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Abstract:

Characterizing Transiting Planets

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We present the recent results of our project aimed to obtain accurate properties of known extrasolar transiting planets (TEPs) via photometric follow-up with medium-class telescopes. The main purpose is to obtain simultaneous high-precision differential photometry of complete planetary transit events, which are analysed to measure the physical properties of the corresponding planetary systems. At present many of the known TEPs do not have high-quality follow-up light curves, and so their properties are relatively uncertain. We are therefore conducting a long-term project to observe these objects with medium-class telescopes. The observations are performed using the defocussing technique, which allows a good control of systematic effects and therefore a much better photometric precision.

Anomalies in transit light curves can arise from several phenomena affecting the parent stars, such as gravity darkening, stellar pulsation, starspots and even the presence of exomoons. High-quality photometric observations are therefore not only important to accurately determine the physical parameters of TEP systems, but can disclose further astrophysical information. However, it is generally a hard task to recognise transit anomalies due to astrophysical effects from those caused by random or systematic noise due to instrumental or atmospheric effects. One solution is to monitor the same transit event
simultaneously from two telescopes located at different sites. If both the telescopes notice the same anomaly, we can discard the possibility that it is caused by instrumental or Earth-atmosphere effects. We successfully implemented this observational strategy to follow up several planetary transits by using the Cassini 1.5m telescope at the Loiano Observatory, and the CA 1.23m telescope at Calar Alto.

An interesting technique to probe TEPs's atmosphere, alternative to the transmission spectroscopy, is to simultaneously obtain photometry of transits in different wavelengths. This observational strategy allows to measure the radius of TEPs in each bandpass filters and to look for possible variations that can be
attributable to the absorption of the light from the parent stars at specific wavelengths due to atoms and/or molecules in their atmospheres. We are exploring this science case by using two imaging instruments designed for simultaneous multi-colour photometry, i.e. BUSCA at the CA 2.2m telescope and GROND at the ESO/MPG 2.2m telescope in La Silla.