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STRUCTURAL PARAMETERS OF M81 COMPACT STAR CLUSTERS

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RESUMEN

Estudiamos las propiedades estructurales de la población de cúmulos estelares compactos en M81 utilizando imágenes del *HST/ACS* en los filtros F435W, F606W and F814W y cubriendo totalmente el disco óptico de la galaxia. La población contiene 263 cúmulos estelares jóvenes así como 172 cúmulos globulares. En este trabajo analizamos la distribución de tamaños de los cúmulos estelares jóvenes y cúmulos globulares en M81 y comparamos esta última población con la distribución de tamaños de los cúmulos globulares de la Vía Láctea.

ABSTRACT

We study the structural properties of the compact stellar cluster population in M81 using the *HST/ACS* images in the filters F435W, F606W and F814W, that cover the entire optical extent of the galaxy. This population contains 263 young compact clusters as well as 172 old globular clusters. In this work, we analyzed the size distribution of the young compact star clusters and globular clusters in M81 and compared the latter with that of the Milky Way.

Key Words: catalogs — galaxies: individual (M81) — galaxies: spiral — galaxies: star clusters

1. INTRODUCTION

From the studies of sizes and structural parameters of globular clusters (GCs) in different galaxies, it has become clear that these properties correlate with the properties of their host galaxies (Brodie & Strader 2006). Also size measurements of young star clusters are on the other hand valuable tools to put constrains on the formation and early dynamical evolution of star clusters (Mackey & Gilmore 2003). Also, the similarity between the compactness and mass of the compact star clusters (CSCs) and that of the GCs is a reason to think of an evolutionary connection between them. But there are only few galaxies where the star cluster systems are rich in number and cover a wide age range (Mackey & Gilmore 2003) where you have the opportunity of studying the evolution history, with M81 being one of such galaxies.

M81 (NGC 3031) is a large Sab spiral galaxy, very similar to M31 in appearance and roughly as massive as the Milky Way (MW). M81 at a distance of 3.63 Mpc [$m - M = 27.8 \pm 0.2$; Freedman et al. 1994] is the biggest member of the M81 Group. The mass, age and metallicity of population of GCs in M81 has been studied in the past by several groups (Perelmuter et al. 1995; Chandar et al. 2001), and some of these GCs has been classified as bonafide after studying their spectra (Schroder et al. 2002; Nantais & Huchra 2010). However, the structural parameters of only a small sample of CSCs in this galaxy have been studied by Chandar et al. (2001). Now we have the opportunity of study the structural parameters of a full sample of M81 CSCs that cover a wide range in age and relate these properties with the evolutionary stage of the star clusters and their location in the galaxy.

2. COMPACT STAR CLUSTER SAMPLE

Previously we detected 435 CSCs in 29 HST/ACS (Hubble Space Telescope/ Advanced Camera for Surveys) fields in M81 (Santiago-Cortés et al. 2010). The observations covering a field of view of $\sim$340 arcmin^2, with a sampling of 0.05″ pix^{-1} (0.88 pc pix^{-1}). For each field, observations were carried out in the F435W, F606W and F814W filters (B, V and I filters, respectively). The reduction of these images was carried out by the Hubble Heritage Team (Mutchler et al. 2007).

We used the automatic detection code SExtractor to create an unbiased sample of cluster candidates (Bertin & Arnouts 1996). The B band was used for the detection of candidates, and we carried out aperture photometry of all the detected sources in each of the B, V and I images for each of the 29 fields. Then we used some photometric and physical parameters provided by SExtractor and applied a colour-based criterion to select a sample of CSCs, which is discussed in detail in Santiago-Cortés et al. (2010). Only clusters with FWHM $\leq$10 pix (8.8 pc) are selected.

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