Fracture Systems in Fault Related Folds, Zagros Fold Belt, Southern Iran

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The Fars province of the Zagros Fold Belt, Iran, displays many examples of thrust-related folds deforming Cretaceous-Miocene carbonates. Large doubly-plunging anticlines exceed 2 km elevation and extend for tens of kilometres along strike. Fold belt evolution commenced in the Late Oligocene-Early Miocene due to closure of Neo-Tethys and Arabian and Iranian plate collision. Platform carbonates on the northern passive margin of the Arabian plate were folded into broad upright detachment folds above the basal Eocambrian Hormuz salt detachment. Folds are box-shaped with moderately to steeply dipping limbs and sub-rounded crests.

This poster summarises the results of detailed fracture studies using high-resolution Quickbird imagery and Aster digital elevation models of two well-exposed, broadly E-W trending detachment folds in the Fars province. Oligocene and Lower Miocene limestones form doubly-plunging anticlines with well developed fracture systems. Both folds have Hormuz salt diapirs at one plunge termination. Stratigraphy, faults and fractures were mapped in ArcGIS, producing detailed fracture maps that were analysed in terms of orientations, lengths and densities. The two folds showed comparable fracture and fault populations and architectures. Fold 1 - Kuh-e-Khurgu, is a ~20 km long, doubly-plunging upright fold with maximum limb dips of 50°-60°, characterised by major NE-trending oblique fracture swarms, conjugate shear fractures at high angles to the fold axis and a prominent NE oblique fracture system. High fracture densities occur on the fold limbs and dense fracture clusters are associated with major oblique systems. Fold 2 - Kuh-e-Finu has maximum limb dips of 70°-90°, is ~20 km long and doubly-plunging. It is characterised by fold axis parallel, crestal-collapse faults with displacements up to 400 m. Axis perpendicular fracture systems are highly developed together with axis oblique systems.

Both folds show similar fracture architectures with Kuh-e-Finu showing well-developed axial crestal-collapse systems that may indicate greater shortening than Kuh-e-Khurgu. Oblique shear fractures on both folds appear to be slightly folded by late stage dextral shear, most likely the result of oblique convergence of the Arabian and Eurasian plates. Balanced cross-sections across both folds are used to develop 4D evolutionary models for the fold/fracture systems, which may be used as analogues for fractured carbonate reservoirs in other fold-thrust belts.