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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Optical extinction by upper tropospheric/stratospheric aerosols and clouds: GOMOS observations for the period 2002–2008" *by* F. Vanhellemont et al.

Anonymous Referee #2

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General Comments

This paper is well written and does a nice job of highlighting pertinent features in the GOMOS aerosol record. This special section of ACP is an appropriate place for publication. As mentioned by the other referee, I would recommend that the premise of the paper be somewhat revised to focus on the new results that are presented, in particular the comparisons with SAGE II/III and POAM III, and the identification of perturbations from lower stratospheric eruptions in the time series.

Specific Comments

Several difficulties in the retrieval of aerosol extinction profiles are well explained in the

paper; however, some aspects could be addressed in more detail to give the reader some needed insight into how these difficulties impact the results. For example, the apparent trade-off between vertical smoothing and residual scintillation perturbations is clear, yet the choice of the 4 km smoothing criteria is not quantified. What is the magnitude of the scintillation error without smoothing, and is the residual reduced to a completely negligible quantity by the smoothing? Similarly, the noise at "other" wavelengths (what are they, by the way?) can certainly be understood by the lack of constraint in the spectral fit, but could this be quantified? Are errors derived as part of the retrieval and if so could they be shown on the profiles in Fig 2 and compared to the percentiles shown in the comparisons of Fig 3?

Could you please comment on the significance of star brightness and temperature for the 500 nm aerosol extinction retrieval?

In section 3.5, the cut-off altitude for 500 nm is discussed; does is not also depend on optical depth, i.e. volcanic plume or cloud in the line of sight? Again a quantification of the error would be helpful in understanding the choice of cut-off altitude. Why is the extinction negative below the volcanic plume shown in Fig 2? Is this within the error bar?

A statement is made regarding the "disappearance" of the residual scintillation in the zonal mean. I understand what the authors are alluding to, but this sentence should be reworded carefully as a smooth mean does not require that the perturbations have zero mean.

The comparison with SAGE II/III and POAM III is very useful. However, more details on the data set would be helpful. For example, how many profiles are compared in each case and what is the geographic distribution of the coincidences? It may be that the systematic shapes of the median profiles could be explained by the sampling. Is any effort made to match the vertical resolutions of the measurements for the comparison?

The statements made regarding the detection of stratospheric features with

CALIPSO/CALIOP should be revised in the light of the recent publication of Vernier et al., JGR, 2009. In fact, some discussion of these results would be pertinent to the volcanic aerosol section.

Fig 6: I cannot see the first vertical line, and would it be possible to show the entire data set rather than the subset of years that are shown?

Could the data set be extended into 2009 to show the effects of the relatively large eruptions of Mt Kasatochi (July 2008) and Sarychev Peak (June 2009)?

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 11109, 2010.