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Multi-scale Data Integration for 3D Reservoir Modeling of Seminole San Andres Unit

The Reservoir Characterization Project on the Seminole San Andres Unit, West Texas began with the ultimate goal to integrate 12,000 feet of core, 600+ wells, a 3D seismic volume, and 40+ years of production history into an integrated reservoir management tool in 3D. This goal was accomplished through several phases: key facies from core, log cleanup, facies prediction, integration of acoustic impedance, stratigraphic-framework delineation, and iterative rock property distribution.

Core description resulted in 15 key facies. Facies, based on their depositional, diagenetic, and petrophysical properties, were combined into 7 groups. Log cleanup involved old, raw neutron counts brought within field-wide porosity range by end-point scaling. Modern curves were corrected for mineralogy. Ultimately, a single porosity variable was assigned. Facies were predicted in all wells as a guide for 3D reservoir property distribution. A fuzzy logic technique was developed which utilizes facies proportion curves and available log data but does NOT require a specific set of curves. Acoustic Impedance (AI) was derived from the seismic amplitude volume using a background model of aerially varying AI calculated from log data. A 15 surface stratigraphic framework was built using core, logs, production data, and AI. These surfaces and facies-indicators provide a deterministic base within which petrophysical properties can be statistically distributed in 3D. The fine-scaled geo-model contains 8,000,000 cells and 250,000 cells upscaled. The model yields new insight for reservoir management by providing quantitative estimates of remaining reserves, effective completion strategies, and impacts the management of the ongoing CO_2 program.