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The Formation of Complex Galactic Luminous Elements through Star Cluster Evolution

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Abstract

This thesis mainly studies numerically the formation of dwarf spheroidal galaxies (dSph) of the Milky Way. We perform numerical experiments to show that the evolution of star clusters within dark matter haloes can explain the formation of the luminous components of the classical dSph galaxies. We propose a scenario in which star clusters form in the dark matter halo of a dSph. These clusters suffer from low star formation efficiency and dissolve while orbiting inside de halo, and/or merge with each other. Thereby they built the faint luminous components that we observe in dSph galaxies.

We also study the formation process of the thick disc in the Milky Way. While the chemical composition and the kinematical properties of the thick disc are well known, the formation scenario is not yet well understood. Here we provide numerical simulations of star clusters suffering from gas-expulsion. These star clusters are orbiting in a Milky Way potential, slowly dissolving and spreading their stars. We show that they could be responsible for the build up of the thick disc.

We investigate a scenario for the formation of the recently observed, extended globular cluster Scl-dE1 GC1. This cluster has a large core radius and it was speculated whether this object could reside in its own dark matter halo and/or might have formed through the merging of star clusters. We perform N-body simulations and show that there are several formation paths for this object involving mergers of star clusters in low-mass DM haloes, which result in a similar object that contains very little or no DM inside of the stellar distribution.