Chapter X

Poster Papers

Formation and Evolution of Globular Clusters

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Judy Cohen fields the discussion after Roger Bell's talk

The poster papers received due attention and discussion

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A MULTICOLOR CCD SURVEY OF SOUTHERN GLOBULAR CLUSTERS

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The existence of deviations of the observed photometric profiles with respect to the King models is a known fact (e.g., Newell and O'Neil, 1978; Aurière, 1983) and has been recently emphasized in the large survey by Kron et al., 1984. The origin of the light "excesses" (or defects) in the nuclear regions is, however, not very well understood. This work aims at clarifying this problem on the basis of multicolor ($BVRI_{KC}$) CCD observations.

Observations were carried out with the 0.9m telescope at CTIO, including a range of expossure times and also off-center images for a good estimate of the sky level. A set of H-alpha frames (taken with a narrow filter centered on λ = 6563 Å) was also secured. Data reduction and handling was performed with the "Quasi-Interactive Image Processing System" developed at La Plata Observatory.

The overall photometric centers of the clusters were determined using different techniques (profile folding on resolution degraded images, etc.) and each profile was fitted with a King curve. We found a very good agreement between our derived concentration radii and those given in the literature (e.g., $\pm$ 0".5)

A summary for some southern clusters is given in Table I. In brief, these clusters can be classified as: "Perfect" King clusters, clusters with light excesses, post-collapse objects (i.e. with slope -1 in the surface brightness vs. radius diagram; Djorgovski and King, 1984) and finally, clusters with defects of light. No significant gradients were found in the peripheral regions of any cluster and, when present, they were confined to the innermost regions, a situation similar to that found by Peterson, 1986, or Forte and Méndez, 1984.

An interesting result is that, after a preliminary remotion of seeing effects, the regions showing excesses of light, have very similar linear sizes. Adopting the scale of distances given by Webbink, 1984, the average half radius for 8 clusters results 0.14 $\pm$ 0.05 parsecs (for clusters spanning core radii from o.16 to 1.86 pc). Furthermore, the in-

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tegrated absolute magnitudes of the excesses M_V are also similar, yielding $M_V = -3.1 \pm 0.4$. NGC 2808, a cluster observed with a different technique (Forte and Méndez, 1984) has also a comparable light excess with $M_V = -3.4$.

Unfortunately, integrated colors for these regions (subtracting the underlying King profiles) do not help in identifying their nature. While NGC 362 (and NGC 2808) have (B-V) colors redder than the average for the cluster, the remaining clusters show bluer colors in their nucleus. The color difference in B-V ranges from zero to -0.23. These values are not correlated with relaxation time, metallicity,absolute magnitude, or Mironov's index (taken from Zinn, 1980), which is a description of the horizontal-branch morphology. An alternative way to produce a nuclear "blueing" would be the presence of hot gas. However, a large range of "astrophysical" gas temperatures would originate an H-alpha contribution which, at our detectability levels, is not present in any cluster. The small linear sizes of the regions with light excesses demands a very careful treatment of seeing effects in order to reveal the existence of gas emission, which is under way.

We did not detect extended H-alpha emission in a number of clusters which have been reported as having emission in the literature. On the other hand, we found (by simulating concentric aperture photometry) that centering errors may originate spuriously large H-alpha excesses, particularly in small core radii clusters.

TABLE I
Southern Globular Clusters CCD Survey

Object	Type	H.W.	Mv(excess)	Δ(B-V)	Observations
NGC 362	Excess	0.130	-3.40	+0.26	
NGC 1261	Excess	0.216	-3.02	-0.11	
NGC 1851	Excess	0.170	-3.16	+0.08	
NGC 5824	King	--	--	--	
NGC 6266	Excess	0.148	-3.24	-0.23	
NGC 6388	Excess	0.160	-3.01	--	
NGC 6624	Post-collapse	0.086	-3.69	+0.00	Djorgovski and King
NGC 6723	Deffect	--	--	--	
NGC 6752	Post-collpase	0.144	-3.10	+0.01	Newly found
NGC 7099	Post-collpase	0.072	-2.46	-0.13	

H.W. : Half width of the light excess in pc.
Mv : Absolute visual magnitude of the excess.
Δ (B-V) : (B-V) difference between the excess and the cluster.

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