

Interactive comment on “

A new coupled ice sheet-climate model: description and sensitivity to model physics under Eemian, Last Glacial Maximum, late Holocene and modern climate conditions” by J. G. Fyke et al.

Anonymous Referee #2

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This paper describes an Earth system model of intermediate complexity coupled to ice sheet/shelf models for Greenland and Antarctica. To my knowledge, this is the first coupled model that includes two-way coupling between a climate model and both ice sheets, with testing for the Last Glacial Maximum and the warm Last Interglacial. I recommend publication with only minor revisions.

Page 1235. Describe the melt rates and calving prescriptions in more detail. A figure
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or table would be useful here.

Section 3.1. Please give the length of the equilibrium simulations for the late Holocene, LGM, and Eemian. Longer than about 5000 years would be a problem for the Eemian because of the changing orbital conditions.

Page 1241. The mean model-based estimate of Otto-Bliesner et al. (2006) of 2.8m of global SLR (range 2.2 to 3.4m) includes contributions of both GIS and other Arctic ice fields. Their study gives a GIS SLR range of 1.9 to 3.0m. Also a counterargument to the Eemian GIS having extensive ice in southern Greenland (Fig. 8f) is the marine core results of deVernal and Hillaire-Marcel [Natural Variability of Greenland Climate, Vegetation, and Ice Volume during the Past Million Years, *Science*, 320, 1622 (2008)]. Their pollen records from marine sediments off southwest Greenland suggest dense vegetation over southern Greenland during Stage 5e. This should be included.

A paper that the authors might find relevant is one by Greve et al. [Greve, Saito, and Abe-Ouchi, Initial results of the SeaRISE numerical experiments with the models SICOPOLIS and IcIES for the Greenland Ice Sheet] just published online in *Annals in Glaciology*. They found that the standard version of SICOPOLIS produces an ice-free northern Greenland for present day, albeit with a positive degree-day method for surface melting.

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