Phosphorus sorption properties of surface sediments in the northeastern Baltic Sea

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Introduction

Hypoxia weakens water ecosystem's health by reducing habitats for living resources and altering the biogeochemical cycle of nutrients. In the Baltic Sea, hypoxia has been present intermittently since the excistence of the sea but its spatial extent and intensity has increased due to anthropogenic nutrient loading [1]. The Gulf of Finland is one of the most eutrophied basins in the Baltic Sea and receives hypoxic near-bottom water from the Baltic Proper.

Oxygen depletion further feeds eutrophication by promoting release of phosphorus (P) from reducible iron(oxyhydr)oxides in sediments. However, P is released from sediments also in oxic conditions, for example, as a result of organic matter decomposition and bioturbation. In addition, P adsorption onto iron(oxyhydr)oxides is at least partly reversible [2,3] and can result in P release also from oxidized particle surfaces. Significant spatial variation in the sediments' P storages and their chemical composition in the Gulf of Finland [4] suggests variation also in P sorption ability of the sediments.

We investigated P sorption-desorption behaviour in occasionally hypoxic surface sediments in the open Gulf of Finland and the northern Baltic Proper by equilibrating oxidized sediments with artificial sea-water of varying P concentrations. In addition, we determined physico-chemical characteristics of the sediments, such as specific surface area, amount of organic matter, total P, as well as iron, aluminium, manganese and their (oxyhydr)oxides, to find out, whether these factors explain the P sorption behaviour.

Results and Conclusions

According to our preliminary results, P sorption behaviour varied among the study sites. P sorption was efficient in sediments with high organic matter and low ambient oxygen concentration in the bottom-water. In these sediments, iron-bound P was probably released during hypoxia but there was enough iron to regenerate good P sorption capacity when samples were oxidized again. The low concentration of easily desorbable P in these sediments and, in contrast, high easily desorbable P in sediments with poor P sorption ability, supported this conclusion.

Sorption-desorption behaviour of P at the sediment-water interface is a dynamic phenomenon. In addition to prevailing oxygen conditions, other physico-chemical characteristics describing the sorption environment are important in explaining the behaviour of P. These results suggest that the iron-rich, poorly oxygenated sediments in the open Baltic may bind P efficiently if oxic conditions return.

[1] Conley *et al.* (2009) *Environ. Sci. Technol.***43,** 3412-3420. [2] Froelich (1988) *Limnol Oceanogr* **33**, 649-668. [3] Ruttenberg & Sulak (2011) *Geochimica et Cosmochimica Acta* **75**, 4095-4112. [4] Lukkari *et al.* (2009) *Biogeochem* **96**, 25-48.

LA-ICP-MS as a tool for elemental mapping geological samples

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17 c. Laser ablation ICPMS for trace-element, isotope and imaging applications in geochemistry

LA-ICP-MS represents suitable analytical tools for elemental mapping minor and trace elements in geological samples. The advantages consists in low limits of detection and sufficient lateral resolution.

We present possibility of elemental mapping by means of LA-ICP-MS. The presented elemental maps were obtained by laser ablation of granitoids from Bohemian massif what represents sufficient heterogenous samples. The new lab-made software was used for creation of elemental maps (Fig.1).

The second part is focused on quantification procedures for elemental mapping – total sum of signals of isotopes and external calibration with internal standard normalization. Their advantages and drawbacks in quantification of heterogeneous samples will be discussed.

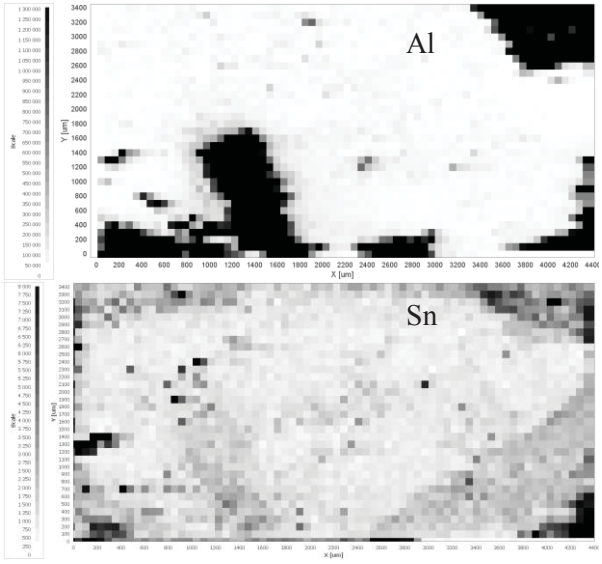

Figure 1: Elemental map of aluminium and tin in granitoid sample from Bohemian massif

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