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Continuous measurements of PM at ground level over an industrial area of Evia (Greece) using synergy of a scanning Lidar system and in situ sensors during TAMEX campaign

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During the TAMEX (Tamyneon Air pollution Mini EXperiment) field Campaign, which took place in the industrial site of Aliveri (38^o,24'N, 24o 01'E), Evia (Greece) between June 25 and September 25, 2008, continuous measurements of airborne particulate matter (PM) were performed by *in situ* sensors at ground level. Additional aerosol measurements were performed by a single-wavelength (355 nm) eye-safe scanning lidar, operating in the Range-Height Indicator (RHI) mode between July 22 and 23, 2008.

The industrial site of the city of Aliveri is located south-east of the city area at distance of about 2.5 km. The *in situ* aerosol sampling site was located at the Lykeio area at 62 m above sea level (ASL) and at a distance of 2,8 km from the Public Power Corporation complex area (DEI Corporation) and 3,3 km from a large cement industrial complex owned by Hercules/Lafarge SA Group of Companies (HLGC) and located at Milaki area. According to the European Environment Agency (EEA) report for the year 2004, this industry emits about 302 tons per year of PM_{10}, 967,000 tons of CO_2, 16700 tons of SO_x and 1410 tons of NO_x while the second industrial complex (HLGC) emits about 179 tons per year of PM_{10}, 1890 tons of CO, 1,430,000 tons of CO_2, 3510 tons of NOx, 15.4 Kg of cadmium and its compounds, 64.2 kg of mercury and its compounds and 2.2 tons of benzene.

The measuring site was equipped with a full meteorological station (Davis Inc., USA), and 3 aerosol samplers: two Dust Track optical sensors from TSI Inc. (USA) and 1 Skypost PM sequential atmospheric particulate matter. The Dust Track sensors monitored the PM_{10}, $PM_{2.5}$ and $PM_{1.0}$ concentration levels, with time resolution ranging from 1 to 3 minutes, while a Tecora sensor was taking continuous PM monitoring by the sampling method on 47 mm diameter filter membrane. The analysis of the PM sensors showed that, systematically, during nighttime large quantities of $PM_{2.5}$ particles were detected (e.g. exceeding 50 ug/m^3). During daytime, the strong local winds were diffusing the emitted particles to large distances, therefore the ambient PM concentrations were quite low ($<$20 ug/m^3).

The Raymetrics eye-safe scanning lidar is a fully automated 3D lidar system equipped with a 200 mm diameter telescope which can work 24-hours per day, outdoor, under unattended operation under almost any weather condition. The single-wavelength (355 nm) lidar, operating in the RHI mode is able to perform volume scanning of the atmosphere, both in the RHI and Plan-Position-Indicator (PPI) scanning modes. The RHI scans revealed the presence of large quantities of dust over the industrial complex HLGC, which were largely diffused at ranges of several km depending on the prevailing wind conditions. According to the lidar measurements large quantities of aerosols were found at heights of more than several hundred meters ASL. The DEI complex provided less quantities of aerosols than the HLGC, which were mainly found at ranges around 2-3 km around the complex. At greater distances these emissions were largely diffused as well.

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