observed. Type-1 shows typical prograde zoning with decreasing XGrs (Grs30 to Grs8) and bell-shaped XSps patterns, as well as increasing XAlm (Alm60 to Alm70) and XPyp (Prp5 to Prp12) from the inner core close to the rim. Type-2 is characterized by homogeneous contents of XGrs (Grs8-10), XAlm (Alm70-75), XPyp(Prp10-15) from the inner core close to the rim. The rims of the porphyroblasts show two different garnet zoning types with significantly higher XGrs and can be distinguished into: type-3 with a small jump in XGrs (from Grs10 to Grs25), in XAlm (Alm75 to Alm60) and in XPrp (Prp15 to Prp10) and type-4 with a higher jump in XGrs (from Grs10 to Grs30), in XAlm (from Alm75 to Alm55) and in XPrp (from Prp15 to Prp5). Type-4 comprises a large garnet volume with a continuous decrease in XGrs (Grs30 to Grs20) and a continuous increase in XAlm (Alm55 to Alm65), and in XPrp (Prp5 to Prp10) towards the outermost rims.

To estimate the P-T conditions of pre-Alpine and eo-Alpine garnet growth, grossular-, almandine- and pyrope isopleths were calculated with the program Theriak Domino. The intersections of the isopleths yielded 0.7-0.9 GPa and 550-650°C for the pre-Alpine type-1 and type-2 garnets and also 0.8-0.9 GPa and temperatures from 550 up to 600°C for the eo-Alpine type-3 and type-4 garnets.

First approaches of this study support Variscan followed by an eo-Alpine metamorphic imprint and exclude a Permian HT/LP event.

Strain localization history of the Simplon Fault Zone: How far can we look back?

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Large-scale shear zones localize deformation, where with progressive exhumation old initial deformation fabrics are continuously overprinted under changing physico-chemical conditions. The study of such meso- to micro-scale structures provides the key for unraveling the retrograde geological evolution. When looking at these structures in the high strain parts, the question arises, up to which former stage these features still can be preserved, i.e. how far back in time can we look? To answer this question, we combine quantitative microstructural analyses in mylonitic quartz veins, with Ti in quartz geochemistry and thermochronological modeling on samples collected along vertical profiles across the Simplon Fault Zone(SFZ, SW-Switzerland).The SFZ is a major mid- to upper crustal shear zone accommodating substantial amounts of orogen parallel extension.

With increasing proximity to the fault plane (FP), dynamically recrystallized quartz grain sizes in the footwall decrease from a few mm (2-4 km away from FP) to sizes as small as 10-20 micrometers (a few meters away from FP). Along with this grain size reduction, dynamic recrystallization processes change from grain boundary migration, over subgrain rotation to bulging recrystallization. These variations indicate continuous strain localization, with decreasing temperature conditions and increasing flow stresses. Despite these trends, in close vicinity to the FP recrystallized grain sizes in different quartz veins show a considerable spread and all three recrystallization processes are found in different veins. When measuring Ti contents in these quartz veins, they are always high in the more distant parts but decrease the closer the sample is located to the FP. Similar to the quartz microstructures, the Ti concentration also shows a considerable spread near the FP, covering the entire range from highest to lowest Ti values. Ti in quartz geothermometry yields temperatures from 530°C down to 350°C. How is it possible that ‘high-T’ and ‘low-T’ microstructural and geochemical signatures can occur in samples just a few millimeters apart from each other, but all located in the most intensely deformed parts of the SFZ?

The answer to this question is synkinematic quartz veining combined with selective strain partitioning. All mylonitic quartz represents former, synkinematic quartz veins that formed during different episodes of the long lasting deformation history of the SFZ. At the time of their formation, their Ti uptake is in equilibrium with the fluid, reflecting the geochemical conditions of vein formation. Due to the inefficient resetting of the Ti concentrations under retrograde deformation conditions, the formation temperatures are largely preserved. In terms of the quartz microstructures, the timing and amount of overprinting of initial structures by subsequent deformation stages depends on the amount of strain accommodated in the gneissic matrix and its variation in space and time. In this sense, some of the early-formed quartz veins preserve an old stage of dynamic recrystallization, while others are completely overprinted by younger low temperature deformation (e.g. small grain sizes, bulging recrystallization). Whether the veins are old or young can be inferred from the Ti in quartz signature. It follows that even in the very high strain part of major shear zones, a careful combination of microstructural and geochemical analysis allows us to look far back into the temporal evolution of such a shear zone, with the potential to thereby obtain improved, high-resolution information on the spatial and temporal evolution of retrograde shear zones.

New geochemical data of Badenian volcanic rocks from south Pannonian Basin in Baranja, Eastern Croatia

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Investigated area is situated in the south part of the Pannonian Basin in Baranja province (Eastern Croatia). This abstract presents new geochemical results of volcanic and pyroclastic rocks, collected during the investigations in Baranja through preparing of Basic geological map of Republic Croatia (scale 1:50 000).

Investigated volcanic rocks (lavas) and pyroclastic rocks that include tuffaceous breccias and crystallovitrophyric tuffs are collected from three localities: Popovac, Vračevo and abandoned Batina quarry. Field evidence suggest polyphase magmatism which is evidenced by Badenian sediments that overlie lavas and by dykes cutting Badenian limestones (Begovac quarry). In Batina quarry volcanic and tuffaceous breccia are overlain by sub-horizontal beds of Quaternary loess. K-Ar measurements on volcanic rocks gave 13.8 and 14.5 Ma.

Volcanic rocks and magmatic fragments of volcanic and tuffaceous breccias (Batina quarry) are composed of plagioclase, olivine and clinopyroxene phenocrysts set in the groundmass of glass, microlites of phenocrystic population and accessory apatite, ilmenite and magnetite. Clinopyroxene and olivine microlites may be pseudomorphosed by chlorite and serpentine, respectively. Amygdules are filled by calcite and chlorite.

Volcanic rocks have SiO_2 ranging from 52.58 wt.% to 57.64 wt.% and Na_2O+K_2O content of 4.97-5.83 wt.%. They are dominantly sodium rich (Na_2O/K_2O = 2.1-5.5). In the TAS diagram they show subalkalic affinity and plot in the field of basaltic andesites and andesites. In the diagram K_2O – SiO_2 they show calc-alkaline to high-K calc-alkaline affinity. The lavas are moderately fractioned in the term of Mg# and Cr content (50.1-61.3 and ~ 110 ppm, respectively) but are very depleted by Ni (< 20 ppm) suggesting olivine + spinel fractionation. Rounded fragments of basaltic andesites from the volcanic breccias are characterized by lower K_2O, HFSE and REE, and higher Cr and Ni contect with regard to the basaltic andesite and andesite lavas.

All lavas show moderate enrichment of LREE over HREE [(La/Lu)cn = 5.41-8.38] at ~ 86 times chondrite relative concentrations. Negative Eu anomaly (Eu/Eu* = 0.77–0.95) indicates early feldspar fractionation at low pressure. The spider diagram normalized to N-MORB values shows an inconsistent secondary LILE enrichment. Negative anomaly of Nb-Ta