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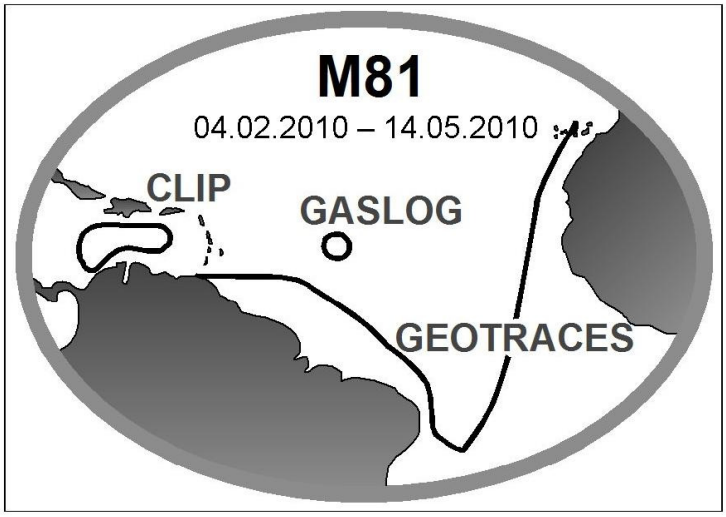
Short Report

METEOR Cruise No. 81 Leg 1

Las Palmas (Canary Islands, Spain) –

Port of Spain (Trinidad and Tobago):

04.02.2010 – 08.03.2010



GEOTRACES Cruise A11: Trace Metals and Their Isotopes in the Tropical Atlantic Ocean

Chief Scientist: Prof. Martin Frank

Captain: Thomas Wunderlich

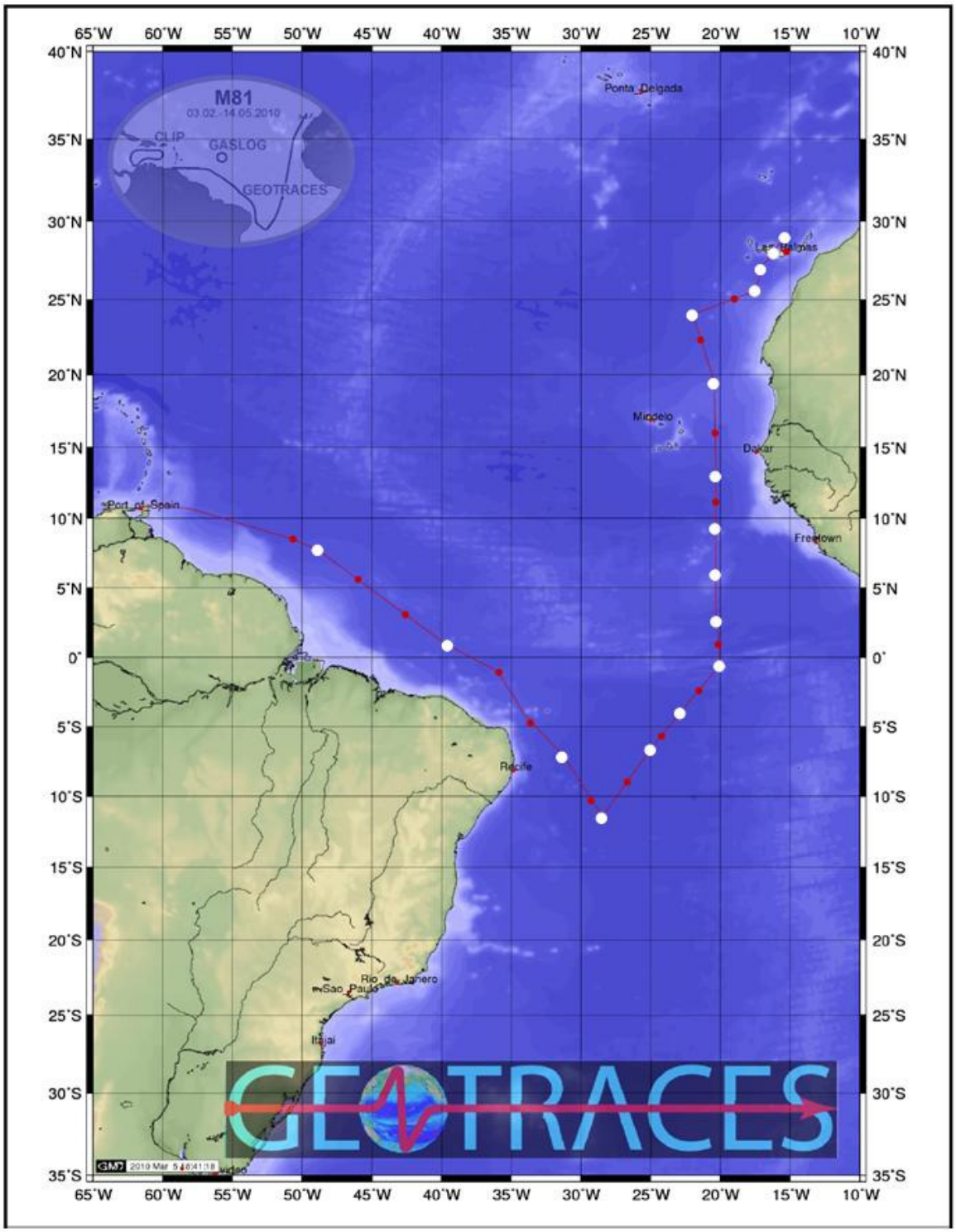


Fig. 1: Cruise track of METEOR 81/1 in the tropical Atlantic Ocean. The white dots mark sampling stations whereas the red dots only mark waypoints.

1. Objectives of the cruise

The main objective of Meteor cruise M81/1 (GEOTRACES cruise A11) was a detailed sampling of the water column for trace metals and their isotopes (TEIs) along a NNE-SSW section in the tropical Atlantic Ocean as part of the international GEOTRACES program. The scientific goal of the cruise was an improved understanding of the sources, sinks, speciation, and biogeochemical cycling of TEIs, which on the one hand control biogeochemical processes as essential micronutrients, as is the case for Fe, Cd, or Zn. On the other hand, the distributions of TEIs are also influenced by biogeochemical and physical processes, which is the reason why many of these metals are used as proxy indicators of past seawater variations. The goal of the GEOTRACES program which has been officially launched in February 2010 and which is planned to last for more than 10 years, is to better understand the processes that govern the distribution of TEIs in the ocean and to establish the sensitivity of these distributions to changing environmental conditions. This will mainly be achieved by a coordinated international effort to carry out ocean sections across the main ocean basins, along which the dissolved and particulate distributions of the TEIs will be measured at high resolution in full depth water column profiles. Internationally established sampling protocols that guarantee the full comparability of data acquired during different cruises carried out by different nations are applied. Combining the results from more about 50 planned sections will ultimately result in a three-dimensional picture of the of the distribution of TEIs in the global ocean which will allow to better constrain sources, such as dust, rivers, exchange with the continental landmasses and shelves, or hydrothermal activity and the biogeochemical cycling of the TEIs including their distribution within the global circulation system. The dissolved data are complemented by collection of TEI compositions of the particulate fraction.

During M81/1 one of the scientific questions that were tackled specifically was the importance of the release of TEIs from Saharan dust, as well as through exchange with volcanic islands and through the inputs of the dissolved and particulate load of the world's largest river, the Amazon, for which particularly surface waters were sampled continuously. How, where, when and in which quantities are TEIs supplied to the surface waters and in which way are they recycled? The chemical oceanographic working groups were interested to use certain TEIs to track ocean currents in the eastern and western North Atlantic basins as part of the global thermohaline circulation system. Finally, the nutrient cycling in the oceans was subject to investigation by utilizing innovative stable isotope compositions, such as those of iron, cadmium, silicon or nitrogen. Essentially all of the above parameters can only be measured in the home laboratories on land, which is the reason why the major focus of cruise M81/1 was contamination-free sea water and particulate sampling.

2. Narrative

Cruise M81/1 started in Las Palmas, Canary Islands, Spain. A first group of scientists from IFM-GEOMAR, Kiel and from the Old Dominion University, Norfolk, U.S.A., arrived in Las Palmas on the 1st February 2010 and boarded Meteor in the morning of the 2nd February. All containers from Germany and the U.S.A. had already arrived and thus the installation of the trace metal clean CTD-rosette equipped with 24 x 12 litre GO-FLO water samplers and mobile winch with an 8 km Kevlar cable of the U.S. GEOTRACES program started immediately. These devices were essential for contamination-free sampling. Two clean room laboratory containers, one from the U.S. GEOTRACES program and one from the Marine Chemistry group of the University of Bremen were installed to guarantee clean laboratory handling of contamination-prone TEIs. The remaining scientists from IFM-GEOMAR, the Autonomous University of Barcelona (UAB), the Universities of Bremen and Cologne, the Jacobs University, Bremen, and the Institute for Baltic Sea Research, Warnemünde (IOW) arrived on board of Meteor in the afternoon of the 3rd February. Unpacking of the equipment from the containers was finished in the same evening, which allowed some visits to German research vessel "RV Poseidon" who was scheduled to leave for an expedition to a big submarine landslide off Northwest Africa on the next morning. After two scientists from UDU and IOW had finished their installation work and had left, "RV Meteor" started cruise M81/1 at 10:30 a.m., one hour after "RV Poseidon" had started.

The ship then steamed for twelve hours to the first planned full water depth station north of Gran Canaria, Canary Islands at 29°N, 15°20'W. On the way to this station Meteor stopped for 30 minutes to carry out a successful test station for the trace metal clean rosette and winch that were operated over a block fixed to the A-Frame of Meteor in order to maintain stable conditions for deployment and recovery. Having reached the first deep water station, the trace metal clean rosette was operated twice alternating with the conventional CTD-rosette equipped with 24 Niskin bottles for sampling of less contaminant prone metals and natural radionuclides. The in situ pumps for sampling of the particulate fraction were also deployed alternating with the water sampling devices, which saved station time and allowed enough time for emptying the sampling bottles and for processing the water and particulate samples. In those cases where samples were taken for all core parameters of the GEOTRACES program and various additional parameters, the entire station time amounted to between 20 and 25 hours. The second main station followed at a location between Gran Canaria and Tenerife at a water depth of about 2000 m, the main purpose of which was to compare open ocean stations with a location influenced by weathering inputs from the volcanic islands on the dissolved TEI distribution. A further station still close to the Canary Islands was carried out south of Tenerife to compare the TEI distribution upstream and downstream of the Canary Islands. Between the three deep water stations, continuous surface water sampling was carried out in order to determine the influence of Saharan dust inputs. For this purpose a towed fish was applied, a device for pumping water under trace metal-

clean conditions, which is towed by the vessel while it is steaming. Surface water sampling was continued between all subsequent stations of M81/1.

The following station at 25°32,7'N, 17°31,2'W completed the work in Spanish waters on the 8th February and the choice of the location was mainly aimed at evaluating the influence of TEIs supplied through exchange with the partly suboxic or anoxic shelf sediments close to the African coast. At this station only water sampling was performed and no particulate samples were taken.

The location of the next full water depth open ocean station at 24°N, 22°W sampled on the 9th/10th February was chosen in order to occupy a crossover station with U.S. GEOTRACES cruise A03, which will cross the North Atlantic in east-west direction on board "RV Knorr" in autumn 2010. This is in fulfillment of the guidelines of the GEOTRACES program and will provide an additional means to guarantee compatibility of the deep water TEI data acquired on different cruises and will also serve as a monitor for TEI variability in the surface waters at this location over time.

The cruise was then continued southward with six more stations outside national EEZs along 20°20'W until the deepest point of the cruise close to 7000 m water depth was reached above the Romanche Fracture Zone (0°37'S, 20°1.8'W) on 19th February. This location was sampled down to the maximum depth permitted by the instrumentation of the CTD systems at 5800 m water depth. The Romanche Fracture Zone is a gap in the Mid-Atlantic Ridge and represents the deepest exchange pathway between the eastern and western Atlantic basins, which is essentially the only location where Antarctic Bottom Water can flow across the Mid Atlantic Ridge and which is mainly responsible for the ventilation of the deep eastern Atlantic Basins. At this location the relationship between TEI signatures and mixing of major water masses was of particular interest. At the same time the cruise track crossed the pronounced east-west directed current bands in the upper 1000 m water depth in the tropical Atlantic between 10°N and 10°S, the cores of which, as identified by the ship's 38 kHz ADCP system, were sampled during the deep stations, wherever possible.

The next four deep water stations were sampled in the Brasil Basin outside the Brasilian EEZ until 26th February and served to complete the NNE-SSW tropical Atlantic section and to acquire data on the TEI signatures of the main water masses of the Atlantic Meridional Overturning Circulation (AMOC) west of the Mid Atlantic Ridge. Surface waters were continuously sampled to determine TEI signatures outside the Saharan dust plume south of the Intertropical Convergence Zone (ITCZ).

The cruise track then continued northwestward along the South American continent to monitor the influence of exchange processes with land on the distribution of TEIs. During this part of the cruise which mainly consisted of the transit towards Port of Spain two more deep water profiles were sampled on 1st March at 0°55'N, 39°37'W and on 4th March at 7°46'N, 48°53'W, the second of which was another

crossover station with planned Dutch GEOTRACES cruise A02 on “RV Pelagia” in summer 2010 that will follow the main pathway of the MOC in the western North Atlantic Ocean. Surface water sampling continued outside South American national EEZs with the towed fish with the goal to sample the plume of the Amazon River. The plume was met in the evening of 5th March and surface water samples were taken at salinities as low as 28 psu until sampling operations were finalized near the EEZ of Trinidad and Tobago at 22:00 on 5th March. During the remaining transit treatment of the samples in the laboratories was finalized and the equipment was packed.

The ship reached Port of Spain, Trinidad and Tobago in the morning of 8th March and the cruise ended after 5396 nautical miles with the disembarking of the scientists in the late afternoon after all the equipment had been packed into three containers and the two clean laboratory containers on the pier in the harbor of Port of Spain.

3. Participants METEOR 81 Leg 1, scientific party

Name	Expertise	Institution
1. Frank, Martin, Prof.	*Chief Scientist*	IFM-GEOMAR
2. Alexander, Brian, Dr.	*Trace metals/speciation*	Jacobs University
3. Merschel, Gila	*Trace metals/speciation*	Jacobs University
4. Fischer, Maitri	*Trace metals/speciation*	Jacobs University
5. Pöhle, Sandra	*Trace metals*	IOW
6. Staubwasser, Michael, Prof.	*Fe isotopes*	University of Cologne
7. Fichtner, Vanessa	*Fe isotopes*	University of Cologne
8. Tang, Xiaoliang, Dr.	*Particulates*	Marine Chemistry Bremen
9. Ostendorf, Michael	*Particulates*	Marine Chemistry Bremen
10. Vogt, Martin	*CTD/ADCP*	IFM-GEOMAR
11. Roth, Christina	*CTD/ADCP-Watch*	IFM-GEOMAR
12. Haynert, Kristin	*Salinity*	IFM-GEOMAR
13. Hagenow, Alexander	*CTD/ADCP-Watch*	IFM-GEOMAR
14. Barnes, Curtis	*Trace-metal clean rosette*	ODU
15. Lorenzen, Janne	*Natural radionuclides*	IFM-GEOMAR
16. Camara-Mor, Patricia	*Natural radionuclides*	UAB
17. Teschner, Claudia	*Natural radionuclides*	IFM-GEOMAR
18. Zieringer, Moritz	*Radiogenic isotopes*	IFM-GEOMAR
19. Ehlert, Claudia	*Stable Cd/Pb isotopes*	IFM-GEOMAR
20. Stumpf, Roland	*Radiogenic isotopes*	IFM-GEOMAR
21. Kraft, Steffanie	*δ^{13}C-DIC*	IFM-GEOMAR
22. Heinze, Jutta	*Stable Cd/Pb isotopes*	IFM-GEOMAR
23. Kretschmer, Kerstin	*CTD/ADCP-Watch*	IFM-GEOMAR
24. Goldstein, Fabian	*Trace metal sampling*	München
25. Truscheit, Torsten, Dr.	*Meteorologist*	DWD

4. Participating Institutions

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Jacobs University
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5. Station list

Gear acronyms in the Station list:

CTD/NISK	CTD-Rosette water sampler with Niskin bottles
CTD/TM	Trace metal clean CTD-Rosette water sampler with GO-FLO bottles
IFISH	Towed Fish surface water sampler
ISP	In-situ pumping system

Station	Gear No.	Date	Station Start				Station End			
			Time	PositionLat	PositionLon	Depth [m]	Time	PositionLat	PositionLon	Depth [m]
104-1	CTD/TM-1	04.02.2010	18:30	28° 30.02' N	15° 20.05' W	3452	19:00	28° 30.09' N	15° 20.10' W	3450
105-1	IFISH-1	04.02.2010	19:15	28° 30.28' N	15° 20.10' W	3462	22:10	28° 58.35' N	15° 20.01' W	3595
106-1	CTD/TM-2	04.02.2010	22:44	28° 59.72' N	15° 20.14' W	3595	03:00	28° 59.64' N	15° 20.53' W	3597
107-1	CTD/NISK-1	05.02.2010	03:23	28° 59.64' N	15° 20.53' W	3598	05:56	28° 59.64' N	15° 20.53' W	3599
108-1	ISP-1	05.02.2010	07:12	29° 0.03' N	15° 20.08' W	3598	12:25	29° 0.01' N	15° 20.13' W	3594
109-1	CTD/TM-3	05.02.2010	13:00	29° 0.01' N	15° 20.13' W	3594	16:41	29° 0.01' N	15° 20.34' W	3570
110-1	CTD/NISK-2	05.02.2010	16:54	29° 0.01' N	15° 20.35' W	3577	17:07	29° 0.01' N	15° 20.35' W	3580
111-1	ISP-2	05.02.2010	17:21	29° 0.01' N	15° 20.35' W	3577	20:23	28° 59.63' N	15° 21.12' W	3582
112-1	IFISH-2	05.02.2010	20:37	28° 59.38' N	15° 21.58' W	3576	02:15	28° 11.25' N	16° 9.64' W	2205
113-1	CTD/NISK-3	06.02.2010	03:40	28° 3.77' N	16° 3.10' W	2001	05:09	28° 3.93' N	16° 3.35' W	2047
114-1	CTD/TM-4	06.02.2010	06:26	28° 3.97' N	16° 3.36' W	1910	08:31	28° 4.03' N	16° 3.49' W	1903
115-1	CTD/NISK-4	06.02.2010	08:41	28° 4.03' N	16° 3.49' W	2007	09:21	28° 4.03' N	16° 3.49' W	2217
116-1	ISP-3	06.02.2010	09:50	28° 4.03' N	16° 3.49' W	2247	11:13	28° 4.07' N	16° 3.61' W	2261
117-1	IFISH-3	06.02.2010	11:30	28° 3.84' N	16° 3.63' W	2073	17:58	27° 12.45' N	16° 59.70' W	3618
118-1	CTD/TM-5	06.02.2010	18:13	27° 12.00' N	17° 0.00' W	3622	21:29	27° 12.03' N	17° 0.03' W	3621
119-1	CTD/NISK-5	06.02.2010	22:23	27° 12.04' N	17° 0.03' W	3619	00:55	27° 12.04' N	17° 0.03' W	3618
120-1	ISP-4	07.02.2010	01:36	27° 12.04' N	17° 0.03' W	3618	06:17	27° 12.04' N	17° 0.03' W	3621
121-1	CTD/NISK-6	07.02.2010	06:34	27° 12.04' N	17° 0.03' W	3620	06:48	27° 12.04' N	17° 0.03' W	3621
122-1	ISP-5	07.02.2010	07:00	27° 12.04' N	17° 0.03' W	3621	09:49	27° 12.04' N	17° 0.03' W	3618
123-1	IFISH-4	07.02.2010	10:00	27° 11.64' N	17° 0.03' W	3620	20:53	25° 33.45' N	17° 30.41' W	3204
124-1	CTD/TM-6	07.02.2010	21:18	25° 32.71' N	17° 31.20' W	3203	00:06	25° 32.73' N	17° 31.21' W	3201
125-1	CTD/NISK-7	08.02.2010	00:20	25° 32.73' N	17° 31.20' W	3204	02:32	25° 32.73' N	17° 31.20' W	3205
126-1	CTD/NISK-8	08.02.2010	03:14	25° 32.73' N	17° 31.20' W	3211	03:30	25° 32.73' N	17° 31.21' W	3209
127-1	IFISH-5	08.02.2010	15:12	24° 50.74' N	19° 33.35' W	3453	05:44	23° 59.70' N	21° 59.78' W	4613
128-1	CTD/NISK-9	09.02.2010	05:55	24° 0.00' N	22° 0.06' W	4611	09:00	23° 59.21' N	22° 1.27' W	4616
129-1	CTD/TM-7	09.02.2010	09:48	23° 59.91' N	22° 0.18' W	4614	11:31	23° 59.87' N	22° 0.29' W	4615
130-1	CTD/NISK-10	09.02.2010	13:50	23° 59.78' N	22° 0.44' W	4612	14:04	23° 59.77' N	22° 0.47' W	4616
131-1	ISP-6	09.02.2010	15:00	23° 59.76' N	22° 0.53' W	4618	20:51	23° 59.13' N	22° 0.09' W	4615
132-1	CTD/TM-8	09.02.2010	20:59	23° 59.11' N	22° 0.07' W	4613	21:37	23° 58.96' N	22° 0.26' W	4614
133-1	CTD/NISK-11	09.02.2010	21:49	23° 58.90' N	22° 0.35' W	4619	22:29	23° 58.79' N	22° 0.54' W	4619
134-1	ISP-7	09.02.2010	22:59	23° 59.99' N	21° 59.99' W	4612	01:53	23° 59.33' N	22° 1.11' W	4618
135-1	IFISH-6	10.02.2010	02:06	23° 59.49' N	22° 1.35' W	4620	06:48	19° 24.72' N	20° 26.54' W	3416
136-1	CTD/NISK-12	11.02.2010	07:00	19° 25.25' N	20° 26.53' W	3424	09:20	19° 25.25' N	20° 26.52' W	3424
137-1	CTD/TM-9	11.02.2010	09:28	19° 25.25' N	20° 26.53' W	3428	12:24	19° 25.28' N	20° 26.54' W	3423
138-1	CTD/NISK-13	11.02.2010	12:30	19° 25.28' N	20° 26.55' W	3423	12:44	19° 25.28' N	20° 26.54' W	3421
139-1	ISP-8	11.02.2010	13:12	19° 25.28' N	20° 26.54' W	3422	15:50	19° 25.29' N	20° 26.55' W	3422
140-1	CTD/NISK-14	13.02.2010	06:52	12° 58.61' N	20° 19.99' W	4678	09:51	12° 58.60' N	20° 20.00' W	4679
141-1	CTD/TM-10	13.02.2010	09:57	12° 58.60' N	20° 20.00' W	4676	12:34	12° 58.64' N	20° 19.99' W	4683
142-1	CTD/NISK-15	13.02.2010	12:40	12° 58.65' N	20° 19.99' W	4677	15:04	12° 58.64' N	20° 19.99' W	4679
143-1	ISP-9	13.02.2010	15:54	12° 58.67' N	20° 19.99' W	4677	21:49	12° 59.38' N	20° 19.95' W	4673
144-1	CTD/TM-11	13.02.2010	21:54	12° 59.38' N	20° 19.95' W	4675	22:07	12° 59.47' N	20° 19.93' W	4674
145-1	CTD/NISK-16	13.02.2010	22:10	12° 59.47' N	20° 19.93' W	4677	22:41	12° 59.47' N	20° 19.93' W	4674
146-1	ISP-10	13.02.2010	22:50	12° 59.47' N	20° 19.93' W	4673	01:25	13° 0.18' N	20° 19.93' W	4671
147-1	IFISH-7	14.02.2010	01:42	12° 59.66' N	20° 19.81' W	4676	20:38	9° 30.18' N	20° 20.20' W	4290
148-1	CTD/NISK-17	14.02.2010	20:47	9° 30.00' N	20° 19.99' W	4301	22:11	9° 30.00' N	20° 19.99' W	4302
149-1	CTD/TM-12	14.02.2010	23:44	9° 29.99' N	20° 19.99' W	4296	03:30	9° 30.00' N	20° 20.00' W	4249
150-1	CTD/NISK-18	15.02.2010	03:39	9° 30.00' N	20° 20.00' W	4276	05:08	9° 30.00' N	20° 20.00' W	4299
151-1	ISP-11	15.02.2010	05:59	9° 30.00' N	20° 20.00' W	4298	08:19	9° 30.00' N	20° 20.00' W	4286

Station	Gear No.	Date	Station Start				Station End			
			Time	PositionLat	PositionLon	Depth [m]	Time	PositionLat	PositionLon	Depth [m]
152-1	CTD/NISK-19	15.02.2010	08:28	9° 30.00' N	20° 20.00' W	4279	08:58	9° 30.00' N	20° 20.00' W	4274
153-1	CTD/NISK-20	15.02.2010	09:32	9° 30.00' N	20° 20.00' W	4279	09:39	9° 30.00' N	20° 20.00' W	4275
154-1	IFISH-8	15.02.2010	09:49	9° 29.87' N	20° 19.93' W	4273	04:20	6° 4.21' N	20° 19.96' W	2768
155-1	CTD/NISK-21	16.02.2010	05:00	5° 59.99' N	20° 20.00' W	2754	06:59	5° 59.99' N	20° 20.00' W	2742
156-1	CTD/TM-13	16.02.2010	07:12	5° 59.99' N	20° 20.00' W	2733	09:40	6° 0.00' N	20° 20.00' W	2763
157-1	ISP-12	16.02.2010	10:20	5° 59.98' N	20° 20.02' W	2791	14:50	5° 59.98' N	20° 20.02' W	2697
158-1	CTD/NISK-22	16.02.2010	15:00	5° 59.98' N	20° 20.02' W	2696	15:10	5° 59.98' N	20° 20.02' W	2670
159-1	ISP-13	16.02.2010	15:18	5° 59.98' N	20° 20.02' W	2665	17:50	5° 59.98' N	20° 20.02' W	2451
160-1	IFISH-9	16.02.2010	18:00	6° 0.14' N	20° 20.04' W	2438	15:24	2° 11.85' N	20° 20.01' W	8
161-1	CTD/NISK-23	17.02.2010	16:48	2° 8.98' N	20° 12.40' W	4594	19:57	2° 8.98' N	20° 12.40' W	4595
162-1	CTD/TM-14	17.02.2010	20:10	2° 9.04' N	20° 12.44' W	4598	00:02	2° 9.07' N	20° 12.49' W	4446
163-1	CTD/NISK-24	18.02.2010	00:10	2° 9.06' N	20° 12.51' W	4584	01:10	2° 9.06' N	20° 12.52' W	4601
164-1	ISP-14	18.02.2010	01:48	2° 9.09' N	20° 12.52' W	4598	04:08	2° 9.09' N	20° 12.53' W	4580
165-1	CTD/NISK-25	18.02.2010	04:18	2° 9.09' N	20° 12.53' W	4588	04:32	2° 9.08' N	20° 12.61' W	4674
166-1	IFISH-10	18.02.2010	04:44	2° 8.96' N	20° 12.87' W	4515	20:54	0° 36.80' S	20° 2.66' W	6614
167-1	CTD/NISK-26	18.02.2010	21:03	0° 36.91' S	20° 2.55' W	6642	00:38	0° 36.90' S	20° 2.54' W	6737
168-1	ISP-15	19.02.2010	00:54	0° 36.90' S	20° 2.54' W	6744	08:02	0° 37.20' S	20° 1.79' W	6682
169-1	CTD/NISK-27	19.02.2010	09:03	0° 37.19' S	20° 1.78' W	6682	11:31	0° 37.19' S	20° 1.80' W	6695
170-1	CTD/TM-15	19.02.2010	11:40	0° 37.19' S	20° 1.80' W	6705	16:16	0° 37.07' S	20° 1.93' W	6653
171-1	CTD/NISK-28	19.02.2010	16:25	0° 37.06' S	20° 1.93' W	6682	17:50	0° 37.03' S	20° 1.86' W	6694
172-1	ISP-16	19.02.2010	18:32	0° 36.97' S	20° 1.92' W	6690	20:54	0° 36.98' S	20° 1.67' W	6675
173-1	CTD/NISK-29	19.02.2010	21:01	0° 36.98' S	20° 1.67' W	6683	21:25	0° 36.97' S	20° 1.66' W	6626
174-1	CTD/TM-16	19.02.2010	21:33	0° 36.92' S	20° 1.68' W	6696	21:46	0° 36.86' S	20° 1.70' W	6706
175-1	CTD/NISK-30	19.02.2010	22:17	0° 36.77' S	20° 1.75' W	6668	22:30	0° 36.74' S	20° 1.71' W	6681
176-1	IFISH-11	19.02.2010	22:38	0° 36.80' S	20° 1.76' W	6669	22:54	3° 56.79' S	22° 49.16' W	5657
177-1	CTD/TM-17	20.02.2010	23:27	4° 0.02' S	22° 51.74' W	5653	00:26	4° 0.19' S	22° 52.41' W	5577
178-1	IFISH-12	21.02.2010	00:32	4° 0.31' S	22° 52.67' W	5534	18:50	6° 38.51' S	24° 59.87' W	5199
179-1	CTD/NISK-31	21.02.2010	19:00	6° 38.99' S	25° 0.01' W	5265	22:42	6° 39.00' S	25° 0.01' W	5780
180-1	CTD/TM-18	21.02.2010	22:52	6° 39.02' S	25° 0.01' W	5504	03:00	6° 39.06' S	25° 0.04' W	5538
181-1	CTD/NISK-32	22.02.2010	03:06	6° 39.06' S	25° 0.04' W	5523	05:33	6° 39.07' S	25° 0.02' W	5515
182-1	ISP-17	22.02.2010	06:27	6° 39.05' S	25° 0.04' W	5516	13:07	6° 39.06' S	25° 0.02' W	5521
183-1	CTD/NISK-33	22.02.2010	13:20	6° 39.06' S	25° 0.02' W	5522	14:26	6° 39.06' S	25° 0.02' W	5544
184-1	ISP-18	22.02.2010	14:36	6° 39.06' S	25° 0.02' W	5527	17:00	6° 39.06' S	25° 0.02' W	5541
185-1	CTD/NISK-34	22.02.2010	18:04	6° 39.05' S	25° 0.02' W	5530	18:24	6° 39.05' S	25° 0.02' W	5524
186-1	CTD/NISK-35	22.02.2010	18:47	6° 39.05' S	25° 0.02' W	5521	18:55	6° 39.05' S	25° 0.02' W	5520
187-1	IFISH-13	22.02.2010	19:06	6° 39.23' S	24° 59.84' W	5511	05:03	11° 28.34' S	28° 28.80' W	5463
188-1	CTD/NISK-36	24.02.2010	05:26	11° 30.03' S	28° 30.02' W	5482	08:39	11° 30.03' S	28° 30.02' W	5523
189-1	CTD/TM-19	24.02.2010	08:44	11° 30.03' S	28° 30.02' W	5521	13:06	11° 30.06' S	28° 30.05' W	5516
190-1	CTD/NISK-37	24.02.2010	13:13	11° 30.12' S	28° 30.10' W	5521	15:42	11° 30.12' S	28° 30.10' W	5499
191-1	ISP-19	24.02.2010	16:24	11° 30.07' S	28° 30.06' W	5499	22:36	11° 30.07' S	28° 30.06' W	5485
192-1	CTD/NISK-38	24.02.2010	22:42	11° 30.07' S	28° 30.06' W	5480	23:59	11° 30.07' S	28° 30.06' W	5492
193-1	ISP-20	25.02.2010	00:36	11° 30.06' S	28° 29.98' W	5497	02:46	11° 30.06' S	28° 29.98' W	5496
194-1	CTD/NISK-39	25.02.2010	03:00	11° 30.06' S	28° 29.97' W	5490	03:14	11° 30.06' S	28° 29.97' W	5487
195-1	CTD/NISK-40	25.02.2010	03:43	11° 30.06' S	28° 29.97' W	5482	04:10	11° 30.06' S	28° 29.97' W	5488
196-1	IFISH-14	25.02.2010	04:20	11° 29.92' S	28° 29.98' W	5487	08:22	7° 10.37' S	31° 19.75' W	5190
197-1	CTD/NISK-41	26.02.2010	08:34	7° 10.01' S	31° 20.00' W	5163	11:58	7° 10.01' S	31° 20.00' W	5192
198-1	CTD/TM-20	26.02.2010	12:06	7° 10.01' S	31° 20.00' W	5178	15:54	7° 10.12' S	31° 20.07' W	5149
199-1	CTD/NISK-42	26.02.2010	16:00	7° 10.12' S	31° 20.06' W	5142	16:12	7° 10.12' S	31° 20.06' W	5154

Station	Gear No.	Date	Station Start				Station End			
			Time	PositionLat	PositionLon	Depth [m]	Time	PositionLat	PositionLon	Depth [m]
200-1	CTD/NISK-43	26.02.2010	16:40	7° 10.12' S	31° 20.06' W	5123	17:33	7° 10.12' S	31° 20.06' W	4898
201-1	IFISH-15	28.02.2010	12:21	1° 2.65' S	35° 53.88' W	4220	11:44	0° 52.75' N	39° 32.21' W	4369
202-1	CTD/TM-21	01.03.2010	13:05	0° 54.74' N	39° 36.09' W	4367	14:24	0° 54.72' N	39° 35.81' W	4394
203-1	IFISH-16	01.03.2010	15:30	0° 56.95' N	39° 40.16' W	4366	10:45	7° 45.31' N	48° 52.06' W	4340
204-1	CTD/NISK-44	04.03.2010	11:12	7° 45.99' N	48° 53.01' W	4308	13:16	7° 45.99' N	48° 53.00' W	4278
205-1	CTD/TM-22	04.03.2010	13:21	7° 46.00' N	48° 53.00' W	4272	15:51	7° 46.02' N	48° 53.00' W	4281
206-1	CTD/NISK-45	04.03.2010	15:54	7° 46.01' N	48° 53.00' W	4301	17:12	7° 46.01' N	48° 53.00' W	4305
207-1	CTD/NISK-46	04.03.2010	17:30	7° 46.01' N	48° 53.00' W	4302	18:15	7° 46.01' N	48° 53.00' W	4298
208-1	ISP-21	04.03.2010	18:50	7° 46.00' N	48° 53.03' W	4302	21:40	7° 45.99' N	48° 53.03' W	4313
209-1	CTD/NISK-47	04.03.2010	21:46	7° 45.99' N	48° 53.03' W	4303	22:04	7° 45.99' N	48° 53.03' W	4313
210-1	CTD/NISK-48	04.03.2010	22:30	7° 45.99' N	48° 53.03' W	4292	23:42	7° 45.99' N	48° 53.03' W	4269
211-1	IFISH-17	04.03.2010	23:56	7° 46.05' N	48° 53.37' W	4296	02:56	7° 57.67' N	49° 20.14' W	4372
212-1	IFISH-18	05.03.2010	11:15	8° 28.75' N	50° 32.47' W	4511	12:08	8° 31.21' N	50° 39.70' W	4555
213-1	IFISH-19	05.03.2010	21:10	8° 58.54' N	52° 12.22' W	4681	22:00	10° 15.86' N	56° 34.29' W	3757