

# A 24 year long-term trend for PM at Melpitz site in Germany – Results for different Weather Type Classification Methods

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The rural-background site Melpitz (12°56' E, 51°32' N, 86 m asl.) is located in Germany near Torgau (Spindler et al. 2013) in the East German lowlands. The TROPOS-site is representative for a large area in Central Europe and integrated in ACTRIS and EMEP. Long-term studies with consideration of marine or continental air mass inflow depending from trajectories or weather type classes allows showing the influence of spatial distributed emissions and long-range transport on PM-concentrations.

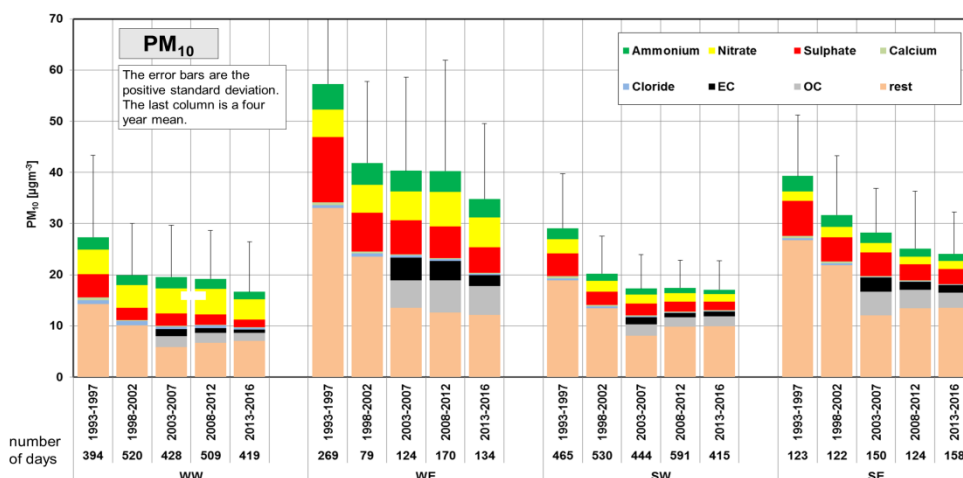
PM-High-Volume quartz filter samples for PM<sub>10</sub> were collected daily since November 1992. PM<sub>2.5</sub> and PM<sub>1</sub> were collected daily respectively every six days since January 2003. The particle mass determination was done gravimetrically. Water-soluble ions, WSI (NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, Cl<sup>-</sup>, Na<sup>+</sup>, NH<sub>4</sub><sup>+</sup>, K<sup>+</sup>, Mg<sup>2+</sup>, Ca<sup>2+</sup>) were analyzed by ion chromatography. The determination of organic and elemental carbon (OCEC) was performed since 2003 by the two-step thermographic method (according to VDI 2465 part 2). Since 2012 also the thermo-optical method (European Standard) was used to quantify OCEC (3 years in parallel). On this base OCEC for 2015 and 16 were estimated for the VDI-method to proceed the long-time data set.

At first daily samples for PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> were evaluated, as yearly means for all and for winter (NDJFMA) and summer (MJJASO) days. At second the influence of three different weather type classification methods, (i) subjective categorization for air mass inflow, **AIWE**, (Figure 1) (ii) objective weather type classification, **OWTC** and (iii) subjective determined Hess-Brezowsky Classification, **SGWL** (Spindler et al. 2013, Werner et al. 2010) were investigated for PM in more continental, more maritime or “mixed” pronounced air masses. Means of PM were calculated for the weather type classifications for the years 1992 to 2016 (PM<sub>10</sub>) and in five year-time-steps for PM with WSI and OCEC. Besides the influence of decreasing emissions, the additional influence caused by the distribution of days in weather classes on PM<sub>10</sub> was shown for five year time steps based on PM<sub>10</sub> in 1993-1997.

PM<sub>10</sub> show a decreasing trend (1993-2000) followed by a period (2001-2016) without trend and a mean mass concentration of about 21.97±1.66 µg m<sup>-3</sup> (variation 7.6%). The yearly means for the sulphate to nitrate ratio and the EC-concentration decrease from 2.1 to 1.0, respectively 2.21 µg m<sup>-3</sup> to 0.94 µg m<sup>-3</sup>.

The nitrate concentration remains more constant all the time, because the emission of NO<sub>x</sub> from traffic does not decrease significantly. For all weather type classification methods the highest particle mass, ECOC and sulphate concentrations were found for long-range transported continental air-masses in winter from an eastern sector with source regions inside and outside the EU.

It can be estimated that the additional influence on the mean PM<sub>10</sub> concentration caused by the distribution of days in weather classes for each of the three weather type classifications is in the range of +3 to -13%. The influence of decreasing emissions on PM<sub>10</sub> was about -40% over the investigated 24 years.



**Figure 1** Five year means for PM<sub>10</sub>, AIWE-classification, WW, Winter West, WE, Winter East, SW, Summer West, SE Summer East

TOPIC: Atmospheric aerosol (indoor – outdoor), oral presentation