Making the Most of Kepler Photometry: Characterizing Exoplanets through Phase Curve Analysis

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Abstract

The Kepler mission's long-term monitoring of stars through high-precision photometry has not only revealed a plethora of exoplanet transits but also provided valuable data for characterizing a subset of these planets. Using over four years of Kepler observations, we have derived phase curves for over a dozen planets, and use these measurements to constrain their mass, brightness/temperature and energy redistribution between the day and the night sides. In our new study, we also investigate possible offsets of the peak brightness of the phase curve, which could be indicative of inhomogeneous clouds and/or substantial winds in the planet's atmosphere. We find significant offsets for over a half-dozen planets. With this growing sample of measured phase curves, we are able to better examine the trends of hot Jupiter energy budgets and albedos, and for the first time relate these properties to the presence of clouds or winds on a planet.

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