

Wyrwoll et al. review for HESSD

This paper provides an examination of the vexed issue of the impact of aboriginal burning practices on climate over the monsoon regions of Australia. It places these changes into the framework of changes due to landscape modification in other regions. I have two contrasting overview comments.

- (1) The framing of this paper is excellent. I have a few general comments that I will detail later, but the paper places the issues relating to the role of aboriginal burning into context very well.
- (2) The detail around what the authors have done in terms of their experiments is almost entirely lacking. This is a little frustrating since this paper might be able to provide a really nice synthesis, combined with a set of new results but I cannot tell from the current explanation.

Thus, in my view, this paper has considerable merit but requires the addition of significant detail around the authors modeling experiments before it can be properly assessed. This would constitute Major Revisions I think.

Specific comments

- Page 3, line 2 – “strong imprint on vegetation” needs a reference
- Page 3, line 3 – “vegetation-climate interactions” needs reference
- Page 3, line 16 – references here are odd. Washington and Parkinson hardly mention terrestrial processes – you might be using this book as a general reference for modeling, but its really only global modeling nad its 10 years old. The Bonan book is an exceptional book but is not an ideal reference here. There are major review papers on these themes in major journals that would be better to cite.
- Page 3, line 20 McPherson is again an odd reference to an HESS audience. That is not grounds to remove the reference of course, but what about Levis’s paper or Arora’s papers?
- Page 4, lines 5-10 If you want to go right back, a lot of this develops from Vernadsky (1926)
- Page 4, lines 10-15. A book I think communicates this superbly is Williams (2003)
- Page 5, lines 10-15 the following might be relevant here
 - Brovkin, V., Claussen, M., Petoukhov, V., Ganopolski, A., 1998: On the stability of the atmosphere-vegetation system in the Sahara/Sahel region. *J.Geophys. Res.*, **103**, 31,613-31,624.
 - Wang, G.L. and Eltahir, E.A.B., 2000, Ecosystem dynamics and the Sahel drought, *Geophysical Research Lett.*, **27**, 795-798.
 - Taylor, C.M., Lambin, E.F., Stephenne, N., Harding, R.J., and Essery, R.L.H., 2002, The influence of land use change on climate in the Sahel, *J. Climate*, **15**, 3615-3629.

- Nicholson, S.E., Tucker, C.J. and Ba, M.B., 1998, Desertification, drought, and surface vegetation: An example from the west African Sahel, *Bull. American Meteorol. Soc.*, **79**, 815-829.
 - Clark, D.B., Xue, Y., Harding, R.J. and Valdes, P.J., 2001, Modeling the impact of land surface degradation on the climate of tropical North Africa, *J. Climate*, **14**, 1809-1822.
 - Douville, H., 2001, Influence of soil moisture on the Asian and African Monsoons. Part II: internannual variability, *J. Climate*, **15**,701-720.
 - Douville, H., Chauvin, F. and Broqua, H., 2001, Influence of soil moisture on the Asian and African Monsoons. Part I: mean monsoon and daily precipitation, *J. Climate*, **14**,2381-2403.
 - Paeth, H., K. Born, R. Girmes, R. Podzun, and D. Jacob, 2009, Regional climate change in tropical and northern Africa due to greenhouse forcing and land use changes, *J. Climate*, **22**, 114-132, doi: 10.1175/2008JCLI2390.1.
- Unless I am missing something, your experimental methods are described in lines 4-14 on page 9. This is wholly inadequate since I am actually interested in exactly how you did your experience because this strongly affects how I interpret them. Specifically:
 - Line 9 – “a comprehensive initial value ensemble approach was employed”. My interpretation of this, since you use the word “comprehensive” might be very different from yours. You might have changed initial years, initial soil moisture, SSTs, MJO phase, ENSO phase etc. Or you might have just played with soil moisture. Far more detail is required.
 - What is the relevance of a multi-century simulation with a perturbed initial state? Presumably you have long since lost memory of the initial state. So, if you analyse results over a period towards the end, you would not actually sample the initial states.
 - You appear to run only for November through March and yet you run multi-centuries. I struggle with this experimental design and it needs some clarification I think. It does not make sense – you run for multi centuries for just Nov-March perturbing initial values ? My guess is this paragraph is not what you actually do
 - Does the model actually work in the region you use it for?
 - I wish to argue about the 220% reduction in vegetation. I propose the following hypothesis. The aborigines burned to promote growth and habitat and to flush out game. If they burned to promote growth one could hypothesise that vegetation should be *increased* as a result of these management practices.

As a consequence of these methodological issues [I am not saying what you have done is wrong, simply that you do not explain what you have done] it is not possible to review the results properly and therefore judge your conclusions. I think your conclusions are right by the way – though not entirely surprising. A more surprising result would be that the findings in Australia were transferable elsewhere and that you could develop a generalized explanation of these

things. That said, identifying the differences in behaviour is useful and points to important approaches in the future I think so this remains worth publishing.

Trivia

- Page 6, “op cit” should be “2004”
- I just read the following that might be worth reading and citing
 - Ellis, E.C., J.O. Kaplan, D.Q. Fuller, S. Vavrus, K. Klein Goldewijk, and P.H. Verburg, 2013, Used planet: A global history, *Proc. National Acad. Sci.*, **110**, 7978–7985, doi: 10.1073/pnas.1217241110.

References cited

Arora, V., 2002, Modeling vegetation as a dynamic component in soil-vegetation-atmosphere transfer Schemes and hydrological models, *Reviews Geophysics*, **40**, 3.1-3.26.

Levis, S., 2010, Modeling vegetation and land use in models of the Earth System, *WIREs*, 1, 1-17, doi: 10.1002/wcc.83.

Vernadsky, V.I., 1926, **The Biosphere**, Springer-Verlag, New York; 192pp.

Williams, M., 2003, **Deforesting the Earth. From Prehistory to Global Crisis**, University of Chicago Press, 689pp.

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