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Aerosol effect on multiple scattering for light propagation in the atmosphere

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When cosmic rays enter the atmosphere, they induce extensive air showers composed of secondary particles. Charged particles excite atmospheric nitrogen molecules, and these molecules then emit fluorescence light in the 300-400 nm range. In cosmic ray observatories as the Pierre Auger Observatory or Telescope Array, the atmosphere is used as a giant calorimeter, where the fluorescence light is proportional to the energy deposited by the shower. The main atmospheric attenuation processes are Rayleigh scattering, by the molecular component, and Mie scattering, by the aerosol component, both being elastic. In this work, we show how the multiple scattering can also contribute to the light recorded by the fluorescence telescopes. Since the aerosol population is highly variable in time and location, multiple scattering with different aerosol conditions will be presented. All these results will be given in the case of an isotropic point source.

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