Determination of fundamental astrophysical properties of poorly known galactic open clusters from Washington photometry

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ABSTRACT: As a complement to our photometric studies on southern open clusters (OCs), we present preliminary results obtained from a photometric analysis in the Washington system C and T_1 passbands of some poorly known Galactic OCs. The observations were made using the CTIO 0.9 m telescope. Basically, we determine reddening, distance and age of the observed objects. The present results are part of a major project which aims to characterize almost a hundred OCs observed and analyzed in a homogeneous way.

PHOTOMETRIC OBSERVATIONS AND REDUCTION

Several telescopes at Cerro Tololo Inter-American Observatory (CTIO, Chile) have been used by our group to perform a systematic investigation of OCs using the Washington photometric system. The obtained results constitute significant contributions not only for the individual characterization of the OCs but also for the global understanding of some properties of the Milky Way (see, e.g, Piatti et al. 2009). As part of this systematic study, we obtained images in the Washington system C and T_1 passbands of almost a hundred of poorly known Galactic OCs. Preliminary results are presented here for BH 84, BH 211, NGC 5381, Ruprecht 128 and Dias 6. Images were taken using the CTIO 0.9 m telescope with a 2048x2048 pixel CCD and a typical seeing of 1". The images were reduced at the Observatorio Astronómico de la Universidad Nacional de Córdoba (Argentina) with IRAF. Figure 1 shows the schematic finding charts of the five observed clusters.

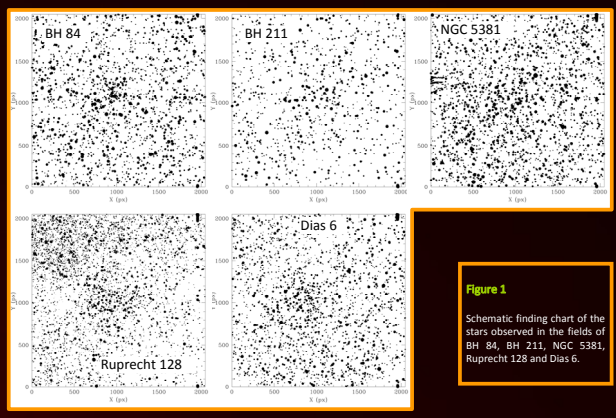


Figure 1

Schematic finding chart of the stars observed in the fields of BH 84, BH 211, NGC 5381, Ruprecht 128 and Dias 6.

STRUCTURAL CHARACTERISTICS AND FUNDAMENTAL PARAMETERS

We first built the stellar radial density profile for each OC following the usual procedure described in detail in Piatti et al. (2009). Figures 2 and 3 show, as examples for the cluster Dias 6, the radial profile and the color-magnitude diagrams (CMDs) for different circular extactions, respectively.

The fiducial characteristics of the studied clusters are well appreciated in the inner circular extractions. For this reason, we decided to use such extractions to fit theoretical isochrones of Girardi et al. (2002), using Z = 0.019 (Figure 4). The resulting reddenings, distances and ages are listed in Table 1. Errors for reddenings and distance moduli have been estimated as 0.10 and 0.25 magnitudes, respectively. We also list in Table 1 the values previously reported by Bukowiecki et al. (2011) for BH 84 and BH 211, and those published by Seleznev et al. (2012) and Dias et al. (2012) for Ruprecht 128 and Dias 6, respectively. For the first time, the parameters for the unstudied cluster NGC 5381 are derived here. Our results appear to be in good agreement with previous determinations, excep for BH 84, whose age seems to have been previously underestimated (Bukowiecki et al. 2012).

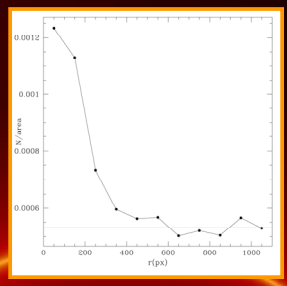


Figure 2

Stellar density profile centered on cluster Dias 6. The horizontal line represents the measured background level.

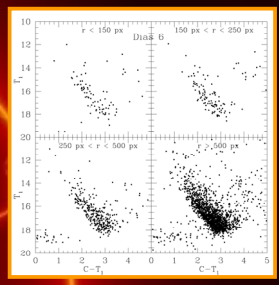


Figure 3

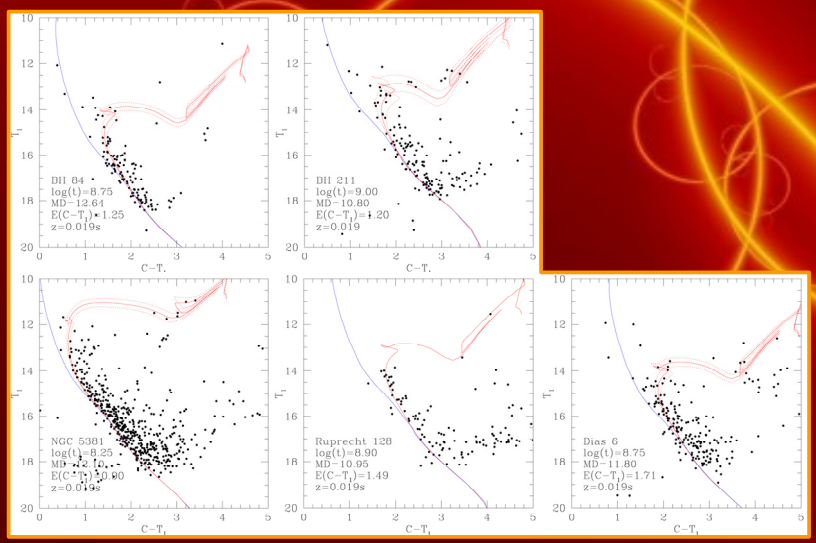
Color-magnitude diagrams of Dias 6 for stars observed in different circular extractions as indicated in each panel.

REFERENCES

Bukowiecki, Ł., 2012 (private comunication)
Bukowiecki, Ł., Maciejewski, G., Konorski, P., Strobel, A. 2011, AcA, 61, 231
Dias, W. S., Monteiro, H., Caetano, T. C., Oliveira, A. F., 2012, A&A, 539, 125
Girardi, L., Bertelli, G., Bressan, A. et al., 2002, A&A, 391, 195
Piatti, A.E., Clariá, J.J., M.C. Parisi, A.V. Ahumada, 2009, New. Astron., 14, 97
Seleznev, A. F., Carraro, G., Costa, E., Loktin, A. V., 2012, New. Astron., 15, 61

Figure 4

Adopted (T_1,C-T_1) CMDs for stars in the five observed clusters. The ZAMS and the adopted isochrones taken from Girardi et al. (2002), computed taking into account overshooting, are overploted with solid lines. For comparison purposes, we included in dashed lines the isochrones obtained considering the associated errors. The resulting fundamental parameters are indicated in each diagram.



Cluster	Age (Gyr)	E(B-V)	d (kpc)	Published Age (Gyr)	Published E(B-V)	Published d (kpc)
BH 84	0.56 ± 0.07	0.63 ± 0.05	3.4 ± 0.4	0.02	0.60	2.92 ± 0.19
BH 211	1.0 ± 0.1	0.61 ± 0.05	1.4 ± 0.2	1.6	0.48	1.38 ± 0.09
NGC 5381	0.18 ± 0.02	0.46 ± 0.05	2.6 ± 0.3	-	-	-
Ruprecht 128	0.8 ± 0.1	0.76 ± 0.05	1.6 ± 0.2	0.8 ± 0.1	0.74 ± 0.15	1.6
Dias 6	0.56 ± 0.07	0.87 ± 0.05	2.3 ± 0.3	0.7 ± 0.2	0.87 ± 0.03	2.239 ± 0.213

Table 1

Fundamental parameters obtained for the studied clusters .

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