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Publication date:
2003

Permanent link:
https://doi.org/10.3929/ethz-a-004582553

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The distribution of morphological types in nearby clusters from the WINGS Survey: first results

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ABSTRACT

WINGS (WIde field Nearby Galaxy Clusters Survey) is a two-band (B and V) Wide-field imaging survey of a complete, all-sky X-ray selected sample of clusters. This sample comprises 78 clusters in the redshift range z=0.04-0.07. The aim of this survey is to provide the astronomical community with a complete set of homogeneous, CCD-based surface photometry and morphological data of nearby cluster galaxies located within 1.5 Mpc from the cluster center. The data collection has been completed in seven observing runs at the INT and ESO-2.2m telescopes. For each cluster, photometric data of about 2500 galaxies (down to V~23) and detailed morphological information of about 600 galaxies (down to V~21) are obtained by using specially designed automatic tools.

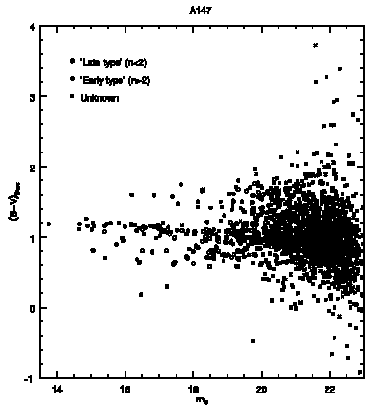


FIG: 1 The color-magnitude diagram for A147 (z=0.045) , it is possible to identify another cluster in the same field. The galaxies belonging to this cluster have a (B-V)~0.6 mag brighter than that of the galaxies in A1795. Each cluster is well defined by its own color-magnitude sequence. We can take advantage of this very useful property in separate the galaxies members of the cluster and the field galaxies.

To perform a detailed study of the morphological distribution of the galaxies in the cluster, we use GAsPHOT (Pignatelli & Fasano,2003, in preparation) an automatic tool for classification. For every cluster we can detect about 2500 galaxies. They are contained in our "deep galaxy catalogues". The completeness of these galaxy catalogues is typically achieved down to V~22. In addition we produce a surface photometry catalogue. In this catalogue we include the photometric profiles of each object together with the global parameters extracted from the profiles (total V magnitude, effective radius (r_e), Sersic index (n), ellipticity profile, isophote position angle (P.A.).

At this moment, a preliminary inspection led us to use the Sersic index n=1.4 in roughly distinguishing early and late-type galaxies. The results of the automatic classification are represented in the colour-magnitude diagram of Figure 1: red points represent "early-type" galaxies, blue points, "late-type". The visual classification is, however, at this moment, the best way to investigate the galaxy morphology.

Preliminary results based on a visual morphological classification are represented in Figure 2. In the central region, the number of early-type galaxies is greater than that of spirals. At intermediate radii (log(r/deg)~-0.9) the increase in the number of spirals is steeper than that of early-type. The galaxy counts are corrected for galactic extinction, according to Burstein & Heiles (1982). The statistical correction for back and foreground has also been applied, according to the galaxy counts of Cabanac et al. (2000).

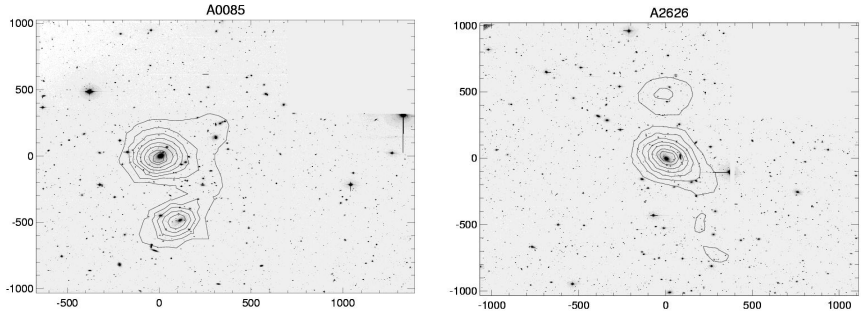


Figure 3: We used our deep catalogues to estimate the density distribution of the galaxies in the cluster; we applied the Adaptive Kernel method (Pisani 1996). The density is based only on the galaxy counts. Here we show the resulting density map superimposed on the image of the clusters A85 and A2626.

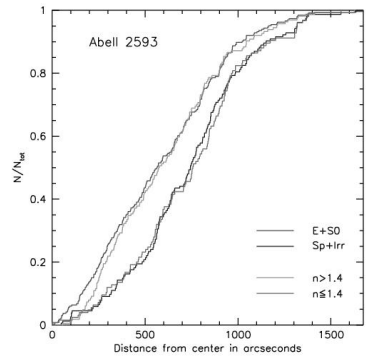
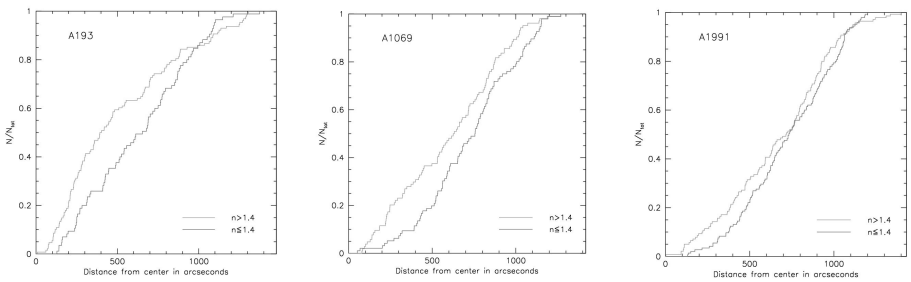


Figure 2: The cumulative profiles for the cluster A2593 are plotted, separating early and late-type galaxies. The Blu and red lines are obtained by visual inspection of the morphological types; the Green and purple lines are from the automatic classifications. As we can see the agreement is quite good using the Sersic index n=1.4 in roughly distinguishing early and late-type galaxies



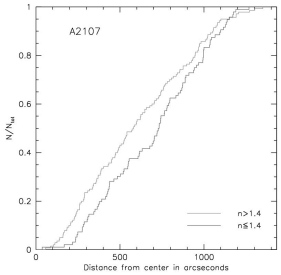


Figure 4: The cumulative profiles for four clusters in our sample. In the central region, the number of early-type galaxies is greater than that of spirals. At intermediate radii (log(r/deg)~-0.9) the increase in the number of spirals is steeper than that of early-type.

see also: http://web.pd.astro.it/wings/