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Astrometric accelerations of stars with candidate transiting planets: blended eclipsing binaries or close companions to planet hosts

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Stars with astrometric signatures such as astrometric acceleration from Gaia or Gaia-Hipparcos proper motion anomaly are known to host additional companions at close separations. In some cases these signatures are due to substellar and even planetary-mass companions, otherwise they are due to stellar companions at separation from a few AU to about 100-200 au. Such companions in some cases are detected by Gaia or they can be revealed by high spatial resolution observations (speckle imaging, adaptive optics). Such stellar companions could be bright enough to be the host of a diluted eclipse mimicking the planetary transit on the main target. At such close projected separations, photometric diagnostics from the high quality photometric light curves obtained from space (e.g. variations of centroid during a transit) can not be used to disentangle the host of the transit. A systematic analysis of all the TESS Targets Of Interest (TOIs) with significant proper motion anomaly revealed a variety of cases, including planetary mass companions in few-au orbit beside the close-in transiting planet, stellar companions close enough to significantly perturb the environment of the inner transiting planet(s), false positives due to diluted eclipsing binaries orbiting the TOI nominal target, and inconclusive cases. A statistical evaluation including also stars with Gaia astrometric orbits and astrometric acceleration shows the negative impact of the presence of close companions on the presence of bona-fide transiting planets. Perspectives to exploit the presence of astrometric acceleration of the targets of the PLATO mission to optimize the follow-up strategy and to identify both cases of special interest (additional planets in wide orbits, close stellar companions) and astrophysical false positives will be discussed.

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