

Interactive comment on “Effect of aerosol composition on the performance of low-cost optical particle counter correction factors” by Leigh R. Crilley et al.

Anonymous Referee #1

Received and published: 6 November 2019

General Comments:

This manuscript suggests a correction, (previously determined and published elsewhere), may be applied to commercial low-cost optical particle counter measurements that enable a direct comparison to PM_{2.5} measurements at high relative humidities in the field. Data is presented from an alphasense OPC-N2 and a TEOM-FDMS at five field locations. Whereas the OPC-N2 measures ambient (wet) aerosol size and number, which assumes a uniform particle density and reports the wet aerosol mass concentration, the TEOM-FDMS measures dry aerosol mass concentration.

The authors argue that hygroscopicity of the aerosol can be calculated from the dif-

C1

ference in wet and dry particle mass using the OPC-N2 measurement for wet particle mass and the TEOM-FDMS measurement for dry particle mass measurement. It is difficult to accept the authors' conclusions without a clearer outline of several key assumptions.

First, the argument hinges on the idea that the OPC-N2 and the TEOM-FDMS instruments report the same aerosol size distribution in a controlled setting with low relative humidity; however this assumption is neither explicitly stated nor validated. Although the authors argue that the use of a dryer in front of the OPC-N2 measurement would render the low-cost OPC more expensive, such a lab-based comparison would substantially bolster their argument. It is disconcerting that the OPC-N2 and reference measurements are correlated but do not agree (1:1) at low humidity (<60%; e.g. Fig. 3). The reason for this disagreement is not clearly articulated. In addition, the authors do not discuss the fact that field measurements from different times of day and days likely have different compositions, which leads to large scatter in observed PM_{2.5} vs. relative humidity (e.g. Fig. 1 and Fig. 2) based on wind velocity and source. Finally, assumptions of spherical particles and refractive index required to calculate particle size from OPC light scattering measurements should also be discussed and are currently not mentioned. I think that this paper requires major revisions.

Specific Comments:

Table 1) Show range and mean +/- SD

Table 2) should have the same format as Table 1, with the addition of ratios to PM_{2.5}

Figure 1 and Figure 2. Reasons for high variability in measured PM_{2.5} with RH should be mentioned.

Figure 3. Show 1-1 line and make the aspect ratio of figures 1:1.

Figure 4. Should this data be presented considering suspected decline in OPC-N2 performance? If so, how much of this data should be presented and how will that be

C2

determined?

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-370, 2019.