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Short Cruise Report
R/V METEOR M148
Belem, Brazil – Walvis Bay, Namibia
24th May – 29th June 2018
Chief Scientist: Dr. Marcus Dengler
Captain: Rainer Hammacher

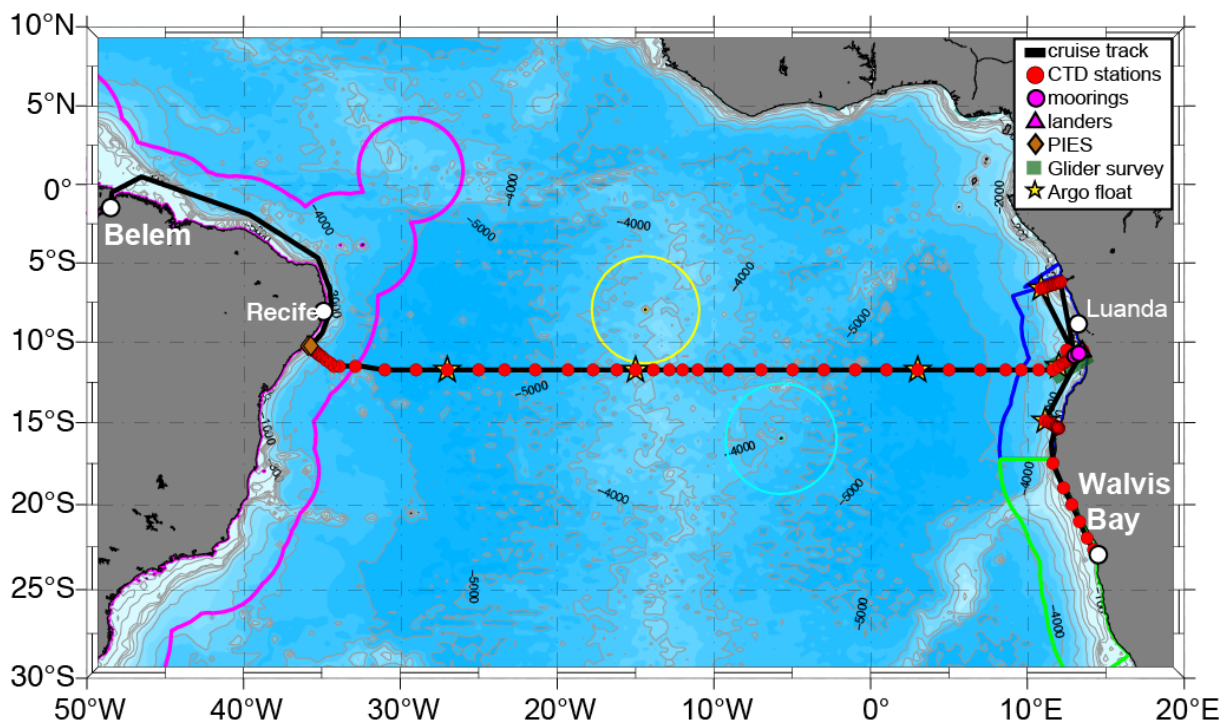


Fig.1: Bathymetric map with cruise track of R/V METEOR cruise M148 (black solid line) including locations of conductivity-temperature-depths (CTD) stations, positions of pressure inverted echo sounder (PIES) deployments, mooring and lander deployments and recoveries, glider operations and positions of Argo float releases.

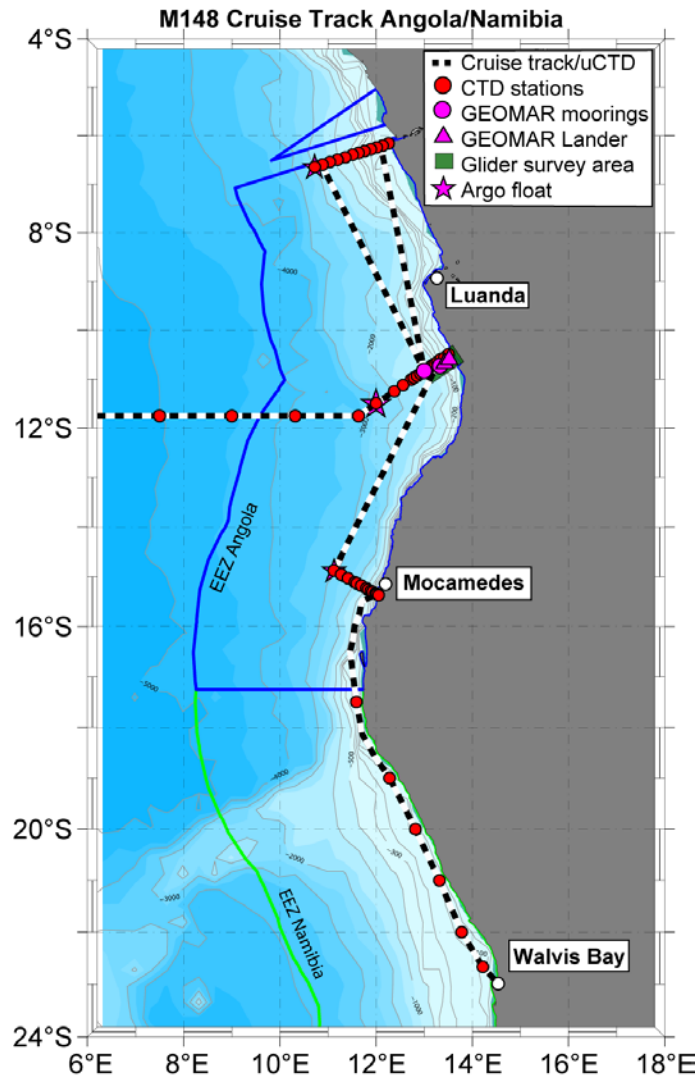


Fig. 2: Detailed bathymetric map and M148 cruise track of the survey area in Angolan and Namibian exclusive economic zones (EEZ).

Objectives

During R/V METEOR cruise M148 a physical oceanography and biogeochemical study was carried out in the tropical South Atlantic along 11°S and in the eastern boundary upwelling region of Angola and Namibia. The cruise combined the foci of the BMBF collaborative projects “Southwest African Coastal Upwelling System and Benguela Niños II (SPACES-SACUS II)” and “Regional Atlantic Circulation and Global Change (RACE II)”. The major objectives of the cruise were to

(1) quantify the variability of the eastern boundary current circulation off Angola and Namibia and to investigate the variability of anomalous water masses advection in conjunction with coastal wave propagation and interannual climate variability;

(2) elucidate the mechanisms sustaining upwelling off Angola during austral winter by carrying out a 4-day upwelling process study;

(3) determine the strength of the tropical Atlantic meridional overturning circulation and long-term variability of deep water masses by collecting a full-depth hydrographic transect across the Atlantic at 11°S.

In addition to the scientific program, a capacity strengthening program for students and scientists from African and South American countries was carried out. Altogether, nine students from Angola, Benin, Brazil, Argentina and Chile received training during the cruise. The training program was supported by the Nippon Foundation and POGO Ship-board Training Fellowship programme and the BMBF-SACUS project.

Narrative

On Thursday, May 24 2018, R/V METEOR departed from the harbour of Belém, Brazil at 6:30 am local time. Following the Rio Para downstream, we reached the Atlantic at 2:30 pm on the same day. Sampling by the underway systems that included trace gas concentration measurements in the surface waters, particularly nitrous oxide (N₂O) and carbon monoxide and dioxide (CO and CO₂), sea surface temperature and salinity measurements and upper ocean velocity measurements was started at 23:00 UTC.

The working program on the Brazilian shelf began on May 30 at 21:00 UTC, about 36 hours later than expected. Strong southeastern trade winds of 5 to 6 Beaufort during the first 4 days and strong westward surface flow within the Brazil Current significantly reduced the speed of our vessel. During the next two days, we completed a conductivity-temperature-depth-oxygen (CTD-O₂) section that was complemented by lowered acoustic Doppler current profiles (IADCP) and nutrient sampling running perpendicular to the coastline at about 11°S. Additionally, two bottom-pressure inverted echo sounders were deployed along the continental slope at 300m and 500m depth.

R/V METEOR left the exclusive economic zone of Brazil just before midnight local time on May 31 to start full-depth CTD-O₂ measurements along a transatlantic section at 11°45'S. Again, water samples for nutrient and nutrient isotope concentrations measurements were collected at most of the CTD-O₂ stations. Station spacing along this transect was 120 nm which reduced to about 60 nm when crossing the Mid-Atlantic Ridge to avoid data gaps due to bottom triangles. In between stations, underway CTD measurements were carried out every 2 hours to obtain a high-resolution hydrographic section in the upper 400m of the water column. Additionally, as a service to the Bundesanstalt für Schifffahrt und Hydrographie (BSH), four Argo floats were deployed along the section. Fortunately, we encountered favourable weather conditions while crossing the Atlantic Ocean that allowed us to make up

some of the lost time. The transatlantic section was completed on June 16 at 18:00 UTC.

During the next three days, R/V Meteor headed towards the Angolan coast while taking hydrographic and velocity profiles, water samples for nutrient, nutrient isotope and microplastics concentration analysis, and microstructure profiles along a section perpendicular to the Angolan coastline at about 11°S. On this section, a mooring array was installed in June 2013 during FS METEOR cruise M98. It was serviced in October 2015 (M120) and November 2016 (M131). The array consisted of a bottom shield at 500m depth and a mooring at 1200m depth mooring, both equipped with an acoustic Doppler current profiler (ADCP) to measure the variability of the eastern boundary current transport. In the afternoon of June 17, we tried to establish communication to the releaser mounted to the bottom shield using underwater acoustics. However, we did not receive any response from the instrument.

As part of the upwelling process study, we successfully deployed two ocean gliders using R/V METEOR's rubber boat and a mooring measuring velocity profiles with two ADCPs at 200m water depth in the morning and afternoon of June 16, respectively. The 11°S section was finalized in the early morning of June 19. Prior to departing to 6°S, two landers equipped with ADCPs were deployed in 50m and 100m water depth and the mooring that had been deployed at 1200m water depth during M131 was successfully recovered.

In the evening of June 20, we headed north to work on a cross-slope section just south of the Congo River inflow at 6°S. During the 22-hour transit, uCTD profiles were taken. The position of the first CTD-O₂ station was reached on June 21 at 16:30 UTC. Sampling along the 6°S section included 12 CTD-O₂ and IADCP profiles as well as 7 MSS stations on which 3 to 5 profiles were collected. Additionally, water samples from the CTD rosette were collected to determine nutrient, nutrient isotope, salinity and oxygen concentrations. Furthermore, water samples for microplastics continued. After deploying another Argo float for the BSH, R/V METEOR started the transit back to the 11°S section on June 21 at 14:00 UTC.

Up on arrival at 11°S, the 1200m mooring as part of the eastern boundary mooring array was redeployed and additional CTD-O₂ and microstructure profiles were taken along the 11°S section. A dredging operation was carried out in the morning of June 23 in an attempt to recover a catch line of the bottom shield moored at 500m depth. However, the attempt proved to be unsuccessful leading to the conclusion that the bottom shield was no longer in its place. An elaborate analysis of fish trawler operation in that area showed that the 500m isobaths is heavily occupied by the vessels. It is thus likely that the bottom shield was relocated or destroyed due to bottom fishing gear. In the afternoon, we successfully recovered the two gliders. During the night, a high-resolution hydrographic section of the upper 100m of the water column was taken on the shelf at 11°S using the Rapid-Cast system. With these measurements, we intend to study non-linear internal wave trains that are generated due to tide-topography interaction on the continental slope. For the same reason, we took two microstructure profiles transects between 200m and 50m bottom depth. During the next morning, the two landers and the mooring deployed on the shelf were recovered before R/V Meteor left the 11°S section heading toward 15°S.

Underway CTD profiles were collected during transit and we reached the position of the first station of the 15°S section at noon on June 25. Altogether, 13 CTD-O₂ profiles were collected along that section, which was completed at 10:00 UTC the next day. Two hours later, while heading towards 11°E, strong northerly winds of 7 to 8 Beaufort and elevated swell of up to 4m from the south forced us to refrain from taking CTD-O₂ profiles along the 11°E section. Instead, underway CTD data were

collected. However, in the afternoon, when the winds again increased, these measurements were omitted as well. Winds weakened around midnight when station work was continued along the 100m isobaths as planned. Data sampling from all underway systems was discontinued on June 28 at 18:00 UTC. Having received permission for early docking from the Leitstelle, R/V METEOR entered the port of Walvis Bay two hours later.

Acknowledgements

We are grateful to Rainer Hammacher and his crew for the excellent collaboration. The crew of R/V METEOR greatly contributed to the success of the cruise. The ship time of R/V METEOR was provided by the German Science Foundation (DFG) within the core program METEOR/MERIAN. Financial support was provided by the German Federal Ministry of Education and Research within the collaborative project "Southwest African Coastal Upwelling System and Benguela Niños II (SACUS).

List of Participants

Abbreviations: PO – Physical Oceanography, CH – Chemical Oceanography, ADCP – acoustic Doppler current profiler, CTD – conductivity-temperature-depth profile measurements and water sampling, uCTD – underway conductivity-temperature-depth measurements, IADCP – lowered ADCP measurements, MSS – microstructure profiles.

No.	Name	Discipline, Function	Institution
1	Dengler, Marcus, Dr.	PO, Chief scientist	GEOMAR
2	Arévalo-Martínez, Damian, Dr.	CH, Trace gases	GEOMAR
3	Assunção, Ramilla	PO, Trainee	UFPE
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5	Burmeister, Kristin	PO, IADCP, Mooring	GEOMAR
6	Campen, Hanna	CH, Nutrients, O ₂ Winkler	GEOMAR
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8	Coelho, Paulo	PO, Trainee	INIP
9	Dias, Anderson	Observer	Brazilian Navy
10	Francisco, José Amaro	PO, Trainee	INIP
11	Herrford, Josefina	PO, CTD, Salinometer	GEOMAR
12	Heukamp, Finn	PO, Salinometer	GEOMAR
13	Houndegnonto, Odilon Joel	PO, Trainee	UAC
14	Kahilo, Emanuel Muhongo	PO, Trainee	INIP
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17	Lopes Branco, Felipe	PO, Trainee	UFPA
18	Lüdke, Jan	PO, ADCP, MSS, Glider	GEOMAR
19	Matos, Fernanda	PO, Trainee	UFPA
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21	Müller, Mario	PO, Moorings, Glider, Argo	GEOMAR
22	Nielsen, Martin	PO, Moorings, logistics	GEOMAR
23	Risaro, Daniela Belén	PO, Trainee	UBA
24	Sanders, Tina, Dr.	CH, Nutrient isotopes	HZG
25	Sandoval Belmar, Marco	PO, Trainee	UCC
26	Stelzner, Martin	Meteorology	DWD
27	Wiskandt, Jonathan	PO, O ₂ Winkler	GEOMAR

GEOMAR GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, Kiel, Germany.

DWD Deutscher Wetterdienst, Hamburg, Germany.

HZG Helmholtz-Zentrum Geesthacht, Geesthacht, Germany.

INIP Instituto Nacional de Investigacao Pesqueira, Luanda, Angola.

SDU University of Southern Denmark, Odense, Denmark.

UAC University of Abomey, Cotonou, Republic of Benin.

UBA University of Buenos Aires, Buenos Aires, Argentina

UCC University of Concepción, Concepción, Chile

UFBA Universidade Federal de Bahia, Ondina, Brazil

UFPA Universidade Federal do Pará, Belém, Brazil

UFPE Universidade Federal de Pernambuco, Recife, Brazil.

Station list

Station No.		Date	Gear	Time	Latitude	Longitude	Water Depth	Remarks
METEOR (M148-)	GEOMAR	2018		[UTC]	[°]	[°]	[m]	
1-1	CTD 1	30.05.	CTD	21:03	10°14.566'S	035°53.610'W	223	CTD to bottom
2-1	CTD 2	30.05.	CTD	22:17	10°15.275'S	035°52.595'W	520	CTD to bottom
3-1	KPO1203	30.05.	Moor	23:22	10°13.625'S	035°52.400'W	320	PIES deployment
4-1	KPO1204	30.05.	Moor	23:41	10°13.965'S	035°51.684'W	517	PIES deployment
5-1	CTD 3	31.05.	CTD	00:20	10°15.994'S	035°51.687'W	902	CTD to bottom
6-1	CTD 4	31.05.	CTD	02:03	10°19.488'S	035°46.107'W	1725	CTD to bottom
7-1	CTD 5	31.05.	CTD	04:28	10°22.727'S	035°40.812'W	2322	CTD to bottom
8-1	CTD 6	31.05.	CTD	07:16	10°27.341'S	035°34.886'W	2879	CTD to bottom
9-1	CTD 7	31.05.	CTD	10:08	10°32.005'S	035°29.294'W	3221	CTD to bottom
10-1	CTD 8	31.05.	CTD	13:06	10°36.500'S	035°23.900'W	3519	CTD to bottom
11-1	CTD 9	31.05.	CTD	16:26	10°41.380'S	035°17.597'W	3699	CTD to bottom
12-1	CTD 10	31.05.	CTD	19:52	10°46.399'S	035°11.617'W	3893	CTD to bottom
13-1	CTD 11	31.05.	CTD	23:46	10°51.399'S	035°05.600'W	3979	CTD to bottom
14-1	CTD 12	01.06.	CTD	03:17	10°56.385'S	034°59.590'W	4127	CTD to bottom
15-1	CTD 13	01.06.	CTD	07:57	10°07.582'S	034°43.926'W	4269	CTD to bottom
16-1	CTD 14	01.06.	CTD	13:38	11°18.790'S	034°28.220'W	4669	CTD to bottom
17-1	CTD 15	01.06.	CTD	19:01	11°29.978'S	034°13.007'W	4601	CTD to bottom
18-1	CTD 16	02.06.	CTD	0:28	11°30.000'S	033°53.011'W	4648	CTD to bottom
19-1	CTD 17	02.06.	CTD	10:18	11°30.188'S	032°51.715'W	4450	CTD to bottom
20-1	uCTD 1	02.06.	uCTD	13:15-23:25	11°30.243'S-11°42.987'S	032°51.466'W-031°15.167'W	4597	6 profiles
21-1	CTD 18	03.06.	CTD	01:15	11°44.991'S	031°00.009'W	5360	CTD to bottom
22-1	uCTD 2	03.06.	uCTD	04:42-16:17	11°44.980'S-11°45.000'S	030°59.449'W-029°14.455'W	5248	7 profiles
23-1	CTD 19	03.06.	CTD	17:56	11°45.004'S	029°00.029'W	5537	CTD to 500m
24-1	CTD 20	03.06.	CTD	18:46	11°45.004'S	029°00.026'W	5537	CTD to bottom
25-1	uCTD 3	03.-04.06.	uCTD	22:16-08:25	11°44.981'S-11°44.999'S	028°59.779'W-027°13.737'W	5536	6 profiles
26-1	CTD 21	04.06.	CTD	09:51	11°44.976'S	026°59.999'W	5528	CTD to bottom
27-1	ARGO 1	04.06.	FLOAT	13:28	11°45.032'S	026°59.958'W	5505	Arvor float AL250018DE004
28-1	uCTD 4	04.-05.06.	uCTD	13:38-00:16	11°44.998'S-11°45.158'S	026°59.440'W-025°06.755'W	5556	6 profiles
29-1	CTD 22	05.06.	CTD	01:18	11°44.998'S	024°59.996'W	6370	CTD to 5700m
30-1	uCTD 5	05.06.	uCTD	05:03-13:12	11°44.939'S-11°45.000'S	024°59.437'W-023°30.841'W	6383	5 profiles
31-1	CTD 23	05.06.	CTD	14:14	11°45.006'S	023°21.009'W	5387	CTD to bottom
32-1	uCTD 6	05.-06.06.	uCTD	17:35-03:50	11°45.080'S-11°45.000'S	023°20.508'W-021°28.280'W	5235	6 profiles
33-1	CTD 24	06.06.	CTD	04:27	11°45.000'S	021°24.003'W	4984	CTD to bottom
34-1	uCTD 7	06.06.	uCTD	08:06-18:18	11°44.998'S-11°45.000'S	021°18.174'W-019°26.349'W	5225	6 profiles
35-1	CTD 25	06.06.	CTD	19:14	11°44.998'S	019°18.002'W	4656	CTD to bottom
36-1	uCTD 8	06.-07.06.	uCTD	22:16-06:43	11°44.969'S-11°44.999'S	019°17.508'W-017°43.032'W	4719	7 profiles
37-1	CTD 26	07.06.	CTD	06:59	11°44.970'S	017°42.015'W	4134	CTD to bottom
38-1	uCTD 9	07.06.	uCTD	09:42-18:13	11°44.964'S-11°44.999'S	017°42.022'W-016°12.678'W	4130	8 profiles
39-1	CTD 27	07.06.	CTD	18:24	11°44.995'S	016°12.035'W	3915	CTD to bottom
40-1	uCTD 10	07.-08.	uCTD	20:56-	11°45.102'S-	016°11.902'W-	3924	4 profiles

		06.		03:01	11°44.999'S	15°07.149'W		
41-1	CTD 28	08.06.	CTD	03:50	11°44.996'S	015°00.015'W	3217	CTD to bottom
42-1	ARGO 2	08.06.	FLOAT	06:03	11°45.200'S	015°00.150'W	3250	Arvor float AL250018DE005
43-1	uCTD 11	08.06.	uCTD	01:58 - 12:08	11°44.997'S- 11°45.001'S	015°18.429'W- 013°56.480'W	3542	4 profiles
44-1	CTD 29	08.06.	CTD	12:45	11°44.997'S	013°51.620'W	3182	CTD to bottom
45-1	uCTD 12	08.06.	uCTD	15:01- 19:16	11°44.902'S- 11°45.001'S	013°51.702'W- 013°08.304'W	3211	3 profiles
46-1	CTD 30	08.06.	CTD	21:04	11°45.021'S	012°51.683'W	3708	CTD to bottom
47-1	uCTD 13	08.- 09.06.	uCTD	23:12 - 03:20	11°44.765'S- 11°44.999'S	012°52.429'W- 012°09.963'W	3250	3 profiles
48-1	CTD 31	09.06.	CTD	04:30	11°44.975'S	012°00.052'W	3820	CTD to bottom
49-1	uCTD 14	09.06.	uCTD	06:53 - 11:02	11°44.989'S- 11°45.000'S	012°00.279'W- 011°16.354'W	3824	3 profiles
50-1	CTD 32	09.06.	CTD	12:32	11°45.009'S	011°01.689'W	4060	CTD to bottom
51-1	uCTD 15	09.06.	uCTD	15:14- 16:43	11°45.002'S- 11°45.000'S	011°01.197'W- 010°45.492'W	4081	2 profiles
52-1	uCTD 16	10.06.	uCTD	00:50- 07:14	11°44.998'S- 11°44.999'S	010°23.472'W- 009°14.190'W	3953	4 profiles
53-1	CTD 33	10.06.	CTD	08:30	11°44.975'S	009°04.080'W	4417	CTD to bottom
54-1	uCTD 17	10.06.	uCTD	11:18- 21:06	11°45.021'S- 11°45.001'S	009°03.948'W- 007°15.954'W	4418	6 profiles
55-1	CTD 34	10.06.	CTD	23:06	11°45.007'S	007°00.013'W	4701	CTD to bottom
56-1	uCTD 18	11.06.	uCTD	02:11	11°44.997'S- 11°45.001'S	006°59.786'W- 005°04.090'W	4713	6 profiles
57-1	CTD 35	11.06.	CTD	12:56-	11°44.986'S	005°00.012'W	4360	CTD to bottom
58-1	uCTD 19	11.- 12.06.	uCTD	15:51- 01:49	11°45.033'S- 11°45.001'S	004°59.640'W- 003°03.868'W	4365	6 profiles
59-1	CTD 36	12.06.	CTD	02:41	11°44.974'S	003°00.020'W	5320	CTD to bottom
60-1	uCTD 20	12.06.	uCTD	06:32- 14:38	11°45.057'S- 11°44.998'S	002°59.439'W- 001°28.084'W	5467	5 profiles
61-1	CTD 37	12.06.	CTD	17:18	11°45.047'S	001°00.034'W	5669	CTD to bottom
62-1	uCTD 21	12.- 13.06.	uCTD	22:07- 08:09	11°44.990'S- 11°44.998'S	000°59.719'W- 000°56.981'E	5557	6 profiles
63-1	CTD 38	13.06.	CTD	08:35	11°44.974'S	001°00.060'E	5603	CTD to bottom
64-1	uCTD 22	13.06.	uCTD	14:15- 22:06	11°44.998'S- 11°44.998'S	001°27.337'E- 002°59.086'E	5635	5 profiles
65-1	CTD 39	13.06.	CTD	22:18	11°44.983'S	003°00.011'E	5605	CTD to bottom
66-1	ARGO 3	14.06.	FLOAT	01:59	11°44.909'S	003°00.115'E	5603	Avor float AL250018DE006
67-1	uCTD 23	14.06.	uCTD	02:03- 12:08	11°44.874'S- 11°44.999'S	003°00.516'E- 004°55.202'E	5604	6 profiles
68-1	CTD 40	14.06.	CTD	12:42	11°44.985'S	004°59.970'E	5497	CTD to 500m
69-1	CTD 41	14.06.	CTD	13:14	11°44.978'S	005°00.015'E	5498	CTD to bottom
70-1	uCTD 24	14.- 15.06.	uCTD	17:07- 03:06	11°44.818'S- 11°44.999'S	005°00.022'E- 006°46.511'E	5500	6 profiles
71-1	CTD 42	15.06.	CTD	04:31	11°44.963'S	007°00.017'E	5209	CTD to bottom
72-1	uCTD 25	15.06.	uCTD	07:55- 16:15	11°44.865'S- 11°44.998'S	006°59.847'E- 008°29.013'E	5217	5 profiles
73-1	CTD 43	15.06.	CTD	17:07	11°44.978'S	008°35.986'E	4614	CTD to bottom
74-1	uCTD 26	15.- 16.06.	uCTD	20:15- 01:44	11°45.074'S- 11°44.998'S	008°36.021'E- 009°19.714'E	4611	3 profiles
75-1	CTD 44	16.06.	CTD	01:44	11°44.972'S	009°35.991'E	4239	CTD to bottom
76-1	uCTD 27	16.06.	uCTD	04:38- 09:06	11°45.204'S- 11°44.996'S	009°36.323'E- 010°27.836'E	4218	3 profiles

77-1	CTD 45	16.06.	CTD	10:30	11°44.999'S	010°41.986'E	3787	CTD to bottom
78-1	uCTD 28	16.06.	uCTD	13:12-17:33	11°45.477'S-11°44.998'S	010°42.389'E-011°33.164'E	3779	3 profiles
79-1	CTD 46	16.06.	CTD	18:05	11°44.984'S	011°38.021'E	3461	CTD to bottom
80-1	CTD 47	16.06.	CTD	22:58	11°29.998'S	012°00.000'E	2586	CTD to bottom
81-1	ARGO 4	17.06.	FLOAT	00:55	11°30.017'S	011°59.951'E	2593	Arvor float AL250018DE002
82-1	CTD 48	17.06.	CTD	02:36	11°19.989'S	012°15.026'E	2282	CTD to bottom
83-1	CTD 49	17.06.	CTD	05:11	11°15.003'S	012°22.499'E	1878	CTD to bottom
84-1	CTD 50	17.06.	CTD	07:31	11°10.008'S	012°29.991'E	1616	CTD to bottom
85-1	CTD 51	17.06.	CTD	09:41	11°05.004'S	012°37.495'E	1533	CTD to bottom
86-1	KPO 1074 - 1	17.06.	MOOR	14:35-15:45	10°41.889'S	013°11.603'E	458	bottom shield KPO 1074 recover (unsuccessful)
87-1	MSS 1	17.06.	MSS	19:19-20:20	10°58.781'S	012°43.885'E	1472	MSS to 250m, 3 profiles
88-1	CTD 52	17.06.	CTD	20:45	10°59.989'S	012°44.003'E	1432	CTD to bottom
89-1	MSS 2	17.-18. 06	MSS	23:15-00:13	10°54.282'S	012°53.184'E	1352	MSS to 250m, 3 profiles
90-1	CTD 53	18.06.	CTD	00:20	10°54.755'S	012°52.341'E	1368	CTD to bottom
91-1	MSS 3	18.06.	MSS	02:17-03:13	10°50.182'S	012°59.710'E	1233	MSS to 250m, 3 profiles
92-1	CTD 54	18.06.	CTD	03:25	10°50.677'S	012°58.722'E	1243	CTD to bottom
93-1	MSS 4	18.06.	MSS	05:21-05:34	10°47.395'S	013°04.192'E	1055	MSS (malfunctioned)
94-1	CTD 55	18.06.	CTD	05:58	10°47.905'S	013°02.976'E	1162	CTD to bottom
95-1	CTD 56	18.06.	CTD	07:24	10°45.998'S	013°06.007'E	946	CTD to bottom
96-1	IFM13	18.06.	GLIDER	09:11-10:40	10°45.999'S	013°06.010'E	946	IFM13 deployment
97-1	CTD 57	18.06.	CTD	11:14	10°44.018'S	013°09.001'E	705	CTD to bottom
98-1	IFM09	18.06.	GLIDER	12:23-13:30	10°44.021'S	013°09.004'E	705	IFM09 deployment
99-1	MSS 5	18.06.	MSS	14:06-15:11	10°43.322'S	013°10.112'E	588	MSS to 250m, 3 profiles
100-1	CTD 58	18.06.	CTD	15:35	10°41.988'S	013°11.867'E	445	CTD to bottom
101-1	KPO 1207	18.06.	MOOR	16:31-16:52	10°41.529'S	013°15.654'E	296	KPO 1207 deployment
102-1	CTD 59	18.06.	CTD	17:24	10°40.554'S	013°14.232'E	261	CTD to bottom
103-1	MSS 6	18.06.	MSS	17:58-18:54	10°40.603'S	013°14.177'E	299	MSS to 250m, 3 profiles
104-1	CTD 60	18.06.	CTD	19:26	10°39.220'S	013°16.204'E	174	CTD to bottom
105-1	MSS 7	18.06.	MSS	19:54-20:34	10°39.259'S	013°16.161'E	175	MSS to bottom, 3 profiles
106-1	CTD 61	18.06.	CTD	21:29	10°37.891'S	013°18.202'E	128	CTD to bottom
107-1	MSS 8	18.06.	MSS	21:53-22:39	10°37.915'S	013°18.163'E	128	MSS to bottom, 4 profiles
108-1	CTD 62	18.06.	CTD	23:05	10°36.591'S	013°20.206'E	117	CTD to bottom
109-1	MSS 9	18.-19. 06.	MSS	23:28-00:14	10°36.615'S	013°20.177'E	117	MSS to bottom, 5 profiles
110-1	CTD 63	19.06.	CTD	00:43	10°35.256'S	013°22.212'E	105	CTD to bottom
111-1	MSS 10	19.06.	MSS	00:59-01:33	10°35.284'S	013°22.193'E	106	MSS to bottom, 5 profiles
112-1	CTD 64	19.06.	CTD	02:05	10°34.204'S	013°23.692'E	96	CTD to bottom
113-1	MSS 11	19.06.	MSS	02:22-02:57	10°34.213'S	013°23.629'E	98	MSS to bottom, 5 profiles

114-1	CTD 65	19.06.	CTD	03:32	10°32.883'S	013°25.706'E	83	CTD to bottom
115-1	MSS 12	19.06.	MSS	03:52-04:28	10°32.903'S	013°25.675'E	84	MSS to bottom, 5 profiles
116-1	CTD 66	19.06.	CTD	04:58	10°31.561'S	013°27.703'E	62	CTD to bottom
117-1	MSS 13	19.06.	MSS	05:19-05:51	10°31.598'S	013°27.682'E	62	MSS to bottom, 5 profiles
118-1	CTD 67	19.06.	CTD	06:21	10°30.299'S	013°29.695'E	52	CTD to bottom
119-1	MSS 14	19.06.	MSS	06:38-07:02	10°30.312'S	013°29.680'E	53	MSS to bottom, 5 profiles
120-1	KPO 1208	19.06.	LANDER	07:53-08:08	10°33.366'S	013°29.199'E	60	SML1 deployment
121-1	KPO 1209	19.06.	LANDER	09:05-09:17	10°37.170'S	013°23.495'E	96	SML2 deployment
122-1	KPO 1174 - 2	19.06.	MOOR	10:57-12:15	10°42.727'S	013°11.363'E	490	search for bottom shield
123-1	KPO 1175	19.06.	MOOR	15:06-16:00	10°49.845'S	013°00.192'E	1223	KPO 1175 recovery
124-1	uCTD 28	19.-20.06.	uCTD	17:21-15:04	10°35.058'S-06°23.379'S	012°56.957'E-011°57.043'E	962	12 profiles
125-1	CTD 68	20.06.	CTD	16:25	06°12.601'S	012°05.982'E	42	CTD to bottom
126-1	CTD 69	20.06.	CTD	17:37	06°14.904'S	011°59.981'E	69	CTD to bottom
127-1	MSS 15	20.06.	MSS	18:08-18:45	06°14.978'S	011°59.916'E	70	MSS to bottom, 5 profiles
128-1	CTD 70	20.06.	CTD	19:16	06°16.758'S	011°53.979'E	86	CTD to bottom
129-1	MSS 16	20.06.	MSS	19:39-20:12	06°16.771'S	011°53.920'E	87	MSS to bottom, 4 profiles
130-1	CTD 71	20.06.	CTD	20:51	06°18.595'S	011°48.005'E	111	CTD to bottom
131-1	MSS 17	20.06.	MSS	21:11-21:35	06°18.636'S	011°47.927'E	110	MSS to bottom, 3 profiles
132-1	CTD 72	20.06.	CTD	22:16	06°20.394'S	011°42.012'E	124	CTD to bottom
133-1	MSS 18	20.06.	MSS	22:36-23:12	06°20.426'S	011°41.989'E	124	MSS to bottom, 3 profiles
134-1	CTD 73	20.06.	CTD	23:45	06°22.262'S	011°36.013'E	213	CTD to bottom
135-1	MSS 19	21.06.	MSS	00:04-00:43	06°22.302'S	011°35.974'E	208	MSS to bottom, 3 profiles
136-1	CTD 74	21.06.	CTD	01:39	06°24.166'S	011°29.992'E	354	CTD to bottom
137-1	CTD 75	21.06.	CTD	03:14	06°26.593'S	011°22.484'E	537	CTD to bottom
138-1	MSS 20	21.06.	MSS	03:52-04:41	06°26.593'S	011°22.432'E	538	MSS to bottom, 3 profiles
139-1	CTD 76	21.06.	CTD	05:37	06°29.010'S	011°15.038'E	838	CTD to bottom
140-1	CTD 77	21.06.	CTD	07:36	06°31.519'S	011°07.426'E	1134	CTD to bottom
141-1	MSS 21	21.06.	MSS	08:30-09:17	06°31.545'S	011°07.421'E	1137	MSS to bottom, 3 profiles
142-1	CTD 78	21.06.	CTD	10:06	06°33.938'S	010°59.998'E	1450	CTD to bottom
143-1	CTD 79	21.06.	CTD	12:04	06°36.372'S	010°52.502'E	1666	CTD to bottom
144-1	ARGO 5	21.06.	FLOAT	13:19	06°36.472'S	010°52.462'E	1673	Avor float AL250018DE001
145-1	uCTD 29	21.-22.06.	uCTD	14:02-14:14	06°44.001'S-10°42.063'S	010°53.130'E-012°55.416'E	1682	13 profiles
146-1	KPO 1200	22.06.	MOOR	15:07-16:48	10°50.025'S	012°59.974'E	1226	deployment of KPO 1200
147-1	MSS 22	22.06.	MSS	17:58-18:52	10°46.056'S	013°05.974'E	949	MSS to 250m, 3 profiles
148-1	CTD 80	22.06.	CTD	19:42	10°44.056'S	013°08.998'E	704	CTD to bottom

149-1	MSS 23	22.06.	MSS	20:50-21:44	10°44.109'S	013°08.955'E	712	MSS to 250m, 3 profiles
150-1	CTD 81	22.06.	CTD	22:43	10°39.240'S	013°16.236'E	169	CTD to bottom
151-1	MSS 24	22.06.	MSS	23:06-00:35	10°39.309'S	013°16.271'E	168	MSS to bottom, 3 profiles
152-1	CTD 82	23.06.	CTD	01:16	10°34.202'S	013°23.704'E	96	CTD to bottom
153-1	MSS 25	23.06.	MSS	01:35-02:19	10°34.221'S	013°23.684'E	96	MSS to bottom, 3 profiles
154-1	CTD 83	23.06.	CTD	03:08	10°31.598'S	013°27.696'E	62	CTD to bottom
155-1	MSS 26	23.06.	MSS	03:28-04:17	10°31.619'S	013°27.677'E	61	MSS to bottom, 3 profiles
156-1	KPO 1074 - 3	23.06.	MOOR	06:13-12:33	10°42.584'S	013°11.700'E	469	dredging for bottom shield
158-1	IFM09	23.06.	GLIDER	13:26	10°40.934'S	013°17.031'E	190	ifm09 recovery
159-1	IFM13	23.06.	GLIDER	14:16	10°43.336'S	013°16.618'E	275	ifm13 recovery
160-1	uCTD 30	23.06.	uCTD	15:18-18:24	10°41.638'S-10°33.345'S	013°15.625'E-013°29.240'E	266	Rapid-Cast transect 11°S
161-1	MSS 27	23.-24.06.	MSS	20:30-03:34	10°38.868'S-10°32.590'S	013°21.179'E-013°27.496'E	120	MSS transect 11°S
162-1	uCTD 31	24.06.	uCTD	03:44-05:14	10°32.884'S-10°37.919'S	013°27.487'E-013°21.754'E	66	Rapid-Cast transect 11°S
163-1	KPO 1208	24.06.	LANDER	05:32-05:59	10°37.042'S	013°23.683'E	104	SLM2 recovery
164-1	KPO 1209	24.06.	LANDER	07:02-07:23	10°33.255'S	013°29.327'E	60	SLM1 recovery
165-1	KPO 1207	24.06.	MOOR	09:36-10:09	10°41.583'S	013°16.931'E	211	KPO 1207 recovery
166-1	CTD 84	24.06.	CTD	10:26	10°41.705'S	013°16.779'E	220	CTD to bottom
167-1	uCTD 32	24.-25.06.	uCTD	11:16-10:20	10°46.379'S	013°14.654'E	97	13 profiles
168-1	CTD 85	25.06.	CTD	12:40	14°52.510'S	011°07.523'E	3024	CTD to bottom
169-1	ARGO 6	25.06.	FLOAT	14:13	14°52.512'S	011°07.521'E	3025	Avor float AL250018DE003
170-1	CTD 86	25.06.	CTD	15:37	14°58.292'S	011°18.350'E	2787	CTD to bottom
171-1	CTD 87	25.06.	CTD	17:48	15°01.965'S	011°25.196'E	2584	CTD to bottom
172-1	CTD 88	25.06.	CTD	20:13	15°05.644'S	011°32.049'E	1838	CTD to bottom
173-1	CTD 89	25.06.	CTD	22:29	15°09.303'S	011°38.847'E	1778	CTD to bottom
174-1	CTD 90	26.06.	CTD	00:28	15°11.734'S	011°43.411'E	1474	CTD to bottom
175-1	CTD 91	26.06.	CTD	02:36	15°14.186'S	011°48.010'E	1084	CTD to bottom
176-1	CTD 92	26.06.	CTD	04:25	15°15.399'S	011°50.264'E	835	CTD to bottom
177-1	CTD 93	26.06.	CTD	05:38	15°16.615'S	011°52.563'E	603	CTD to bottom
178-1	CTD 94	26.06.	CTD	06:45	15°17.857'S	011°54.796'E	621	CTD to bottom
179-1	CTD 95	26.06.	CTD	07:52	15°19.096'S	011°57.103'E	478	CTD to bottom
180-1	CTD 96	26.06.	CTD	08:52	15°20.335'S	011°59.440'E	89	CTD to bottom
181-1	CTD 97	26.06.	CTD	09:36	15°20.941'S	012°00.553'E	50	CTD to bottom
182-1	uCTD 33	26.06.	uCTD	10:08-16:10	15°21.472'S-16°13.694'S	011°59.440'E-011°27.698'E	46	3 profiles
183-1	CTD 98	27.06.	CTD	02:30	17°29.975'S	011°36.981'E	121	CTD to bottom
184-1	CTD 99	27.06.	CTD	14:28	18°59.987'S	012°17.016'E	111	CTD to bottom
185-1	CTD 100	27.06.	CTD	21:37	19°59.999'S	012°48.980'E	114	CTD to bottom
186-1	CTD 101	28.06.	CTD	04:25	20°59.989'S	013°18.982'E	104	CTD to bottom
187-1	CTD 102	28.06.	CTD	10:52	21°59.974'S	013°46.978'E	108	CTD to bottom
188-1	CTD 103	28.06.	CTD	15:46	22°39.915'S	014°12.973'E	104	CTD to bottom