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Comment

Interactive comment on “Error budget analysis of SCIAMACHY limb ozone profile retrievals using the SCIATRAN model” by N. Rahpoe et al.

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Review of Rahpoe et al., “Error budget analysis of SCIAMACHY limb ozone profile retrievals using the SCIATRAN model”.

Bold: Referee’s Comments, Normal font: Author’s Reply

General Comments by Doug Degenstein

The main issue I have with the work is that it relies on only a handful of

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simulated retrievals to estimate the total error for typical ozone profiles inferred from SCIAMACHY measurements. The assumption that these case studies reflect typical behaviour has to be justified. Once this justification is presented the reader will be far more inclined to trust the presented analysis and use the results in their estimate of SCIAMACHY ozone errors. Hopefully the authors can add a section to the paper to justify this hypothesis, as the alternative is to do an exhaustive set of simulations that cover all possible viewing geometries and scene conditions for each of the potential error causing parameters.

In order to increase the number of profiles we use now 9 additional orbits of the year 2008, that increases the total number of profiles for the calculation up to 204 in the northern hemisphere and 137 profiles in the southern hemisphere. his extended dataset includes viewing geometries for 5 different days of the year, covering all seasons. This implies that the considered viewing geometries cover well the full range of possible SCIAMACHY viewing geometries.

Minor issues: I found the figures hard to read when the paper was printed to hard copy. They were complete and well done but as presented within the document they were quite small. Care must be taken with the final version. Section 3.1 needs more work. The correct parameter to vary is not albedo which is the fraction of light incident on the earth that is reflected back. The correct number is the absolute value of the radiation that is reflected. For instance if the solar zenith angle (SZA) is 89 degrees an albedo error of 0.1 will have far less impact on the total retrieval than the same albedo error if the SZA is close to zero degrees. This is because the absolute amount of upwelling radiation is vastly different for the two specific cases. Along a similar line of thought it is my opinion that the stratospheric aerosol analysis in Section 3.2 requires more detail. Viewing geometries with different single scatter angles will result

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in different retrieval errors for the same aerosol uncertainty. This is because the scattering phase function can be very different for different single scatter angles. This needs to be addressed within this section.

In section 3 only an example for a given scene has been used in order to make it as simple as possible for the reader (now Fig. 3 added as an overview for Albedo). For the calculation of the mean (See Tables and Fig. 6-9), additional profiles have been used with different SZAs. The figures have been updated. We also added a contour plot of the error distribution as a function of SZA altitude for a given scene, so to give a better overview for the reader. Moreover, we added Fig. 4 showing the latitudinal variation of SZA, solar azimuth angle and scattering angle for the four days. With the help of these plots, the latitude dependence of the stratospheric aerosol impact is easier to understand. A discussion of the related effects was added to section 3.2. We also agree with the reviewer that it would be interesting to use the amount of reflected radiation, rather than albedo, as a quantity to study the 'albedo effect'. However, this was omitted, because we believe that the results would be more difficult to interpret, compared to using surface albedo.

Line 5 on page 4649 – there is a typo in the word 'regularization'

Corrected

Concluding Remarks I think this is a very worthwhile paper but before I can accept it the authors must address my concerns. I was troubled by the lack of detail within the studies and I strongly feel that the assumption that a small set of case studies is representative of the whole must be justified. I also feel that the treatment of the albedo and the aerosol must be expanded in order

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to provide useful numbers to be used by the measurement and ozone data user communities. I have asked for major revisions but if my concerns can be addressed quickly and without much change to the paper I will also be happy to accept this outcome.

We would like to thank Dr. Degenstein for constructive contribution and suggestion to this paper, and we hope we have fulfilled their requirements and abandoned their concerns.

Please also note the supplement to this comment:

<http://www.atmos-meas-tech-discuss.net/6/C2346/2013/amtd-6-C2346-2013-supplement.pdf>

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