

## 1. Weekly Report MSM 132 MMC-1

2.12. - 8.12.2024

Expedition MSM132 is the first of three cruises of the collaborative project MultiMarex under the umbrella of the German Alliance of Marine Research D.A.M.'s mission MareExtreme. The aim of the project is to develop new monitoring technology towards an early warning system for natural hazards in the Aegean Sea. In the past, this region has experienced the most explosive volcanic eruptions that occurred in Europe in historical times, such as the Minoan eruption in 1600 BCE and the 1650 AD eruption of Kolumbo. It is also the most seismogenic region in southern Europe including the 1956 magnitude 7.7 earthquake of Amorgos. Both volcanic eruptions and earthquakes have caused tsunami waves in the past. MSM132 was supposed to set the scene by acquiring geophysical and video data to fill crucial gaps in the current understanding of the region and to provide a baseline for assessing geological change during the duration of the eight year-long D.A.M. mission.

The specific objectives of the expedition are to survey the Kolumbo volcano east of Santorini to investigate to what extent hydrothermal activity is altering the volcanic edifice and how this would affect its stability. Secondly, we investigate how the tectonic activity in the Santorini Amorgos Tectonic Zone influences the volcanism and vice versa. Particular attention was paid to the nature of the seismogenic Amorgos fault and the Kolumbo fault that dissects the edifice of Santorini. For this, it is crucial to tie the existing seismic data to the recently drilled boreholes of IODP expedition 398. The third objective is to determine a suitable target along the Amorgos fault for a geodesy deployment during the third MultiMarex cruise which is scheduled for December 2025. The fourth objective is to test two new pieces of scientific infrastructure: the MOLA landers and the MOMO video system. Finally, we attempted to retrieve two geodesy stations that were not retrieved off Mount Etna in Sicily during a previous campaign.

MARIA S. MERIAN left the port of Catania in Sicily at 0800 on December 3<sup>rd</sup> 2024 to start on its voyage MSM132. After only one hour we reached the first working area on the flanks of Mt. Etna where we attempted to recover two geodesy stations that had not surfaced during a recent deployment. After running a sound velocity profile and calibrating the Sonardyne USBL system we deployed a new video-guided launch system on the fibre optic cable. Immediately when reaching the seafloor, we found the first instrument in 1038 m water depth. It took about 30 min to navigate the recovery system right over it. When we were only about 1 m away the lights of the video system broke and the attempt had to be abandoned as the system was not repairable with the spare parts we had on board. In the evening, we set out on the 500 nm-long transit to Greece.



RV MARIA S.  
MERIAN in the port of  
Catania with Mt. Etna  
in the background.  
Foto: Andrea Geipel.

In the evening of December 5 we arrived in the study area off Santorini. After casting a sound velocity profile we calibrated the multi-beam echosounder and tested a new kind of ocean bottom lander system before deploying a combined pressure, temperature and seismic observatory in the crater of Kolumbo. Throughout the night we acquired multi-beam and Parasound data between Santorini, Ios, and Amorgos. OBS deployments were continued during the next day. Three OBS were deployed in Kolumbo crater away from the active hydrothermal vent fields and two more OBS NW and SE of the crater. Afterwards we tested the newly developed MOMO video sledge and carried out electronic tests of the MOLA landers.

After successful completion of the tests we moved to the second study area off the coast of Amorgos where we first deployed 2 OBS in the region of the planned 3D seismic block and then took a sound velocity profile. In the evening of the 8<sup>th</sup> we deployed the 2D seismic system which we have been using since to acquire reflection seismic lines starting from Amorgos and back to Santorini.

Weather conditions are reasonable and everybody on board is well and looking forward to the next week of the voyage.

Christian Berndt, Chief Scientist