ECLIPSES OF HOT JUPITERS
THE AAT/IRIS2 SURVEY

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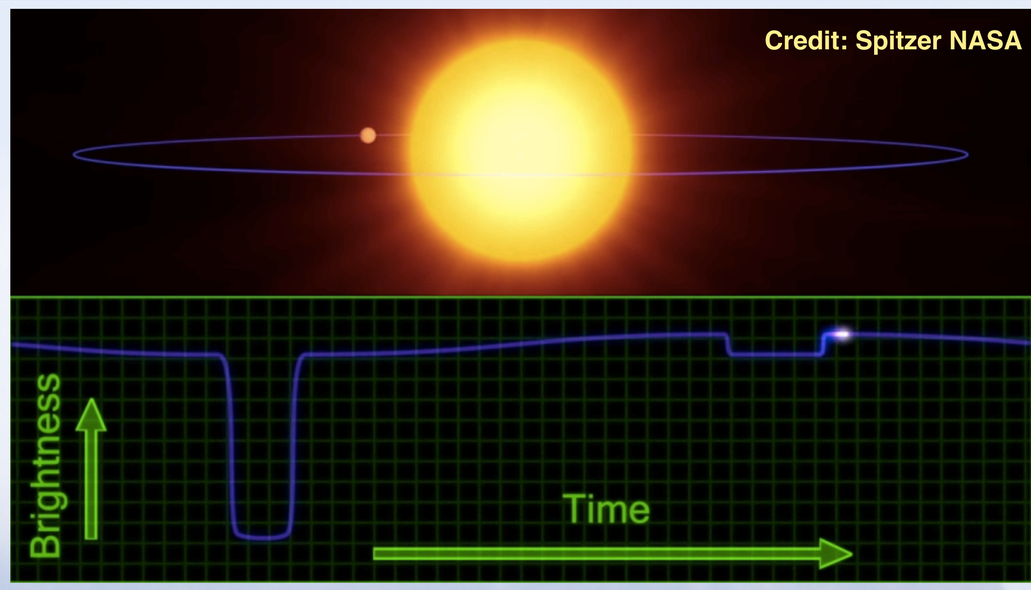
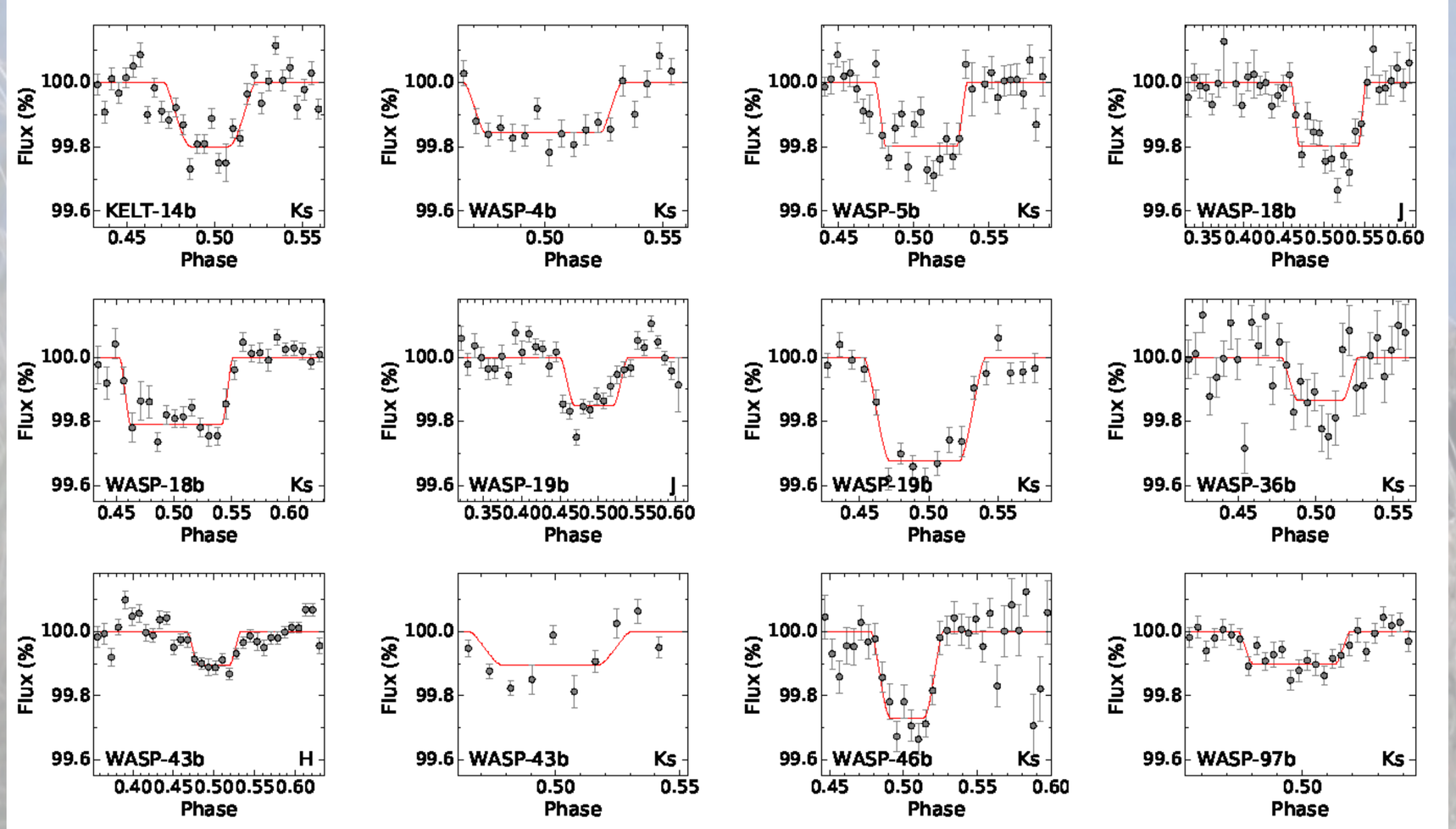
Transiting exoplanets are currently the best candidates for planetary characterisation. In primary transit constituents of the planetary atmosphere leave an imprint on the observed stellar spectrum. Secondary eclipses probe the day-side temperatures and reflectivity of the planets. The depth of eclipses depends on the ratio of planet to star radii and temperatures. The latter becomes favourable in the infrared, the former is maximised for the largest planets around small stars. Therefore most systematic measurements of eclipses so far, have used the Spitzer Space telescope for hot-Jupiters in the mid infrared. Ground-based observations of eclipses in the near IR are even more challenging and have been achieved only for a small sample of hot-Jupiters.



We are undertaking a survey of the eclipses of ~35 transiting hot-Jupiters with the near infrared IRIS2 imaging camera on the 3.9 m, Anglo Australian Telescope. This survey will more than double the current number of planets sampled in eclipse. Our first results (Zhou et al. 2014, MNRAS, 445, 2746, Zhou et al. 2015, MNRAS, 454, 300) demonstrated that the AAT-IRIS2 facility is capable of the required high precision (10^{-3} magnitude) infrared photometry due to the stability of the IRIS2 instrument that has a field of view (7.7' x 7.7') wide enough to allow many reference stars. The telescope's precise tracking allows measurements on the same pixel of the detector reducing the lightcurve red noise. In addition the equatorial mount avoids systematic errors due to pupil rotation present in alt-az systems.



To date we have observed a total of 12 planets in the K band; and 5 planets in two additional bands, H and J (examples on the left). We demonstrated that multiple eclipse observations of WASP-46b are consistent with each other within 1σ, verifying the robustness and repeatability of our measurements.
We also found an unusually deep J-band eclipse for one of the most highly irradiated planet, WASP-18b that is difficult to explain with the atmospheric models published previously.

Our growing sample will allow statistical study of atmospheres for the population of hot-Jupiters. We use near infrared bands to assemble the spectral sequence of exoplanets via colour-magnitude diagrams and compare the hot-Jupiter population against the spectral classes of other luminous objects of the same temperature range (brown dwarfs and M-dwarfs). We use our radiative transfer package VSTAR (Bailey & Kedziora-Chudczer, 2012, MNRAS, 419, 191) to derive atmosphere models for all objects.