CROWDED FIELD ELECTRONOGRAPHY IN THE LMC

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OBSERVATIONS

An area in the LMC situated 1.2 degrees from the centre of the Bar has been studied with the ESO 3.6 m telescope using electronography and photoelectric measurements for calibration. Coordinates for 1950.0 are 5^h20^m, -71^o. Six exposures have been used, with exposure times ranging from 8 to 90 min. Typical seeing was 1.5 arcseconds FWHM. This investigation is a continuation of our earlier study with the ESO 1.5 m telescope (Lindgren et al., 1980).

REDUCTIONS

To deal with the difficulties of making precision photometry in crowded fields, software has been developed along the following principles:

1) A numerical two-dimensional stellar profile (point spread function, PSF) is formed by merging a number of non-overlapping star images.
2) Stars and conglomerates of stars are pin-pointed interactively on high contrast, multi-coloured displays.
3) A least squares fit is iterated between each conglomerate and a model group using the PSF (step 1) and the initial coordinates (step 2). During this process saturated and disturbed pixels are disregarded. Free parameters are intensity, position and background level.
4) Local background positions are interactively selected for each conglomerate.

RESULTS

A. In figure 1 is shown the resulting colour-magnitude diagram, based on 312 stars. The right and top scales, used by ZAMS, are M_V and $(B-V)_o$. The main features are:

1) A well developed giant branch with a narrow red tip, typical of an old population.
2) A clump on the red horisontal branch, similar to clumps in old galactic clusters.
3) A main sequence which also contains young stars.

S. van den Bergh and K. S. de Boer (eds.), Structure and Evolution of the Magellanic Clouds, 99–100.

4) Red giants typical of a young population.
5) An unusual number of stars at the population I subgiant position.

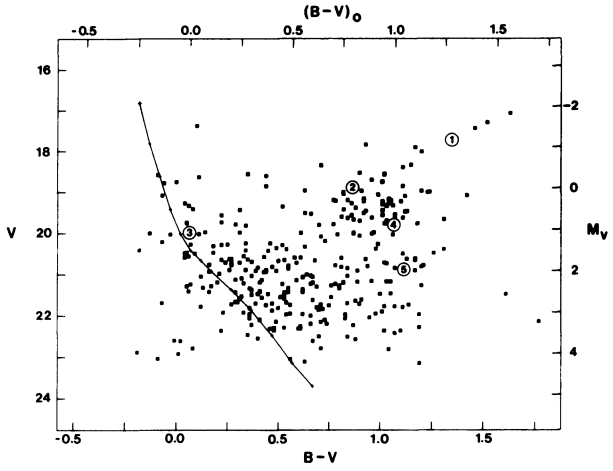

Figure 1. Colour-magnitude diagram.

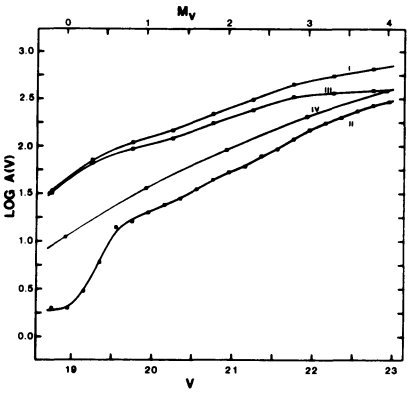

Figure 2. Accumulated star counts.

B. Figure 2 compares the following four graphs of log A(V) values:

I. The counts in our field multiplied by a completeness factor derived from experiments with insertion of synthetic stars.
II. The star counts obtained by Stryker and Butcher (1981) near NGC 1783 corrected for the difference in field sizes.
III. Our counts minus those of Stryker and Butcher. This should approximately cancel the halo contribution to our counts and leave only the LMC disk stars.
IV. Nearby stellar luminosity function reduced to a volume corresponding to the area studied in the LMC with a depth of 600 parsecs. This value has been chosen so as to give the same value for V=23 as log A(V) of graph III.

The main features are:
1) Our field is more than three times richer in stars brighter than V=22 than the field of Stryker.
2) Particularly stars of about V=19 are much more abundant in our field. Figure 2 shows that some of these are blue main sequence stars with ages less than 100 million years.
3) Graph III flattens out at about V=23, showing again the behaviour of a young population. The comparison with the solar neighbourhood graph (IV) reinforces this point.

REFERENCES

Lindgren, H., Ardeberg, A., Linde, P., Lyngå, G.: 1980, in ESO Workshop on two dimensional photometry, Noordwijkerhout, p. 155
Stryker, L.L., Butcher, H.R.: 1981, in IAU Colloquium No. 68, Schenectady, N.Y., p. 255

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