

Interactive comment on “A new study of sea spray optical properties from multi-sensor spaceborne observations” by K. W. Dawson et al.

Anonymous Referee #2

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In this paper the authors infer the lidar ratio of sea salt aerosol by combining the SODA derived AOD with the integrated attenuated backscatter from CALIOP, a method developed in Josset et al. (2008). They apply this globally to determine a more accurate lidar ratio than currently used by CALIOP. They find that there is a relationship between lidar ratio and wind speed, as expected, and potential to parameterize the lidar ratio based on this. They show that the error in integrated attenuated backscatter is not significant and indicate that the current lidar ratio used by CALIOP (20 sr) is too low for most situations and propose a higher global value of (26 sr).

The paper is well written and concise, covering most of the relevant literature. I have one major point that I think should be addressed prior to acceptance and a few other minor comments.

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Major Comment

The paper shows that the lidar ratio has considerable spread globally. Because of this, changing the lidar ratio from the CALIOP default to 26 sr, while improving bias in the retrieved CALIOP AOD from SSA, will not drastically improve the error in spatial and seasonal variability. The current paper appears a half-step towards formulation of a lidar ratio that is a function of the wind speed that would significantly improve the CALIOP retrieval relative to the proposed change in global lidar ratio here. Perhaps the step of parameterizing the lidar ratio with wind should be included in this paper? It appears that minimal extra work would be required and the value of this paper to the community would be increased substantially. Unless there are significant reasons for leaving that work to a separate paper I think effort should be made to parameterize the SSA lidar ratio in this study.

Other Comments

Marine organic aerosol may contribute to the spatial and temporal changes in aerosol properties (e.g. O'Dowd et al., 2004). There is limited mention of the impact of marine organic aerosol on the lidar ratio, beyond mention of general chemical composition. Might marine organic be expected to have different optical properties to pure sea salt and affect the retrieval? Might this contribute to the remaining spread and seasonal-geographical distribution once wind speed has been accounted for? It may be worth investigating this in future and going into a more detail in this paper how the chemical composition of marine aerosol would be expected to alter the retrieval.

pg221 line 16 - should this be less than ($<$) 0.01 sr⁻¹ based on Omar et al., (2009)?

Figure 2 - Just a suggestion, but rather than the rainbow color scale it may be informative to use another color scale (e.g. blue-white-red) to highlight the difference relative to the CALIOP assumed values.

References

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O'Dowd et al., Biogenically driven organic contribution to marine aerosol, *Nature* 431, 676-680 (7 October 2004) | doi:10.1038/nature02959, 2004

Josset, D., Pelon, J., Protat, A., and Flamant, C.: New approach to determine aerosol optical depth from combined CALIPSO and CloudSat ocean surface echoes, *Geophys. Res. Lett.*, 35, L10805, doi:10.1029/2008GL033442, 2008

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