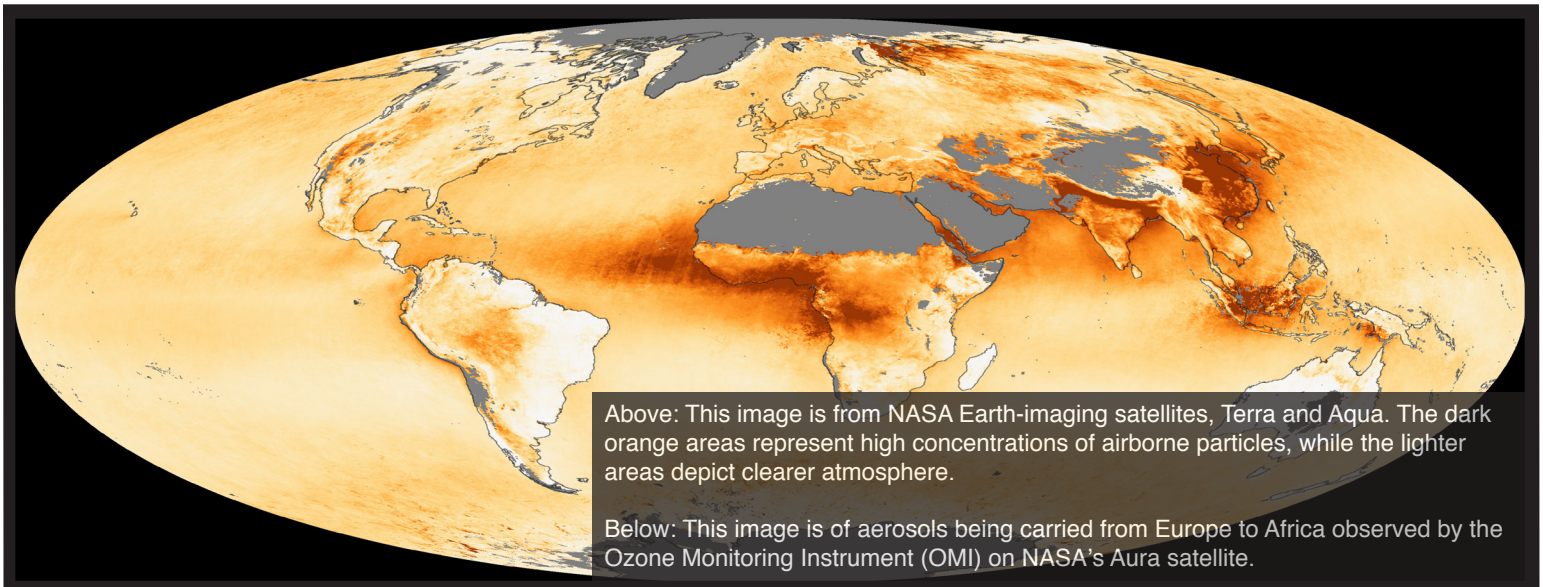
National Aeronautics and Space Administration

Enhancing the Nation's Environmental Forecasting Capabilities

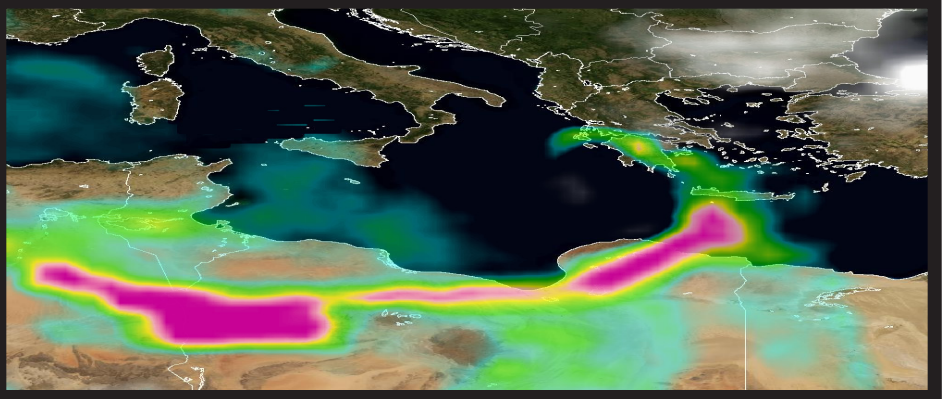
Applying NASA Satellites and Models to Improve Weather-Air Quality Forecasting



Above: This image is from NASA Earth-imaging satellites, Terra and Aqua. The dark orange areas represent high concentrations of airborne particles, while the lighter areas depict clearer atmosphere.

Below: This image is of aerosols being carried from Europe to Africa observed by the Ozone Monitoring Instrument (OMI) on NASA's Aura satellite.

NASA's Aura satellite, carying the OMI instrument.



Project Goals

NASA aerosol modeling technology, GOCART, integrated into NOAA core decision support system

NASA satellite and in situ data are being used to evaluate and refine the GFS-GOCART system

Global aerosol products provide improved initial and lateral boundary conditions for the AQF system

Project Outcomes

Improved accuracy of NOAA Medium Range Weather Forecast

Provide improved estimates of aerosols in the GFS and consequently, improved weather forecasts

NOAA National Air Quality Forecasting System
Provide improved particulate matter initial and lateral boundary conditions for the National AQFC and consequently, improve aerosol air quality forecasts

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Summary

This project assesses the potential uses of NASA remote sensing data (from MODIS, OMI, CALIPSO, and other instruments and satellites) and advanced modeling tools in the National Centers for Environmental Prediction (NCEP) collaboration, an integrated decision support system that the National Oceanic and Atmospheric Administration (NOAA), as well as state and local agencies, use to make predictive models for air quality forecasting. The resulting models can then improve the nation's environmental forecasts that in turn help the public to protect their health, lives and property. NOAA and the National Weather Service (NWS) lead the project with coinvestigators at NOAA-NASA-DOD Joint Center for Satellite Data Assimilation and NOAA Center for Atmospheric Science.

NCEP develops and operates environmental decision support tools to guide users ranging from NWS field offices to state and federal air quality index (AQI) forecasters. The infusion of NASA's modeling technology and measurements into NCEP operations will extend the application of NASA's research results to improve NOAA's decision-making capabilities in two major areas. The first area is in support of NOAA's core mission, which is to serve society's needs for weather and water information. NASA and its partners provide science-based products and services that are used for decision making by NWS field offices, other government agencies, the private sector and the public. The second area is in response to congressional mandate: NOAA and NWS implement the National Air Quality Forecasting Capability (AQFC) in partnership with the EPA. The air quality guidance has been used by state and local environmental agencies to issue air quality forecasts and AQI predictions in their jurisdictions.

Project Details

This project will integrate an aerosol modeling component from NASA's Modeling Analysis Prediction (MAP) program and Global Ozone Chemistry Aerosol Radiation Transport (GOCART) program into NCEP Global Forecast System (GFS). GFS is the decision support tool used by NOAA for medium-range numerical weather prediction. Inclusion of this data will improve model radiative processes while also enabling NOAA's first operational global aerosol forecasting capability. The project also applies existing NASA aerosol optical depth products and imagery from the Terra/Aqua (MODIS, AIRS) and Aura (OMI) satellites, the CALIPSO LIDAR, and ground based network (AERONET, MPLNet) to verify, evaluate and refine the GFS-GOCART system.

Global aerosol products generated in this project will provide an improved estimate of aerosol distributions and variations in GFS, which in turn will improve the accuracy of weather forecasts issued by NOAA to protect life and property. The adoption and sustained use of NASA science products in NOAA's weather-air quality decision support tools will serve NOAA's decision support responsibilities and ultimately, the public. The work of Chin, et al. (2002), in "Tropospheric aerosol optical thickness fromt he GOCART model and comparisons with satellite and sunphotometer measurement" was particularly influential 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:
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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 Web sites

NCEP Environmental Modeling Center
http://www.emc.ncep.noaa.gov/

NCEP Air Quality Forecast
http://www.emc.ncep.noaa.gov/mmb/aq /

NOAA-NASA-DOD JCSDA
http://www.jcsda.noaa.gov/

NOAA Center for Atmospheric Sciences
http://www.gs.howard.edu/atmosci/