

Blog Help Files: CALIPSO

NASA's Cloud-Aerosol Lidar and Infra-Red Pathfinder Satellite Observation (CALIPSO) satellite is a polar-orbiting satellite* that provides information about the vertical distribution of particles in the atmosphere. CALIPSO contains an active lidar* that measures backscattered radiation and generates a profile of aerosols in the atmosphere, up to 30 km altitude. CALIPSO data are especially powerful when used in conjunction with horizontal measurements of particulates, such as aerosol optical depth (AOD),* to generate a three-dimensional map of the location and transport of particulates.

There are several drawbacks to the use of CALIPSO measurements, however. CALIPSO data have minimal accuracy in the boundary layer, the part of the troposphere adjacent to the Earth's surface, so CALIPSO data are most useful for indicating the transport of pollutants about the boundary layer. The CALIPSO satellite has a very narrow measurement swath, which means that it does not have daily global coverage. As a result, CALIPSO data may not be available for an area of interest during an air quality event. CALIPSO profiles made during the nighttime are more accurate than those made during the daytime, due to the absence of solar radiation, which can interfere with the lidar measurements. In addition, clouds block CALIPSO profile measurements, so the satellite cannot detect aerosols that are located in the atmosphere beneath clouds.

Figure 1 is an example of a CALIPSO profile, measured as 532 nm total attenuated backscatter, for July 16, 2009. CALIPSO total attenuated backscatter profiles are given in units of /km/sr. The images are color coded, with reds and yellows corresponding to high concentrations of particulates; white indicates clouds. Altitude is on the y-axis in km, and the overpass swath of the satellite is represented on the x-axis in latitude and longitude. This profile began at 81.00 °N and 46.88 °E, and ended at 11.72 °N and 72.53 °W, over the eastern Caribbean. Figure 2 shows the overpass path of the satellite as a blue line. CALIPSO profiles can be difficult to interpret, so it is helpful to open the profile data in Google Earth, as shown in Figure 3. This CALIPSO profile indicates that high concentrations of Saharan dust were located over the Dominican Republic and eastern Caribbean, shown by the yellow area at approximately 1-6 km altitude on the right side of Figure 1. Figure 4 is the Terra MODIS AOD image for Central America and the Caribbean on the same day, July 16, 2009, indicating the horizontal distribution of Saharan dust over the eastern Caribbean.

*For more information about:

- Polar-orbiting satellites, see the **Satellite Basics Help File**
- Aerosol optical depth (AOD), see the **Aerosol Optical Depth (AOD) Help File**
- Lidar measurements, see the **Lidar Help File**

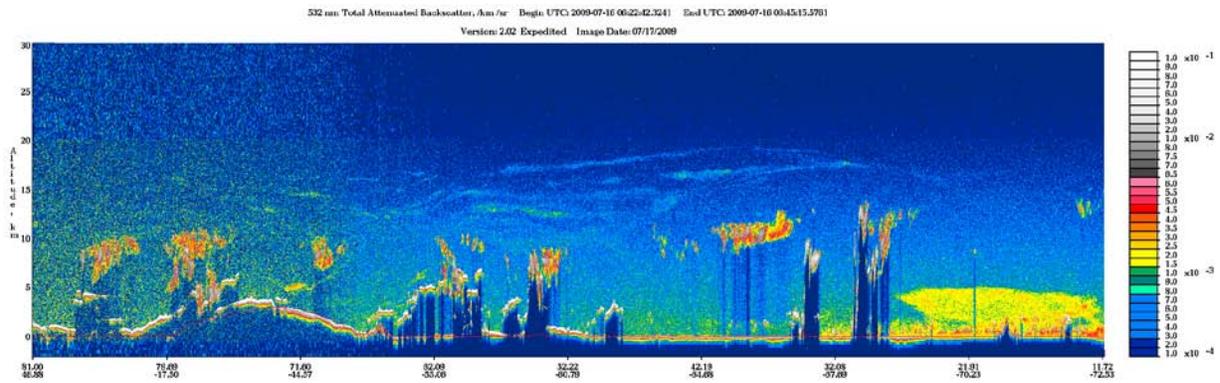


Figure 1. CALIPSO 532 nm total attenuated backscatter profile for July 16, 2009. Altitude is on the y-axis and the overpass swath of the satellite is represented on the x-axis in latitude and longitude. The yellow area on the lower right side of the image is a measurement of Saharan dust located over the Dominican Republic and eastern Caribbean.

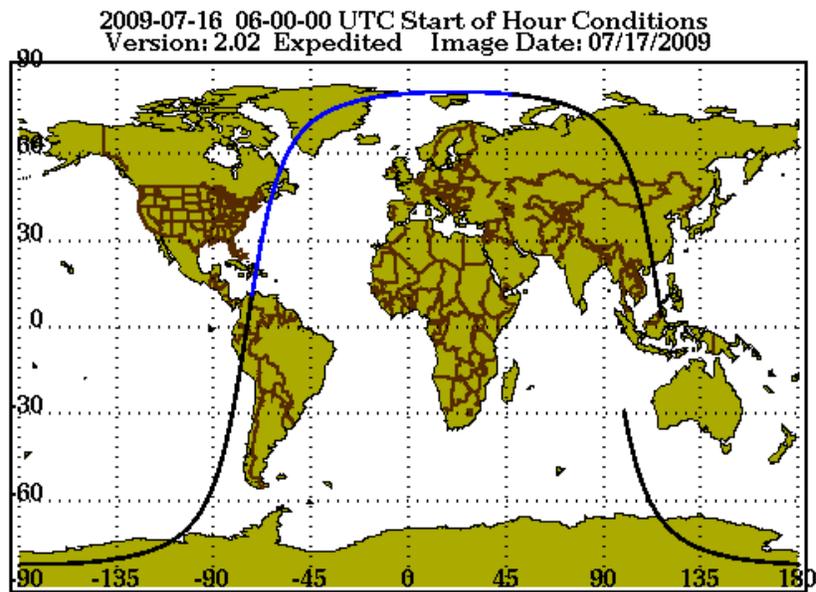


Figure 2. The blue line represents the overpass path of the CALIPSO satellite as it made the measurement shown in Figure 1.

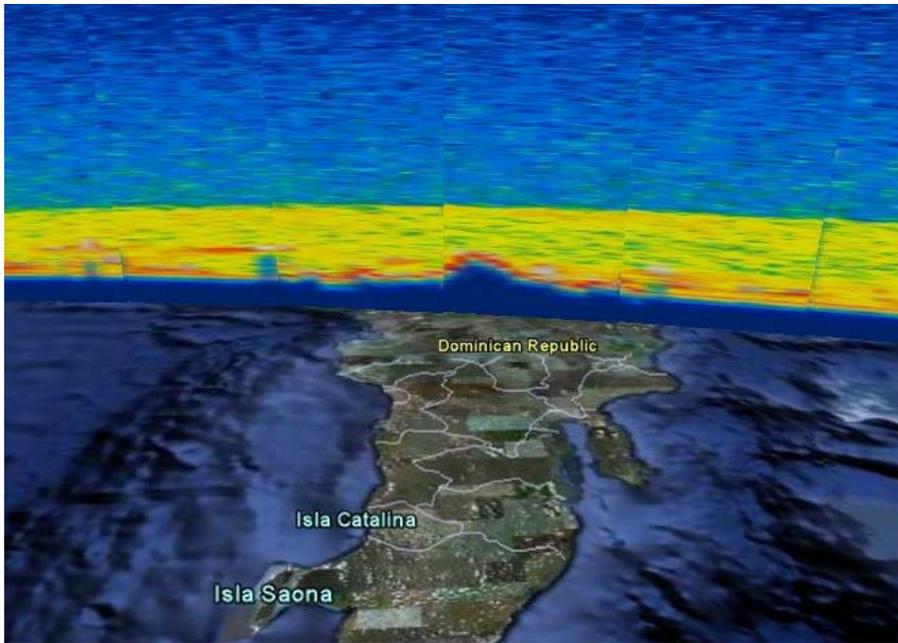


Figure 3. CALIPSO profile from in Figure 1 in Google Earth, looking west. The yellow colored-region represents Saharan dust in the atmosphere over the Dominican Republic and eastern Caribbean.

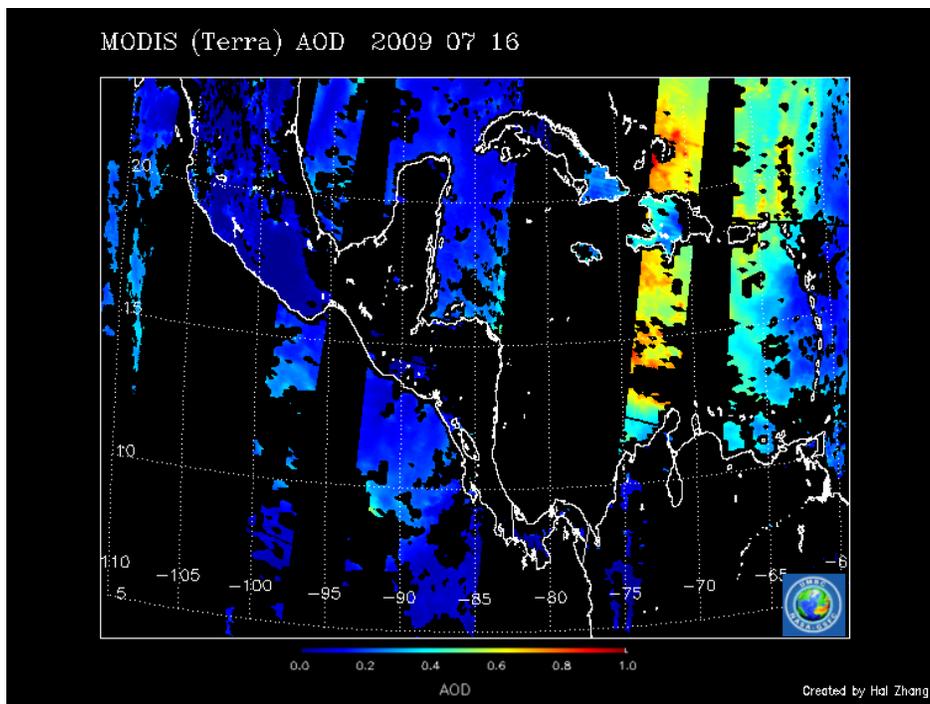


Figure 4. Terra MODIS AOD image of Central America and the Caribbean for July 16, 2009, indicating the horizontal distribution of Saharan dust over the eastern Caribbean.