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Exhumation, cooling and deformation history of the necking zone of the fossil Adriatic rifted margin: the Campo/Grosina section (S-Switzerland and N-Italy)

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The Austroalpine units in SE Switzerland and N-Italy preserve remnants of the fossil Adriatic rifted margin. Notably the Campo-Grosina units represent the necking zone where major crustal thinning was accommodated during the Jurassic rifting. This contribution aims to unravel the complex tectonic evolution recorded in these units from the late Carboniferous – early Permian to the Jurassic rifting. The cooling and exhumation of the Campo and overlying Grosina units, separated by the Eita shear zone are explored by the acquisition of 40Ar/39Ar on hornblende, muscovite and biotite. New geochronological data on the Grosina unit present 40Ar/39Ar ages between 273 and 261 Ma for muscovite and between 248 and 246 Ma for biotite. The Campo unit shows clearly younger ages between 210 and 177 Ma on hornblende, between 186 and 176 Ma on muscovite and between 174 and 171 Ma on biotite. Numerous data were discarded due to frequent excess 40Ar on amphiboles, probably associated to the emplacement of the Sondalo gabbro with a high 40Ar/36Ar ratio in Permian times. These new ages, together with a compilation of existing ages obtained with different chronometers (U–Pb, Sm–Nd, Rb–Sr, K–Ar, 40Ar/39Ar) and performed on different lithologies from both the Campo and the Grosina units allow an estimation of the cooling rates for these units to be done.

The new results show that both the Campo and the Grosina units underwent a cooling rate around 10°C/Ma in Permian time. The Grosina unit, being in a shallower crustal level, did not record the Jurassic cooling, reaching up to 50°C/Ma in the Campo unit. The notable difference in cooling rates between the Permian and the Jurassic events attests of a cooling without being associated to an exhumation in Permian times, whereas the Campo unit cooled rapidly in Jurassic times, due to an exhumation and an emplacement in shallow crustal levels. The latter tectonic event was likely caused by shearing along the Eita or other greenschist facies shear zones located at the base and in the Grosina unit. These results bring new constrains on the strain history and partitioning in mid-crustal levels and the thermal evolution of mid crustal levels during late orogenic extension and subsequent rifting.

* This contribution is dedicated to Marco Beltrando, our friend and colleague who sadly passed away recently. We warmly acknowledge him for his amazing and constant enthusiasm.