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Title: Effect of stellar spots on the high precision transit light curve
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Abstract: Stellar activity features such as spots can create complications in determining planetary parameters through spectroscopic and photometric observations. The overlap of a transiting planet and a stellar spot, for instance, can produce anomalies in the transit light curves that may lead to inaccurate estimation of the transit duration, depth and timing. For instance such inaccuracies can affect the precise derivation of the planet's radius. In this paper, we present the results of a quantitative study on the effects of stellar spots on high precision transit light curves. We show that spot anomalies can lead to the estimate of a planet radius that is 4% smaller than the real value. The effects on the transit duration can also be of the order of 4%, longer or shorter. Depending on the size and distribution of spots, anomalies can also produce transit timing variations with significant amplitudes. For instance, TTVs with signal amplitudes of 200 seconds can be produced when the spot is completely dark and as large as the largest Sun spot. Our study also indicates that the minimum size of a stellar spot with detectable affects on the high precision transit light curve is around 0.03 time the stellar radius for typical Kepler telescope precision. We also show that the strategy of including more free parameters (such as transit depth and duration) in the fitting procedure to measure the transit time of each individual transit will not produce accurate results in the case of active stars.