

Hydrocarbon Potential of Hispaniola and Puerto Rico Based on Combining Depth to Basement and Maturity Information from Previous Wells

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Abstract

The islands of Hispaniola and Puerto Rico in the northeastern Caribbean and their offshore areas have over century of hydrocarbon exploration, with over 72 exploration wells drilled but an insignificant commercial production to date localized to one area of south-central Hispaniola (Dominican Republic). A key question is whether these large oceanic islands of the Greater Antilles – removed from the input of large terrigenous river systems found in other areas like the Gulf of Mexico and northern South America – have experienced sufficient subsidence and depth of burial for any source rocks present to reach maturity and produce widespread areas of commercial hydrocarbons. The basement underlying all basins in the area and the source of much of their clastic fill is island arc crust of the Cretaceous-Oligocene Great Arc of the Caribbean. We have compiled 500 km of pre-existing seismic data to construct an improved depth to metamorphic-igneous island arc basement map for the region. These maps reveals that the basement's greatest depth to igneous-metamorphic basement and overlying fill include the Enriquillo-Cul de Sac basin of Hispaniola (5 km depth), San Juan / Central Plateau basin (5.3 km depth), Cibao basin of Hispaniola (5 km depth), North Coast basin of Puerto Rico (1.7 km depth), South Coast basin of Puerto Rico (1.3 km), and Virgin Islands basin (2.5 km). Of these seven, deep basins, 1D basin modelling using available vitrinite data show that only the collinear Azua-San Juan-Central Plateau of central Hispaniola has achieved sufficient burial to place known source rocks into the oil window. This observation is supported by the existence of natural surface seeps and limited production in the Azua area of the Dominican Republic. The lack of known surface seeps in the other deeper basins supports our proposal that these other basins may lack suitable source rocks or sufficient burial to attain maturity.