

Interactive comment on “Bottom RedOx Model (BROM, v.1.0): a coupled benthic-pelagic model for simulation of seasonal anoxia and its impact” by E. V. Yakushev et al.

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Simulation of alternating oxic/anoxic conditions in coastal ecosystems on the fine spatio-temporal scales is useful for studies of specific questions, from an explicit description of the bottom boundary layer to a succession/alteration of multiple electron donor/acceptor agents to details of alkalinity composition and effects on the carbonate system, etc. Therefore the manuscript could be interesting to a wider audience and published also in the main body of Geoscientific Model Development papers. In that case, the manuscript demands a major revision, because both the form and content are rather sloppily observed and prepared. Many of specific issues and details of such revision have already been indicated by the first reviewer, Prof. J. Middelburg. I concur

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with almost all of them.

However, while trying to further expand the list of questions, suggestions, and requests, I got substantial doubts in the suitability of this specific manuscript for this particular journal, based on the following:

1. Categorization of this manuscript as a “model description paper” requires a comprehensive model description, which internal consistency is verified by demonstration of its capacities, rather than a detailed validation of its implementation as would be expected from a “model evaluation paper”. The ambiguity of the paper’s goals is reflected in repeating expressions like “to develop a model AND analyse seasonal effects”. As it looks now, the manuscript describes a specific model implemented for studies of some particular biogeochemical questions rather than presents some finished single product that can be relatively straightforwardly borrowed and used by interested colleagues.
2. Such ambiguity starts already from rather inconsistent definition of objectives. The title announces “coupled benthic-pelagic model for simulation of seasonal anoxia”, the abstract indicates the goal as a capturing of “biogeochemical processes occurring at the bottom boundary layer (BBL) AND sediment-water interface (SWI)”, the last sentence of “Background” Section indicates the goal as a capturing of “key biogeochemical processes occurring at the bottom boundary layer” only. Even farther, “the main goal of the model was to reproduce the biogeochemical mechanism of transformation of oxic conditions into anoxic in the sediment–water interface”. Perhaps, such obscurity reflects also a story of development of BROM from ROLM by substantially expanding list of variables and their interactions. If, as it seems to me, the real focus and achievements lay in the “middle”, then almost a sole goal of the water column and sediment parts is to generate consistent boundary conditions for interacting BBL and SWI. From the manuscript it is also unclear, why the focus is on seasonal dynamics and what prevents the reproduction of sporadic short-term alterations or long-term persisting states.
3. Then, for a further implementation in diverse geographical areas it should be

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stressed and clearly explained, where from should the user obtain the data about external inputs, internal dynamics and distribution on multiple forms of sulfur, manganese, iron, as well as on different functional groups of bacteria. At the least, recommendations should be given on some proxies that could be derived from the pelagic ecosystem models with less uncommon sets of variables and processes.

4. Furthermore, there are several ad hoc features and patches pertaining, perhaps, only for this implementation that should be explicitly indicated for a prospective users, for instance, holding sea surface concentrations constant results in non-conservation; prescription constant coefficient of vertical transport in BBL, while arbitrarily modifying it by assumed bioturbation in the sediments; extensive use of squared availabilities $(\text{Nutrient/Biomass})^2$ instead of concentrations N in nutrient limitation and trophic functions.

Fortunately, selected results, ideas and formulations can still be gratefully borrowed by interested colleagues with appropriate reference to the ever available discussion paper.

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