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Mercury species transformation near the water-sediment interface at changeable redox conditions: biogeochemistry and ecological consequences

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Coastal lagoons with restricted mixing with the open sea are subjected to oxygen depletion events and seasonal oscillation of anoxic conditions. Oxygen depletion in the bottom water/upper sediment layer and appearance of hydrogen sulphide can alter the form of presence of other elements and change its benthic fluxes. In particular, in such conditions Hg species can be transformed to toxic methylmercury followed by its release to the water column. The goal of this study is to evaluate the effect of periodical arise of anoxia in the bottom water on transformation and transport of Hg species in the benthic layer in coastal zones by example of the Berre Lagoon.
In this study we use the 1-dimensional C-N-P-Si-O-S-Mn-Fe vertical bottom redox model (BROM) describing transport in the sediments, bottom boundary layers (BBL) and the water column coupled with biogeochemical block simulating changeable redox conditions (Yakushev et al., 2017).
Modelled results of seasonal variability of distribution of dissolved oxygen, hydrogen sulphide, species of nutrients, iron, manganese and mercury both in water column and in the sediment upper layer are in good agreement with the data of observation for studied region subjected to seasonal anoxia. Simulation of Hg cycle showed the possibility of MeHg presence in the water column under contrasting oxygenation conditions. Ecological state of the Lagoon under different redox conditions has been assessed.