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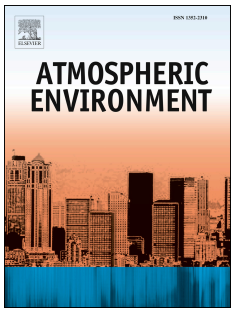

Local source impacts on primary and secondary aerosols in the Midwestern United States

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Local source impacts on primary and secondary aerosols in the Midwestern United States

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Atmospheric particulate matter (PM) exhibits heterogeneity in composition across urban areas, leading to poor representation of outdoor air pollutants in human exposure assessments. To examine heterogeneity in PM composition and sources across an urban area, fine particulate matter samples ($PM_{2.5}$) were chemically profiled in Iowa City, IA from 25 August to 10 November 2011 at two monitoring stations. The urban site is the federal reference monitoring (FRM) station in the city center and the peri-urban site is located 8.0 km to the west on the city edge. Measurements of $PM_{2.5}$ carbonaceous aerosol, inorganic ions, molecular markers for primary sources, and secondary organic aerosol (SOA) tracers were used to assess statistical differences in composition and sources across the two sites. $PM_{2.5}$ mass ranged from 3 – 26 μg m^{-3} during this period, averaging 11.2 ± 4.9 μg m^{-3} (n=71). Major components of $PM_{2.5}$ at the urban site included organic carbon (OC; 22%), ammonium (14%), sulfate (13%), nitrate (7%), calcium (2.9%), and elemental carbon (EC; 2.2%). Periods of elevated PM were driven by increases in ammonium, sulfate, and SOA tracers that coincided with hot and dry conditions and southerly winds. Chemical mass balance (CMB) modeling was used to apportion OC to primary sources; biomass burning, vegetative detritus, diesel engines, and gasoline engines accounted for 28% of OC at the urban site and 24% of OC at the peri-urban site. Secondary organic carbon from isoprene and monoterpene SOA accounted for an additional 13% and 6% of OC at the urban and peri-urban sites, respectfully. Differences in biogenic SOA across the two sites were associated with enhanced combustion activities in the urban area and higher aerosol acidity at the urban site. Major PM constituents (e.g., OC, ammonium, sulfate) were generally well-represented by a single monitoring station, indicating a regional source influence. Meanwhile, nitrate, biomass burning, food cooking, suspended dust, and biogenic SOA were