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Rift-to-collision sediment routing in the Pyrenees: new geochronological constraints from the northern Pyrenees

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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 the Late Cretaceous to the Miocene. The northern thrust belt on the retro-wedge side of the orogen is characterized by the inversion of hyper-extended rift basins that have recorded specific cooling histories. 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 aimed to evaluate the evolution of sediments routing in the northern basins of the Pyrenees from rift-related Mesozoic to Cenozoic collisional processes. Using compilaton of geochronological data and paleogeographical reconstructions in the Pyrenees and new U/Pb and (U-Th-Sm)/He on zircons analyses, we are able to identify the relative role of local versus regional structure and drainage system in an evolving tectonic context from rift to collision.

This study shows that the sediment routing system of the northern Pyrenees is dominated by the role of extensional structures from 110 Ma to 50 Ma, whereas it appears to be controlled by compressional structures in the south. These results suggest that the characteristic Pyrenean non-cylindrism and segmented patterns regarding exhumation and source-to-sink histories are assumed by rift-related inheritance.