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Interactive Comment

Interactive comment on "Improved ozone profile retrievals from GOME data with degradation correction in reflectance" *by* X. Liu et al.

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This paper presents a simple degradation correction of UV nadir spectral measurements from GOME and their impact on the GOME ozone profile retrieval. One major advantage of their correction scheme (ratioing spectral reflectivities averaged over large area on the globe to an early reference period) is that it does not require a-priori assumptions, radiative transfer calculations, and the use of an ozone climatology to estimate the expected albedo. A major disadavantage may be that that changes in atmospheric conditions (for instance, cloud cover or ozone) with time may introduce spurious trends in these ratios (see last paragraph in Section 2). Also, there is considerable inter-annual atmospheric variability, particularly for ozone at high latitudes, that may affect the results. Probably, a restriction to tropical latitudes (less ozone variability) or icy surfaces (reduced impact from clouds) for determining the ratios may work better.

In an earlier paper by us (Bramstedt et al., 2003), where we compared total ozone derived from our profile retrieval (as described in Hoogen et al. (1998)) with TOMS, GOME total columns (derived from 325-335 nm), and many Dobson stations, we found that the total column from profile retrieval appears to be rather insensitive to changes in the calibration (see also the total ozone comparison in Fig. 6 of Liu et al.), however, individual altitude layers are more strongly affected. As the averaging kernels show oscillatory behaviour with altitude, modification in certain altitudes, for instance due to degradation correction, lead to corresponding changes in other altitudes with opposite signs that reduces the impact on the integrated column. This effect is visible in Figs. 3,5, and 7 of Liu et al. For the comparison of the retrieval with and without degradation and with Hohenpeissenberg data, I suggest to add comparisons for individual stratospheric layers (for instance, 9 km wide layers, from 10 km to the burst height of ozone sondes at about 27 km or higher) in Figs. 2, 4, and, in particular, Fig. 6. This way one can better demonstrate how the wavelength dependent degradation correction possibly improves all altitude levels. Using lidar data from Hohenpeissenberg one could even extend the comparisons to higher altitudes.

References: Bramstedt et al., K. Bramstedt, J. Gleason, D. Loyola, W. Thomas, A. Bracher, M. Weber, and J. P. Burrows, Comparison of total ozone from the satellite instruments GOME and TOMS with measurements from the Dobson network 1996-2000, Atmospheric Chemistry and Physics 3, 1409-1419, 2003.

Some specifics:

p. 8286 line 26: Here appears to be a mix-up of two different effects on the cause of the degradation. The etalon effect is mainly related to the ice layer on the detector. The etalon patterns (sinusoidal spectral features) normally change (mainly their phase) after cooler switching of the detectors, when the detectors have been warmed to above

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freezing point. This occured frequently throughout the lifetime of GOME. The actual degradation (lost and gain in intensity) with time is associated with contaminants that fill voids in the MgF2 coating of the scan mirror (Snell, 2000). Those contaminants, which could be water or any other material that has different refractive properties than the coating and Al, are believed to be responsible for the wavelength dependent degradation. They are also believed to produce the observed scan angle dependence in the degradation as discussed by Snell (2000).

references: Snell, In-orbit optical path degradation: GOME experience and SCIAMACHY prediction, ERS Envisat Symposium, SP-461, Gothenburg, Sweden, 2000.

p. 8290, line 9: How is the tropospheric column defined here? A brief description and a reference to one of the authors' earlier paper would be helpful.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 8285, 2006.

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