



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

**ADVISORY COUNCIL  
TECHNICAL COMMITTEE  
REVISED AGENDA**

**WEDNESDAY  
OCTOBER 22, 2008  
1:00 P.M.**

**7<sup>TH</sup> FLOOR BOARD ROOM**

**1. Call to Order – Roll Call**

**2. Public Comment Period**

*Public Comment on Non-Agenda Items, Pursuant to Government Code Section 54954.3. The public has the opportunity to speak on any agenda item. All agendas for Committee meetings are posted at the District, 939 Ellis Street, San Francisco, at least 72 hours before a meeting. At the beginning of the meeting, an opportunity is also provided for the public to speak on any subject within the Committee's purview. Speakers are limited to five minutes each.*

**3. Approval of Minutes of August 4, 2008**

**4. Discussion of Presentations Made to the Advisory Council**

*The Committee will discuss presentations made throughout the year.*

**5. Discussion and Consideration of Proposed Recommendation Resolution**

*The Committee will discuss and consider a proposed recommendation resolution to the full Council.*

**6. Committee Member Comments/Other Business**

*Committee members, or staff, on their own initiative, or in response to questions posed by the public, may ask a question for clarification, make a brief announcement or report on his or her own activities, provide a reference to staff regarding factual information, request staff to report back at a subsequent meeting on any matter or take action to direct staff to place a matter of business on a future agenda.*

7. **Time and Place of Next Meeting.** 9:30 a.m., Monday, December 1, 2008, 939 Ellis Street, San Francisco, CA 94109.

8. **Adjournment**

**CONTACT EXECUTIVE OFFICE - 939 ELLIS STREET SF, CA 94109**

**(415) 749-5127**

**FAX: (415) 928-8560**

**BAAQMD homepage:**

**[www.baaqmd.gov](http://www.baaqmd.gov)**

- To submit written comments on an agenda item in advance of the meeting.
- To request, in advance of the meeting, to be placed on the list to testify on an agenda item.
- To request special accommodations for those persons with disabilities notification to the Executive Office should be given in a timely manner, so that arrangements can be made accordingly.
- Any writing relating to an open session item on this Agenda that is distributed to all, or a majority of all, members of the body to which this Agenda relates shall be made available at the District's offices at 939 Ellis Street, San Francisco, CA 94109, at the time such writing is made available to all, or a majority of all, members of that body. Such writing(s) may also be posted on the District's website ([www.baaqmd.gov](http://www.baaqmd.gov)) at that time.

**BAY AREA AIR QUALITY MANAGEMENT DISTRICT**  
**939 ELLIS STREET, SAN FRANCISCO, CALIFORNIA 94109**  
**(415) 771-6000**

**EXECUTIVE OFFICE:**  
**MONTHLY CALENDAR OF DISTRICT MEETINGS**

**OCTOBER 2008**

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
Special Advisory Council Regular Meeting	Tuesday	21	9:30 a.m.	Board Room
Board of Directors Budget & Finance Committee <i>(Meets 4<sup>th</sup> Wednesday of each month)</i>	Wednesday	22	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
Advisory Council Technical Committee and Board of Directors Climate Protection Committee <i>(AC Technical Cme. Meets 1<sup>st</sup> Monday of every even Month and BD Climate Protection Cme. Meets 3<sup>rd</sup> Thursday every other Month)</i> - CANCELLED	Wednesday	22	1:00 p.m.	Board Room
Advisory Council Technical Committee <i>(Meets 1<sup>st</sup> Monday of every even Month)</i>	Wednesday	22	1:00 p.m.	Board Room
Board of Directors Mobile Source Committee - <i>(Meets 4<sup>th</sup> Thursday of each Month)</i>	Thursday	23	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
Board of Directors Legislative Committee <i>(Meets 4<sup>th</sup> Monday of the Month)</i> - CANCELLED	Monday	27	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
Board of Directors Public Outreach Committee <i>(Meets 1<sup>st</sup> Thursday every other Month)</i>	Friday	31	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room

**NOVEMBER 2008**

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
Board of Directors Nominating Committee <i>(At the Call of the Chair)</i>	Wednesday	5	9:15 a.m.	Room 716
Board of Directors Regular Meeting <i>(Meets 1<sup>st</sup> &amp; 3<sup>rd</sup> Wednesday of each Month)</i>	Wednesday	5	9:45 a.m.	Board Room
Board of Directors Public Outreach Committee <i>(Meets 1<sup>st</sup> Thursday every other Month)</i> - RESCHEDULED TO FRIDAY, OCTOBER 31, 2008	Thursday	6	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
Advisory Council Executive Committee Meeting <i>(Meets 2<sup>nd</sup> Wednesday Every Other Month)</i>	Wednesday	12	9:00 a.m.	Room 716
Advisory Council Regular Meeting <i>(Meets 2<sup>nd</sup> Wednesday Every Other Month)</i>	Wednesday	12	10:00 a.m.	Board Room

## NOVEMBER 2008

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
<b>Board of Directors Personnel Committee</b> <i>(At the Call of the Chair)</i>	Thursday	13	10:45 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Joint Policy Committee</b>	Friday	14	10:00 a.m. – 12:00 p.m.	MTC 101 - 8 <sup>th</sup> Street Oakland, CA 94607
<b>Board of Directors Ad Hoc Cme. on Port Emissions</b> <i>(At the Call of the Chair)</i>	Monday	17	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Board of Directors Regular Meeting</b> <i>(Meets 1<sup>st</sup> &amp; 3<sup>rd</sup> Wednesday of each Month)</i>	Wednesday	19	9:45 a.m.	Board Room
<b>Board of Directors Climate Protection Committee Meeting</b> <i>(Meets 3<sup>rd</sup> Thursday Every Other Month)</i>	Thursday	20	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Board of Directors Legislative Committee</b> <i>(Meets 4<sup>th</sup> Monday of the Month)</i>	Monday	24	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Board of Directors Budget &amp; Finance Committee</b> <i>(Meets 4<sup>th</sup> Wednesday of each month)</i>	Wednesday	26	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Board of Directors Mobile Source Committee</b> – <i>(Meets 4<sup>th</sup> Thursday of each Month)</i>	Thursday	27	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room

## DECEMBER 2008

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
<b>Advisory Council Technical Committee</b> <i>(Meets 1<sup>st</sup> Monday of every even Month)</i>	Monday	1	9:30 a.m.	Board Room
<b>Board of Directors Regular Meeting</b> <i>(Meets 1<sup>st</sup> &amp; 3<sup>rd</sup> Wednesday of each Month)</i>	Wednesday	3	9:45 a.m.	Board Room
<b>Advisory Council Air Quality Planning Committee</b> <i>(Meets 1<sup>st</sup> Thursday Even Month)</i>	Thursday	4	9:30 a.m.	Board Room
<b>Advisory Council Public Health Committee</b> – <i>(Meets 2<sup>nd</sup> Wednesday Even Month)</i>	Wednesday	10	1:30 p.m.	Board Room
<b>Board of Directors Stationary Source Committee</b> <i>(Meets 3<sup>rd</sup> Monday Quarterly)</i>	Monday	15	9:30 a.m.	Board Room
<b>Board of Directors Regular Meeting</b> <i>(Meets 1<sup>st</sup> &amp; 3<sup>rd</sup> Wednesday of each Month)</i>	Wednesday	17	9:45 a.m.	Board Room
<b>Board of Directors Legislative Committee</b> <i>(Meets 4<sup>th</sup> Monday of the Month)</i>	Monday	22	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Board of Directors Budget &amp; Finance Committee</b> <i>(Meets 4<sup>th</sup> Wednesday of each month)</i>	Wednesday	24	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room
<b>Board of Directors Mobile Source Committee</b> – <i>(Meets 4<sup>th</sup> Thursday of each Month)</i>	Thursday	25	9:30 a.m.	4 <sup>th</sup> Floor Conf. Room

Bay Area Air Quality Management District  
939 Ellis Street  
San Francisco, California 94109

**DRAFT MINUTES**

Advisory Council Technical Committee  
9:30 a.m., Monday, August 4, 2008

- 1. Call to Order – Roll Call.** Chairperson, Kraig Kurucz called the meeting to order at 9:35 a.m.

Present: Sam Altshuler, P.E., Robert Bornstein, Ph.D., Fred Glueck, John Holtzclaw, Ph.D., Kraig Kurucz, Chairperson.

Absent: Louise Bedsworth, Ph.D.

- 2. Public Comment Period.** There were no public comments.

- 3. Approval of Minutes of June 9, 2008:**

Dr. Holtzclaw made a motion to approve the minutes. The Committee submitted minor edits to the minutes, discussed the need for speakers to provide a summary of their comments, and suggested that future minutes be summarized to a minimum of 3-4 pages.

Chairperson Kurucz commented that Dr. Duffy did not review the minutes and suggested he be forwarded the draft minutes to edit, for staff to make editorial amendments and resubmit the minutes for approval at the next Technical Committee meeting in October.

- 4. Committee Member Comments/Other Business:**

Mr. Glueck questioned whether or not the Air District could, over the next few months, monitor the differences in air quality due to changes in China during the Olympics and how it affects background here. Gary Kendall, Director of Technical Services, stated that the Air District performs air monitoring and the data are archived and available for such analysis. The Committee then briefly discussed tracking, whether or not background is affected, wind direction and blips up or down which may be caused by meteorology or emissions.

Chairperson Kurucz reported that for the Committee's next meeting, Dr. Schneider has been contacted and is interested in providing a presentation to the Committee. He stated that Board of Directors' Vice Chair Torliatt had expressed interest in Dr. Schneider's presentation. Chair Kurucz asked whether a joint meeting would be possible.

After brief discussion, there was general agreement by the Committee that staff would discuss scheduling of the presentation with Chair Hill for the October 15<sup>th</sup> Board of Directors meeting, Chairperson Kurucz would contact and confirm Dr. Schneider's availability for October 15<sup>th</sup> (with an alternate date of October 20, 2008), and that the presentation focus on the Bay Area,

what are the upcoming impacts, and what could the Air District do in taking a leadership role in adaptation and mitigation.

**5. Discussion of Implications of Climate Change; Synergies and Conflicts of Climate Change on Bay Area Air Quality:** *The Committee discussed the implications of climate change; synergies and conflicts of climate change on Bay Area air quality.*

Mr. Altshuler communicated that he believed there was a conflict between controlling wood smoke and using renewable energy, was surprised the Rule came down hard on perceived cleaner stoves and not as hard on fireplaces and the lack of the argument made for renewable energy. Ms. Roggenkamp, Deputy APCO, explained that this was addressed in the environmental document for the new Rule.

Chairperson Kurucz referred to the format of a recommendation of the Technical Committee and discussed with members recommended actions and important points to identify as “whereas” clauses.

Dr. Bornstein asked staff to identify the last Air District document which would state the position of the Board of Directors and the Air District having to do with climate change in air quality. Ms. Roggenkamp responded that this topic was discussed by the Board at their January Retreat; climate protection is one of the key initiatives of the Air District and since that time the fee schedule for greenhouse gases had been adopted. Staff has also discussed with the Climate Protection Committee about preparing a Work Program for climate protection, which she said was in the planning stages.

Dr. Bornstein recommended that the Air District’s modeling efforts be state-of-the-art and all-encompassing in order to model ozone, PM, climate change and CARE with an integrated set of models, and that the District ensure their modeling group has the tools to carry out this kind of modeling. Ms. Roggenkamp reported that the Air District recently embarked upon a multi-pollutant plan, and she agreed it is important to think about multiple pollutants at the same time and what this means for PM, toxics or greenhouse gases. She said staff held one public workshop to discuss this idea, there was support from those in attendance, and she suggested this as an appropriate avenue. Staff is looking at how to analyze different kinds of control measures, look at benefits and potential conflicts among pollutants which is in concert with what the Committee is suggesting.

Dr. Bornstein reiterated the need to study the local impacts, local observations and conduct modeling to know past conditions, project future conditions, and how to adapt and mitigate.

Chairperson Kurucz suggested the Committee discuss and synthesize the next item in order to develop a recommendation to the Advisory Council.

**6. Discussion of Presentations made to the Advisory Council Technical Committee:**

1. *Update on PM Inventory Development, Modeling and Data Analysis (presented on February 11, 2008 by Mr. Saffet Tanrikulu and Mr. David Fairley);*
2. *Consequences of Changes in Temperature, Inflow Boundary Conditions, and Local Emissions, on Air Quality in Central California (presented on April 7, 2008 by Professor Rob Harley);*

3. *Past and Future Temperature World-Wide, in California, and the Bay Area (presented on June 9, 2008 by Dr. Philip B. Duffy).*

Chairperson Kurucz pointed out the importance of formulating a good summary of the presentations and suggested beginning with “whereas” clauses, which would then lead to recommendations. He suggested one of the actions to recommend be modeling; both multi-pollutant and a regional version of the global models.

Dr. Bornstein said the original global models diverged and people did not believe them until they were able to simulate what happened in the last hundred years. Then they started to believe simulations out for another hundred years. He said if the Committee is recommending some sort of regional modeling, a component of this should be able to reproduce what has happened over the last 40 years and then look at projections out for the next 40 years in a changing climate.

He suggested that an ad-hoc committee be considered, comprised of experts from Livermore Laboratories, Stanford University or other research institutes to meet and form a pool of knowledge on climate change and its impact on the local area. Ms. Roggenkamp noted that there has been some consideration among staff about holding a one-day symposia to discuss potential conflicts as we think about all pollutants at once and representatives of this sort would be invited. She agreed that possibly one of the recommendations out of the symposia could be for representatives to continue to meet.

The Committee discussed at length the following phrases as input to the resolution:

WHEREAS, problem/solution of climate change and regional pollution are inter-related;

WHEREAS, EPA modeling is now becoming multi-scale and multi-pollutant;

WHEREAS, implications of renewable energy involve concentration, energy, conservation, and health;

WHEREAS, climate change can overwhelm and cause unintended consequences and trade-off's (e.g. aerosols and climate, fires, coastal cooling, snowfall, flooding);

WHEREAS, regional reactions to global climate change are varied;

WHEREAS, land use planning strategies impact local climate change;

WHEREAS, Bay Area has unique concentration of analytical capabilities, experts and innovators;

WHEREAS, prediction models need validation on past changes;

WHEREAS, Bay Area has existing observational networks;

WHEREAS, the Bay Area has served as a model in air quality strategies;

THEREFORE, the Technical Committee recommends that the Air District include climate change issues in the Air District's multi-pollutant, multi-scale air quality management planning process, including:

- o Continuing to apply and validate the best available multi-scale and multi-pollutant models to local linked air-quality and climate change issues.

Dr. Bornstein also suggested the clauses reference the individual person who gave the Committee the information/ideas.

Mr. Altshuler recommended that the Air District consider the position of a Climate Protection Officer, similar to the newly approved Public Health Officer, in order to raise the status of the Committee's position. Ms. Roggenkamp reported that employee, Ana Sandoval has been promoted to Senior Policy Advisor in the Executive Office and one of her roles will be working on climate protection issues in a policy-oriented manner and how the Air District works with outside organizations. She also stressed that Planning Division staff currently focus on climate protection, and part of the concept over time is that this be integrated throughout the Air District.

Dr. Bornstein suggested that observations be used to understand what the local climate changes are and that this be a separate recommendation. Chairperson Kurucz stated that this needed to be made in context and not used as a reason to avoid action on a local basis.

In closing, Chair Kurucz expressed thanks to Committee members and agreed to work with two other members of the Committee to wordsmith the draft resolution and bring it back to the full Committee for finalization and submission to the Advisory Council.

**7. Time and Place of Next Meeting:** At the call of the Chair.

**8. Adjournment.** 11:54 a.m.

Lisa Harper  
Clerk of the Boards



BAY AREA AIR QUALITY MANAGEMENT DISTRICT  
Memorandum

To: Advisory Council Technical Committee Members  
From: Kraig Kurucz  
Technical Committee Chair  
Date: October 16, 2008  
Re: Discussion of Proposed Resolution Language

RECOMMENDED ACTION:

None at this time. This item is for a conceptual discussion.

BACKGROUND

A discussion of presentations made to the Advisory Council Technical Committee was had at its August 4, 2008. The Following presentations have been made to the Committee throughout the year:

1. Update on PM Inventory Development, Modeling and Data Analysis (presented on February 11, 2008 by Mr. Saffet Tanrikulu and Mr. David Fairley);
2. Consequences of Changes in Temperature, Inflow Boundary Conditions, and Local Emissions, on Air Quality in Central California (presented on April 7, 2008 by Professor Rob Harley);
3. Past and Future Temperature World-Wide, in California, and the Bay Area (presented on June 9, 2008 by Dr. Philip B. Duffy);
4. Multiscale and Multipollutant Air Quality Modeling Research and Its Applications (presented on May 15, 2008 by Dr. S.T. Rao).

At his meeting the Committee began development of the following “Whereas” clauses which are intended to lead to recommendations to the full Council for approval.

WHEREAS, problem/solution of climate change and regional pollution are inter-related;

WHEREAS, EPA modeling is now becoming multi-scale and multi-pollutant;

WHEREAS, implications of renewable energy involve concentration, energy, conservation, and health;

WHEREAS, climate change can overwhelm and cause unintended consequences and trade-off’s (e.g. aerosols and climate, fires, coastal cooling, snowfall, flooding);

WHEREAS, regional reactions to global climate change are varied;

WHEREAS, land use planning strategies impact local climate change;

WHEREAS, Bay Area has unique concentration of analytical capabilities, experts and innovators;

WHEREAS, prediction models need validation on past changes;

WHEREAS, Bay Area has existing observational networks;

WHEREAS, the Bay Area has served as a model in air quality strategies;

THEREFORE, the Technical Committee recommends that the Air District include climate change issues in the Air District's multi-pollutant, multi-scale air quality management planning process, including:

Respectfully Submitted,

Kraig Kurucz  
Technical Committee Chair



# ***Multiscale and Multipollutant Air Quality Modeling Research and Its Applications***

**Dr. S.T. Rao**

Director, Atmospheric Modeling Division  
U.S. Environmental Protection Agency  
Research Triangle Park, NC, USA

# Health Impacts of Poor Air Quality

**EPA estimates that in the year 2010 meeting the air quality standards would:**

- Prevent 23,000 Americans from dying prematurely;
- avert over 1,700,000 incidences of asthma attacks and aggravation of chronic asthma;
- 67,000 incidences of chronic and acute bronchitis
- 91,000 occurrences of shortness of breath;
- 4,100,000 lost work days, and 31,000,000 days in which Americans would have had to restrict activity due to air pollution related illness; and
- 22,000 respiratory-related hospital admissions would be averted, as well as 42,000 cardiovascular (heart and blood) hospital admissions, and 4,800 emergency room visits for asthma

**Total annual saving = \$110 Billion (2010)**

**Total annual cost = \$27 Billion (2010)**

EPA, *Final Report to Congress on Benefits and Costs of the Clean Air Act, 1990 to 2010*, EPA 410-R-99-001



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## Additional Impacts of Poor Air Quality

- Visibility impairment - regional haze
- Acidic deposition - sensitive ecosystems, fresh water fishery, materials damage
- Eutrophication of coastal areas
- Crop damage - Estimated\* for 1990 to be \$3-5 billion/year
- Air toxics (e.g., mercury) - fish advisories – mercury estimated to reduce U.S. productivity by \$8.7B/year

\*"THE COST OF CROP DAMAGE CAUSED BY OZONE AIR POLLUTION FROM MOTOR VEHICLES", Delucchi, Murphy, Cubbin, and Kim, December 1998 [www.its.ucdavis.edu/publications/1996/UCD-ITS-RR-96-3\(12\).pdf](http://www.its.ucdavis.edu/publications/1996/UCD-ITS-RR-96-3(12).pdf)

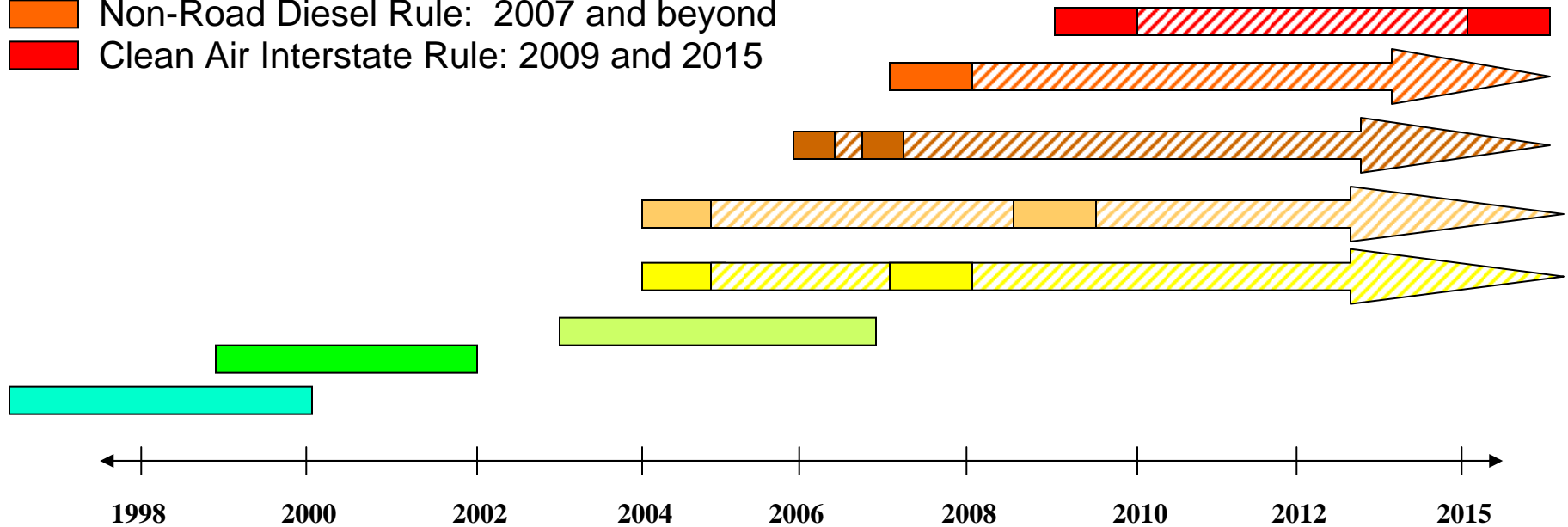


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# Clean Air Interstate Rule (CAIR)

- Acid Rain: 1996-2000
- Ozone Transport Comm.: 1996-2002
- NOx SIP Call: 2003 – 2007
- Nonroad Large Spark-Ignition Engines: 2004 and beyond
- Tier 2 Vehicle/Gasoline Sulfur Program: 2004-2009 and beyond
- Heavy Duty Highway Diesel Program: 2006, 2007 and beyond
- Non-Road Diesel Rule: 2007 and beyond
- Clean Air Interstate Rule: 2009 and 2015



## Major regulations affecting NOx Emissions

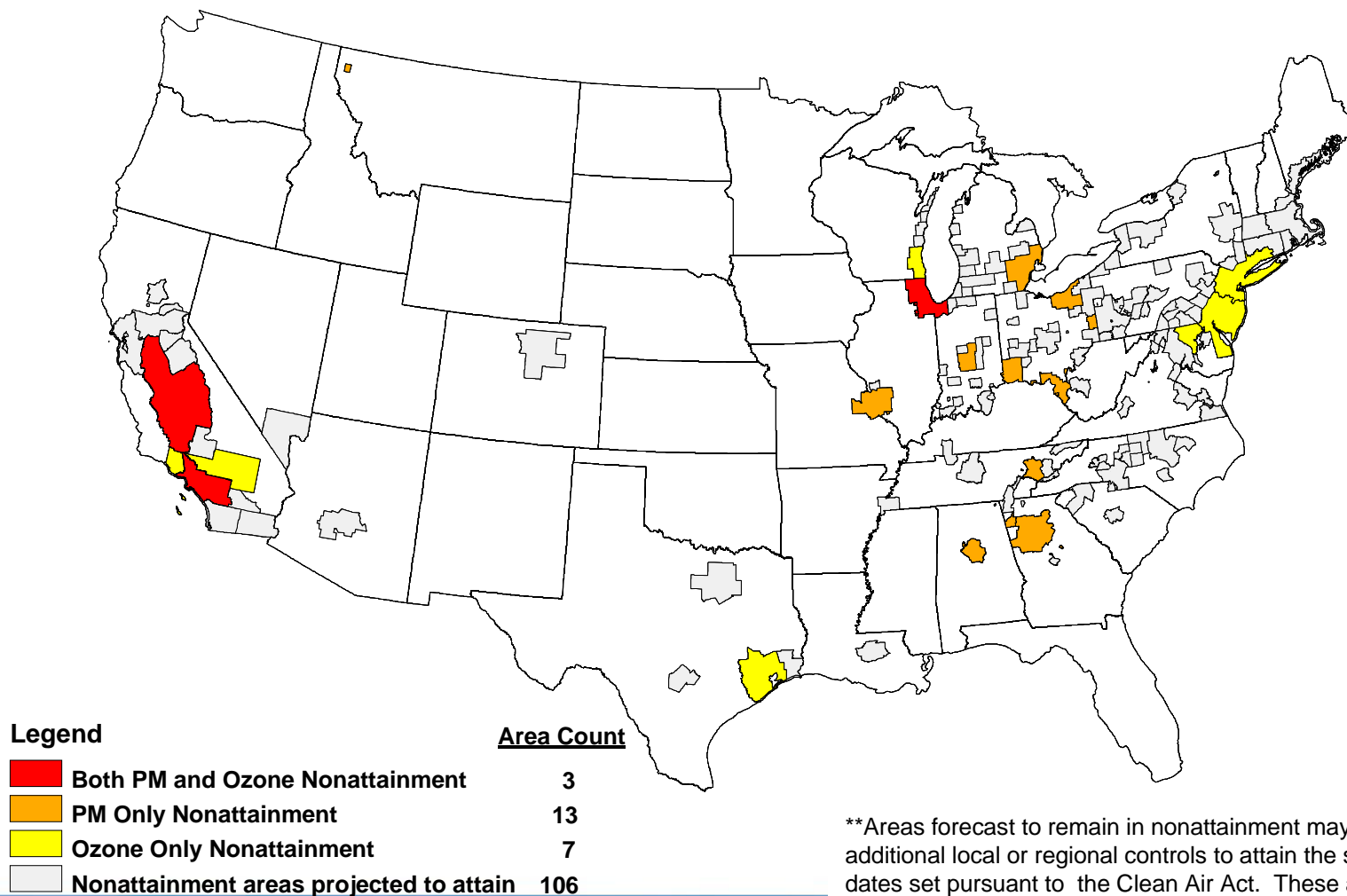


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# Future Air Quality Management Challenges

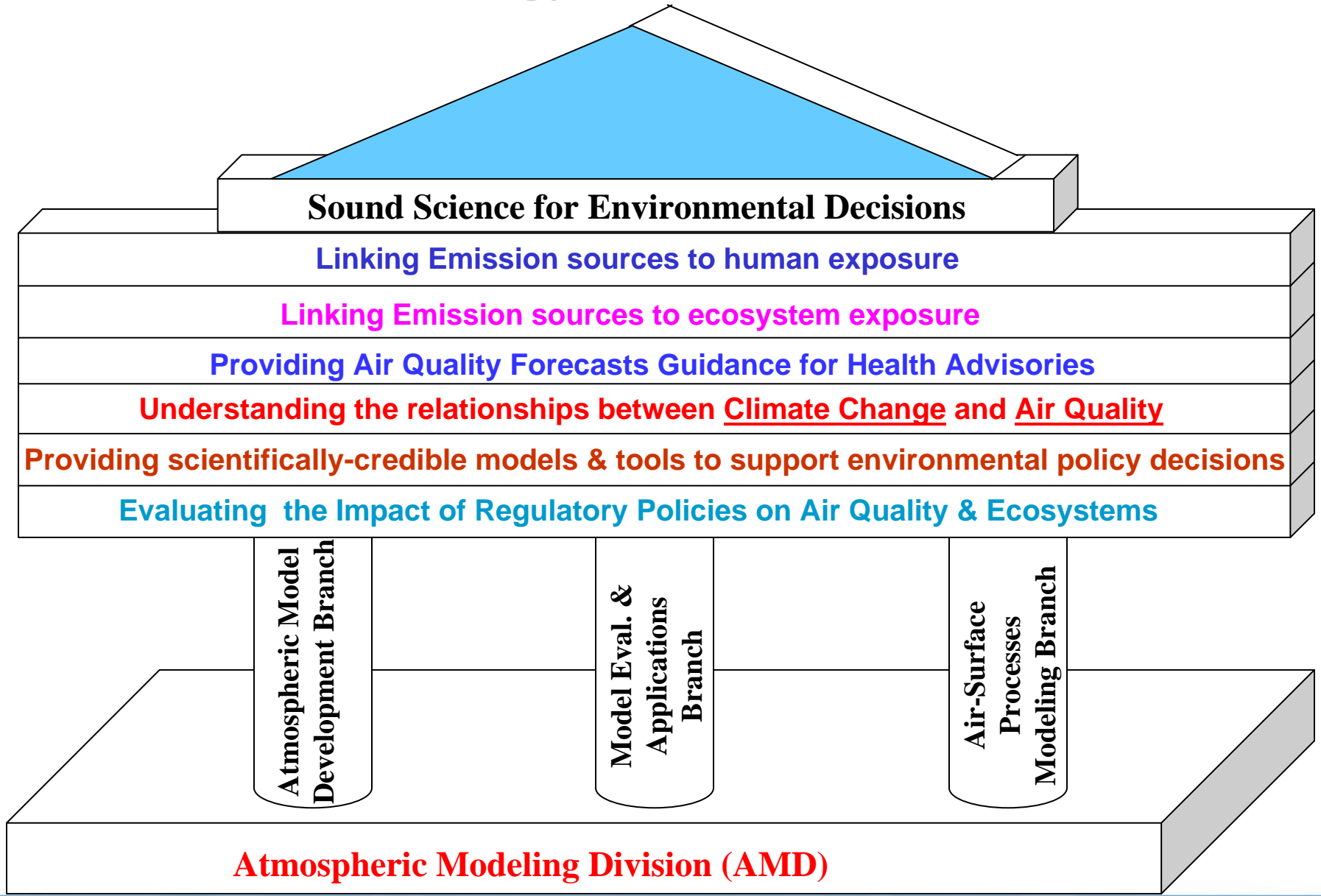
Areas Projected to Exceed the **Current PM<sub>2.5</sub> & 8-Hour Ozone** Standards in 2020  
with CAIR/Mobile, some Current Rules\* Absent Additional Local Controls



\*\*Areas forecast to remain in nonattainment may need to adopt additional local or regional controls to attain the standards by dates set pursuant to the Clean Air Act. These additional local or regional measures are not forecast here, and therefore this figure overstates the extent of expected nonattainment.



# AMD's Strategy to Meet User Needs



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# Managing air quality requires modeling tools that connect among various scales

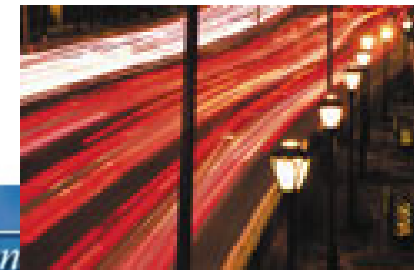


- **Global** – e.g. climate change, stratospheric ozone, intercontinental transport, persistent-bioaccumulative toxic pollutants (Hg, dioxins)

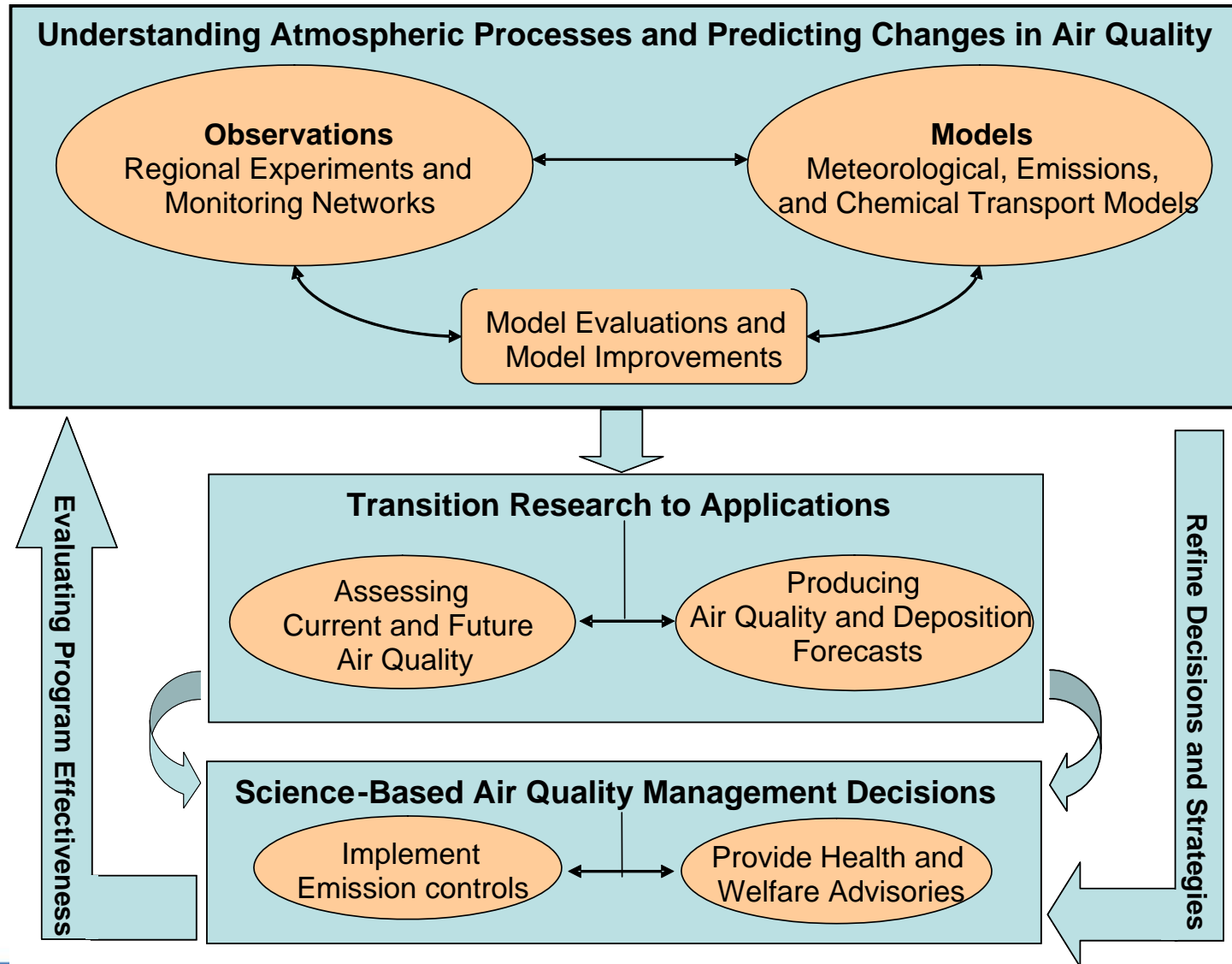
- **Regional** – e.g. ozone, fine particles, health, acid rain, visibility, nutrient loadings

- **Local** – e.g. ozone, PM health, air toxics

- **Personal** – indoor air/outdoor penetration, asthma



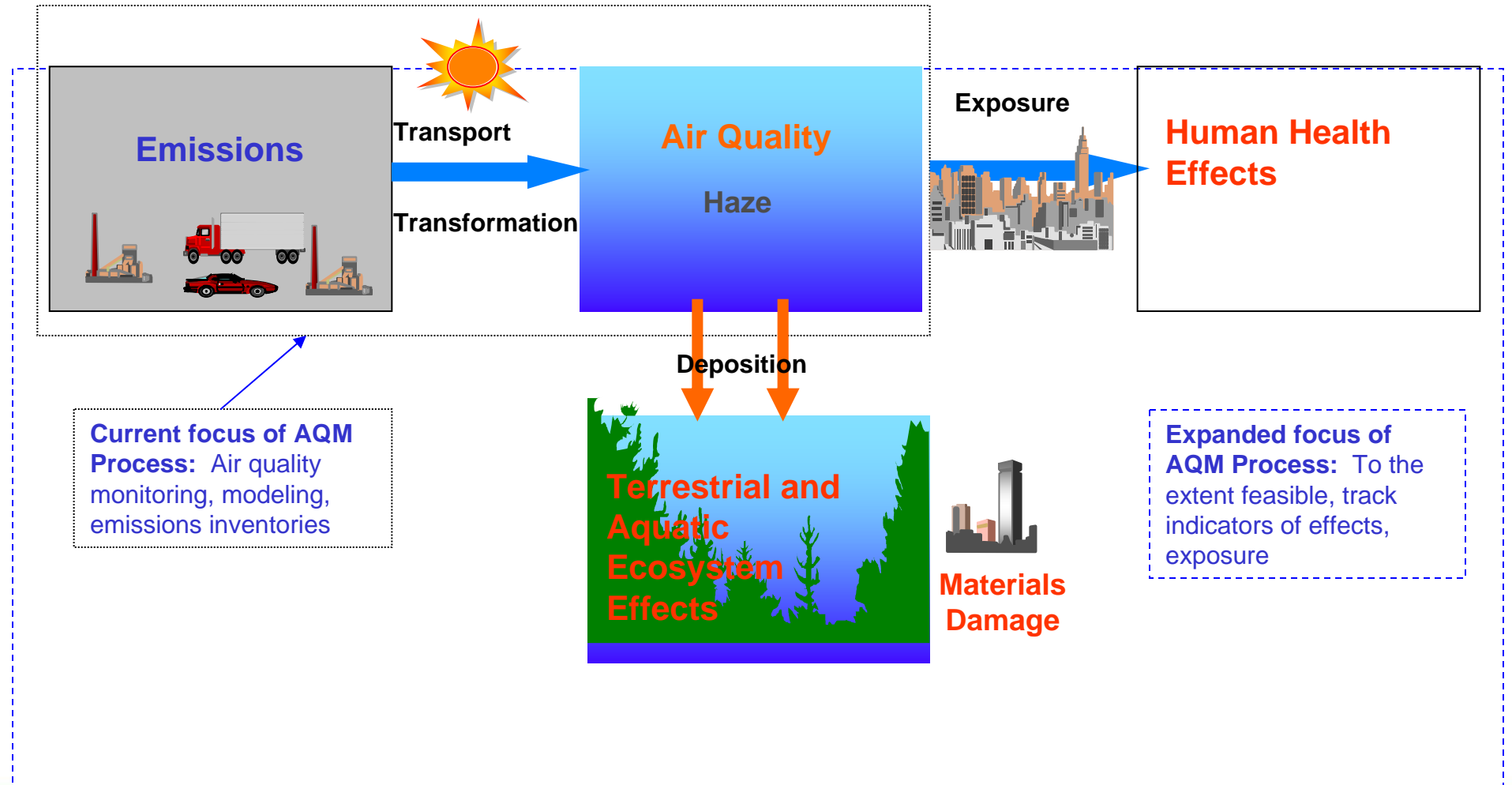
# Air Quality Research Framework



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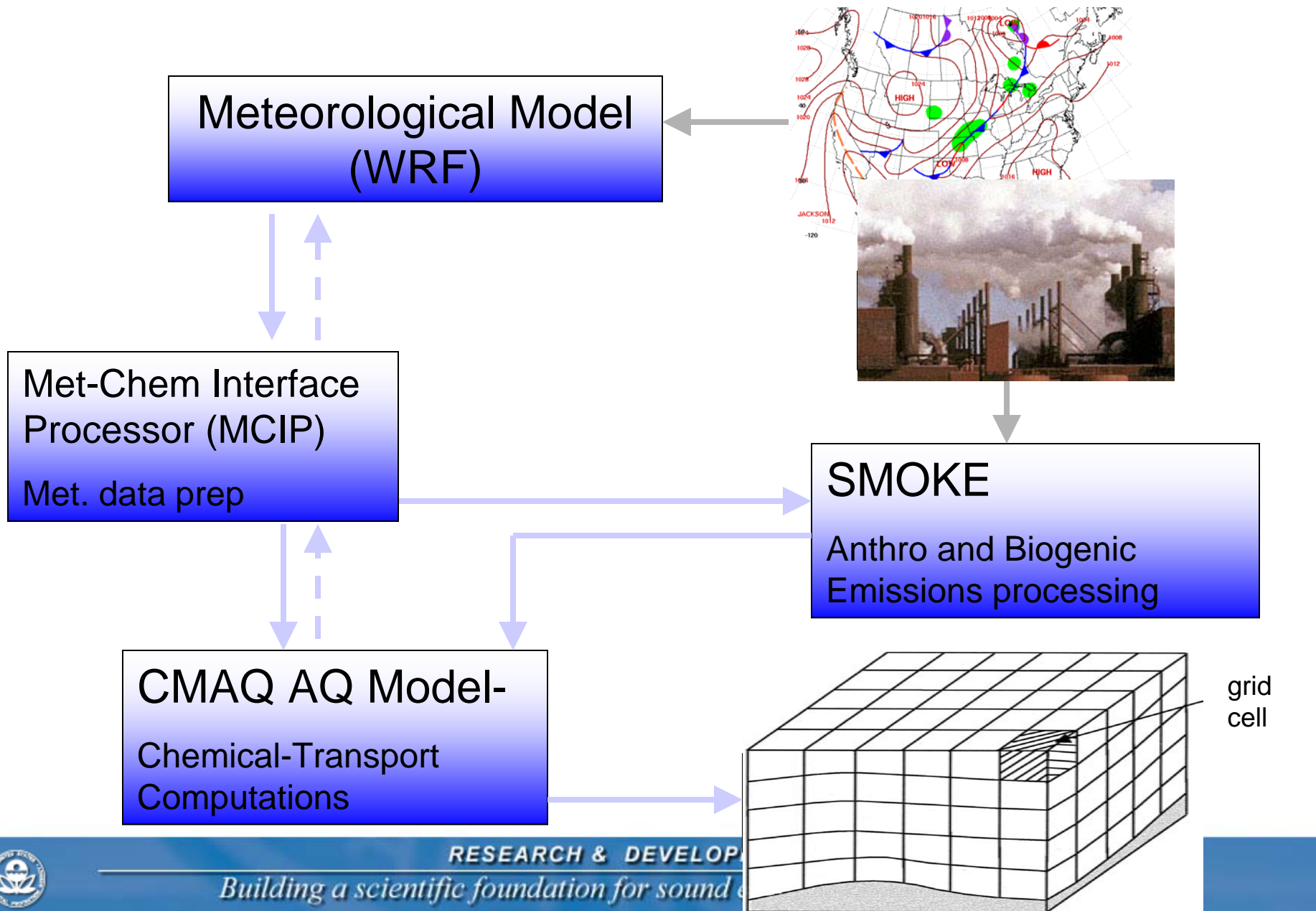
# Using models that integrate multiple data sources to better assess effectiveness of past policies



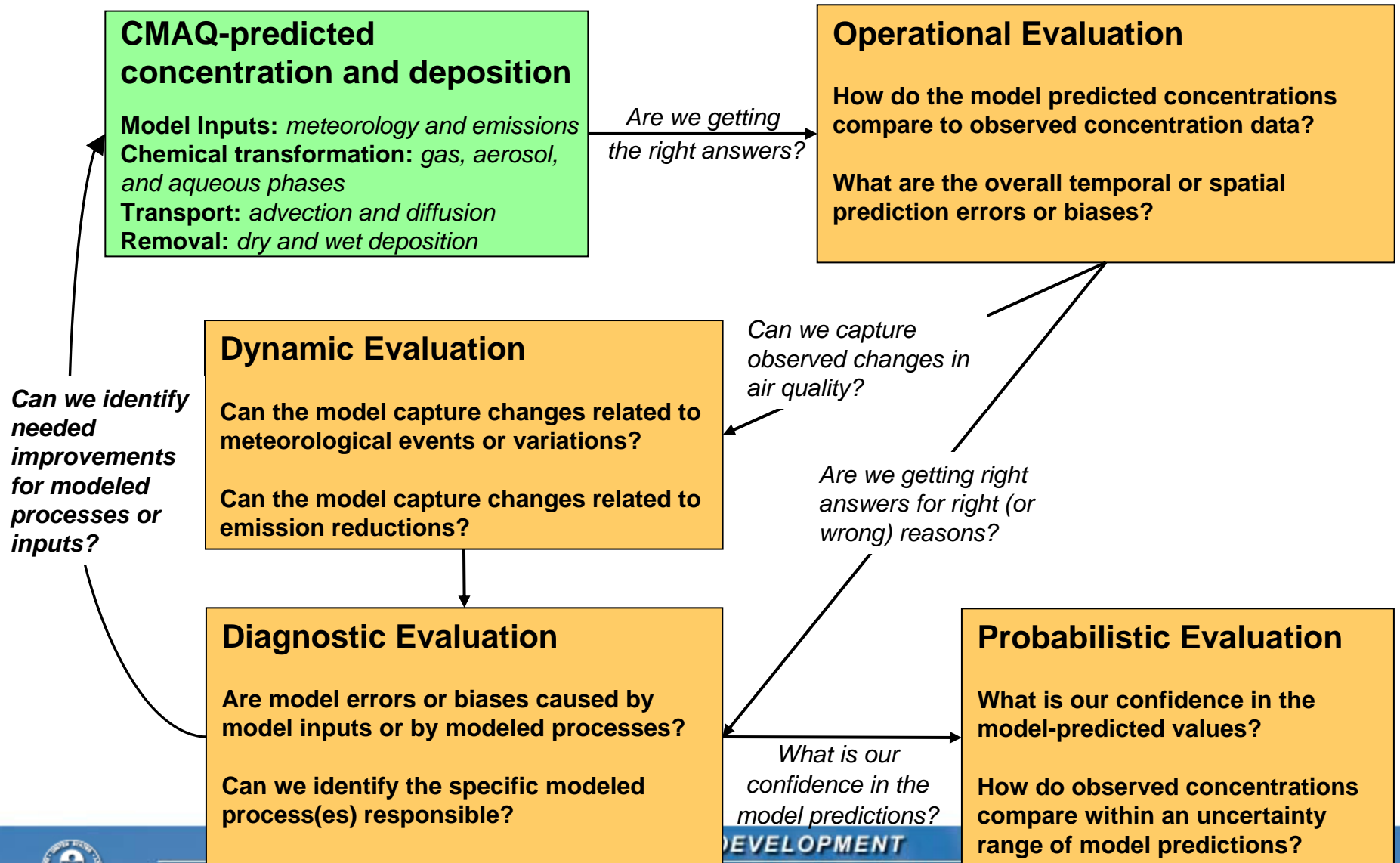
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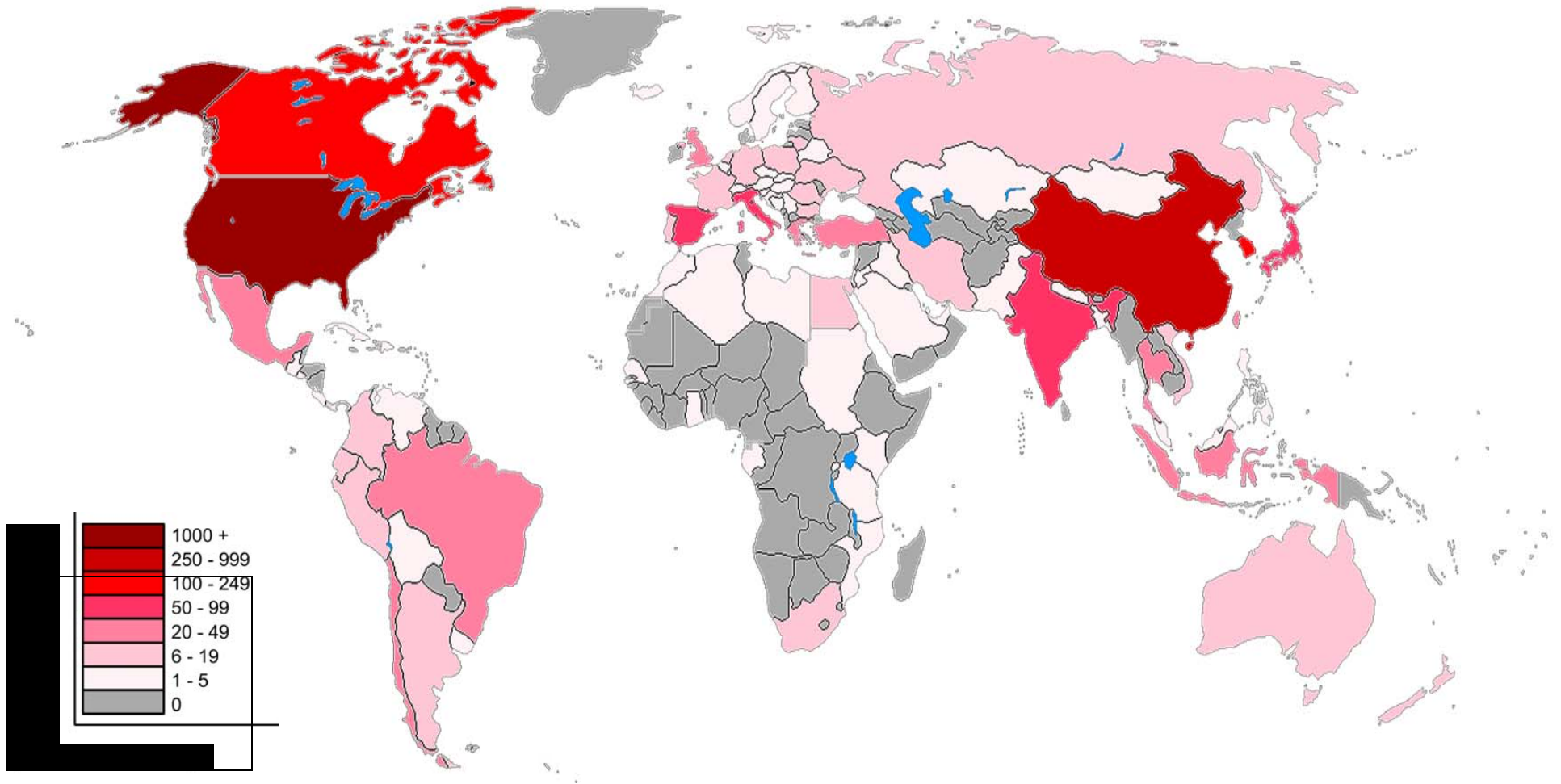
# CMAQ “One-Atmosphere” Modeling System



# Community Multiscale Air Quality (CMAQ) MODEL EVALUATION FRAMEWORK



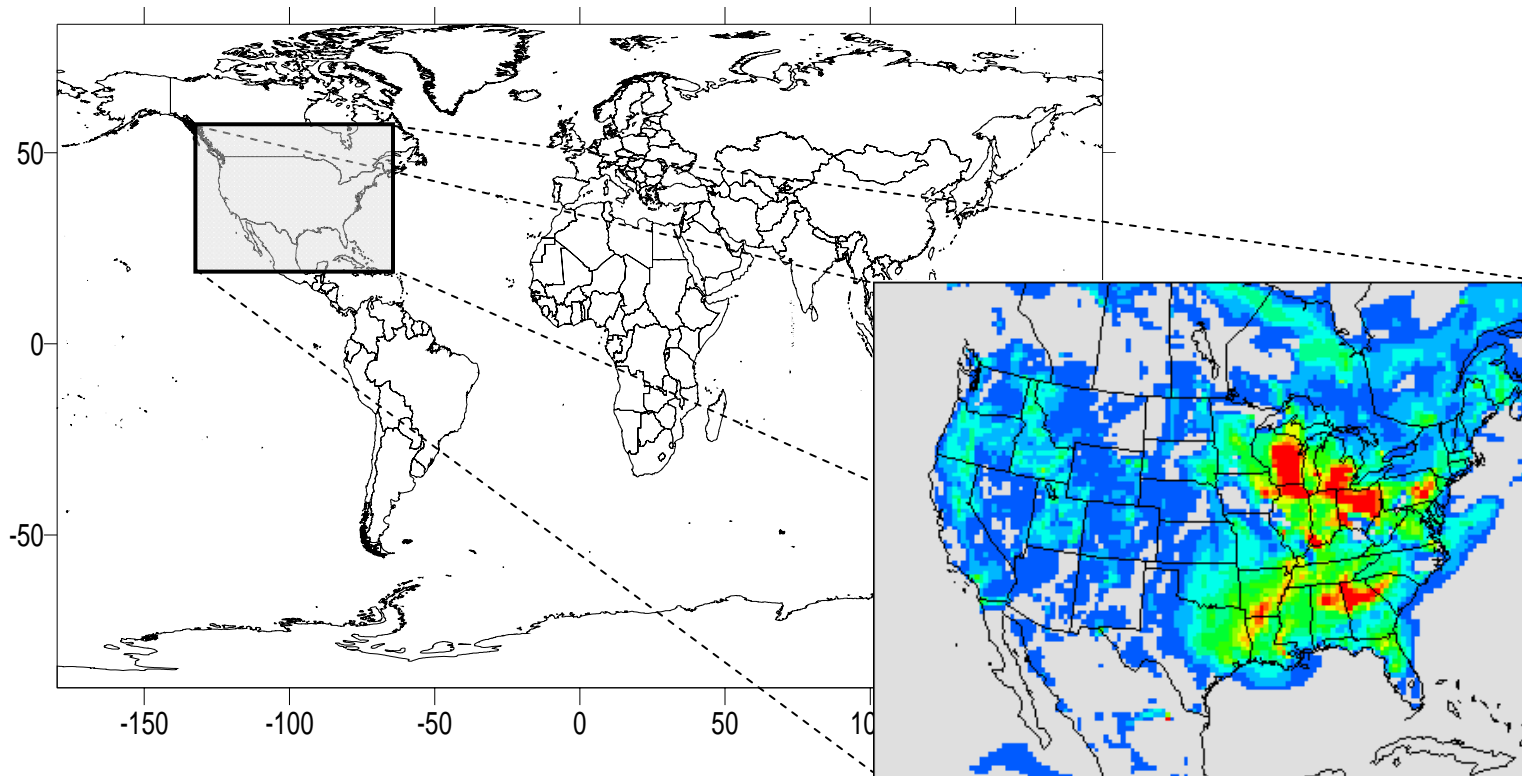
# CMAQ Users World-Wide



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# Application: Evaluating the Interactions of Climate Change and Air Quality



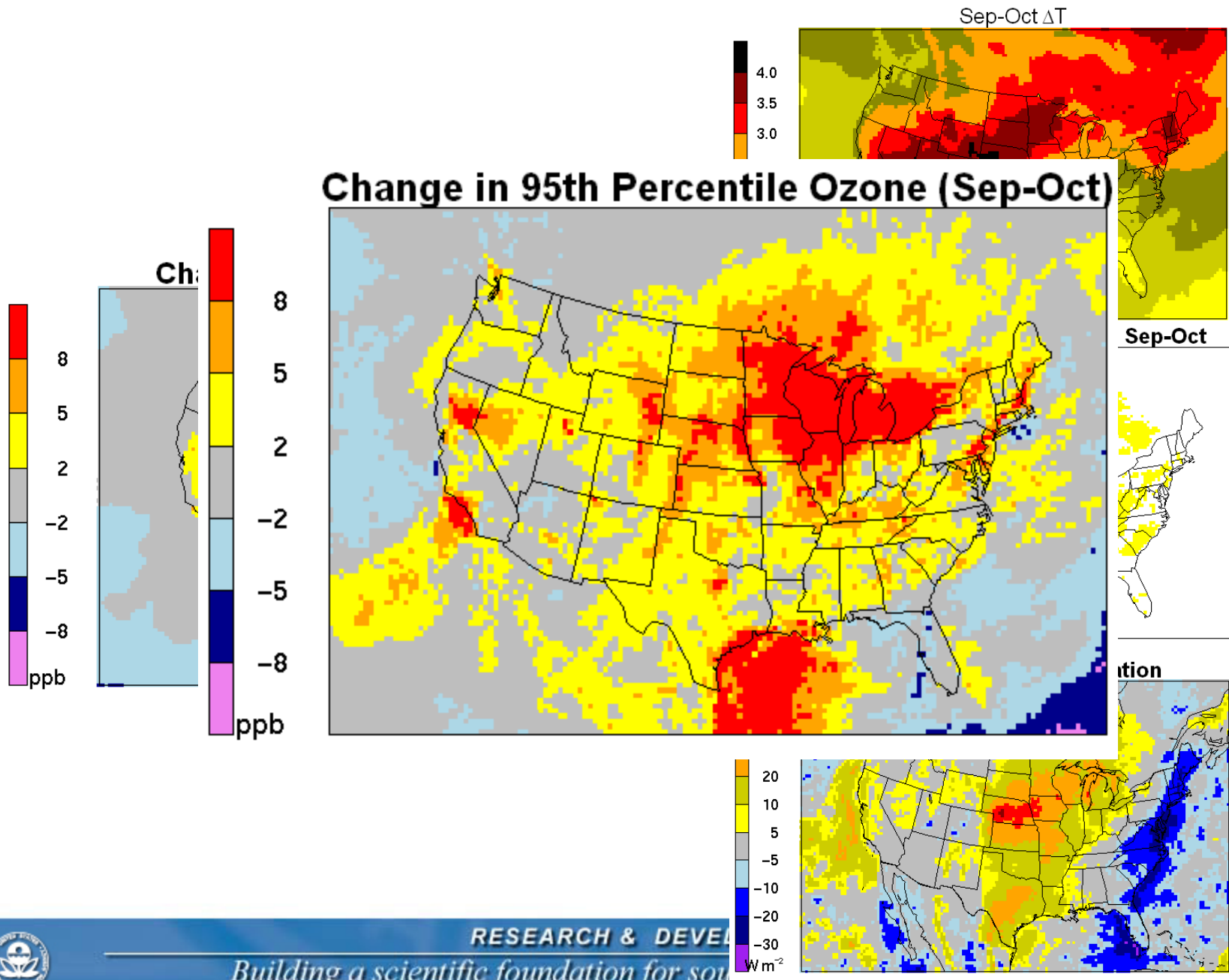
- **Downscaling of Global to regional-scale models of climate and air quality**
  - *How sensitive is air quality to potential climate change scenarios?*
- **Developing integrated regional meteorology and air quality modeling tools**
  - *How do changes in air quality affect regional climate?*



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# Future Climate Simulations Suggest Extension of Ozone Season



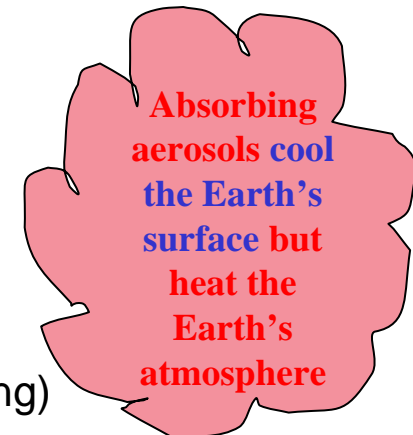
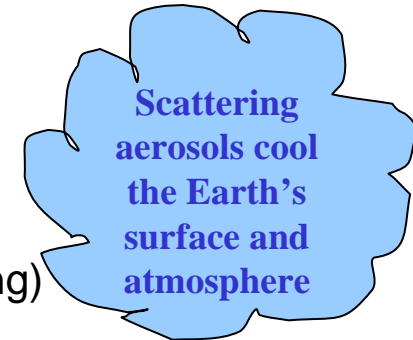
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# Influence of Aerosols on the Radiative Balance of the Earth-Atmosphere System

- Light Scattering Aerosols (the sulfate picture)
  - Backscatter ↓ solar ==>
    - ==> reduce radiation impinging on Earth's surface
    - ==> **cool the surface** (negative surface forcing)
    - ==> increase radiation reflected to space
    - ==> **cool the top of atmosphere** (negative TOA forcing)
- Light Absorbing Aerosols (e.g., black carbon/soot)
  - Absorb ↓ solar
    - ==> reduce radiation impinging on Earth's surface
    - ==> **cool the surface** (negative surface forcing)
  - Absorb ↑ solar reflected from surface and clouds
    - ==> reduce radiation reflected to space
    - ==> **warm the top of atmosphere** (positive TOA forcing)



## Light Scattering + Light Absorbing Aerosols

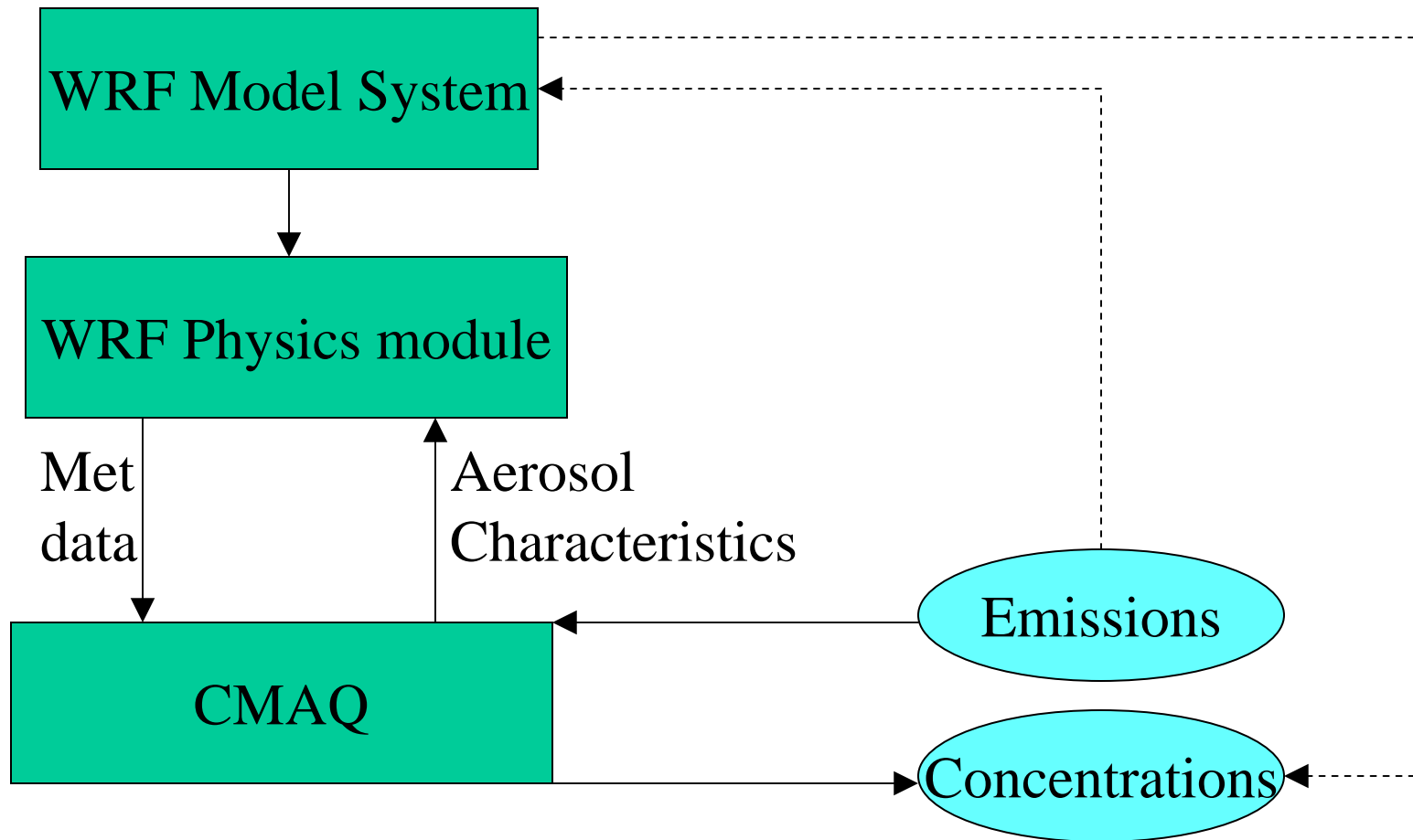
- Surface forcings reinforce ==> **large surface cooling**
- TOA forcings cancel ==> **small TOA cooling or warming**



*A small amount of light absorption can tip the balance at TOA from cooling to warming!*

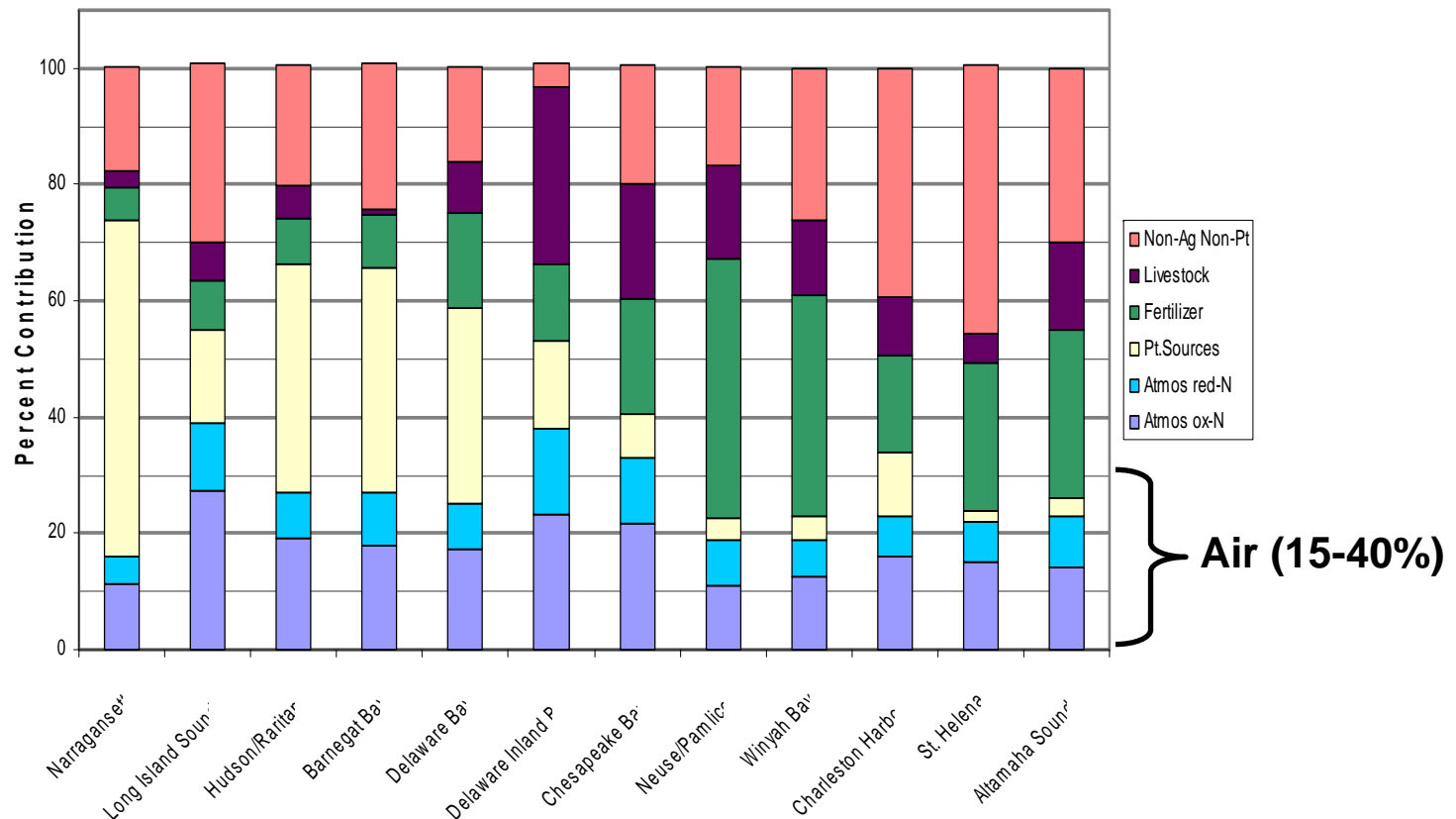


***Development of the WRF-CMAQ Coupled Modeling System: Allow interactions between met & chemistry***



# Nitrogen Deposition is an Important Contributor To Coastal Eutrophication

Nitrogen Loading to Estuaries by Source Type



- Accounts for 15-40% of N loading to estuaries (both indirect and direct)
- Atmospheric deposition of N to coastal ocean is approximately equal to riverine input for mid-Atlantic & New England



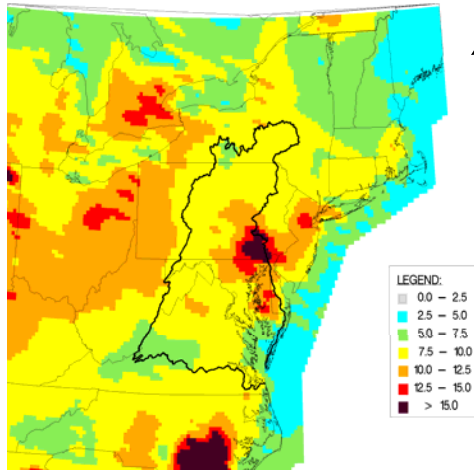
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# Chesapeake Bay Program: What we have learned

## Unique Capabilities of Atmospheric Models

TOTAL (WET+DRY) NITROGEN DEPOSITION (N-KG/HA)  
CMAQ 2001  
ANNUAL



Fill in for space (sparse monitoring)  
Fill in for dry deposition (avoid guessing)

PRINCIPAL OXIDIZED NITROGEN AIRSHEDS FOR:  
NARRAGANSETT BAY, CHESAPEAKE BAY,  
PAMLICO SOUND, TAMPA BAY, MOBILE BAY,  
LAKE PONTCHARTRAIN



DEVELOPED BY P. DENNIS, ATMOSPHERIC SCIENCES MODELING DIVISION,  
APL, NOAA, and NRI/ USEPA

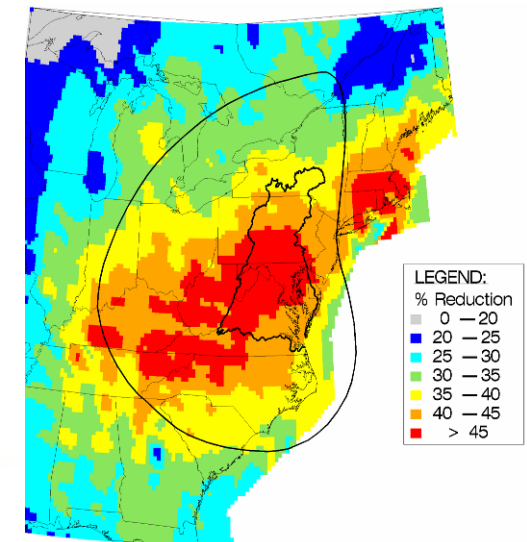


Assess relevant  
scales (airsheds);  
sector and state  
responsibility

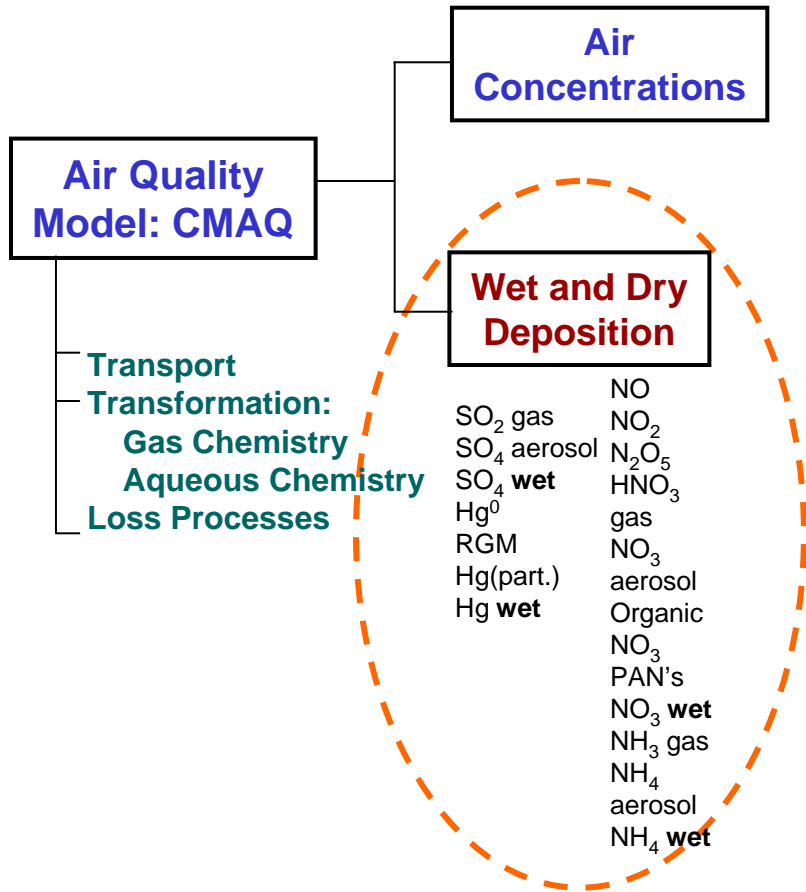


Estimate contribution of CAA  
regulations (aimed at protecting  
health) toward ecosystem health

NOx SIP Reg +  
Tier II Mobile +  
Heavy Duty Diesel Regs  
2020  
ox-N Dep % Change from 1990



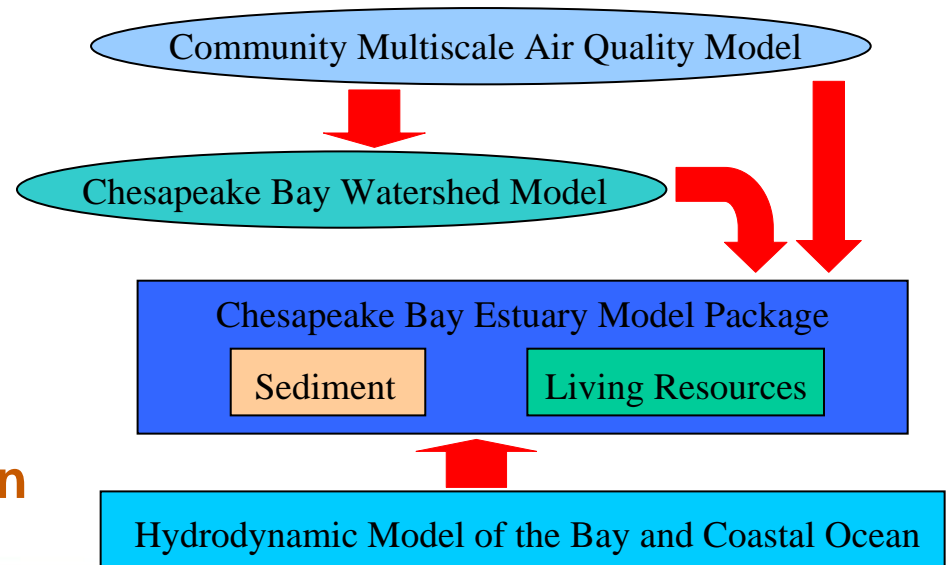
# What ASMD Brings to the Table



Atmospheric modeling capability covering multi-pollutant deposition issues

Atmosphere-water modeling experience with Chesapeake Bay and (soon) others

Cross-Media Models  
Linked for Chesapeake Bay  
Airshed, watershed, estuary

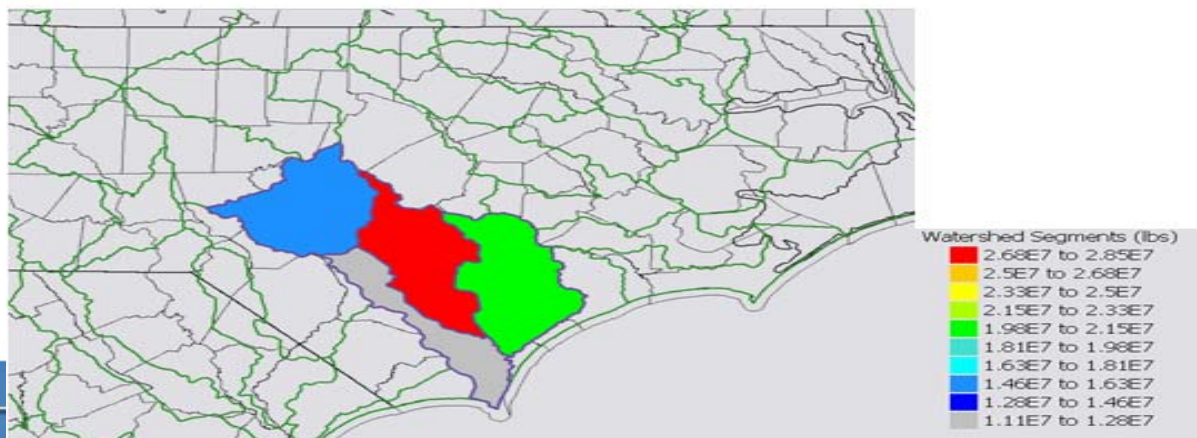
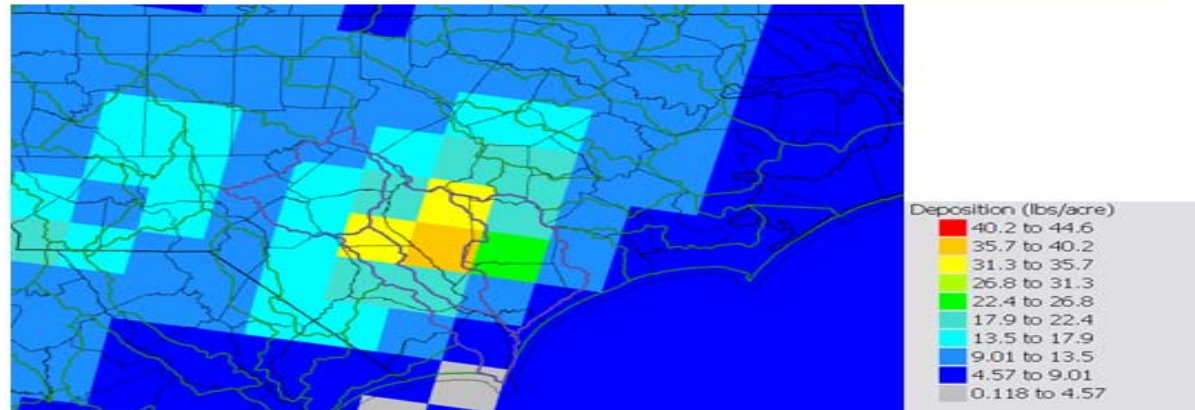
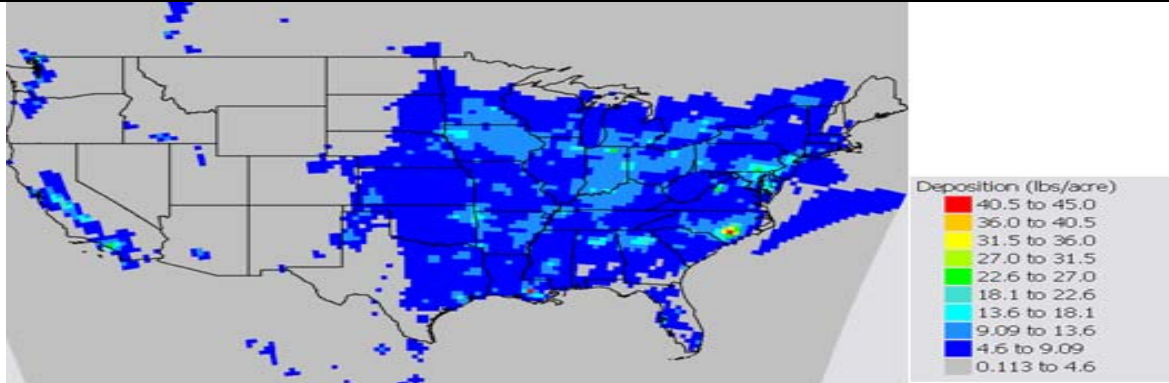


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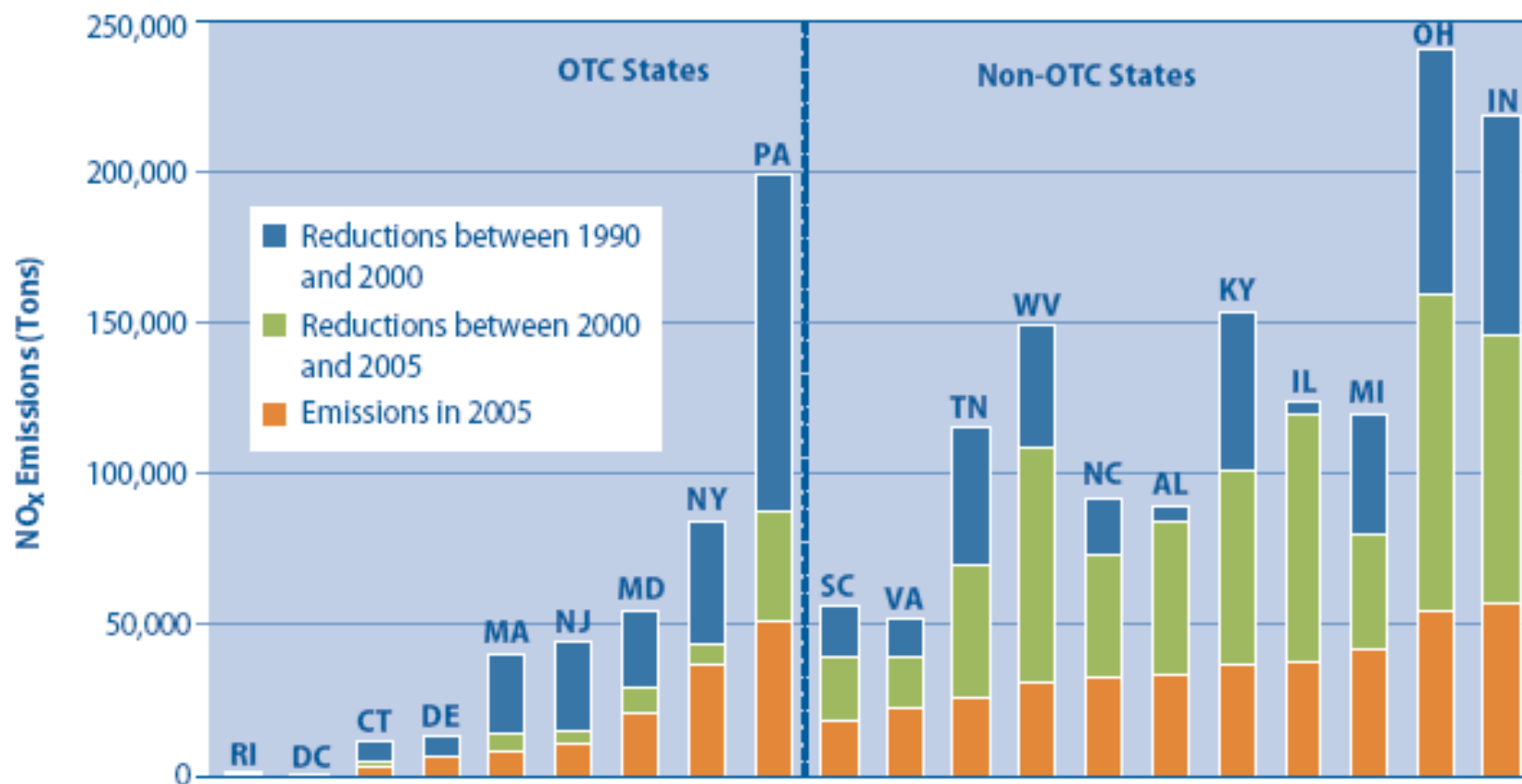
# CMAQ Applications: Linking Airsheds and Watersheds

## Watershed Deposition Tool: Linking CMAQ Model Results to Ecosystem Analysis



# Regional Air Quality: the NO<sub>x</sub> SIP Call has dramatically reduced emissions in the eastern United States

**Figure 7:** NO<sub>x</sub> Budget Trading Program State-by-State Ozone Season NO<sub>x</sub> Emission Reductions from 1990 and 2000



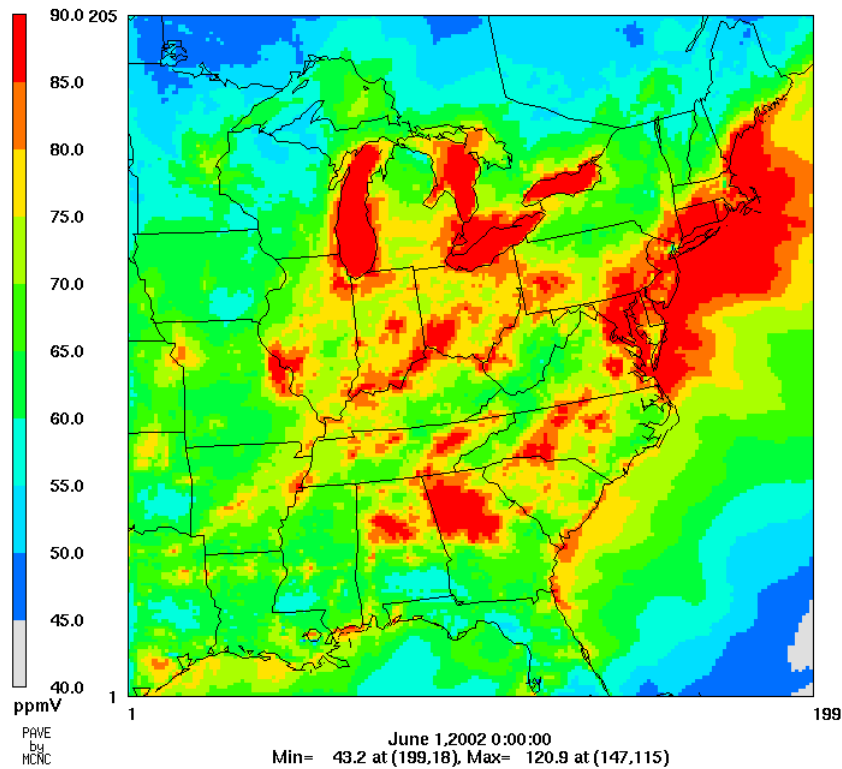
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# Dynamic Evaluation: CMAQ Sensitivity to Emissions and Meteorological Changes

Highest Ozone Episodes: Summer 2002

(Average of 4 highest 8-hour maximum Ozone values)



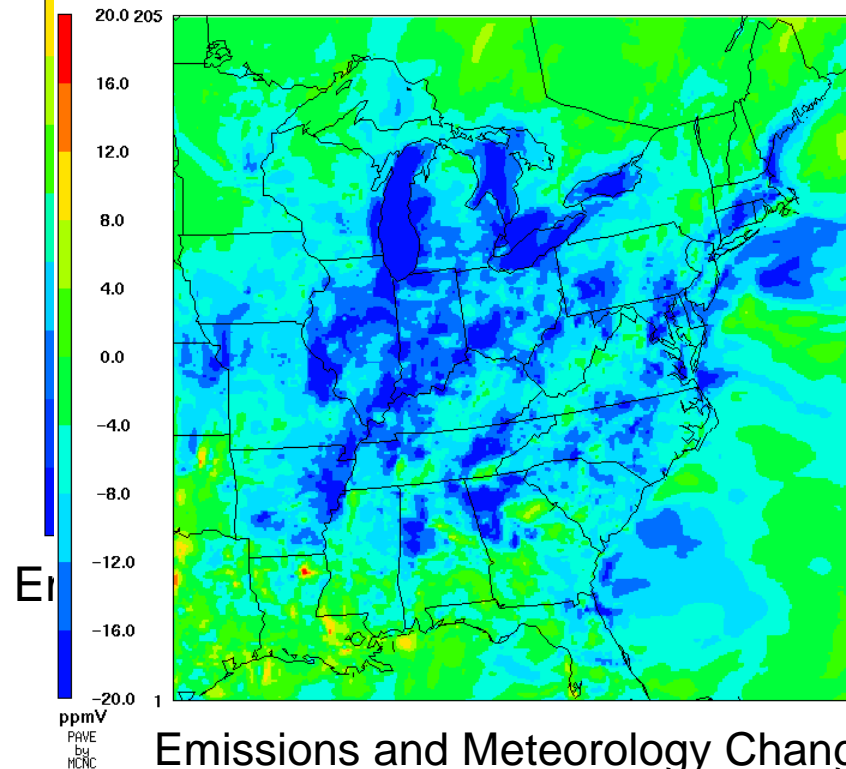
Difference in Highest Ozone Episodes – 2002 Meteorology

(2004 emissions – 2002 emissions, Average of 4 highest 8-hour maximum Ozone values)



Difference in Highest Ozone Episodes

(2004–2002 emissions+meteorology, Average of 4 highest 8-hour maximum Ozone values)



Emissions and Meteorology Change  
(2002 vs. 2004)



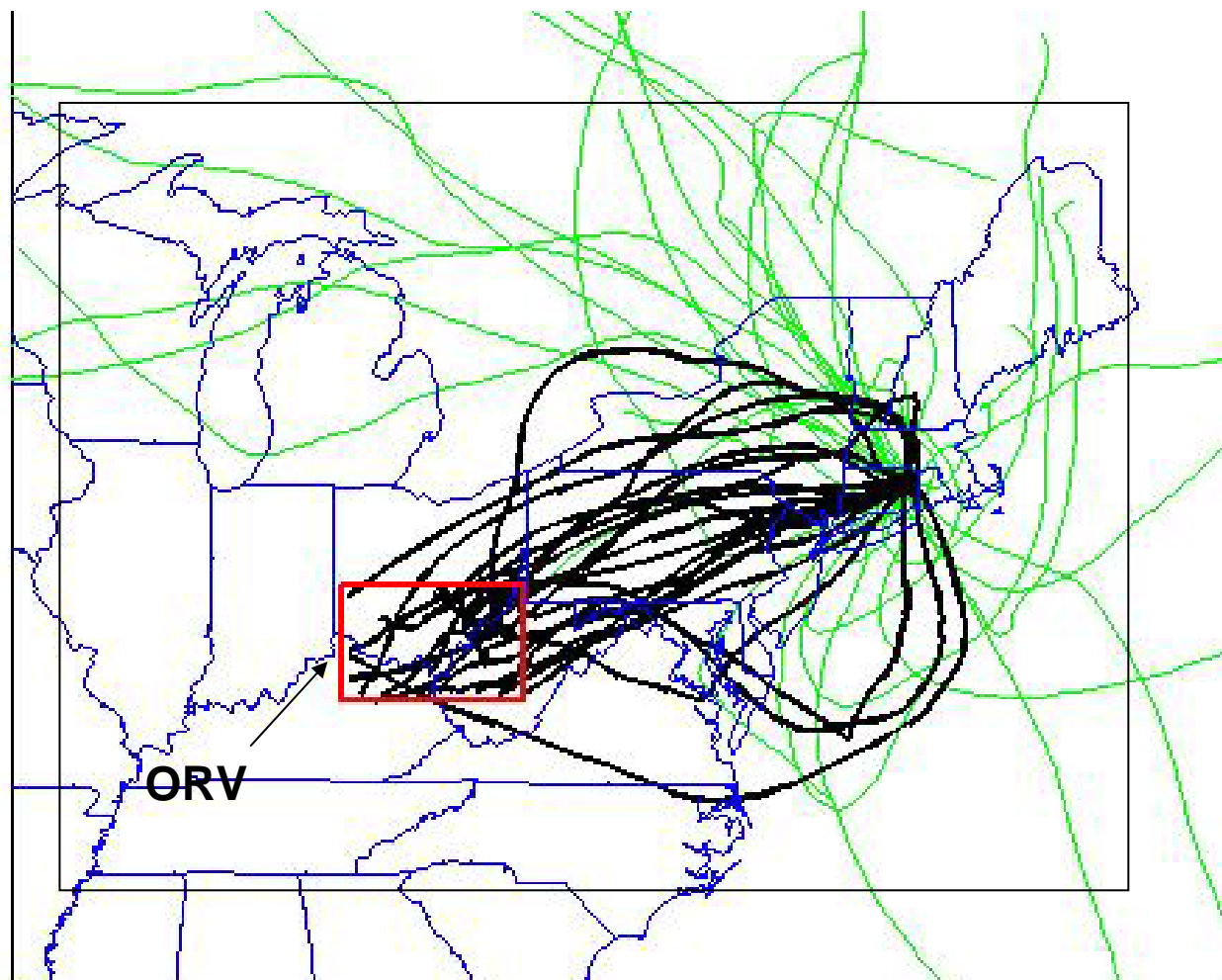
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# HYSPLIT Back-trajectories during 1998 ozone season

Black lines lead back to the Ohio River Valley (ORV)



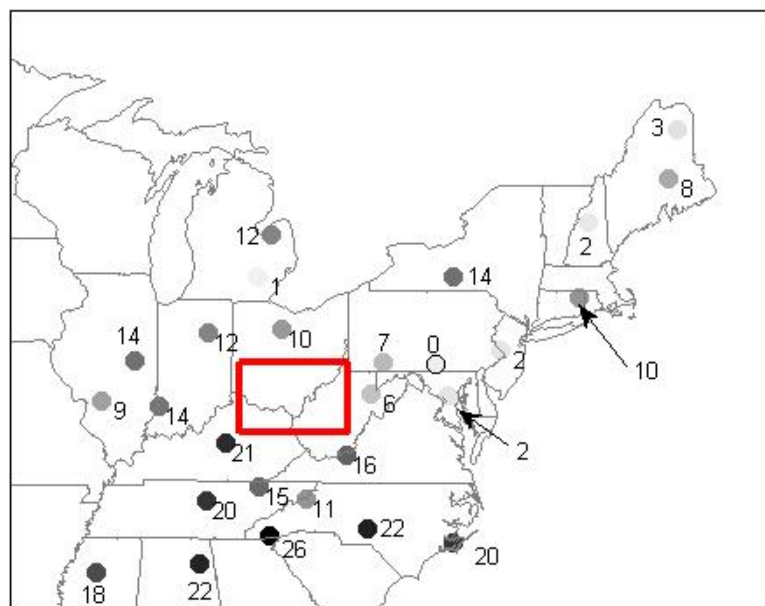
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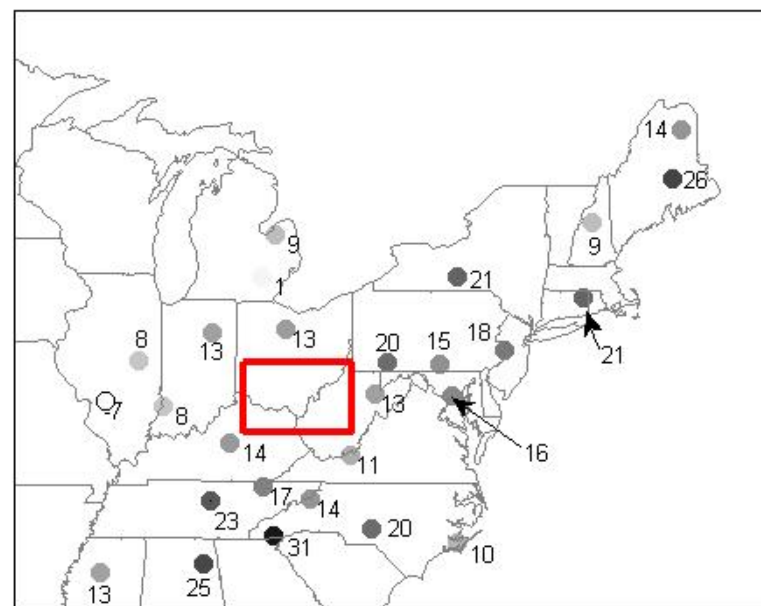
# Sensitivity of reductions in daily max 8-hr ozone to wind trajectories from the Ohio River Valley (ORV)

The NOx SIP Call has greatly helped reduce interstate ozone transport, contributing to improvement in ozone levels in areas downwind of major emission sources

**Not downwind** from the ORV



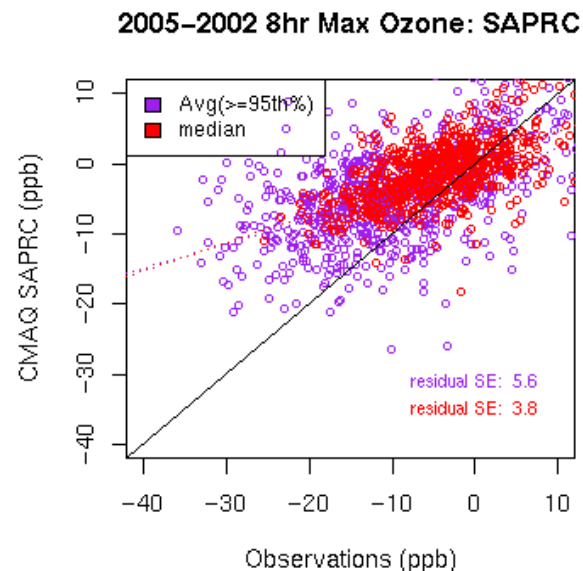
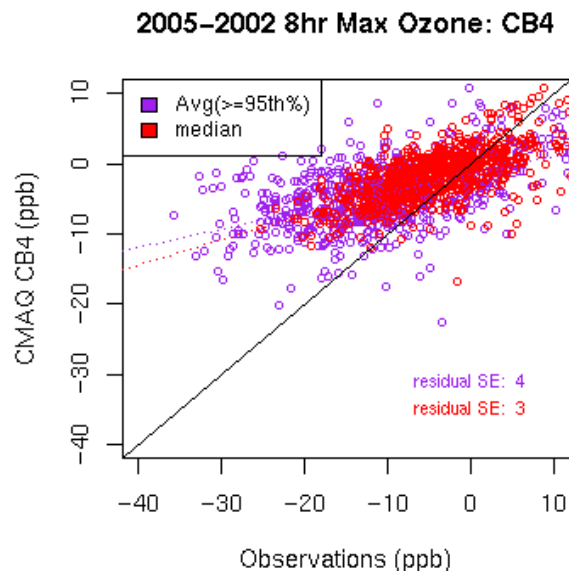
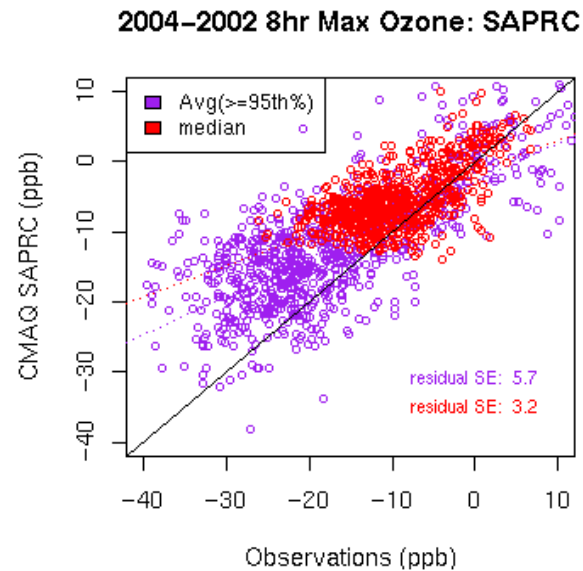
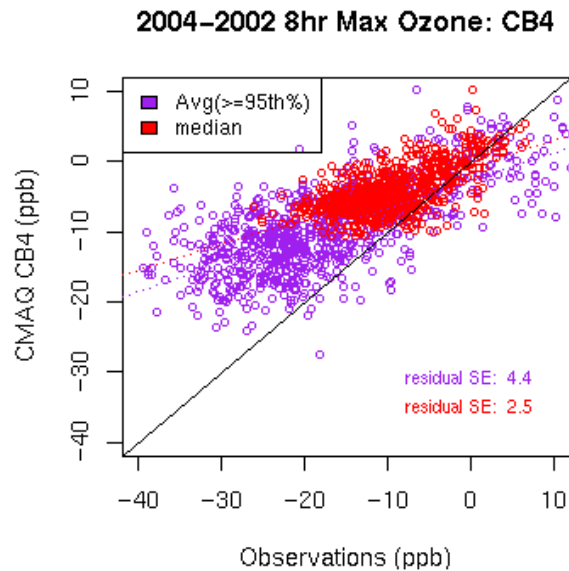
**Downwind** from the ORV



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# Dynamic Evaluation: CMAQ Sensitivity to Emissions and Meteorological Changes

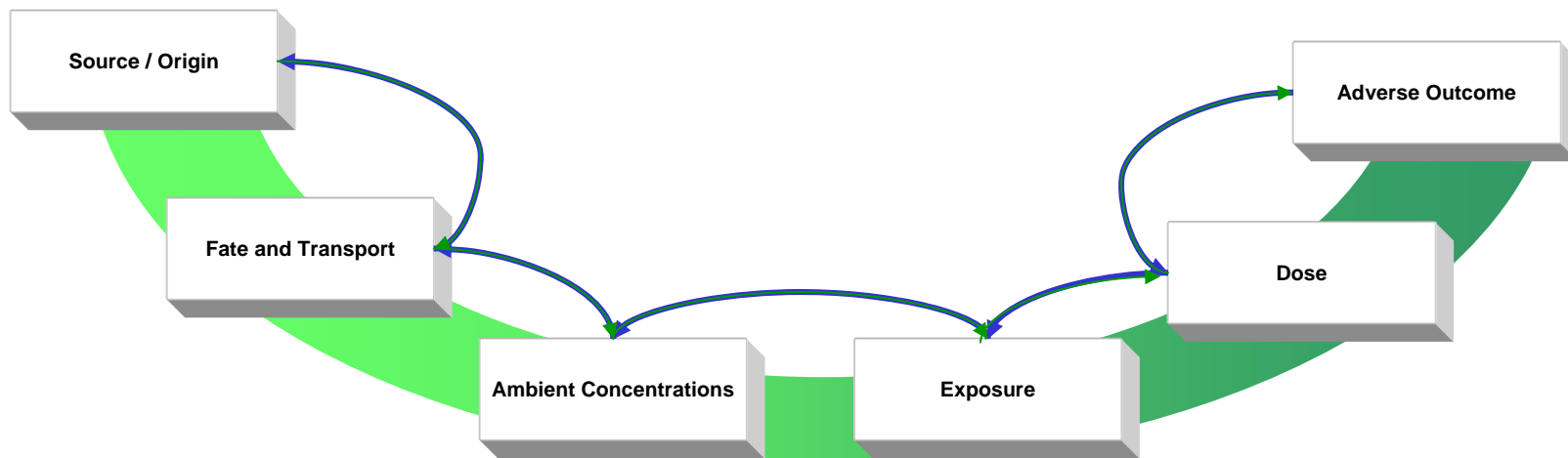


Comparison of modeled to observed changes in daily maximum 8-hour  $O_3$  show model underestimates  $O_3$  improvements between 2002 and 2004, and between 2002 and 2005.

This is the first study that assessed the model's ability to reproduce the changes induced by the changes in emissions and meteorology.

Further diagnostic analyses helping identify key areas of model improvement to better simulate the changes.

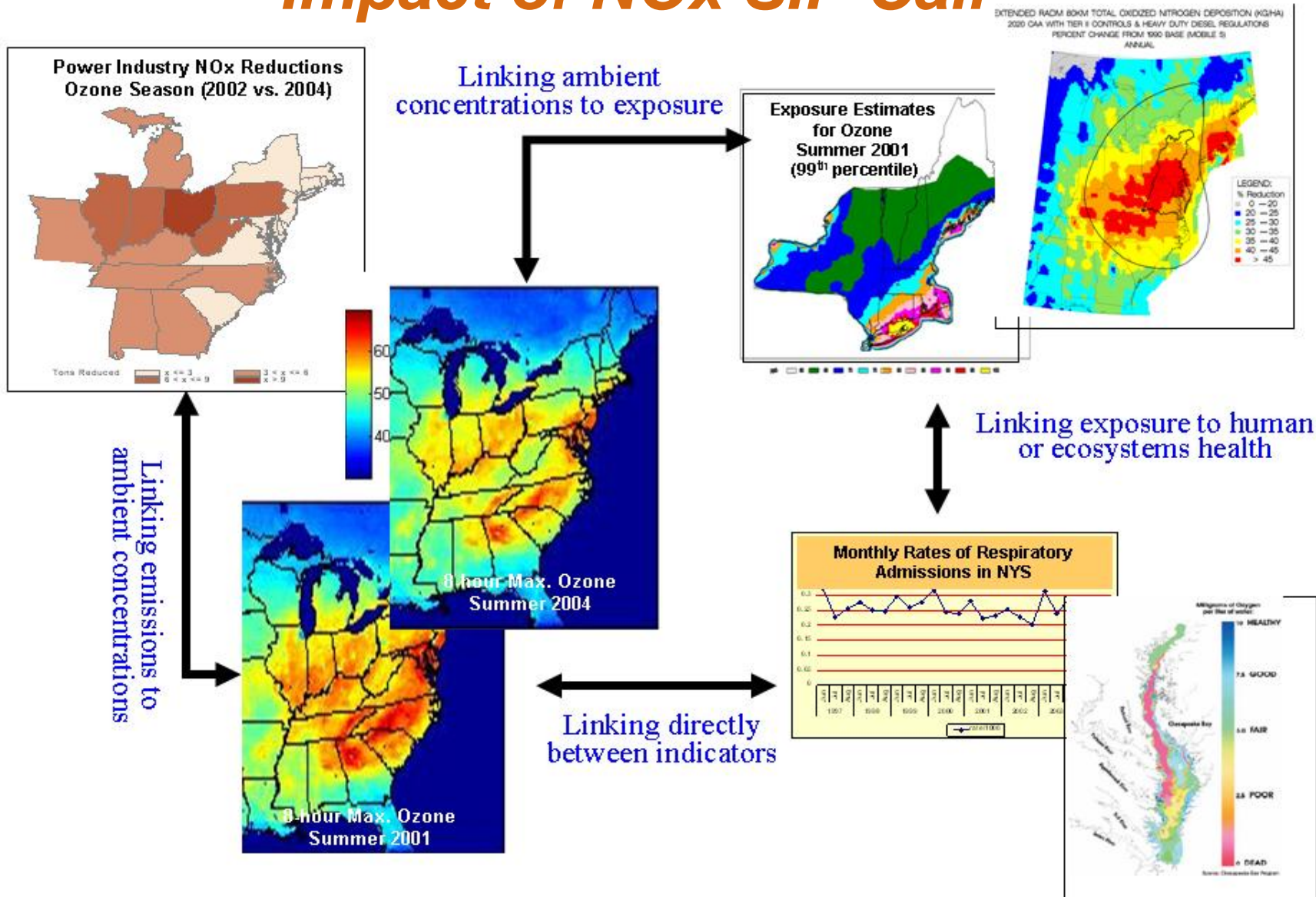
## Source-to-Outcome Continuum



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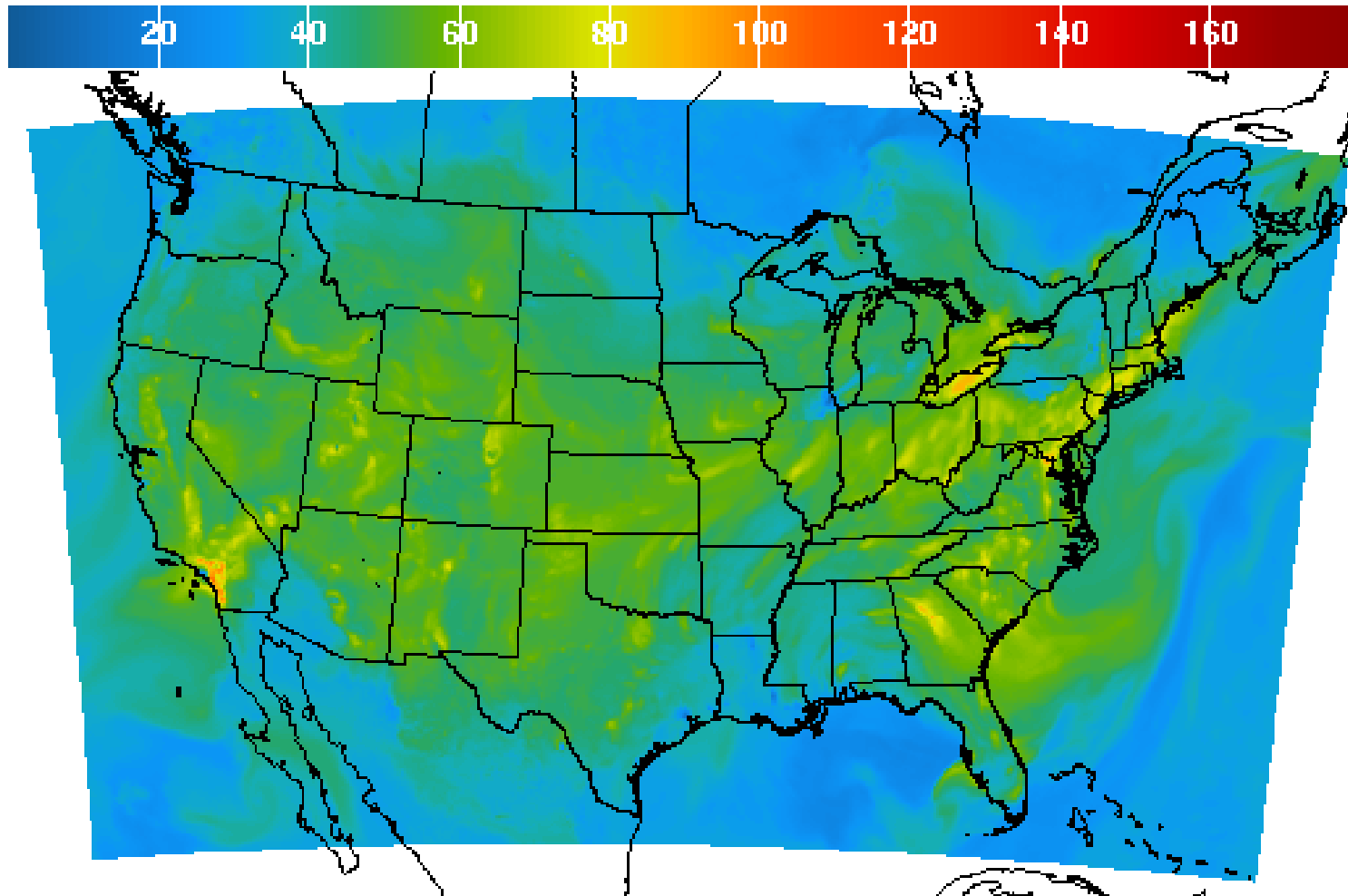
# Impact of NOx SIP Call



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# Gaining insights with air quality forecasts (Available at [www.weather.gov/aq](http://www.weather.gov/aq))



1Hr Avg Ozone Concentration(PPB) Ending Wed Jul 26 2006 3PM EDT

Experimental

(Wed Jul 26 2006 19Z)



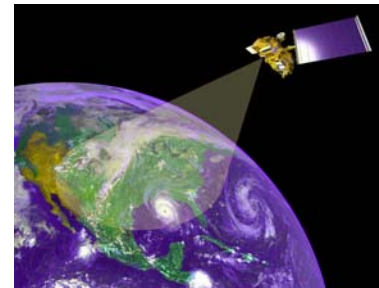
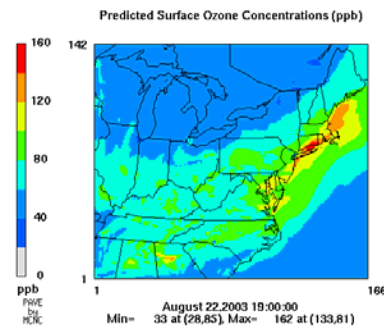
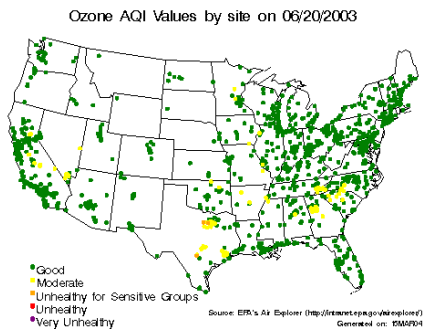
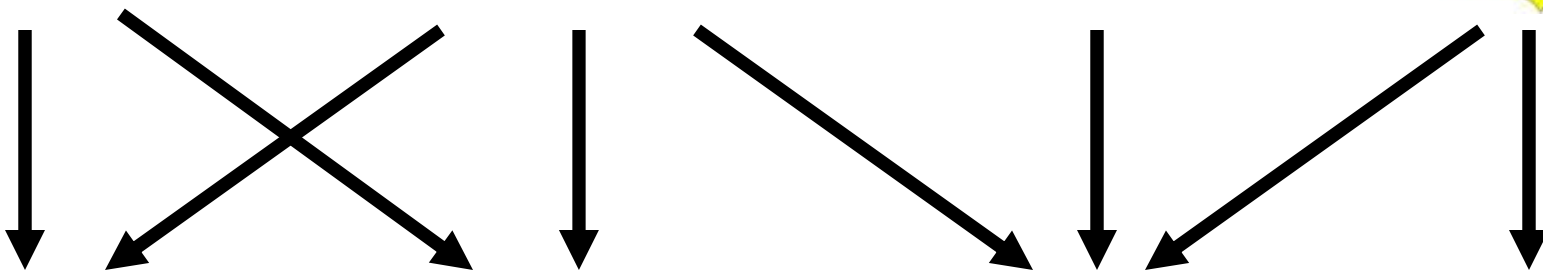
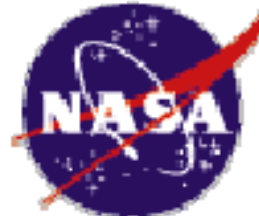
**National Digital Guidance Database**

06z model run

Graphic created-Jul 26 9:32AM EDT



# Sources and Partnerships For Better Characterizing Air Quality



Monitoring



Modeling



Satellite



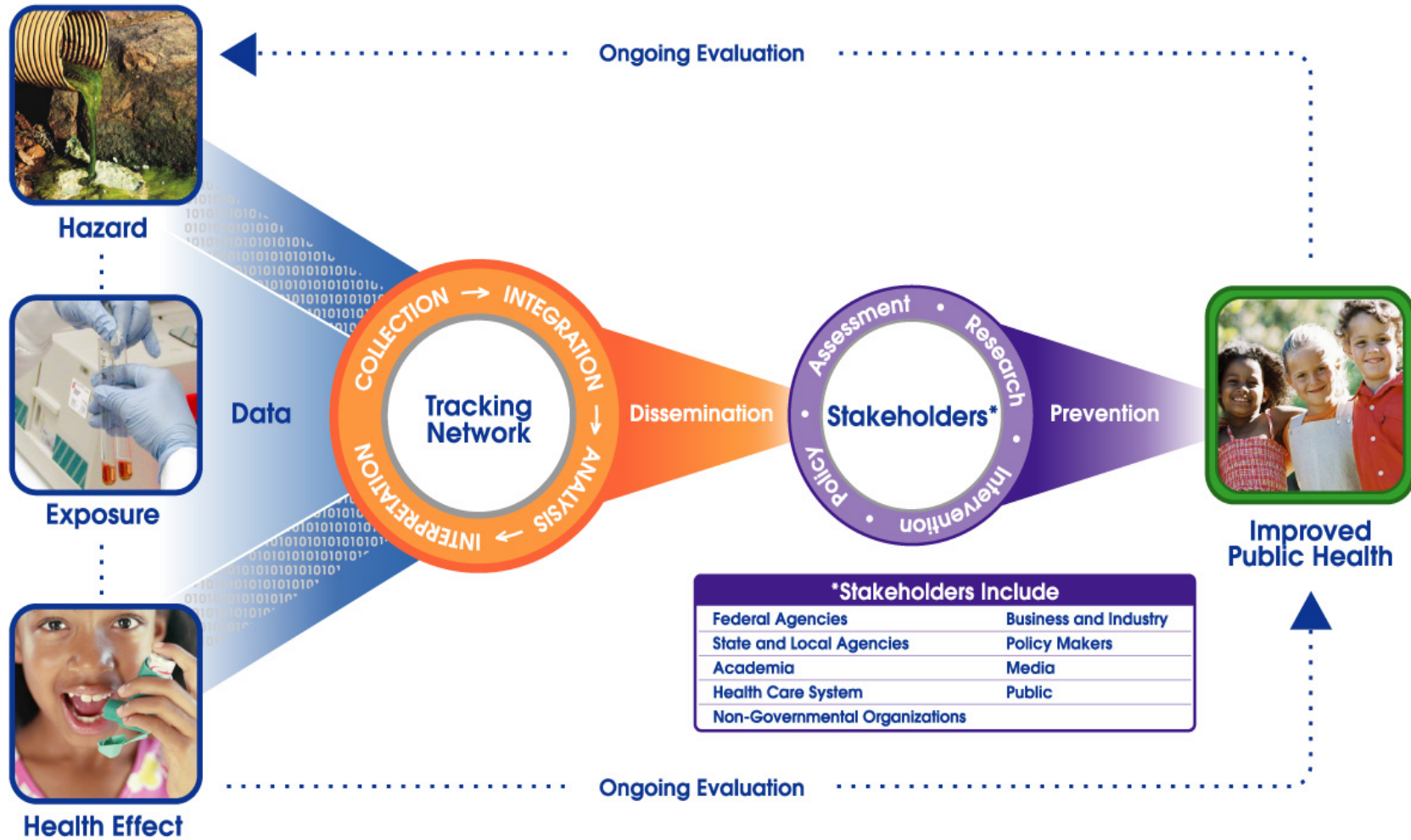
Wildfires



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# ENVIRONMENTAL PUBLIC HEALTH TRACKING



**\*Stakeholders Include**

Federal Agencies	Business and Industry
State and Local Agencies	Policy Makers
Academia	Media
Health Care System	Public
Non-Governmental Organizations	



DEPARTMENT OF HEALTH AND HUMAN SERVICES  
CENTERS FOR DISEASE CONTROL AND PREVENTION  
SAFER • HEALTHIER • PEOPLE





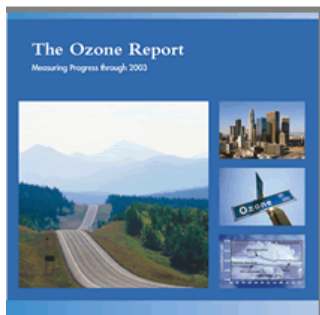
# Desirable Characteristics and Uses for Environmental Public Health Tracking (EPHT) Data

## Characteristics

- Ongoing, Systematic Collection
- Nationwide in Scope
- Std Collection/Reporting
- QA/QC Procedures
- Temporal & Spatial Coverage
- Fine Resolution
- Timely Availability
- Related to Human Exposures

## Uses

- Quantify the magnitude of a problem
- Detect unusual trends, occurrences, relationships
- Identify populations at risk
- Generate and test hypotheses
- Direct and evaluate control and prevention measures
- Develop information for better clinical care and individual-health action
- Facilitate policy development



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# *EPHT and Air Quality*

- The CDC identified Air Quality (PM and Ozone) as a high priority for the NEPHTP
  - Health Impacts
  - Available data
- Questions related to Air Quality and EPHT
  - What Air Quality data are **routinely** available?
  - Of these data, which are most appropriate for EPHT applications?

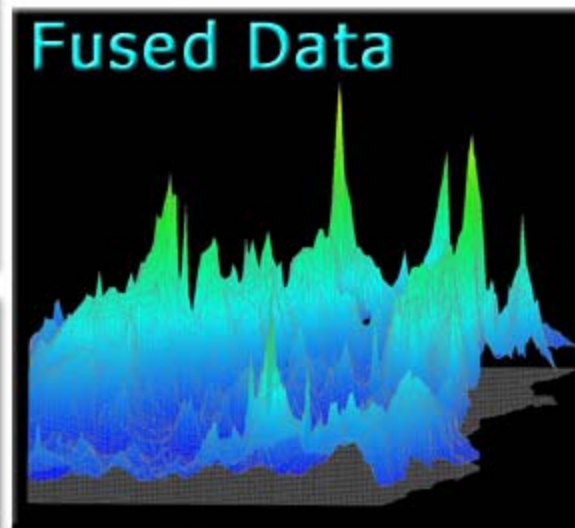


# The PHASE Project

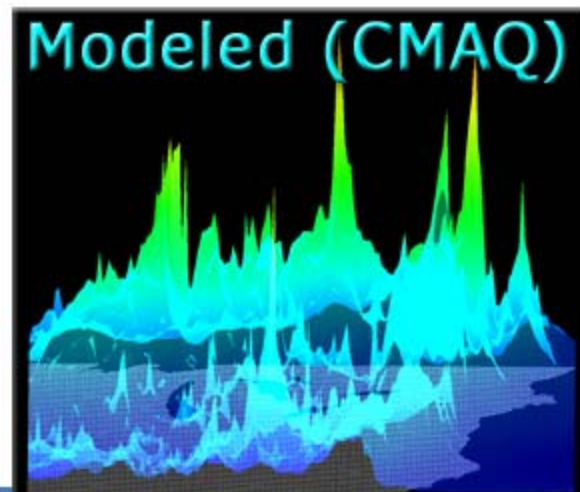
- Collaboration
  - Federal (CDC, EPA, NOAA, and NASA)
  - EPHT State Tracking partners (Maine, New York, and Wisconsin)
- Objective and Scope
  - Develop and evaluate alternative air quality characterization methods for EPHT
  - Air Pollutants
    - Ozone and Particulate Matter
  - Health Endpoints
    - Asthma and Cardio Vascular Disease
- Activities
  - Air Quality Characterization
  - Air Quality Public Health Analyses
- Overall Goal
  - Produce information that can be ROUTINELY used to track potential relationships between public health and air quality



# Improving Temporal and Spatial Resolution at Regional Scale: PM Example



Data fusion results:  
Spatially and temporally  
resolved surface  
enhanced with ground  
truth data from monitors



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# Urban Air Quality

- Link urban air quality to exposure – local sources and regional background.
- Multiple scales are important:
  - **Regional effects** – long-range transport of multiple pollutants from multiple sources
  - **Urban effects** – multiple pollutants, multiple sources influence urban-scale air quality
  - **Local scale** – local sources, local features (e.g., buildings) and land-use influence personal exposure

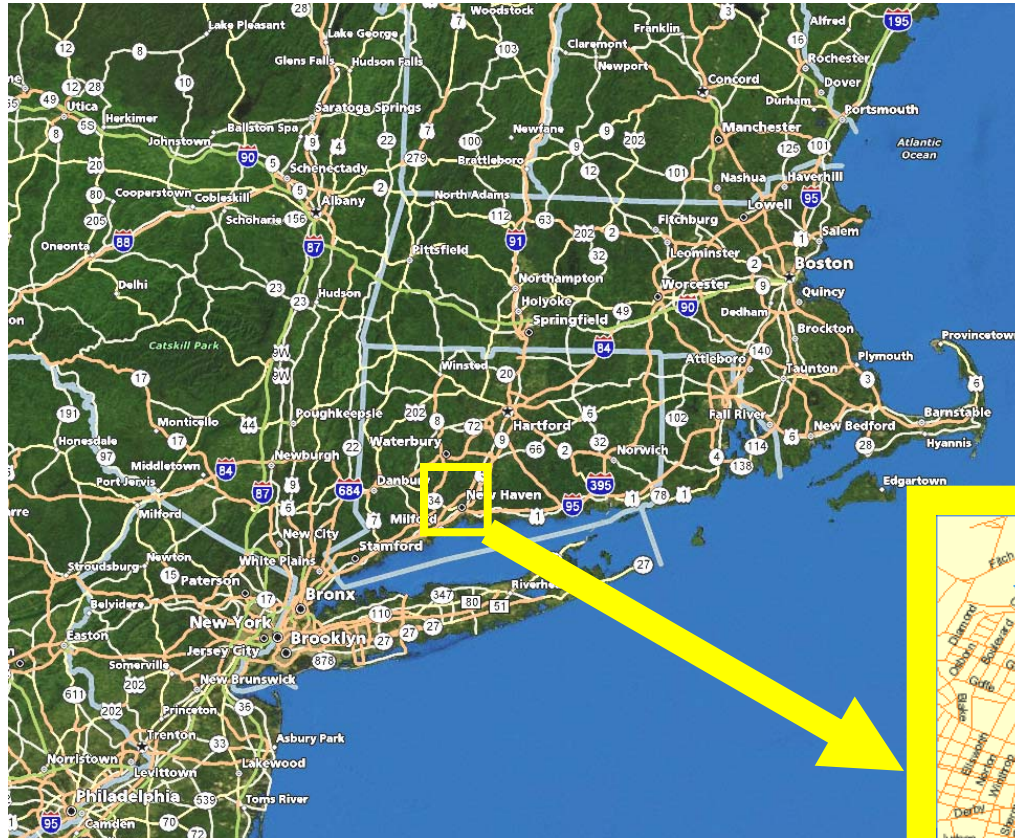


# Urban-Scale Air Quality

- Multiple sources and the modeling tools available:
  - Background (regional sources)  CMAQ
  - Industrial (point sources)  AERMOD – Gaussian model based on boundary layer theory, uses surface roughness, turbulence, and wind direction information;  HYSPLIT – a Lagrangian trajectory model
  - Mobile (line sources)  CALINE4 – commonly used but no longer actively being developed
  - Local scale (highly resolved source and geometry)  Computational Fluid Dynamics (CFD), or empirically-based diagnostic tools (e.g., QUIC). These are resource intensive to apply to an entire urban area.



# Modeling Urban Air Quality - Case Study

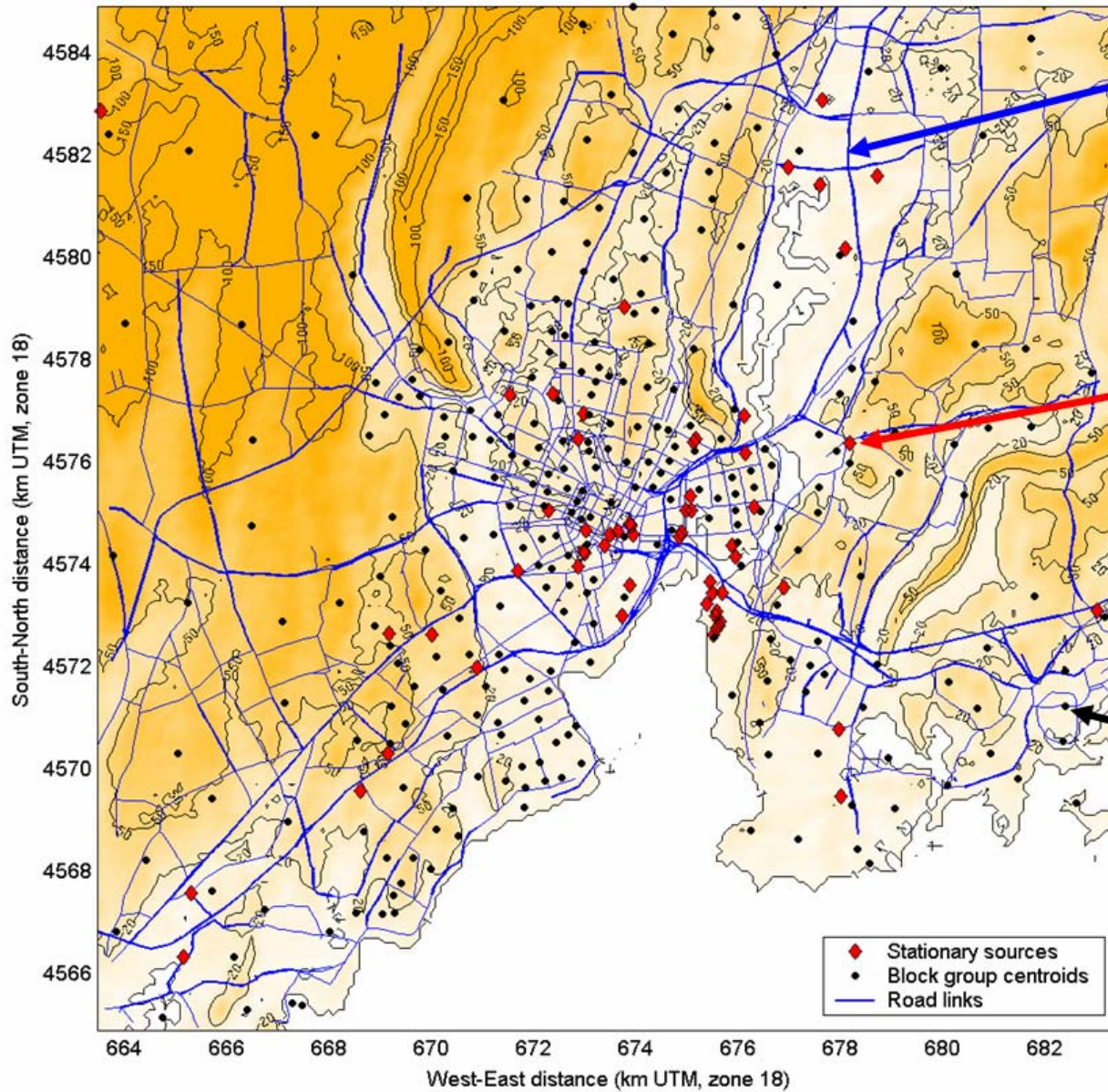


## New Haven, CT



# Modeling Domain, New Haven, CT

locations of emission sources, roads and census block group centroids



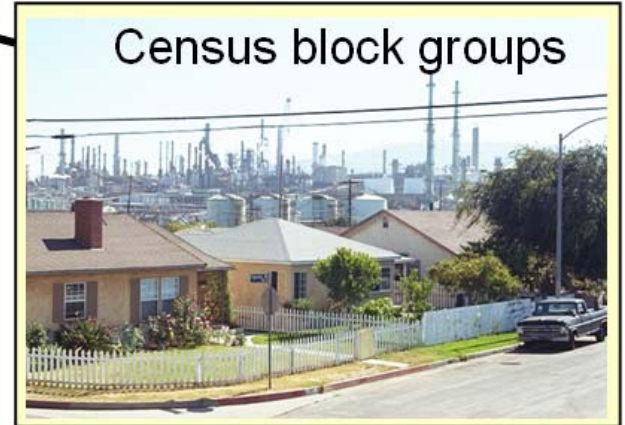
Mobile sources



Industrial sources

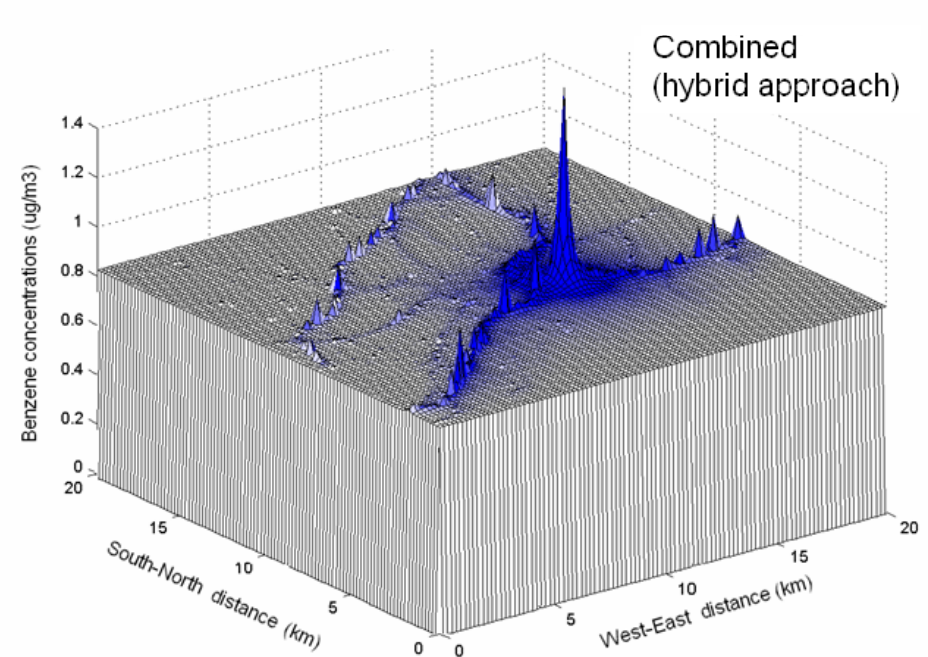
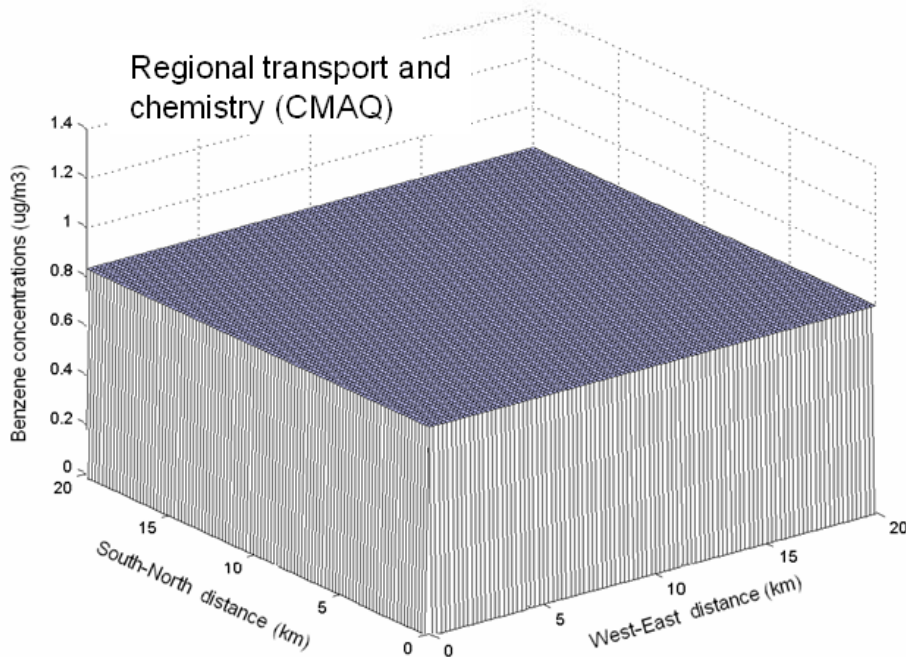
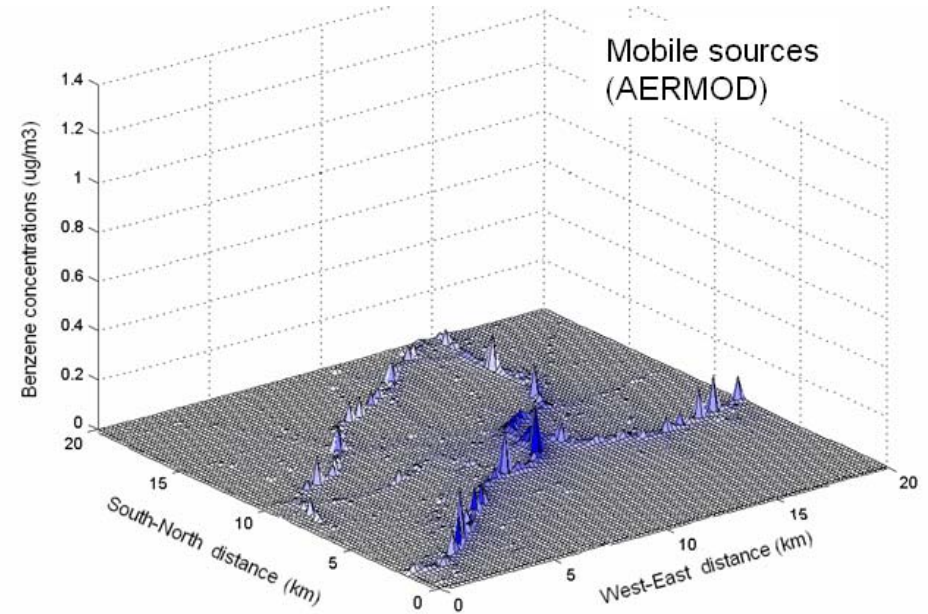
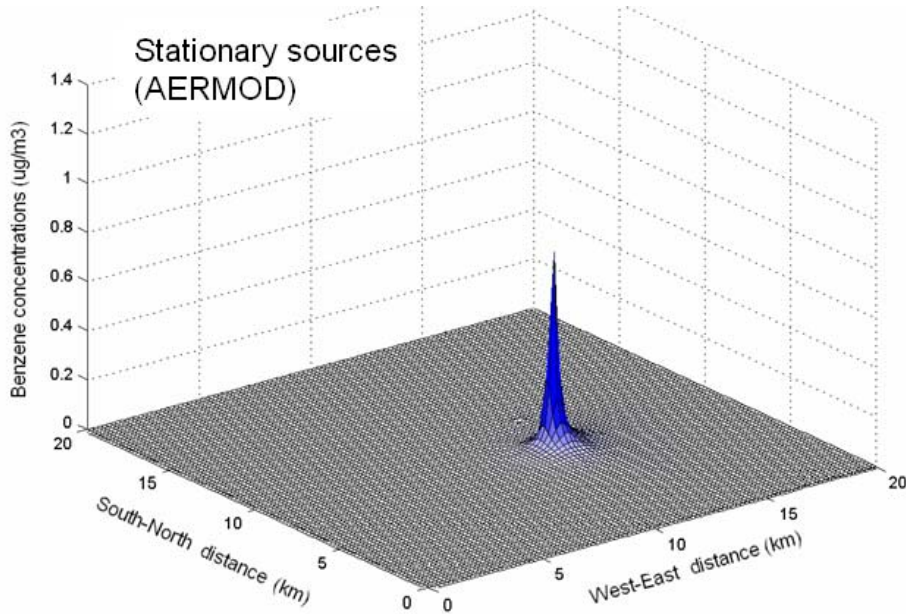


Census block groups

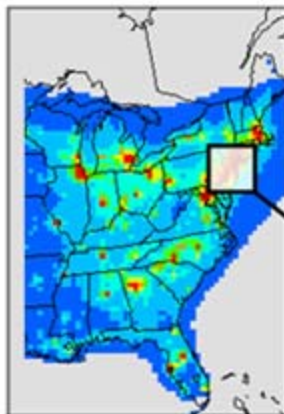




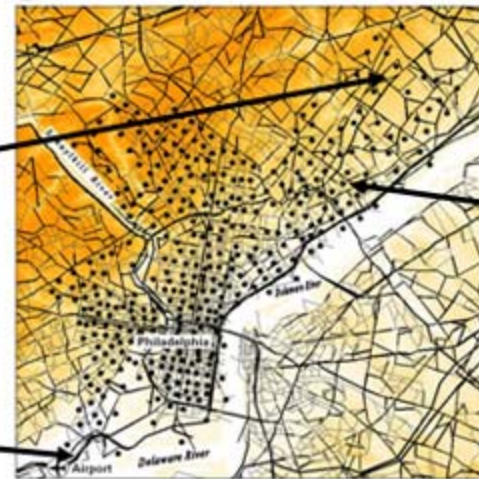
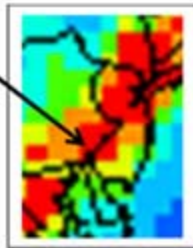
# Example: modeled annual average benzene concentrations



# Linking Emissions, Air Quality, and Human Exposures

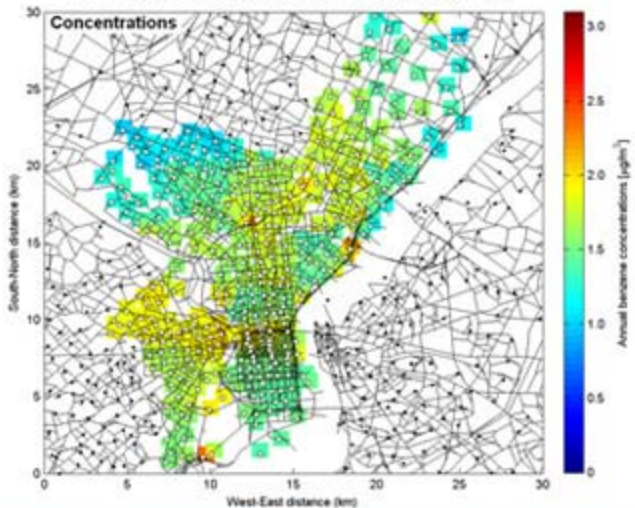


Philadelphia county



Census tracts

Ambient Concentrations

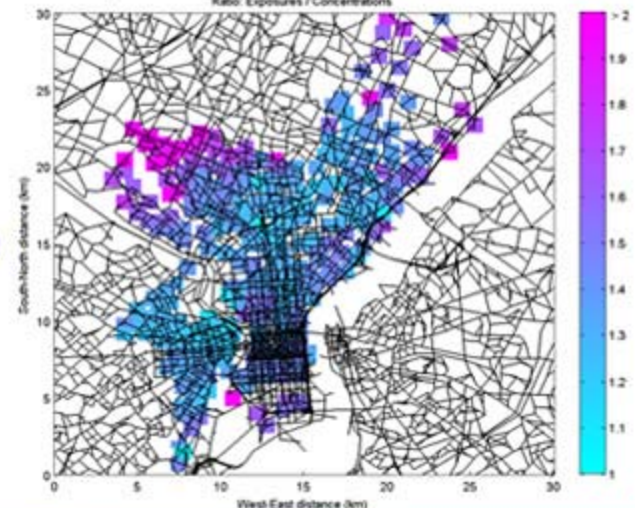


Exposure Modeling



- Indoor Penetration
- Personal Sources
- Human Activity

Ratio: Exposures/Concentrations



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# New findings on roadway pollution



**Micro-scale Hot Spots**

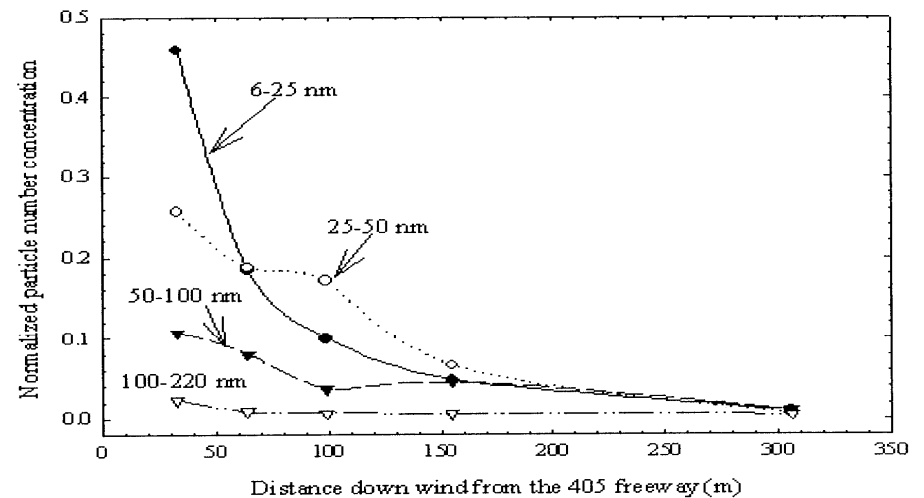


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## New findings on roadway pollution

- Growing body of literature on adverse impacts to populations near “major” roads
  - Adverse health effects associated with residential/school proximity to major roads
    - Asthma
    - Other respiratory diseases
    - Reproductive/developmental effects
    - Cardiovascular
    - Premature mortality
    - Cancer (various types)
  - Elevated pollutant levels
    - CO
    - Benzene
    - PM (ultrafines, EC, SVOCs)
    - Other (e.g. noise, stress)



- *Bibliography of over 100 articles on near road impacts since 2000.*





# *Enhancing Federal & State-Level Air Quality Applications*

## **Enhanced Tools**

Optimized CMAQ  
Satellite Data  
(w/NASA)

## **Enhanced IT**

Grid Services  
Science Subnet to facilitate  
collaboration with our partners

## **Enhanced Air Quality Applications**

### **Traditional Applications**

State Implementation Plans (State and Local Agencies)  
Policy Analysis (National and International)

### **New Applications**

Air Quality Forecasting (w/NOAA-NWS)  
Public Health Tracking (w/DHHS-CDC)

### **Accountability**

Discerning Changes and Tracking Trends in Air Quality  
Evaluating the Effectiveness of Emission Control Programs



# Climate Change and the Built Environment

## Integrated urban planning and air quality management

### Summary

- Air quality in the United States has improved since the inception of the Clean Air Act. However, the NAAQS for 8-hr ozone and fine particles continue to exceed in some parts of the country.
- Need to better understand the interactions of climate change and air quality, and future air quality conditions.
- Improved air quality models are needed to address near-roadway pollution and population exposure to harmful levels of toxic air contaminants.



# For additional information ...

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Disclaimer: Although this has been reviewed by EPA, it does not necessarily reflect EPA's views or policies.



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