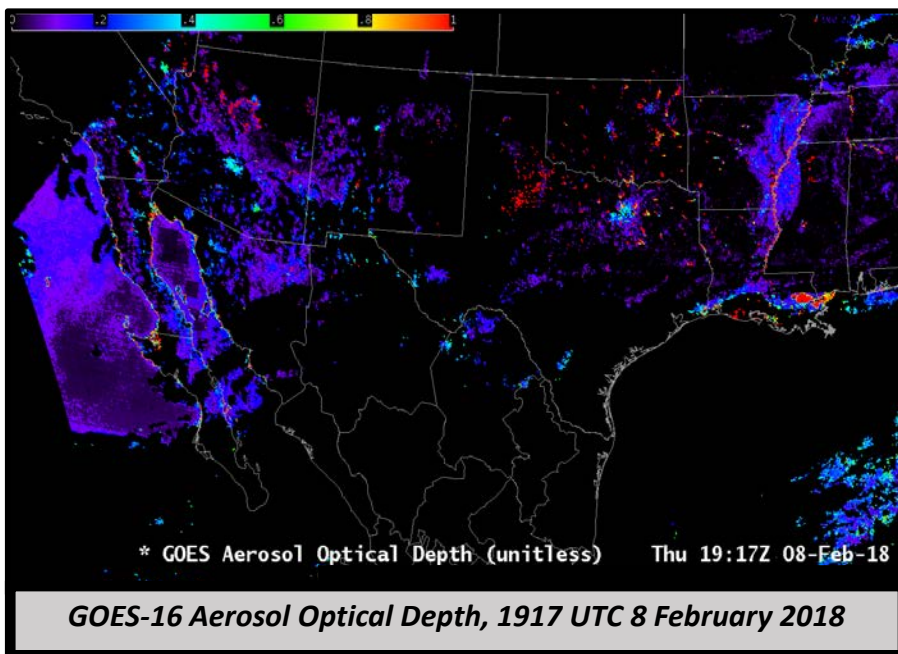# Aerosol Optical Depth

Quick Guide

Why is Aerosol Optical Depth Important?

Aerosols released into the atmosphere from anthropogenic activity (cars, industry) and natural events (fires, dust storms) affect human health, reduce visibility, and alter Earth's radiation budget. Aerosol Optical Depth (AOD) is a <u>quantitative</u> estimate of the amount of aerosol present in the atmosphere, and it can be used as a proxy for surface Particulate Matter PM2.5 (particles smaller than 2.5 μm median diameter). AOD measures the extinction of a ray of light as it passes through the atmosphere. The rate of extinction of the light increases as AOD increases.

GOES-16 Aerosol Optical Depth, 1917 UTC 8 February 2018

Aerosol Optical Depth Specifications

Domain	Temporal Refresh	Product Accuracy	Resolution
Full Disk	15 minutes	Over land: AOD < 0.04: 0.06 ; 0.04 < AOD < 0.8: 0.04 ; AOD >0.8: 0.12 Over water: AOD < 0.40: 0.02 ; AOD > 0.40: 0.10	2 km
CONUS	5 minutes		

Impact on Operations

<u>Primary Application:</u> Aerosol Optical Depth quantifies the amount of aerosol in the atmosphere. The product is useful proxy for air pollution and can be used in monitoring and forecasting air quality.

<u>Application:</u> Compare this product to aerosol detection (smoke/dust flag) and visible, GeoColor, dust RGB imagery. AOD values > 0.5 constitute high aerosol loading.   Typical atmospheric values are between 0.1 and 0.15. The product is more accurate over water surfaces than over land surfaces.

Limitations

Daytime only application: The GOES-16 AOD algorithm uses visible and near-IR bands and is a daytime-only product.
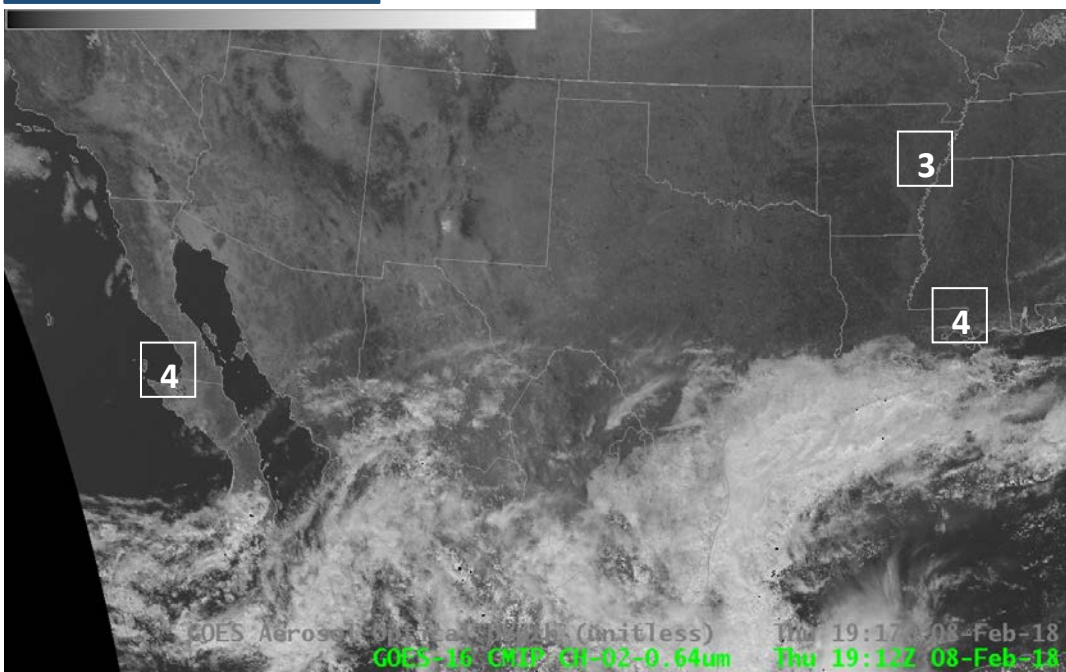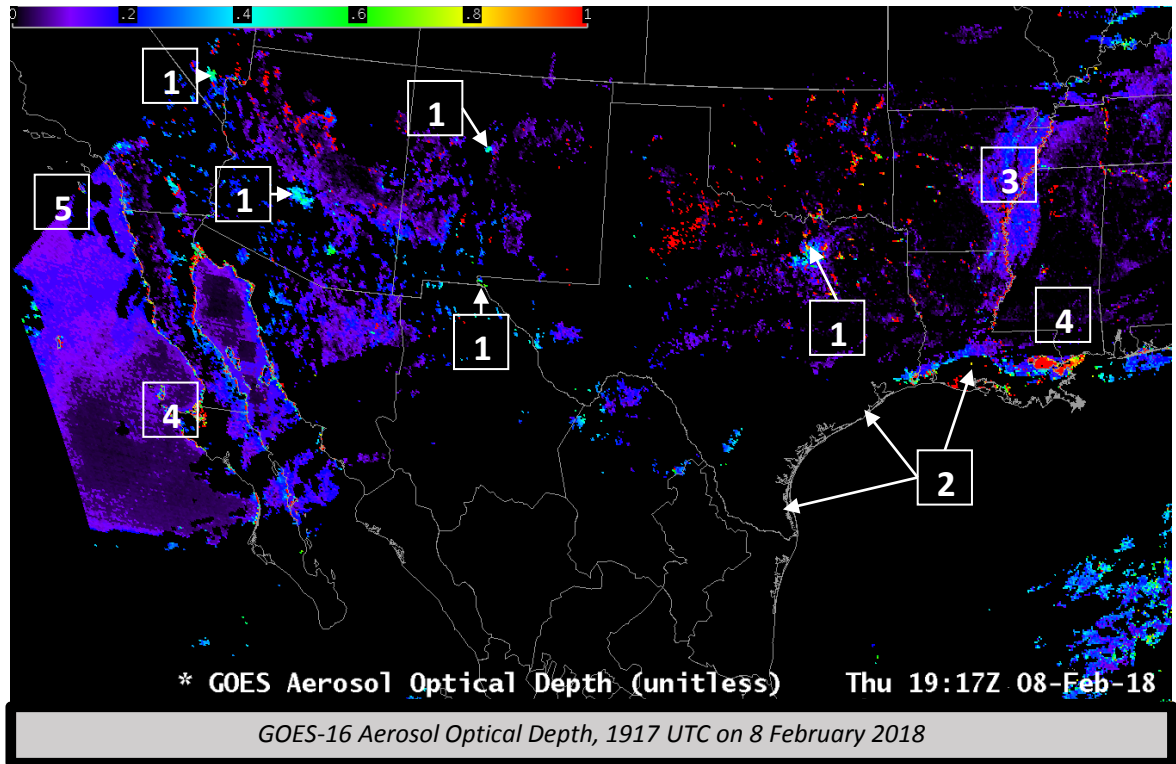
Limitation: Informative flags that could inform you why detection does/does not occur (snow/ice, cloud, etc.) are not included in the AWIPS display.

Limitation: AOD is derived only in snow-free and cloud-free regions.   Use caution if the satellite zenith angle > 60º. AOD is not computed for Mesoscale sectors. The baseline AOD algorithm does not retrieve over bright surfaces. Future updates will include bright surface retrievals.

Aerosol Optical Depth

Quick Guide

GOES-R

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Image Interpretation

1 Increased Aerosol loading over cities is apparent

2 AOD not produced where clouds are present

3 Variability in surface brightness can be misinterpreted as Aerosol Loading.

4 Boundaries of Rivers, lakes, and seas can also show up in AOD.

5 Solar Zenith Angle must exceed 60°

* GOES Aerosol Optical Depth (unitless)   Thu 19:17Z 08-Feb-18

GOES-16 Aerosol Optical Depth, 1917 UTC on 8 February 2018

GOES-16 CMIP CH-02-0.64μm   Thu 19:12Z 08-Feb-18

GOES-16 "Red Visible" 0.64 μm Visible Imagery, 1917 UTC on 8 February 2018