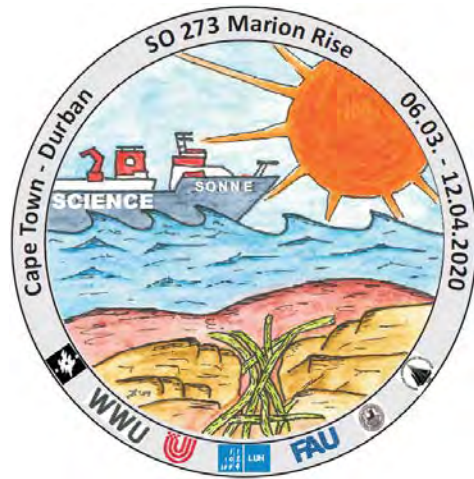


Expedition SO273 – MARION RISE

Cape Town - Durban

Weekly Report No. 2

9. – 15. March 2020



In the last week we successfully performed different investigations in the western part of the southern working area, with a designated focus on the hill slopes adjacent to the axial rift valley. According to our current working hypothesis, large parts of the crust adjacent to the axial valleys at these ultraslow spreading ridges, such as the Southwest Indian Ridge (SWIR), consist of material from the Earth's mantle. One major aim of the MARIO RISE project is to recover these so-called peridotites from the ocean floor. On-shore mineralogical and chemical analysis of these samples will be used to determine the driving forces for the relatively shallower bathymetry of the SWIR close to Marion island, forming the "Marion rise", a plateau which is ~1000 km in diameter. Is it a mantle plume beneath the SWIR or a mantle density anomaly formed during the breakup of the giant continent Gondwana? We will apply mineralogical and geochemical and isotope geochemical methods to the recovered rocks in order to distinguish between these environments.

Mapping program: The transit between the different sampling stations was used to map the ocean floor (bathymetry using multibeam, geomagnetics, gravity). The bathymetric data are processed directly on board so that usable maps are available 12 hours after data acquisition. All scientists on board are delighted about the excellent quality of the maps, which allows to identify even small structures of the sea floor. These allow a detailed structural and lithological interpretation of the seafloor. The high quality of these maps is evident by comparing the new map with older maps available from the same area.

Hard rock sampling using dredges: So far, we recovered 9 dredges which were containing mostly of volcanic samples (basalts, diabases) and a single dredge also contained mantle peridotites.

Dives with the ROV "Quest": We successfully performed two dives using the ROV (Remotely Operated Vehicle) "Quest" from MARUM in Bremen. These dives were aimed to characterize the seafloor in terms of geology and lithology and taking representative samples, preferentially samples which are still within in the original outcrop orientation, in order to characterize the structural relation of the survey area. The first dive investigated an area dominated by basaltic flows, showing structures typical for the eruption of a lava with basaltic compositions in a submarine environment, where the surface is quenched to pillow like structures (pillow basalt). The second dive explored a slope which was covered by carbonate ooze in which we found samples from the volcanic and plutonic oceanic crust.

During the dive, the marine fauna living in these extreme environments (water temperature around 2°C, complete dark, high pressure) provided some mutual entertainment. Among the animals we were able to identify were fish, sea cucumbers, crabs, sea spiders and star fishes. The dives have been successfully broadcasted via internet in HD quality: off-shore scientists were involved in the dives, and a stream was made available for the community via youtube (link: <https://www.youtube.com/user/marumTV>).



Pilar Valseira-Moreno (WWU Münster), Marcel Hanisch (FAU Erlangen), Daniele Brunelli (University Modena), Marie Klose (Leibniz University Hannover, from left to right) during the characterization and description of the basalts (photo. J. Koepke).



The ROV "Quest" from the MARUM in Bremen shortly before diving. A flog of curious albatrosses that have been following us since our departure from Cape Town are highly interested in the launching process. One brave albatross is trying to get a taste of our ROV (photo J. Koepke).

All on board are healthy and are following the situation at home subject of our daily conversation.

From the Southern Indian Ocean, 15. March 2020, 44° 18.3' S / 38° 15.2' E we wish everyone at home all the best.

Jürgen Koepke, chief scientist

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<https://www.geo.uni-hannover.de/de/expedition-marion/>