

Interactive comment on “Implications of land use change in tropical Northern Africa under global warming” by T. Brücher et al.

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The conclusion of this study, that

"In comparison with these changes [i.e., changes in the baseline RCP8.5 climate change simulation], any variation of the type of land use in the study area leads to very small, mostly insignificantly small, additional differences in mean temperature and annual precipitation change in this region"

is not at all surprising in light of the research that has accumulated in the last 10–15 years. Modeling studies aimed at evaluating the potential predictability of regional climate (Giannini et al. 2003 in Science; Bader and Latif 2003 in Geophys Res Lett; Held et al. 2005 in Proc Nat Acad Sci; Lu and Delworth 2005 in Geophys Res Lett;

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Caminade and Terray 2010 in Climate Dynamics, and many more contributions from the AMMA community) have conclusively demonstrated that subtle variations in the surface temperatures of the Atlantic, Indian and Pacific Oceans are sufficient to explain precipitation variations over the instrumental, ~century-long time scale in the broad north African region to the south of the Sahara desert, from the Gulf of Guinea coast inland into the Sahel. In parallel, in the same 10-15 year frame, remote sensing of vegetation has shown that the Sahel is greening at broad scale (e.g. Herrmann et al. 2005 in Glo Env Change; Fensholt et al. 2012 in Rem Sens Env). Whether the positive trend in vegetation cover is due to a partial recovery of the rains since the driest mid-1980s or to a change in natural resources management effected out of concern that the baring of the soils may exacerbate drought is the subject of current scientific interest.

Realization that (1) to first order sea surface temperatures drive precipitation variability, that (2) land surface contributes a second-order feedback that naturally amplifies the initial ocean-forced variation, and that (3) human influence is varied, and possibly positive, meaning contributing to "re-greening", changes the perspective within which to consider the formulation and evaluation of model simulations such as those discussed in this paper.

The opportunity to expand this perspective to scenarios of future climate/environmental is missed in this paper. Two aspects to consider would have been the physical effects of climate change, i.e., whether to expect an increase or decrease of seasonal precipitation, as well as lessons learned in societal response to persistent drought of relevance to adaptation. In contrast, the assumptions made here about farmer-herder conflict and land use-conflict relationship strike me as excessively stylized representations of societal interactions in the Sahel. Because they have little counterpart in the real world, the entire study strikes me as little more than an academic exercise.

Only one simulation is run with the standard RCP8.5 configuration, which raises minor concerns about the robustness of the conclusions. If I understand correctly, land use is partitioned between natural and anthropogenic, and only the anthropogenic fraction is

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changed, either according to the standard RCP8.5 scenario or according to the alternative scenarios designed here. An interesting complementary comparison to this set of simulations would have been an RCP8.5 simulation with no ALCC - no anthropogenic land cover change at all - which would have bypassed the complexity of imposing land use/land cover changes in current state-of-the-art models.

In sum, my comments have to do with the assumptions made, and consequent simulation design, more than with the simulation set-up, results and conclusions. I have no major revisions to suggest, aside from encouraging the authors to reconsider their overly simplistic framing of land use change-conflict. In light of their conclusions, there may be scope to change the title to: "No implications [or impact] of land use change...". I do have one suggestion to make, for future work. In light of the state of our knowledge on land cover/use-climate interactions in the Sahel, in my opinion it would be interesting to begin to use earth system models to understand re-greening, specifically interactions of the physical climate [temperature and precipitation] with hydrology at basin scale, and with greenhouse gases. At the same time, it should be acknowledged that humans may have played and continue to play varied roles, positive and negative, that modify landscapes, and that these will likely escape even the most sophisticated climate modeling effort for quite some time to come.

Minor editorial comments:

p.1102, l.6, "baseline" is one word

p.1105, l.9, should read "synthetic"

p.1105, l.11, should read "Additionally". Also, what properties?

p.1105, l.14, is it "sawing" or "sowing"?

p.1107, l.17, should read "separates", not "seperates"

Figure A1: what letters stand for should be spelled out in the caption.

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