

Response to Reviewer 2

Thank you very much for your careful reading, excellent comments and professional suggestion to our manuscript. We have carefully considered the comments and have modified the manuscript accordingly and thoroughly. The comments and detailed responses can be summarized as follows:

1 Comment: The literature review is too short and condensed which is not convincing enough why this article is special in its own way and how this article builds upon the current research. Coupling both environmental and ecological factors? modelling based on separated zones? Be applied in a different context such as a lake in China? The points here need to be strengthened and deepened further.

Response:

We agree with the reviewer's comments that it is necessary to state the innovation of the paper more clearly. We think the major reason leading to the reviewer thought the literature review is too short is that we did not review the literatures on the models discussing the separate environmental or ecological model. These literatures are not cited due to the following reasons:

1) The key innovation of this paper is to model based on separated zones rather than a well-mixed box

There are two weaknesses that current researches on lake models exist: one is most lake models focused on single water quality or aquatic ecological process, the other is most ecological models in existing integrating models regard the lake as a whole for analysis. For the first weakness, some recent researches have tried to tackle it, but this kind of research is quite limited, only several papers. On the basis of these research, we further proposed to take spatial variations of lakes into consideration and develop a zoning-based environmental-ecological-coupled model. Thus, despite lots of available papers about environmental or ecological models, it is not necessary to review these papers.

2) Almost all the papers coupling the environmental and ecological process are cited in the manuscript.

The papers specifically focusing on coupling the environmental and ecological process are only several papers and are quite limited. Almost all these papers are reviewed. The present review in this manuscript could demonstrate the innovation of this paper. If other literature about environmental or ecological models for lakes are also cited and analysed in the paper, it will obscure the innovation of this paper.

Besides, we think it is necessary to add more references to further clarify the innovation of this paper. The following references are added in the new manuscript.

Xu, F., Yang, Z. F., Chen, B., Zhao, Y. W.: Development of a structurally dynamic model for ecosystem health prognosis of Baiyangdian Lake, China, Ecol. Indic., 29, 398-410, 2013.

Wang, N. M., Mitsch, W. J.: A detailed ecosystem model of phosphorus dynamics in created riparian wetlands, Ecol. Model., 126, 101-130, 2000.

2 Comment: Too many figures and tables are presented in this article. Do all of them needed? Do they help with explaining the content of the article? Can they be combined and condensed in a certain way. For example, section 3.5 listed too many figures and tables with simulation results, what do they tell us then?

Response:

In fact, to a model simulation, there existed many methods to judge whether the model could perform the actual situation or variation trend well. In this paper, we used two methods for model calibration and model validation: statistical parametric evaluation and figures judgments from the comparison between observed values and simulated values. So we think it is essential to show model calibration and validation figures to readers because the figures could help readers to judge whether the model is applicable for their research. According to your comments, we will reduce the size of the figures and condense the manuscript.

3 **Comment:** The conclusion is in a certain sense too short and weak to support the main body of the article which needs to be explored further. Of course the model shows a promising result, so what? Is there any factor this article didn't cover? how can it help with the lake management and decision making process?

Response:

We agree that it will be better if we could further discuss how to implement our proposed model for lake management and decision making. However, the discussion is not incorporated in this paper due to the following reasons.

1) Lake management and decision making on the basis of our proposed model is also a complicated work. It has some technical and administrative difficulty, and is worth writing another paper. Thus, we have finished another paper focusing on how to apply the coupled models for lake health assessments. The paper is entitled "Comprehensive assessment of lake restoration effect based on coupled lake models: a case study of Baiyangdian Lake in North China". This new paper is over 6000 words. If this content is incorporated into the present manuscript, the present manuscript will be too long.

2) This paper focused on model development. The key content for this paper is show the procedure of model development and validation, the performance of the proposed model, and the implications of the model. All these key aspects are included in the manuscript. If we added more contents in the manuscript, the manuscript will be even longer.