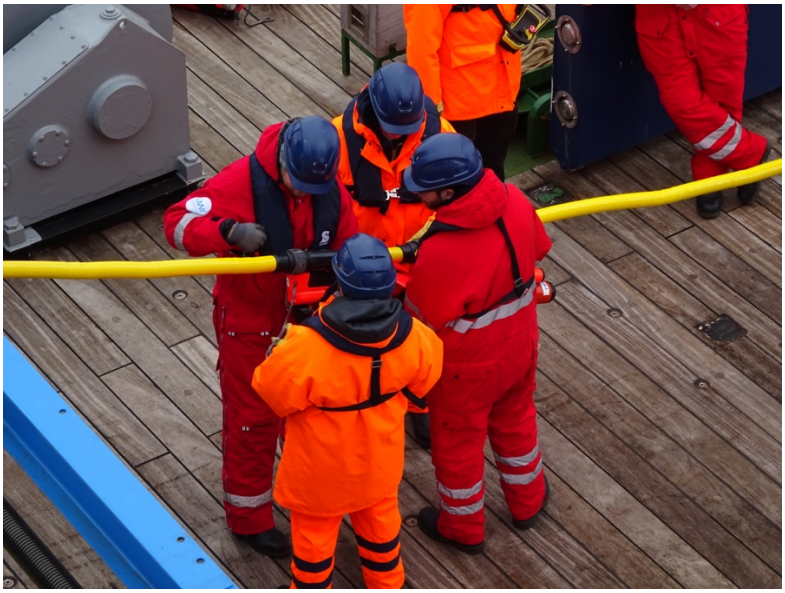
Expedition MSM84
St. John's – St. John's, Newfoundland

Weekly report no 3
July 1 to 7, 2019

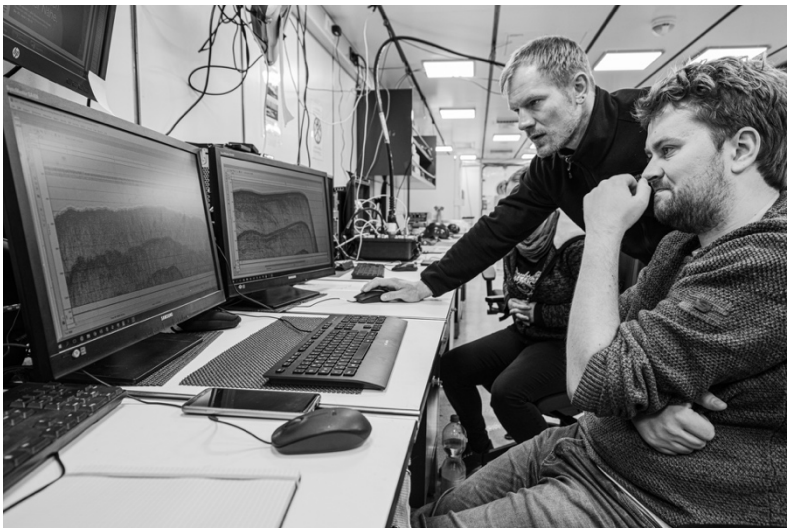
Since we spent almost one week with mapping the lakefloor morphology of Lake Melville, determining interesting sites in the sub-lakefloor, and taking geological samples with heavy equipment, our geophysicists got enough time to process their seismic reflection data and give us a first impression of their findings today. But how do we collect seismic reflection data? We use this method to collect data from layers below the seafloor that are buried too deep to be imaged by the sediment echosounder. In order to generate seismic data, we tow a source behind the vessel that sends out an acoustic signal in defined intervals. The signal is then reflected at the seafloor and at the boundaries of layers underneath, and is returned as an echo. In addition, we tow a long measuring cable behind our vessel. This measuring cable is equipped with a series of hydrophones. The nearby hydrophones record the echoes of the shallow sub-seafloor layers, while the hydrophones located at more distance from the vessel can collect information on deeper layers. Using special geometrical and mathematical techniques, the geophysicists are able to generate an image of the sub-seafloor layers.



Our geophysics team is carefully deploying the measuring cable.
(Foto: Christian Ohlendorf)

This allows us to locate signs of older glacials that are nowadays deeply buried and hence not visible on the seafloor topography. In the first week of our expedition, just before we sailed to Lake Melville, we already spent some days collecting seismic reflection data from the Cartwright Trough on the shelf off Labrador. Last week we finally left Lake Melville after work there was finished, and sailed back northward on the

shelf. Upon arrival in our northernmost working area, we started to collect seismic reflection data from troughs that are located north of Cartwright Trough. These troughs (named “saddles” on the Labrador shelf) were also excavated once by ice streams. For a better understanding of the glacial history of this area, we switch between a short measuring cable (150 m) to image the uppermost layers in high detail, and a longer measuring cable (600 m) to penetrate into the deeper layers.



First data processing and interpretation at the seismics lab. (Foto: Felix Gross)

First results from seismic reflection data indicate that the deepest imaged layer is likely the same hard rock that also forms large parts of the Canadian mainland. It is overlain by material that was deposited by the ice streams during glacial times, and that resembles ground-moraine material of present-day glaciers. We can clearly recognize the u-shaped valleys that were excavated by the ice streams, and we can also see that the exact location of these valleys changed over time. This indicates that the ice streams followed different pathways during different past glacials. The troughs that are nowadays visible in the nautical charts were probably excavated only during the ultimate or penultimate glacial.

We will finish our current seismic program tonight and restart collecting geological samples tomorrow. Again, the geological samples will be collected from areas that show signs of glacial activity, and they will help us to reconstruct the exact timing of the glacial advances and retreats.

All participants are cheerful and send home greetings.

Labrador shelf, July 7, 2019, 55°55.970’N / 58°39.569’W

Catalina Gebhardt & the Expedition MSM84 team

(Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung)

https://www.awi.de/forschung/geowissenschaften/geophysik/expeditionen.html