EXPLORE Targets

Updated 2025 June 16

The targets in this section considered suitable for observation by amateur astronomers include;

- ExoClock database entries identified as having TTVs
- entries in the NASA Exoplanet Archive whose 'Data show Transit Timing Variations' which also appear on the ExoClock database but not listed as exhibiting TTVs
- searches of the NASA Exoplanet Archive require a space after the planet number e.g. WASP-148 b whereas the ExoClock database does not e.g. WASP-148b.
- those listed in the paper 'Exoplanet Ephemerides Change Observations (ExoEcho). I. Transit Timing Analysis of 37 Exoplanets Using HST/WFC3 Data'
- additional targets e.g. Warm Jupiters, Neptunes, Super Earths for which Radial Velocity and TTV data can be combined

Planet	ExoClock status	RA Dec	V mag	Depth (mmag)	Period (days)	Minimum telescope aperture required (inches)
HAT-P-7b (HAT-P-7 Ab TOI-1265.01 TIC 414865156 Kep ID 10666592 KOI Name K00002.01 Kepler-2b)	TTVs	19:28:59.35 +47:58:10.2	10.48	7.41	2.2047	5.00
HAT-P-13b (TOI-5374.01 TIC 20096620)	Low	08:39:31.81 +47:21:07.3	10.42	8.25	2.9162	5.73
HAT-P-18b (TOI-2127.01 TIC 21744120)	Low	17:05:23.15 +33:00:44.9	12.76	24.28	5.5080	6.95
K2-19b (TOI-5145.01 TIC 281885301 EPIC 201505350)	TTVs	11:39:50.48 +00:36:12.9	13.00	7.63	7.9210	12.53

Qatar-1b (TOI-1465.01 TIC 236887394)	Low	20:13:31.62 +65:09:43.5	12.84	25.4	1.4200	7.02
TOI-216.01 (TIC 55652896)	TTVs	05:49:36.41 -54:54:38.6	9.72	20.94	34.5073	5.55
TOI-1130c (TOI-1130.01 (TIC 254113311)	Alert	19:05:30.22 -41:26:15.1	11.59	16.44	8.3498	5.0
TrES-3b (TOI-2126.01 TIC 116264089)	Low	17:52:07.02 +37:32:46.2	12.40	28.34	1.3061	5.82
WASP-4b (TOI-232.01 TIC 402026209)	Low	23:34:15.09 -42:03:41.0	12.48	31.37	1.3382	5.54
WASP-12b (TOI-1725.01 TIC 86396382)	TTVs	06:30:32.80 +29:40:20.3	11.57	17.81	1.0914	5.00
WASP-19b (TOI-655.01 TIC 35516889)	TTVs	09:53:40.08 -45:39:33.1	12.31	22.96	0.7888	5.92
WASP-43b (TOI-656.01 TIC 36734222)	Low	10:19:38.01 -09:48:22.6	12.4	29.73	0.8135	5.85
WASP-148b (TOI-2064.01 TIC 115524421)	TTVs	16:56:31.34 +44:18:09.5	12.04	8.79	8.8038	7.95

Alternative names are shown in brackets;

- TOI; TESS Object of Interest

- TIC; TESS Input Catalogue ID

Searches of the NASA Exoplanet Archive require a space after the planet number e.g. WASP-148 b whereas the ExoClock database does not e.g. WASP-148b.

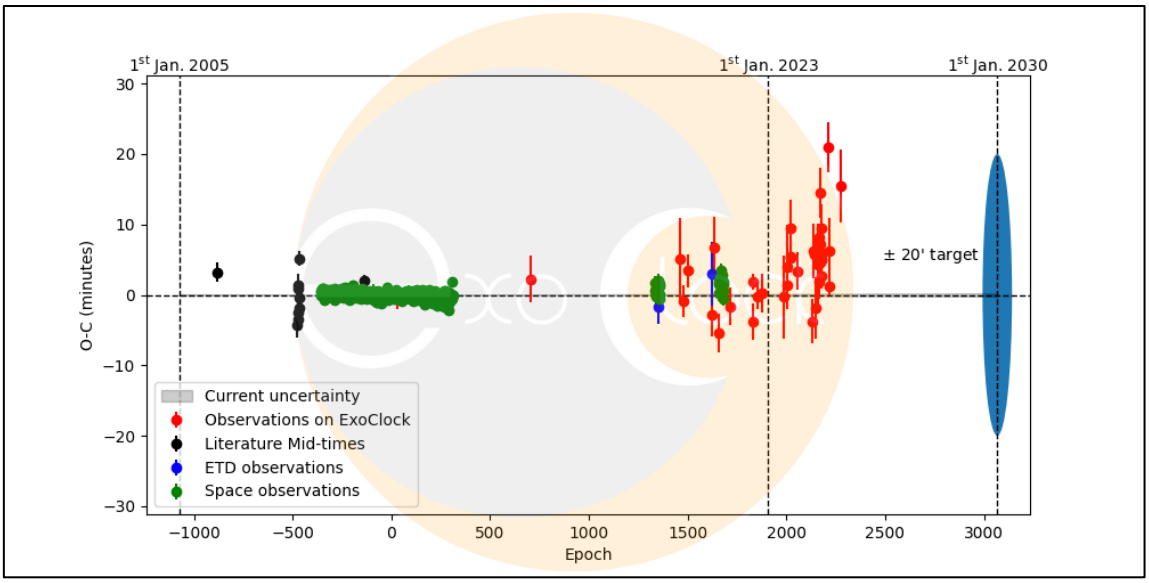
Transit predictions for an observers location can be obtained from;

The ExoWorlds Spies Transit Scheduler

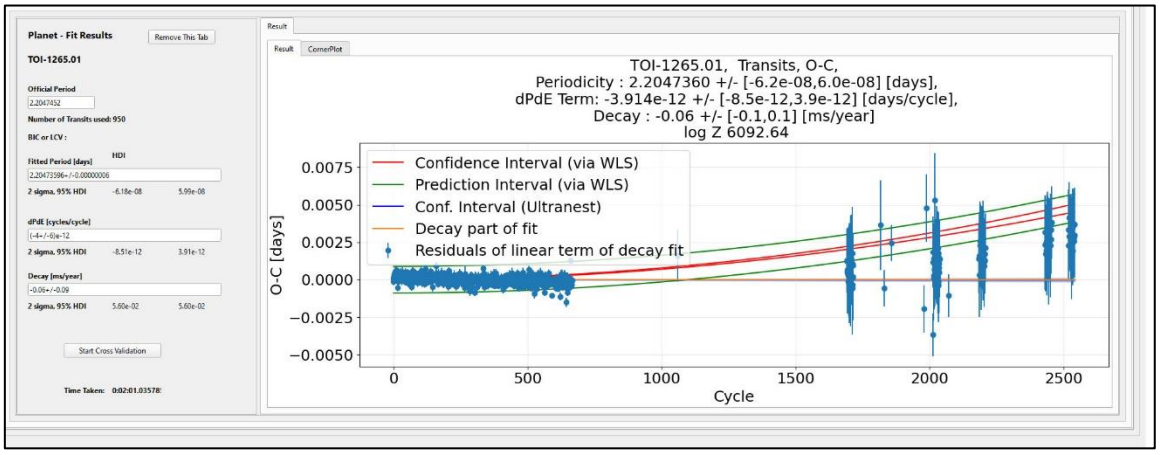
or

Find Exoplanet Transits

HAT-P-7b



ExoClock database

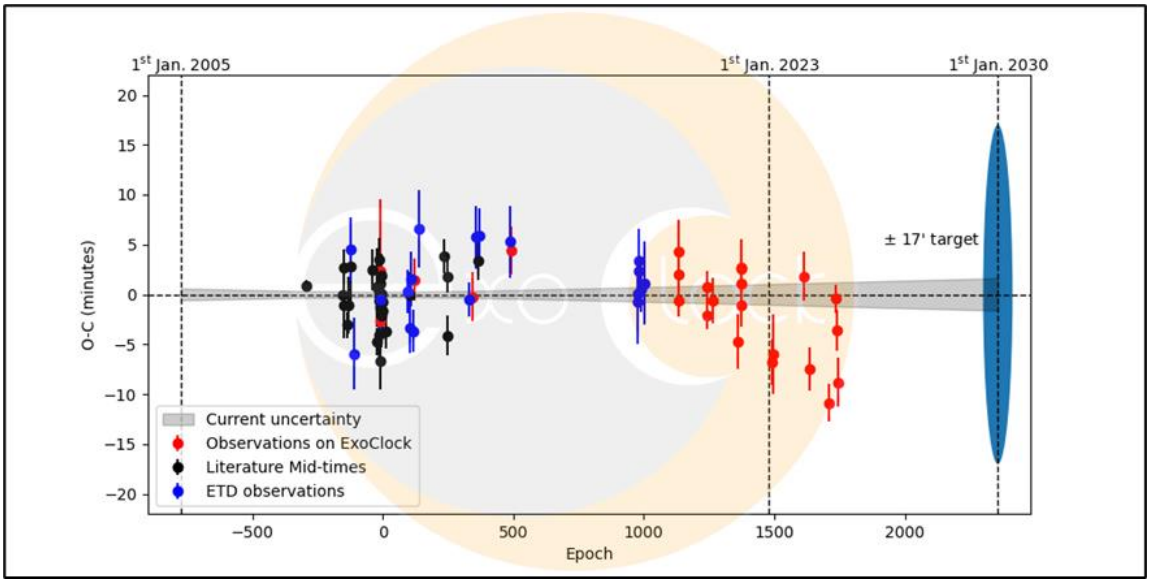


Exoplanetpie

Exoplanetpie analysis indicates an increasing orbital period or an evolving eccentric orbit. The latter is explored in a paper which describes the influence of a third star in the system.

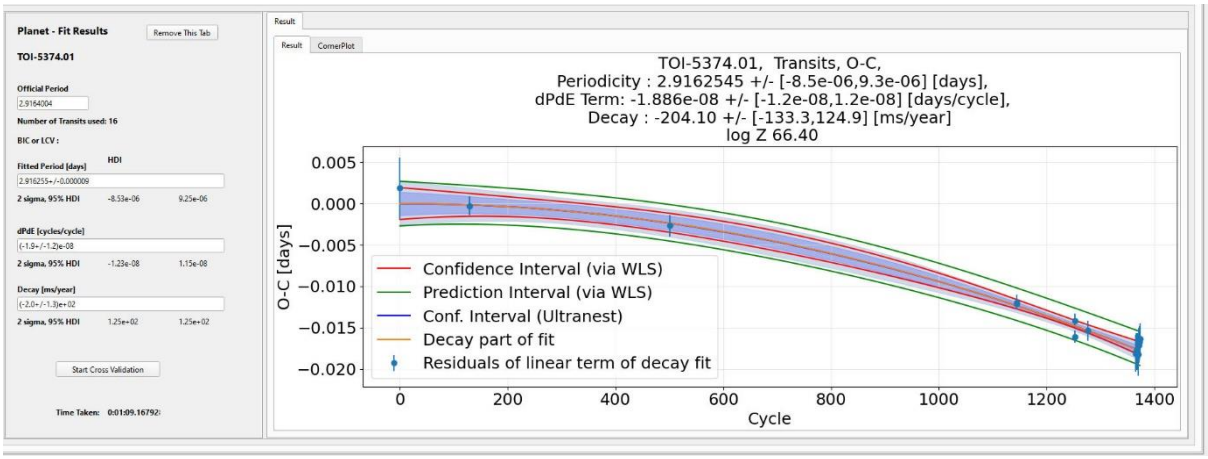
HAT-P-13b

HAT-P-13c is a massive outer planet on a highly eccentric orbit, period 428.5 +/-3 days. Orbital period of HAT-P-13b is 2.916 days. The high mass and eccentricity of the outer planet should induce TTVs of the inner planet - paper [HAT-P-13b,c: A TRANSITING HOT JUPITER WITH A MASSIVE OUTER COMPANION ON AN ECCENTRIC ORBIT∗]



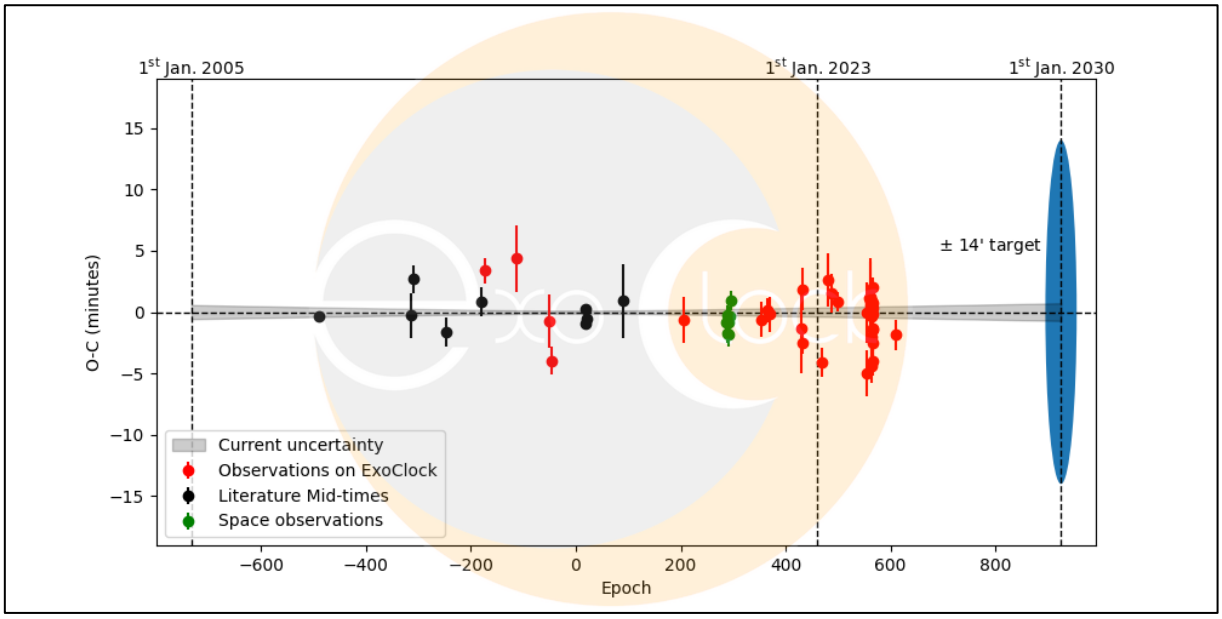
ExoClock database

Observations suggest an increasing and then decreasing orbital period. Possibly due to the presence of an additional exoplanet or a precessing eccentric orbit.

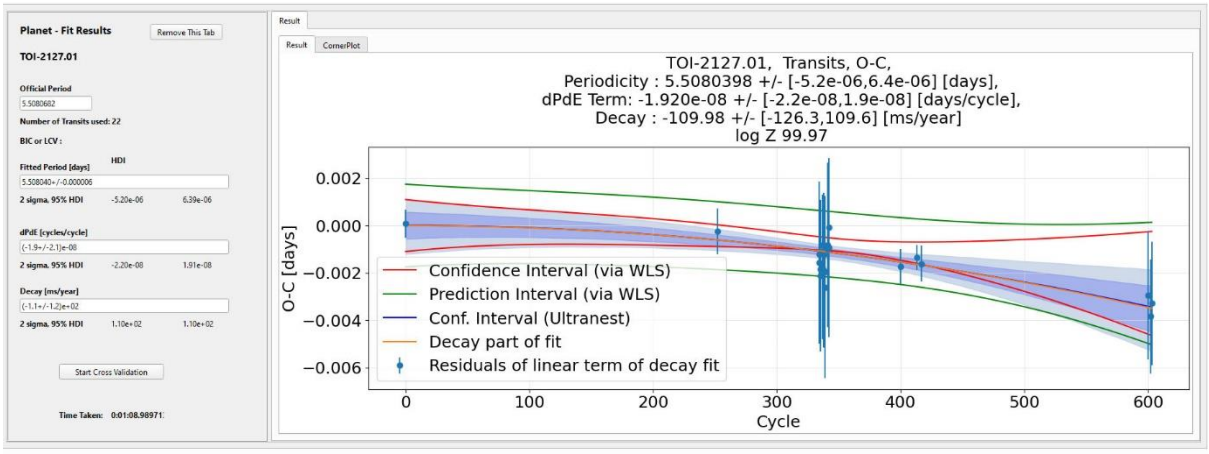


Exoplanetpie analysis indicates a decaying orbit.

HAT-P-18b

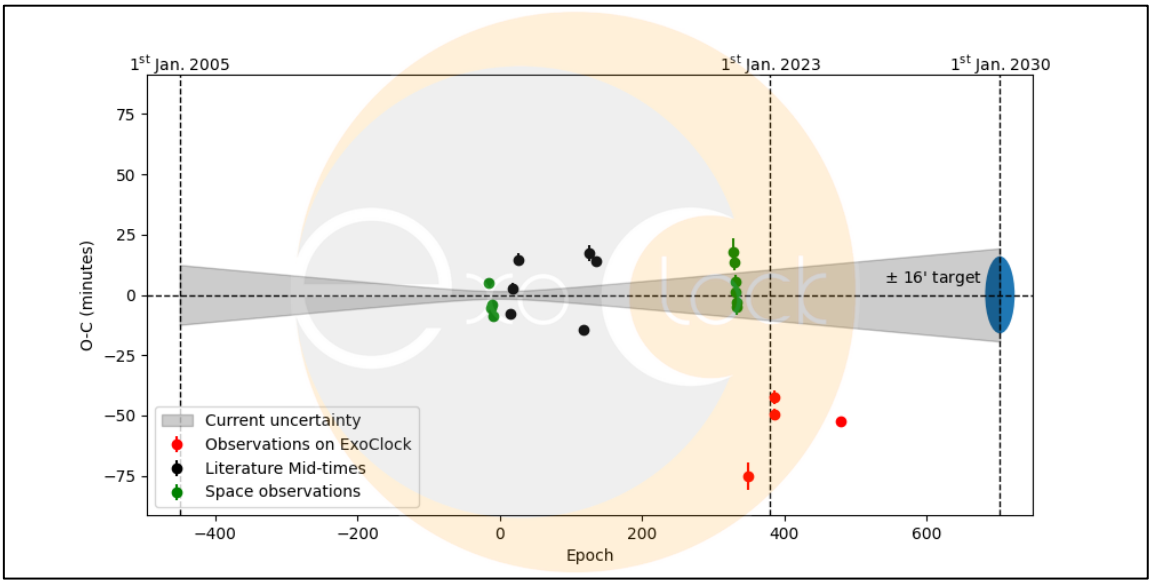


ExoClock database



Exoplanetpie analysis suggests a decaying orbit

K2-19b



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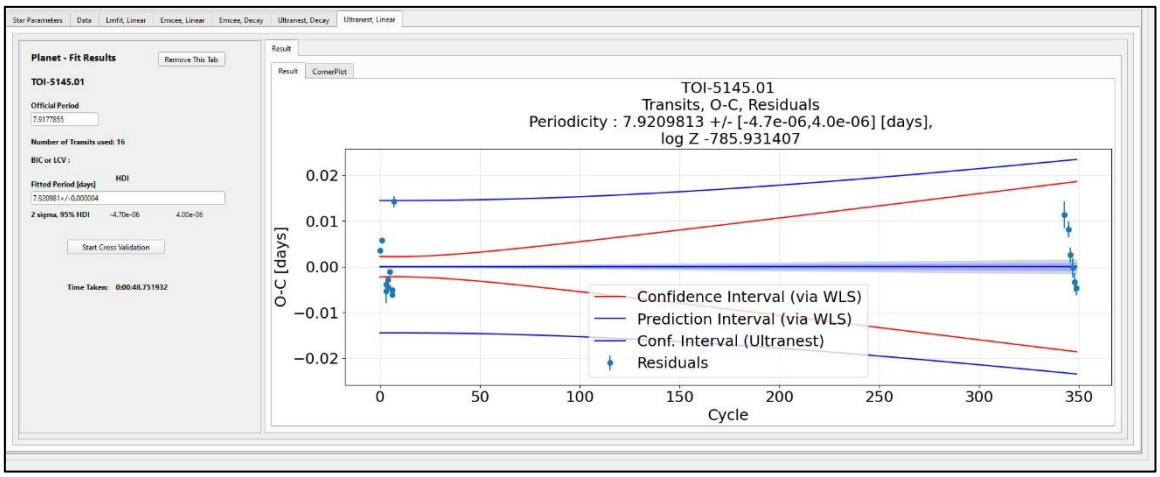


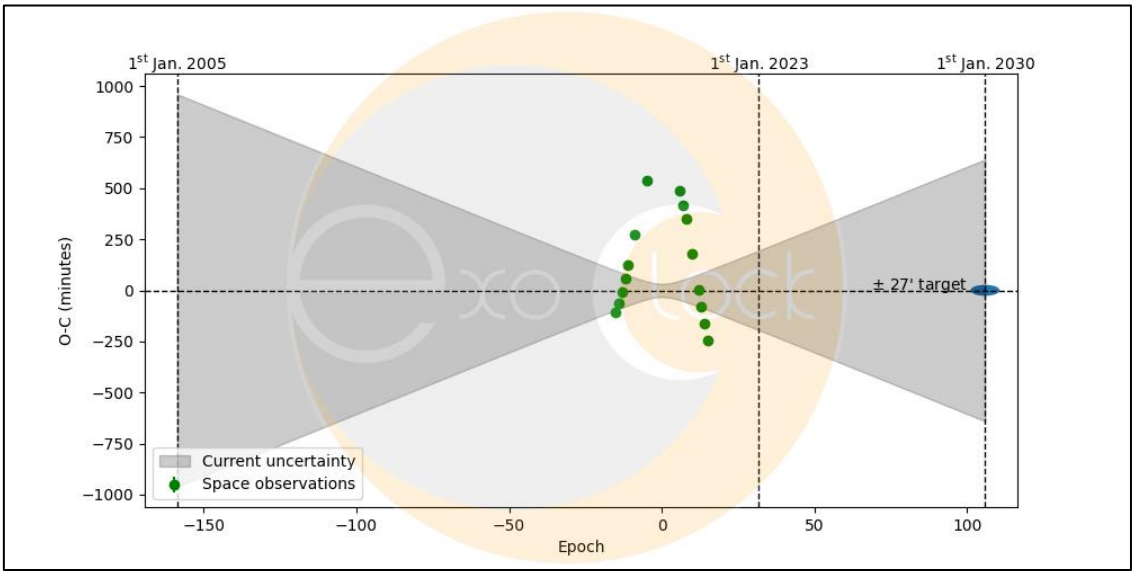
Exoplanetpie

Too little data available to achieve a useful result but suggest we keep this planet under observation – see note below.

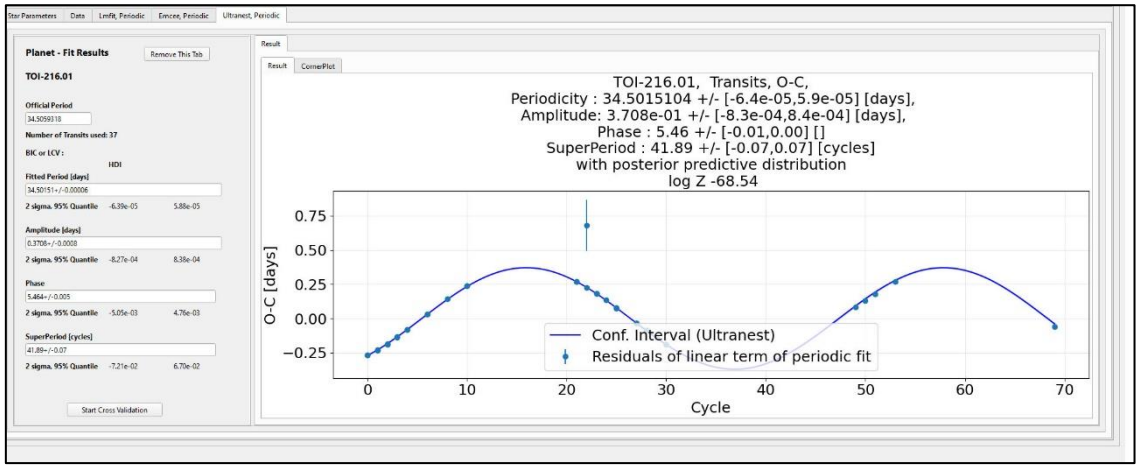
Note. K2-19b and c, are a two-planet system of Neptune-sized objects (4.2 and 7.2 R⊕), orbiting a K dwarf extremely close to the 3:2 mean motion resonance. The two

planets each show transits, sometimes simultaneously owing to their proximity to resonance and the alignment of conjunctions.

TOI-216.01



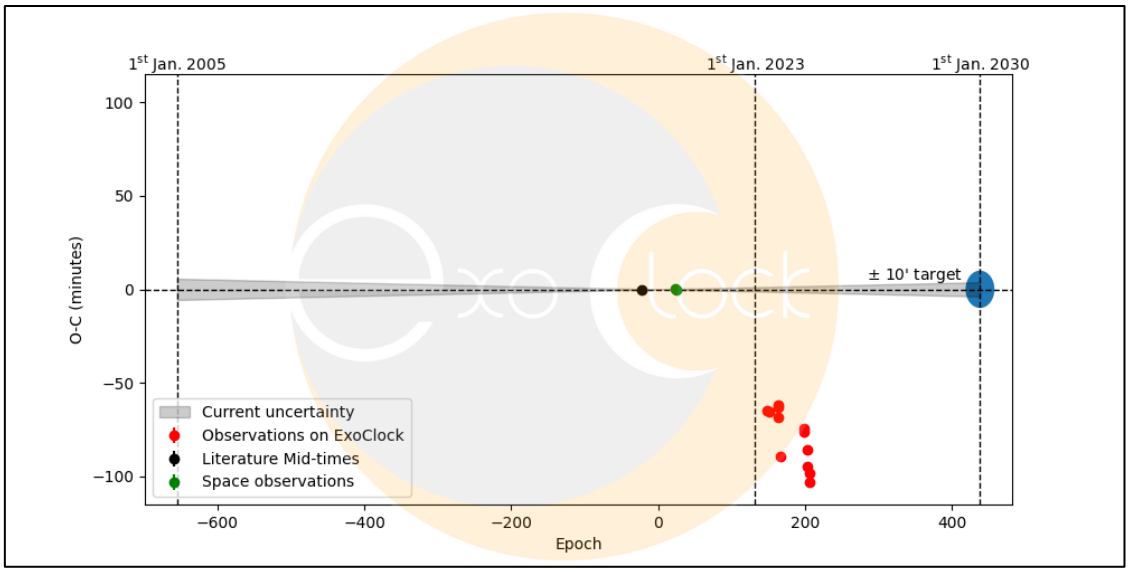
ExoClock database



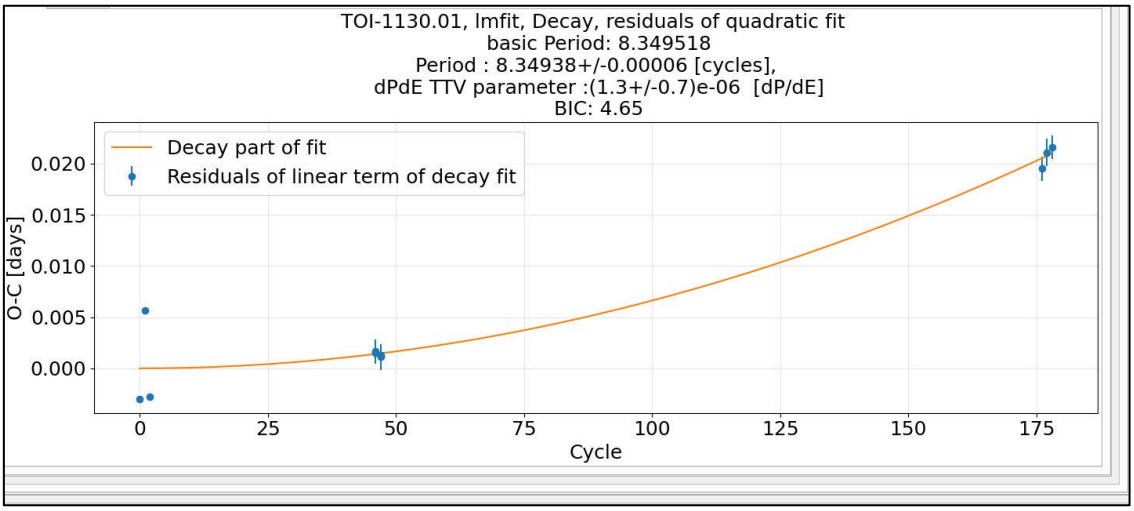
Exoplanetpie

Exoplanetpie analysis indicates the cyclical nature of the transits as does the ExoClock plot. This exoplanet is in a 2:1 resonant orbit with TOI-216.02 - 34.57 and 17.01 days respectively.

TOI-1130c

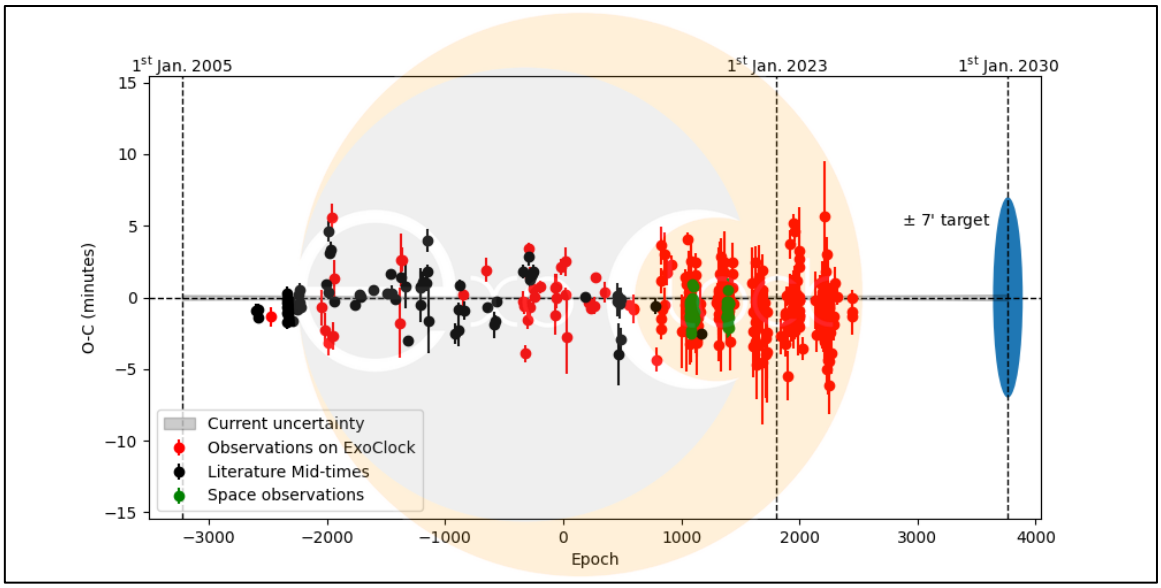


ExoClock database

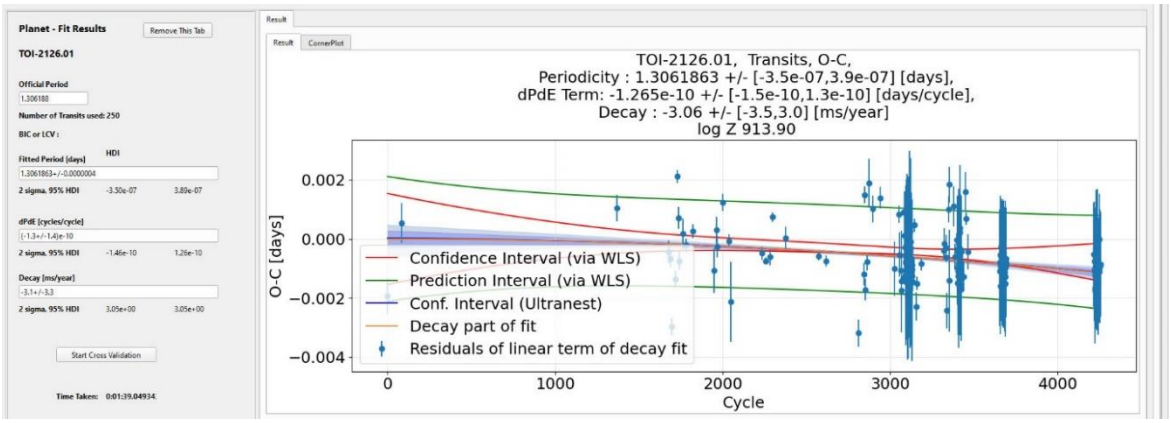


Exoplanetpie analysis -very little data but some indication of an increasing orbital period

TrES-3b

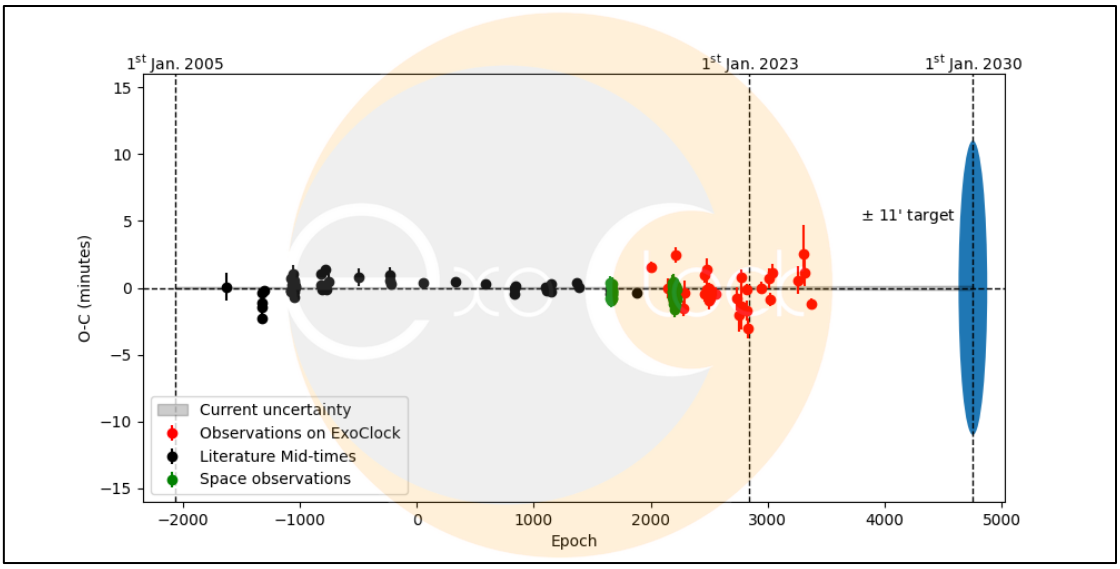


ExoClock database



Exoplanetpie analysis suggests a decaying orbit

WASP-4b



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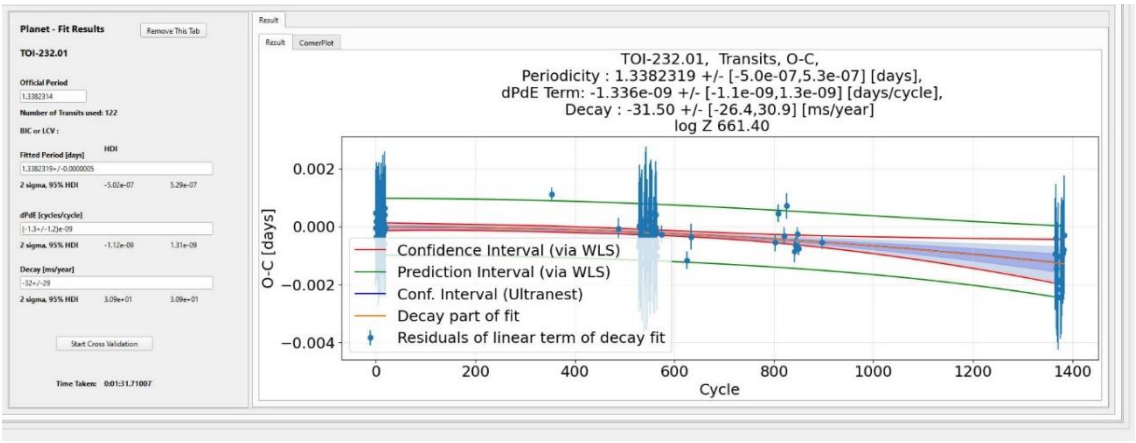
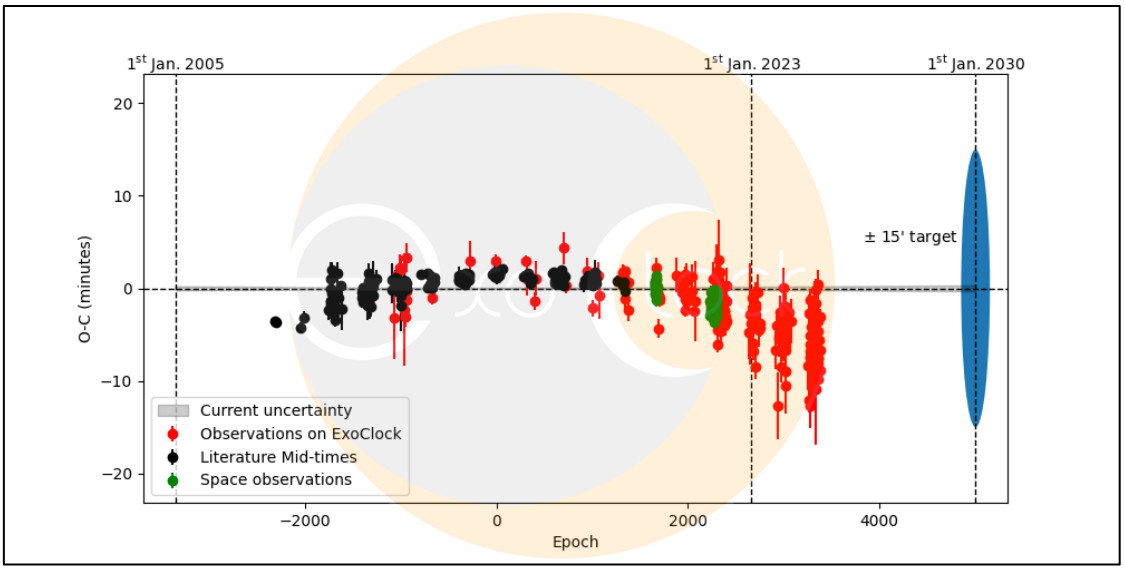
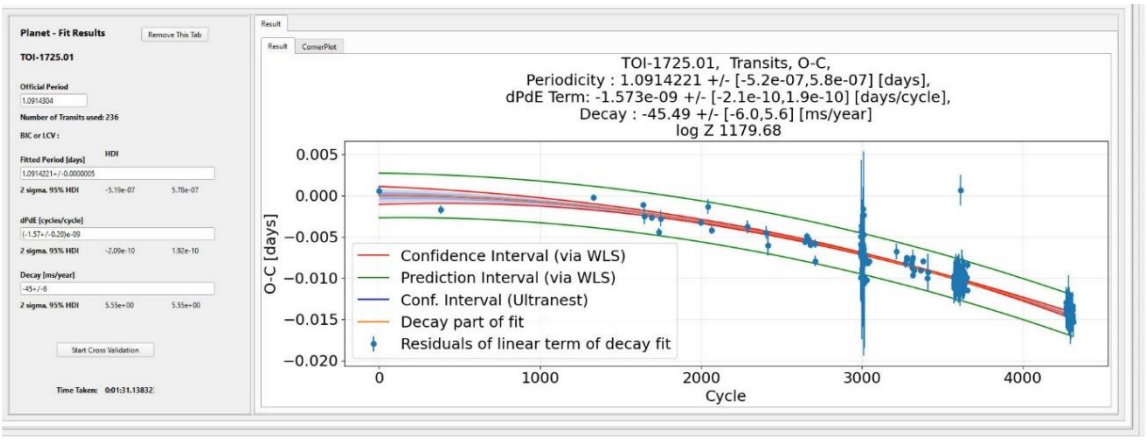


Exoplanetpie analysis suggests a decaying orbit which is confirmed in the paper mentioned above but the decay in that paper given as -6.46 ms/year – much less than shown above.

WASP-12b



ExoClock database



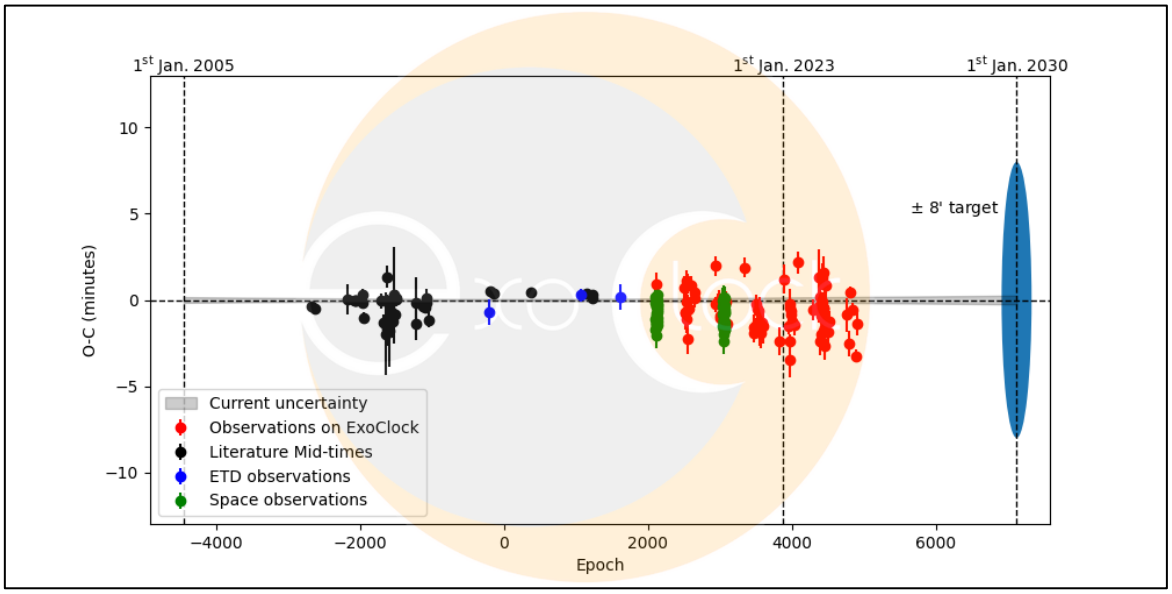
Exoplanetpie analysis indicates a decaying orbit but earlier ExoClock data might indicate a precessing eccentric orbit

Study reveals mystery of decaying planetary orbits

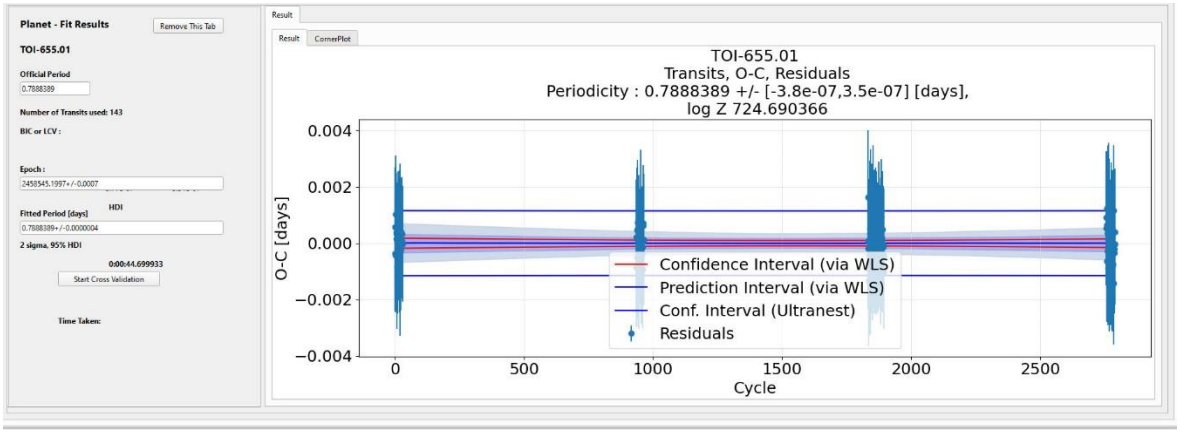
The study, published Mon April 29 2025 in The Astrophysical Journal Letters, proposes that stellar magnetic fields play a crucial role in dissipating the gravitational tides responsible for the orbital decay of ‘hot Jupiter’ exoplanets.

Quote from the above link – ‘At the moment, the only planet we know for certain to be spiralling into its star - and in the far future, possibly being destroyed - is WASP-12b’.

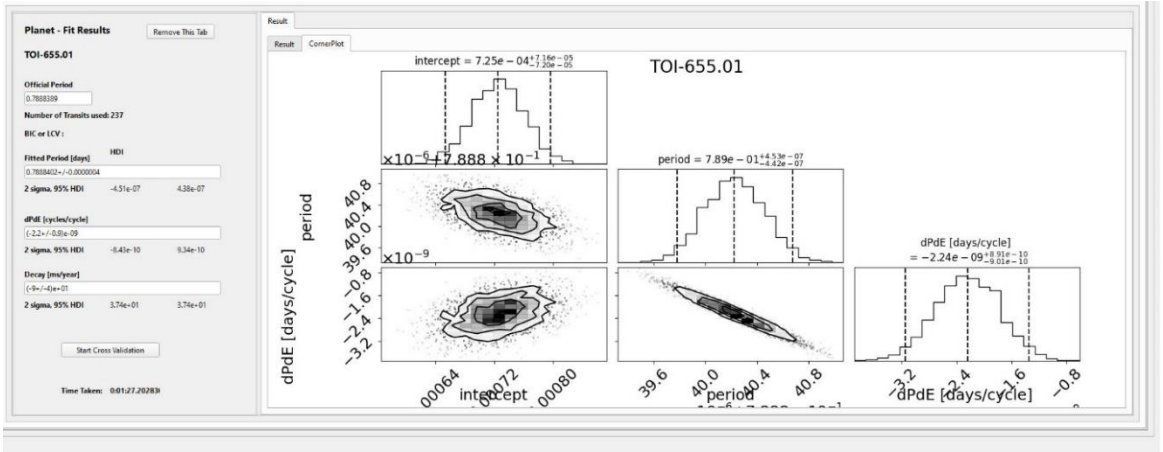
WASP-19b



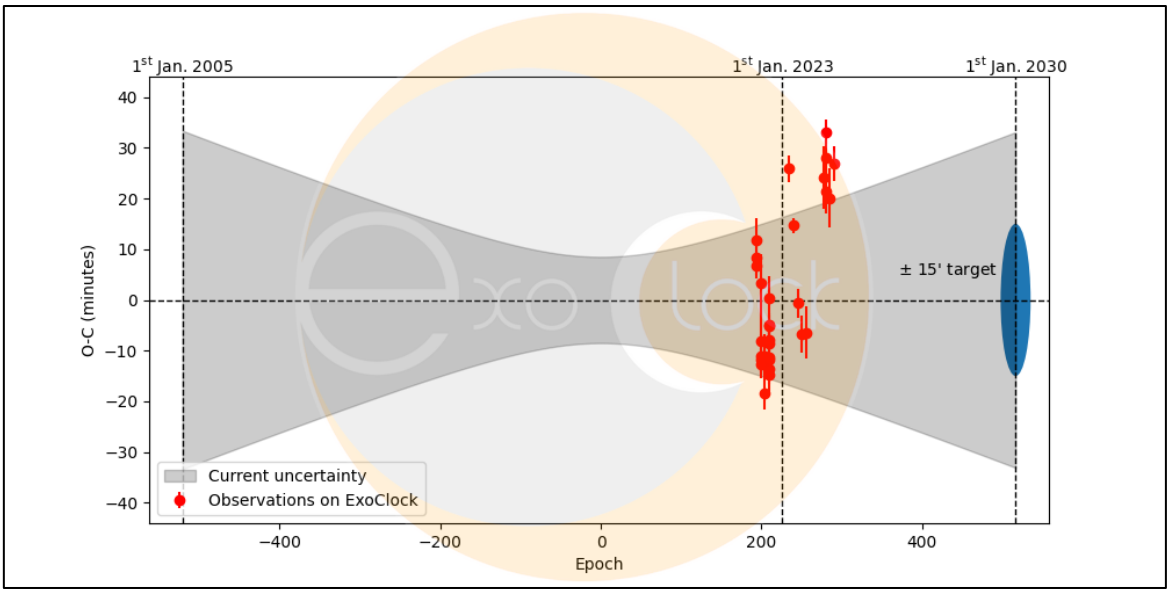
ExoClock database



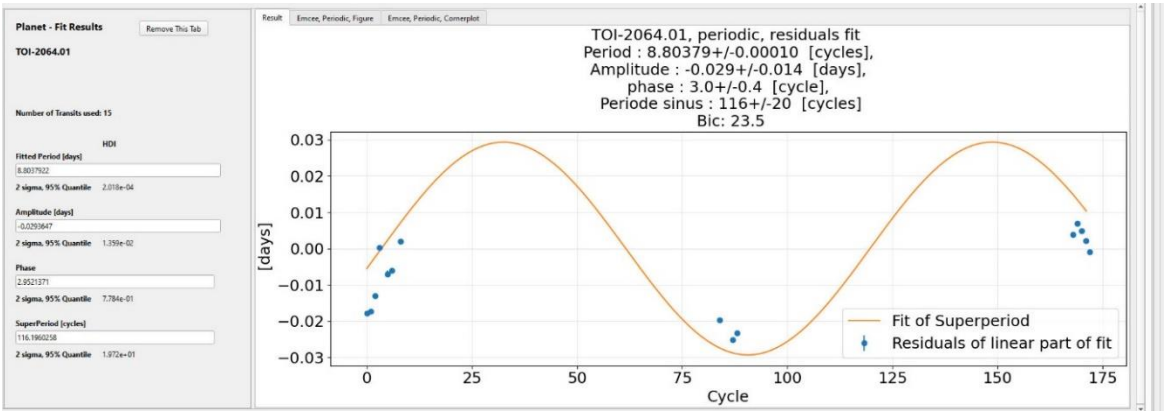
Exoplanetpie analysis indicates a stable orbit



WASP-148b



ExoClock database



Exoplanetpie analysis – indication of a periodic variation but more results needed

Roger Dymock

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