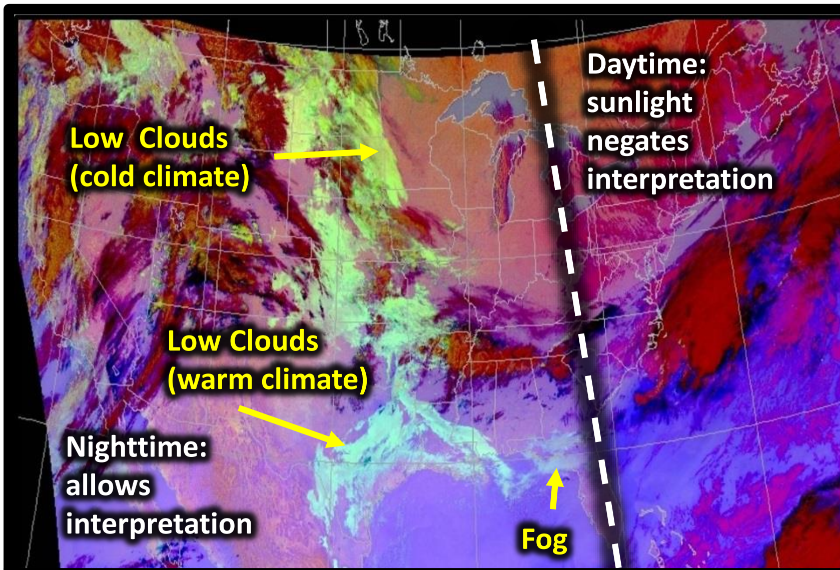
Nighttime Microphysics RGB

Quick Guide

Why is the Nighttime Microphysics RGB Imagery Important?

The distinction between low clouds and fog in satellite imagery is often a challenge. While the difference in the 10.4 and 3.9 µm channels has been a regularly applied product to meet aviation forecast needs, the Nighttime Microphysics (NtMicro) RGB adds another channel difference (12.4- 10.4 µm) as a proxy to cloud thickness and repeats the use of the 10.4 µm thermal channel to enhance areas of warm (i.e. low) clouds where fog is more likely. The NtMicro RGB is also an efficient tool to quickly identify other cloud types in the mid and upper atmosphere.



NtMicro RGB from GOES-16 on 22 March 2017 at 1207 UTC

NtMicro RGB Recipe

(Note: this applies best to opaque clouds. Semi-transparent clouds are influenced by underlying surface)

Color	Band / Band Diff. (µm)	Min – Max Gamma	Physically Relates to...	Small contribution to pixel indicates...	Large Contribution to pixel indicates...
Red	12.4 – 10.4	-6.7 – 2.6 C 1	Optical Depth	Thin clouds	Thick clouds
Green	10.4 – 3.9	-3.1 – 5.2 C 1	Particle Phase and Size	Ice particles; surface (cloud free)	Water clouds with small particles
Blue	10.4	-29.6 – 19.5 C 1	Temperature of surface	Cold Surface	Warm surface

Impact on Operations

Primary Application

Low clouds & fog analysis: Low clouds and fog are aqua in warm regimes, but become more yellow to light green in cold regimes (i.e. decrease in blue component).

Differentiate fog from low clouds: Fog tends to appear "washed out" compared to low clouds. So, look for fog to have a less bright or near gray coloring.

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

Secondary Applications: Cloud height and phase, fire hot spots, moisture boundaries

Limitations

Nighttime only application: The shortwave IR band is impacted by solar reflectance during the day which impacts the 10.4 – 3.9 difference relationship.

Thin fog blends with surface: Thin radiation fog is semi-transparent allowing surface emissions to impact pixel color. Fog often has less blue than low clouds.

Variable land/surface coloring: The color of cloud free regions will vary depending on their temperature, surface type, and the column moisture.

Shortwave IR noise in extreme cold: Speckled yellow pixels appear in very cold clouds (~<-30°C)

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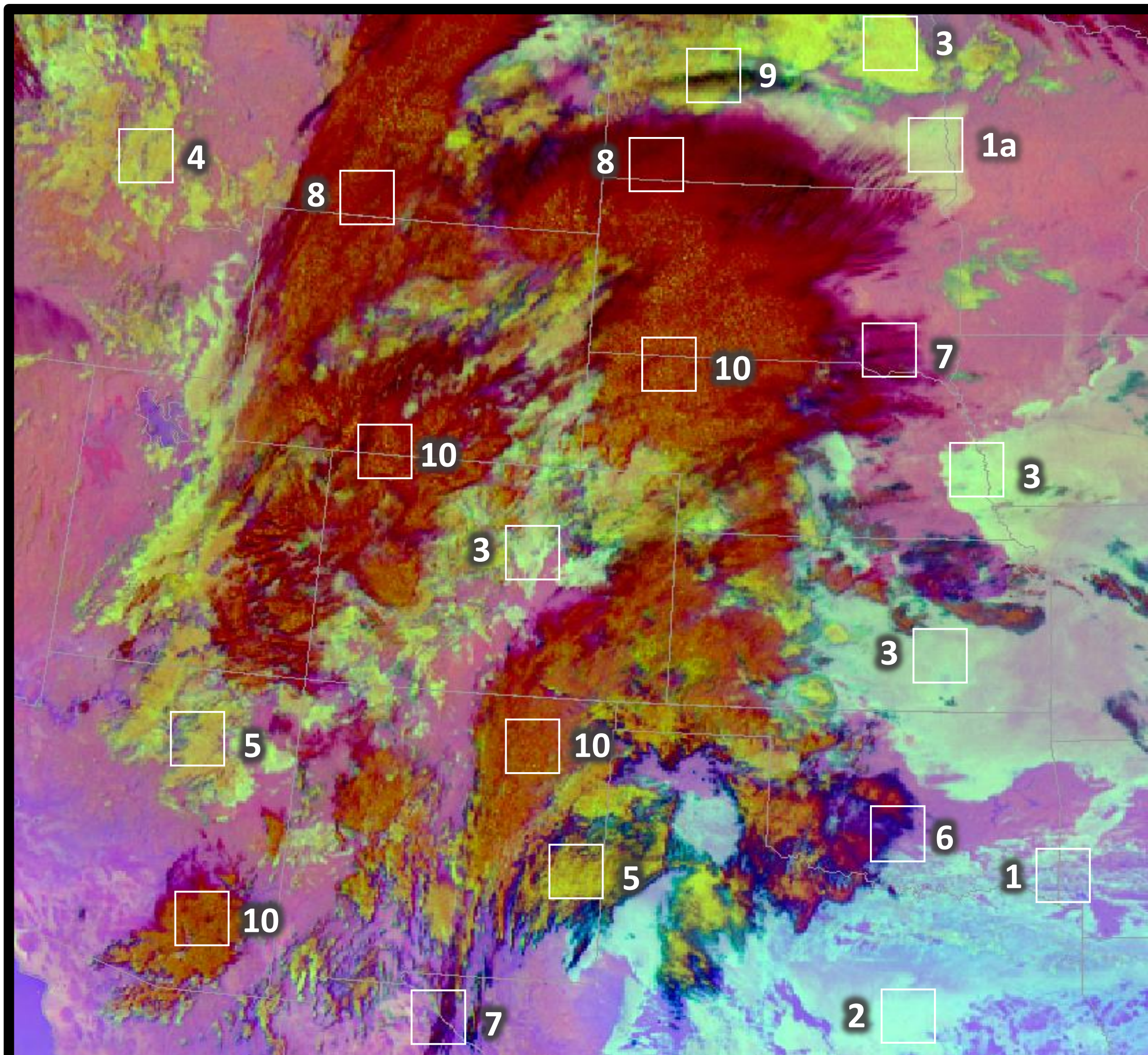
RGB Interpretation

- **1** — **Fog** *(dull aqua to gray)*
- **1a** — **Fog – cold regime** *(dull yellow-green to gray)*
- **2** — **Very low, warm cloud** *(aqua)*
- **3** — **Low, cool, cloud** *(bright green)*
- **4** — **Mid water cloud** *(light green)*
- **5** — **Mid, thick, water/ ice cloud** *(tan)*
- **6** — **High, thin, ice cloud** *(dark blue)*
- **7** — **High, very thin, ice cloud** *(purple)*
- **8** — **High, thick cloud** *(dark red)*
- **9** — **High, opaque cirrus cloud** *(near black)*
- **10** — **High, thick, very cold cloud** *(red/yellow, noisy)*

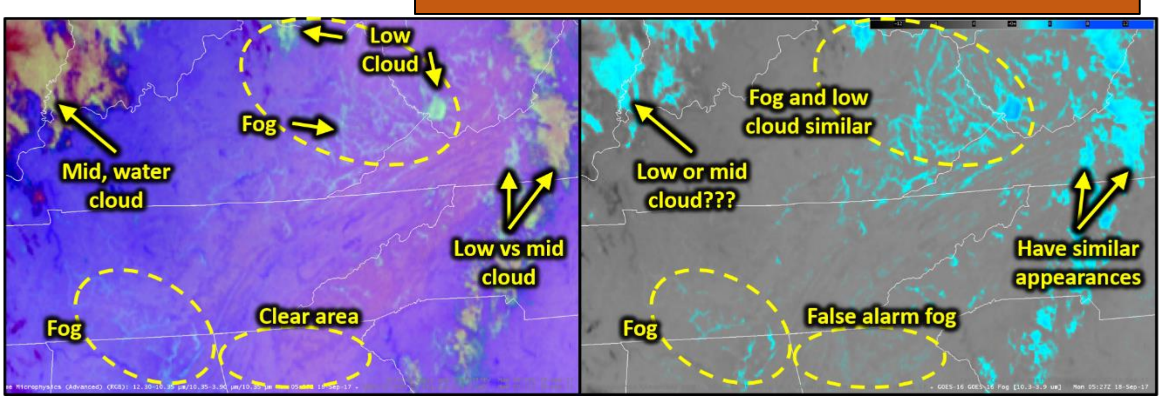
Note:, colors may vary diurnally, seasonally, and latitudinally



NtMicro RGB from GOES-16 ABI at 1127 UTC, 28 March 2017.

Comparison to Other Products (below)

The NtMicro RGB (left) helps to distinguish fog from clouds and "false alarm" features seen in the legacy "Fog" or 10.3-3.9 µm channel difference (right). Recall the 10.3-3.9 µm is also in the RGB.



Resources

UCAR/COMET
Multispectral Satellite Applications: RGB Products Explained

NASA/SPoRT
Nighttime Microphysics RGB Module

EUMETrain
RGB Interpretation Guide

Hyperlinks not available when viewing material in AIR Tool