

The Role of Short-Lived Late Mesozoic - Tertiary Carbonate Banks Along Convergent Margins, Nicaragua – Costa Rica – Panama – Colombia

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Abstract

Carbonate-producing palaeo-environments along the Late Mesozoic – Tertiary intraoceanic subduction zones of Central America and the Colombian Caribbean were short-lived (1-10 Ma) and of limited areal extension. These small carbonate banks and build-ups are fundamentally different from long-lived (10-60 Ma), large carbonate shelves set on (often thinned) continental crust along passive margins such as Florida, Yucatan and the Nicaragua Rise. Models developed for these carbonates do not apply to the small carbonate banks. Oceanic basements in isostatic equilibrium are usually deeply submerged. Their rise into the photic zone and eventual emergence was controlled by convergence/collision tectonics or intraoceanic plateau or arc development. In this context, shallow carbonate palaeoenvironments were short-lived and formed not only on uplifted accretionary prisms, oceanic plateaus and arcs, but also on (later accreted) volcanic edifices of oceanic seamounts. The age and facies evolution of these carbonates provides valuable keys to the tectonic and palaeoenvironmental evolution of active margins:

1. Aptian-Albian shallow water limestones (Cerro Vailavas, Siuna area, NE Nicaragua) rest on Early Cretaceous deep-water sediments that seal the exhumation of the Siuna Serpentinite Mélange,
2. The Upper Campanian El Viejo Formation (N-Costa Rica) unconformably encroaches on the Nicoya- and Santa Elena basement complexes, with rudistid biostromes, followed by platform resediments, overlain by pelagic Maastrichtian-Palaeocene sediments,
3. The Upper Palaeocene/Early Eocene Barra Honda Formation (Tempisque Basin Guanacaste, Costa Rica) transgressively overlies paralic conglomerates and palaeosols on a basement high, whereas to the south a continuous section shows a shallowing upwards pelagic sequence. The Barra Honda Formation is covered by Eocene turbidites,
4. The Upper Eocene Punta Cuevas Limestone (southern point of Nicoya Peninsula) rests with a progressive unconformity of siliceous forearc turbidites and a veneer of tempestites,
5. A Upper Oligocene carbonate bank at Punta Punta Pelada (Nicoya, Costa Rica) rests on a paralic unconformity cut into Eocene siliceous turbidites. The shallow carbonates are overlain by distal tempestites,
6. In the Azuero Peninsula, Upper Eocene carbonates seal the assembly of the Azuero Accretionary Complex, which includes Palaeocene to middle Eocene seamounts,
7. The first shallow water carbonate banks are of Late Eocene age in the Canal Zone and of Oligocene age in the Choconaque Basin of Panama. They mark a diachronous phase of arc activity and uplift before the formation of the basins,

8. In the Colombian Caribbean area the Middle Eocene to Oligocene Formations (Arroyo de Piedra, Chengue, Toluviejo, Ciénaga de Oro) show repeated alternations of carbonate banks and detrital sediments representing the combined effects of tectonic uplift/subsidence and eustatic sealevel changes.

Middle Cretaceous to Oligocene carbonate shoals are characterized by the following features:

- a. They rest with an angular conformity either on basement highs, or on deep water sediments such as turbiditic forearc sequences, often with intervening tempestites,
- b. They are often made of pure carbonate: red algal-foraminifer associations, more rarely coral reefs (Oligocene-Miocene), and bivalve associations,
- c. In general, the carbonate shoals are overlain again by tempestites and/or deeper water turbiditic, hemipelagic-pelagic sediments, often with a progressive unconformity,
- d. They are transgressive, after collision, uplift and erosion,
- e. Regressive-transgressive sequences in forearc regions can be the result of seamount accretion and underplating,
- f. Further origins of shallow carbonate systems are: transpressive systems with uplift and subsidence (Romeral Fault Columbia); shoulder uplift in oceanic rift systems (Hess Rise); and emergence of arc volcanoes or later accreted oceanic islands (S-Costa Rica, Azuero, Panama).