

By using the transit method, Cheops satellite new campaign has enabled us to discover and characterise new exoplanets. In this article, we use the Cheops data to calculate the orbital distance and the density of the planet TOI-560c. An attempt to classify this planet is also done.

On January 23rd 2023 at 13:12 CET, the CHEOPS satellite observed the planet TOI-560c using the photometric transit method. The photometric method measures the variation of the brightness of a star when a planet passes between the satellite and the star. Thanks to this method, the radius of the planet can be calculated. The analysis of this data coupled with additional information can help us characterise this planet. The figure below shows the data analysis and the best model fit obtained for the planet TOI-560c.

insert graphic with the exoplanet transit light curve and best model fit.

To calculate the distance between the star and the planet, we use Kepler's third law: ##### insert formula 1 #####

where d , T , M_s and G are respectively the mean orbital distance, the period of the orbit, the mass of the star and the gravitational constant.

If we relate these quantities to the ones in our solar system, we get: ##### insert formula 2 ##### where $M_s = m M_{\text{Sun}}$ and $T = t T_{\text{Earth}}$.

So the exoplanet is three times closer to its star than Mercury is to the Sun.

The density of the planet can be calculated by $\rho = M/V$. Due to the large uncertainty on the planet mass, its density cannot be precisely obtained. It lies between 3,2 g/cm³ et 4,6 g/cm³ which is comparable to Mars density.

With a surface temperature of 225°C, this planet is not in the habitability zone of its star.

The planet classification is particularly difficult. On one hand it can be classified as a super-earth as its density is close to Mars, a rocky planet. On the other hand, it could be a Neptune-like planet due to its broad radius.

In conclusion, this new data analysis is not enough to definitely classify the TOI-560c planet. Using the James Webb telescope, an atmospheric spectroscopy study of this planet would give important new data that could solve this classification problem.

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