Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union








Atmos. Chem. Phys., 6, 3049-3058, 2006
www.atmos-chem-phys.net/6/3049/2006/


# $NO_2$ Profile retrieval using airborne multi axis UV-visible skylight absorption measurements over central Europe

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Abstract. A recent development in ground-based remote sensing of atmospheric constituents by UV/visible absorption measurements of scattered light is the simultaneous use of several directions with small elevation angles in addition to the traditional zenith-sky pointing. The different light paths through the atmosphere enable the vertical distribution of some atmospheric absorbers such as $NO_2$, BrO or $O_3$ to be retrieved.

In this study, the amount of profile information that can be retrieved from such measurements on aircraft is investigated for the trace gas $NO_2$. A Sensitivity study on synthetic data is performed for a combination of four lines of sight (LOS) (0°(nadir), 88°, 92°, and 180° (zenith)) and three wavelength regions [center wavelengths: 362.5 nm, 437.5 nm, and 485.0 nm]. The method used in this work is a combination of two previously established methods described in Petritoli et al. (2002) and Wang et al. (2004). The investigation presented here demonstrates the potential of this LOS/wavelengths setup to retrieve a significant amount of profile information from airborne multiax is differential optical absorption spectrometer (AMAXDOAS) measurements with a vertical resolution of 3.0 to 4.5 km in the lower troposphere and 2.0 to 3.5 km near flight altitude. Above 13 km the profile information content of AMAXDOAS measurements is sparse. The retrieval algorithm used in this work is the AMAXDOAS profile retrievalalgorithm (APROVAL).

Further, retrieved profiles with a significant amount (up to 3.2 ppbv) of $NO_2$ in the boundary layer over the Po-valley (Italy) are presented. Airborne multiaxis measurements are thus a promising tool for atmospheric studies in the troposphere.

Final Revised Paper (PDF, 1238 KB) Discussion Paper (ACPD)

Citation: Bruns, M., Buehler, S. A., Burrows, J. P., Richter, A., Rozanov, A., Wang, P., Heue, K. P., Platt, U., Pundt, I., and Wagner, T.: $NO_2$ Profile retrieval using airborne multi axis UV-visible skylight absorption measurements over central Europe, Atmos. Chem. Phys., 6, 3049-3058, 2006. Bibtex EndNote Reference Manager