Biogeosciences Discuss., 9, C5237–C5240, 2012
www.biogeosciences-discuss.net/9/C5237/2012/

Biogeosciences Discussions

Interactive comment on "Accounting for spatial variation in vegetation properties improves simulations of Amazon forest biomass and productivity in a global vegetation model" *by* A. D. de Almeida Castanho et al.

Anonymous Referee #2

Received and published: 26 October 2012

The authors present the results of an improved dynamic vegetation model which was parameterized using measured field data. They describe the implementation of spatial variation of the parameters Rubisco carboxylation capacity (Vcmax), woody biomass residence time (τw) and NPP allocation in their model. The comparison between measured and simulated woody above-ground biomass shows that with heterogeneous parameters, observed gradients in woody productivity and woody above-ground biomass are reproduced better.

General comments:

Dynamic global vegetation models are nowadays widely used for estimating the impacts of environmental change and therefore, the improvement of these models is an important task, especially for regional applications of these models. I have however some concerns about the way this was done in the present study. Generally, a more detailed description of the modelled processes and the model setup is needed. Currently it is not possible to evaluate from the description, how Vcmax, τw and NPP allocation influence the simulated woody productivity and above-ground biomass. How Vcmax and τw were identified as the most important parameters seems to be a subjective estimation. Another point is that the authors present here a site-specific (or regional) calibration of model parameters rather than an improvement of the modelled processes. This leads to the question of how these improvements will help to better understand the underlying mechanisms that may lead to potential changes in future carbon fluxes and stocks. Finally, it is not clear to me, why the authors chose a spatial resolution of 1°x1° which seems a rather large scale in the context of improved regional simulations. Also, for improved regional simulations of biomass dynamics, it would probably be important to include more than one PFT throughout the Amazon basin. These shortcomings should be discussed.

Other comments:

- Abstract, L.1-2: It is not clear what "spatially homogeneous biophysical parameters" are.

- Abstract, L. 13-16: What is meant by "spatial variability of 1.8 times in the simulated woody net primary productivity and. . ."?

- P. 11770, L. 11-12: please define what is meant by "spatial heterogeneity and the temporal variability of the forest biophysical properties"

- P. 11771, L. 23 and throughout the manuscript: How are "plant turnover rates" defined and is it the same as "tree turnover" and "stem turnover". Similarly, how is "plant residence time" defined, is it the same as "woody biomass residence time" and "carbon

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residence time"?

- P. 11772, L. 13: Why are biophysical parameters improved in a first step and only in the second step, the most important parameters are evaluated? Shouldn't it rather be the other way around?

- P. 11772: 1°x1° is a rather coarse resolution when improving spatial heterogeneity. Why has this resolution been chosen?

- P. 11773, L. 6: Was the validation and application of the model in these studies successful?

- P. 11773, L. 22: Why not implementing more plant functional types? This would be more logical from the ecological perspective. For biomass production, also biotic interactions such as competition for e.g. light and nutrients are important.

- Section 2.2 is very hard to read, some sub-headings would be useful.

- P. 11774, L. 18: "For similar reasons. . ." The reasons and analyses are not clear.

- P. 11774, L.28-29: Not clear where the numbers were calculated from.

- P. 11775, L. 13: "For this reason we opted to. . ." What would have been the other option?

- P. 11777, L.17-19: This should be stated in the model description. Not clear why allocation to fine roots needs to be estimated (Fig. 2) and how this is applied in the model.

- Section 2.3 and Table 2 is difficult to understand without a detailed model description. It is not clear, how the parameters were spatially varied in the model. Is Equation 1 in Table 1 used for the heterogeneous parameterization described in Table 2?

- P. 11778, L. 18: It is not clear how NPP is allocated to wood, foliage and roots in the model. In P. 11777, L.17-19 it is stated that the model does not differentiate between

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above-ground and belowground components.

- P. 11784, L. 14: Reference to Castanho et al. 2012 is not in the Reference list.

- P. 11785, L. 10: Sentence is not clear.

- Table 1: Caption: the shaded cells are not indicated in the table. Table: “Based on Sand Fraction from. . .”, “Based on Quesada. . .”, “Based on Soil total Phosphorus map..” is not describing the method of upscaling. It is not clear to which of the equations Equation (1) and Equation (2) refers to.

- Table 2: What is meant by “fixed space”?

- Figure 2b: There seems to be an error in the y-axis labels.

Interactive comment on Biogeosciences Discuss., 9, 11767, 2012.