

**RV METEOR**

# **Expedition M194 HEXPLORES**

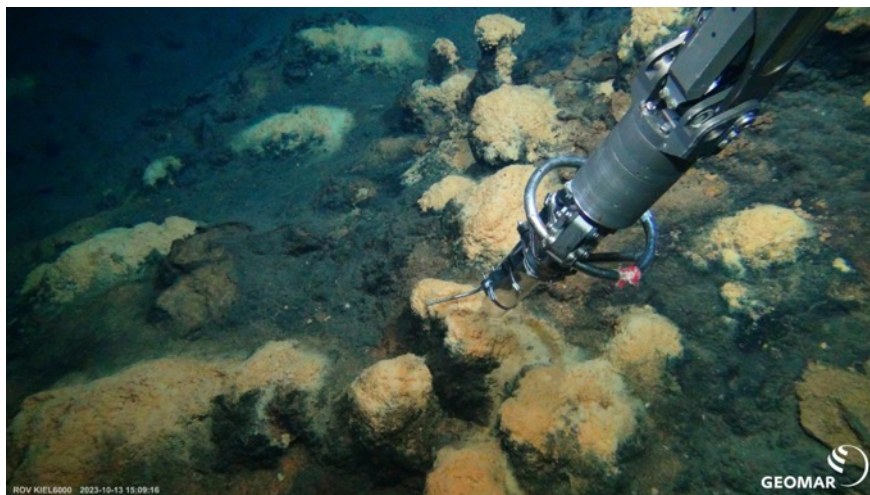
10.10. – 07.11.2023 | Jeddah, SA – Piraeus, GR



## **1. Weekly Report (09.10. – 15.10.2023)**

The main goal of expedition Meteor M194 HEXPLORES is to search for active high-temperature hydrothermal vents in the Red Sea rift and to study their geology and associated ecosystem.

After RV Meteor was visited by the Ambassador and the General Consul of Germany in Saudi Arabia and representatives of the Saudi Ministry of Foreign Affairs, King Abdullah University for Science and Technology (KAUST), Jeddah Port Authorities, and other Saudi entities on Sunday, 08 October, the majority of the scientific and ROV team embarked RV METEOR on Monday, 09 October around noon time. The group consists of 26 scientists and technicians from GEOMAR Kiel, KAUST, the British Antarctic Survey, University Macau, University of Ottawa, and the Saudi National Center for Wildlife (NCW), as well as an observer from GEOSA, the General Authority for Survey and Geospatial Information. While the ROV team was setting up the ROV Kiel 6000 system, the scientists moved the boxes and equipment shipped from Kiel and KAUST into their laboratories and started to set up the lab space for the upcoming geological, biological, and chemical analyses and experiments.



Sampling bacterial mats at Mabahiss Mons volcano with the suction sampler of ROV Kiel 6000.  
© GEMOAR Kiel

The setup of the labs continued on 10 October, and after a successful port test of the ROV system, we could leave Jeddah port on the same day at 04:45 PM. As the ROV team still needed some days to finish the preparations, we had some time before the first dive.

Therefore, before heading north to the first dive site, we took two gravity cores on the summit of the axial volcano Hatiba Mons in the early hours of 11 October. The first core recovered 3 m of layered iron oxides with a temperature of almost 40°C at

the bottom. The second core recovered less than 1m of iron oxides, slightly above the ambient seawater temperature of 23°C.

After these two stations, we headed northwards, east of Kebrit Deep, and did an OFOS video survey over a potentially volcanic areas, to confirm theories about ocean spreading in the Red Sea. Unfortunately, the winch failed shortly before the end of the station and repairs and recovering of the OFOS took until the late afternoon. We finished the day with a CTD cast in the Kebrit brine pool to sample the brine-seawater interface for microbiological studies.

The night from 12 to 13 October was used to transit to Mabahiss Mons Volcano and to perform CTD Tow-Yo's over its 2 km diameter caldera. The Tow-Yo revealed turbidity signals indicating a plume in the water column. The ROV was finally ready to dive into the Mabahiss Mons caldera on the morning of Friday the 13<sup>th</sup>... Due to problems with the USBL underwater navigation, it was difficult to navigate at the bottom of the Hatiba Mons caldera. Nevertheless, we managed to orient us roughly with the high-resolution AUV maps of the volcano, provided by KAUST. We observed abundant bacterial mats, and low temperature venting at some geologically young pillow lava domes. However, accurate navigation at the seafloor is essential for this expedition and for follow up research. Thus, we dedicated the entire night to 14 October to calibrate the ship's USBL system. For this, a transponder was lowered to the seabed, and the Meteor performed multiple defined maneuvers around its position to calibrate the system. The transponder was left at the seafloor, in case there was additional calibration needed.

After the calibration, we started another ROV dive in the Mabahiss Mons caldera but with similar USBL problems as the day before. However, we could locate diverse other sources of low temperature venting. Even though the majority of life seemed to be microbial, our zoologists were happy about the recovery of Polychaeta, Amphipoda, Isopoda, and other macrofauna partly directly associated with the bacterial mats.



Polychaete worm found within the hydrothermal microbial mats in the Mabahiss Mons caldera.

© Katrin Linse, BAS

During the dive, the technical support of Meteor installed a spare USBL antenna, which immediately improved our positioning at the seafloor. After the ROV was back on deck, we performed another round of calibration maneuvers around the transponder, which was left at the seafloor the night before, until 01:00 AM on Sunday. Since the transponder could not be recovered during nighttime, we did one more CTD Tow-Yo over the Mabahiss Caldera before the transponder recovery after sunrise. With the newly installed and calibrated antenna we are significantly slower, as we cannot exceed transit speeds of more than 8-9 knots, which we need to consider in the planning of the coming week. We are currently in transit to Hadarba Deep, a part of the Red Sea rift with recent volcanic activity, where we are planning the next ROV dive on the morning of Monday, 16 October.

All participants are doing well, and the atmosphere on board is excellent.

On behalf of all participants of M194, greetings from aboard the RV METEOR,



Chief Scientist