

## ***Interactive comment on “The importance of paleoclimate modelling for improving predictions of future climate change” by J. C. Hargreaves and J. D. Annan***

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Reply to A. Ganopolski

We would like to thank Andrey for his detailed and helpful review of the paper. The review focusses on the important topic of inter-model differences, and we agree that our manuscript probably did not stress this subject sufficiently, although it was already discussed somewhat towards the end of section 5. We have added further discussion of this point at the end of section 3.

We very much agree that it is important that this paper does not overstate the robustness of the results, and are concerned that this was considered to be the case by the  
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reviewer. We have, therefore, modified the tone throughout the paper. Among other changes: "We find evidence" in the abstract is changed to "we suggest"; the title and last sentence of the paper are lightly modified; and we have moved some of the discussion of the caveats related to the statistical significance from section 5 to earlier in the paper (section 4.1) so they will be known to the reader before the results are considered.

We do, however, disagree on the specific point that finding different correlations for different models necessarily precludes a specific epoch or data set from providing useful information to constrain future predictions (and note further that even if we could not confidently know the sign of a future change, it might still be possible to rule out large changes in either direction, which would itself potentially be a useful result). All of the analysis is necessarily undertaken within the specific modelling structure at hand, and the uncertainties relate to the model and its parameters/parameterisations, rather than the climate system directly. It is widely believed that a model which hindcasts more accurately than another should also, other things being equal, forecast more accurately, although it is challenging to quantify this effect. Discussion of this is now included as part of the additional material at the end of section 3.

Specific comments

Abstract I 11, 14 These sentences have been rewritten to make the meaning more clear.

"Method (p2057)" Hopefully this discussion is now more comprehensible. We have included a description of the q-flux approach, and the relevant values for the two ensembles. We also rephrased the comment relating the q-flux and the ensemble climate sensitivity.

"Discussion (p2067)" This has been clarified in conjunction with the new discussion on the q-flux in section 3. The comparison here is between two integrations of the original unperturbed model at different resolutions.

The errors on the labelling of Figs 7 and 8 have been corrected.

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