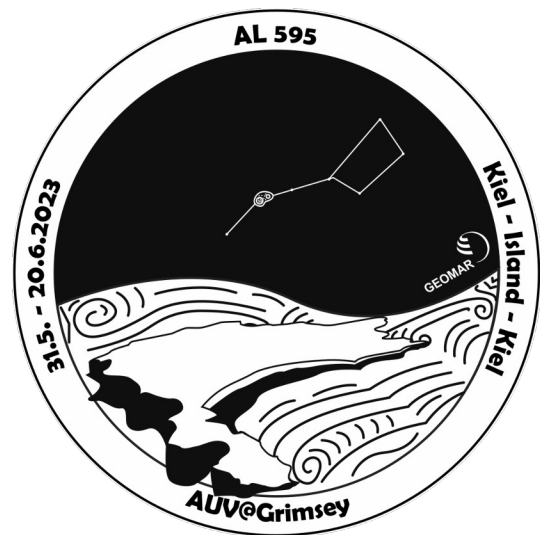


RV ALKOR  
Cruise AL595  
GPF 21-2\_037  
31.05. – 20.06.2023  
Kiel – Iceland – Kiel

**AUV@Grimsey**  
**Bathymetric and microbial**  
**investigations at the Grimsey Vent Field**

**Weekly Report No.2**  
**6.06. – 12.06.2023**



Our first full working week started on 6.6.2023 with sampling west of the actual working area. There, samples are to be taken to establish a baseline microbiology in an area considered to be background in the vicinity of the work area. The sampling with CTD, MUC and gravity corer also gave us the opportunity to familiarize ourselves with the handling of the devices onboard Alkor and to coordinate the work of the various working groups on deck and in the laboratory. In the following days, two more cores were successfully recovered in the area of the hydrothermal field (GC03 & GC04) in three attempts, whereby the core GC03 from the active area was particularly exciting. When hauling in the gravity corer, boiling fluids poured out of the core barrel when reaching the sea surface and a first measurement on deck indicated a temperature of approx. 81°C. After opening the core, it was found to be strongly hydrothermally influenced, with a pronounced zoning containing large amounts of anhydrite (!) and a sulfurous odor (Fig. 1). In the future, the microbiology samples will show the connection between the CO<sub>2</sub>-rich degassing and specialized microbial communities. Core GC04 was taken in a small depression west of the BIGO Lander (see below).



*Fig. 1: GC03 core segment.*

The afternoon of the first day (June 6<sup>th</sup>) was reserved for the first deployment of the BIGO lander. Unfortunately, our plan to find a bacterial mat with the built-in camera did not succeed, because the visibility was limited and precise planning with the map material available so far was only possible to a limited extent. After drifting past the active hydrothermal vents to the south and then diverting to the north, we decided to deploy the lander about 50m west of the active field, since another attempt would have taken too much time. In the next three days, experiments attached to the lander were carried out autonomously. After recovering the lander on June 10<sup>th</sup> these could then be sighted, sampled and evaluated. The chamber attached to the lander had successfully taken sediments. The chamber attached to the lander had successfully taken sediment. The microbiological and geochemical analyzes will be carried out in the home laboratories. The other built-in experiments were successful except for the automated sampling of fluids, which did not recover any material due to a technical problem. Here, adjustments were

made, which will hopefully enable successful sampling for the second experiment. In the afternoon of June 10<sup>th</sup>, the lander was deployed for the second time. The now available, more accurate bathymetric map (see below) greatly facilitated the planing of this second mission. With the newly adjusted camera, the BIGO was guided along the southern edge of the field and, after a few minutes, it was set down precisely on a bacterial mat. We are optimistic that the data from this second mission will provide exciting results in the future. The recovery of the lander is scheduled for June 14<sup>th</sup>.

On June 7<sup>th</sup>, the Hover – AUV "Anton" was deployed in a first test. In this test we found out that the multibeam measurements need to be carried out at a maximum height of 25m above ground, since the DVL (Doppler Velocity Log) used to stabilize the navigation only delivered a stable lock onto the seafloor up to this height. The following first real survey over the northern part of the hydrothermal field then, after an automated processing, yielded a spectacular impressions of the field. Where in the previous bathymetry (horizontal resolution 10m) structures could only be guessed at, the new bathymetry with a horizontal resolution of approx. 40cm now shows the hydrothermal elevations in such detail that even the thin chimneys, i.e. needle-like structures with up to 3m height, are visible at the top of the mounds (Fig. 2). In the following days we were able to carry out three more successful dives with *Anton*. Thus far, bathymetric data have been measured over an area of approximately 0.85km<sup>2</sup>.

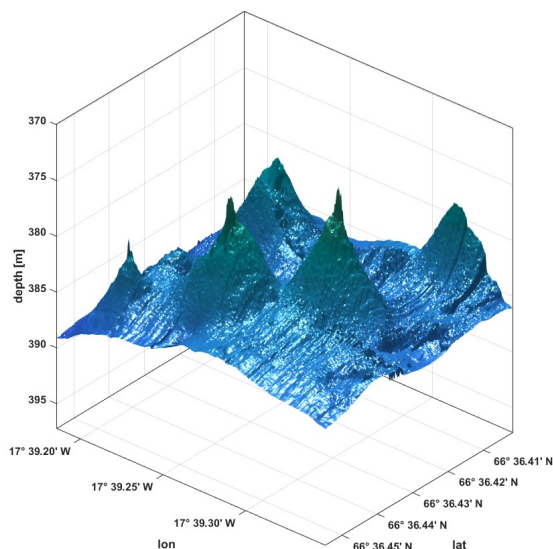


Fig. 2: 3D view of a subset of the newly acquired bathymetric data.

On June 8<sup>th</sup>, the AUV "Luise" was put into operation as last device. A first test showed that meaningful pictures with the camera and lighting attached to Luise could only be made from a maximum height of 1.8m above ground. This generally limits the usability for our trip, since we cannot fly over the hydrothermal hills, which have slopes of 30° and more and elevations of up to 15m. As a first target, we therefore approached a depression south of the inactive mounds to the west, which we had identified on the new bathymetry and had previously also sampled with CTD, GC and MUC. Fig. 3 shows a section of the photo mosaic created by the AUV team directly on board, which shows an amazing wealth of detail. For future interpretation, such visual information will be of great help. During *Luise's* second mission, there were difficulties with the acoustic positioning during the descent towards the seafloor. After failing to reach her first waypoint, she aborted the mission and surfaced. There, she could not be localized for 20 hours due to the sea state and problems with the position transmission via Iridium. Thanks to



Fig. 3: Detail from the photo mosaic taken with *Luise*.

the support of everyone, we were finally able to visually spot her in the morning of the next day with many additional pairs of eyes on the bridge.

In the early afternoon of June 11<sup>th</sup> we set off for Dalvik, as the forecast predicted heavy seas for the afternoon and the following day. Today, June 12<sup>th</sup>, we spent the day in Dalvik and said goodbye to our Icelandic colleague Alexandra Klonowsky. The bunkering of fuel has been postponed to the late afternoon, so that we will only return to the work area at night. We will arrive there tomorrow morning to start the last two working days with fresh energy.

With best regards on behalf of all cruise participants

Sebastian Hölz

(GEOMAR – Helmholtz Centre for Ocean Research Kiel)