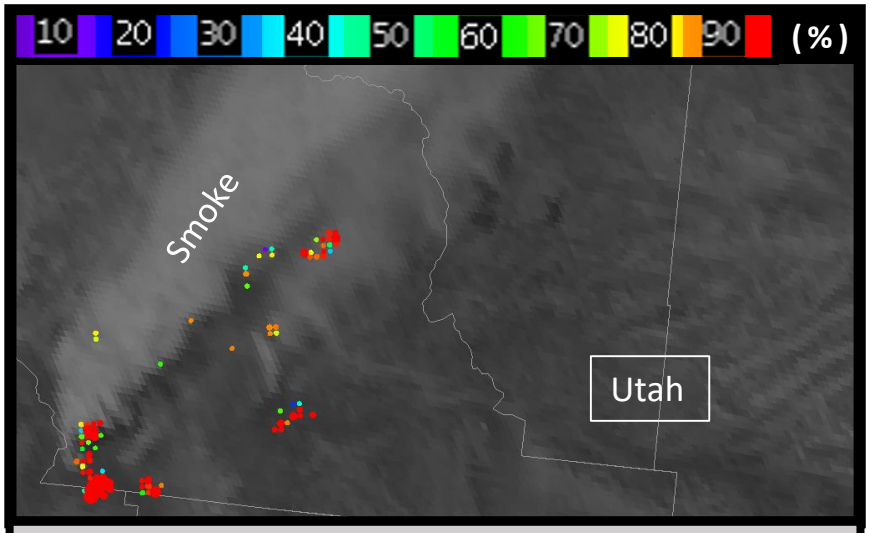
# VIIRS Active Fire Quick Guide

## Why is the VIIRS Active Fire (VIIRS–AF) Important?

The VIIRS-AF product provides information on thermal anomalies for each location across the globe at least twice a day. VIIRS-AF includes data on fire location, fire intensity, and 'fire confidence' (expressed in percentage), which can assist Incident METeorologists (IMETs) and deployed meteorologists in relation to operational response decisions. Product information is used in monitoring the distribution of fires, their intensities, as well as identifying new fires.




Suomi NPP VIIRS-AF overlaid onto GOES-16 0.64 µm visible imagery, observing wildfires and smoke in Utah at 2020 UTC on 19 September 2018. The colors represent detection confidence (%), while the size of the dots increases with FRP.

## VIIRS-AF algorithm and specifications

| Algorithm | Temporal Resolution | Spatial Resolution | Latency |
|---|---|---|---|
| The hybrid threshold and contextual algorithm builds on the Moderate Resolution Imaging Spectroradiometer (MODIS) fire and thermal anomalies product. The mid-wave infrared channel (4.05 µm/M13) is more sensitive to hot fire pixels than the longwave infrared channel (10.76 µm/M15). There are three main display aspects: fire pixel location, Fire Radiative Power (FRP) and Fire Confidence values. An internal cloud mask is used to identify areas where fire detection was not possible. | • CONUS: 2 overpasses per day, per satellite: Suomi NPP and NOAA-20.<br>• More frequent coverage north of 50 degrees latitude. | 742 m x 776 m at nadir, with reduced pixel size growth with increasing scan angle. | 1- 1.5 hours |

## Impact on Operations

**Primary Application**

**Fire Location:** Identify and locate fires; along with point sources for smoke.

**Fire Radiative Power (FRP):** Higher FRP values equate with higher fire intensity and/or larger fires. Smoldering fires are generally 175-575°C whereas intense fires reach 525-925°C. Burning characteristics also depend on fuel type, moisture, temperature and wind.

**Small-scale fires and features:** At ~750-m resolution, VIIRS-AF detects smaller and cooler fires than GOES. VIIRS-AF also detects gas flares.

## Limitations

**Obscuration:** Thin clouds and thick smoke may lower fire intensity values. Areas with thick clouds are masked by the internal cloud mask.

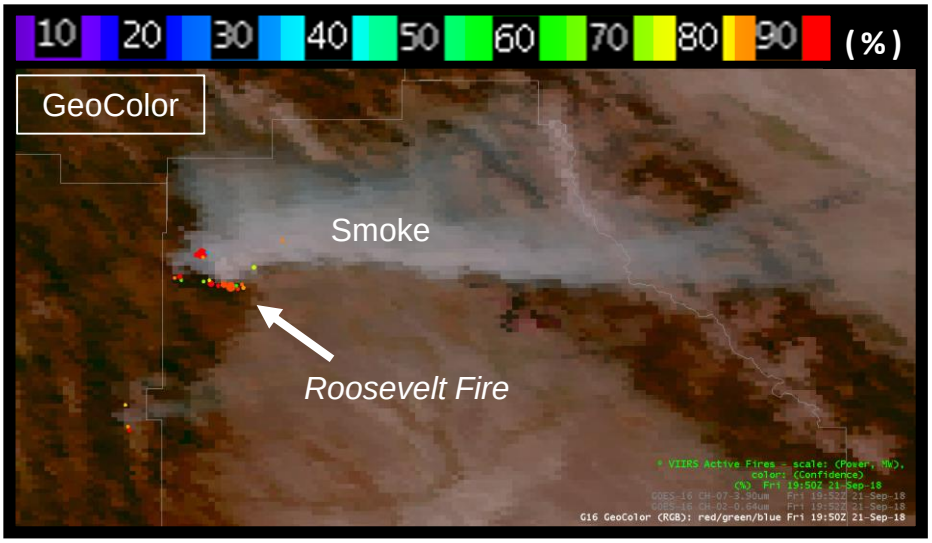
**False Alarms:** During the daytime, potential false alarms include reflected solar radiation from solar panels, hot and bright surfaces and cloud glint.

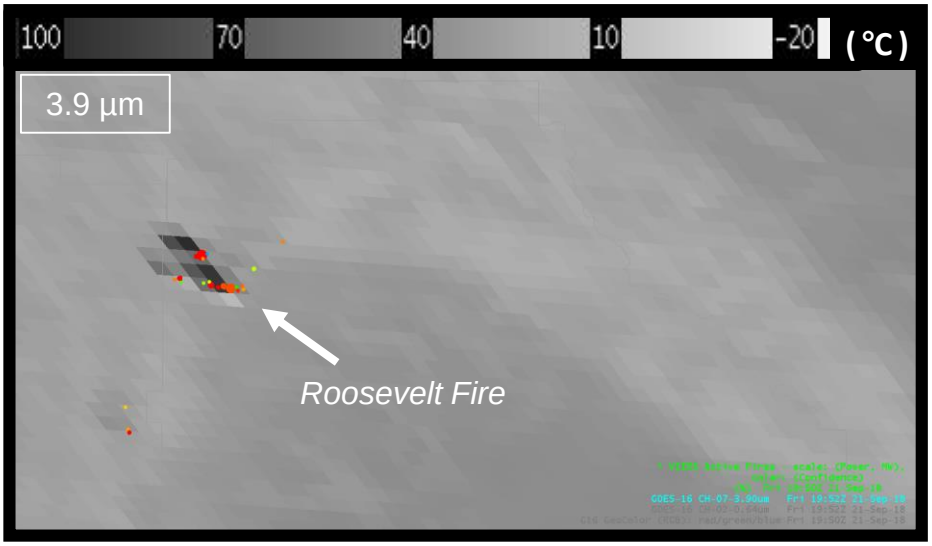
**Temporal Frequency:** The frequency of polar-orbiting data is at least 2 times per day, per satellite, unlike geostationary data which exhibit higher temporal resolution.

Contributors: Jorel Torres, Erin Dagg, Bernie Connell (CIRA), and I. Csiszar (NOAA/NESDIS)

# VIIRS Active Fire

# Quick Guide




## GOES-16 Imagery and VIIRS-AF

The GOES GeoColor (left top) and 3.9 µm image (left below) show the Roosevelt Fire, south of Jackson, WY at 19:50 UTC, 21 September 2018. VIIRS-AF is overlaid on each image, identifying fires and indicating their location and detection confidence. The Fire Confidence and FRP associated with the fires fall between 60-100% and 30-40 megawatts, respectively. GeoColor nicely shows the smoke extending from the point sources towards the east.

The 3.9 µm GOES imagery shows the contrast of the warmer fires (70-100°C) with the cooler background (~35°C), at a coarser spatial resolution (2-km) than VIIRS-AF (~750 m). GOES and VIIRS may differ in fire location due to differing spatial resolutions and satellite parallax effects between the 2 satellite platforms.

## Resources

**STAR JPSS Website**

VIIRS-AF Algorithm Theoretical Basis Document (ATBD)

**Hyperlinks not available when viewing material in AIR Tool**

## Fire Confidence

In the algorithm output, three fire pixel classes are designed to describe the 'fire confidence interval' (i.e. the confidence, expressed in %, that a fire exists within a pixel). Fire pixel classes are listed below. An example expressing 'Nominal Confidence' that a fire is detected, is seen to the right. Note VIIRS-AF is overlaid onto GeoColor imagery, where the size of the dot increases with increasing FRP.

- Low Confidence (0-29%)
- Nominal Confidence (30-79%)
- High Confidence (80-100%)