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The progenitors of early-type dwarf galaxies in the Virgo cluster

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Abstract

In the local universe dwarf galaxies represent 80 % of the overall galaxy population, while their type-distribution (passive, early- vs. star-forming, late-type dwarfs) depends on galaxy density. There are some candidate mechanisms trying to explain the transformation between these different types of dwarf galaxies, but their details are still not well understood. The aim of our project is to unveil these processes with the help of surface photometry of a large sample of late-type galaxies from SDSS in combination with evolutionary synthesis models. With this sample we are able to derive structural properties and compare them with other data and model predictions.

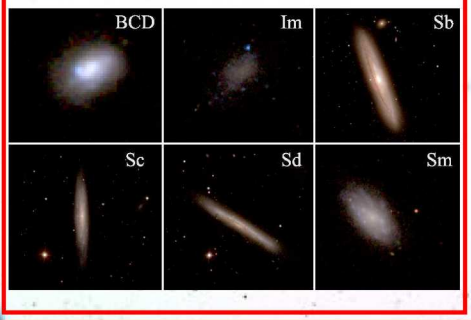
Introduction

As shown in different studies, the morphology type of late-type galaxies depends on the density of galaxies per Mpc^{-2} [1]. Starforming, late-type galaxies (e.g. spirals and/or dwarf irregulars) are mostly found in low-density region, whereas early-type galaxies ([dwarf-]ellipticals) are found in high-density regions such as the Virgo Cluster. To explain this bimodality, several transformation processes have been introduced. Among them are ram-pressure stripping [2] and galaxy harassment [3]. To analyze possible connections between these different types, it is crucial to compare the structural properties from late to early-type galaxies. A study by T. Lisker [4] already analyse the properties of early-type galaxies in the Virgo Cluster, and we here extend this study to late-type galaxies.

Our sample

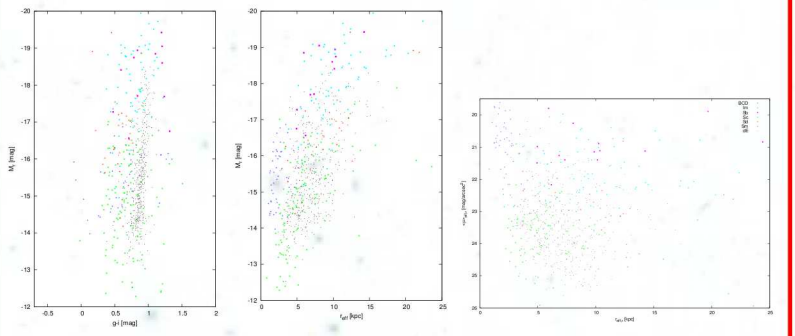
To derive the structural properties and the colours of the late-type galaxies in the Virgo Cluster, we used data from the SDSS archive in all 5 filters.

Figures below show a selection of our sample galaxies ranging from Blue Compact Dwarf Galaxies (BCD) to spiral Sm galaxies.



Result

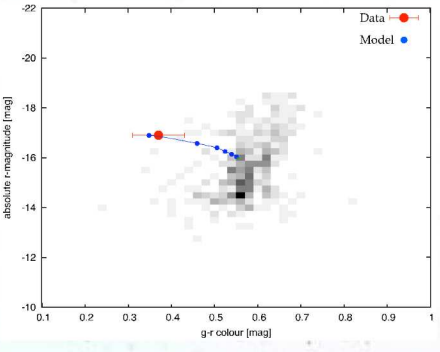
Below we show (g-i)-colour vs. magnitude (left panel), effective radius vs. magnitude (middle) and effective radius vs. mean surface brightness (right panel) of all sample galaxies. For comparison, data of the Virgo Cluster dwarf ellipticals (dE) from [5] are also shown. Symbol definitions are given in the right panel.



The Future

In a next step we will combine our data with GALEV evolutionary synthesis models [6] to model the time evolution of both structural properties and colours. We will use star formation histories as parametrized in [7] for the different galaxy types.

The lower panel shows a first example of a GALEV analysis for an Sd galaxy undergoing a star formation truncation event. For reference we show the parameter space covered by dEs in gray-scale indicating regions with higher or lower density. With the results from these models we will be able to conclude whether the late-type galaxies are progenitors of dEs or not.



References

[1] Dressler 1980, APJ, 236, 351; [2] Gunn et al. 1972, APJ, 176, 1; [3] Moore et al. 1996, Nature, 379, 613; [4] Lisker et al. 2006, AJ, 132, 497; [5] Janz et al. 2009, APJ, 696, L102; [6] Kotulla et al. 2009, MNRAS 396, 462; [7] Gavazzi et al. 2002, AJ, 576, 135

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