



# AN UPDATE ON FIRE MAPPING AND MONITORING ACTIVITIES AT NOAA/NESDIS

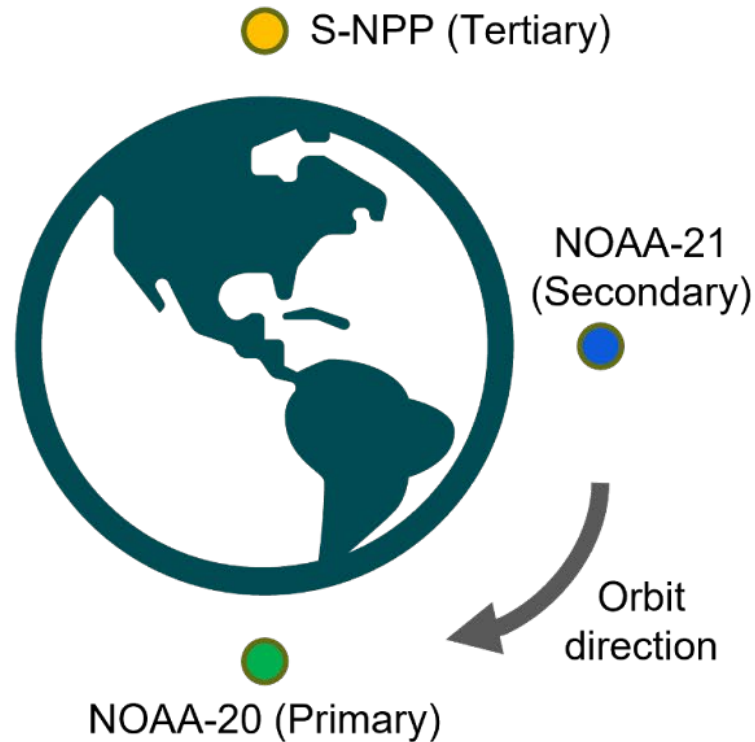
National Environmental Satellite,  
Data, and Information Service  
September 17, 2024

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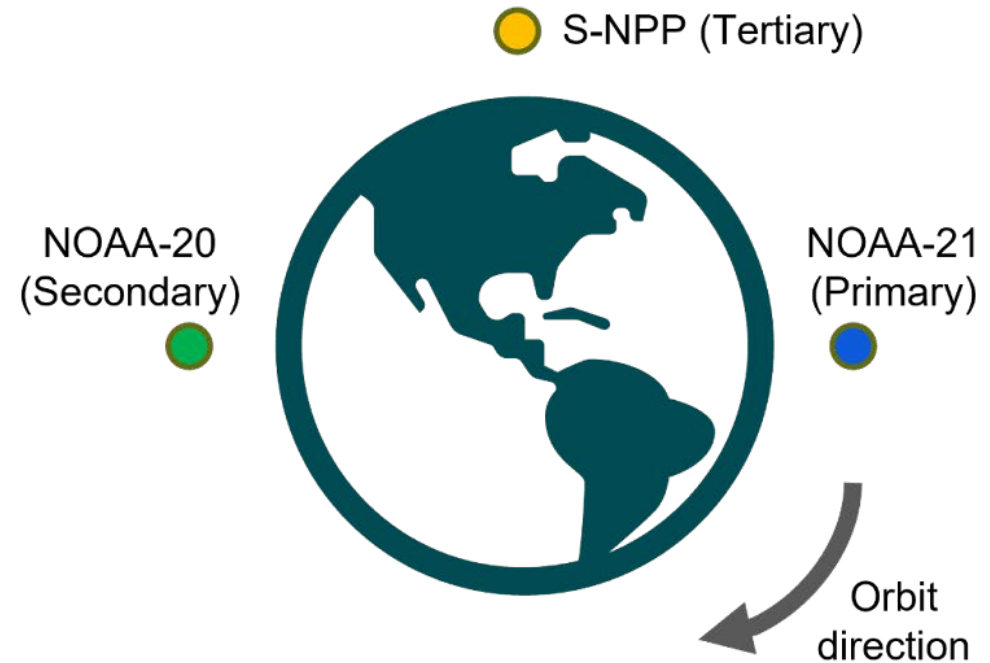
*The scientific results and conclusions, as well as any views or opinions expressed herein, are those of the author(s) and do not necessarily reflect those of NOAA or the Department of Commerce.*

# JPSS System Status

Until March 20, 2024



Beginning April 4, 2024



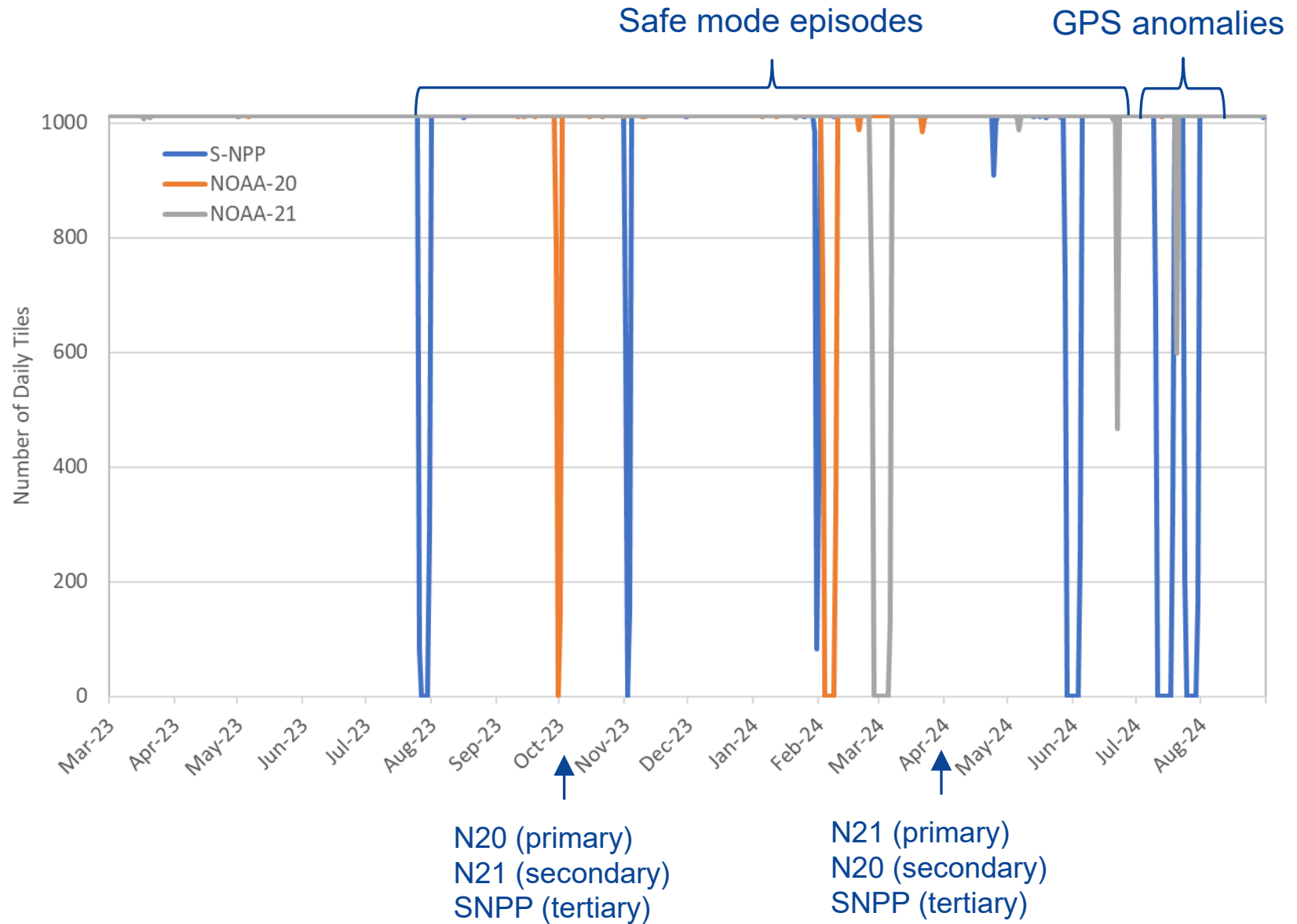
- 3-satellite configuration was operational since Oct 2023
- **NOAA-20 & S-NPP** phased 180° or **50min** apart
- NOAA-21 located between the two or **25min** apart

- **NOAA-20 & NOAA-21** phased 180° or **50min** apart
- S-NPP located between the two or **25min** apart
- **S-NPP could be deorbited as early as 2025**

# JPSS System Status

Platform	Status
NOAA-21	Primary
NOAA-20	Secondary
S-NPP	Tertiary*
JPSS-3	Launch in 2027

\*S-NPP operating on best-effort basis resulting in longer potential downtime following spacecraft/sensor anomalies



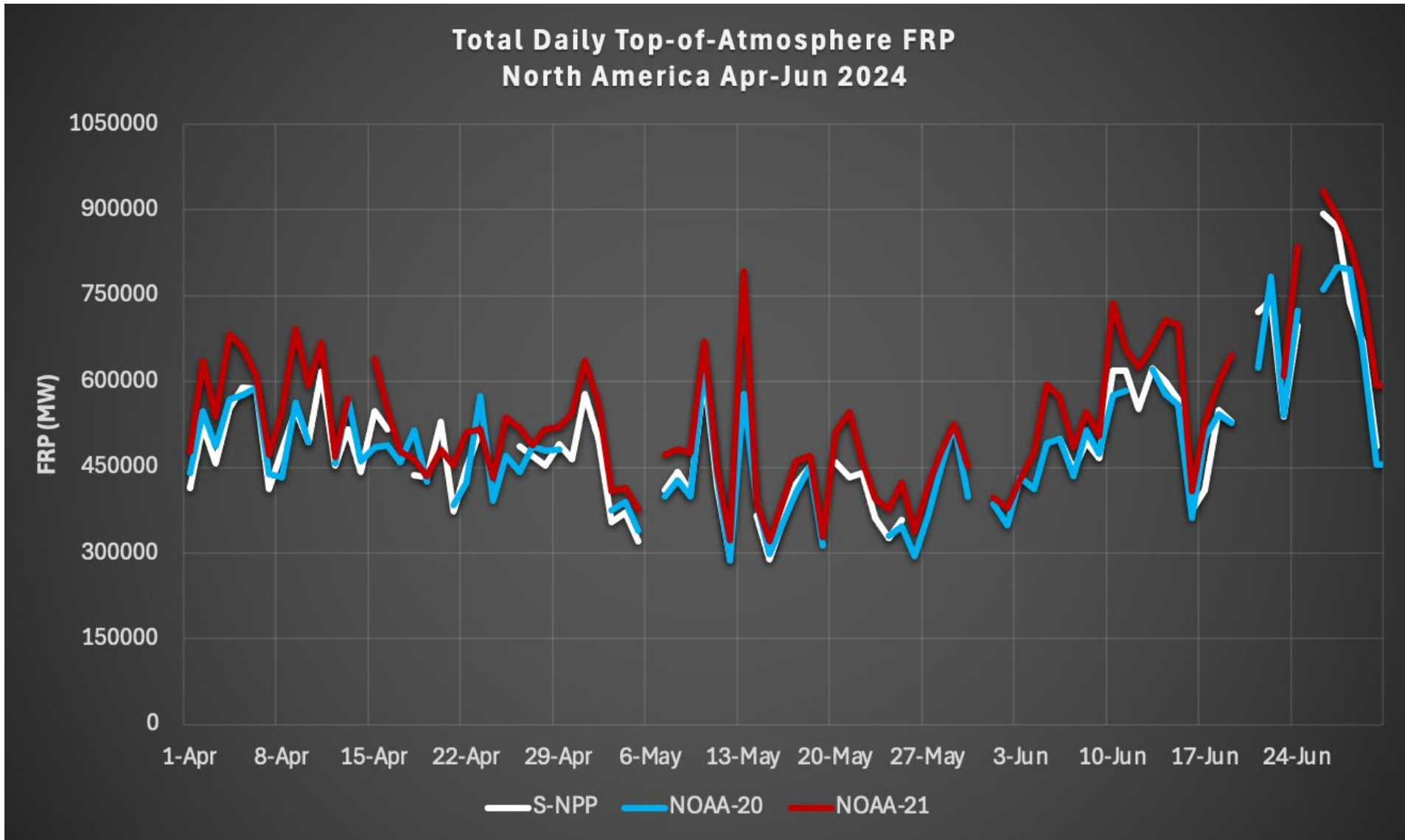
# VIIRS Primary Active Fire Detection Products

Algorithm	NOAA 375m Enterprise Fire (EF)		NASA 375m (V*14IMG)	
Version	v1r3*		Collection 2*, URT**	
Format	86sec NetCDF		6min NetCDF	
Availability	S-NPP, NOAA-20, NOAA-21		S-NPP, NOAA-20, NOAA-21	
Data Reprocessing	Yes		Yes	
Typical Latency	Global	<1h	Global	<2h
	CSPP (Regional DB)	<25min	URT (N America)	<10min

\* NOAA and NASA run similar core algorithms with only small differences due to L1B calibration, along with distinct file & data attribute naming convention. Version upgrades were limited to source code maintenance including bug fixes, changes in response to L1B updates (ex.: quality flags), adding/modifying data attributes. Detection tests remain unchanged

\*\* URT version uses distinct processing flow which can result in larger differences with baseline products

# VIIRS 375m Daily Performance



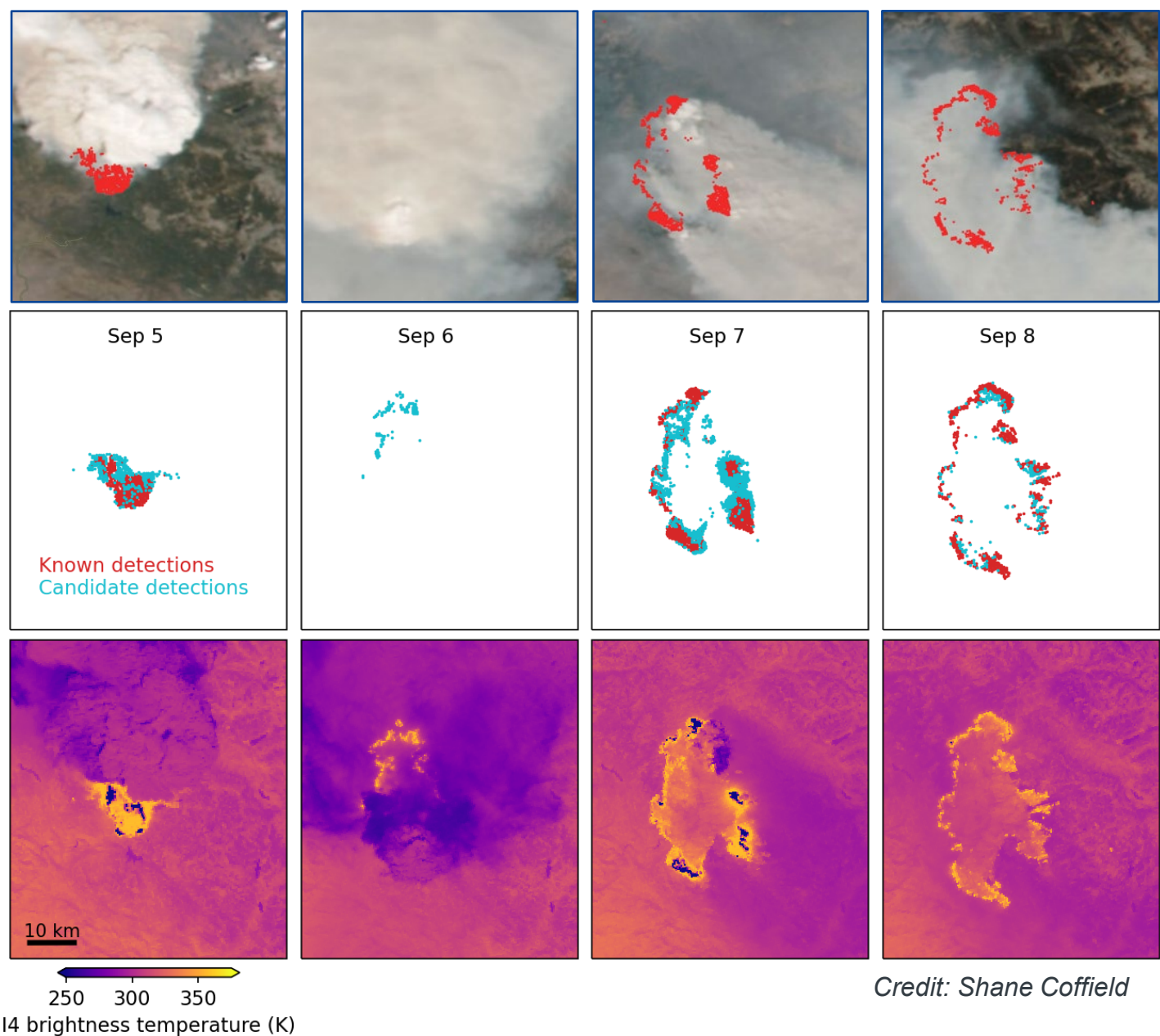
# Outstanding Omission Errors

Cloud/smoke interference leading to omission errors especially during daytime observations

Candidate pixels (undetected fires) often capture greater fire extent

Availability of other VIIRS sensors helps minimize impacts

Impact on total FRP remain relatively small (< 5%)



2020 Wildfires in the Western U.S. viewed by S-NPP/VIIRS

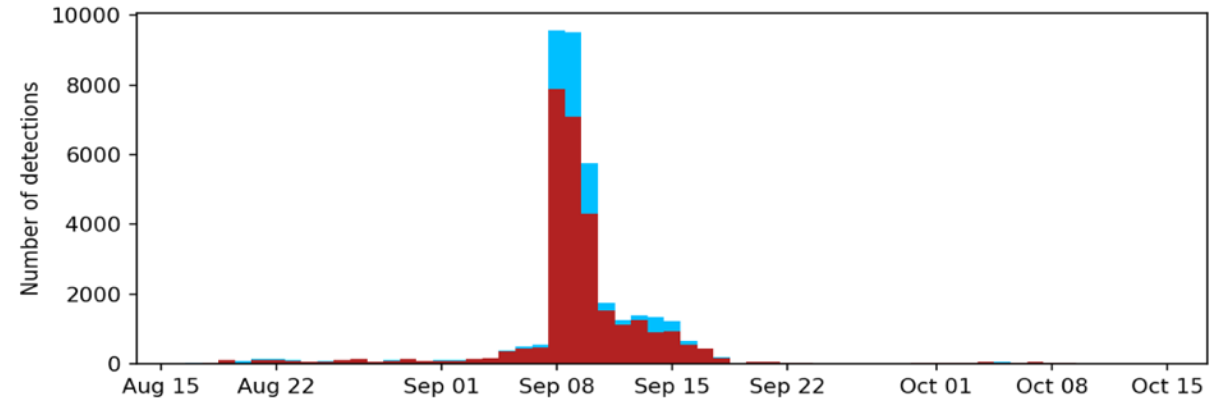
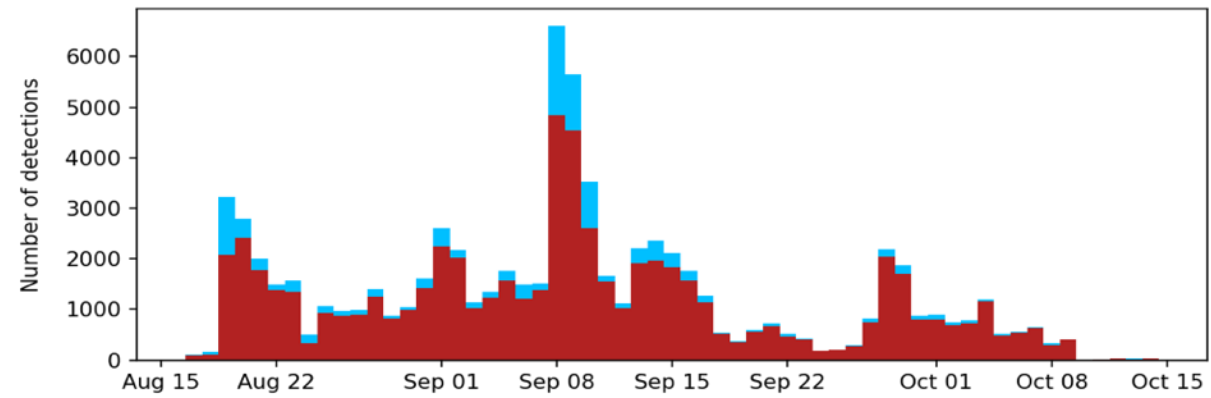
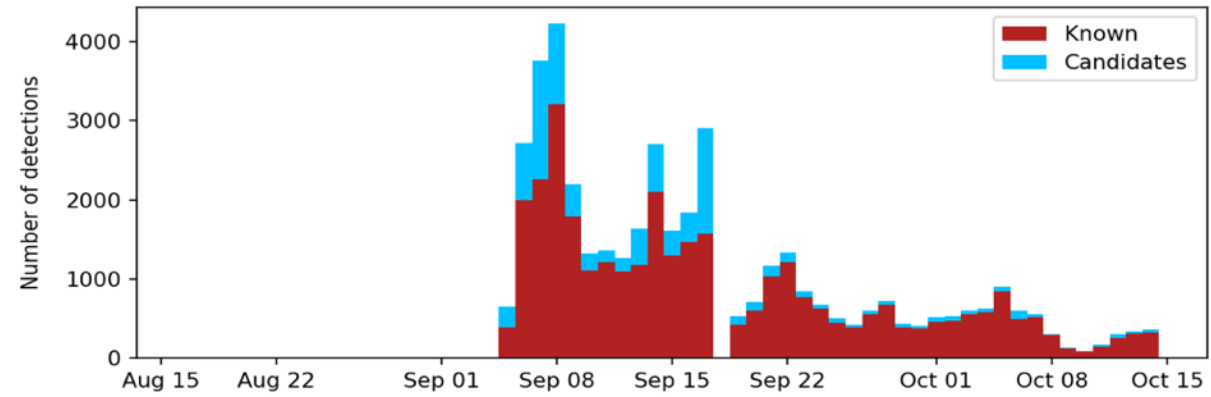
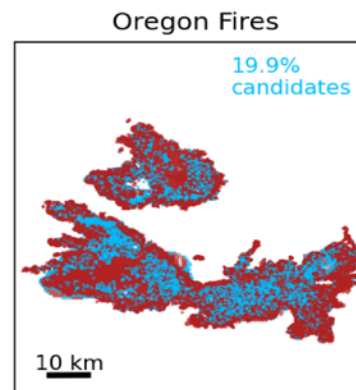
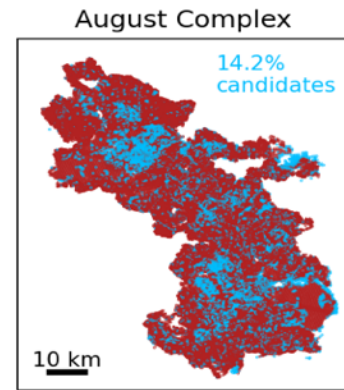
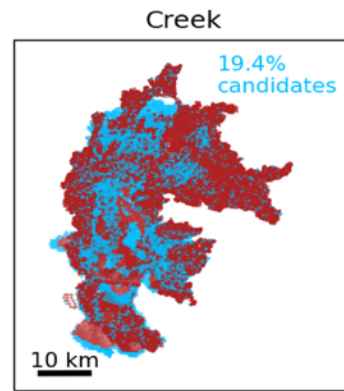
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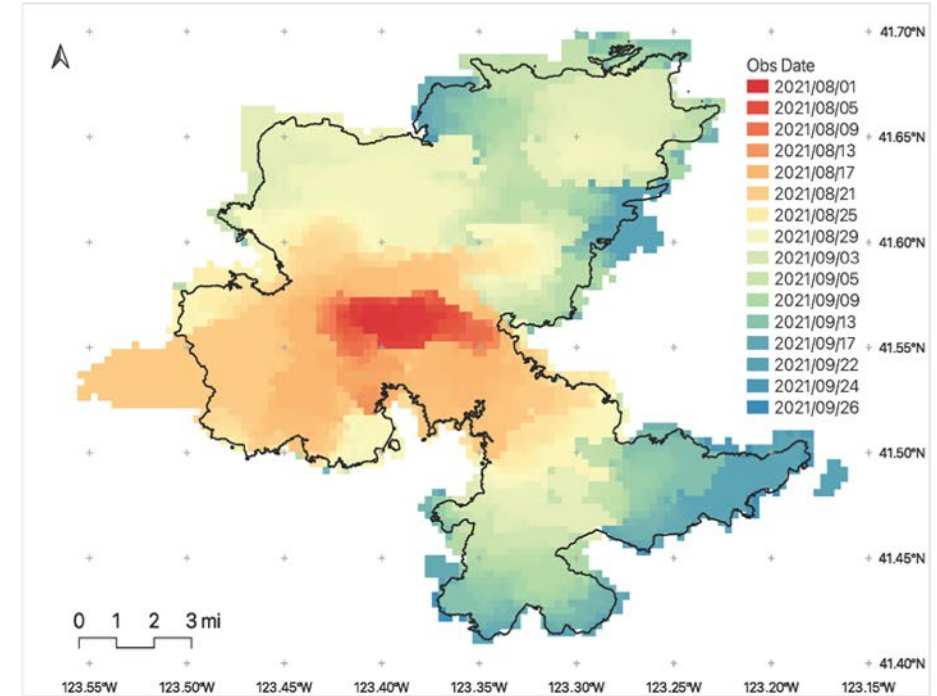
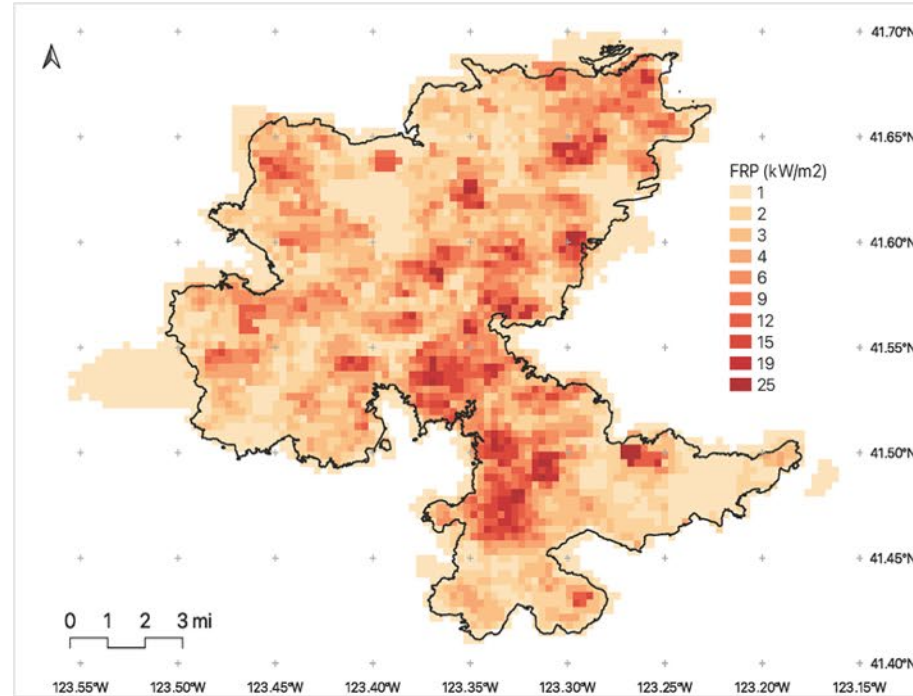


2020 Wildfires in the Western U.S. viewed by S-NPP/VIIRS

Credit: Shane Coffield

# Outstanding Commission Errors

- Hot plume detection artifacts at high view angles continue to be observed



***S-NPP/VIIRS FRP and NIFC fire perimeter, McCash Fire, CA Aug-Sep 2021***

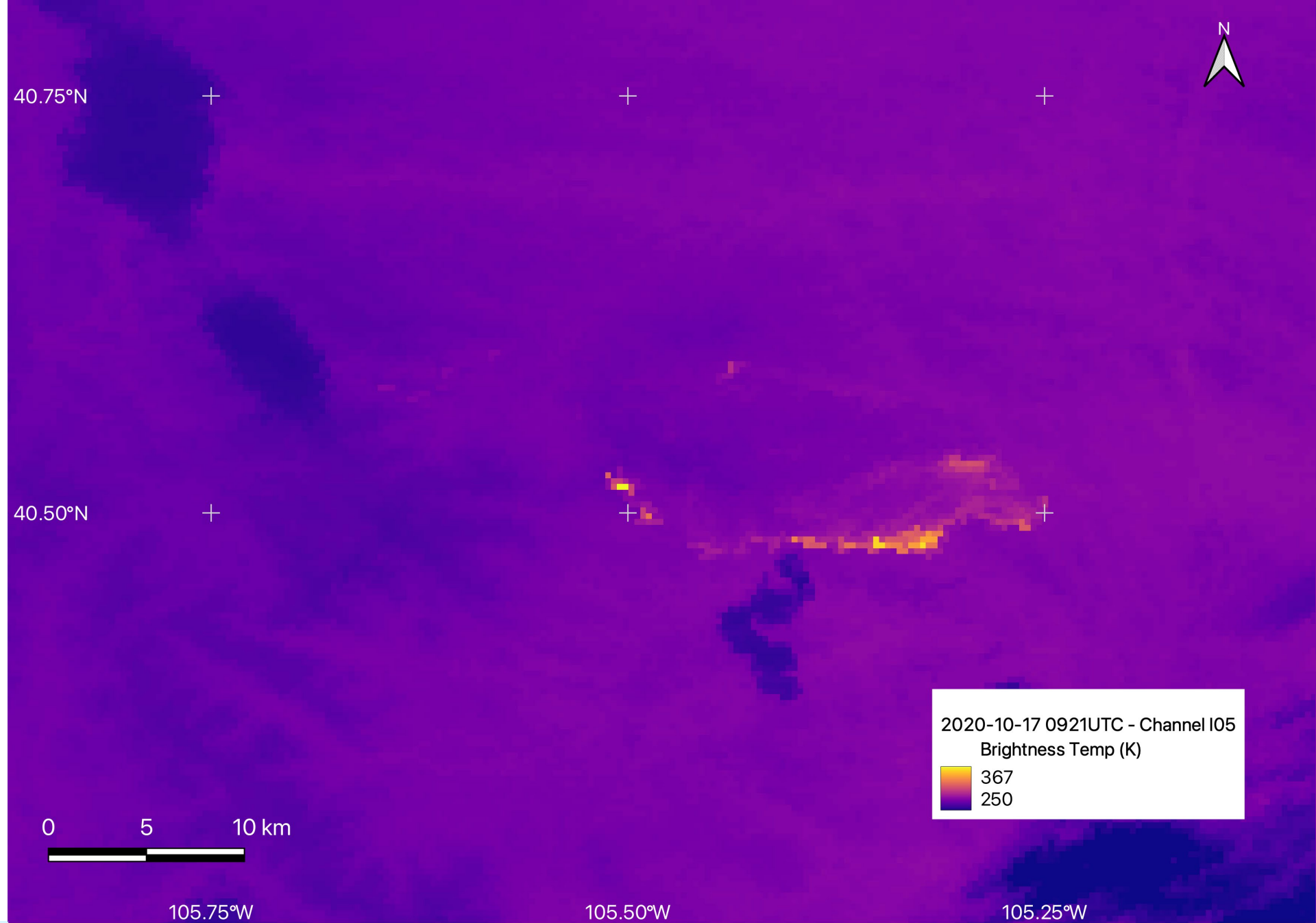




# Outstanding Commission Errors

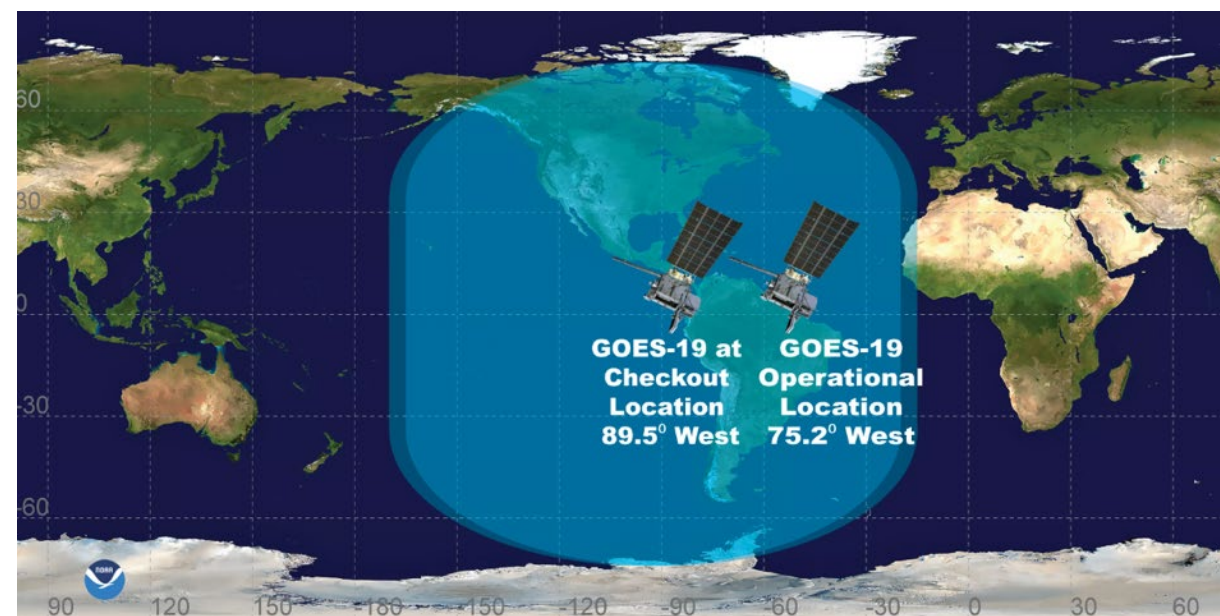
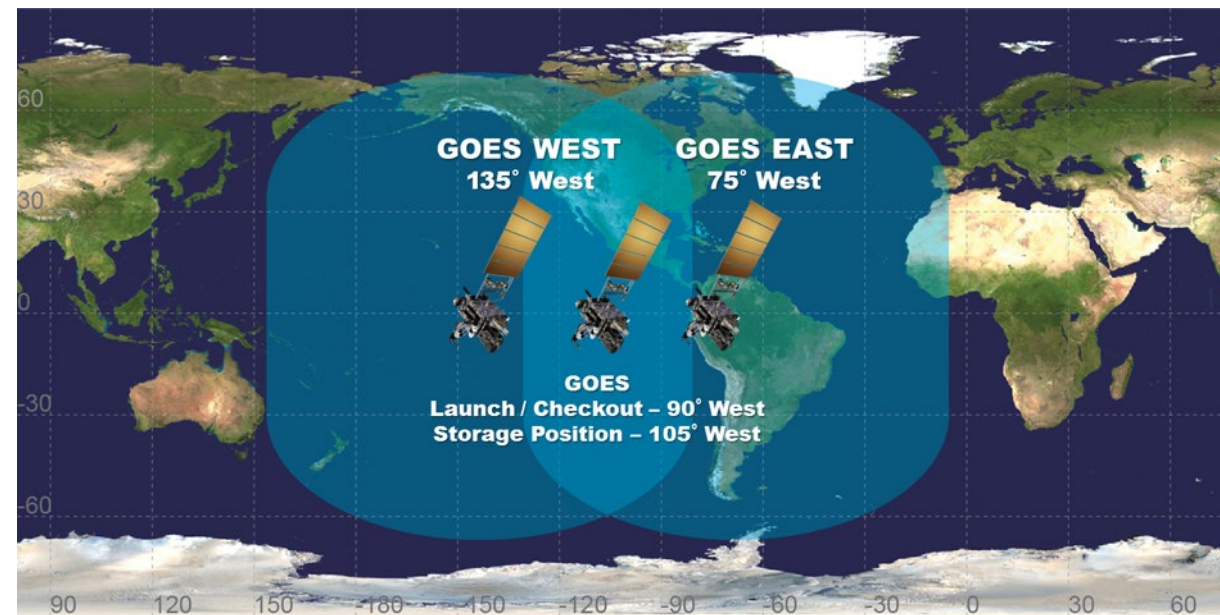
- Diffraction/scattering of fire radiance through clouds

Cameron Peak Fire  
 Colorado/USA  
 17 Oct 2020  
 S-NPP/VIIRS: 0829UTC  
 NOAA-20/VIIRS: 0921UTC



# GOES-R System Status

Platform	Status
GOES-16	Operational GOES-East
GOES-17	On-orbit storage
GOES-18	Operational GOES-West
GOES-19	To become GOES-East in April/2025



# Primary ABI Active Fire Detection Products

Algorithm	2km Fire Detection and Characterization (FDC)	2km Next Generation Fire System (NGFS)
Version	N/A	v2
Format	CONUS/Full Disk sectors in NetCDF	Meso/CONUS/Full Disk sectors in NetCDF
Availability	GOES-East/West	GOES-East/West
Frequency	5min/10min	30-60sec/5min/10min
Typical Latency	<10-20min	<5min

Baseline (FDC) algorithm development is paused, high false alarm rates remain in lower confidence fire pixel classes

NGFS continues to be developed, data being used for initial evaluation by early adopters

FDC and NGFS can/will differ substantially in quality and quantify of fire pixels detected

# Next Generation Fire System

## Modifying volcano monitoring utility (VOLCAT) to detect biomass burning

- Prioritizing GOES/ABI data processing to replace baseline FDC algorithm
- Tuned for early warning applications
- Contextual tests take advantage of GOES high temporal resolution
- Terrain corrected geolocation
- Incorporates event tracking
- Atmospheric correction of FRP retrievals using LBLRTM to estimate transmittance
- Data availability:
  - Mesoscale (30sec-1min)
  - CONUS (5min)
  - Full disk (10min) - Currently GOES-18 only

[https://bin.ssec.wisc.edu/pub/volcat/fire\\_csv/](https://bin.ssec.wisc.edu/pub/volcat/fire_csv/)

- Being expanded to VIIRS data

### Next Generation Fire System Prototype

Home | Dashboards | Satellite Imagery | Alert Reports | Documentation

#### Welcome to the Next Generation Fire System Prototype Website

This website contains output from a prototype version of the Next Generation Fire System (NGFS) under development for satellite-based fire detection at NOAA. The NGFS uses satellite observations, along with advanced spatial and temporal metrics, to detect fires in a manner consistent with human expert analysis of satellite imagery. The fire detection and intensity products account for atmospheric attenuation, thereby making them more resilient to atmospheric obstructions, such as clouds and smoke. The NGFS combines satellite-based fire detections with independent data layers such as National Weather Service fire weather outlooks and Red Flag Warnings, to provide critical context for decision making and analysis. The NGFS event-based data model and accurate terrain-corrected geolocation allow the detections to be combined within downstream applications. The prototype NGFS is run in real-time using observations from the GOES-16 and GOES-18 satellites. It provides complete coverage of the United States and partial coverage of surrounding countries.

#### Resources



Dashboards



Satellite Imagery



Alerts Archive

<https://cimss.ssec.wisc.edu/ngfs/>

# Next Generation Fire System



### Satellite Imagery

**RealEarth Imagery**  
Links to RealEarth terrain-corrected satellite imagery that includes metadata for each thermal anomaly detection, animations, and pan and zoom capabilities.  
Grayed out products are unavailable.

Case Study / Realtime: Real-time

GOES-16 ABI

CONUS

All Products

Scene Detections

- + GeoColor
- + Fire Temp RGB
- + Day Fire RGB
- + Microphysics RGB
- + Shortwave IR (Band 3)
- + Visible (Band 2)
- + Longwave IR (Band 4)

Animation & Times

Tools | Share

White | Grid

Location Search

2024-09-09 15:06UTC  
9.07°N 111.04°W

50° 40° 30° 20° 10°

150° 140° 130° 120° 110° 100° 90° 80° 70° 60° 50°

Products & Layers

Collection: NGFS

Presets | Products | Displayed

- GOES East Scene Fire Detections - CONUS  
2024-09-09 15:01:17
- GOES East Day Fire RGB - CONUS  
2024-09-09 15:06:17

Leaflet | RealEarth labels, 2 new notifications

# Next Generation Fire System



Countries: United States   Locations: All selected   Rankings: All selected   Time Threshold: 3 hours   [Edit Settings](#)

Location	NWS WFO	Most Recent Alert	Alert Info
Hemphill County, TX	Amarillo, TX	just now	<a href="#">Hide</a>
Chero			
Wapel			
Bourb			

Lat/Lon: 35.9208°N 99.9558°W  
Unknown incident: Fire Pixel  
Event: Possible  
Type: Wildland Fire  
Feature 1092.19  
FRP: MW  
Feature  
Duration: 0d, 4.3h  
Pixel 101.98  
FRP: MW  
Pixel 3.9µm 17 °C  
Temp.:



# Next Generation Fire System

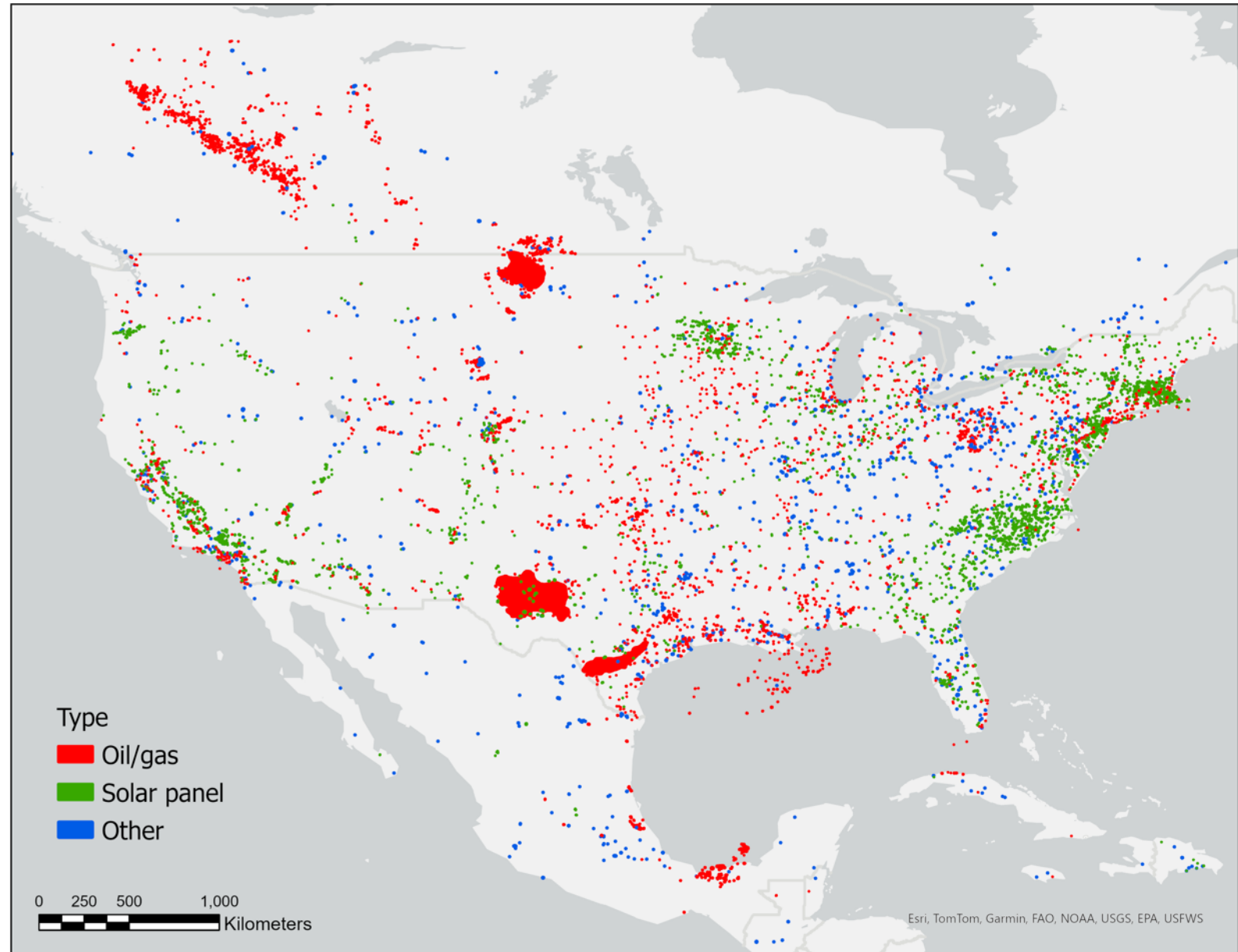


*Credit: Jason Otkin*



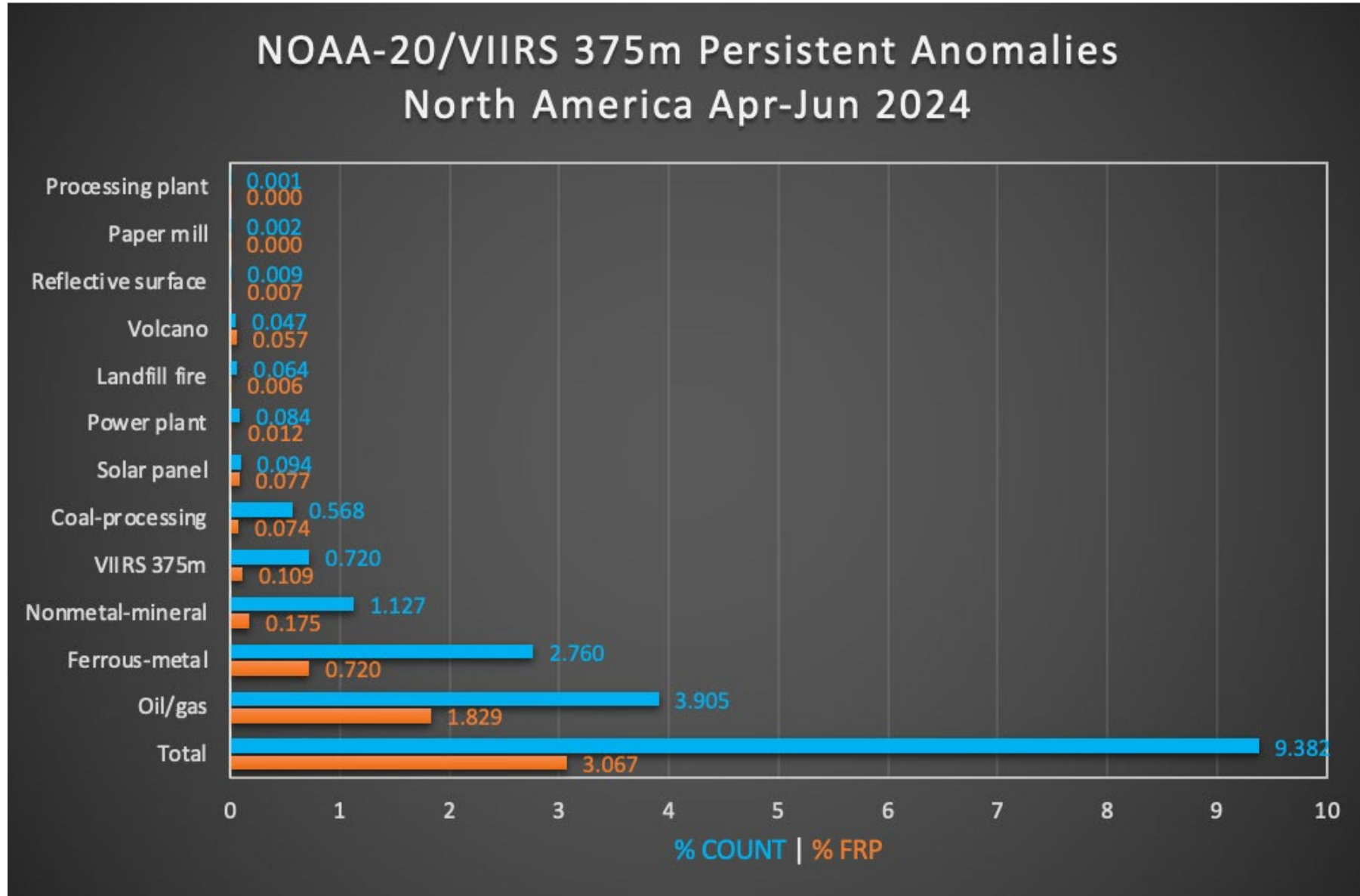
# Persistent Anomalies

- North America dataset updated regularly, now including +12K sites
- Global datasets available using persistence mapping (e.g., Liu et al. 2018, VIIRS Science Team)





# Persistent Anomalies



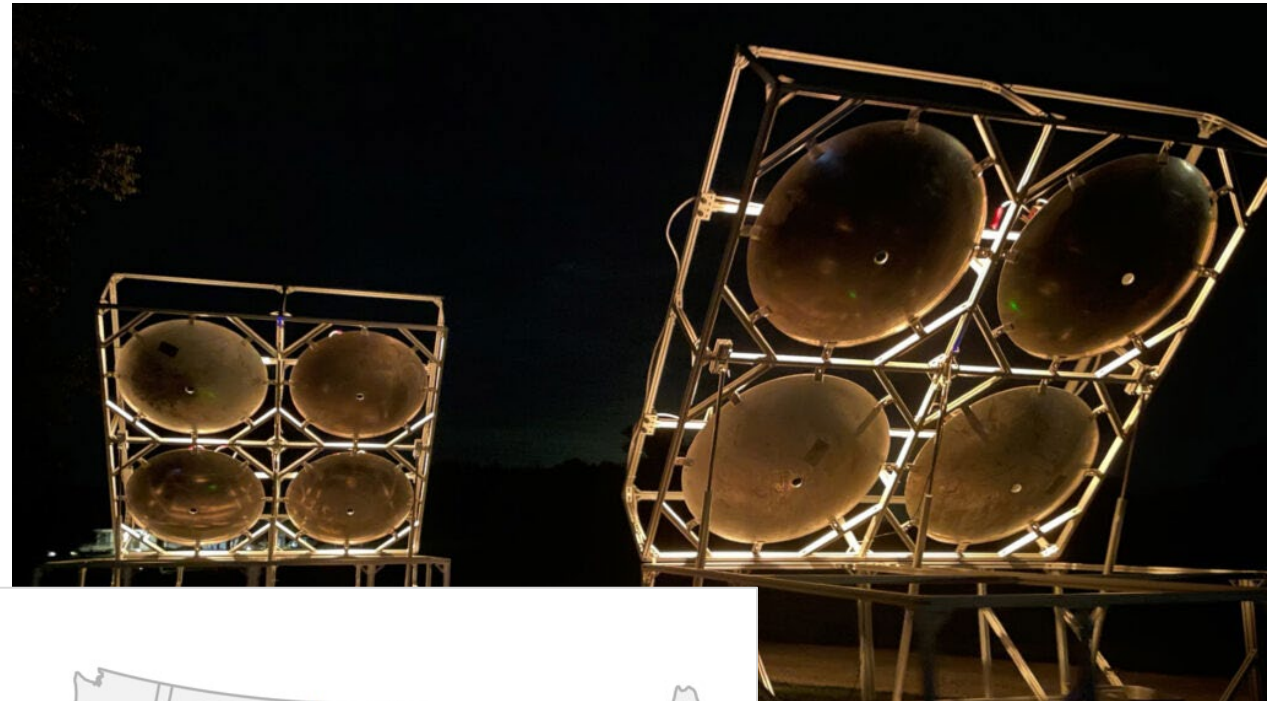
# Data Validation

Collaboration with USFS exploring TerraSTAR pointable infrared beacons capable of producing detectable signature up to GOES ABI's channel 7 (3.9 micron) 2km resolution data

Uses heating elements with temperatures of up to 1,500K mounted to parabolic reflectors



<https://youtu.be/VepVJAyvlUc>



Planned network by 2026

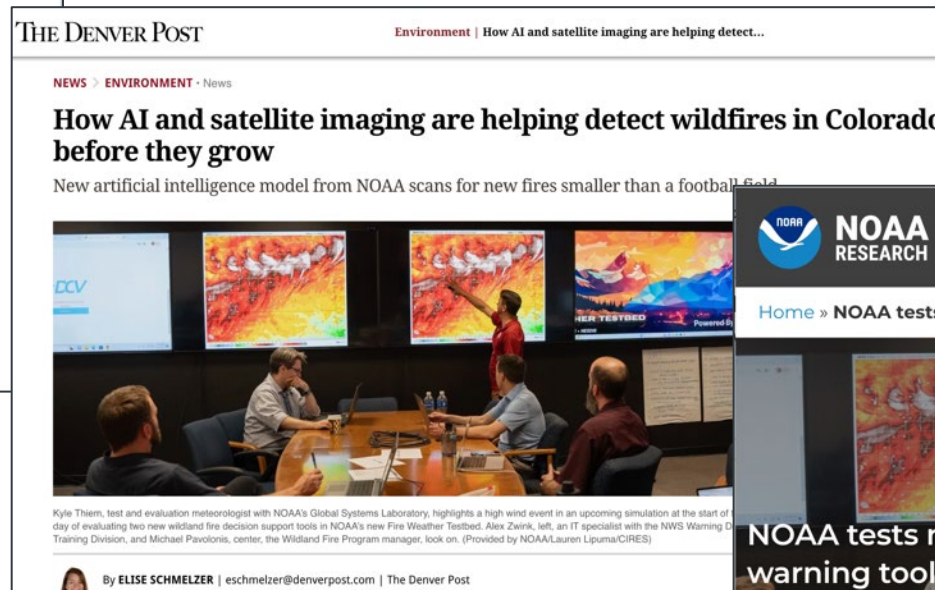
*Credit: Riverside Research*

# Demonstrating New Products and Services

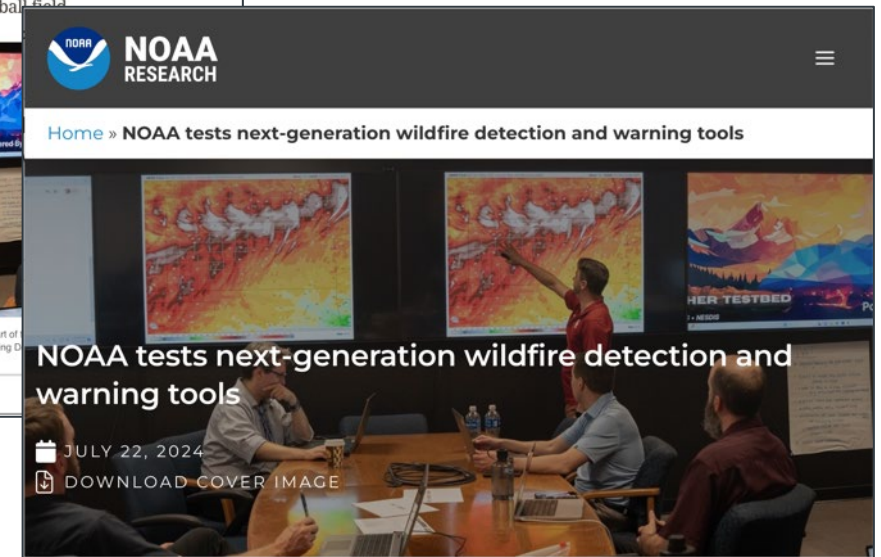
- NWS tests fire warning service, powered by NOAA satellites and NESDIS Next Generation Fire System (NGFS)
- Usability testing of the NESDIS Wildland Fire Data Portal is ongoing



[Washington Post](#)



[Denver Post](#)



[NOAA Research](#)

# Building Momentum

- Increasing use of the experimental NGFS (internal and external users)
- NOAA/DOI/USFS MOU was signed on May 13, 2024



[DOC Press Release](#)

**NWS feedback regarding the Dinosaur fire near the NOAA/NIST campus (7/16/24):** “the detection came about 10 minutes after a human saw the smoke, and called the NIST emergency operation team and Boulder Fire to coordinate response. That's exceptionally fast. I am amazed that the pixel within the pixel location of the first detection is SPOT on. The old detection tool we've used is typically a few km from the actual fire.”

**BLM feedback regarding use in the Northern Rockies region (7/22/24):** “The [NGFS] is having a strong track record in the Northern Rockies this year. A few weeks ago, we had the Horse Gulch fire detected at less than 10 acres and almost simultaneous with the smoke report. Last night the Butler Fire was only detected by NGFS and none of our other systems. How comfortable are you with the usage by dispatch center personnel. I am sharing with my NRCC intelligence folks, very savvy people.”