

Interactive comment on “Do GCM’s predict the climate... or macroweather?” by S. Lovejoy et al.

R. Betts

richard.betts@metoffice.gov.uk

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This is a very interesting paper. I have two main comments, both concerning the issue of comparing like-with-like.

1. I’m not sure why it is useful to compare either a control (unforced) run or pre-1900 forced run with observational / reanalysis data for the 20th Century (figures 3, 4 and 6), since we know the net forcing increased substantially over that time. This is therefore not a fair comparison of the models (without anthropogenic forcing) with the real world (with anthropogenic forcing). I suggest that this comparison be done against models run over the same period of the observations / reanalysis, with all forcings included.
2. I think there is also a difficulty in comparing the multi-proxy palaeo data against models arising from the fact that proxy data is from a number of discrete points whereas the model gives complete spatial coverage. Although a variety of different proxies are

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used, in many cases the original source data will be representative of local conditions at the specific site in question. As I understand it, when the proxies are used together to estimate hemispheric means, it is implicitly assumed that the local-scale patterns of variability at individual sites cancel each other out and that the mean of the individual sites is therefore a good representation of the hemisphere as a whole. This may be a reasonable assumption when the focus is on long time periods, which tended to be the case when the multi-proxy reconstructions were published, but I’d expect it to be more problematic at shorter time periods including those of particular interest here (30+ years). If the spatial coverage of the proxy records is too sparse then I would expect this to result in an overestimation of the true hemispheric mean, so the discrepancy between the models and multi-proxy curves may be larger than the discrepancy between the models and the true hemispheric mean.

Figures 4 and 5 seem to back this up, as the observed / reanalysis curves (which have better global coverage) turn upwards at smaller values on the x-axis than the multi-proxy curves.

This could be investigated by comparing the multi-proxy curves against obs / reanalysis and models only using information from the points where the proxy studies are relevant. ie: take the model data set of individual model gridpoints which contain the sites of the original proxy studies, and use these to construct a hemispheric mean in the same way that the multi-proxy studies did. The same could be done with instrumental data, although this would be subject to the difficulty in my point (1) above at longer timescales.

Minor points:

3. There seems to be inconsistency in the way 20CR is described in different figure captions. In figure 3 it is labelled “Twentieth Century Re-analysis”, but in figure 4 it is “instrumental data”. Please clarify.
4. It’s very useful to see the multi-proxy studies with and without 20th Century data.

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Following my point (1) above, I think that the 20th Century curve should be compared to models and obs / reanalysis separately from the pre-1900 multi-proxy curve (ie: all in a separate figure). However it would also be useful to show a new figure which only shows the multi-proxy curves with and without the 20th Century data. They should also be shown in different colours to make it clear that they apply to different circumstances and are not just two different versions of the same thing.

5. Overall the readability of the paper would benefit from clearer figures with less information in each figures. Separating things out as I suggest in (1) and (4) above would help here.

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