

Aerosols Characterization combining Automatic Two-wavelength Polarization Lidar and Sun/Sky/Moon Photometer

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The automatic CIMEL CE376 micro-pulse lidar with measurements at 532 nm and 808 nm, depolarization at 532 nm, coupled with CIMEL CE318-T sun/sky/moon photometers providing spectral Aerosol Optical Depth (AOD) are integrated for monitoring aerosols properties. Algorithmic and instrumental assessments took place at ATOLL (ATmospheric Observatory of liLLe) platform operated by Laboratoire d’Optique Atmosphérique, University of Lille. METIS, an operational CE376 lidar collocated with CE318-T photometers and with LILAS multi-wavelength Raman lidar, part of ACTRIS (European atmospheric infrastructure) are considered for this study. Thus, a modified AOD constrained lidar inversion algorithm has been adapted for simultaneous two-wavelength elastic lidar observations from METIS. For validation of aerosols optical properties retrieved, intercomparisons with METIS-LILAS were performed, showing presented good agreements between both systems with reasonable differences on the depolarization measurements. Measurements during events of Saharan dust and Biomass Burning aerosols transported over Lille in 2022 were selected for aerosols characterization. We were able to retrieve height resolved profiles of aerosols optical properties that provided us the capacity to qualitatively characterize aerosols size and shape under the different scenarios. Moreover, to enhance the capabilities on aerosols characterization from the synergetic measurements, ongoing work involve the application of more elaborated joint retrieval (GRASP-GARRLIC) combining spectral AOD and downward sky radiance from CE318-T photometer and measurements from the 2-wavelength CE376 lidar.

Keywords: aerosol, micro-pulse lidar, synergy lidar-photometer