



Marine intervals in Neogene fluvial deposits of western Amazonia

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Amazonia is one of the most species rich areas on Earth, but this high diversity is not homogeneous over the entire region. Highest mammal and tree-alpha diversity is found in the fluvio-lacustrine Pebas system, a Neogene wetland associated with rapid radiation of species. The estuarine to marine origin of various modern Amazonian fish, plants, and invertebrates has been associated with past marine incursions into this freshwater Pebas system. The exact nature and age of these incursions is, however, debated. Here we present new evidence from fluvial and fluvio-lacustrine deposits of Neogene age in southeast Colombia, that point to periods of widespread marine conditions in western Amazonia. Our evidence is based on an analysis of marine palynomorphs, such as organic linings of foraminifera and dinoflagellate cysts, present in dark sandy clay sediments that outcrop along the Caqueta and Amazon rivers. Characteristically, the foraminiferal linings can be assigned to three benthic morphotypes only, e.g. *Ammonia*, *Elphidium* and *Trochammina*. This low diversity assemblage is associated with estuarine/marginal marine conditions. No distinct marine elements such as shelf or planktonic species were encountered. The observed foraminiferal linings and dinocyst assemblages are typical for a (eutrophic) shallow marine environment, suggesting that the Pebas freshwater wetland system occasionally changed to (marginal) marine. Although some reworked elements are found, a typical Neogene dinocyst taxon is commonly found supporting in situ deposition. Sedimentological features typical for tidal conditions that are reported for sites in Peru and northeastern Brazil likely relate to these marine incursions. Sea level changes as well as foreland basin development related to Andes formation may have facilitated the entry of marine water during the Neogene.