Observation of Hat-P-56 b using transiting

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Abstract

The purpose of the research was to learn how to do analysis on light curve of exoplanets. An exoplanet is a planet that is found in a star system other than our own. The exoplanet Hat-P-56 b was chosen for the research. Due to lack of data, I was only able to make a partial light curve but I was able to approximate that the radius of Hat-P-56 b is $1.021x10^8$m or 1.4 RJ.

Key words: Exoplanet, Transit, Light Curve, keyword4

Background Information

An exoplanet is a planet that is found in a star system other than our own. In 1992 the first exoplanet was discovered. Now around 33 years later there are over five thousand exoplanets that have been discovered using a many different types of observational methods. One method frequently used is called transiting. Transiting is when a planet moves in front of the star it is orbiting and blocks out some of the light the star is emitting. Also known as a "light curve," transiting leads to a dip in magnitude which can then be used to make calculations to identify characteristics such as exoplanets size, mass, and presence of atmosphere. Although there are many different types of analysis that may be performed with a light curve the current proposal aims to understand the process and application behind transiting to promote future work with other exoplanets. Of the many different methods implored to observe exoplanets, transiting was studied because it is the most common way exoplanets are discovered. Around 75% of all known exoplanets were discovered using transit. By understanding the Transiting process, future access and comprehension of already available data may be possible.

Methods

The website *Transit Finder* was used to conduct this work. *Transit Finder* compiles a large variety of data such as times of transiting, transit visibility, magnitude of transit, etc. Key data points essential for the transit identification include transit visibility percentage and magnitude. For example, if an exoplanet has a very shallow dip in the light curve it may remain visible if the magnitude of the star is low enough. Magnitude is a critical component, seeing as though the utilized telescope can only observe up to 15/16th magnitude, so it remains essential to ensure the exoplanet is bright enough for telescopic observation. Several exoplanets were identified for observation; however, setbacks such as

telescope maintenance, weather delays, and logistical errors slowed progress resulting in the observation of only Hat P 56 (figure 1).

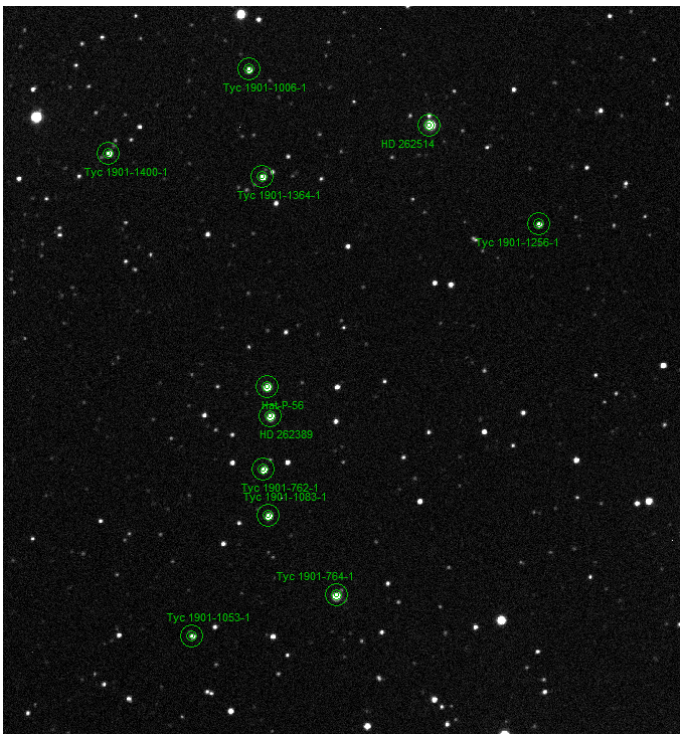

Figure 1; Hat p 56 b and corresponding reference stars in (Maxim DL Astronomy Imaging)

Results

It was planned to receive a light curve for multiple different exoplanets; however, the telescope was not always operational. In turn, limited data was received and only a partial light curve was identified. Further, due to weather constraints, the beginning of the transit was obscured. In response to the limited data collection, an approximate formula (seen below) was used to find the radius of the exoplanet (figure 2).

Approximate Formula

$$\Delta F/F = Rplanet^2/Rstar^2$$

From the analysis on Maxim DL, the period was calculated to 3.5 days. Due to a lack of data, the orbital inclination was undetermined. Orbital inclination was gained from previous work, and was used in calculations to conclude a value of 82.13 degrees.

Using the formula listed above, the radius of the exoplanet to be calculated to be 1.021x10^8m which roughly equates to 1.4 RJ.

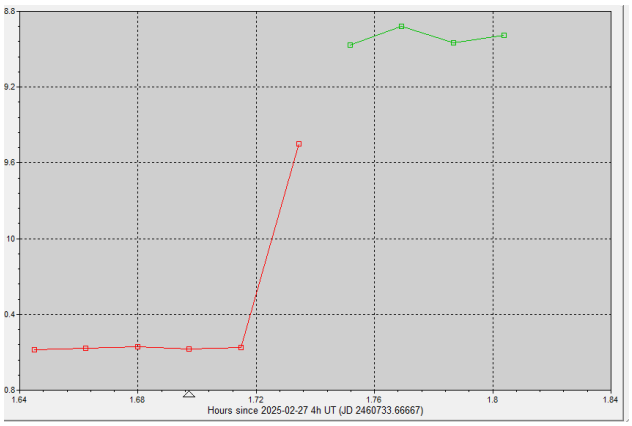

Figure 2; Partial light curve of Hat p 56 b

Discussion

The purpose of this experiment was to learn how to complete analysis on exoplanets. Due to data restraints and the aforementioned setbacks, the experiment was only partially successful. Future data characterizing the entire light curve will likely lead to more accurate results. It seems notable that the calculated results of this experiment were determined similar to the true radius of the studied exoplanet. Despite a lack of data, a tremendous amount of practical knowledge regarding methodology and calculation of exoplanet characteristics was gained throughout the course of this experiment. Further, and most impactfully, knowledge and experience of telescope care and repair was learned. Future work will continue to expound upon the accumulation of data for the Hat p 56 b exoplanet as well as other exoplanets with the goal of further characterizing these entities.

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