# Wintertime distribution of PAH with aerosol particle size in two cities in the Czech Republic

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Distribution of Polycyclic Aromatic Hydrocarbons - PAH with aerosol particles is part of the comprehensive characterization of winter urban aerosol conducted in two cities in the Czech Republic – Ostrava and Mladá Boleslav. Both cities are industrial, but air pollution in each has a different source. Measurements were conducted during smog and non-smog periods in both cities.

In Ostrava, steel industry is supposed to be a major source of nanoparticles with high amount of carcinogenic c-PAH. Concentrations of B(a)P were measured in winter 2012 and reached up to 300 ng/m$^3$. Such concentration represents one of the worst situations in Central Europe.

Large industry (Škoda auto a.s.) is also located in the city of Mladá Boleslav. However, this automotive industry is not expected to be a significant air polluter. We assume that transportation and local heating in suburb areas are the main sources of air pollution in Mladá Boleslav. Measurements were conducted in winter 2013 and our results will be concluded soon.

In both cities, daily characterizations of aerosol were carried out for at least 14 day-long periods, including measuring with high-volume cascade impactor BGI 900 used for analyzing amount and distribution of c-PAH. Subsequently, our samples are used for a toxicology study of c-PAHs within the CENATOX project. Other measured parameters were NOx, $O_3$, CO, $SO_2$, $CH_4$, NMHC, $PM_{10}$, $PM_{2,5}$, and particle number concentrations of 14-20 000 nm with integrating time of 5 minutes. With integrating time of 1 hour, $PM_{2,5}$ OC/EC and 27 chemical elements were recorded.

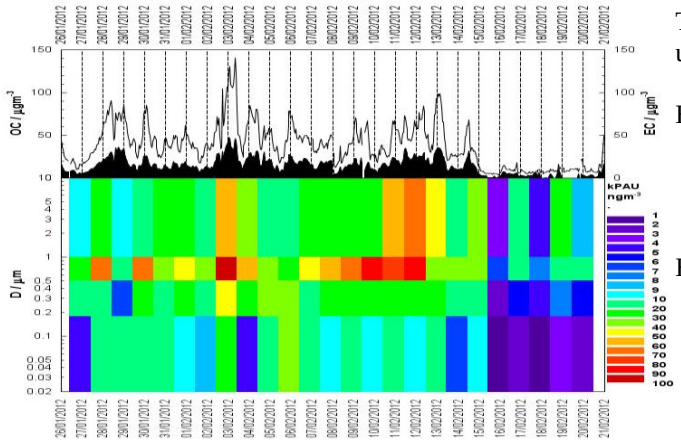


Figure 1. Temporal variation of c-PAH size-distribution and OC/EC concentration in Ostrava (26.1.-26.2. 2012)

For spatial variability assessment and verification of correctness, a network of DustTrak's ($PM_{2,5}$) was deployed in strategic places of both cities.

Remarkable positive sampling artifact - PSA for the high-volume cascade impactor BGI 900 was evaluated in Ostrava (2012). Significant amounts of gaseous phase of phenanthrene, anthracene, fluoranthene, pyrene and benzo(a)anthracene were captured in the experimental PUF (polyurethane foam) after 24 hour air exposure. The extent of the captured gaseous PAHs positively correlated with their individual vapor pressures (ranging from $10^{-4}$ to $10^{-1}$ Pa). Other measured PAHs (coronene, benzo(ghi)perylene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene) with vapor pressures from $10^{-5}$ to $10^{-10}$ Pa did not exhibit the PSA. Based on this finding, a correction for the capture of gaseous phase in the particle size fractions of PAHs captured in BGI 900 was calculated. The deduction for the captured gaseous volatile PAHs ranged from units to tens of percent of measured particle size fractions of PAHs.

In Mladá Boleslav (2013), the same experiment was conducted in larger extent, and we are looking forward to the laboratory results. Afterwards, a general model will be designed for calculating the ratio between solid and gaseous fractions of PAHs captured on the PUF substrates in Hi-Vol BGI 900. This ratio is temperature dependent and will be applicable to future measurements of PAHs by HiVol BGI 900 using the PUF substrates.

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