

Kepler-Keck Double Check: Confirming Exoplanet Candidates Using Keck Radial Velocity Data

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For millennia, humans have pondered the possibility of life on other planets. Since the first exoplanet, or planet outside our solar system, was discovered in 1995, scientists have studied exoplanets to learn about the formation and development of our own solar system and to discover Earth-like planets in other solar systems. The 2009 Kepler space mission has located over 1200 exoplanets through identifying fluctuations in a star's magnitude that usually signify a planet passing in front of it (transit method). Meanwhile, Keck Observatory's High Resolution Echelle Spectrometer (HIRES) measures changes in a star's radial velocity caused by the gravitational pull of a planet. In February 2017, the Carnegie Institution for Science released Keck HIRES radial velocity data to the public. This project endeavors to confirm the existence of potential exoplanets by using this newly-published Keck data. After creating a python program to format Keck star names for recognition by the Kepler database, the researcher used the analytical tool Systemic Console 2 to model the orbit of the planets in order to find the orbital parameters: period, mass, longitude of periastron, mean anomaly, and eccentricity. Once the validity of this analytical tool was verified using confirmed exoplanet HAT-P-7b as a control, the researcher analyzed three Kepler candidate exoplanets: TrES-2B, GJ-1245b and HD-50554b. The researcher confirmed the published data on two exoplanet candidates, HD-50544b and TrES-2b. The analytical tool did not satisfactorily confirm that the transit event occurring at the flare star GJ-1245 constituted an exoplanet (GJ-1245b).

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