Photometric observations of the transiting exoplanet WASP-33b have produced a high-quality light curve. The data has been modelled to determine the system parameters, which confirm that WASP-33b is a bloated hot Jupiter, with a radius up to 30% larger than expected. The data also shows evidence for host star pulsation (Figure 1) with a potential connection to the orbital period.

**THEORY AND MOTIVATION**

Figure 2 schematically shows the transit of a planet across the face of a star. The dip is caused by the obscuration of light from the star by the planet. The depth and duration of the dip are determined by the planet and star radii, orbital inclination, orbital period and orbital separation.

The study of exoplanet transits is important because it provides:
- an estimate of the physical size (radius) of an extra-solar planet
- determinations of orbital inclination, thus constraining mass estimates
- an opportunity to probe properties such as the density and composition of planets
- validation of models of star and planet formation
- examination of the atmospheric composition through transit spectroscopy
- possibility to uncover tracers of extra-solar life, if it exists

**DATA COLLECTION AND ANALYSIS**

The method for data collection and processing followed these steps:
- 17 observations of transits made with the 0.5m *pt5m* on La Palma (Figure 3)
- normalise and remove step in flux by modelling each dataset individually with *minimisation* (Figure 4)
- combine, fold and bin the data to produce final light curve (Figure 5)
- model the final light curve allowing the system parameters to vary
- estimate errors using the prayer-bead technique
- confirm the existence of tidally induced pulsations which resonate with the orbital period.

A selection of parameters of the WASP-33 system are shown in Table 1, including those determined by the modelling of the light curve. The planetary radius suggests that WASP-33b is 15-30% larger compared to the H/He planet models of Fortney et al [6]. The most likely cause of this is the young age of the system (<200 Myr [17]), meaning the planet could hold some leftover thermal energy from formation, which may inflate the radius.

The fact that this hot, massive planet has been discovered orbiting with high orbital inclination, is expected due to the spin-orbit alignment and older stellar ages.

**RESULTS AND CONCLUSIONS**

The combined light curve, Figure 5, shows a prominent bump in the floor of the transit dip, likely to be caused by the pulsation of the host star. This could confirm the existence of tidally induced pulsations which resonate with the orbital period.

**FUTURE WORK**

- remove modelled transit shape from each dataset
- find the most prominent pulsation modes using chi-squared minimisation
- search for harmonics between pulsation period and orbital period

**REFERENCES**

4. Smith S.M.S. et al., 2011, MNRAS, Fig. 2059-2100