Linking zircon growth zones to P-T conditions: An example from the Gruf Complex, Central Alps

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Complexly zoned zircon grains from high grade metamorphic rocks may preserve multiple stages of the magmatic/metamorphic evolution of their host rocks. However, linking the zircon growth or recrystallization zones to P-T conditions can pose a challenge. We present *in situ*, texturally controlled zircon U-Pb ages from UHT granulites in an attempt to link zircon growth zones with metamorphic reactions and thus P-T conditions.

The Gruf Complex of the European Central Alps contains scarce charnockites and sapphirine-bearing granulites that record UHT conditions. Two U-Pb zircon studies on these UHT rocks reported complexely-zoned zircon grains with Permian cores and Oligocene overgrowths and recrystallized zones [1,2]. The authors concluded that UHT conditions occurred either during Permian rifting [1] or Alpine orogenesis [2]. Themodynamic modeling of whole rock samples and microdomains reveals that UHT conditions were reached during decompression, as garnet broke down to sapphirine ± orthopyroxene ± cordierite ± spinel [3]. Monazite grains included in UHT minerals and within garnet-breakdown textures have U-Pb ages of 30.05 ± 0.5 Ma [4].

Zircons from a variety of granulite types have similar internal textures. The grains commonly have weakly to strongly oscillatory-zoned and/or patchy cores with at least one thin unzoned or sector-zoned overgrowth. Many grains also show evidence for recrystallization of cores and rims along fractures. Based on these observations, we infer that the Permian-aged cores [1,2] formed during crystallization of the igneous protoliths. The Alpine-aged overgrowths and recrystallized zones [1,2] likely formed during the later UHT event under dry conditions. Combining *in situ* U-Pb dating with trace element fingerprinting and thermometry will further constrain the P-T conditions of metamorphic zircon growth and recrystallization.

[1] Galli *et al* (2012) *CMP* **163**, 353-378 [2] Liati & Gebauer (2003) *SMPM* **83**, 159-172 [3] Oalmann *et al* (2013) *GSA Annual Meeting Abstract* [4] Möller *et al* (2012) *IGC Abstract*.