GOES-16 Band Reference Guide

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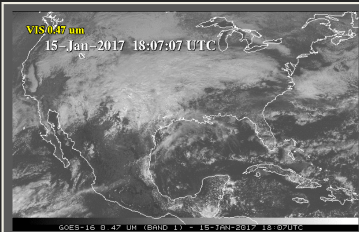


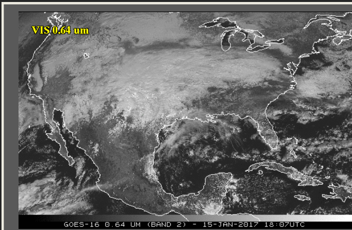
ABI Band #1

0.47 microns

Visible ("Blue Band")

Primary Uses:

- Monitoring aerosols (smoke, haze, dust)
- Air quality monitoring through measurements of aerosol optical depth



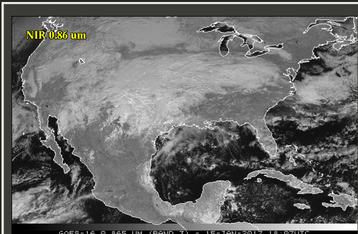
ABI Band #2

0.64 microns

Visible ("Red Band")

Primary Uses:

- Daytime monitoring of clouds (0.5-km spatial resolution)
- Volcanic ash monitoring



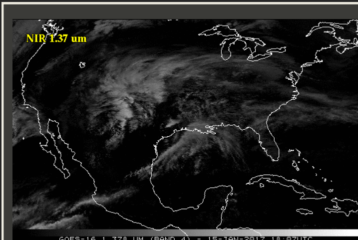
ABI Band #3

0.86 microns

Near–IR ("Veggie Band")

Primary Uses:

- High contrast between water and land
- Assess land characteristics including flooding impacts, burn scars, and hail swath damage



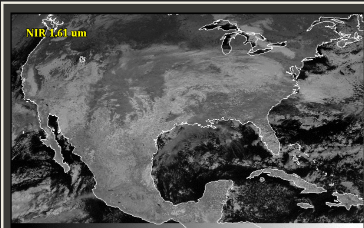
ABI Band #4

1.37 microns

Near-IR ("Cirrus Band")

Primary Uses:

- Thin cirrus detection during the day as the lower troposphere is not routinely sensed
- Volcanic ash monitoring



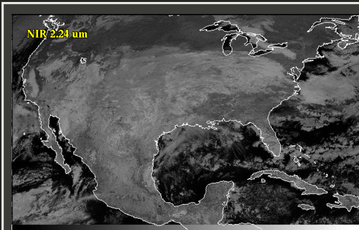
ABI Band #5

1.6 microns

Near–IR ("Snow/Ice Band")

Primary Uses:

- Daytime snow, ice, and cloud discrimination (Snow/Ice dark compared to liquid water clouds)
- Input to "Snow/Ice vs. Cloud" RGB



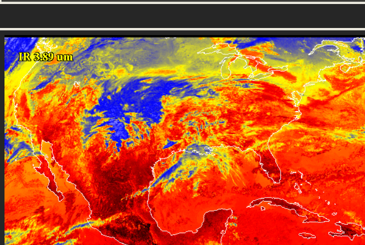
ABI Band #6

2.24 microns

Near-IR ("Cloud Particle Size Band")

Primary Uses:

- Cloud particle size, snow, and cloud phase
- Hot spot detection at emission temperatures of greater than 600K



ABI Band #7

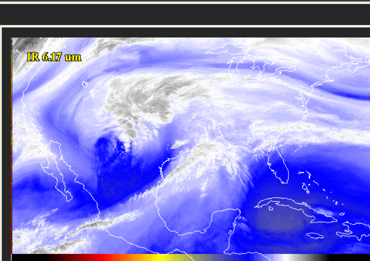
3.9 microns

IR ("Shortwave Window Band")

Contains daytime solar reflectance component

Primary Uses:

- Low stratus and fog (especially when differenced with the 11.2-micron IR channel taking advantage of emissivity differences)
- Fire/hot spot detection and volcanic ash



ABI Band #8

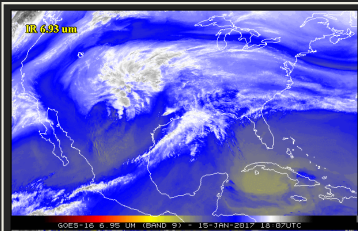
6.2 microns

IR ("Upper-Troposphere WV

In a standard US atmosphere the weighting function peaks around 340 mb. **NOTE: The sensed radiation is from a layer, not just the peak pressure level which itself varies from the standard value

Primary Uses:

- Upper-level feature detection (jet stream, waves, etc.)



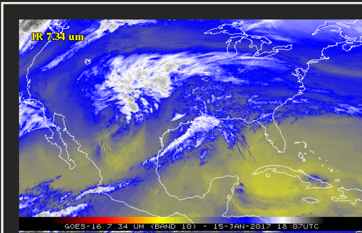
ABI Band #9

6.9 microns

IR (“Mid-Level Tropo-sphere WV Band”)

In a standard US atmosphere the weighting function peaks around 440 mb. **NOTE: The sensed radiation is from a layer, not just the peak pressure level which itself varies from the standard value

<u>Primary Uses:</u> Mid-level feature detection



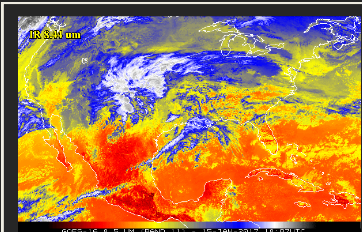
ABI Band #10

7.3 microns

IR (“Low-Level Trop-osphere WV Band”)

In a standard US atmosphere the weighting function peaks around 615 mb. **NOTE: The sensed radiation is from a layer, not just the peak pressure level which it-self varies from the standard value

<u>Primary Uses:</u> Low-level feature detection (EML, fronts)



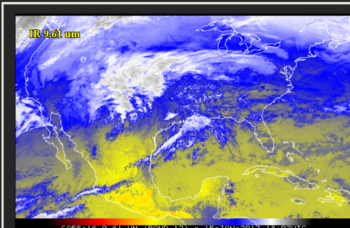
ABI Band #11

8.4 microns

IR (“Cloud-Top Phase Band”)

<u>Primary Uses:</u>

- Cloud-top phase and type products derived when combined with the 11.2- and 12.3- micron channels
- Volcanic ash (S02 detection) and dust



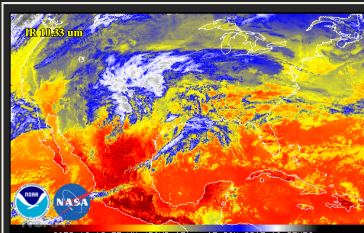
ABI Band #12

9.6 microns

IR (“Ozone Band”)

<u>Primary Uses:</u>

- Dynamics near the tropopause including strato-spheric intrusions (high ozone) associated with cyclogenesis. PV anomaly applications
- Input to Airmass RGB

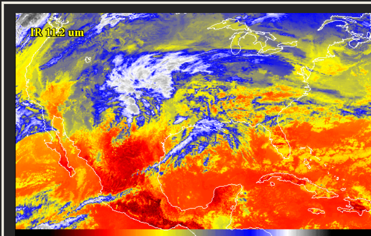


ABI Band #13

10.3 microns

IR (“Clean IR Longwave Band”)

- Less sensitive to atmospheric moisture than the oth-er IR channels. As a result brightness temperatures are usually warmer than traditional IR as less radia-tion is absorbed by water vapor and re-emitted at higher altitudes

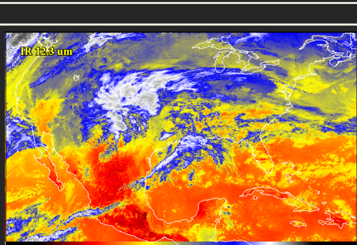


ABI Band #14

11.2 microns

IR (“IR Longwave Band”)

- The traditional IR window
- Differenced with the 3.9 micron near IR channel for low stratus and fog detection

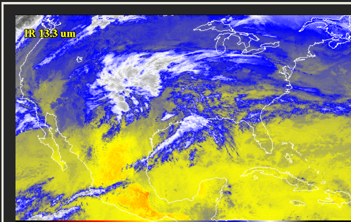


ABI Band #15

12.3 microns

IR (“Dirty IR Longwave Band”)

- Greater sensitivity to moisture compared to the 10.3- and 11.2-micron channels. As a result, brightness temperatures will be cooler
- Contributes to total PWAT and low-level moisture information



ABI Band #16

13.3 microns

IR (“C02 Longwave IR Band”)

<u>Primary Uses:</u>

- Mean tropospheric air temperature estimation
- Input to RGBs to highlight high, cold, and likely icy clouds

<u>Useful Links:</u>

- Individual ABI Band Guides: http://www.goes-r.gov/education/ABI-bands-quick-info.html
- ABI Weighting Function Page: http://cimss.ssec.wisc.edu/goes/wf/ABI/

GOES-16 Baseline Products and RGBs

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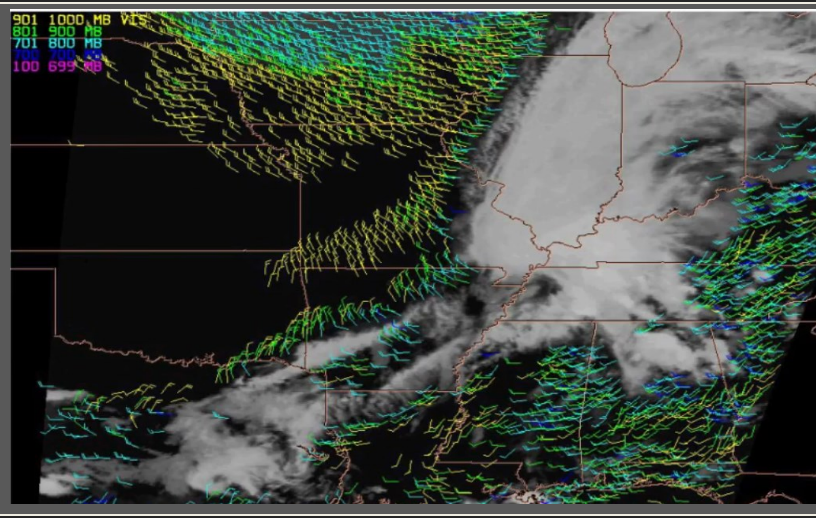
Derived-Motion Winds (DMWs)

Availability:

- Full Disk: 60 minutes
- CONUS: 15 minutes
- Mesoscale: 5 minutes

How it works: Uses a set of three sequential images to estimate atmospheric motion using six ABI bands following a set of targets (cloud edges or clear sky water vapor gradients)

Uses the ABI Cloud Height Algorithm (ACHA) to assign heights



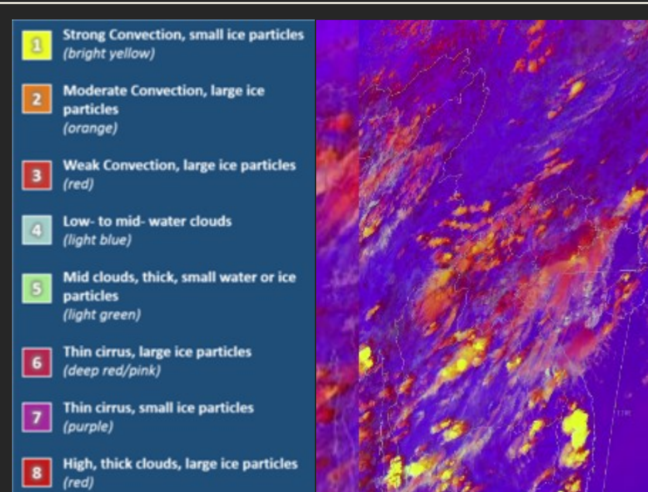
Daytime Convection RGB

Uses:

- Identification of convection with strong updrafts and small ice particles indicative of severe storms
- Microphysical characteristics help determine storm strength and the stage of development

Limitations:

- Daytime only. Pixel color fades when the sun angle is low
- False "Yellow/Strong Convection" may be caused by mountain wave, dust or cold cloud tops with only moderate 3.9-micron reflectance



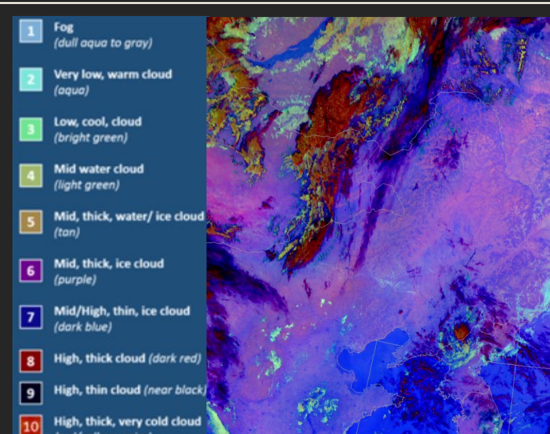
Nighttime Microphysics RGB

Uses:

- Fog and low-cloud analysis and differentiation
- Multi-channel approach allows for quick cloud type discrimination
- Outflow boundaries and drylines can be seen

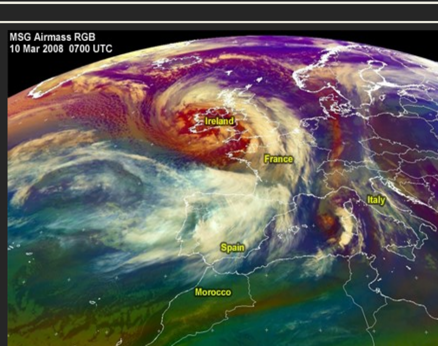
Limitations:

- Nighttime only. Thin fog can blend with the surface
- Shortwave noise in extreme cold. Color of cloud-free regions varies based on temperature, moisture, and surface type



Airmass RGB

Example: High-PV, ozone-rich stratospheric air (appearing red/ orange) can be utilized to monitor stratospheric intrusions during cyclogenesis

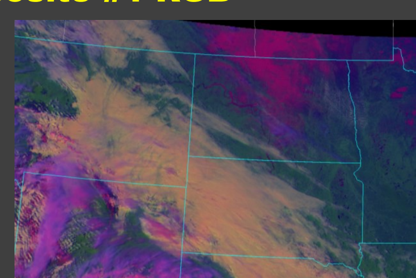


Daytime Composite #1 RGB

Bands 2, 5, and 14

Purple/Pink: Ice or snow

Orange: Liquid water containing clouds



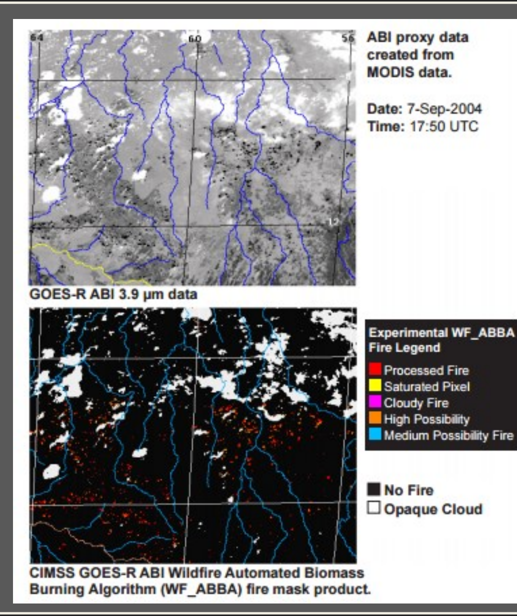
GOES-16 Baseline Products and RGBs

Fire Detection and Characterization (FDC)

<u>How it works:</u> Fires produce a stronger signal in the mid-wave IR bands (around 4 microns) than they do in the long-wave IR bands (such as 11 microns)

The FDC looks for hot spots exploiting the 3.9-micron channel. The algorithm screens out surfaces that are not usable, such as water, tundra, deserts, and sparsely vegetated mountains. The algorithm also screens out clouds that are opaque for ~4-micron radiation. This is different than a typical cloud mask since fires are often detected through thin clouds such as cirrus or stratus decks

Once a fire has been detected and corrections applied to the radiances, the instantaneous fire size and temperature can be estimated. Fire Radiative Power (FRP) is also calculated for the fire. FRP is directly related to fire size and temperature

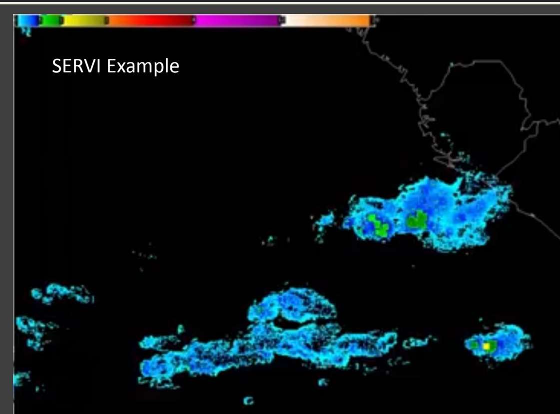


CIMSS GOES-R ABI Wildfire Automated Biomass Burning Algorithm (WF_ABBA) fire mask product.

Rainfall Rate Product

<u>Overview:</u>

- Full ABI pixel resolution
- Available every 15 minutes with less than 5-minute latency
- Full Disk (Day and Night)
- 0 to 3.9 in/hr range



<u>How it works:</u> Using basic assumptions, cloud-top temperature (IR) is related to cloud-top height, which is related to updraft strength transporting moisture into the cloud. Updraft strength is related to rainfall rate

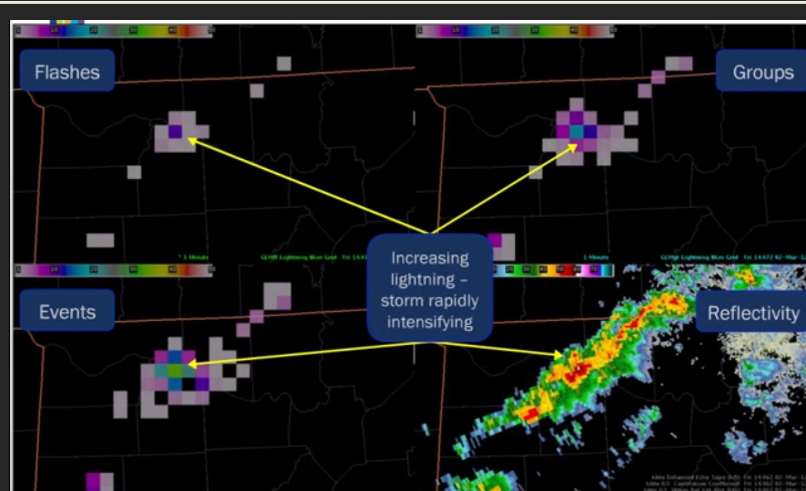
The IR algorithm uses ABI bands 8, 10, 11, 14, and 15 with a fixed calibration to a microwave-retrieved dataset

Clouds are divided into three types (water, ice, and cold top convective clouds) for rainfall rate classes. Satellite rain estimates perform best for convective rain and poorly for stratiform precipitation

Orographic effects, sub-cloud evaporation, and sub-cloud phase changes are not taken into account

Geostationary Lightning Mapper

<u>Event:</u> Any illuminated pixel during a 2-micro second period. Useful for developing convection (initial electrification), lightning spatial extent, and storm triage



<u>Group:</u> A cluster of events in time and space. The location is weighted by optical intensity and is most similar to NLDN and ENTLN CG strikes and in cloud pulses

<u>Flash:</u> Cluster of groups in time and space. Most similar to a flash in all other networks. More closely related to updraft and storm intensity

GLM has 20-second updates