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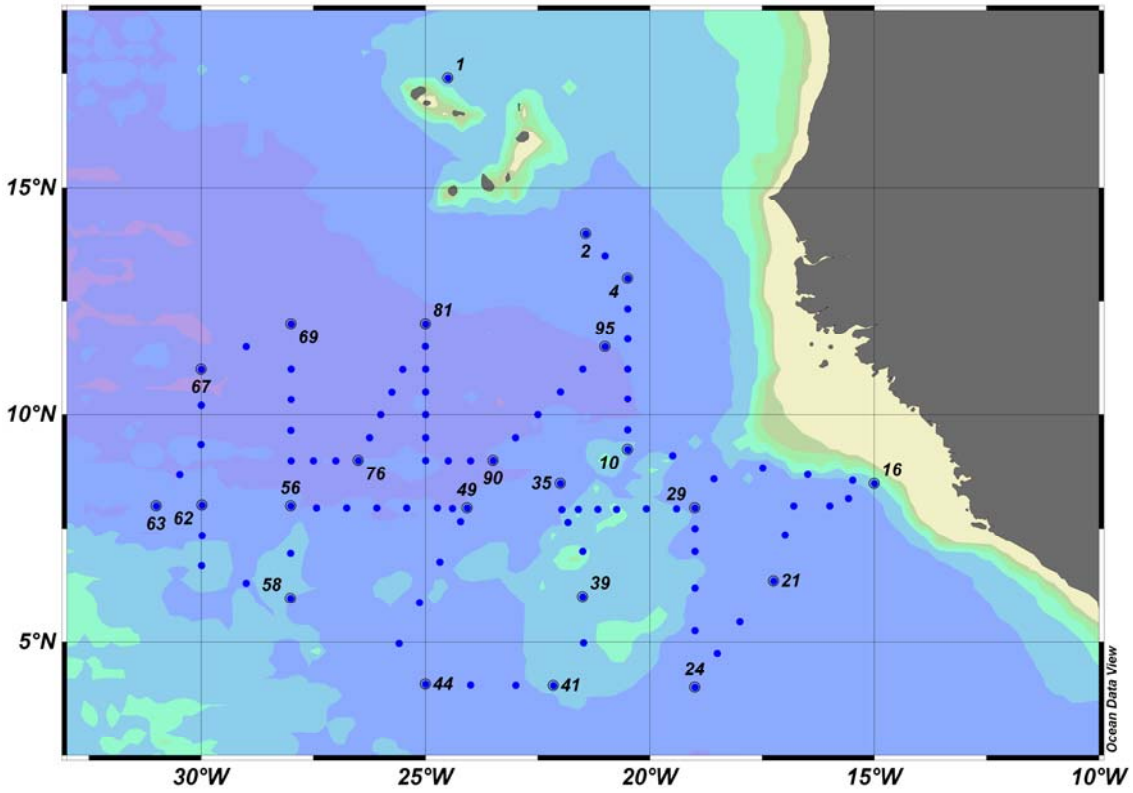
Short Cruise Report
Meteor 80/2

Mindelo - Dakar
26.11.2009 – 22.12.2009
Chief Scientist: Douglas W.R. Wallace
Captain: Walter Baschek



Objectives

The cruise leg contributes to several sub-projects of SFB754 (Climate Biogeochemistry Interactions in the Tropical Ocean): www.sfb754.de.

The primary goal for this cruise leg was to:

A. Document the lateral and vertical distribution of a purposeful tracer that had been released into the subsurface tropical ocean 19 months earlier (during Merian cruise MSM08/1 in April/May 2008). Using the purposeful tracer distribution, we will investigate regional advection as well as lateral and vertical mixing rates. The observed distributions will be compared with high-resolution models of the tracer in the region that are being developed in other sub-projects of SFB754. The resulting information will be applied to measurements of regional oxygen gradients, and associated hydrography, in order to better understand the supply of oxygen to the Oxygen Minimum Zone of the tropical Atlantic Ocean.

Secondary goals of the cruise leg included:

B. Compilation of a detailed and dense map of the oxygen distribution in the region. The data can be used to estimate the oxygen inventory within this OMZ.

C. Collection of water samples for biological and chemical parameters and measurement of surface water parameters along the cruise track. There were five principal programmes conducted on board:

1. N_2-fixation: experimental, small-volume incubations of near-surface seawater were used to investigate rates and controls of nitrogen fixation by the plankton community. This work included sampling for metagenomic characterization of the microbial community.

2. Mesocosms: on-board experiments were conducted using larger volume (c. 150 liter) mesocosms in order to investigate the influence of variable nutrient stoichiometry on pelagic ecosystems, including investigations of zooplankton.

3. Microbial nitrogen cycling within the oxygen minimum zone. This work included experimental, labeling studies to investigate rates of nitrification and other microbial nitrogen transformations in the oxygen minimum zone.

4. N_2O and microstructure: the concentration and in-situ production of the greenhouse gas N_2O was measured at a number of stations and, at the same location, profiles of microstructure were determined in order to estimate turbulent mixing within the water column. One goal is to estimate diapycnal N_2O fluxes and, also, to compare microstructure-based mixing rates with estimate of mixing derived from the tracer profiles.

5. Trace metals: the concentration and speciation of a range of trace metals including Fe, Al, Zn and Co were measured in order to investigate sources, sinks, transformations and bioavailability of important trace metals.

Narrative

The 27 members of the M80/2 scientific party arrived in Mindelo on 24 November in order to unpack and set up all their equipment on board. The time in Mindelo was also used to start a cooperation between schools in and around Kiel with counterpart schools in Mindelo. In connection with 2 Kiel SFBs (SFB754 and also SFB 574), the German Research Foundation has financed an

outreach project which aims to use schoolkids and joint projects between schoolkids and scientists, as a “medium” for communicating science to the public. A unique aspect of this new project is establishment of international partnerships between schools in Germany and schools located in various countries where the SFBs conduct their research.

A 7-strong group including three staff members from IFM-GEOMAR (led by Dr. Joachim Dengg) as well as two teachers and two students from the Heikendorf Gymnasium near Kiel, visited three high schools in Mindelo in order to discuss the cooperation with local teachers and students. A high-point was a tour of Meteor for 80 local high-school students on Nov. 24th. The visit and tour were reported on local TV and radio, and a high degree of enthusiasm for the cooperation was evident from both sides.

Figure 1: Carolin Löscher (CAU, Kiel) and Nuno Viera (INDP, Mindelo) with one of the groups of schoolkids who toured the Meteor during her stay in Kiel.

On November 25th between 1800 and 2230 LT, the SFB754 and IFM-GEOMAR held a reception on board for local marine and harbour-related authorities, representatives from the partner schools, and members of our scientific partner institutions in Mindelo. Up to 90 people enjoyed a buffet of delicacies that was prepared on board, and the Cape Verdean guests particularly appreciated the German character of the food. A tour of Meteor was offered and musical entertainment was provided, from an improvised stage on one of the hatches, by the group *Olinos*, who had recently returned from a tour of Germany. The needs and prospects for improved harbour facilities for the support of research vessels, particularly the need for a heavy, portable crane, were also discussed during the evening.

Meteor departed Mindelo, Cape Verde at 0654 LT on 26th November to start Leg 2 of Meteor Cruise #80. First stop was a visit to the location of the TENATSO interdisciplinary mooring that had been redeployed during Meteor 80/1. We spent a short time searching to make sure that there was no sign of mooring components at the surface (the mooring extends to only a few meters below the surface) and then returned to sample at the TENATSO Ocean Station at 17.4°N 24.5°W (www.tenatso.com). This ocean time-series is sampled regularly by Cape Verde’s Fisheries Development Institute (INDP) however their small research vessel *Islandia* is under repair, hence visits by Meteor on M80/1 and M80/2 are important for maintaining the time-series.

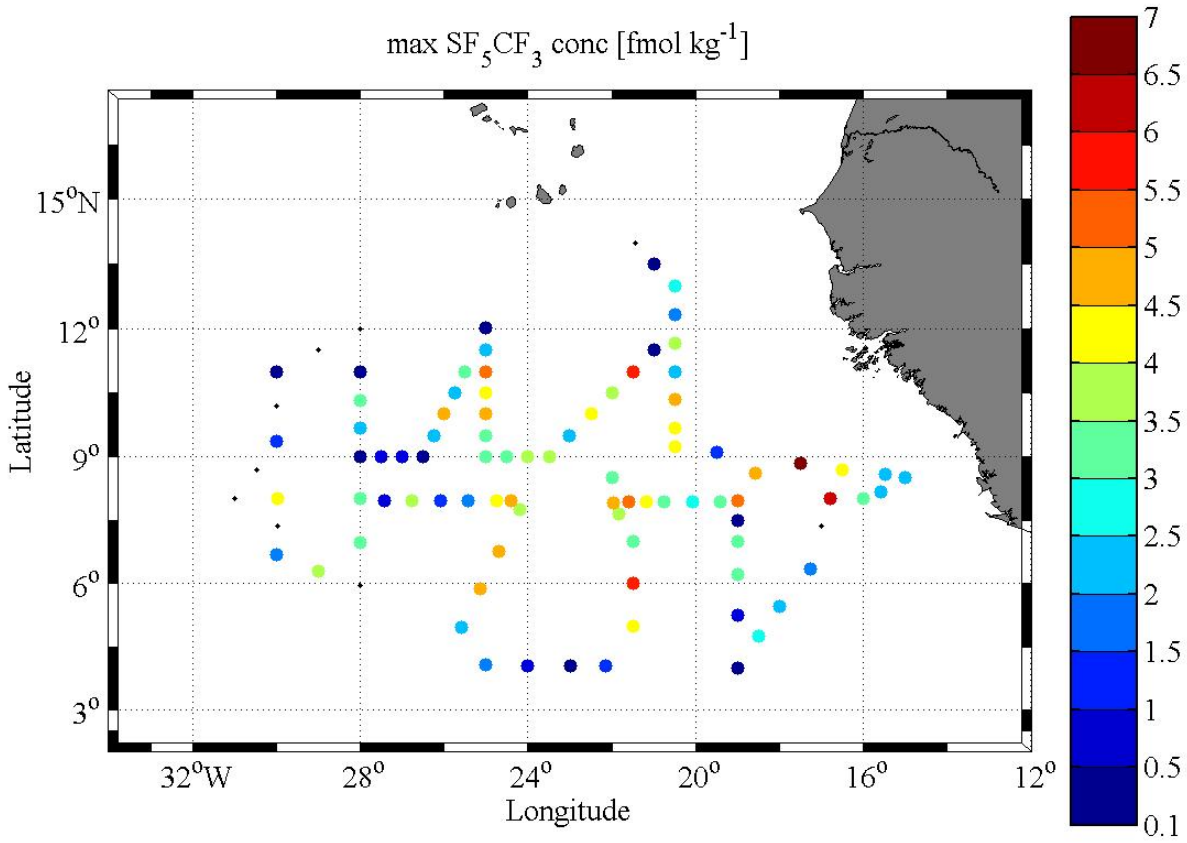


Figure 2: Map of the peak SF_5CF_3 tracer concentrations measured during the cruise.

Following a number of casts at this first station, we transited to the first station of the tracer measurement campaign at c. 14°N, 21.4°W. This location was planned based on preliminary results from the previous leg that had measured no tracer north of c. 13°N (at 23°W). We confirmed this limit to the spreading of the tracer by finding no tracer at this location.

Following this, the cruise track headed southwards, along the edge of the EEZ of Guinea Bissau and then on a zig-zag path covering the area between 15° and 30°W and 4°N to c. 12°N. The general distribution of the tracer can be viewed in Figure 2. The cruise track was aimed at determining the vertical spreading of the tracer, its meridional and zonal extent, and we sought to collect sufficient data to be able to estimate the tracer inventory within the study region. In order to do this within the cruise time available, most sampling was conducted with a station spacing of c. 40-60 nautical miles. However in a few locations, we sampled more closely in order to allow for estimation of correlation length scales of the tracer. The cruise track had a major emphasis on zonal sections at 8° and 9°N where we expected to find high tracer concentrations.

Upon completion of the last station of the tracer hunt (Station 95 at 11.5°N, 21°W) on the morning of 21 December, the Meteor steamed directly for Dakar in order to arrive at the pilot station at 1600 UTC on December 22. Meteor docked in Dakar shortly afterwards, and most harbour and customs formalities were completed soon after arrival. Unloading of containers, and loading of frozen goods into a freezer container and arrangement of air freight were completed on the morning of December 23. The scientific staff departed Meteor for their return flights at 2300.

Activities and Gear Used:

Most sampling was conducted with a 24-bottle rosette (10-liter Niskins) equipped with a **CTD** that included oxygen and fluorescence sensors. Most CTD profiles were conducted to no deeper than 1300m in order to minimize station time. Niskin bottles sampling was focused around the target density where the tracer had been originally in injected (σ_θ = 26.85) in order to maximize resolution of the tracer peak.

At a number of stations, deep casts to below 3000m were made, generally at locations where earlier high quality hydrographic data are available from GEOSECS (1970's), the Transient Tracers in the Ocean programme of the 1980's or the World Ocean Circulation Experment of the 1990's. These data allow for so-called "cross-over" comparisons of data to check quality in deeper waters where temporal and spatial variations are expected to be relatively small.

In addition to normal "tracer" CTD profiles to 1300m, we conducted c. 12 CTD profiles to 1300m in which the sampling focused on resolving the vertical gradient of N_2O (as well as measurements of hydroxylamine) below the mixed-layer and extending into the oxygen minimum. These profiles were always accompanied with a c. 1.5 hour period of vertical profiling with a **microstructure probe**.

At many, but not all, stations samples were collected, at every depth, for Winkler titrations of dissolved oxygen. These data were seen to be of high accuracy and allowed for high-quality calibration of the CTD's oxygen sensor. At some stations, samples were collected for a broader range of biogeochemical parameters including nutrients, POC/PON, chlorophyll, etc..

Additional CTD casts were conducted , at a number of stations, to depths of c. 500m or 50m in order to collect larger volumes of water for the various biological measurement groups on board, for the initiation of experiments, or for the collection of large water samples for metagenomic analysis.

At one station, a set of 4 **in-situ pumps** was deployed to collect samples for metagenomic analysis of the plankton community.

Zooplankton net hauls were conducted at 12 stations (after the CTD casts were completed), using a **WP2 net** with a mesh size of 150µm which was hauled vertically from 50m to the surface. The contents were either sorted alive for experiments, frozen for determination of fatty acid composition, or dried overnight for stable isotopes of C and N. The surface bottles (150, 100, 50, 10/20m) of the preceding CTD cast were sampled for seston fatty acid composition.

Hydrographic casts were performed at 6 stations using **Go-Flo bottles** to collect samples for trace metals. Water samples were collected from eight depths between 20 – 800 m. Shipboard measurements proceeded in a class-100 clean laboratory container that was mounted on Meteor's after deck.

Large Volume **Mesocosms**: During the cruise, two, long-term growth experiments were conducted with the larger volume mesocosms that were deployed on the aft deck. These experiments lasted for 10 and 11 days. In the first experiment, mesocosms were filled (Station #5) with surface water from 5 m depth, using a peristaltic pump to minimize damage to plankton organisms. The experimental setup comprised twelve 150L mesocosm bags that floated in four flow-through water baths for cooling which are gimbals-mounted to prevent spilling. Treatments consisted in fertilization to 4 different N:P target ratios (16, 8, 5.5 and 2.8). In the second trial, mesocosms were filled in a similar way with surface water (Station #48), but each one was inoculated with 20L of water from the Chl-a maximum (CTD-Cast) to ensure a sufficient initial phytoplankton biomass to trigger rapid growth

upon fertilization. The phytoplankton response was monitored on a daily basis in terms of community structure, production, and distribution of dissolved and particulate carbon, nitrogen and phosphorus.

N_2-Fixation studies: At 6 stations, experiments were conducted on-board (in incubators mounted on the after deck) to determine Glucose, Acetate and Bicarbonate uptake of dinitrogen fixing organisms by performing incubations of water samples with the corresponding ^{13}C labelled compounds together with ^{15}N. To identify the fixation rate over time, a time series over 48 hours was performed together with the N_2O group to get extensive information on how nitrogen input and loss processes are connected.
To gain information about macro and micro nutrient limitation of nitrogen-fixation, three bioassay experiments were performed with surface water pumped on-board during transit using a "**towed fish**".

Three **ARGO floats** were deployed on behalf of the Bundesamt für Seeschifffahrt und Hydrographie in Hamburg.

Figure 3: The after deck of Meteor during M80/2 showing the gimbaled holders for the mesocosm bags (front) as well as the on-deck incubators used for smaller volume, shorter.term incubations (behind).

Acknowledgements

The cruise was exceptionally smooth and effective in very large part thanks to the professionalism and cooperation of Captain Walter Baschek and the Officers and Crew of Meteor. Financial support was from the Deutsche Forschungsgemeinschaft, including SFB754.

Participants

1	Wallace	Douglas	IFM-GEOMAR	Chief Scientist
2	Tanhua	Toste	IFM-GEOMAR	Tracers
3	Banyte	Donata	IFM-GEOMAR	CTD
4	Dippe	Tina	IFM-GEOMAR	CTD
5	Karbe	Fritz	IFM-GEOMAR	CTD
6	Link	Rudolf	IFM-GEOMAR	CTD
7	Silva	Pericles	INDP	CTD
8	Franz	Jasmin	IFM-GEOMAR	Mesocosms
9	Hansen	Thomas	IFM-GEOMAR	Mesocosms
10	Hauss	Helena	IFM-GEOMAR	Mesocosms
11	Nachtigall	Kerstin	IFM-GEOMAR	Mesocosms
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13	Fuessel	Jessica	MPI-Bremen	Microbiology
14	Kalvelage	Tim	MPI-Bremen	Microbiology
15	Fischer	Tim	IFM-GEOMAR	Microstructure / Tracers
16	Gill	Diana	IFM-GEOMAR	N2-Fixation
17	Grosskopf	Tobias	IFM-GEOMAR	N2-Fixation
18	Joshi	Falguni	IFM-GEOMAR	N2-Fixation
19	Loescher	Carolin	CAU-Kiel	N2-Fixation
20	Kock	Annette	IFM-GEOMAR	N_2O
21	Stange	Karen	IFM-GEOMAR	Oxygen
22	Baars	Oliver	IFM-GEOMAR	Trace Metals
23	Dammshaeuser	Anna	IFM-GEOMAR	Trace Metals
24	Manke	Anne	IFM-GEOMAR	Tracers
25	Noll	Lina	IFM-GEOMAR	Tracers
26	Syre	Stephanie	IFM-GEOMAR	Tracers
27	Zocher	Johanna	IFM-GEOMAR	Tracers
28	Raeke	Andreas	DWD	Meteorology

Institutes

IFM-GEOMAR:	Leibniz-Institut für Meereswissenschaften
CAU-Kiel:	Christian-Albrechts Universität zu Kiel
MPI-Bremen:	Max-Planck Institut für Marine Mikrobiologie
INDP:	Instituto Nacional de Desenvolvimento das Pescas, Mindelo
DWD:	Deutsche Wetterdienst

Station List

1. Vertical Profiles (CTD, Go-Flo and Plankton Nets)

M80/2 Station#	Meteor Event#	Gear Type	Gear Profile#	Date	Time	PositionLat	PositionLon	Bottom Depth [m]	Profile Depth (m)
1	1220	GoFlo bottles	1	26.11.09	17:24	17° 24.01' N	24° 30.02' W	3544	136
1	1221	CTD	1	26.11.09	19:07	17° 24.01' N	24° 30.02' W	3547	3451
1	1223	CTD	2	26.11.09	22:43	17° 24.01' N	24° 30.08' W	3533	538
1	1224	GoFlo bottles	2	26.11.09	23:46	17° 24.03' N	24° 30.10' W	3537	550
2	1225	CTD	3	28.11.09	3:04	13° 59.40' N	21° 25.79' W	4521	1304
2	1226	WP2 Nets	1	28.11.09	3:58	13° 59.41' N	21° 25.81' W	4523	50
3	1227	CTD	4	28.11.09	8:41	13° 30.05' N	21° 0.01' W	4548	1304
4	1228	CTD	5	28.11.09	14:17	13° 0.01' N	20° 30.05' W	4686	1301
5	1229	CTD	6	28.11.09	19:18	12° 19.80' N	20° 30.00' W	4813	1304
5	1231	CTD	7	28.11.09	21:41	12° 20.72' N	20° 29.46' W	4814	503
6	1232	CTD	8	29.11.09	2:24	11° 40.20' N	20° 30.00' W	4927	1303
7	1233	CTD	9	29.11.09	7:28	11° 0.00' N	20° 30.00' W	4954	1301
8	1234	CTD	10	29.11.09	12:23	10° 20.40' N	20° 30.00' W	5024	1302
9	1235	CTD	11	29.11.09	17:28	9° 40.22' N	20° 30.01' W	4839	1303
10	1237	CTD	12	29.11.09	21:23	9° 14.43' N	20° 30.04' W	4022	1302
11	1239	CTD	13	30.11.09	4:59	9° 6.60' N	19° 30.00' W	4406	1303
11	1240	WP2 Nets	2	30.11.09	5:44	9° 6.62' N	19° 30.11' W	4702	50
12	1241	CTD	14	30.11.09	12:57	8° 36.09' N	18° 34.67' W	4747	1300
13	1242	CTD	15	30.11.09	20:34	8° 50.42' N	17° 29.46' W	4394	502
14	1244	CTD	16	01.12.09	4:44	8° 42.00' N	16° 29.40' W	3987	1303
15	1245	CTD	17	01.12.09	11:49	8° 34.28' N	15° 29.34' W	3907	1303
16	1246	GoFlo bottles	3	01.12.09	16:10	8° 30.00' N	15° 0.01' W	3165	855
16	1247	CTD	18	01.12.09	17:24	8° 30.00' N	15° 0.00' W	3160	1301
16	1248	GoFlo bottles	4	01.12.09	18:18	8° 30.00' N	15° 0.00' W	3159	176
16	1249	CTD	19	01.12.09	19:16	8° 30.01' N	14° 59.99' W	3158	502
17	1250	CTD	20	01.12.09	23:56	8° 10.20' N	15° 34.79' W	4167	1302

18	1251	CTD	21	02.12.09	3:40	8° 0.01' N	16° 0.00' W	4434	1301
18	1252	WP2 Nets	3	02.12.09	4:26	8° 0.04' N	15° 59.99' W	4435	50
18	1253	WP2 Nets	4	02.12.09	4:36	8° 0.06' N	16° 0.01' W	4429	50
19	1254	CTD	22	02.12.09	9:56	8° 0.02' N	16° 47.99' W	4662	1304
21	1256	CTD	24	02.12.09	22:50	6° 20.44' N	17° 15.94' W	4957	1304
21	1258	CTD	25	03.12.09	2:47	6° 20.60' N	17° 14.65' W	4960	4941
22	1259	CTD	26	03.12.09	11:57	5° 27.01' N	17° 59.99' W	4994	1303
23	1260	CTD	27	03.12.09	18:12	4° 45.00' N	18° 30.00' W	5019	1304
24	1261	CTD	28	04.12.09	0:57	4° 0.01' N	19° 0.00' W	4810	1300
24	1262	WP2 Nets	5	04.12.09	1:41	3° 59.99' N	18° 59.98' W	4814	50
24	1263	WP2 Nets	6	04.12.09	1:52	3° 59.96' N	18° 59.92' W	4823	50
25	1264	CTD	29	04.12.09	10:01	5° 15.00' N	18° 59.88' W	4625	1303
26	1265	CTD	30	04.12.09	17:00	6° 11.80' N	18° 59.93' W	4598	1304
26	1267	CTD	31	04.12.09	20:01	6° 13.51' N	18° 59.80' W	4582	501
27	1268	CTD	32	05.12.09	1:27	7° 0.00' N	19° 0.00' W	4591	1301
28	1269	CTD	33	05.12.09	5:33	7° 30.01' N	19° 0.04' W	4482	1302
29	1271	CTD	34	05.12.09	10:49	7° 57.57' N	18° 59.97' W	4555	3043
29	1272	GoFlo bottles	6	05.12.09	12:33	7° 57.37' N	18° 59.96' W	4546	160
30	1273	CTD	35	05.12.09	15:52	7° 56.40' N	19° 24.63' W	4392	1300
31	1274	CTD	36	05.12.09	20:42	7° 56.43' N	20° 4.79' W	4144	1303
32	1275	CTD	37	06.12.09	1:27	7° 55.82' N	20° 45.02' W	3338	1300
33	1276	WP2 Nets	7	06.12.09	4:24	7° 55.77' N	21° 10.01' W	2152	50
33	1277	WP2 Nets	8	06.12.09	4:38	7° 55.83' N	21° 10.00' W	2144	64
33	1278	CTD	38	06.12.09	5:26	7° 55.86' N	21° 10.00' W	2139	1304
33	1280	CTD	39	06.12.09	8:17	7° 57.14' N	21° 9.68' W	1761	510
34	1281	CTD	40	06.12.09	11:37	7° 55.89' N	21° 36.05' W	4060	1302
35	1282	CTD	41	06.12.09	16:55	8° 30.00' N	22° 0.00' W	4570	1303
36	1284	CTD	42	06.12.09	22:04	7° 55.25' N	21° 58.14' W	4304	3004
37	1285	CTD	43	07.12.09	2:15	7° 38.40' N	21° 49.80' W	3302	1301
38	1286	CTD	44	07.12.09	7:42	7° 0.03' N	21° 30.02' W	3312	1303
39	1287	CTD	45	07.12.09	14:43	6° 0.01' N	21° 29.98' W	3570	1318
40	1288	CTD	46	07.12.09	21:48	5° 0.11' N	21° 29.80' W	2474	1304
40	1290	CTD	47	08.12.09	0:11	4° 59.16' N	21° 29.10' W	2800	502

41	1291	CTD	48	08.12.09	7:46	4° 2.22' N	22° 9.22' W	3722	1303
41	1292	WP2 Nets	9	08.12.09	8:32	4° 2.24' N	22° 9.28' W	3724	50
41	1293	WP2 Nets	10	08.12.09	8:44	4° 2.25' N	22° 9.32' W	3725	50
42	1294	CTD	49	08.12.09	14:07	4° 2.42' N	22° 59.40' W	4207	1303
43	1296	CTD	50	09.12.09	3:00	4° 3.00' N	24° 0.01' W	4314	1300
44	1297	CTD	51	09.12.09	9:44	4° 4.20' N	25° 0.00' W	4344	1302
45	1298	CTD	52	09.12.09	17:21	4° 58.22' N	25° 35.40' W	4504	1303
46	1299	CTD	53	10.12.09	0:46	5° 52.08' N	25° 8.43' W	4291	1310
46	1300	WP2 Nets	11	10.12.09	1:37	5° 52.19' N	25° 8.39' W	4293	50
46	1301	WP2 Nets	12	10.12.09	1:50	5° 52.15' N	25° 8.40' W	4291	50
47	1302	CTD	54	10.12.09	8:40	6° 45.62' N	24° 40.82' W	4363	1303
48	1304	CTD	55	10.12.09	15:54	7° 39.64' N	24° 13.25' W	4888	500
48	1305	GoFlo bottles	7	10.12.09	16:48	7° 39.73' N	24° 13.34' W	4889	855
48	1306	CTD	56	10.12.09	18:07	7° 40.05' N	24° 13.66' W	4885	1304
48	1308	GoFlo bottles	8	10.12.09	20:50	7° 41.25' N	24° 13.33' W	4893	176
48	1309	CTD	57	10.12.09	21:16	7° 41.38' N	24° 13.48' W	4885	48
49	1310	CTD	58	10.12.09	23:53	7° 57.56' N	24° 4.33' W	4819	1304
50	1311	CTD	59	11.12.09	2:54	7° 57.03' N	24° 24.03' W	4959	1300
51	1312	CTD	60	11.12.09	6:32	7° 57.61' N	24° 44.40' W	4922	3008
52	1313	CTD	61	11.12.09	12:23	7° 57.57' N	25° 25.32' W	4953	1302
53	1314	CTD	62	11.12.09	17:05	7° 57.60' N	26° 5.40' W	4772	1305
54	1315	CTD	63	11.12.09	21:44	7° 57.58' N	26° 45.67' W	4143	1304
55	1317	CTD	64	12.12.09	2:26	7° 57.60' N	27° 25.80' W	4873	1301
55	1318	WP2 Nets	13	12.12.09	3:09	7° 57.60' N	27° 25.81' W	4875	50
55	1319	WP2 Nets	14	12.12.09	3:19	7° 57.66' N	27° 25.91' W	4891	50
56	1320	CTD	65	12.12.09	7:40	8° 0.01' N	28° 0.06' W	5103	2999
57	1321	CTD	66	12.12.09	14:32	6° 57.60' N	28° 0.60' W	4292	501
57	1323	CTD	67	12.12.09	16:51	6° 58.49' N	28° 0.50' W	4354	1304
58	1324	CTD	68	12.12.09	23:19	5° 57.64' N	28° 0.60' W	3567	1304
59	1325	CTD	69	13.12.09	6:02	6° 18.01' N	29° 0.02' W	4317	1305
60	1326	CTD	70	13.12.09	12:51	6° 41.40' N	29° 59.44' W	3633	1298
61	1327	CTD	71	13.12.09	17:55	7° 21.01' N	29° 58.80' W	4854	1301
62	1328	GoFlo bottles	9	13.12.09	23:05	8° 1.20' N	29° 58.84' W	4335	860

62	1329	CTD	72	14.12.09	1:03	8° 1.20' N	29° 58.84' W	4329	3008
62	1330	WP2 Nets	15	14.12.09	2:19	8° 1.22' N	29° 58.87' W	4338	50
62	1331	WP2 Nets	16	14.12.09	2:30	8° 1.28' N	29° 58.93' W	4375	50
62	1332	GoFlo bottles	10	14.12.09	3:00	8° 1.33' N	29° 58.95' W	4389	255
63	1334	CTD	73	14.12.09	9:48	8° 0.04' N	31° 0.04' W	4872	1303
64	1335	CTD	74	14.12.09	16:27	8° 41.62' N	30° 28.65' W	4462	1300
65	1337	CTD	75	14.12.09	22:22	9° 20.99' N	30° 0.18' W	4896	1302
66	1339	CTD	76	15.12.09	4:19	10° 12.00' N	30° 0.00' W	5057	1302
67	1340	CTD	77	15.12.09	9:39	10° 59.97' N	29° 59.99' W	5890	1302
67	1342	CTD	78	15.12.09	12:05	10° 59.05' N	29° 59.21' W	5899	506
68	1343	CTD	79	15.12.09	18:54	11° 30.02' N	29° 0.01' W	5920	1303
69	1344	WP2 Nets	17	16.12.09	1:39	12° 0.00' N	28° 0.04' W	5621	50
69	1345	WP2 Nets	18	16.12.09	1:50	12° 0.01' N	28° 0.08' W	5623	50
69	1346	CTD	81	16.12.09	2:54	12° 0.00' N	28° 0.00' W	5626	1301
70	1347	CTD	82	16.12.09	9:24	11° 0.00' N	28° 0.02' W	5900	1301
71	1348	CTD	83	16.12.09	14:16	10° 19.80' N	28° 0.00' W	5596	1303
72	1349	CTD	84	16.12.09	19:12	9° 39.62' N	28° 0.16' W	5364	1302
73	1350	CTD	85	16.12.09	23:54	9° 0.01' N	27° 59.98' W	5204	1300
74	1351	CTD	86	17.12.09	3:48	9° 0.00' N	27° 30.00' W	5347	1301
75	1352	CTD	87	17.12.09	7:46	9° 0.01' N	27° 0.02' W	5356	1300
76	1353	CTD	88	17.12.09	11:44	9° 0.13' N	26° 30.12' W	5347	1302
77	1354	CTD	89	17.12.09	15:59	9° 30.00' N	26° 15.00' W	5367	1301
78	1355	CTD	90	17.12.09	20:08	10° 0.00' N	26° 0.01' W	5260	1301
78	1356	WP2 Nets	19	17.12.09	20:54	9° 59.99' N	26° 0.03' W	5247	50
78	1357	WP2 Nets	20	17.12.09	21:04	9° 59.97' N	26° 0.07' W	5266	50
79	1358	CTD	91	18.12.09	1:02	10° 29.86' N	25° 45.14' W	5154	1301
80	1359	CTD	92	18.12.09	5:38	10° 59.88' N	25° 30.38' W	4850	1300
81	1360	GoFlo bottles	11	18.12.09	13:45	12° 0.00' N	25° 0.00' W	5078	855
81	1361	CTD	93	18.12.09	15:00	12° 0.00' N	25° 0.00' W	5083	1301
81	1363	CTD	94	18.12.09	17:30	12° 1.92' N	25° 1.59' W	5083	500
81	1364	GoFlo bottles	12	18.12.09	18:08	12° 2.17' N	25° 1.90' W	5078	255
82	1365	CTD	95	18.12.09	22:12	11° 30.18' N	25° 0.36' W	5311	1317
83	1366	CTD	96	19.12.09	2:20	11° 0.01' N	25° 0.05' W	5358	1300

84	1367	CTD	97	19.12.09	6:24	10° 30.11' N	25° 0.10' W	5409	1301
85	1368	CTD	98	19.12.09	10:21	9° 59.96' N	25° 0.01' W	5498	1302
86	1369	CTD	99	19.12.09	14:25	9° 30.04' N	25° 0.03' W	5376	1300
87	1370	CTD	100	19.12.09	18:28	9° 0.12' N	25° 0.03' W	5174	1302
88	1371	CTD	101	19.12.09	22:31	9° 0.05' N	24° 30.02' W	4885	1301
89	1372	CTD	102	20.12.09	2:23	9° 0.00' N	24° 0.00' W	4911	1300
90	1373	WP2 Nets	21	20.12.09	5:44	9° 0.03' N	23° 29.95' W	5033	50
90	1374	WP2 Nets	22	20.12.09	5:54	9° 0.06' N	23° 29.92' W	5033	50
90	1375	CTD	103	20.12.09	6:42	9° 0.11' N	23° 29.93' W	5037	1303
91	1376	CTD	104	20.12.09	12:00	9° 30.00' N	23° 0.00' W	4634	3006
92	1377	CTD	105	20.12.09	17:44	9° 59.98' N	22° 30.05' W	4884	1301
93	1379	CTD	106	21.12.09	0:15	10° 30.00' N	22° 0.00' W	5131	1311
94	1380	CTD	107	21.12.09	5:24	11° 0.01' N	21° 30.01' W	5093	1301
95	1382	CTD	108	21.12.09	10:31	11° 30.02' N	21° 0.02' W	4992	1303

2. Other Activities

M80/2 Station	Meteor Event#	Gear	Gear Profile#	Date	Time	PositionLat	PositionLon	Bottom Depth [m]	Action
1	1222	Micro structure probe	1	26.11.09	20:45	17° 24.02' N	24° 30.01' W	3542	surface
1	1222	Micro structure probe	1	26.11.09	22:06	17° 24.58' N	24° 29.21' W	3550	on deck
5	1230	Micro structure probe	2	28.11.09	19:58	12° 19.80' N	20° 30.00' W	4817	surface
5	1230	Micro structure probe	2	28.11.09	21:13	12° 20.70' N	20° 29.47' W	4812	on deck
	1236	Towed Fish		29.11.09	18:11	9° 39.69' N	20° 29.93' W	4829	into water
	1236	Towed Fish		29.11.09	20:40	9° 15.30' N	20° 29.84' W	4023	on deck
	1238	Towed Fish		29.11.09	22:07	9° 14.48' N	20° 29.81' W	4021	into water
	1238	Towed Fish		30.11.09	1:56	9° 9.65' N	19° 53.45' W	4301	on deck
13	1243	Micro structure probe	3	30.11.09	20:55	8° 50.51' N	17° 29.52' W	4386	surface
13	1243	Micro structure probe	3	30.11.09	22:13	8° 51.49' N	17° 29.70' W	4332	on deck
21	1257	Micro structure probe	4	02.12.09	23:22	6° 20.45' N	17° 15.90' W	4958	surface
21	1257	Micro structure probe	4	03.12.09	0:43	6° 20.54' N	17° 14.74' W	4960	on deck
26	1266	Micro structure probe	5	04.12.09	17:38	6° 11.88' N	18° 59.96' W	4601	surface

26	1266	Micro structure probe	5	04.12.09	19:42	6° 13.38' N	18° 59.88' W	4590	on deck
33	1279	Micro structure probe	6	06.12.09	6:02	7° 55.89' N	21° 10.02' W	2123	surface
33	1279	Micro structure probe	6	06.12.09	7:58	7° 57.06' N	21° 9.54' W	1747	on deck
35	1283	Towed Fish		06.12.09	17:38	8° 29.71' N	21° 59.94' W	4571	into water
36	1283	Towed Fish		06.12.09	20:40	7° 57.04' N	21° 58.49' W	4337	on deck
40	1289	Micro structure probe	7	07.12.09	22:27	5° 0.03' N	21° 29.72' W	2483	surface
40	1289	Micro structure probe	7	07.12.09	23:52	4° 59.18' N	21° 29.18' W	2759	on deck
42	1295	In situ pump		08.12.09	14:53	4° 2.40' N	22° 59.40' W	4208	into water
42	1295	In situ pump		08.12.09	15:16	4° 2.40' N	22° 59.39' W	4211	at depth
42	1295	In situ pump		08.12.09	17:14	4° 2.41' N	22° 59.40' W	4209	on deck
47	1303	Fisch		10.12.09	9:19	6° 45.81' N	24° 40.85' W	4361	into water
48	1303	Fisch		10.12.09	15:27	7° 39.30' N	24° 13.37' W	4895	on deck
48	1307	Micro structure probe	8	10.12.09	18:48	7° 40.25' N	24° 13.79' W	4886	surface
48	1307	Micro structure probe	8	10.12.09	20:18	7° 41.05' N	24° 13.09' W	4889	on deck
54	1316	ARGO float	1	11.12.09	22:23	7° 57.58' N	26° 45.78' W	4174	surface
57	1322	Micro structure probe	9	12.12.09	14:53	6° 57.61' N	28° 0.60' W	4291	surface
57	1322	Micro structure probe	9	12.12.09	16:14	6° 58.47' N	28° 0.50' W	4361	on deck
62	1333	ARGO float	2	14.12.09	3:26	8° 1.37' N	29° 58.96' W	4376	surface
64	1336	Fisch		14.12.09	17:06	8° 41.75' N	30° 28.58' W	4455	into water
65	1336	Fisch		14.12.09	21:33	9° 19.63' N	30° 0.62' W	4909	on deck
65	1338	Fisch		14.12.09	23:02	9° 21.17' N	30° 0.28' W	4907	into water
66	1338	Fisch		15.12.09	3:38	10° 11.82' N	30° 0.00' W	5065	on deck
67	1341	Micro structure probe	10	15.12.09	10:18	11° 0.01' N	30° 0.00' W	5888	surface
67	1341	Micro structure probe	10	15.12.09	11:45	10° 59.07' N	29° 59.22' W	5894	on deck
81	1362	Micro structure probe	11	18.12.09	15:42	12° 0.11' N	25° 0.08' W	5078	surface
81	1362	Micro structure probe	11	18.12.09	17:11	12° 1.79' N	25° 1.40' W	5087	on deck
92	1378	Micro structure probe	12	20.12.09	18:20	10° 0.05' N	22° 30.04' W	4882	surface
92	1378	Micro structure probe	12	20.12.09	19:52	10° 1.24' N	22° 29.73' W	4810	on deck
94	1381	ARGO float	3	21.12.09	6:08	11° 0.13' N	21° 29.88' W	5091	surface