

Max Moe – Astronomy 2/20/2019

Title: The Formation of Close Binaries and Planets

Abstract: The formation and orbital migration of close binaries and hot Jupiters remain a mystery. The majority of very close binaries have outer tertiary companions, suggesting Kozai-Lidov oscillations coupled with tidal friction play an important role in their dynamical evolution. However, close pre-main-sequence binaries are ubiquitous, indicating most close binaries migrated within a few Myr while there was still dissipative gas in the primordial disk. I will overview a new population synthesis model that incorporates more realistic initial conditions and a novel tidal mechanism to explain the formation of close binaries and hot Jupiters during the pre-main-sequence phase. Although planets may favor metal-rich hosts, recent observations demonstrate the close binary fraction dramatically increases toward lower metallicities. I will discuss five different observational techniques that corroborate this metallicity trend, and will outline a fragmentation model that reproduces the observations. I will conclude by highlighting how close binaries suppress the formation of close (S-type) planets. Close binaries therefore substantially bias planet occurrence rates and the inferred trends with respect to host mass and metallicity.