Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-383

Anonymous Referee #1

Referee comment on "Testing the efficacy of atmospheric boundary layer height detection algorithms using uncrewed aircraft system data from MOSAiC" by Gina Jozef et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-383-RC1, 2022

A novel dataset of detailed atmospheric profiles gathered by a UAS in the Arctic region is being explored to determine how to derive the height of the atmospheric boundary layer using automatic methods. “Subjective”, visual height detection is used as a reference standard to evaluate a number of “objective” methods available in the literature. While the presented work is promising, highlighting the difficulties of accurate layer height detection in the Arctic region, the manuscript requires major revisions to better demonstrate the research results.

Overall, the text is very descriptive and could be made more concise in many sections. The actual research findings need to be pointed out more clearly and should be placed into context to the literature. It is important to highlight how the manuscript provides novel insights and methodological advances. This could be partly improved by removing the severe imbalance between the methods description (Section 2 has 390 lines + 8 figures) compared to the results section (section3 has 150 lines + 2 figures). The focus of the presented figures should be placed on the research findings rather than the introduction of the methods that are in most parts explained in the literature, i.e. the current manuscript does not present a novel method.

Minor comments:

At times, a more precise wording could help make the text less descriptive. E.g. use established terms such as “vertical gradient” instead of “change with height”.

Section2: Maybe the criteria for the subjective height detection could be summarised in a table? What is the expected uncertainty in these methods based on visual assessment of at times very subtle signatures in the profiles?

Line 54: Please provide a short explanation on the concept of "radiative mixing forced by cloud cover".

Line 64: maybe reword. The literature on ABL height detection is obviously very extensive so it would be good to clearly state that Table 1 lists a few examples of relevant publications and atmospheric variable.

Line 71: which humidity variable is analysed here?

Line 73: You state the entrainment zone is located "above" the ABL. Maybe a few words on the relation between ABL height and entrainment zone characteristics would be useful.

Line 132: what is meant by "assess the ice alongside the Polarstern"

Line 259: the term "mixed layer" has not yet been mentioned before. Explain why you are using it now for NBL?

Line 262-267: These sentences are very descriptive. Please condense the key information and try to generalise.

Line 270: again, try to be less descriptive. E.g. the term "increase with altitude" could be replaced by "vertical gradient"

Line 278: "… extends from the surface to …".

Line 284: replace by "change in vertical gradient"

Line 340: what about the methods mentioned e.g. by Collaud Coen et al. (2014)?

Line 452: Explain how the data acquisition platform (radiosonde vs UAS) or the geographic location (mid-latitude vs arctic) are expected to influence the performance of the detection methods and hence warrant the outlined adaptations.

Line 462: what causes this warm bias in the lowest levels?

Line 502-511: Shorten introduction for interpretation of linear regression. It can be assumed that the reader of this scientific publication is familiar with this common approach.

Figure 9: list number of samples.

Line 550: Careful with such statements. Very few samples with DH2 results above 150m

Lines 512-552: So what is the interpretation of these results? How do they compare to the expectations in context of the literature?

Lines 599: discuss relation of LLJ and ABL in the study area. How is it assessed when the LLJ is located above the ABL? How does this relate to the expectations and literature?