

SHORT CRUISE REPORT
RV METEOR cruise M63/1, Southwestern Indian Ocean

Dates: January 24 – February 23, 2005
Port calls Cape Town (South Africa) – Cape Town (South Africa)
Chief scientist: Dr. Jürgen Pätzold, University Bremen

After a few weeks in port, RV METEOR left Cape Town, South Africa, on the early afternoon of Tuesday, February 1, 2005, beginning the first leg of Cruise M63/1. The scientific shipboard party consisted of 26 scientific colleagues, including 19 colleagues from the Universities of Bremen and Kiel, one scientist from the Alfred Wegener Institute for Polar and Marine Research (AWI), Bremerhaven, one scientist from the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover, one scientist from Woods Hole Oceanographic Institute, USA, two young scientists from the Universities of Cape Town and Kwazulu-Natal, South Africa, as well as two colleagues from the Deutscher Wetterdienst (DWD) in Hamburg (Table 1).

The scientific objectives of RV METEOR cruise M63/1 were to carry out geological, geophysical, and geochemical studies along the continental slope of South Africa and Mozambique. Operations were carried out in three different working areas, i.e., the Tugela Cone, the Limpopo Cone, and the Zambezi Cone. The three working areas along the continental slope of Africa are located between 30°S and 18°S (Fig. 1). The scientific studies were carried out in the territorial waters of South Africa and Mozambique. The major aims of the cruise were to carry out hydroacoustic and seismic surveys and to collect sediment cores. Water and plankton samples as well as surface-sediment samples were collected for calibration purposes. The ultimate goal of the project is to carry out an integrative and multidisciplinary reconstruction of paleoclimatic changes in the southwestern Indian Ocean, including the continental climate history of southern Africa and in the northern Natal Basin. The investigations also include geophysical analyses of the structural elements and the mechanisms of sedimentation on the deep sea fans of the Limpopo and Sambesi Rivers. The submarine sediment cores of the three river systems were expected to reveal high-resolution sediment records under the influence of the Mozambique Current and the Agulhas Current. The cruise was originally planned to begin on January 24, 2005. Due to technical problems the cruise started on February 1, 2005 in Cape Town and also ended in Cape Town, South Africa, on February 23, 2005.

In the early afternoon of 1 February 2005 the RV Meteor left the harbor of Cape Town after a few short tests and sailed eastward toward the Indian Ocean. At 20° east longitude, near Cape Agulhas, we crossed from the Atlantic into the Indian Ocean and cruised along the continental margin toward the first target area northeast of Durban, which we reached on Saturday, 5 February 2005. The trip was slowed by the fact that the ship had to sail against the Agulhas Current. Because of the limited time, we restricted our work in the first study area off Tugela, at around 30°S, to a short run with PARASOUND und HYDROSWEEP to search for possible sampling stations in water depths of 1000 to 2500m. The survey map shows deeply cut canyons in the southern and eastern area off the Tugela estuary. A young sediment cover is not present. Only older sediment packages are found here. To the northeast, however, we were able to identify appropriate sampling stations with younger sediment cover, where we planned to come to take a sediment core on the return trip to Cape Town.

During the night of the 5 to 6 of February 2005, we left the South African waters and began our work off the Limpopo around the latitude of Maputo. There, on the morning of February 6, the first successful geological sampling of the sea floor was carried out

with the multicorer and gravity corer, as well as sampling of the water column with the rosette and the multinet. After the usual technical preparations and tests, the first five seismic profiles were carried out on the shallow continental slope off the Limpopo Estuary. The profiles indicate uniform depositional conditions with prominent current-influenced sediment bodies. Near-surface sediment bodies show a clear leveling effect, which indicates high current activity in this area. Subsequent profiles brought us nearer to the shelf and estuary.

On the afternoon of 8 February 2005 we departed the area off the Limpopo and made a course for the third study area of the leg. We reached the sediment fans of the Zambezi during the night of the 9 to 10 of February 2005 and began the work there with a long seismic profile. We sailed initially over a large area that was characterized by multiple slump layers, and therefore decided against taking any sediment cores in the area. On leaving the area, sailing eastward, the first appropriate station was identified and sampled at a water depth of 1725m. In order to obtain an overview of the sediment fan in the short remaining available time, we relocated to a profile with a northeasterly trend and carried out a depth profile of around 1300 meters, extending to the shelf, where various sampling stations were conducted. A northeasterly measurement survey led us into an area of presently inactive canyons, yielding an additional successful coring station on the upper continental slope.

On Sunday, 13 February 2005 we reached the most northerly and easterly point of the cruise at around 18°S and 37°20'E. The weather conditions were relatively good. The wind and swell had abated and enabled smooth work on deck. With the station work, however, we had to repeatedly struggle against strong currents. At these shallow water depths, in places only a few hundred meters deep, the accurate positioning of the sampling tools was difficult. Seismic profiles and geological station work were alternately carried out. Sampling with the gravity corer in water depths between 400 and 700m near the estuary of the Zambezi was particularly successful. We were able to spend a total of 6.5 days working in this marine area. On Wednesday, 16 February 2005 the RV Meteor left the study area off the Zambezi on a southern course for the 1400nm return journey. This transit was interrupted by two previously identified sampling locations south of the Limpopo and northeast of the Tugela. The work was complemented by a further seismic profile in the central part of the Limpopo Fan. Station work for the cruise was concluded at 6:00 a.m. on 20 February 2005 with a gravity core in the deep Natal Basin at around 3000m water depth (Table 2). The RV Meteor reached the harbor of Cape Town two days later on Wednesday, 23 February 2005, where the cruise came to an end. The last containers with scientific equipment were unloaded to the pier and sent back to the home institute. The ship was handed over to the arriving scientists for the second leg of cruise M63.

Of the original 30 days planned for the cruise, only 21 were available for the actual expedition at sea, of which a significant portion were needed for transit time to and from the area around 18°S. Unfortunately there was not enough time to survey and sample the Zambezi Canyon in the eastern part of the Zambezi Fan. The original plan had included searching for channel and levee sediments there. Furthermore, plans for sampling deeper stations in the Mozambique Strait and in the Agulhas Current outside of the sediment fans of the rivers had to be cancelled. There was also insufficient time for detailed survey work with PARASOUND and HYDROSWEEP off the Tugela River.

Table 1 M63/1 scientific party

University Bremen, Geoscience Department	GeoB	17 persons
University Kiel, Institute for Geosciences	IfGK	2 persons
Alfred-Wegener-Institute for Polar and Marine Research	AWI	1 person
Bundesanstalt für Geowissenschaften und Rohstoffe	BGR	1 person
Woods Hole Oceanographic Institution	WHOI	1 person
University of Cape Town, South Africa	UCT	1 person
University of KwaZulu-Natal, Durban, SA	UKN	1 person
Deutscher Wetterdienst, Hamburg	DWD	2 persons
Scientific participants		26 persons

Table 2 Statistics of scientific work

Equipment	employments/profiles
Multichannel seismic profiles	618 nm
Seismic profiles	13
Additional HYDROSWEEP and PARASOUND surveys	441 nm
CTD	13
Water bottle stations with rosette water sampler	13
Multinet with 5 nets	10
Gravity corer	28
Water pumping	20
Aerosol collection	20
Surface measurements underway thermosalinograph	during the cruise

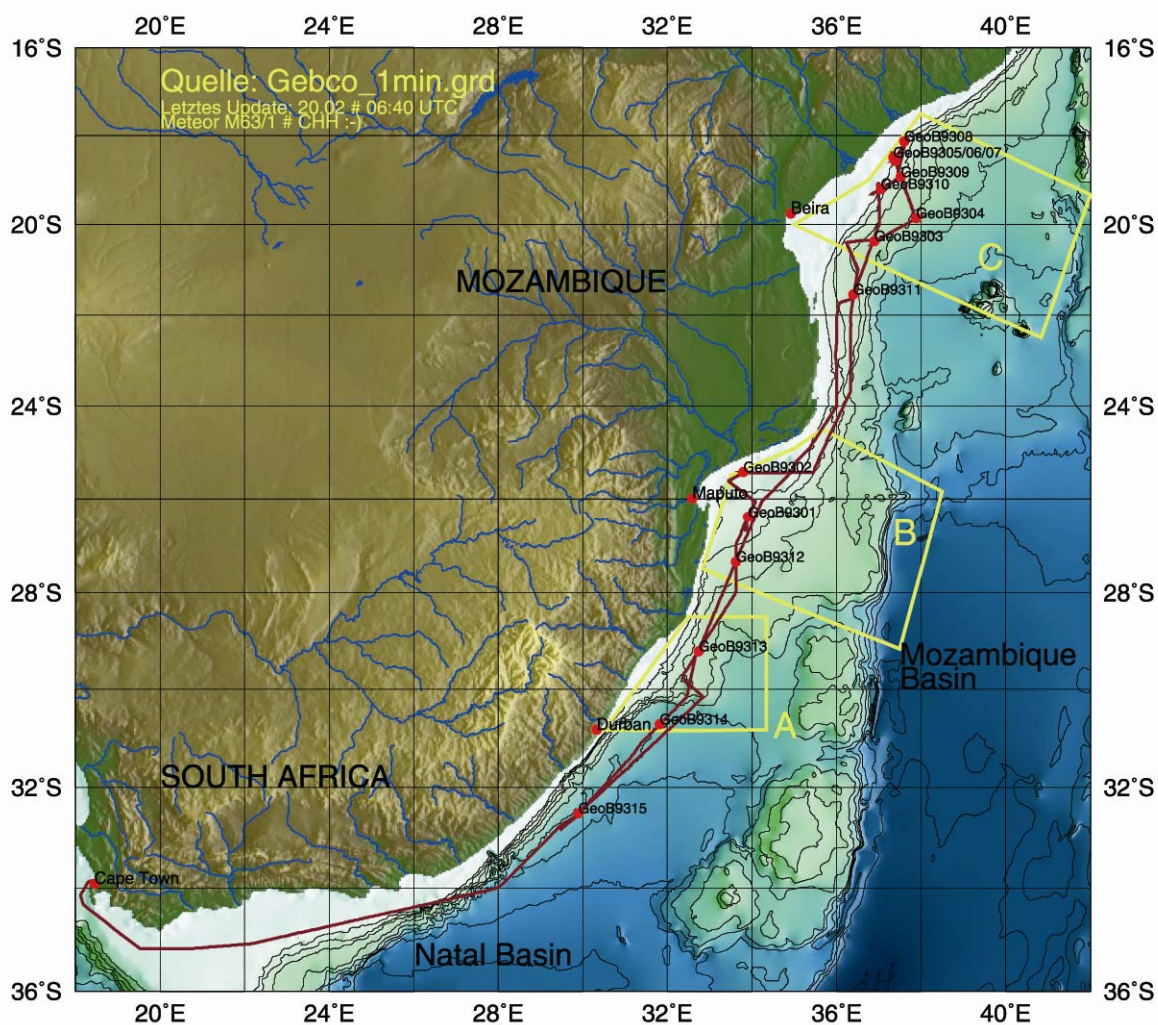


Fig. 1 Track line and working areas of RV METEOR cruise during M63/1.