

Title:**Mobile measurements of PM mass and number concentrations and black carbon in the Greater Athens Area****Authors & affiliations:**

E. Diapouli¹, S. Vratolis¹, V. Vasilatou¹, M. Gini¹, A. Tsakis², L. Chasapidis², F. Akritidis², A. Konstantopoulos², K. Eleftheriadis¹

¹ *Institute of Nuclear Technology and Radiation Protection, Environmental Radioactivity Laboratory, National Centre of Scientific Research "Demokritos", 15310 Ag. Paraskevi, Attiki, Greece*

² *Chemical Process Engineering Research Institute, Laboratory of Aerosol and Particle Technology, Centre for Research & Technology Hellas, 57001 Thessaloniki, Greece*

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

The city of Athens has been known to face air pollution problems over the last decades, with frequent exceedances of the daily PM₁₀ air quality standard in certain stations (Aleksandropoulou et al., 2012). This work presents a survey of the particulate matter (PM) concentrations across the Greater Athens Area (GAA), through mobile measurements. The objectives are to examine the spatial distribution of PM, to evaluate the effectiveness of the National Monitoring Network in characterizing the Athens city population exposure and to identify potential local sources contributing to the very high levels observed in a number of areas.

The measurements were conducted during warm and cold period of 2011 – 2012 (two weeks for each season), by the use of a monitoring vehicle (Mobilab). The parameters measured were: particle size distribution (SMPS, OPC), PM₁₀ and PM_{2.5} mass concentration (photometer) and black carbon (portable aethalometer). In addition, a GPS system was constantly monitoring the vehicle's exact position over time. Mobile measurements were performed during the day, in areas of different traffic density and urbanization characteristics. During the night fixed measurements were performed in selected locations. During these night-time measurements, 12-hr gravimetric samples were also collected by MOUDI impactor.

The results indicate significant variability in PM concentrations and black carbon (BC) across the GAA. Mean PM₁₀ concentrations measured by Mobilab at the different areas of the city were in general comparable to the levels reported by the corresponding stations of the National Monitoring Network (Figure 1). Particle number and black carbon concentrations were found elevated in high-traffic areas, especially during day-time (Figures 2, 3). Mean particle number concentrations across the different areas were in the range $2 - 12 \cdot 10^4 / \text{cm}^3$ during day and $0.6 - 3.0 \cdot 10^4 / \text{cm}^3$ during night. The corresponding range of BC concentrations was $1.4 - 7.0 \mu\text{g}/\text{m}^3$ and $0.5 - 3.5 \mu\text{g}/\text{m}^3$, respectively.

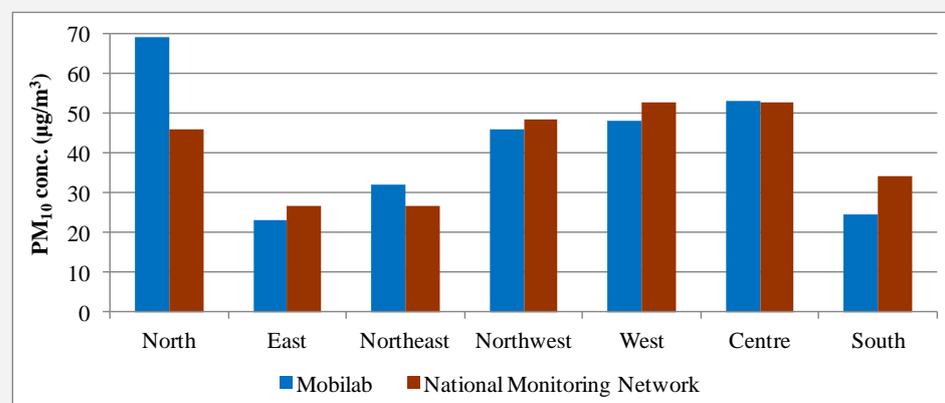


Figure 1. Mean day-time PM₁₀ concentrations measured by Mobilab, compared to the levels reported by the respective stations of the National Monitoring Network.

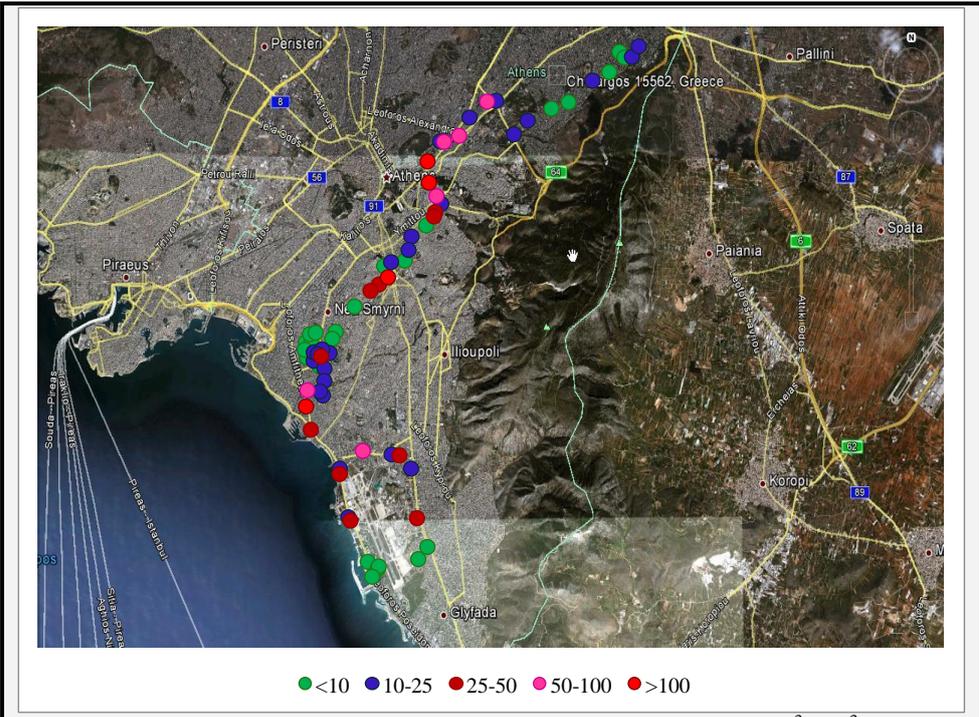


Figure 2. Variation of 2-min averages of total number concentration ($10^3 / \text{cm}^3$) during a 4-hr drive (12-9-2011, 16:00 – 20:00).

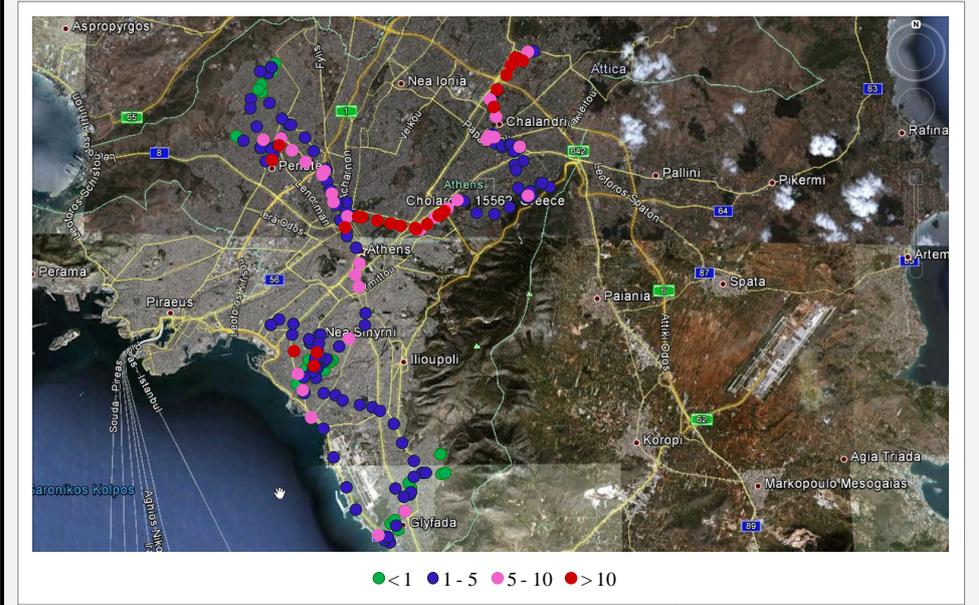


Figure 3. Variation of 2-min averages of black carbon ($\mu\text{g}/\text{m}^3$) during a 9-hr drive (23-9-2011, 8:00 – 17:00).

Keywords: Mobile measurements, $\text{PM}_{10}/\text{PM}_{2.5}$, particle number size distribution, black carbon

References

Aleksandropoulou V., Eleftheriadis K., Diapouli E., Torseth K, Lazaridis M. (2012), “Assessing PM_{10} source reduction in urban agglomerations for air quality compliance”, *Journal of Environmental Monitoring*, 14, 266-278.