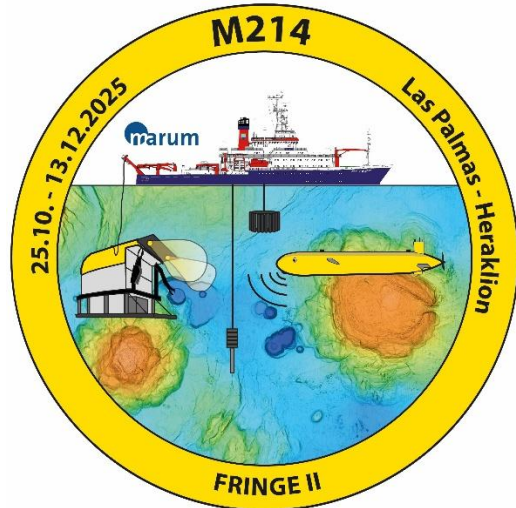


Research Vessel METEOR

M214: 25.10. – 13.12.2025

Las Palmas – Malaga - Iraklion - Iraklion

Fourth Weekly Report: 10 – 16 Nov 2025



At the start of week 4, on Monday, 10 November, we began sampling the Nice mud volcano and a small mud mound on its western side. This mound lies precisely on a north-south strike-slip fault, which we interpret on the bathymetric map as a displacement of morphological structures between the eastern and western blocks, extending for approximately 30 kilometers. On the micro-bathymetric map of the Nice mud volcano, this fault is marked by a thin fissure on the western edge of the map. The small mud mound lies exactly on this fissure, and sampling with the gravity corer yielded very dry mud, which explains why we only managed to extract a core sample of slightly over one meter. This strike-slip fault appears to be a tectonic feature of regional scale, as it is accompanied by several mud volcanoes along its north-south extent. The two largest mud volcanoes (Nice and Gelendzhik), whose mudflows cover the largest areas on the seabed, lie along this tectonic structure. Based on the multibeam echosounder backscatter map, the Nice mud volcano covers an area of approximately 4 x 5 km with mud breccia, while the Gelendzhik mud volcano covers an even larger area of approximately 9 x 9 km. Several morphological vent structures are present, so it can be considered a volcanic field. However, the size of the area is not the reason why we prioritized sampling the Gelendzhik mud volcano field. The reason is the presence of a fresh mudflow, which we discovered emanating from the summit of the northernmost vent in the Gelendzhik volcanic field (Fig. 1).

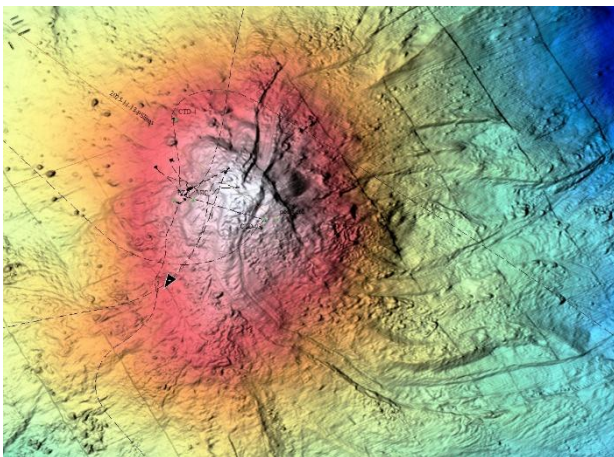


Figure 1: The micro-bathymetric map of the northern summit of the Gelendzhik mud volcano field shows, in addition to numerous mud flows, a relatively fresh mud flow from the top to the south, which is deflected eastward along the slope.



Figure 2: Nighttime deployment of the MARUM AUV using the METEOR's ship crane. The AUV remains in operation for up to twelve hours and is only recovered the following day. (© G. Bohrmann).

Previously, during the night, we conducted a survey drive to the north, primarily investigating a 3,500 m deep basin with three parallel parasound profiles. We were able to trace up to five characteristic horizons across the basin's sedimentary sequence, showing signs of mass waste deposits, the sedimentation of which is very likely related to earthquake events in the subduction zone. The uppermost of these redistribution layers, which appears to be approximately 10 m thick on average in the parasound, was thinned to a depth of up to 5 m at the basin's periphery. The following day, we attempted to penetrate the mass waste deposit

layer there using a gravity corer, hoping to determine the age of the redeposition and, consequently, the timing of the associated earthquake event through further laboratory analyses. Unfortunately, the corer only yielded a recovery of 4.22 m, preventing us from coring the underlying layer and thus rendering the investigation impossible. On Tuesday, 12 November, at 10:15 a.m. ship's time, we had to suspend sampling operations at the northern volcanic structure of the Gelendzhik field. A distress call came in over the radio: a "Mayday Relay" from Radio Olympia. A person overboard (MOB) was reported, and a search and rescue operation was initiated. The coordinates of the search and rescue area were transmitted, and the METEOR had to patrol the assigned area in parallel north-south stripes according to a predetermined search pattern. All of the ship's binoculars were deployed, and the water's surface was scanned in all directions from the ship. Scientific activities were suspended, and all scientists participated in the search from the bridge deck. It wasn't until 10:30 p.m. that we received instructions from the SAR coordination center to be relieved by the MV Evgenia and thus released from the SAR operation. After 12 hours and 35 minutes, we were able to return to our daily research routine and continue the interrupted sampling on the fresh mud flow of the Gelendzhik mud volcano.



Figure 3: With the support of the team, the scientists assemble the individual components for the in-situ piezometer on the eve of the mission. (© Gerhard Bohrmann).



Figure 4: We use the ship's CTD with water samplers almost daily. On our expedition, we primarily measure the methane dissolved in the water. (© Gerhard Bohrmann).

On Friday, 14 November, we deployed an in-situ probe equipped with a piezometer (Fig. 3) on the summit of the mud volcano. This probe responds to pressure and temperature changes and is designed to indicate mud volcano activity. The probe will be retrieved at the end of the next leg of the expedition with the Kiel ROV and will conduct measurements until then. Following a heat flow program, which occupied the remainder of the day, a seabed survey was carried out using the ship's sonar. On Saturday morning, core instruments were deployed, and the water column was sampled using the CTD/rosette. Initial analyses of the AUV measurements revealed several gas bubble vents in the water column, which are associated with higher concentrations of methane in the water samplers. Methane concentrations in ocean water are very low, with background values typically ranging from 1 to 4 nmol/L. Around the gas vents, the values increase significantly, and so far, we have detected concentrations up to 60 nmol/L. The AUV dive planned for the night at the Heraklion dive site had to be postponed to Sunday morning due to weather conditions, when the weather had calmed down again.

All participants are healthy!

Best regards also on behalf of the cruise participants,
Gerhard Bohrmann

R/V METEOR, Sunday 16 November, 2025

We are reporting on our expedition M214 in a weblog: <https://www.marum.de/Fringell.html>