

ASSESSMENT OF ZINC MOBILIZATION IN COASTAL SEDIMENTS

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Abstract

The mobility of zinc in sediments of selected coastal microenvironments of the Aegean Sea (Greece) was investigated with the implementation of the DGT (Diffusive Gradients in Thin Films) technique. The various forms of zinc in sediments – together with those of iron and manganese – determined through sequential extraction schemes, their profiles in pore water and the impact of organic matter, including carbohydrates, were taken into consideration. A case of zinc flux from the sediment to the overlying water was investigated.

Keywords: Zinc, Sediments

Introduction

Heavy metals may be recycled several times through the sediment-water interface before being permanently stored in sediments or released to the overlying bottom waters. Pore water represents an important intermediate in this mobilization procedure, which is influenced by diagenetic reactions, prevailing redox conditions and microbial activity, with organic matter playing a major role via complexation [1]. Through the vertical profiles of metals' concentrations in pore water, the role of diagenetic reactions and the resupply of metals from sediments can be evaluated [2].

Methodology

The total metal content of sediment cores and their various forms according to the BCR sequential extraction scheme were determined by GFAAS. High resolution concentration depth profiles of metals were obtained by the *in situ* technique of DGT (Fig. 1). Organic carbon was measured by High Temperature Catalytic Oxidation and carbohydrates in sediments were measured colorimetrically by the phenol-sulfuric acid method, whereas in pore water according to Myklestad et al [3].

the country, a flux of both zinc (Fig. 1) and organic matter from the sediment to the overlying water is likely to occur. Through the formation of a constant concentration gradient in the sediment-water interface an enrichment of the overlying water in zinc, dissolved organic carbon and carbohydrates takes place. This is confirmed by the higher concentrations of zinc, dissolved organic carbon and carbohydrates detected in seawater samples obtained from the area near the sediment-water interface, in comparison to those collected from upper layers.

References

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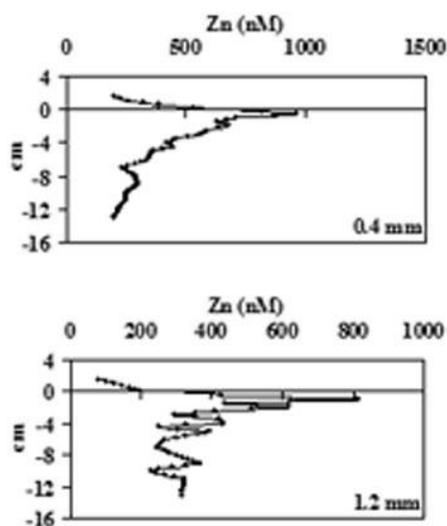


Fig. 1. Concentration depth profiles of the DGT fraction of dissolved zinc in sediment pore water from Loutropyrgos site.

Results and Discussion

At the sites of Loutropyrgos (Saronikos gulf) and Kalamos (Evoikos gulf) the vertical distributions of total metals and organic matter in the solid phase of the sediment demonstrate similar fluctuations with metal profiles in pore water. On the contrary, this is not the case at Molos site (Maliakos gulf), probably due to prevailing turbation. Metal mobility in the cores studied is regulated by the forms under which metals occur in sediment and is significantly affected by diagenesis and the transformations of organic matter. These reactions are largely responsible also for the flux of metals from the sediment to the pore waters [4]. At the site of Loutropyrgos, located at one of the mostly industrialized areas of