National Aeronautics and Space Administration

EARTHDATA

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

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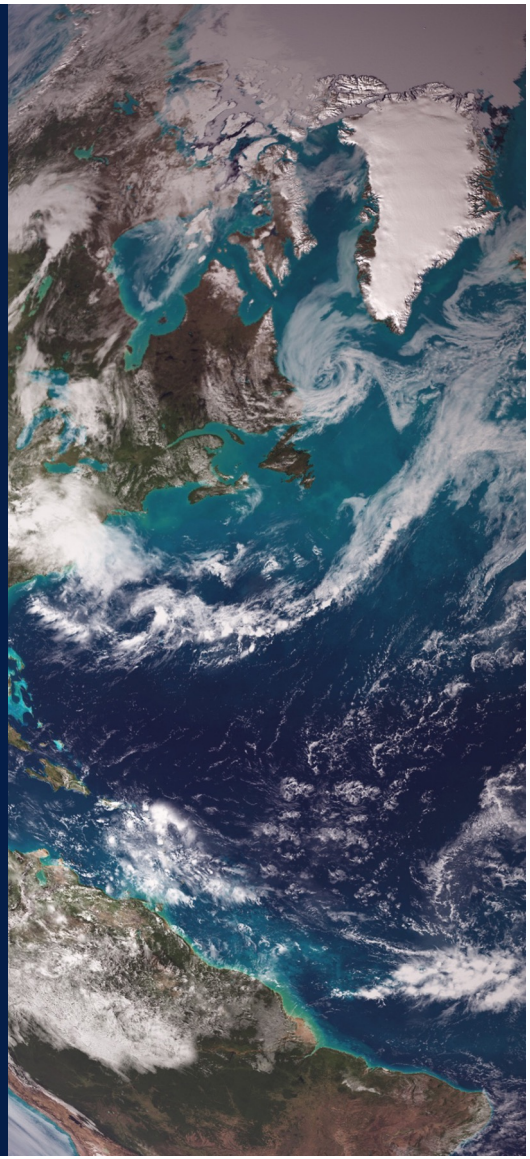
Overview

Background & Introduction to FIRMS

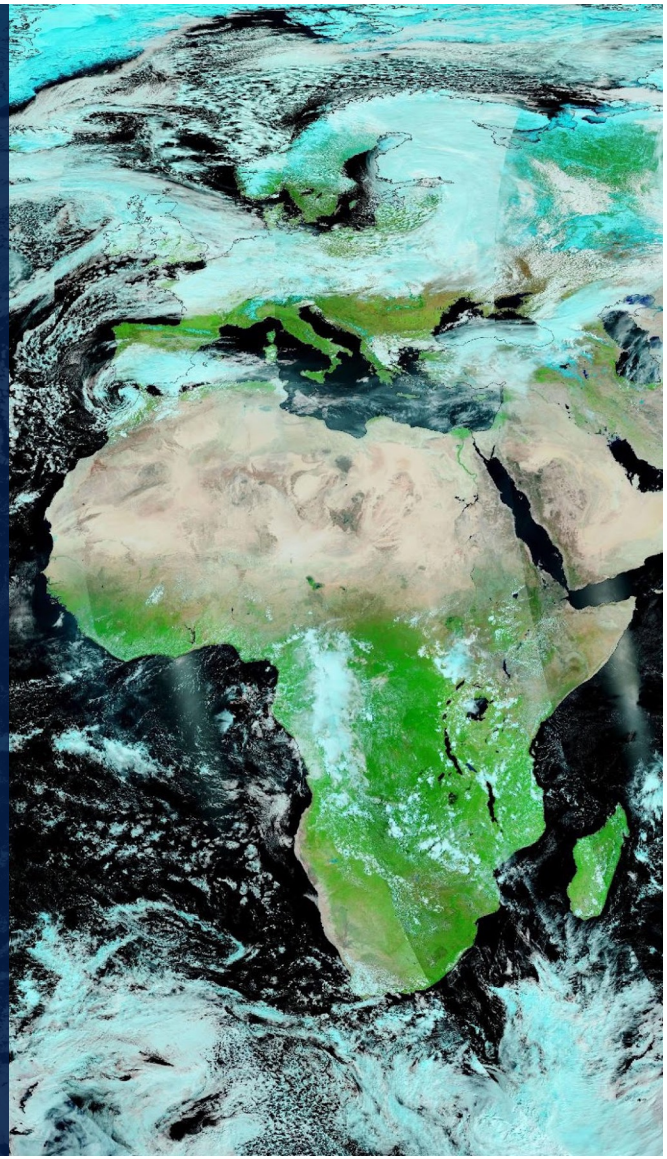
Strengths

Limitations

Future Plans

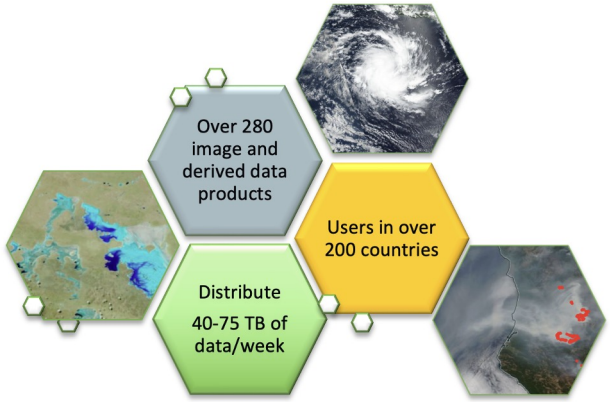


Background & Introduction



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



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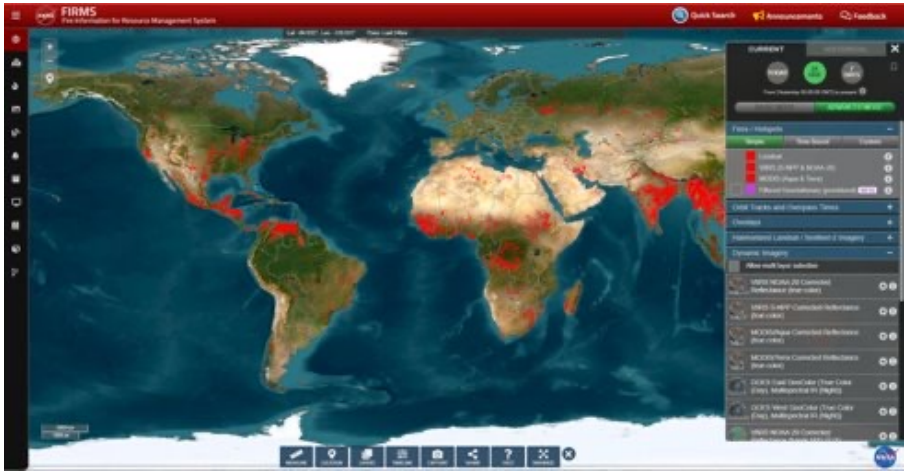
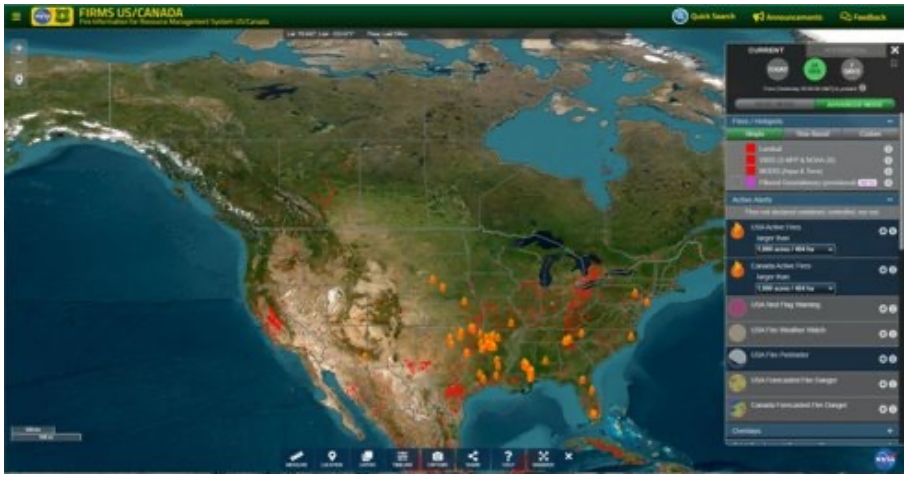
FIRMS Global and FIRMS US/Canada



- 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.

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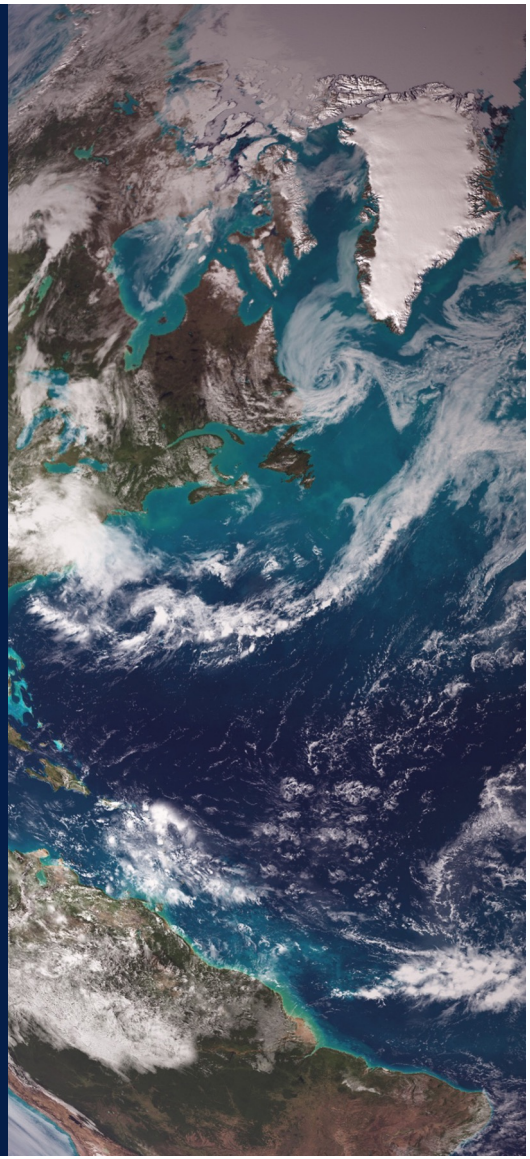
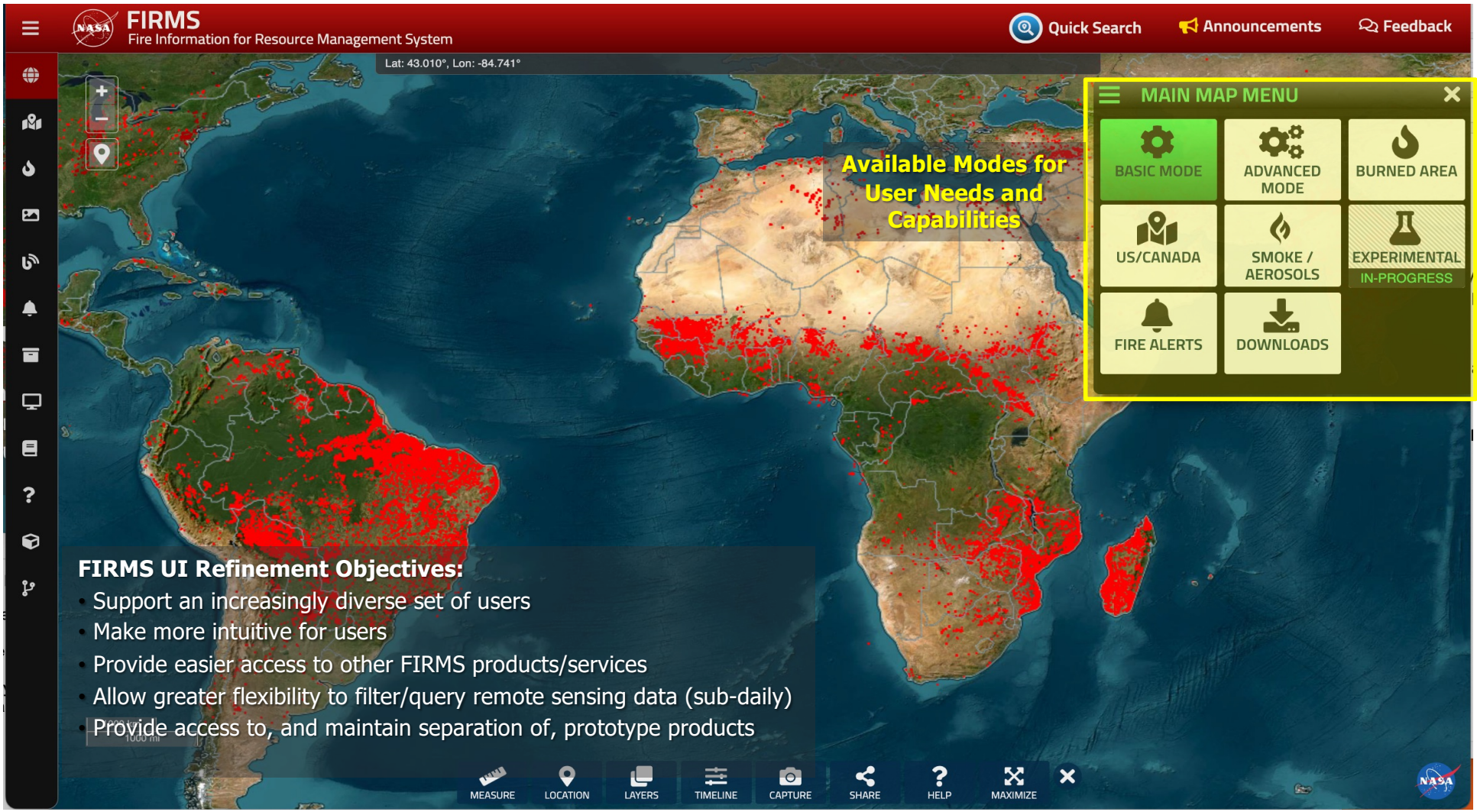
Strengths

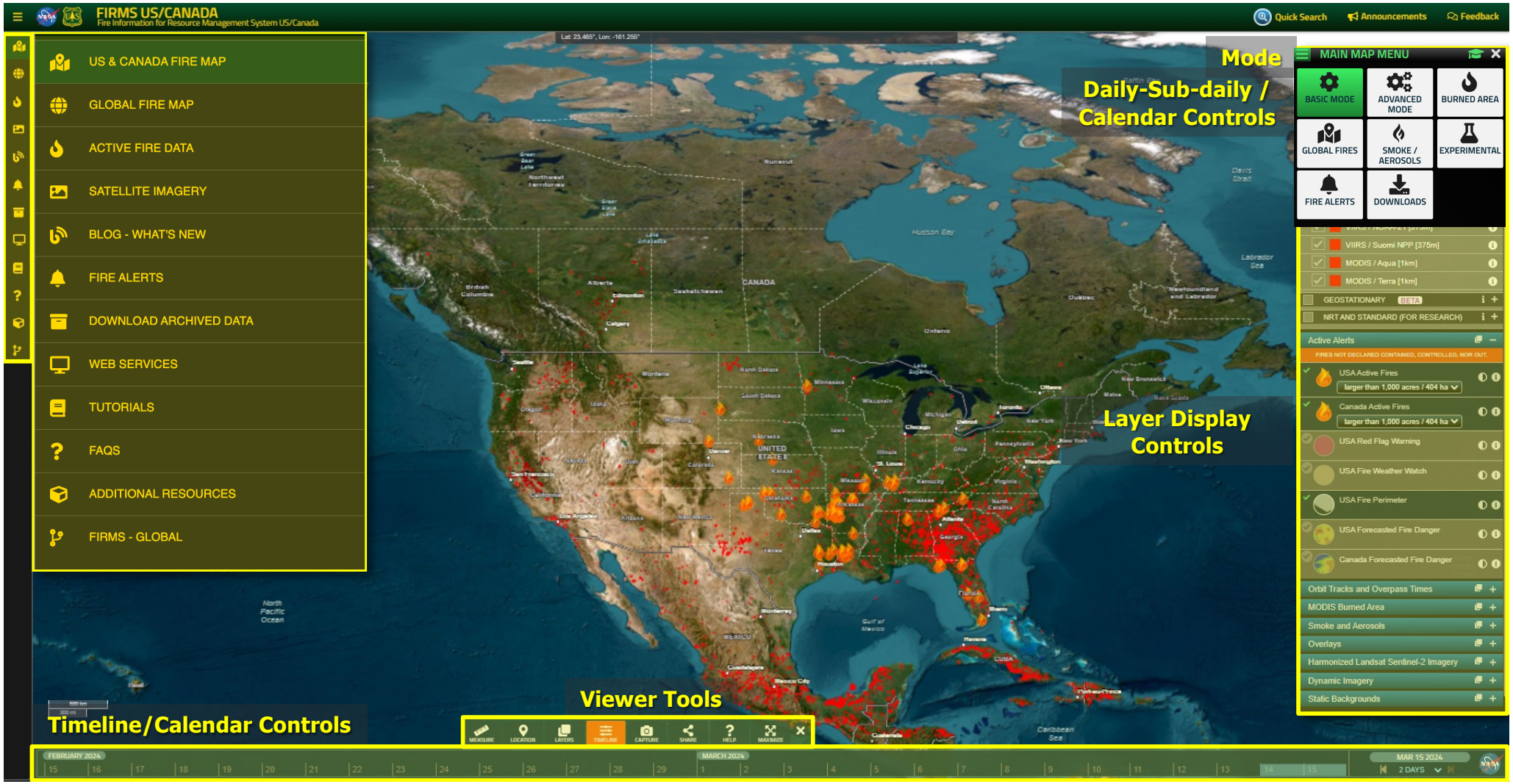
- Web map interface caters for range of users (modes).
- Easy to access other components
- Active fire data provided in multiple formats
- Multi-mission. Integrates AF data from multiple sources.



FIRMS Map User Interface (UI) Updates



FIRMS US/Canada Map User Interface (UI)



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)

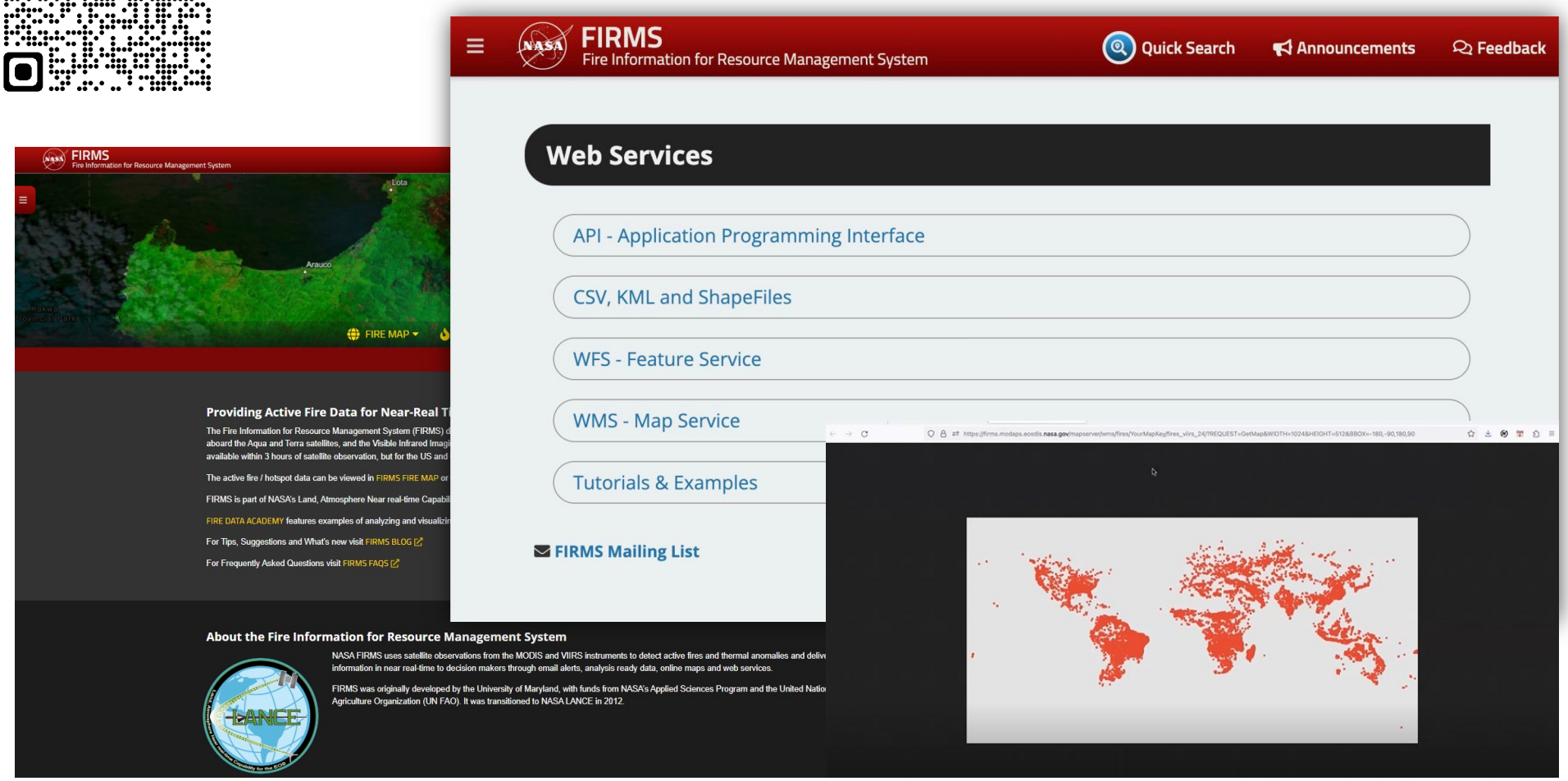
[1] The pixel size systematically grows from sub-satellite towards the edge of the disk/swath.

[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



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.

email address

Get MAP Key

MODIS Layers

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

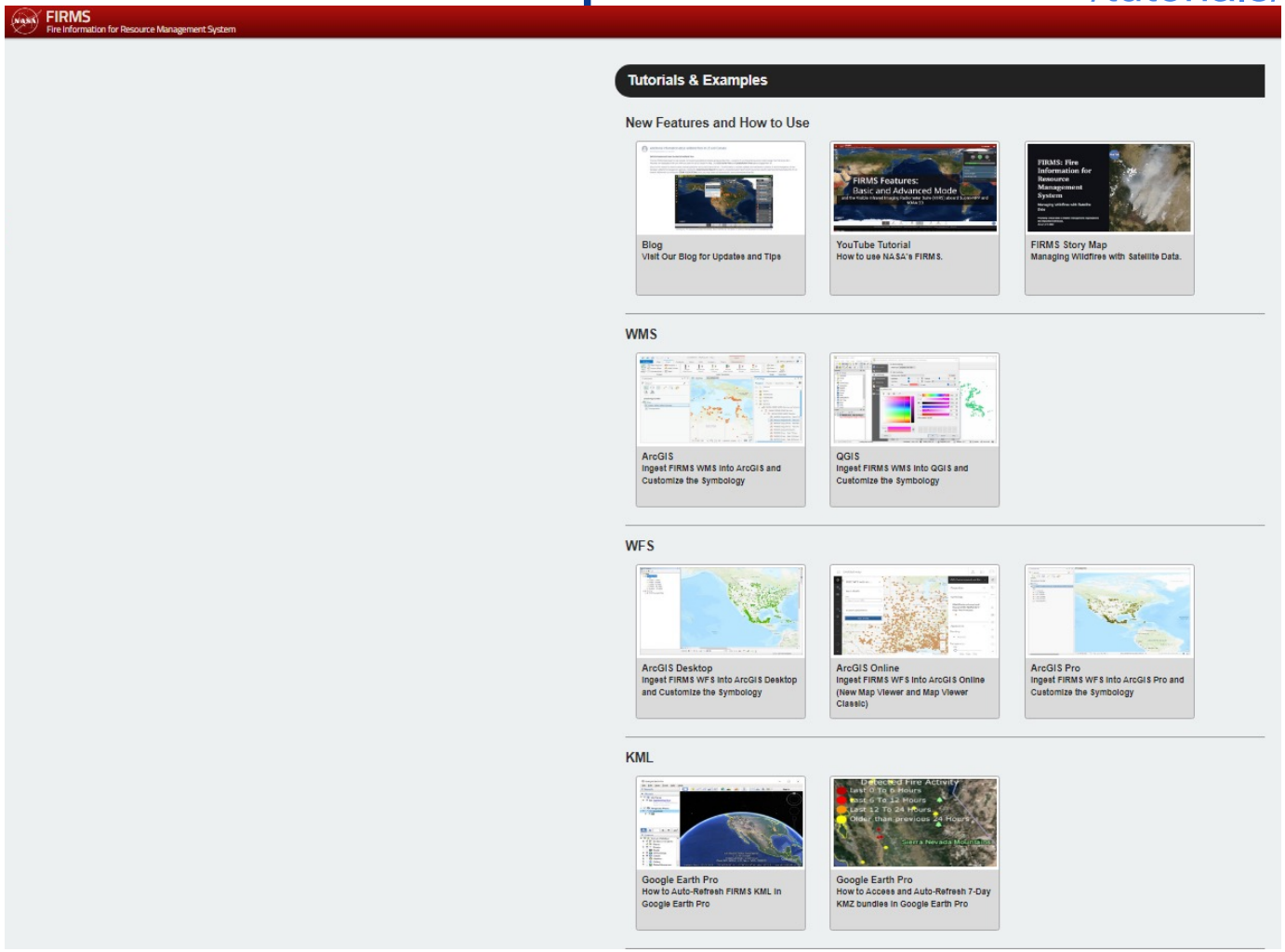
GetCapabilities

LANDSAT Layers

Landsat 8 & 9 OLI
fires_landsat_24

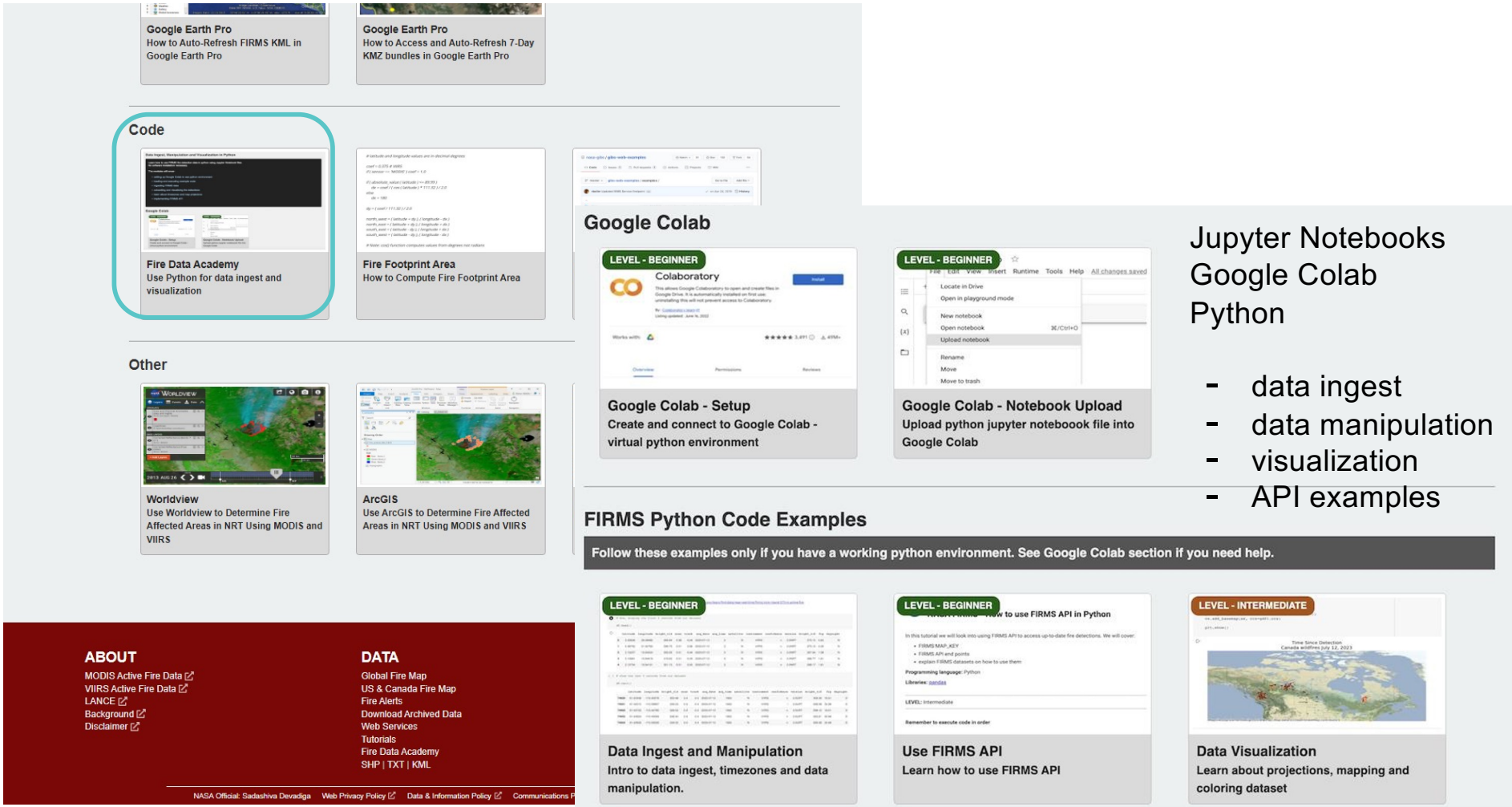
Tutorials and Examples

/tutorials/



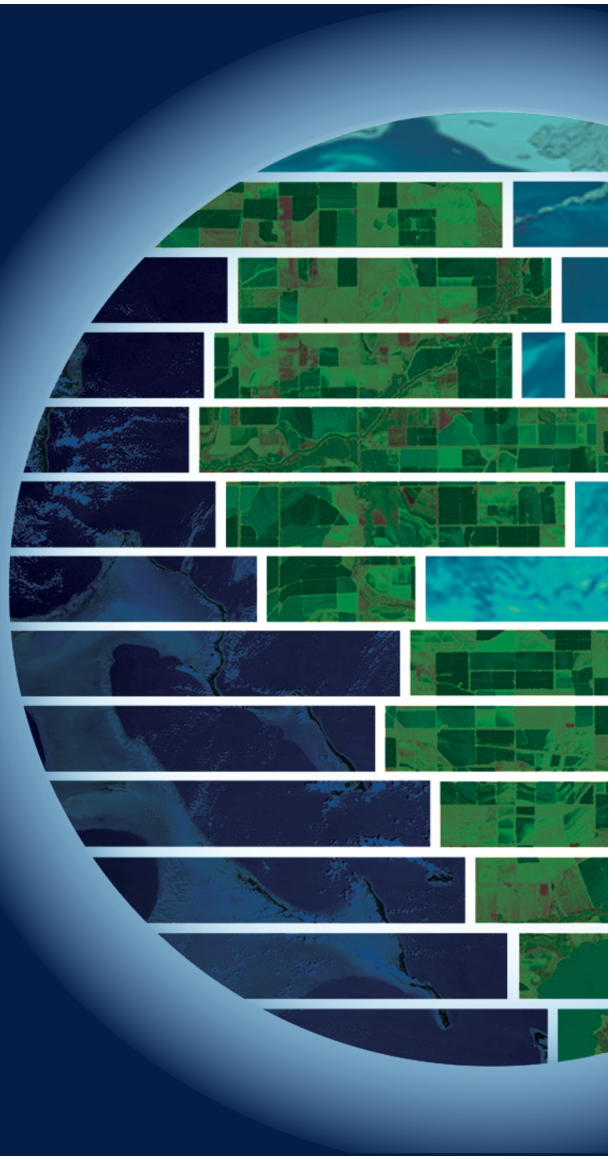
Fire Data Academy

/academy/



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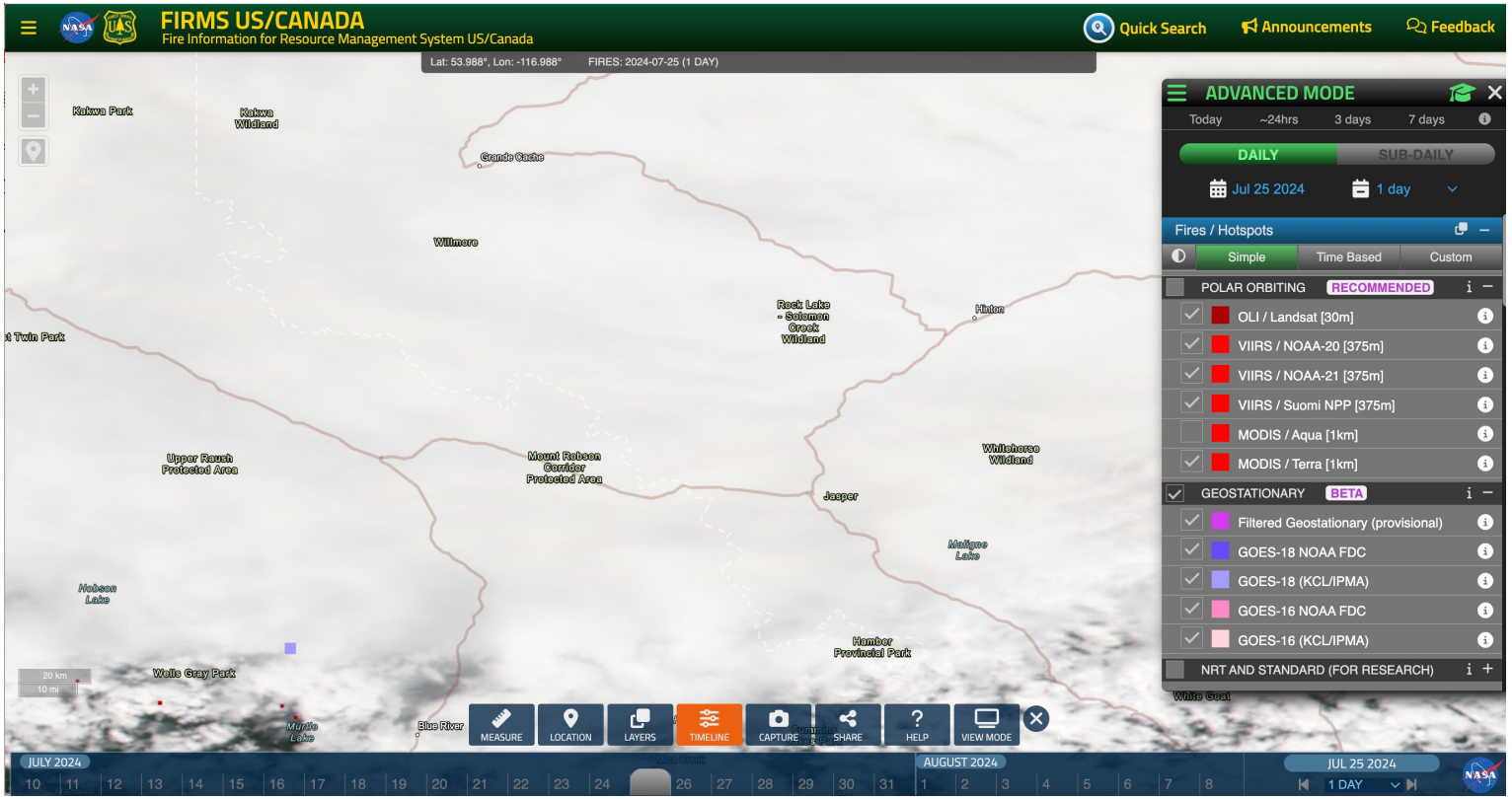
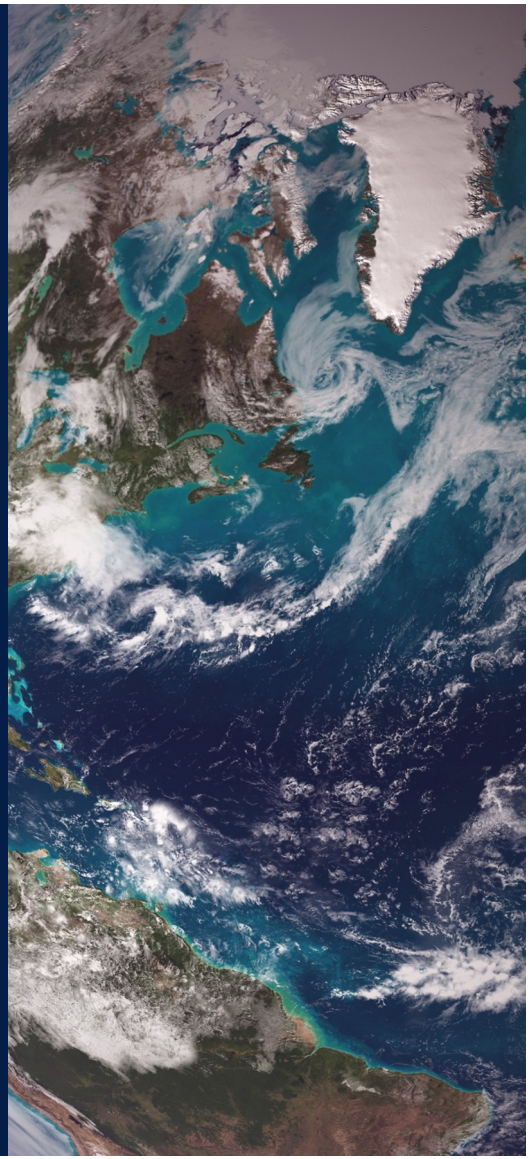
Example from Jasper, Alberta, Canada July 25, 2024.

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



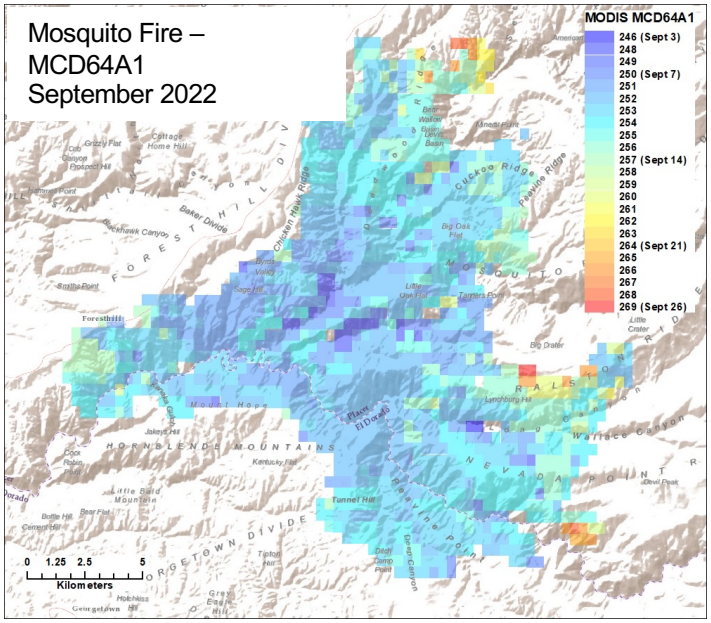
Future Plans

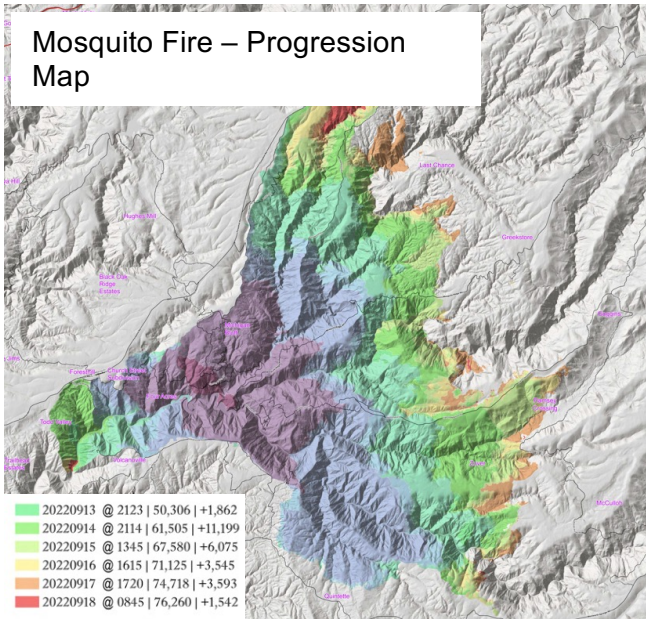
- Experimental tab enables product evaluation
- Static Thermal Anomalies
- NRT burned area
- With MODIS end of life – VIIRS provides continuity for Aqua (PM) overpass. No replacement for Terra (AM) overpass. NASA is considering Sentinel 3 for active fire and corrected reflectance imagery to provide continuity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



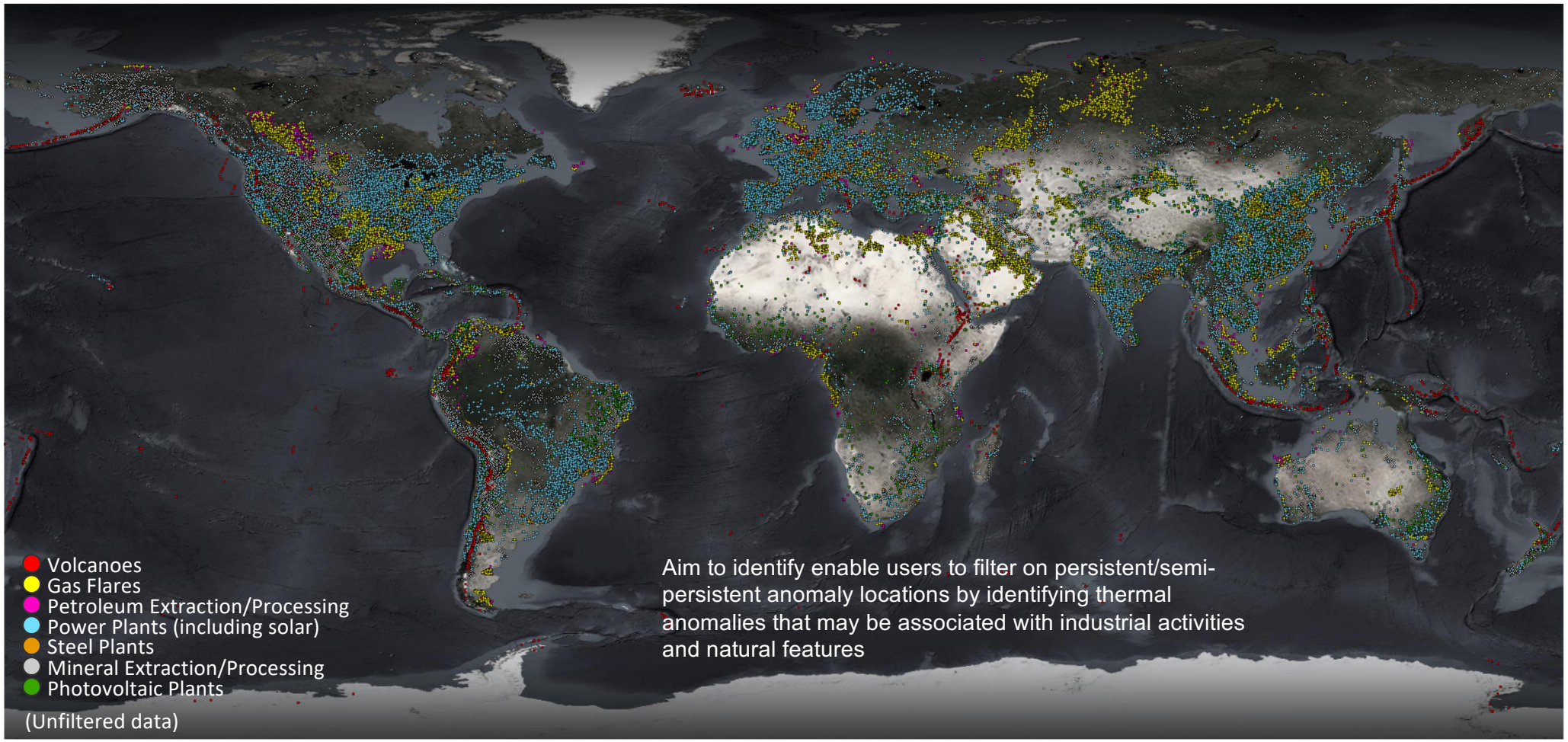
NRT VIIRS Burned Area Product

- 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




FIRMS
Fire Information for Resource Management System
Quick Search
Announcements
Feedback
Lat: 33.108°, Lon: -110.895°
Fires: Last 24hrs
Mogollon Rim
Eastern Arizona/Western New Mexico
June 8, 2023
MODIS/VIIRS Fire Detections for Past 31 Days
2023 NASA EIS Fire Perimeters
Access to Prototype Data Products
EXPERIMENTAL
1hr
4hrs
Today
~24hrs
7days
DAILY
SUB-DAILY
Jun 08 2023
31 days
Experimental
EIS Fire Perimeter Tile
Orbit Tracks and Overpass Times
Overlays
Harmonized Landsat / Sentinel-2 Imagery
Dynamic Imagery
Static Backgrounds
Modeled FirePerimeter Product (Tess McCabe and Eli Orland):
• Provided only for the US
• Derived from SNPP and NOAA-20 VIIRS active fire detections (375m)
• Clustering of active fire detections to approximate area burned
• Cumulative product, updated every 12 hours
• Provides a time series of fire growth for each incident
MEASURE
LOCATION
LAYERS
TIMELINE
CAPTURE
SHARE
HELP
MAXIMIZE
MAY 2023
JUNE 2023
JUN 08 2023
31 DAYS
Snowflake
Pinetop-Lakeside
Eagar
Whiteriver
Apache National Forest
Globe
Gila National Forest
Truth or Consequences
Silver City
Safford
Sitgreaves National Forest

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earthdata.nasa.gov

Thank you

More information on FIRMS:

FIRMS US/Canada

FIRMS Global

NASA LANCE