Biogeosciences Discuss.,
doi:10.5194/bg-2016-161-RC2, 2016


Biogeosciences Discussions

# *Interactive comment on* "Soil carbon response to land-use change: Evaluation of a global vegetation model using meta-data" *by* Sylvia S. Nyawira et al.

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Received and published: 3 July 2016

The study demonstrates an approach for evaluating performance of DGVMs to account soil carbon changes following land use change. It is important to estimate how far DGVM simulations are from the reality and which model setup is closer to observations. The article has rich discussion section, where most of the issues are covered. The paper is well written. Finally I suggest accepting the paper with minor revisions.

I have two concerns:

1. Application of universal function for scaling soil carbon pool to 100 cm (page 3, line 15) could introduce substantial bias. In many cases carbon pool changes in top



layer only, but you propagate observed value down to 1m and increase therefor the magnitude. That might be the reason of having higher amplitude in meta-data. I would either suggest use soil map and soil specific equations or make the analysis for the top layer only if no observation for deep soil layers available.

2. Selection of area/climate for simulation is important. By including extra area (where LUC not going to happen) or excluding potential LCC area, you might bias the overall estimation. Authors suggest three different extends and each is not ideal:

- Entire vegetated area of the land surface (too big. Low chances e.g. for forest on permafrost to be converted to cropland)

- Area where LUC has taken place historically (too narrow, LUC might came to new places, e.g. tropical deforestation)

- Where meta-data were available (even more narrow) I would suggest to overlay PFT map with climate one and define climatic patterns where one or another PFT can appear. This would cover all current and potential LUC.

Minor comments:

Page 7, line 8. In fact, forest might have lower NPP compare to cropland, but most of the dead matter come to soil surface where decomposition is slow.

Page7, line 10. Here could be different explanation. Soil respiration is higher in cropland compare to grassland because of the tillage. That is why having similar NPP grassland accumulate more carbon.

Page 9, line 10 "Without accounting for crop harvesting" makes sense only to demonstrate how DGVMs are far from reality while not taking into account such evident things like management and disturbances.

Page 9, line 10 "switching off disturbances in grass ... leads to the right direction of soil carbon change" hope we aim is to describe the reality with the model, but not just

have a similar estimation. Disturbances exist. If result is better without disturbances, then the model makes mistake in its different part.

Page 10, Line 1. Grassland and cropland NPP generally larger compare to forest in temperate region also because they allocated on best locations (soil, slope, etc.). However if you try to convert existing forest to grassland or cropland you might not get increase of NPP.

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