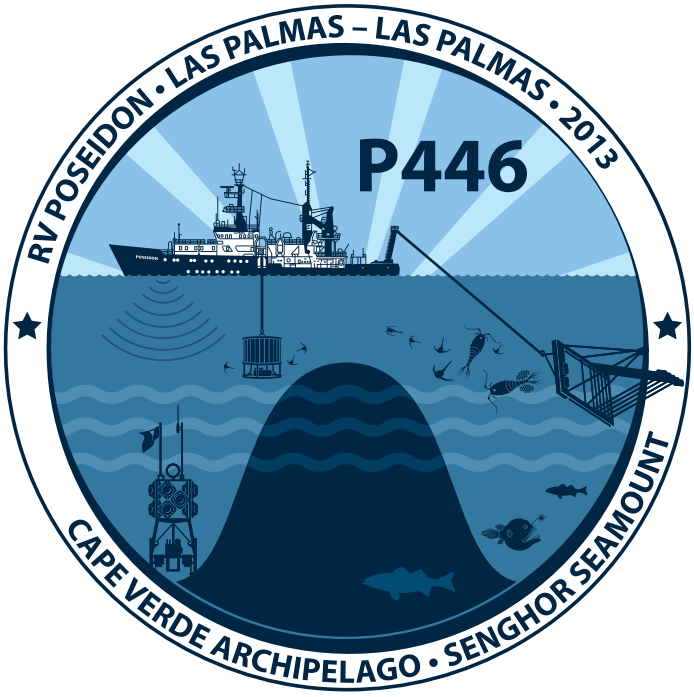
Poseidon 446

Senghor Seamount Ecology

Cruise Report



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Cruise Report R.V. *Poseidon*, cruise POS 446

Las Palmas 04.02.13 - Las Palmas 20.02.13

Principal scientist: Dr. Bernd Christiansen, Universität Hamburg

Scope of the cruise

Seamounts are commonly considered as biological "hotspots", because they often harbour enhanced biomass, biodiversity and a high number of endemic species. However, recently it has become evident that this statement should not be generalised. Several seamounts are located in the Cape Verde region. The shallower of them are important fishing areas, but information on their ecology is still sparse.

A first multidisciplinary cruise addressing ecological questions was conducted on RV *Meteor* in 2009. The cruise included geological, physical, biogeochemical and biological studies mainly at Senghor Seamount. A further cruise on R.V. *Poseidon* in 2011 (cruise P423) aimed to complement these studies, addressing in particular the role of the picoplankton and microzooplankton in the food web and in the POC export flux, and the importance of the tidal oscillations and reflections at the seamount for the resuspension of material. Only part of the goals could be achieved on the cruise due to technical problems of the ship. Cruise P446 thus aimed primarily to fill these gaps, with an extended tidal experiment involving, besides CTD casts, also a lander system.

The scientific programme of the cruise included:
- Description of the hydrographic setting at and around Senghor Seamount (water masses, flow field)
- Assessment of the amount of particulate organic material in the water column, and its composition in terms of carbon and nitrogen (POC/NOC)
- Assessment of the small-scale spatial and temporal distribution of zooplankton with special reference to the micro- and small mesozooplankton
- Biodiversity of micronekton, with special emphasis on myctophids and other mesopelagic fish
- Assessment of phytoplankton with special reference to the picoplankton
- Measurement of near-bottom flows, turbidity and POC

Cruise narratives

The cruise started in Las Palmas de Gran Canaria on 02 Feb 2013 in the afternoon, after repair of the autopilot. The oceanic reference station 50 nm north of Senghor Seamount was reached in the evening of 07 Feb, and the scientific work started with a multicorer cast, which yielded 7 short cores. *Poseidon* then sailed to our tidal experiment station about

midway between reference and seamount, where another multicorer haul was conducted; however, this one failed, obviously not having touched the bottom.

In the morning of 08 Feb we arrived at Senghor Seamount and conducted CTD and multinet profiles at several locations close to the summit and on the upper NE slope. The hydrographic data show a thin mixed layer at the surface (Fig. 1). Below 50 m, steep gradients were observed for temperature, salinity and oxygen. The oxygen minimum was

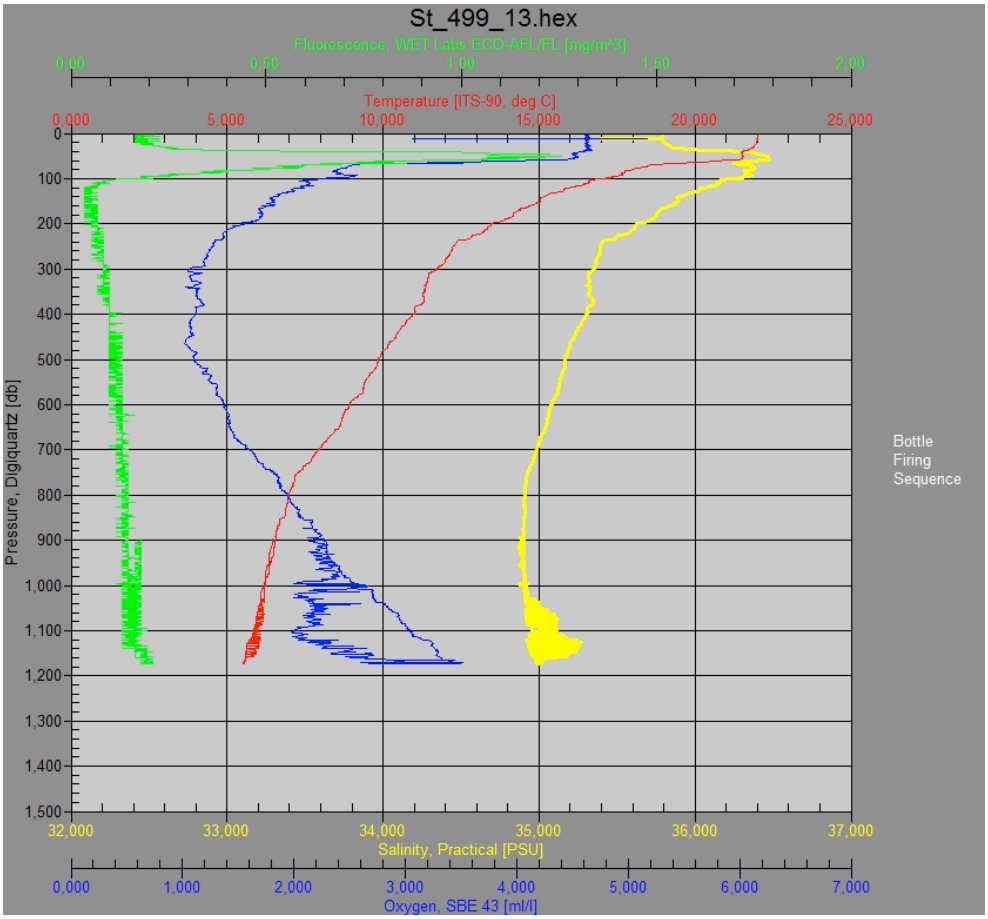

Fig. 1: Plot of temperature, salinity, oxgen and fluorescence against depth; NE slope

between 300 and 500 m with ca. 1 ml l^{-1}. The Chl. *a* maximum occurred below the base of the mixed layer at 60 m.

An IKMT haul followed in the evening; due to a faulty wire length indicator the net could be towed only at the surface and yielded a very small catch. Meanwhile the wind had increased to 25 kn and the multinet series which was planned for the night, was cancelled. Instead, we sailed back to the tidal experiment station, where we started with a deep CTD cast and continued with a "yoyo"-CTD, profiling the near-bottom water layer and sampling water close to the bottom at regular intervals for 19 h.

The CTD cast was finished in the morning of 10 Feb, and the SAMS lander system was prepared for deployment. After a buoyancy and release test, the lander was deployed at 19:00 h, at a water depth of 3340 m (Fig. 2).

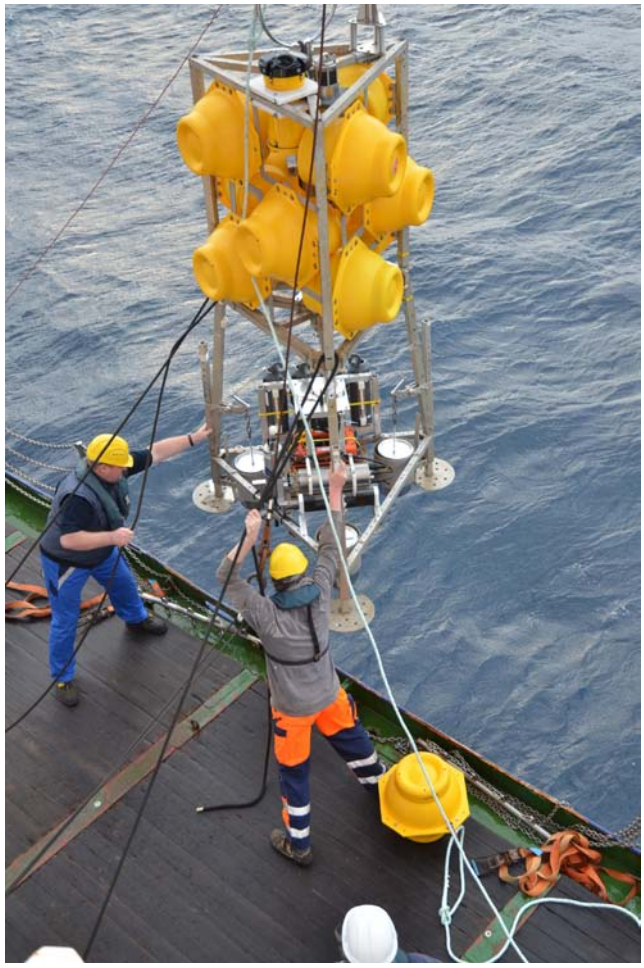

Fig. 2: Deployment of the SAMS lander

On the way back to Senghor Seamount, am IKMT haul was conducted to the north of the seamount, covering the water layer from the surface to 500 m. The catch yielded mainly shrimps and small fish (Fig. 3). Work was continued above the upper NE slope of the seamount with a multinet series, followed by CTD casts and a further multinet series.

Fig. 3: IKMT: Shrimps, fish and salps

In the morning of 11 Feb we steamed back to the tidal experiment location, where the lander was released and successfully recovered in the afternoon. All systems had worked well and provided a wealth of data, including, e.g., current measurements within 20 cm off the sea floor showing a clear tidal pattern (Fig. 4).

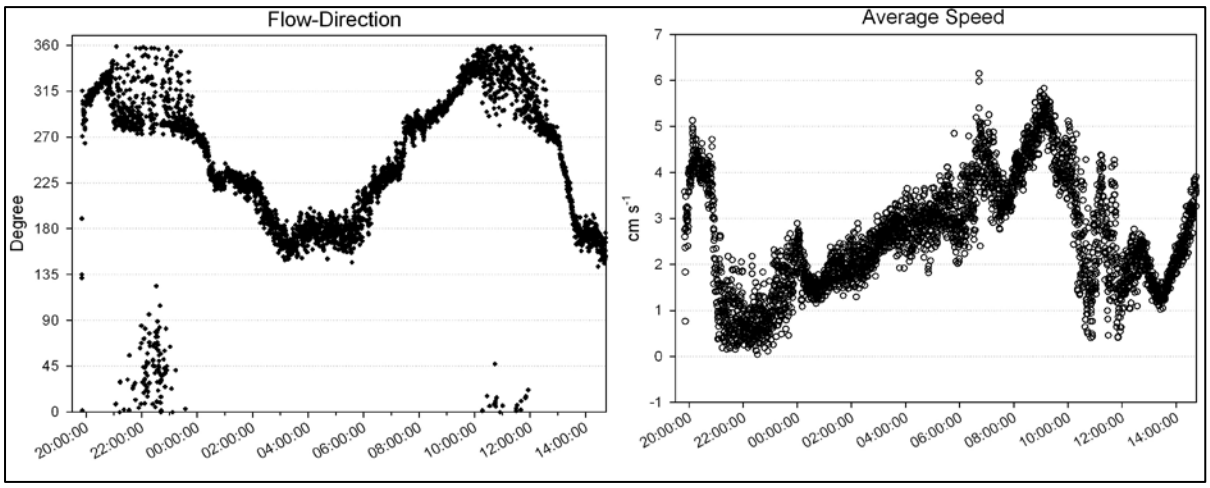

Fig. 4: First results of current velocity measurements (left: Flow direction; right: flow speed) whilst the lander deployment. Used sensor was a 3d-ACM of Falmouth Scientific. Measuring cell was placed 10 cm above sea floor. Current measurements were conducted between 10 and 20 cm above sea floor.

Back at the seamount, the IKMT was deployed above the northern mid slope, again going down to 500 m. A further multinet series was conducted above the upper NE slope, followed by a CTD cast at the same location. During hauling of the CTD, a leakage showed up in the hydraulic system of the winch. The CTD could be recovered successfully, but all station work involving winches W1-W4 had to be abandoned after that. Instead, extended ADCP profiles were conducted across the seamount, interrupted by an IKMT haul in the evening of 12 Feb using the fisheries winch, which is independent of the other winches.

Only on 13 Feb in the afternoon the winch hydraulic system was provisorily repaired, and the sampling programme could be continued with multinet series, CTD casts and IKMT hauls. Work at Senghor Seamount was finished on 15 Feb at 00:00 h, and *Poseidon* sailed to the Reference Station at 18.05°N - 22.00°W, where two CTD casts and a multinet series were performed. At 16:00 of the same day we finished station work, and *Poseidon* headed north towards Las Palmas, where she arrived on 19 Feb at 16:00 h.

Acknowledgements

We would like to thank the captain and crew of RV *Poseidon* for their professional support and for their flexibility in accommodating our scientific needs. The shiptime and financial support were provided by the Universität Hamburg.

Appendix 1: List of participants

Name	First name	Affiliation	Task
Christiansen	Bernd	UHH/IHF	PI
Denda	Anneke	UHH/IHF	zooplankton
Kaufmann	Manfred	UMA, CIMAR	phytoplankton
Mohn	Christian	AU	physics
Montgomery	John	SAMS	lander techniques
Peine	Florian	SAMS	biogeochemistry
Schuster	Anne	URO	biogeochemistry
Springer	Barbara	SAMS	biogeochemistry
Stefanowitsch	Benjamin	UHH/IHF	zooplankton
Turnewitsch	Robert	SAMS	biogeochemistry
Vieira	Rui	UALG, UdA	fish

AU	Aarhus University, Department of Marine Ecology
CIMAR	Centre of Marine and Environmental Research, Porto
SAMS	The Scottish Association for Marine Science Dunstaffnage Marine Laboratory
UALG	Universidade do Algarve, Centre of Marine Sciences
UdA	Universidade de Aveiro
UHH/IHF	Universität Hamburg, Institut für Hydrobiologie und Fischereiwissenschaft
UMA	University of Madeira Marine Biology Station of Funchal
URO	Universität Rostock, Institut für Biowissenschaften – Meeresbiologie

Appendix 2: List of stations. Times and positions correspond to commencement of stations

Station	Date	Time UTC	Position Lat	Position Lon	Depth m	Gear
POS446/497-1	07.02.2013	18:01	18° 04.99' N	22° 00.00' W	3294.9	Multi corer
POS446/498-1	07.02.2013	23:28	17° 37.25' N	21° 49.79' W	3340.5	Multi corer
POS446/499-1	08.02.2013	5:59	17° 14.10' N	21° 55.50' W	1190.3	CTD/rosette water sampler
POS446/499-2	08.02.2013	7:41	17° 14.10' N	21° 55.50' W	1166.1	Multiple net
POS446/499-3	08.02.2013	8:52	17° 14.07' N	21° 55.49' W	1204.5	Multiple net
POS446/499-4	08.02.2013	9:21	17° 14.11' N	21° 55.49' W	1201.8	Multiple net
POS446/499-5	08.02.2013	10:36	17° 14.11' N	21° 55.50' W	1209.1	Multiple net
POS446/500-1	08.02.2013	12:00	17° 11.34' N	21° 56.31' W	267.2	Multiple net
POS446/500-2	08.02.2013	12:25	17° 11.34' N	21° 56.31' W	258.5	Multiple net
POS446/500-3	08.02.2013	13:02	17° 11.34' N	21° 56.37' W	232.4	CTD/rosette water sampler
POS446/501-1	08.02.2013	13:43	17° 11.26' N	21° 57.24' W	102.3	CTD/rosette water sampler
POS446/501-2	08.02.2013	14:21	17° 11.23' N	21° 57.21' W	63.8	Multiple net
POS446/501-3	08.02.2013	14:35	17° 11.24' N	21° 57.20' W	0	Multiple net
POS446/502-1	08.02.2013	15:18	17° 11.29' N	21° 58.16' W	231.3	Multiple net
POS446/502-2	08.02.2013	15:41	17° 11.30' N	21° 58.16' W	226.3	Multiple net
POS446/502-3	08.02.2013	16:12	17° 11.29' N	21° 58.20' W	253	CTD/rosette water sampler
POS446/503-1	08.02.2013	19:34	17° 12.60' N	21° 56.51' W	464.1	IKMT
POS446/504-1	09.02.2013	1:05	17° 37.21' N	21° 49.78' W	3340.8	CTD/rosette water sampler
POS446/505-1	09.02.2013	8:31	17° 37.23' N	21° 49.79' W	3360.1	CTD/rosette water sampler
POS446/506-1	10.02.2013	10:20	17° 40.32' N	21° 49.79' W	0	Bottom lander
POS446/507-1	10.02.2013	18:54	17° 37.22' N	21° 49.79' W	0	Bottom lander
POS446/508-1	10.02.2013	19:59	17° 31.84' N	21° 50.96' W	0	IKMT
POS446/509-1	10.02.2013	23:29	17° 14.09' N	21° 55.49' W	1189.6	Multiple net
POS446/509-2	11.02.2013	0:38	17° 14.07' N	21° 55.47' W	1172.7	Multiple net
POS446/509-3	11.02.2013	1:27	17° 14.07' N	21° 55.55' W	1113.9	Multiple net
POS446/509-4	11.02.2013	1:56	17° 14.08' N	21° 55.54' W	1180.5	Multiple net
POS446/509-5	11.02.2013	3:09	17° 14.07' N	21° 55.53' W	1189	CTD/rosette water sampler
POS446/510-1	11.02.2013	5:04	17° 18.23' N	21° 52.75' W	3091.5	CTD/rosette water sampler
POS446/511-1	11.02.2013	8:07	17° 12.65' N	21° 57.46' W	266.6	CTD/rosette water sampler
POS446/511-2	11.02.2013	8:42	17° 12.65' N	21° 57.48' W	249.7	Multiple net
POS446/512-1	11.02.2013	14:38	17° 37.03' N	21° 49.92' W	3342.4	Bottom lander
POS446/513-1	11.02.2013	19:57	17° 14.34' N	21° 59.64' W	0	IKMT
POS446/514-1	11.02.2013	21:59	17° 14.11' N	21° 55.51' W	1204.4	Multiple net
POS446/514-2	11.02.2013	23:15	17° 14.09' N	21° 55.51' W	1168.9	Multiple net
POS446/514-3	11.02.2013	23:49	17° 14.10' N	21° 55.51' W	1188	Multiple net
POS446/514-4	12.02.2013	0:51	17° 14.08' N	21° 55.47' W	1169.7	Multiple net
POS446/514-5	12.02.2013	1:38	17° 14.08' N	21° 55.46' W	1179.7	CTD/rosette water sampler
POS446/515-1	12.02.2013	3:14	17° 11.35' N	21° 57.30' W	0	Akustik Doppler Current Pro

Station	Date	Time UTC	Position Lat	Position Lon	Depth m	Gear
POS446/516-1	12.02.2013	19:51	17° 09.17' N	22° 00.49' W	1299	IKMT
POS446/517-1	12.02.2013	21:48	17° 12.05' N	21° 57.55' W	123.4	Akustik Doppler Current Pro
POS446/517-2	13.02.2013	3:21	17° 12.28' N	21° 56.40' W	348.1	Akustik Doppler Current Pro
POS446/518-1	13.02.2013	15:15	17° 11.04' N	22° 00.79' W	1061.3	Multiple net
POS446/518-2	13.02.2013	15:56	17° 11.04' N	22° 00.76' W	1086.5	Multiple net
POS446/518-3	13.02.2013	17:08	17° 11.04' N	22° 00.75' W	1056.9	Multiple net
POS446/518-4	13.02.2013	17:36	17° 11.03' N	22° 00.75' W	1058.8	Multiple net
POS446/518-5	13.02.2013	18:55	17° 11.07' N	22° 00.75' W	1077.6	CTD/rosette water sampler
POS446/519-1	13.02.2013	20:01	17° 10.95' N	22° 00.80' W	1079.6	IKMT
POS446/520-1	13.02.2013	21:59	17° 14.08' N	21° 55.47' W	1171.3	Multiple net
POS446/520-2	13.02.2013	23:08	17° 14.08' N	21° 55.50' W	1154.8	Multiple net
POS446/520-3	14.02.2013	0:32	17° 14.08' N	21° 55.50' W	1180.7	Multiple net
POS446/520-4	14.02.2013	1:03	17° 14.10' N	21° 55.52' W	1181.2	Multiple net
POS446/520-5	14.02.2013	1:43	17° 14.07' N	21° 55.53' W	1165	CTD/rosette water sampler
POS446/521-1	14.02.2013	2:54	17° 14.04' N	21° 57.63' W	781.6	CTD/rosette water sampler
POS446/522-1	14.02.2013	4:05	17° 12.11' N	21° 59.94' W	755.3	CTD/rosette water sampler
POS446/523-1	14.02.2013	5:03	17° 11.29' N	21° 58.21' W	264.8	CTD/rosette water sampler
POS446/524-1	14.02.2013	6:13	17° 11.60' N	21° 54.77' W	1049.2	CTD/rosette water sampler
POS446/524-2	14.02.2013	8:00	17° 11.61' N	21° 54.78' W	1030.3	Multiple net
POS446/524-3	14.02.2013	8:45	17° 11.61' N	21° 54.80' W	1024.6	Multiple net
POS446/524-4	14.02.2013	10:05	17° 11.62' N	21° 54.78' W	1031.5	Multiple net
POS446/524-5	14.02.2013	10:37	17° 11.62' N	21° 54.76' W	1053.1	Multiple net
POS446/525-1	14.02.2013	12:55	17° 10.18' N	21° 57.24' W	235.5	Multiple net
POS446/525-2	14.02.2013	13:21	17° 10.18' N	21° 57.26' W	246.7	Multiple net
POS446/525-3	14.02.2013	13:53	17° 10.18' N	21° 57.23' W	227.3	CTD/rosette water sampler
POS446/526-1	14.02.2013	14:59	17° 12.62' N	21° 57.49' W	231.2	CTD/rosette water sampler
POS446/526-2	14.02.2013	15:20	17° 12.63' N	21° 57.50' W	220.6	Multiple net
POS446/526-3	14.02.2013	15:43	17° 12.64' N	21° 57.52' W	213.2	Multiple net
POS446/527-1	14.02.2013	16:37	17° 13.58' N	21° 58.23' W	437.2	IKMT
POS446/528-1	14.02.2013	18:26	17° 14.12' N	21° 55.50' W	1187	CTD/rosette water sampler
POS446/528-2	14.02.2013	20:02	17° 14.09' N	21° 55.50' W	1158.4	Multiple net
POS446/528-3	14.02.2013	21:17	17° 14.10' N	21° 55.52' W	1177.7	Multiple net
POS446/528-4	14.02.2013	21:44	17° 14.10' N	21° 55.50' W	1185.8	Multiple net
POS446/528-5	14.02.2013	21:54	17° 14.09' N	21° 55.52' W	1164.1	Multiple net
POS446/528-6	14.02.2013	22:58	17° 14.09' N	21° 55.51' W	1149.1	Multiple net
POS446/528-7	14.02.2013	23:23	17° 14.09' N	21° 55.51' W	1174.5	Multiple net
POS446/529-1	15.02.2013	8:02	18° 04.99' N	22° 00.02' W	3295.1	CTD/rosette water sampler
POS446/529-2	15.02.2013	10:48	18° 04.98' N	21° 59.95' W	0	Multiple net
POS446/529-3	15.02.2013	11:58	18° 04.98' N	22° 00.01' W	3295.3	Multiple net
POS446/529-4	15.02.2013	12:37	18° 04.95' N	21° 59.99' W	3299.8	Multiple net

Station	Date	Time UTC	Position Lat	Position Lon	Depth m	Gear
POS446/529-5	15.02.2013	12:55	18° 04.98' N	21° 59.98' W	3294.5	Multiple net
POS446/529-6	15.02.2013	14:10	18° 04.99' N	21° 59.97' W	3300.1	Multiple net
POS446/529-7	15.02.2013	14:44	18° 04.96' N	21° 59.96' W	3297.4	Multiple net
POS446/529-8	15.02.2013	15:13	18° 04.96' N	21° 59.98' W	0	CTD/rosette water sampler

Appendix 3: Maps of sampling locations

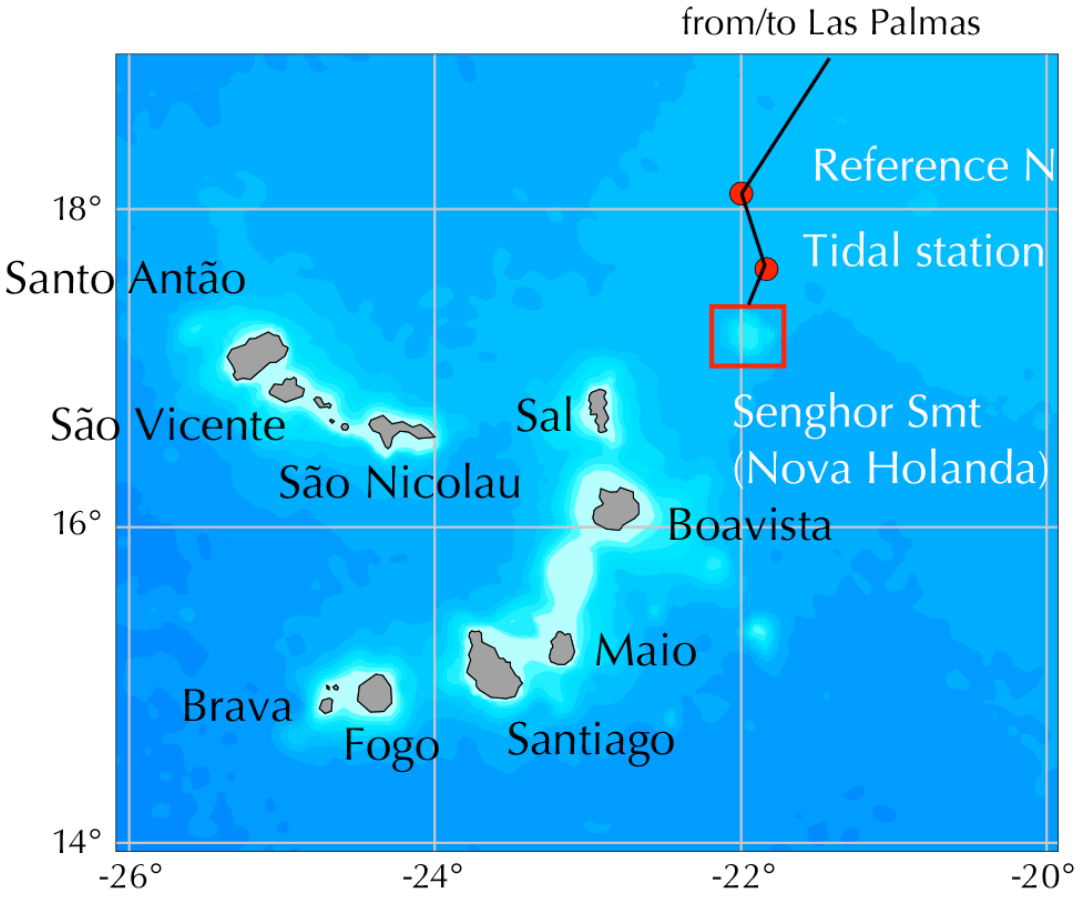

Fig. A1: POS466 cruise track and sampling locations

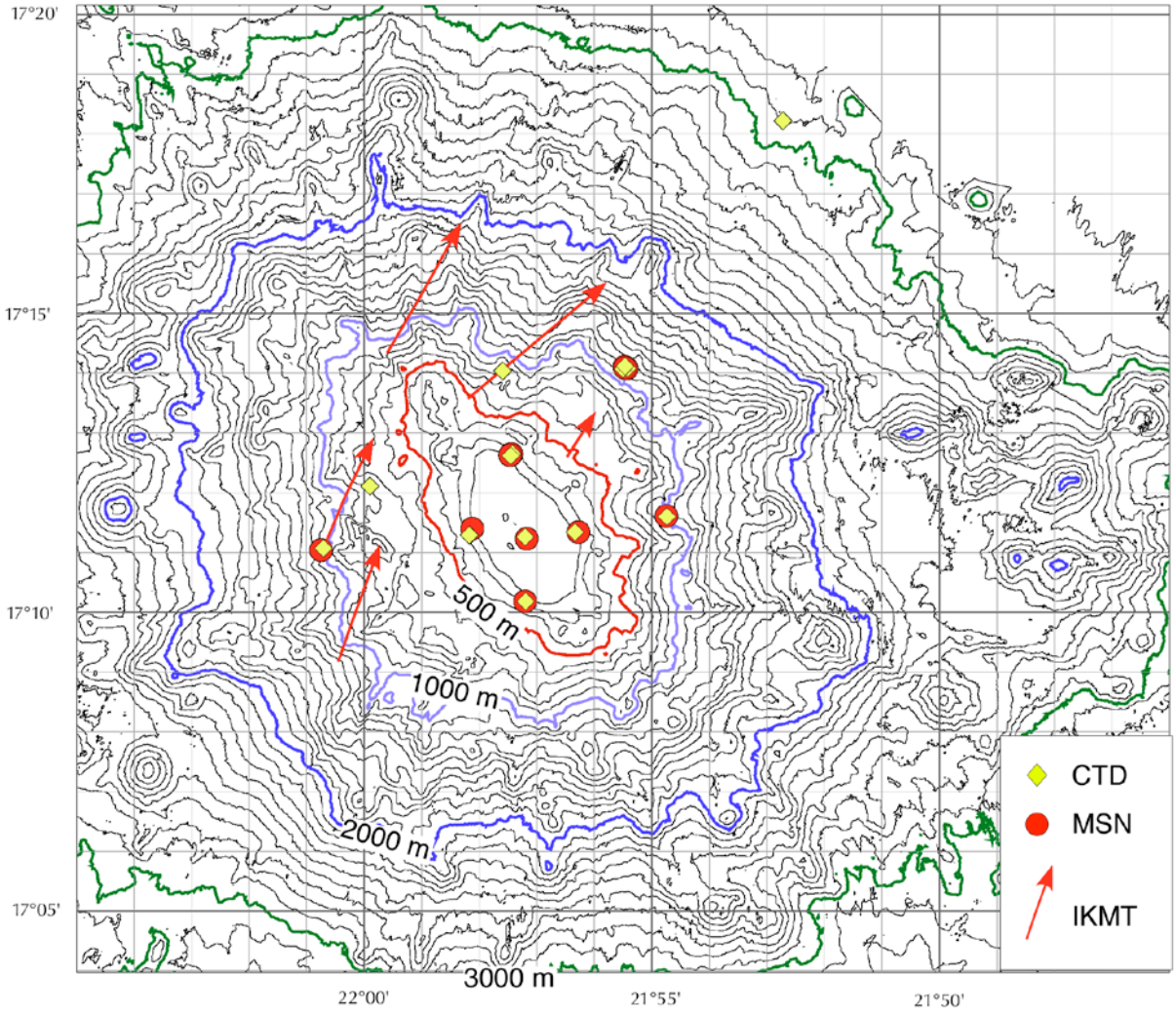

Fig. A2: POS466 sampling stations, central area of Senghor Seamount