Atmos. Chem. Phys. Discuss., 8, S4160–S4162, 2008
www.atmos-chem-phys-discuss.net/8/S4160/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Statistical estimation of stratospheric particle size distributionby combining optical modelling and lidar scattering measurements" *by* J. Jumelet et al.

Anonymous Referee #2

Received and published: 26 June 2008

General comments:

The retrieval of the size distribution function of aerosols in the stratosphere and the determination of microphysical parameters from lidar signals is a very actual topic in nowadays. Most of the Raman lidar systems in networks have the possibility to measure at two or three wavelengths. They produce an enormous data base with those three backscatter profiles.

But for climate model it is more important to have microphysical properties such as total number concentration and single scattering albedo. Therefore, this work addresses a

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very important topic.

Moreover, the authors present a method to include lidar errors, a wavelength-dependent refractive index and statistical aspects into the retrieval procedure of the aerosol size distribution function. The new method is very interesting and very worth full. The abstract, introduction and summary are very fine. But the description of the methodology is poor and boringly. This section needs a major overhaul. After this revision the manuscript should be possible to publish.

Now some details:

Abstract: The authors should give a small explanation or at least a reference for the readers what a 1 sigma-filter is, which they apply to the solution cluster.

Page 8917, line 7: In the description what a regularization method is, it should be mentioned that regularization also includes lidar errors into the retrieval process. A regularization method consists of two parts, namely, of the regularization operator and of the regularization parameter choice rule. Those parameter choice rules include the noise level of the lidar errors and the noisy data itself, e.g. the discrepancy principle, or an estimation of it, e.g. GCV, see Mueller, 1999.

Using the two CRs additionally to the three BCs is a possible idea but it does not bring more additional information into the model since CR depends on BC.

A strong limitation of the presented method is that one needs to know in advanced if a monoor bi-modal distribution is present. Furthermore, a second drawback of this method is that it is assumed that no absorbing particles are present since only a real part of the refractive index is regarded. But absorbing particles can also occur in PSCs.

Page 8929, line 4-5: I am wondering that the retrieval of the surface-area and volume concentration is such bad since in Mueller et al and Boeckmann et al it was shown that those parameters are very stable to retrieve and the errors were not so large. But

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indeed it was also noticed in both references that the retrieval of N0 is very difficult and sensitive. Please cite these references concerning the matter.

Concerning the methodology I would suggest the following:

- First of all, it is not a well known standard method (I do not know a reference) how to calculate the errors in the backscatter coefficient profiles from lidar signals via e.g. Monte Carlo method as the authors suggest. Please describe your method.
- Please, give some references concerning the statistical estimation method.
- The final method should be summarize in an Algorithm:
  Step 1:
  Step 2:
  Step 3 and so on.
- Additionally, I feel it is urgently necessary to give an example in detail with synthetic data to describe the algorithm, to show how it works and to illustrate the method with some figures of the particular example. The reader must be able to recalculate this example. Otherwise, it is worthless for other readers.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 8913, 2008.

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