

Fate and analysis of persistent organic pollutants in the atmosphere

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Abstract:

Semi-volatile organic compounds (SVOCs) in the atmosphere partition between particle and gaseous phases depending on the temperature, the characteristics of atmospheric particulates and the vapour pressure of the compound. This partitioning influences the transport, deposition and degradation processes and thus, the atmospheric residence time of SVOCs. Particulate matter is commonly grouped into ultrafine, accumulation and coarse size modes with aerodynamic diameters of $< 0.01 \mu\text{m}$, $0.01\text{-}2.5 \mu\text{m}$ and $> 2.5 \mu\text{m}$, respectively. The size of particles and their composition is of great relevance for human health and atmospheric transport potential, as finer particles would penetrate deeper in the human respiratory system and would have higher residence time in the atmosphere than do larger particles. Persistent organic pollutants (POPs) have been widely recognized as being persistent, bioaccumulative and toxic for humans and the environment and subject to long-range atmospheric transport.

The goal of this PhD was to assess the seasonal size distribution of SVOCs, including combustion-related compounds (polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and furans and polychlorinated biphenyls) and flame retardants (polybrominated diphenyl ethers, novel brominated flame retardants and hexabromocyclododecane) in the Brno metropolitan area. In addition, the seasonal trends and gas-particle partitioning of legacy and current-use pesticides was also assessed at a background site in the Czech Republic.