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Subthrust Exploration Plays in the Neiva sub-basin, Upper Magdalena Valley

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The Neiva Sub-basin is a complex fold belt formed during Eocene, Late Oligocene and Late Miocene times. Published works state that the east verging faults are progressively younger eastward and they are older than the west-verging faults. Most oil accumulation is associated to hanging-block anticlines and monoclines truncated against the Late Oligocene unconformity. Unfortunately most of these structures have been tested.

An integrated basin analysis was done to define alternative exploration plays in the area. Regional structural and stratigraphic cross-sections showed that some of the low-angle thrusts within the Cretaceous section (where reservoirs are located) are rooted at the higher-angle basement involved faults. This caused that part of the east-verging Eocene and Oligocene fold-belt was reactivated and broken-through at different locations, which in turn resulted in the formation of prospective structures in the footwall of the “higher-angle” basement-involved faults. The 3 thrust sheets (some involving basement) drilled by the Reno-1 well demonstrated that this concept was possible.

Based on this concept, HOCOL designed an exploration program that included acquisition of seismic lines along the borders of the Neiva sub-basin to image below basement outcrops and drilled 2 wells to test the defined structures. The San Francisco Deep well encountered two faults but they only involved Volcanic sediments of the Saldana Formation (considered economic basement). The La Hocha well (50 km southward from the first well) drilled the eastern high-angle forelimb of a 4-way closure anticline below the San Jacinto fault. This well opens a new play concept that may have an impact on the hydrocarbon potential of the Neiva sub-basin.