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Source to sink patterns from the west-central northern Pyrenees constrained by detrital zircon thermochronological analyses

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Reconstructing long-term drainage evolution in collisional setting is key to deciphering between the drivers controlling the landscape (climate or tectonics) and time scales of transfer processes at play in foreland or orogens.

Here, we focus on the Pyrenees, a double vergent orogen that developed in response to the inversion of European and Iberian continental margins from Late Cretaceous to Miocene. The northern thrust belt on the retro-wedge side of the orogen is characterized by the inversion of hyper-extended rift basins characterized by specific cooling history. These constraints may be used to better understand how these margins have been inverted to form the current Pyrenean landscape. These relationships have been well studied for years in the South Pyrenean Zone but the northern wedge of the belt is largely unprocessed.

In this study, we provide new detrital zircon (U-Th-Sm)/He and U/Pb thermochronological data from Albo-Cenomanian to Tertiary sandstone turbidites sampled in the central and western North Pyrenean Zone and southern part of the Aquitanian basin. Age constraints obtained on Mesozoic and Tertiary basins are then compared to available reconstructions of cooling history of the Pyrenees.

A comparison between datasets on both south and north flanks of the orogen supports the idea that Pyrenean drainage system was highly non-cylindrical from east to west. The evolution of sources that fill the basins shows that onset of erosion of northern hercynian massifs initiated as early as the Late Cretaceous, implying some significant relief development in the early stages of plate convergence not reflected in foreland sedimentation rates.