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Interactive comment on "AEROCOM/AEROSAT AAOT SSA study, part I: evaluation and intercomparison of satellite measurements" *by* Nick Schutgens et al.

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Thanks for your interest in our paper.

Indeed, absolute diversity between satellite AOD increases as AOD increases.   But the relative diversity actually decreases (see e.g. https://acp.copernicus.org/articles/20/12431/2020/acp-20-12431-2020.html   , Fig. 22). The latter can be explained as resulting from a better signal-to-noise ratio at high AOD (with noise being everything that affects satellite radiances but is not aerosol, like e.g. unknown surface reflectance), allowing more reliable retrievals.

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Similarly, diversity in SSA decreases at high AOD as signal-to-noise ratios improve and retrievals become more reliable.

Another thing to bear in mind is that AOD is an extensive property while SSA is an intensive property. That is, if the number of aerosol particles were to double, AOD would double as well but SSA stays the same. SSA (=1-AAOD/AOD) is a particle property determined from the ratio of AAOD and AOD. Consequently one may expect error statistics for AOD and SSA to behave quite differently.

As a matter of fact, this is also why we discuss errors in all three observations (AOD, AAOD and SSA) and not just two of these (e.g. AOD and AAOD).

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-1207, 2020.