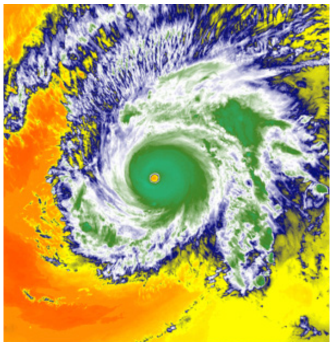
NOAA Satellite and Information Service | GOES-R Program Office

GOES-R ABI Fact Sheet Band 10 (“lower-level water vapor” infrared band)

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



The Advanced Himawari Imager (AHI) 7.3 µm for Typhoon Maysak from March 31, 2015, at 06 UTC. Credit: CIMSS and JMA

In a nutshell

GOES-R ABI Band 10 (approximately 7.3 µm central, 7.2 µm to 7.4 µm)

Similar to MODIS Band 28, SEVIRI Band 6, AHI Band 10

Available on current GOES sounder

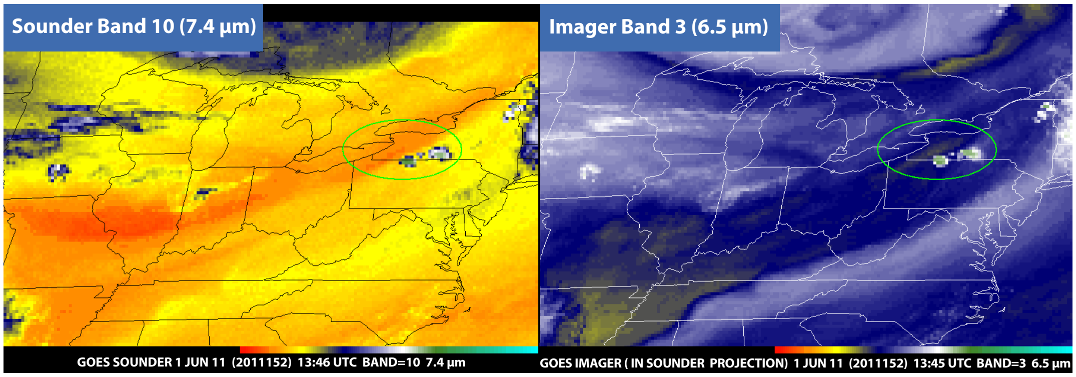
Nickname: “Lower-level water vapor” infrared band

Availability: Both day and night

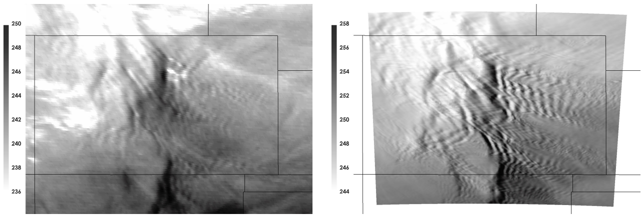
Primary purpose: Monitor atmospheric water vapor features

Uses similar to: ABI/AHI Bands 8/9

The 7.3 µm band is one of three mid-tropospheric water vapor bands on the ABI. It reveals information about lower mid-level atmospheric flow (depending on the amount of moisture in the upper troposphere) and can help identify jet streaks. It has been proven to be useful, under certain conditions, in identifying and tracking volcanic plumes due to upper-level sulfur dioxide absorption. Vertical moisture information can be gained from comparison of measurements in all three ABI water vapor bands as is done with current GOES sounder bands. This water vapor band is similar to a band on the current GOES sounders, although those bands are spectrally narrower. The heritage GOES imager water vapor band falls “between” this band and the 6.2 µm. *Source: Schmit et al., 2005 in BAMS, and the ABI Weather Event Simulator (WES) Guide by CIMSS.*



This image shows better evidence of an elevated mix layer in the current GOES sounder 7.4 µm band compared to the GOES imager water vapor band. The implication for convective initiation is shown in the green circles in this example from June 1, 2011, at approximately 14:00 UTC. The 7.4 µm band senses the lower-level moisture discontinuity that extends from Rochester, New York, to Indianapolis, Indiana, better than the other water vapor bands (some not shown). Credit: ASPB, CIMSS and Christopher Gitro, NWS Pleasant Hill, Missouri



GOES-12 imager 4 km 6.5 µm WV band observations at 20:02 UTC on March 6, 2014, (left panel). Synthetic 2 km resolution imagery at 20:00 UTC for the GOES-R ABI WV Band 10 (7.3 µm) (right panel). The grayscale enhancement is fixed to the warmest temperature in each image and is applied over a 14 K range to make the wave features apparent in all spectral bands. Dark values are warmer values. Credit: Feltz et. al., 2009 (AMS)

Did You Know?

Significant effort is placed on ensuring the spacecraft delivers the imagery we expect without an early-life failure. There are many redundant components on the ABI and both the instrument and spacecraft are put through many tests before launch. These tests include component-level testing, instrument testing (vibration, acoustics, putting the instrument in a vacuum chamber, heating the instrument to extreme temperatures, etc.). Many of these tests are repeated after the instrument is integrated on the spacecraft, before launch. All of these tests, along with corresponding reviews, provide confidence that the ABI will work on-orbit over the long haul.

Baseline Products by Band

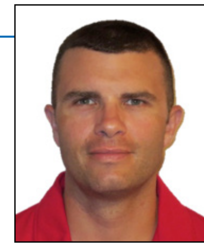
Wavelength Micrometers	7.34
Band number	10
Baseline Products	
Aerosol Detection	
Aerosol Optical Depth	
Clear Sky Masks	√
Cloud & Moisture Imagery	√
Cloud Optical Depth	
Cloud Particle Size Distribution	
Cloud Top Phase	√
Cloud Top Height	
Cloud Top Pressure	
Cloud Top Temperature	
Hurricane Intensity	
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	√

Tim's Topics

When this water vapor band was first proposed on the ABI, it was to be centered at 7.4 µm. This is fine for water vapor applications, but is sub-optimal for aviation applications, such as upper-level SO_2 associated with volcanoes. After working with several in the aviation community, including Gary Ellrod, then of NOAA NESDIS, the band center was moved to 7.34 µm to better capture absorption due to SO_2. Thus, monitoring of some upper-level SO_2 will be possible from the ABI. Knowing the location of SO_2 plumes can be very important for many applications, including aviation, health, and the economy. The rapid refresh and improved spatial resolution, along with new spectral bands, will allow the ABI to better monitor aviation hazards than the heritage imager.

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

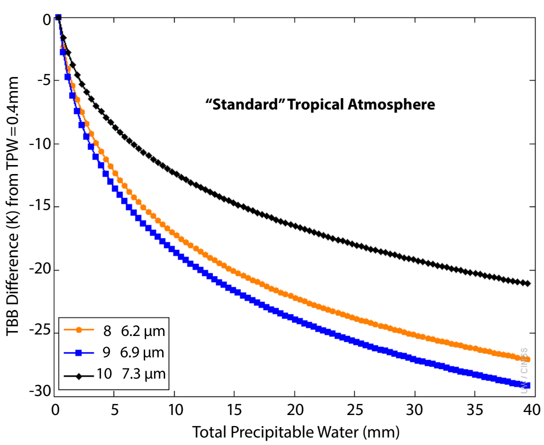
Chris' Corner



With the advent of three water vapor bands on the ABI, monitoring atmospheric water vapor in the GOES-R era will be enhanced. These bands will sample upper-level, mid-level, and low-level water vapor and provide operational meteorologists the opportunity to monitor the evolution of atmospheric features in these levels. These bands will also allow for improved baseline products such as Atmospheric Motion Vectors (AMVs) that contribute to Numerical Weather Prediction models.

The arrival of the 7.3 µm band may have significant impacts on forecasting convection because atmospheric features that are difficult to analyze using the 7.0 or 6.2 µm water vapor bands may be more apparent in the 7.3 µm band. For example, the 7.3 µm band will allow forecasters to track features that have been associated with severe weather such as elevated mixed layers, elevated cold fronts, and low-level boundaries at high temporal and spatial resolution.

Christopher M. Gitro is a senior meteorologist for the National Weather Service at the field office in Pleasant Hill, Missouri.



Calculations demonstrate, for the clear-sky, how the brightness temperatures change with atmospheric moisture for the three ABI water vapor bands. With the same temperature profile, a much colder brightness temperature is expected with more total moisture. In general, more moisture causes more cooling (as water vapor absorption occurs higher in the troposphere). Credit: ASPB and CIMSS

Further reading

ABI Bands Quick Information Guides: http://www.goes-r.gov/education/ABI-bands-quick-info.html
Real-time Weighting Function page: http://cimss.ssec.wisc.edu/goes/wf/
CIMSS Satellite Blog: http://cimss.ssec.wisc.edu/goes/blog/archives/category/himawari-8
VISIT on GOES WV: http://rammb.cira.colostate.edu/training/visit/wv_svr_wx
GOES-R SO_2: http://www.goes-r.gov/products/opt2-so2-detection.html
GOES-R COMET training: http://www.goes-r.gov/users/training/comet.html
GOES-R acronyms: http://www.goes-r.gov/resources/acronyms.html