SO265

SHATSKY EVOLUTION

Weekly report No. 3

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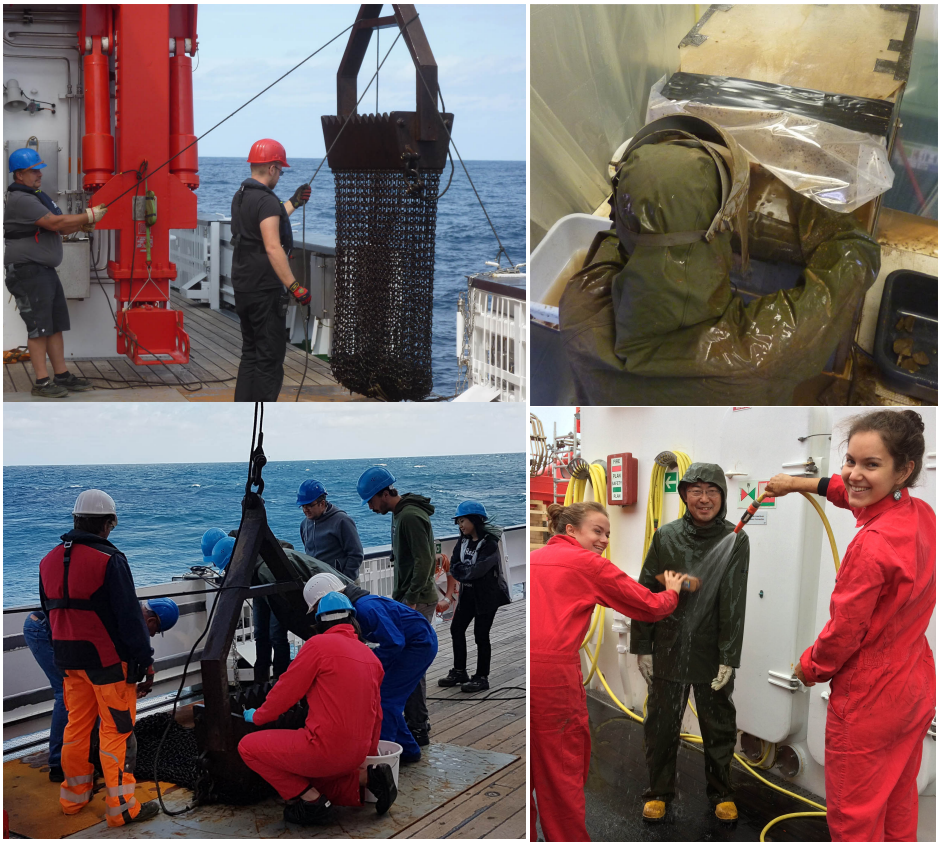
R.V. Sonne

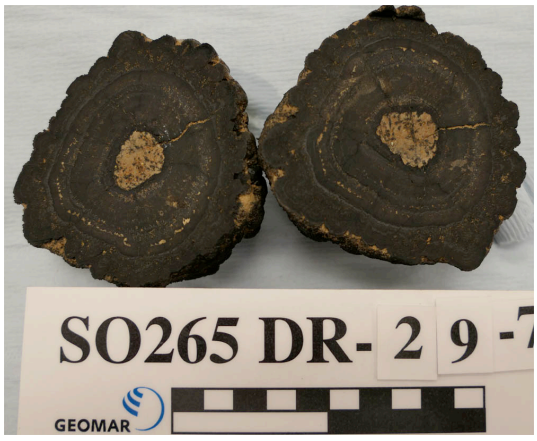
At the beginning of the third week the operations on the northern edge of Papanin Ridge initially continued as planned. Sampling this upper area is of great importance to us because the ridge is proposed to have no longer formed at a spreading axis, but originated by true intraplate volcanism (i.e. volcanism away from plate boundaries). Accordingly, we expect that the lavas obtained from this area possess a different geochemical composition (compared to the southern part of Papanin Ridge).



Upper left: The dredge is hauled on board (Photo: J. Geldmacher). Lower left: Always much excitement! (Photo: F. Hampel) Upper right: Cutting rocks is a messy job! (Photo: J. Geldmacher). Lower right: Cleanup of protective clothing with scientist Takashi Sano inside! (Photo: M.L. Tejada).

How do we get the rock samples from water depths of often more than 5000 meters? We use heavy chain bag dredges. These are basically large metal baskets with an open bottom and a chain bag attached. The dredge is slowly dragged over the sea floor (like a trawl net) and collects/ rips off stones from the ground. Since the Shatsky Rise was formed 120 to 140 million years ago, all its flat surfaces or gently inclined slopes have progressively been covered by up to several hundred meters of pelagic sediment. Only at the steep slopes of seamounts or rampant flanks of deep sea canyons will our dredge actually have a chance to encounter a rocky outcrop. And that's where the knowledge on bathymetry comes into play (see last report)! Since most parts of our working area have never been visited (and mapped) by a research vessel before, we usually need to first pass over the potential sampling side, to check if the slopes are auspiciously steep enough for dredging.

Every time a dredge is hauled on board, at least the 5-6 scientists from the shift on duty and the expedition leadership flock to the working deck and peer over the railing, full of anticipation. It almost feels like Christmas Eve with the joyous expectation of presents. Unfortunately, a tightly filled chain bag does not always guarantee a yield of desired items (another analogy to receiving Christmas presents!) Upon closer examination, it sometimes turns out that the apparent rocks are actually manganese crusts or manganese nodules instead. These are precipitations of metal oxides (mainly iron and manganese compounds) from seawater, which contain economically valuable trace metals like cobalt, cupper or nickel and the so-called "rare earth" elements. Whereas manganese crusts precipitate extremely slowly on outcropping rock surfaces, grow the potato-sized manganese nodules (also slowly) in concentric rings around a nucleus of any solid material. Large parts of the deep ocean floor are densely covered with such nodules. Since the 1970s, the idea of mining these nodules for their metals occasionally pops up. At a very small scale we are now doing this (unintentionally) with some of our dredge hauls.



Cut manganese nodule with a nucleus made of an indurated sediment clast showing concentric growth rings. As meanwhile known, these rings grow extremely slow reaching just 2 to 10 mm in 1 million years!

Sometimes, we are at first disappointed about the seemingly exclusive haul of manganese nodules, but there is a second chance: Occasionally nodules enclose clasts of the desired volcanic rocks, which were broken off from volcanoes slopes a long time ago. Therefore, we cut all manganese nodules in half to check the nature of their nucleus. Sometimes the giving of presents is just belated...

During the middle of the week, we had to avoid an approaching storm. After the ship's command and the expedition leadership consultation with the meteorologist from the National Meteorological Service (DWD), who is joining this expedition, the decision was made to northwardly sidestep the storm and to safely return on its backside into the working area. This plan worked out well. By Saturday morning we found ourselves dredging again on the northern edge of Papanin Ridge in nice weather conditions. The little excursion to the north, furthermore, enabled us to map and sample the hitherto totally uninvestigated Hokkaido Trough, a 1000 km long canyon that likely represents an abandoned spreading ridge. The recovered rock samples will allow us to determine the age of this structure and thus to better constrain the plate tectonic history of this little investigated part of the Pacific ocean.

All cruise participants are doing well and send greetings to everybody at home.

Jörg Geldmacher and the scientific party of SO265