Exploring Convective Applications Using the Day Cloud Type RGB

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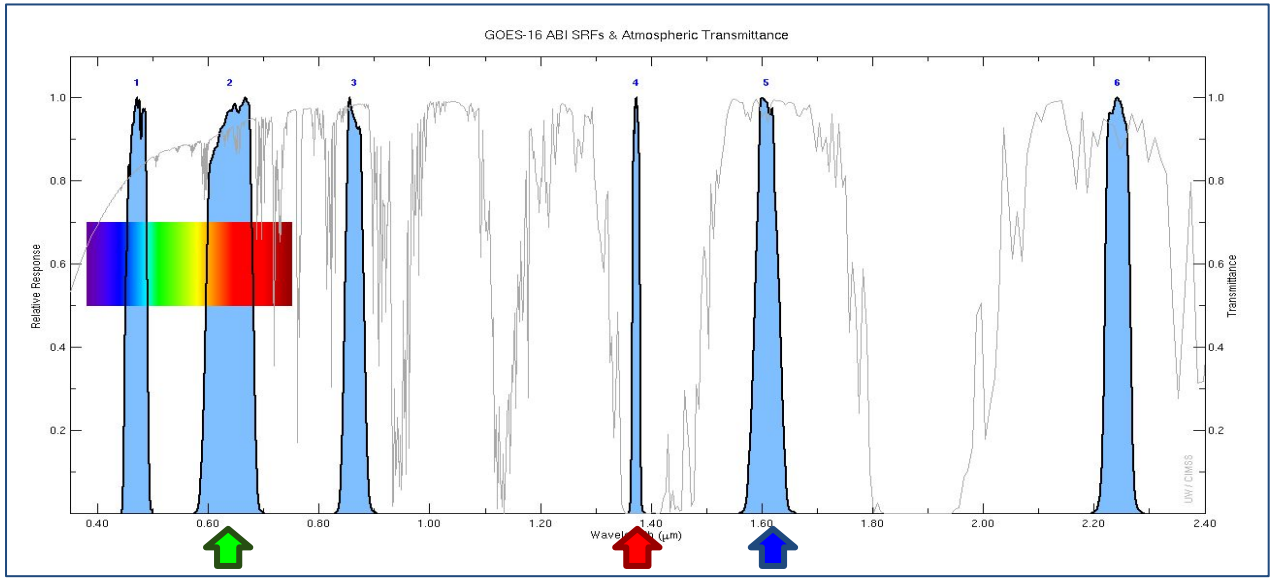
Day Cloud Type RGB

ABI Day Cloud Type RGB (based on CIMSS quick guide)

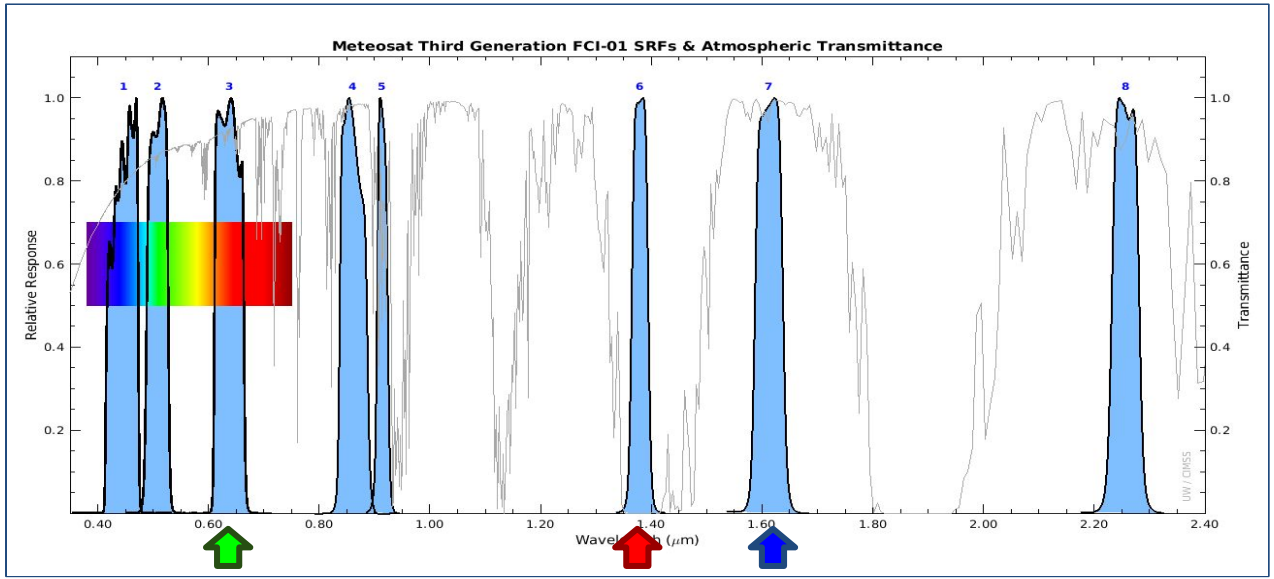
Colour beam	Channel	Range			Gamma
Red	NIR1.37	0	10	%	1.5
Green	VIS0.64	0	78	%	1
Blue	NIR1.6	0	59	%	1



Day Cloud Type RGB

FCI proxy Cloud Type RGB (Andrew Heidinger's recipe)

Colour beam	Channel	Range			Gamma
Red	NIR1.37	0	10	%	1.5
Green	VIS0.64	0	80	%	0.75
Blue	NIR1.6	0	80	%	1



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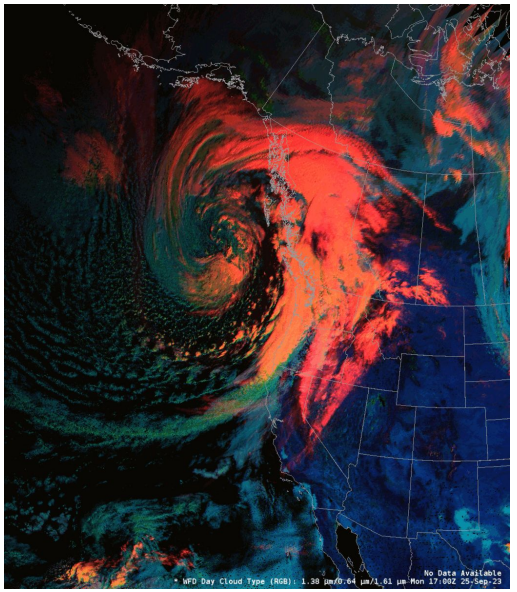
- Originally intended to easily detect thin and thick cirrus
- Similar look to “famous” Day Cloud Phase Distinction RGB (10.3, 0.6, 1.6)
- Made with the intention of using FCI’s newly added 1.37 µm channel.
- Authors:
  - Dr. Andrew Heidinger (NOAA NESDIS)
  - Dr. Jochen Kerkmann (EUMETSAT)

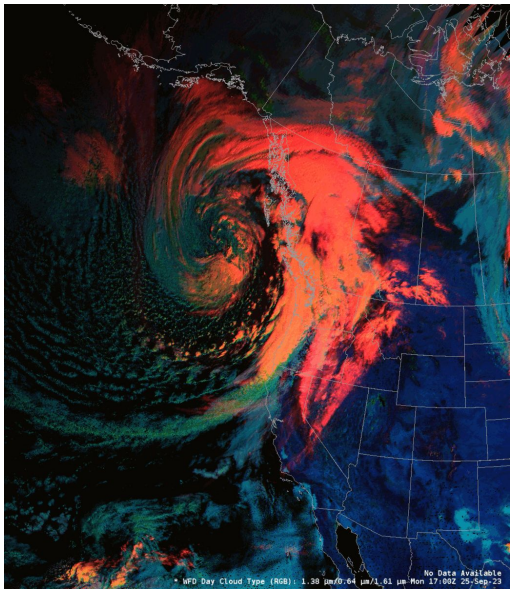


Day Cloud Type RGB

How is the RGB created?

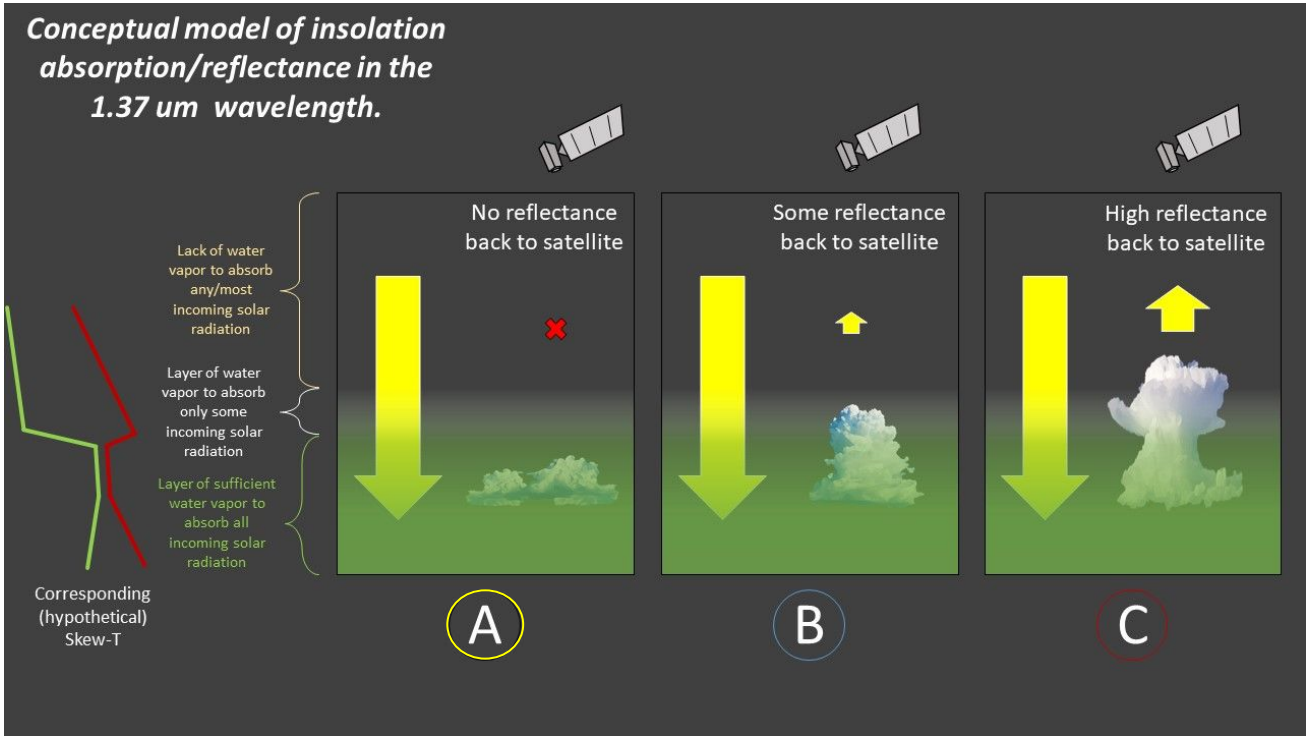
Color	Band, Wavelength, Gamma	Physically relates to	Large Contribution from…	Small contribution from…
Red	4, 1.38 µm, 0.66	Cloud Height	High clouds	Low clouds
Green	2, 0.64 µm, 1.0	Cloud Optical Thickness	Thick Clouds/Snow/Ice	Thin (or no) clouds
Blue	5, 1.61 µm, 1.0	Cloud Phase	Water Droplets	Ice crystals

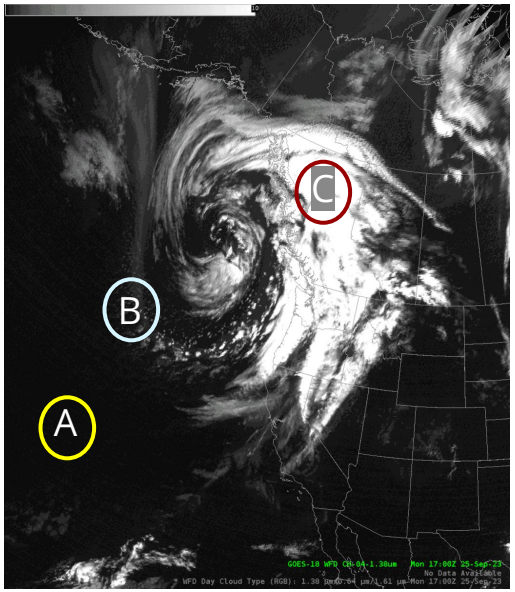
- Very similar color interpretation as the Day Cloud Phase Distinction RGB, and helps differentiate between cloud types.
- Main difference between Day Cloud Phase Distinction and Day Cloud Type RGBs is reddening of the imagery is dictated not by thermal differences in cloud tops, but rather cloud top height as a function of water vapor content.



Day Cloud Type RGB

But what is the 1.37 μm actually detecting??





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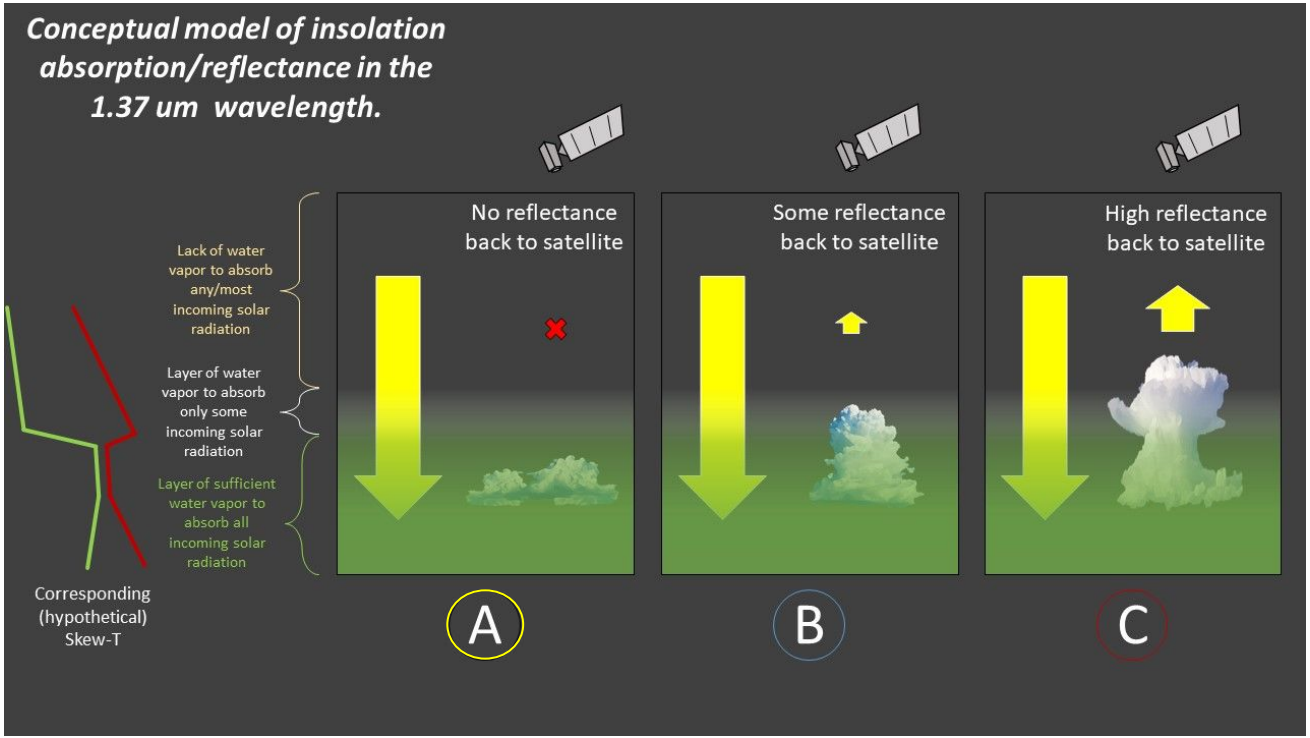

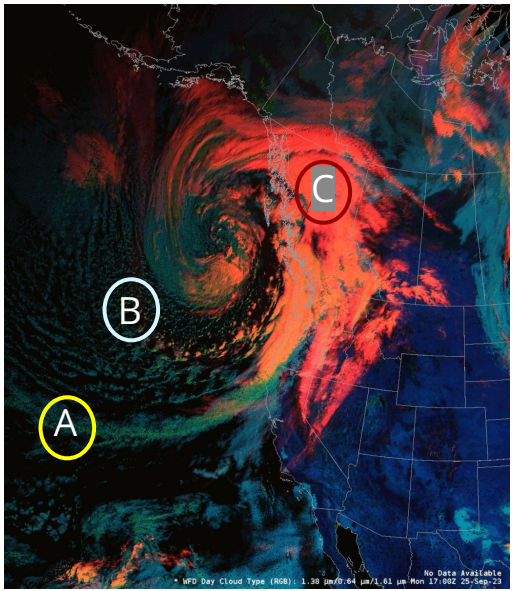

Day Cloud Type RGB

- With the ability to easily detect vertically growing clouds, can this be used to monitor convection?
- How does this compare to the proven Day Cloud Phase Distinction RGB?

Let’s explore using real-time data!

Day Cloud Type RGB

Strengths:

- **Can easily illustrate convective initiation where moisture content is mostly confined within the boundary layer beneath very dry layer aloft (typical of unstable environments).**
- Won't succumb to seasonal thermal differences (like the 10.3 μm channel), outside of seasonal and latitudinal differences in moisture content and solar reflectance.

Weaknesses:

- Environments composed of deep moisture throughout the troposphere (like the tropics), may see a delayed signal (the appearance of orange/red coloring) beyond 'true' convective initiation.
- Environments composed of very dry air throughout the troposphere (typical in arid, very cold, and/or high elevation climates), early-lifecycle clouds will likely have strong orange/red coloring, even before 'true' point of initiation. This may mislead a forecaster to incorrectly signal a transition from infant to maturing clouds.
- Due to dependence on reflected solar radiation, can only be used in daytime.
- Limited use when higher level clouds/aerosols are upstream or above area of interest.

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Considerations:

- ABI 1.38 μm channel can have ‘no data’ for regions where reflectance goes to zero, and affects the RGB appearance.
  - ..I am not sure if this will be the case from FCI.
- The further away from nadir, the more water vapor you are looking through, and will influence the point of reflectance of cloud top height in the 1.37μm channel. This may be important to remember for the European continent with its relatively high latitude.
- If using this RGB to monitor convective initiation, **one must be cognizant of how moisture is parsed throughout the troposphere will aid your understanding of when the 1.37 μm component will begin contributing to the RGB.**

If monitoring for convection AFTER initiation, other imagery and RGBs like the Day Cloud Phase Distinction is likely better suited as it can give information on cloud top temperatures.

Day Cloud Type RGB

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Day Cloud Type RGB – A Tool for Monitoring Convective Initiation

https://satelliteliaisonblog.com/2022/11/07/day-cloud-type-rgb-a-tool-for-monitoring-convective-initiation/

Day Cloud Type RGB Quick Guide:

https://cimss.ssec.wisc.edu/training/QuickGuides/QuickGuide_GOESR_Day_Cloud_Type.pdf

Promoting the Use of the 1.38 Micron Channel from ABI & VIIRS:

https://youtu.be/WZaAh6h-M9A?si=0SkzJL4uPgAuzdRL