Thermal evolution of Permian post-orogenic extension and Jurassic rifting recorded in the Austroalpine basement (SE Switzerland, N Italy)

Benoit Petri*[1], Jan R Wijbrans[2], Geoffroy Mohn[3], Gianreto Manatschal[1], and Marco Beltrando[4]

[1]Institut Terre et Environnement de Strasbourg – université de Strasbourg, INSU, CNRS : UMR7063 – France

[2]Department of Earth Sciences, Vrije Universiteit Amsterdam – Pays-Bas

[3]Département Géosciences et Environnement, CY Cergy Paris Université – Universté Cergy-Pontoise – France

[4]Departimento di Scienze della Terra, Università di Torino – Italie

Résumé

The thermal evolution of the continental lithosphere is intimately linked to its tectonic history. In the present contribution, we explore the thermal evolution of the Austroalpine Campo and Grosina units that composed the former necking zone of the Adriatic rifted margin and that are now exposed in the Eastern Alps (SE Switzerland and N Italy). The Campo unit and the overlying Grosina unit are separated by a Jurassic horizontal extensional structure, the Eita shear zone. We report new muscovite and biotite 40Ar/39Ar ages for the Grosina unit (_˜261 Ma for muscovite and _˜246-245 Ma for biotite) and for the Campo unit (_˜218-178 Ma for muscovite and _˜214-171 Ma for biotite). No geologically meaningful amphibole ages were obtained because of contamination by extraneous argon in these minerals. The new results are combined with published ages obtained with different chronometers (U–Pb, Sm–Nd, Rb–Sr, K–Ar, 40Ar/39Ar). This dataset reveals that the two units record different thermal evolutions from the Permian post-orogenic extension to the Jurassic rifting. Ages of cooling initiation and associated cooling rates are estimated by Monte Carlo simulations based on DiffArgP. The Grosina unit records a Permo-Triassic slow cooling of 5-10 ∘C/Myr initiated during Early Permian in relation to the post-Variscan relaxation of the isotherms and cooling of the lithosphere that caused a large-scale thermal subsidence. By contrast, the Campo unit records a fast cooling of 25-100 ∘C/Myr associated to the tectonic exhumation of basement rocks during the Jurassic rifting and the formation of the Alpine Tethys rifted margin. This fast cooling appears delayed from major basement deformation phases, and likely follows a period of crustal re-heating.

Mots-Clés: Post, Variscan, Alpine Tethys, Rifting, Necking zone, Austroalpine, 40Ar/39Ar ages

*Intervenant