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Changes in Eocene-Miocene shallow marine carbonate factories along the tropical SE Circum-Caribbean responded to major regional and global environmental and tectonic events

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Changes in the factory of Cenozoic tropical marine carbonates have been for long attributed to major variations on climatic and environmental conditions. Although important changes on the factories of Cenozoic Caribbean carbonates seem to have followed global climatic and environmental changes, the regional impact of such changes on the factories of shallow marine carbonate along the Caribbean is not well established. Moreover, the influence of transpressional tectonics on the occurrence, distribution and stratigraphy of shallow marine carbonate factories along this area is far from being well understood.

Here we report detailed stratigraphic, petrographic and Sr-isotope chemostratigraphic information of several Eocene-Miocene carbonate successions deposited along the equatorial/tropical SE Circum-Caribbean (Colombia and Panama) from which we further assess the influence of changing environmental conditions, transtentional tectonics and sea level change on the development of the shallow marine carbonate factories.

Our results suggest that during the Eocene-early Oligocene interval, a period of predominant high atmospheric pCO_2, coralline algae constitute the principal carbonate builders of shallow marine carbonate successions along the SE Circum-Caribbean. Detailed stratigraphic and paragenetic analyses suggest the developed of laterally continuous red algae calcareous build-ups along outer-rimmed carbonate platforms. The predominance of coralline red algae over corals on the shallow marine carbonate factories was likely related to high sea surface temperatures and high turbidity. The occurrence of such build-ups was likely controlled by pronounce changes in the basin paleotopography, i.e. the occurrence of basement highs and lows, resulting from local transpressional tectonics. The occurrence of these calcareous red algae dominated factories was also controlled by diachronic opening of different sedimentary basins along the SE Circum Caribbean resulting from transpressional tectonics.

Calcareous algae persisted as the main constituents of the shallow marine carbonate factories until the middle Oligocene; a period when atmospheric pCO_2 dropped significantly. The drop in atmospheric pCO_2 allowed the onset of global icehouse conditions, which likely resulted in a decrease in sea surface temperatures along the Caribbean. This drop allowed the appearance of corals as the main constituents of the shallow marine carbonate factories along the SE Circum-Caribbean by late Oligocene times.