ALASKA DIRECT BROADCAST QUICK GUIDES

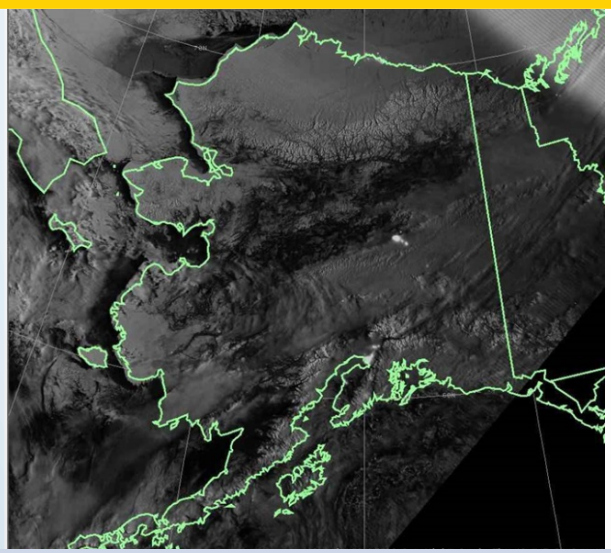
The "Nighttime Visible" Band

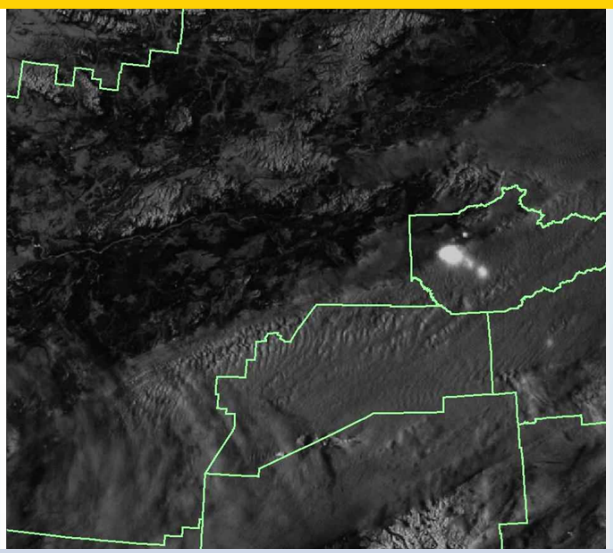
OVERVIEW

Conventional visible imagery centered at a wavelength of roughly 0.64 µm has the great strengths that it is comparatively straightforward to interpret (visible imagery is simply what the human eye would see, although in black and white) and has a fine spatial resolution. The great disadvantage of visible imagery has always been that it assumes sunlight will reflect off clouds or the Earth's surface and then be detected by a satellite's imager. This assumption fails at night, naturally, especially during the extended darkness of the Alaskan winter.

To remedy this shortcoming, separate nighttime visible bands have been added to the SNPP VIIRS instrument (the Day Night Band, or DNB) as well as to the DMSP OLS instrument (the Photo Multiplier Tube, or PMT). These night-time visible bands offer a much improved sensitivity to very weak nighttime signals of light, such as reflected moonlight or even starlight, with the tradeoff that these nighttime bands have a coarser spatial resolution than their equivalent conventional visible channels. The DNB and PMT imagery can be interpreted simply as visible imagery at night, with the caveat that city lights, aurora, and other subtle sources of light that are overwhelmed during daylight hours are also detected by nighttime visible bands.

Below are two screen captures of the VIIRS DNB from 1354Z January 24, 2013, with the image at right being a zoomed in view near Fairbanks. Note how the city lights of Fairbanks and even Delta Junction shine through a thin layer of low stratus clouds.





THE LUNACY OF NIGHTTIME VISIBLE IMAGERY

Nighttime visible imagery still relies on the reflection of incoming light, and thus the moon has a strong influence on the appearance of this imagery. Clouds and topography are easier to identify when the moon is above the horizon and closer to its full phase. During new moon, subtle meteorological signals can be tougher to make out.

ADDITIONAL REFERENCES

The COMET module, "Introduction to VIIRS Imaging and Applications" includes a discussion of the Day-Night Band and the OLS http://www.meted.ucar.edu/satmet/viirs_intro/

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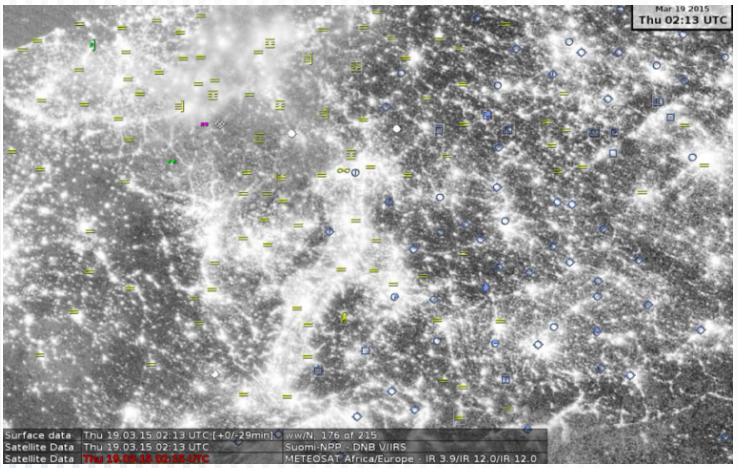

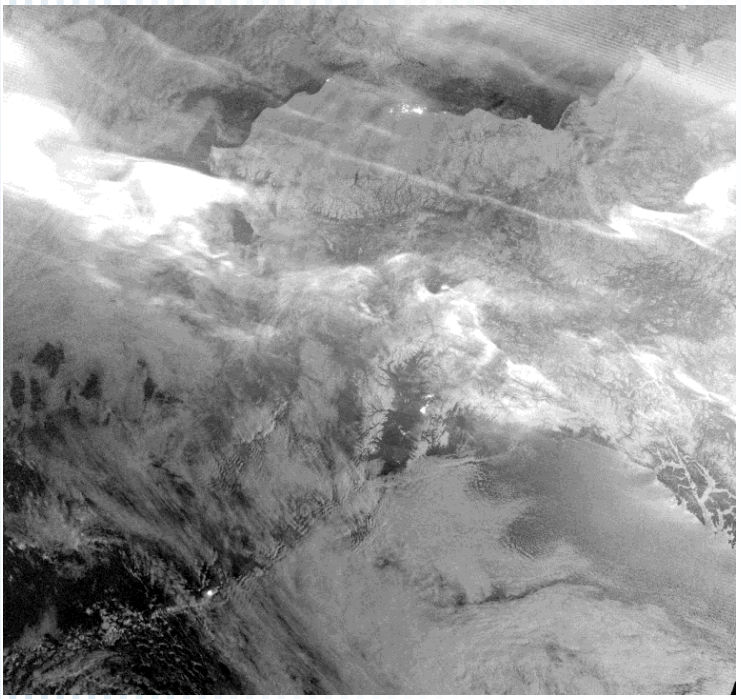

THE UP SIDE OF "ALASKA IS DIFFERENT"

The words, “Alaska is different,” are often said, and in the context of operational meteorology, “different” can be a polite way of saying, “very very challenging.” For example, Alaska suffers from sparse observational networks—radars, river gauges, etc—but the big exception is polar-orbiting weather satellites. Thanks to its high latitude, Alaska gets more frequent coverage from polar orbiters than any other part of the US, so in this respect “different” is actually very good.

Another advantage is Alaska’s low population density. Light pollution from cities, gas flares, and other human activities show prominently in nighttime visible imagery and can overwhelm the meteorological signal. The top image at left (courtesy of Dr. Katja Hungershöfer of the German Weather Service) is the VIIRS DNB over west-central Europe, and city lights make it difficult to see the patchy low stratus and fog reported by several surface stations. The lower image from 1229Z Nov 15, 2014, shows minimal light pollution from cities, but ribbons of aurora obscure clouds and topography underneath. Unlike cities, however, the aurora may move off or fade out by the time of the next satellite pass and allow a better view of the weather

Satellite(s)	Instrument	Band Name	Wavelength	Resolution at NADIR
Suomi NPP	VIIRS	DNP	0.70 μm	750 m
DMSP	OLS	PMT	0.685 μm	2700 m

Note that that the spatial resolution of these bands is coarser than their instruments’ equivalent day-time visible bands. Also, the spectral width of night-time visible channels is much wider than conventional visible channels.

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