HII REGIONS AND YOUNG STAR CLUSTERS IN THE MAGELLANIC CLOUDS

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ABSTRACT. Using *U BV* CCD photometry, the stellar content of HII regions and young star clusters in the Magellanic Clouds has been studied: (1) the reddenings have been determined, and ages of OB associations and young star clusters have been measured; (2) the stellar initial mass functions have been determined by using the main-sequence luminosity functions; and (3) *U BV* CCD surface photometry of nine young star clusters has been obtained and their structural properties investigated.

1. Introduction

Young stellar systems in the Magellanic Clouds provide us with an excellent laboratory to investigate the evolution of massive stars and star clusters in galaxies of lower metallicity compared with our Galaxy. Here we report briefly on a study of these systems using the *U BV* CCD photometry. Details are given in Lee (1990).

U BV CCD frames of stars in 10 HII regions, seven young star clusters and two control fields in the Magellanic Clouds have been obtained by using the CTIO 0.9m telescope plus a TI CCD in 1987 and 1989. Stellar photometry has been derived using DAOPHOT and ALLSTAR.

2. Colour-magnitude diagrams

The reddenings have been determined by using the $(U - B)$ - $(B - V)$ diagram and the ages of the stellar systems have been measured by using the moderate convective overshoot model with intermediate mass loss (Maeder and Meynet 1988, 1989). A summary of the reddenings and the ages thus determined is given in Table 1. Interestingly, some of the clusters show evidence for multiple star formation (NGC 1850, NGC 2004, NGC 2058, and NGC 2100). The distances of NGC 2004 (LMC) and NGC 371 (SMC) have been determined by using the ZAMS fitting method with the V - $(U - B)$ diagram: $(m - M)_0 = 18.4 \pm 0.2$ for NGC 2004 and 18.8 ± 0.3 for NGC 371.

3. Stellar initial mass functions

The stellar initial mass functions (IMFs) have been derived by using the main-sequence luminosity functions. The average slope of the IMFs is $\Gamma = -1.7 \pm 0.5$ for $m > 3M_\odot$, if the IMF is given by $F(\log m) \propto m^\Gamma$ (for comparison, $\Gamma = -1.35$ for the Salpeter's IMF). The slope of these IMFs is

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similar to the slope of the IMFs for the high mass end for seven MC young and old clusters given by Mateo (1988, 1990), similar to that of the IMFs for other MC OB associations given by Massey *et al.* (1989a, b), but steeper than that of the IMFs for six MC young clusters given by Elson *et al.* (1989).

4. Surface Photometry

Surface photometry of nine young star clusters has been obtained. The structural parameters have been derived by combining the surface photometry with star counts available in the literature. The radial surface brightness profiles of seven clusters are fitted well by the single-mass isotropic King models (the profiles of two open clusters, NGC 1844 and NGC 346, are bumpy). Their structural properties such as the core radii, the tidal radii, the concentration degree, and the cluster masses are between those of Galactic open clusters and those of Galactic globular clusters. The masses of NGC 1850 and NGC 2100 ($6x10^5 M_\odot$ and $5x10^5 M_\odot$, respectively) are similar to those of Galactic globular clusters.

Table 1. Reddenings and ages of HII regions and young star clusters

Object	$E(B-V)$	Age(My)	Object	$E(B-V)$	Age(My)
LMC N 11AB	0.20 ± 0.05	3 ± 3	NGC 2004 S4′	0.03 ± 0.03	12 ± 5
LMC N 44BC	0.20 ± 0.05	3 ± 3	NGC 2058	0.25 ± 0.05	60^{+40}_{-10}
LMC N 57A	0.05 ± 0.03	8 ± 3	NGC 2100	0.24 ± 0.05	$8 \pm 3, 18 \pm 10$
LMC N 59A	0.25 ± 0.25	0 ± 5	NGC 2100 E5′	0.15 ± 0.05	$12 \pm 3, 70 \pm 10$
LMC N 83	0.13 ± 0.03	0 ± 3	NGC 2164	0.12 ± 0.05	60 ± 30
LMC N 105A	0.15 ± 0.05	7 ± 3	SMC N 12B	0.22 ± 0.05	0 ± 3
LMC N 157A	0.40 ± 0.20	2 ± 2	NGC 330	0.03 ± 0.05	20 ± 10
NGC 1844	0.09 ± 0.03	80 ± 20	NGC 346	0.10 ± 0.03	5 ± 3
NGC 1850	0.15 ± 0.05	$0 \pm 3, 40^{+50}_{-10}$	NGC 371	0.07 ± 0.05	6 ± 3
NGC 2004	0.08 ± 0.03	$10 \pm 5, 25 \pm 5$			

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5. References

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