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Comparison of UV-RSS spectral measurements and TUV model runs for clear skies for the May 2003 ARM aerosol intensive observation period

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Abstract. The first successful deployment of the fully-operational ultraviolet rotating shadow-band spectroradiometer occurred during the May 2003 US Department of Energy's Atmospheric Radiation Measurement program's Aerosol Intensive Observation Period. The aerosol properties in the visible range were characterized using redundant measurements with several instruments to determine the column aerosol optical depth, the single scattering albedo, and the asymmetry parameter needed as input for radiative transfer calculations of the downwelling direct normal and diffuse horizontal solar irradiance in clear-sky conditions. The Tropospheric Ultraviolet and Visible (TUV) radiative transfer model developed by Madronich and his colleagues at the US National Center for Atmospheric Research was used for the calculations of the spectral irradiance between 300–360 nm. Since there are few ultraviolet measurements of aerosol properties, most of the input aerosol data for the radiative transfer model are based on the assumption that UV input parameters can be extrapolated from the visible portion of the spectrum. Disagreements among available extraterrestrial spectra, which are discussed briefly, suggested that instead of comparing irradiances, measured and modeled spectral transmittances between 300–360 nm should be compared for the seven cases studied. Transmittance was calculated by taking the ratios of the measured irradiances to the Langley-derived, top-of-the-atmosphere irradiances. The cases studied included low to moderate aerosol loads and low to high solar-zenith angles. A procedure for retrieving single scattering albedo in the ultraviolet based on the comparisons of direct and diffuse transmittance is outlined.

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