



Finding Hundreds of Transiting Circumbinary Planets With TESS



While most stars exist in multiple systems (two or more stars orbiting each other), there are only a dozen or so exoplanets that have been found in such systems. This may not be due to planets being more rare in multiple systems, but that they are more difficult to detect with the Terrestrial Exoplanet Survey Satellite (TESS). A planet in a binary system (called a circumbinary planet) will usually have a longer orbital period than TESS's typical observational baseline –TESS observes each area of the sky for 27 days.

The transits of circumbinary planets produce a unique observational feature: the occurrence of multiple transits, or dips in starlight, when the planet is passing in front of the stars, from our perspective. These transits will have different light levels depending on which star is behind the planet, and the transits will have different timing, as the stars in the background are moving around each other. We are developing better search techniques to take all these different transits into account.

Using this detection technique, we estimate that TESS will find hundreds of circumbinary planets producing multiple transits during one orbit. This large sample will enable statistical understanding of the population of such planets and shed new light on their formation and evolution. Combining this technique with the TESS data on hundreds of thousands of eclipsing binary stars is the only way to discover large numbers of planets with two suns in the foreseeable future.

