



Comment on **essd-2021-54**

Joshua King (Referee)

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-RC1>, 2021

The authors introduce 6 years of meteorological, soil and, snow data collected at a tundra site in the Canadian high Arctic. The observed polygonal tundra environment located on Bylot Island, Nunavut is described as well-drained, void of standing vegetation, and typical of permafrost landscape. A thorough review of instrumentation, datasets, and validation at the site are presented prior to an assessment of data quality and correction of the temporal data where necessary. The authors highlight a lack of data available to drive snow physics models in herb (graminoid) tundra environments as motivation. Thin Arctic snowpack common to this area, and greater Arctic regions, consist of contrasting high-density winds slab and lower-density depth hoar elements. The predominate drivers of this composition, wind compaction and upward flux of water vapour, are clearly identified by the authors as a gap in the current generation snow physics models requiring new datasets to evaluate against and improve from.

The described work is a valuable contribution and should be published in ESSD. Public release of this dataset and its associated validation are a service to the snow, climate and meteorological communities where significant effort has been required to initiate and sustain these remote measurements. I have noted instances below where I felt minor clarifications were needed on corrections applied but in general, I felt the dataset was well documented. Where internet data resources were accessed, for example the ECCC station data, date of access should be noted in the references in case of future revision. Useful lessons and anecdotes on sensor deployment, calibration and adaptation punctuate the paper and I felt it could be more impactful if these were summarized in a concise discussion near the end. A discrete guide on how to setup an Arctic site is clearly beyond scope, but some of the more significant choices, for example the use of ERA5 over the CNR4 data, warrant clear recommendations. I would hope such as summary would be a catalyst for development of similar sites, amplifying the efforts here.

Minor comments with line numbers provided:

Lines 47, 68,73 and others – Where the authors are part of the narrative should the citations not be in-line instead of in parenthesis?

Line 149: What does significant mean in the context of the spatial variability described here? It would be helpful to place this in the context of another study or even a metric of the locally observed variability to constrain the use of the word significant.

Line 165 Superscript is missing for \wedge^3

Line 167: Add the total number of pits completed in the sentence or point towards a table to summarize.

Line 181: It is not clear if the correction applied was a constant or varied over time.

Line 198: This internet resource needs to be cited with the data of access.

Line 213: The gas station equation does not have its variables introduced in text with units.

Line 271 The Pond Inlet airport station has an observer. Were the observer comments ever used to evaluate selected precipitation phase threshold at $+0.05\text{C}$?

Line 279: The use of time lapses appears to be key here. Was this approach contrasted against an automated or empirical approach?

Line 307: It was previously stated that there was no small-scale relief at the tundra site in the context of hummock-tussock formations. Is this related to the wedge structures?

Line 395: This reference appears to be incomplete. Please expand on what type of correction was applied.