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Interactive
Comment

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.

Anonymous Referee #2

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Main comments: The manuscript describes a validity test of the decomposition model Yasso07 for tropical conditions. Litter bag experimental data is used to calibrate the model in order to find new more appropriate parameterization for SOC change estimates in tropical ecosystems. The manuscript aims to contribute to an improved applicability of the Yasso07 model, which is of great interest in for ex. GHG fluxes for national reporting. Especially for those countries that use a low level method (Tier 1), have the possibility to improve their SOC change estimates with a newly parameterized model.

The paper is clearly a calibration exercise. However, the authors do not show any of the "calibration results", which can help to clarify the large differences in the decomposition

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rates found. The author show that the quality of litter and the parameter values between global/Benin data varies. This is not enough to analyze the new parameterization found in the calibration with Benin data. You need also to show how (pdfs prior and after calibration) the parameter sets vary and try to explain better why these things vary. Here you could analyze the correlation between parameters and also the density of the parameter prior and after the calibration. Also the decomposition rate between the Yasso07 with Benin only (Y07A) and Global+Benin data (Y07B) should not vary so much, at least not according to the results showed in the figures and also stated in results and discussion: Y07A and Y07B have similar mass loss.

Another thing is why do the authors not show uncertainties of the model estimates? They state early in methods that the calibration method is especially good because it renders confidence intervals. In addition, an evaluation of a model needs to include model residual analysis. The authors state only the magnitude of the residuals in the results. What distribution do the model residuals have? This is important in order to trust the confidence limits coming out of the model. Or did you make some assumptions about the model errors in your Bayesian calibration?

The large litter quality variation should be discussed more thoroughly in order to understand the applicability of the new parameterization in tropical conditions. Are the quality values in the range of other studies? Outside?

Minor and technical comments: p. 3004 l. 5 Unclear if it is the modeling experiment or the field experiment. l. 14-16 This is not specially clear from the previous sentence. Perhaps write that the litter quality varied between the species, which were only captured by the recalibrated parameterizations. l. 22 Is it mandatory to report? And do all tropical African countries report? According to my knowledge it is voluntary to report to the climate convention (UNFCCC). To the Kyoto protocol each country can choose to not report, but then you need to show that the soils are a sink. African countries do not have the same demand on reporting as for ex European countries. p. 3005 l.1-5 Check language. Maybe a verb is missing. l. 6-11. Revise the sentence. Here you could also

add what the changes are? Do all report the same trend? l. 18. It is difficult to make prediction in future with ecosystem models too. Many assumptions need to be made. . . l.21 Mostly? There exists many models and many studies, but the models need data (measurements) to be developed. So, I do not agree with this sentence. p.3006 l.6 What model? p. 3007 l.6 Table 1. Maximum and minimum temperatures should be included? Or did you use a version without the temperature amplitude? l. 16-17 It might be easier to understand what type of forest rather than stating who carried out certain descriptions. l. 25 dry organic matter p.3008 l. 14 Repetition. p. 3009-p. 3011 l.25 Is it meaningful to write the equations again? They are all already published before. p. 3011 l. 9-10. Uncertainty information or values are not needed to run the model. The model can be run without this information. If you use the uncertainty information in the model simulations the results will be estimated with a confidence interval. l. 13 Figures are results? Or are they already published data that can be written about in the methods? l.14. Predictions are for future estimates. Do you mean simulations? l.16 New data is confusing. Is there additional data from Benin. l.19 Here you state that the model is calibrated to two different data sets. In results (table and figures) there is also the original parameterization showed. You should state that the new parameterizations are compared to the original one. l.16-23 Clarifiy. And there are some repeated sentences. l.24-25 What do you mean? l. 26 How do you sample the posterior when you are to produce the posterior? Do you mean prior? p. 3012 l.3-5. What do you use the Metropolis Hasting for? What are your moving chain criteria? The whole section of calibration needs to be clarified. l.19 Are these residuals for one particular species? During whole period? It is unclear. p. 3013 l.5 You should present the model residuals. I is difficult to see the residuals from the figure. In addition the shape is of great interest to be able to check if the model is applicable or not. l.26 These sentences are contradictory. p.3014 l. 6-10. Something is missing in the sentence. l. 10 According to figure 4 it is around 150 mg g-1 for D glauca. Check that the numbers are correct. It is unclear if you mean the difference between the highest and lowest value or just the value. In any case the numbers are not the same from the figure. . .A-values are around

550 in beginning. l.16 which Yasso07. The original version? p. 3015 l.7-8 Reference. l. 10 What are the problems of the model? l.18 Adjusted model or adjusted parameters? Since you use the word Validity in title I assume that you do not change/adjust the model. l. 21 Uncertainty in estimates regarding Y07A and Y07B. Mean residuals? It is crucial to have the residual comparison to be able to compare the results of the different parameterizations of the model. l. l. 17-23 Preformed similar. If they preform similar they should have similar parameters? Y07B had much larger decomposition rate, which should give much faster mass losses. This is not seen in the results. p. 3017 l.3 Is it the model that is refined or is it the models' parameters that are tuned? l.8 Which Yasso07 model? A/B or both? Or the original version? In general in the conclusions there is no conclusion whether the decomposition process in the tropics is affected by the high variation of litter quality. l.20. I think this needs to be discussed more. Different litter types have different effect on SOC changes. This is of importance when assessing SOC changes

Manuscript evaluation Criteria: 1. Does the paper address relevant scientific modelling questions within the scope of GMD? Does the paper present a model, advances in modelling science or a modelling protocol that is suitable for addressing relevant scientific questions within the scope of EGU? Yes 2. Does the paper present novel concepts, ideas, tools, or data? Yes 3. Does the paper represent a sufficiently substantial advance in modelling science? Yes, the new parameterization for tropical ecosystems is important. Especially for reporting of GHG and soil carbon change methodology. 4. Are the methods and assumptions valid and clearly outlined? This should be improved in the next revision. The text is poorly written and there are some information missing that is needed to follow. 5. Are the results sufficient to support the interpretations and conclusions? Yes. But the core of the paper: that the variation in litter quality is the major driver of decomposition in the tropics, needs to be lifted more. This needs to be discussed further by for ex. Comparing the parameterizations found in the paper with old parameterizations. There is a very large difference in decomposition rates which should be high lightened after a thorough discussion and presentation of calibration re-

sults. 6. Is the description sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? In the case of model description papers, it should in theory be possible for an independent scientist to construct a model that, while not necessarily numerically identical, will produce scientifically equivalent results. Model development papers should be similarly reproducible. For MIP and benchmarking papers it should be possible for the protocol to be precisely reproduced for an independent model. Descriptions of numerical advances should be precisely reproducible. Mostly. There are some information left out for example, the model needs max and min temperatures, the part of calibration description is poor. 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Mostly, the discussion part lacks references. The last paragraph has some statements that needs references but include none. 8. Does the title clearly reflect the contents of the paper? The model name and number should be included in papers that deal with only one model. Yes 9. Does the abstract provide a concise and complete summary? Needs language revision. And check that the sentences are linked. It is difficult to understand the conclusions from the information given in abstract. 10. Is the overall presentation well structured and clear? Yes 11. Is the language fluent and precise? No. The manuscript needs language revision. Throughout the whole text there are many words missing in sentences, many repetitions etc. 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes 13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? It seems to me, as I understood the text, the model analyzed is not being developed, but the parameters of the model are being tuned. This means that the mathematical description of the model is not needed since the model is described in very many papers before. It is better to put some more effort in describing the calibration procedure instead. 14. Are the number and quality of references appropriate? More references in the discussion are needed. Especially when the authors state possible explanations of their data. 15. Is the amount and quality of supplementary material appropriate? For model description papers, authors are strongly encouraged

to submit supplementary material containing the model code and a user manual. For development, technical and benchmarking papers, the submission of code to perform calculations described in the text is strongly encouraged. –

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Interactive comment on Geosci. Model Dev. Discuss., 6, 3003, 2013.