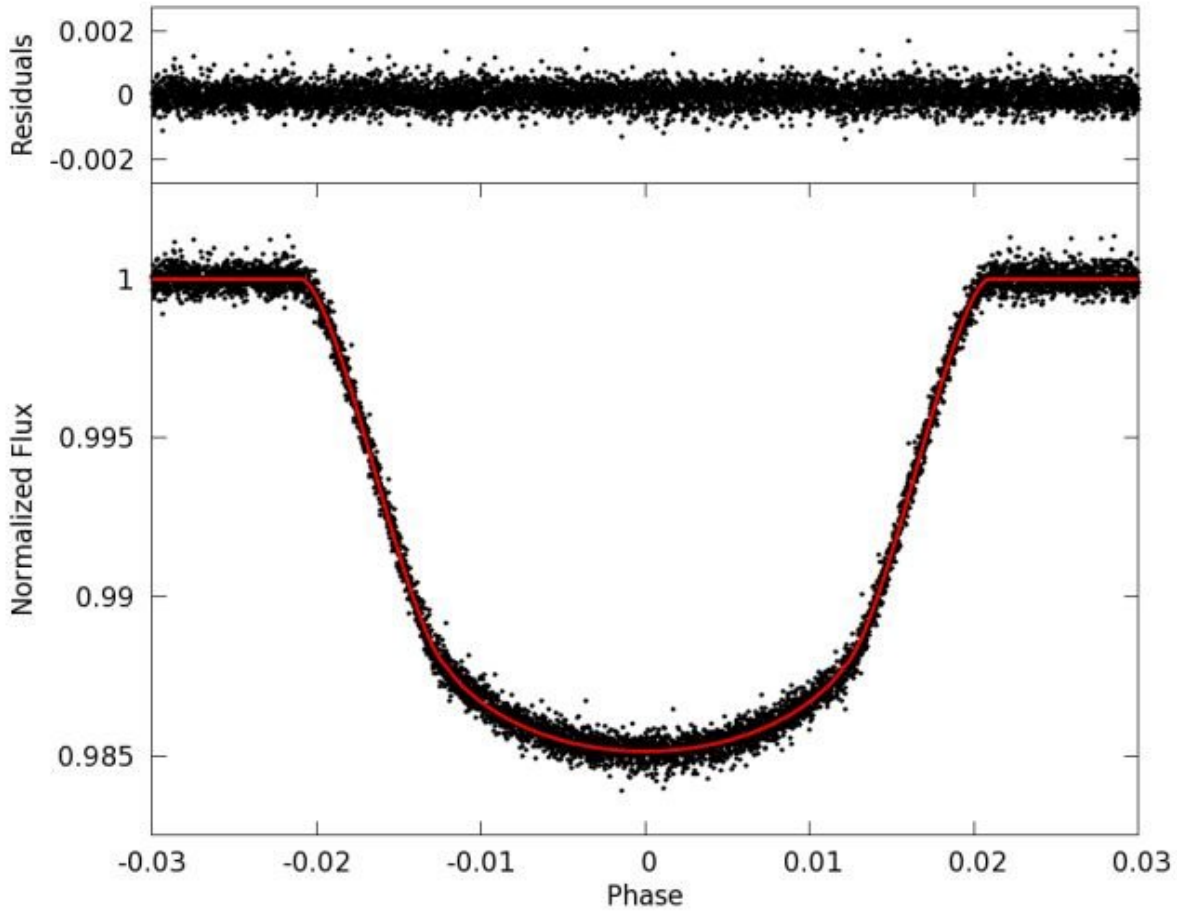
Researchers describe one of the darkest planets ever found (Update)

April 24 2018, by Bob Yirka



Phase-folded K2 light curve of WASP-104. The red line is the best-fitting MCMC transit model. Shown in the upper panel are the residuals from the transit model. Credit: arXiv:1804.05334 [astro-ph.EP]

A team of researchers with Keele University in the U.K. has described one of the darkest planets ever observed. In their paper uploaded to the *arXiv* preprint server, the team describes the planet and where it appears to stand among other dark planets.

The planet in question, WASP-104b, is a hot Jupiter, a gas giant that orbits very close to its star—approximately 4.3 million kilometers away from it (it circles its star every 1.75 days). It is deemed dark because its atmosphere absorbs approximately 97 to 99 percent of the visible light that strikes it from its star. WASP-104b is also tidally locked, which means one side always faces the star while the other side is colder and even darker.

The researchers suggest that the reason the planet is so dark is likely due to it being tidally locked. Such a situation, they suggest, would cause the side that faces its star (a yellow dwarf) to be too hot for cloud or ice formation, which typically brightens a planet by reflecting light. They suspect that the planet also has a very thick atmosphere, which absorbs light. The atmosphere likely consists of potassium and atomic sodium—both absorb most of the light in the visible spectrum. But because the researchers cannot actually see the planet, they have to guess what it actually looks like—probably a glowing purplish ember, they suggest.

Planets such as WASP-104b are typically found not by direct observation through a telescope, but by the transit method—by noting and measuring how much a star dims, and for how long, as a planet transits across it. With planets as big as WASP-104b, researchers can use the radial velocity method, in which a star wobbles slightly due to the gravitation of a planet orbiting it.

WASP-104b is not the darkest planet detected—the record holder is TrES-2b, which prior research has shown reflects just 0.1 percent of the

light that strikes it. WASP-104b is likely in the top three though, the researchers estimate, noting that due to an inability to gather exact measurements, it is difficult to tell which planets are truly darker than others.

More information: WASP-104b is Darker than Charcoal, arXiv:1804.05334 [astro-ph.EP] arxiv.org/abs/1804.05334

Abstract

By analysing the K2 short-cadence data from Campaign 14 we detect phase-curve modulation in the light curve of the hot-Jupiter host star WASP-104. The ellipsoidal modulation is detected with high significance and in agreement with theoretical expectations, while Doppler beaming and reflection modulations are detected tentatively. We show that the visual geometric albedo is lower than 0.03 at 95% confidence, making it one of the least-reflective planets found to date. The light curve also exhibits a rotational modulation, implying a stellar rotational period likely to be near 23 or 46 days. In addition, we refine the system parameters and place tight upper limits for transit timing and duration variations, starspot occultation events, and additional transiting planets.

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