



Basement-sediment decoupled hyperextended rift: the 3D record of the Arzacq Basin, SE France

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The partitioning of deformation through time and space and its tectono-sedimentary record in sedimentary basins represent key issues to understand rifting processes at hyper-extended rifted margin. One approach to address these questions consists in describing and restoring rift architectures from the fossil remnants preserved in mountain belts. The Western Pyrenees represents a good case study where these processes can be studied despite some controversies on the overall rift basin architecture and the associated mechanisms including a HT rift event. We benefit from one century of oil and gas exploration that provided numerous drill-hole data associated to a good 2D and local 3D reflection seismic coverage mainly in the Aquitaine foreland Basin. In this study, we show a new interpretation of a 3D/2D reflection seismic dataset located at the southern part of the Aquitaine foreland Basin, north of the Pyrenean frontal thrust. At this location, seismic interpretations supported by wells constraints reveal the preserved architecture of the Arzacq Basin in details, often referred to as a syn-rift “sag basin”. The structure of this former hyperextended rift basin is controlled by a north-verging top-basement low-angle normal fault decoupling into Triassic salt, located at the interface between the Mesozoic sedimentary cover and the Paleozoic basement. In 3D, the breakaway zone of this low-angle normal fault is segmented by N20°E transfer faults, re-laying the limit of the basin southward. Because of the geometry of the fault associated to the occurrence of the pre-rift Triassic décollement, the syn-tectonic sedimentary record defines an overall asymmetric syncline infilled by Aptian to Albian sediments. Sedimentary growth documents the southward migration of the depocenters above the top-to-the-north detachment fault. Extension ends in Albian time in the Arzacq Basin and is recorded by a kilometeric uplift of the Grand Rieu high, a topographic high between the Arzacq and Mauléon Basin further south. We interpret this dynamic as a thermal uplift related to mantle exhumation, the development of HT-LP metamorphism as well as alkaline magmatism south of the Arzacq Basin (Northern Mauléon Basin). Although the Arzacq Basin should represent a key example to understand pre-orogenic Pyrenean hyperextended basins, its final architecture strongly differs from usual supra-detachment basins described in literature. Thus, this should represent a new type of hyperextended basins and could actually lead to unravel a part of the worldwide-reported hyperextended sag basins.