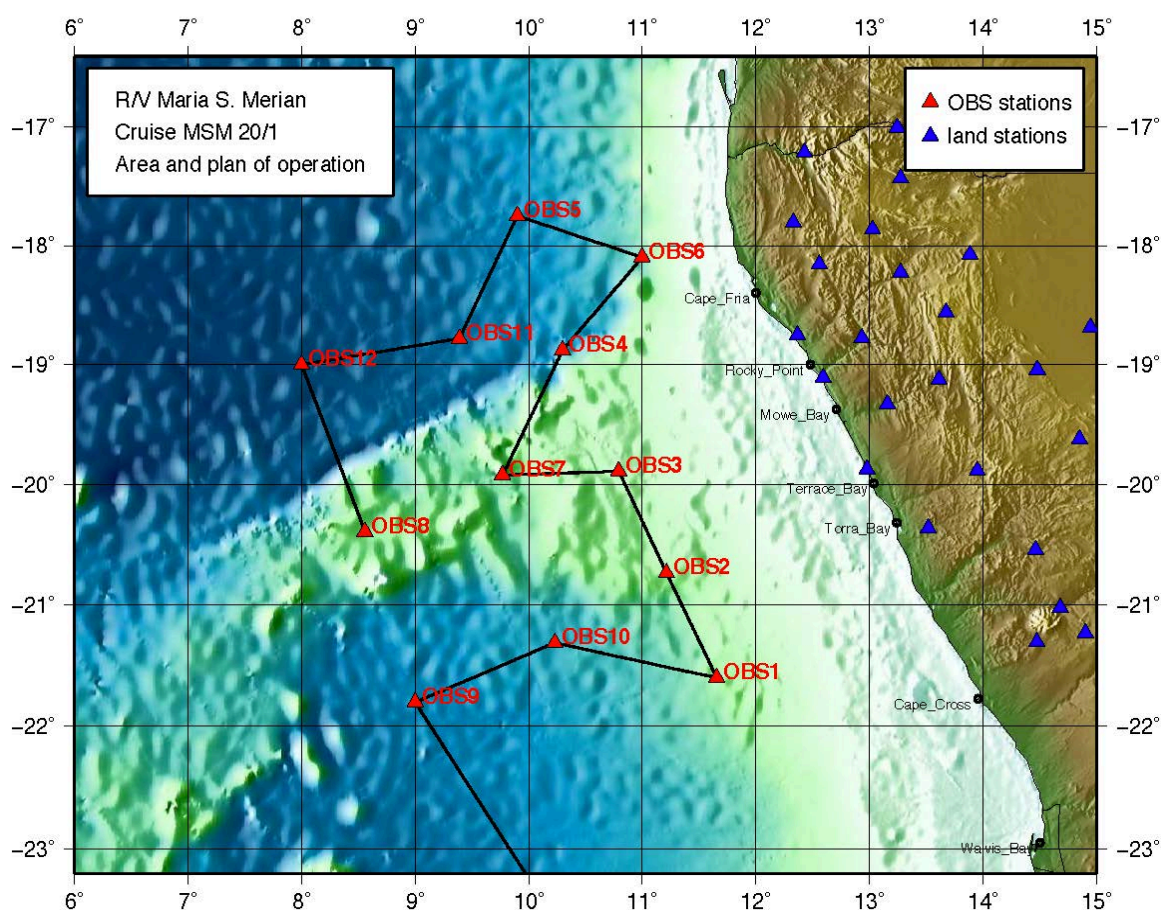


Short Cruise Report

Maria S. Merian; Cruise No. MSM 20/1

Cape Town – Walvis Bay
January 6th, 2012 – January 15th, 2012
Chief Scientist: Wolfram Geissler
Captain: Ralf Schmidt



Cruise track of MSM 20/1 with location of the twelve broadband ocean-bottom seismometers recovered during the cruise. Walvis Bay was the arrival harbour.

Objectives (parts identical with MSM17-1/2 reports)

Continental break-up is closely related to the question regarding the driving forces behind the associated processes. Following a well-accepted hypothesis, mantle plumes are the most important triggers for the separation of continents. Around the head of a plume the upper mantle temperatures are strongly increased. After weakening of the continental crust by horizontal extension the high temperatures cause extensive volcanism, forming flood basalts as parts of so-called Large Igneous Provinces (LIP) on the continents, and in some cases also in the newly formed oceanic basin. Following this hypothesis, in the ideal case flood basalts are deposited on the continents before break-up. After the start of the drifting stage with formation of oceanic crust between the continents, the mantle plume should create an aseismic ridge due to its continuing activity.

The aseismic ridge in the adjacent oceanic basin will mark the plume position through space and time. However, such a clear relationship between volcanism on the continents and the adjoining ocean basins is rarely observed on a global scale. Among the best examples on Earth for such a relationship are the Parana/Etendeka flood basalts and the Rio Grande Rise/Walvis Ridges on both margins of the South Atlantic.

Expeditions MSM17/1+2 and MSM20/1 were dedicated to investigate critical parameters, like crustal thickness and structure of the underlying Earth's mantle offshore northern Namibia. Our work was led by the assumption that in the uppermost Earth's mantle and in the overlying crust structures relating to fossil plume and/or deformation processes are frozen in and can be visualized by geophysical methods. During MSM 20/1 we recovered 12 broadband ocean-bottom seismometers deployed in 2011 during MSM 17/2. The acquired passive seismological data will hopefully shed light into the deep lithospheric structure of the study area.

Additionally, leg MSM20/1 was a "floating university" teaching Master students the acquisition, processing and interpretation of hydroacoustic data gathered with the on-board systems EM120, EM1002 and PARASOUND. Transits to and between the stations were used for running the hydroacoustic systems in different water depths (from upper slope down to the deep sea basin) and environments (slope, abyssal plain, Walvis-Ridge). After the successful recovery of all OBS about two days were available for detailed surveys. A nearby sediment wave field on the slope and some structures on the shallow shelf were chosen as targets.

Narrative

R/V MARIA S. MERIAN left Cape Town (South Africa) on January 6th, 2012 in the morning. Due to a permit of the South African authorities we were able to start acquisition of multibeam and subbottom profiling right after leaving the port. This way the floating university could make use of the long transit to the main working area offshore Northern Namibia. A first sound velocity profile (32 25.860 S / 17 14.300 E) was measured on January 6th for calibration of the multibeam data. Beside the real acquisition of data the students got various lectures in the principles and processing of multibeam echosounding and parametric subbottom profiling. Unfortunately, we had a breakdown of the echosounder EM120 during the night of the 7th to 8th, which could not be recovered until the port call in Walvis Bay at the end of the leg.

The priority task of the leg was the recovery of 12 BB-OBS stations, which were deployed during leg MSM17/2 in January 2011. In the early morning of January 9th, at around 01:30 UTC, we reached the first station at (21° 47.81' S, 9° 2.00' E), where an OBS had been deployed one year ago. The OBS is equipped with a release unit that can be used to range the distance between the ship and the instrument at the seafloor. Therefore, we tried to locate the OBS by triangulation. As we did not get any answer from the OBS at the first triangulation point, we decided to send the release command immediately. The release unit then releases the OBS from the steel anchor, and the device ascends towards the sea surface with a velocity of about 1.2 m/s. At 03:05 UTC the first OBS was recovered from the calm sea after ascending from more than 4000 m water depth. At the recovery position a second sound velocity profile was measured. At 10:17 UTC we reached the first triangulation point for the second OBS. From now on we could triangulate all instruments successfully. With only few exceptions, these measurements gave us better coordinates for the position of the OBS. Usually, only coordinates of the position of deployment and recovery are known. However, they could vary quite a lot, for instance, due to ocean currents. The OBS position has to be known as much precise as possible to reduce uncertainties in the seismological methods that will be applied to the data set. During the following days every six hours one of twelve OBS could be recovered without any problems from water depths ranging between 1200 and more than 5000 m.

The „Floating University Hydro-acoustics“ recorded profiles of the seafloor and the uppermost sediments using PARASOUND along the ship track. At important positions additional water sound velocity profiles were measured. In parallel, students were taught in data processing (e.g., Introduction to Linux operating system, interpretation of water sound velocity profiles, re-processing of PARASOUND data using ATLAS Parastore).

The last OBS was recovered in the afternoon (14:08 UTC) of January 16th from the Walvis Ridge (20° 23.36' S, 8° 33.37' E). We headed on the shortest way towards the continental shelf offshore Namibia. At the shelf slope PARASOUND profiles were measured across a known sediment wave field between January 12th, 23:39 UTC (20° 25.99' S, 10° 41.81' E) and January 13th, 02:32 UTC (20° 7.71' S, 11° 5.22' E). January 13th 09:00 UTC, a sound velocity profile was measured on the shelf (20° 52.19' S, 12° 10.63' E). At the same time the shallow water swath bathymetry tool EM1002 was installed in the moon pool. The task for the floating university was to map existing anomalies in the global bathymetry data set, which is mainly derived from satellite data, in greater detail. Near the coastline two anomalies were chosen. The first one looked like a canyon whereas the second had the shape of the giant footprint. The students on watch had to plan the track for the following hours in order to acquire full spatial data with the E1002 system. The velocity of the ship was thereby reduced from 13 to 8 knots. The EM120 was taken from the moon pool January 14th 17:51 UTC (21° 42.47' S, 13° 18.67' E). During the following hours only the PARASOUND was running.

The measurements of the floating university were finished January 14th 22:00 UTC (22° 10.36' S, 13° 41.74' E). With normal speed we steamed to our final destination. The vessel arrived at Walvis Bay on January 15th, 06:00 UTC.

Acknowledgements

We thank the master and the crew of R/V MARIA S. MERIAN for their professional support of the scientific work at sea. Support by the “Leitstelle Meteor/Merian” in Hamburg, the “Senatskommission für Ozeanografie der DFG”, the “Deutsche Forschungsgemeinschaft (DFG)” and Briese Schifffahrts GmbH & Co. KG was essential for the success of the cruise MSM20/1. We thank the DFG, and especially Dr. Susanne Faulhaber for the support. The scientific coordination of the DFG Priority Program SAMPLE and the colleagues working on SAMPLE companion projects have helped us in many ways in preparing and carrying out our experiments. Special thanks to Dr. Gabi Schneider, Director of the Geological Survey of Namibia, and the German Ministry of Foreign Affairs for supporting our experiment by making the research permits possible.

Participants

Name	Discipline	Institution
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GFZ: Deutsches Geoforschungszentrum, Potsdam, Germany

GSN: Geological Survey of Namibia, Windhoek, Namibia

LMU, Ludwig-Maximilians-Universität München, Geophysik, München, Germany

MARUM: Zentrum für Marine Umweltwissenschaften, Universität Bremen, Bremen, Germany

GEOMAR: Helmholtz-Zentrum für Ozeanforschung, Kiel, Germany

Station Book for Leg MSM 20-1

Station No.	Date	Time [UTC]	Position Lat	Position Lon	Depth [m]	Gear Abbreviation	Action
MSM20/001-1	09.01.12	01:37	21° 49,25' S	9° 0,98' E	0	BB-OBS	Hydrophone in to water
MSM20/001-1	09.01.12	01:57	21° 49,05' S	9° 0,83' E	0	BB-OBS	released
MSM20/001-1	09.01.12	01:57	21° 49,05' S	9° 0,83' E	0	BB-OBS	Hydrophone on Deck
MSM20/001-1	09.01.12	02:19	21° 47,48' S	8° 59,72' E	0	BB-OBS	Hydrophone in to water
MSM20/001-1	09.01.12	02:38	21° 47,47' S	8° 59,73' E	0	BB-OBS	Hydrophone on Deck
MSM20/001-1	09.01.12	02:49	21° 47,47' S	8° 59,73' E	0	BB-OBS	sighted
MSM20/001-1	09.01.12	03:05	21° 47,82' S	9° 0,14' E	0	BB-OBS	back on deck
MSM20/001-2	09.01.12	03:17	21° 47,81' S	9° 0,20' E	0	SVP-SONDE	at sea surface
MSM20/001-2	09.01.12	03:59	21° 47,81' S	9° 0,20' E	4234	SVP-SONDE	at max. depth
MSM20/001-2	09.01.12	04:30	21° 47,81' S	9° 0,20' E	4158	SVP-SONDE	back to deck
MSM20/002-1	09.01.12	10:17	21° 19,28' S	10° 12,30' E	0	BB-OBS	Hydrophone in to water
MSM20/002-1	09.01.12	10:21	21° 19,28' S	10° 12,31' E	0	BB-OBS	Information
MSM20/002-1	09.01.12	10:22	21° 19,28' S	10° 12,31' E	0	BB-OBS	Hydrophone on Deck
MSM20/002-1	09.01.12	10:43	21° 17,15' S	10° 13,86' E	0	BB-OBS	Hydrophone in to water
MSM20/002-1	09.01.12	10:45	21° 17,13' S	10° 13,87' E	0	BB-OBS	Information
MSM20/002-1	09.01.12	10:46	21° 17,12' S	10° 13,87' E	0	BB-OBS	Hydrophone on Deck
MSM20/002-1	09.01.12	11:10	21° 19,47' S	10° 15,10' E	0	BB-OBS	Hydrophone in to water
MSM20/002-1	09.01.12	11:11	21° 19,47' S	10° 15,10' E	0	BB-OBS	Information
MSM20/002-1	09.01.12	11:15	21° 19,43' S	10° 15,08' E	0	BB-OBS	released
MSM20/002-1	09.01.12	11:22	21° 19,44' S	10° 15,00' E	0	BB-OBS	Hydrophone on Deck
MSM20/002-1	09.01.12	11:45	21° 18,02' S	10° 13,61' E	0	BB-OBS	Hydrophone in to water
MSM20/002-1	09.01.12	11:51	21° 18,02' S	10° 13,61' E	0	BB-OBS	Hydrophone on Deck
MSM20/002-1	09.01.12	12:00	21° 18,02' S	10° 13,61' E	0	BB-OBS	sighted
MSM20/002-1	09.01.12	12:15	21° 18,58' S	10° 13,87' E	0	BB-OBS	back on deck
MSM20/003-1	09.01.12	18:41	21° 35,63' S	11° 37,76' E	0	BB-OBS	Hydrophone in to water
MSM20/003-1	09.01.12	18:43	21° 35,62' S	11° 37,75' E	0	BB-OBS	Information
MSM20/003-1	09.01.12	18:46	21° 35,59' S	11° 37,73' E	0	BB-OBS	Hydrophone on Deck
MSM20/003-1	09.01.12	19:05	21° 36,84' S	11° 39,74' E	2050	BB-OBS	Hydrophone in to water
MSM20/003-1	09.01.12	19:06	21° 36,83' S	11° 39,75' E	2050	BB-OBS	Information
MSM20/003-1	09.01.12	19:08	21° 36,79' S	11° 39,75' E	0	BB-OBS	Hydrophone on Deck
MSM20/003-1	09.01.12	19:21	21° 35,21' S	11° 40,12' E	2010	BB-OBS	Hydrophone in to water
MSM20/003-1	09.01.12	19:21	21° 35,21' S	11° 40,12' E	2010	BB-OBS	Information
MSM20/003-1	09.01.12	19:26	21° 35,17' S	11° 40,14' E	0	BB-OBS	released
MSM20/003-1	09.01.12	19:34	21° 35,10' S	11° 40,19' E	0	BB-OBS	Hydrophone on Deck
MSM20/003-1	09.01.12	19:55	21° 35,40' S	11° 39,08' E	0	BB-OBS	sighted
MSM20/003-1	09.01.12	20:10	21° 35,83' S	11° 39,15' E	0	BB-OBS	back on deck
MSM20/003-2	09.01.12	20:19	21° 35,78' S	11° 39,08' E	0	SVP-SONDE	at sea surface
MSM20/003-2	09.01.12	20:43	21° 35,78' S	11° 39,08' E	2052	SVP-SONDE	at max. depth
MSM20/003-2	09.01.12	21:04	21° 35,78' S	11° 39,08' E	2053	SVP-SONDE	back to deck

Station No.	Date	Time [UTC]	Position Lat	Position Lon	Depth [m]	Gear Abbreviation	Action
MSM20/004-1	10.01.12	01:29	20° 44,60' S	11° 13,67' E	0	BB-OBS	Hydrophone in to water
MSM20/004-1	10.01.12	01:35	20° 44,53' S	11° 13,54' E	0	BB-OBS	Information
MSM20/004-1	10.01.12	01:35	20° 44,53' S	11° 13,54' E	0	BB-OBS	Hydrophone on Deck
MSM20/004-1	10.01.12	01:49	20° 44,50' S	11° 11,91' E	0	BB-OBS	Hydrophone in to water
MSM20/004-1	10.01.12	01:52	20° 44,49' S	11° 11,88' E	0	BB-OBS	Information
MSM20/004-1	10.01.12	01:54	20° 44,48' S	11° 11,85' E	0	BB-OBS	Hydrophone on Deck
MSM20/004-1	10.01.12	02:10	20° 43,12' S	11° 12,90' E	0	BB-OBS	Hydrophone in to water
MSM20/004-1	10.01.12	02:11	20° 43,12' S	11° 12,91' E	0	BB-OBS	Information
MSM20/004-1	10.01.12	02:12	20° 43,11' S	11° 12,91' E	0	BB-OBS	released
MSM20/004-1	10.01.12	02:16	20° 43,10' S	11° 12,90' E	0	BB-OBS	Hydrophone on Deck
MSM20/004-1	10.01.12	02:35	20° 43,72' S	11° 12,52' E	0	BB-OBS	sighted
MSM20/004-1	10.01.12	02:45	20° 44,05' S	11° 12,65' E	1615	BB-OBS	back on deck
MSM20/005-1	10.01.12	07:10	19° 53,38' S	10° 48,10' E	0	BB-OBS	Hydrophone in to water
MSM20/005-1	10.01.12	07:12	19° 53,37' S	10° 48,08' E	0	BB-OBS	Information
MSM20/005-1	10.01.12	07:14	19° 53,36' S	10° 48,07' E	0	BB-OBS	Hydrophone on Deck
MSM20/005-1	10.01.12	07:24	19° 53,74' S	10° 47,35' E	0	BB-OBS	Hydrophone in to water
MSM20/005-1	10.01.12	07:25	19° 53,74' S	10° 47,34' E	0	BB-OBS	Information
MSM20/005-1	10.01.12	07:27	19° 53,73' S	10° 47,33' E	0	BB-OBS	Hydrophone on Deck
MSM20/005-1	10.01.12	07:38	19° 52,88' S	10° 47,37' E	0	BB-OBS	Hydrophone in to water
MSM20/005-1	10.01.12	07:38	19° 52,88' S	10° 47,37' E	0	BB-OBS	Information
MSM20/005-1	10.01.12	07:43	19° 52,81' S	10° 47,36' E	0	BB-OBS	released
MSM20/005-1	10.01.12	07:46	19° 52,77' S	10° 47,35' E	0	BB-OBS	Hydrophone on Deck
MSM20/005-1	10.01.12	07:59	19° 52,94' S	10° 47,47' E	0	BB-OBS	sighted
MSM20/005-1	10.01.12	08:11	19° 53,36' S	10° 47,48' E	0	BB-OBS	back on deck
MSM20/005-2	10.01.12	08:16	19° 53,36' S	10° 47,46' E	0	SVP-SONDE	at sea surface
MSM20/005-2	10.01.12	08:42	19° 53,36' S	10° 47,46' E	0	SVP-SONDE	at max. depth
MSM20/005-2	10.01.12	09:05	19° 53,36' S	10° 47,46' E	0	SVP-SONDE	back to deck
MSM20/006-1	10.01.12	13:27	19° 55,22' S	9° 46,71' E	2252	BB-OBS	Hydrophone in to water
MSM20/006-1	10.01.12	13:30	19° 55,23' S	9° 46,67' E	0	BB-OBS	Information
MSM20/006-1	10.01.12	13:31	19° 55,23' S	9° 46,66' E	0	BB-OBS	Hydrophone on Deck
MSM20/006-1	10.01.12	13:41	19° 55,78' S	9° 45,98' E	0	BB-OBS	Hydrophone in to water
MSM20/006-1	10.01.12	13:43	19° 55,78' S	9° 45,97' E	0	BB-OBS	Information
MSM20/006-1	10.01.12	13:44	19° 55,78' S	9° 45,96' E	0	BB-OBS	Hydrophone on Deck
MSM20/006-1	10.01.12	13:54	19° 54,97' S	9° 45,82' E	0	BB-OBS	Hydrophone in to water
MSM20/006-1	10.01.12	13:56	19° 54,94' S	9° 45,83' E	0	BB-OBS	Information
MSM20/006-1	10.01.12	13:57	19° 54,93' S	9° 45,83' E	0	BB-OBS	released
MSM20/006-1	10.01.12	14:00	19° 54,91' S	9° 45,85' E	0	BB-OBS	Hydrophone on Deck
MSM20/006-1	10.01.12	14:29	19° 54,78' S	9° 46,12' E	2246	BB-OBS	sighted
MSM20/006-1	10.01.12	14:42	19° 55,24' S	9° 46,11' E	0	BB-OBS	back on deck
MSM20/007-1	10.01.12	20:08	18° 53,15' S	10° 18,80' E	0	BB-OBS	Hydrophone in to water
MSM20/007-1	10.01.12	20:10	18° 53,15' S	10° 18,79' E	0	BB-OBS	Information
MSM20/007-1	10.01.12	20:11	18° 53,14' S	10° 18,79' E	0	BB-OBS	Hydrophone on Deck

Station No.	Date	Time [UTC]	Position Lat	Position Lon	Depth [m]	Gear Abbreviation	Action
MSM20/007-1	10.01.12	20:25	18° 53,19' S	10° 17,04' E	3195	BB-OBS	Hydrophone in to water
MSM20/007-1	10.01.12	20:27	18° 53,17' S	10° 17,03' E	0	BB-OBS	Information
MSM20/007-1	10.01.12	20:31	18° 53,12' S	10° 17,04' E	0	BB-OBS	Hydrophone on Deck
MSM20/007-1	10.01.12	20:43	18° 51,71' S	10° 17,90' E	3891	BB-OBS	Hydrophone in to water
MSM20/007-1	10.01.12	20:45	18° 51,69' S	10° 17,91' E	3893	BB-OBS	Information
MSM20/007-1	10.01.12	20:46	18° 51,67' S	10° 17,91' E	3893	BB-OBS	released
MSM20/007-1	10.01.12	20:53	18° 51,57' S	10° 17,92' E	0	BB-OBS	Hydrophone on Deck
MSM20/007-1	10.01.12	21:38	18° 52,24' S	10° 17,60' E	3871	BB-OBS	sighted
MSM20/007-1	10.01.12	21:50	18° 52,70' S	10° 17,82' E	3454	BB-OBS	back on deck
MSM20/008-1	11.01.12	02:29	18° 6,54' S	10° 59,00' E	0	BB-OBS	Hydrophone in to water
MSM20/008-1	11.01.12	02:32	18° 6,55' S	10° 59,01' E	0	BB-OBS	Information
MSM20/008-1	11.01.12	02:33	18° 6,54' S	10° 59,02' E	0	BB-OBS	Hydrophone on Deck
MSM20/008-1	11.01.12	02:51	18° 6,34' S	11° 0,77' E	0	BB-OBS	Hydrophone in to water
MSM20/008-1	11.01.12	02:53	18° 6,34' S	11° 0,79' E	0	BB-OBS	Information
MSM20/008-1	11.01.12	02:54	18° 6,35' S	11° 0,79' E	0	BB-OBS	Hydrophone on Deck
MSM20/008-1	11.01.12	03:14	18° 4,95' S	10° 59,74' E	0	BB-OBS	Hydrophone in to water
MSM20/008-1	11.01.12	03:17	18° 4,96' S	10° 59,77' E	0	BB-OBS	Information
MSM20/008-1	11.01.12	03:19	18° 4,95' S	10° 59,78' E	0	BB-OBS	released
MSM20/008-1	11.01.12	03:26	18° 4,89' S	10° 59,79' E	0	BB-OBS	Hydrophone on Deck
MSM20/008-1	11.01.12	03:54	18° 5,48' S	10° 59,69' E	0	BB-OBS	sighted
MSM20/008-1	11.01.12	04:07	18° 6,10' S	10° 59,99' E	0	BB-OBS	back on deck
MSM20/009-1	11.01.12	09:07	17° 45,70' S	9° 55,30' E	0	BB-OBS	Hydrophone in to water
MSM20/009-1	11.01.12	09:11	17° 45,70' S	9° 55,28' E	0	BB-OBS	Information
MSM20/009-1	11.01.12	09:13	17° 45,69' S	9° 55,26' E	0	BB-OBS	Hydrophone on Deck
MSM20/009-1	11.01.12	09:29	17° 45,73' S	9° 52,53' E	0	BB-OBS	Hydrophone in to water
MSM20/009-1	11.01.12	09:31	17° 45,72' S	9° 52,52' E	0	BB-OBS	Information
MSM20/009-1	11.01.12	09:32	17° 45,72' S	9° 52,52' E	0	BB-OBS	Hydrophone on Deck
MSM20/009-1	11.01.12	09:50	17° 43,42' S	9° 53,96' E	0	BB-OBS	Hydrophone in to water
MSM20/009-1	11.01.12	09:51	17° 43,41' S	9° 53,96' E	0	BB-OBS	Information
MSM20/009-1	11.01.12	09:52	17° 43,41' S	9° 53,97' E	0	BB-OBS	released
MSM20/009-1	11.01.12	09:59	17° 43,37' S	9° 53,99' E	0	BB-OBS	Hydrophone on Deck
MSM20/009-1	11.01.12	10:50	17° 44,29' S	9° 54,04' E	0	BB-OBS	sighted
MSM20/009-1	11.01.12	11:05	17° 44,90' S	9° 54,00' E	0	BB-OBS	back on deck
MSM20/009-2	11.01.12	11:14	17° 44,90' S	9° 54,00' E	0	SVP-SONDE	at sea surface
MSM20/009-2	11.01.12	11:37	17° 44,90' S	9° 54,00' E	0	SVP-SONDE	at max. depth
MSM20/009-2	11.01.12	11:59	17° 44,90' S	9° 54,00' E	0	SVP-SONDE	back to deck
MSM20/010-1	11.01.12	17:32	18° 48,02' S	9° 24,38' E	0	BB-OBS	Hydrophone in to water
MSM20/010-1	11.01.12	17:35	18° 48,04' S	9° 24,38' E	0	BB-OBS	Information
MSM20/010-1	11.01.12	17:37	18° 48,04' S	9° 24,38' E	0	BB-OBS	Hydrophone on Deck
MSM20/010-1	11.01.12	17:58	18° 46,97' S	9° 21,87' E	0	BB-OBS	Hydrophone in to water
MSM20/010-1	11.01.12	17:59	18° 46,96' S	9° 21,87' E	3513	BB-OBS	Information
MSM20/010-1	11.01.12	18:01	18° 46,95' S	9° 21,87' E	0	BB-OBS	Hydrophone on Deck

Station No.	Date	Time [UTC]	Position Lat	Position Lon	Depth [m]	Gear Abbreviation	Action
MSM20/010-1	11.01.12	18:20	18° 45,47' S	9° 24,08' E	0	BB-OBS	Hydrophone in to water
MSM20/010-1	11.01.12	18:23	18° 45,44' S	9° 24,10' E	0	BB-OBS	Information
MSM20/010-1	11.01.12	18:25	18° 45,41' S	9° 24,12' E	0	BB-OBS	released
MSM20/010-1	11.01.12	18:30	18° 45,35' S	9° 24,16' E	0	BB-OBS	Hydrophone on Deck
MSM20/010-1	11.01.12	19:28	18° 46,27' S	9° 23,48' E	0	BB-OBS	sighted
MSM20/010-1	11.01.12	19:42	18° 46,77' S	9° 23,46' E	0	BB-OBS	back on deck
MSM20/011-1	12.01.12	01:53	18° 59,69' S	8° 1,62' E	0	BB-OBS	Hydrophone in to water
MSM20/011-1	12.01.12	02:00	18° 59,72' S	8° 1,59' E	0	BB-OBS	Information
MSM20/011-1	12.01.12	02:00	18° 59,72' S	8° 1,59' E	0	BB-OBS	Hydrophone on Deck
MSM20/011-1	12.01.12	02:22	19° 1,38' S	7° 59,49' E	0	BB-OBS	Hydrophone in to water
MSM20/011-1	12.01.12	02:25	19° 1,41' S	7° 59,49' E	0	BB-OBS	Information
MSM20/011-1	12.01.12	02:26	19° 1,41' S	7° 59,48' E	0	BB-OBS	Hydrophone on Deck
MSM20/011-1	12.01.12	02:34	19° 1,17' S	7° 59,11' E	0	BB-OBS	Hydrophone in to water
MSM20/011-1	12.01.12	02:36	19° 1,18' S	7° 59,11' E	0	BB-OBS	Information
MSM20/011-1	12.01.12	02:36	19° 1,18' S	7° 59,11' E	0	BB-OBS	Hydrophone on Deck
MSM20/011-1	12.01.12	02:56	18° 58,78' S	7° 59,04' E	0	BB-OBS	Hydrophone in to water
MSM20/011-1	12.01.12	03:00	18° 58,76' S	7° 59,04' E	0	BB-OBS	Information
MSM20/011-1	12.01.12	03:00	18° 58,76' S	7° 59,04' E	0	BB-OBS	released
MSM20/011-1	12.01.12	03:05	18° 58,73' S	7° 59,05' E	0	BB-OBS	Hydrophone on Deck
MSM20/011-1	12.01.12	04:07	18° 59,63' S	7° 59,80' E	0	BB-OBS	sighted
MSM20/011-1	12.01.12	04:18	19° 0,05' S	8° 0,01' E	0	BB-OBS	back on deck
MSM20/011-2	12.01.12	04:27	19° 0,05' S	7° 59,99' E	0	SVP-SONDE	at sea surface
MSM20/011-2	12.01.12	05:01	19° 0,05' S	7° 59,99' E	0	SVP-SONDE	at max. depth
MSM20/011-2	12.01.12	05:26	19° 0,05' S	7° 59,99' E	0	SVP-SONDE	back to deck
MSM20/012-1	12.01.12	12:43	20° 22,54' S	8° 33,03' E	0	BB-OBS	Hydrophone in to water
MSM20/012-1	12.01.12	12:46	20° 22,53' S	8° 33,03' E	0	BB-OBS	Information
MSM20/012-1	12.01.12	12:47	20° 22,52' S	8° 33,04' E	0	BB-OBS	Hydrophone on Deck
MSM20/012-1	12.01.12	13:05	20° 23,56' S	8° 34,52' E	0	BB-OBS	Hydrophone in to water
MSM20/012-1	12.01.12	13:07	20° 23,55' S	8° 34,54' E	0	BB-OBS	Information
MSM20/012-1	12.01.12	13:08	20° 23,55' S	8° 34,54' E	0	BB-OBS	Hydrophone on Deck
MSM20/012-1	12.01.12	13:25	20° 24,21' S	8° 32,89' E	0	BB-OBS	Hydrophone in to water
MSM20/012-1	12.01.12	13:27	20° 24,21' S	8° 32,89' E	0	BB-OBS	Information
MSM20/012-1	12.01.12	13:28	20° 24,20' S	8° 32,89' E	0	BB-OBS	released
MSM20/012-1	12.01.12	13:31	20° 24,17' S	8° 32,88' E	0	BB-OBS	Hydrophone on Deck
MSM20/012-1	12.01.12	13:56	20° 22,90' S	8° 33,45' E	0	BB-OBS	sighted
MSM20/012-1	12.01.12	14:08	20° 23,36' S	8° 33,37' E	0	BB-OBS	back on deck
MSM20/013-1	12.01.12	23:39	20° 25,99' S	10° 41,81' E	1655	PS	start of profile
MSM20/013-1	13.01.12	02:32	20° 7,71' S	11° 5,22' E	1302	PS	end of profile
MSM20/014-1	13.01.12	08:58	20° 52,19' S	12° 10,63' E	0	SVP-SONDE	at sea surface
MSM20/014-1	13.01.12	09:16	20° 52,19' S	12° 10,64' E	696	SVP-SONDE	at max. depth
MSM20/014-1	13.01.12	09:33	20° 52,18' S	12° 10,64' E	687	SVP-SONDE	back to deck
MSM20/014-2	13.01.12	09:45	20° 52,18' S	12° 10,64' E	684	MB+PS	start profil
MSM20/014-2	13.01.12	10:35	20° 51,12' S	12° 17,19' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	10:57	20° 51,30' S	12° 16,01' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	13:54	20° 47,36' S	12° 40,16' E	0	MB+PS	alter course

Station No.	Date	Time [UTC]	Position Lat	Position Lon	Depth [m]	Gear Abbreviation	Action
MSM20/014-2	13.01.12	15:07	20° 40,50' S	12° 47,55' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	15:50	20° 40,41' S	12° 53,52' E	0	MB+PS	profile break
MSM20/014-2	13.01.12	16:10	20° 40,36' S	12° 53,62' E	0	MB+PS	continue the profile
MSM20/014-2	13.01.12	17:06	20° 40,85' S	12° 46,35' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	17:12	20° 40,23' S	12° 46,01' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	17:23	20° 40,69' S	12° 46,54' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	18:15	20° 41,03' S	12° 53,55' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	19:18	20° 41,34' S	12° 45,20' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	20:24	20° 41,66' S	12° 53,83' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	21:13	20° 42,01' S	12° 47,49' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	22:10	20° 42,50' S	12° 54,49' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	22:55	20° 42,65' S	12° 48,09' E	0	MB+PS	alter course
MSM20/014-2	13.01.12	23:42	20° 42,86' S	12° 54,13' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	00:30	20° 43,55' S	12° 48,20' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	01:14	20° 43,54' S	12° 54,38' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	02:00	20° 43,92' S	12° 48,48' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	02:47	20° 44,13' S	12° 54,61' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	03:31	20° 44,42' S	12° 48,91' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	04:20	20° 44,69' S	12° 54,99' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	05:07	20° 44,97' S	12° 48,97' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	05:58	20° 45,28' S	12° 55,47' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	06:47	20° 45,51' S	12° 48,94' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	07:38	20° 45,78' S	12° 55,48' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	08:22	20° 46,10' S	12° 49,78' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	09:07	20° 46,41' S	12° 55,52' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	09:53	20° 46,73' S	12° 49,57' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	10:00	20° 47,05' S	12° 49,91' E	0	MB+PS	profile break
MSM20/014-3	14.01.12	10:10	20° 47,09' S	12° 50,26' E	0	SVP-SONDE	at sea surface
MSM20/014-3	14.01.12	10:16	20° 47,09' S	12° 50,26' E	0	SVP-SONDE	at max. depth
MSM20/014-3	14.01.12	10:22	20° 47,09' S	12° 50,26' E	0	SVP-SONDE	back to deck
MSM20/014-2	14.01.12	10:31	20° 47,10' S	12° 50,46' E	0	MB+PS	continue the profile
MSM20/014-2	14.01.12	10:43	20° 47,06' S	12° 52,55' E	0	MB+PS	Information
MSM20/014-2	14.01.12	11:52	20° 56,49' S	12° 56,93' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	16:49	21° 42,27' S	13° 26,11' E	0	MB+PS	alter course
MSM20/014-2	14.01.12	17:28	21° 42,47' S	13° 18,67' E	0	MB+PS	profile end
MSM20/014-4	14.01.12	17:51	21° 42,80' S	13° 18,39' E	0	PS	continuation of profile
MSM20/014-4	14.01.12	22:00	22° 10,36' S	13° 41,74' E	0	PS	end of profile

BB-OBS, broadband ocean-bottom seismometer; SVP-SONDE, sound velocity profile tool; MB, Multibeam swath bathymetry; PS, Parasound sub-bottom profiler.

Comment: Additionally to the above mentioned PS and MB-PS profiles, Parasound (PS) and deep-sea multibeam swath bathymetry tool EM120 (until its break-down) was running. After break-down of EM120 the vertical lot EA600 was used to measure the depth to seafloor. All the way from Cape Town to Walvis Bay ADCP 38 kHz was running.