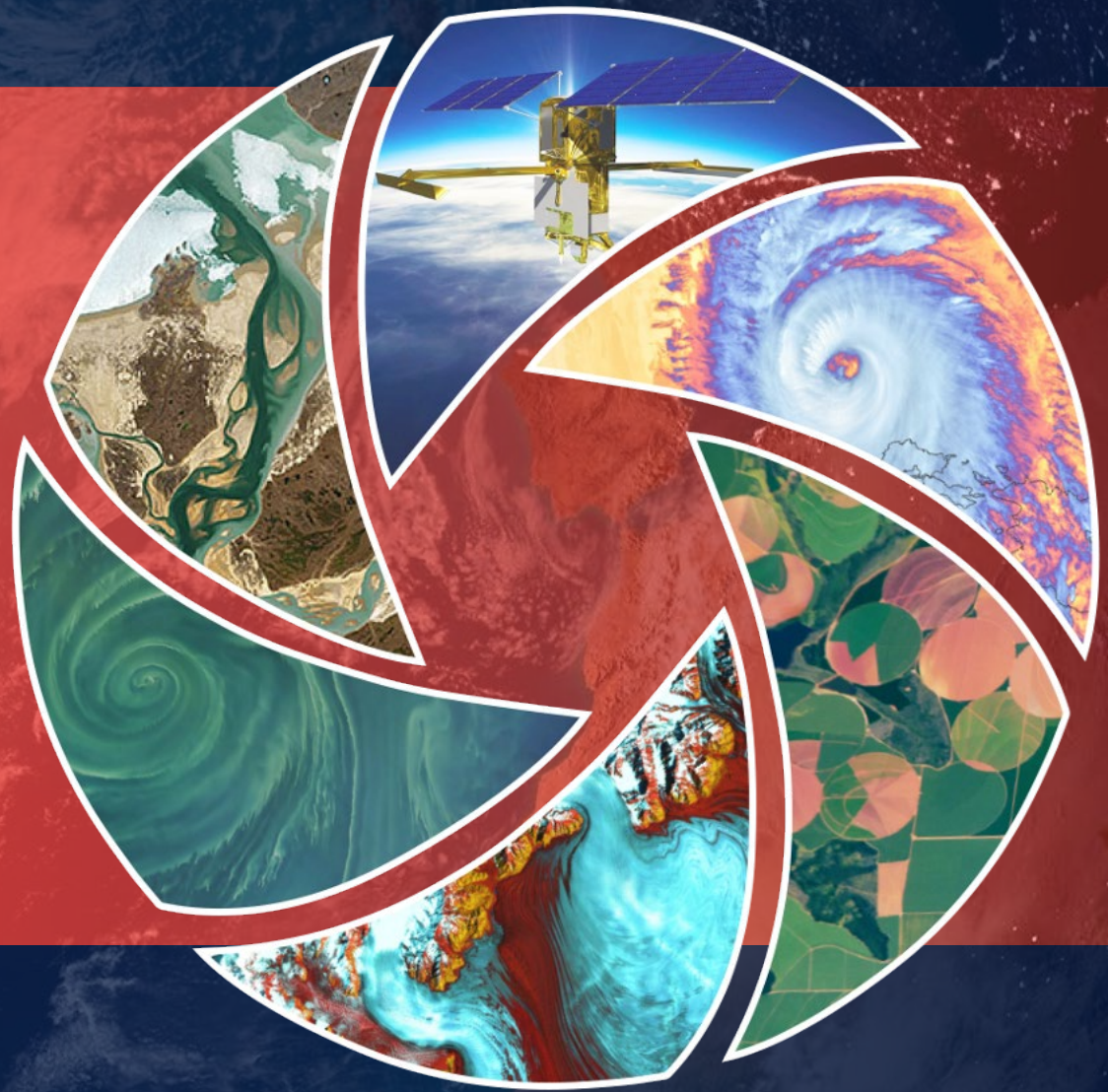
NASA’s Fire Information for Resource Management System (FIRMS). Updates and feedback from end users.

NASA: Diane Davies, Jenny Hewson, Otmar Olsina
USFS: Brad Quayle
UMD: Louis Giglio, Joanne Hall,

Presentation to GOFC-Fire IT. Milan. September 2024



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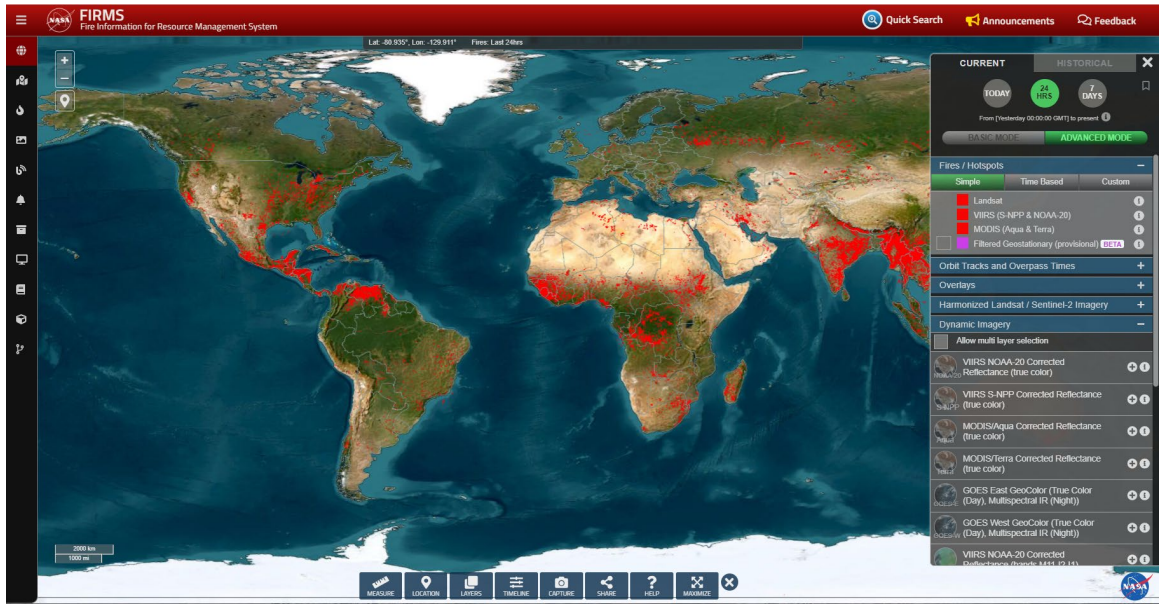
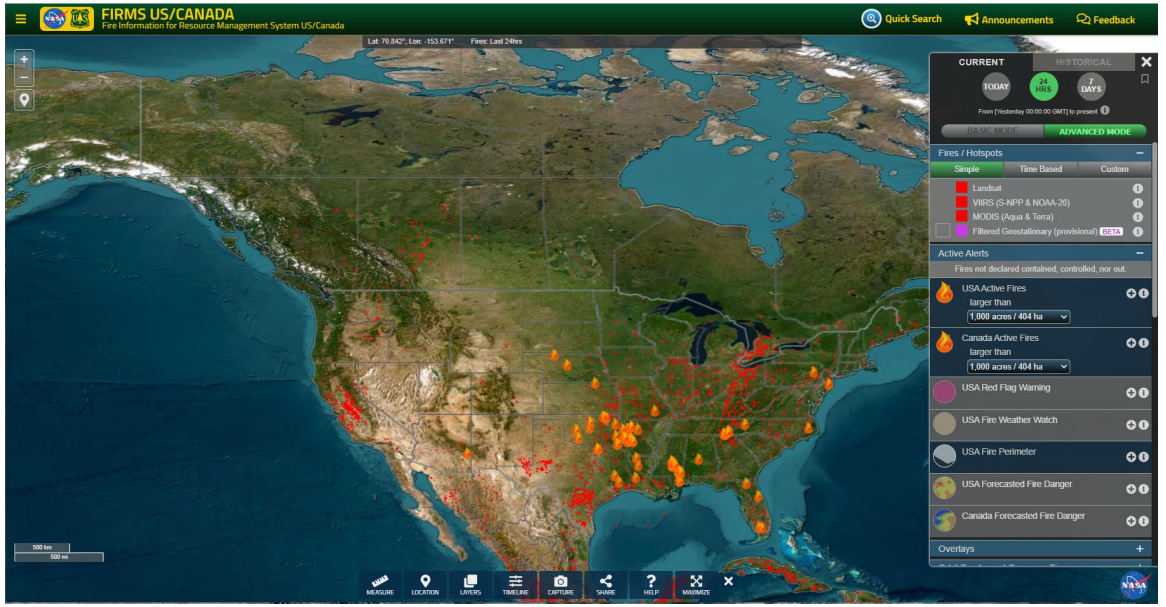
FIRMS Global and FIRMS US/Canada





- 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
- Partnership between NASA and USDA Forest Service
- FIRMS US/Canada was launched within NASA LANCE in 2021.
- NRT, RT and URT imagery and fire remote sensing products for the US & Canada.
- Provides contextual data/information relevant to fire management.

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FIRMS Components

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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-20/21)	NASA LANCE	375m sub-satellite[1]	Twice daily[2]	NRT - <3 hours (Global)
MODIS (Aqua)	SSEC Univ of Wisconsin	1km sub-satellite[1]	Twice daily[2]	RT - <30 mins (US-Canada)
VIIRS (Suomi NPP/NOAA-20/21)	SSEC Univ of Wisconsin	375m sub-satellite[1]	Twice daily[2]	RT - <30 mins (US-Canada)
MODIS (Aqua)	SSEC Univ of Wisconsin	1km sub-satellite[1]	Twice daily[2]	URT - <1 min (US-Canada)
VIIRS (Suomi NPP/NOAA-20/21)	SSEC Univ of Wisconsin	375m sub-satellite[1]	Twice daily[2]	URT - <1 min (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.

Coverage over US/Canada only

[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.

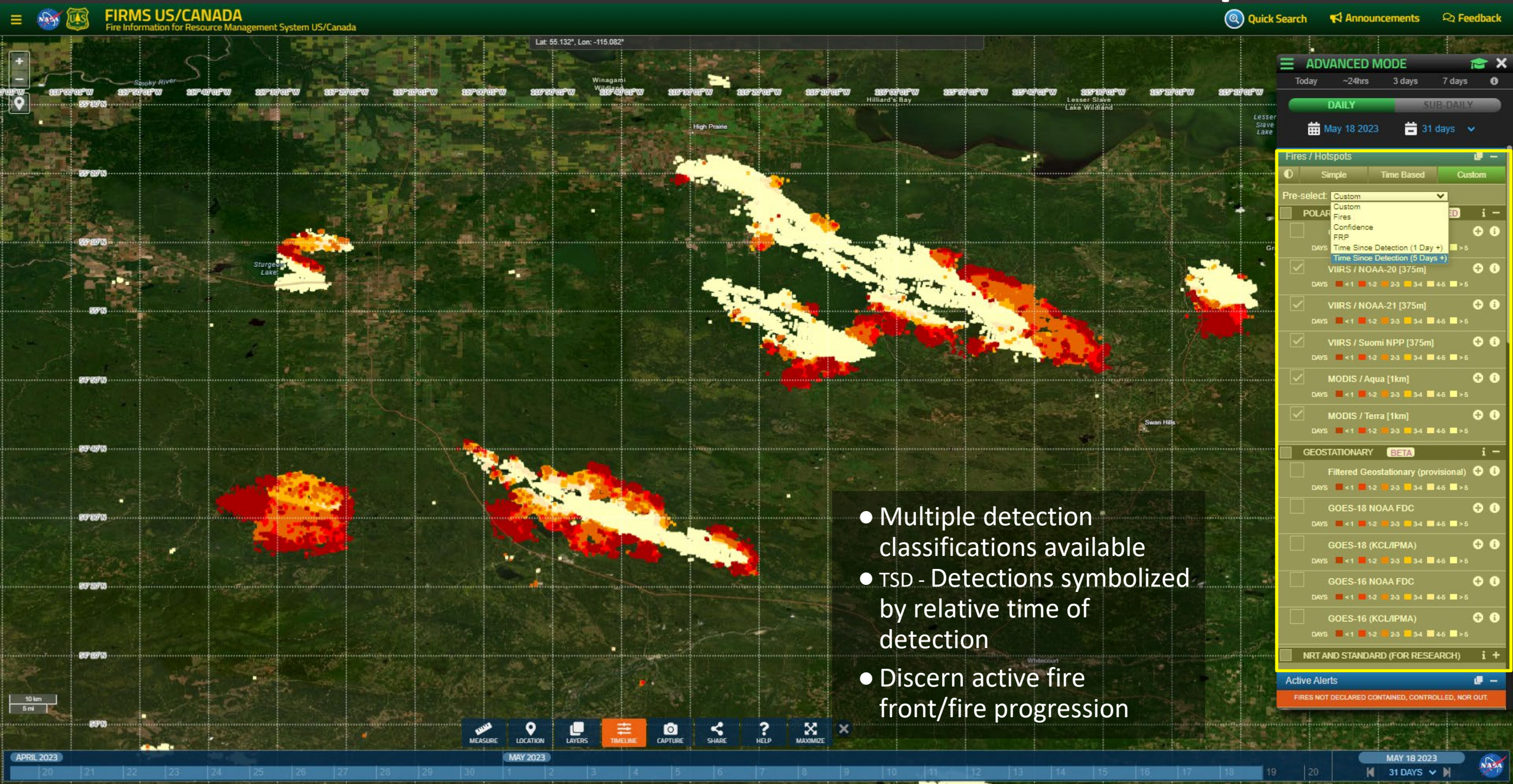
[4] Latency refers to the estimated time from satellite observation to availability in FIRMS. Near Real-Time (NRT), Real-Time (RT) & Ultra-Real-Time (URT).

Current FIRMS Partners & NRT/RT/URT Data Sources

Recent Enhancements

FIRMS Map User Interface (UI) Updates

Fire Detection Data Sources & Visualization Options



- Multiple detection classifications available
- TSD - Detections symbolized by relative time of detection
- Discern active fire front/fire progression

Recently Added to FIRMS

- Volcano layer
- NOAA-21 Active fire/thermal anomalies
- NOAA-21 Corrected Reflectance and Surface Reflectance Imagery
- VIIRS Night-lights imagery (At sensor radiance and Nighttime Blue/Yellow Composite)
- Reginal KMZ data files at the request of Canadian partners

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FIRMS Outreach Activities

- Objectives
- Target Audience
- What we learned
- Activities and Next Steps

Objectives

- Inform users about FIRMS data and capabilities
- Understand how FIRMS data and capabilities have been used in recent fire seasons
- Receive suggestions for enhancements to support operational needs

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FIRMS Outreach Activities

- ❑ Objectives
- ❑ Target Audience
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Canada: Provincial/National Government Users

- Provincial Governments
  - Northwest Territories Dept of Environment and Climate Change
  - Northwest Territories Forest Management Division
  - British Columbia Wildfire Service
  - Saskatchewan Public Safety Agency

- National Government
  - Canadian Forest Service, Northern Forestry Centre
  - Natural Resources Canada (NRCAN)

US: Federal/State Users

- Programs and Applications
  - National Interagency Coordination Center
  - USFS/Interagency Air Quality Response Program
  - USFS Wildland Fire Management Research, Development and Applications
  - USFS Rocky Mtn Research Station Fire, Fuel and Smoke Sciences
  - USFS Fire & Aviation Management - Tools and Technology
  - USFS Fire & Aviation Management - National Infrared Operations
  - BLM California Desert Interagency Fire Program
  - Minnesota Emergency Preparedness group

Wildland Fire Decision Support System

NICC

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

INTERAGENCY WILDLAND FIRE AIR QUALITY RESPONSE PROGRAM

Wildland Fire Management Research, Development & Application
Integrating Science, Technology and Fire Management

NATIONAL INFRARED OPERATIONS

NATIONAL INTERAGENCY FIRE ENTERPRISE GEOSPATIAL PORTAL

Fire, Fuel, and Smoke Science Program
Missoula Fire Sciences Laboratory

Private Sector Users

- SCE – Southern California Edison Electricity
- PG&E – Pacific Gas and Electric
- San Diego Gas & Electric
- Indji

Recent FIRMS Technology Transfer/Training Engagements

- National Interagency Coordination Center (NICC) / Geographic Area Coordination Center (GACC) Intel Group
- CIFFC Geospatial Working Group
- NRCan Community of Practice for Remote Sensing in Operational Fire Management
- Minnesota Emergency Preparedness Committee
- U of Louisiana at Lafayette Regional Application Center

FIRMS Outreach Activities

- ❑ Objectives
- ❑ Target Audience
- ■ What we learned
- ❑ Activities and Next Steps

Comments about FIRMS:

Essential to fire management operations. When not available, can significantly affect operations for some agencies.

Critical source of intel, particularly when aerial reconnaissance is not possible

System redundancy is helpful during periods of high demand, load balancing

Imagery and Active Fire Data Use Cases:

Monitor new ignitions and ongoing fire activity

Burned area delineation using Landsat/Sentinel 2 imagery (potential use case)

Validation of national burned area products using Landsat/Sentinel 2 imagery (potential use case)

Assess potential risk for new fires/fire growth in context of fire danger data

Validate fire growth forecasts

Retrospectively investigate origin of fires and cause

Brief agency/interagency leadership and develop intel reports

Monitor infrastructure assets (electricity transmission, renewable energy sources, etc.)

Support mapping and DSS applications through use of map services, APIs and downloadable data

Monitor fire activity in other countries for which mutual assistance agreements are maintained

National Interagency Coordination Center Command Center Floor

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Requests:

Additional FIRMS training/tech transfer resources

Tools to filter incident location data

NRT VIIRS burned area product

Increased functionality, tools and data for USFS air resource/smoke management needs

Identify sources of persistent/semi-persistent anomalies

Provide more platforms and daily observations to support operational and science activities

Government of Canada | Gouvernement du Canada

FIRMS Outreach Activities

- ❑ Objectives
- ❑ Target Audience
- ❑ What we learned
- ■ Activities and Next Steps

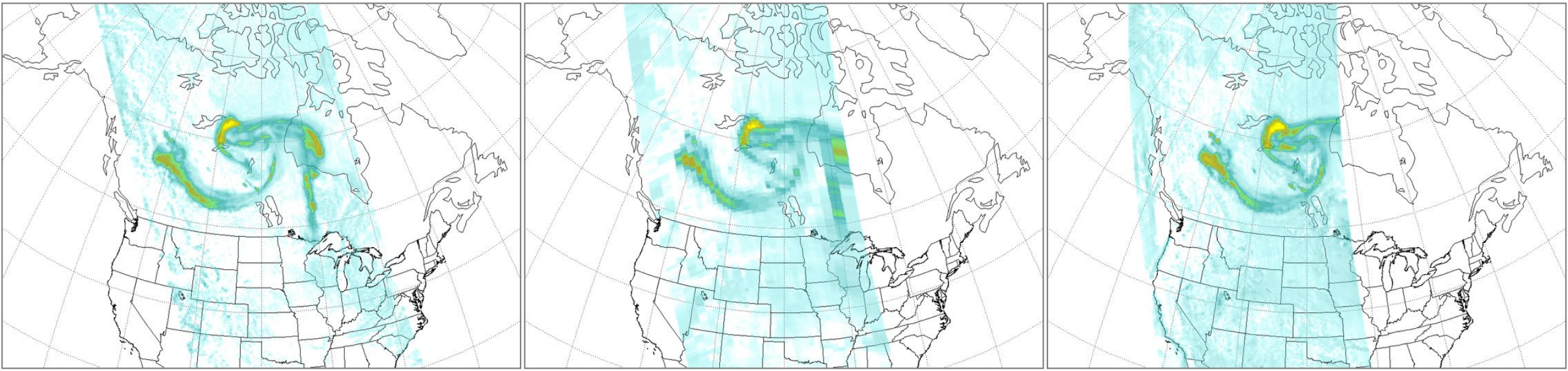
LANCE OMPS Aerosol Index

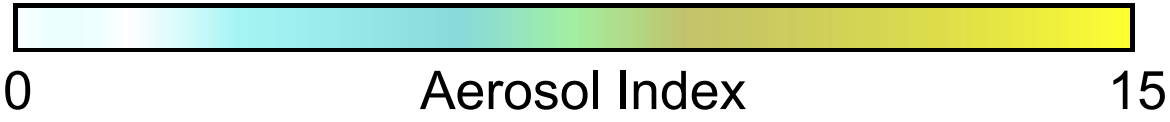
OMPS Aerosol Index for 11 May 2024

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

Persistent/Semi-Persistent Anomaly Sources

Identify thermal anomaly locations not attributable to vegetation fires
- started with the volcano layer (already in FIRMS)

Ongoing review of ~15 global data layers from authoritative sources

Natural features, industrial, energy extraction/processing and mineral extraction/processing facilities, etc.

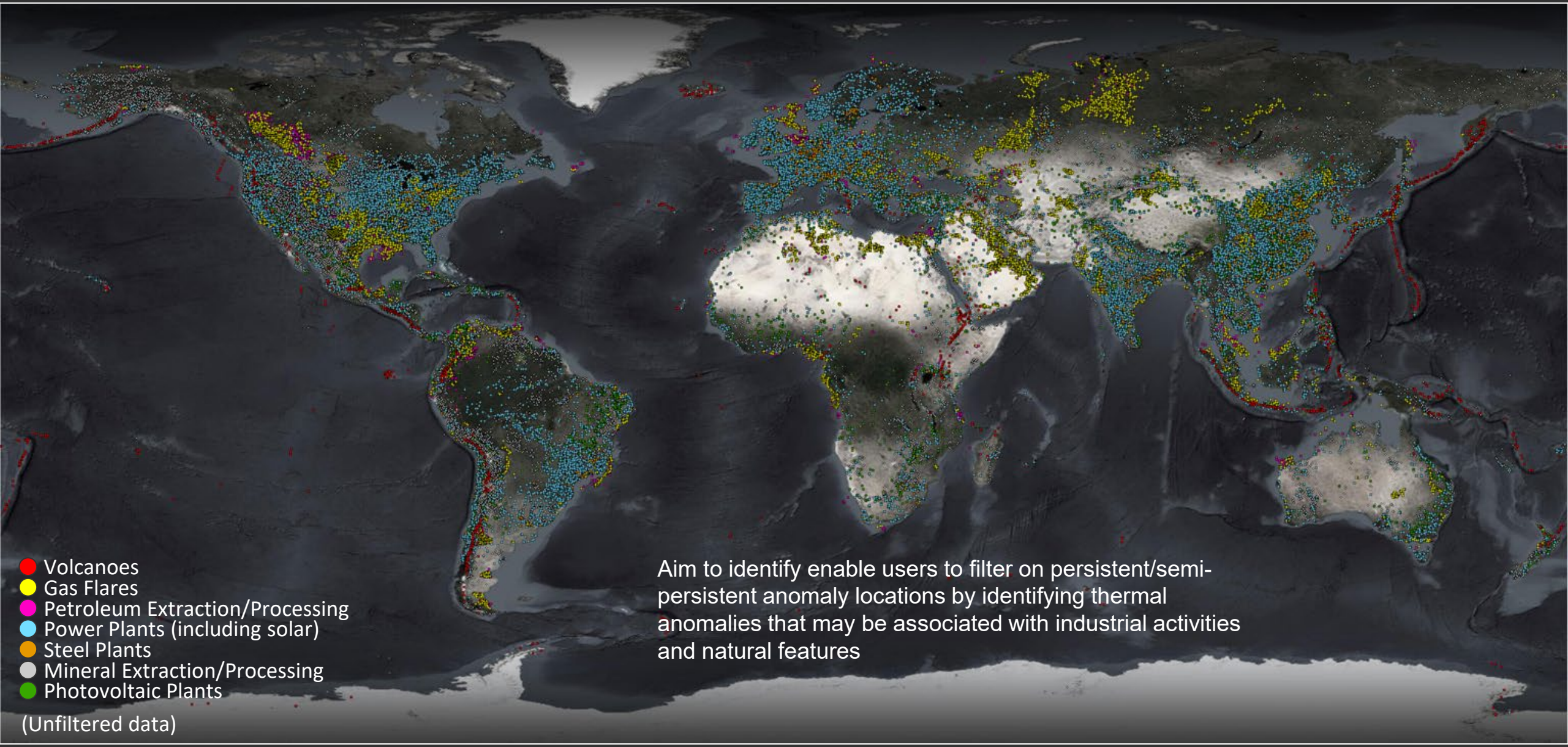
555,000+ features

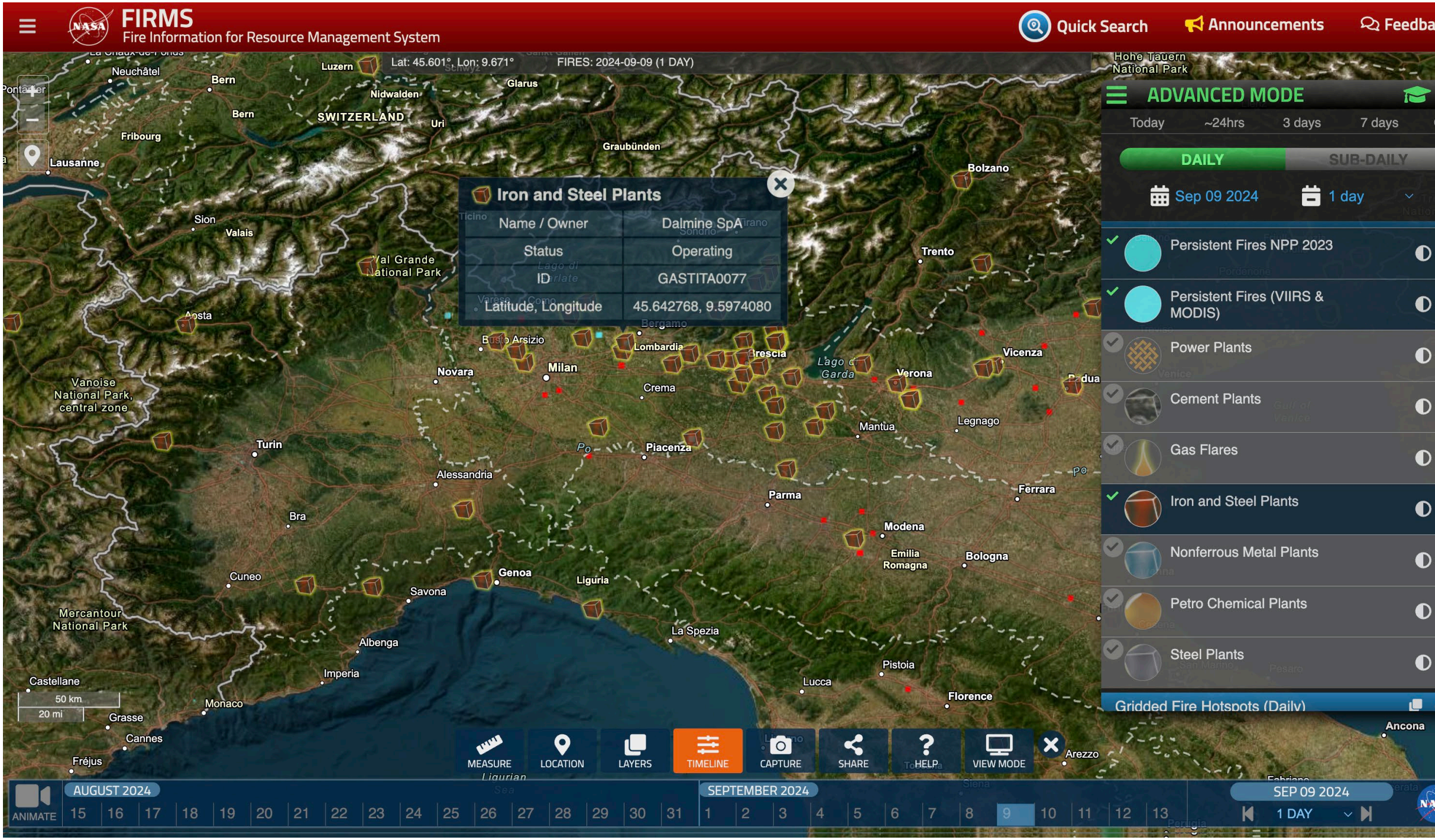
Assess data in context of annual active fire detection data

Identify routinely detected anomaly sources

Provide output dataset(s) as reference or to generate value-added data to aid/guide users

Potential Persistent/Semi-Persistent Anomaly Locations




FIRMS
Fire Information for Resource Management System
Quick Search
Announcements
Feedba
Lat: 45.601°, Lon: 9.671°
FIRES: 2024-09-09 (1 DAY)
Iron and Steel Plants
Name / Owner
Dalmine SpA
Status
Operating
ID
GASTITA0077
Latitude, Longitude
45.642768, 9.5974080
ADVANCED MODE
Today
~24hrs
3 days
7 days
DAILY
SUB-DAILY
Sep 09 2024
1 day
Persistent Fires NPP 2023
Persistent Fires (VIIRS & MODIS)
Power Plants
Cement Plants
Gas Flares
Iron and Steel Plants
Nonferrous Metal Plants
Petro Chemical Plants
Steel Plants
Gridded Fire Hotspots (Daily)
MEASURE
LOCATION
LAYERS
TIMELINE
CAPTURE
SHARE
HELP
VIEW MODE
ANIMATE
AUGUST 2024
SEPTEMBER 2024
SEP 09 2024
1 DAY
Neuchâtel
Bern
Luzern
Glarus
Nidwalden
SWITZERLAND
Uri
Fribourg
Lausanne
Graubünden
Bolzano
Sion
Valais
Val Grande National Park
Trento
Aosta
Busto Arsizio
Lombardia
Brescia
Lago di Garda
Verona
Vicenza
Novara
Milan
Crema
Vanoise National Park, central zone
Mantua
Legnago
Turin
Piacenza
Alessandria
Parma
Ferrara
Bra
Modena
Emilia Romagna
Bologna
Cuneo
Genoa
Liguria
Savona
Mercantour National Park
La Spezia
Albenga
Imperia
Pistoia
Castellane
Lucca
Florence
Monaco
Grasse
Cannes
Fréjus
Arezzo
Ancona
50 km
20 mi

Recent Comments by Operational FIRMS Users

Those images (from FIRMS) really demonstrate how your work is critical to everything we do
Northwest Territories

As local systems failed to fill national system …so went to FIRMS (and USFS legacy system). Data from FIRMS is mission critical..
Northwest Territories

I use FIRMS Rapid Alerts A LOT. I have each of our regions entered as an AOI so get alerts on all the detections
Northwest Territories

Active fire data are mission critical particularly because there is a large land base and a small population… critical first alert tool
Gov't of NWT

It's the first thing I check every morning, of every fire season, while I have morning coffee.
Wildfire Information Systems
Parks Canada Agency
Government of Canada

Hotspots are default currency of fire information everywhere – so critical
Province of British Columbia

I can't tell you how grateful we are to have FIRMS as a resource!
GIS & Wildfire Technician, NWT

Several weeks in 2023 where they could not fly thermal aerial surveys due to unprecedented situation (so hotspots and multi-spectral was all they had)
BC Ministry of Forests

7. We get Canadian wildfire data from FIRMS
National Interagency Coordination Center

Use it daily and routinely to brief the NMAC
National Interagency Coordination Center

Satellite detection programs such as FIRMS and other remote sensing techniques are essential to tracking active wildfires throughout the province of BC during busy fire seasons
Province of British Columbia

Thank you as well for all the hotspot data, which is ever so useful and which you/FIRMS has been providing for many years
Natural Resources Canada

Use Fire Map to look at what support is needed, or likely to be needed, internationally (Australia, Argentina, Chile
NICC

Use Fire Map a lot for situational awareness and to pass to managers
National Interagency Fire Center