Abstract:

The rapidly increasing atmospheric CO_2 concentration and inevitable climate change demand continuous monitoring of the global carbon cycle and assessment of the global carbon budget. Last ~30 years' data suggest that apart from the ocean and atmosphere, terrestrial organic carbon (OC) reservoir also accumulating ~30 % of the yearly emitted carbon. Therefore, the dynamics of the terrestrial OC reservoir in terms of biomass preservation/degradation, and its fate during transportation through rivers for long-term OC storage needs immediate attention. Utilizing carbon isotopic composition ($\delta^{13}C$) of the C3-C4 plants as well as sedimentary organic matter (OM), the present studymade an attempt to understand the OC dynamics in the lower reach of the Ganges-Brahmaputra (G-B) River system. This is because the G-B River system is thought to capable of modulating the global carbon cycle by transferring ~15% of the global OC burial flux to the ocean with ~100% efficiency. The $\delta^{13}C$ values of modern C3-C4 plant-produced OC and sediments from the lower Gangetic floodplain and its adjacent Sundarban Mangrove forestsuggestthat significant ^{13}C enrichment is taking place during OM transfer from the plant source to the sediment sink. Wet-oxidationof the sediments satisfactorily helps in discriminating the ^{13}C enrichment process i.e., whether caused solely due tothe microbial degradation of C3 OC or by a contribution from C4 plant-derived OC, which was hitherto unresolvable using only bulk sediment $\delta^{13}C$ values. In agreement with the inference made from the sediment $\delta^{13}C$ data, the limited DIC data from the Hooghly River and adjacent tidal rivers tentativelysuggest that CO_2 produced during the C3 OC degradation is the dominant source of DIC in the system, and CO_2 outgassing to the atmosphere is the dominant process for the DIC loss from the system. In line with the inference made from the limited water DIC data, the biogenic carbonate proxy-based high resolution (~10 days) DIC data also suggest that C3 OC degradation is the dominant source of DIC and bulk of the C4 OC gets oxidized well before entering the river system. The present study, therefore, suggests that C4 plant-derived OC plays a relatively minor rolein the G-B River system's carbon storage capacity.