FS Maria S. Merian, Cruise MSM 79

Weekly Report 3

Edinburgh (UK) - Las Palmas (Gran Canaria, ES) -Mindelo (Kap Verde) 30.10.2018 - 09.11.2018 - 06.12.18 RIMERAN - MACPEI MSM73 RIMERAN - MACPEI MSM73 RIMERAN - Mindelo 30.10.2018

During the third week of the research cruise MSM 79 our scientific work focused on the production, entry as well as the dispersal, degradation and deposition of carbon on the ocean floor in the upwelling area off Cape Blanc.

The favorable weather conditions allowed the station work in the research area to begin in the early morning of 12.11.2018, with the recovery of the buoy "Carmen". This buoy contains a dust collector that had collected dust for one year. This dust originates from the Sahara and is blown into the region at irregular intervals. The dust contains many trace elements that positively influence the bioproduction in the area. Furthermore, there is strong evidence that the dust input enhances the vertical transport of biogenic particles produced in the uppermost water column. In addition to the dust collector, the buoy is also equipped with a small meteorological station and a CTD, which recorded the weather and water conditions several hours a day over the last year.



Figure 1: buoy Carmen

Thanks to the excellent cooperation between the crew of the Maria S. Merian's and the scientific and technical teams of the Royal Netherlands Sea Research Institute and MARUM, the 3-tonne buoy was successfully recovered and stood safely secured on deck in the afternoon.



Figure 2: Buoy Carmen is recovered

At night, the station work continued with water and sediment sampling. The next day, the sediment-trap mooring "CB" was successfully recovered. The sediment traps at this mooring collect particles from the water column which sediment to the seabed since 1988. This provides important information about how particle flow has changed as a function of environmental and oceanographic changes. The mooring contains three sediment traps at 3635 m, 1235 m and 1135 m water depth. They collected particles over the last year at the same time intervals as the dust buoy "Carmen". It quickly turned out that both the dust collector and sediment traps worked perfectly. This is the best possible starting point for investigating the relationship between Sahara dust input and bioproduction as well as the vertical flux of organic and inorganic material in the water column.

Thanks to the very good weather conditions, both the dust buoy and sediment traps could be deployed already the following day. After they were cleaned and maintained they were returned to the Atlantic Ocean to collect Sahara dust and particles in the water column for another year.

In the second part of the week our research focused on microbial formation and degradation of particulate organic matter (POM) under different redox conditions. Furthermore, we investigated the habitat and growth of the microorganism community, as well as the lateral/vertical transport of POM. Additionally, molecular alteration of POM and lipid biomarkers in the water column will be investigated.

The water column before Cape Blanc is characterized by a permanently present oxygen minimum zone. Furthermore, there are nepheloid layers - water layers, which have increased particle concentrations. Recent studies show that in these layers horizontal transport can take place from the shelf edge to the deep sea. It is however unknown, how far this particle transport exceeds into the open ocean and how long, and which particles remain "trapped" in these layers.



Figure 3: Mooring CB safely recovered

First, the exact location and thickness of the oxygen minimum zone and nepheloid layers in the water column was determined using a series of CTD profiles along a transect running from the coast to the open ocean. Thereafter, the nepheloid layers and water layers with different oxygen concentrations were specifically sampled using rosette and insitu pumps. Immediately after collecting the water, incubation experiments were started to investigate microbial growth under different redox conditions.

At the end of the third week, a second mooring (CBi) with sediment traps was successfully recovered. This mooring has been collecting the vertical export flux of particles for 16 years. It is positioned where upwelling filaments regularly pass in the uppermost water layers. Also these sediment traps have worked perfectly and could be deployed again after cleaning and maintenance.

Meanwhile, we enjoy the wonderful summer weather with water and air temperatures over 25°C and very little wind. We look forward to the next week, where we aim to take a closer look at one of these upwelling filaments.