Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC2
https://doi.org/10.5194/amt-2021-170-RC2, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on amt-2021-170

Anonymous Referee #2

Referee comment on "Evaluating the PurpleAir monitor as an aerosol light scattering instrument" by James R. Ouimette et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-170-RC2, 2021

The paper "Evaluating the PurpleAir monitor as an aerosol light scattering instrument" by Ouimette et al, examines the possibility of using Purple Air PMS sensor data to determine integrated aerosol light scattering coefficient. A model considering Mie theory and the sensor geometry is used to predict light scattering signals expected from the sensor and the forward and backward scattering truncation. The model is used predict sensor performance as a function of particle size and the results confirm that the sensor does not measure size distributions. And that the signal is proportional to scattering coefficient.

The paper presents a comprehensive picture of the working of PMS5003. The sensor details, model results and experimental validation adds to the existing knowledge on PMS 5003 and critically confirms findings of other studies that have concluded that the sensor behaves more like a nephelometer rather than a scattering spectrometer. The paper is well written and its findings are likely to be very useful to the growing community of scientists using these sensors for air quality measurements.

I have minor points for the authors to consider.

Lines 106-108 – "is of light scattered by particles (Kelly et al., 2017) which traditionally has been … using integrating nephelometers". This sentence should be reworded. As it reads currently, it seems like light scattering measurements are only made by nephelometers.

Lines 137-139. "Model predictions are then compared with yearlong field data at NOAA's Mauna Loa Observatory …". Please clarify exactly what predictions are compared with what data.

Lines 140-141: "… an empirical relationship is developed to estimate the light scattering and uncertainty from the PA-PMS data." Light scattering intensity? And uncertainty of what?

How is the uncertainty in the physical geometry and optical geometry accounted for in the model?

In Figure 2, the precision is shown as a function of concentration. How much of the decrease in precision with decreasing concentrations can be explained by Poisson statistics of number of particles expected in the viewing volume of the units?

Figure 10: the x-axis scale is unusual – please use linear or log-scale. Also, could these results be compared against model predictions as validation of model performance?

Section 4.5: It would be good to add a sentence or two about how the nephelometer was integrated with the DMPS for aerosol scattering coefficient distribution measurements.