

## ***Interactive comment on “Does Antarctic glaciation cool the world?” by A. Goldner et al.***

### **Anonymous Referee #1**

Received and published: 25 October 2012

It should be emphasized that these issues only concern the readability of the paper, not its scientific content. One option is to keep the paper as is - the scientific content and value of the paper would still be of high quality, but the paper would remain unusually difficult to read, and lose a large fraction of potential readers I think. The choice can reasonably be left to the authors and editors.

In my earlier review I tried to outline the basic content of the paper, as a guideline for revision of the main text, as follows:

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I would say that the basic results (as opposed to the broader implications which are communicated quite well in the paper) are:

- Shortwave Cloud Forcing (SWCF) is the dominant feedback. In the Eocene, adding

an AIS causes a reduction in low clouds (mainly 60S to 90S). In the Modern, adding an AIS causes the opposite, an increase in low clouds (mainly in tropics). Less low clouds causes warming, so the basic cooling effect of adding an AIS is largely canceled in the Eocene (net is  $< 1$  K), and reinforced in the Modern. This is clearly seen in Fig. 4.

- Sea-ice albedo feedback is subsidiary, amplifying AIS cooling at both times, but weaker than SWCF especially for Eocene.

- At low CO<sub>2</sub> levels, for Modern, the GCM produces (summer?) snow cover over much of non-glaciated Antarctica, so there is little albedo change when an ice sheet is imposed, less cooling than at high CO<sub>2</sub>. Also clearly seen in Fig. 4.

- (Some other secondary results: e.g.,  $d(\text{FSNS})$  and  $d(\text{FSNT})$  are proportional).

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Much of this is contained in the abstract and concluding section reasonably well. The issue is with the readability of the main text in between. One answer to the question in the authors' clarification request would be to omit, or move to appendices, all material not strictly necessary to communicate these points, and re-organize the remaining material in a structure similar to that above. However, that would essentially mean a re-write of most of the paper.

Short of that, here are some specific suggestions, somewhat disjointed and heavy-handed, but aimed at streamlining by omitting, shortening, or moving material not essential to the above outline.

pg. 2647, line 20 to pg. 2648, line 5: Remove paragraph or shorten.

pg. 2650, line 2 to pg. 2652, line 7: Move section 2.1 including Fig. 1 to an appendix, or drastically shorten.

pg. 2653, lines 3 to 19: Replace this paragraph by one short sentence, saying that the change in Antarctic ice size here is generic, and not meant to represent any particular event.

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pg. 2654, line 3 to pg. 2655, line 4: Remove these 2 paragraphs, or summarize with one sentence saying that both surface and TOA changes are considered, to avoid misleading conclusions from one alone.

pg. 2663, line 5 to pg. 2664, line 8: Move section 3.2.2 to an appendix, and/or mention in one sentence in main text.

pg. 2665, line 4 to pg. 2669, line 23: Limit these comparisons to previous work strictly to those that have studied changes due to cleanly removing or adding the Antarctic ice sheet as here. If not, then omit, or drastically shorten.

pg. 2669, line 24 to pg. 2670, line 22: Move section 4.5 to an appendix.

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Interactive comment on Clim. Past Discuss., 8, 2645, 2012.

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