# Assessment of Aerosol Emission Sources in a Traffic Site Combining On-line and Off-line Measurements

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Keywords: Particulate Matter, urban area, PMF, source apportionment
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## Introduction

In urban areas evidences from epidemiological and experimental studies show that traffic-related air pollution has adverse effects on respiratory and cardiovascular systems. Urban air pollution accounts for 3% of mortality from cardiopulmonary disease and 1% of mortality from acute respiratory infections in children under 5 years, worldwide (Cohen et al., 2005). Therefore, disease and mortality associated with vehicle emissions represent a substantial challenge in public health.

Source apportionment, using receptor models, is an essential tool to support the implementation of the European and Member States legislation on air quality and principally to reduce the impact of exposure to Air Particulate Matter (PM) on human health.

This work was developed in the framework of the Interreg Med project REMEDIO and aims to assess the aerosol emission sources in an urban traffic site, located in the outskirts of Lisbon, combining on-line and off-line measurements.

## Methods

$PM_{10}$ and $PM_{2.5}$ were collected in a sampling campaign conducted in the urban centre of Moscavide (North of Lisbon, Portugal). The filters were analysed by XRF for the determination of element concentrations. Simultaneously, online measurements of black carbon and total carbon were performed with an Aethalometer AE33 and with the recently developed TCA08.

With the purpose of characterising ambient aerosols and assess the contribution of the main emission sources and processes leading to aerosol formation in the atmosphere, source apportionment was performed by applying the Positive Matrix Factorization (PMF) model (Paatero & Tapper, 1994). PMF allowed the identification and the quantification of the contributions to the aerosol from different sources.

## Conclusions

Figure 1 shows that $PM_{10}$ and $PM_{2.5}$ daily levels exceed the guidelines stablished by the World Health Organization (50 and 25 $\mu g.m^{-3}$ for the 24-hour mean of $PM_{10}$ and $PM_{2.5}$, respectively). This indicates that mitigation measures should be implemented in the studied area in order to protect the population health.

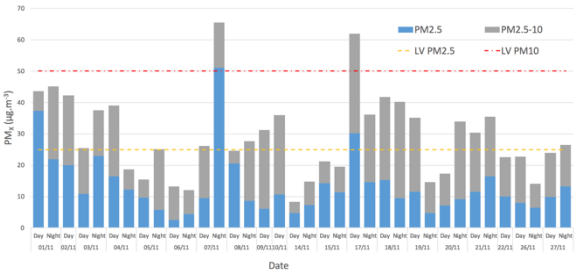


Figure 1. Particulate Matter ($PM_{10}$ and $PM_{2.5}$) daily variation in Moscavide.

Source apportionment using PMF was used to investigate local and regional pollution events, with data from chemical characterisation of particles. Separation of contributions to BC from different combustion sources was based on the dependence of absorption on the wavelength, using the Aethalometer Model (Sandradewi, 2008).

This work was supported by Life Program - Life Index Air project, Interreg Med - REMEDIO project and Cost Action - CA16109 COLOSSAL.

A.J. Cohen, H. Ross Anderson, B. Ostro, K.D. Pandey, M. Krzyzanowski, N. Kunzli et al. (2005). The global burden of disease due to outdoor air pollution. Journal of Toxicology and Environmental Health A., 68 (13-14), 1301–7.

Paatero, P., Tapper, U. (1994). *Environmetrics*, 5, 111-126.

Sandradewi, J., Prévôt, A.S.H., Szidat, S., Perron, N., Alfarra, M.A., Lanz, V.A., Weingartner, E., Baltensperger, U. (2008). *Environ. Sci. Technol.*, 42, 3316-3323.