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Marine environmental changes at the Brazilian equatorial margin related to Amazon River evolution during the Neogene

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Today, the nutrient-rich Amazon River outflow causes massive algal blooms in the western equatorial Atlantic Ocean, forming a considerable carbon sink as well as a primary food source in the otherwise oligotrophic surface water. However, the history of this high-productivity system is largely unknown, although a strong relation to the evolution of the Amazon River can be expected. The Amazon submarine fan provides direct evidence for the development of a transcontinental river system, of which the base of the primarily Andean-sourced siliciclastic deposits is dated as late Miocene. Ditch cuttings from Amazon Fan exploration 'Well 2' were made available by Petrobras for microfossil and lithological research. 'Well 2' is located on the uppermost fan at a water depth of 750 meters. Organic-walled dinoflagellate cyst and foraminifer assemblages were studied to reconstruct Neogene marine environmental changes in relation to the Amazon River development. Planktonic foraminifera are present throughout the studied section and largely confirm the already available biostratigraphic age determination based on nannofossils. Benthic foraminifer assemblages indicate that the paleo-water depth has not substantially deviated from current conditions. The ecological affinities of most observed dinocyst taxa are well known, which allows us to reconstruct changes in paleo-productivity based on the assemblages. Mineral composition suggests that local river systems already drained into the Amazon basin before the onset of the transcontinental system, but environmental conditions remained oligotrophic at this time. Decreased abundances of both dinocysts and planktonic foraminifera during the Pleistocene are related to highest sedimentation rates (dilution effect). Overall, a complex interplay of orogenesis, climatic and sea level variations during the Neogene are responsible for the fluvially-induced changes in the marine environment at the Atlantic margin.