

## ***Interactive comment on “Laurentide Ice Sheet basal temperatures at the Last Glacial Cycle as inferred from borehole data” by C. Pickler et al.***

**C. Pickler et al.**

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### **Response to comments by Reviewer Dmitry Demezhko**

We thank the reviewer for his thoughtful and constructive comments. We do agree with the points that he has made and we shall include his suggestions in the revised manuscript.

*1) The number of publications on the basal temperature reconstructions is broader than is given in the Introduction. I suggest to cite additional papers devoted to the geothermal temperature reconstructions at the base of*

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*Laurentide (Majorowicz et al., 2012, Majorowicz and Safanda, 2014) and Scandinavian (Safanda et al., 2004, Majorowicz and Safanda, 2008, Demezhko et al., 2013) Ice Sheets.*

We shall include more references in the final manuscript as suggested by reviewer.

*2) How well do the geothermal reconstructions published in this paper (Pickler et al., 2015) correspond to the proglacial lake data?*

Outbursts from Lake Agassiz, the proglacial lake covering a portion of the studied area, have been linked to the three largest cooling events during the deglaciation period: (1) the Younger Dryas, (2) the Preboreal Oscillation and (3) 8.2 ka cooling event. These events are all of short duration (several centuries) and cannot be resolved in our GST reconstructions. The most we could infer is a surface temperature above the pressure melting point of ice around these time periods.

*3) P3940, L.4-7. Authors wrote: “For periodic oscillations of the surface temperature, the amplitude of the temperature fluctuations decreases exponentially with depth over a length scale proportional to the square root of the period”. It is better to give here a formula which corresponds exactly to the text.*

We agree: a formula is better. It will be added in the revised manuscript.

*4) P.3942, L.5-7. Authors wrote: “...for a homogeneous, source-free half space...”, but below they give a formula for the horizontally stratified medium*

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*with heat sources.*

We will edit the sentence and delete "source free halspace".

5) P.3952, L.8 *"These correlations suggest a link between heat flux and basal temperatures". This is also supported by modeling of contemporary ice sheets - Greenland (Greve, 2005) and Antarctic (Llubes et al., 2006)*

These references to studies of contemporary ice sheets will be added in the text.

## **References**

Greve, R.: Relation of measured basal temperatures and the spatial distribution of the geothermal heat flux for the Greenland ice sheet, *Annals of Glaciology*, 42, 424–432, 2005.

Kleiven, H. K. F., Kissel, C., Laj, C., Ninnemann, U. S., Richter, T. O., and Cortijo, E.: Reduced North Atlantic deep water coeval with the glacial Lake Agassiz freshwater outburst, *Science*, 319, 60–64, 2008.

Llubes, M., Lanseau, C., and Rémy, F.: Relations between basal condition, subglacial hydrological networks and geothermal flux in Antarctica, *Earth and Planetary Science Letters*, 241, 655–662, 2006.

Teller, J. T., Leverington, D. W., and Mann, J. D.: Freshwater outbursts to the oceans from glacial Lake Agassiz and their role in climate change during the last deglaciation, *Quaternary Science Reviews*, 21, 879–887, 2002.

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Interactive comment on *Clim. Past Discuss.*, 11, 3937, 2015.