

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.

Anonymous Referee #1

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General comments

The study describes water hosing experiments performed with the ECBilt-CLIO-VECODE model that was initialized for the climate of the early Holocene. 5-year long freshwater pulses are released in four different ways and with three different volumes along the western Atlantic coast between about 55 and 35N. The climatic responses are compared in terms of meridional overturning circulation (MOC), convection depth, sea ice area of the northern hemisphere, and temperatures representative for Greenland Summit and Ammersee in Europe. The idea is to investigate the induced climate anomalies to obtain a better understanding of the cause of the 8.2 kyr cold event.

The manuscript is concise and well written. In conclusion it is found that the more south the drainage route the more freshwater drainage is needed to produce similar climatic

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responses. In this respect the simulation results broadly agree with results on water hosing experiments published earlier. It remains open however, how the analysis of the freshwater scenarios helps to provide new insight on the causes of the 8.2 kyr event. In the following, some comments toward a more specific analysis are given.

Specific comments

1. The introduction should contain a brief section on earlier water hosing experiments to give an overview on the existing investigations, as for instance, on the impact of freshwater input released at different latitudes in the North Atlantic (see e.g., Manabe and Stouffer, *Nature*, 1995).
2. The possible drainage route of the pro-glacial lakes Agassiz and Ojibway is displayed in Figure 1 following the Fig 1 in Keigwin et al. (2005). To give a picture of the drainage routes used in the experiments of R1 through R4 the figure should include the actual fluxes of freshwater released in the model together with the areas of freshwater release. The expressions named northerly and southerly drainage routes are obscure.
3. The point is made that the ocean model has a resolution too coarse to resolve the western boundary current (page 1167, line 17 and following). What does that mean for the performance and the interpretation of the scenario simulations?
4. Why is a southerly drainage route considered plausible (page 1175, line 25)? How is the multi-decadal increase in the simulated Greenland temperatures in Figure 6a after the insertion of the freshwater impulse reconcilable with a plausibility criterion?

Technical corrections

- a. Figure 3 shows the MOC in the North Atlantic and the MOC in the GIN Sea. Provide a definition of these MOC values.
- b. The values of the northward heat transport in Fig 3C are low compared to literature values. How are these values determined?

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c. The sea ice extend in Fig 5 is rather in 10^{12} m^2 not in 10^{12} km^2 .

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