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CCD $UBV(RI)_C$ and $2MASS$ photometry of seven open clusters

İ. Akkaya Oralhan[1] and R. Michel[2]

[1] Erciyes University, Science Faculty, Department of Astronomy and Space Sciences, Talas Yolu, 38039, Kayseri, Turkey, e-mail: iakkaya@erciyes.edu.tr

[2] Observatorio Astronómico Nacional, Instituto de Astronomía – Universidad Nacional Autónoma de México, Ap. P. 877, Ensenada, BC 22860, México

Abstract. Fundamental astrophysical parameters have been derived for Be 45, Be 55, Di 07, Feib 01, Ki 02, NGC 457 and NGC 1548 open clusters (OCs) using CCD $UBV(RI)_C$ photometric data and *PPMXL* database. CCD $UBV(RI)_C$ photometric data observed with the 84 cm telescope at the San Pedro Mártir National Astronomical Observatory (SPMO), México. The cluster members and field stars in the cluster regions have separated through their Proper Motion (PM) vector point diagrams. We have used JHK_s photometry of $2MASS$ data taken from *PPMXL* catalogue to have stellar Radial Density Profile (RDP) and determine limit radius of these seven clusters. Five different Color-Magnitude diagrams ane one color-color diagram have been used together with Padova isochrones and intrinsic-colour calibrations to obtain reddenings, metallicities, distance moduli, and ages for these seven clusters.

Key words. Techniques: photometric – (stars:) open clusters and associations: individual (Be 45, Be 55, Dias 07, Feibelman 01, King 02, NGC 457, NGC 1548)

1. Introduction

Our reduction procedures for CCD $UBV(RI)_C$ photometry can be summarized as follows: First, the basic corrections are made taking into account the effects of bias, shutter and flat fields. Second, astrometry and sky subtraction are performed. Third, photometry is performed. Fourth, the calibration is performed considering the atmospheric extinction and the transformation coefficients to the standard system. A supervised-automatic data reduction procedure was carried out with the IRAF. To determine the cluster members in all passbands ($UBV(RI)_C$JHK_s) , we removed the stars with PM uncertainties bigger than 4.0 mas/yr. We have used JHK photometry of 2MASS data taken from PPMXL catalogue to have the stellar Radial Density Profile (RDP) and determined limit radius Be 45 as seen in Fig. 1.

PM with their standard deviations in the direction of both right ascension and declination have been shown in Fig. 2, Be 45 has been taken as an example.

The Gaussian function fit to the central bins provides the mean PM in the direction of both right ascension and declination. Fundamental parameters are derived for seven OCs under this study by following the analytic methods presented in detail in the works of Akkaya et al. (2010) and Akkaya Oralhan et al. (2015) as seen in Fig. 3 and Table 1.

Table 1. The fundamental astrophysical parameters of the seven OCs.

Cluster	E(B–V)	[Fe/H]	$(V_0–M_V)$	A(Gyr)	d (kpc)
Be 45	0.95±0.11	−0.14 ± 0.11	12.04±0.10	1.12±0.17	1.66±0.03
Be 55	0.80±0.07	−0.30 ± 0.13	11.19±0.05	1.12±0.08	1.73±0.04
Di07	0.06±0.05	−0.10 ± 0.05	10.61±0.02	0.75±0.04	1.32±0.01
Fei01	0.43±0.08	−0.31 ± 0.09	11.40±0.02	0.71±0.04	1.91±0.02
Ki02	0.70±0.08	−0.17 ± 0.25	11.20±0.05	1.26±0.16	1.74±0.04
NGC457	0.40±0.07	−0.55 ± 0.33	11.90±0.05	0.18±0.03	2.40±0.05
NGC1548	0.47±0.07	−0.50 ± 0.28	12.70±0.04	1.78±0.22	3.47±0.06

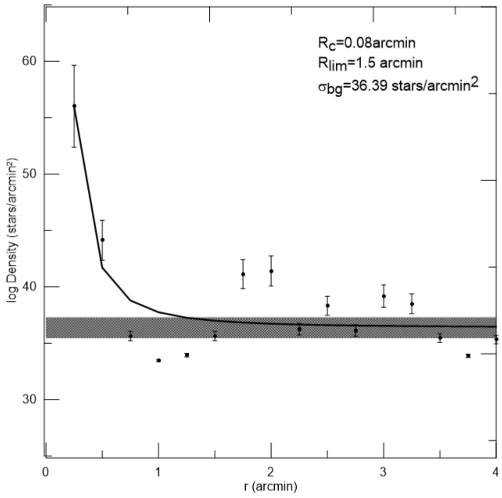

Fig. 1. The RDP of Be 45

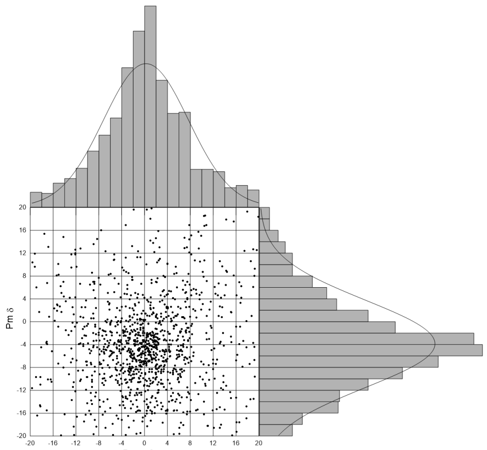

Fig. 2. PM vector point diagrams of Be 45

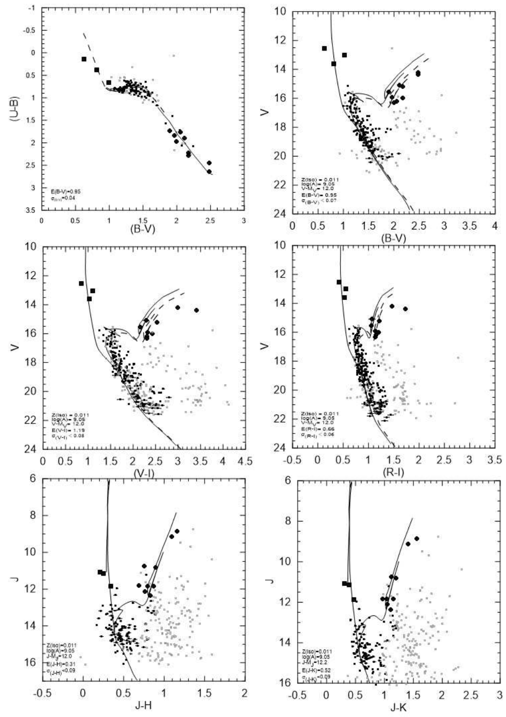

Fig. 3. Color-color and Color-Magnitude diagrams of Be 45

2. Conclusions

While for three clusters (Be 45, Di 07 and NGC 1548) of seven, their parameters are only found by 2$MASS$ and/or USNO-B1.0 catalogs, there is no available analysis for Feib 01 in literature. Also, the studies made for these clusters does not contain both $UBVRI$ and 2$MASS$ analysis simultaneously. The results obtained by us are quite consistent with each other in two data sets($UBV(RI)_C$ and JHK_s) increase the reliability of our analysis as shown in all the figures and tables.

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