$PM_{2.5}$ high-volume measurements in East Germany – a six year study at Melpitz site

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Long-time measurements of daily high volume (HV) quartz fibre filter samples $PM_{2.5}$ were started in January 2003 (synchronous to PM_{10} measurements remaining since 1993, Spindler et al. 2004) in the rural background of Eastern Germany at the IfT research site Melpitz (12°56'E, 51°32'N, 86 m a.s.l.) located downwind of Leipzig near the city of Torgau. The sampling device is the DIGITEL DHA-80 HV-sampler (Walter Riemer Messtechnik, Germany) with a flow rate of 30 m³/h (Gnauk et al., 2005). The PM samples were characterized for mass by weighing, the water soluble ions Cl^-, SO_4^{2-}, NO_3^-, NH_4^+, Na^+, K^+, Ca^{2+}, Mg^{2+} (WSI) were analyzed after extraction with demineralised water by standard ion chromatography and organic (OC) and elemental carbon (EC) analyzed by a two-step thermographic method (VDI 2465, Part 2, 1999).

The chemical species WSI, OC and EC shell be included in $PM_{2.5}$ measurements in future (European Union Directive, 2008). The three year $PM_{2.5}$ mass concentration average (2006 to 2008) for the rural Melpitz site is 17.63 µg/m³ (99.73 % data availability) and observes from the today's point of view the limit for the average exposure indicator of 20 µg/m³ for 2015, which would be based on the future mean concentration for 2008 to 2010. This value is < 18 µg/m³ and therefore the reduction target for 2020 would be 15 % (European Union Directive, 2008).

The monthly mean percentage of $PM_{2.5}$ within PM_{10} varies typically between winter (91.06 % January 2006) and summer (63.18 %, August 2003). The highest values were reached during cold and dry days in winter and the low percentage of $PM_{2.5}$ within PM_{10} in summer caused by re-emission of coarse particles in the surroundings (agricultural activities).

The $PM_{2.5}$ and PM_{10} mass concentration and the content of WSI, OC and EC varies also strongly with the two main long range air mass transport pattern for the Melpitz site. These are more maritime and mostly dry continental air masses from West or East, respectively. Days with long range transport from these both sectors were selected using 96-hour backward trajectories (NOAA-Hysplit-Model). The highest particle mass concentration, with high parts of SO_4^{2-}, NO_3^-, OC and EC was reached in winter during the transport of air masses from East. Reasons are the long-range transport of anthropogenic emissions and a secondary particle mass formation. The main source regions for these air masses are located outside (Russia, Belarus and Ukraine) and inside (Poland, Czech Republic and Slovakia) of the European Union. Such situations can contribute to high PM concentrations in East German cities, when mixing volume and wind velocity are low.

European Union Directive 2008/50/EC on ambient air quality and cleaner air for Europe of 21 May 2008, Official Journal of the EU **L152** (1-44).

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