

Holocene climate- and anthropogenically-driven mobilization of terrestrial organic matter from the Godavari River Basin, India

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The Godavari River transports significant amounts of terrestrial organic carbon from peninsular India to the Bay of Bengal. In order to examine the interplay between the Indian monsoon, anthropogenic activities and terrestrial carbon cycling within the modern river basin, we compare the properties of riverbed sediments and soils from Godavari mainstream and its main tributaries with those of a sediment core collected proximal to the river mouth in the Bay of Bengal. Spatial variations in bulk and compound specific (plant wax fatty acids) stable carbon isotopic compositions reflect the present-day distribution of C₃ and C₄ vegetation in the river basin, while radiocarbon compositions provide further insights into the dynamics of carbon mobilization and turnover within the basin. Corresponding measurements on the sediment core show a marked transition in organic matter signatures towards C₄ plant predominance during the late Holocene. This transition coincided with increased sediment and organic matter fluxes, as well as an increase in the age of exported OM. These suggest that the basin experienced increased aridification in the late Holocene, with increased fluxes of aged organic matter consistent with mobilization of soil organic matter from the basin to the adjacent margin. These large-scales changes within the drainage basin can be attributed to a combination of climate and anthropogenic influences on carbon cycle processes.