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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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In this study, the authors used a type of sensitivity analyses method to understand the behavior of a developed land-surface model (CLM4.5(ED)) to changes in parameter values. They arrive at results which other land surface models such as those that focus more on bio-geochemistry (e.g. CLM4.5) or those that focus more on vegetation dynamics (e.g. ED) could have also come up with if these models were ran separately. While their sensitivity analyses method is okay, their results are trivial. I have concerns regarding the actual simulation method they have used in this study.

My concerns are on the bias and uncertainties the authors may have in their results. I

list the points below, which are likely to be interconnected.

1) The entire parameter space of the model was not explored so how can this be even called a global sensitivity analyses? You looked at 87 parameters in this study. How much uncertainty you have in your existing results for the parameters that you have ignored?

2) How does these results of CLM4.5(ED) compare with the other versions of CLM e.g. with CLM-DGVM or CLM-FATES?

3) The model simulations are performed for 1 deg x 1 deg (approximately at 100 km). This resolution is quite coarse. If you are trying to understand the large-scale vegetation responses to changes in parameter values, then I think that needs to be made clear (at-least in the abstract as well as in the introduction). If not, then you need to address how much your results will change if you did the sensitivity analyses at the local scale using local weather conditions.

4) This simulation is only carried out at one site. Why was this specific site chosen? Isn't this already a bias? Will you get similar results at other biomes?

5) The climate data was recycled, which might be okay, but you used climate data from 1942 to 1972? I don't think you can compare your modeled results with observations unless you believe that the climate at your studied site didn't change much or if your measurements were carried out around 1972? Further, isn't CLM4.5(ED) sensitive to climate forcing?

6) The simulation was carried out for about 130 years, where the changes in parameter values (+/- 15%) was relatively small compared to the default value. This % change was fixed for all parameters. Isn't there any parameter out of 87 that has a wider range in reality. If so, how can one be really sure about these results then?

7) The authors should quantify the relative impacts on the carbon fluxes or vegetation stocks due to parameter changes, and state whether these impacts are statistically

significant or not. At present, it is unclear how much the identified parameters control the carbon fluxes or stocks.

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