

Response to Referee 2 Comments

We would like to sincerely thank Referee 2 for taking the time to read our manuscript and provide their helpful comments. These comments have helped to improve the manuscript. Each referee comment is given below in ***bold italics*** followed by our response to the comment. The line numbers provided in our responses refer to line numbers in the revised manuscript.

This manuscript nicely introduces and describes an aggregated dataset produced from some of the meteorological observations at the year-long MOSAiC drifting experiment. Thermodynamic measurements from frequent radiosondes and from a meteorological tower installed on the sea ice were combined with ceilometer retrievals and surface broadband radiation. These quantities were further used to calculate the bulk Richardson number, atmospheric stability, to locate temperature inversions, and to quantify the presence of low-level jets.

The combination of key measured variables together with derived quantities provides a solid tool, useful to characterize the Arctic atmospheric boundary layer over RV Polarstern during the whole MOSAiC expedition, and provides a valuable common ground that reduces the risk of inconsistencies.

The manuscript is well written and describes in detail the methods that were used to process the data, providing also useful examples. I recommend it for publication with minor revisions.

Thank you for your positive review of our paper. Below we address each of your comments, and explain how and where changes have been made to the manuscript.

Specific comments:

60 – I suggest changing to something like “... including the atmospheric boundary layer (ABL) height and stability ...” as I find that the original formulation is a bit vague, especially since other ABL features are listed afterward.

We have revised this sentence to say:

“... including the atmospheric boundary layer (ABL) height and stability, temperature inversion (TI) and low-level jet (LLJ) characteristics, near-surface meteorological state, cloud cover, and surface radiation budget over the span of an entire year in the Arctic.” (line 60)

Table 1 - The True "10m" height of the wind seemingly has a typo in the ranges (9.9 - 1.1m) since the central value is 10.34m.

Thank you for noticing this typo. We have fixed this, and also adjusted other values in the table to be consistent with the final values given in Cox et al. (2023b).

143-146 - It seems that the temperature and humidity setup listed in Table 2 do not match the text in these lines. The instruments in the text (HMT330 and PTU300) differ slightly from the table (HMT337 and PTU307). Additionally, the 2 m temperature is associated with the PTU in the text and with the HMT in the table.

Thank you for noticing these inconsistencies. The correct instruments are the HMT337 (all 10 m measurements) and PTU307 (all 2 m measurements). This has been fixed.

270 - I tend to think that the final user could benefit more from the speed and direction rather than the u and v components, especially in the case of quicklooks to be compared with the LLJ parameters, which have a speed and direction format (Table 3). However, I also see the value of u and v for other purposes.

The authors believe it is preferable to keep the u and v components, and have added some more text explaining the reasoning:

“Wind is provided in components for ease of calculating a gradient, or temporal or spatial average of wind direction. Total wind speed and wind direction can be calculated from the components, if this is of interest.” (line 271)

295 - radiosonde profile

We have added ‘radiosonde’ to the sentence:

“...if the bottom altitude of the radiosonde profile is above 23 m...” (line 295)