

Research Vessel MARIA S. MERIAN

MSM 57:

Reykjavik – Longyearbyen - Reykjavik

Third Weekly Report: 8 – 14 August 2016



During this week we continued our work on Vestnesa Ridge by drilling two additional sites. Both sites are located at the Lunde Pockmark and sampled sequences of complex lithologies related to recent vent activities. By using the hydro-acoustic systems of the vessel we were able to detect active gas emissions in the surroundings of the drill sites. The drilling sampled gas hydrates occurring in thin layers intercalated in hemipelagic mud. In addition to these relatively soft lithologies, firm carbonate rocks occurred which demanded a change from push coring to rotary drilling. Such a change in drilling operation within the same borehole is not possible using standard drilling platforms, and represents a big advantage of the MeBo drilling system. Typical seep carbonates were recovered composed of lithified sediment clasts that are highly consolidated by light aragonite fringe cements (Fig. 1). The carbonates especially pleased our Norwegian colleagues from the cluster of excellence CAGE, because they are planning to date the carbonates and conduct further more detailed investigations on these unique samples.



Figure 1: A Carbonate layer intercalated in soft sediment was cored by rotary drilling. Light aragonite cements are filling the pore space between dark seep carbonate clasts.



Figure 2: The autoclave core barrel (MDP) has successfully taken a sample in 62 m below seafloor under pressure and will now be degassed quantitatively in the laboratory on the ship.

The autoclave core barrel developed within the collaborative project SUGAR was deployed three times during the drilling on Vestnesa Ridge. In all cases the formation pressure was kept by the tool that allowed a selective degassing and quantification of the gas amount in the formation (Fig. 2). Unfortunately, one of the autoclave tools did not sample sediment; however, the other two autoclave deployments were more successful. During the second last MeBo drilling, we sealed the borehole with a CORK system. Such CORKs have been developed by the scientific community within the international drilling program (ODP/IODP), and were installed inside submarine boreholes allowing to monitor in-situ pressure and temperature conditions. The CORK we used is equipped with a physical sensor package to measure temperature, pressure, and salinity. The data will be

downloaded by an ROV during a future research cruise planned in 1.5 – 2 years. In addition to the MeBo CORK installation, a sonar was deployed at the seafloor, close to the CORK position. The sonar will scan the water column and gas emissions during regular time intervals.

On Thursday, the wind speed increased during late afternoon and the weather forecast predicted a sea state of Beaufort 7. We therefore decided to leave the area of Vestnesa Ridge and moved to the west to map the northern part of the Molloy Ridge area. Although this area is only 60nm away from Vestnesa Ridge, the weather was much better, due to extended ice fields. We reached the ice front around 2 degree of longitude east. We crossed through the sheet of floating ice and very much enjoyed the change in scenery. Many scientists came to the bridge and observed the bizarre shape of the ice floes, and a few seals were also observed. Thursday afternoon, we moved back to Vestnesa Ridge, where the weather had calmed down as well and we were able to continue with MeBo drilling.



Figure 3: The T-lance from GEOMAR is used very often to measure the geothermal gradient in sediments from Vestnesa Ridge.



Figure 4: R/V MARIA S. MERIAN berthed at the coal mine pier in Longyearbyen.

In addition to the drilling program we sampled gravity cores and used the T-lance to measure the heat flow in sediments of Vestnesa Ridge (Fig. 3). In total, we had 8 deployments so far, and took 58 measurements at individual locations inside and outside of several pockmarks. Higher heat flux values were determined inside the pockmarks, and it appears that the higher heat flow values are not correlated to the gas-emission activity of the pockmarks.

On Thursday, RV MARIA S. MERIAN started steaming to Longyearbyen. During the transit we performed seafloor mapping across Vestnesa Ridge and the continental slope, west of Svalbard. During the night we reached the Isfjord, and berthed in the morning at the coal mine pier of Longyearbyen directly at the airport. 14 scientists and 4 crew members were exchanged prior to Leg 2 of this cruise. Despite the rainy weather, many of us enjoyed the time to walk on land. RV MARIA S. MERIAN left the coal mine pier on Saturday morning during sunny weather and continued mapping for the rest of the day and the night.

Everyone on board is fine.

Best regards on behalf of all cruise participants,

Gerhard Bohrman and Stefan Bünz

FS MARIA S. MERIAN Sunday, 14 August 2016