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Subduction of continental crust in the Sesia Zone: Constraints on dynamics from in-situ U-Th-Pb dating of accessory phases (Western Alps, Italy)

B. von Niederhaeusern (1), M. Engi (1), and D. Rubatto (2)

(1) Institut für Geologie, Universität Bern, Baltzerstrasse 1+3, CH-3012 Switzerland , (2) Research School of Earth Sciences, Australian National University, Canberra

The Sesia Zone is composed of continental terranes derived from the Apulian margin of the Europe-Africa collision. This zone consists of slices of continental crust that were juxtaposed during Alpine convergence.
This study is focussed on the SW part of the Sesia Zone, for which geochronological data on the Alpine evolution have been very sparse. Peak metamorphic conditions reached low-temperature eclogite facies, at 500-550°C and close to 1.7 GPa. Post-eclogitic cooling at high pressure led to crystallization of lawsonite, such late growth of which was observed in this SW part of the Sesia Zone only (Pognante 1989).

In-situ U-Th-Pb SHRIMP dating of accessory phases (allanite and zircon) is being combined with detailed petrological, geochemical and structural analysis. This approach allows for the ages to be linked to specific metamorphic stages.
In the locality of Pont Canavese a phengite-omphacite-glaucophane mica schist contains metamorphic zircon rims that date at 75.5 $\pm$ 2.4 Ma (2σ). Zircon rims from a carbonate-bearing glaucophane mica schist have a similar age of 73.4 $\pm$ 0.8 Ma.
Phengite-omphacite orthogneiss and glaucophane-epidote mica schist are associated with lawsonite-bearing mica schist at the locality of Cuorgné. Allanite within the orthogneiss shows up to four metamorphic growth zones that can be distinguished on the basis of texture and ages of 76.8 $\pm$ 1.4, 70.6 $\pm$ 1.4, 64.5 $\pm$ 1.4 and 60.5 $\pm$ 1.3 Ma. Albite inclusions in the external zones suggest that significant decompression occurred between $\sim$71 and 65 Ma.

In the central Sesia Zone a first HP peak has been dated between 79 and 75 Ma, followed by decompression and a second high pressure stage after 65 Ma (Rubatto et al., 2011). The oldest ages from this study are within the range of early high pressure in the central section and are therefore expected to date the high pressure peak. The four growth zones in the allanite sample have the potential to unravel further details of the pressure-temperature-time evolution of Alpine subduction. Petrological and microstructural analysis is underway to link these new ages to the metamorphic evolution in this part of the Sesia block, to further constrain subduction and exhumation rates of the continental crust in the Western Alps.

References:
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Rubatto,D., Regis, D., Hermann, J., Boston, K., Engi, M., Beltrando, M., McAlpine, S.R.B. (2011): Yo-yo subduction recorded by accessory minerals in the Italian Western Alps. Nature Geoscience 4(5), 338-342