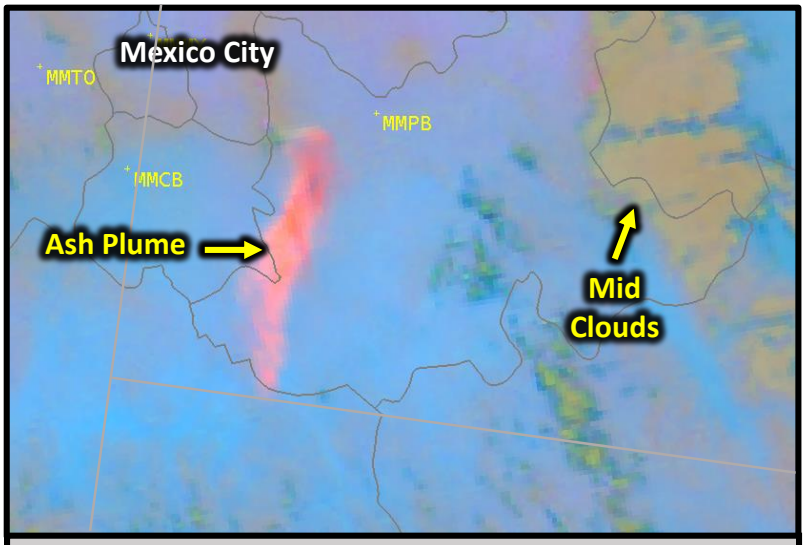
Ash RGB Quick Guide

Why is the Ash RGB Imagery Important?

The Ash RGB uses only infrared window channels, and therefore, it can be used both day and night for the detection and monitoring of volcanic ash as well as sulfur dioxide gas. Both of these emissions can be hazardous to public health and aviation activities. The detection of ash plumes is largely due to the opposite absorption characteristics of ash and ice clouds between the 12.3 and 10.3 µm bands (GOES) in the red component of the RGB recipe. A positive difference occurs for ash providing more red than any other cloud object. Ash plumes appears red to magenta to pink depending on its altitude.



Ash RGB from GOES-16 center on southern Mexico

Ash RGB Recipe

Color	Band / Band Diff. (µm)	Min – Max, Gamma	Physically Relates to…	Small contribution to pixel indicates…	Large contribution to pixel indicates…
Red	12.3 – 10.3	-6.7 to 2.6 K 1	Optical depth / cloud thickness	Thin clouds	Thick clouds, ash plume
Green	11.2 – 8.4	-6.0 to 6.3 K 1	Particle phase/size	Large water or ice particles	Small water or ice particles, sulfur dioxide gas
Blue	10.3	243.6 - 302.4 K 1	Temperature of surface	Cold surface	Warm surface

Impact on Operations

Primary Application

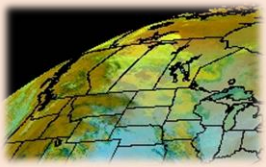
Detection of ash plumes: Ash plumes are easily identified in red/magenta/pink coloring and can be used during both day and night periods.

Sulfur Dioxide (SO2) identification: The 8.4 µm band absorbs SO2 well, resulting in large difference with the 11.2 µm and a bright green for SO2.

Secondary Applications: Water vs ice and thick vs thin clouds can be analyzed fairly well, but the RGB recipe is focused on ash detection. So, other RGBs may be more valuable for specific cloud analysis.

Limitations

Mixed scenes: The Ash RGB will be less effective for ash and SO2 analysis if ice clouds are in the same area.



At high viewing angles, SO2 looks like clouds: SO2 and low clouds appear in similar green coloring close to the limb/edge. The Dust RGB is recommended here for greater contrast of SO2 and ash with clouds.

Ash color blends with cooling surface: As some rocky/desert ground surfaces experience diurnal cooling, their color becomes less blue and more magenta/pink. Hence, the ash plume is less apparent.

Cirrus Clouds: Black cirrus can be a part of either volcanic or non-volcanic cloud systems

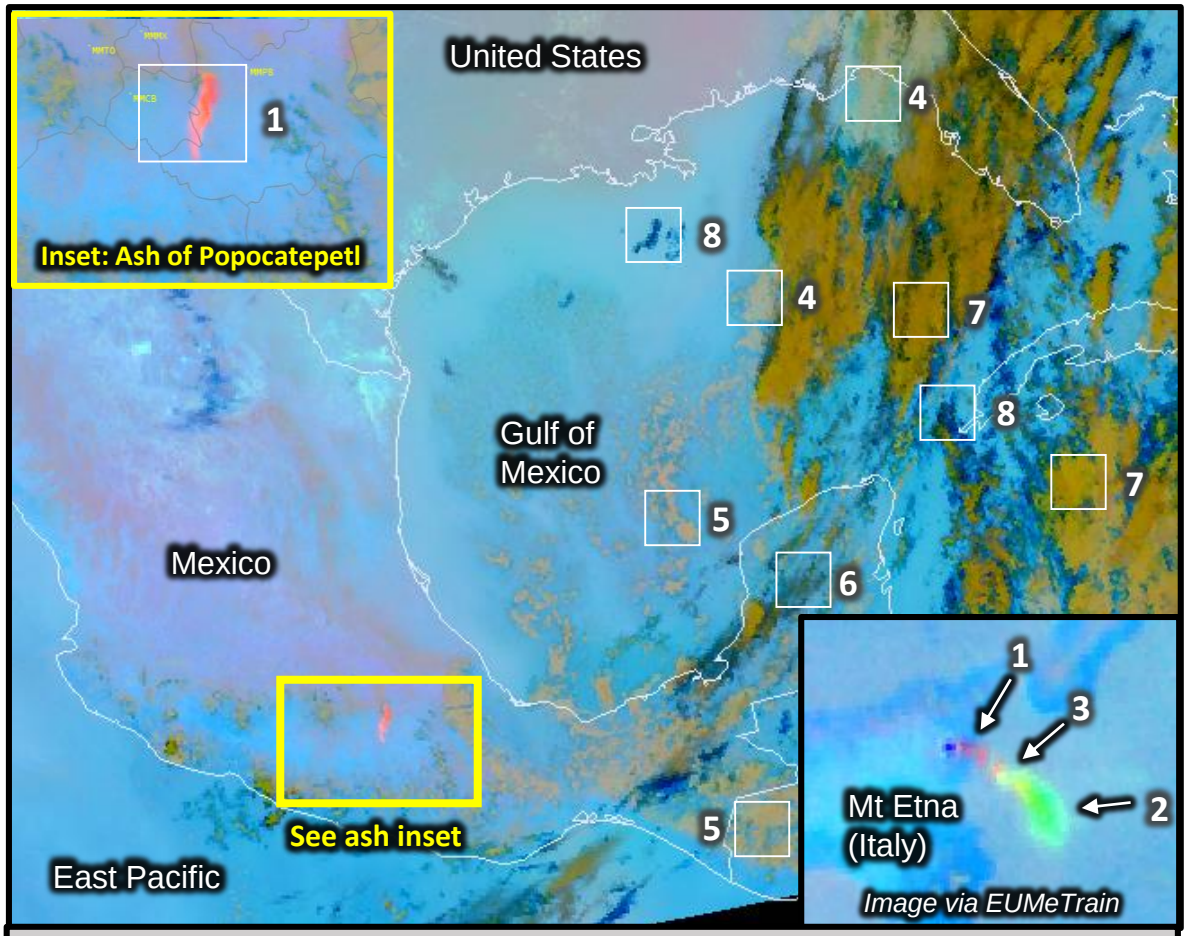
Contributor: Kevin Fuell, NASA SPoRT https://weather.msfc.nasa.gov/sport

Ash RGB Quick Guide

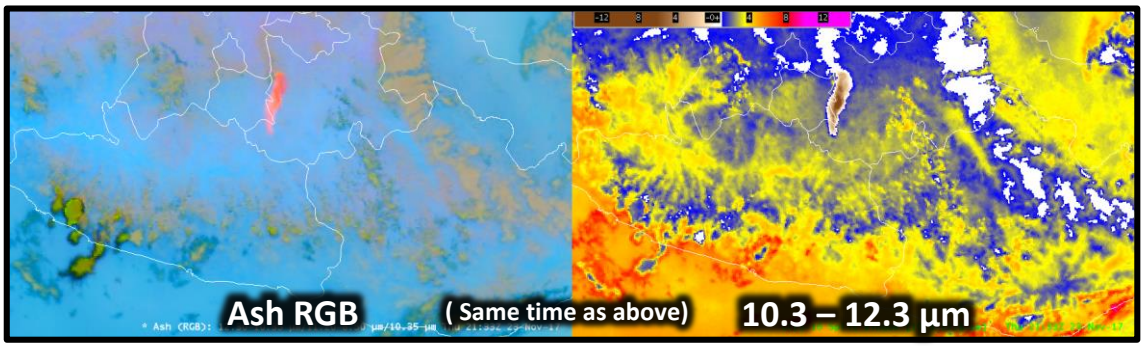
RGB Interpretation

1	**Ash (pure)** *(reds to magentas)*
2	**Sulfur Dioxide Gas (SO2)** *(bright greens)*
3	**Ash (mixed w SO2)** *(yellows)*
4	**Low, thick, water, clouds** *(light green to gray)*
5	**Mid, thick clouds** *(light tan)*
6	**Mid, thin clouds** *(dark green)*
7	**High, thick ice clouds** *(browns)*
8	**High, thin clouds** *(Dark blue to black)*

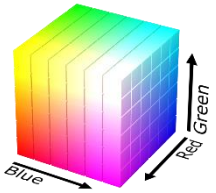
Note:, colors may vary diurnally, seasonally, and with latitude



Ash RGB from GOES-16 ABI for 2133 UTC on 23 November 2017 centered over the Gulf of Mexico. An inset (upper left) magnifies the ash plume from the Popocatepetl eruption in southern Mexico. An Ash RGB image from SEVIRI (lower right) depicts the eruption from the Mt. Etna (Italy) in August of 2011.



RGB Color Guide



Comparison to other products:
The Ash RGB (left) already contains the 10.3 – 12.3 um difference (right) information and both highlight the ash plume. However, the RGB further separates the ash from cloud objects, provides SO2 detection, and also allows analysis of water vs ice clouds.

Resources

UCAR/COMET
Multispectral Satellite Applications: RGB Products Explained.

NASA/SPoRT
Applications Library

EUMETrain
RGB Interpretation Guide

Hyperlinks not available when viewing material in AIR Tool