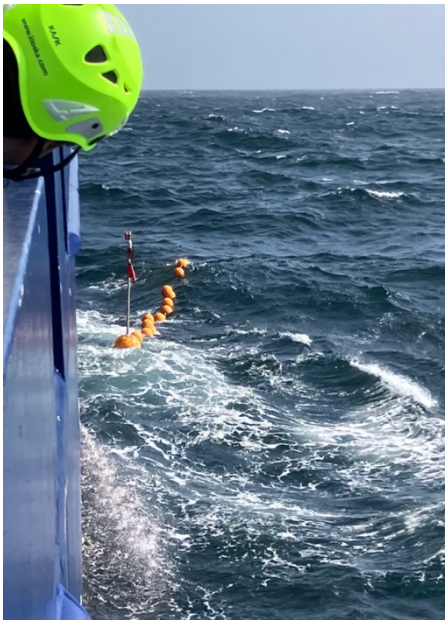
RV. Maria S. Merian
Cruise MSM134 (GPF 23-2_016)
02.02.2025 - 02.03.2025
Las Palmas - Malaga

PAPROTA
Particle Production, Transfer and Transformation
off Cape Blanc

Weekly Report No. 3
17.02.25 - 23.02.25

The cloudless skies that had accompanied us the first two weeks decided to stay along and we experienced beautiful weather with much sunshine. The increasing wind velocities towards the end of the week caused that the amount of Sahara dust in the air increased which provided us beautiful “yellow” sunsets and sunrises. Large waves produced by low pressure areas much further north in the central North Atlantic reached us from a different direction as the local wind blown waves. This caused that all members on the Maria S. Merian were reminded that not previous fixed items can move, even if they are not supposed to do so :-)

Scientific activities in the third week were continued along the shelf break - open ocean transect and the route of the drifting trap. A more or less regular working scheme was introduced starting with the locating of the actual position of the drifting trap in the early hours of the day, to be able to recover and re-deploy the trap in the morning hours. The afternoons were filled by collecting water column samples as well as by collecting ocean floor sediments by Multicoring and Gravity coring whereas the evening and night hours were filled with the characterization of the water column properties by CTD profiling and sampling of water and suspended matter with the Rosette and In-situ pump systems. The schedule was such that sediments were sampled at those stations of which water column characterization and sampling had been executed the night before.



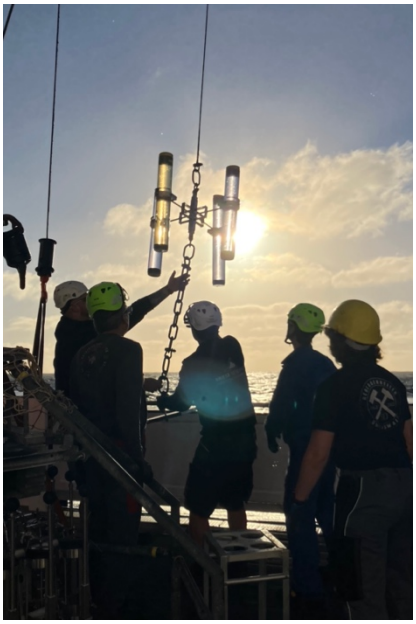


Figure 1. Drifting trap is being recovered (photo’s K. Zonneveld)

The drifting trap started its journey at the rim of an active upwelling cell. Quickly it was trapped in the upwelled waters that move offshore in form of large filaments. This filament can be traced by satellites in the form of temperatures being lower than surrounding waters and high chlorophyll-a concentrations. During the last week it could be traced as far offshore as about 400 km from the shelf break. Our trap did not make it that far but followed the meandering filament with a speed of about 6 nm per day. First results showed that in the first days of collecting, when the trap was positioned at the rim of the active upwelling cell, export production was not that high. Only a few plankton species were able to cope with the vertical moving water masses at this location. Vertical movement of upper water masses can cause that small sized phytoplankton cannot remain at a stable position in the sunlit most upper part of the ocean but is moved in and out of this so called photic zone. This hampers their production and only a few species are specialized to grow in these extreme circumstances.

In the course of the week the offshore floating upwelled water masses at the ocean surface stabilized but just below the photic zone traces of upward moving deeper waters could be detected by the CTD sensor that was connected to the drifting trap. This indicated that the surface waters were still spiced by high amounts of nutrients but that the upwelled water did not reach the surface anymore. The plankton reacted on this with an outburst of production with more and more species joining the association in the course of the week when the trap drifted more and more offshore whereas the “specialist” observed in the first days of the survey disappeared. Apart from analyzing the plankton association composition directly on board, the collected samples were stored to allow analyses on the molecular composition of the organic material produced by the plankton back at our home institutes. This to be able to determine the degradability of the organic matter flux as well as allowing calculation of the amount of carbon that is exported out of the photic zone.

The route of the filament waters more or less parallel to our transect allowed us to follow the plankton export production succession for 12 days at a row. Such a long survey has so far never been executed before and we are extremely happy that we could collect this world-wide unique drifting trap series.

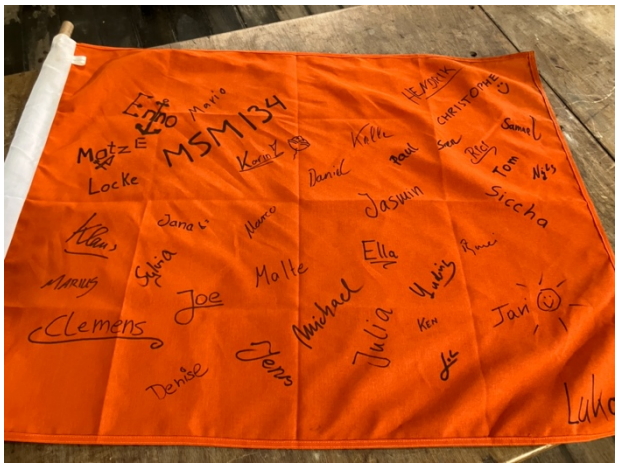


Figure 2. Sediment trap is being deployed. Top flag of the mooring (photo’s K. Zonneveld)

The sampling along the shelf break - open ocean transect provided us with large amounts of high quality water, suspended matter and sediment samples. The characterization of the water column by CTD enabled us to localize the position and extend of several nepheloid layers in subsurface, intermediate and deep waters. Surprisingly, our intense CTD profiling showed that the position of these layers in the water column were not that constant as previously expected. Nevertheless our intense profiling enabled us to determine the exact position of these layers and sampling with Rosette and In-situ pump systems enabled us to collect both their Particulate Organic Matter as well as the Dissolved Organic Matter fractions.
Apart from a phytoplankton production gradient in the surface waters and the presence of nepheloid layers in the water column, a strong oxygen gradient is present in the bottom waters and upper sediments below the transect. Where extreme low oxygen conditions prevail at the most onshore part of the transect, bottom waters and surface sediments show high oxygen concentrations at the most offshore part. The microbial association composition that is degrading organic material reaching the ocean floor, is very much depending on the ambient oxygen concentration. In turn the microbial association composition strongly influences which organic material is being degraded and which not and what material can be permanently stored in sediments and what is being degraded. By means on multi coring and gravity coring at sites characterized by anoxic, suboxic, oxic and well ventilated bottom waters with high oxygen concentrations, insight will be obtained in the degradation of organic at and in the ocean floor sediments.

Our third week of research was finalized by a short transit to a more offshore location where we collected water and sediment samples to execute experiments on the degradability of differential plankton produced sugar molecules during our transit towards Malaga, the endpoint of cruise MSM 134 that we will reach in one week time. We will end at this location our active sampling program with the deployment of a sediment trap mooring that will be the first of a new monitoring program.

Happily, the weather forecast promises us that we can continue to enjoy the summer weather at least until we have passed the Canary Islands. We look forward to pass the Strait of Gibraltar, presumably in the evening hours of the 1th of March. We hope to be able to see some wildlife as we are very curious to the Orca’s, Wales and Delfins of which the region is famous. We thank the crew of the Maria S. Merian for the pleasant cooperation that allowed us to successfully collect super samples and data as well as all the persons at e.g. the MARUM, AWI, University of Oldenburg, the shipping company Briese, the Leitstelle Deutsche Forschungsschiffe and German Science Foundation for all their effort, help and support that made this expedition possible.

on behalf of all cruise participants
met beste groet van de blauwe oceaan

Karin Zonneveld