

FOUR-COLOR MEASURES OF BHB STARS IN M 4, M 13 AND M 55

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Strömgren four-color photometric measures have been made of blue horizontal-branch A stars in the globular clusters M 4, M 13 and M 55 with the Steward Observatory 90 inch telescope and with the 60 inch telescope at Cerro Tololo Inter-American Observatory. These stars are faint, ranging in V magnitude from 13.6 in M 4 to 15.5 in M 13 and the corresponding errors in the four-color indices are ± 0.04 to 0.06 in the c_1 index, for one observation. The error of the mean value of the c_1 indices is approximately ± 0.02 for most of the stars since they have been measured from 4 to 10 times each.

The distribution of the measured indices in the $(b-y)_0$, $(c_1)_0$ diagram is shown in Figs. 1a - c. The solid line indicates the position of the zero-age main sequence for Population I stars. The BHB stars scatter in the diagrams in the characteristic position for horizontal-branch stars 0.2 to 0.4 magnitudes above the main sequence. The vertical size of the triangles is approximately 0.02 mag. In each figure the majority of the points representing the four-color indices of the BHB stars fall about 0.15 magnitudes above the main sequence line. There are also stars in each diagram that fall ~ 0.25 magnitudes or more above the main sequence; these may be stars that are somewhat further along the HB evolutionary track than the stars with $\Delta c = 0.15$. When BHB stars in additional globular clusters of differing $[\text{Fe}/\text{H}]$ values have been measured it will be interesting to see if a similar pattern is found in each cluster.

In February, 1986, CCD photometry in the four-color system was done at Cerro Tololo of three globular clusters, M 4, NGC 2808 and NGC 4833. In the latter two clusters, about 20 BHB stars per cluster were measured. Additional globular clusters will be investigated by means of CCD four-color photometry at Kitt Peak National Observatory. When these data are reduced then it will be possible to see if the relation derived for correcting surface gravities in M 4 is the same relation derived for the BHB stars in NGC 2808 and 4833. In Fig. 1 the distribution of BHB stars in the globular clusters M 4 and M 13 seem to be quite similar, but the c_1 indices for BHB stars in M 55 (the most metal-poor of the three clusters) seem to have average values somewhat

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larger than the c_1 indices in the other two clusters. If the relations for BHB stars are similar in the majority of globular clusters then one can have confidence in the derived surface gravity corrections. The BHB stars in the globular clusters in the observing program range in $[\text{Fe}/\text{H}]$ from -1.3 to -2.2 so that if there is a difference as a function of metal abundance the nature of that relation can be determined.

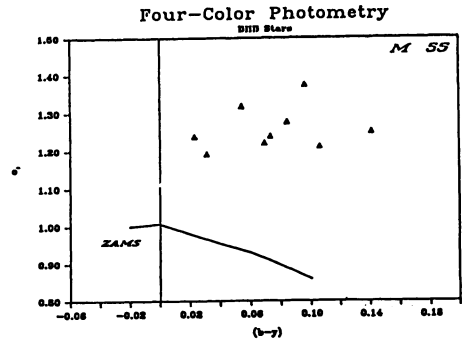
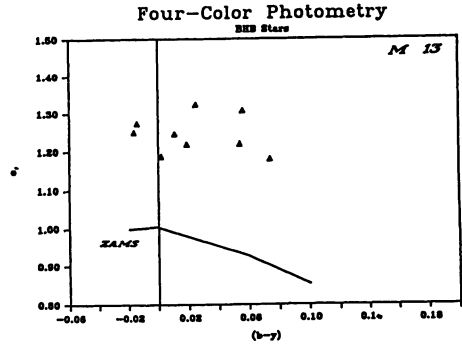
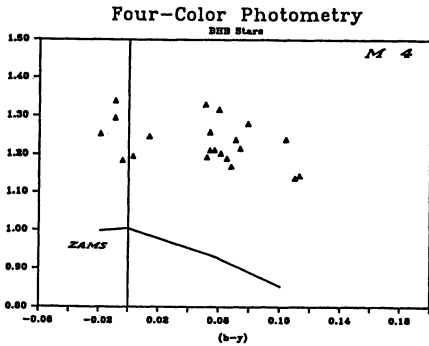


Fig. 1a, b, c.
Four-color photometry
of BHB stars in the
globular clusters M 4,
M 13 and M 55. The
solid line represents
the location of the
ZAMS.