

PHOSPHORUS SPECIES CONCENTRATIONS IN THE MIDDLE ADRIATIC COASTAL SEDIMENT

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Abstract

This paper presents results of investigations of phosphorus species in surface sediment at the central Croatian coast, using modified SEDEX method. Investigated phosphorus species were: P in biogenic apatite (fish-debris P), P in authigenic apatite, P in detrital apatite, P adsorbed on to iron oxyhydroxides and organic P. The predominant inorganic P species in the middle Adriatic is P-Fe form. Seasonal variations of P species and correlations with other parameters (sediment Fe(III)OOH concentration, redox potential, pore water and water column orthophosphate concentration) indicate the importance of P-Fe form in orthophosphate flux.

Keywords : Adriatic Sea, Phosphorus, Sediments.

Material and Methods

Middle Adriatic stations located in Croatian eutrophicated bay (S1), channel (S2) and open sea (S3) were investigated monthly during 2001/2002. Sediment samples were taken with gravity corer (duplicate cores for P analysis, one for redox potential measurement and orthophosphate concentration in pore water). Phosphorus concentrations in surface sediment layer (0-2 cm) were measured according to modified SEDEX methods [1, 2, 3]. Determined phosphorus species were: phosphorus in biogenic apatite or "fish debris" P-FD, authigenic apatite phosphorus P-AUT, detrital apatite phosphorus P-DET, phosphorus adsorbed on iron-oxyhydroxides P-FE, and organic phosphorus P-ORG. Analysis of orthophosphate concentrations in extractant solutions of particular P species were determined colorimetrically on AutoAnalyzer-3. [4].

Results and Discussion

Total sediment P concentrations in central Croatian coastal sediments were in range of 7.9-38.9 $\mu\text{mol g}^{-1}$ (d.w.) with average values of 22.0 ± 3.3 , 15.4 ± 3.0 and 13.5 ± 3.7 $\mu\text{mol g}^{-1}$ for eutrophicated bay, channel and open sea stations, respectively. Portion of organic and inorganic P species greatly depended on granulometric composition, carbonate content, and trophic level of the water column. Average portion of inorganic P species in total P was 65% at S1, 59% at S2 and 81% at S3 station, with P-Fe as the most predominant inorganic P species at all stations (27-40%) (Figure 1). For S3 station statistical significant correlation between P-Fe and orthophosphate concentration gradients at the sediment water interface ($R=0.818$, $n=12$, $p<0.01$) was found which indicated a linkage of P-Fe species with orthophosphate flux between water column and sediment. Investigations of vertical distribution of P-Fe concentration have also showed linkage P-Fe with Fe(III)OOH concentration and sediment redox potential as a result of consequent desorption processes in sediment.

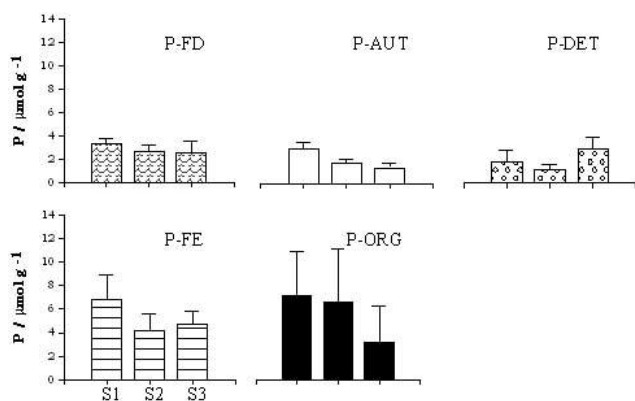


Fig. 1. Average phosphorus species concentrations (biogenic apatite FD-P, authigenic apatite P-AUT, detrital apatite P-DET, adsorbed onto iron oxyhydroxides P-Fe and organic P-ORG) in sediment at S1, S2, and S3 station during 2001/2002.

References

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