EUROVOLC

# European Network of Observatories and Research Infrastructure for Volcanology

## Deliverable Report

## D14.1 Report on the WP14 TA activities during the project

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| Work Package: | *Access to the University of Icelandic* | |
| Work Package number: | *14* | |
| Work Package leader: | *Ármann Höskuldsson and Freysteinn Sigmundsson* | |
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# Summary

The objective of WP14 was to provide access to the University of Icelandic Research Infrastructures and thus offer an opportunity to carry out research on Iceland's volcanic areas. In this sense, UI offered Three types of support (Access to the facility, Field work Type 1-defined as field work in the highlands - and Field work Type 2-defined as field work winter-like environment such as on glaciers and thus requiring snowmobiles and modified jeeps and access to research facilities based in Reykjavik).
Two calls for trans-national access were opened in EUROVOLC, first one in August 2018 and the second one a year later, in August 2019. In total four proposals were received, one in the first call which was accepted, and three in the second call of which all were accepted. First application was for use of research facilities in Reykjavik at the University. The three other applications regarded fieldwork type 1.

Due to travel restrictions caused by the COVID-19 pandemic in 2020, all three funded projects in the second call which were planned to be carried out during the summer of 2020 were postponed to 2021.


# Introduction

The University of Icelandic is operated within the Icelandic educational structure and hosts one of largest research complex in geology and geophysics in Iceland. UI conducts active masters and doctoral programs. Further within UI is seated the Institute of Earth Sciences that hosts the research facilities of the University. The UI has been involved in volcanological research in Iceland since it was founded in the 60's. In EUROVOLC the UI was providing Trans-national access to its hitherto inaccessible multidisciplinary research infrastructure. The Trans-national access provides visitors a unique opportunity to access and use research facilities in Iceland, otherwise only accessible to collaborators and students at the UI.

- UI buildings: Access to UI office space including access to library, computers, internet, office support relevant for the activity;
- Field work: Two types of field work were foreseen: In the Icelandic highlands summer (Type 1) or winter (Type 2).
- All equipment in the care of UI where available for the visiting scholars/researchers;
- Field support systems (logistic support, jeeps, snow scooters, field support equipment).

# First call for research proposals

## Overview of first call

The call was opened at the beginning of August 2018 and closed at 10$^{th}$ of October 2018. Emphasis was placed on field work and the call specified that applications/proposals only for access to UI office facilities research facilities.
One proposal was submitted to the UI Research Infrastructures in the first call:

- **EV-C1-04** *MIVDEXT (Melt Inclusion volatile content in 4-Dimensional context) submitted by Dr. Matthew James Pankhurst, at INVOLCAN, Tenerife.*

**EV-C1-04:** The aim of the MIVDEXT program was to explore the temporal and spatial evolution of volatiles inside an evolving sill in the lead up to and during an eruption. Measurements of $H_2O$ and $CO_2$ concentration will be made from melt inclusions (MIs) within olivine crystals erupted during the

2010 flank and summit eruption of Eyjafjallajökull, Iceland. The origin of these crystals in time and space have been determined using a novel concept of dynamics in a sill (Pankhurst et al., 2018 EPSL). The MIs have been imaged using X-ray microcomputed tomography, their 3D textural context described, and their 3D volumes measured. By adding volatile measurements to the existing knowledge of pre- and syn-eruption volcanic plumbing system dynamics, we can ask 1) if the novel concept of crystal rain is supported by pressure estimates from the volatile concentrations, or not, and 2) whether there are any indications of changing conditions through eruption time that may map onto eruption phenomenology such as discharge rate and explosivity

### Results of first call

The evaluation of the proposals was twofold. An initial technical- and logistic evaluation was made by UI and then forwarded to the International Scientific Review Panel (ISRP) for scientific excellence-based evaluation. The proposals were assigned scores based on several different factors. The maximum attainable score was 30 and to pass evaluation, the proposals needed to receive at least 20 points. The evaluation procedure turned out to be a bit incoherent between the different providers (work packages) requiring a second overall evaluation by the project's Steering Committee to harmonize the evaluation of all proposals received in the first call. More details of the evaluation procedure are described in EUROVOLC'S 1st Periodic Report (pg. 245-249).

After the whole evaluation procedure, the **EV-C1-04** MIVDEXT proposal passed and UI offered support.

## Second call for research proposals

### Overview of second call

The call opened in August 2019 and closed in October 2019. UI access offer in the second call was the same as in the first call.

Since only one project had been accepted in the 1st call, UI was able to accept three projects in the 2nd call, as the budget for the 2nd call was larger than initially foreseen. Three proposals were submitted for access to the UI Research infrastructure:

- **EV-C2-021 KRAFLAMAG** *(High resolution magnetic imaging of the Krafla volcano and its geothermal system using Unmanned Aerial System (UAS) and complementary measurements), submitted by Dr. Claire Bouligard at ISTerre, University Grenobles Alpes, France.*
- **EV-C2_032 LIFE** *(Lava-Induced Fumarolic Environments), submitted by Dr.Christopher Hamilton at University of Arizona, Lunar and Planetary Laboratory, USA.*
- **EV-C2-041 MTHEK** *(MagnetoTelluric Assessment of the HEKla Volcano), submitted by Dr. Duygu Kiyan, at Dublin Institute of advanced studies, Ireland.*

**EV-C2-021**: The aim of **KRAFLAMAG** was to provide new high-resolution datasets to help map the structure and hydrothermal alteration within the Krafla geothermal system. Existing magnetic and gravimetric data were collected in the 1970-80s. Unmanned Aircraft System (UAS) can be used to perform rapid and inexpensive acquisition of magnetic profiles at low elevation hence providing a

high-resolution map of magnetic anomalies. Aerial photography yields high precision digital elevation models, crucial for the precise reduction of existing and new gravimetric data. The plan is to interpret gravimetric and magnetic data together through 3D forward and inverse modeling and integrating information about structure, stratigraphy, alteration and temperature deduced from mapping and borehole measurements and from existing models of electrical resistivity. TIR and gas measurements were used to identify which structures in this model are active pathways for hydrothermal fluids.

**EV-C2_032:** Project **LIFE** The Askja region is an extraordinary landscape that combines a wide range of volcanic, aeolian, hydrological, and glacial processes. The balance in the Askja region was most recently perturbed by the 2014-2015 Holuhraun eruption, which emplaced the largest lava flow-field erupted in Iceland in over 230 years. Investigating the impacts of the Holuhraun eruption with state-of-the-art fixed-wing unmanned aerial systems (UAS), survey instruments, and water sampling equipment to extend an unprecedented time-series record in this region. Using a high-induced Trimble UX5-HP in combination with a Trimble R10 GNSS DGPS, time-lapse cameras, and water-sampling equipment set up to develop surveys of the evolving landscape and aquatic microbiology.

**EV-C2-041:** The **MTHEK** proposal was a collaborative project between the Dublin Institute for Advanced Studies (DIAS) and the University of Iceland to develop an electrical resistivity model beneath and around Hekla volcano through exploiting new Broad-Band MagnetoTelluric (BBMT) data. MT is a deep-probing passive geophysical technique which has been used extensively on volcanic systems around the world. We aim to acquire at least 20 BBMT stations around Hekla to identify low-resistivity zones at depth, which may be a proxy for melt accumulation and migration pathways. The obtained geoelectrical models will enable us to highlight potential real-time electromagnetic monitoring locations which can complement the on-going real-time seismic/deformation monitoring which DIAS is a partner for the past number of years.

### Results of second call

The procedure for proposal review in the first call was revised in the second call to simplify the evaluation. In the second call, passing the technical- and logistic evaluation made by the provider, UI was now a prerequisite for sending the proposals onward to the International Scientific Review Panel (ISRP) for scientific evaluation. The final selection of proposals required them to have received 20 points out of 30 points possible. Of the Three submitted proposals all received a score of 20 or higher and thus accepted.

## Execution of funded projects

Due to the COVID-19 pandemic and thereby extensive travel restrictions in the summer of 2020, all three projects planned to be carried out during that summer needed to be postponed to the following summer, 2021. To be prepared for the possibility of continued travel restrictions in summer 2021, a backup plan was organized involving more assistance from UI staff. Plan B was to adjust the project so that the results could be achieved through remote interaction with UI staff who would carry out the observations and send the data to the user for processing and analysis. However, plan B was not needed.

### MIVDEXT

This project was funded in the 1st call. Visitors were Dr. M. J. Pankhurst and MSc. Beverley Claire Coldwell. It was scheduled to be carried out in early 2019 but was finished late 2019.

The access included: Technicians, Microprobe and FTIR microscope, use of UI general facilities.

### KRAFLAMAG

The KRAFLAMAG project was performed according to plan late summer 2021 and was successful. Visitors were Dr. Claire Bouligand, Dr. Brent Ritzinger, Dr. Jonathan Glen, Dr. Leon Kaub.

The access included: Technicians, vehicles, GPS and use of UI general facilities.

### LIFE

The LIFE project was successfully carried out according to plan in 2021. Visitors were Dr. C. Hamilton and MSc. Joana Voight.

The access included: Technicians, UAS, GPS, vehicles and use of UI general facilities.

### MTHEK

The MTHEK project was carried out according to plan in early summer 2021 and was successful. Visitors were Dr. Duygu Kiyan, Dr. Colin Hogg, Dr. Christopher J. Bean and Gylfi Páll Hersir (ISOR).

The access included: Technicians, GPS, vehicles and use of UI general facilities.

## Conclusions

Despite of the adverse effects of the travel restrictions caused by the pandemic, the work package was able to execute all of the funded project in the final 5 months of the project, justifying the need for a lengthy 10-month-extension of EUROVOLC. All projects have made valuable achievements, which have been described in their reports. All PIs have promised to make the data collected openly available according to the agreements they signed at the time of funding.

The users had access to the research infrastructure of the UI, which otherwise would not have been accessible to them.

Some were young researchers, one PIs was women, all involved interaction or collaboration with local researchers helping to create connections between researchers across Europe.

The collaboration between users and a variety of UI staff has also created and strengthened international connections and forged ties for younger generations of scientists into the international community.