



Nutrient dynamics of the Brahmaputra (tropical river) during the monsoon period

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ABSTRACT

A rapid population growth and continuous migration to urban centers are posing serious challenges to urban water supplies and demands. Urban demands for continuous and secure water supplies rely on available water resources in quantity and quality. The same supplies of water in urban areas are associated with the uncontrolled releases of organic and inorganic chemical species, including nutrients. The lack of technologies or access to them reduces the ability of water systems to restore its original water quality. Further, areas driven by a single release of water in the form of summer precipitation such as the monsoon require water management strategies that allow assessments of water availability, in quantity and quality, all year long. This work aims to characterize the intra-seasonal drivers of contaminant dynamics in response to rainfall. The objective is to use a single precipitation pulse (intra-seasonal monsoonal rainfall) in a large-scale river basin [Brahmaputra River Basin (BRB)] to evidence water quality responses to hydro-climate forcings. The BRB is located in South East Asia, where summer rainfall influences nutrient replenishment, displacement, and dilution of unregulated pollutants through the basin. Results show that changes in nutrient concentration in streams respond to rainfall patterns and events, evidenced by nutrient displacement through surface runoff. Elevated nutrient concentrations found in some downstream sites can be associated to anthropogenic activities such as agriculture and urban sewage release from densely populated areas in the lower lands of the BRB. Multivariate analysis substantiated the probable source of nutrient release in the BRB. While the source of NO_3^- can be associated with anthropogenic inputs that of PO_4^{3-} could be attributed to point sources such as sewage from the ammonia/urea manufacturing industry present near the mainstream. Cluster analysis indicated the potential mobility of PO_4^{3-} carried by suspended solids in river water and subsequently to organisms some distance away from the source.

Keywords: Brahmaputra River; Nitrate; Phosphate; Monsoon; Redfield ratio

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