Ground-based Followups of TESS Exoplanet Candidates

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The goal of this study was to further confirm, characterize, and classify LHS3844b, an exoplanet detected by the Transiting Exoplanet Survey Satellite (TESS). Furthermore, I strove to determine the likeliness of LHS3844b and similar target TESS planets as qualified candidates for spectroscopic observation with the future James Webb Space Telescope (JWST), and additionally, I identified possible improvements to the JWST data analysis process. These objectives were accomplished by analyzing the transit light curve, theoretical emission spectroscopy metric (ESM), and theoretical Planck spectrum of LHS3844b. I remotely obtained pre-reduced ground-based followup data of LHS3844b from the El Sauce Observatory on September 6, 2018. Through AstroImageJ - a graphical user interface - and the Python programming language, I converted the calibrated data images into normalized and fitted transit light curve graphs. Chi-squared goodness of fit tests were used to isolate the best-fit light curve model, and chi-squared maps were used to determine the 68% confidence intervals for all of my planetary calculations. Through my light curve model, I classified LHS3844b as a Terran planet. The calculated ESM of LHS3844b surpassed the projected threshold for simulated planets deemed qualified for JWST spectroscopic followup, and the Planck spectrum of LHS3844b revealed that the observed wavelengths between 6,000 and 10,000 nanometers would produce the most accurate spectroscopic observations of LHS3844b and like planets. I intend to apply these methods to a larger variety of TESS exoplanet systems. The findings of this study will aid in substantially reducing the cumulative cost of the JWST and greatly improving the quality and efficiency of spectroscopic followups done by the mission.

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