FS METEOR
Cruise M200
22.03.2024 – 09.04.2024
Rostock – Rostock

MnION
Elemental coupling of manganese cycling
across redoxclines of the Baltic Sea

1st Weekly Report
23.03. – 25.03.2024

The Meteor arrived in Rostock on March 19 after a long transit at the overseas port in Rostock. The following day, we were able to start preparations for our voyage. First of all, the larger scientific equipment and our container were brought on board before we embarked on March 21. The destination of our journey is the central Baltic Sea. Here, in the deep basins, we want to investigate the manganese cycle and directly related processes in the deep basins. The deep water of the central Baltic Sea is characterized by oxygen-free (anoxic) conditions that lead to the release of hydrogen sulphide from the sediment. A habitat that is deadly for higher organisms, but which is colonized by a large number of microorganisms. Under these conditions manganese in its various oxidation states plays an important role in the vertical transports between anoxic deep water and the oxygen-rich surface layer, which are separated by the so-called halocline.
Our rather international group consists of scientists from the Leibniz Institute for Baltic Sea Research Warnemünde, the Max Planck Institute for Marine Microbiology Bremen, the Woods Hole Oceanographic Institution USA, the Michigan State University USA and the Aarhus University in Denmark. This allows us to comprehensively record all important biogeochemical processes related to the manganese cycle with our planned measurements.

On the morning of March 22, after completing our preparations, we set off for the central Baltic Sea. We reached our first scientific station in the Bornholm Basin on Saturday morning, shortly after midnight. Here, a group of scientists from the Leibniz Institute for Baltic Sea Research and Aarhus University (Denmark) carried out a detailed investigation of methane-converting processes in the surface sediments (down to a depth of 1 m below the seabed). Using coring tubes, also known as Rumohr corer, the researchers took sediment samples from the surface through the sulphate-methane transition zone down to the methanogenic zone. In addition to processing the samples on board, they were also secured for international research partners at the University of Southern Denmark (SDU) and the University of California, Los Angeles (UCLA).
The use of metabolic inhibitors aimed to shed light on the influence of syntrophic microbial consortia on methane production and degradation. The key process rates were directly quantified on board by the addition of radioactive markers. Live samples provided to our

partners at the SDU were used to enrich key organisms in order to elucidate the underlying processes in detail. Sediment samples for collaboration partners at UCLA will be analyzed for grouped isotope ratios of carbon and hydrogen in methane to gain further insight into the complex dynamics of the methane cycle in seafloor sediments.

Obtaining surface sediment samples with the Rumohr corer in the Bornholm Basin (photo: V. Mohrholz)

Further CTD stations were carried out along our route to the Gotland Basin. The data obtained is used to track an inflow of saltwater from the North Sea into the Baltic Sea, which was observed in December 2023. This water spreads northwards along the bottom of the Baltic Sea and transports oxygen to the central areas. This temporarily improves the living conditions for many species. Our first mooring position was reached at midday today and we were able to successfully recover the measuring devices stationed here. After maintenance, we deployed them back in the sea for the next measuring period.

The mood on board is good. We hope that the cool but calm weather will continue so that we can carry out our research program as planned.
Best wishes on behalf of all participants, and special thanks to the DFG, the Research Vessel Control Center and the Briese shipping company for making the expedition possible.

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