Expedition M210 "Dive@MAR 2"

2. Weekly Report, 04.05.2025

The port tests of the new ROV QUEST 5000 on Sunday, April 27, revealed that modifications to the equally new launch frame would be more complex than initially anticipated. As a result, Monday began with a complete dismantling of the launch frame and ended with the successful port deployment of the ROV after a provisional reassembly in a new configuration.

Early Tuesday morning, RV METEOR had to reposition along the harbor pier in Ponta Delgada. Thanks to the excellent support of the ship's crew, we were able to adapt a block suspension on the A-frame to accommodate the launch frame. At 3:00 p.m., two days behind schedule, we set sail.

Due to the delay, we decided to carry out the necessary cable management at a station closer to our working area than originally planned. Although it would not allow to spool out the full 5000 m of cable in the 4000 m deep waters, the chosen site—about 110 nautical miles from Ponta Delgada and slightly off our direct route to Menez Gwen—offered sufficient depth for initial operations. Unfortunately, during the transit, wind speeds increased to 7–8 Bft with gusts up to 10 Bft, and wave heights of 5 meters made it impossible to conduct work at the stern. Nevertheless, we used the stop to perform a CTD cast, which will serve as a baseline for the upcoming hydrothermal station measurements.

Our westward course, contrary to the direction of the bad weather, and a gain of 12 additional hours worked in our favor. By Thursday morning, the weather had calmed down enough that we were able to un-turn the cable at a depth of 3,300 meters at a length that would be sufficient for our planned dives, and the seasick cruise participants gradually recovered.

On Friday morning, we reached Menez Gwen, a hydrothermal site located in relatively shallow waters at a depth of just 800 meters. This area is already well studied, not least due to earlier work by RV METEOR. We began with CTD operations until QUEST 5000 was ready for its maiden dive in the early afternoon. Thanks to our port preparations, the launch and descent went smoothly, and at around 3:10 p.m., QUEST 5000 made contact with the seafloor for the first time. We quickly located a small hill with active hot vents and a rich community of hydrothermal fauna. The entire dive was devoted to testing the ROV's systems and collecting our first seafloor samples. The site was labeled with a marker reading "AMEX ALF2"—a clear indication we were not the first to explore this location.

As expected, the ROV's initial deployment presented a few challenges for the pilots, but all were overcome with flying colors. Despite the dive's relatively short duration, we gathered an impressive array of samples. These included *Bathymodiolus* mussels—destined for aquarium experiments during the cruise—as well as hot and diffuse hydrothermal fluids, collected using various methods. Additional onboard sampling systems were also tested for future dives. All in all, the mission was a complete success.

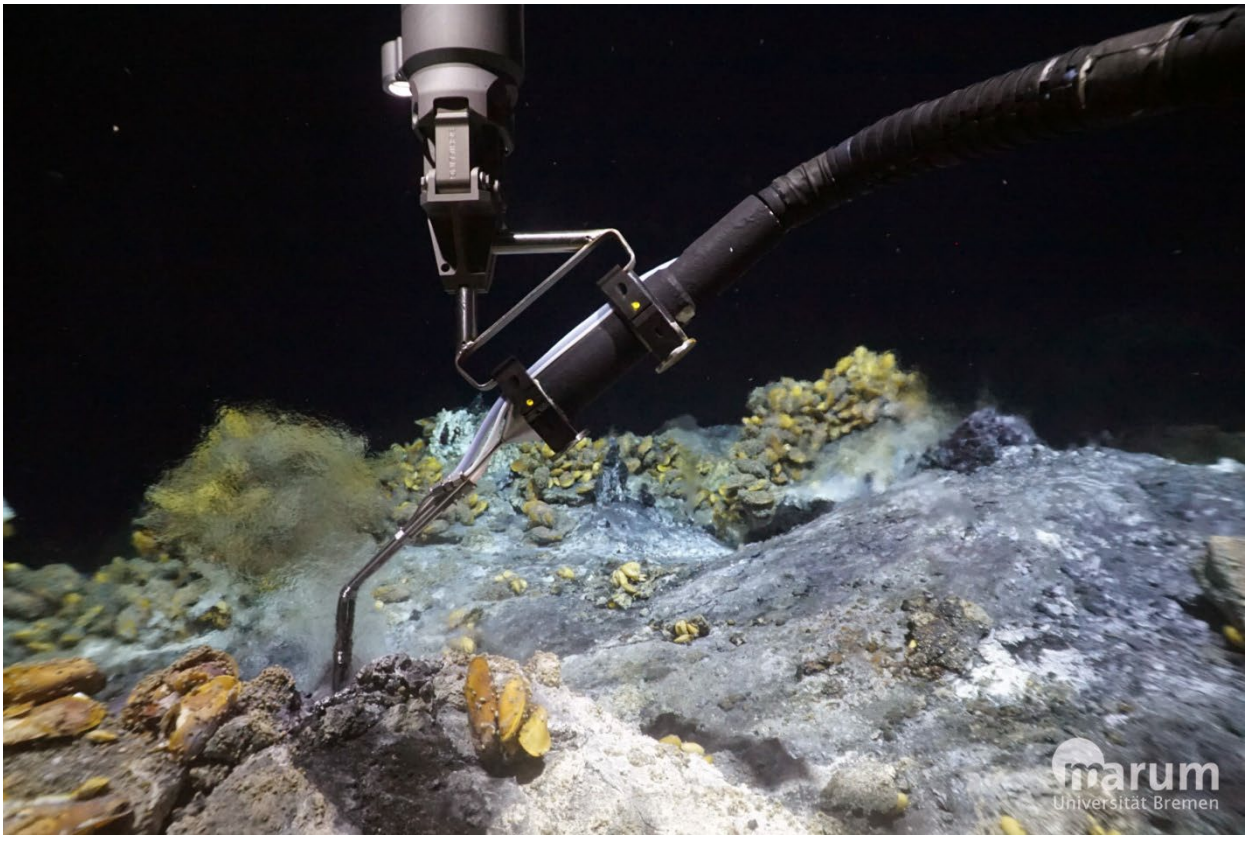

Figure 1 Fluid sampling above hydrothermal mussels in Menez Gwen using the KIPS sampling system installed in the ROV.

The setback occurred at the end of the dive during recovery: as the ROV was being lifted out of the water, the cable tore from its anchorage with a loud bang. Fortunately, QUEST 5000 had already locked into the launch frame and was brought on board undamaged in a coordinated effort between the ROV and ship crews. We are extremely relieved that no one was injured and that the vehicle sustained no further damage.

Before we can resume diving, the cable must be repaired—but more crucially, we must understand why it failed. The investigation is ongoing, and we are awaiting input from the manufacturers. While we are confident that we can repair the cable, without a clear explanation for the failure, we cannot risk continuing ROV operations.

In the meantime, we are focusing on CTD and mapping work. On Saturday, we began an extensive CTD transect across the ridge axis at the Rainbow hydrothermal field. Today, Sunday, we mapped the Saldanha hydrothermal mound using the EM122 multibeam echo sounder and are currently searching for hydrothermal plumes with CTD tow-yo operations.

Despite the setback, spirits remain high on board, and we are optimistic that a solution will be found soon.

Warm greetings from aboard,

On behalf of all cruise participants

Christian Borowski