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The cumulative effect of distant stellar encounters on multi-planet systems in star clusters

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Abstract

The cumulative effect of stellar encounters can substantially affect the dynamical evolution of existing stellar and planetary systems [1,2]. In this poster we present the first results of our study on the cumulative effect of distant stellar encounters on multi-planet systems in star clusters, and how these results depend on the properties of the star cluster in which a planetary system is born.

Planetary systems in dense stellar environments

The majority of stars is formed in clustered environments [3], and many of these stars are thought to form with a planetary system. Close and distant steller encounters can frequently occur (depending on the stellar density of the star cluster). From observations of extra-solar planets, we know that over than 10 percent of the nearby Solar-type stars have Jupiter-mass planets around them [4]. Recent observations with *Kepler* have also shown that a large number of the newly detected planets is actually part of a multiple planetary systems [5]. On the other hand, there are few planets around stars in open and globular clusters, such as the Hyades and 47 Tuc.

Characterizing the environmental dependence of multi-planet systems

We characterize the difference between planetary systems in star clusters, and those in the Galactic field. Speficially, we present how the properties of planetary systems depend on the environoment in which they were formed. We carry out detailed N-body simulations using a modified version of an existing package [6], and model the environment of planetary systems in open clusters, globular clusters and the Galactic field. We show how repeated distant encounters directly affect the planetary orbits, and how these perturbations propagate in multi-planet systems [7]. From the results of our simulations, we will discuss the probability for known and predicted planetary systems to survive in a star cluster.

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