Reply on CC1

Baptiste Dafflon et al.

Author 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-AC4, 2021

CC1: 'Comment on tc-2021-292', Achut Parajuli, 28 Oct 2021

In this article entitled "A Distributed Temperature Profiling System for Vertically and Laterally Dense Acquisition of Soil and Snow Temperature", the authors have presented an inexpensive DTS system to monitor snowpack temperature profile, soil temperature profile as well as snow depth. However, similar research is presented by Lundquist & Lott (2008) (DOI: 10.1029/2008WR007035) using the exact same DTS device. A similar approach has been adopted in Sodankylä, Finland (see DOI: 10.1029/2020MS002144). More recently, a similar snow temperature profiler has been used for various application: derivation of snowpack cold content (DOI: 10.5194/tc-2021-98) and in temperature index snow model (DOI: 10.3390/w12082284). Also, a similar approach has been adopted to understand the permafrost dynamics (DOI: tc-13-2853-2019). Therefore, the applicability of snow temperature profiler (DTS system) is immense. However, I believe this is not a novel work.

Dear Achut,

I carefully read the studies you are referring to and I think our manuscript is far from being "similar" to any of these studies. Below, I clarify the differences between our study and the studies you mentioned. I hope it will help you to re-evaluate differences and similarities between our and other studies. I stay available for answering any other question.

Lundquist & Lott (2008) (DOI: 10.1029/2008WR007035): The comment wrongly claims we use "the exact same DTS device". Lundquist & Lott (2008) study, which we referred to in our introduction, used self-recording temperature sensors (Maxim iButtons) placed on or a few cm below the ground surface. Our method is very different as we measure temperature at multiple heights along a vertical profile with a single logger, and extract different information than possibly done with the device they used.

Day et al. (2021) study with data from Sodankylä, Finland (DOI: 10.1029/2020MS002144): Day et al. (2021) paper contains a vertically-resolved profile of snow temperature. Snow temperature profiles have been measured in several studies (e.g., Oldroyd et al., 2013; Reusser and Zehe, 2011) as described in the introduction of our manuscript. Overall, the topic of Day et al. (2021) study is very different from our...
study which aims at developing a temperature probe and logger to improve our ability to perform vertically-resolved temperature measurements at numerous locations.

Parajuli et al. (2020) (DOI: 10.3390/w12082284) and Parajuli et al. (2021) (DOI: 10.5194/tc-2021-98). Parajuli et al. (2021) are using a snow temperature profiler described in their paper by the following sentence: “Inspired by Lundquist and Lott (2010), we deployed an automated snow-profiling station at each location, composed of 18 T-type thermocouples vertically spaced 10 cm apart”. This approach constitutes one more application of snow temperature profiling (e.g., Oldroyd et al., 2013; Reusser and Zehe, 2011). We do not think that measuring a snow temperature profile (as many other study) is an argument to say that these studies are “similar” and thus not novel. In addition, we can add that Parajuli et al. (2021, under review) seems to recognize the limited amount of snowpack datasets by mentioning in the introduction that “The exact determination of CC (Cold Content) requires direct observations of the snowpack temperature, density, and depth, usually collected from manual snow surveys. As manual collection is tedious and demanding, few datasets that describe snowpack CC are available”. Improving instrumentation for measuring temperature over time and space is what we intended to do in our study.

Leger et al. (2019) (DOI: tc-13-2853-2019): It is an earlier study that we published. We discussed in the introduction of our manuscript how the new system is different from the older one. In short, we went from a Raspberry Pi controlled probe that could not be used for long-term monitoring (due to power consumption, reliability and bulkiness) to a system that is deployable at numerous locations at an acceptable total cost. We clarify this in our manuscript.