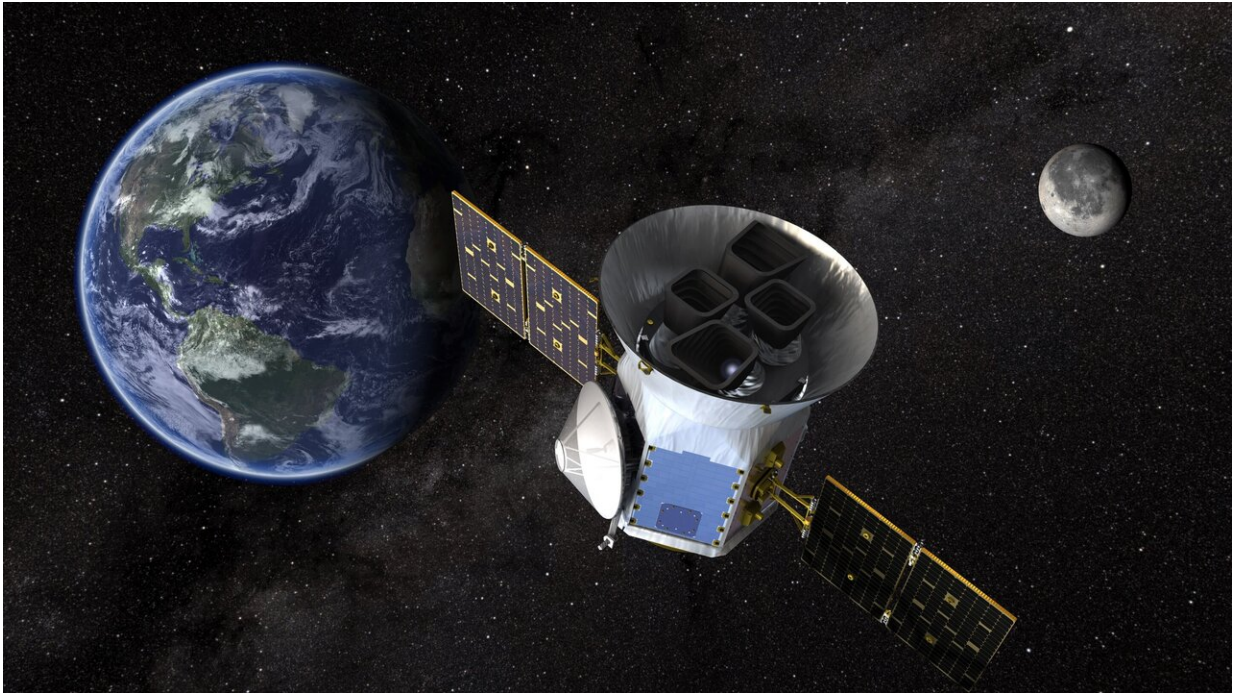


TESS reveals an improbable planet

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Credit: Instituto de Astrofísica e Ciências do Espaço

Using asteroseismology, a team led by an Instituto de Astrofísica e Ciências do Espaço (IA) researcher studied two red-giant stars known to have exoplanets, and around one of them, found a seemingly improbable planet.

The team studied the red-giant [stars](#) HD 212771 and HD 203949. These are the first detections of oscillations in previously known exoplanet-host

stars by TESS. The result was published today in an article in the *Astrophysical Journal*.

Tiago Campante (IA & Faculdade de Ciências da Universidade do Porto) says, "TESS observations are precise enough to allow measuring the gentle pulsations at the surfaces of stars. These two fairly evolved stars also host planets, providing the ideal testbed for studies of the evolution of planetary systems."

Having determined the physical properties of both stars, such as their mass, size and age, through asteroseismology, the authors then focused their attention on the evolutionary state of HD 203949. Their aim was to understand how its planet could have avoided engulfment, since the envelope of the star would have expanded well beyond the current planetary orbit during the red-giant phase of evolution.

Co-author Vardan Adibekyan (IA & Universidade do Porto) says, "This study is a perfect demonstration of how stellar and exoplanetary astrophysics are linked together. Stellar analysis seems to suggest that the star is too evolved to still host a planet at such a short orbital distance, while from the exoplanet analysis, we know that the planet is there."

By performing extensive numerical simulations, the team thinks that star-planet tides might have brought the planet inward from its original, wider orbit, placing it where we see it today. Adibekyan says, "The solution to this scientific dilemma is hidden in the simple fact that stars and their [planets](#) not only form, but also evolve together. In this particular case, the planet managed to avoid engulfment."

In the past decade, asteroseismology has had a significant impact on the study of solar-type and red-giant stars, which exhibit convection-driven, solar-like oscillations. These studies have advanced considerably with space-based observatories like CoRoT (CNES/ESA) and Kepler

(NASA), and are set to continue in the next decade with TESS and PLATO (ESA).

More information: TESS Asteroseismology of the known red-giant host stars HD 212771 and HD 203949. *Astrophysical Journal* (2019). DOI: [10.3847/1538-4357/ab44a8](https://doi.org/10.3847/1538-4357/ab44a8) , arxiv.org/abs/1909.05961

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