



Thermal imprint of rift-related processes in orogens as recorded in the Pyrenees

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To which extent heat recorded in orogens reflect thermal conditions inherited from rift-related processes is poorly constrained. Here, we examine the Mauléon basin in the north-western Pyrenees that experienced both extreme crustal thinning and tectonic inversion within ~30 Myrs.

To constrain the time-temperature histories recorded in the basin from mid-crustal temperatures, we provide new detrital zircon fission-track and (U-Th-Sm)/He thermochronology data. The role of rift-related processes in collision is captured by forward and inverse modeling of our thermochronological data, using relationships between zircon (U-Th-Sm)/He ages and Uranium content, combined with thermo-kinematic models of an extension-collision cycle.

We show that the basin recorded a significant heating event at about 100 Ma characterized by high geothermal gradients (~80°C/km). The high thermal gradient lasted 30 Myr after convergence started. Our modeling and geological constraints support the view that subcontinental lithospheric mantle was exhumed below the Mauléon basin. This study suggests that ductile shortening during convergence, is primarily inherited from extension rather than being only related to tectonic and/or sedimentary burial. This should have strong implications on plate reconstruction from many collision belts that result from inversion of hyper-extended margins.