Distribution and Properties of Syndepositional Faults and Fractures in the Compaction-Modified Capitan Carbonate Platform, Texas and New Mexico, U.S.A.

Kosa, Eduard[1], David Hunt[2] (1) Shell UK Ltd, Aberdeen, United Kingdom (2) Hydro Oil & Energy Research Center, Bergen, Norway

The Upper Permian Capitan carbonate platform is cut by syndepositional faults and fractures. These parallel the platform margin and are clustered within strata that steepen and thicken abruptly into the basin; a pattern attributed to early compaction-induced deformation of the platform. Faults typically pinch out below growth monoclines. Therefore, although faults and fractures are probably below seismic resolution, their existence and distribution in the subsurface could be reliably predicted from identification on seismic of (i) divergent strata and (ii) growth monoclines.

Faults and fractures were repeatedly exploited by karst, leading to the replacement of the primary fault and fracture rocks with sediments. Two karst phases are discussed. The syndepositional KARST 1, associated with virtually all syndepositional faults and fractures, is filled by carbonate, siliciclastic and mixed sediments derived from the platform. The proportion and penetration depth of siliciclastics increases shelfward, as a result of the more frequent and prolonged exposure of the inner parts of the basinward-inclined platform during sea-level lowstands. The burial KARST 2, filed by coarse Cretaceous siliciclastics, is limited to the outermost 1 km of the platform, where the youngest syndepositional faults and fractures have penetrated the shelf top. The connectivity of faults and fractures to overlying stratigraphy is considered to have controlled the distribution of KARST 2.

Fault and fracture properties, which are here related to karst and depositional processes rather than structure, size or displacement, are thus to some extent predictable, as is also their distribution in the subsurface. Consequently, implications for underground fluid flow can be made.