

Comments on tc-2022-138

In the manuscript, 85 ice temperature profiles from Greenland and Canadian Arctic are collected and compiled into a coherent database, of which 68% are digitally available for the first time. In addition, 56 observed temperature profiles from Greenland ice sheet are compared with the PISM simulation of Aschwanden et al. (2016) to identify the possible heat source for misfit of observed and modeled temperature profile. The established database provides a good data source for science community to understand the thermal state of Greenland ice sheet and local ice caps in the Canadian Arctic. Generally, the manuscript is well written and can be accepted after addressing the following questions.

(1) In Table 1, four measurement methods are presented. However, the digital sensor string and thermistor string are not mentioned in the text. It is better to explain more details of the two measurement methods.

(2) In Figure 1, the drill site location in the green box is not shown in Figure 1A. It is better to show the Jakobshavn glacier.

(3) Line 95: Please check the ice thickness in Tuto_D-11 borehole, it looks from the Figure 2 that the ice sheet thickness is 200 ft, which is about 61 m.

(4) In the database, it is better to present the temperature measurement methods (e.g., type and accuracy of temperature sensors) and depth measurement methods (e.g., type and accuracy of encoder) for the readers to evaluate the uncertainty of data source.

(5) Line 210-220: the paper of V. Zagorodnov et al. presented more detailed disturbance uncertainty of mechanical drill and some discussion can be included in the manuscript.

(Zagorodnov, V., Nagornov, O., Scambos, T. A., Muto, A., Mosley-Thompson, E., Pettit, E. C., & Tyufin, S. (2012). Borehole temperatures reveal details of 20th century warming at Bruce Plateau, Antarctic Peninsula. *The Cryosphere*, 6(3), 675-686.)

(6) Section 6: Please provide more details how the author determined surface mass balance regime, the basal thermal state regime and ice dynamic regime. A table with accumulation/ ablation rate, basal temperature and strain rate is preferred.

In addition, some technical errors should be corrected.

(1) Line 15: “the thermal state of the sheet” should be “the thermal state of the ice sheet”.

(2) Line 20: “thermo-mechanical” or “thermodynamic” or “thermomechanical”? Descriptions should be consistent throughout the manuscript.

(3) Line 25: Please check the sentence “borehole logging where a temperature sensor is moved up or down the borehole measuring either “continuously” as the probe moves down”. Borehole logger is used only when moves down? or, it can be used when moving down or up.

(4) Line 25: “fiber-optic distributed temperature sensing”, “Fiber optic distributed sensing string”? The hyphenation between fiber and optic should be consistent throughout the manuscript.

(5) Figure 1: The units of Celsius should have the same format throughout the paper.

(6) Section 4: There are two “Figure 1” in the first sentence of the section.

(7) Line 220 and 230: “hot-water-drilled borehole” or “hot-water drilled borehole”? The style should be consistent throughout the manuscript. I think it should be “hot-water drilled borehole”.

(8) Table 4: The caption of the table 4 is the same as the table 3.

(9) The style of the references should be consistent, for example, the first letter of each word in the title of references should be lowercase. Please carefully check your references.