SO277 (GPF 19-2_012)

2. Weekly report, 17.-23.8.2020

The second week of SO277 consisted entirely of transit from Emden to the study area. We passed through the North Sea, the English Channel, the Bay of Biscay, along the Spanish and Portuguese coasts through the Strait of Gibraltar and then on an easterly course through the Mediterranean, first through the Sea of Alboran and then along the Algerian and Tunisian coasts before entering the Tyrrhenian Sea. We managed to slip through the Bay of Biscay just before the arrival of bad weather and ultimately gained more than a day because of the speedy voyage.

Last night (Saturday) we stopped for a first time north of Sicily to conduct a releaser test for the various autonomous seafloor instruments (OBS, OBEM, geodesy stations) to make sure the releaser will set the instruments free after data acquisition. These tests were successfully completed this morning and we continued through the Aeolian Islands towards the Strait of Messina which we will pass tonight.

All the instruments have been set up and everybody on board is eager to start the work program tomorrow when we will reach our first study area off Mount Etna on Sicily’s east coast. The work in this study area will contribute to the MAPACT project which is run by Morelia Urlaub. The aim of this project is to understand the movements of the flank of Europe’s largest volcano Mount Etna. It has been known for a long time that the flank of the volcano is moving as evident by cracks in roads and houses and large faults that criss-cross the flank. For a long time it was believed that these movements are the result of inflation of the volcano’s magma chamber before eruptions and deflations in their wake. More recently, however, scientists have realized that the movements are at least partly due to gravitational forces that let the flank slip slowly into the ocean. Our previous studies in the Caribbean, Hawaii and Papua New Guinea have shown that this is typical for volcanoes prior to major collapse events. For example, Ritter Island in the Bismarck Sea experienced several thousand years of slow deformation before its volcano suddenly collapsed within one day and caused a major tsunami that affected the entire region. Such sector collapses are the largest sudden mass movements on Earth and they can have devastating effects when they occur as shown by the collapse of the Island of Fogo in the Cape Verde Islands which caused a tsunami with a run-up height of more than 160 m on the neighbouring island of Santiago about 75,000 years ago.

As Etna is located in a populated area with the city of Catania right on its southern slopes it is important to understand how the slow slip that can be observed now will evolve in the future in order to take precautions and hopefully to enable forecasting of a sudden flank collapse. For this reason Italian civil protection authorities and the international scientific community have installed GPS networks on the subaerial flank of the volcano. It turned out, however, that it is not possible to parameterize numerical simulations sufficiently well to make predictions without additional data for the flank movement below the ocean. It is the goal of our cruise to deploy seafloor geodesy stations to fill this data gap.

We will use six seafloor transponders that measure the distance between each other every 120 minutes for the next three years. We will install them on both sides of a major bounding fault that separates the sliding flank of Etna from the stable seafloor further south. There they will measure the distance between each other and in this way the deformation of the slope can be calculated.

On board everybody is well and we are looking forward to begin with the scientific programme.

On behalf of all on board,

Christian Berndt

Chief scientist

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