

= Kepler @-@ 10b =

Kepler @-@ 10b is the first confirmed terrestrial planet to have been discovered outside the Solar System . Discovered after several months of data collection during the course of the NASA @-@ directed Kepler Mission , which aims to discover Earth @-@ like planets crossing in front of their host stars , the planet 's discovery was announced on January 10 , 2011 . Kepler @-@ 10b has a mass of 3.15 ± 0.49 Earth masses and a radius of 1.04 Earth radii . However , it lies extremely close to its star , Kepler @-@ 10 , and as a result is too hot to support life . Its existence was confirmed using measurements from the W.M. Keck Observatory in Hawaii .

= = Nomenclature and history = =

Kepler @-@ 10 , the star that hosts Kepler @-@ 10b , is located 560 light @-@ years from our solar system in the Draco constellation . It is approximately the same size as the Sun , with an estimated age of 12 billion years . Planet Kepler @-@ 10b was the first planet to be discovered in the orbit of its star . For this , it was designated the star 's b planet . The star , in turn , was named for the Kepler Mission , a NASA @-@ led operation aimed at discovering terrestrial planets that transit , or cross in front of , their host stars with respect to Earth . The planet 's discovery was announced to the public on January 10 , 2011 .

The transit method of discovering exoplanets relies upon carefully monitoring the brightness of a star . If a planet is present and crosses the line of sight between Earth and the star , the star will dim at a regular interval by an amount that depends upon the radius of the transiting planet . In order to measure the mass of a planet , and rule out other phenomena that can mimic the presence of a planet transiting a star , candidate transiting planets are followed up with the radial velocity method of detecting extrasolar planets .

Kepler @-@ 10b 's discovery was based on eight months of data collected with the Kepler telescope from May 2009 to January 2010 . The planet 's first transits were observed in July 2009 . According to the collected data , Kepler @-@ 10 dimmed by one part in ten thousand every 0.83 days . Kepler @-@ 10 was the first star in the field of view of the Kepler telescope identified as capable of harboring a small transiting planet , and was considered a high priority target for ground based radial velocity observations intended to confirm the mass of Kepler @-@ 10b . Radial velocity measurements with the Keck I telescope taken intermittently between August 2009 and August 2010 revealed a periodic Doppler shift in the spectrum of Kepler @-@ 10 consistent with a planet of the nature observed by Kepler , confirming the planet 's existence and allowing its mass to be determined . The planet 's discovery was announced to the public on January 10 , 2011 .

On January 13 , 2011 , 3 days after the planet 's discovery was announced , The Economist published an article suggesting ? Vulcan ? as an unofficial name for the planet , after both the hypothetical planet , and the Roman god of the same name .

In September 2011 , the detection of secondary transit and phases were announced . This allowed to determine the temperature and albedo of the planet . This is the first terrestrial exoplanet with observed phases . Detection of phases was possible due to extreme day / night side temperature variations and the amount of starlight the planet receives due to its proximity to the host star .

= = = Reaction = = =

Kepler @-@ 10b 's discovery excited astronomers , who hoped to use data about it to inquire into the formation and structure that terrestrial , Earth @-@ size planets tend to have in common . Geoff Marcy of the University of California at Berkeley said that the discovery was ranked ? as among the most profound scientific discoveries in human history , ? and that the planet ? will go into every textbook worldwide . ? Marcy also described Kepler @-@ 10b as " a bridge between the gas giant planets we ? ve been finding and the Earth itself . " Diana Valencia at the University of Côte d 'Azur in Nice , France considered the planet more of a " super @-@ Mercury " than a super @-@ Earth , granted its physical characteristics .

= = Characteristics = =

Kepler 10b is most noted for its rocky surface . It has a diameter 1.4 times that of the Earth , and a mass of 3.33 ± 0.49 times that of Earth . The density of Kepler 10b is $5.8 \pm 0.8 \text{ g cm}^{-3}$. It orbits its star , Kepler 10 , in less than a day , at less than a twentieth of the distance from Mercury to the Sun . Its surface temperature on the star lit side is approximately 1833 K , which is as hot as a blast furnace and hot enough to melt iron .

Though CoRoT 7b was discovered before Kepler 10b and has been claimed to be rocky , there is more room for other interpretations in the case of CoRoT 7b 's composition than there is for Kepler 10b . This is due to the much larger uncertainty in CoRoT 7b 's mass (and , to a lesser extent , its radius) which is illustrated in the plot to the left . Consequently , CoRoT 7b may be revealed to be a lava ocean planet , whereas Kepler 10b must be predominantly made of rock or iron . In addition to showing the range of masses and radii consistent with the observations of each planet , the plot includes curves of compositions implied by certain masses and radii .

Kepler 10b is tidally locked to its parent star and has extreme variations in temperature between day and night sides . It also reflects about half of the starlight it receives .