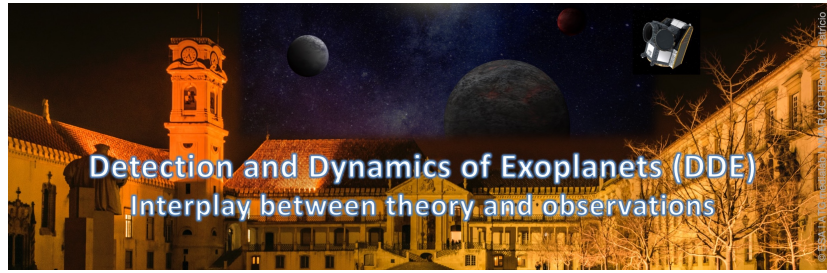


Detection and Dynamics of Exoplanets (DDE): Interplay between theory and observations



Contribution ID: 120

Type: **not specified**

Death and Dearth of Circumbinary Planets

Wednesday, July 9, 2025 10:00 AM (15 minutes)

It has long been argued that the occurrence rate of circumbinary planets (CBPs) should be comparable to that of planets around single stars (~10%). Yet, despite the favorable geometry of eclipsing binaries for transit detection and the modeled efficiency of planet formation in circumbinary natal disks, a set of only 14 transiting CBPs have been identified to date by Kepler and TESS, suggesting a dearth in their existence. Intriguingly, all but one of these transiting planets reside at the precipice of the instability region around their binary hosts. This dearth is more striking among short-period binaries: while two-thirds of observed eclipsing binaries have periods shorter than 7 days, the shortest-period binary known to host a CBP is Kepler-47, with a period of 7.45 days. One then naturally wonders whether these signatures are real—indicative of physical evolution pathways—or merely the byproduct of instrumental limitations and observational bias, and several studies have investigated these two threads. In this talk, we propose a novel mechanism to explain the said observed features. Namely, we report on the effect of encountering a non-linear, secular resonance in the course of these systems' expected evolution histories. When a system is adiabatically captured into this resonance, enhanced angular momentum exchange between the binary and the planet continuously pumps the planet's eccentricity, ultimately placing it at the peril of dynamical instabilities, ejection, or engulfment by the binary.

Presenter: FARHAT, Mohammad (University of California, Berkeley)

Session Classification: Planets in binary systems