

Crystallization-differentiation in the roots of the Bergell intrusion

Contact persons

Dr. Olivier Reubi (ISTE), Prof. Othmar Müntener (ISTE)

Context

Crystallization-differentiation is thought to be the predominant process in the production of silicic arc magmas. The extent to which this takes place in the lower crust, during decompression upon ascent of the magmas, and in upper-crustal sub-volcanic magmatic systems is, however, an enduring debate in arc magmatism. In addition, the link between differentiation and the behavior of volatile elements (H₂O, CO₂, Cl, F, S) at lower- to mid-crustal conditions remains open to question. The aim of this project is to address these questions using the natural laboratory provided by the Bergell intrusion (Central Alps). The 32-30 Ma calc-alkaline Bergell intrusion is one of the two major batholiths in the Alpine magmatic record. It has a “comma” shape with pressure estimates indicating an eastward gradient from ~8 kbar near Bellinzona to ~2.5 kbar in val Forno. This geometry allows a systematic investigation of the magmatic processes controlling the chemical evolution of hydrous magmas at different pressures. This offers a rare opportunity to investigate the deeper section of a trans-crustal magmatic system.

Aims and Methods

The aim of this project is to better constrain the relative influence of isobaric vs. polybaric crystallization-differentiation in the evolution of hydrous magmas and to document the volatile behavior during decompression. The planned work will include: (1) Field work (detailed textural observations and sampling at outcrop scale). (2) Major and trace element bulk rock geochemistry to document subtle variations in magma composition. (3) In-depth petrological and mineralogical investigations combining optical microscopy, electron microprobe and laser ablation ICPMS. A particular focus of the project is the application of apatite to document the volatiles behavior in trans-crustal plutonic systems.

References

Müntener, O., Ulmer, P., & Blundy, J.D. (2021). Superhydrous arc magmas in the Alpine context. *Elements* 17, 35-40.

Gianola, O. et al. (2014). Continuity in geochemistry and time of the Tertiary Bergell intrusion (Central Alps). *Swiss J. Geosci* 107, 197-222.



Website

Prerequisite