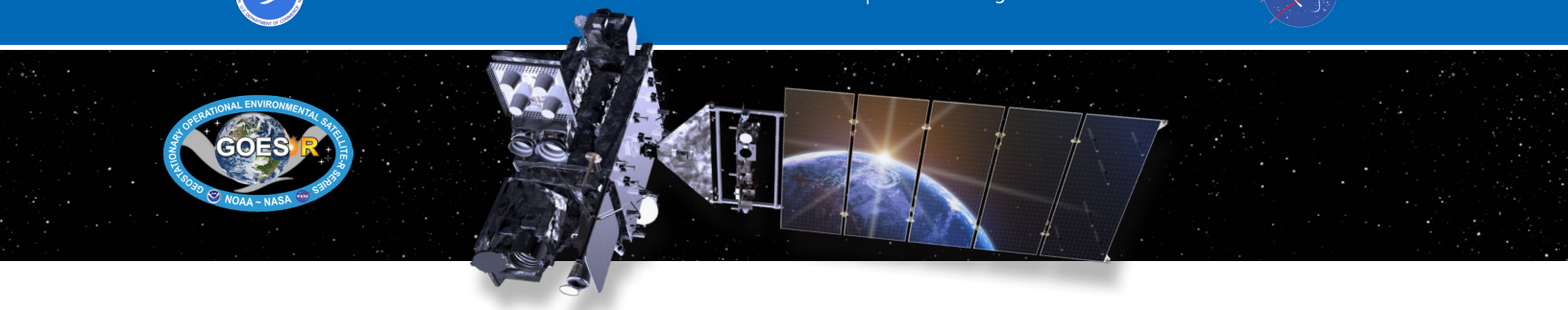


GOES-R ABI Fact Sheet Band 3 (The "vegetation" near-infrared band)

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

Above: Simulated image of ABI Band 3 (0.86 µm) for Hurricane Katrina. This image was simulated via a combination of high spatial resolution numerical model runs and advanced "forward" radiative transfer models. Credit: CIMSS

In a nutshell

GOES-R ABI Band 3 (approximately 0.86 µm central, 0.85 µm to 0.88 µm)

Also similar to the AVHRR Band 2, Suomi NPP VIIRS Band I2/M7, EUMETSAT SEVIRI Band 2 and Himawari-8/9 AHI Band 4.

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

Nickname: "Vegetation" band

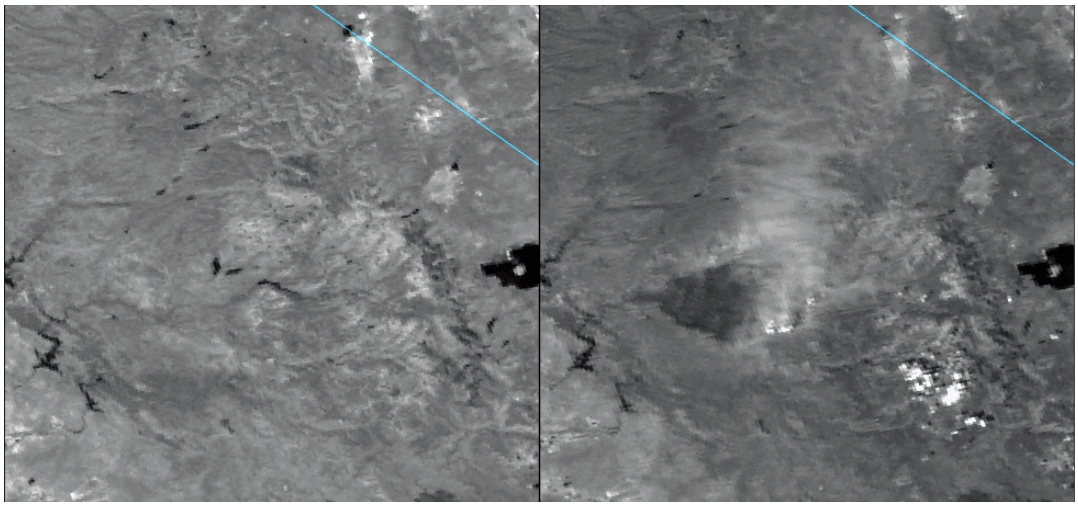
Availability: Daytime only

Primary purpose: Vegetation

Uses similar to: None

The 0.86 µm band (a near-infrared or "reflective" band), along with the 0.64 µm ("red") ABI Band 2, will be used for detecting daytime clouds, fog, and aerosols and for calculating a normalized difference vegetation index (NDVI), hence its nickname the "vegetation" (or "veggie") band. This band can help in determining vegetation index and green vegetation fraction, although these are not baseline products. The lone current GOES visible channel does not effectively delineate burn scars. Thus, this ABI band has potential for detecting forest regrowth patterns, etc. Also, given that vegetated land, in general, shows up brighter in this band, it can be used for monitoring Image Navigation and Registration (INR). This band is also useful to simulate a "green" band needed for a "natural color" image from the ABI.

The 0.86 µm band can be used in assessing land characteristics when determining fire and flood potential. For example, following significant fire damage, water is more likely to run off, and less likely to be absorbed into the soil surface, hence decreasing the amount of rain needed to produce flooding, dangerous landslides and debris flows. *Source: Schmit et al., 2005 in BAMS, Miller et al. 2012 and the ABI Weather Event Simulator (WES) Guide by CIMSS.*



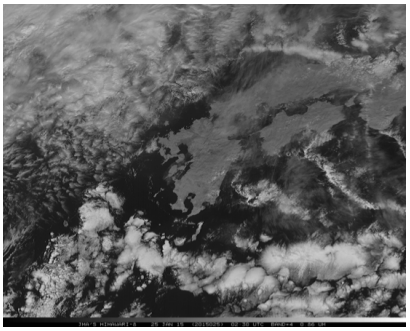
The Suomi NPP satellite VIIRS instrument M7 Band (0.865 µm) is shown at two times. On the left is before (August 13, 2013) and on the right is after (August 30, 2013) the California Rim Fire. Note the smoke plume and pyrocumulus along the periphery of the dark burn scar near the center of the image on the right, and the large burn scar just to the west of the smoke plume. Credit: SSEC

Did You Know?

The spectral width of the ABI vegetation band is narrower than that on heritage instruments such as AVHRR. This means that the ABI band does not include a water vapor absorption feature that complicates the estimating of the surface features. Stated another way, if the NDVI changes in the GOES-R era, it is more likely due to vegetation changes, and not variable atmospheric water vapor. A very similar spectral band is on the Japan Meteorological Agency's Advanced Himawari Imager (AHI).

Baseline Products by Band

Wavelength Micrometers	0.86
Band number	3
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	√



AHI 0.86 µm image from January 25, 2015, showing clouds and land features.

Ward's Words

While the vegetation band has a legacy on NOAA's polar-orbiting satellites, it was not until I viewed recent imagery from the new Himawari satellite that I realized the potential of this band from geostationary orbit. Due to the high reflectance of vegetative surfaces and relative low reflectance of water in this near-infrared band, the contrast between land and water is extremely sharp, especially when coupled with the 1 km spatial resolution at nadir.

In the Pacific Basin, the sharp contrast will make it easy to identify small islands and atolls. Another benefit of this contrast is the ability to monitor coastal inundation and other flooding, especially when viewed in a time animation. In the future, it is possible that this band would contribute to a flood/standing water product. The enhanced reflectance contrast, while maintaining the high reflectance from clouds and snow similar to visible imagery, will likely make the vegetation band a potential replacement to the visible band as a quick reference for surface and land features amongst forecasters.

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

Tim's Topics

Each of the spectral bands on the ABI has a "champion." This person might have suggested it be included on the ABI to better fulfill the various requirements. Or this might have been a band on the first satellites, and hence the champion might be Vern Suomi. The champion for the 0.86 µm ABI band was the late Nagaraja Rao of the NOAA NESDIS research office. In his email from late 1999, he stated "I believe we can increase the usefulness of the ABI very appreciably if we replace the proposed very broad visible channel with two channels in the visible and near-infrared." This was the beginning of Band 3 (0.86 µm) on the ABI. The idea was further bolstered when it was approved by the NOAA research council.

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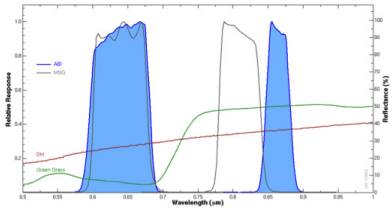

ABI (blue shaded curves) and SEVIRI (gray curves) spectral response functions. Note that SEVIRI has a vegetation band, although with a different spectral center. Also plotted are spectral curves for dirt and grass. Note the transition between 0.70 and 0.75 µm. Credit: CIMSS, EUMETSAT and the ASTER spectral library

ABI Band	Approximate Central Wavelength (µm)	Band Nickname	Type	Nominal sub satellite pixel spacing (km)
2	0.64	"Red" visible band	Visible	0.5
3	0.86	"Vegetation" band	Near-IR	1

Further reading

ABI Bands Quick Information Guides: http://www.goes-r.gov/education/ABI-bands-quick-info.html
Vegetation information: http://www.goes-r.gov/products/opt2-vegetation-index.html
Flood/standing water product: http://www.goes-r.gov/products/opt2-flood-standing-water.html
CIMSS Satellite Blog CA Rim Fire: http://cimss.ssec.wisc.edu/goes/blog/archives/13785
GOES-R COMET training: http://www.goes-r.gov/users/training/comet.html
GOES-R acronyms: http://www.goes-r.gov/resources/acronyms.html