

## ***Interactive comment on “Global and regional effects of land-use change on climate in 21st century simulations with interactive carbon cycle” by L. R. Boysen et al.***

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This paper describes a methodologically well designed ESM model experiment to disentangle BGP and BGC effects of land use change in a world exposed to the RCP8.5 emission scenario. It provides a logical next step after the studies by Pitman et al (2009) addressing land use change effects in the past, and Brovkin et al (2013) exploring the land use effects under prescribed CO<sub>2</sub> concentrations. The analyses includes a number of relevant frameworks, including the transient response to cumulative emissions, and the importance of understanding the nature of the land use transitions considered (and the associated carbon pool reallocation). The paper is well structured and well

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written, and can be accepted for publication. A number of minor comments are given to improve the narrative and presentation even a bit further.

- In the abstract, read before reading the whole manuscript, some confusion is raised when first displaying numbers of land carbon loss followed by the land carbon gains due to the CO<sub>2</sub>-fertilization. I think it would be useful to give a single-sentence explanation on that you try to disentangle the different relevant processes, coming to carbon pool changes that can mutually compensate
- P446-L5: also positive feedbacks could be reduced when the carbon pools are smaller, I would assume
- -L18: swap “both” and “,”
- P447: somewhere here I would appreciate the explicit notion that Brovkin’s experiment is in fact L2A.
- P449-L17: rephrase as “. . .by LULCC which thus affects. . .”
- P450-L12: suggest to include the temperature change over the 21st century in table 4, to support the percentages mentioned here
- -L17: why would vegetation cover changes have an effect on the BGC effects, which are not bound to any location due to the well mixing
- P451-L17: Pitman et al (2009) noted that IPSL also showed warming in the extratropics, due to particular assumptions in the seasonality of LAI for crops
- P452-L18: insert “for the global land area” before “the models coherently. . .”
- -L22: some discussion on which pasture properties actually show that it is important to include them would be welcome here. What are pastures different from grasslands, for instance?

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- P454-L4: a reference to fig 3a is given but there is no fig 3b
- P457-L15: replace “no” by “not”
- Table 5: somewhere in the text the current mass of atmospheric carbon could be given to form a baseline to compare this TRCE to the climate sensitivity defined by the temperature change after doubling the amount of atmospheric CO<sub>2</sub>
- Fig 3: can be printed a bit bigger for clarity.

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