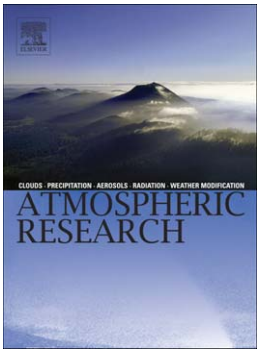

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Dependence of the spectral Diffuse-Direct irradiance ratio on aerosol spectral distribution and single scattering albedo

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Abstract

This study investigates the modification of the clear-sky spectral Diffuse-Direct irradiance Ratio (DDR) as a function of solar zenith angle (SZA), spectral aerosol optical depth (AOD) and single scattering albedo (SSA). The solar spectrum under various atmospheric conditions is derived with Simple Model of the Atmospheric Radiative Transfer of Sunshine (SMARTS) radiative transfer **code**, using the urban and continental aerosol models **as inputs**. The **spectral DDR can be simulated with great accuracy by an exponentially decreasing curve, while the** aerosol optical properties strongly affect the scattering processes in the atmosphere, thus modifying the DDR especially in the ultraviolet (UV) spectrum. Furthermore, the correlation between spectral DDR and spectral AOD can be represented precisely by an exponential function and can give valuable information about the dominance of specific aerosol types. The influence of aerosols on spectral DDR increases with increasing SZA, while the simulations using **the** urban aerosol model **as input in SMARTS** are closer to the measurements taken in the Athens urban environment. **The SMARTS simulations are interrelated with spectral measurements and can be used for indirect estimations of SSA**. Overall, the current work provides some theoretical approximations and functions **that help in understanding** the dependence of DDR on astronomical and atmospheric parameters.