

OVERVIEW

The High Latitude Proving Ground receives data from a number of polar-orbiting satellites as they fly over Alaska. Each of these satellites has several instruments, including an imager which produces the pictures that are processed by the Geographic Information Network of Alaska (GINA) at the University of Alaska Fairbanks and delivered to the NWS for display in AWIPS. The purpose of this quick guide is to briefly describe each of the imagers and compare their characteristics.

FRIENDS, ROMANS, COUNTRYMEN, LEND ME YOUR VIIRS

The newest and most advanced imager accessed by the High Latitude Proving Ground is the Visible Infrared Imaging Radiometer Suite (VIIRS) aboard the Suomi National Polar Partnership (SNPP) satellite launched in October of 2011. The SNPP satellite is a prototype for the new Joint Polar Satellite System (JPSS) series of four satellites that will be launched by the United States between 2017 and the early 2030s. The JPSS series is the follow-on to the NOAA POES series and will replace POES as those satellites age and fail. Each of the four JPSS satellites will be equipped with a VIIRS instrument, so VIIRS is the future of American polar-orbiting meteorological imagers.

In comparison to previous imagers, VIIRS has the advantages of a broader swath width (3000 km), and this advantage is even more meaningful due to the minimal degradation in spatial resolution out at the edges of the swath, the result is the broadest sharpest swath available to NWS forecasters. If VIIRS has a shortcoming, it is the lack of a water vapor band around 7 μm . The VIIRS has 22 channels: five I-bands (where I stands for “imagery”) at 375 m resolution, 16 M-bands (where M stands for “moderate”) at 750 m resolution, and last but not least the Day Night Band nighttime visible channel also at 750 m resolution.

Pi á la MODIS

Two MODerate-resolution Imaging Spectroradiometer (MODIS) instruments are currently in orbit: one MODIS is aboard the Terra Earth Observing System (EOS) satellite, launched in 1999; another MODIS is aboard the Aqua EOS launched in 2002. MODIS has 36 channels ranging from 0.645 μm to 14.2 μm ranging in resolution from 250 m to 1000 m, but does not have a nighttime visible channel. The swath width of MODIS is 2300 km, and unfortunately the spatial resolution of MODIS imagery degrades substantially out at the edges of the swath.

The Suomi NPP launch from Vandenberg Air Force Base October 28, 2011.



ADDITIONAL REFERENCES

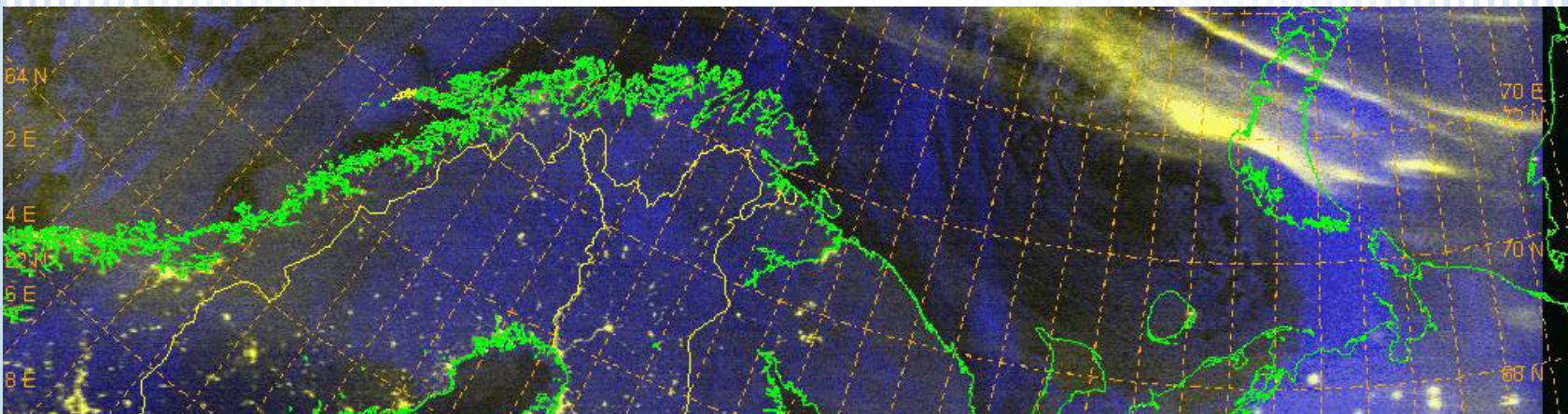
- VIIRS instrument: <http://www.jpss.noaa.gov/viirs.html>
 - MODIS instrument: <http://modis.gsfc.nasa.gov/>
 - AVHRR instrument: <http://noaasis.noaa.gov/NOAASIS/ml/avhrr.html>
 - DMSP information: <http://ngdc.noaa.gov/eog/dmsp.html>
- Eric Stevens: eric@gina.alaska.edu | Carl Dierking: cfdierking@alaska.edu | GINA Staff: www.gina.alaska.edu/people

NOTHING RHYMES WITH AVHRR

Versions of the Advanced Very High Resolution Radiometer (AVHRR) has been in use on various satellites since the late 1970s. AVHRR/3, the third generation of this instrument, is now flying on several polar orbiters: NOAA 15 (launched in 1998), NOAA 18 (launched in 2005), NOAA 19 (launched in 2009), and the European MetOp B satellite (launched in 2012). Each AVHRR/3 has five spectral bands, ranging from 0.64 μm visible to 11 μm and 12 μm longwave infrared. The spatial resolution all AVHRR/3 channels at nadir is 1100 m, and the swath width is 2900 km.

OR DMSP

The imager on the Defense Meteorological Satellite Program (DMSP) is the Operational Linescan System (OLS). The OLS has only two channels: a longwave infrared centered at 11.6 μm and a visible at approximately 0.6 μm . If the small number of channels available on the OLS is a limitation, that shortcoming is mitigated somewhat by the nighttime visible capabilities of the OLS. A photo-multiplier tube (PMT) produces imagery similar to that of the VIIRS' Day Night Band, although at a coarser resolution of 2700 m. The longwave IR and daytime visible have a resolution of 550 m.



DMSP Nighttime Visible image from 1641Z December 28, 2010, showing bright aurora bands circling north of Scandinavia as visualized by combined visual and infrared nighttime observations of DMSP satellites F17 and F18.

Satellite(s)	Instrument	Number of Band	Nighttime Visible?	Swath Width	Resolution at NADIR
Suomi NPP	VIIRS	22	Yes	3000 km	375 m to 750 m
Terra and Aqua	MODIS	36	No	2300 km	250 m to 1000 m
POES and METOP	AVHRR	5	No	2900 km	1100 m
DMSP	OLS	2	Yes	3000 km	550 m to 2700 m

Table showing the various satellites and some basic characteristics of their imaging instruments.

CONTACT

909 Koyukuk Drive
Suite 111 WRRB
P.O. Box 757275

University of Alaska Fairbanks
Fairbanks, Alaska 99775-7275

www.gina.alaska.edu | support@gina.alaska.edu

