WILDLAND FIRES

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Earth Science to Action Strategy

Virtuous Cycle
- User needs inform next iteration of programs, missions and initiatives

Public Understanding & Exchange
- Put more scientific understanding into public sphere
- Deliver applied science to users
- Participate in multi-way info exchange
- Use input to inform subsequent work

Solutions with Value to the Nation
- Offer models, scientific findings and info through Open-Source Science principles
- Support private sector development of applications of Earth observations
- Provide science applications and tools to inform decisions

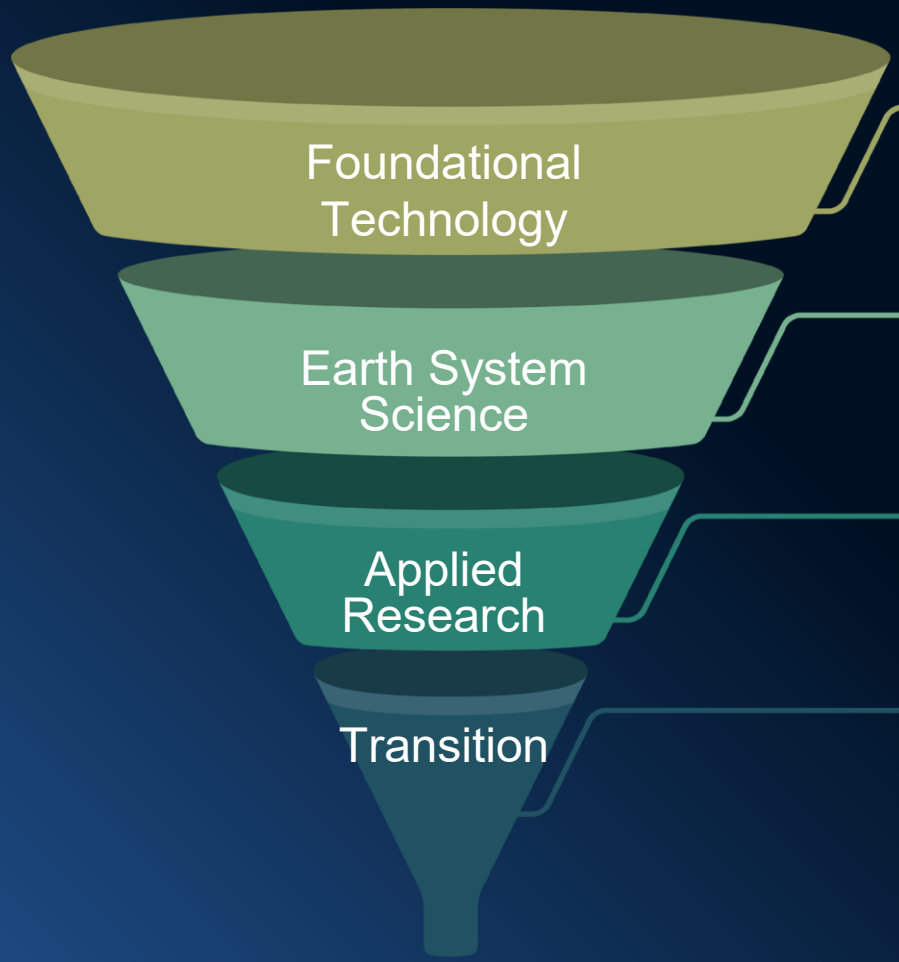
Earth System Science & Applied Research
- Grow scientific understanding of Earth's systems
- Develop predictive models of dynamic Earth systems and tools to understand and adapt to changes

Foundational Knowledge, Technology, Missions & Data
- Technology innovation
- Earth observations missions
- Data collected from space, air and ground

Wildland Fires Program Overview

The NASA Wildland Fires program **develops technology, research, and applications that improve the end-to-end management of wildland fires**, ultimately reducing the impact that fires have on communities and the economy.

The program works closely with wildland fire management agencies, researchers, and technologists in government agencies, academic institutions, and the private sector within the United States and abroad.



Continue to develop foundational Earth Observation and modelling technology for measuring aspects of wildland fire across the entire fire life cycle (pre-, active, & post-fire)

Leverage Earth Observation in use-inspired research to advance our understanding of the role that wildland fire plays in the Earth System

Co-develop and incubate applications that leverage Earth Observation data to support decision makers in wildland fire management

Deliver mature technological capabilities to operational fire management agencies to address key challenges in wildland fire management (e.g., FireSense Project)

Program Focus Areas

Defined by initial stakeholder engagement activities, we focus on technology development and capability transition in four use cases critical to wildland fire management:

Pre-fire: Collect and visualize near real-time risks based on fuel characteristics, soil moisture, surface temperature, and humidity.

Improved assessment of pre-fire (fuel, weather, etc.) conditions to enable more prescribed fire.

Active Fire: Tracking for resource allocation with higher spatial resolution and update frequency - toward 24/7 fire prioritization and monitoring.

Development of new, innovative sensors and models for precisely characterizing fires, fuels conditions, and smoke.

Post-Fire: Improved maps of burn severity for post-fire rehabilitation efforts.

Improved predictions of post fire hazards and impacts.

Air Quality: Enhanced tracking and analysis of smoke plumes, composition, and transport.

Improved forecasts of air quality impacts to natural and human systems as well as operations.

Research, Applications, & Technology Portfolio

FireSense Implementation Team: Deliver operational fire-management tools that translate NASA observations, models, and airborne data into actionable decision support. (31 investigators)

Earth Action Projects: Deliver a coordinated portfolio of Earth-observation-enabled decision-support capabilities to enable faster, more informed decisions before, during, and after wildland fire events. (11 projects)

FireTech Technology Projects: Deliver a portfolio of advanced wildfire technology capabilities to improve the timeliness, resolution, autonomy, and integration of wildfire observations and forecasts. (16 projects)

2026 FireSense Airborne Campaign (Jul-Aug)

Boise, ID
c-FIRST: small, mid-wave infrared sensor
PIRS: hyperspectral infrared sounder

Great Falls, MT
CFI: unsaturated multi-spectral sensor

Boulder, CO
HOT SPOT: Long Wave Infra-Red (LWIR) uncooled microbolometer

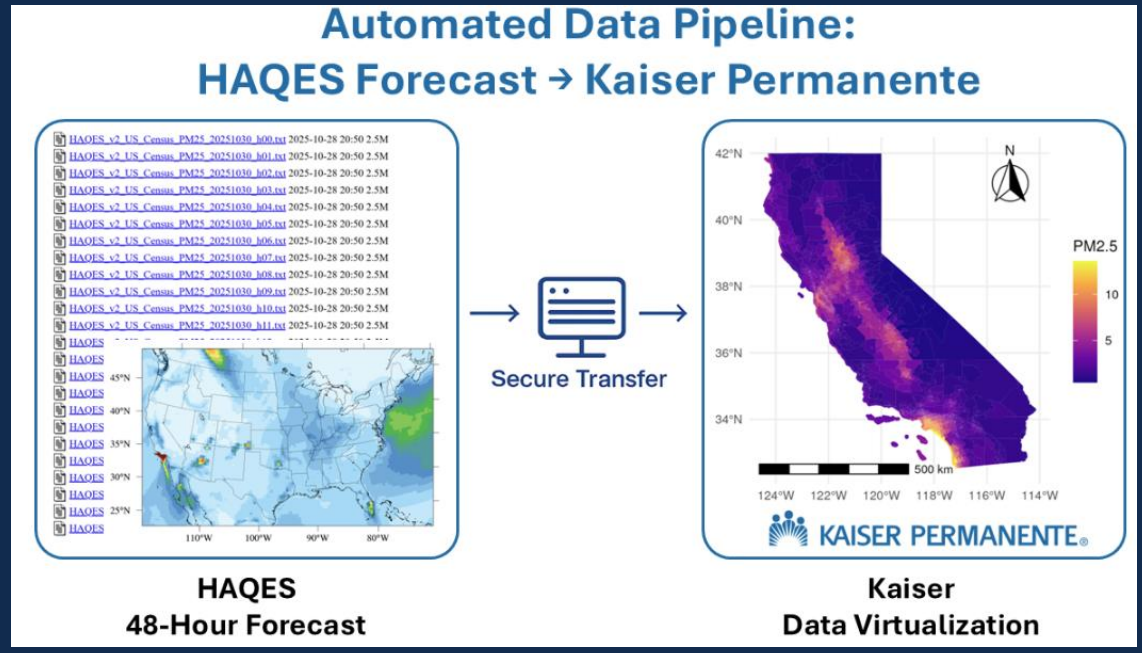
Fire & Smoke Project Highlights

Enhancing Multi-Agency Wildfire Ensemble Forecasts for Health and Air Quality Decision Support in the US and Beyond

Purpose: To advance wildfire air quality forecasting through multi-agency models using satellite and ground-based observations into a unified system for public health and emergency response.

Key Findings: The Hazardous Air Quality Ensemble System v2 (HAQESv2) significantly improved $PM_{2.5}$ forecasts, enabling faster management decisions on patient health.

Impact: HAQESv2 is now operationally supporting Kaiser Permanente, EPA, USFS, and WMO, enhancing national and regional capabilities for smoke forecasting, public health communication, and air quality management.



Kaiser Permanente Northern California receives daily air quality forecasts from HAQES, enabling health risk communication

PI: Yunyao Li (The University of Texas at Arlington)

NASA Earth Action Wildland Fires

Fire & Smoke Project Highlights

Improving EPA Near-Real-Time Air Quality Nowcasts through targeted deployment of PM2.5 low-cost sensors in under-sampled areas

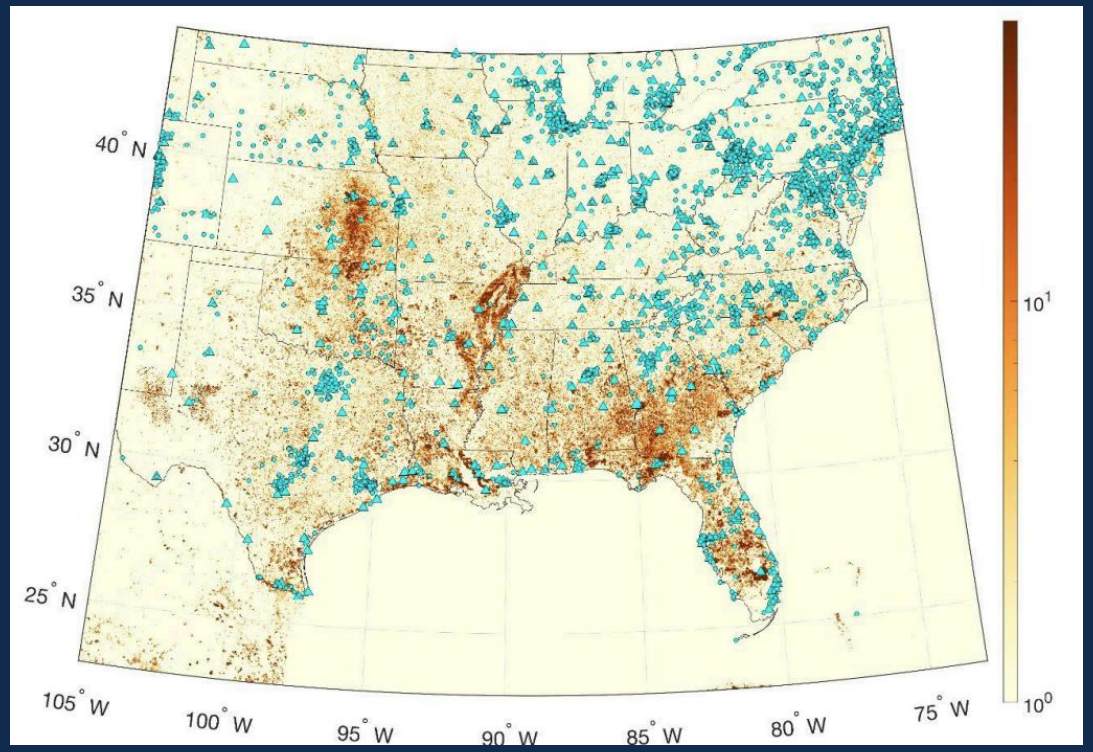
Purpose: Improve EPA near-real-time Air Quality Nowcasts and better quantify the air-quality impacts of small, short-duration management fires in sparsely monitored rural regions of the Southeast where prescribed and agricultural burns are frequent but often missed by satellites and regulatory air-quality networks.

Findings: Cost and staff workload can be reduced while expanding air-quality observations in priority burn regions.

Impact: Improved accessibility of air-quality information for rural communities affected by prescribed and agricultural burning.

PI: Kristina Pistone (NASA Ames Research Center)

NASA Earth Action Wildland Fires (FireSense)



Prescribed fire detections (2021–2025) from GOES-16, VIIRS, and MODIS aggregated to TEMPO grid cells. Blue triangles indicate EPA air quality monitors and blue dots show existing PurpleAir low-cost sensors.

NASA FIRMS: Smoke and Aerosol Mode

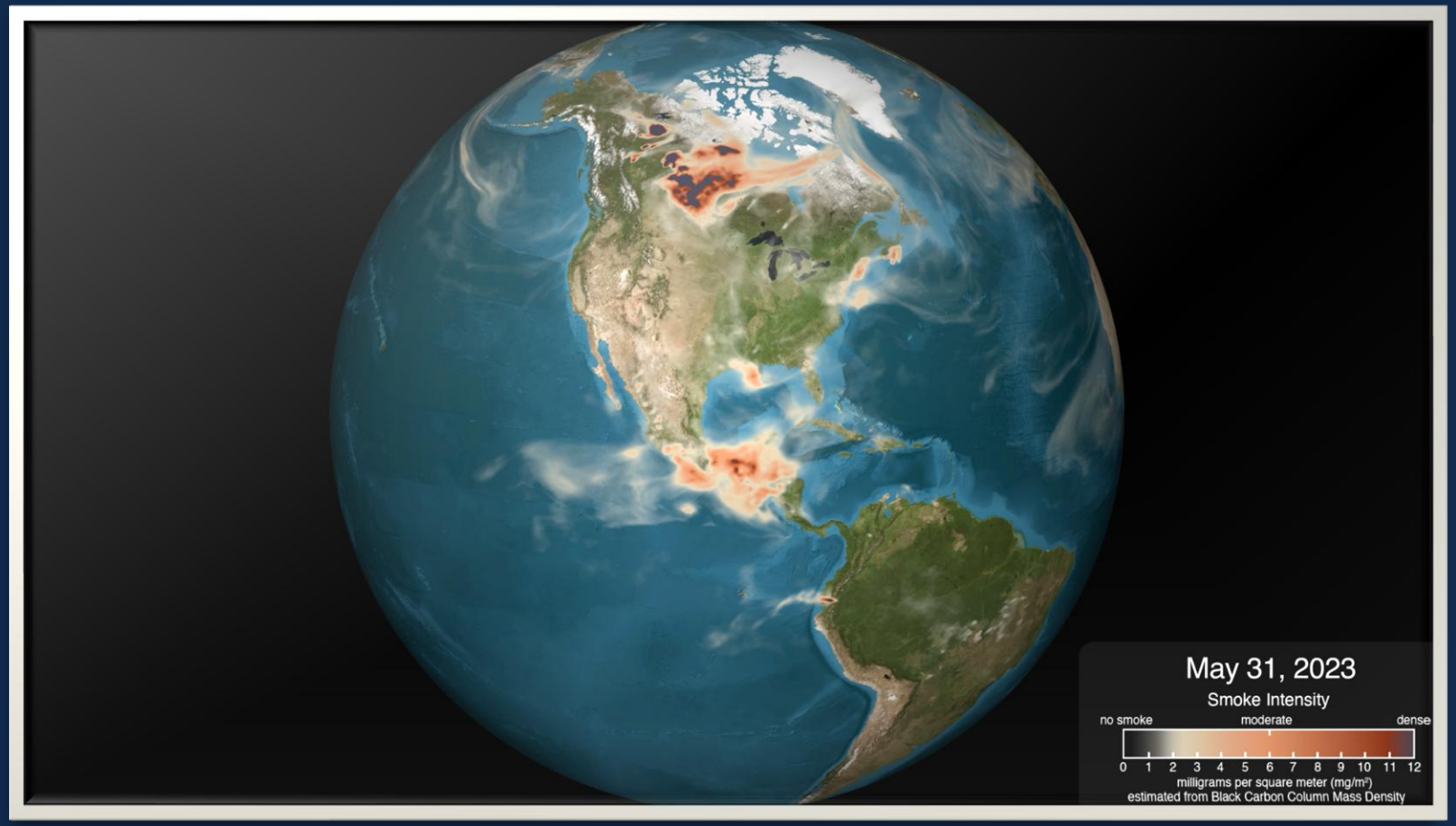
The Pyrocumulonimbus product for the Ozone Mapping and Profiler Suite (OMPS) makes it easier to track and analyze high concentrations of aerosols from wildfires and similar events.

Earthdata.nasa.gov/firms

GEOS Aerosol Composition Forecasts

Tracking smoke in support of air quality & public health research

GEOS-FP Black Carbon – 2023 Canadian Wildfires



Aerosols simulated by the GEOS Forward Processing (GEOS-FP system) capture long range transport of pollution across North America.

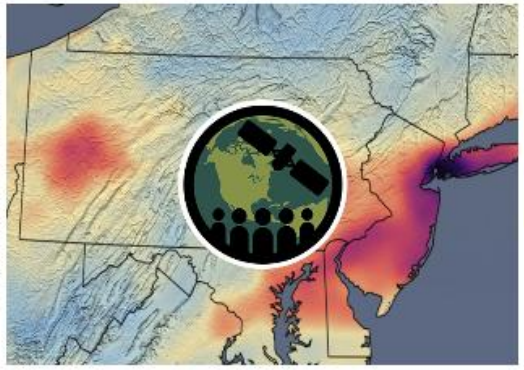
NASA models aerosol and atmospheric composition to advance use of satellite data, support field campaigns, and provide trusted data to scientists and decision-makers around the world.

NASA Applied Remote Sensing Training Program (ARSET)

Accessing and Analyzing Air Quality Data from Geostationary Satellites

This ARSET training provides an overview of geostationary capabilities for monitoring air quality around the world.

TRAINING OCT. 11-25, 2022



An Inside Look at How NASA Measures Air Pollution

This ARSET training is tailored to those interested in learning how to access and visualize NASA satellite imagery.

TRAINING MAY 26-28, 2020

Geostationary Remote Sensing of Trace Gases for Air Quality Applications in North America

This training will provide an overview of TEMPO capabilities and available trace gas data products, and illustrate how TEMPO data can be visualized.

TRAINING JAN. 20-22, 2026

https://www.earthdata.nasa.gov/data/projects/arset

USFS Wildfire Researcher (background) and student (foreground) collecting fuel and soil moisture data while NASA UAVSAR is overhead

Thank You

Image credit: Grace Weikert NASA GSFC