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New constraints on the thermochronologic evolution at the boundary between the Eastern and Western Alps – Vorarlberg, Austria

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The study area in the westernmost part of Austria is marked by the limit between the Western and the Eastern Alps that takes place along the Rhine Valley, south of the Lake Constance. The area is composed, form the north to the south and from lowermost to uppermost structural position, by the European basement together with its autochthonous Mesozoic cover, autochthonous Molasse, subalpine Molasse, the Helvetic and Ultra-Helvetic, the Penninic and the Austroalpine nappes. These units are stacked in a succession of nappes separated by large south-trending overthrusts.
This study presenting new apatite and zircon fission track ages, together with a crustal-scale cross-section (Pomella et al., this session) addresses the thermotectonic evolution of this nappe stack. In comparison with similar studies from eastern Switzerland the boundary between Western and Eastern Alps should be enlightened.

Zircon fissions track ages from the lower freshwater Molasse reveal different age populations. Since all zircon fission track ages are older than the stratigraphic age this clearly indicates that post-depositional temperatures were well below the zircon partial annealing zone (i.e. below 200 °C) and the different age populations can be attributed to different source areas derived from the coevally forming and eroding alpine chain.
Preliminary fission track results on apatite from the lower freshwater Molasse indicate a strong dependence of apatite fission track single-grain ages on their annealing kinetics as inferred from Dpar analyses (Gleadow and Duddy, 1981). F-rich apatites systematically yielded younger ages compared to the Cl-rich grains. The younger ages derived from the F-rich apatites are consistently younger than the stratigraphic age and thus fully annealed while Cl-rich apatites display older ages than the stratigraphic one. The difference in annealing temperatures between Cl- and F-rich apatites (Ravenhurst and Donelick, 1992) thus constrains the maximum temperature to < 100 °C, most likely reached between 20 Ma and 14 Ma by combined sediment and tectonic overburden.

References

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