ENPHASYS Project: 3rd Annual Review

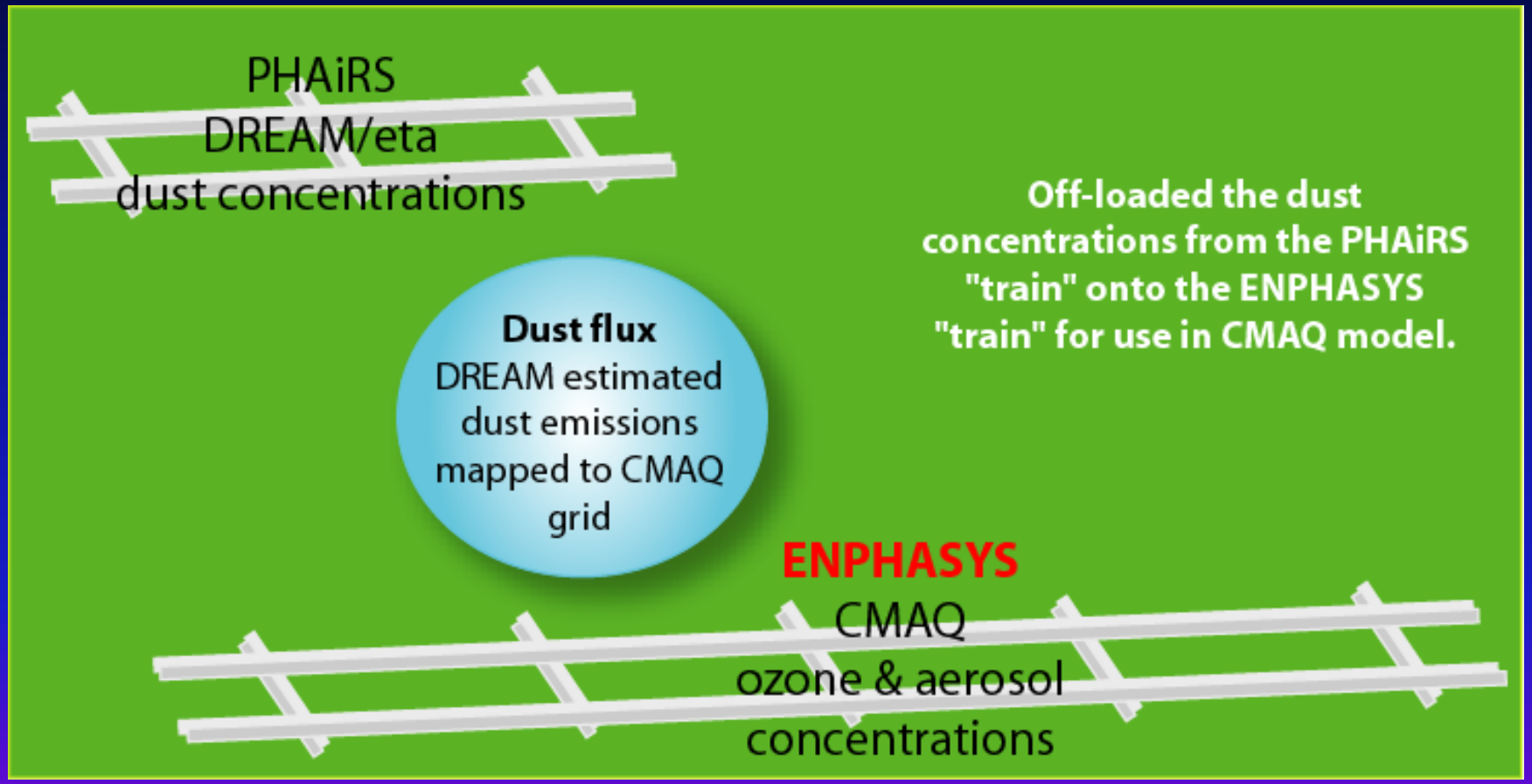
Stan Morain, PI

And

ENPHASYS Team

NASA Public Health Program Review ◆ September 27-28, 2010 ◆ San Antonio, TX

Strategy


PHAiRS
DREAM/eta
dust concentrations
Off-loaded the dust concentrations from the PHAiRS "train" onto the ENPHASYS "train" for use in CMAQ model.
Dust flux
DREAM estimated dust emissions mapped to CMAQ grid
ENPHASYS
CMAQ
ozone & aerosol
concentrations

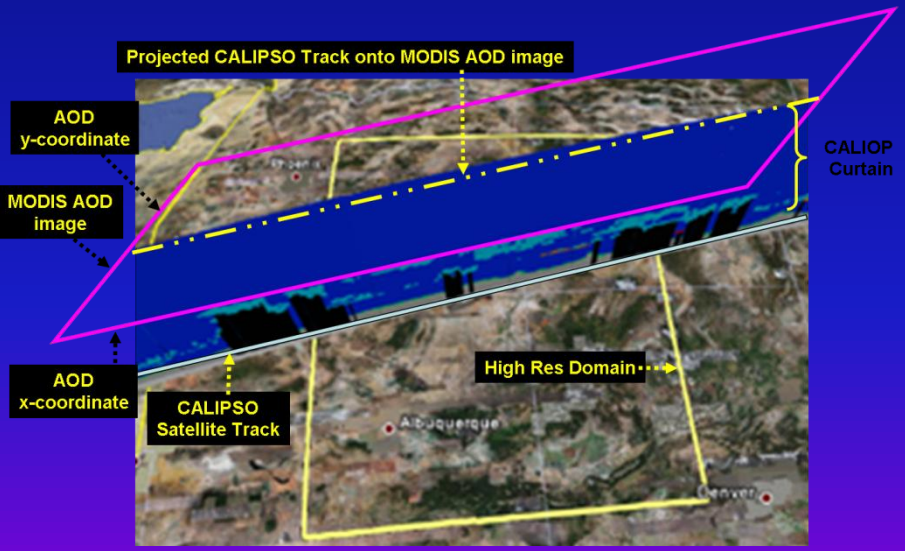
Status of Year-3 Tasks

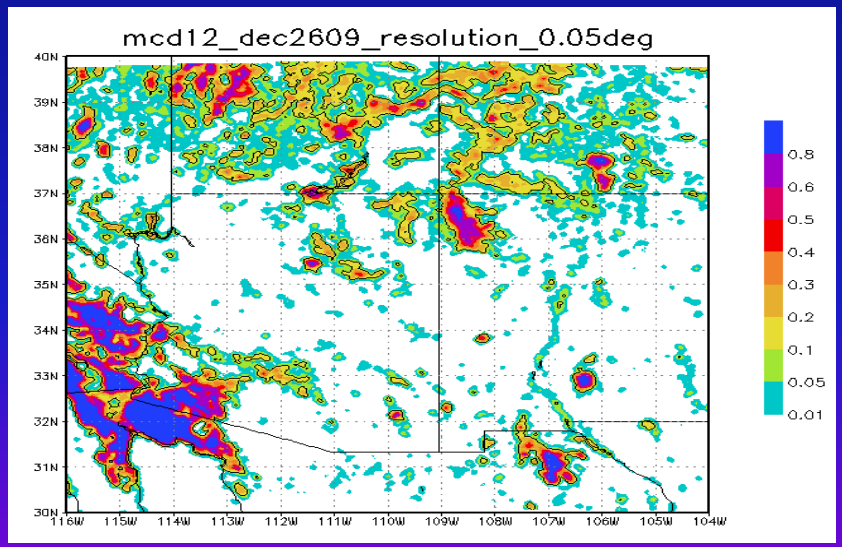
1. Compare MOD12 to MCD12 outputs using & w/o dust source updates
2. Produce daily DREAM outputs using dust masks
3. Produce retrospective model runs of known dust episodes, 2008 & 2009
4. Execute V&V on retrospective and daily model runs
5. Push dust flux output to MSFC for CMAQ modeling of aerosols & ozone
6. Install CMAQ at UNM
7. Execute routine CMAQ model runs for speciated aerosols and ozone
8. Evaluate MODIS AOD for 2006, 2007, & 2008
9. Compare CALIOP curtains with AOD patterns for 2006, 2007, & 2008
10. Assess ability to distinguish anthropogenic from natural air quality episodes
11. Produce twice-monthly dust source distribution updates & evaluate patterns
12. Post-process DREAM/eta and CMAQ model outputs
13. Develop metadata for CMAQ and DREAM/eta products
14. Develop prototype products for EPHTS/N and prototype dust advisories
15. *Environmental Tracking for Public Health Surveillance*

White = completed; Yellow = in progress; Green = needs attention

Accomplishments Oct 2009 to Mar 2010

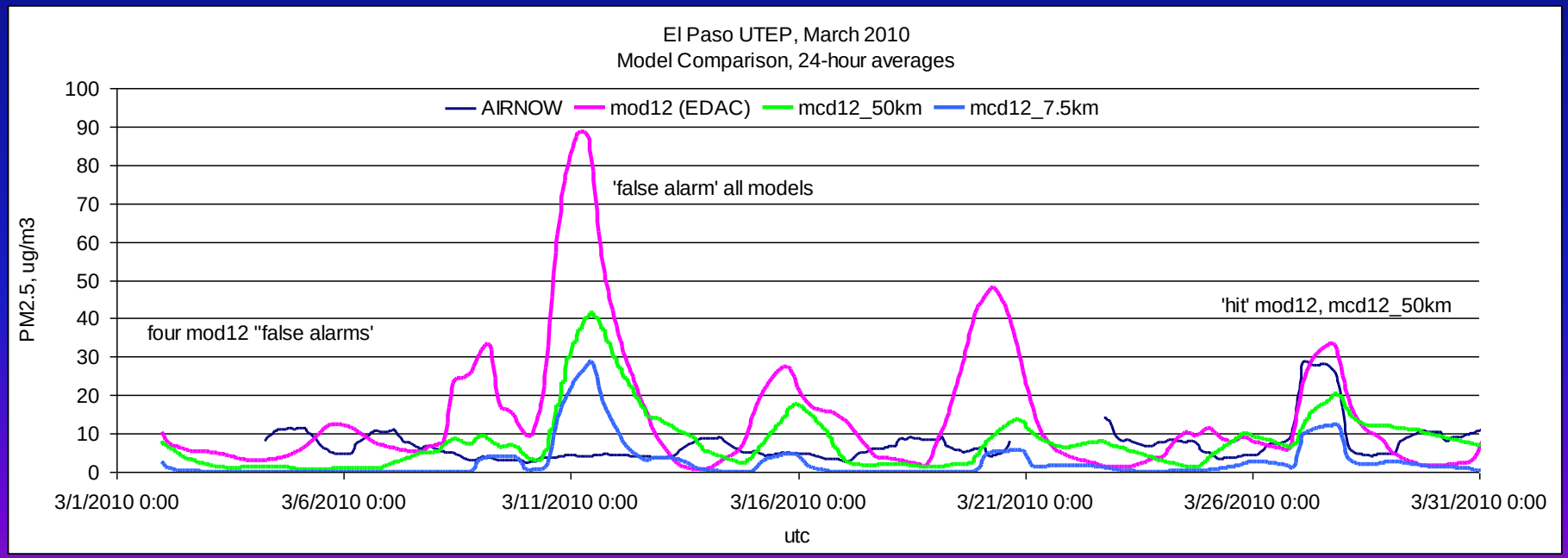
1. UA solved issues at UA comp ctr & tested DREAM/eta with dust masks
2. UNM with MSFC developed plan to validate CALIOP w/ MOD/AOD
3. MSFC base-lined 2 dust events in CMAQ using WRF-SMOKE
4. A naming convention was created for ENPHASYS inputs and outputs
5. Began routine production of DREAM/eta forecasts using dust masks
6. Transferred CMAQ model grids to model fugitive dust, speciated aerosols, and O3





Accomplishments Apr 2010 to Sep 2010

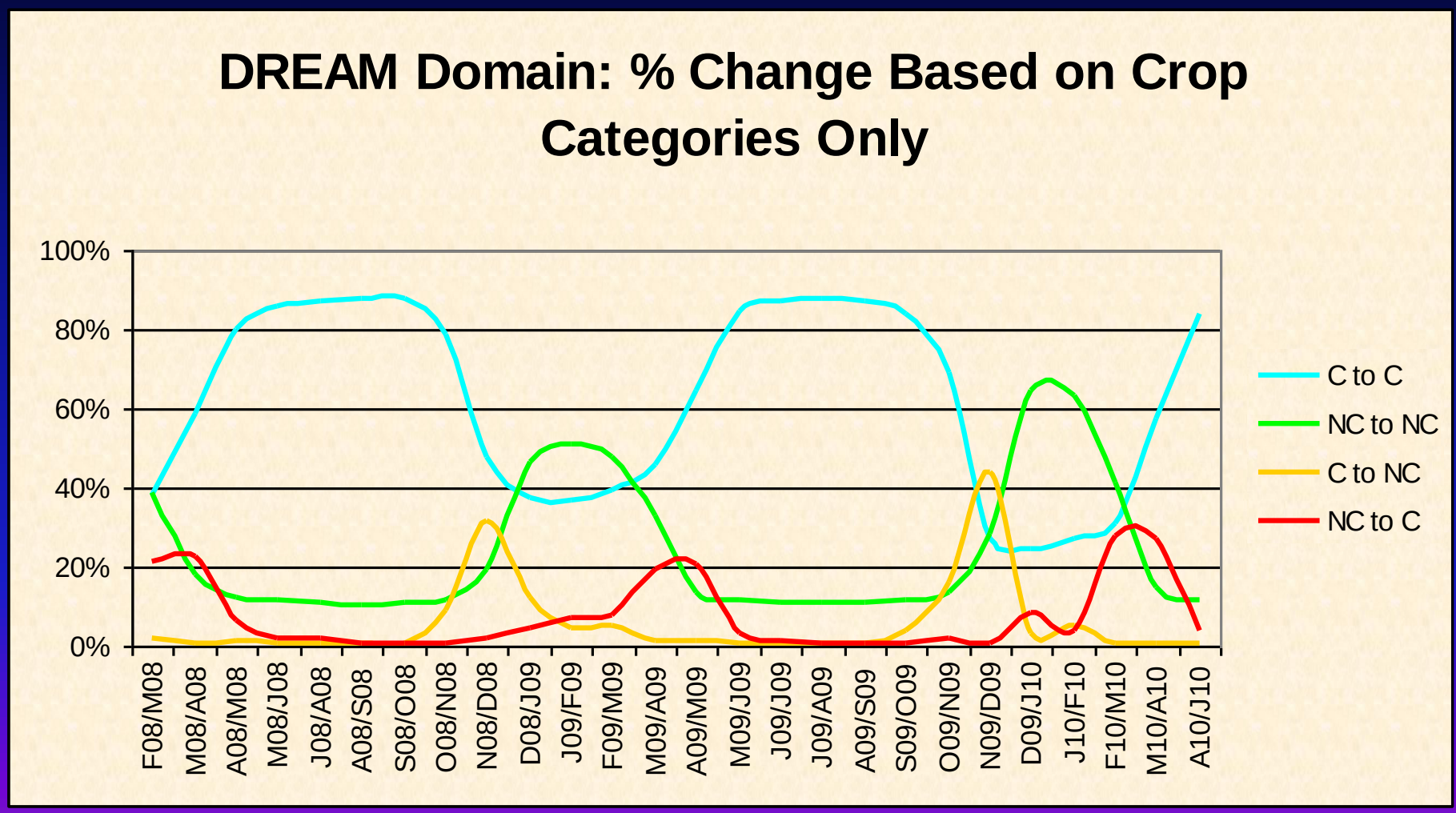
1. Compared MOD12 and MCD12 model runs to assess performance
2. Completed model runs to compare MOD12 w/ MCD12 with and w/o dust source updates
3. Installed CMAQ model at EDAC
4. Initiated metadata templates for EPHTS/N products
5. Designed a dust advisory initiative for cities and towns across AZ and NM
6. Processed and evaluated CALIOPE data for verifying aerosol episodes



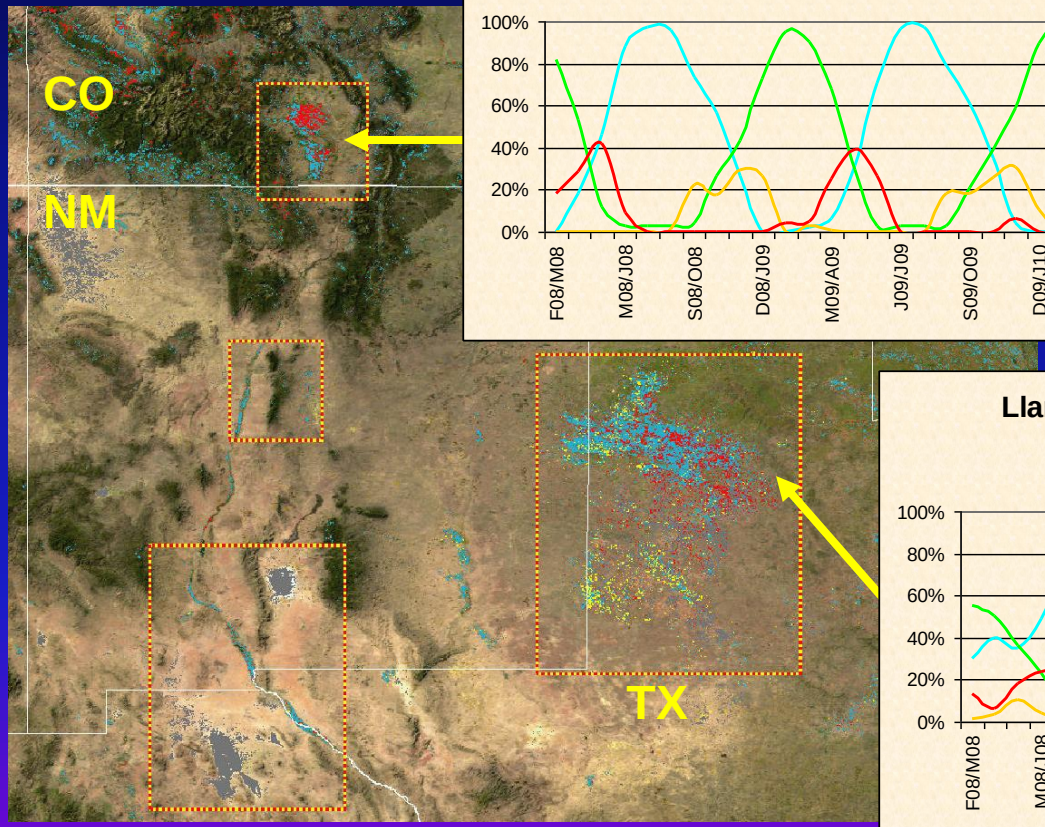
Outreach

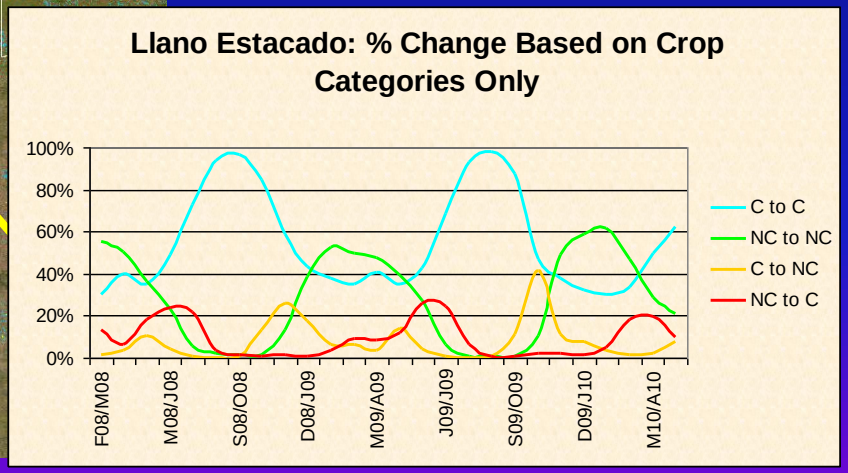
- Created / updated brief for *Public Health Highlights*
- Created brief for *PH Accomplishments*
- Created 1-page NASA flyer
- Published peer-reviewed chapter in JBGIS book
- Participated in EOM Conf. & prepared Use Case
- Poster Session at AGU, Dec 2009, San Francisco
- Presented at AMS, Jan 2010, Atlanta
- Presented at ATS, May 2010, New Orleans
- Presented at Space Technology Applications for Socio-Economic Benefits, Sep 2010, Istanbul

Month-to-Month Changes in Agricultural Dust Sources Across DREAM Domain

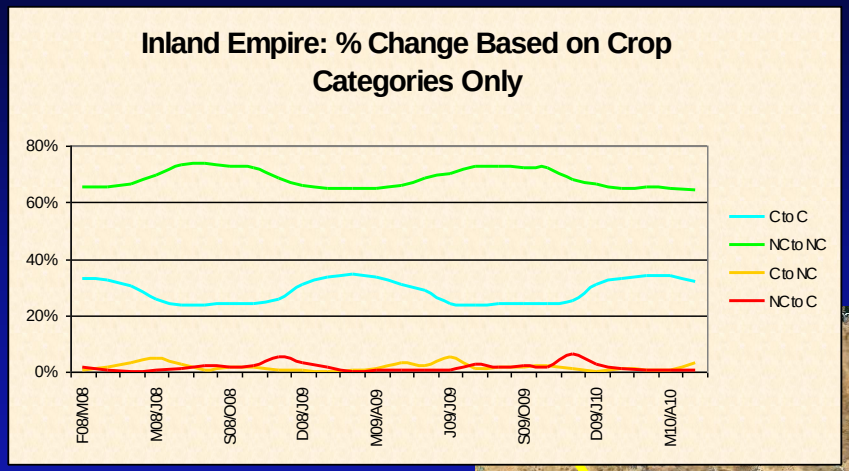


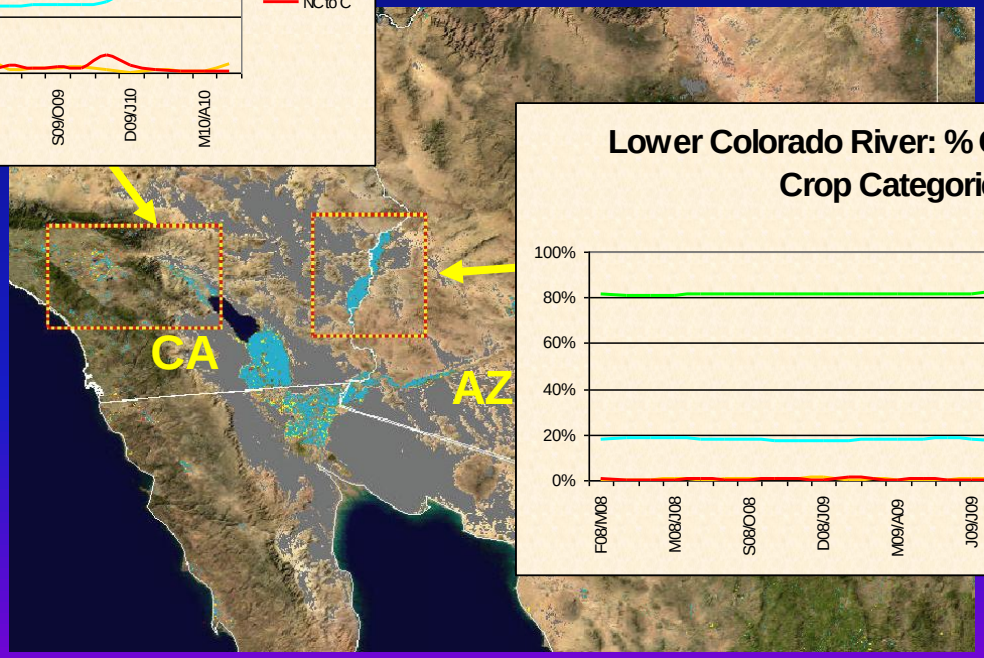
Areas of Greatest Seasonal Variation in Dust Sources from Agriculture





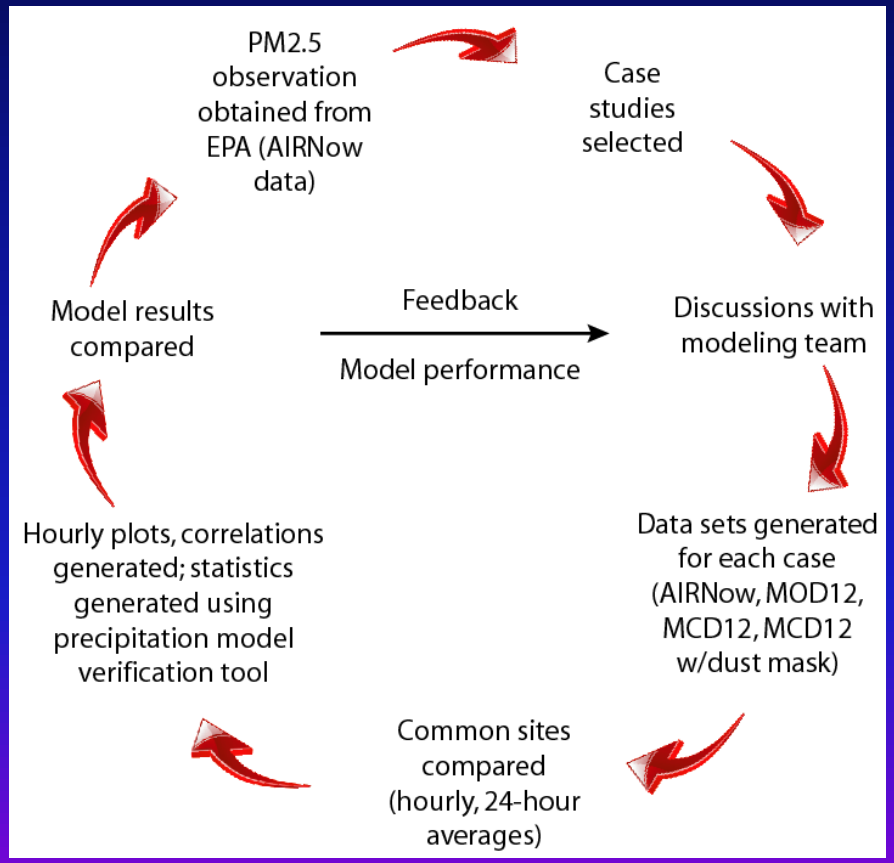
Areas of Least Seasonal Dust Source Variation from Agricultural Fields



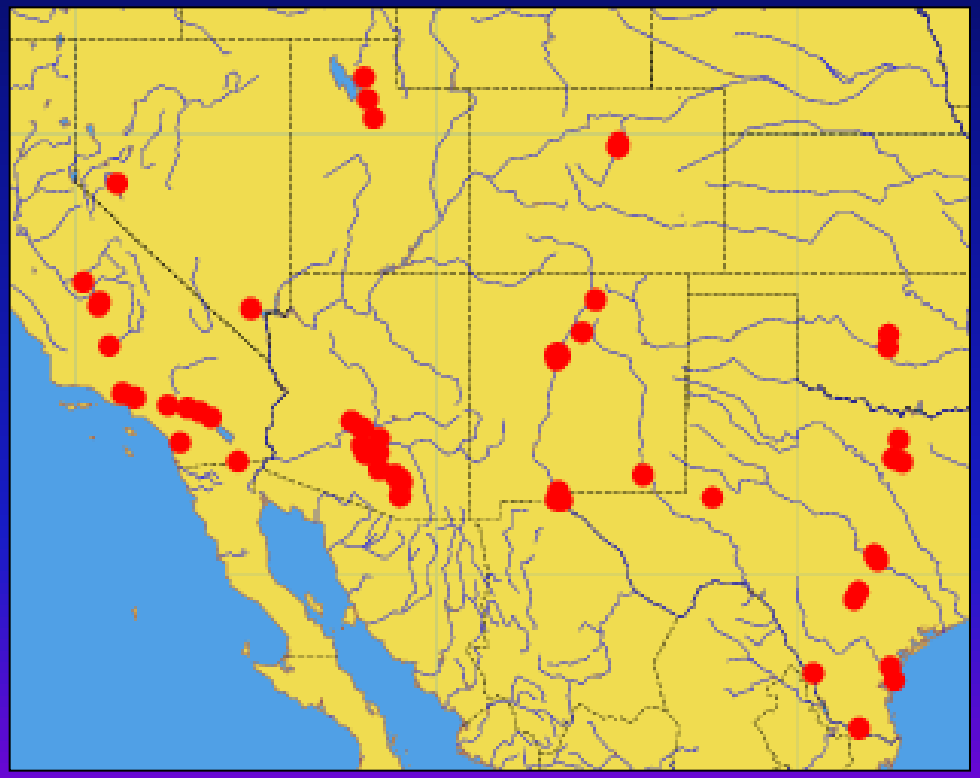


Verification & Validation

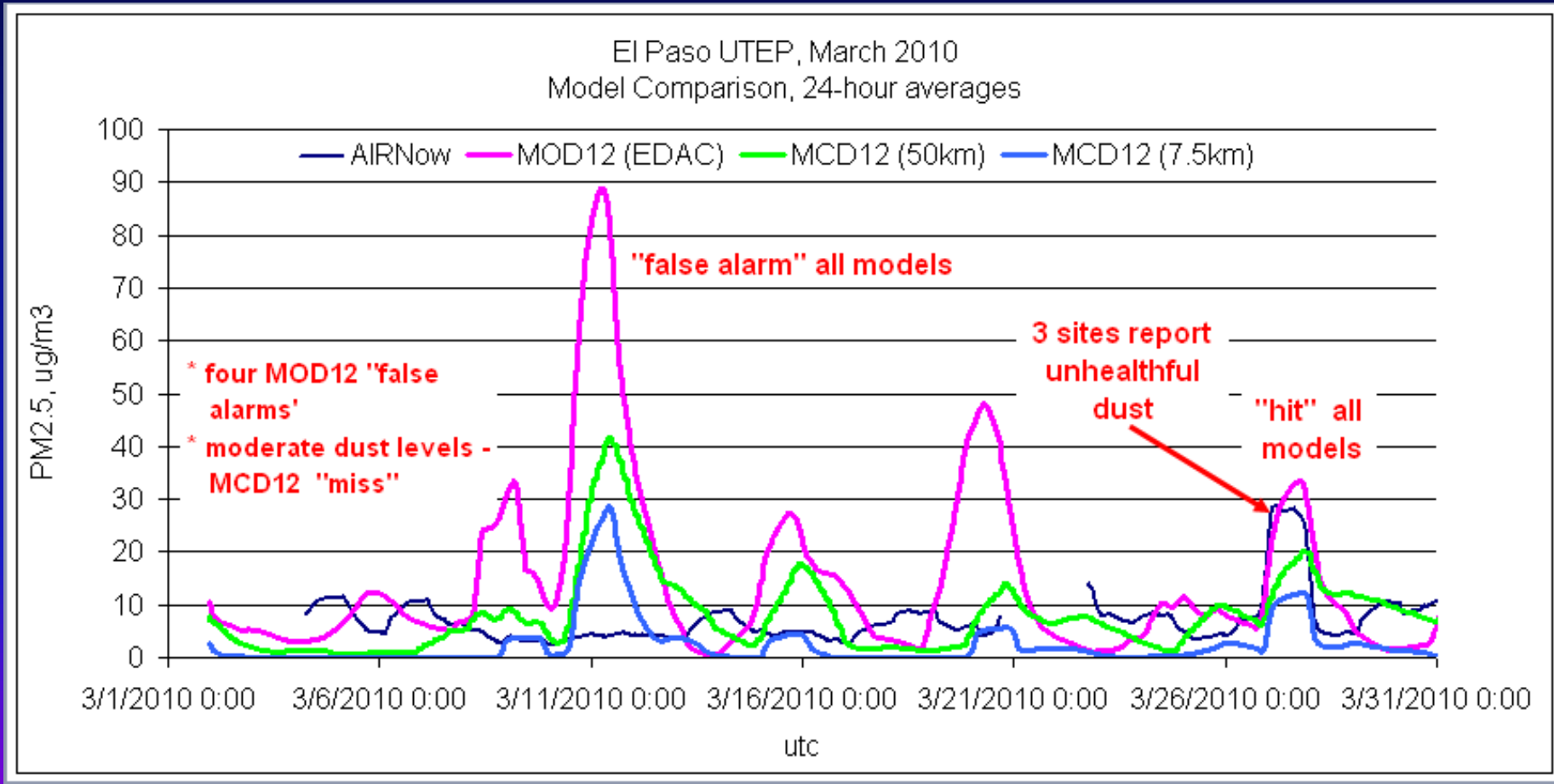
V&V Process Steps



Distribution of PM2.5 AIRNow Stations



Comparing Performance of Models to AIRNow Observations

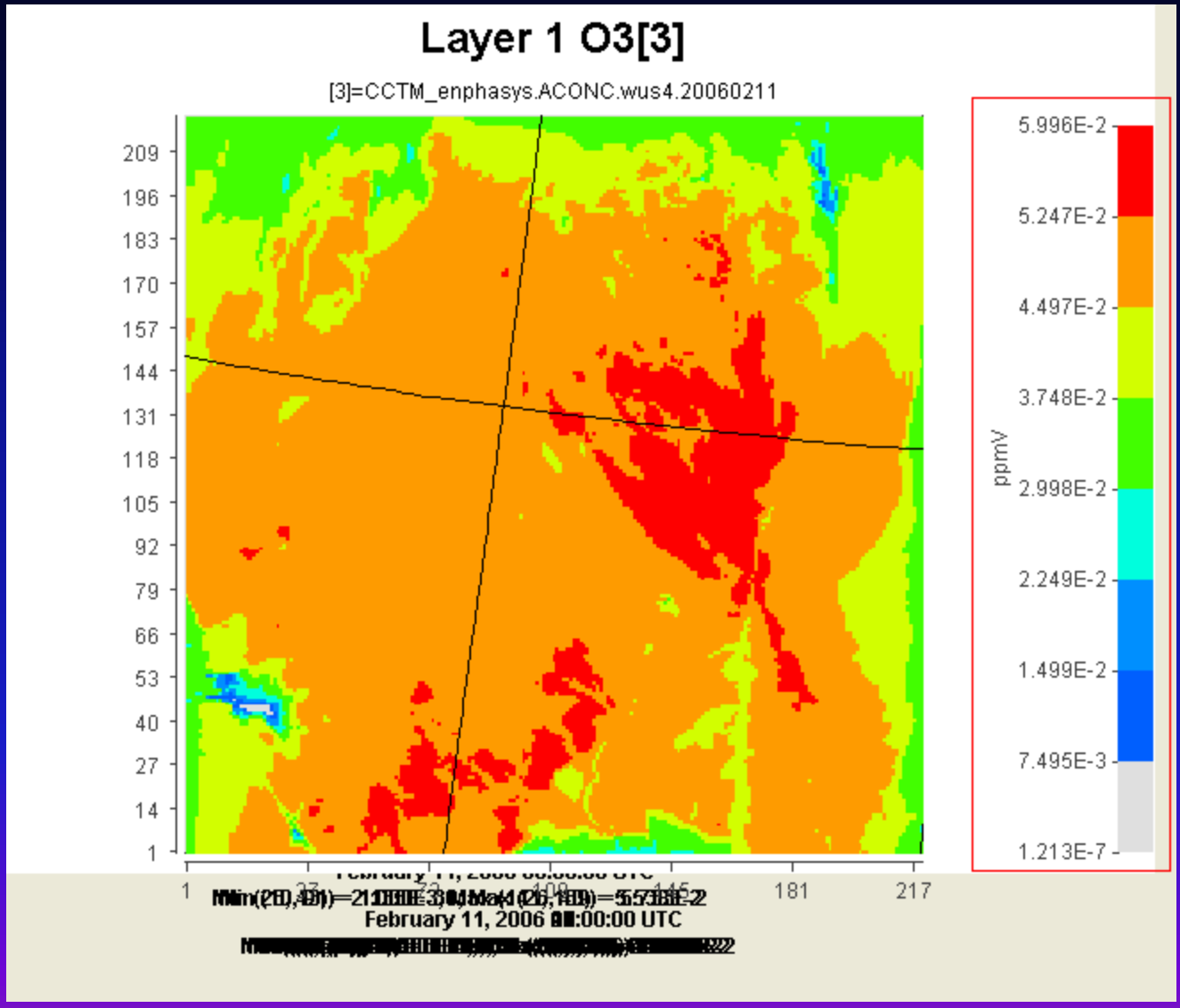


March 2010 Data Analysis
(AIRNow and MCD12 Model Outputs)

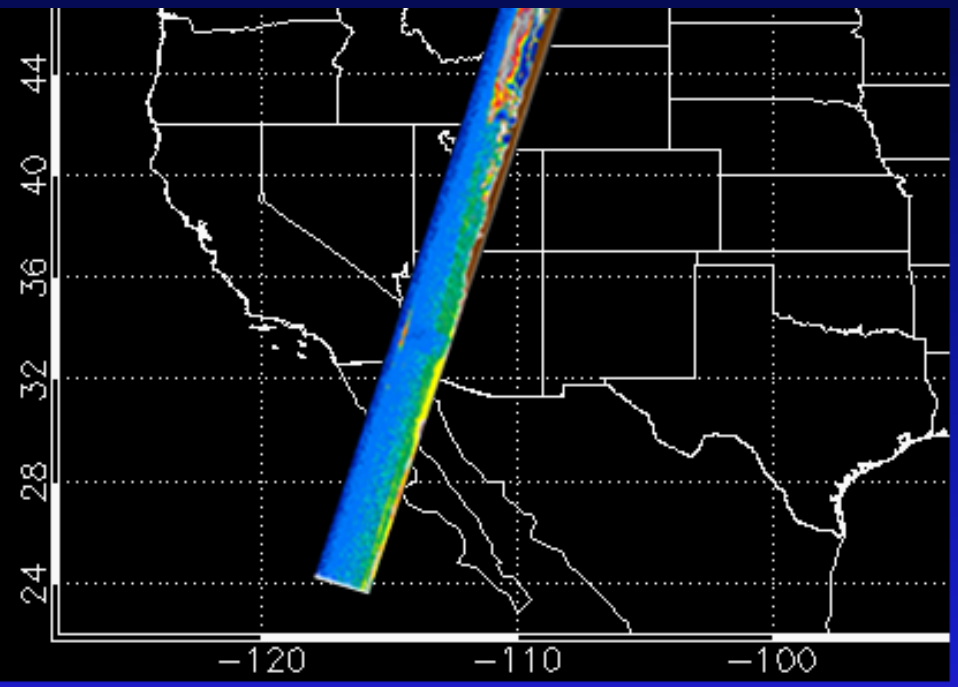
Model resolution	# sites modeled	# days	N	Hits	Misses	False alarms	Non-event days	False alarm ratio	# false alarm days, all sites	# false alarm days, southern CA
7.5 km	23	31	713	0	3	17	693	0.02	9	8
50 km	23	31	713	1	3	55	654	0.08	19	13
50 km	59	31	1829	1	3	203	1622	0.11	28	19

- Model performance evaluated during a relatively “healthy” month for dust
- The low (50 km) resolution model produced a false alarm somewhere in the model domain almost every day (28 of 31 days)
- The high (7.5 km) resolution model produced a 2% false alarm rate, but only one false alarm outside of southern California
- The high resolution model missed the 3/27 event in El Paso; low resolution model indicated a “hit”

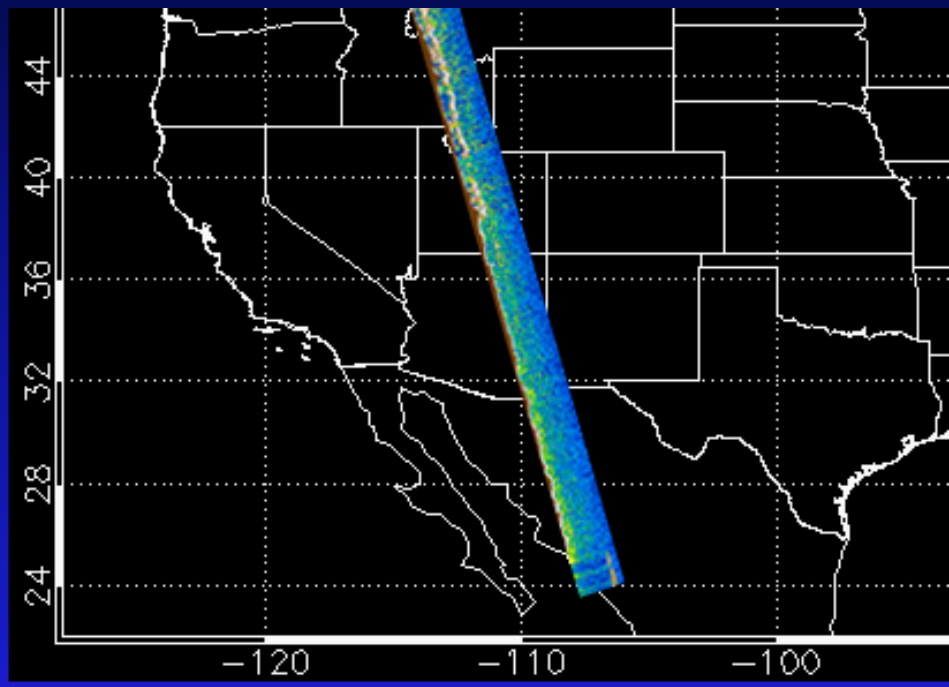
Ozone & Aerosol Tasks



CALIOP Curtains
Ascending and Descending Passes



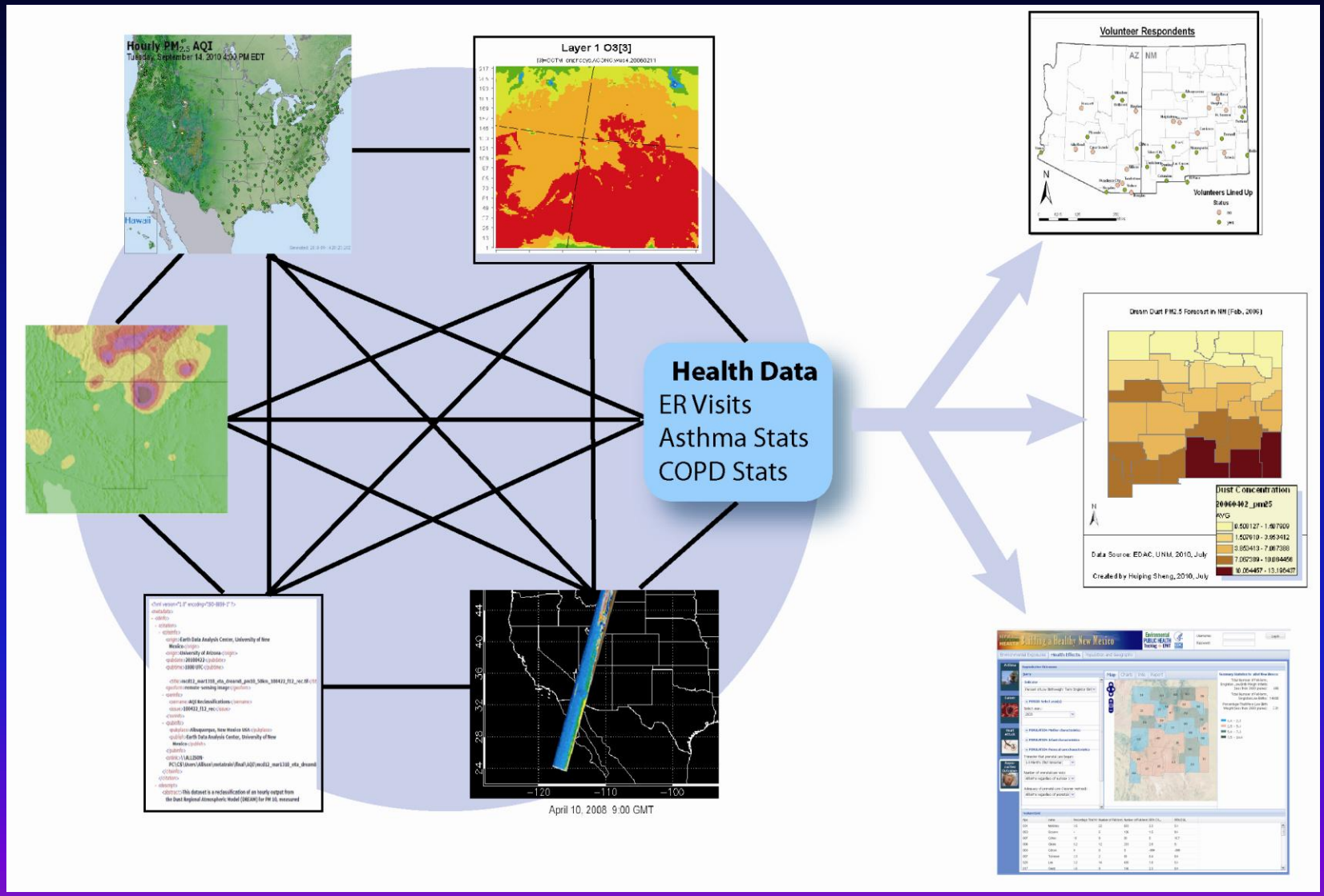
April 10, 2008 9:00 GMT



April 10, 2008 20:00 GMT

Using CALIOP data for verification and validation of AOD

Elements of Product Development



Metadata

- FGDC-compliant metadata created and parsed for:
  - Dust masks
  - Concentrations of $PM_{2.5}$ modeled by DREAM
  - AQI reclassification of $PM_{2.5}$
  - Daily averages of $PM_{2.5}$ by month

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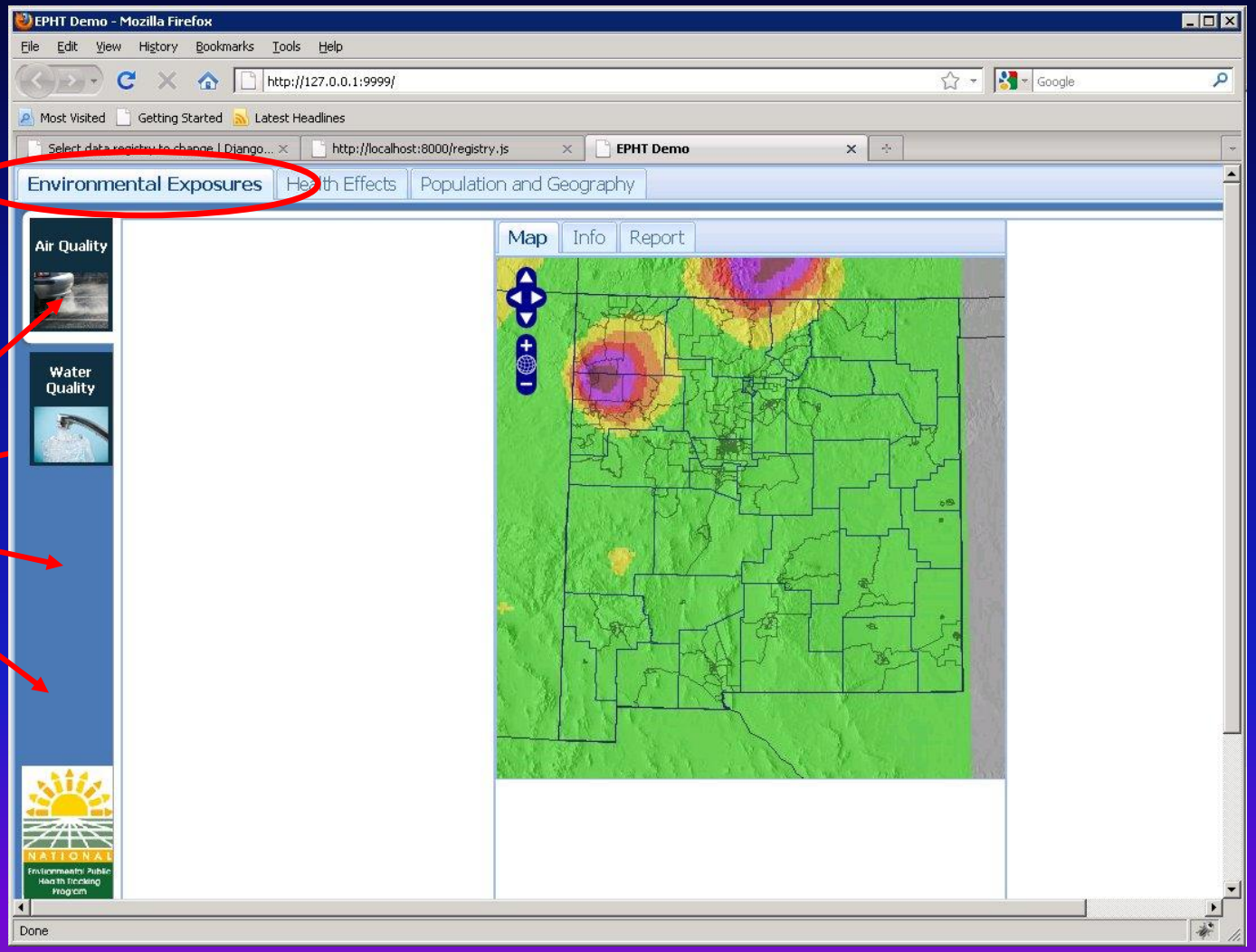
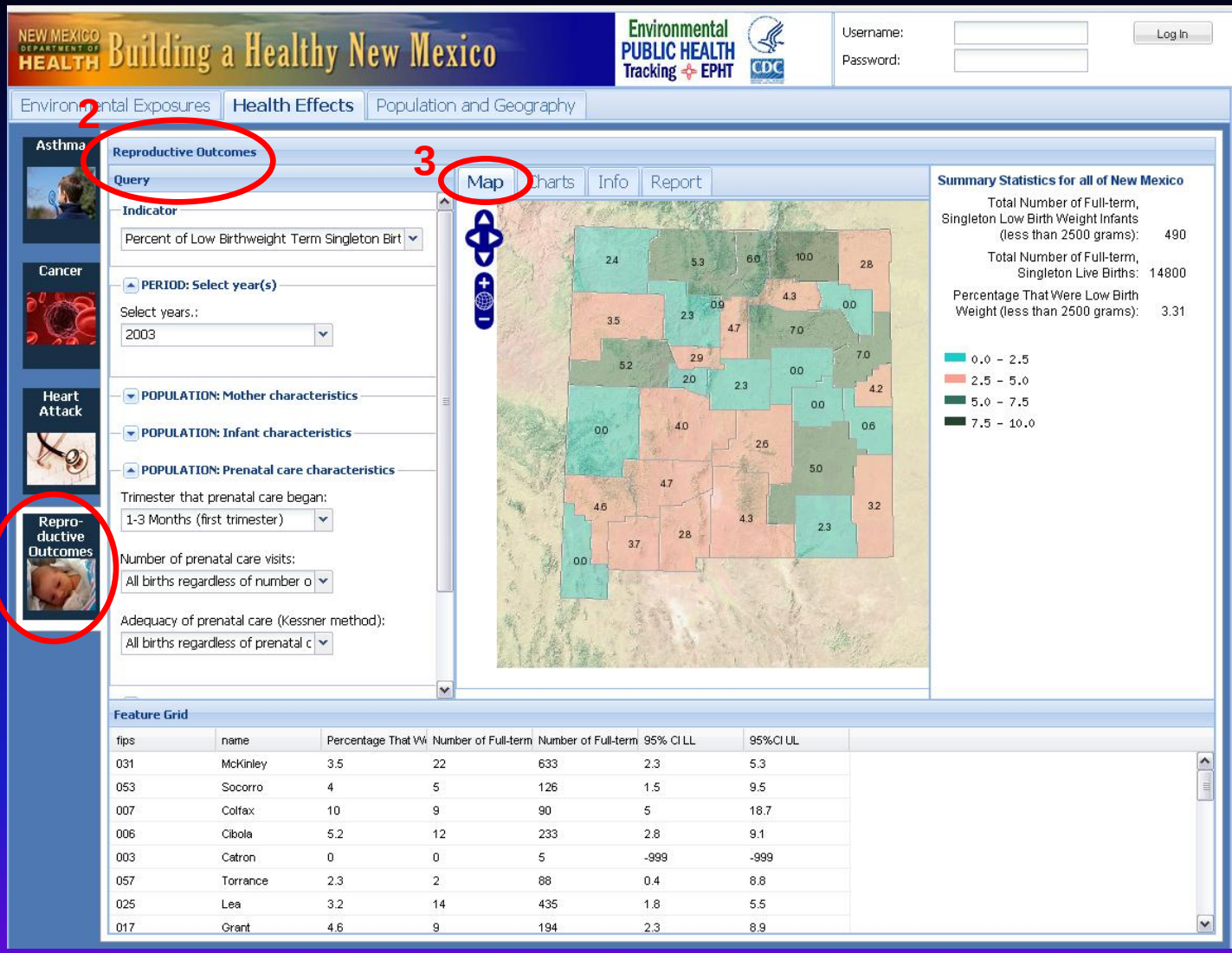
- Automate metadata process for each product line
- Required for data discovery and delivery in EPHT

Developing Interface for Health Client Server: NM EPHT via IBIS

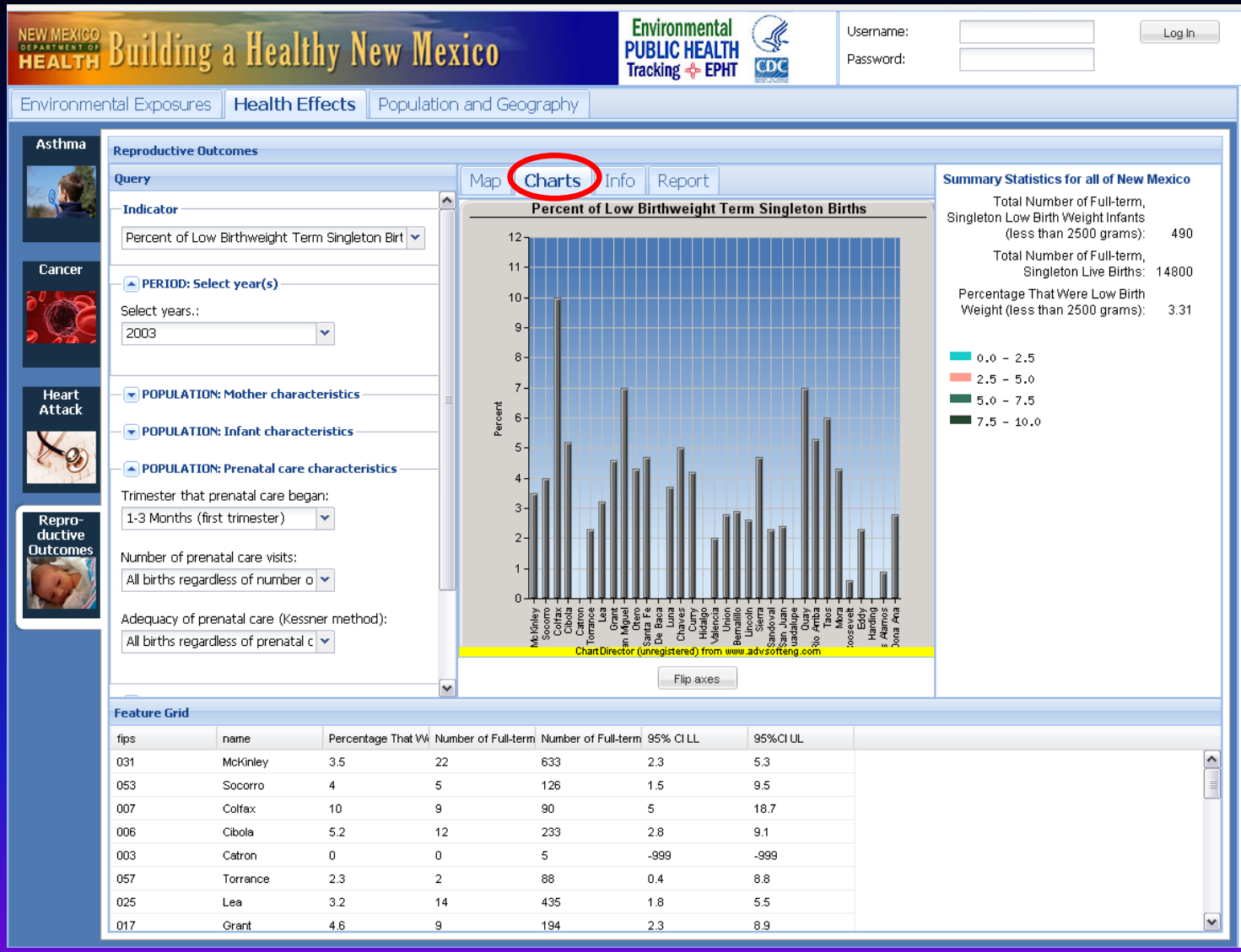


Buttons for pollen, dust, ozone, aerosols

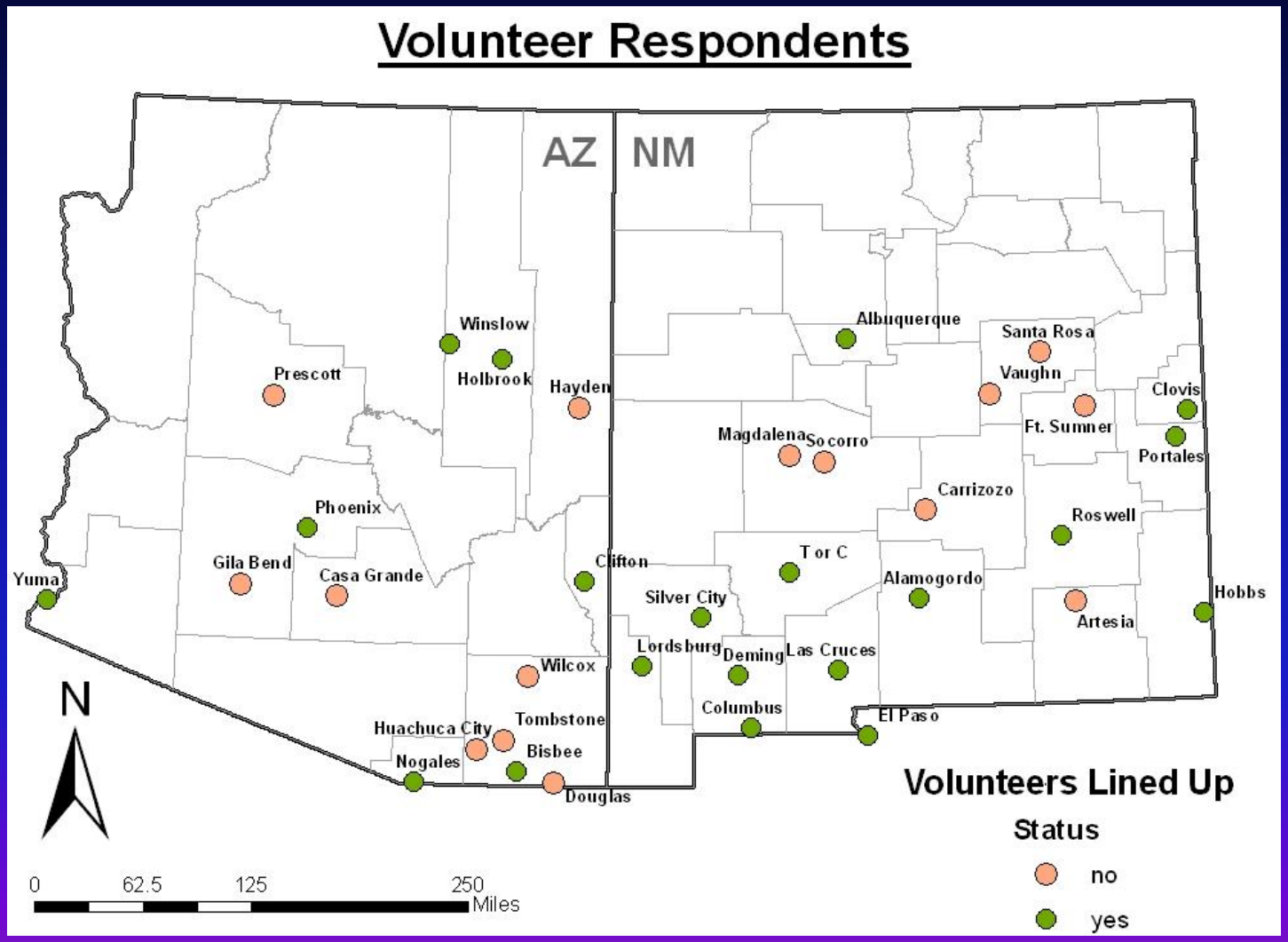
Sample from Demo of NM EPHT



Sample from Demo of NM EPHT



Network of Air Quality Volunteers AZ and NM for Dust Advisory Notices



Challenges

- DOH switch to IBIS
- Scheduling model runs on super computer
- Changes in NOAA's Global Forecast System
- Dust sources north of 35º latitude
- Employee resignation

Project Team

Stan Morain, PI

- Modeling Team
  - Bill Sprigg
  - Slobodan Nickovic
  - Goran Pejanovic
  - Ana Vukovic
  - Maudood Khan
  - Brian Barbaris
- Applications Team
  - Amy Budge
  - Bill Hudspeth
  - Tom Budge
  - Karl Benedic
  - Hays Barrett
  - Matt Gagnon
  - Peggy Allison
  - Orrin Myers