Snow/Cloud Discriminator

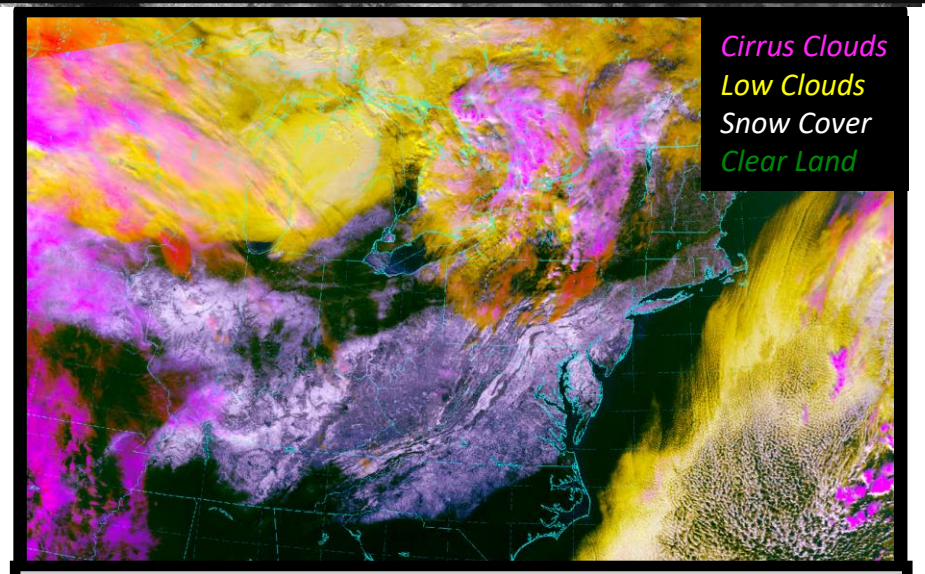
Quick Guide

Why is the Snow/Cloud Discriminator Important?

The Snow/Cloud Discriminator combines information from 10 different bands on VIIRS (6 during the day and 4 at night) to help distinguish clouds from snow and ice. Unlike other RGBs for snow and cloud discrimination, which only work during the day, the Snow/ Cloud Discriminator utilizes the Day/Night Band (DNB) so it works around the clock. This is particularly useful during those long winter nights.

Daytime bands: 0.48, 0.67, 1.38, 1.61, 2.25, 10.7 µm.

Nighttime bands: DNB, 3.7, 8.6, 10.7 µm.



Daytime image of the Snow/Cloud Discriminator from S-NPP VIIRS over the mid-atlantic states at 1808 UTC, 24 January, 2016

Snow/Cloud Discriminator comprised of Day and Night Algorithms

Day	The daytime algorithm uses combinations of reflective and infrared bands on VIIRS, that includes a cloud mask from the 1.38 µm channel, and a normalized difference snow index (NDSI). The blue (B) color comes from scaled combinations of 0.67 µm, 1.38 µm, 2.25 µm, and NDSI. Green (G) is a combination of 0.48 µm and 1.38 µm. Red(R) is a scaled combination of 0.48 µm, 1.38 µm and 10.7 µm. Snow is highlighted in all three colors (white), low liquid clouds contribute to R and G (yellow), high clouds appear in B and R (pink).
Night	At night, we lose information from the visible and near-infrared bands on VIIRS, and replace them with the DNB and longwave IR bands scaled to produce similar colors. The 10.7-3.7 µm brightness temperature difference (BTD) is used to identify high/thin clouds. High/mid thick clouds utilize the 10.7 µm brightness temperature (BT). To identify low water clouds, the 10.7-8.55 µm BTD is applied. Anything bright in the DNB not identified as clouds in these tests is assumed to be snow/ice.

Impact on Operations

Primary Application

Snow/Ice at Night: The Day/Night Band helps identify snow and ice at night, which is difficult to do using traditional IR methods. Most other snow RGBs only work during the daytime.

Low Clouds and Fog: Low clouds appear yellow, making them easy to distinguish from the white snow. Low clouds can be easily discerned over marine areas as well.

Cloud Layers: High clouds appear pink/magenta and mid-level clouds appear orange, making it easy to identify different layers of clouds.

Limitations

Missing Moonlight: The signal from the Day/Night Band at night is very weak without moonlight available, making the images noisy and snow difficult to detect.

Cold Valleys and Inversions: Very cold valleys and other cold (< -30 °F) land surfaces at night may falsely be colored pink like high clouds.

Other False Flags: Under certain conditions, high clouds at night may appear white like snow, or ice may appear yellow like low clouds. Sometimes, there just isn't enough signal to distinguish between them.

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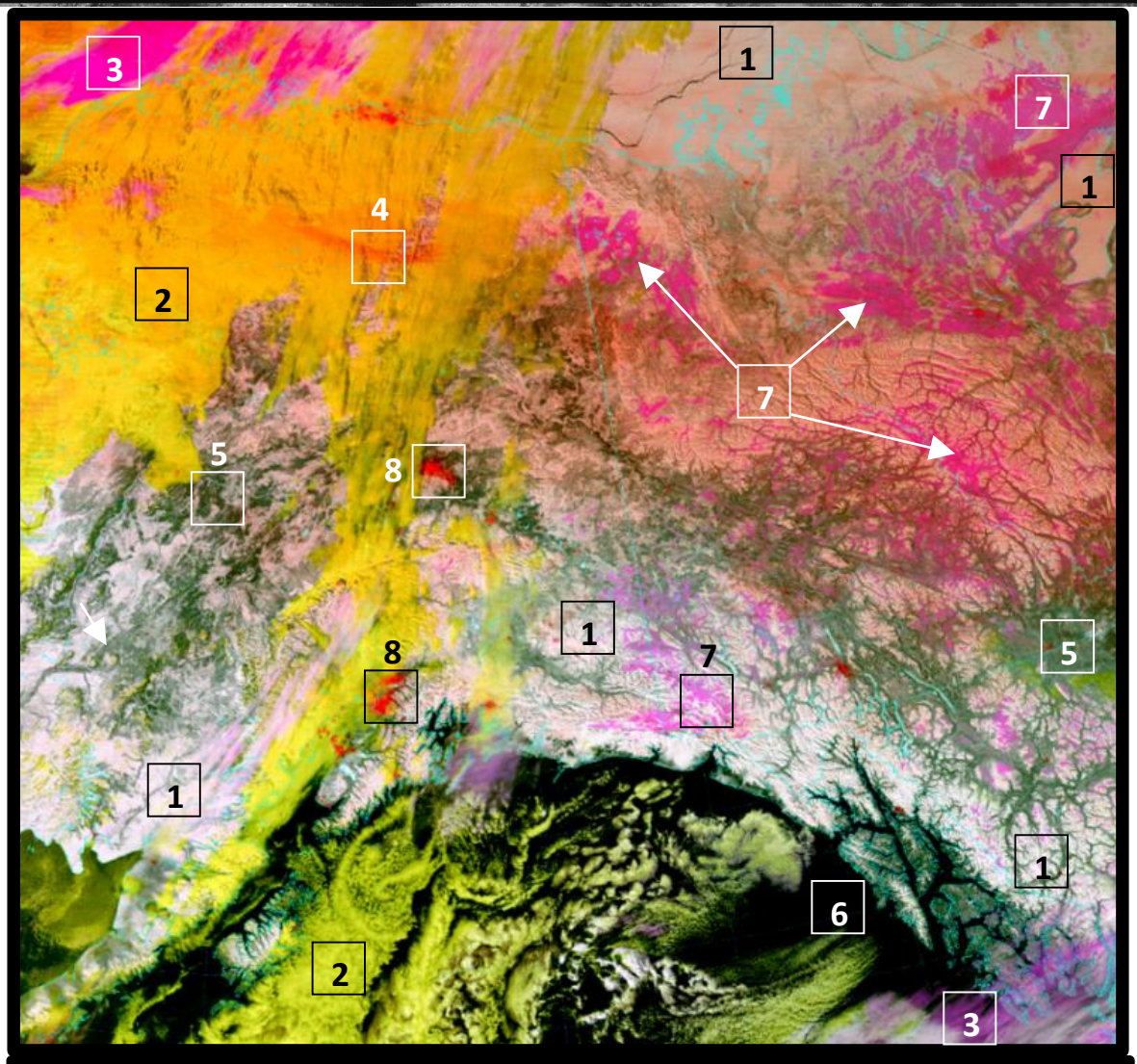
RGB

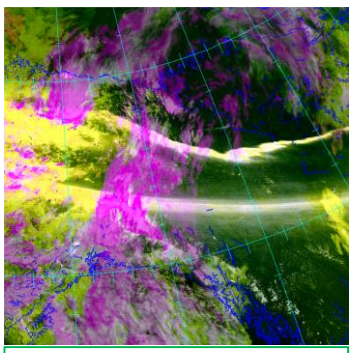
- **1** Snow and ice *(white/off-white)*
- **2** Low/liquid cloud *(yellow)*
- **3** High/cirrus cloud *(pink)*
- **4** Mid-level cloud/ Thin high cloud over opaque liquid cloud *(orange)*
- **5** Bare ground *(dark green)*
- **6** Water *(Black)*
- **7** Very cold ground *(magenta)*
- **8** City lights at night (some versions) *(red)*

Note: colors may vary, particularly near the terminator and nights without moonlight; Auroras may appear white, yellow or pink depending on cloud cover below



Nighttime image of Snow/Cloud Discriminator from S-NPP VIIRS over Alaska at 1121 UTC, 11 March, 2017.

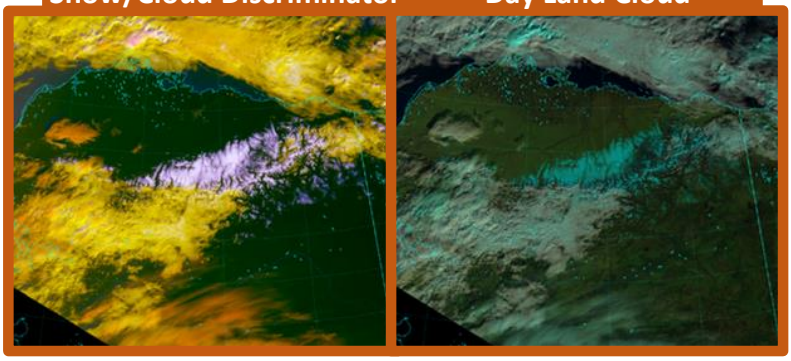
Auroras



Auroras interfere with snow/ice detection, and take on the color of any clouds underneath them.

Comparison to the Day Land Cloud RGB:
Unlike the Day Land Cloud RGB, the Snow/Cloud Discriminator works at night. Plus, it is designed to keep snow white and colors the clouds instead.

Snow/Cloud Discriminator **Day Land Cloud**



1935 UTC 3 September 2017

Resources

RAMSDIS online archive:
http://tinyurl.com/RAMSDIS-Online-Archive

RAMMB-Slider
https://tinyurl.com/Snow-Cloud-Discriminator

NASA: NDSI

http://tinyurl.com/NDSI-NASA

Hyperlinks not available when viewing material in AIR Tool