**Biogeosciences
Discussions**

Interactive
Comment

Interactive comment on "A step-by-step procedure for pH model construction in aquatic systems" *by* A. F. Hofmann et al.

A. F. Hofmann et al.

1   General comments

We thank Prof. Boudreau for his thorough and constructive evaluation. His comments have been useful to further improve our presentation.

2   Replies to detailed comments

1. The transport term of Eq. (1) P_X is meant to be completely generic and can be replaced by any transport formulation a potential pH modeller likes. We now

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explicitly mention in the revised manuscript, that benthic exchange B_X can be included as well.

2. Valid remark. We have added several references to acknowledge the ancestry of the "local equilibrium" idea.

3. This remark is theoretically true, but in our model, the limitation term for oxygen is implemented for rather pragmatical reasons. We deliberately included a strongly simplified model of OM degradation to keep the non-pH part of the model simple: only aerobic respiration is accounted for, while anaerobic pathways are not considered. So we wanted OM degradation to stop when the O_2 runs out (to prevent negative O_2 concentrations). This requires an oxygen limitation which makes the total OM mineralization rate dependent on $[O_2]$. Because the issue is of minor importance to our main story, we did not comment on it in the revised version of our manuscript.

4. Valid remark. We have now added several references to acknowledge the history of the "equilibrium invariant" concept.

5. We raised the mentioned footnote into the proper text and put it as a note in Step 8.

6. The history on how the pH module of CANDI originated *a posterio* is remarkable. However, CANDI is still a well-known code and reference point in the biogeochemical modelling of aquatic sediments, and therefore, we feel that we should mention the electroneutrality dependence of its pH prediction.

7. We are definitely in the lovers' camp. We think Figure 7 provides an easy to grasp, intuitive summary of our main story. So we decided to keep it in the manuscript.

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