Meteor-Cruise M 75 / 2

Short Cruise Report

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Dar es Salaam – Dar es Salaam

Febr. 06th _ Febr. 24th, 2008

SHORT CRUISE REPORT
RV METEOR cruise M75/2, Continental margin East Africa

Dates:	February 06 – February 24 - March 01, 2008
Port calls:	Dar es Salaam (Tanzania) – Dar es Salaam (Tanzania) – Durban (South Africa)
Chief scientist:	Dr. Jürgen Pätzold, MARUM, University of Bremen

Cruise M75/2 was carried out to further the geoscience research activities of MARUM, the Center for Marine Environmental Science at Bremen University, as an effort by the DFG Research Center/Cluster of Excellence, "The Ocean in the Earth System". The primary aims of the work are to reconstruct paleoclimatic and paleoceanographic changes in the tropical western Indian Ocean and to investigate the continental climate history of East Africa. In addition, the effects of climatic and oceanographic changes on the material and sediment transport on the continental slope will be investigated. The planned operations to achieve these goals included geophysical measurement and geologic sampling of the marine realm offshore from Tanzania and Kenya. Hydroacoustic measurements with PARASOUND and SIMRAD echo sounders in conjunction with seismic profiles provided a sea-floor map with important information for selecting the geologic sampling stations. Water-column profile measurements and samples were taken with the CTD/Rosette, and the sea floor was sampled with the multicorer and gravity corer. Because of logistical problems, two containers with scientific equipment and a compressor container could not be sent to Dar es Salaam, Tanzania in time. This resulted in a reduced scientific program that was carried out to a large extent with equipment that remained on board after a previous cruise.

The RV METEOR left Dar es Salaam, Tanzania, at noon on Wednesday, February 7, 2008, beginning the second leg of cruise M75 (Fig. 1). The scientific shipboard party consisted of 29 scientific colleagues, including 21 from the MARUM and Geosciences Department (GeoB) at Bremen University, three scientists from the *Forschungsinstitut Senckenberg am Meer* (FIS) in Wilhelmshaven, three guest scientists from the Institute of Marine Sciences (IMS) of the University of Dar es Salaam, Zanzibar, and two colleagues from the *Deutscher Wetterdienst* (DWD) in Hamburg (Table 1).

We first set a northward course for a study area between the island of Pemba and the mainland. Work at the site began with an initial grid of hydroacoustic measurement profiles in the Pemba Channel. The Pemba Channel is a basin-like structure up to 900 m deep, which is characterized by broad areas of thick, well layered sediment sequences. Active disturbance areas are found on the edge of the basin, with some extremely steep slopes. On Saturday, February 9, 2008, a three-day program of sampling the water column and sea floor was begun in the Pemba Channel. A CTD with water sampler, a multi-corer, and a gravity corer were successfully deployed at all stations.

On Monday, February 11, 2008, the RV METEOR left the Pemba Channel, sailing northward, and started a measurement profile of around 150 nm, extending to a water depth of about 3400 m, east of the island of Pemba. The water column and sea floor were sampled along this transect at three stations, in water depths of around 2800, 3300, and 2300m through Wednesday evening, 13 February, 2008. Northwesterly winds and the strong influence of the East African Coastal Current (or Zanzibar Current) made positioning difficult. The sea floor sampling retrieved carbonate muds rich in foraminifera.

On Thursday, February 14, 2008, the onboard scientific work was interrupted in order to pick up an 1800 kg compressor from the roadstead off Dar es Salaam that had

been flown in by air freight from Germany on short notice as a replacement for the METEOR compressor container. Unfortunately, the supplies that were also flown in for geological sampling could not be taken on board, so we had to improvise during the sampling work.
During the night of 14 to 15 February 2008, the first seismic profile run was begun. Late Friday evening, February 15, 2008, sampling began for two nearshore stations off the mouth of the Rufiji River. This was followed by an additional geological sampling station on the upper continental slope at a water depth of about 1450 m. Here, the strong Zanzibar Current again caused problems with sampling and positioning of the ship. In the early morning hours of Sunday, February 17, 2008, the RV METEOR set off on a 20-hour transit to the southernmost study area of this expedition, off the mouth of the Ruvúma near the border of Mozambique.
The last week of the expedition began on February 18, 2008 with a geophysical survey of the southernmost site at the Mozambique border off the Ruvúma River. The first mapping efforts revealed a large canyon system that very evidently extended into the deep sea. Tectonic processes lead to complex structures on the sea floor. The hydroacoustic profile helped in station selection for subsequent geological sampling.
During the cruise, the intertropical convergence zone (ITCZ) shifted from its position at 16-17°S over Madagascar to our study area at 10°S. At the same time strong rains fell over southern Tanzania. On the morning of February 19, 2008, as we entered the Bay of Ruvúma with the RV METEOR, we encountered a freshwater plume with a large suspension load. There was a very sharp boundary between the fresh and salt water bodies. We immediately carried out sampling of the water column. During the day the runoff from the land mixed with the sea water.
Sampling in the southern study area provided surprising results. Clayey sedimentation is predominant here down to a water depth of around 2500 m. The very soft muds made sampling difficult. At the end of the week we continued our investigations farther to the north off Mafia Island. Here sedimentation on the sea floor at water depths of a few hundred meters is strongly influenced by the input of the Rufiji River with a very sandy and micaceous load.
During the total of 17 days of the scientific part of Cruise M75/2 it was possible to carry out a relatively compact working program with quite successful results in three study areas off Tanzania (Table 2). Achievements included the retrieval of 27 sediment cores at 25 stations for a total of 170 m of core material. Half of this total was retrieved with PVC liner, which we were able to procure on short notice in Dar es Salaam at the beginning of the cruise. The working program of the cruise ended during the night of 23 to 24 February 2008 with a reflection seismic profile off the coast of Dar es Salaam. Seismic profiles with a total length of 525 nm were recorded during the second part of the cruise.
On Sunday morning the RV METEOR arrived at the harbor of Dar es Salaam and lay in the roadstead. Entry to the harbor was delayed until the afternoon, and the scientific participants left the ship. Most of the cruise participants flew home after spending one night in Dar es Salaam, but two small groups visited the Institute of Marine Sciences of Dar es Salaam on Zanzibar. The scientific part of the cruise was concluded on February 24, 2008 in Dar es Salaam, Tanzania (Fig. 1). The marine region off Kenya could not be investigated due to time constraints. The RV METEOR left the harbor of Dar es Salaam in the early evening of February 24, 2008. The crew undertook a five-day long transit, reaching the harbor at Durban, South Africa on the morning of March 1, 2008. The scientific portion of Cruise M75/2 was shortened to 17 days from the 22 days originally planned.

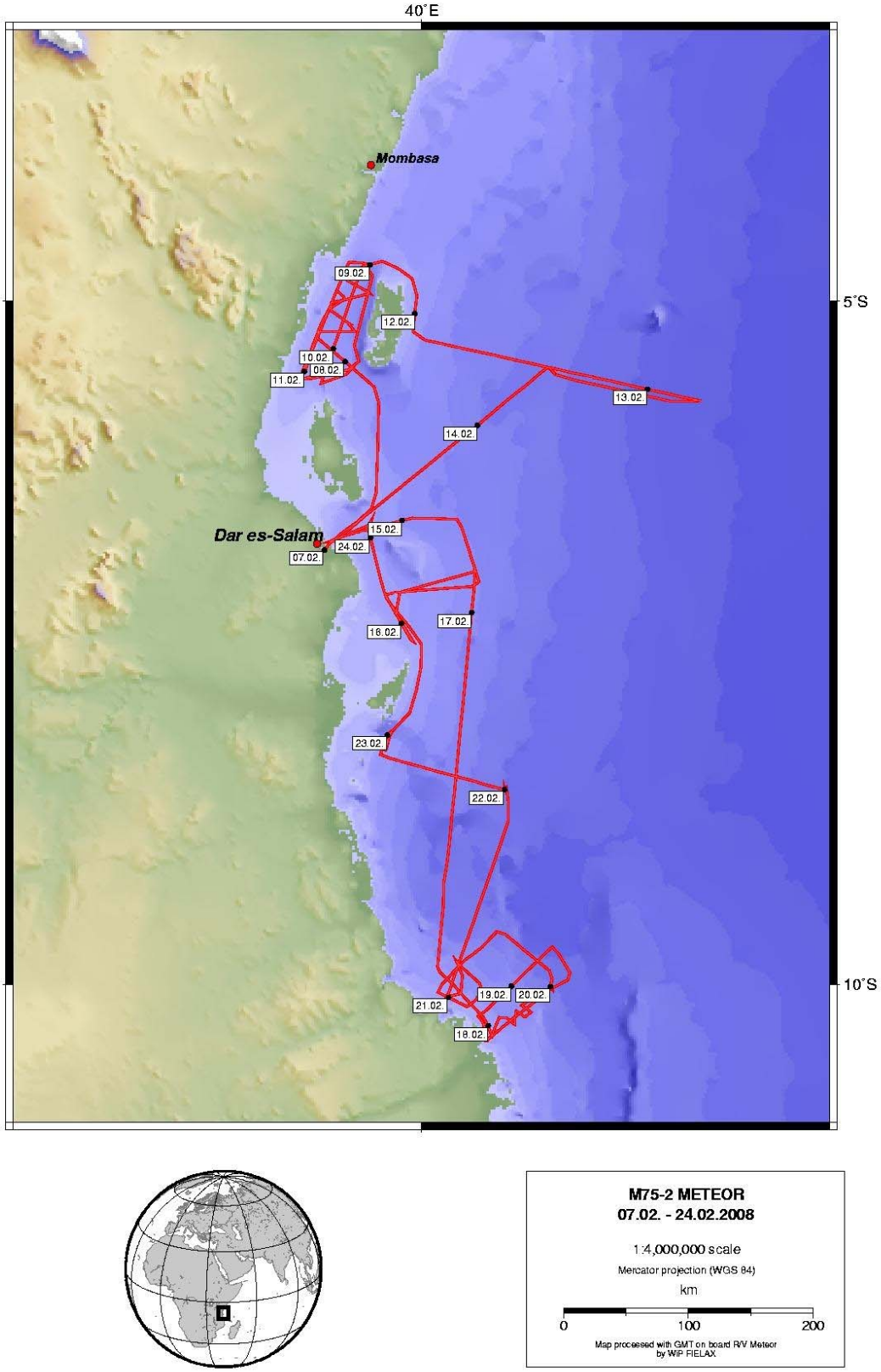

Fig. 1 Track line of RV METEOR during cruise M75/2.

Table 1 Scientific party M75/2

Zentrum für Marine Umweltwissenschaften, University of Bremen, Germany	MARUM	8
Geosciences Department, University of Bremen, Germany	GeoB	13
Forschungsinstitut Senckenberg am Meer, Wilhelmshaven, Germany	FIS	3
Institute of Marine Sciences, University of Dar es Salaam, Tansania	IMS	3
Deutscher Wetterdienst, Hamburg, Germany	DWD	2
Scientific cruise participants M75/2	persons	29

Table 2 Statistics on scientific work M75/2

Equipment	employments/profiles/length
Sound velocity profiler (SVP)	2
ADCP profiles	7
Hydroacoustic surveys: SIMRAD swath sounder and PARASOUND, length (nm)	1276
Hydroacoustic surveys (number of profile groups)	9
Multichannel seismic reflection profiles, length (nm)	525
Multichannel seismic reflection profiles (number)	5
CTD (salinity, temperature, oxygen)	29
Water bottle stations with rosette water sampler	29
Gravity corer	28
Multicorer	35