Recent results from the Iceland Volcanoes Supersite

April 2023

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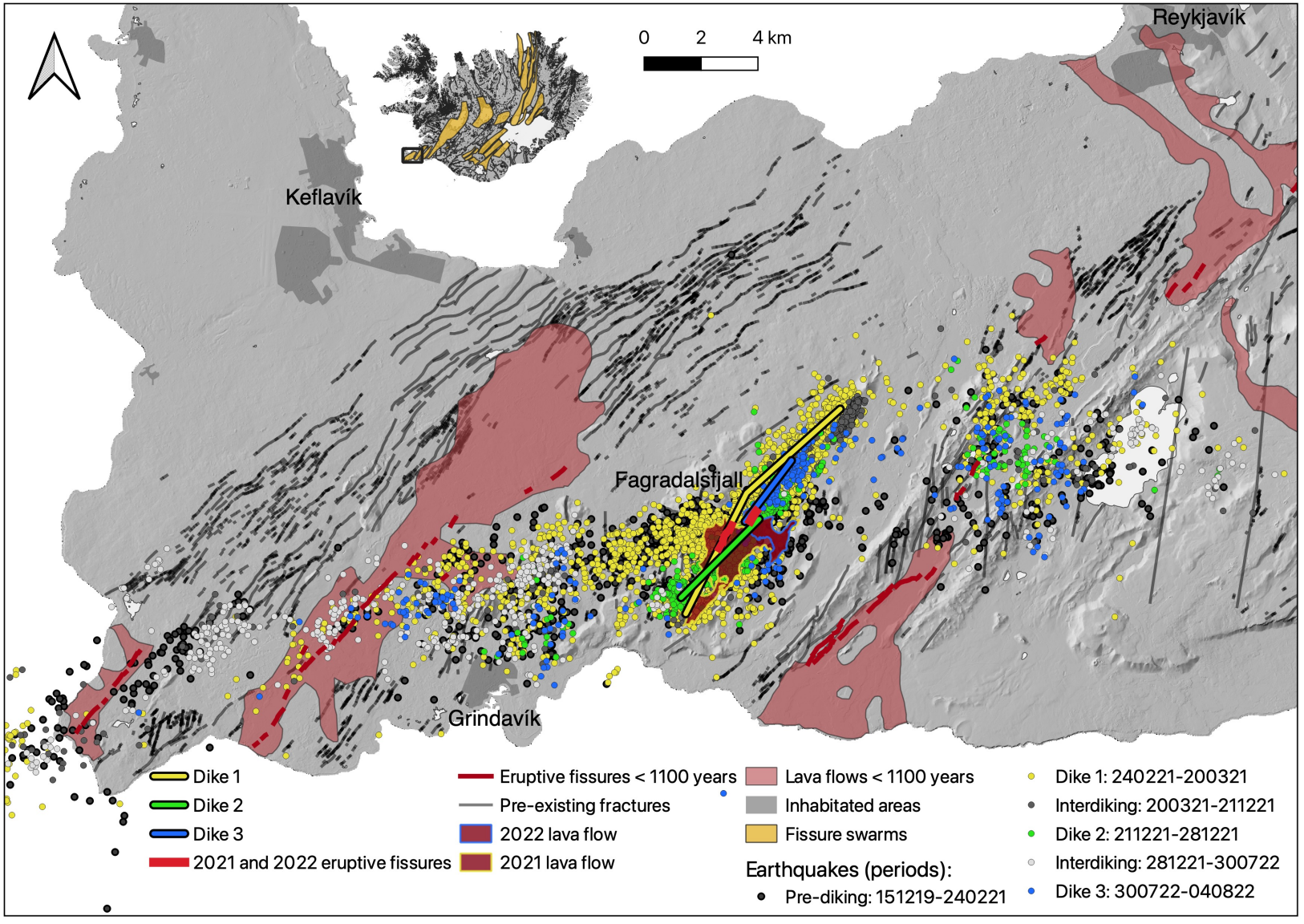
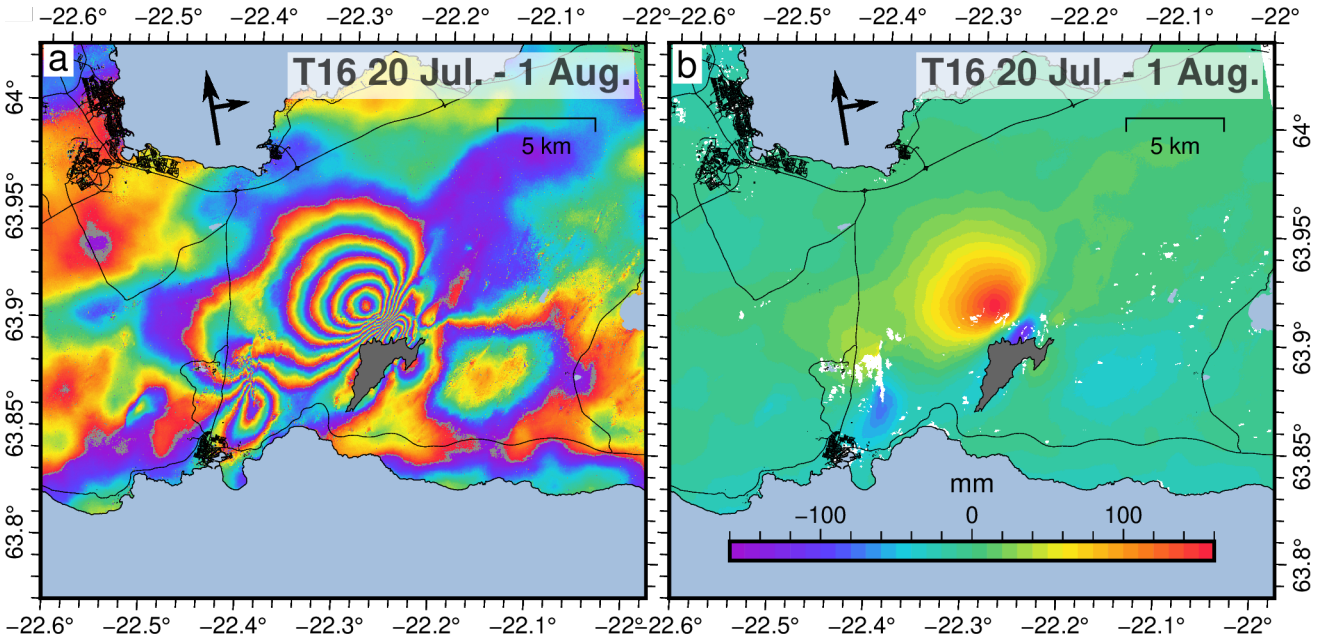
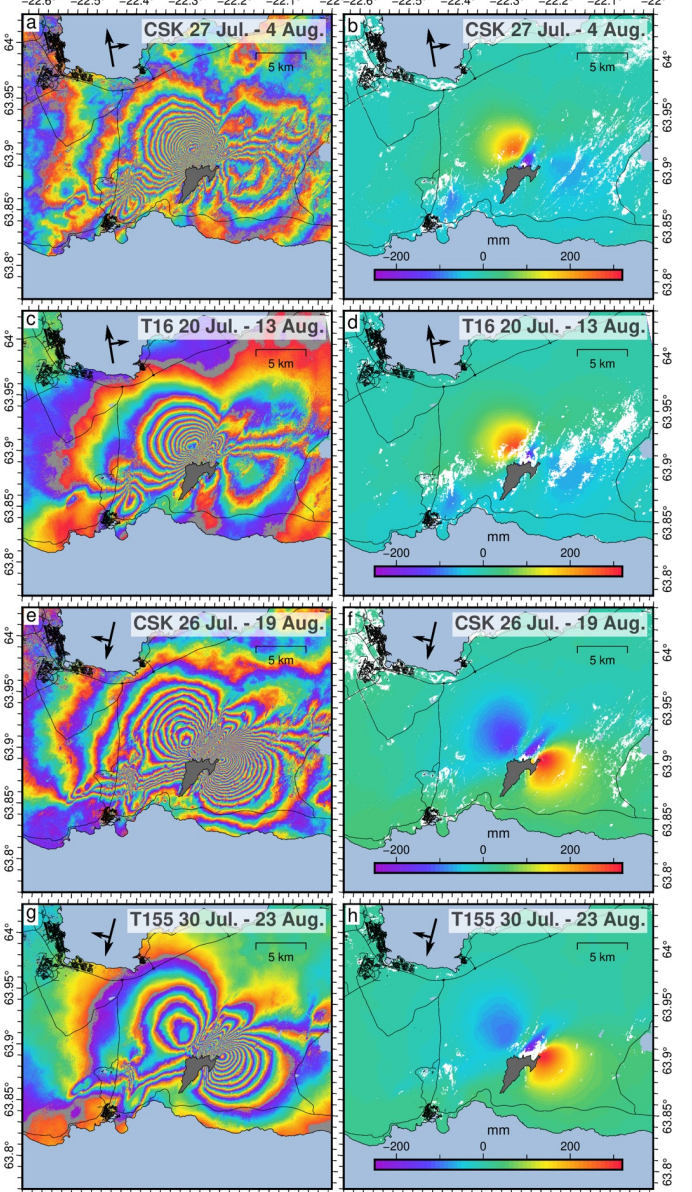
Reactivation of the Reykjanes Peninsula

- Commenced in December 2019
- 4 episodes of inflation at Svartsengi
- Another at Krýsuvík
- 3 dike intrusions and 2 eruptions (so far) at Fagradalsfjall


0
2
4 km
Reykjavík
Keflavík
Fagradalsfjall
Grindavík
Dike 1
Dike 2
Dike 3
2021 and 2022 eruptive fissures
Eruptive fissures < 1100 years
Pre-existing fractures
2022 lava flow
2021 lava flow
Lava flows < 1100 years
Inhabitated areas
Fissure swarms
Earthquakes (periods):
Pre-diking: 151219-240221
Dike 1: 240221-200321
Interdiking: 200321-211221
Dike 2: 211221-281221
Interdiking: 281221-300722
Dike 3: 300722-040822

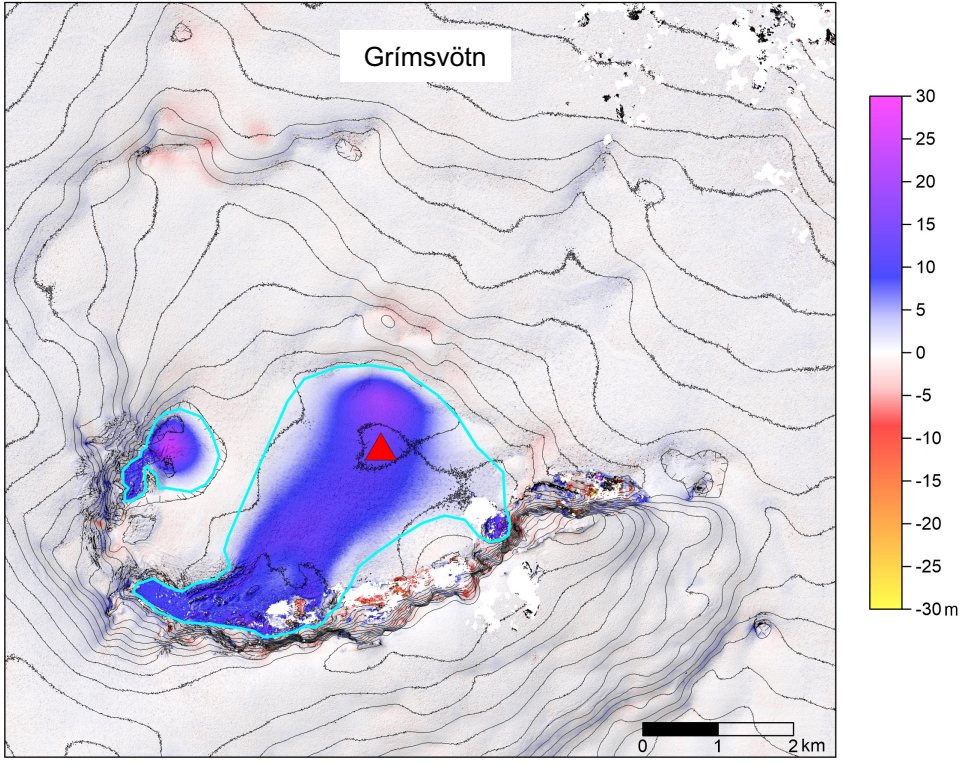
Interferograms spanning July-August 2022 dike intrusion at Fagradalsfjall

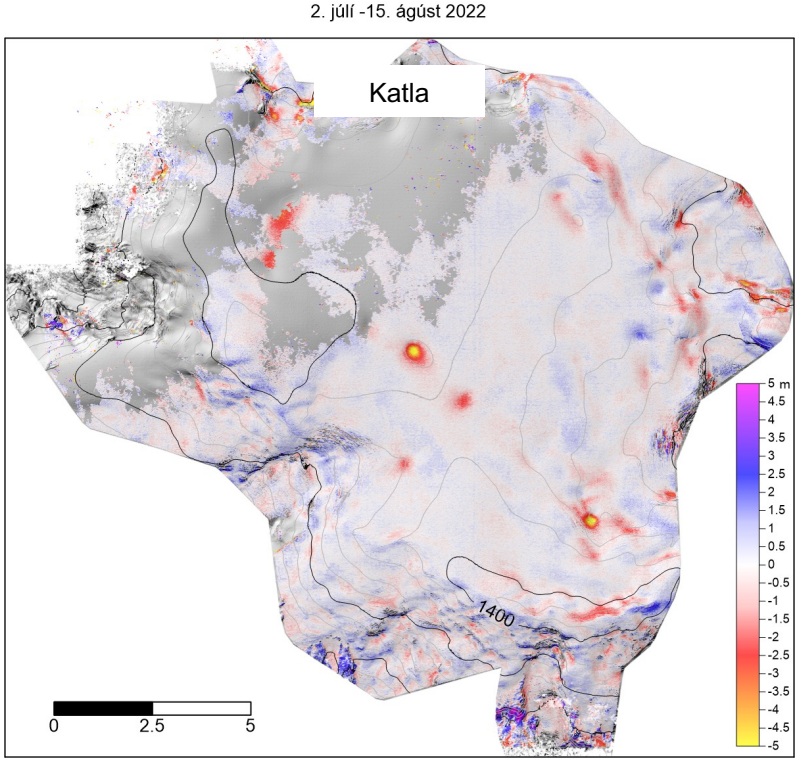




Pleiades data 2022

- Images were acquired over four ice-covered volcanoes: Katla, Grímsvötn, Bárðarbunga and Öræfajökull, and used to generate maps of elevation change





2022 usage of supersite data

- TSX – 184 images (250)
- CSK – 680 images (700)
- Sentinel-1 – 631 images
- Pleiades – 5000 km^2 (5000 km^2)
- SAOCOM 1 – no current usage

There are no issues to report from supersite users.

Plans for 2023

- Upgrade Iceland Volcanoes Supersite webpage
- Facilitate access to near-real time interferograms
- Provide in NRT access to GNSS timeseries for key areas
- Promote access to SIL earthquake catalogue
- Provide access to relocated earthquakes for key areas

New Project - Effects of climate change induced Ice-retreat on Seismic and VOLCanic activity (ISVOLC)

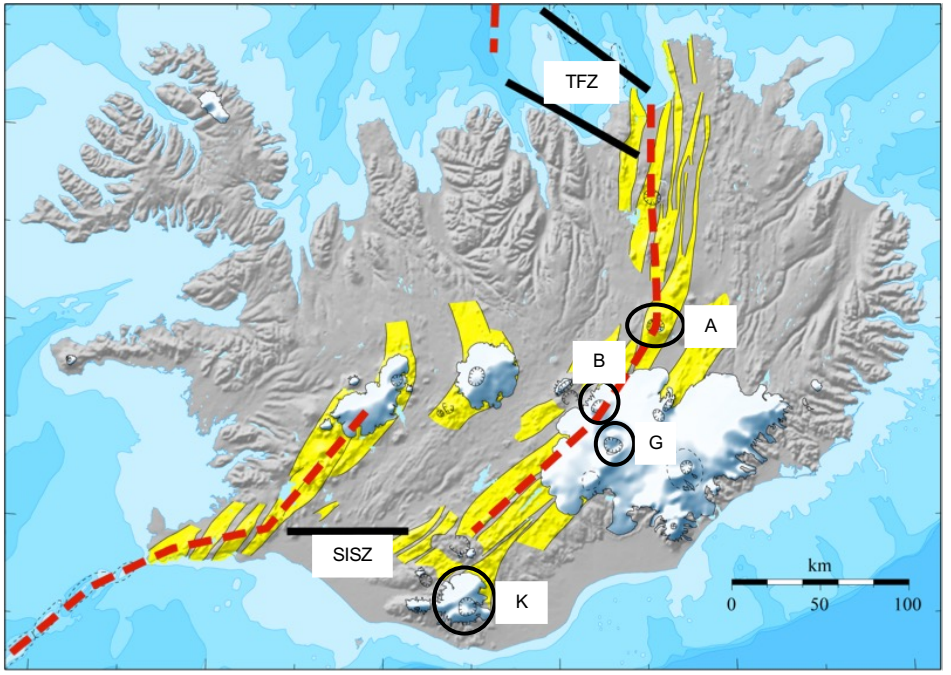
Project details

- **Official start date 1 April 2023**
- Project duration is 3 years
- **Total budget of ~ 153 million ISK**
- 55.7 million ISK has been granted in YR 1
- **2 PhD students**
- **1 PostDoc**
- **Field work in** YR 1

Subglacial volcanic eruption. Eruption in Grímsvötn in 1998. ISVOLC will study the influence of ongoing glacial retreat on magmatic activity at four volcanic systems in Iceland: Grímsvötn, Bárðarbunga, Katla and Askja. Photo: The Icelandic Met Office / Oddur Sigurðsson.

The ISVOLC hypothesis:

- That glacier mass loss is already producing excessive melt, affecting magma migration beneath Iceland, and stress changes are affecting the stability of existing magma bodies (possibly causing variations in inter-eruptive periods), as well as influencing earthquake activity.
- We will focus on 4 volcanoes and 2 seismic zones that serve as a natural laboratory for studying the effects of deglaciation on volcanism and seismicity.



ISVOLC study areas: Map of Iceland with glaciers (white) and fissure swarms (yellow), showing target areas: Katla (K), Askja (A), Grímsvötn (G), Bárðarbunga (B), South Iceland Seismic Zone (SISZ) and Tjörnes Fracture Zone (TFZ).

Effects of climate change induced Ice-retreat on Seismic and VOLCanic activity (ISVOLC)

What we plan to do

- Generate a unified database of volume changes of the Icelandic glaciers since the end of Little Ice Age at high spatial and temporal resolution.
- Create a new set of three-dimensional (3D) GIA models considering a realistic lithospheric/mantle structure.
- Develop advanced 3D models of magma plumbing beneath key volcanoes.
- Combine the GIA model predictions and the magma plumbing models to produce 3D models that describe effects from both deglaciation and magma influx.
- Generate future scenarios of glacial mass loss for Vatnajökull based on ice dynamic modelling and detailed retreat history for the last 4 decades.
- Determine the effect of both recent and future scenarios of glacier changes on magma generation and supply to, and stability of magma bodies beneath volcanoes and effect on seismic triggering of faults in major fault zones.