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Understanding present geomorphic and pedogenic forcing on the organic matter distribution from vegetation to soil and its use in paleovegetation reconstruction

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Many paleovegetation studies unveil the contributions of C_3 and C_4 plants at a given locality by the means of $\delta^{13}C$ value of soil organic matter. This methodology holds incredible potential in the field of paleoecological reconstruction. However, the intimate connection of vegetation with geomorphic processes and landforms may impart uncertainties, that limit the direct application of this method. In fluvial deposits, the response of plants across the landforms may be driven largely by the hydro-geomorphic condition. The variation in the environmental condition influences the plant-adaptive strategies. However, the effect of local geomorphic architecture, along the lateral transects of riverine deposits, on the temporarily stable vegetation and soils with different pedogenic intervals were never quantified from the modern analogs. In this study, sun leaf carbon isotopic composition ($\delta^{13}C_{Bulk}$) of two co-occurring tropical deciduous species (Sal- *Shorearo busta*; Mohul- *Madhuca longifolia*) and its associated leaf litter was investigated from an undulatory geomorphic surface of north-south trending lateritic alluvium of South Bengal (India). Preliminary study on the $\delta^{13}C_{Bulk}$ values of both deciduous species suggests a variation of ca. 6-7‰ as the water-availability, canopy effect, vegetation density varied along the lateral transects with intra-site variability of about 1‰The source of water for the deciduous trees is also thought to have controlled the isotopic variation. $\delta^{18}O$ value of the groundwater was found to have controlled the hydrogen isotopic δD n-alkane value of the tree leaves. The variation in the efficiency of water use within the same species was also observed in the average chain length (ACL) and carbon preference index (CPI) distribution of spatially varied plant leaves n-alkane along the transect. The higher ACL and CPI values are mostly associated with the soil environment with low moisture availability. However, the litter layer $\delta^{13}C_{Bulk}$ values represent a geomorphic and soil texture control in sequestration of the vegetation signals. The badlands or upland areas tend to preserve more positive $^{13}C/^{12}C$ ratio (–24‰) compare to the lowland with well-developed soils (–28‰). The use of $\delta^{15}N_{Bulk}$ values from the same litter soil shows that higher $\delta^{15}N$ value of bulk soil (4‰) is associated with the soils of upland areas suggesting faster decomposition of organic matter (TOC% <0.2) due to higher percolation and soil aeration. Therefore, reconstruction of the past vegetation from the preserved organic records is not straightforward and thus requires detail vegetation, geomorphic and physical or chemical characterisation before employing it as paleo-record archives.