



The Debate over the Plate Tectonic Evolution of the Caribbean

Manuel A. Iturralde-Vinent

Museo Nacional de Historia Natural, Obispo no. 61, Plaza de Armas, La Habana Vieja 10100, Cuba (maiv_cu@yahoo.com)

The scientific debate concerning the origin and evolution of the Caribbean has gone on for more than 100 years, and was the major concern of the recently completed IUGS/UNESCO IGCP Project 433. Here I present two of the main points debated: In situ vs allochthonous origin of the Caribbean Plate. There are two main groups of models: the allochthonous and the autochthonous concepts. Most project participants have adopted the allochthonous model. According to this model, the Caribbean originated and evolved in three main stages. The first one, or ProtoCaribbean stage, took place from latest Triassic through the Early Cretaceous, concurrently with the breakup and disruption of Pangea and the evolution of an in situ oceanic crust in the Gulf of Mexico and the Caribbean realm. The second or MesoCaribbean stage, began in Early Cretaceous time, coincidental with extensive development of volcanic island arcs in the Eastcentral Pacific Ocean which defined the eastern converging margins of the Caribbean Plate (present nuclear Central America and Greater Antilles–Aves Ridge–Caribbean Mountain of Venezuela). As a corollary follows that the Caribbean Plate originated within the Pacific. The third or NeoCaribbean stage, started when the Caribbean Plate began an active eastward drift with respect to the North and South American plates. In this process the ProtoCaribbean lithosphere was largely subducted and overridden by the allochthonous Caribbean Plate. Taking into account uncertainties of this model and some other facts, some authors support the in situ evolution of the Caribbean. Great Arc vs Multiple Arcs. The concept of a single Great Arc shaping the evolution of the Caribbean Plate, is based on the general argument that the most important tectonic event in the Caribbean realm was a subduction reversal (flip) that took place within the Aptian (circa 120 Ma). The Multiple Arc concept proposes that several arcs were active beginning in the Cretaceous, based on the occurrence

of several important pan-Caribbean tectonic events that produced partial or total extinction of arcs, formation of new arcs, deep seated metamorphism and exhumation, deformations and regional unconformities, modifications in arc geochemistry and geometry. Those supporting the single arc concept understand these events as variations and inhomogeneities along the trend of the same arc.