VIIRS Quick Guide by NASA / SPoRT

What is VIIRS?

VIIRS is the Visible Infrared Imaging Radiometer Suite, an instrument on the Suomi National Polar-orbiting Partnership (NPP) satellite that observes the Earth and atmosphere at 22 visible and infrared wavelengths. Suomi NPP is the bridge between the current NASA research Earth-observing satellites, like Aqua and Terra, and future NOAA operational missions, specifically the Joint Polar Satellite System (JPSS). Therefore, VIIRS is very similar to MODIS. This guide will help you understand the similarities and differences between VIIRS and MODIS imagery in the operational setting.

When is VIIRS data available?

NPP is a polar orbiting satellite with an orbit similar to Aqua, so VIIRS data will be available in a similar timeframe as MODIS on Aqua. However, where MODIS is also on the Terra satellite and available multiple times a day, VIIRS is only on one satellite.

How does VIIRS imagery differ from MODIS imagery?

VIIRS's swath width is broader than MODIS (3000 km versus 2330 km), and the resolution on the edges of the swath is greatly improved, so the entire VIIRS image will appear crisp and clear. In fact, the resolution in many channels is a little better in VIIRS imagery than in MODIS imagery. VIIRS includes or encompasses many of the same channels that MODIS provides, and can produce many of the same derived products, like RGBs to make dust and fog more visible. VIIRS also includes a low light sensor called the Day-Night Band (DNB), a broad spectrum visible channel that detects reflected moonlight and emitted city light (view NASA-SPoRT's DNB quick guide at http://weather.mfsc.nasa.gov/sport/training). However, VIIRS does not include water vapor or ozone channels, which are available on MODIS. The table below shows VIIRS products available from NASA-SPoRT.

Subset of Products Available from SPoRT		
Products/Imagery	**Resolution in AWIPS (m)[1]**	**Wavelength[3]/Difference (µm)**
Visible	500	0.645
Longwave & Shortwave IR	1000	LW: 11.45 SW: 3.74
Dust RGB	1000	Red: 12.01-10.76 Green: 10.76-8.55 Blue: 10.76
Night-time Microphysics	1000	Red: 12.01-10.76 Green: 12.01-3.74 Blue: 10.76
Day-Night Band Radiance	1000	0.7
Day-Night Band Reflectance	1000	0.7
Day-Night Band Radiance RGB	1000	Red: 0.7 Green: 0.7 Blue: 10.76
Air Mass RGB[2]	1000	Red: 6.197-7.299 Green: 9.703-10.76 Blue: 6.197 (inverted)
False Color	1000	Red: 0.488 Green: 1.61 Blue: 2.25
Natural Color	1000	Red: 1.61 Green: 0.865 Blue: 0.640
True Color	1000	Red: 0.672 Green: 0.555 Blue: 0.488

1 Data remapped to listed resolution for display in AWIPS.
2 Produced using water vapor and ozone channels from CrIS.
3 Values for Wavelength taken from Lee et. al. 2006 (BAMS)

VIIRS image examples
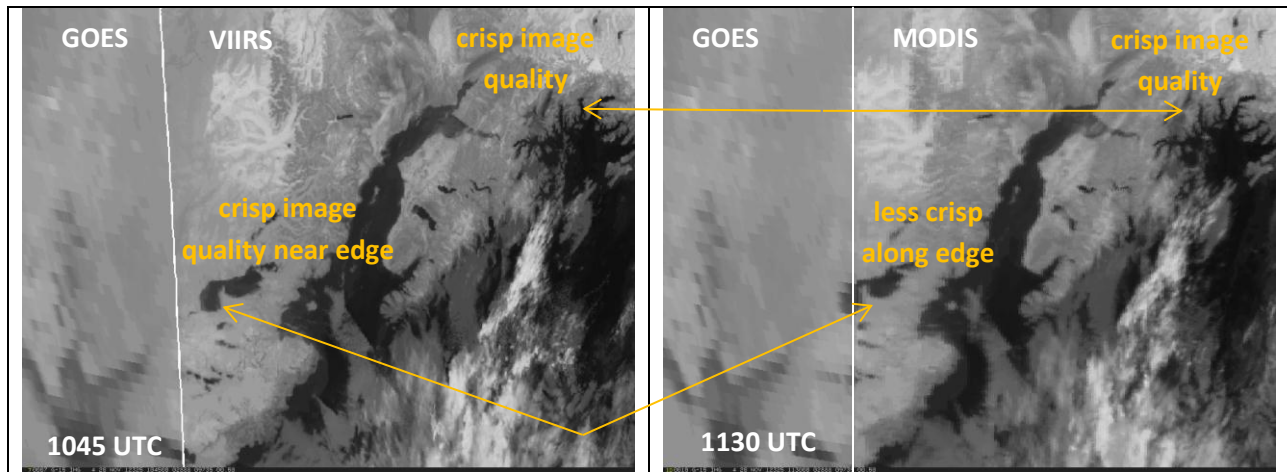
Hybrid products insert polar-orbiting satellite imagery into geostationary views for swaths of improved resolution. In these hybrid examples over Alaska (20 November 2012), note that the VIIRS image resolution does not degrade on the edge of the swath, represented by the white line. However, the MODIS image resolution does degrade along the edge of the swath. Also note that in this 11μm IR channel, MODIS's native resolution is 1000 m, versus VIIRS at 750 m.
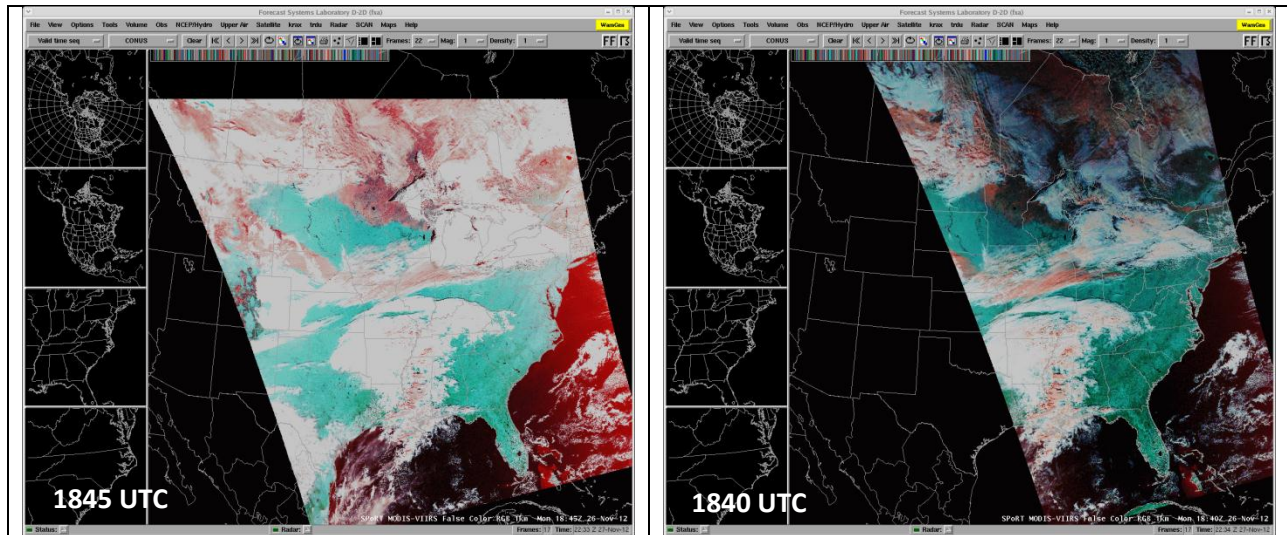
False color images displayed on AWIPS from 26 November 2012. These images are scaled to 1 km resolution in AWIPS. The VIIRS swath at 1845 UTC is much wider (3000 km) than the contemporaneous MODIS image from the Aqua satellite (2330 km).

Resources

Operational applications of VIIRS can be found on the SPoRT blog (http://nasasport.wordpress.com). Other information about the Suomi NPP satellite mission can be found on the Suomi Mission Page (http://npp.gsfc.nasa.gov/index.html). Additional information about VIIRS products and other quick guides can be found at NASA-SPoRT's home page (http://weather.msfc.nasa.gov/sport).

Lee T. E., S. Miller, F. J. Turk, C. Schueler, R. Julian, S. Deyo, P. Dills, S. Wang, 2006: The NPOESS VIIRS Day/Night Visible Sensor, *Bull. Amer. Meeort. Soc.,* **87***,* 191-199.