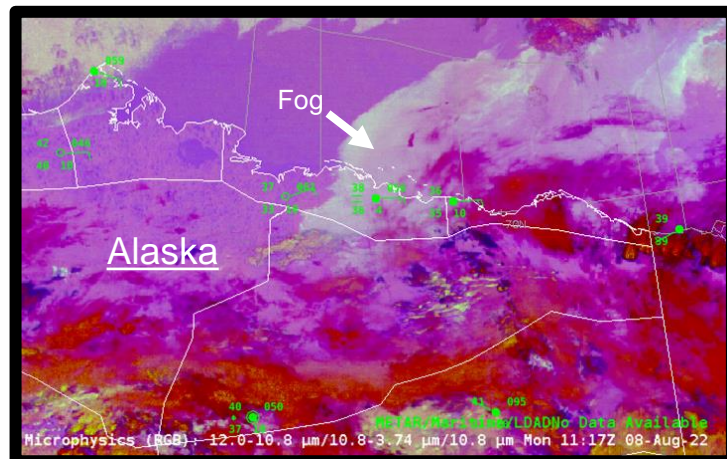


Why is the VIIRS Nighttime Microphysics RGB Important?

The RGB identifies a variety of cloud types throughout the atmosphere at a high spatial resolution of 750-m. The RGB incorporates the $10.8\mu\text{m} - 3.7\mu\text{m}$ channel difference to discriminate between water and ice clouds. Within the red spectra of the RGB, a $12.0\mu\text{m} - 10.8\mu\text{m}$ channel difference is employed to indicate cloud thickness. The multispectral RGB composite can also be utilized to identify other cloud types that are observed in the middle and upper parts of the atmosphere.



The VIIRS Nighttime Microphysics RGB captures fog over the northern Alaskan coastline on 8 August 2022.

VIIRS Nighttime Microphysics RGB Recipe

Color	Band (μm)	Min – Max Gamma	Physically Relates to...	<u>Small</u> contribution to pixel indicates...	<u>Large</u> Contribution to pixel indicates...
Red	(M16) 12.0 - (M15) 10.8	-6.7 – 2.6 ° C 1	Optical depth, temperature, clouds	Thin clouds	Thick Clouds
Green	(M15) 10.8 - (M12) 3.7	-3.1 – 5.2 ° C 1	Particle size and phase	Ice particles	Water clouds with small particles
Blue	(M15) 10.8	-29.6 – 19.5 ° C 1	Surface temperatures	Cold surface	Warm Surface

Impact on Operations

Primary Application

Fog & Low Clouds: With warm surface temperatures, low clouds and fog appear aqua (stronger blue contribution), while in areas with cooler surface temperatures they appear more yellow/gray (less contribution in the blue component). Note, fog tends to be less bright or near gray coloring compared to low clouds.

Efficient Cloud Analysis: The multi-channel approach of the RGB allows for discrimination of cloud types across the imagery.

Additional Applications: Determining cloud phase and relative cloud height, moisture boundaries, dust and temperature inversions and the identification of fire hotspots.

Limitations

Nighttime Only: The $3.7\mu\text{m}$ is affected by solar reflectance during the daytime which impacts the $10.8 - 3.7\mu\text{m}$ brightness temperature difference.

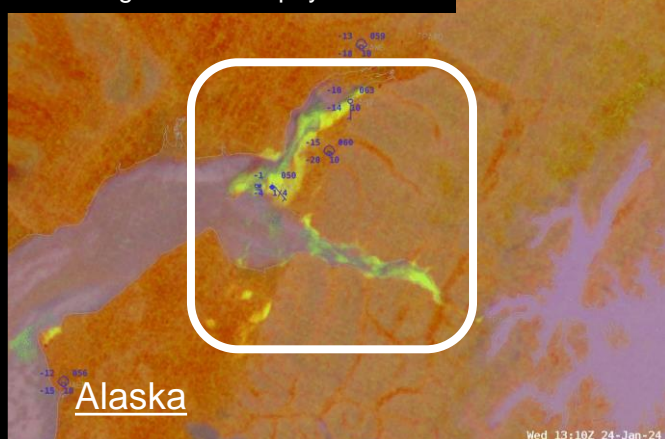
Variable land surface colors: In cloud free regions, surfaces will vary in color and depend on air temperature, surface type and moisture characteristics.

Anomalous noise in the Infrared: In very cold clouds (i.e., $<-30^\circ\text{C}$), speckled yellow pixels may appear.

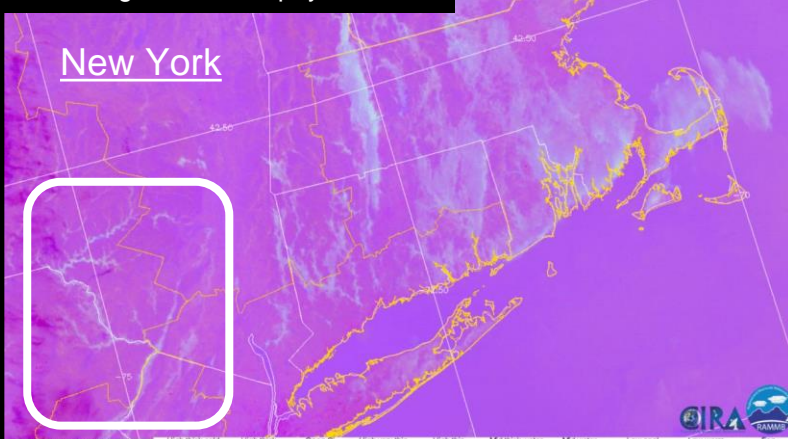
Timeliness: VIIRS overpasses over CONUS are observed at least once per night, per satellite, typically between ~05Z to 12Z. VIIRS coverage is more frequent in northern latitudes, like Alaska, with 2-4 passes per night for each satellite.

Thin Fog: thin fog is semi-transparent which allows surface emissions to impact pixel color, resulting in a less blue color compared to low clouds.

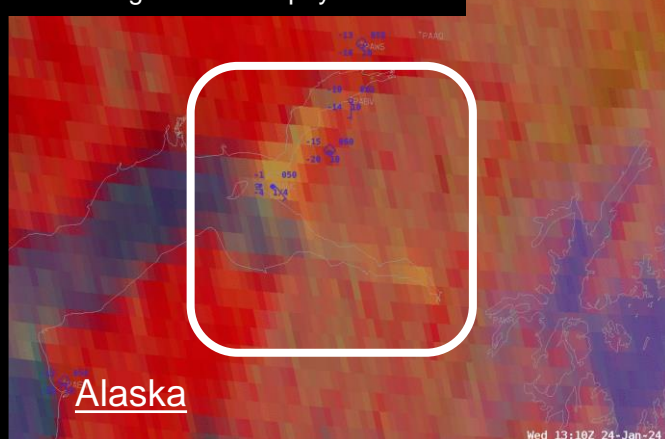
VIIRS Nighttime Microphysics RGB



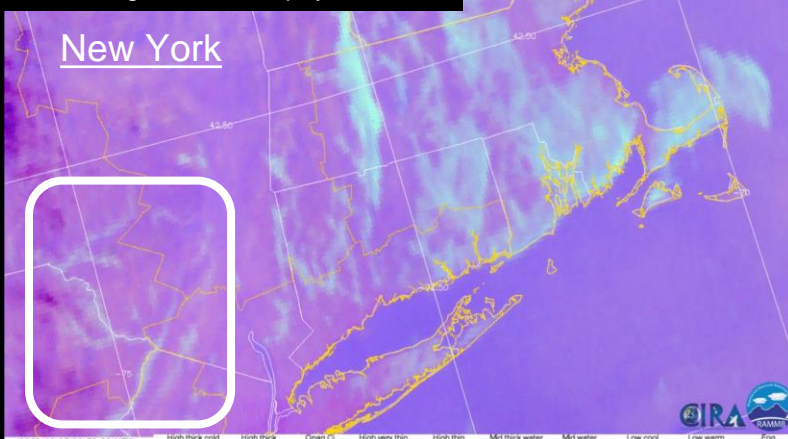
VIIRS Nighttime Microphysics RGB



GOES Nighttime Microphysics RGB

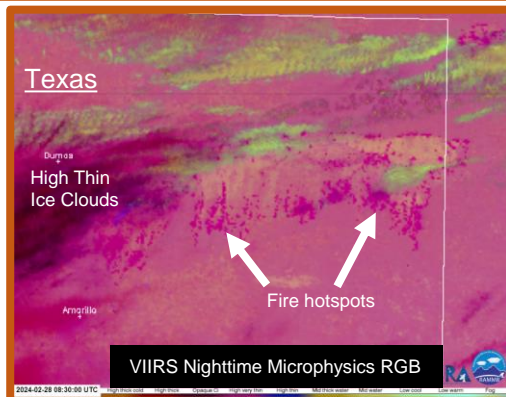
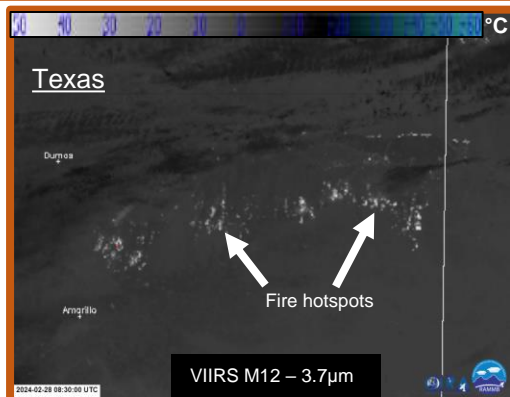


GOES Nighttime Microphysics RGB



Fog events over Alaska (images on left) and over the northeast U.S. (images on right) are captured by JPSS VIIRS and GOES ABI Nighttime Microphysics RGBs. White box insets highlight the fog and low clouds from both satellites. The GOES RGB imagery exhibits a coarser spatial resolution (2-km) compared to VIIRS (750-m), where the GOES pixel size increases significantly over the high latitudes (e.g., see Alaska example). Note, with warm surface temperatures, low clouds and fog appear aqua, while in areas with cooler surface temperatures they appear more yellow/gray.

Fire Detection: The RGB can observe fires at night as the green spectra of the RGB employs a brightness temperature difference that includes the 3.7 μ m. The RGB and the 3.7 μ m detect fire hotspots from the Smokehouse Creek Fire (see below). White pixels in the 3.7 μ m, and corresponding dark pink pixels in the RGB depict the fires in the imagery.



Resources

Satellite Liaison Blog

[Viewing VIIRS Imagery over CONUS](#)

CIRA SLIDER - JPSS Sectors

[Northern Hemisphere](#), [Southern Hemisphere](#), and [CONUS](#).

GOES Nighttime Microphysics RGB

[Quick Guide](#) & [Quick Brief](#)

GINA

[Near-Real-Time Data Online](#)

Hyperlinks not available when viewing material in AIR Tool