ECOLE LEMANIQUE DES SCIENCES DE LA TERRE
DES UNIVERSITES DE GENEVE ET DE LAUSANNE

Master ès Sciences in Earth sciences

Current architecture of the plumbing system of the Askja caldera

Contact persons

Luca Caricchi, Joël Ruch, Eniko Bali luca.caricchi@unige.ch

Context

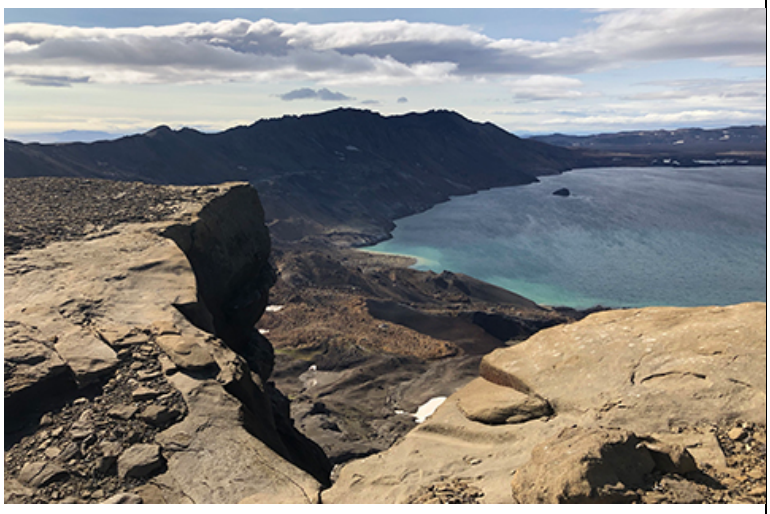
Askja caldera is one of the major volcanic landmarks in central Iceland. The Plinian eruption of 1875 was associated with a collapse of the caldera in response to the draining of a shallow magma reservoir. The collapse generated major ring faults, reactivated by dyke intrusions in the following decades. Since 2014, the seismicity has not decreased and affects the northern part of the collapsed area and is aligned with the normal (ring) faults controlling the collapse structure. In addition, a new phase of rapid uplift (tens of centimeters per week!) began in August 2021 and now affects the entire caldera, suggesting possible magma recharge in the plumbing system.
The interpretation of geodetic and geophysical signals associated with deformation required the most accurate possible model for the architecture of the volcanic plumbing system. To achieve this target the master student will work on the collection, petrographic and chemical analysis of volcanic rocks samples erupted before the 1875 caldera forming eruption until the last eruption of Askja in 1961.
This project will be associated with the master project entitled "Landslide and ground deformation analysis of Askja Caldera (Central Iceland)".

Aims and Methods

We will collect rock samples of 3 eruptions preceding the 1875 caldera forming event and 4 eruptions following this event, which include the last eruption of Askja in 1961. We will use existing literature data for whole rock chemistry and focus on the collection of mineral chemistry data that will be used to obtain information on pressure and temperature of magma storage before the eruptions. The study of the eruption preceding the 1875 caldera forming event and the eruption that followed will allow us to determine if magma and mineral chemistry would have been capable to identify the sign that a caldera forming eruption was impending. Additionally, this study will illuminate the current plumbing system at Askja, which is of the essence to interpret the signs of the ongoing unrest.

References

- *Hartley ME, Thordarson T (2012) Formation of Oskjuvatn caldera at Askja, North Iceland: mechanism of caldera collapse and implications for the lateral flow hypothesis. J Volcanol Geotherm Res 227–228:85–101. https://doi.org/10.1016/j.jvolgeores.2012.02.009*
- *Hartley, M.E., Thordarson, T., 2013. The 1874-1876 volcano-tectonic episode at Askja, North Iceland: Lateral flow revisited. Geochemistry, Geophys. Geosystems 14, 2286–2309. https://doi.org/10.1002/ggge.20151*
- *De Zeeuw-van Dalfsen E, Rymer H, Sturkell E et al (2013) Geodetic data shed light on ongoing caldera subsidence at Askja, Iceland. Bull Volcanol 75(5):1–13. https://doi.org/10.1007/s00445-013-0709-2*
- *Trippanera, D., Ruch, J., Acocella, V., Thordarsson, T (2017). Interaction between central volcanoes and regional tectonics along divergent plate boundaries: Askja, Iceland, Bulletin of Volcanology 80 (1), doi10.1007/s00445-017-1179-8.*



Website

https://www.unige.ch/sciences/terre/en/research/petrology-and-volcanology/

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Prerequiste

Indicate if the student has to take some course or module: Module "Dynamic Earth"