
Change in sedimentary source in a foreland basin: disentangling between tectonic, eustatic, and climatic signals

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Résumé

Source areas are critical elements of sedimentary systems as they determine the input lithologies and grain size of the sediments. Erosional processes depend on external forcings that are tectonics, eustasy, and climate. Yet, disentangling between these forcings remains a challenge. Moreover, because sources are usually not preserved in the rock record, provenance studies constitute an indirect tool for recreating source evolutions.

This study focuses on the South Pyrenean Foreland Basin, where a shift in the predominant source is documented from Late Cretaceous to Early Eocene. The timing of this change from Southern to Northern sources has long been interpreted as tectonic-driven. While coherent with the coeval formation of the Pyrenean reliefs, the exact timing of the shift compared to subsidence curves suggest that tectonics may not be the unique cause of the change in source predominance. Indeed, the major flooding during the Earliest Eocene (Ilerdian transgression) and the climatic perturbation during the PETM (Paleocene-Eocene Thermal Maximum) are other significant events coeval to the change in source. Disentangling between the different forcings requires a finer resolution in time and space.

We propose new provenance data of U/Pb and U-Th/He double dating on detrital zircons and petrography. Our samples span the Ripoll Basin, syn-PETM deposits from the Tresp

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and Ainsa Basins, and the Basque area. A compilation with data from previous studies leads to a reconstitution of drainage patterns from the Late Cretaceous to Early Eocene.

The identified shift in the predominant source area is diachronous over the different sub-basins. In the Central Pyrenees, the Montsec thrust constitutes a physical barrier and isolates the Tremp Basin from Southern sources starting from Thanetian. In the Ripoll and Ager Basins, the shift post-dates the Ilerdian transgression, suggesting the predominance of a base-level signal. Although some results suggest a local effect of the prevalence of specific sources during the PETM, the hypothesis of a connection of the Basque area to Pyrenean sources at this time is questioned.

The shift in the predominant sources in the Southern Pyrenees from Late Cretaceous to Early Eocene is diachronous and seems to be due to successively tectonics and base-level.

Mots-Clés: Source, to, sink, Provenance, Pyrenees