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PM speciation and sources in Mexico during the MILAGRO-2006 Campaign

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Abstract. Levels of PM_{10}, $PM_{2.5}$ and PM_1 and chemical speciation of PM_{10} and $PM_{2.5}$ were measured during the MILAGRO campaign (1st to 31st March 2006, but extended in some cases until 6th April) at four urban, one suburban, two rural background and two rural sites, with different degree of industrial influence, in the Mexico City Metropolitan Area (MCMA) and adjacent regions. PM_{10} and $PM_{2.5}$ daily levels varied between 50–56μg/m^3 and 24–46μg/m^3 at the urban sites, 22–35μg/m^3 and 13–25μg/m^3 at the rural sites, and 75μg/m^3 and 31μg/m^3 at the industrial hotspot, lower than those recorded at some Asian mega-cities and similar to those recorded at other Latin American cities. At the urban sites, hourly $PM_{2.5}$ and PM_1 concentrations showed a marked impact of road traffic emissions (at rush hours), with levels of coarse PM remaining elevated during daytime. At the suburban and rural sites different PM daily patterns were registered according to the influence of the pollution plume from MCMA, and also of local soil resuspension.

The speciation studies showed that mineral matter accounted for 25–27% of bulk PM_{10} at the urban sites and a higher proportion (up to 43%) at the suburban and rural sites. This pattern is repeated in $PM_{2.5}$, with 15% at urban and 28% at suburban and rural sites. Carbonaceous compounds accounted for a significant proportion at the urban and industrial sites (32–46% in PM_{10}, and 51–55% in $PM_{2.5}$), markedly reduced at the suburban and rural sites (16–23% in PM_{10}, and 30% in $PM_{2.5}$). The secondary inorganic aerosols accounted for 10–20% of bulk PM_{10} at urban, suburban, rural and industrial sites, with a higher proportion (40%) at the industrial background site. A relatively high proportion of nitrate in rural sites was present in the coarse fraction.

Typically anthropogenic elements (As, Cr, Zn, Cu, Pb, Sn, Sb, Ba, among others) showed considerably high levels at the urban sites; however levels of particulate Hg and crustal trace elements (Rb, Ti, La, Sc, Ga) were generally higher at the suburban site.

Principal component analysis identified three major common factors: crustal, regional background and road traffic. Moreover, some specific factors were obtained for each site.

Final Revised Paper (PDF, 1502 KB) Supplement (9 KB) Discussion Paper (ACPD)

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