STAR CLUSTERS AS TRACERS OF GALACTIC SUBSYSTEMS

B. BARBUY[1], E. BICA[2], S. ORTOLANI[3]
1 IAG-USP, S. Paulo, 2 UFRGS, Porto Alegre, Brazil; 3 U. Padova, Italy

ABSTRACT. We have obtained CCD BVRI colour-magnitude diagrams for a series of disk globular clusters, improving parameters and detecting a new one: Lyngå 7. Using the magnitude difference between turn-off and horizontal branch Δ(TO-HB) as an age discriminator, and their spatial distribution we compare old disk open clusters, young halo globular clusters, and metal-rich disk globular clusters, obtaining clues to the Galaxy formation process.

1. Discussion

Some star clusters previously catalogued as open clusters have been recently classified as globular clusters from colour magnitude (CMD) analyses, e.g. Ruprecht 106 (Buonanno et al 1990) and Lyngå 7 (Ortolani et al 1992a). They arise a major interest because they might present age and metallicity values of a possible intermediate population between the young disk and the old spheroidal subsystems of the Galaxy. We have improved the sample of metal-rich globular clusters using CCD photometry. These clusters are: NGC 6553 (Ortolani et al 1990), NGC 6528 (Ortolani et al 1992b), Terzan 1 (Ortolani et al 1992c), as well as Lyngå 7. The analyses of Colour Magnitude Diagrams (CMDs) allowed us to better derive reddening, metallicity, position in the Galaxy, and age estimates for the clusters, also based on Δ(TO-HB) values. In Table 1 are given the relevant parameters to the present discussion. Also included in the Table are: (i) the young halo globular clusters Pal 12 (Gratton & Ortolani 1989) and Rup 106 (Buonanno et al. 1989); (ii) some of the oldest open clusters in the Galaxy (Demarque et al 1992); (iv) the classical metal-rich globular cluster 47 Tuc, which seems to be a transient cluster between the halo and disk globular cluster systems.

The spatial distribution of these clusters in the scale height z(kpc) as a function of the projected distance from the Galactic center Rxy(kpc), assuming a distance from the Galactic center from the Sun of 8.8 kpc, is given in Figure 1. The disk system studied by Armandroff (1989) are also shown. Lyngå 7 is at the edge of the disk subsystem of metal-rich globular clusters in the Galaxy, very close to the plane. The scale height of $z \approx 0.8$ kpc for the Galactic disk corresponds to the old open clusters. From the absolute ages and ΔV(TO-HB) estimates (Table 1), one can conclude that while the halo was still forming clusters at moderate metallicities like Pal 12 and Rup 106, the metal-rich subsystem of disk globular clusters with scale height $z \approx 1$ kpc was forming Lyngå 7. This epoch almost overlaps with the formation of old disk clusters of about solar metallicity, like NGC 6791.

Lyngå 7 appears to be the young tail of the disk metal-rich globular clusters.

The connections in time, metallicity and spatial distributions give important clues to the collapse steps of the Galaxy, and consequently to the stellar subsystems formation.

H. Dejonghe and H. J. Habing (eds.), Galactic Bulges, 323–324.

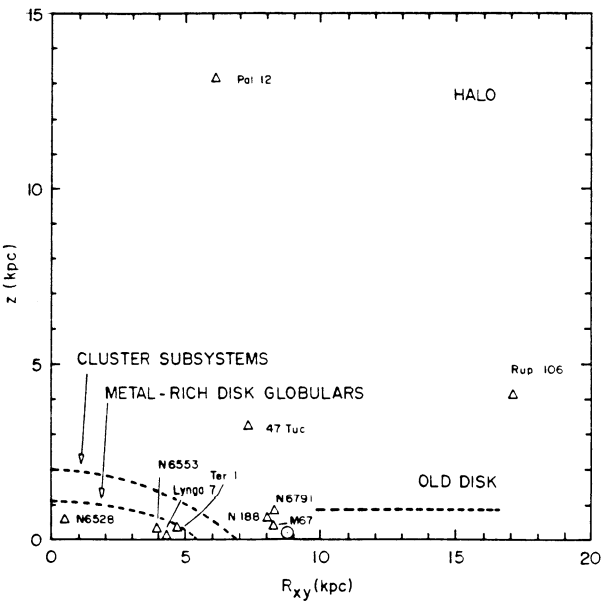
References

Armandroff, T.E.: 1989, AJ 97, 375
Buonanno et al.: 1980, AJ 100, 1911
Demarque, P., Green, E., Guenther, D.: 1992, AJ 103, 151
Gratton, R., Ortolani, S.: 1989, A&AS 73, 137
Ortolani, S., Barbuy, B., Bica, E.: 1990, A&A, 236, 362
Ortolani, S., Barbuy, B., Bica, E.: 1992a, A&A, submitted
Ortolani, S., Bica, E., Barbuy, B.: 1992b, A&AS, 92, 441
Ortolani, S., Bica, E., Barbuy, B.: 1992c, A&A, in press

Table 1 - Basic parameters for the studied clusters

Cluster	$\Delta V(TO-HB)$	z(kpc)	R_{xy}(kpc)	[M/H]
NGC188	2.75	0.6	8.1	0.0
NGC6791	2.95	0.8	8.3	≥ 0.0
M67	2.20	0.4	8.3	0.0
NGC6528	3.3	0.6	0.5	+0.12
NGC6553	3.3	0.3	3.9	−0.29
Terzan 1	− − −	0.1	4.3	+0.24
Lynga 7	3.05	0.3	4.7	−0.4
Rup 106	3.15	4.1	17.1	−1.09
Pal 12	3.10	13.1	6.2	−1.14
47 Tuc	3.60	3.2	7.4	−0.71

Figure 1 - Scale height z(kpc) vs. distance from the Galactic center in the plane R_{xy}(kpc)



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