Geophysical Research Abstracts
Vol. 19, EGU2017-8828, 2017
EGU General Assembly 2017

The fate of continental fragments during subduction at high pressures: insight from the Sesia Zone (Western Italian Alps)

Francesco Giuntoli (1), Pierre Lanari (2), Marco Burn (2), Barbara Eva Kunz (2), and Martin Engi (2)

(1) School of Geography, Earth and Environmental Sciences, Plymouth University, Plymouth PL4 8AA, UK, (2) Institute of Geological Sciences, University of Bern, Baltzerstrasse 1+3, 3012 Bern, CH

The behaviour of the continental crust subducted to high pressure (HP) conditions remains generally poorly known. Where continental HP-fragments are exhumed back to the surface, they provide insight into the processes occurring at convergent margins.

This study is focussed on the central Sesia Zone, a classic HP-terrain located in the Italian Western Alps. The sample series covers the two main tectonic complexes of the Sesia Zone and some of their recently recognized subunits. Our aim is to understand at what conditions and when this zone was assembled. We present new Pressure–Temperature–time (PTt) paths based on petrochrono¬logical analysis, i.e. by linking microstructural analysis and thermobarometry with mineral chronometry.

Our results constrain the main stages of mineral growth and deformation, as well as fluid influx during subduction. In the Internal Complex, several pulses of fluid percolated at eclogite facies conditions, between 77 and 55 Ma (allanite and zircon LA-ICP-MS U-Th-Pb in situ dating). During this time range, the samples from the Internal and External Complexes (IC and EC) show a substantially different metamorphic evolution, with HP-conditions reaching respectively $\sim$2 GPa and 600-670 °C versus $\sim$0.8 GPa and 500 °C. Juxtaposition of the two complexes occurred during exhumation, at $\sim$0.8GPa and 350°C between 46 and 38 Ma. Mean vertical exhumation velocities are constrained between 0.9 and 5.1 mm/year for the IC up to its juxtaposition with the EC. Exhumation to the surface occurred between 55 and 32 Ma with mean vertical velocity between 1.6 and 4 mm/year. Rehydration of mainly dry high temperature basement rocks has previously been attributed to post-HP retrogression during exhumation, but we show that HP-fluid infiltration preceded this late overprint.

This study shows how petrochronology, when based on detailed analysis from the macro-scale to the μm-scale, is a powerful tool to unravel the tectonometamorphic dynamics of polyphase geological settings.