

Shunted raft tectonics: examples from Gabon and Mexico

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Abstract

The down-dip end of extensional raft provinces often exhibit compressional overthrusting of the originally-extended rafts. The thrusts generally verge seaward due to the initial asymmetry of salt rollers, with seaward dipping listric extensional faults favouring this geometry. Although the listric faults themselves were not reactivated, the landward higher footwalls were more easily overthrust over the seaward hangingwall block. Salt was smeared up along the overthrust producing a continuous salt sheet along the base of the overthrust carbonate. The intervening salt rollers and extensional diapirs were closed up; and salt was extruded up the smeared salt feeder and flowed over the top of the thrust rafts. This can provide a top salt seal to the shunted rafts. In Gabon and the Mexican Campeche salt basin the thrust rafts are composed of Cretaceous carbonates which often show depositional thinning onto an original salt high at the crest of each raft. This geometry is produced by a broad salt roller development below a listric fault, with a long-lived structural high developed during carbonate deposition, with the potential for better reservoir facies over a large part of the raft crest. However, some slabs have a consistent thickness of parallel-bedded carbonates which were presumably deposited around a downbuilding salt diapir, which had reached the seabed at an early stage before deposition of the carbonates.

Vertical displacement of the rafts can reach up to greater than 3 km, so that the shunted sheets of carbonates were emergent at the seabed and created a large amount of topographic relief of at least several hundred metres. Leaching and dolomitisation of the shallower-water carbonates could have then occurred, which would have further enhanced the reservoir potential. Erosion and scarp collapse of the uplifted carbonate sheets produced debris flows which piled up at the toe of slope and were dammed by the emergent salt sheets.

The ramps with the most vertical relief, but with low dip inclination will have the best potential for better quality reservoir and reserve size. This is because they will have remained at the seabed for longer time periods, are subsequently less deeply buried and compacted by Tertiary strata, and have larger closure areas. The underexplored shunted raft provinces of Gabon and Campeche Basin, Mexico lie in deepwaters (> 2 km) and offer an untested play fairway.