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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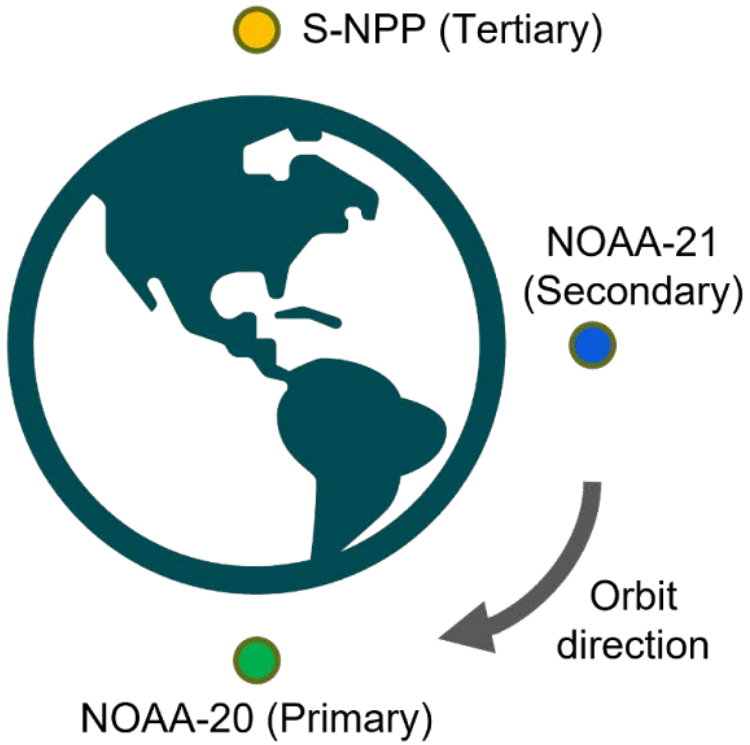
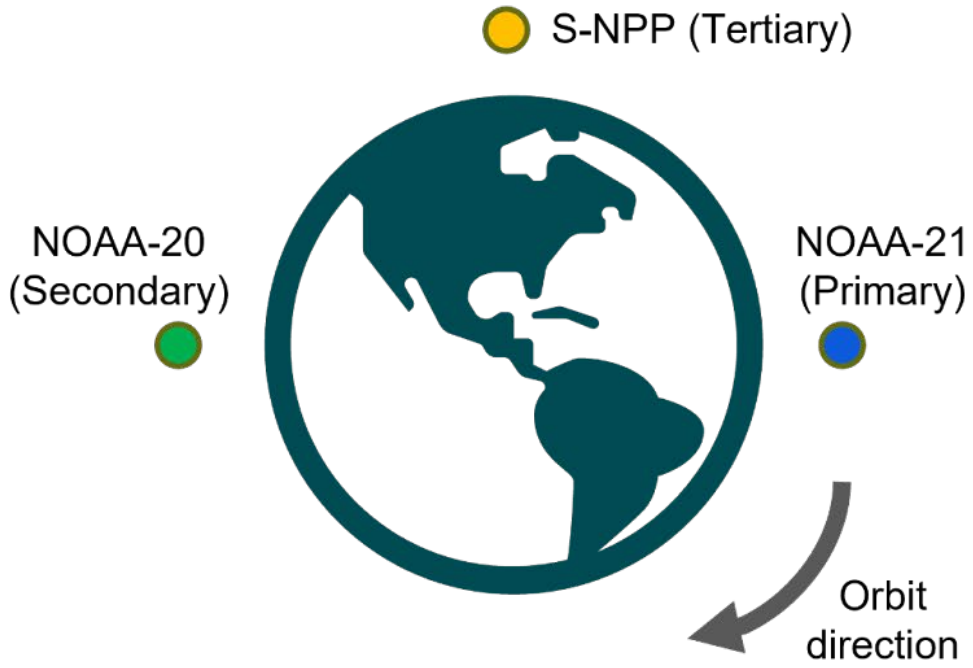
JPSS System Status

Until March 20, 2024



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

Beginning April 4, 2024

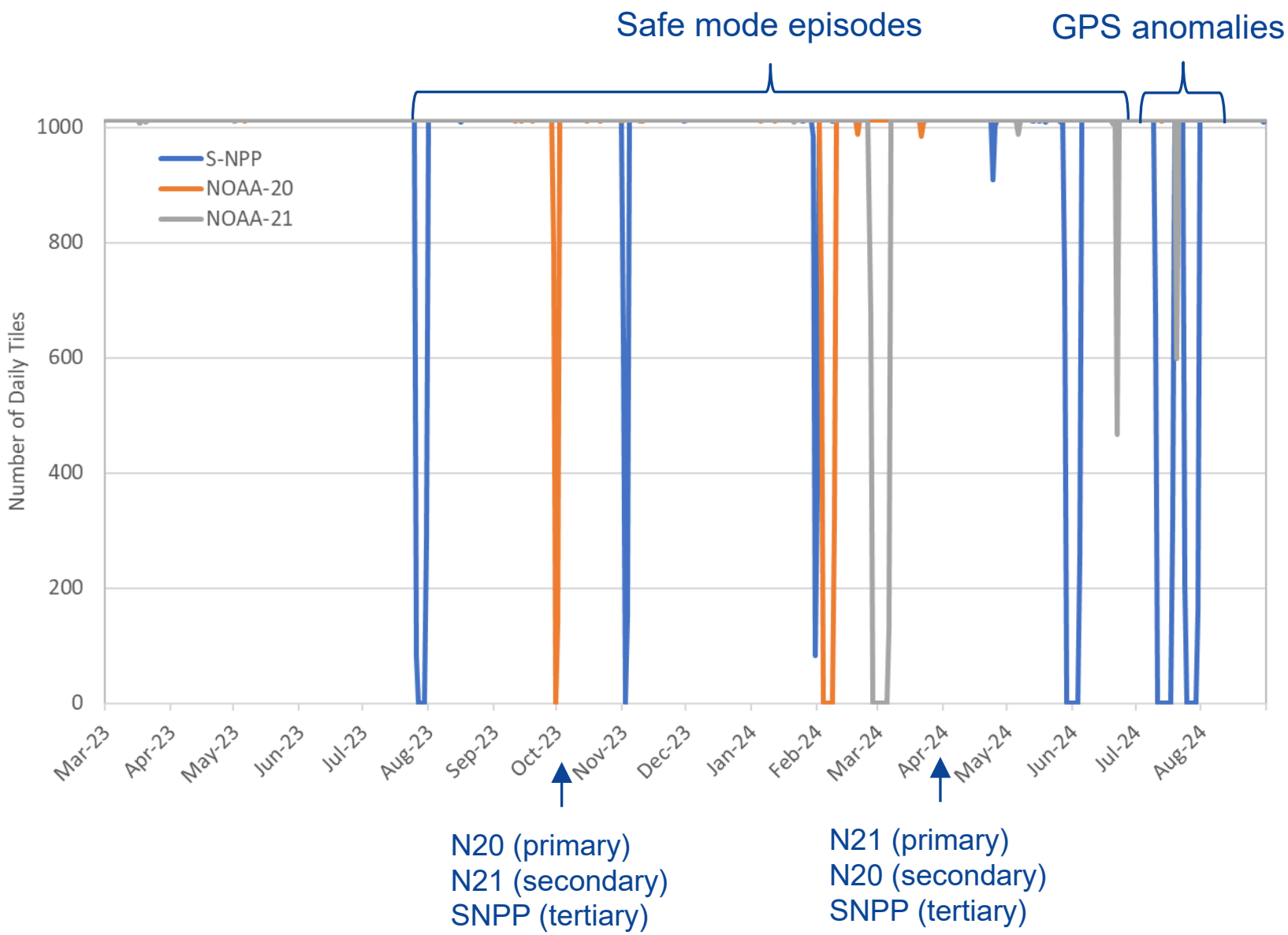


- **NOAA-20 && NOAA-21** phased 180º or **50min** apart
- S-NPP located between the two or **25min** apart
- S-NPP could be deorbited as early as 2025

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



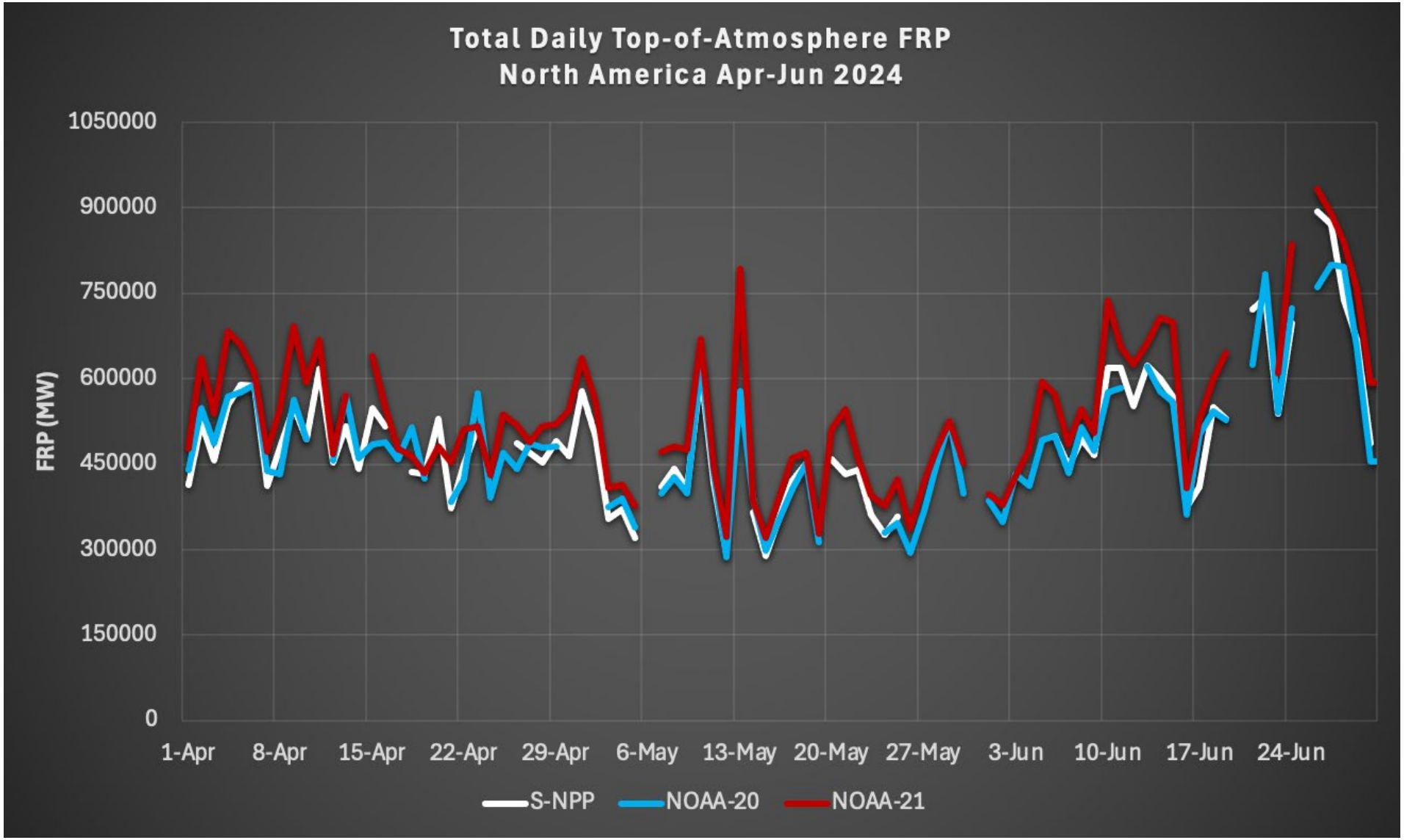
VIIRS Primary Active Fire Detection Products

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



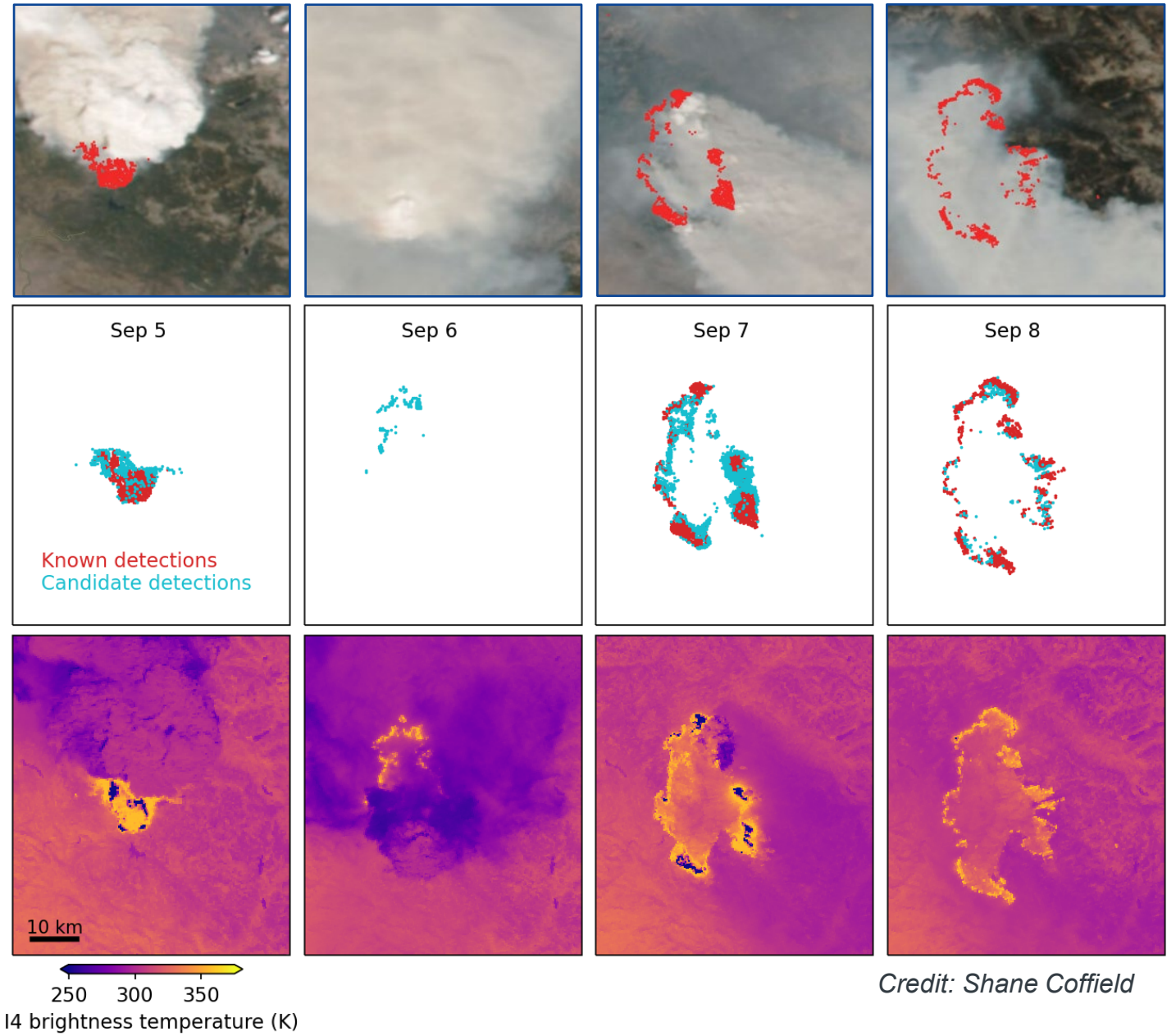
Outstanding Omission Errors

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%)



Credit: Shane Coffield

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

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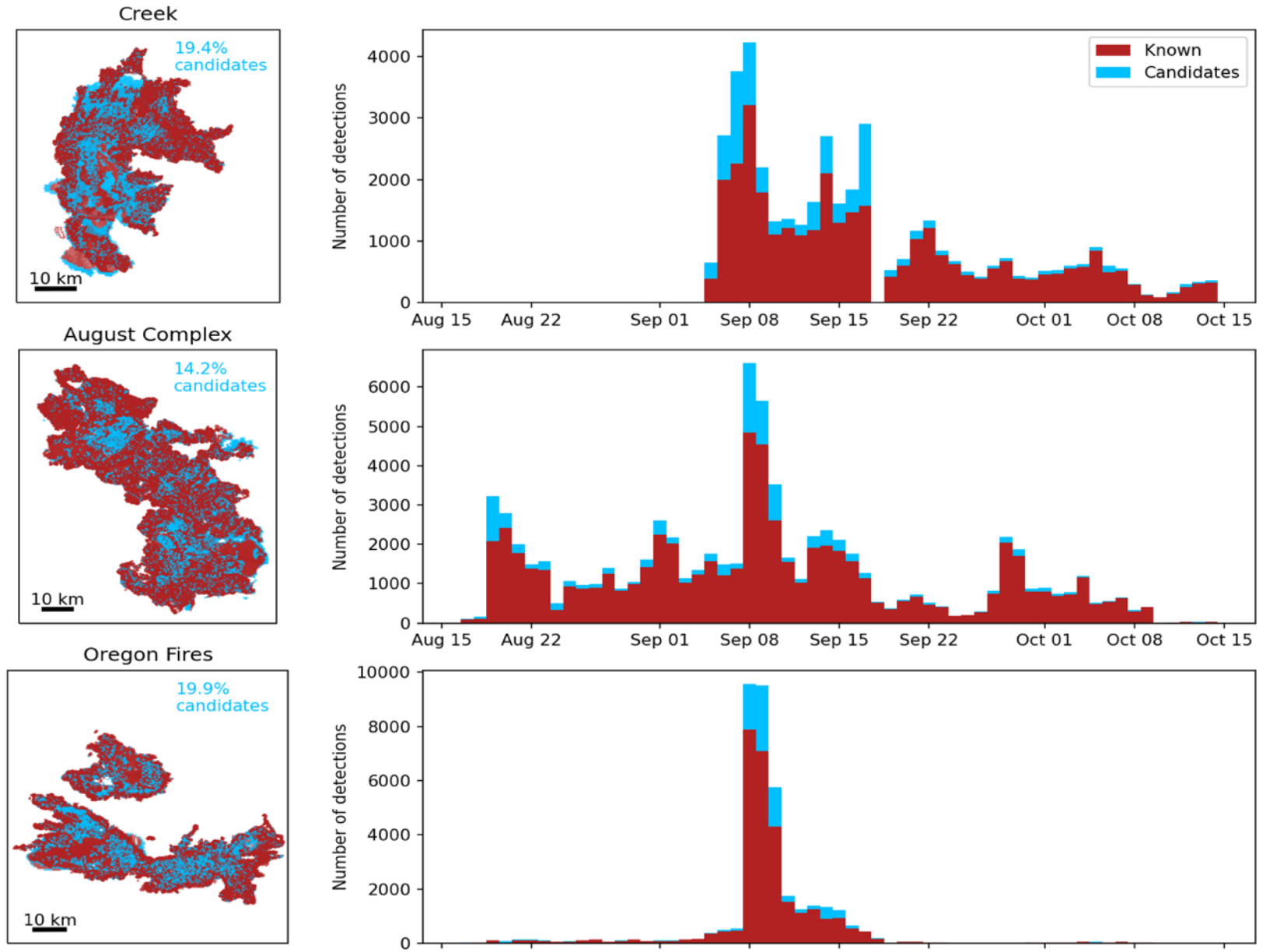
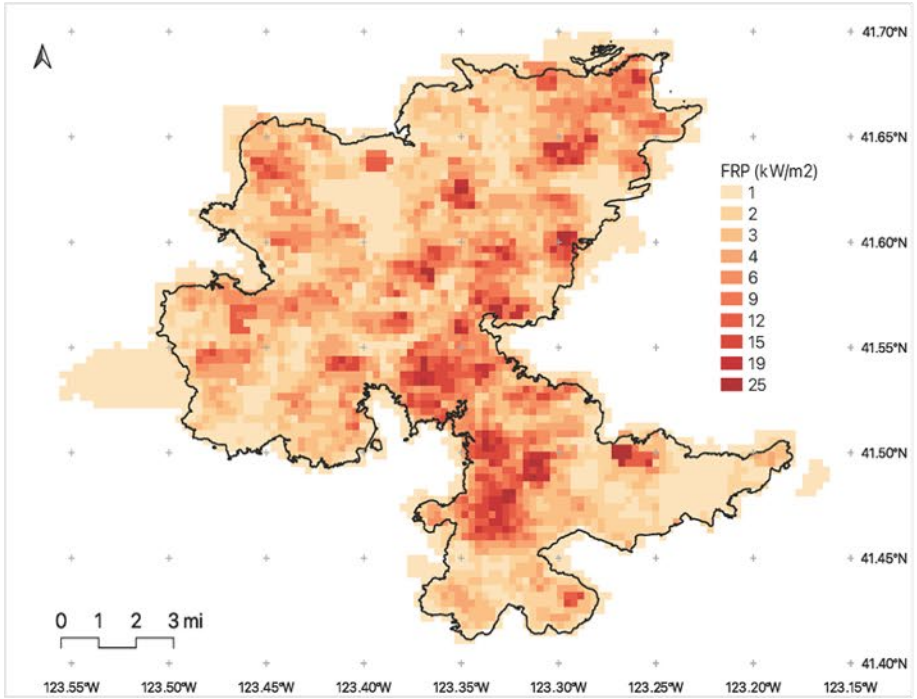


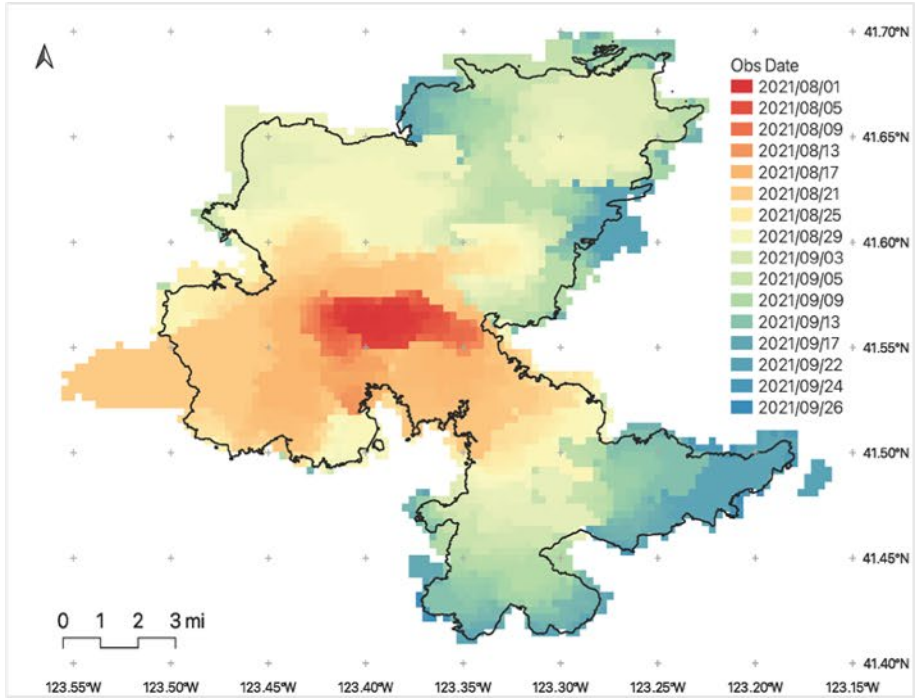
2020 Wildfires in the Western U.S. viewed by S-NPP/VIIRS

Credit: Shane Coffield

Outstanding Commission Errors

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

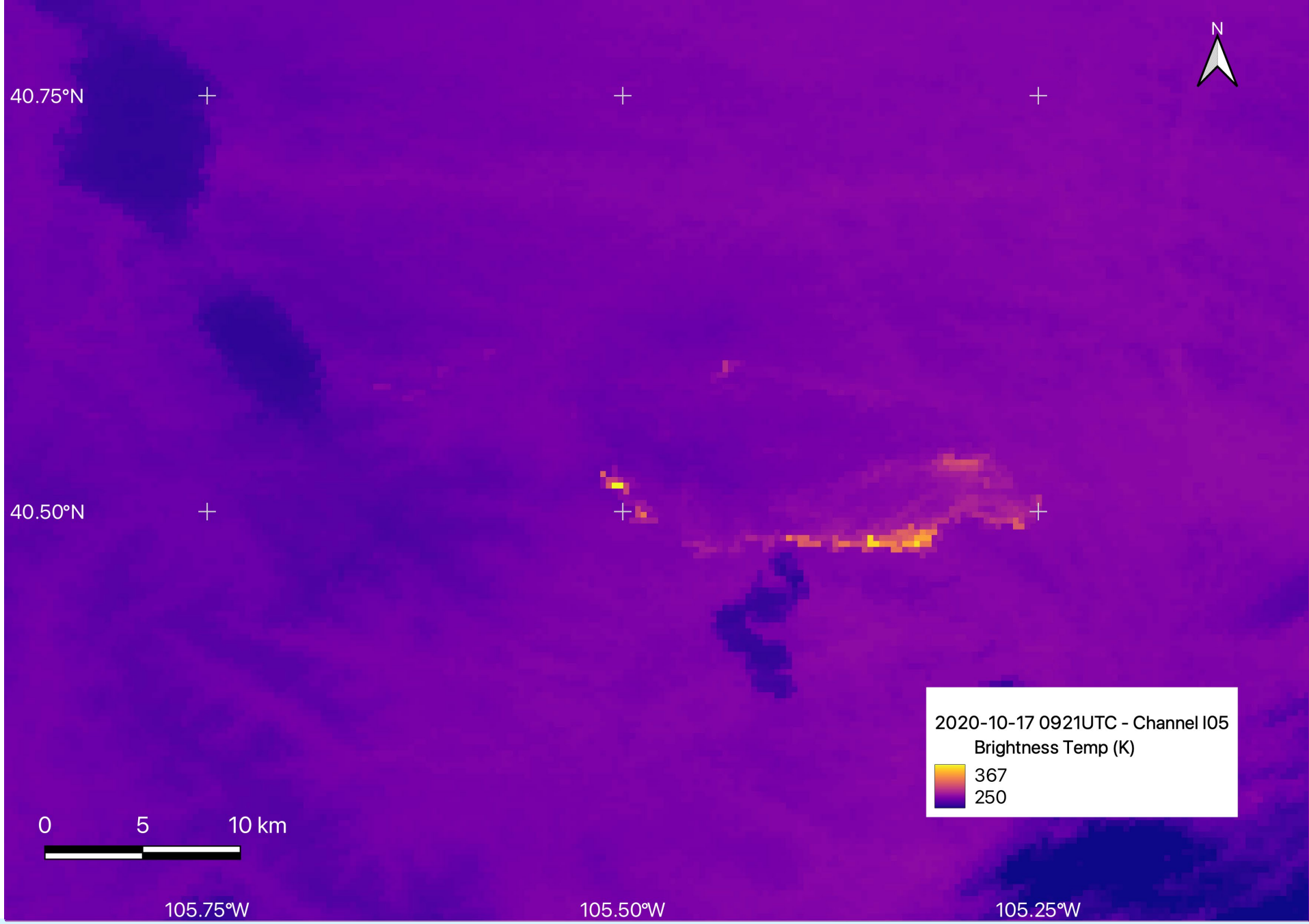




S-NPP/VIIRS FRP and NIFC fire perimeter, McCash Fire, CA Aug-Sep 2021

Outstanding Commission Errors

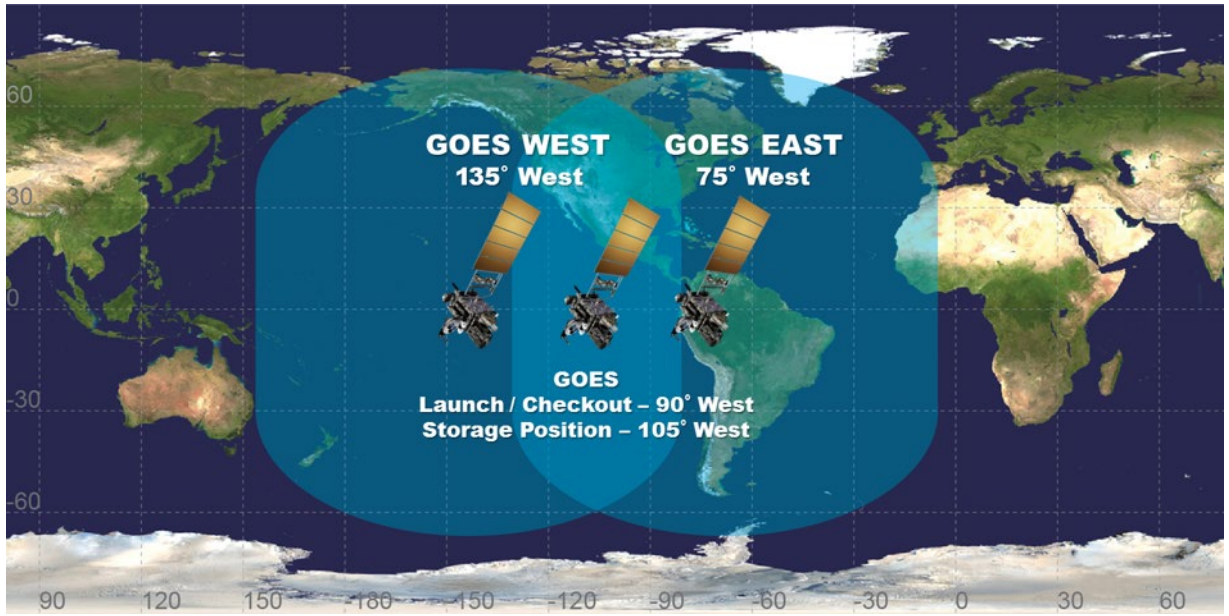
- Diffraction/scattering of fire radiance through clouds

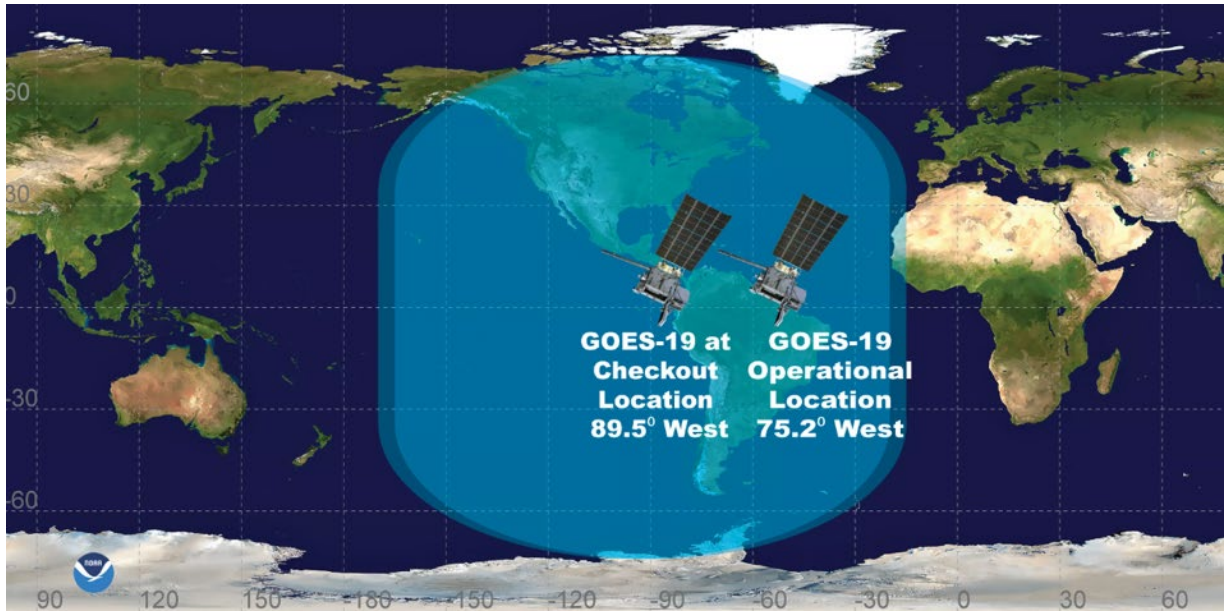


Cameron Peak Fire
Colorado/USA
17 Oct 2020
S-NPP/VIIRS: 0829UTC
NOAA-20/VIIRS: 0921UTC

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

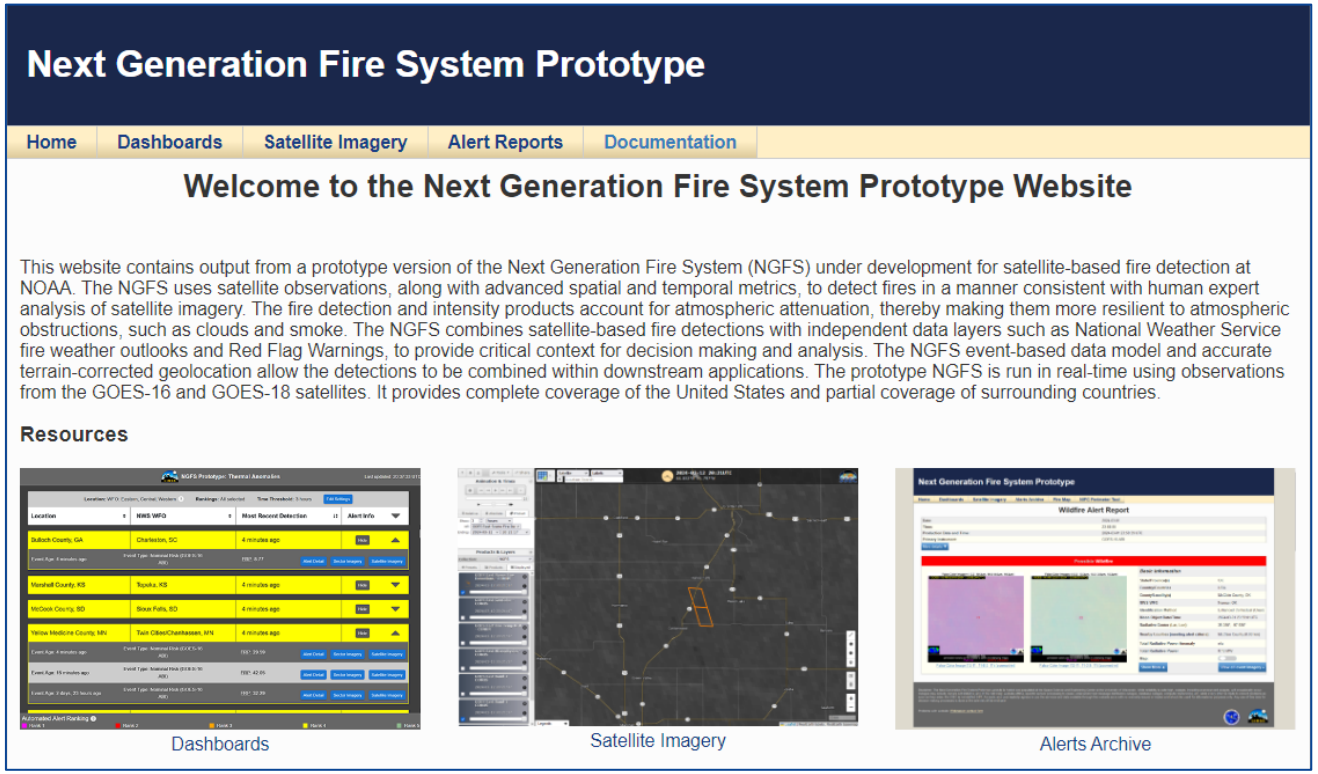
Next Generation Fire System

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

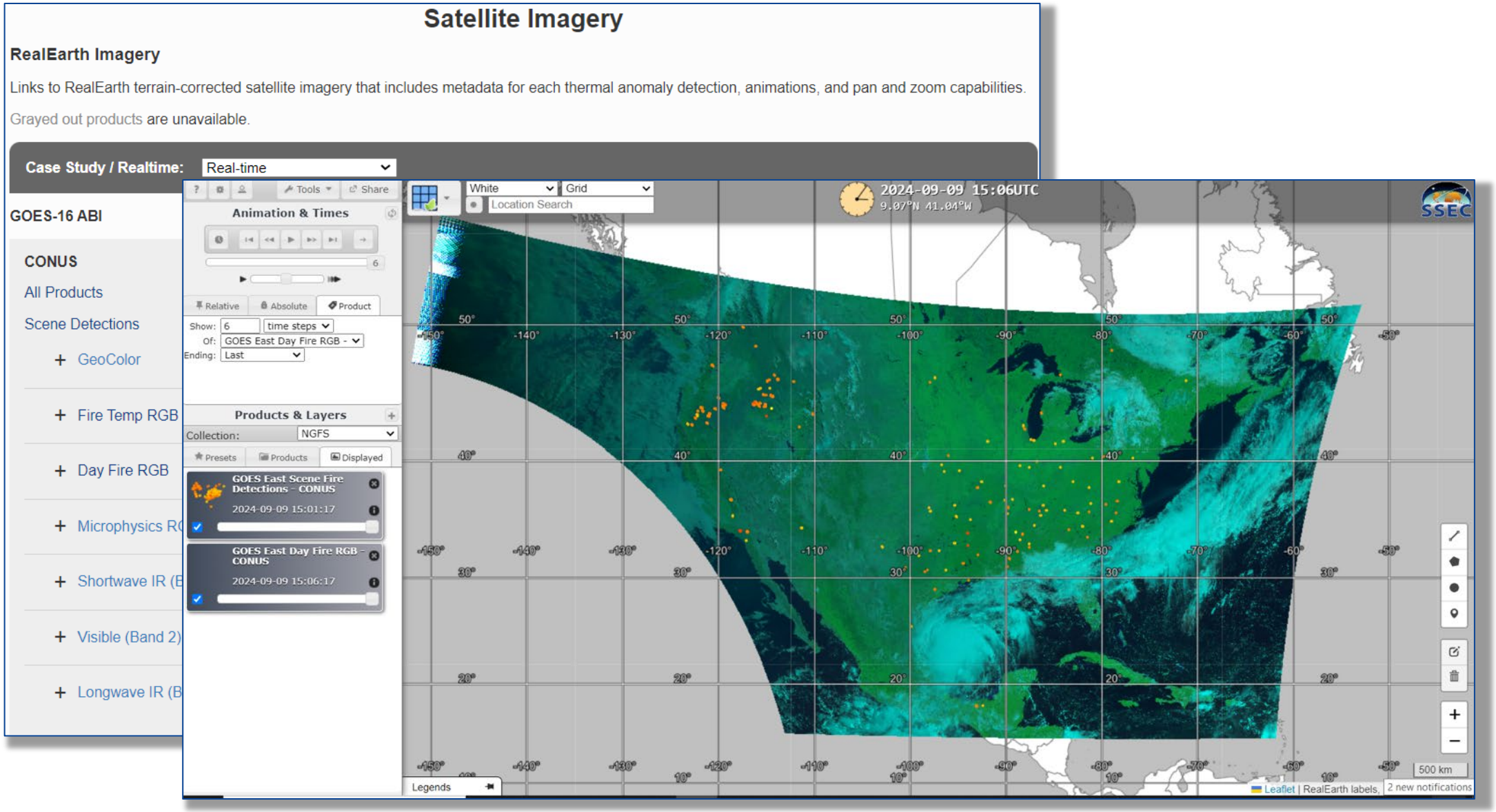
https://bin.ssec.wisc.edu/pub/volcat/fire_csv/

- Being expanded to VIIRS data

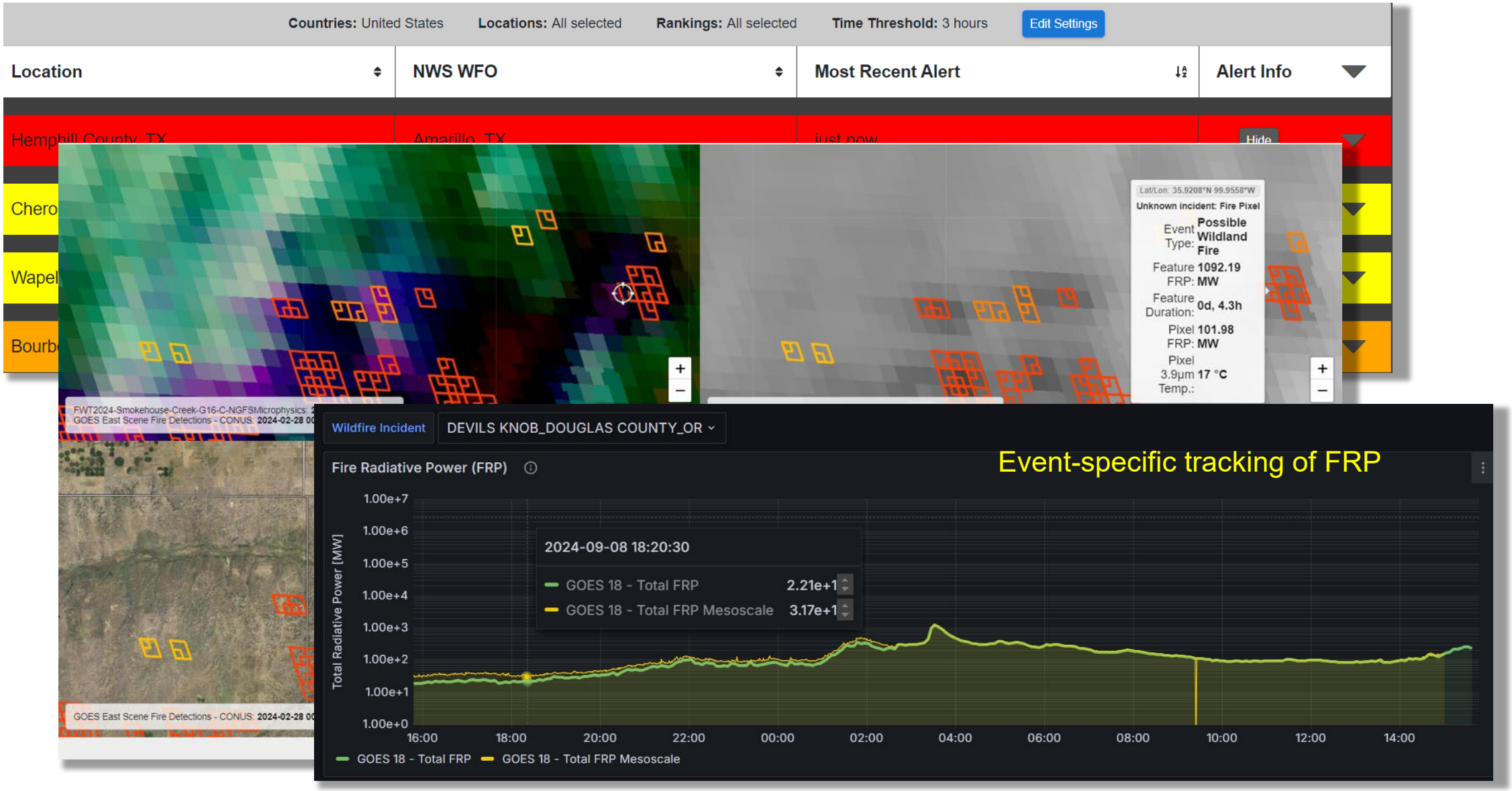


https://cimss.ssec.wisc.edu/ngfs/

Next Generation Fire System



Next Generation Fire System

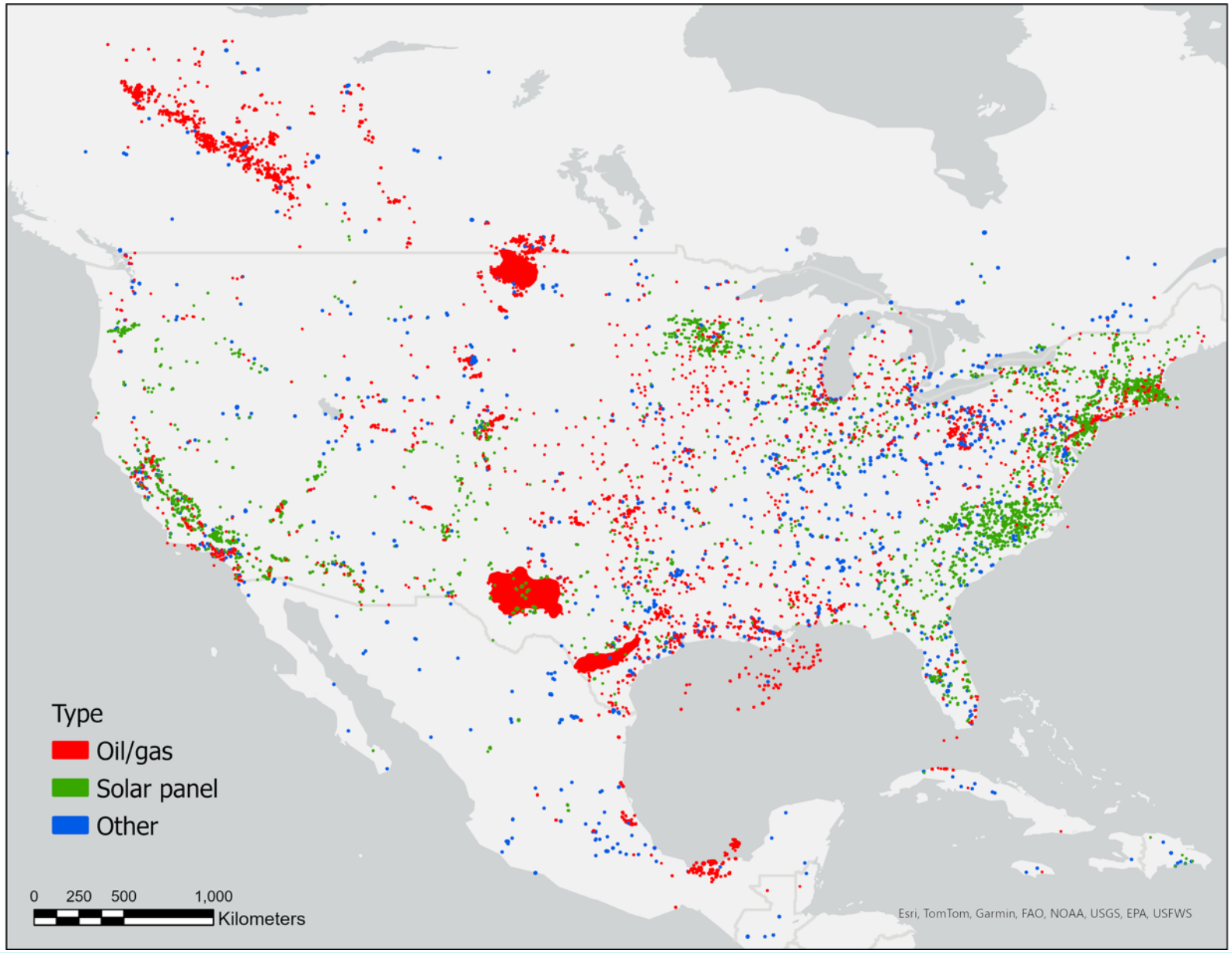


Next Generation Fire System

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)



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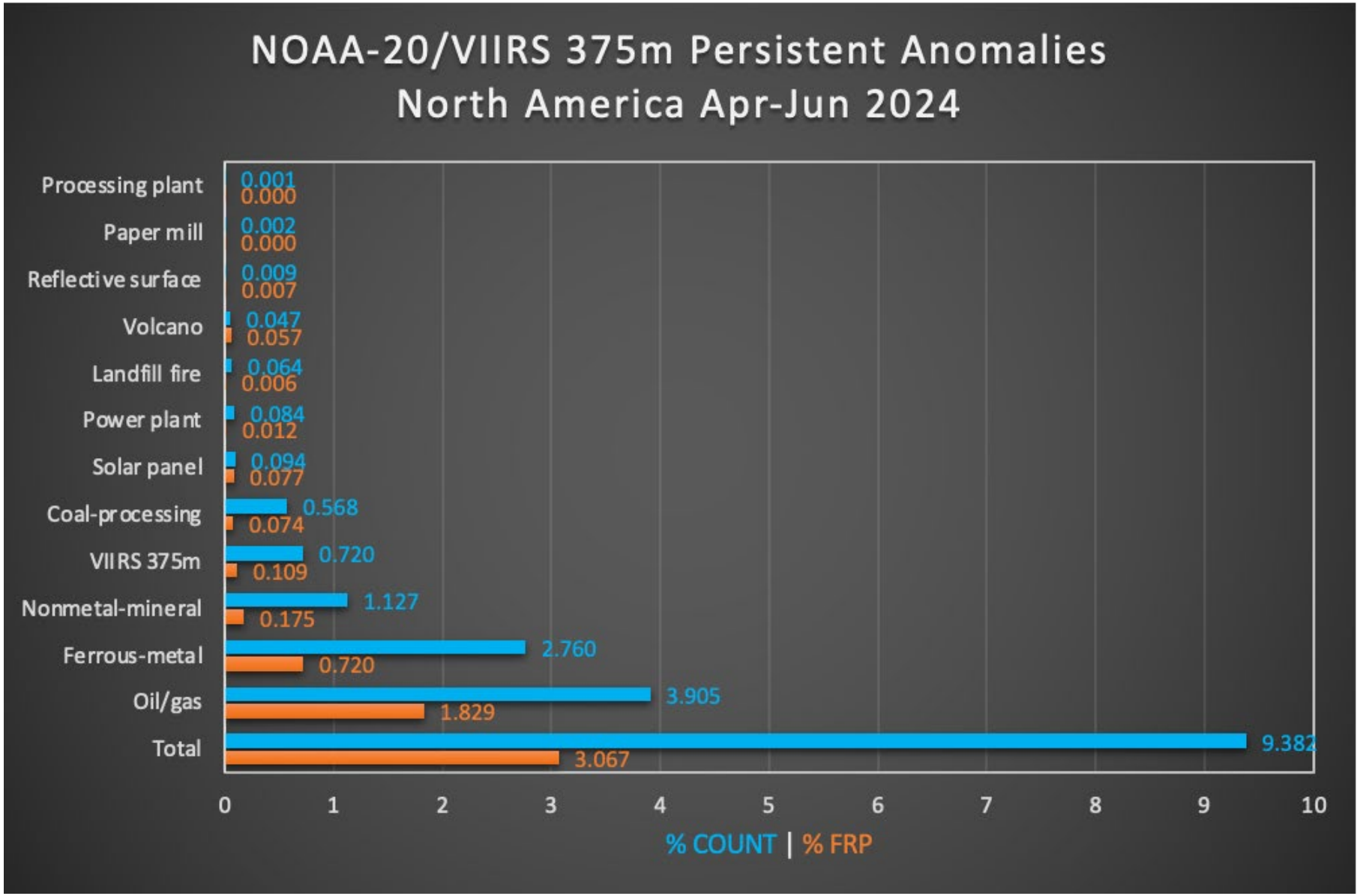
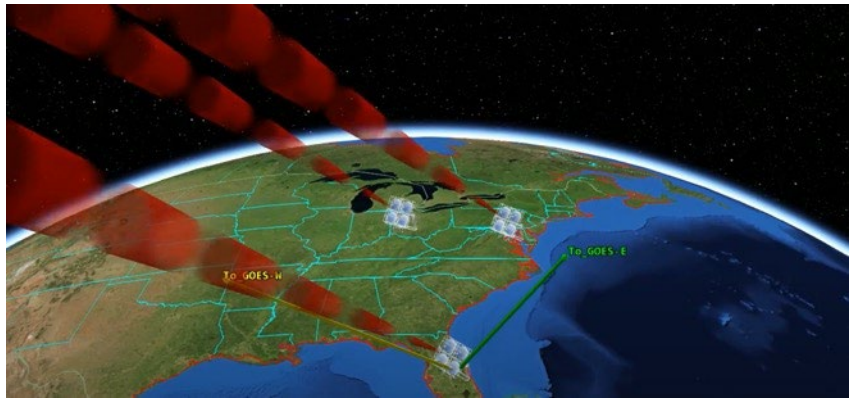


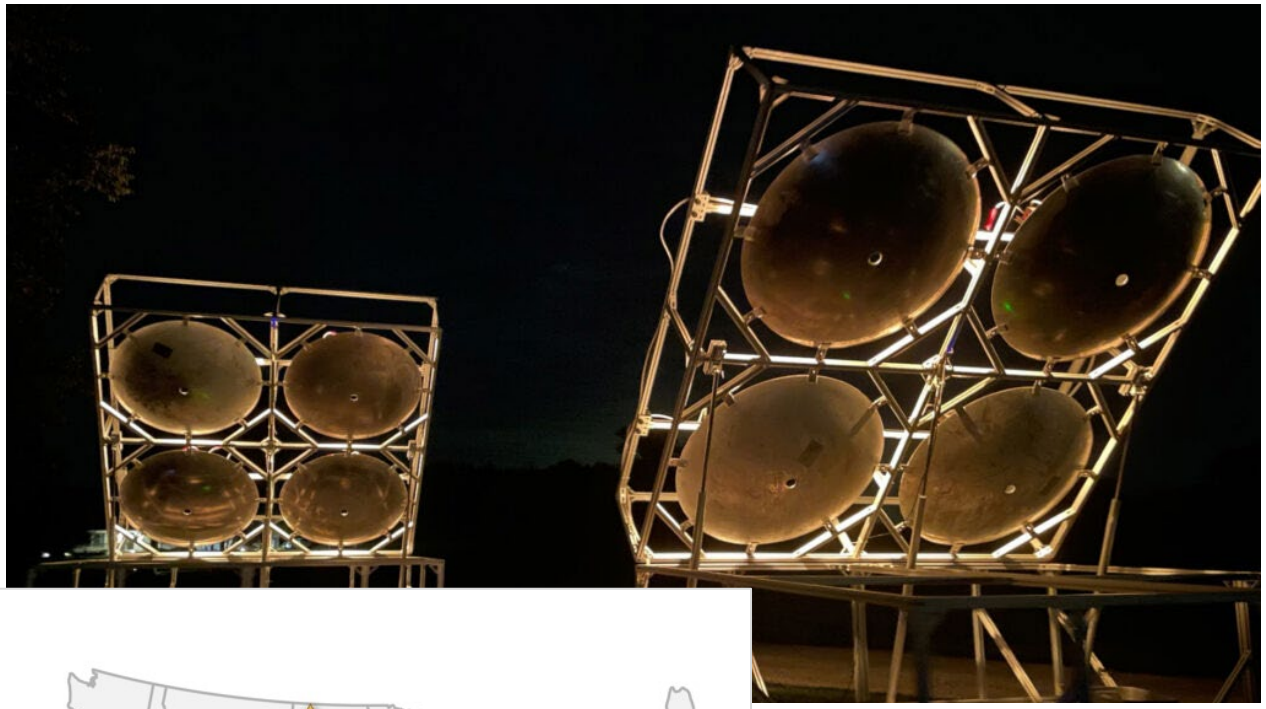
Data Validation

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/VepVJAyvIUc



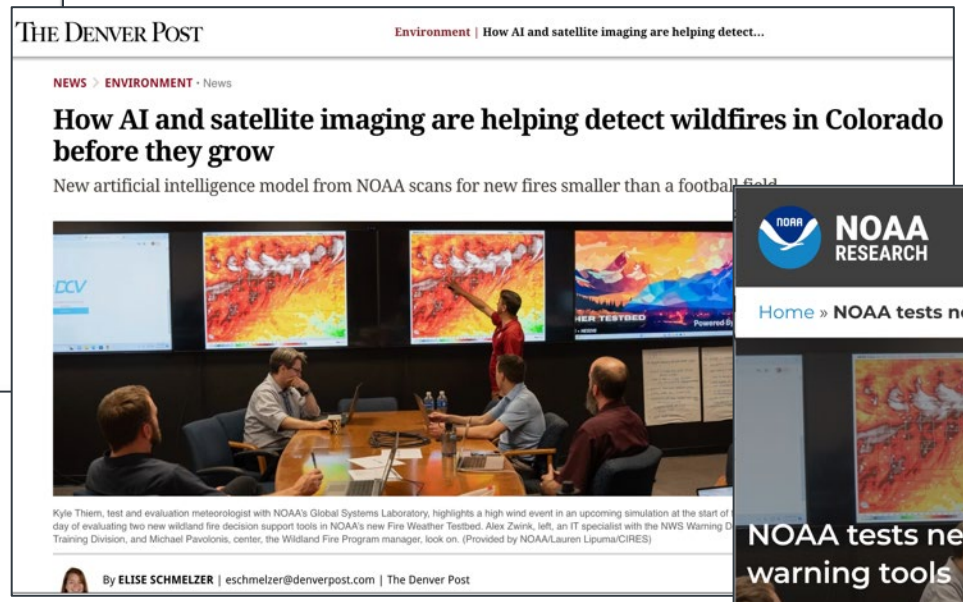
Credit: Riverside Research

Planned network by 2026

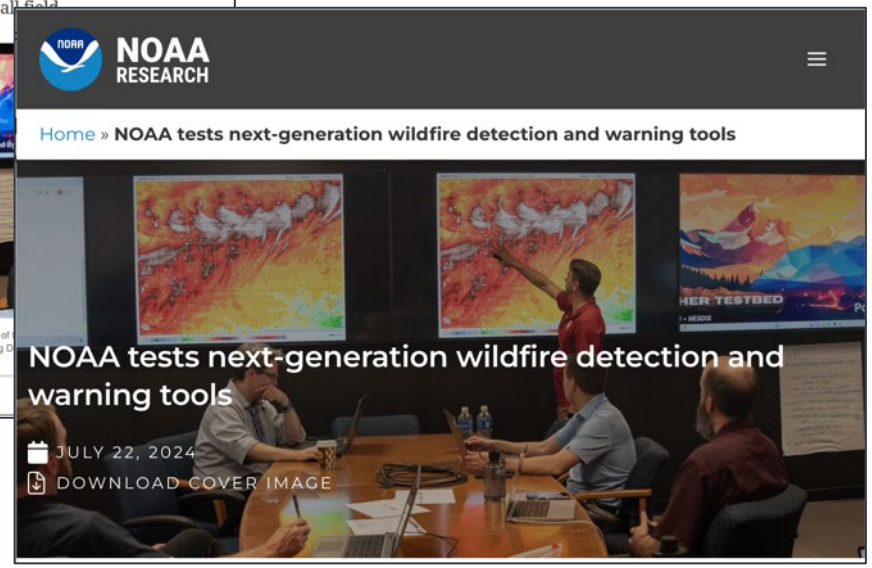
Demonstrating New Products and Services

[Washington Post]

- 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



[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."