

Atmos. Meas. Tech. Discuss., referee comment RC2
<https://doi.org/10.5194/amt-2021-204-RC2>, 2021
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Comment on amt-2021-204

Anonymous Referee #2

Referee comment on "Retrieval of aerosol properties using relative radiance measurements from an all-sky camera" by Roberto Román et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-204-RC2>, 2021

General comment

The manuscript covers aerosol retrievals using normalized radiances from an all-sky camera (simulated and measured) and the GRASP algorithm. The study has been very thoroughly performed and described, and presents interesting and relevant results regarding generalizing all-sky cameras (or normalized radiances) towards aerosol retrievals. The subjects also fits the scope of the journal and I recommend its publication, with some very minor comments.

Specific comments

P4, L117. Is there a reference, where the hybrid geometry is described in more detail?

P7, L192pp. I think the explanation of NSR sensitivity to AOD with dominance of aerosol scattering (Rayleigh vs. aerosol) is not very convincing (wouldn't this AOD sensitivity be the same in an atmosphere without Rayleigh?). Maybe it is because the normalization factor (sum over all radiances) increases with AOD and reduces the relative differences in NSR.

Fig 2. What is the reason for the "kinks" in the radiances at around 40° scattering angle? If I am not mistaken, these features do not appear in almucantar scans (radiance plotted against azimuth not scattering angle).

P9, L218. So the noise in the synthetic data is the same as stated on p5, L128? Also, what is distribution of the random noise? I would guess normal, but it should better be stated.

P11, L258. It works surprisingly well for SZA=30°, considering AERONET limit of 50° (is that correct?) with almucantar measurements only. So the hybrid scan seems effective at small SZA.

Would this mean that really most of the information is in the small scattering angles, <100°?

Fig. 5. I am wondering if the higher deviations of the retrievals towards higher AOD, could also be due to (or at least affected by) the lower number of successful retrievals, i.e. a

statistical effect. Of course, the retrieval success decreases due to decreasing sensitivity to AOD.

Since the STD is really interesting in relation with the Md (e.g. is $\Delta AOD=0$ within the errorbar also for high AOD?), I believe it would be a good alternative to combine right and left columns of the plots and plot STD as error bars (or uncertainty bands) for Md. Maybe with a second uncertainty of the mean MD/\sqrt{N} , N successful retrievals. This will be too much for all scenarios in one plot, so this would need a different grid of plots. Might be worth a try.

Fig. 6 As a general question: If red is the median of noise retrievals, I would expect red and blue line to be very similar (as the retrieval input, the median of noised radiances should be the radiance without noise). This is almost always true except for the coarse mode of MALD. Any idea why?

Fig.7. Again, as for Fig.5, I think it would better if Md and STD are plotted together.

Fig. A33. There is actually quite little one can read from this plot of the complete time series. On this time scale, it would be easier to visualize aggregate values, e.g. monthly means.

Finally, the manuscript can in general be improved with respect to English grammar / language. For example, missing articles: P1, L1. the GRASP code. P1,L8. As a result.