National Aeronautics and Space Administration

Improvement of BlueSky Systems for Assessment of Smoke Impacts

Integrating NASA Satellite Data with Decision Support Systems for Management of Fire Risks and Air Quality

Above: MODIS image of 2007 California wild fires.
Below : The re-engineered BlueSky Framework facilitated near real-time predictions of smoke and PM2.5 air quality impacts during emergency response to the October 2007 California fires.

Fire emissions can affect air quality & public health.
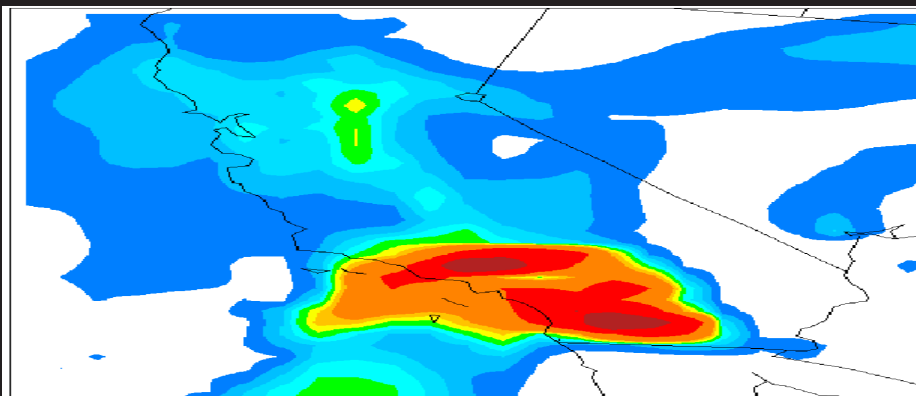
Project Goals

Satellite data integrated into USFS and EPA decision-support systems, including BlueSky systems and the national emissions inventories

BlueSky systems with satellite data integrated with the Canadian Forest Service's air quality forecasting operations, as well as the ClearSky and Airpact-3 forecasting systems

Long -term goals to integrate BlueSky systems satellite data with EPA's AIRNow and NWS's Air Quality Forecast Guidance

Project Outcomes

Prevent potentially hazardous prescribed burns, thus reducing adverse impacts on public health and protected vistas

Improve the quality and likely success of state implementation plans and accuracy of national emmission inventories

Improve air quality forecasts, thus improving the success of efforts for managing risks to public health
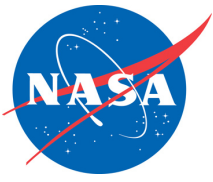
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Integrating NASA Satellite Data with Decision Support
Systems for Management of Fire Risks and Air Quality

Summary

This project assesses the potential uses of NASA remote sensing data (from MODIS, GOES, and other instruments) and advanced modeling tools in the BlueSky framework, an integrated decision support system, that the U.S. Forest Service (USFS), as well as state and local agencies, use to make predictive models for smoke dispersion patterns in wildfires. The resulting models can then assist officials who make crucial decisions about managing prescribed burns and containing wildfires and the impact that the fires will have on air quality.

The purpose of this project is to improve the data that are input into the BlueSky decision support system. BlueSky systems were developed to input satellite-derived fire data, such as those available from the Moderate Resolution Imaging Spectroradiometer (MODIS), Geostationary Operational Environmental Satellites (GOES), and Advanced Very High Resolution Radiometer (AVHRR) sensors. The resulting fire emission inventories are substantially more timely and complete than those used previously.

In addition to the USFS BlueSky systems, the project is intended to support a variety of national air quality decision suport systems including Airpact-3, ClearSky and the EPA's AIRNow system.

Project Details

Forest and land managers plan to significantly increase prescribed burning efforts in the coming years to reduce the risks of uncontrolled wildfires. The need is growing for timely predictions of smoke impacts as increasing numbers of fires will occur within limited airsheds, with the potential to adversely affect human health and scenic vistas.

Predicting smoke and air quality impacts from wildfires presents multiple challenges; obtaining the best available fire data, reconciling data from multiple information sources, characterizing fuels, and predicting plume heights. Distributing predictions for operational use by burn managers raises additional challenges. These challenges are being systematically confronted by frameworks like BlueSky and other EPA and NASA sponsored programs.

The project team developed the Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation ("SMARTFIRE") to acquire data from National Oceanic and Atmospheric Administration (NOAA)'s Hazard Mapping System (HMS) along with other fire data and combine the data into a unified database, and produce inputs for the BlueSky Framework.

Currently, the EPA's national emissions inventory and inventory development protocols are being updated to leverage the products developed through this NASA-funded project. The BlueSky system automatically ingests meteorological predictions and fire data daily, it then merges this data with models of fuel consumption and emissions to produce timely predictions of air quality or smoke dispersion. The ability to apply satellite observations to air quality issues derives from decades of investments by NASA and the atmospheric research community in retrieval methods, sensor technology, validation efforts, and other scientific research. The work of Kaufman, et al. (2003), in "Fire and smoke observed from the Earth Observing System MODIS instrument—products, validation, and operational use" was particularly influential in this project. Kaufman's work laid the foundation for using MODIS fire products to improve BlueSky smoke predictions.