

The Cryosphere Discuss., referee comment RC3
<https://doi.org/10.5194/tc-2021-292-RC3>, 2021
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Comment on tc-2021-292

Anonymous Referee #3

Referee comment on "A distributed temperature profiling system for vertically and laterally dense acquisition of soil and snow temperature" by Baptiste Dafflon et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-292-RC3>, 2021

This research paper presents the development and validation of a low-cost, low-powered Distributed Temperature Profiling (DTP) system to be used for soil and snow temperature monitoring. Details of the DTP system is presented as well as a novel calibration approach on how to increase the factory-assured sensor accuracy from ± 0.1 °C to ± 0.015 °C. They also presented results from two field sites where the first site demonstrated the capability of using the DTP system for understanding snowpack and how it affects water resources in a mountainous location, and the other site was focused on understanding soil properties for a carbon study.

This paper includes a detailed description on how to build this system and how to improve the accuracy of the sensors used in this study. I think that the general science community would benefit from this paper.

Here are some specific comments that could improve this paper:

Line 96: The period is missing.

Line 200-215: This paragraph would benefit from adding how long time it takes to build a DTP system. How long does it take to build a 1.2 m long probe? How long does it take to

program the logger? Is the program shared somewhere? If someone wants to duplicate this system, it would be beneficial if the program can be found at a shared site or perhaps in a supplemental?

Lines 234, 359, 375: inches are used throughout the paper for the OD. Consider having that measurement in parenthesis and use mm instead seeing as the paper is in SI units. There might be other places throughout the paper where inches are listed. If you decide to change, stay consistent.

Line 239: There is a space after ° in "°C"

Line 328 and 331: replace the degree symbol to be consistent with °C everywhere else in document.

Line 386: Here the units are given as mm²/s and Wm⁻¹K⁻¹. This not how the units are written throughout the text. Change to stay consistent. Should it be soil diffusivity "α" as in the alpha sign (I couldn't add the alpha sign)? α (alpha sign) is used in the legend of Figures 3 and 4. Should this be in italic? Same for thermal conductivity "k"?

Line 423: Snotel should be "SNOTEL". Please change everywhere in the document.

Line 424: The distance and elevation difference from location of DTP and SNOTEL site could be drastically different. Authors should mention that the snow depth measured at a 1.5 km distance away will not be exactly the same due to elevation difference and location. It does show similar patterns between the two but there should be a note somewhere about this.

Line 462: Is it 350 m higher elevation or 300 m as written on Line 424?

Line 539: Remove an s from "measurements" in "measurements errors"

Line 551: write "/s" rather than "s⁻¹"

Line 566: Is it a true statement that temperature can be used to determine SWE? The 1997 Sturm paper doesn't mention SWE I don't think. Is it supposed to be snow thermal conductivity?

Line 568: should it be "and/or spring floods"?

Table 1: Add a space before the "3" in (5,3) (column "Probe diameter (mm) (OD, ID)")

Table 2: Should "a" be "α" (as in the alpha sign). Space after "1" in "1mm"

Figure 2: What is the time scale in a)? Remove "Datetime" and add minutes/hours or whatever the time period might have been. Just a date doesn't really show how long the calibration was performed.

Figure 3: In the legend "Skinny" is used. Should that be replaced with "Thin"? You could remove "error" from the legend seeing as that is clear from the x-axis. Wait, it isn't an error for b is it? So just removing "error" from legend should work. Also, it is "Stainless Steel" and not just "Steel" right?

Figure 5: I find this figure a bit unclear. The green lines are really hard to see so I suggest changing the color of the lines. Because a, b, and c, are all different units, should the colors be different? What does G stand for? Gradient? This need to be added to the figure caption. The black line is inferred snow depth and frost depth? Mention that in caption. Add the degree sign to the legends. Should it be "snow depth" rather than "snow thickness? This comment is for the whole manuscript.

Figure 6. Maybe make snow depth thickness and air temperatures using a thicker line so that it can be easier distinguished? I suggest removing negative snow depth in a. Some of the "-100" is cutoff in b. Add degree symbol before "C".