

The Glarus Thrust: an Example of Confined Upflow of Late Hydrothermal Fluids?

Proponents: Marco Herwegh¹, Vénice Akker², and Thomas Buckingham³

contact: 1marco.herwegh@unibe.ch, 2ismay.acker@unibe.ch,

3thomas.buckingham@unesco-sardona.ch

Project description: The Glarus Thrust is a major crustal shear zone in the UNESCO natural world heritage Tectonic Arena Sardona. Besides its relevance as textbook example for thrust tectonics it is also well known as synkinematic fluid conduit. With exhumation and ongoing deformation, shearing resulted in continuous embrittlement. This embrittlement might have important consequences for the late circulation of hydrothermal fluids. Field evidence indeed shows discordant alteration structures in the carbonate mylonites, which clearly postdate mylonitic deformation. We therefore hypothesize that parts of the brittle part of the Glarus thrust may in fact present late-stage fault-bound upflow pathways. In this way, the Glarus thrust could present a key structure to gain an improved understanding on the upwelling of hydrothermal fluids, as potentially still occurring at depth along embrittled carbonate hosted fault zones. The findings of this study may therefore have implications for the exploration of such systems for renewable geothermal energy.

Project tasks: Together with a team of experts from UniBe and UNESCO, your goal is to map out late-stage fluid conduits and hydrothermal alteration zones. Owing to a retreating Vorab Glacier, there are worldclass textbook outcrops not having yet been investigated in detail. Through the use of modern unmanned aerial vehicle (UAV; drones), you will digitally map the structures and alteration zones on the freshly glacial polished rock surfaces. Samples will be collected to identify major microstructural domains as well as the mineralogy and stable isotopes of the alteration zones. For this purpose, optical light microscopy, high-resolution SEM, cathodoluminescence microscopy, XRD and finally cutting-edge LA-ICP-MS will be applied to obtain the geochemical signature of these rocks. In addition, K-Ar dating of potential fault gouges may shed new light on the stages of embrittlement and hydrothermal fluid circulation. The obtained data can be used for inferences on active hydrothermal circulation along carbonate hosted systems in orogenic hydrothermal plays.

