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Atmospheric Measurement Techniques Discussions

Interactive comment on "Technical note: Absorption aerosol optical depth components from AERONET observations of mixed dust plumes" *by* Sung-Kyun Shin et al.

Anonymous Referee #3

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Review on

Technical note: Absorption aerosol optical depth components from AERONET observations of mixed dust plumes

By Shin et al.

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General comments

This article addresses a problem of aerosol absorption (AAOD) separation in the mixed aerosol plumes, which is of high interest of scientific community. Authors suggest

using previously developed lidar based technique but applied to standalone AERONET observations, to separate aerosol absorption between dust and Black Carbon particles. The methodology description and evaluation for Black Carbon AAOD separation are rather brief. I would not recommend this note for publication in its actual state; it needs major revisions, since authors in my opinion had missed some crucial points in their study.

There are two major issues:

1. Dust/non-dust properties separation

Authors use a lidar based method to estimate the proportion of the desert dust in the mixture using only AERONET data, and yet do not show any comparison to an AERONET provided so called "percentage of spherical particles", which by definition gives the proportion between spherical (i.e. non-dust) and non-spherical (dust) particles (see Dubovik et al., 2006). To my strongest belief, any new methodology should be compared to an existing one, in order to estimate its scientific value. At this point it is absolutely unclear, which advantage new method proposes, in case when lidar is not available, in comparison with already existing AERONET provided product.

2. Black Carbon properties separation

The major part of the method description operates in terms of dust and non-dust particles. To me, method to derive a black carbon content from a non-dust AOD, taking black carbon SSA as a coefficient describing the amount of BC in the mixture has no sufficient support. Formula 15 in a given form doesn't have much physical sense and referred papers do not contain any similar equations. Values selected for black carbon SSA are more suitable for laboratory measurements they were taken from. Such low values could be observed only in the immediate vicinity to the particle origin, which is not the case in a situation with aerosol transport. The fact that proposed method significantly overestimates BC over Saharan desert sites proves that such assumption could be made only for selected sites or cases. I would recommend changing SSA value

over Saharan sites to typical for Biomass Burning aerosol to see if correlation could be improved. This would help to support some of the conclusions that were made.

Specific comments:

Page 3. Lines 7–8. “The AERONET inversion is performed for measurements with a 440-nm AOD larger than 0.4” Phrase is not actually correct, AERONET inversions are performed at any AODs, yet it is true that quality assured SSA retrievals (level 2) have a threshold on minimum AOD values.

Page 5. Line 1. “we use the Angstroom exponent ad = 0.06 ± 0.21”, it is not clear which exact value or values were used. Were they selected within the given range? Was the same value used for all the cases or it was varied? There is a significant difference in the formula 8 behaviour having angstrom -0.15 or 0.27.

Page 8. Line 19. “We conclude that that coarse-mode AOD and dust AOD cannot necessarily be considered as synonymous.” I would really like to see same comparison made with non-spherical part of coarse AOD, which can easily be obtained by using AERONET provided percentage of spherical particles. Such comparison would be more correct.

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