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Geometry of Tectonic Inversion in the Moroccan High Atlas: Structural and Gravity Constraints

Diverse modalities of tectonic inversion are illustrated by geological and gravimetric transects through the intracontinental High Atlas range of Morocco. The High Atlas formed during the Cenozoic by shortening of a Triassic-Jurassic oblique rift, accomodated by inversion of earlier extensional faults and newly-formed thrust faults and buckle folds. A gravity survey along corridors following the cross-section lines allows to draw Bouger gravity anomaly maps of higher resolution than existing ones. The short wavelenght component of the anomaly correlates well with the Mesozoic structure and the structural elevation of the denser Paleozoic basement. The main episode of extension during the late Liassic-Dogger was accompanied by the accumulation of up to 6000 m of marine and terrestrial sediments which exhibit growth strata associated to extensional fault-propagation (drape) folding or larger-scale ramp-synclinal folding. The subsequent compressional structural style is thick-skinned, with low-angle thrusting being limited to a narrow belt in the southern margin of the range. Section restoration yields orogenic shortening rations between ~15 and ~25%, in contrast with the high topographic elevation of the Atlas Mountains. The long-wavelenght component of the Bouguer anomaly present minimum values of around -125 mgal, which lead to model a crust thinner than expected for the elevation. These facts, together with a scarce foreland basin record adjacent to the High Atlas, are related to broad uplift that exceeds the extent of the range and was probably associated to a sub-crustal source.