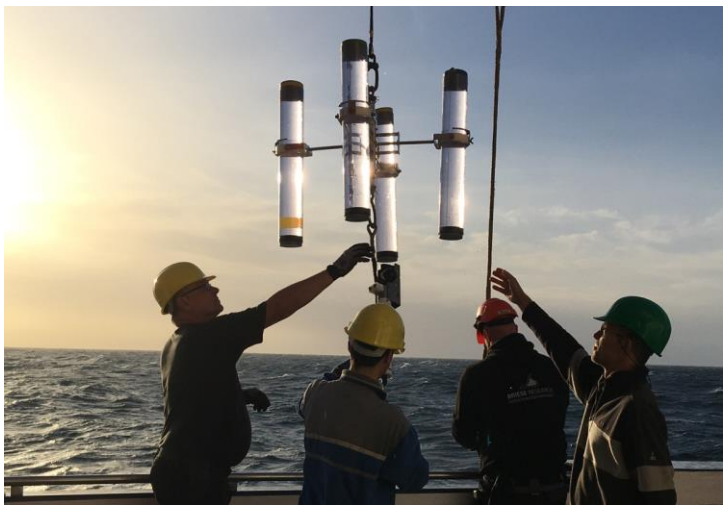
RV MARIA S. MERIAN
Cruise MSM104 (GPF 20-1_69)
18.11.2021 - 15.12.2021
Emden - Las Palmas

SIPA
Sinking particles, their production, transfer and transformation

Weekly Report No. 3
29.11.21 - 05.12.21

This week, winds blowing with increasing strength from the North-East characterized the weather. Although this resulted in more rough sea conditions it also caused the coastal upwelling off Cape Blanc to increase in strength. Satellite images of sea surface temperatures and chlorophyll-a concentrations revealed that after weeks of extreme little upwelling activity, the upwelling cell south of Cape Blanc expanded rapidly over the days, marking the start of the intensive upwelling winter season.

On Monday, we finished station work in international waters by deploying the MARUM sediment trap mooring. Based on satellite data as well as radar located positions of fishery lines, buoys and fishery activity, we selected the location to deploy our drifting trap array with traps at 100 m, 200m and 400m depths.

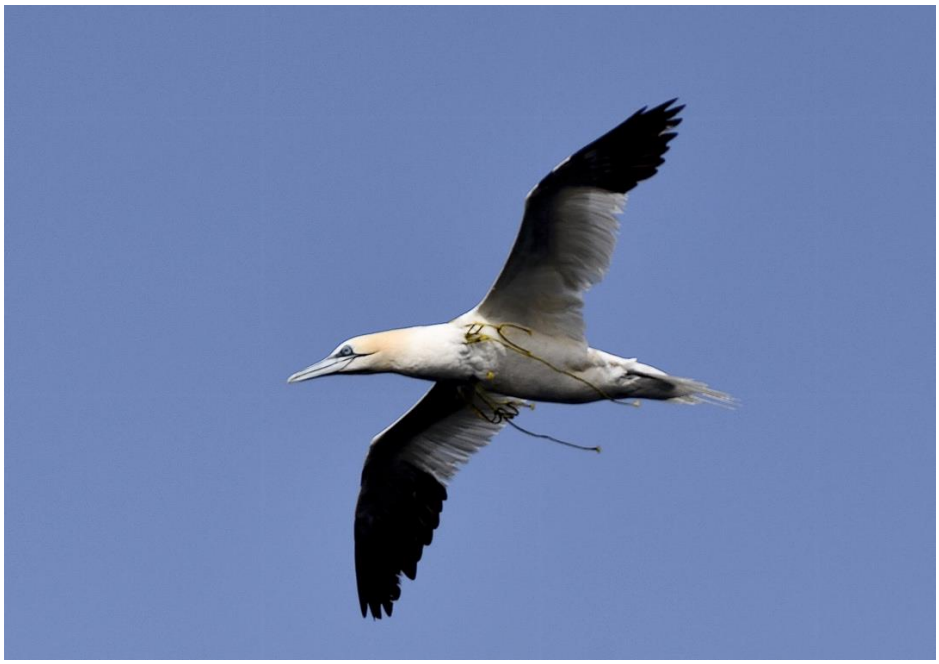


Picture 1. Recovery of a drifting trap (Photo Karin Zonneveld)

We followed the phyto- and zooplankton export production succession during a survey of 7-days duration. After 24 hours of floating with the currents, we recovered the array, replace the traps and deployed the array again for another day of sampling. The first array was released at the rim of a recently formed filament of upwelled water. Over the week, the combination of strong winds and currents operating in opposite directions, resulted that the trap remained almost at the same position. With this we were extremely lucky since due to the strong winds the nearby upwelling cell expanded such that it reached the trap position halfway our survey. We are therefore the first to be able to monitor the particle export production succession during a transition of low upwelling activity conditions towards strong upwelling.

After deploying the first drifting trap, we headed northwards to characterize the ocean floor of the shelf-slope area off Banc d'Arquin (Mauretania) using the ships multibeam system. This region is characterized by numerous underwater distributary channels and canyons that have their origin during ice ages when sea level was lower and more moist conditions characterized in the hinterland of Mauretania. The moist hinterland conditions resulted in a large river system, the so called Tamanrasett river, that formed a big deltaic system Banc d'Arquin and drained through large canyon systems into the ocean around about 170 ka before present. The detailed mapping of the area allowed us to determine the optimal position of sampling stations along a transect that runs from the position of active upwelling near the shelf break towards the open ocean. We were able to position the stations on a small even plane in between two onshore-offshore directed canyon systems.

During the week, the day and nighttime after recovering and deploying the drifting traps array, was used to deploy the CTD/Rosette, in-situ pumps and Multicores at the stations on the onshore-offshore transect. With CTD/Rosette and in-situ pumps we collected both particulate organic matter (POM), as well as dissolved organic matter (DOM). The collected water was used as well for incubation experiments where the relationship between DOM and POM was investigated and to study the composition and degradation of polysaccharides.



Picture 2. Evidence of pollution in the research area. A gannet with fishery line (Photo Götz Ruhland)

To obtain insight into the transport behavior, preservation and final fate of micro plastic particles in the water column and ocean floor sediments respectively, we collected particles from the suspended particle layer just above the sea floor (bottom nepheloid layer) with in-situ pumps and ocean sediments by multicoring. Unfortunately, the Banc d'Arquin is one of the highly with plastic polluted coastal regions and it is therefore likely that sediments at the shelf edge functions as "garbage bin" for micro plastics. To minimize the risk of micro plastic contamination during sampling, we avoid the wearing of plastic derived clothing (e.g. fleece jackets) during sampling, minimizing the air-exposure during harvesting of samples, use stainless steel filters and sieves and always collect blanks. Contamination during coring of the ocean floor is avoided by using stainless stainless-steel multicore tubes that have been constructed at the MARUM and that are unique for Europe. Coring with these tubes appeared extremely successful with an 100% success-rate of recovered sediment.

Next week we will end our activities off Mauretania to head further south towards the Cape Verde Islands. There we will service a dust buoy and sediment trap mooring of the Royal Netherlands Institute of Sea Research. The weather forecast is optimistic with relaxing wind strength and lower wave height. We look forward to the promised summer weather on the blue ocean before return to return to the German winter.

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

Karin Zonneveld
(MARUM – Center for Marine Environmental Sciences at the University of Bremen)