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Mangrove dynamics on the Delta of the Doce River during the Holocene according to sea-level fluctuations: A multi-proxy model

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ABSTRACT

This work integrates sedimentological, geochemical ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$, and C:N), and palynological data with radiocarbon dating from sedimentary organic matter to provide a millennial model of mangrove dynamics resulting by oscillations on relative sea-level (RSL) during the Holocene on the Delta of the Doce River, Southeastern Brazil. A paleo-valley positioned about 25 km from the Atlantic Ocean was occupied by wetlands represented by mangrove and herbaceous vegetation during the mid-Holocene high sea-level. After considering the relative sea-level fall and relatively higher fluvial sediment discharge, during the last ~6350 years, progradation took place along this shoreline, resulting in extensive beach ridge deposits that overlie transgressive muds. This process led to loss of mangrove area. Similar dynamics were repeated at ~3043 cal. yr BP, although in a relatively more distal (i.e. seaward) position. Between ~1337 and ~900 cal. yr BP, a tidal flat attached to the edge of a lagoon near the modern coastline was colonized by herbaceous vegetation (C_4 plants). The phase between ~900 and ~400 or ~100 cal. yr BP, is marked by the transition from herbaceous to mangrove tidal flats with an increased trend of terrestrial organic matter. During the recent centuries, a mangrove vegetation became established, and there was an increased trend of estuarine-derived organic matter. Thus, the final phase may be due to a relative sea-level rise. Under this scenario, erosion of beach ridges and expansion of lagoons and mangroves are expected along the littoral of the State of Espírito Santo in Southeastern Brazil.

Keywords: Brazil, Facies analyses, Geochemistry, Holocene, Pollen records, Sea-level fluctuations