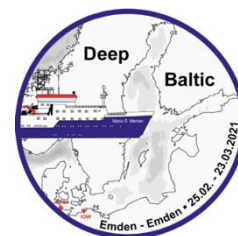




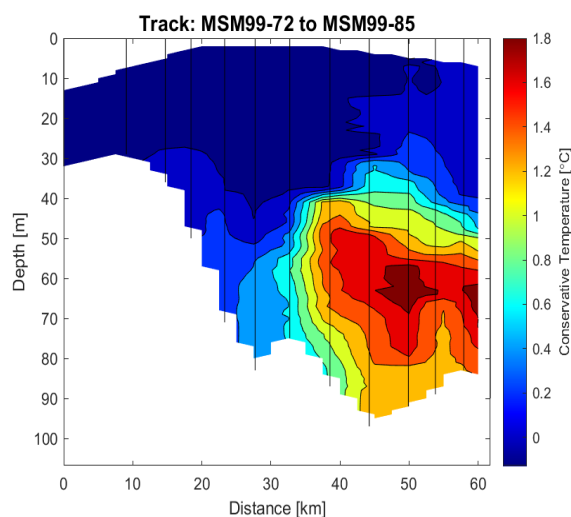
FS MARIA S. MERIAN
MSM 99 (GPF 18-1_097), Emden - Emden
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Baltic Deep Water Circulation

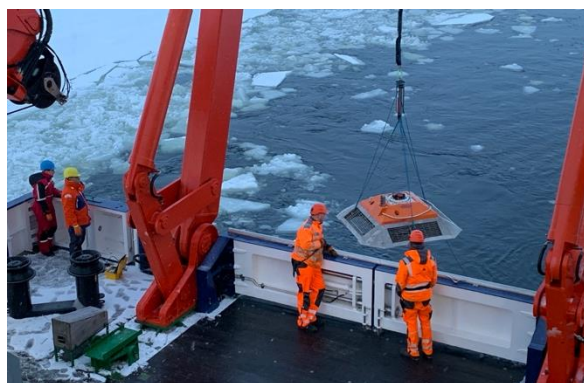
Since we finished sampling of the last ice holes for brine waters on Friday, March 12th, which were observed already in the CTD profiles in the Bothnian Bay as deeper cold-water mass, we this week continued our search for its evidence from the Bothnian Sea to the Åland Deep.

Brine, saline water in the cavities of sea ice was sampled in drill holes. It reveals a salinity of 22g/kg, while surface waters of the Bothnian Bay have a salinity of 3g/kg (Photo to the right, T. Neumann).



Temperature profile from the southeastern Bothnian Bay shows that new, very cold water subverts older, warmer waters (Figure to the left, T. Neumann).

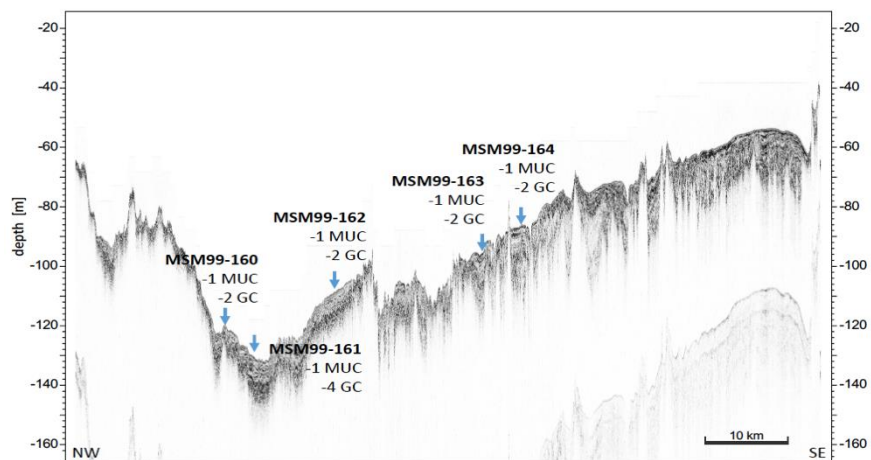
The „turtle“, an ADCP device is launched to measure deep water currents in the Bothnian Bay for one year. (Photo to the right, R. Schneider)



After having deployed an ADCP mooring that will measure deep bottom water currents for the following year, the nights of the past week were used to search with W-E directed sediment echosounder surveys for suitable locations for sediment coring on morphological ridges and in basins from the Bothnian Sea into the Åland Deep. During the day the selected locations in different water depth on ridges and basins were sampled for Holocene sediment sequences covering the Littorina stadium of the Baltic Sea.

The aim was to find proof for missing sediments of warm climate phases on the sills and partly also in the basins, while in other parts, thicker sediment layers, representing cold climate phases, were supposed to be found. The latter was expected, invoking the uptake of material deposited on the sills during the warm phases before and afterwards being eroded and transported to the basins by stronger bottom currents during cold phases. Both, the existence of hiatuses and thicker deposits of older material in the basins provided evidence for a larger winter sea ice extent and thus presumably stronger deep water currents during the colder climate phases of the Holocene, when compared to the modern situation observed before in the Bay of Bothnia. From our echosounder surveys and subsequent sediment coring it turns out, that evidence for such a strengthening of deeper water circulation during cold climate phases can be traced from the northern Bothnian Sea well into the Aland Deep.

The West-East PARASOUND profile from the northeastern Bothnian Sea indicates thick Holocene sediment layers in the basins and low sedimentation or even no sediments deposited above the glacial clays on the ridges. The blue arrows show coring locations for Multi Corer and Gravity Corer. (Figure by S. Papenmeier)



These findings of course have to be confirmed by radiometric dating of the sediment series when back on land. Nevertheless, they underpin the large success of cruise MSM99, with the major goal to find evidence for the northern bottom water formation during winters and its extent towards the Bothian Sea and Aland Deep during cold climate phases. Only by the interdisciplinary sampling of oceanographers and geologists and with the background knowledge of Baltic ecosystem modeling this goal could be reached. The excellent performance of the polar-margin research vessel MARIA S. MERIAN was essential for this success, including the great support and flexibility of the ship's crew during the search for ice stations and sea ice profiles under extremely cold weather conditions.

After finishing some remaining work in the eastern Gotland Basin we are now on our journey back and will pass the Island of Rügen this evening and reach the entrance to the Kiel Canal tomorrow morning, Monday, March 21st. Cruise MSM99 then will end at the port of Emden on Tuesday, March 23rd.

All scientist and crew are healthy and send spring greetings home, today at 5°C.

Ralph Schneider
(Christian-Albrechts-University Kiel)

March, 21st, 2021