# Particulate Measurements & Predictions Into Public Health Decision Systems Using Satellites & Weather Models

William A. Sprigg

American Thoracic Society, May 24, 2006



Beijing, April 17, 2006



Lubbock, December 16, 2003

THE UNIVERSITY OF ARIZONA.

Arizona's First University.

Phoenix, AZ 2004          VF?


California Wildfire 2003


St Francis, KS 5/29/04


Asian Dust Over Pacific 2001

# Today's Outline

**Airborne particulate forecasts: an emerging tool in medical science and health services?**

- **Objective & Principles**
- **Case studies:**
  - Odessa & Lubbock, Texas
  - Phoenix, Arizona
- **How its done**
- **What next?**
- **Acknowledgements**

Public Health Applications in Remote Sensing

- **Objective:** an operational (dust) forecast system for human health decision support
- **Principles:**
  - Numerical models, for objectivity & multiple use
  - NWS models, for world-wide use & operational continuity
  - Satellite sensors, to cover the globe
  - High resolution, for greater accuracy
  - International, for an intercontinental problem
  - Public Health Advisors, for practical design

# Current Product Aims

- 72-48-24-12-6-hour Forecasts
  - Regional, city-wide, or 'at-your-zip-code'
  - Dust concentration at any height
  - 'Critical-concentration-level' arrival/departure time
  - Map, 3-D visualization, …
- Past dust event simulations
  - pinpoint dust sources & simulate areas/times affected

# A CASE STUDY
## DECEMBER 15-17, 2003, A FRONTAL SYSTEM SWEPT ACROSS NEW MEXICO, TEXAS AND NORTHERN MEXICO CREATING A SIGNIFICANT DUST STORM  for Odessa (O) and Lubbock (L)
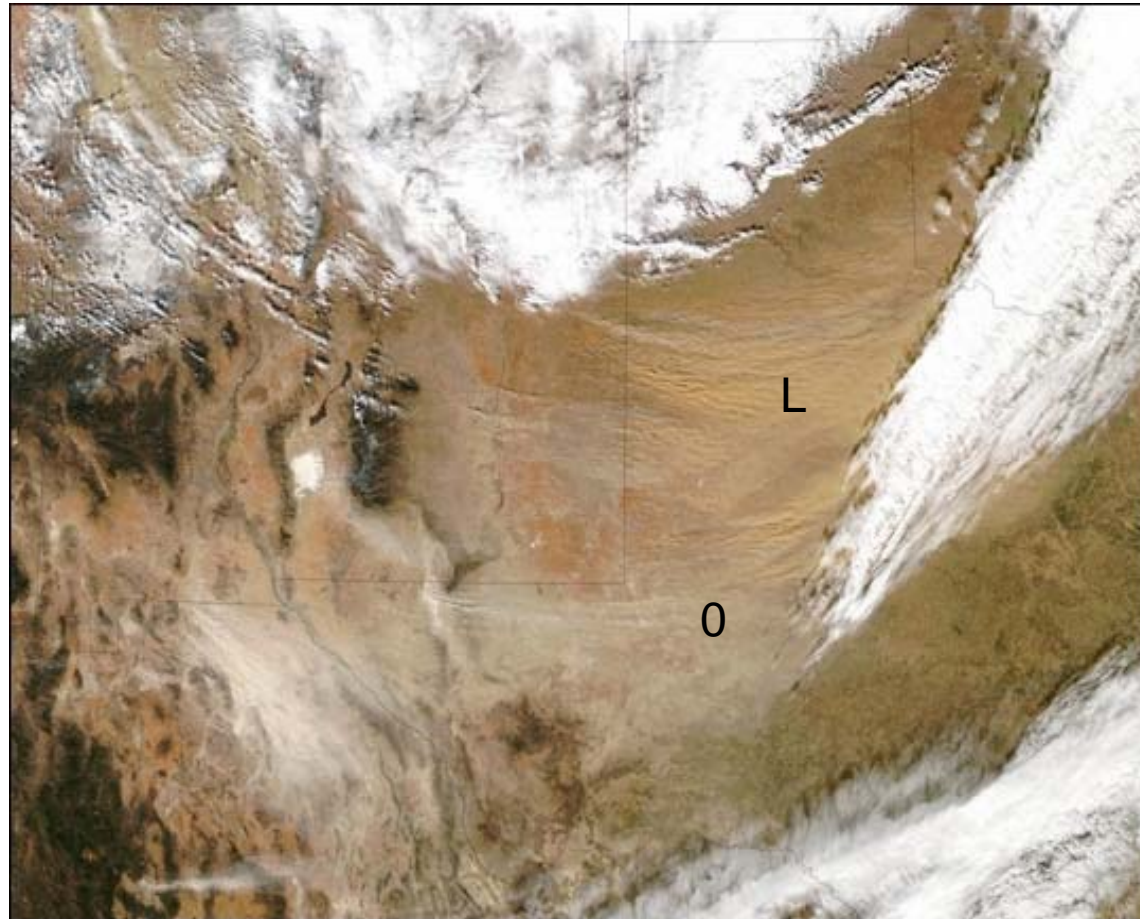


GOES 12 Vis/IR Composite, 12/15/03 @ 1426 CST

W.A.Sprigg to ATS,San Diego, 5/24/06

# PHAiRS Mapping Client Main Page

# Options



Zooming and Plot Options

Boundary and Time Options

Lat/Lon and Map Size
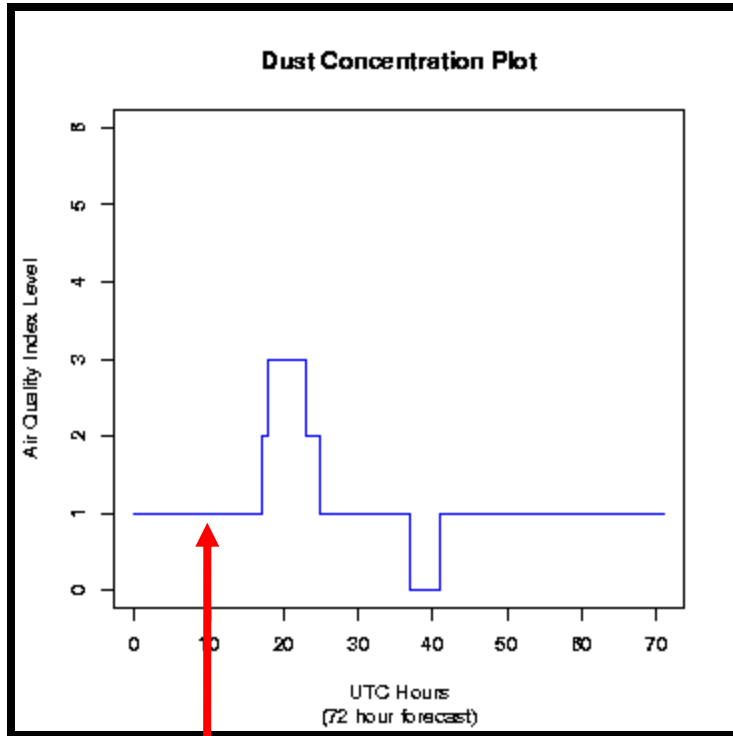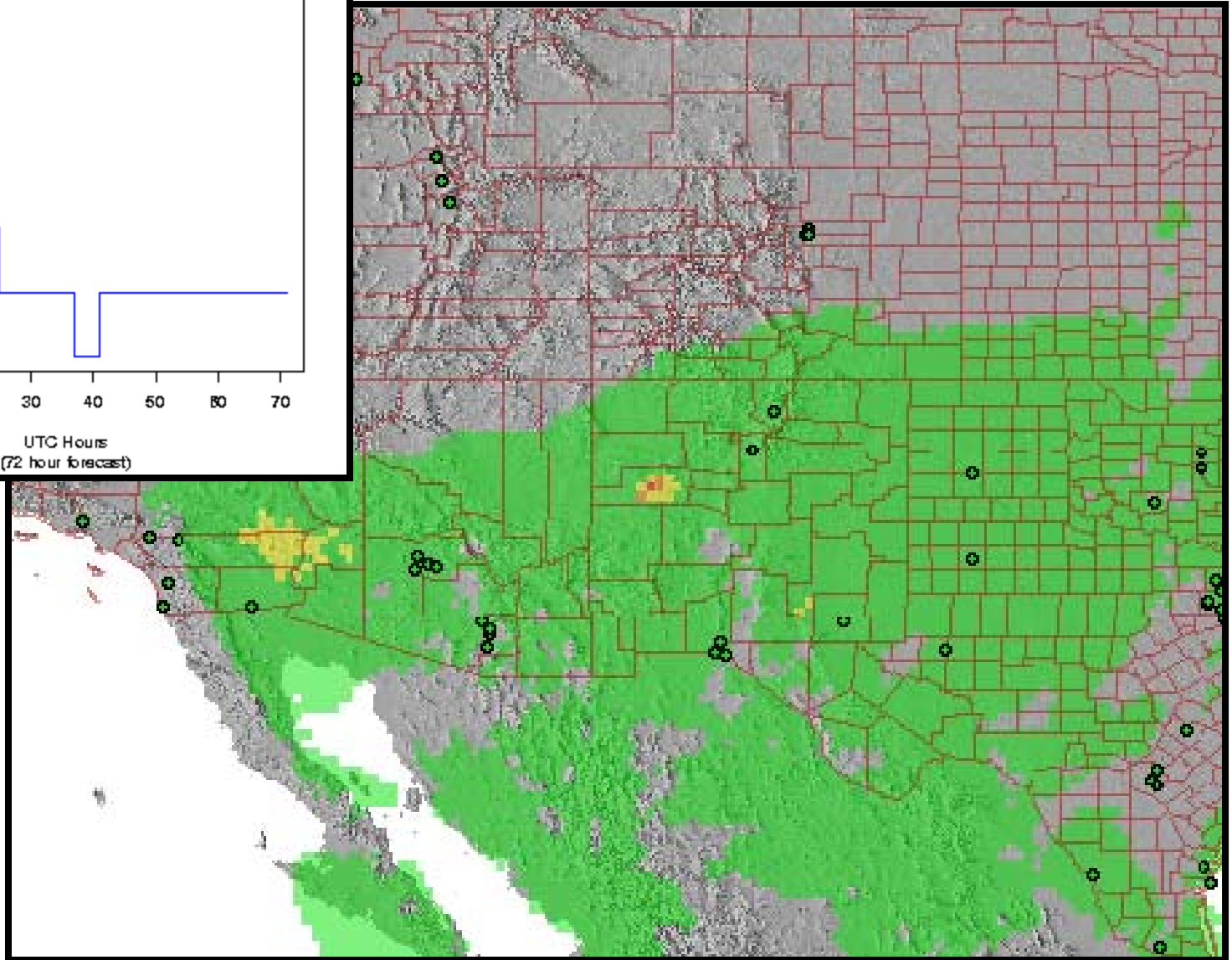
# Sample Web Output: 72-hr Forecast

# PM2.5 Lubbock, TX
## 12/15/03
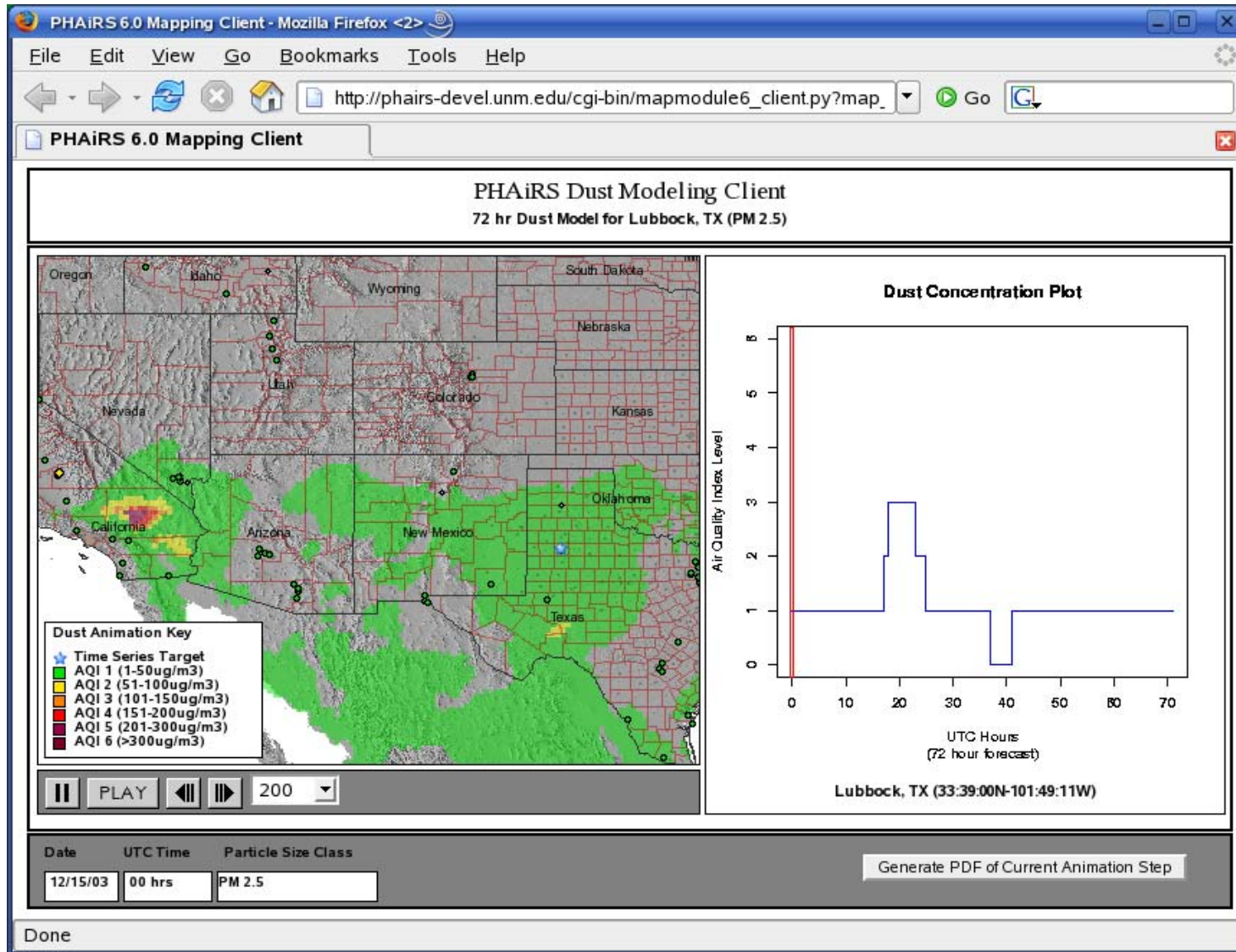


**Dust Concentration Plot**
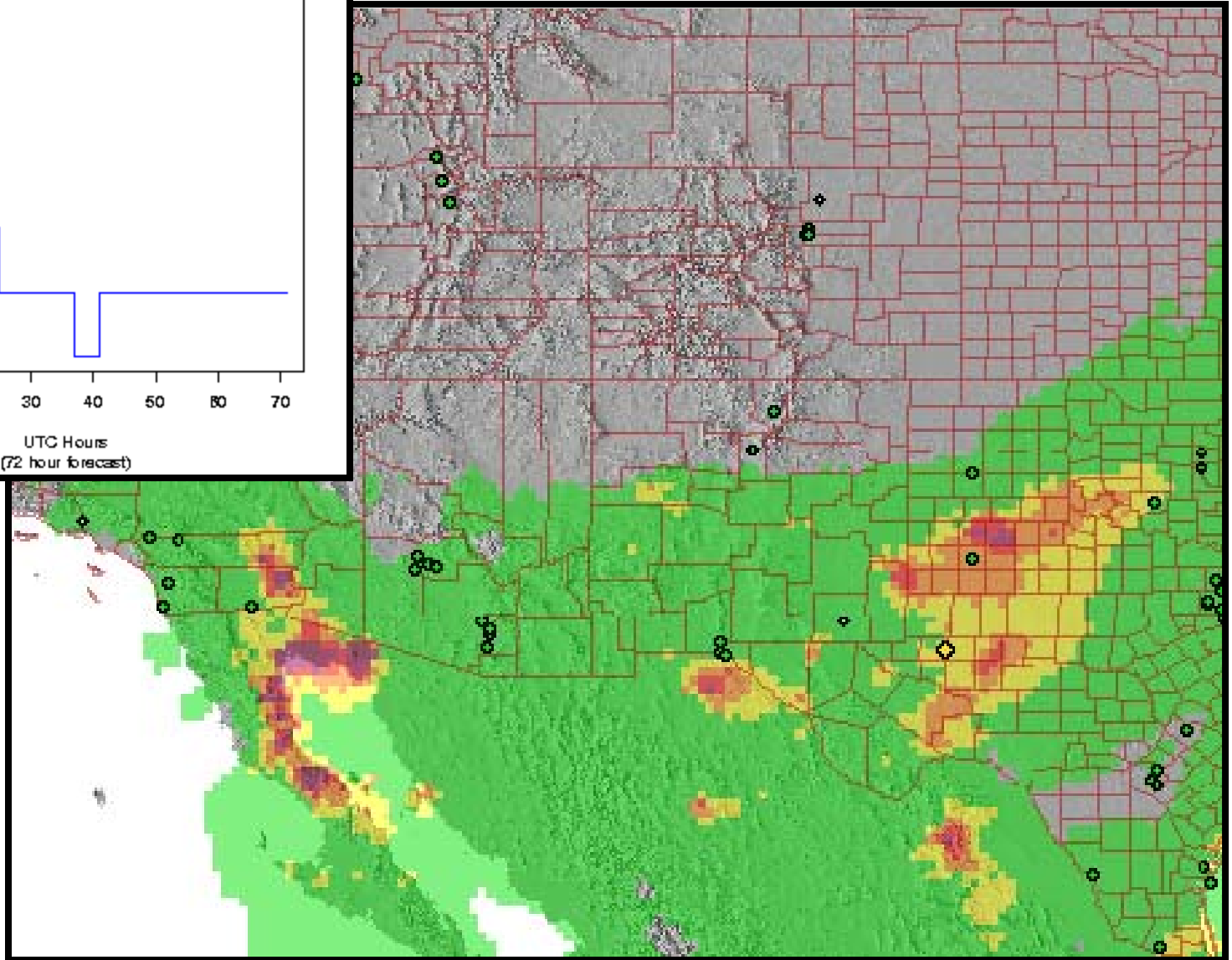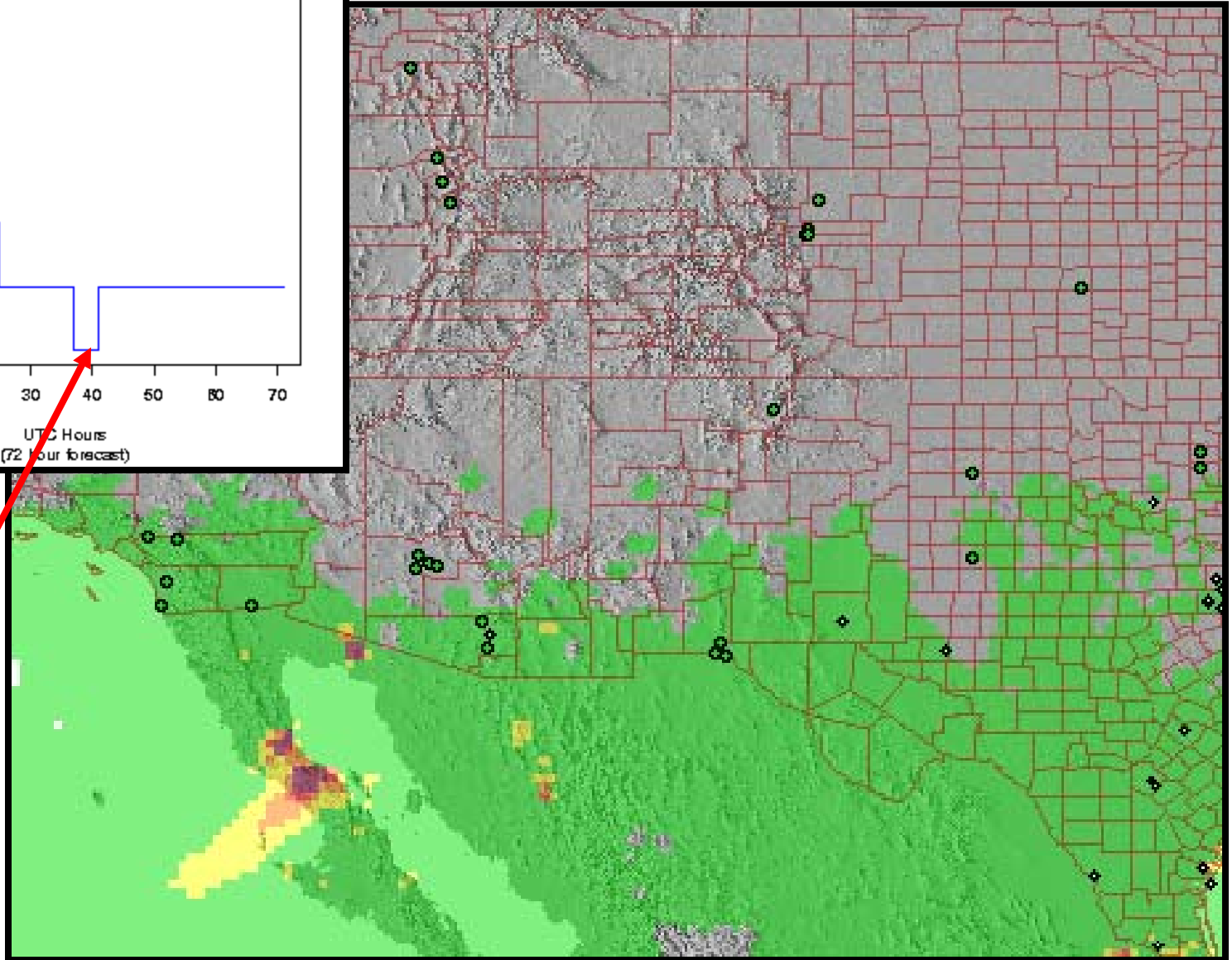
T = 10 hours

PM2.5 Lubbock, TX 12/15/03

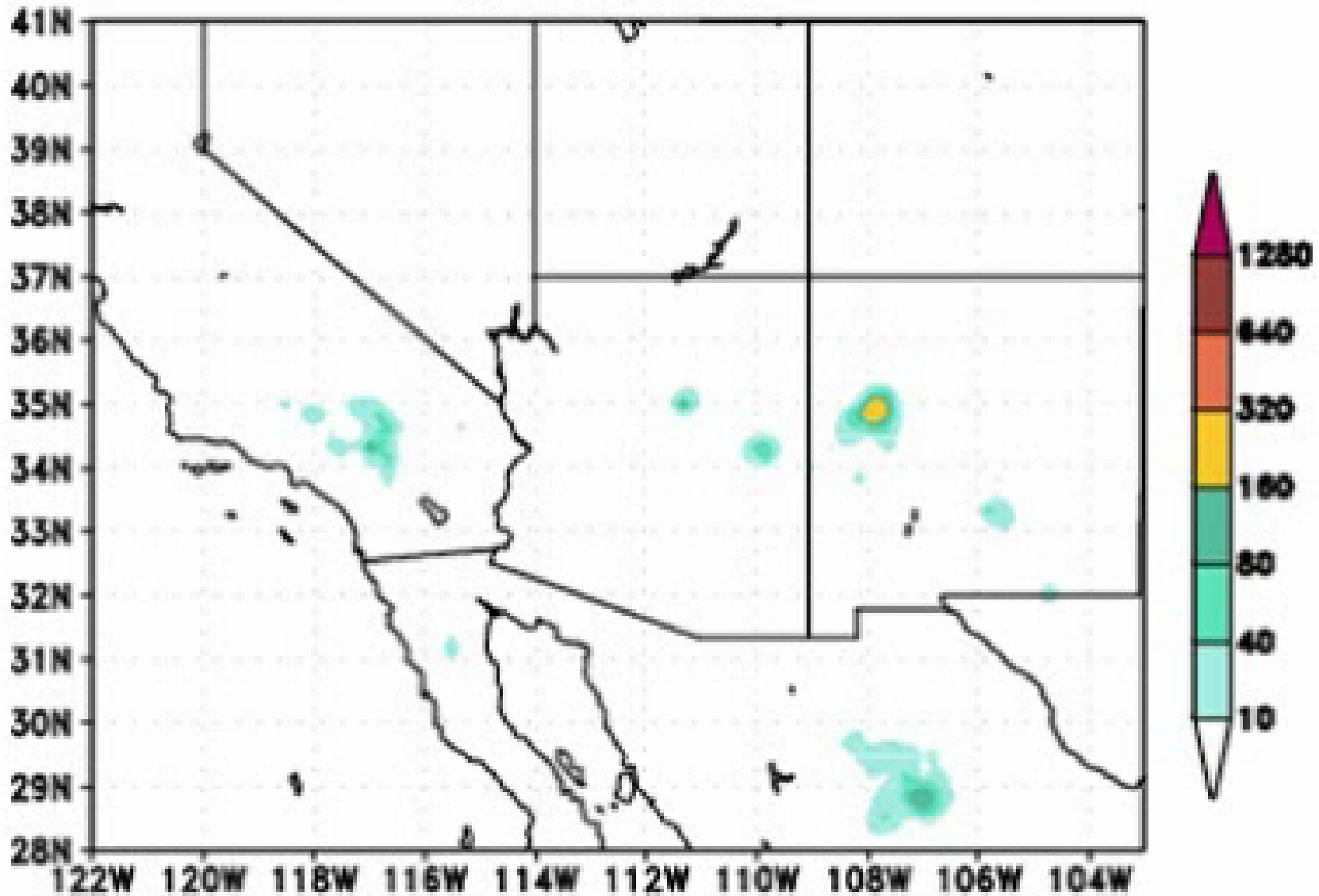Dust Concentration Plot

T = 20 hours

PM2.5 Lubbock, TX
12/15/03

# Case Study
# South of Phoenix
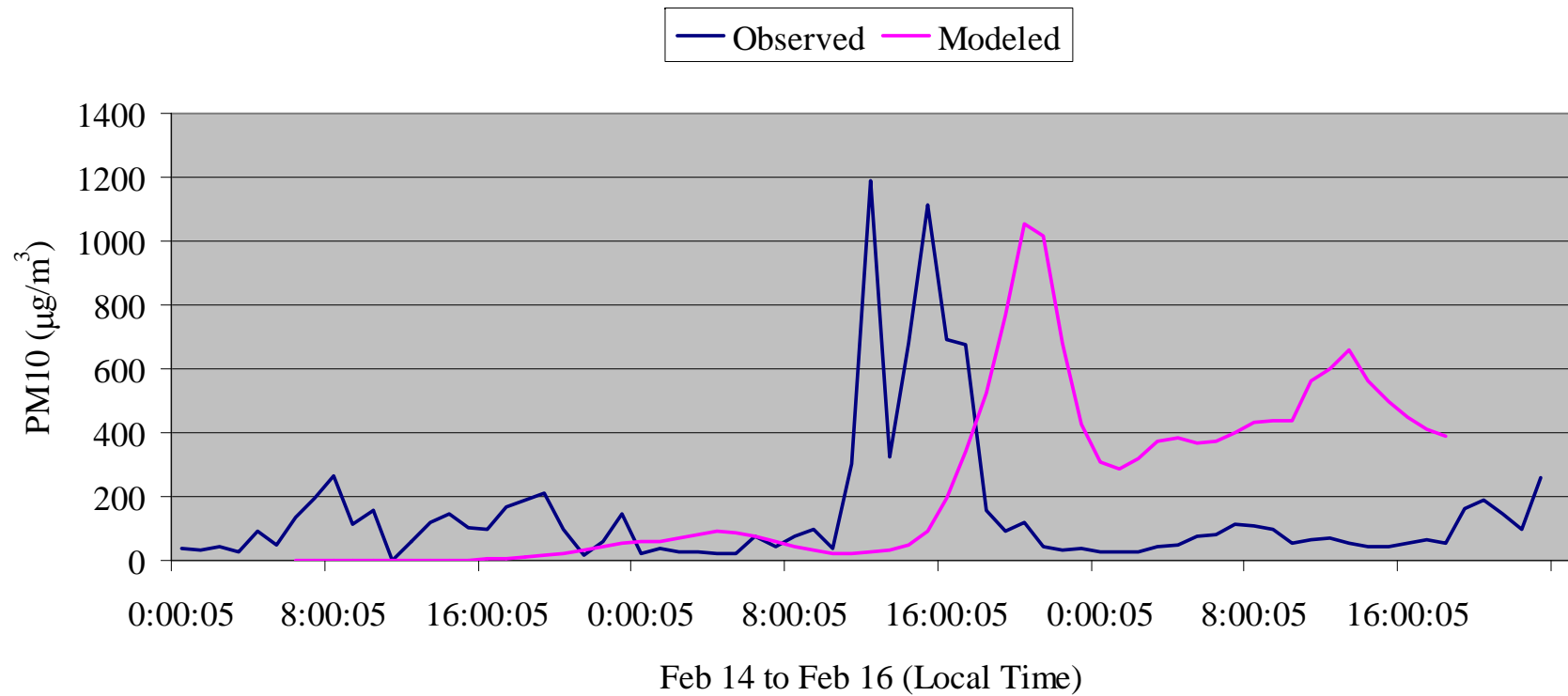




Interstate 8, AZ
2/15/06

Next: 72-hr PM10 concentration forecast…

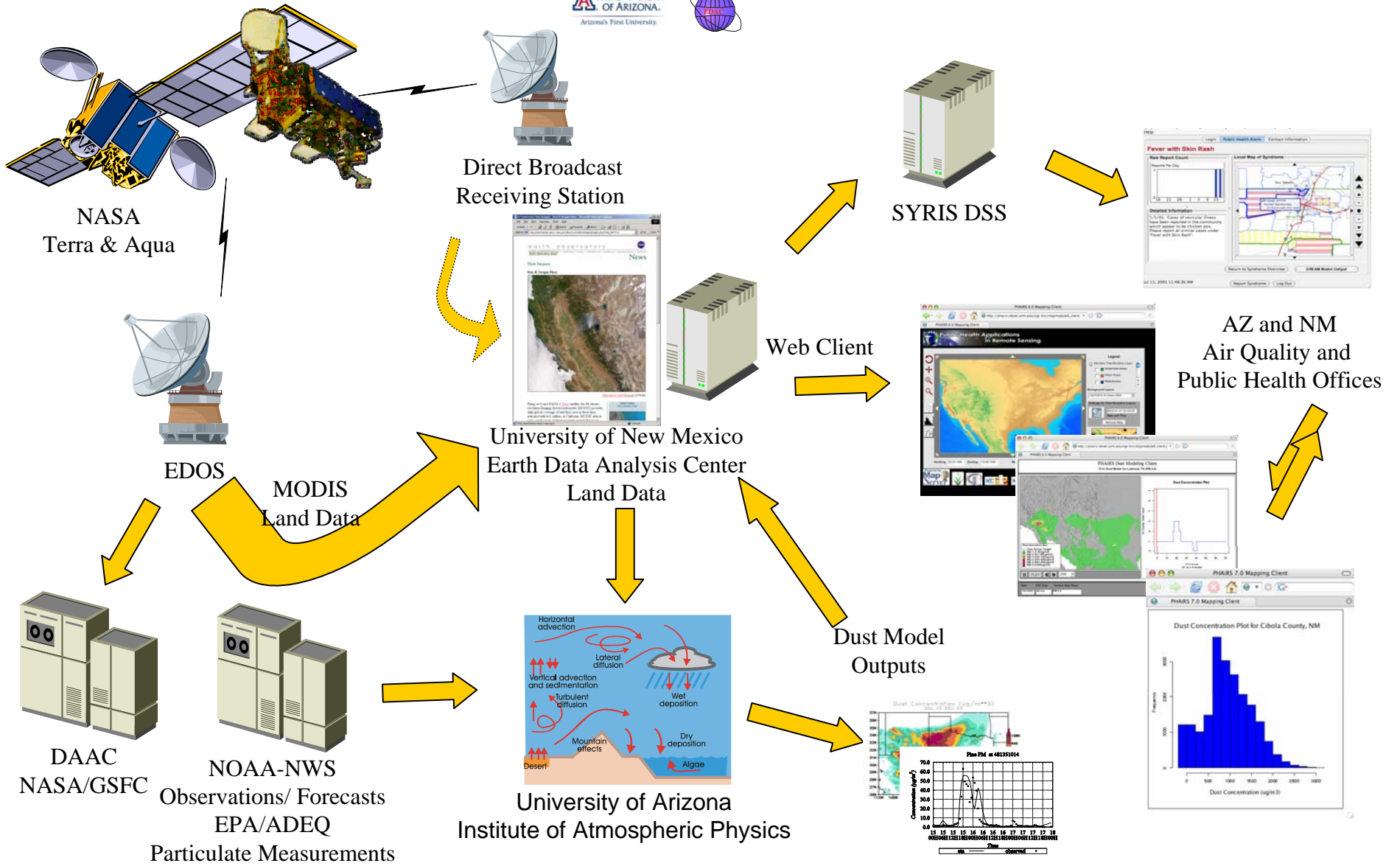PM 10 Dust Concentration (ug/m**3)
13z 15 FEB 06

PM10 at Stanfield (miles away from the accident scene), Arizona

**PHAIRS** Public Health Applications in Remote Sensing

THE UNIVERSITY OF ARIZONA. Arizona's First University.

NASA Terra & Aqua

Direct Broadcast Receiving Station

SYRIS DSS

Fever with Skin Rash

EDOS

MODIS Land Data

University of New Mexico Earth Data Analysis Center Land Data

Web Client
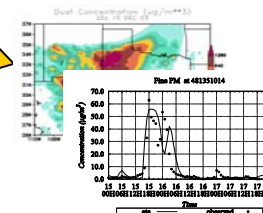
AZ and NM Air Quality and Public Health Offices

Dust Model Outputs

DAAC NASA/GSFC

NOAA-NWS Observations/ Forecasts EPA/ADEQ Particulate Measurements

Horizontal advection
Lateral diffusion
Vertical advection and sedimentation
Turbulent diffusion
Wet deposition
Mountain effects
Dry deposition
Desert
Algae

University of Arizona Institute of Atmospheric Physics

Dust Concentration Plot for Cibola County, NM
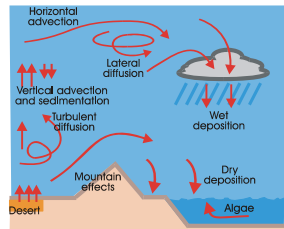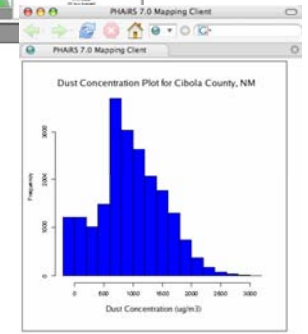
# Comparison of Modeled and Measured PM2.5 Concentrations at Odessa (1014), Texas, Dec. 15, 2003



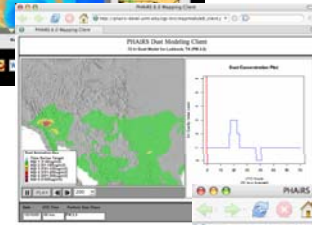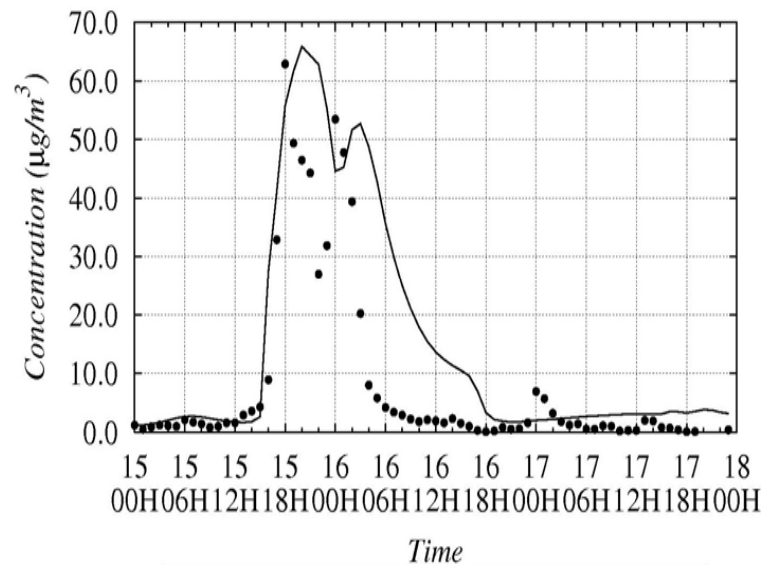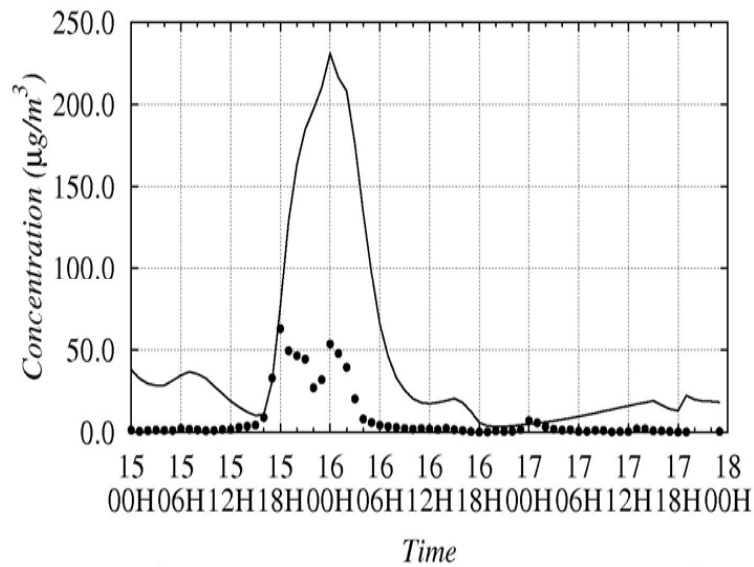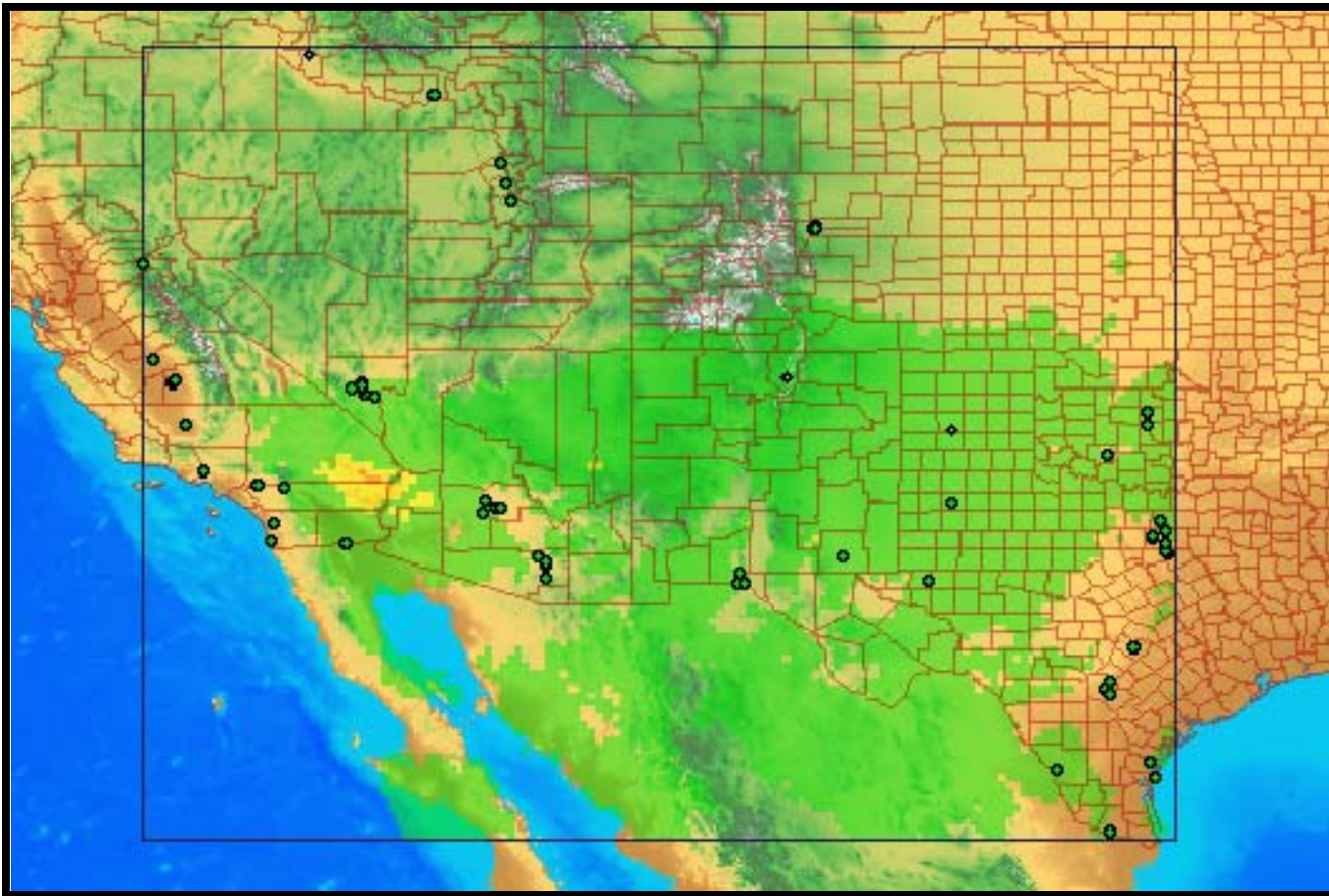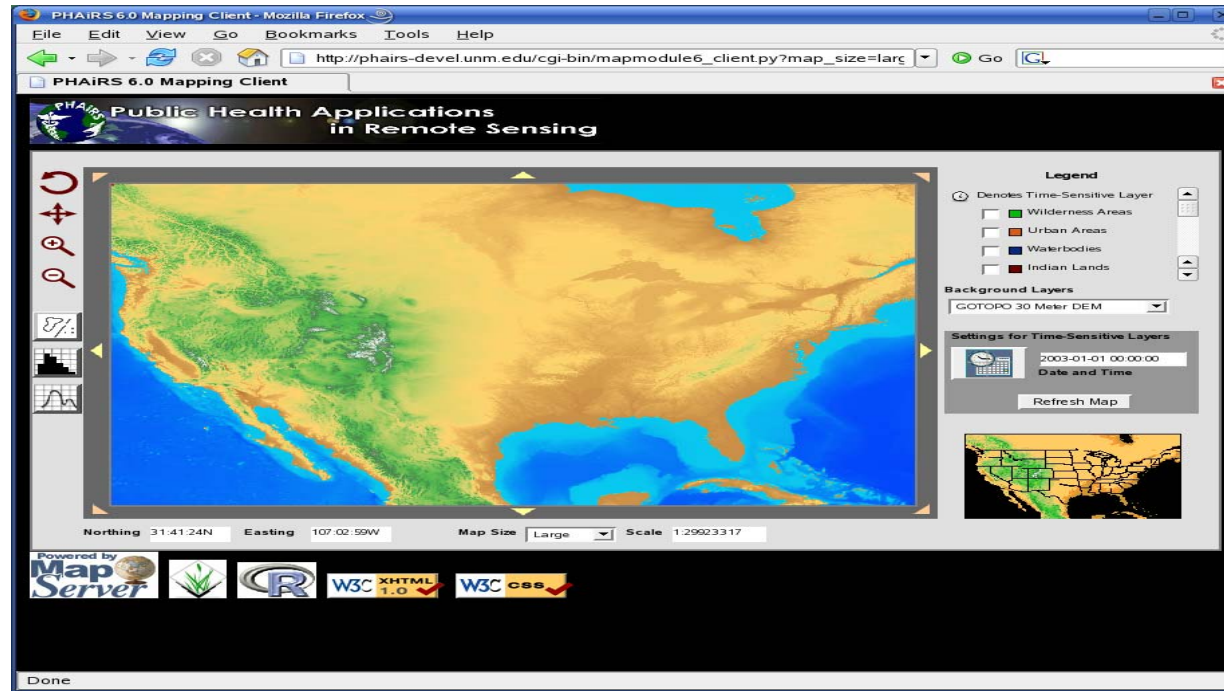Left panel without NASA land surface data; right panel with NASA land data (dots show measured values and lines show modeled values)

# What's Next?

## Model Simulations & Forecasts fill gaps of Particulate Monitoring Network

# http://phairs-devel.unm.edu/cgi-bin/mapmodule6_client.py



**Project Web Site**
**http://phairs.unm.edu**

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