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Climate of the Past Discussions

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

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General comments

This manuscript presents new reconstructions of temperature conditions at the base of the Laurentide Ice Sheet during the last glacial cycle using borehole temperature data. These results are important for understanding the dynamics of the ice sheets and global climate change. Currently, Glacial Systems Models (GSM) or contemporary sheets mainly provide such information. However, there is disagreement between the results of modeling and geothermal data (eg., Ruth et al, 2013). Borehole temperatures provide direct evidence of the temperature history at the base of ice sheets and thus can be used as input parameters of Glacial Systems Models. I have no doubts that the paper should be published in Climate of the Past with minor revisions.

Specific comments

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

The paper continues investigations that were previously conducted in the region (Chouinard, Mareschal, 2009, Rolandone et al, 2003), and uses additional five new boreholes. I guess, the authors have noted in the "Discussion" section what the new information was provided by these new boreholes.

There exist a lot of publications on the Laurentide Ice Sheet deglaciation chronology, proglacial lakes (eg., Lake Agassiz) appearance and their drainage into the Atlantic (inferred from proxy evidences and modeling). So, how well geothermal reconstructions published in the paper correspond to this data?

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. For example: A=Ao exp[-z(pi/k/tau)ˆ1/2], where Ao is the amplitude at the surface. z is the depth, pi=3.1415... , k is the thermal diffusivity, tau is the period of the oscillation.

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 with heat sources.

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)

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