FS SONNE

Expedition SO307: MADAGASCAR, MADAGASCAR-BIO & INDICOM

12.09. – 28.10.2024, Durban – Durban

2. Weekly Report (16.09 – 22.09.2024)

On Sunday, September 15, we reached the main working area, the Madagascar Ridge. This meant that the geology team, which had not yet conducted any sampling during the transit, was able to start their work. The first goal was to obtain rocks from the deep base of the escarpment on the western edge of the Madagascar Ridge, from the presumably oldest phase of its formation. Unfortunately, the slopes encountered were not very steep and therefore probably not free of sediments, so that the first dredge hauls were not successful. But the third dredge haul, placed a little further up the slope, yielded a volcanic rock, the first sample ever recovered from the Madgascar Ridge basement.

During the course of this week more dredge operations were carried out on the wide-spread summit plateau of the Madagascar Ridge (Fig. 1). Sampling at two neighboring seamounts that tower in the center of the northern plateau was especially successful. These seamounts are reminiscent of so called guyots due to their characteristic shape (steep slopes and relatively flat summits). Guyots are formed when former volcanic islands, or peaks of seamounts, that rise up into the surf zone eventually lose their tops due to the effects of wave erosion. All seamounts gradually sink over time to ever greater water depths, due to the slow subsidence of the oceanic crust, and only the flat erosion platform of the guyots bears witness to their former existence as islands. This phenomenon was first described by marine geologist Harry Hess (1906-1969), who named these mountains Guyots because their flattened shape resembled the building of his geological institute in Princeton (USA), the “Guyot Hall”, which in turn was named after a French geographer. The two Guyots in the center of the northern Madagascar Ridge both have plateaus about 30-40 km wide, but each has a conical peak in the southeast, which could indicate a late submarine phase of volcanism, built up after the summit plateaus had already sunk well below sea level (and thus escaped the erosive effect of the surf).

Fig.1: Successful chain bag dredge haul (Photo: J.G.)

Several dredge hauls yielded well-preserved volcanic rocks (as well as carbonates and manganese crusts) that were determined to come from different magma types (Fig. 2 a, b). As “by-catch”, we also recovered a rare predatory sea anemone (Fig. 2c), a genus whose existence in the southern Indian Ocean was previously unknown. In the vicinity of the Guyots, but still on the summit plateau of the Madagascar Ridge, a CTD and a multicorer deployment were successfully carried out to obtain sediment from relatively shallow water depths (<2200 m). Towards the end of this overall successful week, we set course to the northeast, to try again, to obtain rock samples from the lower slope and thus presumably the oldest phase of volcanism, but this time on the eastern flank of the Madagascar Ridge.

Fig. 2 a): Basaltic volcanic rock with bubble voids, which were filled with light-colored mineral phases long after the lava had cooled. Such bubbles were caused by gas (mainly water vapor and CO_2) escaping from the still molten magma during ascent and eruption.

Fig. 2b): Dense basaltic volcanic rock (without bubbles) with relatively well-preserved grayish groundmass and numerous small olivine crystals (now reddish oxidized). This sample is well- suitable for a variety of geochemical analytical methods that will be applied postcruise.

Fig. 2c) Deepsea sea anemone (about 10 cm in diameter when contracted), which belongs to the genus Phelliactis. Compared to other sea anemone species, this one resembles a Venus flytrap when stretched out, which can probably also actively grab its prey.

Best wishes to all those who stayed at home,

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