Photometric follow-up of transiting exoplanets with ground-based medium-class telescopes

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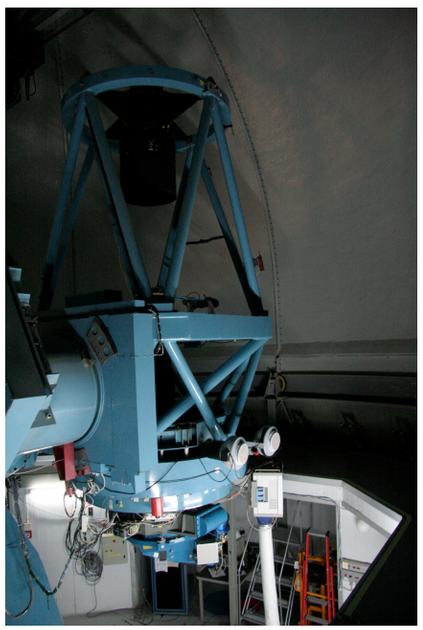
Transiting extrasolar planets (TEPs) are the most interesting exoplanets to study as it is possible to deduce their physical properties to high precision. High-quality photometric observations of TEPs are a vital component of such work, as they strongly constrain the density of the host star. They also allow searches for transit timing variations and for variations of the planetary radius with wavelength, which trace opacity variations in the planet's atmosphere.

Since 2008 we have been photometrically following up known TEP systems from both hemispheres. The aim of this project is to obtain high-precision differential photometry of complete transit events, which can be used to refine the measured physical properties of the planets and parent stars, search for opacity-induced planetary radius variations, and investigate star-spot crossing events. Our observations are performed using an array medium-class defocused telescopes, some of which are equipped with multiband imaging instruments.

MPG 2.2m Telescope

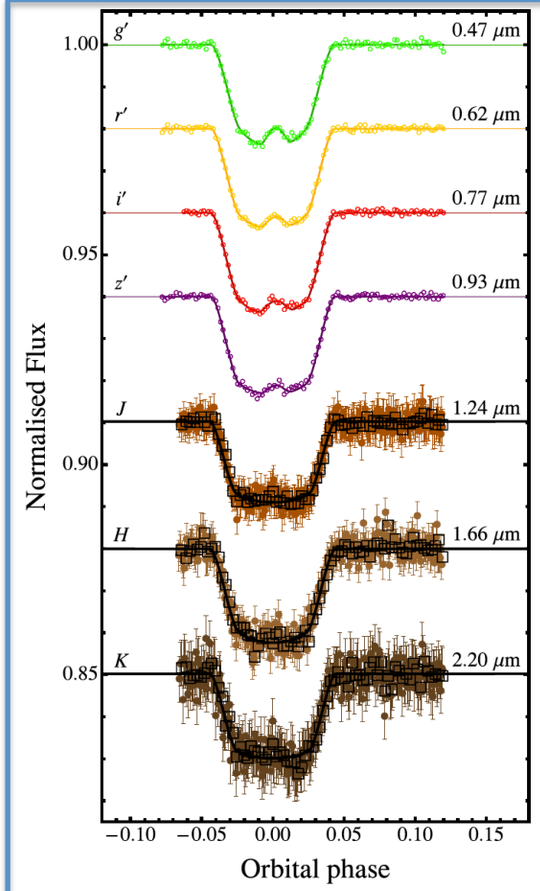
Danish 1.5m Telescope

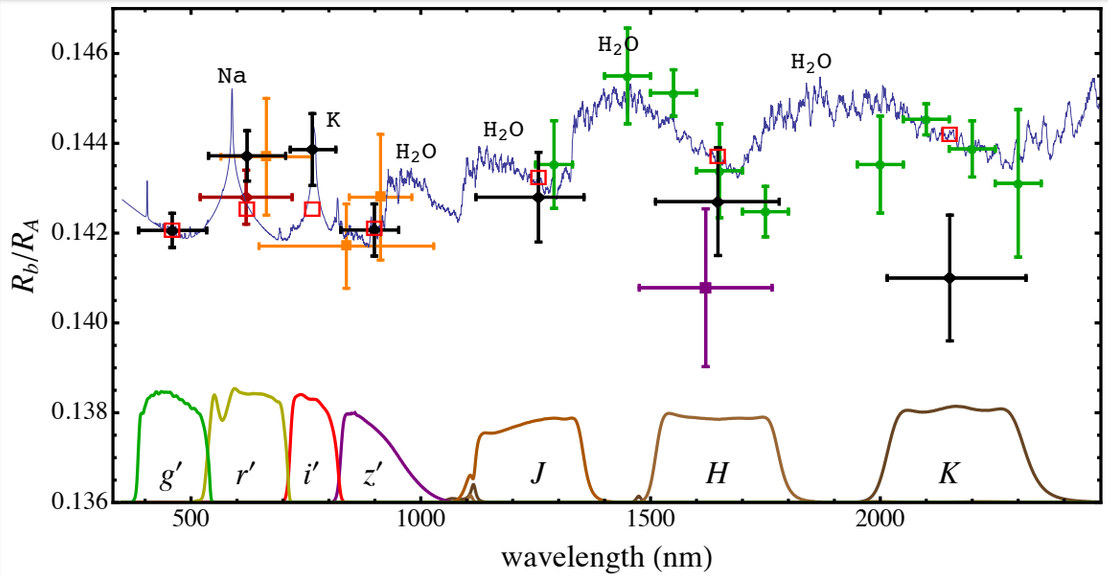


Cassini 1.5m Telescope

CA 2.2m Telescope

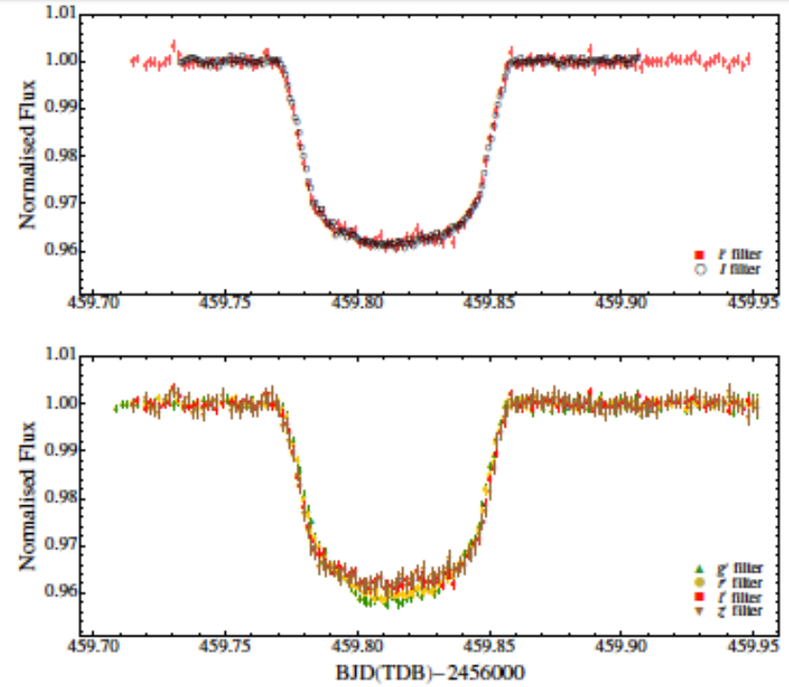
CA1.23m Telescope



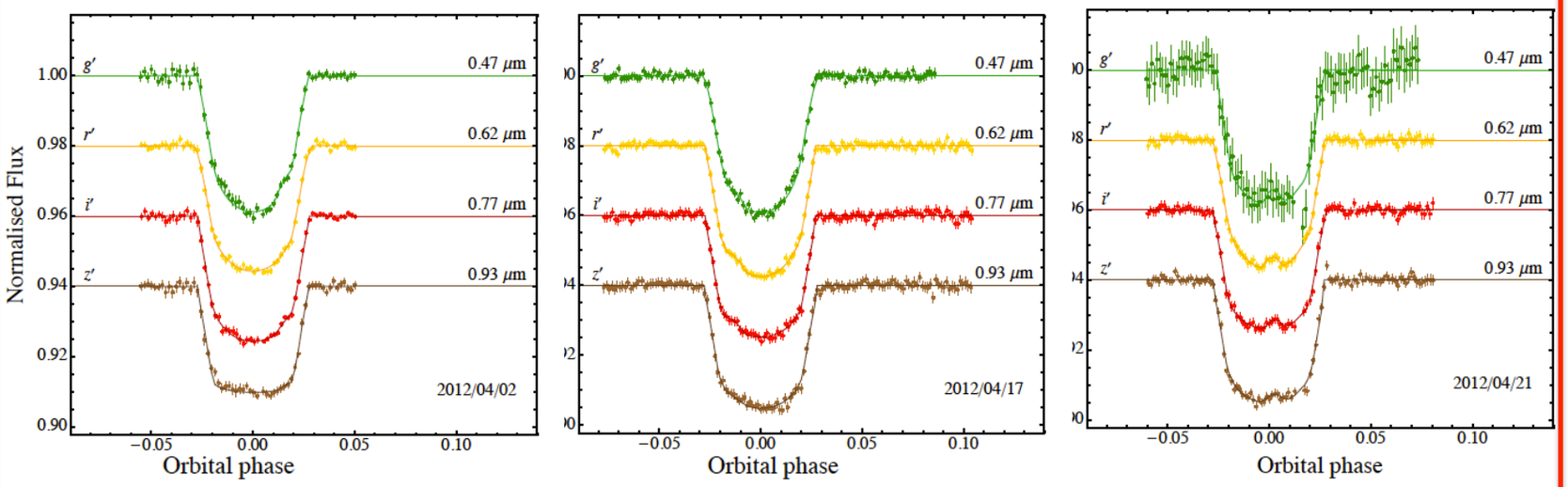


Simultaneous optical and NIR light curves of a transit event of **WASP-19b** observed with GROND at the MPG 2.2m.

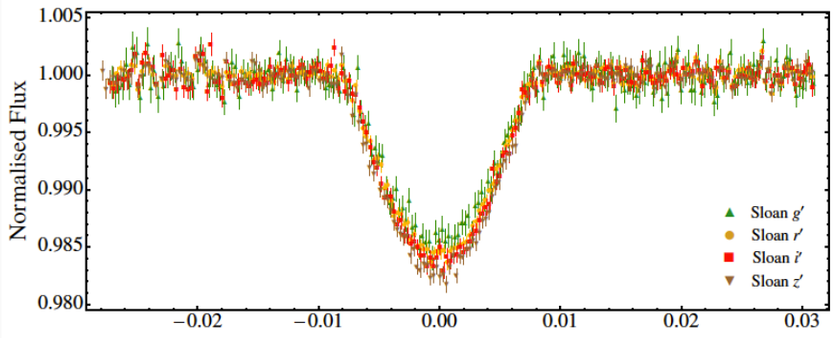
Variation of the planetary radius, in terms of planet/star radius ratio, with wavelength. Black diamonds are from GROND, the others from literature. The synthetic spectrum does not include TiO and VO opacity. Transmission curves of the GROND filters are shown at the bottom of the panel. Prominent absorption features are labeled [1].



Light curves of a transit of **WASP-80b**. *Top panel*: light curves obtained with the DK 1.54m Telescope (Bessel-*I* filter) and with GROND (Sloan-*i*), highlighting the good match between the transit shapes in the two independent observations. *Bottom panel*: light curves obtained with GROND through four optical filters simultaneously, showing how the transit shape changes with wavelength [2].



GROND light curves of 3 transits of **Qatar-2b** observed in April 2012, all showing star-spot crossing events [3].



GROND light curves of a **WASP-67b** eclipse showing how the transit light curve shape changes with wavelength. Contrary to what is expected for higher-inclination systems, the transit in the *g′* band is shallower than the other bands, as expected for a grazing eclipse, as limb darkening is stronger at bluer wavelengths [4].

Reference:
[1] Mancini et al., MNRAS 436, 2 (2013)
[2] Mancini et al., A&A 562, A126 (2014)
[3] Mancini et al., MNRAS 443, 2391 (2014)
[4] Mancini et al, A&A 568, A127 (2014)
See also
Ciceri et al., A&A 557, A30 (2013)
Mancini et al., MNRAS 430, 2932 (2013)
Mancini et al., A&A 551, A11 (2013)

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