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# 3D Modeling of influence of oxygenated inflows on biogeochemical structure of redox-layer of enclosed seas

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In this study we used a coupled hydrophysical-biogeochemical model. Biogeochemical processes were described with O-N-S-P-Mn-Fe ROLM model (Yakushev et al, 2007), designed to study processes of organic matter (OM) formation and decay, reduction and oxidation of species of nitrogen, sulphur, manganese and iron, transformation of phosphorus species. Phytoplankton, zooplankton and bacteria were also parameterized and divided into four groups according to their relation to particular energy source and to OM transformation. Hydrophysical processes where described with 3D General Estuarine Transport Model (Burchard et al, 2004).

We modeled the influence of oxygenated intrusions on the vertical biogeochemical structure of the central Gotland Sea. The model simulations demonstrate that a complete ventilation of the Gotland Deep bottom water caused by massive inflows of oxygenated North Sea water led to substantial changes of the vertical biogeochemical structure within this basin. During the inflow events large amounts of iron and manganese precipitate and discharge from the water column. In this phase redox reactions are accelerated and growth of bacteria leads to an increase of particulate matter content and consecutive particle sedimentation.

An unbalanced structure of water column exists during the period of reestablishment of anoxic conditions. Its appearance is related to the absence of Mn species that play the dominant role in the oxidation-reduction reactions at the pelagic redox interfaces. This unbalanced structure can serve as a biotope for a development of untypical microbial redox-cline reactions (i.e. anammox). According to the model simulations the duration of the reestablishment period for a steady state of biogeochemistry after a complete flushing is about 1.5 years.