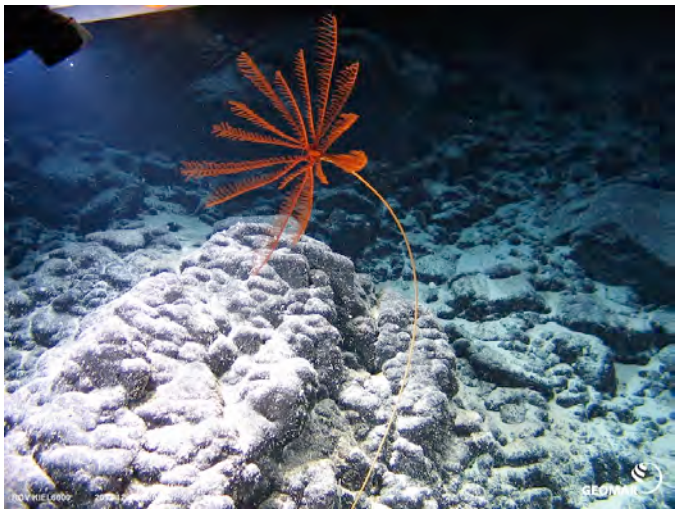
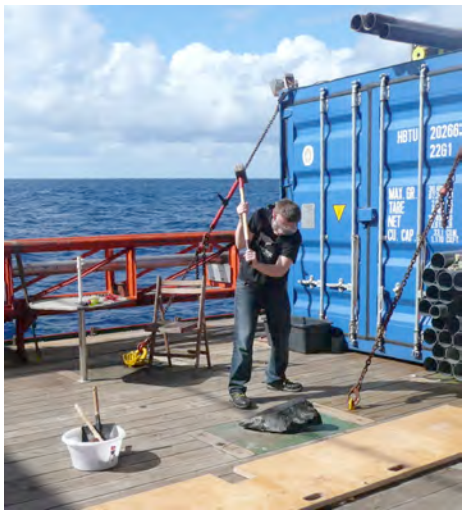
SO224+225 MANIHIKI II 09.10.2012 06.01.2013 AWI / GEOMAR	**SO225** **MANIHIKI II** **Weekly Report No. 3** **(03.12. – 09.12.2012)**	 **R/V SONNE** 03°00,26´S / 165°07,1´W

In the 3rd week R/V SONNE expedition SO225 focused on the northernmost part of the Manihiki Plateau, the so-called "North Plateau", and the ocean floor between Manihiki and the equator. On Monday and Tuesday, two dives with the ROV Kiel 6000 have been conducted in order to sample a c. 3 km long profile reaching from 4,605 m up to 3,260 m water depth across the flank of the south-eastern foothills of the North Plateau. The major objective of ROV sampling on SO225 is to sample stratigraphically controlled the real plateau basement. Previous investigations, however, revealed that large areas of the plateau are overprinted by younger volcanism. We selected the location at the North Plateau for sampling because rock samples dredged in the top region of this site on the former cruise SO193 yielded ages of 125 Ma and therefore fall into the age range assumed for the plateau basement.



Crinoidae on chaotic, pillow-like lava in 3.376 m water depth at a steep slope in the south-eastern part of the North Plateau.



Some ROV samples are too big and must be crushed with a sledge-hammer prior to further processing (photo N. Furchheim).

The pictures from these slope provided by the ROV show a rough, chaotic landscape dominated by steep slopes, small sediment-covered terraces, canyons, and ridge-like structures. Large parts of the slope are covered with rock debris including up to several meter-sized blocs. In between the debris bizarre rock formations are frequently exposed and consist of pillow lava, breccias, and massive rocks. As for the Danger Island Troughs, the abundance of debris, faults, and overall morphology of the slope also indicate for this area intense tectonic movements after formation of the plateau basement. Based on our observations we assume, that relocation of rocks by slope failures continues up to date. Altogether 28 rock samples have been taken by the ROV during the two dives. They mainly consist of fine-grained, relatively fresh volcanics, which are interpreted as dikes in the lower part of the profile. In the same region, sampling yielded coarse crystalline gabbros. Gabbros form when magma resides in the crust and slowly cools until complete crystallization. These rocks are considered to be important witnesses of former magma reservoirs. By laboratory studies at home, we hope to get detailed information on the compositional and age relation between the plutonic rocks and the lavas of the Manihiki Plateau. Interestingly, the ROV collected lava with fresh pyroxene phenocrysts from the upper part of the profile which indicate a higher degree of differentiation for the eruption products of this magma complex. Some rocks show a weak metamorphic overprinting,

which becomes apparent by a slightly greenish color (chloritization) and numerous veins along cracks. Thus the rocks show clear evidence for fluid transport within the plateau crust accompanied by tectonic overprinting as already indicated by the field observations with the ROV.

The remaining week was under the lead of the Paleoceanography working group. A coring station on the southeastern part of the North Plateau was the beginning of a series of 4 coring sites along a N-S-trending transect, which ended ca. 330 km south of the equator. Our accompanying CTD-measurements indicated that we gradually came under the influence of the equatorial currents, namely the South Equatorial Current and Countercurrent. Accordingly, the dominant sediment type changed from pure foraminiferal sands, which were difficult to recover, to more clayey and silty foraminiferal oozes. The larger portions of calcareous phytoplankton in the sediments point to a clearly higher primary productivity in the equatorial region, also reflected in a relatively lively sea fauna with calamari, fish, and birds. The recovery of the unique sediment material will definitely allow us to reconstruct the variability of the upper ocean over geological timescales, mainly due to the fact that the preservation of calcitic microfossil shells, which serve as biotic carriers for our geochemical proxies, is excellent down to even great water depths. Surprisingly, our TV-multi corer provided images of sediment ripples at c. 2 km water depth, pointing to highly dynamic deep water masses.

First investigations of a sediment core using a color scanner (photo GEOMAR).

Deployment of the multi net at night (photo D. Nürnberg).

In the night from Saturday to Sunday we deployed the multi net for the first time on this expedition which can sample plankton from varying water depths and should serve for proxy calibration studies. The multi net has been lowered 7 times up to 500 m water depth and sampled, besides larger organisms like Copepoda, large amounts of plankton from the water column of the nutritious, equatorial water masses. In the early afternoon of Sunday, the studies in the north of the Manihiki Plateaus were completed with a final piston corer deployment and R/V Sonne headed back to the south where we plan to conduct further coring and ROV sampling during next week.

As during the past week the temperature has been very high, but the heavy rain showers occurred more rarely in the north. In the meantime a table tennis tournament has been initiated in which 18 scientists and crew members take part and hope to reach at least the finals. All participants send greetings from the Southwest Pacific to everyone at home.

Reinhard Werner