The Study of Orbital Period of the Exoplanet WASP-19b.

Miss.Yadanan Inta (grade 11), Mr.Montree Nanta (adviser)

[Srisawatwittayakarn School, Nan, Thailand]

Abstract

WASP-19b is an exoplanet in a Vela stars group in the southern hemisphere. It's the hot-Jupiter type and discovered by Cutir R.M.,et al, in 2009. The purpose of this study is to study the physical properties of the planet WASP-19b including its planetary radius, orbital period and distance to the star. In this work, the R filter observed was conducted using 0.6-meter (PROMPT 8) the telescope of NARIT at Cerro Tololo Inter-American Observatory (CTIO). The planetary radius was analyzed by an AstroImageJ program. We calculate the orbital period of the planet from HJD=HJD$_0$+P(E) equation and the distance to the star base on Kepler's Third Law. The result reveals that the planetary radius is 1.38R$_{jup}$, the orbital period is 0.79 days and the distance to the star is 0.016 AU which is 1.08%, 0.14% and 2.36 % different from Eduardo Fernández-Lajús and Romina P. Di Sisto. (2017) [1] respectively.

Research Methodology

1. The exoplanet WASP-19b was observed using 0.6-meter (PROMPT 8) the telescope of NARIT at Cerro Tololo Inter-American Observatory (CTIO) with 10 seconds exposure time on filter R . All image data were calibrated with bias, dark and flat frames by AstroImageJ Program. Measured the brightness of WASP-19b using the aperture photometry technique, which used TYC 8181-2204-1 as the reference star.

2. From data analysis, plot graph between HJD_UTC and Flux to create a light curve to calculate the mid transit (HJD) by differentiating quadratic polynomial functions. (show in Graph 1)

3. The Epoch was derived from the HJD = HJD$_0$ + P(E) equation, with HJD = 54771.745 + 0.790E of the recorded data (Eduardo Fernández-Lajús and Romina P. Di Sisto. (2017) [1]).

4. Plot graph between mid transit (HJD) and the Epoch value to calculate orbital period of the exoplanet. (show in Graph 2)

5. The distance to star was calculate from the equation $a^3 = \frac{T^2 G(M+m)}{4\pi^2}$ (Kepler' third Law).

6. The planet's radius of the exoplanet was figured out via AstroImageJ program by a fit statistics.

Results and Discussion

1. Based on Kepler's third Law, the distance to star is 0.016 AU.

2. The radius of the exoplanet from AstroImageJ program by a fit statistics is 1.38R$_{jup}$.

3. From HJD = 54771.745 + 0.790E equation, the period of exoplanet WASP-19b is 0.79 days.
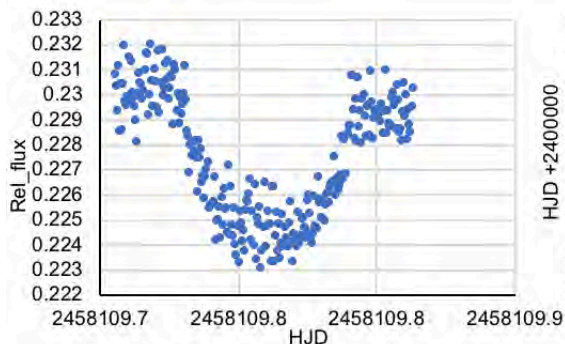
Graph1: Light curve of exoplanet WASP-19b.
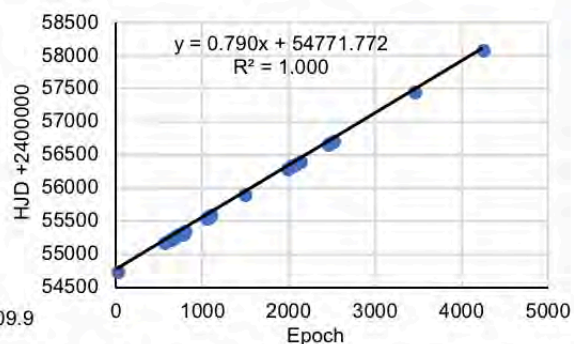
Graph2: A graph between HJD with minimum light and the Epoch value. this show HJD = 54771.745 + 0.790E equation, and get a period.

Conclusion

According to the results, the radius of exoplanet WASP-19b is 1.38R$_{jup}$ which, is different 1.08% comparing to Eduardo Fernández-Lajús and Romina P. Di Sisto. (2017) [1]. After analyzing the data, the orbital period is 0.79 day, and the distance between exoplanet WASP-19b and its host star is 0.16 AU which is 0.14% and 2.36 % different from Eduardo Fernández-Lajús and Romina P. Di Sisto. (2017) [1] respectively.

Acknowledgment

Reference

[1] Eduardo Fernández-Lajús and Romina P. Di Sisto. (2017). Variable Star and Exoplanet Section of Czech Astronomical Society. [Online] from: http://var2.astro.cz/ETD/etd.php?STARNAME=WASP-19&PLANET=b (january 21, 2018)].

[2] Matipon Tangmatitam. (2013). The Handbook of Astronomic Workshop, Chiang Mai: Educational Astronomic Information Service Center.

[3] Exoplanet.eu. data of WASP-19 b planet. [Online] from: http://exoplanet.eu (January 21,2018)].

[4] LESA. Radius of planets. [Online] from: http://www.lesa.biz (January 11, 2018)]