



GOES-16 ABI Aerosol Imagery Products

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1. IMSG
2. NOAA

Introduction

- GOES-16 was launched in November, 2016.
- The ABI (Advanced Baseline Imager) onboard GOES-16 contains 16 bands, which enables us to do different RGB combinations to view aerosols:
 - Synthetic RGB
 - Dust RGB
 - Natural Color RGB
- Near-real-time imagery on Aerosol Watch

Synthetic RGB

- We need red, green, blue reflectance to generate true color image
- MODIS/VIIRS has the three channels so that it is easy for us to generate true color images from MODIS/VIIRS data
- GOES-16 ABI does not have a green channel. To generate true color RGB image, we need to derive green signal from other bands, i.e. **synthetic green.**

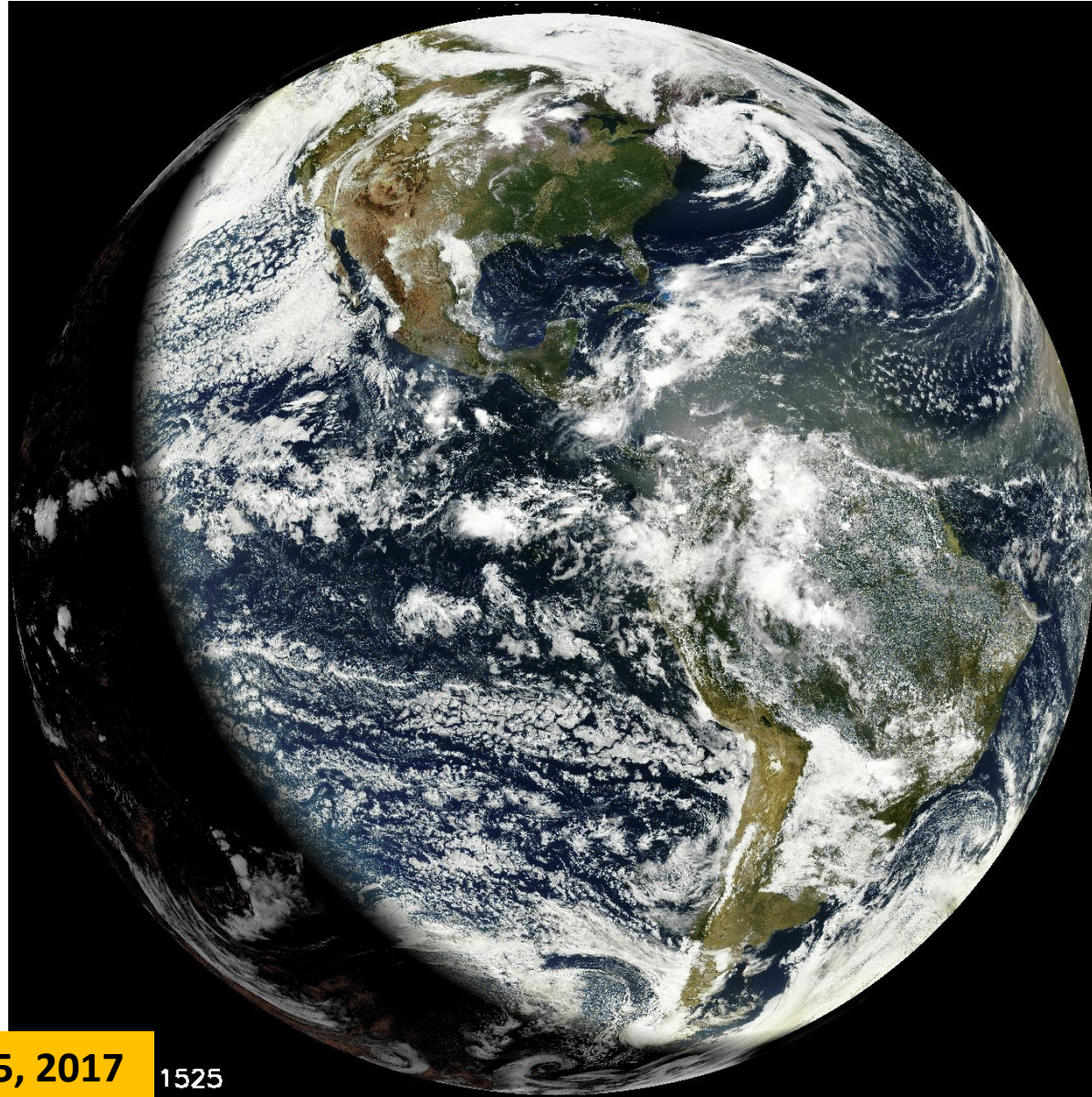
Synthetic Green Generation

- Green band have good correlation with red and blue bands. So we derive green band from these two bands.
- The relationship was set up for different surface types and atmospheric conditions.
 - Linear relationship is assumed: $\text{green} = A \times \text{red} + B \times \text{blue} + C$
 - CONUS land
 - 8-day and 1 degree resolution look-up-table
 - Derived from MODIS BRDF database
 - Over water, bright TOA reflectance (cloud), land over other regions
 - one set of parameters for each type

Night Time Image

- From geocolor images (AHI http://rammb.cira.colostate.edu/research/goes-r/proving_ground/blog/index.php/geocolor-imagery/himawari-8-true-color-geocolor-product/)
- To fill in the night time image of synthetic RGB
- Show clouds
 - BT11 in white
 - BT11-BT3.9 in red
- Continent background

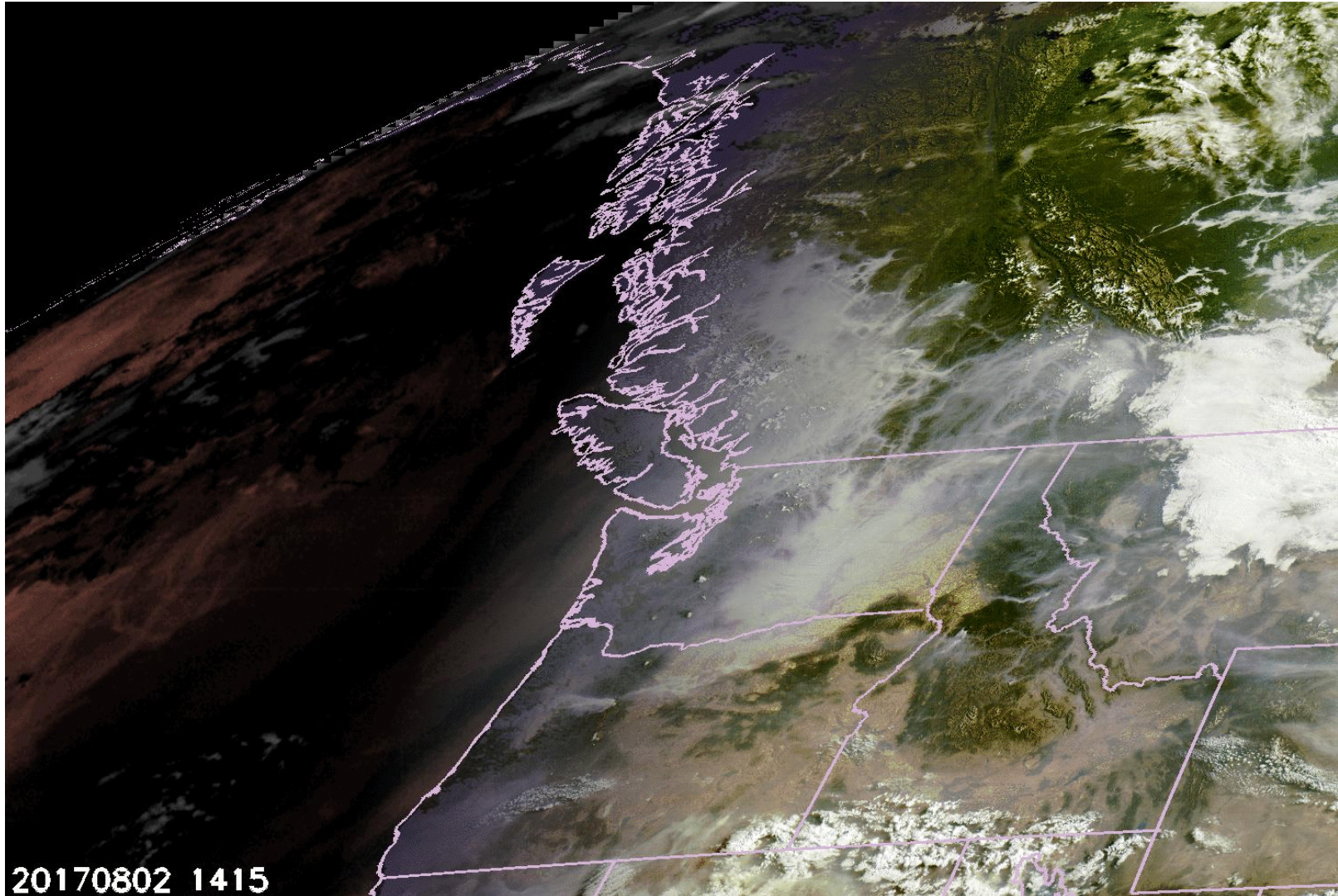
Synthetic RGB Full Disk 15-minute Animation



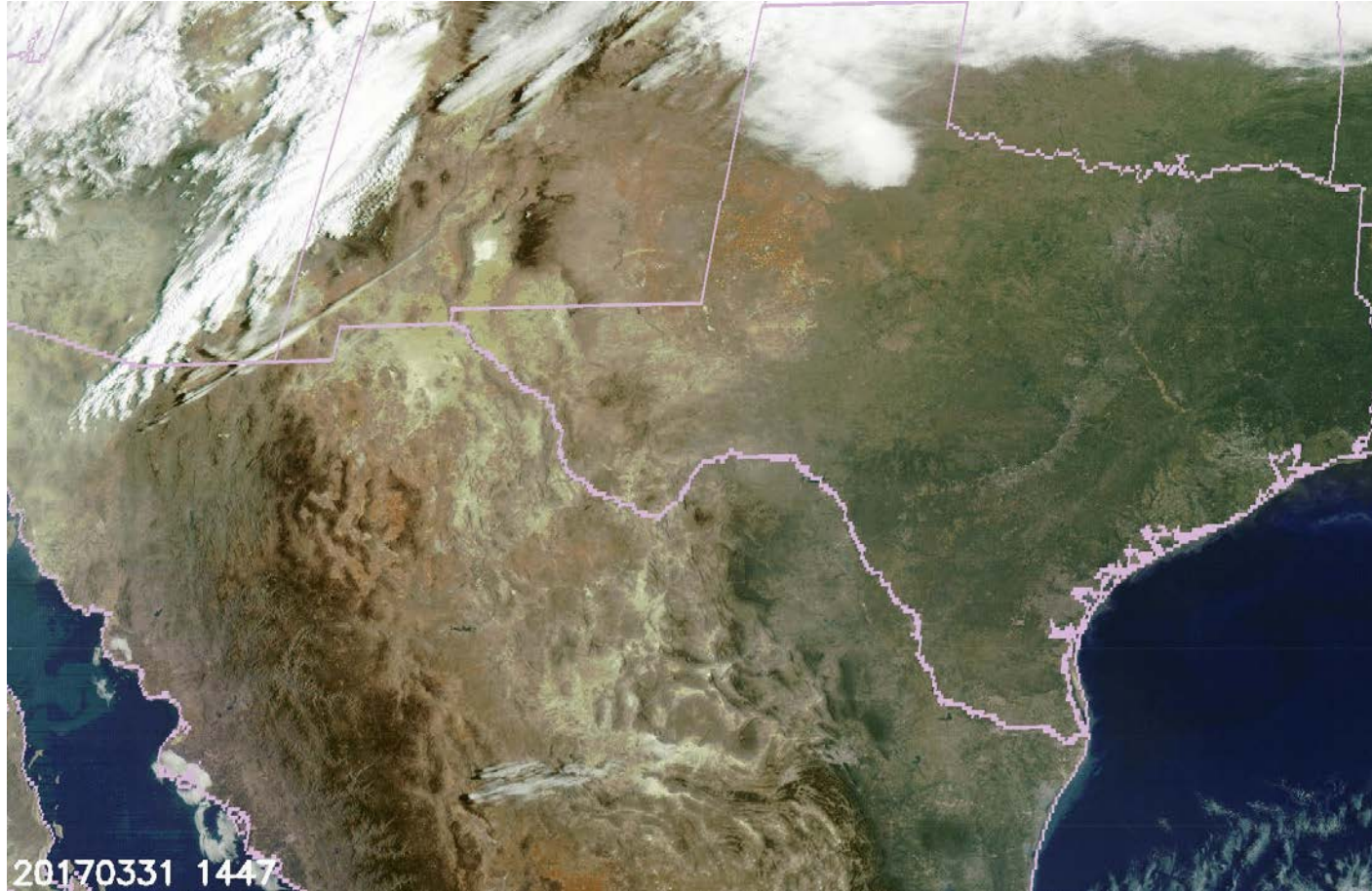
May 15, 2017 1525

Synthetic RGB

20170802 smoke in Northwest CONUS and Canada



Synthetic RGB 20170331 dust storm in Southwest CONUS



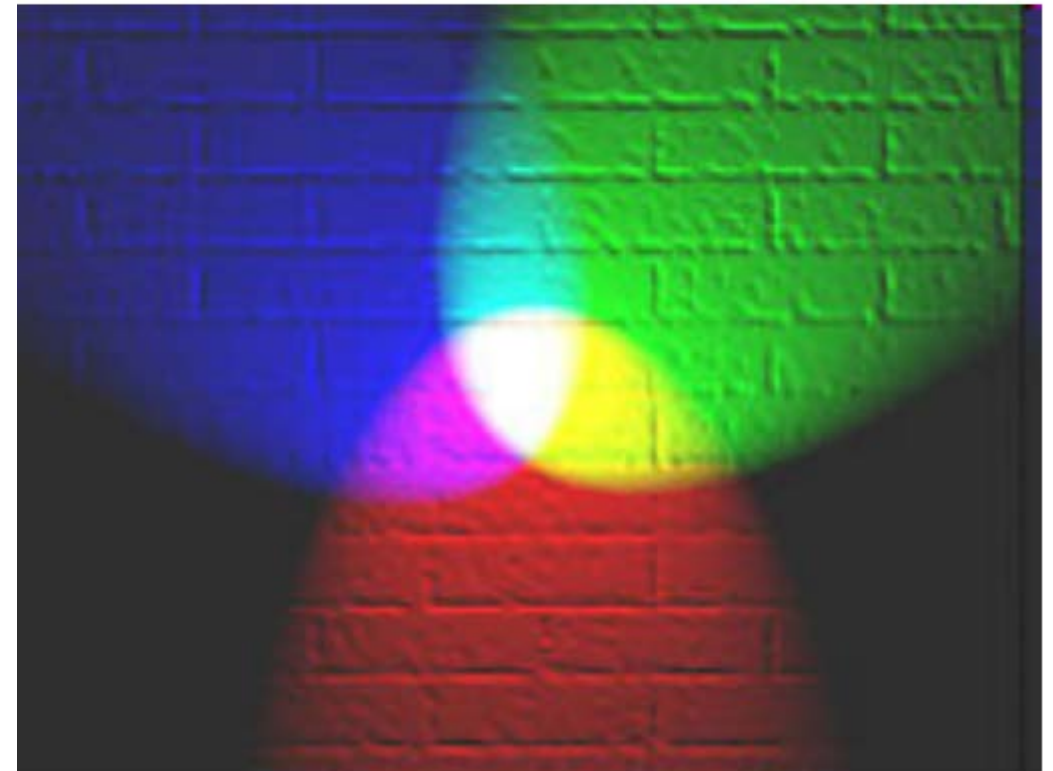
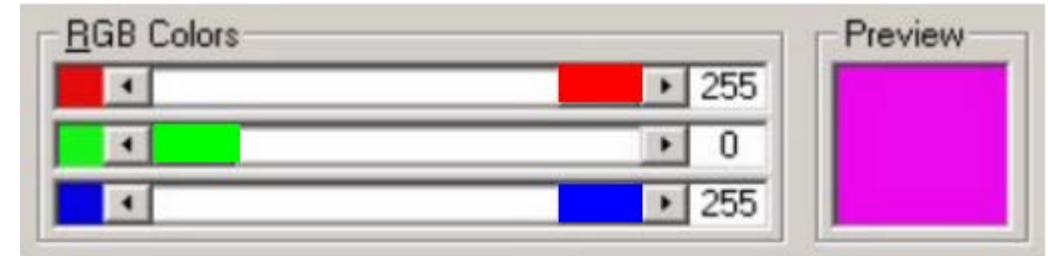
Dust RGB

- Used by EUMETSAT (European Organization for Meteorological Satellites) on MSG (Meteosat Second Generation) (https://www.eumetsat.int/website/home/Data/Training/TrainingLibrary/DAT_2042669.html?lang=EN)
- Three IR bands are used: IR8.4, IR11.2 and IR12.3
 - Brightness temperature at IR11.2 is less than that at IR12.3
 - Surface emissivity in 11.2 μm is similar to that in 12.3 μm
 - More absorption for dust in 11.2 μm than in 12.3 μm
 - Brightness temperature is close in IR11.2 and in IR8.4
 - Surface emissivity in 11.2 μm is higher than that in 8.4 μm
 - More absorption for dust in 8.4 μm than in 11.2 μm

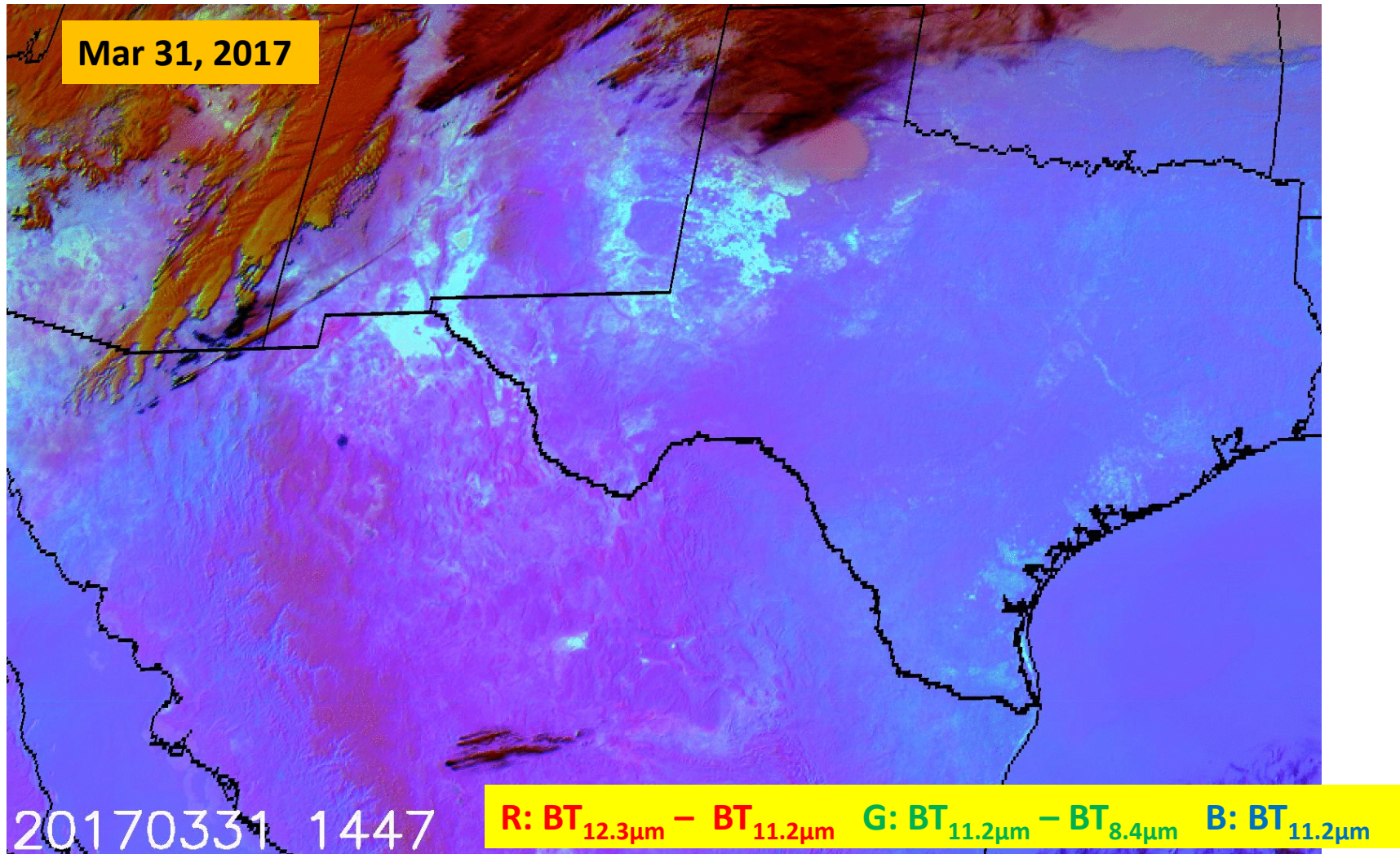
Dust RGB

- R: BT12.3 – BT11.2 (BT–brightness temperature)
- G: BT11.2-BT8.4
- B: BT11.2

- Using this method, dust shows as magenta color over desert

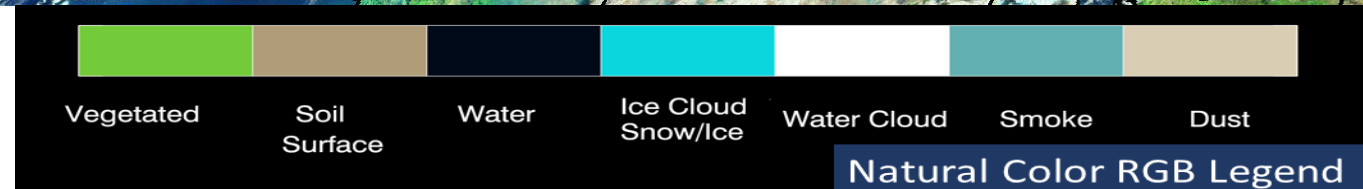
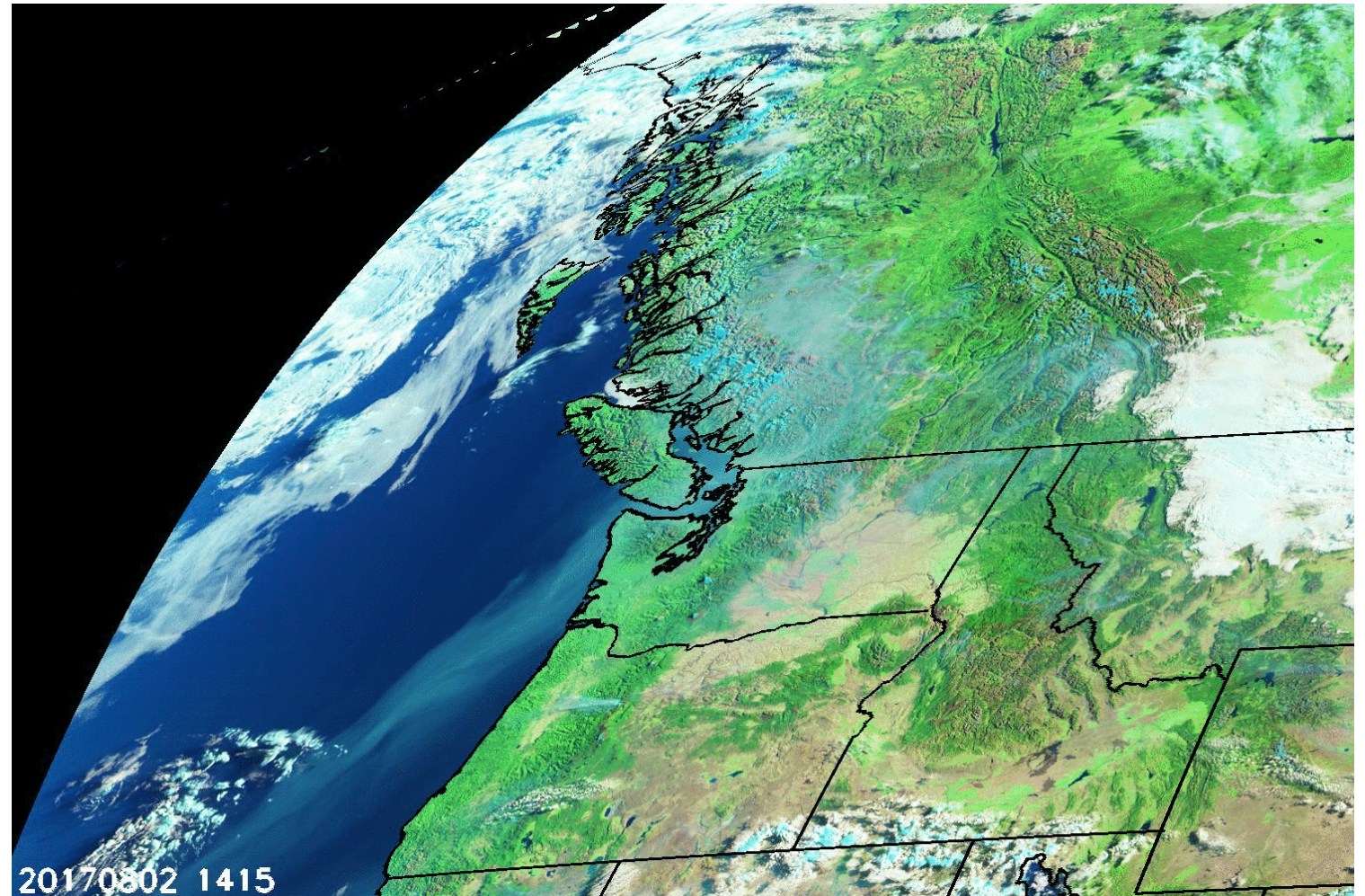


Dust RGB: Dust Storm in Texas (5 min time step)



Natural Color RGB (20170802 smoke)

- Another RGB combination method used on MSG, VIIRS
- R: 1.6 μm ; G: 0.8 μm ; B: 0.6 μm
- Surface is brighter in IR channels than blue/green channels. Therefore aerosol signal is not well seen in some geometries.





<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>

- GOES-16 version of eIDEA (Enhanced Infusing satellite Data into Environmental Applications)
- Near-real-time system to display GOES-16 imagery on the web
- Regions: CONUS and full disk
- Overlay and animate image layers:
 - Synthetic RGB
 - Dust RGB
 - Natural color RGB
 - Red channel image
 - AOD (Aerosol Optical Depth)
 - Smoke Dust Mask
 - FRP (Fire Radiative Power)
- Compared to VIIRS
 - Air quality forecasters can access the images in the morning to be better prepared for the afternoon forecasting.
 - Can view aerosol movement

Aerosol Watch CONUS View

Secure | https://www.star.nesdis.noaa.gov/smcd/spb/qa/AerosolWatch/index.php?product_date=20170904&zoom=5&lat0=37.00000000000003&lon0=-95&layers=1&gmt=1317®ion=conus

TD Bank Log In - Sign | IMSG Portal Login | Deltek Time & Expense | Warren Buffett Portfolio | physics books | IDEA - Infusing satellite | Second S-NPP Application | STAR IT Help Desk Request | STAR Intranet - Information | NASA Atmosphere Science | Bookmarks

20170904 1647 UTC

AerosolWatch
Every 15 minutes...

CONUS Full Disk

- GOES-16 Layers
 - Synthetic RGB
 - Dust RGB
 - Natural Color RGB
 - Visible (0.6 μm band)
 - AOD (beta)
 - Smoke Dust Mask (beta)
 - Fire (beta)
 - Labels Layer

GOES-16 is temporarily located at 89°W now. It will move to the final position at 75°W in Nov, 2017. AOD, Smoke Dust mask and Fire are beta products, which have not been fully validated, and therefore are not recommended for scientific use.

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Aerosol Watch Full Disk View

The screenshot displays the Aerosol Watch Full Disk View interface. At the top, the browser address bar shows the URL: https://www.star.nesdis.noaa.gov/smc/spb/qa/AerosolWatch/index.php?product_date=20170904&zoom=5&lat0=37.00000000000003&lon0=-95&layers=1&gmt=1317®ion=conus. The interface includes a navigation bar with a date selector set to 20170904 and a time of 1645 UTC. The main display area shows a satellite image of Earth with various data layers overlaid. A sidebar on the right lists the available layers under the heading "GOES-16 Layers": Synthetic RGB, Dust RGB, Natural Color RGB, Visible (0.6 μm band), AOD (beta), Smoke Dust Mask (beta), and Fire (beta). The NOAA logo is visible in the bottom right corner.

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Summary

- Three types of GOES-16 ABI RGB images are introduced
- Aerosol events such as smoke and dust are visualized in these images
- The GOES-16 RGB image products along with the images of aerosol/fire products are available in near-real-time on Aerosol Watch