
View Abstract

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TITLE: Influence of Sequence Stratigraphy and Depth of Burial on the Seismic Attributes - Lower Magdalena Valley, Colombia

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ABSTRACT BODY:

Abstract Summary: Pre-stack and post-stack seismic attributes have been critical in exploration of new plays and development of existing fields. Seismic data is also prone to a number of artefacts that can hinder the detection of Direct Hydrocarbon Indicators (DHI) and reservoir quality. The reservoir characterization and field development work carried out over last 10 years for Cienega de Oro (CDO) fluvial and shallow marine sands in Lower Magdalena Valley, Colombia, revealed complex interaction of many parameters that can make seismic interpretation quite challenging.

CDO sands are deposited in fluvial and shallow marine environment along a passive margin west of the rising Andean mountains. Individual sands can be 5-100 ft thick and are often separated by thin shales. If the sands are thick enough, the classic AVO response could be observed. Unfortunately based on depth of burial and interaction of thin bed tuning the reliable prediction of the productive sands is difficult. The work presented here follows cleaning and spectral balancing of pre-stack migrated gathers, revision of seismic interpretation through sequence stratigraphy, application of simultaneous inversion using detailed background model followed by seismic geomorphologic interpretation. Seismic geomorphology is revealed through spectral decomposition and waveform facies analysis.

Due to the presence of extensive normal and strike-slip faulting the trap configuration can often be highly complex. Thinned fault likelihood attribute and dip azimuth interpretation also reduces the structural uncertainty.

Each of the interval Upper, Middle and Lower CDO are calibrated using the modeling of existing wells that take into account the depth of burial and individual lithology control. Lower fluvial sands often contain coal intervals that can carry Class IV AVO response very similar to the reservoir sands. Once calibrated the interval can often be distinguished through lack of structural compliance of DHI. Low saturation gas and low porosity response has been distinguished through the use of frequency attenuation in limited angle stacks.

The study revealed the value of integration and reservoir characterization in the exploration and development workflow.

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