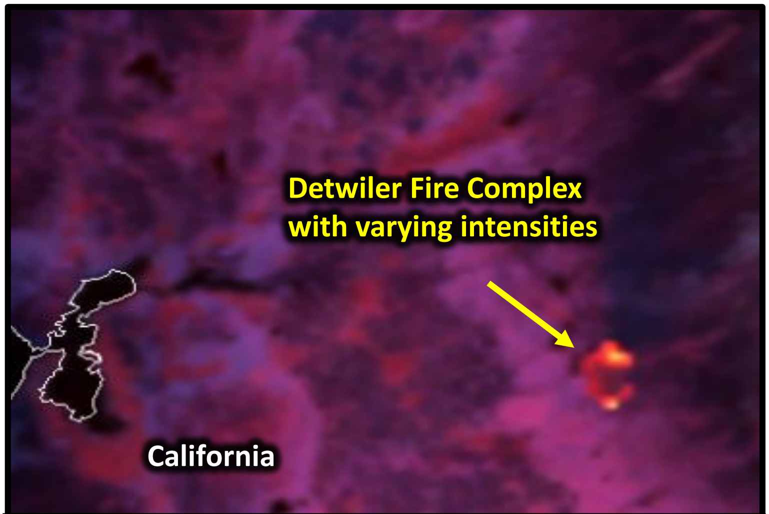
Fire Temperature RGB

Quick Guide

Why is the Fire Temperature RGB imagery Important?

This RGB allows the user to identify where the most intense fires are occurring and differentiate these from "cooler" fires. The RGB takes advantage of the fact that from 3.9 µm to shorter wavelengths, background solar radiation and surface reflectance increases. This means that fires need to be more intense in order to be detected by the 2.2 and 1.6 µm bands, as more intense fires emit more radiation at these wavelengths. Therefore, small/"cool" fires will only show up at 3.9 µm and appear red while increases in fire intensity cause greater contributions of the other channels resulting in white very intense fires.



Fire Temperature RGB from GOES-16 on 19 July 2017 at 1957 UTC

Fire Temperature RGB Recipe

Color	Band / Band Diff. (µm)	Min – Max Gamma	Physically Relates to…	Small contribution to pixel indicates…	Large Contribution to pixel indicates… (saturated)
Red	3.9	0 to 60 C 0.4	Cloud top phase and temperature	Cold land surfaces, water, snow, clouds	Hot land surface, (Low fire temperature)
Green	2.2	0 to 100 % 1	Particle size / land type	Large ice/water particles, snow, oceans	Small ice/water particles, (Medium fire temperature)
Blue	1.6	0 to 75 % 1	Particle size / land type	Ice clouds with large particles, snow, oceans	Water clouds, (High fire temperature)

Impact on Operations

Primary Application

Fire hotspot locations are detected: The saturation brightness temperature of the shortwave-IR 3.9 µm channel is low, around 500 K (i.e. relatively low intensity fire). Therefore, "hotspots" of wild fires look red in RGB.

Fire intensity can be analyzed: High intensity fires are near a maximum of 1400 K and this is near the peak emission detection (i.e. saturation) of the 1.6 µm channel. Therefore, active fires in the RGB transition from red to yellow to white as intensity increases and near-IR channels become saturated.

Limitations

Cloud cover blocks view of fire: The fires will only be visible in the RGB in clear sky areas.

Cloud features/type have less details: While water vs. ice clouds can be identified, other RGB products are better at displaying cloud features.

Daytime only application for clouds: The reflectance from clouds are not available at night in the near-IR bands used in the RGB.

False "red" fires due to land type: Some surfaces in arid, dry regions are highly emissive at 3.9 µm and will appear red but they are not on fire.

Contributor: NASA SPoRT https://weather.msfc.nasa.gov/sport/

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RGB Interpretation

1 **"Warm" Fire**
(red)

2 **"Very Warm" Fire**
(orange)

3 **"Hot" Fire**
(yellow)

4 **"Very Hot" Fire**
(near white)

5 **Burn Scars**
(shades of maroon)

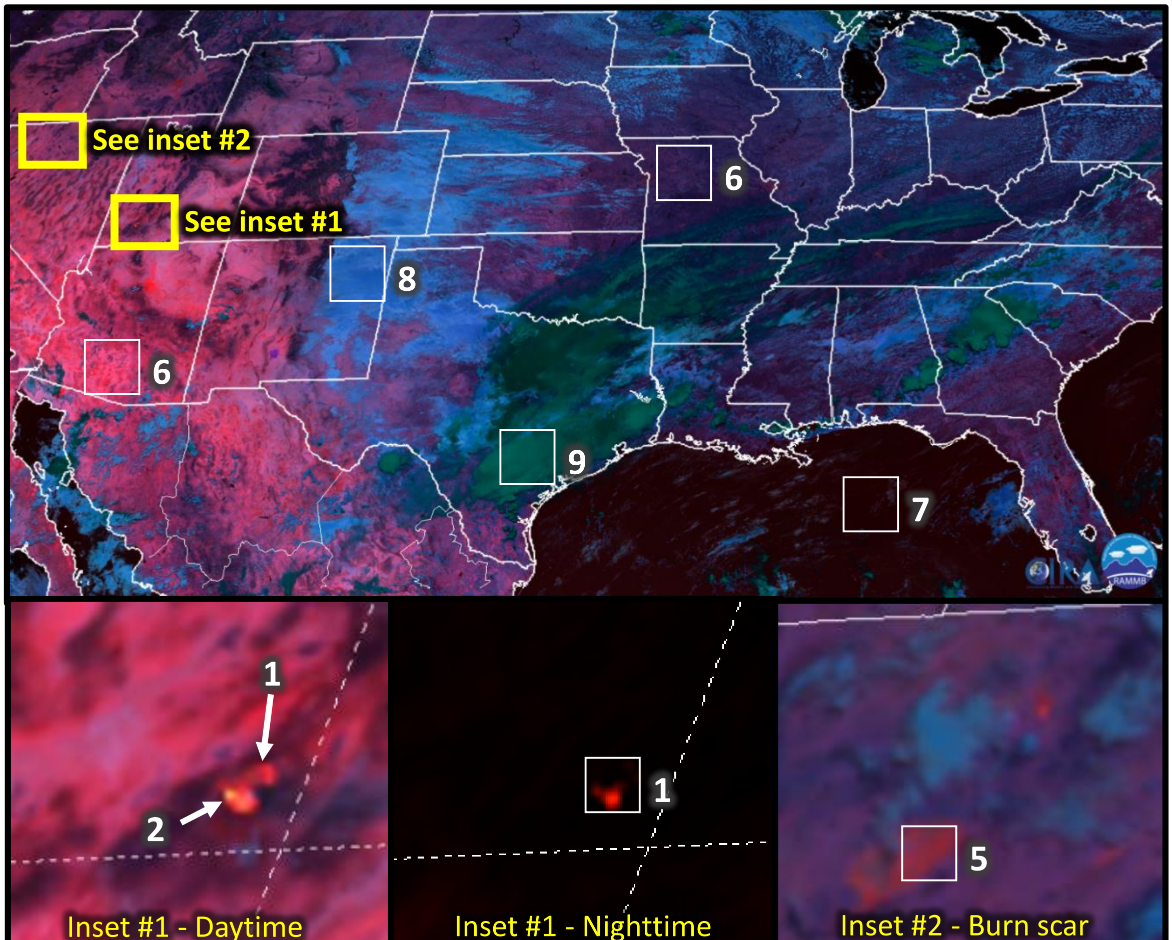
6 **Clear Sky: Land**
(purples to pinks)

7 **Clear Sky: Water/Snow/Night**
(near black)

8 **Water Clouds**
(shades of blue)

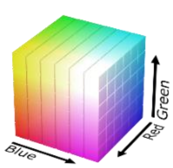
9 **Ice Clouds**
(shades of green)

Note: colors may vary diurnally, seasonally, and latitudinally



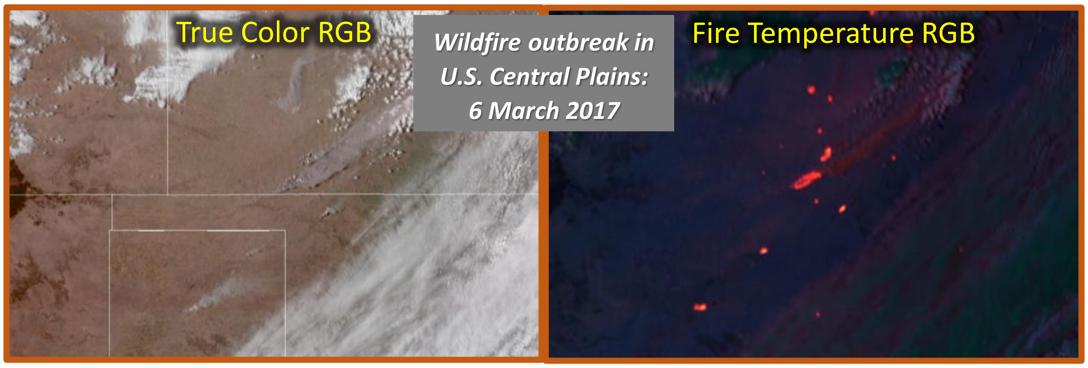
Fire Temperature RGB from GOES-16 AIB at 1807 UTC, 24 June 2017 (above). Inset #1 provides zoomed-in view of active fire at 1952 UTC over southwest Utah for both day (left) and night (center); Inset #2 is zoomed-in view over northern Nevada for 25 July 2017 showing a burn scar.

RGB Color Guide



Comparison to Other Products

The True Color RGB shows smoke from the fires, but does not distinguish the intensity like the Fire Temp. RGB. While missing the smoke, the Fire Temp. RGB provides insight to active fire location and behavior.



Resources

UCAR/COMET
Multispectral Satellite Applications: RGB Products Explained.

VISIT Program
Satellite Chat: Ft. McMurray Fires

CIRA Blog
"Fire" related posts

Hyperlinks not available when viewing material in AIR Tool