Dating metamorphic stages in HP-terranes: Case study in the Sesia Zone (NW-Alps, Italy)

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The dynamics of assembly of HP-terranes is of major geotectonic significance. We report on a field-based study in the Sesia Zone, a HP-terrane formed during Alpine convergence. The three main parts of the Sesia Zone essentially derive from the rifted NW-margin of the Adriatic continent.

Micaschists showing a HP foliation (eclogite to blueschist facies) and weak (greenschist facies) retrogression were studied in detail. Assemblages comprise multiple generations of phengite, garnet, glaucophane (±early omphacite) and allanite, plus quartz, epidote, chlorite, and titanite rimming rutile. Microstructural and mineral-chemical data indicate that growth zones in garnet and allanite correspond to distinct HP stages. In some cases, these can be related to discrete phases of deformation (D1/D2, D3).

Garnet cores are strongly porphyroclastic, with at least two overgrowth phases. Allanite composite grains have a LREE-rich metamorphic core believed to be stable with early grt plus first generation phen (Si-rich), gln, and rutile. Allanite rims (one or more) show lower LREE and seem to be stable with second generation phen, gln and probably grt. Thermobarometry for each stage is in progress.

Preliminary Th-Pb age data for aln were obtained by *in situ* LA-ICP-MS analysis: 80-74 Ma for cores and 68-62 Ma for rims (imprecise owing to small volumes). These ages compare well with the two HP stages (HP1: ~75 Ma; HP2: ~65 Ma) Regis *et al*. (2013) found in several samples of the Fondo slice of the Sesia Zone, from which pressure cycling was inferred (Rubatto *et al*. 2011). Taken together with their data, the present sample suite indicates that YoYo tectonics may have operated in one (or more?) slices, which span at least 16 km along strike of the Sesia Zone.

Field-based research continues to define the size and geometry of tectonic slices that constitute the Sesia HP terrane. Kinematic constraints quantifying the relative mobility of such fragments are sorely needed, as the scale of mixing within subduction channels is poorly known. Understanding the overall processes in subduction channels requires that results from numerical models and field data be combined.

[1] Regis et al. 2013 submitted to J. Petrology. [2] Rubatto et al. 2011, Nature Geosci., doi: 10.1038/ngeo1124.

Inferring a West Antarctica firn temperature history from a shallow ice core using a new proxy.

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The isotopic composition of polar ice has traditionally been used as a proxy for the temperature of the precipitation site. The validity of the method has however been challenged over the years, mainly due to apparent artifacts related to the seasonality of the precipitation, shifts in moisture source areas and others. Water isotope diffusion in firn is a process that can be used to infer past temperatures without the common problems of the traditional slope method. The method exploits the spectral information contained in the water isotopic composition time series and thus requires data sets of high resolution measured with high precision. Here we describe the method of firn water isotope diffusion and present ways to extract the firn temperature signal from high resolution $\delta^{18}O$ and δD time series. We apply this method on a 300 m shallow core from WAIS divide Antarctica (WDC2005A), sampled at a resolution of 3.3 cm and extending back to 1200 years b2k. We discuss on the findings of our temperature reconstruction and compare it to the temperature inferred with the traditional slope as well as with recent borehole temperature studies.

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