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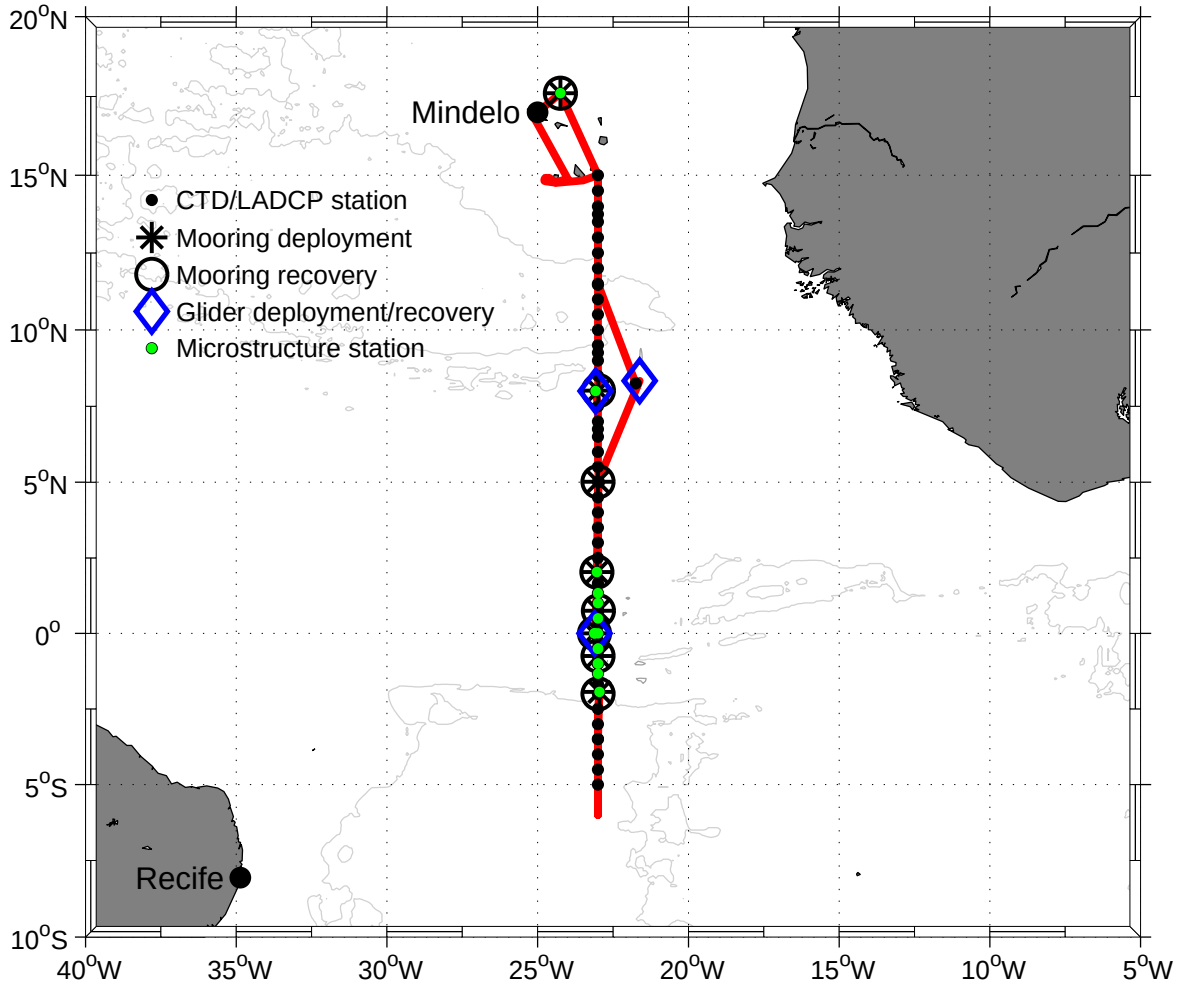
Short Cruise Report
R/V METEOR M80/1Mindelo - Mindelo
26. October – 23. November 2009
Chief Scientist: Peter Brandt
Captain: Walter Baschek



Ship track of R/V METEOR cruise M80/1 with locations of CTD/LADCP casts, mooring deployments and recoveries, glider deployments and recoveries and microstructure stations marked.

Participants M80/1

1	Brandt, Peter, Prof. Dr.	Chief Scientist	IFM-GEOMAR
2	Brownell, Darlene	Tracer (SF6)	BIO
3	Dengler, Marcus, Dr.	Microstructure /ADCP	IFM-GEOMAR
4	Didwischus, Sven-Helge	CTD, moorings	IFM-GEOMAR
5	Fehsenfeld, Sandra	Incubation, genetics	IFM-GEOMAR
6	Fessler, Sebastian	DIC/alkalinity	IFM-GEOMAR
7	Fischer, Jürgen, Dr.	Moorings	IFM-GEOMAR
8	Funk, Andreas, Dr.	ADCP/ Microstructure	IFM-GEOMAR
9	Großkopf, Tobias	Incubation, particle analysis	IFM-GEOMAR
10	Hahn, Johannes	CTD	IFM-GEOMAR
11	Halm, Hannah	Nitrogen loss	MPI-Bremen
12	Hormann, Verena, Dr.	Salinometer/CTD	IFM-GEOMAR
13	Koy, Uwe	Microstructure	IFM-GEOMAR
14	Krahmann, Gerd, Dr.	Glider, CTD, LADCP	IFM-GEOMAR
15	Krupke, Andreas	Nitrogen fixation	MPI-Bremen
16	Melo, Vito	CTD, Chlorophyll	INDP
17	Müller, Mario	Moorings / computers	IFM-GEOMAR
18	Niehus, Gerd	Moorings	IFM-GEOMAR
19	Papenburg, Uwe	Moorings / technology	IFM-GEOMAR
20	Pinck, Andreas	Glider, CTD, optodes	IFM-GEOMAR
21	Schneider, Anke	Tracer (SF5CF3)	IFM-GEOMAR
22	Steinhoff, Tobias	DIC/alkalinity, O_2	IFM-GEOMAR
23	Stöven, Tim	O_2, nutrients	IFM-GEOMAR
24	Viera, Nuno	CTD/ADCP	INDP
25	von Neuhoff, Holger	Media	Freelance
26	Wagener, Thibaut, Dr.	Trace metals, GoFlo	IFM-GEOMAR
27	Wuttig, Kathrin	Trace metals, GoFlo	IFM-GEOMAR
28	Zantopp, Rainer	CTD/Moorings	IFM-GEOMAR
29	Truscheid, Thorsten	Meteorological technology	DWD

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BIO Bedford Institute of Oceanography, Ocean Science, Katherine Ellis Laboratory, Workstation 4-12, 1 Challenger Drive, Dartmouth, Nova Scotia, B2Y 4A2, Canada, e-mail: BrownellD@mar.dfo-mpo.gc.ca

DWD Deutscher Wetterdienst, Geschäftsfeld Seeschiffahrt, Bernhard-Nocht-Str. 76, 20359 Hamburg - Germany, e-mail: edmund.knuth@dwd.de

INDP Instituto de Desenvolvimento das Pescas, Cova de Inglesa, P.B. 132 Mindelo, S. Vicente - Cape Verde, e-mail: pericles.silva@tenatso.com

MPI-Bremen Max-Planck-Institut für Marine Mikrobiologie, Celsiusstrasse 1, 28359 Bremen - Germany, e-mail: glavik@mpi-bremen.de

Objectives

Research cruise M80/1 is a contribution to the SFB 754 “Climate-Biogeochemistry Interactions in the Tropical Ocean”. Shipboard, glider and moored observations are used to study the temporal and spatial variability of physical and biogeochemical parameters within the oxygen minimum zone (OMZ) of the tropical North Atlantic. As part of the BMBF “Nordatlantik” project, it further focuses on the equatorial current system, particularly the Equatorial Undercurrent (EUC), and on oceanic mixing processes in the upwelling regions of the tropical Atlantic. Specific topics of the present research cruise are:

- Analysis of oxygen supply toward the oxygen minimum zone in the tropical North Atlantic, particularly in the area of the northern branch of the North Equatorial Countercurrent (NECC), of the North Equatorial Undercurrent (NEUC) and near the equator;
- Analysis of oxygen variability on daily to interannual time scales;
- Biogeochemical studies regarding the distributions of the key nutrients nitrate and phosphate, pelagic community responses to redox-induced changes in nutrient stoichiometry;
- Determination of the role of fluctuations within the subtropical cell for tropical air-sea interactions, particularly the role of the EUC for equatorial sea surface temperature variations;
- Determination of the role of advection and vertical mixing for the heat budget of the near surface ocean particularly within the equatorial cold tongue;
- Study of the influence of variations of the Atlantic meridional overturning circulation (AMOC) as well as of ENSO/NAO on the tropical Atlantic variability (TAV).

During the research cruise, hydrographic station observations were performed using a CTD/O_2 rosette, including water sampling for oxygen, nutrients and other biogeochemical tracers. Of particular importance were underway current measurements to quantify the strength of the circulation within the OMZ of the tropical North Atlantic as well as of the equatorial current bands. During M80/1, an intensive mooring program were carried out with 8 mooring recoveries and 8 mooring deployments. During RV l’Atalante cruise IFM-GEOMAR-4 in February/March 2008 as part of BMBF “Nordatlantik”, a mooring array consisting of 5 current meter moorings was installed along 23°W between 2°S and 2°N. This array, that was recovered and redeployed during M80/1, is aimed at quantifying the variability of the thermocline water supply toward the equatorial cold tongue which develops east of 10°W during boreal summer. Within the framework of SFB 754, two moorings with CTD/O_2 profilers were recovered and redeployed with other instrumentation in the center and at the southern rim of the OMZ of the tropical North Atlantic. A multidisciplinary mooring near the Cape Verde Islands, which includes a large number of physical and biogeochemical sensors, was recovered and redeployed right at the beginning of the cruise. During the cruise, one glider was recovered that was deployed two months earlier. Another glider was deployed for two short term missions, near the equator for about 8 days and near 8°N for one day. This glider was equipped additionally to standard sensors, i.e. CTD/O_2, chlorophyll and turbidity, with a new microstructure probe.

Narrative

R/V METEOR departed from Mindelo on October 26, 2009 at 10:00 and headed north between the Cape Verdian islands of São Vicente and Santo Antão. North of São Vicente, the Tenatso mooring (**KPO_1028)** was recovered on the day of departure from Mindelo as the first activity of the cruise – just 6h after leaving port. The upper 400m of the mooring were heavily entangled in monofilament fishing lines. However, all instruments were in place with only two Microcats damaged. Biofouling of the upper part of the mooring again was an issue.

During the following night, two CTD/O_2 stations were carried out, that are used for water samples of N_20, dissolved inorganic carbon (DIC), alkalinity, nutrients, oxygen, chlorophyll and other chemical and biological parameters. The two CTD/O_2 stations were also needed for calibration of different moored instruments to be deployed during the next day. Additionally, we had a GoFlo station with water sampling for the determination of trace metals (Fe, Mn, Cu) and phosphate content as well as an extended microstructure profiling. During CTD/O_2 and GoFlo stations we tried to read data out of a pressure - inverted echo sounder (PIES) that was deployed in March 2008. Although communication with the instrument could be established and a correct depth recording of the instrument could be inferred, it was impossible to transfer the recorded dataset.

October 27 began with a mooring deployment (**KPO_1041**) simulation (to be used at each of the deployments). Again, this mooring was very ambitious as the top element should be located at only 20m below surface. Topography was known at great detail and we dropped the anchor at the tentative position allowing for 10% backfall of the anchor. The descent of the top element was well observed (as was possible during each of the deployments). Immediately afterwards we deployed an Inverted Echo Sounder (PIES) at the mooring site und waited for another half hour. We then began a survey along the deployment track of the mooring to make sure that the mooring top remains underwater; nothing was spotted and the mooring was declared successfully deployed.

After these first two very intensive working days, R/V METEOR headed southeast to reach the 23°W meridian at about 15°N. The 23°W section is an important repeat section for hydrographic and current observations. Current observations from aboard R/V METEOR were carried out using a 75-kHz shipboard ADCP. This instrument normally belongs to R/V POSEIDON and was used here because of a failure of R/V METEOR's 75 kHz ADCP a few legs before. It delivered very good data. However, a simultaneous use of the ship's Doppler log results in an almost complete data loss of the shipboard ADCP. Additionally, the use of the ship's thruster regularly used during station work significantly reduced velocity data quality. Along the 23°W section, few CTD/O_2 stations followed for instrument calibration and releaser tests. At 8°15'N we started water sampling for incubations aimed at studying nitrogen fixation. Due to the large amount of water needed for the incubations and accompanying water sample analysis, we performed every other day of the cruise a 600m- CTD/O_2 cast exclusively dedicated to the incubation work.

Two month ago a glider (**ifm03**) was deployed south of São Vicente. This glider was able to reach 8°N following a 1300km long path through the Cape Verdian islands and along the 23°W section recording a full suite of hydrographic data before its batteries ran low. After a

few days of surface drift the glider was recovered at 8°15'N, 21°45'W. This was the most extended mission of an IFM-GEOMAR glider up to now.

Our cruise proceeded along the 23°W section, mainly doing mooring work with few CTD/O_2, GoFlo and Microstructure stations in between. In the morning of October 31, we recovered the mooring at 5°N (**KPO_1026**). This mooring contained a moored profiler (MMP) and it was suspected that fishing lines would be found in the top part of the mooring. To our surprise, the MMP parked at his upper stop and was overgrown by algae. At the lower stop we then found lots of fishing equipment wrapped around the instrument group below the profiling range. Later we found that the profiler worked for only 4 months and then stopped with drained batteries. In the afternoon, following a CTD/O_2 station at the mooring position, we redeployed the SFB-mooring at 5°N (**KPO_1047**); instead of a moored profiler (as in the recovered mooring) we used now discrete measurements of CTD/O_2 about 100m apart. The used oxygen loggers were developed at IFM-GEOMAR.

The current meter mooring at 2°N (**KPO_1025**) was recovered in the afternoon of November 1st, and redeployed (**KPO_1046**) during the following morning. On November 3, we recovered (**KPO_1024**) and redeployed (**KPO_1045**) the current meter mooring at 0° 45'N. During the next day we reached the equator, where we started our work with microstructure measurements. These measurements were continued between mooring work, CTD/O_2 and GoFlo stations to obtain a complete daily cycle of equatorial turbulence. The equatorial mooring (**KPO_1023**) was recovered during the morning of November 4. During the next day, we had a visit with R/V POLARSTERN. We organized a transfer between the two ships allowing scientists and crew members to discuss results and get a tour of the respective other ship, machinery and instrumentation. After the visit, we continued with the deployment of the equatorial mooring (**KPO_1044**). At the equator we deployed our second glider (**ifm02**) in use. For the first time, such a glider was equipped with a MicroRider microstructure probe. It was send out for an 8 day mission to be recovered on our way back to Mindelo. Problems (leak detect) with our third glider (**ifm08**) did not allow to send the glider for a planned northward transect from the equator towards the Cape Verdian islands.

On our way toward 6°S, we recovered only one other mooring (**KPO_1022**) at 0°45'S. On our way back, on November 11, the mooring at 2°S was then recovered (**KPO_1021**) and also redeployed (**KPO_1042**) on the same day. The mooring at 0°45'S (**KPO_1043**) was redeployed the next day. The only significant failure within the equatorial mooring array was the upward looking NB-ADCP that stopped working due to a loose connector. It contained no data. Overall, the instrument performance was exceptional good. All the deployment went very smoothly into the water. Particularly important as all the moorings were equipped with moored profiler (cooperation with J. Toole, WHOI) for the measurement of deep circulation and hydrography between 1000 and 3500m depth. Thus the mooring work here can be considered an very successful operation.

Between 5°N and 5°S we took deep CTD/O_2 profiles down to 4500m (or the bottom if shallower). At the beginning of the deep CTD/O_2 stations there were few problems with noisy oxygen and later also conductivity data. After exchanging sensors, the CTD/O_2 probe itself was identified as the source of data noise and changed against the second instrument aboard. Few CTD/O_2 casts had to be repeated on the way back. Attached to the CTD/O_2 rosette, we

used two 300 kHz WorkHorse ADCPs, that were chosen out of a set of 4 instruments as the best performing combination. They delivered throughout the cruise very good velocity data even at larger depth.

Back at the equator the glider (**ifm02**)/MicroRider package was recovered after an 8 day mission. The MicroRider recorded 256 microstructure profiles (up and downcasts) from the surface to 350m. The 4GB flashcard was full after 6.5 days. A first look at the data showed high quality turbulence data. This was an extremely successful mission demonstrating the value of such a single glider mission with the MicroRider. In comparison, during about 36h of ship time, we were able to take only 106 microstructure profiles by the loosely tethered microstructure probe connected to the winch at the ship's aft deck.

On the way back from 5°N to 15°N we changed the shipboard ADCP in the moon pool. For this section, we used the 38-kHz ADCP that has an increased range compared to the 75-kHz instrument. Due to this change we were able to cover also the lower part of the OMZ with continuous velocity measurements.

During two days of mooring recovery (**KPO_1027**) and redeployment (**KPO_1048**), on November 17 and 18, we used the time for another one day mission of the glider/MicroRider package. Again, a full set of microstructure profiles could be collected this time between the surface and 700m. The recovered mooring was the second SFB754 mooring with an MMP as the main instrument. The MMP sitting at the lower end was also entangled in fishing line, and it must have been caught soon after deployment, with only 3 profiles (2 days) recorded. In conclusion, MMP's in the upper 1000m are subject to being caught by fishing lines and should not be used in this region.

The 23°W section was continued with water sampling for incubations, CTD/O_2 and GoFlo casts until we reached 15°N. Altogether we collected during the cruise 80 CTD/O_2 profiles, out of these we had 4 6h-yoyo stations for the observation of short term variability in the OMZ, 16 GoFlo casts, and one station with the in-situ pump for collecting microorganisms. The scientific work of R/V METEOR cruise M80/1 ended with the ADCP section along the glider transect running between the Cape Verdian islands of Fogo and Santiago towards their nominal deployment position south of São Vicente. From there the ship headed toward Mindelo where the cruise ended on November 23, 9:00.

Acknowledgements

We very much appreciated the cooperative working atmosphere as well as the professionalism and seamanship of crew, officers and Captain of R/V METEOR, which made this work a success. Financial support came from the German Bundesministerium für Bildung, Wissenschaft und Forschung (BMBF) as part of the Verbundvorhaben Nordatlantik (Nordatlantik, 03F0443B) and from the German Science Foundation (DFG) as part of the SFB754 (Climate Biogeochemistry Interactions in the Tropical Ocean).

Tab. 1.1: Station list of RV METEOR cruise M80/1.

Station Ship/Science	**Latitude**	**Longitude**	**Time**	**Work**
1070/ KPO_1028	17°36.40' N	24°14.98' W	26.10. 15:30-19:40	**Mooring** released, on deck
1071/1	17°36.04'N	24°14.61'W	26.10. 20:40-21:10	**GoFlo** water sampling (100m)
1072/1	17°36.01'N	24°14.63'W	26.10. 21:20-00:40	**CTD/LADCP** station (to bottom), additional stops for microcat calibration
				During GoFlo and CTD station PIES communication (correct depth recording but no data transfer possible)
1073/-			26.10. 00:50-02:00	**Microstructure**
1074/2			27.10. 02:20-3:50	**CTD/LADCP** station (~1000m)
1075/-			27.10. 04:00-07:10	**Microstructure**
1076/2			27.10. 07:30-08:30	**GoFlo** water sampling (400m)
1077/ KPO_1041	17°36.40' N	24°14.98' W	27.10. 08:40-16:00	Drift test, **mooring** deployment, anchor slipped, submerse of top-element observed
1078/-			27.10. 16:10	PIES deployment
			27.10. 16:10-16:30	Check that **mooring** stays under water
1079/3	11°30'N	23°W	29.10. 05:10-06:30	**CTD/LADCP** station (1000m), water sampling for salinometer substandard, calibration of microcats, optodes, releaser test
1080/4	11°30'N	23°W	29.10. 08:00-08:40	CTD/LADCP station (600m), water sampling for **Incubations**
1081/3	8°15'N	21°45'W	30.10. 05:00-05:20	**GoFlo** water sampling (100m)
1082/5	8°15'N	21°45'W	30.10. 05:30-06:30	**CTD/LADCP** station (800m), calibration of microcats, optodes
1083/4	8°15'N	21°45'W	31.10. 06:50-07:50	**GoFlo** water sampling (400m)
1084/-	8°20.22'N	21°37.37'W	30.10. 08:00-09:30	**Glider** recovery
1085/6	5°03'N	23°00.0'W	31.10. 06:50-07:40	CTD/LADCP station (600m), water sampling for **Incubations**
1086/ KPO_1026	5°00.9'N	23°00.0'W	31.10. 08:00-10:50	**Mooring** released, on deck
1087/7	5°00.9'N	23°00'W	31.10. 11:10-12:00	**CTD/LADCP** station (1000m)

1088/ KPO_1047	5°00.90'N	23°00.00'W	31.10. 12:10-18:00	Drift test, **mooring** deployment, anchor slipped, submerse of top-element observed
1089/ KPO_1025	2°02.5'N	23°02.0' W	1.11. 11:40-15:30	**Mooring** released, on deck
1090/5	2°02.5'N	23°02.0' W	1.11. 15:50-16:10	**GoFlo** water sampling (100m)
1091/8	2°02.5'N	23°02.0' W	1.11. 16:30-19:40	**CTD/LADCP** station (to bottom)
1092/6	2°02.5'N	23°02.0' W	1.11. 19:40-20:30	**GoFlo** water sampling (400m)
1093/-	2°02.5'N	23°02.0' W	1.11. 20:30-21-10	**Microstructure**
1094/9	1°40'N	23°00' W	1.11. 23:40-2:40	**CTD/LADCP** station (to bottom)
1095/10	2°02.5'N	23°02.0'W	2.11. 05:00-05:20	CTD/LADCP station (600m), water sampling for **Incubations**
1096/11	2°02.5'N	23°02.0'W	2.11. 05:40-06:20	**CTD/LADCP** station (600m), instrument calibration
1097/ KPO_1046	2°02.43'N	23°01.93'W	2.11. 06:30-13:40	**Mooring** deployment, anchor slipped, submerse of top-element observed
1098/12	1°20'N	23°00'W	2.11. 17:40-21:00	**CTD/LADCP** station (to bottom)
1099/-	1°20'N	23°00'W	2.11. 21:10-22-00	**Microstructure**
1100/13	1°00'N	23°00'W	3.11. 00:10-02:50	**CTD/LADCP** station (to bottom)
1101/-	1°00'N	23°00'W	3.11. 03:00-05-50	**Microstructure**
1102/ KPO_1024	0°45.2'N	22°59.3' W	3.11. 07:20-09:40	**Mooring** released, on deck
1103/14	0°45.2'N	22°59.3' W	3.11. 10:20-13:20	**CTD/LADCP** station (to bottom)
1104/ KPO_1045	0°45.13'N	22°59.30' W	3.11. 14:40-18:50	**Mooring** deployment, anchor slipped, submerse of top-element observed
1105/15	0°30'N	23°00'W	3.11. 20:30-23:10	**CTD/LADCP** station (to bottom)
1106/-	0°30'N	23°00'W	3.11. 23:10-00:00	**Microstructure**
1107/16	0°15'N	23°00'W	4.11. 01:40-04:30	**CTD/LADCP** station (to bottom)
1108/-	0°00'N	23°06.8'W	4.11. 06:20-07:10	**Microstructure**
1109/ KPO_1023	0°00'N	23°06.8'W	4.11. 07:30-09:40	**Mooring** released, on deck
1110/-	0°00'N	23°06.8'W	4.11. 10:00-11:00	**Microstructure**

1111/17	0°00’N	23°06.8’W	4.11. 11:20-12:30	**CTD/LADCP** station (to 1000), instrument calibration without bottles
1112/-	0°00’N	23°06.8’W	4.11. 13:20-14:40	**Microstructure**
1113/ifm02	0°07’N	23°06.8’W	4.11. 15:00-18:30	**Glider** deployment
1114/-	0°00’N	23°00’W	4.11. 19:50-20:50	**Microstructure**
1115/7	0°00’N	23°00’W	4.11. 21:20-21:40	**GoFlo** water sampling (100m)
1116/-	0°00’N	23°00’W	4.11. 21:50-22:40	**Microstructure**
			22:40-01:00	**CTD cable termination**
1117/-	0°00’N	23°00’W	5.11. 00:20-01:00	**Microstructure**
1118/18	0°00’N	23°00’W	5.11. 01:10-04:00	**CTD/LADCP** station (to bottom)
1119/-	0°00’N	23°00’W	5.11. 04:20-05:10	**Microstructure**
1120/8	0°00’N	23°00’W	5.11. 05:30-06:30	**GoFlo** water sampling (400m)
1121/19	0°00’N	23°00’W	5.11. 06:40-07:20	CTD/LADCP station (600m), water sampling for **Incubations**
1122/-	0°00’N	23°00’W	5.11. 07:30-09:20	**Microstructure**
			5.11. 10:00-13:00	**R/V POLARSTERN** visit
1123/ KPO_1044	0°00.17‘N	23°06.84‘ W	5.11. 13:00-19:00	Drift test, **mooring** deployment, anchor slipped, submerse of top-element observed
1124/-	0°00.2‘N	23°06.8‘ W	5.11. 19:10-20:10	**Microstructure**
1125/20	0°15’S	23°00’W	5.11. 22:10-01:10	**CTD/LADCP** station (to bottom)
1126/21	0°30’S	23°00’W	6.11. 2:50-06:00	**CTD/LADCP** station (to bottom)
1127/-	0°30‘S	23°00‘ W	6.11. 6:00-7:20	**Microstructure**
1128/ifm08	0°30‘S	23°00‘ W	6.11. 7:40-10:00	**Glider** deployment/recovery (leak detect)
1129/ KPO_1022	0°44.94’S	22°59.70’W	6.11. 11:50-13:50	**Mooring** recovery
1130/ifm08	0°45‘S	23°00‘ W	6.11. 14:20-15:50	**Glider** deployment/recovery (leak detect)
1131/22	0°45’S	23°00’W	6.11. 16:40-19:10	**CTD/LADCP** station (to bottom)
1132/23	1°00’S	23°00’W	6.11. 21:10-00:00	**CTD/LADCP** station (to bottom)

1133/-	1°00‘S	23°00‘ W	7.11. 0:10-1:10	**Microstructure**
1134/24	1°20’S	23°00’W	7.11. 03:10-06:10	**CTD/LADCP** station (to bottom)
1135/-	1°20‘S	23°00‘ W	7.11. 6:20-7:10	**Microstructure**
1136/25	1°20’S	23°00’W	7.11. 07:30-08:10	CTD/LADCP station (600m), water sampling for **Incubations**
1137/26	1°40’S	23°00’W	7.11. 10:20-13:20	**CTD/LADCP** station (to bottom)
1138/-	2°00‘S	23°00‘ W	7.11. 15:30-16:20	**Microstructure**
1139/9	2°00’S	23°00’W	7.11. 16:30-17:00	**GoFlo** water sampling (100m)
1140/27	2°00’S	23°00’W	7.11. 17:10-20:20	**CTD/LADCP** station (to bottom)
1141/10	2°00’S	23°00’W	7.11. 20:30-21:20	**GoFlo** water sampling (400m)
1142/28	2°30’S	23°00’W	8.11. 00:30-04:00	**CTD/LADCP** station (to bottom)
1143/29	3°00’S	23°00’W	8.11. 06:50-10:00	**CTD/LADCP** station (to bottom)
1144/30	3°30’S	23°00’W	8.11. 13:10-16:20	**CTD/LADCP** station (to bottom)
1145/31	4°00’S	23°00’W	8.11. 19:20-22:40	**CTD/LADCP** station (to bottom)
1146/32	4°30’S	23°00’W	9.11. 01:40-04:50	**CTD/LADCP** station (to bottom)
1147/33	4°30’S	23°00’W	9.11. 05:50-06:20	CTD/LADCP station (600m), water sampling for **Incubations**
1148/11	5°00’S	23°00’W	9.11. 09:30-09:50	**GoFlo** water sampling (100m)
1149/34	5°00’S	23°00’W	9.11. 10:00-12:50	**CTD/LADCP** station (to bottom)
1150/12	5°00’S	23°00’W	9.11. 13:00-13:50	**GoFlo** water sampling (400m)
	6°00’S	23°00’W		**ADCP section**
1151/35	3°30’S	23°00’W	10.11. 12:50-17:20	**CTD/LADCP** station (to bottom)
1152/36	2°00’S	23°00’W	11.11. 01:40-04:50	**CTD/LADCP** station (to bottom)
1153/-	2°00‘S	23°00‘ W	11.11. 04:50-06:10	**Microstructure**
1154/37	2°00’S	23°00’W	11.11. 06:20-06:50	CTD/LADCP station (600m), water sampling for **Incubations**
1155/ KPO_1021	1°56.4’S	22°57.0’W	11.11. 08:20-11:00	**Mooring** recovery
1156/ KPO_1042	2°00.04’S	22°59.98’W	11.11. 13:10-17:50	**Mooring** deployment, anchor slipped, submerse of top-element

				observed
1157/38	1°00’S	23°00’W	11.11. 23:30-02:20	**CTD/LADCP** station (to bottom)
1158/39	0°45’S	23°00’W	12.11. 03:50-06:20	**CTD/LADCP** station (to bottom)
1159/ KPO_1043	0°44.95’S	22°59.74’W	12.11. 06:30-11:50	**Mooring** deployment, anchor slipped, submerse of top-element observed
1160/40	0°30’S	23°00’W	12.11. 13:10-17:00	**CTD/LADCP** station (to bottom)
1161/-	0°00‘S	23°00‘ W	12.11. 20:00-22:20	**Microstructure**
1162/41	0°00’S	23°00’W	12.11. 22:50-01:30	**CTD/LADCP** station (to bottom)
1163/-	0°00‘S	23°00‘ W	13.11. 01:40-04:20	**Microstructure**
1164/42	0°00’S	23°00’W	13.11. 04:50-05:20	CTD/LADCP station (600m), water sampling for **Incubations**
1165/-	0°00‘S	23°00‘ W	13.11. 05:30-06:30	**Microstructure**
1166/ KPO_1044a	0°00.2’N	23°06.8’W	13.11. 07:30-08:00	**Mooring** recovery (only top element)
1167/ifm02	0°00’N	23°04.5’W	13.11. 08:00-08:40	**Glider recovery**
1168/-	0°00‘N	23°04.5‘ W	13.11. 09:00-10:10	**Microstructure**
1169/43	2°00’N	23°00’W	14.11. 00:00-07:00	**Yoyo-CTD/LADCP station** (280-520m)
1170/ifm08	2°00’N	23°00’W	14.11. 07:30-09:00	**Glider deployment/recovery** (leak detect)
1171/44	2°00’N	23°00’W	14.11. 09:20-12:20	**CTD/LADCP** station (to bottom)
1172/45	2°30’N	23°00’W	14.11. 15:30-18:40	**CTD/LADCP** station (to bottom)
1173/46	3°00’N	23°00’W	14.11. 23:50-04:30	**CTD/LADCP** station (to bottom)
1174/47	3°30’N	23°00’W	15.11. 07:40-08:10	CTD/LADCP station (600m), water sampling for **Incubations**
1175/48	3°30’N	23°00’W	15.11. 09:00-12:30	**CTD/LADCP** station (to bottom)
1176/49	4°00’N	23°00’W	15.11. 15:20-18:40	**CTD/LADCP** station (to bottom)
1177/50	4°30’N	23°00’W	15.11. 21:40-01:00	**CTD/LADCP** station (to bottom)
1178/13	5°00’N	22°58’W	16.11. 03:40-04:10	**GoFlo** water sampling (100m)
1179/51	5°00’N	22°58’W	16.11. 04:20-07:30	**CTD/LADCP** station (to bottom)
1180/14	5°00’N	22°58’W	16.11.	**GoFlo** water sampling (600m)

			07:40-08:50	
1181/52	5°00’N	22°58’W	16.11. 09:00-15:10	**Yoyo-CTD/LADCP station** (180-520m)
1182/53	5°30’N	23°00’W	16.11. 18:00-18:50	**CTD/LADCP** station (to 1300m)
1183/54	6°00’N	23°00’W	16.11. 21:40-22:50	**CTD/LADCP** station (to 1300m)
1184/55	6°30’N	23°00’W	17.11. 01:50-02:40	**CTD/LADCP** station (to 1300m)
1185/56	6°45’N	23°00’W	17.11. 04:20-04:50	CTD/LADCP station (600m), water sampling for **Incubations**
1186/57	7°00’N	23°00’W	17.11. 06:30-07:20	**CTD/LADCP** station (to 1300m)
1187/58	7°30’N	23°00’W	17.11. 10:30-11:30	**CTD/LADCP** station (to 1300m)
1188/ifm02	7°58’N	23°05’W	17.11. 14:20-16:30	**Glider** deployment
1189/ KPO_1027	8°01’N	22°59’W	17.11. 17:40-20:30	**Mooring** recovery
1190/59	8°01’N	22°59’W	17.11. 21:00-22:00	**CTD/LADCP** station (to 1300m)
1191/-	8°01’N	22°59’W	17.11. 22:20-23:50	**Microstructure**
1192/60	8°01’N	22°59’W	17.11. 00:20-06:10	**Yoyo-CTD/LADCP station** (180-520m)
1193/-	8°01’N	22°59’W	18.11. 06:20-07:40	**Microstructure**
1194/ KPO_1048	8°01’N	22°59’W	18.11. 08:00-14:10	**Mooring** deployment
1195/-	8°01’N	23°04.5’W	18.11. 15:10-16:40	**Microstructure**
1196/ifm02	8°00’N	23°05’W	18.11. 17:10-17:50	**Glider** recovery
1197/61	8°00’N	23°05’W	18.11. 18:20-18:50	**CTD/LADCP** station (to 500m)
1198/-	8°00’N	23°05’W	18.11. 19:10-22:40	**In-situ Pump** station
1199/62	8°30’N	23°00’W	19.11. 01:50-02:50	**CTD/LADCP** station (to 1300m)
1200/63	9°00’N	23°00’W	19.11. 05:40-06:20	CTD/LADCP station (600m), water sampling for **Incubations**
1201/64	9°00’N	23°00’W	19.11. 07:00-08:00	**CTD/LADCP** station (to 1300m)
1202/65	9°15’N	23°00’W	19.11. 09:30-11:00	**CTD/LADCP** station (to 1300m)
1203/66	9°30’N	23°00’W	19.11. 12:40-13:40	**CTD/LADCP** station (to 1300m)
1204/67	10°00’N	23°00’W	19.11. 16:30-17:30	**CTD/LADCP** station (to 1300m)

1205/68	10°30’N	23°00’W	19.11. 20:40-21:40	**CTD/LADCP** station (to 1300m)
1206/15	11°00’N	23°00’W	20.11. 00:50-01:10	**GoFlo** water sampling (100m)
1207/69	11°00’N	23°00’W	20.11. 01:20-02:20	**CTD/LADCP** station (to 1300m)
1208/16	11°00’N	23°00’W	20.11. 02:30-03:10	**GoFlo** water sampling (400m)
1209/70	11°28’N	23°00’W	20.11. 06:10-12:20	**Yoyo-CTD/LADCP station** (280-520m)
1210/71	11°28’N	23°00’W	20.11. 12:20-13:40	**CTD/LADCP** station (to 1300m)
1211/72	12°00’N	23°00’W	20.11. 17:50-18:40	**CTD/LADCP** station (to 1300m)
1212/73	12°00’N	23°00’W	20.11. 19:10-20:10	**CTD/LADCP** station (to 1300m)
1213/74	12°30’N	23°00’W	20.11. 23:20-00:20	**CTD/LADCP** station (to 1300m)
1214/75	13°00’N	23°00’W	21.11. 03:30-04:30	**CTD/LADCP** station (to 1300m)
1215/76	13°30’N	23°00’W	21.11. 07:50-08:40	**CTD/LADCP** station (to 1300m)
1216/77	13°45’N	23°00’W	21.11. 10:20-11:00	CTD/LADCP station (600m), water sampling for **Incubations**
1217/78	14°00’N	23°00’W	21.11. 12:50-13:50	**CTD/LADCP** station (to 1300m)
1218/79	14°30’N	23°00’W	21.11. 17:00-18:00	**CTD/LADCP** station (to 1300m)
1219/80	15°00’N	23°00’W	21.11. 21:20-22:20	**CTD/LADCP** station (to 1300m)
	14°53’N	24°00’W		**ADCP section**