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AtTRIS: A tool to calculate the ionization and secondary particle environment of (exo)planetary atmospheres

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We present the Atmospheric Radiation Interaction Simulator (AtRIS), a new Geant4-based code tailored specifically to enable parametric studies of radiation propagation through (exo)planetary atmospheres. Although similar codes like, e.g., PLANETOCOSMICS (see Desorgher, 2006) are available, none possess the necessary flexibility to simulate particle interactions in a variable (exo)planetary atmospheric environment. The main purpose of AtRIS is to calculate the electron-ion pair production rates, which are a necessary input for atmospheric chemistry models. However, AtRIS can provide detailed information about the altitude-dependent terrestrial secondary particle environment.

Here, we give a detailed introduction to the code and present several validation studies against terrestrial measurements and compare them to results of previous studies.