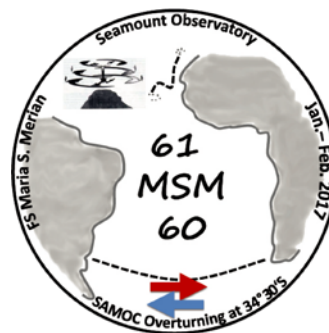


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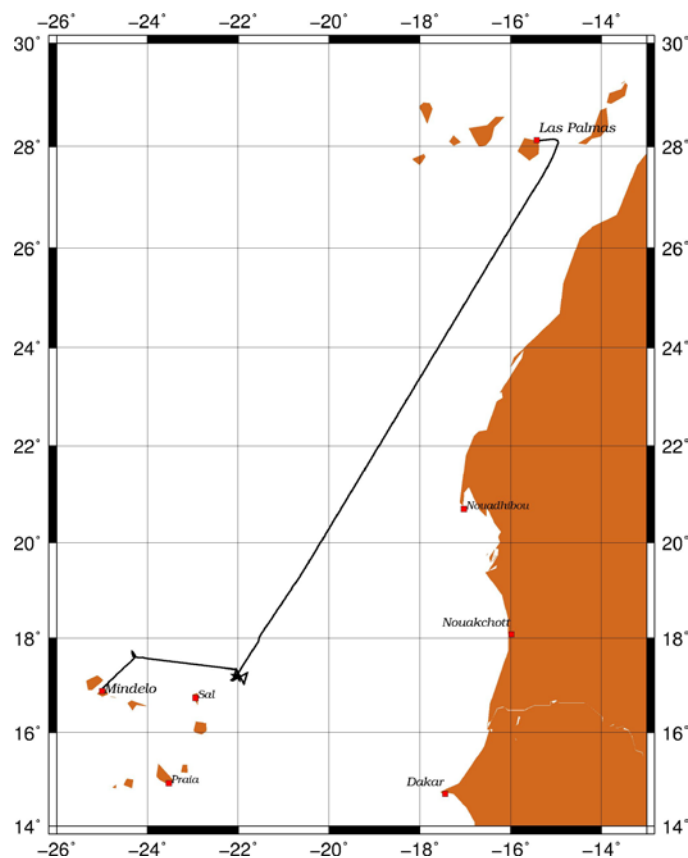
Short Cruise Report RV Maria S. Merian MSM61

Mindelo, Cape Verde – Las Palmas, Spain

18. February 2017 – 27. February 2017

Chief Scientist: Björn Fiedler

Captain: Ralf Schmidt



Objectives

The expedition MSMS61 operated off West Africa at the Cape Verde Ocean Observatory (CVOO) time series station as well as at the Senghor Seamount, northeast of Cape Verde islands. Scientific objectives were:

- Investigating temporal variability and long-term changes of physical and biogeochemical parameters off West Africa by contributing and extending the CVOO time series data set.
- Determining variability of diversity and abundance of predators and prey (micronekton and zooplankton) and their linkage to biogeochemical and hydrographic/currents variability at the seamount crest and flanks?
- How does the seamount topography affects near-field biogeochemistry of the surface ocean and upper water column and how does it relate to net community production (e.g., induced by local upwelling or eddies)?
- Is the Senghor Seamount interacting with the tidal currents and which types of circulation pattern occur (incl. retention)?

The work program was divided into 3 components:

- A full-depth biogeochemical sampling at the CVOO time series site,
- Deployment of an autonomous and modular ecosystem observatory at Senghor seamount,
- Ship-borne hydrographic and video sections across the seamount.

At the CVOO time series station a CTD rosette sampler survey including a biogeochemical sampling was carried out – further extending the time series data set. Moreover, horizontal camera transects were acquired at different depth to estimate the mesozooplankton distribution at the site. At the Sengor Seamount, mobile and moored observatories have been installed that will acquire physical, biogeochemical and ecosystem relevant data even beyond MSM61. The data will be used for investigations on basic physical, biogeochemical, and ecosystem processes at tropical seamounts and in particular their role in shaping the local biodiversity.

The observatory consists of a stationary bottom lander at the edge of the summit for long term recordings. Furthermore, a coordinated swarm of two Wave Gliders (surface incl. acoustic profiling, 0 – 100 m) and an electric glider (water column, 0 – 1000 m) were operated at Senghor Seamount. CTD rosette measurements and ship-ADCP surveys were conducted in order to resolve hydrography, biogeochemistry and circulation around the seamount. Video transects were done in order to record the mesozooplankton distribution at different areas of the seamount and multineets were deployed for taxonomic studies.

Narrative

Expedition MSM61 started on Feb 18th in the morning from the port of Mindelo, Sao Vicente, Cape Verde. The first working area (CVOO) was located 60 nautical miles northeast of Mindelo. Approx. half way a test station was conducted which included a 1000 m hydrocast with the CTD, incl. biogeochemical sampling and a releaser test. A test dive with the towed camera system PELAGIOS had to be aborted due to a technical malfunction.

At CVOO hydrocast station we spent about 23 hours of intense station work which consisted of day- and nighttime Multinet hauls down to 800 m water depth, day- and nighttime PELAGIOS surveys down to 1000 m and a full-depth (3609 m) CTD hydrocast including sampling for biogeochemical parameters (dissolved inorganic carbon, total alkalinity, dissolved oxygen, nutrients). The last task before the transit to the next working area (Senghor Seamount) was the recovery of a small surface telemetry buoy which was attached to the CVOO mooring 2 nautical miles north of the CVOO hydrocast station. The buoy failed just 2 days earlier and therefore a replacement with a dummy buoy became necessary.

After 12 hours of transit we reached the Senghor Seamount and an instrument test was performed with the PELAGIOS (spectral camera test) which was repeated a few times during the next 4.5 days at the seamount. Afterwards we recorded two current sections with the hull-mounted Acoustic Doppler Current Profiler (ADCP, 75 & 38.5 kHz) in order to obtain a first picture of the current flow field during our stay at the seamount.

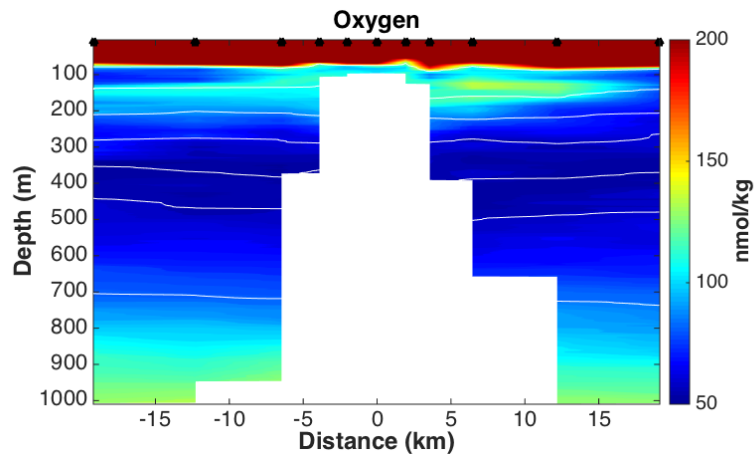
One of the main objectives of this cruise was to install an autonomous observatory at the summit of the seamount that consists of a short mooring incl. a moored profiler, a bottom lander and two autonomous surface vehicles (so-called wave Glider). Thus, we began with installations of these systems already on the first day at the seamount in order to monitor and ensure the functionality of these components during our stay at the seamount. On the first day (February 20th) the mooring as well as the lander were deployed. Furthermore, an underwater glider which was deployed from Sao Vicente Island 4 weeks ahead of our cruise was recovered at the flank of the seamount. Harsh wind conditions didn't allow using the zodiac for this operation. Instead, a rescue net was used to recover the glider safely. The glider got refurbished on board and was redeployed after 2 days again for continuation of its mission at the seamount.

During the following night and day we extensively used PELAGIOS and the Multinet for day- and nighttime observations and we also deployed two Wave Gliders and send them on cross-sections across the seamount for autonomous measurements of biogeochemical parameters and hydroacoustic measurements of biomass and currents.

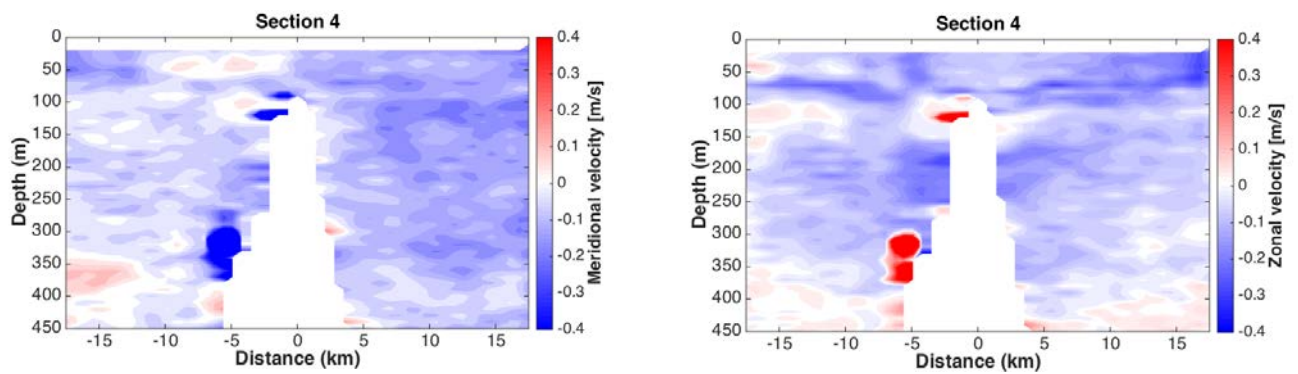
We also conducted a hydrographic northwest-southeast CTD section across the summit including water sampling again for carbon parameters, oxygen and nutrients. For logistical reasons we interrupted the section work with a PELAGIOS deployment. We also had to recover the mooring and one Wave Glider in between as malfunctions of these systems occurred.

The following 24 hour ADCP section was conducted in order to look at tidal influences on the flow field around the summit. We also used that time to fix issues with the moored profiler and the Wave Glider.

Just before the last ADCP section on day 4 (February 23rd) we redeployed the Wave Glider and after the final ADCP section the moored profiler was redeployed as well. During the last night at the Seamount we conducted final PELAGIOS and Multinet deployments. Meanwhile, it turned out that again technical problems with the mooring and the Wave Glider occurred, which made a spontaneous recovery necessary once again. After that we left the working area at Senghor Seamount and started our transit to Las Palmas.



Oxygen distribution at Senghor Seamount derived from a meridional CTD section



Currents at Senghor Seamount observed with the hull-mounted ADCP from one section across the seamount

Acknowledgements

We like to thank Captain Ralf Schmidt and his entire crew for their motivated and professional support on board. Major financial support was provided by the Deutsche Forschungsgemeinschaft (DFG) via the Leitstelle Deutsche Forschungsschiffe and via the Future Ocean Cluster of Excellence in Kiel. Minor financial support was provided by the EU Horizon 2020 project AtlantOS and the Helmholtz Alliance ROBEX.

Participant List

No.	Name	Task	Institute
1	Björn Fiedler	Chief Scientist	GEOMAR
2	Henk-Jan Hoving	Scientist, PELAGIOS	GEOMAR
3	Henrik Gross	Technician, PELAGIOS	GEOMAR
4	Hongbo Liu	Student, PELAGIOS/Spectral Camera	GEOMAR
5	Andreas Pinck	Technician, Mooring	GEOMAR
6	Rene Witt	Technician, Mooring / Lander	GEOMAR
7	Thorsten Schott	Technician Lander	GEOMAR
8	Robin Stechert	Helper, Underwater Winch	GEOMAR
9	Florian Schütte	Scientist, Glider / CTD / ADCP	GEOMAR
10	Cordula Zenk	Helper, CTD / Mooring	GEOMAR
11	Pericles Silva	Scientist, CVOO sampling, oxygen	UNI-CV / INDP, CV
12	Nuno Vieira	Technician, CTD	INDP, CV
13	Patrick Leibold	Technician, GEOMAR Wave Glider	GEOMAR
14	Sebastian Meckel	Technician, MARUM Wave Glider	MARUM
15	Carlos Barrera	Scientist, MARUM Wave Glider	PLOCAN
16	Brian Kieft	Technician, MARUM Wave Glider	MBARI
17	Luciana Genio	Scientist, Larvae traps	Uni-Aveiro
18	Stephanie Czudaj	Scientist, Camera + Net sampling	Thünen
19	Sarah Kaehlert	Outreach, Media	GEOMAR
20	Lisa-Marie Ode	Outreach, school program	GEOMAR
21	Anna-Sophie Liebender	Outreach, KDM/AtlantOS	OECD

GEOMAR: GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany

UNI-CV: Universidade de Cabo Verde, Mindelo, Cape Verde

INDP: Instituto Nacional de Desenvolvimento das Pescas, Mindelo, Cape Verde

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

PLOCAN: Plataforma Oceanica de Canarias, Spain

MBARI: Monterey Bay Aquarium Research Institute

Uni-Aveiro: Universidade de Aveiro, Aveiro, Portugal

Thünen: Thünen Institut für Seefischerei, Hamburg, Germany

OECD: Organisation for Economic Co-operation and Development, Paris, France



Scientific cruise participants of Maria S. Merian MSM61 expedition

Station List MSM61

Gear Coding

CTD/RO/LADCP: CTD/rosette sampler/lowered Acoustic Doppler Current Profiler
 MN: Multinet
 PGS: PELAGIOS towed camera
 MOR: Mooring operations (deployment/recovery)
 ADCP: Acoustic Doppler Current Profiler sections
 XSV: Expandable Sound Velocity Profiler
 GL: autonomous underwater glider
 WAVEGL: autonomous surface glider (Wave Glider)
 LANDER: Bottom Lander

Station	Date	Time (UTC)	Latitude	Longitude	Depth /m	Gear Code
MSM61/470-1	18.02.2017	12:11	17° 12.66' N	24° 41.64' W	2910.3	CTD/RO/LADCP
MSM61/471-1	18.02.2017	16:53	17° 35.02' N	24° 17.04' W	3595	MN
MSM61/471-2	18.02.2017	18:41	17° 34.97' N	24° 17.01' W	3594.1	CTD/RO/LADCP
MSM61/471-3	18.02.2017	21:38	17° 35.01' N	24° 17.07' W	3593.4	PGS
MSM61/471-4	18.02.2017	23:23	17° 34.99' N	24° 17.02' W	3593.7	PGS
MSM61/471-5	19.02.2017	05:51	17° 34.99' N	24° 17.00' W	3594	MN
MSM61/471-6	19.02.2017	07:20	17° 37.15' N	24° 18.23' W	3606.8	PGS
MSM61/472-1	19.02.2017	14:33	17° 36.25' N	24° 15.28' W	3600.9	MOR
MSM61/473-1	20.02.2017	03:30	17° 20.44' N	22° 2.54' W	3210.7	PGS
MSM61/473-2	20.02.2017	04:06	17° 20.53' N	22° 2.53' W	3212.5	ADCP
MSM61/473-3	20.02.2017	09:16	17° 7.96' N	22° 3.86' W	2604.1	XSV
MSM61/473-2	20.02.2017	09:39	17° 6.50' N	22° 6.78' W	2724.2	ADCP
MSM61/474-1	20.02.2017	13:00	17° 12.38' N	21° 57.70' W	-	MOR
MSM61/475-1	20.02.2017	15:55	17° 6.33' N	22° 9.88' W	3211.6	GL
MSM61/476-1	20.02.2017	18:05	17° 10.44' N	21° 56.83' W	0	LANDER
MSM61/476-2	20.02.2017	19:31	17° 9.93' N	21° 58.56' W	647.6	PGS
MSM61/476-3	20.02.2017	20:51	17° 10.29' N	21° 58.77' W	619.9	PGS
MSM61/476-4	20.02.2017	22:00	17° 10.59' N	21° 58.92' W	610.4	PGS
MSM61/476-5	20.02.2017	22:48	17° 10.91' N	21° 59.02' W	672.7	PGS
MSM61/477-1	21.02.2017	00:13	17° 8.22' N	21° 58.95' W	1047.3	MN
MSM61/477-2	21.02.2017	02:23	17° 12.38' N	22° 0.91' W	1090.2	PGS
MSM61/477-3	21.02.2017	03:42	17° 12.65' N	22° 1.12' W	1193.8	PGS
MSM61/477-4	21.02.2017	04:49	17° 12.84' N	22° 1.26' W	1288.3	PGS
MSM61/477-5	21.02.2017	06:28	17° 13.11' N	22° 1.45' W	1280.6	PGS
MSM61/477-6	21.02.2017	07:31	17° 13.52' N	22° 1.75' W	1447.9	PGS
MSM61/478-1	21.02.2017	10:04	17° 12.39' N	21° 57.72' W	140	MOR
MSM61/478-2	21.02.2017	11:15	17° 12.40' N	21° 57.73' W	140	WAVGL
MSM61/478-3	21.02.2017	11:22	17° 12.40' N	21° 57.73' W	-	WAVGL
MSM61/479-1	21.02.2017	12:39	17° 6.52' N	21° 58.27' W	1937.7	MN
MSM61/479-2	21.02.2017	14:41	17° 10.32' N	22° 0.82' W	1272.2	PGS
MSM61/480-1	21.02.2017	20:38	17° 12.36' N	21° 57.66' W	139	MOR
MSM61/480-2	21.02.2017	21:03	17° 12.38' N	21° 57.60' W	140.3	CTD/RO/LADCP

MSM61/481-1	21.02.2017	22:05	17° 13.05' N	21° 58.32' W	409	CTD/RO/LADCP
MSM61/482-1	21.02.2017	23:25	17° 14.41' N	21° 59.10' W	676.3	CTD/RO/LADCP
MSM61/483-1	22.02.2017	01:00	17° 17.14' N	22° 0.65' W	2261.5	CTD/RO/LADCP
MSM61/484-1	22.02.2017	02:25	17° 20.44' N	22° 2.52' W	3215.8	CTD/RO/LADCP
MSM61/484-2	22.02.2017	03:15	17° 20.46' N	22° 2.52' W	3220.9	PGS
MSM61/484-3	22.02.2017	04:32	17° 21.04' N	22° 2.54' W	3237.6	PGS
MSM61/484-4	22.02.2017	05:46	17° 21.36' N	22° 2.60' W	3248.4	PGS
MSM61/484-5	22.02.2017	06:47	17° 21.67' N	22° 2.65' W	3253.8	PGS
MSM61/485-1	22.02.2017	08:53	17° 11.38' N	21° 57.32' W	-	CTD/RO/LADCP
MSM61/486-1	22.02.2017	09:48	17° 10.42' N	21° 56.77' W	119.7	CTD/RO/LADCP
MSM61/487-1	22.02.2017	10:34	17° 12.23' N	21° 57.85' W	140.8	MOR
MSM61/488-1	22.02.2017	11:50	17° 9.88' N	22° 0.13' W	822.2	WAVGL
MSM61/489-1	22.02.2017	12:40	17° 9.83' N	21° 57.63' W	518.6	CTD/RO/LADCP
MSM61/490-1	22.02.2017	13:59	17° 8.28' N	21° 55.65' W	965.9	CTD/RO/LADCP
MSM61/491-1	22.02.2017	15:22	17° 5.53' N	21° 54.03' W	2429.2	CTD/RO/LADCP
MSM61/492-1	22.02.2017	16:39	17° 2.25' N	21° 52.15' W	3274.7	CTD/RO/LADCP
MSM61/493-1	22.02.2017	17:32	17° 2.25' N	21° 52.16' W	3278.5	ADCP
MSM61/493-1	23.02.2017	11:55	17° 19.68' N	22° 2.74' W	3110.1	ADCP
MSM61/494-1	23.02.2017	12:27	17° 20.26' N	22° 2.51' W	3216.6	GL
MSM61/493-1	23.02.2017	13:11	17° 20.25' N	22° 2.78' W	3167.4	ADCP
MSM61/494-1	23.02.2017	13:12	17° 20.29' N	22° 2.76' W	3171.9	GL
MSM61/493-1	23.02.2017	15:18	17° 3.02' N	21° 52.59' W	3219.2	ADCP
MSM61/495-1	23.02.2017	16:53	17° 16.24' N	21° 47.84' W	3273.9	WAVGL
MSM61/493-1	23.02.2017	17:08	17° 16.25' N	21° 47.84' W	3276.2	ADCP
MSM61/496-1	23.02.2017	18:28	17° 12.35' N	21° 57.73' W	140.1	MOR
MSM61/497-1	23.02.2017	20:03	17° 10.43' N	21° 56.74' W	120.8	PGS
MSM61/497-2	23.02.2017	21:43	17° 10.94' N	21° 56.83' W	108.8	PGS
MSM61/498-1	23.02.2017	23:21	17° 11.37' N	21° 57.28' W	108.8	MN
MSM61/499-1	24.02.2017	00:40	17° 12.21' N	21° 58.20' W	226.6	MOR
MSM61/500-1	24.02.2017	02:18	17° 10.88' N	22° 3.13' W	2052.1	PGS
MSM61/499-1	24.02.2017	09:30	17° 12.37' N	21° 57.79' W	139.6	MOR
MSM61/501-1	24.02.2017	11:04	17° 7.85' N	22° 4.85' W	2680.1	WAVGL