

Planetary Spectrum Generator: an accurate online radiative transfer suite for exoplanets

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We have developed an online radiative-transfer suite² applicable to a broad range of exoplanets (e.g., terrestrial, super-Earths, Neptune-like and gas-giants). The Planetary Spectrum Generator (PSG) can synthesize planetary spectra (atmospheres and surfaces) for a broad range of wavelengths (0.1 μm to 100 mm, UV/Vis/near-IR/IR/far-IR/THz/ sub-mm/Radio) from any observatory (e.g., JWST, HST, Keck, SOFIA, ARIEL, LUVOIR, OST, coronagraphs, transit). This is achieved by combining several state-of-the-art radiative transfer models, spectroscopic databases and planetary climatological models (e.g., Parmentier equilibrium P/T models and Kempton EOS chemistry). PSG has a 3D (three-dimensional) orbital calculator for all confirmed exoplanets, while the radiative-transfer models can ingest billions of spectral lines from hundreds of species from several spectroscopic repositories. It integrates the latest radiative-transfer and scattering methods in order to compute high resolution spectra via line-by-line calculations, and utilizes the efficient correlated-k method at moderate resolutions. PSG includes a realistic noise calculator that integrates several telescope / instrument configurations (e.g., interferometry, coronagraphs) and detector technologies (e.g., CCD, heterodyne detectors, bolometers). Such an integration of advanced spectroscopic methods into an online tool can greatly serve the planetary community, ultimately enabling to retrieve planetary parameters from remote sensing data, to efficiently plan mission strategies, to interpret current and future planetary data, to calibrate spectroscopic data and to develop new instrument/spacecraft concepts.

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²<https://psg.gsfc.nasa.gov>