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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Eco-environmentally friendly operational regulation: an effective strategy to diminish the TDG supersaturation of reservoirs" *by* J. Feng et al.

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Comment: In this manuscript, the authors introduce a numerical model to investigate the transport and dissipation processes of total dissolved gas (TDG). The case studies simulated the fate and transport of TDG within the water body in different regulation schemes, and suggested an eco-environmentally friendly operational regulation. The subject is meaningful because an optimized operational regulation of reservoirs is important to diminish the ecological risks due to artificial structures. However, this manuscript has some issues and needs.

Comment 1: The authors need to provide direct evidence to demonstrate if the water transport processes in the computational reservoir could be simplified into a vertical two dimensional numerical model. AUTHORS' RESPONSE: According to the previous studies (QU Lu. Field observation of total dissolved gas supersaturation of high-dams. Science in China, Series E: Technological Sciences, 2011. 54(1): 156-162.), the lateral TDG is not uniform in the near region downstream of the dam because the TDG levels of the spilling and the tailrace are different. But the lateral TDG saturation will be almost uniform when the TDG is transported to the downstream of several kilometers away due to the actions of convection and diffusion. Also, acorroding to the observation, the vetical distribution of TDG in large and deep reservoir is significant and dominated(FENG Jingjie. A laterally averaged two-dimensional simulation of unsteady supersaturation total dissolved gas in deep reservoir. Journal of Hydrodynamics, 2013, 25(3):396-403). For such reasons, a laterally-averaged two dimensional model is suitable for a deep reservoir.

Comment 2: The authors should also provide more information about the model methods such as what water quality parameters are included in the water quality model. AUTHORS' RESPONSE: The model used in this paper is modified basing on the code of CE-QUAL-W2. Tens water quality parameters can be simulated by CE-QUAL-W2, but in this paper, only water temperature and TDG are calculated by using this model.

Comment 3: More seriously, the model calibration and validation was lack of detailed information to show the performance of this model in the Bala Reservior, so that the accuracy of model results was not clear. AUTHORS' RESPONSE: The model for the prediction of TDG transportation and distribution in a reservoir is first proposed by the author in another paper (FENG Jingjie. A laterally averaged two-dimensional simulation of unsteady supersaturation total dissolved gas in deep reservoir. Journal of Hydrodynamics, 2013, 25(3):396-403). The calibration and validation of the model are illustrated in the paper by using the observation data in Dachaoshan Reservoir in China. The simulated TDG variation of the water surface at four locations and the ver-

tical TDG distribution in Dachaoshan Reservoir are both in great agreement with field observation results. It is indicated that the proposed model is available for the TDG prediction in reservoirs. Thus the details of the model calibration and validation are neglected in the discussed paper.

Comment 4: What's more, the relationship between TDG and environmental quality has not been described clearly enough to present what operational regulation scheme is the most eco-environmentally friendly. AUTHORS' RESPONSE: Supersaturated TDG may cause gas bubble disease on fish, potentially increasing the mortality of fishes. The Environmental Protection Agency of USA limited the TDG saturation to be lower than 110% in rivers in the "Quality criteria for water (1986)".As TDG is not a traditional water quality parameter, so the limitation for TDG is not required in the national criteria of water quality in China. Considering the negative impact on fish being enhanced in reservoirs, we try to find an eco-environmentally operational approach to diminish the supersaturation level of TDG as far as possible.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 14355, 2013.