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PM_{10} and $PM_{2.5}$ geochemistry in an industrialized mega-city in Central China

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The geochemistry of atmospheric particle matter (PM_{10} and $PM_{2.5}$) events in an industrialized mega-city of Central China (Wuhan), was investigated. Wuhan constitutes an ideal case scenario for the study of atmospheric pollution episodes, representative of densely populated and industrialized Chinese cities. Levels of PM_{10}, $PM_{2.5}$, NO_2 and SO_2 were evaluated, as well as the chemical composition of PM_{10} (2003-2004) and $PM_{2.5}$.(2006-2007). Sampling and analysis were carried out at an industrial hotspot (Changqian), an urban background site (Hankou) and an intermediate industrial-urban site (Gaoxin). Furthermore, sampling campaigns were carried out in the vicinities specific of industrial sources. A few samples were also collected in a regional background site (Mulanhu).

Levels of PM_{10} and $PM_{2.5}$ are very high (annual means from 150 to 190 μgPM_{10}/m^3, and from 115 to 130 μg $PM_{2.5}$/m^3, in the city in the city). At the regional background site PM levels were very high, reaching around 70% of those measured at the urban background site. Daily speciation showed that the mean chemical composition of PM_{10} and $PM_{2.5}$ presented minimal differences between peak and low PM episodes. This implies that aerosols in the study area result from regional and local emissions, and air quality management and abatement strategies in Wuhan should thus focus on regional-local anthropogenic sources. Mineral dust (46-86 μg /m^3) and secondary inorganic (40-45 μg/m^3, mainly 21-26 μgSO_4^{2-}/m^3, followed by 6-9μgNO_3^-/m^3, and 4-7μgNH_4^+/m^3) were found to be the major components of PM_{10}, followed by OM+EC

(29-31 μg /m^3). OC levels reached 84-88 % of OC+EC in the city. At the regional background site this proportion reached 91%. For most components levels were similar in $PM_{2.5}$, only the mineral matter strongly decreased, but still present in very high levels in the fine fraction (annual mean from 9 (urban) to 21 (industrial) μg/m^3 in $PM_{2.5}$). The levels of some elements of environmental concern are also high (409-615 ngPb/m^3, 66-70 ngAs/m^3, 116-227 ngMn/m^3, 10-12 ngCd/m^3) due to industrial, but also urban emissions. Source apportionment analysis allowed identifying the major PM sources contributing to the high PM levels. a mineral source (probably cement manufacture) as the main contributor at the industrial site, followed by a coal fired power plant and the anthropogenic regional background. At the urban site the major PM source is a mixed coal combustion source, followed by the anthropogenic regional background and traffic.