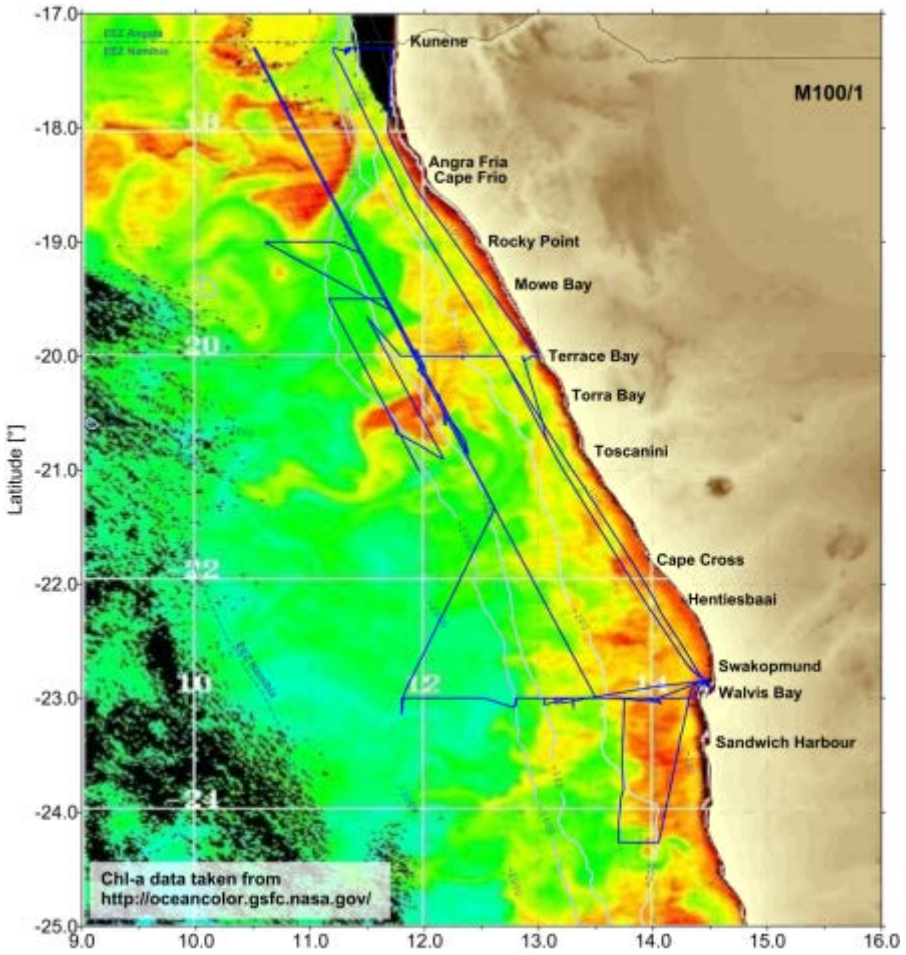
Friedrich Buchholz, Prof. Dr.
Alfred-Wegener-Institute
Helmholtz Centre for Polar and
Marine Research
Am Handelshafen 12
27570 Bremerhaven
fon: +49 471 4831 2444
e-mail: friedrich.buchholz@awi.de

Short Cruise Report
RV METEOR M100/1
Walvis Bay – Walvis Bay
1st September to 1st October 2013

Chief Scientist: Prof. Dr. Friedrich Buchholz

Captain: Klaus Bergmann



Cruise track M100/1 over satellite image of surface chlorophyll content off Namibia on 24.09.2013. The centre of the filament studied is at appr. 20.6°S; 12.5°E (source: Volker Mohrholz, IOW)

Objectives

The Meteor cruise M100/1 was carried out as a joint cruise of the GENUS consortium, representing the BMBF project Geochemistry and Ecology of the Namibian Upwelling System. It is the sixth cruise in a series of expeditions covering the period from 2008 to 2013. The cruise greatly profited from the direct interaction and transfer of knowledge with participating Namibian colleagues. In turn, students were instructed together in the framework of the GENUS capacity building programme. In addition to other objectives, the cruise contributes to the key physical oceanography and modeling research themes in GENUS II, these are:

- Filaments and mesoscale dynamics and the impact on the availability of nutrients and on exchanges of CH_4 and CO_2 and trace cases between atmosphere and ocean
- Primary production and phytoplankton succession in relation with the physical forcing conditions
- Swell, internal waves and turbulent mixing at the sediment-water-interface
- Plankton organisms and their feedback on the oxygen and carbon cycle with special consideration of calcifying primary producers and micro-, meso-, macro-zooplankton and ichthyoplankton

The main focus of the investigations is on the structure and dynamics of upwelling filaments. The field data obtained during the cruise will be used to understand the impact of upwelling filaments on the ecosystem. The following hypotheses will be tested:

1. Surface and deep filaments, and other mesoscale structures control the zonal transport of upwelled water.
2. Vertical mixing at the thermocline and horizontal mixing at fronts and interfaces drive a significant transport of nutrients into the aging upwelling water.
3. Filaments are relatively isolated water bodies, where the temporal changes of nutrient availability determine the plankton succession.
4. Local fronts are hot spots of primary production. (e.g. filament edges, upwelling front,…) and as a consequence of zooplankton growth and performance

Additionally, the Meteor cruise M100/1 provided distributions of physical and geochemical key parameters and of performance of phyto- and zooplankton in late austral winter. Which expand the existing series of hydrographic and ecological data in the northern Benguela.

Narrative

RV METEOR departed from the pier at Walvis Bay harbor at 09:00 on 1st September, 2013 heading for the Walvis Bay Transect along the 23° S – parallel. Namibian colleagues deployed a WP2-net for zooplankton in the frame of a long term series observation at fixed stations until 70nm offshore while routine stations of CTD and various multinets for plankton were run. The Namibian monitoring line was paralleled with vanVeen grab samples.

Continuous measurements of CO_2 and methane in the air and surface waters were initiated and continued underway.

The synoptic work was a repeat of previous cruises to be set in relation to seasonal and interannual environmental variability.

In the morning of 3rd Sep a long term mooring was deployed and a short term mooring set until Feb 2014 carrying ADCPs and TSF-sensors at 130m depth.

From there, a transect was run with a Scanfish undulating between 120m and the surface measuring TSF, accompanied partly by a towed Katamaran with an ADCP on board avoiding the ship's disturbance. The transect ended at 17.3°S, the Kunene Transect and run parallel to the coast to record cross sections of upwelling filaments.

Upon arrival, the data recorded was evaluated and compared with SST and Chl_a images from the MODIS and microwave band satellites received in the meantime.

A conspicuous, well developed filament was identified at 20° S and chosen for intensive study.

A coast parallel Scanfish- transect N-S at 30nm offshore initiated the study, followed by deployments at stations out-South, S-front, centre, N-front and out-North, taking water samples and running net-hauls all along. This included a horizontal haul with a 1m ^{2} Double-MOCNESS opening and closing 18 single nets across the filament at 30m depth. Finally, a MSS, micro structure sonde, transect was run North.

Further cross section transects were conducted at 60 and 90 nm offshore and coastal waters were sampled in the end. In this way, a most complete picture of a well-developed filament was obtained, possibly with unprecedented precision of atmospheric, oceanographic, geochemical and ecological measurements between 7th and 15th Sep.

On the 15th, a N-S coast parallel transect was run towards the 23°S parallel with underway systems running due to a medical case to be delivered at Walvis Bay and back up North until the coastal station of Kunene Transect was reached at 17.3° S. On the 18th Sep a bottom ADCP was moored to record until Feb 2014, at 17°60.0S; 11°40.8E.

On the Kunene Transect at 17.3°S the shelf stations until 400m depth were sampled for our long term synoptic programme of GENUS on the 18th and 19th Sep.

An underway measuring transect was run back towards 23°S. A brief call at Walvis Bay was necessary for one person to disembark for medical treatment.

On 21st work was resumed at two coastal stations at 24.5°S at a prospective phosphate mining site with vanVeen grab and WP2 nets of Namibian colleagues.

Subsequently, sampling of the Walvis Bay line at 23°S was resumed by recovering the short term mooring at 130m and completing the transect with the slope stations at 400 and 900m and an offshore station at 3000m until 25th Sep.

In the meantime, satellite images were received and the further development of the 20°S – filament followed. Unexpectedly, the initially sampled structure persisted and it was decided to conduct a second cross section campaign through it, which began with a Scanfish transect on 26st Sep from the South. From the Northern endpoint a brief excursion to the West at the shelf break was conducted and zooplankton sampled at 600, 1000, and 1800m and related to the pronounced OMZ, oxygen minimum zone, including experimentation on hypoxia tolerance.

In the morning of 28th September, the 2nd Filament cross section was done, starting North of the filament – North front – Centre – South of filament as a repeat of the initial 30nm offshore transect and concluded on 29th Sep, 22:00 with a celebration in the bar.

Figures

The following figure of hydrographic and gas measurements demonstrates the high dynamical situation within the structure of the filament studied at 20°S. This reflects also biological activity of primary and secondary producers, e.g. krill species as environmental indicators and fish larvae as indication of top predatory potential (not shown).

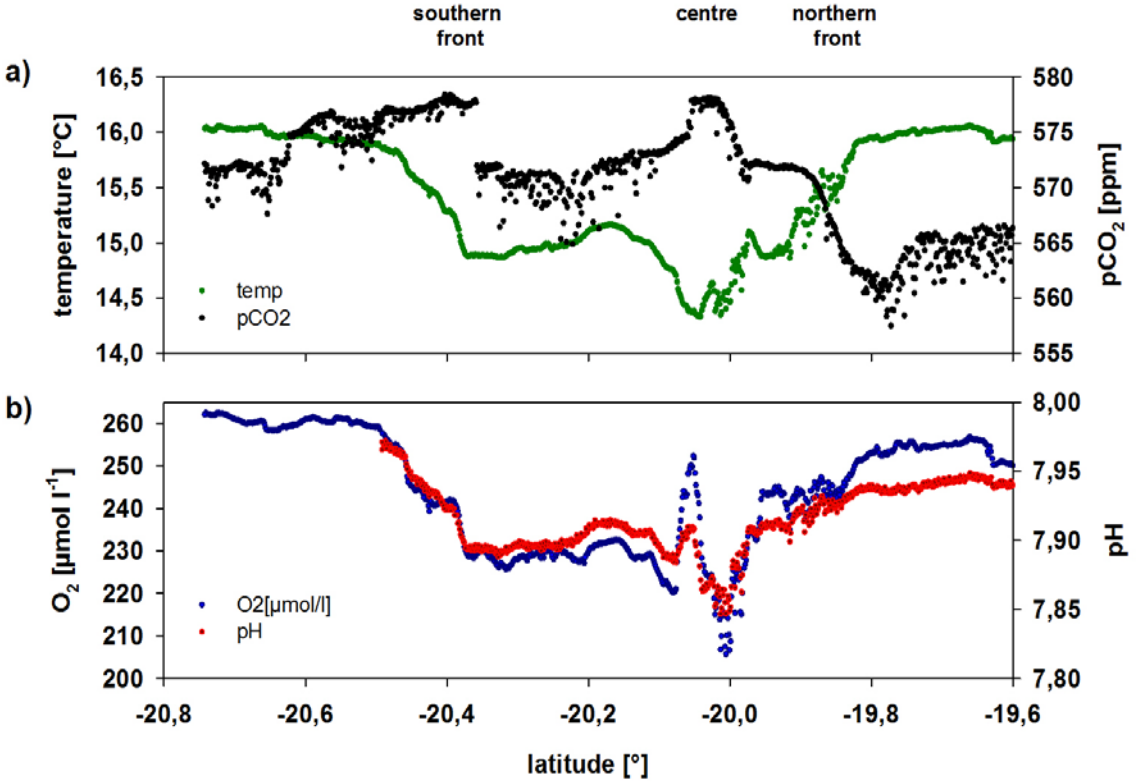


Fig.1: Preliminary results of the surface expression of the filament as observed in a) xCO_2 (ppm) and temperature (°C) and b) O_2 (µmol l^{-1}) and pH during a scan fish cross section (06.09.–07.09.2013) , source: Anita Flohr, ZMT

Acknowledgements

Outstanding event was the celebration of the one hundredths cruise of the RV METEOR, M100/1, being initiated by Three Cheers in the bar: we are proud of our able and handsome ship and consider it a great privilege to be allowed to use such a perfect, so to say ”living instrument” for our research, solidly founded on the experience and unlimited support of the ship’s command and crew: we are a perfect team! Thank you all very much for your continuing support!

Foto: D. Peterke

Fig. 2: Group photo from the one hundredth cruise of RV METEOR, M 100/1. It is a rare occasion that within the tight schedule of shifts crew and scientists can meet all at once: the above picture demonstrates the close spline of technical and scientific cooperation, typical and perfect on our able ship, to the benefit of international marine research.

Additional thanks are due to the tax payer, the ministry (BMBF GENUS II 03F0497F), the senate commission of the German Science Foundation, the steering office and the ship's agency!

Cordially, Fritz Buchholz, chief scientist M 100/1, 30st September 2013

Participants METEOR M100/1

	Name	Task	Institution
1	Buchholz, Friedrich	TP7 Krill Chief Scientist	AWI
2	Buchholz, Cornelia	TP7 Krill	AWI
3	Werner, Thorsten	TP7 Krill	AWI
4	Mlambo, Lindan	TP7 Partner Krill	ISATEC Zimbabwe
5	Mohrholz, Volker	TP2 Oceanography	IOW
6	Heene, Toralf	TP2 Oceanography	IOW
7	Schmidt, Martin	TP2 Oceanography	IOW
8	De Klerk, Arnold	TP2 Partner Phytoplkt	NatMIRC Namibia
9	Wasmund, Norbert	TP2. Phytoplankton	IOW
10	Edward,Josefine	TP2 Partner	NatMIRC Namibia
11	Bahlmann, Enno	TP3 Geochemistry	IfBM
12	Jacob, Juliane	TP3 Geochemistry	IfBM/HZG
13	Beyn, Fabian	TP3 Geochemistry	IfBM/HZG
14	Frame, Caitlin	TP3 Geochemistry	IfBM / Uni Basel / USA
15	Flohr, Anita	TP4 Biogeochemistry	ZMT
16	Peterke, Dieter	TP4 Biogeochemistry	ZMT
17	Lendt, Ralf	TP4 Biogeochemistry	ZMAW HH
18	Geist, Simon	TP4 Ichthyoplankton	ZMT
19	Koppelmann, Rolf	TP5 Zooplankton	IHF
20	Martin, Bettina	TP5 Zooplankton	IHF
21	Bohata, Karolina	TP5 Zooplankton	IHF
22	Bruhn, Jörg	TP5 Zooplankton	IHF
23	Currie, Bronwen	TP5 Partner Benthos	NatMIRC **Observer**
24	Horaeb,Richard	TP5 Partner Zoopl.	NatMIRC Namibia
25	Schukat,Anna	TP6 Copepods	BREMARE
26	Guinio, Marina	TP6 Copepods	BREMARE Croatia
27	Limbuku, Victor	TP4 Biogeochemistry	NatMIRC Namibia
28	Stelzner, Martin	Meteorologist	DWD

Station list

Table : List of CTD/LADCP/MSS stations - CTD casts associated to deployments of nets and other devices

Stat No.	*Stat.No. (Depth)*		*Date*	*Time UTC*	*Latitude*	*Longitude*	*CTD cast(s)*	*LADCP cast*	*MSS casts*
1861	1861 (39m)	Begin	01.09.2013	10:49	23° 00.06'S	14° 02.94'E	V0001F01	001	-
		End	01.09.2013	13:52	23° 00.00'S	14° 02.93'E			
1862	1862 (62m)	Begin	01.09.2013	11:58	22° 59.97'S	14° 19.83'E	V0002F02	002	-
		End	01.09.2013	12:44	22° 59.97'S	14° 19.83'E			
1863	1863 (113m)	Begin	01.09.2013	13:37	22° 59.99'S	14° 13.81'E	V0003F02 V0004F01	003 004	-
		End	01.09.2013	16:15	23° 00.38'S	14° 13.84'E			
1864	1864 (130m)	Begin	01.09.2013	17:23	22° 59.99'S	14° 02.40'E	V0005F02	005	-
		End	01.09.2013	23:32	23° 02.84'S	14° 04.49'E			
1865	1865 (140m)	Begin	02.09.2013	01:10	22° 59.99'S	13° 51.60'E	V0006F01	006	-
		End	02.09.2013	02:18	23° 00.00'S	13° 51.60'E			
1866	1866 (147m)	Begin	02.09.2013	03:22	22° 59.99'S	13° 40.81'E	V0007F01	007	-
		End	02.09.2013	04:42	23° 00.00'S	13° 40.81'E			
1867	1867 (222m)	Begin	02.09.2013	05:41	22° 59.99'S	13° 30.60'E	V0008F01 V0008F02	008	-
		End	02.09.2013	07:49	22° 59.99'S	13° 30.61'E			
1868	1868 (348m)	Begin	02.09.2013	09:13	23° 00.00'S	13° 19.82'E	V0009F01	009	-
		End	02.09.2013	10:33	22° 59.98'S	13° 19.91'E			
1869	1869 (312m)	Begin	02.09.2013	11:54	22° 59.99'S	13° 08.38'E	V0010F01 V0010F03	010	-
		End	02.09.2013	16:21	23° 03.16'S	13° 08.89'E			
1870	X_1870 (131m)	Begin	03.09.2013	06:32	23° 00.03'S	14° 02.92'E	V0011F01	011	-
		End	03.09.2013	09:40	22° 59.86'S	14° 03.24'E			
1871	1 (234m)	Begin	03.09.2013	12:49	22° 59.98'S	13° 29.99'E	V0012F02 Scanfish	012	-
		End	06.09.2013	05:52	17° 25.77'S	10° 35.05'E			
1872	1872-1 (1749m)	Begin	06.09.2013	19:47	19° 30.00'S	11° 40.00'E	V0013F02	013	-
		End	07.09.2013	14:35	20° 51.40'S	12° 23.14'E			

Stat No.	*Stat.No. (Depth)*		*Date*	*Time UTC*	*Latitude*	*Longitude*	*CTD cast(s)*	*LADCP cast*	*MSS casts*
1873	X_1873 (437m)	Begin	07.09.2013	14:51	20° 51.46'S	12° 23.19'E	V0014F01	-	-
		End	07.09.2013	15:25	20° 51.47'S	12° 23.20'E			
1874	1874 (351m)	Begin	07.09.2013	20:34	20° 03.99'S	11° 58.00'E	V0015F01 V0015F05	014	-
		End	08.09.2013	07:34	20° 08.64'S	11° 57.61'E			
1875	1875 (321m)	Begin	08.09.2013	08:55	20° 18.23'S	12° 05.61'E	-	-	-
		End	08.09.2013	14:11	20° 32.40'S	12° 13.14'E			
1876	1876 (318m)	Begin	08.09.2013	15:32	20° 21.01'S	12° 07.20'E	V0016F02 V0016F04	015	-
		End	09.09.2013	00:13	20° 19.85'S	12° 07.19'E			
1877	1877 (415m)	Begin	09.09.2013	03:32	20° 48.06'S	12° 21.58'E	V0017F01 …	016 017	001 … 004
		End	09.09.2013	18:02	20° 48.93'S	12° 21.70'E			
1878	- (380m)	Begin	09.09.2013	18:49	20° 42.76'S	12° 18.83'E	-	-	005 … 008
		End	09.09.2013	19:43	20° 43.59'S	12° 18.83'E			
1879	- (348m)	Begin	09.09.2013	20:33	20° 37.55'S	12° 16.00'E	-	-	009 … 012
		End	09.09.2013	21:27	20°38.33' S	12° 16.10'E			
1880	- (326m)	Begin	09.09.2013	22:23	20° 32.35'S	12° 13.24'E	-	-	013 … 016
		End	09.09.2013	23:19	20° 33.74'S	12° 13.38'E			
1881	- (316m)	Begin	10.09.2013	00:18	20° 27.15'S	12° 10.55'E	-	-	017 … 020
		End	10.09.2013	01:10	20° 28.30'S	12° 11.01'E			
1882	- (317m)	Begin	10.09.2013	02:02	20° 22.01'S	12° 07.73'E	-	-	021 … 024
		End	10.09.2013	02:55	20° 22.92'S	12° 08.21'E			
1883	- (323m)	Begin	10.09.2013	03:42	20° 16.76'S	12° 04.91'E	-	-	025 … 028
		End	10.09.2013	04:36	20° 17.47'S	12° 05.22'E			
1884	- (334m)	Begin	10.09.2013	05:19	20° 11.53'S	12° 02.11'E	-	-	029 … 032
		End	10.09.2013	06:16	20° 12.15'S	12° 02.41'E			
1885	- (346m)	Begin	10.09.2013	07:05	20° 06.39'S	11° 59.40'E	-	-	033 … 036
		End	10.09.2013	08:00	20° 07.29'S	11° 59.62'E			

Stat No.	*Stat.No. (Depth)*		*Date*	*Time UTC*	*Latitude*	*Longitude*	*CTD cast(s)*	*LADCP cast*	*MSS casts*
1886	- (355m)	Begin	10.09.2013	08:51	20° 01.15'S	11° 56.63'E	-	-	037 … 040
		End	10.09.2013	09:46	20° 02.01'S	11° 56.59'E			
1887	- (362m)	Begin	10.09.2013	10:34	19° 55.98'S	11° 53.85'E	-	-	041 … 044
		End	10.09.2013	11:39	19° 57.14'S	11° 54.15'E			
1888	- (371m)	Begin	10.09.2013	12:33	19° 50.83'S	11° 51.07'E	-	-	045 … 048
		End	10.09.2013	13:30	19° 51.73'S	11° 51.52'E			
1889	- (373m)	Begin	10.09.2013	14:17	19° 45.60'S	11° 48.29'E	-	-	049 … 052
		End	10.09.2013	15:20	19° 46.49'S	11° 48.53'E			
1890	- (366m)	Begin	10.09.2013	16:05	19° 40.36'S	11° 45.50'E	-	-	053 … 056
		End	10.09.2013	16:59	19° 41.18'S	11° 45.80'E			
1891	- (361)	Begin	10.09.2013	17:44	19° 35.19'S	11° 42.72'E	-	-	057 … 060
		End	10.09.2013	18:40	19° 36.03'S	11° 42.89'E			
1892	1872-1 (368)	Begin	10.09.2013	19:31	19° 29.97'S	11° 40.00'E	V0018F02	018	061 … 064
		End	10.09.2013	21:36	19° 30.00'S	11° 39.98'E			
1893	1893 (370m)	Begin	11.09.2013	00:48	19° 51.98'S	11° 51.70'E	-	-	-
		End	11.09.2013	04:46	20° 00.08'S	11° 55.90'E			
1894	X_1894 (362m)	Begin	11.09.2013	05:21	19° 56.13'S	11° 53.90'E	V0019F01	019	-
		End	11.09.2013	11:29	19° 56.11'S	11° 53.93'E			
1895	1872-1 (368m)	Begin	11.09.2013	14:31	19° 30.14'S	11° 40.26'E	V0020F02	020	-
		End	12.09.2013	00:25	19° 29.98'S	11° 40.22'E			
1896	1896 (966m)	Begin	12.09.2013	03:29	19° 29.99'S	11° 09.60'E	V0021F01	021	-
		End	12.09.2013	07:10	19° 42.41'S	11° 16.11'E			
1897	1897 (1062m)	Begin	13.09.2013	01:02	20° 59.98'S	11° 56.99'E	V0022F02	022	-
		End	13.09.2013	01:46	20° 59.98'S	11° 56.99'E			
1898	1898 (1042m)	Begin	13.09.2013	04:28	20° 36.01'S	11° 44.29'E	V0023F01 V0023F02	023	-
		End	13.09.2013	12:30	20° 36.00'S	11° 44.27'E			

Stat No.	*Stat.No. (Depth)*		*Date*	*Time UTC*	*Latitude*	*Longitude*	*CTD cast(s)*	*LADCP cast*	*MSS casts*
1899	1899 (1015m)	Begin	13.09.2013	13:44	20° 30.17'S	11° 41.09'E	-	-	-
		End	13.09.2013	16:36	20° 37.04'S	11° 44.73'E			
1900	1900 (1042m)	Begin	13.09.2013	16:56	20° 36.00'S	11° 44.30'E	-	-	-
		End	13.09.2013	21:12	20° 40.82'S	11° 46.63'E			
1901	1901 (733m)	Begin	14.09.2013	00:03	20° 54.28'S	12° 09.15'E	-	-	-
		End	14.09.2013	16:10	19° 39.11'S	11° 29.59'E			
1902	1902 (565m)	Begin	14.09.2013	16:28	19° 39.99'S	11° 29.99'E	V0024F02	024	-
		End	14.09.2013	16:59	19° 39.99'S	11° 30.00'E			
1903	WW20070 (436m)	Begin	14.09.2013	20:08	20° 00.00'S	11° 47.40'E	V0025F01	025	-
		End	14.09.2013	22:59	20° 00.00'S	11° 47.40'E			
1904	WW20060 (344m)	Begin	15.09.2013	00:23	19° 59.98'S	11° 58.18'E	V0026F01	026	-
		End	15.09.2013	01:36	19° 59.98'S	11° 58.18'E			
1905	WW20050 (278m)	Begin	15.09.2013	02:47	20° 00.01'S	12° 08.99'E	V0027F01	027	-
		End	15.09.2013	03:48	20° 00.00'S	12° 09.00'E			
1906	WW20040 (212m)	Begin	15.09.2013	05:02	20° 00.01'S	12° 19.79'E	V0028F01 V0028F03	028 029	-
		End	15.09.2013	12:27	19° 59.98'S	12° 19.78'E			
1907	WW20030 (149m)	Begin	15.09.2013	13:45	19° 59.98'S	12° 29.99'E	V0029F01	030	-
		End	15.09.2013	14:42	19° 59.98'S	12° 29.99'E			
1908	WW20020 (123m)	Begin	15.09.2013	15:56	20° 00.00'S	12° 40.77'E	V0030F02	031	-
		End	15.09.2013	16:37	20° 00.00'S	12° 40.78'E			
1909	WW20010 (97m)	Begin	17.09.2013	11:15	19° 59.98'S	12° 51.58'E	V0031F02	032	-
		End	17.09.2013	13:31	20° 02.81'S	12° 51.81'E			
1910	WW20005 (59m)	Begin	17.09.2013	14:14	19° 59.97'S	12° 56.39'E	V0032F01	-	-
		End	17.09.2013	14:34	19° 59.97'S	12° 56.39'E			
1911	WW20002 (28m)	Begin	17.09.2013	15:07	19° 59.99'S	12° 59.98'E	V0033F01	-	-
		End	17.09.2013	15:22	19° 59.92'S	12° 59.99'E			

Stat No.	*Stat.No. (Depth)*		*Date*	*Time UTC*	*Latitude*	*Longitude*	*CTD cast(s)*	*LADCP cast*	*MSS casts*
1912	1912 (117m)	Begin	18.09.2013	03:43	17° 59.99'S	11° 40.76'E	V0034F01	033	-
		End	18.09.2013	09:35	18° 02.23'S	11° 40.89'E			
1913	1913 (53m)	Begin	18.09.2013	13:40	17° 17.98'S	11° 42.01'E	V0035F02	-	-
		End	18.09.2013	14:45	17° 18.52'S	11° 42.00'E			
1914	1914 (148m)	Begin	18.09.2013	15:57	17° 18.00'S	11° 30.00'E	V0036F01 V0036F02	034	-
		End	18.09.2013	21:34	17° 17.99'S	11° 30.00'E			
1915	1915 (401m)	Begin	18.09.2013	22:54	17° 18.15'S	11° 18.59'E	V0037F01	035	-
		End	19.09.2013	12:08	17° 19.76'S	11° 20.86'E			
1916	1916 (833m)	Begin	19.09.2013	13:20	17° 17.99'S	11° 11.97'E	V0038F02	036	-
		End	19.09.2013	16:12	17° 20.27'S	11° 12.03'E			
1917	1917 (180m)	Begin	22.09.2013	06:26	24° 15.99'S	14° 03.02'E	V0039F02	037	-
		End	22.09.2013	08:19	24° 15.99'S	14° 03.02'E			
1918	1918 (204m)	Begin	22.09.2013	08:59	24° 15.99'S	13° 59.98'E	V0040F01	038	-
		End	22.09.2013	10:37	24° 15.99'S	13° 59.98'E			
1919	1919 (301m)	Begin	22.09.2013	12:28	24° 15.96'S	13° 42.02'E	V0041F02	039	-
		End	22.09.2013	14:03	24° 15.96'S	13° 42.02'E			
1920	1920 (142m)	Begin	22.09.2013	21:05	22° 59.99'S	13° 44.99'E	V0042F02	040	-
		End	23.09.2013	01:33	22° 59.98'S	13° 45.00'E			
1921	WW23020 (132m)	Begin	23.09.2013	03:17	23° 00.00'S	14° 02.40'E	V0043F01	041	-
		End	23.09.2013	12:27	23° 01.92'S	14° 02.63'E			
1922	1922 (628m)	Begin	23.09.2013	17:19	22° 59.99'S	13° 08.40'E	V0044F02	042	-
		End	23.09.2013	21:06	23° 03.48'S	13° 02.57'E			
1923	1923 (358m)	Begin	23.09.2013	22:49	22° 59.99'S	13° 17.98'E	V0045F01	043	-
		End	24.09.2013	04:27	23° 00.00'S	13° 18.01'E			
1924	1924 (896m)	Begin	24.09.2013	07:18	22° 59.99'S	12° 48.00'E	V0046F01 V0046F03	044 045	-
		End	24.09.2013	23:05	23° 04.80'S	12° 47.29'E			

Stat No.	*Stat.No. (Depth)*		*Date*	*Time UTC*	*Latitude*	*Longitude*	*CTD cast(s)*	*LADCP cast*	*MSS casts*
1925	1925 (2909m)	Begin	25.09.2013	04:34	22° 59.99'S	11° 48.00'E	V0047F01 V0047F02	046 047	-
		End	25.09.2013	16:30	23° 08.81'S	11° 48.04'E			
1926	1926 (386m)	Begin	26.09.2013	03:34	21° 19.53'S	12° 36.74'E	-	-	-
		End	27.09.2013	06:31	19° 05.49'S	11° 25.77'E			
1927	1927 (493m)	Begin	27.09.2013	07:18	19° 05.13'S	11° 24.36'E	-	-	-
		End	27.09.2013	07:26	19° 05.13'S	11° 24.36'E			
1928	1928 (846m)	Begin	27.09.2013	08:50	18° 59.99'S	11° 12.01'E	V0048F01	048	-
		End	27.09.2013	11:33	18° 59.99'S	11° 12.03'E			
1929	1929 (1283m)	Begin	27.09.2013	12:52	18° 59.98'S	10° 59.99'E	V0049F01	049	-
		End	27.09.2013	15:54	18° 59.98'S	10° 59.98'E			
1930	1930 (1822m)	Begin	27.09.2013	18:11	18° 59.99‘S	10° 36.60'E	V0050F02	050	-
		End	27.09.2013	23:12	18° 59.98'S	10° 36.52'E			