

Earth Syst. Sci. Data Discuss., referee comment RC2
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Comment on **essd-2021-54**

Anonymous Referee #2

Referee comment on "Meteorological, snow and soil data (2013–2019) from a herb tundra permafrost site at Bylot Island, Canadian high Arctic, for driving and testing snow and land surface models" by Florent Domine et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-54-RC2>, 2021

* general comments

The authors describe and provide an extensive set of in-situ meteorological, snow and soil data to force and evaluate snow schemes in a tundra environment. Such an extensive set of forcing and evaluation data, especially for snow, is unprecedented in the literature in this type of environment. As the most complex snow models to date fail to represent tundra snow characteristics, despite their huge significance at the global scale and w/r to global warming, this paper and dataset are in my opinion an important contribution to snow science.

The site and the dataset are well described, the quality assessment of the data is thorough, and the corrections performed to the data are well explained and justified (see just some minor clarification needs in the specific comments).

I recommend the paper for publication in ESSD after these minor comments have been addressed.

* specific comments

- L51-52: "The explanation proposed (Domine et al., 2019; Domine et al., 2016b) is that Crocus and SNOWPACK were designed primarily for avalanche forecasting in the Alps, i.e. for mid latitude warm thick snowpacks while the Arctic features cold thin snowpacks." It would seem more faithful to me to cite also the other applications of these models besides avalanche forecasting (something like " were designed for avalanche forecasting and process-studies/other applications in the Alps")

- L58-59 : "This process is not simulated by Crocus or SNOWPACK, leading to erroneous outputs."

I think the attempts to partially account for this process in both models (Touzeau et al., 2018 and Jafari et al., 2020), should be mentioned here.

Touzeau, A., Landais, A., Morin, S., Arnaud, L., and Picard, G. (2018). Numerical experiments on vapor diffusion in polar snow and firn and its impact on isotopes using the multi-layer energy balance model crocus in surfex v8.0. *Geosci. Model Dev.* 11, 2393–2418. doi: 10.5194/gmd-11-2393-2018

Jafari M, Gouttevin I, Couttet M, Wever N, Michel A, Sharma V, Rossmann L, Maass N, Nicolaus M and Lehning M (2020) The Impact of Diffusive Water Vapor Transport on Snow Profiles in Deep and Shallow Snow Covers and on Sea Ice. *Front. Earth Sci.* 8:249. doi: 10.3389/feart.2020.00249

- L181 : "Based on several years of simultaneous temperature measurements of the HCS2-S3-XT and CNR4 sensors, we corrected the CNR4 sensor values. We found that there was no bias between the two temperature measurements and a RMSD=0.784°C"

I am rejoining the comment from Referee #1 on this : Details on the correction (does it involve radiations ?) would be welcome as an help/ a reference for other people encountering similar problems at their sites

-L332 : "Figure 2 may also indicate a decrease in summer air temperature"

The statement is too vague, please clarify.

- L345: At several places like this one "However, all these criteria are not 100% certain, and there may be some data in the absence of snow." the honesty of the authors is much appreciated !

- L358 : "The deepest sensor was placed just above the frozen soil layer"

Maybe it would be more clear if you specify that this is the frozen layer at its summer position.

- L 395 : "Briefly, the amount of correction decreases with increasing snow density and is about 1.1 for dense wind slabs and 1.5 for soft depth hoar"

Is this a multiplicative factor ? Thanks in advance for clarifying this

- Dataset : As a suggestion for later updates of this dataset, a time-series flag for each meteorological variable indicating whether the data has been gapfilled, corrected, or is the raw measure, could be usefull and more precise/exhaustive than what is currently written in the paper (for wind speed for instance)

* technical corrections

- I spotted an inconsistency in the dataset webpage (years differ between French and English) :