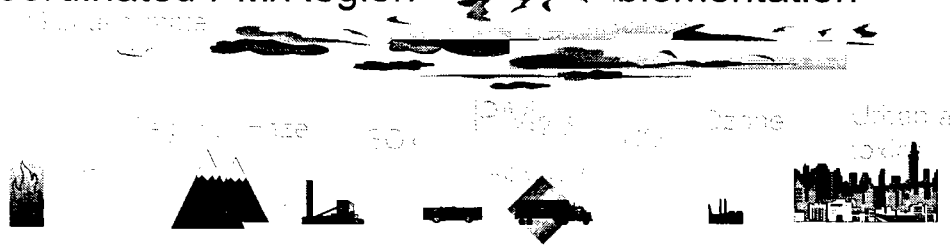
Update on review and implementation of PM standards

John Bachmann
May 19, 2000

Overview

- The ongoing PM NAAQS review
  - Why we did this
  - Litigation status
  - Criteria, staff paper, NAAQS schedule update
- Monitoring, reporting for PM2.5
  - The Air Quality Index (AQI) for fine particles
  - Preliminary results from mass network
  - Insights on trends, composition from IMPROVE network
- Coordinated PM/Regional Haze implementation



EPA airs toughened standards

The Washington Post

Industry Gasps at Idea of New Air Standards

THE REGULATORS, From F1

perspective, human hair is about 70 microns thick.

EPA says it is on firm ground. It is relying on an outside panel of scientists who voted that EPA should revisit the standards, though they did not agree on specifics.

"The industry position seems to be we should stick to where we are," said **Richard Wilson**, EPA's deputy assistant administrator for air and radiation. "It's hard to understand when you look at the advice we got from the outside

set the standards to protect public health.

The agency is expected to issue a final rule in June, but implementation probably wouldn't begin until 2002.

Industry, however, has decided not to wait for that.

It has enlisted law firms such as **Collier, Shannon, Rill & Scott; Hale and Dorr**, and **Shaw, Pittman, Potts & Trowbridge.**

Trade associations with members on the coalition's steering committee have chipped in as much as $100,000 apiece to bankroll the effort.

A provision showed up in th conference report for EPA's 1997 appropriation advisin change" option in the PM while including $18.8 m further research.

A source familiar v activities said docto epidemiologists, t and economists build the case group will ha each of the coalitions farmers overlo

Th

Smog Alert

The EPA proposes tough new clean-air standards

THE CLEAN-AIR ACT WENT A LONG WAY toward making the air we breathe cleaner and healthier, but it ... far enough. De... sulfur di...

THE WALL STREET JOURNAL.

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Provo, Utah, Provides Combatants in Clean-Air Fight

BRUSSELS

...tal news was ...nnel had opened to ..., spilling headlines from that year onto today's pages. The federal ...vernment proposed strict new regula- ... for smog reduction, something that ...pened in 1970. And, just as in ...

Ignore All Doomsayers on EPA Laws

The Seattle Times

Healthy skepticism for new clean-air rules

HOW clean is clean enough — and how much are we willing to pay?

As the U.S. Environmental Protection Agency prepares to tighten air-quality standards dramatically, these are two fundamental questions that Congress must debate and taxpayers must have answered before any government action is final.

Great progress in reducing air pollution has been made since ...

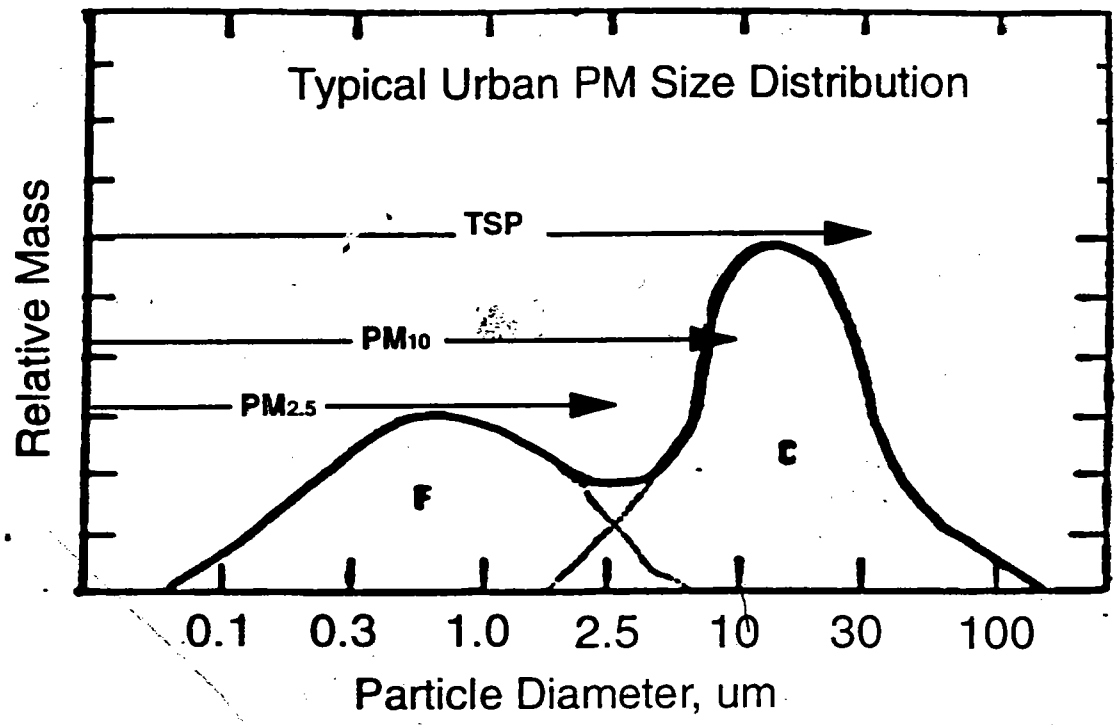
Recent PM Review

- Do the 1987 standards protect public health with an adequate margin of safety?
  - Overarching question addressed by assessment of substantial new body of epidemiology - especially time series - on mortality, hospital admissions, symptoms, lung function
  - Analyses of individual studies, reanalyses, consistency and coherence across numerous locations at levels below standards led to criteria document conclusion of "likely" causality

Alternatives for Revision

- The Indicator
  - PM10 still appropriate definition for thoracic particles
  - Recognition of profound differences in fine and coarse fraction particles
- Stengthen the PM10 Standards
  - Most studies used PM10 but....
  - History of PM10 suggest disproportionate emphasis on coarse PM
  - Some epidemiology, toxicology, exposure considerations suggested PM2.5 more important for effects seen in PM10 studies
- Add standards for PM2.5 to separate fine and coarse

Characteristics, Sources of Particulate Matter



Fine Particles

Combustion, gases to particles

Sulfates/acids
Nitrate
Ammonium
Organics
Carbon
Metals
Water

Sources

Coal, oil, gasoline, diesel, wood combustion
Transformation of SOx, NOx, organic gases, including biogenics
High temperature industrial processes (smelters, steel mills)

Exposure/Lifetime

Life time days to weeks, regional distribution over urban scale to 1000s of km

Coarse Particles

Crushing, grinding, dust

Resuspended dusts (soil, street dust)
Coal/oil fly ash
Sea salt
Aluminum, silica, iron -oxides,

Tire wear
Biological materials (Pollen, mold, plant/insect fragments)

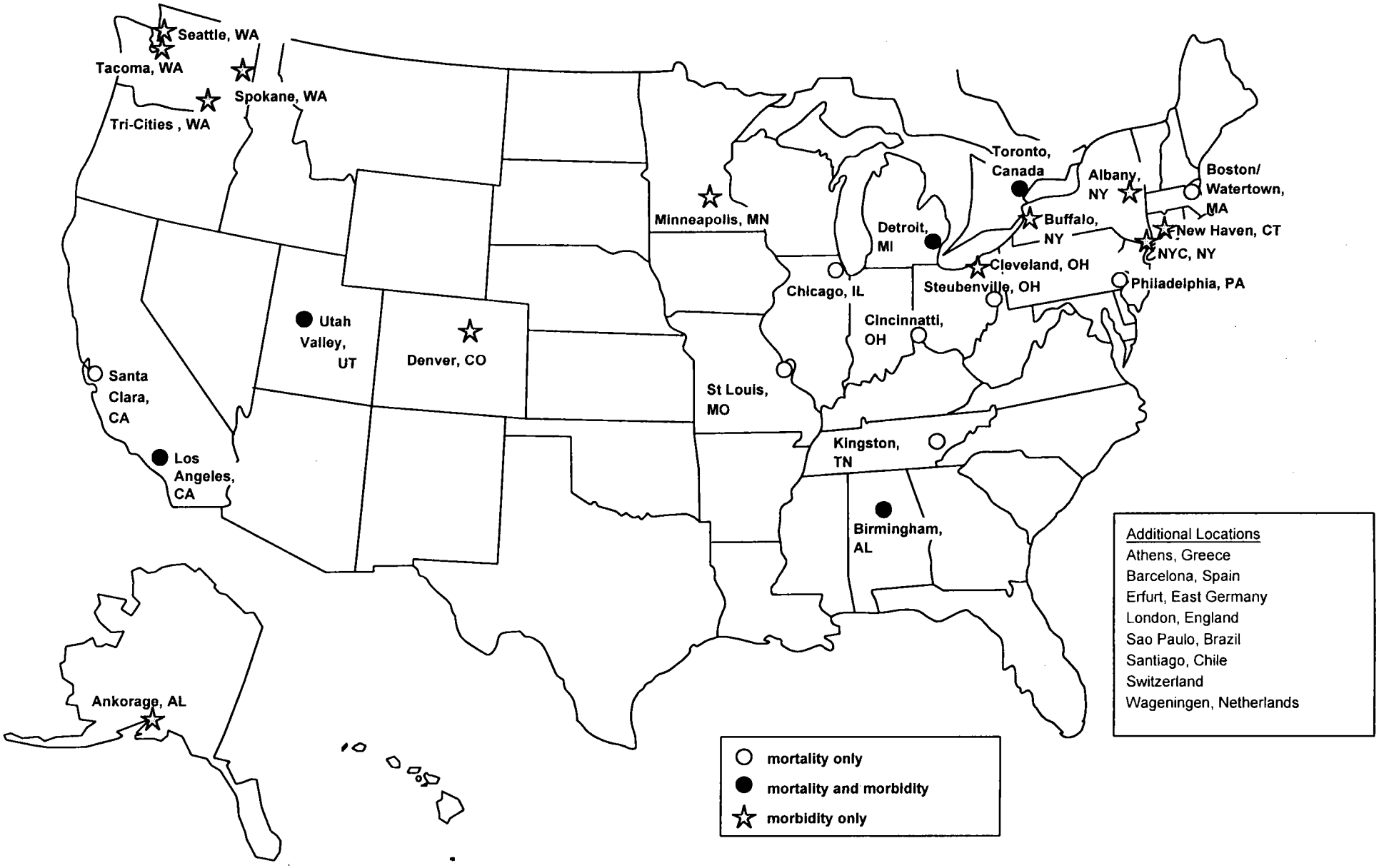
Sources

Resuspension of dust tracked onto roads
Suspension from disturbed soil (farms, mines, unpaved roads)
Construction/demolition
Industrial fugitives
Biological sources, sea spray

Exposure/Lifetime

Coarse fraction (2.5-10) lifetime of hours to days, distribution over smaller scales up to 100s km

Location of Recent PM Epidemiological Studies



[1] Locations of PM studies using a variety of PM indicators (e.g. PM_{10}, $PM_{2.5}$, $SO_4^=$, TSP) and reporting statistically significant results. Health effects include mortality and morbidity, as indicated. (See CED tables 12-2 through 12 5)

Coarse Fraction Particles Still of Health Concern

- Coarse fraction particles could be sensitive areas of the lung

- Health effects of concern
  - Aggravation of asthma
  - Increased respiratory illness
  - Children are particularly sensitive
  - Concerns about long-term accumulation

- Best evidence is from studies with higher concentrations

Implementation Timeline for $PM_{2.5}$ Standards

- 1997 — EPA issues Final PM2.5 NAAQS
- 1998 - 2000 — Monitors put in place nationwide
- 1999 - 2003 — Collect monitoring data
- 2002 — EPA completes 5-year scientific review of standards
- 2002 - 2005 — EPA designates nonattainment areas
- 2005 - 2008 — States submit implementation plans for meeting the standard
- 2012 - 2017 — States have up to 10 years to meet standards plus two 1-year extensions

EPA'S Revised PM Standards

- $PM_{2.5}$ standards:
  - 15 ug/m3, annual arithmetic mean, allows for average of multiple community oriented monitors (averaged over 3 years)
  - 65 ug/m3, 24-hour average, 98th percentile concentration (averaged over 3 years), maximum population oriented monitor in an area
- PM_{10} standards:
  - Retain annual standard of 50 ug/m3
  - Retain level of 24-hour standard (150 ug/m3) but revise form to 99th percentile concentration (3 year average)
- Original PM_{10} standards will remain in effect until area meets certain criteria

Judicial Review

- D.C. Circuit
  - Two of three judges: unconstitutional delegation of legislative powers
  - All ozone and PM standards remanded to EPA
  - Rejected various procedural and cost consideration claims
  - En banc Court votes 5 to 4 to rehear, but EPA loses
- In the meantime:
  - EPA/DOJ filed for certiorari by the Supreme Court
  - $PM_{2.5}$ and new ozone standards remain "on the books"
  - Revised PM_{10} coarse standards "vacated"
  - Old (more stringent) PM_{10} standards remain in effect
  - Cannot implement new ozone standards

Was it insufficient science?

- Unanimous opinion on fine particles:

"the growing empriical evidence demonstrating a relationship between fine particle pollution and adverse health effects amply justifies establishment of new fine particle standards"

- Unanimous opinion on coarse particles:

"we find ample support for EPA's decision to regulate coarse particulate pollution above the 1987 levels"

Effect on $PM_{2.5}$ Schedule

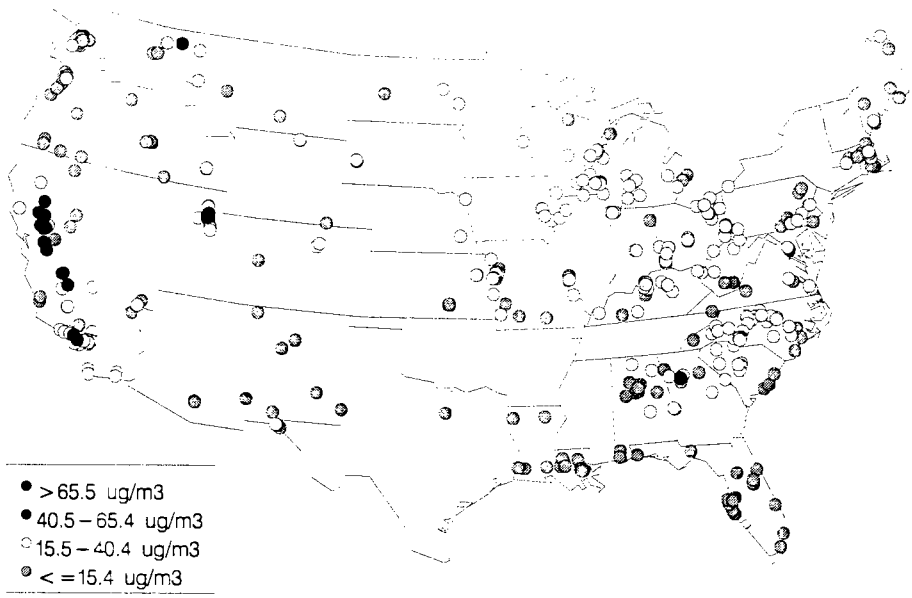
- Awaiting Supreme Court response
- Unclear how significant this decision would be for PM2.5 implementation in any case
  - Greatly expanded monitoring program being put into place nationwide and collecting data
  - Major research effort continues apace (NAS support)
  - Review of the scientific criteria and standards on track for completion in 2002
    - Some delay in intermediate steps
    - Revised Criteria Document by late summer, staff paper one month later
    - CASAC review in the fall

Air Quality Index for $PM_{2.5}$

Air Quality Index Values	$PM_{2.5}$ Levels ug/m3, 24-hr average	Air Quality
0 to 50	0.0 - 15.4	Good
101 to 150	40.5 - 65.4	Unhealthy for Sensitive Groups
151 to 200	65.5 - 150.4	Unhealthy
201 to 300	150.5 - 350.4	Very Unhealthy
301 to 500	350.5 - 500.4	Hazardous

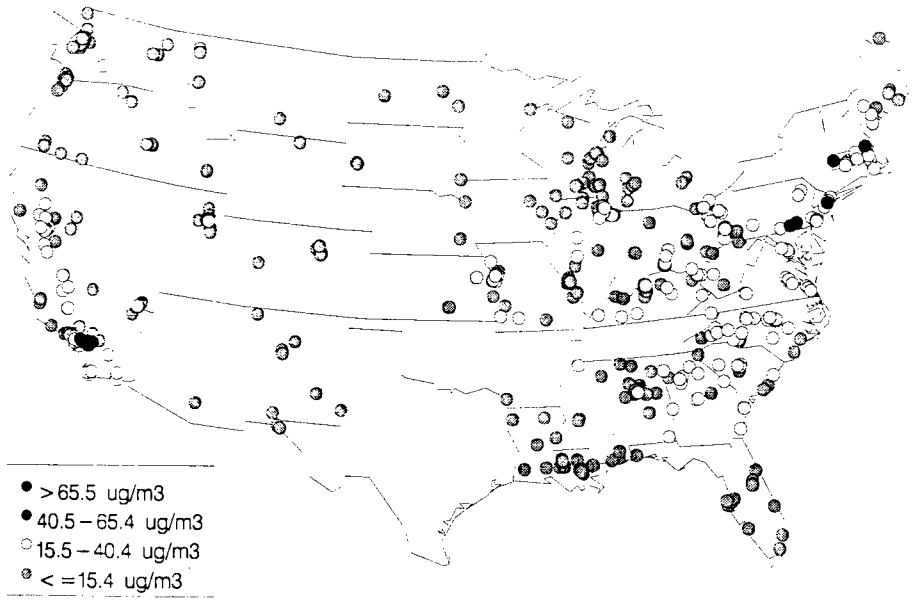
PM2.5 Concentrations – 01/30/1999

(as of 3/28/00)



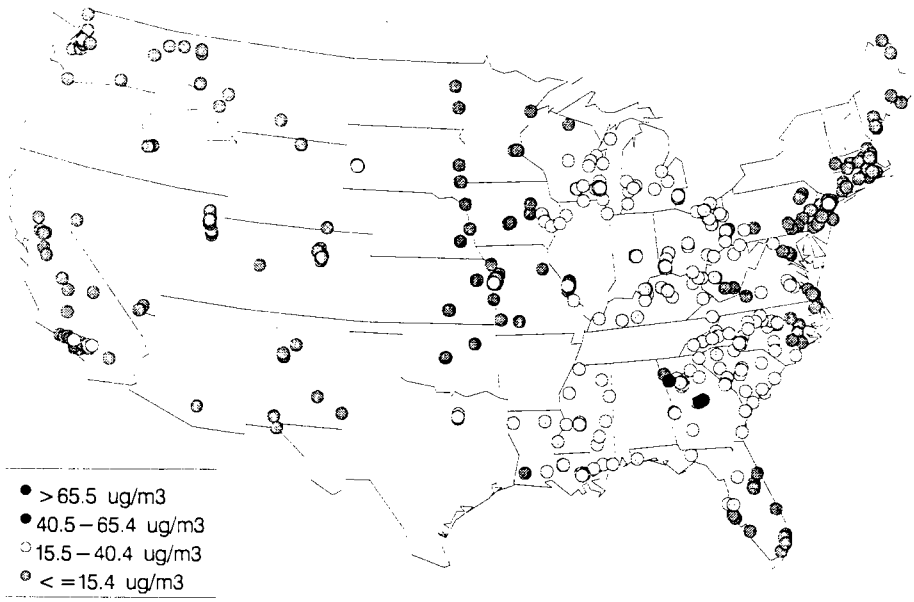
PM2.5 Concentrations – 02/17/1999

(as of 3/28/00)



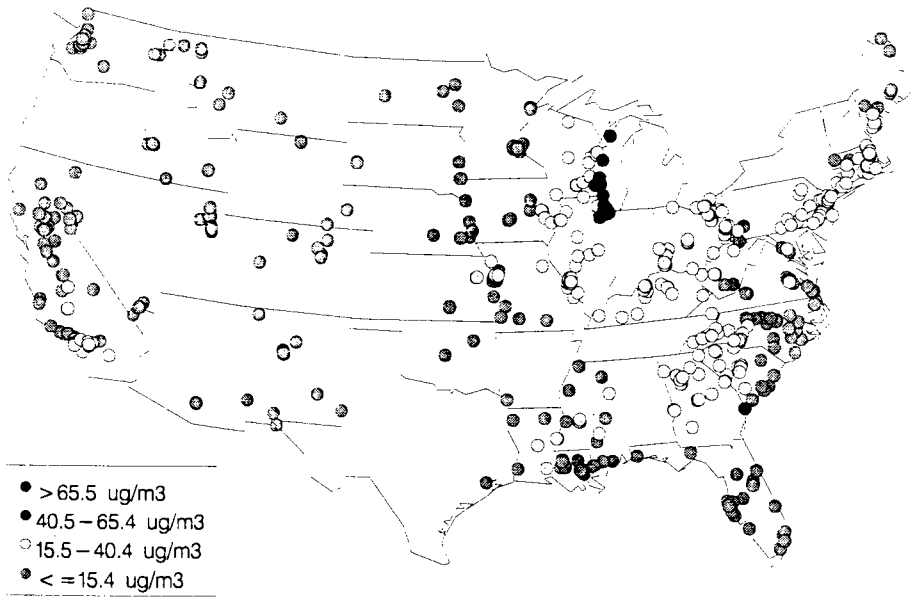
PM2.5 Concentrations – 05/21/1999

(as of 3/28/00)



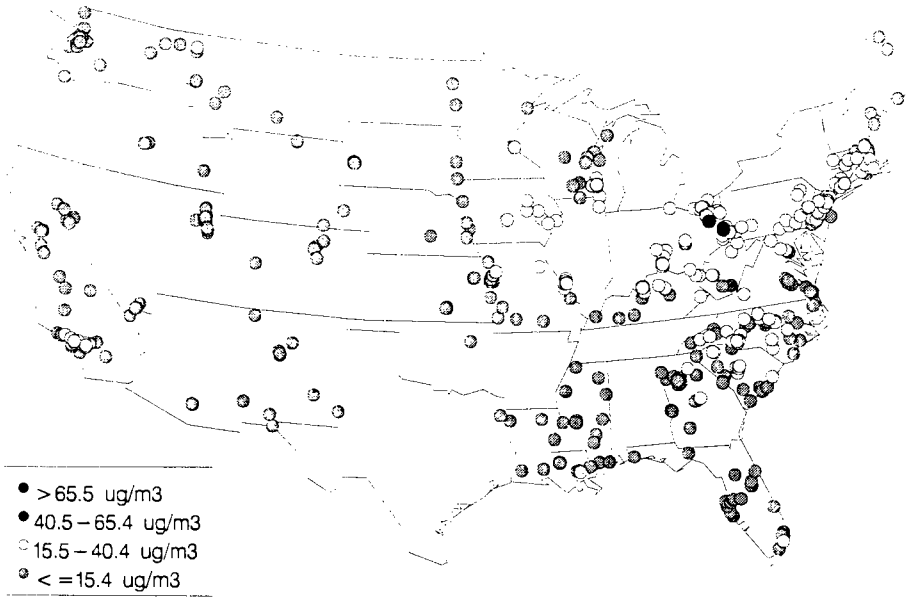
PM2.5 Concentrations – 06/23/1999

(as of 3/28/00)



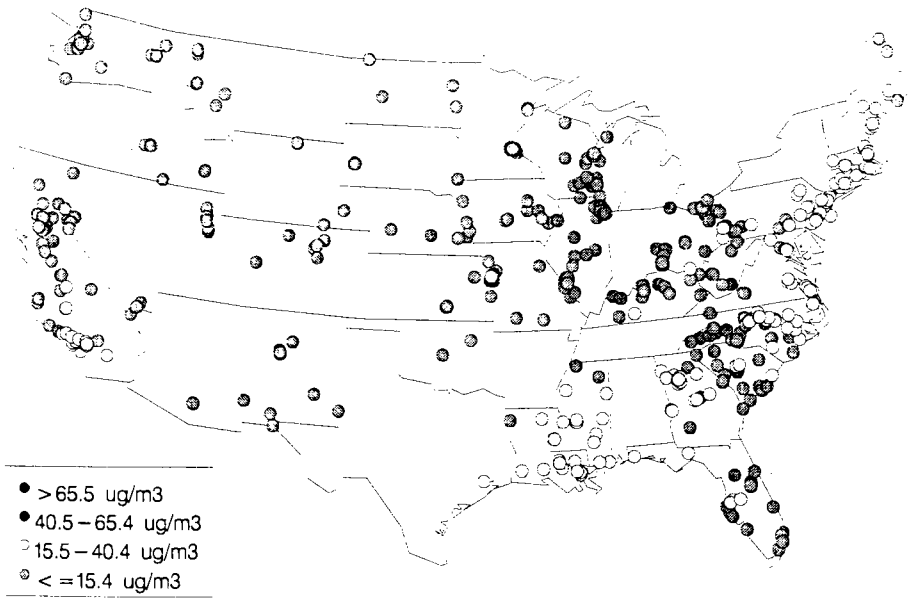
PM2.5 Concentrations – 06/26/1999

(as of 3/28/00)

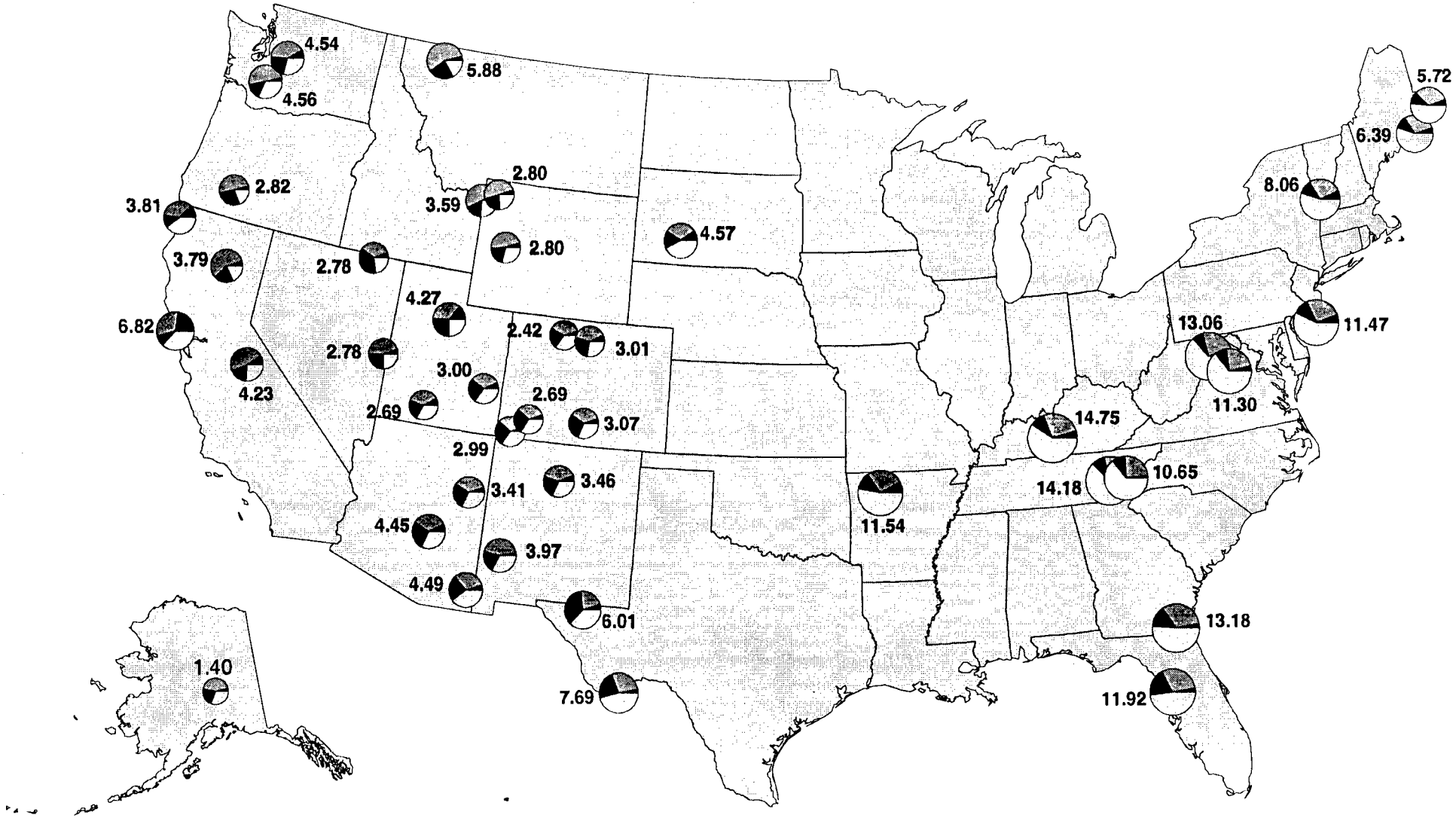


PM2.5 Concentrations – 06/29/1999

(as of 3/28/00)

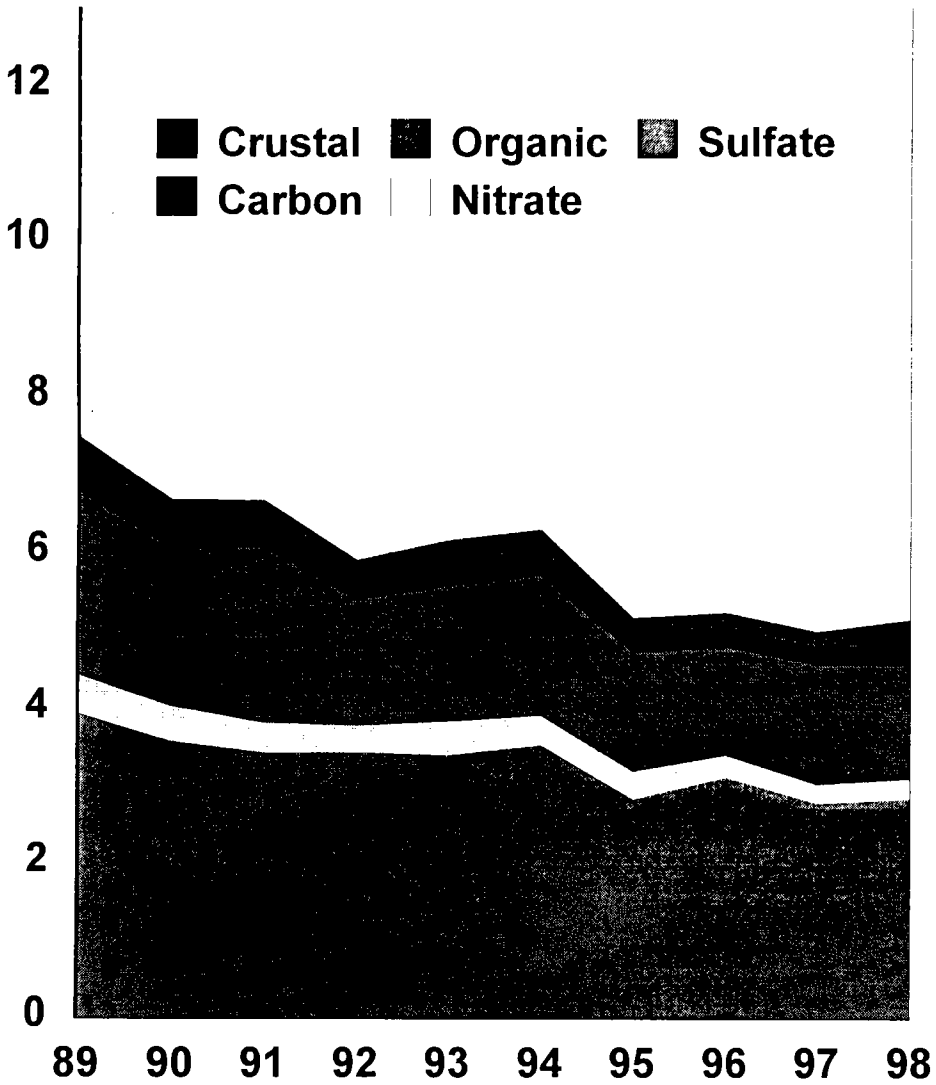


1998 IMPROVE Fine Particle Concentrations

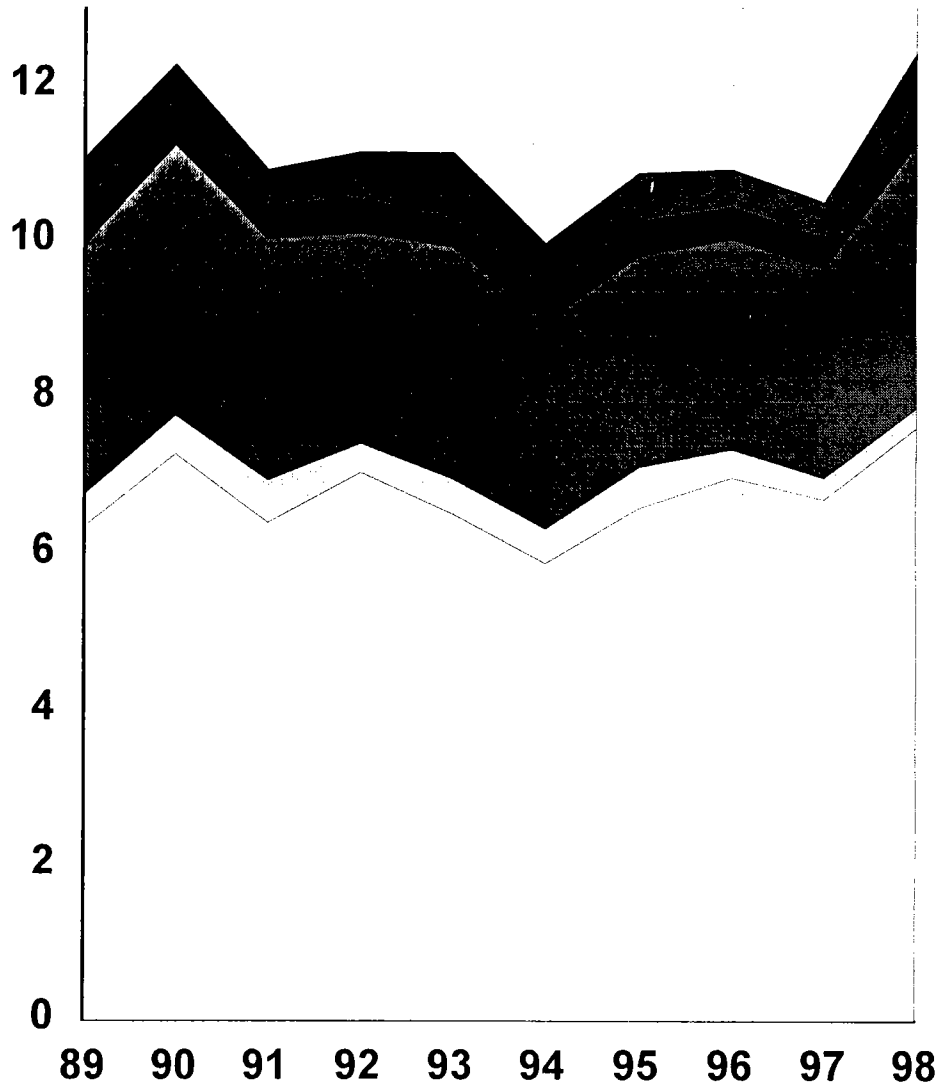


Regional $PM_{2.5}$ Trends Comparison

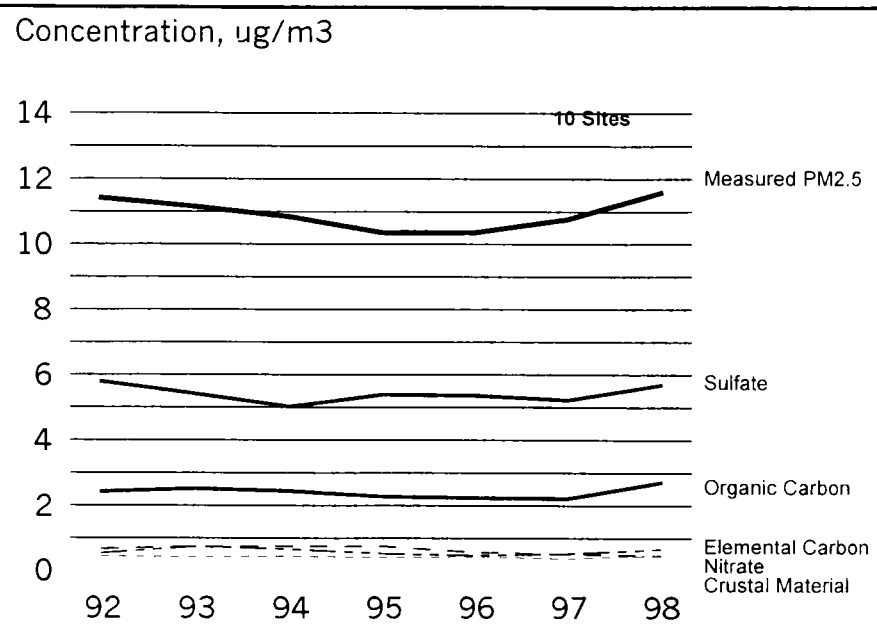
Acadia, Maine



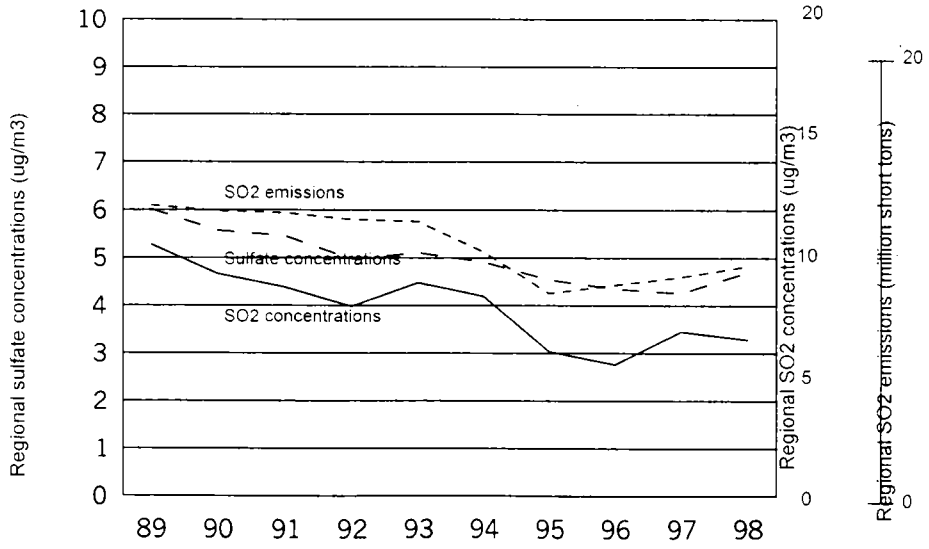
Great Smokies



PM2.5 Concentrations, 1992-1998
Eastern IMPROVE sites meeting trends criteria



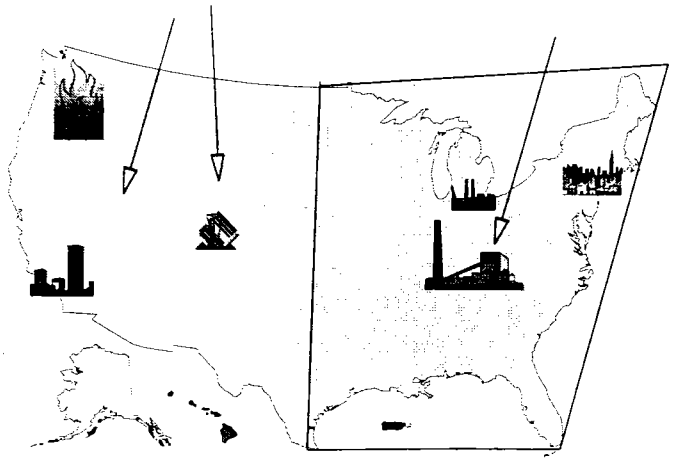
Trends in Eastern SOx



Key Science-Policy Issues: Health/Exposure/Implementation

- Health
  - Review of the PM NAAQS by 2002
  - Relative importance of key constituents, semi-volatiles
- Exposure
  - Integration of effects of ozone/PM/other pollutants of outdoor origin
  - Indoor perspective
- Implementation
  - Integration of programs for Ozone/PM2.5/Regional Haze/Urban air toxics
  - Relationship to other programs
  - Timing

Fine PM Strategy Considerations



Key Science-Policy Issues:
Fine PM Implementation Programs

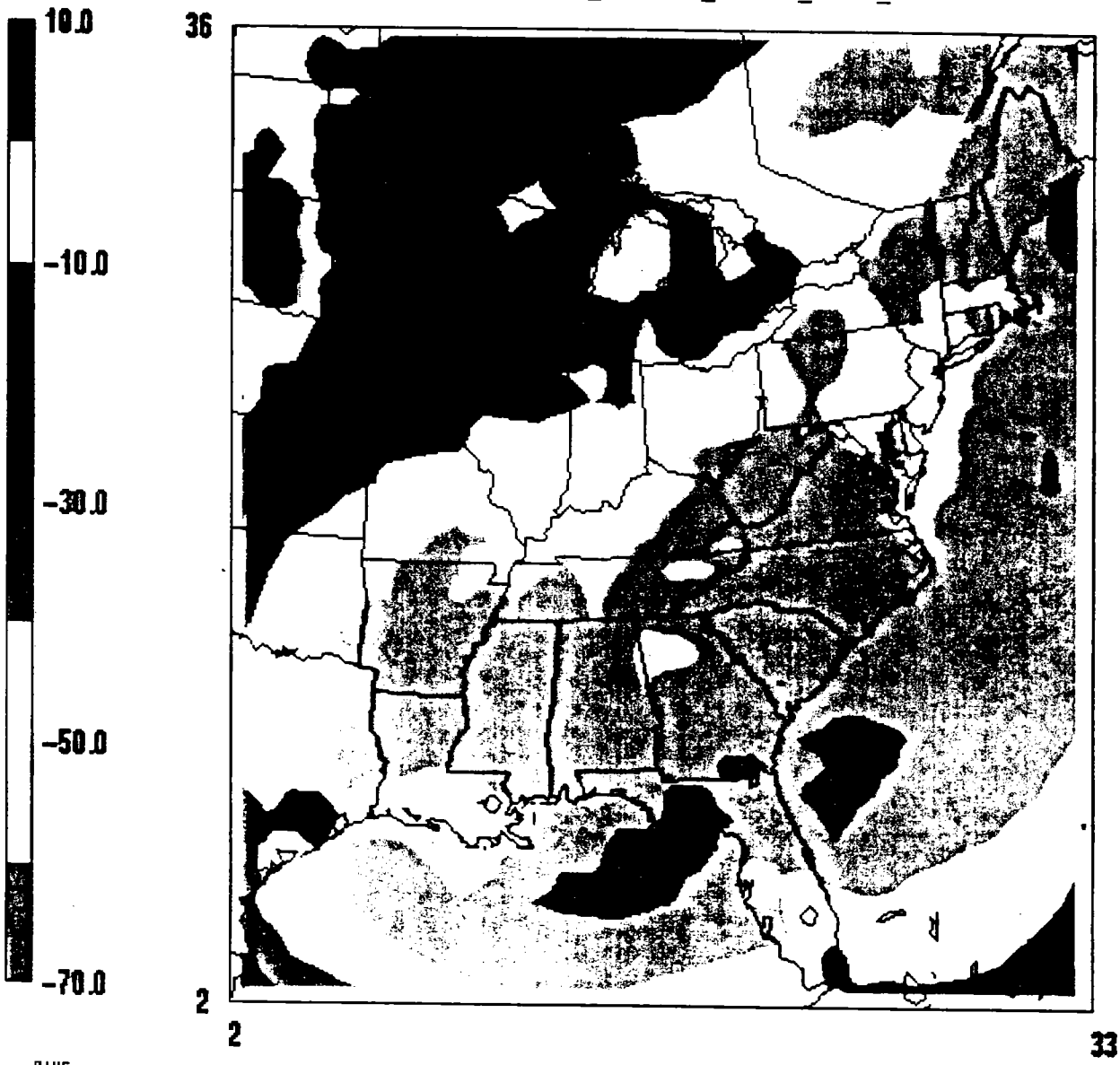
- What is the spatial and temporal distribution of $PM_{2.5}$ and key constituents?
- What are the major source categories contributing to elevated PM levels on urban and regional scales?
- Adequacy of current air quality modeling tools and related inputs for annual, 24-hour assessments - predictive and receptor oriented
- Relative cost-effectiveness of alternative controls on reducing target substances, consequences for other issues/programs

Integrating Implementation

- Integration of programs for Ozone/$PM_{2.5}$/Regional Haze/Urban air toxics
- Relationship to other programs, e.g. climate
- Perspectives:
  - Rationale - efficiency, not an excuse for delay
  - Timing
  - Pollutant
  - Source Category
  - Geography (East/West, Regional/Local)

NH4+SO4+NO3 percent diff

Average, all Aggr
i90v4_newnh3_all-i90v3_75rsox_beis2_all

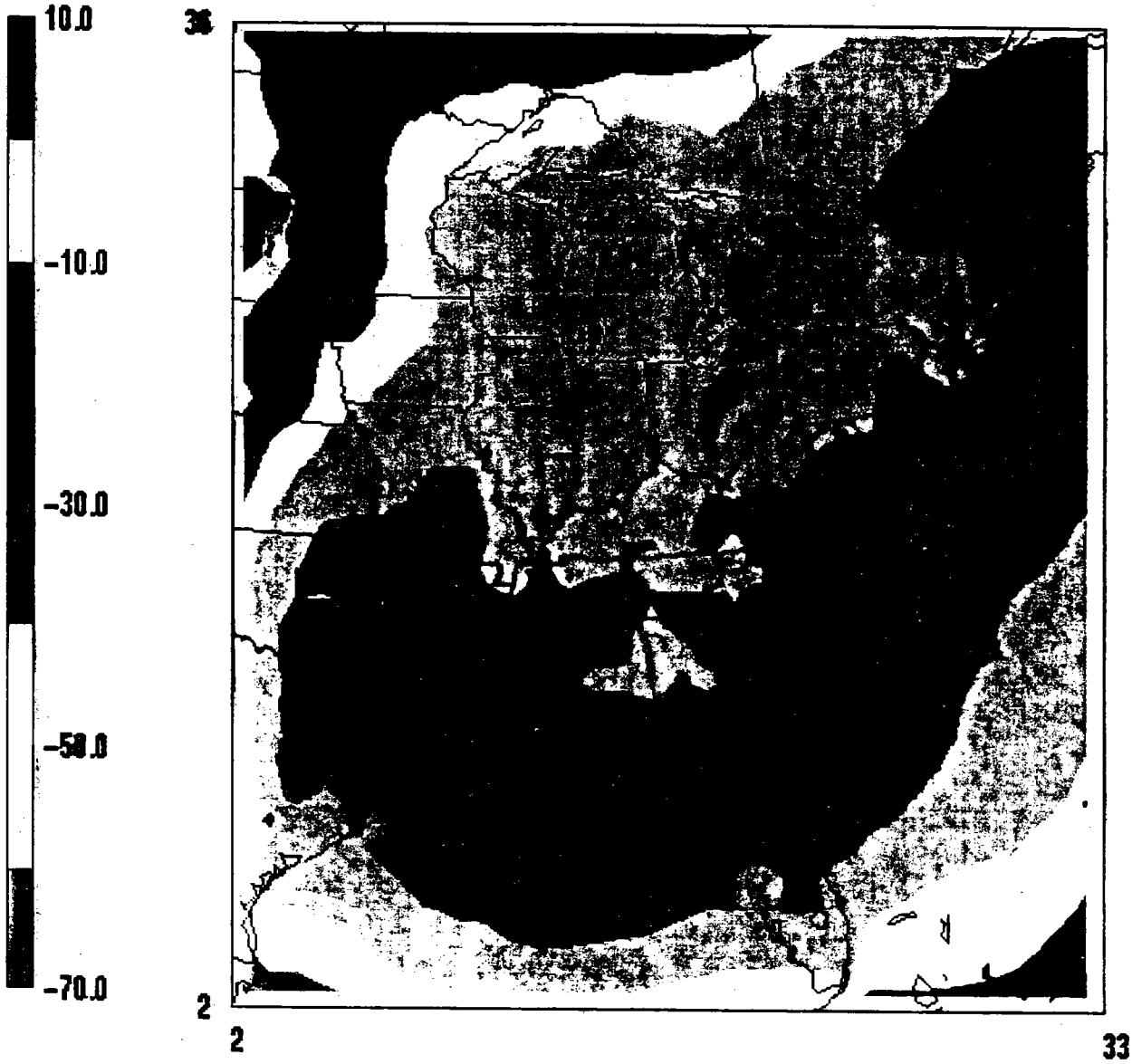


PAVE
by
MCNC

May 1,1992 23:00:00
Min=-62.7 at (33,36), Max=63.7 at (2,30)

NH4+SO4+NO3 percent diff

Average, all Aggr
i90v4_newnh3_all i90v3_75rsoxnox_beis2_all



PAVE
by
MCNC

May 1,1982 23:00:00
Min=-71.2 at (10,8), Max=56.2 at (2,30)