Atmos. Chem. Phys. Discuss., 4, S2778–S2781, 2004
www.atmos-chem-phys.org/acpd/4/S2778/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Total ozone retrieval from GOME UV spectral data using the weighting function DOAS approach" *by* M. Coldewey-Egbers et al.

M. Coldewey-Egbers et al.

Received and published: 1 December 2004

We thank Anonymous Referee 2 for his positive review and his comments.

Pg. 4919 (The scalar temperature shift parameter)
The scalar temperature shift parameter of the entire profile is mainly determined through the temperature dependence of the ozone cross-section. The temperature shift can be regarded as being representative for the ozone layer, where the influence of atmospheric temperature on the solar radiation is maximum.

Pg. 4920 (Polar view mode)
It is correct, that we used the pseudo-spherical approximation for the calculation of our

reference spectra. In addition, we took the viewing geometry (solar zenith angle, line-of-sight, and relative azimuth angle) from ground-level instead of top-of-atmosphere. De Beek et al., 2004, have shown, that this minimizes the slant column fit error even for large swath widths ($\pm$ 45°). It is about 1% using ground-level geometry, and it can reach up to 5% using top-of-atmosphere geometry. Therefore, ozone retrieval from GOME with WFDOAS is possible, even in the very special case of the polar view mode, but it is excluded from our analysis. We will add a comment in the manuscript.

Pg. 4921 (Fit window selection)
The boundaries of the fit window we selected were mainly determined by the correlation coefficient between ozone and temperature weighting function. It should be minimized which enables us to retrieve both, ozone and temperature, independently. The correlation depends on both, window width and start wavelength. The wider the window is, the smaller is the correlation. On the other hand, the residual decreases using smaller fit windows, but ozone and temperature then highly correlate. Towards larger wavelengths the temperature dependence of the cross sections increases, but ozone absorption gets smaller. The balance between the various requirements lead to the current choice of the fitting window.

Pg. 4921 (TOMS V7 vs. TOMS V8)
For the calculation of our reference and Ring spectra, we used the TOMS V7 ozone climatology, which depends on total ozone for three latitude belts. Only for the estimation of the ghost vertical column we used the TOMS V8 monthly and zonal mean climatology, which has been created using monthly and 10 degree wide latitude band means. A monthly mean climatology is a much better representaion of the troposphere, since biomass burning and enhanced pollution events are generally seasonal dependent and to a large extent independent of the stratospheric variability. We did not use the alternative total ozone dependent TOMS V8 climatology, that is an update of the TOMS V7 climatology.

Pg. 4922 (Fractional cloud weighting)

ACPD

4, S2778–S2781, 2004

The reviewer refers to the approach used in air mass factor calculation for determining vertical columns in a standard DOAS approach. The cloud fraction that is used in weighting the clear-sky and cloud airmass factor is in addition weighted by the radiance intensity. Based upon some simulated radiative transfer calculation the differences in the calculated airmass factors using different weighting schemes are well below 1% in most cases.

Pg. 4923 (Ring correction for LER retrieval)
From a set of 32 Ring spectra, which were calculated for a fixed atmospheric scenario but varying solar zenith angle, that wavelength has been selected, where variation due to the solar zenith angle was very small ($\approx$377.6 nm). The variation for that single wavelength with solar zenith angle was expressed by a polynomial (4th degree). This polynomial is then used to correct the precalculated radiances (without the Ring effect) for the LER retrieval. The corrections are between 0.3% for nadir and 0.8% for 90° solar zenith angle.

Pg. 4924 (Find the nearest neighbor Ring spectrum)
We will formulate this more clearly. The Ring spectra do depend on sza, ozone, albedo, altitude, and latitude, but not on line-of-sight and azimuth angle, in contrast to the reference spectra.

Pg. 4928 (Aerosols)
Aerosols are excluded from the calculation of the reference data base, since they are accounted for to first order by using the effective reflectivity. However, as mentioned in the paper larger errors may occur in cases of UV absorbing aerosols.

Pg. 4930 (Figure 8 already in section 5)
In the revised version of the manuscript, we will show Figures 7, and 8, and the accompanying discussion already in an additional Section called 'Comparison with version 3 and ground data'

All minor points and typos are corrected.

ACPD
4, S2778–S2781, 2004

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 4915, 2004.