Supplemental Information

$PM_{2.5}$ and $PM_{10-2.5}$ Compositions during Wintertime Episodes of Elevated PM Concentrations across the Midwestern USA

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Table S1. Monitors selected for use in this study from the Criteria Pollutants Monitoring Network (FRM for measuring $PM_{2.5}$ masses), and the Chemical Speciation Network ($PM_{2.5}$ bulk composition). Each selection is accompanied with justifications.

City	Site ID-FRM	Frequency	Reason FRM site was chose	Site ID-CSN	Reason CSN site was chosen
Kansas City, MO	290950034	Daily	Highest frequency sampler nearest the urban center	202090021	Only 1 CSN monitoring site
Des Moines, IA	191530030	Daily	Highest frequency sampler nearest the urban center	191530030	Only 1 CSN monitoring site
Minneapolis, MN	270530963	1-in-3 day	Highest frequency sampler nearest the urban center	270530963	Only 1 CSN monitoring site
St. Paul, MN	271230886	1-in-3 day	1-in-3 day sampler with a collection on 2/3/05 (the cedar st. sampler is also a 1-in-3 day sample closer to the city's center, but is missing data for that day)	271230871	Only 1 CSN monitoring site
St. Louis, MO	295100085	1-in-3 day	Closest to urban center with CSN sampler	295100085	Only 1 CSN monitoring site
Green Bay, WI	550090005	1-in-3 day	1-in-3 day sampler (2 on site-chose POC#1)	N/A	No CSN data available
Milwaukee, WI	550790099	1-in-3 day	Highest frequency sampler nearest the urban center	550790026	Only 1 CSN monitoring site
Chicago, IL	170310052	Daily	Highest frequency sampler IN the city of Chicago and NOT a suburb	170310076	Sampler in city and not suburbs – 1-in-3 day sampler with all ions of interest
Gary, IN	180890026	1-in-3 day	Both FRM samplers near city center – both within a block of each other – chose sampler classified by EPA as "Urban and Center City"	180890022	Sampler in city and not suburbs
Muskegon, MI	261210040	1-in-3 day	Only 1 FRM sampler	N/A	No CSN data available
Indianapolis, IN	180970043	1-in-3 day	Highest frequency sampler nearest the urban center	180970078	Only 1 sampler for CSN with data for full year
Louisville, KY	211110044	Daily	Closest daily sampler to urban center	211110043	Closest to the FRM site chosen
Cincinnati, OH	390610006	1-in-3 day	Closest to urban center; located in a commercial rather than an industrial area	3090610040	Only 1 CSN monitoring site
Toledo, OH	390950024	1-in-3 day	Highest frequency sampler nearest the urban center	390950026	Only 1 CSN monitoring site
Detroit, MI	261630016	Daily	Close to urban center, with CSN samplers	261630001	2 samplers at same site – chose one with all ions of interest – also chose the site with 1-in-3 day samplers instead of 1-in-6 day samplers
Columbus, OH	390490024	1-in-3 day	Both sites equidistant to urban center-chose fairground sampling site	390490081	Only 1 CSN monitoring site
Cleveland, OH	390350038	1-in-3 day	Highest frequency sampler nearest the urban center	390350038	Same site as FRM, same Collection frequency
Akron, OH	391530017	1-in-3 day	Only one sampler available	391530023	Only 1 CSN monitoring site

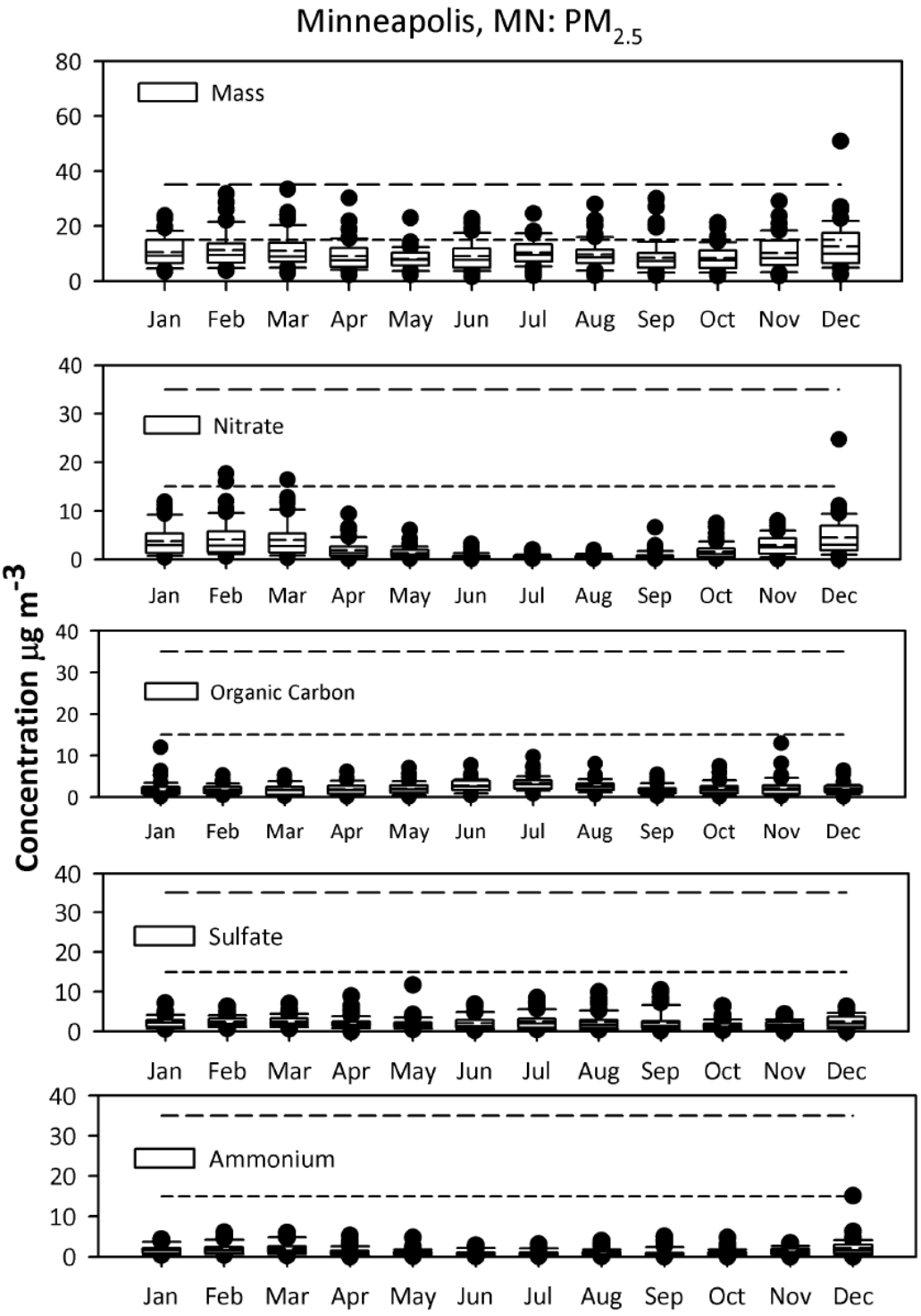

Fig. S1. Measurements of $PM_{2.5}$ mass, nitrate, organic carbon, sulfate and ammonium made at Minneapolis, MN (see Table S1 for sampler numbers, and measurement dates) by the US Environmental Protection Agency using the Criteria Pollutants Network and the Chemical Speciation Network. The box plots show the 10^{th} and 90^{th} percentiles as whiskers, the 25^{th} and 75^{th} percentiles as the box ends, the median as a solid line intersecting the box, the mean as a dashed line, and the data beyond the 10^{th} and 90^{th} percentiles as individual measurements.

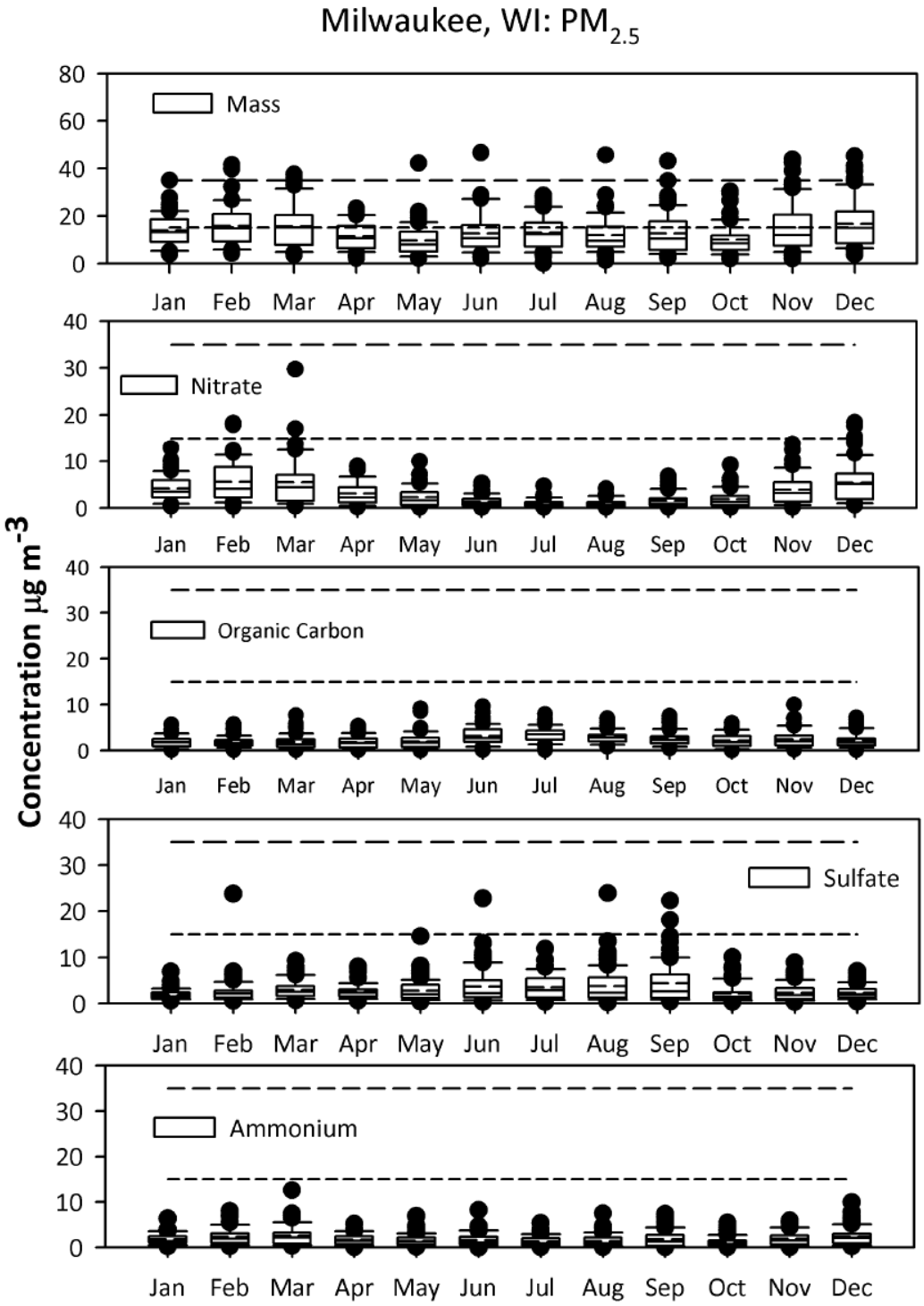

Fig. S2. Measurements of $PM_{2.5}$ mass, nitrate, organic carbon, sulfate and ammonium made at Milwaukee, WI (see Table S1 for sampler numbers, and measurement dates) by the US Environmental Protection Agency using the Criteria Pollutants Network and the Chemical Speciation Network. The box plots show the 10^{th} and 90^{th} percentiles as whiskers, the 25^{th} and 75^{th} percentiles as the box ends, the median as a solid line intersecting the box, the mean as a dashed line, and the data beyond the 10^{th} and 90^{th} percentiles as individual measurements.

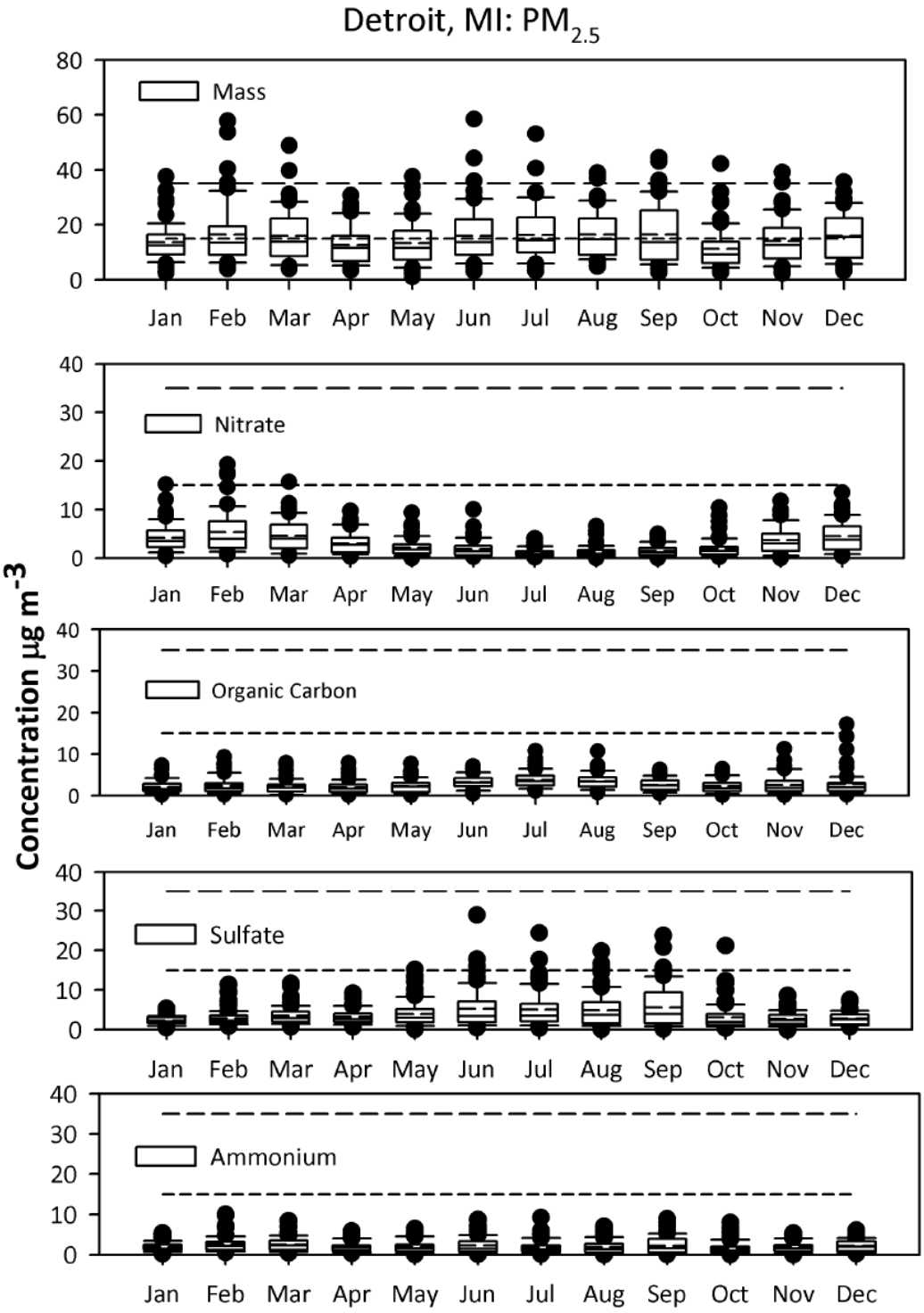

Fig. S3. Measurements of $PM_{2.5}$ mass, nitrate, organic carbon, sulfate and ammonium made at Detroit, MI (see Table S1 for sampler numbers, and measurement dates) by the US Environmental Protection Agency using the Criteria Pollutants Network and the Chemical Speciation Network. The box plots show the 10th and 90th percentiles as whiskers, the 25th and 75th percentiles as the box ends, the median as a solid line intersecting the box, the mean as a dashed line, and the data beyond the 10th and 90th percentiles as individual measurements.

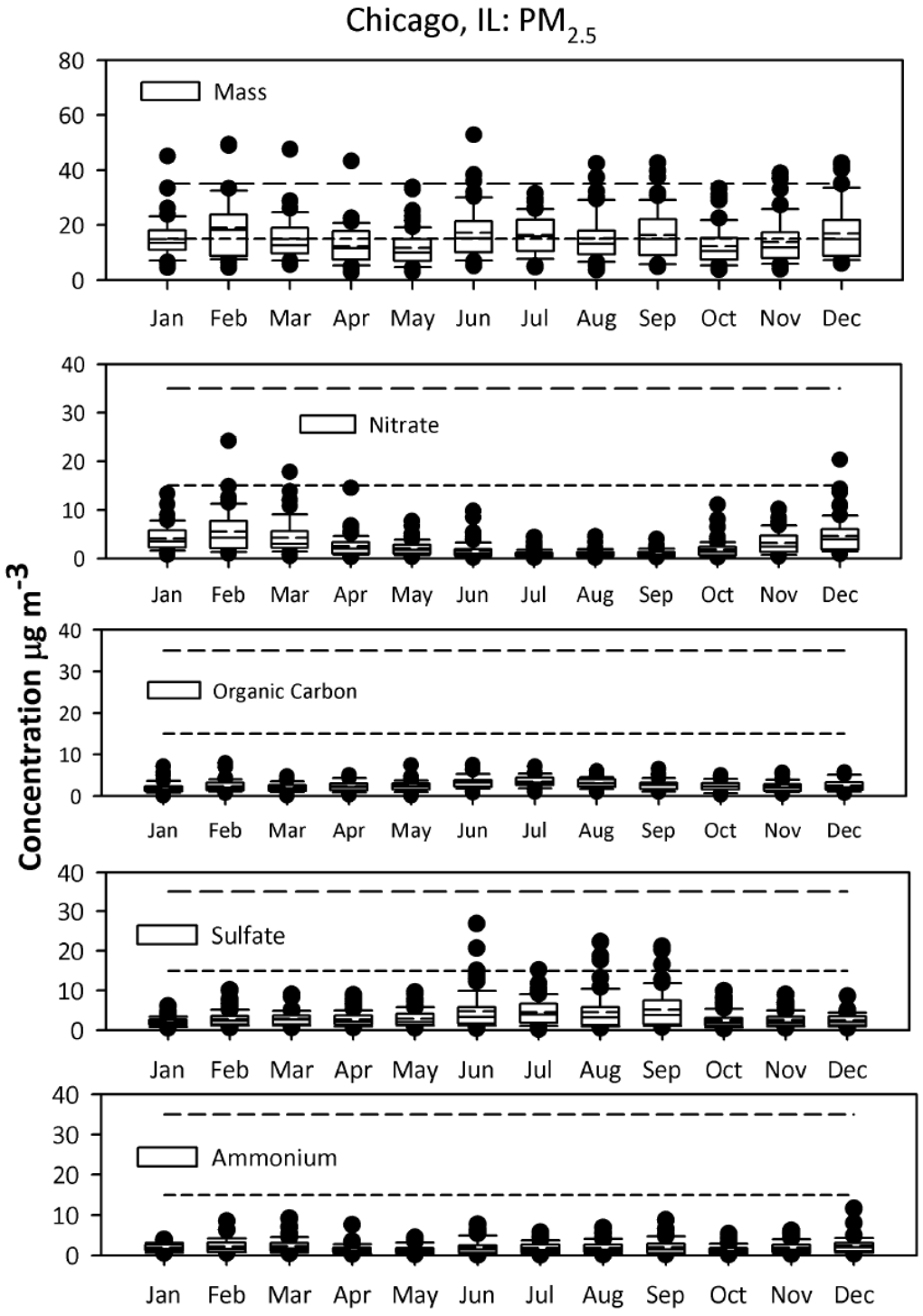

Fig. S4. Measurements of $PM_{2.5}$ mass, nitrate, organic carbon, sulfate and ammonium made at Chicago, IL (see Table S1 for sampler numbers, and measurement dates) by the US Environmental Protection Agency using the Criteria Pollutants Network and the Chemical Speciation Network. The box plots show the 10th and 90th percentiles as whiskers, the 25th and 75th percentiles as the box ends, the median as a solid line intersecting the box, the mean as a dashed line, and the data beyond the 10th and 90th percentiles as individual measurements.

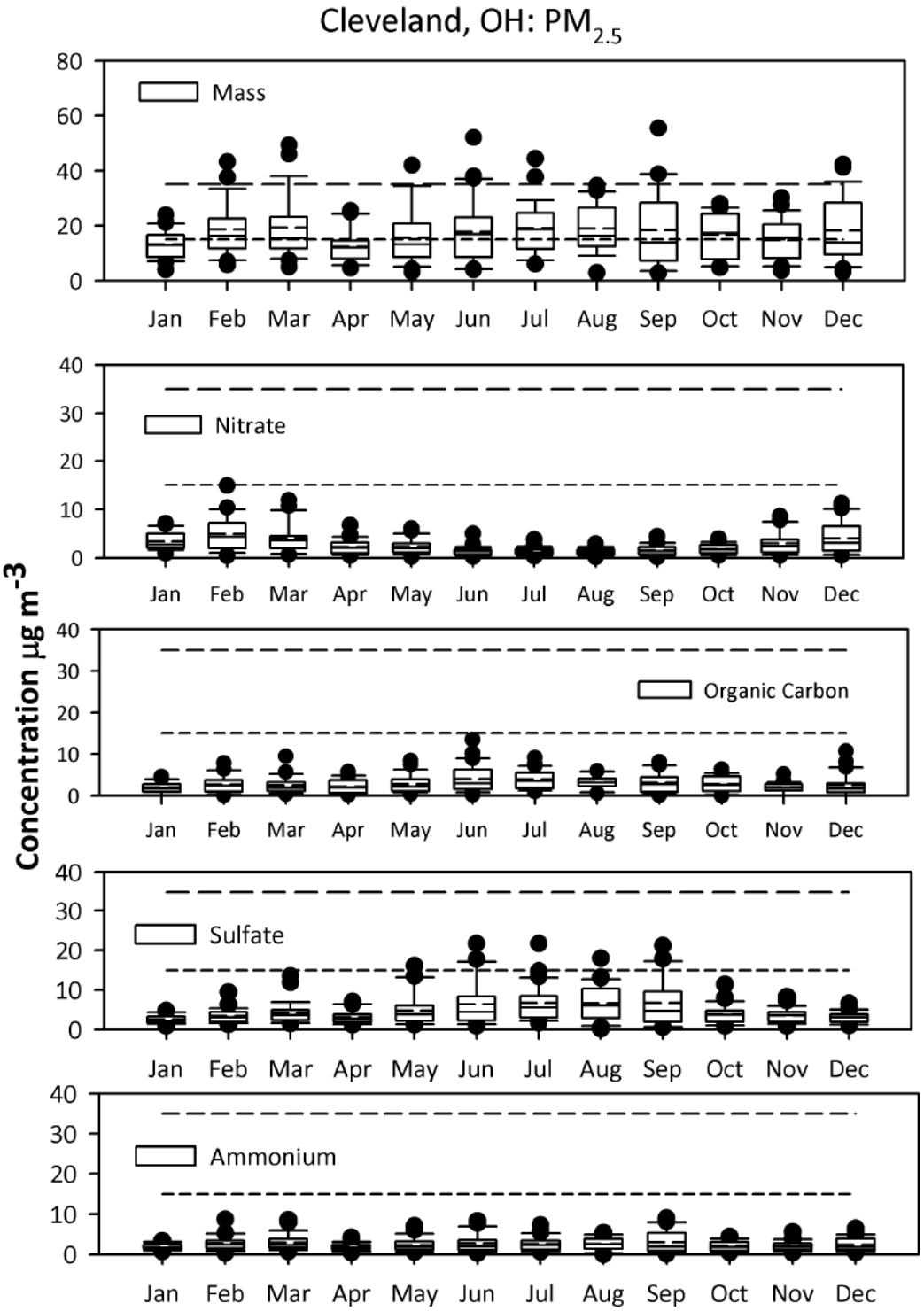

Fig. S5. Measurements of $PM_{2.5}$ mass, nitrate, organic carbon, sulfate and ammonium made at Cleveland, OH (see Table S1 for sampler numbers, and measurement dates) by the US Environmental Protection Agency using the Criteria Pollutants Network and the Chemical Speciation Network. The box plots show the 10th and 90th percentiles as whiskers, the 25th and 75th percentiles as the box ends, the median as a solid line intersecting the box, the mean as a dashed line, and the data beyond the 10th and 90th percentiles as individual measurements.

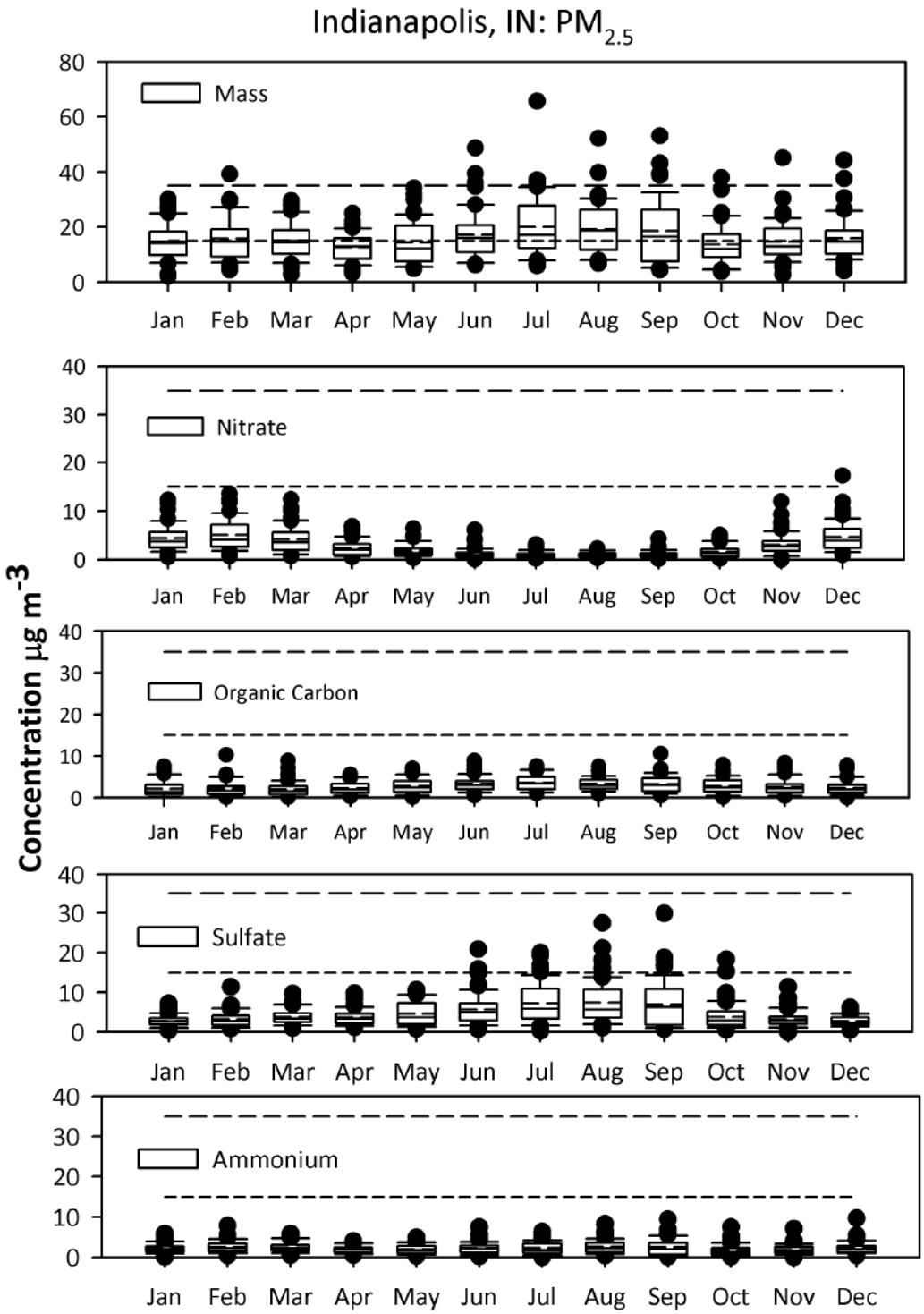

Fig. S6. Measurements of $PM_{2.5}$ mass, nitrate, organic carbon, sulfate and ammonium made at Indianapolis, IN (see Table S1 for sampler numbers, and measurement dates) by the US Environmental Protection Agency using the Criteria Pollutants Network and the Chemical Speciation Network. The box plots show the 10th and 90th percentiles as whiskers, the 25th and 75th percentiles as the box ends, the median as a solid line intersecting the box, the mean as a dashed line, and the data beyond the 10th and 90th percentiles as individual measurements.

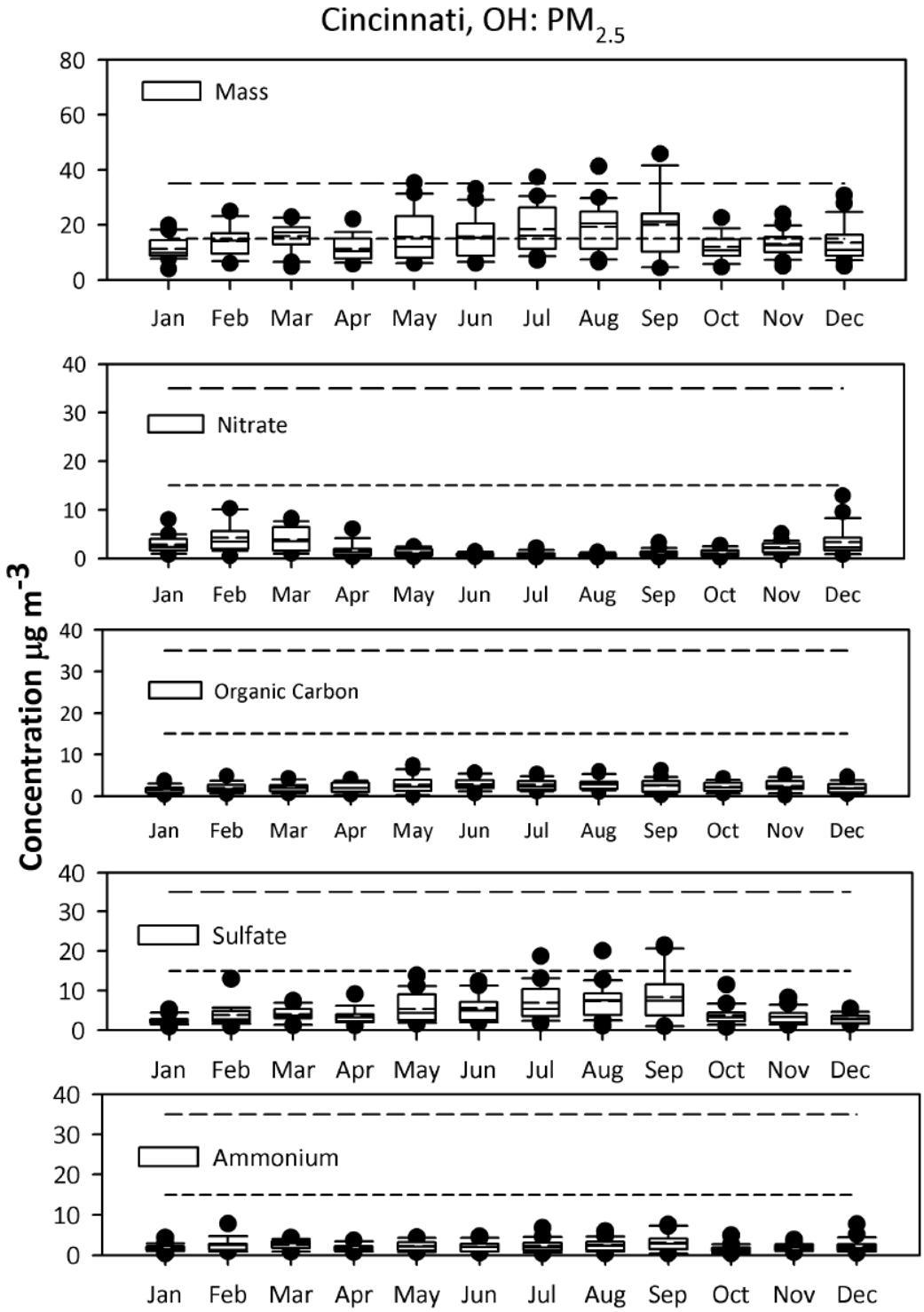

Fig. S7. Measurements of $PM_{2.5}$ mass, nitrate, organic carbon, sulfate and ammonium made at Cincinnati, OH (see Table S1 for sampler numbers, and measurement dates) by the US Environmental Protection Agency using the Criteria Pollutants Network and the Chemical Speciation Network. The box plots show the 10^{th} and 90^{th} percentiles as whiskers, the 25^{th} and 75^{th} percentiles as the box ends, the median as a solid line intersecting the box, the mean as a dashed line, and the data beyond the 10^{th} and 90^{th} percentiles as individual measurements.

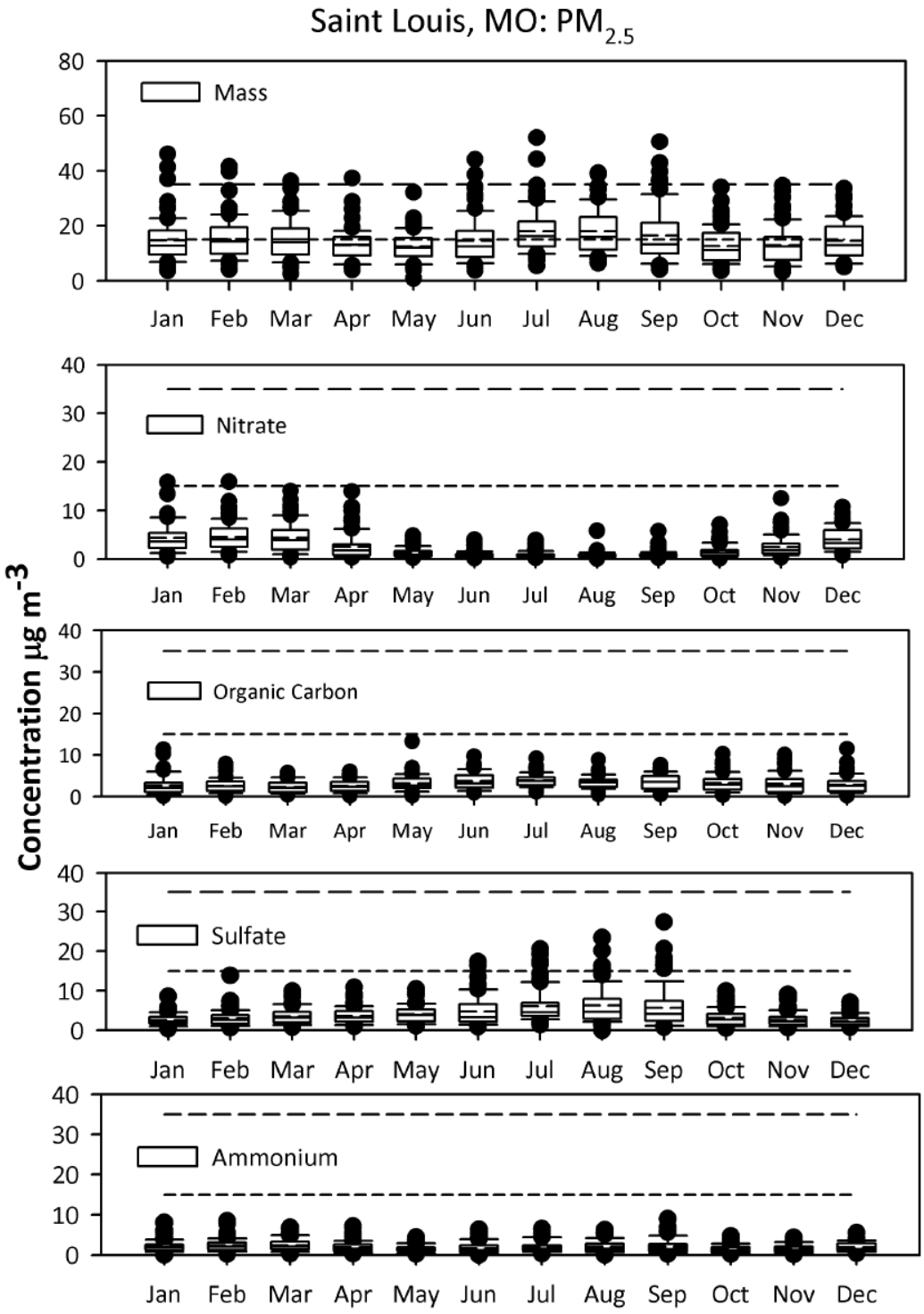

Fig. S8. Measurements of $PM_{2.5}$ mass, nitrate, organic carbon, sulfate and ammonium made at Saint Louis, MO (see Table S1 for sampler numbers, and measurement dates) by the US Environmental Protection Agency using the Criteria Pollutants Network and the Chemical Speciation Network. The box plots show the 10th and 90th percentiles as whiskers, the 25th and 75th percentiles as the box ends, the median as a solid line intersecting the box, the mean as a dashed line, and the data beyond the 10th and 90th percentiles as individual measurements.

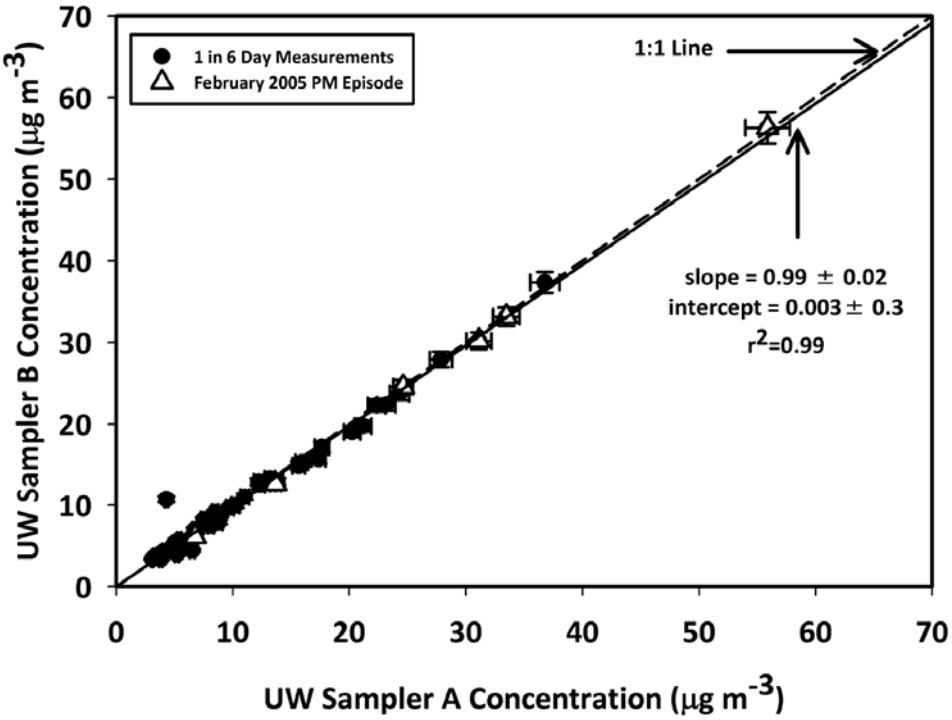

Fig. S9. A comparison mass measurements made using the two UW-Madison $PM_{2.5}$ sampling channels at Milwaukee, WI. The samplers were operated on 1-in-6 day schedules between June 2004 and May 2005, and on a daily basis between 1 and 4 February 2005 during the PM episode.

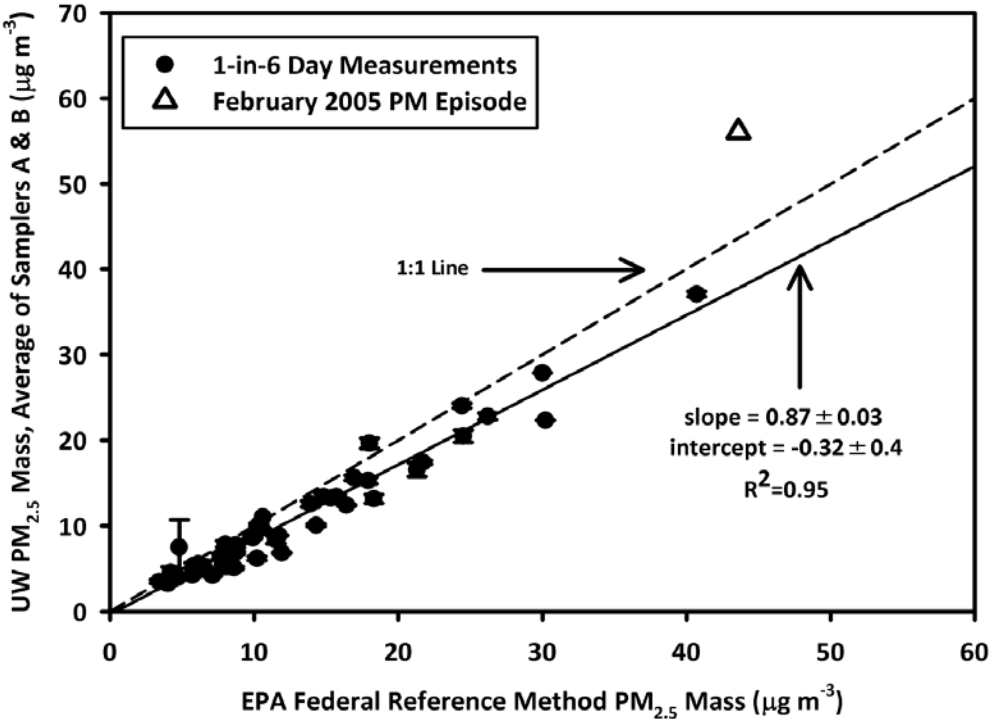

Fig. S10. A Comparison of $PM_{2.5}$ mass measurements made by the US EPA (FRM) and UW-Madison at Milwaukee, WI. Both samplers were operated on 1-in-6 day schedules between June 2004 and May 2005.

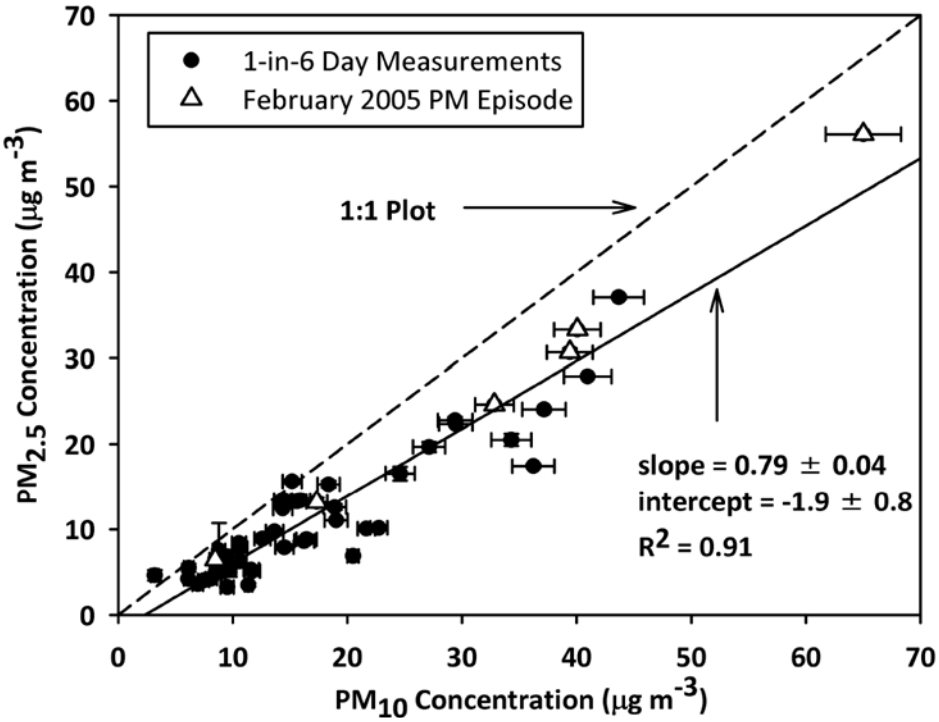

Fig. S11. A comparison of PM $_{2.5}$ against PM $_{10}$ mass measurements made by UW-Madison at Milwaukee, WI. The samplers were operated on 1-in-6 day schedules between June 2004 and May 2005, and on a daily basis between 1 and 4 February 2005 during the PM episode.

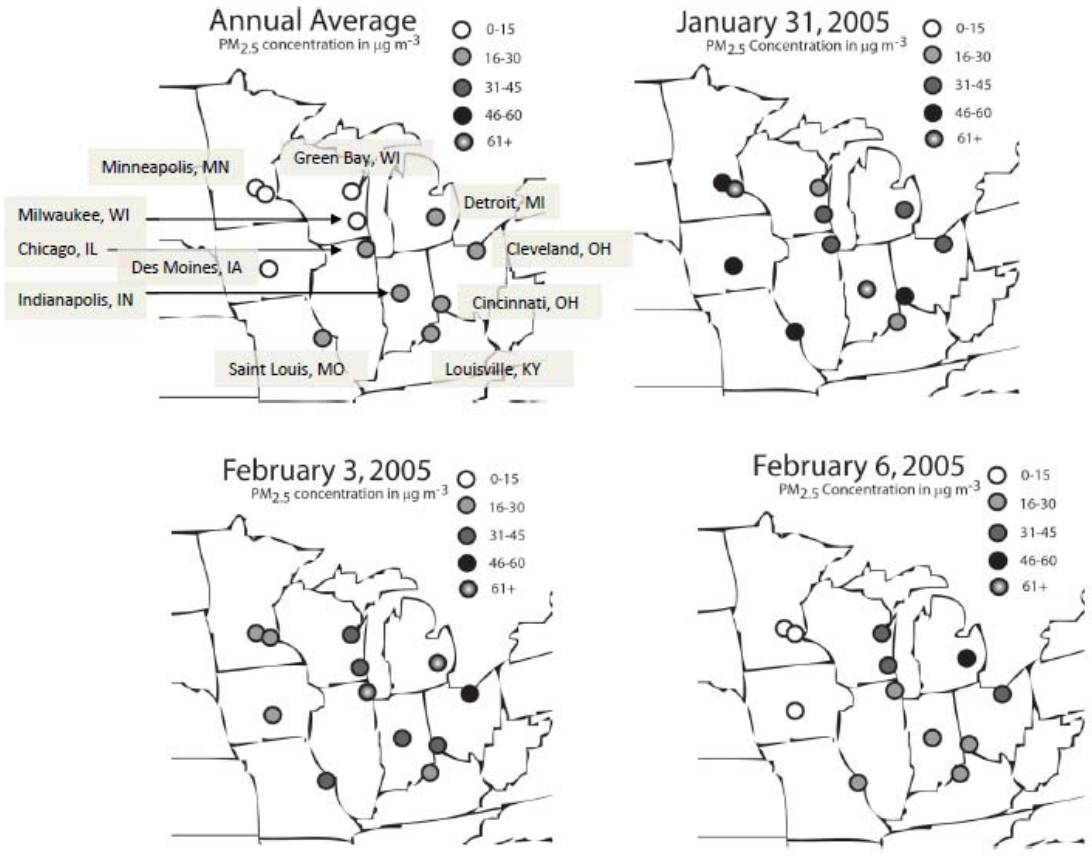

Fig. S12. PM$_{2.5}$ concentrations from each of the cities in the study. The figure presents the annual average and 1-in-6 day averages during the February 2005 PM episode.

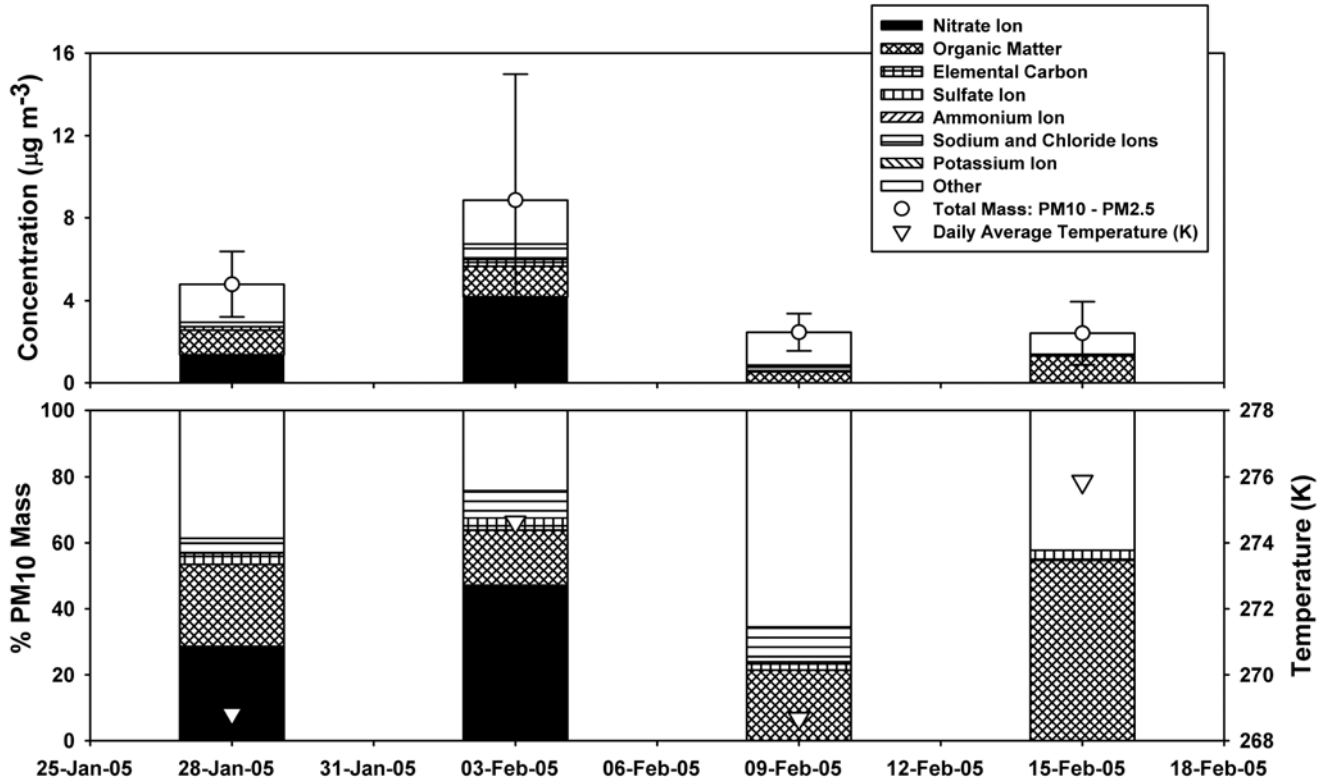

Fig. S13. Absolute and relative $PM_{10-2.5}$ composition during the February 2005 high PM concentration episode at Milwaukee, WI.