Unravelling thermal history in lower greenschist metamorphic conditions: coupling thermochronometers and thermometers in axial zone, Pyrenees

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Constraining the thermal history of upper crustal tectonic units accreted under greenschist metamorphic conditions is usually rather unprecise because of uncertainties in closure temperatures, small phases, or in PT estimations. As a consequence, the thermo-structural evolution of brittle-ductile wedge is only known at the first order preventing from a precise understanding of the tectonic processes. The solution lies in coupling (classical and new) methods to both over-constrain the thermal history and inter-calibrate methods.

Our case study is the Axial Zone of the Pyrenees, which resulted from the convergence between European and Iberia following the Mesozoic rifting in the North Pyrenean Zone. In the axial zone, the collision is characterized by an anti-formal stack of tectonic units with a complex pre-collisional story. In particular, the strong structural Variscan inheritance complicates the cartography and dating of alpine structures. Moreover, recent studies suggest a strong thermal inheritance and a Feldspar destabilization that seem to influence the development of alpine mylonite in brittle-ductile conditions.

A multidisciplinary analysis of pyrenean (Alpine) structures, in the central (near ECORS profile) and central-western Pyrenees aims to constrain the thermo-structural evolution. By combining low temperature thermochronology (ZFT, ZHe, Including laser ablation depth profile from surface of grain), geochronology (K/Ar in situ), Raman thermometry, and chlorite-phengite thermobarometry, we document the structural evolution between 200 and 350°C. This study will allow a better understanding of the kinematics and rheological evolution of orogenic wedges.

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