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

Master ès Sciences in Earth sciences

# Fingerprinting magma mixing: crystal forensics at outcrop scale in the Ivrea-Verbano Zone and Adamello Tertiary pluton (Southern Alps, Italy).

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## Context

*Magma mixing and mingling are ubiquitous processes in plutonic and volcanic systems. They play an important role in producing the chemical and textural diversity of magmas and have a strong impact on the dynamics of magmatic systems. Besides, magma mixing is often recognized as an eruption trigger mechanism. In volcanic rocks, magma mixing is primarily documented on the basis of crystal chemistry and zoning. The interpretation of the data rely largely on the assumption that the crystals faithfully record the mixing event independently of the size and geometry of the magmatic system, and of the physical state of the magmas. The relative influence of the mechanisms at play (mechanical transfer of melts and crystals, chemical and thermal diffusion, vapor migration) and the length-scale (and time-scale) over which the chemistry and texture of crystals in the host magma are impacted are, however, poorly documented in geological systems.*

## Objectives and Methods

*The aim of this project is to better constrain the processes and impact of magma mixing and mingling by doing detailed investigations of key outcrop showing spectacular mingling and mixing textures in the Ivrea-Verbano zone and the Tertiary Adamello Massif, Southern Alps, Italy. 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 investigations combining optical microscopy, scanning electron microscopy, electron microprobe and laser ablation ICPMS to characterize the chemical and textural response of crystals as a function of the geometry of the system and controlling processes.*

## Literature

*Blundy, J. Sparks, S.R.J. Petrogenesis of mafic inclusions in granitoids of the Adamello massif, Italy. Journal of Petrology, vol 33, pp. 1039-1104.*

*Pistone, M., Blundy; JD., Broker; RA. Textural and chemical consequences of interaction between hydrous mafic and felsic magmas: an experimental study. Contribution to Mineralogy and petrology, 171, 2016*

*Sparks, S.R.J. & Sigurdson H., (1977) Magma mixing: a mechanism for triggering acid explosive eruptions. Nature, 267, pp 315-3018.*

*Reubi & Blundy (2009), A dearth of intermediate melts at subduction zone volcanoes and the petrogenesis of arc andesites. Nature, 461, pp 1269-1273.*

Mingling-mixing textures in tonalites of the Adamello massif

## WEB sites

## Choice of orientation :

2) Geochemistry, Alpine tectonics, Ore Deposits