

– Short Cruise Report –

RV METEOR-Cruise M76/1

Cape Town (Rep. of South Africa) –
Walvis Bay (Rep. of Namibia)

April 12 – May 13, 2008

Chief scientists:

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The major objective of the first Leg of METEOR-Cruise 76 was the investigation of the deep biosphere, an area which has come into the focus of geoscientific and microbiological research only ten years ago. Previous studies on long sediment cores have demonstrated the existence of a marine deep biosphere. Due to the lack of cultured representatives our knowledge about the physiology and ecology of deep biosphere microorganism is still limited. Biomarker studies and the detection of certain marker genes in deep sediments indicated the presence of potentially chemolithotrophic bacteria and archaea, gaining their energy by metabolizing inorganic compounds.

This cruise should provide us with sediment material from the deep subsea floor at the upper continental margin off Namibia. Specific biogeochemical processes, involved microbial communities, and their interrelations with the local oceanography and sedimentation regime should be investigated with a variety of chemical and microbiological methods and approaches.

This was the first cruise where the new wire-line drilling technique of the sea floor drill rig (MeBo) should be tested in unconsolidated marine sediments. Based on the necessary support for this technique and the whole device by a commercial enterprise (*Prakla Bohrtechnik*) which already has been involved in the development of the MeBo system, the cruise had to be split into two legs. Therefore, the cruise was interrupted on April 25 to exchange 3 scientists.

According to plan, RV METEOR left Cape Town only with a very short delay of several hours at 5 pm on Saturday, April 12, 2008. Figure 1 shows the whole cruise track. Due to good weather and current conditions METEOR arrived at the first station at 28°S on April 14. Unfortunately, but typical for the season, strong low-pressure areas around the Southern Ocean caused high swell up to 6m in the whole working area during most of the time. Because the dimension of the MeBo system is close to the limit which can be handled on board of a ship like RV METEOR and therefore for reasons of safety, MeBo was deployed only when the sea was below about 3 m. Despite the rough sea, several deployments of the gravity corer and the multicorer were successful. First preliminary investigations show the expected low microbial

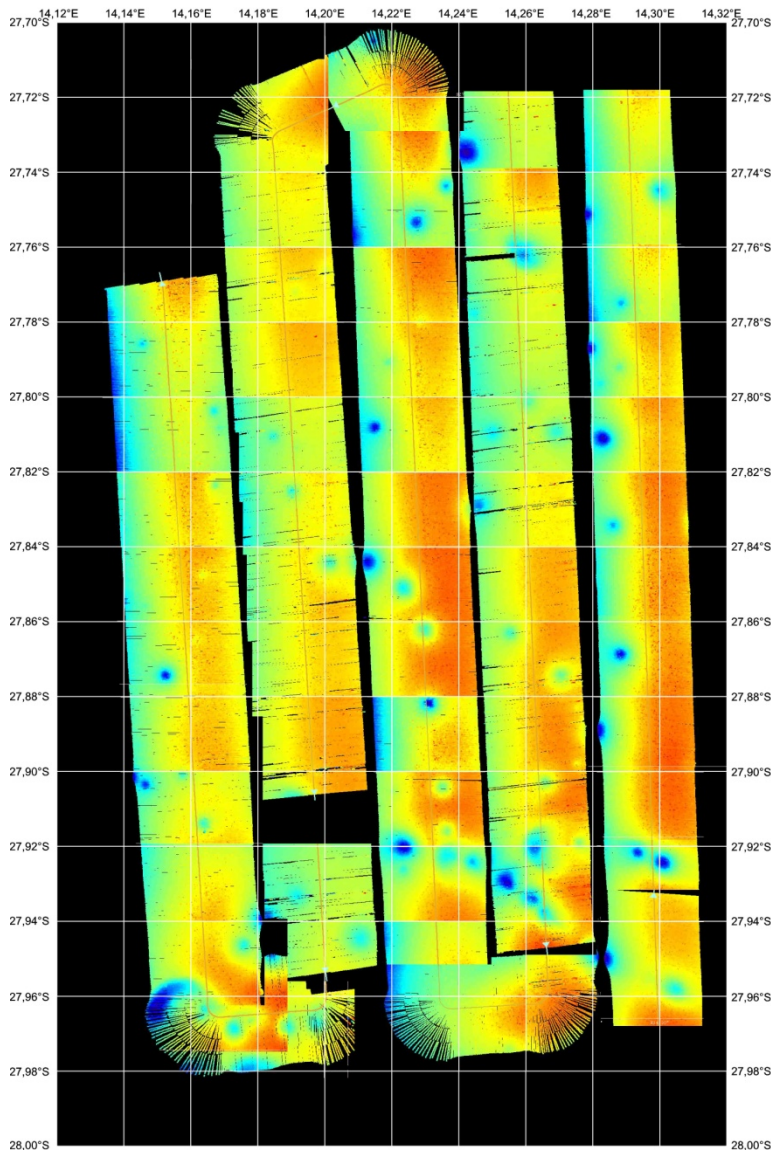


Fig. 2 EM120-survey at 27,8°S, 14,2°E

younger history.

Based on previously existing results, a transect across the upper slope between 25,2°S and 24,6°S has been chosen as the main working area during this expedition. Here, at about 800m water depth, the MeBo system could be deployed for the first time. A first hole with wire-line coring was drilled down to 14 mbsf. Nearly each of the 6 segments retrieved sediment, but a continuous coring failed.

Again, deteriorating wave and wind conditions prevented further MeBo operations. The meantime was used to take valuable samples from the well-known mudbelt off Namibia as well as from the continental rise. Even in the mudbelt, two gravity cores could be obtained successfully. As expected, a series of multicorer cores contained filaments of the world's largest bacteria – *Thiomargarita namibiensis* – on the surface. A huge number of samples could be taken for

incubations and other special experiments to decipher microbially mediated element cycles. With good hope on improving weather we started looking on a site with more consolidated deposits. Such sediments, an outcropping strata could be found in about 300 m wd at the shelfbreak. Unfortunately several technical and electrical problems the MeBo system could not be deployed successfully.

Considering the scientific goal of this leg, we decided to continue sampling down the slope. In about 3800 m water depth an excellent 5.6 m long core was retrieved. The whitish foraminiferal nannofossil ooze represents just the opposite of the organic rich sediments of the depocenter on the upper slope. Among other things these sediments reveal a big contrast in benthic life and microbial activity. However, pore water geochemistry indicates further ongoing microbial activity in the deeper, dark layers of these sediments which let surmise the magnitude of this deep sub-seafloor microbial habitat.

On account of persistent difficulties with MeBo, we decided to sample further sites in the mudbelt on the continental shelf. Two additional sites were intensely sampled with Multicorer and gravity corer.

Despite all the various difficulties with the new wire-line system on Mebo, this first test was not a waste of time. The development of such a highly complex system takes time. With this cruise we have gained a lot of valuable information which will lead to important improvements for the new challenges in the near future. After thirty days on sea the cruise ended on May 13 where it has started, in Walvis Bay. All scientists could send home a lot of new exciting data and samples for ongoing investigations in the home labs. So in total, the work on cruise science objectives was relatively successful.

A detailed listing and documentation of the scientific program achieved during M76/1 can be found in the regular final report which should be available in summer 2009 (http://www.dfg-ozean.de/de/berichte/fs_meteor).

Dr. M. Zabel & Dr. T. Ferdelman (chief scientists)

Supplement

Scientific party M76/1 (institutions and companies in alphabetic order)

BGR – Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover, Germany

DWD – Deutscher Wetterdienst, Hamburg, Germany

GeoB – Department of Geosciences, Bremen University, Germany

ICBM – Inst. for Chemistry and Biology of the Marine Environ., Univ. Oldenburg, Germany

Marum – Zentrum für Marine Umweltwissenschaften, Bremen University, Germany

MPI-MM – Max-Planck-Institute for Marine Microbiology, Bremen, Germany

Prakla Bohrtechnik, Peine, Germany

UNC – Univ. of North Carolina at Chapel Hill, Dept. of Marine Sciences, Chapel Hill, USA

(Scientific cruise participants: M76/1 persons 33)

Equipment employments/profiles/length

Hydroacoustic surveys: EM120 swath sounder and PARASOUND, length (nm): 2982

MeBo – Sea Floor Drill Rig: 14 deployments

Gravity corer: 23 deployments (max. length: 6m)

Multicorer: 35 deployments

