Dynamics of Organic Carbon Molecules in Oxbow Lakes of Gangetic Plains

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Dynamics of Organic Carbon Molecules in Oxbow Lakes of Gangetic Plains

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The Ganges Delta is a key area where elemental contamination of groundwater constitutes a human catastrophe. The delta plain geomorphology comprises a large number of abandoned meander bends or oxbow lakes (Donselaar et al., 2017; Ghosh et al., 2021) characterized by an anoxic environment in the lower part of the lake water column (hypolimnion). Here we present the critical role of these abandoned-river channels forming oxbow lakes. The geomorphological the juxtaposition of (a) abandoned channels (or: oxbow lakes) where the cocktail of organic matter and sediment leads to the release of various elements, (b) the topographically higher point bars where the released elements accumulate in the aquifer and provide a blueprint to explain the origin and localization of elemental toxicity. Dissolved organic matter (DOM) is implicated in the mobilization of elements via microbial metabolic processes. Organic matter (OM) is preserved in this environment and provides a perfect environment for microbial oxidation and mobilization of Fe-oxides. Additional deposition of human-introduced sewage wastes adds to a rich source of nutrients to the indigenous microbial communities.

A multidisciplinary approach was effective in understanding the geomorphology of river meanders, forming abandoned channels, which act as a growth bed for biomass. While acting as an incubator for primary production (lake vegetation dynamics), and subsequent organic debris accumulation (anoxic, hypolimnion water column), where selective preferential preservation of organic carbon compound (anoxic sediment base) occur. We have described how organic compound infiltration, deposition and abundance depends on their hydrophobicity, molecular weights and bioavailability and further, due to diagenetic alteration (microbial metabolic oxidation). Different classes of surface derived organic carbon from vegetation with anthropogenic inputs, can have different effects on the mineral weathering and in controlling the downstream cationic fluxes such as Fe, Mn, As, F etc. and contamination of aquifers in various river plains across the world.