Integration of AQ data into AQM Efforts: How to motivate and promote AQ Actions and Engage Stakeholders

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Introduction

- Without monitoring data it is not feasible to manage air quality

- Well established that air quality monitoring is a powerful tool to engage students and community groups in data collection

- Monitoring data provides other important opportunities:
  - The basis for local impact assessment
  - The basis for assessing compliance
  - The basis for trend analysis
  - The basis for source impacts
  - The basis for accountability and policy evaluation

Local Impact Assessment

- The adverse effects of air pollution have been well documented on a scientific basis and on a global public health basis

- Local assessments of the impacts of air pollution on human health tend to resonate with community groups and policy makers

- Monitoring data is needed as input to local impact assessment for air quality
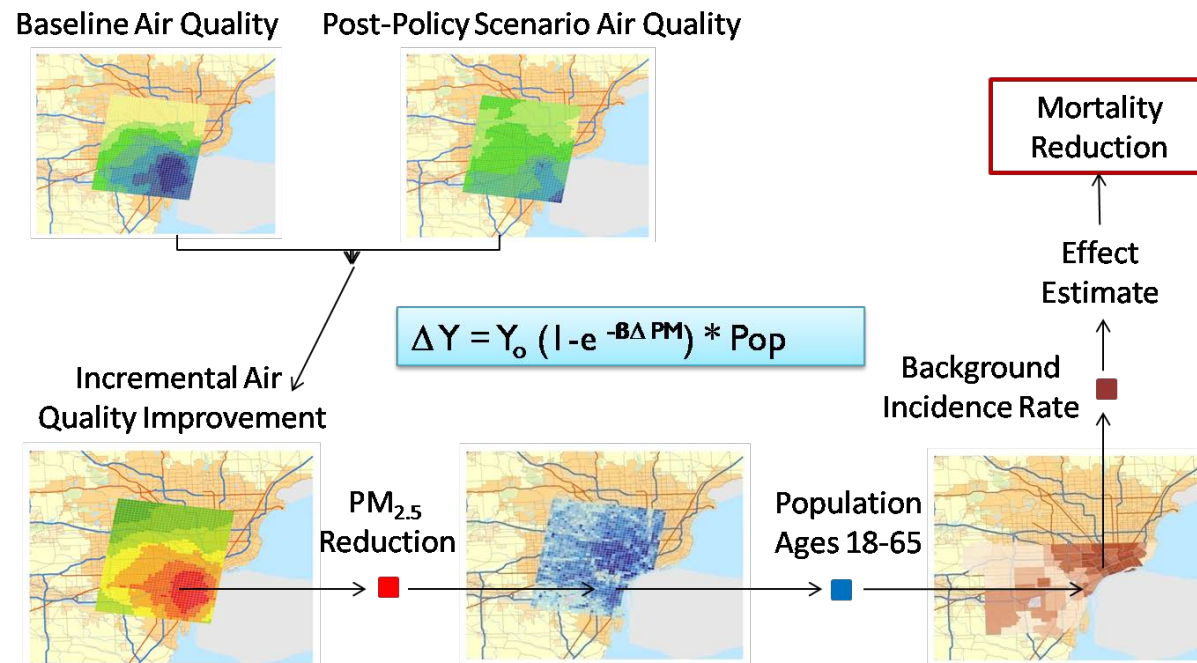
BenMAP Community Edition

○ Proven software that estimates the health impacts and economic value of changes in air quality.

○ Powerful enough to perform a full-scale benefits assessment, but easy enough for beginners to use.

○ Open-source to encourage community ownership.

BenMAP
COMMUNITY EDITION

BenMAP-CE enables users to load their own data or use pre-loaded datasets for the U.S. and China, including

- Air quality data
- Demographic data
- Economic values
- Concentration-response relationships

Baseline Air Quality   Post-Policy Scenario Air Quality

Mortality Reduction

$$\Delta Y = Y_o \, (1 - e^{-\beta \Delta PM}) * Pop$$

Incremental Air Quality Improvement

Effect Estimate

Background Incidence Rate

$PM_{2.5}$ Reduction

Population Ages 18-65

Local Impact Assessment

- Many community groups and policy makers do not have the scientific background to understand the air pollution and concentrations and even Air Quality Index (AQI) Data

- Risk assessments that place air pollution in the context of health impacts or health impact costs are accessible to community groups and policy makers

- Demonstrated effective engagement tool

Compliance Assessment

- In some cities, the metric of air quality is visibility or haze (i.e. blue skies).

- Number of "blue sky days" is a poor metric for human health as pollution levels can have very large health impacts even if they are not visible

- The public and policy makers tend to be concerned about air quality during poor viability

- Air quality standards are based on pollutant concentrations and need to be measured to properly facilitate compliance

http://www.marketplace.org/topics/sustainability/we-used-be-china/what-would-your-city-look-beijings-air-smog-simulator

Compliance Monitoring

- Air pollution standards typically have regulations for daily average and annual average

- Most health effects assessment are based on annual average concentrations and the annual average metric is critically important for human health

- Human perception of air pollution focusses on poor days and cannot really assess annual average concentrations

Identification of potential source areas for elevated PM$_{2.5}$, nitrate and sulfate concentrations

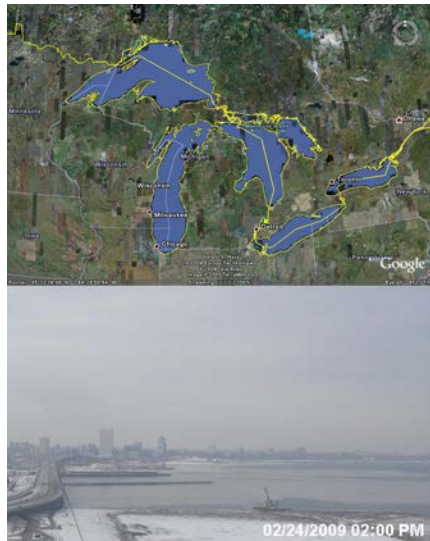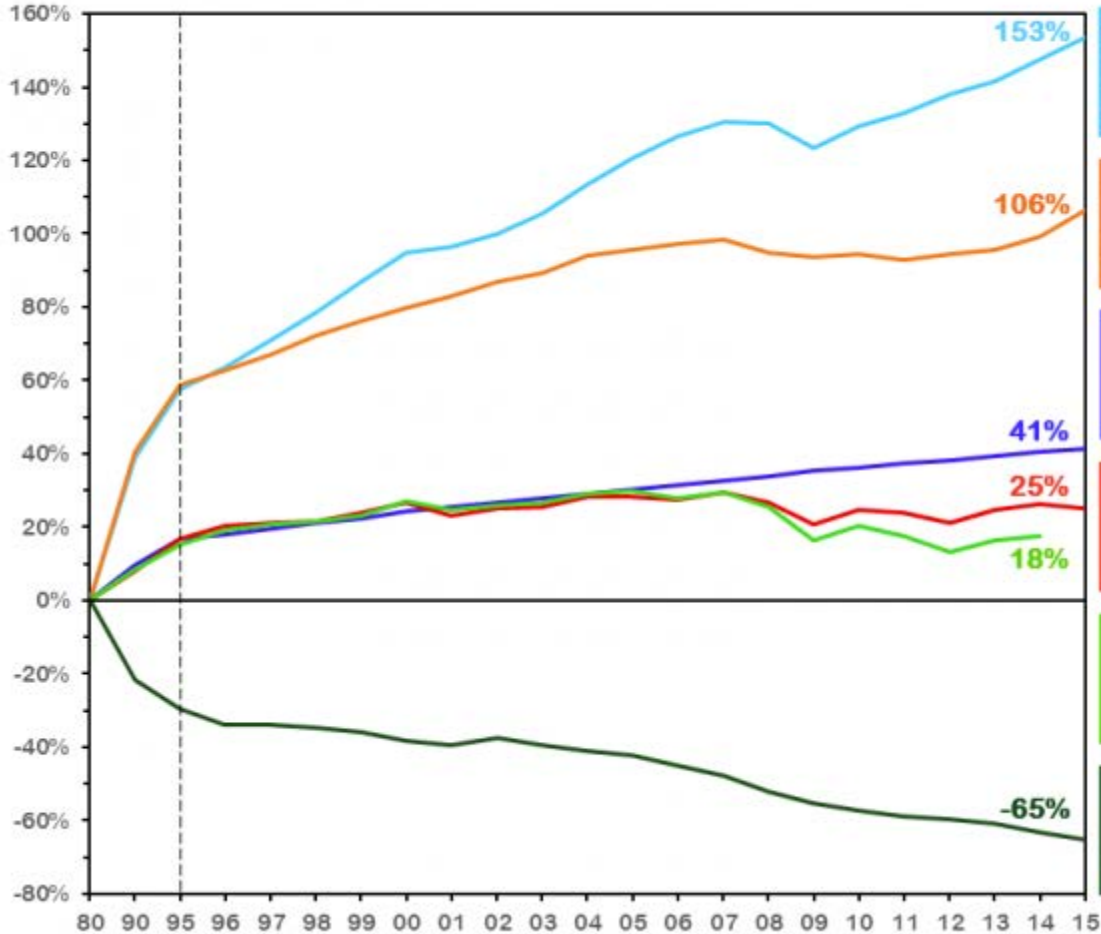Jongbae Heo[a], Jerome E. McGinnis[a], Benjamin de Foy[b], James J. Schauer[a,c,*]
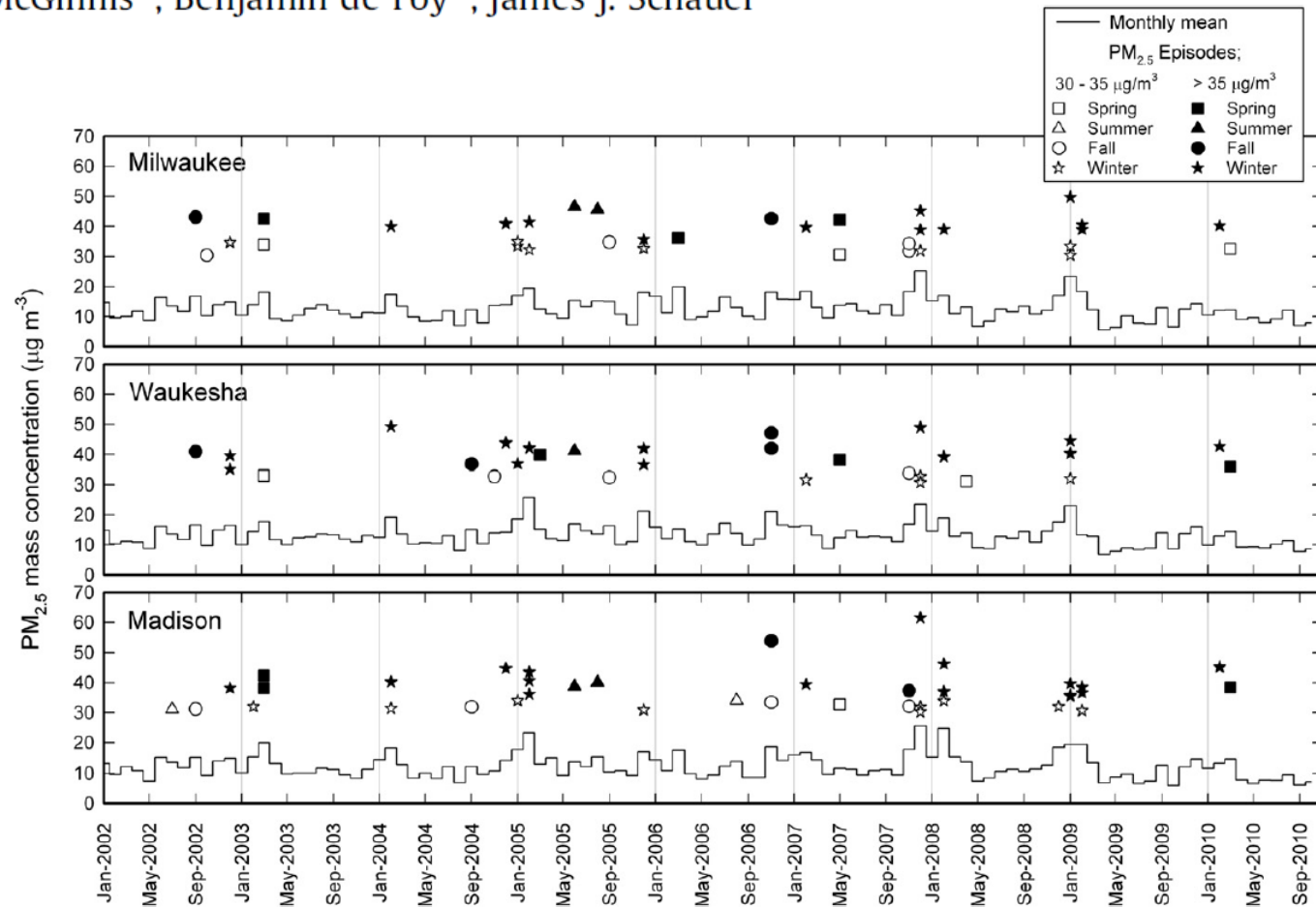
Fig. 1. Monthly mean concentrations of PM$_{2.5}$ mass and frequency of PM$_{2.5}$ mass over 30 µg per cubic meter.

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Trend Analysis

- Effective air quality management needs to address changes in emissions and the drivers of emissions over time including population, vehicle miles traveled, energy use

- Reductions in emission factors can easily be outweighed by growth in source activity

- Trends in air pollution need to be studied carefully to properly assess progress in air quality management

Comparison of Growth Areas and Emissions, 1980-2015

https://www.epa.gov/transportation-air-pollution-and-climate-change/accomplishments-and-success-air-pollution-transportation15

PM Monitoring Approaches
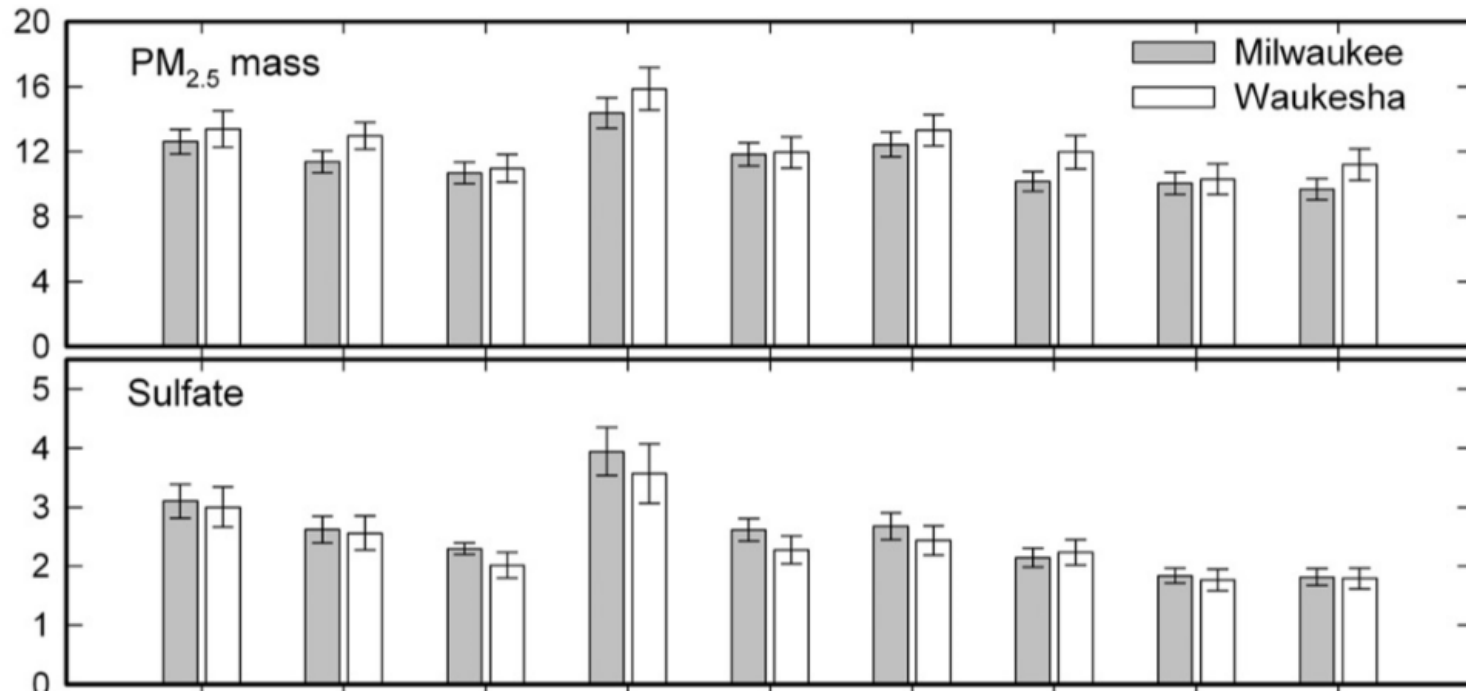
- Two major categories of particulate matter monitoring:

  - Concentration Monitoring – Critical for trend compliance, risk assessment, and trend analysis

  - Composition Monitoring – Critical for understanding sources and source apportionment
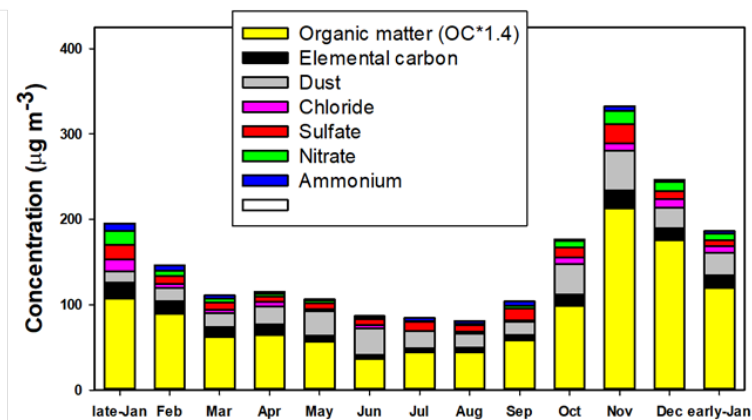
Trend Analysis of Components

Jongbae Heo[a], Jerome E. McGinnis[a], Benjamin de Foy[b], James J. Schauer[a,c,*]

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Source Apportionment

- If source apportionment is implemented properly, it can be an effective tool to engage with air pollution source sectors

- Source apportionment presented as a "black box" and is not transparent can be divisive

- There are many examples of when source sectors are engaged with source apportionment studies and are provided with a compelling evidence of their impacts that they will be more open to regulation

Opportunities for Engagement

- Capacity building and collaboration for chemical speciation and source apportionment/data analysis

- Technology transfer for air pollution control technologies

- Technology innovation for low emission technologies and low carbon energy

- Training for best management practices for Air Quality Management – State and City Function in the USA

Source Apportionment and Engagement

- We need more from source apportionment than a nominal understanding of sources

  - "Knowing" the sources is insufficient to drive policies to mitigate air pollution

- Need source apportionment to facilitate engagement with sources and source sectors through transparency

- Need a robust understanding on seasonal and spatial distribution of source impacts

- Need to understand sources of episodic events and annual average source contributions

- Need source apportionment to assess the effectiveness of control programs - Accountability

Spatial Representativeness

Intra-urban spatial variability in wintertime street-level concentrations of multiple combustion-related air pollutants: The New York City Community Air Survey (NYCCAS)

Jane E. Clougherty[1], Iyad Kheirbek[2], Holger M. Eisl[3], Zev Ross[4], Grant Pezeshki[2], John E. Gorczynski[3], Sarah Johnson[2], Steven Markowitz[3], Daniel Kass[2] and Thomas Matte[2]
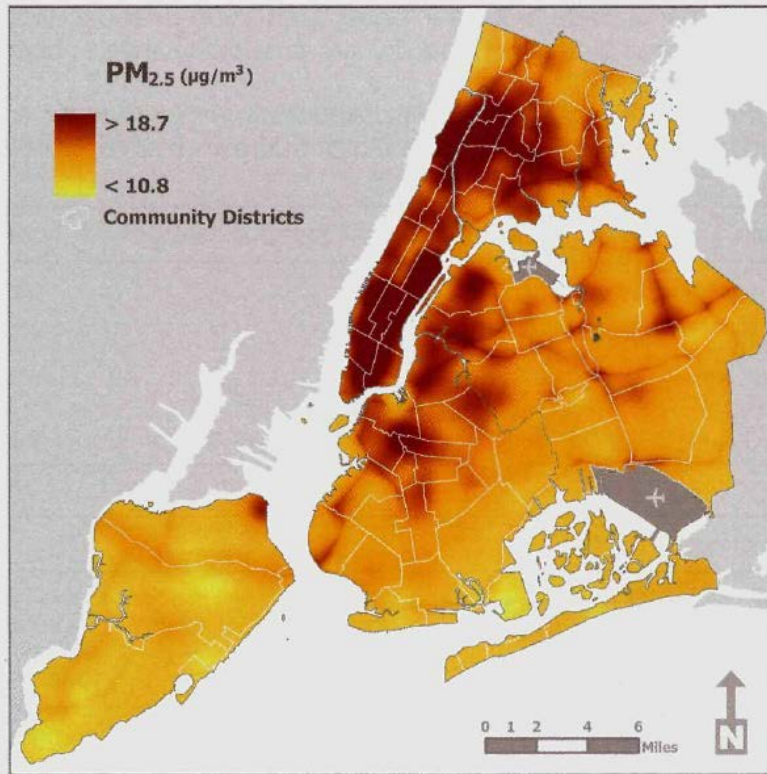
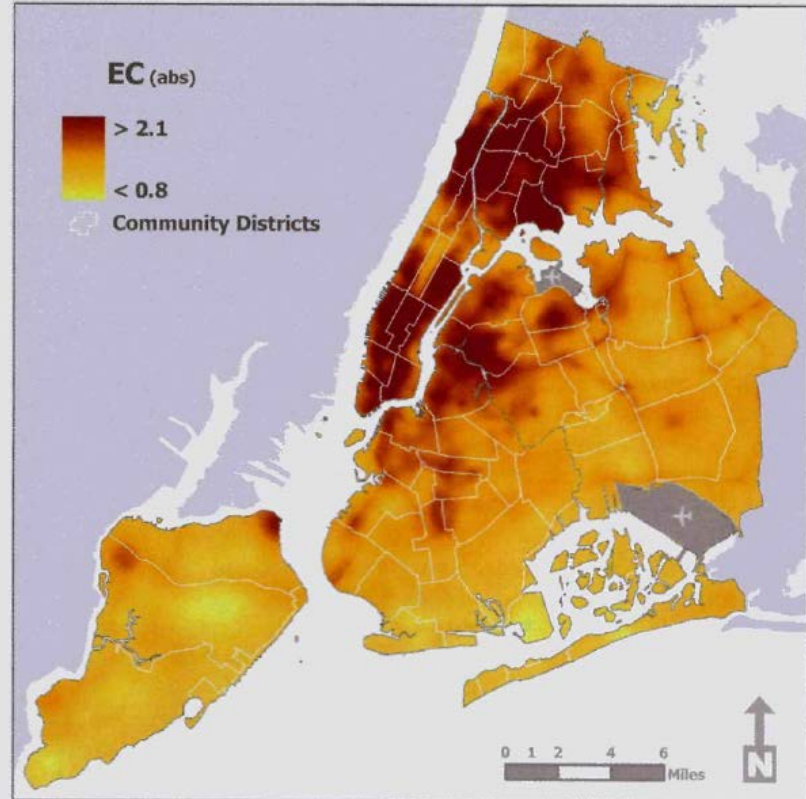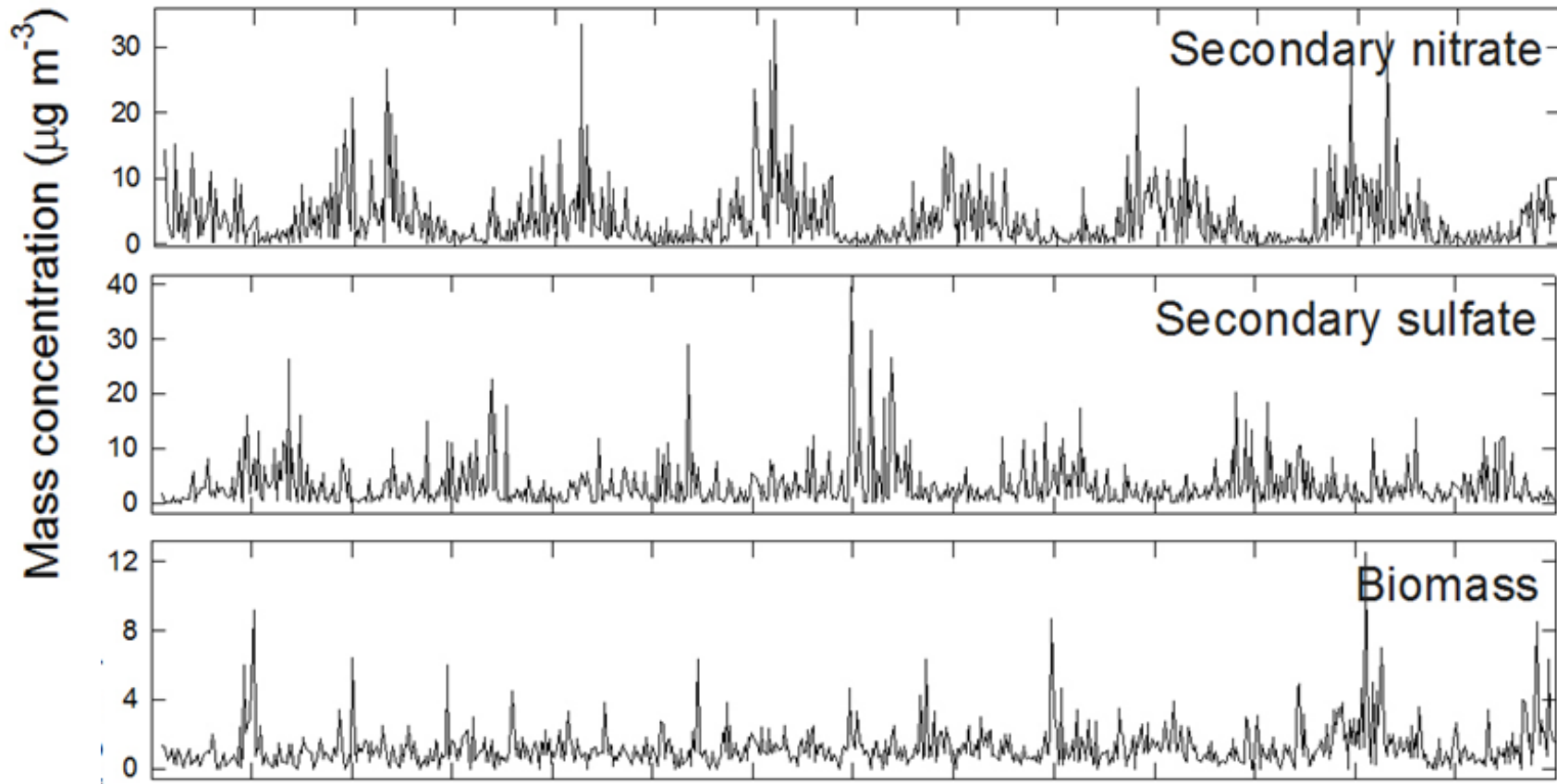Figure 3. Map of estimated fine particles (PM$_{2.5}$) concentrations, winter 2008–2009.

Figure 4. Map of estimated black carbon (BC) concentrations, winter 2008–2009.

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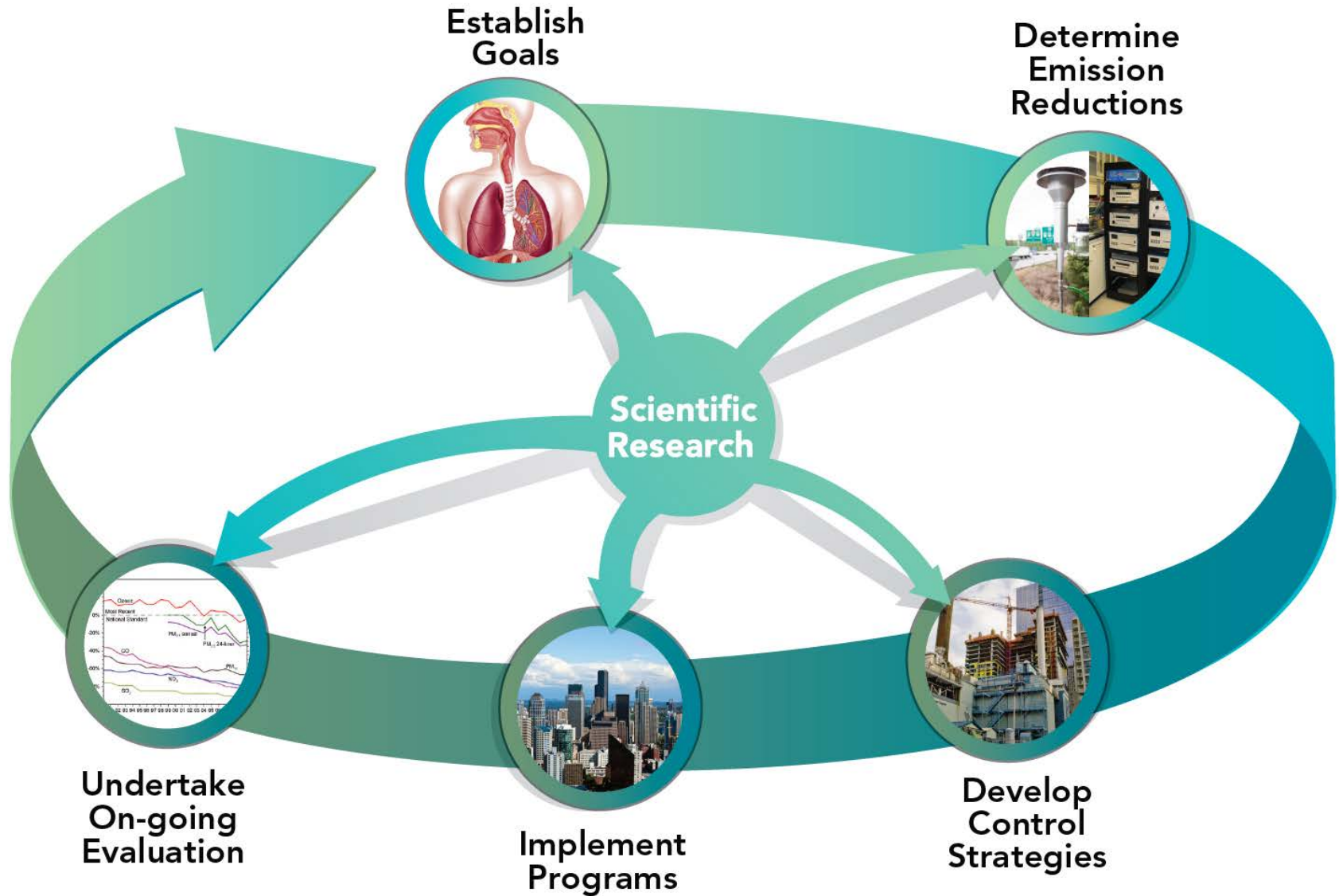UNIVERSITY OF WISCONSIN–MADISON

Understanding the sources and composition of the incremental excess of fine particles across multiple sampling locations in one air shed

Jerome E. McGinnis[1], Jongbae Heo[1], Michael R. Olson[1], Andrew P. Rutter[1], James J. Schauer[1,2,*]

AIR QUALITY MANAGEMENT CYCLE

Establish
Goals

Determine
Emission
Reductions

Scientific
Research

Undertake
On-going
Evaluation

Implement
Programs

Develop
Control
Strategies

Key Message

- Monitoring data provides engagement opportunities:
  - Local impact assessment
    - Community Groups/Policy Makers
  - Assessing compliance
    - Community Groups/Policy Makers
  - Trend analysis
    - Source Sectors/ Policy Makers
  - Source Impact Analysis
    - Source Sectors/Policy Makers
  - Accountability and policy evaluation
    - All Stakeholders

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