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Thermal and Maturity Reconstruction in Northern Fars and Zagros Mountain Belt (Iran)

Temperature and hydrocarbon generation and expulsion in the Zagros Belt and its foreland has been modelled through geological time. Simultaneously, the history of folding and thrusting shows which structures did exist at peak expulsion time.

Coupled structural and geochemical computations were performed with the Thrustpack software. The 300 km long cross section starts in the foreland near the Persian Gulf and crosses the entire fold belt perpendicular to the main structural trend.

Paleozoic source rocks generated and expelled liquid hydrocarbons during Late Cretaceous and Early Cenozoic, ie before the Zagros folding started. Presently, only gas from Paleozoic source rocks charges the structures formed during the Zagros orogeny.

The mesozoic source rocks in the synclines and the anticlines sometimes have very contrasted behaviour. When present, Jurassic source rocks might be in the peak oil window before the Zagros folding in the deepest synclines and only in the condensate or wet gas zone after the development of structures. When the Cretaceous Kazhdumi source rock is in the favourable facies, it is in the peak oil expulsion phase in the deepest synclines during the peak time of folding, whereas it is not mature or early mature in the shallowest anticlines. It contributes to the major charge in oil to the Tertiary reservoirs. Finally, the Tertiary Pabdeh is a potential source rock only in the northern part of the transect, though it is immature in the anticlines and early mature in the deepest synclines.

One of the key factors for efficient exploration in the area is to understand and predict the source rock occurrence in the sedimentary sequence. Then, coupled structural, thermal and expulsion modelling highlights the major factors influencing the charge history to the various reservoirs.