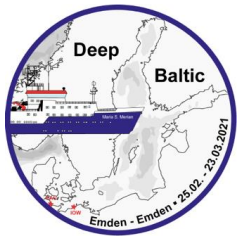
R/V MARIA S. MERIAN
MSM99 (GPF 18-1_097), Emden - Emden
2nd Weekly Report, 01. - 07.03.2021

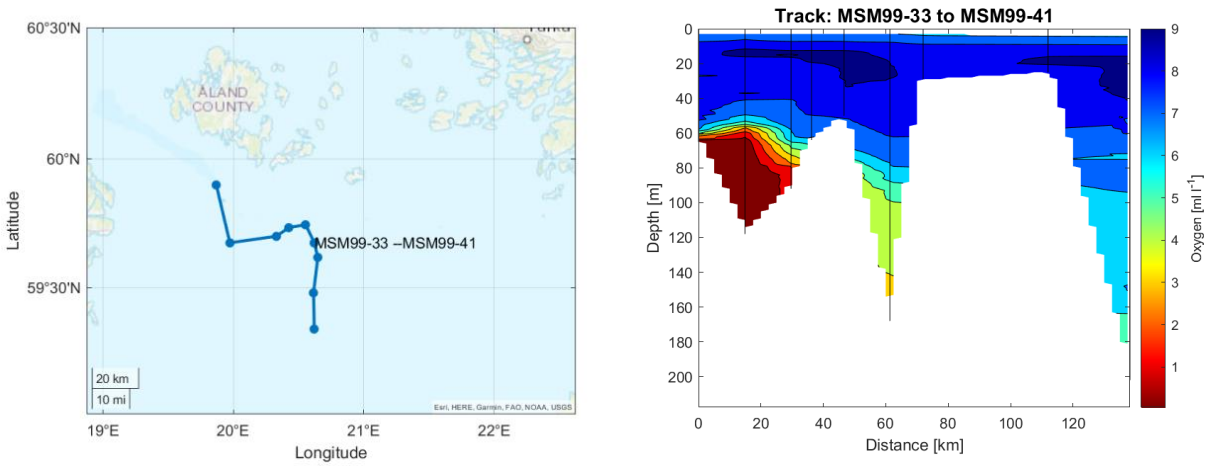


Baltic Deep Water Circulation

The first half of the second week of cruise MSM99 **Deep Baltic** was characterized by hydroacoustic surveys with the multi-beam echo sounder EM712 and the sediment echo sounder PARASOUND in order to determine suitable geological sampling stations in the eastern Gotland Deep and in the northern Central Basin. The hydroacoustic surveys were followed by locating suitable positions for sediment sampling with the multi and gravity corer.

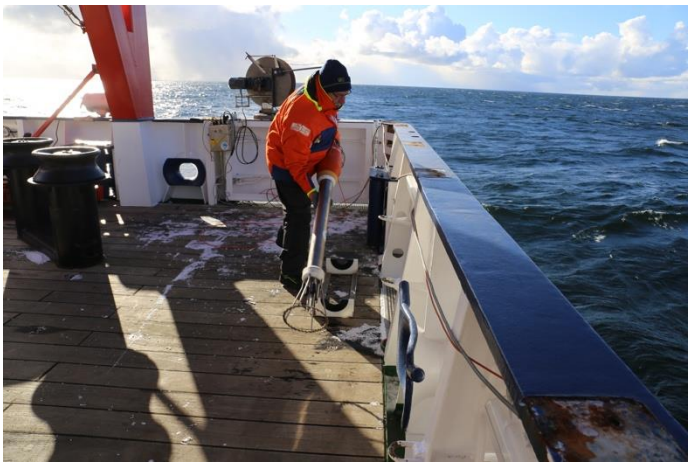
Instead of the common sampling of deep basins, the slope areas and sills between the deep basins were sampled this time. On the one hand, this helps to determine the extent and volume of the deep anoxic water body for the warm intervals during the last about 8000 years by the different water depths of the coring stations. On the other hand, hiatuses in these sediment cores will give information in which depths the oxygenated deeper waters, which origin in northernmost basins of the Baltic, has eroded older sediment layers. This process was probably heavily intensified during the cold periods of the Holocene and has eroded the anoxic sediment layers that have been deposited during the warmer phases before. This erosional effect could be determined especially in the northern parts of the central basins between ca. 80 and 180 m water depth. This corroborates our hypothesis that oxygen-rich waters must have entered the central basins overflowing the sill south of the Åland Deep during cold phases. In warm climate phases, such as the recent warm phase, these well-oxygenated water masses filling the Bothnian Sea and Bothnian Bay in water depths between 80 to 200m only extend to the northern border of the sill while in the southern part the upper limit of the oxygen-free zone reached into water depth up to 60-80m.

To investigate the modern oxygen concentrations and temperature/salinity stratification, CTD casts were carried out in the central basins and a N-S transect with 20 CTD stations up north to the ice edge in the Bothnian Sea has been started on Thursday, March 4th, and continued until today, Sunday March 7th. Beforehand, the functions of the CTD has been used to calibrate the instrument and to verify the data quality.



CTD profile south of the Åland Islands across the sill separating the central basins from the Åland Deep. The figure to the right shows the distribution of the salt-rich, but oxygen-free, water mass south of the sill reaching up to ca. 70m, while on the northern side of the sill, the well-oxygenated water masses low in salt are found down to the sea floor. (Figure Thomas Neumann).

In between CTD station transect crossing the Åland Deep into the Bothnian Sea another work area west of the Åland Islands has been mapped. At four geological stations the sediments have been sampled and with additional CTD and microstructure probe casts the water column properties were investigated and sampled at high vertical resolution.



The first deployment of the microstructure probe in the Åland Deep, back in winterly conditions. (Foto B. Hentzsch).

Followed by a stormy winter night and freezing spray clouds which left R/V MARIA S. MERIAN covered in ice, we now are approaching the narrow strait Kvarken between the Swedish town of Umeå and the Finnish town of Vasaa on Sunday afternoon, March 7th. We just crossed the first thin ice fields and we are excited for next week during which we will sample the sea ice and the water column beneath in the Bothnian Bay. All equipment for sea ice sampling is prepared and ready for use. With the help of the shipboard crew, we will determine the best and reachable sampling positions by using sea ice charts from the Finnish Meteorological and Hydrological Institute.

We all are feeling good and sending cold greetings from R/V MARIA S. MERIAN just entering the Bothnian Bay.

Ralph Schneider 07. March 2021

(Christian-Albrechts-University Kiel)