

Interactive comment on “Spatial-temporal variations in riverine carbon strongly influenced by local hydrological events in an alpine headwater stream” by Xin Wang et al.

Anonymous Referee #2

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General comments:

The manuscript investigated the riverine carbon dynamics in an alpine headwater system on the Qinghai-Tibetan Plateau where is less monitored. Ideal methodologies were applied to reach the outlined objectives of this research initiative. The manuscript is generally well written, and the data is properly presented, it is well-suited for the journal Biogeosciences. However, there are some issues, listed below, should be considered.

Major comment:

The water sources of the headwater system could be very complicated in the
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permafrost-affected area. It could be the precipitation and also could be the soil pore water as the permafrost thaw. The inputs of those two water sources to the river change with time, and it caused inter-annual changes in the physicochemical characteristics. The manuscript focused on the carbon flux changes influenced by hydrological events, therefore I expect to see more discussion on the interaction effects. In mid-June, Fig. 2 revealed the highest water discharge and the lowest DIC concentration throughout the year, however, the DOC concentration was always stable at around 3 mgL⁻¹. The author has the detailed freezing period and thawing period temperature (Fig. 1), and I think it might be used as a piece of strong evidence to describe the input of permafrost soil pore water. So I encourage the authors to discuss more on the fluctuation of DOC concentration with consideration of the hydrological conditions.

Specific comments:

- 1) Study area: The Shaliu River is about 110 km, however the plotting scale in the map revealed that the distance between SLH-0 and SLH-6 is less than 3 km. Is there a mistake of the plotting scale?
- 2) Sampling collection: Why do you choose May and August to represent for pre-monsoon season and monsoon season? Please add some description on the monsoon season.
- 3) Line 225-235: Why the acid-to-aldehyde ratios of lignin phenols in topsoil are consistently higher than those in the subsoil in this region? Does that mean topsoil undergo higher degradation than subsoil?
- 4) Line 251-254: the DOC and lignin phenols data in this sentence are VERY hard to compare, please reverse this sentence.
- 5) Figure 5: I would recommend the author to change the legend into individual colors rather than gradients.
- 6) Table 1: Have you collected the river discharge data during this precipitation event?

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