**The Cryosphere
Discussions**

Interactive
Comment

Interactive comment on "Evidence of accelerated englacial warming in the Monte Rosa area, Switzerland/Italy" *by* M. Hoelzle et al.

Anonymous Referee #1

Received and published: 3 December 2010

This paper deals with the relationship between the atmospheric warming and the englacial temperatures increase. This paper contains data coming from englacial temperature measurements performed in boreholes between 1982 and 2008 in the Monte Rosa area. The authors compare the 20 m deep temperature changes and conclude that there is a clear evidence of accelerated warming since 1991. They conlude also that the observed increase since 2000 is far beyond a modelled firn temperature increase based on the IPCC scenario.

The paper is based on a comprehensive set of field data. These data are rare and valuable. Furthermore, the field measurements have been obtained in very hard conditions However, I believe that the abstract and the conclusions are not relevant for the following reasons:

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

. First, the conclusion relative to a warming acceleration can be questioned: in most of the boreholes (Figures 5, 6, 8 and 9), it is not possible to compare the differences betwwen 1991-1999-2008 because data are missing. We can make this comparison for measurements presented in Figures 4 and 7 only. In fact, Figure 7 shows a decelerated warming since 1991. It is not discussed in this paper. The warming acceleration is seen from Figure 4 only. This warming depends largely on the location (difference of 1.6 °C in 2008 for 2 sites 20 m apart...). Consequently, the analysis suffers from rigour. From these measurements, I conclude that temperature changes in firn can be very different according to depth and locations. I do not understand why the authors do not use the modelling tools they used previously (Suter, 2002) to interpret the temperature measurements profile. Moreover, the authors do not mention the effect of horizontal advection. Could the difference in temperatures between the boreholes B08-1 and B08-2 come from the horizontal flowlines ? It is not discussed in the paper.

. Secondly, heat flow modelling has not been carried out in this paper. The abstract is misleading. Modelling study has been performed in a previous study (Suter, 2002). The comparison between the results of this heat transfer model and the measurements is not discussed here (2 sentences in the conclusions). The modelling results (Suter, 2002, Figure 7.10) show that the calculated temperature is -12.7 °C in 2008 at Colle Gnifetti. The measured temperature is -10.4 at boreole B08-1 and -12.1 °C at borehole B08-2 (Figure 4). The uncertainties (relative to heat flow model, IPCC scenarios and measurements) are not discussed. Consequently, the conclusions "that the observed increase since 2000 is far beyond a modelled firn temperature increase based on the IPCC scenario" can be questioned. The analysis presented here remains qualitative

. Thirdly, the paper is not well organised. Most of the data have been published eslewhere, except data of 2008, and I do not believe that all data presented here are needed. For instance, I do not understand why the authors show the figure 8. The figure 8 shows data from 2003 and 2004 measurements. This figure has been published in (Schwerzmann, 2006, p. 32). Here, data from this figure are not discussed

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

(it seems that the measured temperatures profile was not very far from a steady state profile. Why ?) This figure is reproduced here without any change and without any reference in the caption. . Fourthly, the discussion suffers from vagueness and repetition. Moreover, many details should be corrected by the authors (the locations of boreholes of Grenzgletscher on the map are missing. Figure number in p. 2283 is wrong. . ..).

Interactive comment on The Cryosphere Discuss., 4, 2277, 2010.