



Interactive comment on “A global study of hygroscopicity-driven light scattering enhancement in the context of other in-situ aerosol optical properties” by Gloria Titos et al.

Anonymous Referee #2

Received and published: 29 April 2021

The submission by Tito et al provides an extensive compilation of measurements of the aerosol humidification factor "f(RH)" for total scattering and hemispheric backscattering for 23 sites representing a broad range of aerosol types. Most of the scattering measurements were obtained with TSI integrating nephelometers at three nominal red, green, and blue wavelengths. In addition, more than half of the sites included alternating size-cut operation permitting Tito et al to probe the humidification effects as a function of fine or coarse aerosol contributions. And while the humidification of absorption was not explicitly addressed (and is assumed to be negligible), concurrent dry aerosol absorption measurements were frequently available which permitted

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Tito et al to explore correlations between between (dry) SSA and $f(\text{RH})$ as well as relationships between $f(\text{RH})$ and wavelength dependence, backscatter fraction, and fine/coarse contributions for potential use in estimating $f(\text{RH})$ when humidified measurements are unavailable. Ultimately, while completely general relationships remain elusive, the authors demonstrate 1) agreement with previous reported published results and 2) relationships with limited utility when applied to different "types" of locations, for example marine, rural, urban, arctic, etc.

I recommend accepting this paper for publication after addressing several minor concerns. Although there are quite a few changes I've suggested, in my opinion they are not very arduous.

I've attached commented version of the submission as "acp-2020-1250-manuscript-version2.RC2.pdf" .

1. Line 54, suggest "smaller" rather than "lower". (Just personal preference, of course.)
2. line 58-60, suggest slight reordering of text in this paragraph.
3. line 90, poor hyphenation
4. line 103, awkward phrasing. Simplify?
5. line 109-110: A double parenthetical? Revise or strike.
6. line 125, hyphenate "scattering-related" perhaps?
7. line 144, more detail on selection criteria please
8. line 164, Important to identify the specific ARM datastreams as there are multiple and they are not interchangeable.
9. Eq 4, recommend alternate more intuitive form.
10. line 191, substitute "vary" for "range" to avoid unwanted connotation of "wavelength range"

11. line 235, Can't generalize from a sample size of 2.
12. line 244, Well said.
13. line 286-7, rephrase for clarity
14. line 288, Unneeded comma.
15. line 290, Cleaner?
16. lines 312-14, Suggest deeper explanation.
17. lines 374-381, figure 5. Focus this figure and discussion on SSA.
18. lines 452-467, figure 7. Suggest revising fig 7 to let symbol size represent angstrom exponent and then let the symbol color indicate the predominate aerosol type (rural,urban, marine, etc.) This may also open the door to more a more illuminating discussion than provided by the current figure.

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2020-1250/acp-2020-1250-RC2-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1250>, 2020.

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