The transiting exoplanet community early release science data challenge: lessons for MIRI spectroscopic sime-series analysis

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The Transiting Exoplanet Community Early Release Science Data Challenge #1: Lessons for MIRI Spectroscopic Time-Series Analysis

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The Transiting Exoplanet Community Early Release Science (ERS) Program produced a simulated time series of spectral images encompassing a full-orbit phase curve of the transiting planet NGTS-10b as would be observed by MIRI LRS Slitless mode spanning 5 to 12 µm. Detector noise, non-linearities, and pixel response drift has been included in the simulations. The data are consistent with the ERS observing plan, with 300 groups per integration and 1,857 integrations defining the exposure. Stage 0 (raw, uncalibrated frame data), Stage 1 (calibrated, ramp-fit data), and Stage 2 (flux-calibrated, extracted spectra) outputs and and their corresponding reference files were delivered to the community and used as inputs at an open Data Challenge where independent analysis tools could be compared at multiple stages of the process. Participants performed iIntercomparisons of reduced data, light curves, models and transmission spectra. We describe the simulated data products and report on the lessons learned from this ERS Data Challenge regarding MIRI LRS phase curve data analysis. We describe the open-source tools currently available and outstanding challenges that drive continued development leading up to the actual JWST observations expected later in the year.

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