

## Dating exhumation and brittle tectonics on a regional scale through hydrothermal cleft monazite

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In-situ SIMS dating of hydrothermal monazite is a powerful tool to unravel the low-T tectonic history of an area. Hydrothermal monazite from open fissures (clefs) has the advantage of dating crystallization at <350°C without the risk of diffusional lead-loss at the prevalent temperatures. Tectonic events may cause dissolution-reprecipitation reactions resulting in new growth domains and more than one geologically significant age. According to internal zonation, 15 to more than 30 ion-probe analysis spots per sample were distributed across 20, mm-sized, monazites to capture the entire age range recorded in the crystals.

All analyzed monazite samples come from an area in the Central Alps encompassing the Lepontine metamorphic dome. The region has a complex tectonic history (e.g. Steck; 2008), with nappe stacking largely predating greenschist to amphibolite facies Barrow-type metamorphism. This was followed by exhumation, and further folding and thrusting. Later deformation, affecting the entire region, combined with hydrothermal fluid flow worked to produce the famous mineralized Alpine clefs. The westernmost part of the region was overprinted by dextral ductile to brittle strike-slip deformation along the Rhone-Simplon Line (e.g. Mancktelow; 1985).

The cleft monazites record <sup>232</sup>Th-<sup>208</sup>Pb ages between ~19 and 5 Ma, distributed over at least three age groups. Ages generally decrease from east to west. However, almost all samples suggest an event affecting the entire area at around 12 to 10 Ma. Age domains as young as 7 to 5 Ma are rarely found outside the close proximity of the Rhone-Simplon Line. Combined with already published data from more local studies of the surrounding area, the monazite data provide an overview over a portion of the brittle tectonic evolution of much of the Central Alps.

[1] Steck (2008) *Swiss J. Geosc.* **101**, 515-546 [2] Mancktelow (1985) *Ecl. Geol. Helv.* **78**, 73-96