1.165 Temporal variability of polycyclic aromatic hydrocarbons and their oxidative derivatives in Beijing, China: wintertime observations..

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Abstract:

Polycyclic Aromatic Hydrocarbons (PAHs) are known to be produced directly by combustion and are mostly emitted from anthropogenic sources; some have a strong mutagenic effect on human health. PAHs undergo reaction with oxidants in the atmosphere leading to the generation of a range of airborne nitrated-PAHs and oxygenated-PAHs, that in some cases are more toxic than the parent-PAHs. The formation of oxy-derivative and nitro-derivatives is influenced by local/regional emissions of PAH and oxidation rates, although relatively little is known about the variability in concentrations between daytime and night-time.

This study shows the temporal distribution of 16 particulate phase parent-PAHs, 11 oxy-derivative (o-PAHs) and 5 nitro-derivative (n-PAHs) in Beijing - China. $PM_{2.5}$ samples were collected using a high volume air sampler ($80\ m^3\ h^{-1}$) every three hours during daytime and over 15h at night-time during 18 continuous days (22 November 2016 to 9 December 2017). Fifty-seven samples in total were collected and extracted using an accelerated solvent extractor and analysed by GC-Q-ToF-MS in electron impact mode.

A range of different PAHs and o-PAHs were observed on most days, however n-PAHs were not always detectable in the 3h day samples and for some days the detection limit of the n-PAHs provides an upper estimate of possible concentrations. The total daytime concentrations during high particulate loading conditions for PAHs, o-PAHs and n-PAHs were 665, 85, and 38 ng m^{-3}, respectively, concentrations which were of the order ~ 4.7, 2.9, and 2.7 times higher than average night-time values. In addition, the most abundant PAHs during polluted day were Pyrene (82.49 ng m^{-3}), Fluoranthene (85.34 ng m^{-3}), Chrysene (81.19 ng m^{-3}) and Benzo(b)fluoranthene (119.5 ng m^{-3}). 6-Nitrobenzo[a]pyrene (28.27 ng m^{-3}) was the most abundant n-PAH, while 9-Fluorenone (12 ng m^{-3}), 1-Pyrenecarboxaldehyde (11.45 ng m^{-3}) and Benzo[a]fluorenone (16.3 ng m^{-3}) were the three major o-PAHs species.