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Sediment DSi and DIP fluxes under simulated redox conditions

Love-Raoul Nteziryayo and Åsa Danielsson
love-raoul.nteziryayo@liu.se

The Baltic Sea is one of the most eutrophic water bodies in the world. This eutrophication of the Baltic Sea has resulted in the expansion of areas of hypoxic bottom waters. Hypoxia is known to cause the release of dissolved inorganic phosphorus (DIP) from sediment. It is largely assumed that dissolved silica (DSi) reacts in an analogous way in hypoxic conditions. From sediment incubation experiments, we found that P reacts faster to oxygen changes than Si. Here we show that DSi and DIP behave differently to changing oxygen concentrations in the bottom waters, and that the adsorption and de-sorption on Fe oxihydroxides may control the release of P more efficiently than of Si. The results showed that DSi fluxes were higher under oxic conditions (2.21$\pm$0.28 mmol Si $m^{-2}d^{-1}$) than under hypoxic conditions (1.36$\pm$0.29 mmol Si $m^{-2}d^{-1}$). The opposite was observed for P fluxes (0.06 $\pm$0.01 and 0.10$\pm$0.09 mmol P $m^{-2}d^{-1}$) under oxic respective hypoxic conditions). Our results indicate that the increase of hypoxic conditions in coastal areas may directly cause the decrease of Si fluxes from sediment and thereby contribute to the diminishing Si concentrations observed in the Baltic Sea waters.