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Biogeosciences Discussions

Interactive comment on "Reviews and syntheses: Dams, water quality and tropical reservoir stratification" *by* R. Scott Winton et al.

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We, the authors, provide a more thorough response to comments from Reviewer 1. General comments

Reviewer Comment 1: Although they all make sense, most of the examples seem rather theoretical and look like hypotheses more than facts. I feel like the presented damming impacts would benefit from adding more actual data proving that downstream rivers are impacted or could be potentially impacted. For example, could the authors add reservoir temperature profiles, or give some idea of how much colder bottom waters could be. And how hypoxic it can be by giving some example of O2 concentration measured in rivers near a reservoir discharge. Same for P and Si concentrations. Such

data should be reported in the literature. If such data are not available, it would be good to mention it.

Authors' response: The suggestion that the examples of water quality impacts and physical/chemical processes could be more quantitative is a very good one. Most of these processes are not merely theoretical; they have been demonstrated by empirical data, indeed. We like the suggestion of being more quantitative and providing specific numbers to describe dam-induced changes to water quality.

Reviewer's Comment 2: It looks to me that most of the potential impacts for tropical systems are also true for temperate/boreal reservoirs. What makes tropical reservoirs/dams particular? The authors mentioned that tropical reservoir can also stratify, similar to temperate ones, and that less is known about tropical systems. Are there any other main differences? Particularities of tropical systems should be explicitly emphasized in each section.

Authors' response: The reviewer also makes a great point that we need to more clearly highlight differences between tropical and temperate/boreal reservoirs for each type of impact. This would make the need for the focus on the tropics more clear and also help make the information more targeted. Of course, for some types of impacts, such as sediment trapping, there may not be something particularly special about low latitudes (at least as far as the physical process is concerned). But there is some evidence that tropical aquatic systems are more sensitive to eutrophication, and warmer water already has a lower saturation point for oxygen, so may be more susceptible to hypoxia. It is worth highlighting these differences in the appropriate sections.

Reviewer's Comment 3: Section 3 is overly long for the ultimate message that tropical reservoirs do stratify. The authors have the stratification information for more than half of the reviewed reservoirs, so I am questioning how relevant (although quite interesting itself) is this thorough analysis of tropical reservoir stratification (i.e. Figs. 3 and 4). This statement (that tropical reservoir do stratify) can be delivered more efficiently and

earlier in the manuscript, e.g. implemented in section 2.1. If section 3 is reduced (or implement in section 2.1), this would leave more room of a more in-depth review of tropical damming effect on water quality, and maybe no limited by the 50 most cited papers.

Authors' response: We previously replied publicly to this comment on 6th of Feb. Upon further reflection it occurred to us that we could do a better job of preparing the reader for this section, by adding some information to the fourth paragraph of the introduction where we introduce the concept of lake stratification. In particular, the link between within-reservoir processes and down-stream could be more explicit. We suspect that many readers will be river-oriented and we could improve our arguments for why they should care about reservoirs as well. This is related to Comment 4 below.

Comment 4: It is not always clear if the focus of this work is on water quality of the reservoir itself or the downstream river water quality. For example, the eutrophication impact discussion is mostly on reservoir water itself, and not on the downstream river. This distinction must be clear throughout the manuscript.

Author's response: Our intent was to focus on downstream effects, but it became clear as we developed the paper that in order to understand what's happening downstream, one has to consider quite a lot of the processes within the reservoir itself, including eutrophication. So it isn't really possible to focus only on downstream effects. We could certainly do a better job of explaining the types of effects we care about and why they are important.

Specific comments: The reviewer provides several instances in which changes could be made either to address one of the 'General comments' above or to improve clarity of the writing. These are quite helpful for the revision process and implementing these should greatly improve the quality of the paper for readers. We thank the reviewer for being so specific here.

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