

***Interactive comment on* “Numerical reconstructions of the Northern Hemisphere ice sheets through the last glacial-interglacial cycle” by S. Charbit et al.**

Anonymous Referee #2

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General Comments:

Charbit et al. describe a series of experiments that attempt to reconstruct the last glacial-interglacial cycle northern hemisphere ice sheet distribution using a 3-D thermo-mechanical ice-sheet model forced by the climate obtained from six atmospheric general circulation models (AGCMs). These models are part of the first PMIP project that inter-compared model results from a series of experiment with the same or similar boundary conditions. Thus, it is very useful to use these results to force a model that predicts ice sheet distributions during the last glacial cycle (~120 KaBP to present) and investigate the sensitivity of the ice sheet model to the variations in model atmospheric

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forcing. Also, this study attempts to validate these PMIP climate forced simulations of ice sheet extent and volume against ice sheet margin deglacial chronologies and glacial cycle sea-level variation. While these concepts are not new and the methods have been used before, this series of experiments does make use of a modeling framework that merits investigation. Although, I feel, that the content of the main manuscript somewhat lacks sufficient depth into the investigation (e.g. only the temporal and spatial evolution of ice volume mass and extent), the material is presented in a fairly well constructed and logical manner. The authors have conducted a very thorough examination of the model results that they have presented and have made reference to numerous citations that pertain to this work. The introduction of this paper also gives a fairly comprehensive review of previous research related to this paper. The main conclusion from this work illustrates that there are deficiencies in both the atmospheric and ice models and that these results are likely contributing to the lack of reconciliation with observations of sea-level variations inferred during the last glacial cycle. Also some of the conclusions tend to reinforce conclusions that were obtained from previous studies and allow for future testing of these results.

Specific comments:

Page 889, Line 24: The authors may want to reference a paper on ice-sheet atmospheric dynamical interaction (e.g. Roe and Lindzen, 2001).

Page 891, Section 3.1.2 (~ line 12): The authors may want to reference some data that implies an ice free Eastern Siberia during glacial maximum (e.g. Vartanyan et al., 1995)

Page 893, Line 18,19: The authors might provide a reference for this statement.

Figures 5 and 6: Why does the Bering strait look open in the simulations that apparently have the biggest sea level drop (Fig. 8a.) at 57K and 18K (ECHAM3, UGAMP, CCRS1)? Is this just a plotting anomaly.

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Technical corrections:

Pg. 880,13: "The analysis allows for an evaluation of the ability of GCMs to simulate climates consistent with the reconstructions of past ice sheets." Pg. 887,11; 887,14; 889,25, 890,6 and others: "Artifact" is spelt incorrectly in a number of places. Pg. 888,6: Replace the word "during" with "for" Pg. 888,19: "the six experiments are in full agreement" Pg. 891,5: "consisted of small" Pg. 891,12: "At present, some groups propose" Pg. 891,24: "First the southern margin is much too extended" Pg. 891,29: "same place as in ICE-4G." Pg. 894,10: "simulate the recession"

References:

Roe, G.H, and R. S. Lindzen, 2001: The Mutual Interaction between Continental-Scale Ice Sheets and Atmospheric Stationary Waves, *J. Climate*, 14(7), 1450-1465.

Vartanyan, S. L. et al., 1995: Radiocarbon Dating Evidence for Mammoths on Wrangel Island, Arctic Ocean, until 2000 BC, *Radiocarbon* 37 (1), 1-6.

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