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Earth System Dynamics
Discussions

Interactive comment on "Historical and future carbon emissions from croplands" *by* S. J. Smith

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As editor I agree to most of the remarks and suggestions made by the two reviewers. As pointed out in the author's response to reviewer #1, a number of questions are already answered in the author's 2013 paper in Biogeosciences. Nevertheless, a paper should provide all necessary information to be smoothly readable without further investigations in other papers. This is sometimes only achievable by some repetition of things published already elsewhere.

Partly overlapping with comments of the reviewers, but also in addition, I would like to ask the author to address (also) the following issues upon revision of the paper:

1) I have not understood how emissions from land use and land use change are computed. I propose you write down explicitly what equation you use for emissions.

2) I have not understood how you initialize your model in terms of carbon. This touches e.g. the question whether your approach includes legacy emissions arising from a contrast in carbon input across land use transitions.

3) As far as I understand you solve your carbon equations not at the resolution of the 0.5° grid of past and future land use transitions, but only at regional resolution. This coarsening probably implies a (large) reduction in land use transitions with potentially large effects on carbon emissions. How do you handle this problem? And related to this: Do you account (using the terminology by Hurtt) for the gross changes in land use or only for the net changes?

4) Pongratz et al. (2014) found that large differences between estimates of land use emissions already arise from the use of different definitions. Please use for better comparison with other studies the classification of Pongratz et al. to specify the definition you use.

5) You write that the emissions you compute are measurable. But large part of the land-atmosphere CO2 exchange is determined by climate variations and, particularly in the future, also by climate change. Such contributions to carbon fluxes are not caused by land use or land use change. Therefore I doubt that the fluxes you compute qualify as measurable.

6) If I understand your approach correctly, your emission estimates differ from other published estimates of land use emissions only by not including what you call instantaneous emissions. If so, it would be easy to compare your estimates with published estimates using your values of instantaneous emissions (I read that you use a value of 30% of converted carbon for instantaneous emissions).

Literature

Pongratz et al. (2014), Terminology as a key uncertainty in net land use and land cover change carbon flux estimates, Earth System Dynamics, 5, 177-195.