

Seasonal variations of phosphorus species in surface sediments of the Three Gorges Reservoir

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Eutrophication has been observed in the Three Gorges Reservoir (TGR) which has been safely run by artificial control for several years. However, the seasonalities of phosphorus (P) species in the TGR sediment was little known yet. In this study, P species of the TGR sediments collected in summer and winter, 2017 were investigated with a sequential extraction method and interannual variation of sedimentary P was summarized. The results showed that the total P concentration of surface sediment was higher in summer than in winter and the concentrations of P species were in the orders, detrital P > authigenic P > organic P > iron-bound P > exchangeable P for summer sediment and detrital P > organic P > authigenic P > iron-bound P > exchangeable P for winter sediment. Exchangeable P was closely related to organic matter and iron oxides, iron-bound P was tightly associated with clay minerals and iron oxides and other P species could be affected by multiple factors for summer sediment whereas exchangeable P and authigenic P were mainly controlled by iron oxides and other P species tended to accumulate in the silt fraction for winter sediment. The bioavailable P (BAP) was regarded as the sum of exchangeable P, iron-bound P and organic P. This P fraction was averagely higher in winter than in summer, accounting for > 29.5% of total P in the two seasons. The total P storage was evaluated to be about 1.34×10^6 tons and the BAP storage was around 1.90×10^5 tons during 2003-2017. Although the storages of total P and BAP showed decreasing trends, the BAP concentration increased significantly since the TGR impoundment in 2003. If the BAP concentration is not essentially controlled, water eutrophication will be developed and algae bloom will happen widely in the TGR.