

# Using Remote Sensing in Environmental Public Health Tracking

*Applications of Environmental Remote Sensing to Air Quality  
and Public Health*

*May 8-9, 2007*

*Potomac, Maryland*

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Centers for Disease Control and Prevention (CDC)**

**&**

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**New Mexico Department of Health Tracking Program**

# EPH Concerns



**Safe Water**



**Healthy Communities**



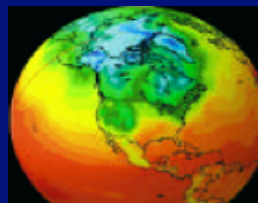
**Safe Food**



**Healthy Homes**



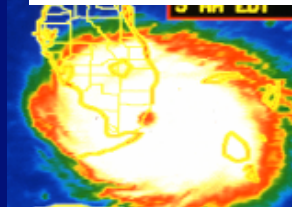
**Safe Air**



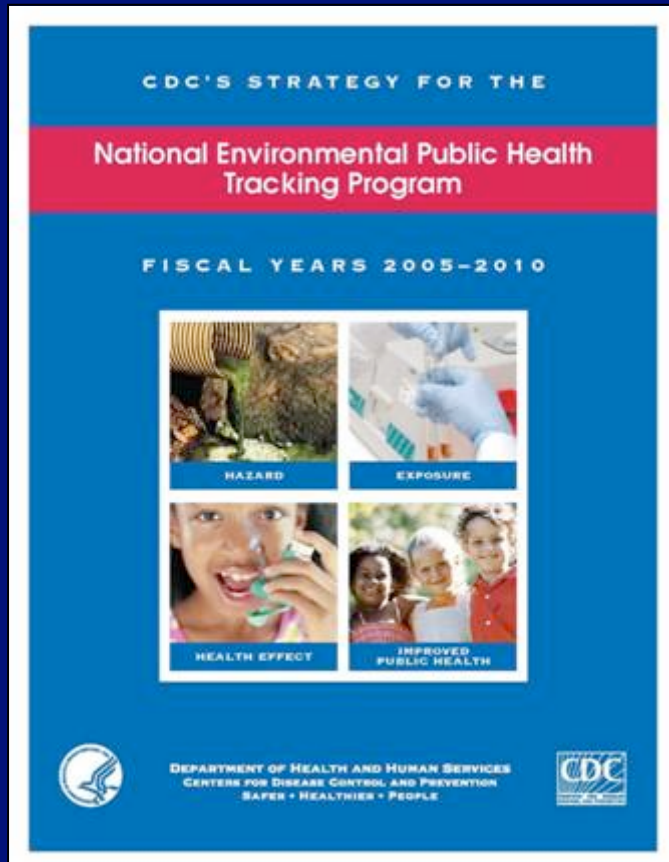
**Global Climate Change**



**Proper Waste Management**



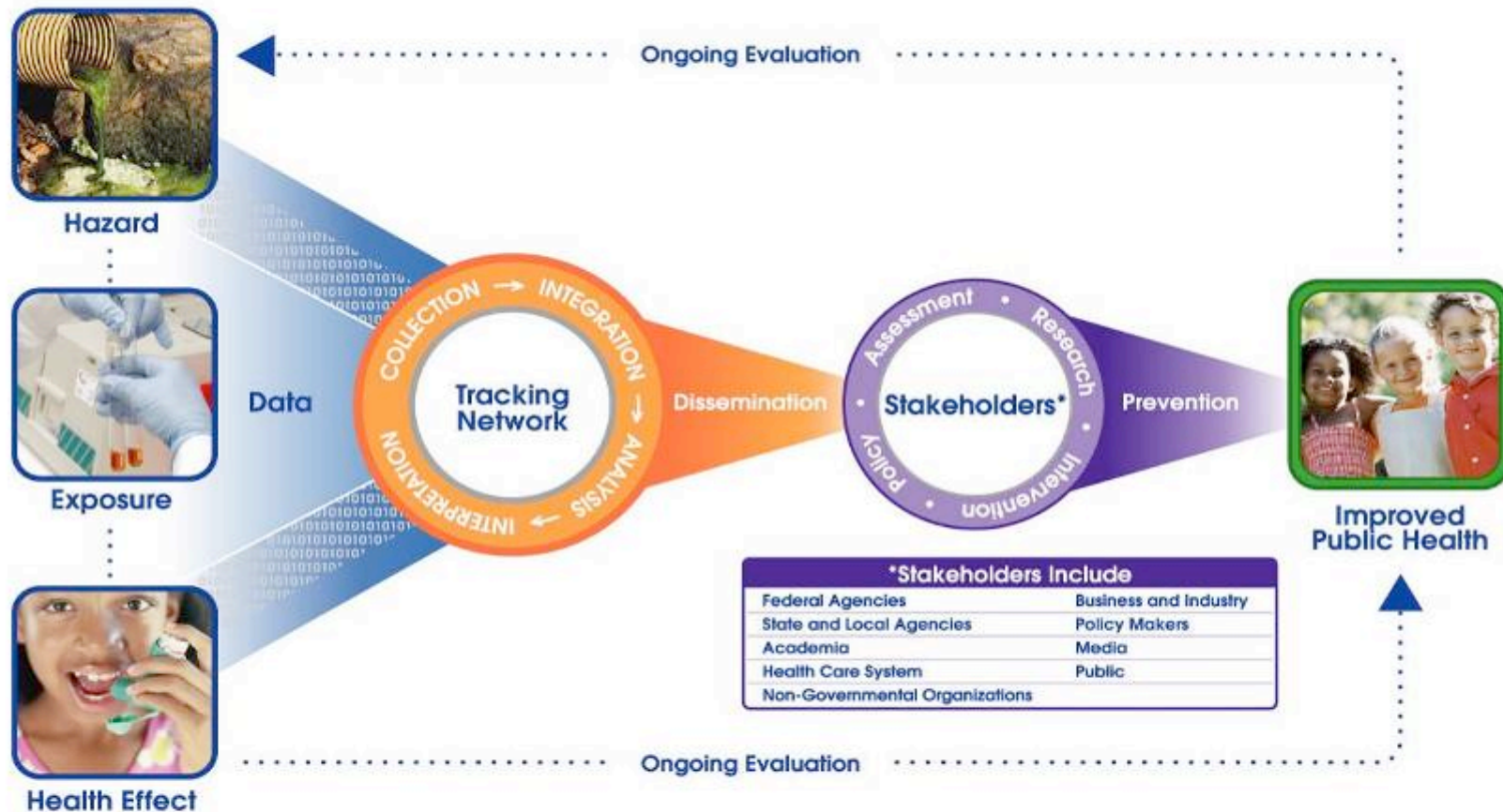
# CDC's National Environmental Public Health Tracking Program



## Mission

*To provide information from a nationwide network of integrated health and environmental data that drives actions to improve the health of communities*

# ENVIRONMENTAL PUBLIC HEALTH TRACKING



**\*Stakeholders Include**

Federal Agencies	Business and Industry
State and Local Agencies	Policy Makers
Academia	Media
Health Care System	Public
Non-Governmental Organizations	



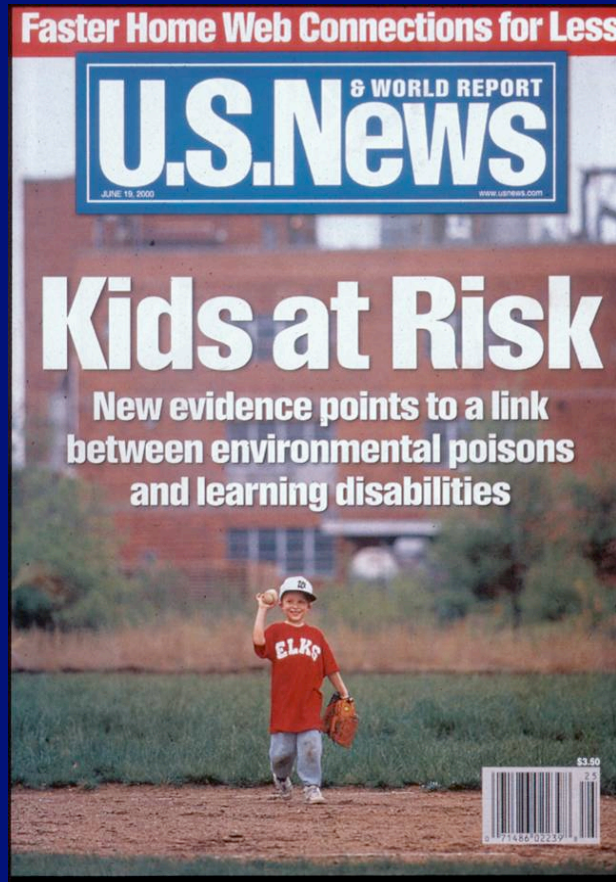
DEPARTMENT OF HEALTH AND HUMAN SERVICES  
CENTERS FOR DISEASE CONTROL AND PREVENTION  
SAFER • HEALTHIER • PEOPLE



# Uses of Tracking Data

- **Quantify the magnitude of a problem**
- **Detect unusual trends, occurrences, relationships**
- **Identify populations at risk**
- **Generate hypotheses**
- **Provide data to test some hypotheses**
- **Direct and evaluate control and prevention measures**
- **Facilitate policy development**

# Environmental Public Health



- The science and service that promote human health by creating healthy human environments and protecting people from disease and other health effects related to the environment

# National Tracking Network

## *On the Horizon - 2008*

### Functions:

- Provide Nationally Consistent Data and Measures
- Describe and Discover Data
- Exchange Data
- Provide Data Management and Analysis Tools
- Inform and Interact with the Public

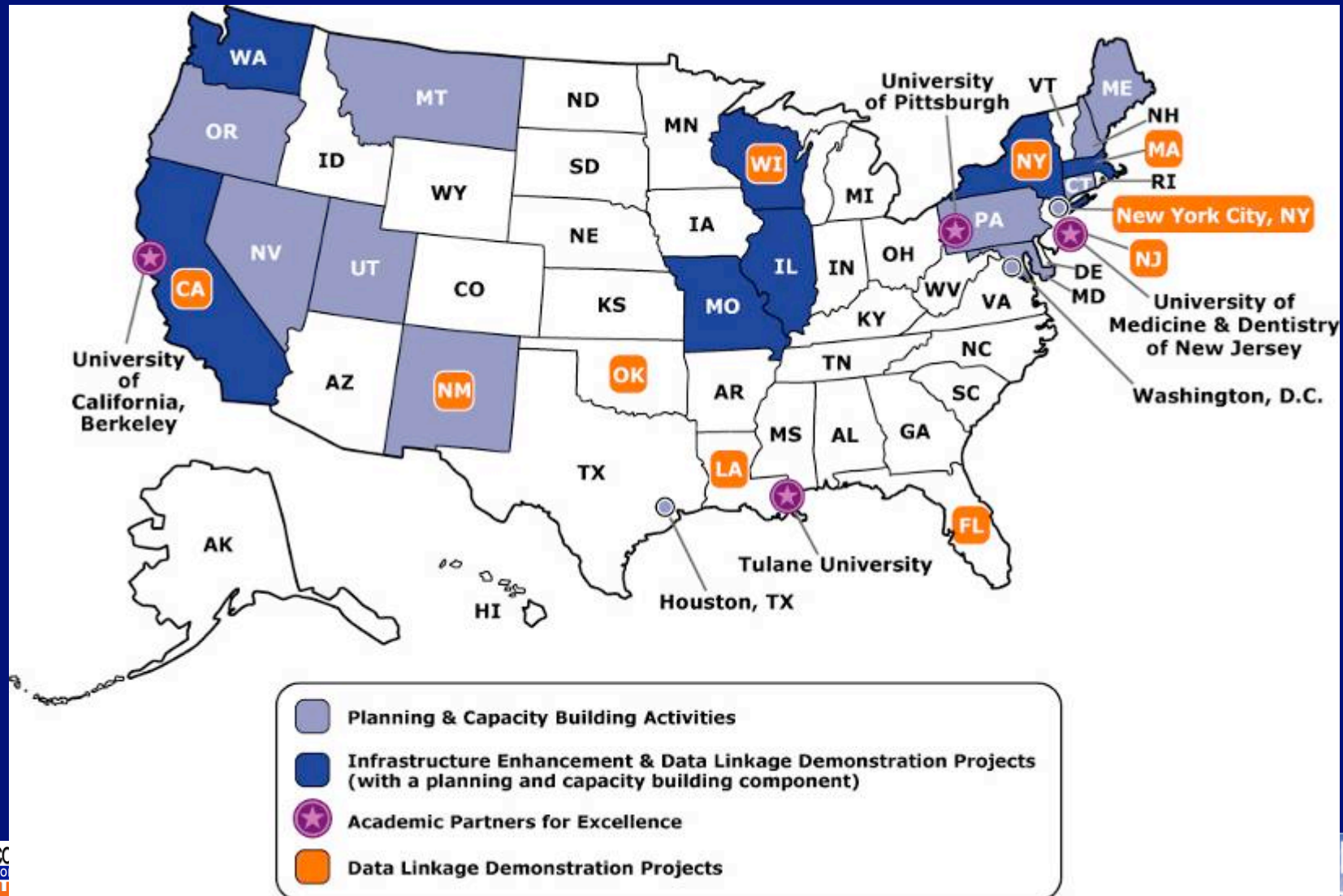


# **Building a National Environmental Public Health Tracking Network**

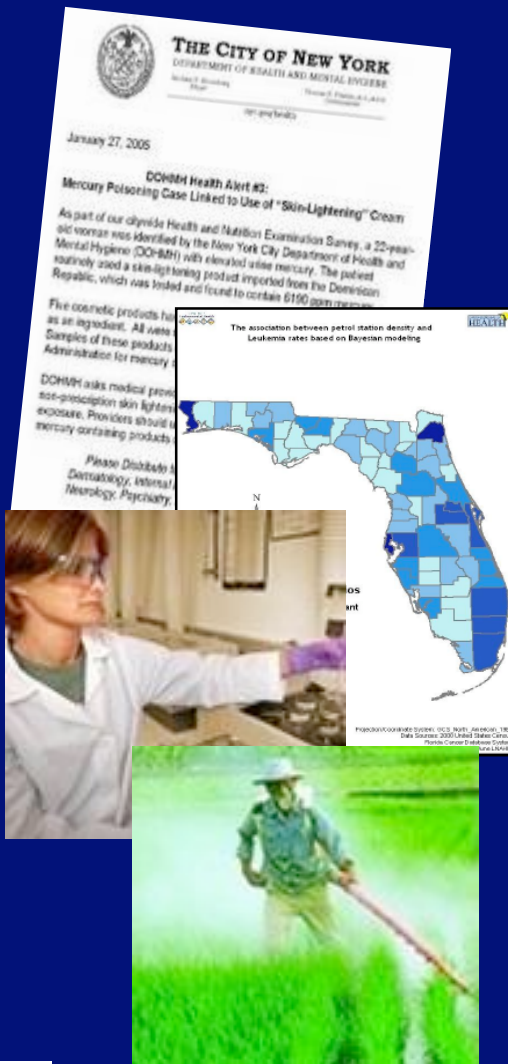
**Pilot Projects Lead the Way.....**



# Developing the Tracking Program: Grantees – 2002 to 2006

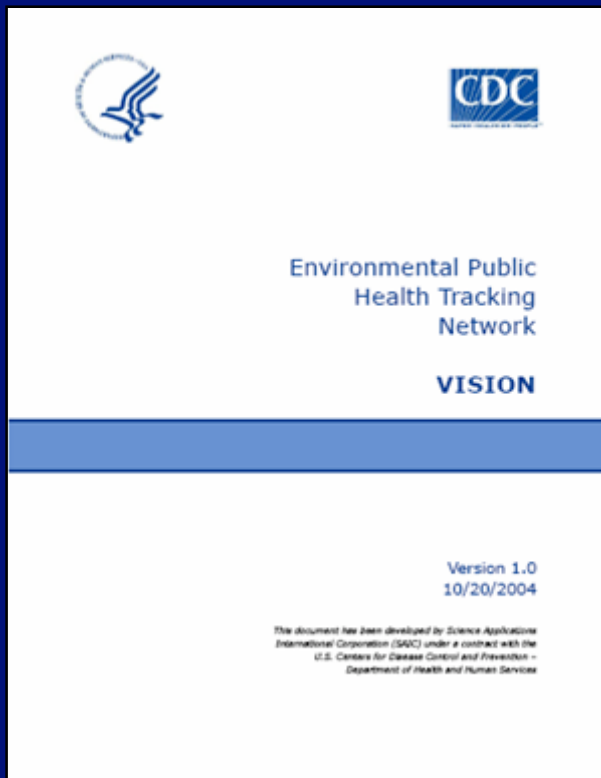


# Results from Funded Projects

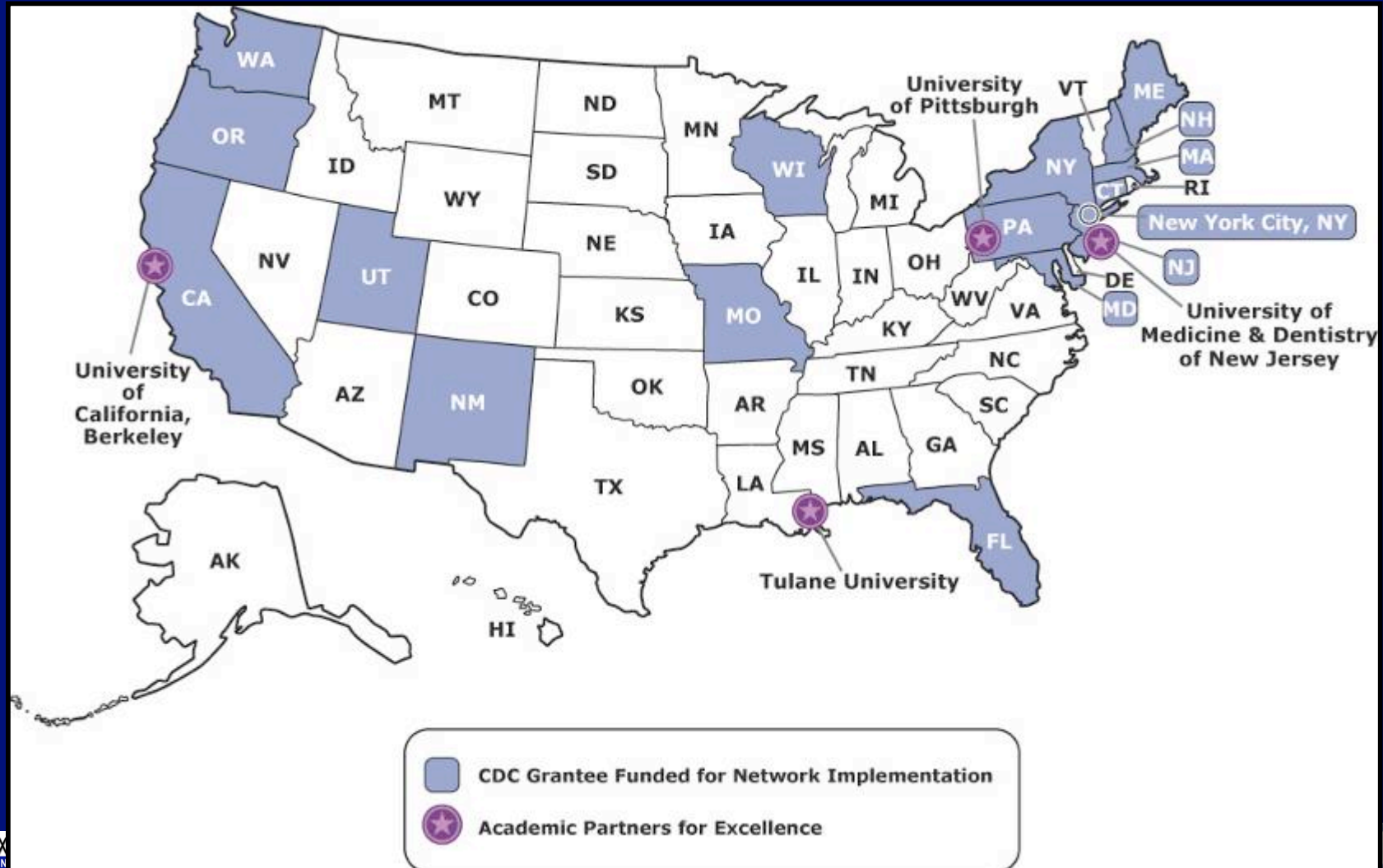


- Increased capacity
- Increased availability and enhancement of existing data
- Built new data systems
- Created analytic tools
- Linked data
- Took action

# Planning to Implementation



# CDC's Tracking Program Grantees



# Complexity...

*“Initially we thought we could quickly link environmental and health data to investigate community concerns; however, we found tracking is like peeling an onion—each layer reveals more issues that require extensive work to find the answers we seek.”*

**LuAnn E. White, Ph.D.  
Professor and Director  
Tulane School of Public Health and Tropical Medicine  
Center for Applied Environmental Public Health**

# Challenges Encountered in Pilot Projects

## Data

- Access
- Quality
- Not in electronic format
- Geocoding issues
- Little standardization
- No metadata
- Spatial/temporal misalignment
- Little exposure data

## Methods

- No common toolbox of methods
- Issues with exposure estimation and misclassification
- Level of resolution
- Small numbers
- Latency/induction
- Confidentiality

## Interpretation & Communication

- Sensitivity /Specificity
- Confidentiality
- Audience
- “Plain speaking”
- Actionable?

# Challenge: Data Gaps/Estimating Air Exposure

## Possible Solution:

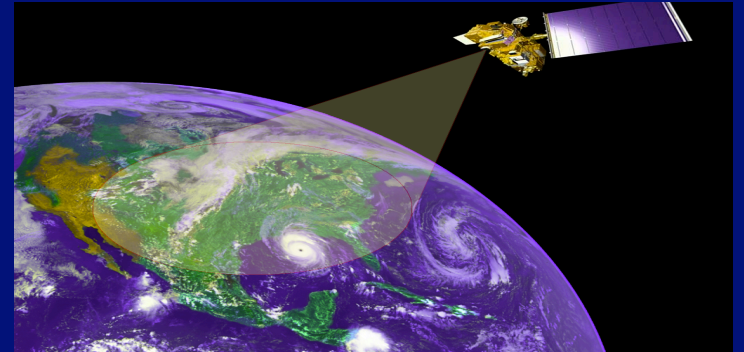
- Applying remote sensing to estimate air exposures

## Tracking Projects

- PHASE
- HELIX-Atlanta
- DREAM-New Mexico



# DREAM-New Mexico Remote Sensing Project



- **Purpose:**
  - To link existing data sets on environmental indicators and health outcomes to track public health
- **Pilot Study:**
  - Linked asthma and air quality data in San Juan County, NM using measured data
- **NASA PHAiRS Study:**
  - DREAM model used to estimate PM<sub>2.5</sub>/PM<sub>10</sub> to link with asthma and myocardial infarction hospital data



# Hypothesis

*High levels of particulates and ozone are associated with increased hospital visits for asthma and myocardial infarction.*



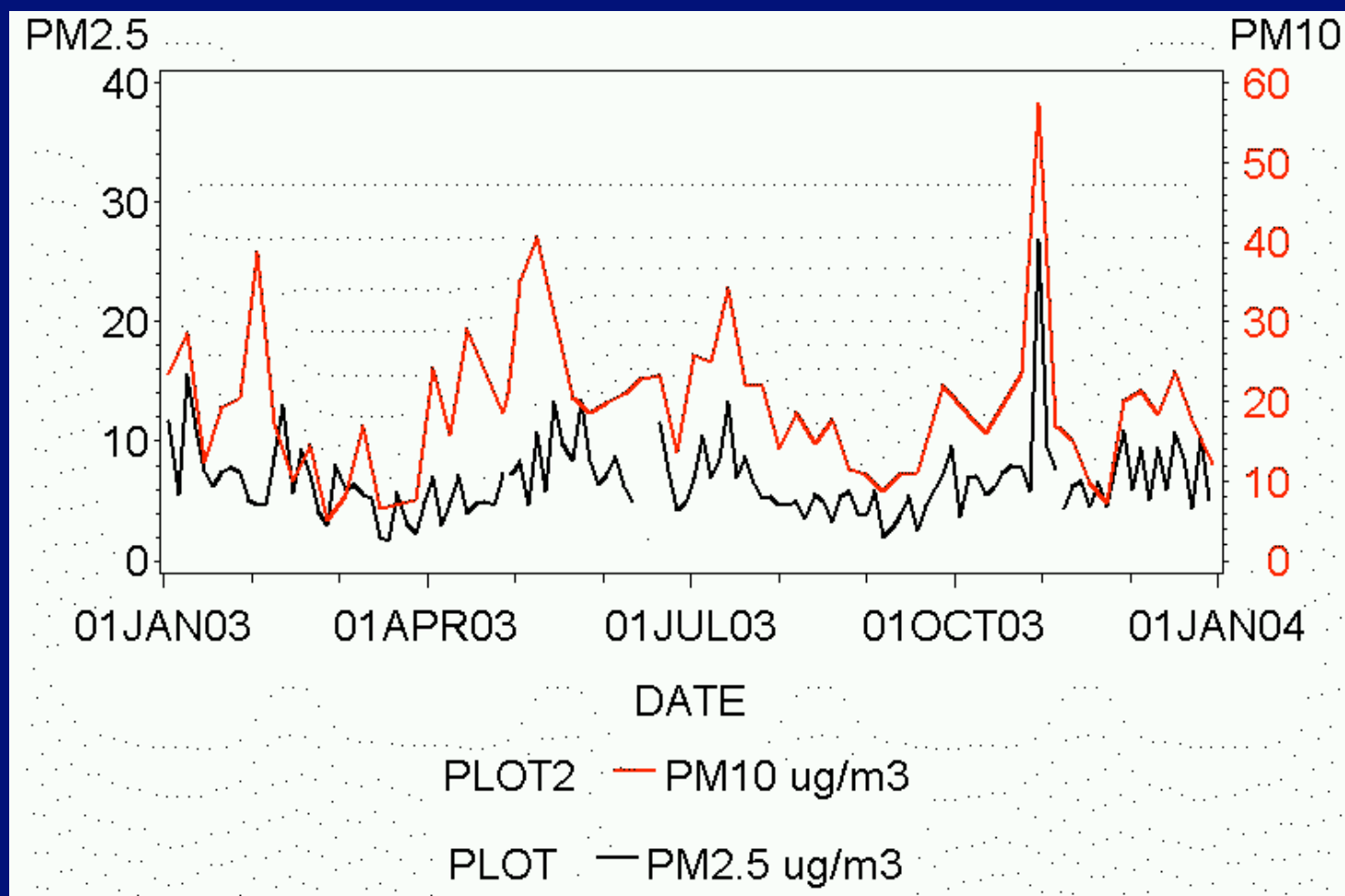
# Pilot Study: Health Outcomes Data

- Utilized outcome data for Emergency & urgent care visits for asthma & other respiratory illnesses in San Juan County (Northwest NM)
  - Data by illness category; zip code; date; age & gender

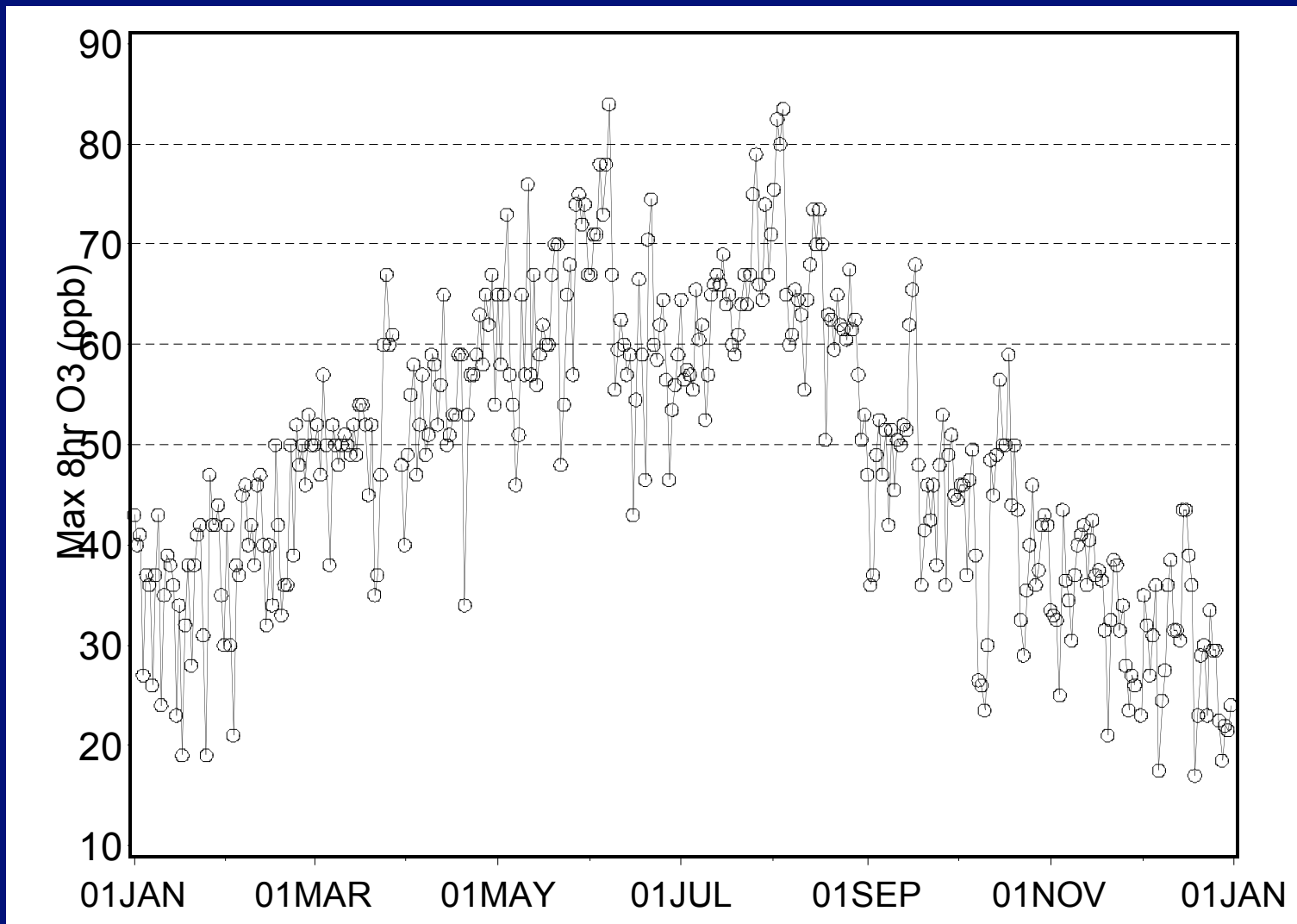
# Pilot Study: Exposure Data

- **NM Environment Department monitored air quality**
- **Two ozone monitors (hourly):**
  - Ozone – daily max and max 8-hr
  - weather information
- **One Particulate Monitor in Study Area:**
  - PM2.5 (every 3 days)
  - PM10 (every 6 days)
- **14 EPA AirData Particulate Monitors in NM**

# Measured Particulates Data



# Measured Ozone: Annual Pattern



# Results

- **Logistic regression for any summer asthma visit**  
Two-day lagged ozone (8-hr max)  
odds ratio of 1.7 (95% CI 1.1 to 2.8) for a 10 ppb increase in ozone (P = 0.01)
- **Poisson regression on summer counts**  
Two-day lagged ozone (8-hr max)  
relative risk ratio of 1.17 (95% CI 1.02 to 1.34) for a 10 ppb increase in ozone (P = 0.03)
- **Small effect of PM<sub>2.5</sub> (2-day lag)**  
relative risk ratio = 1.02 (P = 0.10)

# PHAiRS Enhancements for Analysis

- **NASA/UNM/UA DREAM model for estimating PM<sub>2.5</sub> and PM<sub>10</sub> where no measured data are available and where higher levels of particulates are present**
- **Evaluate cardiovascular effects as well as asthma**

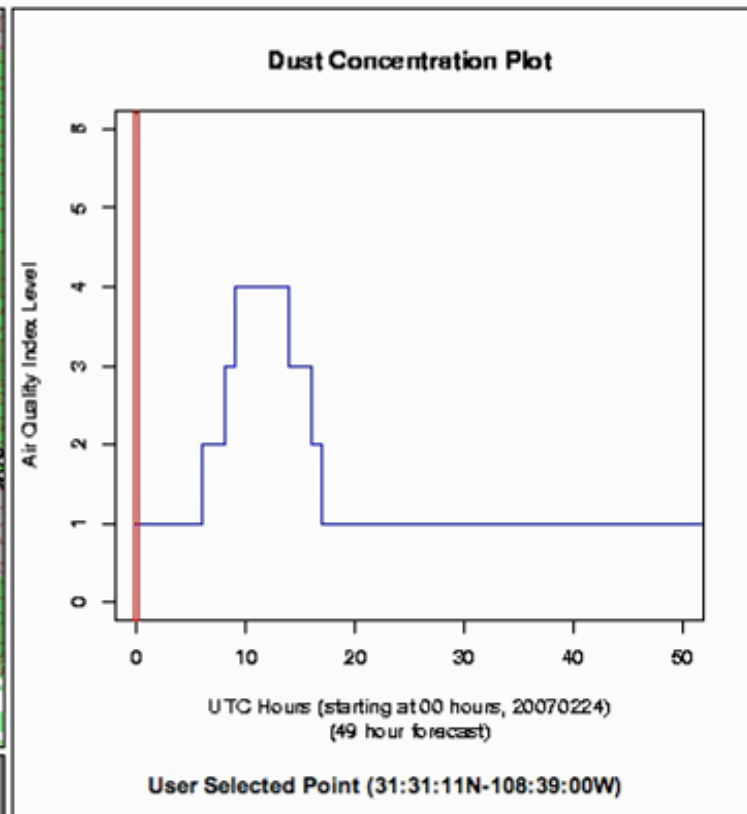
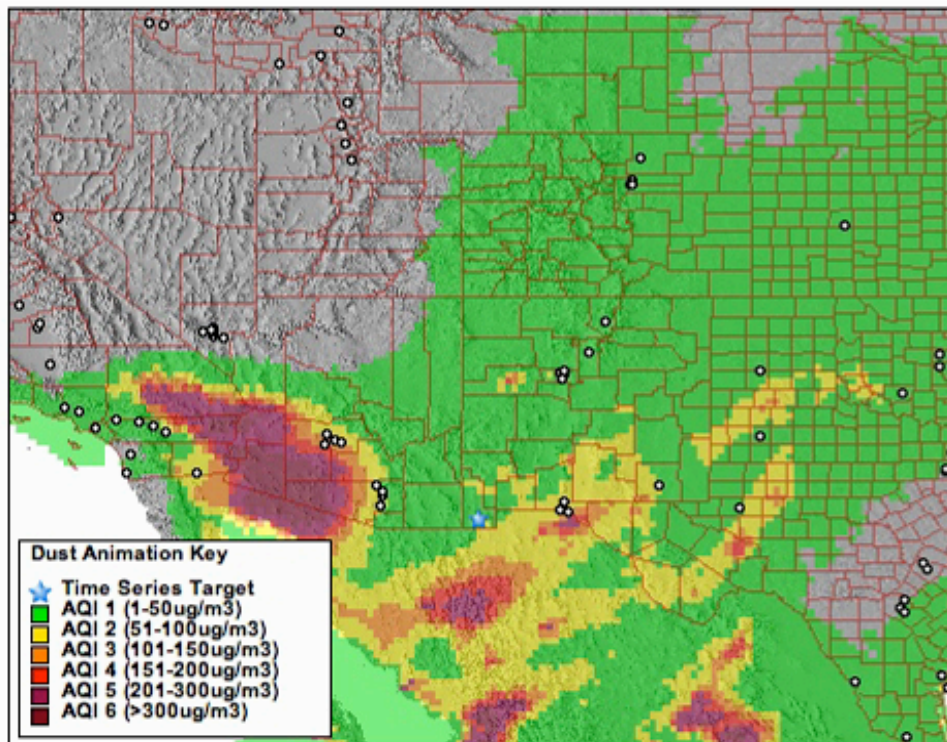


# PHAiRS Map Output from DREAM: T = 0

File Edit Movie Favorites Window Help

## PHAiRS Dust Animation Client

49 hr Dust Model for User Selected Point (PM 2.5) beginning on 02-24-2007 at 00:00:00 hours UTC



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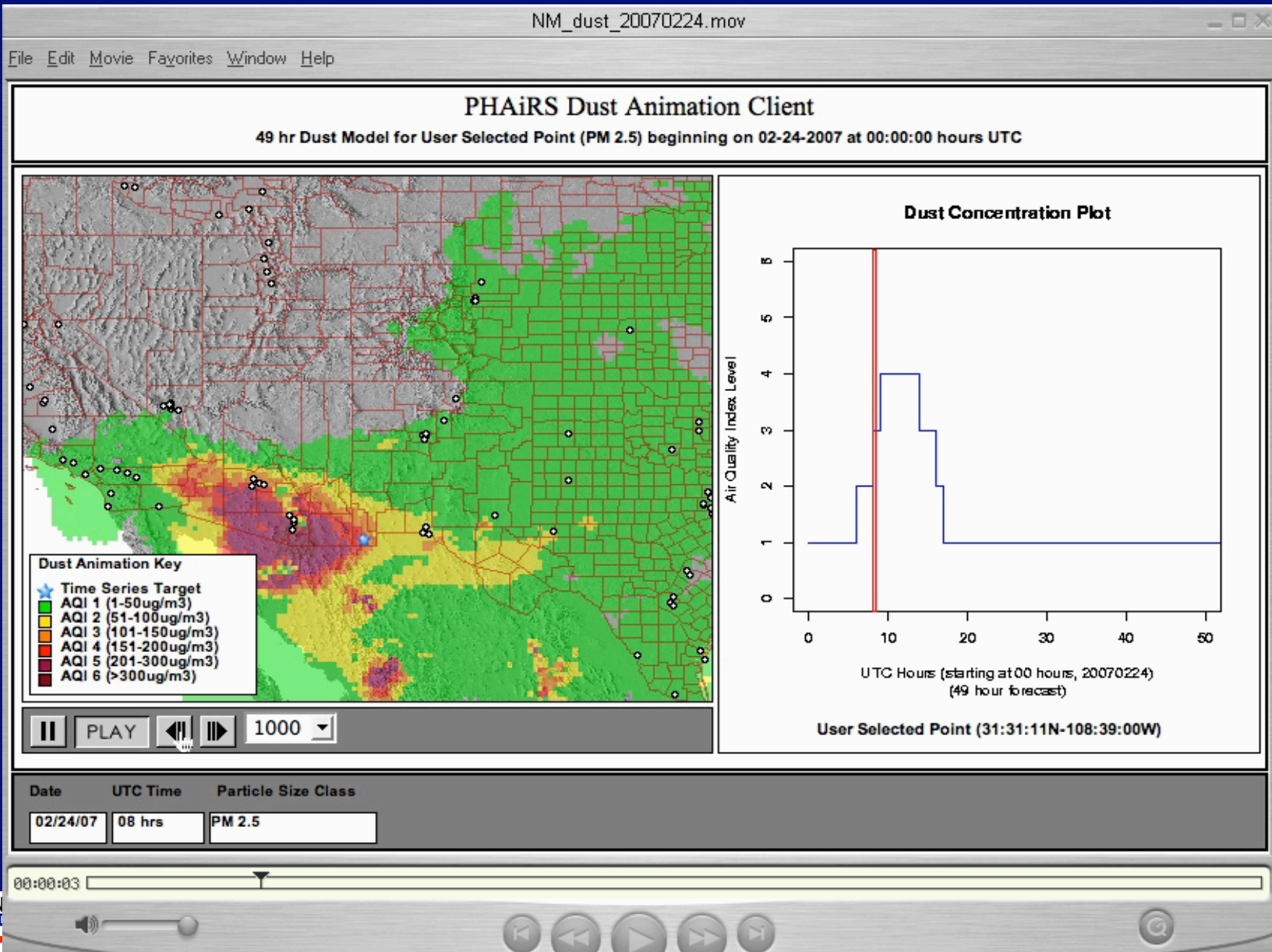
Date	UTC Time	Particle Size Class
02/24/07	00 hrs	PM 2.5

00:00:00

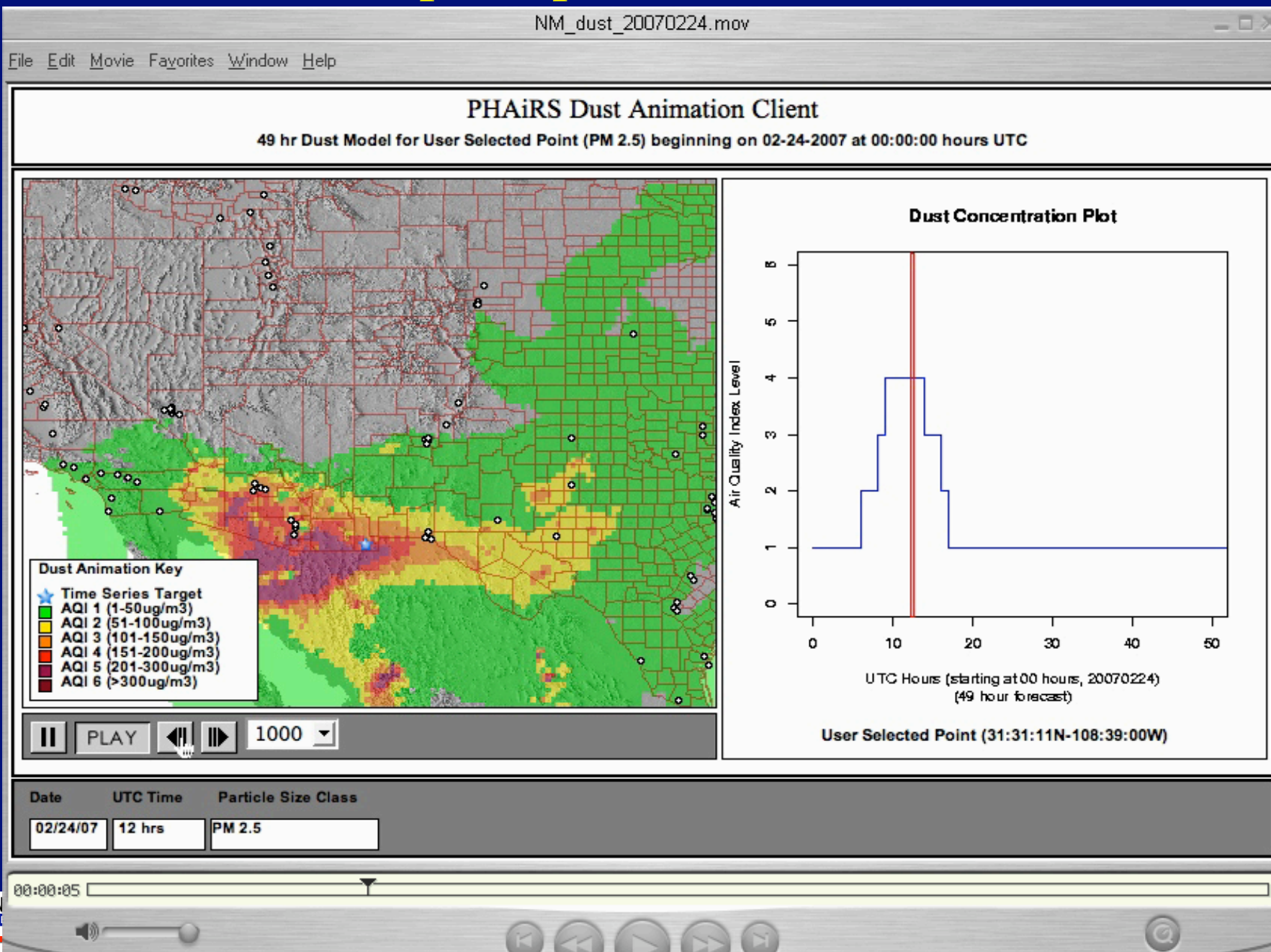
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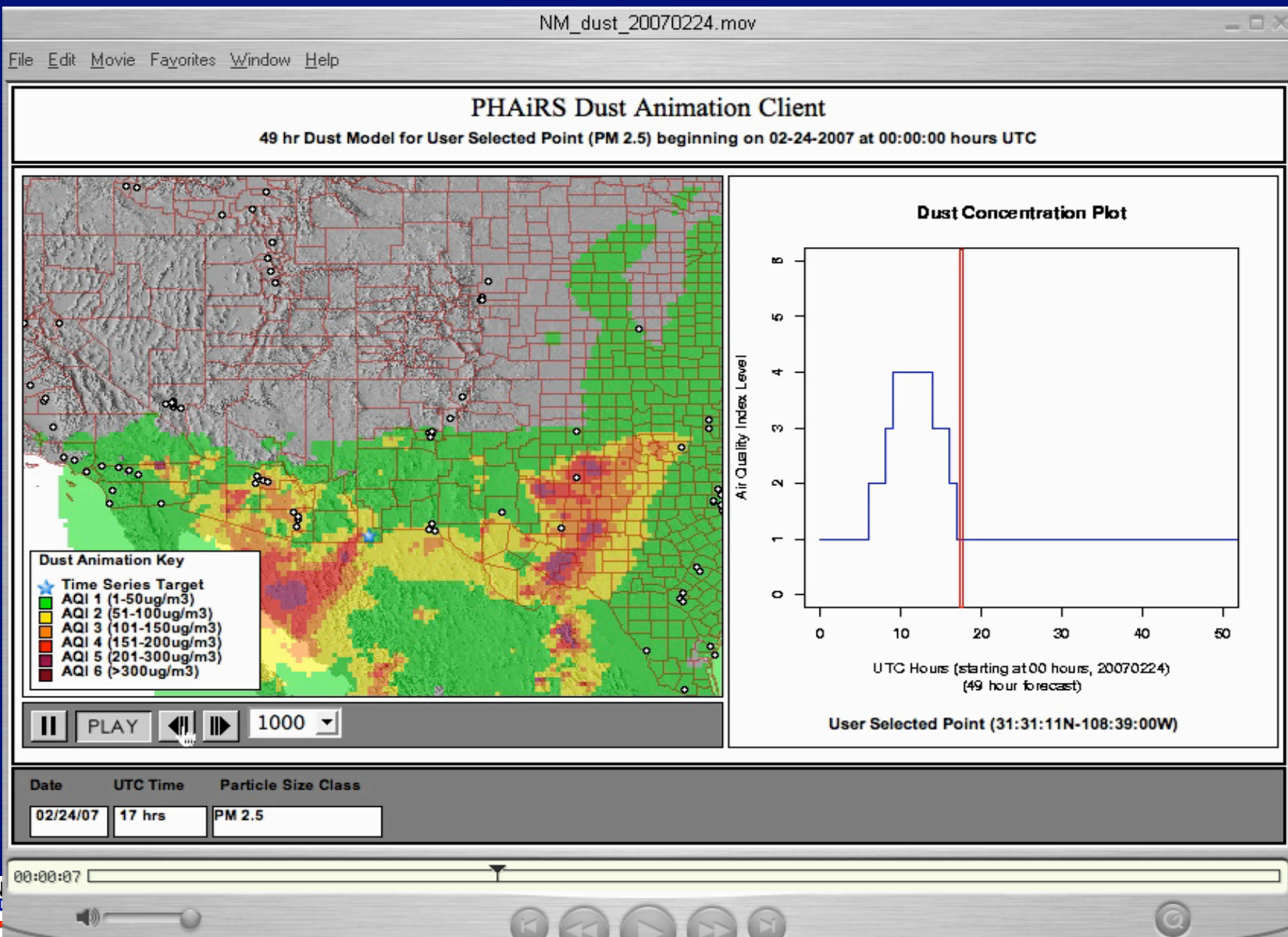
# PHAiRS Map Output from DREAM: T = 8



# PHAiRS Map Output from DREAM: T = 12



# PHAiRS Map Output from DREAM: T = 17





## Tracking DREAM-New Mexico Project Summary

- **Pilot Study showed two-day lagged increased asthma visits with increased ozone (and possibly PM<sub>2.5</sub>)**
- **NASA/PHAiRS/DREAM modeled PM<sub>2.5</sub> and PM<sub>10</sub> data linkage with asthma and myocardial infarction data will be conducted in 2007**
- **Progress toward a locally-calibrated metric for monitoring environmental public health**

## **CDC Tracking Program:**

For more information: [www.cdc.gov/nceh/tracking](http://www.cdc.gov/nceh/tracking)

Contact us: [EPHT@cdc.gov](mailto:EPHT@cdc.gov)

## **New Mexico Department of Health Tracking Program:**

Contact us: [len.flowers@state.nm.us](mailto:len.flowers@state.nm.us)

# Questions

