

Interactive comment on “Convergent modeling of past soil organic carbon stocks but divergent projections” by Z. Luo et al.

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We appreciate the comments from Dr G. Ågren. He pointed out an important issue about the internal inconsistency of soil carbon models. By studying five common models, Dr Ågren found that the dispersion function (our understanding is that this is similar to the transformation between carbon pools) is markedly different among the models (Fig. 2 in his comments). Its potential effect on soil carbon projections certainly warrants further investigation. The APSIM model used in our manuscript shares the similar structure for simulating soil carbon dynamics with the models studied by Dr Ågren. Indeed, as mentioned by Dr Ågren, the dispersion function in APSIM is also not constant, i.e., the fraction of a typical pool transferring to other pools is pool-specific. In our study, we did not address this issue and used the default dispersion functions. One

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reason is that, as also mentioned by Dr Ågren, we lack relevant empirical information to constrain them. Another reason is that, if not more important, all this kind of soil carbon models are based on conceptual pools. These conceptual pools themselves cannot be measured, and have different potential decomposition rates in different models. This means that the dispersion function would be dependent on how we conceptualize the pools and derive their decomposition rates.

However, we acknowledge the important of this issue raised by Dr Ågren. We will expand the relevant discussion on this topic during the paper revision by citing the relevant reference cited in Dr Ågren's comments. We suggest that multi-model inter-comparison as used by Dr Ågren will help us to assess the consequence on soil carbon projection and identify the potential solutions.

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