

Building a large igneous province: Characterizing the emplacement depth and duration of the Seiland Igneous Province (Northern Norway).

Contact persons: Dr. Benjamin Klein (ISTE), Prof. Othmar Müntener (ISTE)

Context

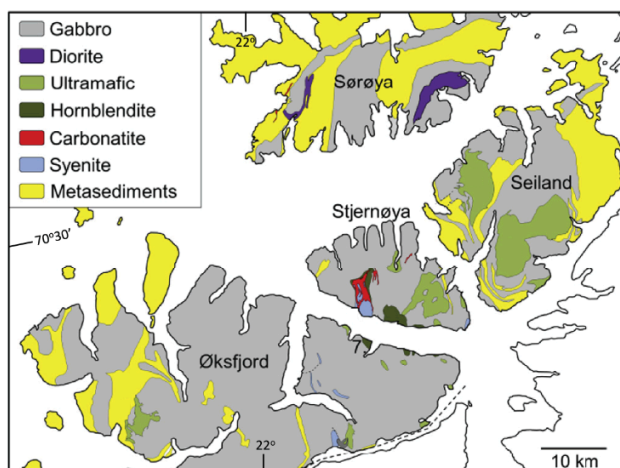
Catastrophic flood basalt eruptions (referred to as Large Igneous Provinces) have reshaped Earth's surface and life repeatedly over Earth's history. However, the magmatic evolution of these systems remains poorly understood, as in nearly all instances only the erupted basalts are exposed and available to study. The Seiland Igneous Province (SIP) in northern Norway represents the gabbroic to ultramafic lower-crustal plumbing system associated with one such flood basalt province, and therefore represents a unique location to better understand the petrologic evolution of these systems. This project will use a mix of geochronology and metamorphic and igneous petrology to produce first-order constraints on the emplacement and construction of this system. Questions that may be pursued include: For how long was the SIP active? What were the pressure and temperature conditions of the lower crust that the SIP intruded into? What is the record of contact metamorphism in the host rocks?

Objectives and Methods

The aim of this project is to better constrain the emplacement conditions of the Seiland Igneous Province. Depending on the specific interests of the Master's student, the project can focus on either (1) characterizing the metasediments that the SIP intruded, and using the metamorphic assemblages to constrain the temperature and pressure conditions during SIP emplacement or (2) constraining the duration of magmatism from a U-Pb zircon geochronology study focusing on the more evolved facies of the Seiland Igneous Province as well associated the late-stage alkaline magmas. Both focuses have the option to conduct detailed fieldwork in the SIP this July and will subsequently use the range of tools available at UNIL to complete the study (e.g., LA-ICPMS, Electron Microprobe, scanning electron microscope, Raman spectrometry).

Literature

Larsen, R.B., et al., (2018) Portrait of deep-seated magmatic conduit system: The Seiland Igneous Province. *Lithos*, 296-299, pp 600-622. Elvevold, S., Reginiussen, H., Krogh, E.J., and Bjørklund, F., (1994) Reworking of deep-seated gabbros and associated contact metamorphosed paragneisses in the southeastern part of the Seiland Igneous Province, northern Norway. *Journal of Metamorphic Geology* 12, pp 539-556. Roberts, R.J., Corfu, F., Torsvik, T.H., Ashwal, L.D., and Ramsay, D.M., (2006) Short-lived mafic magmatism at 560-570 Ma in the northern Norwegian Caledonides: U-Pb zircon ages from the Seiland Igneous Province. *Geological Magazine* 143(6) pp 897-903



Map of the Seiland Igneous Province from Larsen et al., 2018.