

Takutu Basin Rift as a Conduit for Continent-Interior Drainage Into the Guyana Basin

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Abstract

The Takutu basin of Guyana and Brazil is known as a Jurassic to Early Cretaceous (pre-Aptian) age non-marine continental rift basin associated with the initial opening of the North Atlantic Ocean. However, in Guyana a previously unrecognized section of claystone, sandstone, and anhydrite above the Lower Cretaceous was drilled in the 1993 Turantsink-1 well. This was dated as a Late Cretaceous (probably Turonian) restricted marine unit by a biostratigraphic study. Tentatively correlated to the deltaic Tucano Formation in Brazil, it demonstrates that a marine embayment of the Atlantic Ocean extended at least this far south along the Takutu rift during a Late Cretaceous highstand. In addition, although the Takutu basin is today separated from the coast by a broad expanse of Precambrian basement rocks, seismic data show that the rift once extended further northeast. This is supported by the NE-SW orientation of numerous faults cutting the Precambrian. The Takutu sedimentary section did not pinch out depositionally, but rather was truncated by post-depositional uplift and erosion. Uplift probably occurred during a Miocene regional tectonic event, related to the Andean orogeny, which also caused internal structural deformation in the Takutu basin. In the offshore Guyana basin, the head of the submarine Berbice paleocanyon is just offshore from the relatively minor Berbice river, with headwaters near the northeast end of the Takutu basin. This giant shelf-incised canyon system, some 80 km long, was cut over several million years during the late Coniacian to Santonian, following the Turonian transgression into the Takutu, and filled during Campanian to Maastrichtian time. It served as a conduit for transporting vast amounts of sediment from the continent across the shelf into deep water as channel deposits and submarine fans. The modern Berbice river is

incapable of transporting this volume of sediment, but a much larger proto-Berbice river system must have then existed, draining northeastward from the South American interior across the Guiana Shield through the topographic low of the Takutu rift. The Miocene uplift caused drainage re-alignment and stream capture of the upper proto-Berbice river by the Amazon river system, thus greatly reducing sediment input. This scenario provides the most logical source-to-sink explanation of the formation and subsequent abandonment of the Berbice paleocanyon and of the associated deep-water deposits that comprise hydrocarbon reservoirs of the Guyana basin.