

Expedition METEOR 84/2

6th and last Weekly Report: 28.03. – 02.04.2011



On Sunday we had already visited the two mud volcanoes Dvurechenskii MV and Helgoland MV and had recorded gas activity by acoustic analyses as well as we had sampled sediments of the mud volcanoes. With this we wanted to continue next day. But meanwhile our little post-processing group on board had completely processed the multibeam echosounder data measured so far along the Ukrainian continental slope, and we looked amazed at the brilliant maps. Though there were unfortunately several blanks in the data due to the lack of time which we would rather have liked to fill in by reproduced measurements. Furthermore we found a couple of gaps in the backscatter intensity maps which we liked to fill by further measurements. We therefore quickly decided to plan a further measuring day in the area of Kerch Fan in order to substantiate the pressing questions with further data. So far we had left behind an area in the North on the Ukrainian Shelf, which had been restricted for us because of military exercises for several days from 7:30 a.m. until 11:30 p.m. We had hoped now to have another chance to measure those parts of the shelf by this new measurement. But on Monday morning the vessel received another message which restrained us from doing so. We had to give way once again.

But in the end we could fill in the gaps during the measurements on the upper continental slope, and so we could achieve a complete detailed image from this highly interesting slope morphology giving us an important insight into the geological processes. We were astonished about the highly detailed structures which are characterized by the down-slope transport. The overlaying areas with high backscatter intensity turned out as areas with stronger gas emissions which strengthens our work hypothesis of quantifying these emissions.

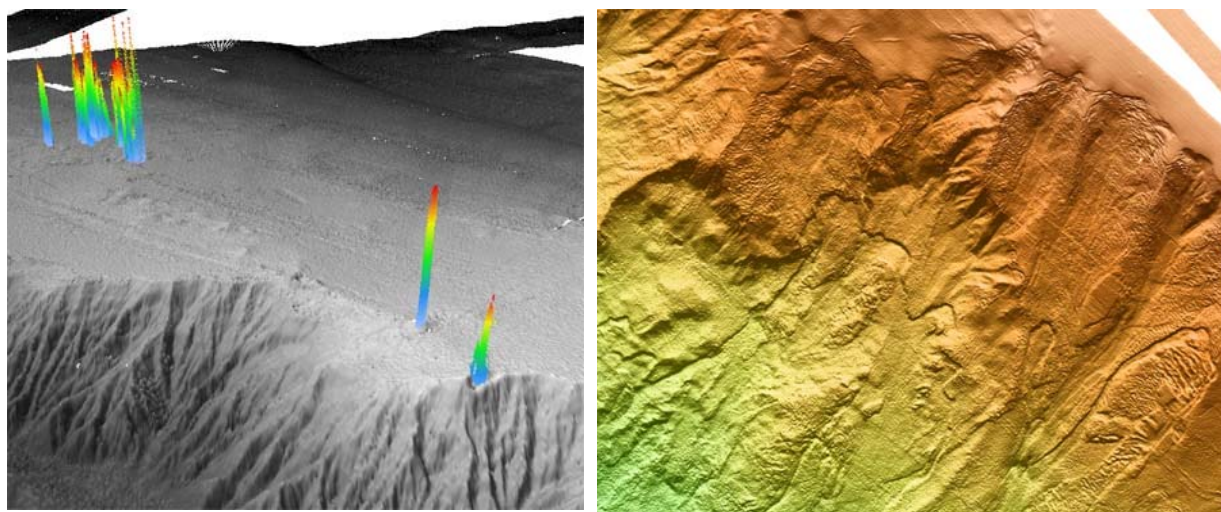


Fig. 1: 3-D-view of gas emissions at Ordu Ridge (left). Section of upper continental slope morphology S' of Kerch Peninsula recorded with the EM 710 multibeam system (right).

On our way back to the West to the two mud volcanoes we crossed numerous mud volcanoes among which the Tbilisi MV, the Odessa MV, Vodianskii MV as well as the NIOZ mud volcano clearly showed activities in the form of flares. Also the Dvurechenskii mud volcano now showed a definite gas flare in its center. The mud volcanoes of the Sorokin Trough in general are related to the zone of diapirs formed by the Maikop Formation in the underground. In the cap area of the mud diapirs, due to the higher gas pressure, often appears break-through of relatively liquid and gas bearing mud channelling upwards along

discontinuities and developing cone-like structures on arrival at the seafloor which we consider the virtual mud volcanoes. The Sogokin Trough itself is characterized by crustal compression supporting the diapir-like uplifting of the mud formation and which had been shaped in the course of the Caucasus mountains' development. Back to the two mud volcanoes, the Dvurechenskii and the Helgoland MV, both turned out active whereas two days ago the Dvurechenskii seemed to be in a calm phase. A precise analysis of echosounder data taken two days ago thus showed that the Dvurechenskii MV had already been active, however, we could not see this in the proximate profile below the vessel. An 18-hours long sampling program followed up mainly at Helgoland mud volcano, and we could take highly interesting sediment cores. One gravity core was very near to the conduit of the mud volcano where we measured temperatures of about 20°C and we could directly sample fluids rising from very deep. The extremely high ammonium concentrations of the pore waters give a hint on special diagenesis conditions occurring in greater depth. Ten meters beneath we could sample gas hydrates with a gravity corer, i. e. there the temperature is already lower than 16°C. A bit deeper in the area of the edge of the inner volcano structure we had already 9°C corresponding to the normal bottom water temperature in the deep Black Sea. After further measurements at Ukraine and in Turkey we finished our station and profile work of this cruise on Friday, 1 April at 10:37 a.m.



Fig. 2: Sampling the mini-corer (left); decomposing gas hydrate, releasing so much methane that it feeds a flame (burning ice; right; V. Diekamp, MARUM Bremen).

Today the cruise will finish in the port of Istanbul. Since yesterday evening we are lying in the roads in the entry to Bosphorus. Because of the intensive fog the entry to the channel is strictly limited, and even today we do not know when exactly we will reach the port. Thus it is clear that we achieved many and very good samples and new important knowledge about the distribution of gas hydrates in sediments of the Black Sea. Despite of the technical problems it was a very successful cruise. We thank the Captain Michael Schneider and the entire crew of RV METEOR for their outstanding support of our scientific work on board the research vessel. We really felt comfortable on board.

On behalf of the cruise participants for the last time from M84/2,

Gerhard Bohrmann

RV METEOR, Saturday 2 April 2011

Further information on the cruise (in German): http://www.marum.de/Logbuch_Meteor_84/2