

Caribbean Evolution from Pangea to the Present: Framework for Basin Evaluation

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Abstract

Numerous new data sets from recent years continue to bolster the Pacific origin model of Caribbean evolution, including assessments or refinements of: Atlantic opening history; gravity, magnetic and seismic data in the Gulf of Mexico, across Florida, and over Demerara Rise; HPLT metamorphic suites around the circum-Caribbean sutures that date to 120 Ma or more; arc magmatism associated with those sutures that dates from 133 Ma; seismic tomography (BOLIVAR) showing two opposing slabs (Caribbean and Atlantic) many hundreds of km in length beneath northern South America denoting large plate motions; eastward-younging inception of arc magmatism in SW Mexico that demonstrates the migration of Chortis with the rest of the Caribbean's oceanic crust; Proto-Caribbean passive margin sedimentology and stratigraphy which have found no proximal record of Caribbean airborne arc volcanism (or Caribbean plume intrusion for that matter) in over 40 to 100 Ma of measured section (depending on location, increasing eastward); northward-driven arc-related terrane accretion in the Gulf of Tehuantepec, Mexico, indicating an origin for Chortis farther to the west along Mexico; the W or NW directed emplacement of a structural belt along eastern Yucatan that is best explained by the Late K/Palaeocene passage of Cuba on its way north to the Bahamas; and eastward-Cenozoic migration of the Venezuelan foredeep, among others. Cretaceous spatial separation and large allochthoneity of mobile Caribbean magmatic terranes with respect to the tuff-free and passive Proto-Caribbean margins are clear. However, this talk will not stress the Pacific origin, but rather will examine the Caribbean basins and flanking terranes to show that the Pacific origin is not only required, but that tectonic models acknowledging it can help us to understand the genesis and evolutionary geometries of the basins, especially where our understanding from direct study is poor. A number of basin stratigraphies and structural histories will be outlined, with the goal of identifying passive margin stratigraphic sections, foredeep basin sections, intra-arc basin stratigraphic sections, and pull-apart basin sections. This analysis defines the rate and timing at which Caribbean lithosphere was engulfed between the westward drifting (relative to the mantle) American continents, thereby highlighting the predictive value of the Pacific origin model. Classes of basins can be identified, along with assessments of basin prospectivity. This talk is intended to provide a framework for basin genesis across the Caribbean, and for subsequent talks of this symposium.