Biogeosciences Discuss., 11, C1370–C1372, 2014
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Biogeosciences
Discussions
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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 #1

Received and published: 1 May 2014

[general comments]

The authors addressed uncertainty of the land-use change carbon emissions estimated by global vegetation models which is derived from the implementation dependency about how sub-grid-scale land-use change dataset are used. In addition to the recently published analysis of the implication of differences in the definition of land use emissions employed by the various models (Gasser et al 2013; Pongratz et al 2014), this analysis shows additional exposition toward the meaningful model inter-comparison of the effect of land-use change on the carbon balance of terrestrial ecosystems, which emphasize the importance of sub-grid scale phenomenon such as shifting cultivation. Also, as authors denoted, preparing gross transitions land-use in-

formation need more input data, and current provided data rely on some rather simple assumptions. In this regard, the analysis of this paper contains useful information for both further vegetation model development and preparing rigorous land-use change dataset.

The paper shows how terrestrial carbon cycle model of MPI-EMS treats the land use change transitions and its effect on resultant carbon flux, however, some conclusions are discussed without explicit results. Thus, the authors should show more quantitative result to conclude, particularly for the effect and process of wildfire emissions which may be affected by the sub-grid scale land-use change implementations.

A few specific comments and suggestions follow.

[specific comments]

Page 5449, line 13: Could you describe the reason to use "a fixed rate of wood harvest" in the without LULCC experiment? I felt it is natural to conduct experiments 1) without wood harvest in the "without LULCC experiment" or 2) with the same wood harvest of the experiment with LULCC in the "without LULCC experiment" as a baseline.

Page 5465 Fig. 1: The figure seems to be too complex after 2006. It may be better to draw historical, RCP2.6, RCP4.5 and RCP8.5 separately.

Page 5450, line 16, 24: You describe the decrease of desert area is both caused from natural change and increase of cropland and pasture. But I couldn't understand why some area of desert are converted to cropland and pasture. Could you show which part of the desert is converted to the agricultural land?

Page 5451, line 5-14: It maybe better to add supplemental figures (like Fig. 2) for the RCPs period to support the description.

Page 5452, line 6-9: Is it really the conversions from grassland to pasture? It seems the area from grassland to cropland match the uptake of carbon (e.g. in South-West U.S., Southern Argentina). Could you please add quantitative analysis here? Also, you

didn’t show any result of changes in fire activity in these regions.

Page 5452, line 13-14: You should show quantitative result of the fraction of converted cropland originally occupied by the forest.

Page 5464, Table 2: From Brovkin et al. 2013, LCE is 1.84 Pg C yr-1 for RCP2.6 and 2.16 Pg C yr-1 for RCP8.5 with MPI-ESM-LR. In Table 2, however, it shows 1.69 Pg C yr-1 for RCP2.6 and 2.38 Pg C yr-1 for RCP8.5. What causes the differences between offline CBALANCE and coupled MPI-ESM-LR?

Page 5453, line 10-13: Could you elaborate more about "The convergence of gross and net LCE towards the end of the 21st century is most likely to be due to the projections prescribing essentially constant rates of conversion..."?

Page 5454, line 10-13: Related to the above point, you might need to explain the difference about the conversion pattern between RCP2.6 and RCP8.5.

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