Application Library: Dust RGB

Transportation and Decision Support Services

Contributed by:
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Region:
CONUS West/Southwest

Office:
NWS Albuquerque, NM (ABQ)

Date:
11 March 2014

Product(s):
Dust RGB

Application Area:
Public Event Decision Support

Feature:
Dust
Mid-level clouds

Instrument(s):
GLM, MODIS, VIIRS

Works well with:
Ceiling and visibility observations

Related Links:
Dust Quick Guide (2-pager): SPoRT

Dust RGB Interactive Quick Guide: SPoRT

RGB Interpretation Guide: EUMETrain

Event Description: A potent storm system departing the Front Range forced a strong cold front southward across Colorado and New Mexico. As the front passed it produced high winds, blowing dust, low visibility, and ceilings at several airport observation sites.

Product Impact: The Dust RGB imagery (Fig. 1) confirmed the low visibility was due to dust rather than low clouds expected from the approaching cold front. The Dust RGB was also able to distinguish mid-level clouds which could be mistaken for dust in the GOES visible image. Application of the RGB resulted in improved forecasting of the visibility and spatial extent of the dust plume heading into northeastern New Mexico. Forecasters were able to confidently establish the timing and location of impacts along the I-40 corridor and communicate this via graphicast to state officials and the public, with a 3-hour lead time (Fig. 2). At 5:00 PM local at Tucumcari (KTCC) visibility was reduced to 1.0 statute miles, verifying the graphicast. Radar detection of the dust plume was limited due to overshooting of the beam; thus, the satellite imagery provided valuable remote sensing of the event.

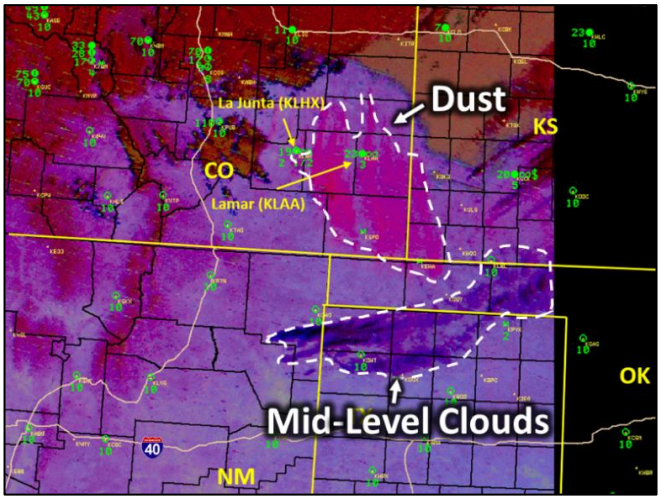

Figure 1. Dust RGB product valid 1801 UTC 11 March 2014 with aviation station plots overlaid.

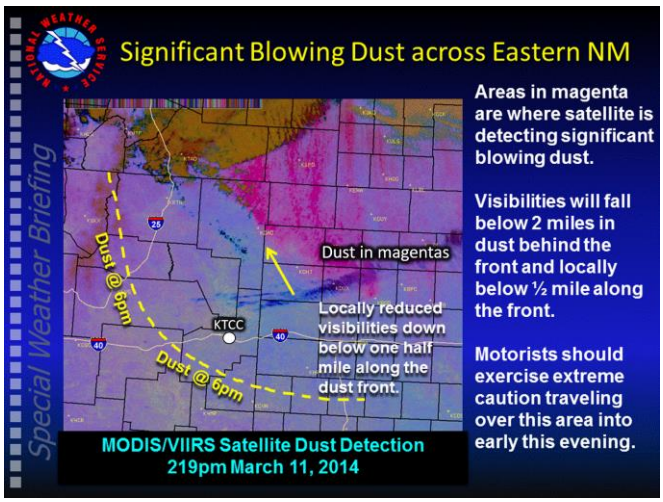

Figure 2. NWS ABQ Graphicast issued via the web and social media at 1500 local time on 11 March 2014. Dust RGB is valid at 1419 local time.

Interpretation: In standard visible imagery, dust and thin clouds often appear the same due to their similar reflectance and texture (Fig. 3). In the RGB images, dust is shown as magenta and is differentiated from the thin mid-level clouds which appear in dark purple to brown/tan tones as the thickness (i.e. red) increases. The large red contribution for dust is related to less absorption by dust at the 12 µm wavelength compared to clouds of similar optical depth. Therefore, the underlying warm surface below the dust influences the 12.0 – 10.4 µm difference of the RGB's red component to be a large positive value. Combined with the moderate blue contributions due to relatively warm dust particles, a magenta color results to represent the dust plume.

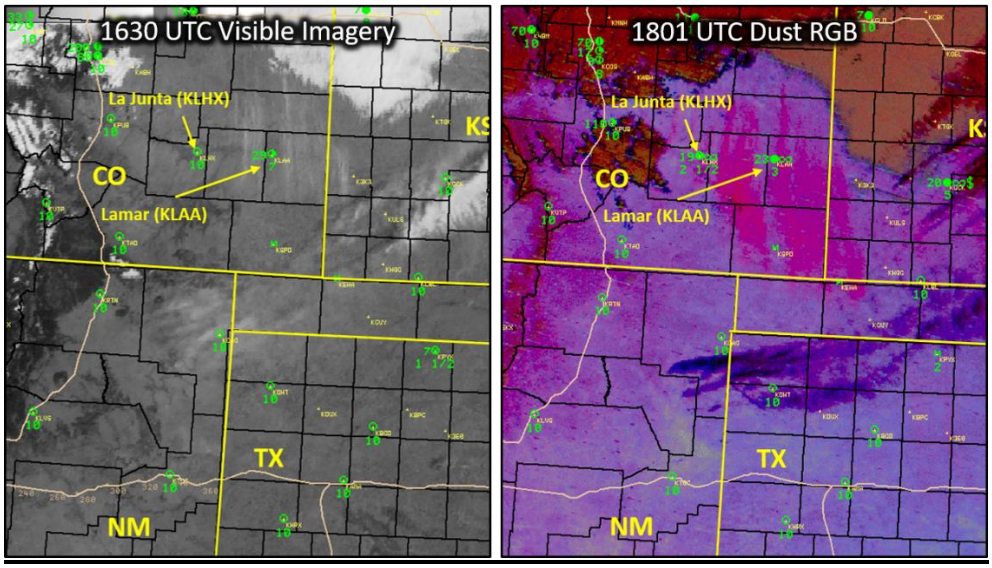

Figure 3. Visible Imagery (left) at 1630 UTC and the Dust RGB (right) at 1801 UTC on 11 March 2014. Note north-south streaks in visible near Lamar, Colorado are early dust plumes (magenta in RGB), while the same shades further south over Oklahoma, Texas, and New Mexico are thin, mid clouds (purple in RGB).