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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Development of a zoning-based environmental-ecological-coupled model for lakes: a case study of Baiyangdian Lake in North China" *by* Y. W. Zhao et al.

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The manuscript attempts to develop a zoning-based environmental-ecological-coupled model for lakes and apply this model to Baiyangdian Lake in China as a case study. Environmental characteristics about hydrology and water quality have a deep relation with aquatic ecology in lakes. It is essential to couple environmental model and ecological model together for lake research. Besides this, hydrological and geological parameters show spatial heterogeneity. Zoning is an effective measure to reflect spatial variations in lake systems. Thus, this paper is innovative and meaningful. It proposed a useful model, which integrates environmental and ecological models together and uses

zoning to show spatial variations in lakes. However, the coupling process between environmental and ecological models is not clearly described. The language of the manuscript also needs to be improved. Minor revision is suggested for the manuscript before possible publication. Some suggestions are proposed for authors, which are shown as below. 1. Water quality and aquatic ecology interact with each other. In the manuscript, MIKE21 was used to model the hydrology and water quality in lakes, and then these data were used for ecological model. This practice considered the effects of hydrology and water quality on ecology. However, the effects of ecology factors on hydrology and water quality were not considered. Why these effects are not considered? 2. The manuscript attempts to couple environmental model and ecological model. In the manuscript, authors used environmental model (MIKE21) for hydrology and water quality, and then used these data obtained for ecology model (STELLA). However, the coupling process is not clearly described. More detailed description is required. 3. At line 16 on Page 1698: Flow field distribution map was used to test the rationality of water areas zoning results. Where does the flow field distribution map come from? 4. At line 18 on Page 1698: Zoning is one important highlight of the manuscript and authors thought that dividing the lake into four or five zones is suitable. I want to know why dividing lake into four or five zones is suitable? If we divide lake into more zones, I think the results will be more accurate. 5. At line 1-3 on Page 1700: the manuscript made a hypothesis that all state variable concentrations and parameters in each compartment model were the same. This is incomprehensible. One of the most important points of the manuscript is that space heterogeneity of hydrological and ecological parameters is considered. Why do you not consider space heterogeneity in this place? The state variable concentrations and parameters in these compartments are impossible to be the same. 6. In Section 2.4, the connections between these water zones are considered. Equations 1-4 are used to handle the boundary conditions. Have these equations been used in former researches? If they have not been used before, authors need to show the derivation process to prove that the method is rational to be used here. 7. The language needs to be polished by a native speaker. For example, at line

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21 on Page 1695, verb is missed in this sentence. At line 12 on Page 1696, “this” in this sentence is unclear.

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