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Interactive comment on "Temperature data acquired from the DOI/GTN-P Deep Borehole Array on the Arctic Slope of Alaska, 1973–2013" *by* G. D. Clow

Anonymous Referee #1

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General Comments

The paper by Clow provides a good description of the deep borehole array on the Arctic slope and the data collected from this array since 1973. This is one of the largest arrays of deep boreholes in the world and has one of the longest data records (and perhaps is one of the few such networks still in operation). The methods and instrumentation utilized for deep borehole temperature measurement are clearly described. The paper focusses on the processing of the deep temperature data and provides a clear discussion of each of the steps and the rationale. The major corrections such as those relating to drilling disturbance and convection are outlined. The paper is generally well

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written and provides sufficient information for the reader to utilize the deep borehole temperature database available from the ACADIS repository and also to understand any limitations of the database. The paper should be of interest to the permafrost and climate change research community and also provides valuable information with respect to development of protocols for international monitoring networks.

The paper is acceptable for publication in Earth System Science Data and only minor revisions are suggested. A few comments for the author's consideration are offered below.

Specific Comments (Comments are keyed to page and line number)

Abstract

Pg 2 line 1 – DOI/GTN-P should be defined here

Introduction

Pg 2 line 20 – Suggested revision ". . ..global mean air temperature as. . .." Pg 3 line 11 – Reference could be made to the map for location. Pg 3 line 29 – It might be better to say "estimates of the depth of the base of permafrost" or "estimates of permafrost thickness" Pg 4 line 14 – You could be more precise regarding the time interval over which the warming occurred (during the 20th century? Over the previous 80 years?).

Pg 4 line 16-21 – Note that while some of these studies determined ground surface temperature histories from deep ground temperature profiles, others such as Smith et al. (2005) which tracked permafrost warming in the upper 20 m over a period of 10-20 years. Reference could be made to the more recent IPY work (eg. Romanovsky et al. 2010; Smith et al. 2010) which documented changes in permafrost temperature over the last 2-3 decades.

Pg 4 line 28-29 – It would appear that this is a rather unique array of deep Arctic boreholes and it likely has one of the longest records (perhaps the longest?) and perhaps is one of the few still in operation. It may be worth mentioning some of these

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things.

Pg 6 line 1-5 – The dynamic coastal environment would appear to be an important factor influencing borehole temperatures in part of the study region. Some of the observed changes in ground temperature in the 4 boreholes mentioned here for example, are likely due to their proximity to the coast and coastal erosion rather than a changing climate. The effect of coastal erosion is not really mentioned in the paper as something that needs to be considered in the interpretation of the ground temperature records. The author should perhaps comment on this.

Section 3

Pg 13 line 18 – The digital version of the temperature profiles should probably be referred to as Clow (2013) as this would better link to the reference list.

Pg 14 line 1-3 – Since permafrost extends below depths of 200 m (as shown in a number of the figures), periodic measurements at depths >200 m (if still possible in some boreholes) would be useful for tracking changes in the base of permafrost over time.

Pg 16 line 5-15 – You could also note that the latent heat effect is an important factor influencing the response of the ground temperature to changes in climate (especially for warmer permafrost) – see for example Romanovsky et al. (2010)

Pg 18 line 25 to pg 19 line 5 – The author could consider saying a bit more about the magnitude of changes in permafrost temperature since the late 1980s and comment on whether changes vary over the study region etc.

Figure 8 – 30 – Consider using the USGS code on the figures so it is easier for the reader to match the temperature profiles with the BH location on the map.

Figure 13 – Portion of the profile is isothermal. Is this latent heat or convection effect?

References

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Romanovsky, V.E., Smith, S.L., and Christiansen, H.H. 2010. Permafrost thermal state in the polar Northern Hemisphere during the International Polar Year 2007-2009: a synthesis. Permafrost and Periglacial Processes, 21: 106-116.

Smith, S.L., Romanovsky, V.E., Lewkowicz, A.G., Burn, C.R., Allard, M., Clow, G.D., Yoshikawa, K., and Throop, J. 2010. Thermal state of permafrost in North America - A contribution to the International Polar Year. Permafrost and Periglacial Processes, 21: 117-135.

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