Oligocene Unconformity and Depositional Model Update: Application for Hydrocarbon Prospectivity, Llanos Basin, Colombia

Ignacio Iregui[1], Alexis Medina[1], Ivan Becerra[1], Martin Morales[1], and Diana Quinche[1]

[1]EXPLORATION, CEPSA, Bogota, Colombia.

ABSTRACT

Data integration from sequence stratigraphy, biostratigraphy, crono-well correlations techniques among others as log signature, thorium/potassium ratios and fluid analysis suggests that early tertiary sand deposits presence - C9 formation - (former Eocene Mirador formation) is controlled by an erosional surface named Oligocene Unconformity (OU), acting as the base of these reservoirs and defining the deposit geometry from upper cretaceous to lower tertiary sequences. It became necessary to use 3D seismic surveys available that, combined with new well data, made possible to adjust interpretation and seismic attributes that allowed to map the C9 Formation (main reservoir), the OU and the cretaceous Guadalupe K formation (secondary reservoir) for the first time, usually bypassed regarding to previous models. The OU seems to record and control both reservoirs geometries (dendrite geoforms associated to an estuarine environment) therefore useful to determine presence and/or absence of Lower C9 formation but also and more important, of Guadalupe K formation, recognized as the main reservoir for neighbor areas but never tested inside the area of study. Given the drawback of low seismic resolution due to relatively thin reservoirs and the OU presence, the use of seismic attributes was determinant to guide the detailed horizon picking, also key tool to overcome the notable difficulty of following the nearly plan parallel unconformity surface (paraconformity). All these results were used as main inputs for a complimentary project which involves quantitative interpretation methodology (seismic inversion, spectral decomposition, seismic facies classification) out of the scope of the present work, to complete the final prospectively assessment. It can be concluded that The Upper C9 Formation is present everywhere inside the study area with some slight thickness variation, and corresponds to amalgamated siliciclastic sandstones genetically related to estuary environment of low accommodation. The Lower C9 Formation is very similar to Upper C9 but confined to the channels and mostly absent outside of them with some exceptions. Finally, the Guadalupe K formation is partially or totally truncated/eroded by Lower C9 formation incision, corresponding to “lows” and it is found where the paleo-topography of the OU exposes its shoulders or “highs”. The latter opens the floor to a new regionally unexplored stratigraphic play of a world class reservoir.