

Variscan and pre-Variscan plutonism and high-grade metamorphism in the basement along the southern margin of the Aar massif (Central Alps)

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Context

The pre-Alpine basement of the Aar massif (central Alps) hosts high-grade metamorphic gneisses, migmatites and amphibolites of igneous and sedimentary origin, which underwent several cycles of metamorphism. They were intruded by mafic to felsic magmas during the Variscan orogeny, between approximately 350 and 300 million years ago. Therefore, a temporal framework for the evolution of the plutonic rocks would resolve and identify post-/syn-Variscan and pre-Variscan tectonic and metamorphic processes.

The aim of this project is to study the basement rocks that exhibit clear overprinting relationships and petrographic characteristics that will allow the different tectono-metamorphic phases to be identified using isotopic age determinations. The study region traverses the southern border of the Aar massif in central Switzerland (the canton of Valais, Brig-Fiesch area). Rock exposure is partly along the road, although some field work is required at higher elevations. No large-scale mapping is necessary, although a detailed structural analysis may be useful at the outcrop scale.

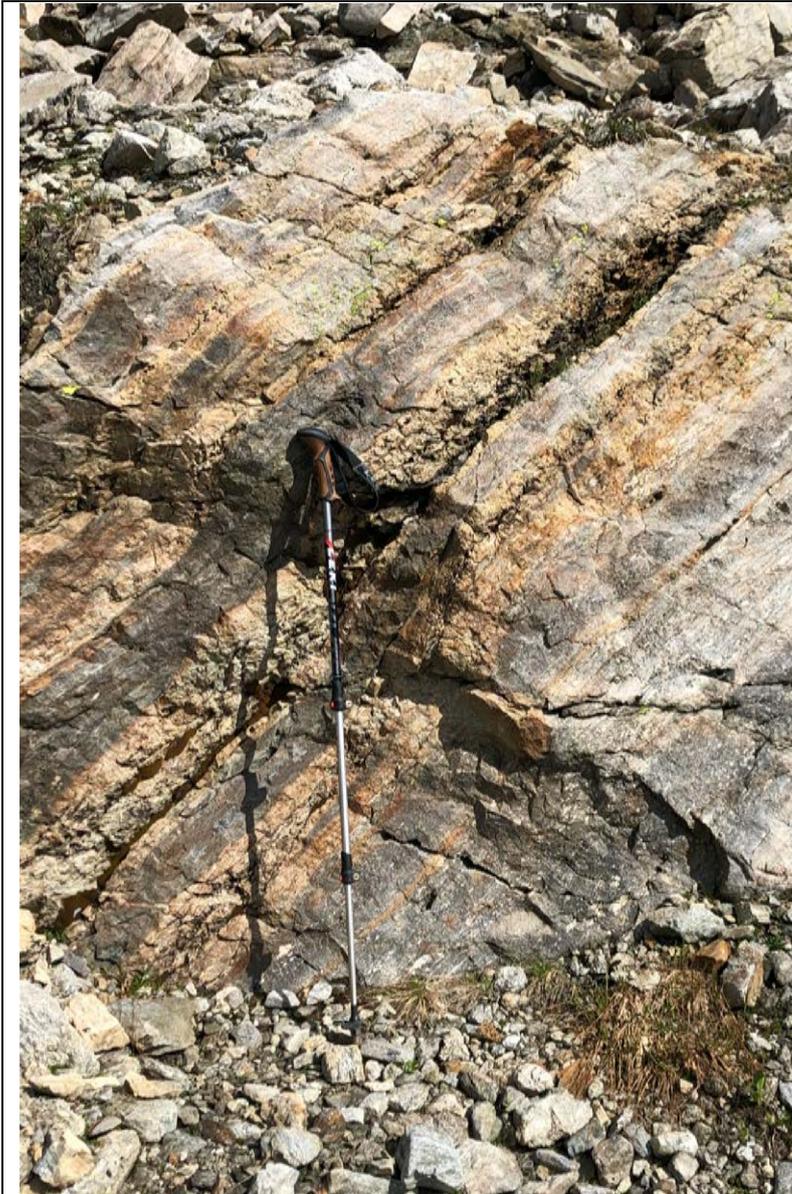
This project will occur in cooperation with swisstopo, and is suitable for a student who would like a deeper insight into precise analytical methods. The topic is independent of the sanitary situation with COVID-19, and has excellent touristic infrastructure in the field area, including a large number of mountain huts for overnight stays!

Objectives and Methods

The planned work will consist of the following tasks: 1) Recognition and documentation of different types and generations of leucosomes in migmatites of the Ausserberg-Avat Zone; 2) sampling of leucosomes and gneisses for geochronology; 3) separation of accessory minerals for U-Pb geochronology (zircon, monazite, titanite); 4) cathodo-luminescence and backscattered electron imaging of selected grains; 5) U-Pb dating, possibly trace element analysis using laser-ablation ICP-MS; 6) isotope-dilution TIMS U-Pb dating of individual grains of monazite, titanite and apatite.

Literature

Berger, A., Mercolli, I., Herwegh, M., Gnos, E (2017) Geological map of the Aar Massif, Tavetsch and Gotthard Nappes. Geol. spec. Map 1:100'000, explanatory notes 129. Federal Office of Topography swisstopo.



Websites to visit :

<https://www.unige.ch/sciences/terre/en/research/isotope-geochemistry-geochronology-and-thermochronology/u-pb-geochronology/>

Choice of orientation and modules:

Orientation GATO (Geochemistry, Alpine tectonics and Ore Deposits)