Climate
of the Past
Open Access
Discussions

Interactive comment on "Regional climate model simulations for Europe at 6 k and 0.2 k yr BP: sensitivity to changes in anthropogenic deforestation" *by* G. Strandberg et al.

Anonymous Referee #2

Received and published: 19 December 2013

This is an interesting study that addresses the question of how much anthropogenic land-cover change feeds back to regional climate using a regional climate model to conduct sensitivity tests, with land-cover estimates informed by theoretical and empirical land-cover data. The study is elegantly designed and presents some intriguing results. There are very few problems with the study, but I do wonder about the wisdom of including the last experiment/comparison, as I fear it is not given enough attention and is about rather a different point than the rest of the work, which is a sensitivity experiment.

Comparisons of proxy-climate reconstructions with simulated climate, which form the final element of this paper, led to mixed success, with both variation in GCM input and

uncertainty in proxy reconstructions raised as possible explanations. This is not surprising, but I wonder about about the logic behind the approach to the climate comparison and indeed whether it needs to be in this paper at all. The model simulations reflect global forcing and also local grid-scale dynamics such as surface energy, and they are likely to be sensitive to land-cover variation. The fossil reconstructions, purposefully chosen to not reflect vegetation, largely use proxies reflecting summer temperature (lake organisms, tree rings). In the case of lake organisms, there is also uncertainty associated with the transfer function method itself. Neither of these proxies is sensitive to change in land cover, so the reconstructions would be expected not to agree with any simulation that is sensitive to deforestation. Reconstructions based on pollen values, even with PFTs, assume the signal is that of potential natural vegetation, which is detectable even in considerably transformed landscapes (otherwise the bioclimatic link underpinning the reconstruction breaks down). Thus I am not surprised that the reconstructions are different. It seems to me that this mismatch is quite important. It may be that where human impact on land cover is important that there is a serious likelihood that most proxy-based reconstructions will deviate from simulated data (and more importantly, the actual historical values). I would suggest that more could be made of this in both the rationale for the experiments, the explanation of what the different proxy datasets can and cannot do, and the explanation of the results. If this makes the paper too unwieldy, as I suspect it would, you might think about making this part a different paper. It might be less confusing, as I think at the moment this part a somewhat incompletely investigated add-on to the really elegant sensitivity tests.

That Northern Britain does not fit anything is no surprise at all. This region has been almost 100% deforested and is maintained via human action in a state would be an azonal vegetation type under less disturbed conditions and which, therefore, has little in the way of a useful climate signal. I think you say this, and it is worth emphasizing, as the weirdness of British vegetation is quite likely not universally understood!

Minor comments linked to page/line numbers

5789/2 change sentence around – awkward. Since we expect vegetation change to affect climate at the local/regional spatial scale, a high spatial resolution in the climate model is critical When evaluating model results by comparison with observations and/or proxies that represent local to regional environment conditions. [need to know how used data re 6000 yr BP 5789/21]

5790/20 – clarify for the reader where the circular reasoning is potentially coming from in this exercise. Presumably RCA is informed by the landcover that you also use to reconstruct past climate?

5793/1 - change, not changes

5793/6 - curious that all forest + snow albedo is the same, as there could be a considerable difference between deciduous and coniferous cover with snow?

5796/8 - clarify the spatial nature of the K, H and LANDCLIM treatments – is the rescaling per grid cell and thus homogeneous across the model domain?

5797/13...based on a multi-method approach... (not previously mentioned) and – the paragraph is slightly unclear about the role of pollen-based reconstructions. You take care to remove the pollen from the LANDCLIM climate proxy dataset but then you use two pollen-based reconstructions as comparators in part of the region. This needs a bit more explanation for the reader. It may not be the same dataset, but it is still a pollen dataset. See also commentary above.

5811/3 ..understanding of past land...

Table 2 – the caption reads "the three PFTs". Do you mean "the three LCUs"?

_____