

Responses to the reviewer 2 (2nd review)

This is the 2nd time that I have reviewed this submission. I didn't have any substantial comments on the previous draft and my feedback mostly related to technical issues. I note that these have been addressed appropriately by changes made to this version of the manuscript.

We warmly thank the reviewer for the detailed revision of the manuscript and for the time he dedicated to it. His valuable input has significantly contributed to the quality of the paper, and we express our gratitude in the 'Acknowledgements' section.

I have raised a number of issues with the revised manuscript, but they are all minor technical issues.

1) Line 66: The meaning of the symbol D (i.e. the depth of CBL) should be given here since it was previously only given in the abstract. (I note that the same symbol is used with a slightly different meaning, i.e. the depth of shear-generated turbulent layer, on line 153 although I have no problem with that).

The parameter D plays a central role in this paper; therefore, we have adjusted the text to consistently use the symbol throughout (and in Figures 8 and 11). It is now introduced in Lines 50-53 as follows:

“Reliable and continuous measurements of this parameter covering the whole CBL depth (*hereafter denoted as D throughout the paper*) are necessary to assess and improve the subgrid turbulence schemes in numerical weather forecast models.”

We retained the same notation for the depth of the shear-generated turbulent layer (line 153) and revised the text to clarify that this choice was intentional. After Eq. (3): “Here, D represents the depth of the shear-generated turbulent layer”

2) lines 68 and 130. The reference to O'Connor et al. (2010) has been corrected on line 550 of the References section, i.e. by showing the letter "C" in upper case. However, it is still shown with a lower case "c" within the main body of the text.

Corrected

3) line 81: The words "Very High Frequency" should be moved to line 71, where the abbreviation VHF is first used.

Indeed. It is correctd

4) line 168: "Outside this time window, the two instruments do not sample a priori the same atmospheric dynamics due to the absence of height overlaps." There is an absence of height overlaps at all times, so should this sentence instead be referring to the fact that the two instruments are not both sampling the CBL outside of this time window?

The reviewer is right. We have modified the sentence as follows: "Outside this time window, the CBL is not sampled by the two instruments."

5) line 176: Reference to "Figure 3a" should be to "Figure 4a".

Corrected: "Figure 3a" -> "Figure 5a"

6) Figure 2: It would be better to swap the order of the two panels so that the plot for 11th September is shown first as in other figures. The caption for Figure 2 suggests that this was the authors' intention.

Done.

7) line 200: "The cloud base is highlighted by black dots". These dots are not clearly visible, in part because they are superimposed on dark red colours. Maybe the authors could try using white dots instead?

The cloud base is now marked by white dots, providing a clearer indication of its location.

8) line 204: "The height of the cloud base is consistent with the height of the lifting condensation level (blue curve) calculated from surface meteorological data collected at the observatory using Emanuel's (1994, pp 129- 130) derivations." The LCL curve is green rather than blue. The same mistake is made in the caption for Figure 4.

Corrected.

9) Figure 4: The caption should explain the the meaning of the vertical lines, i.e. indicating the 07 - 17 LT time window.

The caption now indicates: "The vertical solid black lines show the [07:00-17:00] LT time window used for the comparisons between LQ7 and DL. "

10) line 278: "The red dashed line shows the theoretical inertial spectrum ($-5/3$ slope) and the blue dotted curve, the best fit of the DL spectrum with the theoretical Kristensen et al. (1989) 1-D line spectrum using $\mu = 1$ ". There are two types of red dashed lines in Figure 6a. I think the authors are referring here to the $-5/3$ slope line rather than to the vertical red dashed lines? Also, I think that the authors intended to refer to the "blue dashed line" rather than to the "blue dotted curve".

We are sorry for the confusion. The text referred to the red dotted curve (not blue) showing the best fit of the DL spectrum with the theoretical *Kristensen et al. (1989)* 1-D line spectrum. It is now corrected in the text and in the caption.

11) line 283: "Even if the calculated slopes are flatter than $-5/3$, the two spectra are not inconsistent with an inertial subrange as suggested by the red dashed line." As for point 10, the authors should clarify which red dashed line they are referring to, i.e. the one for the $-5/3$ slope.

'Red dashed line' should be corrected to 'Blue dashed line,' as it was mistakenly carried over due to color changes between the submitted and revised versions. Several similar inconsistencies (as reported in 15 and 16 by the reviewer) were found throughout the text and have now been corrected.

12) line 284: "The LQ7 spectrum agrees well with the high wavenumber part of the DL spectrum in slope, shape and level suggesting that the same turbulent regime was detected by both instruments." I think the authors intended to refer to the low (not high) wavenumber part of the spectrum?

Yes, it is corrected.

13) line 286: "Note that the two wavenumber ranges of the spectra overlap more than those shown in Fig. 6a because the wind speed was $\sim 2.5 \text{ m s}^{-1}$ in both altitude ranges selected for DL and LQ7." The two wavenumber ranges do not overlap, but are closer together.

We revised the wording as per the reviewer's suggestion.

14) line 291: " Incidentally, the LQ7 spectrum exhibits a peak at $k_m \sim 0.07 \text{ rad m}^{-1}$, a $-5/3$ slope at higher wavenumbers and a flat spectrum at lower wavenumbers down to $2 \cdot 10^{-3} \text{ rad m}^{-1}$ " Should the reference to "0.07 rad m-1" instead be t .007 rad m-1", i.e. to $0.7 \cdot 10^{-2} \text{ rad m}^{-1}$?"

Yes. It is corrected.

15) line 320: "(i.e. the differences between the black and blue curves in Fig. 7)". I think that the authors intended to refer to the "red" rather than "blue" curve?

Yes, it is corrected

16) line 323: "The red curve shows . . ." I think that the authors intended to refer to the "blue" rather than "red" curve in Figure 8?

Yes, it is corrected.

17) line 447: "Due to the lack of range overlap, comparisons make sense for convective boundary layers only, for which we expect some degree of homogeneity with height in the

mixed layer." I think the authors need to refer to "well-developed convective boundary layers" rather than just "convective boundary layers" here?

"well developed is added . The term indeed refers to mature and a quasi-steady-state structure with a well-mixed layer, likely a necessary condition for good agreements between the instruments.

18) lines 466, 470, and 473: The authors have started to use the subscript "t" for " ε " in these lines, but not elsewhere in the manuscript. Is this intentional ?

It is not intentional. The subscripts have been removed.

19) line 490: "The finite radar volume (noted 2a and 2b in the radial and transverse directions, e.g., Hocking et al., 2016) and the limited acquisition time (temporal resolution) ΔT can play the role of spatial filters if the outer scales of turbulence L_{out} are much larger than 2a, 2b and $U\Delta T$." I am noting that the meanings of symbols "a" and "b" have not be given in the appendix. The authors should consider whether the meanings should be given.

The meaning of the symbols is now given.