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Earth System Dynamics Discussions

Interactive comment on "Regional feedbacks under changing climate and land-use conditions" *by* L. Batlle Bayer et al.

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The article by Batile-Bayer et al. reviews the role and importance of biogeochemical and biophysical feedbacks in the earth system. The authors present an overview for the role of the carbon cycle and land surface processes on climate, and then discuss 4 case studies where land-atmosphere feedbacks are influenced by land cover and land use (Europe, Sub-Saharan Africa, Amazon, and South East Asia).

A novel aspect of the manuscript is the use of state diagrams for each region that outline the role of drivers of land surface changes and consequences for climate.

The paper clearly illustrates the complexity of land-atmosphere feedbacks for earth system modeling but it could be strengthen by building on the state diagrams to:

1) assess uncertainty, 2) distinguish between local and global feedbacks (and short to

long timescales) 3) better quantify the role of feedbacks in forcing units (i.e., Wm-2), and 4) discuss challenges and solutions for improving earth system models.

For example; What is the relative ranking of our understanding of these feedback processes and their representation in models?

Are existing datasets and observational networks sufficient for parameterizing and testing models?

Which processes contribute primarily to the range of climate uncertainty from the C4MIP and CMIP5 model comparisons – and is it likely that this range of uncertainty will be reduced.

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