
TOI 560c

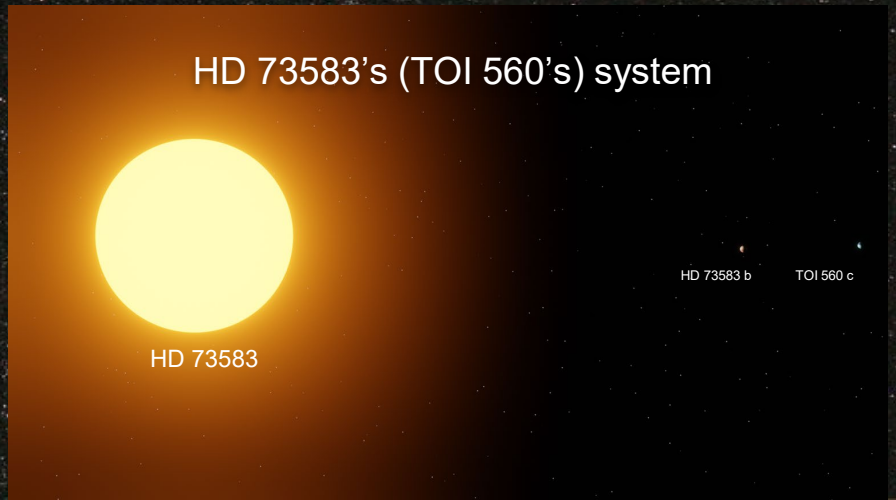
The story begins

Hello, we’re going to take you closer to the work of an astronomy physicists, who specialize on observing exoplanets. First of all, we should introduce our team which consist of 3 members: Jakub, Matěj, David...

People living on our planet are under a lot of pressure due to imminent pandemics, global warming, impending nuclear war or just extincion of the human race. That's the biggest motivation for our team to solve the mystery about new exoplanets. We´re searching for every possible exoplanet that could host humans for future centuries.

System of TOI-560

500-Myr-old active K dwarf TOI-560 has two planets orbiting around it - TOI-560b and our exoplanet TOI-560c. The system is located in constellation of Hydra. Both of these planets are really close to the star. The TOI-560b has orbiting time around 9 days and the TOI-560c has orbiting time almost 19 days. I think that this is pretty short. Also both of these planets can still be forming to its final state, because they are still young.



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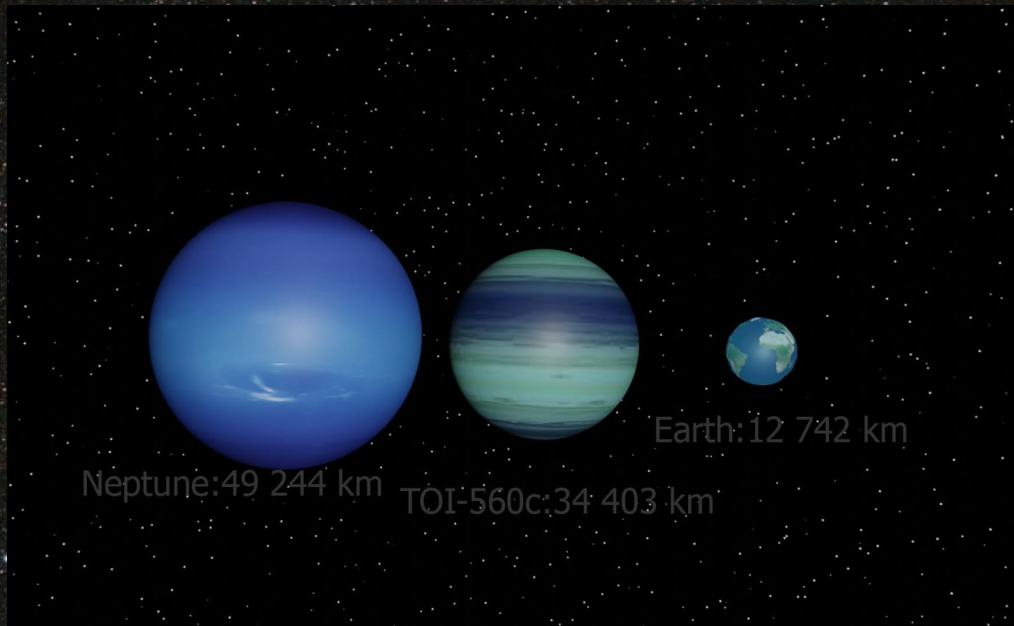
Radius of TOI-560c

$$\text{Transit depth (\%)} \approx \frac{\pi . {R_p}^2}{\pi . {R_s}^2} \times 100$$

Rp=0,025174 Rs => 2,743966 Re

2,743966 Re=17501015,15 km



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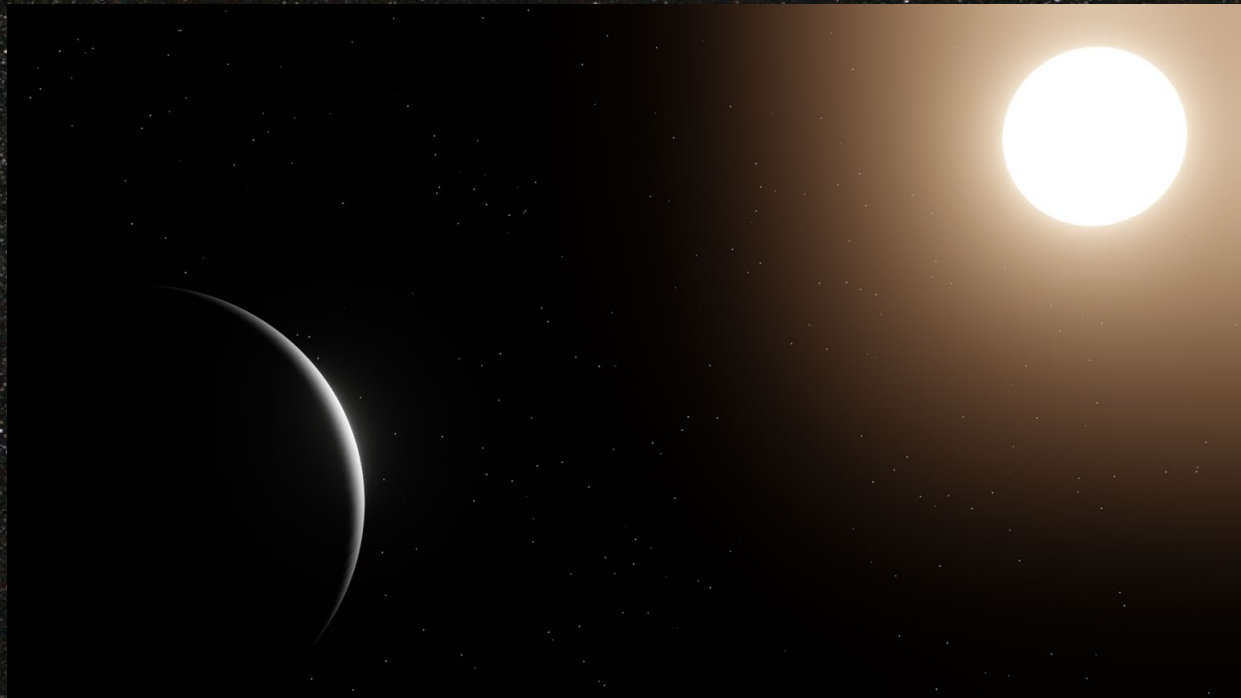
Distance of TOI-560c from its sun TOI-560

$$T^2 = \left(\frac{4\pi^2}{GM_s}\right)d^3$$

d=0,12 au



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Volume and density of TOI-560c

$$V = \frac{4}{3}\pi R^3$$

$V=2{,}245320.10^{22}$

$$\rho = \frac{M}{V}$$

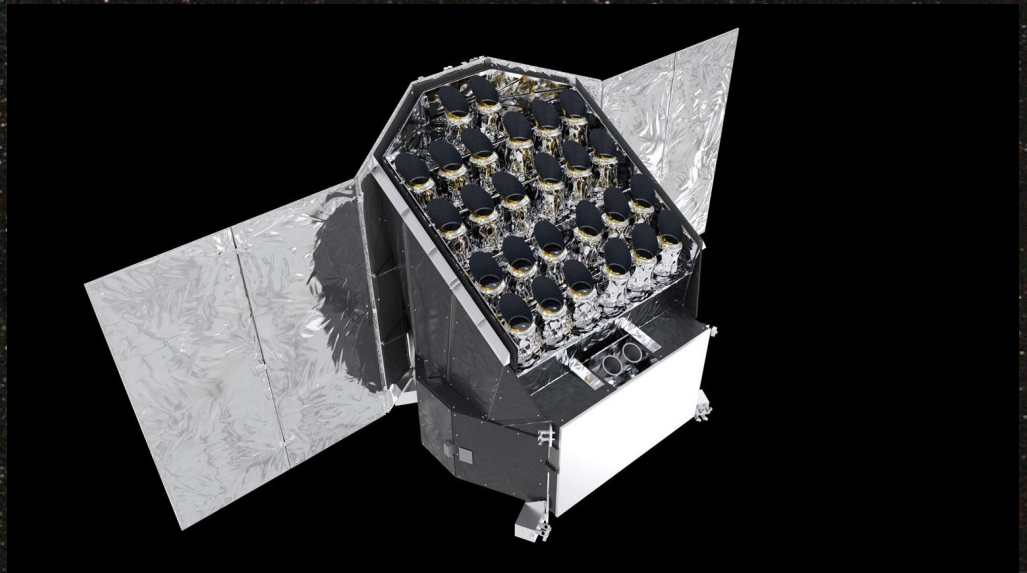
$m=5{,}793034.10^{24}$

$\rho=2{,}58\ g/cm^3$

Based on our calculations, Volume of TOI 560c is $2{,}245329x10^2 m^3$ and density is $2{,}58\ g/cm^3$.

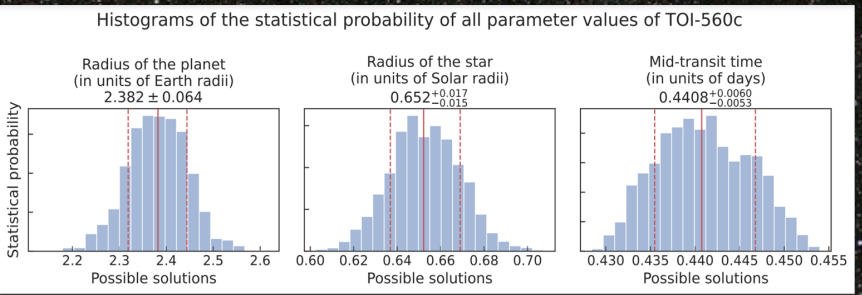
Gravitational force on TOI-560c is 1,3x greater than on earth

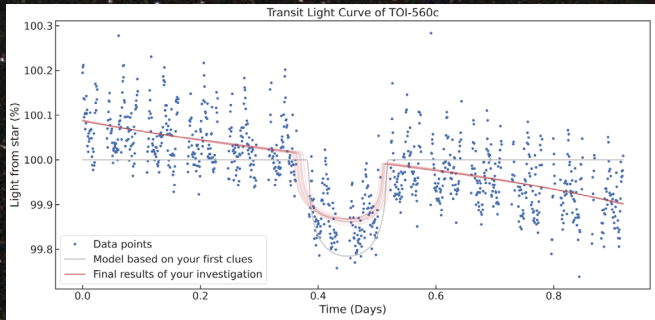
To measure the pressure of the exoplanet we would need to know the composition of the atmosphere through spectroscopy, which we could get from upcoming mission Plato. Then we could calculate if on the exoplanet can be water in fluid state or not.



Datasets

We got new data and basic informations about our target, exoplanet TOI-560c, from CHEOPS survey 2021. TOI-560c is orbiting a small orange-red star TOI-560 (HD 73583). Our exoplanet is almost tropical with temperature around 225°C (that's under melting point of lead). Radius of this planet is about 2,74 R_e based on our calculations, mass is 9,70 M_e , orbital period is quite short- only around 18,8797 days, it is most likely, that the exoplanet is tidally locked, because it is so close to its star, density of this exoplanet is about 2 580,42 $kg*m^{-3}$(if the planet would be made from only one element, we could call it big aluminium sphere). That brings us to the biggest mystery of our research, what does the exoplanet look like?



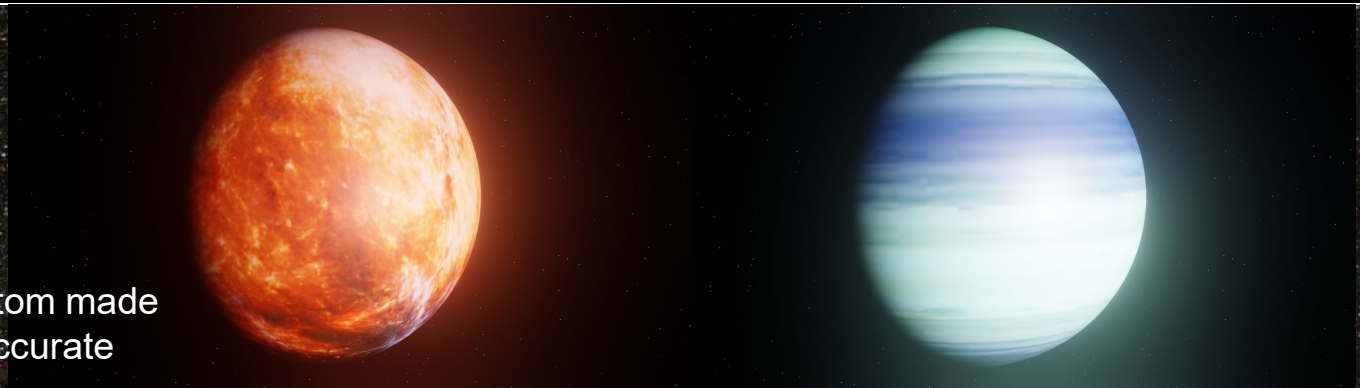


Our first hypothesis is, that the exoplanet is a Mini-Neptune with metal core, that could also mean that there could be a magnetosphere around TOI 560c, that could explain its density

Our second hypothesis is, that TOI 560c is a rocky Super-Earth with rivers, lakes of lava, this could also explain its density

Our 3rd hypothesis is, that TOI 560c is a Mini-Neptune with rocky core, this could also explain its density

ESA's catalogue says that it is a Mini-Neptune, but NASA's catalogue says that it is a Super-Earth, so we aren't so sure what it could be



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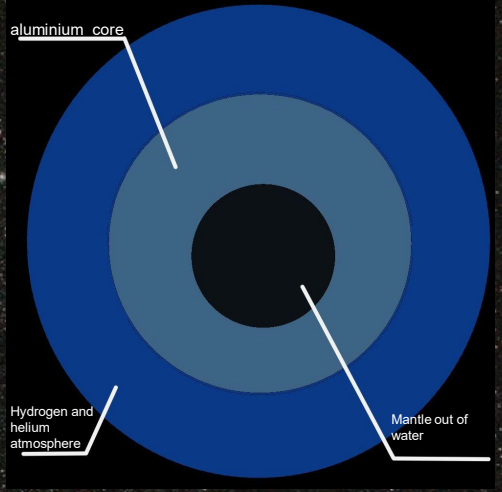
What if?



If it is a Mini-Neptune with rocky core, then the core would be made out of granite or silicon, the “surface” could be made out of hydrogen and helium, just like other gas giants

If it is a Rocky planet it would consist aluminium and it could have a thin atmosphere made out of little water vapor and etc...

If it is a Mini-Neptune with metal core, then the core would consist aluminium and have a “surface” which could be made out of hydrogen and helium

Our biggest question

And the most important question of our work, is it possible that TOI 560c has some sort of life? We can almost certainly say that not in form of live that we know from Earth. Technically there might me new form of live unknown for us. We could live there only under certain conditions: needed composition of atmosphere, form of organic elements, places with lower temperature (or we should consider inventing new materials for spacesuits just like for normal clothing). We´re taking responsibility and sending message to ESA to start inventing and developing technology needed for that type of mission. It would be really useful for further exploring the universe and expansion of humanity.

See you in the FUTURE!