Reply on RC2

Norman T. O'Neill et al.

Author 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-AC2, 2022

The referee's comments are presented in italic and our answers are written in plain text. **Modifications of the manuscript, if any, are written in plain bold text.**

The authors presented a simple sub-micron fraction versus fine mode fraction linear equation that makes it possible to better understand the well recognized empirical result of SMF being greater than FMF. The paper is well-constructed, and the statistical method is serious analyzed and has scientific value. Overall, publication is recommended after addressing the following minor revisions.

We thank the referee for the insightful feedback.

Comments:

1. Line 91: "governed by that relationship", Maybe it would be better for the reader to understand the paper by stating in the text which relationship is governed by.

We changed the sentence to the version below in an effort to clarify our meaning:
We seek to demonstrate that the AERinv-derived value of SMF and the SDA-derived value of FMF are largely linked by that simple relationship and that fitting parameters extracted from their empirical comparison yields insight into their fundamental opto-physical dynamics.

2. Table1 and line 208-212: for the classification of aerosol types at AERONET sites, maybe some citations for aerosol types needed here as a basis for the classification of different aerosol types.

A citation column was added to Table 1.

3. Figure 3: Maybe it should be "$1 - \varepsilon_c - \varepsilon_f$" instead of "$1 - \varepsilon_f$"?

No, when $\eta = 1$, at the extreme right of the Figure 3 scattergram, then $\eta' = (1 - \varepsilon_c - \varepsilon_f) \eta + \varepsilon_c = 1 - \varepsilon_c - \varepsilon_f + \varepsilon_c = 1 - \varepsilon_f$

4. Line 213: First line indent. √
5. Line 244: First line indent. √

6. Line 253, 261 and 273: figure S1 was not found in the paper.

Figure S1 is part of the "supplementary material" submitted with this paper.
To make sure this is clear, at the first Figure S1 instance, the sentence
"scattergrams for the rest of the aerosol types and sites can be seen in Figure S1"
became in the new draft
"scattergrams for the rest of the aerosol types and sites can be seen in Figure S1 **of the supplementary material**"

7. Line 275: As well, Figure S2 was not found in the paper

Figure S2 is part of the "supplementary material" submitted with this paper. The Figure S1 clarification above applies equally well to Figure S2.

8. Figure A1 caption: maybe it should be "τ_f vs $\tau_{f'}$" instead of "$\eta' - \eta$ vs ð□□□ð□□□"?

Yes, this was corrected in the new draft with the caption:
τ'_f vs τ_f FO distributions for GSFC and Mongu. The FO colour scale is tied to variations on a logarithmic scale (with an attendant tendency to enhance the contributions of large FO values). $N(r_0)$ is the total FO at a given r_0 value.