

Research Vessel SONNE

SO278: 12.10. – 01.12.2020

Emden – Emden

6th Weekly Report: 16. – 22.11.2020



Last week we had already left our main area of work, the Olimpi mud volcano field, to move west along the Mediterranean ridge to the so-called “cobblestone area”. Here we had previously mapped an area of approx. 1500 km² with the ship's own multi-beam echo-sounder on our transit to the main working area more than 3 weeks ago. The resulting backscatter map enabled us to assign values of high backscatter to known mud volcanoes from the area. We noticed one mud volcano with particularly high backscatter intensity, which, according to the literature known to us, was unnamed and had never been properly investigated. As the high backscatter seemed to indicate that it could be one of the recently active mud volcanoes, we wanted to conduct more measurements at this location. We started by carrying out an AUV dive from Sunday evening, 15 November, to Monday morning. On Monday, 16 November, while waiting for the AUV data to become available, we sampled the central area of the mud volcano and a neighboring mud volcano with a gravity corer and a multicorer, with sampling locations based on the ship-acquired data (Fig. 2). In the afternoon we were then able to use the newly acquired AUV map to plan a transect with heat flow measurements for the following night. From the map it also became clear that the previous coring stations had not been ideal, and had missed the crater area by several meters. On Tuesday, 17 November, we therefore took some more gravity and multicores, using the AUV data for crater-targeted location selection. This whole process showed once again how important AUV maps are for scientifically precise sampling. In our afternoon meeting of the scientists we discussed the positive results and also chose the name “Helios mud volcano” for the mud volcano, which we want to use in future scientific publications.



Figure 1: The research vessel SONNE photographed in the evening light during the MARUM AUV SEAL recovery, after its measurements at the seafloor (© Till von Wahl).



Figure 2: In addition to other sampling devices, the multicorer is always present on the working deck. By using it, the top 50 cm of the sea floor are sampled very precisely. (© Julia Krahl).

As our pore water investigations have shown, the fluids of the Helios mud volcano, like some of the other mud volcanoes we have investigated so far, have a significantly lower salinity than the seawater. This means that we can be sure that we have sampled the relatively fresh mud from the

chimney area of the mud volcano. On Tuesday afternoon we left the "Cobblestone" area and started another transit to the Calabrian Arc in Italy. There, we began sampling with gravity and multicorers in the vicinity of the Sartori mud volcano on the afternoon of Wednesday, 18 November. When selecting the stations for sampling mud flow deposits of different ages, we used an AUV backscatter map acquired during a previous cruise, and chose sampling sites based on different backscatter intensities. This succeeded quite well, as both, hemipelagic sediments with sapropel layers and individual volcanic ash with mud flow breccias, were cored (Fig. 4).

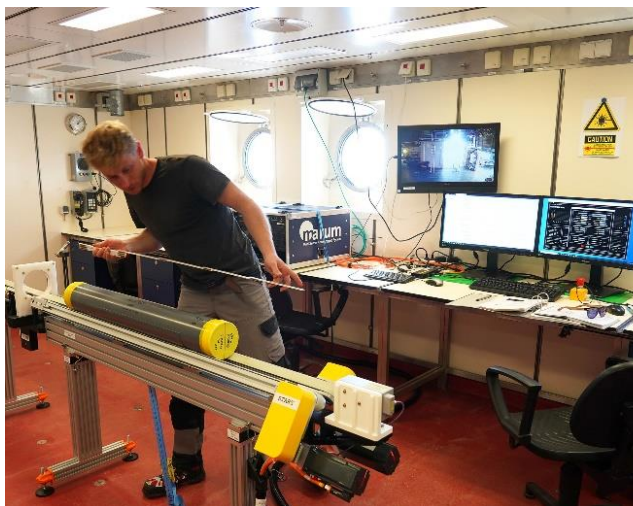


Figure 3: Before the meter-long sections of the sediment cores are split length-wise into working and archive halves, various physical properties of the sediments are systematically measured with a multisensor core logger (© Tabea König).

Gravity Core -37 (GeoB24375-01) SW of Sartori MV

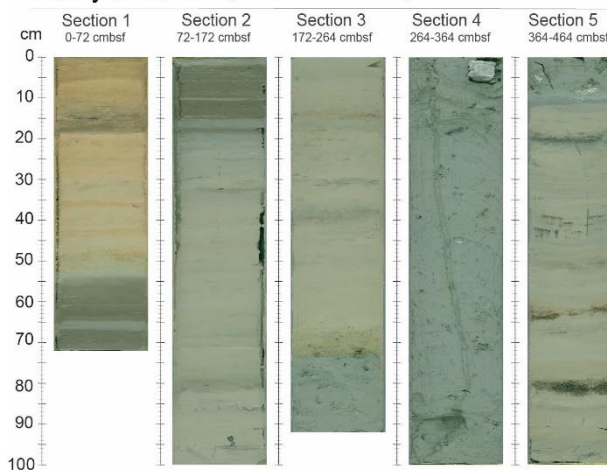


Figure 4: Sediment sequence about 3 km west of the Sartori mud volcano from the sea floor (top left) to a depth of 4.64 m (bottom right). At the bottom of section 3, as well as at the tops of section 4 and 5, a mud flow breccia with up to fist-sized clasts, derived from the Sartori mud volcano, can be seen.

The age determination of the mud flow deposits will be carried out in the Bremen laboratories in the future, using radiocarbon dating (mainly ^{14}C) of carbonate grains and tephra layers in sediments which are above and below the mud flow deposits. In addition to the thus obtained sediment ages, the distribution of the magnetic susceptibility, which we already measured on board with the multisensor core logger (Fig. 3), will be used to correlate stratigraphic horizons. The multisensor core logger is also used to measure the electrical conductivity of the sediments, which gives us information on lithological parameters. On the afternoon of Thursday, 19 November, we stopped the station work of the cruise and carried out a short survey profile over the Venere mud volcano, with the focus on mapping previously observed flares in the water column. 6 years ago, this mud volcano was the most active, showing gas emissions of variable intensity at 5 locations on the edge of the caldera and in the center. This time, 4 of the 5 locations were active and showed acoustic anomalies in the water column. On Friday, 20 November, we were already on the way back, which we will report on in the last weekly report next Sunday.

The weather conditions this week were again very sunny and the very good sea conditions made all station work possible. All participants are healthy!

Best regards also on behalf of the cruise participants,

Gerhard Bohrmann (Marum, University of Bremen) R/V SONNE, Sunday 22 November 2020