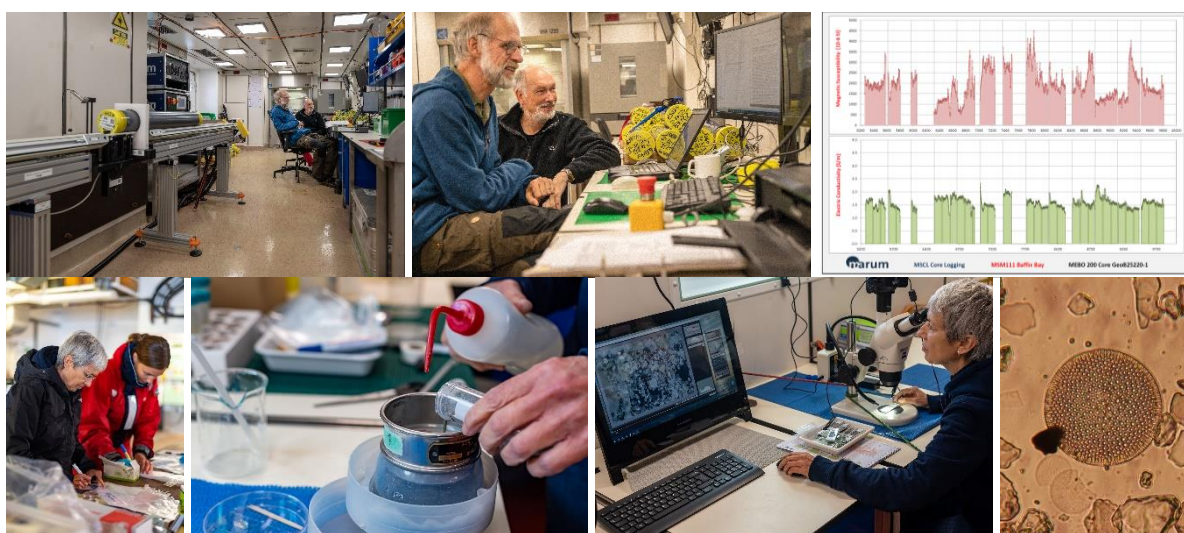


RV MARIA S MERIAN
MSM111 "BAFFDEEP"
02.09. - 04.10.2022



4th Weekly Report
19 – 25.09.2022

In the fourth week of the expedition, we continued our investigation of the geology of the continental slope of Greenland. In the process, we were able to deploy the MeBo rig three times, reaching the greatest depth of 94.5 m during the second deployment. Evaluation of all the data available to date, particularly the changes in sediment magnetic susceptibility in all cores and in the second MeBo borehole, indicates that the boundary of the two sediment packages on the continental slope corresponds to the MIS11-MIS12 interval and that we have probably reached MIS14 or even MIS16. MIS stands for marine isotope stages, the sequence of which corresponds to the alternation of ice ages and warm periods. MIS11 is our target - the time 400,000 years ago, when the Greenland ice sheet almost completely melted for the last time.



All sediment cores are analyzed in the laboratory for magnetic susceptibility and electrical conductivity of the sediments in the core. In addition, small sediment samples are taken at the end of each drilling segment and the microscopic fossils contained in the rock are examined. The data obtained will allow a first insight into the history of sedimentation off Greenland. Photos and graphics: Johan Faust, Volker Diekamp, Tilo von Dobeneck and Anne de Vernal.

The most productive deployment of the MeBo so far began right away on Monday. After a reconnaissance of the sediment with a gravity corer, the MeBo was launched in the morning and landed softly with the first attempt. This time we had chosen a different position where our PARASOUND profiles showed well stratified deep layers. We decided to flush the uppermost 52 m, which had already been reached in the first well, and only take cores from 52 m onwards. This plan worked and within less than two hours we reached 21 m depth. Here, damage to the drill pipe was detected as a connector had separated from the pipe. Thanks to the experience and ingenuity of the MeBo team, the problem was solved and at midnight the planned core depth was reached. We were now in uncharted geological territory. Drilling with core recovery started and continued to work through the depth of the suspected unconformity at approximately 60 m. It was not until 72 m that a layer was reached at which we could make no progress. Fortunately, this depth could be traversed with a rotary drilling unit, and we reached the depth of 94.5 m in the morning. Here, we discovered that the catch hook, which is used to retrieve the core units from the pipe, was damaged and could break off. To our relief, we were able to catch the last pipe in the borehole and this allowed us to insert a probe, with which we

were then able to continuously record the properties of the layers in the borehole as we pulled out the drill string.

The MeBo instrument saw the surface again on Wednesday after almost two days on the seafloor and to our great delight we found that the core tubes were full of sediment (core recovery almost 90%). Our joy increased even more when it was clear that the probe had indeed measured. The magnetic susceptibility values were in excellent agreement with the measurements on the cores. In front of us was the first complete archive of the history of several ice ages and warm periods from Baffin Bay. Still on Wednesday, we explored the deeper slope and retrieved another gravity core there. The susceptibility curve of this 14 m long core confirmed the assumed low sedimentation rate, so that with this core we now also have a sedimentary archive of the younger glaciations.

Still on Wednesday, the third position for a MeBo well was located not far from the productive second well, and the third deployment of the rig could begin. On the one hand, we hoped to obtain a complete sediment sequence in the upper sediment unit, which was drilled with low core recovery at the first position and without core recovery at the second position. Secondly, we wanted to penetrate to even greater depths, where we suspected the position of the last magnetic pole reversal of the Earth's magnetic field - an event that can presumably be readily identified in the drilled sediments and should provide a clear time marker. Unfortunately, we did not succeed in doing either. The borehole suffered from backpressure, which caused sediment to enter the drill pipe, making it difficult to capture and retrieve the core barrels. In addition, there were several layers that were difficult to penetrate, so we had to switch from the desired coring to flushing a full three times. At 91.4 m, the core barrel could no longer be recovered from the drill pipe and the operation would have to be abandoned on Saturday morning after more than two days.



From top left: Sediment cores containing the valuable archive of the history of the Greenland ice cap are removed from the MeBo instrument and the individual 3.5 m long pieces are carried to the laboratory in the snowfall. Fortunately, the drilling work, whilst the ship has to remain on station, is not disturbed by icebergs - these remain rare and stay in the distance. Photos: Volker Diekamp.

However, we are not giving up and since the rig with its complicated controls, telemetry, electronics and hydraulics is working well so far, we have started again with the last operation in Baffin Bay on Saturday evening at the site of the second well. This last drilling operation is expected to last until Monday. In the meantime, we continue to sit in front of monitors for hours at a time, watching the robotic action on the seafloor. Tubes are taken from rotating magazines, screwed together and pushed into the sediment with the drill head rotating, core barrels are lowered and retrieved, and in all the light and dance of the equipment, fascinating denizens of the deep ocean can be glimpsed again and again. And then there is the weather - the last



three days have reminded us with cold and snowfall that we are in the Arctic, beyond the Arctic Circle. Fortunately, even on a research vessel there are snow shovels and road salt!

All participants of the expedition are in good health and good spirits and greet their families, friends and colleagues at home.

For all participants

Michal Kucera, 25.9.2022
(MARUM / University of Bremen)

To learn more about our expedition, follow us on:

<https://www.marum.de/en/Discover/MARIA-S.-merian-on-course-for-baffin-bay.html>
<https://www.marum.de/Entdecken/Logbuch-MSM-111.html>

<https://twitter.com/lilafisch>
<https://twitter.com/HenriekaD>
<https://twitter.com/VolkerDiekamp>
<https://twitter.com/drjofaust>

<https://www.instagram.com/jopst>



Inhabitants of the deep ocean admire the MeBo on the seafloor in Baffin Bay: left and center: two different ray species at the drill string and at the open borehole, respectively; right: two squid mating. Screenshots from the MeBo telemetry: Sophia Schillai.