Petroleum Exploration in Subandean Basins
“Knowledge Integration - The key to success”

Geophysical expression of Late Oligocene-Early Miocene Reservoirs in the Guarrojo area, Llanos Basin of Colombia: from reconnaissance to simultaneous 3D seismic inversion

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The Guarrojo block, in the Llanos Basin of Colombia, is a case history of successful exploration where geophysical tools were progressively used from regional, reconnaissance work through to prospect definition, field development and further exploration. Prospective areas were identified with coarse airborne gravity-magnetics and 2D seismic (2005-2006). The first well (Ocelote-1, 2007) resulted in a significant oil discovery in sandstones of the Oligocene Carbonera (C7) Formation. The Ocelote field is currently producing 20,000 bopd, with significant untested potential.

Two 3D seismic surveys covering 378 km² were acquired (2007, 2009) and merged. Seismic interpretation and attribute analyses of pstm and psdm volumes were used for field appraisal and development. In addition, amplitude anomalies and coherence patterns suggested narrow, low sinuosity channels as upside potential in the Carbonera C5 member. The first C5 channel drilled in 2008 resulted in a significant oil discovery. Simultaneous 3D seismic inversion (P-S impedance) allowed for improved characterization of the C7 reservoir, but no fluid discrimination. Nevertheless, the inversion yielded improved estimation of both rock and fluid types of the overlying C5, C3 and C1 members. Sand-prone C5 channels were mapped with enhanced detail and P-S impedance cross-plots potentially discriminate water vs. oil bearing zones. Inversion prediction of oil pools failed in the first new well.

Further to a new 3D acquisition and merge (2010), a feasibility analysis including more wells still suggests the power to discriminate fluids. Upon completion of a new run of the simultaneous inversion, additional C5, C7 prospects will be ranked and tested.