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SFB 754

Short Cruise Report RV METEOR M-107
Fortaleza (Brasil) – Las Palmas (Spain)
30.5. – 3.7.2014
Project: Collaborative Research Centre 754 "Climate-Biogeochemistry Interactions in the Tropical Ocean"

Chief Scientist: Stefan Sommer, Captain: Michael Schneider

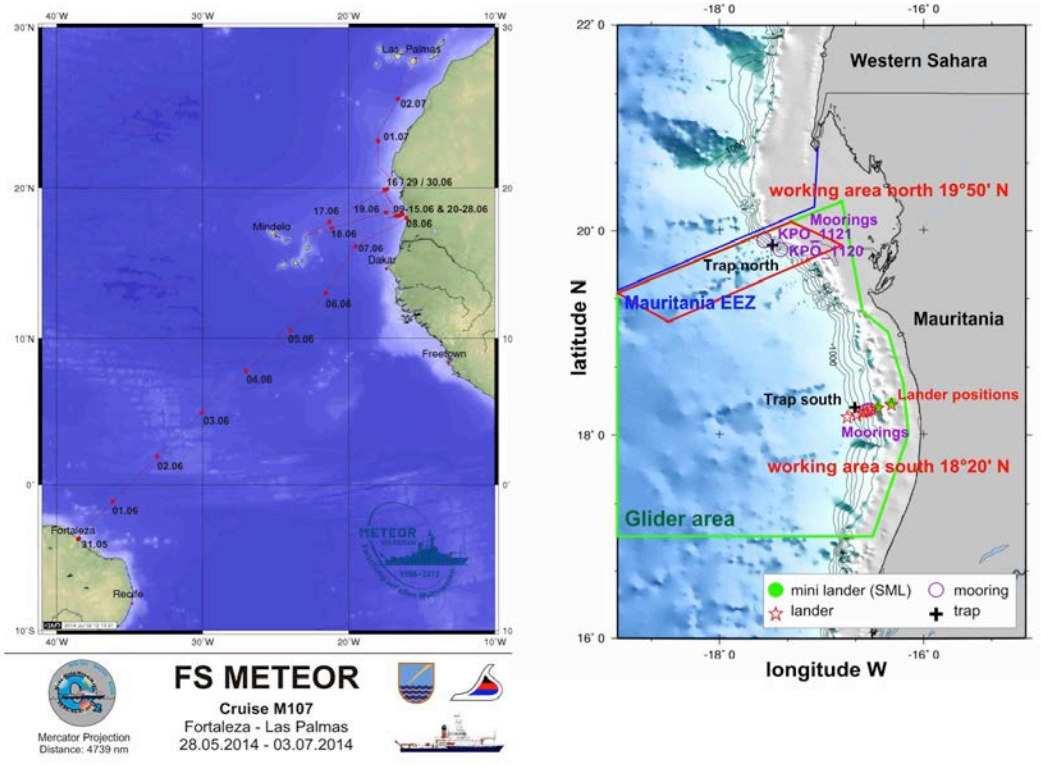

Fig. 1: Ship track during Meteor cruise M107 and detail map showing the southern (18°20' N) and northern (19°50' N) working areas off Mauritania.

Objectives

Oxygen Minimum Zones (OMZ) are key regions for the biogeochemical cycling of major elements where benthic fluxes and microbial activity in the water column are the driving mechanisms. The major goal of this cruise is to advance understanding of how the OMZ off Mauritania is maintained and to determine potential feedbacks of benthic nutrient release on the currently expanding Mauritanian OMZ. The measurement program combines approaches of benthic biogeochemistry, rate determinations in the pelagic and the benthic, chemical and physical oceanography. The research cruise was carried out within the context of the 2nd phase of the Kiel Collaborative Research Centre 754 "Climate-Biogeochemistry Interactions in the Tropical Ocean".

The major objectives were:
a. to determine variability of benthic nutrient release in response to the hydrodynamic forcing and regional differences in bottom water levels of oxygen (O_2), nitrate (NO_3^-), nitrite (NO_2^-), and sedimentary carbon content (C_{org});
b. to quantify diapycnal and advective fluxes of ammonium (NH_4^+), phosphate (PO_4^3), Fe, Si, and radium isotopes between the benthic boundary layer (BBL), and the stratified interior ocean and into the surface mixed layer;
c. to investigate microbial processes involved in the sediment and the water column N (e.g. N-fixation, denitrification, anammox), Fe, and P cycles;
d. to study the influence of viruses on pelagic biogeochemical processes in the OMZ;
e. to study the distribution of trace metals.

The above objectives were approached by synoptically coupling in situ benthic fluxes, current measurements using different types of lander and moorings, microstructure shear and temperature profiles, CTD measurements including high vertical resolution water column sampling and Gliders. The working areas were at 18°20'N and to a lesser extent at 19°50'N, Figure 1. The results of this cruise will be interpreted in conjunction with data from a previous cruise to the Mauritanian OMZ that were collected in March/April 2011 (Cruise MSM 17/4) during upwelling conditions. This cruise took place just at the transition between upwelling and non-upwelling conditions, which was expected to affect benthic and pelagic biogeochemical element turnover.

Narrative

At the 28th May a small group of scientists was boarding the RV Meteor to prepare loading and to organize the visit of the vice-minister from the BMBF Dr. Thomas Rachel and representatives of the Brazilian German embassy of the research vessel. Prof. Dr. P. Brand and Dr. S. Sommer reported about their research activities. In the evening a reception took place hosting the vice-minister, Brazilian politicians and scientists as well as members of the Brazilian DAAD. At the 29th May the remaining scientific crew arrived at RV Meteor and

loading of scientific gear was started. Due to delays caused by the Brazilian customs the departure was delayed until Saturday 31st May at 11:00 local time.
The following transit across the Atlantic lasted until the 08th June 13:00 UTC when we reached Nouakchott and Mr. Mamadou Ba the Mauritanian observer (IMROP, Institut Mauritanien de Recherche Océanographiques et des Peches) came on board. During the transit outside the Brazilian EEZ various underway measurements were conducted, a tow fish was deployed to continuously sample surface water at a water depth of 5m. The thermosalinograph permanently recorded surface water temperature and salinity. Additionally, every 2 hours the water column was hydrographically investigated using an underway-CTD (u-CTD). These measurements were supplemented by current measurements using the shipboard ADCP and continuous pCO_2 measurements of the surface water. Furthermore, the laboratories were established and the lander systems prepared. The scientific team of the M107 cruise was very interdisciplinary ranging from physical oceanography deploying CTD/water sampling rosette, microstructure CTD, glider, and moorings to benthic and pelagic biogeochemistry as well as microbiology and virology. Benthic biogeochemistry and microbiology involved the deployment of the benthic observatories BIGO (Biogeochemical Observatory) in order to measure solute fluxes inside chambers and a TV-guided multiple corer (TV-MUC) to retrieve undisturbed sediments for porewater analyses. Pelagic biogeochemistry relied on casts of the CTD water sampling rosette and the trace metal CTD. Further more in situ pumps were deployed for tracer geochemistry. In addition to these sampling activities ex situ experiments and incubations were conducted on board.
Until the 15th June our research activities focused on a depth transect in the southern working area at 18°20'N. This working area comprises 7 major stations in water depths of 1095, 787, 412, 236, 171, 91, and 47 m where all instruments were deployed in order to obtain a spatially coherent data set. The length of this transect was ca. 26 nm. For physical and biogeochemical measurements the depth transect extended to a water depth of about 2200 m covering a distance of ca. 58 nm from the shallowest to the deepest station.
At the beginning of this first working period at 18°20'N the moorings KPO 1118 and KPO 1119 as well as the benthic observatories Deep-sea Observation System (DOS) and Physical Oceanography Lander (POZ) were anchored at the seafloor in water depths of 356, 164, 91 and 41 m to synoptically record the current regime. In the following days the benthic observatories BIGO I and BIGO II were deployed beginning with the deepest stations at 1095, 787, and 412 m. At each of the BIGO stations the TV-MUC was deployed to obtain undisturbed surface sediment samples with about 40 cm sediment retrieval. From the sediments retrieved by the TV-MUC N-species, P, Fe, Si, TA, porosity, and water content was determined. From selected samples stable N-isotopes will be measured. From the BIGO, which obtains water and sediment samples, nutrients (N-species, P, Fe, Si), pCO_2, DIC and TA were determined in the water samples.

Benthic works were predominantly conducted during the daytime, whereas the water column was mostly studied during the nighttime comprising the deployment of a CTD water sampling rosette, microstructure CTD and a trace metal CTD. The CTD water-sampling rosette was subsampled for measuring nutrients, N P fixation rates as well as DOM and partially nitrogen stable isotopes. Samples of the Trace Metal CTD were analysed for trace metals. Furthermore, for the analysis of radiotracers (Ra, Th, U) in situ pumps were deployed at all major stations, which were mounted onto a wire and kept in the water for about 3 – 4 hours. Three glider for the continuous measurements of physical parameters (temperature, conductivity), oxygen, nitrate (only one glider) and microstructure (only one glider) were deployed along the depth transect. Lastly a profiling lander (Profiler) was deployed to conduct in situ voltammetric measurements in the sediment. The profiler was further equipped with a "lab on a chip" (LOC) for short time series measurements (days) of nitrate and during one deployment of nitrite in conjunction with temperature, conductivity, pressure, oxygen and turbidity measured by a RBR CTD. An example of a nitrate / nitrite time series at 174 m water depth is shown in Figure 2.

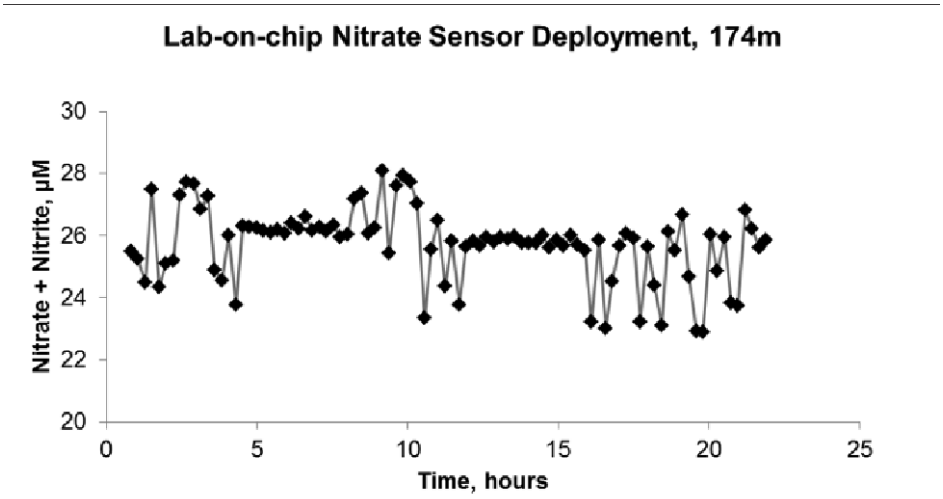

Fig. 2: Timeseries of nitrate concentration in the bottom water at the 174 m station. The measurements were conducted with a Lab on the Chip system (LOC), which was made available from the National Oceanography Centre, Southhampton

At Sunday 15th June we left the southern working area and moved towards the northern working area in a distance of about 115 nm, where we deployed our third Mooring (KPO1121) in a water depth of 148 m. At Monday 16th June 13:00 we interrupted our research activities and headed towards the island Sal (Cape

Verde Islands) in order to enable a fast transfer of a crew-member, who unfortunately had a serious injury of his hand to Germany. After a transit of about 70 hours we started our research activities again in southern working area with the uptake of a drifting sediment trap.
Until Friday 27th June research activities were continued in the southern working area as described above with the deployment of the BIGOs, TV-MUC, Profiler and in situ pumps during daytime and investigations in the water column during the night-time. In addition to these activities a total of 6 floats were deployed in water depths of 2050 to 2200 m. After recovery of the moorings and the glider we finished our activities in this area at the 27th June and headed northwards. Unfortunately, the mooring KPO119 did not respond to hydro-acoustic signals and could not be recovered. We assume that this mooring was lost due to fishing activities.
Due to time constraints, in the northern working area predominantly ADCP- and u-CTD transects were conducted across frontal systems. We further had bad luck with the mooring KPO1121, whose head-buoy was detached due to fishing activities. This buoy was then transferred by a trawler to Nouakchott and stored in the IMROP facility. First trials to locate the remaining mooring which was still anchored at the bottom failed and only after increasing the search area considerably we were able to locate and retrieve it.
At the morning of Monday the 30th June we finished our station work of M107 with the retrieval of the glider under very calm weather conditions. Subsequently we went to Nouakchott where we organized a handing-over of the head-buoy from IMROP at sea. Then we started our transit to Las Palmas (Spain) where we due to bad weather conditions arrived at Thursday afternoon 3rd July. Our observer Mamadou Ba, who during the entire time course of the cruise was very helpful and supportive left RV Meteor at the same day in the evening hours. It was planned that the remaining scientists depart at the morning of the 4th July, but caused from our late arrival and problems with container logistics a small group stayed until the 5th July.
Despite the delays we were able to successfully conduct our research at the southern working area, which was the main focus of our activities. However, the research at the northern working area was affected as almost no biogeochemical measurements were conducted in the water column. Nevertheless, a total of 9 BIGO- and 3 Profiler- deployments were conducted along the depth transect in the southern working area. In addition 22 TV-guided multiple corer casts were carried out to investigate the sediment geochemistry. Analyses of these results will provide a broad benthic biogeochemical database, which will be interpreted in the context of the physical and biogeochemical measurements conducted in the water column that are based on 73 CTD casts, a multitude of micro-structure CTDs and u-CTD casts as well as on moorings and glider data. Furthermore these data will be carefully interpreted in comparison to the measurements made during the MS Merian cruise MSM 17/4.

Acknowledgements

We thank Captain Michael Schneider, his officers and the crew of RV METEOR for their outstanding support. They created a very professional working environment and contributed a lot to the success of this cruise. The friendly atmosphere aboard is greatly acknowledged. We thank the Ministère des Peches et de l'Economie Maritime for its support and we would like to acknowledge the contribution of the German Ministry of Foreign Affairs (Wolfgang Mahrle). Many thanks are due to the Mauritanian observer Mamadou Ba (IMROP) who was very helpful and supportive.

We would also like to express our gratitude to the Leitstelle METEOR/MERIAN for its valuable support. The ship time of RV METEOR was provided by the Deutsche Forschungsgemeinschaft. The collaborative research centre 754 "Climate – Biogeochemistry Interactions in the Tropical Ocean" is funded by the German Research Council, DFG.

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Appendix: Station list M107

station #	date	time (UTC)	gear #	latitude	longitude	depth (m)
M107 - 435	01.06.14	16:06	fish 01	00°38.42' S	35°39.59' W	4449
M107 - 436	01.06.14	17:30	uCTD 01	00°29.001' S	35°30.418' W	4501
M107 - 437	01.06.14	19:32	uCTD 02	00°13.89' S	35°15.48' W	4501,3
M107 - 438	01.06.14	21:30	uCTD 03	00°02.23' N	34°59,54' W	4522
M107 - 439	02.06.14	00:03	uCTD 04	00°21.22' N	34°40.77' W	4525,2
M107 - 440	02.06.14	01:26	uCTD 05	00°32.28' N	34°30.17' W	4200
M107 - 441	02.06.14	03:54	uCTD 06	00°51.60' N	34°11.09' W	3920
M107 - 442	02.06.14	05:32	uCTD 07	01°04.50' N	33°58.34' W	3675
M107 - 443	02.06.14	07:28	uCTD 08	01°19.61' N	33°43.42' W	3716,1
M107 - 444	02.06.14	09:34	uCTD 09	01°36.07' N	33°27.16' W	3597,5
M107 - 445	02.06.14	11:52	uCTD 10	01°54.30' N	33°09.15' W	3710,5
M107 - 446	02.06.14	13:25	uCTD 11	02°06.73' N	32°56.87' W	3129,9
M107 - 447	02.06.14	15:31	uCTD 12	02°23.68' N	32°40.12' W	3697
M107 - 448	02.06.14	17:35	uCTD 13	02°39.78' N	32°24.20' W	3240
M107 - 449	02.06.14	19:32	uCTD 14	02°54.71' N	32°09.44' W	3622
M107 - 450	02.06.14	21:35	uCTD 15	03°10.05' N	21°52.40' W	3000
M107 - 451	02.06.14	23:33	uCTD 16	03°25.17' N	31°39.32' W	3158,6
M107 - 452	03.06.14	01:21	uCTD 17	03°39.71' N	31°24.93' W	2691,6
M107 - 453	03.06.14	04:03	uCTD 18	03°59.08' N	31°05.75' W	3850
M107 - 454	03.06.14	05:28	uCTD 19	04°09.83' N	30°55.11' W	3248
M107 - 455	03.06.14	07:29	uCTD 20	04°25.13' N	30°39.24' W	3207
M107 - 456	03.06.14	09:38	uCTD 21	04°41.26' N	30°21.92' W	3599
M107 - 457	03.06.14	11:31	uCTD 22	04°54.84' N	30°07.32' W	3915,8
M107 - 458	03.06.14	13:22	uCTD 23	05°07.52' N	29°53.69' W	3870,4

M107 - 459	03.06.14	16:08	uCTD 24	05°28.47' N	29°30.87' W	3685
M107 - 460	03.06.14	17:26	uCTD 25	05°38.62' N	29°18.42' W	3620
M107 - 461	03.06.14	19:38	uCTD 26	05°54.74' N	29°02.89' W	4219,8
M107 - 462	03.06.14	21:29	uCTD 27	06°08.22' N	28°48.33' W	4235,7
M107 - 463	03.06.14	23:29	uCTD 28	06°22.67' N	28°32.82' W	4324
M107 - 464	04.06.14	02:42	uCTD 29	06°38.48' N	28°15.77' W	4054,4
M107 - 465	04.06.14	03:26	uCTD 30	06°50.52' N	28°02.79' W	4390
M107 - 466	04.06.14	05:24	uCTD 31	07°03.84' N	27°48.42' W	4464
M107 - 467	04.06.14	07:28	uCTD 32	07°17.56' N	27°33.62' W	4742
M107 - 468	04.06.14	09:34	uCTD 33	07°31.50' N	27°18.56' W	4546
M107 - 469	04.06.14	11:33	uCTD 34	07°44.48' N	27°04.54' W	4590,8
M107 - 470	04.06.14	13:31	uCTD 35	07°57.44' N	26°50.53' W	4251,7
M107 - 471	04.06.14	15:32	uCTD 36	08°11.17' N	26°35.68' W	5100
M107 - 472	04.06.14	17:35	uCTD 37	08°25.29' N	26°20.40' W	4740
M107 - 473	04.06.14	19:36	uCTD 38	08°39.36' N	26°05.17' W	4939
M107 - 474	04.06.14	21:30	uCTD 39	08°52.39' N	25°51.04' W	5137
M107 - 475	04.06.14	23:33	uCTD 40	09°05.72' N	25°36.60' W	5100
M107 - 476	05.06.14	01:35	uCTD 41	09°19.58' N	25°21.56' W	4860
M107 - 477	05.06.14	03:23	uCTD 42	09°31.99' N	25°08.09' W	
M107 - 478	05.06.14	05:31	uCTD 43	09°46.31' N	24°52.54' W	5241
M107 - 479	05.06.14	07:31	uCTD 44	10°00.07' N	24°37.57' W	
M107 - 480	05.06.14	09:30	uCTD 45	10°13.97' N	24°22.45' W	5029,1
M107 - 481	05.06.14	11:30	uCTD 46	10°30.09' N	24°04.89' W	4738,9
M107 - 482	05.06.14	14:19	uCTD 47	10°47.55' N	23°45.88' W	5204,3
M107 - 483	05.06.14	15:40	uCTD 48	10°56.88' N	23°35.70' W	5025
M107 - 484	05.06.14	17:31	uCTD 49	11°09.86' N	23°21.54' W	5147,1

M107 - 485	05.06.14	20:37	CTD 01	11°27.27' N	22°59.90' W	5088
M107 - 486	05.06.14	20:50	CTD 02	11°27.27' N	22°59.90' W	5090
M107 - 487	06.06.14	01:28	uCTD 50	11°46.58' N	22°44.34' W	5008
M107 - 488	06.06.14	03:34	uCTD 51	12°02.40' N	22°29.72' W	4950
M107 - 489	06.06.14	05:29	uCTD 52	12°16.64' N	22°16.54' W	4898
M107 - 490	06.06.14	07:37	uCTD 53	12°32.35' N	22°01.99' W	4823
M107 - 491	06.06.14	09:23	uCTD 54	12°45.21' N	21°50.06' W	4765
M107 - 492	06.06.14	11:52	uCTD 55	13°03.92' N	21°35.21' W	4685
M107 - 493	06.06.14	13:47	uCTD 56	13°19.22' N	21°25.58' W	4660
M107 - 494	06.06.14	15:45	uCTD 57	13°34.87' N	21°15.71' W	4531,4
M107 - 495	06.06.14	17:33	uCTD 58	13°48.83' N	21°06.90' W	4437
M107 - 496	06.06.14	19:32	uCTD 59	14°04.07' N	20°57.27' W	4319
M107 - 497	06.06.14	21:34	uCTD 60	14°19.59' N	20°47.46' W	4255,8
M107 - 498	06.06.14	23:41	uCTD 61	14°35.96' N	20°37.12' W	4168,6
M107 - 499	07.06.14	01:31	uCTD 62	14°50.36' N	20°27.96' W	4040
M107 - 500	07.06.14	03:34	uCTD 63	15°07.01' N	20°17.52' W	3950
M107 - 501	07.06.14	05:31	uCTD 64	15°23.09' N	20°07.17' W	3716,6
M107 - 502	07.06.14	07:35	uCTD 65	15°39.55' N	19°56.69' W	3528,6
M107 - 503	07.06.14	09:32	uCTD 66	15°54.30' N	19°47.29' W	3517,9
M107 - 504	07.06.14	12:28	uCTD 67	16°13.09' N	19°29.28' W	3469,9
M107 - 505	07.06.14	13:37	uCTD 68	16°18.03' N	19°19.92' W	3420
M107 - 506	07.06.14	15:35	uCTD 69	16°26.85' N	19°03.19' W	3360
M107 - 507	07.06.14	17:36	uCTD 70 - 1	16°36.34' N	18°45.17' W	3245,9
M107 - 508	07.06.14	18:05	uCTD 70 - 2	16°38.69' N	18°40.72' W	3211,1
M107 - 509	07.06.14	19:56	uCTD 71	16°40.32' N	18°37.62' W	3186,6
M107 - 510	07.06.14	21:29	uCTD 72	16°56.50' N	18°09.10' W	2887,8
M107 - 511	07.06.14	23:33	uCTD 73	17°05.87' N	17°48.64' W	2650,1

M107 - 512	08.06.14	01:33	uCTD 74	17°15.33' N	17°27.99' W	2380
M107 - 513	08.06.14	03:28	uCTD 75	17°25.55' N	17°08.06' W	1807
M107 - 514	08.06.14	05:31	uCTD 76	17°36.58' N	16°46.51' W	957
M107 - 515	08.06.14	17:10	POZ Lander 01	18°16' N	16°19' W	50
M107 - 516	08.06.14	18:34	CTD 03	18°15.201' N	16°29.944' W	92,1
M107 - 517	08.06.14	21:48	CTD 04	18°15.133' N	16°27.02' W	92
M107 - 518	08.06.14	22:54	MSS 01	18°15.11' N	16°27.06' W	92 - 95
M107 - 519	09.06.14	00:11	CTD 05	18°14.333' N	16°30.996' W	169
M107 - 520	09.06.14	01:59	MSS 02	18°14.37' N	16°31.03' W	170
M107 - 521	09.06.14	03:32	CTD 06	18°13.089' N	16°33.31' W	238
M107 - 522	09.06.14	05:21	MSS 03	18°13.43' N	16°33.43' W	314
M107 - 523	09.06.14	06:32	CTD 07	18°12.51' N	16°35.72' W	424,4
M107 - 524	09.06.14	08:11	TV-MUC 01	18°09.991' N	16°45.023' W	1108
M107 - 525	09.06.14	10:05	TV-MUC 02	18°09.997' N	16°45.031' W	1098
M107 - 526	09.06.14	10:51	Trace Metal CTD 01	18°09.47' N	16°45.02' W	1091
M107 - 527	09.06.14	14:00	BIGO II 01	18°10' N	16°44.99' W	1095,5
M107 - 528	09.06.14	15:52	Glider 01	18°12.11' N	16°45.03' W	1110
M107 - 529	09.06.14	17:37 - 21:05	in situ pumps 01	18°11.0' N	16°45.0' W	1104
M107 - 530	10.06.14	00:01	CTD 08	18°02.00' N	17°10.01' W	2024,7
M107 - 531	10.06.14	02:12	APEX Float 01	18°00.071' N	17°12.141' W	2050
M107 - 532	10.06.14	02:27	APEX Float 02	18°00.442' N	17°12.221' W	2050
M107 - 533	10.06.14	03:59	CTD 09	18°04.99' N	17°00.01' W	1760
M107 - 534	10.06.14	08:10	TV-MUC 03	18°11.288' N	16°39.328' W	786
M107 - 535	10.06.14	11:00	Mooring 01	18°12.00' N	16°34.32' W	356,1
M107 - 536	10.06.14	13:36 - 15:30	Glider 02	18°13.29' N	16°39.36' W	740
M107 - 537	10.06.14	17:21 - 19:59	in situ pumps 02	18°11.30' N	16°39.28' W	781
M107 - 538	10.06.14	20:17	CTD 10	18°11.30' N	16°39.28' W	781

M107 - 539	10.06.14	21:21	Trace Metal CTD 02	18°11.31' N	16°39.22' W	781
M107 - 540	10.06.14	23:28	MSS 04	18°10.00' N	16°44.94' W	1093
M107 - 541	11.06.14	01:26	CTD 11	18°09.99' N	16°14.99' W	1095
M107 - 542	11.06.14	03:25	MSS 05	18°07.84' N	16°51.40' W	1447,7
M107 - 543	11.06.14	05:32	CTD 12	18°07.79' N	16°51.39' W	1452,5
M107 - 544	11.06.14	08:03	BIGO II 01	18°09.73' N	16°44.97' W	1095
M107 - 545	11.06.14	09:22 - 12:21	in situ pumps 03	18°11.0' N	16°45.0' W	1104
M107 - 546	11.06.14	12:40	CTD 13	18°11.00' N	16°45.01' W	1102,6
M107 - 547	11.06.14	14:27	BIGO-I 01	18°11.31' N	16°39.335' W	787
M107 - 548	11.06.14	18:53	Sinkstofffalle 03	18°08.20' N	16°52.36' W	1497
M107 - 549	11.06.14	19:23	CTD 14	18°07.01' N	16°52.57' W	1600,1
M107 - 550	11.06.14	20:39	in situ pumps 04	18°07.01' N	16°52.57' W	1601,6
M107 - 551	12.06.14	01:36	MSS 06	18°09.66' N	16°47.84' W	1241,8
M107 - 552	12.06.14	03:37	CTD 15	18°09.00' N	16°48.32' W	1237,3
M107 - 553	12.06.14	05:07	Trace Metal CTD 03	18°10.03' N	16°45.03' W	1097,5
M107 - 554	12.06.14	08:03	MUC 05	18°12.504' N	16°35.583' W	412
M107 - 555	12.06.14	08:50	MUC 06	18°12.507' N	16°35.583' W	412
M107 - 556	12.06.14	10:00	Glider 03	18°10.48' N	16°35.59' W	438
M107 - 557	12.06.14	12:59	BIGO-II 02	18°12.504'N	16°35.585' W	412
M107 - 558	12.06.14	14:15	Mooring 02	18°14.06' N	16°31.03' W	164
M107 - 559	12.06.14	15:06	CTD 16	18°14.00' N	16°31.00' W	166
M107 - 560	12.06.14	18:02	CTD 17	18°14.00' N	16°31.00' W	166,2
M107 - 561	12.06.14	19:05	MSS 07	18°14.02' N	16°31.03' W	167,4
M107 - 562 - 1	12.06.14	20:36	Trace Metal CTD 04	18°13.98' N	16°30.93' W	165
M107 - 562 - 2	12.06.14	21:15	Trace Metal CTD 05	18°14.00' N	16°31.01' W	167
M107 - 563	12.06.14	22:00	in situ pumps 05	18°4.070' N	16°31.102' W	174
M107 - 564	13.06.14	00:29	MSS 08	18°13.71' N	16°31.96' W	189,7

M107 - 565	13.06.14	01:45	CTD 18	18°14.67' N	16°32.54' W	302,2
M107 - 566	13.06.14	02:55	MSS 09	18°13.01' N	16°33.30' W	240
M107 - 567	13.06.14	04:21	MSS 10	18°12.97' N	16°33.27' W	243,9
M107 - 568	13.06.14	05:27	CTD 19	18°13.02' N	16°33.26' W	239,9
M107 - 569	13.06.14	08:00	BIGO-I 01	18°10.836' N	16°39.229' W	789
M107 - 570	13.06.14	09:14 - 11:40	in situ pumps 06	18°11.30' N	16°39.30' W	784
M107 - 571	13.06.14	13:35	Glider 04	18°13.13' N	16°39.71' W	729
M107 - 572	13.06.14	16:08	Profiler 01	18°14.195' N	16°31.008' W	167
M107 - 573	13.06.14	17:51	MSS 11	18°16.90' N	16°19.00' W	46,7
M107 - 574	13.06.14	20:13	CTD 20	18°17.29' N	16°18.91' W	46,3
M107 - 575	13.06.14	20:40	Trace Metal CTD 06	18°17.29' N	16°18.91' W	46
M107 - 576	14.06.14	00:46	CTD 21	18°10.37' N	16°43.03' W	1019
M107 - 577	14.06.14	00:46 - 04:25	MSS 12	18°11.61' N	16°40.46' W	888 - 210
M107 - 578	14.06.14	04:45	CTD 22	18°13.60' N	16°31.76' W	183
M107 - 579	14.06.14	07:11	CTD 23	18°12.33' N	16°36.07' W	455
M107 - 580	14.06.14	08:08	BIGO-II 02	18°12.273' N	16°95.530' W	410
M107 - 581	14.06.14	09:00 - 12:30	in situ pumps 07	18°12.514' N	16°35.588' W	412
M107 - 582	14.06.14	13:58	CTD 24	18°13.02' N	16°33.14' W	231
M107 - 583	14.06.14	13:51	MUC 07	18°12.998' N	16°33.197' W	237
M107 - 584	14.06.14	15:30	Profiler 01	18°14.195' N	16°31.008' W	167
M107 - 585	14.06.14	17:05	DOS-Lander 01	18°13.985' N	16°26.983' W	91,7
M107 - 586	14.06.14	19:02	CTD 25	18°10.87' N	16°41.58' W	950
M107 - 587	14.06.14	20:19	CTD 26	18°10.88' N	16°41.59' W	950
M107 - 588	14.06.14	21:21	MSS 13	18°10.89' N	16°41.59' W	952,5
M107 - 589	14.06.14	23:58	MSS 14	18°11.95' N	16°37.06' W	987,9
M107 - 590	15.06.14	01:13	CTD 27	18°13.00' N	16°37.59' W	620
M107 - 591	15.06.14	02:46	MSS 15	18°12.94' N	16°35.89' W	434

M107 - 592	15.06.14	04:42	CTD 28	18°12.58' N	16°35.56' W	410
M107 - 593	15.06.14	05:55	MSS 16	18°13.64' N	16°31.74' W	183
M107 - 594	15.06.14	07:00	CTD 29	18°13.57' N	16°31.74' W	183
M107 - 595	15.06.14	08:17	CTD 30	18°12.29' N	16°36.14' W	460
M107 - 596	15.06.14	10:00	in situ pumps 08	18°12.286' N	16°36.125' W	460,8
M107 - 597	15.06.14	12:47	Sinkstofffalle 04	18°12.41' N	16°36.22' W	470
M107 - 598	15.06.14	14:24	BIGO I 02	18°13.286' N	16°33.334' W	236
M107 - 599	16.06.14	07:06	MB Profil 01	19°53.76' N	17°32.13' W	715
M107 - 600	16.06.14	08:17	Mooring 03	19°54.94' N	17°30.55' W	148
M107 - 601	16.06.14	11:31	CTD 31	19°53.83' N	17°32.59' W	659
M107 - 602	19.06.14	14:15	Glider 05	18°30.46' N	17°05.66' W	1914
M107 - 603	19.06.14	16:07	Glider 06	18°30.44' N	17°05.65' W	1910
M107 - 604	19.06.14	21:00	Sinkstofffalle 04	18°10.589' N	16°42.522' W	997
M107 - 605	19.06.14	22:30	CTD 32	18°11.24' N	16°39.31' W	792,7
M107 - 606	19.06.14	23:24	Trace Metal CTD 07	18°11.25' N	16°39.32' W	799,4
M107 - 607	20.06.14	00:24	MSS 17	18°11.30' N	16°39.33' W	784,4
M107 - 608	20.06.14	02:11	MSS 18	18°12.55' N	16°35.63' W	415,4
M107 - 609	20.06.14	04:06	CTD 33	18°12.41' N	16°35.59' W	412
M107 - 610	20.06.14	05:32	MSS 19	18°13.01' N	16°33.30' W	240
M107 - 611	20.06.14	06:39	CTD 34	18°13.00' N	16°33.29' W	240
M107 - 612	20.06.14	07:55	TV-MUC 08	18°12.945' N	16°33.153' W	236
M107 - 613	20.06.14	08:35	TV-MUC 09	18°12.945' N	16°33.154' W	236
M107 - 614	20.06.14	09:03	BIGO I 02	18°12.95' N	16°33.15' W	236
M107 - 615	20.06.14	13:34	in situ pumps 09	18°12.444' N	16°35.605' W	414
M107 - 616	20.06.14	13:56	CTD 35	18°12.44' N	16°35.61' W	414
M107 - 617	20.06.14	15:47	BIGO II 03	18°14.397' N	16°31.000' W	171
M107 - 618	20.06.14	17:00	CTD 36	18°14.18' N	16°31.00' W	167

M107 - 619	20.06.14	17:35	Trace Metal CTD 08	18°14.18' N	16°31.09' W	167
M107 - 620	20.06.14	17:59	Trace Metal CTD 09	18°14.10' N	16°31.09' W	169
M107 - 621	20.06.14	18:47	MSS 20	18°13.19' N	16°32.45' W	202
M107 - 622	20.06.14	19:50	MSS 21	18°14.89' N	16°28.80' W	112,7
M107 - 623	20.06.14	21:31	CTD 37	18°14.87' N	16°28.79' W	112
M107 - 624	20.06.14	22:30 - 01:00	MSS 22	18°15.15' N	16°27.99' W	91-97
M107 - 625	21.06.14	01:36	CTD 38	18°15.16' N	16°26.98' W	91
M107 - 626	21.06.14	02:39	MSS 23	18°16.00' N	16°24.09' W	71
M107 - 627	21.06.14	05:02	CTD 39	18°15.98' N	16°24.09' W	72
M107 - 628	21.06.14	07:50	TV-MUC 10	18°15.197' N	16°27.002' W	90
M107 - 629	21.06.14	08:15	TV-MUC 11	18°15.196' N	16°27.002' W	91
M107 - 630	21.06.14	10:23	BIGO I 03	18°15.006' N	16°27.010' W	91,1
M107 - 631	21.06.14	11:00 - 13:30	in situ pumps 10	18°14.81' N	16°27.05' W	92
M107 - 632	21.06.14	13:58	CTD 40	18°14.81' N	16°27.05' W	92
M107 - 633	21.06.14	15:10	Profiler 02	18°14.699' N	16°27.005' W	92,3
M107 - 634	21.06.14	16:51	CTD 41	18°11.28' N	16°39.29' W	784
M107 - 635	21.06.14	19:33	MSS 24	18°11.29' N	16°39.29' W	784
M107 - 636	21.06.14	23:12	Trace Metal CTD 10	18°09.91' N	16°45.04' W	1100
M107 - 637	22.06.14	00:47	CTD 42	18°09.91' N	16°16.45' W	1097
M107 - 638	22.06.14	02:14	CTD 43	18°09.90' N	16°45.07' W	1098
M107 - 639	22.06.14	03:02	MSS 25	18°09.93' N	16°45.12' W	1102
M107 - 640	22.06.14	05:57	MSS 26	18°14.05' N	16°31.24' W	173
M107 - 641	22.06.14	06:47	CTD 44	18°14.09' N	16°31.23' W	174
M107 - 642	22.06.14	08:00	BIGO II 03	18°14.4' N	16°31.0' W	174
M107 - 643	22.06.14	09:00	in situ pumps 11	18°14.194' N	16°31.034' W	170
M107 - 644	22.06.14	12:58	CTD 45	18°14.19' N	16°31.04' W	168
M107 - 645	22.06.14	14:37	CTD 46	18°17.291' N	16°18.937' W	46

M107 - 646	22.06.14	14:39	CTD 47	18°17.291' N	16°18.937' W	46
M107 - 647	22.06.14	15:23	TV-MUC 12	18°17.297' N	16°19.000' W	46
M107 - 648	22.06.14	15:55	in situ pumps 12	18°17.279' N	16°18.985' W	46,7
M107 - 649	22.06.14	19:24	MSS 27	18°17.11' N	16°18.84' W	46
M107 - 650	22.06.14	21:27	CTD 48	18°17.23' N	16°18.96' W	46,3
M107 - 651	22.06.14	22:42	CTD 49	18°15.19' N	16°27.01' W	91
M107 - 652	22.06.14	23:19	Trace Metal CTD 11	18°15.19' N	16°27.01' W	91
M107 - 653	22.06.14	23:53	MSS 28	18°15.24' N	16°27.02' W	91,2
M107 - 654	23.06.14	02:20	MSS 29	18°15.97' N	16°24.10' W	71,4
M107 - 655	23.06.14	04:38	CTD 50	18°15.98' N	16°24.10' W	72
M107 - 656	23.06.14	05:24	MSS 30	18°16.71' N	16°21.40' W	61
M107 - 657	23.06.14	06:28	CTD 51	18°16.69' N	16°21.49' W	60
M107 - 658	23.06.14	07:48	MUC 13	18°17.299' W	16°18.994' W	47
M107 - 659	23.06.14	08:18	MUC 14	18°17.299' W	16°18.994' W	46
M107 - 660	23.06.14	09:32	BIGO I 03	18°14.763' N	16°27.000' W	92,8
M107 - 661	23.06.14	10:55	in situ pumps 13	18°13.102' N	16°33.294' W	236,5
M107 - 662	23.06.14	14:00	CTD 52	18°13.10' N	16°33.30' W	236,4
M107 - 663	23.06.14	14:49	mooring 04	18°14.19' N	16°31'W	167
M107 - 664	23.06.14	15:45		18°14.51' N	16°26.98' W	91,5
M107 - 665	23.06.14	17:59	BIGO II 04	18°17.100' N	16°18.997' W	47,1
M107 - 666	24.06.14	00:14	ARGO float 02	17°59.59' N	17°18.12' W	2219
M107 - 667	24.06.14	01:10	CTD 53	17°59.99' N	17°16.99' W	2165
M107 - 668	24.06.14	03:26	CTD 54	18°00.03' N	17°17.01' W	2168
M107 - 669	24.06.14	08:08	TV-MUC 15	18°10.001' N	16°44.997' W	1099
M107 - 670	24.06.14	10:00	in situ pumps 14	18°10.595' N	16°42.479' W	995
M107 - 671	24.06.14	15:18	TV-MUC 16	18°14.765' N	16°28.759' W	111,7
M107 - 672	24.06.14	15:52	TV-MUC 17	18°14.483' N	16°29.634' W	129,1

M107 - 673	24.06.14	18:14	BIGO I 04	18°14.485' N	16°29.635' W	130,6
M107 - 674	24.06.14	19:21	in situ pumps 15	18°13.10' N	16°33.30' W	476,6
M107 - 675	24.06.14	21:35	CTD 55	18°13.09' N	16°33.30' W	237,5
M107 - 676	24.06.14	22:22	Trace Metal CTD 12	18°13.09' N	16°33.30' W	238
M107 - 677	24.06.14	23:08	MSS 31	18°13.16' N	16°33.32' W	237,4
M107 - 678	25.06.14	00:47	CTD 56	18°12.49' N	16°35.60' W	412,5
M107 - 679	25.06.14	01:31	MSS 32	18°12.54' N	16°35.65' W	416
M107 - 680	25.06.14	03:24	CTD 57	18°12.49' N	16°35.60' W	412
M107 - 681	25.06.14	04:28	MSS 33	18°14.34' N	16°31.01' W	169,2
M107 - 682	25.06.14	06:09	CTD 58	18°14.30' N	16°31.02' W	169,7
M107 - 683	25.06.14	08:02	BIGO II 04	18°16.850' N	16°18.953' W	53
M107 - 684	25.06.14	10:00	in situ pumps 16	18°17.003' N	16°18.97' W	46,7
M107 - 685	25.06.14	12:30	TV-MUC 18	18°17.003' N	16°18.976' W	46,5
M107 - 686	25.06.14	13:25	TV-MUC 19	18°16.287' N	16°22.910' W	65,5
M107 - 687	25.06.14	15:45	Profiler 03	18°16.999' N	16°18.990' W	40,4
M107 - 688	25.06.14	18:36	BIGO II 05	18°16.286' N	16°22.932' W	66,9
M107 - 689	25.06.14	20:25	CTD 59	18°12.48' N	16°35.57' W	411,8
M107 - 690	25.06.14	21:10	Trace Metal CTD 13	18°12.48' N	16°35.57' W	413
M107 - 691	25.06.14	22:16	MSS 34	18°12.50' N	16°35.59' W	412,5
M107 - 692	26.06.14	00:35	MSS 35	18°14.79' N	16°28.60' W	108,4
M107 - 693	26.06.14	02:49	CTD 60	18°14.790' N	16°28.574' W	108
M107 - 694	26.06.14	03:44	CTD 61	18°16.001' N	16°24.106' W	71
M107 - 695	26.06.14	04:27	MSS 36	18°15.18' N	16°26.99' W	90,5
M107 - 696	26.06.14	06:18	CTD 62	18°15.186' N	16°26.994' W	91,2
M107 - 697	26.06.14	07:53	TV-MUC 20	18°14.299' N	16°30.995' W	169
M107 - 698	26.06.14	08:30	BIGO I 04	18°14.527' N	16°29.659' W	130
M107 - 699	26.06.14	09:28	TV-MUC 21	18°13.073' N	16°33.340' W	240

M107 - 700	26.06.14	10:17	mooring 01	18°11.92' N	16°34.92' W	210
M107 - 701	26.06.14	12:38	mooring 02	18°12.79' N	16°31.09' W	150
M107 - 702	26.06.14	15:14	mooring 04	18°13.859' N	16°31.254' W	168
M107 - 703	26.06.14	16:17	DOS-Lander 01	18°13.86' N	16°26.94' W	90,7
M107 - 704	26.06.14	18:00	in situ pumps 17	18°13.098' N	16°33.306' W	235
M107 - 705	26.06.14	21:32	CTD 63	18°13.67' N	16°32.00' W	188
M107 - 706	26.06.14	22:49	Trace Metal CTD 14	18°13.67' N	16°32.00' W	189
M107 - 707	26.06.14	23:35	MSS 37	18°13.69' N	16°32.01' W	188 - 230
M107 - 708	27.06.14	02:26	MSS 38	18°10.02' N	16°44.98' W	1097
M107 - 709	27.06.14	04:20	CTD 64	18°09.99' N	16°44.97' W	1095
M107 - 710	27.06.14	08:00	BIGO II 05	18°16.056' N	16°22.836' W	65
M107 - 711	27.06.14	09:00	POZ Lander 01	18°16.0' N	16°19.0'W	50
M107 - 712	27.06.14	10:00	CTD 65	18°17.7' N	16°19.0' W	50
M107 - 713	27.06.14	10:31	Profiler 03	18°16.862' N	16°18.995' W	47,9
M107 - 714	27.06.14	12:11	TV-MUC 22	18°13.023' N	16°30.996' W	163
M107 - 715	27.06.14	14:48	Glider 03	18°09.43' N	16°37.43' W	236
M107 - 716	27.06.14	15:32	Glider 01	18°07.25' N	16°37.32' W	162
M107 - 717	27.06.14	17:00	mooring 02	18°13.27' N	16°31.04' W	164
M107 - 718	28.06.14	07:53	mooring 03	19°53.48' N	17°33.77' W	835
M107 - 719	28.06.14	12:00	CTD 66	19°53.68' N	17°49.24' W	720,5
M107 - 720	28.06.14	13:54	ADCP/uCTD section 01	19°55.02' N	17°24.87' W	119,1
M107 - 721	28.06.14	17:37	ADCP/uCTD section 02	19°29.97' N	17°52.43' W	2025
M107 - 722	28.06.14	21:40	ADCP/uCTD section 03	19°53.19' N	17°27.28' W	686
M107 - 723	29.06.14	00:45	CTD 67	19°38.99' N	17°42.02' W	1908,7
M107 - 724	29.06.14	01:43	CTD 68	19°40.81' N	17°40.13' W	1787,1
M107 - 725	29.06.14	02:34	CTD 69	19°42.56' N	17°38.31' W	2020,9
M107 - 726	29.06.14	03:28	CTD 70	19°44.35' N	17°36.45' W	1876,7

M107 - 727	29.06.14	04:20	CTD 71	19°46.08' N	17°34.58' W	1493
M107 - 728	29.06.14	05:26	CTD 72	19°49.73' N	17°30.84' W	1180
M107 - 729	29.06.14	06:29	CTD 73	19°53.32' N	17°27.10' W	623
M107 - 730	29.06.14	06:56	ADCP/uCTD section 04	19°53.31' N	17°27.05' W	570
M107 - 731	29.06.14	09:08	ADCP/uCTD section 05	19°39.00' N	17°42.05' W	1910
M107 - 732	29.06.14	12:05	ADCP/uCTD section 06	19°53.37' N	17.27.13' W	650
M107 - 733	29.06.14	15:04	ADCP/uCTD section 07	19°38.95' N	17°42.03' W	2060
M107 - 734	29.06.14	17:55	ADCP/uCTD section 08	19°53.28' N	17°27.09' W	778
M107 - 735	29.06.14	21:17	ADCP/uCTD section 09	19°38.98' N	17°42.04' W	1907,3
M107 - 736	29.06.14	23:36	mooring 03	19°50.15' N	17°30.22' W	1200
M107 - 737	30.06.14	02:49	ADCP 01	19°50.18' N	17°30.16' W	980 - 2033
M107 - 738	30.06.14	07:12	Glider 02	19°39.08' N	17°47.44' W	1894
M107 - 739	30.06.14	08:05	Glider 06	19°42.77' N	17°38.17' W	1717,9
M107 - 740	30.06.14	08:57	Glider 05	19°45.77' N	17°33.82' W	1672,8
M107 - 741	30.06.14	10:20	mooring 03	19°48.823' N	17°26.444' W	1237

Abbreviations of the different gears

Water column

CTD: CTD watersampling rosette, **Trace Metal CTD:** CTD watersampling rosette specifically designed for the measurement of trace metals**,**

u-CTD: underway CTD, **fish:** towed fish for continuous surface water sampling, **MSS:** Microstructure CTD for the measurement of physical properties and turbulence, **Glider**: for the measurement of physical properties, turbulence, O_2, nitrate, **in situ pumps**: radiotracer and C,N,P composition of particles, **mooring**: currents (ADCP)

Benthos

BIGO-I, BIGO-II (Biogeochemical observatory): Geochemistry, Microbiology, flux measurements

TV-MUC (Multiple corer video-guided): Geochemistry, Microbiology, Foraminifera
Profiler: Lander equipped with voltammetry, Lab on a Chip, CTD, turbidity
POZ Lander (Physical Oceanography Lander): ADCP current measurements