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Climate of the Past Discussions

Interactive comment on "Heinrich event 1: an example of dynamical ice-sheet reaction to oceanic changes" *by* J. Álvarez-Solas et al.

Anonymous Referee #1

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Review of: "Heinrich event 1. . ." by Alvarez-Solas

General comments: This is an important paper that serves to document a new mechanism for Heinrich events that overcomes a long-standing set of inconsistencies and contradictions in previous mechanisms. The work is well presented, well articulated (with the exception of a few areas where the English can be corrected, as indicated below), and convincing. The work builds on previous theory, including aspects of previous theories that were part of mechanisms that have not succeeded. The modeling demonstration both illustrates the working of the mechanism and indicates various scales of response (e.g., sea level rise rates) that can be addressed with observation.

I strongly support the publication of the paper essentially "as is". Some readers will find the model description very short, however I believe that there is sufficient documenta-

tion in the on-line supplement and in cited literature to allow a reasonable scientist to be able to reproduce the experiments.

Specific comments:

Abstract, it would be helpful to give a time range for H1 (some readers may not remember).

It would be great if the paper had line numbers: Where it says: "Recently, the sensitivity of the glacial AMOC to the wind-stress strength was investigated by integrating the model to equilibrium with the Trenberth et al. (1989) surface wind-stress climatology multiplied globally by varying factors α âĹĹ [0.5,2] (Montoya and Levermann, 2008)." It is not clear what the factors are and what "climatology" means. . . is "climatology" a vector field? And what does it mean to multiply "globally" as opposed to simply multiplying?

"Ice streams velocities and ice-shelves behavior" should be rewritten: ice stream velocities and ice shelf behavior.

In subtitle 3, change "ice-streams" to "ice-stream" (no need for plural).

It is not clear what this sentence means: "In the glacial simulation, NADW takes place in the Nordic and Labrador Seas (not shown)."

In this sentence: "To investigate its potential effects on the LIS," what does LIS mean? Is this the Labrador Ice Shelf, if so, can something be said about this in the previous section where model spin up is described, i.e., when does the LIS first appear?

Change "for ice shelves breakup" to for ice shelf break up (it is presumed plural)

In Figure 1 it might be a nicer figure if a 4th panel were added (this would balance the array from 2 by 1 to 2 by2). The panel to add would be one which shows ice type, e.g., where is the floating ice shelf, where are the ice streams that are going to respond to the loss of the ice shelf, etc. This would be a kind of "ice-sheet parts map". . .

In figure 3, the black and blue color scheme for the top two panels isn't easy to see. Maybe the blue can be lighter? Also all the panels would benefit if there were vertical lines added (and labeled by letters?) to signify when the ice-shelf basal melting starts, when the ice shelf has collapsed by $\sim$90%, and other such things. . .

In figure 4, and in the text. . . is the sea level rise rate for all the ice sheets (including the Fennoscandian, which I see is part of the model), or just that due to the loss of ice in response to the H-event forcing?

Interactive comment on Clim. Past Discuss., 7, 1567, 2011.