

## ***Interactive comment on “Apparent ecosystem carbon turnover time: uncertainties and robust features” by Naixin Fan et al.***

**Naixin Fan et al.**

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Dear referees:

Thank you for making these constructive comments on our manuscript. The responses to your comments can be found below. Please also find the marked-up manuscript in the attachment, where all the changes from the original submission are highlighted. In the following response, I first list your original question or comment then response to it.

Responses to the comments:

1) The dataset can only be downloaded when the users registered on the website. After I registered, somehow, I still cannot download the dataset. So, I only reviewed the manuscript not the dataset. Whether the original data and the process data used to

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derive the turnover time can also be downloaded from the link? This would be helpful for people trying to reproduce the data generation process or for those that would like to use original data or process data. Answer: We have checked the issue and the link seems working fine to us. We received data downloading request from people outside of our institute and they are able to obtain the data. Maybe a second attempt could solve the problem? Anyway, please inform us if there is still problem downloading the data. We would love to help. 2) The turnover time was estimated assuming steady state, in which the efflux equals to the influx. While the reality is in non-steady state. The effects of this assumption on the estimation of turnover time should be discussed. Answer: Yes, please see Section 5.2 in the updated manuscript. 3) Was the high consistency of vertical structure of soil carbon storage caused by the consistent extrapolation model? i.e. same model parameters lead to the same vertical ratio? (P15L393) Answer: No, our empirical models extrapolate soil to the full soil depth. But if one looks at the vertical structure before 2 meters (that is the maximum provided depth of the three soil datasets), They are also similar (Table 2). 4) How to compare the sensitivities of turnover times to precipitation and temperature? They have different units (P16L430). Answer: Thanks for the question! We rephrased to a more accurate statement. Please see the updated line. 5) The influence of other factors on turnover times are missing. Could you give further results or discussion? (P16L435) Answer: Our focus in this study is the contribution of uncertainty from different components. And we tried to see if the established pattern of latitudinal correlation between turnover and climate factors from the previous study (Carvalho et al., 2014) is robust using our updated estimations. The effect of other factors worth another paper to address therefore we prefer not to involve in this paper.

6) The GPP only used one data source, i.e. FLUXCOM produced by Jung. There are also other sources of GPP such as the GPP generated using LUE model published in Nature Scientific Data. It would be interesting to see the change in uncertainty. Answer: Please see the added discussion on this matter in Section 5.2.

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Specific comments: P6L188: The R and r is not consistent. L188: revised. P10L256: The vegetation biomass is missing in the first sentence. L256: revised. P14L378: “caused” should be “caused by”. L378: revised. P16L436: Why the relationship between turnover time and precipitation are different with previous studies? L436: It is because of the large difference between new and previous estimations of soil. Results and discussion on this matter is added into the manuscript (also see Figure S7).

P16L447: Typo. Should be “state-of-the-art”. L447: revised. P19L570: The color of this reference is different from other parts of the manuscript. Fig. 1 and Fig. 2: It should be noted that the bottom diagonal subplot was the regression of row with column, i.e.  $y=\text{row}$ ,  $x=\text{column}$ ? Besides, what did the color around the origin represent? L570: The color of the reference is adjusted. More description of the Figure 1 is added. The color around the origin is the density of the data which is also specified in the caption. Fig. 3: Quantile range here is 25. Fig. 5: How to determine the turning point? It seems like not 0? Fig. 5: We try to locate the local maximum by searching the latitudinal turnover values. You are right, the point is actually is little bit below 0. Fig. 6: The lines in subplot c and f indicate? The individual lines in Fig. 6 is each member of the turnover estimation. Terminology: The soil dataset provided by Sanderman et al 2017 was noted as S2017 in the text and the tables, while in the figures it was noted as Sanderman. Please be consistent through the manuscript. Revised. supplement-P2L32: CO2 should be CO<sub>2</sub>. supplement-P3L59: The period was missing between “Table 2” and “All”. Revised.

Sincerely, Naixin Fan, on behalf of the co-authors

Please also note the supplement to this comment:

<https://www.earth-syst-sci-data-discuss.net/essd-2019-235/essd-2019-235-AC2-supplement.pdf>

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Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2019-235>,

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2020.

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