



Pore water dynamics of iron and manganese in the northern Baltic Sea surface sediments

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The Baltic Sea is a brackish inland sea characterised by varying hydrographic conditions. High input of nutrients and inorganic pollutants from discharge area intensifies eutrophication, increases the area of anoxic bottom water and may affect the internal cycling of elements. Despite the fact that sediments can be an effective storage for pollutants, changes in environmental conditions may result in the release of metals and nutrients from the sediment to the water column. Release processes are generally redox-driven reactions associated with the microbial degradation of organic matter and/or degree of anoxia in the sediments and in the near-bottom water (1,2).

Reduction of solid iron (Fe) and manganese (Mn) (hydr)oxides play important role in the biogeochemical cycles of many elements, including carbon (C), sulphur (S), phosphorus (P) and several trace elements in marine environment (3). Fe and Mn (hydr)oxides are significant scavengers of heavy metals and phosphate in oxic environment, whereas the presence of sulphide is thought to limit the pore water concentration of several metals in anoxic conditions. To understand these processes, it is important to gain knowledge on the inter-linkages of the elements in the sediments.

Pore water dynamics of Fe and Mn at the sediment-water interface were studied in the northern Baltic Sea surface sediments in order to assess their role in the release processes of phosphate and heavy metals. A hydrogel-based technique, Diffusive Gradients in Thin-Films (DGT research Ltd, UK), was used in pore water sampling. While inserted in the sediments, a binding gel in DGT accumulates solutes after their diffusion through a filter and a diffusive hydrogel. The pore water concentration is locally lowered, which may be counteracted by a flux from the sediment solid phase. Thus, DGT measurement depends both on the bulk pore water concentrations and the supply

from sediment solid phases to pore water. By comparing DGT measurement to bulk pore water concentration, information on the extent of which the resupply from solid phase maintains the pore water concentrations, is achieved. If the resupply is significant, DGT can be used to measure kinetic parameters (4). The behaviour of studied elements in sediment pore waters in relation to the degree of anoxia (i.e. oxygen and sulphide contents) at different sampling sites in the Northern Baltic Sea is discussed.

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