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Evaluation of phosphorus species and their relationship to benthic microalgae in an estuarine tidal flat

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Estuarine tidal flat ecosystem plays a significant role in suppressing eutrophication of marginal seas through the uptake and accumulation by organisms comprising complex foodweb. Nitrogen and phosphorous are known to be major two elements that potentially cause eutrophication, although their behavior in tidal flat ecosystems are distinct. While nitrogen, one of the main nutrients input to intertidal flats, is supposed to be removed from there finally by denitrification, the other major nutrient, phosphorus stays in the subaqueous ecosystem, in various forms such as hydroxide, ions, and organic matters. So far, numbers of studies on phosphorus cycle in tidal flat have been operated. However, the quantitative analyses of contribution of benthic microalgae to the phosphorous cycles in tidal flat ecosystem have not yet been fully addressed.

In this study, we chose Fujimae tidal flat, Nagoya City, Central Japan, as research field and examined contribution of microalgae to the phosphorous cycles in the tidal flat ecosystems, by analyzing major and minor compositions of sediments, concentration of chlorophyll a and opaline silica, and numbers of diatoms on the surface and with the subsurface of sediments.

Bulk concentrations of phosphorous obtained by XRF analyses are positively correlated with biomass calculated from chlorophyll($r = 0.78$), suggesting that phosphorus is the limiting nutrient in this tidal flat. In addition, results of a sequential extraction of phosphorus show that iron-binding phosphorus accounted for more than 50 % on the sediment surface, and authigenic apatite and detrital apatite accounted for about 50 % at the 15 cm depth of the sediment. While insoluble phosphorus including benthic microalgae and terrigenous organic matter accounted for 3 % and 8 %, respectively.

Further observation and analysis will identify the relationship between phosphorus forms and benthic microalgae, and their response.

Keywords: phosphorus, estuarine tidal flat, benthic microalgae