

Interactive comment on “SAGE III aerosol extinction validation in the Arctic winter: comparisons with SAGE II and POAM III” by L. W. Thomason et al.

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Review of ms by Thomason, Poole and Randall

This paper has a number of minor problems, but none that affect the main arguments or conclusions. Therefore, I recommend publication in ACP after correcting the problems described below.

This paper (as clearly indicated by the title) compares extinctions obtained by three different satellite systems, namely, SAGE II, SAGE III and POAM III. (Unfortunately, none of these systems is presently active, so follow-on studies will be of an historical character.)

The paper is clearly written and reports the results of a careful analysis. This is no more than one would expect from looking at the authorship: all are first-rate scientists whose area of expertise lies in the measurement of the extinction of stratospheric aerosol particles by satellite-borne sensors.

There were two motivating factors for carrying out the analysis: (1) the observation by Russell et al. (ACP, 5, 1211, 2005) that the SAGE III extinction measured during the SOLVE II experiment was significantly lower than the value determined from the Ames Airborne Sun Photometer, and (2) to determine whether or not the SAGE III data set is suitable for PSC studies.

Concerning this second goal, it is clear that the SAGE III data set yields extinctions that can be interpreted as due to PSC's, but to determine the type of PSC requires knowing the "color ratio," that is, the ratio of extinction at (say) 450 nm to extinction at 1020 nm, as in the studies of Strawa et al. (JGR, 2002) and Poole and Pitts (JGR, 106, 9923, 2001). After reading the ms, it is unclear to me whether such studies can still be considered valid. Specifically, the fact that POAM and SAGE III color ratios are not well correlated (figure 13b) makes one wonder whether this is a well defined characteristic of the PSC's or an artifact of the measurements or instruments. The authors do not address this question, although they do conclude that the SAGE III data are "reliable over a broad range of aerosol extinction values and suitable for use in PSC studies." Furthermore, the puzzle as to why the Russell et al. measurements are lower than SAGE III is not resolved, although the authors speculated that the disagreement could arise from a systematic low bias in SAGE III.

I will now make a number of small corrections (most of these are simply typographical errors, so the general reader of ACPD may wish to quit reading at this point).

1. Authorship. The affiliation of Lamont Poole is incorrect.
2. Page 11359 line 9: "have to potential" should read, "have the potential".

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3. Page 11359 line 15: “as those points” should read, “as those observations” or “measurements.”
4. Page 11360 line 1: “this data is useful” should read, “these data are useful”.
5. Page 11361 line15: “by spacecraft” should read, “by the spacecraft”. 6. Page 11361 line 17: “brightness.” Perhaps “intensity” is a better word.
7. Page 11361 line 21-22: “the horizontal scale of variability is large...” suggest changing to “horizontal variability is small...” (less confusing)
8. Page 11362 line 15: “POAM III stares at...” suggest changing to “POAM III observes...”
9. Page 11362 line 16-17 and also line 17 page 11363: “a priori” should be italicized.
10. Page 11364 line 13: “(not shown)” unnecessary, suggest deleting.
11. Page 11364 line 23: “...at 18 km...” This refers to Figure 2. But the figure caption states “20 km.” One of these is wrong.
12. Page 11364 lines 23-ff: It would be useful for the general reader to explain why PV can be used instead of latitude and the value of doing so, as well as the associated dangers in this transformation.
13. Page 11365 lines 12-13: “...all three instruments have roughly the same range in potential vorticity.” No. The observations or measurements made by all three instruments have roughly the same range in PV, not the instruments.
14. Page 11371 bottom of page: The first reference is inserted here. This is in the wrong place.
15. Page 11372 line 5: “Sage III data at both 1020 and 449 nm is...” replace “is” with “are”
16. Page 11375 Table caption includes the words “check numbers” . Check the num-

bers and delete the parenthetical phrase.

17. Figures 1, 3, 4, 5, 6 must be redrawn. The symbols (plus signs) are overlaid one on the other, so many data points are obscured. This is a serious problem that needs to be fixed before publication. As drawn these figures are not acceptable. (The data symbols could be replaced by small dots so that the reader can see all the data.)

18. Figure 4. The numbers along the extinction axis do not line up with the tic marks in panels b and c. Must be fixed before publication.

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