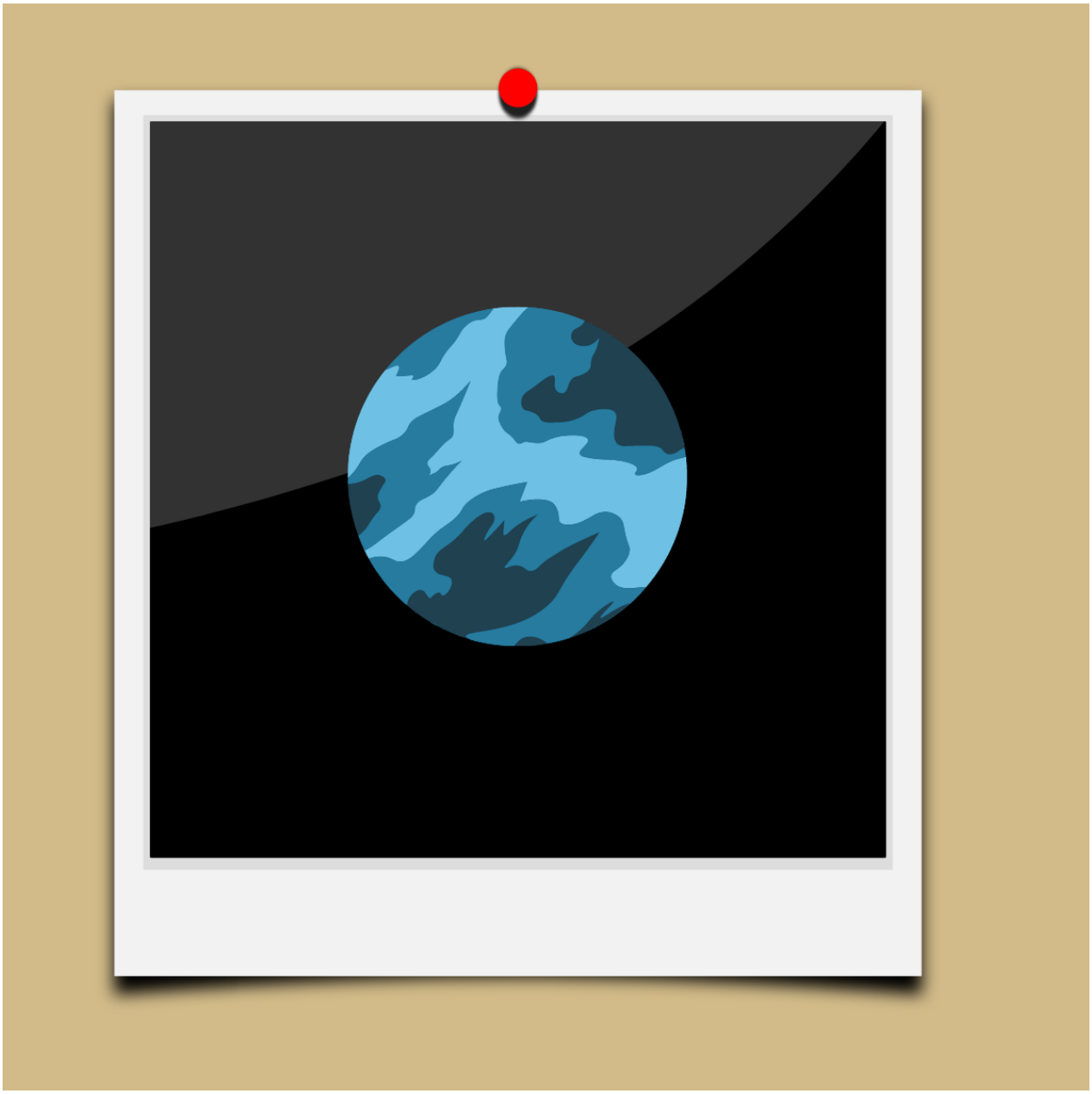
IES FERNANDO III

TOI 560-C analysis



Summary

This work has sought to know in depth the most characteristic properties of this exoplanet, of course with the invaluable help of the Cheops satellite and the software used to know the data, "Allifists". In addition, we have also used the Kepler and Newton equations along with the video tutorials provided by ESA. From its own radius, which is 2.6977 R_T, up to the distance from himself to his star, this being 0.1244 AU. Also applying logic from the data given by the organization we were able to assume that life on this planet was impossible due to its high temperatures reaching up to 225º C. TOI 560-C has a density of 2.72 kg/m^3, which makes it have a lower density than Earth.

Analysis of the obtained results

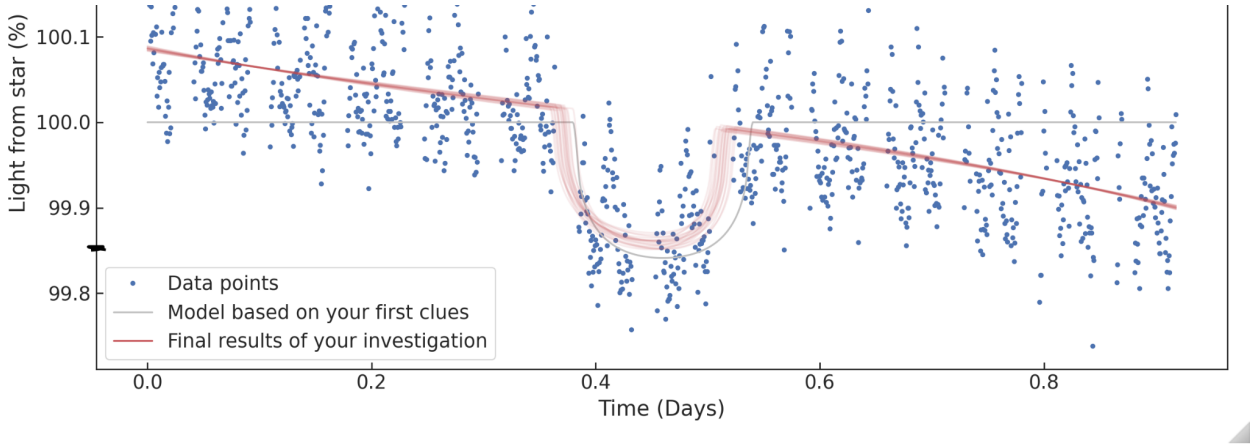
The first of the calculations led us to know the radius of our planet, thanks to the transit depth equation.

$$Profundidad\ de\ tránsito\ (\%) = \frac{\pi \cdot Rp^2}{\pi \cdot Rs^2} \cdot 100$$

Which was essential to obtain data that would be substituted in the following equation:

$$Rp = \sqrt{\frac{Depth\ transit \cdot 0{,}65^2 \cdot Rs}{100}}$$

And thus know the radius of our exoplanet.It gave us a value of 2.6977 R_T , that is, the radius of the exoplanet is 2.7 times the terrestrial radius. For this we had to rely on this graph:



In our second objective we had to calculate the distance at which this planet is from its reference star. We realized that it was much closer than our planet to the sun, exactly at0.1244 AU, that is, it is ten times closer to its star than Earth is to the Sun. Then, we could understand that it is at a higher temperature than Earth.All this thanks to Kepler's formula that, once we clear the distance, says the following:

$$d = \sqrt[3]{\frac{T^2 \cdot G \cdot Ms}{4\pi^2}}$$

Which brings us to our third objective, in which, by relating the temperature of the exoplanet, which is 225ºCwith the possibility of lifeTaking into account that at these temperatures the presence of water in a liquid state is null, then life for living beings with a complex molecular structure is impossible. However, some bacteria could live in such conditions, but they would have to be studied in more detail.

In our last calculation we have managed to know the density of TOI 560-CFor this we had to, first find the volume that this planet occupies by means of the following equation:

$$v = \frac{4}{3}\pi\, r^3$$

And later we have substituted it in this equation:

$$d = \frac{m}{v}$$

It gives us a result of about 2.72 kg/m^3. After analyzing the table of the densities of the other planets in the solar system, we can come to the conclusion that this planet is gaseous, just like Neptune for example.

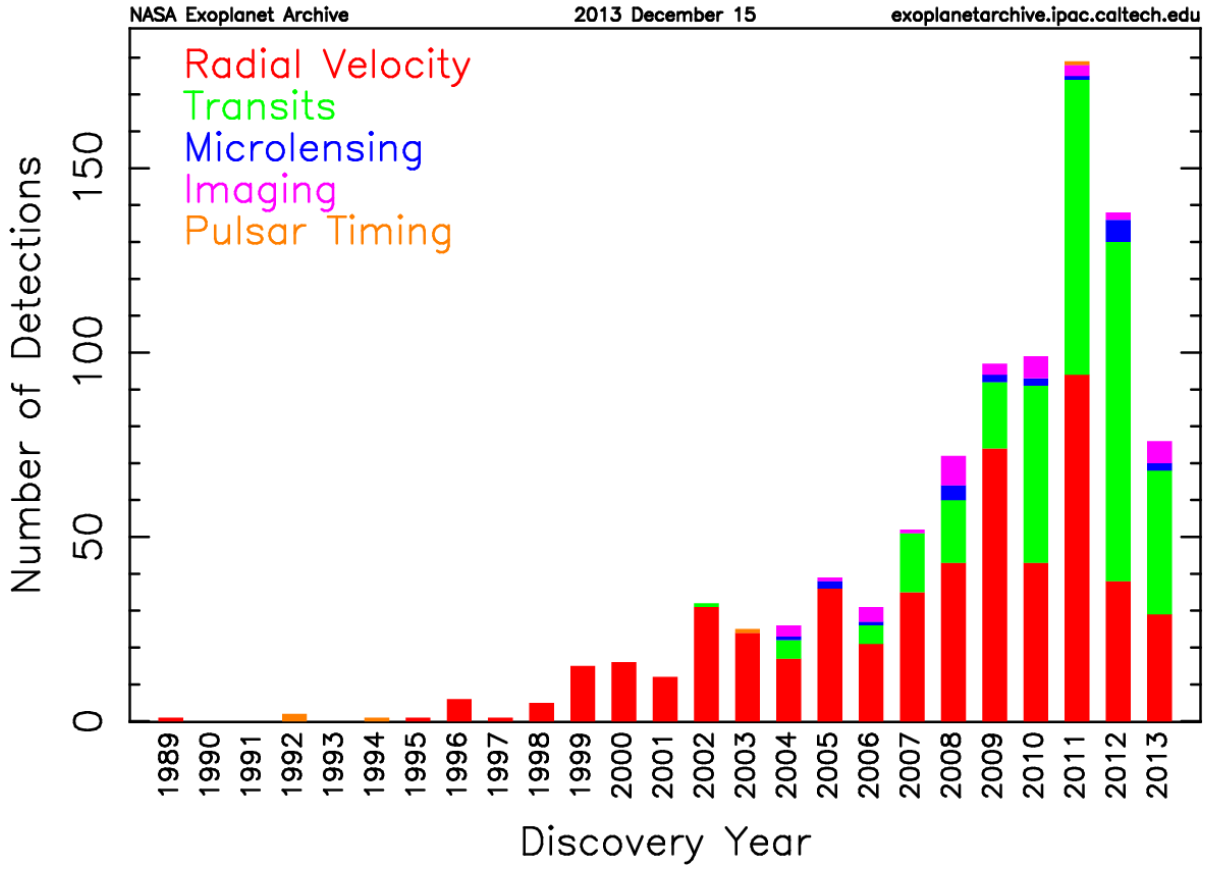
Also thanks to the table given by the program we have been able to obtain a lot of data such as:

- The orbital period of the planet: being 18.87 days to go around its star. This very short orbital period is due to the closeness between the star and the planet.

Name	Median value	Lower error	Upper error	Case note	Target
Radius of the planet (in units of Earth radii)	2.379	0.067	0.071	Cheops observations	TOI-560c
Radius of the star (in units of Solar radii)	0.651	0.017	0.018	Cheops observations	TOI-560c
Mid-transit time (in units of days)	0.442	0.0056	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

Conclusions

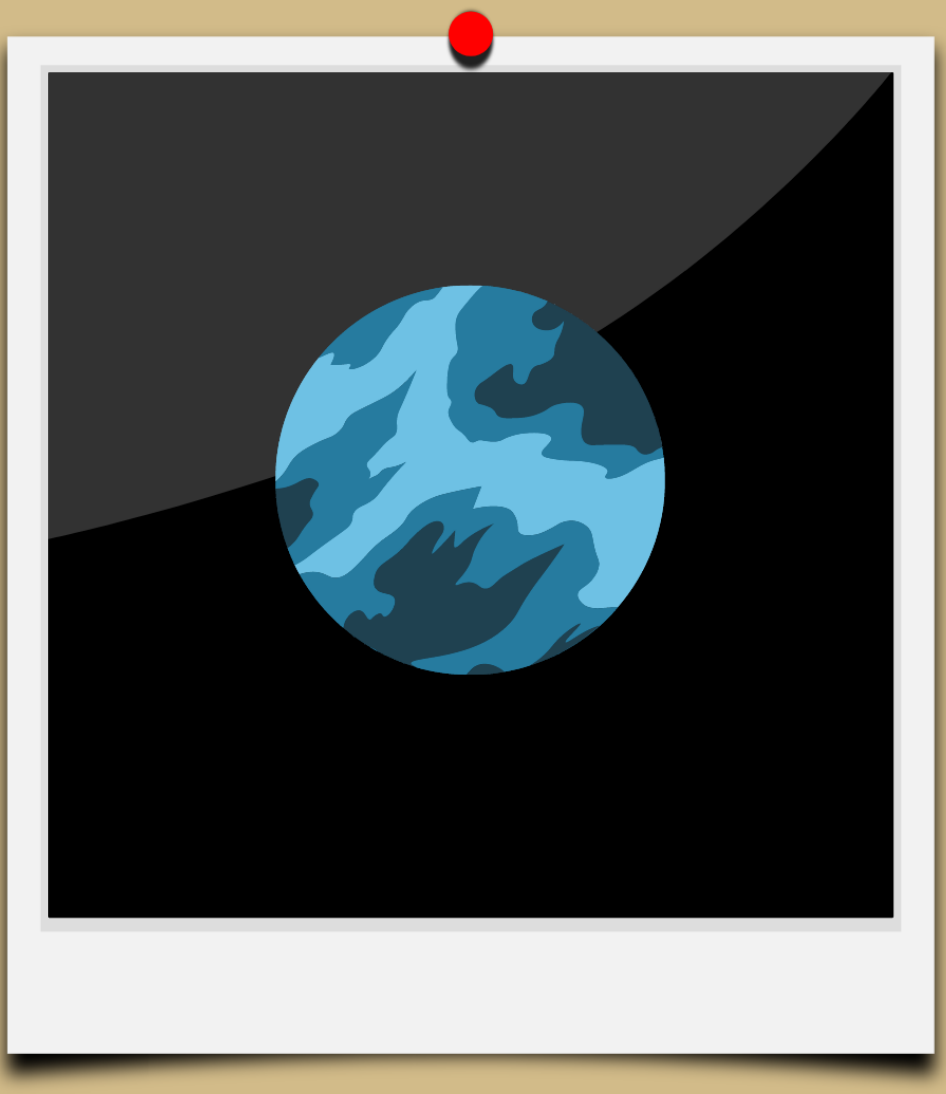
TOI 560-C is a planet closer to its star than Earth is to the sun, being in turn larger than Earth, at a higher temperature than Earth and less dense than it. But not everything is about these data, it is impressive how simply by measuring the amount of light received it is possible to know of the existence of a planet that we do not even see or imagine. This also makes us see the essence of the human being always thirsty for curiosity, looking for new places and who knows if in which to live one day.



This graph given by NASA represents the number of exoplanets discovered per year, although it is not an updated graph, we can see that the trend is clearly upward, with further of 150 new exoplanets. This gives us an idea of the constant advances that this branch of astronomy is undergoing,equal It is the advancement of technology that makes these discoveries possible.

IES FERNANDO III

Análisis de TOI 560-C



Resumen

Este trabajo ha buscado conocer a fondo las propiedades más características de este exoplaneta, por supuesto con la inestimable ayuda del satélite Cheops y del software empleado para conocer los datos, “Allifistter”. Además, también nos hemos apoyado en las ecuaciones de Kepler y Newton junto con los videotutoriales facilitados por la ESA . Desde su propio radio, que es de 2,6977 R_T , hasta la distancia que hay desde él mismo hasta su estrella, siendo esta de 0,1244 UA. También aplicando la lógica a partir de los datos dados por la organización pudimos suponer que la vida en este planeta era imposible debido a sus altas temperaturas llegando hasta 225º C. TOI 560-C tiene una densidad de 2,72 kg/m^3, lo que lo hace tener una densidad menor a la Tierra.

Análisis de los resultados obtenidos

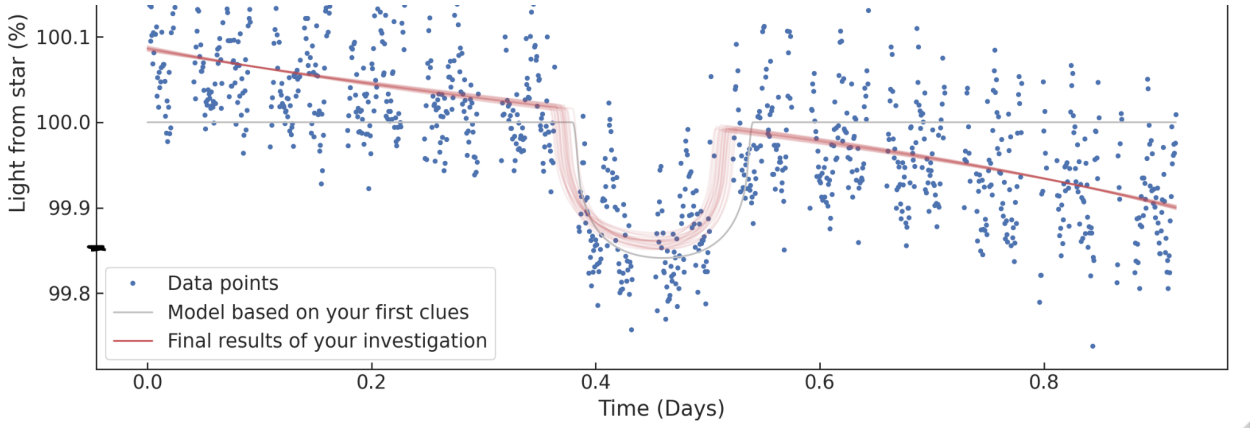
El primero de los cálculos nos llevó a conocer el radio de nuestro planeta, gracias a la ecuación de la profundidad de tránsito.

$$Profundidad\ de\ tránsito\ (\%) = \frac{\pi \cdot Rp^2}{\pi \cdot Rs^2} \cdot 100$$

La cual era esencial para obtener un dato que se sustituiría en la siguiente ecuación:

$$Rp = \sqrt{\frac{Depth\ transit \cdot 0{,}65^2 \cdot Rs}{100}}$$

Y así conocer el radio de nuestro exoplaneta. Nos daba un valor de 2,6977 R_T ,es decir, el radio del exoplaneta es 2,7 veces el radio terrestre. Para ello tuvimos que apoyarnos en esta gráfica:



En nuestro segundo objetivo tuvimos que calcular la distancia a la que este planeta se encuentra de su estrella de referencia. Nos dimos cuenta que se encontraba mucho más cerca que nuestro planeta del sol, exactamente a 0,1244 UA, es decir, se encuentra diez veces más cerca de su estrella que el la Tierra del Sol. Luego, podríamos entender que está a mayor temperatura que la Tierra. Todo esto gracias a la fórmula de Kepler que, una vez despejamos la distancia, dice lo siguiente:

$$d = \sqrt[3]{\frac{T^2 \cdot G \cdot Ms}{4\pi^2}}$$

Lo que nos lleva a nuestro tercer objetivo, en el cual, mediante relacionar la temperatura del exoplaneta que es de 225ºC con la posibilidad de vida, teniendo en cuenta que a esas temperaturas la presencia de agua en estado líquido es nula, luego la vida para seres vivos con una estructura molecular compleja es imposible. No obstante algunas bacterias, sí que podrían vivir en dichas condiciones pero habría que estudiarlas más detalladamente.

En nuestro último cálculo hemos conseguido conocer la densidad de TOI 560-C.Para ello tuvimos que, primero hallar el volumen que ocupa este planeta mediante la siguiente ecuación:

$$v = \frac{4}{3}\pi\, r^3$$

Y posteriormente lo hemos sustituido en esta ecuación:

$$d = \frac{m}{v}$$

Nos da un resultado de unos 2,72 kg/m^3. Tras analizar la tabla de las densidades de los otros planetas del sistema solar, podemos llegar a la conclusión de que este planeta es gaseoso, tal y como Neptuno por ejemplo.

También gracias a la tabla dada por el programa hemos podido obtener muchos datos tales como:

- El periodo orbital del planeta: siendo de 18,87 días en dar una vuelta alrededor de su estrella. Este periodo orbital tan corto se debe a la cercanía entre la estrella y el planeta.

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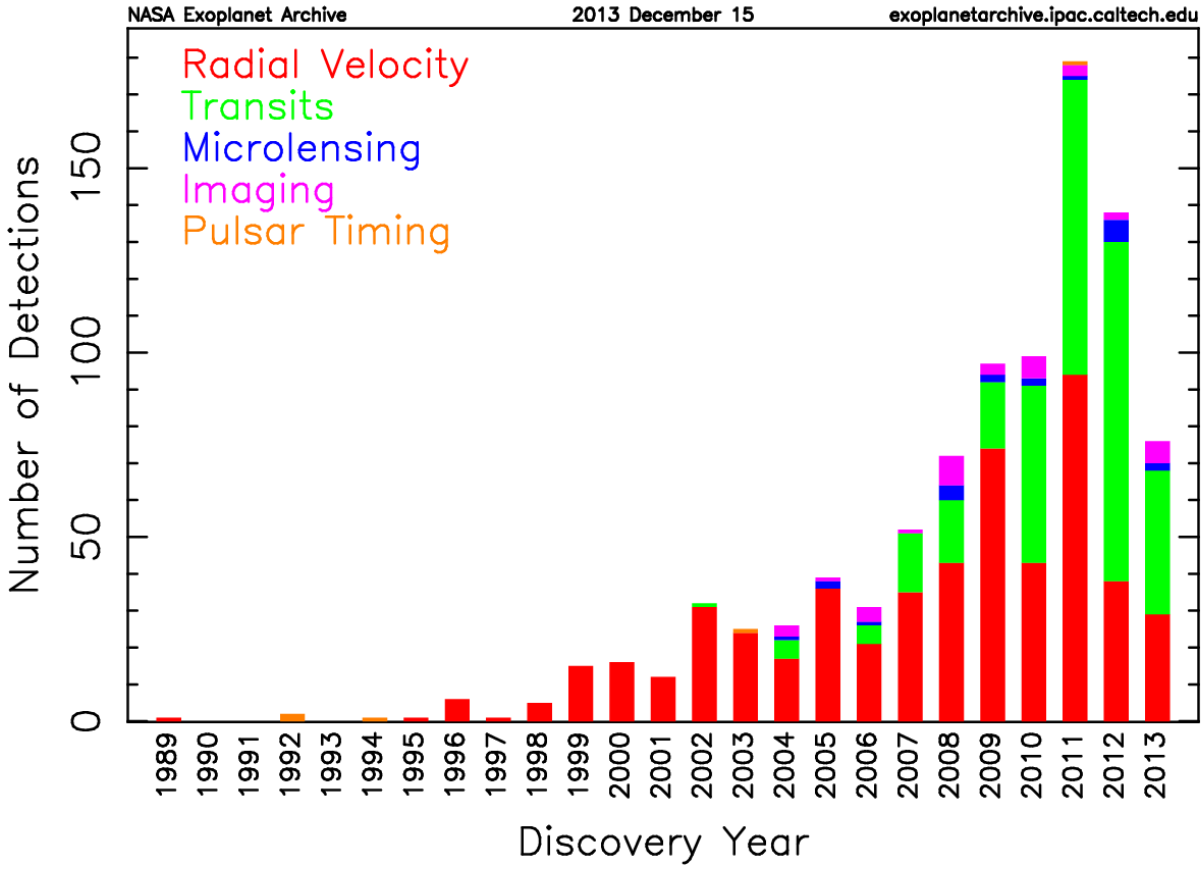
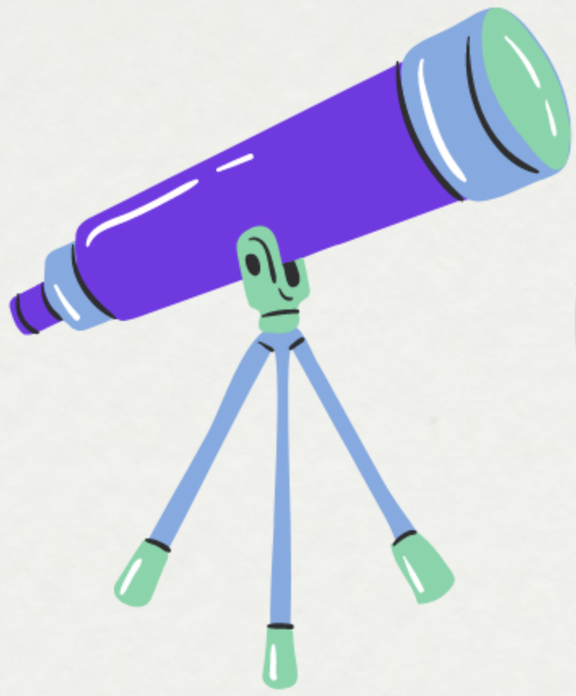
Conclusiones

TOI 560-C es un planeta más cercano a su estrella que la Tierra al sol, siendo a su vez más grande que la Tierra, a mayor temperatura de la Tierra y siendo menos denso que ella. Pero no todo se trata sobre estos datos, es impresionante como simplemente mediante la medición de la cantidad de luz recibida se puede saber de la existencia de un planeta que ni si quiera vemos o imaginamos. Esto también nos hace ver la esencia del ser humano siempre sediento de curiosidad, buscando nuevos lugares y quien sabe si en los que vivir algún día.



Esta gráfica dada por la NASA representa el número de exoplanetas descubiertos por año, aunque no sea una gráfica actualizada podemos ver que la tendencia es claramente al alza, con más de 150 nuevos exoplanetas. Esto nos da una idea de los avances constantes que está sufriendo esta rama de la astronomía, al igual que el avance de la tecnología quien es la que hace posible estos descubrimientos.

DATA ANALYSIS OF TOI 560-C



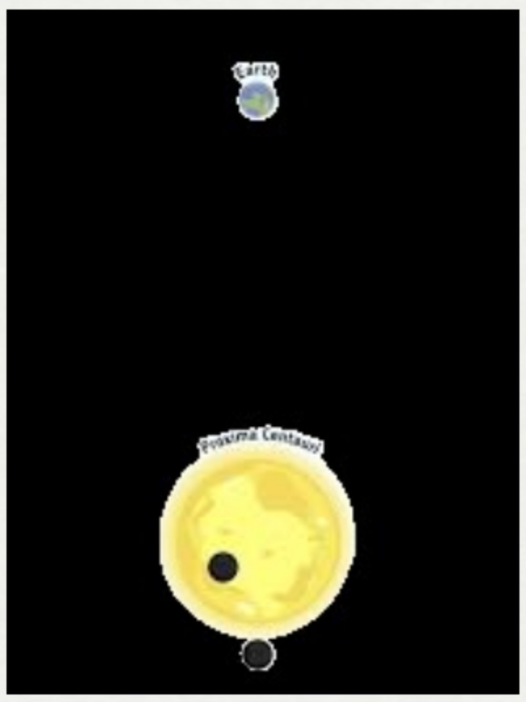
TOI 560-C ES UN EXOPLANETA QUE SE ENCUENTRA A 103 AÑOS LUZ DE LA TIERRA

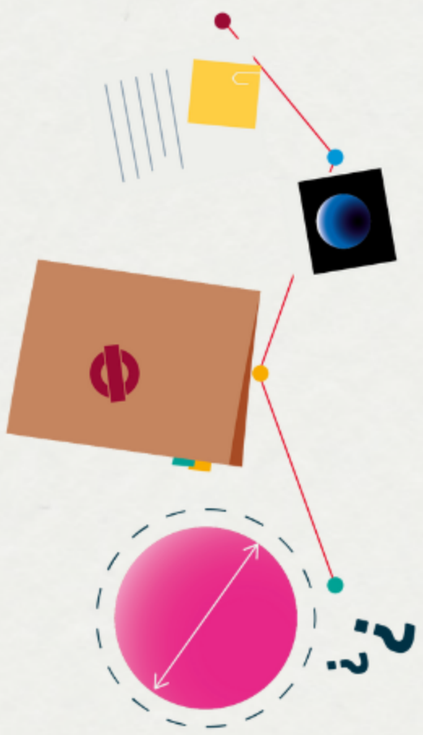
EXOPLANET SIZE

The first of the calculations led us to know the radius of our planet, thanks to the transit depth equation. It gave us a value of 2.6977 RT , which alerts us to the fact that it is larger compared to the Earth.

TEMPERATURE AND HABITABILITY

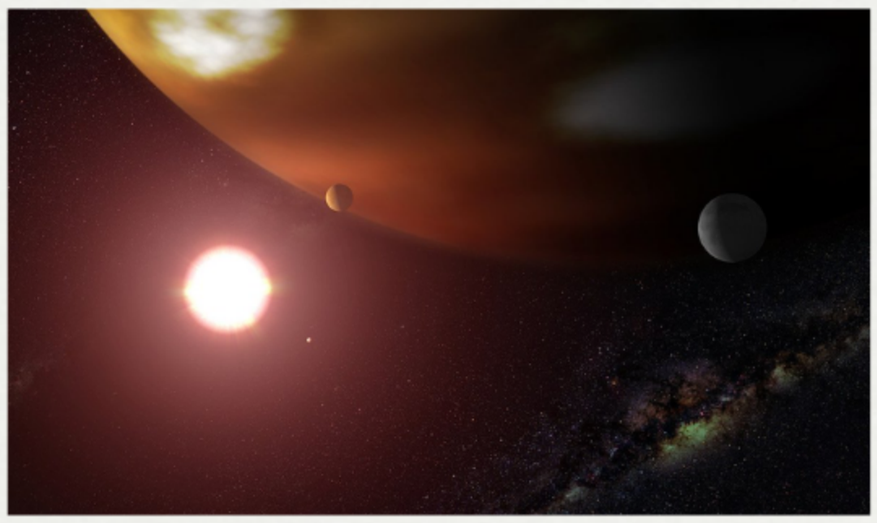
This brings us to our third objective, in which, by relating the exoplanet's temperature of 225°C to the possibility of life, we have come to the conclusion that the possibility of life on that planet is practically nil. Also, due to this high temperatures water cannot exist in liquid state.





COMPOSITION OF THE PLANET

Thanks to the volume equation and then the density one, we know that the density is 2.72 kg/m3, this means that this exoplanet is a gaseous one.



ORBITAL PERIOD AND DISTANCE

For our second objective we had to calculate how far away this planet is from its reference star. We realised that it was much closer than our planet is to the sun, at exactly 0.1244 AU. Then, we could understand that it is at a higher temperature than the Earth.