Abstract Submitted
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Application of Monte Carlo Method to Simulate Radiation Transfer through Exoplanetary Atmospheres[1] MICHAEL ROTHMAN, ANIL PRADHAN, SULTANA NAHAR, Ohio State University, BILAL SHAFIQUE, University of Azad Jammu Kashmir, KEVIN HOY, Ohio State University, EXOMOL, UNIVERSITY COLLEGE LONDON COLLABORATION — Development is underway of an exoplanetary atmosphere simulator Geant4-EXOPlanets (G4-EXOP) based on Geant4, a Monte Carlo program package enabling modeling of radiation and particle transmission through matter. G4-EXOP will be a toolkit to model host-star radiation transmission through atmospheric layers utilizing atomic and molecular data, allowing the comparison of observations with simulated spectra. We focus on atomic biosignatures (H, C, N, etc.) and molecules containing them (H_2O, CO_2, etc). Phosphorus is a focus as abundances in stellar systems are vital for DNA-based life. Atomic transition data are calculated using SUPERSTRUCTURE (SS), with phosphorus results reported. Utilizing molecular data obtained through ExoMol, we report computed oscillator strengths for H_2O. We also report G4-EXOP filtered Gaussian convolutions of the solar irradiance and flux residual simulated spectra as a test. Following further development, we will simulate the flux residual and irradiance spectra of the Earth and Sun before simulating other star – exoplanet pairs. G4-EXOP will be a toolkit for modeling host-star radiation transmission through exoplanet atmospheres to characterize biosignature abundances within observations.

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