

Multispectral Imagery Applications

Dr. Emily Berndt¹

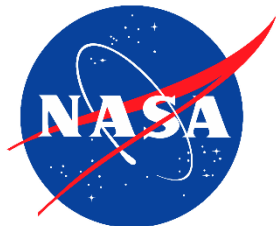
with contributions from Kevin Fuell², Dawn White², Angela Burke², and
Kris White³

NASA SPoRT

¹NASA Marshall Space Flight Center

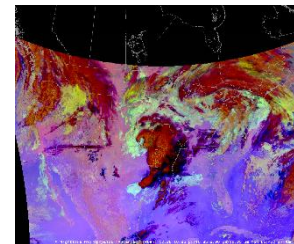
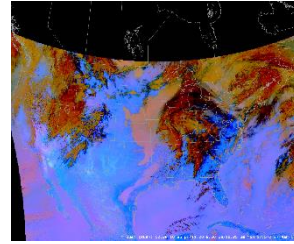
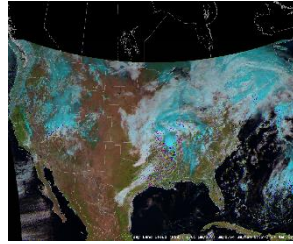
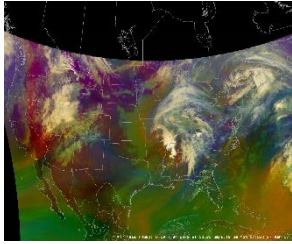
²University of Alabama in Huntsville

³ NWS Huntsville, AL



Short-term Prediction Research and Transition Center

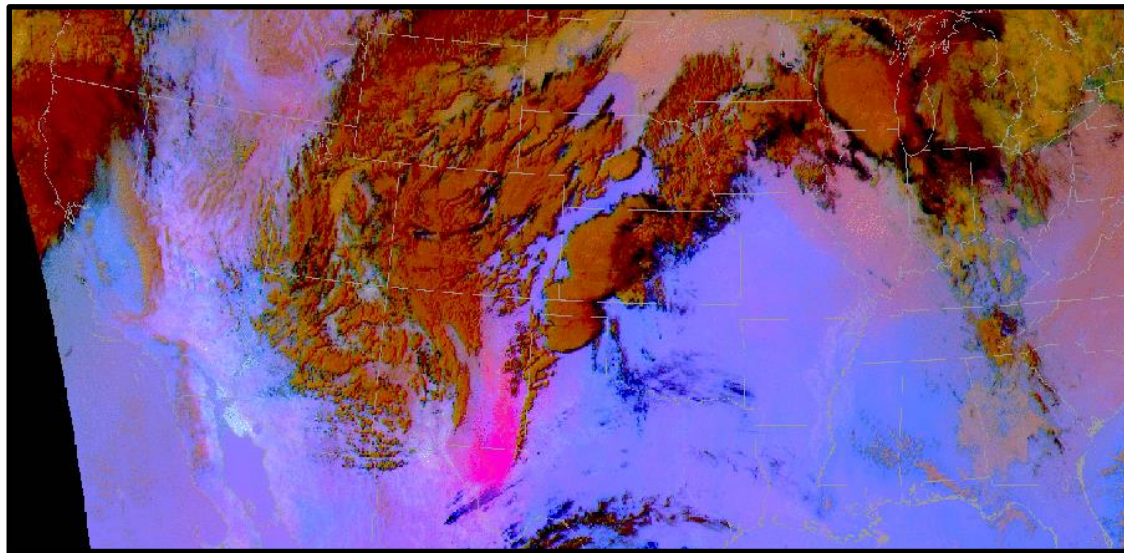
Introduction



- Since 2012, SPoRT has worked closely with the GOES-R/JPSS Proving Grounds to transition and evaluate EUMETSAT based RGB imagery with NWS WFOs, National Centers, and OPG
- More recently, in collaboration with the Experimental Products Development Team (EPDT), worked on a solution to display client-side RGB imagery in AWIPS
- This capability has been transitioned to the Total Operational Weather Readiness – Satellites (TOWR-S) team for distribution across all WFOs
- In the near future, forecasters will have access to EUMETSAT based GOES-16 RGBs in AWIPS
- SPoRT has been collecting use cases, developing training, and posting blog examples

Dust RGB

- **Primary Application:** Identification of dust both day/night
- **Secondary Applications:**
 - Moisture boundaries
 - Volcanic ash
 - Cloud height/type analysis

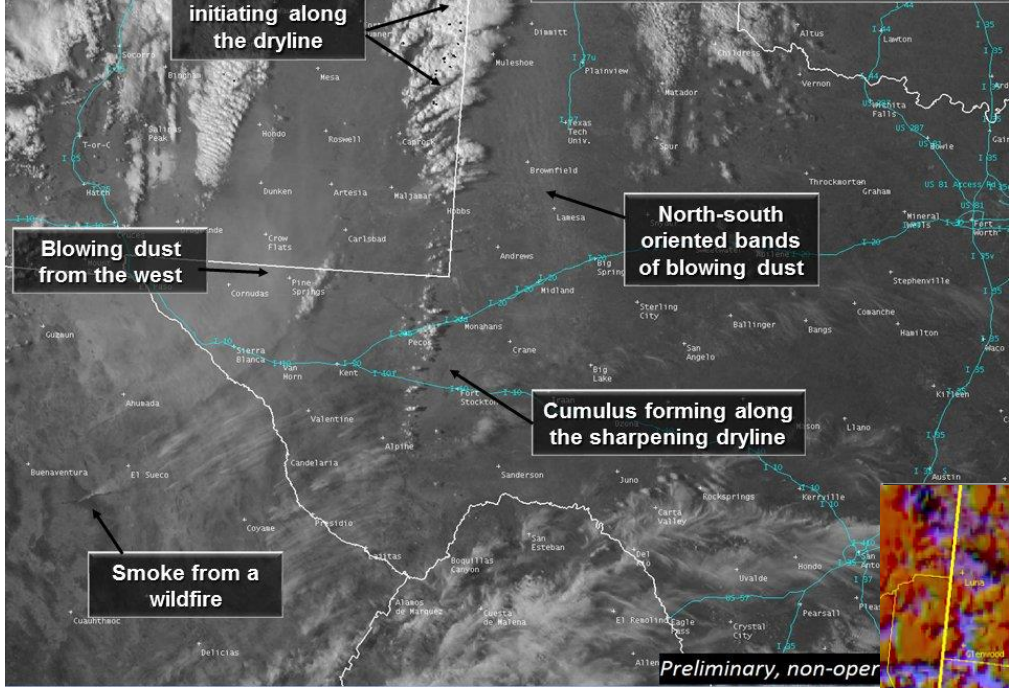


Dust RGB Imagery from 0002 to 0357 UTC, 23 March 2017 centered over western Texas. Blowing dust is colored in magenta.

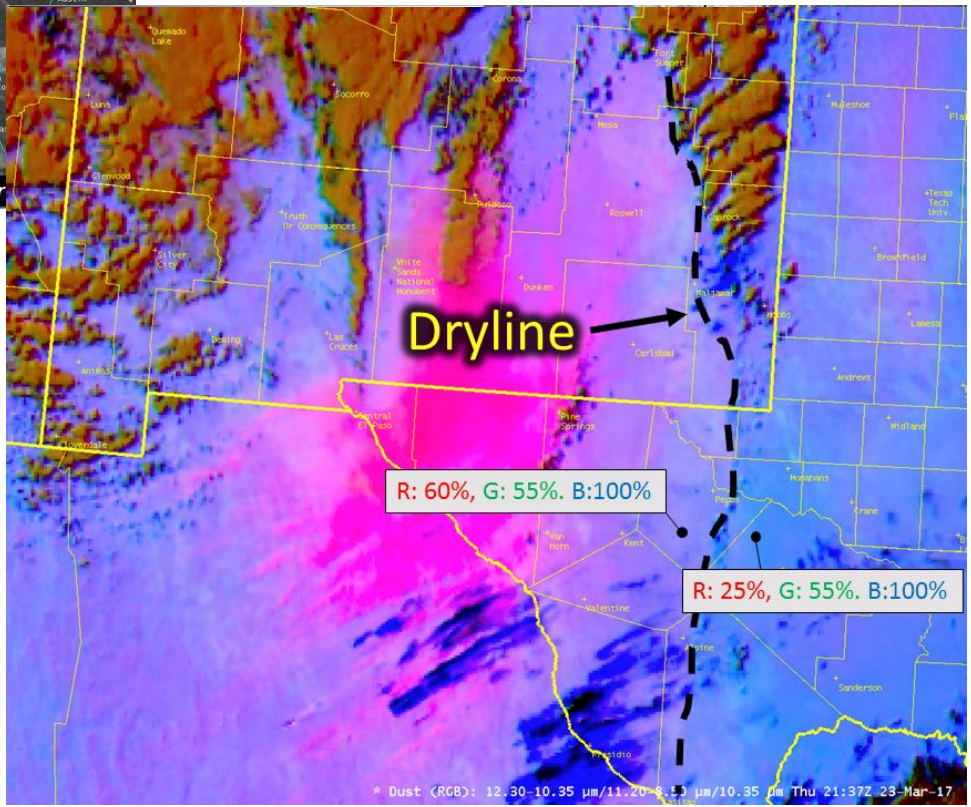
- Dust RGB derived from MODIS/VIIRS has been extensively used at the Albuquerque WFO to prepare for GOES-16
 - Increased confidence in tracking dust day to night
 - Policy changes to allow blowing dust to impact TAF ceiling conditions
 - Now issue stand-alone blowing dust advisories and dust storm warnings
 - Improved decision support services to state officials to forewarn the public
 - Forecasters are ready for and prepared for RGBs in the GOES-R era

Fuell, K. K., B. J. Guyer, D. Kann, A. L. Molthan, and N. Elmer, 2016: Next generation satellite RGB dust imagery leads to operational changes at NWS Albuquerque. *J. Operational Meteor.*, **4**(6), 75–91.

GOES16 Visible Satellite Imagery
(5:07 PM CDT March 23, 2017)



Midland WFO Twitter Image of Annotated Visible Imagery



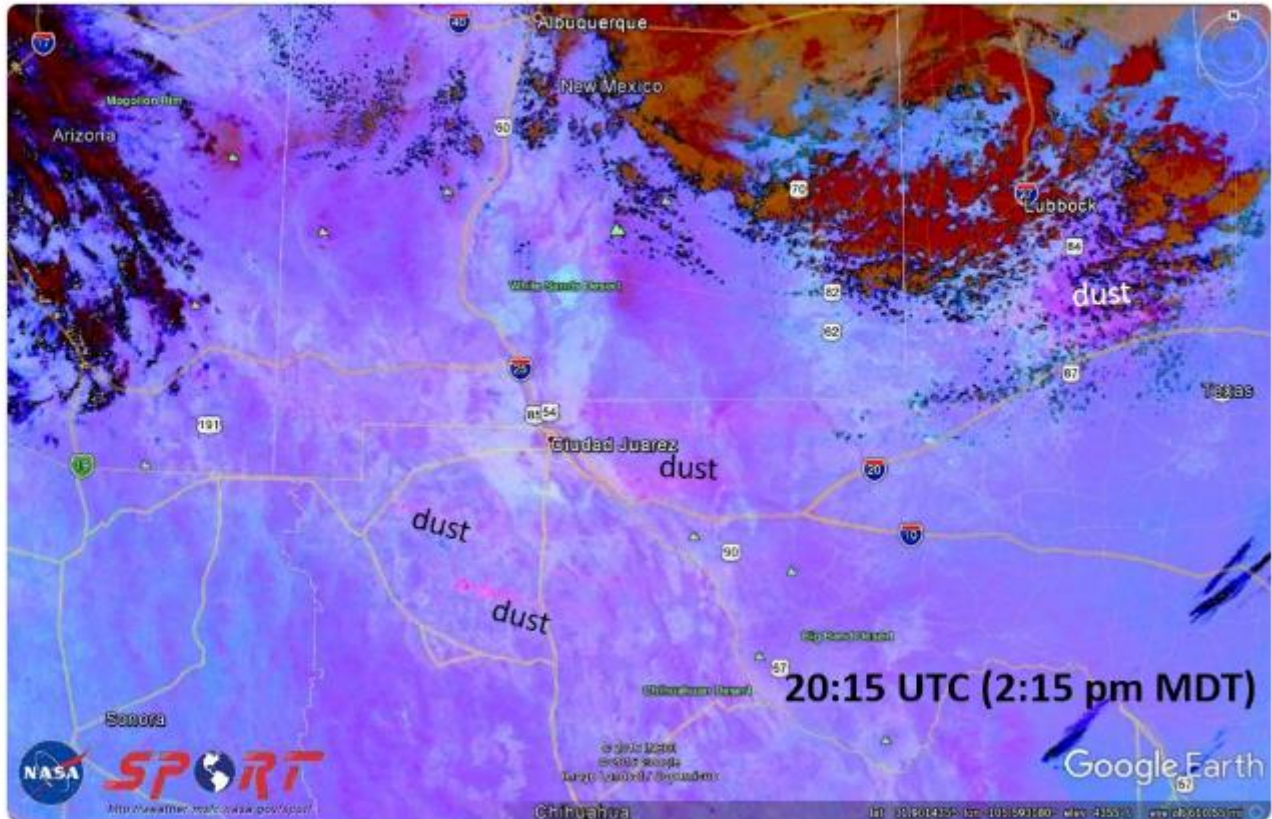
* Dust (RGB): 12.30-10.35 μm/11.20-8.13 μm/10.35 μm Thu 21:37Z 23-Mar-17

NASA SPoRT Retweeted



Dave DuBois @NMClimate · Apr 5

A couple of dust sources in Chihuahua were active from the #duststorm on Apr 4 based on this NASA SPoRT VIIRS dust image.



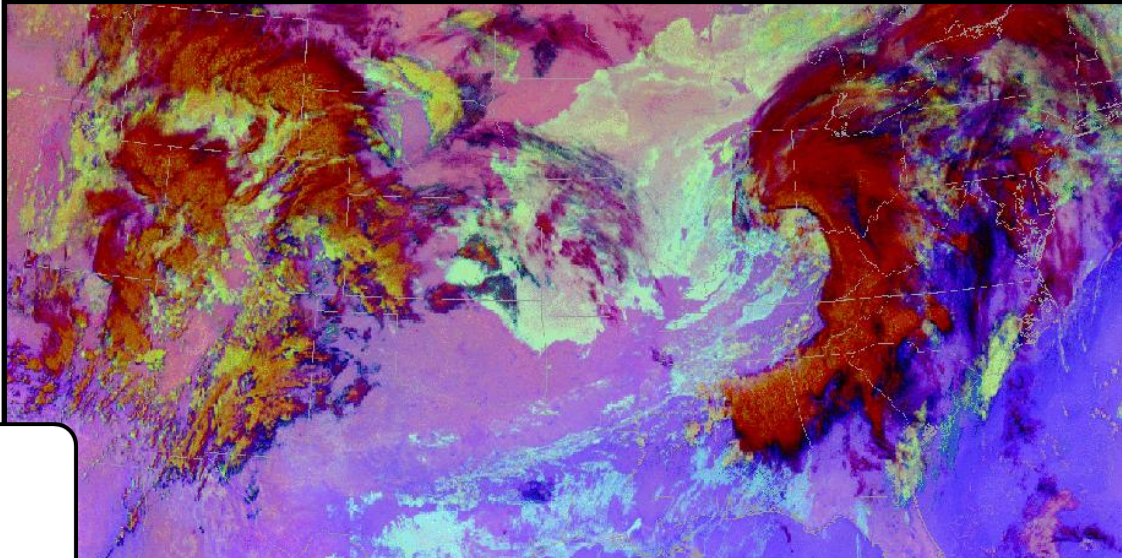
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<https://twitter.com/NMClimate/status/849520659508203521>

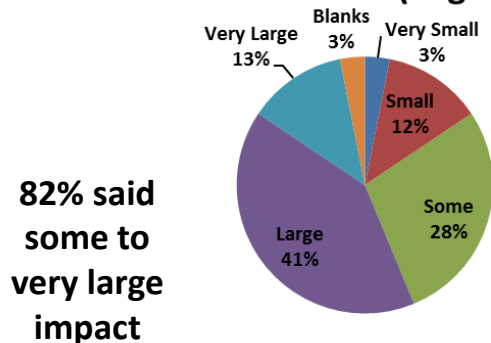
Night-time Microphysics RGB

- **Primary Application:**
Low cloud and fog analysis
- **Secondary Applications:**
 - Cloud height/phase analysis
 - Moisture boundaries
 - Fire hot spots

NtMicro RGB Imagery from GOES-16 at 0602 to 0957 UTC, 28 March 2017.

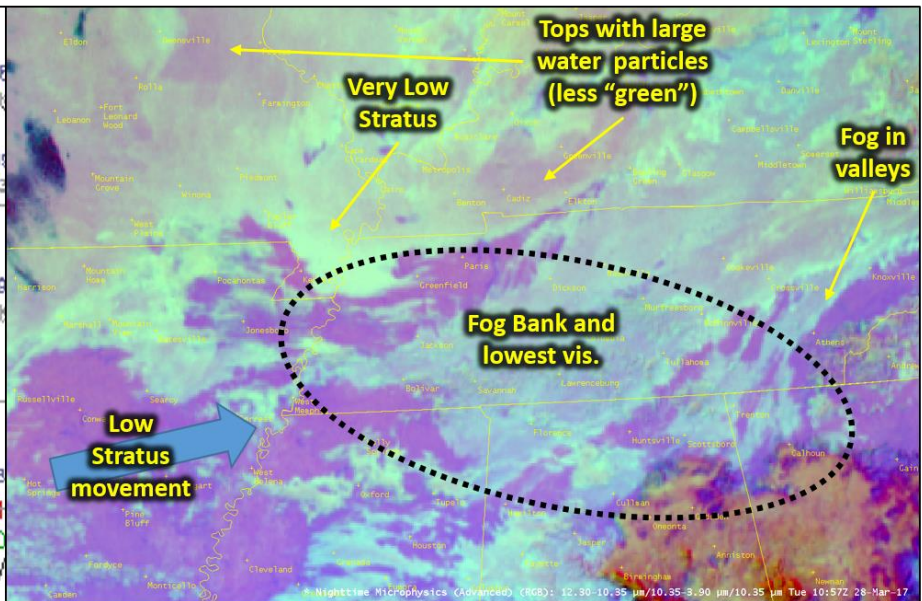
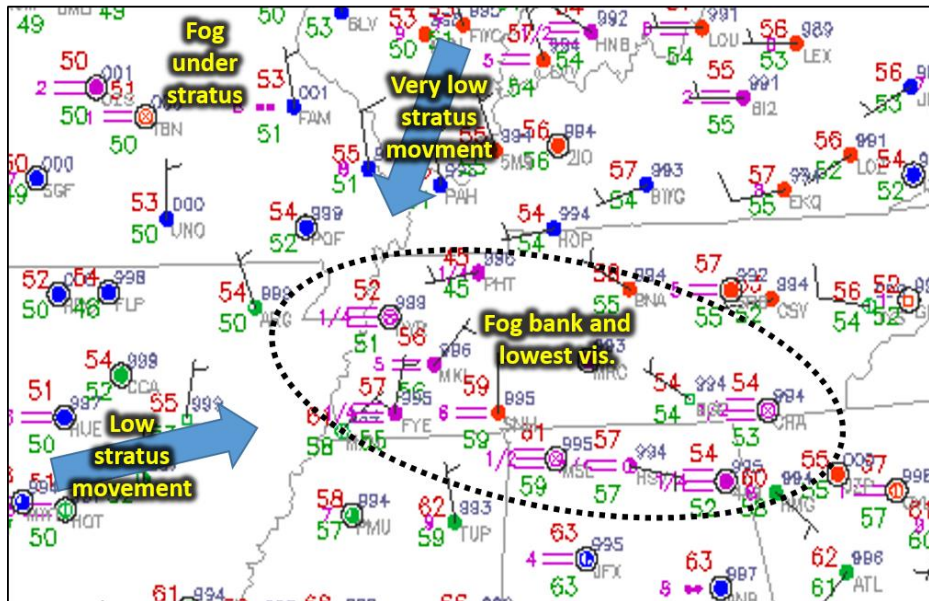


Impact of NTmicro RGB to Aviation Forecast Issues (in general)

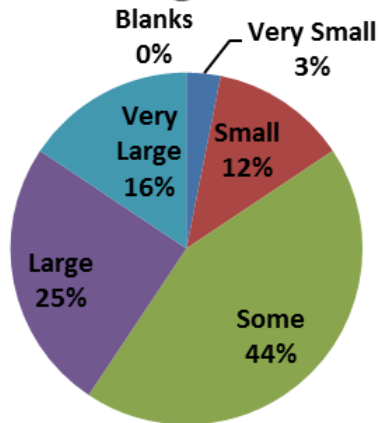


Forecaster feedback from VIIRS and MODIS Multispectral Imagery for Aviation Weather and Cloud Analysis at High Latitudes Assessment in 2014

- NtMicro RGB derived from MODIS/VIIRS has been extensively evaluated and used at WFOs across the CONUS to prepare for GOES-16
“Raleigh, NC (RAH): “...the RGB product provided a much easier way to identify the location of the stratus vs. the traditional 11-3.9 product and based upon the shading it was apparent the clouds were high bases. Very Handy!”



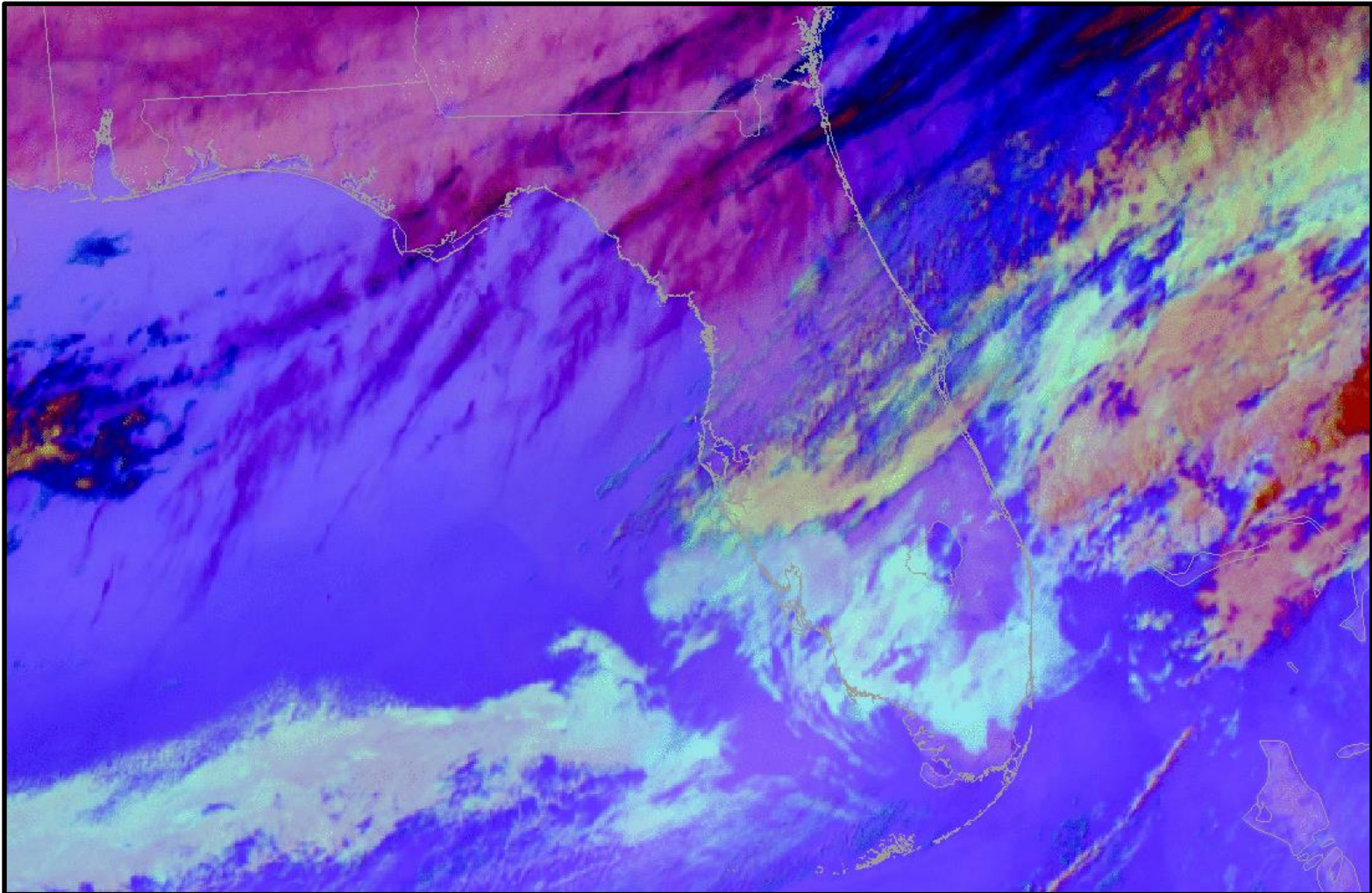
Impact of NTmicro RGB to Differentiate Fog from Low Cloud



85% said some to very large impact

Forecaster feedback from VIIRS and MODIS Multispectral Imagery for Aviation Weather and Cloud Analysis at High Latitudes Assessment in 2014

Night-time Microphysics RGB



Nighttime Microphysics RGB over Florida from GOES-16 0701 UTC to 1156 UTC on 3 March 2017. Aqua colored clouds depicting impacts to TAF sites experiencing MVFR ceilings.

Air Mass RGB

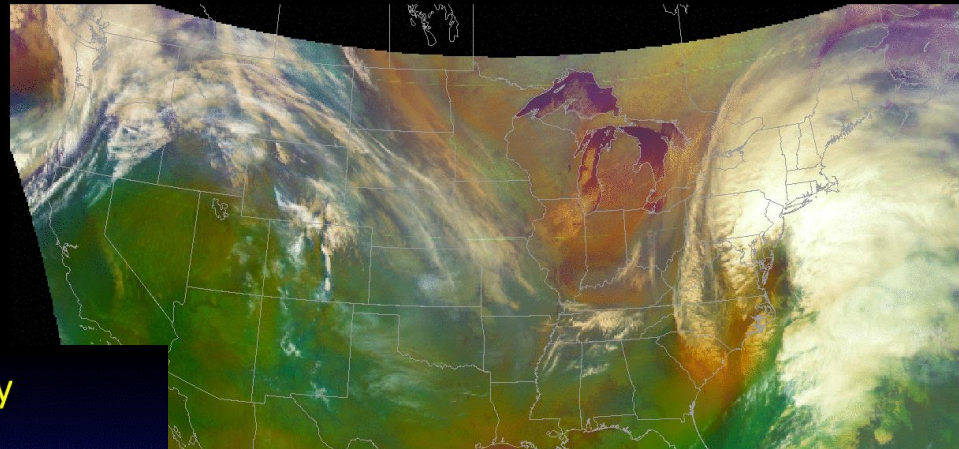
- **Primary Application:**

- Identifying air masses
- Inferring cyclogenesis

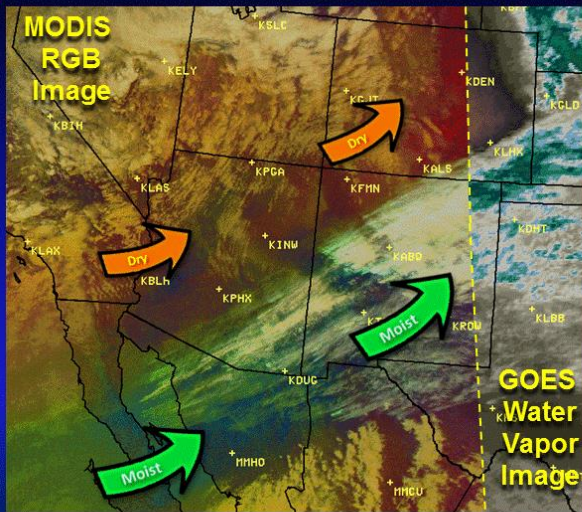
- **Secondary Applications:**

- Cloud height analysis
- Moisture boundaries

Air Mass RGB Imagery from GOES-16 at 1142 to 1422 UTC, 14 March 2017.



RGB Air Mass View of Dry Slot Friday



200pm Friday, February 8, 2013
Courtesy of NASA SPoRT
<http://weather.msfc.nasa.gov/sport/>

- Air Mass RGB derived from SEVIRI, MODIS, and AHI has been extensively evaluated/used at National Centers to prepare for GOES-16

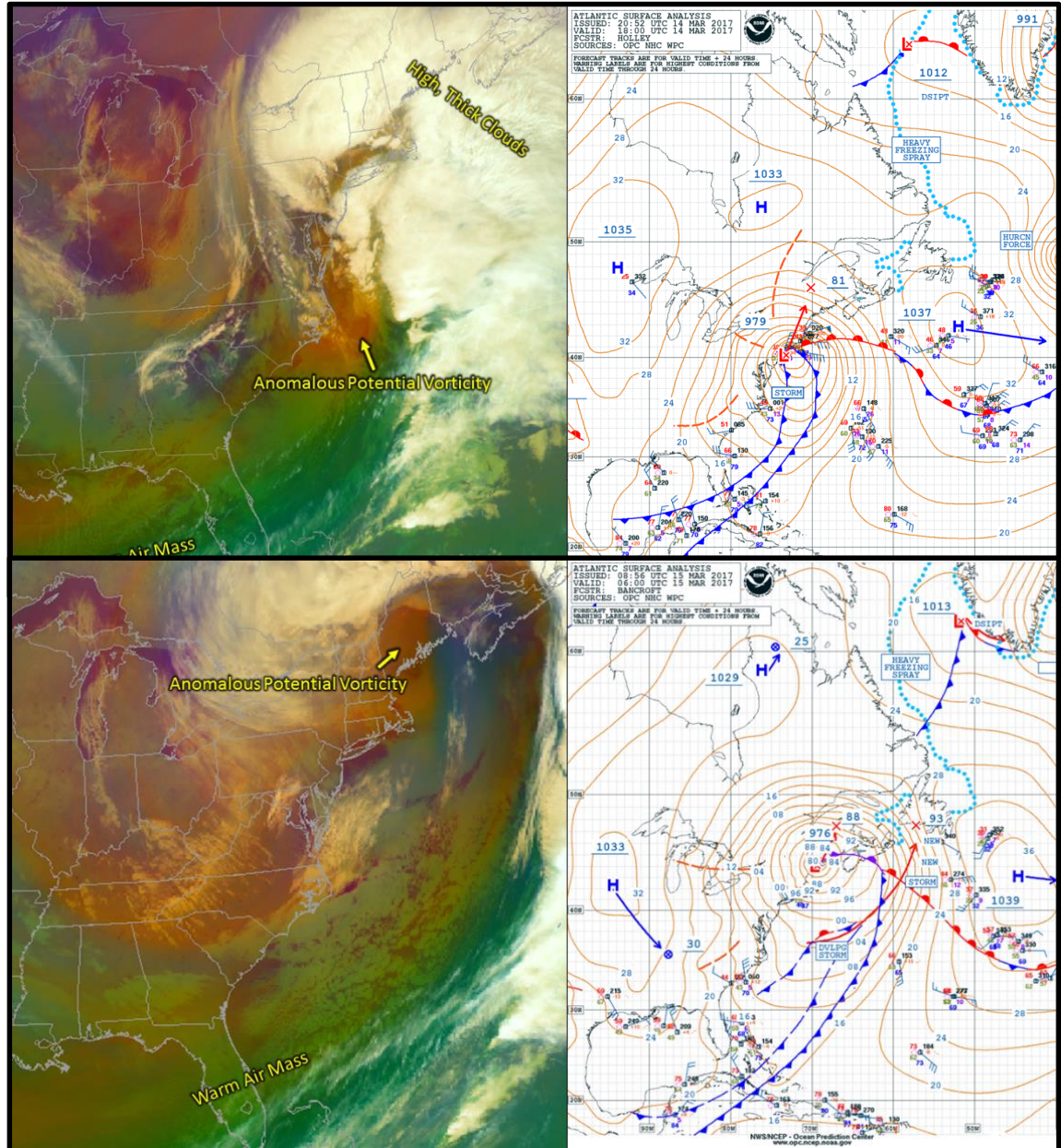
- Regular use in operations at OPC along with Social Media posts
- Used by Western Region WFOs to anticipate hazards associated with strong winds due to dry slots

See Zavodsky et al. (2013), Berndt et al. (2016), and Elmer et al. (2016)



Air Mass RGB

- Collaboration with OPC forecasters to create and review 1-minute training material for the SPoRT Applications Library
- Highlight main uses and examples of the Air Mass RGB
- Short, regional examples to be viewed in the AIR Tool
- Emphasis on peer-to-peer examples



AIR Tool

CAVE File View Options Tools Volume Obs NCEP/Hydro Local Upper Air Satellite kgwx khtx kbmw Radar MRMS SCAN Maps Local Maps DSS Help

Valid time seq - CDONUS - Clear [Navigation icons] Frames: 30 - Mag: 1.0 - Density: 1.0

LEO 24-bit Recipe 23

QuickGuide_NtMicro_NASA_SPoRT.pdf - NWS - AWIPS Interactive Reference - Mozilla Firefox

QuickGuide_NtMicro_NASA_SPoRT...

https://lab.ncep.noaa.gov/awips-reference?p_p_auth=3w8lq4C

QuickGuide_NtMicro_NASA_SPoRT.pdf (Version 1.0)

Uploaded 0 Stars April 3/7/15 5:27 AM

Average (0 Votes)

☆☆☆☆☆

A 2-page reference (PDF) describes the fundamental aspects of the Nighttime Microphysics (NtMicro) RGB imagery product and it demonstrates color interpretation of the multi-channel imagery. The RGB is based on the internationally accepted EUMETSAT RGB "best practices" guidelines. The imagery is often applied to analyzing fog related to both aviation and public transportation hazards, but it also differentiates fog from low-level cloud features. This Quick Guide style is intended to help users recall important points from foundational training. The PDF can be printed and used as a job aid in the operations area. The PDF can be downloaded for local use via intranet or within the user's display system.

Color	Band/Channel	Scale	Primary Substrate	Key Characteristics	Key Characteristics
Red	IR-3.75	0-100	0-100	0-100	0-100
Green	IR-6.2	0-100	0-100	0-100	0-100
Blue	IR-10.4	0-100	0-100	0-100	0-100

Frames: 9 Time: 13:00:23.00 Mar 17 2163M of 3268M

https://twitter.com/NASA_SPoRT/status/840281176262742016

Summary

- The capability to generate client-side RGB imagery has been transitioned to the Total Operational Weather Readiness – Satellites (TOWR-S) team for distribution across all WFOs
- In the near future, forecasters will have access to EUMETSAT based GOES-16 RGBs in AWIPS
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