Integrating Sequence Stratigraphy and Seismic Attributes for Quantitative Reservoir Characterization: A Case Study of a Pliocene Reservoir, Campeche Sound, Mexico

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ABSTRACT

An integrated workflow including analysis of seismic, core, well log, and biostratigraphic data was developed and conducted to both construct a reliable geologic model and characterize a Pliocene gas reservoir which overlies the Cantarell Field in the Campeche Sound, southern Gulf of Mexico. Campeche Sound is the most prolific Mexican oil-producing province where the best fields are Mesozoic-Paleocene carbonates in structural traps. Therefore, little exploration has been focused on the overlying upper Tertiary and more siliciclastic section, where new expectations arise for non-associated gas entrapments in a traditionally oil-producing province. In 2003, an exploratory well was drilled to investigate the gas potential of the Pliocene sequence. The well provided successful results from facies characterized by thin mixed siliciclastic-carbonate beds contained within a faulted rollover anticline. Based upon development of a sequence stratigraphic framework, a new play analysis is developed where the reservoirs are identified as retrogradational shoreface parasequences sitting atop third-order sequence boundaries. Basic and advanced seismic attributes contribute to the stratigraphic interpretation and gas detection. Seismic inversion for reflectivity allowed better identification of key stratigraphic surfaces. Modeled type-I amplitude versus offset (AVO) and a dimmed spectral decomposition response that follows structural contours provide reliability to gas discrimination and reservoir delineation.

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