TEMPORAL VARIABILITY of the AEROSOL OPTICAL PROPERTIES USING a CIMEL SUN/LUNAR PHOTOMETER OVER THESSALONIKI, GREECE: SYNERGY with the UPGRADED THELISYS LIDAR SYSTEM

***K. Michailidis**[(1)], K-A. Voudouri[(1)], N. Siomos[(1,2)] and D. S. Balis[(1)]*

[(1)] *Laboratory of Atmospheric Physics, Physics Department, AUTH, Greece*, komichai@physics.auth.gr

[(2)] *Meteorological Institute, Ludwig Maximilian Universität München, LMU, Munich, Germany*

Thessaloniki station (40.63°N, 22.96°E; 60 m a.s.l.), member of ACTRIS, is a crossroads of long-range-transported pollution with complex nature, consisting of both natural and anthropogenic constituents, (Siomos et al., 2018). The background aerosol load, is mostly characterized of urban, traffic-related particles and marine aerosols. Among other atmospheric research instruments, the station operates a multispectral Raman/Depolarization lidar system and a Cimel sun-lunar photometer. Both instruments have been upgraded during 2019, in the frame of PANACEA, which is part of the Greek National Research Infrastructure for aerosol research, under the umbrella of the European Strategy Forum on Research Infrastructures (ESFRI). The two instruments represent two individual networks, the European Lidar Aerosol Network (EARLINET) and the Aerosol Robotic Network (AERONET) following different measurement schedules. Thessaloniki lidar system (THELISYS; Raymetrics LR321-D400), part of the EARLINET, has been recently upgraded regarding its operational wavelengths and the detection configuration. Commissioning of the upgraded system operation started in October 2021. The current setup of THELISYS consists of three elastic channels at 355, 532, and 1064nm and two night-time only Raman channels at 387nm and 607nm. The linear depolarization ratio at 532 nm is derived from the cross- and co-polarized (with respect to the polarization plane of the emitted laser radiation) signals, which allows the determination of the linear volume depolarization ratio (VLDR) and linear particle depolarization ratio (PLDR) at 532nm. Lidar measurements follow the EARLINET schedule (Pappalardo et al. 2014). In addition, we demonstrate the new sun-lunar photometer (CE-318T), capable to perform a complete cycle of diurnal photometric measurements at both day and nighttime. The new improvements of this new device permit this new photometer version to extend the photometric information at nighttime using the moon as a light source. The main objective of this study is to assess the lidar-derived aerosol columnar optical properties (i.e., Aerosol oprical depth, Angstrom exponent) along with the new well established sun-sky-lunar photometric measurements. Therefore, quality assured cases in cloudy free conditions are selected to demonstrate the synergstic performance of the lidar and the lunar photometer (Barreto et al. 2014). Timeseries of the AOD measured by Lidar and sun/lunar photometer will provide a long-term aerosol monitoring for the investigation of the amount, sources and atmospheric processes over Thessaloniki.

Barreto, Á., et al.: The new sun-sky-lunar Cimel CE318-T multiband photometer – a comprehensive performance evaluation, Atmos. Meas. Tech., 9, 631–654, https://doi.org/10.5194/amt-9-631-2016, 2016.

Pappalardo, G., et al.: EARLINET: towards an advanced sustainable European aerosol lidar network, Atmos. Meas. Tech., 7, 2389–2409, doi:10.5194/amt-7-2389-2014, 2014

Siomos, N., et al..: Are EARLINET and AERONET climatologies consistent? The case of Thessaloniki, Greece, Atmos. Chem. Phys., 18, 11885–11903, https://doi.org/10.5194/acp-18-11885-2018, 2018.