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# GDGT stable carbon isotope ratios reveal changes in organic carbon cycling in the Ganges-Brahmaputra-Meghana River basin due to modern land use practices

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The Ganges-Brahmaputra-Meghna (GBM) river system delivers 7 megatons of organic carbon (OC) per year to the Bay of Bengal, and, with sediment accumulation rates up to 30 cm/yr, facilitates sustained OC burial and the accumulation of robust archives of terrestrial environmental change [1,2,3]. Membrane-spanning lipids of Bacteria and Archaea, glycerol di-alkyl glycerol tetraethers (GDGTs), are useful tracers of paleoenvironmental conditions in terrestrial and aquatic systems. In this study, we examine the stable isotopic composition ($\delta^{13}C$) of isoprenoid (iso-) and branched (br-) GDGTs exported from the GBM catchment and archived in a modern sediment core spanning the period 1945-2006. This analysis was performed using preparatory liquid chromatography and spooling-wire microcombustion isotope ratio mass spectrometry. The record shows a gradual decrease in the bulk OC $\delta^{13}C$ value starting in the mid-1980s, from about -20.0 to -21.5 ‰ to -22.5 ‰ by 2006 [3]; these most recent values are more depleted than nearly any time during the Holocene [4]. Minor isoGDGTs and GDGT-0 exhibit a decrease in $\delta^{13}C$ values co-eval with the bulk OC $^{13}C$ depletion, which we attribute to rice paddy expansion in Bangladesh and increased influence of methanotrophy-driven accumulation of OC in the GBM catchment [5,6]. Using the isotopic composition of GDGTs exported from the GBM catchment, ramped pyrolysis oxidation over the sediment core, and historical analysis of land use change in the region, we examine the cause and impact of the bulk $\delta^{13}C$ change on OC and GDGT sourcing in the GBM catchment.

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