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Inversion of a salt-rich hyper-extended rift: geometry and evolution of the retrowedge foreland system of the French Pyrenees. Results of the PYRAMID project.

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The north Pyrenees represents the retrowedge of the Pyrenean orogen, which developed from Late Cretaceous to Oligocene due to moderate convergence between the Iberian micro-plate and Eurasia. It is now recognised that mantle was exhumed during Aptian-Albian opening of the Bay of Biscay and rifting in the northern Pyrenees. Pyrenean convergence was obliquely superimposed into this complex template. How does this kind of extremely thinned lithosphere respond to convergence and to loading? What is the elastic strength of such a plate and how does it change in space and time? How does the orogenic wedge and flexural basins evolve through time and space? The north Pyrenees offers an exceptional case study to investigate the inversion of a salt-rich hyper-extended rift system in the upper plate of a collisional orogen. We present a synthesis of the results of the PYRAMID project (funded by the French ANR) that focuses on this topic.

The Pyrenean retrowedge comprises the North Pyrenean Zone (NPZ) and the Aquitaine foreland basin (AB). Keuper evaporites are distributed discontinuously across these zones, strongly affecting

inversion styles and distribution of shortening. The NPZ is a thick-skinned, north-verging fold and thrust belt in the east, changing to a bivergent thin-skinned fold and thrust belt in the west. Keuper evaporites locally and regionally behaved as a decoupling layer. Many cryptic structures and stratigraphic geometries indicate the presence of pre-convergence salt diapirs, which were then squeezed and dissolved during inversion. In the west, the North Pyrenean Frontal Thrust (NPFT) represents the suture zone between Iberia and Europe. This boundary steps southward to the east to lie on the North Pyrenean Fault, forming the southern boundary of the NPZ. The NPFT to the east comprises a series of en echelon segments representing the inverted northern margins of Apto-Ablian rifts. The southernmost NPZ (in the centre and east) includes a zone of HT-LP syn-extension metamorphism affecting mantle-rich breccias and other highly deformed sediments (Metamorphic internal Zone; MIZ).

The Aquitaine retroforeland basin (> 5 km syn-orogenic infill) records the full orogen history with two main phases of subsidence and migration. The European plate is compartmentalised by major NE-SW faults. Flexural basin behaviour changes significantly across these crustal faults, partly due to the presence or absence of Keuper evaporites. The early basin was fed from the east as the Pyrenean orogenic wedge was still submarine. The edifice first rose above sea level in the east in the Eocene, gradually emerging toward the west.

