Atmospheric dust inputs to the oceans

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In this presentation we will consider atmospheric inputs of dust to the oceans and their impacts. Several components of the atmospheric aerosol have the potential to impact ocean biology including iron but also phosphorus, nitrogen and potentially some contaminants. We will illustrate how the relative proportion of these components varies in the aerosol over different ocean regions, reflecting emission, cycling and transport pathways. The impacts on the ocean depend on the total deposition flux and the speciation and solubility of individual components. We will present results on the solubility of major components in the dust, particularly iron, and consider the factors that regulate this solubility.

Seasonal to decadal dynamics of phosphorus cycling in the Baltic Sea: The role of sediments

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The Baltic is an anthropogenically eutrophied coastal sea with a salinity-stratified water column. During stagnations lasting years or decades, hypoxia continuously intensifies in the deep central basins, while physical erosion of the halocline later in a stagnation reduces the total hypoxic area by ventilating intermediate water depths. The behavior of the key nutrient element phosphorus (P) is acknowledged to be crucial to the biogeochemical feedbacks sustaining hypoxia, but the role of sediments as an internal source of P is still incompletely understood. Here we show that a strong seasonal cycle exists at intermediate depths, in which P released during organic matter breakdown in the upper sediments is temporarily retained by iron oxides before rapid expulsion to the water column during late summer hypoxia. The intensity of this cycle decreases towards the deep basins, where iron oxides are less prevalent in the sediments, resulting in a more continuous efflux of dissolved P from decaying organic matter. Although expansion of the total hypoxic area early in each stagnation increases P regeneration from intermediate-depth sediments, burial of P increases simultaneously, necessitating increased productivity to maintain the P budget. Continued reductions in anthropogenic P loading are needed to remediate the current eutrophied state.