

Influence of Particulate Matter (PM) on Air Quality – a Transboundary Problem ?

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PM causes a wide range of diseases, contributing to a significant reduction in life expectancy (e.g. Dockery et al., 1993). Airborne particles are varying much in their properties such as size, chemical composition, etc., (e.g. Herrmann et al., 2006). They play a key role in atmospheric chemistry and in the balance of global climate, (e.g. Ramanathan et al. 2001). PM can be divided into primary and secondary particles both from natural and anthropogenic sources. In the 1980s the region around the city of Leipzig (West-Saxony) was one of the most polluted regions in central Europe. Long-time measurements of PM₁₀ has started in 1993 at the IfT-research site Melpitz located leeward of the Leipzig conurbation in Saxony near the city of Torgau (12°56'E, 51°32'N, 86 m above sea level). The main wind direction is Southwest; the second-class wind direction is East. The measured PM₁₀ concentration in 1993 was about 38 µg/m³ in summertime and about 44 µg/m³ in wintertime. The PM₁₀ level decreased to 24 µg/m³ and 28 µg/m³ for winter and summer in 1998 and 1999, respectively (Spindler et al. 2004). The yearly variation of the mean concentration was lower in summer than in winter. With the decrease of anthropogenic emissions in the Saxon cities and whose direct surroundings in the 1990s the influence of the long-range transport especially with air masses from the East during high pressure situation with low mixing heights in winter became more and more evident and is the cause for distinctive episodes with elevated particle concentrations in wider areas. The main source regions for wintertime anthropogenically influenced air masses are inside and outside of the European Union. Figure 1 shows the influence of transboundary long-range transport on concentration and distribution of PM₁₀ to the region of Saxony near the Polish border. In the winters 2004/05 and 2005/06 the daily PM₁₀ mass concentration at the rural Melpitz site exceeded the limit value of 50 µg/m³ for 8 and 9 days, respectively. These days contributed to the 35 days with exceeding the limit value of 50 µg/m³ allowed in cities.

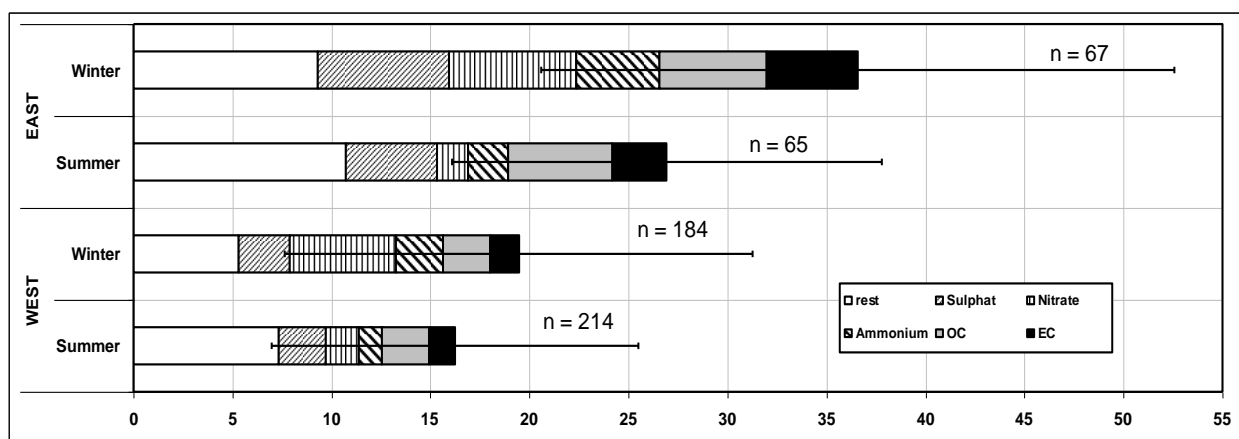


Figure 1 Daily Mean PM₁₀ mass concentration and the concentration of the main ions and organic (OC) and elemental carbon (EC) in winter 2004/05 and 2005/06 (November to April) and summer 2004 and 2005 (May to October). Only days with air mass transport explicitly from West or from East are considered. The error bars are the standard deviation for the particle mass concentration. n is the number of days.

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