

US EPA ARCHIVE DOCUMENT



EPA's Assessment of the Impacts of Global Change on Regional Air Quality in the U.S.

Workshop on the Impacts of Climate Change on Air Quality
in the Pacific Southwest

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Global Change & Air Quality

Long-term Goal

Enhance the ability of air quality managers to consider global change in their decisions through improved characterization of the potential impacts of global change on air quality.

- Two major objectives:
 - Interim Assessment (FY 2007): Effects of **climate change** on air quality
 - Final Assessment (FY 2012): Effects of **global change** on air quality



2007 “Interim” Assessment

Completed in September 2008
Planned release for public review: November 2007

- Collaborative effort:
 - Scientists in EPA’s Labs/Centers
 - AQ modeling and emissions inventories expertise: regional-scale simulations under present and future climate conditions
 - Expertise in developing future emissions scenarios: energy demand and technology penetration
 - Assessment
 - Grantees funded through EPA STAR program
 - ~**25 STAR grants (\$25 million) to support assessment**
 - Office of Air and Radiation



Motivation – Why is this important?

- Meteorology plays essential role in whether or not a metropolitan area meets the NAAQS (particularly ozone and particulate matter)
 - For example, air quality managers understand, intuitively, that high temperatures and stagnation events affect the number of high ozone days
- IPCC 2007: A warming climate will lead to significant changes in regional meteorological patterns
- What is not known: How a changing climate affects air quality for a given metropolitan area – *and its future success in attaining and maintaining attainment of the NAAQS*



Motivation – Why is this important?

- Climate change expected to impact air pollution in ways that have not been explicitly considered in AQ program planning
 - *Chemical reaction rates and atmospheric transport processes*
 - *Biogenic (and anthropogenic) emissions rates*
- Potential to confound attainment of clean air objectives?
- Recent National Academies committee (NRC, 2004: Air Quality Management in the US) identified “*adapting the air quality management system to a changing (and most likely warmer) climate*” as a key challenge in coming decade
- Critical assessment of emerging science needed to assist in making significant, long-term decisions



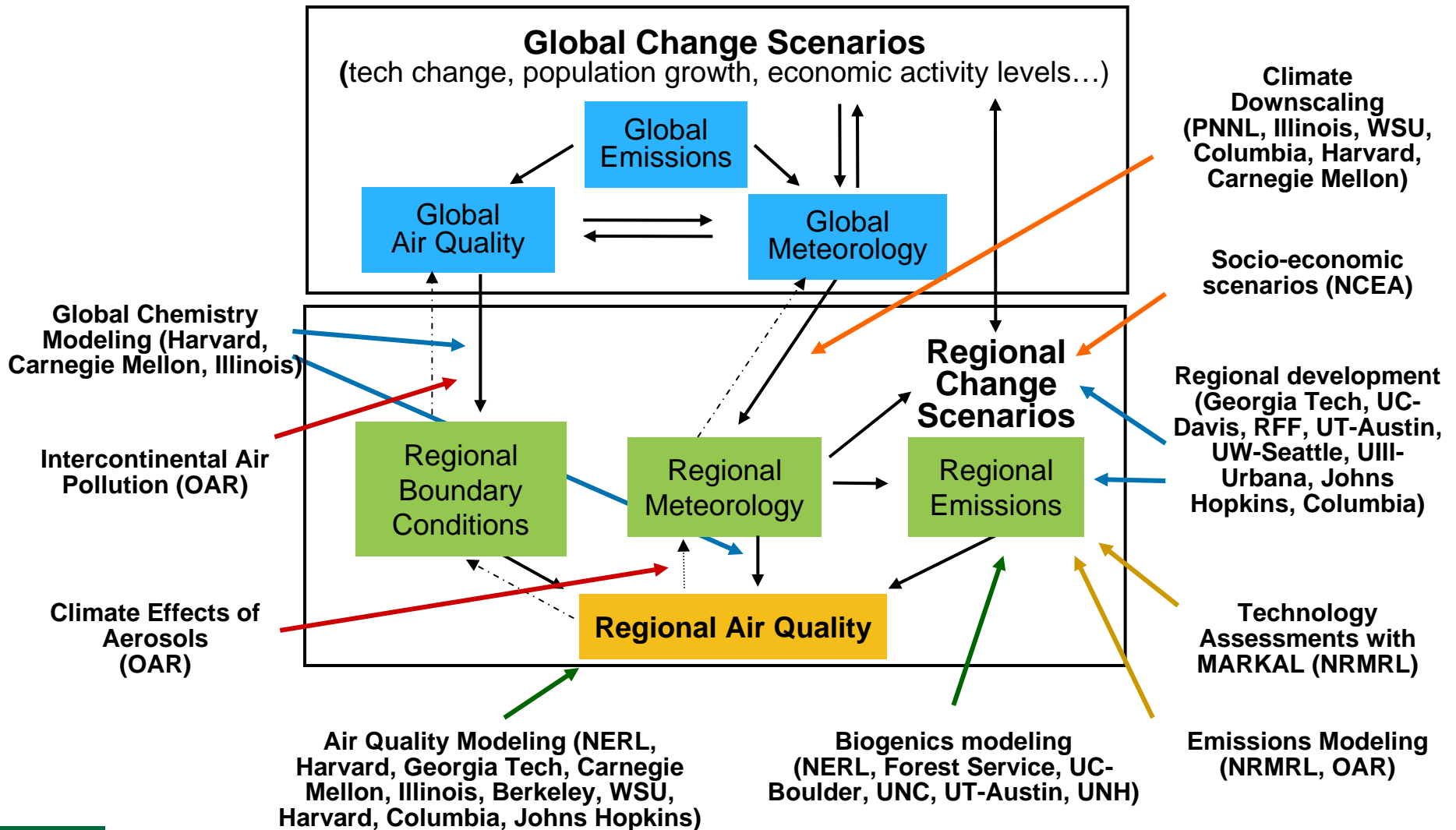
Key Questions:

- What is effect of projected changes in climate, climate variability and land-use patterns on regional U.S. AQ (O₃, PM, also Hg)?
- Which areas will experience AQ improvements and which deterioration due to climate change alone?
- How many areas are at risk of failing to attain standards?
- What is impact of climate change relative to emissions changes (due to controls, land use change, and socioeconomic changes)?
- How is the effectiveness of AQ management affected by climate change?

Fundamentally: Is this something we have to pay attention to going forward?



Air Quality Assessment Framework – 3 Key Linkages: Across spatial scales, temporal scales, and disciplines





Two Phase Assessment Effort:

Phase I

- Develop capabilities of climate and atmospheric chemistry models to investigate current and future meteorological effects on regional AQ
- Explore range of scenarios and alternative model specifications to begin defining uncertainty space of climate change/AQ simulations
- Investigate potential impacts of climate change alone on regional U.S. AQ (initial focus on O₃)

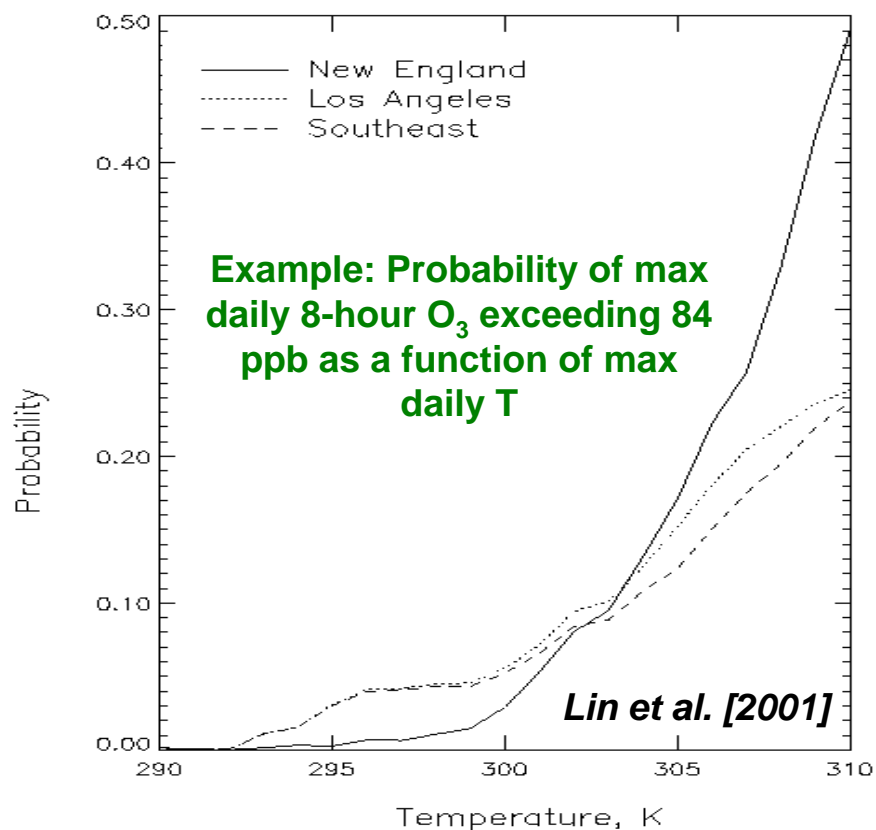
Phase II

- Extend capabilities of modeling systems from Phase I (new pollutants, improved processes, ensembles of more simulations)
- Develop tools to project land use, technology, and demographic changes to construct plausible scenarios of U.S. pollutant emissions 50 years from now
- Investigate combined impact of changing climate and changing anthropogenic emissions on AQ



Impacts of Climate Change on Ozone

- O₃ episodes (mostly summer) are generally what we care about
- Right combination of meteorological conditions – e.g., high temperature, clear skies, stagnant air – with the right blend of precursor pollutants, e.g., NO_x, VOCs
- Global climate change has the potential to affect both regional meteorology and regional emissions
- Likely to see different degrees of change in different regions





Implications

- All else being equal, what kind of additional pressure might climate change put on our existing concerns and strategies? Is this something we need to begin folding in to our planning?
- Examples:
 - Interannual variability
 - Extension of O₃ “season” into spring and fall
 - “Climate Penalty” on control strategies: additional emissions reductions required in the future?



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