Salt-controlled rift dynamics and paleotemperature in the Mesozoic North Pyrenean margin: the case of the Tarascon Basin (Northern Pyrenees)

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Résumé

Salt tectonics provides a robust framework for interpreting the structural evolution of Keuper-bearing sedimentary basins such as the Tarascon Basin in the Northern Pyrenees, characterized by complex tectonostratigraphic and geometric relationships. This study aims to develop a detailed evolutionary model for the basin within the broader context of the Mesozoic hyper-extended rift system of the Pyrenees. It is based on detailed surface observations, an updated geological map, newly constructed cross-sections to characterize lateral variations, sequential restoration of a representative section, and RSCM analyses of peak temperatures recorded by the sediments.
The structural results reveal that the Tarascon Basin is highly compartmentalized. A major, throughgoing salt weld in the central part (named the Tarascon Central Weld) divides the basin into two distinct domains: to the south, large, tightly folded structures; to the north, several smaller asymmetric synformal (Rabat-La Pique and Saurat) and tilted (Roc de Sédour) minibasins. These are bounded by minor evaporite welds where most evaporite rocks have been expelled, leaving mainly ophite bodies-except for a significant allochthonous Keuper gypsum mass in the northern sector and a few minor outcrops. The basin's development during the Jurassic and Cretaceous reflects a dynamic interplay between tectonic extension and salt migration.

RSCM peak temperatures recorded in the basin infill display a general north-to-south positive gradient. This gradient remains largely unaffected by diapiric highs and welds, except for a pronounced paleotemperature step across the Tarascon Central Weld. This jump indicates a wide diapir that divided the basin, placing the southern minibasin closer to the hyper-extended rift axis, where crustal thinning and mantle exhumation were more intense. Isotherms are subhorizontal and cut the folded minibasins, implying that the temperature peak postdates the main folding episode. The structural evolution suggests that halokinesis

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drove minibasin folding, preceding Alpine compression that later affected the North Pyrenean margin.
Overall, the Tarascon Basin occupies a relay zone between two basement blocks: the Arize and Saint-Barthélemy massifs to the northeast, and the Trois-Seigneurs to the west. It formed on a relay ramp that deepened southward toward the hyper-extended rift axis, consistent with the observed south-increasing peak temperature.

Mots-Clés: hyper, extended rift, salt tectonics, paleotemperatures, Tarascon Basin, Pyrenees