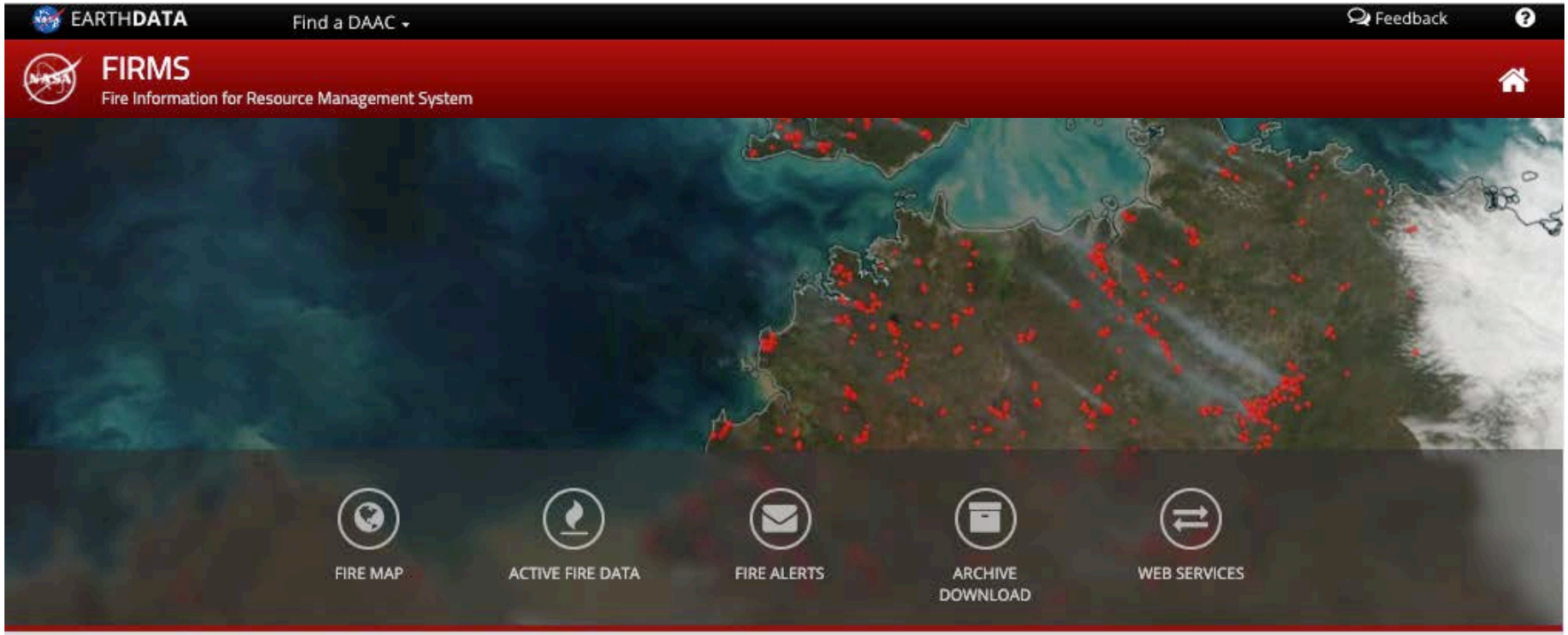
NASA's Fire Information for Resource Management System (FIRMS): Near Real-Time Global Fire Monitoring using Data from MODIS and VIIRS

Presented by Diane Davies
LANCE Operations Manager

Diane Davies[1,2], Greg Ederer[3], Otmar Olsina[3] Minnie Wong[2], Matthew Cechini[2], Ryan Boller[4]
Trigg-Davies Consulting Ltd, UK [2]Science Systems and Applications Inc. / NASA GSFC, USA. [3] Global. Science & Technology Inc,/ NASA GSFC, USA [4] NASA GSFC, USA



Earth Observation Data › LANCE: NASA Near Real-Time Data and Imagery › **Fire Information for Resource Management System (FIRMS)**

FIRE INFORMATION FOR RESOURCE MANAGEMENT SYSTEM (FIRMS)

The Fire Information for Resource Management System (FIRMS) distributes Near Real-Time (NRT) active fire data within 3 hours of satellite observation from both the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Visible Infrared Imaging Radiometer Suite (VIIRS).

The active fire / hotspot data can be viewed in FIRMS Fire Map or in NASA's Worldview, delivered as email alerts or downloaded in the following formats: SHP, KML, TXT, WMS

FIRMS is part of NASA's Land, Atmosphere Near real-time Capability for EOS (LANCE).

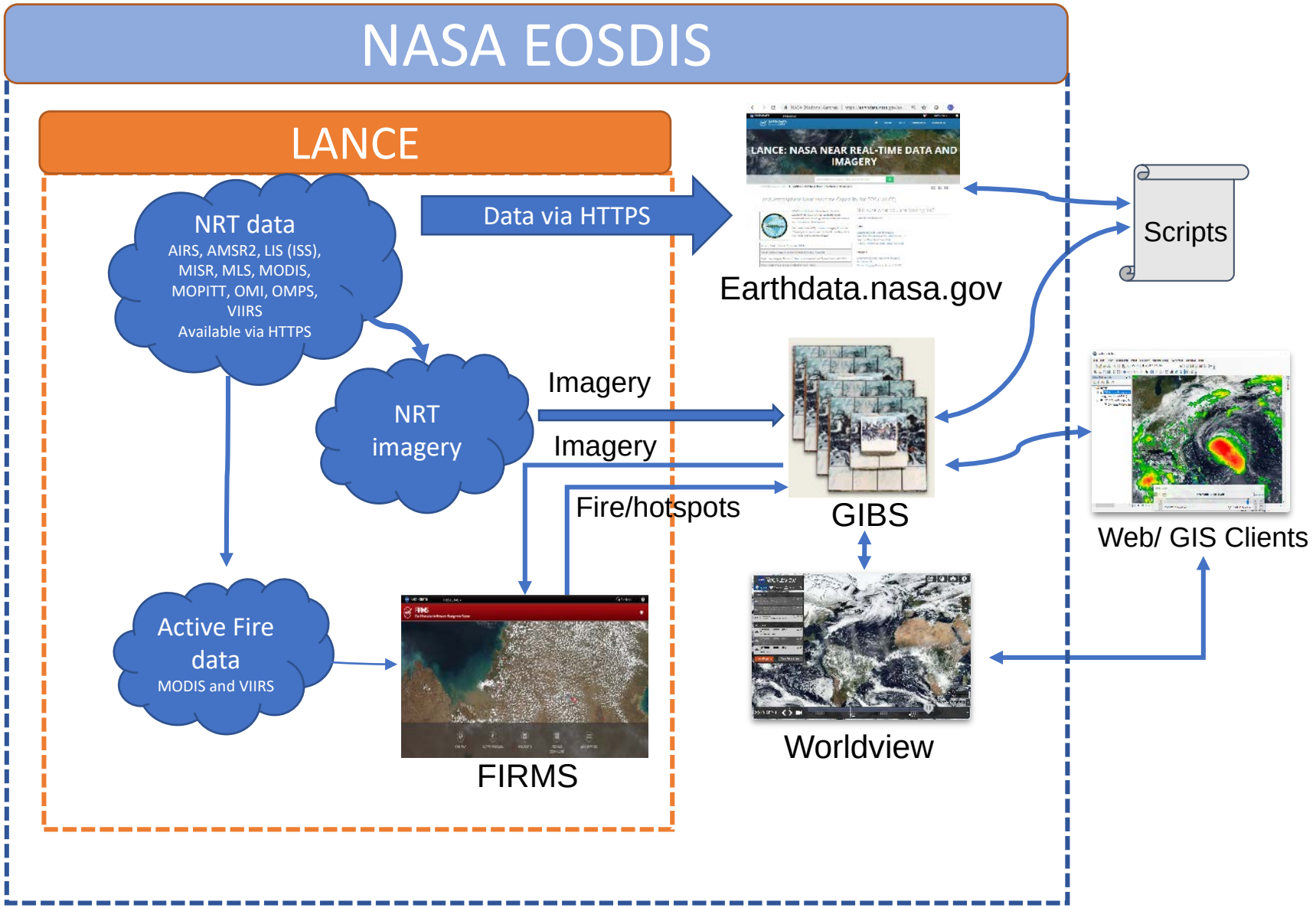
https://firms.modaps.eosdis.nasa.gov/ or https://earthdata.nasa.gov/firms

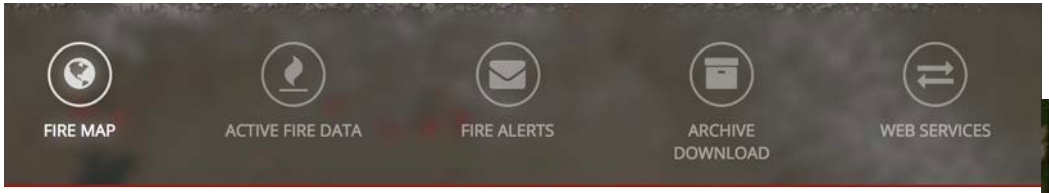
Land, Atmosphere Near Real-time Capability for Earth Observing Systems (LANCE)

- NASA LANCE provides near real-time data and imagery much quicker than routine processing allows - to meet the timely needs of applications users
- Data products are available within 3 hours. Imagery generally takes another 1-2 hours.
- LANCE is used by a broad range of users including: natural resource managers, those monitoring hazards and disasters, scientists and researchers monitoring and analyzing natural and man-made phenomena, the press and members of the public.
- More information: https://earthdata.nasa.gov/lance

LANCE products are used for monitoring: Air Quality, Dust Storms, Fires, Smoke Plumes, Crops, Drought, Floods, Volcanic Eruptions, Ash plumes, Sea Ice and Severe Storms

Distribution of LANCE Data and Imagery





Secure https://firms.modaps.eosdis.nasa.gov/map/#z:9;c:-122.9,39.1;t:adv-points;l:firms_comb_modis_t,fire_terra_crc,2018-08-12..2018-08-12

FIRMS

Fire Information for Resource Management System

Fires: 2018-08-12 .. 2018-08-12 Imagery: MODIS/Terra 2018-08-12

Fire Map
Active Fire Data
Fire Alerts
Archive Download
Web Services

Protected Areas [0] MODIS / Terra [6]

latitude	longitude	brightness	scan	track	acquire_time	confidence	version	brightness2	frp	daynight
39.376	-123.009	341.5	1	1	2018-08-12 19:00:00	87	6.0NRT	303.6	39.3	D
39.377	-122.949	327.8	1	1	2018-08-12 19:00:00	68	6.0NRT	302.5	18.4	D
39.378	-122.961	324.8	1	1	2018-08-12 19:00:00	55	6.0NRT	300.2	15.2	D
39.378	-123.018	306.2	3.8	1.8	2018-08-12 05:25:00	18	6.0NRT	291.7	45.3	N
39.38	-122.972	325.1	1	1	2018-08-12 19:00:00	50	6.0NRT	301.8	16	D

20 km

Last Updated: 2018-08-13 08:18 GMT
Version: VIIRS 375 m

PAN IDENTIFY BASEMAPS OVERLAYS MAXIMIZE

NASA Official: Ed Masuoka Web Privacy Policy Data & Information Policy Communications Policy Freedom of Information Act USA.

Quick View Advanced Burned Area

today 24 hrs 48 hrs 72 hrs 7 days

VIIRS 375m

Fires
Fire Radiative Power (FRP)
Confidence

0 200+

0 200+

MODIS / Aqua

Day Night

Confidence Auto

0 50 75 100

0 100

MODIS / Terra

Day Night

Fires Auto

Satellite Imagery

2019-09-25

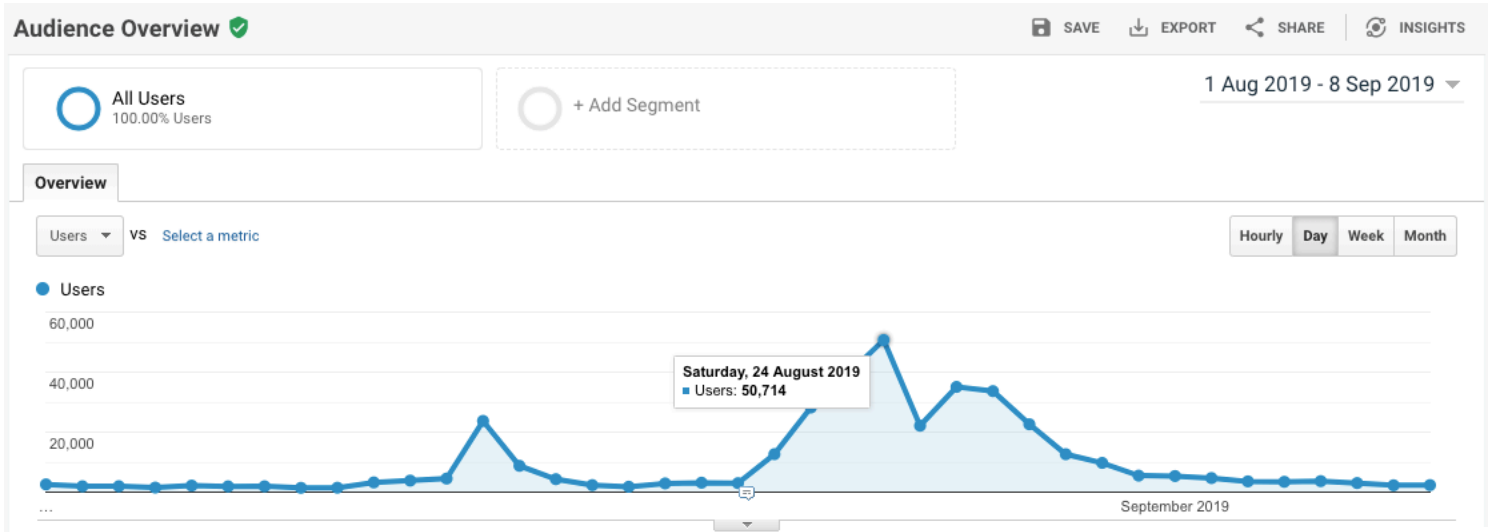
- VIIRS Corrected Reflectance (true color)
- VIIRS Corrected Reflectance (bands M11-I2-I1)
- MODIS/Aqua Corrected Reflectance 721
- MODIS/Aqua Corrected Reflectance (true color)
- MODIS/Terra Corrected Reflectance 721
- MODIS/Terra Corrected Reflectance (true color)

Orbit Tracks

- VIIRS (Asc)
- VIIRS (Desc)
- MODIS/Aqua (Asc)
- MODIS/Aqua (Desc)
- MODIS/Terra (Asc)
- MODIS/Terra (Desc)

Note: Cloud cover may obscure active fire detections.

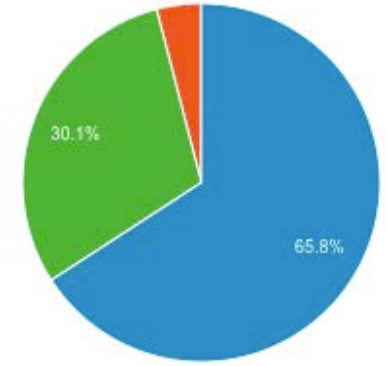
FIRMS Metrics



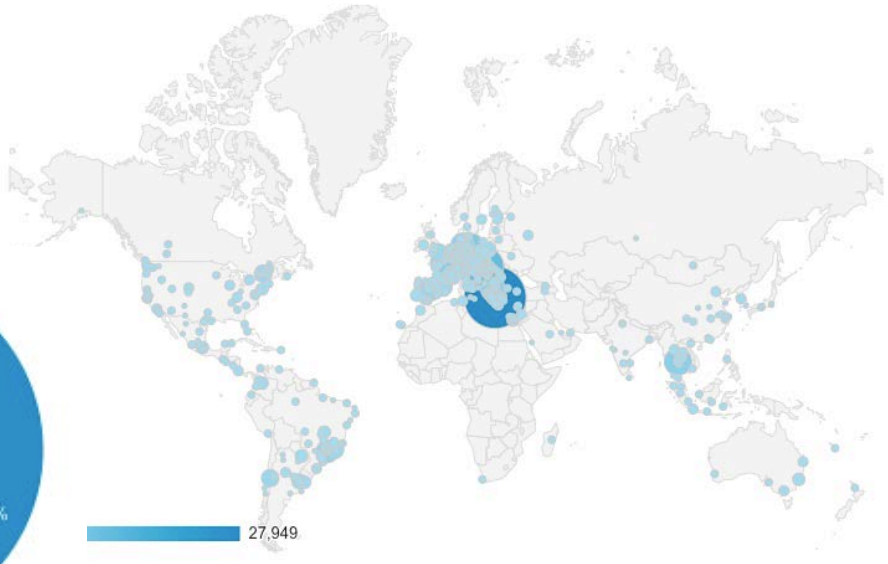
Users	New Users	Sessions
327,580	321,458	432,679

Number of Sessions per User	Page Views	Pages/Session
1.32	770,201	1.78

Avg. Session Duration	Bounce Rate
00:02:20	16.80%

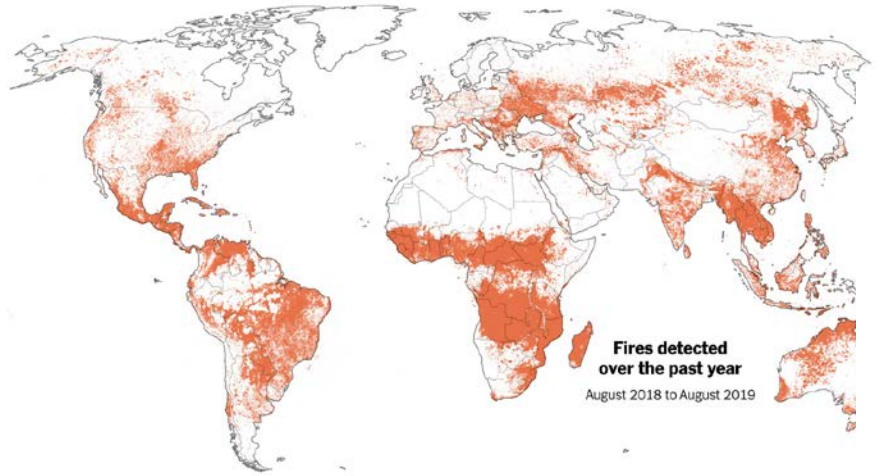


1. mobile
2. desktop
3. tablet



The New York Times

CLIMATE | The Amazon, Siberia, Indonesia: A World of Fire

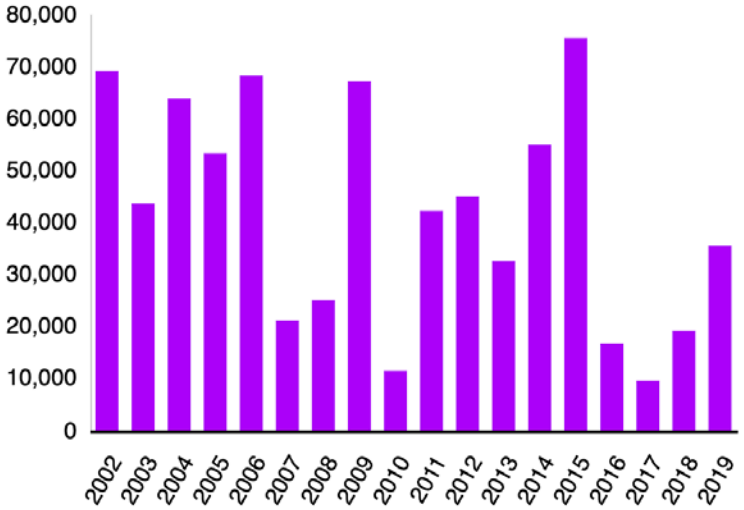


Source: NASA · By The New York Times

BBC

Fires in Indonesia

(Data covers 1 Jan - 19 September for all years)



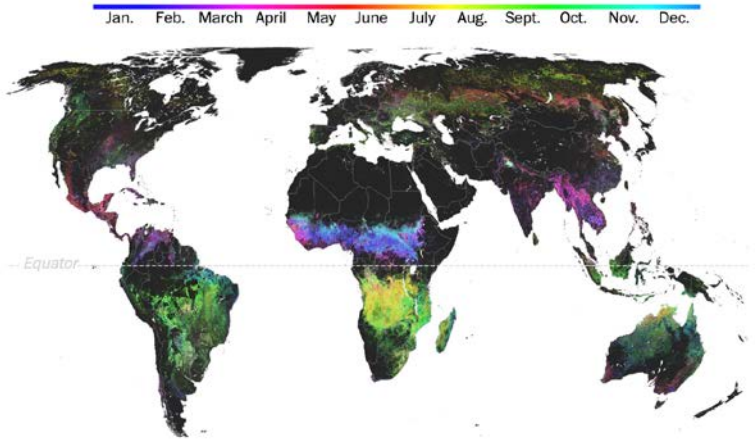
Source: University of Maryland and distributed by Nasa Fire Information for Resource Management System (FIRMS)

BBC

Sections | The Washington Post — Democracy Dies in Darkness | Sign In | Subscribe for $

of human population.

Fires detected by satellite, 2000 to 2019



Obtaining MODIS or VIIRS active fire / hotspot data from FIRMS

EARTHDATA Find a DAAC Feedback

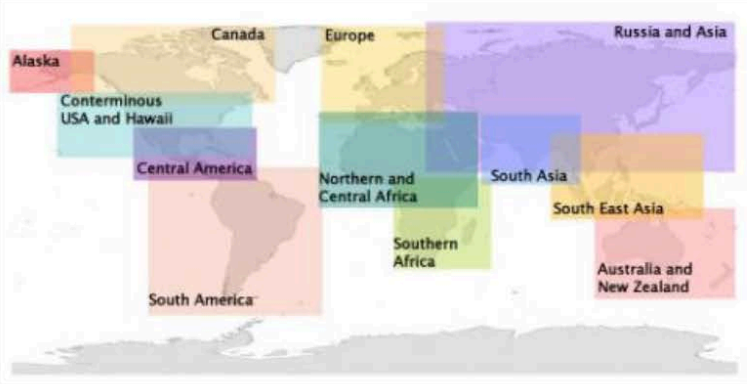
FIRMS
Fire Information for Resource Management System

Fire Map
Active Fire Data
Fire Alerts
Archive Download
Web Services

Active Fire Data

Download Near real-time MODIS (C6) and VIIRS (375 m) active fire data using the tables below.

For data older than seven days, use the Archive Download



Shapefiles | Google Earth KML | Text Files (CSV)

	MODIS 1km	VIIRS 375m
World	24h 48h 7d	24h 48h 7d
Canada	24h 48h 7d	24h 48h 7d
Alaska	24h 48h 7d	24h 48h 7d

FIRMS Email Notifications of MODIS or VIIRS Hotspot Detections in your Area of Interest

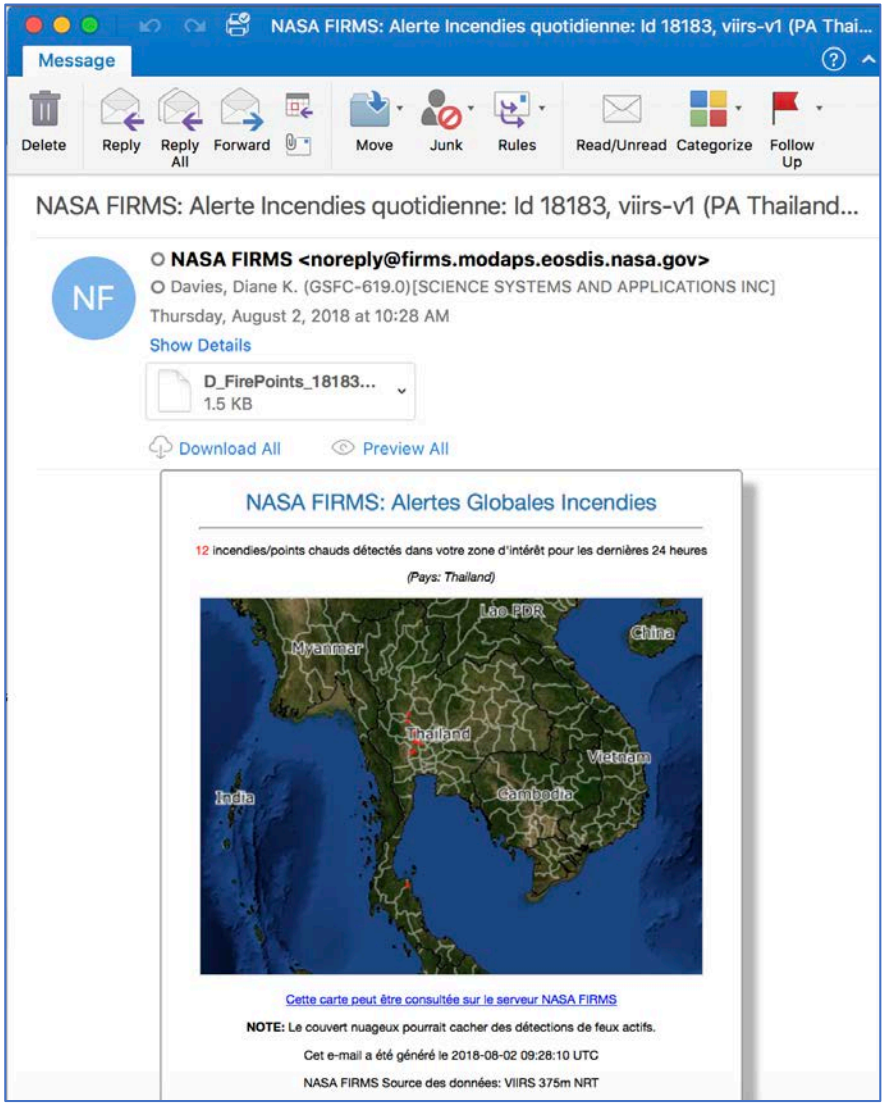
Fire Map

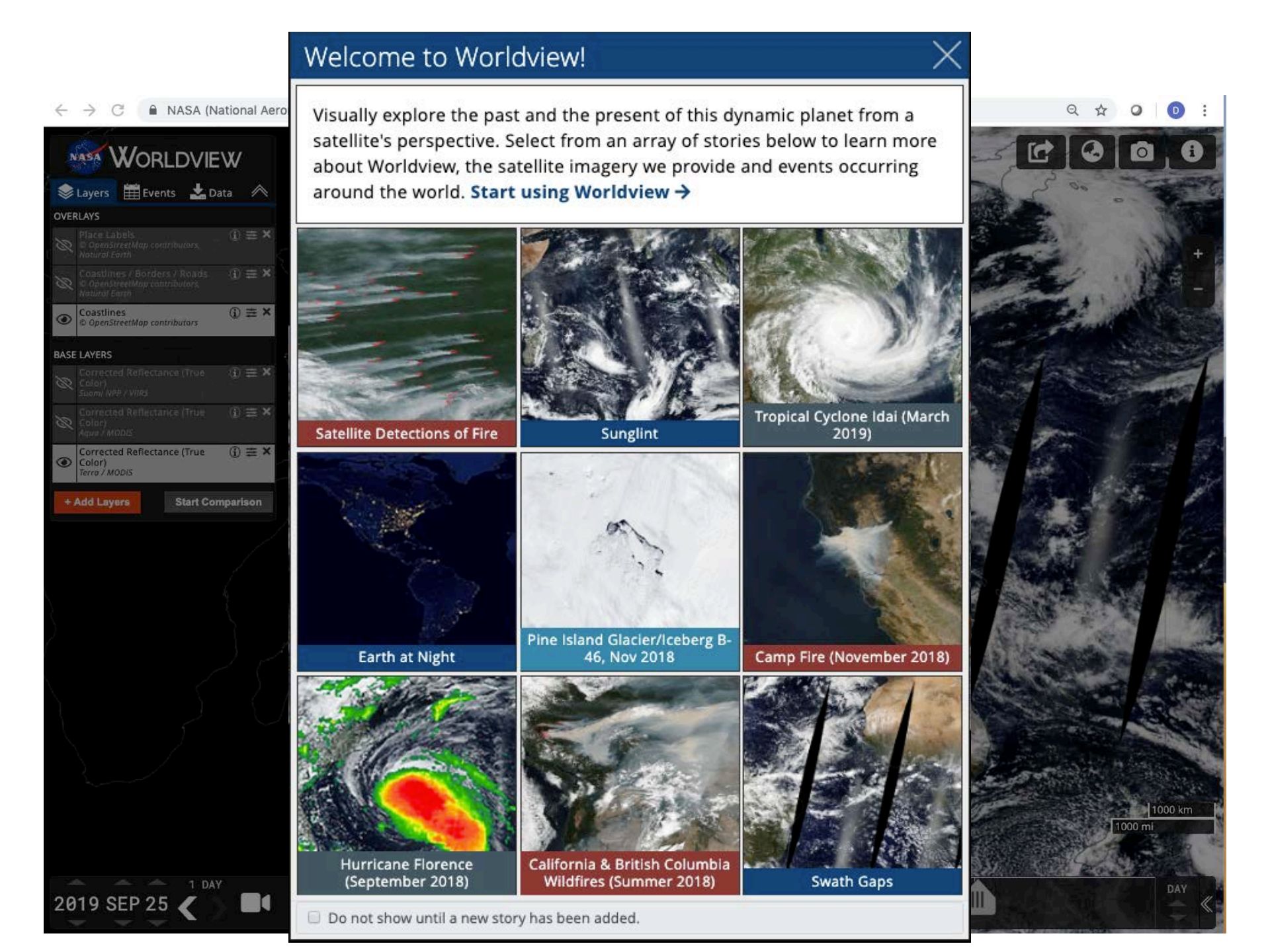
Active Fire Data

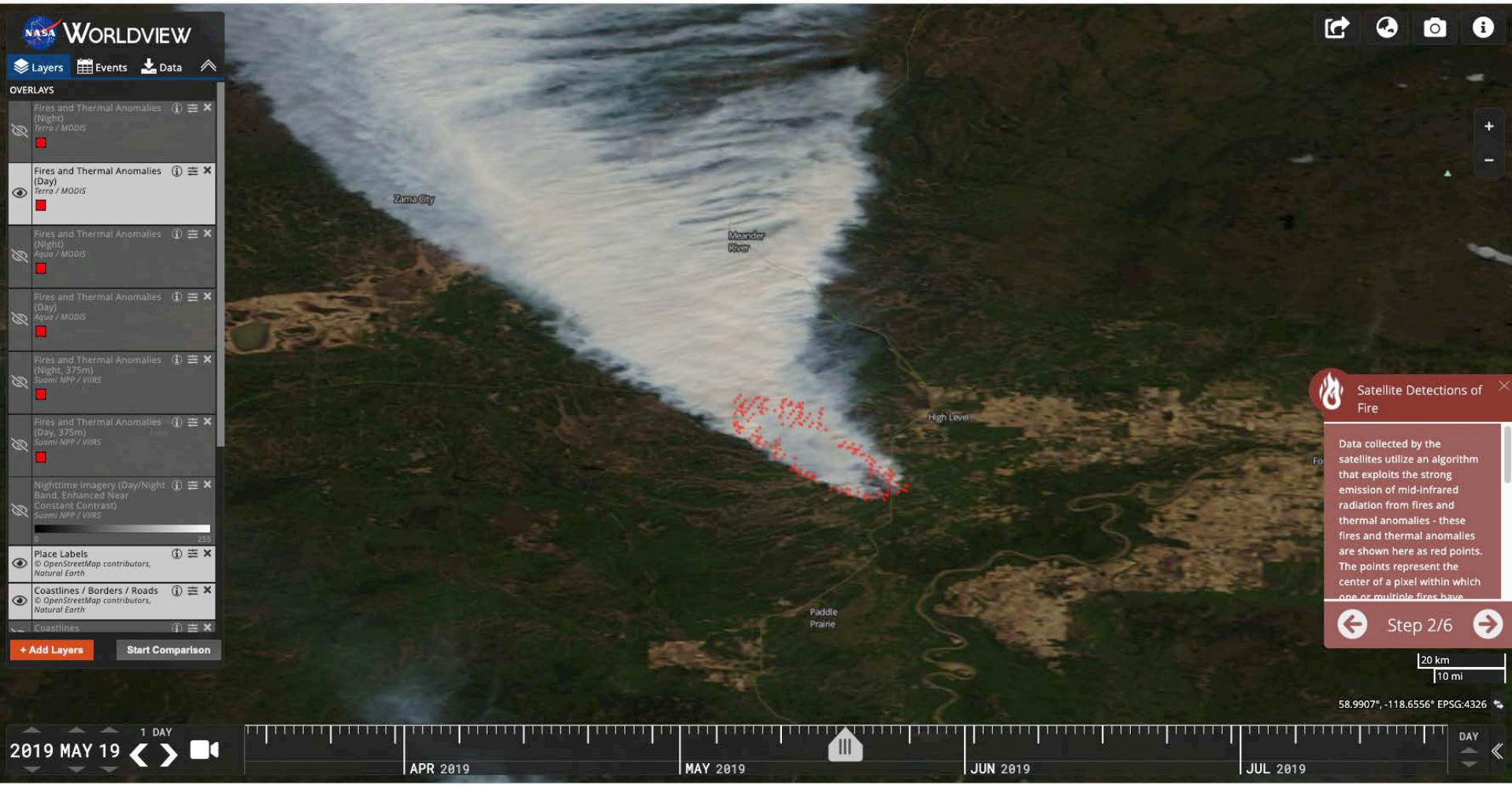
Fire Alerts

Archive Download

Web Services




Welcome to Worldview!
Visually explore the past and the present of this dynamic planet from a satellite's perspective. Select from an array of stories below to learn more about Worldview, the satellite imagery we provide and events occurring around the world. Start using Worldview →
Satellite Detections of Fire
Sunglint
Tropical Cyclone Idai (March 2019)
Earth at Night
Pine Island Glacier/Iceberg B-46, Nov 2018
Camp Fire (November 2018)
Hurricane Florence (September 2018)
California & British Columbia Wildfires (Summer 2018)
Swath Gaps
Do not show until a new story has been added.
WORLDVIEW
Layers
Events
Data
OVERLAYS
Place Labels
Coastlines / Borders / Roads
Coastlines
BASE LAYERS
Corrected Reflectance (True Color)
Corrected Reflectance (True Color)
Corrected Reflectance (True Color)
+ Add Layers
Start Comparison
2019 SEP 25
1 DAY
1000 km
1000 mi
DAY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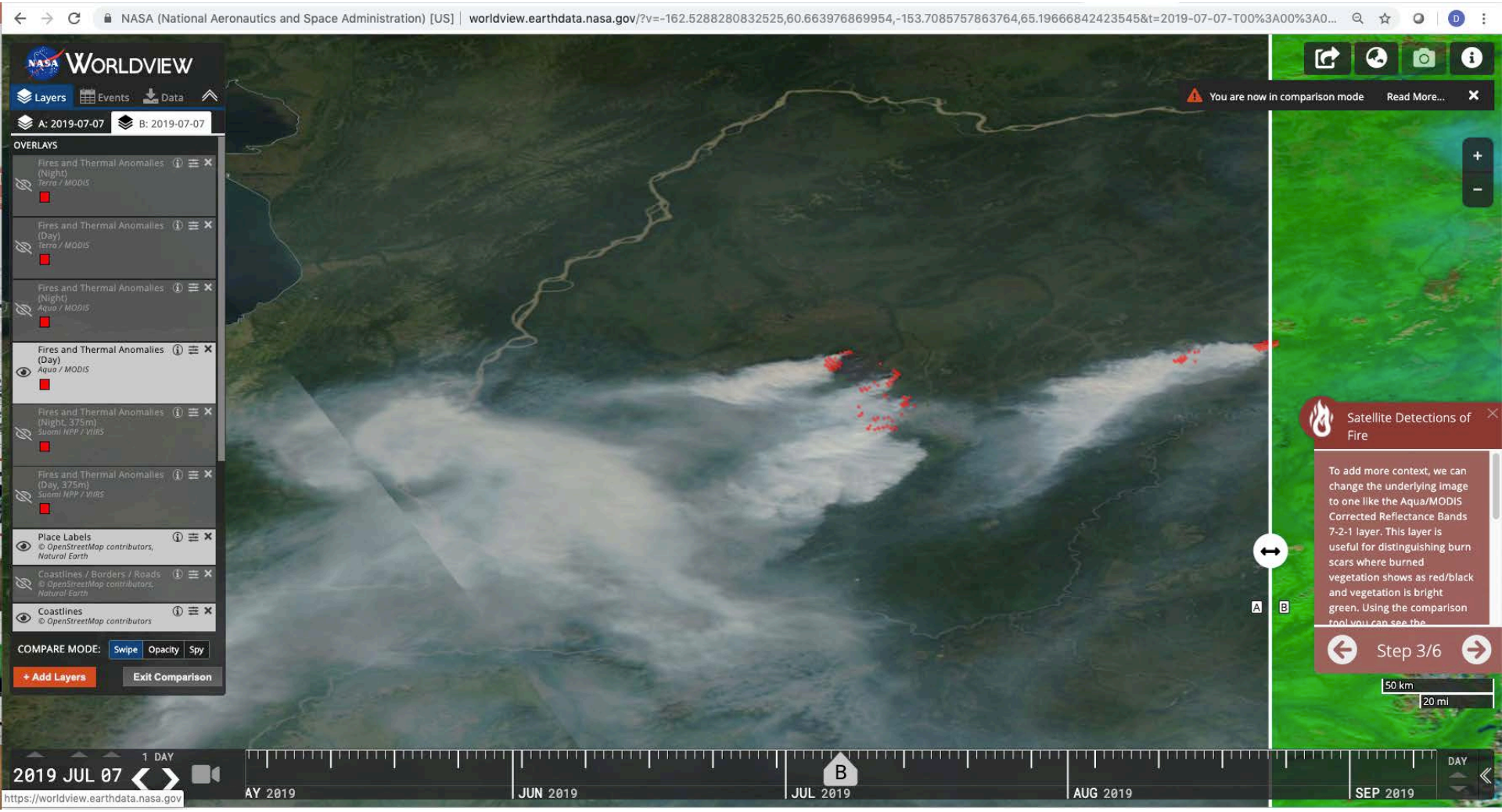
WORLDVIEW
Layers
Events
Data
OVERLAYS
Fires and Thermal Anomalies (Night)
Terra / MODIS
Fires and Thermal Anomalies (Day)
Terra / MODIS
Fires and Thermal Anomalies (Night)
Aqua / MODIS
Fires and Thermal Anomalies (Day)
Aqua / MODIS
Fires and Thermal Anomalies (Night, 375m)
Suomi NPP / VIIRS
Fires and Thermal Anomalies (Day, 375m)
Suomi NPP / VIIRS
Nighttime Imagery (Day/Night Band, Enhanced Near Constant Contrast)
Suomi NPP / VIIRS
Place Labels
© OpenStreetMap contributors, Natural Earth
Coastlines / Borders / Roads
© OpenStreetMap contributors, Natural Earth
Coastlines
+ Add Layers
Start Comparison
Zama City
Meander River
High Level
Paddle Prairie
Satellite Detections of Fire
Data collected by the satellites utilize an algorithm that exploits the strong emission of mid-infrared radiation from fires and thermal anomalies - these fires and thermal anomalies are shown here as red points. The points represent the center of a pixel within which
Step 2/6
20 km
10 mi
58.9907°, -118.6556° EPSG:4326
1 DAY
2019 MAY 19
APR 2019
MAY 2019
JUN 2019
JUL 2019
DAY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WORLDVIEW
Layers
Events
Data
A: 2019-07-07
B: 2019-07-07
OVERLAYS
Fires and Thermal Anomalies (Night)
Terra / MODIS
Fires and Thermal Anomalies (Day)
Terra / MODIS
Fires and Thermal Anomalies (Night)
Aqua / MODIS
Fires and Thermal Anomalies (Day)
Aqua / MODIS
Fires and Thermal Anomalies (Night, 375m)
Suomi NPP / VIIRS
Fires and Thermal Anomalies (Day, 375m)
Suomi NPP / VIIRS
Place Labels
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Coastlines / Borders / Roads
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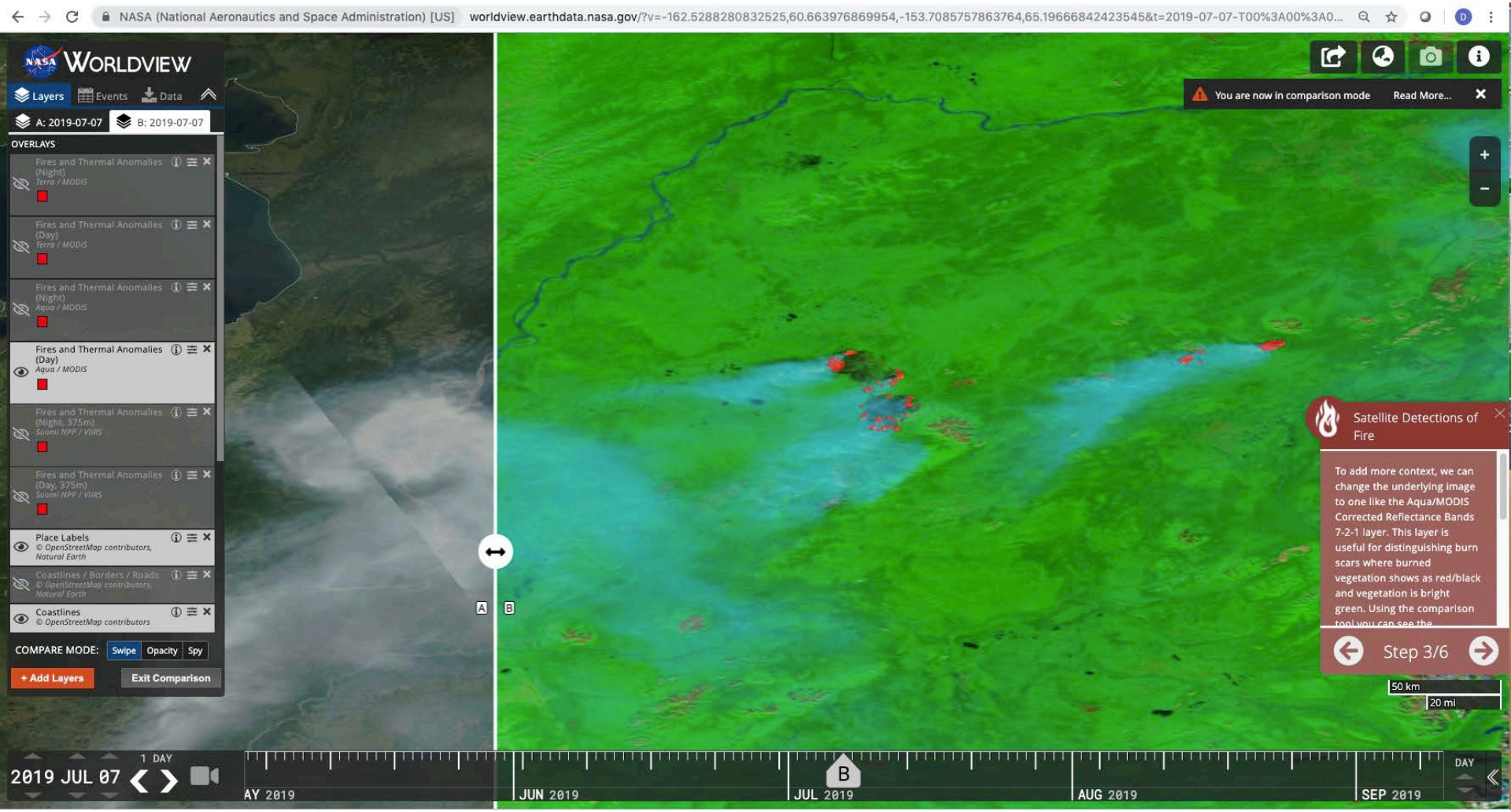
Coastlines
© OpenStreetMap contributors
COMPARE MODE:
Swipe
Opacity
Spy
+ Add Layers
Exit Comparison
You are now in comparison mode
Read More...
Satellite Detections of Fire
To add more context, we can change the underlying image to one like the Aqua/MODIS Corrected Reflectance Bands 7-2-1 layer. This layer is useful for distinguishing burn scars where burned vegetation shows as red/black and vegetation is bright green. Using the comparison tool you can see the
Step 3/6
50 km
20 mi
1 DAY
2019 JUL 07
AY 2019
JUN 2019
JUL 2019
AUG 2019
SEP 2019
DAY
https://worldview.earthdata.nasa.gov


NASA (National Aeronautics and Space Administration) [US]
worldview.earthdata.nasa.gov/?v=-162.5288280832525,60.663976869954,-153.7085757863764,65.196668424235458t=2019-07-07-T00%3A00%3A0...
WORLDVIEW
Layers
Events
Data
A: 2019-07-07
B: 2019-07-07
OVERLAYS
Fires and Thermal Anomalies (Night) Terra / MODIS
Fires and Thermal Anomalies (Day) Terra / MODIS
Fires and Thermal Anomalies (Night) Aqua / MODIS
Fires and Thermal Anomalies (Day) Aqua / MODIS
Fires and Thermal Anomalies (Night, 375m) Suomi NPP / VIIRS
Fires and Thermal Anomalies (Day, 375m) Suomi NPP / VIIRS
Place Labels © OpenStreetMap contributors, Natural Earth
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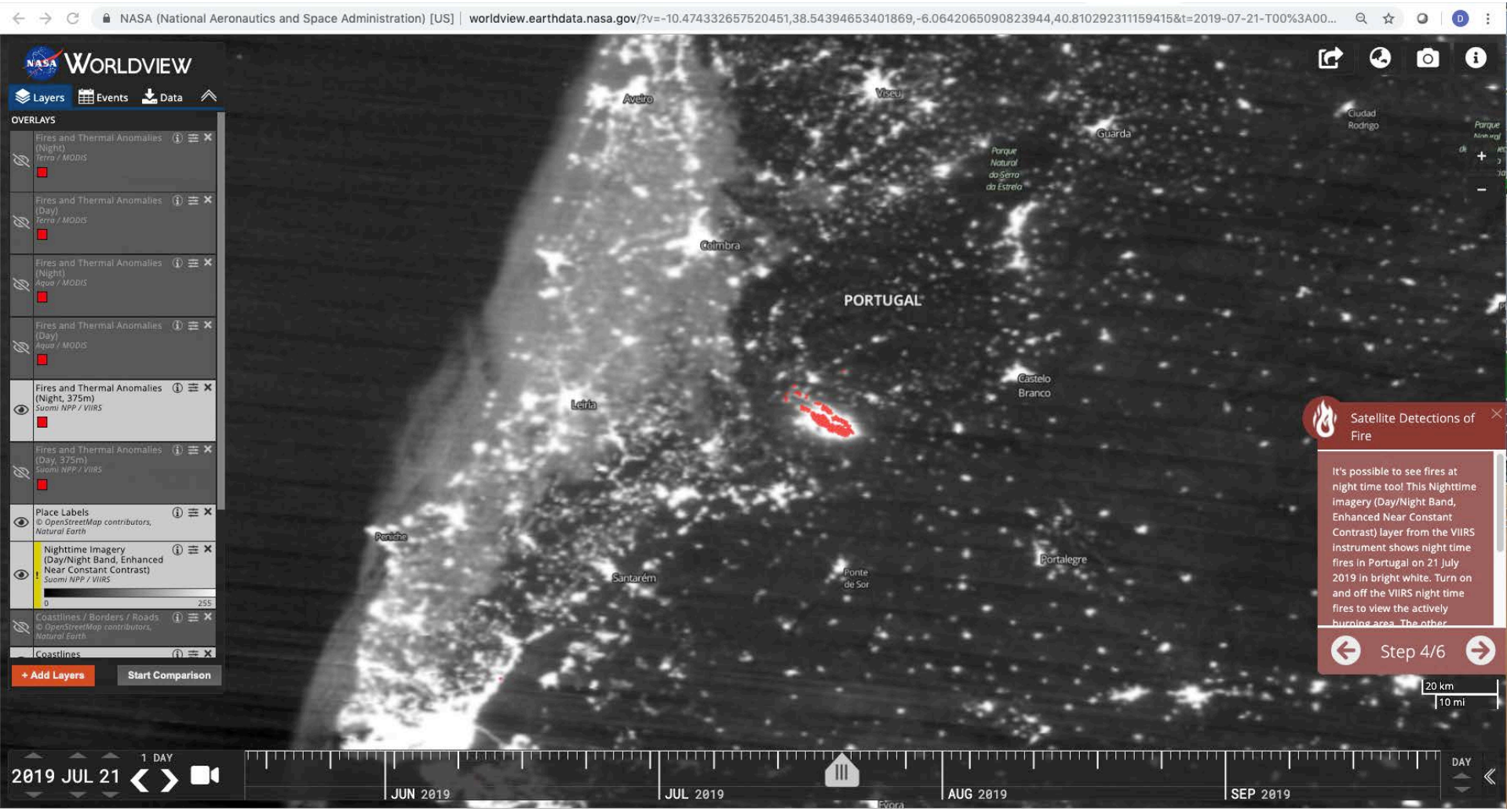
Coastlines © OpenStreetMap contributors
COMPARE MODE: Swipe Opacity Spy
+ Add Layers
Exit Comparison
You are now in comparison mode
Read More...
Satellite Detections of Fire
To add more context, we can change the underlying image to one like the Aqua/MODIS Corrected Reflectance Bands 7-2-1 layer. This layer is useful for distinguishing burn scars where burned vegetation shows as red/black and vegetation is bright green. Using the comparison
Step 3/6
50 km
20 mi
1 DAY
2019 JUL 07
AY 2019
JUN 2019
JUL 2019
AUG 2019
SEP 2019
DAY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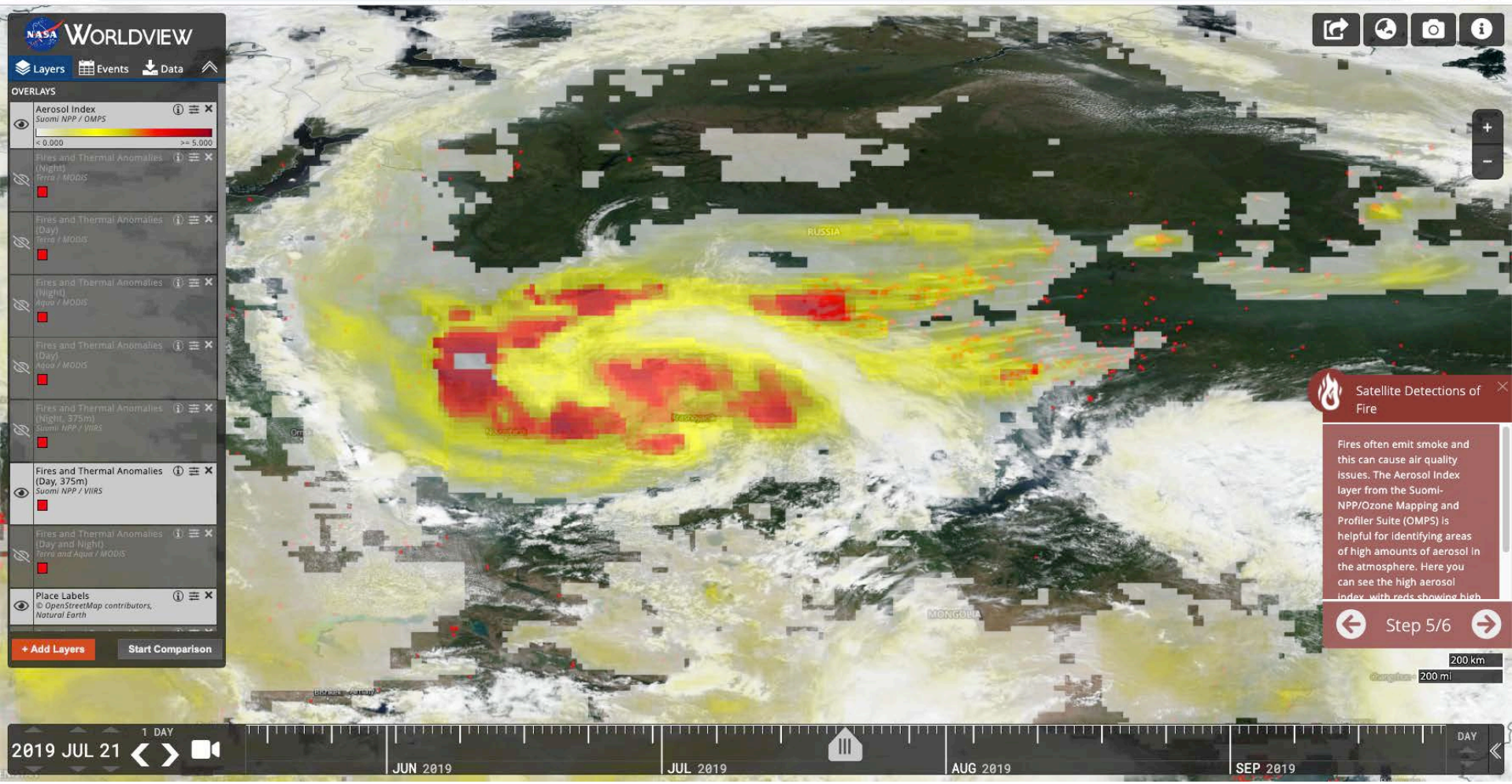
WORLDVIEW
Layers
Events
Data
OVERLAYS
Fires and Thermal Anomalies (Night) Terra / MODIS
Fires and Thermal Anomalies (Day) Terra / MODIS
Fires and Thermal Anomalies (Night) Aqua / MODIS
Fires and Thermal Anomalies (Day) Aqua / MODIS
Fires and Thermal Anomalies (Night, 375m) Suomi NPP / VIIRS
Fires and Thermal Anomalies (Day, 375m) Suomi NPP / VIIRS
Place Labels © OpenStreetMap contributors, Natural Earth
Nighttime Imagery (Day/Night Band, Enhanced Near Constant Contrast) Suomi NPP / VIIRS
0
255
Coastlines / Borders / Roads © OpenStreetMap contributors, Natural Earth
Coastlines
+ Add Layers
Start Comparison
Aveiro
Viseu
Guarda
Ciudad Rodrigo
Parque Natural da Serra da Estrela
Coimbra
PORTUGAL
Castelo Branco
Leiria
Peniche
Santarém
Ponte de Sor
Portalegre
Satellite Detections of Fire
It's possible to see fires at night time too! This Nighttime imagery (Day/Night Band, Enhanced Near Constant Contrast) layer from the VIIRS instrument shows night time fires in Portugal on 21 July 2019 in bright white. Turn on and off the VIIRS night time fires to view the actively
Step 4/6
20 km
10 mi
1 DAY
2019 JUL 21
JUN 2019
JUL 2019
AUG 2019
SEP 2019
DAY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WORLDVIEW
Layers
Events
Data
OVERLAYS
Aerosol Index
Suomi NPP / OMPS
< 0.000
>= 5.000
Fires and Thermal Anomalies (Night)
Terra / MODIS
Fires and Thermal Anomalies (Day)
Terra / MODIS
Fires and Thermal Anomalies (Night)
Aqua / MODIS
Fires and Thermal Anomalies (Day)
Aqua / MODIS
Fires and Thermal Anomalies (Night, 375m)
Suomi NPP / VIIRS
Fires and Thermal Anomalies (Day, 375m)
Suomi NPP / VIIRS
Fires and Thermal Anomalies (Day and Night)
Terra and Aqua / MODIS
Place Labels
© OpenStreetMap contributors, Natural Earth
+ Add Layers
Start Comparison
RUSSIA
MONGOLIA
Satellite Detections of Fire
Fires often emit smoke and this can cause air quality issues. The Aerosol Index layer from the Suomi-NPP/Ozone Mapping and Profiler Suite (OMPS) is helpful for identifying areas of high amounts of aerosol in the atmosphere. Here you can see the high aerosol
Step 5/6
200 km
200 mi
1 DAY
2019 JUL 21
JUN 2019
JUL 2019
AUG 2019
SEP 2019
DAY

More Information

FIRMS: https://firms.modaps.eosdis.nasa.gov/

Worldview: https://worldview.earthdata.nasa.gov

LANCE: https://earthdata.nasa.gov/lance

NASA Earthdata article: Wildfires Can't Hide from Earth Observing Satellites https://earthdata.nasa.gov/learn/articles/wildfires-cant-hide-from-earth-observing-satellites

FIRMS Webinar – part of the NASA Earthdata Webinar Series:

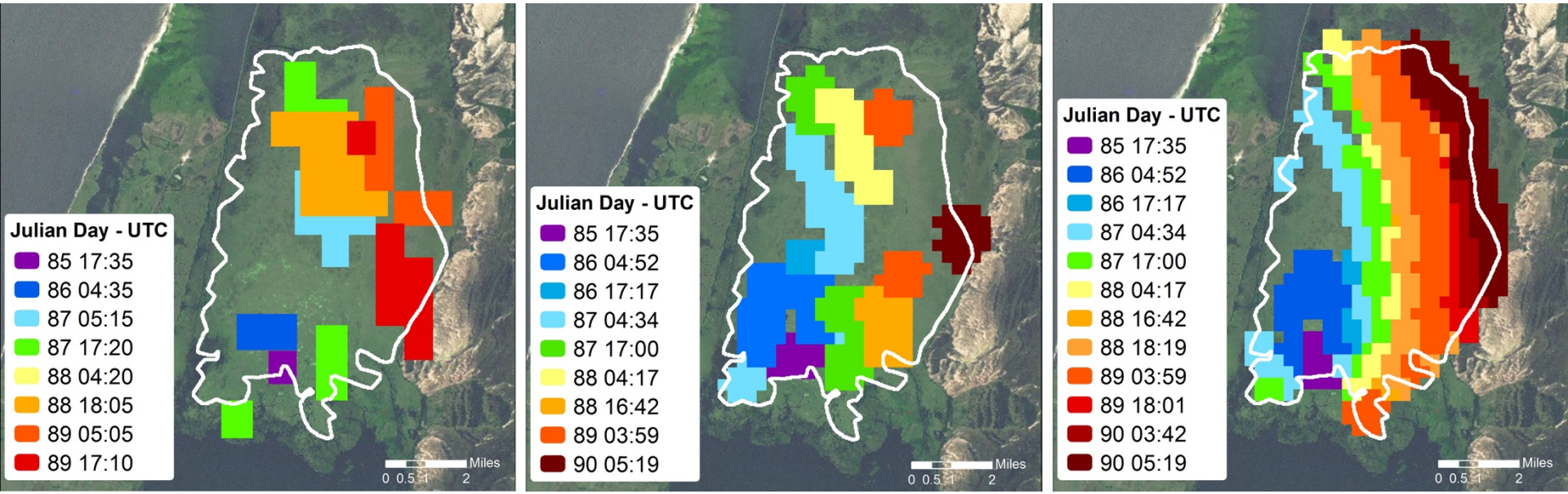
- Discover NASA's Fire Information for Resource Management System (FIRMS) : https://www.youtube.com/watch?v=0fPVmnY6pBs&feature=youtu.be

Differences between MODIS and VIIRS

Aqua/MODIS 1KM Pixel

VIIRS 750m

VIIRS 375m



Daily fire spread mapped by 1km Aqua/MODIS (left), 750 m VIIRS (center) and 375 m VIIRS (right) data at the Taim Ecological Reserve in southern Brazil. The data cover the period 26 -31 March 2013. The white outline shows represents the burned area mapped using 30m Landsat-7 on 31 March. This figure is reproduced here courtesy of Wilfrid Schroeder, NOAA University of Maryland

Fire Detections

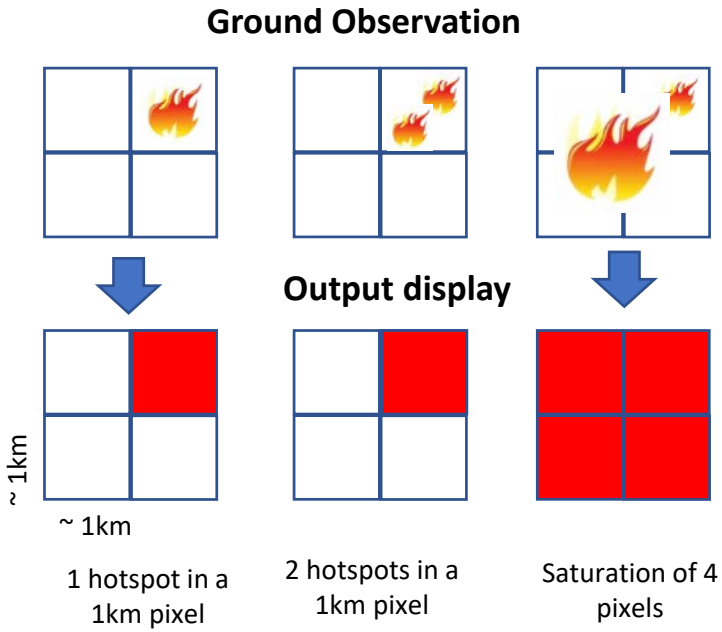
The fire detection algorithms use a contextual algorithm that exploits the strong emission of mid-infrared radiation from fires.

See FIRMS FAQs for references –
https://earthdata.nasa.gov/firms-faq#ed-fire-detection

- MODIS PI: Louis Giglio (UMD)
- VIIRS PI: Wilfrid Schroeder (NOAA/UMD)

What does a MODIS fire detection mean on the ground?

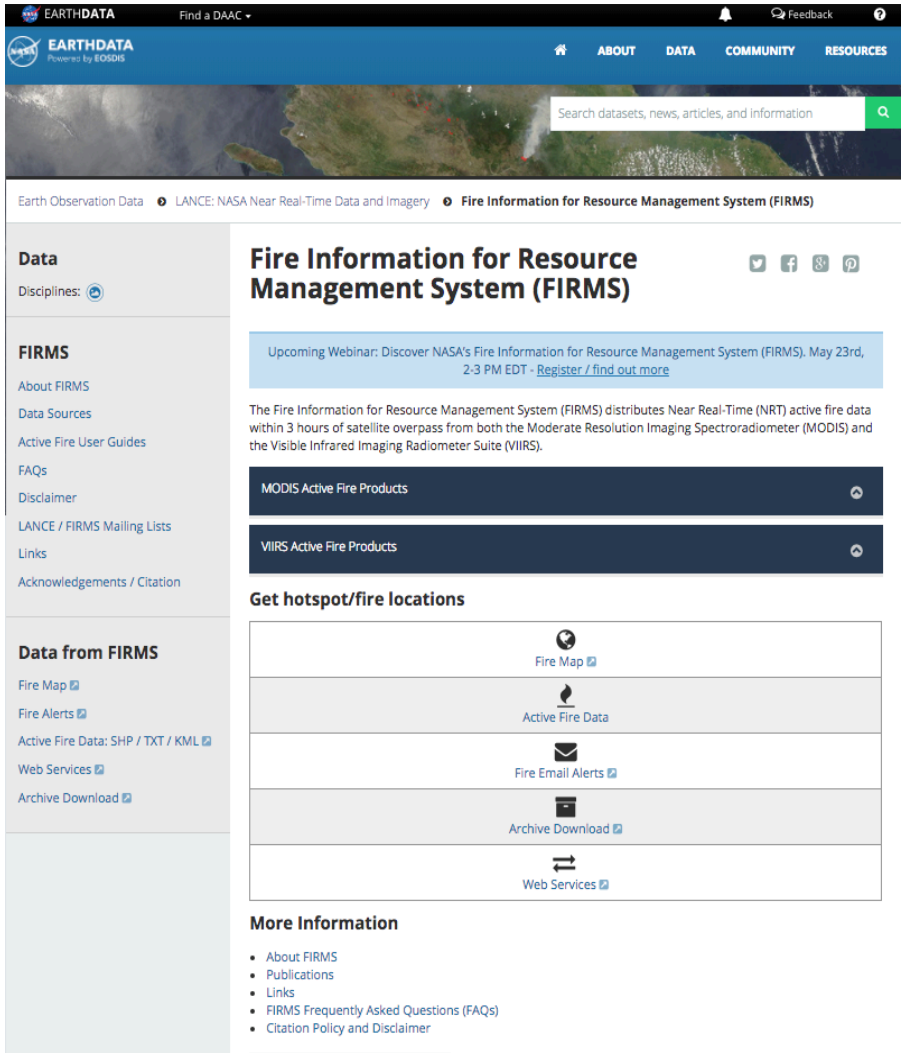
MODIS represented by a 1km pixel
VIIRS 375m spatial resolution

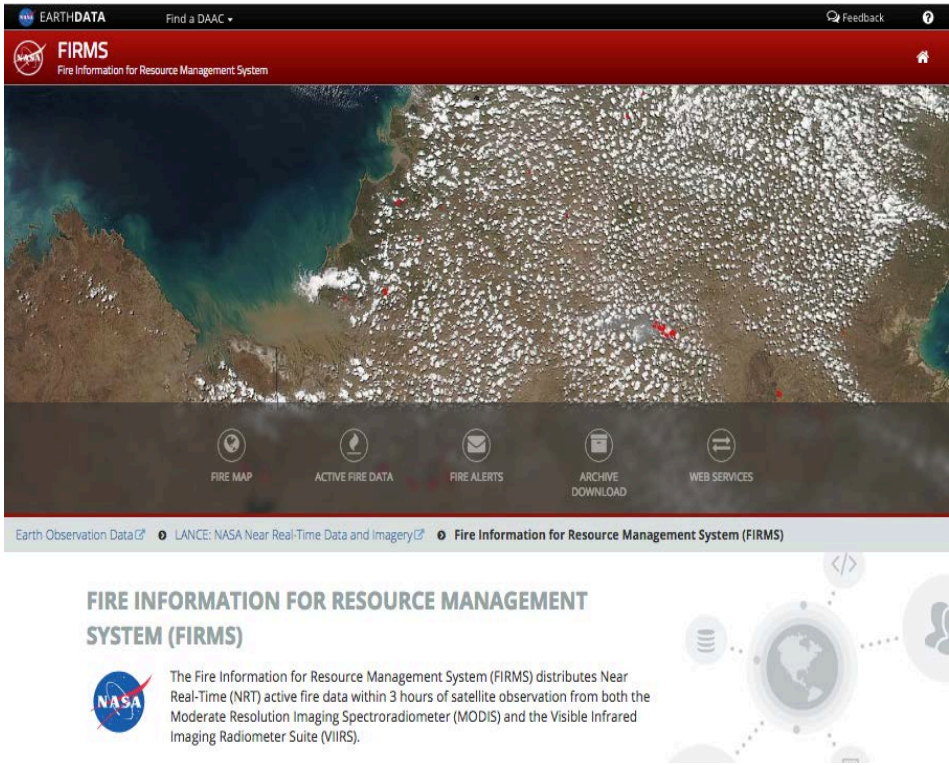


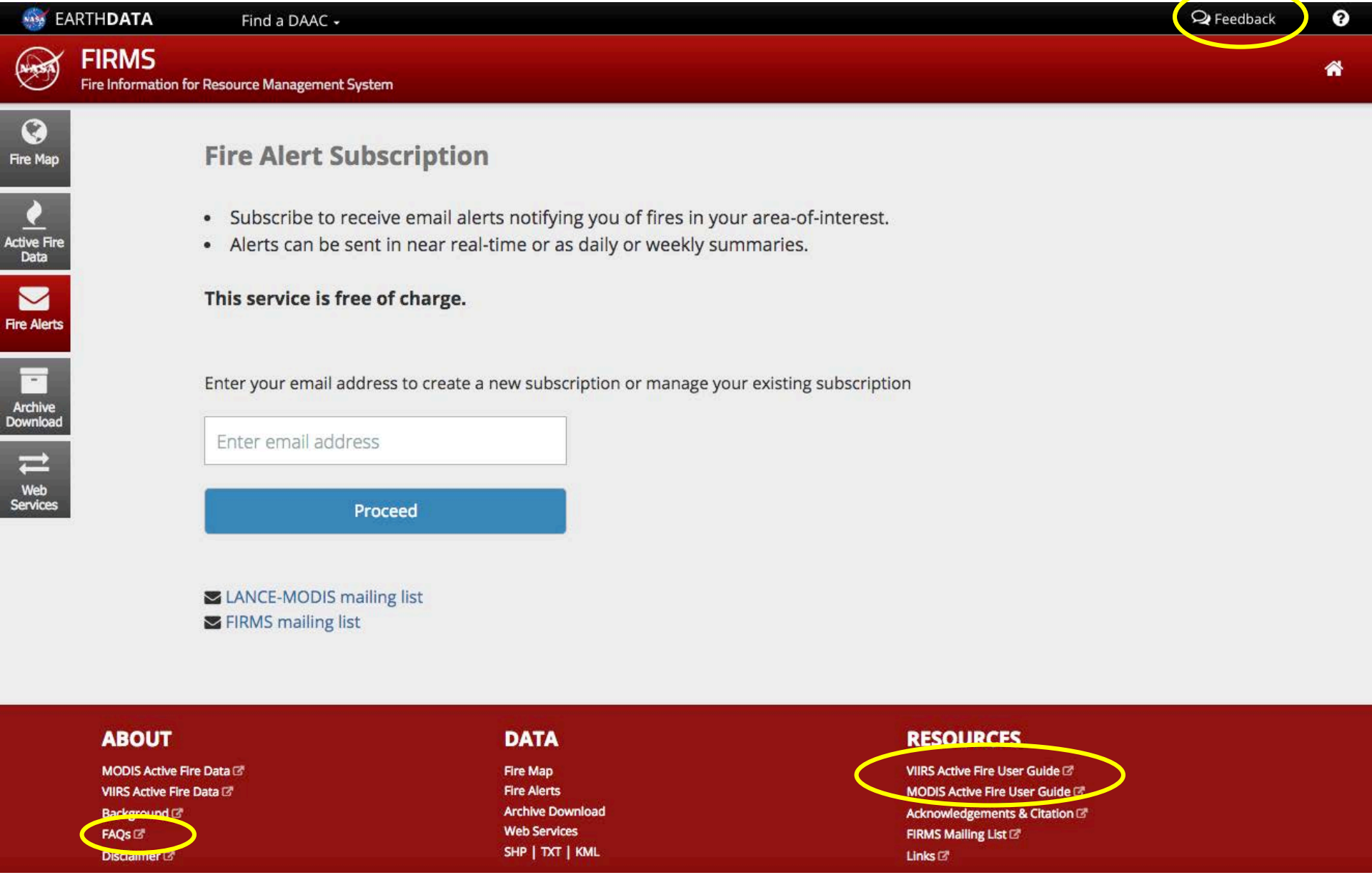
FIRMS has 2 landing pages: they are interlinked and provide links to the same data

[Earthdata FIRMS Landing page](https://earthdata.nasa.gov/firms)
https://earthdata.nasa.gov/firms

[LANCE MODAPS FIRMS Landing page](https://firms.modaps.eosdis.nasa.gov/)
https://firms.modaps.eosdis.nasa.gov/






EARTHDATA
Find a DAAC
Feedback
FIRMS
Fire Information for Resource Management System
Fire Map
Active Fire Data
Fire Alerts
Archive Download
Web Services
Fire Alert Subscription
Subscribe to receive email alerts notifying you of fires in your area-of-interest.
Alerts can be sent in near real-time or as daily or weekly summaries.
This service is free of charge.
Enter your email address to create a new subscription or manage your existing subscription
Enter email address
Proceed
LANCE-MODIS mailing list
FIRMS mailing list
ABOUT
MODIS Active Fire Data
VIIRS Active Fire Data
Background
FAQs
Disclaimer
DATA
Fire Map
Fire Alerts
Archive Download
Web Services
SHP | TXT | KML
RESOURCES
VIIRS Active Fire User Guide
MODIS Active Fire User Guide
Acknowledgements & Citation
FIRMS Mailing List
Links