

1) lines 86f and 92f: In this new paragraph, you provide more detail on different metrics for ABL height detection. 'MLH can be derived from analysing a concentration profile (e.g. aerosol concentration, temperature, moisture)...' and '... concentration profiles of temperature, moisture, and aerosols...'. Temperature is not a concentration. Please correct and revise.

Updated.

2) What does MURK stand for? Please explain.

MURK refers to one of the original goals in its development in the operational Unified Model which was visibility prediction. MURK does not specifically stand for a longer term. In Clark et al. 2008 the scheme was not given a name but has since been referred to in later papers as 'MURK' (e.g. Lean et al. 2022). We have modified L92 in order to make this clearer.

3) Line 123f: '.. vertical spacing below 200 m is ~60 m increasing to ~120 m...'. This implies that the vertical spacing below 200 m is ~60 m at all heights, which it is clearly not based on Fig. S7. Perhaps say something like '.. less than ~60 m below 200 m increasing to ...'

Updated.

4) Supplemental figures: The order of the supplemental figures needs to be modified to match the occurrence in the main text. For example, Fig. S7 should be Fig. S1.

Updated this.

5) Line 149-150: Information on the minimum and maximum plume height are given in the response to the reviewer's comments, but not in the main text. Please include this relevant information in the text as well.

Added this information at L150.

6) Line 191: Reference to Fig. 6 is not in order. Figures need to appear in the order they are referenced.

Reference removed.

7) Line 245ff: Thank you for including information on the BLD diagnostic, including how it is determined under unstable conditions. How is BLD defined under stable conditions? It is shown in Fig. 4 during the night, so this information is relevant.

In stable conditions it is the first height where the gradient Richardson number becomes super critical (>0.25). This has been added at L250.

8) Line 251ff: Evidence of enhanced vertical mixing is not clearly visible in the 300 m run on August 4 during the time of the discrepancy in BLD and MLH (Fig. S9 b,d), raising some doubt in the explanation given in the text. Could horizontal advection play a role? Did you investigate this?

It is quite possible that horizontally advected aerosol is playing a role; however, we have not focused on this in the analysis. The enhancement of vertical mixing in the Aug. case compared to the Apr. case is notable and was worth describing; however, further qualification is needed to make clear that this is speculative in explaining the difference. L254 has been modified.

9) Sect. 4.2: This section benefits from adding the quantitative tables as requested by reviewer 1, but is still fairly descriptive. Please consider adding some explanations of the findings as requested by Reviewer 2 (comment 4).

We have modified the text at L310-313, L326-331, and L340-341 in order to make descriptions clearer and add physical explanations.

10) Sect. 4.3: Reviewer 2 (comment 5) raises the question about the differences between the model and the observations in the evening. For example, there are quite substantial differences in MLH upwind and downwind of the urban area in Fig. 10 and 12. Please add additional explanation to the text, to address this comment.

We have added additional explanation to the text at L375-377, and L389 in order to discuss the difference between model and observations.