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Apparent Bluing of Aerosols Near Clouds

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Numerous studies based on satellite observations have reported that aerosol optical depths increase with increasing cloud cover. Part of the increase comes from the humidification and consequent growth of aerosol particles in the moist cloud environment, but part comes from 3D cloud-radiative transfer effects on the retrieved aerosol properties. Often, discerning whether the observed increases in aerosol optical depths are artifacts or real proves difficult. We describe a simple model that quantifies the enhanced illumination of cloud-free columns in the vicinity of clouds that are used in the aerosol retrievals. This model is based on the assumption that the enhancement in the cloud-free column radiance comes from enhanced Rayleigh scattering that results from the presence of the nearby clouds. This assumption leads to a larger increase of AOT for shorter wavelengths, or to a "bluing" of aerosols near clouds. Examples from the MODIS observations that illustrate the apparent bluing of aerosols near clouds will be discussed.