Biogeosciences Discussions

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Comment on bg-2021-131

Anonymous Referee #2

Referee comment on "Enhanced bioavailability of dissolved organic matter (DOM) in human-disturbed streams in Alpine fluvial networks" by Thibault Lambert et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-131-RC2, 2021

This manuscript has potential to improve our knowledge regarding the long-standing debate of whether human activities can significantly affect the biodegradation of terrestrial DOM across aquatic ecosystems. However, I have several concerns not allowing me to accept the manuscript at its current stage. I look forward to hearing from the authors' response.

First, the investigation of this work was only conducted between fall and winter seasons, with similar precipitation and water discharge condition during the two field trips. This is not reflected in the manuscript's title, as the title sounds that all conditions were examined in this work. How about spring and summer seasons? When are the wet and dry seasons, respectively? How much was represented from the samples collected in this study? Indeed, if the wet season was not included in this study at all, the contribution of terrestrial DOM could be significantly underestimated.

Second, I wonder if the degradation or transformation of terrestrial DOM can be discerned by the limited analytical methods applied in this study. Some typical LMW compounds were examined in this work to show the biodegradation of autochthonous compounds. Similarly, it would be more convincing to show the constant presence of biomarkers of terrestrial DOM during the incubation, such as lignin phenols, to verify the stability of terrestrial DOM. The slope ratio from CDOM data was not reported for the bioassay experiments. Such information could indicate whether the molecular weight of terrestrial DOM was shifted during biodegradation.

Thirdly, the mineralization of DOM includes both photo- and bio- degradation processes. This study only conducted bioassay under dark condition. The title and abstract should reflect this fact. I would recommend to replace mineralization with biodegradation. Indeed, one scenario was overlooked in this study at all. The increased terrestrial DOM from human activities may be first photo-degraded to lower molecular weight DOM, followed by promoting the primary production and bacterial respiration. The bioassay experiment in this study could include light condition as well to examine scenarios more comprehensively.

In a word, this work was conducted by limited tools and limited conditions. The authors should revise the manuscript carefully to reflect these facts and to avoid exaggerating the conclusions.