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Biogeosciences Discussions

Interactive comment on "The influence of land cover change in the Asian monsoon region on present-day and mid-Holocene climate" *by* A. Dallmeyer and M. Claussen

Anonymous Referee #2

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1. I found this a very interesting modelling study, attempting to understand some of the reasons for changes in the Asian monsoon over the late Holocene. The study builds on an established base of general understanding of both the effects of land cover change on climate and the atmospheric processes involved in the Asian monsoon - it's novel aspect is to combine the two. The authors use well-known models and established techniques, and I think their analysis of the results is sound.

2. The main comment I have is that it is a shame the authors chose to use prescribed SST rather than a coupled atmosphere-ocean GCM, since (as the authors themselves point out in the introduction) ocean-atmosphere feedbacks are an important part of

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the Asian monsoon system. For example, Abram et al (2008, Nature Geoscience 1,849-853) suggest positive feedbacks between the monsoon circulation and the Indian Ocean Dipole acting via ocean upwelling driven by changes in windstress over the ocean. I realise that this could introduce additional difficulties in establishing significance of the results through a possible increase in variability, but with 100 years of simulation this probably would still have been possible - but then I guess interpretation of the results might also have been harder. Nevertheless, missing out such a potentially important part of the process does have implications for how well this study captures the influence of vegetation change on climate.

It would be unfair at this stage to insist that the study be re-done with an AOGCM, but I think the authors should at least look into whether such a study would be likely to be an important second step or not. For example, they could analyse the effect of the vegetation change on windspeed over the ocean (and/or temperature or freshwater input via precipitation), and (through reference to the literature if possible) assess whether these vegetation-induced changes might be significant enough for the resulting feedbacks to be important. This could then point to a next stage of work.

3. Also, it's a little surprising that the simulations only included 2 years for spin-up. Was this long enough? How was this checked? Soil moisture can sometimes take a while (sometimes several years) to reach equilibrium after a large vegetation perturbation.

4. It would be useful to have more information on how the vegetation model actually interacts with the atmosphere, ie: the biogeophysical parameters (eg: roughness length? albedo in snow-free conditions, and how this is modified with snow cover? Leaf area index? Parameters relating to evapotranspiration?) Currently we have no way to really see what the perturbation to the land surface properties actually was, to allow comparison with other models that may be used for similar studies.

Overall this is potentially a very useful contribution to the literature, but I think further detail is required in order to allow the work to more easily compared with other models

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and for the possible importance of the omitted land-ocean feedbacks to be seen.

Interactive comment on Biogeosciences Discuss., 8, 1693, 2011.