

Changes in Eocene-Miocene Shallow Marine Carbonate Factories Along the Tropical Southeast Circum-Caribbean Responded to Major Regional and Global Environmental and Tectonic Events

Juan Carlos Silva-Tamayo¹, Alcides Sial², Andres Pardo³, Bayona, German⁴, Agustin Cardona⁵, and Camilo Montes⁶

¹*Earth and Atmospheric Sciences, University of Houston, Houston, TX, United States.*

²*Geosciences, UFPE, Recife, Brazil.*

³*Geological Sciences, Universidad de Caldas, Manizales, Colombia.*

⁴*Corporacion Geologica ARES, Bogota, Colombia*

⁵*Petroleum and Material Ingeniering, Universidad Nacional de Colombia, Medellin, Colombia.*

⁶*Geosciences, Universidad de los Andes, Bogota, Colombia*

Abstract

Changes in the factory of Cenozoic tropical marine carbonates have been long been attributed to major variations on climatic and environmental conditions. Although important changes in the factories of Cenozoic Caribbean carbonates seem to have followed global climatic and environmental changes, the influence of tectonics on the occurrence, distribution and stratigraphy of shallow marine carbonate factories in this area is far from well understood. We use sedimentologic characterization and multiple geochemical proxies to assess the influence of changing environmental conditions, tectonics and sea level change on the development of the shallow marine carbonate factories. During the Palaeocene-early Oligocene interval, which was a period of high atmospheric pCO₂, coralline algae were the principal carbonate builders of shallow marine carbonate successions. The predominance of coralline red algae over corals in the shallow marine carbonate factories was likely related to high sea surface temperatures and high turbidity. Deposition of these factories was also controlled by diachronic opening of different sedimentary basins along the SE circum-Caribbean resulting from transpressional tectonics. Calcareous algae persisted until the middle Oligocene, when a drop of atmospheric pCO₂ allowed the appearance of corals as the main constituents of the shallow marine carbonate factories by late Oligocene times. The late Oligocene was characterized by the occurrence of low diversity, patchy coralline reefs, often mixed with siliciclastic sediment. The occurrence of these patchy coralline successions occurred along rimmed mixed siliciclastic/carbonate platforms and seems to have been related to low sea level. The Early Miocene was characterized by the development of rimmed carbonate platforms along which high diversity fringing coral reefs. The occurrence of these high diversity coralline carbonate factories was favoured by a decrease in the continental siliciclastic input and a further decrease in sea surface temperatures. Coral reefs dominated the shallow marine carbonate factories until the Middle Miocene, when a new period of calcareous algae reefs occurred around the Caribbean. This resulted from major changes in Caribbean environmental conditions, which were driven by increased continental sediment runoff resulting from the exhumation of the northern Andes.