

## ***Interactive comment on “The land-ice contribution to 21st century dynamic sea-level rise” by T. Howard et al.***

### **Anonymous Referee #1**

Received and published: 7 February 2014

Review of

The land-ice contribution to 21st century dynamic sea-level rise

by Howard and others

Summary

This paper addresses the impact of land ice melt on dynamic sea level (caused by changes in ocean density and circulation). It uses a coupled, low-resolution GCM forced by prescribed land ice melt from mountain glaciers and ice caps and the large ice sheets of Greenland and Antarctica. The paper is reasonably well written, but the Introduction is poorly focused and structured (see below). The figures are of good quality. Although the resulting signals in DSL are small, this paper is of interest to the

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sea level rise community, and may be acceptable after minor revisions.

General comments

The introduction should be shortened and better structured. The text of the Introduction now jumps apparently randomly from glaciological processes to dynamic sea level rise, AMOC changes and model complexity. In the revised Introduction please focus on the role of land ice melt on DSL: what has been done in the past in this field and what does this paper add to that knowledge. If that is what the title suggests, i.e. improved knowledge on the contribution of land ice melt to DSL, then please specify what the progress reported here entails. Also, references could be selected more carefully (see specific comments below for some examples).

Please use 'high' and 'low' temperature rather than 'warm' and 'cold' temperature throughout.

Specific comments

p. 125, l. 12 and 14: Bevan et al (2012) and Barrand et al. (2013) references out of place; the first paper deals with dynamics of Greenland outlet glaciers, the second with melting in the AP.

p. 125, l. 20: Van den Broeke (2011) reference out of place; that paper mainly discusses variability in surface mass balance. Please check appropriateness of references throughout Introduction!

p. 127, l. 15: Specify average strength of AMOC to put listed changes into perspective, or simply add percentage between brackets.

p. 127, l. 26: To aid the non-specialist reader, please specify 'Boussinesq' vs 'non-Boussinesq' model.

p. 133: The sentence "There is no explicit representation of iceberg calving, so a prescribed water flux is returned to the ocean at a rate calibrated to balance the net snow-

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fall accumulation on the ice sheets, geographically distributed within regions where icebergs are found (Gladstone et al., 2001)." implies that the model is forced with 'balance' freshwater fluxes from land ice before the anomalies of Fig. 1 are imposed. Could you please specify the magnitude of these balance freshwater fluxes, i.e. how much snow is assumed to fall on the ice sheets and how much runs off as melt water or breaks off as icebergs? Are these fluxes realistic, i.e. how do they compare to recent estimates of balance mass fluxes from other techniques?

Sections 2.2 and 2.3: Please explain -already here- in short the irregular behaviour of the high-end GrIS and AIS freshwater fluxes, or refer to the section 2.4 for an explanation.

Fig. 1b: please add unit (m) to y-axis label.

My copy of Fig. 4 was of poor resolution.

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Interactive comment on Ocean Sci. Discuss., 11, 123, 2014.