OBSERVED VARIATIONS IN THE DENSITY PROFILES OF STAR CLUSTERS IN THE LMC

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Several dynamical theories have been developed in order to approach the dynamical evolution of stellar systems and explain the observational data. The observed density profiles of the clusters can be a valuable source of information towards the understanding of their dynamical properties. King in a series of papers has connected the established theories with the observed profiles in clusters of our own Galaxy (King, 1962, 1966; etc.). Density profiles can be obtained by means of star counts and/or by means of photometric photometry. So far the observations for clusters in our Galaxy and the MCs appear to fit well the so called King models and provide information of their tidal radii, total masses and concentration parameters (Kontizas, 1984).

Thirty eight remote LMC clusters randomly distributed around the LMC rotation centre were measured by means of star counts in plates taken with the 1.2 m U.K. Schmidt telescope to derive their tidal radii and total masses. For some regions I and J plates were available.

Seven of these clusters were found to violate the usual picture of a conventional density profile. Fig. 1 illustrates the number of stars per unit area versus the distance from the cluster centre for one of those clusters. A clear density fluctuation occurs at the outer regions of all seven clusters which is systematic and too large to be attributed to random background anomalies.

The radii r_a and r_b are defined as the distances from the centre of the clusters to the limits of the observed bumps (Fig. 1). If $w = r_b - r_a$, is the width of the fluctuation, the diagram of w versus r_b (Fig.2) shows that there is a linear correlation between these two quantities.

It was attempted to define a tidal radius r_t using the conventional methods usually applied to similar studies. Two values of the background density were used. Although it seems that the background is reached beyond the fluctuation, the tidal radius was not always possible to be found. For the background value corresponding to the density at

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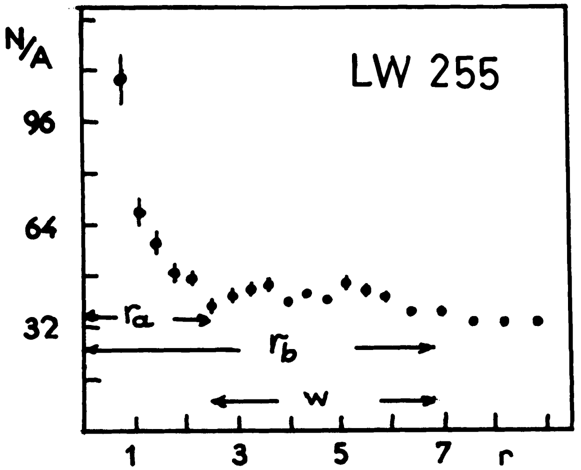

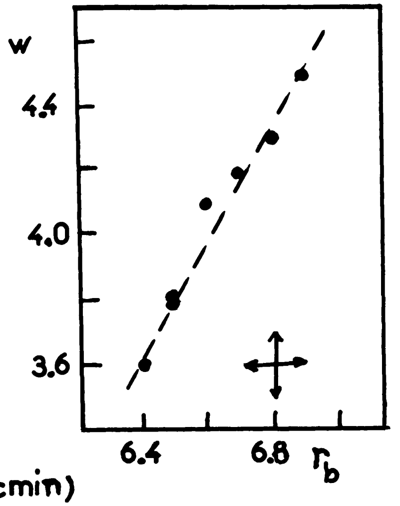

Fig. 1. Number of stars per unit area versus the distance from the cluster center.

Fig. 2. The width of the observed fluctuation versus the distance r_b.

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r_a a tidal radius has been derived for all clusters. The so defined tidal radii show a clear correlation with the ratio r_b/r_t.

The phenomenon is extremely interesting and it has to be studied further both observationally and theoretically. Is it a stage of the cluster's dynamical evolution and how this is related to the gravitational attraction by the central mass of their parent galaxy? A possible explanationcan be given by the existence of a corona around the cluster due to the irregular forces of the star field surrounding it (Agekyan and Belozerova 1979).

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