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

Master ès Sciences in Earth sciences

Metamorphism of and Fluid-Rock interaction in the High-Pressure Sediments of the Zermatt-Saas zone

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Context

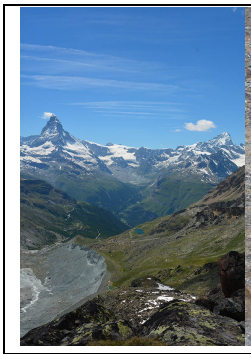
The metamorphism of mafic and ulztramafic rocks and timing of metamorphism have been studied by many authors in the Zermatt-Saas ohiolite sequence (e.g. (Van der Klauw et al. 1997; Bucher 2005; Angiboust et al. 2009; Frezzotti et al. 2011; de meyer and Baumgartner 2014; Skora et al. 2015; Kempf et al. 2020)*) and some work has been completed on the sedimentary sequence as well (*(Angiboust et al. 2009; de meyer and Baumgartner 2014)*)Pressure proposed for the metamorphism span values fromca. 2GPa to nearly 3GPa. The pressures obtained result in very different tectonic szenarios. Here I propose to use modern petrologic tools to evaliuate the P/T conditions of selected outcrops of high-pressure carbonates and pelites using field work, phase petrology, stable isotopes, and Raman thermo-barometry.*

Objectives and Methods

Field work: *Detail mapping of key localities in the Zermatt-Saas zone of the area between Täschalp and Breithorn (Mattervaley), establish detailed profiles. Detailed structural data collection, sample collection*
Petrography: *thin section analysis of mineralogy, microstructures; XRD analysis*
Analytical work: *XRF whole rock, SEM -textural analysis, EMPA mineral analysis, Ramanof organic and quartz inclusions in garnet*
Petrology and Geochemistry: *Comparing obtained data with literature; establish P-T estimates for selected profiles, establish coherence/incoherence of the Zermatt-Saas zone; identify and characterizesource of fluids as well as mechanism of water-rock interaction; synthesize the metamorphic, structural, and geochemistry history. Propose timing of alteration event(s)*

Literature

Angiboust S, Agard P, Jolivet L, Beyssac O (2009) The Zermatt-Saas ophiolite: the largest (60-km wide) and deepest (c. 70-80 km) continuous slice of oceanic lithosphere detached from a subduction zone? Terra Nova 21:171–180. doi: 10.1111/j.1365-3121.2009.00870.x
Bucher K (2005) Blueschists, eclogites, and decompression assemblages of the Zermatt-Saas ophiolite: High-pressure metamorphism of subducted Tethys lithosphere. American Mineralogist 90:821–835. doi: 10.2138/am.2005.1718
de Meyer C, Baumgartner LP (2014) Rb–Sr ages from phengite inclusions in garnets from high pressure rocks of the Swiss Western Alps. Earth Plan Sci Let 395:205–216.
Frezzotti ML, Selverstone J, Sharp ZD, Compagnoni R (2011) Carbonate dissolution during subduction revealed by diamond-bearing rocks from the Alps. Nature Geosci 4:703–706. doi: 10.1038/ngeo1246
Kempf ED, Hermann J, Reusser E, et al (2020) The role of the antigorite + brucite to olivine reaction in subducted serpentinites (Zermatt, Switzerland) (vol 113, 16, 2020). Swiss J Geosci 113:–1. doi: 10.1186/s00015-020-00377-z
Skora S, Mahlen NJ, Johnson CM, et al (2015) Evidence for protracted prograde metamorphism followed by rapid exhumation of the Zermatt-Saas Fee ophiolite - Skora - 2015 - Journal of Metamorphic Geology - Wiley Online Library.
Van der Klauw S, Reinecke T, Stöckhert B (1997) Exhumation of ultrahigh-pressure metamorphic oceanic crust from Lago di Cignana, Piemontese zone, western Alps: the structural record in metabasites. Lithos 41, 79-102



WEB sites

Choice of orientation : (supprimer les orientations qui ne conviendraient pas)

2) Geochemistry, Alpine tectonics, Ore Deposits