Geophysical Research Abstracts
Vol. 15, EGU2013-11689, 2013
EGU General Assembly 2013

Modeling basic features of biogeochemical structure of water column, bottom boundary layer and benthic boundary layer in changeable redox conditions

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Climate Change affects oxygen depletion and leads to spreading of the bottom areas with hypoxic and anoxic conditions in the coastal areas of the seas and inland waters. This work aimed in estimation of a role of changes of redox conditions in the biogeochemical structure there.

We use a 1-dimensional C-N-P-Si-O-S-Mn-Fe vertical transport-reaction model describing the water column, bottom boundary layer and benthic boundary layer with biogeochemical block simulating redox conditions changeability. A biogeochemical block is based on ROLM (RedOx Layer Model), that was constructed to simulate basic features of the water column biogeochemical structure changes in oxic, anoxic and changeable conditions (Yakushev et al., 2007). Organic matter formation and decay, reduction and oxidation of species of nitrogen, sulfur, manganese, iron, and the transformation of phosphorus species are parameterized in the model. ROLM includes a simplified ecological model with phytoplankton, zooplankton, aerobic autotrophic and heterotrophic bacteria, anaerobic autotrophic and heterotrophic bacteria. We simulate changes in the parameters distributions and fluxes connected with the vertical displacement of redox interface from the sediments to the water.