Current Usage and Future Prospects of Multispectral (RGB) Satellite Imagery in Support of NWS Forecast Offices and National Centers

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What is an RGB Composite Image?

- Current and future satellite instruments provide remote sensing at a variety of wavelengths.
- RGB composite imagery assigns individual wavelengths or channel differences to the intensities of the red, green, and blue components of a pixel color.
- Each red, green, and blue color intensity is related to physical properties within the final composite image.
- Final color assignments are therefore related to the characteristics of image pixels.
- Products may simply the interpretation of data from multiple bands by displaying information in a single image.

Current Products and Usage

- Collaborations between SPoRT, CIRA, and NRL have facilitated the use and evaluation of RGB products at a variety of NWS forecast offices and National Centers.
- Table 4 provides a list of RGB products that have been developed by these groups and disseminated to end users for a variety of applications.

Product Examples and Usage

- Several product are being disseminated for test and evaluation by NOAA/NWS field offices and National Centers as part of NOAAs GOES-R and Joint Polar Satellite System (JPSS) Proving Grounds.
- SPoRT has partnered with the Naval Research Laboratory in Monterey, CA to transition popular passive microwave composite products to AWIPS for use at the National Hurricane Center and the Hydroeteorological Prediction Center.
- Feedback is provided through informal discussion or more formalized product survey, in addition to operational use cases provided through GOES and SPoRT partner blog entries.

Future Directions and Opportunities

- The examples provided here demonstrate that multispectral (RGB) composite satellite imagery may offer some new applications using current satellite observations and those expected from future instruments such as GOES-R and JPSS.
- However, current decision support systems such as AWIPS, AWIPS II, and N-AWIPS lack capabilities to display imagery at the full color depth. AWIPS and AWIPS II are currently limited to 256 colors, whereas N-AWIPS is limited to 96 colors. 24-bit imagery assigns 8-bit colors to three values, resulting in 256 possible colors.
- New capabilities will need to be developed for the AWIPS II environment to support RGB image analysis and manipulation. These capabilities likely include, but may not be limited to the following:
  - Shader language or other color palette capabilities to display the full 24-bit color resulting from the R, G, B triple at each pixel.
  - The ability to load pre-defined RGB composites as a "product baseline," in addition to the forecast or analyst being able to make minor adjustments as needed to enhance specific features.
  - Other image enhancement techniques that are beneficial to single-channel or channel-difference imagery, such as histogram equalization or multiple segments of linear stretching.
  - Opportunities to expand to 32-bit imagery that incorporates an alpha channel or transparency layer to blend quantitative information or cloud textures provided by high resolution visible or infrared data.

Data Dissemination Strategies

- As new satellites are launched and come online, they provide a tremendous increase in data volume distributed to operational centers in addition to continued increases in model output and availability of additional radar products.
- Some, but not all satellite platforms or channels are included as baseline products.
- Some RGB products may require the inclusion of an additional band, or several bands, that are outside of the baseline.
- In the context of efficient data distribution, there are several options that can be discussed and debated, ranging from dissemination of all required (missing) bands and production of the final product at the forecaster workstation to construction of products by a provider and shipment of a single file. Some options are outlined below.