Clim. Past Discuss., 7, C1844–C1848, 2011
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Climate of the Past Discussions

Interactive comment on "Impact of postglacial warming on borehole reconstructions of last millennium temperatures" *by* V. Rath et al.

J.-C. Mareschal (Referee)

mareschal.jean-claude@uqam.ca

Received and published: 14 November 2011

This is a very nice little paper. It makes the point that the warming after the last glacial episode has affected temperature depth profiles from the surface down to 2000m and that this has an impact on the inversion of the recent (last 1000 years) ground surface temperature history from profiles less than 1000m. It shows that the interpretation of such profiles could be greatly improved if the post glacial warming is accounted for before the profiles are inverted. This is convincingly shown by the example in Figure 3. I have a small question concerning the level of noise used in this example and what happens when the level of noise is increased.

The synthetic heat flux profile shown in Figure 4 is amazingly similar to a profile that we have measured in deep borehole at Falconbridge (near Sudbury, Ontario) and is re-

ported in the Chouinard and Mareschal (2009) paper (see Fig. 1). The climate model used by the authors thus appears very consistent with some deep borehole temperature profiles. Unfortunately there are topography effects at this site and the shallow part of the profile can not be interpreted for climate and used to test the proposed approach. This being stated, I think we need to use some caution and not blindly apply a correction to all the temperature profiles. We have also several examples of deep profiles (also in northern Ontario) that do not exhibit any increase in heat flux with depth (see Fig. 2). Even near Sudbury, two profiles in deep holes less than 50km apart are different (although consistent). It would be useful to have a criterion before applying the correction. Unfortunately, Figure 4 also shows that the variations in heat flux in the 500-1000m range are likely too small to be identified even when the record is not noisy.

In spite of this little caveat, this is a useful little paper that will help those who are struggling to interpret temperature depth profiles. The idea is simple but I am ashamed to confess that I had not thought that a correction could improve our interpretation of the very recent ground temperature history.

I have a few very minor edits.

P 3326. Line 16: Replace by “In steady state conditions, with constant thermal conductivity and neglecting heat production, the subsurface temperature depth profile is linear. “

Line 20 replace “registered” by “recorded”

p. 3327 line 7: replace “at shallower . . .” by “at depths shallower than 1000m”

line 13 “Following Birch (1948), . . .”

line 29 “This illustrates. . ..”

P 3328 line 10 “boundary condition . . .”

P 3329 line 3 replace “typical” by “a range of”

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Line 18 “steady state geothermal gradient”

Line 19 replace “true” by “steady state”.

Line 21. Replace “this transient effect mistaken for a” by “miscalculating the . . .”

P 3330 line 20 replace “significant” by “meaningful”.

P 3332. AOGCM?

Line 21 “above above”

P 3333 “ the nearly linear behavior . . .”. I am not sure what you mean. Figure 2b shows that your temperature gradient changes almost as much from 0 to 500m than between 500 and 1000m. I think the approximation of a constant heat flux is simply better because the total variation due to the transient is less.

Figure 7. What is the value of ε?

Figure 6 caption line 3 “parameter”

Figure 5 caption line 3 “For comparison, GSTH assuming no surface temperature change before the LIA.

Figure 1. I think you do not need the label “Global Warming” in the Figure. It is irrelevant to this study.

Interactive comment on Clim. Past Discuss., 7, 3325, 2011.

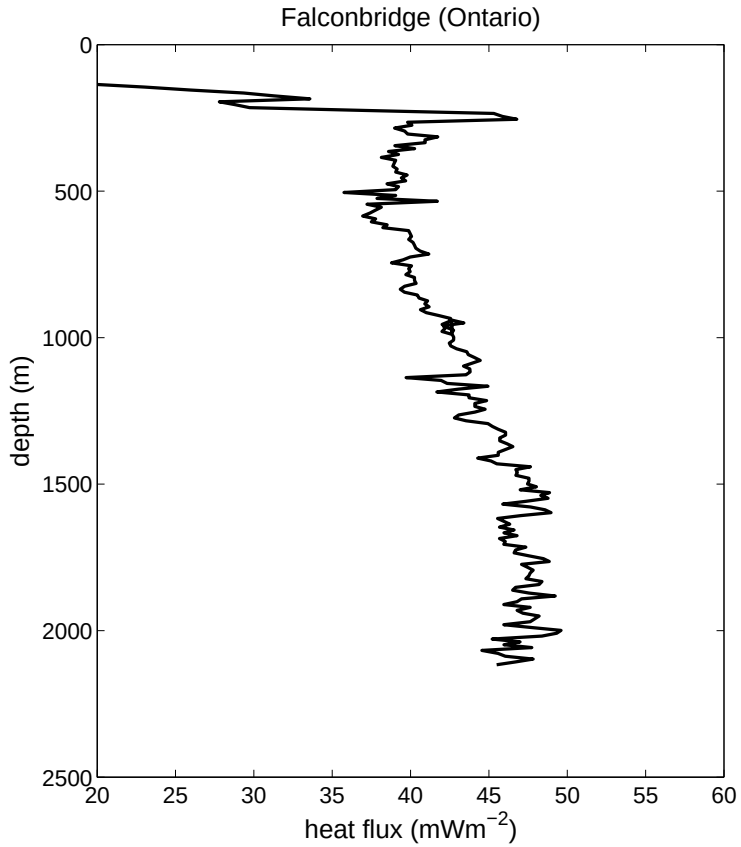

Fig. 1.

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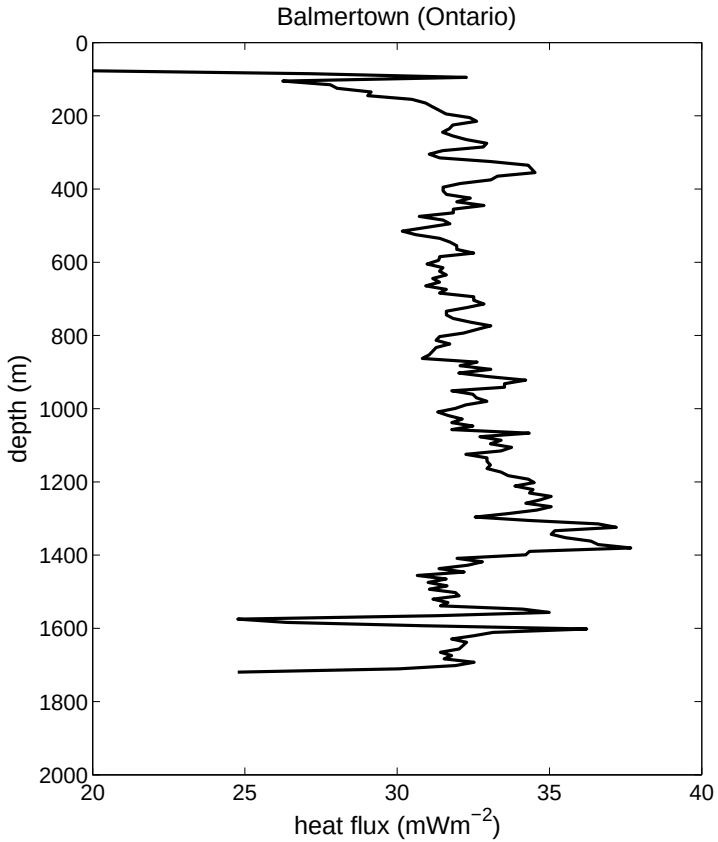

Fig. 2.

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