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A Search for Globular Clusters in the Surroundings of Dwarf Galaxies in Fornax: Intracluster Globulars?

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Abstract. We present the results of a search for globular clusters in the surroundings of 15 low surface brightness dwarf galaxies in the Fornax cluster, on CCD images in the C and T_1 bands. Globular cluster candidates show a clear bimodal color distribution. Their surface density distribution shows no concentration towards the respective dwarf galaxies but it does show concentration towards the center of the Fornax cluster. We suggest that the potential globular clusters might not be bound to the dwarf galaxies, but might instead belong to the intra-cluster medium.

1. Introduction

A survey for globular cluster (GC) candidates was carried out on 15 CCD fields centered on LSB galaxies in the Fornax cluster. The nature of those objects, selected according to photometric criteria explained below, is not yet clear: on one side, they could be globulars associated with the LSB galaxies or, alternatively, they could be identified as loose globulars that move in the potential well of the galaxy cluster. This kind of scenario has been proposed by West et al. (1995) in order to explain the high GC specific frequencies (S_N) observed in some central elliptical galaxies.

A preliminary analysis, based on the spatial distribution and number statistics, favors the latter hypothesis.

The expected number of GCs in fact associated with the LSB galaxies in our field was estimated on the basis of the results obtained by Miller et al. (1998) who made HST observations of 9 dwarf galaxies (none in common with this work) and adopting their estimates of S_N as representative values for our sample.

2. Observations

CCD images of the 15 dwarf galaxies, located up to 175′ from the cluster center, were obtained (for other purposes) with the 0.90-m and 1.50-m telescopes at CTIO (Chile) and the C and T_1 filters of the Washington system. Field sizes range from 10 to 17 arcmin^2 (for more details we refer to Cellone et al. 1994).

To identify the GC candidates we first subtracted the dwarf galaxies with the IRAF/STSDAS tasks "ellipse" and "bmodel". Using the software SourceExtractor (Bertin & Arnouts 1996) we detected all the sources, measured their

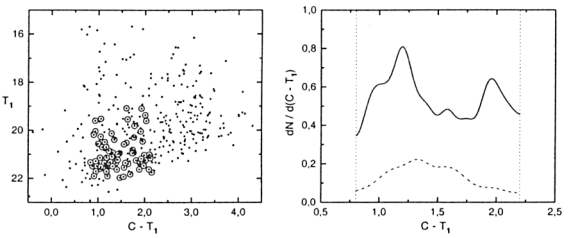

Figure 1. Left panel: color-magnitude diagram for all detected sources (dots) and GC candidates (open circles). Right panel: $(C-T_1)$ color distribution for GC candidates (solid line: raw data) and for the comparison field (dashed line); not scaled to the same area.

magnitudes and colors, and classified them with the "stellarity-index" to perform the resolved/unresolved source separation. All the sources classified with a "stellarity-index" below 0.35 were considered as resolved sources and were discarded. Finally, we selected 75 GC candidates as those point sources with: $0.8 < (C - T_1) < 2.2$ mag (a typical color range for GCs in the Milky Way), and $19 < T_1 < 22$ mag, with $T_1 \approx 22$ mag the completeness limit of the sample (Figure 1).

3. Analysis

The $(C - T_1)$ color distribution of the GC candidates, corrected to remove the background contamination, presents a clear bimodal distribution, with two peaks at $(C - T_1) = 1.2$ and 1.9 mag that, according to the relation given by Geisler & Forte (1990), correspond to metallicities $[Fe/H] \approx$ -1.6 and 0.1, respectively (see Figure 1). Most of the numerous studies of GCs in NGC 1399 and Fornax early-type galaxies (Ostrov, Forte & Geisler 1998; Grillmair et al. 1999; etc.) show that their color distribution is bimodal due to the presence of two GC populations ("red" and "blue" ones). Alternatively, Miller et al. (1998) show that the (V-I) colors of the dwarf's GCs are similar to those of the blue metal-poor GC population.

With regard to the luminosity function, limited to $T_1 = 21.5$ mag, our sample covers only 7% of the area under a Gaussian with the parameters obtained by Ostrov et al. (1998) for the NGC 1399 GC system and, after background subtraction, we are left with 40 GC candidates. According to the S_N for dEs, $S_N = 2 - 6$ (Miller et al. 1998), and the total integrated brightness of our sample's dEs, we should have found between 4 and 13 GC candidates within our T_1 range. By comparison, we have found significantly more GC candidates than what is inferred from the S_N values.

If the GCs were bound to the respective dwarf galaxies, the projected density of GCs vs. the galactocentric distance should increase towards the center. However, the projected number density of the GC candidates (background-corrected), calculated in concentric annuli around all the dwarfs, shows no concentration towards the center, as shown in Figure 2.

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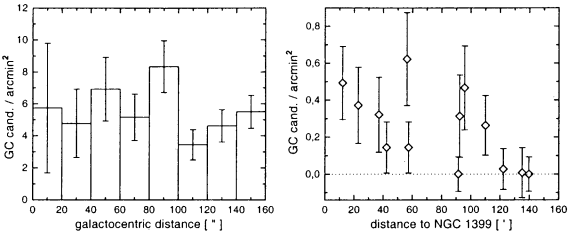

Figure 2. Projected number density of GC candidates with respect to the dE's (left panel) and with respect to the center of the cluster (right panel). Errors are calculated with Poisson's statistics.

On the other hand, the projected number density of GC candidates (after background-correction) vs. the distance to the center of the Fornax cluster, more precisely to NGC 1399, does show an increase towards the center (Figure 2).

These results suggest that the GC candidates may be moving freely throughout the potential well of the cluster, without being bound to any galaxy, thus in agreement with the existence of intracluster GCs (White 1987; West et al. 1995).

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References

Bertin, E., & Arnouts, S. 1996, A&AS, 117, 393

Cellone, S.A., Forte, J.C., & Geisler, D. 1994, ApJS, 93, 397

Geisler, D., & Forte, J. C. 1990, ApJ, 350, L5

Grillmair, C.J., Forbes, D.A., Brodie, J.P., & Elson, R. 1999, AJ, 117, 167

Miller, B.W., Lotz, J.M., Ferguson, H.C., Stiavelli, M., & Whitmore, B.C. 1998, ApJ, 508, L133

Ostrov, P.G., Forte, J.C., & Geisler, D. 1998, AJ, 116, 2854

West, M.J., Côté, P., Jones, C., Forman, W., & Marzke, R.O. 1995,AJ, 453, L77

White, R. E. 1987, MNRAS, 227, 185