



Regional Air Quality: Wrap Up

Two Research Topics

Drivers for Future Research

Plans for 2008 & 2010

- *Jim Meagher*
- *Chemical Sciences Division*

ESRL Atmospheric Chemistry Review

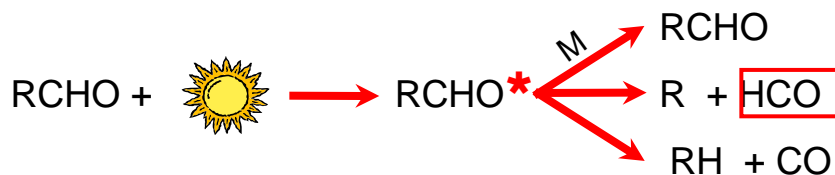
January 29-31, 2008 ~ Boulder, Colorado



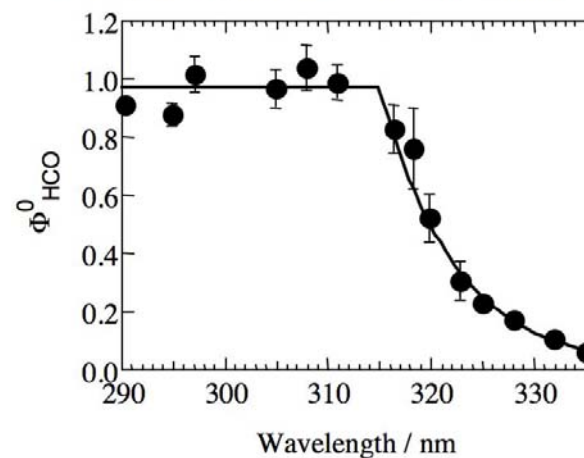
Laboratory Kinetics - *the building blocks for models*

Focus: Two areas of uncertainty in air quality models

- Quantifying rate parameters for oxygenated VOCs
 - ✓ Aldehyde reactivities (glyoxal, C₅, C₆, C₇, C₁₀)
 - ✓ HCO quantum yields (glyoxal, C₂, C₃)



HCO quantum yield from acetaldehyde photolysis



- Aerosol nucleation from photochemistry of biogenic precursors
 - ✓ α -pinene, β -pinene, sesquiterpenes
 - ✓ CH₂I₂





Air Quality Research at ESRL

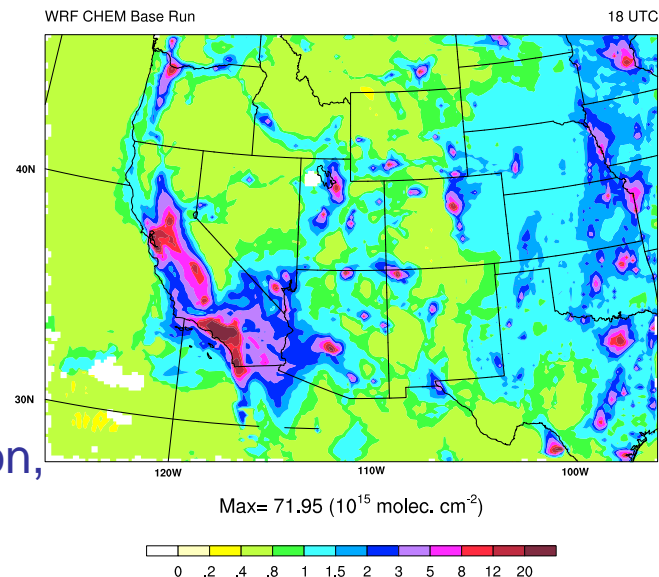


Modeling

Focus: Improved predictive capability for forecasting, research, and regulatory needs.

- Model Development
 - ✓ WRF-Chem - online community model
- Analysis of data from field intensives (FLEXPART, WRF-Chem)
- Air quality forecast models
 - ✓ Diagnostic evaluation using data from intensive field studies
 - ✓ Post processing (ensembles, bias correction, etc.)
 - ✓ Chemical data assimilation (O₃, PM)

2005 July WRF-Chem NO₂ Column



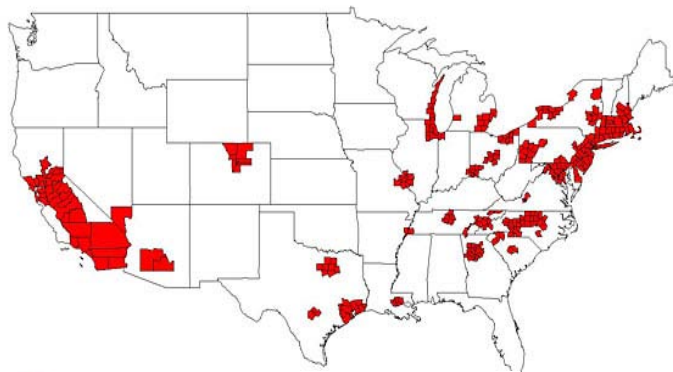


Air Quality Drivers for the Future -1



EPA is Conducting a Periodic Review of the Ozone Standard

**Attainment and Nonattainment Areas in the U.S.
8-Hour Ozone Standard**



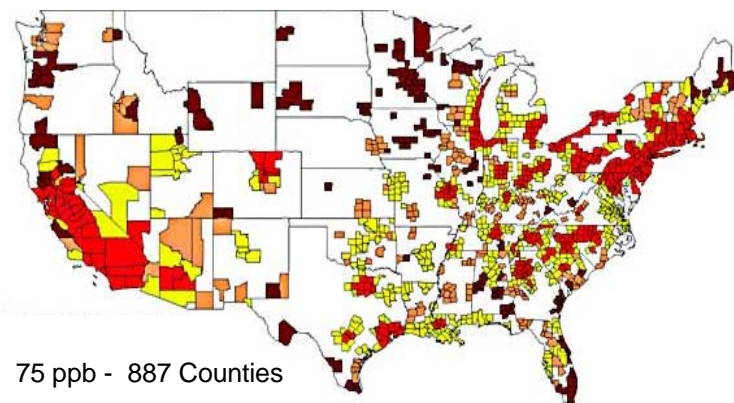
■ Nonattainment Areas (347 Counties)

Source: U.S. EPA

12/2007

A.S.L. & Associates, Helena, Montana

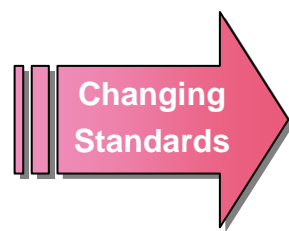
Estimated Future Nonattainment Areas



- 75 ppb - 887 Counties
- 70 ppb - 1091 Counties
- 60 ppb - 1243 Counties

Source: Based upon U.S. EPA data interpreted by A.S.L. & Associates, Helena, MT

7/2007



Implications

Transport is even more important !

Regional, inter-regional, inter-continental

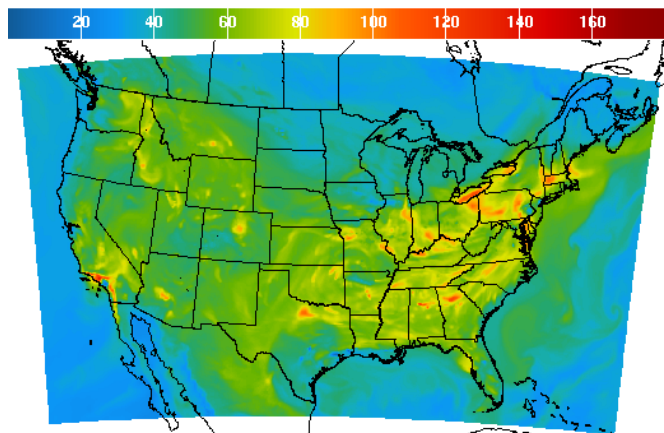
***Models must accurately represent multi-day
transport and nocturnal chemistry***



Air Quality Drivers for the Future - 2



NOAA's Evolving (2004) Air Quality Forecast Capability



1Hr Avg Ozone Concentration(PPB) Ending Thu Aug 16 2007 6PM EDT
Experimental (Thu Aug 16 2007 22Z)
National Digital Guidance Database
06z model run Graphic created-Aug 16 9:21AM EDT



Operational AQ forecast guidance

www.weather.gov/aq

Now - 1-day O₃ guidance for CONUS

Next (5-7 yrs) - PM guidance

Later (<10 yrs) - Extend forecast period (2+ days),
additional pollutants

Implications

Research is essential to NOAA's expanding air quality forecasting capability!

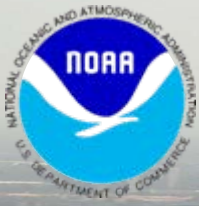
Need to understand weaknesses in current models

Need to improve O₃ forecast accuracy

Need improved PM predictive capability

Emissions - Chemistry - Meteorology

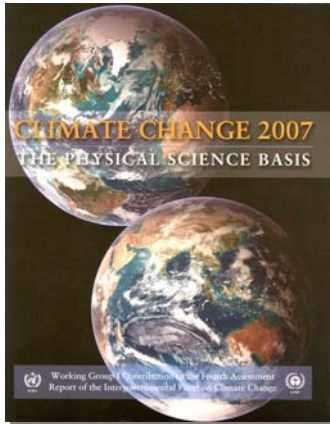
Chemical data assimilation? Post processing?



Air Quality Drivers for the Future - 3



IPCC Report - Call to Action for Climate Change



Air quality and climate change are fundamentally linked because ...

1. Climate change affects air quality - air quality affects climate change
2. Many of the sources targeted for emissions reduction are the same (power plants, transportation, industry, etc.)
3. Many of the atmospheric processes that connect sources to impacts are the same.

Emission strategies developed to mitigate climate change will almost certainly impact air quality - for better or worse

Implications

An integrated approach to emissions management for air quality and climate change will provide increased efficiencies and additional benefits.

Need decision support resources to **evaluate options**:

Emissions evaluation

Linking process understanding

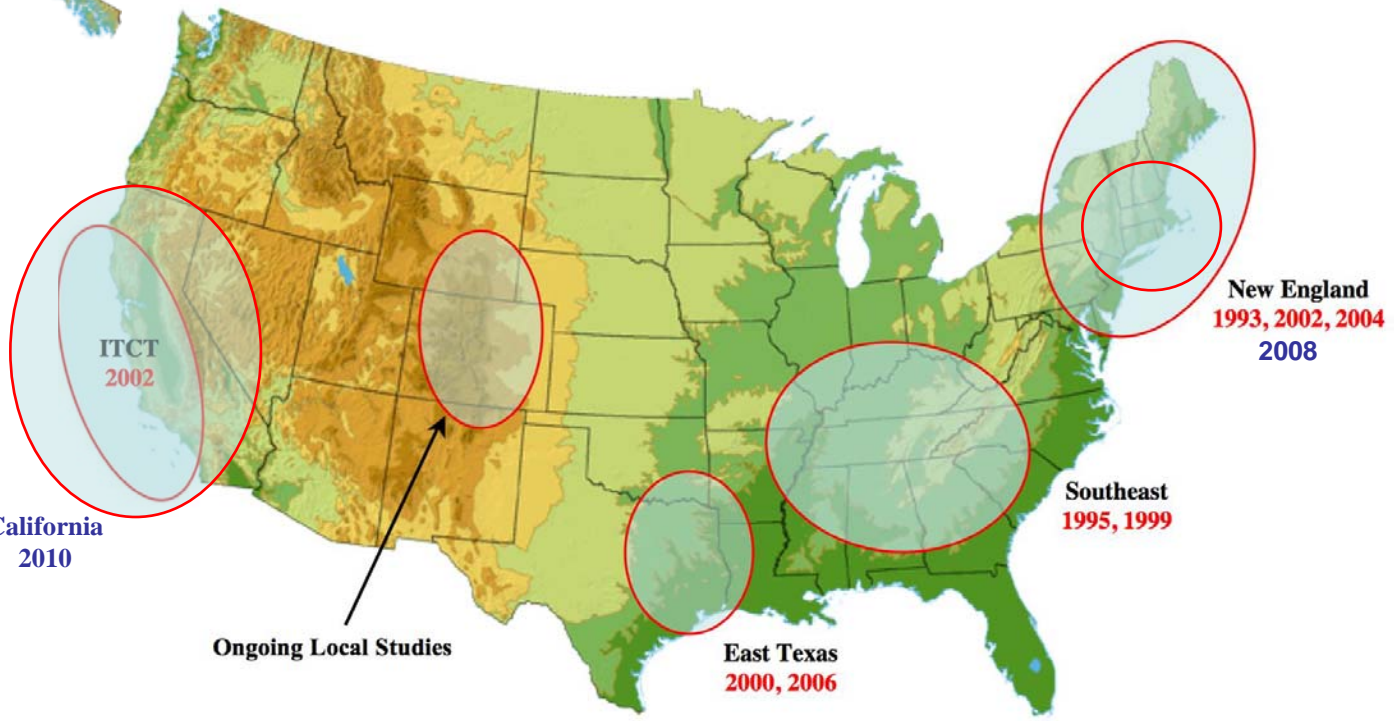
Modeling and assessment



Regional Air Quality Assessments Future Plans



FY 2008 - Wintertime Aerosol Study
New England, Mountain West, Fairbanks



FY 2010 - California



Regional Air Quality Summary



- Current Focus is on O₃ and PM
- National perspective with a regional focus
- Science presentations
 - Lab - Field - Models
- Future
 - We will provide capabilities that improve and extend Air quality forecasts
 - The changing situation dictates that we extend our horizons
Local → Regional → Continental → Global
 - Linkages with Climate: provide the science that supports “win-win” solutions
 - California 2010: an opportunity to include these evolving perspectives
- ESRL Air Quality Research begins and ends with the stakeholders

*“NOAA’s discoveries ... have allowed for the development of more cost-effective strategies that will result in cleaner air”**

* Letter from the Deputy Director of the Texas Commission on Environmental Quality to the NOAA Administrator