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Title: A Transmission Spectrum of the Possibly Disintegrating Planet KIC 12557548b
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Abstract:

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The Kepler mission has uncovered a variety of exotic planetary systems including the highly variable but periodic KIC 12557548 system (Rappaport et al. 2012). The transit-like dips in flux are hypothesized to come from a disintegrating rocky object (≤ 0.1 MEarth) that is losing mass via atmospheric escape. The purported planet's escaping debris cause a broadband optical absorption signature with a constant period, but with varying depth (average is 0.54%). KIC 12557548b's short period (16 hours) corresponds to a semi-major axis of 0.013 AU and an equilibrium temperature of 2100K, providing an extreme environment where particle mass loss is possible.

Rocky planets are usually out of the realm of spectroscopic characterization because of their small size relative to host stars. KIC 12557548b, with of order 1 moon mass (Perez-Becker & Chiang 2013) to 1 Mercury mass (Rappaport et al. 2012), therefore represents a unique possibility for characterization. By losing mass that expands to an absorption area 1% as big as the star, KIC 1255748b presents its contents for dynamical and particle size characterization. We investigated the wavelength dependence of these transits using the SpeX+MORIS instruments on the NASA Infrared Telescope Facility. The wavelengths covered by MORIS photometry in R band and the SpeX low resolution prism spectra (0.8um to 2.4um) are sensitive to dust particle size distribution for sizes from ~0.05 μm to 0.2 μm. Preliminary analysis of the data indicate highly variable absorption where both the overall amplitude of the spectrum and the slope vary from transit to transit over 4 separate nights. The time-variable nature of the spectra may indicate multiple compositions of scattering or absorbing material coming from KIC 12557548b's disintegration.