

Comment on amt-2022-284

Anonymous Referee #1

Referee comment on "Relationship between the sub-micron fraction (SMF) and fine-mode fraction (FMF) in the context of AERONET retrievals" by Norman T. O'Neill et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-284-RC1>, 2022

In this paper "Relationship between the sub-micron fraction (SMF) and fine mode fraction (FMF) in the context of AERONET retrievals", the authors explored differences between two AERONET products: sub-micron fraction from the AERONET inversion method and fine mode fraction (FMF) from the Spectral Deconvolution Algorithm. This is a well written paper with both the methods and results nicely presented. Also, FMF/SMF are widely used for discriminating fine from coarse mode aerosols, and thus this paper shall be of interest to AERONET data users as well as other readers. I recommend publication of this paper after some minor changes as listed below.

- AERONET data may be subject to thin cirrus cloud contamination. How would thin cirrus cloud contamination affect results as illustrated in this study?
- This is more of a thought than a request for changes. Log-normal size distributions are assumed for fine mode and coarse mode aerosols in this study. However, aerosol particle size distributions may not be perfect log-normal. Could some of the observed differences between FMF and SMF be attributed to non-perfect log-normal distributions?
- Page 160, "Figure 2 is a plot of $\delta\tau_{\text{SMF}}/\tau_{\text{SMF}}$ vs $\Delta\delta\tau_{\text{SMF}}/\delta\tau_{\text{SMF}}$ for a variety of retrievals from the sites listed in Table 1". Could the authors be more specific about "a variety of retrievals"? Any criteria for selecting retrievals from the sites listed in Table 1? It is also confusing as the Figure 2 caption seems to indicate data points shown in Figure 2 are "simulated optical depth retrievals".
- Figure 3, " $1 - \epsilon_f$ " shall be " $1 - \epsilon_c - \epsilon_f$ "?
- Line 200, "within a time window of ± 16 minutes about the nominal". Any reason for picking ± 16 minutes as the temporal window? Do the authors considered temporal homogeneity in spectral AODs in their data selection steps?
- Line 207, need a citation for the SDA method.
- Line 300, "The values corresponding to the four red-colored". It looks like 5 red-colored circles above the $\epsilon_c=0$ line to me.
- Figure A1 caption. " $\eta' - \eta$ vs $\delta\tau_{\text{SMF}}/\tau_{\text{SMF}}$ " shall be τ_f vs τ_f' "?

