FS Maria S. Merian

Reise MSM102 (GPF 20-1-31)

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

Weekly Report No.5, 16.08. – 22.08.2021

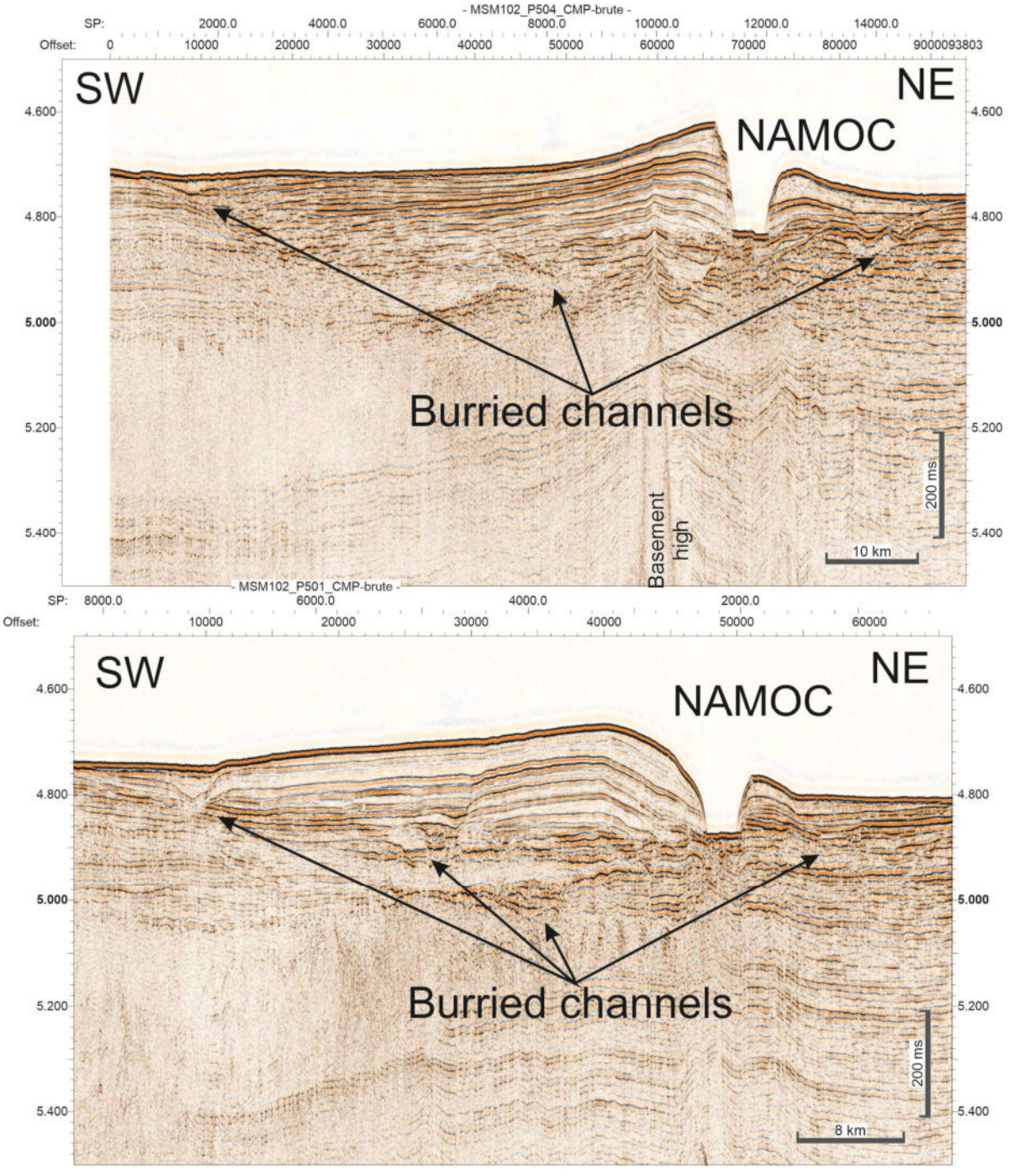
Sediment Transport in the Northwest Atlantic Mid-Ocean Channel (NAMOC), Labrador Sea

We reached our next focus area on the morning of August 16 while heading northwest along the NAMOC. There, old available maps show the confluence of so-called Yazoo Channels with the NAMOC. The Yazoo Channels are channels that parallel the NAMOC for several 100 km, but do not join the NAMOC for long distances due to morphologically elevated levees of the NAMOC. Levee structure actually appears to change significantly in this area. While levees downslope of the confluence usually rise well less than 50 m above the surrounding seafloor, levees upslope of the confluence are nearly 100 m higher than their surroundings. However, the Yazoo Channels cannot be traced much further upslope as morphological structures on the new bathymetric maps. On the Parasound data, they are initially visible as infilled incisions, but quickly transition to poorly defined broad morphologic depressions. They appear to be buried primarily by glaciogenic debris flows, implying that no active sediment transport is currently occurring there.

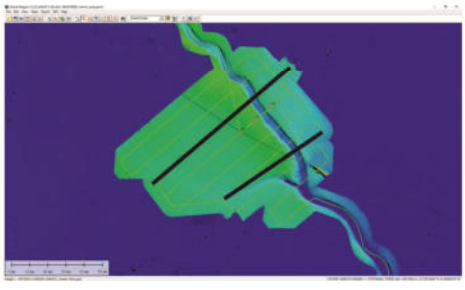
Deployment of seismic system

We recorded two seismic profiles across the NAMOC on August 17 and 18 to identify channels at greater depths and to image the general levee architecture. These profiles show various buried channels, but they cannot be correlated between the profiles. We suspect that they form a buried braided channel system rather than Yazoo Channels. However, the NAMOC itself appears to have had little lateral migration for a long time. Very large differences between the levees can be seen in the seismic data. The two profiles shown in the figure are only about 25 km apart, but look completely different. Both profiles show a much better developed western levee. The western levee on the northern profile has a

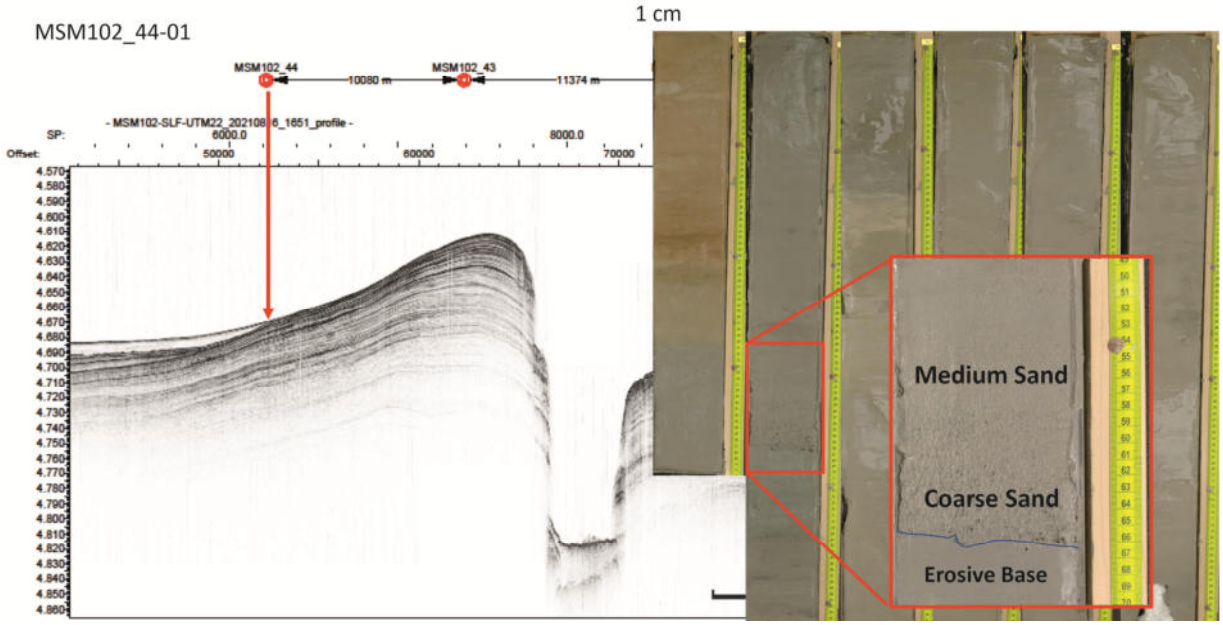
typical wedge-shaped structure; such a wedge-shaped architecture is not pronounced in the southern profile. Although the western levee on the southern profile appears to be less pronounced, the upper unit of low amplitude reflectors is thicker there. We will acquire additional profiles in this area at the end of the cruise to study the evolution of the levees in more detail.



Seismic profiles crossing the NAMOC. The levee architecture differs significantly between the northern (upper) and southern (lower) profiles. We will collect additional profiles in this area in order to investigate levee formation.



We collected three gravity cores on the afternoon of August 18 following the seismic survey. In addition to the eastern and western levees, we also sampled a transparent layer onlapping the western levee. We have observed this layer significantly farther to the southeast on numerous Parasound profiles. The core recovery at this location (MSM102_44) was 569 cm, and thus we sampled the base of the transparent layer at a depth of about 150 cm. At the corresponding depth, we found the base of an erosional sandy turbidite. We are as yet uncertain as to the origin of this turbidite and will therefore also carry out further work in this area on the way back along the channel.



Sampling of a transparent unit onlapping the western levee. The base of the transparent unit correlates with the sandy base of a turbidite.

After geologic sampling, we continued to follow the NAMOC to the northwest, where the morphology changed significantly. There is a narrow erosive thalweg at the bottom of the channel that meanders along the channel floor. We reached the next focus work area at approximately 60° North late in the evening of August 19. There, several tributaries join to form the main NAMOC. The newly collected bathymetric data show large tributaries on the west side, while NAMOC itself appears to merge into a broad depression, rather than a well-bounded channel. Here, the NAMOC appears to be buried by glaciogenic debris flows; however, deep incisions downslope indicate present sediment transport. In order to image the deeper subsurface structures, we have been collecting seismic data since yesterday, now again in very good weather conditions after it was quite windy last night. Also the fog has left us, at least temporarily, so that we could even see faint northern lights.

Everyone on board is still doing well. With best wishes on behalf of all participants.

Sebastian Krastel
(Christian-Albrechts-Universität zu Kiel)
At Sea, 60°20‘N, 057°55’W