Tracing Permian metamorphism in fragments of continental crust through rifting, subduction and orogenesis

BARBARA E. KUNZ[1]*, PAOLA MANZOTTI[1], BRIGITTE VON NIEDERHÄUSERN[1], DANIELE REGIS[1], MARCO BURN[1], FRANCESCO GIUNTOLI[1] AND MARTIN ENGI[1]

[1]Institute of Geological Sciences, University of Bern, Baltzerstrasse 1+3, CH-3012 Bern, Switzerland
*correspondence:(barbara.kunz@geo.unibe.ch)

Fragments of continental crust, derived from the NW margin of Adria, are widely distributed across the Western Alps (Italy). However, due to strongly variable Alpine overprint, correlation of these units is difficult, and their original relation at the Adriatic margin prior to rifting, subduction and orogeny is unknown. In many cases, mineral relics or pseudomorphs retain evidence of pre-Alpine history. Zircon is particularly robust to resetting even under severe geological conditions, hence it represents an ideal archive.

In order to compare and link the crustal fragments to their pre-Alpine position, it is necessary to understand the zircon characteristics in the source region, i.e. the Adriatic margin. We sampled clastic metasediments from the Ivrea Zone (Kinzigite Formation) and established four types of core-rim morphology, a sequence of up to four overgrowth rims and their geochemical characteristics (U-Pb ages, Th/U ratios and Ti-in-Zrn temperatures). We also sampled clastic metasediments in tectonic fragments of the Western Alps (IIDK, EMC, Valpelline and Emilius klippe). A weak Alpine overprint in most of the the IIDK and the Valpelline slices (Sesia - Dent Blanche units) allows recognition of numerous similarities (zircon, mineral assemblage, *P–T* condition) with the Kinzigite Formation in the Ivrea Zone. Strongly overprinted fragments, such as large parts of the Sesia and Emilius Klippe, are less straightforward to link to a counterpart in the present Southern Alps (Adriatic margin). First results from the Emilius klippe show zircon with similar characteristics as in the Kinzigite Formation. The same is true for some of the EMC samples, but other samples show wider high-pressure overgrowths, leaving little similarity with Ivrea samples. This renders correlations with the Adriatic margin difficult.

The approach used here combines textures of zircon growth/resorption, its trace element data and age relations. Such records provide a tool for very robust correlations across tectonic fragments. In the present case, the evolution of lower continental fragments in the Western Alps were shown to be very similar – up to Permian rifting – as in the Ivrea Zone.