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Biogeosciences
Discussions

# *Interactive comment on* "The carbon footprint of a Malaysian tropical reservoir: measured versus modeled estimates highlight the underestimated key role of downstream processes" *by* Cynthia Soued and Yves T. Prairie

**Ji-Hyung Park (Editor)**

jhp@ewha.ac.kr

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Dear Authors,

To expedite the review process, I, as handling associate editor, provide a short technical review focusing on terminological and methodological details.

I hope that my comments can help you clarify some ambiguous use of terms and lacking methodological details.



Sincerely,

Ji-Hyung Park Associate Editor, Biogeosciences

<Major comments> 1. Terms and methods of four pathways This study compared four major pathways for GHG emissions. While this is a strength of this manuscript, authors did not pay enough attention to providing clear definitions and methodological details on the GHG fluxes associated with the four pathways. - First, it would be a good idea to define each pathway at its first use and use the term consistently. For instance, authors use diffusion or diffusive flux interchangeably, but I wondered if these terms were used to represent the flux associated with evasion or outgassing (more common terms in the literature). If authors opt for common terms and provide references wherever the terms are defined at their first use, the results of this manuscript could be more easily compared with other studies. - Second, it is quite difficult to understand how authors quantified downstream emissions (L 137-). It looks like that authors are dealing with two separate processes (downstream emission and degassing). Please make it clear by using an appropriate subtitle and equations specifying each separate process in the relevant methods section. If my understanding is correct, degassing at the turbine may refer to the flux associated with the concentration difference across the dam. If downstream emission occurs as the next step following dam discharge, the flux calculation should take the concentration at discharge point, not Cup (gas concentration upstream of dam), as the entry point. Another uncertainty in downstream flux calculation is Cbase. It is not clear why authors wanted to use a natural baseline in the outflow river (previous to reservoir construction), not using simply measured data at a downstream location. Another thing to clarify is how the two assumptions for the upper and lower bounds are valid. Please refer to (and cite) other studies that calculated dam discharge and downstream fluxes. - Third, comparing monitoring results with predictions based on two models. Though details are provided in supplementary information, it would help readers figure out why this comparison is useful if you briefly describe how these models work and differ from each other (L 164-166).

3. Missing details on methods Authors appear to weigh more on brevity, so many important details are missing throughout the Methods section. - Is this oligotrophic reservoir with very low DOC conc. common in the region? Please provide some regional background information about rivers and reservoirs as well as watershed information related to the reservoir nutritional status. - Two inflowing rivers and the outflowing river are indicated by names, but not shown on Fig. 1. Please show at least the reach included in your "downstream emission" calculation on the map. - It is also missing in section 2.2. how and where you collected water samples. Please also check the accuracy of the provided instrument information (for instance, Total Organic Carbon analyser 1010-OI?). - The measurement of "Chl a" could be cited by a relevant reference, if you don't want to go into detail. - There is no QC information about not only water analysis but also gas concentration and isotope analysis. For example, did you confirm the accuracy of CRDS measurements (L113) by using any certified standard gases? You also need to describe how you used CRDS for individual samples (not in continuous measurement mode).

<Minor comments> - L132: lower "bounds"? - L171: something wrong with TP and TN values (probably with TN unit) - L220-221 "$\delta$13CH4 steadily increased indicating riverine CH4 oxidation": What about the effect of gas evasion? Please cite relevant references to explain why $\delta$13CH4 changed. - L229: there might be more studies; for instance, refer to DelSontro et al. 2016 (Limnol. Oceanogr. 61: S188) though their dam was a ROR. - L333-334 "withdrawal depth decrease": this must be "increase", right?

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