

Evidence for Early Miocene Pre-Orogenic Margin Inversion/Basement Faults Reactivation and Related Vertical Movements in Central Zagros (Iran)

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Reactivation of Tethyan and Panafrican basement faults related to early orogenic inversion of the Arabian margin is evidenced by depositional patterns and facies variations within the Lower-Middle Miocene strata of the Zagros foreland basin, as well as distribution of pre-folding fracture populations within folds.

In the Fars, isopachs maps reveal an inhomogeneous pattern of deposition: the northwards increase in thickness of the Fars Group reflects flexurally-induced subsidence, while second-order depocenters suggest a more complex subsidence pattern in relation with tectonic inheritance in the Arabian margin and basement faulting: along the Persian Gulf, the lack of Gashsaran and lower Mishan Formations on the southern limb of the Asaluyeh anticline may indicate early movements along the Mountain Front Fault, while variations in thickness of the Gashsaran and Razak formations support early reverse movements along the Surmeh-Qir Thrust.

In the Dezful, facies variations and development of subbasins during the sedimentation of the Asmari Formation also support early basement fault reactivation; the evaporitic series of the Kalhur Member likely resulted from the development during Aquitanian of a long and narrow restricted lagoon environment, between two main basement faults. Early basement fault reactivation is additionally suggested by prefolding joint sets in the Asmari Fm which are oblique to present-day anticlines (and observed even within synclines) and are not compatible with simple fold-related fracture models: these sets likely formed within the cover in response to local extensional stresses caused by large-scale flexures/drape forced folds above reactivated N-S and NW-SE trending basement faults.

This early orogenic compressional deformation reflects early Miocene stress build-up in the Arabian plate resulting from a (far-field) stress transmission from the Arabia-Eurasia plate boundary.

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