Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2019-6-RC3, 2019
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Geoscientific Model Development Discussions

Interactive comment on "Identification of key parameters controlling demographicallystructured vegetation dynamics in a Land Surface Model [CLM4.5(ED)]" *by* Elias C. Massoud et al.

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Received and published: 4 March 2019

The presented study performs a sensitivity analysis of parameters in the land model CLM4.5(ED), featuring demographic vegetation. The Fourier Amplitude Sensitivity Test (FAST) is applied to a set of 87 parameters governing vegetation processes. The parameters are sampled using a uniform distribution limited by a +/-15% variation of the default parameter values. The model is run at a single tropical site with one PFT enabled and starting from bare ground conditions. The sensitivities of demographic and carbon cycle quantities are reported and the simulations are qualitatively compared to observations.

The study is successful in identifying key parameters controlling vegetation dynamics in the model in a quantitative manner. This is a useful starting point for further studies optimizing model parameters and investigating parameter related uncertainty. Furthermore, the FAST method is introduced in the context of LSMs. Potential shortcomings of the presented sensitivity analysis are acknowledged in the study, including the choice of the parameter sampling range, potential additional correlation of parameters and the use of a single model configuration at a specific site. Some of the raised caveats might be explored further. For instance, the effect of the used climate forcing could be qualitatively investigated by performing a simulation using climate data of a different gridded reanalysis product (e.g. CRU-NCEP) and comparing it to the observed spread of the simulation ensemble. Nevertheless, I think the study fits the scope of the journal GMD.

In the following some more specific remarks/suggestions:

-Section 2.1: Average period of 30 years: Maybe expand a bit on this choice, would a shorter/longer period substantially alter the results?

-Section 2.4 Data and Model Setup: I think this section is a bit brief and could be improved. The 1x1 degree grid in the first sentence might be confusing since it suggests multiple grid cells. I was also missing information about the atmospheric forcing of CO2 or nitrogen deposition (if enabled).

-Figures 1-6: I wonder if it might not be better to combine the change in the parameters and their respective sensitivities in a single 4x2 figure. This would also reduce the overall number of figures, allowing to include the plot of the number of trees per size class (Figure D2) in the main text, which is quite an important figure in understanding how the sensitivities of the size classes translate to all trees.

-'Most important parameter' in Results 3.1 and Figure 2,4,6 captions: Mention somewhere that this refers to the sensitivity at the end of the simulated period/equilibrium.

-P10L11: Briefly mention again what H2 is (allometric parameters important for vegetation growth)

- Figure 9: Comparison would be easier if rows had identical y-axes. Also, axes are not aligned properly.

Some typos I noticed:

P3L15: Extra space in Farquahr , 1989

P3L18-25: Three times “Therefore, we hypothesize”

P3L23: allmoetry → allometry

P4L10: Missing whitespace: structure.CLM4.5

P9L10: purpose → purposes

P10L1: Extra whitespace after medium

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