MSM 10/1

(31.10.2008 – 06.12.2008)

Short Cruise Report

SFB 754

PONTA DELGADA-MINDELO

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an der Universität Kiel

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Scientific Background

Major changes to marine sources and sinks of important nutrient elements such as nitrogen, phosphorus and iron occur when oceanic oxygen concentrations decrease below threshold levels. Paleo-records give evidence for periods of dramatically reduced oceanic oxygen that had major consequences for marine ecosystems. Oxygen levels can therefore be viewed as a “switch” or “tipping point” for nutrient cycling.

Oceanic oxygen levels are, themselves, controlled by interplay of physics and biology that is not fully understood. The Oxygen Minimum Zones (OMZs) of the tropics are the key regions of low oxygen in today’s ocean. These spatially limited OMZs impact nutrient budgets, biological productivity and CO_2-fixation of the global ocean. Recent modeling results suggest that oxygen levels will decrease significantly over the next decades in response to climate change, and altered ocean circulation. Hence the future ocean may experience major shifts in nutrient cycling triggered by expansion and intensification of tropical OMZs.

There are numerous feedbacks between oxygen, nutrient cycling and biological productivity; however existing knowledge is insufficient to understand past interactions or to adequately assess the potential for future change. The overall goal of the Collaborative Research Project 'Climate-Biogeochemistry Interactions of the tropical Ocean' (SFB-754) is to improve understanding of the coupling of tropical climate variability and circulation with the ocean’s oxygen and nutrient balance, to quantitatively evaluate the nature of oxygen-sensitive tipping points, as well as to assess consequences for the Ocean’s future. SFB-754 research focuses on the following questions: How does subsurface dissolved oxygen in the tropical ocean respond to changes in ocean circulation and ventilation? What are the sensitivities and feedbacks linking low oxygen levels and key nutrient source and sink mechanisms? What are the magnitudes, timescales and controlling factors of past, present and likely future variations in oceanic oxygen and nutrient levels?

Circulation, Mixing and dissolved Oxygen

This second SFB754 expedition focused on key processes responsible for the structure of the oxygen minimum zone in the tropical North Atlantic region. Of special interest are the diapycnal mixing processes and their associated vertical transport of oxygen, as well as the several lateral oxygen supply pathways into the OMZ. The focus during this cruise was on a purposeful tracer release, where about 100kg of a chemically inert and nontoxic substance (SF_5CF_3 for short SF5 in the following text) was injected and tracer surveys are planned 6, 18, and 30 months after injection. This method allows a very accurate estimation of the mixing, which can be used to improve and calibrate mixing parameterizations in numerical ocean models. The diapycnal mixing can also be locally estimated using a microstructure profiling device, that can observe the turbulence spectra of the upper 400m of the water column. A regional survey of the oxygen minimum zone in the vicinity of the tracer release site in an east-west direction was conducted.

Nitrogen fixation

Open ocean waters are often limited by nutrients that are essential for microbial growth. Nitrogen, in the form of nitrate and ammonia, is supposed to be the major limiting factor in these oligotrophic areas. There is increasing biogeochemical evidence that nitrogen fixation by marine diazotrophs contributes significantly to new production.

Nitrogen fixation is a highly energy consuming process, in which microorganisms, so called nitrogen fixers, assimilate atmospheric nitrogen and incorporate it into bioavailable forms. This process is of interest as it is the major source for nitrogen input into oceans.

Dispite recent progress in mapping the diversity of diazotrophs in the tropical North Atlantic only a small portion of these microorganisms are assumed to be identified. So far every new effort to investigate the diversity of marine diazotrophs usually presents new phylotypes of the nifH gene. Such molecular studies have led to the discovery of multiple novel unicellular organisms capable of fixing nitrogen in addition to the globally important Trichodesmium species.

Trace Metals

While it is established now that Fe can be a (co)limiting nutrient for phytoplankton in High Nutrient Low Chlorophyll (HNLC) regions of the world we still know little about the processes by which Fe and other trace metals are supplied to the ocean (Saharan dust, resuspension of continental shelf sediments, etc.) and how processes in the ocean scavenge/uptake, solubility or remineralize dissolved trace metals. By examining trace metal chemistry in the Tropical Atlantic we can try to complete the overview of the key processes controlling biogeochemistry of trace metals in seawater. From this basis we can start to quantify the fluxes involved in each individual process.

Research Program

In order to accomplish the various research objectives a rough cruise plan was developed and refined in response to the amounts of tracer found. The first days were occupied with a transit from the Azores south towards the region where tracer could be expected. A few CTD stations were taken on the way several profiling Argo floats deployed. Underway SADCP measurements were performed continuously. At several stations we planned to add a few microstructure casts after the CTD profile to measure the oceanic turbulence levels over the upper 400m depths.

In addition to the tracer survey several zonal and meridional sections were planned to survey the vertical and horizontal extend of the North Eastern Tropical Atlantic oxygen minimum zone. A few extra stations were included to sample for trace metal species using special GOFLO samplers.

Additional samples were taken for nutrients, DNA/RNA analyses and N_2O. Several other small programs were added that needed no extra station time such as spectral light measurements to detect dust in the atmosphere and an effort to develop a more reliable method to calibrate the new oxygen optical measurements.

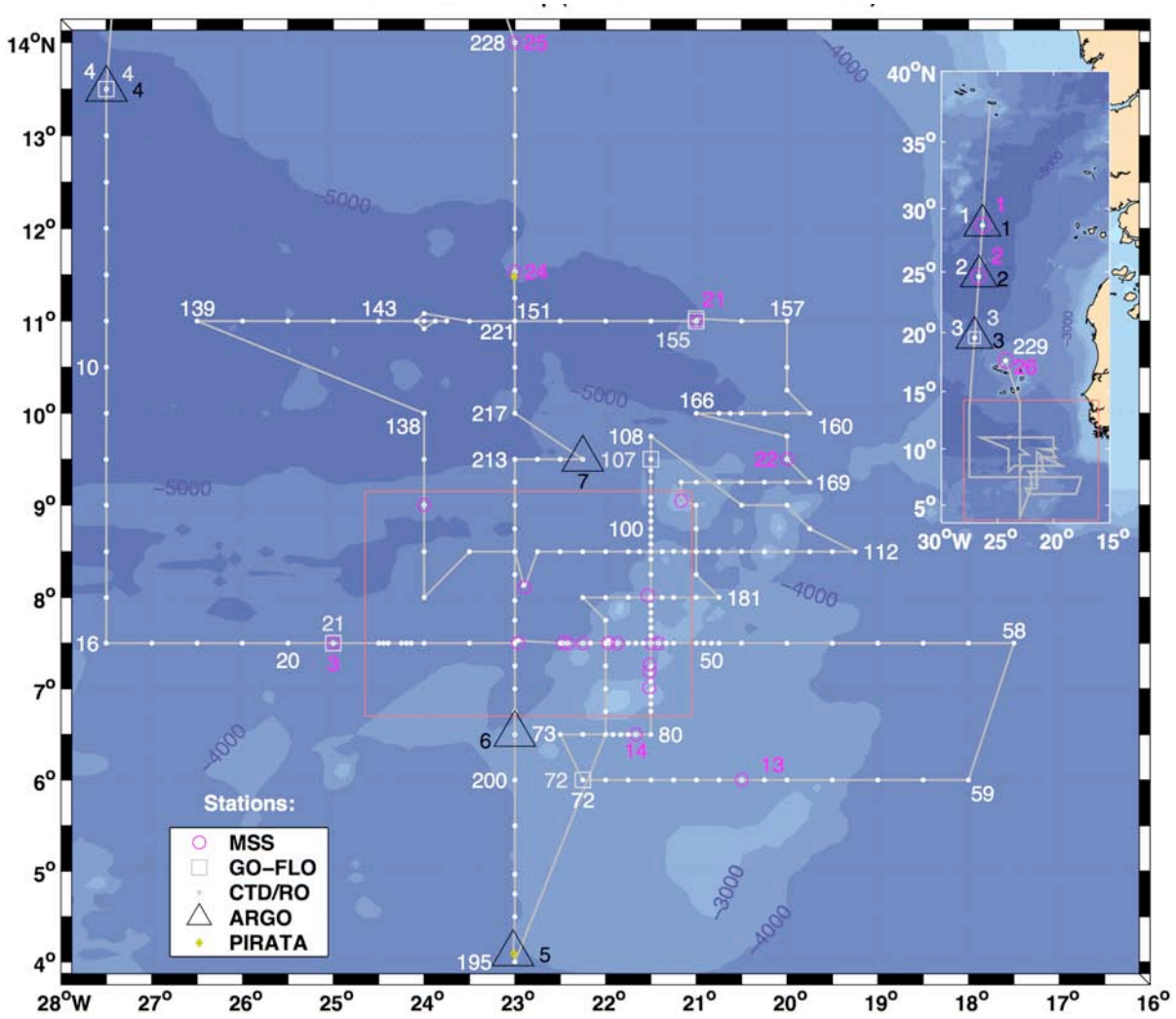

Figure 1: Station map of MSM10/1 cruise.

Narrative of the cruise

October 31: All scientists went on Board MERIAN in Ponta Delgada, unpacked containers and installed our gear in the laboratories. At 23:00 we departed 12 hours early because of a potential worker strike at Ponta Delgada.

November 1: All the sampling and analysis equipment is readied, laboratories are prepared and instruments checked. Abandon ship procedures were practiced.

November 2: First CTD station in the afternoon down to 2000m depth followed by an MSS down to 500m depth and an Argo float deployment at 28º 42'N and 26º 20'W at 20:20 UTC.

November 3: Second CTD station in the afternoon down to 2000m depth followed by three MSS down to 500m depth and an Argo float deployment at 24º 39'N and 26º 39'W at 18:57 UTC.

November 4: Third CTD station in the evening down to 2000m depth followed by a GOFLO test cast to 400m depth and an Argo float deployment at 19º 34'N and 27º 01'W at 21:45 UTC.

November 5: No stations, transit south.

November 6: At 2:00 am start of 27.5°W transect at 13.5°N first station with GOFLO cast to 800m depth. Argo float deployed at 13° 30'N and 27° 30'W at 06:03 UTC. Beginning of 27°30'W section with 1000m CTD stations every 30 miles.

November 7: Argo float #5 did not start up, thus we canceled deployment. Continued CTD section southward along 27°30'W. At 23:00 we reached the southernmost point and turned east along 7°30'N with a station spacing of 30'.

November 8: Continued east along section. In the afternoon at 25°W a GOFLO station and 3 MMS profiles were added to the normal CTD station.

November 9: At 2:00 am on station 22 at 7°30'N and 24°W west we encountered the tracer. In the following closely spaced stations ample tracer was found in typically 6 sampling bottles per cast. The first tracer patch had a dimension of about 15 nm. In the evening a second patch of tracer was found at 23°W.

November 10-11: Chasing the tracer. We alternated between survey stations and tracer hunt stations and found a lot of places with tracer. Once in a while a MSS was interspersed. All systems are running well.

November 12: Last station on 7°30'N 17°30'W was reached after lunch followed by a transit to the next waypoint where shortly before midnight a westward heading section began at 7°30'N 18°W.

November 13: Sampling west towards the next suspected location of the tracer.

November 14: About midday we have reached the end of the short section at 21°15W without a trace of SF5. The final station was also used for a deeper CTD and GO-FLO cast. After dinner we started a new section heading east along 6° 30'N at 22°30'W a very small amount of SF5 was detected.

November 15: About midday we have reached the end of the short section at 21°30W with a nice streak of tracer. After it faded we turned north to sample along 21°30W a section which is located between two of the Argo float positions that marked the tracer.

November 16: Repairs to both SF5 GCs took them out of service for a few hours

each. After lunch both systems were running again. Continued CTD section along 21°30'W and found quite a few streaks of tracer. MSS profiles showed mixing events for the first time.

November 17: Finished 21°30W at 9°45'N where the tracer faded away after some very significant concentrations earlier. We steamed eastward along 9°N.

November 18: Two stations at 9°N at 20°30'W and 20°00'W showed large tracer concentration. At 8°30'N and 19°30'W we met POLARSTERN on their journey towards Cape Town. Both ships stopped their science and an exchange of scientific and ships personal happened. Three hours later Polarstern continued the journey south but here on board we have a few more hours of scientific downtime culminating in a mid-cruise party.

November 19-21: Station work resumed in the early morning hours with a transect along 8°30'N from 19°15'W heading west with 15nm normal station spacing. We found small patches of tracer enroute to the release site at 8°N 23°W. There we also took water samples 30m off the bottom to check for spills during the injection. But fortunately no tracer could be detected there.

November 22-24: After a transit towards the west we began an eastward section along 11°N at 26°W 30'. The main focus of this section is on dissolved oxygen. Again we discovered record low dissolved oxygen values. At one station near 24°W a rather significant peak of SF5 appeared somewhat surprisingly to us. Close to the end of the section we took our last GOFLO station and also measured N_2O profiles and the oceans microstructure.

November 25-26: After completing the 11°N transit with the easternmost station at 20°W just a few miles away from the Senegal EEZ we began to work our way south again sampling between sections we have surveyed earlier.

November 27-28: We work our way south along several short zonal and meridional transsects surveying in more detail the extent of the tracer patch. So far we have never found really high tracer concentrations but several stations above 250 fmol/l.

November 29: In the early morning we began a transit towards 4°S 23°W the southernmost point of the cruise. From there we embarked on the final section along 23°W northward in the afternoon. We sailed by the PIRATA buoy and found it to be in good condition and deployed an ARGO float nearby.

November 30 – December 3: Just 30nm north of the PIRATA buoy a small patch of tracer was found at a rather unexpected southward position some 300km south of the release site. From time to time some smaller amounts of tracer were found south of the release site (8°N). At 11°N we saw once again some isolated patches of tracer, but north of 11°30'N no more tracer was detected. On the 3rd at 16:00 we began the transit towards the Cape Verde Island.

December 4-5: Arrived at 14:30 the TENATSO time series site at 17° 38' N and 24° 15' W and performed a CTD cast to the bottom followed by a large number of micro structure measurements. On December 5 at 2:00 am the MSS was back on deck and we departed for Mindelo port.

Summary of cruise:

The research cruise MSM10/1 (Fig. 1) was extremely successful. All programs were able to collect high quality data and the anticipated goals of the expedition were fully met. We have been able to carry out the first comprehensive survey of a tracer release in the Guinea Upwelling region (GUTRE) roughly seven month after the tracer was released at 8°N 23°W in April 2008 during the MSM08/1 campaign. We have estimated that a total of 40% of the tracer was found during this cruise (Fig. 2). While the horizontal spreading and mixing was larger than anticipated, the vertical extent of the tracer found was small. Our preliminary estimates of the diapycnal (vertical) mixing rates range between $2 \cdot 10^{-6}$ m^2 s^{-1} based on the analysis of the individual profiles to no more than $6 \cdot 10^{-6}$ m^2 s^{-1} if the overall diapycnal spreading of the tracer is considered. Even the latter higher diapycnal mixing rate estimate is a factor of two below the values found during the classical first large scale tracer release experiment in Canary Basin (NATRE). The low vertical tracer spreading rate estimates are supported by the micro structure profile data. At most stations the observed turbulence levels were very low and often below the detection level of the instrument. Only at very few locations vertically and spatially limited energetic mixing events were found. The overall low vertical exchanges might provide the key link to explain the behavior of the oxygen minimum zone.

The extensive survey of the upper 1000m of the oxygen minimum zone (OMZ) allowed comparing our sections with several previous surveys. Somewhat surprisingly we found that the lowest oxygen values in the core of the OMZ have dropped below 40 µmol/kg a value that has never been reported before from the Tropical North Atlantic OMZ (Fig. 3). At the same time the oxygen concentration above the OMZ seem to have increased. These counteracting trends can only be maintained if the vertical exchange between the shallower oxygen supply layer and the deep OMZ is very small, as suggested by the tracer spreading rates and microstructure profiles.

The preliminary findings from the trace metal work focused on Fe ligand measurements shows a slight higher excess ligand concentration in the surface (50m) for three stations. The two other stations show a slight decrease at this depth. The reason for this is not clear. Below the euphotice zone, four of the five stations show a slight maximum of excess Fe binding ligands in the maximum of the OMZ. This can be caused by a higher decomposition rate of organic matter and the release of organic ligands in this depth. For more detailed understanding of these results the total dissolved Fe concentrations, which will be measured by GF-AAS in Kiel, are necessary.

A large number of biochemical samples were taken and will be analyzed in Kiel for DNA and RNA diversity. The tracer release experiment provided an ideal environment for repeated biochemical sampling in the same water mass.

Overall we have taken 229 CTD profiles, brought 4610 water samples on deck of which 2607 were analyzed for SF_5CF_3 and F12 concentration. An additional 148 samples of SF6 were measured to obtain estimates of water mass ages and ventilation rates. 692 samples were titrated by hand to determine the dissolved oxygen concentrations in order to calibrate the CTD data. 470 water samples were analyzed for salinity in order to ensure a high quality CTD calibration.

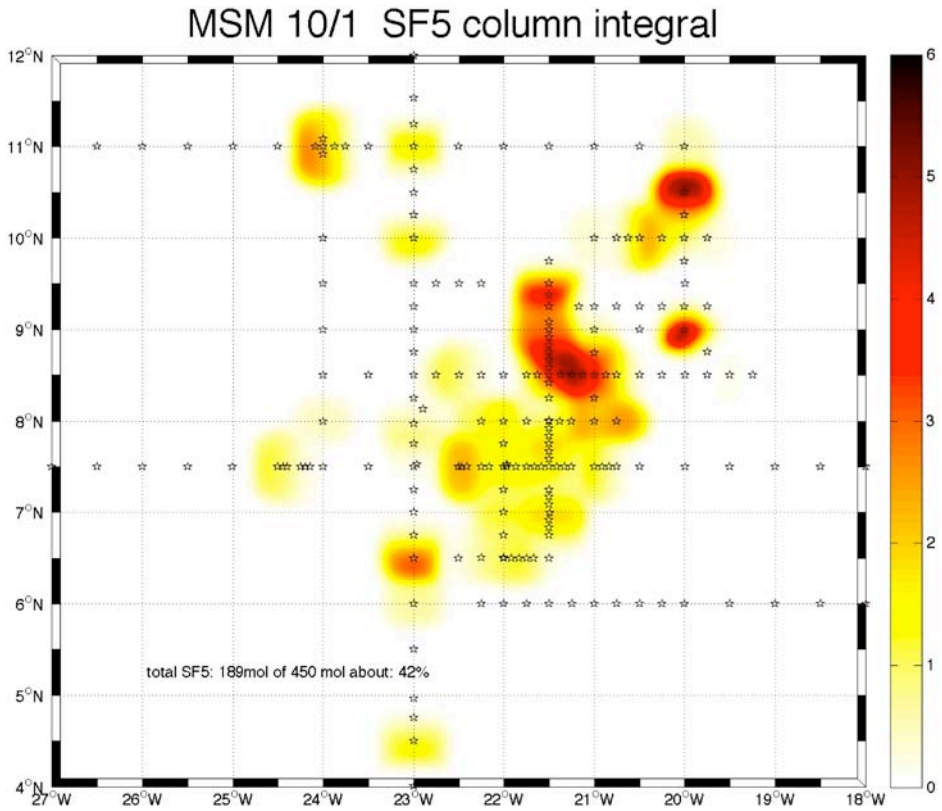

Figure 2: Vertical Integral of the tracer concentration in nmol/m^2 found during the MSM10/1 survey about seven months after the tracer release.

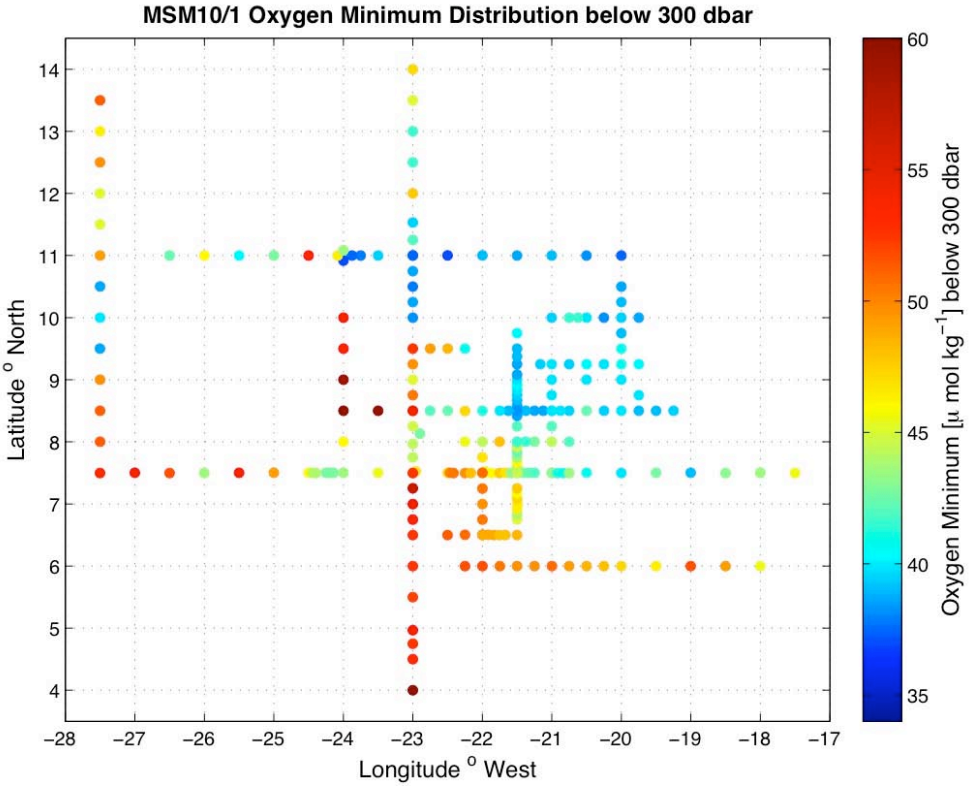

Figure 3: Minimum dissolved oxygen concentration. During the MSM10/1 survey several stations showed values below 40 µmol/kg.

Tables:

Table 1: Station parameters

P# signifies 'number of profiles at station' for MSS.

Station	P#	Date	Time	Latitude	Longitude	Gear	Comment
1	1	02-Nov-2008	18:10	28° 41.71' N	26° 19.37' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
MSS 1	1	02-Nov-2008	19:56	28° 42.13' N	26° 19.92' W	MSS	
ARGOFL 1	1	02-Nov-2008	20:23	28° 42.32' N	26° 19.66' W	ARGOFL	
2	2	03-Nov-2008	16:08	24° 37.12' N	26° 39.42' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
MSS 2	3	03-Nov-2008	17:38	24° 37.50' N	26° 39.69' W	MSS	
ARGOFL 2	1	03-Nov-2008	18:56	24° 38.68' N	26° 38.89' W	ARGOFL	
3	3	04-Nov-2008	19:36	19° 33.70' N	27° 1.66' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
GO-FLO 3	1	04-Nov-2008	21:01	19° 34.12' N	27° 1.86' W	GO-FLO	
ARGOFL 3	1	04-Nov-2008	21:46	19° 34.39' N	27° 2.01' W	ARGOFL	
GO-FLO 4	1	06-Nov-2008	02:41	13° 30.00' N	27° 30.00' W	GO-FLO	
4	4	06-Nov-2008	03:39	13° 30.00' N	27° 30.00' W	CTD/RO	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
GO-FLO 4	2	06-Nov-2008	05:07	13° 30.00' N	27° 30.00' W	GO-FLO	
ARGOFL 4	1	06-Nov-2008	06:03	13° 30.01' N	27° 30.00' W	ARGOFL	
5	5	06-Nov-2008	08:51	13° 0.00' N	27° 30.00' W	CTD/RO	Oxygen, Salinity, SF5, CFC-12
6	6	06-Nov-2008	12:25	12° 29.96' N	27° 30.00' W	CTD/RO	Oxygen, SF5, CFC-12
7	7	06-Nov-2008	15:54	12° 0.10' N	27° 30.06' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
8	8	06-Nov-2008	19:22	11° 30.00' N	27° 30.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
9	9	06-Nov-2008	22:47	10° 59.98' N	27° 30.02' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
10	10	07-Nov-2008	02:06	10° 30.03' N	27° 29.97' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
11	11	07-Nov-2008	06:00	9° 59.97' N	27° 29.97' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
12	12	07-Nov-2008	09:34	9° 29.97' N	27° 30.05' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
13	13	07-Nov-2008	13:13	9° 0.01' N	27° 30.01' W	CTD/RO/lADCP	Oxygen, RNA/DNA, SF5, CFC-12
14	14	07-Nov-2008	16:49	8° 30.00' N	27° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
15	15	07-Nov-2008	20:24	8° 0.01' N	27° 30.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
16	16	08-Nov-2008	00:03	7° 29.99' N	27° 30.05' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, RNA/DNA, SF5, CFC-12
17	17	08-Nov-2008	03:45	7° 30.00' N	27° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, SF5, CFC-12
18	18	08-Nov-2008	07:30	7° 29.98' N	26° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
19	19	08-Nov-2008	11:13	7° 29.98' N	26° 0.04' W	CTD/RO/lADCP	Oxygen, Nutrients, SF5, CFC-12
20	20	08-Nov-2008	14:51	7° 30.00' N	25° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, SF5, CFC-12
GO-FLO 21	1	08-Nov-2008	18:33	7° 30.03' N	25° 0.01' W	GO-FLO	
21	21	08-Nov-2008	19:09	7° 30.03' N	25° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
MSS 3	3	08-Nov-2008	20:39	7° 30.05' N	24° 59.99' W	MSS	
GO-FLO 21	2	08-Nov-2008	21:48	7° 30.03' N	24° 59.99' W	GO-FLO	
22	22	09-Nov-2008	01:29	7° 30.00' N	24° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
23	23	09-Nov-2008	03:04	7° 30.00' N	24° 26.75' W	CTD/RO/lADCP	Nutrients, SF5, CFC-12

24	24	09-Nov-2008	04:33	7° 29.99' N	24° 23.82' W	CTD/RO	SF5, CFC-12
25	25	09-Nov-2008	06:09	7° 30.00' N	24° 15.01' W	CTD/RO/lADCP	SF5, CFC-12
26	26	09-Nov-2008	07:37	7° 30.01' N	24° 11.66' W	CTD/RO	SF5, CFC-12
27	27	09-Nov-2008	08:54	7° 29.99' N	24° 8.55' W	CTD/RO	SF5, CFC-12
28	28	09-Nov-2008	10:24	7° 30.00' N	23° 59.98' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, SF5, CFC-12
29	29	09-Nov-2008	13:53	7° 30.00' N	23° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, SF5, CFC-12
30	30	09-Nov-2008	17:28	7° 29.98' N	23° 0.00' W	CTD/RO/lADCP	Oxygen, Nutrients, RNA/DNA, SF5, CFC-12
MSS 4	3	09-Nov-2008	18:54	7° 30.08' N	22° 57.76' W	MSS	
31	31	09-Nov-2008	20:12	7° 31.54' N	22° 57.58' W	CTD/RO	SF5, CFC-12
32	32	09-Nov-2008	23:18	7° 30.02' N	22° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, SF5, CFC-12
33	33	10-Nov-2008	00:57	7° 30.02' N	22° 28.08' W	CTD/RO	SF5, CFC-12
MSS 5	3	10-Nov-2008	01:43	7° 30.07' N	22° 28.08' W	MSS	
34	34	10-Nov-2008	03:34	7° 29.99' N	22° 24.89' W	CTD/RO	SF5, CFC-12
MSS 6	3	10-Nov-2008	04:12	7° 29.98' N	22° 24.89' W	MSS	
35	35	10-Nov-2008	06:38	7° 29.99' N	22° 15.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
MSS 7	3	10-Nov-2008	07:37	7° 30.02' N	22° 14.99' W	MSS	
36	36	10-Nov-2008	09:39	7° 29.98' N	22° 10.00' W	CTD/RO/lADCP	SF5, CFC-12
37	37	10-Nov-2008	11:23	7° 29.99' N	21° 59.99' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, RNA/DNA, SF5, CFC-12
38	38	10-Nov-2008	12:54	7° 30.02' N	21° 57.99' W	CTD/RO	RNA/DNA, SF5, CFC-12
MSS 8	3	10-Nov-2008	13:35	7° 30.07' N	21° 57.98' W	MSS	
39	39	10-Nov-2008	14:59	7° 31.62' N	21° 57.87' W	CTD/RO	SF5, CFC-12
40	40	10-Nov-2008	16:26	7° 29.99' N	21° 52.01' W	CTD/RO	SF5, CFC-12
MSS 9	3	10-Nov-2008	17:10	7° 30.02' N	21° 52.00' W	MSS	
41	41	10-Nov-2008	19:16	7° 29.99' N	21° 45.00' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, RNA/DNA, SF5, CFC-12
42	42	10-Nov-2008	20:54	7° 29.99' N	21° 39.99' W	CTD/RO	SF5, CFC-12
43	43	10-Nov-2008	22:29	7° 29.99' N	21° 35.05' W	CTD/RO	SF5, CFC-12
44	44	10-Nov-2008	23:54	7° 29.99' N	21° 30.03' W	CTD/RO/lADCP	Oxygen, Salinity, N2O, Nutrients, SF5, CFC-12
MSS 10	3	11-Nov-2008	00:58	7° 30.02' N	21° 30.03' W	MSS	
45	45	11-Nov-2008	02:47	7° 30.00' N	21° 25.01' W	CTD/RO	SF5, CFC-12
MSS 11	3	11-Nov-2008	03:32	7° 30.03' N	21° 25.00' W	MSS	
46	46	11-Nov-2008	05:25	7° 29.99' N	21° 20.00' W	CTD/RO	SF5, CFC-12
47	47	11-Nov-2008	06:42	7° 29.99' N	21° 15.00' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, SF5, CFC-12
MSS 12	1	11-Nov-2008	07:45	7° 30.15' N	21° 14.99' W	MSS	Aborted. Problems with cable
48	48	11-Nov-2008	09:36	7° 29.99' N	21° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, RNA/DNA, SF5, CFC-12
49	49	11-Nov-2008	11:09	7° 29.99' N	20° 55.03' W	CTD/RO	SF5, CFC-12
50	50	11-Nov-2008	12:26	7° 29.98' N	20° 50.02' W	CTD/RO	SF5, CFC-12
51	51	11-Nov-2008	13:47	7° 30.00' N	20° 45.01' W	CTD/RO/lADCP	SF5, CFC-12
52	52	11-Nov-2008	16:19	7° 29.99' N	20° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, SF5, CFC-12
53	53	11-Nov-2008	20:14	7° 29.98' N	19° 59.99' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, RNA/DNA, SF5, CFC-12
54	54	11-Nov-2008	23:45	7° 29.99' N	19° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, Nutrients, SF5, CFC-12
55	55	12-Nov-2008	03:15	7° 29.99' N	19° 0.01' W	CTD/RO	Oxygen, Salinity, Nutrients, SF5, CFC-12
56	56	12-Nov-2008	06:58	7° 29.99' N	18° 30.02' W	CTD/RO/lADCP	Oxygen, Salinity,

							Nutrients, SF5, CFC-12
57	57	12-Nov-2008	10:43	7° 30.00' N	18° 0.02' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
58	58	12-Nov-2008	14:21	7° 30.01' N	17° 30.00' W	CTD/RO/lADCP	Salinity, RNA/DNA, SF5, CFC-12
59	59	12-Nov-2008	22:40	6° 0.03' N	18° 0.02' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
60	60	13-Nov-2008	02:20	5° 59.99' N	18° 30.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
61	61	13-Nov-2008	05:58	6° 0.00' N	19° 0.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
62	62	13-Nov-2008	09:33	6° 0.01' N	19° 30.03' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
63	63	13-Nov-2008	13:05	5° 59.98' N	20° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
64	64	13-Nov-2008	15:38	5° 59.99' N	20° 15.00' W	CTD/RO	Oxygen, SF5, CFC-12
65	65	13-Nov-2008	18:09	6° 0.01' N	20° 29.96' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
MSS 13	3	13-Nov-2008	19:11	6° 0.09' N	20° 29.96' W	MSS	
66	66	13-Nov-2008	22:01	5° 59.99' N	20° 45.00' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
67	67	14-Nov-2008	00:32	6° 0.01' N	20° 59.95' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
68	68	14-Nov-2008	03:01	6° 0.00' N	21° 14.95' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
69	69	14-Nov-2008	05:35	6° 0.01' N	21° 29.96' W	CTD/RO/lADCP	Oxygen, SF5, CFC-12
70	70	14-Nov-2008	08:06	6° 0.02' N	21° 44.97' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
71	71	14-Nov-2008	10:38	6° 0.01' N	22° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
GO-FLO 72	1	14-Nov-2008	13:17	6° 0.01' N	22° 15.00' W	GO-FLO	
72	72	14-Nov-2008	13:59	6° 0.01' N	22° 15.00' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
GO-FLO 72	2	14-Nov-2008	15:50	6° 0.01' N	22° 15.00' W	GO-FLO	
73	73	14-Nov-2008	19:50	6° 30.00' N	22° 30.03' W	CTD/RO/lADCP	Oxygen, RNA/DNA, SF5, CFC-12
74	74	14-Nov-2008	22:10	6° 30.07' N	22° 14.98' W	CTD/RO/lADCP	Oxygen, SF5, CFC-12
75	75	15-Nov-2008	00:28	6° 30.08' N	22° 0.02' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
76	76	15-Nov-2008	02:05	6° 30.02' N	21° 55.00' W	CTD/RO	SF5, CFC-12
77	77	15-Nov-2008	03:24	6° 30.01' N	21° 49.95' W	CTD/RO	SF5, CFC-12
78	78	15-Nov-2008	04:50	6° 30.01' N	21° 44.99' W	CTD/RO	SF5, CFC-12
79	79	15-Nov-2008	06:13	6° 30.02' N	21° 40.00' W	CTD/RO	SF5, CFC-12
MSS 14	3	15-Nov-2008	06:55	6° 30.02' N	21° 39.97' W	MSS	
80	80	15-Nov-2008	09:13	6° 30.02' N	21° 30.02' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
81	81	15-Nov-2008	12:16	6° 45.12' N	21° 30.00' W	CTD/RO	Salinity, RNA/DNA, SF5, CFC-12
82	82	15-Nov-2008	13:43	6° 50.01' N	21° 30.00' W	CTD/RO	RNA/DNA, SF5, CFC-12
83	83	15-Nov-2008	14:56	6° 55.08' N	21° 29.99' W	CTD/RO	RNA/DNA, SF5, CFC-12
MSS 15	3	15-Nov-2008	16:19	7° 0.68' N	21° 31.11' W	MSS	
84	84	15-Nov-2008	17:44	6° 59.83' N	21° 29.71' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
85	85	15-Nov-2008	19:23	7° 5.01' N	21° 30.00' W	CTD/RO	SF5, CFC-12
MSS 16	3	15-Nov-2008	20:44	7° 11.32' N	21° 30.87' W	MSS	
86	86	15-Nov-2008	22:09	7° 10.22' N	21° 30.14' W	CTD/RO	SF5, CFC-12
MSS 17	3	15-Nov-2008	23:33	7° 15.96' N	21° 30.80' W	MSS	
87	87	16-Nov-2008	01:00	7° 15.01' N	21° 30.00' W	CTD/RO	Oxygen, Salinity, SF5, CFC-12
88	88	16-Nov-2008	03:13	7° 30.01' N	21° 29.99' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
89	89	16-Nov-2008	04:55	7° 35.01' N	21° 30.00' W	CTD/RO	SF5, CFC-12
90	90	16-Nov-2008	06:13	7° 40.01' N	21° 30.00' W	CTD/RO	SF5, CFC-12
91	91	16-Nov-2008	07:32	7° 44.99' N	21° 30.01' W	CTD/RO	SF5, CFC-12

92	92	16-Nov-2008	08:53	7° 50.00' N	21° 30.01' W	CTD/RO	Oxygen, SF5, CFC-12
93	93	16-Nov-2008	10:15	7° 54.99' N	21° 30.04' W	CTD/RO	RNA/DNA, SF5, CFC-12
MSS 18	3	16-Nov-2008	14:06	8° 1.34' N	21° 32.10' W	MSS	
94	94	16-Nov-2008	15:40	8° 0.00' N	21° 30.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
95	95	16-Nov-2008	18:09	8° 15.00' N	21° 30.01' W	CTD/RO	SF5, CFC-12
96	96	16-Nov-2008	20:13	8° 30.02' N	21° 29.99' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
97	97	16-Nov-2008	22:20	8° 25.03' N	21° 30.03' W	CTD/RO	SF5, CFC-12
98	98	17-Nov-2008	00:10	8° 34.95' N	21° 30.04' W	CTD/RO	Oxygen, SF5, CFC-12
99	99	17-Nov-2008	01:29	8° 40.01' N	21° 30.00' W	CTD/RO	Oxygen, SF5, CFC-12
100	100	17-Nov-2008	02:50	8° 45.01' N	21° 30.00' W	CTD/RO	Salinity, SF5, CFC-12
101	101	17-Nov-2008	04:08	8° 50.01' N	21° 30.00' W	CTD/RO	SF5, CFC-12
102	102	17-Nov-2008	05:33	8° 54.98' N	21° 30.00' W	CTD/RO	SF5, CFC-12
103	103	17-Nov-2008	06:49	8° 59.99' N	21° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
104	104	17-Nov-2008	08:24	9° 4.99' N	21° 30.00' W	CTD/RO/lADCP	RNA/DNA, SF5, CFC-12
105	105	17-Nov-2008	10:02	9° 15.00' N	21° 30.03' W	CTD/RO	Salinity, SF5, CFC-12
106	106	17-Nov-2008	11:34	9° 22.48' N	21° 29.98' W	CTD/RO	SF5, CFC-12
GO-FLO 107	1	17-Nov-2008	12:58	9° 29.96' N	21° 30.02' W	GO-FLO	
107	107	17-Nov-2008	13:35	9° 29.95' N	21° 30.02' W	CTD/RO	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
GO-FLO 107	2	17-Nov-2008	15:11	9° 29.96' N	21° 30.02' W	GO-FLO	
108	108	17-Nov-2008	17:32	9° 44.99' N	21° 30.00' W	CTD/RO/lADCP	SF6, SF5, CFC-12
109	109	17-Nov-2008	23:52	9° 0.00' N	20° 30.03' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
110	110	18-Nov-2008	03:16	9° 0.01' N	20° 0.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
111	111	18-Nov-2008	06:01	8° 45.01' N	19° 45.00' W	CTD/RO	SF5, CFC-12
112	112	19-Nov-2008	05:09	8° 30.01' N	19° 15.02' W	CTD/RO	SF5, CFC-12
113	113	19-Nov-2008	07:16	8° 30.00' N	19° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
114	114	19-Nov-2008	09:37	8° 29.97' N	19° 45.00' W	CTD/RO/lADCP	SF5, CFC-12
115	115	19-Nov-2008	11:40	8° 30.00' N	19° 59.95' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
116	116	19-Nov-2008	14:06	8° 30.00' N	20° 14.99' W	CTD/RO	Oxygen, SF5, CFC-12
117	117	19-Nov-2008	16:26	8° 30.00' N	20° 30.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF6, SF5, CFC-12
118	118	19-Nov-2008	18:48	8° 29.98' N	20° 44.98' W	CTD/RO	RNA/DNA, SF5, CFC-12
119	119	19-Nov-2008	20:14	8° 29.99' N	20° 52.50' W	CTD/RO	SF6, SF5, CFC-12
120	120	19-Nov-2008	21:36	8° 30.00' N	20° 59.98' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
121	121	19-Nov-2008	23:22	8° 30.02' N	21° 7.50' W	CTD/RO	SF5, CFC-12
122	122	20-Nov-2008	00:52	8° 30.03' N	21° 14.95' W	CTD/RO	Oxygen, Salinity, SF5, CFC-12
123	123	20-Nov-2008	02:24	8° 29.99' N	21° 22.50' W	CTD/RO	Salinity, SF5, CFC-12
124	124	20-Nov-2008	03:53	8° 29.99' N	21° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
125	125	20-Nov-2008	05:42	8° 30.00' N	21° 37.48' W	CTD/RO	SF5, CFC-12
126	126	20-Nov-2008	07:11	8° 30.00' N	21° 44.99' W	CTD/RO	SF5, CFC-12
127	127	20-Nov-2008	09:19	8° 29.96' N	21° 59.98' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
128	128	20-Nov-2008	11:49	8° 29.94' N	22° 14.99' W	CTD/RO	SF5, CFC-12
129	129	20-Nov-2008	13:57	8° 29.99' N	22° 29.97' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
130	130	20-Nov-2008	16:23	8° 29.99' N	22° 45.00' W	CTD/RO	SF5, CFC-12
MSS 19	3	20-Nov-2008	19:18	8° 6.54' N	22° 53.57' W	MSS	
131	131	20-Nov-2008	20:41	8° 7.80' N	22° 53.95' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
132	132	21-Nov-2008	01:34	8° 30.00' N	23° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5,

							CFC-12
133	133	21-Nov-2008	05:12	8° 29.99' N	23° 30.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF6, SF5, CFC-12
134	134	21-Nov-2008	09:50	7° 59.98' N	23° 59.96' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
135	135	21-Nov-2008	13:27	8° 30.00' N	24° 0.01' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
136	136	21-Nov-2008	17:05	9° 0.00' N	23° 59.98' W	CTD/RO/lADCP	Salinity, SF6, SF5, CFC-12
MSS 20	5	21-Nov-2008	18:00	9° 0.05' N	23° 59.99' W	MSS	
137	137	21-Nov-2008	22:37	9° 29.96' N	24° 0.02' W	CTD/RO/lADCP	Salinity, RNA/DNA, SF5, CFC-12
138	138	22-Nov-2008	02:04	9° 59.99' N	24° 0.02' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
139	139	22-Nov-2008	15:41	11° 0.00' N	26° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
140	140	22-Nov-2008	19:15	10° 59.99' N	25° 59.99' W	CTD/RO/lADCP	Oxygen, Salinity, SF6, SF5, CFC-12
141	141	22-Nov-2008	22:46	10° 59.99' N	25° 30.05' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
142	142	23-Nov-2008	02:18	11° 0.01' N	25° 0.00' W	CTD/RO/lADCP	Salinity, SF6, SF5, CFC-12
143	143	23-Nov-2008	05:49	11° 0.00' N	24° 30.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF6, SF5, CFC-12
144	144	23-Nov-2008	09:16	11° 0.01' N	24° 0.02' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
145	145	23-Nov-2008	11:31	11° 0.00' N	23° 45.01' W	CTD/RO	Salinity, SF5, CFC-12
146	146	23-Nov-2008	14:08	10° 59.98' N	23° 52.53' W	CTD/RO	SF5, CFC-12
147	147	23-Nov-2008	15:49	10° 55.01' N	24° 0.01' W	CTD/RO	SF5, CFC-12
148	148	23-Nov-2008	17:17	10° 59.99' N	24° 5.02' W	CTD/RO	SF5, CFC-12
149	149	23-Nov-2008	18:39	11° 5.00' N	23° 59.99' W	CTD/RO	SF5, CFC-12
150	150	23-Nov-2008	21:57	10° 59.97' N	23° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
151	151	24-Nov-2008	01:39	10° 59.99' N	23° 0.04' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
152	152	24-Nov-2008	05:26	11° 0.00' N	22° 30.03' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
153	153	24-Nov-2008	09:07	11° 0.00' N	22° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
154	154	24-Nov-2008	12:47	10° 59.99' N	21° 30.01' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
GO-FLO 155	1	24-Nov-2008	16:51	11° 0.00' N	21° 0.01' W	GO-FLO	
155	155	24-Nov-2008	17:27	11° 0.00' N	21° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, N2O, Nutrients, RNA/DNA, SF6, SF5, CFC-12
MSS 21	4	24-Nov-2008	19:01	11° 0.04' N	21° 0.02' W	MSS	
GO-FLO 155	2	24-Nov-2008	20:56	11° 1.64' N	21° 0.19' W	GO-FLO	
156	156	25-Nov-2008	00:52	10° 59.99' N	20° 30.02' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
157	157	25-Nov-2008	04:41	11° 0.00' N	20° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
158	158	25-Nov-2008	08:35	10° 29.98' N	20° 0.03' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
159	159	25-Nov-2008	11:05	10° 14.98' N	20° 0.02' W	CTD/RO	SF5, CFC-12
160	160	25-Nov-2008	13:49	10° 0.00' N	19° 45.01' W	CTD/RO	Salinity, SF5, CFC-12
161	161	25-Nov-2008	16:00	10° 0.00' N	20° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
162	162	25-Nov-2008	18:30	9° 59.99' N	20° 15.00' W	CTD/RO	SF5, CFC-12
163	163	25-Nov-2008	20:45	10° 0.00' N	20° 30.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
164	164	25-Nov-2008	22:31	9° 59.99' N	20° 37.50' W	CTD/RO	SF5, CFC-12
165	165	26-Nov-2008	00:03	9° 59.99' N	20° 45.01' W	CTD/RO	Salinity, SF5, CFC-12
166	166	26-Nov-2008	02:12	10° 0.00' N	21° 0.01' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
167	167	26-Nov-2008	08:22	9° 44.98' N	20° 0.01' W	CTD/RO	RNA/DNA, SF5, CFC-12
168	168	26-Nov-2008	10:28	9° 29.98' N	20° 0.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
MSS 22	3	26-Nov-2008	12:12	9° 30.05' N	19° 59.99' W	MSS	
169	169	26-Nov-2008	15:40	9° 15.00' N	19° 45.01' W	CTD/RO	Salinity, SF5, CFC-12

170	170	26-Nov-2008	17:52	9° 15.00' N	20° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF6, SF5, CFC-12
171	171	26-Nov-2008	20:11	9° 14.99' N	20° 15.00' W	CTD/RO	SF5, CFC-12
172	172	26-Nov-2008	22:17	9° 14.98' N	20° 30.02' W	CTD/RO/lADCP	Oxygen, SF5, CFC-12
173	173	27-Nov-2008	00:37	9° 14.99' N	20° 45.01' W	CTD/RO	Salinity, SF5, CFC-12
174	174	27-Nov-2008	02:38	9° 15.00' N	21° 0.01' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
175	175	27-Nov-2008	04:33	9° 15.00' N	21° 10.01' W	CTD/RO	SF6, SF5, CFC-12
MSS 23	3	27-Nov-2008	06:29	9° 2.98' N	21° 9.92' W	MSS	
177	176	27-Nov-2008	09:19	8° 59.98' N	21° 0.02' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
178	177	27-Nov-2008	11:31	8° 44.96' N	21° 0.03' W	CTD/RO	SF5, CFC-12
179	178	27-Nov-2008	13:40	8° 30.00' N	21° 0.01' W	CTD/RO	SF5, CFC-12
179	179	27-Nov-2008	13:56	8° 30.00' N	21° 0.01' W	CTD/RO	Salinity, RNA/DNA, SF5, CFC-12
180	180	27-Nov-2008	16:15	8° 15.00' N	21° 0.01' W	CTD/RO	Salinity, SF6, SF5, CFC-12
181	181	27-Nov-2008	18:53	7° 59.98' N	20° 45.00' W	CTD/RO	SF5, CFC-12
182	182	27-Nov-2008	20:59	8° 0.00' N	20° 59.99' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
183	183	27-Nov-2008	23:28	7° 59.97' N	21° 15.01' W	CTD/RO	SF5, CFC-12
184	184	28-Nov-2008	01:03	7° 59.99' N	21° 22.67' W	CTD/RO	SF5, CFC-12
185	185	28-Nov-2008	02:39	8° 0.00' N	21° 30.01' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
186	186	28-Nov-2008	05:01	8° 0.00' N	21° 45.01' W	CTD/RO	SF6, SF5, CFC-12
187	187	28-Nov-2008	07:07	7° 59.98' N	22° 0.03' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
188	188	28-Nov-2008	09:30	7° 59.99' N	22° 15.02' W	CTD/RO	SF5, CFC-12
189	189	28-Nov-2008	12:06	7° 44.98' N	22° 0.02' W	CTD/RO	Oxygen, RNA/DNA, SF5, CFC-12
190	190	28-Nov-2008	14:10	7° 30.00' N	22° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
191	191	28-Nov-2008	16:27	7° 15.00' N	22° 0.01' W	CTD/RO	SF5, CFC-12
192	192	28-Nov-2008	18:38	7° 0.00' N	22° 0.02' W	CTD/RO/lADCP	Oxygen, SF6, SF5, CFC-12
193	193	28-Nov-2008	21:01	6° 44.98' N	22° 0.00' W	CTD/RO	Oxygen, Salinity, SF5, CFC-12
194	194	28-Nov-2008	23:07	6° 29.97' N	22° 0.00' W	CTD/RO	SF5, CFC-12
195	195	29-Nov-2008	14:00	4° 0.01' N	23° 0.00' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF5, CFC-12
196		29-Nov-2008	16:05	4° 5.44' N	23° 0.46' W	MOR	Check PIRATA Mooring
ARGOFL 5	1	29-Nov-2008	19:03	4° 5.49' N	23° 1.07' W	ARGOFL	
198	196	29-Nov-2008	21:15	4° 30.01' N	23° 0.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
199	197	29-Nov-2008	23:45	4° 45.00' N	23° 0.01' W	CTD/RO	SF5, CFC-12
200	198	30-Nov-2008	01:43	4° 58.01' N	22° 59.99' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
201	199	30-Nov-2008	05:32	5° 30.01' N	22° 59.99' W	CTD/RO/lADCP	Oxygen, Salinity, SF6, SF5, CFC-12
202	200	30-Nov-2008	09:05	6° 0.01' N	23° 0.00' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
203	201	30-Nov-2008	12:43	6° 29.99' N	23° 0.00' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
ARGOFL 6	1	30-Nov-2008	13:47	6° 30.11' N	22° 59.97' W	ARGOFL	
204	202	30-Nov-2008	15:11	6° 45.00' N	23° 0.01' W	CTD/RO	SF5, CFC-12
205	203	30-Nov-2008	17:15	7° 0.00' N	22° 59.99' W	CTD/RO/lADCP	Oxygen, Salinity, SF6, SF5, CFC-12
206	204	30-Nov-2008	19:35	7° 15.00' N	23° 0.00' W	CTD/RO	RNA/DNA, SF5, CFC-12
207	205	30-Nov-2008	21:41	7° 29.97' N	22° 59.99' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
208	206	01-Dec-2008	00:05	7° 44.98' N	23° 0.00' W	CTD/RO	Salinity, SF5, CFC-12
209	207	01-Dec-2008	01:59	7° 57.99' N	23° 0.01' W	CTD/RO/lADCP	Salinity, SF5, CFC-12
210	208	01-Dec-2008	04:28	8° 15.00' N	23° 0.01' W	CTD/RO	SF5, CFC-12
211	209	01-Dec-2008	06:35	8° 30.00' N	23° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF6, SF5, CFC-12
212	210	01-Dec-2008	08:57	8° 45.00' N	23° 0.02' W	CTD/RO	SF5, CFC-12

213	211	01-Dec-2008	11:07	9° 0.00' N	23° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
214	212	01-Dec-2008	13:25	9° 15.00' N	23° 0.01' W	CTD/RO	SF5, CFC-12
215	213	01-Dec-2008	15:32	9° 30.00' N	23° 0.01' W	CTD/RO/lADCP	Salinity, RNA/DNA, SF5, CFC-12
216	214	01-Dec-2008	18:00	9° 30.01' N	22° 45.02' W	CTD/RO	SF6, SF5, CFC-12
217	215	01-Dec-2008	20:06	9° 29.99' N	22° 30.01' W	CTD/RO	SF5, CFC-12
218	216	01-Dec-2008	22:16	9° 30.00' N	22° 15.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
ARGOFL 7	1	01-Dec-2008	23:20	9° 30.06' N	22° 15.02' W	ARGOFL	
219	217	02-Dec-2008	03:57	10° 0.00' N	23° 0.01' W	CTD/RO/lADCP	Salinity, SF6, SF5, CFC-12
220	218	02-Dec-2008	06:15	10° 15.00' N	23° 0.00' W	CTD/RO	SF5, CFC-12
221	219	02-Dec-2008	08:18	10° 29.99' N	23° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
222	220	02-Dec-2008	10:35	10° 44.99' N	23° 0.02' W	CTD/RO	SF5, CFC-12
223	221	02-Dec-2008	12:46	11° 0.00' N	23° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, SF5, CFC-12
224	222	02-Dec-2008	15:03	11° 15.00' N	23° 0.01' W	CTD/RO	SF5, CFC-12
225		02-Dec-2008	16:55	11° 28.81' N	23° 0.47' W	MOR	Check PIRATA Mooring
226	223	02-Dec-2008	19:43	11° 32.00' N	23° 0.01' W	CTD/RO/lADCP	Oxygen, Salinity, RNA/DNA, SF6, SF5, CFC-12
MSS 24	3	02-Dec-2008	20:39	11° 32.04' N	23° 0.03' W	MSS	
227	224	03-Dec-2008	00:40	11° 59.99' N	23° 0.00' W	CTD/RO/lADCP	SF5, CFC-12
228	225	03-Dec-2008	04:15	12° 30.00' N	23° 0.01' W	CTD/RO/lADCP	SF6, SF5, CFC-12
229	226	03-Dec-2008	07:57	13° 0.01' N	23° 0.01' W	CTD/RO	Oxygen, SF5, CFC-12
230	227	03-Dec-2008	11:37	13° 30.00' N	23° 0.00' W	CTD/RO/lADCP	Oxygen, SF5, CFC-12
231	228	03-Dec-2008	16:03	14° 0.00' N	23° 0.01' W	CTD/RO/lADCP	SF5, CFC-12
MSS 25	1	03-Dec-2008	17:07	14° 0.04' N	23° 0.05' W	MSS	
232	229	04-Dec-2008	15:38	17° 38.00' N	24° 15.01' W	CTD/RO/lADCP	Oxygen, N2O, Nutrients, RNA/DNA, SF5, CFC-12
MSS 26	18	04-Dec-2008	17:59	17° 38.04' N	24° 15.01' W	MSS	