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Atmospheric Chemistry and Physics Discussions

Interactive comment on "How should we aggregate data? Methods accounting for the numerical distributions, with an assessment of aerosol optical depth" *by* Andrew M. Sayer and Kirk D. Knobelspiesse

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I'd like to thank Dr. Povey for these thoughtful comments - this sort of thing is exactly the type of discussion we were hoping to provoke.

I agree with Dr. Povey's thinking that we need to have some deeper discussion of what we intend users to take away when we provide them with aggregates and how to best provide concise, useful information while decreasing the chance of misunderstanding or misuse. My personal opinion is that the geometric mean (lognormal statistics) is a

better summary statistic than arithmetic mean (normal statistics) for AOD aggregates, overall, for those cases when there is likely only a single mode (due to the skew and nonnegativity). In the case of multimodal distributions, the answer is less clear. Perhaps it lies in decreasing aggregation scales so that these become less frequent (e.g. encourage use of daily rather than longer-term composites). The idea of providing fit statistics for multiple modes as outlined in Povey & Grainger (2019) is also a good one, although requires extra thought on the user end, as would providing histograms directly (alongside a data volume issue). I look forward to carry these discussions on with the broader community through AeroCom and AeroSat.

The Figure included in the comment is an interesting one (and essentially a multidimensional version of our Figure 1). I will consider creating something like it for the revised manuscript, as it could be quite informative to overplot typical values for certain AERONET sites on the top. I will note that since Dr. Povey's example is calculated in natural log while our example was in base 10 log, the geometric standard deviations covered in Dr. Povey's simulations should be decreased by a factor of ln 10 (about 2.3) to be equivalent, i.e. our geometric standard deviation of 0.35 would correspond to about 0.8 (off the top of the scale) in his plot.

Thanks also for the grammatical/reference comments, which I'll check and correct as necessary.

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