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Interactive comment on "Comparing the influence of net and gross anthropogenic land use and land cover changes on the carbon cycle in the MPI-ESM" *by* S. Wilkenskjeld et al.

Anonymous Referee #3

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General Comments

The paper estimates the affect of sub-grid scale land cover transitions on the carbon cycle. The representation of sub-grid scale land cover changes differs between land surface models and quantifying its impacts helps understand the differences in the behaviour of the models. The paper is clearly written and a good experimental design is used. Results showing the affect of sub-grid scale processes on land-use emissions are significant and clearly shown. The discussion section provides a good summary of the paper and a good description of uncertainties and of other estimates of land-use emissions. More context could be provided by comparing the results to other carbon fluxes. Some of the discussion section could be clarified.

Specific Comments

Section 5, first paragraph - The significance of the differences in LCE could be made clearer by comparing them to the spread of CMIP5 estimates of NBP or to anthropogenic CO2 emissions rates.

Section 5, first paragraph - "The differences between the LULCC methods are getting smaller towards year 2100, probably due to establishment of equilibria between local carbon reservoirs and essentially constant LULCC-rates." Do the LCE differences between the LULCC methods get smaller because the differences between the areas of LULCC get smaller? A plot of the timeseries of area converted would be interesting.

Page 12, Line 3 - I would argue that gross transitions don't add extra uncertainty, but that they allow the uncertainty to be estimated/quantified. You could suggest that future work could quantify this uncertainty; with your model you could test the sensitivity to the forcing data, i.e. to Hurtt et al.'s assumptions (I'm not suggesting that this test is done here!).

Page 12, Line 20 - Can you show LCE estimates from a net transitions sub-ensemble and a gross transitions ensemble? Or is it not clear which estimates should be in each sub-ensemble? If it's not clear, perhaps you should suggest that this should be made clear in future.

Page 13, Lines 15-27 - I think the line 25 to 27 requires elaboration. Why have you chosen these numbers and what is the implication of this estimate? What is the significance of 0.1 Pg/yr? Why not assume a delay of 50 years? Can you constrain either the delay or the harvest emission? Alternatively, the paragraph could be removed, the paper is about LULCC emissions and not about wood harvest.

Page 15, Lines 9-10 - Please clarify the last sentence of the appendix, as I read it it says that: Using net instead of gross transitions underestimates the area of land converted by $\sim$66% during the historical period, and underestimates the area converted

by ∼90% during the RCP period. Is this what you mean? From the values in section 4.1.2 I calculate that using net instead of gross transitions underestimates the area by 57% during the historical period (at MPI-ESM-LR resolution). I can't find the equivalent values for the future period, please could you add these in. Again, a plot of the timeseries of area converted would be interesting.

Technical Corrections

Page 2, line 26 - change "the industrialization" to "industrialization"

Page 5, line 20 - delete "eventual"

Section 2.3 - reference the documentation of harvesting, or explain what happens if the "harvest request" is larger than the natural vegetation carbon content.

Page 11, line 21 - change "extend" to extends"

Page 11, line 24 - change "while" to "because they are"

Page 13, line 16 - change "on" to "or"

Interactive comment on Biogeosciences Discuss., 11, 5443, 2014.