

Analysis of combined light curves of selected stars with exoplanetary transits collected by Kepler and TESS orbital telescopes

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The analysis of the light curves of stars hosting planetary systems can potentially provide information about various physical processes taking place in the system: the physical variability of the star itself caused by pulsations, the rotation period of the star revealed by spots, the planet's orbital and rotation periods, etc. The data sets of the orbital telescopes Kepler and TESS (Transiting Exoplanet Survey Satellite) allow one to investigate both the exoplanets and their host stars with sub-mmag precision. Combining the two data sets obtained at different epochs and with different resolutions (sampling rates) enables expanding and supplementing the observation base for time series analysis. We present analysis of the light curves for stars from the KOI (Kepler Object of Interest) catalog, which were also observed by the TESS. The existence of the planets near the selected stars has not been confirmed yet, although the change in star brightness caused probably by a planet transit was recorded in the Kepler light curves. The Python package Lightkurve 2.3, which is freely available in the MUST (Barbara A. Mikulski Archive for Space Telescopes) archive, was used to process the light curves. The frequency spectrum was estimated based on the least-square fit of sinusoids to the data samples, similar to Fourier analysis as well as the Box Least Square Periodogram method. Some parameters (period, depth, duration) of the transit events have been extracted from the two data sets and compared. Another goal of our work is to derive the stellar rotation periods and compare them with the derived planet orbital periods, which may provide insight into the formation and evolution of planetary systems.

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