

Pervasive carbon export from the Indian sub-continent in response to Holocene climate change.

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The Indian summer monsoon (ISM) is responsible for more than 80% of the annual rainfall over the Indian subcontinent. The impact of past variations in monsoon dynamics on sediment and organic matter fluxes to the Bay of Bengal remains poorly constrained.

We have constructed detailed records of ISM dynamics derived from stable carbon and radiocarbon isotopic characteristics of bulk OC and terrestrial plant biomarker preserved in fluvially-dominated sedimentary sediments in cores recovered along the north-western Bay of Bengal. Marked shifts in plant wax $\delta^{13}\text{C}$ values between the early and late Holocene, correlate well with available regional paleoclimate records. When coupled with bulk and molecular-level radiocarbon measurements, they reveal dramatic changes in vegetation cover and intensity of soil erosion accompanying late-Holocene aridification within drainage basins of peninsular India. High-resolution radiocarbon chronologies are used to assess the temporal evolution in climate-driven responses across different river basins over the Holocene. Overall, our results reveal a close coupling between monsoonal dynamics and the provenance and flux of sediments and organic matter exported to the Bay of Bengal, implying major carbon cycle perturbations across the entire subcontinent.