Differences in Planet Distributions of Iron-Rich and Poor Stars That Change With Eccentricity: Evidence of Whole Planet Pollution of Stars

Abstract

We present new differences in the distributions of planets of iron-rich and iron-poor stars ([Fe/H] above and below solar respectively) that further show that these are two different populations. We present the new result of an eccentricity dependence of the metallicity-stellar mass correlation found by Murray & Chaboyer (2002, MC02).

Surprising structure in period distributions is dramatically different for systems of high and low stellar [Fe/H]

There are more giant than medium planets at the shortest period range of roughly one day, even though there are more medium planets. We challenge the conclusion that the shortest period giant planets are present due to unexpectedly weak tidal dissipation in the star. We find that it would only take a small resupply rate of inwardly migrating giant planets to keep this region populated.

Eccentricity-dependent iron abundance correlations with mass of stars

Rates of future infall show rates of flow required are reasonable

An ongoing infall of less than $10^{-12}$ giant planets per star per year would give a steady infall rate at more reasonable tidal dissipation values.

Conclusion: Ongoing mergers a major part of planet/star evolution

Planet migration and planet/star mergers an important part of solar systems evolution. It is essential to research how the distributions of planets evolves, and how the stars are affected. Infall occurring at a rate of $10^{-3}$ per star per gigayear is a rate the planet population can supply. We predict that shortening of periods of the closest planets will soon be observed, showing the closest planets are migrating towards merger at a rate indicating a planet flow inward (Hellier 2009; Hamilton 2009; Socrates et al. 2012). Planet/star mergers will be observable by transient searches such as the LSST (Taylor 2010; Metzger et al. 2012).

See Taylor 2013b, in submission, at ar.Xiv:1305.5197