MSM 30 CORIBAR

– Ice dynamics and meltwater deposits: coring in the Kveithola trough –

Western Barents Sea
Tromsø – Tromsø
July 15th – August 16th, 2013

2nd Weekly Report – July 22nd to 28th, 2013

The second week of our CORIBAR cruise was a successful performance with regard to our scientific objectives and we hold already highly valuable material in our hands.

However, the prime target of our program – to drill down long sediment cores with MeBo – could not be put into practice yet. However on last Monday, after having drilled 10 m below seafloor, an unexpected, severe failure occurred in the hydraulic system of the drill rig. It was turned out that the required cleansing of this system could not achieved on board. With fortunately three weeks of cruise time still ahead, we decided to return to Tromsø (what we are currently doing) for repairing the hydraulics with land-based support.

In the meantime, we continued our research survey with multibeam seafloor mapping, PARASOUND sediment-echosounder profiling, surface sampling and gravity coring. First, we finished the preparation program for the MeBo drilling sites inside the Kveithola Trough (Fig. 1). The respective sites are located at the outer edges of two *grounding-zone wedges* and we received long, fine-grained sediment cores from the area-draping Holocene cover. The subbottom architecture of the trough and the *trough-mouth fan* is well documented by our nighttime PARASOUND profiling surveys. These profiles illustrate the dominant sedimentary processes since the last glacial maximum.

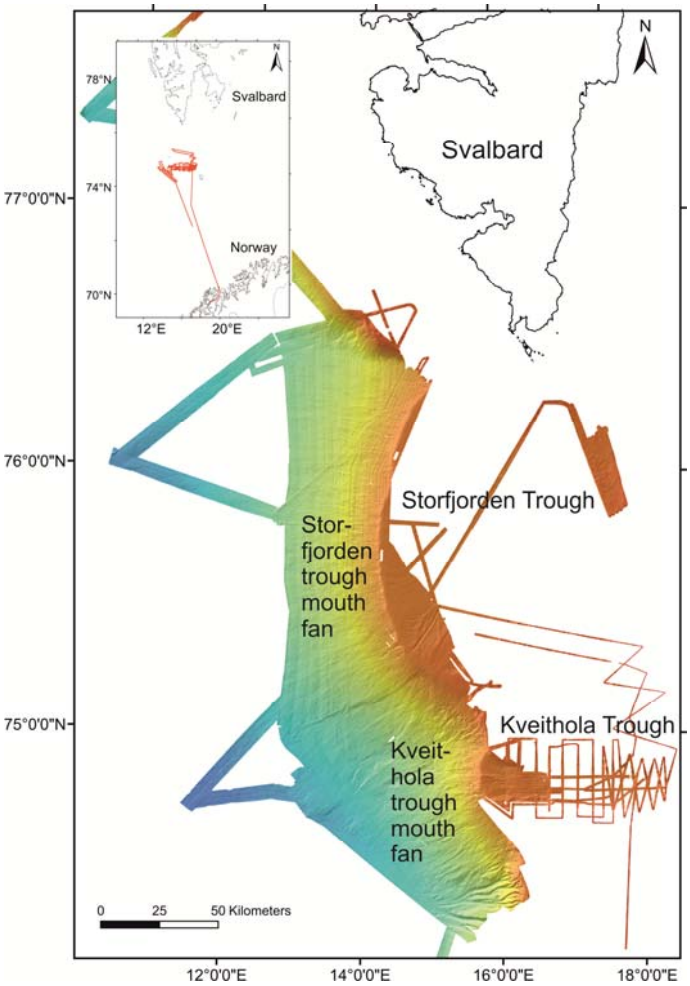

Figure 1: Our new bathymetric data (CORIBAR survey shown in inlay) added to the existing map of the preceding cruises. Brown colors indicate the Barents shelf, blue colors the deep-sea basin.

We used two consecutive nights to cover a *contouritic drift deposit* at the innermost part of the trough with a dense grid of profiles (Fig. 1). Such a drift forms as a result of major bottom currents which lead to focused material deposition at a particular place besides the core of these currents. These drifts appear commonly mounded as well as separated from the surrounding relief by a current channel (Fig. 2). Since these depocenters show highly enhanced sediment accumulation rates, they represent valuable archives recording past environmental conditions in great temporal resolution. We cored across this drift at four stations with the aim to receive material from the high-accumulation center (best temporal resolution), from the margin with reduced accumulation rates (deepest look back into the past) and the marginal channel (current velocity). We also mapped the sedimentary infill of a 50-km long, structurally controlled channel which is supposed to re-direct shelf bottom currents towards the drift deposit. The aim was to identify suited coring locations to obtain material which provides valuable information about the formation process of the drift.

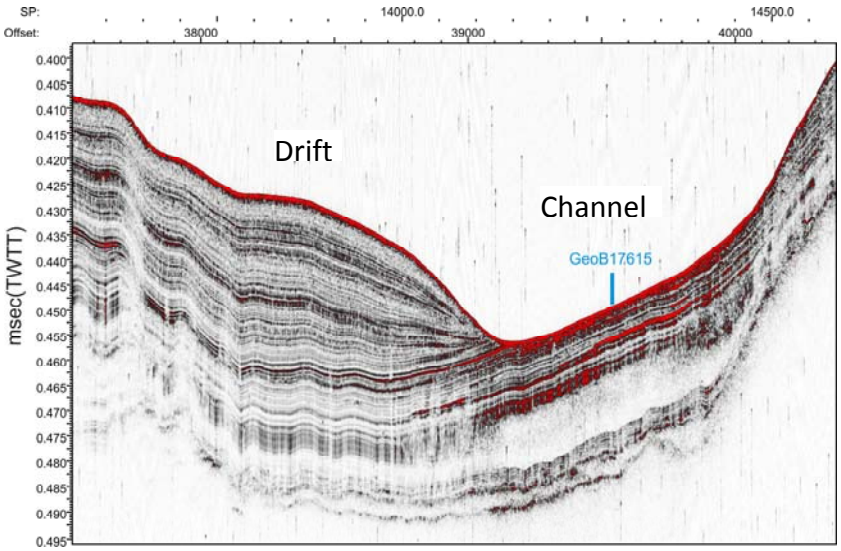

Figure 2: The current-induced drift in the inner Kveithola Trough with high sediment accumulation on the left side and non-deposition of sediments on the right flank, forming a channel structure.

Next, we went to the mouth area of the wide Storfjorden Trough which is located just south of Svalbard (Fig. 1). A previous cruise of our Spanish collaboration partners has shown that some tills are covered by younger sediments which are thin enough to be potentially reached by gravity coring (Fig. 3). First physical property measurements on the two cores we took now indicate that what we got indeed penetrated into these ice-stream deposits, enabling our specialists to estimate the thickness of the former ice coverage overburden.

Finally, we run a number of multibeam lines to extend the edges of the already existing high-resolution bathymetric map (Fig. 1). This bathymetric map was generated by our Spanish, Italian and Norwegian partners during preceding cruises and shows in great variability and appearance ice-stream related *mega-scale glacial lineations*, *plough marks* of drifted icebergs, and *grounding-zone wedges* on the shelf and inside the trough; and shelf-edge gullies, *glacigenic*

debrites, landslides and collapse scars on the associated slope fan. Our mapping survey extends this map at the margins of the Kveithola Trough as well as at the distal part of the trough-mouth fan. Two brief stops brought surface samples to the deck to complete a downslope profile for palaeoceanographic investigations.

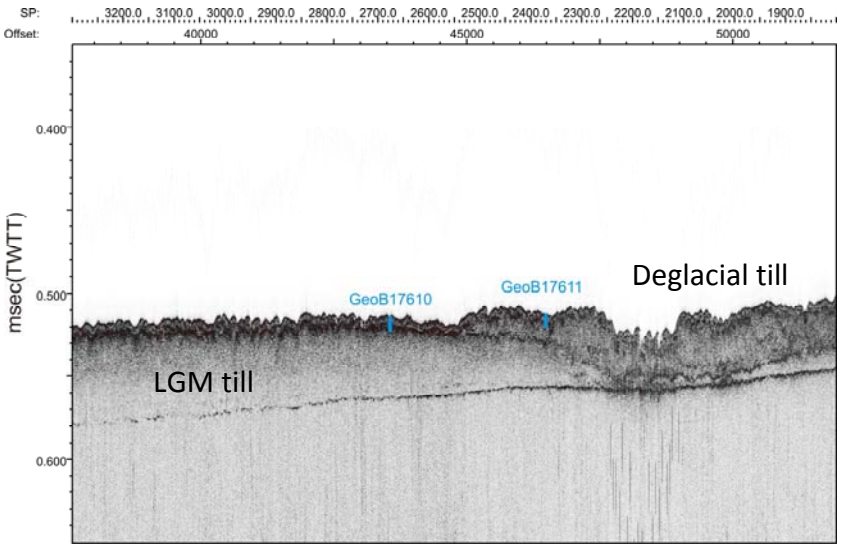

Figure 3: Overlapping till generations at the Storfjorden trough mouth as relicts resulting from Last Glacial Maximum (deeper) and deglacial of ice-stream positions (shallower), overlain by only a thin drape of marine sediments. The rough topography results from drifted iceberg plough marks.

In contrast to the good image concerning the seafloor morphology in this region, core material was particularly lacking up to now. With this newly obtained sediment-acoustic and core material (17 stations with a total recovery of 77.5 m) we can state that we have used the past two weeks sufficiently. We will be able to determine major processes having shaped the sedimentary system in the study area as well as to decipher the environmental/climatic variability. With a cleaned hydraulic system of MeBo, we are confident to obtain the desired long sediment cores during the remaining cruise time.

Our team works hand-in-hand and enjoys the internationality. The collaboration with bridge and crew of R/V MARIA S. MERIAN could not be better. We all wish to send our best greetings home!

Till Hanebuth

Chief Scientist

On the transit back to Tromsø, July 28, 2013, 72°53'N 17°14' E

Scientists recovering the tubes of a Multicorer.