Clim. Past Discuss., 5, C483–C485, 2009
www.clim-past-discuss.net/5/C483/2009/

Climate of the Past Discussions

Interactive comment on "Investigating the impact of Lake Agassiz drainage routes on the 8.2 ka cold event with climate modeling" *by* Y.-X. Li et al.

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Received and published: 22 July 2009

We would like to thank the reviewer for his/her comments that will help improve the manuscript. A southerly LAO drainage route has been proposed to explain the observed oxygen-isotope record around 8.2 ka in the northwestern North Atlantic Ocean. The purpose of this study is to examine whether this postulated southerly drainage route is plausible. Our modeling work shows that a southerly route can yield an overall similar but weaker response than does a northerly route. Therefore, for the given climate anomaly of the 8.2 ka event, more freshwater drainage would be required for a southerly route than a northerly route. Since there is a wide range of estimates of the drainage volume, our modeling work would provide a basis for favoring relatively larger estimate of drainage volume, thus contributing to better constrain the cause of the 8.2

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Interactive Discussion

Discussion Paper

ka event.

Below is the point-by-point response to the reviewer's comments.

1. A brief overview of previous hosing experiments has been provided in the revised version.

2. The approximate areas of freshwater release, together with actual flux of 1.03 Sv, 2.06 Sv, and 3.09 Sv have been indicated in Fig 1 in the revised version.

3. In light of Reviewer #2's comments regarding the western boundary current, this sentence has been changed to: "The coarse resolution of the model also prevents it from describing in detail the speculated drainage, which flows along the North America coast. This means that the model cannot track freshwater drainage following a southerly route." It means that the model cannot physically track a plume of freshwater drainage as the plume of freshwater moves. We employed an alternative approach where we introduced freshwater at three locations on the southerly route to represent the southerly drainage scenario. As to the performance of the model, Spence et al. (2008) show that the model yield largely similar responses to those from eddy-permitting resolution models. As such, interpretations of first-order phenomena of model responses are considered significant.

4. Since simulation of a southerly route can yield a first-order similar, but weaker response than that of a northerly route, a southerly drainage is considered plausible. The short-lived initial warming of southerly routes in Fig 6a is considered a local phenomenon and may be due to local intensification of convective activities associated with the sudden introduction freshwater to a site away from deepwater formation sites. So only the subsequent cooling is considered significant.

Fig. 3 caption is revised as follows:

"Fig. 3 Time series of maximum overturning stream function (Sv) in the North Atlantic (A) and the GIN Sea (B), and meridional heat transport in the Ocean at 30° S (C). Left,

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middle, and right columns are results of 0.45m SLE, 0.90m SLE, and 1.35m SLE freshwater perturbation, respectively. Arrows mark the time when freshwater perturbation is introduced."

The heat transport values are low compared to literature, how are these values determined?

Fig. 3C shows the meridional heat transport of the ocean at 30oS and the values are comparable with those shown in Wiersma et al. (2006).

The unit for sea-ice extent in Fig. 5 has been revised to mˆ2.

Interactive comment on Clim. Past Discuss., 5, 1163, 2009.