

Transits and Radial Velocity – the basics

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Transits

Chart 1 shows what can be determined knowing the timing and depth of transits.

Determining the time between successive transits defines the orbital period of the planet – green path.

Knowing the mass and diameter of the host star gives us the semi-major axis of the planet's orbit – yellow and green path.

The magnitude drop during the transit, from which the flux ratio in and out of transit can be calculated, combined with knowledge of the host star's diameter will enable the planet's diameter to be calculated – yellow and red path.

Key measurements are shown in Figure 1 and an example of observations showing TTVs in Figure 2.

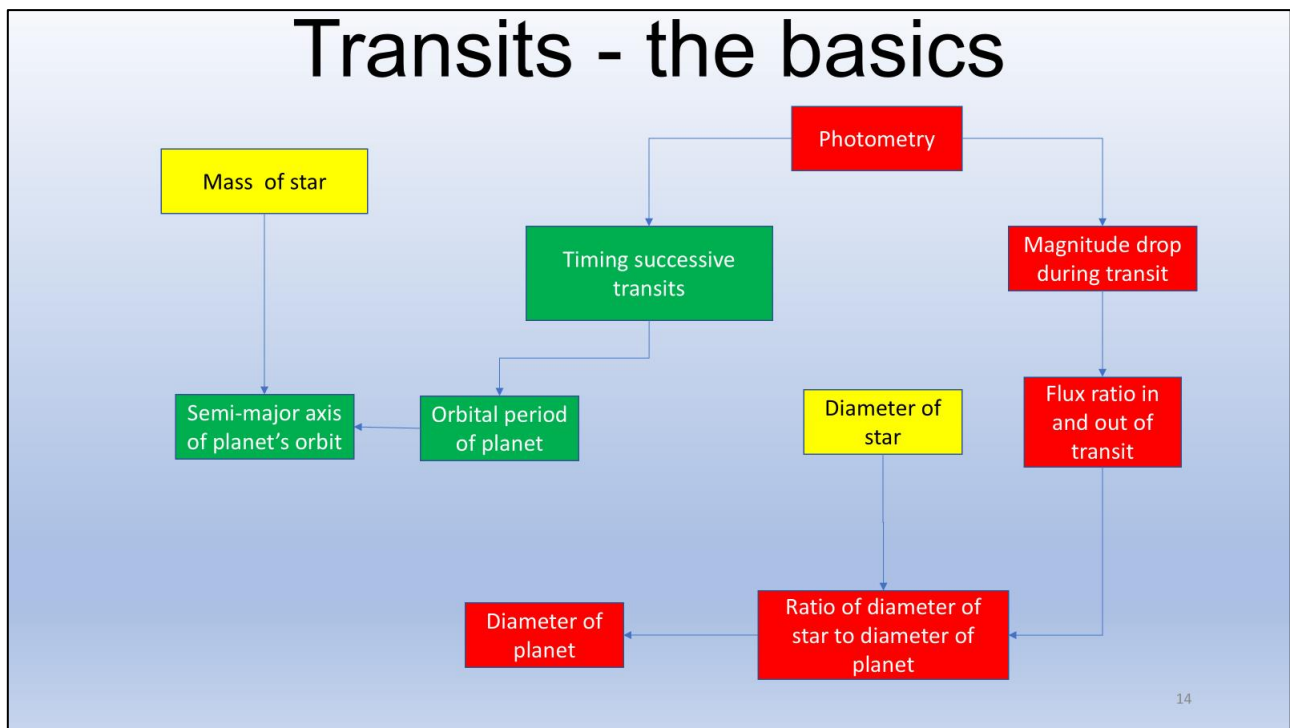


Chart 1. Determining exoplanet characteristics from transit observations

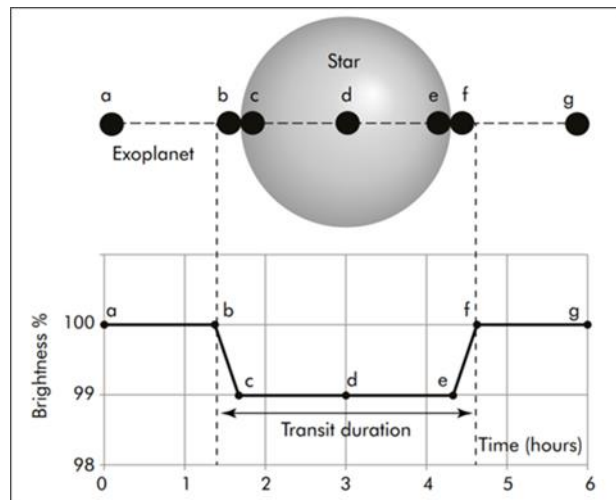


Figure 1. Key transit measurements

The BAA's Exoplanet Division has been providing observations to the [ExoClock project](#) since its inception and is an excellent starting point for those wishing to participate in exoplanet transit observations and thus this project.

The [ExoClock project database](#) indicates which exoplanets exhibit Transit Timing Variations e.g. WASP-148b – Figure 2.

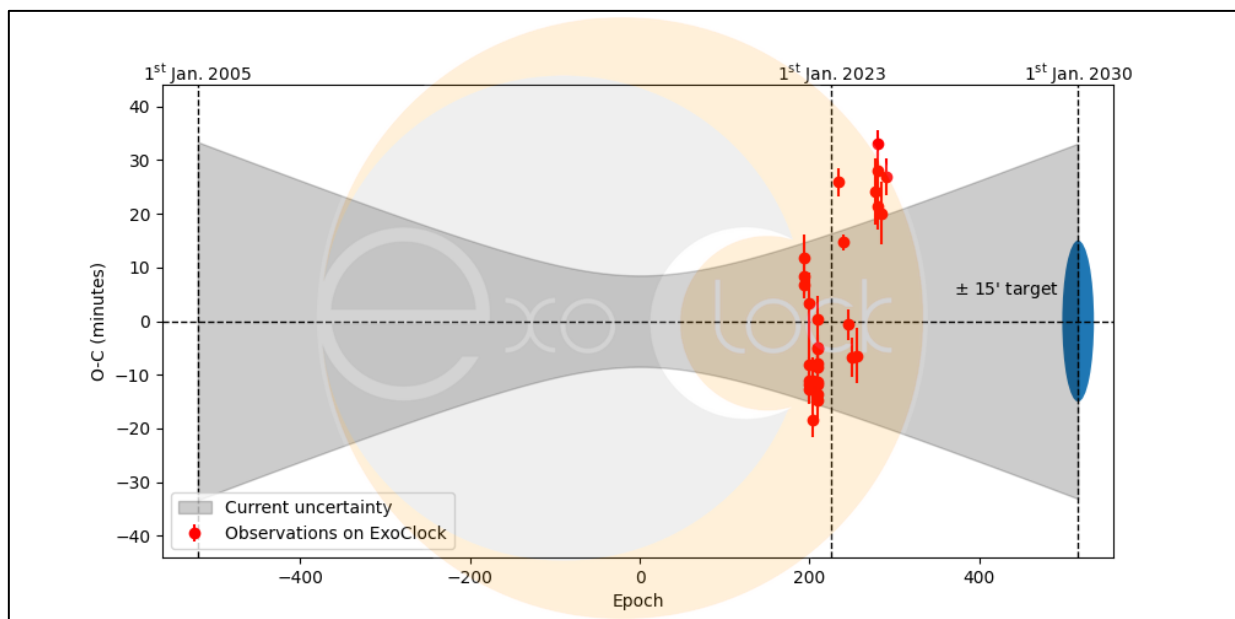


Figure 2. Transit timings for WASP-148b

Credit ExoClock

Radial velocity

Planets and their host star orbit a common centre of gravity – the Barycentre – as shown in Figure 3. The masses of the star and planets plus their distances from their

host star will determine the 'wobble' induced onto the position of the host star -
Figure 4.

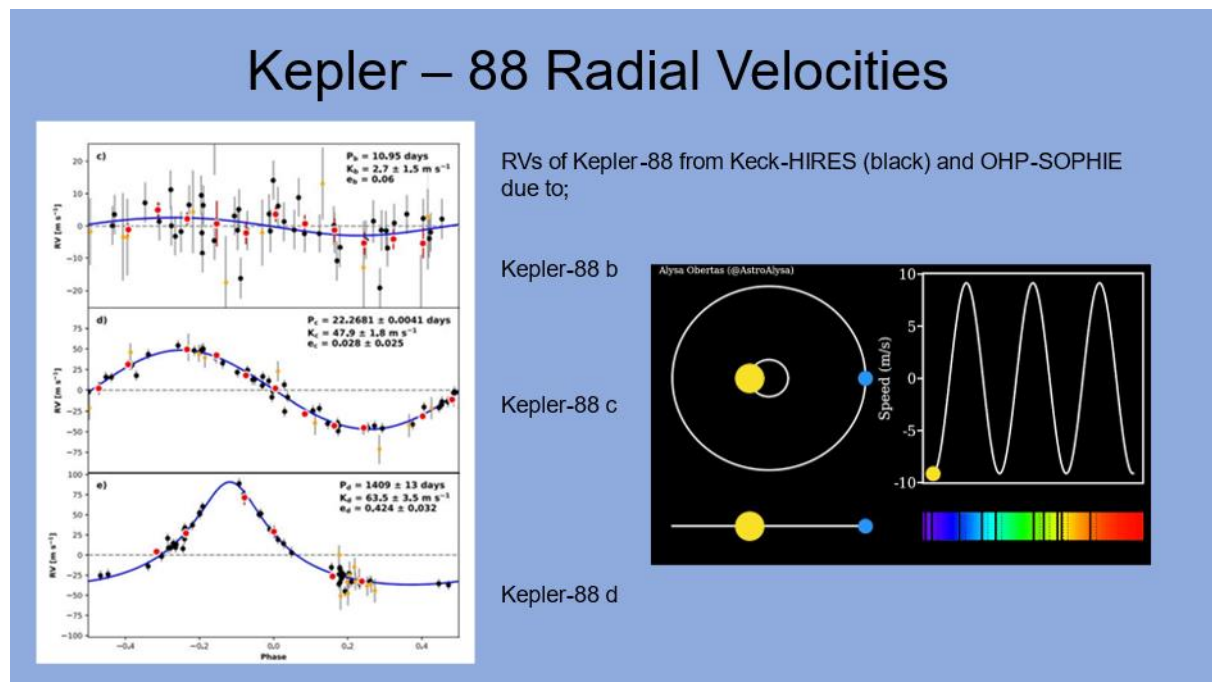


Figure 3. Radial velocities in the Kepler-88 system

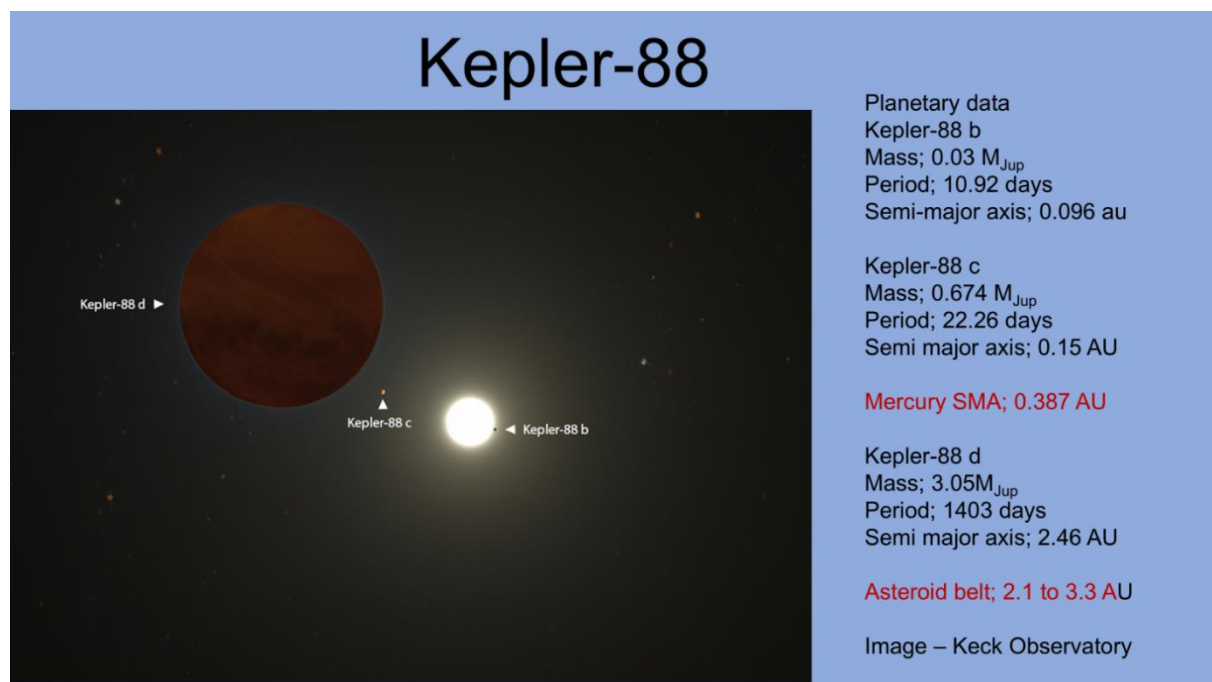


Figure 4. Kepler-88 system data