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Discussions

Interactive comment on "Ages and transit times as important diagnostics of model performance for predicting carbon dynamics in terrestrial vegetation models" *by* Verónika Ceballos-Núñez et al.

Anonymous Referee #1

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General comments : The research article 'Ages and transit times as important diagnostics of model performance for predicting carbon dynamics in terrestrial vegetation models' promotes using the distribution of C ages and C transit times of different tree organs for improving performance of vegetation model. In order to do so, the authors tested three different carbon allocation schemes into a simple vegetation model with the aim to discriminate the three allocation models in terms of C stock, C flux, radiocarbon, C ages and C transit times distribution. The paper concludes that C ages and C transit times distribution can indeed be used to evaluate the skill of the allocation

schemes. Furthermore, the authors encourage the scientific community to use their approach for future model comparison or validation. In my opinion the authors did a good job in developing a powerful method to help reducing uncertainty in model output as well as facilitating model development. I really appreciate that the R scripts are clear and easy to use by someone interested in applying this method to their own model. I'm convinced that the ideas presented in this paper our of interest to the readership of biogeosciences, but the presentation itself needs to be improved. The methods and result sections lack essential information. Before resubmitting the manuscript, a senior researcher should carefully edit these sections such that they meet the minimal requirements for publication. Furthermore, the following concerns should be addressed in the manuscript:

1) The study relies on theoretical simulations from an unrealistic vegetation model to match the requirements of the mathematical calculation of ages and transit time. I understand and agree with the need for this approach. This caveat should, however, be addressed in the discussion and the conclusion where it was argued that the method can be useful for evaluating more complex vegetation models. In my opinion this suggestion is overly simple and this statement is not needed for the study. I would recommend the authors to stick to the more theoretical conclusions. Based on my understanding of complex vegetation models, the numerical and conceptual work required to implement the proposed method into a vegetation model with full complexity is too large to be downplayed. If the authors disagree, I would expect at least a paragraph dedicated to how this functionality couldbe integrated into a model with phenology, environmental changes, forest management i.e. forest structure and genetics. This would really enhance the impact of the manuscript as it may convince modellers to apply your method in their models.

2) The method section is concise, which in general I like, but the current description of the methods is too concise making it hard to follow. Each time the authors refer to a method described by another study they referring to it without a explanation or

at least the reason why they choose this one. As a general guideline readers should be able to undertand the method section without having to consult any other papers. What justifies the use of a two-step instead of one step optimization? Why do you need Bayesian optimization? Why do you test co-linearity between parameters (answered too late in the discussion) ? 3) Since the authors use a lot of R packages to manage complex statistical methods, I guess that they are familiar with statistics and coding. Surprisingly, simple tests such as the t-test, anova, or metrisc like Root Mean Squared Error are not used to highlight their finding. The conclusions are not backed-up by any statistics, which is mandatory for publication in a journal like Biogeosciences.

Detailed comments on the tables and figures : Table 1: the column called 'final' is not clear ! Why this column differs from 'Best2' column ? I guess it is because of the constraint optimization on C stock but it is not described in the caption. Do not show the median and the quantiles of Best2 if you will not use these values in the next step.

Table 2:I am not sure this one is necessary ...

Figure 3: Two figures instead of one can be better to avoid the compressing of the leaf C stock.

Figure 5,7: Put some statistics to highlight your results. You argue that mean ages and transit time are different across allocation model. Support it with a probability!

Figure 8: Again show that mean ages are significantly different.

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