

Research Vessel METEOR

M214: 25.10. – 13.12.2025

Las Palmas – Malaga - Iraklion - Iraklion

7th Weekly Report: 01 - 07 Dec 2025



Since our originally approved area south of Crete, granted by the Greek authorities, could no longer be used for the last leg of the expedition due to the refugee crisis, we quickly applied for alternative locations in Italy and northwest of Crete in Greece. The particularly positive feedback from the very committed embassies in Rome and Athens at the beginning of the week gave us confidence that we would receive the diplomatic notes in the coming days. That would then allow us to resume our scientific work. We used the waiting time to refuel in Kali Limenes, a town on the south coast of Crete, a logistical task that was originally planned for the end of the cruise before entering Heraklion (Fig. 1) but could now be carried out earlier.



Fig. 1: This is our second time in Kali Limenes on the south coast of Crete. While the first time we came with rescued refugees, the second time we were refueling. (© Andreas Täuber).



Fig. 2: Due to its central location on the ship, the geology laboratory is an important place for the exchange of information, where the freshly recovered sediment cores are processed (© A. Täuber).

On Thursday afternoon, 4 December, the official permit letters from the authorities finally arrived, much to our relief. Surprisingly, the letters arrived at roughly the same time, even though they came from authorities in different countries. A huge thank you goes to the staff of both embassies and especially to the German Research Fleet Coordination Centre in Hamburg, which persistently addressed our problem of the missing research permit. We had prepared corresponding work programs for the METEOR in both regions and were able to begin our scientific activities immediately in the so-called "Cobblestone Area." First, a CTD profile was recorded across the water column to generate a current underwater acoustic model, which was then used to calibrate the acoustic measuring instruments. During the night from Thursday to Friday, several soundings were taken at the Prometheus mud volcano, in a basin at a depth of 3230 m, and at the Novorossiysk mud volcano to map the distribution of mud flows in the sediments and to collect the pore water from these sediments. On Friday, 5 December, the ROV Kiel 6000 was finally able to launch. We dove on the Helios mud volcano, which was surveyed in detail with the MARUM AUV SEAL 5000 during the SONNE expedition SO278 in 2020. The map served as the basis for the dive and already showed readily interpretable phenomena of mud volcanism. The volcanic structure, which rises about 100 m above the seabed at a water depth of 2,950 m, has a diameter of about 2 km at its base and a plateau of approximately 180 m in diameter at its top. The flattened top area of the mud volcano, the youngest mudflow, is clearly separated from the older mudflows by a 1 m drop in elevation. The homogeneous distribution and a channel approximately 10-15 m wide and up to 3 m deep, connected to the plateau's mud cake and extending to the base of the mud volcano on the south

side, indicate a formerly quite water-rich mudflow. Two similarly furrowed, older channels are morphologically formed on the southwest and southeast flanks. During the first dive, we were able to clearly distinguish the most recent mudflow from the older mudflows in the video footage based on its surface structure. There, a significantly more uneven surface with narrow ridges and interspersed elongated depressions with depth differences of 10-50 cm is evident, barely covered by younger hemipelagic sediments. This surface morphology appears to be a result of the mudflow, with the longitudinal structures of the ridges and interspersed depressions forming perpendicular to the flow direction. This was particularly evident during the dive in the south-facing gully, as the longitudinal structures are arranged parallel to the slope and the mudflow followed the gradient of the hillside. No immediate outflow area at the top of the mud volcano could be observed.



Fig. 3: When our largest and most complex equipment tool, the Kiel ROV 6000, is launched into the water or returns to the deck, all ROV pilots and the entire deck crew are in operation. (© Andreas Täuber).



Fig. 4: Images from the HD camera of ROV Kiel 6000 can be seen on the high-resolution screen in the METEOR's conference room, which attracts many scientists to follow the current dive. (© Andreas Täuber).

A temperature probe program, consisting of 15 measurements taken at various locations above the Helios mud volcano, was conducted during the night from Friday to Saturday. As expected, the results showed a higher heat flux in the center of the volcano than in the surrounding area. A highly interesting dive followed on Saturday, 6 December, guided by a complex backscatter pattern on the AUV map at the base of the Helios mud volcano. Right from the start, upon first seeing the bottom, numerous circular patches were observed, exhibiting dark gray discolorations at the edges and covered in the center by a snow-white bacterial mat. Sampling revealed a solid crust beneath the sediment, the presence of which can be explained by precipitation under the influence of rising fluids. Shimmering, denser water with schlieren formation was directly observed emerging from the surface. Such saline fluids were also observed elsewhere, where bacterial mats covered large areas (Fig. 4). To our great surprise, we then discovered a very shallow lake with a higher salt concentration on the seabed. It appeared only a few centimeters deep in the flat terrain, but was clearly distinguished by a low backscatter in the forward-looking sonar of the deep-sea robot. This discovery at the foot of the Helios mud volcano not only fascinated us all, but also raises many questions that we intend to answer through further dives. However, due to the weather, diving will not be possible again until Monday.

All participants are healthy, and we send our best wishes for the second Sunday of Advent on behalf of everyone.