

APPLYING THE METHOD OF TRANSIT TIMING VARIATIONS TO KEPLER

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Measuring the masses of many of the Kepler planets will present significant challenges. Most of the target stars will be faint; many of the planets will have low masses; and, some of the planets will have distant orbits. Although high-precision spectrographs on large aperture telescopes on which ample amounts of observing time are available will be able measure the masses of some of these planets, an alternative means of estimating the masses of Kepler planets and, in some cases, confirming their terrestrial nature is highly desirable. The variations in the time interval between transits, produced by gravitational interactions with additional planets, allow for the detection of those perturbing planets. And, perhaps more importantly, the variations allow the orbital period and mass of the additional planets to be determined from transit observations alone (Holman & Murray 2005, Agol et al. 2005). This suggests a promising means of detecting and measuring the masses of additional planets with Kepler photometry. I propose to contribute to the theoretical and analytical interpretation the photometry from the Kepler mission. The specific scientific objectives of this proposal are: (1) to develop the transiting timing variations (TTV) method for application to Kepler and (2) to detect additional nontransiting planets with Kepler using the TTV method.