

Interactive comment on “Stable isotopic constraints on global soil organic carbon turnover” by Chao Wang et al.

Chao Wang et al.

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Authors' response: We would like to thank reviewer for the time and effort put into reviewing our manuscript. We agree with reviewer's comments that there are uncertainties associated with kinetic decomposition constant k – which have been discussed previously. However, to our knowledge, the approach we took is the best available for providing integrative soil carbon decomposition rates estimates along profiles. Numerous published modeling studies have used approaches involving multiple data sources and assumptions – similar to our approach. While we agree that the coupling of different data sources inherently injects uncertainties – and we are happy to discuss the caveats in revision. Getting quantitative with the uncertainty is unfortunately not possible (as other studies have noted), for the following reasons.

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First, we mainly focus on soil ^{13}C -based proxy and its variations with MAT and MAP in this manuscript. Hence, we compared our beta value with the kinetic decomposition constant k to explore correlation between these two factors, but we can't quantitative assess the relationships at the global scale. This does not devalue the correlations we find across sites, though it does limit our quantitative assessment, pointing to an area for future research for the community. Thus, if useful, we could move the comparison between beta and k to the supporting information if this seems like the best approach.

Second, just because there are large uncertainties with the kinetic decomposition constant k , we believe the independent approach provided in this manuscript using carbon isotope variations along soil profiles is a promising. Indeed, it allows for larger-scale geographic exploration of soil carbon decomposition at the global scale in a way that differs fundamentally from current approach. We believe that this constraint can be used to help benchmark global models, which are lacking in their ability to generation global soil C patterns and responses to change. We will add the detailed information of the data source (spatial information of global SOC and WorldClim) in the revision and discuss the inherent uncertainties associated with those estimated k values.

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