Anonymous Referee #1

Specific comments

RC1: The reviewer is of the opinion that this work shows the performance limitation of the commercial LCS device that the authors used rather than a general conclusion of the limitations of LCS application in ambient AQ monitoring because there are large body of work that shows this, the authors need to capture this in some form in their conclusions.

AC: We agree that our findings primarily reflect the performance limitations of the specific commercial LCS device used in our study, rather than representing a general limitation of all LCS applications in ambient air quality monitoring. In response, we revised the conclusion section to clearly state that our observations are device-specific.

Technical corrections

RC1: The abbreviation 'cf.' is incorrectly being used throughout the manuscript. It means "to compare to" and I think the authors are using it to mean "see". Authors need to correct this.

AC: We acknowledge the incorrect use of the abbreviation "cf." in the manuscript. We revised the text to replace it with the appropriate term (e.g., "see") where necessary.

RC1: Authors sometimes also make statements that are not really justified in the first instance but are subsequently justified later on in the manuscript. For instance, in the final paragraph on page 6, the authors introduced periods classified as dust and non-dust period without justification or any citation to back this up, but did subsequently add a citation on page 8 second sentence when discussing the dust event. I would suggest the authors look into instances of this and make corrections.

AC: We thank Referee 1 for pointing this out. In the updated version of the manuscript, we have changed the final paragraph on page 6 to:

"We should highlight here that the agreement between PM LCSs and reference instruments improved significantly during periods with dust events, a phenomenon that occurs with higher frequency and intensity during spring and autumn in the region (Yukhymchuk et al. 2022, Kezoudi et al. 2021)."

and page 8 second sentence to:

"The striking peak observed in April 2022 is due to a strong dust event as discussed above in section 3.1".

We have also gone through the manuscript and identified a few more points having the same issues and did the necessary corrections.

RC1: On page 8, the reviewer also struggle to agree with authors the general conclusion that systematic bias in the LCS PM reading between the background site (UBS) and the traffic site (TRS) is mainly due to the former having less particles with diameter < 600 nm compared to the traffic site and the inability of the Vaisala unit to detect below this cutoff. This conclusion cannot explain why the LCS UBS is still significantly biased high compared to the TRS during dust episodes (Fig. 4e) when the PM is expected to be dominated by large diameter sized particles

AC: We agree that a difference remains between the UBS and TRS sensors during dust events (Fig. 4e). However, this does not contradict the claim that the presence of smaller particles is higher at the TRS. To clarify that, we added a supplementary figure (Figure S6 in the updated supplement) showing that, even during the dust event, $PM_{2.5}$ concentrations are consistently higher at the TRS compared to UBS. This figure highlights that the TRS station systematically records higher concentrations of smaller particles ($PM_{2.5}$). That said, it does not exclude the fact that TRS also experiences more coarse particles than UBS during dust events (see subplot c in the figure below).

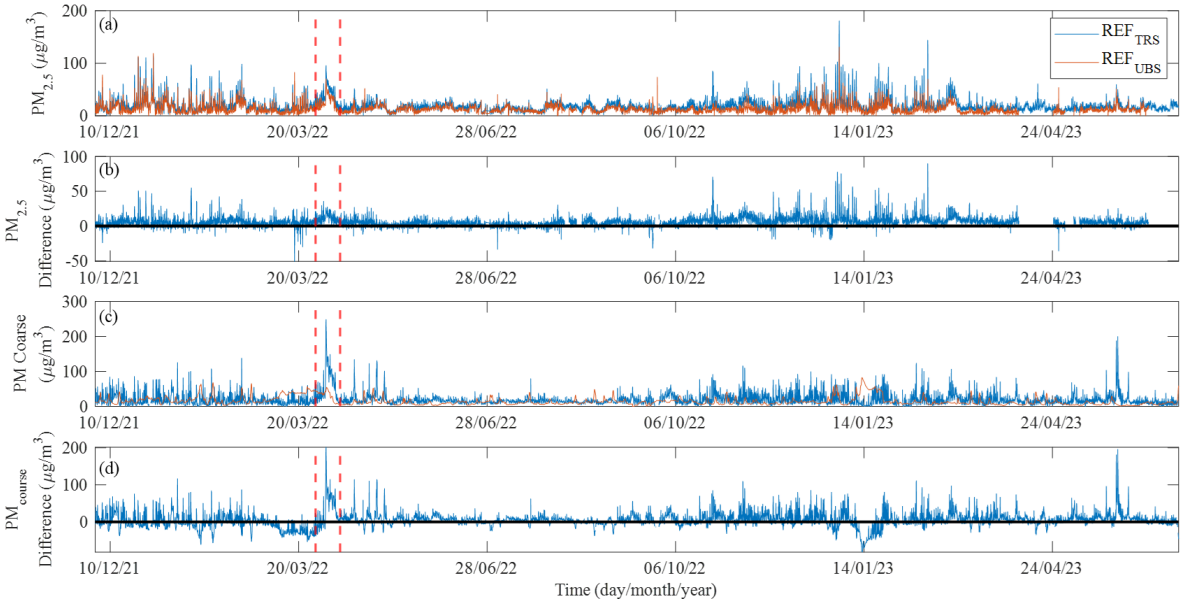

Figure 1: Time series of 1-hour averaged $PM_{2.5}$ and PM coarse concentrations measured by the reference instruments at TRS and UBS. The differences in $PM_{2.5}$ and PM coarse between the two reference measurements (i.e., $REF_{TRS} - REF_{UBS}$) are also plotted. The solid black line represents zero. Data between the red dashed lines indicate a major dust event in April 2022.

***RC1**: Page 8 first paragraph " …. PM10 concentrations, however, are generally higher at the TRS compared to the UBS, as indicated by the reference instruments (Fig. 3g), which is in contrast to what the LCS measurements indicate (Fig. 3h)" Figures 3g and 3h are scatter plots for CO and NO2 respectively that have no relation to PM10. Authors need to correct this.*

AC: We thank the referee for seeing this error. This was indeed a typo. We will correct the text to refer to the appropriate figures, changing "Fig. 3g" to "Fig. 4d" and "Fig. 3h" to "Fig. 4e," which correctly correspond to the PM_{10} data being discussed.

RC1: Page 8 second paragraph " …. while those measured by the reference instruments were below 6–10 µg/m3" this statement is wrong. The difference for the reference instruments is never negative between the TRS and USB site as shown in Fig. 4f (solid line).

AC: We acknowledge that the word 'below' may have misled the meaning of this sentence. We revised the sentence to:

"The PM concentration differences between the two stations in these cases, as measured by the LCSs, were less than 4 µg/m^3 while those measured by the reference instruments were less than 10 µg/m^3."

RC1: Authors need to add legends to Fig 4, Fig 5, Fig S14 and Fig S15 to help the readers.

AC: We agree and added appropriate legends to all these figures.

RC1: Suggest the authors annotate Fig S2 to show when the firmware was changed for the NO2 and O3 sensors.

AC: The point is well taken. We have updated Fig. S2 to indicate the times when the firmware was changed for the NO_2 and O_3 sensors.

RC1: Table 4 appears to be an "image" and the font size is too small making it difficult to read. I suggest presenting this as an actual table and to increase the font size.

AC: We updated the table accordingly.