

Integrated Multidisciplinary Techniques Applied to the Evaluation of the Lower Magdalena Valley, Colombia

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The major tectonic forces that built the Andean Cordillera to the south and caused the convergence of the Caribbean plate to the north have played important roles in the history of the Lower Magdalena Valley (LMV), located in northernmost central Colombia. Owing to the high degree of structural complexity (e.g., basement-involved strike-slip, transpression, transtension) of some areas of the LMV, it is often difficult to obtain good seismic images. A depth to basement study using formation well tops, magnetics, gravity and seismic data was used to develop a tectonic elements analysis, to assist the evaluation and high-grading of exploration acreage, and for identifying exploration leads for more detailed follow-on geophysical analysis.

The integration of gravity and magnetic anomaly data with seismic and well data added to knowledge of the area's structural elements and features. The Ligia Ridge for instance is now believed to have a more pronounced structural expression than previously recognized.

The presence of major strike-slip structural elements in the study area (e.g., Santa Marta-Bucaramanga and Chimichagua Fault Zones) implies that basement faults within the region can exhibit, at different locations along their lengths, apparent dips characteristic of either normal or reverse faults. Integrated structural modeling (using gravity, magnetics and seismic) places constraints on the steepness of dips along the major fault zones.

Magnetic basement depth interpretation and high-density/acoustic basement mapping suggests that some of the sub-basin deeps may host Cretaceous carbonates representing a potentially viable hydrocarbon source rock.
