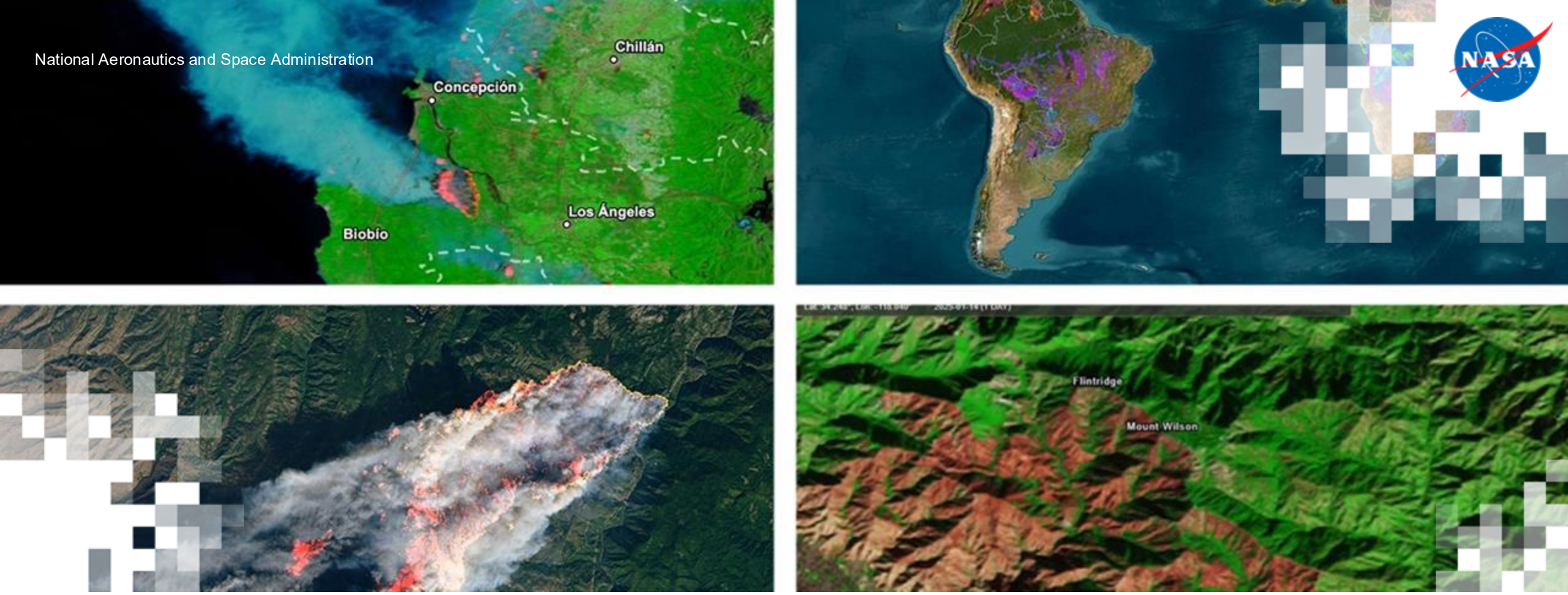
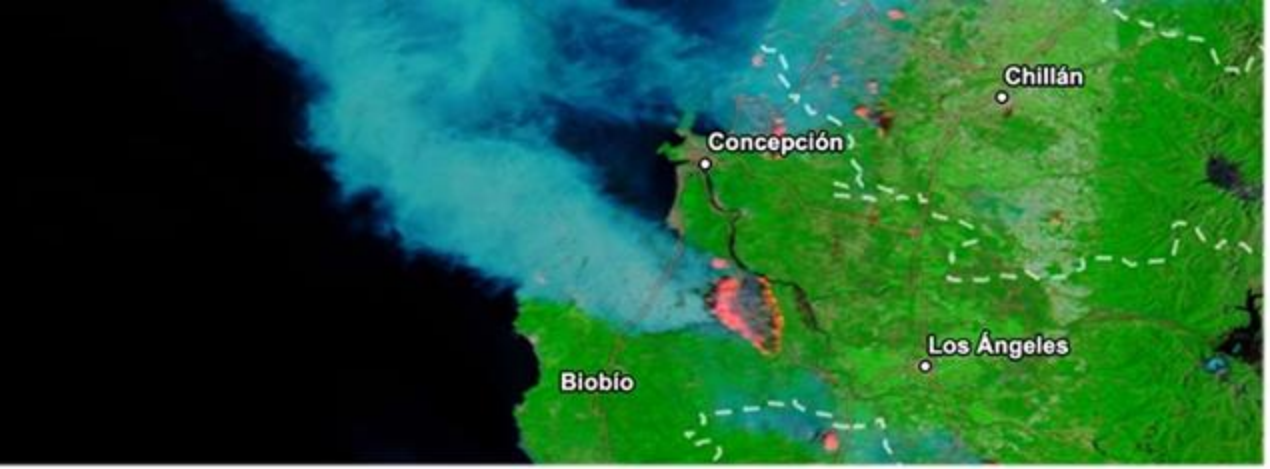


Advanced NASA Earth Observations and Tools for Active Fire, Smoke, and Post-Fire Monitoring

Part 1: Post-Fire Imagery and Smoke Monitoring

Jenny Hewson (SSAI), Diane Davies (SSAI/Trigg-Davies Consulting Ltd.), & Brock Blevins (SSAI)

November 12, 2025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About ARSET

About ARSET

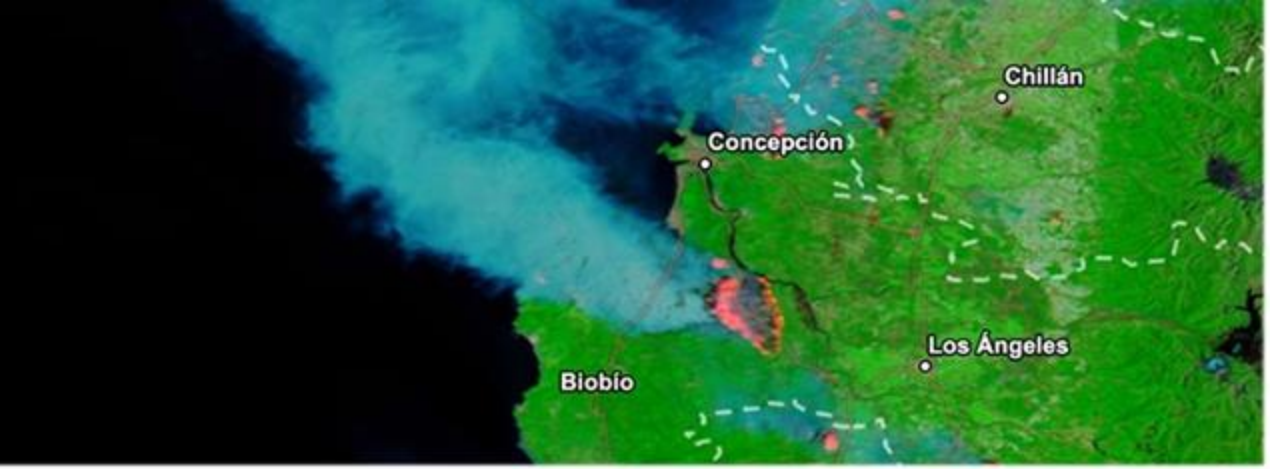
- **ARSET provides accessible, relevant, and cost-free training on remote sensing satellites, sensors, methods, and tools.**

- Trainings include a variety of applications of satellite data and are tailored to audiences with a variety of experience levels.

About ARSET Trainings

- Online or in-person
- Live and instructor-led or asynchronous and self-paced
- Cost-free
- Bilingual and multilingual options
- Only use open-source software and data
- Accommodate differing levels of expertise

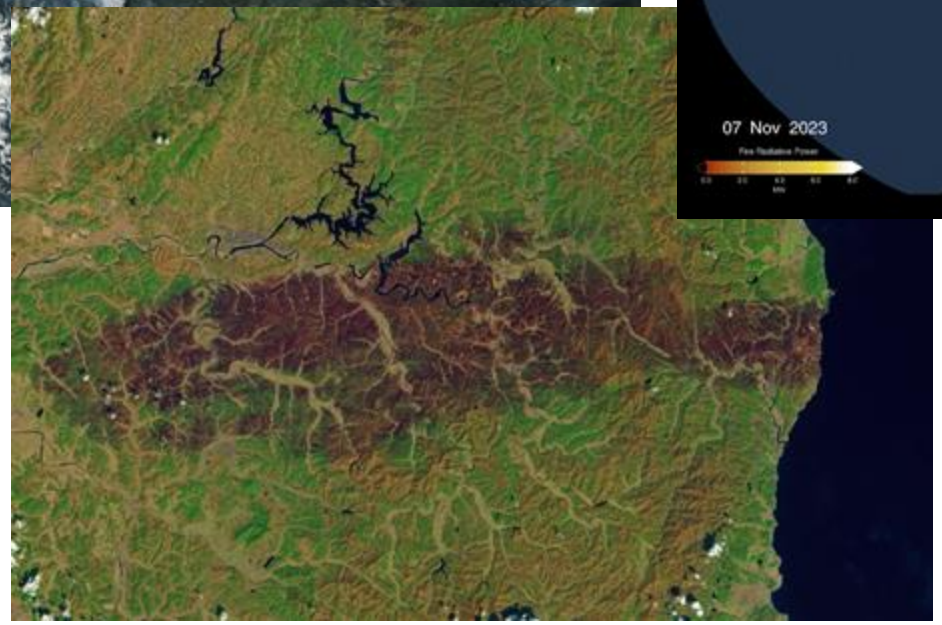
- Visit the ARSET website to learn more.



Advanced NASA Earth Observations and Tools for Active Fire, Smoke, and Post-Fire Monitoring

Overview

Active Fire, Smoke, and Post-Fire Monitoring



[B.C. Wildfires Send Smoke Skyward – NASA Earth Observatory]

[Active Fires As Observed by VIIRS, 2023-Present – NASA Scientific Visualization Studio]

[South Korea Charred by Fire – NASA Earth Observatory]

Training Learning Objectives

By the end of this training, participants will be able to:

- Access relevant post-fire imagery in the FIRMS Burned Area Mode to assess burned area, burn severity, and other factors for an event of interest.
- Identify and track wildfire smoke over time using Corrected Reflectance, OMPS Aerosol Index, and PyroCB layers available in the FIRMS Smoke/Aerosols Mode. Understand when to use the PyroCb layer.
- Use relevant data in FIRMS to identify STA associated with industrial or natural sources that are not vegetation fires.
- Use Jupyter Notebooks to access and visualize FIRMS data for different case studies.

Prerequisites

- Fundamentals of Remote Sensing
- Introduction to NASA Earth Observations and Tools for Wildfire Monitoring and Management
- Spectral Indices for Land and Aquatic Applications

Training Outline

Part 1

Post-Fire Imagery and Smoke Monitoring

November 12, 2025

Part 2

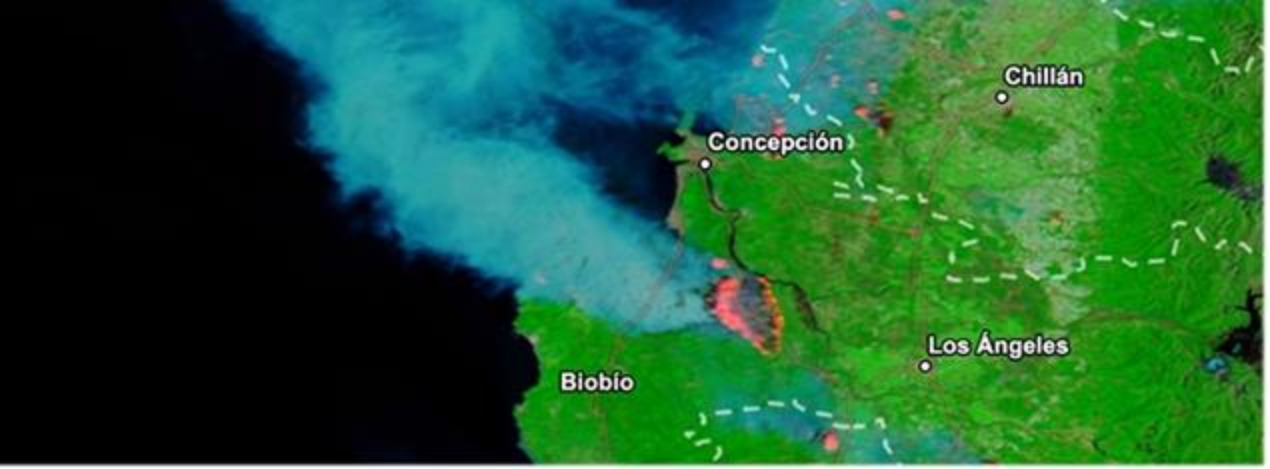
Data Analysis and Visualization

November 19, 2025

Homework

Opens November 19 – Due December 3 – Posted on Training Webpage

A certificate of completion will be awarded to those who attend all live sessions and complete the homework assignment before the given due date.



Advanced NASA Earth Observations and Tools for Active Fire, Smoke, and Post-Fire Monitoring

Part 1: Post-Fire Imagery and Smoke Monitoring

Part 1 – Trainers

Jenny Hewson

LANCE Manager
SSAI

Diane Davies

LANCE Operations Manager
SSAI/Trigg-Davies Consulting Ltd

Part 1 Objectives

By the end of Part 1, participants will be able to:

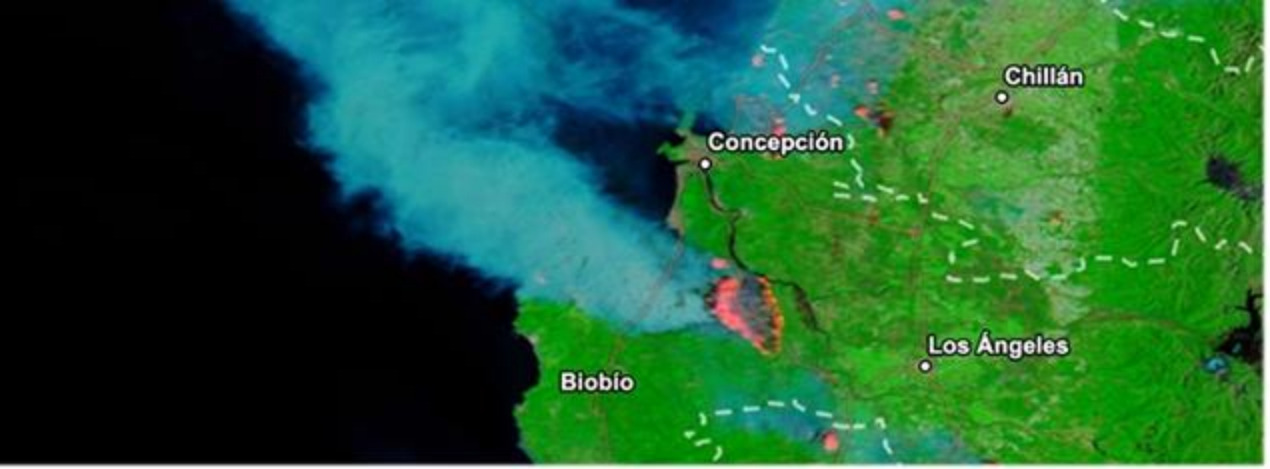
- Recognize the strengths and limitations of available post-fire indices and imagery products in the Burned Area Mode
- Access available indices and imagery products in FIRMS to assess burned area and fire damage severity, burned area recovery status, and other land cover characteristics
- Recognize the strengths and limitations of available smoke and aerosol data products in FIRMS for monitoring smoke extent and tracking progression
- Access available satellite data products in FIRMS that can be used to track the extent and progression of smoke

Review of Prior Knowledge

- True- vs. False-Color Imagery
- Burned Area
- Spectral Indices
  - Normalized Burn Ratio (NBR)
  - Normalized Difference Vegetation Index (NDVI)
  - Aerosol Index

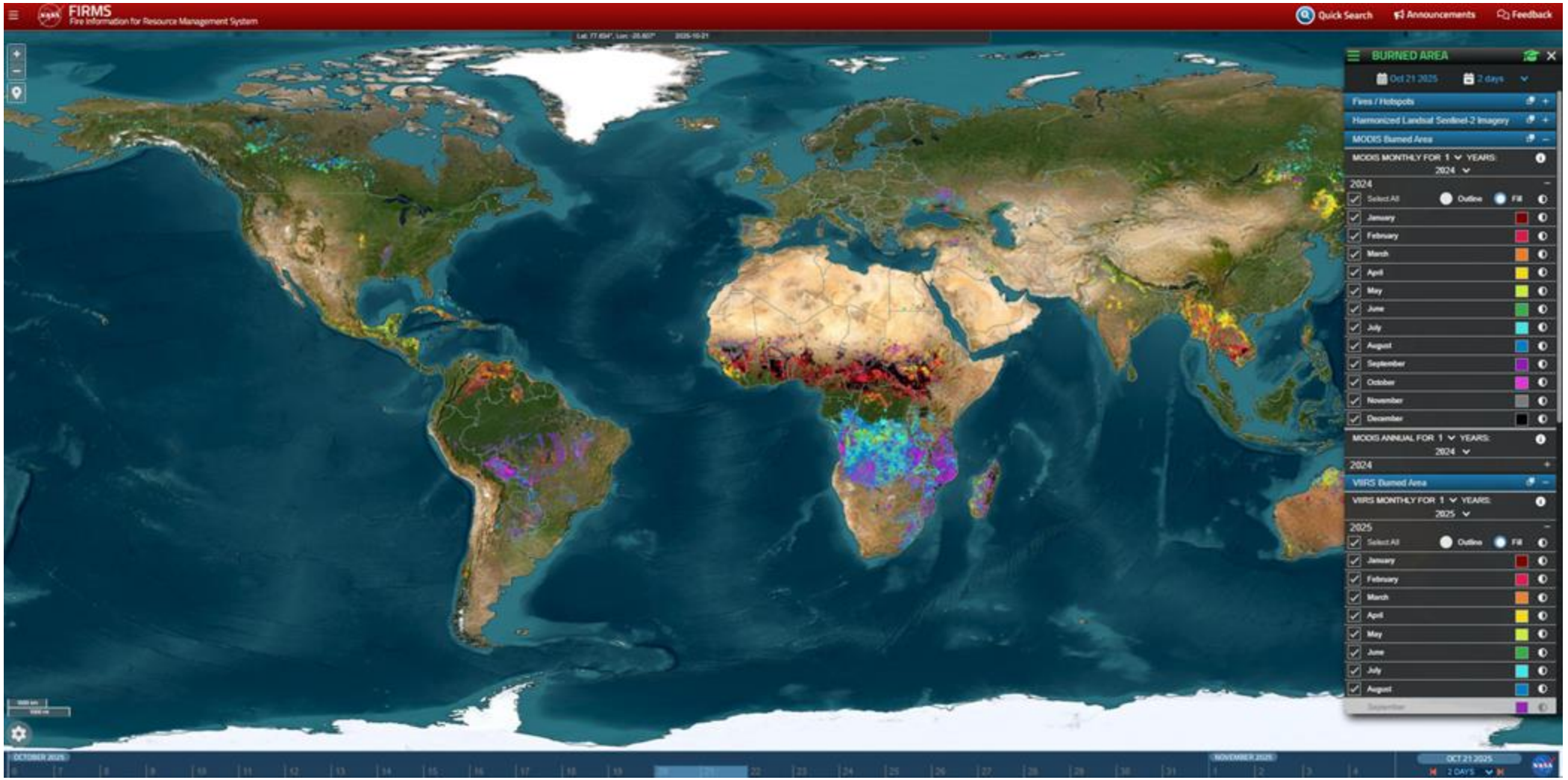
How to Ask Questions

- Please put your questions in the Questions box and we will address them at the end of the webinar.
- Feel free to enter your questions as we go. We will try to get to all of the questions during the Q&A session after the webinar.
- The remainder of the questions will be answered in the Q&A document, which will be posted to the training website about a week after the training.



Burned Area Mode

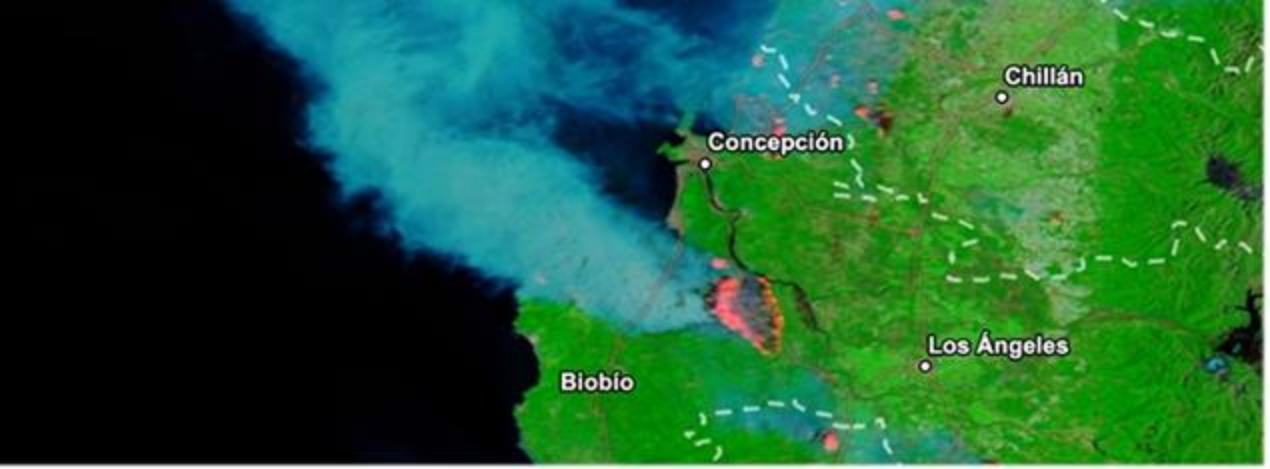
Burned Area Monitoring and Post-Fire Dynamics using FIRMS



Burned Area Monitoring and Post-Fire Dynamics – Demonstrations

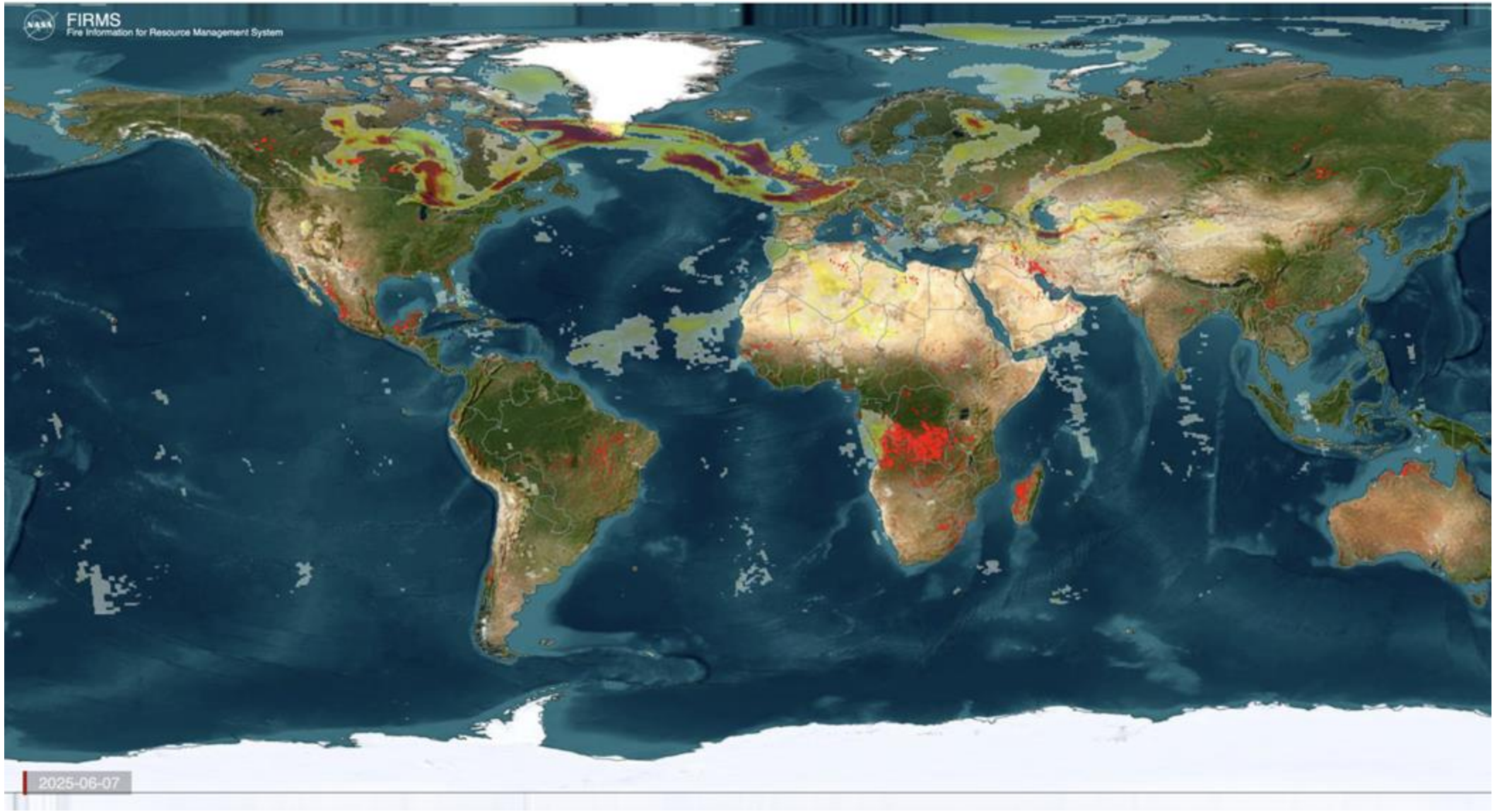
Demo Outline

- Overview of the burned area interface and global burned area products
- Overview of vegetation Indices and other imagery available to analyze burned area and post-fire dynamics for an area of interest



Smoke/Aerosols Mode

Smoke and Aerosol Monitoring using FIRMS



Smoke as Aerosols

- Aerosols are tiny particles suspended in the atmosphere.

Natural	• Sea Salt • Dust	• Pollen • Volcanic Ash
Human	• Vehicle Emissions • Industrial Pollution	
Fires	• Smoke • Ash	• Soot • Organic compounds

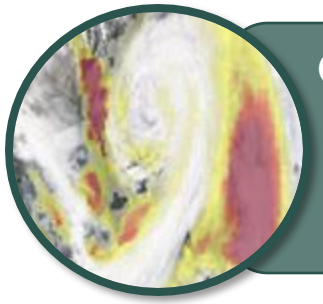
- Smoke = Fire-generated aerosols that are trackable by satellite

Data Products in FIRMS for Identifying and Tracking Smoke

Corrected Reflectance Imagery

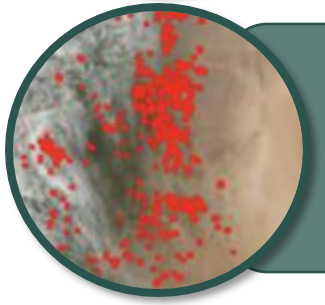
True-Color "Natural" Imagery – Smoke is visible to the human eye.

Sources: Terra MODIS, Aqua MODIS, Suomi-NPP VIIRS, NOAA-20 VIIRS



Ozone Monitoring Mapping Profiler Suite (OMPS) Aerosol Index Layers

OMPS designed for ozone monitoring & detects aerosols over any surface type.



Active Fire/Thermal Anomaly Data

Polar Orbiting: Terra MODIS, Aqua MODIS, Suomi-NPP VIIRS, NOAA-20 & 21 VIIRS, OLI Landsat

OMPS Aerosol Index

Standard OMPS Aerosol Index (Range 0.0 – 5.0)	PyroCB OMPS Aerosol Index (Range 5.0 – 50.0)
• 0-1: Clear/Minimal • 1-3: Light Smoke/Dust • 3-5: Moderate Smoke • 5.0: Heavy Aerosols (Health Visibility Impacts) • >5: Screened Out	• 5-10: Dense smoke, possibility of a PyroCb event – The higher the AI value the higher the probability of a PyroCb event • >10: – Often reaches stratosphere – Extreme fire conditions

Technical Specifications:
Data Availability: Near Real-Time (within 3 hours)
Global Coverage: Daily Polar Orbiting Satellites
Current Spatial Resolution in FIRMS: 50 x 50 km
Source: Suomi-NPP OMPS and NOAA-20 OMPS (NOAA-21 OMPS – Coming Soon)

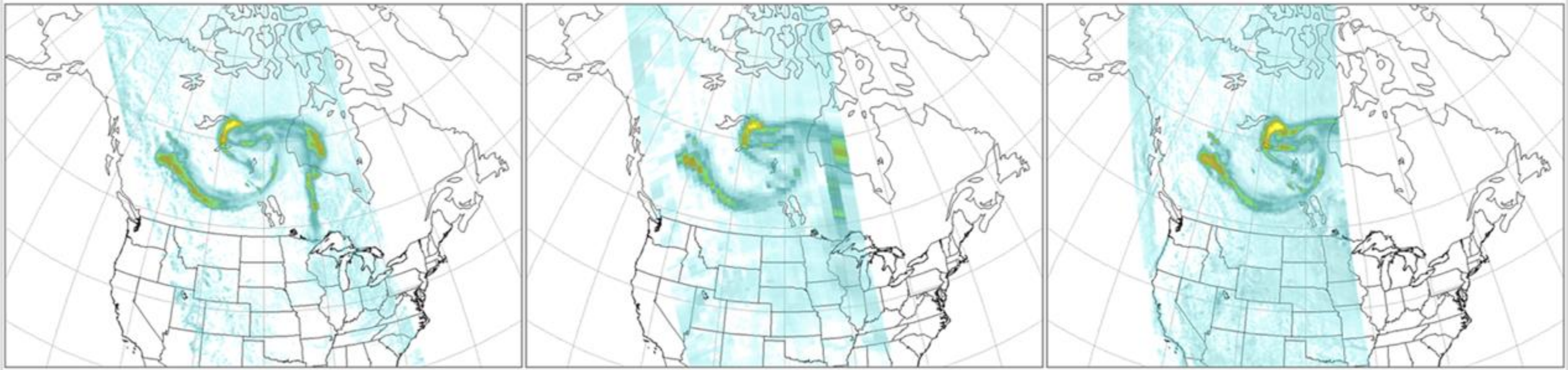
LANCE OMPS Aerosol Index

OMPS Aerosol Index for 11 May 2024

N21 (178 xtrack FOVs)
10x10 km nadir

S-NPP (36 xtrack FOVs)
50x50 km nadir

N20 (140 xtrack FOVs)
12x17 km nadir



Slide courtesy of Colin Seftor, NASA GSFC

Smoke and Aerosols Mode - Demonstration

Demo Outline

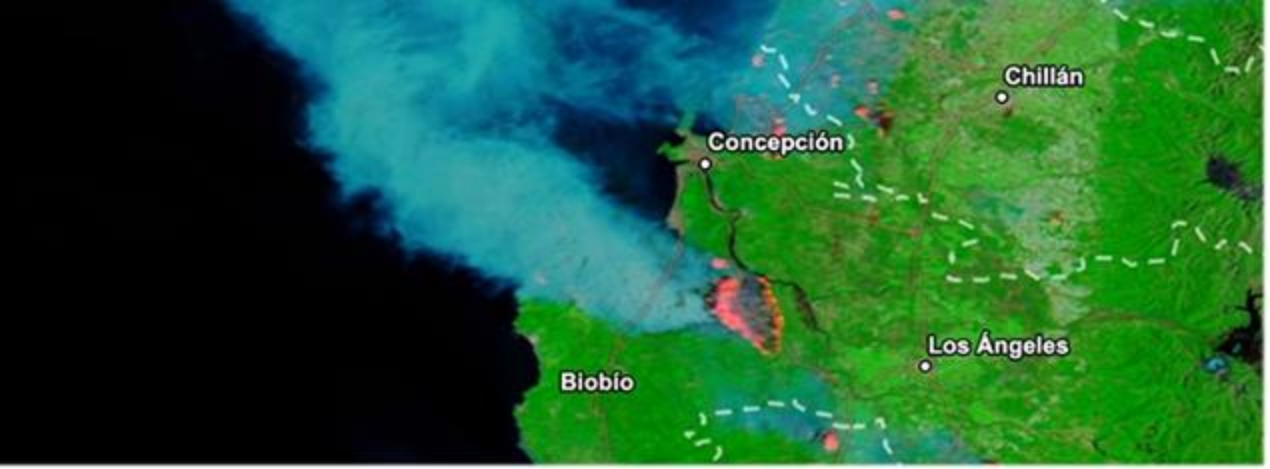
- Overview of the smoke/aerosols mode
- Tracking smoke and aerosols using OMPS Aerosol Indices and corrected reflectance imagery

Decision Tree and Workflow for Tracking Smoke in FIRMS

- **When to Use Each Product:**
  - Standard OMPS Aerosol Index: Most situations, routine monitoring
  - PyroCb AI: When fires create thunderstorms, extreme events, gaps in standard Aerosol Index

- **Workflow:**
  1. Start with true-color imagery (visual)
  2. Add Standard OMPS Aerosol Index
  3. Add active fires to better distinguish between smoke and other aerosols
  4. Switch to PyroCb AI if values exceed 5
  5. Track temporal progression over days

- **Note:** Orbit tracks and sub-daily timeline can be used for timing context.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Summary

Summary

- Overview of available burned area datasets and post-fire imagery and indices
- Demonstration of FIRMS Burned Area mode
- Overview of available aerosol indices
- Demonstration of FIRMS Smoke and Aerosols mode

Looking Ahead to Part 2

- Visualize active fire information on static graph and interactive map
- Analyze active fire information using a fire count histogram
- Overview of Static Thermal Anomaly (STA) data available in FIRMS
- How to use STA information to identify thermal anomalies that are likely not vegetation fires

Homework and Certificates

- **Homework:**
  - One homework assignment
  - Opens on 11/19/2025
  - Access from the training webpage
  - Answers must be submitted via Google Forms
  - **Due by 12/3/2025**

- **Certificate of Completion:**
  - Attend both live webinars (attendance is recorded automatically)
  - Complete the homework assignment by the deadline
  - You will receive a certificate via email approximately two months after completion of the course.

Contact Information

Trainers:

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- Brock Blevins
  - brock.Blevins@nasa.gov

- ARSET Website
- ARSET YouTube


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Thank You!