**Climate
of the Past
Discussions**

Interactive comment on "A model comparison
study for the Antarctic region: present and past"
by M. N. A. Maris et al.

Anonymous Referee #2

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This study presents a comparison of GCM simulation data for different periods with present-day regional climate model data and ice core proxy data. The motivation is to understand how well GCMs are able to simulate the Antarctic region, with the idea in mind to use the best GCM simulations to drive ice sheet models. This could be a very valuable contribution to the community and could help both ice sheet and atmospheric modelers with future work. However, in its current state the manuscript does not clearly describe the methods used to evaluate the models or substantiate how the key conclusions were made. This makes it unlikely that the results could be very useful to others. The work is worth publishing in principle, but I would recommend a major revision with a focus on a clearly laid out methodology that shows how the evaluation and ultimate ranking of the models is achieved, as well as more in-depth discussion of the significance of the regional biases. Some specific points are below:

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The methods used are not well described. Specifically, each of the metrics (bias, rmsd, correlation coefficient) should be mathematically shown. A discussion should explain how each of these metrics is used in the evaluation and which of them bears more weight in each case (and why).

It is not clear how the GCM output is compared to the high resolution RACMO output. Is it interpolated to high resolution, or is the RACMO field aggregated to lower resolution? Is any lapse-rate adjustment applied to the temperature data before comparison? This is especially important because if the topography between RACMO and the GCMs is different, the estimated temperature biases will be strongly affected.

I find it nice that not all model results are plotted in each case. It can be overwhelming to see plots for 18 models together and it can be more instructive to simply show representative results. However, it does not come across to the reader why the specific model results are shown. Are these somehow considered to be representative models? If so, how? Also, care should be taken that if a model is mentioned as a best performer, then its results are presented and highlighted. This seems to be missing in some cases.

Are the ice core locations representative in some way of the performance of the models? Their relation to the larger-scale climate should be described. Concerning Tables 3 and 5, why are results only shown for 3 ice core locations, when all 5 locations are presented for the temperature results?

In general, some emphasis should be placed on discussing the importance of the regional differences in the results (in terms of ice sheet modeling, for example), rather than only stating what can be seen. An "interesting feature" in the Bellingshausen Sea and Amundsen Sea region is only mentioned in the paper and discussed in the conclusions. If this is important, the discussion (eg, discussing the representation of circulation as a potential cause) should happen in the paper itself. It would also help to add some geographical descriptions to the plots to highlight regions that are discussed.