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Modeling CO_2 sediment-water flux variations connected with changes of redox conditions

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Changes of bottom redox conditions from oxic to hypoxic, suboxic and anoxic affect rates of sediment-water fluxes of chemical parameters, i.e. oxygen, nutrient (including carbon), redox metals. Chemosynthetic organic matter production in suboxic and anoxic conditions additionally affects transformation of carbon. This work aimed in estimation of a potential influence of changes of the bottom redox conditions on the sediment –water fluxes of carbon. We use a 1-dimensional C-N-P-Si-O-S-Mn-Fe vertical transport-reaction model describing both the sediments and bottom boundary layers coupled with biogeochemical block simulating changeable redox conditions, and the carbonate system processes block. 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. The model includes blocks for phytoplankton, zooplankton, aerobic autotrophic and heterotrophic bacteria and anaerobic autotrophic and heterotrophic bacteria. In this study we additionally parameterized transformation of Si and C and forms of alkalinity. We simulate changes in the bottom boundary layer pH in different redox conditions under the same leakage scenario.