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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol optical depth measurements by airborne sun photometer in SOLVE II: Comparisons to SAGE III, POAM III and airborne spectrometer measurements" *by* P. Russell et al.

Anonymous Referee #1

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General Comments

This paper discusses at length and in great detail, aerosol optical depth measurements made by the NASA Ames sun photometer mounted aboard a DC-8 during the SOLVE II campaign. In particular it compares these multi-wavelength measurements with those of the DIAS instrument and the SAGE III and POAM III satellites. Most of the paper is devoted to a detailed consideration of the differences in the sets of results and an examination of possible causes for the discrepancies - in particular between the sun

photometer (AATS) and SAGE III. Although it seems that some of the observed differences might be explained by differences in viewing path, in timing and in solar zenith angle, for the most part these cannot explain all the differences observed. The authors then examine other possible causes one by one.

The paper is well-written, clear and very thorough. I have no doubt as to its accuracy and the scientific methodology employed, and the paper is fundamentally very sound. It presents new data and new results, which are scientifically interesting. Its major weakness stems from the nature of its conclusion that significant differences exist between the SAGE III and AATS measurements which are unresolved. This may indeed be the case, but in order to make a useful contribution to this problem, the authors need to at least state what they intend to investigate next as the cause, or what further experiment or data would be needed in order to resolve the problem. Although there is a valid and significant scientific contribution made by stating that a problem exists and that they have examined umpteen different possible causes, which have not led to a resolution - this is not enough. The authors need to state either where they intend to look next for an explanation, what further data or calculations are necessary, or what further experiments must be carried out.

My other general comment for resolution is the size of the figures. I cannot read them even with a magnifying lens. All the figures need to be printed at least twice as big as their current size in the pdf manuscript.

Specific Comments

There is an enormous amount of detail in the paper, including 4 pages of Tables and 24 figures. I am not sure that quite as much detail needs to be presented. The fact that the figures are far too small made it impossible for me to examine them in much detail. I would suggest making the paper more readable by eliminating some of the figures - although I do not have specific recommendations. Many of the discussion points can be made without reference to a figure, and it would certainly help to reduce

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the length of the paper were this done. I also think that the Appendix is unnecessary. One other comment - is “airmass” a common term? I found its use quite confusing because I would not normally consider the ratio of the slant path optical depth to the vertical optical depth to be an “airmass” but more of an optical path difference (or ratio).

Technical Corrections

pg 7297, line 21. Figsures should be replaced by Figures. pg 7298, line 20. “more-transmission oriented” should be replaced by “more transmission-oriented”

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 7291, 2004.