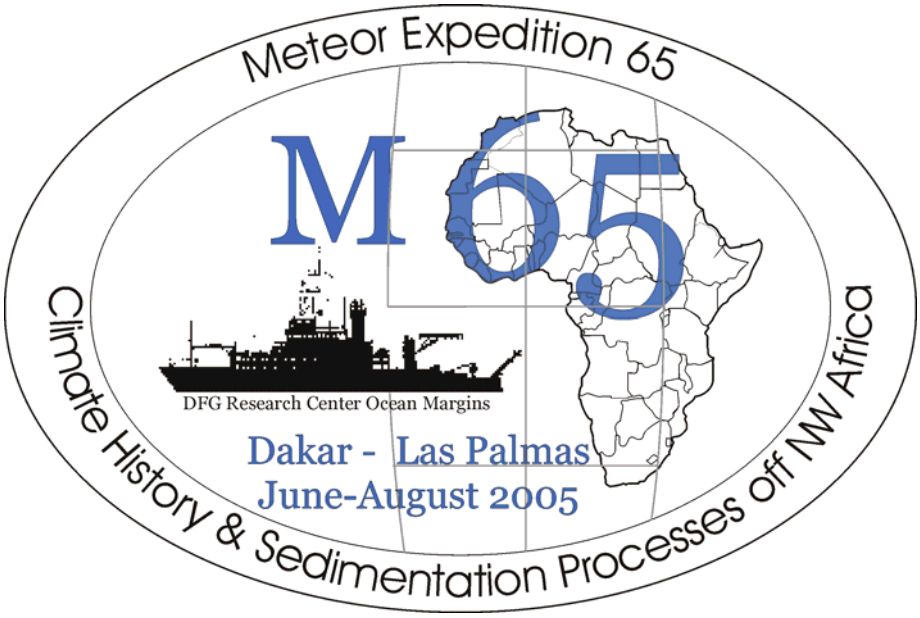
METEOR-CRUISE M65/1
DAKAR – DAKAR, 11.06.2005- 1.07.2005

Short Cruise Report



Participants

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Paul, André, Dr.	*Geosystem Modeling*	GeoB/RCOM
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Zabel, Matthias	*Geochemistry*	GeoB/RCOM
Zonneveld, Catharina, Dr.	*Micropaleontology*	GeoB/RCOM

GeoB/RCOM	Fachbereich Geowissenschaften /Forschungszentrum Ozeanränder, Universität Bremen
FSR	Mohammed V – Agadal University
DWD	Deutscher Wetterdienst, Geschäftsfeld Seeschiffahrt
NIOZ	Netherlands Institute for Sea Research

Research Program

The main purpose of METEOR-Cruise M65/1 was to collect samples and data from the continental slope off NW Africa to investigate several research themes within the Research Center Ocean Margins (RCOM) at Bremen University. These samples shall allow

- the reconstruction of changes in the vertical temperature and nutrient distribution (RCOM Project A3,
- the contemporaneous reconstruction of time series for continental aridity and sea surface temperature and to examine the link between these parameters (RCOM Projects A7, A8),
- to study isotopic composition and distribution of modern plankton communities to broaden our knowledge of the biogeographic distribution and seasonal occurrence of the species and the recording of hydrographic information in their shells (RCOM Project A9),
- the characterization of the benthic phosphorus cycle in surface sediments (RCOM Project B5),
- the detailed examination of early diagenetic modification of primary composition and rock magnetic properties of the sediment within the sulfate/methane transition zone (RCOM Project C1),
- the quantification and geochemical characterization of suspended particles in the water column and the eolian dust input to the ocean (RCOM Projects B2, B3).

Six main working areas (Senegal Mudbelt and working areas A-E, Fig. 1) were selected for sampling of sediment and water column with multicorer, gravity corer, multinet, CTD and water sampler. The main purpose of the sampling in the Mudbelt Area on the shelf off Senegal was to retrieve high resolution Holocene sediments to get information on the Holocene history of the Sahel Zone and the Holocene history of surface water temperature in the region. Sampling transects in working Areas A, B and E were oriented downslope between about 500 and 4100 m water depth to cover the main water masses. Special emphasis was given to obtaining cores from the upper continental slope to get information on the quaternary history of the main thermocline. In working area C and D, where sedimentation is strongly influenced on bottom currents and slumped sediments, we only sampled the depth range between about 1000 and 3000 m water depth. Undisturbed sediment cores from area D and E did not exist prior to this cruise. At each station we deployed one or two multicorers.

This material will be used to complement the often disturbed uppermost part of the gravity cores and will serve for (coretop) calibrations of paleoclimatic proxies. Since information on sediment structures were sparse in the working areas an intense site survey was done prior to geological sampling with PARASOUND and HYDROSWEEP.

Narrative of the Cruise

METEOR departed from Dakar, Senegal on June 11 around 15:00 (UTC) with 28 scientists from the Research Center Ocean Margins (RCOM), one scientist from the Netherlands Institute for Sea Research, one scientist (observer) from the Mohammed V – Agadal University in Morocco, and one observer from the Senegalese Navy. Departure was delayed by about two days because METEOR's forward propulsion had to be repaired in the docks of Dakar. About three hours after departure, immediately after leaving the three mile zone of Senegal, all continuous measurements (thermosalinograph, pump systems, echosounding) were started.

In the evening of June 11 we arrived in our first working area, the **mud belt** in front of the Senegal River mouth where we intended to sample high-resolution Holocene Sediments. A one-day site survey with PARASOUND and HYDROSWEEP allowed identification of five appropriate coring stations. Our site survey data showed that the mud belt consists of an up to 15 m thick sediment layer; becoming thinner towards the southern extension of the mud belt. The site survey ended north of the Mauretania Canyon where the first station with gravity corer, multi corer, water sampler and multi opening closing net was performed on the northern flank of the Mauretania Canyon. Here, we recovered a 547 cm long gravity core, consisting mostly of homogenous greenish mud of presumably Holocene age. The four following stations (GeoB 9502 – 9505) were done in the mud belt area in water depth between 36 and 63 m. Coring was generally very successful with core length between 575 and 808 cm for the gravity corer and core length between 40 and 51 cm for the multicorer. Due to positioning problems one entire gravity core tube (GeoB9503-4) was bent during retrieval. However, a repeat deployment of the gravity corer at this position was successful. All cores from the Senegal mudbelt area revealed homogenous greenish muds of presumably Holocene age with low but detectable contents of foraminifera and molluscs. Work on the shelf off Senegal was finished on June 13, 21:08 (UTC).

We arrived in **Working Area A** on June 14, 0:41 (UTC). In the following 12 hours we performed a site survey on a transect perpendicular to the coast down to about 3200 m water depth. For most of the transect, the PARASOUND survey showed a largely unstructured and

smooth continental slope. Sub-bottom reflectors were identified between approximately 1300 and 1600 m as well as below 2300 m water depth. Hummocky-like sea-floor existed below 3000 m water depth and around approximately 1500 m depth. Five coring stations between 2958 and 494 m water depth were selected on basis of the site survey and subsequently sampled. To increase the density of the hydrographic observations additional stations with CTD/Rosette and Multinet were performed between the coring stations. A total of 8 gravity cores with lengths between 991 und 520 cm were retrieved from the continental slope on profile A. The cores consist of homegenous greenish muds. Our shipboard stratigraphy suggests that the cores are generally almost undisturbed and reach marine isotope stage 4 to 6 depending on the local sedimentation rate. Finally, at the end of profile A, we took a gravity corer in the southernmost extension of the Senegal mudbelt. This core only retrieved 141 cm of sandy mud with abundant solitary corals. Work in on Profile A ended on June 16, 20:56 (UTC).

Site survey in **Working Area B** slightly south of 14°N started on June 17 at 5:58 (UTC) and was continued until 14:00 UTC on the same day. Working area B consisted of a downslope transect from the shelf from 89 m down to about 3500 m. Between approximately 3500 m and 1700 m water depth, the PARASOUND survey revealed a smooth morphology and clear sub-surface reflectors which were continuous over long distances. Gravity cores up to 970 cm long were obtained from Stations GeoB 9516 to 9518. By contrast, the upper slope lacks sub-surface reflectors over some parts of the profile, possibly due to the steepness of the sea-floor. However, despite poor evidence from PARASOUND four continuous quaternary gravity cores, from water depths between about 1500 and 500 m, were retreived from Stations GeoB 9519 to 9521.

Since we received no permission to work within the 200 mile zone of Guinea-Bissau, **Working Area C** had to be shifted slightly to the North to 12°26.00 N. We arrived at Working Area C on June 20, 5:11 (UTC) in shallow shelf waters and continued a PARASOUND survey downslope to about 3700 m, which we reached at 14:06 (UTC). The PARASOUND data on this profile only showed slumped sediments at the upper slope. For this reason, two additional PARASOUND profiles were measured slightly north of the first one. However, in spite of the extended PARASOUND survey, continuous subsurface reflectors were only detected below approximately 2600 m water depth. For this reason only three relatively deep stations were sampled in Working Area C.

During the transit into **Working Area D** which started on June 22 at 18:30 (UTC), we passed through the economic zone of Guinea-Bissau. Since the permission to work in this area was denied, all data acquisition was interrupted immediately after leaving Working Area C.

Data storage started again upon arrival in Working Area D at the southern Guinea Plateau Margin, in the territorial waters of Guinea, on June 23 at 11:15 (UTC). Here the upper slope of the Guinea Plateau is characterized by outcrops of consolidated sediments. Below about 2000 m water depth, however, an intermediate basin filled with sediments dammed behind a marginal basement ridge offered the opportunity to sample quaternary sediments. Our site survey in this area started immediately after arrival. The sediment structures shown by the PARASOUND survey suggested that most of the sediments at the southern Guinea Plateau Margin are current-moulded. Suitable coring sites were found at two positions where we retrieved two almost undisturbed sediment records that presumably extend back into isotope stage 6. Another gravity core (GeoB 9529-3) was recovered from the upper slope of the Guinea Plateau Margin at 1233 m water depth. Finally, an attempt to take a gravity core from the cone of a submarine volcano (GeoB 9530-1) was not successful; apparently, all the fine sediments were washed out and only some gravel remained in the core catcher.

After finishing the work in Area D, Meteor sailed eastwards to **Working Area E** located on the Guinea Continental Margin. Due to the very gentle tilt of the upper slope, we were able to retrieve an excellent series of sediment samples from very shallow water depths. These sediments will help to reconstruct the structure of the permanent thermocline. The profile was complemented by two deep cores form 3409 and 4147 m water depth. On Tuesday, June 28, METEOR finished its last station (GeoB 9538) in working area E. The transit back to Dakar was used to obtain PARASOUND data and to take a latitudinal multicorer transect in the shelf areas of Guinea, Gambia and Senegal. Together with the multicorer transect from the mud belt, these samples will provide information on the present-day imprint of the different vegetation types in the sediments off NW-Africa. The first leg of cruise M65 ended with the arrival in Dakar on June 1 at 7:54 (UTC).

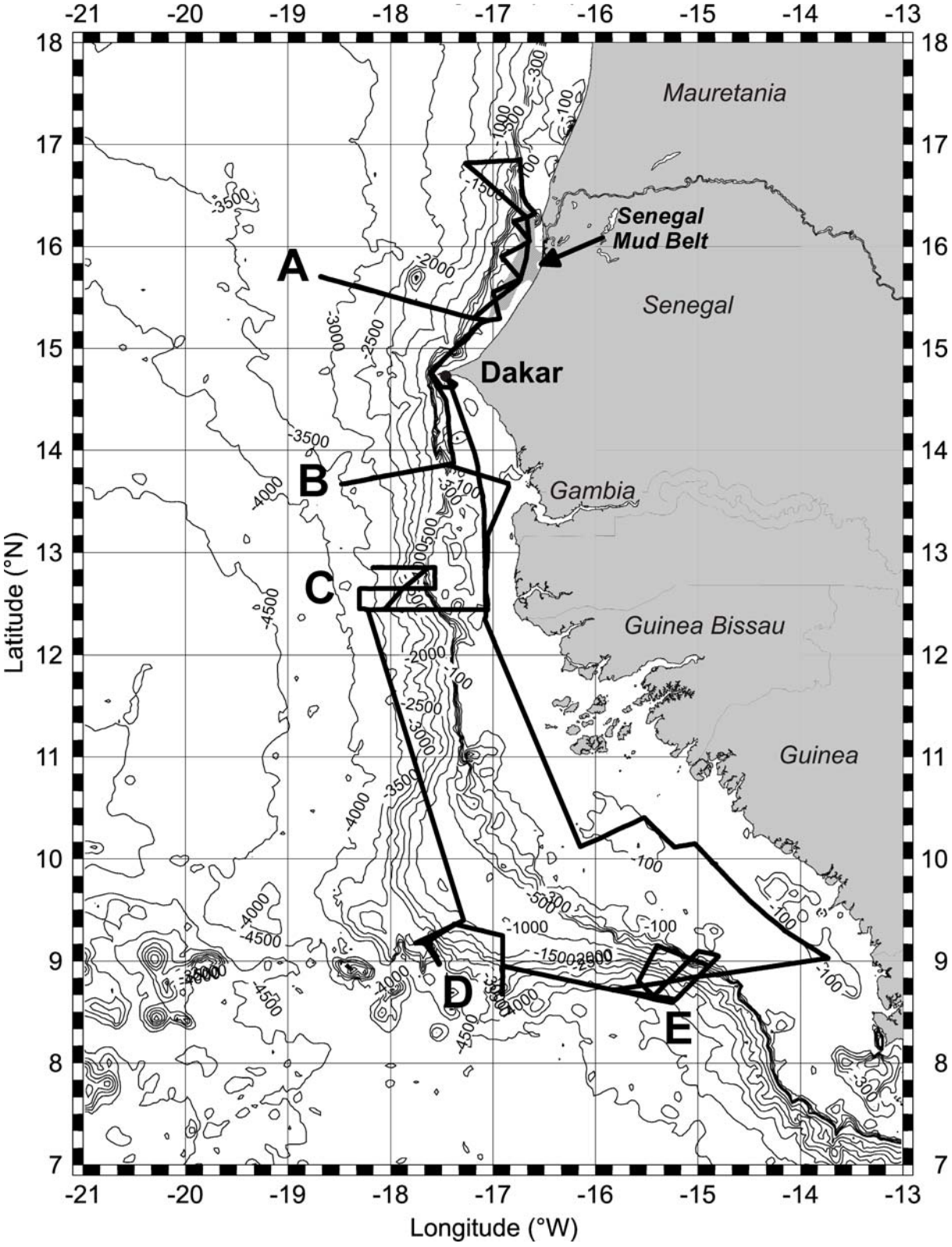

Figure 1 Track of R/V METEOR Cruise M65/1.