

Research Vessel METEOR

M142:

Varna - Varna

5th Weekly Report: 27 Nov. – 3 Dec.2017



We had a difficult beginning of the week as the MeBo drill rig had damaged its heaving traverse when reversing on the working deck of METEOR. The traverse, that is carrying the 10 ton-drill rig, could not be repaired from resources available on board. After investigating all options, the company BAUER at record speed arranged for the construction, production and transportation to Varna of respective spare parts for this special equipment. In Varna we received the spare parts on Saturday lying in the roadstead with METEOR. The MeBo team at once started the mounting, and on Sunday morning, 3 December, MeBo went to the sea floor again and is drilling since then. A big Thank You to BAUER in Schrobenhausen for their great support that made MeBo fit for work again.



Fig. 1: Dr. Susan Mau in GEO-lab aboard METEOR, measuring greenhouse gases CO₂ und CH₄ in air and water by means of a Laser-based ICOS device. (© A. Popa).



Fig. 2: Curious scientists waiting in front of the GEO-lab for the sediments until the boatswain and his crew have safely heaved the gravity corer back on the working deck. (© C. Rohleder).

During the past week, we extensively sampled sediment profiles by gravity corer in order to find connections between changes in the sediment layers with slide masses and to execute biogeochemical investigations at those layers. Tuesday, Wednesday and Thursday this work concentrated on two profiles east and west of the S2-Canyon. At the western side, several gravity cores were taken across a horse shoe-shaped landslide of about 3 km in diameter. This seems to slide into the S2-Canyon at the basis, as well as to initialize further slides up to the edge of the shelf, slide upwards across the real slide mass. The gravity core profile followed a traverse of temperature measurements by the T-lance that had recorded the changes of the geothermic gradients in- and outside the slide mass. In the frame of a night program, we furthermore did temperature gradient measurements at the eastside of S2-Canyon, slope upwards across a terrace and a north-south fault known from seismic data. Supplement gravity cores were taken also here along the traverse. Within the 12 sediment cores the upper sediment segments are clearly structured and mark the Quaternary phases of the Black Sea evolution. The youngest segment is characterized by the occurrence of coccoliths. Those marine calcareous algae had immigrated via the Mediterranean with increasing salt enrichment about 2,700 years ago. Before, very carbon rich sapropel had developed which has a laminated structure and mark in the entire Black Sea the beginning of the phase of oxygen-free bottom water by construction of a clear thermocline in salinity. Those upper layers vary only little (Fig. 3) while in the lower core segments more frequently slide phenomena can be observed. The biogeochemical variations are very interesting, and in the anoxic system show an overlap of sulphate and iron reduction with anaerob methane oxidation. The result of these processes are complex geochemical zonings with a production of hydrogen sulfide in the sulfide/methane interface zone in about 2-3m sediment depth. The hydrogen sulfide diffuses from the so-called AOM-zone

upwards, as well as downwards to the depth where it gets together with dissolved iron, building a prominent sulfide front of iron monosulfides (Fig. 3).

M142, gravity corer GC-12, GeoB22619-2

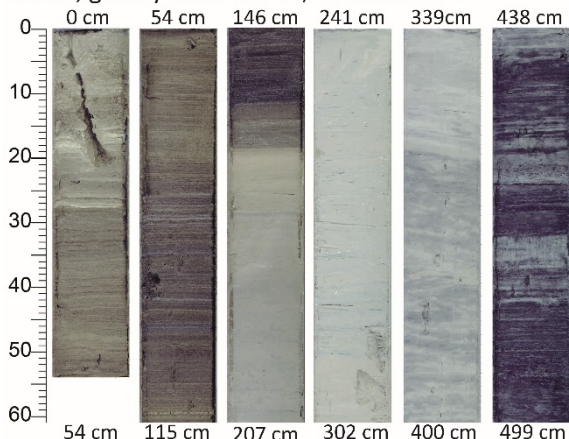


Fig 3: Youngest sediment sequence of Black Sea. Below coccolith ooze (0-27 cm) a laminated sapropel follows (28-165 cm), being underlayered by lake sediments with dark up to black iron sulfide coloring.

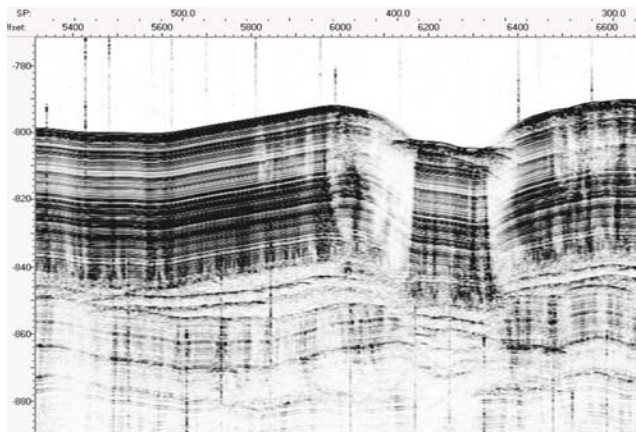


Fig 4: The newly installed PARASOUND-system MK2 shows a more than 80m sediment penetration depth in the Danube Fan. Here a graben structure with faults of up to 15m vertical offset.



Fig 5: On Sunday morning, 3 December, the drill rig was fit for work again after its repair, and was launched at absolutely calm sea. (© C. Rohleder).

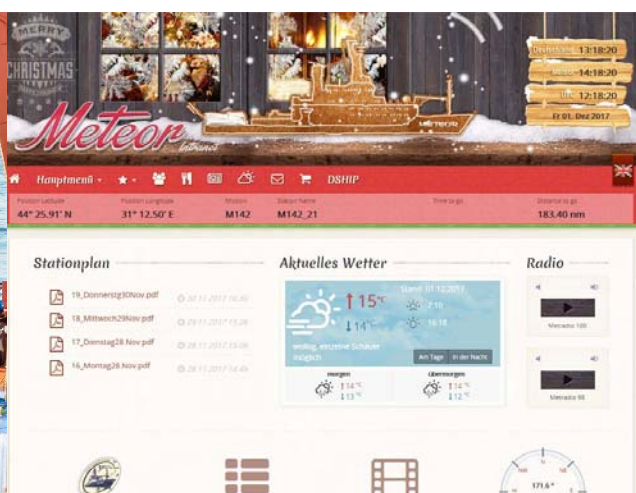


Fig 6: For the weekend of First Advent the Intranet page of METEOR got a festive Christmas outfit. Connoisseurs of METEOR will recognize her even in a gingerbread dress.

A further part of our ship time is used to do hydro-acoustic measurements with both echo-sounder EM122 and EM710, as well as the PARASOUND system. By this, we mainly could map quite exactly the mouth areas of the most important canyons in the transition area of the shelf edge to the continental slope. The relatively large-scale branched channel system at the sea floor suggests a more laminar dewatering of the shelf, which probably developed during glacial time while big parts of the shelf lay dry. Now our scientists are eagerly considering which scientific results could be achieved during the last week. It is very nice that the ship's crew does prepare us for Christmas time not only with a little something in the mess (Fig. 6).

The sea is absolutely calm, and also the sun showed several times today. We wish a wonderful first Advent to all relatives and friends at home.

Best regards from Black Sea,

for and on behalf of the participants, Gerhard Bohrmann, RV METEOR, Sunday, 3 December 2017