THE DEVELOPMENT OF THE RED GIANT BRANCH IN MAGELLANIC CLOUD CLUSTERS: PROGRESS REPORT

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In close connection with a parallel theoretical study (see Sweigart, Greggio and Renzini 1987) CCD photometry in the B and V bands of star clusters in the LMC and SMC was started in 1983 using the ESO telescopes. To study the development of the red giant branch (RGB) we selected intermediate age clusters using the following criteria : 1) integrated (B-V) color between 0.3 and 0.6 and/or 2) membership in the type IV group of the Searle, Wilkinson and Bagnuolo (1980) classification (SWB). A few other clusters (e.g. NGC 121) were observed for calibration purposes. The observed clusters are NGC 121, 152, 1756, 1831, 1841, 1987, 2164, 2173, 2209, 2249, 1466, 1866, 2107, 2108 and 2134 and good or very good quality CM diagrams have been obtained for the first ten of them. Out of this list, those clusters with a well developed RGB are NGC 121, 152, 1841, 1987 and 2173. Using the CCD frames, integrated (B-V) colors have also been obtained for some of the clusters.

A preliminary comparison of these CM diagrams with theoretical isochrones obtained from the models presented by Sweigart et al. (1987) gives the following indications: 1) Good agreement between the theoretical Main Sequence (MS) and the observations of the clusters is achieved, adopting a foreground reddening of 0.1 mag. and a true distance modulus of 18.5 mag. This result differs from that found at an early stage of this investigation (Buonanno et al. 1986) as our early CM diagrams were affected by a strong color equation. It appears that access to sufficiently blue standards is of crucial importance for settling the LMC distance issue (cf. Schommer, Olszewski and Aaronson 1984). 2) NGC 1756 exhibits an extended blue loop, indicating a fairly young age. From the MS fitting to theoretical isochrones one derives that this cluster is younger than 0.3 gyr. A fainter red clump is also present, which clearly belongs to the LMC field. This suggests that the intermediate color of 0.40 (van den Bergh 1981) reflects the

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field contamination, the cluster itself being intrinsically bluer. 3) An age between 0.3 and 0.5 gyr can be inferred for NGC 1831 and 2249. In these clusters no extended RGB is present. The integrated colors are respectively (B-V) = 0.34 and 0.43, suggesting SWB type III and IV for the two clusters. 4) For NGC 2209 the comparison with the isochrones gives an age of ~ 0.8 gyr, while the RGB is still only sparsely populated. This may indicate that the RGB develops at an age older than predicted by standard models, as first suggested by Barbaro and Pigatto (1984). The integrated (B-V) color turns out to be 0.52, taking into account all stars within 31" from the center, but drops to 0.46 when two very red carbon stars are taken out. 5) NGC 1987 is the youngest cluster in our sample which seems to have a well developed RGB. However, the CM diagram for the inner part ($r < 31"$) of the cluster does not exhibit an extended RGB and the MS fitting yields a much younger age (~ 0.4 gyr) than the CM diagram for the outer part (~ 1 gyr). Therefore, this cluster turns out to be substantially contaminated by an older LMC field, in which the RGB has already developed. The integrated (B-V) colors are 0.54 and 0.65 for the inner and for the outer parts, respectively.

For a 62" 'aperture' we find (B-V) = 0.52 and 0.54 for NGC 2209 and 1987 respectively, in very good agreement with photoelectric values. This seems to indicate that the presence of the RGB has little effect on the integrated (B-V) colors of star clusters, as anticipated by Wyse (1985). This point is further illustrated by the following experiment: when subtracting RGB images from a CCD frame the (B-V) color for the outer part of NGC 1987 drops from 0.65 to 0.53. This shows that the presence of an extended RGB makes the cluster redder by only ~0.1 mag. For this reason, we are now inclined to exclude the development of the RGB from the list of possible origins of the dichotomy in the (B-V) distribution of Magellanic Cloud clusters (cf. Renzini and Buzzoni 1986). This dichotomy is instead more likely to be due to a degeneracy in the (B-V) of old and young clusters, coupled with the rapid fading of the clusters (cf. Elson and Fall 1985).

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