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Architectural Analysis of Tectonically Influenced Shallow Water Mouth Bar Complexes, Lower Cretaceous Maestrat Basin, Spain: Implications for Reservoir Characterization and Modeling*

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Abstract

A combination of field data, remote sensing data, structural restoration and validation techniques are being used to evaluate the controls on delta mouth bar sand body architecture in a superbly exposed succession of deltaic facies and genetically related carbonates (Lower Cretaceous Xert Formation) in the region of Aliaga, eastern Spain. This presentation illustrates how shallow water deltaic sand body architecture can be described and evaluated along with how these techniques can be applied in reservoir characterisation and modelling studies. The study area falls within the Galve sub-basin - a component of the larger Mesozoic Maestrat rift basin system. These basins formed during an extensional phase affecting Iberia from the Oxfordian through to Albian, which created an epicontinental seaway connected to the western Tethys Ocean. Inversion during the Palaeogene left a strong E-W structural fabric; however, the Galve sub-basin has an N-S striking “Aliaga-Miravete” fault and anticline. We hypothesize that this structure is the result of reactive salt tectonics related to the extension of the overburden, and not due to Paleogene inversion. This is a new theory of the evolution of the Galve sub-basin, and the potential influence of synsedimentary salt tectonics on the architecture and stacking pattern of the deltaic sandbodies is being evaluated. The shallow-water deltaic succession represents a retrogradational parasequence set deposited during a longer-term transgressive phase. It was strongly river dominated, with progradation into a relatively shallow (20-30m) carbonate shelf setting. The limited accommodation space and low relief pro-delta shelf led to relatively thin mouth bars and mouth bar complexes. The deltaic sand bodies were deposited over an area >100km^2 with cumulative sand body thicknesses up to 70m. The development of a high-resolution correlative framework has allowed for the establishment of the degree of mouth bar amalgamation. This work provides an outcrop analogue for Tethyan reservoirs and Middle Eastern producing fields where the reservoir represents siliciclastic deposition into a predominantly carbonate environmental setting. The results put forward an architectural and correlative model of delta mouth bar and mouth bar complexes, which can then be used for facies prediction and correlation (reservoir modelling) between oil and gas wells.

Reference Cited

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