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Wide Field CCD Photometry of the Young Open Cluster NGC 663

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Abstract. A deep and wide field CCD photometry of the young open cluster NGC 663 has been carried out. We report preliminary results of our investigations, specifically the determination of the cluster mass function which is found variable within the cluster region.

1. Introduction

The open cluster NGC 663 ($\alpha_{1950} = 01^h50^m.6, \delta_{1950} = 62°07'$) is located in the Cassiopeia region. The central region of the cluster has been studied widely by various authors. CCD photometry of $\sim 19 \times 19$ arcmin^2 region has been carried out by Phelps & Janes (1993). The radial density profile for the cluster derived by Nilakshi et al. (2001) using the digitized sky survey indicates a diameter of ~ 27 arcmin for the cluster NGC 663. None of the studies reported earlier covers the entire region of the cluster. Observations of low mass stars (M $\leq 1M_{\odot}$) in the corona of star clusters are of critical importance in determining the true shape of the cluster mass function (Scalo 1998). Present study is an effort to study the cluster in detail.

2. Observations and Data Reduction

The CCD $UBVI_C$ data of the cluster NGC 663 were acquired in November 1999 using the 2048 x 2048 CCD camera mounted on the 105-cm Schmidt telescope of the Kiso Observatory (Japan). At the Schmidt focus ($f/3.1$) each pixel corresponds to 1.5 arcmin and the entire chip covers a field of $\sim 50 \times 50$ arcmin^2 on the sky. The photometric measurements of the stars were performed using the DAOPHOT II profile fitting software.

3. Results

The area covered by present CCD observations is sufficiently large to study the radial structure of the cluster. The radial variation of the projected stellar density for different magnitude levels is shown in Fig. 1. Dashed lines show the density of field stars.

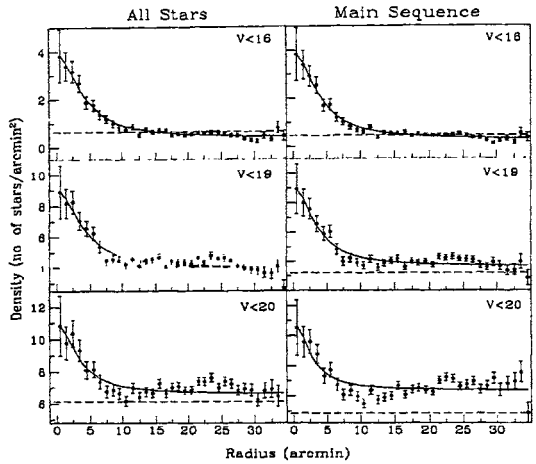

Figure 1. The radial variation of the projected stellar density. Left panel shows distribution of all the stars present in the cluster region. Right panel shows the distribution of stars in the main-sequence band.

The continuous curves represent the empirical model of King (1962) which gives core radius for the cluster ~ 4.17 arcmin. To study the mass function (MF) of the cluster we divided the cluster into two subregions; core ($r < 4.17$ arcmin) and outer region ($4.17 < r < 17.5$ arcmin). The slope Γ of the MF for the core and outer region is estimated as 0.87 ± 0.16 and 1.71 ± 0.25 respectively, which indicates that the cluster MF is steeper in the outer region of the cluster. However the MF for the cluster region having $r \leq 17.5$ arcmin is similar to the Salpeter MF ($\Gamma = 1.38 \pm 0.22$). The slope of the MF, Γ, for the cluster region having $r \leq 10$ arcmin comes out to be 1.10 ± 0.18 which is in good agreement with the value (1.06 ± 0.05) obtained by Phelps & Janes (1993) for the same region of the cluster.

References

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