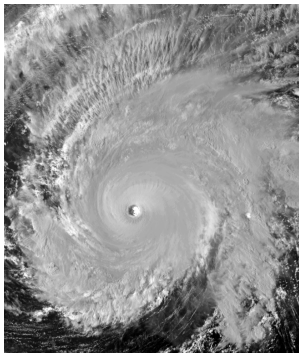
GOES-R ABI Fact Sheet Band 5 ("Snow/Ice" near-infrared)

The "need to know" Advanced Baseline Imager reference guide for the NWS forecaster



Above: The Advanced Himawari Imager (AHI) 1.6 µm image for Typhoon Maysak from March 31, 2015 at 6 UTC. Glaciated clouds appear dark in this band, due to less solar reflection. Credit: JMA/CIMSS

In a nutshell

GOES-R ABI Band 5 (approximately 1.61 µm central, 1.59 µm to 1.63 µm)

Similar to Suomi NPP VIIRS Bands I3 and M10, Landsat Band 6, MODIS Band 6, Meteosat Second Generation (MSG) Band 3, Himawari-8/9 AHI Band 5, and AVHRR Band 3A

New for GOES-R series, not available on current GOES

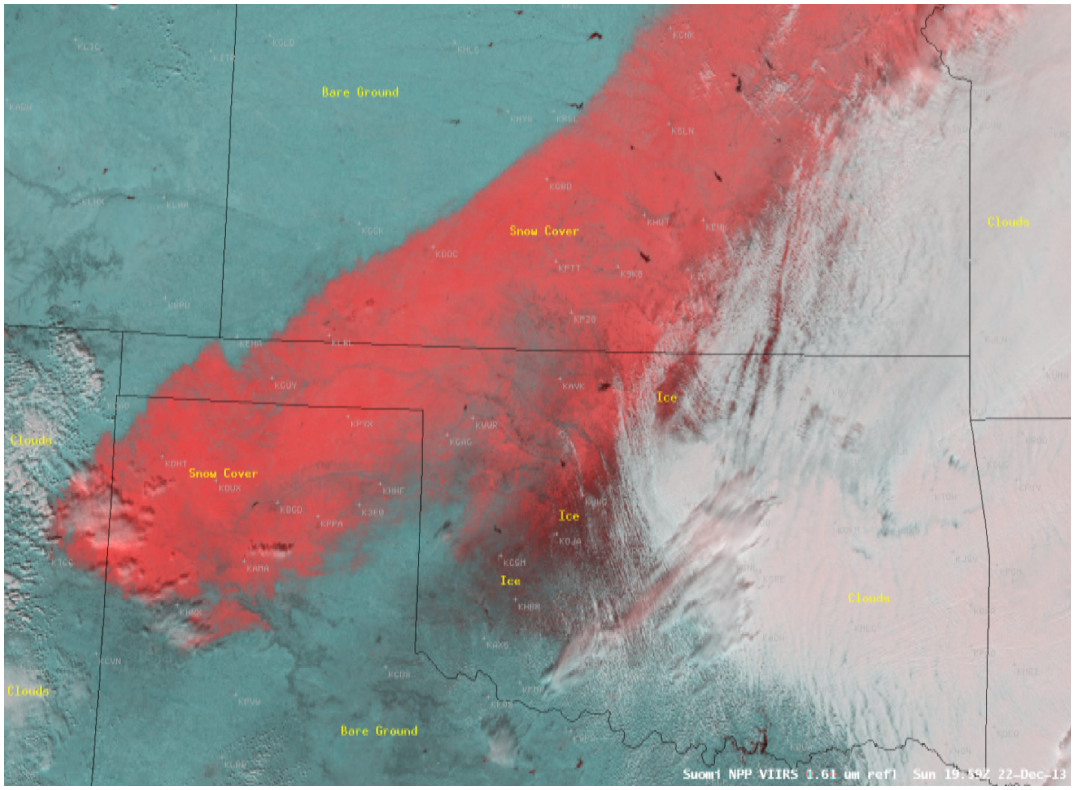
Nickname: "Snow/Ice" near-infrared band

Availability: Daytime only for snow and cloud applications

Primary purpose: Snow and ice discrimination, cloud top phase

Uses similar to: GOES-R ABI Band 6 (2.2 µm), for nighttime fire locations

In conjunction with other bands, the 1.6 µm, or "snow/ice" band will be used for daytime cloud, snow, and ice discrimination, total cloud cover estimation, cloud-top phase, and smoke detection from fires with low burn rates. The 1.6 µm band takes advantage of the relatively large difference between the refraction components of water and ice. This makes daytime water/ice cloud delineation possible, which will be very useful for aircraft routing. This band on MODIS and VIIRS has also been used to highlight areas that previously experienced freezing rain, even when on top of snow. At night, in lieu of solar reflection, radiating fires might be particularly noticeable against the dark background. *Source: Schmit et al., 2005 in BAMS, and the ABI Weather Event Simulator (WES) Guide by CIMSS.*



This Suomi NPP VIIRS false-color snow/ice-vs-cloud RGB image on December 22, 2013, at 19:59 UTC combines the visible band (red) and the snow/ice band (green and blue). Red shades indicate features that are more reflective in the visible band, whereas cyan areas are more reflective in the 1.6 µm band. Credit: SSEC

Did You Know?

When generating derived (Level 2) products, such as cloud heights, each product directly uses a number of the ABI bands. Yet, many products may employ other derived products as inputs, i.e., prerequisite products. For example, a derived product such as Total Precipitable Water (vapor) utilizes the cloud mask, which uses the 1.37 µm band. Due to this product precedence, more bands are used in total than may be listed in a products-by-band table.

Baseline Products by Band

Wavelength Micrometers	1.6
Band number	5
Baseline Products	
Aerosol Detection	√
Aerosol Optical Depth	√
Clear Sky Masks	√
Cloud & Moisture Imagery	√
Cloud Optical Depth	
Cloud Particle Size Distribution	
Cloud Top Phase	
Cloud Top Height	
Cloud Top Pressure	
Cloud Top Temperature	
Hurricane Intensity	
Rainfall Rate/QPE	
Legacy Vertical Moisture Profile	
Legacy Vertical Temp Profile	
Derived Stability Indices	
Total Precipitable Water	
Downward Shortwave Radiation: Surface	√
Reflected Shortwave Radiation: TOA	√
Derived Motion Winds	
Fire Hot Spot Characterization	
Land Surface Temperature	
Snow Cover	√
Sea Surface Temperature	
Volcanic Ash: Detection/Height	
Radiances	√

Ward's Words

The GOES-R series presents the first opportunity for operational meteorologists in the Western Hemisphere to observe the Americas from geostationary orbit in the near-infrared. Near-infrared bands are similar to visible bands in that they predominantly capture reflected solar energy. However, near-infrared bands close to the shortwave infrared window can detect heat from fires and other terrestrial sources. This capability will be particularly beneficial at night when there are few other sources for radiation in the near-infrared.

The 1.6 µm band can also help forecasters discriminate between ice- and snow-covered ground, as well as ice and water cloud.

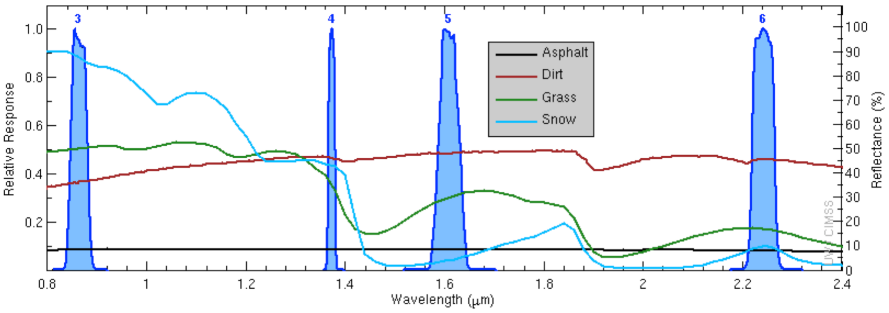
Bill "Hima-Ward-i" Ward is the ESSD Chief in NWS Pacific Region and a former Guam forecaster.

Tim's Topics

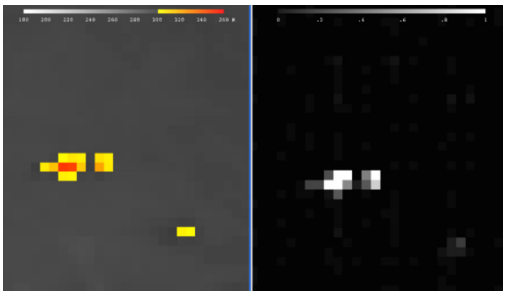
This band on the ABI fulfills the NWS requirement related to snow detection from geostationary orbit.

Snow and ice surfaces are strongly absorbing at 1.6 µm. It is this absorption that allows the snow or ice to stand out, compared to a 0.64 µm where snow appears bright, but not substantially different from the water cloud. The GOES-R cloud mask algorithm uses, as one of its inputs, information from the 1.6 µm band. According to Andrew Heidinger, NOAA NESDIS STAR, "The near-IR channels, particularly the 1.6 µm reflectance, are useful in discriminating between snow and clouds, as snow has very low 1.6 µm reflectance, while the 1.6 µm reflectance of clouds remains high."

Tim Schmit is a research meteorologist with NOAA NESDIS in Madison, Wisconsin.



The ABI (blue shaded curve) spectral response functions for the ABI near-infrared bands, along with three high-spectral resolution curves. The light blue solid line indicates how snow in the 1.6 µm band is not as reflective as in the 0.86 µm and the visible bands. Credit CIMSS, ASTER spectral library



Nighttime AHI images over Australia on March 23, 2015 of bands 3.9 µm (left) and 1.6 µm (right) showing several fires. The AHI 1.6 µm band is nominally 2 km spatial resolution, while the ABI band will be 1 km. Credit: JMA/CIMSS

ABI Band	Approximate Central Wavelength (µm)	Band Nickname	Type	Nominal sub satellite pixel spacing (km)
5	1.6	"Snow/Ice" band	Near-IR	1
6	2.3	"Cloud-top phase" band	Near-IR	2

Further reading

ABI Bands Quick Information Guides: http://www.goes-r.gov/education/ABI-bands-quick-info.html
Landsat bands: http://landsat.gsfc.nasa.gov/?page_id=5377
CIMSS Satellite Blog: http://cimss.ssec.wisc.edu/goes/blog/archives/14635
Cloud Mask ATBD: http://www.star.nesdis.noaa.gov/goesr/docs/ATBD/Cloud_Mask.pdf
GOES-R COMET training: http://www.goes-r.gov/users/training/comet.html
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