

Prestack depth images of the deep stratigraphy and structures, offshore Trinidad & Tobago and Barbados, and implications for oil and gas exploration

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While earlier studies have inferred that the Late Cretaceous hydrocarbon source rocks of Venezuela extend into the subsurface of Trinidad & Tobago, delineating their distribution in the offshore area had proven elusive, due to a lack of deep seismic imaging.

To better understand the distribution of the Cretaceous source rocks, as well as the broader regional geology of the area, 5,000 km of seismic reflection data were collected in the offshore areas of Trinidad & Tobago in 2003. Record lengths of 18 seconds, a cable length of 9000 meters, and pre-stack depth migration were employed to image the deep structure and stratigraphy.

Depth images show a northward-dipping (~5°) reflector package correlated to the carbonate rocks of the late Cretaceous passive margin of South America. These reflectors are overlain by approximately 17 km of Cenozoic clastic rocks deposited on the passive margin, or as part of the Eastern Venezuelan foreland basin. Although the northward-dipping reflectors pass off the bottom of the 18-second (~19 km) record, we can infer their line of intersection with the eastwardly-moving Barbados accretionary prism of the Caribbean plate.

Unlike the passive margin formed along the northern margin of South America, the Barbados prism rocks were deposited in a paleogeographic setting far to the west of their present accreted position. The presence of hydrocarbon seeps in cores from the seafloor around Barbados is attributed to a prism-derived source rock different from the late Cretaceous carbonates of the South American margin.
