ALASKA DIRECT BROADCAST QUICK GUIDES
Who's Who in Polar Products for Alaska

OVERVIEW

An increasing number of new polar-orbiter satellite products spanning a variety of wavelengths is becoming available for use in AWIPS by NWS Alaska Region. It is the purpose of this quick guide to summarize these single-channel and the multi-channel products.

THREE IMAGERS, THREE SETS OF WAVELENGTHS

Table 1 lists the single-channel products available from the VIIRS, MODIS, and AVHRR imagers. While these three imagers have their similarities - each delivers visible imagery in the red portion of the visible spectrum at 0.64 µm, for example - there are also some important differences. For instance, the VIIRS instrument is the only imager that includes a night-time visible channel, and only MODIS covers the wavelengths that detect water vapor. The AVHRR Instrument offers the fewest number of channels, and none of those channels are unique to AVHRR. What AVHRR lacks in variety and uniqueness, however, is compensated by the large number of passes made by AVHRR imagers that are carried aboard several NOAA POES and MetOp satellites.

ON THE SPECTRUM

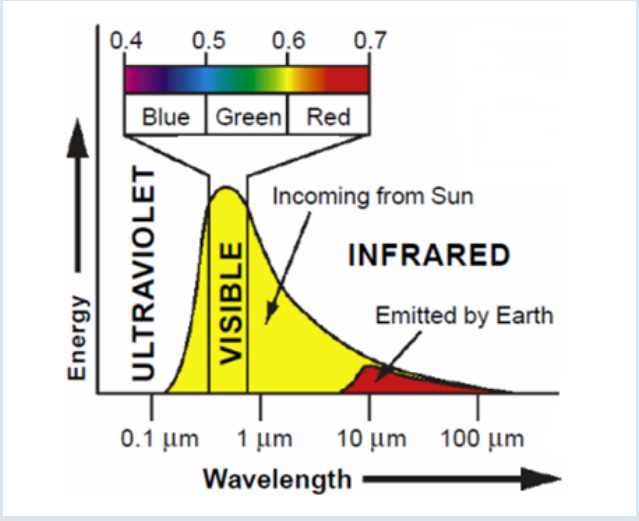

Figure 1 shows the relative positions of various visible and IR wavelengths sampled by polar-orbiting weather satellites. Note that the horizontal axis is logarithmic. This figure illustrates how the longer IR wavelengths represent signal coming from Earth, while shorter wavelengths include reflection of incoming solar radiation.

Table 1: Single-channel Products by Wavelength (µm)

Band Nickname	VIIRS	MODIS	AVHRR
Blue Visible	0.49	0.47	-
Green Visible	0.56	0.56	-
Red Visible	0.64	0.64	0.64
Day Night Band	0.7	-	-
Veggie Band	0.86	0.86	0.86
Cirrus Band	1.4	1.4	-
Snow-Ice Band	1.6	1.6	1.6
Cloud Particle Size	2.3	2.1	-
Fog and Fire IR Window	3.7	3.7	3.7
Fire Band	4.0	4.0	-
Upper Level Trop WV	-	6.7	-
Lower-Mid Level WV	-	7.3	-
Cloud Top Phase	8.6	8.5	-
Ozone Band	-	9.7	-
Clean IR Longwave	10.8	-	-
IR Longwave Window	11.4	11.0	10.8
Dirty Longwave Window	12.0	12.0	12.0

ADDITIONAL REFERENCES

- VIIRS channel information from CIRA: http://rammb.cira.colostate.edu/projects/npp/Beginner_Guide_to_VIIRS_Imagery_Data.pdf
- The graphic in figure 1 originated at http://remote-sensing.net/concepts.html

- Eric Stevens: eric@gina.alaska.edu | Carl Dierking: cfdierking@alaska.edu | GINA Staff: www.gina.alaska.edu/people

Table 2: Multi-channel Products and their Component Wavelengths (µm)			
Multi-channel Product	**VIIRS**	**MODIS**	**AVHRR**
Fog	11.4, 3.7	11.0, 3.7	10.8, 3.7
Natural Color	0.64, 0.86, 1.6	0.64, 0.86, 1.6	0.64, 0.86, 1.6
Snow Cloud	0.64, 1.6, 11.4	0.64, 1.6, 11.0	0.64, 1.6, 10.8
True Color	0.49, 0.56, 0.64	0.49, 0.56, 0.64	0.49, 0.56, 0.64
DNB Radiance	DNB, 11.4	-	-
Fire Temperature	3.7, 2.3, 1.6	3.7, 2.1, 1.6	-
Nighttime Microphysics	3.7, 11.4, 12.0	3.7, 11.0, 12.0	3.7, 10.8, 12.0
24 Hr Microphysics	8.6, 11.4, 12.0	8.6, 11.0, 12.0	-
Air Mass	-	6.7, 7.3, 9.7, 11.0	-
Dust	8.6, 11.4, 12.0	8.6, 11.4, 12.0	-

THE WHOLE IS GREATER THAN THE SUM OF THE PARTS

Multi-channel products, also known as multi-spectral products or RGBs, are the result of combining several single-channel products into a single color product. Table 2 lists several multi-channel products and the individual channels needed to construct them.

There are two advantages to combining several channels into a single product. First, it is time consuming to examine all the single-channel products from each satellite pass; a multi-channel product allows a meteorologist to review a large amount of information across several wavelengths by looking at only one product, thus saving time on the forecast desk. Second, certain weather and terrain features only become obvious after combining different channels. The Natural Color RGB is a good example of this advantage. Natural Color allows a forecaster to easily differentiate areas of sea ice from areas of cloud despite the fact that such a distinction is not possible using any of the single channels used to build the Natural Color multi-channel product.

Note that not all multi-channel products are available from all instruments. As seen in table 1, the VIIRS and AVHRR instruments lack channels at wavelengths appropriate for sensing water vapor. Consequently, there are no VIIRS or AVHRR versions of the Air Mass product, since Air Mass requires the inclusion of water vapor imagery.

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