

Defining the 3D Unconformity Architecture and the Seismic Characterization of a Complex Reservoir from a Simultaneous-Stochastic Inversion: Case Study in the Llanos Basin, Colombia

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Abstract

A simultaneous-stochastic (geostatistical) seismic inversion was applied to an oil discovery to understand the vertical and lateral variations of a one-wavelength thick complex clastic reservoir in the Llanos Basin. Surprisingly, from the most likely solution, small changes in the elastic properties allowed us to make more detailed maps and to split an operational formation into three different flow units (stacked sands) separated by unconformities.

The questions about the actual age and stratigraphic position of these new reservoir packages were properly addressed, and the reservoir was successfully dated and stratigraphically positioned. This was accomplished by integrating the biostratigraphic calibration of the field and core data with the interpretation of the impedance and most probable lithology volumes. In addition to this geological improvement, the pressure, temperature and production data could be better understood.

Since the geostatistical approach provides a significant uplift to the reservoir image, as long as we have a proper definition of interval biozones, the applied workflows, inversion strategy, rock physics models and algorithms that we have used have broad application to invert a wide-range of analogous data sets for an integrated reservoir characterization beyond the vertical seismic resolution in this part of the basin.