About VIIRS

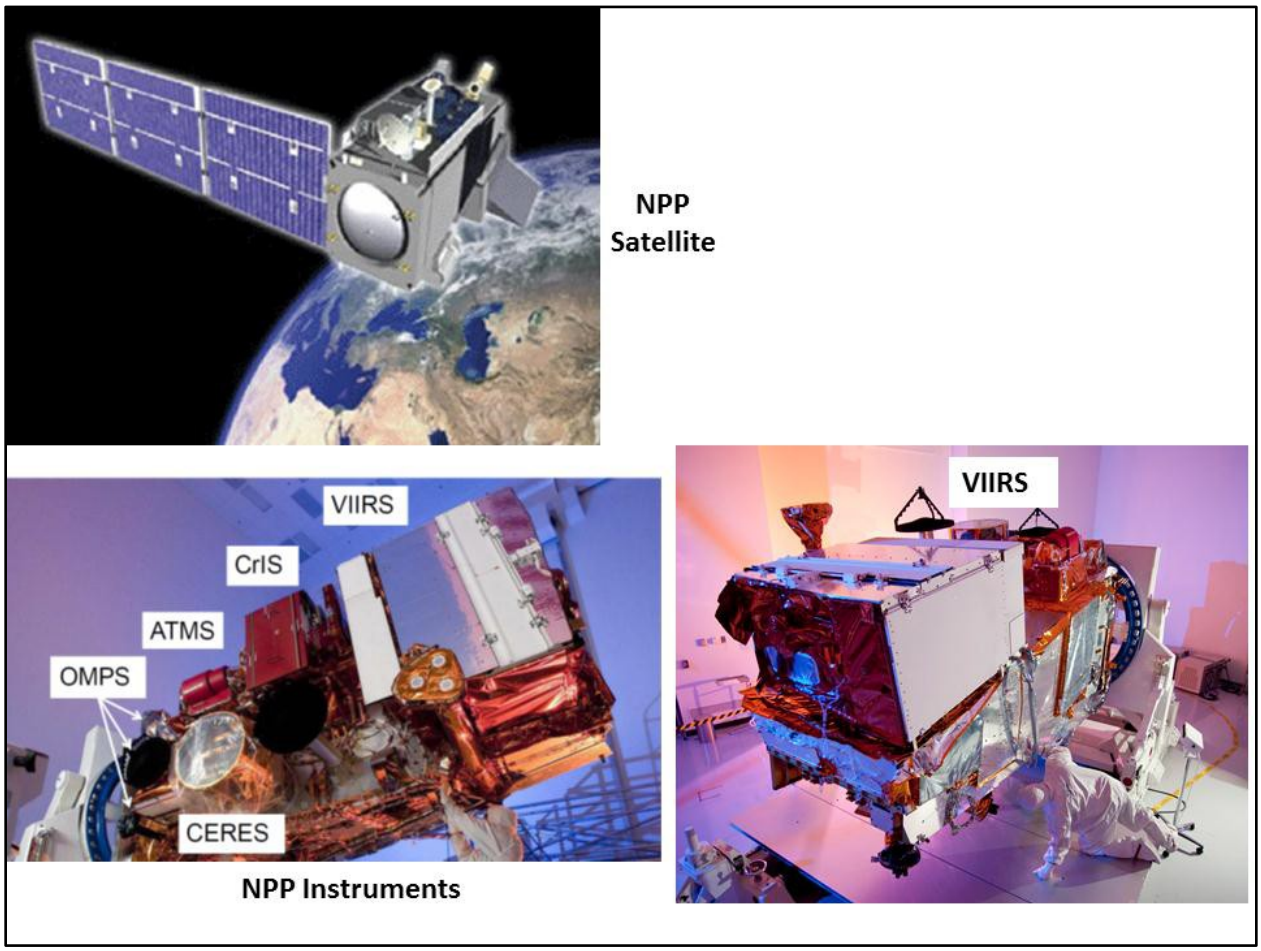

Figure 1. Schematic of the NPP satellite (top) with its suite of instruments (lower left) and an expanded view of the VIIRS sensor (lower right) ***Courtesy of NASA and JPSS***

What is VIIRS?

The recent launch (October 28, 2011) of the Visible Infrared Imaging Radiometer Suite (VIIRS) onboard the Suomi National Polar orbiting Partnership (NPP) platform has ushered in a new era of Earth- observing sensors. VIIRS products will look significantly sharper and contain greater detail than current operational weather sensors. Figure 1 displays the NPP satellite and instruments onboard, with VIIRS being the largest instrument. The NPP satellite occupies a 13:30 (early afternoon) sun synchronous orbit, i.e., the satellite passes over the equator at the same times (1:30 pm and 1:30 am) every day and night. Each of the five instruments shown is designed to provide remote sensing of the environment. NexSat's primary focus is to display

VIIRS-derived satellite products, but the other sensors could be adapted in the future.

VIIRS sensing is designed similarly to its heritage operational and research predecessors (AVHRR, OLS, and MODIS), but with significant improvements that will greatly enhance applications related to the earth's atmosphere, ocean, and terrain. VIIRS provides 22 bands (channels) ranging from visible (0.4 microns) to infrared (12 microns). Table 1 relates the 22 VIIRS bands (or channels) to the corresponding central wavelengths and current MODIS channels. As shown, the VIIRS sensor is closely aligned with MODIS. The one exception is the "Day Night Band" (DNB) band which does not have a MODIS equivalent. The DNB is similar to the OLS low light sensor, but is fully calibrated and has digitization improvements that will provide unprecedented nighttime quantitative capabilities. The VIIRS data-stream began on Nov 21, 2011 and associated products are planned to become available within the next few months (early 2012).

NPOESS VIIRS		EOS MODIS		
Band number	**Central wavelength (µm)**	**Band number**	**Central wavelength (µm)**	**Wavelength Type**
M1	0.412	**8**	0.412	VIS
M2	0.445	**9**	0.443	VIS
M3 (b)	0.488	**3 (b)**	0.469	VIS
M4 (g)	0.555	**4 (g)**	0.555	VIS
M5 (r)	0.672	**1 (r)**	0.645	VIS
M6	0.746	**15**	0.748	NIR
M7	0.865	**2**	0.858	NIR
M8	1.240	**5**	1.240	SWIR
M9	1.378	**26**	1.375	SWIR
M10	1.61	**6**	1.640	SWIR
M11	2.25	**7**	2.13	SWIR
M12	3.7	**22**	3.959	MWIR
M13	4.05	**23**	4.05	MWIR
M14	8.55	**29**	8.55	LWIR
M15	10.763	**31**	11.03	LWIR
M16	12.013	**32**	12.02	LWIR
DNB	0.7	**No equivalent width**	**No equivalent width**	VIS
I1 (r)	0.64	**1 (r)**	0.645	VIS
I2	0.865	**2**	0.858	NIR
I3	1.61	**6**	1.64	SWIR
I4	3.74	**22**	3.959	MWIR
I5	11.45	**31**	11.03	LWIR

M: Moderate resolution band (0.74 km) "smooth"
I: Imaging band (0.37 km) "fine"
DNB: Day night band

Table 1. Listing of VIIRS channels and corresponding MODIS channels. The true color channels are color coded and indicated by(r): red, (g): green, and (b): blue designations. Under Wavelength Type: VIS=visible, NIR=Near Infrared, SWIR=Shortwave Infrared, MWIR=Midwave Infrared, and LWIR=Longwave Infrared. The Day Night Band (DNB) within the VIIRS column is not represented by MODIS.

What's so special about VIIRS?

The global weather scientific community is eagerly anticipating the imaging capabilities of VIIRS. The community includes operational weather forecasters, climatologists, numerical weather prediction modelers, satellite meteorologists, hurricane/typhoon trackers, and general researchers. Typically, VIIRS will provide four times higher spectral resolution, three times higher spatial resolution, and significantly more detailed sea-surface temperatures than its operational polar orbiting predecessors. As a result, images will be sharper, with greater detail and atmospheric property retrievals will be more accurate and precise. Additionally, problems associated with edge of scan coverage will be minimized by changes in the sensor optics along the scan line. VIIRS also has a fully calibrated day-night band (DNB) that provides unprecedented views of the environment at night, including clouds, city lights, fires, dust; taking visible radiometric imagery to the next level. The derived environmental variables will provide modelers and researchers with overall improvements in qualitative and quantitative environmental assessments. Overall, VIIRS will greatly improve research in studies related to global warming, aerosol and cloud properties, fires, vegetation, tropical cyclones, ocean color (e.g., phytoplankton, sediment, chlorophyll, etc.), hydrology, land use, and general weather applications.

NexSat's role for VIIRS

Since its inception in 2003, the goal of the NexSat mission has been to prepare for the VIIRS era by demonstrating the sensor's capabilities using AVHRR, MODIS, and OLS-derived products. Table 2 summarizes the products that are currently available in NexSat as well as what will be displayed with VIIRS data.

NexSat Product Catalog

Standard Products
Visible (daytime)
Visible (night time)
Infrared
Water Vapor
True Color
Pseudo/GEO True Color
Rain Rates
Rain Totals – 3, 6, 12, 24 hours – 2, 3, 4, 5, 6, 7, 10, 12, 14 days
*Winds – speed and direction – low level – middle level – upper level

Cloud Products
Cloud layers (snow, low-middle, high)
CloudSat (cloud profile)
Cirrus cloud detection
Contrail detection
Low cloud detection (night)
Convective cloud top height
Cloud properties –effective radius –optical depth –cloud top temperature –cloud top height –cloud type

Environmental Products
Aerosol amounts (optical depth)
Biomass (vegetation type)
Dust detection
Fire detection (hot spots)
Lightning detection
Snow cover (surface)

*NWP model overlays
Sea Level Pressure
500 mb Heights
sfc, 700 500 300 mb Winds
1000-500 mb Thickness
Surface Temperature
Jet Stream

* NOGAPS and COAMPS®

VIIRS products in red

Table 2. List of NexSat environmental products.

Training
NexSat is dedicated to provide users with VIIRS information to educate the public. We provide on-line training with every product and also provide on-line links related to VIIRS. As VIIRS products become available, NexSat will provide updated links and information.

Feedback

As with any NexSat product, we strongly encourage NexSat users to provide us with feedback related to VIIRS. Please use our feedback button within our NexSat pages above.

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