Permian inheritance: post-orogenic extension and metamorphic core complex formation (Western Pyrenees)

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This study documents the sedimentary and structural response of continental crust in relatively hot lithosphere that is subjected to extension. We focus on the Permian rift system in the Western Pyrenees, where the narrow, post-orogenic intracontinental extensional Bidarray Basin is in contact with late Variscan granulites of the Ursuya massif. The western margin of the N-S trending Bidarray Basin preserves alluvial fans dominated by hyperconcentrated flows and interdigitating eastward into a N-S trending fluvial system. Structural analysis of the Ursuya granulites shows that they underwent orogen-parallel mid-crustal flow and were exhumed owing to strain localization during retrogressive metamorphism within an extensional shear zone flanking an E-W elongated domal structure. We show that the Bidarray Basin formed during Permian time on the hanging wall of a south-vergent detachment system that developed in response to the formation of an immature “a-type” metamorphic core complex (the Ursuya massif) under regional E-W extension, resulting in homogeneous thinning of the hot crust. This core complex was later exposed by denudation during Cenomanian time. The preservation of the Permian and Triassic paleogeography and structure indicates that there has been no lateral motion between Iberia and Europe in the study area. The Cretaceous Pamplona transfer zone, responsible for the shift of the Mesozoic rift axis, reactivated a N-S trending Permian crustal heterogeneity.