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MAX-DOAS aerosol retrievals with the aid of co-located lidar profiles and comparisons with aerosol optical depth from Brewer spectrophotometer and CIMEL sun photometer

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During the last decade, the Multi-AXis Differential Optical Absorption Spectroscopy (MAX-DOAS) technique has been increasingly used for the retrieval of aerosol and trace gases vertical distribution in the troposphere and a number of MAX-DOAS inversion algorithms have been developed. MAX-DOAS aerosol profiles are retrieved for the first time in Thessaloniki, Greece, a European city characterized by high levels of particulate air pollution. A mini MAX-DOAS system (Phaethon) is operating since 2011 at the Laboratory of Atmospheric Physics (LAP), located at the roof of the Physics department of Aristotle University in the city center. O4 differential Slant Column Densities (dSCDs) derived from MAX-DOAS UV spectra obtained at several elevation and azimuth viewing angles are analyzed with the optimal estimation by means of the bePRO profiling tool (BIRA-IASB). The importance of the a priori aerosol profile shape is investigated by using climatology as well as daily extinction profiles from the co-located raman lidar system, operating since 2000 as part of the European Aerosol Research Lidar Network (EARLINET). The resulted aerosol extinction profiles from the MAX-DOAS system are compared with close-in-time aerosol distributions from lidar. Moreover, the aerosol optical depth (AOD) derived from MAX-DOAS O4 observations is compared with AOD products from three co-located instruments; a double-monochromator Brewer spectrophotometer, a CIMEL sun photometer and the raman lidar system.