



## USAirQual: Multisensor Fusion for Air Quality Applications



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## Outline

- USAQ “The Smog Blog”
  - What Does the Blog Look Like?
  - Example of Local Air Pollution found
  - Example of Transported Air Pollution
  - Volcanic ash near Puerto Rico
  - Big Dust Storm in West Texas
  - HDFLook
  - HDFLook Example
- REALM
  - REALM Locations
- Acknowledgements
- Questions?

## U.S. Air Quality (USAQ): “The Smog Blog”

<http://alg.umbc.edu/usaq>

- Web Log (Blog) style enables quick updating of text and images by multiple users
- We use multiple information sources to monitor air quality on a daily basis
  - NASA Satellites (Aqua, Terra, etc.)
  - EPA Ground-based Particulate Matter monitors
  - Lidar at UMBC (will link to REALM)
- Interesting events are documented and studied in detail later


## Review of Instruments used on the Blog

- Satellite Sensors
  - MODIS aboard TERRA & AQUA
- EPA Ground-based Particulate Matter monitors
  - Tells you the cleanliness of the air and whether it will affect your health
- LIght Detection And Ranging (LIDAR)
  - Laser radar to detect particles/pollution at different heights (km) in the atmosphere

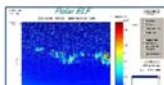

**U.S. Air Quality**  
The Young Blog

December 11, 2003  
**MOSTLY CLEAR SKIES**  
Skies are mostly clear across the US and there are some small fires in the north of Florida.  
Posted by Mike Jordan at 05:11:00


December 10, 2003  
**12/10**  
High pressure systems with accumulated clouds pushed the Midwest haze off shore. Also, moderate precipitation provided some sediment run off in the Mississippi Delta and Atchafalaya Bay LA.  
Posted by Mike Jordan at 06:55:00

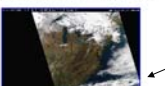
December 09, 2003  
**MIDWEST HAZE**  
Haze remains in the Midwest and skies are mostly cloudy in the US. Several condensation trails are also present in the MODIS AODQ image below.  


Labels: Daily, Satellite Images, Indexed

December 09, 2003  
**12/9 CIRRUS**  
This cirrus continued today that thickened towards the end of the run. We can see the thickening in the Q2 composites as well as the OD timeseries, however the OD of  $-0.1$  may not be detectable in the beginning of the run.  
  


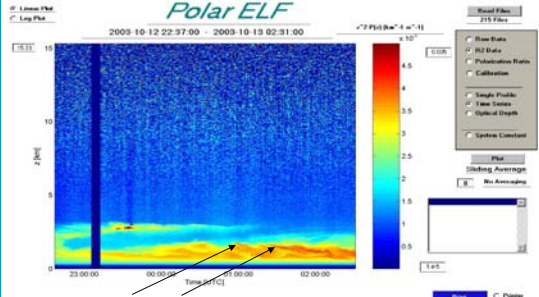
Labels: Catalog by instrument, Lidar, Calendar, Archived monthly, Optical Depth Time Series

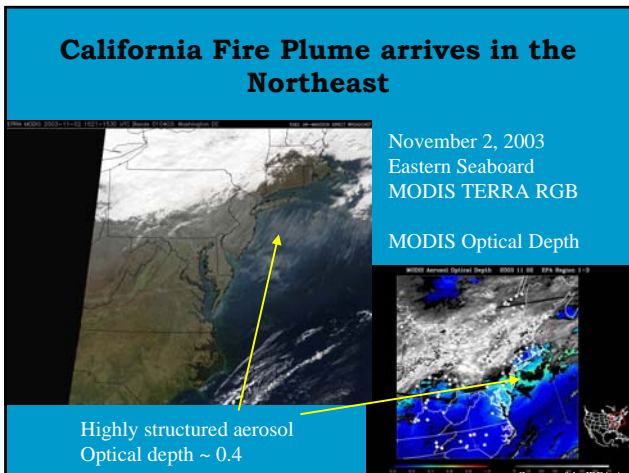
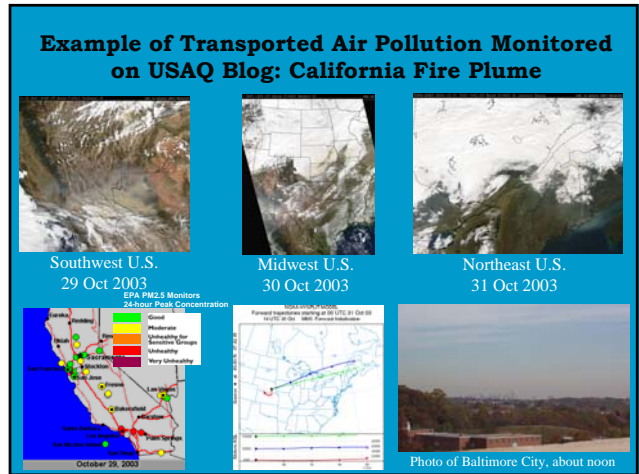
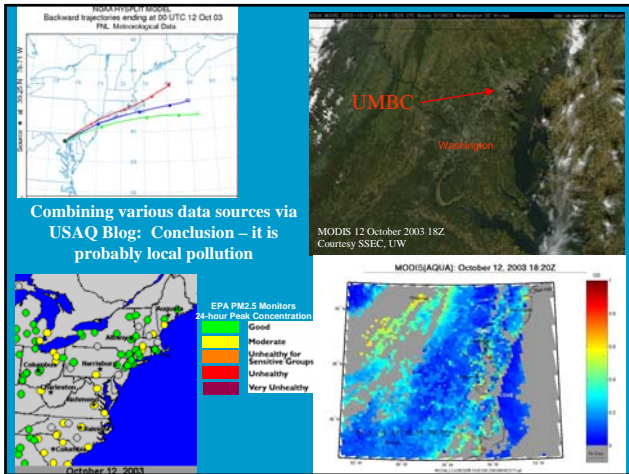
December 31, 2003  
**PM2.5 DATA FROM EPA AIRNOW**  
I added a new link to U.S. Air Quality's resource sites: the U.S. Environmental Protection Agency's [AirNow website](#). AirNow has been making real-time ground level ozone data available for several years, starting with the eastern states and gradually expanding. They have recently added real-time PM2.5 data to the site, with data from all but a few north-west plains states. Our research has found good correlation between EPA's PM2.5 data and MODIS AOD, so this should be useful in verifying events.  
Here is an example for today, a relatively clear day, at about the time MODIS was passing over the eastern half of the U.S.  
  
Posted by Jill Singh Cox at 05:37:00

December 31, 2003  
**CLOUDY AND CLEAR**  
Dense clouds continued in the western U.S., while there were clear, cloudless skies in most of the eastern U.S. Possibly, some very light haze or dust in the Midwest (Iowa, Missouri).  


Labels: EPA PM2.5 data, Ability to compare similar datasets from same time period

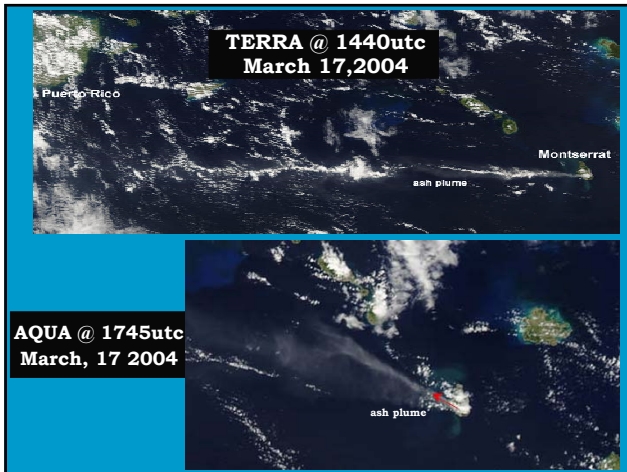
**Example of Local Air Pollution Found on USAQ Blog: 12 October 2003**

Polar ELF  
2003-10-12 22:57:00 - 2003-10-13 02:31:00  
 $r^2 = 0.77$  ( $R_{max} = 1 \times 10^{-11}$ )  
  
What's this stuff?



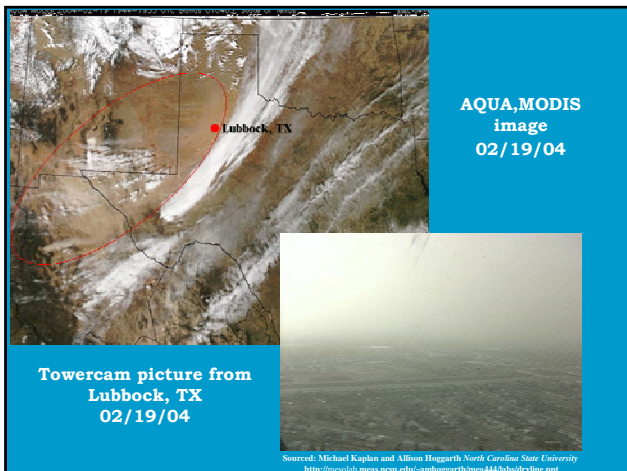
**Volcanic Ash near Puerto Rico**

- Montserrat Soufriere Hills Volcano emits a plume of ash
- Plume moved towards Puerto Rico
- MODIS AQUA image sourced March 17, 2004



## Big Dust Storm in West Texas

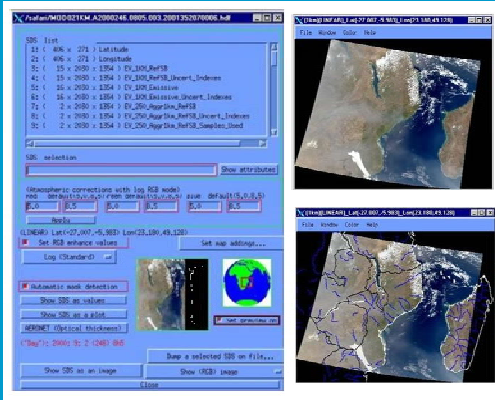
- Large Pollution Event
- Strong winds moved across eastern New Mexico and western Texas, resulting in a vast amount of blowing dust



## HDFLook

- A Multifunctional data processing and visualization tool for MODIS
- Fairly easy to use, some familiarity with scripting techniques might be useful
- Mosaic – Multi-granule processing
- Plus many more features

## HDFLook Example



## Outline

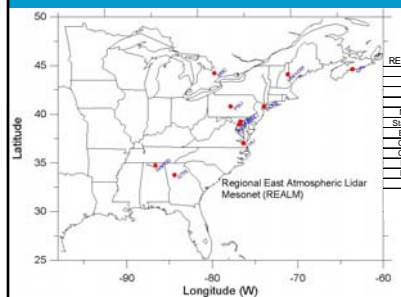
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## Regional East Atmospheric Lidar Mesonet (REALM)

<http://alg.umbc.edu/REALM/index.htm>

- REALM is lidar mesonet designed to monitor air quality in the vertical from multiple locations
- REALM can provide better information about regional air pollution events and transport than individual lidar systems
- Lidar data combined with satellite sensor and ground-based data can provide detailed understanding of air quality in all dimensions
- Communication is near-real-time through USAQ blog so we know when to turn the lidars on

## REALM Locations



Location	PI	Type(s)
Edison, CN	K.I. Strawbridge	Scientific elastic
Durham, NH	I. Dor	Winds
Hadley, NE	T. Duck	Elastic, Raman
New York, NY	S. Ahmed	Elastic, DIAL
State College, PA	C.R. Philbrick	Raman, DIAL
Baltimore, MD	S.M. Hoff	Elastic, Raman
Greensboro, MD	D.N. Whiteman	Raman
Greenville, MD	D. Venables	Raman
Hampson, VA	M.P. McCormick	Elastic
Huntsville, AL	M. Neachurch	DIAL
Atlanta, GA	G. Simmesler	DIAL

Sourced from: Hoff et. al. 2002

## **Acknowledgements**

- This work was supported by grants from NOAA CREST (through the City College of New York Foundations), from the Maryland Department of Environment, and from NASA Langley Research Center (CALIPSO Science Team grant).

## **Questions?**



**Final Note - You can download this  
Presentation at:**

**<http://alg.umbc.edu/nikisa.htm>**