# Decoupling of zircon characteristics at HT conditions (>850°C)

BARBARA E. KUNZ[1*], DANIELE REGIS[1,2] & MARTIN ENGI[1]

[1] Institute of Geological Sciences, University of Bern, Baltzerstrasse 1+3, 3012 CH-Bern, Switzerland
*correspondence: barbara.kunz@geo.unibe.ch
[2] Geological Survey of Canada, Natural Resources Canada, 601 Booth St., Ottawa, ON, Canada

Zircon is an important chronological tool in metamorphic geology. Several studies from (U)HT metamorphic terranes show large ranges in U-Pb zircon dates, and it is not clear what processes cause this behaviour and what such data indicate in the context of metamorphic evolution.

The Ivrea Zone in the Southern Alps (N-Italy) preserves a continuous metamorphic field gradient from mid amphibolite to granulite facies conditions. We studied the response of zircon to increasing temperatures and found an overall trend from lower to higher grade: detrital cores get resorbed, and metamorphic rims grow; rims show an increase in Th/U ratio and Ti-in-zircon concentration, while U-Pb dates decrease. However, the scatter in U-Pb dates, Th/U ratios and Ti-concentration of zircon also increases with increasing grade. At granulite facies conditions, in particular, zircon shows more heterogeneity in individual samples than in amphibolite facies zircon grains.

Our work aims to understand whether granulite facies zircon grew in response to continuous or episodic processes or if zircon crystals were affected by a secondary alteration. When examined in detail, the U-Pb dates fom granulite facies zircon do not correlate with internal textures, Th/U ratios or trace element concentrations, whereas Th/U ratios and Ti-concentration of zircon are positively correlated. The decoupling U-Pb zircon dates from other characteristics is not readily explained by continuous or episodic growth. The large range of Th/U ratios and Ti-concentration may represent episodic growth during various periods. A more likely scenario to account for the scatter and decoupling of U-Pb dates is a secondary disturbance process caused by different behaviour and stability of elements in the zircon crystal lattice. However, based on our data we exlude that radiation damage, fluid alteration or crystal plastic deformation acted as important disturbance mechanisms. The details of the process that caused this disturbance remain obscure, but since only the highest-grade samples (>850°C) are affected by this decoupling, it must have operated at such high temperatures only.