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Neogene Tectonics as a Major Control on Hydrocarbon Plays of the Upper Magdalena Valley, Colombia

Tectonic controls on major hydrocarbon plays of the Upper Magdalena Valley (UMV) are reviewed based on an integrated, comprehensive evaluation of 2-D-3-D seismic, well logs, cores, surface geology, biostratigraphic, geochemical and remote sensing data. The UMV is an NE-SW elongated intermontane basin between the Central and Eastern Cordilleras of Colombia. Basin fill comprises predominantly siliciclastics, with up to 6 km of mostly marine Cretaceous and continental Tertiary deposits. Over 30 oil fields were discovered, producing from three main sandstone reservoirs, charged by an Upper Cretaceous source.

The UMV basin is highly compartmented and structurally complex. Anisotropies in the pre-Cretaceous substratum strongly influenced the style of Neogene compressional and transpressional structures. A wide range of styles results from the varying degree of basement-involvement, oblique reactivation and presence of detachments.

Two major Neogene tectonic pulses primarily control hydrocarbon distribution in the UMV. 'Pre-Andean' (Oligocene) E-W compression dramatically changed the basin configuration. Strong basin compartmentalization by thrusts and transpressional reactivation of rift faults resulted in the removal of Cretaceous and Paleogene sections over large areas, isolating areas of incipient and future hydrocarbon generation, controlling the preservation of reservoirs and creating migration pathways. Strong 'Andean' (Late Miocene) WNW-ESE compression overprinted most of the previous structuration. New thrusting and dextral transpression were widespread and both re-reinforcement and breaching of previous structures occurred, with additional removal of prospective sections.