

## ***Interactive comment on “A hybrid GCM paleo ice-sheet model, ANICE2.1 – HadCM3@Bristolv1.0: set up and benchmark experiments” by Constantijn J. Berends et al.***

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This paper describes the numerical ice-sheet model ANICE2.1, with coupling design of climate-model for 100kyr global ice-sheet simulation. Climate model part to interact with changes in ice-sheet distribution is computed using so-called matrix method, which is built from a series of pre-calculated outputs of a GCM (HadGCM).

I think this paper is fairly well written with some exception below, and can be accepted with minor revision.

Abe-Ouchi et al (2013) use a different approach to force an ice-sheet model, in which a

C1

series of GCM snapshots are used to separate orbital, CO<sub>2</sub>, albedo etc effects on ice-sheet surface temperature. The method is not the same as two approaches (glacial index method and ESM coupling), and also not the same as the approach of the present paper. This study is limited to the northern hemisphere, but if the authors agree (I am not sure whether it is fair to tell this, because I am one of the authors of the paper), the authors may include the study as yet another example of hybrid GCM ice-sheet model application. In addition, several processes not included in the model are discussed in conclusion (around p13), which are discussed in Abe-Ouchi (2009, 2013).

As far as I understand, since ice sheet evolution is computed on the four separate regions, there is no chance to connect two ice sheets, e.g., Greenland and North America. In Fig. 4 the northwest part of Greenland seems to connect with NA ice sheet. I wonder how to handle this situation. Moreover, also in Fig. 4 or 7, simulated NA ice sheet extends on Eurasia. How to treat this? I suspect the model domain of NA ice sheet cover until East Siberia. Of course it is reasonable to assume that Siberia has been ice-free, in principle this is just a specification of the model of this paper. It is better to clarify these configuration. Possibly, it is enough to describe the four separated domain on the map.

Minor points.

p1 L10 ‘all ice’ it too much. as far as I understand, neither glacier nor sea ice is included.

p3 L5 LGM should be defined here (now defined at L29).

p4 L4 degree C should be K.

p14 Eq A4, etc. write ‘\exp’ instead of ‘exp’ if using LaTeX.

p15 L1. 2e-11, etc, should be written as  $2 \times 10^{-11}$ .

p15 L25 refer Table 1 after c3.

Fig.1. Need to describe the color as bedrock elevation where not covered by ice.

C2

Fig.5,8,9. Need to describe the contour lines (thickness or surface elevation?)

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