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Interactive comment on "An ice sheet model of reduced complexity for paleoclimate studies" *by* B. Neff et al.

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This paper aims at presenting a new ice sheet model which can be used for paleoclimate studies. If focus was only on the model, then Geoscientific Model Development (GMD) would have a much better venue than Earth System Dynamics (ESD). But the authors also want to show that interesting results can be obtained with this model, in particular the hysteresis of the northern hemispheric ice sheet distribution versus global temperature offset (section 4).

On both aspects, however, the paper is not sufficiently developed to recommend publication and a major revision is needed. Below suggestions are given to improve the paper; only major issues are mentioned.

1. In section 2, many essential details of the model are not given. For example, it is unclear how the surface mass balance (please use M instead of SMB in (1)) is precisely

computed from the temperature and precipitation. The model uses a C-grid but, as only h and B appear to form the state vector, how are the variables staggered? What is the time step and is this accurate enough over long integration periods?

2. What is important to show in section 2 is that an integral mass balance (over the model domain) is satisfied in the model. As boundary conditions at the ice interface are dealt with in a rather sloppy way, such an integral balance may be easily violated with possibly large consequences for the solutions. If there is no integral balance of mass, the paper cannot be published.

3. The most interesting results are presented in section 4.3 but these are only described, without any further analysis on the mechanisms of the hysteresis behavior. For a paper in ESD, it is important that further analysis should be done. So what feedbacks (mass balance-height, marine ice-sheet instability, ..) determine the transition from a solution on one branch in Fig. 8 to the other?

Interactive comment on Earth Syst. Dynam. Discuss., 6, 1395, 2015.