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ExoNoodle: A Python package spectral time-series of transiting exoplanets

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Summary

exonoodle is a Python 3 package which generates time-series spectra of transiting exoplanet systems. This package reads modelled spectral contributions from planet and star (or generates a black-body spectrum) and creates the spectra variation of the star-planet system light while the planet is rotating around the star.

Scientific details of the algorithm along with an example of scientific use of the package can be found in a companion paper (Martin-Lagarde, Morello, Lagage, Gastaud, & Cossou, 2020). Technical usage and a detailed user manual are available on GitLab.

The main calculation of the transit spectral light-curve is adapted from the model of (Mandel & Agol, 2002). The main novelty of this code compared to ones already available in the community is that it includes planetary contribution, and computes the spectra directly. It means the algorithm solutions changed compared to existing codes, as it does not provide light-curves directly, but time-series spectra. Hence, the computation is almost fully vectorial on the wavelength, and the output is a folder containing a set of spectral files. Flexibility and efficiency in the input of the package is due to extensive use of the `Astropy` package (Astropy Collaboration, 2013) (and especially `astropy.units`)

The exonoodle package has been developed in the frame of the preparation of JWST-ERS observations, and is already used along with instrument simulator to produce synthetic MIRI-LRS data. These data will be delivered for the ERS data challenge of late 2020.

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