

**Integration of Satellite-Derived Data into
EPA's Air Quality Decision Support Systems**

**National Air Quality Conference
Orlando, Florida, February 12-14, 2007**

smoke

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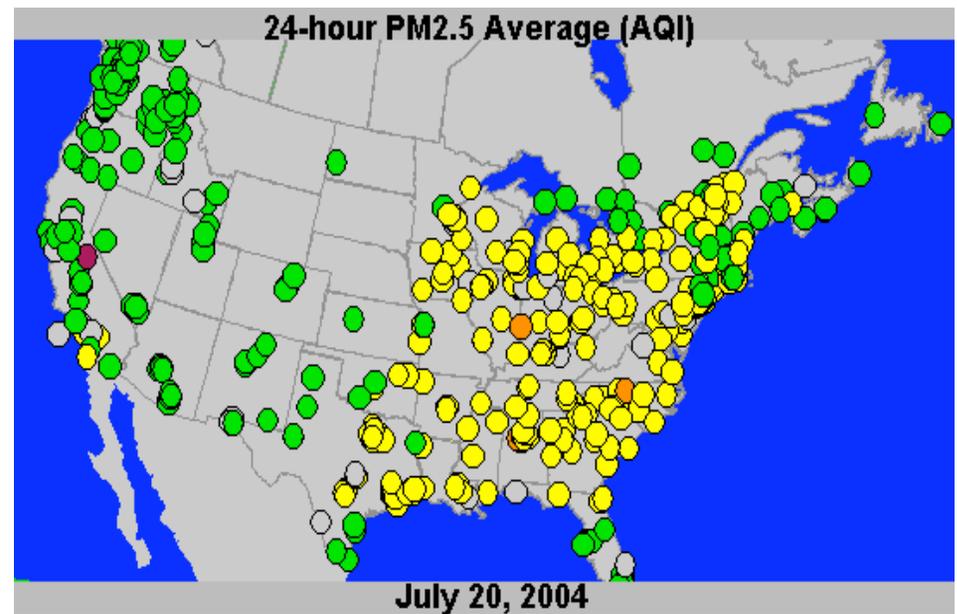
haze

Overview

- Current data and why EPA is interested in satellite and lidar data
- Overview of 3D-AQS project
- Quick overview of satellite data
- Quick overview of lidar
- Status of 3D-AQS project
- How you can access these data and provide input to 3D-AQS

Current Datasets: Ambient Air Monitoring

- “True” measure of air quality
 - Varying temporal scales (hourly, daily, 1 in 3 days)
 - Sparse networks spatially
- Ground-based concentration in mass units ($\mu\text{g} / \text{m}^3$)
- Monitors usually sited in urban or rural areas only, e.g.,
 - Urban FRM network
 - IMPROVE in Class I areas
- Used for forecasting and historical analysis (including compliance)
- Decision support systems include:
 - AQS / AirQuest (<http://www.epa.gov/ttn/airs/airsaqs/>)
 - AIRNow (<http://www.airnow.gov>)



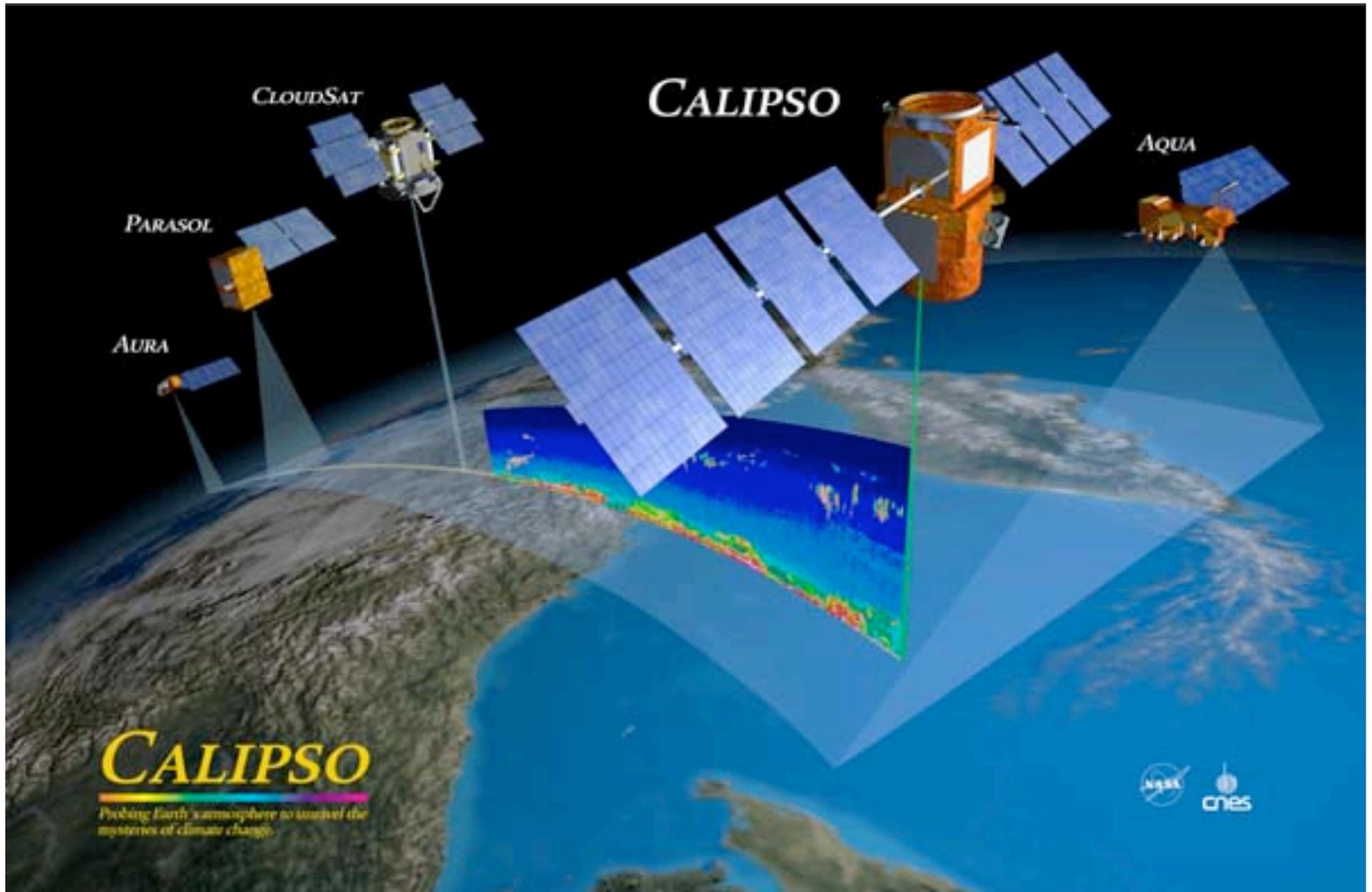
Why are we interested in measuring air quality data in 3D?

- Regional haze and regional scale events
- Long and medium distance transport
- Clean Air Interstate Rule
- Improved modeling
- Regulatory accountability

Satellite sensors can provide horizontal data coverage, ground and space-based lidar can measure aerosols in the vertical dimension.

Yet, it is difficult to access these data...

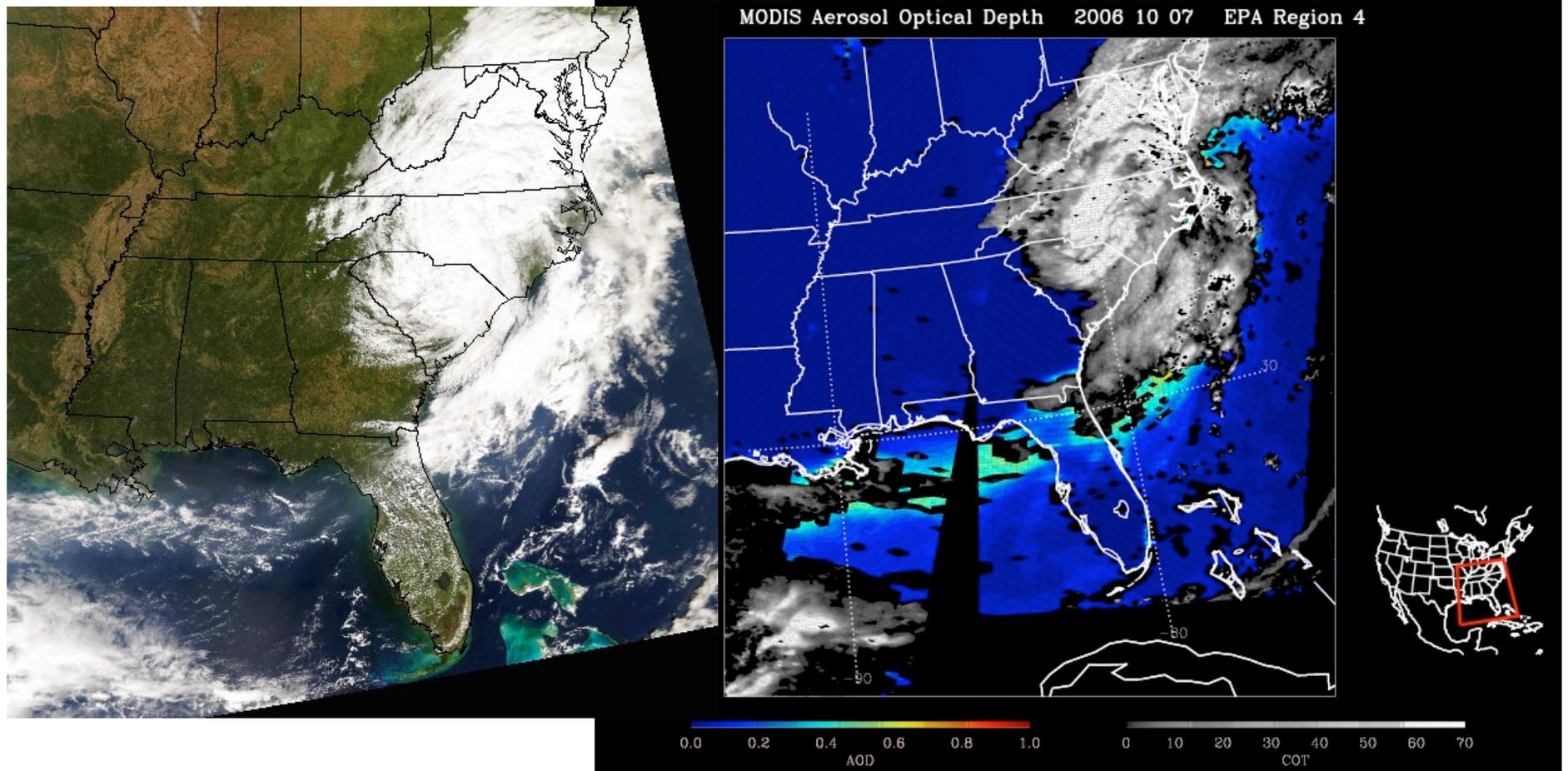
Some key air quality satellite sensors



MODIS Direct:

<http://eosdb.ssec.wisc.edu/modisdirect/>

IDEA: <http://idea.ssec.wisc.edu/>



MODIS Terra, October 10, 2006
MODIS Direct and IDEA run by UW-SSEC



U.S. Air Quality (The Smog Blog), <http://alg.umbc.edu/usaq/>



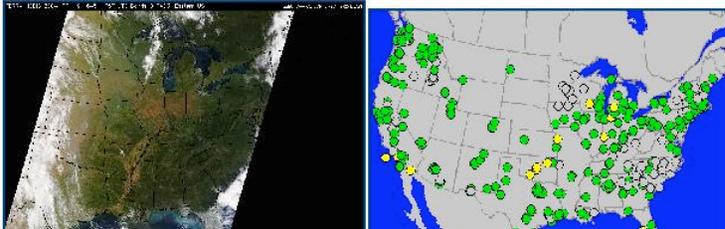
September 19, 2004

CLEAR, LIGHT HAZE, AND CLOUDS

Daily posts

Beautiful clear skies in much of the eastern with a few exceptions in the midwest.

and cloudy in the west. PM2.5 concentrations were similar, mostly good



NASA satellite images, EPA data, etc.

Posted by Jill Engel-Cox at 06:30 PM

September 18, 2004

SOUTHCENTRAL HAZE

The remnants of hurricane Ivan continued up the eastern U.S. producing very heavy rain and strong storms. The midwest and west were clear, but some smoky haze has built up in the southcentral region (Texas, Oklahoma, Arkansas, Louisiana).



**Daily posts from 3.5 years
~ 35,000 visitors per month, including
universities, EPA, NASA, NOAA, &
States, and general public**

About U.S. Air Quality

USAQ is a daily diary of air quality in the U.S. using information from NASA satellites, ground-based lidar, EPA monitoring networks, and other monitors. Interpretation and analysis is provided by the staff of the University of Maryland, Baltimore County Atmospheric Lidar Group.

Search

Search this site:

Recent Entries

- Clear, light haze, and clouds
- Southcentral haze
- Mostly GOOD AQI
- Northeastern haze is out
- Smoke in Arizona and Louisiana while Ivan is approaching
- Northeastern & Midwest Haze
- Haze Remains Over the Plains...and is moving eastward
- Aerosols Aloft in the Morning
- Haze over the plains
- Southern smoky haze

Links

- EPA AirNow
- NASA/EPA/NOAA/UW IDEA
- UW MODIS Direct

Index & Links

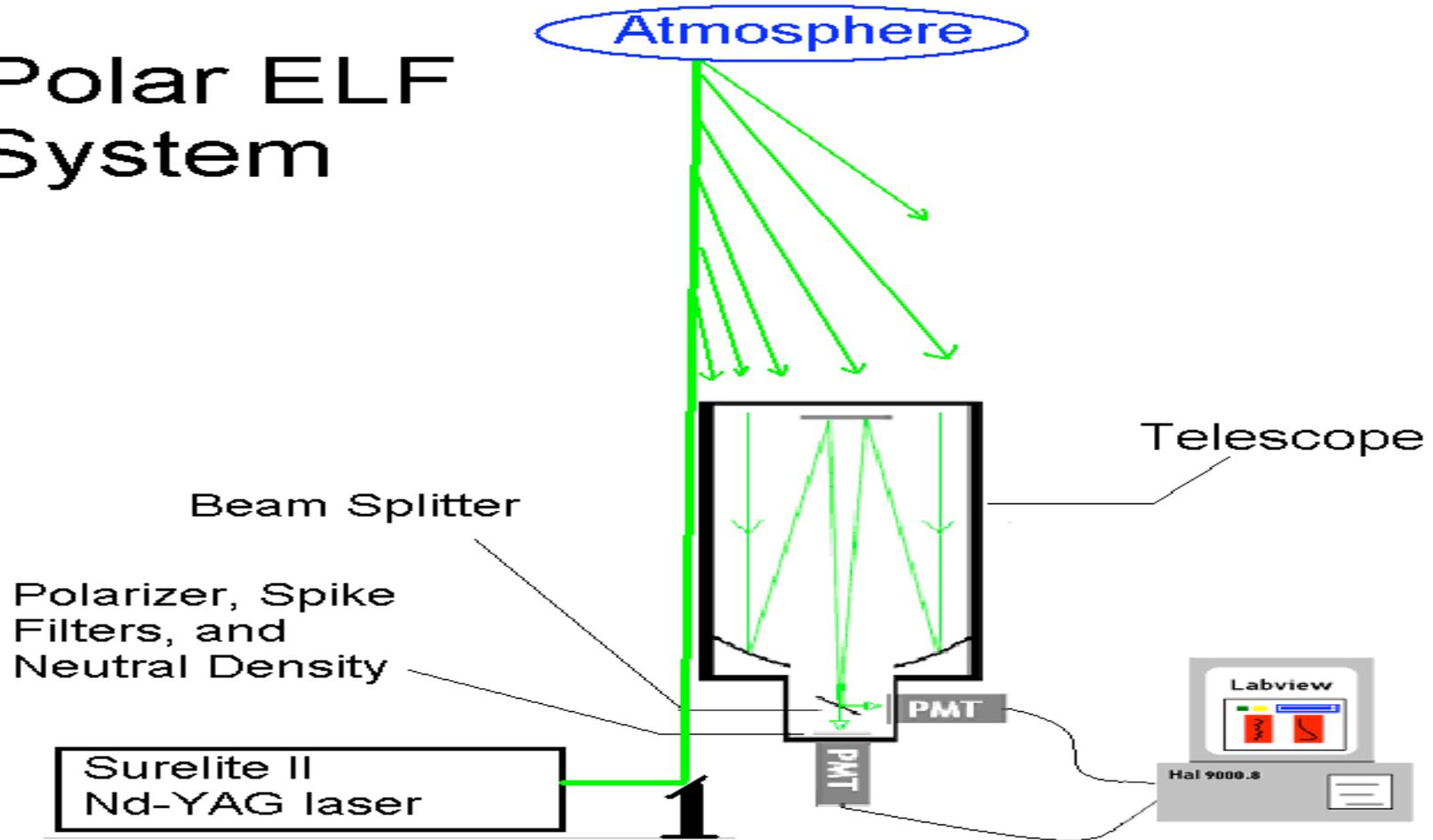
- NOAA GOES
- NOAA NESDIS GASP
- A GASP Viewer
- A Hysplit Model
- Monterey Aerosol Page
- PM2.5 Forecast
- more-DC Air-Watch.net
- C-ALG Webcam
- C AIRS CO
- R Real-Time Weather
- tal Weather

Categories

- S Data
- /Forward Trajectory
- Fusion
- Exercise
- nd-based PM Data
- Note
- Photograph
- SUOMINET

Elastic Lidar Facility (ELF)

Polar ELF System



*Comer, J, "UMBC Elastic Backscatter Lidar Facility (ELF): Subvisible Cirrus Cloud and Aerosol Measurements during ABOVE 2002." UMBC 2002

REALM DATA CENTER

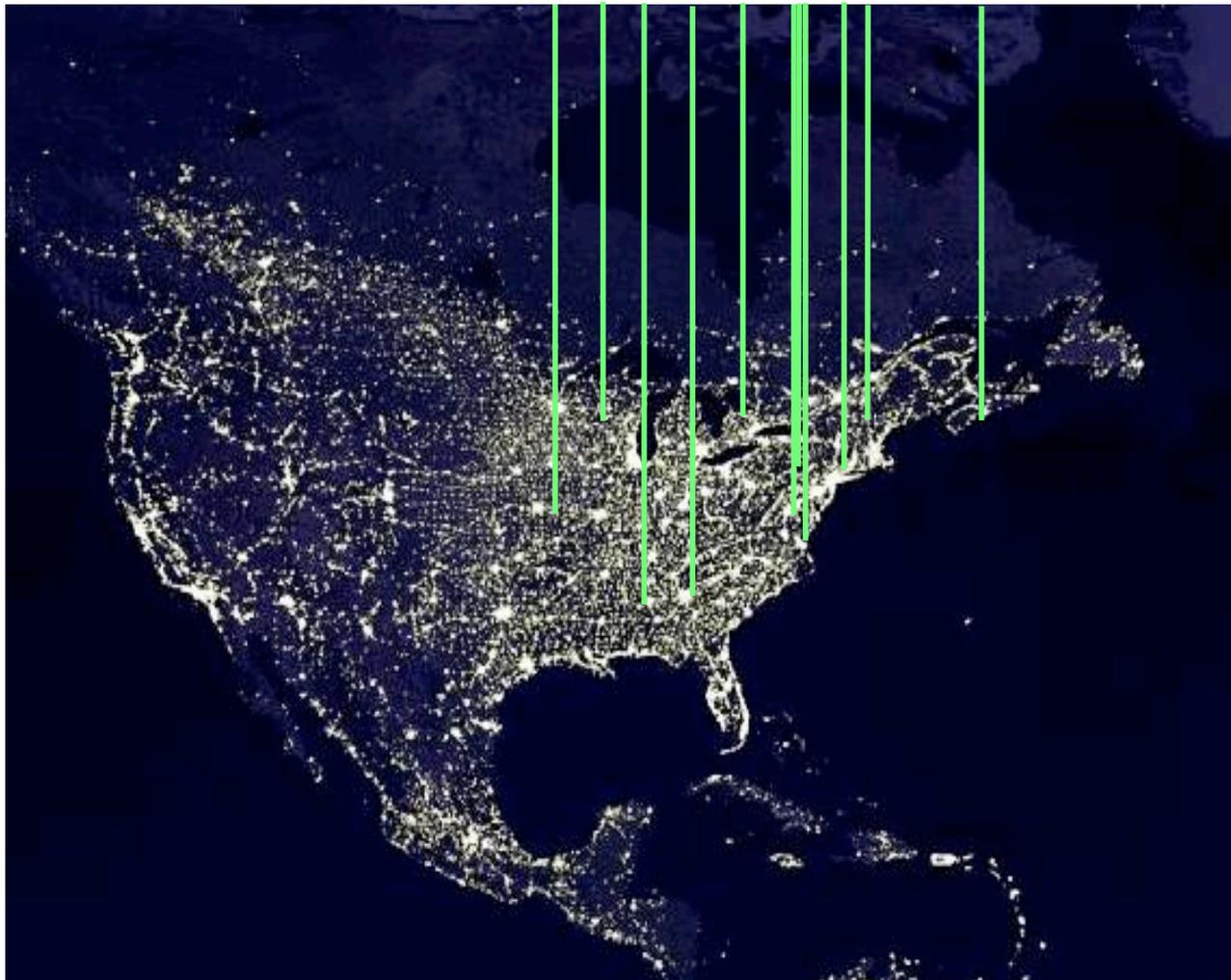
NOAA CREST

REALM
HOME

CENTER



Data for: September 1, 2004



to monitor air quality in the vertical from multiple LM participants are posted and archived on this site.

SEPTEMBER 2004

Sun	Mon	Tue	Wed	Thur	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25

NASA Three-Dimensional Air Quality System (3D-AQS) Project

- Integrate operationally NASA satellite sensor and lidar data into EPA's air quality data systems: AQS/AirQuest, AirNow
- Provide greater accessibility and usability of satellite and lidar data to all users of these systems: IDEA, Smog Blog, REALM
- Develop visualization tools in horizontal and vertical dimensions for forecasting and retrospective analysis



Battelle



Integrated System Solutions for 3-D AQS Impacting Air Quality & Public Health

Sun-Earth Observations and Models for Predictions/Assessments/ Forecasts

Observations

Terra/Aqua
 MODIS
 AIRS
 LIDAR
 REALM
 MPLNet
 GOES
 GASP
 Aura
 OMI
 CALIOP
 CALIPSO
 AERONET

Models

NOAA
 Hysplit
 LaRC
 modified
 IMPACT
 trajectory
 model

IDEA

3D-AQS

USAQ
Weblog

Partnership Area

Decision-Support Tools

- AIRNow/AQS-EPA/NOAA**
- Increase synoptic data for PM_{2.5} forecasters
- AQS/AIRQuest (EPA)**
- Multi-dimensional aerosol related data and analyses:
 - Assess general state of air quality and trends
 - Assess progress of SIPs and compliance
 - Waivers to air standards
 - Air quality rule development
- NEPHTN-PHASE (CDC)**
- Produce better AQ maps through statistical models

Value & Benefits to Citizens & Society

Increase accuracy in AQ forecast: reduce poor air quality health impacts.

Increase knowledge in causes or poor air quality – leading to improvements in AQ and confidence in government.

Improved prevention initiative targeting.

INPUTS

OUTPUTS

OUTCOMES

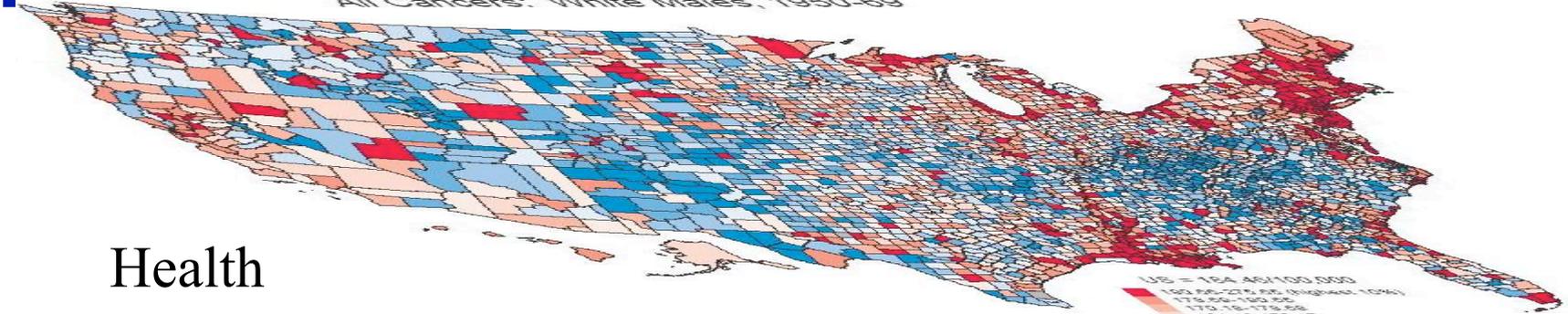
IMPACTS

NASA/NOAA/EPA/ UMBC/CIMSS/BMI

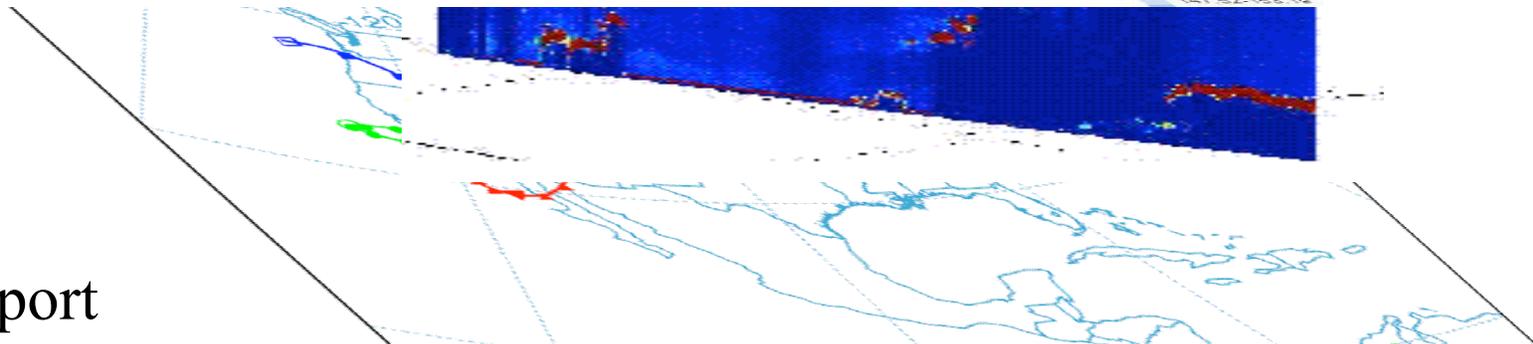
EPA/NOAA/CDC

3D-AQS seeks to integrate disparate datasets

Cancer Mortality Rates by County (Age-adjusted 1970 US Population)
All Cancers: White Males, 1950-69

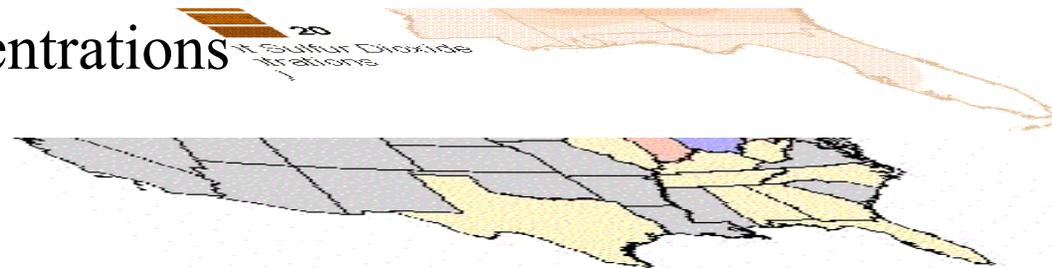


Health



Transport

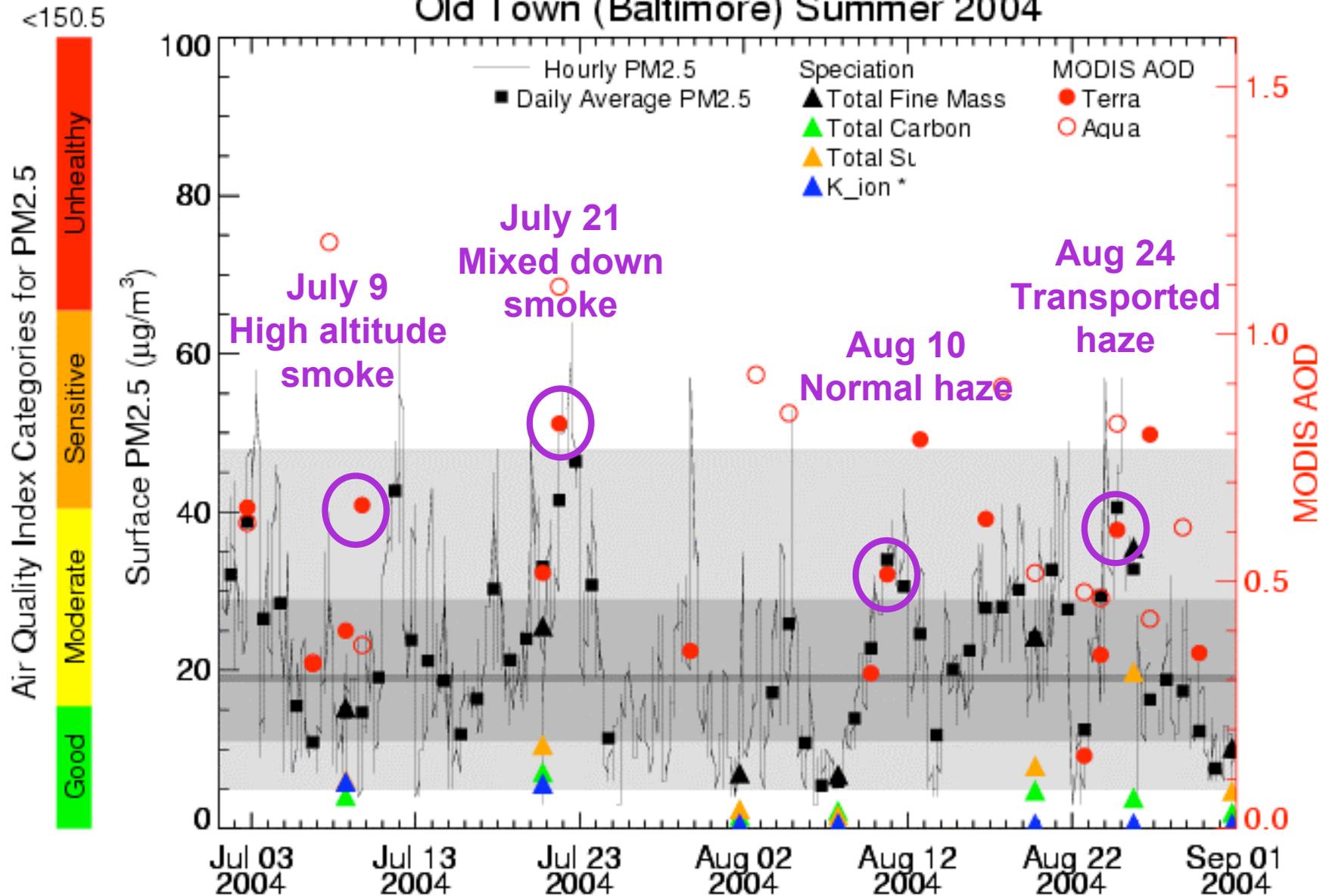
SO₂ Concentrations

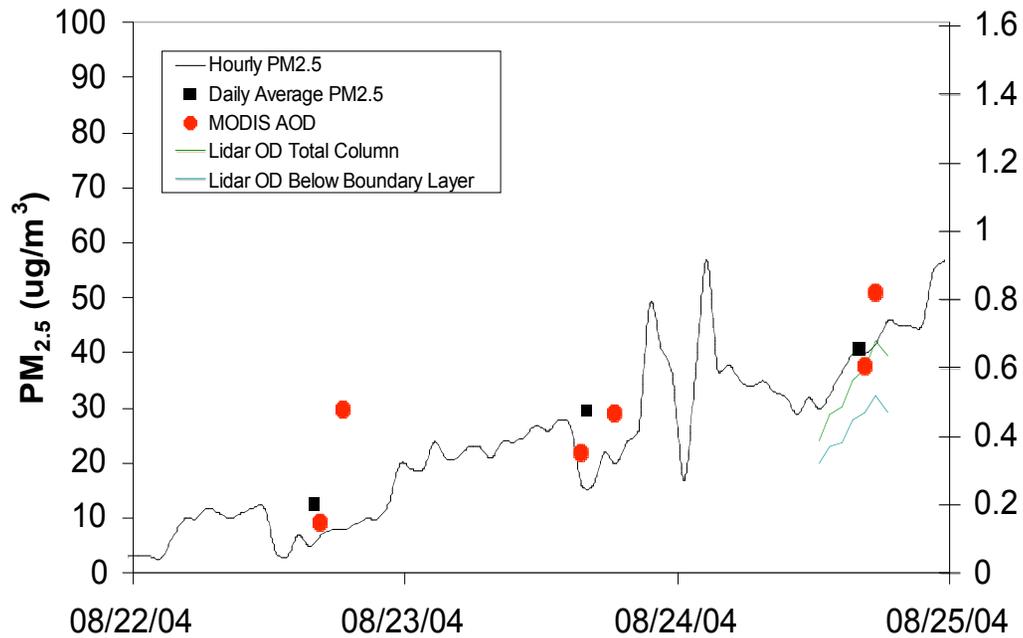


Emissions

Baltimore, MD Summer 2004

Old Town (Baltimore) Summer 2004



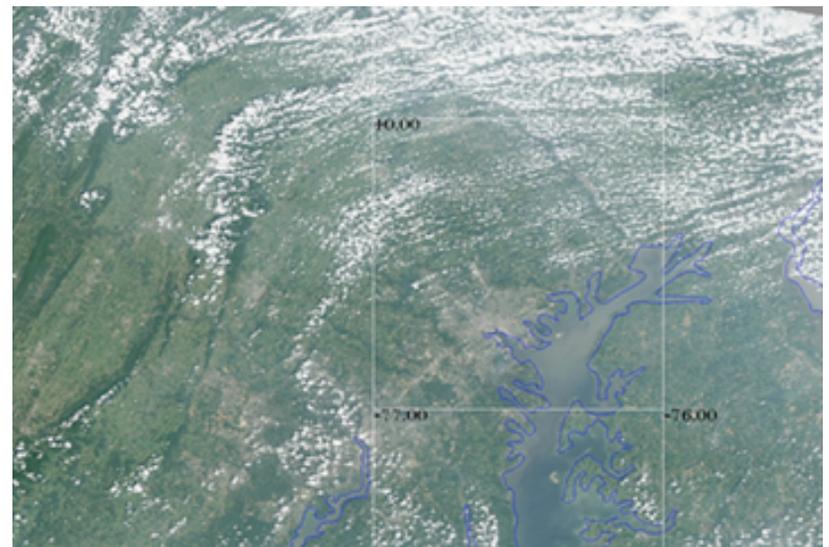
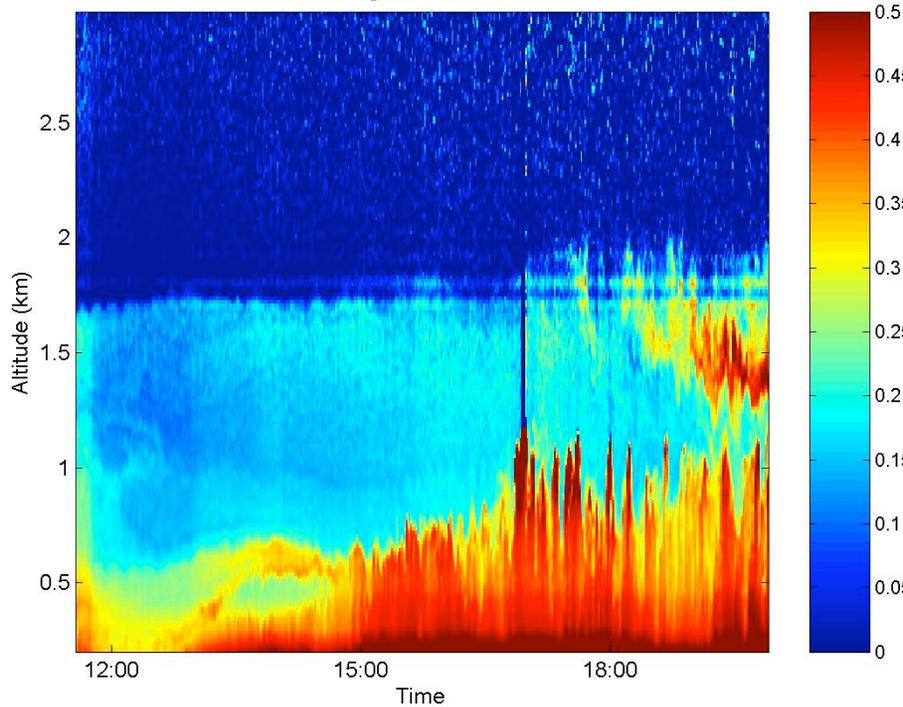


Sulfate transport to Maryland 24 August 2004

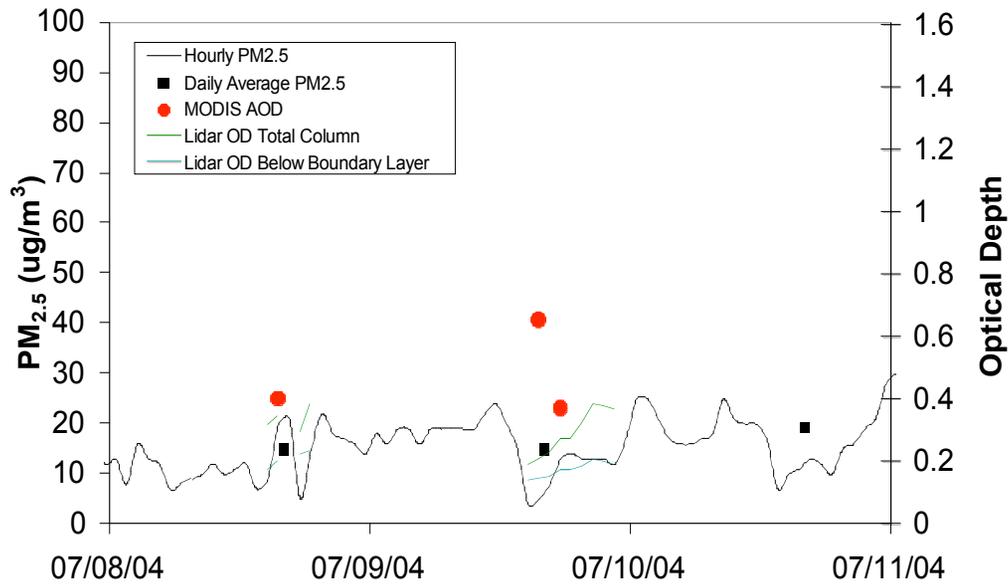
Optical Depth



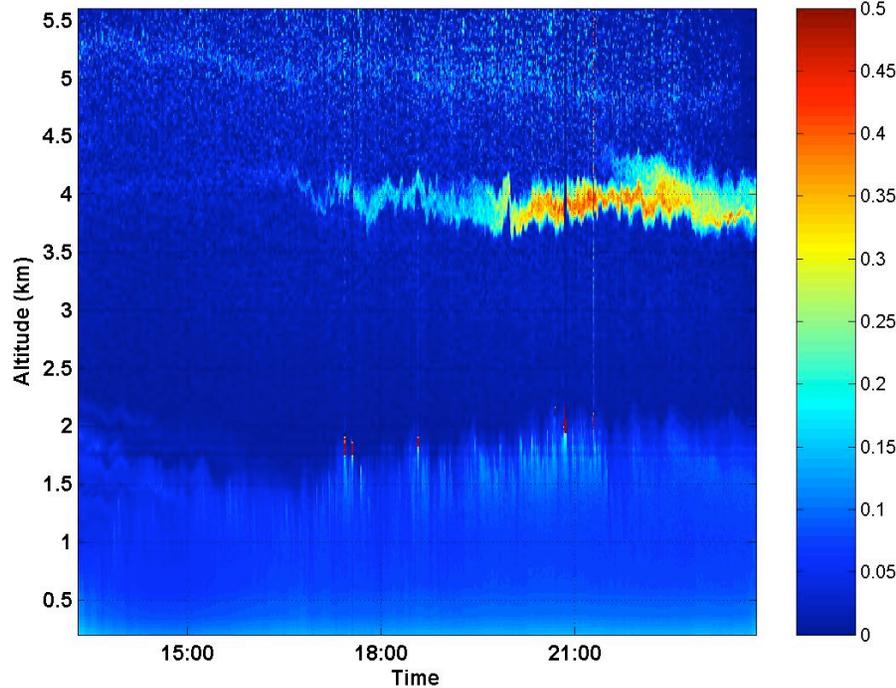
August 24, 2004



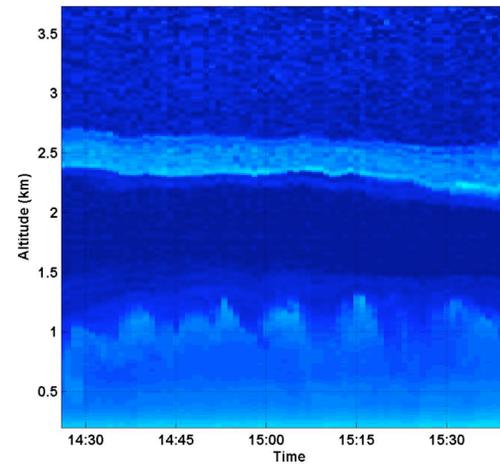
Alaskan Smoke over Maryland 9 July 2004



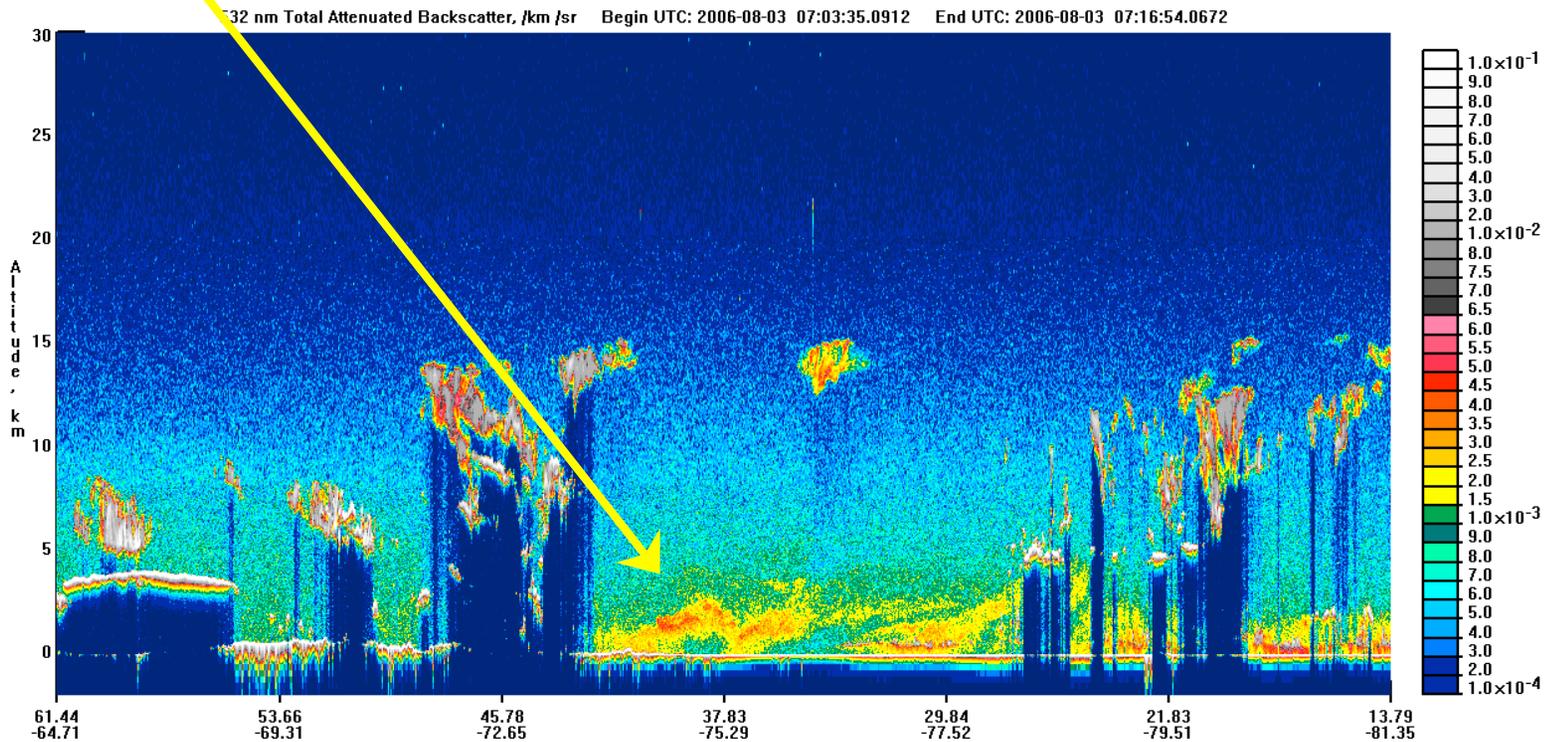
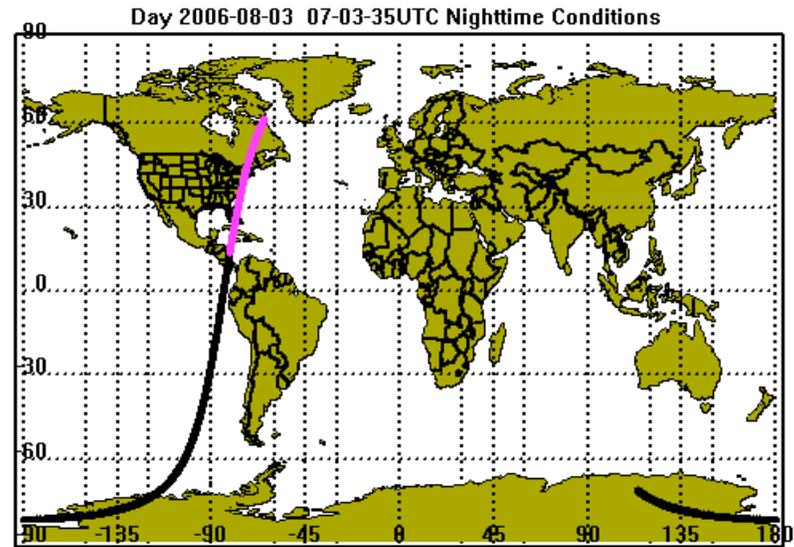
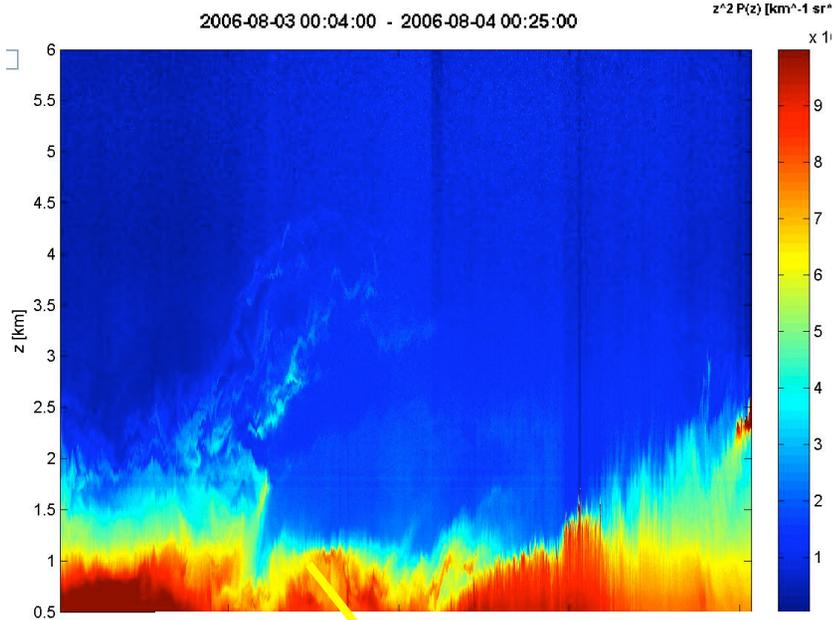
July 9, 2004



July 10, 2004



10 July 2004, am



Progress of 3D-AQS Project

Progress

- Formation and interaction with end user committee
- Determined priority datasets:
 - MODIS AOD and PM_{2.5} monitor matched data
 - MODIS AOD on CMAQ grid
- Porting historical MODIS AOD-PM_{2.5} matched data to AirQuest
- Started development of finer resolution AOD data
- Started development of 3D visualization methods
- Transferring IDEA to operational NOAA environment

Timeline

- 2007-08: Evaluation of other sensors (OMI, AIRS) for integration into AirQuest. Implementation of 3D visualization and data output.
- 2008-09: Complete data integration and transition to operations

3D-AQS Needs Input

- End user input needed
 - User poll posted at Smog Blog (<http://alg.umbc.edu/usaq/>)
 - Input sought through end user committee
 - Email always welcome: engelcoxj@battelle.org
- Type of input needed
 - Data types of interest
 - Level of processing and format required
 - Type and style of visualization
 - Temporal and spatial needs
- Better data accessibility = more use and demand for environmental information = greater understanding of our atmosphere

A satellite-style map of the Gulf of Mexico and the Florida peninsula. The land is shown in shades of brown and green, while the water is dark blue. A prominent white cloud formation is visible in the lower-left quadrant of the Gulf. The word "Questions?" is written in a bold, orange, sans-serif font across the center of the image.

Questions?