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First application of a newly developed algorithm for the retrieval of aerosol optical properties in the lower troposphere from MAX-DOAS measurements

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Changes in the concentration and composition of atmospheric aerosol strongly influence the energy balance of the climate system. Aerosol can scatter and absorb sun light hereby altering the Earth's radiation budget resulting in climate change. In a more indirect way, aerosol influence climate as they affect cloud formation, composition, and precipitation. Additionally, aerosol affect the air quality and the health of people and ecosystems.

In order to better understand the climatic and environmental effects of aerosol, retrieval techniques are needed to determine their concentration, their vertical distribution, and to characterize their optical properties as well. Recently it has been shown that ground-based MAX-DOAS observations in the UV-VIS spectral range contain information on aerosol optical properties.

We will present a fully automated algorithm to retrieve aerosol vertical profiles from measurements of differential absorption structures of O4 for different geometrical configurations and wavelength intervals in combination with measurements of the intensities of the scattered and direct-sun light. The measurements are made using a state-of-the-art MAX-DOAS instrument. The optimal estimation method is used for the inversion step, and the forward model is the linearized discrete ordinate radiative transfer model (LIDORT). One major advantage of this code is that it includes an analytical calculation of the weighting functions needed for the inversion step.

Results from recent observations performed in Belgium nearby Brussels are presented. Strengths and limitations of the retrieval algorithm and the information content of the MAX-DOAS measurements will be discussed.