

FOUR-COLOR OBSERVATIONS OF BLUE HORIZONTAL-BRANCH STARS*

(Abstract)

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Effective temperatures and surface gravities can be calculated for early-type stars with $0.5 < \theta_e < 0.7$ and $2.0 < \log g < 4.4$ by means of a grid computed by a graduate student at State University of New York at Albany, (Linda Matlock) which relates the four-color indices $b-y$ and c_1 to θ_e and $\log g$. The four-color indices must be dereddened and deblanketed, then θ_e and $\log g$ can be read off the grid with rms errors of ± 0.015 in θ_e and ± 0.2 in $\log g$. The details concerning these relations will be published soon in another article.

Blue horizontal-branch stars have been measured in the following globular clusters: M4, M5, M13, M55, and NGC 3201. Each star has been observed an average of four times and the rms error of the mean c_1 and $b-y$ indices are approximately ± 0.03 to ± 0.04 mag. About ten blue horizontal-branch stars, well-spaced in $b-y$ color, are selected for measure in each globular cluster. The indices of the measured stars are plotted in Figure 1. The index c_1 is plotted against the index $b-y$ (both indices have been dereddened and deblanketed). Lines of equal θ_e , from 0.5 to 0.7 and lines of equal $\log g$ from 2 to 4 are indicated. A double line indicates an evolutionary blue horizontal-branch model ($M_c = 0.475 M_\odot$, $M = 0.62 M_\odot$, $Y = 0.3$, and $Z = 10^{-3}$) calculated by Sweigart and Gross (1973, unpublished). The indices of the blue horizontal-branch stars in the metal-poor globular cluster, M55, scatter about this double line and thus one could expect its parameters to agree with those defined by the blue horizontal branch model above. The indices of the blue horizontal-branch stars in the intermediate metal abundance ($[Fe/H] \simeq -1.5$) clusters M 13 and NGC 3201 indicate surface gravities approximately 0.2 smaller in $\log g$ while the indices of the blue horizontal-branch stars in the more metal-rich ($[Fe/H] = -0.6$) clusters M4 and M5 indicate surface gravities approximately 0.2 larger in $\log g$. The bluest stars in the last two clusters scatter about M55 relation. It is not known which parameter, or combination of parameters, is causing this different behavior of blue horizontal-branch stars in the c_1 , $b-y$ diagram or in its analogue, the $\log g$, $\log T_{\text{eff}}$ diagram, but it is evident from these data that at least one parameter must vary in some clusters.

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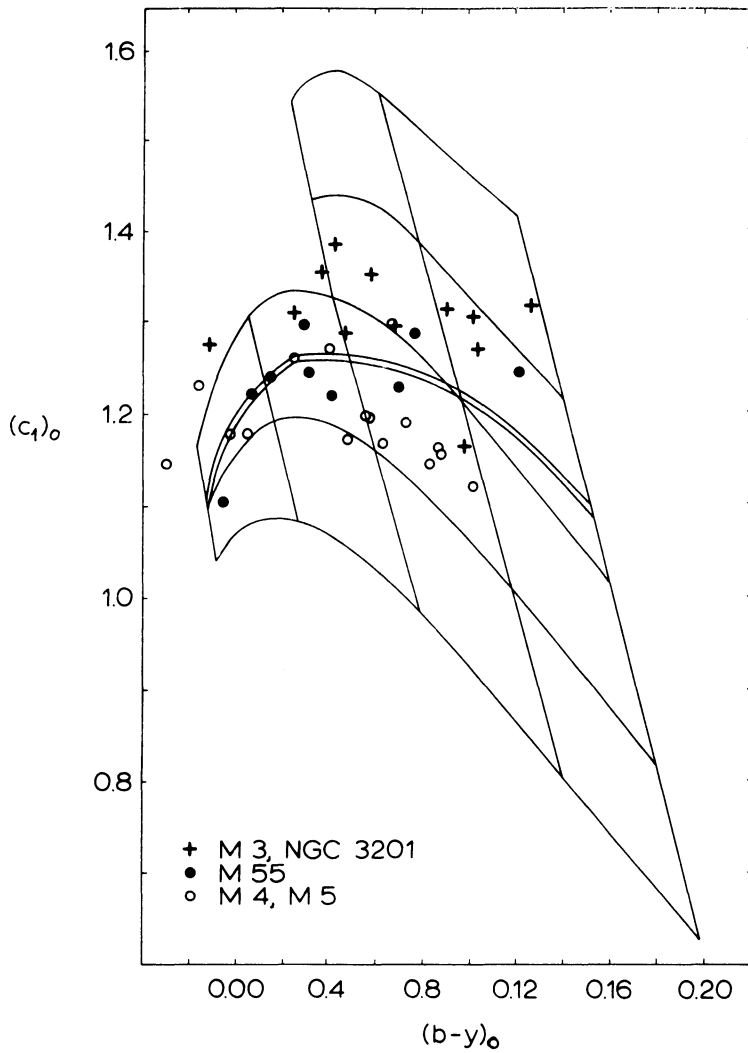


Fig. 1. Four-color observations of blue horizontal-branch stars.