

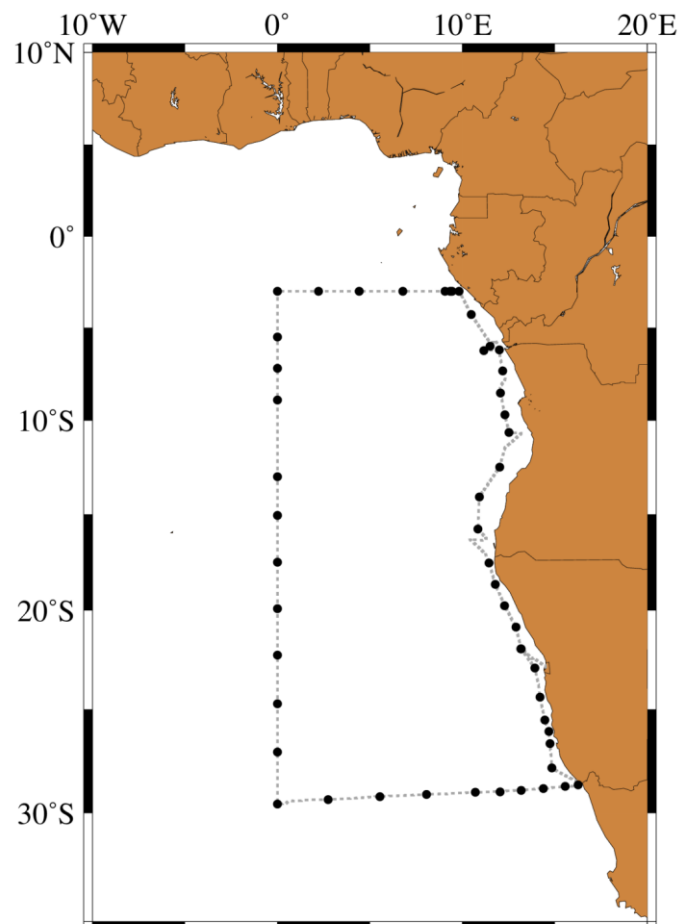
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Short Cruise Report Meteor Cruise No. 121

**Walvis Bay (Namibia) – Walvis Bay
(Namibia) 22.11.2015 – 27.12.2015**

**Chief Scientist: Martin Frank
Captain: Rainer Hammacher**



Objectives

The main objective of Meteor Cruise M121 was the investigation of the distribution of dissolved and particulate trace metals and their isotopic compositions (TEIs) in the full water column of the Angola Basin and the northernmost Cape Basin and their driving factors, which includes the main external inputs, as well as internal cycling and ocean circulation. The research program of the cruise is official part of the international GEOTRACES program (www.geotraces.org) and cruise M121 corresponds to GEOTRACES cruise GA11. The main goal of the cruise was the trace metal clean and contamination-free sampling of waters and particulates for subsequent analyses of the TEIs in the home laboratories of the national and international participants. Besides a standard rosette for the less contaminant prone metals, trace metal clean sampling was realized by using for the first time a new dedicated, coated trace metal clean rosette equipped with Teflon-coated GO-FLO bottles operated via a plastic coated cable from a mobile winch of GEOMAR Kiel. The particulate samples were also collected under trace metal clean conditions using established in-situ pump systems operated from Meteor's Aramid line. The cruise track crossed areas of major external inputs including dust from the Namib Desert and exchange with the West African continental margin and with the oxygen depleted shelf sediments of the Benguela Upwelling, as well as with the plume of the Congo outflow. In terms of internal cycling the extremely high productivity associated with the Benguela Upwelling and the elevated productivity of the Congo plume in contrast to the extremely oligotrophic waters of the southeastern Atlantic Gyre were subject of investigations, which also included the nitrogen cycle. The major water masses contributing to the Atlantic Meridional Overturning Circulation were sampled in order to investigate if particular TEI signatures are suitable as water mass tracers, in particular near the ocean margin and in the restricted deep Angola Basin. A total of 51 full water column stations were sampled for the different dissolved TEIs, which were in most cases accompanied by particulate sampling using the in-situ pumps. In addition, surface waters were continuously sampled under trace metal clean conditions using a towed fish and aerosol and rain samples were also continuously taken to further constrain the atmospheric inputs.

Narrative

Cruise M121 started in Walvis Bay, Namibia. A first group of 13 scientists from GEOMAR, Kiel and the University of Kiel arrived in Walvis Bay on the 18th November 2015 and started to prepare for the cruise, in particular setting up the trace metal clean winch and the laboratories on the Meteor in the afternoon of the 19th November. All containers from Germany 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 the newly acquired mobile winch with an 8 km plastic coated conducting cable of GEOMAR started immediately. These devices were essential for contamination-free sampling of seawater. The clean lab container of GEOMAR served as clean laboratory space. Glove boxes for contamination free working environments were set up in the isotope container and one other laboratory to guarantee clean laboratory handling of contamination-prone TEIs. The remaining scientists from GEOMAR, the University of Kiel, the Jacobs University, Bremen, the Max Planck-Institute for Marine Microbiology, Bremen, the University of Oxford, United Kingdom, and the Instituto Nacional de Investigação Pesqueira (INIP), Luanda, Angola arrived on the 19th November in Walvis Bay. All scientists boarded Meteor in the morning of the 20th November. Unpacking of the equipment from the containers started immediately and continued on 21st November accompanied by continuous strong winds blowing dust from the Namibian desert onto the vessel, and it took several days at sea to get rid of the dust. This was the day initially scheduled for leaving port but due to delays, in particular the delivery and spooling of a new cable for one of the winches, which finally turned out not to be usable, delayed departure for one day so that M121 in the end started in the morning of the 22nd November.

The ship then steamed north to the first station on the Namibian Shelf where the sampling of the water column started on the evening of the same day at 22°58.5'S, 13°11'E. In order to perform sampling of the surface waters near the vessel, a towed fish for pumping water under trace metal-clean conditions, which is towed by the vessel while it is steaming and allows continuous pumping directly into the clean laboratory container, was deployed via one of the ship's cranes immediately after the start of the cruise. Main focus of the work along the Namibian shelf, that was covered by a total of six stations until 16°45.4'S, 11°13'E was the investigation of the behavior of the trace metals and their isotopes in the water column of the Benguela Upwelling system. Given the relatively high swell of 4-5 m the trace metal clean CTD rosette and winch were not used at the first two stations but instead single GOFLO bottles were deployed on the aramid line to collect coarse resolution water profiles. On Monday the 23rd the swell had gone down and the new CTD rosette system could be used. At each station the normal stainless steel CTD rosette was used to collect samples for less contaminant prone trace elements, nutrients, nitrate isotopes, DIC, and others. This was accompanied by sampling of the particles from discrete depths in the water column using in situ pumps, which at the same time also pumped water across Mn fibres to adsorb the dissolved radium that will be applied as a tracer for the last contact of the respective waters with the ocean margin. In addition to the trace metal samples extensive amounts of samples were taken for experiments investigating the nitrogen cycle in the oxygen depleted subsurface waters of the upwelling region. On the 24th and 25th November two autonomous gliders were successfully recovered that had been released by previous cruise M120 and that had investigated the

upper water column for different hydrographic properties along sections perpendicular to the coast for approximately 4 weeks.

Continuing northwards we carried out the first stations in deeper waters of up to 3000 m. This was started by a mobile winch test station with a weight in order to adjust the spooling of the new winch when for the first used in deep waters. At the deep station at 14°11.3'S, 10°53'E on Thursday 26th November technical problems with the new winch system were encountered that forced us to carry out sampling with the GOFLO bottles on the aramid line again. The problems could finally be overcome after one day with the help of the ship's chief engineer and electrician. Trace metal clean sampling was from then on performed with the new sampling system without further problems. A third glider was successfully recovered near the Angolan coast at 10°40'S, 10°53'E on Friday 27th although it turned out that the glider must have had a collision during which some of the sensors were damaged.

After a total of seven stations in Angolan waters at different depths we encountered the freshwater plume of the Congo River on the shallow shelf south of its mouth. A total of 3 more stations and intense surface water sampling with the towed fish were performed across the main salinity gradient reaching values as low as 24 psu. We then followed the Congo plume in northerly direction until 3°S on the shallow shelf of Gabon, where the salinity was still markedly decreased with values of 32 and 33 psu.

On Tuesday 1st December the cruise continued westwards along 3°S with high resolution profiles perpendicular to the continental slope, where intense sampling at 4 closely spaced stations until a water depth of 1000 m took place in order to obtain samples for combined radium isotope and trace metal concentrations in order to be able to quantify the amount of trace metals released from the continental margin sediments to the open ocean. Further offshore along the 3°S section at 6°46.5'E systematic deep water sampling down to depths below 4000 m at a spacing of approximately 2° started and continued with a total of 4 stations until the Zero Meridian, where the cruise turned south on the 5th December and followed the Zero Meridian southward until 30°S. The spacing between the deep stations reaching up to 5800 water depth was approximately 2.5° and the end of the section was reached on the 15th December after a total of 12 deep stations.

The last station was already somewhat shallower at 4200 m because the cruise track met the Walvis Ridge that was crossed during the eastward continuation of the cruise track on the 17th December and one station was occupied directly above the ridge at 3500 m water depth. During the transit to the latter station, collection of two large volume reference samples (500 litres each) under trace metal clean conditions was performed for the GEOTRACES program (for science plan see: SCOR working group, 2007). For this purpose a tent designed especially for this purpose by the group of K. Bruland, Santa Cruz, U.S. was installed below the hatch of the working deck of Meteor. The tent was supplied by HEPA-filtered air and the surface water was directly pumped into a first acid-cleaned 500 litre tank. The content of the cubitainer was then filled into 500 ml bottles for later distribution to laboratories interested in intercalibration of their measurements and participation in the GEOTRACES program. The second 500 litre tank was filled with water obtained from 2000 m water depth during two extra casts with the trace-metal clean rosette at the first station in the northern Cape Basin.

The cruise continued eastward at 30°S until the Namibian shelf and the Benguela Upwelling was reached, where again a high resolution section between 1000 m and 50 m water depth on the continental slope was sampled for combined radium isotope and trace metal investigations. The cruise track then followed the Namibian shelf northwards where another 7 shallow stations were sampled to complete the near shore north-south section along the West African coast. Immediately offshore Walvis Bay at 22°56.4'S, 13°56.2'E the last glider that had been deployed by previous cruise M120 was recovered with the zodiac. The last station was a revisit of the location of the very first station where it had not been possible to deploy the trace metal clean CTD rosette due to the high swell. The towed fish was taken out of the water and station work was finalized in the night of the 24th December after 190 deployments and 5170 nautical miles. Meteor then went to anchor in Walvis Bay and finally went to the pier in the morning of the 26th of December, where the cruise ended by packing of the containers and the disembarking of all scientists in the morning of the 28th December.

Acknowledgements

We thank Captain Rainer Hammacher and his crew for the friendly atmosphere and their competent technical assistance on board, in particular for their help with the electrics and the mechanics of the mobile winch. Furthermore we acknowledge the Leitstelle METEOR and the 'Auswärtiges Amt' for providing logistical and administrative support. This cruise was funded by the Deutsche Forschungsgemeinschaft (DFG).

List of Participants

<i>Name</i>	<i>Task</i>	<i>Institute</i>
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7. Langer, Julia	CTD-Watch	GEOMAR
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11. Menzel, Jan Lukas	Trace Metals/Aluminium	GEOMAR
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14. Schlosser, Christian, Dr.	Trace Metals	GEOMAR
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23. Heinze, Jutta	Nd/Si isotopes	GEOMAR
24. Vieira, Lucia	Ra isotopes	GEOMAR
25. Koesling, Sabrina	Ra isotopes/In situ Pumps	CAU
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7 Station list

Station	Instrument	Date	Station Start				Station End		
			Time	Pos. Long.	Pos. Lat.	Depth	Time	Pos. Long.	Pos. Lat.
						(m)			
1155	Fish	2015/11/22	09:26:00	014° 19,78' E	22° 44,89' S	75,4			
1156	CTD/SS	2015/11/22	18:36:00	013° 10,99' E	21° 58,45' S	194,2	18:59:59	013° 10,99' E	21° 58,45' S
1157	GoFlo	2015/11/22	19:22:00	013° 10,99' E	21° 58,45' S	191,7	19:55:59	013° 10,99' E	21° 58,45' S
1158	GoFlo	2015/11/22	19:59:00	013° 11,00' E	21° 58,45' S	192,6	20:17:59	013° 10,99' E	21° 58,45' S
1159	CTD/SS	2015/11/23	03:00:00	012° 53,49' E	20° 52,17' S	199,9	03:17:59	012° 53,49' E	20° 52,17' S
1160	GoFlo	2015/11/23	03:27:00	012° 53,49' E	20° 52,17' S	200,4	03:55:59	012° 53,49' E	20° 52,17' S
1161	GoFlo	2015/11/23	03:58:00	012° 53,49' E	20° 52,17' S	200,6	04:16:59	012° 53,49' E	20° 52,17' S
1162	CTD/SS	2015/11/23	04:28:00	012° 53,49' E	20° 52,17' S	197,9	04:44:59	012° 53,49' E	20° 52,17' S
1163	CTD/SS	2015/11/23	11:34:00	012° 17,32' E	19° 45,88' S	201,5	11:55:59	012° 17,31' E	19° 45,88' S
1164	CTD/TM	2015/11/23	12:16:00	012° 17,31' E	19° 45,88' S	202,4	12:42:59	012° 17,29' E	19° 45,87' S
1165	CTD/SS	2015/11/23	13:13:00	012° 17,28' E	19° 45,87' S	201,6	13:31:59	012° 17,28' E	19° 45,87' S
1166	CTD/SS	2015/11/23	20:07:00	011° 46,86' E	18° 39,63' S	204,3	20:30:59	011° 46,86' E	18° 39,63' S
1167	CTD/TM	2015/11/23	20:43:00	011° 46,84' E	18° 39,62' S	203,7	21:02:59	011° 46,80' E	18° 39,60' S
1168	CTD/SS	2015/11/24	03:30:00	011° 26,37' E	17° 33,41' S	211,6	03:48:59	011° 26,38' E	17° 33,41' S
1169	CTD/TM	2015/11/24	04:00:00	011° 26,37' E	17° 33,44' S	210,6	04:20:59	011° 26,28' E	17° 33,80' S
1170	CTD/SS	2015/11/24	05:05:00	011° 26,28' E	17° 33,81' S	209,8	05:20:59	011° 26,35' E	17° 33,94' S
1174	CTD/SS	2015/11/25	08:16:00	010° 50,93' E	15° 47,65' S	3659,1	10:08:59	010° 50,92' E	15° 47,65' S
1175	CTD/TM	2015/11/25	10:25:00	010° 50,84' E	15° 47,49' S	3064,4	13:42:59	010° 50,89' E	15° 47,10' S
1176	CTD/SS	2015/11/25	14:04:00	010° 50,88' E	15° 47,12' S	3068,1	14:45:59	010° 50,79' E	15° 47,08' S
1177	CTD/SS	2015/11/25	23:40:00	010° 54,36' E	14° 05,98' S	3473,7	01:39:59	010° 54,58' E	14° 05,98' S
1178	SAPS	2015/11/26	02:00:00	010° 54,59' E	14° 05,98' S	3475,9	03:47:59	010° 54,63' E	14° 05,99' S
1179	CTD/SS	2015/11/26	03:56:00	010° 54,63' E	14° 05,99' S	3473,5	04:14:59	010° 54,64' E	14° 06,00' S
1180	GoFlo	2015/11/26	04:26:00	010° 54,64' E	14° 06,00' S	3470,4	05:30:59	010° 54,75' E	14° 06,13' S
1181	GoFlo	2015/11/26	05:33:00	010° 54,75' E	14° 06,16' S	3470,1	06:00:59	010° 54,81' E	14° 06,36' S
1182	CTD/TM	2015/11/26	08:17:00	011° 05,31' E	13° 49,96' S	3391,2	11:49:59	011° 05,86' E	13° 49,24' S
1183	CTD/SS	2015/11/26	19:51:00	012° 00,95' E	12° 29,97' S	2367,7	21:31:59	012° 00,96' E	12° 29,97' S
1184	CTD/TM	2015/11/26	21:39:00	012° 00,95' E	12° 29,96' S	2372,4	23:21:59	012° 00,92' E	12° 29,96' S
1185	CTD/SS	2015/11/26	23:37:00	012° 00,92' E	12° 29,96' S	2372,6	23:53:59	012° 00,92' E	12° 29,96' S
1186	CTD/SS	2015/11/27	00:20:00	012° 00,92' E	12° 29,96' S	2363,1	00:49:59	012° 00,92' E	12° 29,96' S
1188	CTD/SS	2015/11/27	16:05:00	012° 31,58' E	10° 38,82' S	1592,5	17:07:59	012° 31,57' E	10° 38,82' S
1189	CTD/TM	2015/11/27	17:15:00	012° 31,57' E	10° 38,82' S	1596,4	18:20:59	012° 31,41' E	10° 38,87' S
1190	CTD/SS	2015/11/27	18:40:00	012° 31,40' E	10° 38,89' S	1602,8	18:58:59	012° 31,40' E	10° 38,89' S
1191	SAPS	2015/11/27	19:14:00	012° 31,40' E	10° 38,89' S	1602,7	23:39:59	012° 31,54' E	10° 38,92' S
1192	CTD/SS	2015/11/28	04:59:00	012° 17,63' E	09° 41,75' S	1612,0	06:04:59	012° 17,63' E	09° 41,76' S

Station	Instrument	Date	Station Start				Station End		
			Time	Pos. Long.	Pos. Lat.	Depth	Time	Pos. Long.	Pos. Lat.
						(m)			
1193	CTD/TM	2015/11/28	06:11:00	012° 17,62' E	09° 41,76' S	1611,5	07:11:59	012° 17,50' E	09° 41,77' S
1194	CTD/SS	2015/11/28	07:25:00	012° 17,41' E	09° 41,80' S	1622,0	07:39:59	012° 17,41' E	09° 41,81' S
1195	CTD/TM	2015/11/28	07:47:00	012° 17,40' E	09° 41,80' S	1617,4	07:54:59	012° 17,31' E	09° 41,85' S
1196	CTD/SS	2015/11/28	14:02:00	012° 03,77' E	08° 32,21' S	2028,5	15:15:59	012° 03,77' E	08° 32,21' S
1197	CTD/TM	2015/11/28	15:20:00	012° 03,78' E	08° 32,21' S	2030,0	16:44:59	012° 03,74' E	08° 32,34' S
1198	CTD/SS	2015/11/28	16:51:00	012° 03,74' E	08° 32,34' S	2026,2	17:05:59	012° 03,74' E	08° 32,34' S
1199	SAPS	2015/11/28	17:12:00	012° 03,74' E	08° 32,34' S	2025,1	21:01:59	012° 03,77' E	08° 32,37' S
1200	CTD/SS	2015/11/29	04:03:00	012° 10,81' E	07° 19,48' S	287,5	04:22:59	012° 10,81' E	07° 19,48' S
1201	CTD/TM	2015/11/29	04:27:00	012° 10,81' E	07° 19,48' S	288,6	04:42:59	012° 10,81' E	07° 19,42' S
1202	CTD/SS	2015/11/29	10:32:00	011° 59,68' E	06° 11,93' S	57,4	10:44:59	011° 59,68' E	06° 11,93' S
1203	CTD/TM	2015/11/29	10:53:00	011° 59,68' E	06° 11,93' S	56,8	11:03:59	011° 59,70' E	06° 11,93' S
1204	CTD/TM	2015/11/29	11:10:00	011° 59,71' E	06° 11,94' S	57,8	11:17:59	011° 59,73' E	06° 11,94' S
1205	SAPS	2015/11/29	11:29:00	011° 59,73' E	06° 11,94' S	56,5	13:09:59	011° 59,74' E	06° 11,94' S
1206	CTD/SS	2015/11/29	17:27:00	011° 09,82' E	06° 13,97' S	1004,1	18:17:59	011° 09,78' E	06° 14,00' S
1207	CTD/TM	2015/11/29	18:24:00	011° 09,77' E	06° 14,00' S	1005,2	19:08:59	011° 09,69' E	06° 14,08' S
1208	CTD/SS	2015/11/29	19:23:00	011° 09,69' E	06° 14,08' S	1008,6	19:53:59	011° 09,69' E	06° 14,08' S
1209	SAPS	2015/11/29	20:06:00	011° 09,69' E	06° 14,08' S	1008,1	23:23:59	011° 09,69' E	06° 14,08' S
1210	CTD/SS	2015/11/30	02:01:00	011° 29,48' E	06° 00,01' S	356,4	02:26:59	011° 29,48' E	06° 00,00' S
1211	CTD/TM	2015/11/30	02:34:00	011° 29,46' E	05° 59,99' S	364,5	02:52:59	011° 29,40' E	05° 59,93' S
1212	CTD/SS	2015/11/30	03:17:00	011° 29,39' E	05° 59,93' S	378,3	03:39:59	011° 29,39' E	05° 59,93' S
1213	SAPS	2015/11/30	03:51:00	011° 29,40' E	05° 59,93' S	381,3	05:54:59	011° 29,40' E	05° 59,93' S
1155	Fish						15:30:00	011° 29,40' E	05° 30,74' S
1155	Fish	2015/11/30	23:05:00	010° 28,92' E	04° 16,31' S	895,4			
1214	CTD/SS	2015/11/30	23:07:00	010° 28,92' E	04° 16,31' S	895,4	23:46:59	010° 28,92' E	04° 16,31' S
1215	CTD/TM	2015/11/30	23:51:00	010° 28,91' E	04° 16,31' S	895,8	00:25:59	010° 28,84' E	04° 16,34' S
1216	CTD/SS	2015/12/01	00:44:00	010° 28,83' E	04° 16,33' S	904,5	01:06:59	010° 28,83' E	04° 16,33' S
1217	SAPS	2015/12/01	01:14:00	010° 28,83' E	04° 16,33' S	901,9	04:17:59	010° 28,83' E	04° 16,33' S
1218	CTD/SS	2015/12/01	11:16:00	009° 49,71' E	03° 00,08' S	52,2	11:31:59	009° 49,71' E	03° 00,08' S
1219	CTD/TM	2015/12/01	11:42:00	009° 49,65' E	03° 00,02' S	52,5	11:51:59	009° 49,63' E	02° 59,93' S
1220	CTD/TM	2015/12/01	11:56:00	009° 49,62' E	02° 59,89' S	52,9	12:01:59	009° 49,61' E	02° 59,84' S
1221	SAPS	2015/12/01	12:12:00	009° 49,57' E	02° 59,80' S	52,2	13:56:59	009° 49,69' E	02° 59,91' S
1222	CTD/SS	2015/12/01	16:55:00	009° 25,97' E	03° 00,06' S	179,4	17:15:59	009° 25,97' E	03° 00,06' S
1223	CTD/TM	2015/12/01	17:20:00	009° 25,97' E	03° 00,06' S	179,9	17:35:59	009° 25,93' E	03° 00,01' S
1224	CTD/SS	2015/12/01	18:10:00	009° 25,93' E	03° 00,01' S	178,9	18:29:59	009° 25,93' E	03° 00,01' S
1225	SAPS	2015/12/01	18:36:00	009° 25,93' E	03° 00,01' S	178,7	20:58:59	009° 25,93' E	03° 00,01' S

Station	Instrument	Date	Station Start				Station End		
			Time	Pos. Long.	Pos. Lat.	Depth	Time	Pos. Long.	Pos. Lat.
						(m)			
1226	CTD/SS	2015/12/01	21:53:00	009° 20,04' E	03° 00,14' S	533,3	22:24:59	009° 20,04' E	03° 00,14' S
1227	CTD/TM	2015/12/01	22:28:00	009° 20,03' E	03° 00,14' S	507,1	22:54:59	009° 20,00' E	03° 00,16' S
1228	CTD/SS	2015/12/01	23:07:00	009° 20,00' E	03° 00,16' S	512,7	23:46:59	009° 20,00' E	03° 00,16' S
1229	SAPS	2015/12/02	00:52:00	009° 20,00' E	03° 00,16' S	512,8	02:57:59	009° 20,00' E	03° 00,16' S
1230	CTD/SS	2015/12/02	06:00:00	009° 03,99' E	02° 59,93' S	1027,0	06:42:59	009° 03,99' E	02° 59,93' S
1231	CTD/TM	2015/12/02	06:47:00	009° 03,99' E	02° 59,93' S	1029,3	07:26:59	009° 03,93' E	02° 59,97' S
1232	CTD/SS	2015/12/02	07:39:00	009° 03,93' E	02° 59,98' S	1032,7	07:54:59	009° 03,93' E	02° 59,97' S
1233	SAPS	2015/12/02	08:24:00	009° 03,92' E	02° 59,97' S	1032,1	11:44:59	009° 03,92' E	02° 59,97' S
1234	CTD/SS	2015/12/02	22:48:00	006° 46,56' E	03° 00,05' S	4188,6	01:36:59	006° 46,57' E	03° 00,04' S
1235	CTD/TM	2015/12/03	02:05:00	006° 46,57' E	03° 00,04' S	4180,9	04:45:59	006° 46,54' E	03° 00,05' S
1236	CTD/SS	2015/12/03	04:51:00	006° 46,54' E	03° 00,05' S	4170,1	05:15:59	006° 46,54' E	03° 00,05' S
1237	SAPS	2015/12/03	05:23:00	006° 46,54' E	03° 00,05' S	4172,8	09:09:59	006° 46,54' E	03° 00,05' S
1238	CTD/SS	2015/12/03	20:31:00	004° 24,95' E	03° 00,16' S	4503,0	23:10:59	004° 24,95' E	03° 00,16' S
1239	CTD/TM	2015/12/03	23:14:00	004° 24,95' E	03° 00,16' S	4505,6	01:57:59	004° 24,94' E	03° 00,19' S
1240	CTD/SS	2015/12/04	02:09:00	004° 24,94' E	03° 00,19' S	4520,6	02:37:59	004° 24,94' E	03° 00,19' S
1241	SAPS	2015/12/04	02:43:00	004° 24,94' E	03° 00,19' S	4500,8	06:00:59	004° 24,94' E	03° 00,19' S
1242	CTD/SS	2015/12/04	06:10:00	004° 24,94' E	03° 00,19' S	4512,0	06:27:59	004° 24,93' E	03° 00,23' S
1243	CTD/SS	2015/12/04	17:23:00	002° 12,83' E	03° 00,04' S	4503,8	20:09:59	002° 12,82' E	03° 00,04' S
1244	CTD/TM	2015/12/04	20:15:00	002° 12,81' E	03° 00,04' S	4507,6	23:07:59	002° 12,76' E	03° 00,05' S
1245	CTD/SS	2015/12/04	23:19:00	002° 12,76' E	03° 00,05' S	4504,4	23:33:59	002° 12,76' E	03° 00,05' S
1246	SAPS	2015/12/04	23:39:00	002° 12,76' E	03° 00,05' S	4504,5	02:56:59	002° 12,76' E	03° 00,05' S
1247	CTD/SS	2015/12/05	14:05:00	000° 00,31' W	02° 59,91' S	4474,3	19:17:59	000° 00,43' W	02° 59,93' S
1248	CTD/SS	2015/12/05	19:57:00	000° 00,43' W	02° 59,93' S	4476,9	22:13:59	000° 00,43' W	02° 59,94' S
1249	CTD/TM	2015/12/05	22:22:00	000° 00,43' W	02° 59,94' S	4698,4	01:38:59	000° 00,45' W	02° 59,94' S
1250	CTD/SS	2015/12/06	01:50:00	000° 00,45' W	02° 59,95' S	4481,3	02:16:59	000° 00,45' W	02° 59,95' S
1251	SAPS	2015/12/06	03:04:00	000° 00,49' W	02° 59,97' S	4480,1	06:17:59	000° 00,47' W	02° 59,95' S
1252	CTD/SS	2015/12/06	19:46:00	000° 00,01' E	05° 29,96' S	4223,5	20:04:59	000° 00,01' E	05° 29,96' S
1253	CTD/TM	2015/12/06	20:11:00	000° 00,01' E	05° 29,96' S	4217,7	22:44:59	000° 00,01' E	05° 29,98' S
1254	CTD/SS	2015/12/06	22:56:00	000° 00,01' E	05° 29,99' S	4217,1	01:29:59	000° 00,01' E	05° 29,99' S
1255	CTD/SS	2015/12/07	10:26:00	000° 00,00' W	07° 12,00' S	4914,4	13:08:59	000° 00,01' W	07° 12,00' S
1256	CTD/TM	2015/12/07	13:14:00	000° 00,01' W	07° 12,00' S	4916,0	16:38:59	000° 00,05' E	07° 12,84' S
1257	CTD/SS	2015/12/07	16:44:00	000° 00,05' E	07° 12,84' S	4918,8	17:20:59	000° 00,05' E	07° 12,86' S
1258	SAPS	2015/12/07	17:26:00	000° 00,05' E	07° 12,86' S	4921,8	20:51:59	000° 00,17' E	07° 12,86' S
1259	CTD/SS	2015/12/08	06:04:00	000° 00,09' E	08° 54,02' S	5256,9	08:58:59	000° 00,10' E	08° 54,03' S
1260	CTD/TM	2015/12/08	09:08:00	000° 00,09' E	08° 54,02' S	5255,8	12:39:59	000° 00,05' E	08° 54,14' S

Station	Instrument	Date	Station Start				Station End		
			Time	Pos. Long.	Pos. Lat.	Depth	Time	Pos. Long.	Pos. Lat.
						(m)			
1261	CTD/SS	2015/12/08	12:51:00	000° 00,05' E	08° 54,14' S	5277,6	13:02:59	000° 00,05' E	08° 54,14' S
1262	CTD/SS	2015/12/09	10:58:00	000° 00,01' W	13° 00,93' S	5435,1	14:05:59	000° 00,01' W	13° 00,93' S
1263	CTD/TM	2015/12/09	14:10:00	000° 00,01' W	13° 00,92' S	5435,4	17:28:59	000° 00,09' E	13° 01,30' S
1264	CTD/SS	2015/12/09	17:37:00	000° 00,09' E	13° 01,31' S	5428,4	18:13:59	000° 00,09' E	13° 01,31' S
1265	SAPS	2015/12/09	18:20:00	000° 00,09' E	13° 01,32' S	5930,7	21:57:59	000° 00,09' E	13° 01,32' S
1266	CTD/SS	2015/12/09	22:07:00	000° 00,09' E	13° 01,32' S	5430,1	22:38:59	000° 00,09' E	13° 01,32' S
1267	CTD/SS	2015/12/10	09:26:00	000° 00,04' E	15° 04,22' S	5779,4	12:39:59	000° 00,04' E	15° 04,22' S
1268	CTD/TM	2015/12/10	12:44:00	000° 00,04' E	15° 04,22' S	5812,8	16:31:59	000° 00,03' E	15° 04,22' S
1269	CTD/SS	2015/12/10	16:36:00	000° 00,02' E	15° 04,22' S	5829,1	16:46:59	000° 00,02' E	15° 04,22' S
1270	CTD/SS	2015/12/11	06:05:00	000° 00,03' W	17° 30,93' S	5749,2	09:04:59	000° 00,02' W	17° 30,93' S
1271	CTD/TM	2015/12/11	09:09:00	000° 00,03' W	17° 30,93' S	5362,5	12:37:59	000° 00,10' W	17° 30,97' S
1272	CTD/SS	2015/12/11	12:46:00	000° 00,11' W	17° 30,98' S	5380,5	13:22:59	000° 00,11' W	17° 30,98' S
1273	SAPS	2015/12/11	13:28:00	000° 00,11' W	17° 30,98' S	5380,6	16:48:59	000° 00,11' W	17° 30,97' S
1274	CTD/SS	2015/12/12	05:49:00	000° 00,01' W	19° 54,93' S	6223,6	09:00:59	000° 00,01' W	19° 54,93' S
1275	CTD/TM	2015/12/12	09:06:00	000° 00,02' W	19° 54,95' S	5177,8	12:03:59	000° 00,04' W	19° 54,98' S
1276	CTD/SS	2015/12/12	12:12:00	000° 00,04' W	19° 54,98' S	5162,9	12:34:59	000° 00,04' W	19° 54,98' S
1277	CTD/SS	2015/12/13	01:30:00	000° 00,01' E	22° 17,58' S	5103,0	04:33:59	000° 00,01' E	22° 17,58' S
1278	CTD/TM	2015/12/13	04:40:00	000° 00,00' W	22° 17,58' S	5099,2	07:34:59	000° 00,02' E	22° 17,64' S
1279	CTD/SS	2015/12/13	07:45:00	000° 00,02' E	22° 17,65' S	5106,0	08:22:59	000° 00,02' E	22° 17,65' S
1280	SAPS	2015/12/13	08:34:00	000° 00,02' E	22° 17,65' S	5107,0	12:08:59	000° 00,02' E	22° 17,65' S
1281	CTD/SS	2015/12/14	01:08:00	000° 00,02' W	24° 42,87' S	5385,0	04:22:59	000° 00,00' W	24° 42,94' S
1282	CTD/TM	2015/12/14	04:26:00	000° 00,00' W	24° 42,95' S	5293,1	07:37:59	000° 00,04' W	24° 43,00' S
1283	CTD/SS	2015/12/14	07:47:00	000° 00,05' W	24° 43,02' S	5292,3	08:02:59	000° 00,05' W	24° 43,02' S
1284	CTD/SS	2015/12/14	20:30:00	000° 00,03' W	27° 05,53' S	4967,7	00:51:59	000° 00,05' W	27° 05,46' S
1285	CTD/TM	2015/12/15	00:56:00	000° 00,05' W	27° 05,46' S	4968,3	03:52:59	000° 00,02' W	27° 05,50' S
1286	CTD/SS	2015/12/15	04:00:00	000° 00,00' W	27° 05,50' S	4968,7	04:21:59	000° 00,00' W	27° 05,51' S
1287	SAPS	2015/12/15	04:31:00	000° 00,01' W	27° 05,52' S	4969,8	07:56:59	000° 00,04' E	27° 05,52' S
1288	CTD/SS	2015/12/15	20:22:00	000° 00,02' E	29° 34,72' S	4715,7	22:58:59	000° 00,01' E	29° 34,72' S
1289	CTD/TM	2015/12/15	23:04:00	000° 00,02' E	29° 34,71' S	4779,3	01:31:59	000° 00,05' E	29° 34,69' S
1290	CTD/SS	2015/12/16	01:40:00	000° 00,05' E	29° 34,69' S	4681,9	02:15:59	000° 00,05' E	29° 34,68' S
1291	SAPS	2015/12/16	02:23:00	000° 00,05' E	29° 34,68' S	4792,5	06:00:59	000° 00,04' E	29° 34,69' S
1292	CTD/SS	2015/12/16	21:11:00	002° 44,45' E	29° 22,57' S	4718,8	01:43:59	002° 44,45' E	29° 22,58' S
1293	CTD/TM	2015/12/17	01:52:00	002° 44,38' E	29° 22,60' S	3691,2	03:54:59	002° 44,64' E	29° 22,75' S
1294	CTD/SS	2015/12/17	04:01:00	002° 44,65' E	29° 22,76' S	4847,3	04:21:59	002° 44,69' E	29° 22,84' S
1295	CTD/SS	2015/12/17	16:50:00	005° 32,07' E	29° 13,75' S	5020,6	22:18:59	005° 32,15' E	29° 13,76' S

Station	Instrument	Date	Station Start				Station End		
			Time	Pos. Long.	Pos. Lat.	Depth	Time	Pos. Long.	Pos. Lat.
						(m)			
1296	CTD/TM	2015/12/17	22:23:00	005° 32,16' E	29° 13,77' S	5039,8	01:14:59	005° 32,20' E	29° 13,77' S
1297	CTD/SS	2015/12/18	01:26:00	005° 32,20' E	29° 13,77' S	5017,2	02:01:59	005° 32,20' E	29° 13,77' S
1298	SAPS	2015/12/18	02:12:00	005° 32,20' E	29° 13,77' S	5033,4	05:46:59	005° 32,20' E	29° 13,77' S
1299	CTD/SS	2015/12/18	17:11:00	008° 03,21' E	29° 07,61' S	5076,4	20:17:59	008° 03,31' E	29° 07,65' S
1300	CTD/TM	2015/12/18	20:24:00	008° 03,33' E	29° 07,65' S	5057,4	23:19:59	008° 03,01' E	29° 08,39' S
1301	CTD/SS	2015/12/18	23:28:00	008° 03,01' E	29° 08,39' S	5073,9	23:40:59	008° 03,01' E	29° 08,39' S
1302	SAPS	2015/12/18	23:54:00	008° 03,01' E	29° 08,39' S	5072,5	03:09:59	008° 02,74' E	29° 08,94' S
1303	CTD/SS	2015/12/19	16:30:00	010° 42,41' E	29° 01,89' S	4763,8	22:14:59	010° 42,41' E	29° 01,89' S
1304	CTD/TM	2015/12/19	22:20:00	010° 42,40' E	29° 01,89' S	4760,7	01:00:59	010° 42,30' E	29° 01,90' S
1305	CTD/SS	2015/12/20	01:11:00	010° 42,28' E	29° 01,90' S	4765,2	01:31:59	010° 42,28' E	29° 01,90' S
1306	SAPS	2015/12/20	01:47:00	010° 42,28' E	29° 01,90' S	4766,1	05:23:59	010° 42,28' E	29° 01,90' S
1307	CTD/SS	2015/12/20	05:30:00	010° 42,28' E	29° 01,90' S	4767,1	06:11:59	010° 42,28' E	29° 01,90' S
1308	CTD/TM	2015/12/20	13:11:00	012° 01,86' E	28° 58,69' S	4029,2	14:51:59	012° 01,79' E	28° 59,83' S
1309	CTD/TM	2015/12/20	16:50:00	012° 01,78' E	28° 59,90' S	0,0	18:40:59	012° 01,54' E	29° 01,03' S
1310	CTD/SS	2015/12/21	01:07:00	013° 10,66' E	28° 55,53' S	2626,9	02:46:59	013° 10,66' E	28° 55,53' S
1311	SAPS	2015/12/21	02:53:00	013° 10,66' E	28° 55,53' S	2625,1	06:04:59	013° 10,57' E	28° 55,14' S
1312	CTD/SS	2015/12/21	06:11:00	013° 10,57' E	28° 55,15' S	2629,0	06:24:59	013° 10,49' E	28° 55,19' S
1313	CTD/TM	2015/12/21	06:31:00	013° 10,48' E	28° 55,23' S	2630,4	08:13:59	013° 10,31' E	28° 56,00' S
1314	CTD/SS	2015/12/21	14:34:00	014° 22,80' E	28° 50,35' S	466,2	14:59:59	014° 22,82' E	28° 50,36' S
1315	CTD/TM	2015/12/21	15:01:00	014° 22,82' E	28° 50,36' S	465,8	15:25:59	014° 22,87' E	28° 50,57' S
1316	SAPS	2015/12/21	15:38:00	014° 22,86' E	28° 50,58' S	465,2	18:26:59	014° 23,29' E	28° 50,60' S
1317	CTD/SS	2015/12/22	00:36:00	015° 33,50' E	28° 44,96' S	187,8	00:51:59	015° 33,50' E	28° 44,96' S
1318	GoFlo	2015/12/22	01:00:00	015° 33,50' E	28° 44,96' S	187,1	01:32:59	015° 33,50' E	28° 44,96' S
1319	GoFlo	2015/12/22	01:38:00	015° 33,50' E	28° 44,96' S	517,3	01:52:59	015° 33,50' E	28° 44,96' S
1320	CTD/SS	2015/12/22	02:02:00	015° 33,50' E	28° 44,96' S	187,7	02:16:59	015° 33,50' E	28° 44,96' S
1321	SAPS	2015/12/22	02:19:00	015° 33,50' E	28° 44,96' S	188,2	04:19:59	015° 32,87' E	28° 45,12' S
1322	CTD/SS	2015/12/22	08:37:00	016° 16,06' E	28° 40,56' S	67,4	08:49:59	016° 16,06' E	28° 40,56' S
1323	CTD/TM	2015/12/22	08:55:00	016° 16,06' E	28° 40,56' S	68,8	09:04:59	016° 15,99' E	28° 40,53' S
1324	SAPS	2015/12/22	09:31:00	016° 15,96' E	28° 40,52' S	71,7	11:10:59	016° 15,96' E	28° 40,52' S
1325	CTD/SS	2015/12/22	19:39:00	014° 50,93' E	27° 51,85' S	236,9	19:59:59	014° 50,93' E	27° 51,85' S
1326	GoFlo	2015/12/22	20:09:00	014° 50,93' E	27° 51,85' S	236,1	21:06:59	014° 50,67' E	27° 51,80' S
1327	GoFlo	2015/12/22	21:11:00	014° 50,63' E	27° 51,80' S	251,8	21:23:59	014° 50,50' E	27° 51,76' S
1328	SAPS	2015/12/22	21:30:00	014° 50,41' E	27° 51,74' S	263,2	23:42:59	014° 49,94' E	27° 51,64' S
1329	CTD/SS	2015/12/23	06:04:00	014° 44,57' E	26° 40,65' S	190,1	06:21:59	014° 44,57' E	26° 40,65' S
1330	CTD/TM	2015/12/23	06:26:00	014° 44,57' E	26° 40,65' S	189,8	06:40:59	014° 44,52' E	26° 40,65' S

Station	Instrument	Date	Station Start				Station End		
			Time	Pos. Long.	Pos. Lat.	Depth	Time	Pos. Long.	Pos. Lat.
						(m)			
1331	SAPS	2015/12/23	07:15:00	014° 44,50' E	26° 40,65' S	191,0	09:40:59	014° 44,50' E	26° 40,65' S
1332	CTD/SS	2015/12/23	09:49:00	014° 44,50' E	26° 40,65' S	191,3	10:02:59	014° 44,50' E	26° 40,65' S
1333	CTD/TM	2015/12/23	13:25:00	014° 41,22' E	26° 04,48' S	159,2	13:37:59	014° 41,25' E	26° 04,48' S
1334	CTD/SS	2015/12/23	16:53:00	014° 27,35' E	25° 31,70' S	154,7	17:05:59	014° 27,37' E	25° 31,72' S
1335	CTD/TM	2015/12/23	17:00:00	014° 27,36' E	25° 31,71' S	154,0	17:22:59	014° 27,37' E	25° 31,76' S
1336	SAPS	2015/12/23	17:36:00	014° 27,37' E	25° 31,76' S	154,6	19:56:59	014° 27,37' E	25° 31,76' S
1337	CTD/SS	2015/12/23	20:03:00	014° 27,37' E	25° 31,76' S	155,1	20:25:59	014° 27,37' E	25° 31,76' S
1338	CTD/SS	2015/12/24	02:30:00	014° 12,00' E	24° 23,18' S	137,9	02:43:59	014° 11,99' E	24° 23,17' S
1339	CTD/TM	2015/12/24	02:48:00	014° 12,01' E	24° 23,19' S	136,0	02:58:59	014° 12,00' E	24° 23,22' S
1341	CTD/SS	2015/12/24	11:01:00	013° 55,33' E	22° 56,28' S	139,5	11:13:59	013° 55,33' E	22° 56,28' S
1342	CTD/TM	2015/12/24	11:19:00	013° 55,33' E	22° 56,28' S	140,5	11:30:59	013° 55,37' E	22° 56,28' S
1343	SAPS	2015/12/24	11:49:00	013° 55,37' E	22° 56,28' S	139,9	13:58:59	013° 55,37' E	22° 56,28' S
1344	CTD/SS	2015/12/24	20:03:00	013° 10,80' E	21° 58,37' S	195,0	20:20:59	013° 10,80' E	21° 58,38' S
1155	Fish						20:08:00	013° 10,80' E	21° 58,38' S
1345	CTD/TM	2015/12/24	20:26:00	013° 10,80' E	21° 58,38' S	195,9	20:39:59	013° 10,73' E	21° 58,37' S

Gear acronyms in the Station list:

CTD/NISK CTD-SS stainless steel water sampler with Niskin bottles
CTD/TM Trace metal clean CTD water sampler with GO-FLO bottles
GoFlo single GO-FLO bottles on Meteor line
FISH Towed Fish surface water sampler
SAPS In-situ pumping system