

PHOTOMETRIC MODELS FOR GLOBULAR CLUSTERS FROM POPULATION SYNTHESIS

R. Capuzzo Dolcetta

Astronomical Institute, Univ. of Rome

ABSTRACT: Integral fluxes (Bolometric and U, B, V) are computed in a completely theoretical frame in order to investigate the structural properties and stellar content of coeval stellar systems of various ages and metal abundance. Some results concerning the problem of the color gap in the distribution of the sample of Magellanic Cloud clusters are discussed.

1. THE SYNTHETIC EVOLUTIONARY MODELS

We computed a set of synthetic cluster models for bolometric and U, B, V fluxes for globular clusters of various ages and chemical compositions ($1.2 \times 10^7 \leq \text{age} \leq 10^{10}$ (yrs); $X = 0.68$, $Y = 0.3$, $Z = 0.02$, 0.001) in the way described in detail by Battinelli and Capuzzo Dolcetta (1986, hereafter BCD).

2. AN APPLICATION TO MAGELLANIC CLOUD CLUSTERS

In BCD we investigated data on ages and masses of Magellanic Cloud (LMC and SMC) clusters. Here we report only on some considerations of the problem of the gap in the distribution of these clusters in the HR diagram, around $(B-V) = 0.5$ (Gascoigne 1980, van den Bergh 1981).

Following the line described in BCD and in Capuzzo Dolcetta (1986), we obtained theoretical color histograms and synthetic HR diagrams (to be compared with the corresponding observational ones). They show a clear gap in the $(B-V)_0$ color in the range of 0.3 to 0.5. One of the theoretical color-magnitude diagrams is shown in the left panel of Fig. 1. Fig. 1b shows the distribution of the LMC clusters.

What we can infer is that (being aware of some necessary approximations in the models) the occurrence of a gap in the synthetic HR diagram at roughly the same color as the gap in the observed distribution can be due to a maximum in the velocity along the synthetic evolutionary path for $(B-V)_0$ near 0.3 (for $Z = 0.001$). We do not need an ad hoc hypothesis of two bursts of cluster formation,

only a reasonable choice of the cluster age distribution.

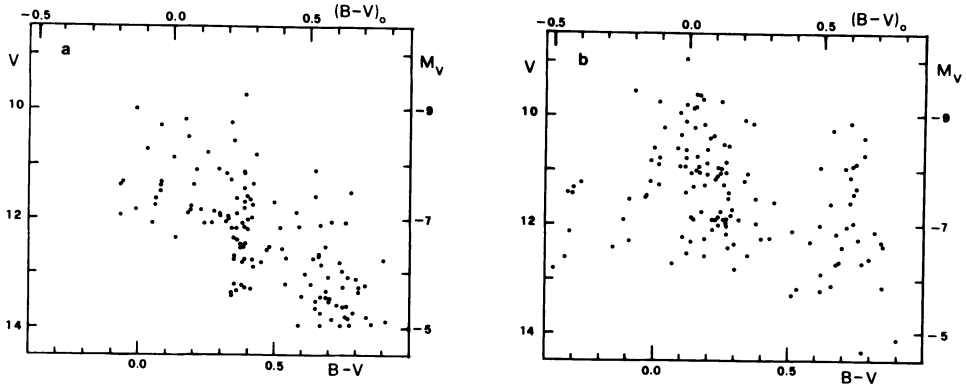


Fig. 1a. A theoretical CM diagram for a sample of clusters (in the range $-0.2 < (B-V)_0 < 0.8$) to be compared with Fig. 1b. in which an observational diagram of LMC clusters is presented. (Data from van den Bergh 1981)

A more precise answer to the problem will be given by the introduction in our population synthesis code of a more detailed set of stellar evolutionary tracks with masses in the interval of 2 - 3 solar masses.

REFERENCES

- Battinelli, P. and Capuzzo Dolcetta, R. 1986, in preparation.
 Capuzzo Dolcetta, R. 1986 in Proc. of the Rome Astrophys. Coll., The Age of the Stellar Systems, in press
 Gascoigne, S. B. C. 1980 in IAU Symposium No. 85, Star Clusters, J. E. Hesser, ed., Reidel, Dordrecht, p. 305.
 van den Bergh, S. 1981 Astron. Astrophys. Suppl. 46, 79.