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Spatial variations, temporal trends, and emission sources of air pollutants in seven cities of northern China

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Particulate matter (PM), polycyclic aromatic hydrocarbons (PAHs), and the derivatives of PAHs (nitro-PAHs and oxy-PAHs) were measured each month between April, 2010 and March, 2011 in seven large cities (18 sites) in the ambient air of northern China. Similarities in the concentrations of PM, PAHs and oxy-PAHs between rural village and urban area are found, indicating the severe air pollution in the rural villages and strong contribution of solid fuels combustion. Higher nitro-PAHs concentrations in the cities than those in the rural area suggests the influence of motor vehicles, both on primary emission and secondary formation. Without local emission sources, pollutants levels in the rural field area are the lowest. Air pollution in the less developed west China is as severe as that in the east with more population and urbanization, both heavier than that in the coastal area. Such spatial patterns are caused by differences in the sources of contaminants and the removal process. A strong seasonality of all pollutants with higher concentrations in winter and lower in summer is observed due to large heating demand for solid fuel combustion in winter and rich precipitation in summer. Natural sources such as sandstorms also take effects on the spatial distribution and temporal trend of PM.