Mobile Source Air Toxics

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Topics

- What are the Mobile Source Air Toxics (MSATs)?
- Contribution of mobile sources to air toxics
- How is EPA reducing emissions of MSATs?
- NATTS and Community-scale monitoring data in the mobile source program
- Monitoring needs for MSATs

What are the Mobile Source Air Toxics?

- Have the potential for adverse health effects
- List of 21 compounds in EPA's 2001 rule are not a defining list of MSATs
- In 2007 rule: there is not an "MSAT "list"
  - Master List of Compounds Emitted by Mobile Sources (evaporative and exhaust emissions) >1,000
    - www.epa.gov/otaq/toxics.htm
  - 96 compounds on the Master List are in IRIS
  - 53 compounds on the Master List are on the HAP list

Mobile Source Contribution to Air Toxics

MSAT	Mobile Source Contribution
Acetaldehyde*	60%**
Acrolein*	25%**
Benzene	68%
1,3-Butadiene	58%
Formaldehyde*	47%**
Lead	29%
Naphthalene*	27%

***EPA Re-evaluation of health effects underway; For some compounds health benchmark values are not currently available (e.g., ethanol, propionaldehyde, 2,2,4-trimethylpentane)**

****Secondary formation in the atmosphere contributes significantly**

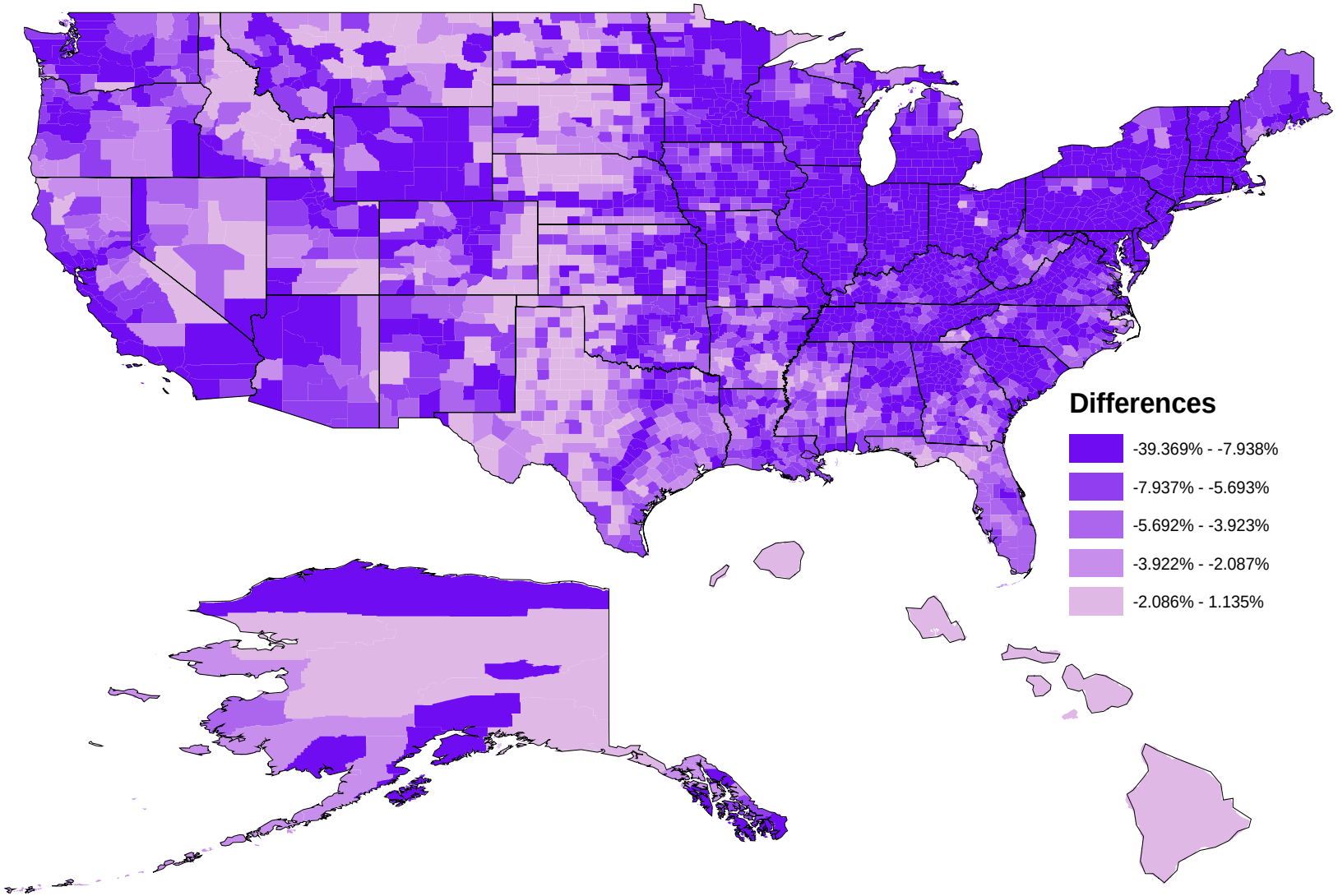
Recent OTAQ actions that decrease emissions of air toxics

- (Tier 1 and Reformulated Gasoline)
- Tier 2 Standards 2000
- Heavy-duty diesel rule 2001
- Non-road diesel rule 2004
- Mobile Source Air Toxics Rules 2001 & 2007
- National Clean Diesel Campaign
- Locomotive & marine diesel - proposed
- Small gasoline engines - proposed

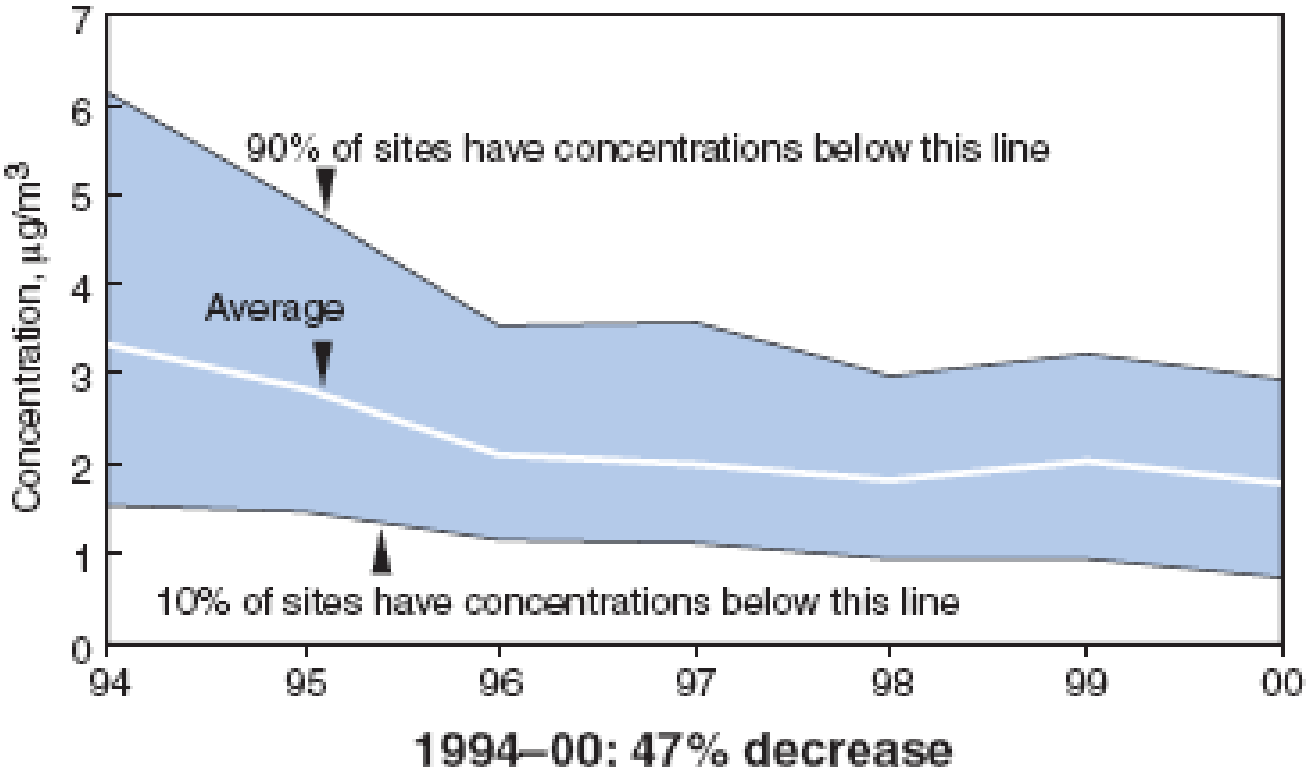
The regulations on light-duty vehicles, when fully implemented will result in 80% reduction in emission of mobile source air toxics (mass)

Collectively, the regulations on all mobile sources will result in 45% reduction in MSATs (mass)

Distribution of Percent Reductions in Median MSAT Cancer Risk, 2030, for U. S. Counties with Controls in this Rule



NATTS Monitoring Data to Assess Impact of Regulation on Mobile Sources: Benzene



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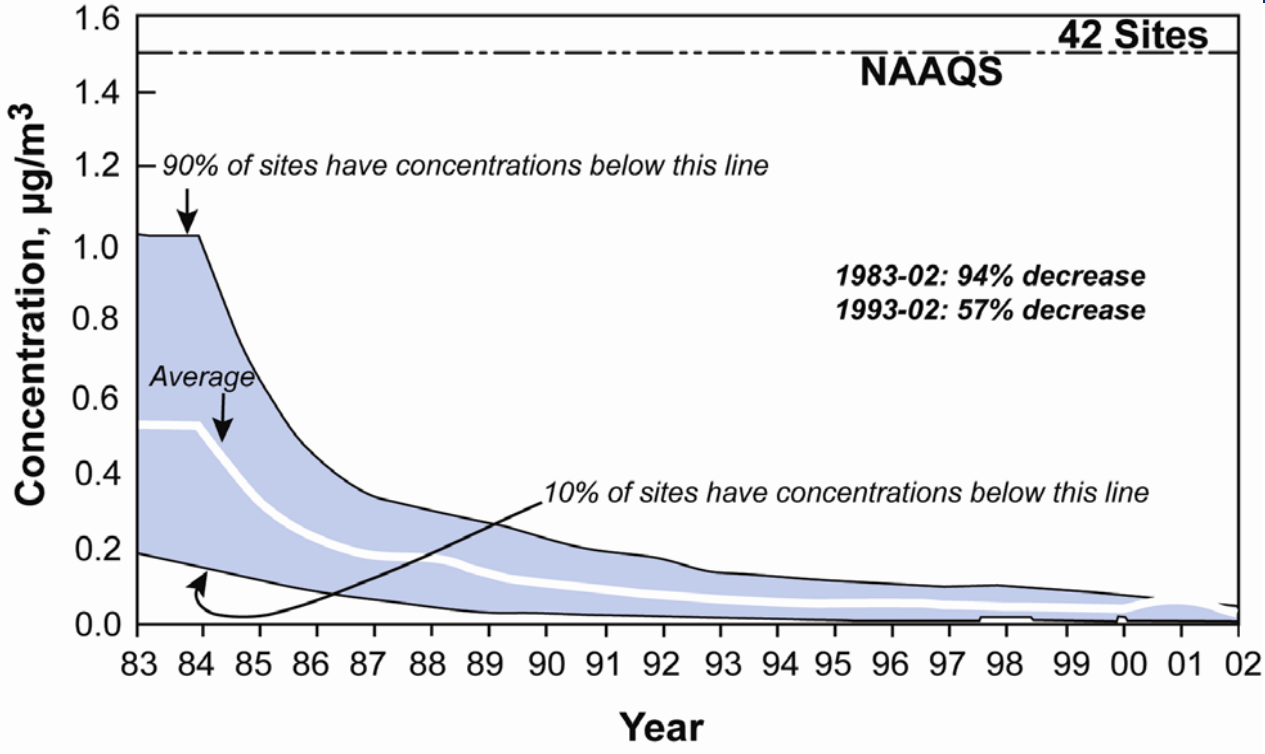


Significant challenges in analyzing regulatory impacts

NATTS Monitoring Data: Assess Impact of Fuel & Technology Changes

- Renewable Fuel Standard 2006
  - Additional 3.5 billion gallons of renewable or alternative fuel by 2012
- Greenhouse Gas Rule Proposal being developed
  - In response to President's Executive order of May 14, 2007
  - Reduce gasoline consumption through vehicle fuel efficiency and renewable/alternative fuels
- Implications for Toxics
  - Ethanol impact on aldehydes, PAN, BTEX, 1,3-butadiene
  - Biodiesel and other fuel options
  - Precursors to secondary organic aerosols
- Other Fuel and Technology Changes in Progress
  - Light-duty fuel and vehicle regulations
  - Diesel regulations
  - Voluntary Programs

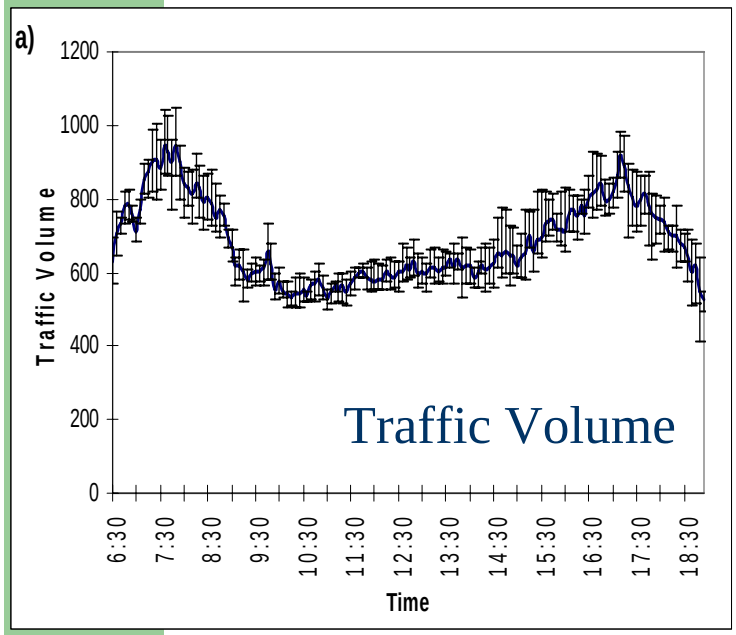
Community-scale Toxics Monitoring Informing Mobile Source Issues

- Investigate mobile source emission impacts in environments where toxics exposure can be much greater than at the “neighborhood scale” such as
  - Near roads, Airports, Ports, Railyards, Transportation Expansion Projects
- Improve local-scale model estimates
- Investigate acute and chronic exposure scenarios, susceptible population exposures
- Inform decisions regarding regulation, communication, voluntary measures for reducing exposure
- Assess efficacy of local mitigation measures (e.g., anti-idling, retrofit programs)
- Potentially provide data to support epidemiological investigations
- Investigate emerging issues
- Develop collection and analysis methods

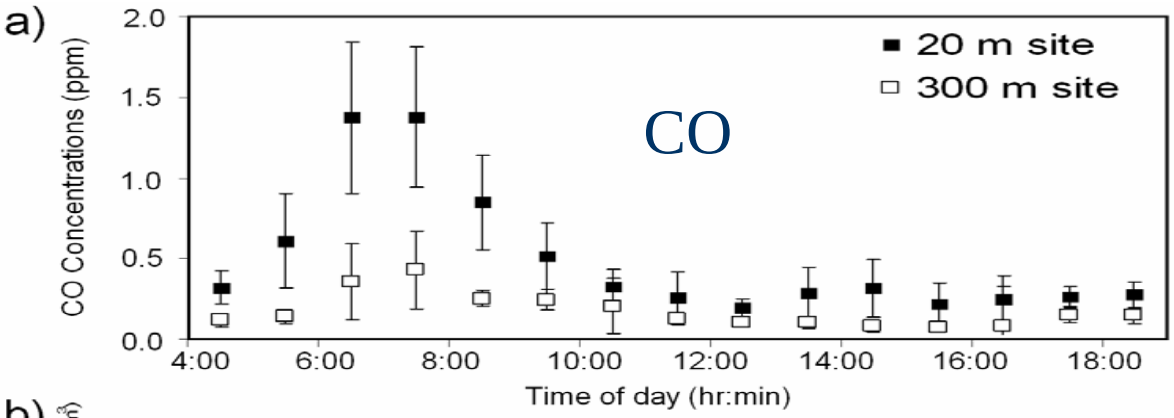
Exposure Near Transportation Sources

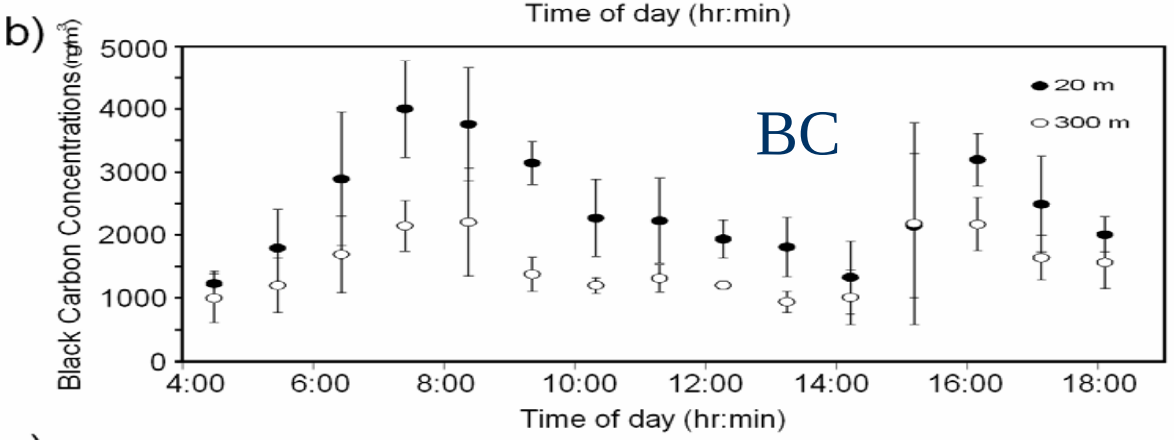
- Mobile sources are ubiquitous and contribute significantly to local, national and international emissions for numerous air pollutants
- Exposures occur to “fresh” and “aged” emissions
- Large segments of the population live, work, and/or go to school in close proximity to mobile source emissions
  - 2001 American Housing Survey estimates that 12.4% of U.S. living quarters (over 35 million people) are within 300 feet of a road with 4+ lanes, a rail line, an airport
- Concentrations of directly-emitted MSATs are elevated within 100-200 meters of major roads

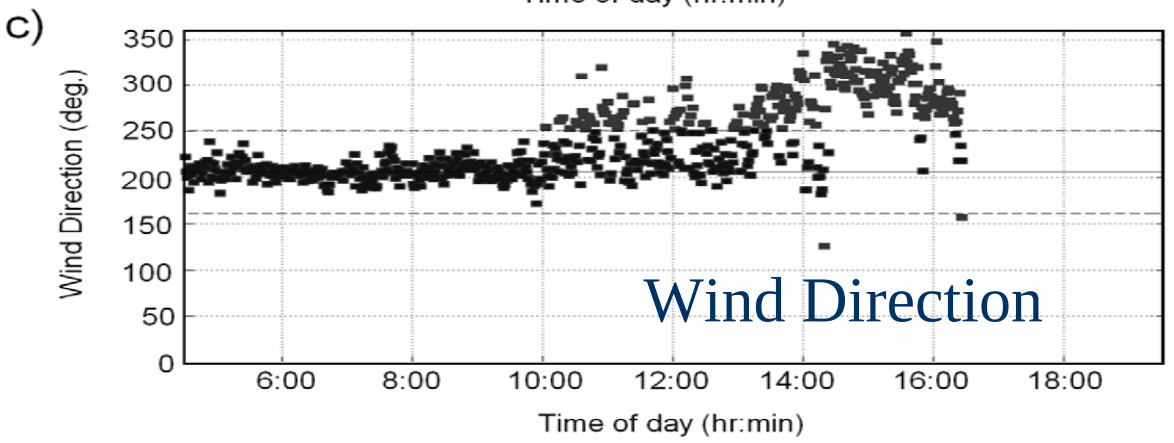
Near Road Air Quality:
Short term variability



Raleigh, NC







Benzene: average 2.4x greater; 95th %ile up to 7x greater

Health Effects Near Transportation Sources

- ~300 studies on exposure and/or health effects mainly in last 10 years
- Living, working or going to school near major roads has been associated with several adverse health effects
  - Respiratory effects (e.g., asthma, bronchitis)
  - Cardiovascular effects
  - Premature mortality
  - Adverse birth outcomes/developmental effects
  - Childhood cancer
  - Neurological effects
- Evidence is not equally as strong for each of these health effects
- Impact of noise and socioeconomic status

Monitoring Near Transportation Sources

- Complex mixture of MSAT sources
  - Exhaust
  - Evaporative Emissions
  - Brake & Tire Wear
  - Re-entrained Road Dust
- Need Data on:
  - Meteorology
  - Traffic (number of vehicles, type, speed, LTO, idle time, fuel type, etc)
  - Distance from Source
  - Barriers (e.g., noise wall)
  - Other sources

Studies Needed and Underway

- Studies needed to
  - Evaluate mitigation measures such as vegetation and barriers
  - Evaluate trade-offs in requiring set-backs from the road (e.g., greater time in vehicle or other means of transportation)
  - Evaluate key factors impacting health
  - Evaluate gradients near airports and other major transportation sources
- Studies underway
  - EPA ORD: Raleigh, Las Vegas, Detroit (tentative)
  - EPA PM Centers: Southern California, Harvard, Rochester
  - EPA Regions
  - Health Effects Institute
  - Mickey Leland Center

In Conclusion

- Air Toxics Monitoring in the NATTS and community-scale programs provide valuable information for OTAQ programs
- Specific needs include
  - Trends sites to evaluate control strategies and fuel changes
  - Trends sites and community-scale monitoring to improve models
  - Community-scale monitoring to
    - Evaluate concentrations near transportation sources
    - Evaluate mitigation measures
    - Evaluate local-scale impact of fuel and technology changes
    - Support epidemiological studies
    - Develop monitoring methods suited to shorter collection periods