FS SONNE

Expedition SO320/2: Hess Evolution

19.06. – 03.08.2026, Honolulu (USA) – Vancouver (Canada)

3. Weekly Report (29.06 – 05.07.2026)

Since last weekend, we have been working our way further and further west along the steep southern slope of the vast Hess Rise plateau, and on Monday July 29, we also crossed the imaginary International Date Line. Our days and nights are spent alternating between mapping and sampling with the chain-bag dredge. Since a large part of Hess Rise has not yet been mapped by a research vessel, we first have to create our own maps of these areas, which we then use to identify suitable locations for dredging using specialized visualization software (Fig. 1).

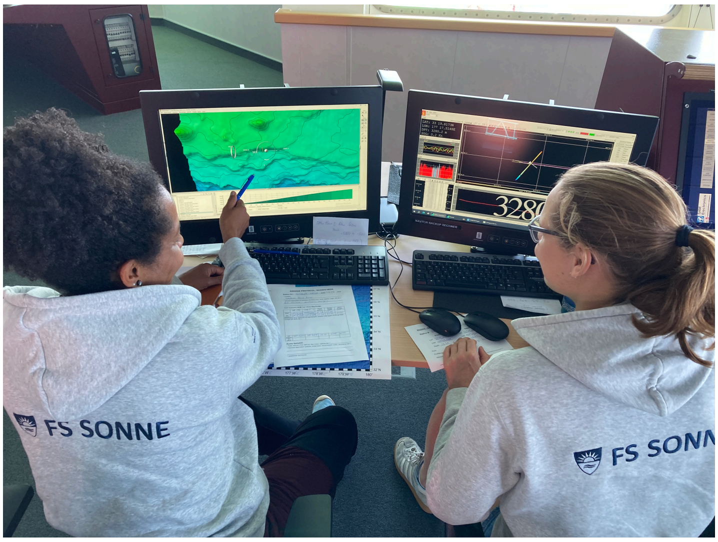

Fig. 1: SO320/2 researchers selecting suitable sampling locations using the Kongsberg SIS (right screen) and QPS Fledermaus (left screen) visualization software.

We obtain initial information about the highs and lows of the seafloor—and thus know which general direction to head—from publicly available satellite altimetry data (www.gebco.net). Satellites obtain this data by measuring the sea surface height with great precision. If there is an underwater mountain beneath a given measurement point, the local gravitational pull is increased there, causing the surrounding water to be drawn towards it and form a small hill on the sea surface. Although this hill is too shallow to be noticed from a ship, it can be measured by a satellite. Computer programs then use this data to calculate the topography of the seafloor (in the marine context, this is referred to as “bathymetry”). However, bathymetric maps based on satellite altimetry have very low resolution, and features smaller than 10 kilometers in diameter and less than 1,000 meters in height are too small to be reliably displayed (Fig. 2).

To supplement the missing details, we therefore use the multibeam echo sounder installed beneath the ship. This fan-beam echo sounder emits sound waves that are reflected off the seafloor. By measuring the time it takes for the sound waves to return—and since we have precisely determined the speed of sound in the local water column (see the second weekly report on the CTD)—the depth can be calculated exactly. Unlike a conventional echo sounder (sonar), it does not just detect a single point directly below the ship, but rather scans the seafloor over a wide field of view of 130°, thereby generating a broad swath to generate a two-dimensional map (with contour lines) in real time. Depending on the water depth, we can achieve horizontal resolutions of about 100 m. This means that we can now detect features that are 10 to 100 times smaller than those shown in satellite altimetry images (see Fig. 2).

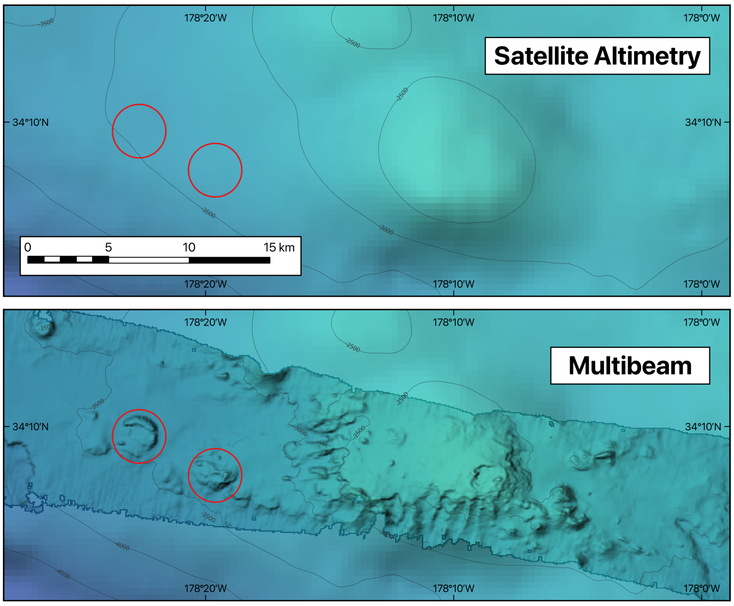

Fig. 2: The top map is based on solely on satellite altimetry data (www.gebco.net). A small bathymetric heigh can be seen in the center-right. The bottom map shows the same area mapped with the multibeam sonar (Kongsberg EM122). The feature can now be clearly identified as a volcano with a small summit crater. In addition, two smaller cones to the left (circled in red) are now showing up, which were not visible at all in the satellite altimetry. The feature is located in the eastern Hess Rise at 3,000 m water depth (map created with QGIS).

Sampling along the southern slope of the Hess Plateau has been quite successful so far: Of the 31 dredge hauls conducted here to date at water depths of up to 4,600 m, 71% have yielded volcanic rock, some of which is very well preserved. On the last night of the week, we were finally able to also retrieve good samples from the deep toe of the slope at a depth of 5,000 meters.

Greetings on behalf of all cruise participants from FS SONNE,

Jörg Geldmacher
(GEOMAR Helmholtz Centre for Ocean Research Kiel)