Follow Up of Transiting Hot Jupiters with the OpenScience Observatories

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Follow Up of Transiting Hot Jupiters with the OpenScience Observatories

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ABSTRACT

We have been using the Open University OpenScience Observatories (OSO) to undertake follow up observations of known transiting hot Jupiters for the past three years. Here we present recent system characterisation and transit timing results for WASP-52b and HAT-P-23b and report on the performance of the observatory.

The OSO consists of two 0.4 meter class telescopes (PIRATE and COAST) used for undergraduate distance learning and research (Kolb et al. 2018). The telescopes, located at Teide Observatory on Tenerife at an altitude of 2390m, can be operated remotely in real time for teaching or fully available night. Concurrent Host Star Monitoring

Motivated by a suspected ~3% variation in HAT-P-23 brightness (Sada et al. 2016) we obtained monitoring observations covering 50 nights over a 93 day period consecutive with our transit observations. We detected a clear 7.015d periodic variation, though with a smaller amplitude than expected, which we attribute to stellar rotation due to surface spots.

WASP-52b Transit Timing

Our analysis of the new transit mid-times and reanalysis of those from the literature slightly prefers a quadratic ephemeris with $\Delta T = 0.07$ and $\Delta BIC = 1.53$ compared to a linear ephemeris. We calculate a period change $\gamma_{\text{peri}} = 3.86 \pm 0.01\%$ and find that orbital decay due to tidal interaction is unlikely. A plausible explanation is transit mid-time errors introduced through undetected spot crossing events. We predict further observations through the 2021 season will be able to confirm or refute this suspected period change (below).

Photometric Performance

The excellent photometric performance of the telescopes at the OSO can be seen in the light curve below which is a phase fold of five complete transits of WASP-52b made through an Rc filter with PIRATE.

References

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Image by Elena Mora