

# FS METEOR Expedition M140 “FORAMFLUX”



Weekly Report 1  
11 – 13. 8.2017

The expedition M140 on the research vessel METEOR began by leaving the port of Mindelo on 11.8. at 9 am. Our objective is to reveal the secrets of the life of foraminifera in the ocean plankton, to study the production and transport of particles in the ocean and to determine the flux of Sahara dust over the Atlantic. The science crew includes researchers from the MARUM – Center for marine environmental sciences at the University of Bremen, together with colleagues from the universities in Angers, Birmingham, Geneva, Oregon State University, Tokyo and Tübingen, the German research institutes AWI and GEOMAR and the NIOZ – Royal Netherlands Institute of Sea Research. All containers and instruments have safely arrived in Mindelo before the start of our expedition, so that we could prepare the deck for the recovery of moorings and set up all instruments and labs already on the 10.8.

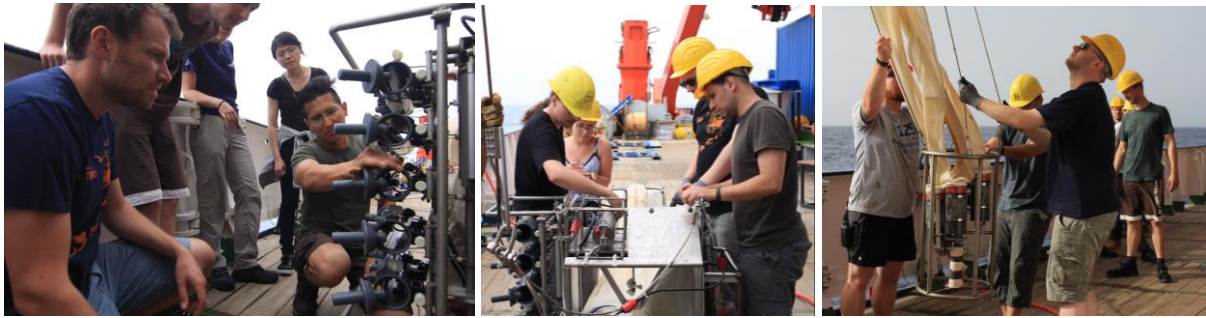
The expedition combines the research goals of Working Group 138 „Planktonic foraminifera and ocean changes“ of the international organisation SCOR (Scientific Committee on Oceanic Research) with long-term monitoring and particle research program of the MARUM in the Cape Blanc area, and the NIOZ project DUSTTRAFFIC.

Planktonic foraminifera are single-celled, amoeba-like organisms, who build intricate and ornate shells made of calcite. They inhabit the upper layer of the ocean, but their shells sink after their death in large quantities to the seafloor, where they form a substantial portion of the deep-sea sediment. Shells of foraminifera preserved in those sediments as fossils serve as an important archive of climate change. To unlock the information on past climate that is contained in chemical signatures in the calcite of the fossil shells, we need to understand the lifestyle of individual species. This is because each species has a distinct habitat in the ocean and grows during different seasons. To do so, we will combine the deployment of sediment traps with sampling of living plankton and physiological experiments. In this way, we can determine not only the spatial and temporal change in the growth of each species but also study the timing of their reproduction, the presence and activity of their symbionts and the extent of their genetic diversity.

Together with mineral dust, biogenic minerals such as the shells of planktonic foraminifera act as a ballast for sinking particles in the ocean and in this way mediate transfer of organic carbon from the surface to the abyss. To study the role of particle ballasting for oceanic carbon cycle, we will investigate the fluxes of mineral dust and particulate matter in the ocean. To this end, we will combine highly resolved time series of particle flux from sediment traps with data on dry deposition of dust from dust-collecting buoys and air filters installed on the ship. Sinking particle flux will be characterised by underwater cameras and drifting particles traps will be used to collect pristine aggregates in the surface ocean.



*Panorama of the port of Mindelo before the departure of FS METEOR on 10.8.2017.*



*Left: preparing the plankton net with water collecting bottles. Middle and right: the first deployment of the plankton net on 11.8.2017.*

During the first days of the expedition, the scientific program includes plankton sampling along a transit from Mindelo to the first mooring station. Using our newly configured multi-purpose plankton net, we collect each day a series of vertically resolved net hauls until 700 m depth, whilst continuously recording profiles of physical parameters in the water column and collecting water samples for nanoplankton and chemical analyses. The net hauls are used on the deck to separate all foraminifera and determine the particle load in the water column. The collected foraminifera are used to measure the photosynthetic activity of their symbiont algae using two different instruments: the PAM spectrometer from MARUM and the FRRF fluorometer from Tokyo (which we were lucky to safely receive on deck two hours before leaving the port).



*The symbiont-bearing planktonic foraminifera *Globorotalia menardii* is unusually abundant in our plankton hauls and has so far proven to be most happy to submit itself to analyses of symbiont activity, thus helping to raise the spirit in our symbiont lab. The pictured specimen is about 0.5 mm across. It sports a thick keel on the margin of the shell and the yellow-green coloration of its cytoplasm reveals the presence of algal symbionts.*

A betting contest on the size of the daily catch helps to overcome the burden of routine sorting and separation of the foraminifera from the plankton. The first station yielded 2799 foraminifera, the second provided over 3000! This is a nice catch for the local tropical waters with well-developed thin mixed layer (30 m) and a deep chlorophyll maximum at 65 m. Fair weather and calm sea facilitate a smooth operation of all our microscope work, chemical analyses, and various measurements

Our expedition now heads towards the middle of the central Atlantic, further south-west off the Cabo Verde archipelago. High dust load in the atmosphere on Saturday has filled the filters of our dust collectors and provided for a sunset with a spectacular display of colours, an ideal setting for a lovely icebreaker party on deck. From Monday onwards, we have to count with the first tropical showers.

All participants of the expedition are in high spirit, enjoy the splendid food and the most pleasant and cooperative atmosphere on board and send their greeting to all left on dry land.

For all participants of M140

Michal Kucera, 13.8.2017