

FS Maria S. Merian

Reise MSM102 (GPF 20-1-31)

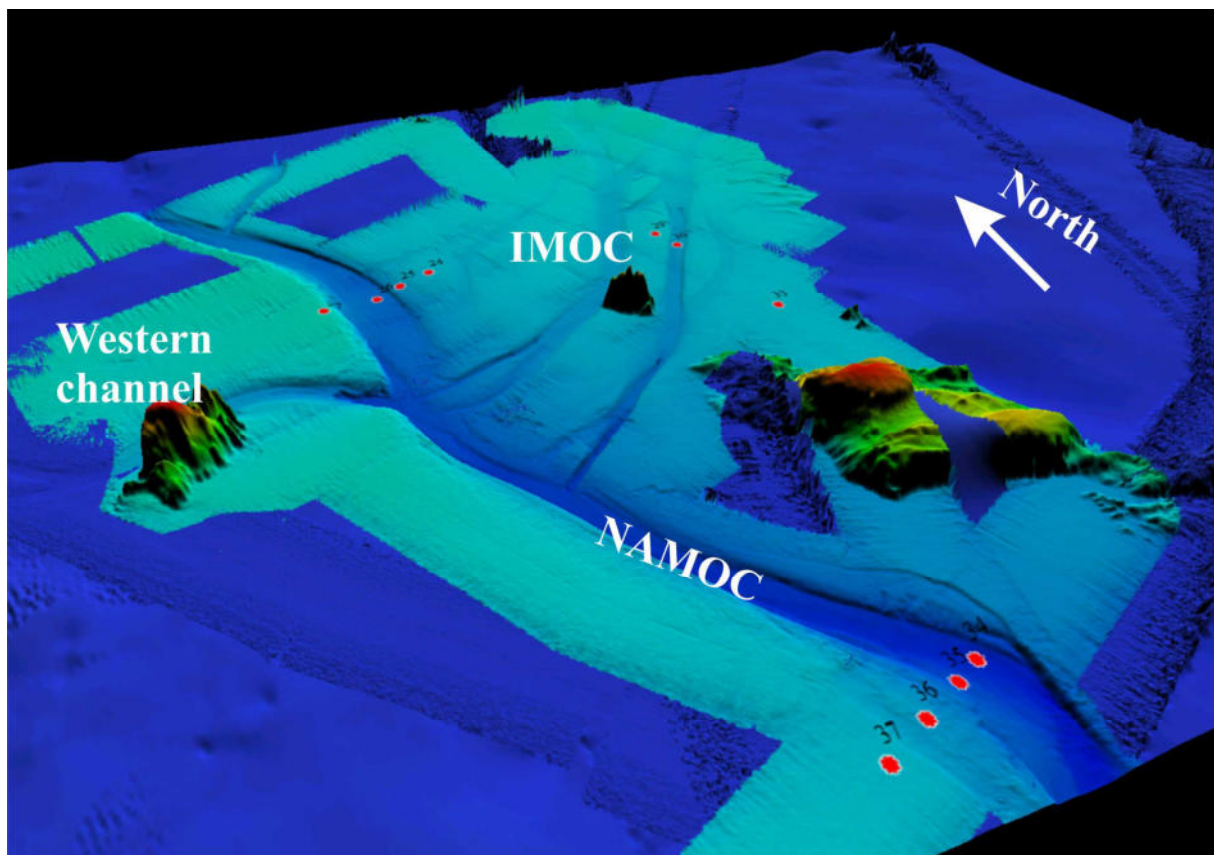
23.07. – 09.09.21, Emden – St. John's - Emden

Weekly Report No.4, 09.08. – 15.08.2021

Sediment Transport in the Northwest Atlantic Mid-Ocean Channel (NAMOC), Labrador Sea



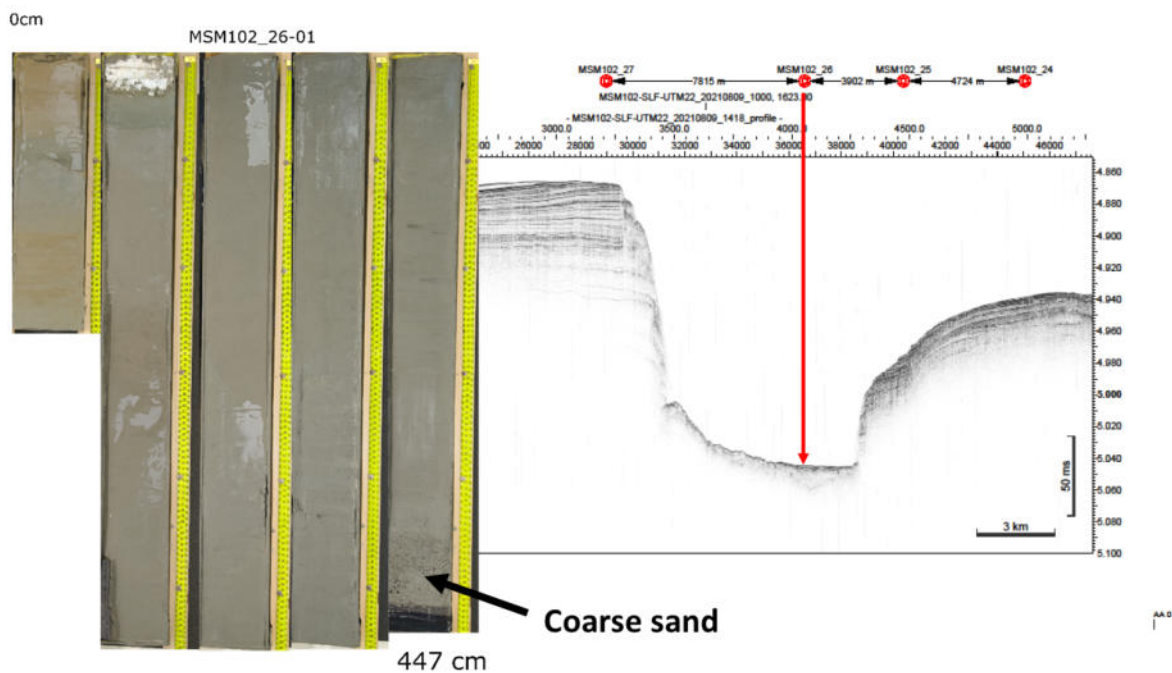
A busy and successful week lies behind us. Having already mapped the NAMOC for almost 1000 km, we reached the first focus area of the cruise in the morning of August 9. The focus area is located just seaward of Hamilton Spur. This spur is a detached drift (contourite) that is a major feature of the margin. In addition, this is the area of the Imarsuaq Mid-Ocean Channel (IMOC) junction. On one hand, this site is chosen to study the interplay of the growth of the detached drift and NAMOC. It should be possible to determine the relative ages of the features, depending on infill. On the other hand, the site allows investigating the influence of the Greenland margin by covering the IMOC. The IMOC is the only known major eastern tributary of the entire system.



Perspective view of the NAMOC / IMOC junction. Red dots mark coring locations.

An important goal of the past week was therefore to map this area in detail. By the end of the week, the mapped area had grown more and more, so that we now have detailed insights into the morphology. The NAMOC can be seen as a relatively straight channel that is up to 100 m deep and has much higher western levees. South (below) the tributaries, the NAMOC shows a distinctly different morphology with v-shaped pattern in the thalweg indicating that a significant amount of sediment is being introduced into the system by the tributaries. There is a larger tributary to the west that is incised to a similar depth as the NAMOC. The IMOC, as the eastern tributary, is not a single channel but shows a very complex braided pattern with multiple tributaries into the NAMOC. The southernmost of these tributaries appears to be the active one, as it is the most deeply incised. However, the active tributary appears to have changed several times over time. Numerous channel arms can be seen that are now only shallowly incised and already show thick sediment fill in the Parasound data. The pattern of the IMOC suggests that the relatively sandy braidplain east of the NAMOC extends farther south than previously thought.

We collected a first coring transect across the NAMOC in this area on August 10. The profile with core stations MSM102-24 - 27 is located north of the confluence of the IMOC and the NAMOC. Sampling along this profile was extremely successful and yielded good core recovery on both levees as well as at the channel thalweg. The core at the channel thalweg has a length of 447 cm. A turbidite with a layer of coarse sand nearly 10 cm thick is found at the base of the core. Such turbidity currents probably formed the NAMOC and we are confident that we can correlate this and other turbidites along the profile to reconstruct the flow characteristics of the turbidity currents that formed the NAMOC.

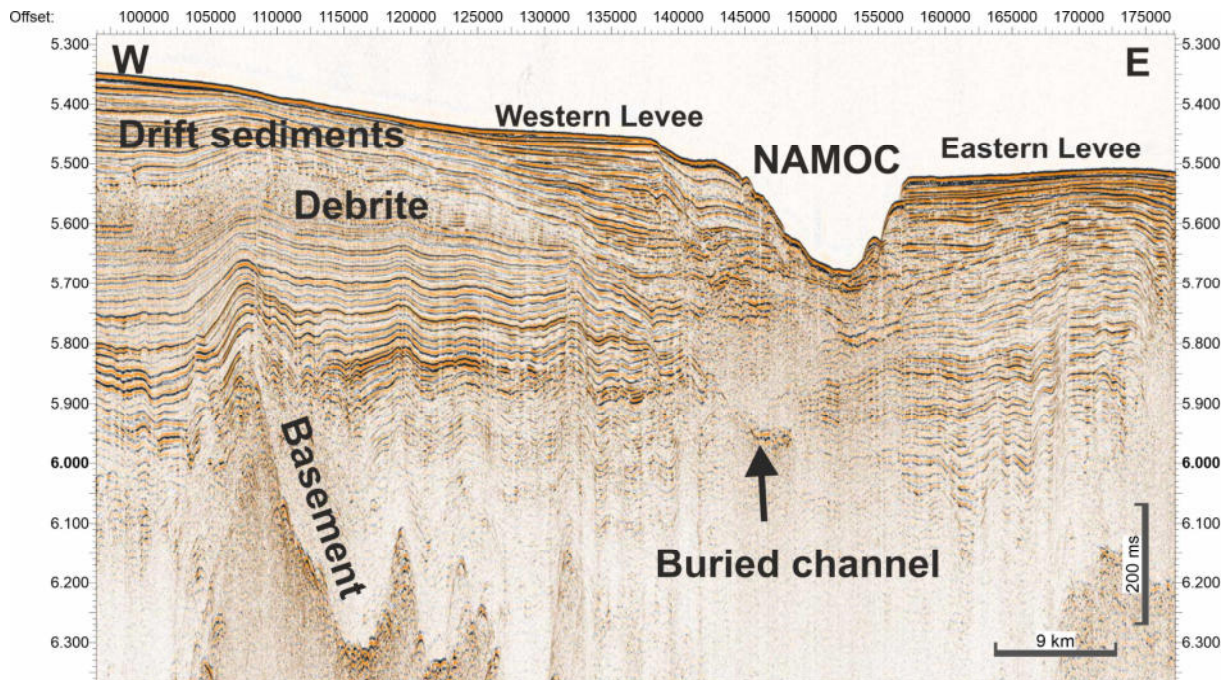


Sediment echo sounder profile across the NAMOC and core photo of core MSM102_26-01 taken at the channel thalweg.

We collected two additional cores in the thalweg and on a levee of the IMOC on August 11. Coring in this area was more difficult because the sand content is very high. The levee core has a length of only 132 cm although the Parasound data shows thick well layered stratified sediments. A gravity core in the channel thalweg was unsuccessful but a giant box core revealed some silt layers with cross bedding.

Coring was followed by a seismic survey. An initial long profile crossed the NAMOC south of the confluence with the IMOC. This profile was extended about 75 nautical miles to the west to image the Hamilton Spur sediment drift. The new line connects to an old seismic line that continues up the continental slope. The new seismic data clearly show that the NAMOC

levee onlaps the drift body, suggesting that the NAMOC is younger than the drift body. However, the seismic data also show an old buried channel interacting with the drift body. The seismic equipment was retrieved in the early morning of August 14. After a 7-hour transit, seismic was again deployed. Two long seismic lines were recorded, including tying in existing data. The first line crosses the NAMOC north of the confluence with the IMOC, and the second line crosses the IMOC's braided channel system. The seismic survey was completed at 10:00 AM on August 14, and was followed by another highly successful day of geologic sampling. A total of 5 stations were sampled, 4 of which resulted in very good core recovery (up to 850 cm). A comparison of the core profiles south and north of the IMOC will allow to quantify the importance of the IMOC for the evolution of the NAMOC.



Seismic profile crossing the NAMOC. The Hamilton Spur drift is found west of the NAMOC.

We have been following the NAMOC towards the northwest again since last night. Three additional floats were deployed this afternoon. Tomorrow we will reach an area where small side channels (Yazoo channels) run parallel to the main channel, which we want to examine for their importance for the NAMOC.

Tomorrow half of the long trip will be over and we are curious what the second half will bring in terms of interesting findings. The weather has been kind to us so far in terms of wind and waves and we hope it will stay that way, even if we would all be happy about less fog and more sun.

Everyone is well onboard. With best regards from RV Maria S. Merian

Sebastian Krastel
(Christian-Albrechts-Universität zu Kiel)

At sea, 57°30'N, 051°15'W