VIIRS Day-Night Band Quick Guide by NASA / SPoRT

Why is the Day-Night Band (DNB) imagery important?

The VIIRS low-light channel (a.k.a. day-night band or DNB) provides a night-time image of reflected and emitted light, but with the resolution of day-time visible imagery. Analogous to how visible imagery uses reflected sunlight, the DNB uses reflected moonlight to see small-scale features at night that are not as readily seen in standard IR channels. For example, users can better detect smoke plumes, fog, and convective cloud structures at night by using the DNB (see page 2).

DNB Products – How are the various products created and what is their purpose?

The Suomi National Polar-orbiting Partnership (NPP) satellite was developed and launched by NASA and NOAA in October 2011 and is a precursor to the operational satellites of the NOAA Joint Polar Satellite System (JPSS). The VIIRS instrument on NPP provides high-resolution multispectral imagery similar to MODIS and includes a 750 m low-light channel called the Day Night Band (DNB) for nighttime weather applications. From this channel several products are possible. Here are two examples:

Radiance	Reflectance
How it is created: This product is the raw image from the sensor of emitted and reflected light. Because the cities lights are far brighter than reflected moonlight, the clouds can appear very faint while ground sources appear very bright.	***How it is created:*** The radiance product is normalized by the available amount of moonlight (phase and angle) in order to focus on the reflected portion of the imagery; hence the "DNB Reflectance" product. Normalizing provides a more consistent brightness in the resulting image throughout the moon cycle.
What to look for in imagery: In the absence of moonlight close to the new moon phase, emission sources like city lights and fires are most prominent. A difference in the normal city light pattern provides user awareness of clouds, fog, dust, or smoke that is obscuring the source or the presence of additional sources, such as fires. Other emission sources like lightning and auroras can also been seen.	***What to look for in imagery:*** Use this product like the typical day-time GOES visible imagery, mostly during full to quarter moon phases. Smoke plumes at night are especially visible compared to IR imagery. Cloud and surface features are also more evident at times than with standard IR channels. In addition, cloud thickness can be inferred from amount of source light that is scattered.

When is the imagery available?

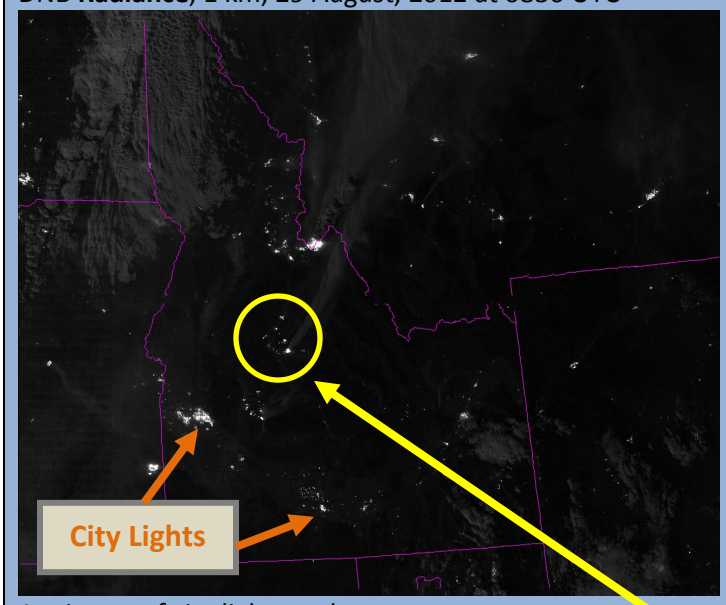
VIIRS DNB products are available 1x/night near 1:30 a.m. (nominal) local time, at all locations, similar to the MODIS-Aqua passes. But, the swath width is larger than MODIS and therefore, a location may have a second pass near the edge of an adjacent swath. VIIRS has improved resolution retention at the swath edge compared to MODIS.

Resources:

Operational applications can be seen on SPoRT's blog site (http://nasasport.wordpress.com/) in addition to other sources. A primer on VIIRS and a DNB module can be found at the UCAR/COMET MetEd website. More in depth information can be found at the Suomi Mission's homepage (http://npp.gsfc.nasa.gov/index.html)

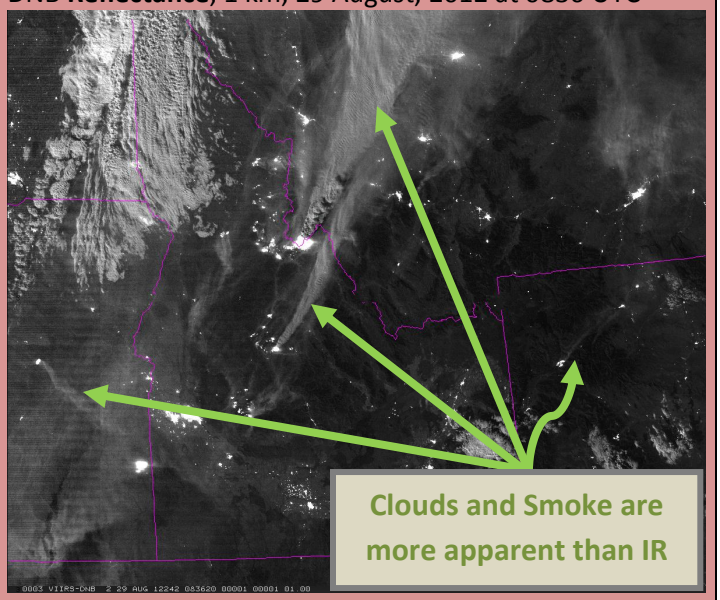
Examples of Day-Night Band Imagery from VIIRS

DNB **Radiance**, 1 km, 29 August, 2012 at 0836 UTC



A mixture of city lights and hotspots is seen. Local knowledge of the city lights pattern allows users to recognize changes due to smoke, fog, clouds, power outages, etc.

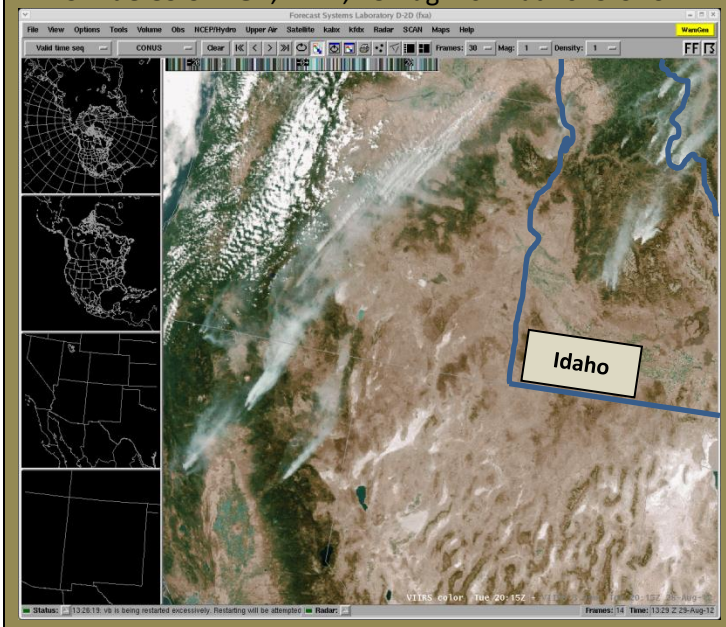
DNB **Reflectance**, 1 km, 29 August, 2012 at 0836 UTC



City lights and fires are evident, just as with the Radiance product. However, the Reflectance shows smoke at night very well. Note the large smoke plumes from Idaho and many smaller plumes throughout the image.

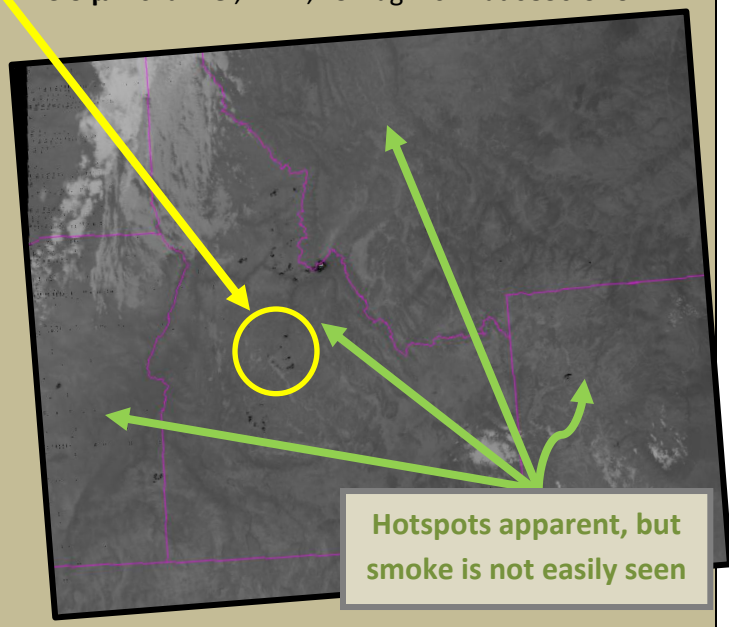
Hot spots – DNB better depicts location & intensity

VIIRS **True Color RGB**, 1 km, 28 Aug. 2012 at 2015 UTC



Day-time imagery of smoke plumes in the Western U.S. with Idaho outlined in blue. Visible bands are used to create this image. Clouds and smoke are easily discerned.

3.9 µm channel, 1 km, 29 Aug. 2012 at 0836 UTC



Typical short-wave IR imagery used to detect fire hotspots. Note that the DNB Radiance depicts varying brightness with each hotspot compared to this channel. Smoke is hard to see compared to the DNB Reflectance.

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