WASP-10b

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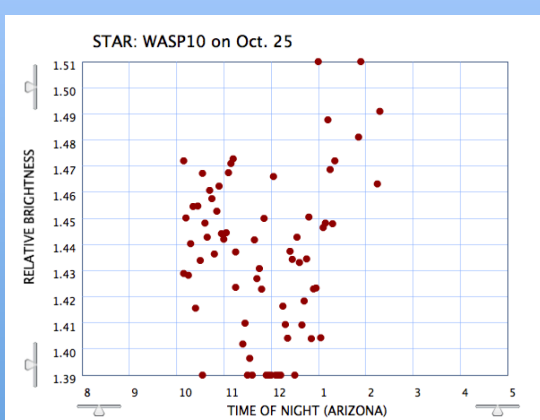
The study of exoplanets is one of the most essential areas of investigation in modern astronomy. Exoplanets, or planets that orbit stars other than our sun, can provide invaluable insights into the nature of planetary behavior. But more importantly, exoplanets can point to the direction of the future of humanity. If astronomers were able to locate exoplanets that both orbited around sun-like stars and resided in the habitable “Goldilocks” zone (a distance comparable to that of Earth’s from the sun), we could as a result end up discovering conditions suitable for life. This particular study examines an exoplanet revolving around the star WASP 10b. By collecting data pertaining to the brightness of this star over time, we constructed a light curve to confirm the existence of this planet. The following report focuses on the data collected that both confirms the existence of this planet, and highlights its various properties. WASP-10b is part of the Pegasis constellation

Brightness Curve:



This graph produces a curve that relays the star’s relative brightness at different times during the night. Through this specific Brightness curve it is portrayed that starting around 10 p.m. The brightness is at 1.47 brightness counts. As the hour reaches 12 a.m. the relative brightness dips all of the way to 1.39. The relative brightness then increases all the way up to 1.5 by the hour of 2 a.m.

Visualization of orbit and planet

Methodology and Exoplanet Characteristics

To properly examine the qualities of our potential exoplanet, we had to first measure the brightness of our star at different times during the day. Harvard’s telescope allowed us to measure the brightness units of WASP 10 during roughly a five-hour period. The measured total brightness of the star according to the Harvard image lab was 6,890 brightness units. After compiling data, we discovered that a clear transit occurred, evidenced by the significant decrease in detected light emittance from the star (as displayed by the light curve we constructed from the data). Essentially, we discovered there existed an actual exoplanet orbiting WASP 10. The exoplanet took roughly 2 hours to complete a transit across WASP 10. The first characteristic of the planet we elected to discover was its size. To calculate size, we first consulted the size and duration of the graph’s “dip”. We calculated the percent of starlight blocked by the planet to be roughly 7.95%. After using proportions to compare this percentage to the star’s diameter, the relative size of the planet was calculated to be the square root of the original brightness fraction, or 28.2%.

The orientation of our planet’s orbit was determined by analyzing our brightness curve. An exoplanet that passes through the exact center of its star would likely produce a longer, more significantly deep “dip” in brightness. On the contrary, an exoplanet that grazes its star would produce a significantly shorter, less significant decrease in brightness. Our brightness curve resulted in a hybrid of these two extremes, suggesting that the exoplanet passes through the upper or lower half of its star, not the precise center. As a result, we predicted our tilt to be roughly 11 degrees. However, this is merely an assumption, not grounded specifically in calculation.

The next characteristic of our planet we discovered was its relative distance to its star. In order to determine this property, we first measured the time required for the planet to complete a transit. From this value, we determined its relative “closeness” to WASP 10. Finally, we used a graph, mapping length of transit versus distance from star, to graphically deduce our planet’s distance. After calculating the distance, we found that it was relatively similar to Earth’s distance to the Sun; as a result, we deduced that our exoplanet was “Earth like”, or had the environmental qualities similar to Earth due to its exposure to WASP 10—this was based on calculated data, not an assumption.

The final piece of information we collected for the exoplanet was its distance to our own planet, Earth. In order to accomplish this task, we compared the brightness of WASP 10 with our sun. Since the exposure time for the images of WASP 10 and our sun differed, we had to make a correction. Similarly, we had to make a correction for the filter present on our telescopes for the sun’s image. Finally, we were able to calculate the relative dimness of our star. Using this value, we recognized that the square of the value of the distance is proportional to the dimness of the star, thus allowing us to determine the distance of WASP 10 to Earth, roughly 236 light-years. According SuperWASP.org, the officially measured distance from Earth to WASP 10b is approximately 300 light years, ±70.