

# **Analysis of Hydrocarbon Under-Filled Miocene Deep-Water Reservoirs, Eastern Mexico Offshore**

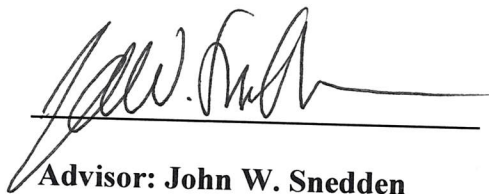
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## **ABSTRACT**

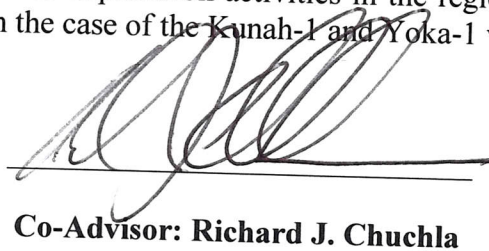
Hydrocarbon exploration in the deep-water portion of the southwestern Gulf of Mexico commenced just a few years ago, but well discoveries have not been able to meet the optimistic expectations based on historical success in the northern Gulf of Mexico. Based on the existence of organic-rich source rocks and high-quality Miocene reservoir rocks, this thesis hypothesizes that the lack of significant hydrocarbon accumulations in some prominent traps in the western Catemaco fold belt (Veracruz Trough) is probably the result of an ineffective sealing and/or trapping mechanism. Identifying and assessing the petroleum system elements that suppose the greatest risks for new discoveries in this under-explored hydrocarbon province is relevant as it can help guide prudent future investments in exploration activities.

By integrating well core, 3D seismic, and other well data provided by the Mexican National Hydrocarbon Commission, this thesis attempts to determine the cause of hydrocarbon under-filled or water-wet Miocene traps within the Veracruz Trough using the structures drilled by Pemex operated Kunah-1 and Yoka-1 wells as case studies. Three hypotheses are considered and analyzed: top seal leakage, the existence of unmapped shallow spill points, and late trap formation relative to hydrocarbon charge. Assessment of the sealing capacity of the rocks capping the reservoirs of interest involved pressure data analysis and MICP laboratory measurements on cuttings. On the other hand, interpretation of the location of the structural spill points for each Yoka-1 Miocene reservoir was accomplished by using 3D seismic mapping. Lastly, a trap timing analysis was undertaken to estimate the age at which anticlinal structures began to form, relative to the time at which hydrocarbon charge likely occurred.

Seal bed leakage analyses suggest that analyzed intra reservoir and top seal rocks are at least moderately effective. In addition, 3D seismic structural interpretation around the Yoka-1 trap strongly suggests that the spill points are much deeper than fluid contacts. However, the trap formation assessment showed that by the time the traps began to develop, the oil generation phase was exhausted and gas generation was at a very late stage for the most prominent source rocks. Consequently, a more robust explanation for the Kunah-1 and Yoka-1 under-filled structures is a poor timing between the hydrocarbon charge and trap volume evolution. Given these important conclusions, some recommendations are made for future exploration activities in the region, as well as the value of information for risk assessment in the case of the Kunah-1 and Yoka-1 wells.



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