RGB Products, Applications, and Future Opportunities

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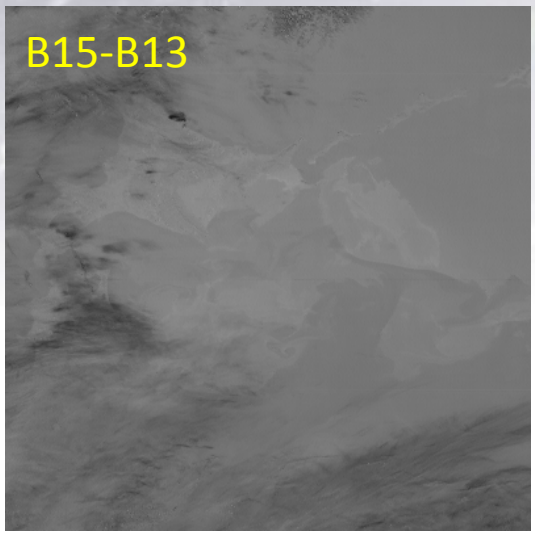
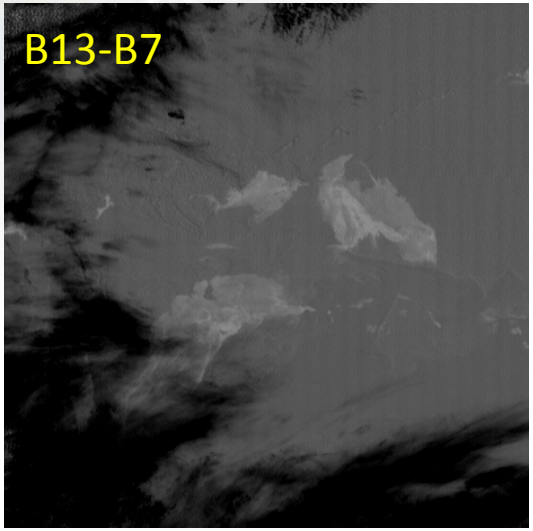
Background

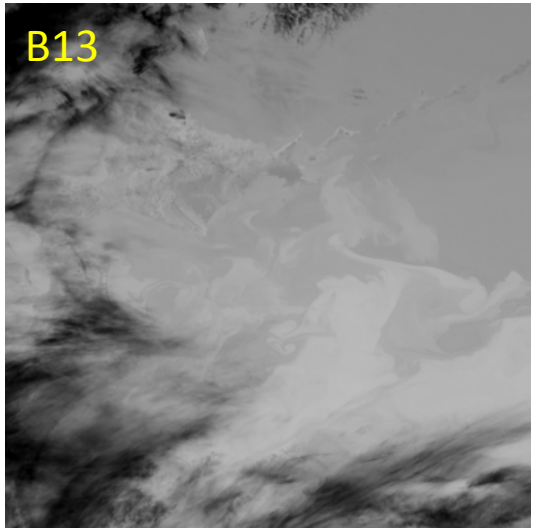
- Multi-spectral instruments such as MODIS, VIIRS, SEVIRI, and AHI provide a unique opportunity to synthesize “spectral signatures” of key features.
- Over the past several years, Proving Ground partners have developed various true or false color (RGB) products to address specific needs, such as:
  - Separating cloud from snow in daytime imagery
  - Using true color imagery to identify smoke and ash
  - Aiding in the detection of low stratus, or fog
  - Providing cloud height information to visible data through blending of the infrared brightness temperatures

Creation of an RGB

Selection of Input Spectral Bands, Differences, or Derived Products



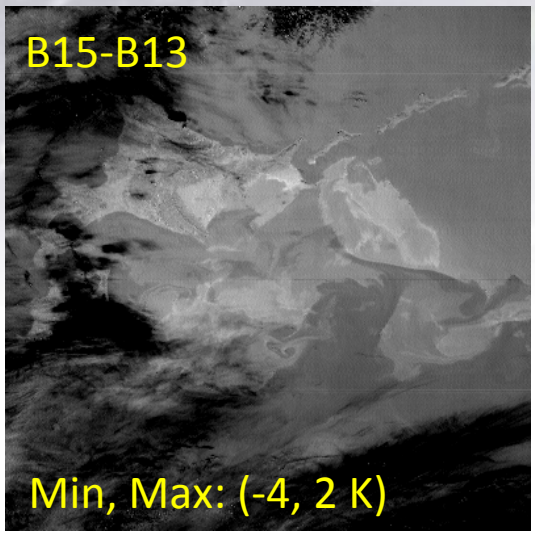


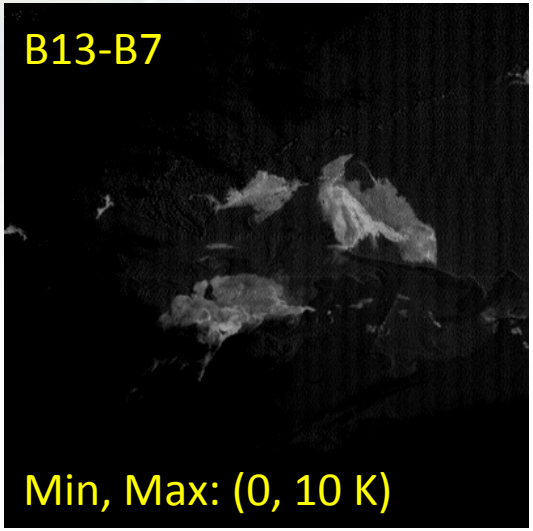


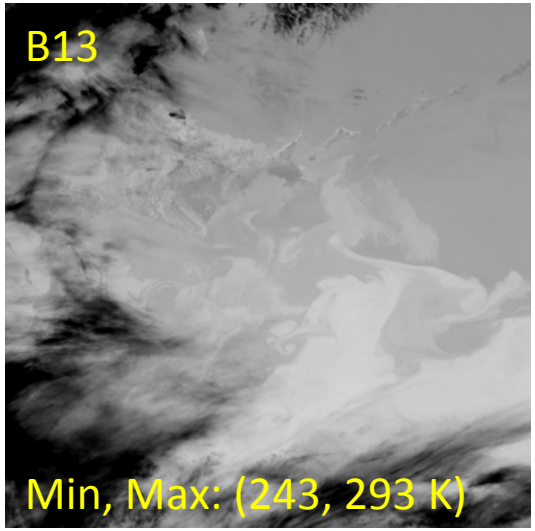
Using the EUMETSAT "Nighttime Cloud Microphysics" recipe and Himawari-8/AHI, here we have: B15-B13, B13-B7, and B13 images shown with an arbitrary grayscale.

Creation of an RGB

Image Enhancement to Improve Feature Detection



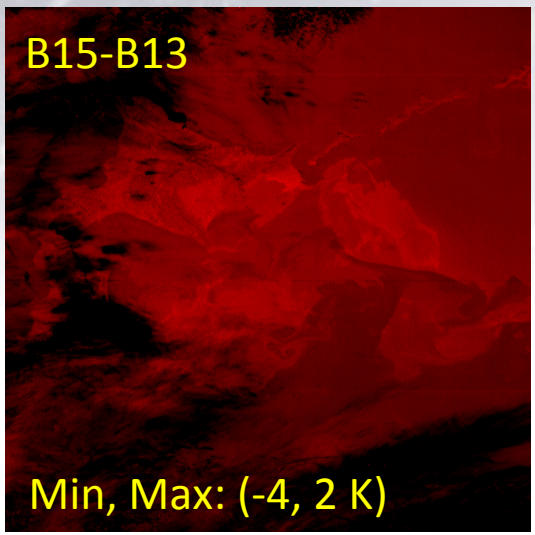


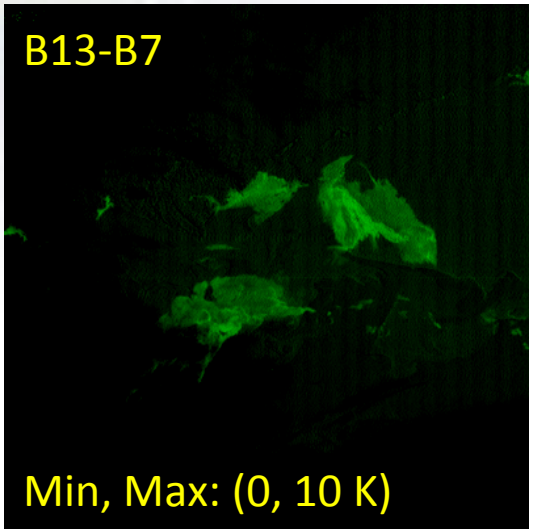


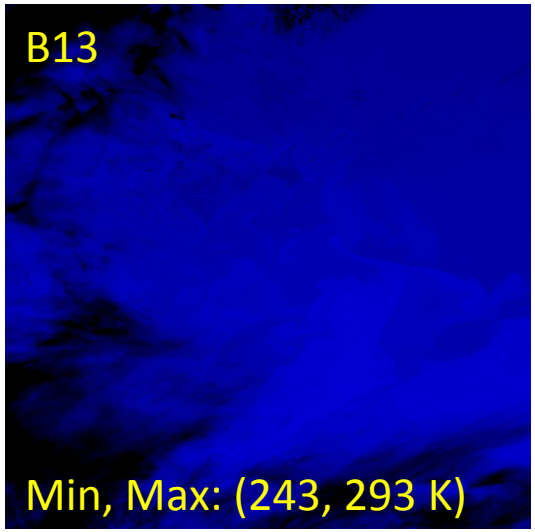
Based upon the typical characteristics of their ***spectral signature***, images are enhanced using an equation that maps physical properties to an 8-bit value.

Creation of an RGB

Assignment of Color Contributions



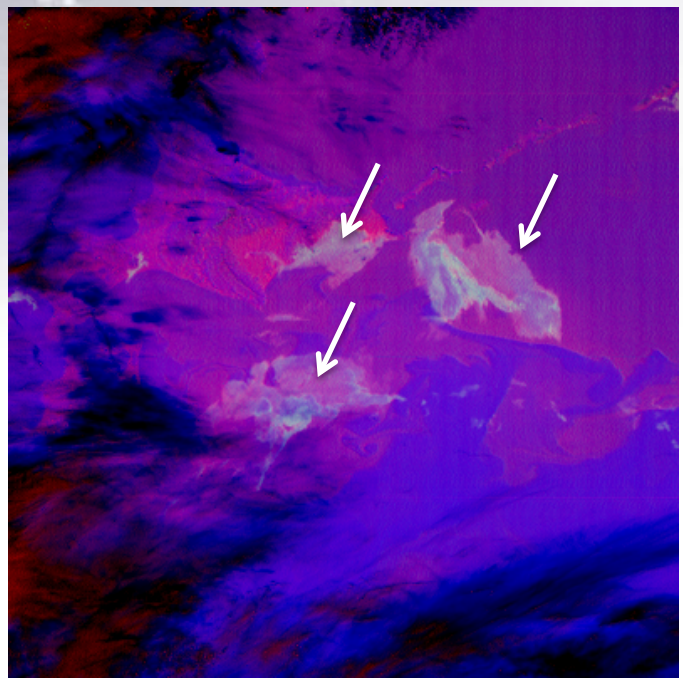


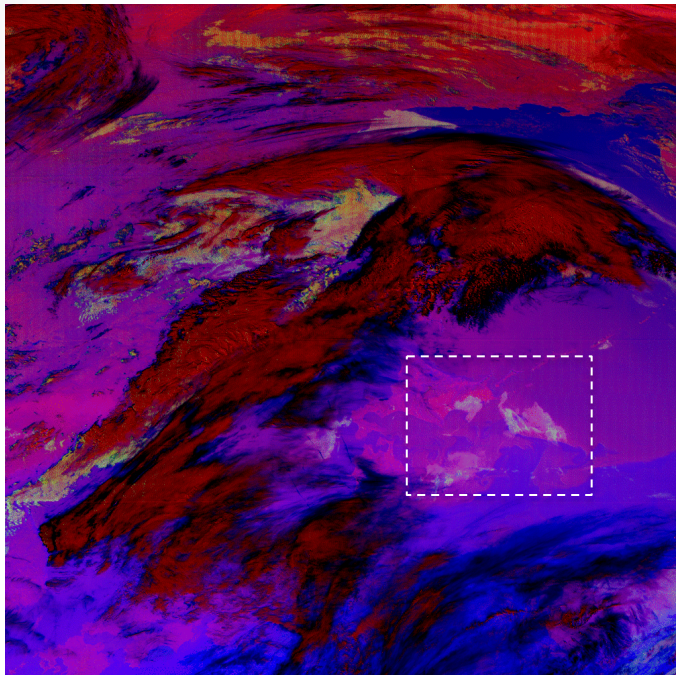


Once the features have been enhanced through appropriate stretching, each contribution is assigned to one of the **red**, **green**, and **blue** color contributions.

Creation of an RGB

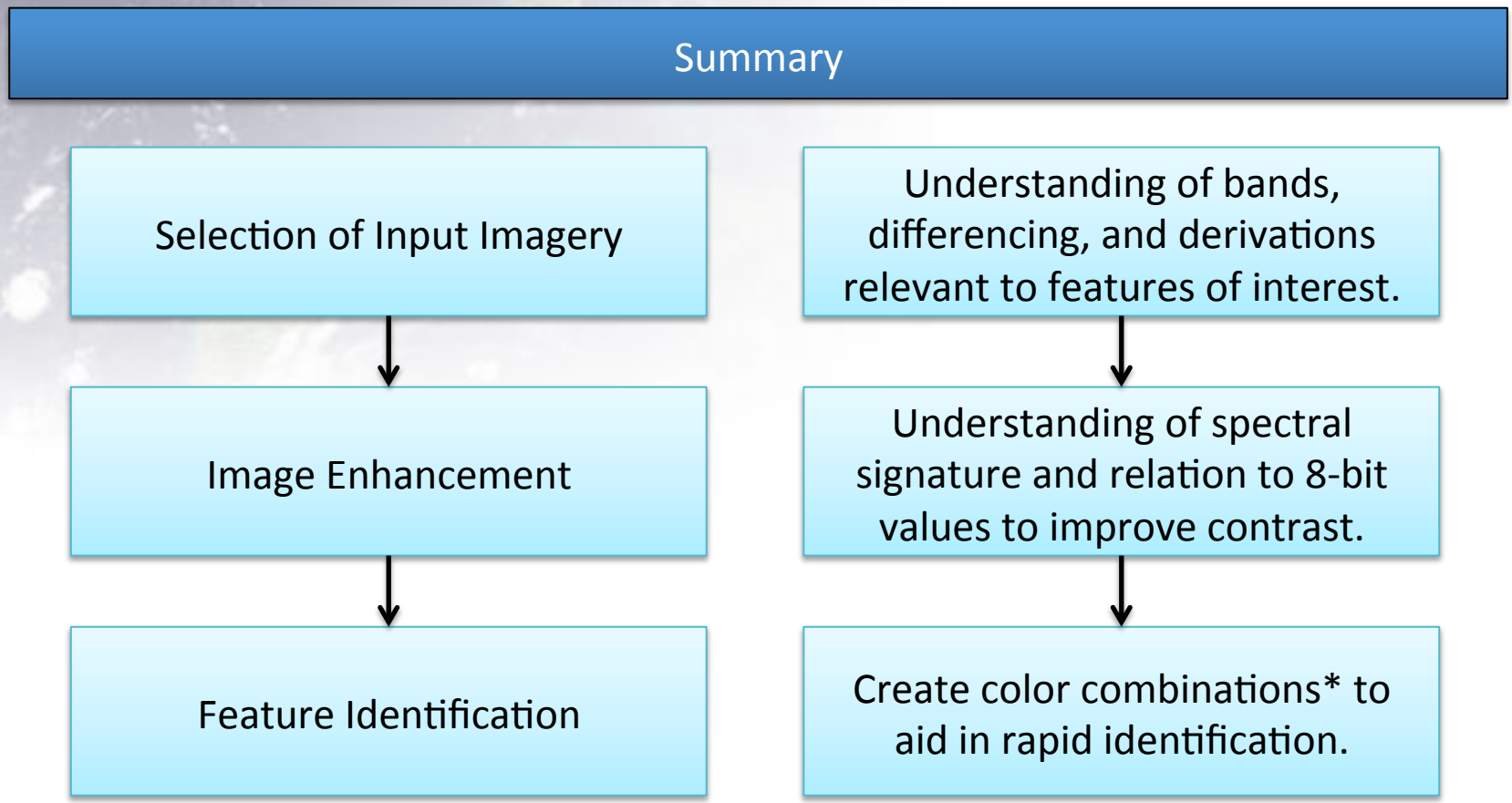
Final Product: EUMETSAT "Nighttime Cloud Microphysics" Imagery





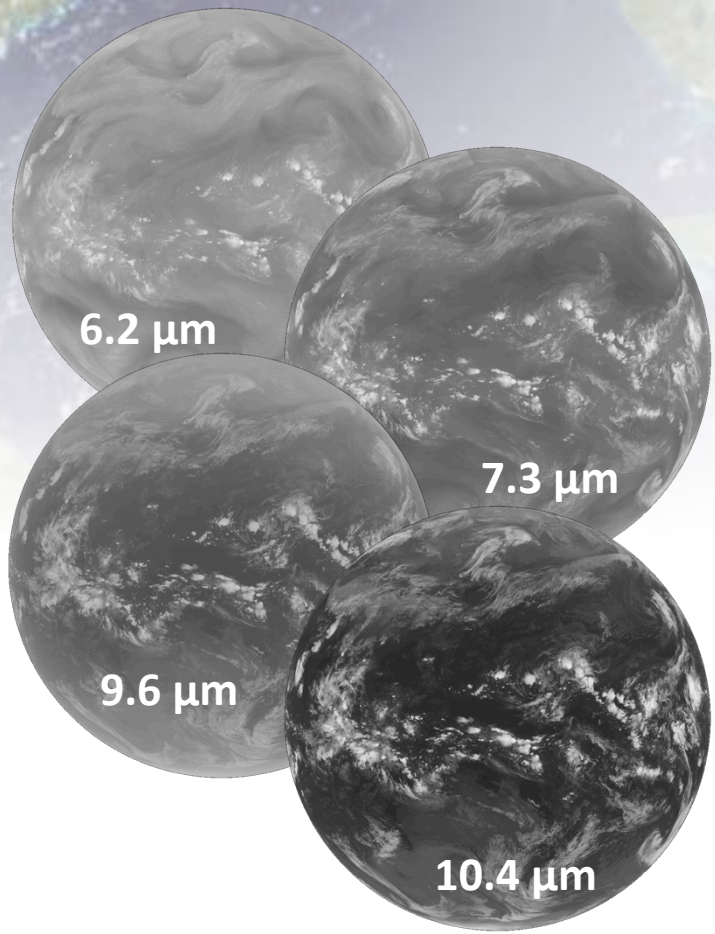
Features of interest – here, low clouds and fog – stand out from other features in a **distinct light blue to cyan color**, while preserving texture from the source imagery.

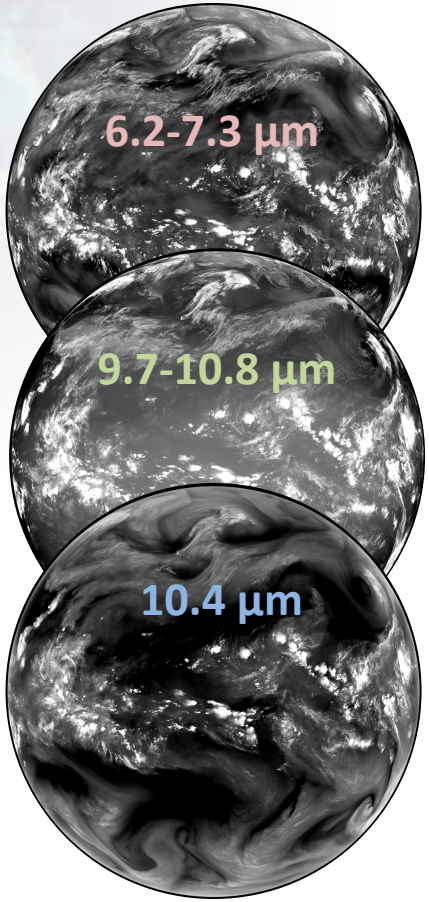
Creation of an RGB

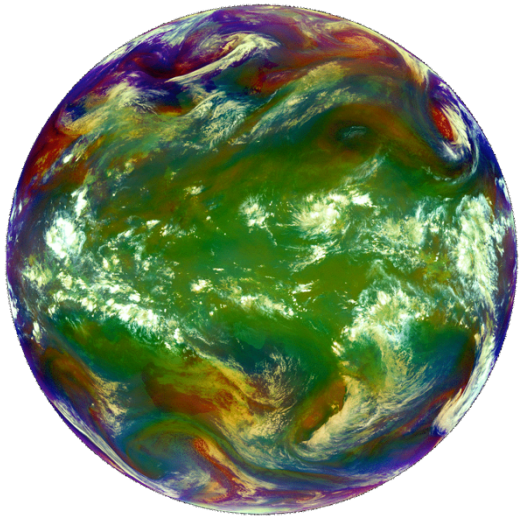


**adjusting as needed to compensate for users with difficulty in seeing certain colors*

Creation of an RGB







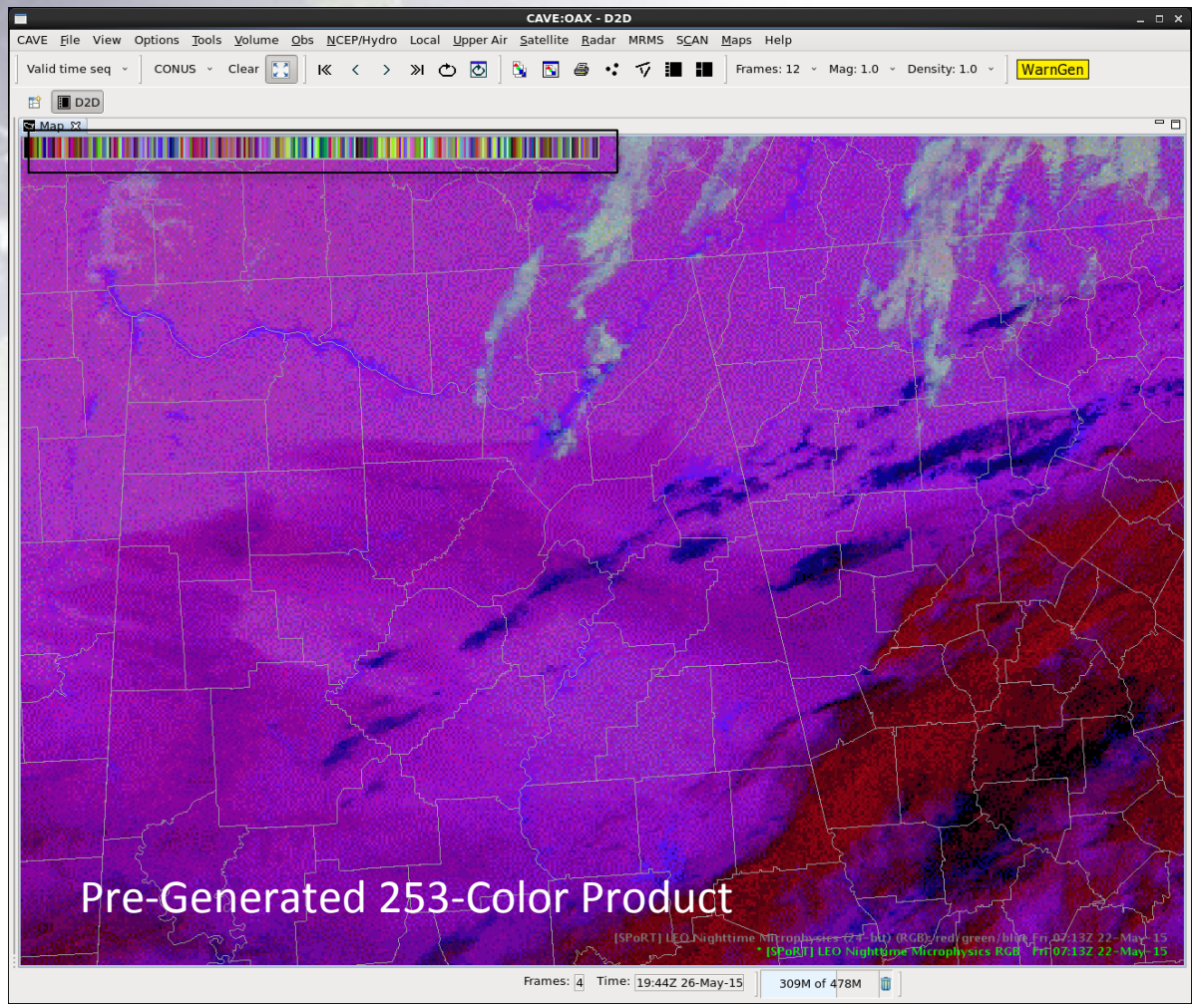
EUMETSAT Air Mass RGB

Single-band information and texture, spectral signatures of features, and interpretation

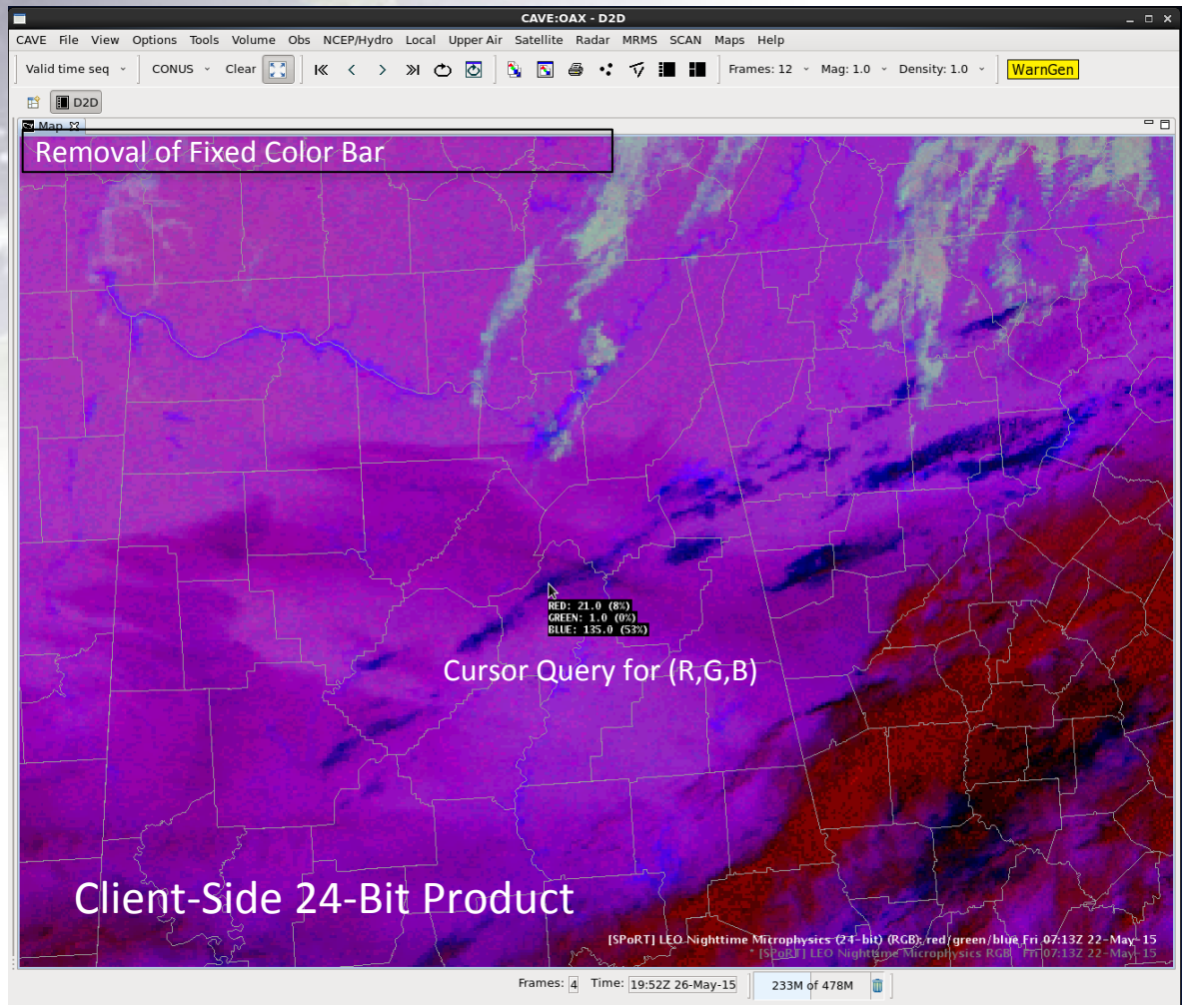
Generation of RGB Products

- **Client-Side (2015-Onward!)**
  - Available for AWIPS II using localizations produced by Experimental Products Development Team collaborators and recently improved TrueColor plugin.
    - Baselined, and no additional ATAN process is required.
    - "National Centers Perspective" development continues…
  - Requires that all necessary bands be provided, either through the SBN or a supplemental source (LDM, etc.)
- **Pre-Generated (2011-?)**
  - Legacy AWIPS and N-AWIPS systems, helping to familiarize numerous forecasters with RGB concepts.

Generation of RGB Products



Generation of RGB Products



Suggested* Collaborations

**presenter's opinion, your mileage may vary!*

- Product Generation
  - Development teams could consult with NWS Training to identify a subset of RGB products to incorporate as a "baseline" set of products.
  - Focus on products with previous demonstrations, with some available training, and where responses have been favorable.
  - Use experiences gathered to date to broaden training, including single-band use, RGB interpretation, and use of other PG products.

Suggested* Collaborations

**presenter's opinion, your mileage may vary!*

- RGB Simulators
  - End users will ***definitely benefit*** from an "RGB Sandbox" to explore these capabilities.
  - Develop AWIPS II capabilities to allow forecasters to generate image enhancements and RGBs "on the fly" within their system.
    - Emphasize the value of spectral signatures (BTs, refl.) beyond a combination of arbitrary gray scales.
  - Allow the simulator to write a localization for new products to improve functionality.

Future Opportunities

Opportunities	Challenges
• Increased number of spectral bands and improved spatial-temporal resolution will give an unprecedented opportunity to develop new products.	• Training for each new product will need to begin with the basics of spectral bands and spectral signatures to ensure proper interpretation.
• As users gain experience, they will want to create their own products for use in their operational environment.	• Providing a simulation environment within the DSS that allows for "sandbox" creation of new concepts and deployment. • Vetting of products (by whom?) and consistency in their availability and training among WFOs.
• Blending of other fields, such as cloud properties, model output, and data from other sensors.	• Varying spatial resolutions, data types, texture, enhancements, etc. may need to be accommodated.

Planned SPoRT Activities

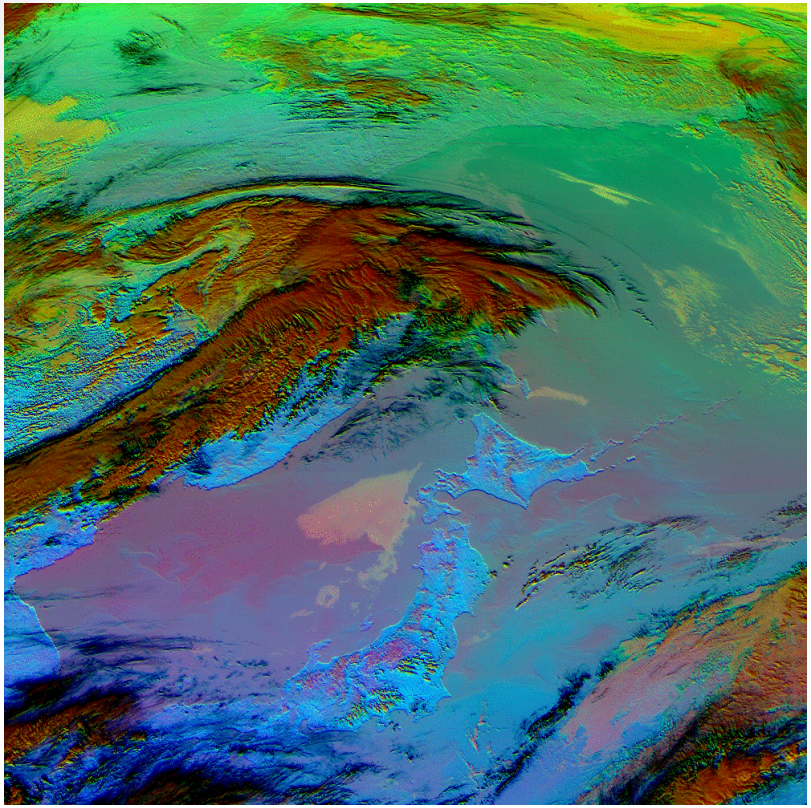
- Explore refinement of EUMETSAT recipes to improve depictions in high latitudes.
- Incorporate 3.9 um reflectance component to extend EUMETSAT product suite.
- Continued development of limb cooling correction to improve several products.
- Pixel-based query of *physical properties* in AWIPS II, beyond simple colors.

Planned SPoRT Activities

- Explore cloud and land surface property retrievals for more quantitative approach to RGB products.
- Extend 24-bit “on the fly” capability to passive microwave products.
- Refined training products with greater emphasis on “O2O” demonstrations and “just in time” training via AWIPS II / EPDT.

Evaluation of Himawari RGB Imagery

- Partnering with OPG in Fall 2015 to evaluate the following:
  - 24-bit "on the fly" product generation from within AWIPS II, using AHI data
  - Forecaster understanding of single band usage, band differences, and spectral signatures for feature identification in RGBs
  - Explore forecaster refinement and adjustment of inputs.
  - Selected RGBs focused on specific forecast challenges.



Prototype AHI "24-Hour Microphysics" RGB from April 23, 2015.

Questions?

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