

# Predicting Particle Pollution

William A. Sprigg

Pima Co. Environmental Quality Advisory Council

May 17, 2006

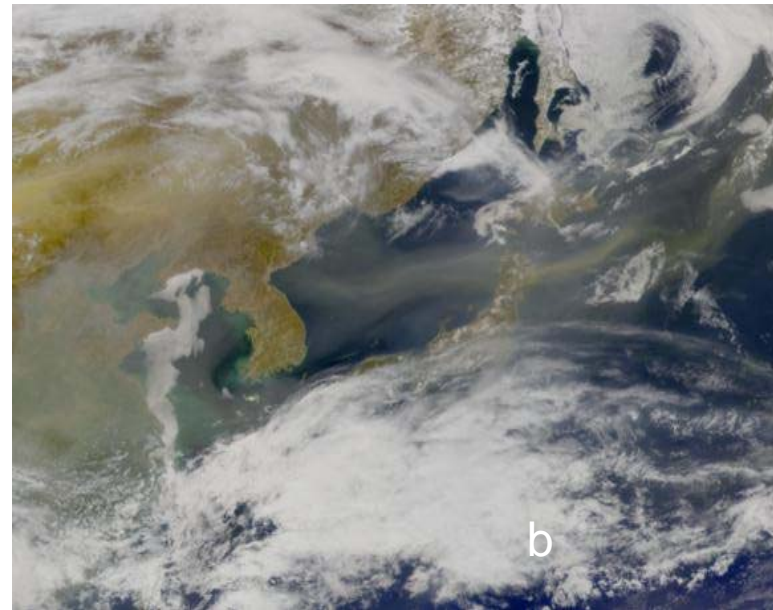
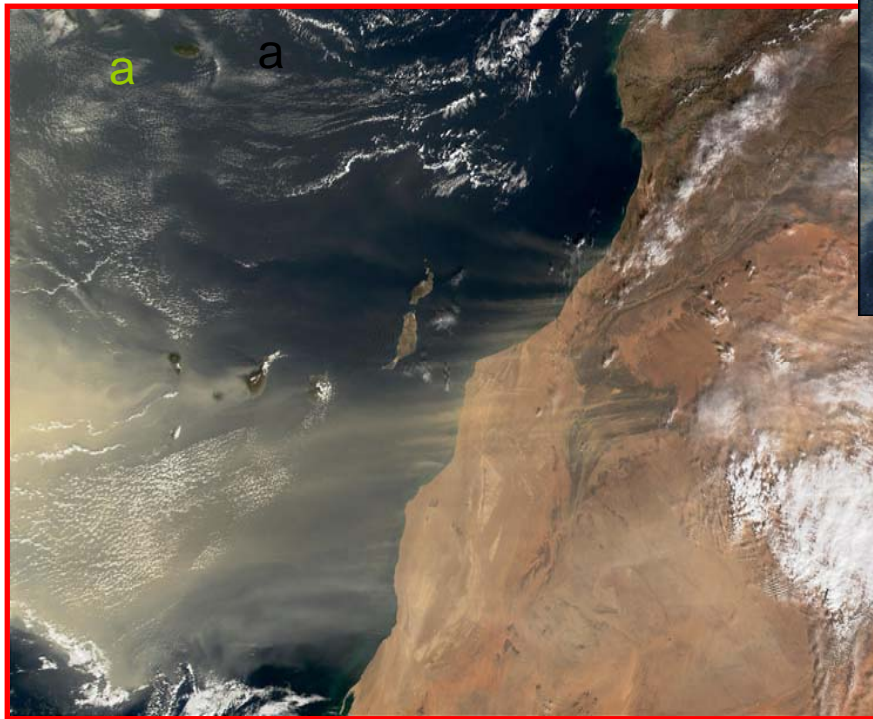


Beijing, April 17, 2006



Lubbock, December 16, 2003

Counterclockwise from left: (a) Saharan Dust Over the Atlantic Ocean;  
(b) Asian Dust Over the Pacific 2001; (c) California Wildfire 2003



Interstate 8, AZ  
2/15/06



St Francis KS  
5/29/04



Phoenix AZ  
2004

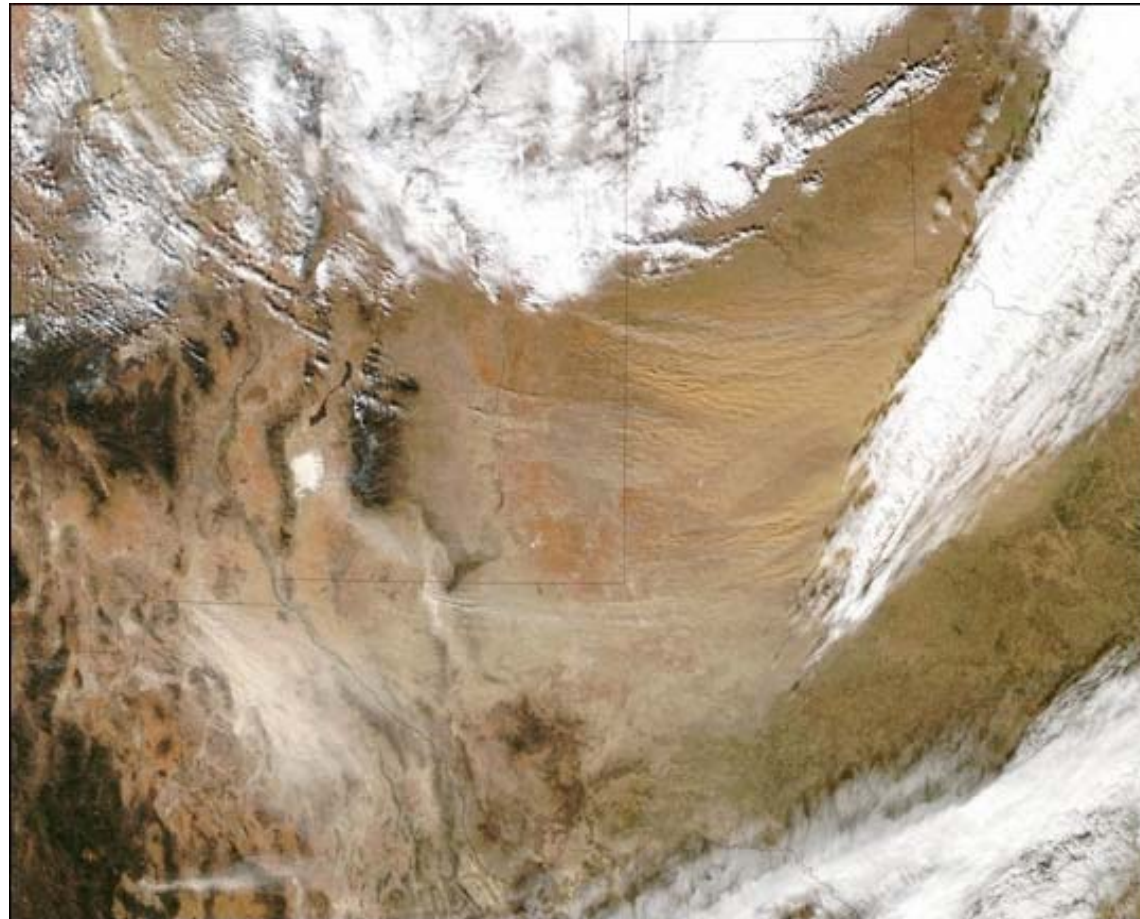




# Objectives and Principles

- 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

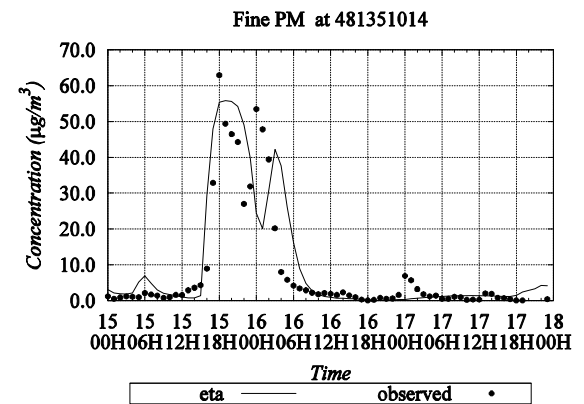
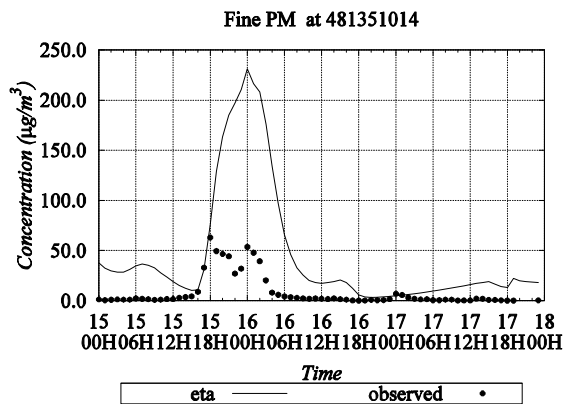
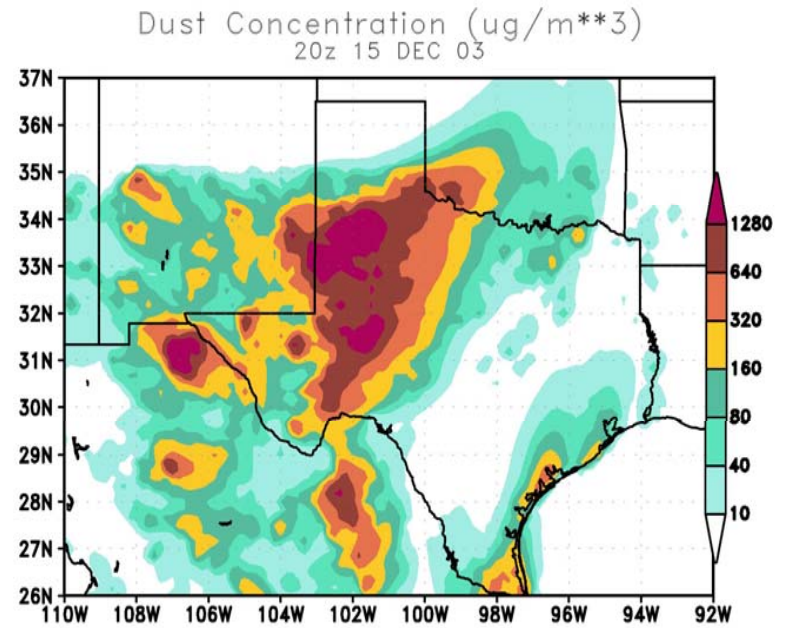
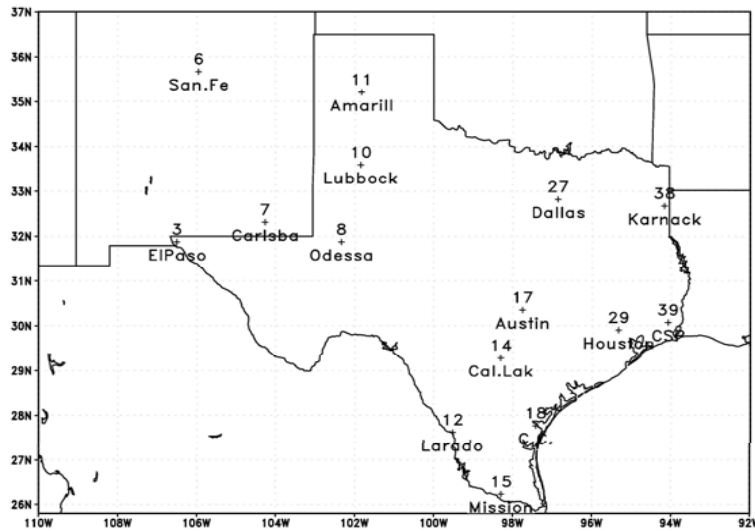
DECEMBER 15-17, 2003, A FRONTAL SYSTEM SWEEP ACROSS NEW MEXICO, TEXAS AND NORTHERN MEXICO CREATING A SIGNIFICANT DUST STORM AND AN OPPORTUNITY FOR  
**PREDICTING dust PARTICLE POLLUTION**



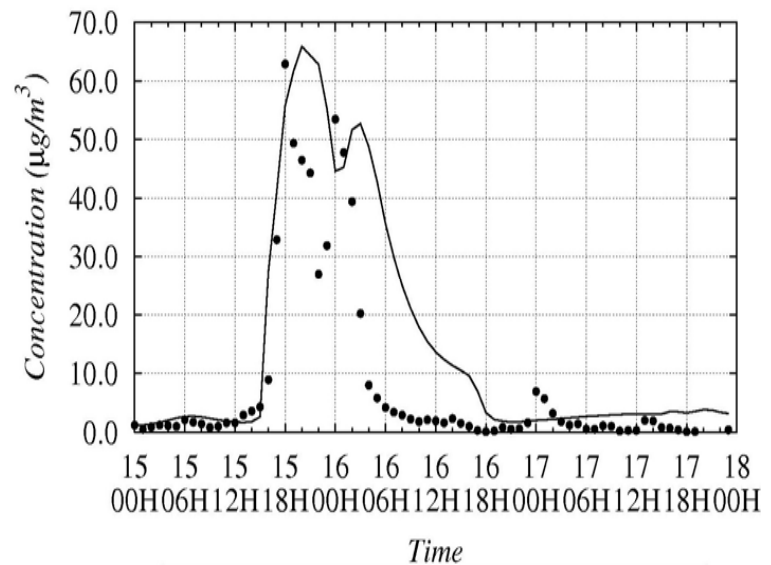
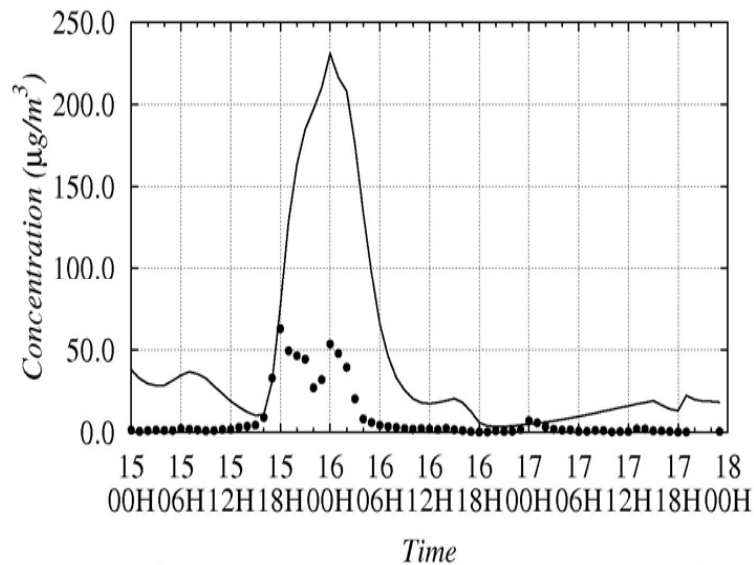
GOES 12 Vis/IR Composite, 12/15/03 @ 1426 CST

W.A.Sprigg to Pima Co. E.Q.  
Advisory Council, 5/17/06

Comparison of modeled and observed PM2.5 concentrations at Odessa1014, Texas (Dec'03)  
 LL: before MODIS land cover      LR: after MODIS land cover



# 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)

Presented at World Federation of Scientists, October 2005, Geneva

# 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
  - User needs: e.g. pinpoint dust sources, simulate areas/times affected



# 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](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 of the map 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 the current map's location.

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 shows "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

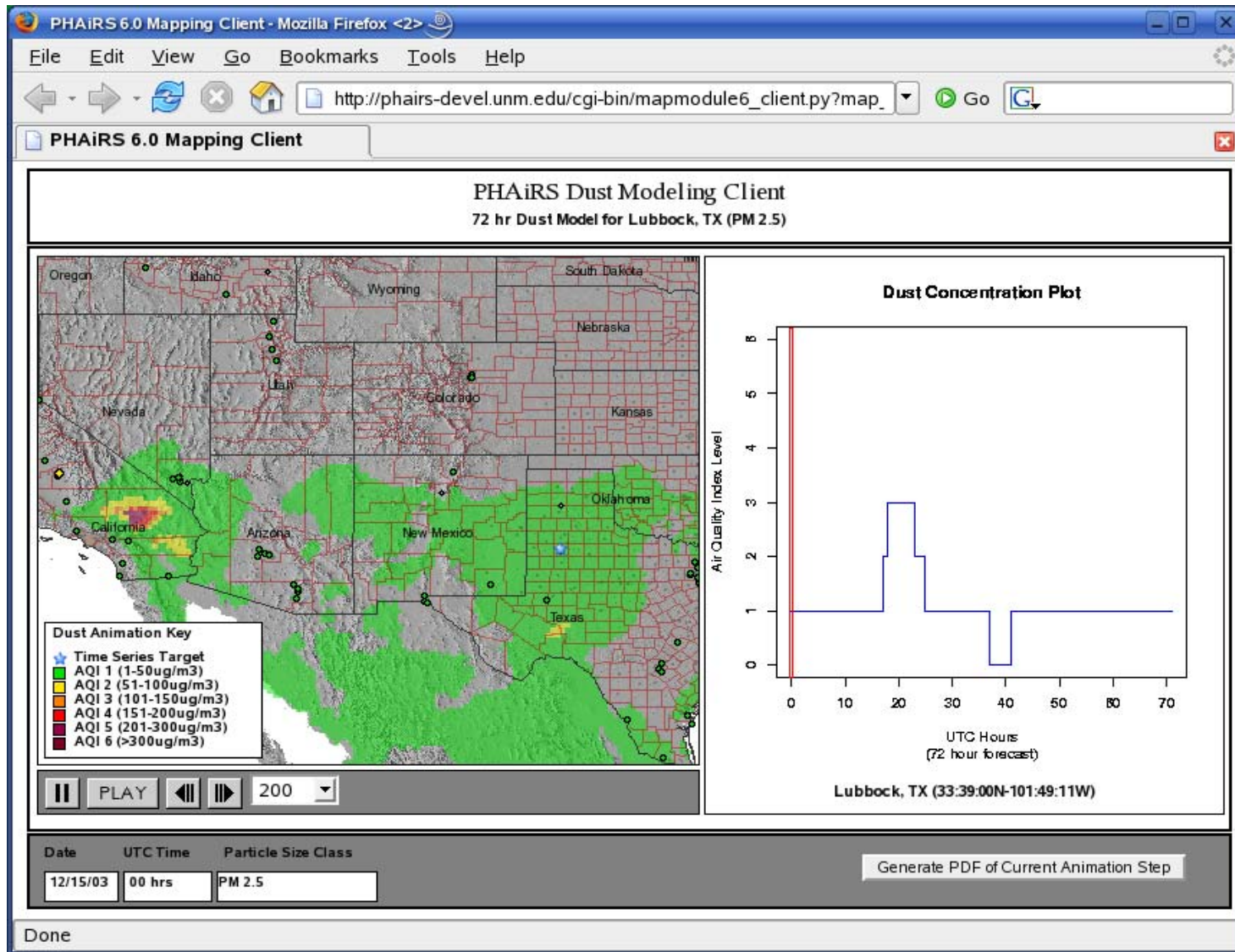
Northing 33.37.48N Easting 120.23.24W Map Size Large Scale 1:14961658

PowerMap Server

W3C CSS

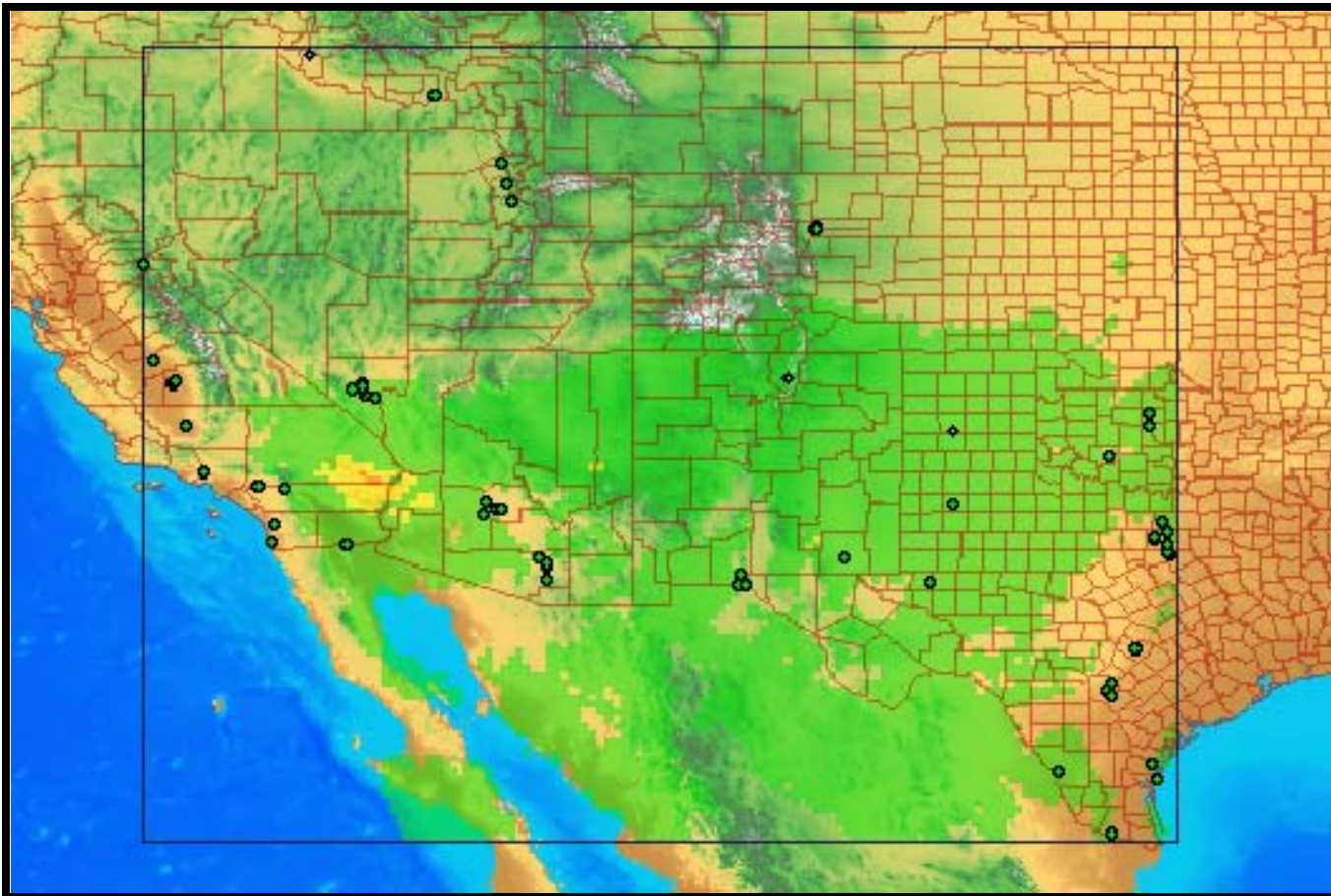
Done

# Sample Web Output

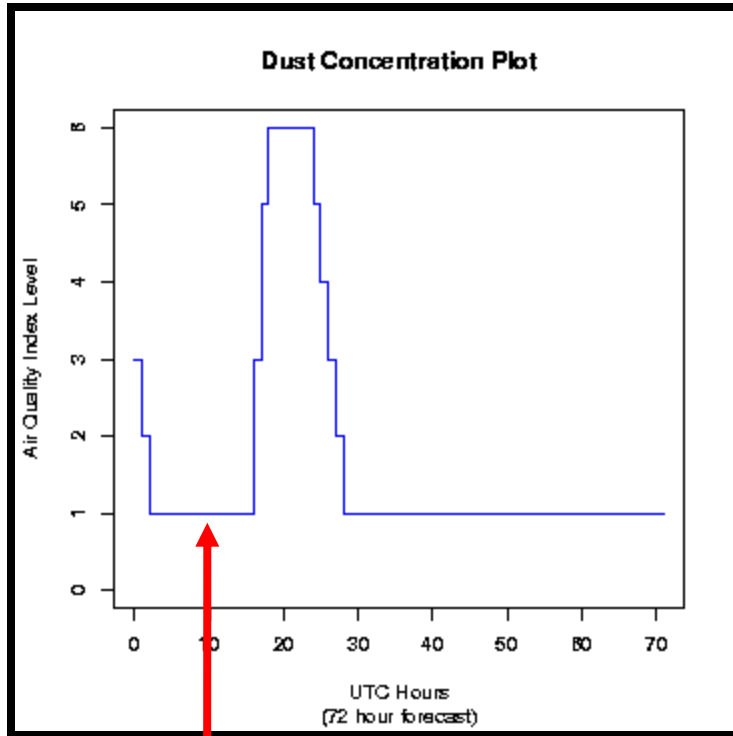




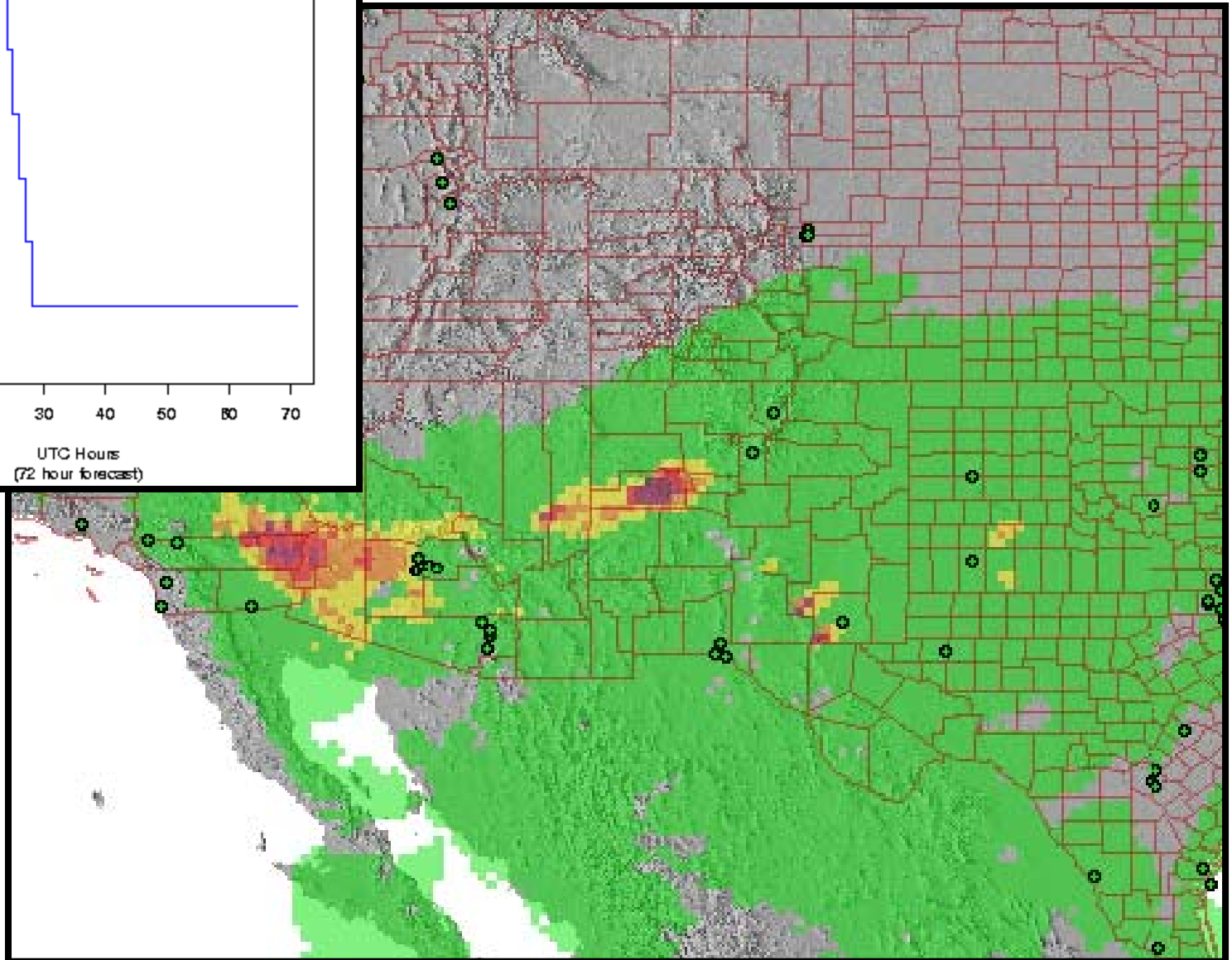
# Public Health Applications in Remote Sensing



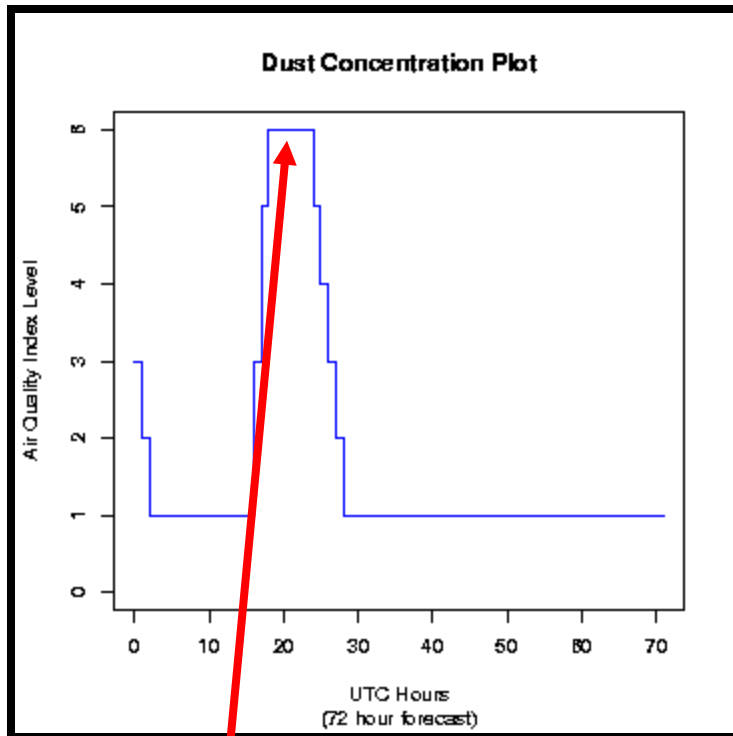
# PM10 Lubbock, TX 12/15/03



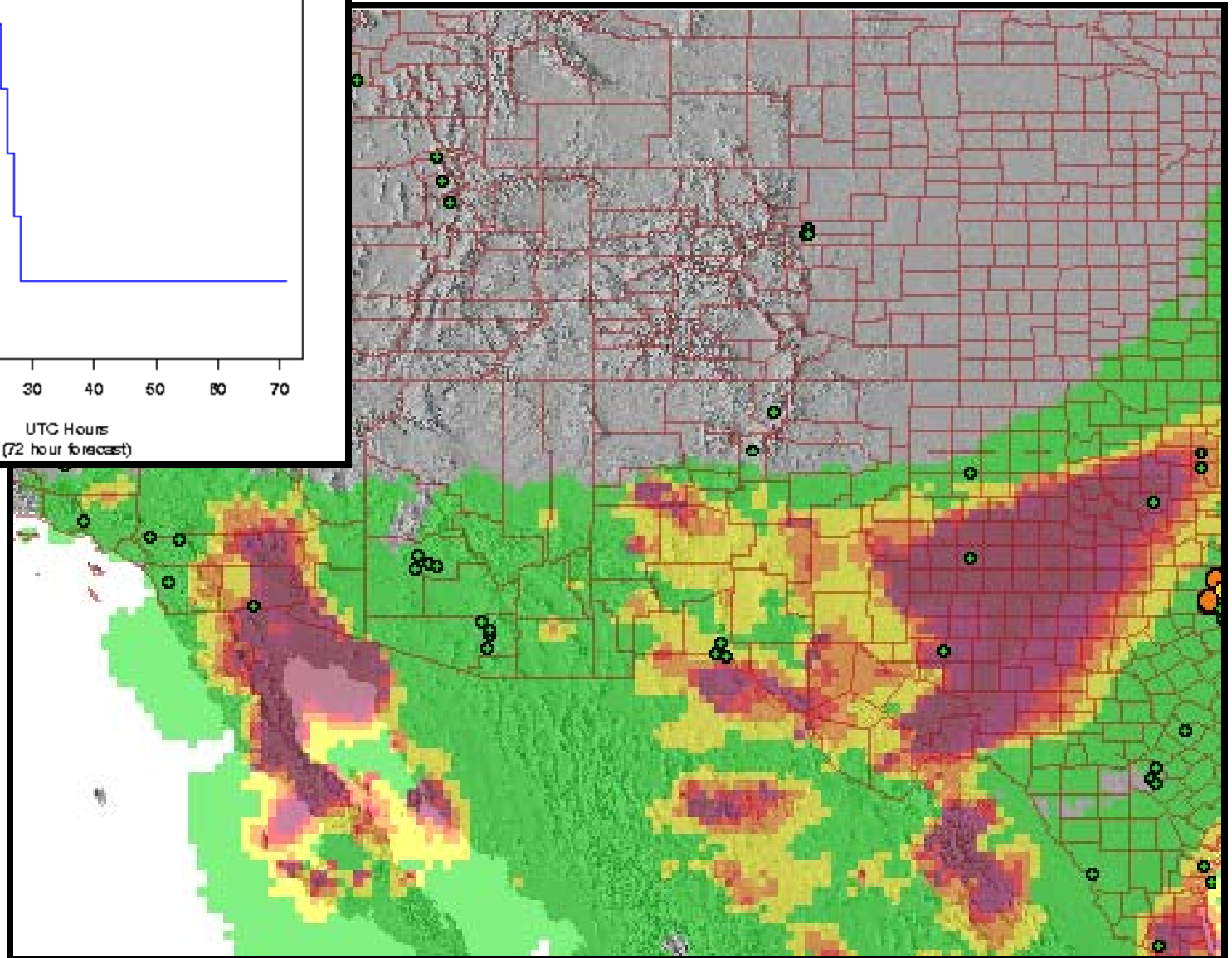
**T = 10 hours**



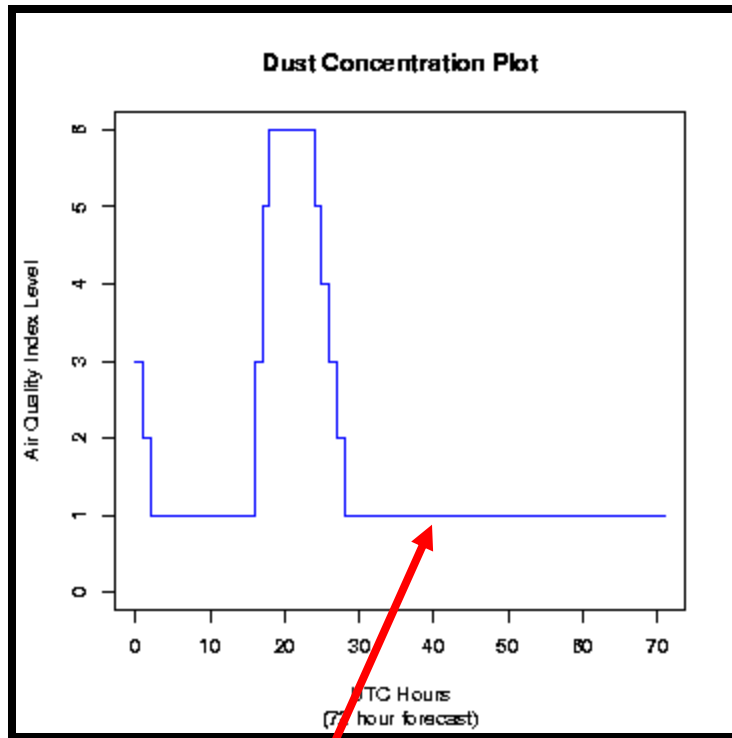
# PM10 Lubbock, TX 12/15/03



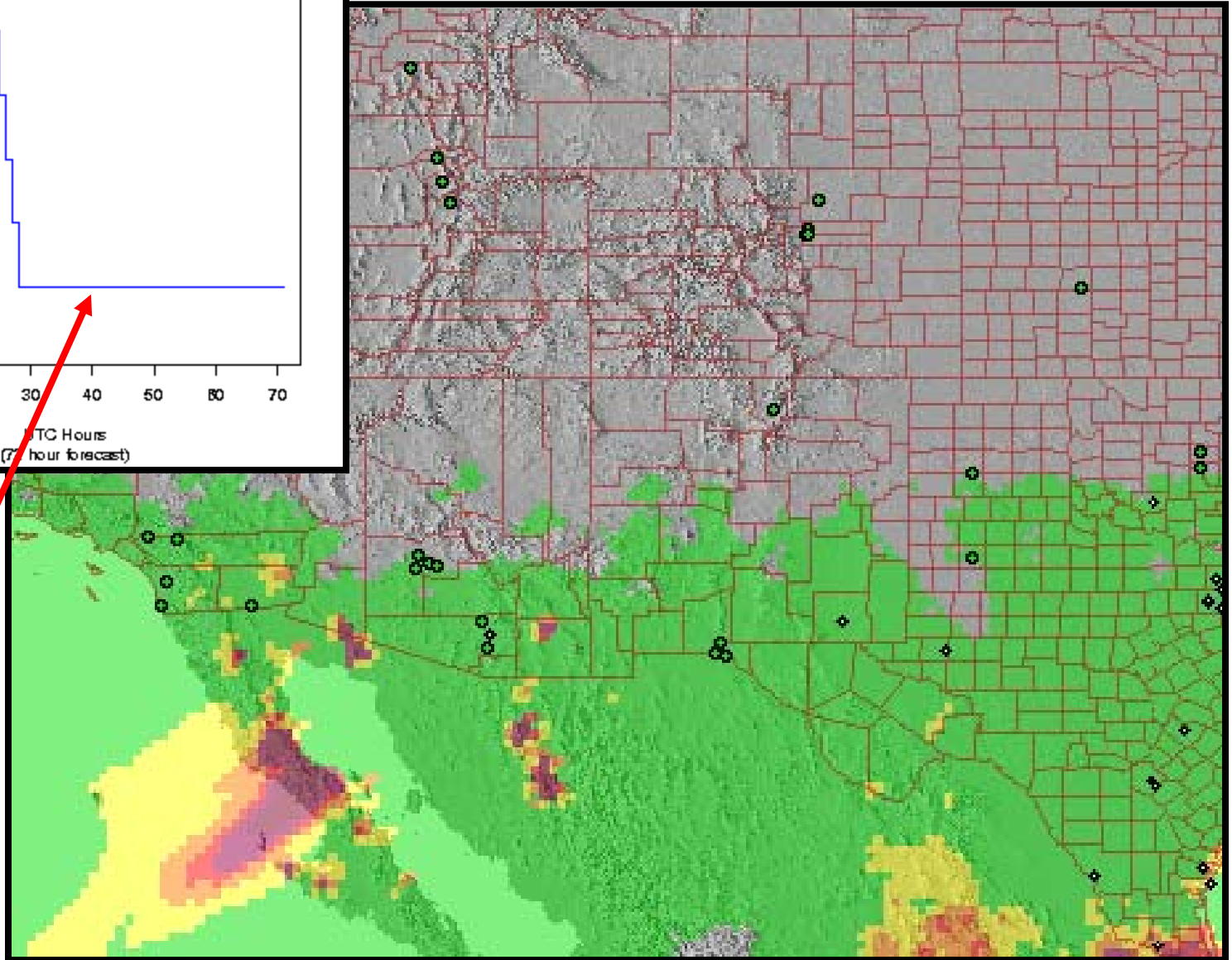
**T = 20 hours**



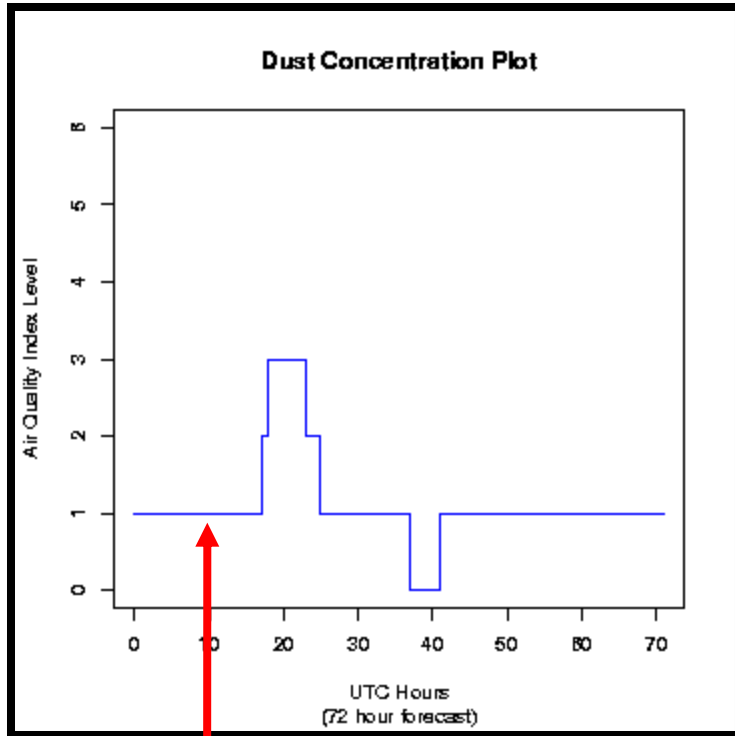
# PM10 Lubbock, TX 12/15/03



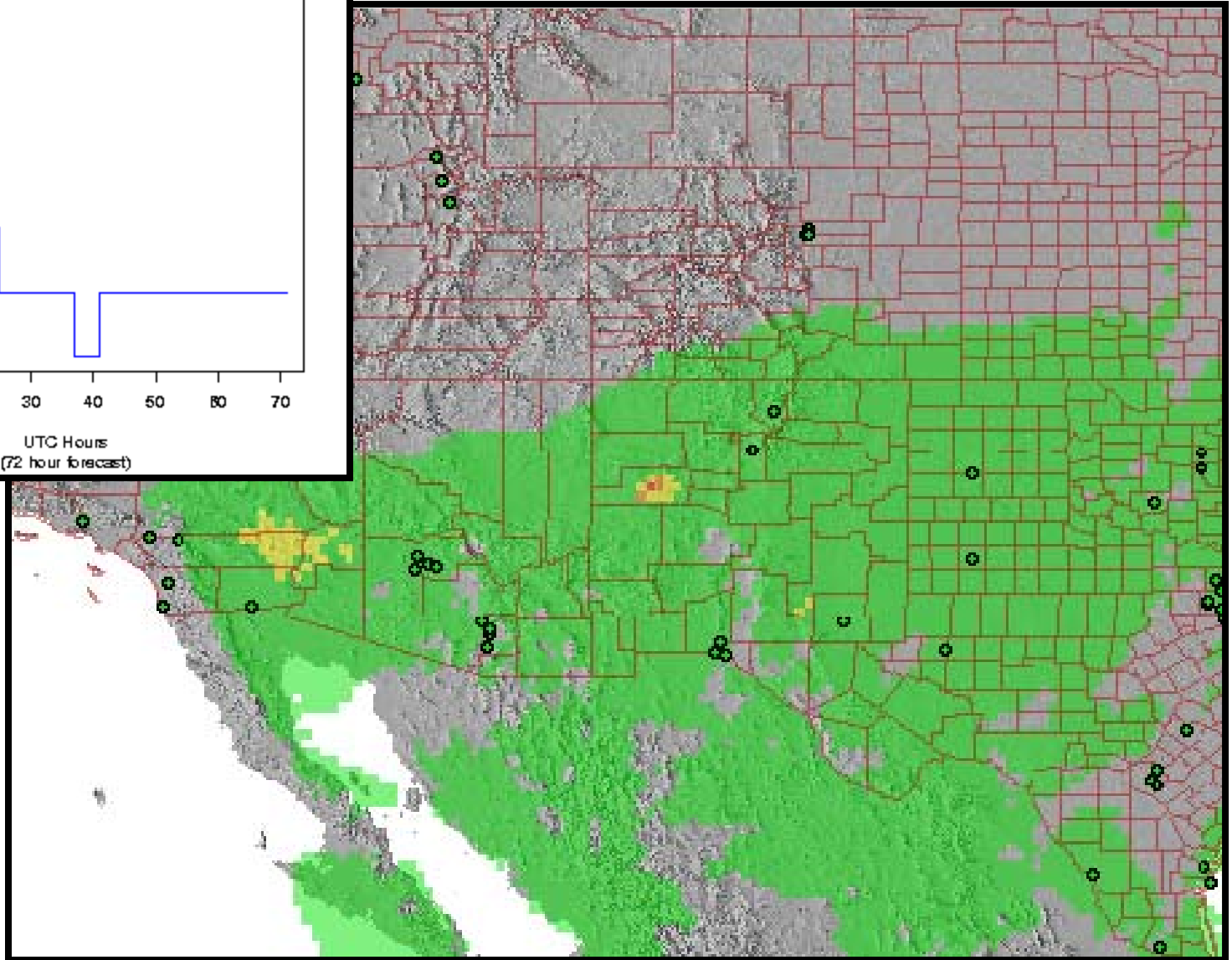
**T = 40 hours**



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

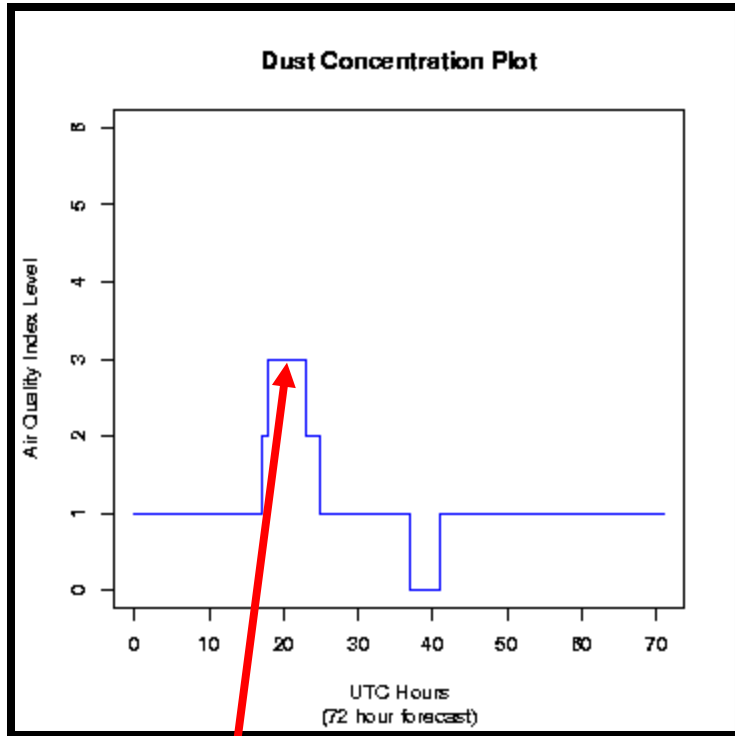


**T = 10 hours**

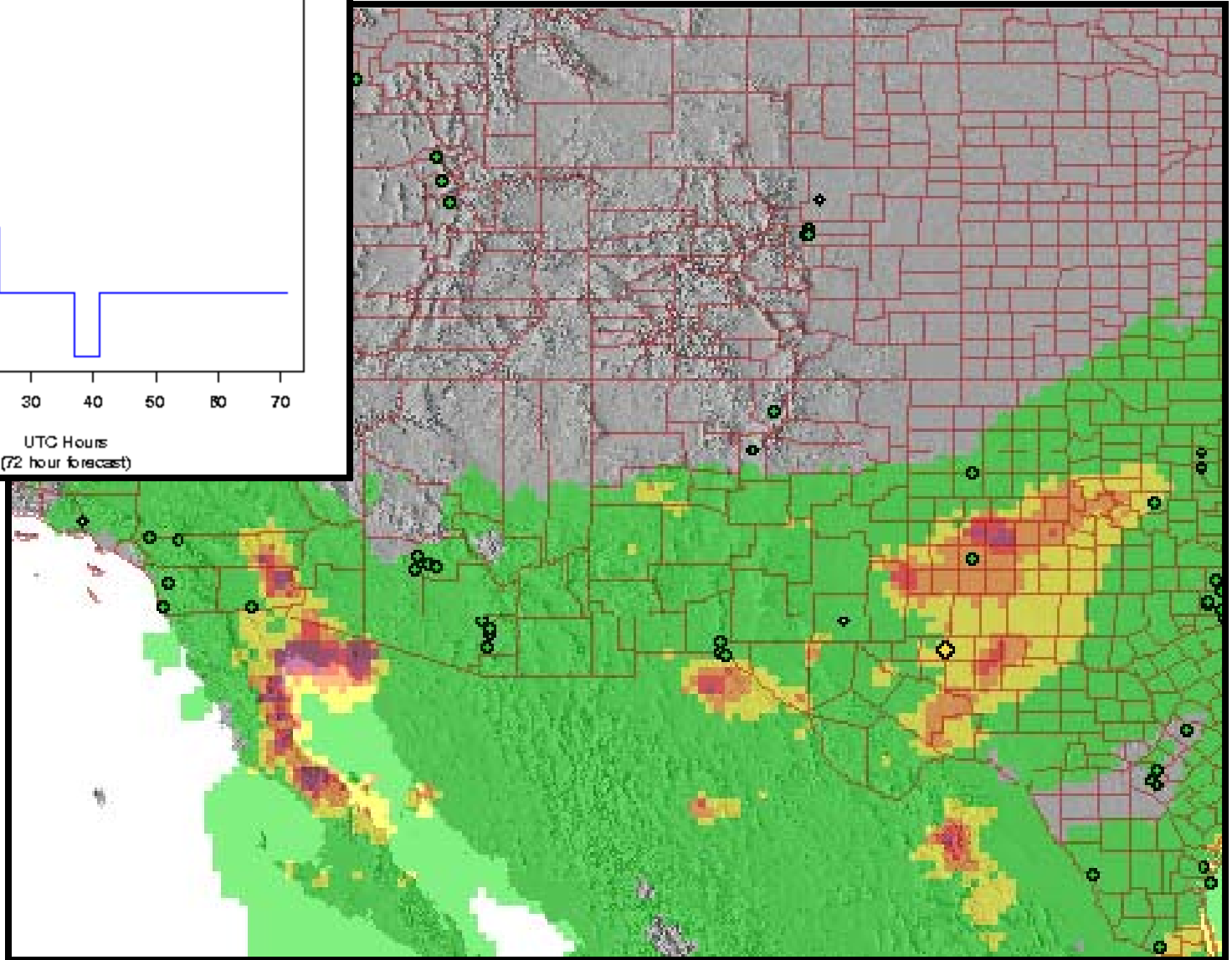




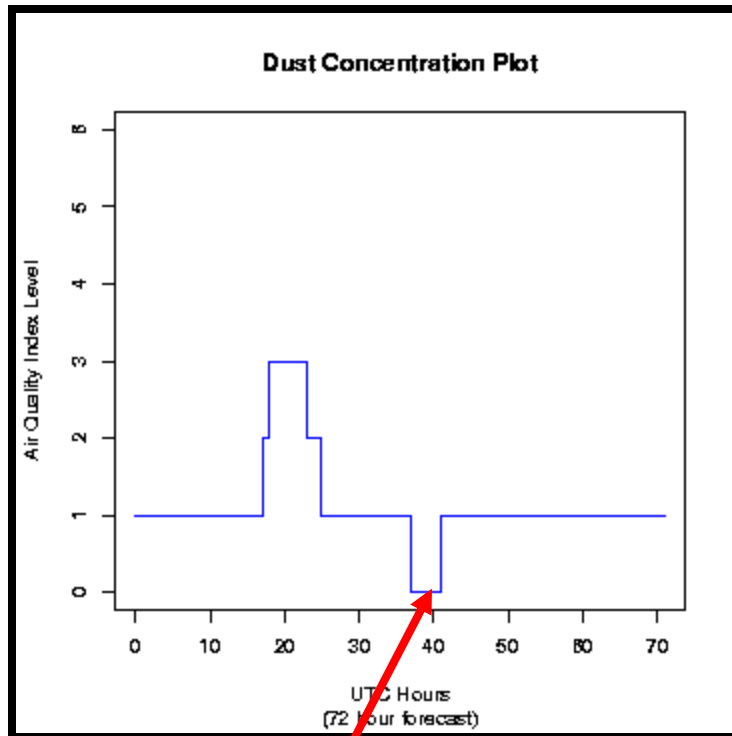
# PM2.5 Lubbock, TX 12/15/03



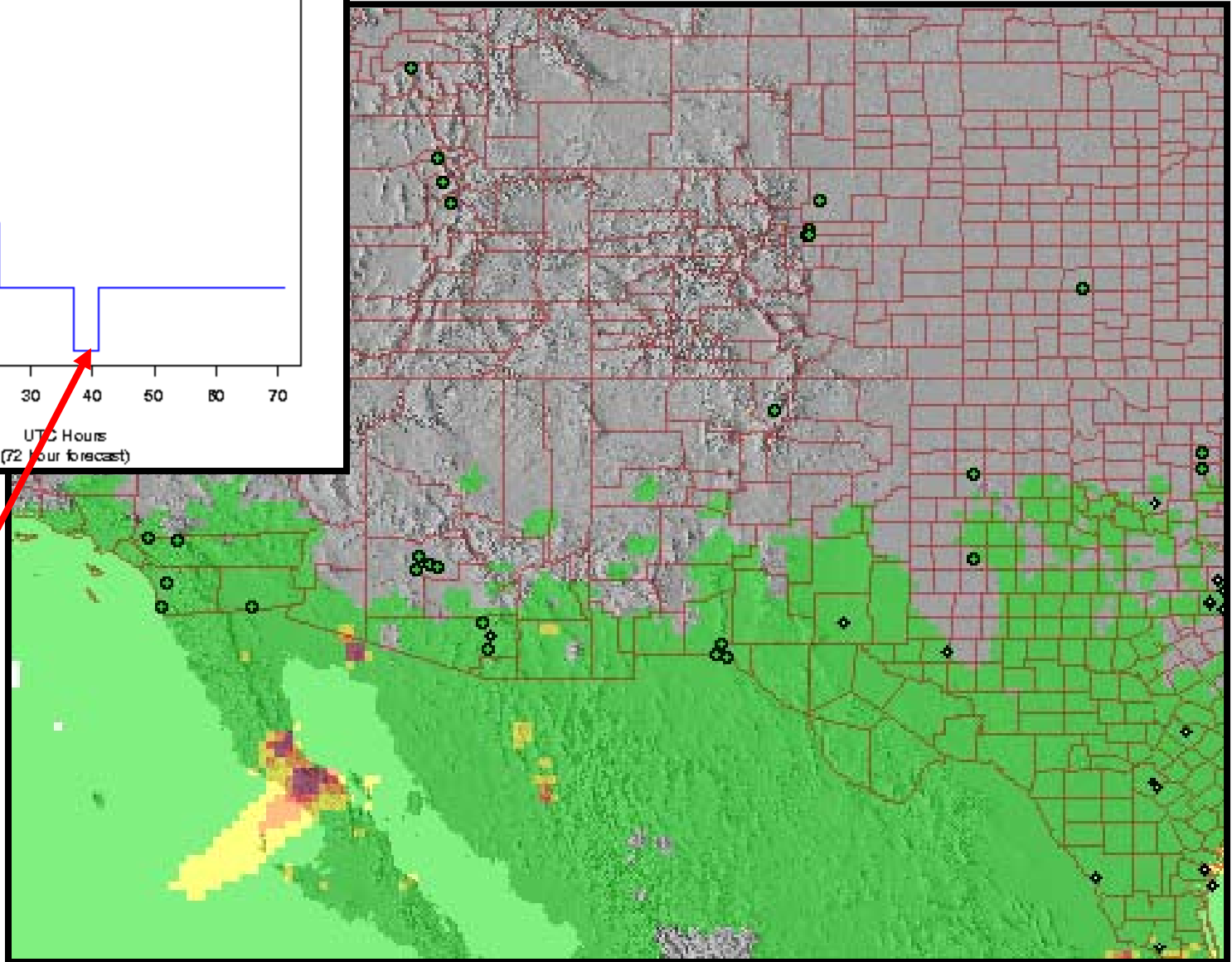
**T = 20 hours**



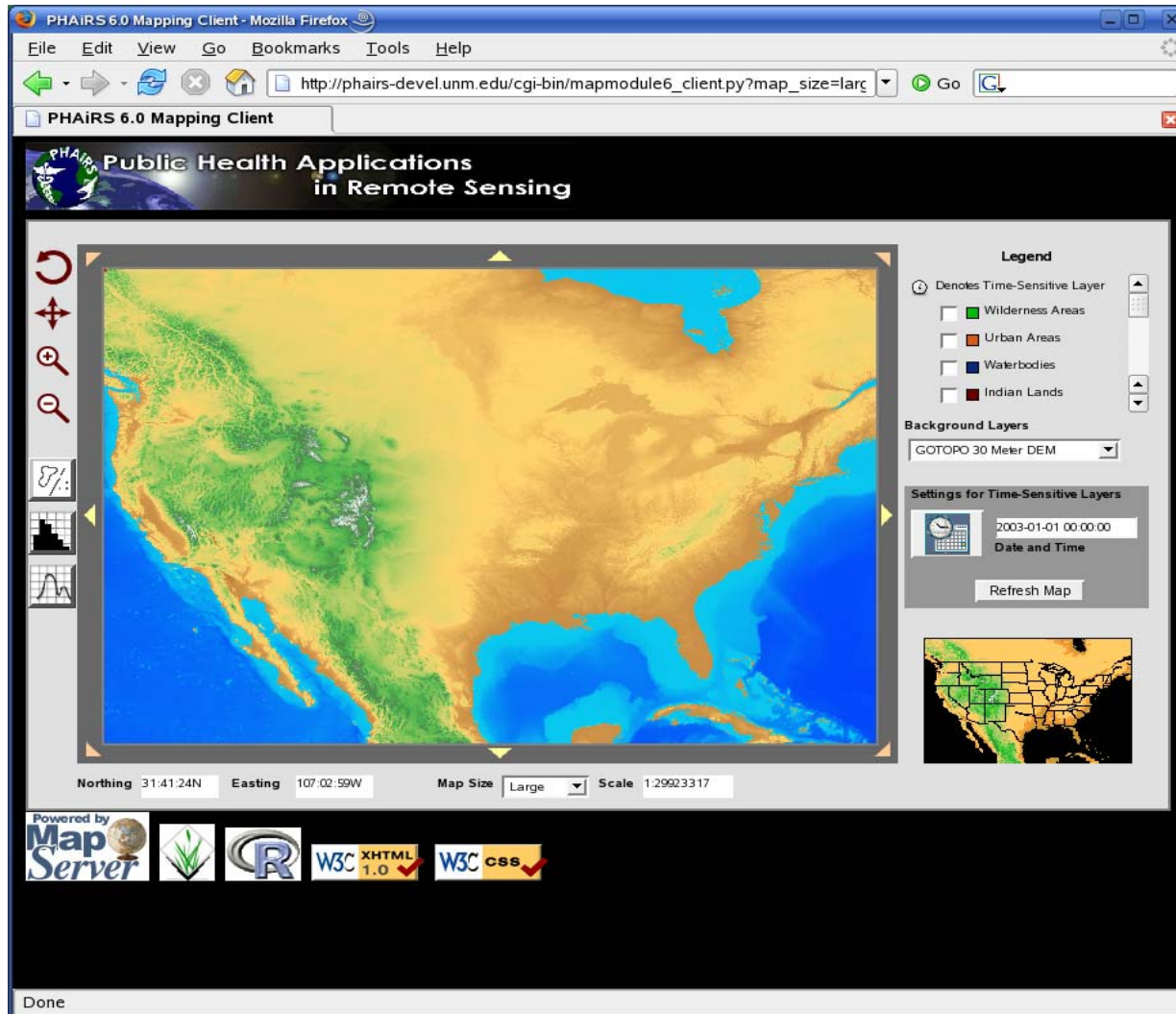
# PM2.5 Lubbock, TX 12/15/03



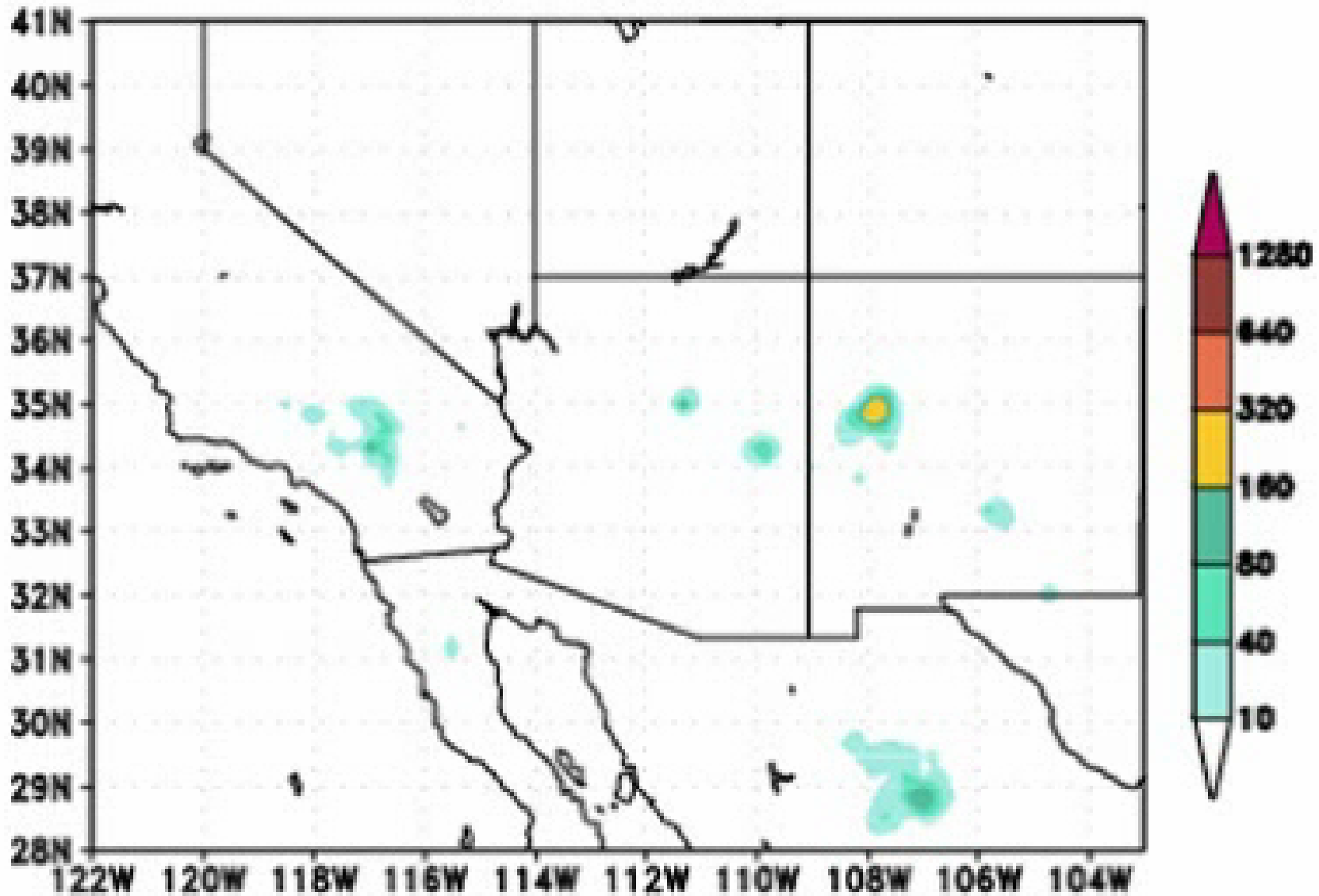
**T = 40 hours**

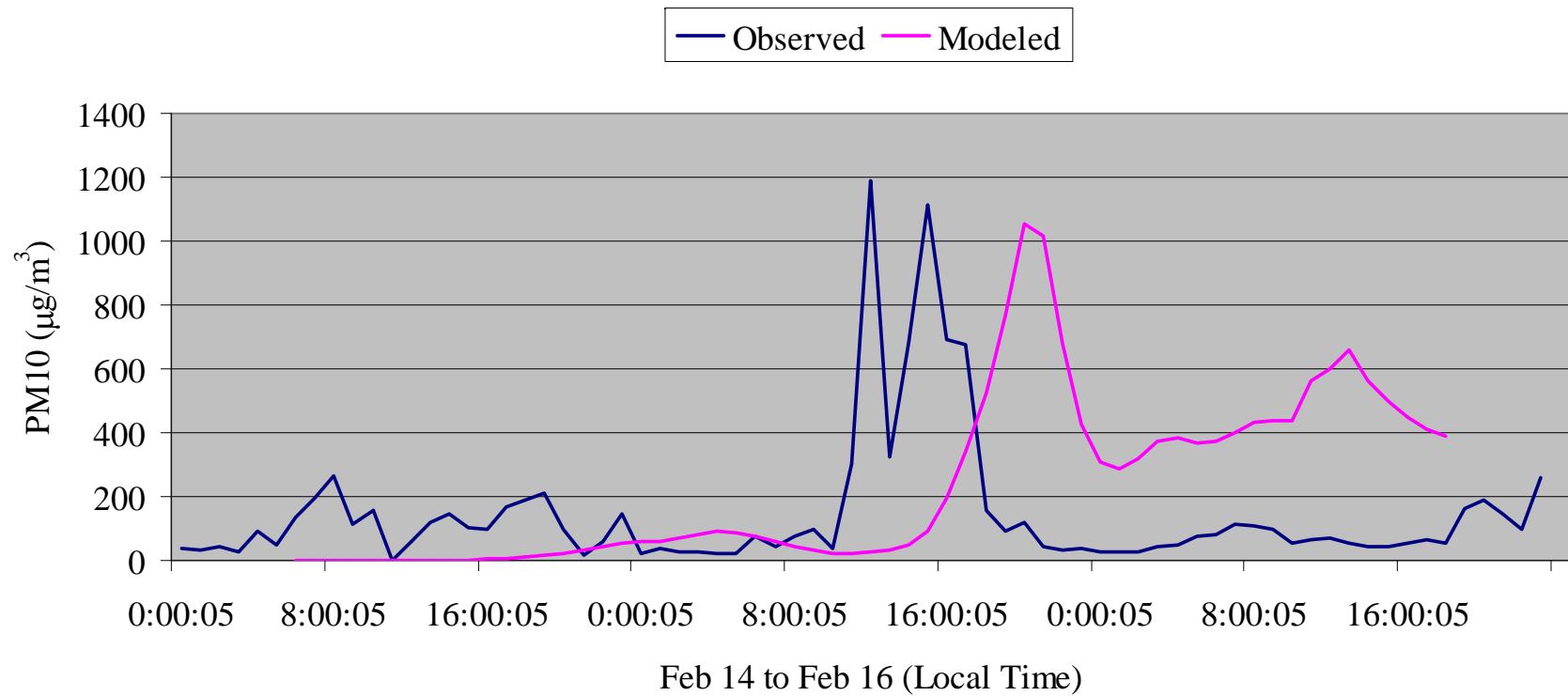


[http://phairs-devel.unm.edu/cgi-bin/mapmodule6\\_client.py](http://phairs-devel.unm.edu/cgi-bin/mapmodule6_client.py)



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





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

# Acknowledgements

**Modeling:** Dazhong Yin, Slobodan Nickovic, Zavisla Janjic

**Forecast Verification:** Brian Barbaris, Kurt Thome, Anna-Britt Mahler, Patrick Shaw

**Land Characteristics:** Gary Sanders, Tom Budge, Don Holland

**Health Applications:** Susan Caskey, Chandra Bales, Shirley Baros, Mike Inglis, Alan Zelicoff

**Product Design, WEB Page, Data Support:** Bill Hudspeth, Karl Benedict, Marvin Landis

**Advisors:** Beth Gorman, Wayne Byrd, Ken Komatsu

**Integration:** Stan Morain, Amy Budge, Bill Sprigg

Appreciation is extended to the Pima County Department of Environmental Quality and the Arizona and New Mexico Departments of Public Health who review our work and keep us on a practical course. The project is sponsored by NASA's Earth System Science Directorate

**ARIZONA**