FS SONNE

Expedition SO320/2: Hess Evolution

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

4. Weekly Report (06.07 – 12.07.2026)

Last weekend, work on the southern and western edges of the main plateau of Hess Rise was completed. On our way to northern Hess Rise, we conducted several more dredging stations in a cluster of scattered seamounts. Five of the six dredge hauls were successful, some yielding large quantities of well-preserved igneous rock.

For rock sampling, we use “chain-bag dredges” (Fig. 1). These are large metal boxes with a chain chain-bag attached to the bottom, which are slowly dragged across a steep volcanic slope to collect rocks (similar to a bottom trawl net). It is only on such steep structures that the bedrock is accessible and not covered by thick layers of sediment. Since a large part of our study area has not yet been mapped by other research vessels, we must first use the multibeam echo sounder (see Weekly Report 2) to create a map of the seafloor topography in order to locate such steep slopes.

Fig. 1: A chain-bag dredge is being pulled back onto the deck of R/V SONNE (Photo: H. von Drenkmann)

When the dredge is hauled back on board, at least five scientists from the current shift, along with the expedition leader, wait eagerly by the ship’s edge to see as soon as possible whether the dredging operation was successful (Fig. 2a). Other scientists and some crew members watch from the upper decks when the dredge is being brought in. Unfortunately, a full chain bag does not always mean that the desired booty has been retrieved. Upon closer inspection, the black “stones” of different sizes often turn out to be manganese nodules or manganese crusts. These are precipitates of metal oxides from seawater (primarily iron and manganese compounds), but they also contain valuable trace metals (such as cobalt, copper, and nickel) as well as the so-called “rare earth” elements. Even the volcanic rock samples we seek are almost always covered by manganese crusts ranging from millimeters to centimeters in thickness. Therefore, one of the first steps in our work flow is to cut open all the finds with a rock saw (Fig. 2b). The rocks are then washed, sorted, and documented (Fig. 3). Samples suitable for further analysis at our home institutions are prepared on board already (thin sections billets for rock microscopy, hand specimens for geochemical analysis).

Fig. 2a (left): Collecting the recovered booty from the dredge during the night shift. 2b (center): A researcher sawing rock samples. 2c (right): Sawed slices of pillow lava (DR33). Visible are the elongated bubble cavities —some filled with white material, others open (black)— that form when gases dissolved in the magma rise outward (upward) before the lava finally solidifies. The chilled margin forms a black-and-orange rim (composed partly of fresh and weathered volcanic glass) (Photos: J.G.).

Fig. 3: Sorting the samples that have already been cut. The manganese crust, which is in some places more than 1 cm thick, is clearly visible (Photo: M. Portnyagin).

As expected, most of the recovered rocks are basaltic lavas. Basalt is the most common volcanic rock in the ocean and also forms the oceanic crust. We often recover fragments of “pillow lava”—rounded structures that form when lava erupts underwater. In addition to their shape, they can be recognized by a thin cooling crust, radially striking fissures, and elongated bubble channels (Fig. 2c). Due to the rapid cooling of the molten lava, volcanic glass forms at the interface with seawater, as the rock does not have enough time to grow ordered crystals. Sometimes such glass remains preserved for millions of years and is then highly sought after, as it is suitable for a wide range of geochemical analyses.

Greetings on behalf of all cruise participants from FS SONNE,

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