Size-segregated physical-chemical Characterization of Particles Depending on Air Mass Origin at German lowlands (Melpitz site)

G. Spindler[1], E. Brüggemann[1], Th. Gnauk[1], A. Grüner[1], H. Herrmann[1], K. Müller[1], Th. M. Tuch[2], B. Wehner[1], M. Wallasch[3], A. Wiedensohler[1]

[1]Leibniz-Institut für Troposphärenforschung e.V., Permoserstrasse 15, 04318 Leipzig, Germany
[2]Umweltforschungszentrum, Permoserstrasse 15, 04318 Leipzig, Germany
[3]Umweltbundesamt, Wörlitzer Platz 1, 06844 Dessau, Germany

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The joint investigation (supported by the Umweltbundesamt, project 351 01 022) for a size-segregated physical-chemical characterization of tropospheric aerosol has started in spring 2004 at the research station of the Leibniz-Institut für Troposphärenforschung (IfT) in Melpitz situated in the vicinity of the city of Torgau in the river Elbe valley (12°56' E, 51°32' N, 86 m asl.). This spot is integrated in the EMEP activities and a supersite in the EUSAAR network (Flossmann *et al.*, 2006).
24 hour samples for PM_{10}, $PM_{2.5}$ (every day) and PM_1 (at least every six days) were collected at quartz fibre filters (Munktell, S) using high volume samplers (DHA-80, DIGITEL Electronic AG, CH).
Particle mass concentration was determined gravimetrically under constant conditions (24 hours: 50% relative humidity, temperature 20°C). Figure 1 shows exemplary the percentage of $PM_{2.5}$ in PM_{10} with a typical seasonal variation.

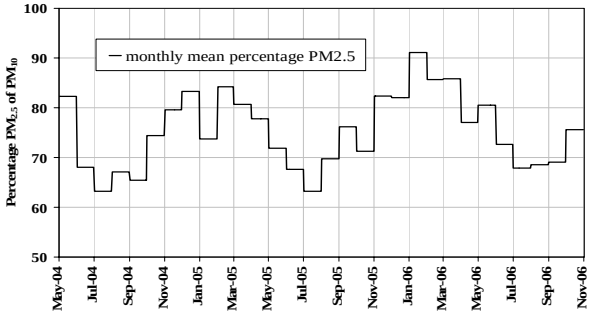

Figure 1. Time series of monthly percentage of $PM_{2.5}$ in PM_{10}

The concentration of water-soluble ions was detected by ion chromatography (Metrohm, CH). Total carbon was quantified as sum of organic and elemental (TC=OC+EC) by a thermographic method applying a Ströhlein C-mat 5500 carbon analyzer (Spindler *et al.*, 2004). The particle number size distribution was measured in the range 3 to 800 nm and using a thermodenuder for evaporation of volatile particle mass (Wehner, *et. al*., 2003). During selected days in winter and summer with distinct air mass origin particles in the range of PM_{10} up to $PM_{0.05}$ were sampled with a five stage BERNER-type low pressure impactor and analysed for mass, the content of water soluble ions, organic and black carbon and selected organic species.

Under the dominating wind direction southwest to northwest (W) air masses from the Atlantic Ocean with integrated showers are transported, often during low pressure situations, to Melpitz. They pass large parts of Germany. The second main wind direction is East (E). Then dry air masses are transported with moderate wind velocity during high pressure situations over long distances to Melpitz. The main sources regions for these air masses are in Russia, Poland, Belarus, Ukraine, and the North of Czech Republic. In these areas coal heated power plants sometimes with little exhaust treatment; old industry and older cars still exist as air pollution sources. The mean particle distribution for these main air mass directions are given in Table 1.

Table 1. Mean particle mass distribution in summer 2004 and 2005 and winter 2004/05 and 2005/06 for two air mass origins at Melpitz site

amo	**PM**	***n***	**mass**	**SO_4^{2-}**	**NO_3^-**	**NH_4^+**	**TC**
W_{summer}	1	*51*	8.8	1.9	0.7	1.0	1.9
W_{summer}	2.5	*206*	11.4	2.2	1.0	1.1	2.2
W_{summer}	10	*214*	16.2	2.4	1.7	1.1	3.7
E_{summer}	1	*12*	16.3	3.4	0.8	1.5	3.8
E_{summer}	2.5	*65*	19.7	4.2	1.0	1.8	4.8
E_{summer}	10	*65*	26.9	4.6	1.6	2.0	8.0
W_{winter}	1	*42*	11.8	1.7	3.3	1.6	2.1
W_{winter}	2.5	*173*	16.2	2.4	4.6	2.3	3.0
W_{winter}	10	*184*	19.5	2.6	5.4	2.4	3.8
E_{winter}	1	*11*	21.0	4.0	3.8	2.5	5.8
E_{winter}	2.5	*67*	31.0	6.1	5.6	3.9	8.1
E_{winter}	10	*67*	36.6	6.6	6.4	4.2	10.0

summer: May till September, **winter**: October till April; **amo**, air mass origin; **n**, number of measurements; for mass, ions and TC mass-concentrations in µg/m³

For identifying air mass source regions 96 hours backward trajectories (www.arl.noa.gov) were used.

Flossmann, A., Laj, P., the EUSAAR Partners (2006) *European Supersites for Atmospheric Aerosol Research (EUSAAR): a new FP6 Integrated Infrastructure Initiative.* Geophysical Research Anstracts, Vol. 8, 02357

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