SHORT CRUISE REPORT

RV METEOR cruise M53/1

Dates: March 30 – April 10 – April 18 – May 3

Port calls: Limassol – Las Palmas – Las Palmas – Mindelo

Chief Scientist: Dr. Helge Meggers, University of Bremen

- Participating Institutions:
  - Fachbereich 5 – Geowissenschaften der Universität Bremen, Germany
  - Alfred Wegener Institut, Bremerhaven, Germany
  - Deutscher Wetterdienst, Hamburg, Germany
  - Institut für Biogeochemie und Meereschemie der Universität Hamburg, Germany
  - Institut für Meereskunde der Universität Kiel, Germany
  - Instituto Canario de Ciencias Marinas in Telde, Gran Canaria, Spain
  - Raumfahrt + Umwelttechnik OHB-System-GmbH Bremen, Germany
  - Universidad de Las Palmas de Gran Canaria, Spain

Summary METEOR - cruise M53/1

During METEOR cruise M53/1, fieldwork of the Research Center Ocean Margins of the University of Bremen started and work was carried out in connection with the following projects:

- ANIMATE ("Atlantic Network of Interdisciplinary Moorings and Time series for Europe")
- DFG-projects
  - "In-situ measurements and sampling of marine aggregates"
  - "Zooplankton structures and particle flux in the Levantine Sea against the background of the changes in the thermohaline circulation"
- DOLAN ("Operational Data Transmission in the Ocean and Lateral Acoustic Network in the Deep-Sea")
- ESTOC ("European Station for Time-Series in the Ocean, Canary Islands")

Due to logistical reasons the cruise M53/1 was subdivided into three subparts (M53/1a, M53/1b and M53/1c), the first part focusing on particle flux studies south of Crete, the second on particle flux studies and marine technology work (wireless acoustic data transfer into the deep sea

and its link to a satellite-supported communication network), and the third concentrated mainly on sedimentological work off Cape Blanc (Mauritania).

The final preparations for cruise M53/1a were carried out on RV METEOR in the harbour of Limassol (Cypres) on the 29th of March. Two scientists of the University of Hamburg (Institute for Biogeochemistry and Marine Chemistry) and the Chief-Scientist of the University of Bremen (Department of Geosciences) came onboard. Guided ship tours were held in the harbour together with the crew of the METEOR for scientists of the Cyprus Geological Survey and for professors and students of the Ship-Building Technical University of Nicosia. The cruise started due to a high volume of ships traffic in the harbour one day earlier than scheduled on the 30th of March in the earlier morning in Limassol, Cypres. METEOR reached the first working station south of Crete on the 1st of April in the early morning.

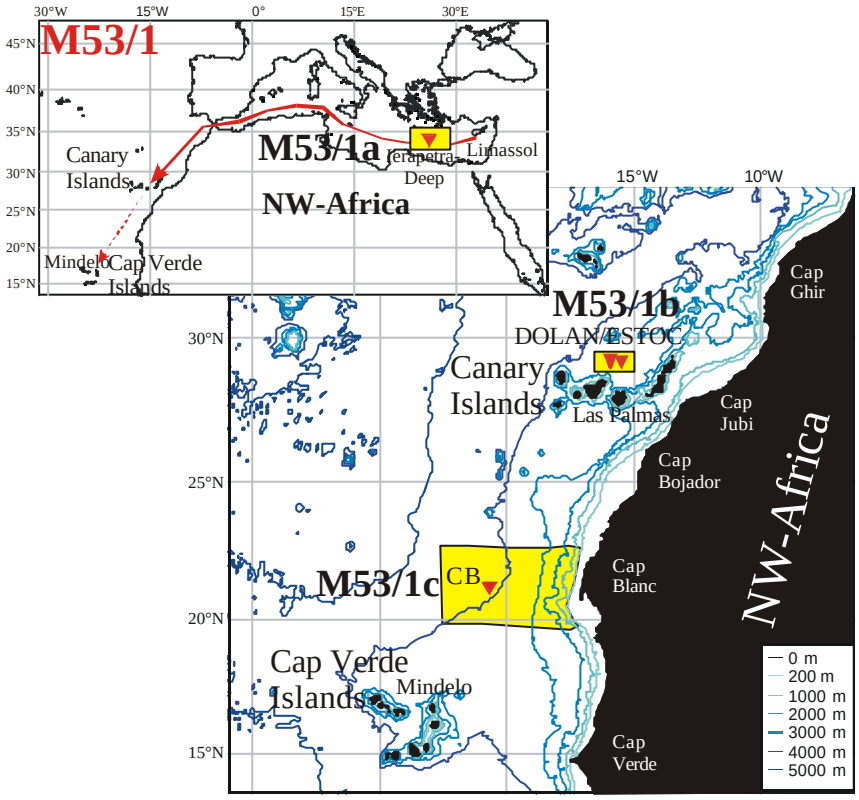

Fig. 1: Working areas during METEOR cruise M53/1 (M53/1a: south of Crete in the Ierapetra-Deep; M53/1b: mainly north of the Canary Islands at ESTOC and DOLAN-moorings; M53/1c: mainly off Cape Blanc and Timirist (Mauritania)).

The scientific programme started with a first CTD-survey, which was deployed to 3500 m water-depth on the mooring position MID-2 (Mediterranean Ierapetra Depth) in order to obtain the spring hydrographic characteristic of the station. With the first daylight the mooring was recovered (Fig 1). After some surface water sampling the scientific work during M53/1a was terminated and

METEOR took course to the Canary Islands calling Las Palmas harbour in the morning of the 10th of April, finishing the first subpart of M53/1.

The vessel preparation including intensive container packing work for cruise M53/1b started on the same day. The scientists of the University of Hamburg disembarked and 18 scientists from the University of Bremen, the Instituto Canario de Ciencias Marinas in Telde (Gran Canaria), the University of Las Palmas, the Alfred-Wegener-Institute in Bremerhaven and the Institute for Oceanography of the University of Kiel embarked. The scientist team was accompanied by five journalists (a TV-journalist including cameraman, two newspaper journalists and a journalist of an on-line scientific medium), who documented the scientific work during M53/1b in the framework of the Year of Geosciences 2002 in Germany. In the evening of the 11th of April a reception was held for invited persons from the scientific and politic community (including local journalists) of the Canary Islands onboard. The scientists and crewmembers used the opportunity to present their scientific work to the public.

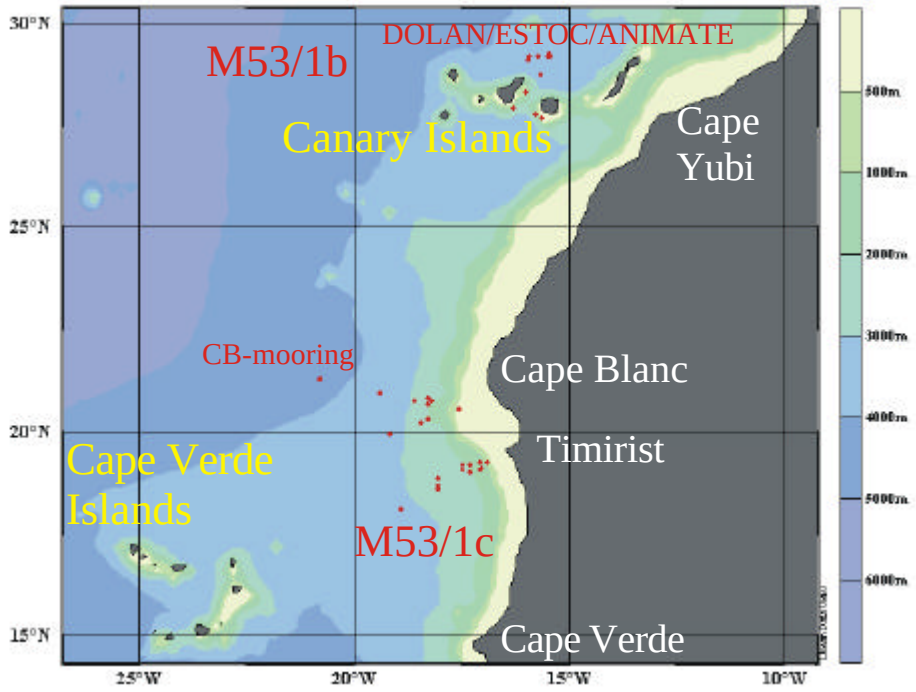

Fig. 2 Stations during METEOR cruise M53/1 b and c.

RV METEOR left Las Palmas on the 12th of April in the early morning, taking course to the ESTOC-mooring position (Fig. 2). Underway scientific work started with the deployment of XBT`s on the way every 10 nautical minutes beginning at 28°10`N. Station work started in the late afternoon with the monthly work (CTD/Rosette casts, deployment of a NOAA-drifter) for April

2002 at the ESTOC time-series station, located 60 nm north of Gran Canaria. The main purpose of this station is to build a long-term oceanographic data base to be able to discern seasonal from long-term variability of hydrographic and biogeochemical parameters. ESTOC is also used as an important reference station for ANIMATE, a EU-project for thermocline measurements of CO_2- and nutrients at various key-sites in the NE-Atlantic. On the 13th of April the sediment trap mooring CI14 was recovered successfully. This mooring contains three sediment traps (20 cup collector), the upper one at least 500 m above the sea floor, the lower one at least 500 m below surface. Sampling periods are two weeks. The particulate material collected will be analysed to determine total flux, particulate flux, particulate organic carbon, particulate nitrogen, biogenic opal, carbonate and carbon isotopes of organic matter, and lithogenic material. The trapped material will further be investigated for species composition of the planktonic organisms (pteropods, foraminifera, radiolaria, coccolithophorids, and diatoms), together with the chemical and isotopic compositions of these organisms and the composition of the organic and terrigenous material.

In the following days testing of deep-sea technology in the framework of DOLAN and use of the CTD/Rosette-system alternate with each other. The deep-sea technology testing included various tests of satellite telemetry via OrbComm– satellite, the programming and interface tests between the under water and satellite communication and tests of the under water communication via the top buoy as a master unit. After this successful testing programme the SBU-mooring (additionally implemented in the mooring chain a nutrient analyser and a fluorometer) was deployed in the morning of the 12th of April 30 nm west of ESTOC. In the afternoon of the same day a second mooring with a Multi Sensor Device (MSD) including a sediment trap, a particle camera and a CTD at 3000 m water depth was deployed. After testing the entire data path with SBU and MSD the operational commission of the platforms with measuring and transmission started. In the morning of the 16th of April a combined CI15/ANIMATE mooring (including 2 sediment traps, current meters and various Microcat-CTD`s) was deployed near ESTOC. After finishing work north of the Canary Islands METEOR took course southward in the lee of the Canary Islands to get weather condition favourable for an intensive testing programme of the new “Remotely Operating Vehicle” (ROV). This device can reach depths up to 1000 m and with aid of this new and innovative technology high-resolution datasets for the quantitative balancing of particle fluxes through the water column will be obtained. During M53/1b balance testing and pilot testing were carried out intensively. The second subpart of M53/1 ended in the morning of the 18th of April in Las Palmas.

Since one main focus of the third subpart of M53/1 was the sampling of sediments in the research area off Cap Blanc, the devices for the geology sampling were prepared during port time. Next to this preparation the scientific team and the crew of the METEOR take some time to gave guided tours through the ship and its labs for two school classes of the German School in Las Palmas to give an overview of the scientific work in the area.

Part M53/1c started in the early morning of the 20th of April. A small group of the scientific group was exchanged in Las Palmas and two observers, one from Mauritania and another from Morocco were welcomed onboard of METEOR. METEOR took course southward between the Canary Islands Gran Canaria and Fuerteventura/Lanzarote to a mooring position 200 nm off Cap Blanc (CB). Underway scientific work started with the deployment of XBT`s on the way in a nautical distance of 1° beginning at 27°N.

The structures of the near-surface sediments, which reflect the effects of paleo-oceanographic and paleoclimatic variability in the sedimentation processes, were continuously recorded at high resolution during the entire METEOR Cruise 53/1c with the PARASOUND echo sounder. In addition, a survey of the general morphologic setting was achieved by the swath bathymetry system HYDROSWEEP. Both acoustic board systems were used on site as a proven tool to find suitable locations of sampling sites. Suitable locations were sampled with conventional wire-line coring techniques (multicorer and gravity corer) and subsequently sampled and described. In the early morning of the 22nd of April the mooring CB12 was exchanged successfully to CB13. Afterwards METEOR took course eastward towards the Mauritanian coast.

On a first profile west off Cap Blanc sediments were sampled at 6 stations with multicorer and gravity corer in water depths between 3400 and 70 m (Fig. 2). The sedimentological work was accompanied by deployments of the ROV and the particle camera system for documentation, measurements, sampling and subsequently analysis of the sinking and suspended material against the background of the not sufficiently understood processes of the formation of aggregates and their vertical and lateral transport processes in the ocean. In addition to this on several stations the CTD/Rosette –system was used.

The work was continued on a second transect off Cap Blanc on the 26th of April with 4 stations from the eutrophic area directly off Cap Blanc to the mesotrophic domain offshore in water-depths from 70 m to 3100 m. This profile was sampled with multicorer and gravity corer as well as with the particle camera system. A third NE-SW profile with 3 stations off Timirist followed to complete the scientific work, which was done during METEOR leg M53/1. This profile started on

the 28th of April and samples/photographs were taken between 1300 and 3100 m water depth with multicorer, gravity corer, CTD/Rosette and particle camera (Fig. 2).

The objective of sampling transects perpendicular to the coast was to obtain sediment material to reconstruct the history of coastal upwelling and Saharan dust supply during the last glacial/interglacial cycles and to reconstruct the influence of filaments on the particle flux. Initial results indicate that the 5 to 17 m long cores were collected with little disturbance of the recovered material.

During the whole cruise M53/1b and c surface waters were sampled on the way and at various stations using the shipboard membrane pumping system for chlorophyll and CO_2 measurements.

After completion of the work on this last profile in the afternoon of the 1st of May, METEOR continued to Mindelo, Cape Verde Islands, arriving in the early morning of the 3rd of May, ending the first leg of cruise 53 (see Tab. 1 for sampling statistics of M53/1).

Tab. 1 Statistics of scientific work during METEOR cruise M53/1:

CTD-casts	2 stations
Water sampling with CTD/rosette	15 stations
Mooring work	4 stations
ROV	5 stations
Particle camera	17 stations
Gravity corer	11 stations
Multicorer	10 stations
Marine technology testing	3 stations
Hydrosweep and Parasound Profiles	