

## ***Interactive comment on “Global soil organic carbon stock projection uncertainties relevant to sensitivity of global mean temperature and precipitation changes” by K. Nishina et al.***

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Dear authors,

I was very interested by your work that aims to narrow down sources of uncertainty in soil organic carbon (SOC) projections by driving several biome models with a harmonised climate data set.

However, I must agree with Reviewer #2 that the spread in initial SOC stock is of concern. Basically, it accounts for about half of the range in CMIP5 models that was highlighted by Todd-Brown et al. (2013). I therefore think that it should be given more importance in the results or discussion.

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First, more explanations on why this range exists and the initialisation procedure are needed. In particular, quantifying the respective contribution of differences in NPP and differences in residence time (and/or decomposition) at equilibrium would highlight where models disagree the most.

Second, as substrate availability controls heterotrophic respiration (e.g. your equation 1), initial conditions must play a role in the response of SOC stocks and decomposition to climate change. In other words, is the steady-state of the pool driving its dynamics? This would provide insights on how important it is to initialise models to match existing SOC stocks. A more philosophical point is whether simulated SOC is comparable to actual SOC, or whether it should be considered a model-specific state variable (see work on soil moisture by Koster et al., 2009).

For your information, we have recently touched on these aspects in a sensitivity analysis targeting the formulation of the environmental scalar  $f(T) \times f(M)$  in a model driven by similar NPP (Exbrayat et al., 2013).

### References

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