THE DISTANCE MODULUS OF LMC

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Deep CCD photometry of the star clusters NGC2162 and NGC2190 in LMC presented by Schommer et al.(1984)is used togheter with new evolutionary models computed by Bertelli et al.(1985a) which take into account overshooting from convective cores, to derive the clusters ages and the distance modulus of LMC. A preliminary analysis of the two clusters indicates that NGC 2162 and NGC 2190 belong to the same class of clusters discussed by Barbaro and Pigatto(1984).In fact,for the turn-off mass estimated by means of classical models(<2.2 $m_\odot$),these clusters should possess an extended red giant branch and a bimodal distribution of red stars(cifr.Fig.2). On the contrary they show a clump of red stars. This means that ages and other properties derived from classical models for this range of masses, may not correspond to reality. With the new models,stars of mass as low as 1.6 $m_\odot$,ignite helium in non degenerate conditions,avoid the long lived RG phase,and burn helium as more massive stars. As consequence of it, a clump of red giants is expected. In Fig.1,we show new isochrones(Bertelli et al.1985b)derived from models with overshooting,overlaid to the CM diagram of NGC 2162. Theoretical luminosities and T_{eff}'s are converted into M_V:$(B-V)_0$ plane by means of T_{eff}:(B-V):BC scales based on models atmospheres collected from several authors(Chiosi,1985). At any given age,the new isochrones run brighter than those of Ciardullo and Demarque(1977). By means of the luminosity function,a method more objective(Paczsynski,1984) than the standard one of ZAMS and/or isochrone fitting,with a reddening of E(B-V)=0.06 and chemical composition X=0.700 and Z=0.02,we find ages of 1 10^9yr and a true distance modulus of $(m-M)_0$=18.6 instead of 18.2±0.2 mag given by Schommer et al.(1984). Fig.2 shows the theoretical luminosity function at age 1 10^9yr,(age preliminarly assigned to the clusters by isochrone fitting) for main sequence and red giant stars obtained with Salpeter's IMF(top panel), compares it with the correspondent one of Ciardullo and Demarque(1977),and finally shows the observational LF we derive from stars counts(bottom panel) for NGC 2162. By imposing coincidence between theoretical and observational LF's at the side of main sequence fall-off and rising of the red giant clump,we derive the distance modulus $(m-M)_0$=18.6. In conclusions,models with overshooting not only interpret the morphology of this class of clusters,but assigne LMC a distance modulus in agreement with other independent determinations(Walker,1984; Visvanathan,1985).

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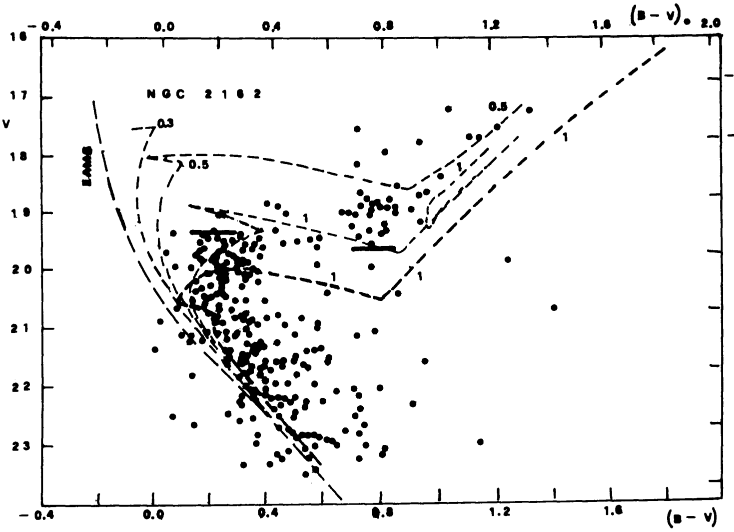

Figure 1.
CM diagram of NGC 2162 from Schommer et al. (1984). The dashed lines indicate new isochrones for Z = 0.02 as described in the text. The heavy dashed line shows the isochrone of 1 10^9 yr of Ciardullo and Demarque(1977) with Z=0.01. The heavy horizontal lines indicate the caracteristic luminosity used to derive the main sequence and red giant star luminosity function.

Figure 2.
Theoretical luminosity functions (top panel) for main sequence and red giant stars along the isochrone 1 10^9 yr. The red giant luminosity function derived from Ciardullo's and Demarque's isochrone with age 1 10^9 is shown by the dashed line. Observational luminosity functions (bottom panel) for NGC 2162.