MASSES AND RELAXATION TIMES OF STAR CLUSTERS IN THE SMC

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ABSTRACT

Plates taken with the 1.2m U.K. Schmidt Telescope and the 3.8 AAT Telescope have been used in order to derive the dynamical parameteres of 43 various clusters of the SMC by means of star counts. The clusters are divided into two main categories : (i) the disk, "blue" and "intermediate" in colour, young, mainly globulars and (ii) the halo, "red", old globular clusters. The disk clusters have been found to be more massive and older than the galactic open clusters, whereas the halo clusters are at least 10 times less massive than the galactic globulars. The relaxation times of the disk clusters are larger than their evolutionary age while the observed density profiles always show evidence of well relaxed systems.

OBSERVATIONS

The observational material was taken by the 1.2m U.K. Schmidt Telescope in Australia and by the 3.8m AAT Telescope on IIaD and IIaO emulsion plates. The star count reductions and the derived density profiles are discussed and given elsewhere (Kontizas, Danezis, Kontizas, 1981 ; Kontizas and Kontizas, 1982).

DYNAMICAL PARAMETERS

By means of star counts it is possible to derive the stellar density distribution and therefore the tidal radii, r_t, of the star clusters (King, 1962). Assuming that all clusters are approximately spherical a fit with theoretical models gives us the core radii, r_c, and the concentration parameters, $\log \frac{r_t}{r_c}$.

These values and the location of each cluster in the SMC permit us to derive their masses and relaxation times. The integrated colours,

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existing c-m diagrams and previous classifications of the SMC clusters were the criteria of dividing the clusters into two basic categories :

(i) the disk clusters which are the young, "blue" and intermediate in colour clusters and

(ii) the halo, "red" old clusters

The disk clusters were found to have large tidal radii compared to the galactic open clusters with values accumulated at ~30pc and concentration parameters higher than their galactic counterparts. Their masses are also found at least 10 times higher than those of our galaxy. Their relaxation times, much higher than their evolutionary ages mean that the clusters are not relaxed, although their density profiles favour well relaxed systems. The LMC, "blue", clusters were found to behave in the same way (Freeman, 1974 ; Geyer and Hopp, 1982).

The "halo" clusters are found to have tidal radii and concentration parameters similar to those of the galactic globulars. The masses are at least 10 times less massive than their galactic counterparts and the $M/_L$ ratios rather small for old clusters. Their relaxation times are smaller than their evolutionary ages (where exist) showing that the old SMC clusters are well relaxed systems and being in agreement with their density profiles.

CONCLUSION

The disk clusters of the SMC are more massive and older than the galactic open clusters whereas the halo SMC clusters are less massive and younger than the galactic globulars.

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