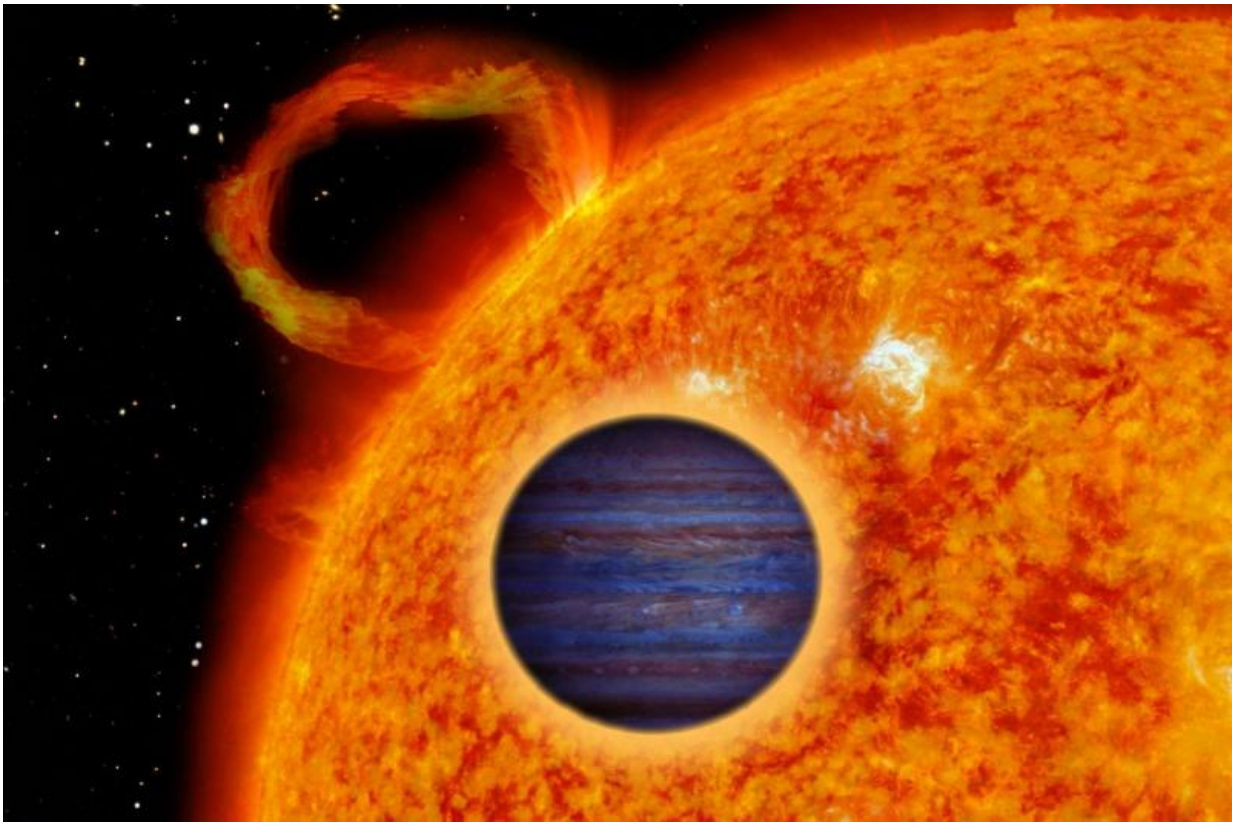
Astronomers discover two new 'hot Jupiter' exoplanets

March 10 2016, by Tomasz Nowakowski



Artist's impression of a 'hot Jupiter'. Credit: Ricardo Cardoso Reis (CAUP)

(Phys.org)—A team of Chilean astronomers recently detected two new "hot Jupiters" using the data from NASA's Kepler spacecraft operating in a new mission profile called K2. The planets, designated

EPIC210957318b and EPIC212110888b, were discovered via the radial velocity method, and are excellent candidates for further orbital and atmospheric characterization via detailed follow-up observations. A research paper describing the discovery appeared online on Mar. 5, on the arXiv server.

The so-called "hot Jupiters" are gas giant planets, similar in characteristics to the solar system's biggest planet, with orbital periods of less than 10 days. They have high surface temperatures as they orbit their parent stars very closely—between 0.015 and 0.5 AU—while Jupiter orbits the sun at 5.2 AU. To date, about 250 transiting "hot Jupiters" have been found, mostly by ground-based photometric surveys. Now, the researchers have made use of a space-borne telescope to detect new, interesting hot giant exoworlds.

K2 is a repurposed mission of the Kepler spacecraft to perform high-precision photometry of selected fields in the ecliptic, following the failure of two reaction wheels in 2013. Due to this malfunction, observations are currently conducted only within the orbital plane of the spacecraft, which approximates to the ecliptic. However, despite these difficulties, K2 has managed to detect 234 planetary candidates in the first year of the mission.

The researchers, led by Rafael Brahm of the Pontifical Catholic University of Chile, have analyzed the photometric data of K2's two observation campaigns and discovered that the stars EPIC210957318 and EPIC212110888 show significant periodic signals every four and three days, respectively.

"Both of these systems were selected as strong Jovian planetary candidates based on their transit properties (depths, shapes and durations), and due to the lack of evident out of transit variations," the paper reads.

Next, the researchers acquired high-resolution spectra of the two candidates, with three different stabilized spectrographs mounted on telescopes at the La Silla Observatory in Chile. These instruments were helpful in measuring the radial velocity variation of the stellar hosts produced by the gravitational pull of orbiting planets.

According to the paper, the smaller planet of the newly discovered duo, named EPIC210957318b, orbits its parent sun-like star, located about 970 light years from the Earth, every 4.1 days. The mass of this exoplanet is between the Saturn and Jupiter masses (approximately 0.65 Jupiter masses) and its radius is slightly larger than the one of the solar system's largest planets. The temperatures on this planet range from 584 to 939 degrees Celsius.

EPIC212110888b is more massive and larger than Jupiter. Having a mass of about 1.63 Jupiter masses, this planet orbits its host star every three days and is even hotter than EPIC210957318b, with temperatures spanning from 932 to 1,430 degrees Celsius. The star, slightly more massive than sun, lies some 1,270 light years away from our planet.

Both planets have similar densities, close to half of Jupiter's. The scientists noted that the physical and orbital properties of both of these extrasolar systems are typical of the population of known hot Jupiters. They also concluded that these two exoplanets are interesting candidates for follow-up studies.

"The low density of EPIC210957318b combined with the relatively small radius of its host star implies a scale height of 340 km and a transmission spectroscopic signal of 744 ppm (assuming an H_2 dominated atmosphere and a signal of five scale-heights), which means that this system is a good target to be observed via transmission spectroscopy to characterize its atmosphere," they wrote.

More information: An independent discovery of two hot Jupiters from the K2 mission, arXiv:1603.01721 [astro-ph.EP] arxiv.org/abs/1603.01721

Abstract

We report the discovery of two hot Jupiters using photometry from Campaigns 4 and 5 of the two-wheeled Kepler (K2) mission. EPIC210957318b has a mass of 0.65±0.14MJ, a radius of 1.070±0.018RJ and transits its G dwarf (Teff=5675±50 K), slightly metal rich ([Fe/H]=+0.06±0.04 dex) host star in a 4.1 days circular orbit. EPIC212110888b has a mass of 1.63±0.12MJ, a radius of 1.38±0.014RJ and has an orbital period of 3.0 days in which it orbits a late F dwarf (Teff=6149±55 K) solar metallicity star. Both planets were validated probabilistically and confirmed via precision radial velocity (RV) measurements. They have physical and orbital properties similar to the ones of the already uncovered population of hot Jupiters and are well-suited candidates for further orbital and atmospheric characterization via detailed follow-up observations.