Geophysical Research Abstracts
Vol. 19, EGU2017-11190-1, 2017
EGU General Assembly 2017

Enticed by the punschrulle: Preliminary investigation of the Seve Nappe Complex's incorporation into the Scandinavian Caledonides via 'vacuum-cleaner' exhumation.

Chris Barnes (1), Jaroslaw Majka (1,2), David Schneider (3), Michal Bukala (1), and Katarzyna Walczak (1)

(1) AGH - University of Science and Technology, Faculty of Geology, Geophysics and Environmental Protection, Kraków, Poland. (cjbarnes@agh.edu.pl), (2) Uppsala University, Department of Earth Sciences, Uppsala, Sweden., (3) University of Ottawa, Department of Earth and Environmental Sciences, Ottawa, Canada

Recent discoveries of ultra-high pressure (UHP) metamorphism in the Seve Nappe Complex (SNC) of the Scandinavian Caledonides provide the basis for new investigations into the subduction - exhumation dynamics of the Baltoscandian margin during Caledonian tectonism. Specifically, exhumation of (U)HP complexes during subduction remains enigmatic. The recently proposed 'vacuum-cleaner' model details a method of exhumation for the SNC driven by conditions of underpressure within the subduction channel. This model, however, still requires extensive testing. Metasedimentary rocks hosting eclogite boudins of the SNC in Norrbotten, Sweden, preserve both metre-scale folding and a pervasive foliation which were developed during exhumation, as purposed by previous studies. Thus, the SNC host-rock offers an excellent region to test the vacuum-cleaner exhumation model.

Preliminary investigation of the host-rock reveals a regional mineral assemblage of Qz + Ms + Grt + Bt + Ksp + Pl + Czo + Aln + Ttn (+ Tur + St). Garnet inclusions (Qz + Rt + Ms) are interpreted to represent the peak pressure assemblage. Chemical profiles of Grt show homogenization of the cores with thin retrogressive rims. Homogenization of Grt requires temperatures $\sim$>700°C, interpreted to represent peak temperature conditions. Field observations of exhumation-related folds uncovered an axial-planar alignment of mica within the fold hinges, and an abundance of Aln and Czo requires upper-greenschist to lower-amphibolite facies conditions and presence of fluids. The current host-rock mineral assemblage is representative of retrogressive metamorphism at <550-600°C contemporaneous with deformation.

Microstructures of the metasedimentary rocks are variable and strongly correlated with competency of the rock. Competent domains abundant in e.g. Qz, Grt, Czo, Ksp etc. exhibit coarse-grained subgrain and bulging-grain recrystallized Qz and development of micrometer-scale shear bands. Less competent domains, dominated by micas, are characterized by very fine-grained recrystallized Qz, mica (Ms) fish bundles and rotated, pre-kinematic Grt and Tur, illustrating strain localization which accommodated the exhumation of eclogite boudins. Kinematic orientations determined from mica-rich shear zones are variable; rigid eclogite boudins are likely controlling local shear sense. Compositional mapping of white mica reveals a narrow range of composition (61-73% XMs/27-39% XCel) regardless of degree of deformation experienced by the crystal. However, individual grains show patchy Mg-depleted/Al-enriched zones (70-84% XMs/16-30% XCel), which are spatially correlated with Bt-after-Ms reactions. Graphical representation of total Mg + Fe-content vs. excess Si-content of white mica illustrates a strong Tschermak substitution towards Ms end-member composition, with moderate Prl and Ti substitutions also contributing to the overall excess Si-content. Growth of Bt-after-Ms and the associated Tschermak substitution towards Ms-composition suggests a decrease in temperature during retrogressive metamorphism, perhaps marking the transition from lower-amphibolite to upper-greenschist facies.

Future work on resolving the timing of exhumation of the SNC will involve in-situ 40Ar/39Ar dating of white mica and U-Pb depth profiling of zircon. This preliminary study regarding the petrology, mineral chemistry, and microstructures of the SNC host-rock in Norrbotten will be crucial for interpreting the geo/thermochronological results and will be instrumental for evaluating the vacuum-cleaner model.

This work is financially supported by NCN "CALSUB" research project no. 2014/14/E/ST10/00321.