IDEA Infusing satellite Data into Environmental Applications

Use of MODIS Satellite Observations in "Near Real Time" to Provide Large-Scale Forecast Guidance of Fine Particulate Matter, PM2.5, in the U.S.
An Experimental Forecast Tool

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Air Quality Trends and Analysis Group
RTP, NC 27709

SAMWG National Meeting
Point Clear, AL
13 May 2004

NASA MODIS - EPA AIRNow Aerosol (PM2.5) Air Quality Forecasting

Objective: Prototype a near-real-time MODIS trajectory forecast product for select group of EPA PM2.5 Air Quality Forecasters

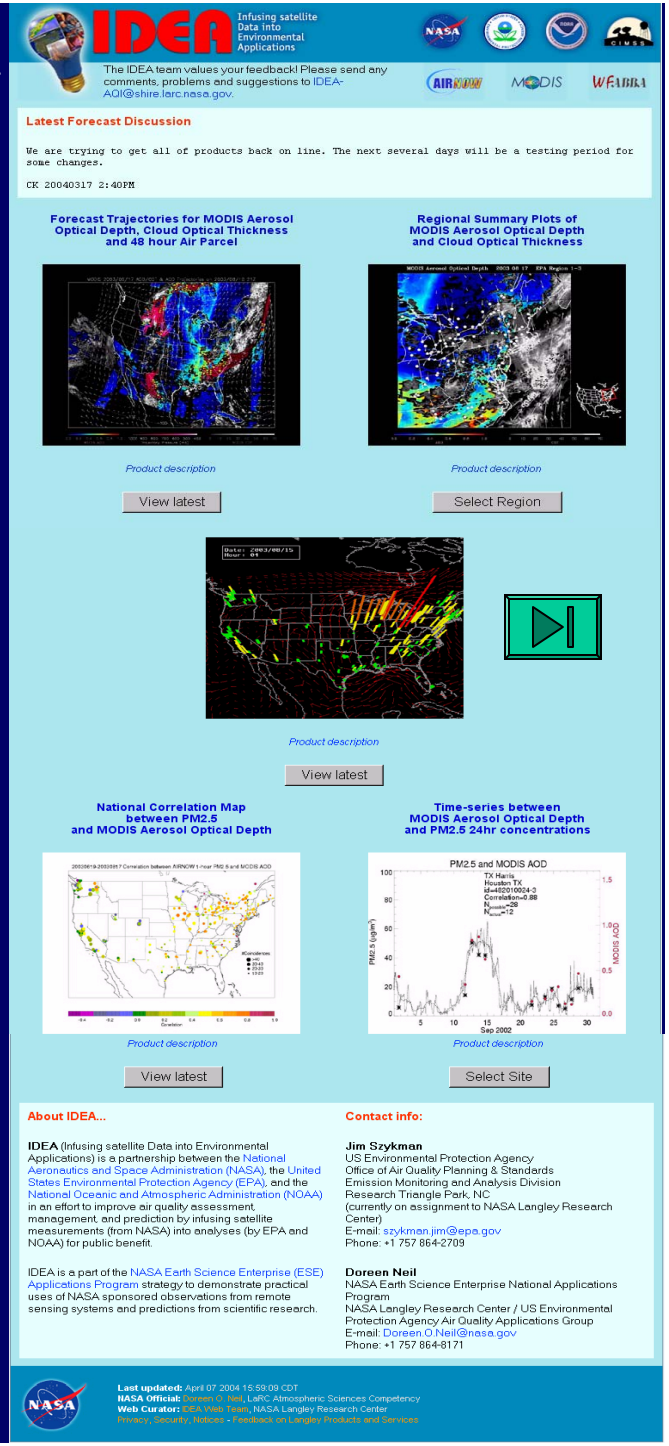
Goal: Improve accuracy of next day $PM_{2.5}$ AQI forecast during large aerosol events

- ***Prototype System demonstrated during Summer 2003****
- ***Operational System implemented at CIMSS May 1, 2004*****
- ***Linked to AIRNow as Forecast Tool***

Direct Team Members: Chieko Kittaka[1], John White[2], Jassim Al-Saadi[3], Brad Pierce[3], Doreen Neil[3], Allen Chu[4], Lorraine Remer[4], Elaine Prins[5], Liam Gumley[6]

[1]SAIC/LaRC, [2]EPA/OAQPS, [3]NASA/LaRC, [4]NASA/GSFC, [5]NOAA/NESDIS/CIMSS,[6]SSEC/CIMSS/UW-Madison

*MODIS DATA via NESDIS/ORA; **MODIS DATA via SSEC/CIMSS DB

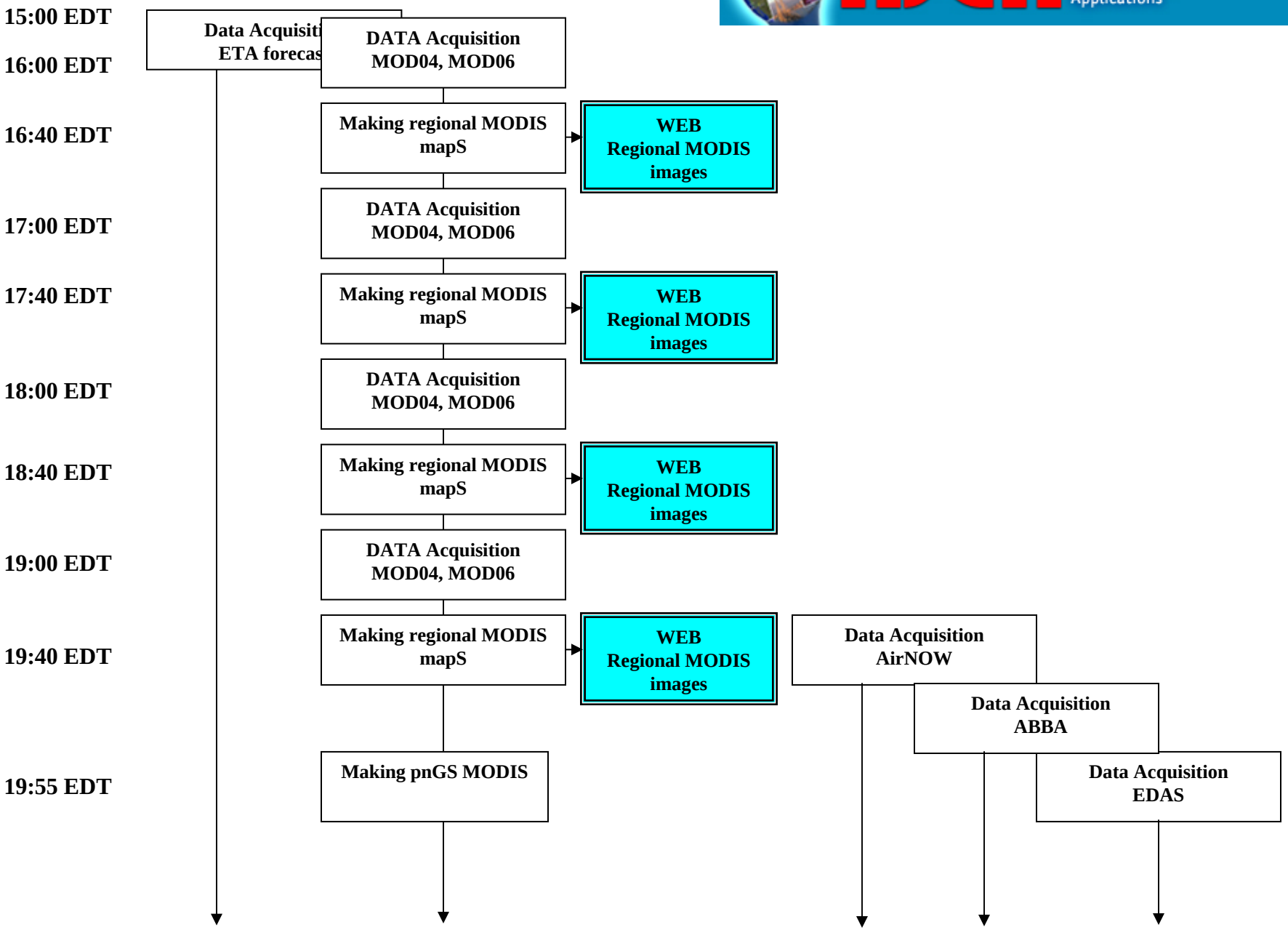


MODIS/AIRNow
Forecast Tool Products URL

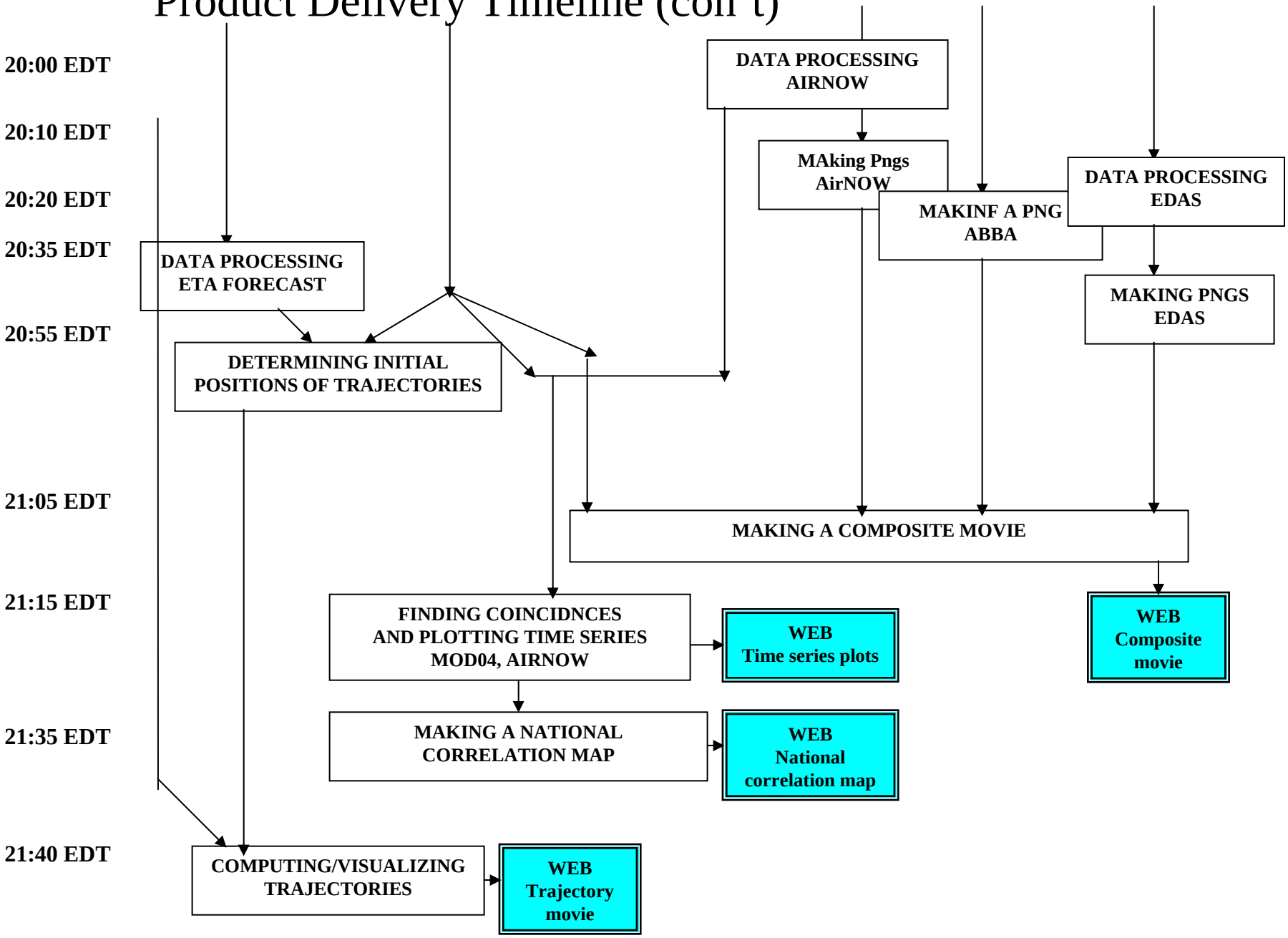
http://idea.ssec.wisc.edu

- AIRNow List Serve Announcement within next several days.
- Please use website to provide direct feedback.

Prototype Product Delivery Timeline



Product Delivery Timeline (con't)



Product Delivery Time

Prototype vs. CIMSS (MODIS DB)

16:40 EDT	WEB Regional MODIS images
17:40 EDT	WEB Regional MODIS images
18:40 EDT	WEB Regional MODIS images
19:40 EDT	WEB Regional MODIS images
21:15 EDT	WEB Time series plots; WEB Composite movie
21:35 EDT	WEB National correlation map
21:40 EDT	WEB Trajectory movie

13:15 EDT	WEB Regional MODIS images
14:50 EDT	WEB Regional MODIS images
16:25 EDT	WEB Regional MODIS images
16:30 EDT	WEB Trajectory movie
17:45 EDT	WEB Composite movie
18:15 EDT	WEB Time series plots; WEB National correlation map

All Images Posted to IDEA website by 6:15 EDT.

Regional Views Available 1-1.5 hrs after local MODIS overpass.

Current/Future Work

- Transitioned from NASA-LaRC to SSEC/CIMSS for operations, May 1, 2004 – Now Using MODIS D.B.
- Refinements to current products based on forecaster feedback.
- Provide as a forecast tool to all AQ forecasters through direct links with AIRNow-TECH.
- Researching feasibility to provide a boundary layer MODIS AOD product (i.e., indication when majority of aerosol in BL).
- Work with NESDIS/ORA to further evaluate use of GOES aerosol product (GASP), focus on temporal resolution from GOES.

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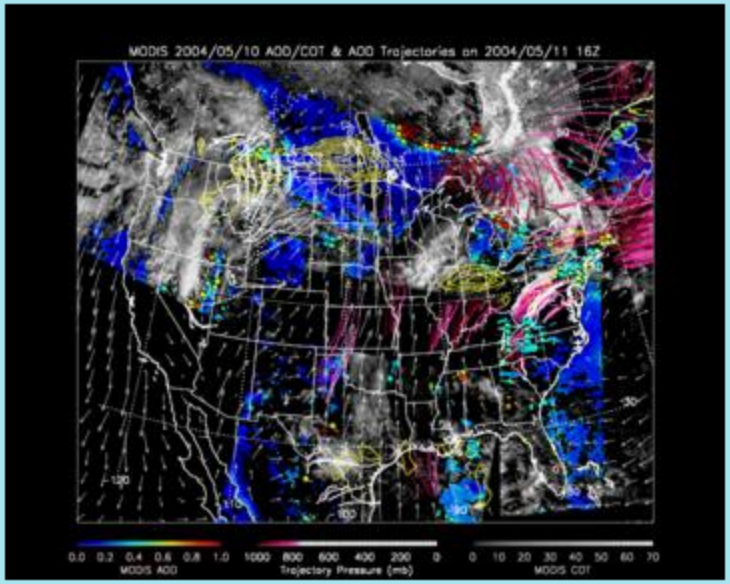
Latest Forecast Discussion - May 10, 2004

MODIS observes moderately elevated AOD over the mid-Atlantic and over the VA/NC/TN/KY/WV area. AOD over the mid-Atlantic is forecast to move NE over eastern seaboard early in forecast period, with potential for surface AQ impact, then exit over ocean. Aerosol over the southeast should also move NE, but some large scale ascent (as indicated by these trajectories) may limit surface influence.

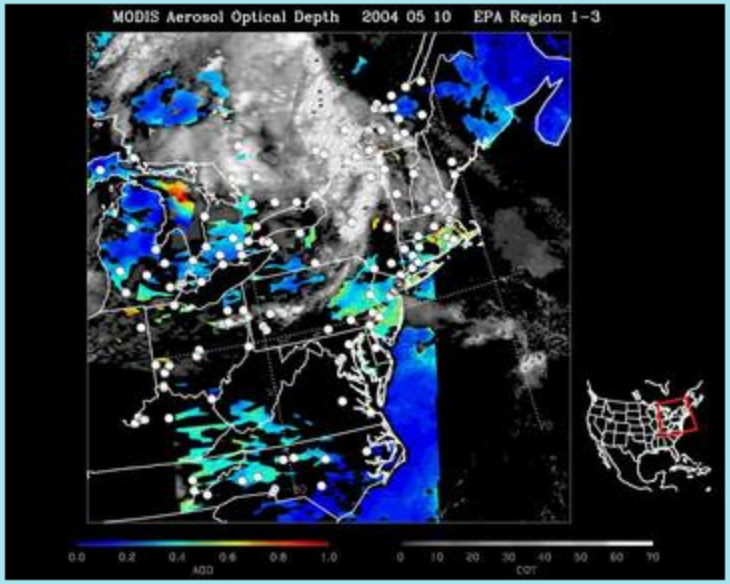
More

jalsaadi 04:56 PM

Forecast Trajectories for MODIS Aerosol Optical Depth, Cloud Optical Thickness and 48 hour Air Parcel



Regional Summary Plots of MODIS Aerosol Optical Depth and Cloud Optical Thickness



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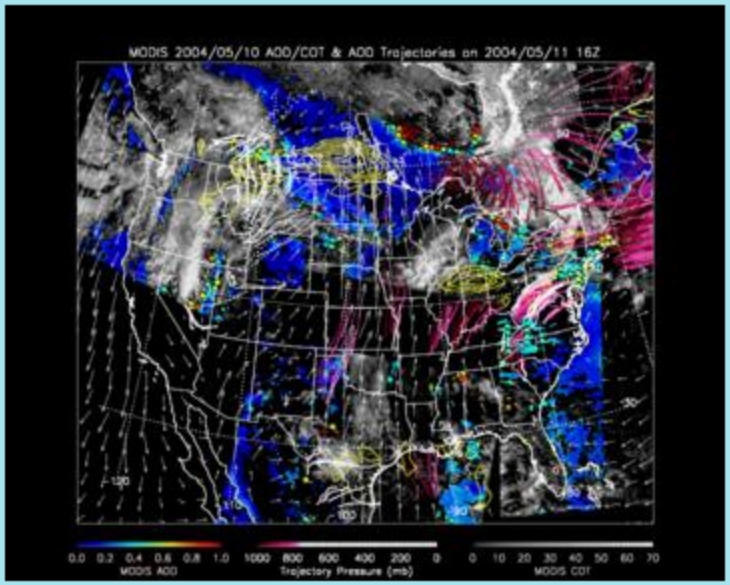
Forecast Trajectories for MODIS Aerosol Optical Depth, Cloud Optical Thickness and 48 hour Air Parcel



Product description

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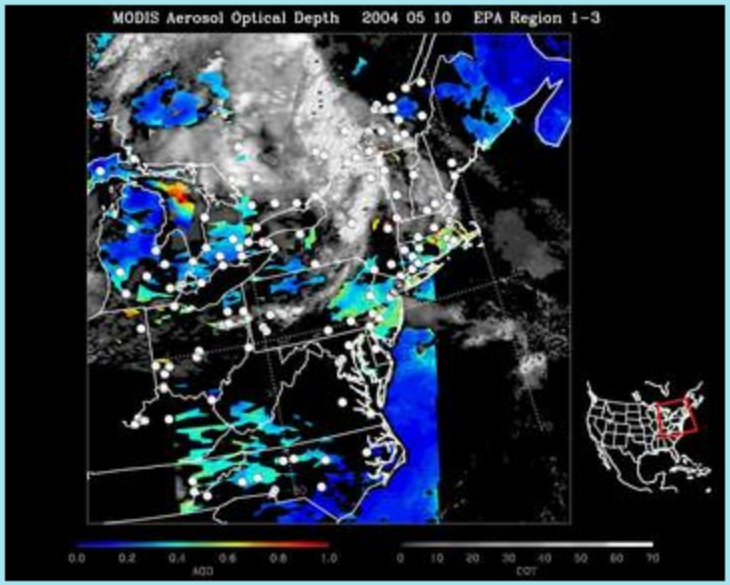
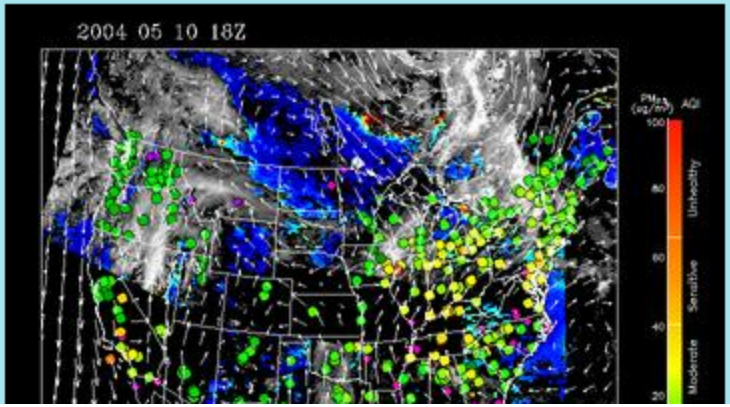
Regional Summary Plots of MODIS Aerosol Optical Depth and Cloud Optical Thickness



Product description

Select Region

VGEO Composite PM2.5/MODIS Aerosol Optical Depth Data Fusion Animation



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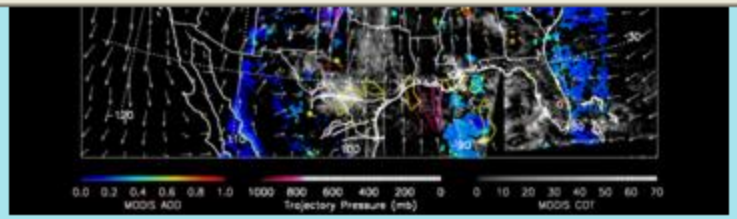

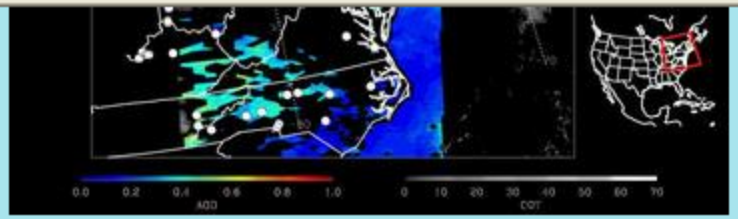

Product description

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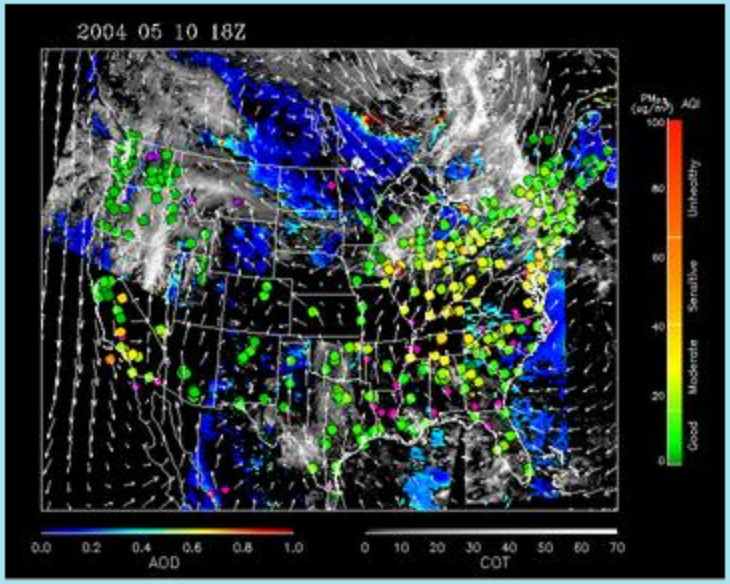

Product description

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National Correlation Map between PM2.5 and MODIS Aerosol Optical Depth

Time-series between MODIS Aerosol Optical Depth and PM2.5 24hr concentrations

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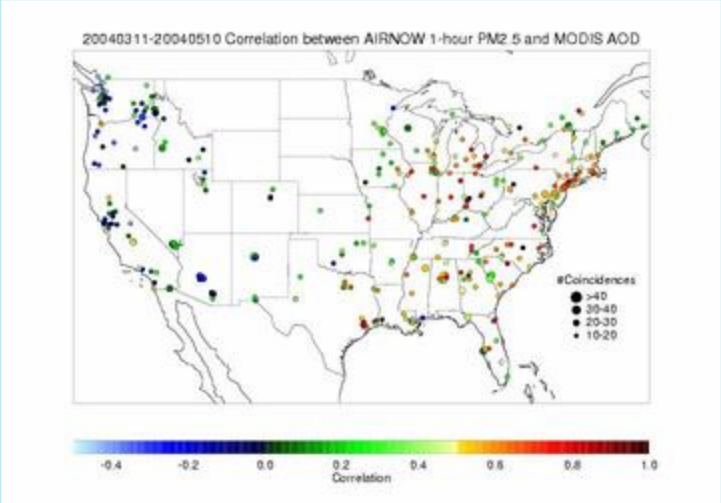
National Correlation Map between PM2.5 and MODIS Aerosol Optical Depth



Product description

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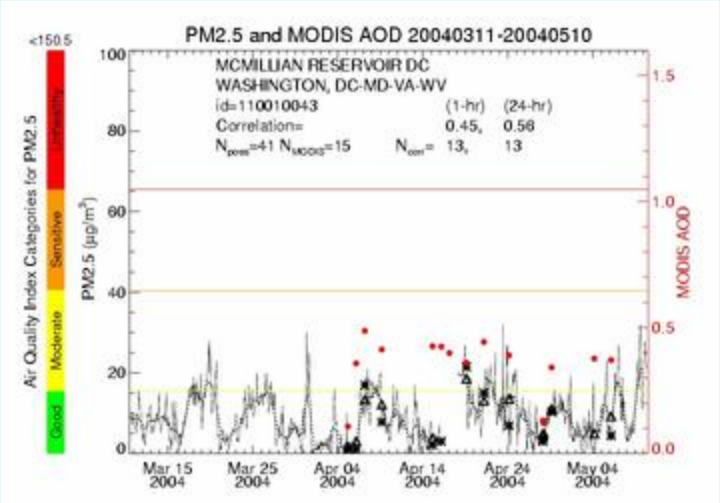
Time-series between MODIS Aerosol Optical Depth and PM2.5 24hr concentrations



Product description

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About IDEA...

IDEA (Infusing satellite Data into Environmental Applications) is a partnership between the National Aeronautics and Space Administration (NASA), the United States Environmental Protection Agency (EPA), and the National Oceanic and Atmospheric Administration (NOAA) in an effort to improve air quality assessment, management, and prediction by infusing satellite measurements (from NASA) into analyses (by EPA and NOAA) for public benefit.

IDEA is a part of the NASA Earth Science Enterprise (ESE) Applications Program strategy to demonstrate practical uses of NASA sponsored observations from remote sensing systems and predictions from scientific research.

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Select an EPA Region

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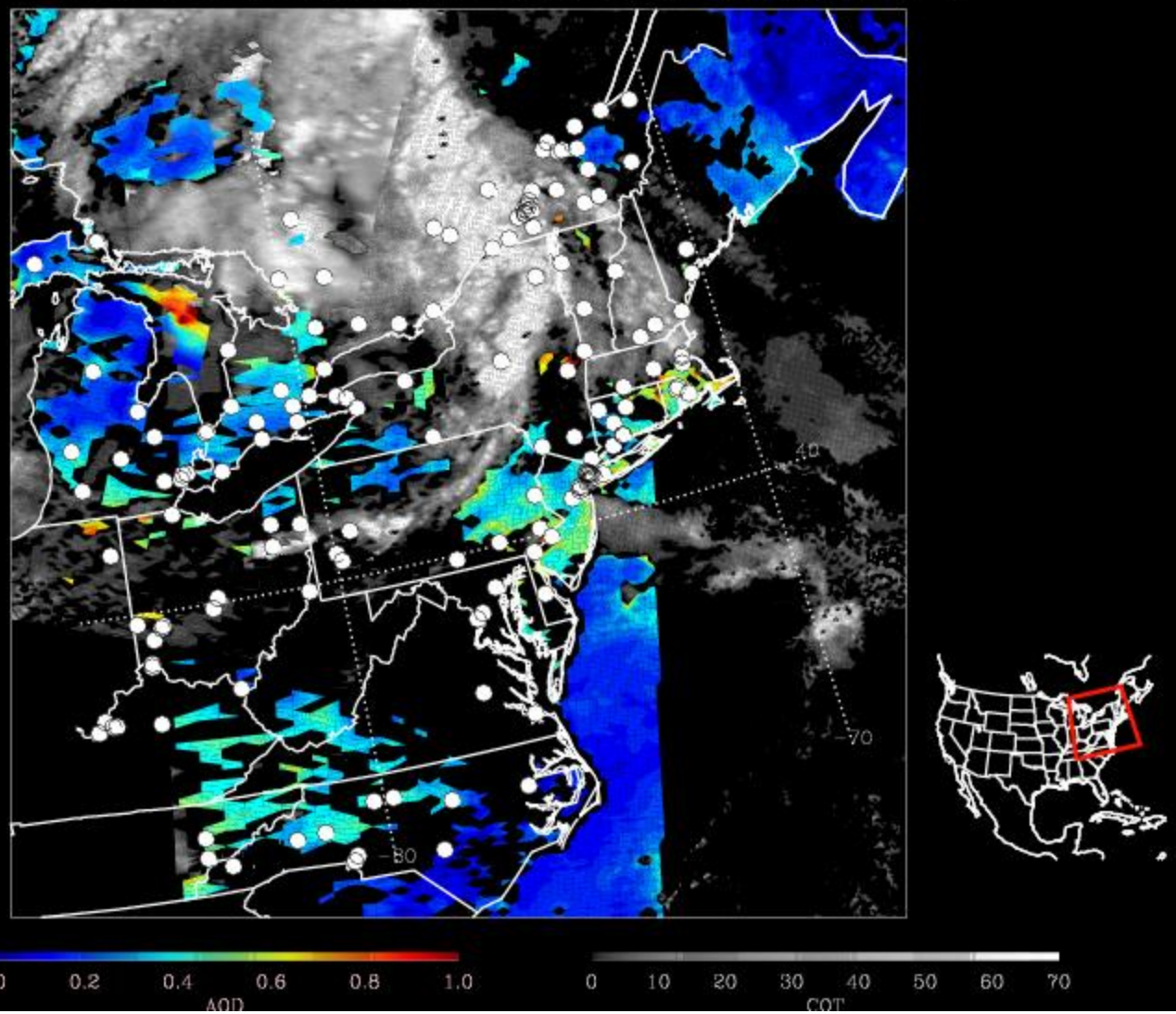
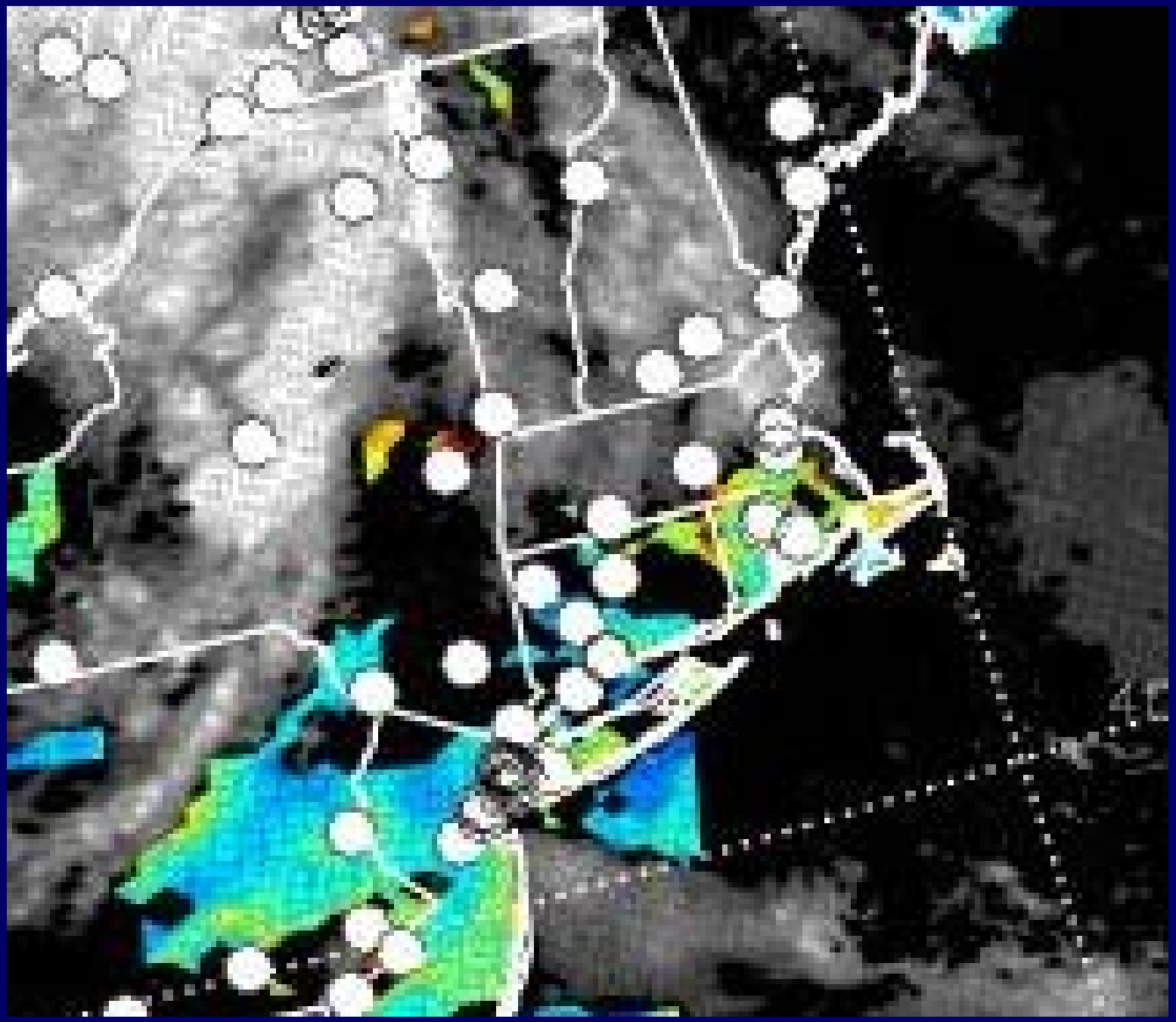
http://idea.ssec.wisc.edu/index.php?plot_type=mod_Region&region=01-03&product_date=latest

SELECT PLOT | PREVIOUS FORECAST DAY | NEXT FORECAST DAY | 2004 May 09 Go | Product description

Valid date ranges (20030826 to 20040509)

MODIS Aerosol Optical Depth 2004 05 10 EPA Region 1-3





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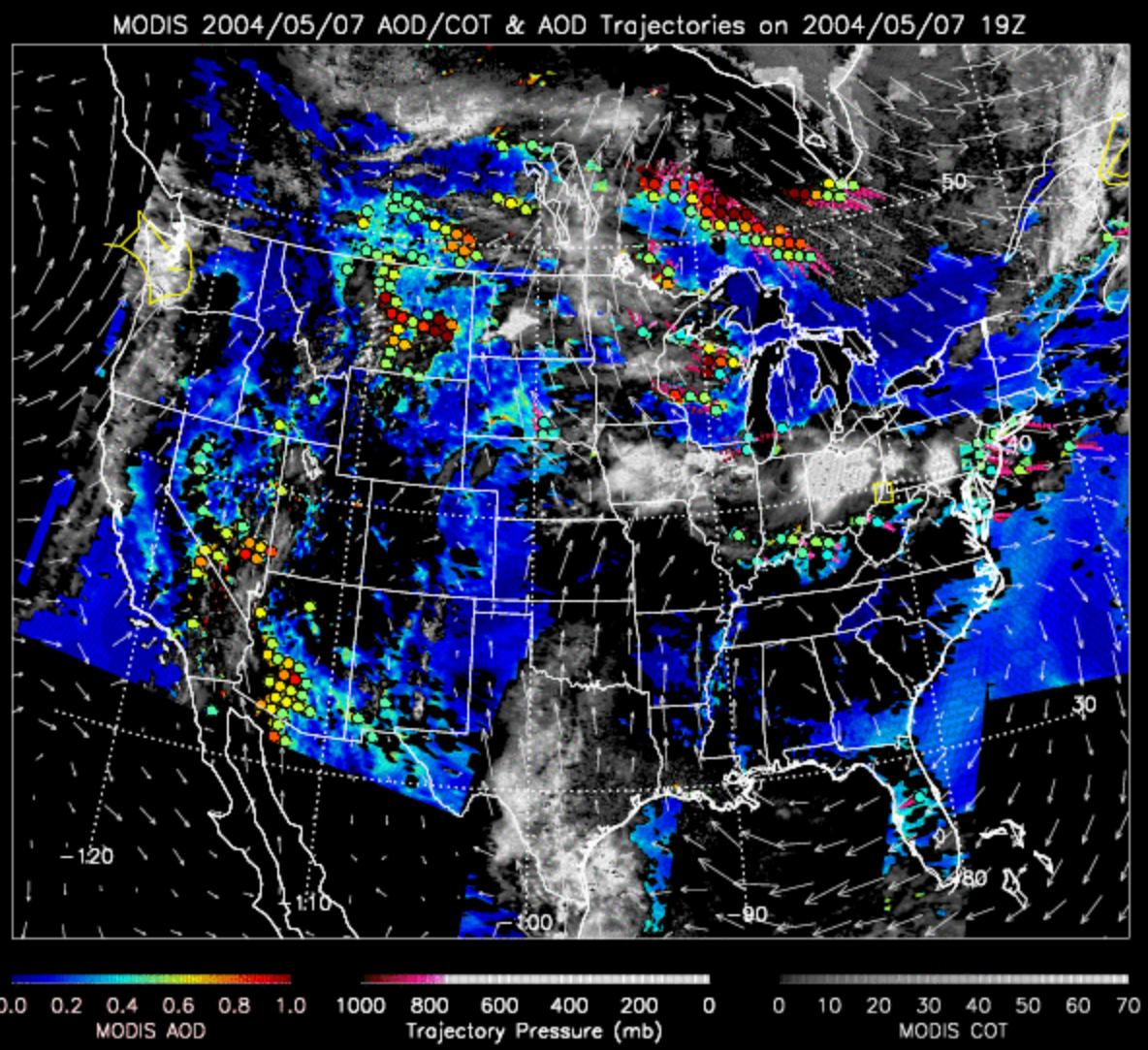
SELECT PLOT | PREVIOUS FORECAST DAY | NEXT FORECAST DAY | 2004 May 07 Go | Product Description

Valid date ranges (20030826 to 20040509)



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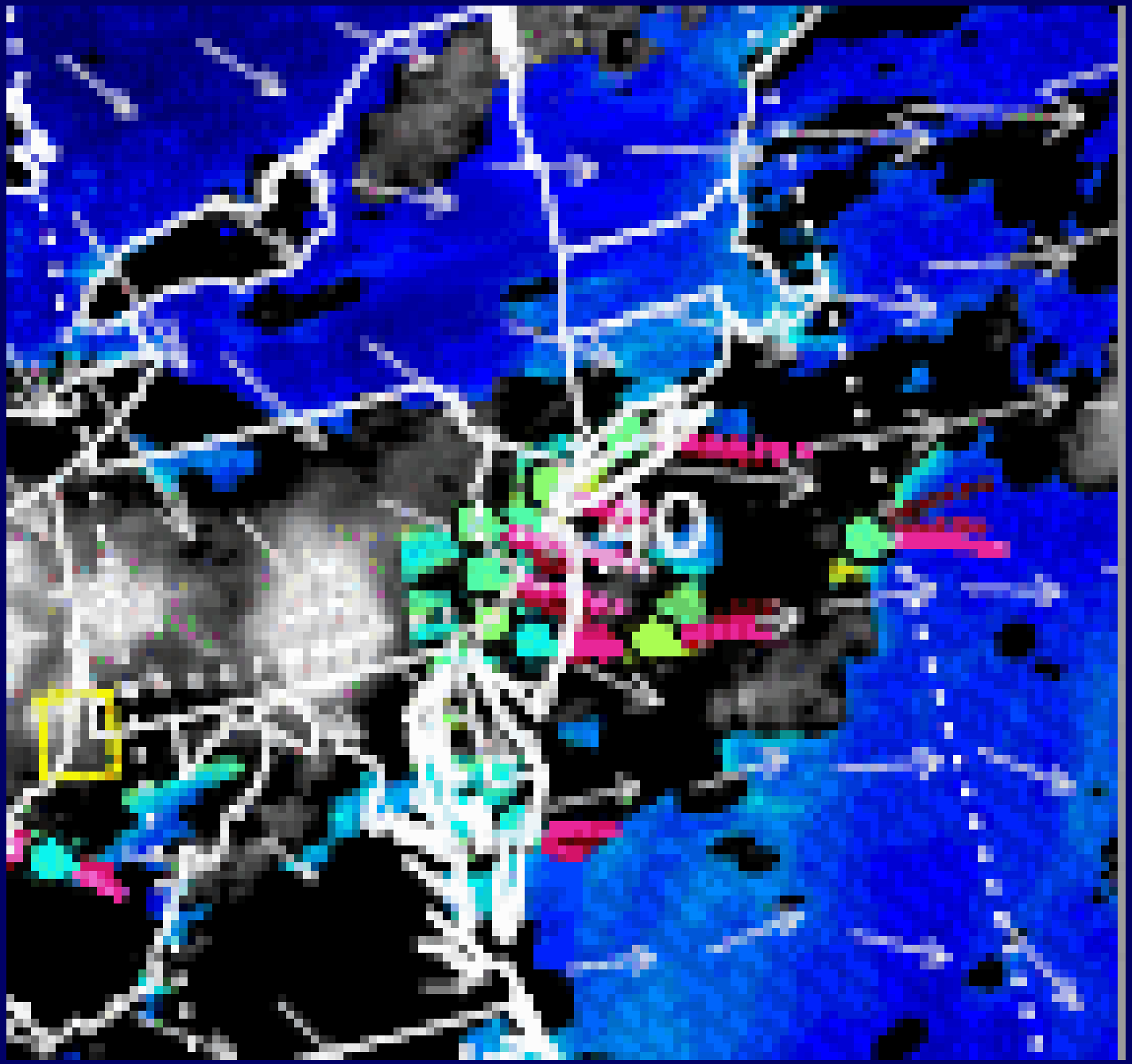

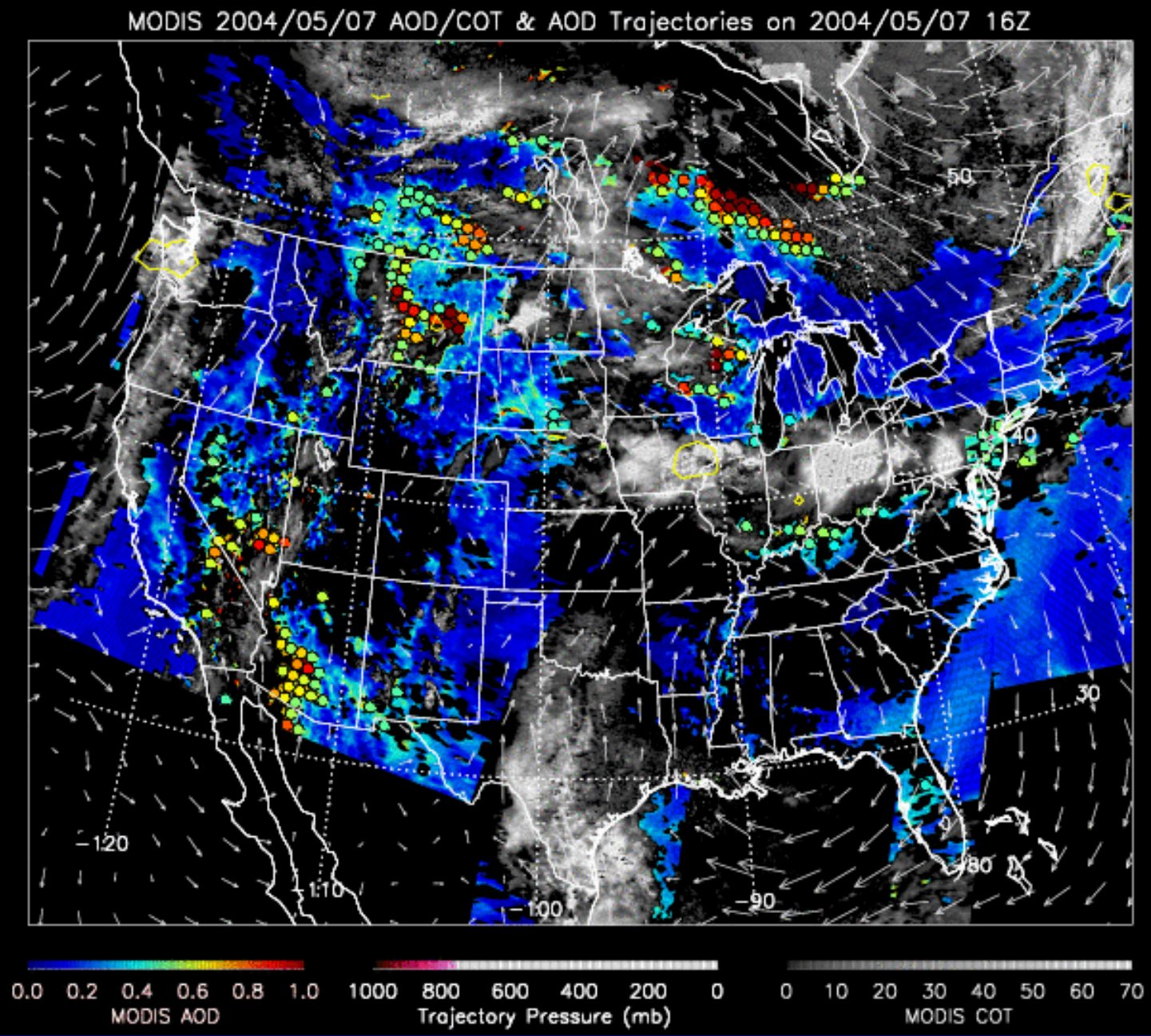
MODIS 2004/05/07 AOD/COT & AOD Trajectories on 2004/05/07 16Z
50
40
30
20
−120
−110
−100
−90
−80
0.0 0.2 0.4 0.6 0.8 1.0
MODIS AOD
1000 800 600 400 200 0
Trajectory Pressure (mb)
0 10 20 30 40 50 60 70
MODIS COT

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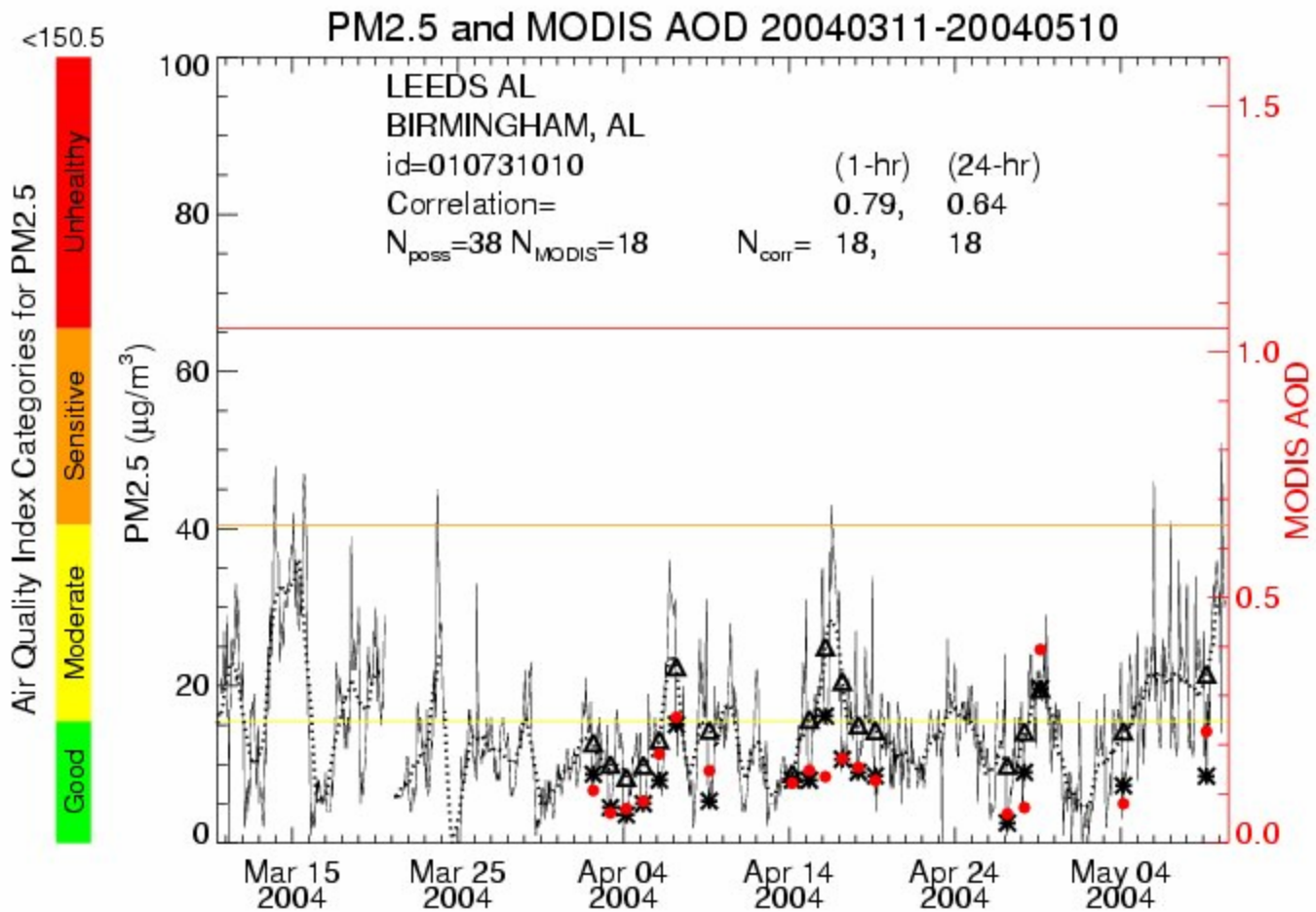
SELECT PLOT | PREVIOUS FORECAST DAY | NEXT FORECAST DAY | 2004 May 09 Go | Valid date ranges (20030826 to 20040509) | Product description



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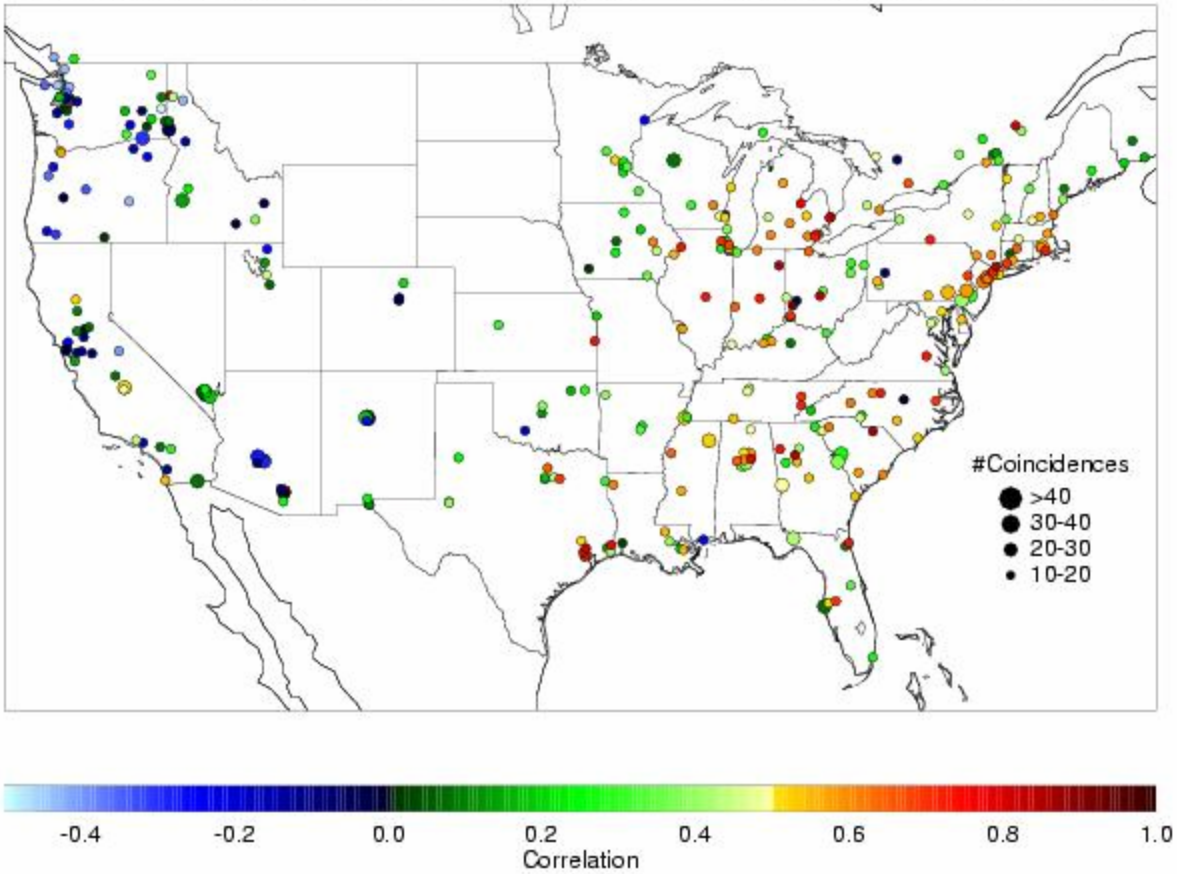
20040311-20040510 Correlation between AIRNOW 1-hour PM2.5 and MODIS AOD



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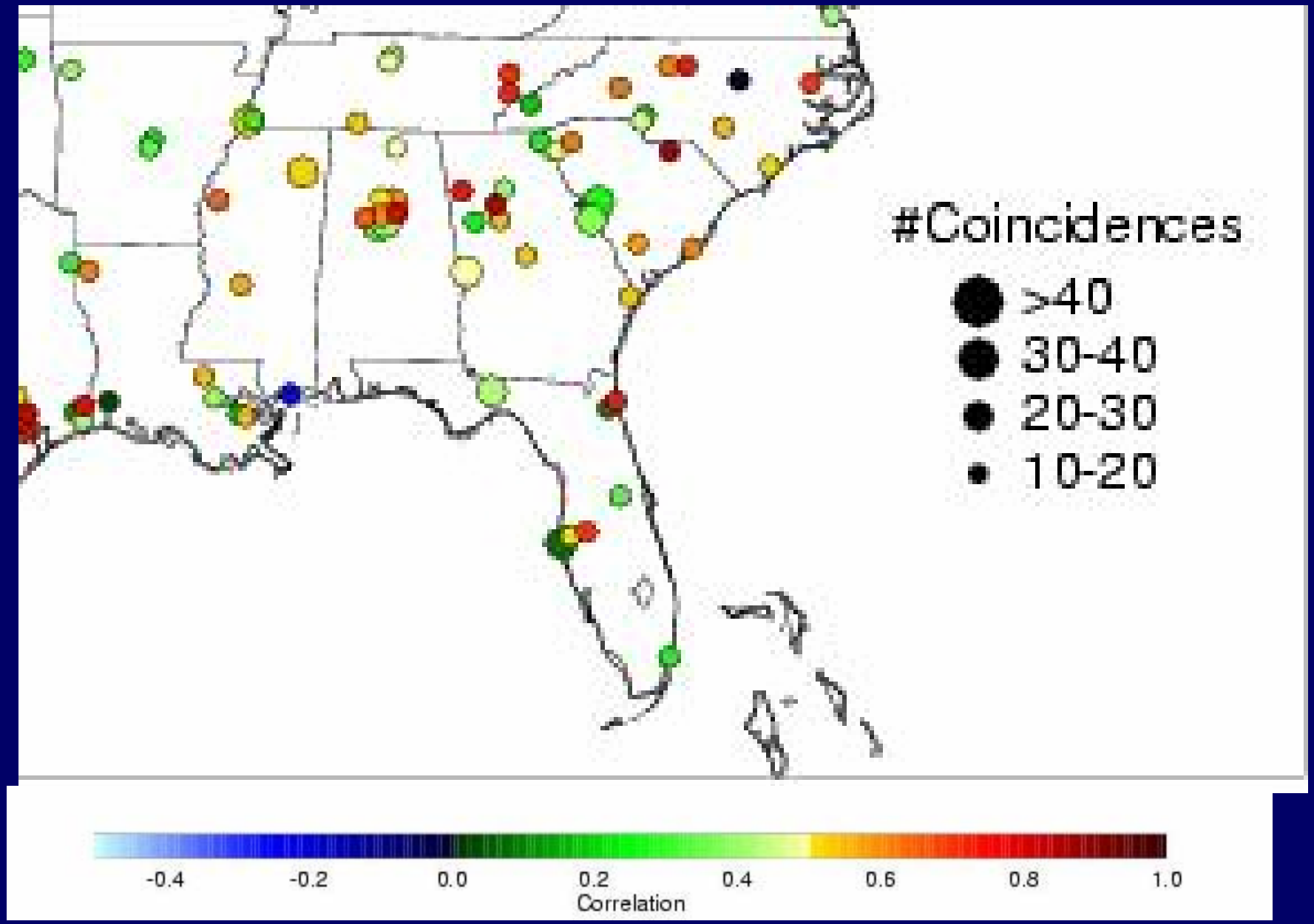
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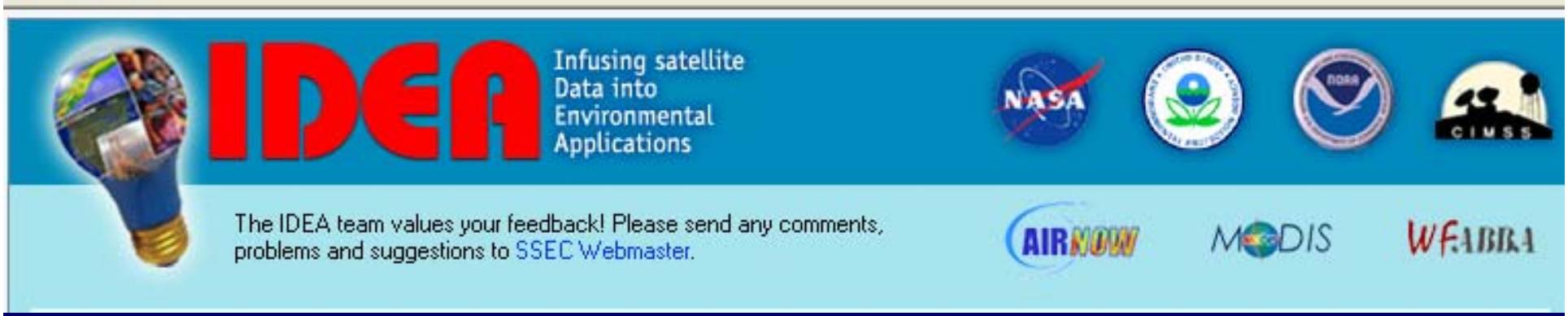
30-40
20-30
10-20
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
Correlation



Acknowledgements:

MODIS aerosol optical depth and cloud optical thickness data is being obtained from NOAA/NESDIS/Office of Research and Applications through the Cooperative Institute for Meteorological Satellite Studies University of Wisconsin, Madison

In-situ PM2.5 mass concentration data is being obtained from the US EPA AIRNow Program in cooperation with State and Local Air Agency Partners

Eta meteorological forecast data is being obtain from the National Weather Service component of NOAA