The New Exoplanet TOI1147b: A Hot Jupiter Orbiting Its Subgiant-Class Star in a Highly Elliptical Orbit

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The aim of this project is to discover a new extrasolar system and characterize its properties for the first time. For this purpose, I searched for periodic transit events in the light curves of the TESS space telescope, using exclusion criteria like visibility and apparent brightness of the parent star. For determining what kind of object is causing the periodic dimming, it is necessary to calculate the mass of the second object. Therefore, I selected the star with the best criteria and observed it using the radial velocity method with the STELLAs Echelle Spectrograph at Izana observatory on Tenerife. In TOI 1147's light curves, a dimming is visible every 10.9 days. With approximately 270 days of data collection, I detected the same periodicity as in the TESS light curves and was able to calculate whether there were other planets in this system. The new exoplanet TOI 1147b has a mass of 1.3 Jupiter masses and a radius of 2.3 Jupiter radii. It can therefore be categorized as a puffy exoplanet and has a highly elliptical orbit. Using the spectra from STELLA, I was able to take a closer look at the parent star by analyzing the H-alpha index. The result shows that the parent star is an evolving, Sun-like star. There is also a third, long-period object in the system that was not detected in the transits. This object is visible for the first time in the new radial velocity data. More data is needed to calculate accurate properties, because the orbital period is longer than my observation time. The observations on Tenerife are ongoing. This research is fundamental for exploring the diversity of planetary systems. Additionally, it helps us better understand planetary evolution and formation.

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