

Research Vessel METEOR

M142:

Varna - Varna

Third Weekly Report: 13 – 19 November 2017



From Saturday to Tuesday we were busy with our first MeBo200 drilling. The drilling team persistently deployed step by step the core barrels until we had reached a final drilling depth of 147.3m with 42 core segments, which is unique for MeBo. All of us were thrilled by this record in drilling depth. We are especially glad about the very good recovery. The content of gas was very high. During heaving from 870 m water depth MeBo's video cameras observed gas bubbles sparkling from the core barrels. The intensity increased during rising up. While taking the cores from the MeBo magazines onboard METEOR (Fig. 3), we recognized that the gas pressure was such high in several core segments that the sediments were pressed out.



Figure 1: MeBo200 being launched via the A-frame of METEOR. The modern launching-system enables a safe launching of this large device. (© C. Rohleder).

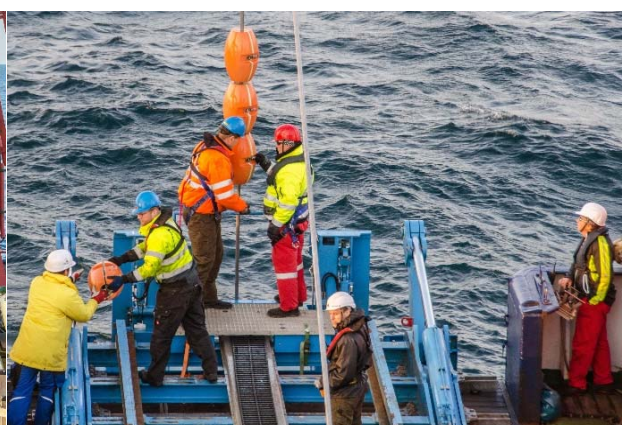


Figure 2: On top of MeBo200 the glass-fibre armed special wire being equipped with floats preventing the wire from dropping to the sea floor. (© P. Wintersteller).



Figure 3: Side view of MeBo200 after the first drilling during cruise M142. Taking the core tubes out of the magazines by means of a special construction, a hydraulic loading/unloading unit. (© P. Wintersteller).

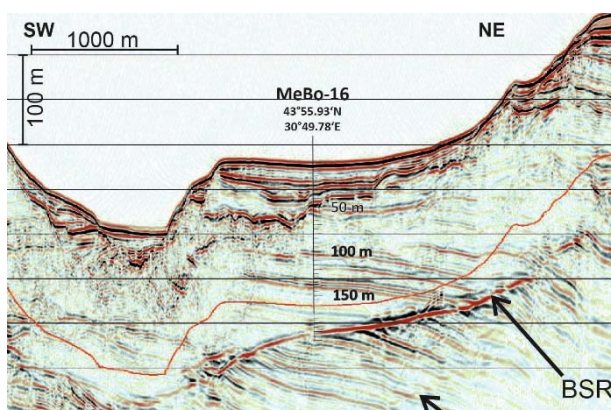


Figure 4: Seismic record with S2-Canyon (left) and MeBo-16 position on the shoulder northeastern of the canyon. The drilling intersected several levee layers, and with 147.3 m it reached the greatest depth of a MeBo drilling ever.

Due to the pressure release under atmospheric conditions, towards the pressure in the sea floor, the gas solubility is decreasing. Free gas accumulates in certain areas of the core segments at which it has also pushed apart some sediment sections. Formation of free gas could happen from dissociation of finely distributed methane hydrate, or from outgassing of former dissolved methane. Both mechanisms have the same effect of gas formation. The drilling intersected a sediment progression of at least three seismic units while we with 147.3 m drilled through deep layers with higher amplitudes (Fig 4). The intersection of a deep reflector, the so-called bottom simulating reflector (BSR in Fig. 4) in 180m depth should be avoided at our first drilling. At

this location most probably a high amount of free gas is available that might cause some problems during drilling. On the other hand the BSR marks the lower limit of gas stability, and above the reflector certainly gas hydrate is available, that, of course, we would like to sample. During the cruise, we therefore plan to thoroughly approach the sampling close to the BSR and do not want to risk too much during our first drilling. The 42 core segments were subject of a treatment divided in many steps: Sampling of gases in the core catcher, removing the liners from the core tubes, measuring the temperature anomalies with infrared-camera, separation of the 3.5 m long cores into smaller segments, labelling of the cores, longitudinal cut of the cores to archive and work halves, color scanning and description of lithology, porewater sampling, sampling of sediments for determination of physical properties, measuring the electric conductivity, etc..



Figure 5: The geo-scientists had to work on more than 40 core segments after the drilling. The lab space was not enough for this, so that they had to use the work deck in addition (© P. Wintersteller).



Figure 6: Mammatus-clouds in the sky above the Black Sea. They are indicators for high vertical lability, as explains Meteorologist Carola (© A. Vasilev).

On Wednesday, 15 November, during the treatment, whose analysis in detail is still going on, we performed a measurement of a CTD profile downwards the slope in the so-called S2-Canyon at the sea floor, and at the same time took water samples with the hydro-casts for methane analyses. Before starting the next MeBo drilling, we successfully recovered the gas lander that had been set 5 days before in a water depth of 642 m for monitoring the surrounding gas seeps. All systems went well, and we are curious for the results. In the evening Mebo again was launched in order to drill on the S2 Canyon as there the BSR is nearer to the sea floor in about 160 m sediment depth. During the following 12 hours we tried 10 times to land on the canyon's sea floor with MeBo but failed although we had good maps of the sea floor. In seven cases the slope angle was too steep and the drill rig could not stand right upwards with its 4 feet. In three cases we succeeded on more plain ground but the drill rig subsided up to 1/3 into the underground so that we could not start drilling. Alternatively, we moved to the western shoulder of the canyon to a location in 772 m water depth. There we managed a perfect landing on the sea floor and could start drilling. This went on until this morning when we observed a gas bubble rise in 143.95 m drill depth. For safety reasons we had to stop drilling and hope to be able to start with the core treatment tonight, when the drill rig is back in its magazine and MeBo on deck again. Beneath drilling cores, 10 temperature analyses were measured in the drill hole, as well as taking two autoclave cores from the formation under *in situ* pressure for quantification of the gas. On dismantling the drill string a drill hole logging of natural Gamma radiation and P-wave velocity was performed.

Everyone is safe and healthy on board R/V METEOR!

Best regards on behalf of all cruise participants,
Gerhard Bohrmann

RV METEOR, Sunday, 19 November 2017