AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

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Regional- to reservoir-scale Tectonic Evolution of the Zagros Orogenic Belt

Using legacy geological data and new field observations, we have re-evaluated the kinematic evolution of the Zagros orogenic belt at all scales from the regional plate collision to the formation of reservoir-analogue folds. Broadly north-south plate convergence is accommodated by different kinematic regimes in different parts of the orogen. In the northwestern domain, convergence is partitioned onto northwest-southeast trending shortening structures and northwest-trending dextral strike-slip faults. In the southeastern domain, shortening vectors are closer to the Arabian plate motion, indicating lesser partitioning. North-south dextral strike-slip faults accommodate the strain differential between these two domains. We postulate that reactivation of basement fabrics, including rift structures, is a dominant control on the kinematic regimes. Hydrocarbon reservoirs in the Zagros are mostly fractured carbonates in anticline structures. Field, map and satellite data show that no single fold growth mechanism has been responsible for all of the observed structures, with implications for the geometry and internal evolution of reservoirs in different structural settings. Ductile detachment horizons at different depths have controlled the wavelength of compressional structures. Salt-cored detachment folds can be distinguished from fault-related folds, and both thin-skinned and basement-involved thrusting are implicated in the tectonic evolution of the belt. Exposed folds image the underlying network of faults, including linked thrust segments, relay zones and partially-decoupled basement strike-slip systems. Propagation of faults through basement blocks and palaeo-basins is a fundamental control on both the geometry of structures and the thermal evolution of the orogen.