Transit Observation of Extrasolar planet TrES 5b

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Abstract
TrES 5b is a massive Hot Jupiter that orbits the star GSC 03949-00967 with an orbital period of 1.48 days. Observations of this exoplanet conducted in July 2016 at the Paul and Jane Meyer Observatory, located in Clifton, TX, yielded data that was analyzed using transit photometry in order to calculate the planetary radius. This value was then compared to the current accepted measurements and used in conjunction with other values presented by the original discovery of the extrasolar planet. Furthermore, a background of the importance of extrasolar planets to the understanding of the formation and evolution of planets is discussed. Further work is needed in order to improve parameters and to provide more data for study.

Background
Extra-solar planets are important objects to study because of their role in helping us understand the formation and evolution of planets. Planets observed in evolutionary stages different from those in our Solar System may reveal insights into the formation and evolution of planets in the Solar System. These planets can be observed through varying methods, including radial velocity measurements and photometric transits. These observations are conducted via ground-based surveys or satellite missions.

Methods
Raw science images were corrected and used in order to produce a light curve through photometry program Astrolmage. Comparator stars were chosen in order to correct for discrepancies caused by irregularities in the sky. Images were taken with a 30 second exposure and no filter. The resulting plot was trimmed to disregard corrupted data caused by the icing over of the telescope.

Results
Light curve of TrES 5b. Red values indicate flux of target star orbited by exoplanet TrES 5b. Other values are the flux measurements of comparator stars. The gap in the data was due to a mechanical malfunction of the telescope’s nitrogen cooling system.

Change in total observed flux:
\[ \Delta F = F_{\text{no transit}} - F_{\text{transit}} \]
Radius Ratio:
\[ \frac{R_p}{R_{\text{sun}}} = \sqrt{n} \]
Planetary Radius:
\[ R_p = \sqrt{n} \times 10^6 \text{m} \]
Percent Error: 2%

Conclusion
• Exoplanet TrES 5b can be considered a Hot Jupiter.
• Photometric analysis is capable of detecting exoplanets even with faint stars.
• Radial velocity observations of the planet are necessary in order to obtain the mass of the planet as well as spectroscopy of the host star.

Future Work
• Due to technical malfunctions the observation was interrupted.
• More images could be collected, over a number of days in order to provide more data.
• The project could benefit from introducing the radial velocity method in order to calculate the mass of the planet. It would also benefit from spectroscopy of the host star.

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References

Images were taken at the Central Texas Astronomical Society Paul and Jane Meyer Observatory’s 24 inch Telescope.