

# RV METEOR Expedition M140 “FORAMFLUX”



Weekly report 4  
28.8. – 3.9.2017

The working area of the second leg and with that the whole fourth week was Cape Blanc off Mauritania. There, MARUM maintains a series of particle traps since for nearly 30 years whose samples are by now an unparalleled archive for particle fluxes in the water column and their seasonal and interannual variability in an important coastal upwelling area. Moorings are being redeployed on two sites since 1988 and 2003, respectively, in order to investigate the particle fluxes from the surface ocean to the sea floor. Since 10 years these investigations are accompanied by process studies on the biological pump. The area off Cape Blanc is part of an eastern boundary upwelling ecosystem where cold nutrient rich deep water comes to the surface resulting in high productivity throughout the whole food chain. These, by their high fish yield also economically interesting areas make up less than 1% of the ocean's surface area, yet generate around 40% of the annual fish catch. Furthermore these continental margins are responsible for around 40% of the marine carbon storage and thus for the global carbon cycle. For the objectives in this area a team of five scientists and technicians, working mainly on particle fluxes and process studies, were brought on board during the stopover in Mindelo at the 26<sup>th</sup> of August.

The first task in the working area was the recovery of dust buoy “Carmen”. The by now well-rehearsed team from NIOZ, now supported by the sediment trap team from MARUM, picks up the buoy in no time without any problems. Directly afterwards we recovered the sediment trap mooring “CB-28” around 200 nm off the coast. The number in the shorthand tells that it was the 28<sup>th</sup> deployment of a mooring on that site. Since their deployment with RV Poseidon in January 2017 the two particle traps mounted on the mooring have continuously recorded particle fluxes at 1200 m and 3600 m depth. In addition to these tried and tested instruments a relatively newly developed system, the BioOptical Platform (BOP) had been deployed. Twice daily this device performed video recordings of larger sinking particles („marine snow“) who sank through a cylinder on the platform. The recordings will later be analysed for the in-situ, meaning on location in the water column, sinking velocity of particles. These values play an important role in the global carbon cycle and have until mostly been calculated empirically. After having travelled through the cylinder the particles are captured in a gel, which allows the later analysis of size, form and constituents of the marine snow.



*The short trip with the rescue boat gave us completely new views of the METEOR.*



The planktic foraminifera *Globorotalia menardii* in different sizes. Foraminifera grow by adding new chambers to their tests. In this picture, all individuals are orientated with the last and newest chamber to the top.

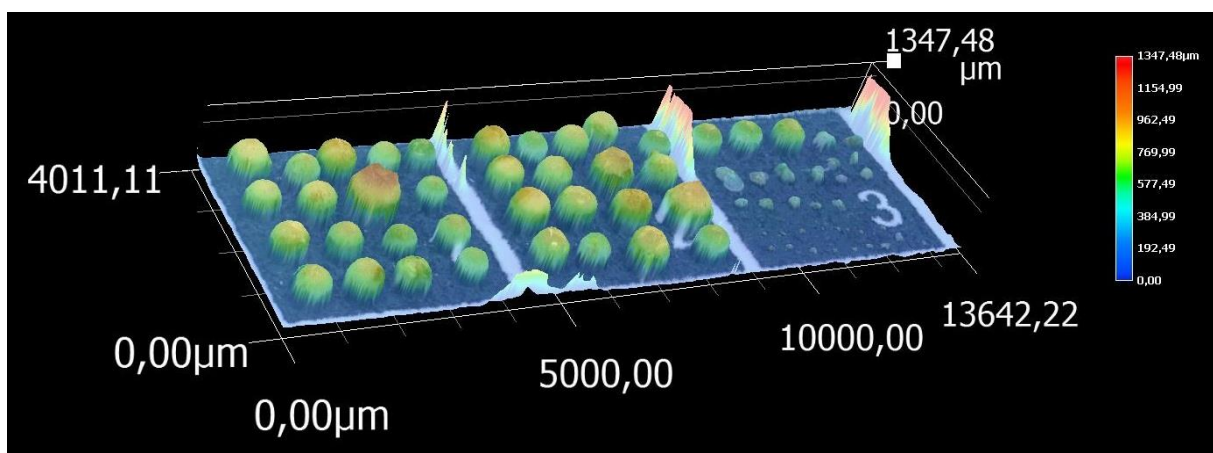
In the afternoon we deployed two drifting traps and did a full multi-plankton-sampler station with three casts. During the night to Tuesday we deployed the particle camera, which also serves to determine particle fluxes through the water column by measuring sinking velocities. On the next day we deployed both „Carmen“ as well as „CB-29“. Both deployments were conducted smoothly and quickly leaving us with enough time to record more particle camera profiles, recover the two drifting traps and do one multi-plankton-sampler cast. After these stations we sailed towards the second mooring position closer to the Mauritanian coast.

The mooring at station „CBI“ has been maintained since 2003 and just before lunch on Wednesday we could recover „CBI-15“ successfully. Again everything went smoothly and we could deploy another drifting trap and record further camera profiles.

Thursday was almost fully at the disposal of the particle camera team. At four locations in ten miles distance to the mooring position of „CBI“ the team recorded camera profiles in order to determine the variability of the particle flux in the vicinity of the mooring. The drifting trap deployed on Wednesday was recovered and another drifting trap deploy directly afterwards.

As last main objective of the research program, the mooring „CBI-16“ was deployed on Friday morning. Afterwards we followed the last drifting trap and recorded camera profiles until the recovery of the trap. By that the scientific program in the Cape Blanc area was concluded and we began sailing in direction Las Palmas.

While technicians and some scientist had been working on the deck during the mooring program, the by far larger portion of the scientific crew toiled away in the laboratories. In demanding and sadly also repetitive manual work the scientists extracted tens of thousands



An image of a sample slide taken with the konfocal digital microscope. By focussing on different planes and processing of the contrast information of the resulting images one can obtain the height information of the observed objects. On this slide there mainly large individuals of the species *Orbulina universa*. This planktic foraminifera is easily identified due to its characteristic shape, a sphere, and its comparatively large size (often larger than 1 mm).

of planktic foraminifera with brush and needle out of the samples of the first full-day-sampling. Only someone who has tried himself to manipulate an object of 100  $\mu\text{m}$  size under a stereo microscope can truly appreciate how difficult this work is.

New among the brought instrumentation is a digital microscope that allows to take konfocal images of the picked foraminifera. The images will enable us to obtain accurate automated size measurements, which in turn will tell us more about the community structure of these organisms.

There was no station work conducted on Saturday, all scientists were busy until the evening with picking of samples, evaluating data and writing on the report. The mooring team began stowing the containers. The morning without any station work was a perfect opportunity to perform a fire fighting training manoeuvre, which is done regularly by the crew of the METEOR. The scientific crew play, apart from evacuating the cabins and lab spaces in an orderly fashion, no role in this exercise. During the time we had to remain on deck a few scientist had the chance to try out the survival suits, which are available for all members of the crew. The fickle weather conditions, regarding rain, during the last weeks had not allowed for a barbecue on deck. This was now rectified on Saturday evening and we had a wonderful below the open sky.

On Sunday morning finally, we deployed the multi-plankton-sampler for the last time. Altogether it had sampled on 137 casts during the cruise without a single malfunction. To the relief of all participants, the counting of the last sample of the first full-day-sampling was concluded during the afternoon. More than 50 thousand planktic foraminifera have been extracted from the samples, a noteworthy performance.

With this station the scientific program of expedition M140 is concluded and require the remaining time to pack our equipment and stow the containers. All research goals of the expedition have been met, we have been incredibly lucky with the weather and will return home with a fantastic set of samples. Altogether the cruise was an outstanding success. This is the last time we convey greeting from METEOR cruise FORAMFLUX to all friends, colleagues and families on land.

For all participants of M140

Michael Siccha,  
RV Meteor, 3rd<sup>th</sup> of September 2017, 25° 42.2' N 16° 10.5' W



*A few participants try the survival suits (left). Fine work: the tip of a 00-brush next to three planktic foraminifera of about 100  $\mu\text{m}$  size (upper right). A particle of marine snow capture in gel, viewed with a microscope.*