

SO268/1

6th weekly report

24.-26.03.2019



As the deployment of the gravity corer was one of last stations of Leg 1 the collaborating team of marine geochemists from the Alfred Wegener Institute (AWI) in Bremerhaven, the Jacobs University Bremen and GEOMAR Kiel was still busy to process the large amount of samples during our transit while the other groups have already started to pack, clear up, maintain instrumentation and write the cruise report. In total, 5 long sediment cores of up to 5 m were retrieved from the German and Belgian contract areas using a gravity corer. This size of corer can still be handled without using the ships core deployment stage under the given space limitation on deck. The liner inside the corer was usually nicely filled with sediment and was cut into 1 m sections once the gear was secured on deck after the deployment.



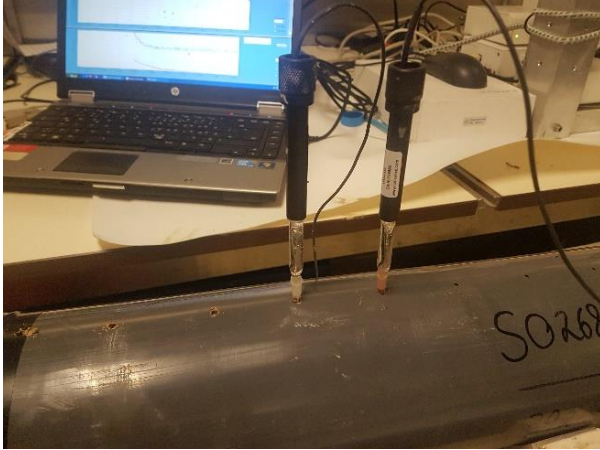
The last successful gravity core of the first leg on deck after the deployment (above).

The plastic liner of the gravity corer is cut into 1 m sections on deck (right).



In order to keep the sediment core at similar conditions which prevail in the deep-sea – also referred to as *in situ* conditions – the 1-m long sections were immediately transferred into the cold room of RV SONNE at 4°C. The core is left to equilibrate for 12 hours in the cold room before the sampling is continued. First, oxygen is measured on the whole-round sections using amperometric electrodes. Oxygen represents a major component for the degradation of organic material in the sediments during the metabolic activity of microorganisms. While oxygen is usually consumed within the upper few millimeters in sediments adjacent to coasts where large amounts of organic material are buried in the sediments, oxygen penetrates several meters into the sediments of the deep-sea due to much lower burial rates of organic material. Therefore, the determination of oxygen concentrations in the deep-sea sediments allows for the geochemical characterization and quantification of biogeochemical processes in the sediments.

Subsequently to the oxygen analysis, the sediment core is cut into two halves – a work half and an archive half – from which the work half is sampled for pore water and solid phase in the cold room. The pore water is sampled with rhizons – where the pore water is filtered through a pore space of 0.1 μm in order to avoid particles or organisms to be extracted from the sediments – and by centrifugation of the sediment.



Oxygen measurements in the gravity core using electrodes onboard (above).

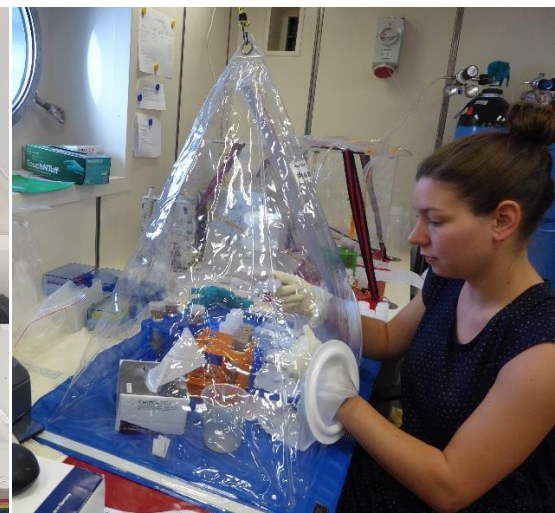
Pore-water extraction with rhizons. Samples for centrifugation have already been taken from these cores – visible where the holes remain in the sediment (right).



Onboard, the concentrations of nutrients such as nitrate, ammonia and phosphate are measured simultaneously in the pore water using a Seal Analytical QuAatro39 segmented flow analyzer. While ammonia and phosphate are released during the degradation of organic matter, nitrate is consumed in oxygen-free sediments. Therefore, the determination of nutrients further allows for the characterization and quantification of biogeochemical processes in the sediments.



QuAatro39 segmented flow analyzer for the analysis of nutrients onboard.



Filtration of centrifuged samples in a glove tent filled with nitrogen to ensure *in situ* conditions during sample treatment.

In addition to the analyses onboard, splits of pore-water and solid-phase samples are stored for the later determination of dissolved/total organic carbon, Sr isotopes, major elements, various metals such as Mn, Co, and Cu in the home laboratories. Dissolved organic carbon for example is a product of organic matter degradation and can help to understand degradation processes in the sediment. These might be impacted during future deep-sea mining activities and should therefore be clearly understood and quantified in the license areas. Metal cycling in the sediments might also be impacted by deep-sea mining and differences such as sediment removal, redeposition, or mixing can be inferred from the comparison of solid-phase and pore-water profiles pre- and post-impact. Therefore, a thorough understanding of the natural conditions and especially the variability is necessary to later identify potential anthropogenic impacts.

On Wednesday 27th March at 08:10 LT, the vessel arrived in Manzanillo at the fiscal pier to await the handover of scientists and gear between both legs. Hopefully the logistics for the discharge of our 3 AUV-containers and unloading of 6 other containers with important supply for the vessel will be handled more efficiently than at the start of this leg.

We look back to a very demanding cruise with many draw backs and technical problems. However, we were able to keep the spirits high and worked together as a great team achieving a comprehensive data set and most of the goals of this baseline study. This would not been possible without the excellent and professional collaboration and support by captain Lutz Mallon and his great crew letting us feel to be at home and welcome for another cruise to come. Thank you very much!

Many greetings on behalf of the scientific party of SO268/1 - all healthy and well,

Peter Linke