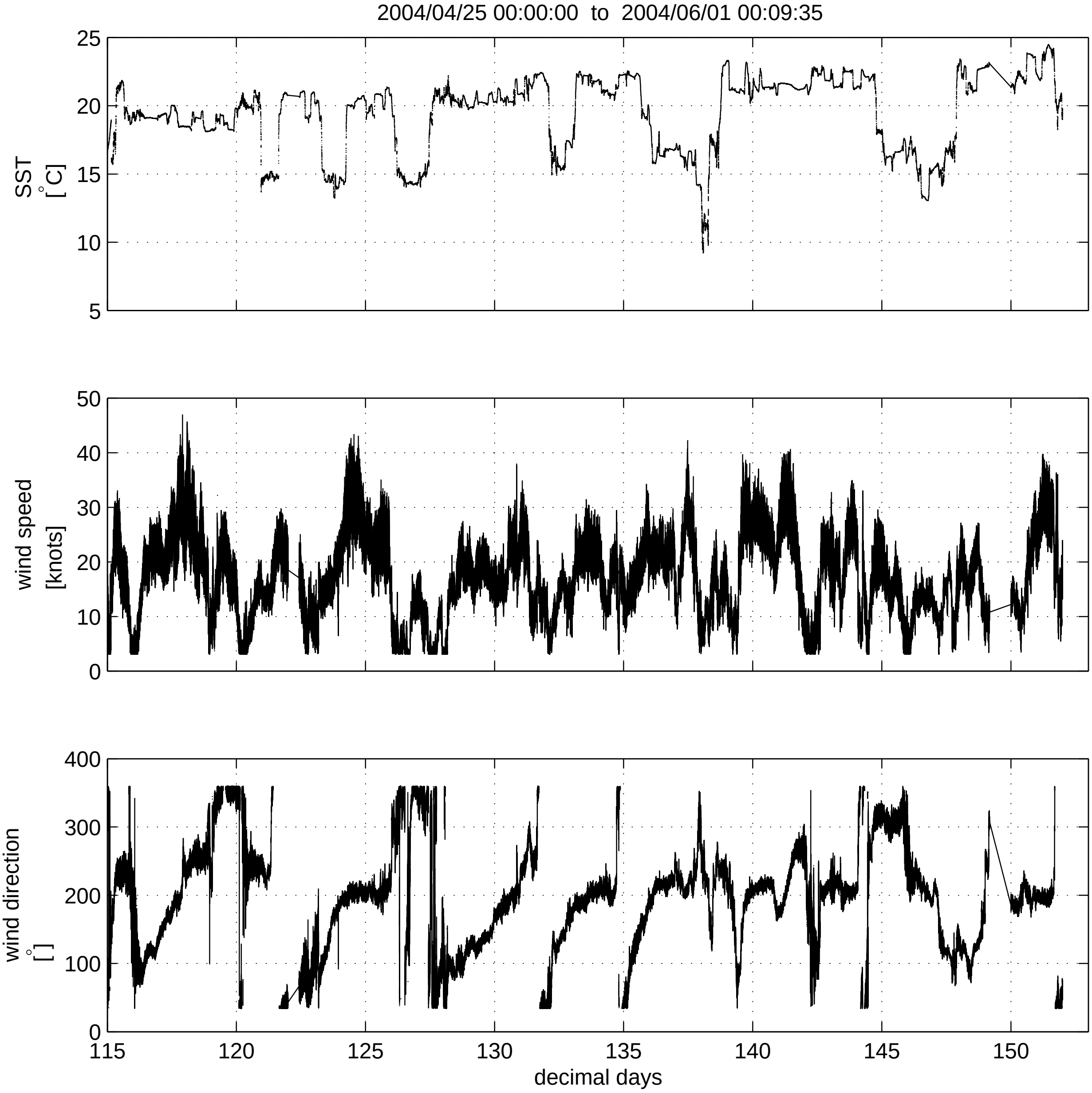


Figure 76: Meterological data taken by the R/V T.G. Thompson during the KESS deployment cruise

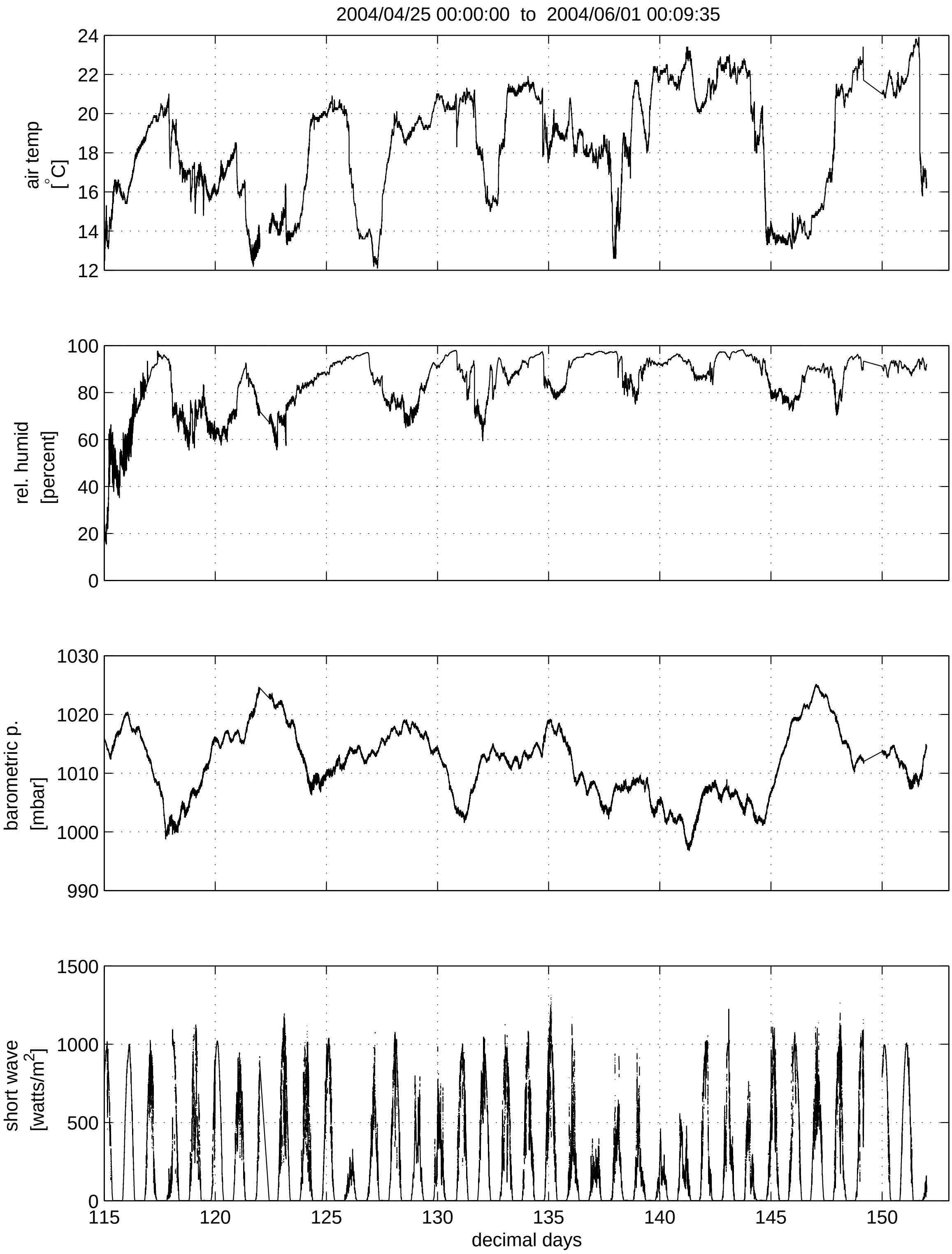


Figure 77: Meterological data taken by the R/V T.G. Thompson during the KESS deployment cruise

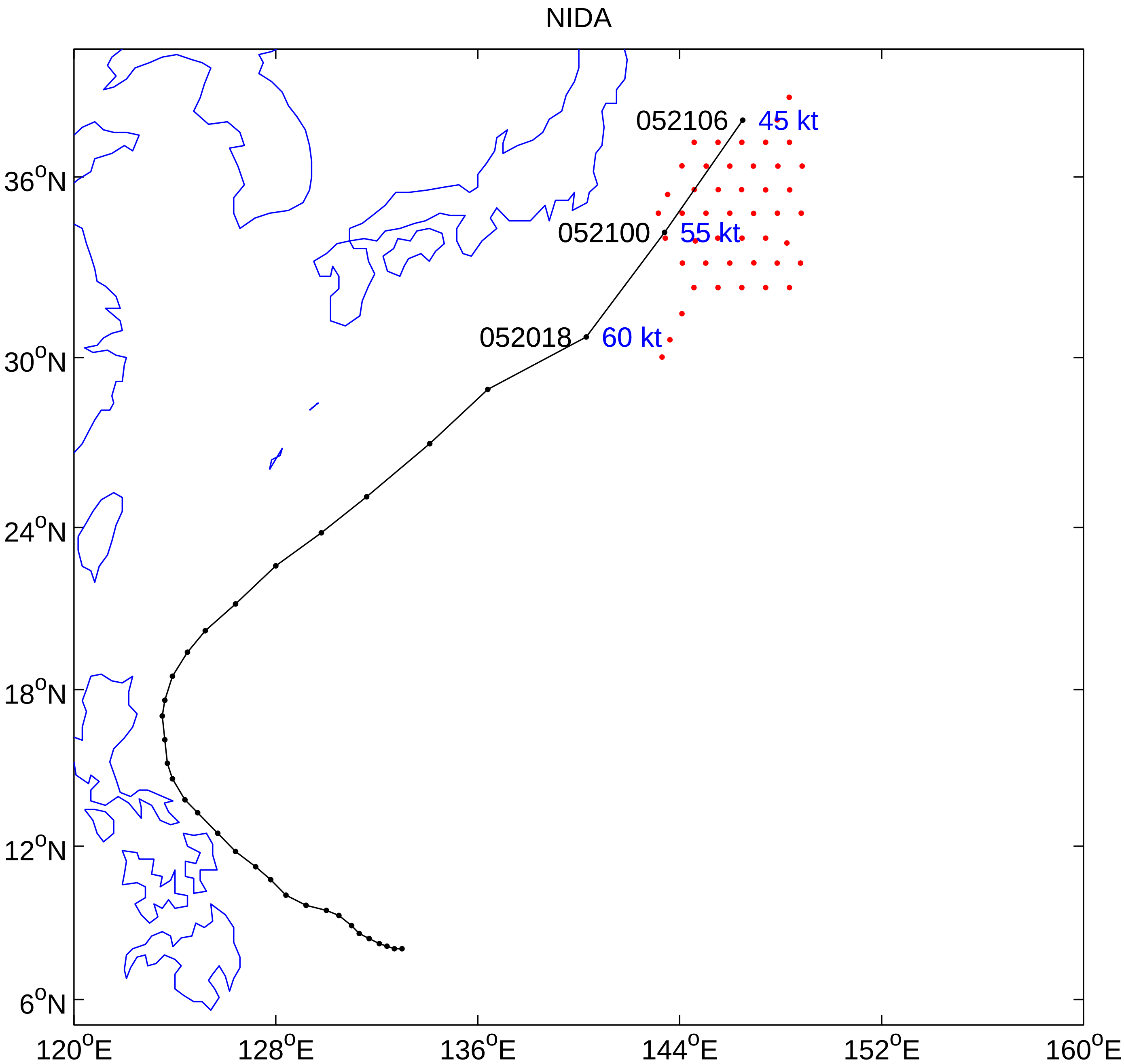


Figure 78: Super typhoon Nida storm track