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Interactive Comment

Interactive comment on "Remote sensing of soot carbon – Part 2: Understanding the absorption Angstrom exponent" *by* G. L. Schuster et al.

Anonymous Referee #1

Received and published: 5 September 2015

The manuscript acp-2015-235 by G.L. Schuster et al. is a well written paper on the limits of using absorption angstrom exponent (AAE) for apportioning the absorption aerosol optical depth (AAOD) to aerosol components (mainly soot carbon-sC, brown carbon-BrC, and mineral) starting from AERONET data.

In the reviewer's opinion, the manuscript is very well written, clear, and the dissertation is detailed and coherent. The merit of the paper is to highlight clearly the range of application of the modelling and data analysis performed: They are based on the same hypotheses of the AERONET retrieval algorithm (internally mixed aerosol with the same complex refractive index for all particles, bimodal size distribution) and cannot be extended e.g. to data directly measured in situ. In the AERONET frame, however, the paper rises important issues commonly neglected in the literature concerning the applicability of the AAE use for AAOD apportionment to aerosol components. The paper shows that under the AERONET retrieval algorithm hypotheses, AAE cannot be used for apportioning the absorption aerosol optical depth (AAOD) to sC assuming that sC <=> AAE=1 as commonly performed in the literature. Modelling was carried out for invariant imaginary k(λ) and the modelled results are supported by real data, which were filtered for invariant imaginary k(λ) and other parameters were used to ensure the presence of different types of aerosols. The results of the paper both show that different AAE for sC can be obtained depending on particle size and sC relative content. Opposite, there exist combination of other components k(λ) (e.g. mineral)/particle size that lead to AAE=1.

The reviewer's opinion is that only technical corrections are needed before the paper is accepted for publication.

1) Conclusion. It should be clearly stated (as previously extensively done in the text) that the conclusions refer only to the use of AAE calculated from AERONET dataset, as the modelling in the paper is referred to approximations used in the AERONET retrieval process;

2) equations 4 and 5 illustrate refer to literature approach. Whereas eq. 4 is right for externally mixed aerosol, it is noteworthy that - whereas the reviewer is aware that the approach is commonly used in the literature - eq. 5 is mathematically wrong, as Axy+Bxz cannot be represented as Cxw (i.e. the sum of exponential is not an exponential)

3) page 20918 vs. Fig.2 caption: please, be coherent with Rp: 0.026 um is used in the text, 0.025 in the figure caption

4) page 20923: please, define AOD at line 3

5) page 20928: please check "k=0.36+" at line 23

6) page 20933: please, change "has" into "have" at line 6

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7) page 20934, line 3: double "which" is present

Figure 5: yellow X for coarse median is hardly visible

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 20911, 2015.

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