

## **Quantitative seismic interpretation workflows for exploration in Colombian frontier basins**

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Quantitative seismic interpretation techniques have been applied with a frequent success to predict lithology and fluids in areas with good, local well control. By contrast, the application of the same techniques in frontier basins in cases where the nearest well control is some distance away is problematic. When empirical models are extrapolated outside the range of calibration, seismic responses can not be reliably predicted.

We introduce an integrated methodology for exploration in frontier basins that combines rock physics modeling and seismic-based evaluation techniques, allowing the interpreter reliably to extrapolate, predict, and quantify seismic responses of multiple geologic scenarios. This method includes consideration of depositional and diagenetic processes, with a clear understanding of the important geological and geophysical effects on the seismic properties and their variations from distant well control to prospect locations.

The method uses modern rock physics modeling techniques that are integrated effectively with existing thermal, burial, and reservoir quality prediction models based on regional basin modeling and petrographic analog data. These techniques link rocks' elastic properties to their bulk properties (porosity, lithology), physical conditions (pressure, temperature, and pore fluid properties) and geological effects (texture and composition). Elastic rock properties based on regional petrophysical data are modeled and extrapolated through velocity-based Vertical Effective Stress (VES) and reservoir porosity predictions. Seismic interval velocities are used to estimate the fluid pressure and to constrain the mudrock modeling. We apply scenario-based Amplitude Versus Offset (AVO) forward modeling and volume-based multi-attribute seismic scanning workflows to investigate the potential for Direct Hydrocarbon Indicators (DHI) and highlight potential reservoir and fluids. Examples from Colombian offshore and onshore frontier basins will be presented.