Response to Anonymous Referee #2:

Dear Referee #2,

Thank you very much for your helpful comments and suggestions to improve our manuscript. To facilitate this discussion, we first retype your comments in **bold font** and then present our responses to the comments.

This study aims to assess the effects of anthropogenic regulation of waters on the global transport of DOC by rivers. Given the importance of DOC in the carbon cycle and the potential of human activities to alter its cycling, this is a very important aim. I find the paper generally interesting, but have a few concerns:

Response: We appreciate your clear and detailed feedback, and hope that the response has fully addressed all your concerns.

The presentation can be made clearer. The authors should make an effort to make it more accessible to non-modelers (like me), and to readers who want to take home the message without detailed reading of the methods. For example, the different simulations of control conditions and different parts of water regulation considered (CTL, EXPA, EXPB) are in several of the figures presented without explanation or spelling out.

Response: Thank you very much for your suggestion. We will modify the subtitle and legend of Fig. 4~12 to make it easier for the reader to understand.

Is there some way to add (or more carefully discuss) uncertainty ranges around the various estimates and graphs? The current version presents and compares several numbers with 3-4 significant digits, with no confidence intervals.

Response: Based on your comment, we will add a standard deviation after the estimated value to indicate its uncertainty range (mean±std).

Table 2 could be expanded, it appears incomplete. There are several additional estimates of DOC export (possible resulting in a higher median than presented in the manuscript). Some (but not all) are cited in Drake et al. 2018 (Limnol Oceanogr Letters).

Response: Thanks for your detailed comment. We have read the article you mentioned and found that most of the carbon flux which export to the ocean is estimated to be 0.95 Pg C yr^{-1}, but it includes all forms of carbon in rivers. We set the organic carbon (OC) / inorganic carbon (IC) ratio to 0.4/0.5, in which 55% of OC flux is dissolved (DOC). Finally, we calculated that the riverine DOC export flux was 232.22 Tg C yr^{-1}. We will add this result to the table at the same time. Besides, we will also add another result from van Hoek et al. (2021, Environ. Sci. Technol.).

I do not understand how transformations in the regulated and unregulated waters are treated. The methods (line 196) say that "migration transformation" is ignored in the model, and loss rate is assumed equal in reservoirs and rivers. In contrast, one of the model results (line 287) is suggested to be due to increased residence time by the construction of reservoirs, causing increased DOC removal. How is this compatible?

Response: Thank you so much for your careful check. We will revise this sentence to "This may be related to the fact that the reservoir adjusting the river discharge and intercepting the riverine DOC."

Line 292: "alpine" should be "arctic"

Response: We will revise it in our manuscript.

Thank you again for your detailed and precious comments on our manuscript.

Sincerely,

Yanbin You, Zhenghui Xie, Binghao Jia, et al.