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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spectral absorption properties of atmospheric aerosols" *by* R. W. Bergstrom et al.

R. W. Bergstrom et al.

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First, the authors would like to thank the reviewers and commenter for their time and suggestions. The suggestions were quite helpful.

Comment #1

The commenter noted that we neglected to reference the very relevant study of Collaud Coen et al., (2004). The commenter is correct. While not an excuse, the Collaud Coen et al., (2004) study was included in earlier versions of our paper and was inadvertently eliminated in one of the revisions. We have now included the discussion of this work that was one of the first to show the AAE for dust. We apologize for the oversight.

Reviewer 1

Reviewer 1 had three comments:

1) The paper is both a data presentation and a review paper - the reviewer is correct and we have modified both the abstract and the text to reflect that.

2) We should attempt to describe the effect of aging of the particles in the atmosphere. Because our data are relatively far from the sources of pollution, our results could be considered as describing aged particles. However, since we don't precisely know the source and don't have measurements along the transport path, we can't determine the changes in properties as the particles move away from the source. This question is very important and as the reviewer undoubtedly knows, there have been attempts to understand the aging process without a great deal of success. This is still one of the largest uncertainties in the climate effects of aerosols.

3) Figure 2 shows AAE values smaller than one. The spread in AAE values shown in Figure 3 indicates the variability in the values of the optical properties of the particles. The AAE should be 1 only if the particles are small and have constant refractive indices. In the atmosphere this need not be the case. It would be quite remarkable if there were no spread. We have included a brief discussion of this in the text.

Reviewer 2

1) The idea of the Angstrom coefficient is not new. The reviewer is correct and we did not intend to assert that the use of the AAE is something new with this paper. We have modified the paper to make clear that we are not claiming that the idea of exponential falloff is new.

2) The paper should include more framework. We appreciate the suggestion and have added a broader discussion of the results.

Reviewer 3

1) The reviewer asked for a clarification of the sentence involving the conclusion of Bond and Sun (2005) concerning accounting for different values in climate models. The reviewer's first interpretation is the correct one: that models use different aerosol

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parameterizations that lead to dissimilar results. These results in part can be reconciled by accounting for the different assumptions. We have rewritten the sentence to make our meaning clearer. Basically for small amounts of absorption, the TOA flux change is linear in the absorption coefficient. Scaling the results by the absorption coefficient eliminates the effect of the different values of the absorption coefficient used by different models.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 10669, 2007.