



National Aeronautics and
Space Administration

EARTHDATA

NASA's Fire Information for Resource Management System (FIRMS): A Wildfire Management Platform

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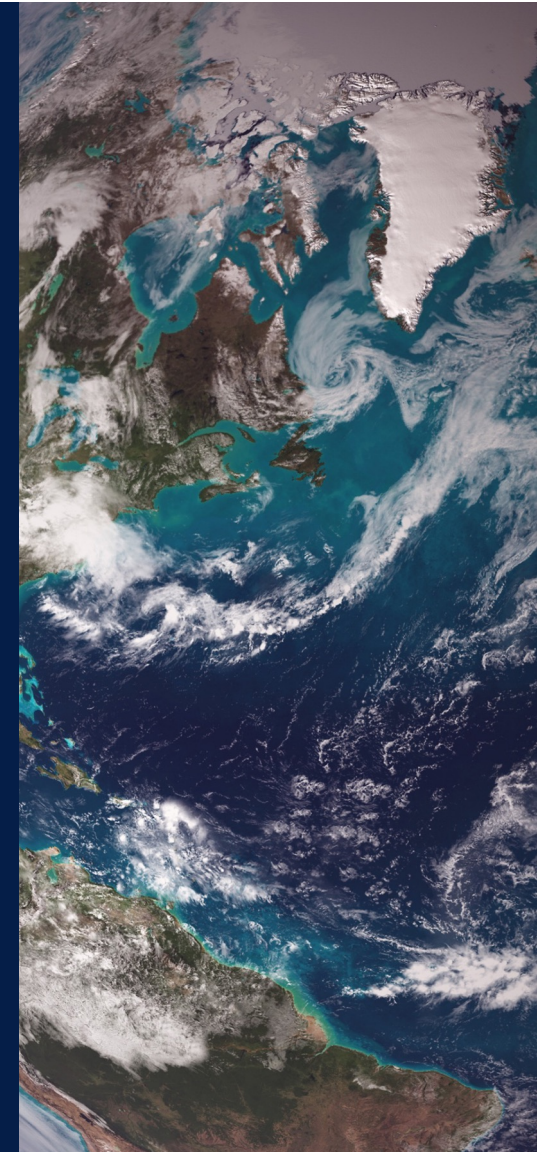
Overview

Background & Introduction to FIRMS

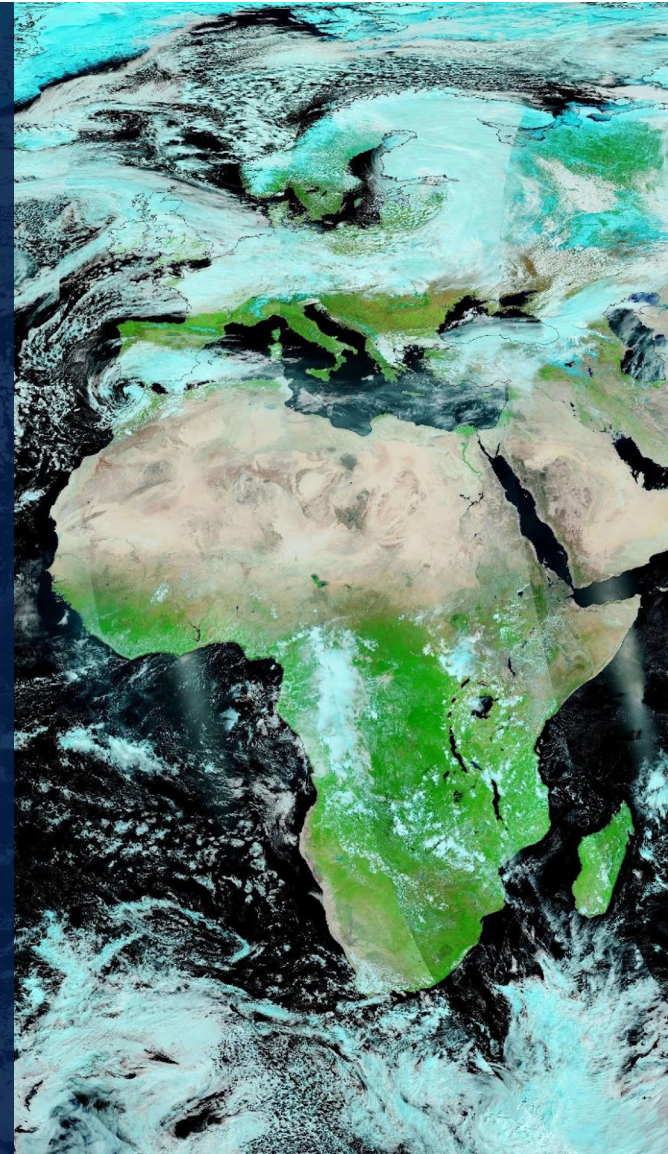
Strengths

Limitations

Future Plans

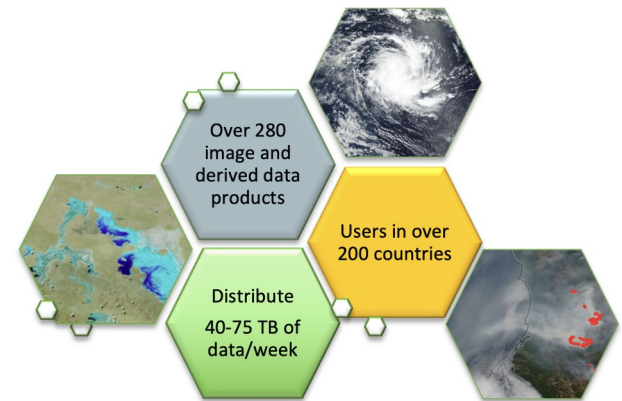


Background & Introduction



FIRMS - part of NASA's Land, Atmosphere Near Real-time Capability for Earth observation (LANCE)

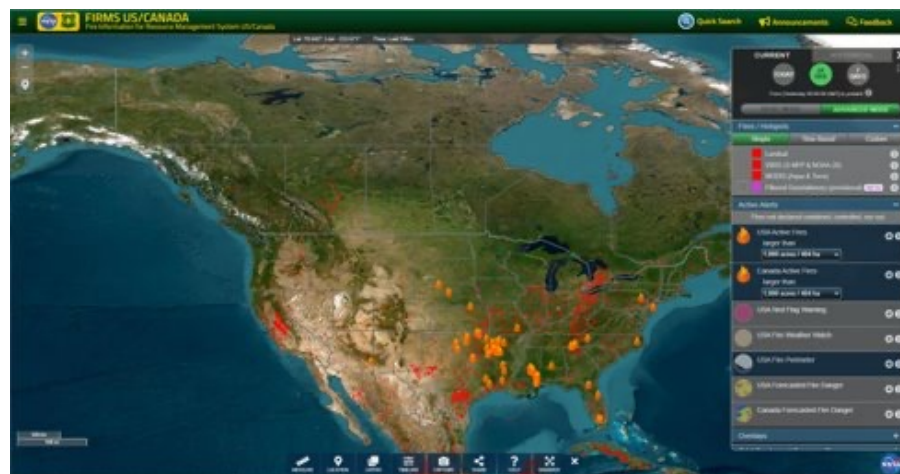
- Goal: to provide near real-time (NRT) data products within 3 hours of observations to meet the timely needs of applications users including disasters.
- NRT Imagery is available from GIBS and Worldview.
- LANCE aims to enable NRT science and applications and is used by a broad range of operational and applications users, including USDA-FAS, USAID FEWS-NET, USFS, US National Ice Center, NRL, FEMA, NASA SPoRT, Global Forest Watch, Conservation International, GEOGLAM, ECMWF



FIRMS Global and FIRMS US/Canada



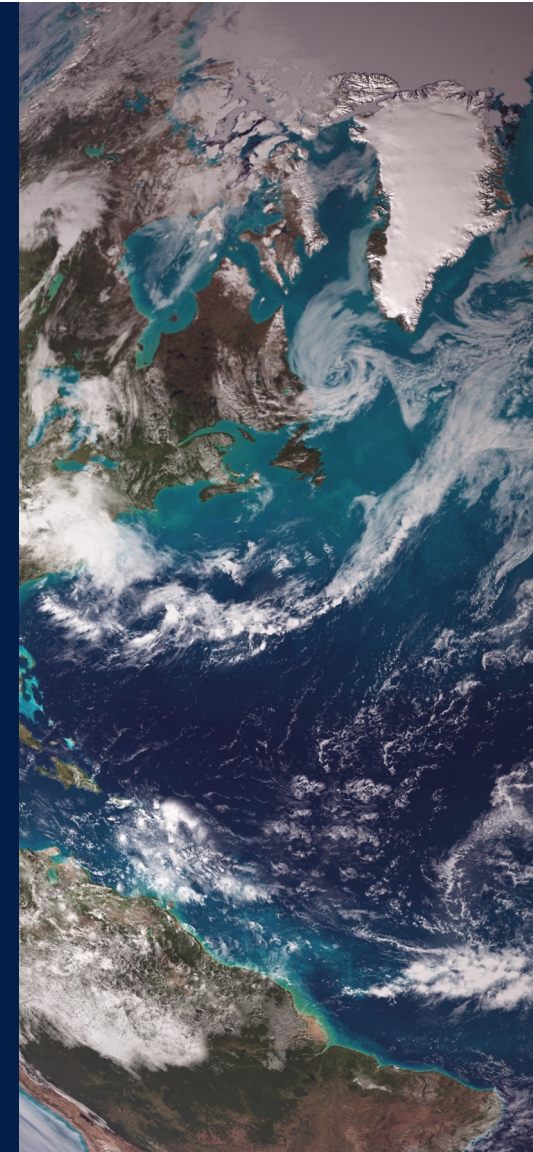
- <https://firms.modaps.eosdis.nasa.gov>
- NRT and RT imagery and fire remote sensing products for the world.
- Developed by U of Maryland in early 2000s and used data from MODIS Rapid Response.
- Transitioned to NASA LANCE in 2012.



- <https://firms.modaps.eosdis.nasa.gov/usfs>
- FIRMS US/Canada was launched within NASA LANCE in 2021.
- NRT, RT and URT imagery and fire remote sensing products for the US & Canada.

Strengths

- Web map interface caters for range of users (modes).
- Easy to access other components
- Active fire data provided in multiple formats
- Multi-mission. Integrates AF data from multiple sources.



FIRMS Map User Interface (UI) Updates

The image displays the FIRMS (Fire Information for Resource Management System) web application interface. The top navigation bar includes the NASA logo, the title "FIRMS Fire Information for Resource Management System", and links for "Quick Search", "Announcements", and "Feedback". The main content area features a satellite-style world map with red dots indicating fire activity. A "MAIN MAP MENU" is overlaid on the right side of the map, containing several interactive options: "BASIC MODE", "ADVANCED MODE", "BURNED AREA", "US/CANADA", "SMOKE / AEROSOLS", "EXPERIMENTAL IN-PROGRESS", "FIRE ALERTS", and "DOWNLOADS". A text box in the center of the map reads "Available Modes for User Needs and Capabilities". In the bottom-left corner, a text box titled "FIRMS UI Refinement Objectives:" lists five goals for the interface update. The bottom of the screen contains a toolbar with icons for "MEASURE", "LOCATION", "LAYERS", "TIMELINE", "CAPTURE", "SHARE", "HELP", and "MAXIMIZE".

Available Modes for User Needs and Capabilities

BASIC MODE	ADVANCED MODE	BURNED AREA
US/CANADA	SMOKE / AEROSOLS	EXPERIMENTAL IN-PROGRESS
FIRE ALERTS	DOWNLOADS	

FIRMS UI Refinement Objectives:

- Support an increasingly diverse set of users
- Make more intuitive for users
- Provide easier access to other FIRMS products/services
- Allow greater flexibility to filter/query remote sensing data (sub-daily)
- Provide access to, and maintain separation of, prototype products

FIRMS US/Canada Map User Interface (UI)

The screenshot displays the FIRMS US/Canada Map User Interface (UI). The main map shows North America with various fire data overlays, including active fires, smoke, and burned areas. The interface includes several key components:

- Top Header:** "FIRMS US/CANADA Fire Information for Resource Management System US/Canada" with navigation icons for Quick Search, Announcements, and Feedback.
- Left Sidebar:** A vertical menu with icons and text for: US & CANADA FIRE MAP, GLOBAL FIRE MAP, ACTIVE FIRE DATA, SATELLITE IMAGERY, BLOG - WHAT'S NEW, FIRE ALERTS, DOWNLOAD ARCHIVED DATA, WEB SERVICES, TUTORIALS, FAQs, ADDITIONAL RESOURCES, and FIRMS - GLOBAL.
- Map Area:** A satellite-style map of North America with fire data overlays. A coordinate box at the top shows "Lat: 23.465°, Lon: -161.255°".
- Right Panel (MAIN MAP MENU):** A grid of buttons for: BASIC MODE, ADVANCED MODE, BURNED AREA, GLOBAL FIRES, SMOKE / AEROSOLS, EXPERIMENTAL, FIRE ALERTS, and DOWNLOADS.
- Layer Display Controls:** A list of layers with checkboxes and expand/collapse icons. Active layers include: VIIRS / Suomi NPP [375m], MODIS / Aqua [1km], MODIS / Terra [1km], GEOSTATIONARY, NRT AND STANDARD (FOR RESEARCH), USA Active Fires (larger than 1,000 acres / 404 ha), Canada Active Fires (larger than 1,000 acres / 404 ha), USA Red Flag Warning, USA Fire Weather Watch, USA Fire Perimeter, USA Forecasted Fire Danger, and Canada Forecasted Fire Danger.
- Viewer Tools:** A horizontal toolbar at the bottom with icons for: MEASURE, LOCATION, LAYERS, TIMELINE, CAPTURE, SHARE, HELP, and MAXIMIZE.
- Timeline/Calendar Controls:** A calendar view at the bottom showing "FEBRUARY 2024" and "MARCH 2024" with dates from 15 to 15.

Satellite Active Fire Detection Data Used in FIRMS

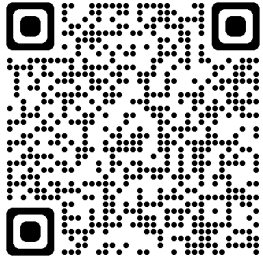
Active Fire and Thermal Anomalies Data				
Sensor (Platform)	Source	Spatial Resolution	Temporal Resolution	Latency ⁴ (Coverage)
ABI (GOES-16 & 18)	NOAA	2km sub-satellite ¹	Sub-hourly	RT - ~20-30 mins (Americas)
ABI (GOES-16 & 18)	KCL/IPMA	2km sub-satellite ¹	Sub-hourly	RT - ~20-30 mins (Americas)
SEVIRI (Meteosat 9 & 11)	EUMETSAT/LSA SAF	3km sub-satellite ¹	Sub-hourly	RT - ~30 mins (Europe-Africa-India)
AHI (Himawari-8)	KCL/IPMA	2km sub-satellite ¹	Sub-hourly	RT - ~30 mins (Australia-Asia)
MODIS (Terra/Aqua)	NASA LANCE	1km sub-satellite ¹	Twice daily ²	NRT - <3 hours (Global)
VIIRS (Suomi NPP/NOAA-20)	NASA LANCE	375m sub-satellite ¹	Twice daily ²	NRT - <3 hours (Global)
MODIS (Terra/Aqua)	SSEC Univ of Wisconsin	1km sub-satellite ¹	Twice daily ²	RT - <30 mins (US-Canada)
VIIRS (Suomi NPP/NOAA-20)	SSEC Univ of Wisconsin	375m sub-satellite ¹	Twice daily ²	RT - <30 mins (US-Canada)
MODIS (Terra/Aqua)	SSEC Univ of Wisconsin	1km sub-satellite ¹	Twice daily ²	URT - <1 mins (US-Canada)
VIIRS (Suomi NPP/NOAA-20)	SSEC Univ of Wisconsin	375m sub-satellite ¹	Twice daily ²	URT - <1 mins (US-Canada)
OLI (Landsat 8 & 9)	USGS EROS	30m	8 days ³	RT - <30 mins (US-Canada)

¹ The pixel size systematically grows from sub-satellite towards the edge of the disk/swath.


² Thermal data are collected for daytime and nighttime observations ~ 12 hours apart.

³ L8 and L9 orbit cycles each have 16-day orbit cycles and their orbits are 8 days out of phase. This does not include potential nighttime observations.

⁴ Latency refers to the estimated time from satellite observation to availability in FIRMS. Near Real-Time (NRT), Real-Time (RT) & Ultra-Real-Time (URT).



API & Web Map Services



Providing Active Fire Data for Near-Real Time

The Fire Information for Resource Management System (FIRMS) is based on data from the MODIS and VIIRS instruments aboard the Aqua and Terra satellites, and the Visible Infrared Imager Radiometer Suite (VIIRS) aboard the Suomi-NPP satellite. Data is available within 3 hours of satellite observation, but for the US and Alaska, data is available in near-real-time.

The active fire / hotspot data can be viewed in [FIRMS FIRE MAP](#) or [FIRMS FIRE DATA](#).

FIRMS is part of NASA's Land, Atmosphere Near real-time Capability (LANCER) program.

[FIRE DATA ACADEMY](#) features examples of analyzing and visualizing fire data.

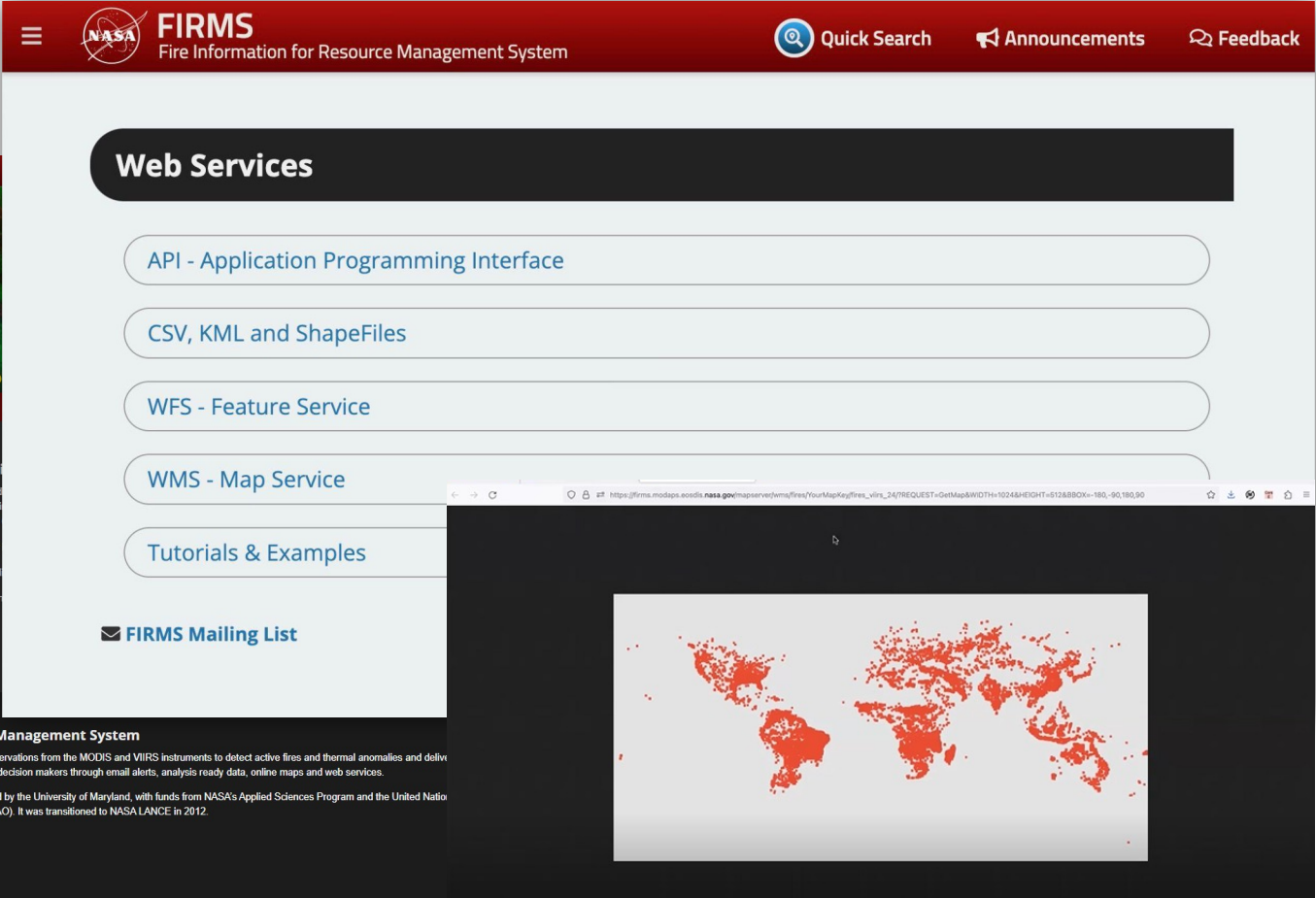

For Tips, Suggestions and What's new visit [FIRMS BLOG](#)

For Frequently Asked Questions visit [FIRMS FAQs](#)

About the Fire Information for Resource Management System

NASA FIRMS uses satellite observations from the MODIS and VIIRS instruments to detect active fires and thermal anomalies and deliver information in near real-time to decision makers through email alerts, analysis ready data, online maps and web services.

FIRMS was originally developed by the University of Maryland, with funds from NASA's Applied Sciences Program and the United Nations World Food Programme (UN WFP). It was transitioned to NASA LANCE in 2012.



Web Services

- API - Application Programming Interface
- CSV, KML and ShapeFiles
- WFS - Feature Service
- WMS - Map Service
- Tutorials & Examples

[FIRMS Mailing List](#)

API

Service	Description
area	Fire detection hotspots based on area, date and sensor in CSV format
countries	List of supported countries
country	Fire detection hotspots based on country, date and sensor in CSV format
data_availability	Date availability of SP and NRT data
kml_fire_footprints	KML fire detection footprints
map_key	Setup MAP_KEY

Active Fire Data

Download active fire products from the [Moderate Resolution Imaging Spectroradiometer \(MODIS\)](#), [Visible Infrared Imaging Radiometer Suite \(VIIRS\)](#) and [Landsat Operational Land Imager \(OLI\)](#) for the last 24, 48 hours and 7 days in [shapefile](#), [KML](#) or [text](#) file formats. Also available through [FIRMS](#).

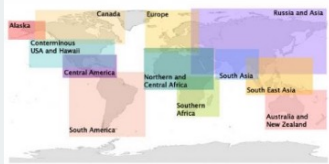
- [WMS and WMS-T](#)
- [FIRMS Archive Download](#) * for data older than 7 days
- Daily text files for the last two months via HTTPS: <https://firms.modaps.eosdis.nasa.gov/archive/FIRMS>

Register for an [Earthdata Login](#) to start downloading data

* Please note on the Archive Download, the NRT data is replaced with data extracted from the standard MODIS and VIIRS active fire products as it becomes available (usually after 2-3 months). Users intending to perform scientific analysis are advised to download the standard (science quality) data.

- MODIS C6.1 is available from November 2000 (for Terra) and from July 2002 (for Aqua) to the present.
- VIIRS 375 m (S-NPP) data are currently available from 20 January 2012 to the present.
- VIIRS 375 m (NOAA-20) data are currently available from 01 January 2020 to the present.
- LANDSAT 30 m OLI (8 / 9) data are currently available from 20 June 2022 to the present.

For more information about [FIRMS](#) and the active fire products.



Details about regional coordinates.

◀ Web Services / WMS

FIRMS fire-based maps (images) are offered through [Web Map Service \(WMS\)](#) and WMS with time support (WMS-Time). Supported projections: Lat-long projection (EPSG:4326) and Web Mercator projection (EPSG:3857 or 900913).

To use the service [request free MAP_KEY](#)

Data for WMS is updated once every 15 mins.

- [Map Key](#)
- [WMS](#)
- [WMS-Time](#)

Request FIRMS Map Key

Due to heavy server resource demand when generating data, MAP_KEY is needed in order to process your request.

MAP_KEY limit is **1000 transactions / 10-minute interval**.

Larger transactions may count as multiple requests (ex. requesting 7 days). Contact us if you need limit increase.

Get MAP Key

MODIS Layers

MODIS Aqua & Terra	MODIS-Aqua	MODIS-Terra
fires_modis_24 fires_modis_48 fires_modis_72 fires_modis_7	fires_aqua_24 fires_aqua_48 fires_aqua_72 fires_aqua_7	fires_terra_24 fires_terra_48 fires_terra_72 fires_terra_7

[GetCapabilities](#)

LANDSAT Layers

Landsat 8 & 9 OLI
fires_landsat_24 fires_landsat_48

Tutorials and Examples

/tutorials/

Tutorials & Examples

New Features and How to Use



Blog
Visit Our Blog for Updates and Tips



YouTube Tutorial
How to use NASA's FIRMS.

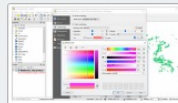


FIRMS Story Map
Managing Wildfires with Satellite Data.

WMS

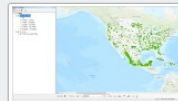


ArcGIS
Ingest FIRMS WMS into ArcGIS and Customize the Symbology



QGIS
Ingest FIRMS WMS into QGIS and Customize the Symbology

WFS



ArcGIS Desktop
Ingest FIRMS WFS into ArcGIS Desktop and Customize the Symbology

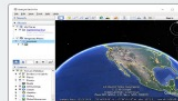


ArcGIS Online
Ingest FIRMS WFS into ArcGIS Online (New Map Viewer and Map Viewer Classic)



ArcGIS Pro
Ingest FIRMS WFS into ArcGIS Pro and Customize the Symbology

KML



Google Earth Pro
How to Auto-Refresh FIRMS KML in Google Earth Pro



Google Earth Pro
How to Access and Auto-Refresh 7-Day KML bundles in Google Earth Pro

Limitations

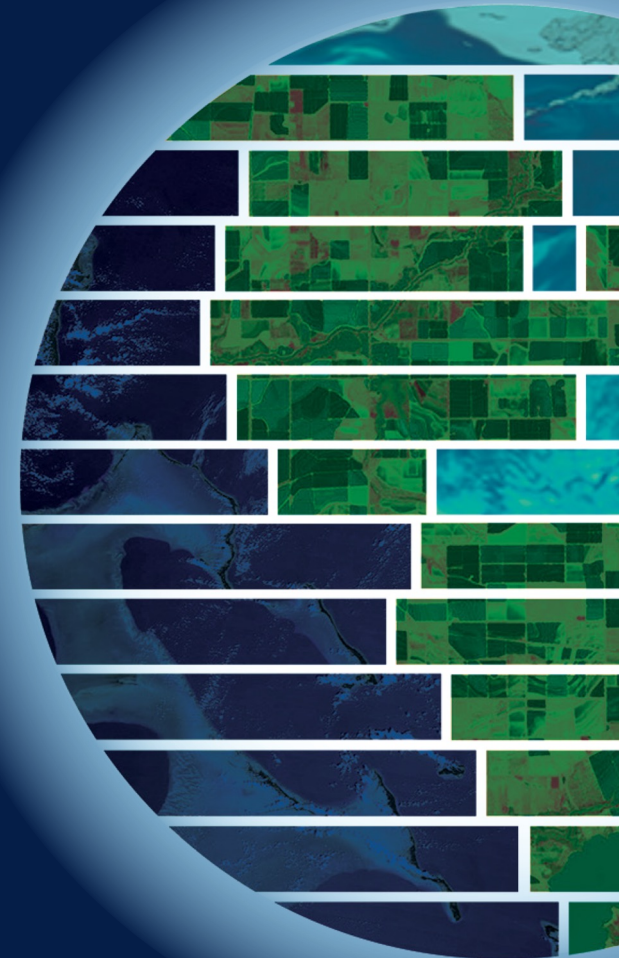
Polar orbiting satellites each typically collect two observations per day and only detect fires as they pass over head.

Geostationary provide 24/7 coverage spatial resolution is coarser and less sensitive to small fires

Heavy cloud/smoke can obscure fire detections – example of Jasper fire



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Example from Jasper, Alberta, Canada July 25, 2024.

Fires were reported in the news and by locals but on FIRMS the fires were obscured by heavy cloud causing users to question whether FIRMS was working

The screenshot displays the FIRMS US/CANADA web interface. The top navigation bar includes the NASA and US Forest Service logos, the title "FIRMS US/CANADA", and the subtitle "Fire Information for Resource Management System US/Canada". It also features a "Quick Search" button, "Announcements", and "Feedback" links. The map area shows a satellite view of Jasper, Alberta, Canada, with a heavy cloud cover obscuring the ground. The interface includes a right-hand sidebar for layer selection, a bottom timeline, and a top status bar showing coordinates and the date "FIRMS: 2024-07-25 (1 DAY)".

ADVANCED MODE

Today ~24hrs 3 days 7 days

DAILY SUB-DAILY

Jul 25 2024 1 day

Fires / Hotspots

Simple Time Based Custom

POLAR ORBITING RECOMMENDED

- OLI / Landsat [30m]
- VIIRS / NOAA-20 [375m]
- VIIRS / NOAA-21 [375m]
- VIIRS / Suomi NPP [375m]
- MODIS / Aqua [1km]
- MODIS / Terra [1km]

GEOSTATIONARY BETA

- Filtered Geostationary (provisional)
- GOES-18 NOAA FDC
- GOES-18 (KCL/IPMA)
- GOES-16 NOAA FDC
- GOES-16 (KCL/IPMA)

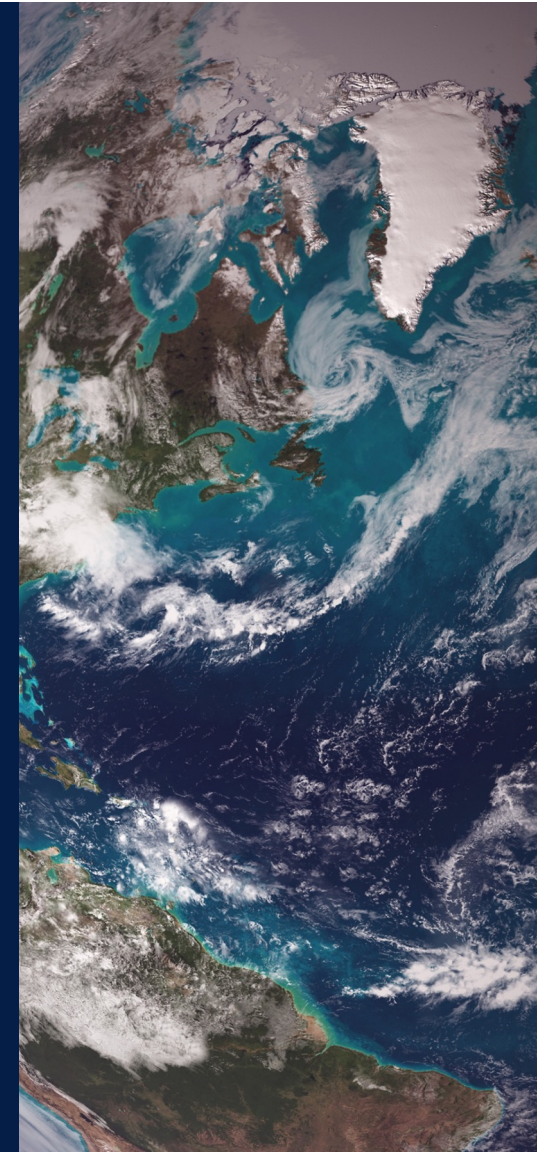
NRT AND STANDARD (FOR RESEARCH)

MEASURE LOCATION LAYERS TIMELINE CAPTURE SHARE HELP VIEW MODE

JULY 2024 AUGUST 2024 JUL 25 2024 1 DAY

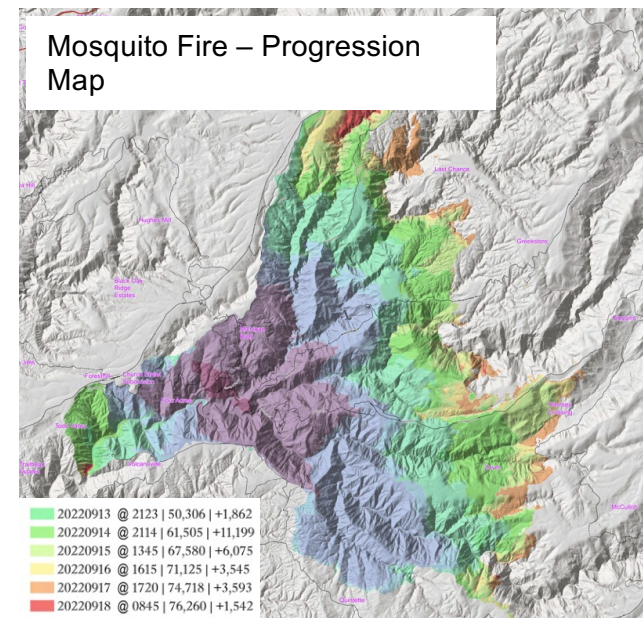
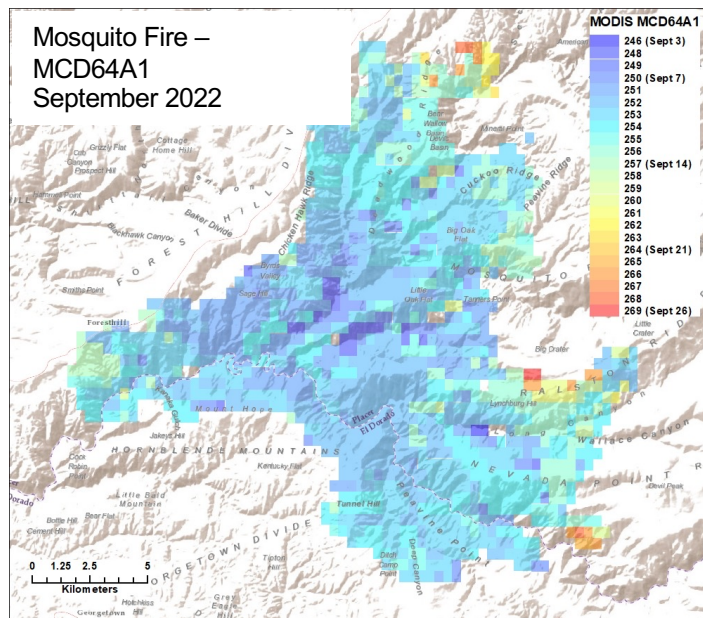
Future Plans

- Experimental tab enables product evaluation
- Static Thermal Anomalies
- NRT burned area
- With MODIS end of life – VIIRS provides continuity for Aqua (PM) overpass. No replacement for Terra (AM) overpass. NASA is considering Sentinel 3 for active fire and corrected reflectance imagery to provide continuity for the morning observations

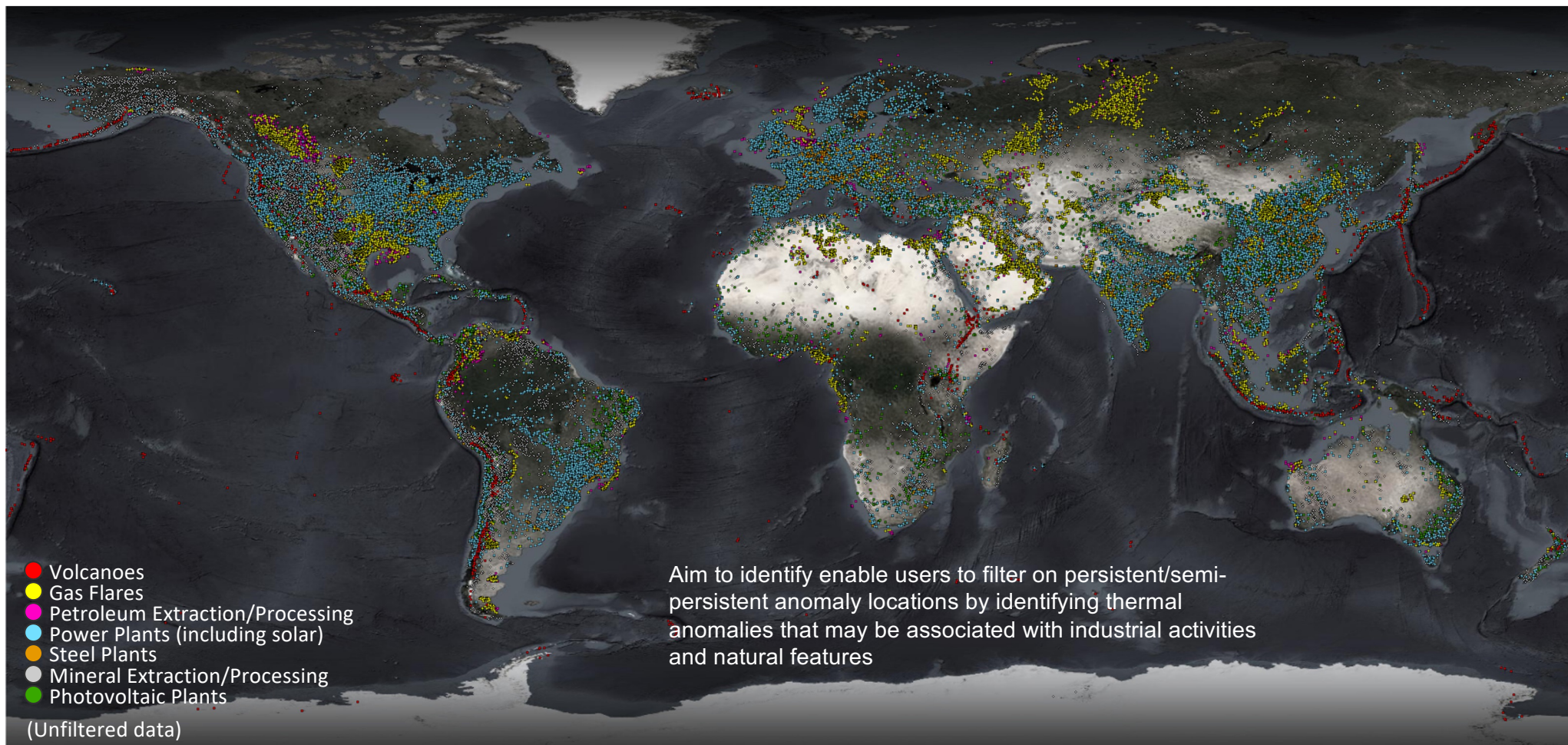


NRT VIIRS Burned Area Product

- Daily/sub-daily capture of fire growth is beneficial to multiple applications
- Product details:
 - Based on an adaptation of MODIS MCD64A1/VIIRS VNP64A1
 - Daily cumulative updates at ~375m spatial resolution
 - Global coverage
 - Produce operationally in LANCE/MODAPS environment
 - Anticipate 12-to-24-month period to implement



Potential Persistent/Semi-Persistent Anomaly Locations





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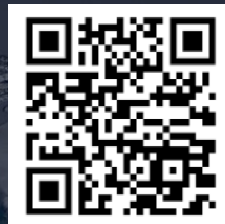
earthdata.nasa.gov

Thank you

More information on FIRMS:



FIRMS US/Canada



FIRMS Global



NASA LANCE