

Spatial Distribution of PM_{2.5}-bound Polycyclic Aromatic Hydrocarbon (PAHs) over Xi'an nine communities of northwest China

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To investigate the spatial variability of PAHs associated with respirable particulate matter (PM), 16 PAHs were measured in 24-h integrated PM_{2.5} samples collected simultaneously at 9 communities of Xi'an, China, from 15 to 21 June, 2013. The PAH concentrations ranged from 32.4 to 104.7 ng m⁻³, with an average value of 57.1 ± 23.0 ng m⁻³. The PAH concentrations at suburban communities (average: 86.3 ng m⁻³) were much higher than those at urban communities (average: 48.8 ng m⁻³), due to the significant number of locally distributed sources and mixed land use at suburban area (Figure 1).

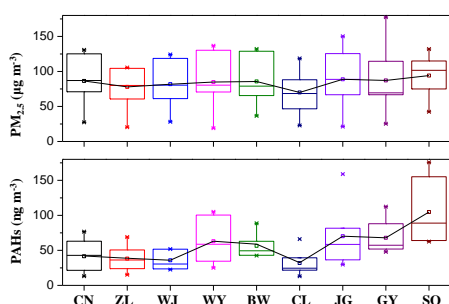


Figure 1. Spatial distributions of PM_{2.5} and PAH concentrations at 9 Xi'an communities.

Elevated PAH levels were observed to occur downwind and industrialized area (west and northwest of Xi'an), suggesting the contribution of local sources. A suburban-urban decline trend of PAH concentrations in this study may be attributable to the disorganized management of motor vehicles and massive building constructions (Figure 2).

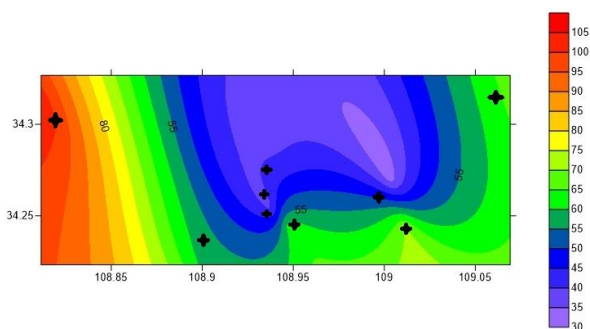


Figure 2. Kriging interpolation of PAH concentrations (units: ng m⁻³) in Xi'an.

Figure 2. Percentages of PAH ring concentrations at 9 Xi'an communities.

The average benzo[a]pyrene-equivalent toxicity ($\Sigma[\text{BaP}]_{\text{eq}}$) at 9 communities during the sampling period was 6.9 ± 2.2 ng m⁻³, showing a generally similar spatial distribution to PAHs (Figure 3) (Bi et al., 2003; Wang et al., 2006). The excess inhalation cancer risk derived from $\Sigma[\text{BaP}]_{\text{eq}}$ indicated that average 8 persons per million community residents in Xi'an would develop cancer due to PM_{2.5}-bound PAHs.

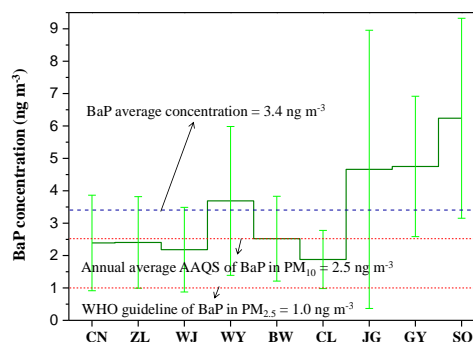


Figure 3. Spatial distributions of BaP concentrations at Xi'an 9 communities.

The much greater spatial variability of PAH relative to PM_{2.5} demonstrated variability in PM_{2.5} composition and confirmed the importance of the local scale for PAH exposure health risk assessment.

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Bi, X.H., Sheng, G.Y., Peng, P.A., Chen, Y.J., Zhang, Z.Q. and Fu, J.M. (2003) *Atmos. Environ.* **37**, 289-298.

Wang, G.H., Kawamura, K., Lee, S.C., Ho, K.F. and Cao, J.J. (2006) *Environ. Sci. & Technol.* **40**, 4619-4625.