Geoscientific
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Interactive comment on "Test of validity of a dynamic soil carbon model using data from leaf litter decomposition in a West African tropical forest" *by* G. H. S. Guendehou et al.

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This manuscript presents an evaluation of the Yasso07 model of soil organic matter dynamics. The original Yasso07 model was parameterized with litter decomposition data from North America and Europe with an important underrepresentation of tropical regions. This manuscript is important because it evaluates the performance of Yasso07 predicting data from a litter decomposition experiment from a tropical forest. The authors do a good job reparameterizing the model to include the new data; however new questions arise regarding the identifiability of the parameter set of Yasso07 using only litter decomposition data (see below).

Main comments

- My main concern with this analysis is the large differences between the different sets of parameters among Y07, Y07A and Y07B. Table 2 shows the parameter values for these sets. It is particularly intriguing the large differences among the α_i parameters. For example, the parameter α_A is 5 times larger in Y07B than the original Y07, but in Y07A this parameter is 0.5 times lower than the original. Similar large differences are presented for other parameters. Why are the differences so large and why are not the values of Y07A somewhere in between Y07 and Y07B? To me, this is an indication of poor identifiability of the parameters given the available information.

  I think this issue should be better discussed in the manuscript. One option would be to show the posterior frequency histograms alongside the scatter plots of the parameters of the model runs. Similarly, the correlation coefficients among the parameters may give some insight on possible identifiability issues. Depending on the software you use, you may be able to perform a full identifiability analysis. In R, this can be easily done with package FME. Unfortunately, I am not aware of similar procedures implemented in Python or other languages.

  In any case, I think the authors should address better this potential issue of the identifiability of the parameter set of Yasso07 using litter decomposition data. A good reference for this topic is Brun et al. (2001, Water Resour. Res. 37: 1015-1030).

- One important question that emerges after reading this manuscript is whether the new parameterization proposed with Y07A significantly changes the predictions obtained with the original Y07 parameterization? Do this new parameterization drastically change previous predictions with Y07? I think a discussion on this subject would be pertinent for this manuscript.

Minor and technical comments

- The description of the methods for inverse parameter estimation using MCMC needs to mention the criterion to assess convergence of the chains. Also in the results, what proportion of chains were accepted by the algorithm? Can you show some convergence diagnostics?

- Pg. 3005, ln. 17-18. Please reword sentence. It's not clear what are you trying to say here.

- Table 2. Please add Y07B, Y07A, and Y07 to the column names after Benin data, All data, and Original calibration, respectively.

- The use of the English language can be improved in many sentences. Please review the next version carefully.