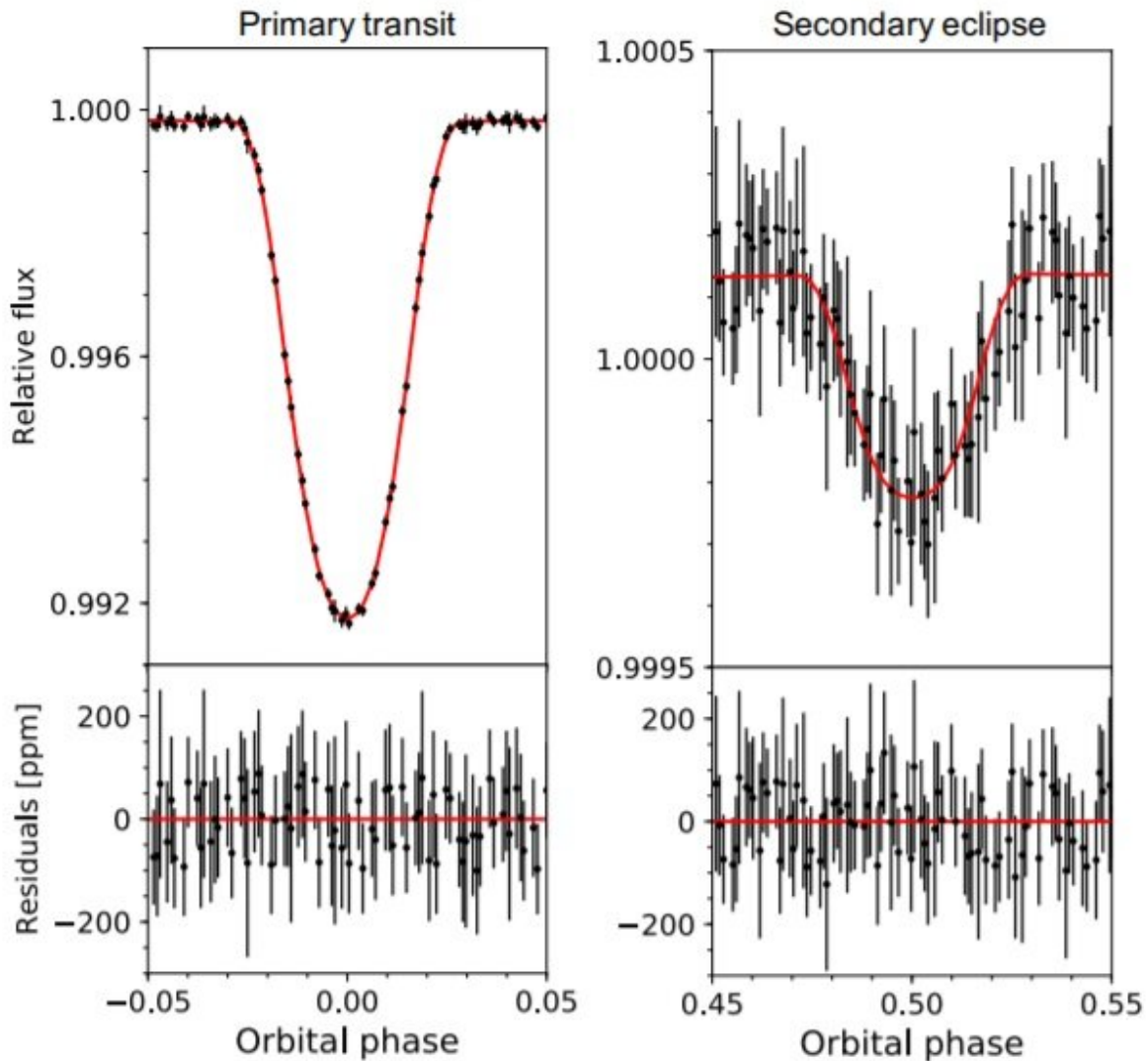


New ultra-hot Jupiter exoplanet discovered

September 6 2021, by Tomasz Nowakowski



Zoomed-in views of the primary transit (left) and secondary eclipse (right) of TOI-1518b. Credit: Cabot et al., 2021.

An international team of astronomers has detected a new ultra-hot Jupiter extrasolar planet using NASA's Transiting Exoplanet Survey Satellite (TESS). The newfound alien world is nearly two times larger than Jupiter and has a misaligned orbit. The finding is detailed in a paper published August 25 on the arXiv pre-print repository.

The so-called "hot Jupiters" are similar in characteristics to the solar system's biggest planet, but have orbital periods of less than 10 days. Such exoplanets have high surface temperatures, as they orbit their parent stars very closely.

Now, a group of astronomers led by Samuel H. C. Cabot of Yale University reports the finding of a new exoplanet of this type, which turns out to have an ultra-high surface [temperature](#). While observing a bright star designated TOI-1518 with TESS, a transit signal was identified in the light curve of this object. The planetary nature of this signal was confirmed by follow-up [high-resolution observations](#) with the EXPRES spectrograph at the Lowell Discovery Telescope.

"We present the discovery of TOI-1518b—an ultra-hot Jupiter orbiting a bright star ($V = 8.95$). The transiting planet is confirmed using high-resolution optical transmission spectra from EXPRES," the researchers wrote in the paper.

TOI-1518b has a radius of about 1.875 Jupiter radii, while its mass is uncertain, estimated to not exceed 2.3 Jupiter masses. Future radial velocity monitoring of this system will put more constraints on its mass. The planet orbits its host every 1.9 days, at a distance of nearly 0.04 AU from it.

The study found that TOI-1518b has an equilibrium temperature of 2,492 K and a measured dayside brightness temperature of 3,237 K, which suggests that it might exhibit a thermal inversion. However,

further spectroscopic observations of this exoplanet are required in order to confirm this.

According to the paper, TOI-1518b has a highly misaligned orbit—about 240.34 degrees. Trying to explain this finding, the astronomers noted that in general close-in gas giants around hot [stars](#) are commonly misaligned. The star TOI-1518 has an effective temperature of approximately 7,300 K, is about two times larger than the sun and its mass is estimated to be at a level of 1.79 solar masses.

The research also detected iron (Fe) in the atmosphere of TOI-1518b. The team conducted an atmospheric cross-correlation analysis and found neutral iron. They underlined that so far there have been only a handful of previous detections of iron in ultra-hot Jupiters.

"We searched for neutral and ionized Fe in the companion's atmosphere through high-resolution transmission spectroscopy. (...) We detect neutral iron (5.2σ), at $K_p = 157$ km/s and $V_{\text{sys}} = -16$ km/s, adding another object to the small sample of highly irradiated gas-giant [planets](#) with Fe detections in transmission," the scientists wrote.

More information: TOI-1518b: A Misaligned Ultra-hot Jupiter with Iron in its Atmosphere, arXiv:2108.11403 [astro-ph.EP]
arxiv.org/abs/2108.11403

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