

Yao, Xinyu

Using Ground-Based Surveys to Precover TESS Single Transits.

Due to the mission configuration, in 74% of the observed area, TESS can only capture one or two transits for planets with orbital periods longer than 13.5 days, which means the true ephemerides will be difficult to determine from TESS data alone. The Kilodegree Extremely Little Transit (KELT) survey has a long observation baseline and monitors fields that largely overlap with the TESS footprint, and also observes stars of similar brightness. We insert simulated TESS-detected single transits into KELT light curves, and find that KELT photometry can be used to confirm ephemerides with high accuracy for planets of Saturn size or larger with orbital periods as long as a year, and therefore span a wide range of planet equilibrium temperatures. In a large fraction of the sky our average recovery rate can be as high as 40%. The resulting periods and ephemerides of the signals can then be used by follow-up teams, to plan and coordinate follow-up observations to confirm candidates as planets, eclipsing binaries, or other false positives, as well as to conduct detailed transit observations with facilities like JWST or HST.