Simultaneous forecasting of air quality and weather at ESRL

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NOAA Earth System Research Laboratory
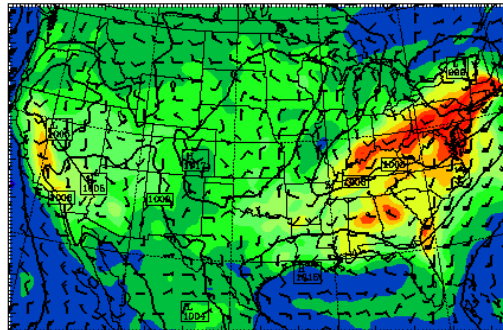
Dedication and Open House

August 23-24, 2006

Outline

Simultaneous prediction of air quality and weather:

- *Objectives*
- *Towards an integrated earth systems simulation and prediction model*

Examples:
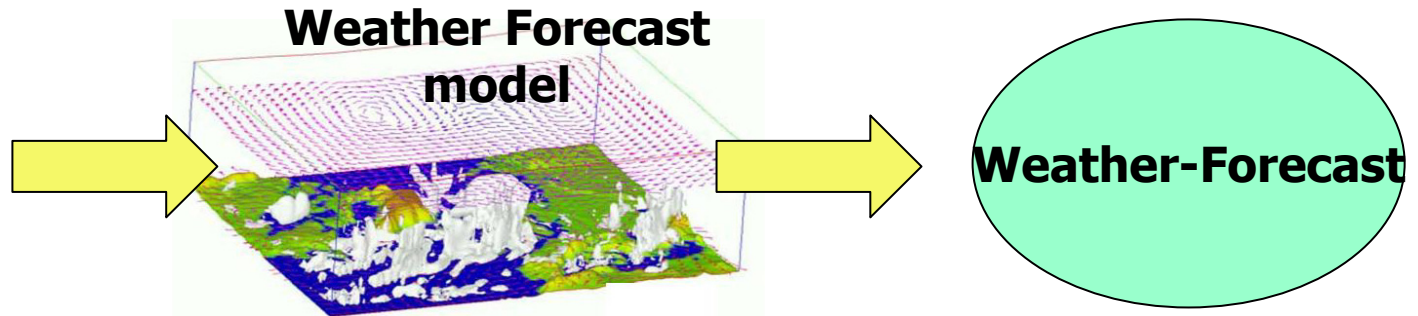
Real-time air quality and weather forecast

Improving Predictability of Air Quality Why?

- Public Health

- Planning for businesses and governments
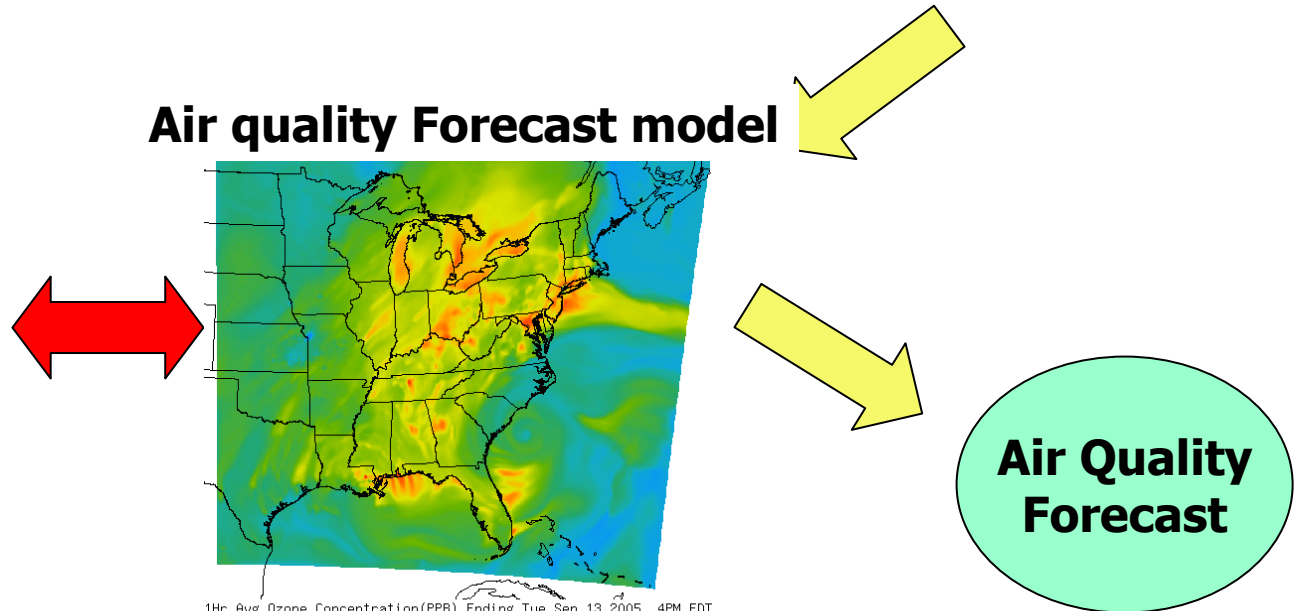
- Emergency response

- Wildfires and smoke

Air Quality Forecasting: The commonly used approach ("offline")

Weather Data Analysis & Assimilation

Weather Forecast model

Weather-Forecast

Air quality Forecast model

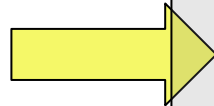**Biogenic and Anthropogenic emissions**

1Hr Avg Ozone Concentration(PPB) Ending Tue Sep 13 2005   4PM EDT
(Tue Sep 13 2005 20Z)
National Digital Guidance Database
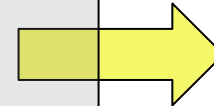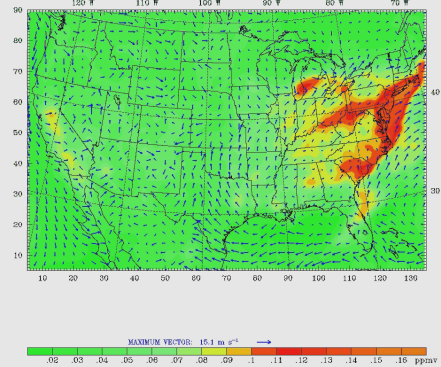12z model run   Graphic created-Sep 13 1:22PM EDT

Removal modules

Air Quality Forecast

Air Quality Forecasting: The NOAA/ESRL approach ("online")

Simultaneous forecast of weather and air quality

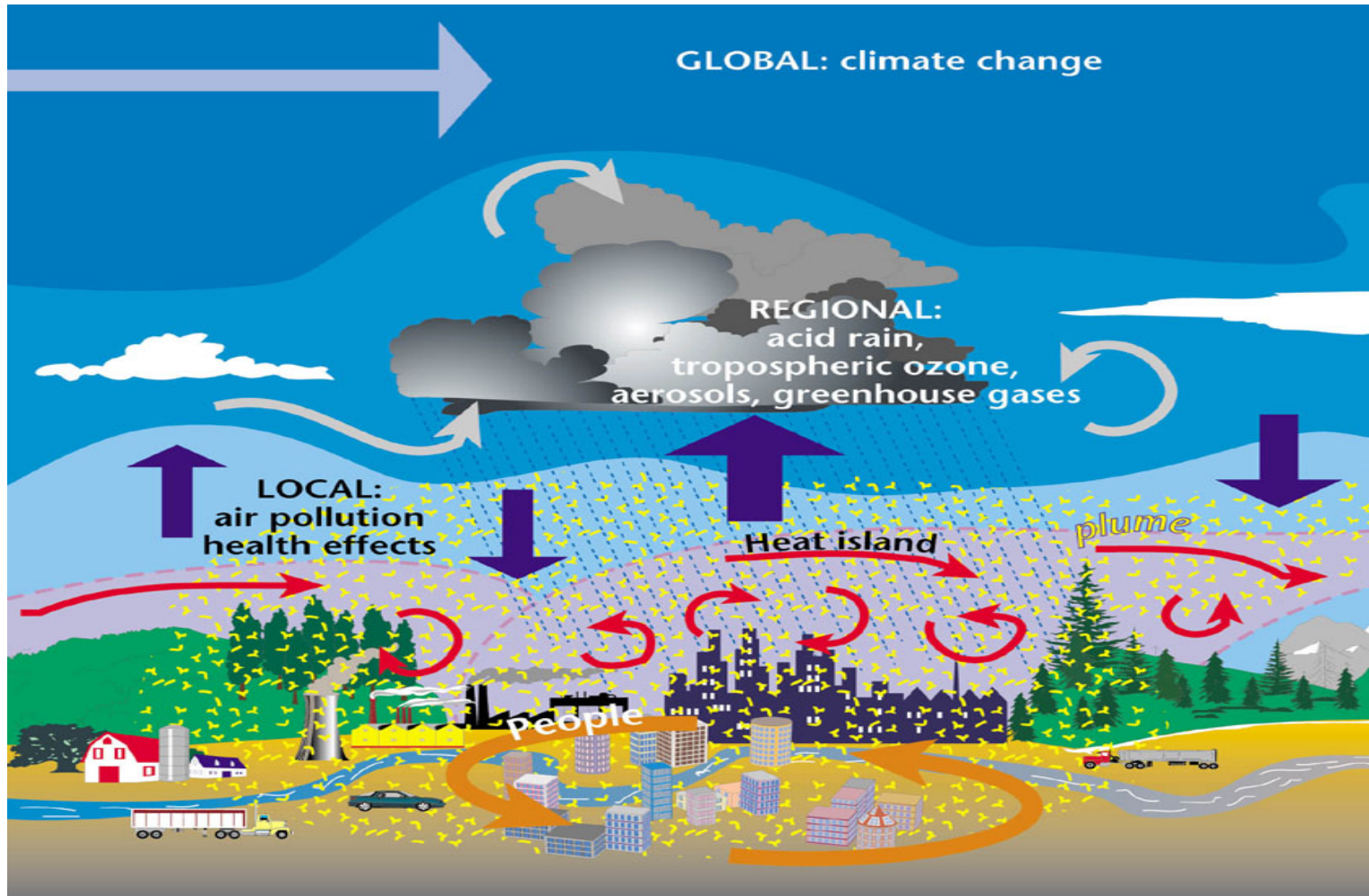**Weather Data Analysis & Assimilation & Emissions**

Weather and Air quality Forecast

Chemistry, Aerosols, radiation, clouds, temperature, winds

An Earth System approach with full interaction of meteorology and chemistry

Coupled Weather Research and Forecast and Chemistry model (WRF/Chem)
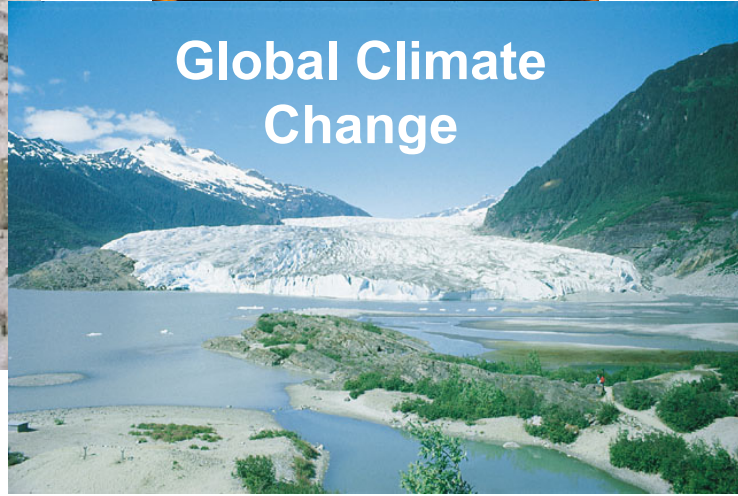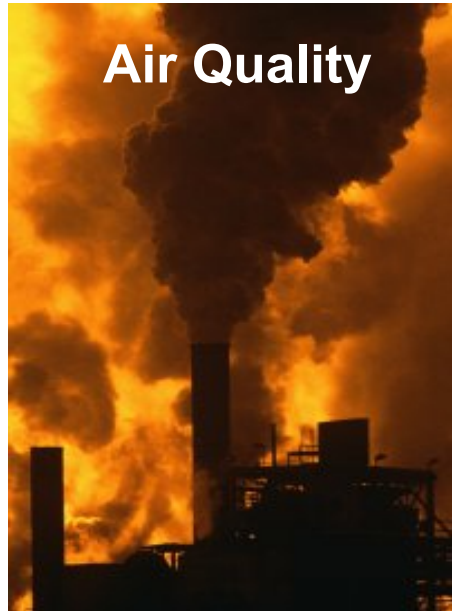
Earth system interactions

Weather, air quality, climate, biology, agriculture, land surface, oceans, lakes

All interact on global to local scales, with various degrees of importance on different scales and for different applications
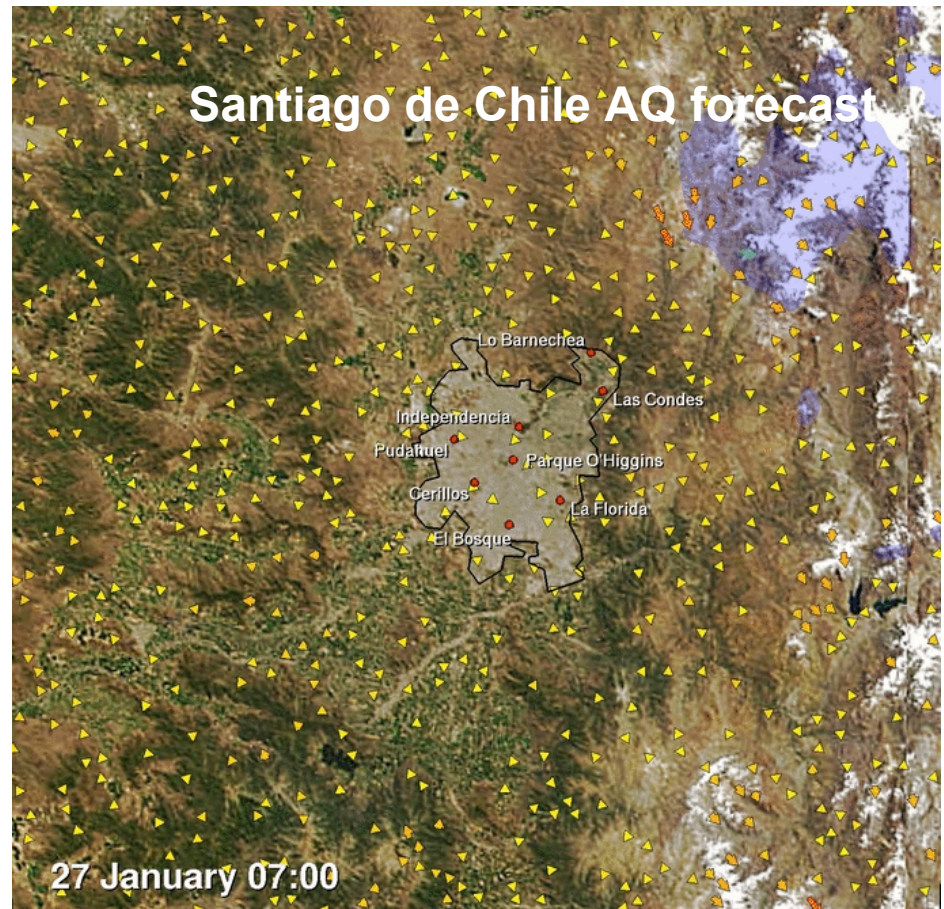
Modified after Carmichael/GURME

Current possible applications

Weather

Air Quality

Hazardous Release

Global Climate Change

Current collaborations

- Developers: USA, South America, Europe, and Asia

Santiago de Chile AQ forecast

27 January 07:00

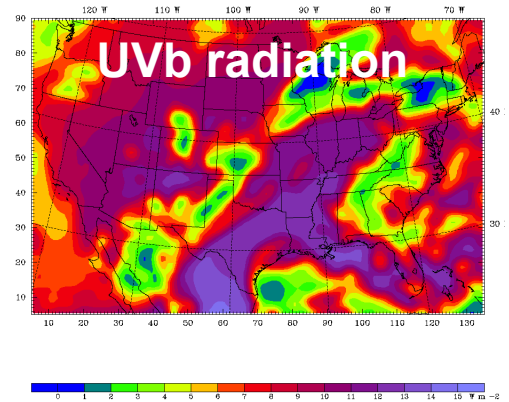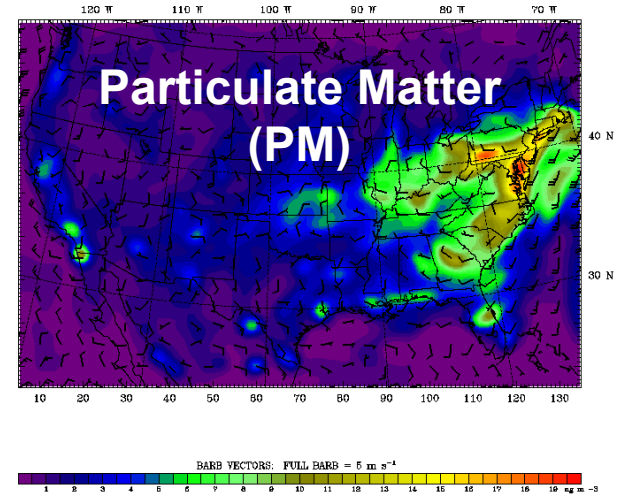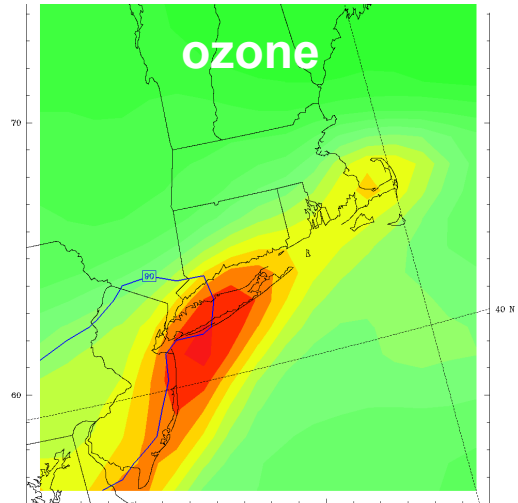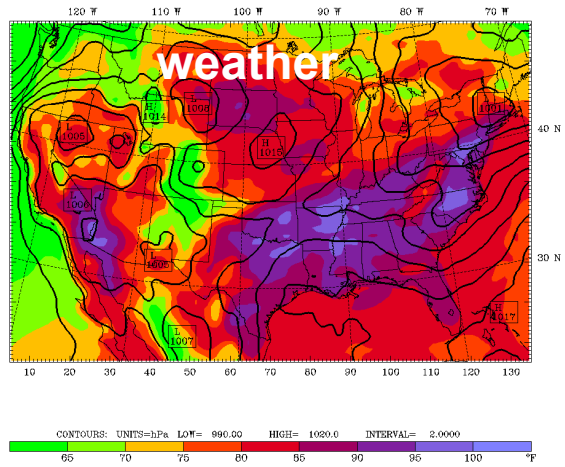• Applications: Currently about 150 national and international users

Part II: Examples of forecasting application

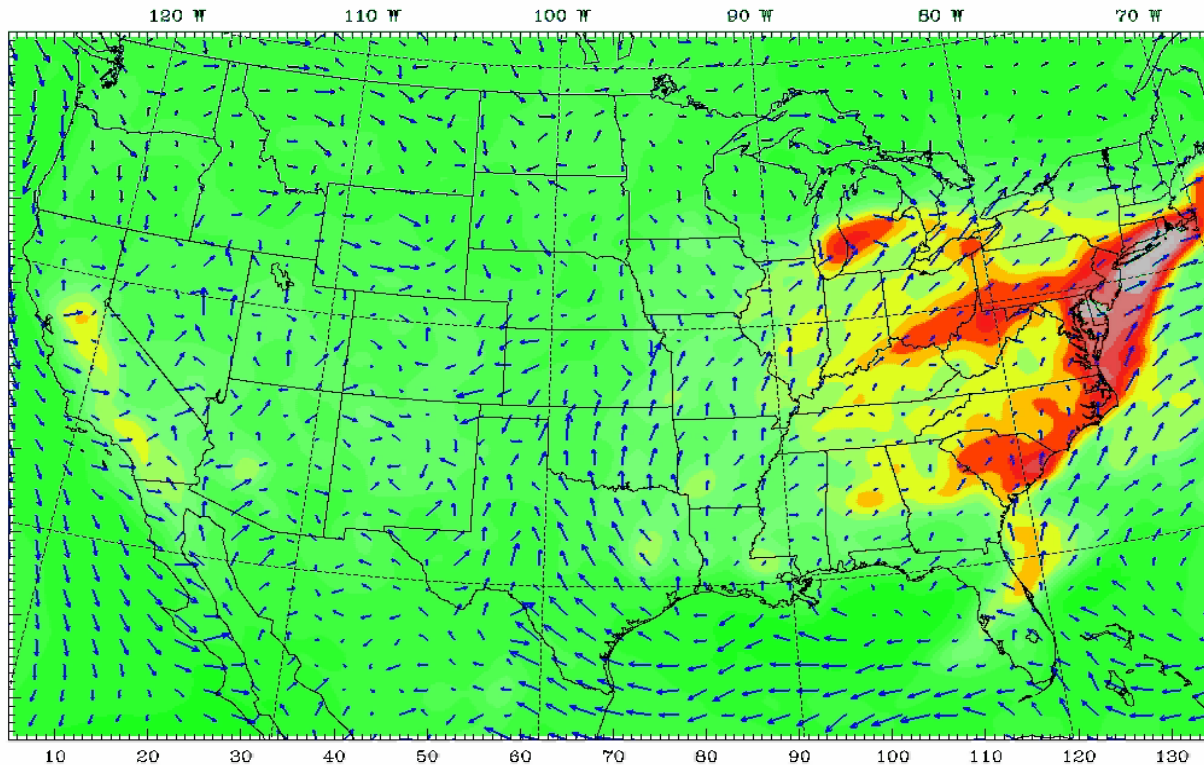## Current predictions at ESRL

AUG.3

72-hr forecast of ozone, winds, and precipitation: August 3 -6, 2006

Init: 0000 UTC Thu 03 Aug 06
Fcst: 0.00 h
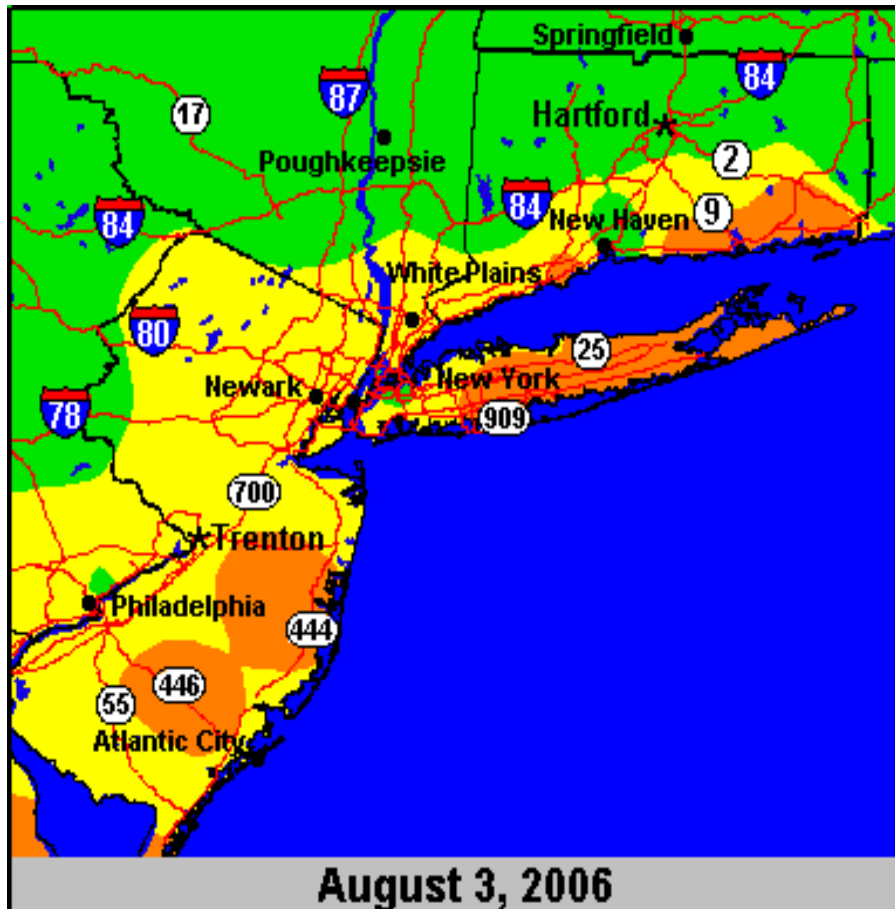Valid: 0000 UTC Thu 03 Aug 06 (1800 MDT Wed 02 Aug 06)

Colors: Ozone
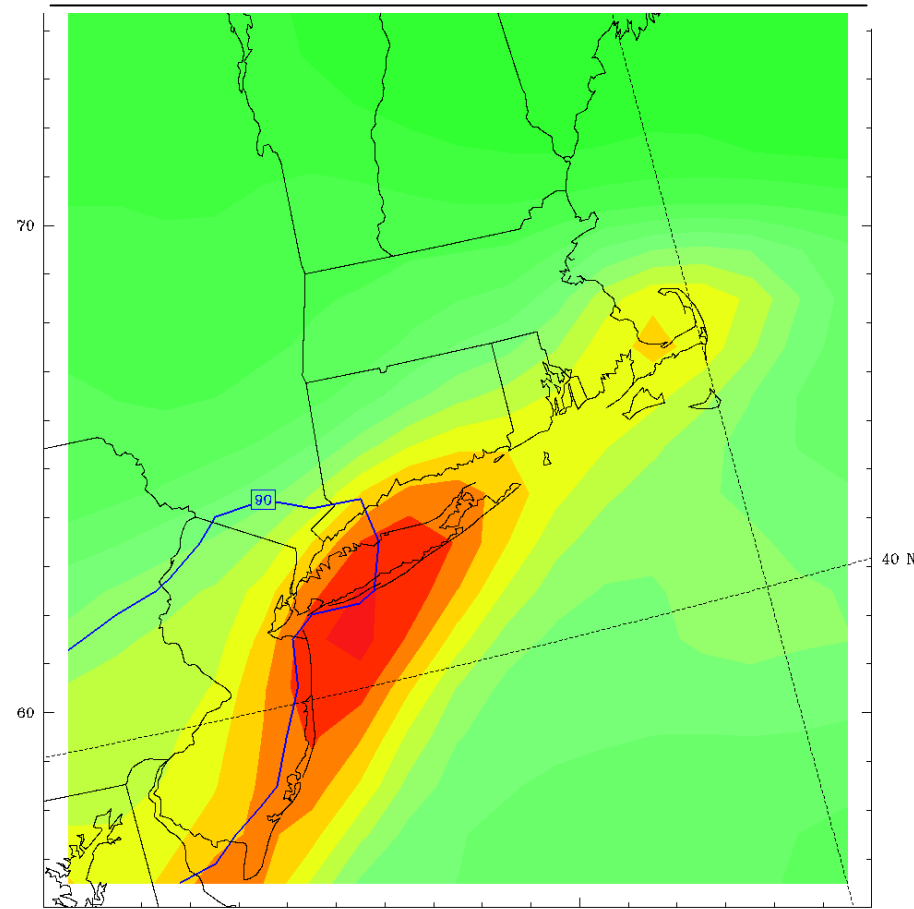
Blue arrows: Wind

White Contours:
Hourly Precipitation

Air quality and weather forecasts for Aug. 3 2006 (the big heat wave in the east)

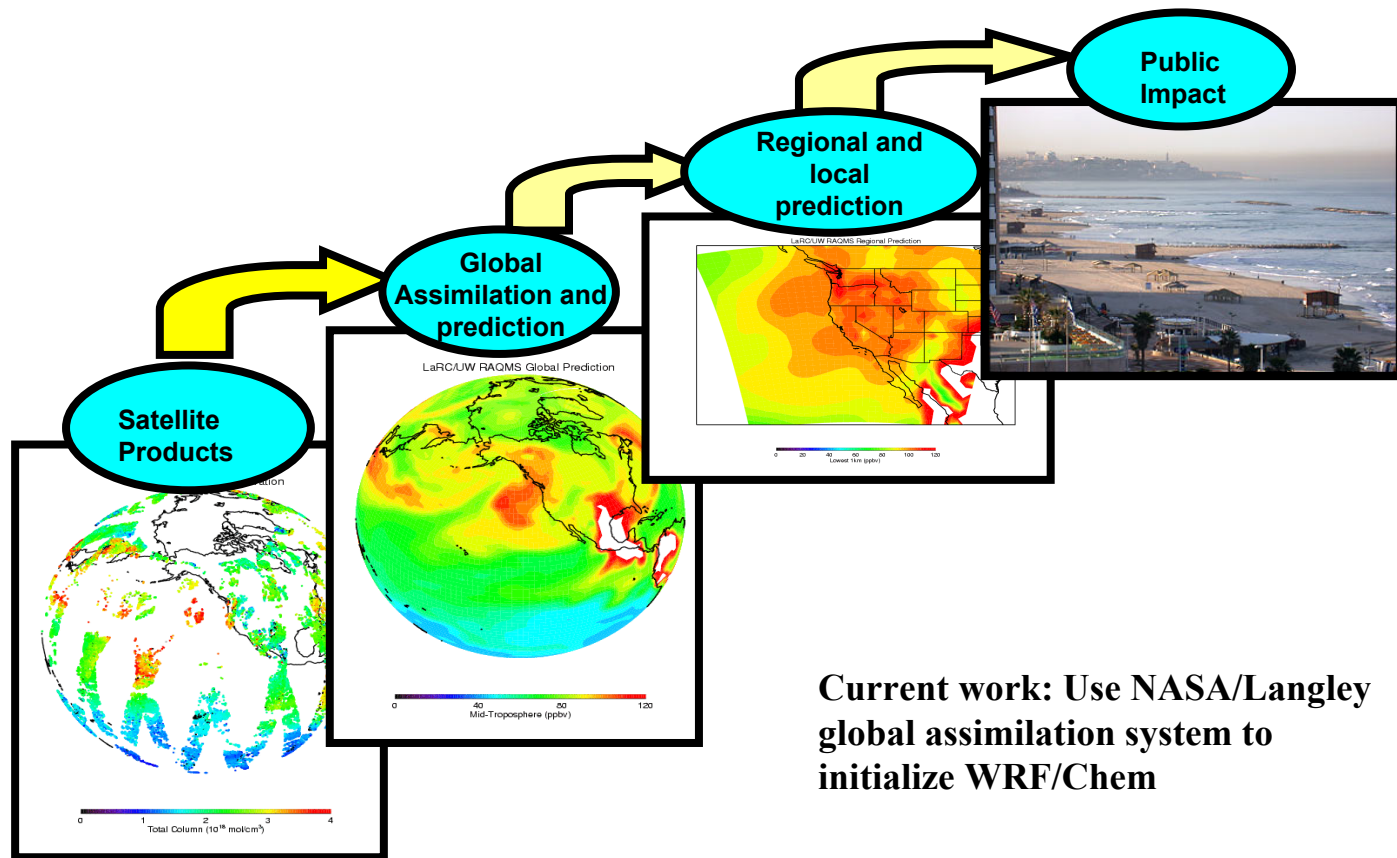Analyzed and observed by Environmental Protection Agency

Predicted by WRF/Chem

August 3, 2006

ESRL has successfully lead the development of a complex modeling system, used for state-of-the-art air quality and weather forecasting, and earth system research applications

Next step: from chemical data assimilation and global modeling to public impact

Satellite Products

Global Assimilation and prediction

LaRC/UW RAQMS Global Prediction

Regional and local prediction

LaRC/UW RAQMS Regional Prediction

Public Impact

Current work: Use NASA/Langley global assimilation system to initialize WRF/Chem

Modified after Pierce NASA/Langley