

*Dear Carlos,*

*Thanks for you comments please find below our answer and attached the revised manuscript.*

*Best regards*

*Bertrand*

Comments to the Author:

Dear authors

Thanks for submitting a revised version of your manuscript addressing reviewer's comments. In general I think most issues were well addressed in the revised version. However, there are a couple of issues I identified that need attention before final acceptance.

- It is very important that you also present the model structure of the reference model you are comparing with, which seems to be a modified version of Century. From some of your comments and the entries in Table 2, it seems that you are using a version of Century with only 3 parameters, but the version of Century described in Parton et al. (1998) has more parameters that represent transfers among pools. To avoid confusion and misunderstandings, it'd be better if you also provide the equations for the version of Century you are using. This way, the reader can directly compare differences in model structure.

*Actually, we used the carbon related modules of CENTURY with the same parameters controlling the transfer among pools but since this study is focused on decomposition we only presented (and optimized) the parameters related to decomposition.*

*We clarified this aspects page 8: "To represent priming, we used the ORCHIDEE soil decomposition module, which is based on the carbon-related modules of CENTURY (Parton et al., 1988). "*

*Page 8: "The transfers among pools are described using the CENTURY equations with similar parameters (Parton et al., 1988). "*

- Please be consistent with your notation of boldface on page 14 for the terms presented in equation (9).

*We corrected this.*

- On line 292 you mention an important issue with correlation of errors that may occur in overparameterized models, but you don't show any results on this. Please add a table with correlations among parameter errors or posterior distribution values. In my own research I found serious identifiability problems for more than 4 parameters when using data only on respiration rates from incubations (see Sierra et al. 2015, SBB 90, 197–203).

*We add this information on table 5.*

- Figures 2 and 3. Cumulated is not a commonly used word in English and it doesn't appear in some dictionaries (at least not in my New Oxford dictionary). Probably better to use cumulative. Also, can you reduce the length of the y-axis labels?

*We modified the axis label.*

- Lines 484-485. How do you know your model doesn't show oscillations? The nonlinear structure of your model suggest to me that oscillations are possible, but this depends a lot on parameter values. To make any conclusive statement about oscillations you would have to do an eigenvalue analysis such as that in Wang et al. (2014, Biogeosciences 11, 1817). I suggest you don't make any conclusive statement about this unless you show a full eigenvalue analysis.

*We added this sentence in response of one of the reviewer comments. We modified it: "Finally, the use of microbial steady state model like ORCHIDEE-PRIM present some advantages compared to explicit microbial models. Wieder et al., (2015) identified several challenges related to the incorporation of explicit microbial models in ESMs. In particular, it needs much more parameter than the classical approach. With ORCHIDEE-PRIM these difficulty is resolved since we only add three more parameters."*