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Interactive comment on "Representing icebergs in the *i*LOVECLIM model (version 1.0) – a sensitivity study" *by* M. Bügelmayer et al.

Anonymous Referee #1

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This is an interesting paper, exploring the impact of iceberg size on climate in three different climate states, while documenting inclusion of an iceberg model in a well used EMC. Their main conclusion is that whether icebergs are small, large, or a mix of sizes (at least using the standard size classes of current iceberg models) their impact on climate is similar and small. This is true even if net flux varies between states – the large-scale radiative forcing is most important for producing change. This is a conclusion that would have been expected a priori, but it is good to have the unimportance of iceberg size verified. The authors explain their procedures, and set forth their experiments clearly.

I do have a few specific comments that the authors may wish to comment on:

1. The authors seem not to differentiate between ocean and atmospheric components

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of the melting parameterisation. One of the big effects – the wave-induced erosion – is purely wind-related, while the other large effects, such as basal melting and buoyant convection, are oceanic effects. This will impact on the southward extent of the tracks, possibly as significantly as size. Was this effect included, but not noted? If not, its exclusion needs to be made clear. 2. It is not clear what the experiments do in the Southern Hemisphere. Is it only Greenland that is supplying icebergs, and is the ice sheet model also causing changes in calving fluxes in each hemisphere? 3. By only considering Greenland the restriction of the iceberg sizes to 1 km in length is reasonable, even under glacial conditions. However, the Antarctic has a proportion of icebergs at > 10 km size. These provide a significant freshwater flux to the Southern Ocean, but previous models have capped SH icebergs at the same 1 km size as used here. It would have been interesting to see if a predominantly giant iceberg flux from Antarctica led to the same lack of impact, although as the paper focuses on the Northern Hemisphere this paper only requires comment on this issue, rather than additional work.

Technical points p. 4354, l. 26 "... conditions and constant ..." p. 4356, l. 10-15: the authors should acknowledge, in the otherwise good description of the development of iceberg models, the extension of the Bigg et al. model to include coupling to an intermediate complexity model by Levine and Bigg (2008). It was the first published coupled iceberg model considering climate conditions in both the present and a low carbon dioxide climate. Levine, R. C., and G. R. Bigg, 2008, The sensitivity of the glacial ocean to Heinrich events from different sources, as modeled by a coupled atmosphere-iceberg-ocean model, Paleoceanogr., 23: PA4213, doi:10.1029/2008PA001613.

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