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Climate of the Past Discussions

Interactive comment on "Impact of the Last Glacial Cycle on Late-Holocene temperature and energy reconstructions from terrestrial borehole temperatures in North America" *by* H. Beltrami et al.

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I read this paper with great interest: it provides an analysis of borehole temperatures and thermal energy stored during the last 120000 years. A climatic ice sheet model designed for North America provides the ground surface temperature history for this analysis. Although I'm not a specialist, the topic of the paper seems suitable for publication in Climate of the Past. It is generally well-written, but section 3.2 could be expanded and clarified, as some of its statements are rather abrupt! In particular, the procedure that consists to add the geothermal gradient to the temperature anomalies

obtained from a forward model and then remove a linear trend at the bottom of the temperature profile (line 8 page 2370) needs to be better explained and justified. I understand that it is supposed to reproduce the procedure used to invert the ground surface temperature history in the real-world, but I wonder why it is also applied to calculate the amount of energy instead of using directly the forward model results (figure 7). I guess that as the temperature anomaly associated with the LGC is mostly linear below 300m, it has been integrated in the geothermal gradient and therefore, I wonder what is the significance of the energy discussed in the paper? In addition, I have few minor remarks:

1. title is ambiguous, as it can be interpreted in a way that the impact of LGC is derived from real data.
2. page 2365 line 6: Ts(z) "often called geothermal gradient" (????).
3. What is the difference between figure 3 and figure 5 (except the range)? it seems that conclusions of section 3-1 can be also drawn from figure 3.
4. page 2370, line 8: you should probably give the value of the linear trend removed from the synthetic T(z) compared to the 20 mK/m added to the temperature anomaly.
5. page 2372, discussion and conclusions: say few words on the impact on heat-flow estimates and lithospheric thermal regime in North America.
6. page 2374 equation 7: z^2 instead of z in exponential term?
7. page 2374 line 2: 100 years BP instead of 100 ka BP
8. pages 2373-2374: discussion on the detection of a future 1K increase is not well related to the LGC

9. In the beginning of the discussion, you mention that the effect of the LGC on the surface temperature reconstructions is not important, but conclude (top of page 2375) that it represents 60% of the energy and cannot be ignored! You should explain this paradox.

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