

Reply to Referee 2

October 6, 2025

Dear Referee,

Thank you very much for reviewing our manuscript. We are very grateful for the extremely helpful and constructive comments. In the following, we provide point-by-point replies to the points raised in your report. We have written the original text of the reviews in blue colour and our response in black colour.

Congratulations on an interesting data set that I am sure will serve many in the ABL community, particularly for those interested in low-altitude cloud microphysics. Your article already has key elements of a good data paper, and my suggestions below are targeted at improving it to increase its impact. The suggestions are broken down into three categories: Conceptual, targeting the use of specific wording or concepts that can be misconstrued; Organizational, targeting the best ordering of information for improved reading experience; and Textual, targeting typos and minor mistakes.

We thank the reviewer for the encouraging assessment and thoughtful suggestions. We have revised the manuscript accordingly, with point-by-point responses below; all changes are tracked in the marked version.

– Conceptual –

1 - High-resolution:

The article's title, abstract, and introduction refer to the MPCK and Wind Dart as a source of high-resolution atmospheric data. However, given the current information in the paper, it is not clear what the authors mean by it. Do you mean high-temporal-resolution because the sensors sample fast? Do you mean high-spatial-resolution in the XY plane because the system is allowed to drift, covering a "large" plane? Although not detailed in the paper how fast you can bring the system up and down, I imagine you are not using it to travel vertical ranges for a high-vertical-resolution. Am I correct? This is further complicated by using the term "high spatio-temporal resolution" (a term often used in the ABL literature in association with the vertical dimension) in Section 3.2 (line 97) when referring to a measurement that seems to be at a fixed height.

In the case you do mean "high spatio-temporal resolution", based on a "rolling atmosphere assumption" for the tower/tethered-based atmospheric measurements, I would

caution against it as it would indicate you are capturing averaged atmospheric behaviours, which do not benefit from high spatio-temporal resolution measurements.

Given all these questions, I recommend that the authors refrain from using the term high-resolution in their work, or at the very least add a qualifier such as temporal.

Thank you for this valid point. We have removed ambiguous uses of “high-resolution” and, where relevant, explicitly refer to “high temporal resolution.”

2 - Radiosondes:

In lines 23 - 28, you mention the pros/cons of radiosondes. It might be beneficial to add that because of their extensive operational range (35 vertical km), they have a varying vertical resolution, which yields a very limited number of observations in the ABL.

We added: Furthermore, due to their extensive operational range of up to 35 km, radiosondes have a non-uniform vertical resolution, resulting in a relatively sparse number of observations within the ABL.

3 - Entire ABL:

In section 1, line 32, you say the MPCK can profile the “entire ABL”. However, all seems to indicate that although you can set the sensor height at any altitude, once that altitude is set, altitude changes are done in the scales of hours and not minutes (based on plots for figure 5). If that is the case, considering that ABL profiling is usually done by radiosondes, WxUAS, and tall towers in less than 10 minutes, using the term “entire ABL” is misleading because the different altitudes are sampled at different times and potentially at very different conditions. I recommend rewording this passage to clarify what is meant by “profiling the entire ABL” and how that differs from the majority of ABL profiling systems that are often interpreted as “instantaneous”.

We agree. Some statements in this and other sections were qualitative and/or ambiguous. We have revised the text to provide quantitative and factual statements, e.g here we have modified the text to: They bridge the gap between tower-based and research-aircraft measurements by enabling controlled vertical profiling of the ABL or long time series (up to 7 hours for the first-generation WinDarts) at different heights—typically <2 km—under a wide range of atmospheric conditions.

4 - Platform motion correction:

The legend for Figure 9 indicates the data shown without any corrections for platform motion. Given the implications the motion has on the data, I believe this information should be explicitly given in the text’s body (unless it is and I missed it).

Thank you, we agree this is an important point. We added:

“The velocity time series corresponds to the wind velocity vector as measured by the platform, without corrections for platform motion.”

Furthermore, we have added a detailed explanation and a new figure, i.e. figure 9, to clarify how velocity corrections for platform motion can be performed, and why a dataset-wide application is not straightforward with the current data given the performance of the onboard inertial measurement system. We also clarify that large-scale variability (frequencies < 0.1 Hz; spatial scales >100 m) is expected to be minimally affected by platform motion.

– Organizational –

5 - Section 3.2.1:

I believe your article would read better if this section was promoted to a higher level as section 3.4, after describing all instruments in use.

Thank you, we have moved this subsection to section 4. We believe the paper now reads with a better flow.

6 - File Naming Convention:

The information in lines 118 to 125 does not make sense as part of section 3.2.1. (Wind Dart). Perhaps, it would be more appropriate to move it to section 4 (Data description) or even as part of section 5 (File Structure).

Same as the previous comment. We think it reads better now.

7 - Data availability statement:

For some reason, this statement is on page 9 instead of alongside the other statements on page 20. Additionally, it seems odd (for an open data paper) that the statement says data is available upon request (lines 141 through 143). It is even more odd that immediately following (lines 144 through 150) indicate it is available, and it is, as part of its uploaded assets. Please review this section.

Thank you for pointing this out. Our original intent was to indicate that the plotting scripts are available upon request; we have revised the section to clearly explain how the data can be openly accessed.

8 - Data Asset Names:

The uploaded data assets have the same name without indicating which one is CSV and which is NetCDF. Please change their names to include this information.

Thank you. We have now added this information to the title.

– Textual –

Line 14: "fir example" should be "for example". Done

Line 55: PaCE acronym seems to have already been defined in Line 48. Done

Section 3.1 Title: MPCK acronym seems to have already been defined in Line 30. Given the MPCK+ use, redefining it here could be unclear. Done

Other author comments and modifications

We have also corrected several typographical errors, as indicated in the marked manuscript.