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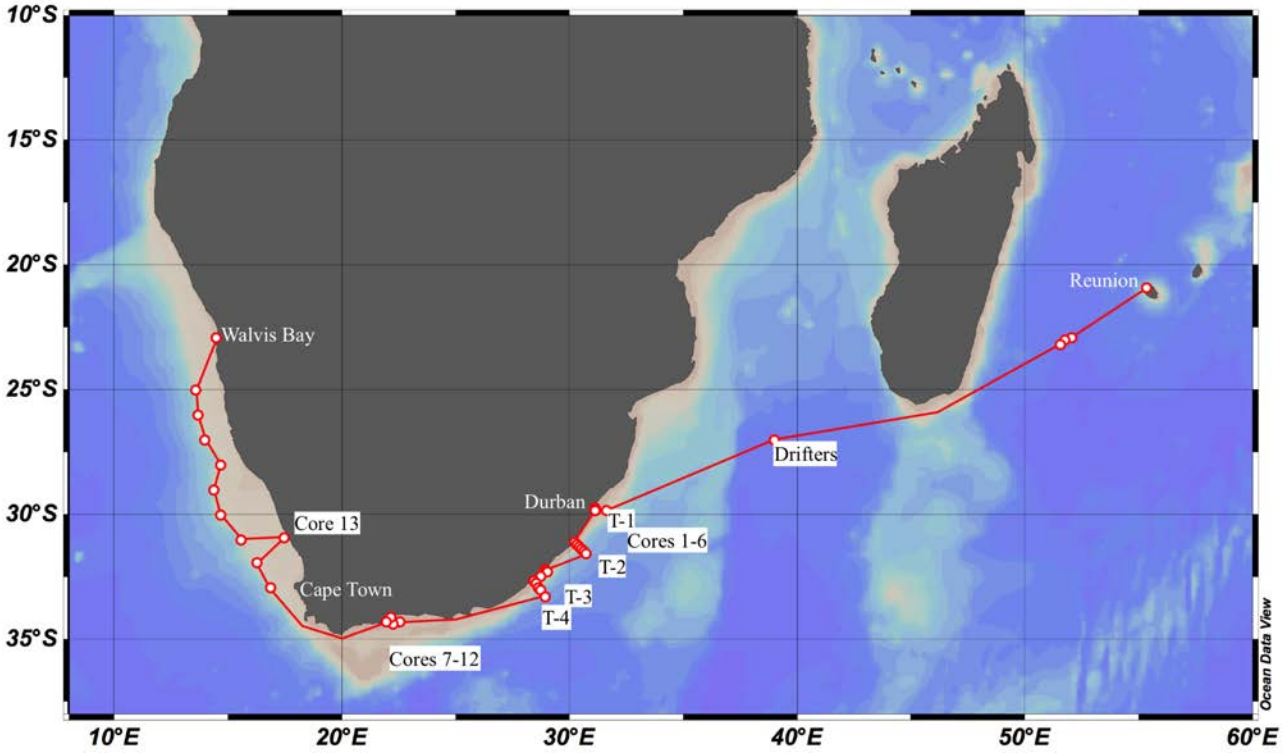
Short Cruise Report
RV Meteor – M102

Le Port, Ile de la Reunion – Walvis Bay, Namibia
06.12.13 – 23.12.13
Chief Scientist: Dr. Werner Ekau
Captain: Michael Schneider



Objectives

The cruise is embedded in the German South African cooperation within the framework of the SPACES program and provides a very important extension and contribution to the works planned in the RAIN (Regional Archives for Integrated Investigations) and WCLL (Wild Coast Living Laboratory) projects as well as a valuable additional data set in the GENUS-II project. The information retrieved from this cruise will improve our knowledge on origin and dynamics of the Agulhas current and its interplay with estuarine systems along South Africa's east coast, and the dynamics of ESACW and SACW and its impact on the OMZ in the northern Benguela upwelling system. A strong focus was put on training and capacity building activities in physical, biological, biogeochemical and geological marine research. A total of 15 berths was provided for post-graduate or PhD students and young scientists to learn state of the art methods in marine science. The joint work at sea of ca. ten South African and five German trainees will foster intercultural exchange and provide a common basis for potential future cooperation.

Students were split into working groups to investigate the following research objectives:

- Calibrate and analyse CTD data along the cruise track
- CO_2 emission along the cruise track
- Distribution of Macrozooplankton off the southeastern coast of South Africa
- Distribution of main ichthyoplankton off the southeastern coast of South Africa
- Distribution of jelly fish along the southeastern coast of South Africa.
- Description of sediment cores off Durban and Mossel Bay

Narrative

The cruise M102 with RV Meteor was designed as a research and training cruise within the German – South African cooperation in marine science SPACES (Science for the Assessment of Complex Earth System Processes). Scientific participants boarded the RV METEOR in the morning of December 5th and immediately started to prepare the laboratories using the calm conditions in the port. After leaving the port on December 6th, the ship reached the first stations on the 7th early in the morning and deployed three ARGO floats between La Reunion and Madagascar.

To gain a better understanding of the circulation and entrapment within mesoscale eddies, and their potential to transport biological material from Madgascar to southern Africa. The Argo floats and SVP drifters were deployed in one of these cyclonic eddies near Madagascar and measure the vertical height of the internal doming of the thermocline. Another set of two ARGO floats and five surface drifters was released on the 10th half way between Madagascar and South Africa at 27°S, 39°E. All floats and drifters are working and collecting hydrographical data since then.

Other aims of the hydrographical investigations were:

- To determine the spatial and temporal characteristics of the hydrographic patterns south off Durban, and it's influence on the circulation and productivity of the shelf waters of the Transkei (CTD) and water mass dynamics for better prediction of future scenarios.
- To investigate the northward spreading of ESACW and the related oxygen supply in the southern and central Benguela.
- To train regional and German young scientists in state-of-the-art marine science and practical work on board.

These aims were achieved by means of CTD casts along three coast-perpendicular transects cross the Agulhas current in the Wildcoast area and one south-north longshore transect following the 500m water depth isoline from north of Cape Town to near Walvis Bay. These investigations will improve our understanding of shallow-water and deep-water ecosystems and the connectivity of subtropical estuaries with the adjacent coastal waters.

The plankton work focused on the macro-zooplankton and ichthyoplankton in the Wildcoast area and along the Benguela Current and was performed by means of a vertical and a towed multinet as well as by a ringtrawl. Onboard analyses targeted jelly fish, general macro-zooplankton composition and fish eggs and larvae.

Hauls aiming for gelatinous zooplankton were done with a ring trawl (1.6 m diameter, 1,000 µm mesh size) at 17 stations during the cruise. For the distribution patterns eight stations (station 3, 4, 6, 7, 13, 14, 16 and 17) on two inshore-offshore transects (T-2 and T-4) were selected. Changes in the composition, as well as the overall abundance of gelatinous zooplankton along the two inshore-offshore transects were found. In general a reduction of the total abundance of gelatinous organisms towards the open ocean could be verified specially in transect T-2.

Preliminary sorting of samples indicated, that copepods dominated the zooplankton community in all samples collected off the east coast of South Africa. Generally, higher abundances were found at depth than in surface waters, implying a predator-avoidance strategy; however, higher abundances were also found at depth during night sampling. This is in contrast with literature which suggests zooplankton migrate vertically to the surface at night and therefore needs further analysis. No clear trends in copepod abundance from coastal waters to open ocean or horizontally along the coast were detected. Of the zooplankton taxa, excluding copepods, ostracods and chaetognaths were generally found to be most abundant and were ubiquitous across the sampling area.

Onboard analyses of the towed multinet and ringtrawl samples resulted in a total of 52 fish larvae and 183 fish eggs were found in the preliminary sorting of the multinet hauls. Another 480 were found in the ring trawl samples. The first biological transect conducted contained 75% of the eggs identified during the preliminary sorting with 63 unidentified eggs and 77 round herring eggs (*Etrumeus whiteheadi*). Generally, more eggs were found in station further from the coast. The Clupeiforms were the dominant coastal species caught in the multinet (11 larvae), whereas the Myctophidae were the dominant oceanic species (17). The ringtrawl showed a similar picture with higher amounts of clupeiforms in the southern coastal samples than in the northern stations. Also, more Bregmacerotide were found in the southern stations. Except for one station there were always more coastal larvae than oceanic larvae.

Correlating the abundance of larvae with salinity and temperature we found a preference of the larvae for temperatures above 22°C and salinity beyond 34.5 for both coastal and oceanic species.

Besides two oceanographical stations with CTD and plankton nets, the work off Durban focused on Parasound imaging of the sediment and coring for lagoonal sediments to reconstruct shore evolution along the south/southeast coast of South Africa. Several survey transects were undertaken using the shipboard PARASOUND system. These comprised one transect across the continental slope during the approach to the Durban working area and three coast-perpendicular transects for core siting purposes. A total of ~ 62 line km were acquired. The raw data were processed in SEISEE with a high cut filter of 10 kHz, automatic gain application and colour correction to the imagery.

Along the South African coast off Durban, Mossel Bay and Elands Bay eight cores were obtained by using a vibrocorer. Gravity coring was also attempted at these sites but unfortunately due to the sediment composition and seafloor characteristics this was unsuccessful. Three cores were opened on board and some preliminary geological analysis was performed, including core descriptions, smear slide and spectrophotometer analysis.

The long transit routes from La Reunion to the South African coast, from Wildcoast to Mossel Bay, and from Mossel Bay around the Cape to Walvis Bay were used for presentations of the students on topics of their choice (home institute, thesis theme, etc.) and lectures by the PIs. The result was a series of information from various disciplines and overarching discussions, that broadened the knowledge of the students as well as of the PIs!

RV Meteor reached its last station on 22nd of December after midnight and then headed towards Walvis Bay for calling in the port the same day. The ship sailed a total of ~3000 nm and spent ~87 hours of station time.

Acknowledgements

Our gratitude goes to captain Michael Schneider and his crew for their excellent support during the cruise. The ship time of RV Meteor was provided by the German Science Foundation (DFG) and BMBF within the core program METEOR/MERIAN. The cruise was financially supported by the SPACES program of the BMBF.

Teilnehmerliste

Name	Discipline	Institution
Ekau, Werner	Chief scientist	ZMT
Mohrholz, Volker	Physical Oceanography	IOW
Baumann, Till	Physical Oceanography	IOW
Martens, Johann Peter	Chemistry	ICBM
Schirber, Sebastian	Aerosols	MPI Met
Lüskow, Florian	Jelly fish	ZMT
Pilgram, Katharina	Biogeochemistry	ZMT
Bode, Maya	Zooplankton	BreMarE
Eich, Andreas	Zooplankton	ZMT
Wolf, Klara	Ichthyoplankton	ZMT
Mill, Simon	Geology	MARUM
Hahn, Annette	Geology	MARUM
Herrmann, Nicole	Geology	MARUM
Kugel, Martin	Geology	MARUM
Weiser, Jens	Geology	MARUM
Olivar Buera, Maria Pilar	Scientist	
Paubert, Mahatante Tsimanaoraty	Physical Oceanography	FIMS
Gachui, Samuel Ndirangu	Physical Oceanography	KMFRI
McQuaid, Kirsty	Zooplankton	SANBI
Schlegel, Robert	Ichthyoplankton	UCT
Sadasing, Oocheetsing	Physical Oceanography	MOI
Jacobs, Lee-Ann	Physical Oceanography	UWC
Du Plessis, Nadia	Geology	UCT
Green, Andrew, Dr.	Geology	UKZN
Dixon, Shannon L.	Geology	UKZN
Nel, Holly Astrid	Zooplankton	UKZN
Pretorius, Lauren	Geology	UKZN
Kieser, Jens	Meteorology	DWD
Stelzner, Martin	Meteorology	DWD

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DEA
Department of Environmental Affairs
Cape Town
South Africa

FIMS
Fisheries Institute and Marine Sciences
Toliara University
Madagascar

KMFRI
Kenya Marine and Fisheries Institute
Mombasa
Kenya

MOI
Mauritius Oceanography Institute
Mauritius

SANBI
South African National Biodiversity Institute
Cape Town
South Africa

UCT
University of Cape Town
Cape Town
South Africa

UKZN
University of Kwa-Zulu Natal
Durban
South Africa

UWC
University of the Western Cape
Cape Town
South Africa

Stationsliste

Station	Date	Time	PositionLat	PositionLon	Gear	Depth [m]
ME1020/2164-1	2013/12/07	1:23:59	22° 51,49' S	52° 7,33' E	ARGOS	4855,4
ME1020/2165-1	2013/12/07	3:04:59	23° 0,68' S	51° 49,62' E	ARGOS	4615,9
ME1020/2166-1	2013/12/07	4:51:59	23° 11,46' S	51° 32,08' E	ARGOS	4863,1
ME1020/2167-1	2013/12/07	5:05:00	23° 11,46' S	51° 31,78' E	CTD/RO	0
ME1020/2168-1	2013/12/10	0:55:00	26° 59,98' S	38° 59,75' E	CTD/RO	5351,5
ME1020/2169-1	2013/12/10	2:13:00	27° 0,10' S	38° 59,78' E	ARGOS	4648,4
ME1020/2170-1	2013/12/10	2:17:59	27° 0,41' S	38° 59,79' E	LD	4657,8
ME1020/2171-1	2013/12/11	16:00:00	29° 50,79' S	31° 36,78' E	CTD/RO	5078,1
ME1020/2172-1	2013/12/11	16:45:00	29° 51,64' S	31° 35,15' E	MSN	471,3
ME1020/2173-1	2013/12/11	17:58:00	29° 53,01' S	31° 33,30' E	CTD/RO	467,3
ME1020/2174-1	2013/12/11	18:39:00	29° 54,31' S	31° 32,52' E	MSN	484,4
ME1020/2175-1	2013/12/11	22:26:01	29° 50,26' S	31° 10,27' E	MB-PS	80
ME1020/2175-1	2013/12/11	22:50:00	29° 48,62' S	31° 8,20' E	MB-PS	40,1
ME1020/2175-1	2013/12/11	23:06:00	29° 48,86' S	31° 7,30' E	MB-PS	36,6
ME1020/2175-1	2013/12/11	23:31:00	29° 50,56' S	31° 9,39' E	MB-PS	462
ME1020/2175-1	2013/12/11	23:51:00	29° 51,33' S	31° 8,71' E	MB-PS	72,3
ME1020/2175-1	2013/12/12	0:11:59	29° 50,27' S	31° 7,18' E	MB-PS	35,6
ME1020/2176-1	2013/12/12	0:38:00	29° 48,84' S	31° 7,44' E	CTD/RO	36,7
ME1020/2177-1	2013/12/12	1:14:00	29° 48,88' S	31° 7,37' E	MSN	37,2
ME1020/2178-1	2013/12/12	1:29:00	29° 48,88' S	31° 7,37' E	CTD/RO	36,4
ME1020/2179-1	2013/12/12	1:48:00	29° 48,90' S	31° 7,33' E	MSN	36,8
ME1020/2180-1	2013/12/12	2:12:00	29° 49,16' S	31° 6,89' E	RTR	31
ME1020/2181-1	2013/12/12	3:26:00	29° 49,14' S	31° 7,62' E	GC	37,7
ME1020/2182-1	2013/12/12	5:17:00	29° 50,96' S	31° 8,15' E	GC	62,4
ME1020/2183-1	2013/12/12	7:28:00	29° 50,96' S	31° 8,15' E	VC	63,4
ME1020/2184-1	2013/12/12	9:34:00	29° 49,84' S	31° 9,72' E	VC	67,3
ME1020/2185-1	2013/12/12	11:54:00	29° 49,84' S	31° 9,73' E	VC	67,9
ME1020/2186-1	2013/12/12	18:22:00	29° 49,14' S	31° 7,62' E	VC	39,2
ME1020/2187-1	2013/12/13	4:33:00	31° 7,08' S	30° 11,94' E	CTD/RO	28
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ME1020/2189-1	2013/12/13	5:17:00	31° 7,20' S	30° 12,08' E	MSN	29,6
ME1020/2190-1	2013/12/13	5:42:00	31° 7,58' S	30° 12,56' E	RTR	41,5
ME1020/2190-2	2013/12/13	6:05:00	31° 8,25' S	30° 13,37' E	RTR	45,4
ME1020/2191-1	2013/12/13	7:20:00	31° 12,89' S	30° 17,52' E	CTD/RO	4787,3
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ME1020/2193-1	2013/12/13	9:20:00	31° 15,77' S	30° 16,07' E	MSN	1431,5
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ME1020/2197-1	2013/12/13	13:29:00	31° 21,62' S	30° 21,25' E	MSN	2120,1
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ME1020/2201-1	2013/12/13	17:55:00	31° 27,33' S	30° 28,78' E	MSN	2916,2
ME1020/2202-1	2013/12/13	18:39:00	31° 27,56' S	30° 28,54' E	RTR	2910,3
ME1020/2203-1	2013/12/13	20:17:00	31° 30,62' S	30° 38,77' E	CTD/RO	2948,7
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ME1020/2205-1	2013/12/13	22:04:00	31° 31,70' S	30° 37,50' E	MSN	2945,5
ME1020/2206-1	2013/12/13	22:46:00	31° 31,30' S	30° 37,27' E	RTR	2942,4
ME1020/2207-1	2013/12/14	0:14:00	31° 36,63' S	30° 44,97' E	CTD/RO	2871,8
ME1020/2208-1	2013/12/14	1:19:00	31° 36,52' S	30° 44,69' E	MSN	2869,6
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ME1020/2210-1	2013/12/14	2:47:00	31° 35,94' S	30° 44,97' E	RTR	2884,4
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ME1020/2214-1	2013/12/14	12:02:00	32° 15,45' S	28° 55,30' E	RTR	24,1
ME1020/2215-1	2013/12/14	12:56:00	32° 18,63' S	28° 57,36' E	CTD/RO	90,4

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ME1020/2218-1	2013/12/14	14:07:00	32° 20,19' S	28° 55,85' E	RTR	91,9
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ME1020/2221-1	2013/12/14	15:52:00	32° 23,66' S	28° 58,84' E	MSN	53,1
ME1020/2222-1	2013/12/14	16:22:00	32° 24,17' S	28° 58,10' E	RTR	58,1
ME1020/2223-1	2013/12/14	18:16:00	32° 29,99' S	28° 40,98' E	RTR	67,4
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ME1020/2225-1	2013/12/14	20:48:00	32° 41,95' S	28° 24,04' E	MSN	35,7
ME1020/2226-1	2013/12/14	21:08:59	32° 41,78' S	28° 24,32' E	RTR	35,8
ME1020/2227-1	2013/12/14	22:02:00	32° 44,04' S	28° 26,02' E	CTD/RO	42
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ME1020/2235-1	2013/12/15	4:08:00	33° 0,32' S	28° 31,06' E	MSN	1812
ME1020/2236-1	2013/12/15	4:55:00	33° 1,16' S	28° 29,76' E	RTR	1707,2
ME1020/2237-1	2013/12/15	7:21:00	33° 3,99' S	28° 44,95' E	CTD/RO	2354,5
ME1020/2238-1	2013/12/15	8:28:00	33° 5,15' S	28° 43,07' E	MSN	2329,6
ME1020/2239-1	2013/12/15	9:12:00	33° 5,25' S	28° 42,90' E	RTR	2327,2
ME1020/2240-1	2013/12/15	9:48:00	33° 5,45' S	28° 42,56' E	MSN	2316,3
ME1020/2241-1	2013/12/15	12:42:00	33° 16,93' S	28° 56,40' E	CTD/RO	3143,5
ME1020/2242-1	2013/12/15	13:42:00	33° 17,33' S	28° 55,32' E	RTR	3133,1
ME1020/2243-1	2013/12/15	14:06:00	33° 16,95' S	28° 55,58' E	MSN	3126,5
ME1020/2244-1	2013/12/15	15:09:00	33° 16,01' S	28° 56,13' E	MSN	3103,4
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ME1020/2246-1	2013/12/16	22:49:00	34° 21,45' S	22° 34,98' E	GC	86,2
ME1020/2246-1	2013/12/16	22:46:00	34° 21,45' S	22° 34,97' E	GC	86,1
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ME1020/2250-1	2013/12/17	6:38:00	34° 8,36' S	22° 10,43' E	GC	29
ME1020/2253-1	2013/12/17	11:52:00	34° 22,40' S	21° 55,75' E	GC	39,2
ME1020/2254-1	2013/12/17	12:22:00	34° 22,39' S	21° 55,75' E	GC	40,3
ME1020/2255-1	2013/12/18	15:11:00	32° 59,93' S	16° 49,87' E	CTD/RO	529,8
ME1020/2256-1	2013/12/18	15:53:00	33° 0,02' S	16° 49,91' E	MSN	529,3
ME1020/2257-1	2013/12/18	22:34:00	31° 59,97' S	16° 15,01' E	CTD/RO	492,7
ME1020/2258-1	2013/12/18	23:18:00	32° 0,06' S	16° 15,00' E	MSN	2290,5
ME1020/2259-1	2013/12/18	23:58:00	32° 0,61' S	16° 14,96' E	MSN	497,9
ME1020/2260-1	2013/12/19	9:12:00	30° 55,00' S	17° 30,01' E	GC	121,9
ME1020/2262-1	2013/12/20	2:08:00	30° 59,87' S	15° 34,93' E	CTD/RO	567,1
ME1020/2263-1	2013/12/20	2:53:00	31° 0,16' S	15° 34,98' E	MSN	572,8
ME1020/2264-1	2013/12/20	11:05:00	29° 59,96' S	14° 39,00' E	CTD/RO	511
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ME1020/2268-1	2013/12/20	19:31:00	29° 0,05' S	14° 21,95' E	MSN	573,9
ME1020/2269-1	2013/12/21	1:57:00	27° 59,92' S	14° 40,03' E	CTD/RO	383,2
ME1020/2270-1	2013/12/21	2:35:00	28° 0,09' S	14° 40,08' E	MSN	367,4
ME1020/2271-1	2013/12/21	9:30:00	26° 59,96' S	13° 59,98' E	CTD/RO	443,8
ME1020/2272-1	2013/12/21	10:10:00	27° 0,02' S	13° 59,99' E	MSN	445,2
ME1020/2273-1	2013/12/21	16:57:00	25° 59,90' S	13° 39,86' E	CTD/RO	514,7
ME1020/2274-1	2013/12/21	17:36:00	26° 0,07' S	13° 39,86' E	MSN	515,4
ME1020/2275-1	2013/12/22	0:00:00	25° 0,02' S	13° 35,98' E	CTD/RO	513,9
ME1020/2276-1	2013/12/22	0:40:00	25° 0,19' S	13° 35,96' E	MSN	511,4