

Thermal rift inheritance in the north-western Pyrenees

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How the thermal state of extended continental lithosphere controls the thermal evolution of collisional orogens is still poorly constrained. Here, we provide new low-temperature (U-Th-Sm)/He thermochronology data in the Mauléon basin of the north-western Pyrenees, which has possibly resulted from the inversion of a hyper-extended margin. Both detrital and in-situ zircon (U-Th-Sm)/He ages on Cretaceous and Tertiary series, and on two samples from the Labourd Massif. These data show two important and rapid phases of cooling, the first during the Albian and Albo-Cenomanian, the second during the Eocene. These cooling events reflect both cooling and/or denudation mainly from the Axial Zone and Northern Pyrenees. Taking sediment thickness and a heat diffusion setting into account, the first cooling phase appears to be characterized by an abnormally high thermal gradient of $\sim 80^\circ/\text{km}$, contemporaneous with the thermal event responsible for the HT-BP metamorphism. This phase lasted until the inversion initiated due to plate convergence in the Late Cretaceous. Our zircon (U-Th-Sm)/He ages finally suggest that exhumation in the north-western Pyrenees started as early as 50 Ma.