Estimation of the formation and reduction of organic mud in tidal river using sulfate ionic flux and principal component analysis

Hiroki Itamura[1], *Yoriko Yokoo[1]

1. Faculty of Science and Engineering, Doshisha University

We determined the elemental compositions of river water and pore water in order to estimate the sites where the formation and reduction of organic mud occur in delta rivers using the principal component analysis. We collected river water and bed sediment samples at river mouth with tidal intrusion in Ota River, Hiroshima prefecture, and analyze the elemental concentrations using IC and ICP-MS. We calculated major cations and SO_4^{2-} flux (J_{SO4}). There was positive correlation between J_{Ca} and J_{SO4}. At the sites where their J_{SO4} showed negative values, J_{SO4} had strongly positive correlation to J_{Ca}. These results demonstrate that SO_4^{2-} concentrations in pore water decreased and J_{SO4} showed negative values due to the reduction of SO_4^{2-}, therefore, the formation and reduction of organic mud could occur at those sites and SO_4^{2-} has same behavior to Ca^{2+}. We conducted the principal component analysis using eight factors such as J_{Ca}, J_{SO4}, water content, porosity, salinity, pH of pore water and concentration of Mn and Fe in pore water for the sites where their J_{SO4} showed negative values. The first principal component loadings of Fe and Mn concentrations, J_{Ca}, J_{SO4} and porosity were positive and the second principal component loadings of water content, pH, J_{SO4}, and J_{Ca} were negative, indicating that the first and second principal component are the index of redox and the formation of organic mud, respectively. The reduction of organic mud could occur at sites plotted in the range of the negative first principal component loadings and the positive second principal component loadings.

Keywords: tidal river, sulfate flux, principal component analysis, organic mud