Fluxes and Retention of Nutrients and Organic Carbon in Manko Estuary, Okinawa, Japan: Influence of River Discharge Variations

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Abstract
Estuaries are often considered important filters for inorganic and organic nutrients, as they are located between the land and sea. This study reports on the fluvial fluxes and estuarine transformations and retention of dissolved nutrients (total oxidized nitrogen [TON = NO_2^- and NO_3^-]), NH_4^+, PO_4^{3-}, and dissolved organic carbon (DOC) in Manko estuary, Okinawa, Japan. The transport and transformation of dissolved nutrients and DOC varied widely among the eight conducted surveys due to variations in freshwater discharge and subsequent flushing times. Under high fluvial discharge, particularly during the May–June rainy season, the transport of nutrients and DOC accounted for up to 70%, 88%, 93%, and 53% of the annual transport of TON, NH_4^+, PO_4^{3-}, and DOC, respectively. The flushing times of river water into the estuary, which varied from 0.5 to 46 days, were important in determining the degree to which fluvial nutrients were transformed and retained within the estuary. The effect of long flushing times was evident during the dry months (December–March), when biological and geochemical processes within the estuary removed most of the fluvial nutrients and DOC.

Keywords
Manko estuary,
Nutrients,
Fatty acids,
Fluxes,
Organic matter