# O3-05 INVERSE MODELLING OF MULTI-AXIS DOAS MEASUREMENTS: A NEW TECHNIQUE TO DERIVE INFORMATION ON ATMOSPHERIC AEROSOLS

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A retrieval algorithm for the determination of aerosol properties using Multi-AXis Differential Optical Absorption Spectroscopy (MAX-DOAS) measurements based on non-linear optimal estimation is presented. By observing scattered sunlight from different elevation angles, MAX-DOAS measurements are very sensitive to trace gases located close to the surface and contain information on the vertical profile of various tropospheric trace gases, such as $NO_2$, HCHO, BrO and IO. However, the interpretation of MAX-DOAS measurements requires the accurate simulation of the radiative transfer through the atmosphere, which depends strongly on the amount and optical properties of aerosols present in the light path.

Based on simulated MAX-DOAS measurements of the optical depth of the oxygen dimer $O_4$ as well as on the variation of the intensity of diffuse skylight measured at different viewing directions and wavelengths, the capability of this measurement technique to derive the aerosol extinction profile as well as information on the phase function and single scattering albedo will be demonstrated. The information content, vertical resolution and retrieval errors under various atmospheric conditions will be discussed. Furthermore, it will be demonstrated how a smooth variation of the aerosol properties between successive measurements can be used to improve the quality of the retrieval by applying a Kalman smoother.

The results of this model study suggest that the accuracy of MAX-DOAS measurements of the aerosol total optical depth is comparable with established methods of aerosol detection by Sun photometers (e.g. within the AERONET network) over a wide range of atmospheric conditions. Moreover, MAX-DOAS measurements contain information on the vertical profile of the aerosol extinction, and can be performed with a relatively simple, robust and self-calibrating instrumentation.