

The Influence of the Cluster Environment on the Formation and Evolution of Planetary Systems

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Most stars are not formed in isolation but as part of a group of stars. At the same time these young stars are initially surrounded by a protoplanetary disc which potentially develops into a planetary system. Naturally the question arises whether the surrounding stars influence the forming planetary system. There are two ways the surrounding stars can influence the forming planetary systems either through their radiation (external photo-evaporation) or by dynamical interactions.

Both processes can lead to the reduction of the size and the mass of the protoplanetary disc, and in the extreme case also its complete destruction. The later can lead to the reduction of the disc frequency in a cluster. The strength of the influence of neighbouring stars on the disc of a young star obviously depends on their distance and their mass. The distribution of these parameters depends on the type of stellar association or cluster one is dealing with.

Star clusters and associations span a wide parameter space in terms of the number of stars they contain and their radial extend. Dense clusters containing many high-mass stars tend to have a stronger influence on the forming planetary systems than sparse associations containing only a dozen members. However, it turns out that it is equally important to consider the evolutionary stage of the cluster. Clusters form compact, with a half-mass radius of less than 1 pc, but expand rapidly after gas expulsion at the end of the star formation process. As a consequence the degree of influence of the cluster environment on the discs changes with cluster age. We will show the details of this complex interplay between cluster environment and forming planetary systems.