EPSC Abstracts
Vol. 7 EPSC2012-49 2012
European Planetary Science Congress 2012

Prospects on the detection of additional circumbinary extrasolar planets

T. C. Hinse (1), N. Haghighipour (2), K. Goździewski (3), J. W. Lee (1) & C.-U. Lee (1)
(1) Korea Astronomy and Space Science Institute, Republic of Korea (tchinse@gmail.com).
(2) Institute for Astronomy & NASA Astrobiology Institute, University of Hawaii, USA.
(3) Nicolaus Copernicus University, Torun Centre for Astronomy, Poland.

Abstract

The presence of additional bodies orbiting a binary star system can be detected by monitoring the binary's mid-eclipse timing. These so-called circumbinary objects will reveal themselves by i) either introducing a reflex motion of the binary system about the total system's barycenter creating a light-travel time effect (LITE), ii) by gravitational perturbations on the binary orbit, or iii) a combination of the two effects resulting in eclipse timing variations (ETVs). Motivated by the three recently detected circumbinary planets by the Kepler space telescope (Kepler-16b, Kepler-34b, Kepler-35b), we have launched a large project aiming to study the detectability of non-transiting and inclined circumbinary planets using the ETV technique. We have used MEGNO to quantitatively map the chaotic/quasi-periodic regions of the orbital parameter-space and to determine where the orbit of a circumbinary planet will be stable. We have calculated the amplitudes of ETV signals for different values of the mass and orbital elements of the planet and binary. Special attention has been given to several high-order mean-motion resonances (MMRs). While we have been able to verify the orbital configurations of the currently known transiting circumbinary planets, we have determined the ranges of the planet's orbital elements and mass for which the resulted ETV will be within the limits of the sensitivity of ground- and space-based telescope. We will present our results and discussed their implications for detecting such bodies with CoRoT and Kepler.