

Interactive comment on “Integrating aquatic and terrestrial biogeochemical model to predict effects of reservoir creation on CO₂ emissions” by Weifeng Wang et al.

Anonymous Referee #1

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The paper presents a model, developed specifically for calculation of CO₂ emissions from hydroelectric reservoirs. To the best of my knowledge of the literature available so far, this is the first mechanistic model of CO₂ emissions applied to and validated at a concrete operating reservoir. The model demonstrated generally fair agreement to observations. This work is a substantial step towards process-based modelling assessment of GHG efflux from either existing or planned hydroelectric stations. The perspectives for the development of this work via including methane dynamics and more process-based approaches to simulate C transformations are clear and promising. I have no doubts that the manuscript is worthy to publish in Biogeosciences.

I have a number of specific comments, especially in the model description section.

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They are mostly related to justification of model formulations chosen, but also to processes, that are omitted. For instance, the vertical bubble transport of gases and the CO₂ flux from turbine flow, are not included, and there is no discussion what it might imply for the model performance. I would also like to see the details of vertical diffusion of DIC between hypolimnion and epilimnion, given there is usually a huge DIC gradient there (BTW, is it the case for Eastmain-1 reservoir?), so that the vertical CO₂ flux from bottom waters to surface is controlled by diffusivity coefficient. What is the value for this coefficient used?

The paper lacks comprehensive explanation on the choice of parameters the model sensitivity was studied in respect to. What parameters entering model formulae for biogeochemical processes can be considered as firmly established, and what are loosely defined? Of course, this is a difficult task for such distinction to be made, if even possible so far, but anyway some discussion on this topic should be provided.

All specific comments are added as sticky notes to the original manuscript.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/bg-2016-100/bg-2016-100-RC1-supplement.pdf>

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-100, 2016.

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