Cruise Report

GISR Cruise GS03

R/V *Pelican* Cruise PE13-15

Tracer, Hydrographic, and Geochemical Sampling

Cocodrie to Cocodrie, Louisiana

28 November to 20 December 2012

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R/V Pelican*, operated by the Louisiana Universities Marine Consortium (LUMCON)*

4 January 2013

Acknowledgements

The skill and cooperation of the master and crew of R/V *Pelican* were essential to the success of the cruise. The staff of LUMCON, and especially Joe Malbrough, liaison for the cruise, were of great help with preparations. The work described here is part of the Gulf Integrated Spill Response Consortium (GISR), whose lead institution is Texas A&M University (TAMU). Piers Chapman, Principal Investigator for GISR, has been an outstanding supporter of the tracer experiment. He, co-PI Scott Solocofsky, their administrative assistant, Laura Caldwell, and others at TAMU, as well as Linda Cannata and staff at WHOI, have worked hard to keep contractual and other arrangements for our work on track. Numerical simulations of the motion of particles released at the time and place of the tracer release were run by Ruoying He and his group at North Carolina State University and by Ping Chang and his group at TAMU to help track the tracer. RAFOS floats were prepared by Jim Valdes at WHOI and by Brian Guest, and tracking assistance was provided by Heather Furey at WHOI. Satellite altimetry data reduced and made available to us by R. Leben and M. Shannon at the Colorado Center for Astrodynamic Research proved to be particularly helpful in guiding the tracer survey. Funding for GISR is provided by British Petroleum through the Gulf of Mexico Research Initiative (GOMRI), and is administered by the Consortium for Ocean Leadership.

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Contents

Cruise Personnel

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1. Cruise Objectives

The objectives of the cruise were to locate and sample a tracer, 16.8 kg of trifluoromethyl sulfur pentafluoride (CF_3SF_5), that was released during the GISR Cruise GS02 on R/V *Brooks McCall* in late July 2012, and to survey hydrography and chemistry of the north-central Gulf of Mexico. The tracer was released on an isopycnal surface near 1100 m depth in the vicinity of the 2009 Deepwater Horizon accident, on the continental slope south of Louisiana. The movement of the tracer patch will give an example of the circulation of the northern Gulf for comparison with numerical simulations of that circulation and subsequent improvement of the models. The spreading of the tracer will contribute to estimates of lateral and vertical dispersion parameters, such as eddy diffusivities, that will be of general use. The experiment will also give the nature and rate of homogenization and dilution of a tracer released on the slope of the Gulf of Mexico and the diminishment with time of peak concentrations. The hydrographic survey and measurements of chemical constituents in the water column will add to the historical data base and will contribute to studies of secular trends in these properties.

2. Methods

Hydrography and ocean chemistry were sampled with two CTD/Rosette systems. One was a 12 x 10-liter system from the Geochemical and Environmental Research Group (GERG) of Texas A&M University (TAMU) with a SeaBird 9*plus* CTD and SeaBird SBE 32 pylon for tripping the bottles. This system also carried auxiliary sensors for oxygen, light transmission, chlorophyll fluorescence and height above bottom, and was used for top to bottom profiles of seawater properties. Water samplers for oxygen, DIC, DOC, nutrients, salinity, hydrocarbons, and the tracer were drawn from the 10-liter Niskin bottles, though not from all bottles for all constituents. The second CTD/Rosette system was a 22 x 4-liter system from WHOI, also with a SeaBird 9*plus* CTD and Seabird SBE 32 pylon for tripping bottles. Up to Station 82, this WHOI system was lowered to the bottom or 2000 meters, whichever came first. Because of problems with the winch for this system, which resulted in lowering the package slowly, the depth limit for casts after Station 82 was 1500 m. The 22 Niskins for tracer sampling were tripped between approximately 1500 and 800 meters depth, which was the layer containing the tracer. The WHOI system also carried an altimeter provided by the Louisiana Universities Marine Consortium (LUMCON). Separate winches and wires were used for the two rosette systems, making deployment very efficient. Sea state permitting, one set of bottles could be sampled while the other was being lowered.

Underway measurements provided by LUMCON on R/V *Pelican* were meteorological variables, surface seawater temperature, salinity, and fluorescence, and water velocity to about 700 meters with a 75-khz hull-mounted ADCP. Students of Shari Yvon-Lewis of TAMU set up a system to measure underway pCO_2 in the surface water and the atmospheric boundary layer throughout the cruise.

Oxygen and CF_3SF_5 samples were run on board within hours of the casts with a Winkler system and a gas chromatograph with electron capture detector, respectively. Other samples drawn from the Niskin bottles were returned to TAMU for analysis.

3. The Tracer

The tracer used was trifluoromethyl sulfur pentafluoride, CF_3SF_5, a compound which is neither chemically nor biologically active in the ocean, and is thus harmless and conservative. The material is not generally available commercially, and that used for this experiment was manufactured specifically for our use by Fluorochemika of Poland.

Seventeen kilograms (actually 16.8 kg) of CF_3SF_5 were released on 28 July 2012, on two segments of a track roughly parallel to the isobaths along the continental slope bounding the northern Gulf of Mexico at the target density $\sigma_1 = 32.254$ kg/m^3, where σ_1 is the potential density anomaly referenced to 1000 dbar. The location of the injection streak is shown in Fig. 1 and a detailed picture of it and stations occupied around it on the present cruise is in Fig. 2. The initial distribution of the tracer was sampled from R/V *Brooks McCall* from 3 to 15 August 2012. A report on that cruise is at GISR G02 Cruise 30 July to 9 August 2012.

4. Cruise Narrative

The tracer that was found in August 2012 was to the southwest of the injection area, and appeared to be moving along the isobaths of the continental slope. We had been guided in this direction by two RAFOS floats that were released with the tracer and programmed to come to the surface after a few days. Another RAFOS float deployed with the tracer came to the surface in October 2012 and indicated a drift in the same direction during its mission. From these bits of information we estimated that the center of mass of the tracer cloud ought to be approximately due south of Cocodrie, and concentrated along the continental slope.

A numerical simulation by Ruoying He and his group at North Carolina State reinforced this expectation by showing the trajectories of most numerical floats released at the time, place, and depth of the tracer also roughly following isobaths to the southwest, although their center of mass was further west than Cocodrie, with some of the numerical floats traveling far into Mexico. Also a few of the simulated floats had stayed in the east and travelled off shore.

With these lines of evidence in hand we expected to start south of Cocodrie and move to the west as we sampled tracer, along lines perpendicular to the slope at a spacing yet to be determined by how disperse the tracer appeared to be. The optimal station spacing along lines was also not known, as the spatial covariance of this tracer patch, four months after release, along a continental slope was virtually unknown. Indications from the August 2012 survey were, however, that the tracer would be better mixed and stirred than in the open ocean where isolated streaks on the order of 10 km wide, separated by areas of tracer-free water more than 100 km across, were found at 5 and 6 months after release [Ledwell *et al.*, 1998].

Since three or four days are required to get a tracer analysis system up and running smoothly, we opted to scout to the west with relatively sparsely spaced stations (Fig. 1). Although we found high tracer concentrations at the first few stations south of Cocodrie, between 90^{o}W and 92^{o}W, as expected, we were somewhat surprised to find virtually no tracer beyond 92^{o}W within 70 km of the slope, although there were small amounts at Stations 11 and 14.

Once at Station 14 we were able to handle a full throughput of samples with the analysis system, and we started occupying tracer stations at intervals of about 6 miles along tracks roughly perpendicular to the bathymetry. Tracer profiles seemed to vary systematically in some respects with distance from the slope. Those profiles obtained at stations located within 50 km or so of the 1000-m isobath, i.e., near where the isopycnal surface of the tracer release intersects the continental slope, tended to be relatively smooth with a single maximum (Figs. 3 and 4). Further away from the continental slope multiple peaks were often found in the vertical profiles (Figs. 3 and 4), and, rather oddly, the samples from near the target density surface were often relatively low in tracer. The mean of 11 profiles with significant tracer concentrations near the boundary is compared with the mean of 53 profiles with significant tracer further off shore in Fig. 5. The mean profile near the boundary is clearly broader than that in the interior, both above and below the peak. This result suggests that diapycnal mixing is enhanced near the boundaries, as has been found in other settings [e.g., Ledwell and Bratkovich, 1995; Ledwell and Hickey, 1995]. Numerical estimates of diapycnal diffusivity in the two regimes will be made during the early analysis of the data, with an inverse model.

Even though, as noted above, tracer was found to be low near the target density in many of the interior profiles, the mean does not have a valley there, although it does have a rather flat peak. Also, the peak of the mean tracer distribution, both boundary and interior, is 20 to 40 meters deeper than the target density surface. This was also found to be true in the August survey shortly after injection and so we must conclude that much of the tracer fell before dissolving, in the mean. This effect will increase the uncertainty in the initial distribution of the tracer in density space. However, we expect that the initial distribution, with error bars, will be estimated well, along with diapycnal diffusivity with the inverse model.

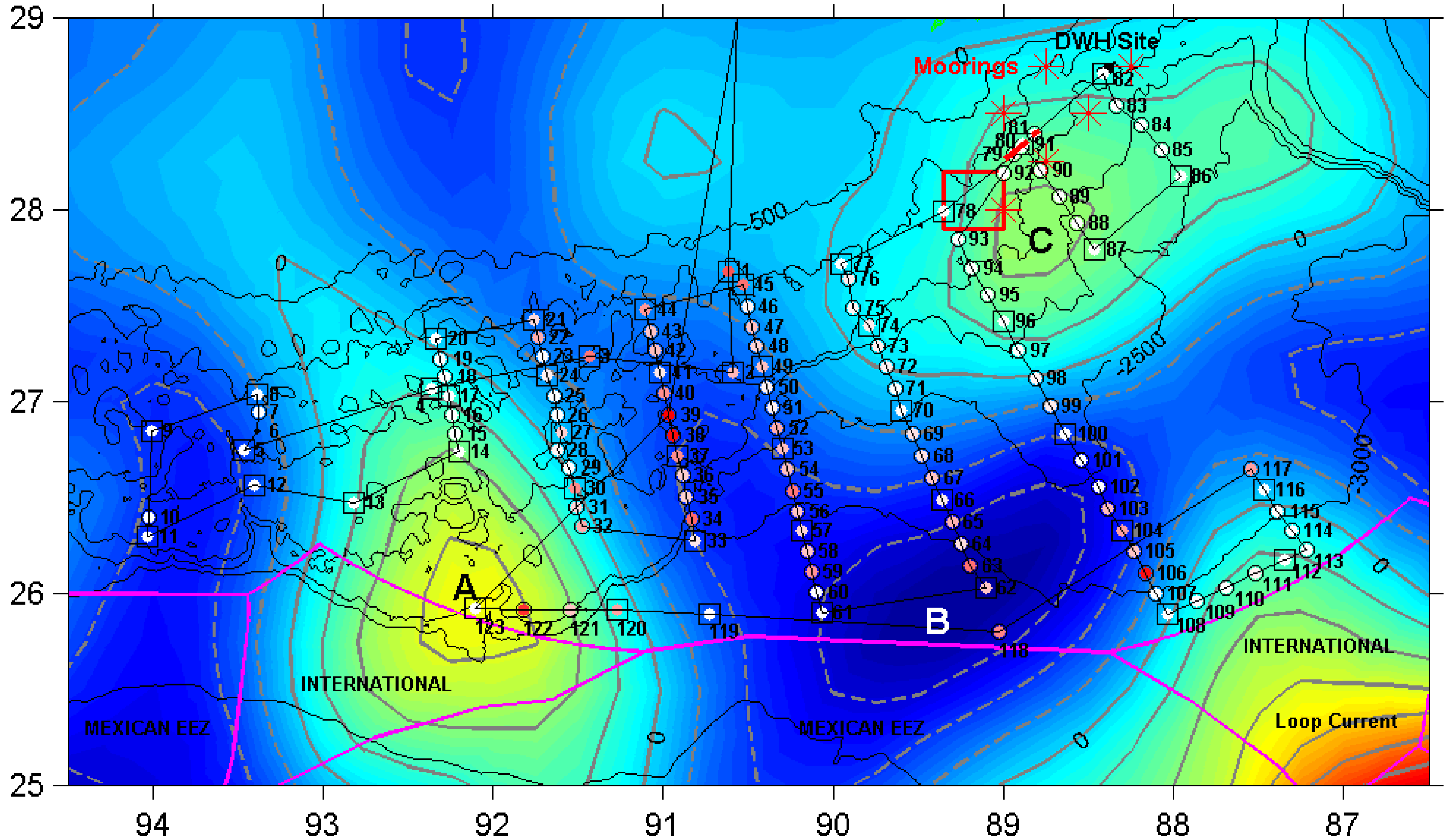


Fig. 1. Station Map. The southern tip of Louisiana is barely visible in green near 29°N, 89.5°W. The background color shows qualitatively the sea surface height (SSH) on 16 December 2012, from CCAR analysis of AVISO data. SSH is also quantitatively contoured in grey at 5-mm intervals, with the 0-contour indicated and negative contours dashed. Anticyclonic eddies A and C, cyclonic eddy B, and the northwest end of the loop current are indicated. The magenta lines demarcate Exclusive Economic Zones, with Mexico or international zones to the South and the USA to the north. Bathymetric contours are shown as fine black lines, every 500 meters. The cruise track is shown as straight black line segments, along which the stations are numbered. The station symbols are colored according to the column integral of tracer found; from white (no tracer) through pink to red. The largest column integral, 3.0 nmol/m^2, was found at Station 39. Round symbols indicate stations at which only the WHOI rosette was deployed, specifically for sampling the tracer in the layer between approximately 800 and 1500 m depth. Square symbols indicate stations at which the

TAMU/GERG rosette was deployed for full depth measurements of hydrographic and chemical variables. Tracer casts were also done with the WHOI rosette at most of these stations. The site of the Deepwater Horizon wreckage is marked just northeast of Station 82. Moorings deployed by TAMU during GISR Cruise GS01 are shown as red stars in the northeast. The location of the tracer deployment amidst these moorings on GISR Cruise GS02, on 28 July 2012, is shown as a broken diagonal red line overlying Stations 79–81 and 91. The red box delimits the tracer survey done between 5 and 11 days after the tracer deployment, on GISR Cruise GS02 in August 2012. Altimetry data were provided through the courtesy of Robert Leben and Michael Shannon at the Colorado Center for Astrodynamics Research, and are viewable at the site: http://eddy.colorado.edu/ccar/data_viewer/index. Bathymetry data in this and in Fig. 2 are from the NOAA National Geophysical Data Center, U. S. Coastal Relief Model, available at the web site: http://www.ngdc.noaa.gov/mgg/coastal/crm.html.

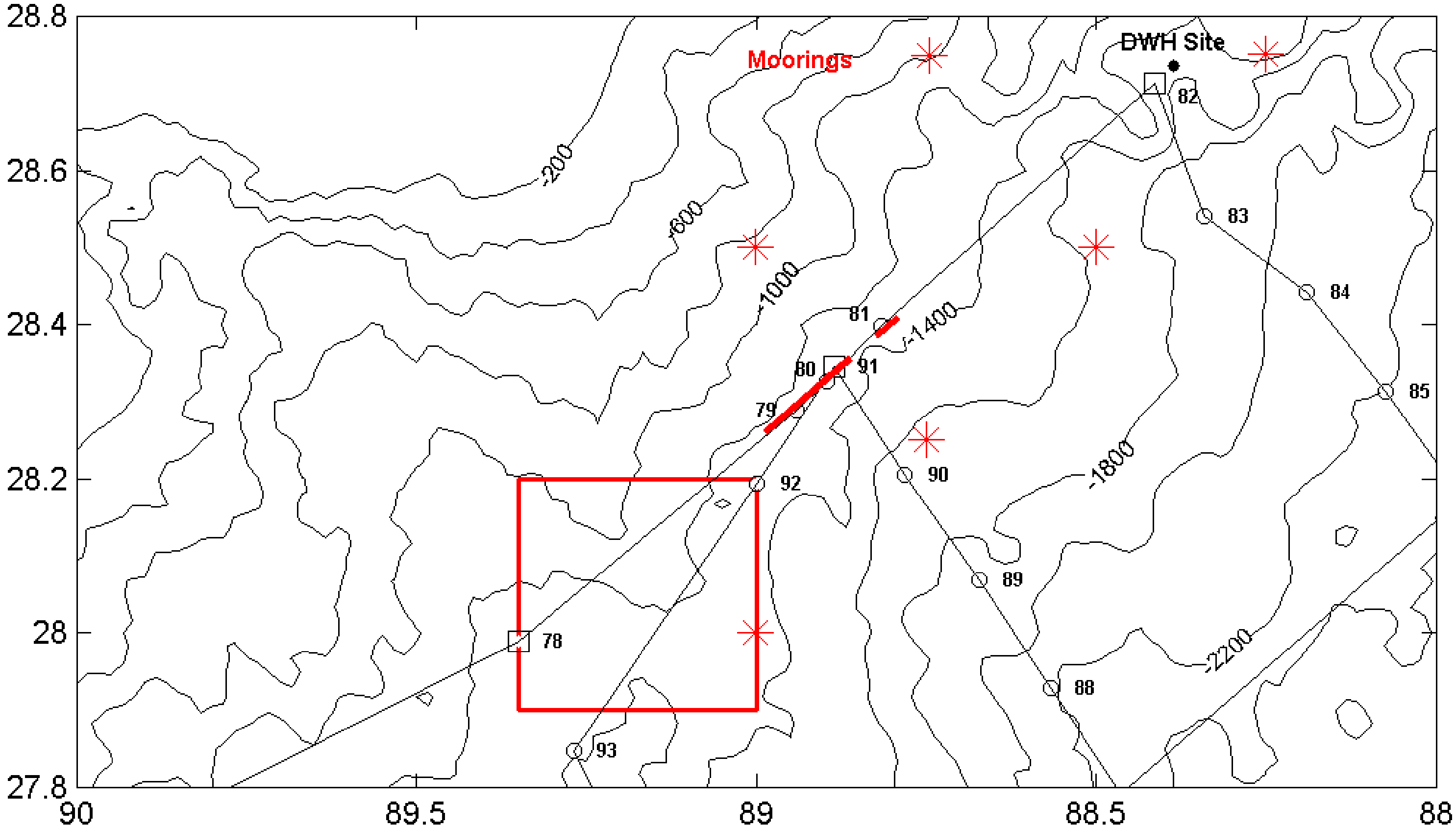


Fig. 2. Stations near the Injection Area. Isobaths are shown every 200 m. The Deepwater Horizon site is shown as a black dot. Red asterisks show the locations of GISR moorings deployed by TAMU in July 2012. The track during the injection deployment is shown as a broken diagonal line, the break being during a period when the injection pumps were off. The red box delimits most of the initial survey of August 2012. Stations for the present cruise marked with squares were full water column profiles done with the TAMU/GERG rosette as well as the WHOI rosette, except that at Station 91 only the GERG sampler was deployed. None of the stations shown here yielded tracer except within the bottom 100 m from Stations 79–81, which were done with the WHOI rosette with samples concentrated near the bottom. Fig. 6 shows the concentration profiles from these stations. Deep samples from Station 91 also may have had tracer.

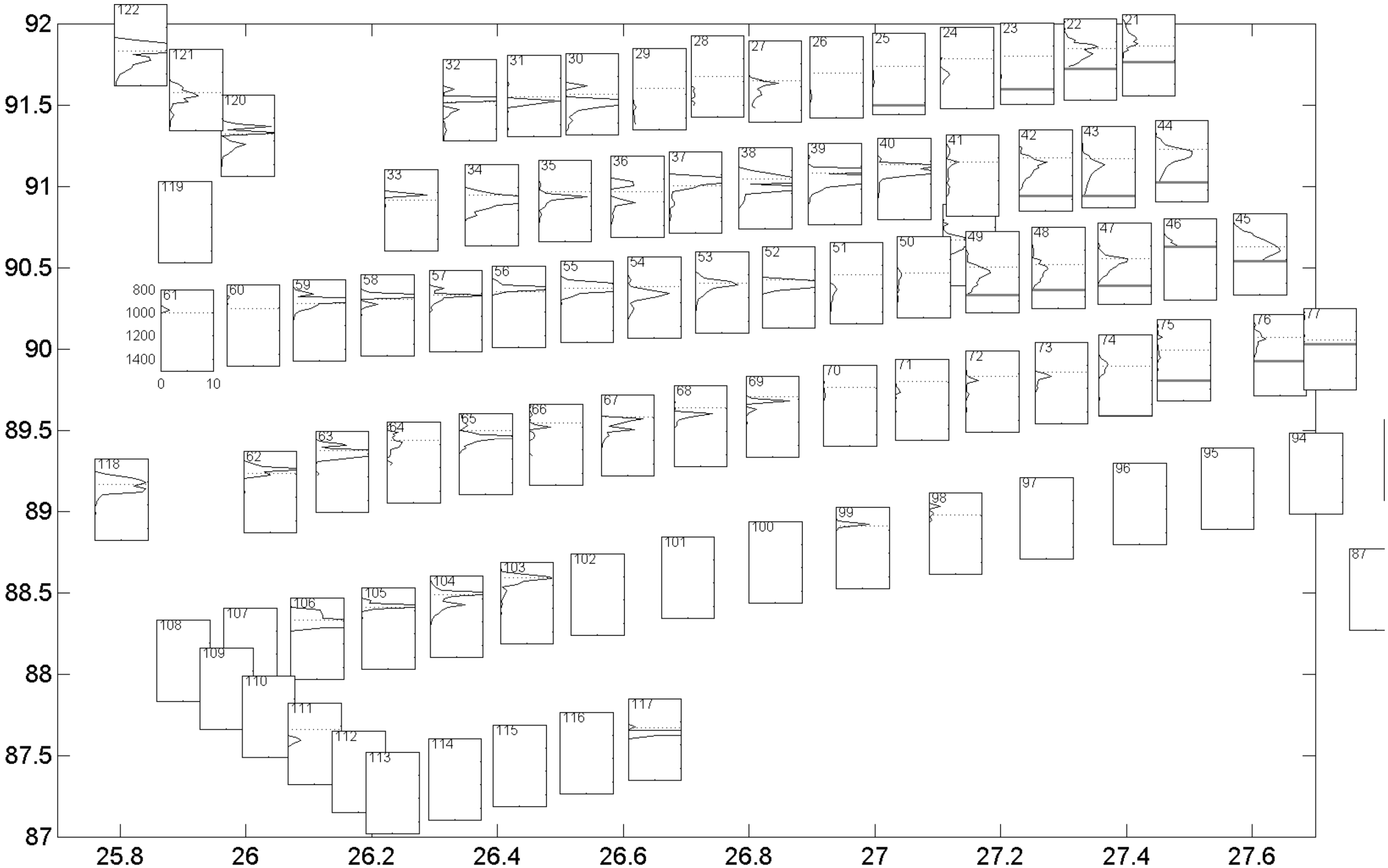


Fig. 3. Individual Tracer versus Depth Profiles. Most of the profiles between 88°W and 92°W are plotted. The exceptions are Stations 78-93, which had little or no tracer. The panels are centered at the positions of the stations, except that 120 and 122 have been offset a bit to make them visible. Station 2 is hidden behind Stations 49 and 50. The vertical axis on each is depth from 800 to 1500 m, and the horizontal axis is concentration, from 0 to 10 fM, as shown for Station 61. The dotted line is at the depth of the 32.254 potential density surface. The solid grey line indicates the bottom depth where it is less than 1500 m. The panels that are blank had little or no perceptible tracer.

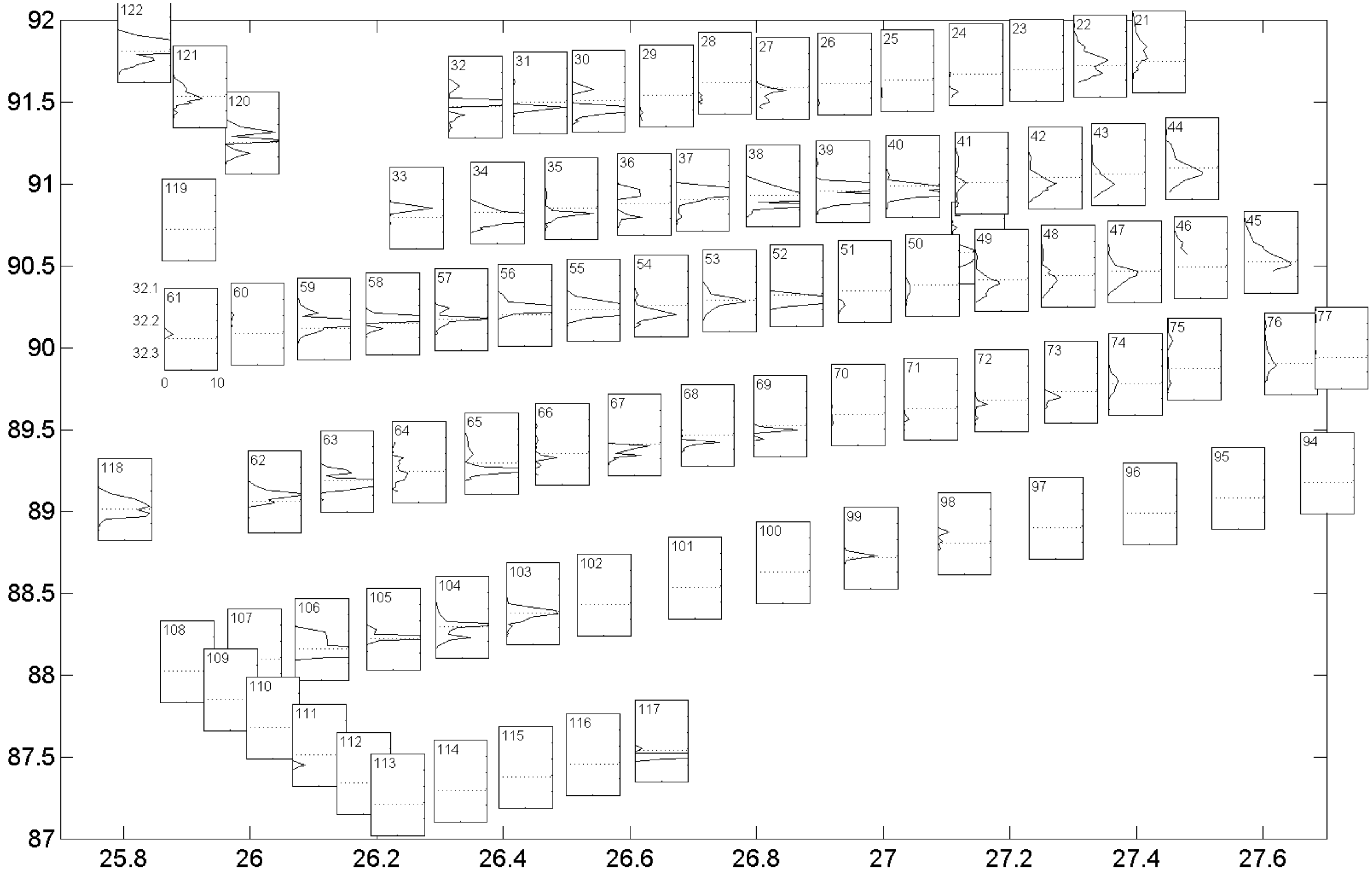
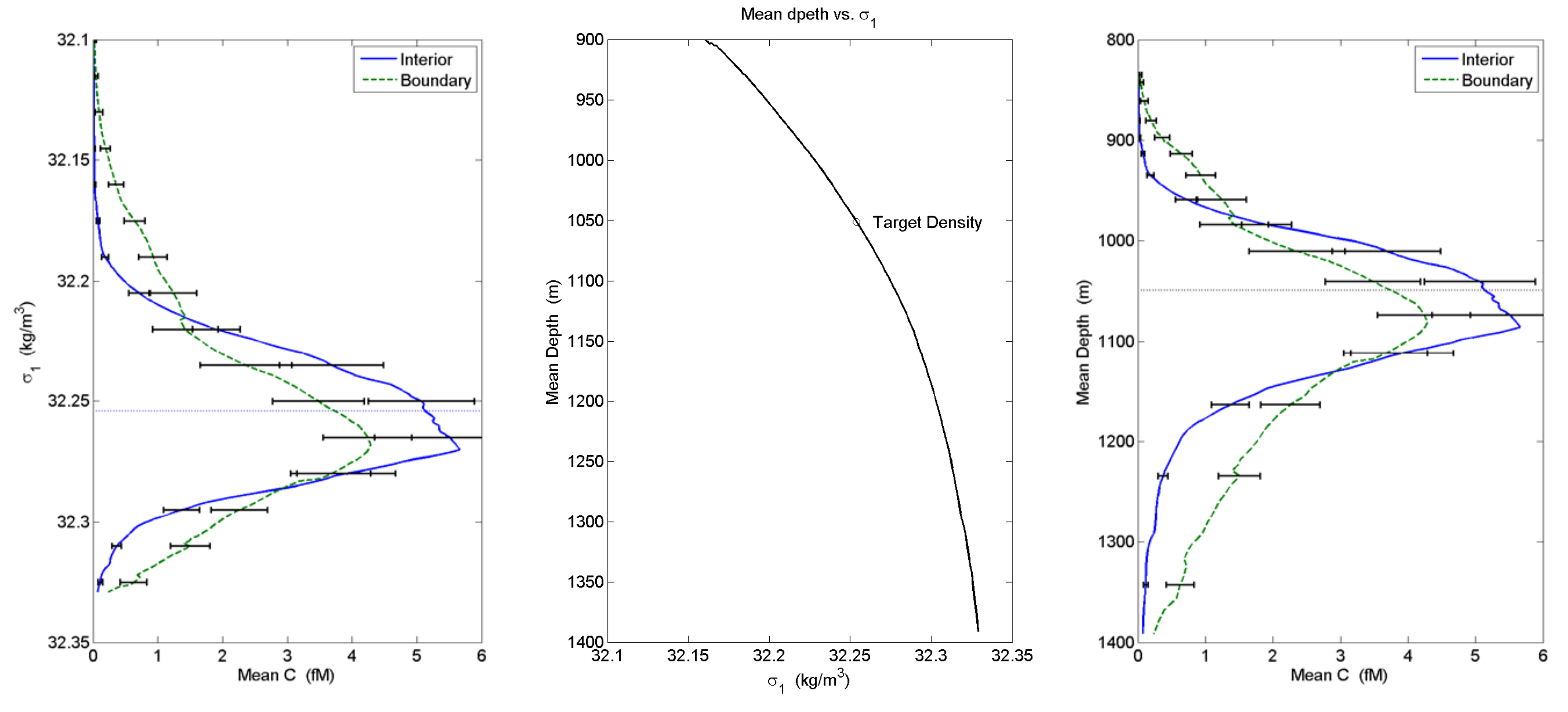


Fig. 4. Individual Tracer versus Density Profiles. The same as Fig. 3 but the vertical axes of the panels is now σ_1, from 32.1 to 32.35 kg/m^3. The axes of the panel are shown for Station 61. The dotted line is at the target density in each panel. The potential density at the bottom under the injection track is approximately 32.32 kg/m^3, so tracer peaks in the bottom fifth of the panels may be from the tracer that dropped to the bottom.



(A)	(B)	(C)

Fig. 5. Mean Boundary and Interior Tracer Profiles. A: Mean concentration profile versus density for the 53 interior profiles and 11 boundary profiles with significant tracer levels. B: Mean depth versus density for the 53 interior profiles used in (A). C: Mean of the interior and boundary profiles transformed to depth using the mean depth versus density relation for the interior shown in (B). Profiles are allowed to drop out of the means where there are no data, creating small discontinuities. The target density of 32.254 is shown in A and B, and the mean depth of this density surface in the interior is indicated by the dotted line in (C).

Tracer concentrations waxed and waned along the lines through about Station 73, beyond which tracer concentrations fell to virtually zero. With little inclination to do another line with low concentrations, and having found a total of only about 20% of the tracer released, crudely estimated by assigning an area to each station equal to the spacing between the lines and the stations, we worried that a great deal of the tracer had gone missing, and we decided to see if some of it was lying in the sediments below the injection track. (The method of estimating the amount of tracer found is not justified by the length scale of the spatial covariance of the tracer field, which is much smaller than the spacing of more than 50 km between lines, though perhaps of the same order as the 10 to 20 km spacing between stations along the lines.)

Stations 79, 80 and 81 were occupied along the track of the injection (Figs. 1 and 2). Bottles were tripped every 10 meters, starting at the bottom. Indeed, tracer was found in a layer on the order of 100 meters deep above the bottom (Fig. 6). As no other tracer was found in the vicinity it is safe to conclude that this tracer was emanating from the sediments. Some tracer at least had fallen to the bottom during the injection. This imperfection is almost unavoidable and is to be expected for even the cleanest of releases. The tracer must be atomized into droplets with a diameter of around 25 microns so that they will dissolve before sinking to the bottom; such is the low solubility of the tracer in water. The formation of some larger droplets is unavoidable.

The concentrations found at Stations 79–81 were quite low, however, in the sense that if we suppose that water is sweeping past the site at speeds on the order of 1 cm/s, the concentrations suggest a source strength on the order of 1 to 10 x 10^{-8} moles/s. In the roughly 10^{7} seconds since the release, at this rate only 0.1 to 1 mole of tracer would have been released. Of course the source strength could have been stronger at the start and diminished over time. We in fact see evidence of this in the distribution of tracer with density in some of the profiles shown in Fig. 4. The potential density near the bottom under the injection track, where Fig. 6 shows tracer, was around 32.32. Small peaks can be seen in some of the profiles near this density, for example at Stations 24, 30, and 32. However, this fly in the ointment of the experiment proves not to be a serious one.

We left the site of the injection to visit a site within 2 miles of the Deepwater Horizon drill site accident. There, at Station 82, we did a double cast, one for tracer and the other for hydrography and chemistry. As luck would have it heavy weather temporarily knocked out the 10-liter system – excessive ship motion had apparently allowed the cable to go slack, creating kinks that required retermination. The Optical Backscatter Sensor was also damaged on this cast, and that was apparently the immediate cause for the CTD signal to be lost. Thus both casts at Station 82 were done with the WHOI system, with sufficient water obtained for the various chemical properties by doubling up on the 4-liter bottles.

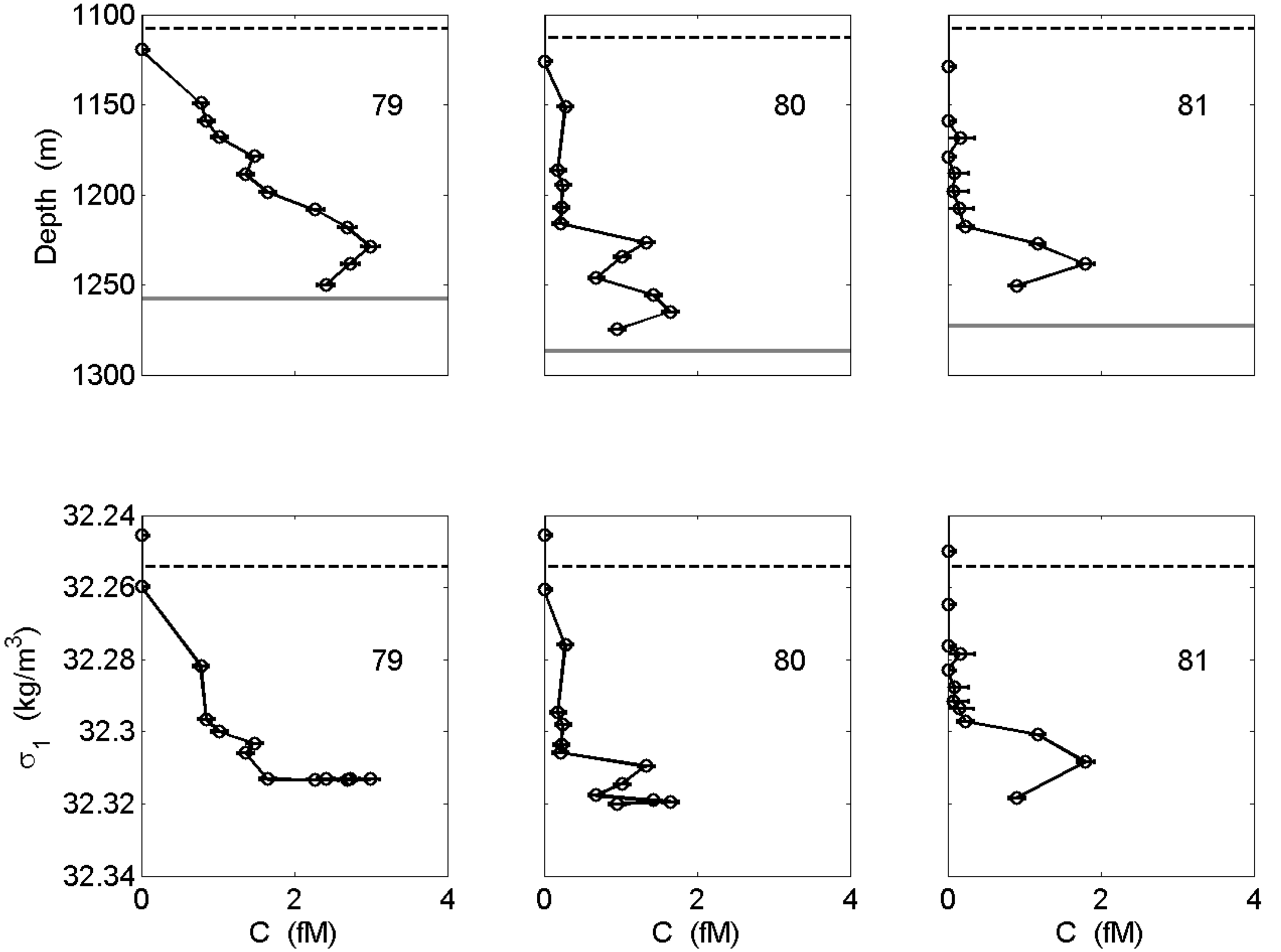


Fig. 6. Tracer Profiles at the Injection Site. Concentration profiles from Stations 79, 80 and 81, located along the injection track (see Figs. 1 and 2), as a function of depth (top row) and potential density, σ_1 (bottom row). The grey line in the top row indicates the bottom depth. The dashed line in both rows indicates the level of the target density surface, at σ_1 = 32.254 kg/m^3.

With seemingly little prospect of finding tracer in the far east we nevertheless stayed there long enough to occupy Stations 83 through 90, at which point we were back at the injection site. We occupied two more stations there, one to fill out the pattern of TAMU casts and the other to check again for deep tracer a bit further from the injection track than Stations 79–81. There was no tracer there, at Station 92. With Station 93 we started a long track to the southeast following the pattern we had established with the earlier lines, but at a station spacing of 10 miles since we were anxious to get to the southern end where tracer was expected, based on the previous finds in the south. We did indeed find tracer there in very high concentration at Station 106. This tracer seemed to continue a stripe of tracer that seemed to emanate from the slope but move offshore to the southeast. By this time we were paying attention to the eddy field as revealed by satellite altimetry. The tracer appeared to be moving roughly along lines of constant sea surface height anomaly, or at least to have been strongly influenced by the eddy field. In particular it appears that the tracer moved along the slope until it encountered an anticyclonic eddy (‘A’ in Fig. 1) centered near 26^{o}N, 92^{o}W. At that point it appears to have been sent offshore by the flow, moving along the eastern side of the eddy and then around a cyclonic feature to the east (‘B’ in Fig. 1). This pathway would be consistent with the pattern of tracer found up to and especially including at Station 106.

With the cruise nearing an end, we attempted to find the end of this eastward tending streak with Stations 108 to 117. A quick check of samples from Station 117 indicated that there was no tracer there, and so we decided that there was unlikely to be much tracer along the line of which that station was an element. It seemed to us that we had not sampled the Eddy A well enough and we opted to steam back to it rather than continue to come up with little tracer in the east, even though it meant a long steam with few stations, since time was running out. It turned out that Station 117 had more tracer than our quick check suggested, however.

Station 118, along the way to Eddy A and just north of the Mexican EEZ was relatively rich in tracer, as were the first three stations across the eddy, namely 120, 122, and 122. Station 123, near the center of the eddy was free of tracer, perhaps not surprisingly, but the eddy in general proved to be relatively rich in tracer. In retrospect, looking at the tracer map superposed on the SSH map, we suspect that there was tracer also to be found in the east where time constraints did not allow us to sample.

Station 123 was the last to be occupied. The crude sum of the tracer found by this point comes out to about 60% of the tracer injected. It seems clear that there was tracer east of our survey, south of our survey in the Mexican EEZ, and perhaps even in the far west, near Texas, beyond our westernmost stations – tracer that may have passed 92^{o}W before Eddy A stepped in to interfere. There may also be a small amount of tracer on the bottom beneath the injection track, but the evidence so far is that not very much of the tracer fell to the bottom.

4.1 Oxygen Samples

Seawater samples were collected using the Texas A&M CTD frame for dissolved oxygen at stations determined by the chief scientist. The samples were properly stored and analyzed throughout the cruise using a Winkler titration system by Erik Quiroz of GERG. In conjunction with the samples, standards and blanks were run every 24 to 36 hours in order to monitor any fluctuations in the titrant (sodium thiosulfate). These data were plotted against the dissolved oxygen sensor (SBE-43) data to determine any offsets and to recognize suspicious data points. The data shown below in Fig. 7, comparing the Winkler results with the SBE 43 oxygen sensor on the TAMU rosette frame, are preliminary.

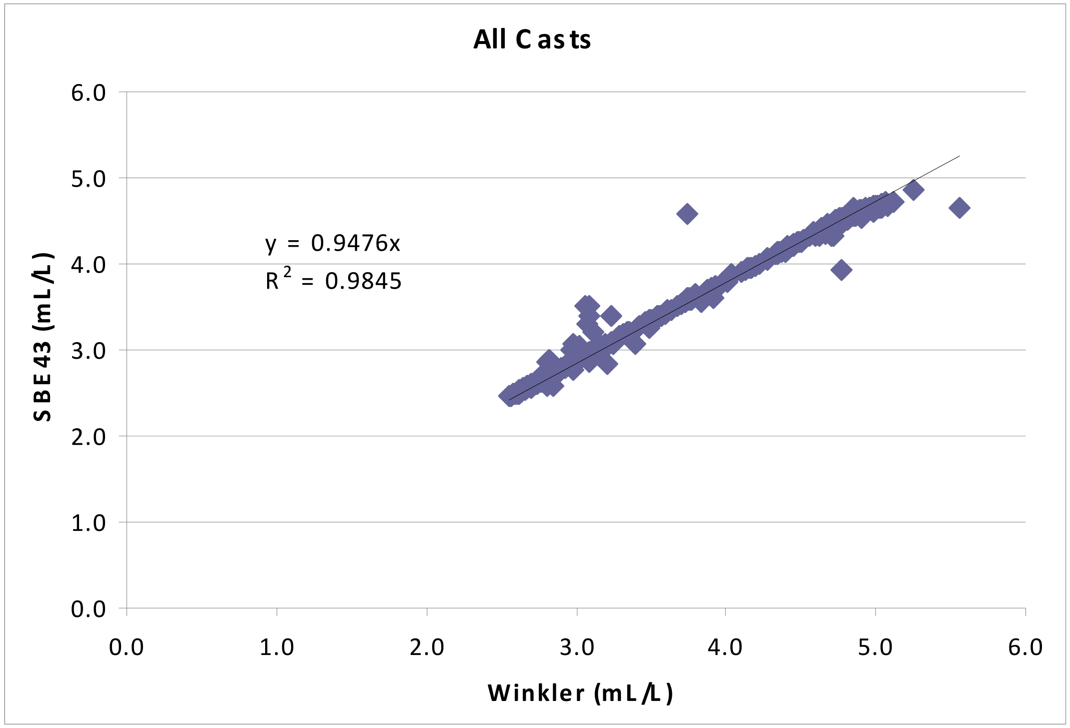


Fig. 7. Oxygen Sensor/Winkler Comparison. Preliminary comparison of Winkler results with the SBE 43 oxygen sensor on the TAMU rosette frame.

4.2 Dissolved Inorganic Carbon Samples and pCO_2 Analysis

Samples were taken from the TAMU CTD for future analysis for Dissolved Inorganic Carbon (DIC), by grad students Jordan Young and Alison Smyth under the supervision of Shari Yvon-Lewis of TAMU. Two different sample sizes were taken randomly, 250-ml combustible bottles and 500-ml combustible bottles. The sampling method was to rinse the bottles upside down and then slowly fill the bottle to the neck. When full, the bottles were overflown with about four full volumes. The flow was then stopped and the tube was removed to leave a very small headspace. The bottles were then poisoned with Mercuric Chloride to kill diatoms that would alter the dissolved CO_2. A small amount of vacuum grade grease was applied to the stoppers and then secured into the bottles using industrial rubber bands to prevent any gas flow into or out of the samples.

The pCO_2 for both the surrounding air and the surface water was measured for the entire trip. The measurement was taken by pumping air from the bow into a column of silica gel to remove most of the water vapor. The air then passed through a glass bead column and a following Nafion drying column to make sure the air had as little water vapor as possible. This stream was then passed into a Licor instrument to read the pCO_2. The method for water samples was roughly the same, except that the air that is pulled into the Licor is provided from a set of equilibrators being fed surface sea water through spray nozzles. The air is pulled from one equilibrator while the second is there to provide an equivalent draw of air into the main equilibrator if there is a change in atmospheric pressure. The air that is drawn to the Licor goes through a glass bead trap and a Nafion dryer as well, although separate from the surrounding air stream mentioned earlier. The system automatically alternated which stream was being analyzed with a Visual Basic program that allowed the equilibrator to run for 45 minutes and the surrounding air for 15 minutes. Twice each day the system was calibrated using a high known pCO_2 and a low known pCO_2 as well as a zero air blank.

4.3 Dissolved Organic Carbon Samples

Dissolved organic carbon (DOC) samples were drawn from the TAMU Rosette by grad students Ivan Maulana and Noura Randle under the supervision of Thomas Bianchi of TAMU. Seawater from each Niskin bottle was passed through 47-mm GF/F filters in gravity filter sets pre-rinsed with 2N HCl and Milli-Q water. A duplicate was drawn for every 12 samples, and approximately 30 ml were sampled in 40-ml borosilicate vials. Samples were immediately frozen at 10^{o}F, and transported frozen to Texas A&M University in College Station, TX.

4.4 Hydrocarbon Samples

Samples for hydrocarbons were drawn by the science party from several of the 10-liter Niskins for each of the TAMU casts, under the supervision of Dr. Terry Wade at TAMU. About 3.6 liters were drawn into 4-liter amber glass bottles that had been preloaded with an aliquot of dimethyl sulfide to stop bacterial activity after sampling. For some samples, however, the DMS had evaporated from the bottles before sampling. The samples were returned to TAMU/GERG for analysis in the lab.

4.5 Nutrient Samples

Samples were taken for analysis in the lab of nitrate, nitrite, ammonia, phosphate and silicate. The samples were frozen and will be analyzed at TAMU/GERG.

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Appendix A. CTD Operation

CTD Instrument Overview

Two Seabird SBE 9*plus* CTD units were used on the PE1315 cruise. One was from the Tracer Release Laboratory at Woods Hole Oceanographic Institution (WHOI) and the other was from the Geochemical and Environmental Research Laboratory (GERG) of Texas A&M University (TAMU). The WHOI CTD was used for tracer sampling and the TAMU CTD was used for hydrography and chemistry sampling throughout the water column. The WHOI CTD had dual pumped C/T sensors and a pressure sensor for the primary variables. The TAMU CTD had single pumped C/T sensors as well an SBE43 Oxygen sensor, a Seatech LS6000 OBS optical backscatter sensor, a WetLabs Seastar transmissometer, and a Chelsea Aquatracka 3 chlorophyll fluorometer . Both CTD's had altimeters. Tables A.I and A.II list the serial numbers of the sensors used.

A total of 123 stations were occupied during cruise. At roughly 2 stations per day a cast with each CTD was performed. At the other stations only the WHOI CTD was used, except for Station 45 where both casts were done with the TAMU CTD.

Table A.I. WHOI CTD Sensor Information		
Sensor Type	**Serial No.**	**Calibration Date**
Pressure	59933	
Primary Temperature	1085	7/22/2011
Secondary Temperature	1080	11/15/2011
Primary Conductivity	763	11/15/2011
Secondary Conductivity	3648	11/15/2011
Altimeter	1205	11/15/2011

Table A.II. TAMU CTD Sensor Information		
Sensor Type	**Serial No.**	**Calibration Date**
Pressure	75675	01/12/2000
Primary Temperature	2840	12/13/2010
Primary Conductivity	2374	08/05/2011
Oxygen (stations 1–9)	1498	12/10/2010
Oxygen (stations 11– SSS)	803	05/05/2012
Transmissometer	CST-339DR	12/21/2000
Fluorometer	88220	12/21/2000
OBS	470	05/1/2000
Altimeter	743	unknown

Cast notes:

CTD file names are structured as follows:

PE1315XSSSCCL

where X is either W for the WHOI CTD frame or T for the TAMU CTD frame, SSS represents the 3-digit sequential number of each location where one or more casts were performed, CC represents the 2-digit sequential number of the deployment of any CTD at that location, and L represents a sequential letter if the cast was divided into more than one part which only happened in a few cases.

- PE1315W00201 - is in 2 parts - 'A' is second part
- PE1315T01101 - replaced O2 sensor (rinsed cells with TritonX and DI)
- PE1315T01201 - Fixed problem with NMEA prior to this cast. Casts before this had bad NMEA data (no decimal minutes)
- PE1315W02002 - no NMEA data – would not connect to NMEA
- PE1315W04801 - touched bottom - rinsed cells with TritonX and DI after cast
- PE1315T08201 - CTD shut down during downcast; no bottles were fired
- PE1315T08601 - OBS instrument removed from TAMU CTD configuration due to flooded connector (see previous cast)

Appendix B. Tracer Analysis

Tracer concentrations were analyzed by degassing aliquots of seawater samples taken from the 4-liter Niskin bottles with a stream of nitrogen, trapping the tracer on a Unibeads 2S trap at approximately -60^{o}C, heating the trap to +80^{o}C, and sending the trapped contents to a series of chromatographic columns and an electron capture detector, following the general method described by Law *et al*. [1994], developed for sulfur hexafluoride. Details of the components of the system are listed in Table B.I.

Table B.I. Tracer Analysis Parameters

Sample size	550-ml glass bottle filled from 4-liter Niskin bottles
Aliquot size	270 ml, sprayed into a 330-ml evacuated glass tower
Sparge gas	Nitrogen, 2.5 minutes at approximately 160 ml/minute.
Trap	0.1 ml of Unibeads-2S 60/80 in 2.1-mm ID SS tubing at approx. -60^{o}C
Release temperature	+80^{o}C
Carrier Gas	Nitrogen at 30 ml/minute
Precolumn	250 mm x 2.1 mm ID SS tubing with 80/100 Molecular Sieve 5A, 70^{o}C
1st main column	1200 mm x 2.1 mm ID SS tubing, Unibeads 3S 80/100, 70^{o}C
2nd main column	1800 mm x 2.1 mm ID SS tubing, Carbograph-1 10 AT1000 60/80, 70^{o}C
GC	Shimadzu GC8A with Electron Capture Detector at 330^{o}C, 2.0 nA
CF3SF5 Retention Time	2.8 min
Minimum Detectable Level	0.1 fM

The amount of oxygen in the samples is very large compared with the tracer, and the tail of the oxygen peak would swamp the tracer peak if the oxygen were allowed to come through the columns. Unibeads-2S traps the tracer efficiently but lets the oxygen through.

The purpose of the precolumn was to hold up nitrous oxide, which elutes at nearly the same time as the tracer. The precolumn was backflushed after 1.5 minutes at the start of the cruise. This time was reduced to 1.25 minutes after problems were encountered with the nitrous oxide breaking through the column before backflush. 1.25 minutes was as short as we could make the time without losing some of the tracer.

The main columns were backflushed 3.4 minutes after injection of the sample.

The signal to noise ratio of our system for the tracer is only half as great as for similar systems, using the same columns, developed by W. Smethie at Lamont-Doherty Earth Observatory [Ho *et al.*, 1998], and by Marie-Jose Messias at the University of East Anglia in the U.K. The main reason is that the retention time of the tracer is about twice as great for us as for those systems and so the peak is not as sharp. The situation could presumably be improved with different columns. The LDEO and UEA columns were run at around 110^{o}C. We had to run at 70^{o}C to obtain adequate separation of the tracer from CCl_2F_2, which elutes right after the tracer, and which in fact interfered with the tracer for tracer concentrations greater than about 5 fM.

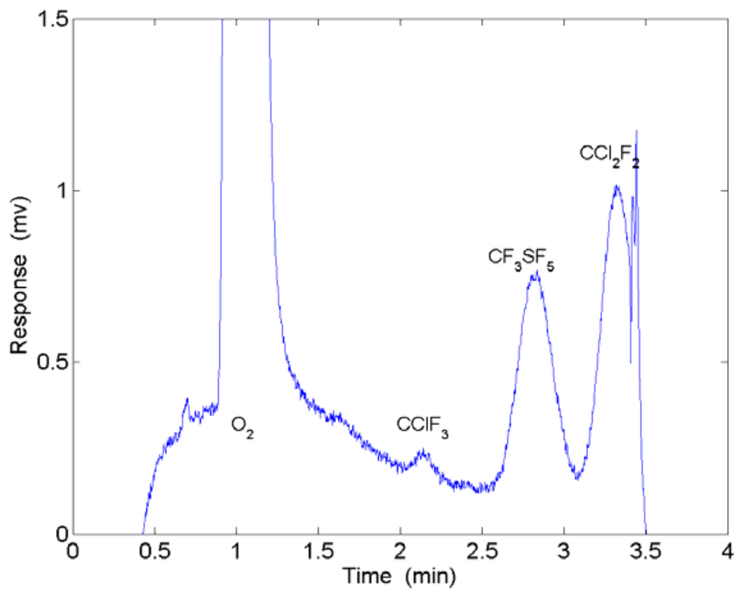

Fig. B.1. Example Chromatogram. The sample was introduced at 0 min, the precolumn backflushed at 1.25 min, and the main columns backflushed at 3.4 min. The concentration of CF_3SF_5 for this example was approximately 5 fM.

The peaks were integrated as follows. Points were chosen manually on the baseline at the start and end of a peak, a straight line was drawn between these points, and the signal (in mv) above this straight line was integrated over the time between the points. For very small peaks, guidance in choosing the times for start and end was provided by the elution time of small, but clearly identifiable, peaks. For larger peaks whose tails overlapped with the leading part of the CCl_2F_2 peak, a flat baseline was chosen between the start of the peak and the time of the minimum between the two peaks, i.e., the "valley" between the two peaks. The standard used Standard 5A, which contained 106 parts per billion CF_3SF_5 in nitrogen. Standard loop sizes were 0.922 ml and 4.95 ml. No sample gave peaks larger than this standard in the larger loop.

Analysis of concentrations at Stations 6 and 29 were spoiled by nitrous oxide peaks breaking through the Molecular Sieve column. This problem was eventually solved by baking the Molecular Sieve column at about 220^{o}C after every 50 samples or so and also by reducing the time after injection at which the Molecular Sieve column was backflushed.

The minimum detectable level and also the minimum uncertainty assigned to the concentrations was 0.1 fM. This minimum uncertainty was doubled for peaks that were ambiguous to integrate by the method described above. An uncertainty of 2% was also included for all concentrations. The greatest uncertainty for practical interpretation of the data, however, is probably not these uncertainties, but, more likely, variations in the actual concentration field over short time and length scales. The present cruise afforded a unique opportunity to quantify this kind of variability since we often did two casts at the same station. Nevertheless, due to ship movements during the casts, there is likely to be on the order of a 500-m difference in lateral position of the casts and there was around 2 hours in time between the two casts. Samples were taken for tracer from most of the 10-liter Niskin bottles of the GERG rosette that were tripped in the tracer layer, and were analyzed as described for the samples from the WHOI rosette. Comparison of these samples with the WHOI rosette samples at the same density levels and nominal station location will give a unique estimate of the overall uncertainty of our procedures: that due to small scale variability in the field as well as all the possible errors associated with drawing the samples and running them on the GC. This analysis has not yet been done.

Appendix C. Tracer Profile Cast List

Tracer Profile Cast List

GISR Cruise GS03 R/V *Pelican* PE1315 Tracer Casts, 28 November to 20 December 2012

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Preliminary Results for Stations at which tracer profiles were obtained. The last column lists the column integral of tracer, in nmoles/m^2. Uncertainty estimates for these are not yet finalized so have not been included. Some of the stations listed as having column integrals as 0.00 may have very small but detectable amounts of tracer. The chromatograms from these have not all been thoroughly inspected yet. This list includes only casts done with the WHOI 22 x 4-liter rosette, specifically for tracer.
The one exception is at Station 45 where the TAMU rosette was used for both the general hydrography/chemistry cast and the tracer cast. The tracer profile for this station was based on samples from both casts, T04501 and T04502. Only the latter is listed here for simplicity because that is the one that obtained most of the tracer samples and that sampled tracer closest to the bottom.
Please consult Ledwell if you intend to use these data and certainly if you intend to publish them, as they are the primary product the work of the people at sea on the cruise.
Ledwell and coworkers are particularly interested in estimates of lateral dispersion parameters, in measures of streakiness, such as spatial covariance, and in other statistics of the lateral distribution of the tracer, as well as the circulation of the deep water in the Gulf.

Positions are in degrees and minutes (in separate columns). Times are UTC.

Station	Cast ID	Mo	Day	Time (UTC)	Latitude (N)		Longitude (W)		ctd depth	water depth	col integral
									(max.)	(est.)	nmol/m^2
2	W00201	Nov	28	22:52:32	27	9.88	90	34.92	1544	1557	0.84
4	W00402	Nov	29	18:58:06	27	5.19	92	21.96	1487	1506	0.01
5	W00501	Nov	30	4:08:51	26	43.67	93	22.81	1473	1496	0.04
7	W00701	Nov	30	10:54:20	26	56.16	93	22.96	1207	1217	0.03
8	W00802	Nov	30	15:41:38	27	1.65	93	22.95	1223	1233	0.00
9	W00902	Nov	30	23:38:31	26	50.64	94	0.32	1239	1252	0.01
10	W01001	Dec	1	5:05:03	26	23.29	94	0.03	1598	1606	0.01
12	W01202	Dec	1	17:36:18	26	34.15	93	24.05	1619	1629	0.02
13	W01301	Dec	2	0:30:13	26	27.3	92	47.61	1780	1804	0.02

14	W01401	Dec	2	9:27:20	26	43.48	92	11.97	1841	1849	0.08
15	W01501	Dec	2	15:59:15	26	49.87	92	13.46	1855	1870	0.01
16	W01601	Dec	2	18:54:33	26	55.9	92	14.74	1369	1383	0.00
17	W01702	Dec	2	22:18:59	27	1.73	92	16.02	1447	1463	0.00
18	W01801	Dec	3	0:28:06	27	7.71	92	17.52	1405	1416	0.00
19	W01901	Dec	3	2:46:39	27	13.59	92	18.94	1380	1398	0.01
20	W02002	Dec	3	5:29:13	27	19.54	92	20.06	1159	1179	0.01
21	W02102	Dec	3	13:58:57	27	25.57	91	45.22	1193	1211	0.43
22	W02201	Dec	3	16:29:10	27	19.95	91	43.89	1214	1236	0.98
23	W02301	Dec	3	18:57:39	27	14.05	91	42.36	1360	1375	0.01
24	W02402	Dec	3	22:26:04	27	8.38	91	40.7	1483	1510	0.17
25	W02501	Dec	4	0:37:40	27	2.26	91	39.3	1389	1421	0.05
26	W02601	Dec	4	2:45:49	26	56.37	91	37.93	1843	1857	0.03
27	W02702	Dec	4	6:51:04	26	50.35	91	35.77	1827	1840	0.55
28	W02801	Dec	4	10:21:48	26	44.73	91	34.98	2179	2199	0.11
29	W02901	Dec	4	13:44:32	26	38.95	91	33.53	1837	1852	0.08
30	W03002	Dec	4	18:45:46	26	32.89	91	31.34	2263	2430	1.34
31	W03101	Dec	4	21:39:37	26	27.19	91	30.57	2008	2100	0.45
32	W03201	Dec	5	0:00:22	26	21.29	91	29.18	1981	2222	0.99
33	W03302	Dec	5	8:49:56	26	16.44	90	48.79	2001	3060	0.26
34	W03401	Dec	5	12:42:47	26	24.34	90	50.63	2001	2900	1.77
35	W03501	Dec	5	16:25:18	26	30.8	90	52.28	2002	2300	0.55
36	W03601	Dec	5	19:35:42	26	37.22	90	53.77	1992	2078	0.56
37	W03702	Dec	5	23:47:32	26	43.61	90	55.45	1935	1954	1.34
38	W03801	Dec	6	2:46:39	26	50.16	90	56.89	1557	2072	2.85
39	W03901	Dec	6	5:18:33	26	56.59	90	58.38	1652	1667	2.99
40	W04001	Dec	6	8:11:23	27	3.08	91	0	1631	1645	1.29
41	W04102	Dec	6	12:25:26	27	9.48	91	1.35	1538	1540	0.28
42	W04201	Dec	6	15:06:29	27	15.98	91	3.06	1358	1371	0.74
43	W04301	Dec	6	17:39:43	27	22.54	91	4.61	1386	1399	0.70
44	W04402	Dec	6	21:27:11	27	29.34	91	6.36	1325	1335	1.20
45	T04502	Dec	7	3:42:21	27	36.62	90	31.91	1202	1212	1.65
46	W04601	Dec	7	5:41:47	27	29.96	90	30.15	1032	1041	0.12
47	W04701	Dec	7	8:07:53	27	23.6	90	28.36	1337	1342	0.73

48	W04801	Dec	7	10:39:47	27	17.19	90	26.6	1340	1340	0.51
49	W04902	Dec	7	14:53:10	27	10.8	90	24.91	1344	1354	0.74
50	W05001	Dec	7	17:35:30	27	4.37	90	23.13	1486	2048	0.13
51	W05101	Dec	7	19:57:10	26	57.97	90	21.28	1503	2365	0.16
52	W05201	Dec	7	22:15:15	26	51.59	90	19.56	1502	2414	0.98
53	W05302	Dec	8	2:25:28	26	45.24	90	17.79	1487	2521	0.76
54	W05401	Dec	8	4:49:49	26	38.66	90	15.99	1502	2699	0.74
55	W05501	Dec	8	7:16:36	26	32.28	90	14.28	1487	2893	1.59
56	W05601	Dec	8	9:57:43	26	25.87	90	12.5	1503	3038	0.71
57	W05702	Dec	8	14:53:47	26	19.54	90	10.75	1486	3115	0.50
58	W05801	Dec	8	17:35:21	26	13.08	90	8.96	1502	3202	0.70
59	W05901	Dec	8	19:52:43	26	6.68	90	7.21	1502	3231	1.25
60	W06001	Dec	8	22:22:38	26	0.29	90	5.5	1487	3238	0.02
61	W06102	Dec	9	3:17:54	25	53.93	90	3.63	1486	3248	0.06
62	W06201	Dec	9	10:17:27	26	1.69	89	8.13	1487	3093	0.68
63	W06301	Dec	9	14:54:34	26	8.52	89	11.49	1486	3045	1.66
64	W06401	Dec	9	17:25:34	26	15.43	89	14.92	1501	3002	0.37
65	W06501	Dec	9	19:50:54	26	22.32	89	18.19	1502	3000	0.91
66	W06602	Dec	10	0:02:28	26	29.21	89	21.48	1486	2902	0.24
67	W06701	Dec	10	2:28:57	26	36.04	89	24.77	1507	2835	0.69
68	W06801	Dec	10	4:53:43	26	42.93	89	28.15	1501	2766	0.33
69	W06901	Dec	10	7:28:57	26	49.82	89	31.43	1487	2648	0.32
70	W07002	Dec	10	12:05:33	26	56.68	89	34.79	1487	2458	0.04
71	W07101	Dec	10	14:45:46	27	3.56	89	38.07	1485	2294	0.07
72	W07201	Dec	10	17:31:03	27	10.53	89	41.35	1502	2187	0.16
73	W07301	Dec	10	20:02:17	27	17.41	89	44.72	1502	1966	0.20
74	W07402	Dec	10	23:57:42	27	24.25	89	47.94	1503	1504	0.23
75	W07501	Dec	11	2:42:51	27	29.87	89	53.27	1306	1329	0.12
76	W07601	Dec	11	5:26:56	27	39.03	89	55.02	1188	1208	0.24
77	W07702	Dec	11	9:10:47	27	43.68	89	57.33	1088	1109	0.04
78	W07802	Dec	11	16:15:12	27	59.96	89	21.04	1227	1239	0.00
79	W07901	Dec	11	21:24:42	28	17.86	88	56.61	1252	1258	0.20
80	W08001	Dec	11	23:29:59	28	20.14	88	53.71	1276	1287	0.08
81	W08101	Dec	12	1:53:30	28	24.03	88	48.61	1251	1273	0.05

82	W08202	Dec	12	8:07:05	28	43.31	88	24.77	1546	1559	0.00
83	W08203	Dec	12	10:59:10	28	43.3	88	24.77	1486	1559	0.00
84	W08301	Dec	12	14:00:50	28	33.14	88	20.34	1487	1887	0.00
85	W08401	Dec	12	16:59:18	28	27.14	88	11.41	1487	2050	0.00
86	W08501	Dec	12	19:53:00	28	19.14	88	4.68	1544	2185	0.00
87	W08602	Dec	13	0:49:19	28	11.07	87	57.98	1595	2387	0.00
88	W08702	Dec	13	8:33:13	27	48.1	88	26.93	1488	2271	0.00
89	W08801	Dec	13	11:53:45	27	56.27	88	33.33	1488	2175	0.00
90	W08901	Dec	13	15:02:53	28	4.49	88	39.84	1486	1834	0.00
91	W09001	Dec	13	18:03:44	28	12.69	88	46.37	1673	1701	0.00
92	W09201	Dec	13	23:26:49	28	12.04	88	59.43	1308	1330	0.00
93	W09301	Dec	14	3:32:15	27	51.26	89	15.51	1351	1381	0.00
94	W09401	Dec	14	6:18:35	27	42.49	89	10.03	1481	1541	0.00
95	W09501	Dec	14	9:37:17	27	33.76	89	4.54	1487	1708	0.00
96	W09602	Dec	14	14:24:18	27	25.14	88	59.13	1438	1895	0.00
97	W09701	Dec	14	17:19:43	27	16.4	88	53.67	1492	2041	0.00
98	W09801	Dec	14	20:25:53	27	7.61	88	48.17	1486	2148	0.12
99	W09901	Dec	14	23:11:34	26	58.91	88	42.61	1502	2268	0.21
100	W10002	Dec	15	4:13:30	26	50.24	88	37.13	1504	2360	0.00
101	W10101	Dec	15	7:15:30	26	41.48	88	31.72	1493	2409	0.00
102	W10201	Dec	15	10:37:22	26	32.77	88	26.16	1486	2536	0.00
103	W10301	Dec	15	13:28:10	26	26.2	88	22.09	1487	2655	0.80
104	W10402	Dec	15	18:24:11	26	19.7	88	18.03	1502	2740	1.12
105	W10501	Dec	15	20:58:38	26	13.24	88	13.87	1503	3083	0.67
106	W10601	Dec	15	23:30:36	26	6.6	88	9.75	1502	2832	2.82
107	W10701	Dec	16	2:02:12	26	0.11	88	5.8	1487	2928	0.00
108	W10801	Dec	16	4:34:05	25	53.6	88	1.61	1486	3077	0.00
109	W10901	Dec	16	10:17:30	25	57.71	87	51.4	1487	3066	0.00
110	W11001	Dec	16	13:07:47	26	1.81	87	41.27	1487	3075	0.00
111	W11101	Dec	16	15:56:23	26	5.89	87	31.12	1486	3088	0.13
112	W11201	Dec	16	18:46:47	26	10.01	87	20.97	1491	3078	0.00
113	W11301	Dec	16	23:15:39	26	13.42	87	13.36	1502	3105	0.00
114	W11401	Dec	17	1:42:00	26	19.54	87	18.25	1486	3046	0.00
115	W11501	Dec	17	4:08:54	26	25.71	87	23.05	1502	2974	0.00

116	W11601	Dec	17	6:29:33	26	31.81	87	27.72	1487	2863	0.00
117	W11701	Dec	17	11:40:35	26	38.1	87	32.65	1486	2816	1.12
118	W11801	Dec	18	0:56:40	25	47.76	89	1.55	1484	3220	1.42
119	W11902	Dec	18	15:27:09	25	54.39	90	43.65	1488	3384	0.00
120	W12002	Dec	18	22:24:19	25	55.17	91	15.64	1489	3338	1.07
121	W12101	Dec	19	1:39:24	25	55.18	91	32.47	1487	2489	0.67
122	W12201	Dec	19	4:55:09	25	55.18	91	49.08	1516	2375	2.42
123	W12301	Dec	19	8:29:26	25	55.24	92	5.81	1500	2709	0.00

Appendix D. Event Log

Event Log – GISR03/PE1315 R/V *Pelican* 28 November to 20 December 2012									
Date	Time GMT	Station	Cast	Lat deg N	Lon deg W	Water Depth (m)	Instrument	Event	Filename
11/28/12	06:00			29.253667	090.661140	5	Pelican	leave port	n/a
11/28/12	17:28	1	1	27.686633	090.607350	1097	TAMU CTD	start	PE1315T00101
11/28/12	18:34	1	1	24.666667	090.616683	1097	TAMU CTD	end	PE1315T00101
11/28/12	22:52	2	1	27.164597	090.581958	1557	WHOI CTD	start	PE1315W00201
11/29/12	01:00	2	1	27.126467	090.594317	1557	WHOI CTD	end	PE1315W00201A
11/29/12	01:28	2	2	27.165922	090.582877	1551	TAMU CTD	start	PE1315T00202
11/29/12	02:57	2	2	27.141167	090.591167	1551	TAMU CTD	end	PE1315T00202
11/29/12	08:18	3	1	27.235967	091.430767	1618	TAMU CTD	start	PE1315T00301
11/29/12	09:53	3	1	27.233233	091.440017	1618	TAMU CTD	end	PE1315T00301
11/29/12	17:15	4	1	27.085700	092.367067	1497	TAMU CTD	start	PE1315T00401
11/29/12	18:36	4	1	27.078205	092.353443	1497	TAMU CTD	end	PE1315T00401
11/29/12	18:49	4	2	27.086795	092.367600	1506	WHOI CTD	start	PE1315W00402
11/29/12	20:28	4	2	27.013637	092.348825	1506	WHOI CTD	end	PE1315W00402
11/30/12	04:04	5	1	26.726628	093.383303	1496	WHOI CTD	start	PE1315W00501
11/30/12	04:43	5	1	26.738347	093.383303	1496	WHOI CTD	end	PE1315W00501
11/30/12	05:42	5	2	26.754747	093.387555	1441	TAMU CTD	start	PE1315T00502
11/30/12	07:05	5	2	26.778433	093.709733	1441	TAMU CTD	end	PE1315T00502
11/30/12	08:07	6	1	26.836517	093.382800	1238	WHOI CTD	start	PE1315W00601
11/30/12	09:42	6	1	26.862267	093.383767	1238	WHOI CTD	end	PE1315W00601
11/30/12	10:53	7	1	26.935850	093.382733	1217	WHOI CTD	start	PE1315W00701
11/30/12	12:23	7	1	26.957483	093.379367	1217	WHOI CTD	end	PE1315W00701
11/30/12	13:24	8	1	27.027750	093.383533	1223	TAMU CTD	start	PE1315T00801
11/30/12	14:37	8	1	27.041617	093.384600	1223	TAMU CTD	end	PE1315T00801
11/30/12	15:42	8	2	27.027633	093.382633	1233	WHOI CTD	start	PE1315W00802
11/30/12	17:13	8	2	27.040650	093.386800	1233	WHOI CTD	end	PE1315W00802
11/30/12	22:29	9	1	26.832230	094.000243	1240	TAMU CTD	start	PE1315T00901
11/30/12	23:32	9	1	26.842723	094.005260	1240	TAMU CTD	end	PE1315T00901
11/30/12	23:38	9	2	26.843943	094.005367	1252	WHOI CTD	start	PE1315W00902
12/01/12	00:59	9	2	26.856497	094.009377	1252	WHOI CTD	end	PE1315W00902
12/01/12	05:04	10	1	26.388222	094.005867	1606	WHOI CTD	start	PE1315W01001
12/01/12	06:51	10	1	26.401433	094.040683	1606	WHOI CTD	end	PE1315W01001
12/01/12	08:42	11	1	26.289700	094.010983	1753	TAMU CTD	start	PE1315T01101
12/01/12	10:15	11	1	26.301350	094.054583	1753	TAMU CTD	end	PE1315T01101

12/01/12	16:07	12	1	26.551250	093.381717	1609	TAMU CTD	start	PE1315T01201
12/01/12	17:32	12	1	26.568367	093.400000	1609	TAMU CTD	end	PE1315T01201
12/01/12	17:35	12	2	26.569200	093.400867	1629	WHOI CTD	start	PE1315W01202
12/01/12	19:05	12	2	26.584870	093.417157	1629	WHOI CTD	end	PE1315W01202
12/02/12	00:27	13	1	26.453820	092.793512	1804	WHOI CTD	start	PE1315W01301
12/02/12	02:21	13	1	26.471123	092.817620	1804	WHOI CTD	end	PE1315W01301
12/02/12	02:27	13	2	26.471752	092.818840	1750	TAMU CTD	start	PE1315T01302
12/02/12	03:52	13	2	26.488620	092.851297	1750	TAMU CTD	end	PE1315T01302
12/02/12	09:25	14	1	26.724483	092.199583	1849	WHOI CTD	start	PE1315W01401
12/02/12	11:28	14	1	26.740317	092.196800	1849	WHOI CTD	end	PE1315W01401
12/02/12	11:32	14	2	26.740450	092.196933	1824	TAMU CTD	start	PE1315T01402
12/02/12	12:00	14	2	26.742783	092.198633	1824	TAMU CTD	end	PE1315T01402
12/02/12	15:58	15	1	26.831083	092.224383	1870	WHOI CTD	start	PE1315W01501
12/02/12	17:49	15	1	26.838000	092.222133	1870	WHOI CTD	end	PE1315W01501
12/02/12	18:53	16	1	26.931507	092.245787	1383	WHOI CTD	start	PE1315W01601
12/02/12	20:10	16	1	26.938150	092.245265	1383	WHOI CTD	end	PE1315W01601
12/02/12	20:56	17	1	27.029770	092.266432	1480	TAMU CTD	start	PE1315T01701
12/02/12	22:04	17	1	27.031988	092.259887	1480	TAMU CTD	end	PE1315T01701
12/02/12	22:18	17	2	27.028750	092.267097	1463	WHOI CTD	start	PE1315W01702
12/02/12	23:34	17	2	27.030292	092.258657	1463	WHOI CTD	end	PE1315W01702
12/03/12	00:26	18	1	27.128380	092.292195	1416	WHOI CTD	start	PE1315W01801
12/03/12	01:50	18	1	27.125777	092.273088	1416	WHOI CTD	end	PE1315W01801
12/03/12	02:44	19	1	27.226497	092.316133	1398	WHOI CTD	start	PE1315W01901
12/03/12	04:11	19	1	27.219247	092.302297	1398	WHOI CTD	end	PE1315W01901
12/03/12	05:29	20	1	27.325140	092.338628	1166	TAMU CTD	start	PE1315T02001
12/03/12	06:34	20	1	27.325533	092.334450	1166	TAMU CTD	end	PE1315T02001
12/03/12	06:37	20	2	27.325617	092.334267	1179	WHOI CTD	start	PE1315W02002
12/03/12	08:12	20	2	27.327500	092.326533	1179	WHOI CTD	end	PE1315W02002
12/03/12	12:36	21	1	27.425167	091.752833	1195	TAMU CTD	start	PE1315T02101
12/03/12	13:42	21	1	27.432883	091.758100	1195	TAMU CTD	end	PE1315T02101
12/03/12	13:56	21	2	27.425850	091.753417	1211	WHOI CTD	start	PE1315W02102
12/03/12	15:18	21	2	27.436533	091.762950	1211	WHOI CTD	end	PE1315W02102
12/03/12	16:25	22	1	27.331967	091.731500	1236	WHOI CTD	start	PE1315W02201
12/03/12	17:50	22	1	27.344383	091.735600	1236	WHOI CTD	end	PE1315W02201
12/03/12	18:55	23	1	27.233947	091.706265	1375	WHOI CTD	start	PE1315W02301
12/03/12	20:15	23	1	27.242702	091.709343	1375	WHOI CTD	end	PE1315W02301
12/03/12	21:09	24	1	27.135152	091.680993	1511	TAMU CTD	start	PE1315T02401
12/03/12	22:21	24	1	27.139123	091.678635	1511	TAMU CTD	end	PE1315T02401

12/03/12	22:23	24	2	27.139488	091.678475	1510	WHOI CTD	start	PE1315W02402
12/03/12	23:43	24	2	27.145598	091.677300	1510	WHOI CTD	end	PE1315W02402
12/04/12	00:37	25	1	27.037690	091.654900	1421	WHOI CTD	start	PE1315W02501
12/04/12	02:01	25	1	27.030060	091.631693	1421	WHOI CTD	end	PE1315W02501
12/04/12	02:44	26	1	26.939507	091.632433	1857	WHOI CTD	start	PE1315W02601
12/04/12	04:28	26	1	26.930583	091.613562	1857	WHOI CTD	end	PE1315W02601
12/04/12	05:18	27	1	26.843165	091.601368	1840	TAMU CTD	start	PE1315T02701
12/04/12	06:45	27	1	26.839333	091.596417	1840	TAMU CTD	end	PE1315T02701
12/04/12	06:49	27	2	26.839817	091.596233	1840	WHOI CTD	start	PE1315W02702
12/04/12	08:46	27	2	26.834750	091.591983	1840	WHOI CTD	end	PE1315W02702
12/04/12	10:20	28	1	26.745600	091.583150	2199	WHOI CTD	start	PE1315W02801
12/04/12	12:58	28	1	26.745833	091.666200	2199	WHOI CTD	end	PE1315W02801
12/04/12	13:41	29	1	26.649083	091.559050	1852	WHOI CTD	start	PE1315W02901
12/04/12	15:31	29	1	26.658483	091.542317	1852	WHOI CTD	end	PE1315W02901
12/04/12	16:48	30	1	26.549317	091.533600	2430	TAMU CTD	start	PE1315T03001
12/04/12	18:40	30	1	26.548258	091.522940	2430	TAMU CTD	end	PE1315T03001
12/04/12	18:43	30	2	26.548105	091.522640	2430	WHOI CTD	start	PE1315W03002
12/04/12	20:50	30	2	26.544430	091.511718	2430	WHOI CTD	end	PE1315W03002
12/04/12	21:34	31	1	26.453117	091.509707	2100	WHOI CTD	start	PE1315W03101
12/04/12	23:12	31	1	26.454603	091.508685	2100	WHOI CTD	end	PE1315W03101
12/04/12	23:58	32	1	26.354987	091.486447	2222	WHOI CTD	start	PE1315W03201
12/05/12	01:50	32	1	26.348667	091.472213	2222	WHOI CTD	end	PE1315W03201
12/05/12	06:25	33	1	26.297217	090.819650	3060	TAMU CTD	start	PE1315T03301
12/05/12	08:45	33	1	26.274600	090.813933	3060	TAMU CTD	end	PE1315T03301
12/05/12	08:48	33	2	26.274167	090.813350	3060	WHOI CTD	start	PE1315W03302
12/05/12	10:58	33	2	26.242850	090.797767	3060	WHOI CTD	end	PE1315W03302
12/05/12	12:40	34	1	26.406133	090.844367	2900	WHOI CTD	start	PE1315W03401
12/05/12	14:50	34	1	26.368133	090.821817	2900	WHOI CTD	end	PE1315W03401
12/05/12	16:24	35	1	26.513367	090.871483	2300	WHOI CTD	start	PE1315W03501
12/05/12	18:09	35	1	26.492683	090.851200	2300	WHOI CTD	end	PE1315W03501
12/05/12	19:35	36	1	26.627005	090.896017	2078	WHOI CTD	start	PE1315W03601
12/05/12	21:08	36	1	26.609583	090.874348	2078	WHOI CTD	end	PE1315W03601
12/05/12	22:13	37	1	26.728368	090.923325	1948	TAMU CTD	start	PE1315T03701
12/05/12	23:28	37	1	26.719183	090.913388	1948	TAMU CTD	end	PE1315T03701
12/05/12	23:42	37	2	26.728258	090.924090	1954	WHOI CTD	start	PE1315W03702
12/06/12	01:30	37	2	26.692605	090.898623	1954	WHOI CTD	end	PE1315W03702
12/06/12	02:44	38	1	26.836380	090.948277	2072	WHOI CTD	start	PE1315W03801
12/06/12	04:08	38	1	26.806553	090.930630	2072	WHOI CTD	end	PE1315W03801

12/06/12	05:16	39	1	26.943385	090.973042	1667	WHOI CTD	start	PE1315W03901
12/06/12	07:01	39	1	26.920750	090.958350	1667	WHOI CTD	end	PE1315W03901
12/06/12	08:09	40	1	27.051500	090.999967	1645	WHOI CTD	start	PE1315W04001
12/06/12	09:52	40	1	27.032933	090.993700	1645	WHOI CTD	end	PE1315W04001
12/06/12	10:55	41	1	27.158200	091.021600	1542	TAMU CTD	start	PE1315T04101
12/06/12	12:13	41	1	27.146050	091.015983	1542	TAMU CTD	end	PE1315T04101
12/06/12	12:23	41	2	27.158467	091.015467	1540	WHOI CTD	start	PE1315W04102
12/06/12	14:03	41	2	27.143033	091.015467	1540	WHOI CTD	end	PE1315W04102
12/06/12	15:04	42	1	27.266750	091.050783	1371	WHOI CTD	start	PE1315W04201
12/06/12	16:36	42	1	27.267767	091.046583	1371	WHOI CTD	end	PE1315W04201
12/06/12	17:38	43	1	27.375633	091.076800	1399	WHOI CTD	start	PE1315W04301
12/06/12	19:03	43	1	27.357955	091.066980	1399	WHOI CTD	end	PE1315W04301
12/06/12	20:08	44	1	27.488708	091.106097	1335	TAMU CTD	start	PE1315T04401
12/06/12	21:17	44	1	27.478588	091.102265	1335	TAMU CTD	end	PE1315T04401
12/06/12	21:24	44	2	27.488948	091.106170	1335	WHOI CTD	start	PE1315W04402
12/06/12	22:38	44	2	27.478735	091.104075	1335	WHOI CTD	end	PE1315W04402
12/07/12	02:26	45	1	27.610123	090.530685	1211	TAMU CTD	start	PE1315T04501
12/07/12	03:27	45	1	27.604268	090.531565	1211	TAMU CTD	end	PE1315T04501
12/07/12	03:42	45	2	27.610405	090.531863	1212	TAMU CTD	start	PE1315T04502
12/07/12	04:39	45	2	27.606527	090.533762	1212	TAMU CTD	end	PE1315T04502
12/07/12	05:39	46	1	27.499505	090.502530	1041	WHOI CTD	start	PE1315W04601
12/07/12	07:18	46	1	27.494533	090.505333	1041	WHOI CTD	end	PE1315W04601
12/07/12	08:06	47	1	27.393317	090.472700	1342	WHOI CTD	start	PE1315W04701
12/07/12	09:45	47	1	27.392300	090.480733	1342	WHOI CTD	end	PE1315W04701
12/07/12	10:36	48	1	27.286433	090.443117	1340	WHOI CTD	start	PE1315W04801
12/07/12	12:21	48	1	27.288333	090.457150	1340	WHOI CTD	end	PE1315W04801
12/07/12	13:19	49	1	27.180183	090.415583	1350	TAMU CTD	start	PE1315T04901
12/07/12	14:40	49	1	27.182417	090.429133	1350	TAMU CTD	end	PE1315T04901
12/07/12	14:50	49	2	27.180083	090.414967	1354	WHOI CTD	start	PE1315W04902
12/07/12	16:35	49	2	27.185183	090.429400	1354	WHOI CTD	end	PE1315W04902
12/07/12	17:33	50	1	27.072767	090.385467	2048	WHOI CTD	start	PE1315W05001
12/07/12	19:03	50	1	27.074460	090.396017	2048	WHOI CTD	end	PE1315W05001
12/07/12	19:55	51	1	26.966167	090.354707	2365	WHOI CTD	start	PE1315W05101
12/07/12	21:25	51	1	26.966697	090.362208	2365	WHOI CTD	end	PE1315W05101
12/07/12	22:13	52	1	26.859682	090.326090	2414	WHOI CTD	start	PE1315W05201
12/07/12	23:48	52	1	26.858185	090.335062	2414	WHOI CTD	end	PE1315W05201
12/08/12	00:37	53	1	26.752780	090.296435	2501	TAMU CTD	start	PE1315T05301
12/08/12	02:16	53	1	26.751395	090.302977	2501	TAMU CTD	end	PE1315T05301

12/08/12	02:22	53	2	26.754100	090.296095	2521	WHOI CTD	start	PE1315W05302
12/08/12	03:53	53	2	26.752220	090.304948	2521	WHOI CTD	end	PE1315W05302
12/08/12	04:47	54	1	26.644412	090.266610	2699	WHOI CTD	start	PE1315W05401
12/08/12	06:23	54	1	26.646533	090.273017	2699	WHOI CTD	end	PE1315W05401
12/08/12	07:14	55	1	26.538033	090.238167	2893	WHOI CTD	start	PE1315W05501
12/08/12	09:05	55	1	26.538283	090.244083	2893	WHOI CTD	end	PE1315W05501
12/08/12	09:56	56	1	26.431283	090.208367	3038	WHOI CTD	start	PE1315W05601
12/08/12	11:42	56	1	26.428700	090.210550	3038	WHOI CTD	end	PE1315W05601
12/08/12	12:30	57	1	26.324250	090.179500	3115	TAMU CTD	start	PE1315T05701
12/08/12	14:43	57	1	26.327583	090.192550	3115	TAMU CTD	end	PE1315T05701
12/08/12	14:51	57	2	26.325650	090.179267	3115	WHOI CTD	start	PE1315W05702
12/08/12	16:35	57	2	26.333267	090.192800	3115	WHOI CTD	end	PE1315W05702
12/08/12	17:13	58	1	26.217867	090.149500	3202	WHOI CTD	start	PE1315W05801
12/08/12	19:00	58	1	26.225043	090.162225	3202	WHOI CTD	end	PE1315W05801
12/08/12	19:50	59	1	26.111293	090.120273	3231	WHOI CTD	start	PE1315W05901
12/08/12	21:15	59	1	26.114005	090.130600	3231	WHOI CTD	end	PE1315W05901
12/08/12	22:17	60	1	26.004582	090.091400	3238	WHOI CTD	start	PE1315W06001
12/08/12	23:53	60	1	26.010558	090.102350	3238	WHOI CTD	end	PE1315W06001
12/09/12	00:50	61	1	25.898518	090.061575	3248	TAMU CTD	start	PE1315T06101
12/09/12	03:01	61	1	25.914510	090.078352	3248	TAMU CTD	end	PE1315T06101
12/09/12	03:16	61	2	25.898887	090.060605	3248	WHOI CTD	start	PE1315W06102
12/09/12	04:40	61	2	25.906525	090.070830	3248	WHOI CTD	end	PE1315W06102
12/09/12	10:15	62	1	26.028150	089.002300	3093	WHOI CTD	start	PE1315W06201
12/09/12	11:58	62	1	26.040650	089.141683	3093	WHOI CTD	end	PE1315W06201
12/09/12	12:11	62	2	26.027833	089.135700	3093	TAMU CTD	start	PE1315T06202
12/09/12	14:04	62	2	26.041617	089.144817	3093	TAMU CTD	end	PE1315T06202
12/09/12	14:51	63	1	26.141800	089.191583	3045	WHOI CTD	start	PE1315W06301
12/09/12	16:34	63	1	26.155850	089.195833	3045	WHOI CTD	end	PE1315W06301
12/09/12	17:24	64	1	26.257100	089.248767	3002	WHOI CTD	start	PE1315W06401
12/09/12	18:58	64	1	26.269177	089.250647	3002	WHOI CTD	end	PE1315W06401
12/09/12	19:48	65	1	26.369845	089.302533	3000	WHOI CTD	start	PE1315W06501
12/09/12	21:18	65	1	26.383960	089.304300	3000	WHOI CTD	end	PE1315W06501
12/09/12	22:08	66	1	26.486452	089.357527	2902	TAMU CTD	start	PE1315T06601
12/09/12	23:48	66	1	26.494417	089.355115	2902	TAMU CTD	end	PE1315T06601
12/10/12	00:01	66	2	26.486485	089.358113	2902	WHOI CTD	start	PE1315W06602
12/10/12	01:34	66	2	26.491232	089.360595	2902	WHOI CTD	end	PE1315W06602
12/10/12	02:26	67	1	26.600263	089.413077	2835	WHOI CTD	start	PE1315W06701
12/10/12	03:58	67	1	26.605605	089.424393	2835	WHOI CTD	end	PE1315W06701

12/10/12	04:52	68	1	26.715525	089.469550	2766	WHOI CTD	start	PE1315W06801
12/10/12	06:31	68	1	26.722017	089.485700	2766	WHOI CTD	end	PE1315W06801
12/10/12	07:26	69	1	26.830283	089.523733	2648	WHOI CTD	start	PE1315W06901
12/10/12	09:12	69	1	26.836133	089.541100	2648	WHOI CTD	end	PE1315W06901
12/10/12	10:04	70	1	26.945217	089.580817	2458	TAMU CTD	start	PE1315T07001
12/10/12	11:50	70	1	26.953483	089.601050	2458	TAMU CTD	end	PE1315T07001
12/10/12	12:03	70	2	26.953517	089.601100	2458	WHOI CTD	start	PE1315W07002
12/10/12	13:52	70	2	26.958417	089.604900	2458	WHOI CTD	end	PE1315W07002
12/10/12	14:43	71	1	27.059250	089.634567	2294	WHOI CTD	start	PE1315W07101
12/10/12	16:39	71	1	27.082300	089.642700	2294	WHOI CTD	end	PE1315W07101
12/10/12	17:27	72	1	27.175250	089.689567	2187	WHOI CTD	start	PE1315W07201
12/10/12	19:05	72	1	27.189267	089.685867	2187	WHOI CTD	end	PE1315W07201
12/10/12	20:00	73	1	27.290148	089.745485	1966	WHOI CTD	start	PE1315W07301
12/10/12	21:38	73	1	27.294800	089.737883	1966	WHOI CTD	end	PE1315W07301
12/10/12	22:37	74	1	27.405017	089.800065	1504	TAMU CTD	start	PE1315T07401
12/10/12	23:41	74	1	27.398098	089.790818	1504	TAMU CTD	end	PE1315T07401
12/10/12	23:53	74	2	27.404083	089.799017	1504	WHOI CTD	start	PE1315W07502
12/11/12	01:32	74	2	27.383533	089.779817	1504	WHOI CTD	end	PE1315W07502
12/11/12	02:43	75	1	27.497500	089.886967	1329	WHOI CTD	start	PE1315W07501
12/11/12	04:06	75	1	27.476017	089.879083	1329	WHOI CTD	end	PE1315W07501
12/11/12	05:27	76	1	27.650283	089.917167	1208	WHOI CTD	start	PE1315W07601
12/11/12	07:00	76	1	27.629233	089.911317	1208	WHOI CTD	end	PE1315W07601
12/11/12	07:57	77	1	27.727150	089.954333	1096	TAMU CTD	start	PE1315T07701
12/11/12	08:54	77	1	27.713533	089.948000	1096	TAMU CTD	end	PE1315T07701
12/11/12	09:10	77	2	27.728200	089.955317	1109	WHOI CTD	start	PE1315W07702
12/11/12	10:32	77	2	27.710617	089.946800	1109	WHOI CTD	end	PE1315W07702
12/11/12	14:58	78	1	28.000000	089.349883	1236	TAMU CTD	start	PE1315T07801
12/11/12	16:01	78	1	27.984000	089.348917	1236	TAMU CTD	end	PE1315T07801
12/11/12	16:16	78	2	27.999017	089.350583	1231	WHOI CTD	start	PE1315W07802
12/11/12	17:46	78	2	27.975417	089.350400	1231	WHOI CTD	end	PE1315W07802
12/11/12	21:25	79	1	28.297717	088.943533	1258	WHOI CTD	start	PE1315W07901
12/11/12	22:44	79	1	28.280617	088.936100	1256	WHOI CTD	end	PE1315W07901
12/11/12	23:30	80	1	28.335583	088.895200	1287	WHOI CTD	start	PE1315W08001
12/12/12	00:53	80	1	28.318200	088.895183	1287	WHOI CTD	end	PE1315W08001
12/12/12	01:53	81	1	28.400367	088.810233	1273	WHOI CTD	start	PE1315W08101
12/12/12	03:15	81	1	28.398333	088.820433	1273	WHOI CTD	end	PE1315W08101
12/12/12	06:49	82	1	28.722883	088.412250	1547	TAMU CTD	start	PE1315T08201
12/12/12	07:11	82	1	28.718280	088.413480	1547	TAMU CTD	end	PE1315T08201

12/12/12	08:06	82	2	28.721900	088.412733	1547	WHOI CTD	start	PE1315W08202
12/12/12	09:43	82	2	28.698733	088.414933	1547	WHOI CTD	end	PE1315W08202
12/12/12	10:59	82	3	28.721683	088.412883	1547	WHOI CTD	start	PE1315W08203
12/12/12	12:43	82	3	28.693833	088.414983	1547	WHOI CTD	end	PE1315W08203
12/12/12	14:00	83	1	28.552367	088.339017	1887	WHOI CTD	start	PE1315W08301
12/12/12	15:43	83	1	28.530367	088.341917	1887	WHOI CTD	end	PE1315W08301
12/12/12	16:59	84	1	28.452200	088.190183	2050	WHOI CTD	start	PE1315W08401
12/12/12	18:39	84	1	28.431183	088.188683	2050	WHOI CTD	end	PE1315W08401
12/12/12	19:53	85	1	28.318883	088.077983	2185	WHOI CTD	start	PE1315W08501
12/12/12	21:49	85	1	28.307033	088.068317	2185	WHOI CTD	end	PE1315W08601
12/12/12	22:57	86	1	28.184722	087.965980	2387	TAMU CTD	start	PE1315T08601
12/13/12	00:33	86	1	28.165043	087.954658	2387	TAMU CTD	end	PE1315T08601
12/13/12	00:46	86	2	28.184517	087.966300	2387	WHOI CTD	start	PE1315W08602
12/13/12	02:27	86	2	28.164267	087.959533	2387	WHOI CTD	end	PE1315W08602
12/13/12	06:21	87	1	27.801617	088.449067	2271	TAMU CTD	start	PE1315T08701
12/13/12	08:15	87	1	27.777800	088.461450	2271	TAMU CTD	end	PE1315T08701
12/13/12	08:33	87	2	27.801617	088.482333	2271	WHOI CTD	start	PE1315W08702
12/13/12	10:19	87	2	27.782833	088.463633	2271	WHOI CTD	end	PE1315W08702
12/13/12	11:52	88	1	27.937817	088.555617	2175	WHOI CTD	start	PE1315W08801
12/13/12	13:43	88	1	27.920300	088.575683	2175	WHOI CTD	end	PE1315W08801
12/13/12	15:03	89	1	28.074833	088.664167	1834	WHOI CTD	start	PE1315W08901
12/13/12	16:43	89	1	28.064183	088.677917	1834	WHOI CTD	end	PE1315W08901
12/13/12	18:03	90	1	28.211517	088.772833	1710	WHOI CTD	start	PE1315W09001
12/13/12	19:50	90	1	28.197933	088.789633	1710	WHOI CTD	end	PE1315W09001
12/13/12	21:12	91	1	28.348570	088.878955	1254	TAMU CTD	start	PE1315T09101
12/13/12	21:12	91	1	28.340527	088.890568	1254	TAMU CTD	end	PE1315T09101
12/13/12	23:26	92	1	28.200700	088.990483	1330	WHOI CTD	start	PE1315W09201
12/14/12	00:51	92	1	28.187317	089.006033	1330	WHOI CTD	end	PE1315W09201
12/14/12	03:32	93	1	27.855000	089.258333	1381	WHOI CTD	start	PE1315W09301
12/14/12	05:03	93	1	27.839383	089.278900	1381	WHOI CTD	end	PE1315W09301
12/14/12	06:19	94	1	27.707983	089.167500	1541	WHOI CTD	start	PE1315W09401
12/14/12	08:16	94	1	27.686700	089.204917	1541	WHOI CTD	end	PE1315W09401
12/14/12	09:37	95	1	27.562633	089.075800	1708	WHOI CTD	start	PE1315W09501
12/14/12	11:27	95	1	27.549900	089.105767	1708	WHOI CTD	end	PE1315W09501
12/14/12	12:44	96	1	27.418483	088.985217	1895	TAMU CTD	start	PE1315T09601
12/14/12	14:09	96	1	27.410867	089.009017	1895	TAMU CTD	end	PE1315T09601
12/14/12	14:26	96	2	27.419033	088.985617	1895	WHOI CTD	start	PE1315W09602
12/14/12	15:59	96	2	27.415417	089.009317	1895	WHOI CTD	end	PE1315W09602

12/14/12	17:19	97	1	27.273267	088.894583	2041	WHOI CTD	start	PE1315W09701
12/14/12	19:02	97	1	27.264783	088.923033	2041	WHOI CTD	end	PE1315W09701
12/14/12	20:22	98	1	27.126867	088.802967	2148	WHOI CTD	start	PE1315W09801
12/14/12	21:53	98	1	27.121133	088.824517	2148	WHOI CTD	end	PE1315W09801
12/14/12	23:11	99	1	26.981833	088.710383	2268	WHOI CTD	start	PE1315W09901
12/15/12	00:44	99	1	26.971200	088.742733	2268	WHOI CTD	end	PE1315W09901
12/15/12	02:05	100	1	26.836410	088.618328	2360	TAMU CTD	start	PE1315T10001
12/15/12	03:53	100	1	26.829500	088.654367	2360	TAMU CTD	end	PE1315T10001
12/15/12	04:13	100	2	26.837367	088.618967	2360	WHOI CTD	start	PE1315W10002
12/15/12	05:52	100	2	26.838600	088.651283	2360	WHOI CTD	end	PE1315W10002
12/15/12	07:15	101	1	26.691483	088.528817	2409	WHOI CTD	start	PE1315W10101
12/15/12	09:08	101	1	26.705217	088.554917	2409	WHOI CTD	end	PE1315W10101
12/15/12	10:37	102	1	26.546133	088.436117	2536	WHOI CTD	start	PE1315W10201
12/15/12	12:17	102	1	26.563983	088.443967	2536	WHOI CTD	end	PE1315W10201
12/15/12	13:28	103	1	26.436617	088.368233	2655	WHOI CTD	start	PE1315W10301
12/15/12	15:05	103	1	26.448700	088.407000	2655	WHOI CTD	end	PE1315W10301
12/15/12	16:05	104	1	26.327983	088.300067	2737	TAMU CTD	start	PE1315T10401
12/15/12	18:09	104	1	26.331817	088.306233	2737	TAMU CTD	end	PE1315T10401
12/15/12	18:24	104	2	26.328383	088.300533	2737	WHOI CTD	start	PE1315W10402
12/15/12	20:00	104	2	26.333417	088.308367	2737	WHOI CTD	end	PE1315W10402
12/15/12	20:58	105	1	26.220700	088.231117	3083	WHOI CTD	start	PE1315W10501
12/15/12	22:30	105	1	26.224033	088.234417	3083	WHOI CTD	end	PE1315W10501
12/15/12	23:30	106	1	26.109983	088.162583	2832	WHOI CTD	start	PE1315W10601
12/16/12	01:02	106	1	26.108167	088.170383	2832	WHOI CTD	end	PE1315W10601
12/16/12	02:02	107	1	26.001867	088.096667	2928	WHOI CTD	start	PE1315W10701
12/16/12	03:32	107	1	26.003717	088.110783	2928	WHOI CTD	end	PE1315W10701
12/16/12	04:34	108	1	25.893300	088.027500	3077	WHOI CTD	start	PE1315W10801
12/16/12	06:05	108	1	25.898600	088.038717	3077	WHOI CTD	end	PE1315W10801
12/16/12	06:15	108	2	25.893383	088.026583	3077	TAMU CTD	start	PE1315T10802
12/16/12	08:33	108	2	25.898683	088.043150	3077	TAMU CTD	end	PE1315T10802
12/16/12	10:17	109	1	25.961833	087.856600	3066	WHOI CTD	start	PE1315W10901
12/16/12	11:52	109	1	25.967883	087.865117	3066	WHOI CTD	end	PE1315W10901
12/16/12	13:08	110	1	26.030233	087.687800	3075	WHOI CTD	start	PE1315W11001
12/16/12	14:43	110	1	26.033617	087.692483	3075	WHOI CTD	end	PE1315W11001
12/16/12	15:56	111	1	26.098133	087.518717	3088	WHOI CTD	start	PE1315W11101
12/16/12	17:32	111	1	26.112000	087.524717	3088	WHOI CTD	end	PE1315W11101
12/16/12	18:48	112	1	26.166967	087.349467	3078	WHOI CTD	start	PE1315W11201
12/16/12	20:14	112	1	26.184417	087.353380	3078	WHOI CTD	end	PE1315W11201

12/16/12	20:28	112	2	26.168185	087.349790	3078	TAMU CTD	start	PE1315T11202
12/16/12	22:22	112	2	26.183038	087.350462	3078	TAMU CTD	end	PE1315T11202
12/16/12	23:15	113	1	26.223667	087.222667	3105	WHOI CTD	start	PE1315W11301
12/17/12	00:45	113	1	26.234767	087.219683	3105	WHOI CTD	end	PE1315W11301
12/17/12	01:42	114	1	26.325667	087.304167	3046	WHOI CTD	start	PE1315W11401
12/17/12	03:10	114	1	26.330633	087.303833	3046	WHOI CTD	end	PE1315W11401
12/17/12	04:09	115	1	26.428500	087.384167	2974	WHOI CTD	start	PE1315W11501
12/17/12	05:38	115	1	26.434233	087.388300	2974	WHOI CTD	end	PE1315W11501
12/17/12	06:29	116	1	26.530267	087.461933	2963	WHOI CTD	start	PE1315W11601
12/17/12	08:19	116	1	26.545367	087.472233	2863	WHOI CTD	end	PE1315W11601
12/17/12	08:33	116	2	26.530283	087.462883	2863	TAMU CTD	start	PE1315T11602
12/17/12	10:52	116	2	26.549700	087.471283	2863	TAMU CTD	end	PE1315T11602
12/17/12	11:40	117	1	26.635117	087.544217	2816	WHOI CTD	start	PE1315W11701
12/17/12	13:24	117	1	26.656917	087.550700	2816	WHOI CTD	end	PE1315W11701
12/18/12	00:56	118	1	25.795967	089.025800	3220	WHOI CTD	start	PE1315W11801
12/18/12	02:15	118	1	25.801067	089.016983	3220	WHOI CTD	end	PE1315W11801
12/18/12	12:39	119	1	25.906067	090.727517	3384	TAMU CTD	start	PE1315T11901
12/18/12	15:02	119	1	25.877650	090.727167	3384	TAMU CTD	end	PE1315T11901
12/18/12	15:27	119	2	25.906517	090.727667	3384	WHOI CTD	start	PE1315W11902
12/18/12	16:56	119	2	25.891283	090.733367	3384	WHOI CTD	end	PE1315W11902
12/18/12	20:10	120	1	25.919567	091.261583	3338	TAMU CTD	start	PE1315T12001
12/18/12	22:08	120	1	25.905683	091.275167	3338	TAMU CTD	end	PE1315T12001
12/18/12	22:24	120	2	25.919433	091.260767	3338	WHOI CTD	start	PE1315W12002
12/18/12	23:41	120	2	25.909433	091.269417	3338	WHOI CTD	end	PE1315W12002
12/19/12	01:39	121	1	25.919683	091.541133	2489	WHOI CTD	start	PE1315W12101
12/19/12	03:04	121	1	25.914167	091.546717	2489	WHOI CTD	end	PE1315W12101
12/19/12	04:55	122	1	25.919583	091.818033	2375	WHOI CTD	start	PE1315W12201
12/19/12	06:30	122	1	25.905817	091.820583	2375	WHOI CTD	end	PE1315W12201
12/19/12	08:29	123	1	25.920667	092.096867	2709	WHOI CTD	start	PE1315W12301
12/19/12	10:10	123	1	25.926000	092.105367	2709	WHOI CTD	end	PE1315W12301
12/19/12	10:20	123	2	25.920267	092.097033	2709	TAMU CTD	start	PE1315T12302
12/19/12	12:12	123	2	25.928200	092.107267	2709	TAMU CTD	end	PE1315T12302
12/20/12	08:00							arrive port	