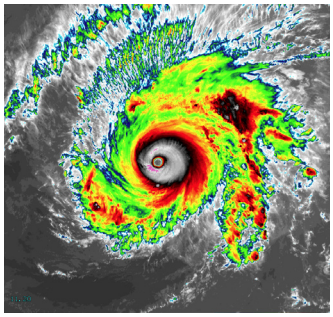
GOES-R ABI Fact Sheet Band 14 (longwave infrared window band)

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



The Advanced Himawari Imager (AHI) 11.2 µm longwave infrared window band image for Typhoon Maysak from March 31, 2015, at 6 UTC. Credit: CIMSS and JMA

In a nutshell

GOES-R ABI Band 14 (approximately 11.2 µm central, 10.8 µm to 11.6 µm)

Also similar to AHI Band 14 and Suomi NPP VIIRS Bands I5 and M15

Similar band available on current GOES imager and sounder

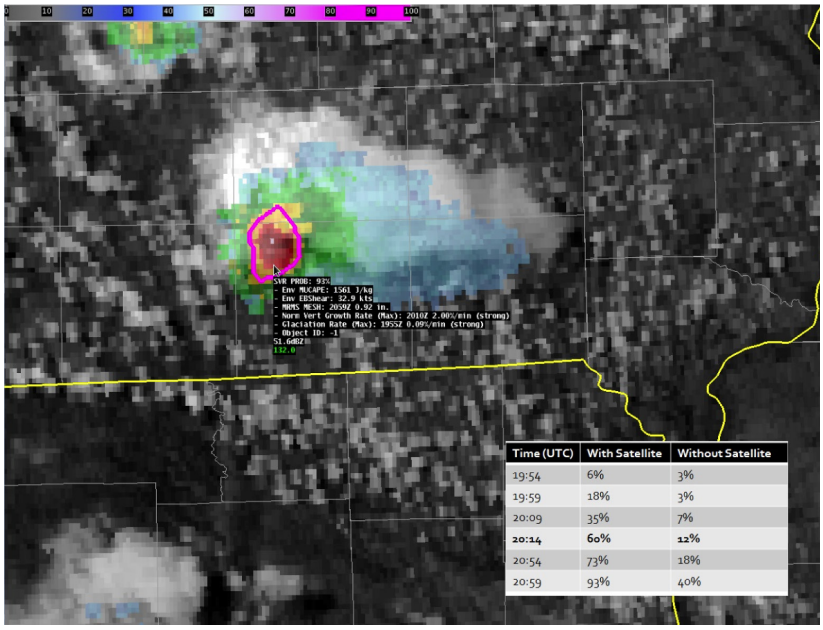
Nickname: Longwave infrared window band

Availability: Both day and night

Primary purpose: Clouds

Uses similar to: GOES-R ABI Bands 11, 13 and 15

The traditional longwave infrared window (11.2 µm) band enables operational meteorologists to diagnose discrete clouds and organized features for general weather forecasting, analysis, and broadcasting applications. Observations from this infrared window channel can characterize atmospheric processes associated with extratropical cyclones and also in single thunderstorms and convective complexes. The window channel also contributes to many satellite derived products, such as precipitation estimates, cloud-drift winds, hurricane intensity and track analyses, cloud-top heights, and volcanic ash detection, as well as fog detection, cloud phase, and cloud particle size estimates in a multi-spectral approach. *Source: Schmit et al., 2005 in BAMS, and the ABI Weather Event Simulator (WES) Guide by CIMSS.*



This figure depicts a GOES visible image at 20:59 UTC on June 18, 2013, combined with radar and a contour of the probability of severe, or "ProbSevere," a product that combines satellite observations with other data such as radar and numerical weather prediction. The image was generated with AWIPS II. This ProbSevere probabilistic forecast is the likelihood a developing storm will produce severe weather within the next hour. The combined product suggested a 60% chance of a severe storm at 20:14 UTC. Rerunning ProbSevere without satellite data (e.g., cloud vertical growth rate from a window channel), the probability would have been only 12%. The much higher ProbSevere probability with satellite data offered 45 minute lead time on the first severe weather report. The ProbSevere product will be improved in the GOES-R era, given the additional information from the ABI and total lightning data from the Geostationary Lightning Mapper (GLM). We fully expect that the impact of the satellite component in blended products will increase with GOES-R as a result of more frequent images, a factor of four improvement in spatial resolution, more spectral bands for inferring cloud properties, and lightning mapping. Credt: ASPB and CIMSS

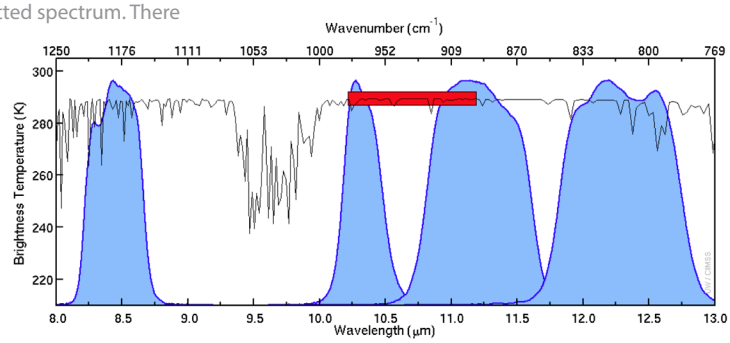
Did You Know?

1974 was the first year geostationary imagers offered infrared imagery. Before this geostationary imagers only imaged the earth in the visible part of the electromagnetic spectrum. In May of that year, both the Visible Infrared Spin-Scan Radiometer (VISSR) on the Synchronous Meteorological Satellite (SMS) and the Geosynchronous Very-high Resolution Radiometer (GVHRR) on the Applications Technology Satellite (ATS)-6 were launched. ATS-6 was a three-axis stabilized spacecraft and the SMS legacy continued with GOES-1. Three-axis stabilization continues to keep weather satellites steady today, including GOES-R.

Baseline Products by Band

Wavelength Micrometers	11.2
Band number	14
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	√

The solid blue curves represent the instrument response functions for the ABI longwave window bands. The red bar represents the spectral region where most of the energy is captured by the GOES imager longwave window infrared band. The black line represents a high spectral resolution Earth-emitted spectrum. There is cooling due to ozone absorption within the ozone band wavelengths (centered at 9.7 µm) and absorption due to water vapor within most of this longwave window region. Credit: CIMSS



Tim's Topics

There are three main types of products from GOES-R: baseline, future capability, and envisioned. The baseline products are part of the ground segment on "day one." Examples of these include imagery, cloud properties, satellite derived winds, sea surface temperature, and total precipitable water.

The AWG developed ATBDs for future capability products. Examples of these products include overshooting tops and total ozone.

The final class of products contains those that were envisioned subsequently. ProbSevere is one such product. This product provides the probability that a storm will become severe within the next one hour. Other envisioned products include convective nearcasting and a host of decision aids such as image combinations.

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

Ken's Corner

Many operational uses for the infrared window band are well known with widespread utility of the infrared window through the NWS, especially during overnight hours. Recent applications of the infrared window are leveraging the coming improvements in temporal (5-minute over the contiguous U.S.) and spatial (2 km) resolution from geostationary orbit. The rate of vertical cloud growth is an important input for fused products, which can help identify convective initiation, such as the GOES-R SATCAST and ProbSevere products. Additional "blended" products that combine observations and model output from different sources, will hopefully become more common in the future as it becomes recognized that forecasters have less time to review disparate sets of imagery and data in the forecast and warning process.

The takeaway message related to studies involving fused convective initiation aids is that trends in vertical cloud growth can portend changes in storm severity. When GOES-R imagery is available, we will use the infrared window to watch the evolution, upscale growth, and decay of convection via cloud top temperatures relative to radar.

Ken Johnson is the SSD Chief in the NWS Eastern Region. Jordan Gerth contributed to this segment.

Further reading

ABI Bands Quick Information Guides: http://www.goes-r.gov/education/ABI-bands-quick-info.html
ABI WES Guide: http://cimss.ssec.wisc.edu/goes/abi/loops/WES_for_GOES-R_ABI_2011_Version.pdf
ProbSevere: http://cimss.ssec.wisc.edu/severe_conv/probsev.html
CIMSS Satellite Blog: http://cimss.ssec.wisc.edu/goes/blog/?s=infrared+window
GOES-R COMET training: http://www.goes-r.gov/users/training/comet.html
GOES-R acronyms: http://www.goes-r.gov/resources/acronyms.html
HWT: https://satelliteliaisonblog.wordpress.com/2014/05/05/noaacimss-probsevere-model-introduced-at-ewp/