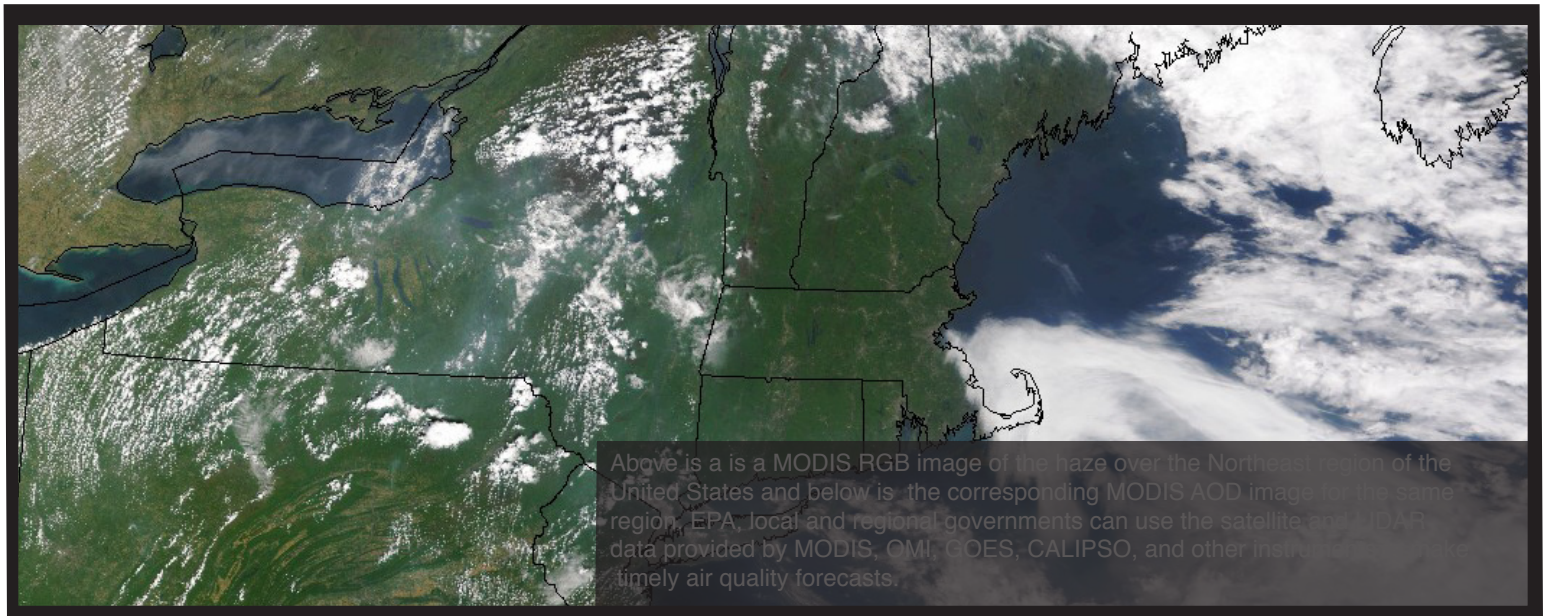
National Aeronautics and Space Administration

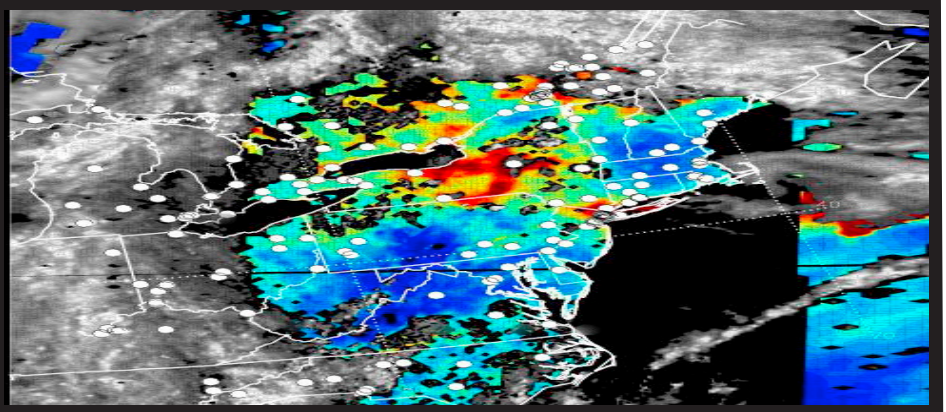
Improving Air Quality through the use of Satellite and LIDAR data

Enhancements to the VIEWS/TSS System with Data from CALIPSO



Above is a is a MODIS RGB image of the haze over the Northeast region of the United States and below is the corresponding MODIS AOD image for the same region. EPA, local and regional governments can use the satellite and LIDAR data provided by MODIS, OMI, GOES, CALIPSO, and other instruments to make timely air quality forecasts.

NASA's Terra satellite and the MODIS instrument.



Project Goals

Integrate NASA satellite data and advanced analysis capabilities into the VIEWS/TSS air quality decision support system

Permit better characterization of pollutants according to local emission sources versus long-range transport and their vertical mixing characteristics

Engage end-user participation in the optimal design of the system for the use and interpretation of satellite data products in air quality assessments

Project Outcomes

Increase reliability of air quality forecasts to reduce health impacts and visibility degradation due to poor air quality, which will promote healthier ecosystems

Increase understanding of source-receptor relationships, leading to defensible and achievable control strategies for decision makers

Create and distribute valuable case studies and precedents for improved legislation creation

Improving Air Quality through the use of Satellite and LIDAR data

Enhancements to the VIEWS/TSS System with
Data from CALIPSO, Aura, Terra and Aqua

Summary

This project assesses the potential uses of NASA remote sensing data (from MODIS, OMI, GOES, CALIPSO, and others) and advanced analysis tools in the Visibility Information Exchange System and the Western Regional Air Partnership (WRAP) Technical Support System (VIEWS/TSS), an integrated decision support system. The U.S. Environmental Protection Agency (EPA), as well as other federal, state and local agencies use VIEWS/TSS to make three-dimensional air quality models, such as the Community Multiscale Air Quality (CMAQ) modeling system, in order to meet National Ambient Air Quality Standards and address visibility impairment in national park and wilderness areas.

U.S. air quality is affected by both local emissions and long-range transport (LRT) of pollutants from other regions. Trans-Pacific transport of pollutants has affected background ozone in the Western U.S., while dust and smoke plumes from China have been seen to reduce visibility in the rural Midwest. States must assess LRT versus local source contributions to prepare effective state implementation plans demonstrating compliance with EPA air quality and haze regulations. Integrating modeled and observational data for 3D characterization of air quality is critical for their success.

The project supports and engages end user groups, including the Western Regional Air Partnership, the National Park Service, the EPA and the North Carolina and Utah Divisions of Air Quality. The University of North Carolina leads the project with co-investigators at the Cooperative Institute for Research in the Atmosphere (CIRA) and the University of Maryland, Baltimore County (UMBC).

Project Details

This project applies existing NASA aerosol optical depth products and imagery from the Terra/Aqua (MODIS, AIRS) and Aura (OMI) satellites, the CALIPSO LIDAR, and fire activity data from the NOAA GOES satellite. The various NASA satellite data inputs, in conjunction with ground-based network data currently available in the VIEWS/TSS framework, provide a more complete picture of the aerosol concentrations and sources over the U.S.

The system will include metadata in order for air quality planners to use the satellite data in a complementary manner with ground-based observations to understand source characteristics and composition of particulate matter most significantly contributing to air quality and visibility degradation in a particular region. In addition to satellite data, the enhanced system will include advanced analysis tools to apply and interpret this data in the urban-to-regional scale modeling required to develop state and regional air quality implementation plans.

The ability to apply satellite observations to air quality issues stems from decades of investments by NASA and the atmospheric research community in aerosol retrieval methods, sensor technology, validation efforts, and other scientific research. Initial results from the CALIOP instrument aboard CALIPSO published by Winker et al. in “Initial Performance Assessment of CALIOP” have been promising, and provided the basis for the use of CALIPSO data in this project.

NASA APPLIED SCIENCES PROGRAM & AIR QUALITY

The NASA Applied Sciences Program supports innovative approaches to integrate Earth science research results (e.g., satellite observations and models) in decision-making tools that organizations use to benefit the nation and society.

The air quality applications program supports activities to apply Earth science research results to air quality management, policy, and decision making.

The air quality program focuses its activities according to four themes: air quality planning, forecasting, emissions inventories, and compliance.

For more information about this project:
Uma Shankar
The University of North Carolina
137 E. Franklin St, CB #6116
Chapel Hill, NC 27599-6116

For more information regarding the NASA Applied Sciences program, contact:
Lawrence Friedl at
202-358-1599
http://science.hq.nasa.gov/earth-sun/applications/index.html

Key Websites:

The Visibility Information Exchange Web System
http://vista.cira.colostate.edu/views

WRAP Technical Support System
http://vista.cira.colostate.edu/views

Infusing satellite Data into Environmental Applications (IDEA)
http://idea.ssec.wisc.edu/

EPA Air Quality System (AQS)
http://www.epa.gov/ttn/airs/airsaqs/