FS Maria S. Merian

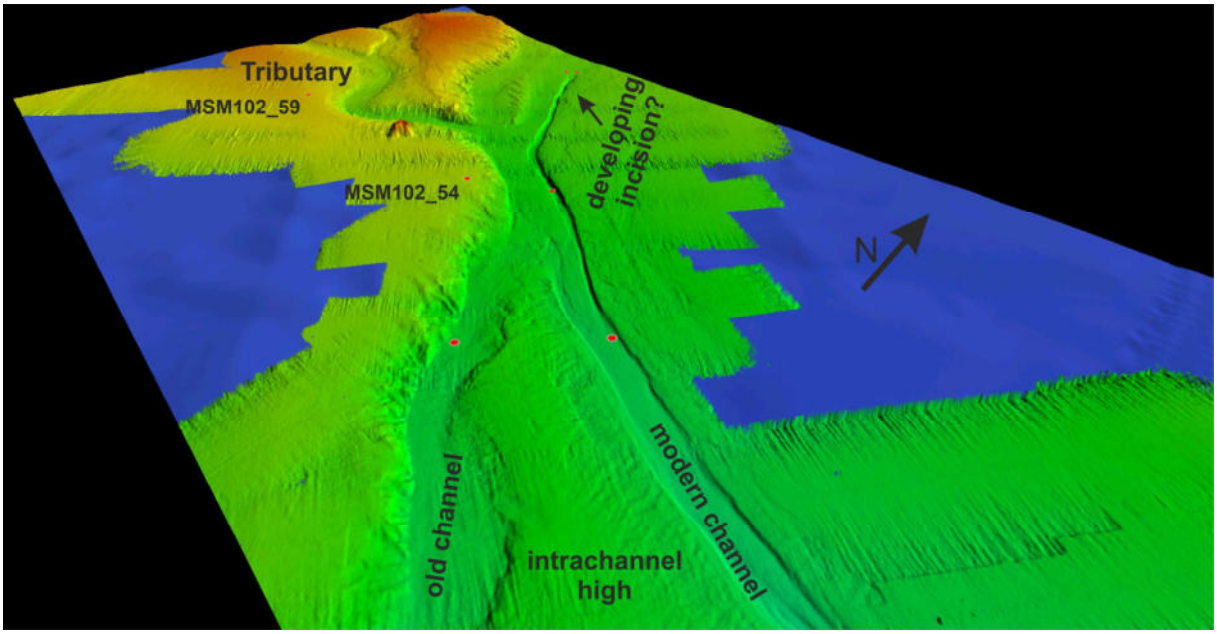
Cruise MSM102 (GPF 20-1-31)

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

Weekly Report No. 6, 23.08. – 29.08.2021

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

Another busy and successful week lies behind us. The main focus of this week was our northernmost working area at about 60°N. This area is characterized by the confluence of various channels, which form the NAMOC. The multibeam system always reveals surprising and exciting details.

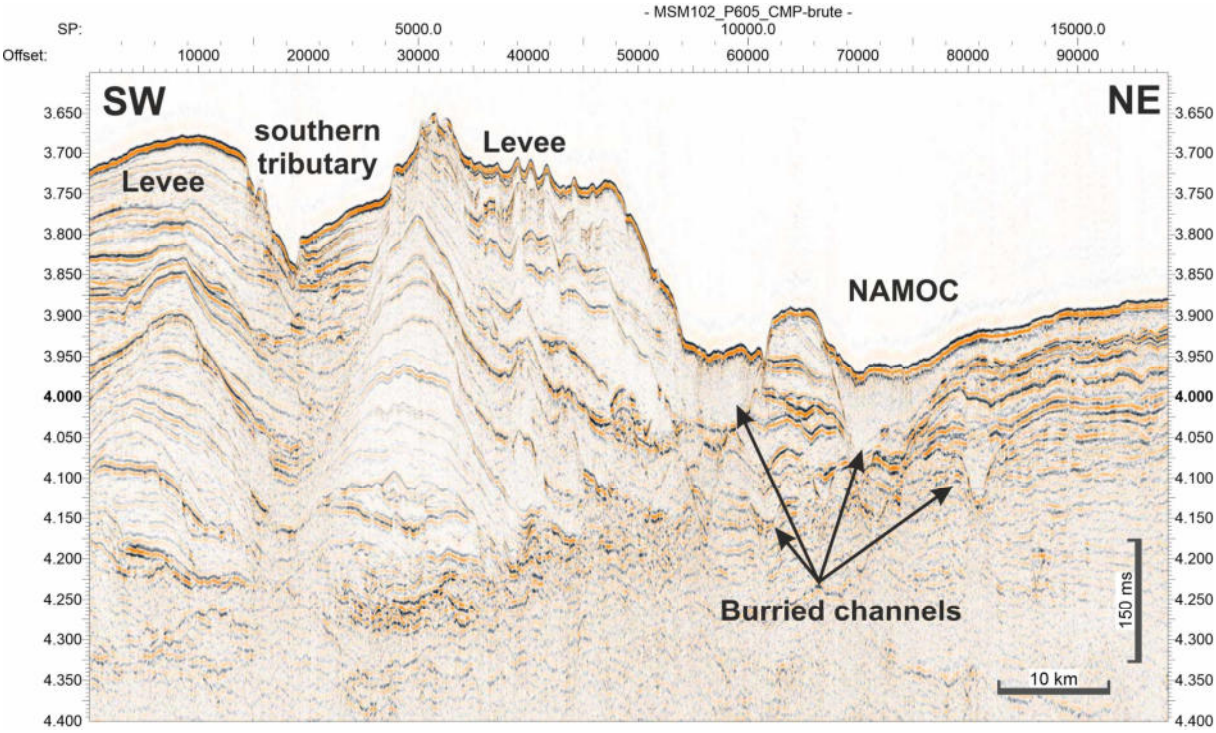


3D perspective view of the bathymetry of the northernmost working area. The blue area shows globally available background data. The colored area was mapped in detail by us for the first time. The red dots show the coring locations.

In the lower (southern) part of the figure, one can see a split in the channels. Sediment echo sounder and seismic data clearly show that the northern of the two channels is the currently active channel. A major confluence is seen further upstream. While the southern channel is clearly pronounced here, the northern channel is only visible as a broad morphological depression with a pronounced narrow incised thalweg. This thalweg disappears abruptly further upslope.

We acquired seismic data until the morning of August 23 in order to image the architecture of the channels. The seismic data recording went without problems, and had to be interrupted only once briefly because we had some pilot whales near the ship. We interrupt the seismic measurements when marine mammals are within the so-called mitigation area in order to minimize the impact on mammals as much as possible. The radius of the mitigation area is 500 m for our small seismic source, and even if the whales were outside this radius, we interrupted the measurements for safety. After such an interruption, we start the measurements (as we always do at the beginning of a seismic measurement) with a soft

start, in which the energy introduced into the ground is gradually increased over about 30 minutes.
The seismic data (see below) show that older channels in the surveyed area are buried by debris flows. Debris flows occurred on this continental slope primarily during the last glacial, as glaciers deposited large amounts of debris on the continental slope. However, the narrowly incised channel indicates that a new transport pathway for sediments is currently forming. The seismic data also show other buried channels. Thus, this has not been a one-time event for the NAMOC, but has occurred repeatedly. Overall, the NAMOC is probably a very long-lived structure.

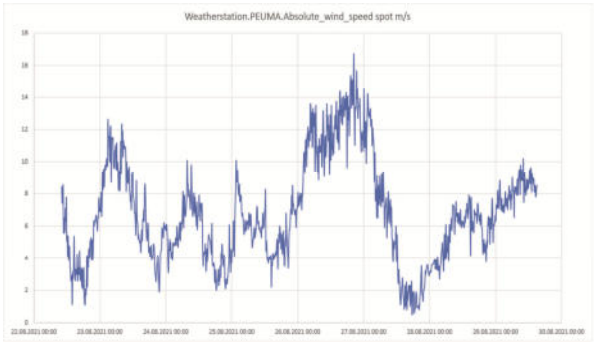


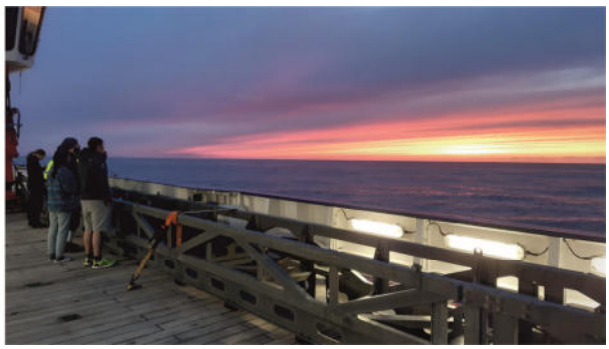
Approximately 100 km long seismic profile across the NAMOC. The data show numerous buried channels.

Much of the time until the evening of August 25 was spent for geological sampling in the northern work area. Both the levees and the channel fills were sampled. The cores have now been opened and provisionally described. However, a detailed analysis will only be possible after the cruise. Nevertheless, the first interesting results are already emerging. A comparison of the cores at positions MSM102_54 and 59 (see bathymetric figure for locations) show characteristic sedimentary structures that can be clearly correlated between the cores, but the clearly recognizable sedimentary boundaries in core 54 are at greater core depth, since this core presumably receives sediment input from all tributaries of the NAMOC, while core 59 only documents sediment transport through the southern tributary.

Core opening in the Hangar

We left the northern working area on the night of August 26 after recording a final seismic profile there and performing a roll calibration for the multibeam. Heading southeast, we primarily followed the western levee of the NAMOC. Various profiles were also recorded across NAMOC. Among other profiles, we crossed two positions where the French research vessel Marion Dufresne had obtained cores about 30 m long with a 'Giant Piston Corer' in 1999, which will help us a lot in interpreting the sediment echosounder profiles. We then continued our work in an area already mapped during the cruise. There we acquired another seismic profile as well as various cores. Since yesterday evening (28.08) we are again collecting seismic data. The main goal is to connect our seismic network to a well drilled in 2004 as part of the Integrated Ocean Drilling Program during Expedition 303. The age information from the well is important to interpret our data. We actually planned to record the profile at the beginning of the transit toward Emden as the well is located about 90 nautical miles east of our main working area. However, the current extremely good weather conditions and the rather moderate weather forecasts for the coming week have led us to record the profile already now.
In general, the unexpectedly good weather conditions have made our work extremely easy during the last week. Except for isolated short periods we had very little wind and calm seas, and even impressive sunsets, albeit at a cool 10° Celsius. This is not necessarily to be expected in the North Atlantic.





Left: Wind speeds during the past week with many low wind phases. Right: Sunset in the Labrador Sea.

Now there are only a few more working days ahead of us before we set off on the long transit back towards Emden on September 1. The mood on board is still very good and everyone is well.

Best regards

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