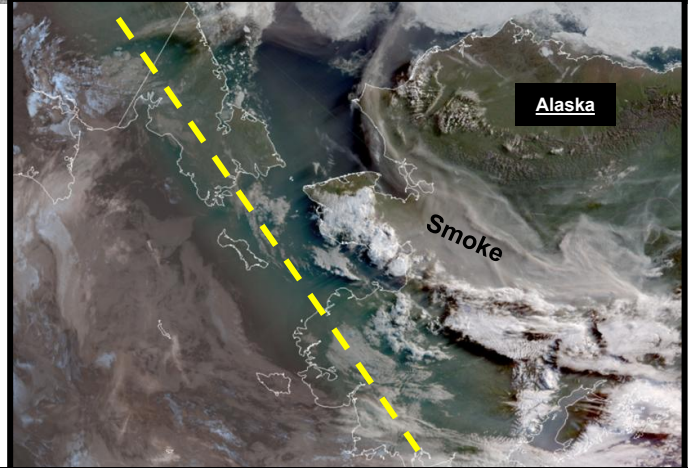


### Why is the VIIRS GeoColor Important?

The multi-spectral product incorporates the VIIRS True Color RGB recipe that provides an intuitive interpretation of surface and atmospheric features during the day. At night, the VIIRS GeoColor blends a high cloud mask, low cloud mask and the VIIRS Day/Night Band (DNB), which is scaled to highlight emitted light sources. The product is excellent for daytime aerosol detection, vegetation changes, and sediment monitoring in water bodies, as well as nighttime cloud detection, with the DNB also providing georeferencing capabilities (e.g., power outages). Phytoplankton blooms can also be identified in the imagery.



At 1426 UTC, 5 July 2025, the VIIRS GeoColor shows swaths of smoke over the Alaskan Interior, with the day/night terminator (dashed yellow line) visible across the region.

### VIIRS GeoColor Algorithm and Specifications

Algorithm Makeup	Resolutions and Latency
<p><b>Daytime Channels:</b> M03 (0.49 <math>\mu\text{m}</math>), M04 (0.55 <math>\mu\text{m}</math>), and M05 (0.67 <math>\mu\text{m}</math>) are utilized and corrected for Rayleigh scattering which maximizes the contrast between clear sky and clouds, resulting in vibrant and distinguishable colors.</p> <p><b>Nighttime Channels:</b> High clouds are identified in grayscale using the longwave infrared M15 (10.7 <math>\mu\text{m}</math>), while the brightness temperature difference, M15 - M12 (3.7 <math>\mu\text{m}</math>), is used to highlight low clouds in blue. The resultant imagery is then made partially transparent and placed atop a dynamic city lights background, provided by the DNB (0.7 <math>\mu\text{m}</math>). The DNB may also show the aurora and fires in bright yellow.</p>	<p><b>Spatial:</b> 750-m</p> <p><b>Temporal:</b> 1-2 times per day and night, per satellite. More frequent overpasses over high latitudes.</p> <p><b>Latency:</b> ~15-30 min via Direct Broadcast (DB)</p>

### Impact on Operations

**Daytime Aerosol Detection:** Identifies smoke, blowing dust, smog, haze, and other aerosols in the atmosphere.

**Nighttime Cloud Detection:** Differentiates low liquid water clouds from higher ice clouds at night.

**Nighttime Emitted/Reflected Lights:** Emitted city lights aid georeferencing by helping determine whether features (e.g., clouds) are impacting populated areas. Other emitted light sources (e.g., fires, aurora, lightning) may be seen at night due to the use of real time DNB data. The reduction of emitted city lights from power outages can also be identified. Note, dynamic city lights from the DNB is an improvement over the GOES GeoColor which uses a static city lights database, where non-city light sources are not observed in the imagery.

**VIIRS Green Channel:** VIIRS more accurately represents True Color RGB imagery during the day, as the instrument contains a green visible band at 0.55  $\mu\text{m}$ . GOES ABI does not have the 0.55  $\mu\text{m}$ , and a synthetic green band must be created to simulate True Color imagery for ABI.

### Limitations

**Thick Clouds at Night:** The nighttime cloud layer is made partially transparent, and the amount of opacity is a function of the cloud top temperature. Sometimes optically thick low-level clouds, including precipitating convection, may show up as being partially transparent.

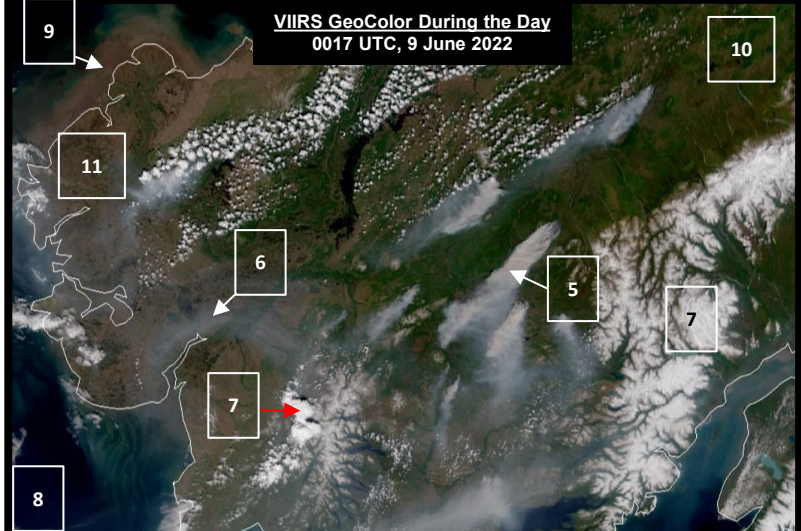
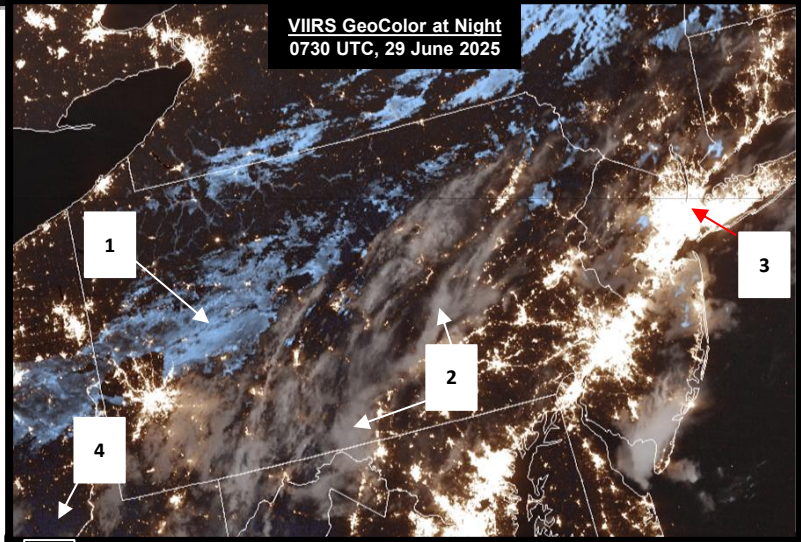
**Low Cloud Layer:** The low cloud layer is based on the M15-M12 brightness temperature difference. Surface emissivity differences between these two bands and low level temperature and humidity profiles may lead to false low clouds. In the high latitudes during the winter, very cold surfaces may cause low clouds to be detected by the high cloud mask and will not appear blue.

**Lunar Cycle:** The product will look different across the lunar cycle as the moonlight reflection contribution changes with moon phase, in turn, changing the appearance of the surface and atmospheric features. Cities and other surface lights will appear dramatically different between full moon and new moon.

**Sunrise/Sunset:** Near sunrise and sunset, the daytime and nighttime portions are blended, which may cause certain clouds (i.e., the blue low clouds) to briefly change colors or disappear.

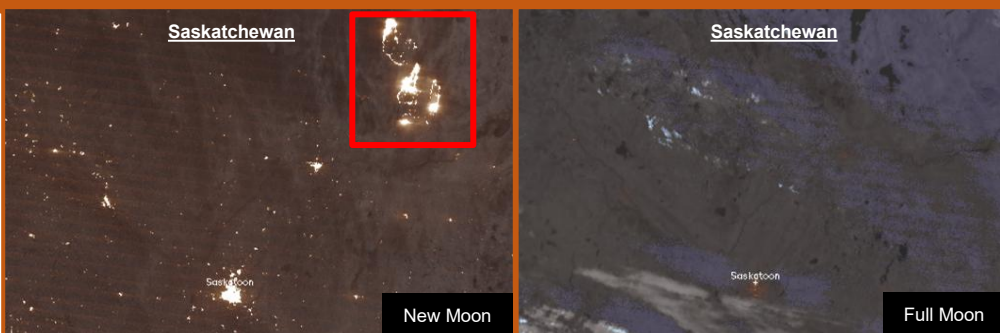
## RGB Interpretation

Night	1	Low-Level Water Clouds <i>(light blue)</i>
	2	Mid-Level and Cirrus Clouds <i>(grayish white)</i>
	3	City/Emitted Lights (from Day-Night Band) <i>(golden-white)</i>
	4	Clear Sky Land at Night <i>(dark brown, black)</i>
Day	5	Thick Smoke/Dust <i>(dark gray/tan)</i>
	6	Thin Smoke <i>(bluish gray)</i>
	7	High Thick Clouds or Snow/Ice <i>(bright white)</i>
	8	Ocean Surface <i>(shades of blue)</i>
	9	Water with Sediment <i>(green-brown)</i>
	10	Vegetation/Forest <i>(shades of green)</i>
	11	Dry Land/Desert <i>(shades of brown)</i>



Top: VIIRS GeoColor product at night over the northeast U.S.  
Bottom: Daytime observations of fires and smoke over southwestern Alaska.

**Lunar Cycle Impacts on the Imagery:** A VIIRS GeoColor new moon (26 May 2025) versus full moon (11 June 2025) comparison over Saskatchewan. The appearance of atmospheric and surface features in the imagery will vary significantly due to the moonlight reflection contribution changes that are dependent on the lunar cycle. Surface light emissions will appear more distinct with higher contrast when there is less moonlight. Since the product utilizes the DNB, emitted lights produced from the wildfires over Saskatchewan are also seen in the imagery (i.e., red box).



## Resources

### Satellite Blogs

[Viewing VIIRS Imagery over CONUS Fires Near the Hottest City in the Arctic](#)

### CIRA SLIDER - JPSS Sectors

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

### CIRA VISIT - Quick Guides

[GOES GeoColor](#), [VIIRS True Color RGB](#)

### FDTD Webinar

[GOES GeoColor Applications: Smoke and Dust Identification](#)

**Journal of Atmospheric and Oceanic Technology**  
[GeoColor: A Blending Technique for Satellite Imagery](#)