

PM trends, chemical composition and source apportionment of particulate matter in Mediterranean countries: Results from the Med-Particles project

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The Mediterranean Basin, (MB) is characterised an air pollution hotspot, located at a crossroad of air masses coming from Europe, Asia and Africa (Lelieveld et al., 2002). Pollution in the area results from traffic and industrial sources and domestic heating. Dust storms coming mainly from the Sahara desert and to a lesser extent from the Middle East, transport high quantities of mineral aerosols increasing significantly the levels of particulate matter (Pey et al., 2013). Forest fires and agricultural burning emissions are also affecting the area. Moreover, marine aerosols and ship emissions are considered to be an important contributor to the MB aerosol burden. The large variety of aerosol sources coupled with the complex orography and atmospheric dynamics gives rise to a complex mixture of gaseous and particulate matter (PM) pollutants that merits further investigation.

In the framework of the Med-Particles project (<http://www.epidemiologia.lazio.it/medparticles/index.php/en/>). Ambient concentrations of PM_{2.5}, PM₁₀, gaseous pollutants and also chemical components were collected from traffic and urban background sites in MB countries: Spain (Barcelona, Madrid, Huelva), France (Marseille), Italy (Rome, Turin, Bologna, Milan) and Greece (Athens, Thessaloniki) for the period 2001-2010. The objective of Med-Particles is to investigate the health effects of long-term exposure to ambient air pollution in the Mediterranean Basin. Specific emission sources will be investigated in order to assess the health effects in the MB and point out any differences between North and South Europe.

Firstly the air quality of the MB and the pollution sources were investigated. The long-term trends of PM₁₀ and PM_{2.5} show a decreasing trend for all the traffic sites in the MB despite the important variability of the concentration values, Figure 1 (Carslaw and Ropkins 2011). This decreasing trend could be attributed to the effectiveness of the vehicular emission control strategies that have been implemented in Europe and the improvement in motor engine characteristics. Again the role of economic crisis in the region should be taken into account as traffic intensity has been reduced due to the increase of fuel price.

Source apportionment by PMF provided 6 common sources for PM_{2.5} and PM₁₀, namely, local dust, secondary aerosol, mobile source, biomass burning, coal combustion, and minor industrial emission. Among these sources, the mineral source (road dust and soil) is the major contributor to PM₁₀, up to 40% of its mass concentration, while for fine particles traffic and secondary aerosol are the main sources contributing 25% and 30% correspondingly to the PM_{2.5} mass concentrations. Regarding the background sites, crustal particles are the dominant constituent.

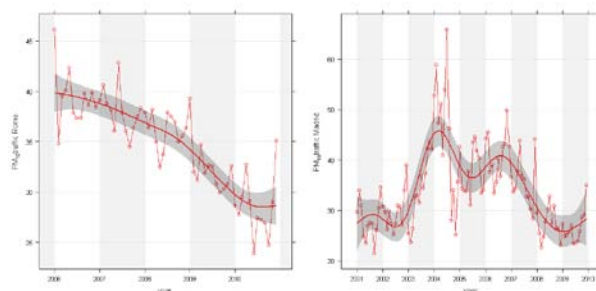


Figure 1. PM₁₀ trend analysis in representative traffic sites in Rome and Madrid

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