Research Vessel SONNE   Voyage SO246   Project CHATHAM RISE

Weekly Letter No. 3 of 21 Feb 2016

This week, we utilised almost all equipment and instruments we have on board for our work. For recovery of all 40 ocean-bottom seismometers (OBS) of the first long profile, we released the systems from their anchor at the seafloor via an acoustic signal. At large water-depth of around 5000 m, it takes about 70-80 minutes to float back to the sea-surface. It is always a moment full of tension until an OBS returns back to the surface with a flashlight and radio beacon signal to be found in the ship's greater perimeter. A first glance at the recorded data shows that we collected useful data from the deep Earth's crust with most of the OBS systems. The full content and detailed information of the seismic data will be revealed during analyses later in the institute.

The heat-flow probe with its high-precision temperature sensors is being brought to the seafloor to measure the temperature gradient in the sediments.

The marine mammal observer team of *Gardline Environmental Ltd.* is searching across the ocean for whales, dolphins and seals (Photo: R. Price).

We spent some more time on some stations during OBS collection so that Ricarda could deploy the heat-flow probe. This instrument actually consists only of a 5 m long massive steel rod, which is being pushed into the seafloor by its heavy top weight. The rod is, however, equipped with a series of high-precision temperature sensors. Pushed into the seafloor sediments, they measure the temperature in various depths over several minutes so that the geothermal heat flow can be derived when the instrument is back on board. Our hope is that these measurements may give us more information on any younger volcanic activities of the Chatham Rise. Unfortunately, the sediments turned out to be too hard or too consolidated on many stations so that the probe could not penetrate into the seafloor. We will try again at other sites.

A frightening monster-like beast, the steel dredge lies on the deck and waits for its deployment. Its 'mouth' consists of a toothed steel frame to which a bag made of chain pieces is attached. A long steel cable carries the dredge to the seafloor, where its cable is laid out over hundreds of meters before the dredge is towed across the seafloor by being pulled via the ship's winch. With this method, hard rocks such as volcanic basalts can be collected very effectively along the flanks of seamounts or other steeply inclined features of the seafloor. Rocks from 8 seamounts have been sampled by Reinhard and his group so far, with some sites being more than 4000 m deep. In this quite successful program, the boxes are being quickly filled with valuable samples. But before being stored away for thorough analysis, the rock samples are carefully cleaned and cut by a heavy-duty rock saw for classification and documentation. A particular focus lies on samples that have not much been altered over the millions of years since they were formed. Such samples are ideal for geochemical analysis and possible radiometric age dating after arriving in the home institute's laboratories. But they can already be prepared on the ship for later analysis. The chemical composition of the rocks and their age will lead to knowledge on the magmatic processes that formed the seamounts and the seafloor structures in the area of the Chatham Rise. This will be a step further towards reconstructing the evolution of the Chatham Rise, which is the overarching goal of this research project.

It is fascinating to see how a highly detailed seafloor map is generated by our multi-beam echosounder while we cross these seamounts. Largely of volcanic origin, every one of these seamounts has a different appearance and structure; often seen with a top plateau (guyot), sometimes with well-formed crater rims. We want to give names to those unnamed seamounts we map for the first time, so that they can be referred to in the cruise report and later in publications. Our marine mammal observer Maryjane, who is a Maori from New Zealand, will write a list of names in Maori language with a story behind that will be well suited to the shape of these seamounts.

Mirja working the rock saw. Every rock contains a surprise.

Steffen looks enthusiastically at his rock sample.

After being spoiled by pleasant weather in the last few weeks, sea strength was finally put to test in the second half of this week. A storm crossed our region and forced us to interrupt a seismic profile and to wait for weather improvement. The ship behaves absolutely great in heavy seas, so that all coped well with the storm. After the storm, we began with a new seismic refraction profile with the deployment of 35 OBS instruments ….

With best wishes from all

Karsten Gohl (with contribution by Reinhard Werner)