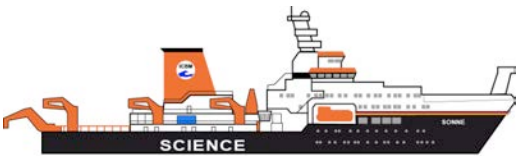
SO-255

Vitiaz

5. Weekly Report

(27.03. – 02.04.2017)



R/V SONNE

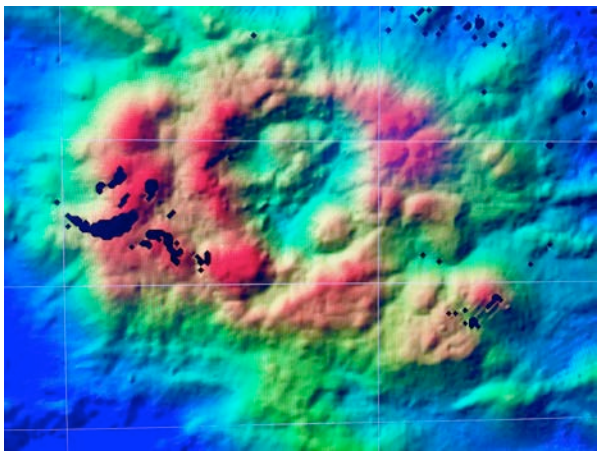
32°47´ S / 179°30´ W

During the first part of this week (Monday through Friday), we sampled volcanic structures within the Havre Trough between 29–31°S latitudes. All of the sampling was carried out in the eastern half of the Havre Trough due to the western half consisting primarily of large sediment-filled basins and smooth basement morphology. In contrast the eastern half of the Havre Trough contained abundant small cones and ridge-like structures, as well as some grabens with steep walls, that were successfully sampled by dredging. The most spectacular discovery of the week is what appears to be a volcanic structure (possibly dome field) with a caldera >2 km in diamater in the middle of it (see photo). The caldera has resurgent domes in it, formed after collapse of the caldera floor. The caldera is located about 50 km behind the Macauley Volcano, which also has a large caldera and is located at the Kermadec volcanic front. Although calderas are common on the volcanic front in this region, none have been previously discovered this far in the backarc. The Giggenbach volcanic field, consisting of a half dozen large volcanic cones that we sampled two weeks ago, lies between Macauley and the dome field with caldera. The dome field is located at the intersection of NE-SW and ESE-WNW trending ridges, presumably formed through magma rising up along faults in the backarc basement. Two dredges were carried out on the inside caldera walls and two on domes outside the caldera. Most samples were dacitic to rhyolitic but some samples from outside the caldera appear to be andesitic. Thereafter we sampled NW and NE of the Havre Volcano, which erupted in 2012 forming pumice rafts that reached Australia and Tasmania one to two years later. We were surprised despite our proximity to Havre Volcano that many of the dredges didn't contain any of the Havre pumice, despite the pumic raft having passed over these structures. On Saturday we began dredging on the Kermadec Ridge (between 31-33°S), in order to get older samples predating the splitting of the Vitiaz Arc into the Kermadec and Colville Ridges. We recovered a mix of volcaniclastic rocks and fresh lavas with varying amounts of plagioclase, clinpyroxene and olivine phenocrysts. A small cone on the western side of the Kermadec Ridge produced ankaramitic lavas with up to centimeter-sized chrome diopside crystals, similar to a cone near Kibbelwhite Volcano sampled during the first week of the cruise. Thus far 82.8% of the dredge hauls on this cruise were successful.

In order to calibrate the SIMRAD multi-beam system used for mapping the seafloor to find appropriate sampling sites for dredging, CTD (conductivity-temperature-depth) acoustic profiles were made through the water column. Biological oceanographers are studying samples taken with the CTD to study degradation processes in the deep sea to depths of 4000m. Bacteria, which play a key role in the marine carbon cycle, degrade the majority of the organic carbon that is photosynthetically fixed by microalgae in the surface ocean. However, a certain fraction of the organic matter is refractory in the deep sea. In order to understand why bacteria do not degrade these compounds, the biologists are running lab experiments and sampling the water column to determine the concentration and composition of the organic matter controlling the bacterial degradation processes. On board, the deep sea water is incubated under various test conditions for 30 days in bottles and sampled at regular intervals. The collected samples will then be analysed for bacterial growth, carbohydrates, amino acids, gel particles and other biogeochemical parameters in the laboratories at GEOMAR.

Although the weather this week reminded us of northern Germany (overcast and rainy) and the seas were somewhat choppy, the sun came out again and the seas calmed to provide us with a beautiful Sunday! All on board are doing well, although somewhat exhausted – the price of the successful dredging this week.

Kaj Hoernle and the SO255 scientific crew



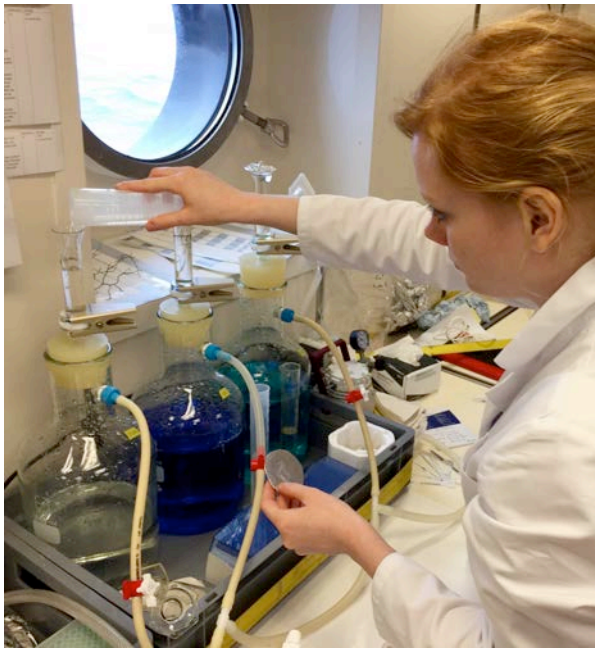
Volcanic structure with 2km diameter caldera in the middle and younger resurgent domes in the caldera. Both inner and outer walls of the caldera were successfully dredged.

A dredge from the Kermadec Ridge with large blocks of volcaniclastic rocks: the beginning of a long night.

The blocks were so large that it was difficult to pry them out of the chain sack. Scientists patiently wait in the background to get to the rocks.

After more than 20 minutes, just one last boulder to pry loose.

Playing with fire on a rocking ship: Biologist sealing glass tube containing seawater sample.



Brewing up some magic potions? No, bacteria from seawater samples were being dyed and filtered.