

	<p style="text-align: center;"><b>SO225</b> <b>MANIHIKI II</b></p> <p style="text-align: center;"><b>Weekly Report No. 5</b> <b>(17.12. – 23.12.2012)</b></p>	 <p style="text-align: center;"><b>R/V SONNE</b> 11°03,1'S / 161°31,9'W</p>
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Sampling the flanks of the Danger Island Troughs by dredging was the focus of our work during the 5<sup>th</sup> week of R/V SONNE expedition SO225 to the Manihiki Plateau. The Danger Islands Troughs are elongated, deep basins, which represent large fault systems bifurcating the plateau into the Western Plateaus, to the west, and the High Plateau, to the east. Their flanks as well as the northern margin of the High Plateau expose the interior of the Manihiki Plateau which is not accessible elsewhere. First, however, we finished sampling along the northern margin of the High Plateau. Two dredge hauls at a ridge-like feature at the foot of the northern flank and at its base recovered partly olivine bearing sheet and pillow lavas as well as a large fragment of a pillow breccia.

Afterwards R/V Sonne sailed to the northern end of the Danger Island Troughs. On Tuesday, December 18th, the deepest dredge haul of this cruise has been carried out at a small ridge located in the center of the northernmost basin in more than 5.800 m water depth. The dredge returned altered lava fragments and lithified sediments. Two dredges conducted in an adjacent trough yielded similar results, confirming our earlier impression from cruise SO193 in 2007, that lithified sediments dominate the upper rock layers in the entire northern part of the Danger Island Troughs. Therefore we decided to continue further south, where a SO193 dredge haul yielded particularly interesting, c. 120 m.y. old rocks of the plateau basement and where a seismic profile conducted on the previous cruise SO224 showed exposed plateau basement.



*The geological lab full of rocks....*



*Cut sample of an only slightly altered lava.*

Here, we conducted 11 dredge hauls in 4.800 to 3.000 m water depth between the early morning of Wednesday and Friday evening. Here, a structure of most likely tectonic origin, characterized by several terraces along its southwestern slope, has been studied particularly intense, through systematic sampling of the cliffs below each terrace. The dredges returned various lavas, a broad variety of volcanoclastic rocks and also some intrusives. Some lava fragments appeared oxidized, which may indicate eruptions under subaerial conditions. A special highlight, however, was the recovery of considerable amounts of fresh volcanic glass from the base of this feature. Volcanic glass forms by rapid cooling of lava for example when hot lava comes in contact with water. Such unaltered glasses is of particular interest to study the original composition of melts. Volcanic glasses, however, is not stable and alters over the course of time; initially to palagonite and finally to clay. This process can significantly accelerate when glass is exposed to sea water. The recovery of fresh glass from a presumably c. 120 million years old flood basalt province is therefore something special and a great achievement which

will enable detailed petrological and geochemical studies of the plateau forming melts.

Some 15 nm further north, two dredge tracks not only recovered lava and sediments, but also metamorphically overprinted rocks (greenschists). Most notably is the spinifex-texture of the lava, named after a sharp Australian grass species that describes the needle-like growth of pyroxene and olvine crystals. The very beautiful spinifex-texture forms by rapid crystallization of very hot, mostly ultramafic melts, pointing to unusual high magma temperatures during the formation of Manihiki Plateau.

Finally, we dredged samples from the western and eastern flanks of Danger Island Troughs, at the intersection with detailed seismic profiles of SO224. On the western slope, sheet and pillow lava dominate, partly also with spinifex-texture. The eastern slope mainly exhibited lithified sediments and manganese crusts. Complementing mapping of the ocean floor and sediment echo sounding, a total of 17 dredges have been carried out during the first five days of this week. Of these, 12 dredges recovered magmatic rocks, 7 volcanoclastic rocks, and 6 lithified sediments.

At the very end of the week, the paleoceanography group started again, carrying out 2 coring stations on the High Plateau. Site selection was based on seismic profiles from SO224, which showed sediment deposits characterized by hundreds of meters in thickness. Unfortunately, sediment recovery was not as easy as thought, with many coring failures and loss of equipment probably due to the hard and lithified sediment even at very shallow core depths. After many attempts at extremely hot conditions on the working deck, the paleoceanographers were finally paid off with a high quality sediment record.



*Merry Christmas from the SO225 scientists. The picture was taken in the geology laboratory of R/V SONNE, as it started raining just prior to the shooting.*

On December 21, we celebrated that earth did not tumble down as predicted by the Mayan calendar, together with the birthday of a colleague in the seismic laboratory. On Christmas Eve, the scientific program of SO225 will be continued with dredging and mapping at Suvorov Trough in the southern part of Manihiki Plateau. In the evening, we will celebrate Christmas jointly in the mess, and with a ceremonial lunch on the first Christmas day. All SO225 participants send cordial greeting from the SW Pacific: Merry Christmas to all of you.

Reinhard Werner