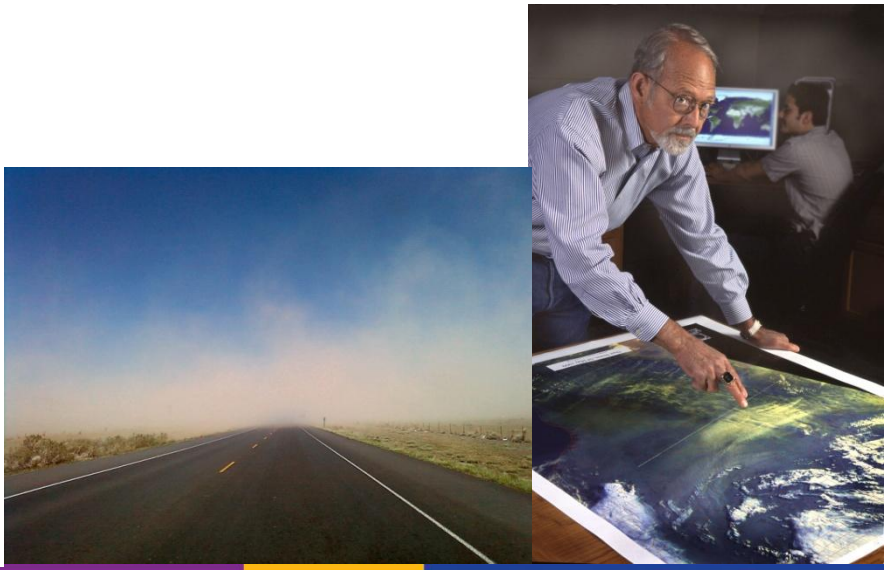
The Development of a Dust Event Climatology of the US/Mexico Border Region Including the Four Corners Region and the Panhandle of Texas During the Period 2000-2012

Dave DuBois
Rebecca Armenta
Dept. Plant & Environmental Sciences, NMSU

Max Bleiweiss
Miranda Flores
Dept. Entomology Plant Pathology & Weed Science, NMSU



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Motivation for the Climatology

- Dust storms are a significant health hazard
- Dust storms occur throughout the year in the region
- Establish baseline for use in health studies
- Assess climate extremes
- Build database for forecasting
- Support local regulatory programs

Our Process

- Literature review
- Build database of satellite imagery and ground data
- Standardize data processing
- Process imagery
- Meteorological attributes during storms
- Create geodatabase

Sources of Data

- AVHRR, MODIS, GOES imagery
- PM_{10} and $PM_{2.5}$ data
- Surface weather stations: ASOS/AWOS
- Meteorological model output: RUC & NARR
- Weather maps
- Personal documentation

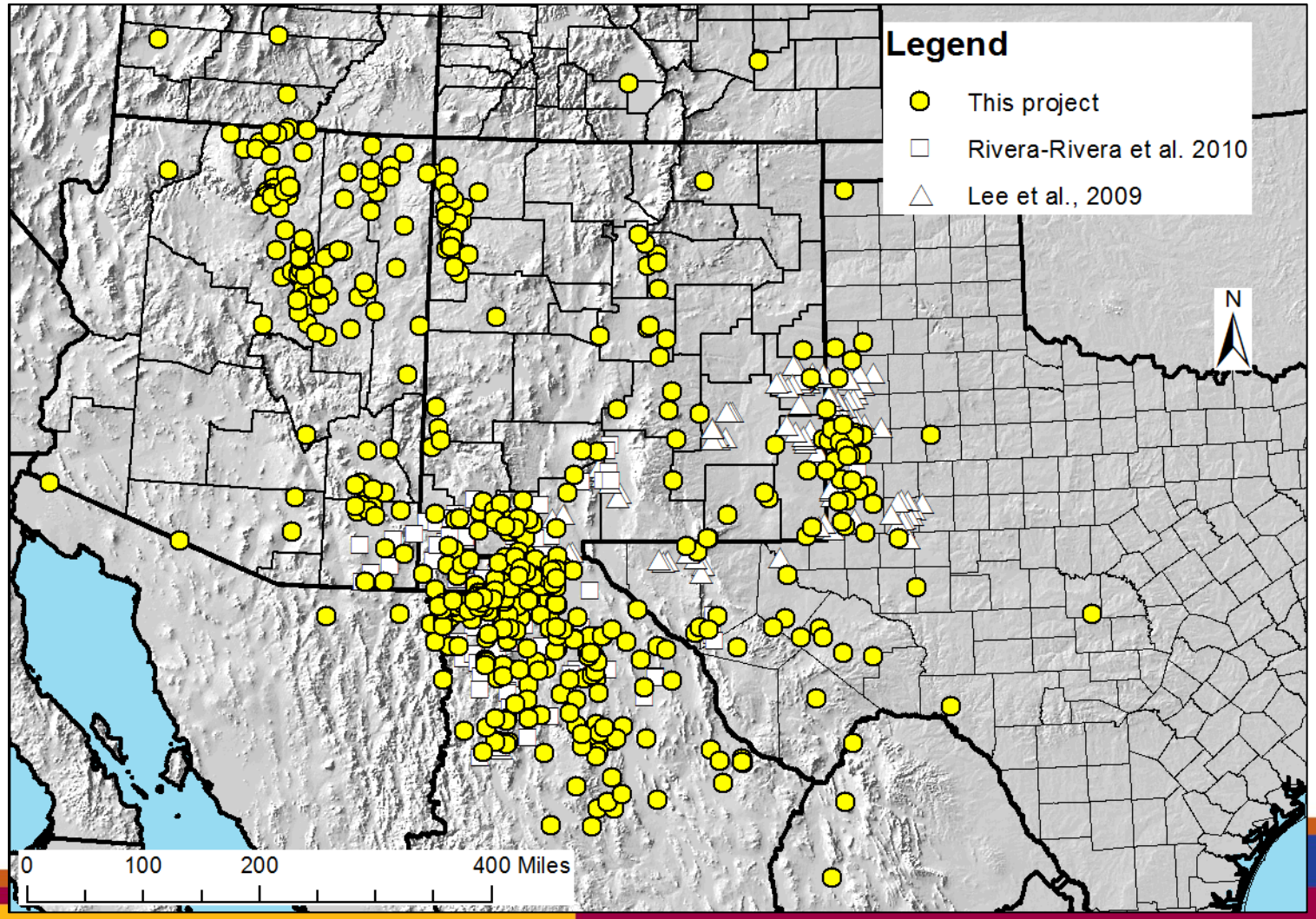
Processing Satellite Imagery

- Analyzed archive of AVHRR imagery at NMSU (2000 to present, +some earlier)
- Used GOES high temporal resolution to extract timing and incorporate AVHRR and MODIS
- Evaluated dust source locations manually
  - Trained students to look for signature

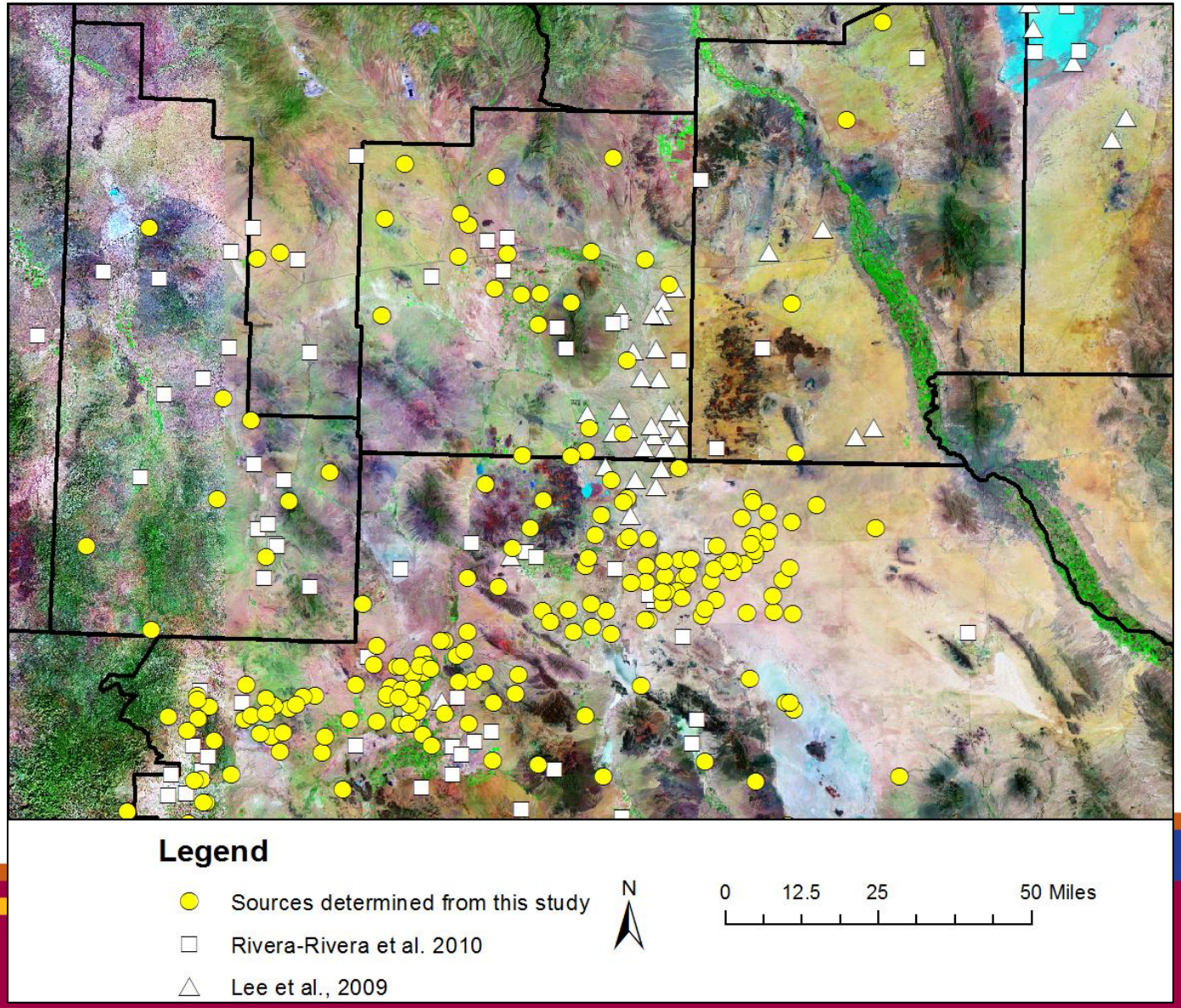
Sources of Ground based Dust Data

- Agencies and Networks
  - New Mexico Environment Department
  - Texas Commission on Environment Quality
  - City of Albuquerque Air Quality Division
  - IMPROVE
- Daily PM_{10} data going back to 1988
- Hourly PM_{10} data going back to 1996

Dust Source Areas



Status of source areas in Southern NM

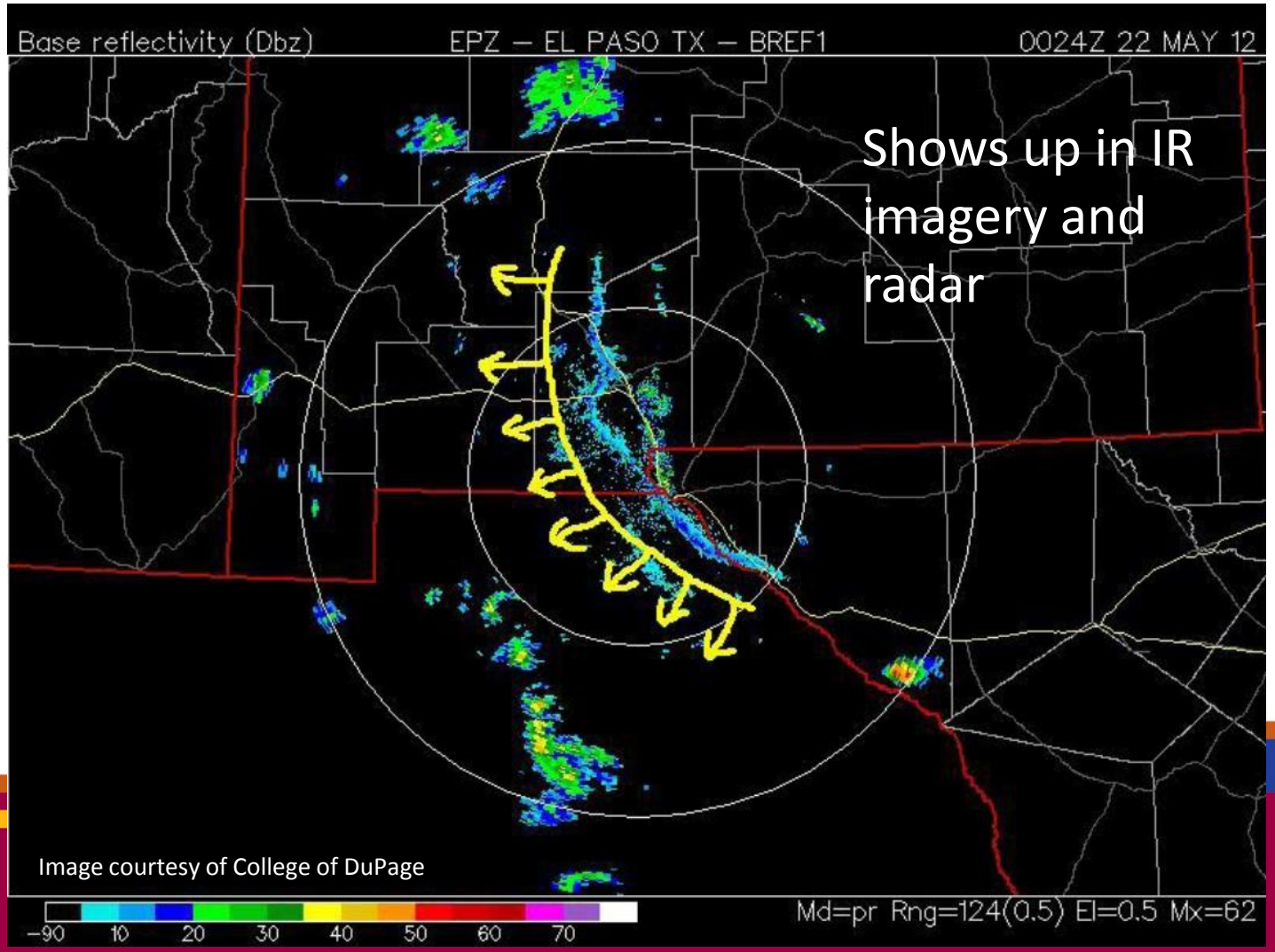


Metadata

- Goal to document wx conditions during storm
- Use local weather data when possible
- Use models otherwise
- Storm typing: local vs synoptic
  - Local: convective
  - Synoptic: frontal
- Generate statistics on season, time of day, duration, wind direction, source locations

Storm Typing

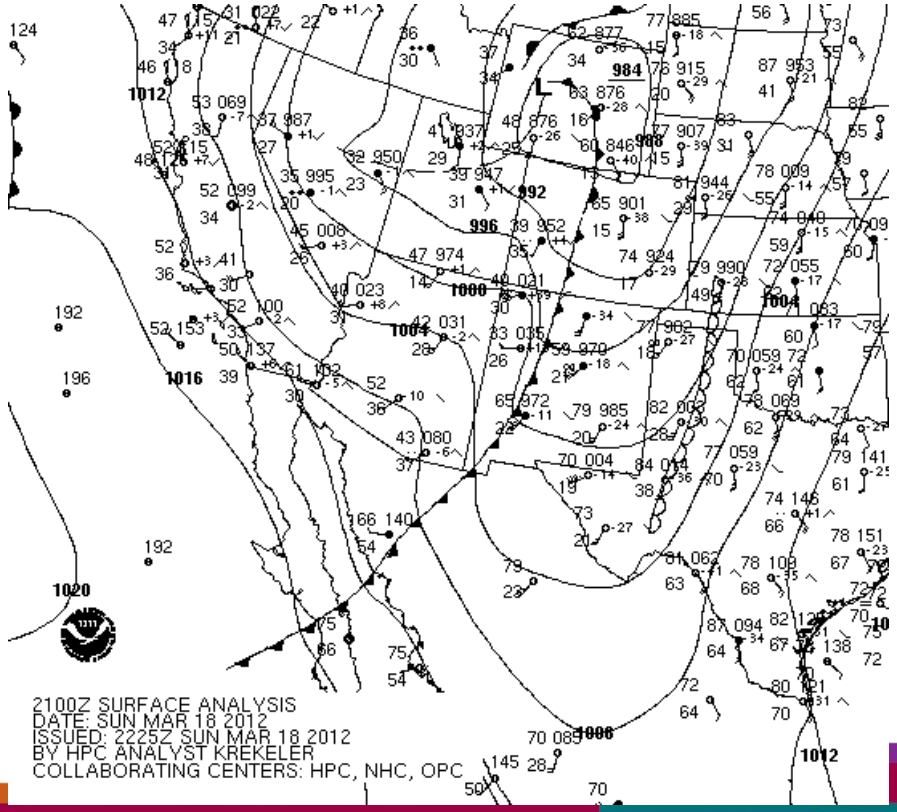
- Thunderstorm Outflow



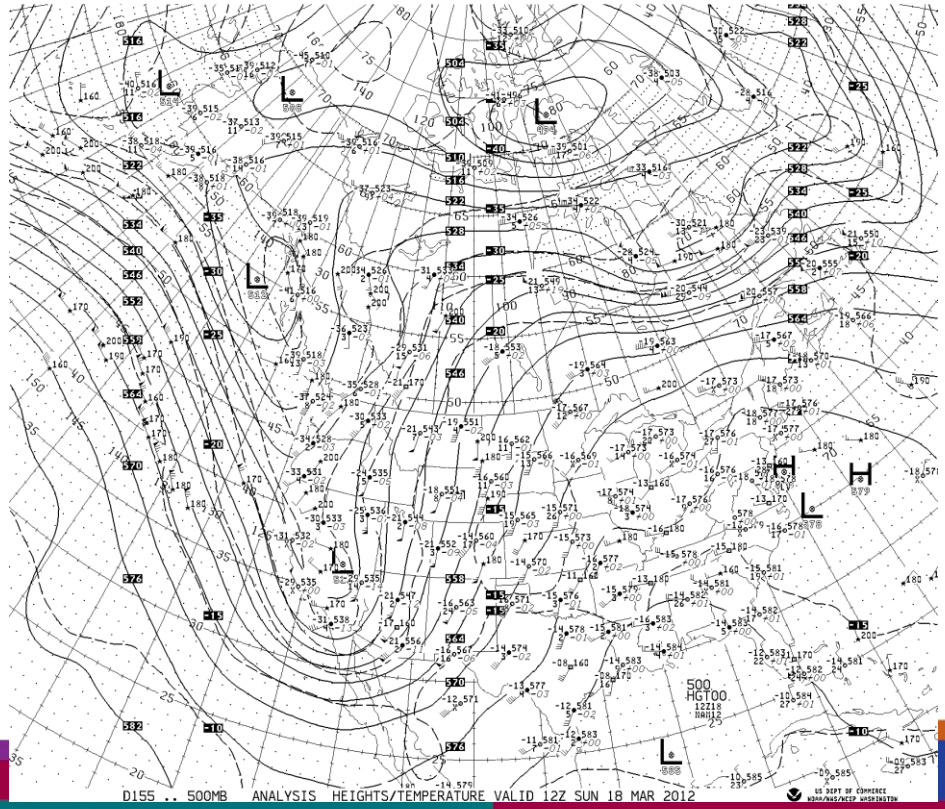
Storm Typing

- Frontal Example 3/18/2012

surface

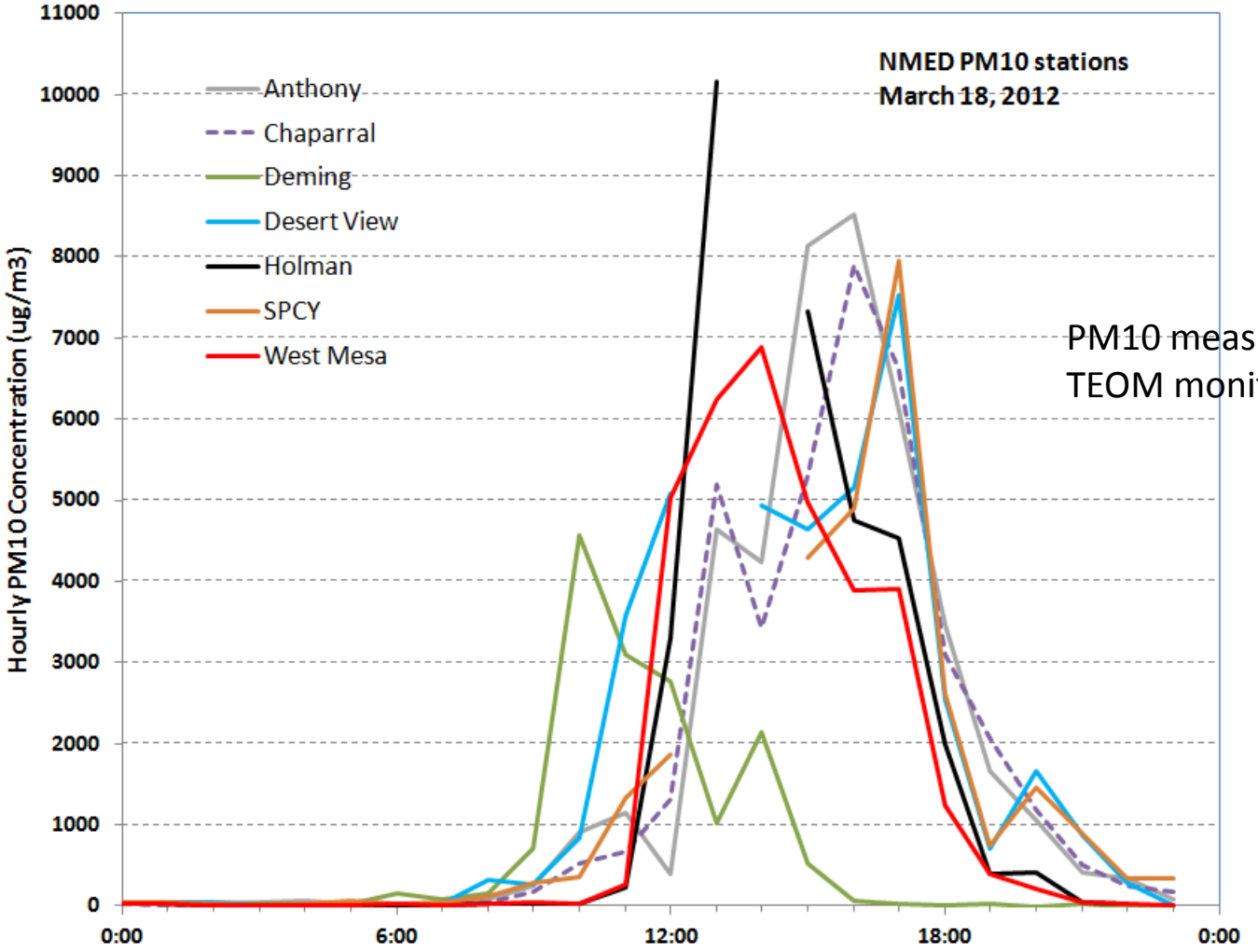


500 mb



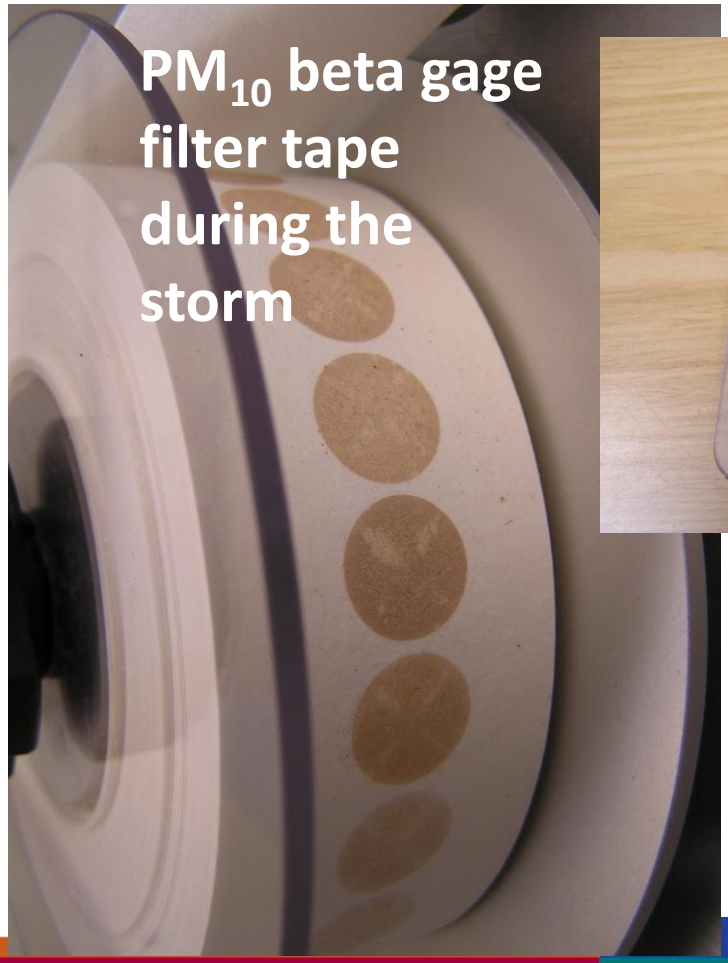
Frontal Storm

- Duration: most of day



PM10 measured using TEOM monitors

Frontal Storm



3/18/2012 storm

Public Outreach

- Post on NM Border Air Quality website
  - For general public and scientific community
  - http://nmborderair.nmsu.edu
- Post data on our THREDDS website
- Post noteworthy episodes on our Unidata RAMADDA server

Future Work

- Continue analysis of imagery over region
- Expand climatology to earlier dates
  - 70s and 80s with Total Suspended Particulate data
  - Limited airport data
- Research sources of dust storm information from historical documents
  - NWS Cooperative Observer comments
  - Monthly weather review publications
  - Others

Future Work

- Support dust emission study in spring 2013
- Portable wind tunnel (PI-SWERL)

Contact

Dr. Dave DuBois
State Climatologist
New Mexico State Univ.

dwdubois@nmsu.edu
weather.nmsu.edu
@nmclimate