# Petroleum System Analysis of the Nicaraguan Rise and Colom-bia Basin: A regional overview from seismic and well data

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## ABSTRACT

The Caribbean region covers only 0.4% of the world's surface but has an extremely complex tectonic history due to the interaction of the North American, South American and Pacific plates. To reevaluate the prospectivity of this area, we have used 8,500 km of vintage 2D seismic data acquired in the early 1980s and 3,000 km of high-resolution, deep-penetration 2D seismic data acquired in 2007. The seismic data set was tied to 27 existing exploration wells and five ODP and DSDP wells containing a complete set of geochemical, geological and geophysical logs. We have also integrated our interpretation with previous work by Bowland (1993)
using UT lines from the early 1980s that effectively expands our study area to cover a 621,000 km2 area of the Nicaraguan Rise and Colombian basin. Main results include: 1) The sediment deposition controlled by tectonic events is represented by localized horst and grabens in the Nicaraguan Rise, and major depocenters in Jamaica offshore, Panama offshore and Colombia Basin. 2) We identify key petroleum system elements and processes using geological, geophysical, and geochemical data integrated into a 3D petroleum system model that includes an Early and Late Eocene / Oligo-Miocene (!) petroleum system. 3) Early and Late Eocene source rocks identified in the Nicaraguan Rise include clayey, calcareous limestone and pelagic shale containing kerogen type II and III with a TOC between 0.85% and 3.74%. 4). Potential reservoirs include transitional to deep marine environments with clastic pinchouts; dolomitized, shallow marine carbonate complexes; and reefal buildups. 5) Potential seal rocks include gray calcareous shale, siltstone, and silty shale deposited above regional and local unconformities and as intraformational facies changes. 6) Thermal history modeling based on paleo-heat flows, burial histories, and transformation ratio maps shows that the initiation of hydrocarbon generation began during the Early Oligocene (35 Ma) at ~69 mW/m2 with an average hydrocarbon expulsion of 7.15 MMBOE per km2 between Eocene source rock intervals. 7) Our proposed model predicts vertical migration in the Nicaraguan Rise with a predicted generation-accumulation efficiency of 3.5%.