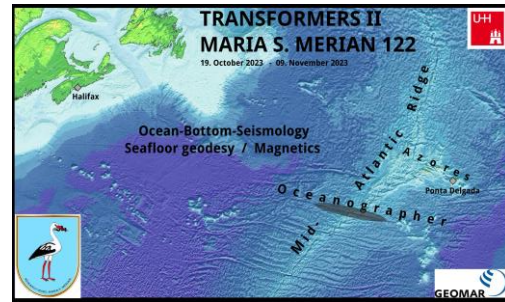


MARIA S. MERIAN 122

Ponta Delgada – Halifax

19 October to 9 November 2023

1. Weekly Report (19.10.- 22.10.2023)



The cruise MSM122 of the research vessel MARIA S. MERIAN studies in the framework of the *Transformers II* expedition the 120 km long Oceanographer transform fault to the south of the Azores archipelago near 35°N in the north Atlantic Ocean. Transform faults, mid-ocean ridges and subduction zones build the foundation of plate tectonics. Within this framework, mid-ocean ridges define constructive plate boundaries, where new seafloor is created, while at subduction zones, called destructive plate boundaries, tectonic plates are recycled into the mantle; transform faults define the third type of plate boundary, where two plates slide past each other without forming or consuming lithosphere. Any of the three types of plate boundary is the focus of tectonic and seismic activity.

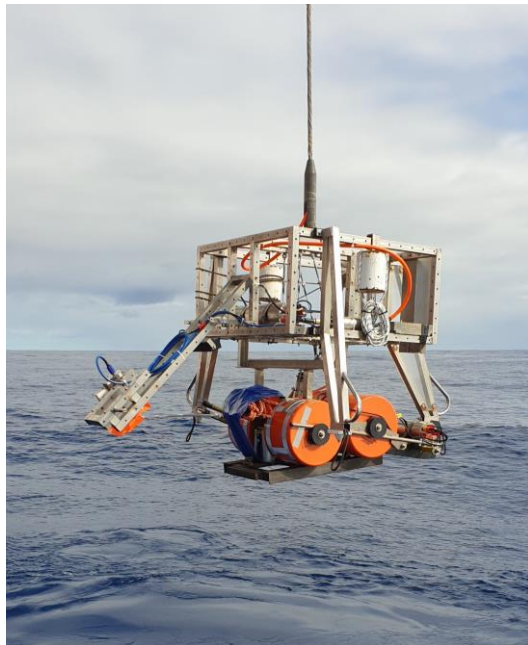


Deployment of the first OBS during the Expedition MSM122 (Photo: B. Bauer)

Recent research, however, suggests that oceanic transform faults – in contrast to transform faults on land – cannot be defined as conservative plate boundaries, but are rather highly dynamic features, nurturing extension and hence crustal and lithospheric stretching below the surface trace of the transform fault. Further, the thinned transform crust is augmented by a second stage of magmatism as it passes the opposing ridge-transform intersection. These hypotheses will be investigated during MSM122 along the Oceanographer transform fault. During the first week, we already deployed 15 short-period ocean-bottom-seismometers (OBS) and 6 broadband OBS to study local micro-earthquakes as well as distant teleseismic events. The seismic network will operate for the next 12 months, to be recovered in the fall of 2024. Data will be used to reveal tectonic stresses acting on the transform fault and to reveal the structure of the fault zone. In the second week of the expedition, geodetic stations will be deployed to measure active fault

slip. Furthermore, bathymetric and magnetic data will be acquired to yield evidence for magmatic and tectonic processes shaping both the active transform and the inactive fracture zones.

The equipment for the expedition – especially the large number of ocean-bottom-seismometers –



Video-controlled deployment frame for OBS

was already assembled on Tuesday and Wednesday in the Port of Ponta Delgada. On Thursday 19th of October 2023, we left the port. The scientific party continued preparing the equipment during transit into the working area. Unfortunately, rather rough weather conditions restricted us to prepare equipment in the hangar of the vessel, while OBS situated on the main deck could not be handled. However, two casts were done to test the release systems of all ocean-bottom gear at 1000 m water depth. On Saturday, the weather situation improved and equipment was made ready for deployment. In the night from Saturday to Sunday we started the deployment of the first station and on Sunday evening the last of OBS we deployed ~9:30 p.m. UTC. Two stations, including the last OBS, were deployed using a video-controlled system to position OBS precisely on the seabed on flat and hence perfect sites.

The expedition MSM122 is supported by the German Science Foundation (DFG) and the GEOMAR Helmholtz Centre for Ocean Research in Kiel. The deployment of broadband OBS is funded through the recently established EU Advance Grant project ERC-Transformers-101096190.

In the name of all cruise participants, best regards from 35°10'N / 34°50'W,

Ingo Grevemeyer

GEOMAR Helmholtz Centre for Ocean Research Kiel