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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieval of tropospheric NO_2 using the MAX-DOAS method combined with relative intensity measurements for aerosol correction" *by* T. Vlemmix et al.

Anonymous Referee #1

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Manuscript no. AMTD-3-2317-2010 Authors: T. Vlemmix, A.J.M. Piters, P. Stammes, P. Wang and P.F. Levelt Title: Retrieval of tropospheric NO2 using the MAXDOAS method combined with relative intensity measurements for aerosol correction

General comments

The MAXDOAS technique is a new and promising development in the area of atmospheric passive remote-sensing applications, with great potential for unattended monitoring of tropospheric pollutants and satellite validation. This paper proposes a new approach to retrieve in a simple and accurate way tropospheric NO2 columns and AOD from a combination of relative intensities and MAXDOAS measurements. The

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strength of the approach relies on that several angles are used to conclude on an error estimate of the retrieved quantities. Also the presence of interfering clouds can be inferred from the observations. The method is clearly described and illustrated on a few sample days. Observations performed in De Bilt during one year are compared with satellite NO2 column measurements from the OMI instrument, and the AOT retrievals are validated against a CIMEL photometer belonging to the AERONET network. The method proposed here is original and the manuscript very well written. These results clearly fit into the focus of AMT and are of great interest to the atmospheric chemistry remote-sensing scientific community.

I definitely recommend publication in AMT after attention to the comments given below.

Specific comments

The sensitivity study performed and illustrated e.g. in Table 1 demonstrates that the main source of uncertainty on the NO2 column retrieval is related to the boundary layer height. Why not including this as an additional free parameter in the look up table? One may easily think of a modified retrieval algorithm where the BLH could be iteratively optimized until best agreement between columns retrieved from the 3 angles is achieved. Is there a technical limitation to this approach, please comment on this possibility.

P. 2325, L. 16: Note that the approach of subtracting the signal from the blind pixels below the ozone cut-off not only correct for the read-out offset, but also for the dark current itself, which added to the fact that integration time for individual acquisitions is generally small (of the order of 1 sec or less) probably explains that a specific dark current correction is not necessary.

P. 2326, L. 10: why not interpolating zenith-sky measurements at the time of the off-axis measurements. In particular for near-twilight measurements, this would allow for some compensation of the fast changing light path and possibly photochemical state.

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P. 2328, L. 8: Is the earth curvature really the limiting factor here? I would expect that the assumption of homogeneity in the BL is maybe causing a larger problem than earth curvature for low elevations.

P. 2334, L. 16: It is correct that intensity measurements are weakly sensitive to changes in the BLH (this is clear from table 1), however it should be mentioned that intensities are in contrast very sensitive to the presence of clouds. In fact more than O4 observations.

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