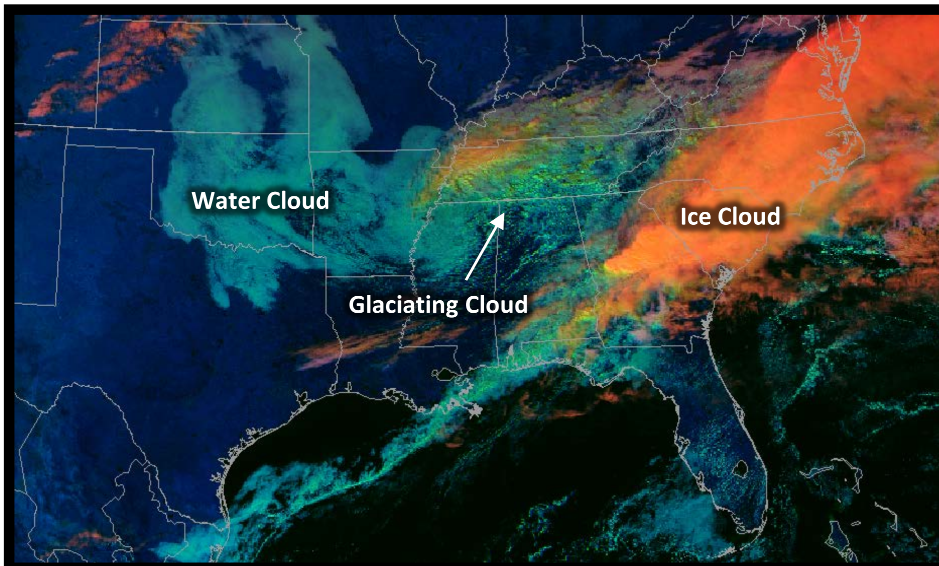
Day Cloud Phase Distinction RGB

* Interpretation still under investigation

Quick Guide

Why is the Day Cloud Phase Distinction RGB Important?

This RGB is used to evaluate the phase of cooling cloud tops to monitor convective initiation, storm growth, and decay. It can also be used to identify snow on the ground. The Day Cloud Phase Distinction RGB takes advantage of cloud reflectance differences between the visible and near infrared channels and temperature variances between land and clouds in the infrared to provide increased contrast between background surfaces and phases of clouds (i.e. water vs. ice).



Day Cloud Phase Distinction RGB from GOES-16 ABI at 1912 UTC, 20 Dec 2017

Day Cloud Phase Distinction RGB Recipe

Color	Band (µm)	Min to Max Gamma	Physically Relates to…	<u>Small</u> contribution to pixel indicates…	<u>Large</u> Contribution to pixel indicates…
Red	10.3 (Ch. 13)	7.5 to -53.5 °C 1	Surface or cloud top temperature	Warm: land (seasonal), ocean	Cold: land (winter), snow, high clouds
Green	0.64 (Ch. 2)	0 to 78 % albedo 1	Reflectance of clouds and surfaces	Water, vegetation, land	Cloud, snow, white sand
Blue	1.6 (Ch. 5)	1 to 59 % albedo 1	Reflectance, particle phase	Ice particles	Water particles, land surface

Impact on Operations

<u>Primary Application</u>

Convective initiation: Used to monitor when clouds are breaking the stable capping layer. Cumulus transitioning from light shades to bolder green and yellow shades indicates vertical development and increasing cloud ice seen with strong storms. Signs of updrafts and overshooting tops help to evaluate how a storm is evolving.

Snow squalls: Preliminary comparisons with radar indicate glaciated cloud bands are associated with heavy precipitation snow events.

Limitations

Daytime only application: The 0.64 µm (VIS) and 1.6 µm (NIR) bands rely on reflected visible solar radiation.

Solar angle and limb effect: For low solar angles (i.e. sunrise and sunset, and during winter) the reflectance values of the VIS and NIR (green and blue components) are decreased. For cold winter scenes and also for viewing at high latitudes (limb cooling effect) the 10.35 µm IR (red component) is skewed towards cold temperatures. Both these effects result in a "reddish" scene.

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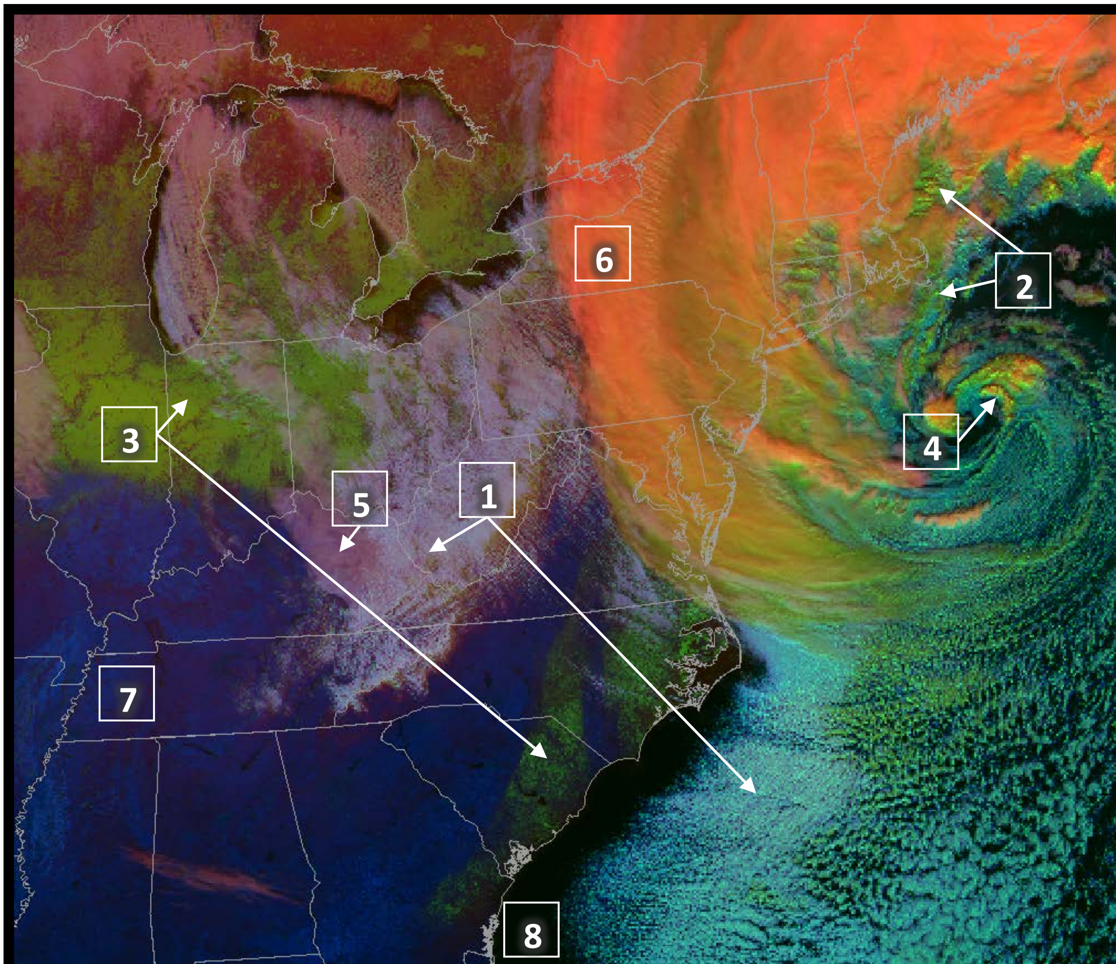
RGB Interpretation

1. **Low level clouds with water droplets** *(cyan, lavender)*
2. **Glaciating clouds** *(green)*
3. **Snow** *(shades of green)*
4. **Thick high level clouds with ice particles** *(yellow)*
5. **Thin mid level clouds with water droplets** *(magenta)*
6. **Thin high-level clouds with ice particles** *(red-orange)*
7. **Land surface** *(shades of blue)*
8. **Water surface** *(black)*

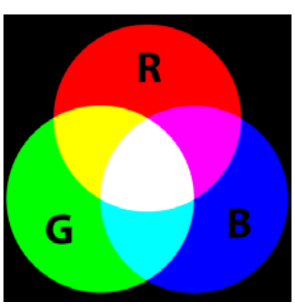


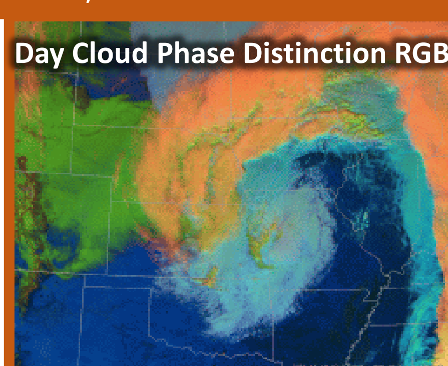
Day Cloud Phase Distinction RGB from GOES-16 ABI at 1735 UTC, 04 January 2018.

Note: colors may vary diurnally, seasonally, and by latitude. Since the 10.35 µm IR band is one of the RGB components, the color of a particular feature will vary seasonally, particularly for warm/cold surface temperatures and thin cloud features. The JMA developer identifies thin high level cloud as magenta whereas in the image above, a similar color cloud presents as a mid level cloud (5). In an animation, the long dark magenta colored feature in central Alabama is thin high level ice cloud (cirrus).

Comparison to visible imagery: The Day Cloud Phase Distinction RGB is beneficial for observing rapidly developing cumulus. Compared to traditional visible imagery, it provides greater contrast for distinguishing between ice and water clouds and background features. Imagery from https://satelliteliaisonblog.com/2018/01/21/storm-system-brings-snow-severe-weather-and-blowing-dust-to-central-us/

RGB Color Guide





Note: This RGB composite was developed by the Japan Meteorological Agency (JMA) for Himawari-8. Interpretation is still under investigation.