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Salt Diapirism Rise and its Incidence on Facies Distribution and Reservoir Characteristics in Lower Cretaceous Carbonates, Cardenas Field, Mexico

The Cardenas field is located south of the Gulf of Mexico in the Chiapas-Tabasco Basin. This onshore field was discovered in 1980 and produces hydrocarbons from Lower Cretaceous carbonate reservoirs. Until recently, it was thought that production came from a fracture network which formed in the vicinity of major faults. However, a detailed log analysis by means of electrofacies modelling (EasyTrace), 3D-seismic interpretation and petrographic observations on core samples, correlated with production patterns, revealed a direct control of vugular porosity and dolomitization process on reservoir connectivity and permeability.

Microfacies analyses on thin sections from the Lower Cretaceous series allowed to identify both pelagic and platformal paleo-environments with lateral transitions between them. We could also evidence two unconformities by truncation which relate to at least two distinct episodes of uplift in the Cardenas area, associated to the diapiric rise of underlying Jurassic salt. Uplift was locally associated with platform development. However, surface exposures and erosion of the topographic highs induced also the coeval deposition of rock avalanches and debris flow in adjacent basinal depocenters. These reworked carbonate series were subsequently affected by dissolution and dolomitization, vuggy porosity -not fractures- resulting here in very good reservoir characteristics. Numerous episodes involving gravitational sequences were identified and correlated along the structure, thus outlining lateral and vertical distribution of the reservoir.

This new model promotes to test new reservoir intervals in the field, but also to explore new sites immediately adjacent to the structure, given the stratified character and lateral pinch out of traps proposed in this study. Regionally, this new interpretation will have repercussion for other fields. Effectively, in the Chiapas-Tabasco Basin, the Mesozoic tectonic activity of salt domes, which occurred long before the main deformation stage in Miocene times, was either ignored or at least largely underestimated, although it is the main controlling factor for reservoir development.