

# ***Interactive comment on “A note on the influence of atmospheric model resolution in coupled climate–ice-sheet simulations” by Marcus Löffverström and Johan Liakka***

## **Anonymous Referee #1**

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This short manuscript presents an assessment of the influence of atmospheric model resolution in coupled climate-ice-sheet simulations. It shows that the atmospheric resolution matters enormously for an accurate simulation of the major LGM ice sheets. The manuscript is concise, clearly written, easily readable and presents an important, albeit un-surprising, result. This study can prove to be an easy to read and quick to fall back on article when introducing new and old glaciologists fresh into these kinds of simulations.

My main concern with the manuscript is whether the differences between the different atmospheric resolutions is of dynamical/physical nature, or just a matter of res-

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olution and the model topography. The authors argue that the main cause of accurate/inaccurate simulation of the ice sheets is an inaccurate temperature field. Differences in precipitation are rather small. I think that temperature is a very straightforward parameter to model correctly: it largely depends on elevation, which directly depends on the model resolution. Therefore, this conclusion could have been found without doing any of the model simulations presented. How robust are the temperature anomalies shown in Fig. 2? Are these resolution differences also found for other atmospheric models (used for ice-sheet forcing)? Or is it CAM3-specific? The authors should make this finding more convincing by comparing (more) the results to other studies. Currently, in the discussion section, much attention is on the quality of the T21 forcing. I would like to see some more focus, in this section, on the intermodel resolution differences.

In order to warrant publication this concern should be addressed and made less qualitative. Possibly some of the following questions could be addressed in more detail: What do the results of this study say about current studies of coupled atmosphere-ice-sheet models? Have other studies been conducted with inaccurate climate forcing; is this a big issue or not? Have other studies attacked and/or addressed the simple temperature discrepancies; possibly by additional topography (down)scaling techniques, spectral diffusivity, lapse rate corrections? Does the current glaciological community realize that the atmospheric resolution is as important for the results of these types of simulations? How large is the trade-off between “accuracy” and “speed”?

A different approach might be to use different atmospheric climatologies at several model resolutions to make the results more robust, but I understand if this might prove to be beyond the work of this study.

Because I do like the brevity of this manuscript and the concise and to the point explanation of this problem, I do suggest publication after minor revisions. Hopefully the authors can tackle my concerns adequately.

I have no additional minor comments, except for a typo on p6, line 6: considerable->

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considerably.

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2017-235>, 2017.

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