

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.

Anonymous Referee #2

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This is an interesting paper, which, although of mainly technical character, is very suitable for publication in ACP. The topic is timely and important, because the paper contributes to the discussion about the comparability and possibility for combined analysis of extinction data sets derived from the satellite instruments SAGE II, SAGE III, and POAM III. The authors address in particular extinction data from these sensors for winter months in the Arctic. During winters with a cold stratosphere Polar Stratospheric Clouds (PSCs) form, which can be detected by the instruments. A central question, which the paper tries to answer, is whether SAGE III aerosol extinction data is strongly biased and possibly not suitable for the detailed analysis of PSCs.

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I recommend to publish this paper after clarifying some conceptual issues and some technical improvements.

A major difficulty which this reviewer has, is the deliberate exclusion of PSCs in the match criteria described on page 11365 and repeatedly referenced in the text. First, I expect that the criteria applied can not completely eliminate every PSC, which means that the data points “matched using the above criteria” actually can contain thin PSCs around their threshold temperature. Secondly, many conclusions are drawn explicitly on data fulfilling “the above criteria”, i.e. being (almost) free of PSCs, while at the same time the applicability of SAGE III data sets for PSC analysis shall be deduced. Therefore, I would appreciate, if the authors would analyse the effects, which their PSC removal criteria have. For example, the threshold temperature is altitude dependent, which means that a fixed value of 200 K has different effects in different altitudes. Also the extinction threshold of $4 \times 10^{-4} \text{ km}^{-1}$ is somewhat arbitrary and in between typical extinction values of PSCs. This needs to be discussed. The authors should state more clearly in the text, whether particular interpretations are drawn from the PSC-free data set or not (they correctly always mention it in the figure captions). In addition, they shall discuss whether the results drawn from the PSC-free data set are applicable for PSC analyses, this confers to conclusions drawn from pictures 7, 8, 10, 11, and 13.

Further issues:

The concept of using formula (2) for fig. 7, 8, 10, and 11 is unclear. While the r values given in the text are useful and rightly applied in fig. 9, 12, what is the connection to the plots 7, 8, 10, 11 ? This needs to be better explained or if not relevant here, the text should be rearranged so that formula 2 is discussed together with fig. 9 earliest.

The least square fits in figures 8, 11, and 13 are forced to pass through the origin (0,0). If this requirement would be dropped, it would be more clearer, that there is poor correlation at altitudes of 15 and 18 km.

Figures 8 and 11 show, that SAGE II extinction values at 1020nm and 452 nm are

effectively useless as a reference for comparing SAGE III and POAM III extinction data at altitudes of 15 to 18 km. Accordingly, I suggest to change the wording in the abstract (p11358, line 21, 22) to “ \checkmark data sets are not well correlated at and below 18 km.”

Following the above mentioned issues, also the conclusions should be partly re-written.

More technical aspects: In chapter 3, Comparisons: The meaning of PV units or equivalent latitude and its relevance for this analysis should be explained.

P 11363 line 14: should read “ \checkmark 1-nm wide NO₂ channels \checkmark ”

P 11365 line 5 : delete “a”

P 11367 line 8: should read “POAM III data also show \checkmark ”

P 11368 line 19: should read “ \checkmark a function of \checkmark ”

P 11369 line 15: I would write “On the other hand, at and below 18 km the correlation coefficient between \checkmark ” Line 16: must read POAM III not II Second last line “ \checkmark denotes either the \checkmark ”

Fig. 3: is this only north hemisphere data ? Please state in the captions and in the text, where the match criteria are presented.

Fig. Caption 10 refers to eq. (2) not (1)

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 11357, 2006.

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