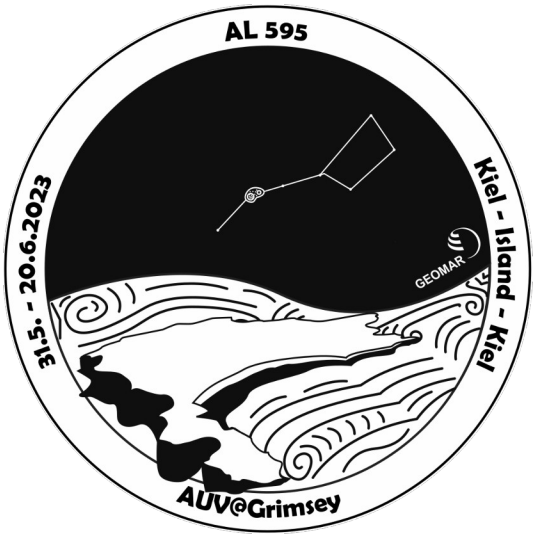
RV ALKOR
Cruise AL595
GPF 21-2_037
31.05. – 20.06.2023
Kiel – Iceland – Kiel

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

## Weekly Report No.1
## 31.05. – 05.06.2023




Cruise AL595 aboard RV Alkor will take us to the Arctic Circle near the island of Grimsey, which is within sight of Northern Iceland. About 20km north-east of the island, at a water depth of about 400m, there is the "Grimsey Hydrothermal Field" (GHF), which is characterized by high activity with temperatures around 250°C and degassing with high levels of $CO_2$ and $CH_4$ (up to 40% and 23%, respectively).

The research work at the GHF was originally initiated in the late 1990s / early 2000s by colleagues from IFM-GEOMAR during several research cruises with the RV Poseidon (POS229, POS252/253, POS291). During these research cruises, mapping and sampling with JAGO, seismic investigations and sampling with gravity corers were carried out on the hydrothermal field. Likewise, a first ship-based bathymetry was recorded, which with a resolution of 10m already shows smaller structures, but is not yet precise enough for really detailed analyzes.

In the past few years, the EM group of GEOMAR has resumed this original work during two trips (POS524, POS535) by further investigating the underground of the hydrothermal field with novel electromagnetic measuring methods. Here, our analyzes in the underground at a depth of approx. 30m show a laterally extended electrical conductivity anomaly, which could be explained either by highly saline and hot hydrothermal fluids or by mineralization.

As part of the current research cruise AL535, we now want to focus on two research items. On the one hand, we want to use GEOMAR's new mini AUVs Anton and Luise for the first time in water depths that are close to the AUVs' maximum operating depth of 500m. These measurements can be understood as device tests, but are at the same time intended to make a valuable contribution to the scientific understanding of the working area. With the multi-beam system attached to Anton, we hope to map an area of approx. 1 – 2km$^2$ at a planned flight altitude of approx. 25m and achieve a resolution in the decimeter range. The camera and lighting attached to Luise allow for the creation of photo mosaics over large areas and will provide us with new optical insights into the structure of the hydrothermal field and of the adjacent fault systems. We are curious to see how these relatively new platforms prove themselves when used at greater depths. As a second focus, we will carry out microbiological and metagenomic investigations on this trip, with particular interest in organisms that are adapted to the extremely high $CO_2$ concentrations of the degassing of the hydrothermal field. For this purpose, we will carry out experiments with the BIGO-Lander and collect samples

(gravity corer, MUC), which will be evaluated in the context of biogeochemical and metagenomic studies by the working group of Prof. Mirjam Perner (RD2). The samples will then also be examined in Kiel by the working group of Prof. Deniz Tasdemir (RD3) in the context of marine natural product chemistry / biotechnology and by the MMR working group (Prof. Sylvia Sander, Dr. Sven Petersen) for fluid geochemistry. Ultimately, the results of this work will contribute to Topic 8 InnoPool project "High CO2 – metabolic responses and bioeconomic opportunities", which is being carried out in cooperation with the FZ Jülich (Prof. Michael Bott) and the GFZ (Dr. Jens Kallmeyer).

In the morning hours of May 31st we left Kiel and after a sunny and very relaxing transit through the Kiel Canal, we were greeted in the North Sea by ever stronger winds and waves. After a wild ride to the east coast of Great Britain, which practically brought all preparations to a standstill, we were finally able to start work on preparing the experiments and equipment after the passage between the Orkney and Shetland Islands with the wind decreasing and the waves barely swell. In the night from June 3rd to June 4th we passed the Faeroe Islands, a spectacular sight in the midnight sun and low clouds. With our arrival at the eastern coast of Iceland in the morning hours of June 5th, all preparations were finally complete. That same day around 15:00h, we reached the working area and right away started the scientific work with a first CTD measurement and a successful immersion test of the two AUVs. For the upcoming week, fair weather and calm seas are predicted. Consequently, we are optimistic to be able to carry out our work program successfully to then report our first results next week.

With best regards on behalf of all cruise participants

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(GEOMAR – Helmholtz Centre for Ocean Research Kiel)

*Wissenschaftliche Crew nach Abfahrt im Nord-Ostsee-Kanal (von links nach rechts): Matthias Türk, Nicole Adam-Beyer, Arlette Wenzel-Storjohann, Mirjam Perner, Anna Jäckle, Torge Kurbjuhn, Danilo Scheppukat, Patrick Leibold, Nikolaj Diller, Wanda Schmitz, Sebastian Hölz*