

# Impact of aerosol vertical profile and optical parameters on the accuracy of satellite AOD retrieval

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Satellite sensors are widely used to monitor large scale aerosol variability from space. However, current aerosol retrieval algorithm used by passive sensors still suffers from uncertainties in a series of assumptions, with two important ones being aerosol vertical distribution and scattering/absorbing parameters. In this study, we investigate the effect of these two assumptions on the accuracy of retrieved aerosol optical depth (AOD) using both sensitivity experiments and actual retrieval practices. Using the 6S and Modtran radiative transfer model, we find that the retrieved AOD is very sensitive to the height of absorbing aerosols, and the effect increases with surface albedo. In extreme cases, the error can be as large as 80%. The retrieval results are also quite sensitive to aerosol single scattering albedo, compared to other parameters such as asymmetry parameter and effective radius. Using the aerosol profiles and optical parameters measured by lidar and sunphotometer at the PKU site, we find that the retrieval accuracy can be greatly improved by ~50%. Our results highlight the necessity to refined aerosol profile and optical parameters in the passive retrieval algorithms, possibly through space born lidars and ground based observations.

Keywords: aerosol satellite retrieval, aerosol vertical profile, aerosol single scattering albedo, lidar