Analyzing TOI-560c and seeking its possible impact on humanity.

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Resume

This activity consists of getting information on an exoplanet (TOI-560c) using only the light curve that it generated during transit, its mass, the radius of the star that it orbits, and the mass of the star that it orbits. The data in the light curve was obtained by the TESS probe in 2021 and a lot of the data from the planet was obtained using a program (Jupyter Notebook). The features used to analyze the exoplanet and compare it to the planets in our solar system are radius, mass, mean orbital distance, orbital period, density, and temperature.

Results

Data used for realizing Transit light Curve of TOI-560c.

- Radius of the planet: $3.17 R_{Earth}$
- Radius of the star: $0.65 \pm 0.02\ R_{Sun}$
- Mid-transit time: $0.44\ days$

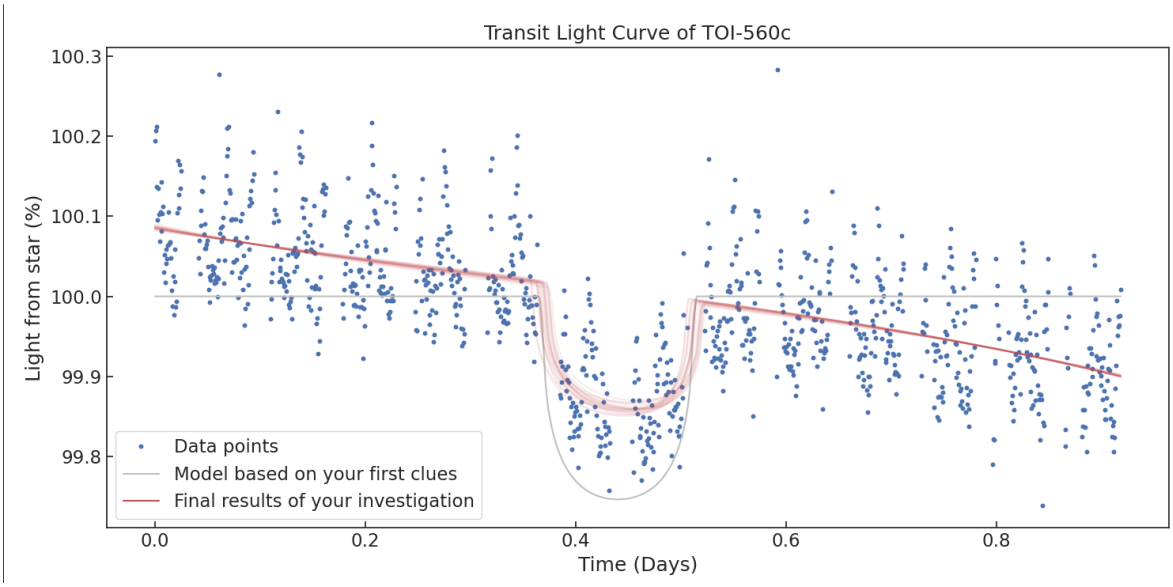


Image 1. Transit Light Curve of TOI-560c

Given data by Jupyter Notebook:

Name	Median value	Lower error	Upper error	Case note	Target
Radius of the planet (in units of Earth radii)	2.39	0.071	0.068	Cheops observations	TOI-560c
Radius of the star (in units of Solar radii)	0.651	0.018	0.018	Cheops observations	TOI-560c
Mid-transit time (in units of days)	0.4411	0.0052	0.0051	Cheops observations	TOI-560c
Orbital period (in units of days)	18.8797			Other observations from the archive	TOI-560c
Orbital semi-major axis (in units of AU)	0.1242			Other observations from the archive	TOI-560c

Image 2. Given data by Jupyter Notebook

Given data:

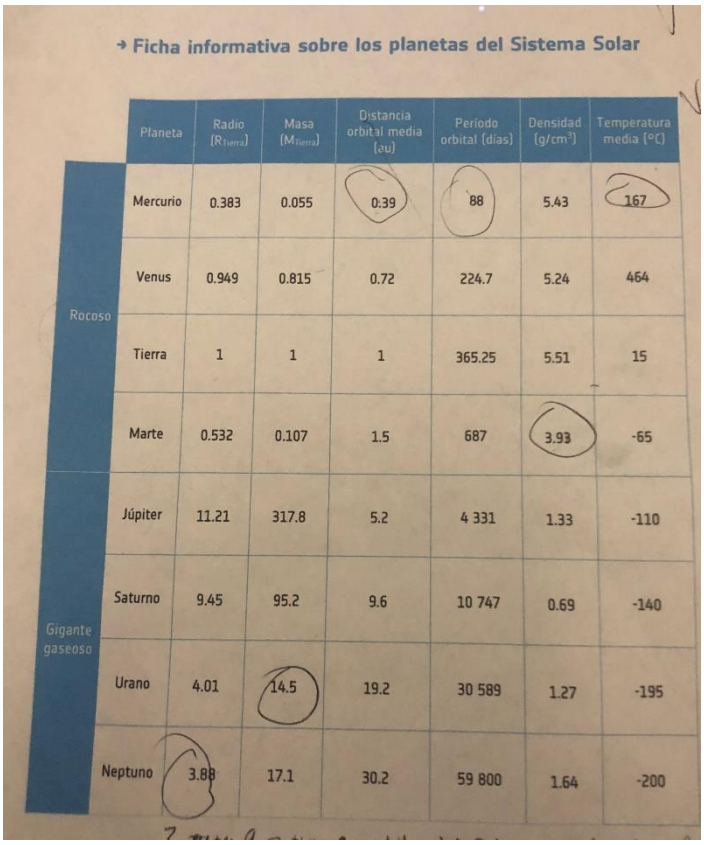
Planet mass: $9.70 \pm 1.75\ M_{Earth}$

Temperature: $225 \pm 15°C$

Calculated data:

Density: $3.904555826 gcm^{-3}$

Mean Orbital Distance: $0.1249409494 AU$



→ Ficha informativa sobre los planetas del Sistema Solar

	Planeta	Radio (R_{Tierra})	Masa (M_{Tierra})	Distancia orbital media (ua)	Período orbital (días)	Densidad (g/cm^3)	Temperatura media (°C)
Rocoso	Mercurio	0.383	0.055	0.39	88	5.43	167
	Venus	0.949	0.815	0.72	224.7	5.24	464
	Tierra	1	1	1	365.25	5.51	15
	Marte	0.532	0.107	1.5	687	3.93	-65
Gigante gaseoso	Júpiter	11.21	317.8	5.2	4 331	1.33	-110
	Saturno	9.45	95.2	9.6	10 747	0.69	-140
	Urano	4.01	14.5	19.2	30 589	1.27	-195
	Neptuno	3.88	17.1	30.2	59 800	1.64	-200

Image 3. Data Chart used to compare the exoplanet with our solar system's planets.

Analysis

The first anomaly perceived is the difference between the Radius of the planet used for realizing de Transit Light Curve of TOI-560c observed in *Image 1* ($3.17 R_{Earth}$). and the same feature calculated by Jupyter Notebook seen in *Image 2* ($2.39 R_{Earth}$). This occurs since the application used creates

an estimated value of the exoplanet's radius by searching for the best model that better adjusts with the data points, creating the Final results of our investigation line seen in *Image 1*.

Moreover, there were found approximate similarities regarding the features belonging to the planets in our solar system seen in *Image 3.* Mercury is the planet that most adjusts to the mean orbital distance, period, and mean temperature of the studied exoplanet. Meanwhile, the exoplanet has a similar density to the planet Mars and a similar mass to Uranus. Finally, Neptune has the closest radius regarding exoplanet.

Considering the density of the exoplanet, it is possible to infer that it will be composed of high-density materials, such as metal or rock. Furthermore, it can be said that the planet does not orbit its star in the habitable zone since while analyzing its temperature it is too high to maintain water in a liquid state, so it is inferred that it is too close to the planet.

Conclusion

After analyzing the results, it is possible to conclude that:

- This exoplanet is not habitable.
- This exoplanet is more likely to be a rocky planet than a gaseous one.
- When comparing TOI-560c with Milky Way's planets, it is possible to conclude that it shares more similarities with Rocky planets such as Mercury, Venus, Earth, and Mars, than Gaseous planets such as Jupiter, Saturn, Uranus, and Neptune.