FS METEOR

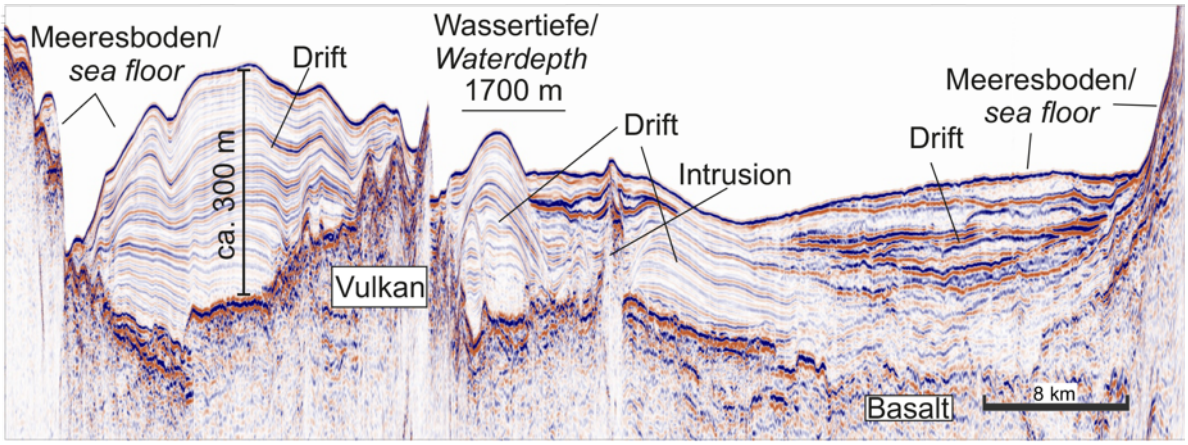
Expedition M201 VebVolc

09.06. – 18.07.2024 | Reykjavik – Praia da Vitoria

2. Weekly Report (10. - 17. June 2024)

The week began with the seismic profile that was started in the late afternoon of Sunday, 09 June. Together with the multi-channel seismics, we collected magnetic data, Parasound sub-bottom profiles, and multibeam echosounder data to achieve a comprehensive dataset from diverse instruments along the same profile. The profile was designed to give us a first impression of the large-scale geology in the area and lead us over prominent structures on the Icelandic shelf, the Reykjanes Ridge (which is the current spreading center between the American and Eurasian plates), westwards into the Vesturdjup Basin – our main working area. The profile was 348 nautical miles (645 km) long, and we arrived at the final waypoint on Wednesday afternoon, June 12.

The seismic data are processed on board directly by the geophysics team. Thus, we can view and discuss the amazing new seismograms daily, e.g., large sediment drifts between the volcanoes caused by strong, deep water bottom currents, which explain the somewhat chaotic bathymetry in some parts of the basin.



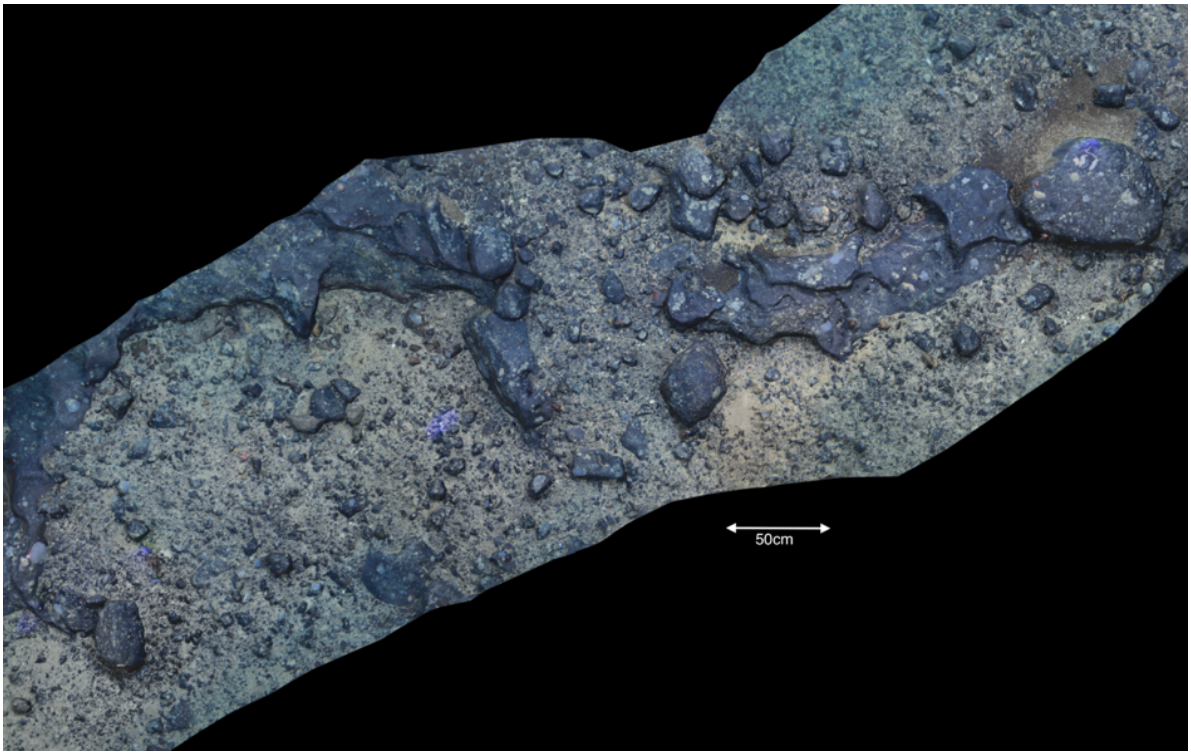
An approximately 65 km long cross-sectional image of the seabed and underlying layers of the earth, a so-called seismogram, was created using the reflection seismic method. The complicated topography of the seabed and geological structures down to about 300 m below can be seen. Above the basaltic crust are undulating deposits known as "drifts". The undulating patterns are formed when oceanic currents flowing along the seabed are deflected by uplifts, in this case, volcanoes formed on the earth's crust. This is comparable to snow drifts or sand dunes, for example, even if these landforms are naturally smaller. © Marine Geophysics Team, University Hamburg

Because RV METEOR came to Iceland from scheduled dry dock maintenance in Emden, Germany, it was planned to recalibrate the echosounder systems during the transit to Iceland before our expedition. However, strong winds and rough seas

prohibited this calibration. Therefore, we dedicated some time from Wednesday afternoon until Thursday morning to collect a suitable dataset for calibrating the deep water echosounder. The water depths in our working area do not allow for the calibration of the shallow water echosounder, which will be done later.

Following the successful calibration of the multibeam echosounder, we deployed a seafloor observations camera system (OFOS) to capture the first seafloor images. The camera system performed flawlessly, revealing outcropping volcanic rocks, relatively coarse sediments, and a rich diversity of deep-sea creatures, including fish, corals, sponges, and anemones.

After three OFOS deployments at different volcanic structures, we conducted short dredge tows on the same targets to recover rock samples. While all dredge tows yielded a good number of samples, we were surprised by the number of drop-stones, mainly rocks from Greenland transported by icebergs, which we had underestimated a bit. We collected many rocks that weren't from the old mid-ocean ridge, but still, some good basalt samples were among the foreign rocks and will provide valuable geochemical information about the history of the southern Vesturdjup basin.



The 3D reconstruction from OFOS images shows a layer of volcanic rocks within coarse sediment and talus material. The mosaic covers about 2 x 7 meters. © M201 Geology Team, Image: O. Eisermann

Left: The seafloor imaging system (OFOS) is launched for its first dive. Right: Happy faces of the geology team about the first rock samples © N. Augustin

Two gravity core stations were planned in the same area in addition to the rock sampling to sample the near-surface sediments. Due to relatively coarse, uppermost sediment, we only recovered about 1.3 m of sediment core, but this gives us the first insight into the shallowest subsurface structures.

The seafloor observation and sampling program ended in the early morning hours of Saturday, 15 June. Before we started the next seismic survey, a calibration of the USBL underwater navigation system was needed. This included dropping off a transponder to the seafloor and some maneuvering patterns of the ship, and it was finished by the afternoon.

Since then, we have been on our second seismic survey, which will last about five days. It is likely the longest seismic profile that will cover the volcanic cones in the central Vesturdjup basin and end in the northern end of the basin.

All participants are doing well, and the atmosphere on board is excellent.

On behalf of the M201 science party, greetings from aboard the RV METEOR,

Nico Augustin

Chief Scientist