Galaxy Transformations in Different Environments of the Shapley Supercluster

A. Mercurio[1], P. Merluzzi[1], C. P. Haines[1], A. Gargiulo[2], G. Busarello[1], F. La Barbera[1], and M. Capaccioli[2,3]

[1]INAF-Osservatorio Astronomico di Capodimonte, Napoli

[2]Dipartimento di Fisica, Università degli studi "Federico Ii", Napoli

[3]INAF-VSTCeN, Napoli

Abstract. We studied ~ 2 deg^2 region in the Shapley Supercluster (SSC) core at z$\sim$0.05 in two bands (B and R). By studying the galaxy luminosity function (LF) and the colour distribution of galaxies we find that processes directly related to the supercluster environment are responsible for transforming faint galaxies, rather than galaxy merging.

Keywords. galaxies: evolution, galaxies: luminosity function, galaxies: colors

1. The Shapley Optical Survey

In order to investigate the effects of the environment on the galaxy populations, we have studied galaxy properties up to M*+7 in the core of the SSC. The analysis shows that the red galaxies are concentrated in cluster cores, while blue galaxies avoid the cluster centers (Fig. 1). A dip is present in the LF at M$_R$ $\sim$-19.8 for intermediate- and low-density regions, while for high density regions the data can be drawn by the Schechter function (Fig. 2). Moreover α shows a strong dependence on environment, becoming steeper at > 3 significance level from high to low-density environment in both bands.
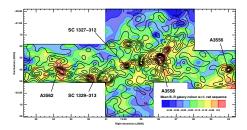

Figure 1. Mean B-R galaxy colour offset of the supercluster galaxy population with respect to the observed red sequence. Black lines are the isodensity contours corresponding to 1.5 (high density), 0.95 (intermediate) and 0.375 (low) gal/arcmin^2.
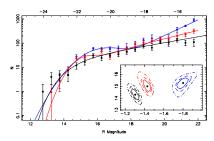
Figure 2. R-band LFs in high- (black), intermediate- (red) and low- (blue) density regions. Continuous lines draw their best fitting function. In the small panel the 1 (continuous), 2 (dashed) and 3σ (dot-dashed) confidence levels of the best–fit parameters for α and M* from the fit, are shown.

These results indicate that global properties of faint galaxies change significantly from the cluster core to the virial radius, both in terms of the LF and mean colours, indicating that galaxies are being transformed by processes related to the environment. The environmental effect of changes in the shape of the LFs and the mean colours can be explained as the consequence of galaxy harassment and mechanisms such as ram-pressure stripping and starbursts triggered by shocks in the intracluster medium.

224