Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2018-342-RC1, 2018

Biogeosciences Discussions

Interactive comment on "Evaluating the simulated mean soil carbon transit times by Earth system models using observations" *by* Jing Wang et al.

Anonymous Referee #1

Received and published: 11 September 2018

In this paper, the authors evaluate soil carbon transit times in 12 CMIP5 models. They found that, compared to in-situ observations, transit times are usually underestimated by models, especially in cold regions and dry/hot regions. The authors show that some of these biases can be resolved by adopting more vertically-resolved parameterization of soil C dynamics with the CLM4.5 model.

I have concerns about this manuscript as it seems very similar to previous papers by e.g. Todd-Brown et al. (2013): the same models are evaluated with the same HWSD-MODIS based product. The novelty here is the comparison of models against transit times measured in worldwide soils, and I think it should be the main aim of the study. If the authors decide to keep the global evaluation, the HWSD-MODIS product should be confronted to in situ observations to justify its use as a global benchmark or,

alternatively, the creation of this database could be used to derive a more robust global product.

Section 3.2 is very hard to understand. It is not clear whether models are evaluated against the in-situ observations, or whether they are evaluated against the HWSD-MODIS based global product (as it seems in Figure 3). The discussion around improvements due to the addition of a vertical resolution in CLM4.5 is reduced to less than 10 line while it seems to be one of the key findings of the whole study.

Hereafter are some more detailed comments:

p3 l 21-29: which period of the historical simulation did the authors consider?

p3 l30: I find that there is a missed opportunity here to use in situ observations to derive a more robust global dataset of transit times. HWSD and MODIS NPP both come with known biases and there may be other products to choose from e.g. soilgrids (www.soilgrids.org)

p6 l30-35: I do not understand what is learned by replacing MODIS NPP with TRENDY models (which ones? reference is missing here). Does that mean that TRENDY is considered as an observation of NPP against which ESMs are evaluated?

Figure 2: from the legend, panels c and d are missing. Panel a is hard to understand and uncertainties are missing from panel b.

Figure 3: in panel a and b, do black dots represent data from the 187 sites? or were they extracted from the HWSD/MODIS product?

references

Todd-Brown, K.E., Randerson, J.T., Post, W.M., Hoffman, F.M., Tarnocai, C., Schuur, E.A. and Allison, S.D.: Causes of variation in soil carbon simulations from CMIP5 Earth system models and comparison with observations. Biogeosciences, 10, 1717-1736, https://doi: 10.5194/bg-10-1717-2013.