

## Source of CO<sub>2</sub> in large veins talc-magnesite veins in serpentinites of the Zermatt-Saas Fee unit

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### Context

Reaction of CO<sub>2</sub>-bearing fluids with serpentinites and peridotites is one of the potential mechanisms for the technical CO<sub>2</sub>-sequestration.

The retreat of the glaciers in the area of the “Trockener Steg” have uncovered exceptional talc(tc)-magnesite(mag) veins which formed during exhumation of the Zermatt-Saas Fee (ZS) unit, most likely during greenschist facies metamorphism. The general petrology was studied in a previous Master co-advised by Baumgartner and Eric Reusser (ETHZ). The exceptional outcrops provide a unique possibility to study the behavior of carbon and oxygen isotopes during carbonation, and to establish the mechanism of reactions. This case study will go a long way towards understanding stable isotope tracing of metamorphic reactions, and is a case study for CO<sub>2</sub> sequestration.

### Objectives and Methods

- A limited amount of field work is required to sample the veins, and to establish the geometry of vein replacement on the glacier polished outcrops. A drill is available to obtain detailed sampling profiles.
- A set of ca. 20 samples will be collected from carbonate bearing rocks in the ZS-zone to establish a potential protolith data base
- Samples will be analyzed for major and trace element composition, along with oxygen and carbon isotope analysis of mag and oxygen isotope analysis of tc. Isotopes on detailed micro drilling will complete the data set
- Interpretation of data will include geochemical, phase petrologic, regional geologic aspects

### Literature

Kelemen PB, Matter JM (2008) In situ carbonation of peridotite for CO<sub>2</sub> storage. PNAS 105:17295–17300. doi: 10.1073/pnas.0805794105

Rudge JF, Kelemen PB, Spiegelman M (2010) A simple model of reaction-induced cracking applied to serpentinization and carbonation of peridotite. Earth and Planetary Science Letters 291:215–227. doi: 10.1016/j.epsl.2010.01.016

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### Choice of orientation :

Geochemistry, Alpine tectonics, Ore Deposits