

Regional Paleo-Drainage and Stratigraphic Hydrocarbon Trap Potential From 3-D Onshore Seismic, Llanos Basin (Colombia)

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ABSTRACT

Subsurface imaging of regional paleo-drainage systems from 3D onshore seismic allows to indicate direction of sediment transport, interpret depositional environments, predict reservoir facies distribution, mapping of erosional surfaces and delineate potential stratigraphic traps in an exploration acreage of the Llanos Basin (Colombia). The Llanos Basin is one of the most prolific hydrocarbon provinces in Colombia. It is a foreland controlled by the compressional movements and uplift of the Andes fold thrust belt. The Basin infill consists of a siliciclastic-dominated section deposited in a shallow marine to continental setting, ranging in age from Early Cretaceous to Quaternary. The petroleum system includes several organic-rich intervals, from Late Cretaceous to Paleogene. Sandstones of Paleogene age are the main reservoir, but Cretaceous sandstones are also good hydrocarbon producers. During the last 15 years, hydrocarbon exploration was based in 3D seismic data which has allowed to image subtle structural traps. The area of study is cover by eight different 3D seismic surveys, which were merged into one single volume aiming to homogenize and improve the data, resulting in a coverage of 1200 Km². The final Pre-Stack Time Migration (PSTM) seismic volume was calibrated using 31 wells with a good quality set of logs, including vertical seismic profiles and check-shots surveys. Interpretation of the PSTM merged seismic volume confirmed the regional presence of erosional surfaces, fluvio-deltaic geomorphologies and paleo-drainage at different stratigraphic levels, from Cretaceous to Paleogene age. Seismic inversion, supervised and non-supervised wave form classification maps and high definition spectral decomposition allowed to predict facies, reservoir distribution and identify prospective geobodies. Most of the significant structural traps identified within the 3D merge volume have been already drilled. This regional study has allowed to detect potential stratigraphic traps, opening new opportunities for exploration drilling.