

Linking time-Temperature history of the Aquitaine basin with post-orogenic evolution of the Pyrenees : new insights from borehole thermochronology

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Within their sedimentary record, foreland basins document vertical movements of the lithosphere, climatic changes, paleogeographic evolution but also history of exhumation of the adjacent mountain belt. Comparing vertical movements in a range and in its foreland is key to identify processes involved in growth and destruction of mountain belts.

The Aquitaine basin, geomorphologically stable since the early Pyrenean orogenesis has the potential to help understanding the driving mechanisms during the late to post-orogenic phases, but the lack of outcrops makes the studies particularly difficult to achieve. To bring a new point of view on the processes involved in the Cenozoic exhumation of this range, we present new low-Temperature thermochronology data from boreholes of the Aquitaine basin.

With the objectives to study rift-related to post-orogenic processes, numerous low-T thermochronological ages (~300 across the range) have been published, documenting pre-, syn-, and post-orogenic exhumation in the Pyrenees. Using thermal modeling of a new low-T database in the western Axial Zone, we show that a late Miocene (around 10 Ma) uplift occurred in the western Pyrenees, which generalizes the post-orogenic signal already detected in the south central Pyrenees. In previous studies, we linked the post-orogenic exhumation in the Southern Pyrenees to the excavation of the foreland valleys caused by the opening of the endorheic Ebro basin towards the Mediterranean Sea. To the West, the tectonic out-of sequence reactivation of the Gavarnie thrust has been invoked to explain the late Miocene AHe ages in the Bielsa massif. These new data might lead us to re-think the causes for such an exhumation signal during "post-orogenic" times. We thus summarize all evidences for the post-orogenic phase and attempt to provide explanation for it: is exhumation driven by Aquitaine foreland basin evolution? Does it reflect a tectonic reactivation of the Pyrenees? or is the signature of a regional/global climate change conditions ?

To answer these questions, we present a new dataset of ZHe and AFT ages from borehole samples in three localities of the Aquitaine basin. We use these new data to link the late Miocene exhumation history with the vertical movements in the Aquitaine basin.

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