

Atmos. Chem. Phys. Discuss., referee comment RC1  
<https://doi.org/10.5194/acp-2021-860-RC1>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Comment on acp-2021-860

Anonymous Referee #1

---

Referee comment on "Measurement report: Interpretation of wide-range particulate matter size distributions in Delhi" by Ülkü Alver Şahin et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-860-RC1>, 2022

---

This manuscript presents an analysis of the particle number concentrations in the range of 15nm to 10µm during winter, autumn, and summer of 2018 in Delhi. The particle size distribution measurements presented here are based on a scanning mobility particle sizer (SMPS) and a GRIMM spectrometer/dust monitor which were deployed 15m above ground and 100-200m away from a major arterial road in Delhi. Consistent with past studies, the mode diameters observed in Delhi during polluted periods (e.g., winter/autumn early-morning/nighttime) are some of the highest observed anywhere on the planet. Overall, this measurement report article is well written and generally easy to follow. However, I do think that some revisions are required to the manuscript.

Please consider the following comments which may improve the manuscript:

Major comments:

1. Mixing layer height (MLH) is an important factor in both seasonal and diurnal variation of pollutant concentrations in Delhi (Gani et al., 2019). The interpretation of Figure S7 "Seasonal changes in mixing depths are surprisingly small (Figure S7) and hence unlikely to have a major influence." (page 14, line 365) is not convincing. Please consider the following:

a) Figure S7 does show that autumn/winter has longer periods with shallow inversions.

b) The major increases/decreases in the diurnal plots of pollutants (Figure 2) seem to be consistent with decrease/increase in MLH diurnal plots for each season.

c) Please include data source and averaging method (arithmetic mean, median?) for MLH data. You can also consider the implications of the averaging method used to the interpretations of the influence of the MLH to pollutant concentrations.

d) Assuming these data are from some reanalysis dataset, one must be careful about interpreting them for smaller MLH values (higher uncertainty).

2. Connected to the previous point, interpreting the diurnal patterns of particle number concentrations (e.g., in the abstract: page 2, line 58) only in terms of traffic levels can be misleading. In addition to MLH, cooking in all seasons, biomass burning for heating in autumn/winter, and agricultural burning in autumn can all emit particles in the accumulation mode. I suggest considering these processes and additional (non-traffic) sources carefully throughout the manuscript.

Minor comments:

3. (Page 3, line 82) "Although the sources of particles are mostly local (Hama et al., 2020)..." This citation may be misread as a reference from Delhi given the discussion before. Furthermore, the authors should be careful and intentional in writing "particles" (number or mass?).

4. (Page 5, line 128) Is this site "representative of an urban background environment"? I understand that using such terminologies will always be difficult in a polluted megacity like Delhi with large spatial variations in air pollution levels. However, this site seems to be close to a major arterial road (please add this distance in the site description) and given the importance of traffic-emissions in particle number concentrations, "urban background" may not be a correct representation.

5. (Page 10, line 255) The difference in distance from the major arterial road between the two studies could be another factor in differences in concentrations observed (same comment for page 14, line 373-375). Also, in line 256, do you mean "sampling period" instead of "sampling time"?

6. I am unable to interpret the colors/legend in Figure 5.

Technical corrections:

7. (Page 16, line 430) Cited article is missing from the bibliography.

8. Recent updates to ACP/Copernicus guidelines state that “it is important that the colour schemes used in your maps and charts allow readers with colour vision deficiencies to correctly interpret your findings.” This means that jet/rainbow (non-uniform) color scales need to be changed to other appropriate color scales. Please update figures 4, 11, S5, and S12 accordingly. More here: <https://www.atmospheric-chemistry-and-physics.net/submission.html#figurestable>

### **References:**

Gani, S., Bhandari, S., Seraj, S., Wang, D. S., Patel, K., Soni, P., Arub, Z., Habib, G., Hildebrandt Ruiz, L., and Apte, J. S.: Submicron aerosol composition in the world’s most polluted megacity: the Delhi Aerosol Supersite study, 19, 6843–6859, <https://doi.org/10.5194/acp-19-6843-2019>, 2019.