Trends and sources vs air mass origins in a major city in South-western Europe: Implications for air quality management

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A 17 years database of different air quality parameters was studied in the largest city in the south of Spain (Seville) where atmospheric pollution is frequently caused by traffic emissions and is directly affected by Saharan dust outbreaks. The source contributions to PM10 under different air mass origins were identified in order to quantify the impact of both natural and anthropogenic sources in this area. Hourly, daily and seasonal variation of PM10 and gaseous pollutant concentrations (CO, NO_2 and SO_2), all of them showing negative trends during the study period, point to the traffic as one of the main sources of air pollution in Seville. Mineral dust, secondary inorganic compounds (SIC) and trace elements, such as Ni, As, Zn, Ti and Mn, showed higher concentrations under North African (NAF) air mass origins than under Atlantic. A decreasing trend was observed in all chemical components of PM10 during the study period under both types of air masses, NAF and Atlantic. The principal component analysis under the more frequent air mass origins in the area allowed five PM10 sources to be identified: crustal, regional, marine, traffic and industrial. Natural sources (crustal and marine) were more relevant in NAF events (20.6 $\mu g \cdot m^{-3}$) than in Atlantic episodes (13.8 $\mu g \cdot m^{-3}$). Moreover, the contribution of the anthropogenic sources (regional, traffic and industrial) under NAF scenarios was double that under Atlantic ones (33.6 $\mu g \cdot m^{-3}$ and 15.8 $\mu g \cdot m^{-3}$, respectively). During Saharan dust outbreaks, the accumulation process of local anthropogenic pollutants in the lower atmosphere are frequent, resulting in poor air quality and an increased risk of mortality. The results of this study are relevant to the reduction of the impact of anthropogenic emissions (traffic and industrial) on the population of large cities. The increase in potentially toxic elements during Saharan dust outbreaks should also be taken into account in the process of discounting the number of exceedances due to non-anthropogenic or natural origins of the pollution. Moreover, air quality managers could be alert to these events using dispersion models for Saharan dust with a view to reducing local anthropogenic pollutant emissions in large cities.