

## ***Interactive comment on “Riverine carbon export in the arid-semiarid Wuding River catchment on the Chinese Loess Plateau” by Lishan Ran et al.***

**m. lee**

minjinl@princeton.edu

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This study provides rich river carbon data from a watershed influenced by arid-semiarid climate. The data, including river carbon concentrations, exports, contents, and emissions in different carbon species, are very informative. I believe that more careful analyses of these comprehensive data can enhance our understanding of river carbon cycling and its role in linking terrestrial and marine biogeochemistry. I found some small and large problems which I think should be addressed for publication of this manuscript in Biogeosciences.

Estimation method of river carbon exports P4L156-160: River carbon exports are one of key results of this study, and thus should be estimated very carefully. However,

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I found that the estimate method of the exports is not clear. There are various estimation methods that could be applied. Aulenbach, B.T., Buxton, H.T., Battaglin, W.A., and Coupe, R.H., 2007, Streamflow and nutrient fluxes of the Mississippi-Atchafalaya River Basin and subbasins for the period of record through 2005: U.S. Geological Survey Open-File Report 2007-1080, <https://toxics.usgs.gov/pubs/of-2007-1080/index.html> Cohn, T.A., Caulder, D.L., Gilroy, E.J., Zynjuk, L.D., Summers, R.M., 1992, The validity of a simple statistical model for estimating fluvial constituent load—An empirical study involving nutrient loads entering Chesapeake Bay: Water Resources Research, v. 28, no. 9, p. 2353–2363. Runkel, R.L., Crawford, C.G., and Cohn, T.A., 2004, Load estimator (LOADEST)—A FORTRAN program for estimating constituent loads in streams and rivers: U.S. Geological Survey Techniques and Methods, book 4, chap. A5, 69 p.

Estimation method and uncertainty of NEP P5L182-199 and P7281-291: For river carbon budget analysis, the NEP result is critical to drive the conclusion. However, I am a bit skeptical about the approach to calculate NEP. The authors are using different independent data sources for NPP and SR, and then, to calculate Rh, adapting another study's assumption "Rh accounts for 54% and 40% of SR in forested and non-forested areas.". This methodology probably led to large uncertainty in the final NEP estimate, which should be at least discussed.

Data availability and clarification A strength of this study is that it provides and interpret the very comprehensive river carbon data. Biogeosciences readers would be interested to see the data/results in more detail. There are many results which are described in texts, yet cannot be directly read by figures or tables. Also, the authors might want to have a simple table that lists the data with time (which year, season,...), units (concentration, contents, exports...), and brief estimation methods. This study covers a lot of interesting data, but I am confused by how they were presented. Also, I am confused by the use of "concentrations" and "contents".

P1L15: What do you mean by "redistribution"?

P1L17-18: I am not sure what you meant with this “While the DOC concentration was spatially comparable within the catchment,” I would remove this.

P1L18-19 vs. P8L312-314: Is this sentence consistent with your claims in P8L312-314? I am confused. “it was generally higher in spring and summer than in autumn, especially in the loess subcatchment.” vs. “There was no discernible seasonal difference in DOC concentrations in both subcatchments, although the hydrograph varied significantly among the three seasons.”

P1L19-21 vs P8314-321 vs P9L375-377: I am also confused that these discussions appear to contradict each other. High soil carbon leaching due to high rainfalls in many cases leads to high river carbon exports (massC/time), but not high river carbon concentrations (massC/volumeH<sub>2</sub>O). High rainfalls increase river flows as well, so concentrations can increase or decrease.

P1L23 and P5L209: Did you mean “showed” by “shown”?

P2L84, P2L89, P2L94: An exact time period or years should be provided.

P6L225-228: The assumption should be justified better. Why did you particularly use hydrological data for 2015?

P7L298: Did you mean “concentrations” by “contents”?

P7L299: Specify by providing values to support “both DOC and POC contents in the Wuding catchment were relatively low compared with most rivers in the world.”

P8L303: I am not sure if this statement is valid. “This decomposition is generally associated with increasing water residence time for bacterial respiration in downstream streams due to decreasing flow velocities.” I don’t think that flow velocity generally decreases toward downstream. I think that travel time generally increases toward downstream and longer travel times provide more opportunity for decomposition.

P8L326-328: I don’t understand what you mean here.

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