

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

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American Thoracic Society, May 24, 2006



**Beijing, April 17, 2006**



Arizona's First University.



**Lubbock, December 16, 2003**



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**



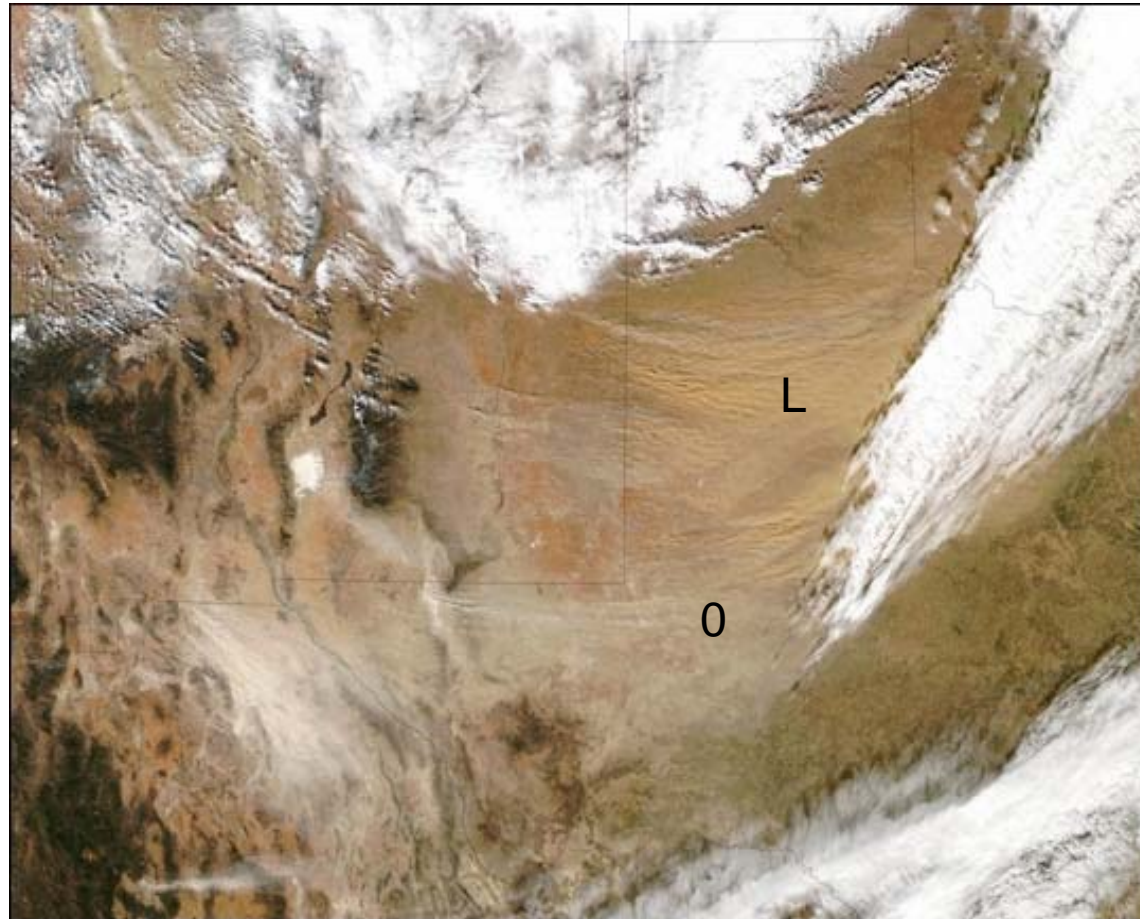
- **Objective:** an operational (dust) forecast system for human health decision support
- **Principles:**
  - Numerical models, for objectivity & multiple use
  - NWS models, for world-wide use & operational continuity
  - Satellite sensors, to cover the globe
  - High resolution, for greater accuracy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

The screenshot shows the PHAIRS 6.0 Mapping Client interface in Mozilla Firefox. The browser window title is "PHAIRS 6.0 Mapping Client - Mozilla Firefox". The address bar shows the URL: `http://phairs-devel.unm.edu/cgi-bin/mapmodule6_client.py?map_size=large`. The page header reads "Public Health Applications in Remote Sensing".

The main content area features a map of the United States with a color-coded topographic overlay. To the left of the map is a vertical toolbar with icons for home, pan, zoom in, zoom out, and other navigation functions. To the right is a control panel with the following sections:

- Legend:** Includes a "Denotes Time-Sensitive Layer" icon and checkboxes for Wilderness Areas, Urban Areas, Waterbodies, and Indian Lands.
- Background Layers:** A dropdown menu currently set to "GOTOPO 30 Meter DEM".
- Settings for Time-Sensitive Layers:** Includes a clock icon, a date and time input field set to "2003-01-01 00:00:00", and a "Refresh Map" button.
- Inset Map:** A small thumbnail map of the United States showing state boundaries.

Below the map, the coordinates are displayed as "Northing 31:41:24N" and "Easting 107:02:59W". The "Map Size" is set to "Large" and the "Scale" is "1:29923317".

At the bottom of the page, there are logos for "Powered by Map Server", "W3C XHTML 1.0", and "W3C CSS". The status bar at the very bottom of the browser window displays the word "Done".

# Options

Zooming and  
Plot Options

Boundary and  
Time Options

Lat/Lon and  
Map Size

PHAIRS 6.0 Mapping Client - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://phairs-devel.unm.edu/cgi-bin/mapmodule6\_client.py?map\_size=large

PHAIRS 6.0 Mapping Client

Public Health Applications  
in Remote Sensing

Legend

- Denotes Time-Sensitive Layer
- Wilderness Areas
- Urban Areas
- Waterbodies
- Indian Lands

Background Layers

GOTOPO 30 Meter DEM

Settings for Time-Sensitive Layers

2003-01-01 00:00:00  
Date and Time

Refresh Map

Northing 33.37.48N Easting 120.23.24W Map Size Large Scale 1:14961658

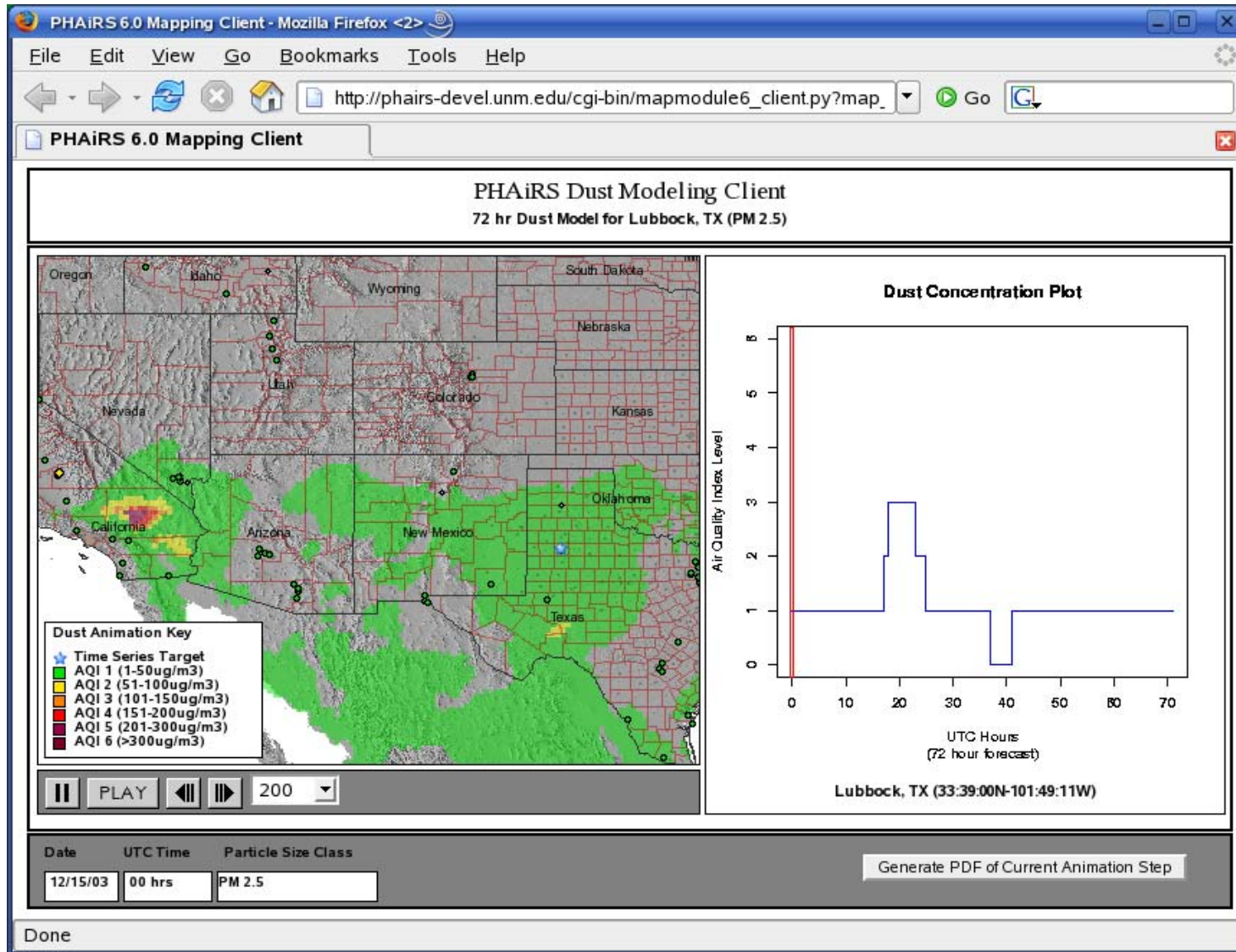
PowerMap Server

W3C CSS

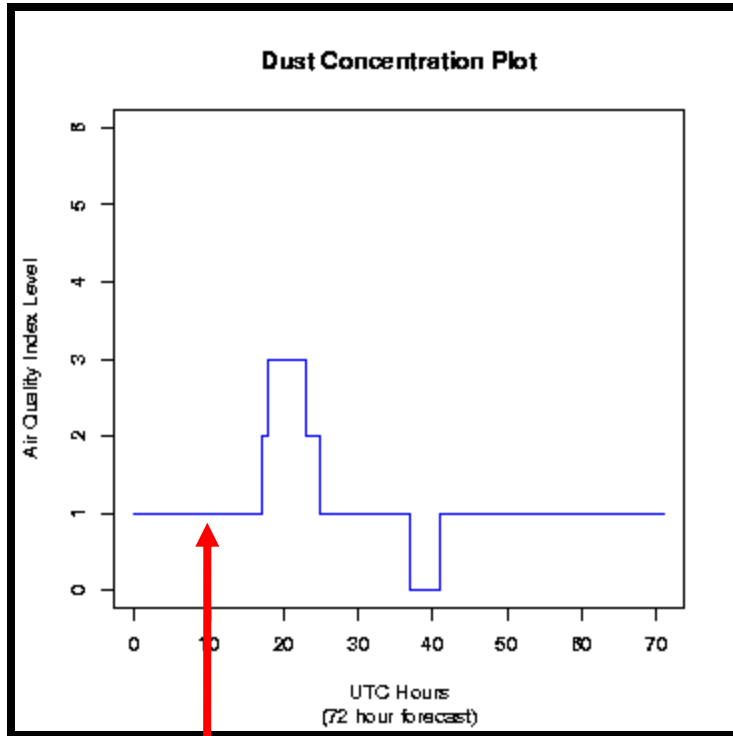
Done



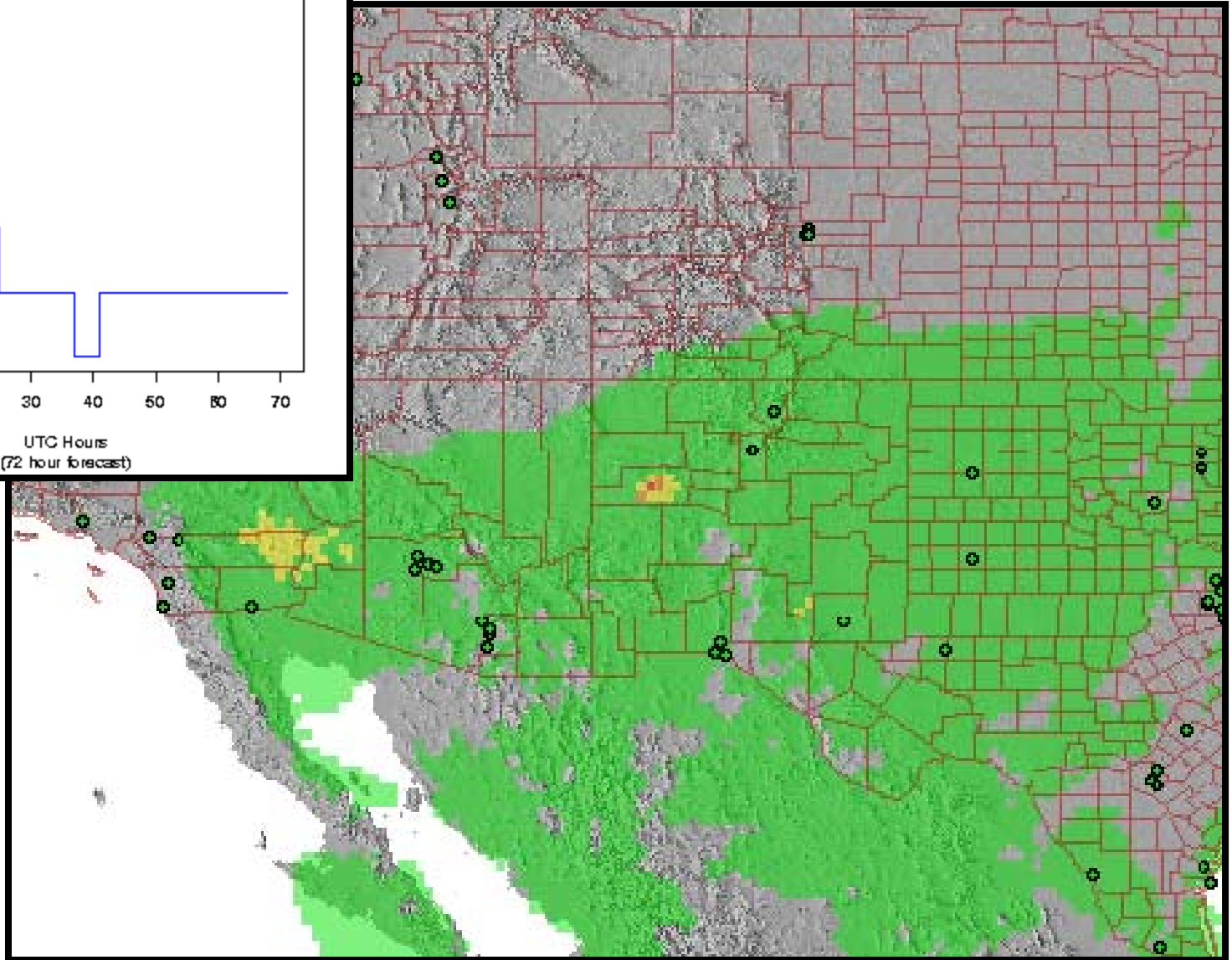
# Sample Web Output: 72-hr Forecast



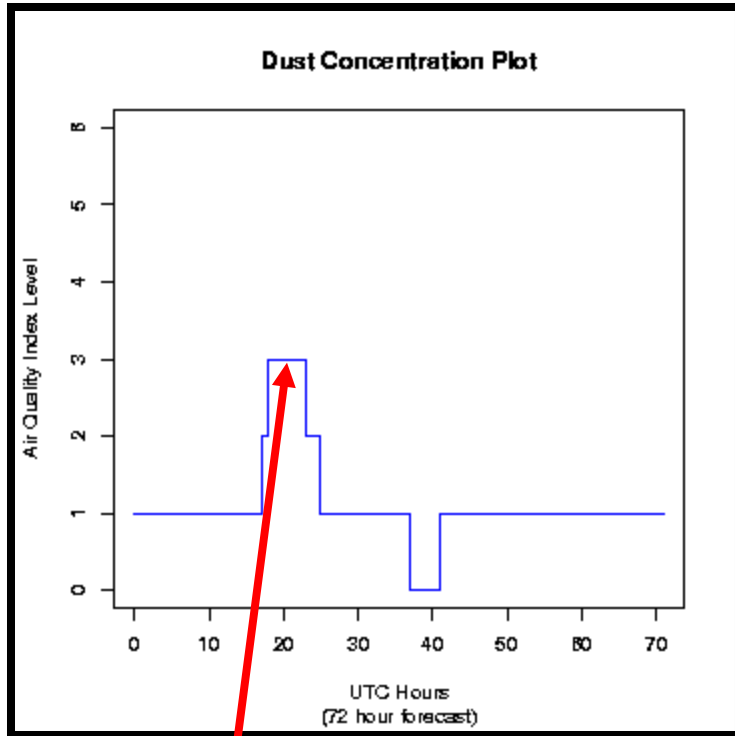
# PM2.5 Lubbock, TX 12/15/03



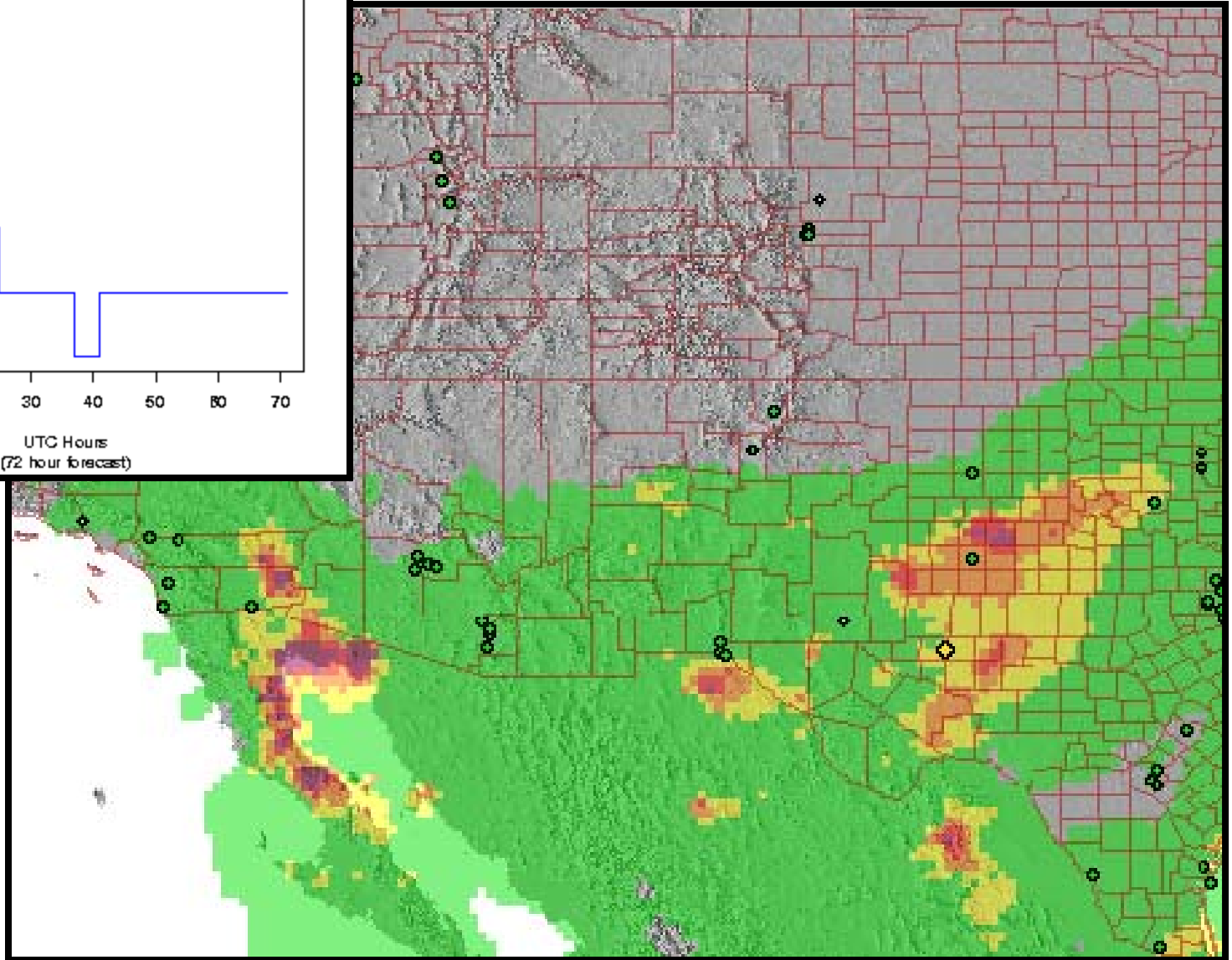
**T = 10 hours**



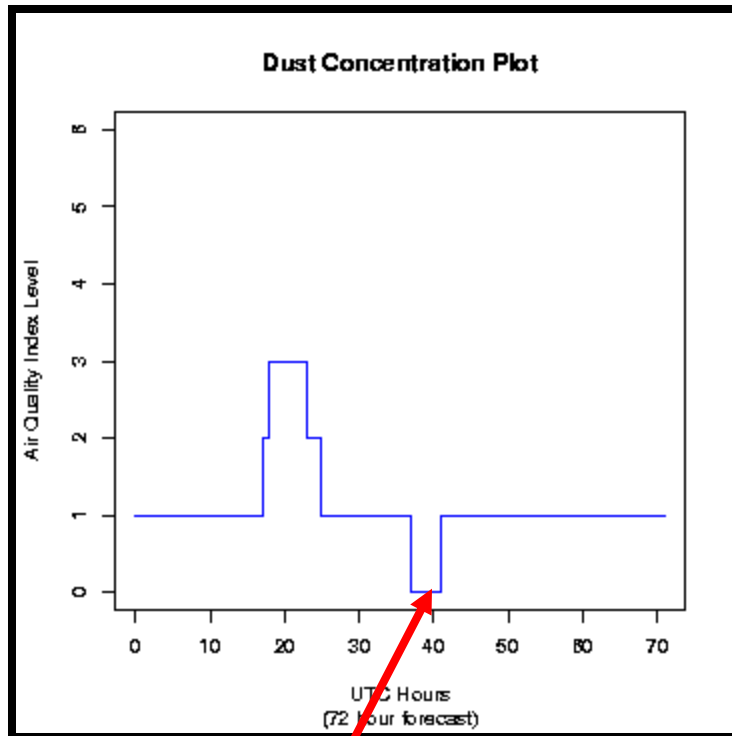
# PM2.5 Lubbock, TX 12/15/03



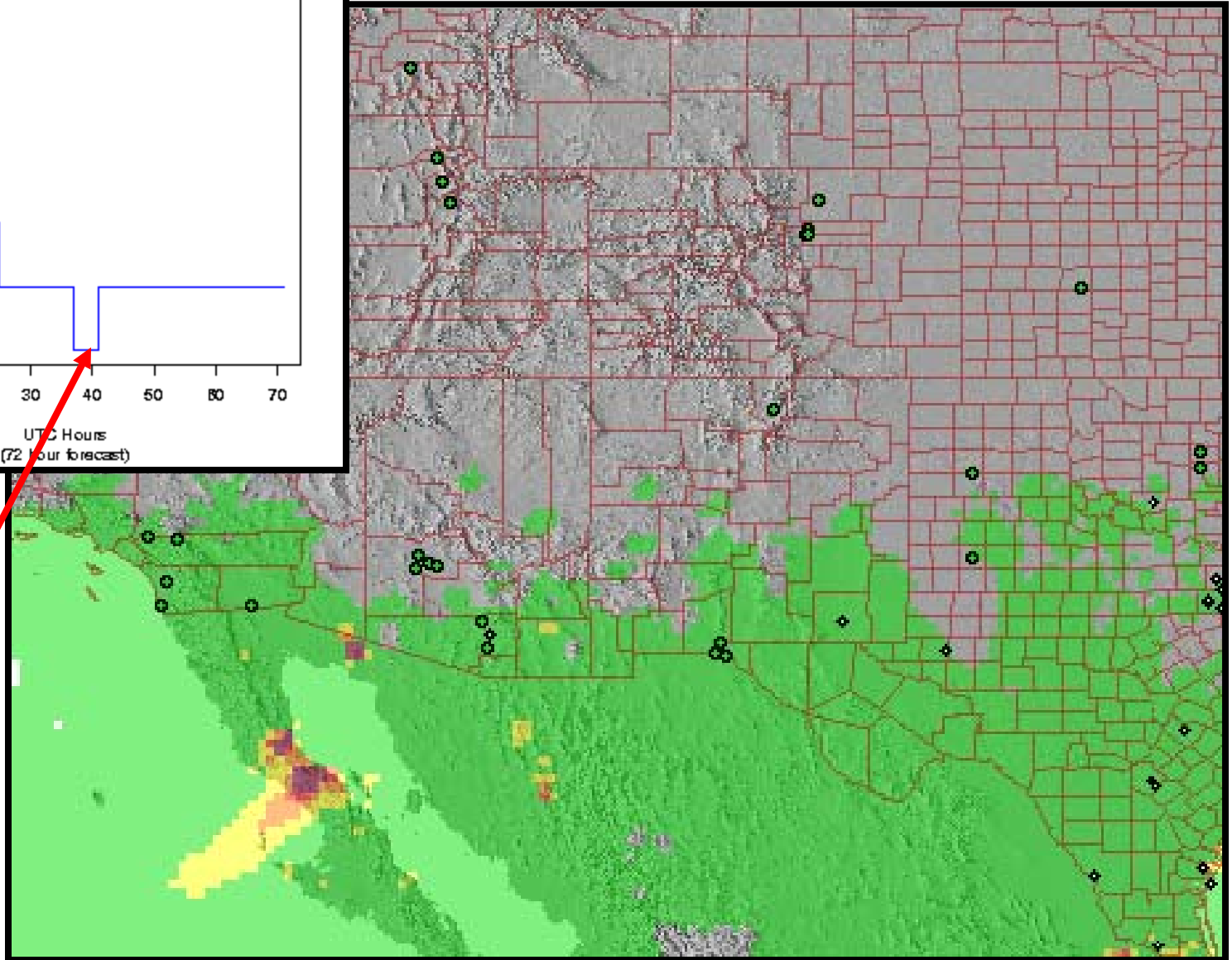
**T = 20 hours**



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



**T = 40 hours**



# Case Study

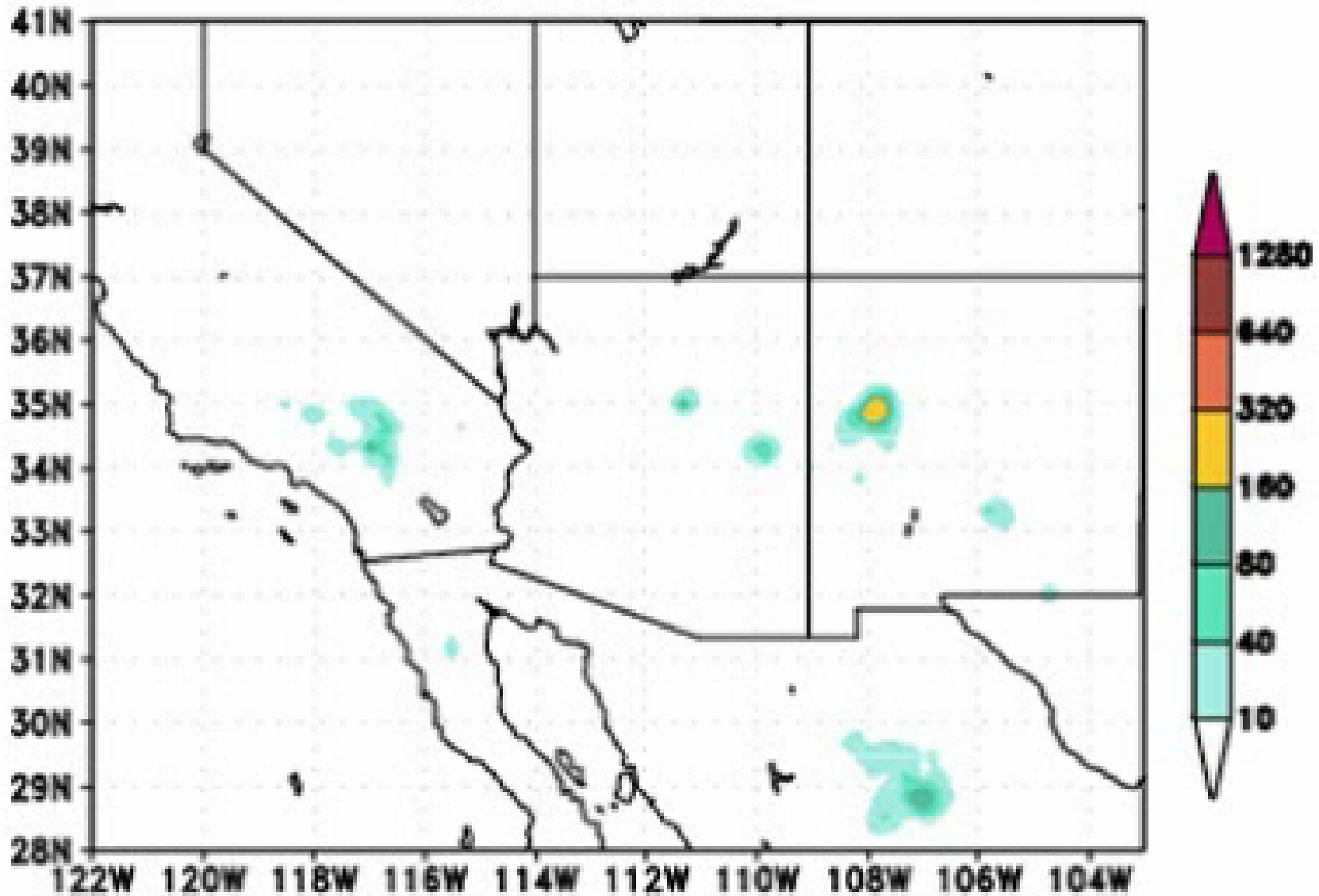
## South of Phoenix

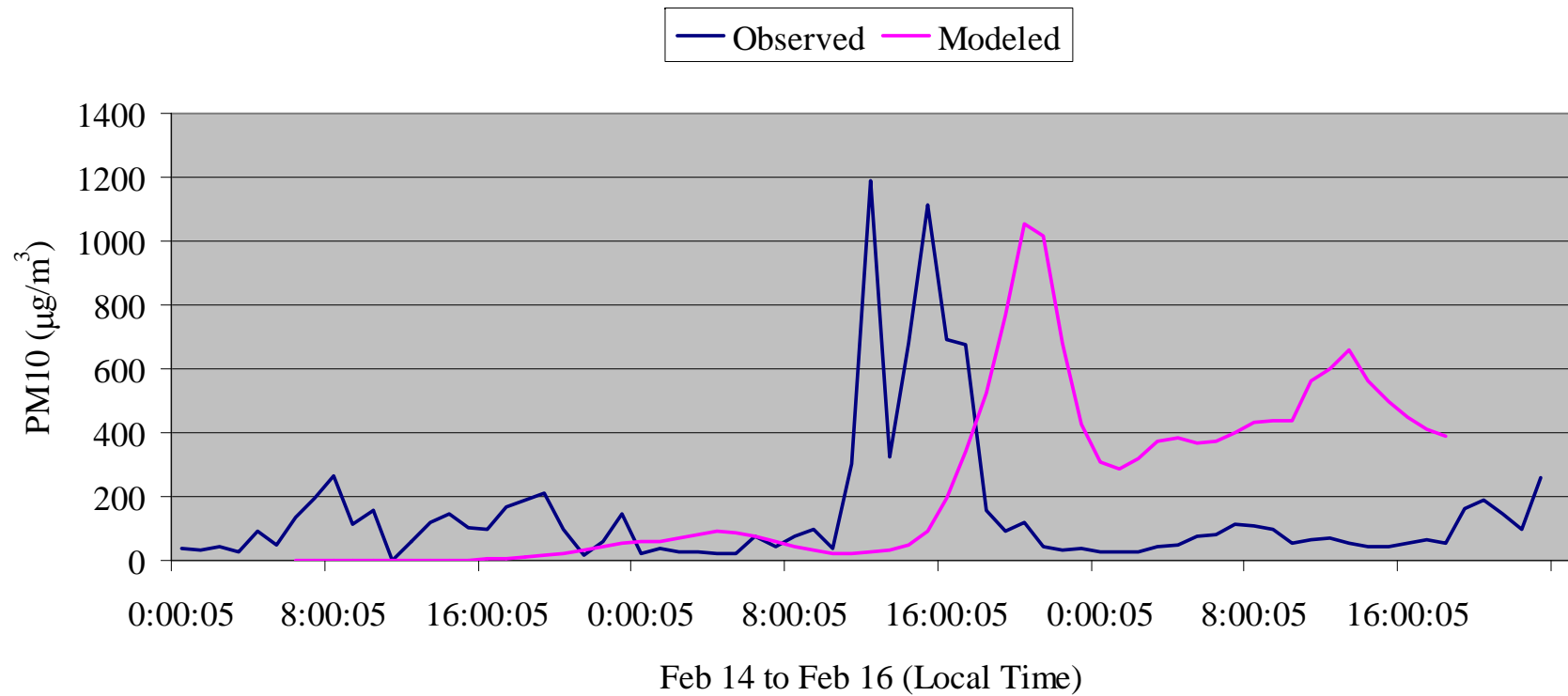


Interstate 8, AZ  
2/15/06

Next: 72-hr PM10 concentration forecast...

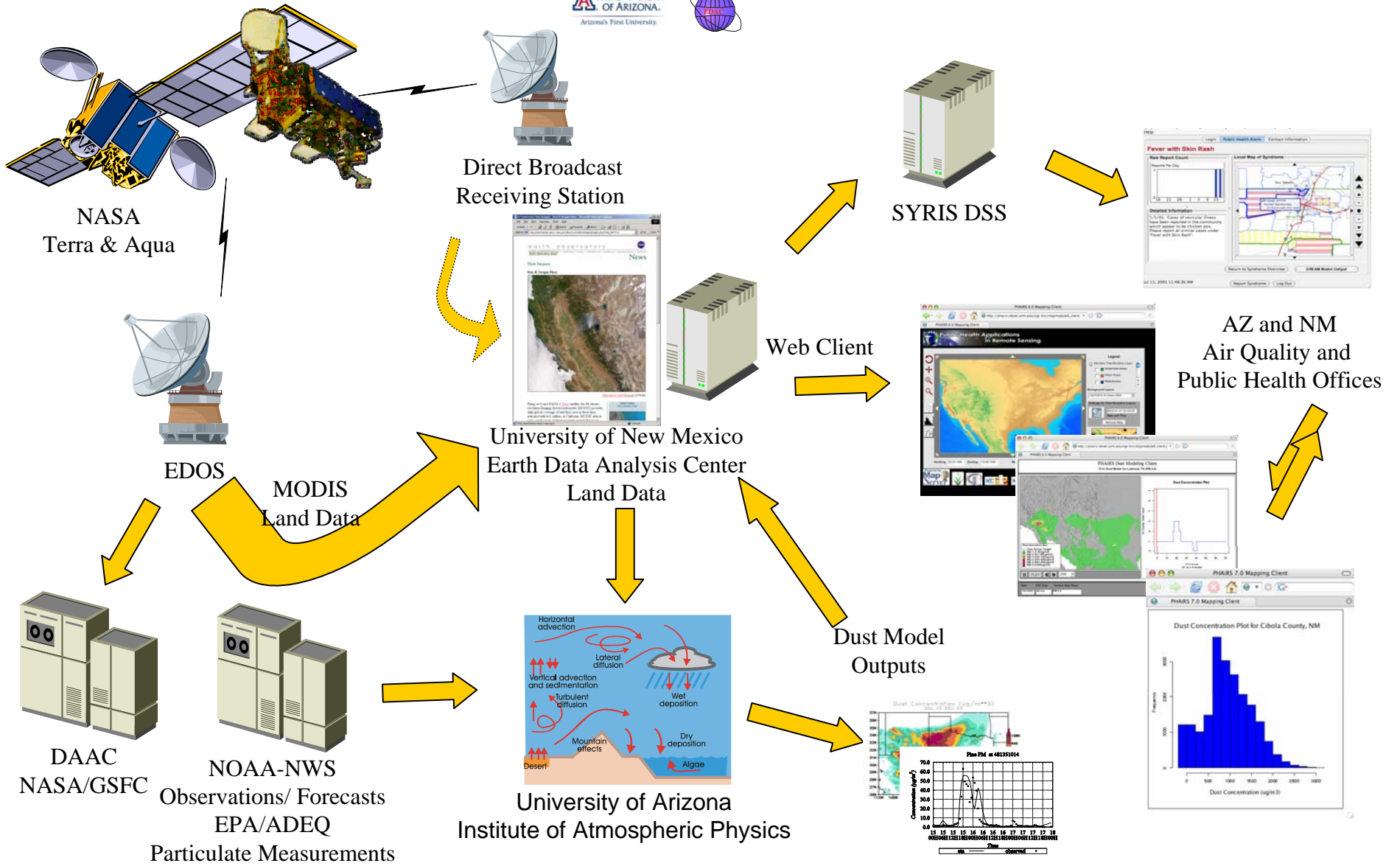
PM 10 Dust Concentration ( $\mu\text{g}/\text{m}^3$ )  
13z 15 FEB 06





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

# PHAIRS Public Health Applications in Remote Sensing



Direct Broadcast Receiving Station

SYRIS DSS

Web Client

University of New Mexico Earth Data Analysis Center Land Data

Dust Model Outputs

University of Arizona Institute of Atmospheric Physics

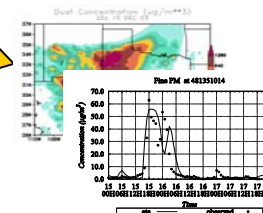
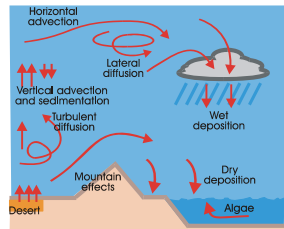
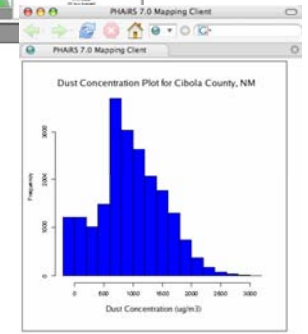
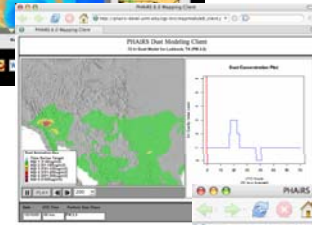
AZ and NM Air Quality and Public Health Offices

NASA Terra & Aqua

MODIS Land Data

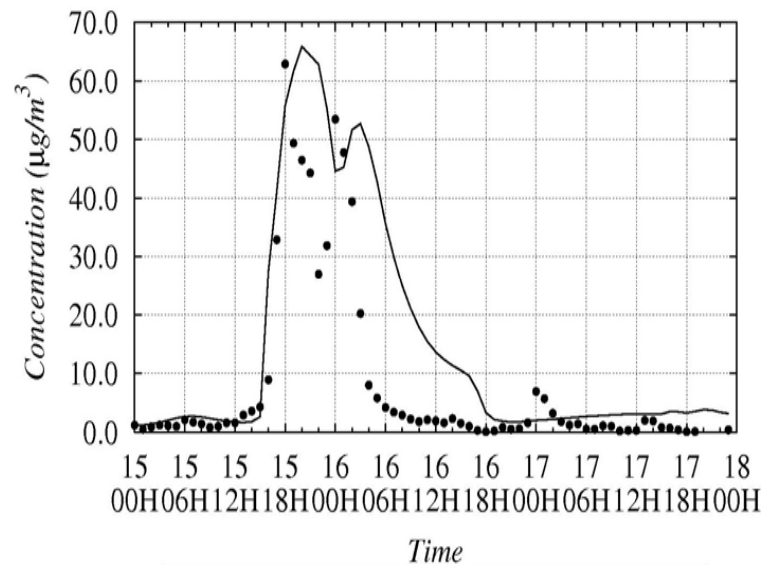
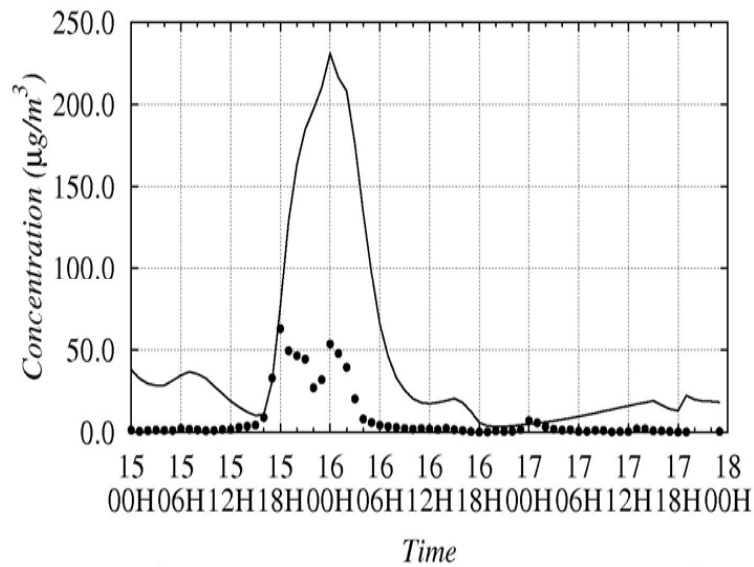
DAAC NASA/GSFC

NOAA-NWS Observations/Forecasts EPA/ADEQ Particulate Measurements





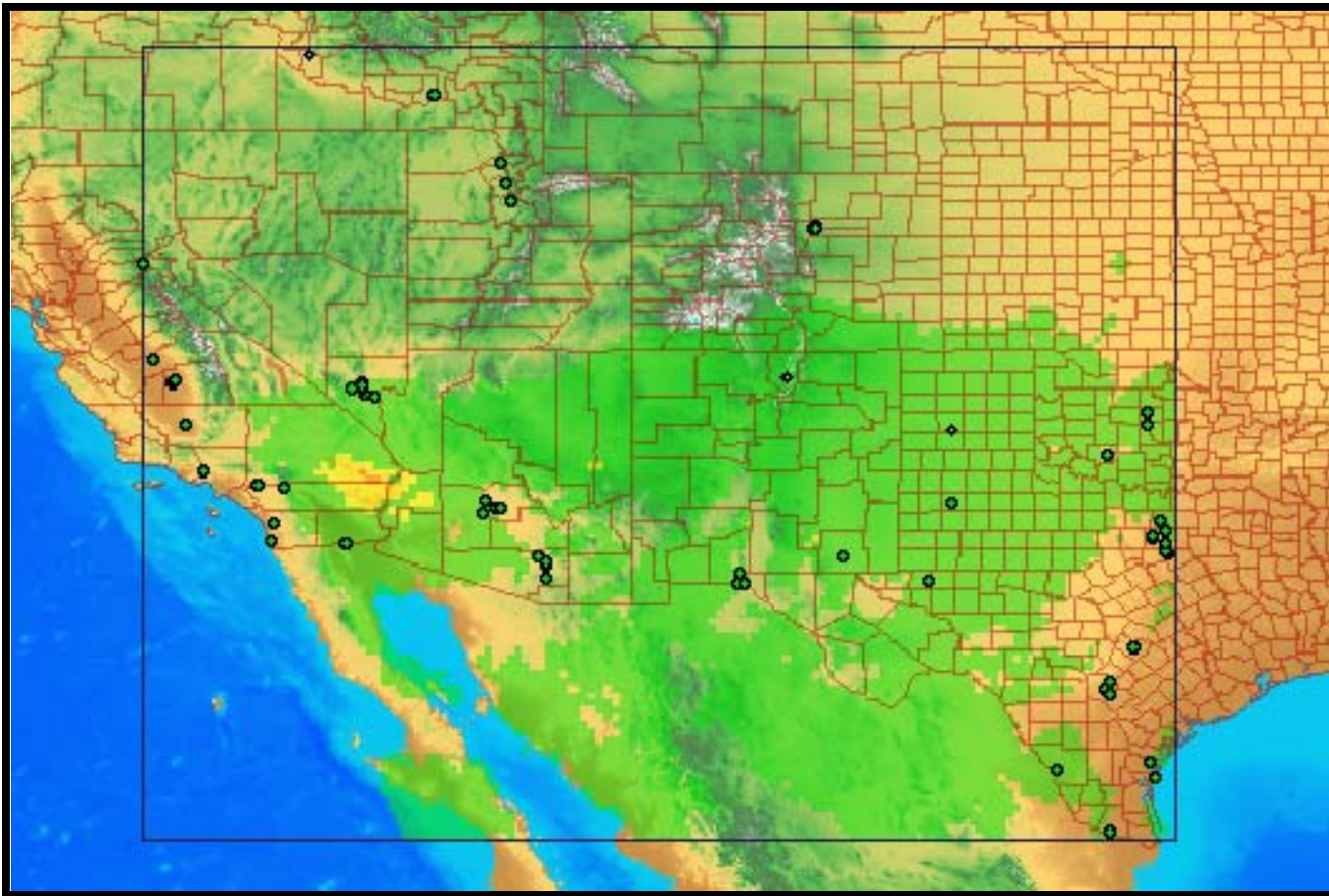
# Comparison of Modeled and Measured PM2.5 Concentrations at Odessa (1014), Texas, Dec. 15, 2003



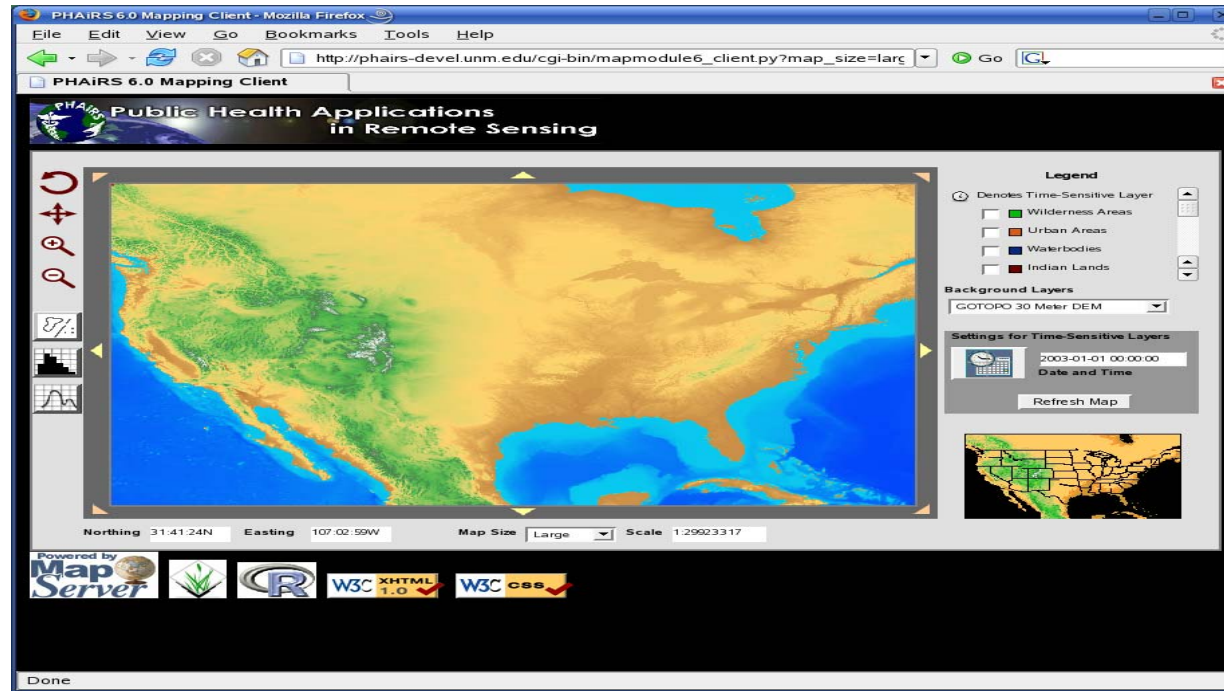
Left panel without NASA land surface data; right panel with NASA land data (dots show measured values and lines show modeled values)

## What's Next?

Model Simulations & Forecasts fill gaps of Particulate Monitoring Network



[http://phairs-devel.unm.edu/cgi-bin/mapmodule6\\_client.py](http://phairs-devel.unm.edu/cgi-bin/mapmodule6_client.py)



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

# Acknowledgements

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