Cruise Report

R/V *Thomas G. Thompson* Cruise TN246

15 January 2010 to 5 March 2010

Diapycnal and Isopycnal Mixing Experiment in the Southern Ocean

DIMES Cruise US2

Survey Cruise

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(Photo by K. Newell, U. Washington)

11 October 2012

Acknowledgements

Captain Phillip Smith succumbed to an illness a few days into this cruise. We express our sincere sympathy to his family and to the crew, many of whom had sailed with him for years. The tragedy was handled with both great competence and dignity by the crew. Arrangements for a ceremony of remembrance in Punta Arenas and return of Captain Smith's remains to his home were handled efficiently and sensitively by Daniel Schwartz and Marine Operations at the University of Washington, and by the Chilean authorities. First Mate John Wilson took over expertly as captain when the cruise resumed.

Marine Operations at the University of Washington were helpful and patient in preparing for the cruise. University of Washington technicians Robert Hagg, Patrick A'Hearn and Thomas Aaron Morello were very helpful during the cruise, as were all the members of the science party. Laurence Anderson, Valery Kosneyrev and Dennis McGillicuddy, all of Woods Hole Oceanographic Institution, helped with planning the cruise track by sending simulations of the tracer distribution based on velocities derived from AVISO satellite altimetry. Editorial assistance was provided by Marjorie Parmenter.

The Diapycnal and Isopycnal Mixing Experiment in the Southern Ocean (DIMES) is supported in the United States by the National Science Foundation, Division of Ocean Sciences, Physical Oceanography Program. The work represented in this cruise report was supported by NSF Grants OCE-0622825 (Ledwell and Duda, WHOI), OCE-0622630 (Toole, WHOI), OCE-0622629 (Owens and LaCasce, WHOI), OCE-0622670 (Speer, Lazarevich, and St. Laurent, FSU), OCE-0623177 (Girton, APL-UW), and OCE-0622740 (Gille, SIO).

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1. Introduction

James R. Ledwell

Note: See Appendix H for means of accessing the data for the various measurement programs, and contact information for the originators of the data from this cruise. The data themselves or links to them are at the U.S. DIMES website: http://dimes.ucsd.edu. Appendix A lists the science personnel on the cruise. Section 12.3 has been revised.

1.1 Objectives

The Diapycnal and Isopycnal Mixing Experiment in the Southern Ocean (DIMES) is a study of mixing in the Antarctic Circumpolar Current (ACC), and the dynamics driving that mixing. The objectives of the present cruise, TN246 on R/V *Thomas G. Thompson*, were to survey tracer that had been released a year earlier in 2009, to survey fine-structure and microstructure using free-falling profilers, to release a number of RAFOS floats to study isopycnal mixing, to deploy two sound sources to augment the array for the RAFOS float program, and to deploy EM-APEX floats and Shearmeters to measure fine-structure over long time periods. Fine-structure was also measured with CTD and Lowered ADCP and with XCTD and XBT probes. The target for about half of the floats and for the tracer release was the 27.9 kg/m^3 neutral density surface, located in the deeper region of the Upper Circumpolar Deep Water, one to two hundred meters below the oxygen minimum layer. This surface is at a depth of about 2000 m north of the Subantarctic Front (SAF) of the ACC, about 1500 m deep between the Subantarctic Front and the Polar Front (PF), shoals to less than 1000 m depth south of the Polar Front (Fig. 1.1.1), and blends with the mixed layer near Antarctica in winter. About half of the RAFOS floats were programmed to follow a shallower isopycnal surface at neutral density 27.3 kg/m^3.

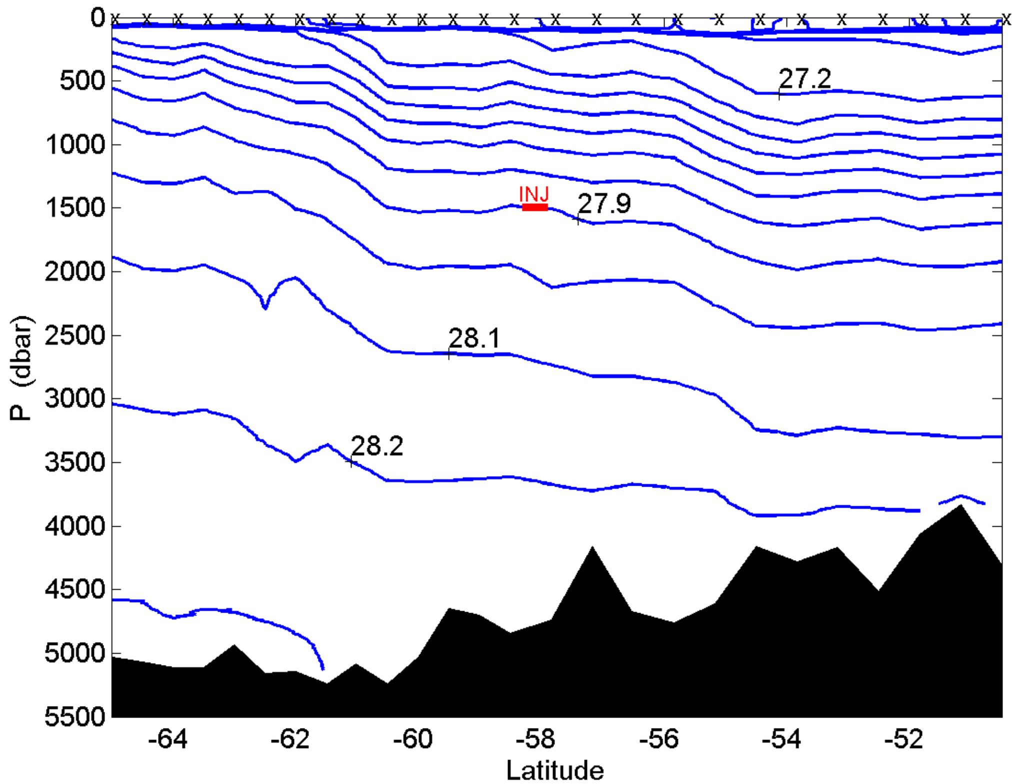

Fig. 1.1.1. Neutral density (minus 1000 kg/m³) from Section P18 at 105°W of the World Ocean Circulation Experiment (WOCE). The red bar marked "INJ" indicates the approximate location of the tracer release in the context of this section.

1.2 Cruise Track

Punta Arenas, Chile, was the start and end port of the cruise. The cruise was interrupted after deployment of the first sound source mooring by the death from an illness of Captain Philip Smith. We returned to Punta Arenas with his remains, and headed out again after a ceremony and coroner's report were completed. The total loss of time due to this tragedy was about 8 days. The activities along the ship track are explained in the caption of Fig. 1.2.1. An event log is in Appendix B.

Two sound sources were deployed early in the cruise to supplement the six that had been deployed in 2009. Figure 1.3.1 shows the cruise track and the locations of the sound sources deployed this year (2010). These two new sound sources did not function properly, however. Four SOLO floats deployed along the float line at 105°W were programmed to come to the surface every 10 days and relay data via System Argos. These floats are equipped with RAFOS receivers and should be able to be used to evaluate the functioning of the sound sources. SOLO launch positions and some other details on the floats are in Section 7.

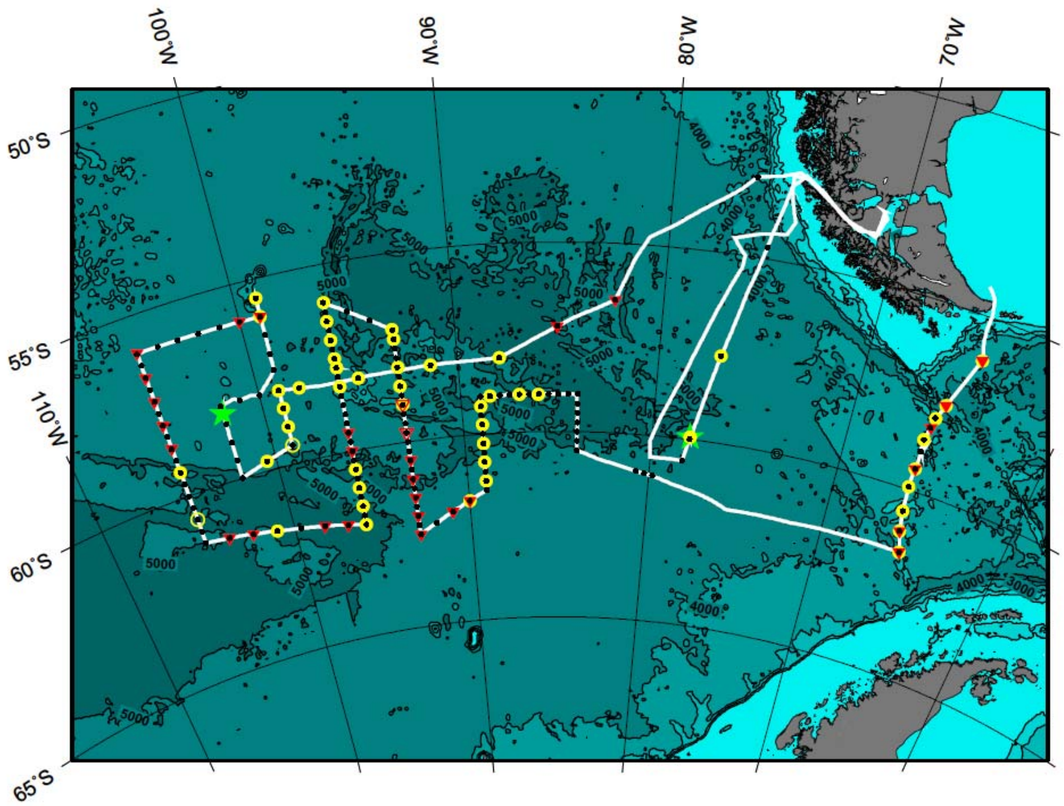

Fig. 1.2.1. Cruise track and stations. CTD/LADCP stations (black dots), HRP stations (yellow circles), and DMP stations (red triangles) occupied during Cruise TN246. The green stars mark the positions of two malfunctioning sound source moorings deployed during the cruise. Samples were taken for tracer at all but the Drake Passage CTD/LADCP stations. RAFOS Float launch locations are shown in Fig. 5.3.1.

1.3 Underway Measurements

Meteorological parameters, surface seawater parameters, navigation data, and bottom depth were recorded throughout most of the cruise. The quality of these data has not been extensively checked, but many of the sensors seemed to produce reasonable values. The air temperature sensor was not functioning for much of the cruise, however.

Both a narrow-band and a broad-band 75 kHz hull-mounted ADCP were running along most of the cruise track. Data from these instruments have been processed by Jules Hummon at the University of Hawaii. The results of her work are in files maintained at the DIMES website.

Data return from the 300-kHz Multibeam bathymetry system on board was poor for depths greater than 4000 m and at ship speeds greater than 8 knots or so. The ship was often traveling at speeds of over 11 knots and over depths greater than 4000 meters so that the multibeam bathymetry is only likely to be useful for those times when we were surveying a site for a mooring deployment or a microstructure profile near a seamount or ridge. The quality of the multibeam data has not been checked, but these data are available to the public at http://www.marine-geo.org/tools/search/entry.php?id=TN246. There is also a tool at that site that enables the viewer to zoom into the cruise track and look at the available bathymetry from the archive at high resolution.

All of the underway data are catalogued at the Rolling Deck to Repository (R2R) site http://www.rvdata.us, which will also act as a portal to these data at the national data centers once they are archived there. Daily files of underway data are also maintained at the DIMES website.

1.4 Altimetry

A satellite map of Absolute Dynamic Topography (ADT) shows several bands of relatively strong currents within the ACC, separated by weaker currents, eddies and still areas (Fig. 1.4.1).

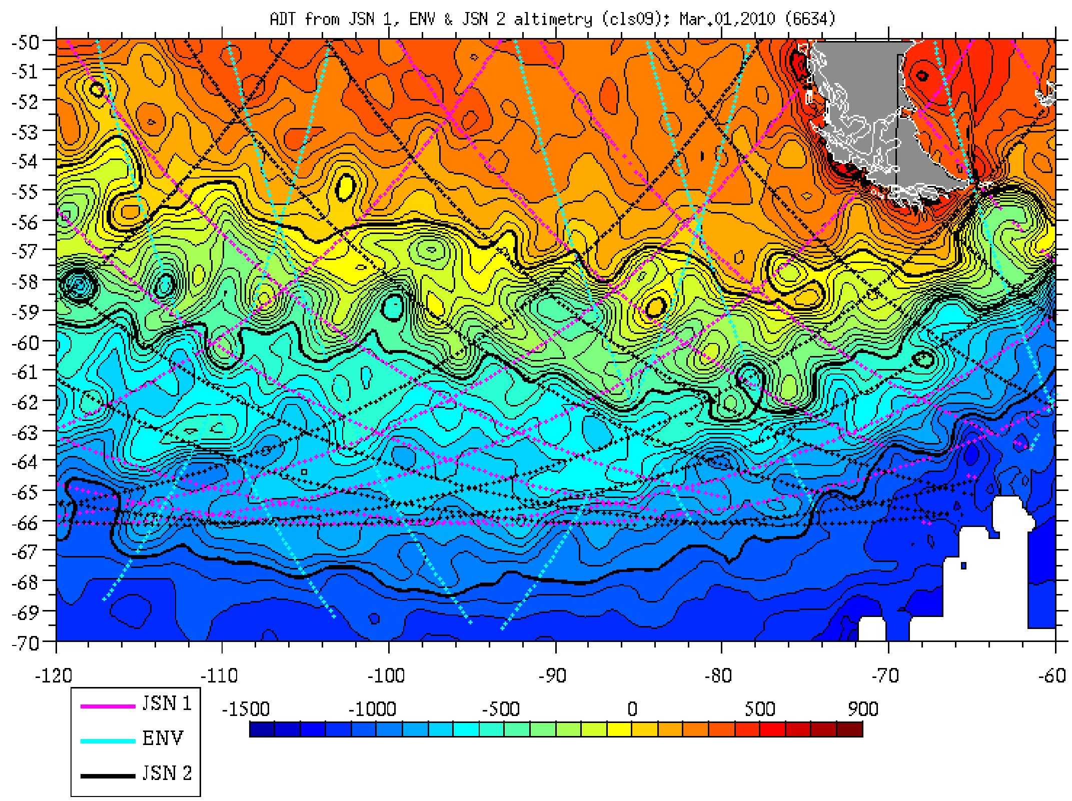

Fig. 1.4.1. Absolute Dynamic Topography (ADT) on 1 March 2009 based on AVISO (Archiving, Validation and Interpretation of Satellite Oceanographic Data, Collective Localisation Satellites; France) data. The color scale is in mm, and the contour interval is 50 mm, with bold contours at -1000, -500, and 0 mm, from south to north. The mean dynamic topography underlying this map is from CNES CLS09 [Rio et al.*, 2011]. The maps and data were provided from on shore during the cruise by Valery Kosnyrev at WHOI.*

The tracer was released in 2009 near an ADT of -225 mm in this reference frame, about midway between the bold 0 and -500 mm contours in Fig. 1.4.1. At the time, and at 106.7°W, the longitude of the release, this contour was at 58.2°S, i.e., about 60 miles north of where it is in Fig. 1.4.1. This contour was north of the Polar Front and south of the Subantarctic Front at the time of the tracer release, and that remains roughly true in 2010. However, there are several bifurcations and eddies in the altimetry field, and strong altimetry gradients do not always stay with the same ADT contours, so close examination will be required to identify front locations in the various transects made during the cruise.

1.5 CTD/LADCP/Rosette Stations

CTD/LADCP/Rosette stations were occupied all along the ship track to search for tracer, measure the hydrographic and shear structure, and to obtain temperature and conductivity calibration data for the various free-falling profilers (black dots in Fig. 1.2.1; a list of CTD casts is given in Appendix D). Early in the cruise, as *Thompson* headed to the mooring sites, station spacing was on the order of 100 miles. A forecast of bad weather led us to delay the deployment of the second mooring, allowing us to occupy a set of stations at 30-mile spacing in a box near 100°W (Fig. 1.2.1). After deployment of the mooring it was desirable to allow the sound source on the second mooring to come to full power over a period of 3 or 4 days before deploying floats. This led to us occupying a set of stations at 30-mile spacing to the north of this mooring, on an indirect course to the start of the RAFOS float deployment line at 105°W, 56°S to 61°40'S. Then, CTD stations were occupied every 40 miles along this line, with sets of 6 floats released every 20 miles. At the stations between CTD casts, 1800-meter XBTs were deployed to improve resolution of the location of the fronts.

The maximum depth of the CTD casts was usually 2000 meters, although several of the early casts went to 3000 meters, and a few casts, spread throughout the cruise, went to within 50 meters of the bottom for calibration of the sensors. HRP and DMP profiles often went to 3000 or 4000 meters, so that once their CTDs are calibrated, these profilers will give better depth coverage than the main CTD.

Samples were taken for tracer at all of the CTD stations, with the exception of those on the transect across Drake Passage near 65°W toward the end of the cruise. Evidence was strong that there was little or no tracer to sample as far east as those stations. No tracer had been found at stations east of 80°W, and various global ocean model simulations of the tracer patch (LANL/POP, SOSE, OCCAM, and the simple simulation based on ADT shown in Section 13) suggested that the eastern edge of the tracer patch would not have reached Drake Passage after only one year.

1.6 XBT/XCTD Profiles

Three types of expendable probes were used on the cruise: Type TF XBTs (Expendable Bathythermographs), which record temperature and depth to 1000 m depth; Type T5

XBTs, which record temperature and depth to 1800 m; and Type C3 XCTDs (Expendable CTDs) which record temperature and conductivity to 1100 m depth. Depths are nominal. Not all probes recorded to their full depth. The XBTs were used occasionally to supplement CTD transects in order to better locate ACC fronts, and also for sound speed profiles for the multibeam system. The XCTDs were organized by Sarah Gille of Scripps Institution of Oceanography (SIO) to attempt to obtain Thorpe scales from which Ozmidov scales, and therefore turbulent dissipation rates and ultimately diffusivity, can be estimated. The XBT/XCTD program is described in a little more detail in Section 10. The drops are listed in Appendix E.

1.7 Tracer Sampling

The tracer that had been released in early 2009 was sampled at all the CTD stations shown in Fig. 1.2.1 except those in the Drake Passage transect, east of 70°W. Early results from these measurements are presented in Section 2.

1.8 Fine- and Microstructure Sampling

Two instruments were used during the cruise to sample fine- and microstructure, the High Resolution Profiler (HRP) built by Woods Hole Oceanographic Institution (WHOI) and the Deep Microstructure Profiler (DMP) built by Rockland Scientific in British Columbia. Also, an Expendable Microstructure Profiler (XMP) from Rockland Scientific was tried out, with promising results. A total of 49 HRP deployments, 30 DMP deployments and 5 XMP drops were made during the cruise (Fig. 1.2.1). A link to the data from these instruments is at the DIMES website. A summary of results from the stations in the Pacific, i.e., excluding Drake Passage, is in Ledwell *et al.*, 2011. The microstructure program is described in Section 3.

1.9 Sound Source Moorings

The array of sound sources deployed in 2009 was augmented by two more sound sources, whose positions are shown in Fig. 1.2.1. These sound sources are described in Section 4. However, apparently no useful time delays were obtained from these two sources.

1.10 RAFOS Float Deployments

RAFOS floats were deployed along the CTD line at 105^{o}W, starting at 56°S, and every 20 n. miles south to 61°20’S. These floats will come to the surface two years after deployment, in early 2012. Two triplets of floats were deployed at each station. One triplet was programmed to settle on the $\gamma = 27.9$ kg/m^3 neutral density surface, on which the tracer was released. The other triplet was programmed to settle at $\gamma = 27.3$, about 800 m deep between the SAF and PF, but coming very shallow south of the PF. Many of the shallow floats returned to the surface shortly after deployment. It was discovered that they were programmed to release their weights at 2000 cbar rather than 2000 dbar due to a miscommunication between the manufacturer and the float group. The RAFOS program is described in detail in Section 5.

1.11 EM-APEX Floats

Six EM-APEX (Electro-Magnetic Autonomous Profiling Explorer) Floats were released along the cruise track. These floats are equipped with electromagnetic current meters and CTDs. They cycle between the surface and 2000 dbar every 3 days, obtaining shear profiles. Between profiles they rest at 1500 dbar for 2 days. Their data are transmitted by the Iridium system every time they come to the surface. Details on the deployment of the EM-APEX floats are in Section 8.

1.12 Shearmeter Floats

Four Shearmeters designed by Tim Duda (WHOI) were brought on the cruise. One of these produced data for about 10 days as a test, but could not be recovered due to heavy weather. The other deployments did not return data for various reasons. One Shearmeter was not deployed due to a malfunction and was brought back to WHOI. The other two Shearmeters were deployed but did not return data. Details are in Section 6.

2. Tracer Observations

James R. Ledwell

2.1 Lateral Tracer Distribution

Samples were taken for tracer at all the CTD stations except for those in Drake Passage. Tracer profiles were obtained from the CTD/Rosette by tripping approximately 20 of the Niskin bottles at depth intervals of 15 meters, centered near the potential density surface of the tracer release. A variety of shapes and amplitudes of tracer profiles was obtained; the profiles are shown both as a function of depth and of potential density at the DIMES website.

Figure 2.1.1 shows the column integral of tracer at each station west of 75°W. Virtually no tracer was found east of 80°W. However, a fairly large column integral of 1.16 nmol/m^2 was found near 57°S, 85°W. The highest levels of tracer by far were found along the northern edge of the survey, with 3.46 nmol/m^2 (see red dot in the figure near 56.5°S, 94.5°W). These stations show that the tracer patch was not delimited to the north. On the other hand, virtually no tracer was found along the western edge at 105°W, and very little along the southern edge of the survey, so the patch seems to have been delimited in the east, south and west.

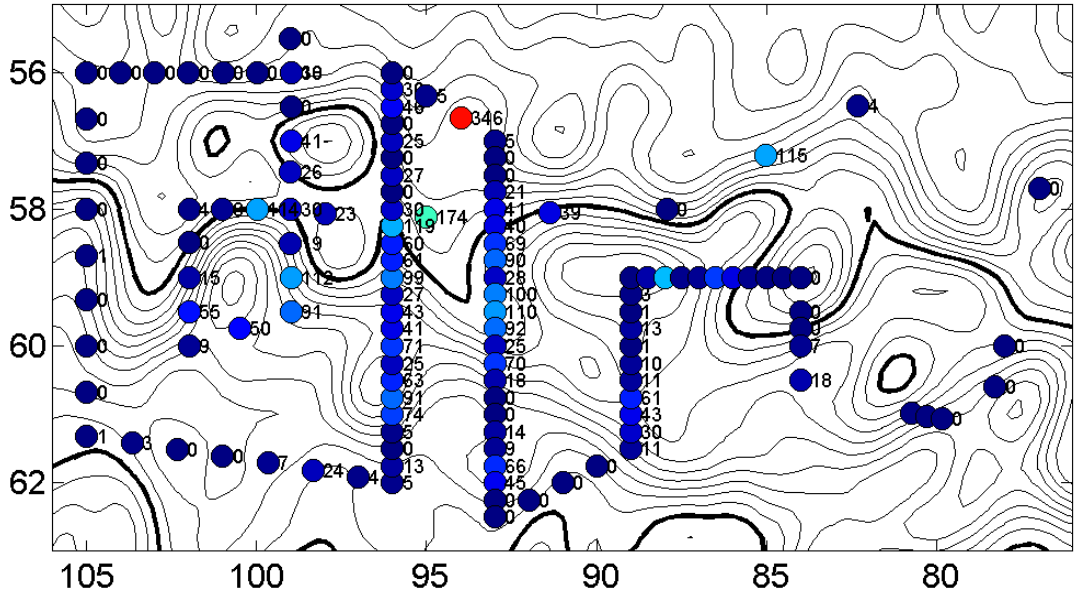

Fig. 2.1.1. Tracer survey. The numbers to the right of the stations give the column integral of tracer in units of 10^{-11} mol/m^2. The color indicates qualitatively how much tracer was found. Sea surface height is contoured at intervals of 5 cm.

The lateral tracer distribution was extremely heterogeneous within the overall tracer patch. Fig. 2.1.2 shows transects of the column integral measured along 96°W and 93°W where the coverage is best. Fifteen nautical mile station spacing does not appear to resolve the tracer streaks, at least in many cases.

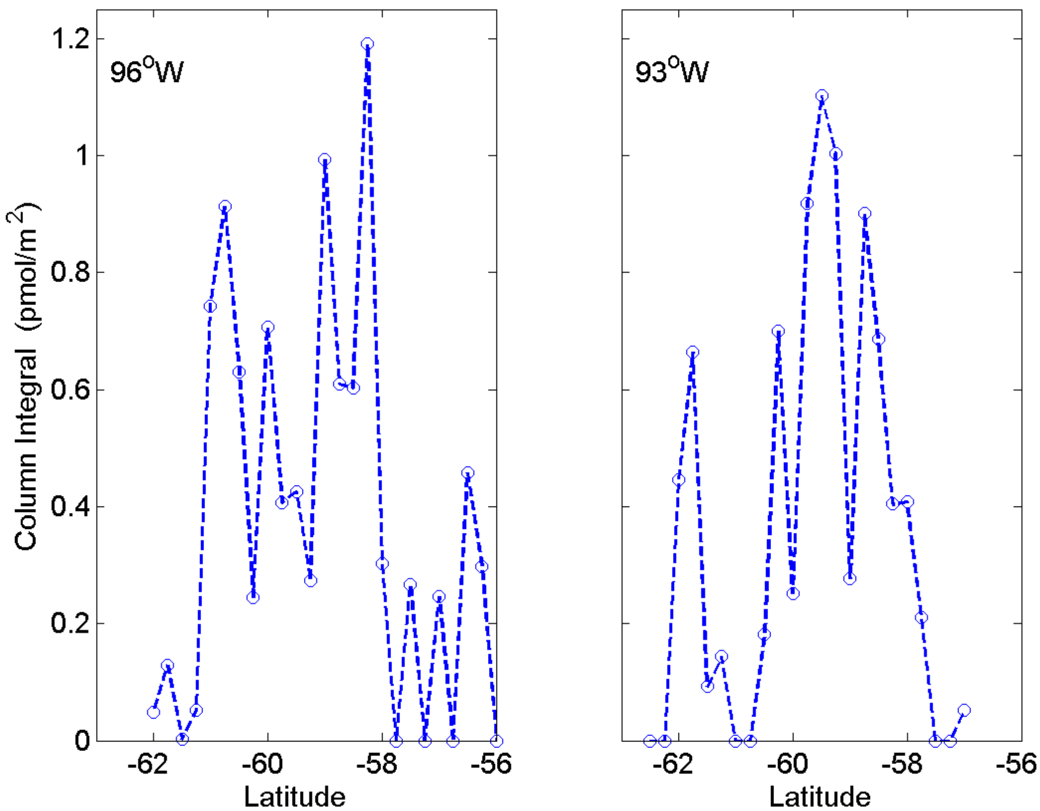

Fig. 2.1.2. Transects of the column integral of tracer along 96°W and along 93°W.

Despite the low spatial correlation, a smoothed contour map of the tracer can be made with objective analysis by invoking an artificially large length scale for the spatial covariance of the field (Fig. 2.1.3). The amount of tracer within the dashed error boundary in this figure is about 65% of the amount released. It is not clear whether the missing tracer is to the north of the surveyed region or in tracer-rich streaks lying between the stations and thus escaping detection.

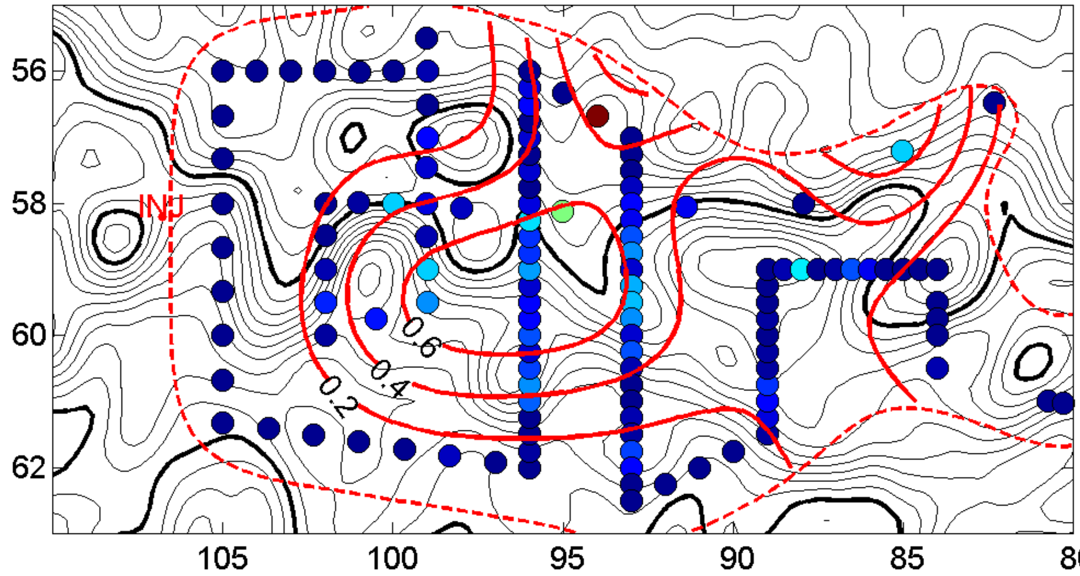

Fig. 2.1.3. A highly smoothed contour map of the tracer (red curves with contour interval of 0.2 nmol/m^2. The red dashed curve is an error boundary. The colored dots and black contours are as in Fig. 2.1.1.

2.2 Average Tracer Profile

The distribution of tracer in density space was estimated by interpolating each profile to a uniform potential density grid, and then averaging over all the profiles (Fig. 2.2.1). At the same time a plot of the average depth as a function of density may be made (Fig. 2.2.2). Using this relation between density and mean depth we can transform the mean tracer profile into depth coordinates (Fig. 2.2.3).

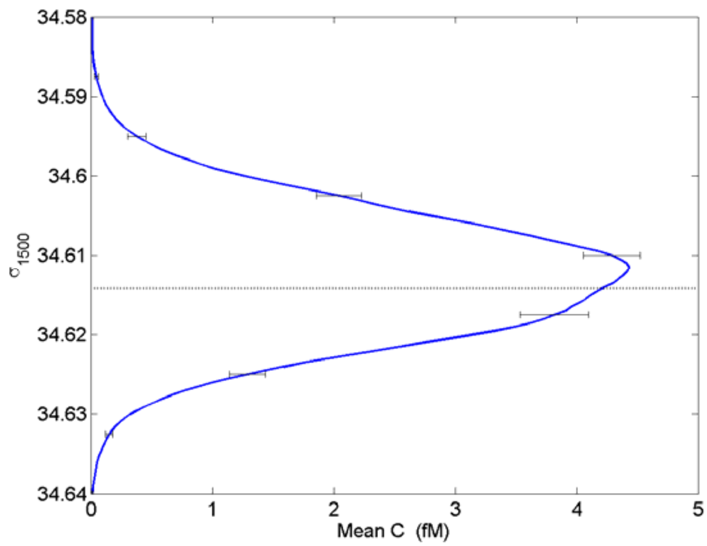

Fig. 2.2.1. Mean tracer concentration versus potential density for all 67 profiles with measurable tracer.

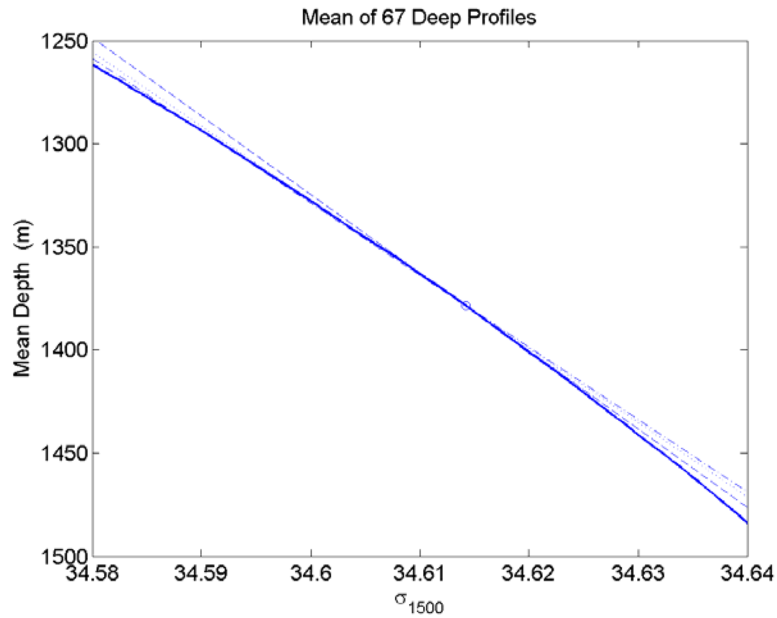

Fig. 2.2.2. Mean depth versus potential density for the 67 profiles with tracer.

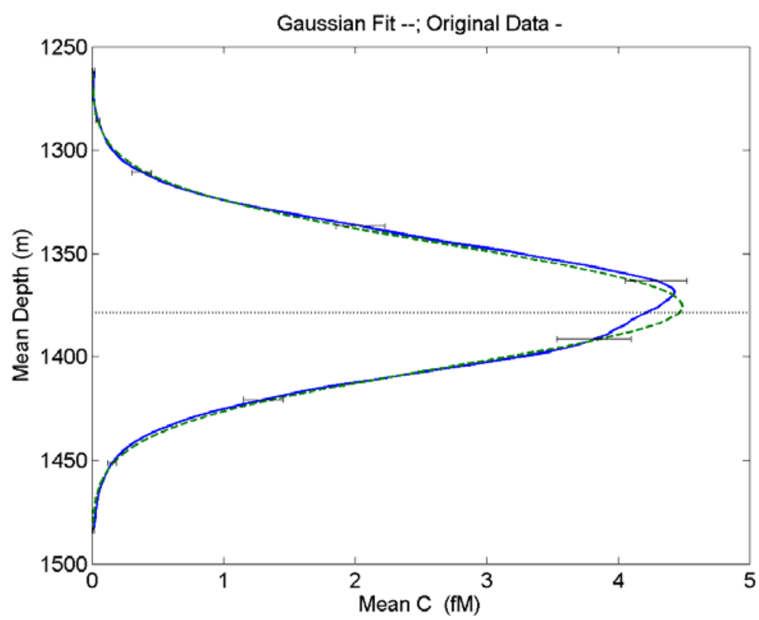

Fig. 2.2.3. Distribution of tracer with depth, using data from the two preceding figures (solid curve). The error bars envelop the range of shapes of the individual tracer profiles in a 1-standard deviation sense. The dotted line is at the estimated target for the release. The dashed curve is a Gaussian function which best fits the observations, in a least squares sense.

2.3 Estimate of the Diapycnal Diffusivity

A preliminary estimate can be made of the diapycnal diffusivity k_z which brings the initial profile obtained in February 2009 to this mean profile a little over a year later by fitting a Gaussian curve (Fig. 2.2.3). The formula is simply:

$$k_z = 1/2(\sigma_2^2 - \sigma_1^2)/(t_2 - t_1)$$

where $\sigma_{1,2}$ are the standard deviations of Gaussian fits to the initial and final profiles, and $t_{1,2}$ are the initial and final times of the surveys. We use a tracer-weighted average time for t_1 and t_2. The resulting estimate is:

$$k_z = 1.3 \times 10^{-5} \text{ m}^2/\text{s}$$

A more elaborate 1-D advection diffusion model has also been run to estimate k_z, with essentially the same result (see Ledwell *et al*., 2011).

3. Fine- and Microstructure Programs

Louis St. Laurent, John M. Toole, Richard Krishfield, and Ken Decoteau

3.1 Introduction

The fine-structure and microstructure contributions to DIMES were designed to complement the diapynal tracer dispersion program. Whereas surveys documenting the evolution of the tracer distribution in depth/density yield very accurate estimates of the time-averaged effects of turbulent mixing acting on the tracer (and the ocean stratification), the tracer observations have limited temporal resolution (effectively one time-averaged diffusivity estimate for the period between each pair of survey cruises) and provide no information about the physical mechanisms supporting the mixing. During the US2 cruise, several instruments were deployed to sample the ocean fine-structure and microstructure characteristics including the High Resolution Profiler (HRP), the Deep Microstructure Profiler (DMP), a Lowered Acoustic Doppler Current Profiler (LADCP) mounted on the CTD frame, Expendable Microstructure Profilers (XMP), EM-Apex floats, and Shearmeter floats. The HRP, DMP and XMP microstructure data collected during the tracer survey yield estimates of the diapycnal diffusivity profile with depth for the cruise period that may be compared (at one depth horizon) to the time-averaged diffusivity estimate given by the tracer data. The HRP and LADCP additionally provide observations of the fine-scale velocity field, motions believed to provide the energy that drives the turbulent mixing. The EM-APEX floats also sample fine-scale velocity variations. Although they operate over more limited depth span than do the HRP and LADCP, the floats should return data throughout their design lifetimes of 1 year or longer.

3.2 High Resolution Profiler-II and Deep Microstructure Profiler

DIMES represented the first science application of HRP-II, an instrument designed and built nearly 10 years ago at the Woods Hole Oceanographic Institution to replace the HRP that was used with great success in the 1980s and 1990s. HRP-II is a cylindrical, untethered instrument that when deployed, sinks to a pre-programmed depth making fine- and microstructure observations. At a specified depth, HRP-II drops expendable ballast weights and returns to the surface for recovery and data download.

HRP-II is equipped with a CTD (sampling fine-scale conductivity, temperature and pressure), a 4-path acoustic travel time current meter, an electric field current meter and 3-axis fluxgate compass, accelerometers, and velocity, temperature and conductivity microstructure sensors.

A profiler deployment carriage (originally designed for the HRP, but easily adapted to work with the DMP as well) was installed on rails mounted to the ship's deck that ran between the hangar and a hydraulic lifting rig mounted at the stern (Figs. 3.2.1 and 3.2.2). For deployment, the lifting rig tilts the carriage up past vertical and a winch-controlled line is used to lower the Profiler into the water (Fig. 3.2.3).

Fig. 3.2.1. The HRP-II (right) mounted in the deployment carriage inside the R/V Thompson *hangar and the DMP (left) in its storage cradle.*

Fig. 3.2.2. Looking aft at the Profiler rail system and lifting rig.

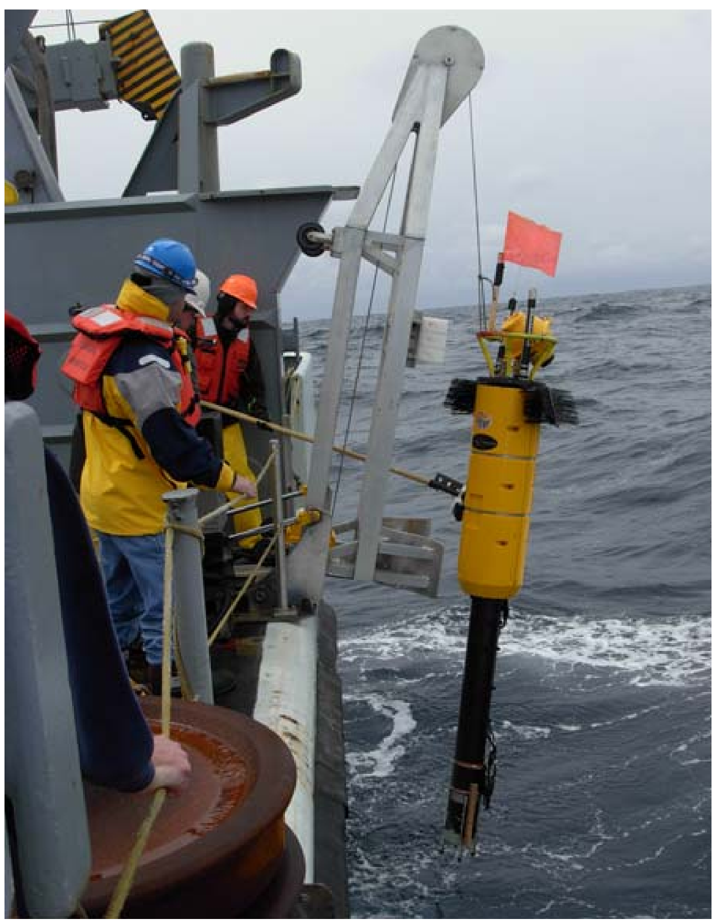

Fig. 3.2.3. The lifting rig and carriage being used for a test lowering of the DMP.

During a dive, the HRP and DMP sink at 30–40 m/min while sending out periodic 12 kHz pings that were followed on R/V *Thompson's* echosounder system. After dropping ballast, both instruments rise to the surface where a radio direction finder and strobe light direct the ship for approach and recovery.

Once located on the surface, the *Thompson* was brought close alongside the Profiler and a light tag line was attached to control the instrument. Then, the main lifting line was hooked on and the instrument was guided aft for lifting back on deck. Significant skill was required to maneuver the *Thompson* sufficiently close to allow the tag and lifting lines to be attached without damaging the Profilers (Fig. 3.2.4).

The ship maneuvering and pole work skills refined during Profiler recovery operations proved valuable mid-cruise when the opportunity presented itself to sample the remains of an iceberg (Fig. 3.2.5).





Fig. 3.2.4. Attaching tag lines to HRP for recovery, guiding HRP aft, lifting back aboard, and returning it to the hangar for data offload.

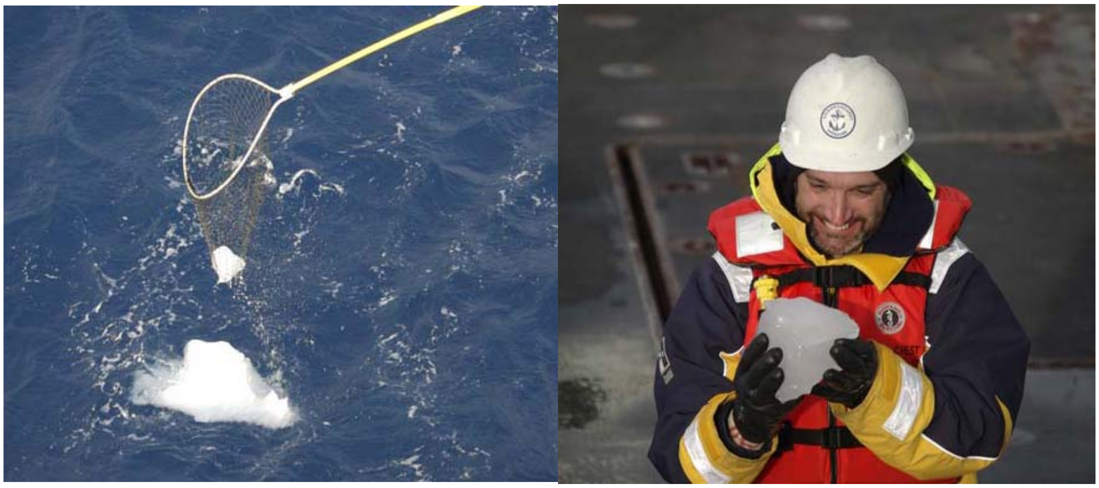

Fig. 3.2.5. Sampling a bergy-bit.

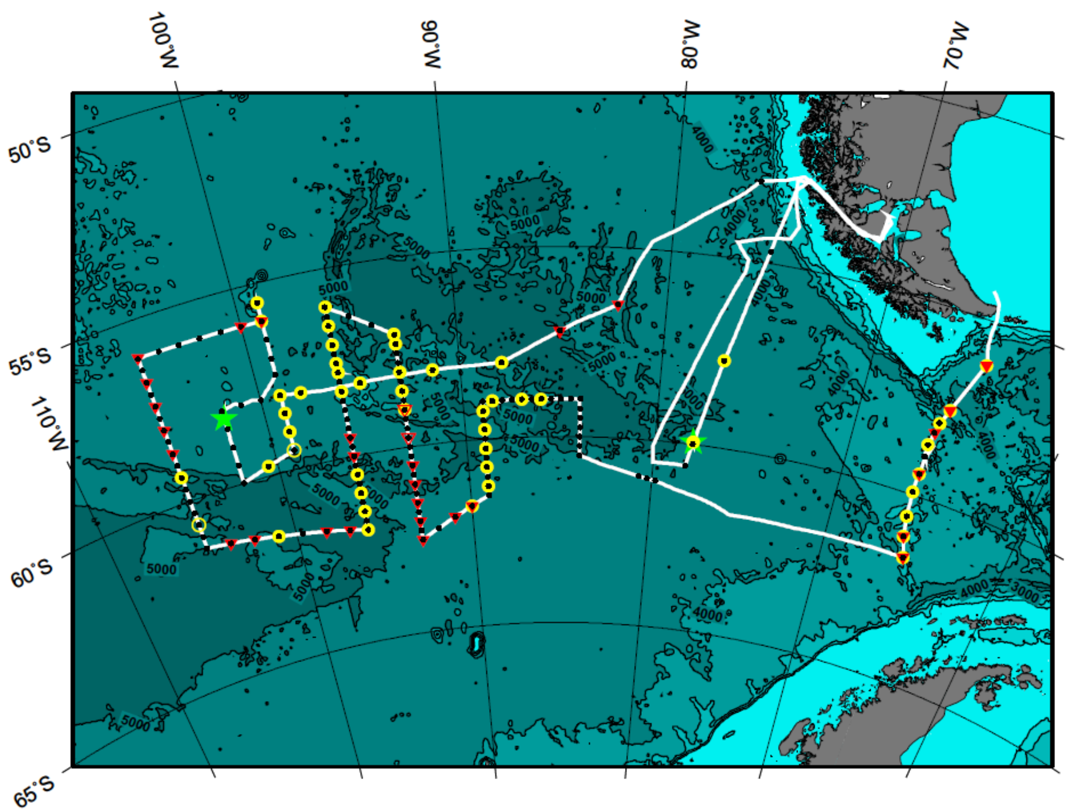

Fig. 3.2.6. CTD (black dots), HRP (yellow circles), and DMP stations (red triangles) occupied during cruise TN246. The green stars mark the positions of the two moorings that were also deployed during the cruise.

HRP-II logs data internally during a dive; those files are offloaded to ship-based support computers after recovery. A multi-step processing system was developed during cruise TN246 that yielded engineering quality control plots as well as preliminary temperature, salinity, velocity and turbulent dissipation rate profiles, within minutes of an HRP recovery.

A total of 49 HRP deployments, 30 DMP deployments and 5 XMP drops were made during the 2010 US2 cruise TN246 (Fig. 3.2.6. and Table 3.2.1).

Table 3.2.1 HRP Stations

Table 3.2.1. DIMES 2010 US2 TN246: HRP Stations										
HRP #	**Deploy time (UTC)**	**Lat. °S**	**Long. °W**	**Water depth (m)**	**Max. pres. (dbar)**	**Recov. time (UTC)**	**Lat. °S**	**Long. °W**	**CTD #**	**Notes**
1	1/17 16:48	57 42.045	76 57.692	4940	1002	1/17 17:38	57 42.3924	76 57.6843	2	
2	1/18 17:17	59 56.15	78 00.26	4946	2001	1/18 18:58	59 55.88	78 00.69	3	2nd try to deploy near first moorin g site
3	1/28 10:28	58 00.0	87 55.81	5201	2002	1/28 12:29	58 00.03	87 53.29	8	
4	1/28 22:35	58 02.978	91 22.23	4262	3001	1/29 00:59	58 02.7815	91 21.0489	9	
5	1/29 11:15	58 07.2	95 00.9	4323	3002	1/29 13:30	58 07.2	95 00.6	10	
6	1/29 22:25	58 04.129	97 59.299	4825	3002	1/30 00:42	58 04.301	97 59.632	11	HRP before CTD
7	1/30 03:52	58 00.11	99 00.18	4322	3002	1/30 06:18	58 00.2	99 00.5	12	
8	1/30 08:59	58 27.87	98 59.60	4786	3002	1/30 11:45	58 30.52	98 58.37	13	Bale broken on recover y
9	1/30 14:36	59 00.04	98 59.57	4840	3002	1/30 17:03	59 00.512	98 57.841	14	Bale jury rigged
10	1/30 20:10	59 29.988	98 59.810	4654	~2500	1/30 22:21	59 30.095	99 00.059	15	NO DATA - Releas ed due to low battery
11	1/31 02:51	59 44.88	100 29.60	4900	3002	1/31 05:21	59 45.09	100 30.38	16	
12	2/03 08:19	56 00.02	98 59.97	4750	3864	2/03 11:16	56 00.09	98 59.64	27	Releas ed due to time becaus e of winch trouble s on deploy ment
13	2/03 14:08	55 29.98	99 00.16	3901	3701	2/03 16:42	55 29.791	99 00.324	28	Winch better,

										but not best; big hook forward of crane
14	2/06 19:46	59 20.1676	104 59.6083	4850	4000	2/06 22:26	59 20.859	104 59.524	45	Rough recovery
15	2/07 09:18	60 40.12	104 59.86	5225	4000?					NO DATA - HRP program locked up after release
16	2/08 10:07	61 37.00	101 00.27	5005	4001	2/08 13:06	61 36.98	101 00.01	54	
17	2/09 09:04	62 00.00	95 59.98	5022	4002	2/09 12:06	61 59.77	96 00.43	58	
18	2/09 16:44	61 30.04	95 59.99	4986	4001	2/09 19:42	61 29.805	95 59.61	60	Analog sensors stopped on down profile; ok on up
19	2/10 04:08	60 59.95	95 59.97	4990	4002	2/10 07:10	60 59.28	95 59.06	62	
20	2/10 11:47	60 29.91	96 00.16	4902	4002	2/10 14:51	60 29.2	95 59.9	64	Analog sensors stopped 3 s into down profile; ok on
21	2/11 21:51	58 15.02	96 00.05	4656	4003	2/12 00:45	58 15.19	96 00.16	73	no pinger
22	2/12 06:17	57 45.07	95 59.91	4943	4001	2/12 06:20	57 45.29	95 59.02	75	no pinger
23	2/12 14:39	57 30.23	95 59.75	4740	4002	2/12 17:39	57 30.19	95 59.62	76	After aborted shearmeter search; no pinger
24	2/12 22:34	56 59.992	95 59.993	5116	4002	2/13 01:35	57 00.16	95 59.86	78	Had to reboot HRP CPU before dive – program hung
25	2/13 06:14	56 30.10	95 59.94	5215	4002	2/13 09:59	56 30.81	95 59.65	80	Fog

26	2/13 14:44	56 00.11	95 59.94	4590	4001	2/13 17:41	56 00.526	95 58.963	82	
27	2/14 06:53	56 59.95	93 00.05	4880	4002	2/14 09:46	57 00.50	93 00.17	85	
28	2/14 13:53	57 14.64	92 59.99	4895	4002	2/14 16:59	57 15.318	93 00.498	86	w/ XMP #1
29	2/15 00:47	58 00.077	93 00.01	5439	4003	2/15 03:47	58 00.138	92 59.634	89	
30	2/15 08:25	58 30.01	92 59.94	4490	4002	2/15 11:19	58 30.27	92 59.30	91	
31	2/15 16:04	59 00.138	93 00.162	4172	4002	2/15 19:07	58 59.718	93 00.558	93	w/ DMP
32	2/18 12:40	61 44.98	89 59.87	4498	4002	2/18 15:31	61 44.90	89 59.12	110	w/ DMP
33	2/18 21:30	61 14.996	88 59.987	4875	4000	2/19 00:25	61 15.194	88 59.266	112	Upcast terminated on time; operator error in setup
34	2/19 05:02	60 45.00	89 00.02	4535	4002	2/19 08:00	60 44.63	88 59.80	114	EF off for engineering test
35	2/19 12:20	60 15.13	89 00.03	5044	4002	2/19 15:16	60 15.13	89 00.66	116	Poor spinner
36	2/19 19:44	59 44.983	89 00.007	4570	4002	2/19 22:36	59 45.102	88 59.766	118	
37	2/20 03:19	59 15.20	88 59.93	5077	4002	2/20 06:09	59 15.11	89 00.10	120	
38	2/20 10:50	58 59.93	88 29.89	4802	4003	2/20 13:46	58 59.70	88 29.64	122	
39	2/20 22:10	59 00.016	87 00.099	5218	4002	2/21 01:16	59 01.398	86 59.958	125	
40	2/21 05:49	59 00.05	86 00.34	4851	4003	2/21 09:07	59 00.48	86 00.32	127	
41	2/26 07:52	61 39.839	65 25.992	1842	1793	2/26 09:49	61 39.588	65 24.824	141	w/ DMP 25
42	2/26 16:33	61 07.53	65 47.44	3674	3692	2/26 19:37	61 44.532	65 45.222	142	w/ DMP 26
43	2/27 00:55	60 34.996	65 58.501	1250	1203	2/27 02:20	60 34.428	65 58.800	143	no DMP - too short & windy
44	2/27 08:54	59 55.18	66 05.32	3910	3601	2/27 11:30	59 55.04	66 04.72	144	no DMP
45	2/27 16:21	59 25.021	66 05.234	3500	3252	2/27 18:53	59 25.242	66 04.698	145	w/ DMP 27
46	3/01 09:33	58 36.504	66 08.132	3740	3702	3/01 12:24	58 36.25	66 07.69	147	no DMP
47	3/01 21:55	57 58.604	65 56.009	2498	2438	3/02 00:24	57 57.750	65 53.562	149	no DMP
48	3/02 04:13	57 33.8117	65 38.9530	3132	3150	3/02 06:40	57 33.08	65 38.11	No	w/ DMP 29
49										

3.3 HRP-II Performance

Typical of a new instrument, the HRP-II experienced several technical irregularities during the cruise. Nevertheless, the majority of deployment attempts of the HRP yielded good fine-structure and microstructure data. Overall, the cruise work returned a total of approximately 160 km of profile data from 50 instrument deployments. The most significant shortcoming was the temperature microstructure observations; most of the FP07 thermistors brought on the cruise were defective and yielded no usable data. Those that did work initially did not survive through multiple deployments. However, one (and often two) micro-conductivity series were acquired on each profile, and, at depths where there was a reasonable temperature-conductivity relationship, sensible-looking temperature dissipation rate estimates were obtained. Beyond the interesting science that will emerge from the acquired HRP data, the cruise produced an extensive list of modifications and improvements to HRP-II that will need to be addressed before the next use of the instrument.

3.4 Deep Microstructure Profiler (DMP)

The DMP instrument was built by R. G. Lueck Consulting for Florida State University in 2004 for the Co-PI's (St. Laurent) Office of Naval Research supported projects. Since that time, the DMP has been used in several NSF sponsored projects and the instrument moved with the Co-PI to WHOI. The DMP measures the same CTD and microstructure parameters as the HRP using similar sensor hardware (details differ), but lacks the fine-structure velocity sensors of the HRP. Like the HRP, the DMP uses a 3-axis compass and a 3-axis accelerometer motion package for use in evaluating the flight properties. While both instruments use a programmable weight release, the implementations are quite different, though we will not discuss this here. The DMP instrument is now produced by Rockland Scientific (by RGL Consulting) as the VMP-6000. Details of the instrument are described at http://www.rocklandscientific.com. Two DMP units were operated during the survey; unit 010 "Vader" during the first half, and unit 008 "Vito" during the latter half. These units are essentially identical (010 has a turbidity sensor that 008 does not, although this was inconsequential for the current study). Both units performed well, and required only regular maintenance for attrition of connectors, seals and microstructure probes.

The DMP was operated in a fashion very similar to the HRP. The deployment and recovery operations are described above. Programming is done through a terminal login, using script files running in the XLinux environment. Data from the DMP are downloaded via a 100baseT connection to a laptop. The system's lead-acid battery can be recharged via a cable connection between dives. Like the HRP, the DMP was routinely used to make profiles to depths as great as 4000 m.

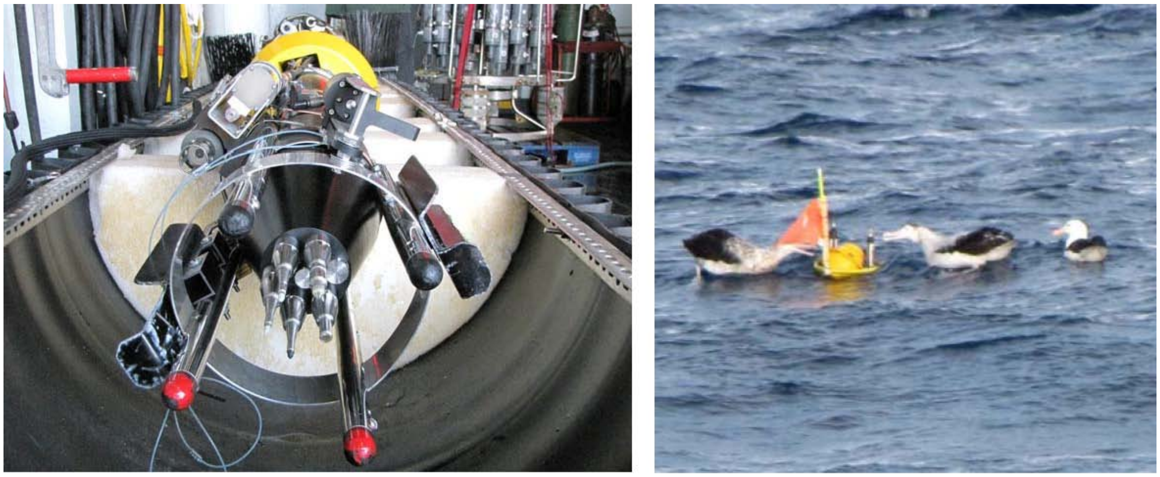

Fig. 3.4.1. Left: DMP nose, guard assembly, weight release system, and sensor array. All microstructure sensors are mounted in a circular arrangement on the nose. Four struts protrude forward as a protective frame. The Seabird temperature and conductivity cells were mounted along the neck of the profiler, just above the pressure port (not visible). The weight release mechanism is also shown, as are the weight trays, and the nylon cord that is used to secure the payload. Right: Bail assembly of the DMP after its return to the sea surface. The Benthos pinger, strobe, and radio beacon are visible. The local albatross flock showed their hospitality.

3.5 Preliminary Science Results from the DMP

Information on the thirty DMP dives during the cruise is listed in Table 5.3.1. The basic story of our survey can be summarized by two statements. I. Turbulence levels in the tracer cloud, well west of Drake Passage, were comparable to the "weak" mixing environment typically associated with the mid-latitude thermocline, $k_\rho = O(10^{-5}\ m^2/s)$. The intensity of the fine-scale shears sampled in this region was consistent with the Garrett-Munk background level. II. Turbulence levels along Phoenix Ridge in Drake Passage showed considerable increase with depth, ranging from $k_\rho = O(10^{-5}\ m^2/s)$ in the upper 500 m to $k_\rho = O(10^{-3}\ m^2/s)$ in the lower half of the water column. In Drake Passage, significant deep-reaching horizontal flows incident on rough bathymetric features are believed responsible for the enhanced fine-scale shear variance there (several times the GM level) that is believed to support the significantly elevated turbulent dissipation rates.

Table 3.5.1. DMP Dive Record

DMP	Dive Record			TN246					
Date:		20100303					Total(km)	86,865	
Dive	CTD Sta	Date(GMT)	Time(GMT)	Lat	Lon	Pressure	T_max	Case	
1	6	20100127	0980	-56.4822	-82.2972	965	1800	SN010	CTD failed; Cable pin
2	7	20100127	2199	-57.2098	-85.0301	2002	3042	SN010	CTD press-fitted with
3	29	20100203	2120	-55.9969	-98.9993	2002	3042	SN010	M370 toast. M371 rat
4	30	20100205	0256	-56.0028	-99.9986	2417	4384	SN010	Early release. Mag re
5	35	20100205	0954	-55.9833	-104.9928	3023	4384	SN010	
6	37	20100205	1687	-56.6667	-105.0000	3023	4384	SN010	New extended weight
7	39	20100206	2296	-57.3333	-105.0000	3023	4384	SN010	Shear issue with char
8	41	20100206	0458	-57.9997	-105.0043	3023	4384	SN010	Investigating shear ch
9	43	20100206	1354	-58.6658	-105.0000	3023	4384	SN010	
10	52	20100207	2174	-61.4167	-104.9968	3023	4384	SN010	M372 bad. Swapped
11	53	20100207	0475	-61.5167	-102.3333	3023	4384	SN010	
12	56	20100208	2197	-61.8167	-98.3333	3023	4384	SN010	Had to kickstart batte
13	67	20100208	0389	61.9167	97.0000	3023	4384	SN010	
14	66	20100210	2098	-60.0000	-96.0000	3023	4384	SN008	Bail broke during reco
15	68	20100211	0365	-59.5000	-96.0000	3023	4274	SN008	M470 DOA. Using do
16	93	20100215	1740	-59.0000	-93.0000	4000	5535	SN008	Both shears new. Bot
17	96	20100215	0466	-59.7495	-92.9995	3023	4274	SN008	Nose flooded. BAD b
18	99	20100216	1496	-60.4982	-92.9978	3023	4274	SN008	T1 and SH2 trashed.
19	101	20100216	2206	-61.0000	-93.0000	3023	4274	SN080	Sh1 Marginal, T1 iffy,
20	103	20100217	0358	-61.4988	-93.0020	3023	4274	SN080	
21	105	20100217	1013	-61.9997	-92.9978	4050	5598	SN080	
22	107	20100217	2051	-62.5015	-92.9998	4050	5598	SN080	
23	109	20100218	0618	-62.0007	-91.0003	4050	5598	SN080	
24	110	20100218	1203	-61.7497	-90.0002	4050	5598	SN080	
25	141	20100226	0837	-61.6640	-63.4339	1785	2664	SN080	HRP 41. muC is shot.
26	142	20100226	1616	-61.1247	-65.7913	3690	5135	SN080	HRP 42 Double P. Sta
27	145	20100227	1640	-59.4170	-66.0871	3250	4565	SN080	HRP. 20 min after HR
28	146	20100301	1641	-58.2588	-66.0045	2768	3943	SN080	
29	150	20100302	0434	-57.5634	-65.6485	3101	4373	SN080	HRP 48. LED flickery
30	151	20100302	1828	-56.1313	-64.7514	1320	2062	SN080	HRP 49.

Our turbulence estimates are based on the turbulent kinetic energy dissipation rate, ε. This parameter is calculated using the measurements of shear microstructure, in the manner described by Gregg (1999). The shear wavenumber spectra, $\Phi(k)$, for 1-m bins (taken on a running 0.5 m interval) are analyzed using standard time series methods (windowing, filtering, etc) and integrated in wavenumber k to give the micro-shear variance in the expression:

$$\varepsilon = (15/2)\nu \int \Phi dk ,$$

where ν is the molecular viscosity. Example spectra from the profile data in Fig. 3.5.1. are shown in Fig. 3.5.2.

Both the HRP and DMP resolve micro-shear spectral variance to levels as low as 3 x 10^{-11} W/kg (Fig. 3.5.3). Thus, the noise level for ε is well below the O(1 x 10^{-10}) W/kg that defines the background level of turbulence in our profiles. Diffusivity estimates based on the method of Osborn (1980) rely on an assumed mixing efficiency of 20% and estimation of the buoyancy gradient (N^2) on scales considerably larger than that of the turbulent patches. In the estimates presented in Figs. 3.5.1 and 3.5.3, we have used a running 50-m window for averages of ε and calculations of N^2 for the calculation of k_ρ. We note that these preliminary, "on-the-fly" estimates of diffusivity are not proper average estimates. A proper analysis will be carried out using profile ensembles of dissipation rate statistics, and for a stable estimate of N^2 based on multiple profiles of density.

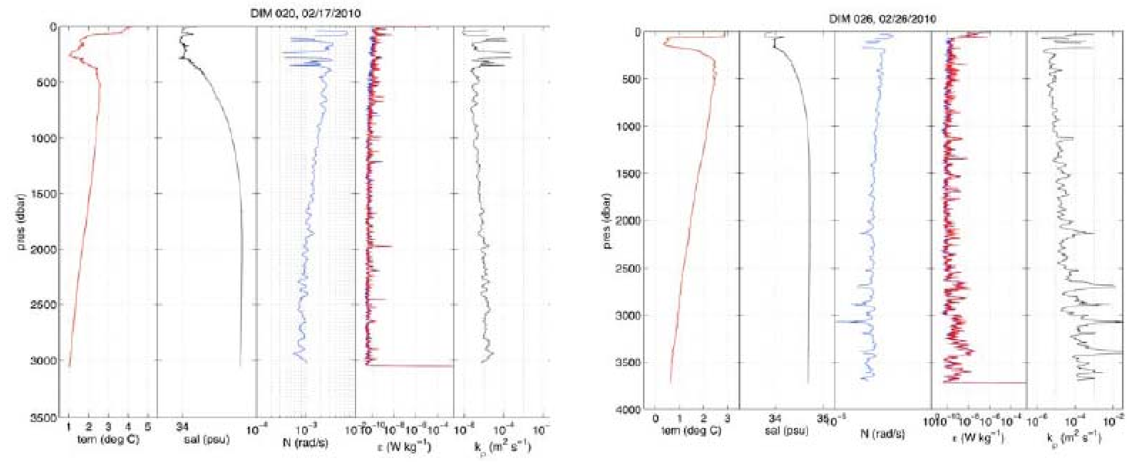

Fig. 3.5.1. Fine- and microstructure parameters from the DMP. Cast 20 (left panels) was within the tracer patch and shows weak turbulence and diffusivity levels. Cast 26 (right panels) was along the southern half of the Phoenix Ridge which spans Drake Passage and shows the enhancement of turbulence levels in the lower half of the water column.

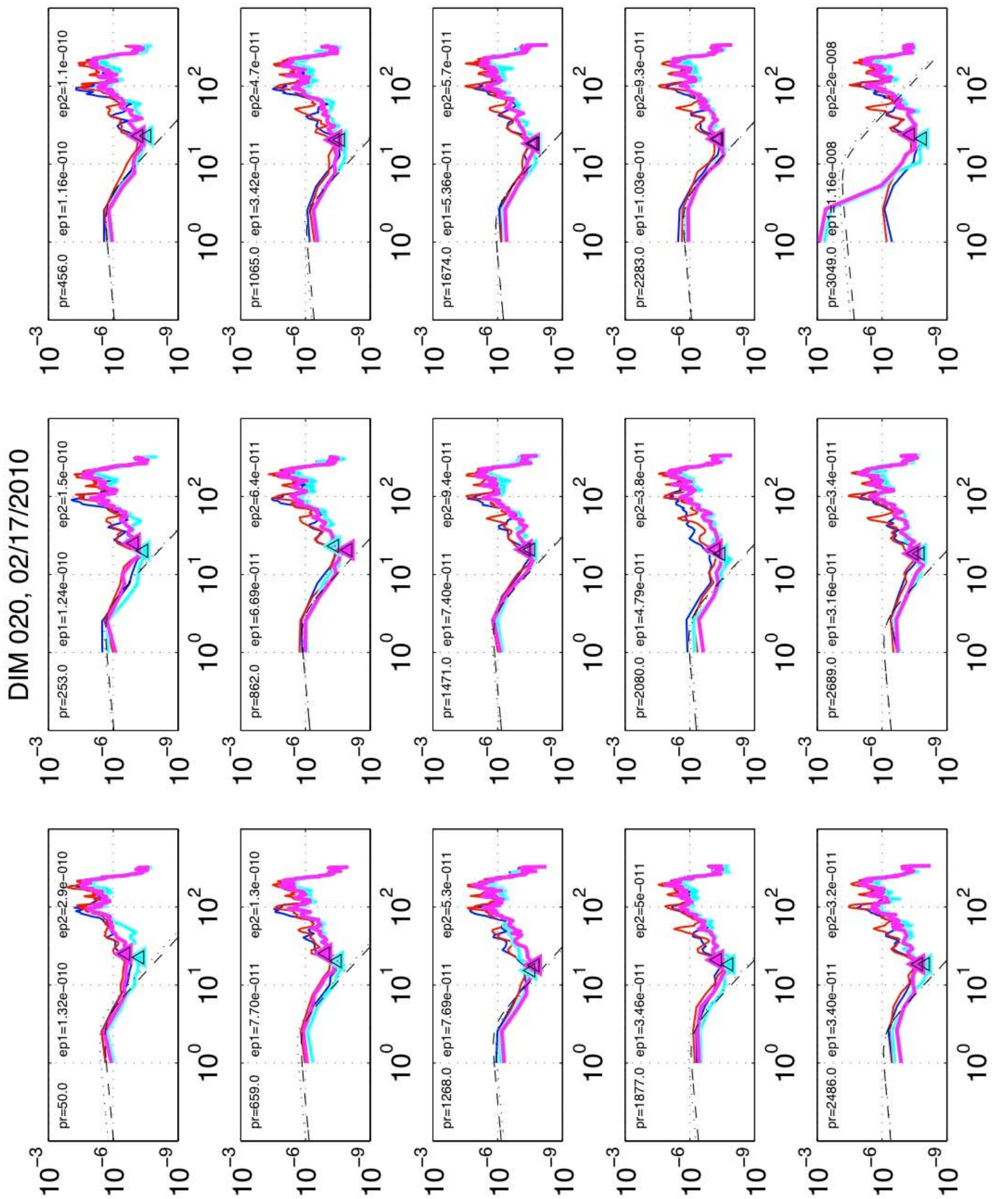

Fig. 3.5.2. Example wavenumber spectra from DMP cast 20. These show the pre-filtering (thin lines) and post-filtering (thick lines) spectral estimates of two shear probes (blue/cyan = probe 1, red/magenta = probe 2). The upper limit of integration of the filtered spectra was estimated to be the spectral minimum (triangles). The Nasmyth model curves for the reported values of ε are also shown (black broken curves).

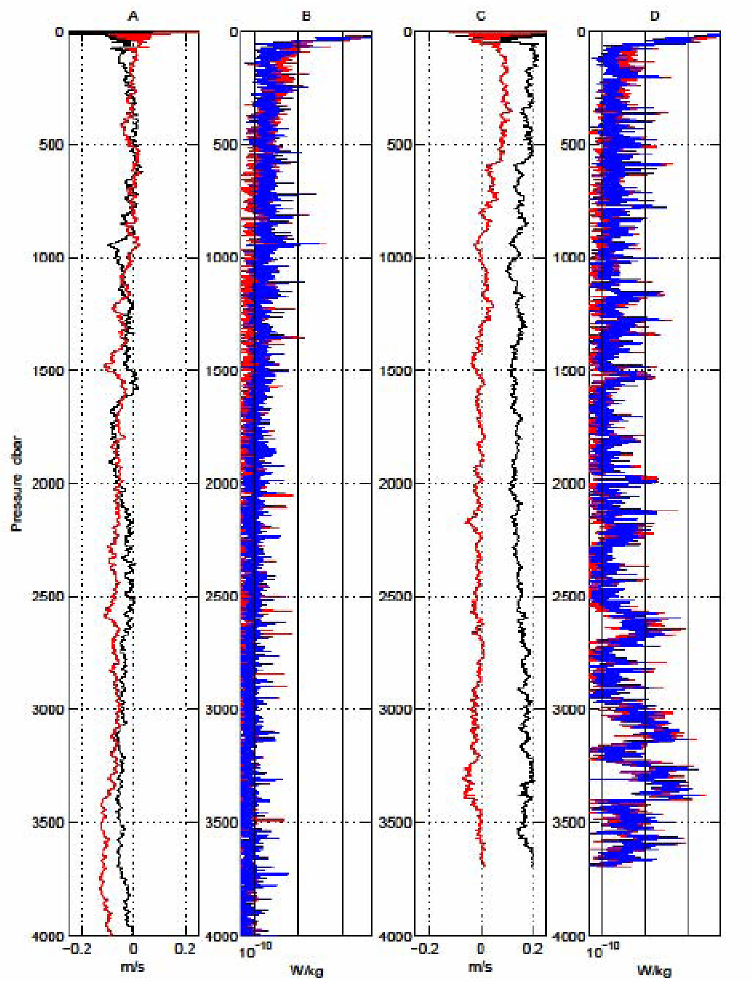

Fig. 3.5.3. Vertical profiles of absolute horizontal velocity (panels A and C) and the turbulent kinetic energy dissipation rate (panels B and D) from HRP deployments 40 in the region about the tracer patch and 41 in Drake Passage. The zonal velocity is shown as black curves and the meridional component in red. Dissipation estimates from the two shear probes on the instrument shown in red and blue are plotted on a semi-logarithmic scale with each whole decade marked.

4. RAFOS Sound Source Moorings

Peter Lazarevich and Brian Guest

Note: It was found once the RAFOS floats surfaced that useful time delays were not obtained from these sound sources.

4.1 Overview

In support of the RAFOS float component, we deployed two sound-source moorings on the US2 cruise. We chose locations to best enhance the existing array of six sources, which were deployed early in 2009.

The University of Miami designed and built the moorings. They consist of, from the bottom to the top: a steel railroad-wheel anchor, a combination of wire and rope amounting to several kilometers in length, the RAFOS sound source, additional wire, and flotation spheres. The mooring designs are shown at the end of this section (Figs. 4.3.2 and 4.3.3).

The purpose of the mooring is to support the sound source at a nominal depth between 1000 m and 1200 m. The sound source is used for the purpose of acoustically-tracking subsurface floats. Once a day, at a prescribed time, the source transmits an 80 s long, frequency-swept signal, from 258 to 261 Hz. The float listens for the presence of signals from an array of sources, and their arrival times are used to triangulate the float's position.

Two types of sources were used: one manufactured by the University of Rhode Island (URI), and the other by Sparton. The URI source is based upon a new, efficient and compact design. The unit has a resonator pipe and battery/electronic case, which are attached along side each other. The source has an anticipated range of operation of about 800 km. The Sparton source is an older unit, refurbished, but is slightly more powerful. It is also substantially heavier. As with the URI source, the Sparton also has a resonator pipe and battery/electronics case, but these are separated by a 30 m umbilical cable that carries the power signal. Its operational range is expected to be about 1000 km.

4.2 Deployment Method

Prior to deployment, a bottom survey using the ship's multibeam sounder was conducted in the area around the planned mooring site. The survey began a few miles upwind from the original target and ran 4 to 5 miles downwind. The optimal deployment site was chosen for both the correct bottom depth and flatness of the terrain in the immediate vicinity. Once the target site was selected, the ship was positioned about 5 miles downstream on a heading towards the target, and the deployment began. Brian Guest led the deck operations. Peter Lazarevich programmed the source missions and, along with several of the science party and ship's crew, assisted with the deployments.

The moorings were deployed top first, bottom last. Deck operations began by stringing the flotation spheres together on chain. The entire length was slowly eased off the deck into the water with a pair of snatch hooks to help take the load (Fig. 4.2.1).

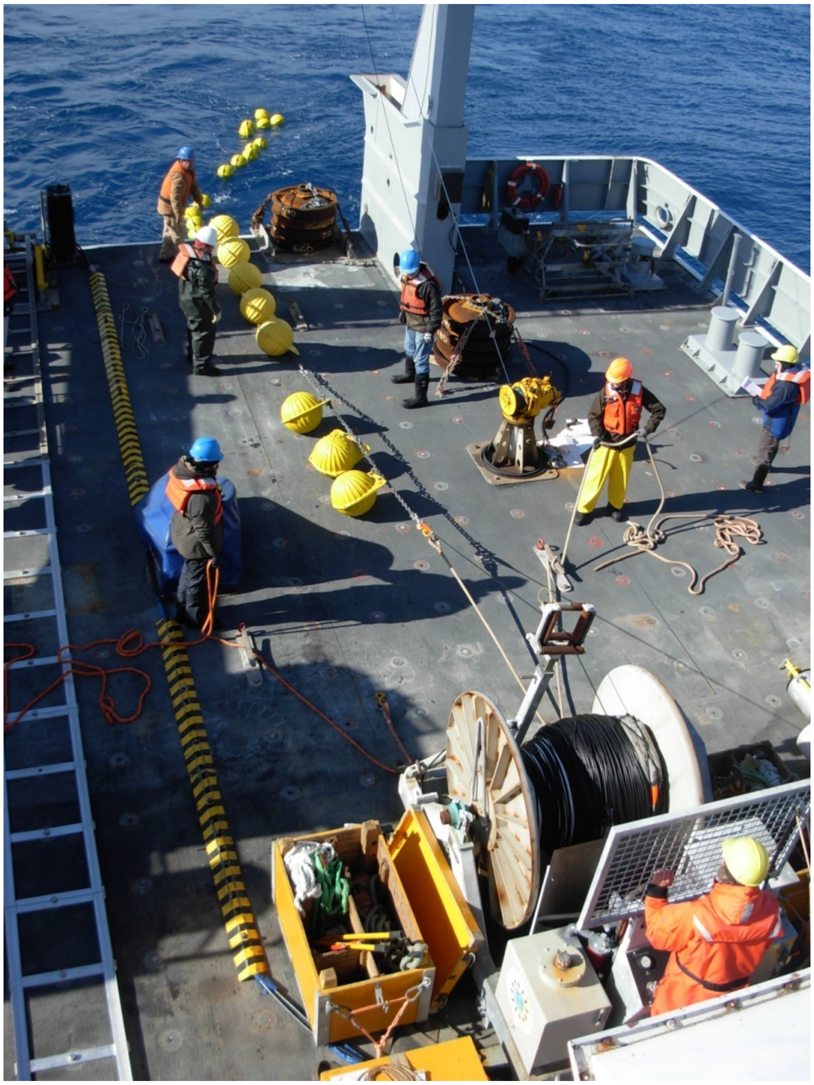

Fig. 4.2.1. Flotation spheres being eased off the deck and into the water.

After the flotation was in the water, wire was paid from the winch, stopping at the first break to insert the sound source. The source is lifted by a quick-release snap hook that runs up to a block on the A-frame and onto a capstan on deck. It is also secured with slip lines as it is moved off the deck into the water. Once in the water, the snap hook is released and the winch can continue to pay out the wire. For the Sparton source, this operation is employed for both the resonator pipe and the battery/electronics case (see Fig. 4.2.2).

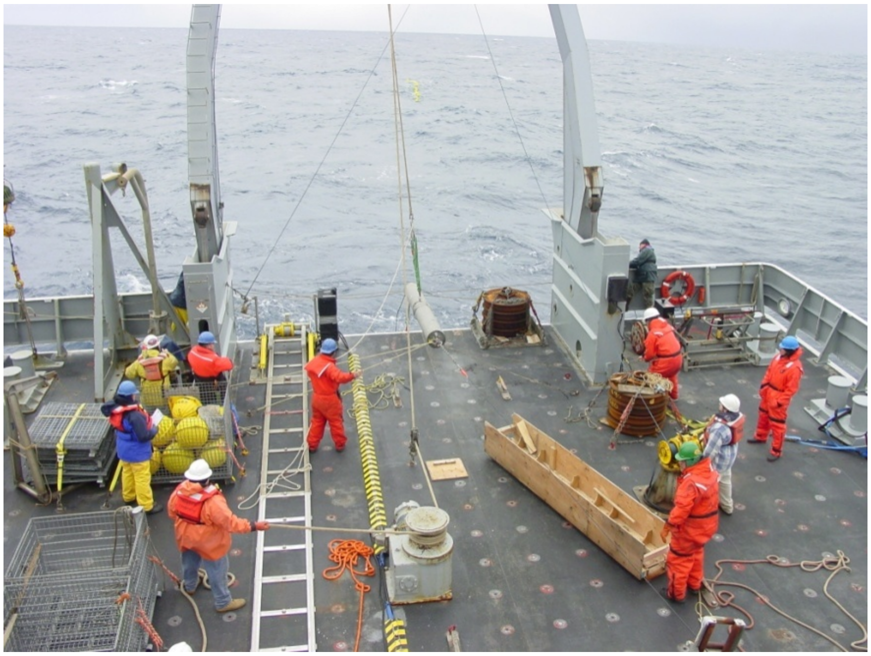

Fig. 4.2.2. The Sparton battery/electronics case being hoisted off the deck and into the water.

An unexpected difficulty arose during the deployment of the Sparton source. After the resonator pipe was placed in the water and as we began to pay out the wire and umbilical cable that runs to the battery/electronics case, the umbilical did not freely slip through the block. Instead, it tended to bind and wound up into loops, which then took up quite a bit of slack from the cable on the resonator pipe end. It is quite possible that the tension could have pulled the cable lose from the connector on the resonator.

Following the source, the remaining wire and rope were spooled off the winch until the bottommost piece of wire was eased out to the fantail, where it was attached to a 5-m length of chain and the anchor. The mooring tension was then transferred from the winch onto the anchor, which sits directly on the fantail. Using a ratchet strap with ends attached to the deck, the anchor was slowly scooted back over the fantail and dropped into the water.

4.3 Deployment Summary

The following table summarizes the mooring deployments, indicating which source was used, the time it begins its daily transmission (pong time), and the time, location, and ship heading when the anchor was released.

Table 4.3.1. Sound Source Mooring Deployment Information

Mooring	Source type (s/n)	Pong time (GMT)	Anchor-over time (GMT)	Anchor-over location	Anchor-over depth (m)	Ship heading (°)
7	URI #41	0115	1648 1/18/2010	59° 56.35' S 78° 00.20' W	4950	350
6	Sparton #89	0135	2135 2/1/2010	58° 10.14' S 102° 01.25' W	4774	210

For both moorings, there were slight differences between the design and what was actually deployed: mooring #7 had an additional 120 m shot of Dacron line, and mooring #6 had one shot 50 m longer than design and one shot 102 m shorter than design (see diagrams in Figs. 4.3.2 and 4.3.3 at the end of the section). The following table summarizes the differences between the mooring designs and the moorings as deployed, and gives the estimated sound source depths: 1039 m for mooring #7 and 1182 m for mooring #6.

Table 4.3.2. Estimated Sound Source Depths.

	Mooring #7	**Mooring #6**
Bottom depth, design (m)	4920	4670
Bottom depth, actual (m)	4950	4774
Bottom depth, difference (m)	+30	+104
Mooring rope adjustment (m)	+120	–52
Source depth, design (m)	1129	1026
Source depth, estimated (m)	1129 + (+30) – (+120) = 1039	1026 + (+104) – (–52) = 1182

The map below shows the sound source array at the conclusion of the US2 cruise.

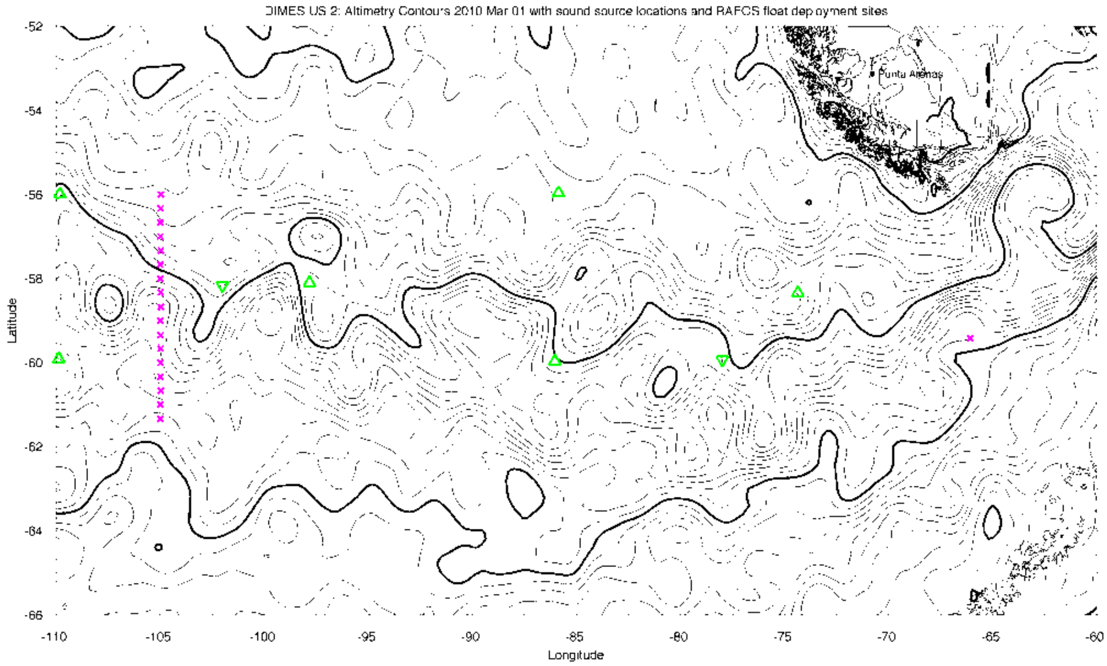

Fig. 4.3.1. Map of sound source mooring deployments. The two sources deployed on US2 are indicated by the downwards pointing, green triangles. Also shown are the RAFOS float deployments (magenta crosses) and the six sources deployed last year on US1 (upwards pointing, green triangles).

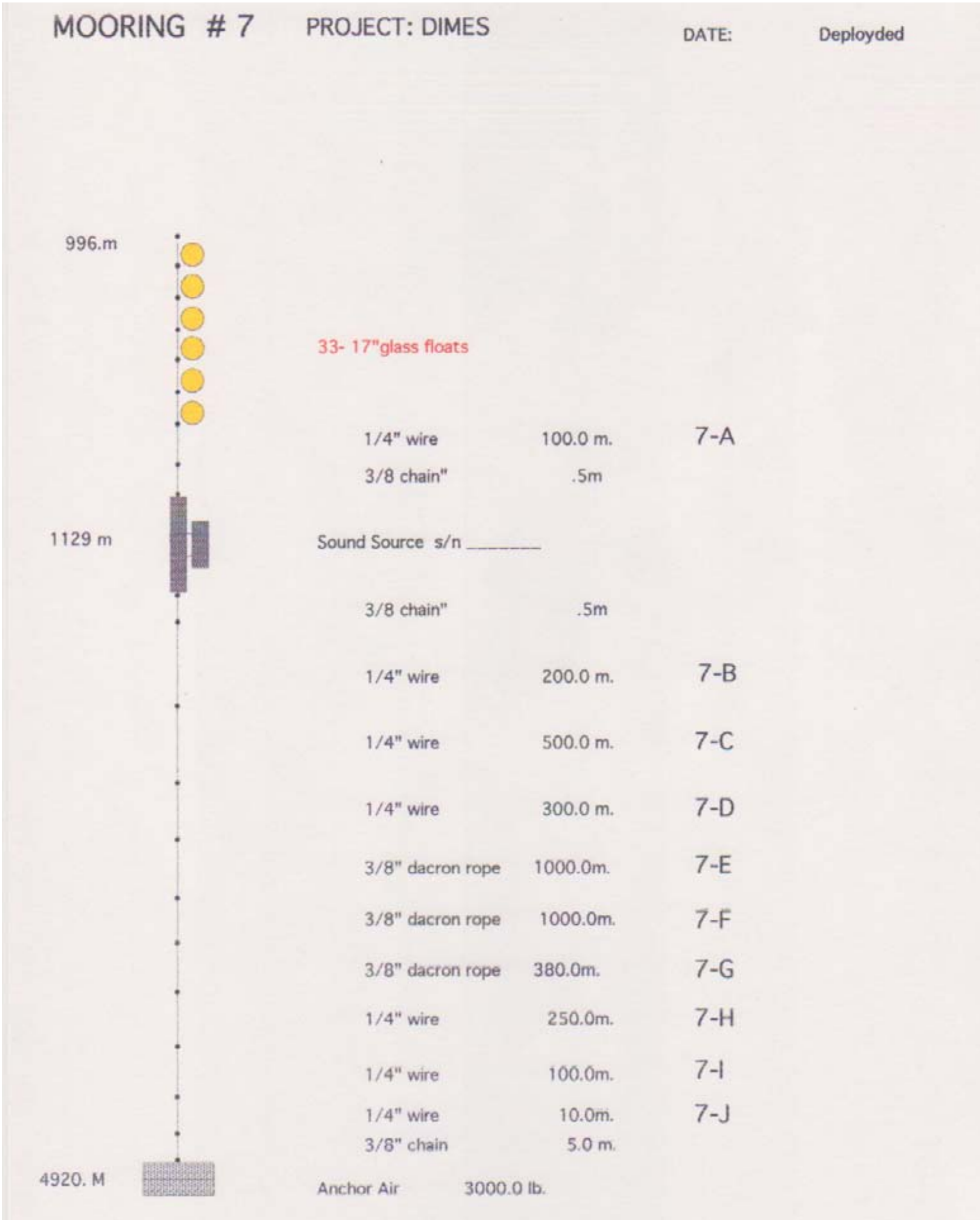

Fig. 4.3.2. Original design of Mooring #7. The deployed mooring had an additional shot of 120 m Dacron rope, located below the shot of 380m Dacron rope (labeled 7-G).

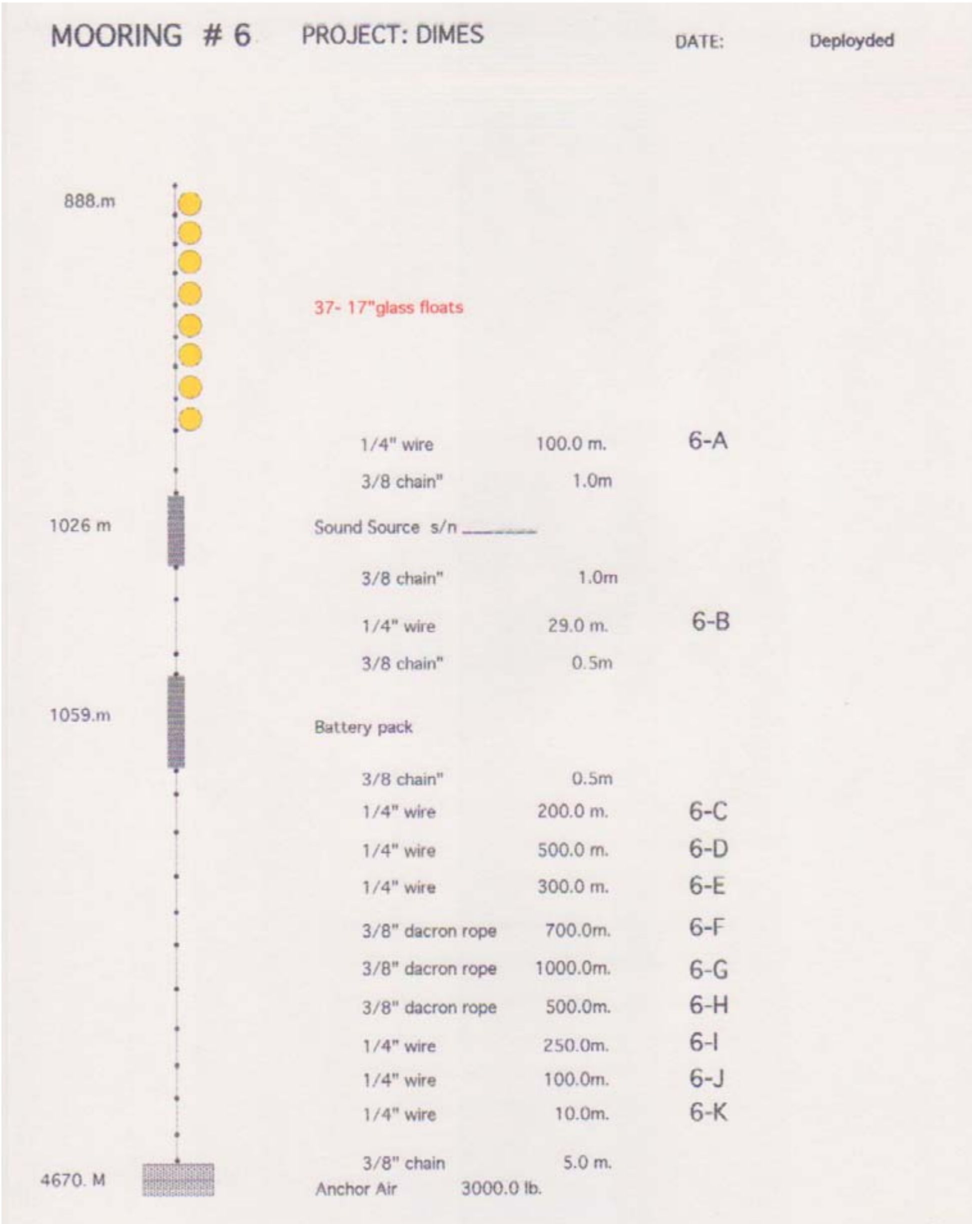

Fig. 4.3.3. Original design of Mooring #6. The deployed mooring had the following differences: the 1000 m shot (labeled 6-G) was actually 1050 m and the 500 m shot (6-H) was shortened to 398 m.

5. RAFOS Floats

Peter Lazarevich and Brian Guest

5.1 Overview

In support of the RAFOS float component, we deployed 105 RAFOS floats on the US2 cruise TN246. The bulk of floats, 102, went in along the 105°W section, the same upstream location that the floats were deployed during the US1 cruise. An additional three floats were deployed on the Drake Passage section, at 66°W.

The floats were designed and built by Seascan, based in Falmouth, MA. They consist of a glass tube housing, aluminum end plate, drop weight (either a lead weight or a compressee), pressure and temperature sensors, a hydrophone, and a burn wire.

Each float was precisely ballasted for a either a target pressure or a target density. The floats ballasted for a target pressure (isobaric) have a lead drop weight. This type of float is rather incompressible, compared to water, and remains at a constant pressure. The floats ballasted for a target density (isopycnal) have as a drop weight a compressee, which is fashioned from a spring-backed piston. This device provides the correct amount of pressure-related volume change, so that the entire compressibility of the float more closely matches that of seawater (in this case, about 90%). This gives the float the ability to make vertical excursions that mimic the motion of the water around it.

Once deployed, the float descends to the target surface and remains for a fixed period of time. The float drifts with the currents, measures temperature and pressure, and listens for the arrival of acoustic tracking-signals from moored sound sources. At the end of the mission, the burn wire is activated, releasing the drop weight and sending the float to the surface, which then begins its data transmission via a satellite service.

Table 5.1.1 summarizes the types of floats. The times and locations of the float launches are listed in Appendix G, as well as various ID numbers for the floats.

Table 5.1.1. Float Summary

Quantity	Ballasted by	Type	Target surface	Target density (σ_θ)	Target depth (dbar)	Satellite service
53	Woods Hole	Isopycnal	Deep	27.667	NA	Argos
32	URI	Isopycnal	Shallow	27.219	NA	Argos
11	URI	Isopycnal	Shallow	27.219	NA	Iridium
9	Woods Hole	Isobaric	Shallow	NA	400	Iridium

5.2 Deployment Method

Prior to each station, floats were powered up, checked for correct time and mission parameters, and their missions were activated. To assist in launching the floats overboard in a safe and fast way, the floats were inserted into launch tubes, which were carried to the deck and secured in place. The tubes have a starch release mechanism that keeps a bottom trap door shut. When the release is submerged in water it activates, allowing the trap door to swing open and the float to fall free. The tubes were hoisted through a block on the A-frame, lowered to water level, and allowed to drift on a tether, free from any ship motion. After a few moments, a starch release mechanism would break and allow the float to fall through a bottom hatch. This method is shown in Fig. 5.2.1.

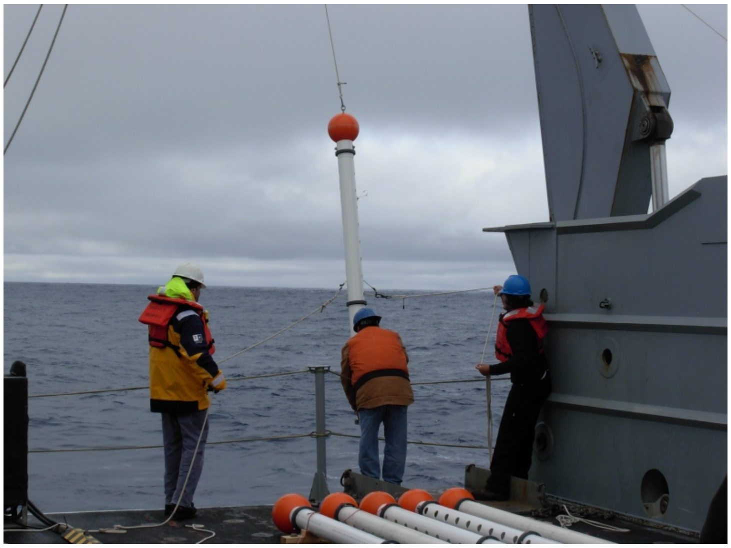

Fig. 5.2.1. Float launch tubes in use.

While the launch tube method worked well for most of deep floats, it did not work as well for the shallow floats. The shallow floats were not heavy enough at the surface to drop quickly out the launch tube. In fact, some floats came out of the launch tube only to bob on the surface momentarily, before beginning a slow descent. We decided to deploy the shallow floats by hand, lowering over the fantail. This method worked quite well, and we decided to use it for all remaining floats. This method is shown in Fig. 5.2.2.

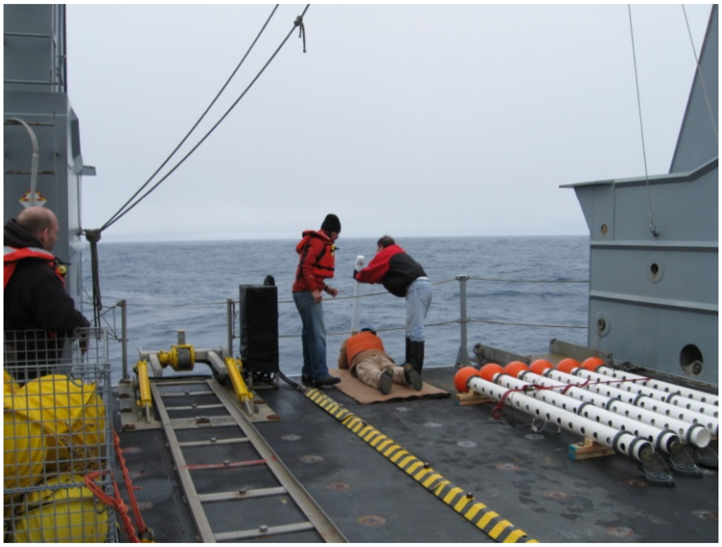

Fig. 5.2.2. Launching a RAFOS float by hand.

5.3 Deployment along the 105°W Section

Between 2/5/2010 and 2/7/2010, a total of 102 floats were deployed at 17 stations, from 54°S to 61°20'S, at 20 mile intervals. At each station, a total of six floats were deployed: 3 shallow and 3 deep. These floats were set for a two year mission. At the three northernmost stations, all the shallow floats were of the isopycnal, Argos type (3 each, 9 total). At the three southernmost stations, all the shallow floats were of the isobaric type (3 each, 9 total). At the eleven central stations, the shallow floats were split between the isopycnal Iridium type (1 each, 11 total) and the isopycnal Argos type (2 each, 22 total). See Fig. 5.3.1.

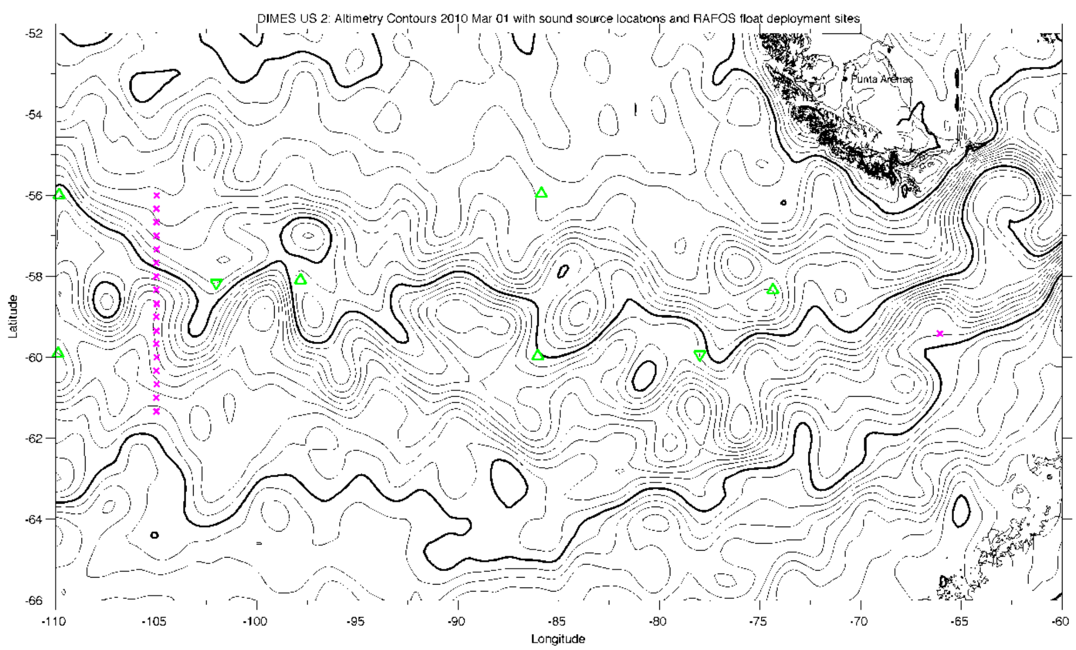

Fig. 5.3.1. RAFOS float deployment sites (indicated by magenta crosses) and, for reference, sound source mooring locations (green triangles).

5.4 Deployment in Drake Passage at 66°W

Three remaining floats were deployed on 2/27/2010 at 59°25.11' S by 66°04.55' W, during the Drake Passage section. These floats were programmed for a 300 day mission. See Fig. 5.3.1.

6. Shearmeters

Brian Guest
(For further information, please contact Timothy F. Duda, Woods Hole Oceanographic Institution, tduda@whoi.edu.)

6.1 Introduction

Tim Duda at the Woods Hole Oceanographic Institution (WHOI) sent four (4) Shearmeters to be deployed as part of the DIMES US2 cruise. The instruments were sent to the University of Washington in Seattle as part of the WHOI shipment in December of 2009. The four 24 foot long pressure cases had the buoyancy pumps installed and the electronic controllers needed to be installed during the cruise.

6.2 Shearmeter 08

The plan was to deploy a single instrument for a short test mission before deciding if the remaining 3 instruments would be deployed. The original full size battery pack was removed from Shearmeter 08 and a smaller pack was installed. This was to compensate for the additional weight of a recovery ring (Fig. 6.2.1) that was attached to the top of the pressure case. Upon completion of the short mission the instrument was to be recovered, the large battery reinstalled and redeployed on a full 1 year mission. The instrument was deployed, completed its 11 day mission and surfaced. Due to rough seas, poor visibility and confusion over the GPS positions we were receiving by email, we were unable to recover it. The instrument was using σ_θ to determine its target.

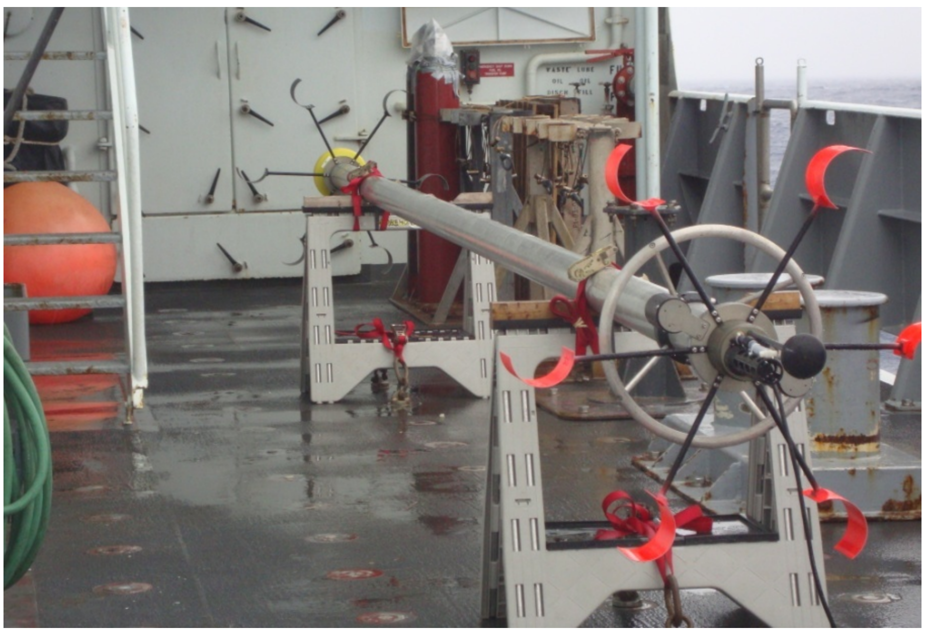

Fig. 6.2.1. A Shearmeter ready for launch.

6.3 Shearmeter 06

Deployed on 02/15/10, Shearmeter 06 was launched as planned with a 365 day mission. Everything went smoothly and the instrument is assumed to be working properly.

6.4 Shearmeter 07

The third planned deployment was to be Shearmeter 01 which was prepped and awaiting deployment on deck. During the prelaunch checks, B. Guest was unable to acquire the Iridium satellite and the deployment was aborted. He then prepared Shearmeter 07 and it was deployed at the next opportunity. During the checkout of #07 he also had difficulty with the Iridium communications, but it appeared to be an interboard connection problem, which was repaired. The instrument was deployed in the normal manner using the Shearmeter launch rig (Fig. 6.4.1). Within about 5 hours we started to receive email messages indicating that the instrument had dropped its ballast weights and surfaced. The message stated that it had exceeded the programmed maximum depth allowance and aborted. An attempt was made to locate the instrument but high seas, poor position information and a lack of time led to aborting the attempt.

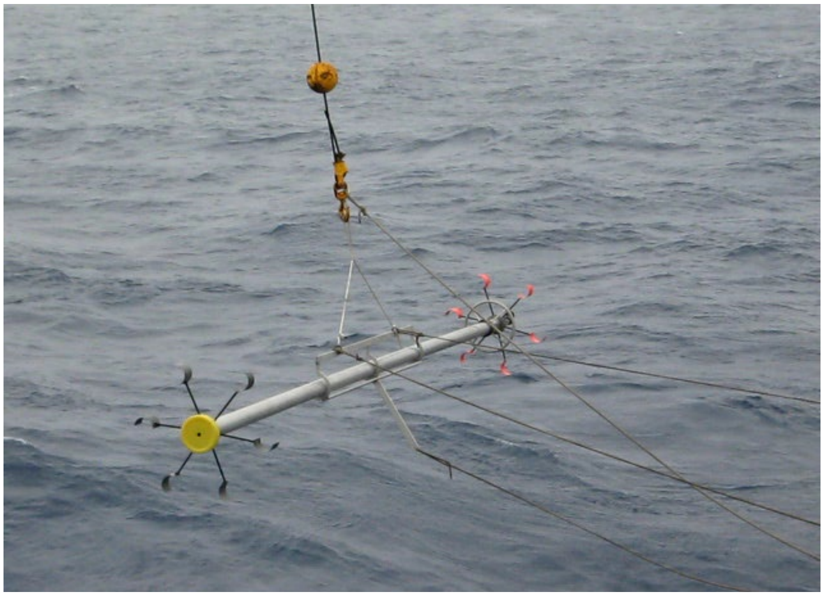

Fig. 6.4.1. Launch of Shearmeter 07.

6.5 Shearmeter 01

We were not able to repair the Iridium problem and the instrument was not deployed. It was shipped back to WHOI.

Table 6.1. Shearmeter Launch Parameters

Inst. #	Deployment Date	Latitude	Longitude	Mission Length	Surface Due Date
08	01/29/10	–58.130250	–96.938300	11 days 17 hours	02/10/10
06	02/15/10	–59.249430	–93.000258	365 days	02/15/11
07	02/20/10	–59.500343	–88.999573	320 days	01/06/11
01	N/A	N/A	N/A	N/A	N/A

7. SOLO Floats

Brian Guest

As part of DIMES, 4 SOLO floats were deployed along a line at 105°W. The floats had been shipped to R/V *Thompson* in Seattle in December of 2009. Shortly after shipping, it was discovered that the controller boards had a firmware problem, so new electronics were hand carried to the vessel in January 2010. The electronics were swapped out and a basic inspection of the mission parameters was done prior to deployment.

Table 7.1. SOLO Launch Parameters

Instrument #	Date	Time Z	Latitude	Longitude	Start Up Date	Start Up Time Z
963	02/05/10	19:01	–56.668685	–104.997335	02/05/10	17:15
964	02/06/10	03:58	–57.669887	–105.005697	02/06/10	02:30
962	02/06/10	22:57	–59.348780	–104.993373	02/06/10	19:55
965	02/07/10	07:09	–60.333833	–104.996500	02/07/10	03:09

The floats were deployed by attaching a small loop of monofilament line to the dampening ring. A quick release that had been supplied as part of the EM-APEX gear was attached to the monofilament. The float was lifted over the stern using a line run through a block on the A-frame, and once the float had reached the water the quick release was tripped. All of the floats went into the water without incident. Prior to deployment, each instrument was started by swiping a magnet over the reset mark and checked to insure that the air bladder inflated to indicate the mission was running.

8. EM-APEX Floats

Brian Guest

(For further information, please contact James Girton, Applied Physics Laboratory, U. Washington.)

James Girton of the University of Washington sent six (6) EM-APEX (Electro-Magnetic Autonomous Profiling Explorer) floats to be deployed at various locations during the US2 cruise (Table 8.1). The instruments were sent running in a hibernation mode. They were programmed to wake up and start their mission as they were deployed and descended below 10 meters in depth. Prior to deployment each instrument was connected to a terminal and monitored to insure it was in the active mission mode and the output of the float was saved as a file.

The EM-APEX floats are equipped with electromagnetic current meters and CTDs. They cycle between the surface and 200 dbar every 3 days, obtaining shear profiles. Between profiles they rest at 1500 dbar for 2 days. Their data are transmitted by the Iridium system every time they come to the surface.

Table 8.1. EM-APEX Launch Parameters

Instrument #	Date	Time Z	Latitude	Longitude
4815	02/03/10	22:55	–55.998950	–99.090283
4814	02/07/10	18:23	–61.333087	–105.000233
4813	02/11/10	23:44	–58.250683	–96.002390
4090	02/17/10	21:42	–62.501563	–93.001468
4089	02/21/10	23:34	–59.000002	–84.000205
4812	02/27/10	19:28	–59.418102	–66.077312

Prior to deployment each float was placed into a bucket of seawater to remove air from a protective shroud over the buoyancy control bladder and to fill it with water. This allowed the float to descend immediately upon deployment and minimize time on the surface. About 15 minutes prior to launch, protective plugs in the Seabird CTD and protective covers on the EM sensors were removed. Each instrument was deployed by lifting the instrument over the stern by a line that was run through a block on the A-frame and attached to a UW supplied quick release. All six instruments went into the water smoothly and without incident. Results from the EM-APEX floats are online at http://charybdis.apl.washington.edu/dimes/.

9. LADCP (Lowered Acoustic Doppler Current Profiler)

Angel Ruiz-Angulo and Andrew Kowalczyk
(For further information, please contact Andreas Thurnherr, Lamont-Doherty Earth Observatory; LADCP data are maintained at the DIMES website.)

9.1 Data Acquisition

The LADCP velocity profiles measured during the R/V *Thompson* Cruise TN246 were obtained using RDI WorkHorse 300 [kHz] ADCPs. As shown in Fig. 9.1.1, two instruments were mounted on the CTD rosette in a paired configuration; one of the instruments was set as a down-looker and the second one as the up-looker.

Typically, the down-looker instrument is set as a master and the up-looker as a slave. The slave ADCP head remains on standby until it hears the master ADCP head pinging, and at a specified period of time after first hearing the master, the slave starts pinging. During station #3 no data were collected by the up-looker, suggesting that it never heard the pings from the down-looker. After that station, the down-looker was set as the slave and the up-looker as the master. No miscommunication problems were reported after this change.

Fig. 9.1.1. LADCP dual head configuration mounted on the CTD frame.

On board were 4 ADCP heads; one of them (Sentinel SN 1804) belonged to Florida State University (FSU) (Kevin Speer/Peter Lazarevich) and the rest of the instruments to Lamont-Doherty Earth Observation of Columbia University, New York City (LDEO), Monitor SNs 3441, 149 and 299. The FSU-Sentinel instrument was powered with a non-rechargeable internal battery and the LDEO-Monitor instruments were powered externally with a battery pack attached to the CTD rosette. The two ADCP heads mounted on the rosette were connected through the "octopus" cable, which was also connected to the battery pack. On-deck communication with the ADCPs was carried out through a long cable leading into the wet lab. The end of this cable had an RS-232 serial port connector split into two; each of the ends hooked up to RS-232 to USB Keyspan 19H converters, feeding into the iMac running the latest version of the LADCP acquisition software written by Andreas M. Thurnherr. This software was used to send commands to the instruments and download the data from them.

A spare instrument (SN 7322) had the RDI firmware, allowing bottom tracking. Although most of the stations terminated several meters above the seabed, there were a few important stations that used bottom tracking, specially the last stations in Drake Passage. The instruments SN 3441 and 149 did not have RDI firmware with bottom tracking; this was not an issue since both were used as up-lookers only.

In addition to the ADCP instruments, a CTD Sea-Bird SBE-9plus system with dual temperature and conductivity sensors was mounted on the rosette (See Fig. 9.1.1). Ship navigation data were automatically recorded during the casts and incorporated into the CTD data files. The shipboard ADCP measurements were made with an OS75NB unit (75 kHz narrowband).

The following table instrument setup parameters were used (unchanged) throughout the cruise.

Table 9.1.1. LADCP Set-up Parameters

Number of Depth Cells	25
Length of Depth Cells	8 [m]
Blanking Distance	0 [m]
Coordinate System	Radial Beam
Pinging Setup	Staggered Pings Every 1.5/2.0 [s]
Ambiguity Velocity	2.5 [m/s]

9.2 Processing

Data from all LADCP casts were processed using the LDEO software package, version IX_5 including bottom tracking inverse solutions. This software implements an inversion for the best possible velocity profile estimates. The CTD/GPS navigation data were added to better estimate the depth, and the processed on-station shipboard ADCP data were used to constrain the barotropic flow. When the weather allowed, the casts were done while the ship was in DP (Dynamic Positioning) mode. Towards the end of the cruise, the ship was running on one propeller and the ship DP mode was turned off several times.

9.3 Files and Directories

The LADCP datasets should contain the following directories in order to reprocess the LADCP data.

raw/ contains the raw data downloaded from the ADCP instruments. The raw files are included in a folder with the station number, each folder contains log, command and data files. There are two data files for each station, "*dn.000" for the up-looker and "*up.000" for the down-looker.

ctd/ contains the ctd time series and navigation data (gps).

sadcp/ contains the shipboard ADCP data (mat files).

processed/ contains the processed data as ".mat" files. The files are saved with the corresponding station number. It also contains ".log" files and saved figures resulting from processing the stations. These files are overwritten every time a given station is processed.

9.4 Survey Station Summary

The location of the stations is shown in Fig. 9.4.1. The first stations were used as 'test' stations, and after Station 3 the instruments remained unchanged until Station 49. At this station, the processed data from the up-looking (master) ADCP head (SN 149) reported a "broken beam" warning; however, reasonable data were still collected from all four beams and the instrument successfully passed the manufacture's bench test for all four beams. After Station 49, the up-looker ADCP head (SN 149) was replaced by SN 3441. Appendix F contains the full list of LADCP cast stations (1–149).

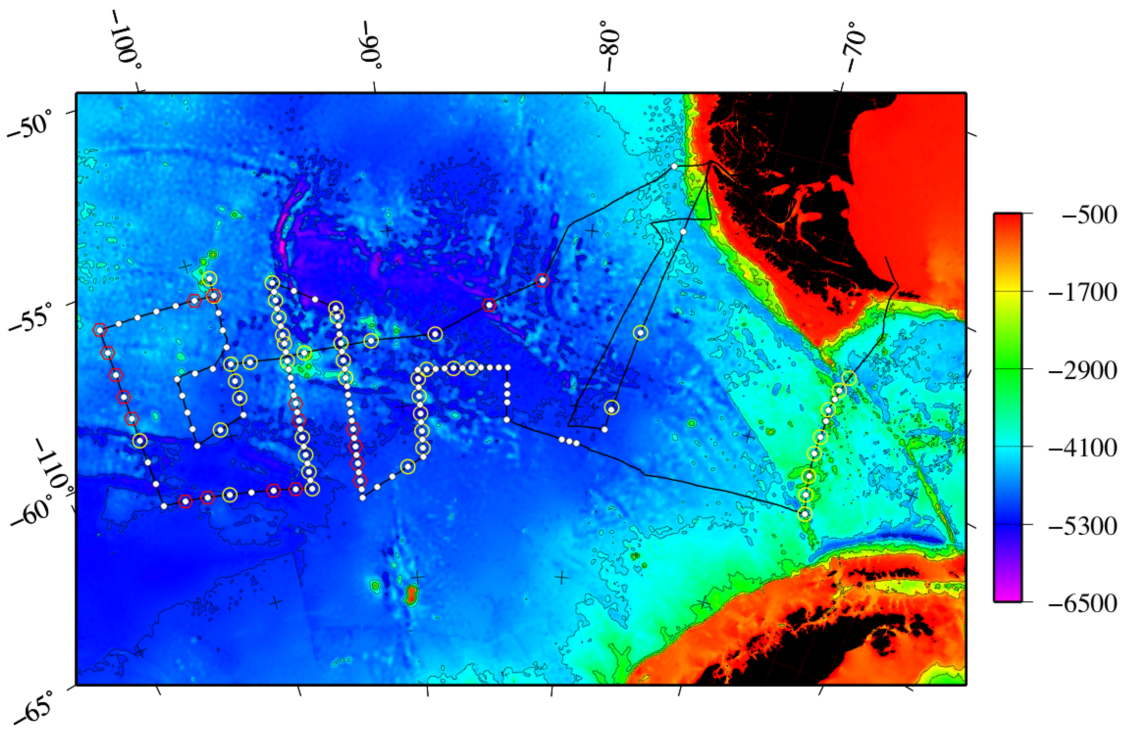

Fig. 9.4.1. Survey region during the US2 Cruise. The white solid dots represent the CTD/LADCP stations, the yellow circles correspond to the HRP stations and the red hexagons are the DMP operations. The black solid line is the ship track.

The maximum depth for most of the LADCP/CTD casts was 2000 m. The bottom tracking capability of the LADCP processing software was not used for most of the stations since the average seafloor depth was ~ 4500 m. The only stations using bottom tracking were the ones in Drake Passage (Stations 141–149). Stations 141, 143, 145 and 146 showed problems finding the bottom. Weather conditions during those stations did not allowed DP mode on the ship and perhaps the poor bottom tracking was due to the excessive displacements close to the bottom.

For this cruise turbulent microstructure and hydrographic fine-structure data were obtained for a considerable number of the stations (See DMP and HRP sections). It is of future interest to collaborate with L. St. Laurent and J. Toole to compare turbulent estimates from fine-structure parameterizations (CTD/LADCP) with microstructure turbulence measurements.

10. XBT/XCTD Program

Gillian Damerell and Cynthia Sellers

(For further information on the XCTD program, contact Sarah Gille, Scripps Institution of Oceanography; XBT and XCTD data are maintained at the DIMES website.)

36 XCTDs and 13 XBTs were deployed during the course of this cruise using a hand-held launcher, and using the WinMK21 software to record the data. Two types of XBTs were used: Type Fast-Deep (TF) which can be launched at ship speeds of up to 20 knots and which record to 1000 m, and Type T5 which can be launched at ship speeds of up to 6 knots and record to 1830 m depth. The XCTDs can be launched at ship speeds up to 12 knots and record to 1100 m depth. The station number, time, position, type, serial number and the name of the datafile for each deployment are listed in Appendix E. The 2nd, 3rd and 4th XBTs were launched half-way between stations, thus their station numbers are in the format 12-13, meaning half-way between stations 12 and 13.

Appendix E also contains the maximum depth to which we believed the XBT or XCTD recorded meaningful data. During the early part of the cruise the instruments were deployed from the starboard side of the fantail, immediately behind the main lab. This proved problematic as the wire from the canister to the falling instrument could come into contact with the ship's hull, causing spikes in the data; although at deeper depths the data values may be perfectly fine, we chose to truncate the casts where we saw the first spike. Also on two occasions the wind blew the wire up on deck where it snagged and broke off. Deployments were put on hold temporarily after station 50 while this issue was considered. Rob Hagg, one of the marine technicians, managed to extend the cable between the launcher and the deck unit so that deployments could be made from the rear of the fantail. Deployments were resumed at station 66, and were made while the ship was still on approach to stations so that the forward motion would further reduce the chance of the wire touching the ship. These actions significantly increased the number of deployments which continuously recorded meaningful data to the instrument's full depth.

XBT and XCTD files:

***.RDF** files are the raw data files, encoded.

***.EDF** contain the original data as ASCII.

***.mat** files for each XBT are all called XBT##.mat although the data can be from T5 or TF XBT's as well as XCTD's. Each .mat files contains a variable 'ptype' which indicates the type of probe that was used. For XCTD's variables Cond and Sal are included with conductivity and salinity values.

The XBT deployments were used to provide sound velocity profiles for the multi-beam swath. The XCTDs were deployed at the request of Sarah Gille at SIO, and their positions, along with the HRP and DMP profiler deployments, are shown in Fig. 10.1. The aim was to provide XCTD data in conjunction with profiler data. During the western, tracer-sampling part of the cruise XCTDs were deployed at a range of latitudes, with the intention of acquiring data on either side of the Polar Front. Twelve XCTDs were saved for deployment in Drake Passage, where increased mixing was expected.

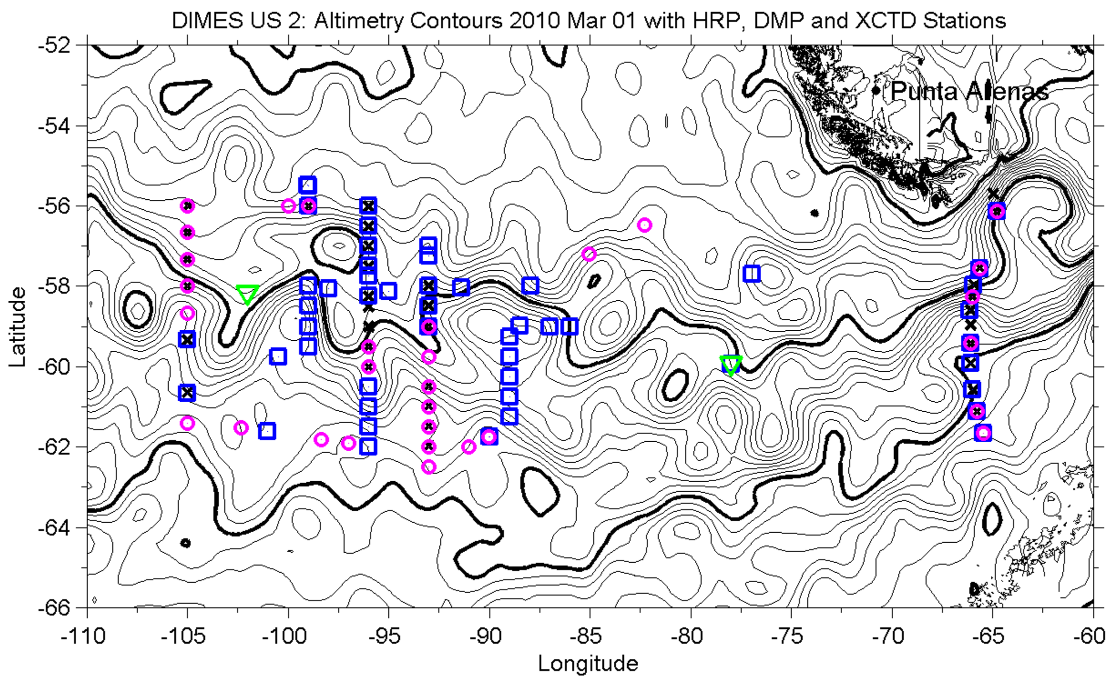

Fig. 10.1. XCTD deployments (x), HRP deployments (blue squares), and DMP deployments (magenta circles). The green triangles show the mooring locations.

11. Hull-Mounted ADCPs

The ship was equipped with an Ocean Surveyor 75 kHz Broadband and Narrowband Acoustic Doppler Current Profilers (ADCP). The data have been processed by Jules Hummon at the University of Hawaii. Files and documentation are maintained at the DIMES website.

12. CTD/O2 Program and Calibration

James R. Ledwell, Cynthia Sellers, and Thomas Aaron Morello

Note: Section 12.3 has been revised.

12.1 Overview

Two Seabird SBE 9*plus* CTD units were used on the DIMES US2 cruise. One was the Tracer Release Experiment CTD from Woods Hole Oceanographic Institution (WHOI) and the other was supplied by the University of Washington (UW). Both 9*plus* units were used, at different times, on the WHOI rosette frame with a SeaBird SBE 32 Water Sampler rosette pylon and twenty-two 4-liter Niskin bottles at positions 1 through 21 and position 24. The Niskin bottles were used for tracer and salinity samples for most casts and for Oxygen samples on four deep casts. For most casts the CTD was lowered only to 2000 m. A list of the casts and their parameters is in Appendix D.

Both CTD's had dual pumped C/T sensors and a pressure sensor for the primary variables as well as an SBE 43 Oxygen sensor and an Altimeter, both provided by UW. There were some instrument and sensor problems throughout the cruise and sensors and CTD 9*plus* units were changed to diagnose and correct these problems. Table 12.1.1 lists the serial numbers of the sensors used for groups of casts.

A total of 149 stations were occupied during the cruise. At all but a few of these stations a CTD cast was performed. The station/cast numbers are of the form SSSCC where SSS is the station number and CC is the cast number. At most stations, only one CTD cast was performed. At Station 021 only Cast 02 contains good data, and at Station 075 two CTD casts were performed. Appendix D lists the time and location of all of the casts. Table 12.1.2 lists data for those casts that went close to the bottom.

Table 12.1.1. CTD Sensor Serial Numbers and Calibration Dates

Sensor Type	**Serial No.**	**Calibration Date**
Ledwell 9*plus* Casts 00101-02001:		
Pressure	59933	31 Oct 2008
Ship's 9*plus* Casts 02102-14901:		
Pressure	0057	27 June 2008
Casts 00101-08201 & 08401-14901:		
Primary Temperature	1080	11 August 2009
Secondary Temperature	0661	11 August 2009
Casts 00101-08201 & 08501-11201:		
Primary Conductivity	224	11 August 2009
Secondary Conductivity	648	11 August 2009
Casts 11301-14901:		
Primary Conductivity	1084	21 August 2009
Secondary Conductivity	2881	09 December 2009
Cast 08301:		
Primary Temperature	1080	11 August 2009
Secondary Temperature	1085	

Primary Conductivity	224	11 August 2009
Secondary Conductivity	763	11 August 2009
Cast 08401:		
Primary Temperature	0661	11 August 2009
Secondary Temperature	1080	11 August 2009
Primary Conductivity	648	11 August 2009
Secondary Conductivity	224	11 August 2009
Casts 00301-10501 & 10701-14901:		
Oxygen	0542	05 December 2009
Altimeter	1137	Unknown
NOTE: Secondary conductivity on the CTD was often unusable. Many casts had a large difference on the upcast and after Cast 12901 the value is completely unreasonable.		

Table 12.1.2. CTD Casts to Near the Bottom

Station / Cast #	Max Depth	MAB	Water Depth
02701	4779	15	4794
07501	4912	28	4940
14101	1844	15	1859
14201	3694	15	3709
14301	1243	20	1263
14401	3876	12	3888
14501	3479	18	3497
14601	2665	20	2685
14701	3664	14	3678
14801	2730	17	2747
14901	2512	17	2529

Cast notes: (These notes are repeated at the end of Appendix D)
Cast 00301: The oxygen sensor was connected.
Cast 02101: Communication errors appeared on the console and the cast was aborted.
Cast 02102: Ship's 9*plus* unit was installed.
Cast 02901: Switched the port collecting Altimeter and O2 data from 0/1 to 4/5.
Cast 04501: Problems with secondary conductivity differences on the upcast started here.
Cast 05501: An outflow tube was attached to the secondary pump, with the outflow of tube at same level as inflow to the temperature sensor.

Cast 05601: Secondary pump was replaced prior to this cast.
Cast 05701: Changed target density surface from 27.6745 to 27.678.
Cast 06101: Reterminated CTD wire after two-blocking during deployment; detached altimeter for this cast only.
Cast 08301: Swapped secondary sensors with alternates for this cast.
Cast 08401: Returned original sensors for this cast but swapped primary and secondary cables at the sensors for this cast only.
Cast 10501: Changed target density surface from 27.680 to 27.6765.
Cast 10601: Removed Y cable to O2 sensor and altimeter at the bottle; took O2 out of the primary pump loop.
Cast 10801: Replaced Y cable to O2 sensor and altimeter at the bottle; put O2 back into the primary pump loop.
Cast 11201: Pumps turned off twice on the downcast causing periods of bad conductivity data.
Cast 11301: Replaced primary and secondary conductivity sensors with ship's sensors.
Cast 12701: Added Altimeter data to 1m and 1dbar .mat files (first deep cast).
Cast 12901: Secondary conductivity failed at 850 m on upcast; sensor not replaced.

12.2 CTD Processing

CTD data were processed using the Seabird Data Processing software. The following steps were performed for 24 Hz data (.hf):

Datcnv
Wildedit
Filter
CellTM

CTD data were further processed into 1-meter, 1-second, and 1-dbar files. The additional steps performed on the .hf files were:

LoopEdit
Binavg
Derive (to compute potential temperature and potential density)

The values suggested by SeaBird were used in Filter, and CellTM. In LoopEdit all pressure reversals were excluded. The parameters actually used are always listed in the header of each file, along with the history of the processing steps applied to the file. Consult SeaBird Data Processing documentation for details.

12.3 CTD Data Files
Note: This section has been revised.

CTD Data files are maintained at the DIMES website and are documented here.

A netCDF data file has been generated that includes 1dbar downcast data from all of the CTD casts. Conductivity and salinity values have been corrected based on the calibration determined below in section 12.4. The variable C0 contains the primary conductivity data while C0_c contains corrected primary conductivity. C1, S0 and S1 have all been included with both uncorrected and corrected (with suffix '_c') values.

Data flags(e.g. C0_flag) have been generated for conductivity and salinity data using the WOCE flag convention. The following flags have been used:

not_calibrated=1;
acceptable=2;
bad=4;

Note: calibrated and flagged variables for oxygen data are also included.

12.4 Conductivity and Salinity Calibration

Six Niskin bottles were usually sampled for salinity analysis on each cast. For deep casts (02701 and 07502) all bottles were sampled for salinity. Salinity samples were taken directly from the Niskin bottles into 250-ml glass bottles (pre-rinsed three times prior to sampling). Samples were then allowed to equilibrate to ambient temperature (22–24°C) for a minimum of 24 hrs. They were run on a Guildline Autosal 8400B salinometer with the bath temperature set at 24°C. The most recent performance evaluation check (OSIL, attached) yielded a +0.002 PSU difference. A new, sealed vial of standard seawater (Ocean Scientific International, IAPSO Std SW batch #P151 expiry date 20 May 2012) was used for each run of samples. Samples were run every 2–3 days. A check seawater sample was run at the beginning and end of each run to monitor potential drift. Sensor calculated salinities vs. measured sample bottle salinities averaged roughly 0.001–0.004 PSU difference.

The conductivity at the *in situ* temperature and pressure for each sample was calculated from the Autosal measurement of salinity. This back-calculated conductivity was compared with the original *in situ* conductivity to obtain a conductivity offset.

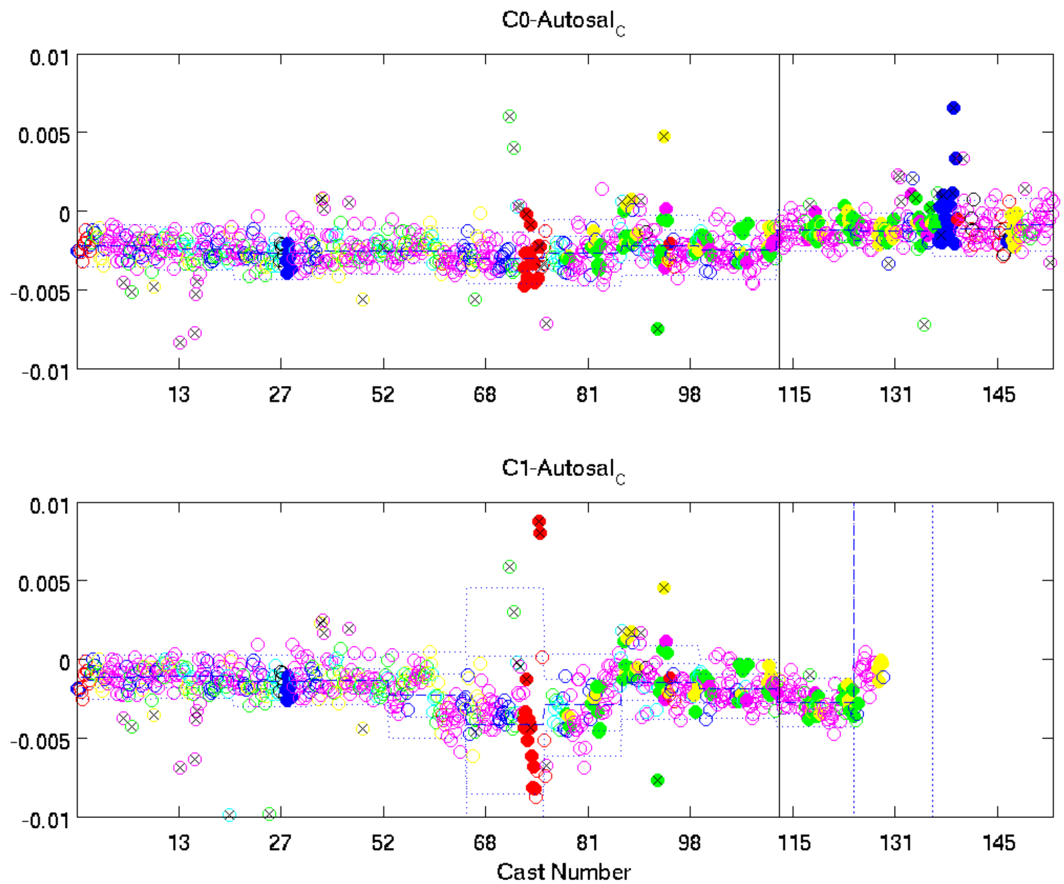

Fig. 12.4.1 Differences (mS/cm) between the original reading from the primary (C0, upper panel) and secondary (C1, lower panel) conductivity and the conductivity back-corrected from the Autosal calibration (Autosal_C). The points marked with an 'x' were not used for the mean correction.

Figure 12.4.1 shows the differences C0-Autosal and C1-Autosal. The vertical line indicates where the sensors were changed for Cast 11301. The horizontal lines represent the mean and ± one and two standard deviations from 76-sample averages. An 'x' is placed over symbols for data not considered in these averages.

The average difference for the primary conductivity (from sensor 224) prior to cast 113 (excluding cast 84 where the sensors were swapped) is Autosal – C0 = 0.00251 mS/cm.

The average difference for the secondary conductivity (from sensor 648) prior to cast 113 (excluding casts 08301 and 08401 where a different sensor was used) is Autosal – C1 = 0.00193 mS/cm.

The average difference for the primary conductivity (from sensor 1084) for casts 113 and beyond is Autosal – C0 = 0.00115 mS/cm.

The secondary conductivity sensor (2881) was not working properly for cast 113 and beyond.

Table 12.4.1 lists the corrections to be applied to the conductivities from the primary and secondary sensors for all of the casts. The corrections should be added to the raw conductivities. The data in most of the CTD files provided have not been corrected. The one exception are the files in the directory 1dbar_asc/, wherein the conductivites and oxygen concentrations have been corrected.

Table 12.4.1. Corrections to be Applied to Conductivities

Station	Primary Conductivity		Secondary Conductivity	
	Sensor	**Correction (mS/cm)**	**Sensor**	**Correction (mS/cm)**
1 to 82	224	+0.00251	648	+0.00193
83	224	+0.00251	763	Unknown
84	648	+0.00193	224	+0.00251
85 to 112	224	+0.00251	648	+0.00193
113 to 149	648	+0.00193	2881	Dysfunctional

12.5 Oxygen Calibration

Accurate oxygen concentrations were not a high priority on this cruise. However, there was usually an oxygen sensor in the CTD/Rosette system and samples were taken at four stations for calibration of this sensor. Oxygen samples were taken directly from the Niskin bottles into volumetrically calibrated 125-ml glass flasks at Stations 3, 27, 75 and 141. The sampling temperature was measured and each sample was fixed immediately with $MnCl_2$ and NaOH-NaI. The samples were subsequently run using Carpenter's modification of the Winkler titration method. Standards (0.0100 N KIO_3) and blanks were run with each titration session. Data for each station, as originally recorded by Aaron Morello are contained in Excel spreadsheets at the DIMES website.

The rosette positions of the Niskin bottles are not recorded in these spreadsheets and the sampling temperature is not recorded in some of them. The spreadsheets are maintained at the DIMES website.

The thermometer used to measure sampling temperature failed to give a useful reading for O2 sample bottles 441 through 445 during sampling of Station 141. A value of 2°C, estimated from the values for the other samples at the station, was assigned to these samples in order to include them in the following analysis.

Analysis was done in November 2011 by Ledwell. Figure 12.5.1 shows the general pattern of Winkler oxygen concentrations as a function of neutral density. The minimum is at $\gamma_n = 27.8$ kg/m^3, which was typically about 100 meters above the target density surface of $\gamma_n = 27.9$ kg/m^3 for the tracer release.

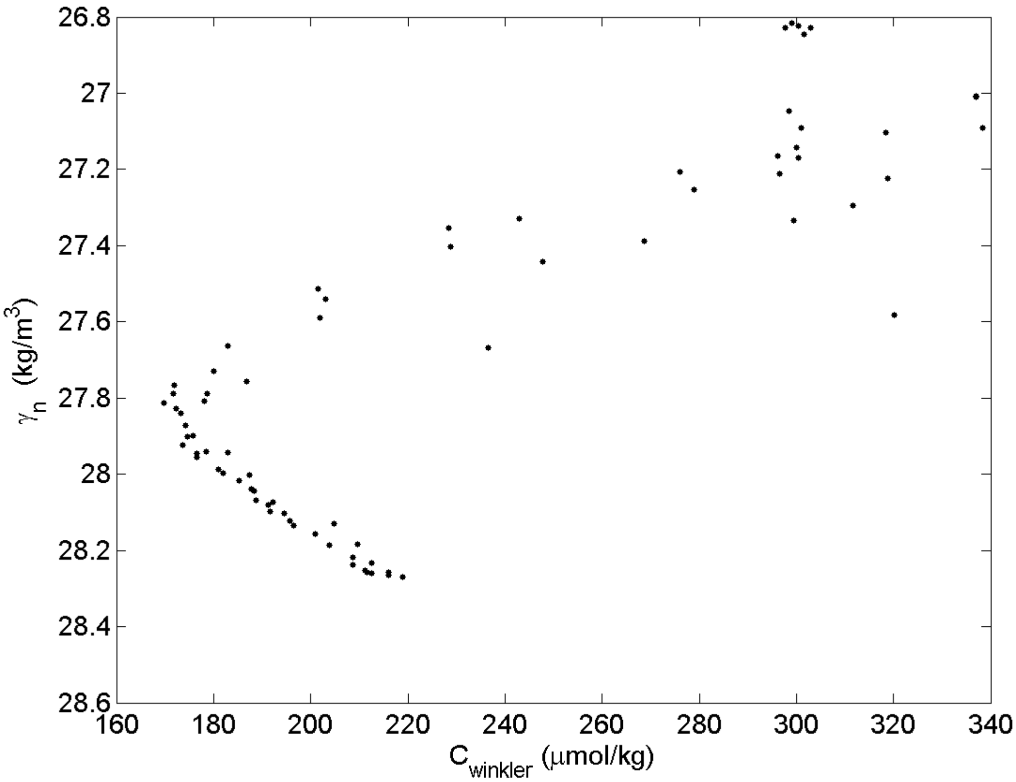

Fig. 12.5.1. Scatter plot of oxygen concentration versus neutral density (γ_n) for all the samples from the four stations for which Winkler analyses were run.

The differences between the Winkler analysis and the readings from the CTD sensor are shown in Fig. 12.5.2, with the points distinguished by station. One can see a systematic variation with both pressure and station.

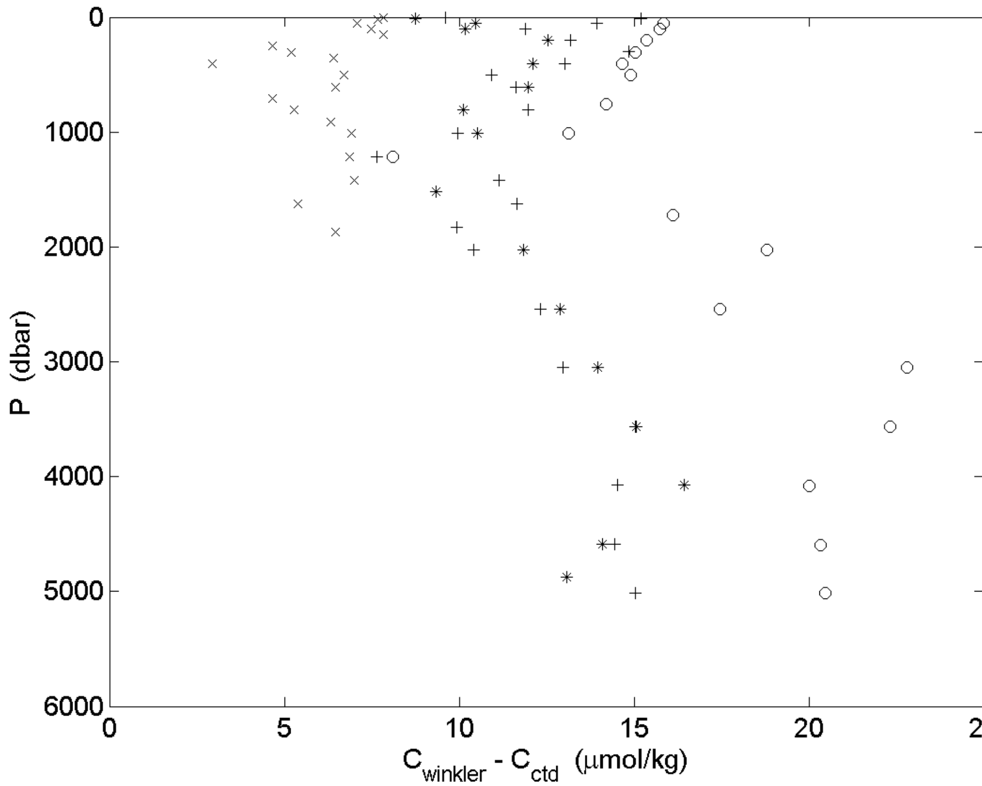

Fig. 12.5.2. Scatter plot of the difference between Winkler analysis and CTD sensor reading versus pressure. The different symbols denote the stations as listed in Table 12.5.1.

Table 12.5.1. Symbols Used for Stations in Figs. 12.5.2–12.5.5, and Station Locations.

Symbol	Station	Latitude (^{o}S)	Longitude (^{o}W)
o	3	60.0003	77.9995
*	27	56.0002	98.9993
+	75	57.7510	95.9985
x	141	61.6638	65.4317

The mean difference for each station is plotted versus station number in Fig. 12.5.3. A linear fit between mean difference and station number is drawn. It is obvious that this linear fit is poor. It is possible that the mean difference at each station, if samples were taken, would have been constant for most of the cruise, while the differences for the early and late stations were exceptionally large and small, respectively. However, we will use the linear fit to make a reasonable correction, and accept the uncertainty as relatively large.

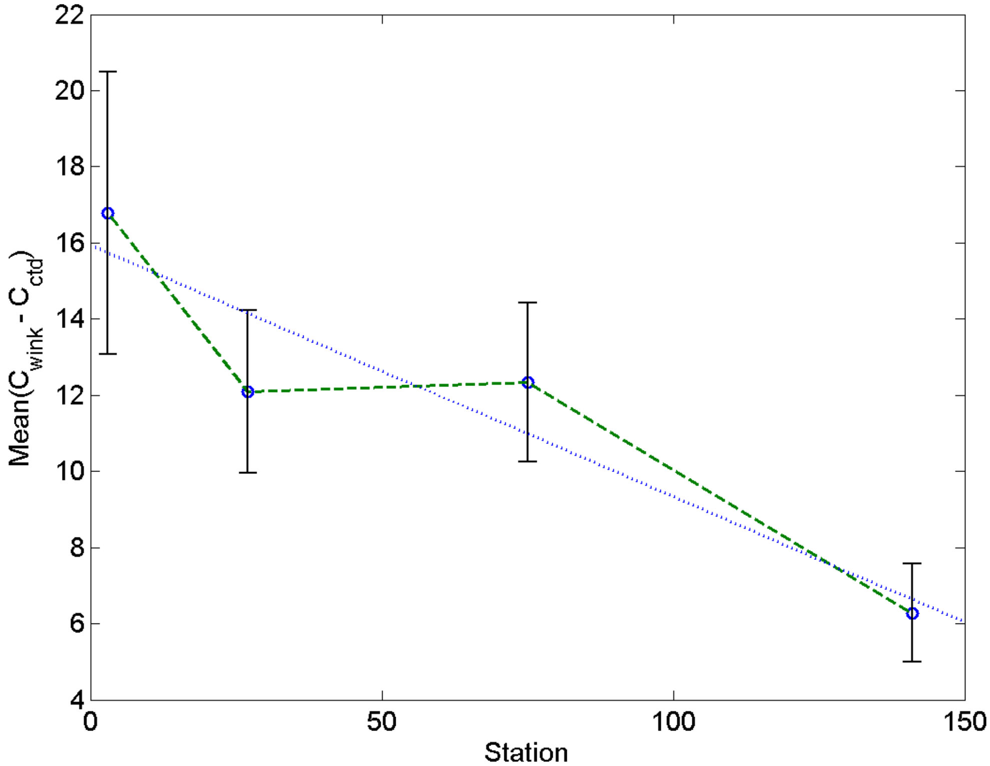

Fig. 12.5.3. Mean difference between Winkler and CTD oxygen concentration for each station. The error bars show one standard deviation of the differences for each station. The dotted line is a linear fit to the data used for correcting by station number.

After subtracting the mean difference from the individual differences for each station, the residual differences were plotted as a function of pressure (Fig. 12.5.4).

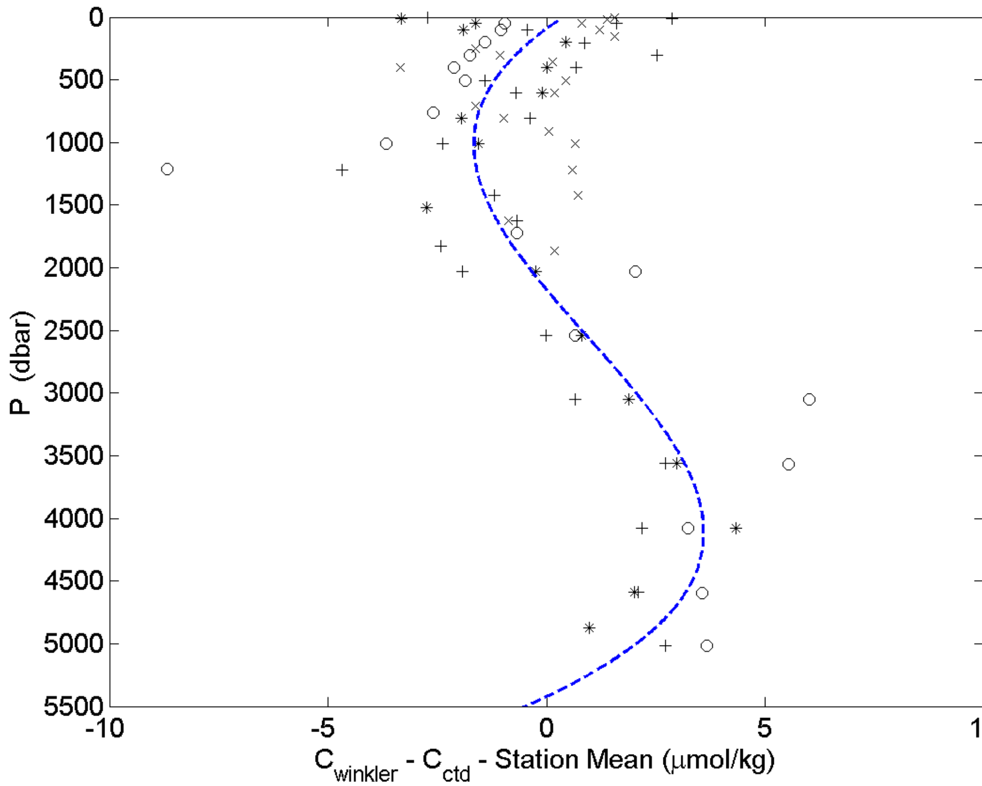

Fig. 12.5.4. Residual differences between the Winkler and CTD oxygen concentrations as a function of pressure. The mean difference for each station has been subtracted to obtain the residuals. The symbols identify the casts as listed in Table 12.5.1. The dashed curve is a cubic fit to the differences as a function of pressure. This curve will be used to correct the CTD concentrations.

It seems fruitful to correct the CTD oxygen concentrations with the cubic fit to pressure shown in Fig. 12.5.4, as well as with the linear fit to station number shown in Fig. 12.5.2. The equation for the correction is:

$$\Delta C = a_1 + a_2 n + b_1 + b_2 P + b_3 P^2 + b_4 P^3$$

Where the constants a_1 and a_2 are for the linear fit with station number, n, shown in Fig. 12.5.2, and the constants b_i (i = 1 to 4) represent the cubic fit with P shown in Fig. 12.5.3. The values of the constants are listed in Table 12.5.2. The units of P should be dbar. The correction ΔC is to be added to the CTD oxygen concentration originally produced by the calibration set prior to the cruise in the SBE Data Processing software.

Table 12.5.2. Constants for Correction of CTD Oxygen Readings.

Constant	Value
a_1	15.9280
a_2	–0.06597
b_1	0.37672
b_2	–4.4058 E-03
b_3	2.7137 E-06
b_4	–3.5316 E-10

Fig. 12.5.5 shows the residuals if this correction is made, in addition to the correction for the station number from the linear fit shown in Fig. 12.5.3. The range of the residuals is about 10 μmol/kg, the mean residual is 0.11 μmol/kg, and the square root of the variance is 2.2 μmol/kg. The square root of the variance of the original differences shown in Fig. 12.5.2 is 4.4 μmol/kg, so the corrections have reduced the variance, relative to a constant mean offset, by a factor of 4. Either a formal application of statistics or an inspection of the various figures suggest that an uncertainty of 5 μmol/kg be assigned to the oxygen concentrations from the CTD sensor after calibration is applied, in the sense of 95% confidence limits.

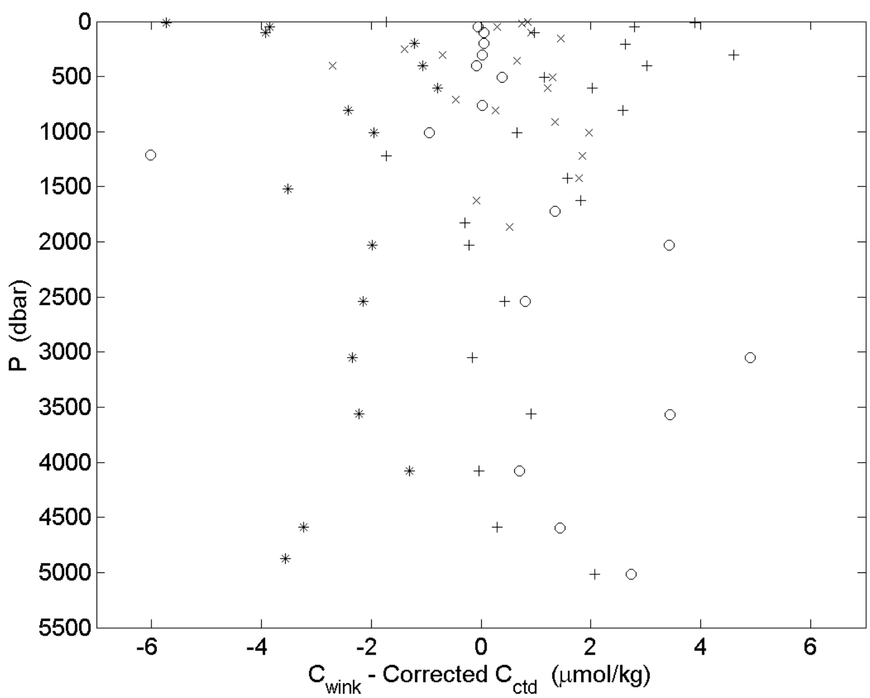

Fig. 12.5.5. Scatter plot of the differences between the Winkler concentrations and the CTD concentrations after the latter have been corrected for both the linear dependence on station number shown in Fig. 12.5.3 and the cubic fit shown in Fig. 12.5.4. The symbols identify the stations as listed in Table 12.5.1.

13. Tracer Simulation Based on Altimetry

Larry Anderson, Valery Kosnyrev, and James R. Ledwell
(Larry Anderson and Valery Kosnyrev are at Woods Hole Oceanographic Institution, landerson@whoi.edu, vkosnyrev@whoi.edu.)

A simulation of tracer dispersion based on sea surface height from real-time altimetry was used to guide the tracer survey. The simulation uses a velocity at the depth of the tracer which is a fixed fraction of the geostrophic velocity at the surface based on sea surface height, or more precisely, Absolute Dynamic Topography (ADT). Lateral diffusion in the simulation is Fickian with a constant diffusivity. Both the coefficient applied to the surface velocity and the constant diffusivity are adjustable to try to match the observations. It seemed that a coefficient of 0.38 gave about the right amount of eastward advection of the tracer patch (Fig. 13.1). This estimate was arrived at gradually as data arrived. The lateral diffusivity was set at 2 m^2/s. This value gives a tracer distribution which is quite streaky, as is the observed distribution. Lowering the lateral diffusivity to 1 m^2/s had little effect in the simulation, suggesting that we had hit the numerical limitations.

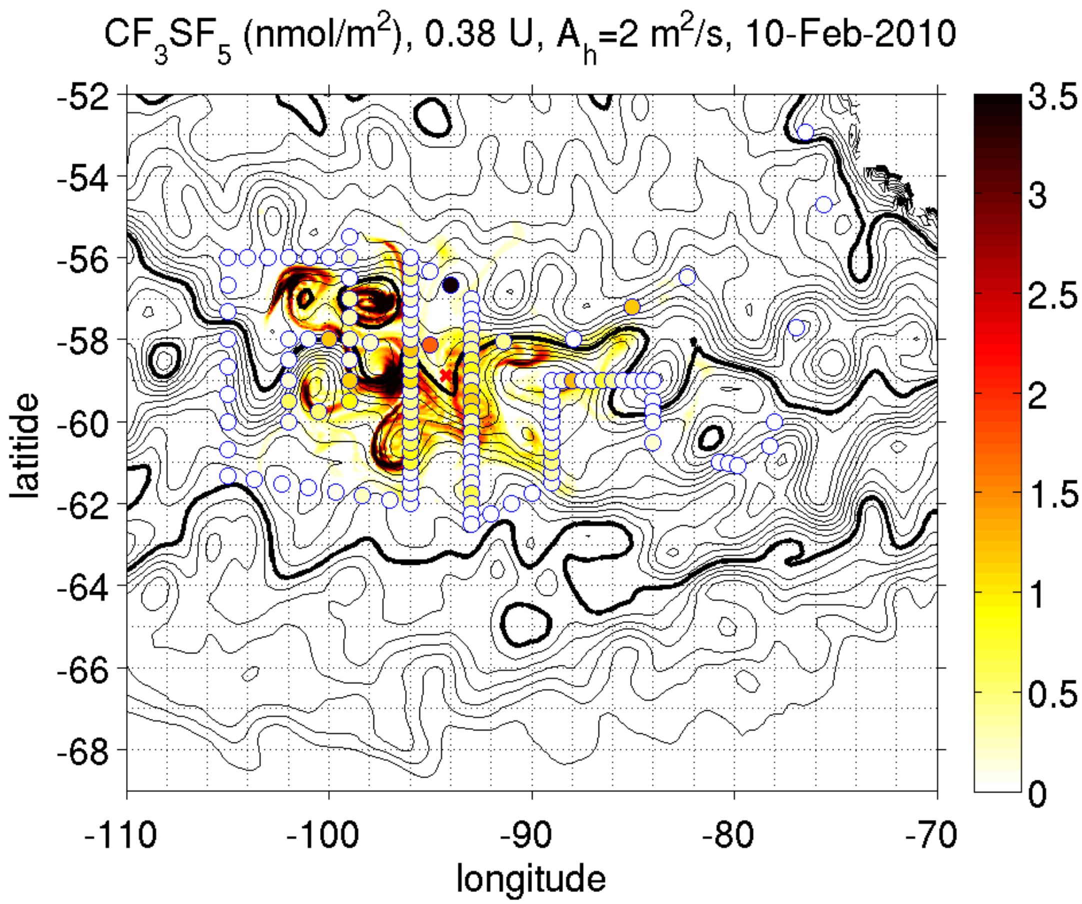

Fig. 13.1. Simulated tracer distribution (color) overlaid on the observed tracer distribution (circles colored with the same color scale. The contour interval for the Absolute Dynamic Topography lines (black) is 50 mm.

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Appendices

Appendix A. Cruise Participants

Patrick Neil A'Hearn, UW, Marine Technician
Angel Ruiz Angulo, LDEO, Scientist
David Ciochetto, WHOI, Technician
Gillian Damerell, UEA, Grad Student
Ken Decoteau, WHOI, Technician
Catherine Grendi, Catholic University of the Holy Conception, Chilean Observer
Brian Guest, WHOI, Technician
Robert Hagg, UW, Lead Marine Technician
Jay Hooper, FSU, Grad Student
Leah Houghton, WHOI, Technician
Andrew Kowalczyk, FSU, Technician
Richard Krishfield, WHOI, Technician
Steve Lambert, FSU, Grad Student
Peter Lazarevich, FSU, Scientist
James Ledwell, WHOI, Chief Scientist
Thomas Aaron Morello, UW, Marine Technician
Craig Daniel Rye, UEA, Grad Student
Louis St. Laurent, WHOI, Scientist
Cynthia Sellers, WHOI, Technician
John Toole, WHOI, Scientist
Dave Wellwood, WHOI, Technician

FSU: Florida State University
LDEO: Lamont-Doherty Earth Observatory
UEA: University of East Anglia
UW: University of Washington
WHOI: Woods Hole Oceanographic Institution

Appendix B. Crew List

University of Washington, School of Oceanography
Ship: R/V Thompson **Cruise:** 09H/TN-246
Port: Punta Arenas to Punta Arenas **Dates:** 1/15-3/5/10

Full Name	Position
Smith, Philip Alan	Master
Wilson, John Kimball	Ch Mate
Drake, Thomas Glynn	2 Mate
Haugland, Steven Gary	3 Mate
Clampitt, Brian William	AB
Spetla, Frank Leo Jr.	AB
Worrad, Robert Donavin	AB
Hansen, Michael Lauren	AB
Piscitello, Peter Charles	AB
Machado, Ezequiel Eduardo	AB
Anderson, Terrence Sigfred	Ch Engr
Swanton, James Thomas	1 Asst Engr
Aguiar, Christina Maria	2 Asst Engr
Castner, Dominic Raymond	3 Asst Engr
Yordan, Mario Salvan	Oiler
Rowley, Russell Richard	Oiler
McCormick, Richard T.	Oiler
Gardner, Kimberly Marie	Wiper
Wicker, Sarah Lee	Ch Stwd
Balbon, Anthony Tirol	2 C-B
Singerline, Terence	Mess Attd

Appendix C. Event Log

Event Log												
% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT. Number - running total for each instrument.												
% Save filtered file with just text values and period at the end as CSV format. Read cvs formatted file into matlab data cell with read_event_log.m												
% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.												
% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	1	16	15	30	NaN	NaN	CTD	NaN	NaN	1	NaN	Aborted (Left PA ~ 11:00 Z on 1/15/10)
2010	1	16	18	42	54.6948	75.5967	CTD	1	1	1	3503	Test Cast
2010	1	16	22	6	54.8996	75.6654	XBT	1.5	1	1	1000	TF 00000000
2010	1	17	12	37	57.7007	76.9615	CTD	2	2	1	4951	Calibration cast; aim to get water of many S and O2 values
2010	1	17	16	48	57.7008	76.9615	HRP	2	1	1	1002	HRP depths in db
2010	1	18	6	0	60.0003	77.9998	CTD	3	3	1	4911	
2010	1	18	16	48	59.9392	78.0033	Mooring	3	1	NaN	4950	Mooring 7; Time when anchor over.
2010	1	18	17	17	59.9358	78.0043	HRP	3	2	NaN	2002.7	
2010	1	18	23	6	60.5903	78.2583	CTD	4	4	1	2010	
2010	1	19	7	0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	times approx.; left site to return to PA. Cpt. Phil passed away.
2010	1	22	23	0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	times approx. docked at PA after 10 h standing in harbor
2010	1	24	12	10	NaN	NaN	NaN	NaN	NaN	NaN	NaN	times approx. Depart PA again

Event Log, continued												
% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT. Number - running total for each instrument.												
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% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.												
% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	1	25	16	9	52.9433	76.4945	CTD	5	5	1	2506	Collect blanks with no tracer.
2010	1	26	0	22	53.45	77.4	CTD	5.5	NaN	1	500	Test cast; (Check DAS log for actual position)
2010	1	27	7	12	56.48	82.2998	CTD	6	6	1	3001	
2010	1	27	9	47	56.4822	82.2972	DMP	6	1	NaN	985	Launch. Recovery time = 10:42. SN010
2010	1	27	19	33	57.2032	85.0301	CTD	7	7	1	3003	
2010	1	27	NaN	NaN	57.2098	85.0301	DMP	7	2	NaN	2002	SN010
2010	1	28	9	14	58	87.9302	CTD	8	8	1	3002	
2010	1	28	10	28	58	87.9302	HRP	8	3	NaN	2000	
2010	1	28	22	8	58.0498	91.3704	CTD	9	9	1	2001	
2010	1	28	22	35	58.0496	91.3705	HRP	9	4	NaN	3000	
2010	1	29	10	53	58.1192	95.0143	CTD	10	10	1	2001	
2010	1	29	11	15	58.12	95.015	HRP	10	5	NaN	3000	
2010	1	29	19	15	58.1304	96.9382	Shearm eter	10.5	1	NaN	NaN	Shearmeter 8; short test; never recovered
2010	1	29	22	25	58.0688	97.9883	HRP	11	6	NaN	3000	
2010	1	29	22	26	58.0688	97.9883	CTD	11	11	1	2002	Target surface 1605 m
2010	1	30	3	52	58.0018	99.003	HRP	12	7	NaN	3000	
2010	1	30	4	12	58.0018	99.0032	CTD	12	12	1	2002	
2010	1	30	7	40	58.25	99	XBT	12.5	2	7	1000	TF_00007. edf; #2-6 were tests and no drops; TF; 00010617
2010	1	30	8	59	58.4978	98.9933	HRP	13	8	NaN	3000	

Event Log, continued

% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT.
Number - running total for each instrument.

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Read cvs formatted file into matlab data cell with read_event_log.m

% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.

% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	1	30	9	13	58.5002	99	CTD	13	13	1	2002	
2010	1	30	13	8	58.7526	98.9748	XBT	13.5	3	8	1800	T5_00008. edf; T5; 00348325
2010	1	30	14	36	59.0007	98.9928	HRP	14	9	NaN	3000	
2010	1	30	14	47	59.001	98.9985	CTD	14	14	1	2002	
2010	1	30	18	35	59.2522	98.985	XBT	14.5	4	9	1800	T5 00348326
2010	1	30	20	10	59.4998	98.9968	HRP	15	10	NaN	NaN	Early weight release / no data
2010	1	30	20	17	59.5005	98.9987	CTD	15	15	1	2002	
2010	1	31	2	51	59.748	100.493	HRP	16	11	NaN	3000	
2010	1	31	4	35	59.748	100.495	CTD	16	16	1	2003	recovery location and time
2010	1	31	10	5	59.9967	101.999	CTD	17	17	1	2004	
2010	1	31	17	8	59.4973	101.994	CTD	18	18	1	2004	
2010	1	31	22	0	59.0028	101.999	CTD	19	19	1	2001	
2010	2	1	2	16	58.4918	101.985	CTD	20	20	1	2004	
2010	2	1	6	56	57.998	102	CTD	21	NaN	1	300	Full depth cast; ~4480 m cast. Abort - at 300 m CTD failed
2010	2	1	21	35	58.169	102.021	Mooring	21.5	2	NaN	4770	Mooring #6; anchor over; depth ~4770 m
2010	2	1	23	28	57.9993	101.998	CTD	21	21	2	2003	with new CTD S/N 91416
2010	2	2	6	5	57.992	101.003	CTD	22	22	1	2003	
2010	2	2	11	48	57.9965	99.995	CTD	23	23	1	2001	
2010	2	2	18	2	57.448	99.0033	CTD	24	24	1	2001	
2010	2	2	22	32	57.003	98.9938	CTD	25	25	1	2000	
2010	2	3	2	50	56.5028	98.9942	CTD	26	26	1	2001	

Event Log, continued												
% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT. Number - running total for each instrument.												
% Save filtered file with just text values and period at the end as CSV format. Read cvs formatted file into matlab data cell with read_event_log.m												
% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.												
% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	3	7	17	56.0003	98.9995	CTD	27	27	1	4779	Full depth; oxygen cast
2010	2	3	8	19	56.0003	98.9995	HRP	27	12	NaN	4000	
2010	2	3	11	14	56.0017	98.9943	XCTD	27	1	13	1100	C3_00013.edf; C3; 08112116
2010	2	3	14	8	55.4997	99.0027	HRP	28	13	NaN	3700	
2010	2	3	14	19	55.5013	99.0048	CTD	28	28	1	2004	
2010	2	3	16	42	55.4926	99.0127	HRP	28	13	NaN	3700	Recovered. Remained on station to work on HRP winch & shift to DMP
2010	2	3	20	30	55.9963	98.9992	CTD	29	29	1	2001	
2010	2	3	22	21	55.997	98.9994	DMP	29	3	NaN	2002	recovered; SN010
2010	2	3	22	55	55.999	99.0903	EM-APEX	29	1	NaN	NaN	B/C 1280260 S/N 4815
2010	2	4	2	7	56.0003	99.9987	CTD	30	30	1	2002	
2010	2	4	2	19	56.0003	99.9986	DMP	30	4	NaN	2417	3000 m; deploy; SN010
2010	2	4	8	10	56.0017	100.982	CTD	31	31	1	2001	
2010	2	4	14	7	56.0003	101.995	CTD	32	32	1	2002	
2010	2	4	20	14	55.9995	102.995	CTD	33	33	1	2005	
2010	2	5	3	29	55.9975	103.998	CTD	34	34	1	2002	
2010	2	5	8	30	55.9982	104.967	XCTD	35	2	14	218	only went to ~200 m; wind blew wire into ship; snagged and broke.
2010	2	5	8	47	55.9983	104.993	DMP	35	5	NaN	3023	
2010	2	5	9	2	55.999	104.997	CTD	35	35	1	2004	
2010	2	5	11	44	56.0028	104.983	RAFOS	35	1	NaN	NaN	838

Event Log, continued

% Station = physical location.   Cast - number of casts at that station for CTD and file number for XCTD and XBT.
Number - running total for each instrument.

% Save filtered file with just text values and period at the end as CSV format.
Read cvs formatted file into matlab data cell with read_event_log.m

% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.

% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	5	11	46	56.0028	104.983	RAFOS	35	2	NaN	NaN	837
2010	2	5	11	48	56.003	104.982	RAFOS	35	3	NaN	NaN	831
2010	2	5	11	50	56.0032	104.982	RAFOS	35	4	NaN	NaN	881
2010	2	5	11	53	56.0032	104.982	RAFOS	35	5	NaN	NaN	887
2010	2	5	11	56	56.0032	104.982	RAFOS	35	6	NaN	NaN	880
2010	2	5	13	55	56.332	104.999	XBT	36	5	15	1342	T5; 00348327; T5_00015.edy
2010	2	5	14	6	56.3323	104.999	RAFOS	36	7	NaN	NaN	846
2010	2	5	14	8	56.3323	104.999	RAFOS	36	8	NaN	NaN	853
2010	2	5	14	10	56.3325	104.999	RAFOS	36	9	NaN	NaN	840
2010	2	5	14	12	56.3325	104.999	RAFOS	36	10	NaN	NaN	871
2010	2	5	14	16	56.3325	104.999	RAFOS	36	11	NaN	NaN	870
2010	2	5	14	19	56.3325	104.999	RAFOS	36	12	NaN	NaN	891
2010	2	5	16	24	56.6667	105	DMP	37	6	NaN	3023	SN010; recovered 18:33
2010	2	5	16	20	56.669	105	XCTD	37	3	16	1100	C3 08112119; c3_00016
2010	2	5	16	34	56.669	105	CTD	37	36	1	2004	
2010	2	5	18	49	56.6687	104.997	RAFOS	37	13	NaN	NaN	852
2010	2	5	18	49	56.6687	104.997	RAFOS	37	14	NaN	NaN	851
2010	2	5	18	49	56.6687	104.997	RAFOS	37	15	NaN	NaN	845
2010	2	5	18	49	56.6687	104.997	RAFOS	37	16	NaN	NaN	886
2010	2	5	18	49	56.6687	104.997	RAFOS	37	17	NaN	NaN	873
2010	2	5	18	58	56.6687	104.997	RAFOS	37	18	NaN	NaN	872
2010	2	5	19	1	56.6687	104.997	SOLO	37	1	NaN	NaN	963
2010	2	5	20	58	56.9999	105	XBT	38	6	17	1800	T5 00348328; T5_00017
2010	2	5	21	7	57	105	RAFOS	38	19	NaN	NaN	904
2010	2	5	21	9	57	105	RAFOS	38	20	NaN	NaN	832
2010	2	5	21	17	57	105	RAFOS	38	21	NaN	NaN	824
2010	2	5	21	18	57	105	RAFOS	38	22	NaN	NaN	829

Event Log, continued												
% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT. Number - running total for each instrument.												
% Save filtered file with just text values and period at the end as CSV format. Read cvs formatted file into matlab data cell with read_event_log.m												
% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.												
% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	5	21	20	57	105	RAFOS	38	23	NaN	NaN	899
2010	2	5	21	22	57	105	RAFOS	38	24	NaN	NaN	898
2010	2	5	23	24	57.3319	105	XCTD	39	4	18	500	C3 08112112
2010	2	5	23	33	57.3333	105	DMP	39	7	NaN	3023	SN010
2010	2	5	23	36	57.3318	105	CTD	39	37	1	2002	
2010	2	6	1	50	57.3318	104.983	RAFOS	39	25	NaN	NaN	825
2010	2	6	1	52	57.3318	104.983	RAFOS	39	26	NaN	NaN	826
2010	2	6	1	53	57.3318	104.983	RAFOS	39	27	NaN	NaN	828
2010	2	6	1	54	57.3318	104.983	RAFOS	39	28	NaN	NaN	900
2010	2	6	1	56	57.3318	104.983	RAFOS	39	29	NaN	NaN	888
2010	2	6	1	57	57.3318	104.983	RAFOS	39	30	NaN	NaN	889
2010	2	6	3	52	57.6699	105.006	XBT	40	7	19	370	T5 00348332; T5_00019.edf
2010	2	6	3	58	57.6699	105.006	SOLO	40	2	NaN	NaN	964
2010	2	6	4	1	57.6698	105.006	RAFOS	40	31	NaN	NaN	864
2010	2	6	4	3	57.6698	105.006	RAFOS	40	32	NaN	NaN	841
2010	2	6	4	5	57.6698	105.006	RAFOS	40	33	NaN	NaN	842
2010	2	6	4	7	57.6698	105.006	RAFOS	40	34	NaN	NaN	894
2010	2	6	4	9	57.6698	105.006	RAFOS	40	35	NaN	NaN	895
2010	2	6	4	13	57.6698	105.006	RAFOS	40	36	NaN	NaN	901
2010	2	6	5	55	57.9919	105.005	XCTD	41	5	20	1100	C3 08112115; C3_00020.edf
2010	2	6	6	4	57.9997	105.004	DMP	41	8	NaN	3023	SN010
2010	2	6	6	18	58.0005	105.004	CTD	41	38	1	2003	
2010	2	6	8	33	58.0042	105.005	RAFOS	41	37	NaN	NaN	844
2010	2	6	8	35	58.0042	105.005	RAFOS	41	38	NaN	NaN	843
2010	2	6	8	36	58.0042	105.005	RAFOS	41	39	NaN	NaN	863
2010	2	6	8	40	58.0042	105.005	RAFOS	41	40	NaN	NaN	893
2010	2	6	8	42	58.0042	105.005	RAFOS	41	41	NaN	NaN	892
2010	2	6	8	43	58.0042	105.005	RAFOS	41	42	NaN	NaN	905

Event Log, continued													
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% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	6	10	31	58.3332	104.997	XBT	42	8	21	1800	T5 00348331; T5_0021.edf
2010	2	6	10	41	58.3333	104.997	RAFOS	42	43	NaN	NaN	822
2010	2	6	10	42	58.3335	104.997	RAFOS	42	44	NaN	NaN	835
2010	2	6	10	44	58.3335	104.997	RAFOS	42	45	NaN	NaN	836
2010	2	6	10	48	58.3335	104.997	RAFOS	42	46	NaN	NaN	877
2010	2	6	10	49	58.3335	104.997	RAFOS	42	47	NaN	NaN	876
2010	2	6	10	50	58.3335	104.997	RAFOS	42	48	NaN	NaN	909
2010	2	6	12	48	58.6658	105	DMP	43	9	NaN	3023	SN010
2010	2	6	13	6	58.6658	104.997	CTD	43	39	1	2003	
2010	2	6	15	35	58.679	104.98	RAFOS	43	49	NaN	NaN	857
2010	2	6	15	36	58.6798	104.98	RAFOS	43	50	NaN	NaN	858
2010	2	6	15	37	58.679	104.98	RAFOS	43	51	NaN	NaN	867
2010	2	6	15	39	58.679	104.98	RAFOS	43	52	NaN	NaN	908
2010	2	6	15	40	58.679	104.98	RAFOS	43	53	NaN	NaN	890
2010	2	6	15	41	58.679	104.98	RAFOS	43	54	NaN	NaN	883
2010	2	6	17	29	59.0032	105	XBT	44	9	22	1800	T5 00348330; T5_00022
2010	2	6	17	40	59.0038	104.998	RAFOS	44	55	NaN	NaN	859
2010	2	6	17	41	59.0038	104.998	RAFOS	44	56	NaN	NaN	860
2010	2	6	17	42	59.0037	104.998	RAFOS	44	57	NaN	NaN	866
2010	2	6	17	42	59.0037	104.998	RAFOS	44	58	NaN	NaN	903
2010	2	6	17	43	59.0037	104.998	RAFOS	44	59	NaN	NaN	882
2010	2	6	17	43	59.0037	104.998	RAFOS	44	60	NaN	NaN	879
2010	2	6	19	26	59.3306	105	XCTD	45	6	23	1100	C3 08112114; C3_00023
2010	2	6	19	46	59.337	104.993	HRP	45	14	NaN	4000	
2010	2	6	19	49	59.336	104.994	CTD	45	40	1	2001	24604501
2010	2	6	22	57	59.3488	104.993	SOLO	45	3	NaN	NaN	962
2010	2	6	22	59	59.3487	104.993	RAFOS	45	61	NaN	NaN	849
2010	2	6	22	59	59.3487	104.993	RAFOS	45	62	NaN	NaN	850

Event Log, continued													
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% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	6	23	0	59.3488	104.993	RAFOS	45	63	NaN	NaN	868
2010	2	6	23	0	59.3488	104.993	RAFOS	45	64	NaN	NaN	902
2010	2	6	23	1	59.3487	104.993	RAFOS	45	65	NaN	NaN	878
2010	2	6	23	1	59.3487	104.993	RAFOS	45	66	NaN	NaN	885
2010	2	6	23	14	59.3488	104.993	XCTD	45	7	25	855	C3 08112111; C3_00025
2010	2	6	23	26	59.3492	104.992	XBT	45	10	26	855	T5 00000000; T5_00026
2010	2	7	1	17	59.6675	104.999	XBT	46	11	29	1200	T5 00348335; T5_00029
2010	2	7	1	25	59.6675	104.999	RAFOS	46	67	NaN	NaN	869
2010	2	7	1	25	59.6675	104.999	RAFOS	46	68	NaN	NaN	817
2010	2	7	1	26	59.6675	104.999	RAFOS	46	69	NaN	NaN	818
2010	2	7	1	26	59.6675	104.999	RAFOS	46	70	NaN	NaN	884
2010	2	7	1	27	59.6675	104.999	RAFOS	46	71	NaN	NaN	875
2010	2	7	1	27	59.6675	104.999	RAFOS	46	72	NaN	NaN	906
2010	2	7	3	26	60.0022	104.993	CTD	47	41	1	2002	24604701
2010	2	7	5	8	60.0022	104.993	RAFOS	47	73	NaN	NaN	827
2010	2	7	5	9	60.0022	104.993	RAFOS	47	74	NaN	NaN	823
2010	2	7	5	10	60.0022	104.993	RAFOS	47	75	NaN	NaN	855
2010	2	7	5	11	60.0022	104.993	RAFOS	47	76	NaN	NaN	874
2010	2	7	5	12	60.0022	104.993	RAFOS	47	77	NaN	NaN	897
2010	2	7	5	13	60.0022	104.993	RAFOS	47	78	NaN	NaN	907
2010	2	7	6	55	60.3194	104.998	XBT	48	12	30	1800	T5 00348334; T5_00030
2010	2	7	7	9	60.3338	104.997	SOLO	48	4	NaN	NaN	965
2010	2	7	7	16	60.3368	104.999	RAFOS	48	79	NaN	NaN	821
2010	2	7	7	17	60.3368	104.999	RAFOS	48	80	NaN	NaN	862
2010	2	7	7	18	60.3367	104.999	RAFOS	48	81	NaN	NaN	861
2010	2	7	7	20	60.3368	104.999	RAFOS	48	82	NaN	NaN	896
2010	2	7	7	21	60.3368	104.999	RAFOS	48	83	NaN	NaN	910

Event Log, continued													
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% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	7	7	22	60.3368	104.999	RAFOS	48	84	NaN	NaN	854
2010	2	7	9	4	60.6502	104.989	XCTD	49	8	31	40	C3 08112122; C3_00031
2010	2	7	9	18	60.6687	104.998	HRP	49	15	NaN	NaN	deploy; no data; software issue
2010	2	7	9	32	60.6667	105	CTD	49	42	1	2004	24604901
2010	2	7	12	27	60.6703	104.985	RAFOS	49	85	NaN	NaN	856
2010	2	7	12	28	60.6703	104.984	RAFOS	49	86	NaN	NaN	834
2010	2	7	12	29	60.6703	104.985	RAFOS	49	87	NaN	NaN	833
2010	2	7	12	30	60.6703	104.985	RAFOS	49	88	NaN	NaN	914
2010	2	7	12	32	60.6703	104.984	RAFOS	49	89	NaN	NaN	915
2010	2	7	12	35	60.6703	104.984	RAFOS	49	90	NaN	NaN	911
2010	2	7	14	20	60.992	104.999	XBT	50	13	32	1800	T5 00348329; T5_00032
2010	2	7	14	31	60.9992	105	RAFOS	50	91	NaN	NaN	865
2010	2	7	14	32	60.9992	105	RAFOS	50	92	NaN	NaN	815
2010	2	7	14	33	60.9992	105.001	RAFOS	50	93	NaN	NaN	816
2010	2	7	14	35	60.9992	105	RAFOS	50	94	NaN	NaN	913
2010	2	7	14	36	60.999	105.001	RAFOS	50	95	NaN	NaN	912
2010	2	7	14	38	60.999	105	RAFOS	50	96	NaN	NaN	918
2010	2	7	16	36	61.333	105	CTD	51	43	1	2002	
2010	2	7	18	23	61.3335	105.023	EM-APEX	51	2	NaN	NaN	4814
2010	2	7	18	26	61.3332	105	RAFOS	51	97	NaN	NaN	819
2010	2	7	18	27	61.333	105	RAFOS	51	98	NaN	NaN	830
2010	2	7	18	28	61.3332	105	RAFOS	51	99	NaN	NaN	820
2010	2	7	18	28	61.3332	105	RAFOS	51	100	NaN	NaN	916
2010	2	7	18	28	61.333	105	RAFOS	51	101	NaN	NaN	917
2010	2	7	18	29	61.333	105	RAFOS	51	102	NaN	NaN	919
2010	2	7	22	10	61.4167	104.997	DMP	52	10	NaN	3023	SN010
2010	2	7	22	16	61.4168	103.67	CTD	52	44	1	2003	
2010	2	8	4	8	61.5167	102.333	DMP	53	11	NaN	3023	SN010

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% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	8	4	24	61.5162	102.335	CTD	53	45	1	2004	24605301
2010	2	8	10	7	61.616	100.999	HRP	54	16	NaN	4000	
2010	2	8	10	19	61.6177	101	CTD	54	46	1	2001	24605401
2010	2	8	16	31	61.7163	99.6672	CTD	55	47	1	2002	24605601
2010	2	8	21	33	61.8167	98.3333	DMP	56	12	NaN	3023	SN010
2010	2	8	21	37	61.8172	98.3313	CTD	56	48	1	2002	24605601
2010	2	9	3	27	61.9167	97	DMP	57	13	NaN	3023	SN010
2010	2	9	3	39	61.916	97.0005	CTD	57	49	1	2002	24605701
2010	2	9	9	6	62	95.9997	HRP	58	17	Nan	4000	
2010	2	9	9	19	62	95.9998	CTD	58	50	1	2004	24605801
2010	2	9	13	36	61.7485	96.0002	CTD	59	51	1	2002	24605901
2010	2	9	16	56	61.5007	96	CTD	60	52	1	2002	24606001
2010	2	9	16	44	61.501	96	HRP	60	18	NaN	4001	
2010	2	10	1	1	61.2495	95.9947	CTD	61	53	1	2003	
2010	2	10	6	8	60.999	95.999	HRP	62	19	NaN	4000	
2010	2	10	4	27	60.999	95.9995	CTD	62	54	1	2004	24606201
2010	2	10	8	45	60.7497	96.0002	CTD	63	55	1	2003	24606301
2010	2	10	11	47	60.499	96.002	HRP	64	20	NaN	4000	
2010	2	10	12	0	60.4963	96.0065	CTD	64	56	1	2002	24606501
2010	2	10	16	21	60.2475	96.0017	CTD	65	57	1	2004	24606601
2010	2	10	19	22	60.0102	96.0026	XCTD	66	9	35	1100	C3 08112118
2010	2	10	19	34	60	96	DMP	66	14	NaN	3023	SN008
2010	2	10	19	41	59.9982	96.0017	CTD	66	58	1	2002	24606601
2010	2	10	23	40	59.7528	96.0003	CTD	67	59	1	2003	24606701
2010	2	11	2	47	59.4998	95.9947	XCTD	68	10	36	1100	C3 08112117; C3_00036
2010	2	11	3	0	59.5	96	DMP	68	15	NaN	3023	SN008
2010	2	11	3	13	59.4893	95.9955	CTD	68	60	1	2001	24606801
2010	2	11	7	0	59.2512	95.9987	CTD	69	61	1	2003	24606901
2010	2	11	9	54	59.0079	95.9908	XCTD	70	11	37	1100	C3 08112121; C3_00037

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% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	11	10	22	58.9995	95.9998	CTD	70	62	1	2003	24607001
2010	2	11	13	57	58.7477	95.9998	CTD	71	63	1	2002	24607101
2010	2	11	17	20	58.5063	96.0015	XCTD	72	12	38	1100	C3 08112120; C3_00038
2010	2	11	18	34	58.4975	96.0057	CTD	72	64	1	2002	24607201
2010	2	11	21	35	58.2566	96.0002	XCTD	73	13	39	522	C3 08112110; C3_00039; data collected to 857 m T bad after ~525 m
2010	2	11	21	51	58.25	96	HRP	73	21	NaN	4003	
2010	2	11	21	56	58.2503	96.0008	CTD	73	65	1	2003	
2010	2	11	23	44	58.2507	96.0024	EM-APEX	73	3	NaN	NaN	4813
2010	2	12	2	18	58.0007	95.9993	CTD	74	66	1	2004	24607401
2010	2	12	5	27	57.751	95.9985	CTD	75	NaN	1	4912	24607501
2010	2	12	10	1	57.7548	95.9835	CTD	75	67	2	2002	24607502
2010	2	12	6	17	57.755	95.983	HRP	75	22	NaN	4000	
2010	2	12	14	31	57.5091	95.9959	XCTD	76	14	40	1100	C3 08112109; C3_00040; 0.59 - 0.33 nmiles
2010	2	12	14	39	57.504	95.995	HRP	76	23	NaN	4000	
2010	2	12	14	50	57.5032	95.9965	CTD	76	68	1	2001	24607601
2010	2	12	19	13	57.25	96.0003	CTD	77	69	1	2003	24607701
2010	2	12	22	17	57.0059	95.9925	XCTD	78	15	41	1100	C3 08112108; C3_00041
2010	2	12	22	34	57	95.999	HRP	78	24	NaN	4002	
2010	2	12	22	37	56.9998	95.9998	CTD	78	70	1	2000	24607801
2010	2	13	3	3	56.7495	96.0033	CTD	79	71	1	2002	24607901

Event Log, continued												
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% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	13	6	1	56.5155	96.0003	XCTD	80	16	42	1100	C3 08112105; C3_00042; 1 nm from station
2010	2	13	6	14	56.502	95.999	HRP	80	25	NaN	4000	
2010	2	13	6	24	56.5007	95.9983	CTD	80	72	1	2002	24608001
2010	2	13	11	31	56.2505	95.999	CTD	81	73	1	2001	24608101
2010	2	13	14	30	56.0168	95.9976	XCTD	82	17	43	1100	C3 08112106; C3_00043; 1.02 nm from station
2010	2	13	14	44	56.002	95.999	HRP	82	26	NaN	4000	
2010	2	13	14	51	56.0015	95.9982	CTD	82	74	1	2001	24608201
2010	2	13	20	59	56.3332	94.9995	CTD	83	75	1	2002	24608201
2010	2	14	2	0	56.666	93.9998	CTD	84	76	1	2002	24608301
2010	2	14	6	53	56.999	93.001	HRP	85	27	NaN	4000	
2010	2	14	7	21	56.9985	93	CTD	85	77	1	2002	24608501
2010	2	14	11	16	57.251	92.9995	CTD	86	78	1	2002	24608601
2010	2	14	13	53	57.244	93	HRP	86	28	NaN	4000	
2010	2	14	14	18	57.2553	93.0083	XDP	86	1	NaN	3732	sn 14; file 005; Box around STA. 1-2knts.
2010	2	14	18	26	57.5032	92.997	CTD	87	79	1	2001	24608701
2010	2	14	21	37	57.7498	92.9987	CTD	88	80	1	2001	24608801
2010	2	15	0	36	57.9907	92.9959	XCTD	89	18	44	1100	C3 08112107; C3_00044; 1100 m but spikes
2010	2	15	0	47	58.003	92.994	HRP	89	29	NaN	4000	
2010	2	15	0	53	58.0008	93.0005	CTD	89	81	1	2002	24608901
2010	2	15	5	12	58.2497	92.9978	CTD	90	82	1	2002	24609001

Event Log, continued

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Number - running total for each instrument.

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% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	15	8	10	58.4863	92.995	XCTD	91	19	45	1100	C3 08112104; C3_00045; 0.84 - 0.25 nm from station
2010	2	15	8	25	58.5	92.998	HRP	91	30	NaN	4000	
2010	2	15	8	34	58.5	92.9998	CTD	91	83	1	2001	24609101
2010	2	15	12	51	58.7502	93.0002	CTD	92	84	1	2004	24609201
2010	2	15	15	49	58.988	93.003	XCTD	93	20	46	1100	C3 08112103; C3_00046
2010	2	15	16	4	59.002	93.003	HRP	93	31	NaN	4002	
2010	2	15	19	24	59	93	DMP	93	16	NaN	4000	SN008; recovery; max t = 5535
2010	2	15	16	11	59.0028	93.0028	CTD	93	85	1	2002	24609301
2010	2	15	23	21	59.2494	93.0003	Shearm eter	94	2	NaN	NaN	s/n 1
2010	2	15	21	22	59.2493	93.0002	CTD	94	86	1	2002	24609401
2010	2	16	0	48	59.4997	92.9997	CTD	95	87	1	2000	24609501
2010	2	16	3	56	59.7495	92.9995	DMP	96	17	NaN	3023	SN008
2010	2	16	4	6	59.7497	93.0002	CTD	96	88	1	2002	24609601
2010	2	16	8	9	60.001	92.997	CTD	97	89	1	2002	24609701
2010	2	16	11	19	60.2492	92.9995	CTD	98	90	1	2001	24609801
2010	2	16	14	20	60.4849	92.9955	XCTD	99	21	47	1100	C3 08112102; C3_00047; 0.98 nm from station
2010	2	16	14	30	60.4982	92.9978	DMP	99	18	NaN	3023	SN008
2010	2	16	14	39	60.4995	92.9988	CTD	99	91	1	2003	24609901
2010	2	16	18	26	60.75	92.9993	CTD	100	92	1	2003	24610001
2010	2	16	21	21	60.9837	93.0053	XCTD	101	22	48	1100	C3 08112101; C3_00048; (no spikes)
2010	2	16	21	31	61	93	DMP	101	19	NaN	3023	SN080

Event Log, continued												
% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT. Number - running total for each instrument.												
% Save filtered file with just text values and period at the end as CSV format. Read cvs formatted file into matlab data cell with read_event_log.m												
% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.												
% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	16	21	48	60.9998	92.9998	CTD	101	93	1	2001	24610101
2010	2	17	1	44	61.2498	93.001	CTD	102	94	1	2002	24610201
2010	2	17	4	36	61.4845	92.999	XCTD	103	23	49	1100	C3 08112100; C3_00049
2010	2	17	5	0	61.4988	93.002	DMP	103	20	NaN	3023	SN080
2010	2	17	5	2	61.499	93.0027	CTD	103	95	1	2001	24610301
2010	2	17	8	58	61.7498	92.9998	CTD	104	96	1	2002	24610401
2010	2	17	11	45	61.9844	92.9931	XCTD	105	24	50	1100	C3 08112099; C3_00050; 0.96 nm from station
2010	2	17	12	0	61.9997	92.9978	DMP	105	21	NaN	4050	SN080
2010	2	17	12	8	62.0002	92.9995	CTD	105	97	1	2002	24610501
2010	2	17	16	42	62.2512	92.9967	CTD	106	98	1	2002	
2010	2	17	19	55	62.5	92.9998	CTD	107	99	1	2002	
2010	2	17	19	49	62.5002	92.9998	DMP	107	22	NaN	4050	SN080
2010	2	17	21	42	62.5016	93.0015	EM-APEX	107	4	NaN	NaN	4090
2010	2	18	1	50	62.249	91.9985	CTD	108	100	1	2001	24610801
2010	2	18	6	9	62.0007	91.0003	DMP	109	23	NaN	4000	
2010	2	18	6	19	62	90.9993	CTD	109	101	1	2002	24610901
2010	2	18	12	3	61.7497	90.0002	DMP	110	24	NaN	4000	
2010	2	18	12	12	61.7495	89.9978	CTD	110	102	1	2002	24611001
2010	2	18	12	40	61.7497	89.9978	HRP	111	32	Nan	4002	
2010	2	18	18	24	61.5002	88.9995	CTD	111	103	1	2001	24611101
2010	2	18	21	30	61.2499	88.9998	HRP	112	33	NaN	4000	
2010	2	18	21	33	61.25	88.9998	CTD	112	104	1	2001	24611201
2010	2	19	1	56	61	88.9993	CTD	113	105	1	2001	24611301
2010	2	19	5	2	60.75	89.0003	HRP	114	34	NaN	4002	
2010	2	19	5	10	60.75	89.001	CTD	114	106	1	2001	24611401
2010	2	19	9	27	60.4998	88.9998	CTD	115	107	1	2002	24611501
2010	2	19	12	20	60.2522	89.0005	HRP	116	35	NaN	4002	
2010	2	19	12	30	60.2498	89.0013	CTD	116	108	1	2001	24611601

Event Log, continued													
% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT. Number - running total for each instrument.													
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% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.													
% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	19	16	42	60.0002	89.0002	CTD	117	109	1	2001	24611701
2010	2	19	19	44	59.7497	89.0001	HRP	118	36	NaN	4002	
2010	2	19	19	47	59.75	89	CTD	118	110	1	2002	24611801
2010	2	20	0	2	59.5003	88.9995	CTD	119	111	1	2002	24611901
2010	2	20	1	51	59.5003	88.9996	Shearm eter	119	3	NaN	NaN	s/n 7; mission failed
2010	2	20	3	19	59.2533	88.9988	HRP	120	37	NaN	4002	
2010	2	20	3	27	59.2522	88.9995	CTD	120	112	1	2001	24612001
2010	2	20	7	49	59	88.9997	CTD	121	113	1	2001	24612101
2010	2	20	10	50	58.9988	88.4982	HRP	122	38	NaN	4003	
2010	2	20	11	0	58.9987	88.4965	CTD	122	114	1	2001	24612201
2010	2	20	16	1	59	88.0002	CTD	123	115	1	2001	24612301
2010	2	20	19	2	59.0002	87.4992	CTD	124	116	1	2002	24612401
2010	2	20	22	10	59.0003	87.0017	HRP	125	39	NaN	4002	
2010	2	20	22	14	58.9998	87.0012	CTD	125	117	1	2003	24612501
2010	2	21	2	49	59.0017	86.5013	CTD	126	118	1	2003	24612601
2010	2	21	5	49	59.0008	86.0057	HRP	127	40	NaN	4003	
2010	2	21	5	58	59.0005	86.0022	CTD	127	119	1	2001	24612701
2010	2	21	10	41	59.0002	85.5002	CTD	128	120	1	2003	24612801
2010	2	21	14	8	58.9997	84.999	CTD	129	121	1	2002	24612901
2010	2	21	17	21	58.9997	84.5018	CTD	130	122	1	2002	24613001 Z-drive failed after this cast?
2010	2	21	21	51	58.9993	83.9993	CTD	131	123	1	2003	24613101
2010	2	21	23	34	59	84.0002	EM-APEX	131	5	NaN	NaN	4089
2010	2	22	2	0	59.25	84	NaN	132	NaN	NaN	NaN	ABORTED
2010	2	22	5	20	59.4945	84.0007	CTD	133	124	1	2001	24613301
2010	2	22	12	42	59.7532	83.9975	CTD	134	125	1	2003	24613401
2010	2	22	16	49	59.995	84.0025	CTD	135	126	1	2003	24613501
2010	2	22	23	3	60.493	84.0022	CTD	137	127	1	2002	24613701; skipped station 136

Event Log, continued

% Station = physical location.   Cast - number of casts at that station for CTD and file number for XCTD and XBT.
Number - running total for each instrument.

% Save filtered file with just text values and period at the end as CSV format.
Read cvs formatted file into matlab data cell with read_event_log.m

% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.

% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	23	15	27	60.9848	80.7053	CTD	138	128	1	2002	24613801
2010	2	23	19	6	61.0265	80.2592	CTD	139	129	1	2003	24613901
2010	2	23	22	28	61.0632	79.8147	CTD	140	130	1	2001	24614001
2010	2	26	7	40	61.6638	65.4317	CTD	141	131	1	1844	24614101; full depth
2010	2	26	7	52	61.664	65.4332	HRP	141	41	NaN	1793	1790 m weight release
2010	2	26	8	35	61.6642	65.4338	DMP	141	25	NaN	1785	1785 m weight release
2010	2	26	15	18	61.1236	65.7805	XCTD	142	25	52	1100	C3 08080673; C3_00052
2010	2	26	15	52	61.1235	65.7922	CTD	142	132	1	3694	24614201; full depth
2010	2	26	16	16	61.1247	65.7913	DMP	142	26	NaN	3690	
2010	2	26	16	33	61.1255	65.7907	HRP	142	42	NaN	3674	
2010	2	27	0	9	60.5854	65.9727	XCTD	143	26	53	1100	C3 08080677; C3_00053
2010	2	27	0	39	60.5837	65.9743	CTD	143	133	1	1243	24614301
2010	2	27	0	55	60.5833	65.975	HRP	143	43	NaN	1203	
2010	2	27	8	19	59.9196	66.0887	XCTD	144	27	54	1100	C3 08080682; C3_00054
2010	2	27	8	35	59.9195	66.0887	CTD	144	134	1	3876	24614401; full depth
2010	2	27	8	54	59.9197	66.0887	HRP	144	44	NaN	3601	
2010	2	27	15	41	59.4294	66.0856	XCTD	145	28	55	1100	C3 08080680
2010	2	27	19	23	59.4185	66.0775	RAFOS	145	103	NaN	NaN	848
2010	2	27	19	24	59.4185	66.0775	RAFOS	145	104	NaN	NaN	847
2010	2	27	19	25	59.4185	66.0775	RAFOS	145	105	NaN	NaN	839
2010	2	27	19	28	59.4181	66.0773	EM-APEX	145	6	NaN	NaN	4812
2010	2	27	16	0	59.4165	66.0865	CTD	145	135	1	3479	24614501
2010	2	27	16	21	59.417	66.0872	HRP	145	45	NaN	3252	

Event Log, continued												
% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT. Number - running total for each instrument.												
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% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.												
% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	2	27	16	40	59.417	66.0871	DMP	145	27	NaN	3250	
2010	3	1	1	30	58.9325	66.062	CTD	146	136	1	2657	24614601
2010	3	1	4	5	58.9577	66.0792	XDP	146	2	NaN	1623	sn 16; file 012; Line 1-2knts. Into wind.
2010	3	1	5	11	58.9577	66.0792	XCTD	146	29	56	1100	C3 08080681; C3_00056
2010	3	1	8	39	58.6	66.1046	XCTD	147	30	57	1100	C3 08080679; C3_00057; 1.1-0.6 nm from station
2010	3	1	9	6	58.6083	66.1355	CTD	147	137	1	3660	24614701; full depth
2010	3	1	9	33	58.6084	66.1355	HRP	147	46	NaN	3702	
2010	3	1	15	39	58.2584	65.9917	XCTD	148	31	58	1100	C3 08080676
2010	3	1	15	54	58.2586	66.0047	CTD	148	138	1	2726	24614801
2010	3	1	16	41	58.2588	66.0045	DMP	148	28	NaN	2768	
2010	3	1	21	27	57.9769	65.9229	XCTD	149	32	59	1100	C3 08080678; C3_00059
2010	3	1	21	42	57.9767	65.9334	CTD	149	139	1	2512	24614901; full depth
2010	3	1	21	55	57.9767	65.9335	HRP	149	47	NaN	2438	
2010	3	2	3	51	57.55	65.6451	XCTD	150	33	60	1100	C3 08080672; C3_00060; 0.9-0.5 nm from station
2010	3	2	4	13	57.5635	65.6492	HRP	150	48	NaN	3150	
2010	3	2	4	31	57.5634	65.6485	DMP	150	29	NaN	3100	
2010	3	2	7	4	57.547	65.6298	XCTD	150	34	61	1100	C3 08080675
2010	3	2	17	48	56.1608	64.758	XCTD	151	35	62	1100	C3 08080674; C3_00062
2010	3	2	18	42	56.1313	64.7514	HRP	151	49	NaN	1352	

Event Log, continued													
% Station = physical location. Cast - number of casts at that station for CTD and file number for XCTD and XBT. Number - running total for each instrument.													
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% The percent signs are comments in Matlab to read in this file; the NaN values were blank in the log or not required.													
% Date (GMT)			Time (GMT)		Latitude (S)	Longitude (W)	Event	Station	Number	Cast	Max Depth | p	Comments
% Year	Month	Day	Hour	Min	(deg)	(deg)					(m) | (db)	
2010	3	2	18	28	56.1313	64.7514	DMP	151	30	NaN	1320	
2010	3	2	20	20	56.1291	64.7531	XDP	151	3	NaN	900	sn 13; file 018; Line 1-2knts at wind. Deep fish.
2010	3	3	0	17	55.6994	64.9561	XDP	152	4	NaN	1680	sn 17; file 022; Line 1-2knts. Shallow fish with bungie.
2010	3	3	1	9	55.7015	64.9737	XCTD	152	36	63	1100	C3 08080671; C3_00063
2010	3	3	4	22	55.3071	65.0481	XDP	153	5	NaN	1732	sn 15; file 026; Hove to instructions . Bungie.

Appendix D. CTD Cast List

CTD Cast List									
R/V *Thompson* TN246			DIMES Cruise US2			15 Jan–5 Mar 2010			
Station/ Cast	Date	Time GMT	Lat Deg(S)	Lon Deg(W)	Max Depth (m)	Target Sigma (m)	Target Surface (m)	PDR Depth (m)	EM300 Depth (m)
101	01/16/10	18:42	54.6948	75.5967	3503	27.6745	1911	4099	NaN
201	01/17/10	12:49	57.7005	76.9613	4951	27.6745	1721	4910	4992
301	01/18/10	6:07	60.0003	77.9995	4911	27.6745	1524	4945	4908
401	01/18/10	23:08	60.5903	78.2582	2010	27.6745	1448	NaN	4961
501	01/25/10	16:29	52.9432	76.4943	2506	27.6745	2022	4703	NaN
601	01/27/10	7:15	56.4800	82.2998	3001	27.6745	1852	4780	4765
701	01/27/10	19:37	57.2098	85.0298	3003	27.6745	1766	NaN	5466
801	01/28/10	9:14	58.0000	87.9300	3002	27.6745	1627	5201	5200
901	01/28/10	22:11	58.0497	91.3703	2001	27.6745	1533	4264	4259
1001	01/29/10	10:53	58.1192	95.0143	2001	27.6745	1634	4600	NaN
1101	01/29/10	22:31	58.0687	97.9883	2002	27.6745	1603	4825	NaN
1201	01/30/10	4:12	58.0018	99.0030	2002	27.6745	1561	4160	NaN
1301	01/30/10	9:14	58.5000	98.9998	2002	27.6745	1553	NaN	NaN
1401	01/30/10	14:49	59.0008	98.9985	2002	27.6745	1354	4840	NaN
1501	01/30/10	20:19	59.5003	98.9987	2002	27.6745	1205	4654	NaN
1601	01/31/10	2:57	59.7480	100.4945	2003	27.6745	1194	NaN	NaN
1701	01/31/10	10:05	59.9965	101.9990	2004	27.6745	1171	NaN	NaN
1801	01/31/10	17:10	59.4988	101.9942	2004	27.6745	1196	5109	NaN
1901	01/31/10	22:03	59.0027	101.9992	2001	27.6745	1275	4504	NaN
2001	02/01/10	2:19	58.4918	101.9850	2004	27.6745	1537	4467	NaN
2102	02/01/10	23:29	57.9990	101.9975	2003	27.6745	1660	4505	4457
2201	02/02/10	6:09	57.9920	101.0030	2003	27.6745	1575	4188	4147
2301	02/02/10	11:49	57.9965	99.9950	2001	27.6745	1532	4479	4464
2401	02/02/10	18:02	57.4980	99.0032	2001	27.6745	1511	4580	4587
2501	02/02/10	22:32	57.0028	98.9940	2000	27.6745	1450	4929	4958
2601	02/03/10	2:52	56.5028	98.9942	2001	27.6745	1657	4551	4527
2701	02/03/10	7:19	56.0002	98.9993	4779	27.6745	1803	4750	4790
2801	02/03/10	14:20	55.5012	99.0048	2004	27.6745	1777	NaN	NaN
2901	02/03/10	20:31	55.9968	98.9993	2001	27.6745	1814	4761	NaN
3001	02/04/10	2:09	56.0002	99.9985	2002	27.6745	1802	4562	NaN
3101	02/04/10	8:11	56.0017	100.9818	2001	27.6745	1760	4512	NaN
3201	02/04/10	14:08	56.0002	101.9948	2002	27.6745	1696	NaN	NaN
3301	02/04/10	20:15	55.9995	102.9953	2005	27.6745	1700	4454	3368
3401	02/05/10	3:30	55.9973	103.9980	2002	27.6745	1754	4500	NaN
3501	02/05/10	9:04	55.9988	104.9973	2004	27.6745	1732	4190	4028
3701	02/05/10	16:34	56.6690	105.0000	2004	27.6745	1688	4524	NaN
3901	02/05/10	23:36	57.3318	105.0000	2002	27.6745	1536	4285	NaN

CTD Cast List, continued									
R/V *Thompson* TN246			DIMES Cruise US2			15 Jan–5 Mar 2010			
Station/ Cast	**Date**	**Time GMT**	**Lat Deg(S)**	**Lon Deg(W)**	**Max Depth (m)**	**Target Sigma (m)**	**Target Surface (m)**	**PDR Depth (m)**	**EM300 Depth (m)**
4101	02/06/10	6:18	58.0005	105.0043	2003	27.6745	1404	NaN	NaN
4301	02/06/10	13:06	58.6658	104.9967	2003	27.6745	1356	NaN	NaN
4501	02/06/10	19:49	59.3360	104.9935	2001	27.6745	1291	4890	4847
4701	02/07/10	3:26	60.0022	104.9927	2002	27.6745	1198	NaN	NaN
4901	02/07/10	9:32	60.6667	104.9998	2004	27.6745	1075	5210	NaN
5101	02/07/10	16:36	61.3330	105.0002	2002	27.6745	970	4960	4222
5201	02/07/10	22:16	61.4168	103.6695	2003	27.6745	1076	5148	NaN
5301	02/08/10	4:24	61.5162	102.3347	2004	27.6745	1141	~5000	NaN
5401	02/08/10	10:19	61.6177	101.0000	2001	27.6745	1035	5000	NaN
5501	02/08/10	16:31	61.7163	99.6672	2002	27.6745	1082	5252	NaN
5601	02/08/10	21:37	61.8172	98.3313	2002	27.6745	1060	5168	NaN
5701	02/09/10	3:39	61.9160	97.0005	2002	27.6780	1162	5180	NaN
5801	02/09/10	9:19	62.0000	95.9998	2004	27.6780	1144	5000	NaN
5901	02/09/10	13:36	61.7485	96.0002	2002	27.6780	1148	5130	NaN
6001	02/09/10	16:56	61.5007	96.0000	2002	27.6780	1163	4482	NaN
6101	02/10/10	1:01	61.2495	95.9947	2003	27.6780	1201	4739	NaN
6201	02/10/10	4:27	60.9990	95.9995	2004	27.6780	1287	4971	NaN
6301	02/10/10	8:45	60.7497	96.0002	2003	27.6780	1334	4620	NaN
6401	02/10/10	12:00	60.4963	96.0065	2002	27.6780	1410	4894	NaN
6501	02/10/10	16:21	60.2475	96.0017	2004	27.6780	1433	5075	NaN
6601	02/10/10	19:41	59.9982	96.0017	2002	27.6780	1394	4218	NaN
6701	02/10/10	23:40	59.7528	96.0003	2003	27.6780	1360	4811	NaN
6801	02/11/10	3:13	59.4893	95.9955	2001	27.6780	1368	4400	NaN
6901	02/11/10	7:00	59.2512	95.9987	2003	27.6780	1397	4475	NaN
7001	02/11/10	10:22	58.9995	95.9998	2003	27.6780	1472	4610	NaN
7101	02/11/10	13:57	58.7477	95.9998	2002	27.6780	1542	4840	NaN
7201	02/11/10	18:34	58.4975	96.0057	2002	27.6780	1523	3962	3940
7301	02/11/10	21:56	58.2503	96.0008	2003	27.6780	1495	4656	4670
7401	02/12/10	2:18	58.0007	95.9993	2004	27.6780	1550	4947	NaN
7501	02/12/10	5:27	57.7510	95.9985	4912	27.6780	1603	4930	NaN
7502	02/12/10	10:01	57.7548	95.9835	2002	27.6780	1607	5040	NaN
7601	02/12/10	14:50	57.5032	95.9965	2001	27.6780	1630	4790	NaN
7701	02/12/10	19:13	57.2500	96.0003	2003	27.6780	1605	~4450	NaN
7801	02/12/10	22:37	56.9998	95.9998	2000	27.6780	1605	5127	5135
7901	02/13/10	3:03	56.7495	96.0033	2002	27.6780	1614	4670	4860
8001	02/13/10	6:24	56.5007	95.9983	2002	27.6780	1644	5770	NaN
8101	02/13/10	11:31	56.2505	95.9990	2001	27.6780	1692	4100	4260
8201	02/13/10	14:51	56.0015	95.9982	2001	27.6780	1722	4590	NaN
8301	02/13/10	20:59	56.3332	94.9995	2002	27.6780	1773	5087	NaN

CTD Cast List, continued									
R/V *Thompson* TN246			DIMES Cruise US2			15 Jan–5 Mar 2010			
Station/ Cast	**Date**	**Time GMT**	**Lat Deg(S)**	**Lon Deg(W)**	**Max Depth (m)**	**Target Sigma (m)**	**Target Surface (m)**	**PDR Depth (m)**	**EM300 Depth (m)**
8401	02/14/10	2:00	56.6660	93.9998	2002	27.6780	1607	5319	NaN
8501	02/14/10	7:21	56.9985	93.0000	2002	27.6780	1672	5090	NaN
8601	02/14/10	11:16	57.2510	92.9995	2002	27.6780	1680	4890	NaN
8701	02/14/10	18:26	57.5032	92.9970	2001	27.6780	1680	4888	NaN
8801	02/14/10	21:37	57.7498	92.9987	2001	27.6780	1628	5603	5630
8901	02/15/10	0:53	58.0008	93.0005	2002	27.6780	1570	NaN	5635?
9001	02/15/10	5:12	58.2497	92.9978	2002	27.6780	1550	4995	NaN
9101	02/15/10	8:34	58.5000	92.9998	2001	27.6780	1464	4400	NaN
9201	02/15/10	12:51	58.7502	93.0002	2004	27.6780	1438	NaN	NaN
9301	02/15/10	16:11	59.0028	93.0028	2002	27.6780	1486	4172	4261
9401	02/15/10	21:22	59.2493	93.0002	2002	27.6780	1523	5015	NaN
9501	02/16/10	0:48	59.4997	92.9997	2000	27.6780	1526	5004	NaN
9601	02/16/10	4:06	59.7497	93.0002	2002	27.6780	1483	4710	NaN
9701	02/16/10	8:09	60.0010	92.9970	2002	27.6780	1415	4990	NaN
9801	02/16/10	11:19	60.2492	92.9995	2001	27.6780	1298	4830	NaN
9901	02/16/10	14:39	60.4995	92.9988	2003	27.6780	1215	5000	5000
10001	02/16/10	18:26	60.7500	92.9993	2003	27.6780	1140	4991	4992
10101	02/16/10	21:48	60.9998	92.9998	2001	27.6780	1124	4990	NaN
10201	02/17/10	1:44	61.2498	93.0010	2002	27.6780	1140	4966	NaN
10301	02/17/10	5:02	61.4990	93.0027	2001	27.6780	1172	NaN	4898
10401	02/17/10	8:58	61.7498	92.9998	2002	27.6780	1243	4930	4930
10501	02/17/10	12:08	62.0002	92.9995	2002	27.6765	1160	4930	4930
10601	02/17/10	16:42	62.2512	92.9967	2002	27.6765	1072	4900	NaN
10701	02/17/10	19:55	62.5000	92.9998	2002	27.6765	1027	4917	NaN
10801	02/18/10	1:50	62.2490	91.9985	2001	27.6765	1038	4869	NaN
10901	02/18/10	6:19	62.0000	90.9993	2002	27.6765	986	4890	4890
11001	02/18/10	12:12	61.7495	89.9978	2002	27.6765	997	4500	4500
11101	02/18/10	18:24	61.5002	88.9995	2001	27.6765	1171	4583	NaN
11201	02/18/10	21:33	61.2500	88.9998	2001	27.6765	1273	4882	NaN
11301	02/19/10	1:56	61.0000	88.9993	2001	27.6765	1324	4831	NaN
11401	02/19/10	5:10	60.7500	89.0010	2001	27.6765	1363	4535	NaN
11501	02/19/10	9:27	60.4998	88.9998	2002	27.6765	1363	4770	4840
11601	02/19/10	12:30	60.2498	89.0013	2001	27.6765	1341	NaN	5040
11701	02/19/10	16:42	60.0002	89.0002	2001	27.6765	1291	5025	NaN
11801	02/19/10	19:47	59.7500	89.0000	2002	27.6765	1330	4558	NaN
11901	02/20/10	0:02	59.5003	88.9995	2002	27.6765	1381	4987	4887
12001	02/20/10	3:27	59.2522	88.9995	2001	27.6765	1347	NaN	5070
12101	02/20/10	7:49	59.0000	88.9997	2001	27.6765	1315	NaN	5060
12201	02/20/10	11:00	58.9987	88.4965	2001	27.6765	1301	4750	NaN

CTD Cast List, continued									
R/V *Thompson* TN246			DIMES Cruise US2			15 Jan–5 Mar 2010			
Station/ Cast	**Date**	**Time GMT**	**Lat Deg(S)**	**Lon Deg(W)**	**Max Depth (m)**	**Target Sigma (m)**	**Target Surface (m)**	**PDR Depth (m)**	**EM300 Depth (m)**
12301	02/20/10	16:01	59.0000	88.0002	2001	27.6765	1260	5041	NaN
12401	02/20/10	19:02	59.0002	87.4992	2002	27.6765	1214	4960	NaN
12501	02/20/10	22:14	58.9998	87.0012	2003	27.6765	1348	5218	NaN
12601	02/21/10	2:49	59.0017	86.5013	2003	27.6765	1476	5201	NaN
12701	02/21/10	5:58	59.0005	86.0022	2001	27.6765	1528	4850	NaN
12801	02/21/10	10:41	59.0002	85.5002	2003	27.6765	1577	5000	5430
12901	02/21/10	14:08	58.9997	84.9990	2002	27.6765	1671	5100	4910
13001	02/21/10	17:21	58.9997	84.5018	2002	27.6765	1711	5103	NaN
13101	02/21/10	21:51	58.9993	83.9993	2003	27.6765	1718	NaN	5108
13301	02/22/10	5:20	59.4945	84.0007	2001	27.6765	1683	5090	5090
13401	02/22/10	12:42	59.7532	83.9975	2003	27.6765	1604	5080	5080
13501	02/22/10	16:49	59.9950	84.0025	2003	27.6765	1536	5075	5064
13701	02/22/10	23:03	60.4930	84.0022	2002	27.6765	1392	4489	NaN
13801	02/23/10	15:27	60.9848	80.7053	2002	27.6765	1440	4938	NaN
13901	02/23/10	19:06	61.0265	80.2592	2003	27.6765	1377	4933	NaN
14001	02/23/10	22:28	61.0632	79.8147	2001	27.6765	1333	4935	4932
14101	02/26/10	7:40	61.6638	65.4317	1844	27.6765	568	1850	1851
14201	02/26/10	15:52	61.1235	65.7922	3694	27.6765	910	3708	3706
14301	02/27/10	0:39	60.5837	65.9743	1243	27.6765	924	1251	1286
14401	02/27/10	8:35	59.9195	66.0887	3876	27.6765	977	3910	3900
14501	02/27/10	16:00	59.4165	66.0865	3479	27.6765	1059	NaN	3506
14601	03/01/10	1:30	58.9323	66.0620	2665	27.6765	1104	3657	NaN
14701	03/01/10	09:08	58.6082	66.1355	3664	27.6765	1224	3650	NaN
14801	03/01/10	15:54	58.2587	66.0045	2730	27.6765	1382	2738	2740
14901	03/01/10	21:42	57.9767	65.9333	2512	27.6765	1608	2572	2500

Cast notes:

Cast 00301: The oxygen sensor was connected.
Cast 02101: Communication errors appeared on the console and the cast was aborted.
Cast 02102: Ship's 9*plus* unit was installed.
Cast 02901: Switched the port collecting Altimeter and O2 data from 0/1 to 4/5.
Cast 04501: Problems with secondary conductivity differences on the upcast started here.
Cast 05501: An outflow tube was attached to the secondary pump. Outflow of tube at same level as inflow to temperature sensor.
Cast 05601: Secondary pump was replaced prior to this cast.
Cast 05701: Changed target density surface from 27.6745 to 27.678.
Cast 06101: Reterminated CTD wire after tube blocking during deployment; detached altimeter for this cast only.

Cast 08301: Swapped secondary sensors with alternates for this cast.
Cast 08401: Returned original sensors for this cast but swapped primary and secondary cables at the sensors for this cast only.
Cast 10501: Changed target density surface from 27.680 to 27.6765.
Cast 10601: Removed Y cable to O2 sensor and altimeter at the bottle; took O2 out of the primary pump loop.
Cast 10801: Replaced Y cable to O2 sensor and altimeter at the bottle; put O2 back into the primary pump loop.
Cast 11201: Pumps turned off twice on the downcast causing periods of bad conductivity data.
Cast 11301: Replaced primary and secondary conductivity sensors with ship's sensors.
Cast 12701: Added Altimeter data to 1m and 1dbar .mat files (first deep cast).
Cast 12901: Secondary conductivity failed at 850m on upcast; sensor not replaced.

Appendix E. XBT/XCTD Cast List

XBT/XCTD Cast List								
Station No.	**Date**	**Time (GMT)**	**Latitude (deg S)**	**Longitude (deg W)**	**Depth (m)**	**Type**	**Serial no.**	**Filename**
1	01/16/2010	22:06	54.8996	75.6654	1000	Fast-Deep XBT	not recorded	TF_00001.edf
12-13	01/30/2010	07:40	58.2505	98.9979	1000	Fast-Deep XBT	00010617	TF_00007.edf
13-14	01/30/2010	13:08	58.7527	98.9748	1830	T5 XBT	00348325	T5_00008.edf
14-15	01/30/2010	18:35	59.2522	98.9850	1830	T5 XBT	00348326	T5_00009.edf
27	02/03/2010	11:14	56.0017	98.9944	1100	XCTD	08112116	C3_00013a.edf
35	02/05/2010	08:28	55.9971	104.9598	218	XCTD	08112113	C3_00014a.edf
36	02/05/2010	13:55	56.3320	104.9991	1342	T5 XBT	00348327	T5_00015.edf
37	02/05/2010	16:20	56.6690	105.0002	1100	XCTD	08112119	C3_00016a.edf
38	02/05/2010	20:58	56.9999	105.0004	1830	T5 XBT	00348328	T5_00017.edf
39	02/05/2010	23:24	57.3319	105.0002	500	XCTD	08112112	C3_00018a.edf
40	02/06/2010	03:52	57.6699	105.0057	370	T5 XBT	00348332	T5_00019.edf
41	02/06/2010	05:55	57.9919	105.0048	1100	XCTD	08112115	C3_00020a.edf
42	02/06/2010	10:31	58.3332	104.9965	1830	T5 XBT	00348331	T5_00021.edf
44	02/06/2010	17:29	59.0032	104.9998	1830	T5 XBT	00348330	T5_00022.edf
45	02/06/2010	19:26	59.3306	104.9996	1100	XCTD	08112114	C3_00023a.edf
45	02/06/2010	23:14	59.3488	104.9932	692	XCTD	08112111	C3_00025a.edf
45	02/06/2010	23:26	59.3492	104.9921	855	T5 XBT	00000000	T5_00026.edf
46	02/07/2010	01:17	59.6675	104.9989	1200	T5 XBT	00348335	T5_00029.edf
48	02/07/2010	06:55	60.3194	104.9981	1830	T5 XBT	00348334	T5_00030.edf
49	02/07/2010	09:04	60.6502	104.9891	40	XCTD	08112122	C3_00031.edf
50	02/07/2010	14:20	60.9920	104.9987	1830	T5 XBT	00348329	T5_00032.edf
66	02/10/2010	19:22	60.0102	96.0026	1100	XCTD	08112118	C3_00035.edf
68	02/11/2010	02:47	59.4998	95.9947	1100	XCTD	08112117	C3_00036.edf
70	02/11/2010	09:54	59.0079	95.9908	1100	XCTD	08112121	C3_00037.edf
72	02/11/2010	17:20	58.5063	96.0015	1100	XCTD	08112120	C3_00038.edf
73	02/11/2010	21:35	58.2566	96.0002	522	XCTD	08112110	C3_00039.edf
76	02/12/2010	14:31	57.5091	95.9959	1100	XCTD	08112109	C3_00040.edf
78	02/12/2010	22:17	57.0059	95.9925	1100	XCTD	08112108	C3_00041.edf

XBT/XCTD Cast List, continued								
Station No.	Date	Time (GMT)	Latitude (deg S)	Longitude (deg W)	Depth (m)	Type	Serial no.	Filename
80	02/13/2010	06:01	56.5155	96.0003	1100	XCTD	08112105	C3_00042.edf
82	02/13/2010	14:30	56.0168	95.9976	1100	XCTD	08112106	C3_00043.edf
89	02/15/2010	00:36	57.9907	92.9959	1100	XCTD	08112107	C3_00044.edf
91	02/15/2010	08:10	58.4863	92.9950	1100	XCTD	08112104	C3_00045.edf
93	02/15/2010	15:49	58.9880	93.0030	1100	XCTD	08112103	C3_00046.edf
99	02/16/2010	14:20	60.4849	92.9955	1100	XCTD	08112102	C3_00047.edf
101	02/16/2010	21:21	60.9837	93.0053	1100	XCTD	08112101	C3_00048.edf
103	02/17/2010	04:36	61.4845	92.9990	1100	XCTD	08112100	C3_00049.edf
105	02/17/2010	11:45	61.9844	92.9931	1100	XCTD	08112099	C3_00050.edf
142	02/26/2010	15:18	61.1236	65.7805	1100	XCTD	08080673	C3_00052.edf
143	02/27/2010	00:09	60.5854	65.9727	1100	XCTD	08080677	C3_00053.edf
144	02/27/2010	08:19	59.9196	66.0887	1100	XCTD	08080682	C3_00054.edf
145	02/27/2010	15:41	59.4294	66.0856	1100	XCTD	08080680	C3_00055.edf
146	03/01/2010	05:11	58.9577	66.0792	1100	XCTD	08080681	C3_00056.edf
147	03/01/2010	08:39	58.6000	66.1046	1100	XCTD	08080679	C3_00057.edf
148	03/01/2010	15:39	58.2584	65.9917	1100	XCTD	08080676	C3_00058.edf
149	03/01/2010	21:27	57.9769	65.9229	1100	XCTD	08080678	C3_00059.edf
150	03/02/2010	03:51	57.5500	65.6451	1100	XCTD	08080672	C3_00060.edf
150	03/02/2010	07:04	57.5470	65.6298	1100	XCTD	08080675	C3_00061.edf
151	03/02/2010	17:48	56.1608	64.7580	T failed	XCTD	08080674	C3_00062.edf
152	03/03/2010	01:09	55.7015	64.9737	1100	XCTD	08080671	C3_00063.edf

Appendix F. LADCP Cast List*

LADCP Cast List															
Cast #	Lat Deg	Lat Min	LAT	Long Deg	Long Min	LONG	Date	WH ID# DN	WH ID# UP	Dep Time (Z)	HRP?	HRP Dep Time (Z)	DMP?	DMP Dep Time (Z)	Notes
1															
2	57	42.0416	57.7007	76	57.6908	76.9615	1/17/2010	1804	3441	12:32	Y	16:49	N		
3	60	0.0202	60.0003	77	59.9742	77.9996	1/18/2010	1804	149	5:44	Y	17:17	N		Changed Uplooker Head from SN #3441 to SN #149
4	60	35.4215	60.5904	78	15.5009	78.2583	1/18/2010	1804	149	23:06	N		N		
5	52	56.5909	52.9432	76	29.6725	76.4945	1/25/2010	1804	149	16:30	N		Y	18:09	
6	56	28.9111	56.4819	82	18.2079	82.3035	1/27/2010	1804	149	6:30	N		Y	9:47	
7	57	12.5900	57.2098	85	1.7960	85.0299	1/27/2010	1804	149	19:35	N		Y	21:58	
8	58	0.0039	58.0001	87	55.8114	87.9302	1/28/2010	1804	149	8:46	Y	10:34	N		
9	58	2.9800	58.0497	91	22.2300	91.3705	1/28/2010	1804	149	22:12	Y		N		
10	58	7.1527	58.1192	95	0.8665	95.0144	1/29/2010	1804	149	10:43	Y	11:18	N		
11	58	4.1297	58.0688	97	59.3007	97.9883	1/29/2010	1804	149	22:39	Y	22:30	N		
12	58	0.1132	58.0019	99	0.1879	99.0031	1/30/2010	1804	149	3:55	Y	3:53	N		
13	58	30.0028	58.5000	98	59.9968	98.9999	1/30/2010	1804	149	9:05	Y	9:00	N		
14			59.0010			98.9985	1/30/2010	1804	149	14:38	Y	14:36	N		
15	59	30.0297	59.5005	98	59.9216	98.9987	1/30/2010	1804	149	20:18	Y	19:57	N		
16	59	44.8910	59.7482	100	29.6783	100.4946	1/31/2010	1804	149	2:56	Y	2:45	N		
17	59	59.3595	59.9893	101	59.9635	101.9994	1/31/2010	1804	149	9:53	N		N		Main Battery Changed after cast
18	59	29.9000	59.4983	101	59.6500	101.9942	1/31/2010	1804	149	17:10	N		N		
19	59	0.1700	59.0028	101	59.9480	101.9991	1/31/2010	1804	149	22:04	N		N		
20	58	29.5146	58.4919	101	59.1057	101.9851	2/1/2010	1804	149	2:16	N		N		
21	57	59.8800	57.9980	101	59.9800	101.9997	2/1/2010	1804	149	6:56	N		N		
22	57	59.5636	57.9927	101	0.1889	101.0031	2/2/2010	1804	149	6:00	N		N		
23	57	59.7672	57.9961	99	59.6868	99.9948	2/2/2010	1804	149	11:42	N		N		

LADCP Cast List, continued															
Cast #	Lat Deg	Lat Min	LAT	Long Deg	Long Min	LONG	Date	WH ID# DN	WH ID# UP	Dep Time (Z)	HRP?	HRP Dep Time (Z)	DMP?	DMP Dep Time (Z)	Notes
24	57	29.8800	57.4980	99	0.1935	99.0032	2/2/2010	1804	149	18:03	N		N		
25	57		57.0030	99		98.9938	2/2/2010	1804	149	22:20	N		N		
26	56	30.1772	56.5030	98	59.6597	98.9943	2/3/2010	1804	149	2:54	N		N		
27	55	59.9957	55.9999	98	59.9534	98.9992	2/3/2010	1804	149	7:09	Y	8:15	N		
28	55	30.0000	55.5013	99	0.0000	99.0048	2/3/2010	1804	149	14:13	Y	14:09	N		
29	56	0.0000	56.0000	99	0.0000	99.0000	2/3/2010	1804	149	20:20	N		Y	22:21	
30	56	0.0172	56.0003	99	59.9170	99.9986	2/4/2010	1804	149	2:09	N		Y	2:19	
31	56	0.1217	56.0020	100	58.9978	100.9833	2/4/2010	1804	149	7:54	N		N		
32	56	0.0139	56.0002	101	59.6984	101.9950	2/4/2010	1804	149	13:56	N		N		
33	55	59.9700	55.9995	102	59.7700	102.9962	2/4/2010	1804	149	20:15	N		N		
34	55	59.8659	55.9978	104	0.0000	104.0000	2/5/2010	1804	149	3:18	N		N		
35	55	59.9326	55.9989	104	59.8388	104.9973	2/5/2010	1804	149	8:58	N		Y	8:46	
36															
37	56	40.1418	56.6690	105	0.0102	105.0002	2/5/2010	1804	149	16:32	N		Y	16:20	Both Main battery and FSU ADCP battery changed before cast
38															
39	57	19.9118	57.3319	105	0.0017	105.0000	2/5/2010	1804	149	23:37	N		Y	23:35	
40															
41	58	0.0421	58.0007	105	0.2839	105.0047	2/6/2010	1804	149	6:06	N		Y	6:04	
42															
43	58	39.9521	58.6659	104	59.8060	104.9968	2/6/2010	1804	149	12:50	N		Y	12:48	
44															
45	59	20.2080	59.3368	104	59.5882	104.9931	2/6/2010	1804	149	19:55	Y	19:45	N		
46															
47	60	0.1156	60.0019	104	59.6411	104.9940	2/7/2010	1804	149	3:19	N		N		
48															

LADCP Cast List, continued															
Cast #	Lat Deg	Lat Min	LAT	Long Deg	Long Min	LONG	Date	WH ID# DN	WH ID# UP	Dep Time (Z)	HRP?	HRP Dep Time (Z)	DMP?	DMP Dep Time (Z)	Notes
49	60	40.0035	60.6667	105	0.0009	105.0000	2/7/2010	1804	149	9:24	Y	9:18	N		
50															
51	61	19.9800	61.3330	105	0.0100	105.0002	2/7/2010	1804	149	16:38	N		N		Changed Uplooker Head from SN #149 to SN #3441 after cast. SN #149 giving bad beam signal.
52	61	25.0151	61.4169	103	40.1747	103.6696	2/7/2010	1804	3441	22:14	N		Y	22:10	
53	61	30.9730	61.5162	102	20.0953	102.3349	2/8/2010	1804	3441	14:13	N		Y	14:10	
54	61	37.0424	61.6174	101	0.0114	101.0002	2/8/2010	1804	3441	10:10	Y	10:08	N		
55			61.7163			99.6672	2/8/2010	1804	3441		N		N		
56	61	49.0298	61.8172	98	19.8781	98.3313	2/8/2010	1804	3441	21:36	N		Y	21:29	
57	61	54.9661	61.9161	97	0.0358	97.0006	2/9/2010	1804	3441	3:25	N		Y	3:26	
58	62	0.0003	62.0000	95	59.9961	95.9999	2/9/2010	1804	3441	9:08	N		Y	9:04	
59	61	44.9094	61.7485	96	0.0117	96.0002	2/9/2010	1804	3441	13:25	n		N		
60	61	30.0469	61.5008	95	59.9973	96.0000	2/9/2010	1804	3441	16:55	Y	16:43	N		
61	61	14.9773	61.2496	95	59.6840	95.9947	2/10/2010	1804	3441	1:00	N		N		Second cast at station, first cast aborted
62	61	0.0000	60.9990	96	0.0000	95.9990	2/10/2010	1804	3441	4:10	Y	4:08	N		Replaced Battery Before cast
63	60	45.0000	60.7497	96	0.0000	96.0002	2/10/2010	1804	3441	8:32	N		N		
64	60	29.7878	60.4965	96	0.3856	96.0064	2/10/2010	1804	3442	11:53	Y	11:49	N		
65	60	14.8570	60.2476	96	0.1020	96.0017	2/10/2010	1804	3441	16:20	N		N		
66	59	59.8940	59.9982	96	0.1055	96.0018	2/10/2010	1804	3441	19:41	N		Y	19:33	
67	59	45.1722	59.7529	96	0.0284	96.0005	2/10/2010	1804	3441	23:41	N		N		

LADCP Cast List, continued															
Cast #	Lat Deg	Lat Min	LAT	Long Deg	Long Min	LONG	Date	WH ID# DN	WH ID# UP	Dep Time (Z)	HRP?	HRP Dep Time (Z)	DMP?	DMP Dep Time (Z)	Notes
68	59	29.9458	59.4991	95	59.6891	95.9948	2/11/2010	1804	3441	2:59	N		Y	2:56	
69	59	15.0808	59.2513	95	59.9351	95.9989	2/11/2010	1804	3441	6:54	N		N		
70	58	59.9653	58.9994	96	0.0007	96.0000	2/11/2010	1804	3441	10:07	N		N		
71	58	44.8605	58.7477	95	59.9899	95.9998	2/11/2010	1804	3441	13:43	N		N		
72	58	29.8542	58.4976	96	0.3410	96.0057	2/11/2010	1804	3441	18:35	N		N		Abort2 used before deployment because long wait. Data discarded before cast.
73	58	15.0282	58.2505	96	0.0532	96.0009	2/11/2010	1804	3441	21:54	Y	21:50	N		
74	58	0.0450	58.0008	95	59.9649	95.9994	2/12/2010	1804	3441	2:19	N		N		
75_01	57	45.0718	57.7512	95	59.9128	95.9985	2/12/2010	1804	3441	5:15	Y	6:17	N		First cast at station, deep cast to 4900 m
75_02	57	45.2975	57.7550	95	59.0127	95.9835	2/12/2010	1804	3441	9:50	N		N		Second cast at station, shallow to 2000 m
76			57.5032			95.9965	2/12/2010	1804	3441	14:45	Y	14:40	N		
77	57	15.0099	57.2502	96	0.0142	96.0002	2/12/2010	1804	3441	19:15	n		N		
78	56	59.9950	56.9999	95	59.9927	95.9999	2/12/2010	1804	3441	22:36	Y	22:34	N		Main battery replaced after cast
79	56	44.9768	56.7496	96	0.2147	96.0036	2/13/2010	1804	3441	2:55	N		N		
80	56	30.0510	56.5009	95	59.9135	95.9986	2/13/2010	1804	3441	6:18	Y	6:15	N		
81	56	14.9947	56.2499	96	0.1237	96.0021	2/13/2010	1804	3441	11:25	N		N		Troubles downloading data, OKAY
82	56	0.0930	56.0016	95	59.8929	95.9982	2/13/2010	1804	3441	14:45	Y	14:43	N		
83	56	20.0033	56.3334	94	59.9925	94.9999	2/13/2010	1804	3441	20:59	N		N		

LADCP Cast List, continued															
Cast #	Lat Deg	Lat Min	LAT	Long Deg	Long Min	LONG	Date	WH ID# DN	WH ID# UP	Dep Time (Z)	HRP ?	HRP Dep Time (Z)	DMP ?	DMP Dep Time (Z)	Notes
84	56	39.9648	56.6661	94	0.0058	94.0001	2/13/2010	1804	3441	1:59	N		N		
85	56	59.9161	56.9986	93	0.0112	93.0002	2/14/2010	1804	3441	6:58	Y	6:53	N		
86	57	15.0692	57.2512	92	59.9821	92.9997	2/14/2010	1804	3441	11:09	N		N		
87	57	30.1855	57.5031	92	59.8277	92.9971	2/14/2010	1804	3441	18:27	N		N		
88	57	44.9938	57.7499	92	59.9276	92.9988	2/14/2010	1804	3441	21:37	N		N		
89	58	0.0534	58.0009	93	0.0425	93.0007	2/15/2010	1804	3441	0:52	Y	0:48	N		
90	58	14.9214	58.2487	92	59.9730	92.9996	2/15/2010	1804	3441	5:07	N		N		
91	58	30.0071	58.5001	92	59.9970	93.0000	2/15/2010	1804	3441	8:28	Y	8:26	N		
92	58	45.0711	58.7512	93	0.0048	93.0001	2/15/2010	1804	3441	12:38	N		N		
93	59	0.1727	59.0029	93	0.1783	93.0030	2/15/2010	1804	3441	16:12	Y	16:05	Y	16:25	
94	59	14.9673	59.2495	93	0.0174	93.0003	2/15/2010	1804	3441	21:22	N		N		
95	59	29.9912	59.4999	92	59.9919	92.9999	2/16/2010	1804	3441	0:48	N		N		
96	59	44.9904	59.7498	93	0.0103	93.0002	2/16/2010	1804	3441	3:58	Y	3:57	N		Main battery replaced before cast
97	60	0.0017	60.0000	92	59.9600	92.9993	2/16/2010	1804	3441	7:59	N		N		
98	60	14.9561	60.2493	92	59.9760	92.9996	2/16/2010	1804	3441	11:12	N		N		
99	60	29.9753	60.4996	92	59.9399	92.9990	2/16/2010	1804	3441	14:32	N		Y	14:30	
100	60	45.0065	60.7501	92	59.9944	92.9999	2/16/2010	1804	3441	18:35	N		N		
101	60	59.9989	61.0000	92	59.9903	92.9998	2/16/2010	1804	3441	21:47	N		Y	21:43	There exists an 101.abort file
102	61	14.9916	61.2499	93	0.0673	93.0011	2/17/2010	1804	3441	1:46	N		N		
103	61	29.9428	61.4990	93	0.1709	93.0028	2/17/2010	1804	3441	4:54	N		Y	4:53	
104	61	45.0001	61.7500	93	0.0003	93.0000	2/17/2010	1804	3441	8:50	N		N		
105	62	0.0103	62.0002	92	59.9714	92.9995	2/17/2010	1804	3441	12:01	N		Y	12:00	

LADCP Cast List, continued															
Cast #	Lat Deg	Lat Min	LAT	Long Deg	Long Min	LONG	Date	WH ID# DN	WH ID# UP	Dep Time (Z)	HRP?	HRP Dep Time (Z)	DMP?	DMP Dep Time (Z)	Notes
106	62	15.0720	62.2512	92	59.8000	92.9967	2/17/2010	1804	3441	16:44	N		N		Abort2 command used since unit suddenly unplugged while uploading commands.
107	62	30.0071	62.5001	92	59.9873	92.9998	2/17/2010	1804	3441	19:51	N		Y	19:47	
108	62	2.2010	62.0367	92	14.9461	92.2491	2/17/2010	1804	3441	1:50	N		N		
109	62	0.0054	62.0001	90	59.9586	90.9993	2/18/2010	1804	3441	6:12	N		Y	6:09	Changed both main and FSU ADCP batteries before cast
110	61	44.9728	61.7495	89	59.8767	89.9979	2/18/2010	1804	3441	12:05	Y	12:39	Y	12:03	
111	61	30.0082	61.5001	88	59.9761	88.9996	2/18/2010	1804	3441	18:25	N		N		
112	61	15.0028	61.2500	88	59.9989	89.0000	2/18/2010	1804	3441	21:17	Y	21:32	N		
113	61	0.0066	61.0001	88	59.9655	88.9994	2/19/2010	1804	3441	1:53	N		N		
114	60	45.0045	60.7501	89	0.0678	89.0011	2/19/2010	1804	3441	5:03	Y	5:02	N		
115	60	30.0025	60.5000	89	0.0024	89.0000	2/19/2010	1804	3441	9:18	N		N		
116	60	14.9989	60.2500	89	0.0920	89.0015	2/19/2010	1804	3441	12:20	Y	12:19	N		
117	60	0.0124	60.0002	89	0.0154	89.0003	2/19/2010	1804	3441	16:41	N		N		
118	59	44.9986	59.7500	88	59.9971	89.0000	2/19/2010	1804	3441	19:47	Y	19:44	N		download problem, had to backup data by hand
119	59	30.0203	59.5003	88	59.9736	88.9996	2/19/2010	1804	3441	23:59	N		N		
120	59	15.1400	59.2523	88	59.9849	88.9997	2/20/2010	1804	3441	3:21	Y	3:19	N		
121	58	59.9600	58.9993	88	59.9700	88.9995	2/20/2010	1804	3441	7:34	N		N		
122	58	59.9277	58.9988	88	29.7992	88.4967	2/20/2010	1804	3441	10:51	Y	10:50	N		
123	59	0.0090	59.0002	88	0.0218	88.0004	2/20/2010	1804	3441	15:59	N		N		

LADCP Cast List, continued															
Cast #	Lat Deg	Lat Min	LAT	Long Deg	Long Min	LONG	Date	WH ID# DN	WH ID# UP	Dep Time (Z)	HRP ?	HRP Dep Time (Z)	DMP ?	DMP Dep Time (Z)	Notes
124	59	0.0129	59.0002	87	29.9714	87.4995	2/20/2010	1804	3441	19:01	N		N		
125	59	0.0002	59.0000	87	0.0798	87.0013	2/20/2010	1804	3441	22:13	Y	22:10	N		
126	59	0.1018	59.0017	86	30.0884	86.5015	2/20/2010	1804	3441	2:48	N		N		Main battery changed after cast
127	59	0.0049	59.0001	86	0.0983	86.0016	2/21/2010	1804	3441	5:49	Y	5:49	N		
128	59	0.6750	59.0113	85	30.3558	85.5059	2/21/2010	1804	3441	10:33	N		N		
129	58	59.9853	58.9998	84	59.9434	84.9991	2/21/2010	1804	3441	13:58	N		N		
130	58	59.9893	58.9998	84	30.1011	84.5017	2/21/2010	1804	3441	17:19	N		N		
131	58	59.9619	58.9994	83	59.9695	83.9995	2/21/2010	1804	3441	21:50	N		N		
132														Aborted due to weather	
133	59	29.6773	59.4946	84	0.0352	84.0006	2/22/2010	1804	3441	5:06	N		N		
134	59	45.6400	59.7607	83	59.0101	83.9835	2/22/2010	1804	3441	12:36	N		N		
135	59	59.7066	59.9951	84	0.1585	84.0026	2/22/2010	1804	3441	16:48	N		N		
136															
137	60	29.5876	60.4931	84	0.1377	84.0023	2/22/2010	1804	3441	22:01	N		N		
138	60	59.0972	60.9850	80	42.3308	80.7055	2/23/2010	1804	3441	15:27	N		N		
139	61	1.5925	61.0265	80	15.5529	80.2592	2/23/2010	1804	3441	19:04	N		N		
140	61	3.8103	61.0635	79	48.8504	79.8142	2/23/2010	1804	3441	22:27	N		N		
141	61	39.8308	61.6638	65	25.9155	65.4319	2/26/2010	1804	3441	7:30	Y	7:52	Y	8:35	
142	61	7.4800	61.1247	65	47.5310	65.7922	2/26/2010	1804	3441	15:51	Y	16:33	Y	16:16	
143	60	35.0271	60.5838	65	58.5734	65.9762	2/27/2010	1804	3441	0:40	Y	0:55	N		Changed both main and FSU ADCP batteries before cast. 143.aborted1 and 143.aborted2 exist
144	59	55.1756	59.9196	66	5.3216	66.0887	2/27/2010	1804	3441	8:28	Y	8:54	N		

LADCP Cast List, continued															
Cast #	Lat Deg	Lat Min	LAT	Long Deg	Long Min	LONG	Date	WH ID# DN	WH ID# UP	Dep Time (Z)	HRP?	HRP Dep Time (Z)	DMP?	DMP Dep Time (Z)	Notes
145	59	24.9943	59.4166	66	5.1987	66.0866	2/27/2010	1804	3441	16:01	Y	16:21	Y	16:40	
146	58	55.9471	58.9325	66	3.7162	66.0619	3/1/2010	1804	3441	1:30	N		N		
147	58	36.5052	58.6084	66	8.1413	66.1357	3/1/2010	1804	3441	8:53	Y	9:33	N		
148	58	15.4953	58.2583	65	59.8673	65.9978	3/1/2010	1804	3441	15:50	N		Y	16:41	
149	57	58.6042	57.9767	65	56.0079	65.9335	3/1/2010	1804	3441	21:40	Y	21:55	N		

*The information in this table is available as a spreadsheet and a csv file at the DIMES website as described in Appendix H.

Appendix G. RAFOS Float Deployment List

DIMES RAFOS Float Deployments

	Float	Argos ID	Argos ID	Start		Launch		Launch Position		Clock Offset	
	S/N	Hex	Decimal	Date	Time (Z)	Date	Time (Z)	Degrees & Minutes		seconds fast	Notes
1	838	F84A668B	89464	2/5/2010	03:55	2/5/2010	11:44	-56 00.17	-104 58.98	0	
2	837	F84A6679	89463	2/5/2010	04:02	2/5/2010	11:46	-56 00.17	-104 58.97	0	
3	831	F84A6613	89457	2/5/2010	04:07	2/5/2010	11:48	-56 00.18	-104 58.94	0	
4	881	F82116AD	89018	2/5/2010	04:16	2/5/2010	11:50	-56 00.19	-104 58.94	0	
5	887	F8242600	89024	2/5/2010	04:20	2/5/2010	11:53	-56 00.19	-104 58.93	0	
6	880	F8211698	89017	2/5/2010	04:12	2/5/2010	11:56	-56 00.19	-104 58.91	0	
7	846	F84A9300	89472	2/5/2010	13:22	2/5/2010	14:06	-56 19.94	-104 59.92	0	
8	853	F84A9379	89479	2/5/2010	13:18	2/5/2010	14:08	-56 19.94	-104 59.93	+0.5	
9	840	F84A66AD	89466	2/5/2010	13:10	2/5/2010	14:10	-56 19.95	-104 59.93	0	
10	871	F8211600	89008	2/5/2010	13:05	2/5/2010	14:12	-56 19.95	-104 59.93	0	
11	870	F820FCF2	89007	2/5/2010	12:59	2/5/2010	14:16	-56 19.95	-104 59.93	0	
12	891	F84AC098	89497	2/5/2010	12:54	2/5/2010	14:19	-56 19.95	-104 59.92	0	
13	852	F84A936A	89478	2/5/2010	14:56	2/5/2010	18:49	-56 40.12	-104 59.84	-1	
14	851	F84A935F	89477	2/5/2010	15:00	2/5/2010	18:50	-56 40.12	-104 59.84	0	
15	845	F84A66F2	89471	2/5/2010	15:06	2/5/2010	18:52	-56 40.12	-104 59.84	-0.5	
16	872	F8211613	89009	2/5/2010	15:21	2/5/2010	18:53	-56 40.12	-104 59.84	0	
17	873	F8211626	89010	2/5/2010	15:15	2/5/2010	18:56	-56 40.12	-104 59.84	0	
18	886	F82116F2	89023	2/5/2010	15:10	2/5/2010	18:58	-56 40.12	-104 59.84	+0.5	
19	904	300034012292840		2/5/2010	16:21	2/5/2010	21:07	-57 00.00	-104 59.99	+2	Iridium
20	832	84A6626	89458	2/5/2010	19:42	2/5/2010	21:09	-57 00.00	-105 00.00	0	
21	824	849E1AD	89450	2/5/2010	19:53	2/5/2010	21:17	-57 00.00	-105 00.00	-0.8	
22	829	F849E1F2	89455	2/5/2010	19:11	2/5/2010	21:18	-57 00.00	-105 00.00	+2	
23	899	F84B2A13	89505	2/5/2010	18:42	2/5/2010	21:20	-57 00.00	-105 00.00	0	
24	898	F84B2A00	89504	2/5/2010	18:37	2/5/2010	21:22	-57 00.00	-105 00.00	0	
25	825	849E1BE	89451	2/5/2010	22:55	2/6/2010	01:50	-57 19.91	-104 58.96	+0.5	
26	826	849E1C9	89452	2/5/2010	22:49	2/6/2010	01:52	-57 19.91	-104 58.96	0	
27	828	849E1E1	89454	2/5/2010	22:44	2/6/2010	01:53	-57 19.91	-104 58.96	0	
28	900	300034012294810		2/5/2010	17:26	2/6/2010	01:54	-57 19.91	-104 58.96	+2	Iridium
29	888	8242613	89025	2/5/2010	22:29	2/6/2010	01:56	-57 19.91	-104 58.96	0	
30	889	8242626	89026	2/5/2010	22:38	2/6/2010	01:57	-57 19.91	-104 58.96	-0.3	
31	864	84AC026	89490	2/6/2010	0:38	2/6/2010	04:01	-57 40.19	-105 00.34	+0.5	
32	841	84A66BE	89467	2/6/2010	00:44	2/6/2010	04:03	-57 40.19	-105 00.34	0	
33	842	84A66C7	89468	2/6/2010	00:55	2/6/2010	04:05	-57 40.19	-105 00.34		
34	894	84AC0C7	89500	2/6/2010	02:28	2/6/2010	04:07	-57 40.19	-105 00.34	-0.2	
35	895	84AC0D4	89501	2/6/2010	02:24	2/6/2010	04:09	-57 40.19	-105 00.34	0	
36	901	300034012297730		2/5/2010	17:02	2/6/2010	04:13	-57 40.19	-105 00.34	+2	Iridium
37	844	F84A66E1	89470	2/6/2010	04:44	2/6/2010	08:33	-58 00.25	-105 00.31	-0.5	
38	843	F84A66D4	89469	2/6/2010	04:33	2/6/2010	08:35	-58 00.25	-105 00.31	0	
39	863	F84AC013	89489	2/6/2010	03:41	2/6/2010	08:36	-58 00.25	-105 00.31	0	
40	893	F84AC0BE	89499	2/6/2010	03:35	2/6/2010	08:40	-58 00.25	-105 00.31	0	
41	892	F84AC0AD	89498	2/6/2010	03:31	2/6/2010	08:42	-58 00.25	-105 00.31	0	
42	905	300034012298730		2/6/2010	03:15	2/6/2010	08:43	-58 00.25	-105 00.31	+1	Iridium

DIMES RAFOS Float Deployments, continued											
	Float	Argos ID	Argos ID	Start		Launch		Launch Position		Clock Offset	
	S/N	Hex	Decimal	Date	Time (Z)	Date	Time (Z)	Degrees & Minutes			S/N
43	822	F849E18B	89448	2/6/2010	05:50	2/6/2010	10:41	-58 20.00	-104 59.82	-0.5	
44	835	F84A665F	89461	2/6/2010	05:34	2/6/2010	10:42	-58 20.01	-104 59.82	0	
45	836	F84A666A	89462	2/6/2010	05:26	2/6/2010	10:44	-58 20.01	-104 59.82	0	
46	877	F821166A	89014	2/6/2010	09:12	2/6/2010	10:48	-58 20.01	-104 59.82	-0.5	
47	876	F821165F	89013	2/6/2010	09:04	2/6/2010	10:49	-58 20.01	-104 59.82	0	
48	909	300034012296840		2/6/2010	06:57	2/6/2010	10:50	-58 20.01	-104 59.82	+2	Iridium
49	857	F84A93BE	89483	2/6/2010	09:52	2/6/2010	15:35	-58 40.74	-104 58.78	0	
50	858	F84A93C7	89484	2/6/2010	10:01	2/6/2010	15:36	-58 40.79	-104 58.79	-1	
51	867	F84AC05F	89493	2/6/2010	11:04	2/6/2010	15:37	-58 40.74	-104 58.79	+0.5	
52	908	300034012293800		2/6/2010	10:05	2/6/2010	15:39	-58 40.74	-104 58.79	+3	Iridium
53	890	F84AC08B	89496	2/6/2010	11:12	2/6/2010	15:40	-58 40.74	-104 58.79	0	
54	883	F82116C7	89020	2/6/2010	11:20	2/6/2010	15:41	-58 40.74	-104 58.79	-0.5	
55	859	F84A9304	89485	2/6/2010	11:56	2/6/2010	17:40	-59 00.23	-104 59.87	+1.5	
56	860	F84A93E1	89486	2/6/2010	11:51	2/6/2010	17:41	-59 00.23	-104 59.88	-0.5	
57	866	F84AC04C	89492	2/6/2010	11:31	2/6/2010	17:42	-59 00.22	-104 59.88	-0.5	
58	903	300034012299830		2/6/2010	13:44	2/6/2010	17:42	-59 00.22	-104 59.88	+1	Iridium
59	882	F82116BE	89019	2/6/2010	12:17	2/6/2010	17:43	-59 00.22	-104 59.88	0	
60	879	F821168B	89016	2/6/2010	12:26	2/6/2010	17:43	-59 00.22	-104 59.88	0	
61	849	84A9335	89475	2/6/2010	18:30	2/6/2010	22:59	-59 20.92	-104 59.59	-1	
62	850	84A934C	89476	2/6/2010	18:24	2/6/2010	22:59	-59 20.92	-104 59.59	-1	
63	868	84AC06A	89494	2/6/2010	18:20	2/6/2010	23:00	-59 20.93	-104 59.59	-0.5	
64	902	300034012299740		2/6/2010	13:54	2/6/2010	23:00	-59 20.93	-104 59.60	+1	Iridium
65	878	8211679	89015	2/6/2010	18:34	2/6/2010	23:01	-59 20.92	-104 59.60	0	
66	885	82116E1	89022	2/6/2010	18:38	2/6/2010	23:01	-59 20.92	-104 59.60	0	
67	869	84AC079	89495	2/7/2010	00:27	2/7/2010	01:25	-59 40.05	-104 59.94	0	
68	817	849E135	89443	2/7/2010	00:23	2/7/2010	01:25	-59 40.05	-104 59.94	0	
69	818	849E14C	89444	2/7/2010	00:16	2/7/2010	01:26	-59 40.05	-104 59.93	+0.2	
70	884	82116D4	89021	2/7/2010	00:11	2/7/2010	01:26	-59 40.05	-104 59.94	0	
71	875	821164C	89012	2/6/2010	23:59	2/7/2010	01:27	-59 40.05	-104 59.94	0	
72	906	300034012299730		2/6/2010	13:29	2/7/2010	01:27	-59 40.05	-104 59.94	+2.5	
73	827	849E1D4	89453	2/7/2010	02:35	2/7/2010	05:08	-60 00.13	-104 59.57	0	
74	823	849E198	89449	2/7/2010	02:28	2/7/2010	05:09	-60 00.13	-104 59.57	-0.5	
75	855	84A9398	89481	2/7/2010	02:22	2/7/2010	05:10	-60 00.13	-104 59.57	0	
76	874	8211635	89011	2/7/2010	02:47	2/7/2010	05:11	-60 00.13	-104 59.57	0	
77	897	84AC0F2	89503	2/7/2010	02:53	2/7/2010	05:12	-60 00.13	-104 59.57	0	
78	907	300034012290740		2/6/2010	12:41	2/7/2010	05:13	-60 00.13	-104 59.57	+2	Iridium
79	821	F849E179	89447	2/7/2010	05:41	2/7/2010	07:16	-60 20.21	-104 59.92	-1	
80	862	F84AC000	89488	2/7/2010	05:43	2/7/2010	07:17	-60 20.21	-104 59.92	0	
81	861	F84A93F2	89487	2/7/2010	04:19	2/7/2010	07:18	-60 20.20	-104 59.91	+3	
82	896	F84AC0E1	89502	2/7/2010	05:52	2/7/2010	07:20	-60 20.21	-104 59.92	0	
83	910	300034012295840		2/7/2010	04:40	2/7/2010	07:21	-60 20.21	-104 59.92	-0.5	Iridium
84	854	F84A938B	89480	2/7/2010	05:48	2/7/2010	07:22	-60 20.21	-104 59.92	0	
85	856	F84A93AD	89482	2/7/2010	08:52	2/7/2010	12:27	-60 40.22	-104 59.07	0	
86	834	F84A664C	89460	2/7/2010	08:57	2/7/2010	12:28	-60 40.22	-104 59.06	+0.5	

DIMES RAFOS Float Deployments, continued												
	Float	Argos ID	Argos ID	Start		Launch		Launch Position		Clock Offset	
	S/N	Hex	Decimal	Date	Time (Z)	Date	Time (Z)	Degrees & Minutes		seconds fast	Notes
87	833	F84A6635	89459	2/7/2010	09:01	2/7/2010	12:29	-60 40.22	-104 59.07	0	
88	914	300034012295810		2/7/2010	08:10	2/7/2010	12:30	-60 40.22	-104 59.07	+2	Iridium
89	915	300034012291810		2/7/2010	08:05	2/7/2010	12:32	-60 40.22	-104 59.06	+5	Iridium
90	911	300034012294740		2/7/2010	06:16	2/7/2010	12:35	-60 40.22	-104 59.06	+1.5	Iridium
91	865	F84AC035	89491	2/7/2010	13:13	2/7/2010	14:31	-60 59.95	-105 00.02	-0.5	
92	815	F849E113	89441	2/7/2010	13:06	2/7/2010	14:32	-60 59.95	-105 00.02	0	
93	816	F849E126	89442	2/7/2010	12:58	2/7/2010	14:33	-60 59.95	-105 00.03	+0.5	
94	913	300034012291740		2/7/2010	11:46	2/7/2010	14:35	-60 59.95	-105 00.02	+2	Iridium
95	912	300034012296740		2/7/2010	11:44	2/7/2010	14:36	-60 59.94	-105 00.03	+2	Iridium
96	918	300034012290840		2/7/2010	10:20	2/7/2010	14:38	-60 59.94	-105 00.02	+1	Iridium
97	819	F849E15F	89445	2/7/2010	14:02	2/7/2010	18:26	-61 19.99	-105 00.02	0	
98	830	F84A6600	89456	2/7/2010	13:57	2/7/2010	18:27	-61 19.98	-105 00.02	0	
99	820	F849E16A	89446	2/7/2010	13:51	2/7/2010	18:28	-61 19.99	-105 00.01	0	
100	916	300034012296810		2/7/2010	06:21	2/7/2010	18:28	-61 19.99	-105 00.02	+7	Iridium
101	917	300034012294840		2/7/2010	06:26	2/7/2010	18:28	-61 19.98	-105 00.02	+2	Iridium
102	919	300034012796800		2/7/2010	10:18	2/7/2010	18:29	-61 19.98	-105 00.02	-1	Iridium
103	848	F84A9326	89474	2/27/2010	12:25	2/27/2010	19:23	-59 25.11	-66 04.65	0	300 days
104	847	F84A9313	89473	2/27/2010	12:16	2/27/2010	19:24	-59 25.11	-66 04.65	0	300 days
105	839	F84A6698	89465	2/27/2010	12:20	2/27/2010	19:25	-59 25.11	-66 04.65	0	300 days

Appendix H. Data Access

Data from this cruise are maintained at the U.S. DIMES website http://dimes.ucsd.edu or at sites linked from there. The path to a TM246_Report directory or data file should be clear once a user accesses the FILES section of that site, though the detailed path may change from time to time. Navigating from a subdirectory level to a higher directory or to the topmost level of the File Listing is achieved by clicking ⇑ Parent directory (rather than the browser's back arrow). In some cases only processed data are at the site. In other cases raw data and/or intermediate products are included as well. Data at various levels of processing, if not at the site, can in most cases be obtained from the originator of the data, whose names are at the head of the appropriate section of this report, and also listed below. Much of the data should be available at the National Oceanographic Data Center and, for the raw multibeam bathymetry, the National Geophysical Data Center, sometime in 2012. The Rolling Deck to Repository (R2R) program at http://www.rvdata.us promises to serve as a portal to the underway data and CTD data, and already catalogs data files from the cruise, though not the data themselves.

We will attempt to document the data and keep this documentation up to date in text files stored with the data in their directories and subdirectories. We request that those interested in using the data from this cruise contact the originators of the data, or the chief scientist. Originators can make sure the version of the data with which users wish to work is the most current, can help to avoid redundant efforts, and can assist with interpretation of the data. Data originators will appreciate the opportunity to join as coauthors on publications relying on the data, but they may also simply wish to indicate the most appropriate way to acknowledge and attribute the data source.

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