

## ***Interactive comment on “Soil organic carbon decomposition rates in river systems: effect of experimental conditions” by Man Zhao et al.***

**Anonymous Referee #2**

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In the present study, the authors aim to understand the mechanisms of the SOC decomposition in river systems. Their study is based on 2 hypotheses (e.g., (i) in the river water, SOC is exposed to an aquatic microbial community which may be able to metabolize SOC much more quickly than the soil microbial community, and (ii) SOC decomposition in rivers is facilitated due to the hydrodynamic disturbance of sediment) for which they will investigate their weight through an incubation experiment. The paper is interesting and the study is well designed. However, before acceptance, I would suggest addressing my comments.

My main concern is related to the discussion. I think the authors could improve the discussion with a deeper exploration of their results. Some parts look weak and not necessarily well supported by the literature (see my specific comments). Then, some

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other parts are the opposite. I would also suggest adding sub-sections to the Discussion to give a framework to the discussion.

Specific comments

Line 65-103: I would suggest re-organizing these three sub-sections. For example, in the first sub-section, you present the site but you also include extra information in subsection 3. Then, in reading the sub-section 2, several questions came up in my mind. But I could find the answers only on sub-section 3. In the current form, it is a bit confusing and the readers need to go back and forth to gather all the information.

Figures 6 and 7: I would suggest changing the scale of the Y-axis and/or use color. In particular, Figure 7 a and c or even d are not easily readable.

Line 172-174: Does this “increase” really mean something?

Line 205-207: This needs to be supported by the literature. Please refer to Ward et al., 2019, Wu et al., 2018, etc.

Line 244: What about the combined effect of AMO and rotation?

Line 273: After 160h of incubation, can we expect a significant shift of the  $\delta^{13}\text{C}_{\text{POC}}$ ? This needs to be discussed.

Line 278-290: You never discuss the combined effect of the occurrence of aquatic microbial organisms and physical disturbance. The discussion needs to be improved regarding this point.

Line 184-290: I have observed specific behavior for each type of soils. I think this point needs to be highlighted and also discussed. How do you explain these variations?

References:

Ward, N.D., Morrison, E.S., Liu, Y., Rivas-Ubach, A., Osborne, T.Z., Ogram, A. V., Bianchi, T.S., 2019. Marine microbial community responses related to wetland

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carbon mobilization in the coastal zone. *Limnol. Oceanogr. Lett.* 4, 25–33.  
<https://doi.org/10.1002/lol2.10101>

Wu, X., Wu, L., Liu, Y., Zhang, P., Li, Q., Zhou, J., Hess, N.J., Hazen, T.C., Yang, W., Chakraborty, R., 2018. Microbial interactions with dissolved organic matter drive carbon dynamics and community succession. *Front. Microbiol.* 9, 1234.  
<https://doi.org/10.3389/fmicb.2018.01234>

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2020-267>, 2020.