RGB Night-Time Microphysics Quick Guide by NASA / SPoRT

Why is the Night-time Microphysics RGB Imagery Important?

The distinction between low clouds and fog is often a challenge. While the difference in the 10.8 and 3.9 channels has been a regularly applied product to meet this challenge, the Night-time Microphysics RGB adds another channel difference to indicate cloud thickness and repeats the use of the 10.8 thermal channel to enhance areas of warm clouds where fog is more likely. Other applications include analysis of cirrus and contrail clouds, fire hot spots, and snow.

RGB Night-time Microphysics Product - What is used in the combine and what does each color represent?

Color	Band / Band Diff.	Physically Relates to….	Little contribution to composite indicates…..	Large contribution to composite indicates …..
Red	12.0 – 10.8	Optical Depth	Thin clouds	Thick clouds
Green	10.8 – 3.9	Particle Phase and Size	ice particles; surface (i.e. cloud free)	Water clouds with small particles
Blue	10.8	Temperature of surface	Cold surface	Warm surface

What should I be looking for in the imagery?

Fog and low clouds in warm climates tend to have aqua or light blue areas in the RGB. This appears very light green in colder climates because the 10.8 thermal channel used for the blue band contributes less.

Low clouds, warm climate	Low clouds, cold climate

In general, areas of fog and low clouds in the standard 10.8-3.9 difference product will look similar to the aqua blue areas in the RGB. However, the RGB and 10.8-3.9 product will differ in some cases, such as when clouds are above the surface (see 2011, November 11 example). These low clouds above the surface appear in shades of tan and light green as they are higher and tend to be colder, which means less blue coloring. Mid-level cloud colors lean toward green (thin, less red) to light brown (thick, more red).

For fog and low clouds the thickness may vary, therefore the RGB green and red contributions also vary. Thick cloud or fog that extends above the surface may have nearly equal amounts of red and blue contributions with large amounts of green in the RGB. This combination produces the aqua color as we might expect for low clouds or fog in warm climates.

However, relatively thin fog near the surface tends to have less green and red contributions, and the resulting RGB color in these areas can appear to have more of a purple coloring with hints of the light blue and aqua areas mixed together (see 2012, March 25 example).

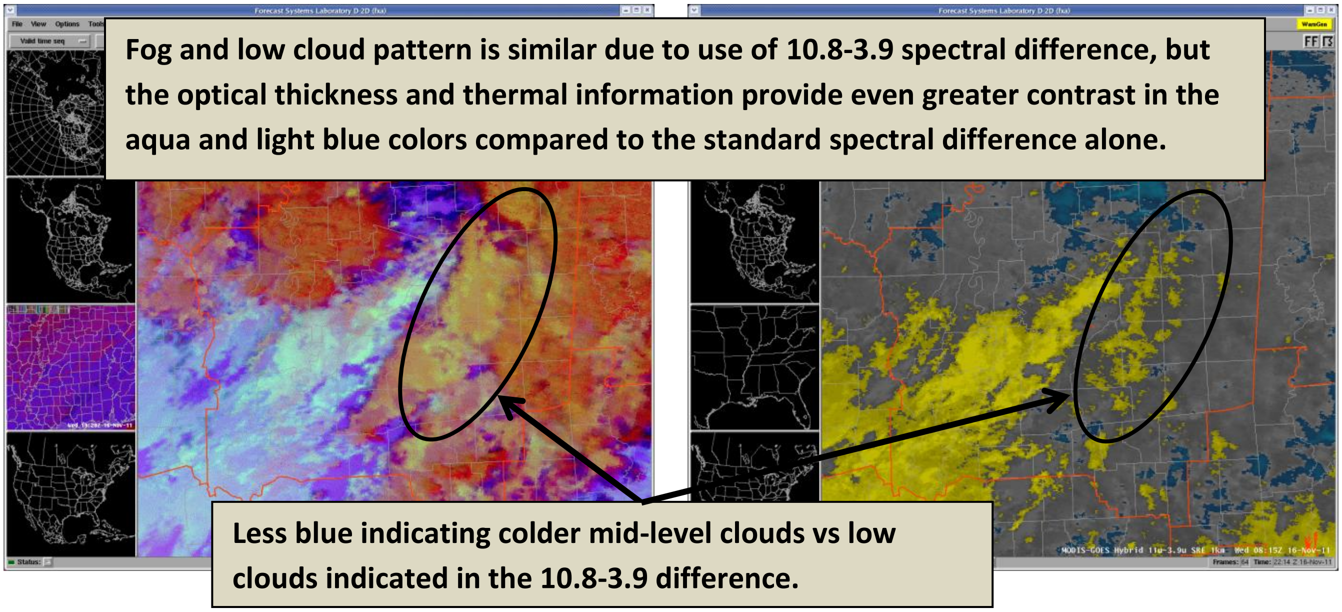
Fog at surface, warm climate	Fog at surface, cold climate

Essentially, there is slightly more blue (temperature) than red (thickness), but of most significance is that the green has been reduced because the 3.9 channel is seeing some emissions from not only the thin fog but the surface as well. Hence the 3.9 channel is warmer and the difference from the 10.8 is less in this near surface fog event, resulting in less green-coloring. This change in green helps to distinguish fog from low clouds.

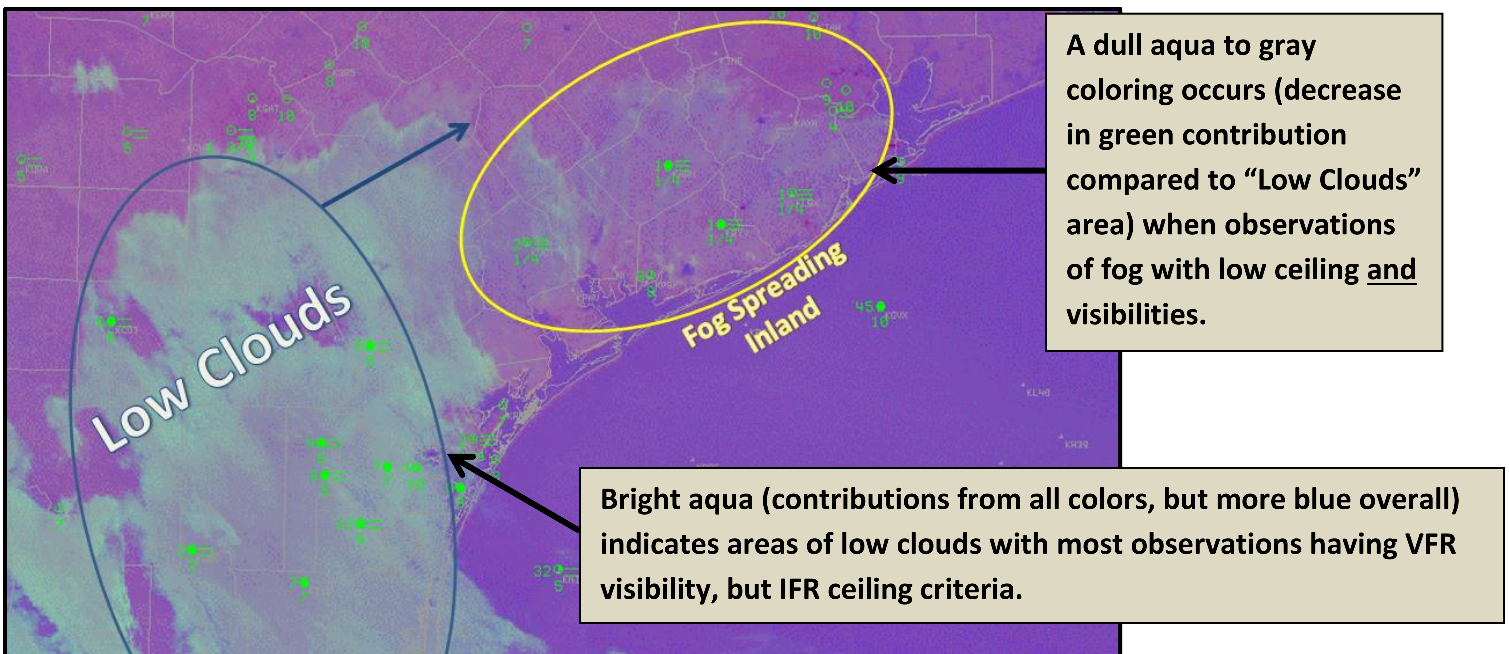
What are the things to watch out for?

The 3.9 channel is subject to noise at very cold temperatures. Fog at high latitudes in winter may have noise in the pixels representing fog. Similarly, the depiction of very high, cold clouds (i.e. cumulonimbus tops) will have yellow pixels mixed in areas of dark red for this RGB due to the 3.9 channel noise at such temperatures.

Example RGB Night-Time Microphysics Imagery from MODIS – 2011, November 11



Example RGB Night-Time Microphysics Imagery from MODIS – 2012, March 25



This image is an example submitted by the Corpus Christi, TX WFO. The RGB shows fog in a dull aqua to gray coloring affecting the Gulf Coast near Victoria and Port Lavaca, extending to areas just southwest of Houston. Low clouds in aqua are seen surrounding Corpus Christi and to the west.

Resources:

This guide provides a highlight of the Night-time Microphysics RGB product as quick reference. Operational applications of RGB imagery can be seen on SPoRT's blog site (http://nasasport.wordpress.com/). A primer of the RGB imagery concept can be found at the UCAR/COMET MetEd website (https://www.meted.ucar.edu).More in depth information can be found at EUMETRAIN's website (http://eumetrain.org/).

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