Response to reviewer 2

This manuscript builds on previous papers (by Luce and various co-authors) that have developed a novel formulation for extracting turbulence kinetic energy dissipation rates from wind profiling radar observations. The earlier papers looked at shear generated turbulence within the free troposphere as observed by a lower-VHF radar. The present manuscript extends the analysis to turbulence occurring within the Convective Boundary Layer (CBL). It compares observations made by a UHF radar and a Doppler Lidar. Despite the fact that there is no altitude overlap between the two sets of measurements, the manuscript shows that the data are consistent when the CBL is well developed, but differ when the CBL is less well developed.

This is an interesting manuscript. The analysis and discussion are sufficiently thorough that I do not have substantial questions about the science. There are, however, a few points that would benefit from clarification. Most of my comments relate to the figures, since some aspects were not entirely clear when the manuscript was printed out at A4 size.

We sincerely appreciate the time and effort the reviewer took to evaluate our manuscript and for his positive assessment.

POINTS REQUIRING CLARIFICATION

1) On line 53, it is stated that LQ7 observations are made at a time resolution of 59 s and that the data are also processed to provide deliverables at a time resolution of 10 minutes. It would be helpful if the authors could clarify when they are using 59 s data (presumably for the time series analysis) and when they are using 10 minute data.

We have clarified this point in Sections 2.1 and 2.2, where the TS and DS methods are described, as these methods have not yet been introduced in the Introduction. Specifically, the TS method utilizes data collected at a time resolution of 59 s, while the DS method relies on the (10-min) processed data of spectral width and horizontal wind speed (the latter being used for beam-broadening correction). The 59-second time resolution data can also be used for the DS method; however, our intention was to show that the publicly available 10-minute data can be used as well, making it easier for interested readers to verify the method.

2) Do references, on line 90, to the mean wind (U bar) and the angle between the beam axis and mean wind direction (α) imply three-dimensional measures or just horizontal ones?

According to Banakh et al. (1999), the mean wind refers to the three-dimensional wind $\vec{U}\ (u, v, w)$. Strickly speaking, α is the angle between the beam direction and the direction of the 3D wind.

3) What does the word "minimum" imply on line 105 in the sentence, "However, we did not observe such a characteristic, but rather a very clear -5/3 slope when the horizontal wind is minimum."? Does this imply slow wind speeds or actually to the minimum values?

The word “Minimum” is indeed ambiguous and we replaced it by “weak (~2-5 m/s)”

4) In section 2.2, it would be useful to add a paragraph that summarises the spectral width method, e.g. indicating that vertical beam observations corrected for the effects of beam

broadening have been used. At present, the reader must refer to the earlier papers for these details.

Following the suggestions of both reviewers, the methodology for applying the spectral width technique has been expanded.

5) For completeness, the following abbreviations should be given in full where they first appear in the main manuscript. I note that two of them are given in the abstract.

5a) "CBL" on line 46; it is given on line 47 (and on line 21 in the abstract)

5b) "UHF" on line 48

5c) "TS" on line 61 (given on line 17 in the abstract)

5d) "VHF" on line 62

5e) "rms" on line 94

The acronyms are now defined

FIGURES

6) The axis labels in Figure 2 are difficult to read since they are so small. Using a non bold font might help. Otherwise it would be useful to mark the location of the observation site with a marker.

Done

7) The tick labels on the time axis of Figures 4, 7, and 9 are quite far apart (5 hour intervals). It would be helpful for the reader if these could be shown at shorter intervals (c.f. Figure 5) since the manuscript refers to features that occur at specific times. It would also help if the tick marks could be shown pointing outwards from the plot area.

We have replotted with a 1-hour time interval.

8) For the right hand side of the bottom panel of Figure 4, the wind direction arrows overlap each other making it difficult to see if they represent easterly or westerly winds (I note that this is clarified in the main text).

The scales have been adjusted to shorten the arrows, and a scale reference has been added. Although the wind direction still overlaps after 16:00 LT in Fig. 4b, we hope this version is more readable.

9) For clarity, it would be helpful to state the approximate backscatter values corresponding to the "red" and "brown" colours in Figure 4, which are referred to on lines 178 and 179. I think what the authors refer to as "brown" is what I would describe as dark red.

The text has been revised to include quantitative levels.

10) It can be difficult to distinguish between the blue and black lines on the upper two panels of Figure 4 and in Figure 6a. Using higher contrast colours could help. It is also difficult to distinguish between the grey and blue dots in Figure 10. Using larger dots might help.

The blue line has been replaced by a green line in Fig 4a and 4b. In Figs. 6a and 6b, in accordance with request 13), DL plots are shown in red and LQ7 in black. The marker and font sizes have been increased for more legibility.

11) The black dashed line indicating the proxy for the CBL top height in Figure 5 is a little difficult to see. Could the line be made thicker?

The dashed is now plotted in bold. We also expanded the font size in Figs. 5a and 5b for more legibility.

12) The thin red lines in right hand plots of Figure 9 showing the availability of LQ7 data (and to some extent the thin blue lines showing the availability of DL data) are initially difficult to see. Creating separate plots for these lines could help.

We understand that the plot showing data availability may not be immediately clear because it is included in the right panel showing the mean profiles. However, including a third panel would require reducing the size of the contour plot, which contains the most important information. To preserve the clarity and visibility of the contour plot, we opted to present the data availability within the existing panel, even though it may require a bit more effort to interpret. The data availability profiles are now plotted in bold dashed lines and the colors have been modified (red: DL, black: LQ7) to fit the colors of the other figures.

13) It would be useful to consistently use the same colours to represent DL and LQ7 data in Figures 5, 6, 7, 9 (right hand plots), and 13. Moreover, it would be helpful to use these colours for the vertical lines in Figure 6 to distinguish between the scale sizes used for the different instruments.

In the revised version, DL plots are shown in red and LQ7 in black in Figs 5, 6 7, 9 and 13. In Fig. 8, the averaged curve has been replotted in blue (instead of red) to prevent misinterpretation, as red is used for all DL information.

TECHNICAL CORRECTIONS

14) The name O'Connor, in the reference to O'Connor et al. (2010) should be shown with the letter "c" in upper case rather than in lower case.

corrected

15) The DOI https://doi.org/10.5194/amt-2023-38 for Luce et al. (2023a) shown in the manuscript refers to the discussion version of the paper. The DOI https://doi.org/10.5194/amt-16-3561-2023, which refers to the accepted version, should be used instead.

corrected