Research Cruise SO 313 with RV SONNE

Louisville Ridge

At See 32°10’ S, 171°52’ W

2. Weekly Report (09.06. – 15.06.2025)

The second week of research cruise SO 313 began with a 24-hours multibeam echosounder (EM122) survey of the northern seamount 420, which has a base area of approx. 60 x 60 km and rises approx. 3800 m above the surrounding deep-sea plain. In 24 hours we were able to map about half of this guyot-type seamount, the second half will be mapped at a later stage of this research cruise. The preliminary bathymetric map is mainly used to position a 2500 m long mooring on the western slope of the seamount, which is equipped with current meters and ADCPs. In combination with further L-ADCP/CTD stations, the current regime on the western flank of the seamount will be investigated. A multinet was deployed to a water depth of 4610 metres in the vicinity of seamount 420.

After deploying and triangulating the mooring, RV SONNE began the 24-hours transit to the southern seamount of the working area, the so-called Burton Seamount. At first a CTD station was deployed there on 11 June, followed by an 8-hours EM122 mapping of the seamount. With a base diameter of approx. 35 km, this seamount is significantly smaller than the northern seamount 420, but still has impressive dimensions and, like the latter, rises almost 4000 m from the surrounding deep-sea plain. A first result of the mapping with EM 122 is the occurrence of numerous larger and smaller erosion structures on the seamount slopes, which lead to a strong dissection of the slopes. Blocks up to kilometres in size that have slipped downhill bear witness to the fact that these erosion processes continue to today (see Figure 1). Contrary to previous assumptions, the Burton Seamount is also a guyot, whose summit plateau at a water depth of 1400 - 1500 m covers an area of approx. 19 km².

On 12 June, the BGR bathymetry sled HOMESIDE was used to map an approximately 700 m wide strip across the northern slope and the summit plateau in high resolution (2m) in order to investigate the relationship between the occurrence of ferromanganese crusts and the slope characteristics. Numerous interesting structures were discovered on the seabed such as erosion channels that are around 10 metres deep and several hundred metres long, or structures on the summit plateau that are several hundred metres in diameter and up to 50 metres high, which are reminiscent of limestone reefs. A video profile was then realized on the HOMESIDE track using the BGR ROTV STROMER. In addition to the video and photo cameras, this ROTV records side-scan sonar (approx. 70 m to both sides) and sensor data and can take two near-bottom water samples. An important result of the video station is that the summit plateau, at least in the areas investigated, has no sediments whatsoever, but is completely covered by ferromanganese crusts over its entire area.

Between the HOMESIDE and STROMER stations, a CTD station was realized on 12 June down to a water depth of approx. 4500 m north-east of the Burton Seamount, as well as a multi-net station at the same position. The stations were successful and various water depths could be sampled, including the low-oxygen Pacific Deep Water.

The 22 km long STROMER track was interrupted on 13 June for the deployment of the second mooring. Similar to the northern seamount 420, the current field around the summit of Burton

Seamount should be investigated based on the mooring data and numerous L-ADCP/CTD stations. Initial data from the L-ADCP measurements indicate currents of up to 20 cm/s in the summit area of Burton Seamount. Such strong currents could prevent the deposition of pelagic sediments,

Due to the lack of sediments, an Epibenthic sled cannot be used in the summit area. A Seamount sled specially designed for benthic sampling in rough seafloor conditions was therefore used to sample the benthic communities. After a first attempt was unsuccessful, various animals such as sponges, brittle stars, sea urchins, corals and shrimps were sampled during the second deployment on 14 June (Figure 2). In addition, numerous dead corals were recovered that were coated with ferromanganese oxides. Thus, they may have been dead for some time (several thousand years?). The occurrence of numerous dead corals coated with ferromanganese oxides is also known from other seamounts of the Louisville Ridge.

On 14 June, the TV grab was used for the first time of this cruise to sample ferromanganese crusts on the summit plateau of Burton Seamount. Up to 4 cm thick, layered crusts were recovered. The seamount sled was also used to sample massive crusts from the transition from the summit plateau to the northern slope.

During the night of 14-15 June, several CTDs were conducted to collect physico-chemical data for hydrographic modelling at Burton Seamount. Included in this programme was the deployment of the trace metal CTD to sample the water column over the summit plateau and southwest slope for trace metal analysis.

An Epibenthos sled is currently running on the northern slope of Burton Seamount. Further sampling with the TV grab and the TV multicorer as well as further CTD stations are planned for the next few days before we return to the northern working area.

The weather in the wintery south-west Pacific has played along well so far. Unavoidable low-pressure systems usually move quickly through the working area and our on-board meteorologist warns us in good time before they occur, so we have been able to adjust our work programme to these situations well so far.

All participants of the SO313 are doing well. Co-operation with the ship's crew is excellent.

Best regards,

Thomas Kuhn (Chief Scientist)

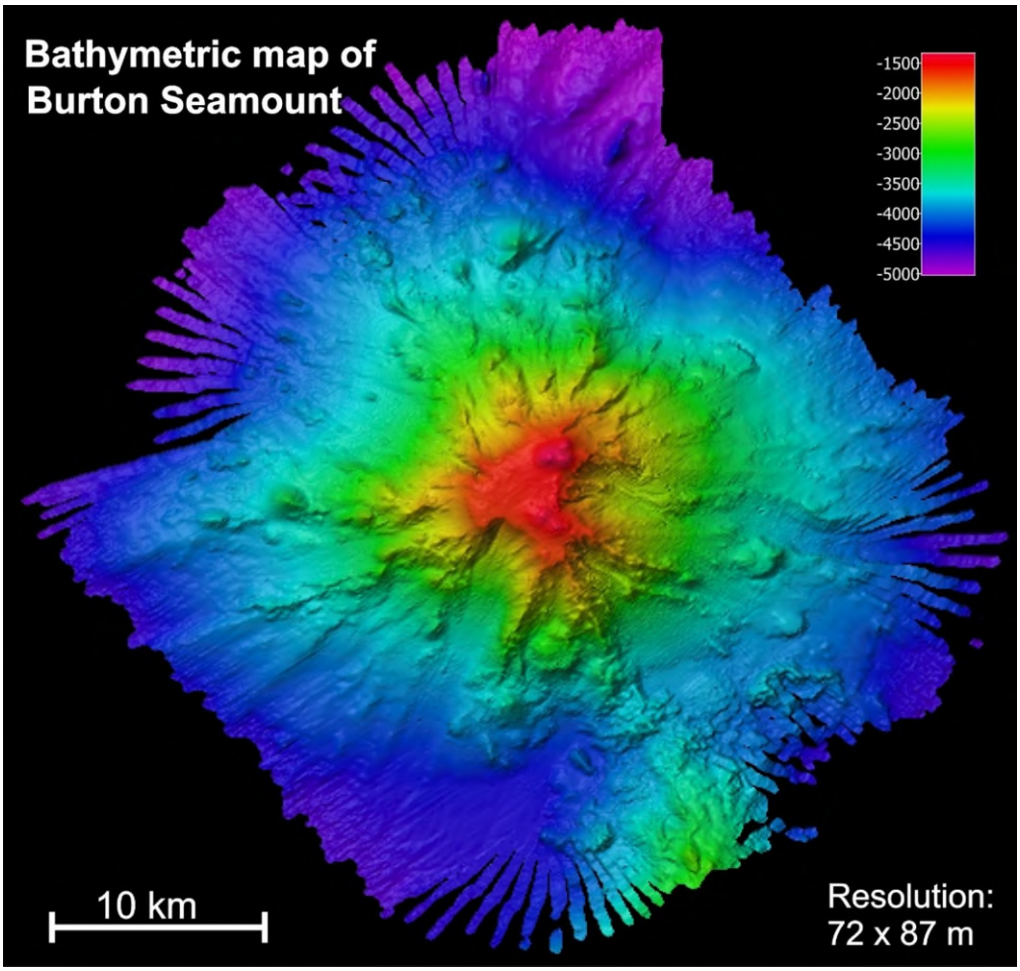

Figure 1: Bathymetry of Burton Seamount based on EM 122 data of RV SONNE.

Figure 2: A: Polyplacophora (sat on a crust), B: Gina Dambrowski & Annika Hellmann gather animals from dead coral fragments, C: Crusted fragments of dead corals. Photo: P. Martinez.