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Levels and composition of PM in Spain (1999-2007)

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This presentation summarises the results of measurements and PM speciation studies performed at 37 monitoring sites (at least on an annual basis, but in some cases with 8 years for speciation and 12 years for measurements) across Spain are summarised. Data on PM levels, speciation, levels of around 40 trace elements, and source apportionment are presented. Average levels of PM_{10}, $PM_{2.5}$ and PM_1 and chemical composition in Spain show significant variations across the country, with current PM_{10} levels at several industrial and traffic hotspots exceeding recommended pollution limits. Such variations and exceedances are linked to patterns of anthropogenic and natural PM emissions, climate, and reactivity/stability of particulate species. In 2006 around 40 and 70% of urban-traffic stations exceeded the annual and the daily PM_{10} limit values in Spain, respectively. PM_{10} and $PM_{2.5}$ concentrations reach 14-22 $\mu gPM_{10}/m^3$ and 8-12$\mu gPM_{2.5}/m^3$ in most rural/regional background sites, 25-30 PM_{10}/m^3 and 15-20$\mu gPM_{2.5}/m^3$ in suburban sites, 30-46 $\mu gPM_{10}/m^3$ and 20-30$\mu gPM_{2.5}/m^3$ in urban background and industrial sites, and 46-60$\mu gPM_{10}/m^3$ and 30-35$\mu gPM_{2.5}/m^3$ heavy traffic hotpots.

Spatial distributions show sulphate and carbon particle levels reaching maxima in industrialized areas and large cities (where traffic emissions are higher), and nitrate levels increase from the Atlantic to the Mediterranean (independent of the regional NO_x emissions). African dust outbreaks have an influence on the number of exceedances

of the daily limit value; additionally load on the mean annual PM_{10} levels ranges from 1-2 $\mu g/m^3$ in most areas of the Iberian Peninsula to 4-5 in the Canary and Balearic Islands and the southern ends of Iberia. The marine aerosol contribution is near one order of magnitude higher in the Canaries and the Atlantic coast of Iberia compared to the Mediterranean regions. Important temporal influences include PM intrusion events from Africa (more abundant in February-March and spring-summer), regional scale pollution episodes, and weekday vs. weekend activity. Ambient trace element concentrations at metallurgical areas, ceramic and petrochemical estates, and urban and rural areas were evaluated. Results obtained at sites with no significant industrial impact allowed us to define usual concentration ranges for a number of trace elements in rural and urban background environments. At industrial and traffic hotspots average trace metal concentrations were highest, exceeding rural background levels by even one order of magnitude in the cases of Cr, Mn, Cu, Zn, As, Sn, W, V, Ni, Cs and Pb. Steel production emissions were linked to high levels of Cr, Mn, Ni, Zn, Mo, Cd, Se and Sn (and probably Pb). Copper metallurgy areas showed high levels of As, Bi, Ga and Cu. Zinc metallurgy was characterised by high levels of Zn and Cd. Glazed ceramic production areas were linked to high levels of Zn, As, Se, Zr, Cs, Tl and Pb. High levels of Ni and V (in association) recorded at one site under the influence of heavy vessel traffic could be considered tracers (although not exclusively) of shipping emissions. Levels of Zn-Ba and Cu-Sb were relatively high in urban areas when compared with industrialised regions due to tyre and brake abrasion, respectively.

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