

# NOTIFICATION OF PROPOSED RESEARCH CRUISE

## PART A – GENERAL

**1. Name of Ship**

FS Alkor, Cruise No. AL595

**2. Dates of Cruise**

31.5.2023 (Kiel, Germany) – 20.6.2023 (Kiel, Germany)

**3. Operating Authority**

Helmholtz-Zentrum für Ozeanforschung Kiel – GEOMAR

Wischhofstraße 1-3

24148 Kiel

Germany

Telephone +49 431 600 2132

E-Mail klackschewitz@geomar.de

**4. Owner**

See above.

**5. Particulars of Ship**

Name ALKOR

Nationality German

Overall length 55,20 meters

Maximal draught 4,16 meters

BRT 1000

GT 1322

NT 396

Propulsion Diesel Electric

Call Sign DBND

AIS yes

IMO no. 8905880

MMSI no. 211216570

Telephone VoIP +491 91979010

E-Mail bruecke@alkor.briese-research.de

**6. Crew**

Name of master Jan-Peter Lass

Number of crew 11

## 7. Scientific Personnel

Name & Address of Scientist in Charge

Dr. Sebastian Hölz

Helmholtz-Zentrum für Ozeanforschung Kiel – GEOMAR

Wischofstraße 1-3

D-24148 Kiel, Germany

Telephone +49 431 600 2519

E-Mail [shoelz@geomar.de](mailto:shoelz@geomar.de)

No of Scientists 12

## 8. Geographical areas in which ship will operate

(with reference in latitude and longitude)

Work is planned in a working area within a larger area, for which the company *North Tech Energy* (NTE) has been granted an exclusive exploration license in Spring 2017 by Orkustofnun. We don't know if this license is still in effect but have already reached out to inform NTE's CEO Geir Brynjar Hagalinsson ([geir@nte.is](mailto:geir@nte.is)) about our proposed cruise. In past cruises, we have carried out work in cooperation with NTE and ISOR and, thus, we apply to ask to be granted permission to work in the licence area as outlined in Fig. 1.

Currently, detailed work is only planned in one main working area (WA1) around the Grimsey Hydrothermal Field (GHF), where experiments were previously carried out during several research cruises by GEOMAR in the years 2018 and 2019 (POS524, POS535) and in the late 1990s (POS524, POS229, POS253, POS291). The main working area WA1 is shown in Fig. 2 with the inlay in the lower right (Hannington et al., *Marine Geology*, 2011) showing a detailed map of the GHF:

- WA1: 66° 33'N – 66° 38'N 17° 30'W – 17° 55'W

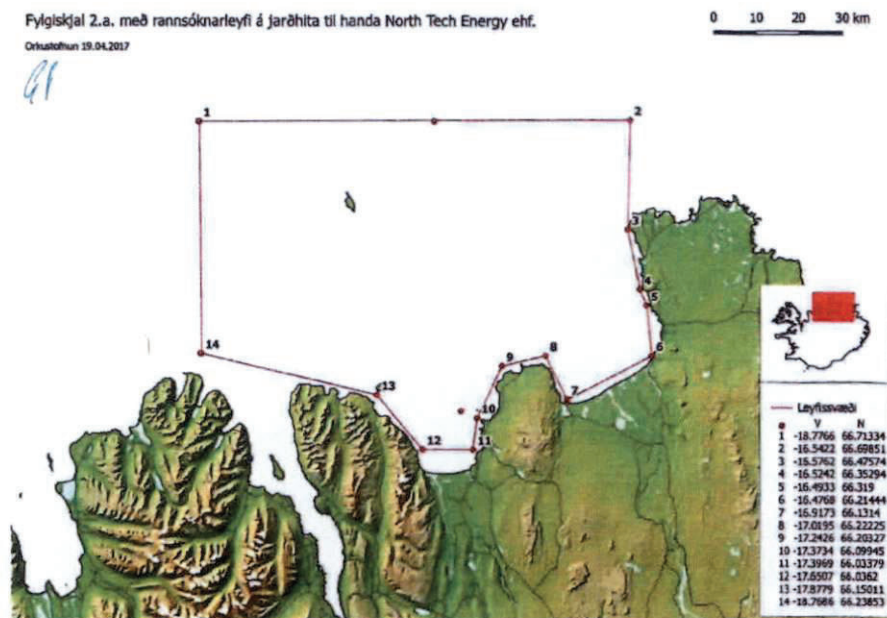


Fig. 1: Area around Grimsey Island covered by exclusive license for hydrothermal exploration granted to NTE. Map is taken from the license report. More detailed working program is described in Fig. 2.

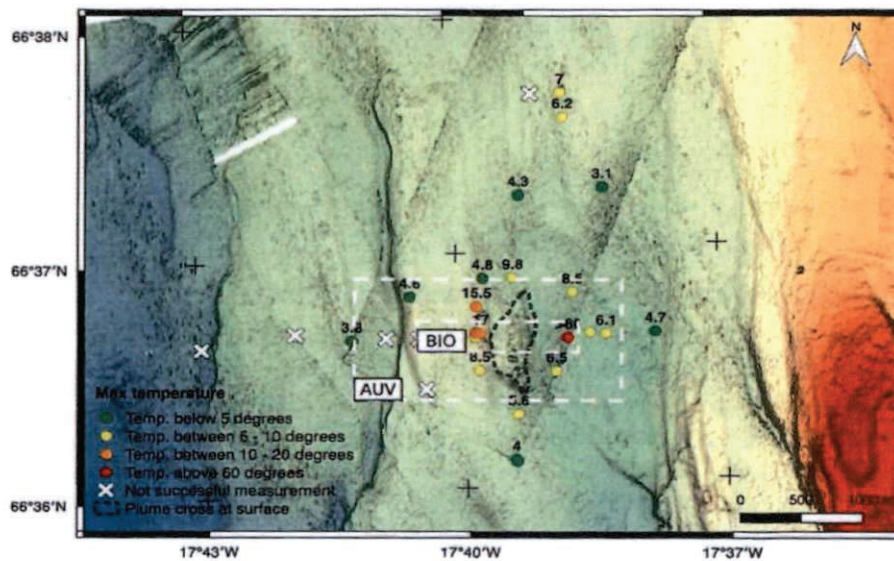


Fig. 2: Map (from Hölz et al., 2019, changed) with previous heat-flow measurements and approximate outlines for the planned high-resolution bathymetry (AUV) and sampling work (BIO).

Work in additional working areas within the licensing area as outlined in Fig. 1 would only be carried out upon request and in coordination with NTE depending on the availability of ship time.

### 9. Brief Description of Purpose of Cruise

Studies of active hydrothermal systems in the vicinity of the GHF during previous expeditions were mainly focused on geophysical methods – namely electromagnetics (EM) – and on sediment sampling for geochemical sediment and pore-fluid analyses. These investigations gave first insight into the hydrothermal structure and revealed potential covered mineralizations at depth.

Within the current cruise, we plan to acquire a high resolution bathymetric map of the area surrounding the GHF, which will help in the interpretation of the previously acquired data. Furthermore, high resolution bathymetric data can also aid in the planning of a potential drilling campaign, which would be an interesting scientific project for the future.

As institute, GEOMAR covers essentially all aspects of marine research, not only geological research but also biological investigations. Consequently, our past geoscientific investigations at the unique GHF site have raised the interest of colleagues from life sciences as well. Therefore, as part of the upcoming cruise, we also plan to take sediment cores to gather material (sediments & pore-fluids) suitable for metagenomic studies. These samples will give insight into how microbial life adapts to vent sites with extremely high levels of CO<sub>2</sub> exhalations as present at the GHF.

### 10. Dates and Names of Intended Ports of Call

Akureyri (Iceland) 12.6.2023 for pick up of previously lost instrument (~1h)

In early 2022, we were informed by colleagues from ISOR that a GEOMAR measurement instrument, which was lost in the Atlantic a few years ago, had been washed ashore in NW Iceland. We are currently trying to organize a transport of the equipment to Akureyri to take this station onboard during cruise AL595. Depending on the outcome, we would try to take the station onboard in the second half of our cruise.

### 11. Special Logistic Requirements at Ports of Call

None

## Part B – Details

### 1. *Name of Ship*

FS Alkor, Cruise No. AL595

### 2. *Dates of Cruise*

31.5.2023 (Kiel, Germany) – 20.6.2023 (Kiel, Germany)

### 3. *Purpose of Research and General Operational Methods*

Bathymetric mapping of active hydrothermal systems in the vicinity of the Grimsey Vent Field by means of mini AUVs. The AUVs will use an acoustic array (long baseline – LBL) for precise navigation, which will be installed temporarily on the seafloor. In addition to the multibeam, the AUVs may also carry passive sensors to measure the state of the seawater (CTD, Eh, ...) or geophysical quantities (self potential, magnetics). The activity of the vent field may also be monitored in the by one or two CTD stations, which would be deployed stationary to the seafloor for about 10d during the experiments.

Sediments and pore-fluids from gravity cores (max. length 500cm) will be used for metagenomic studies to investigate the interaction of microbial life at high temperatures and high CO<sub>2</sub> concentrations and potentially existing mineralizations within the seafloor. These samples may also be taken with a short multi-corer (MUC). Around sampling sites, the activity may also be monitored with mini landers carrying geochemical sensors (H<sub>2</sub>S, H<sub>2</sub>, O<sub>2</sub>, pH, T, alkalinity) and in-situ information about the activity in the seafloor may be measured with a short heat-flow probe (220cm length). Additionally, water samples taken in the water column with a water sampling rosette may yield information about the activity and characteristics of hydrothermal field.

Work is planned to be carried out in following steps:

1. At start of project: deployment of stationary CTD probes and LBL network.
2. Bathymetric measurements with mini AUVs (potentially also carrying additional sensors),
3. sediment sampling with gravity corer or MUC,
4. direct sampling within water column, measurements with heat-flow probe
5. temporary deployment of mini-lander.
6. At end of project: recovery of stationary CTD probes and LBL network.

Steps 2 – 5 will be repeated several times in interchanging order, depending on wind, weather and waves.

### 4. *Working Areas*

*Attach a chart showing (on an appropriate scale) geographical area of the intended work, positions of intended stations, tracks of survey lines, positions of moored / seabed equipment.*

See Fig. 2 for an overview of the main workarea WA1.

### 5. *Types of Samples Required (e.g. Geological / Water / Plankton / Fish / Radioactivity / Isotope)*

*Methods of Sampling (including dredging / Coring / drilling)*

Gravity cores of a maximum length of 500cm length or short cores (~50cm) taken with the MUC will be used for the metagenomic analyses of sediments and the pore fluids contained therein. Additionally, fluid samples may also be taken directly from the water column with a sampling rosette or in small quantities close to the seafloor with a mini-lander.

## **6. Details of Moored Equipment**

An LBL acoustic network and a couple of stationary CTD stations will be deployed to the seafloor at the start of the cruise (~ 6.6.23). They will be recovered before leaving working area (~15.6.23). We do not intend to leave any equipment on the seafloor after leaving the working area.

## **7. Explosives**

No explosives or seismic sources will be used during this cruise.

## **8. Detail and reference of ...**

### **8.1. ... any relevant previous / future cruises**

The Grimsey Vent Field, main target within proposed working area WA1, has been studied during the following previous research cruises by GEOMAR with the research vessel FS Poseidon:

- POS229 (1997)
- POS253 (1999)
- POS291 (2002)
- POS524 (2018)
- POS535 (2019)

### **8.2. ... any previous published research data relating to the proposed cruise**

- Atkins, D. & Audunsson, H., 2013: Exploration Techniques for Locating Offshore Geothermal Energy Near Iceland. Proceedings of the 38. Workshop on Geothermal Reservoir Engineering, Stanford University, 11-13.2.2013, SGP-TR-198.
- Botz, R., Winckler, G., Bayer, R., Schmitt, M., Schmidt, M., Garbe-Schönberg, D., Stoffers, P. & Kristjánsson, J.K., 1999: Origin of trace gases in submarine hydrothermal vents of the Kolbeinsey Ridge, north Iceland. EPSL, 171, 83 – 93.
- Dekov, V., Scholten, J., Garbe-Schönberg, C.D. & Botz, R., 2008: Hydrothermal sediment alteration at a seafloor vent field: Grimsey Graben, Tjörnes Fracture Zone, north of Iceland. JGR, 113, B11101.
- Gudmundsdóttir, E.R., Eiríksson, J. & Larsen, G., 2011: Identification and definition of primary and reworked tephra in Late glacial and Holocene marine shelf sediments off North Iceland. J. Quat. Sci., 26, 589–602.
- Hannington, M., Herzig, P., Stoffers, P., Scholten, J., Botz, R., Garbe-Schönberg, D., Jonasson, I.R., Roest, W. & Shipboard Scientific Party, 2001: First observations of high-temperature submarine hydrothermal vents and massive anhydrite deposits off the north coast of Iceland. Marine Geology, 177, 199 – 220.
- Hölz, S. & Martins, S. (eds): RV POSEIDON Fahrtbericht / Cruise Report POS524 - GrimseyEM: Geophysical and geological investigations in the vicinity of the Grimsey Hydrothermal Field offshore Northern Iceland for the assessment of the geothermal potential and the exploration for potential mineralizations within the seafloor, Reykjavik (Iceland) – Bergen (Norway), 7.6 - 26.6.2018 . Open Access . GEOMAR Report, N. Ser. 044 . GEOMAR Helmholtz-Zentrum für Ozeanforschung, Kiel, Germany, 69 pp, 2018. DOI 10.3289/CR\_POS524.
- Hölz, S., Haroon, A. & Martins, S., eds. (2019): RV POSEIDON Fahrtbericht / Cruise Report POS535 - Loki2GrimseyEM: Geophysical and geological investigations of massive sulfides at and in the vicinity of Loki's Castle (Norway) and similar experiments around the Grimsey Hydrothermal Field (Iceland) for the assessment of the geothermal potential and the exploration for potential mineralizations within the seafloor. Akureyri (Iceland) – Bremerhaven (Germany), 09.06 – 03.07.2019. GEOMAR Report, N. Ser. 0053. GEOMAR Helmholtz-Zentrum für Ozeanforschung, Kiel, Germany, 89pp. DOI 10.3289/GEOMAR\_REP\_NS\_53\_2019.
- Lackschewitz, K.S., Botz, R., Garbe-Schönberg, D., Scholten, J. & Stoffers, P., 2006: Mineralogy and geochemistry of clay samples from active hydrothermal vents off the north coast of Iceland. Marine Geology, 225, 177 – 190.
- Magnúsdóttir, S., Brandsdóttir, B. Driscoll, N. & Detrick, R., 2015: Postglacial tectonic activity within the Skjálfandajúp Basin, Tjörnes Fracture Zone, offshore Northern Iceland, based on high resolution seismic stratigraphy. Marine Geology, 367, 159 – 170.

**9. Names and addresses of scientists of the coastal state in whose waters the proposed cruise takes place with whom previous contact has been made**

Geir Hagalinsson	Bjarni Richter
North Tech Energy	ISOR – Iceland Geosurvey (Director Geothermal Energy)
Tel:+354 5711711	Telephone: +354 528 1526
Mobile: +354 8999780	Mobile phone: +354 896 9336
E-Mail: geir@nte.is	E-Mail: <a href="mailto:br@isor.is">br@isor.is</a>

Additionally, GEOMAR's Nagoya Protocol Coordinator Jan Dierking ([nagoyaprotokoll@geomar.de](mailto:nagoyaprotokoll@geomar.de)) has contacted Mr. Sigurdur Thrainsson ([sigurdur.thrainsson@environment.is](mailto:sigurdur.thrainsson@environment.is), [sigurdur.thrainsson@uar.is](mailto:sigurdur.thrainsson@uar.is), [sigurdur.thrainsson@umh.stjr.is](mailto:sigurdur.thrainsson@umh.stjr.is)) to ensure that possible obligations under Icelandic ABS regulations are addressed.

**10. State ...**

- a) ... whether visits to the ship in port by scientists of the coastal state concerned will be acceptable:  
Yes, if we indeed have the port call to pick up the previously lost equipment.
- b) ... whether it will be acceptable to carry on board an observer from the coastal state for any part of the cruise and dates and ports of embarkation / disembarkation:  
Yes.
- c) ... when research data from intended cruise is likely to be made available to the coastal state and if so by what means:
- Cruise report three months after finishing the research cruise
  - Scientific publication within the following three years

**11. Scientific Equipment – Coastal State: Iceland**

Complete the following table – SEPARATE COPY FOR EACH COASTAL STATE

List of all major marine scientific equipment which is proposed to be used and indicate waters in which it will be deployed	Fisheries Research within Fishing Limits	Research concerning			
		Continental Shelf out to Coastal State's Margin	Within 12 NM	Between 12 – 50NM	Between 50 – 200NM

Coastal State: Iceland					
Mini AUV (2x) with LBL array	No	No	Yes	Yes	No
Gravity coring (500cm) & MUC	No	No	Yes	Yes	No
Heat probe (220cm)	No	No	Yes	Yes	No
CTD Measurements	No	No	Yes	Yes	No
Mini lander	No	No	Yes	Yes	No

(on behalf of the Principal Scientist)

Dated: 13 Dec 2022

**GEOMAR**  
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 Operating Authority  
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 24148 Kiel