Geophysical Research Abstracts, Vol. 7, 07775, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07775
© European Geosciences Union 2005

Inverse modelling of Multi-Axis DOAS measurements: a new technique to derive information on atmospheric aerosols

U. Friess (1), T. Wagner (2), P.S. Monks (1), J.J. Remedios (1), R. Sinreich (2), and U. Platt (2)

(1) Space Research Centre, University of Leicester, U.K., (2) Institute for Environmental Physics, University of Heidelberg, Germany

A new method for the continuous monitoring of atmospheric aerosol properties will be presented, which allows for the first time to derive substantial information on the aerosol extinction profile by passive remote sensing. While established passive remote sensing techniques using Sky photometers only provide the total optical depth, information on the aerosol vertical distribution is derived from measurements of the optical depth of the oxygen dimer (O_4) in addition to the (relative) intensity of diffuse skylight at different viewing directions and wavelengths by Multi- AXis Differential Optical Absorption Spectroscopy (MAX-DOAS). Using a newly developed retrieval algorithm based on optimal estimation, the capability of MAX-DOAS measurements to derive the extinction profile, phase function and single scattering albedo of atmospheric aerosols will be demonstrated. The information content, vertical resolution and retrieval errors under various atmospheric conditions will be discussed, including recommendations for the optimal instrument setup. The results of these model studies suggest that the accuracy of MAX-DOAS observations of the aerosol total optical depth is comparable with measurements from the AERONET network. Moreover, MAX-DOAS measurements contain substantial information on the vertical distribution of aerosols, are not restricted to clear sky conditions, and can be performed with a relatively simple, robust and self-calibrating instrumentation. The retrieval algorithm can be easily adapted to retrieve the vertical profile of various tropospheric trace gases (such as NO_2, HCHO, BrO and IO) from MAX-DOAS measurements.