

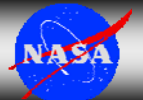


# Public Health Applications in Remote Sensing

## Adding GIS and Earth Observations to Syndromic Surveillance

Stan Morain, Ph.D.  
Earth Data Analysis Center  
University of New Mexico

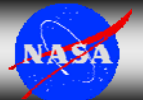
International Society for Disease Surveillance  
October 20, 2006  
Baltimore, MD





# Topics

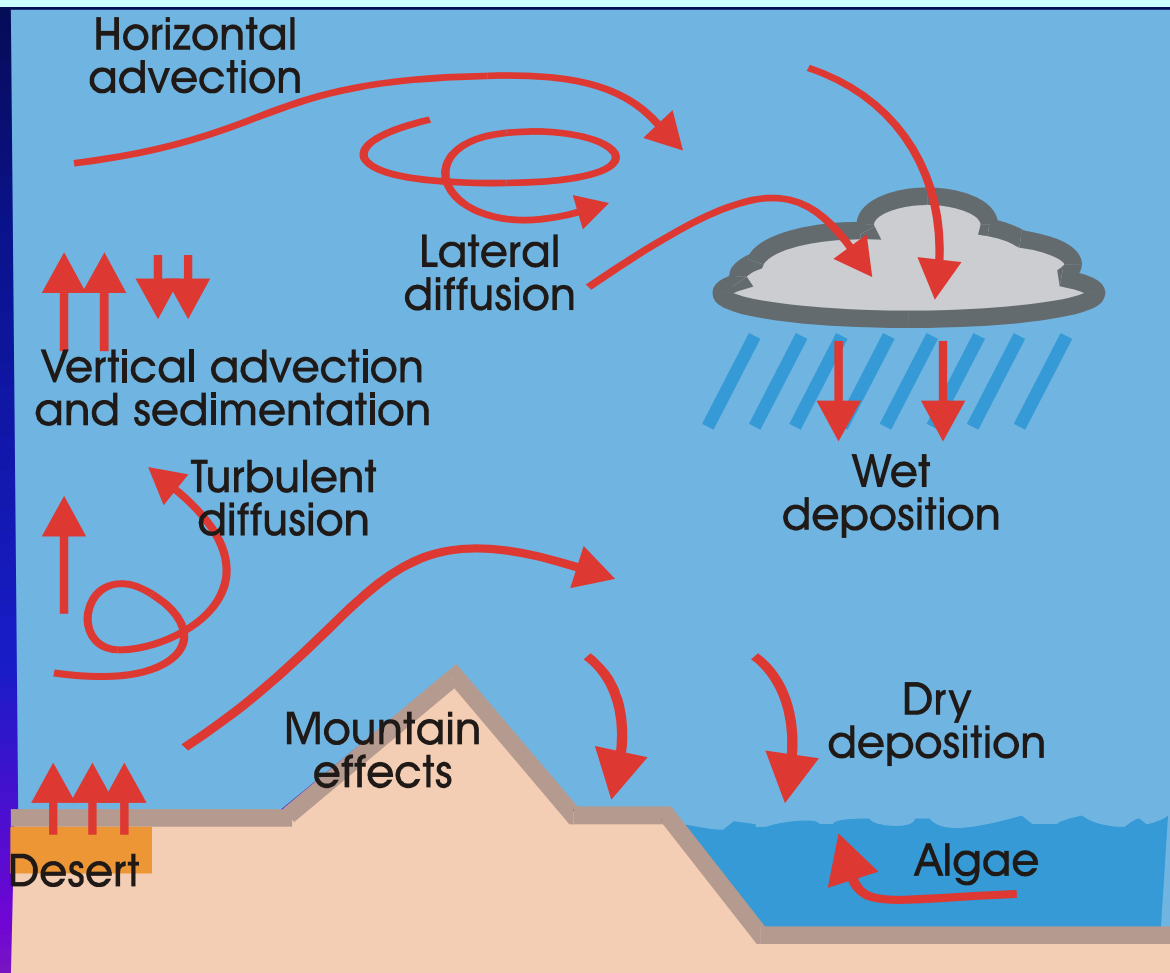
- Forecasting PM-2.5,10
- Verifying and validating model performance
- Visualization and statistical analyses
- Information for decision support
- Next Steps





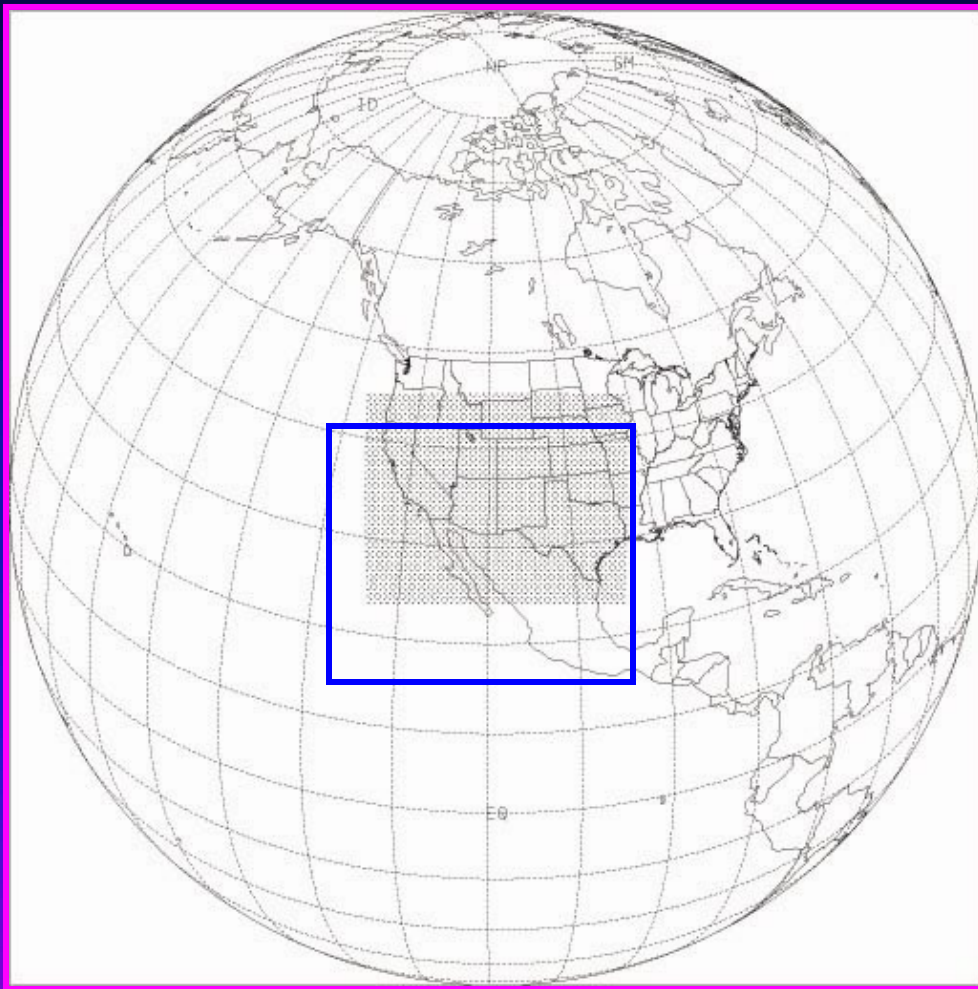
# DREAM's GOVERNING EQUATION

$$\frac{\partial C_k}{\partial t} = -u \frac{\partial C_k}{\partial x} - v \frac{\partial C_k}{\partial y} - (w - v_{gk}) \frac{\partial C_k}{\partial z} - \nabla \cdot (K_H \nabla C_k) - \frac{\partial}{\partial z} \left( K_Z \frac{\partial C_k}{\partial z} \right) + \left( \frac{\partial C_k}{\partial t} \right)_{SOURCE} - \left( \frac{\partial C_k}{\partial t} \right)_{SINK}$$

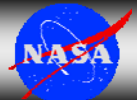




# Model Domain



- Domain center at  $(109^{\circ}\text{W}, 35^{\circ}\text{N})$
- Horizontal semi-staggered Arakawa E grid
- Horizontal grid spacing  $1/3$  degree



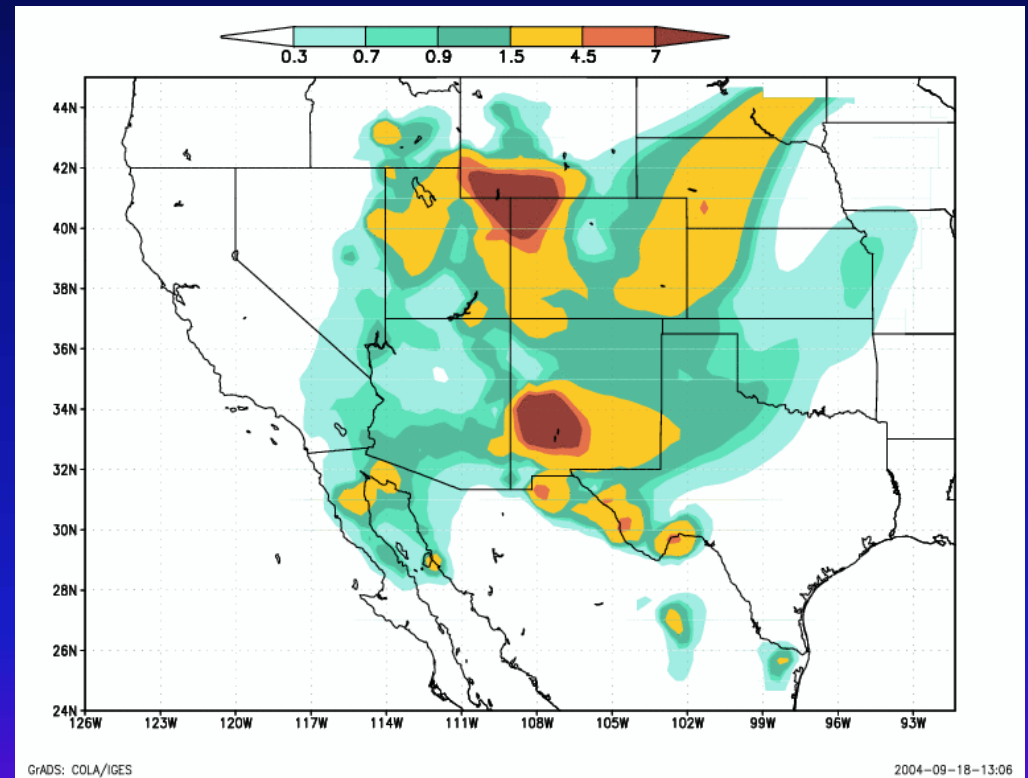


# Observed Visibility vs Modeled Dust Concentrations Dec. 15-16, 2003



Texas

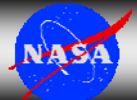
Continuous Air Monitoring Stations



DREAM Baseline (no EO data included)



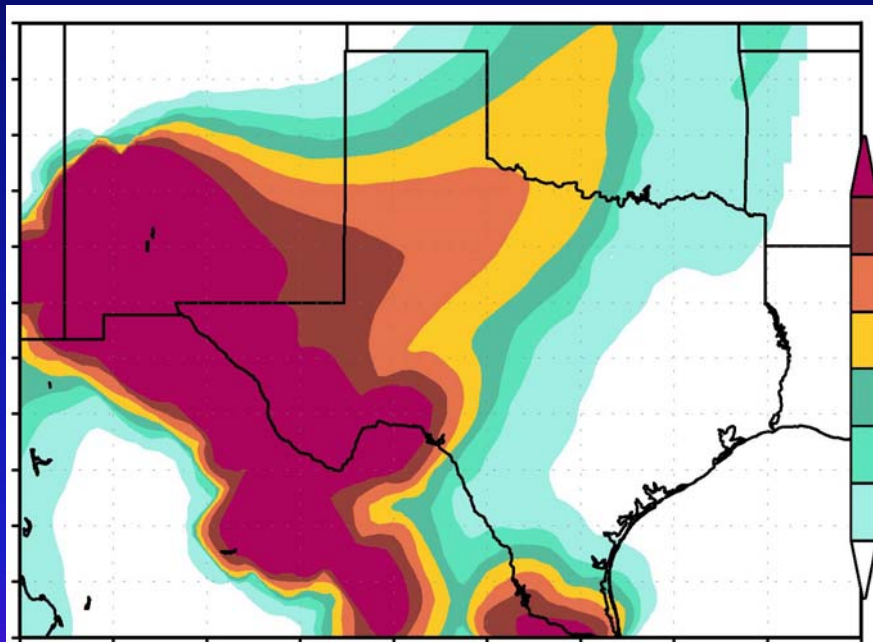
ISDS, Baltimore, 2006



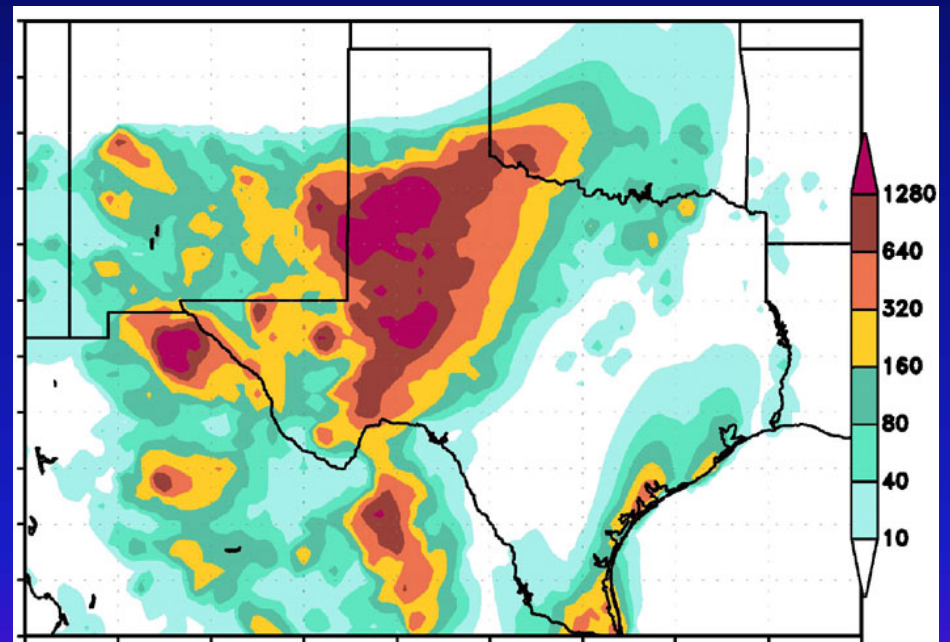




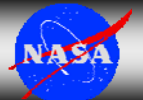
# Comparison of DREAM Dust Concentrations at 20Z 15 Dec 03



Static Surface Inputs



EO Surface Inputs



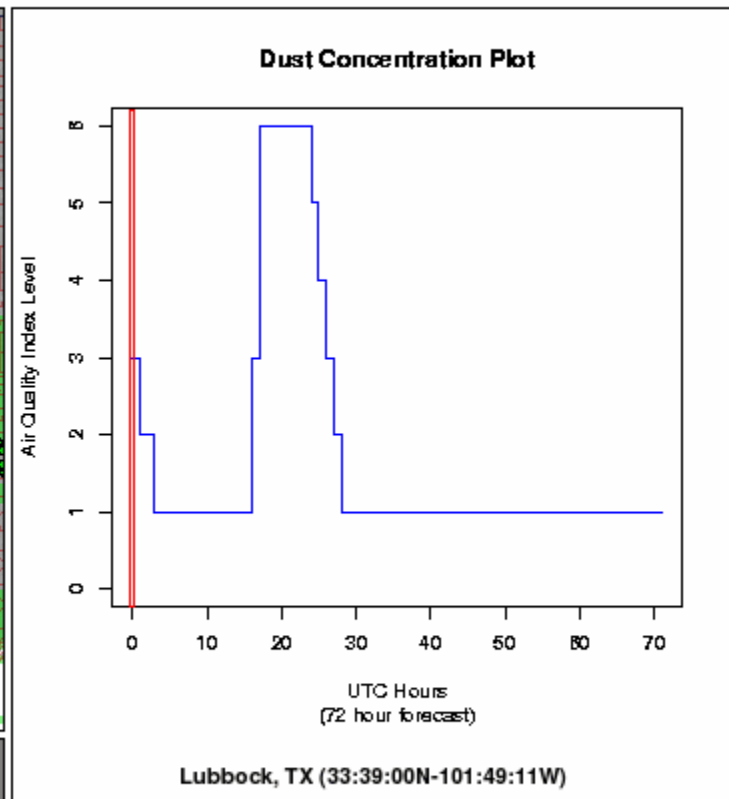
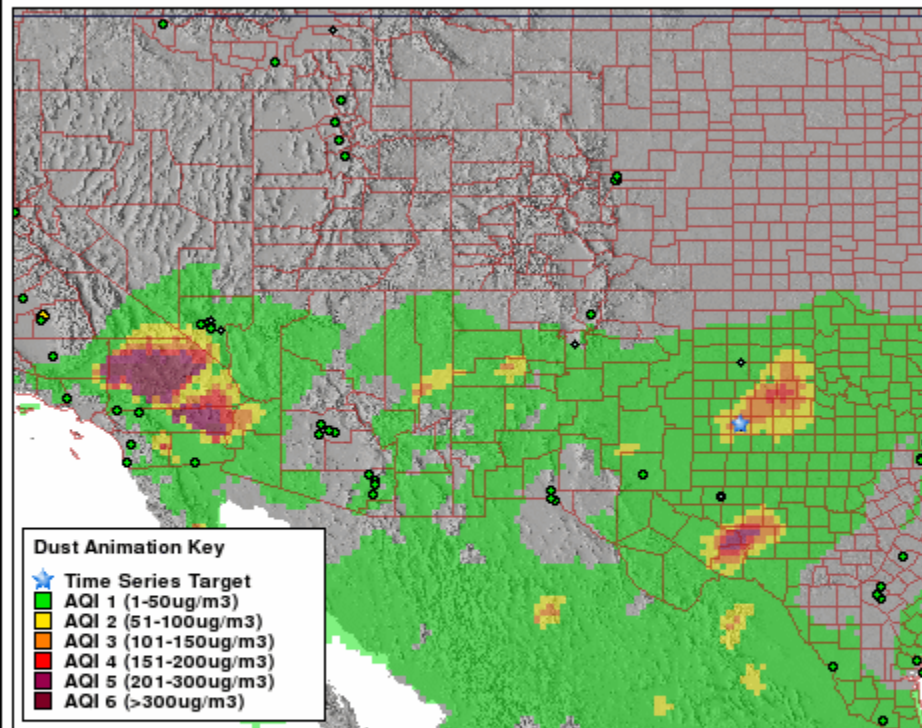


# PHAIRS Dust Animation

## 72 Hr Dust Outlook for Lubbock, TX (PM-10)

PHAIRS Dust Animation Client

72 hr Dust Model for Lubbock, TX (PM 10)



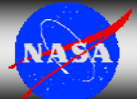
|| PLAY ||| 200

Date	UTC Time	Particle Size Class
12/15/03	00 hrs	PM 10

Generate PDF of Current Animation Step



ISDS, Baltimore, 2006





# Data Assimilation Concept

e.g. Environ

Other data in:  
Raster/Vector

Dust/Smoke  
Questions  
Where, When, How much

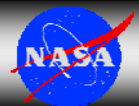
Epidemiologists  
Analysis & Visualization

State DOH, CDC  
Via NEDSS

Data in:  
Doctors/Schools

*Report*

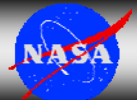
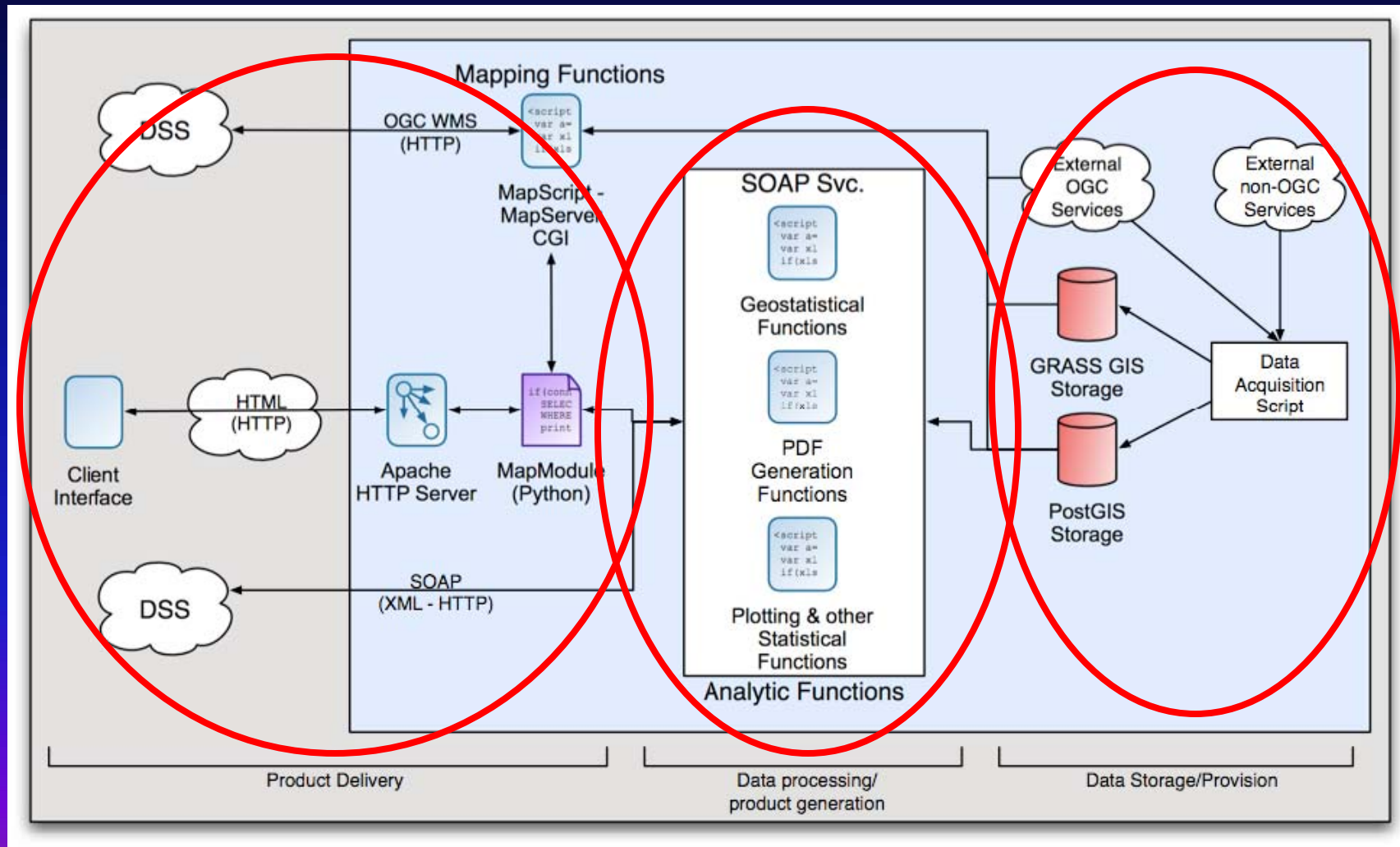
Health Questions  
Respiratory syndromes







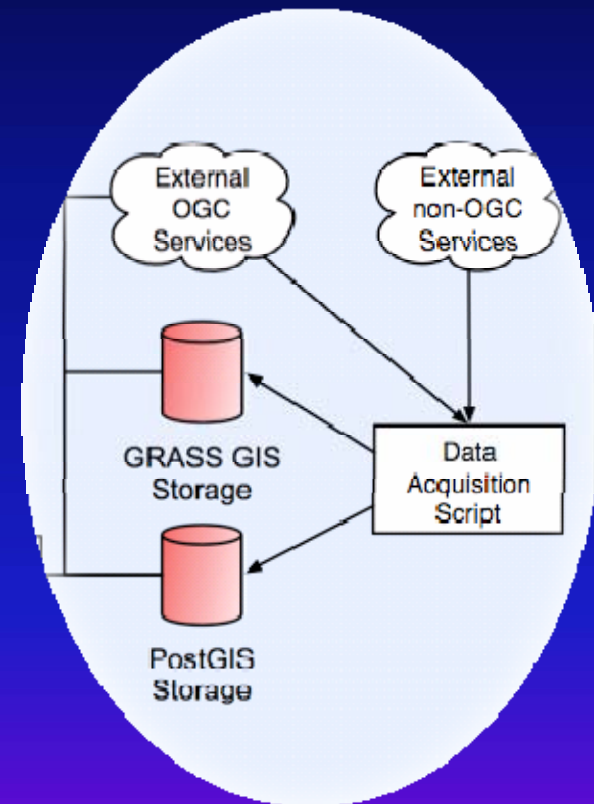
# Developing a Service Oriented Architecture





# Data Storage

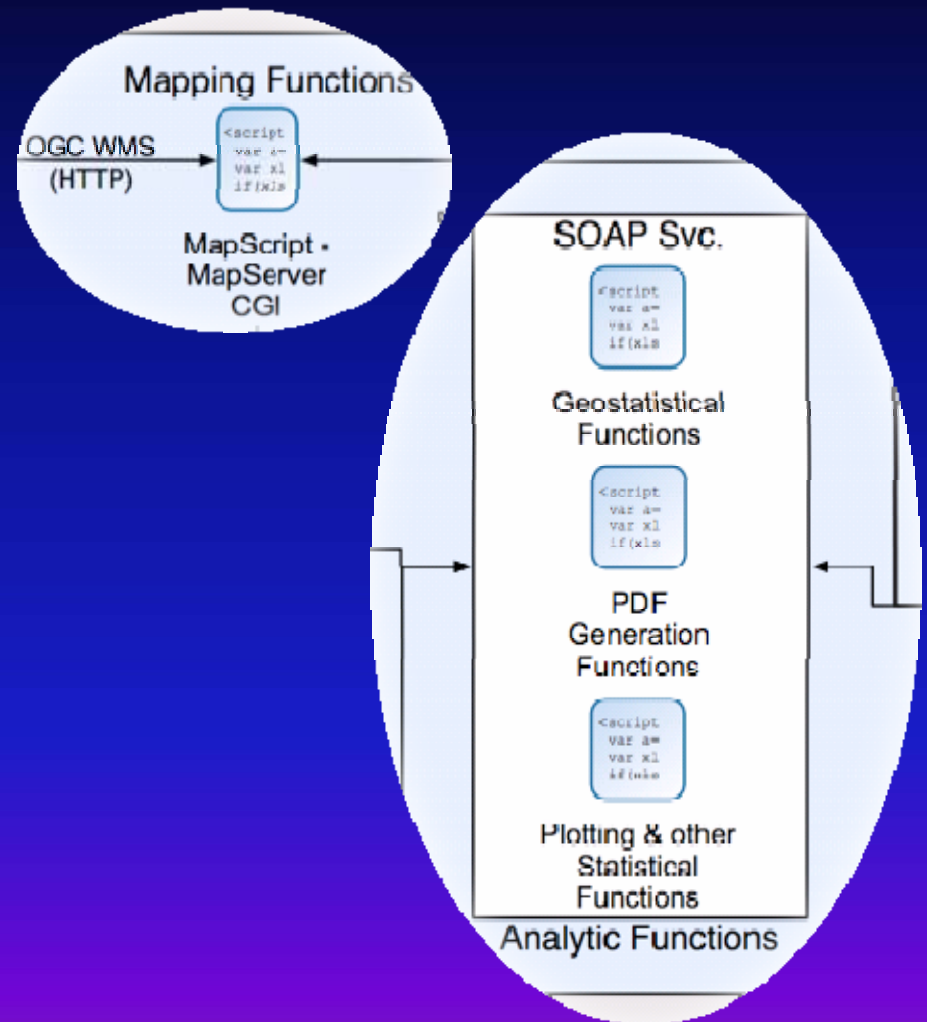
- Store geospatial and related attribute data, and external data resources
- Includes:
  - GRASS GIS
  - PostGIS
  - External OGC service providers
  - External non-OGC service providers





# Product Generation

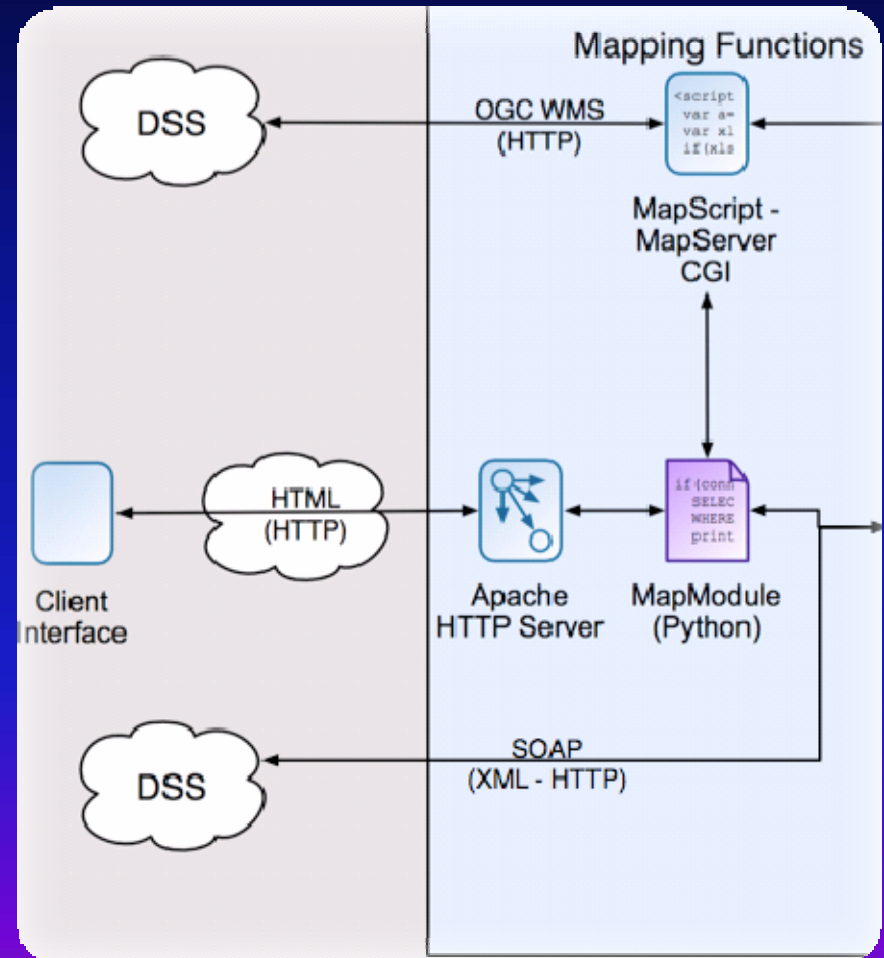
- Two service models
  - OGC WMS
  - W3C SOAP
- SOAP services provide:
  - Geostatistical analysis functions
  - Statistical and graphics generation
  - High quality PDFs





# Product Delivery

- Products delivered via
  - OGC WMS
  - SOAP services
  - Client interface
- Enhancing DSSs by
  - Integrating PHAIRS products into existing DSS
  - Linking directly from DSS to the client interface

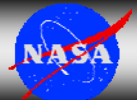






## Next Steps

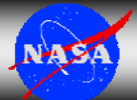
- Transition to NCEP/NMM
- Complete a 3-year retrospective statistical analysis of daily atmospheric and dust observations; and transition to forecast
- Initiate Beta-test program
- Evolve efficient and effective information products as per Beta-test results





# Acknowledgements

- University of New Mexico
  - Karl Benedict
  - William Hudspeth
  - Amelia Budge
  - Gary Sanchez
- University of Arizona
  - William Sprigg Co-PI
  - Dazhong Yin
  - Brian Barbaris
- Collaborators
  - TX Tech Health Science Ctr
  - Lubbock
  - Az Dept. of Health
  - NM Dept. of Health
  - Pima Co., AQO
  - Bernalillo Co., AQO
  - ARES/ SYRIS





# Public Health Applications in Remote Sensing

Thank you

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ISDS, Baltimore, 2006

