CALCIUM ABUNDANCE IN THE RR LYRAE STARS IN NGC 3201 AND M 5

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The assumption that individual globular clusters formed from chemically homogeneous protosystems, which seems to be valid for some clusters, is clearly not valid in others, e.g., ω Cen and M22 (see Freeman and Rodgers 1975, Hesser, Hartwick and McClure 1976, Butler, Dickens and Epps 1978 and references quoted therein). One indicator of chemical inhomogeneity is the width of the cluster giant branch in the C-M diagram, because the B-V colors for the cool giants are sensitive to heavy element abundance. NGC 3201 and M 5 show narrow giant branches (Lee 1977, Arp 1962) and so are not expected to show large star-to-star heavy element differences.

To verify this indicator, spectra at a dispersion of 30 A mm^{-1} have been obtained with the Anglo-Australian Telescope at Siding Spring for 20 RR Lyrae stars in NGC 3201 and 6 in M 5. The equivalent widths of the Hγ-,Hδ- and CaII K- lines have been measured. A series of relations between the calcium K- line equivalent width and the mean equivalent widths of the hydrogen Hβ, Hγ and Hδ lines define the loci of RR Lyrae variables with the same calcium abundance (Freeman and Rodgers 1975, Manduca and Bell 1978). Manduca and Bell's relations are shown in Figure 1, together with the present data and with Freeman and Rodgers' data for ω Cen for comparison. The following remarks can be made: (a) The present data for NGC 3201 and M 5 define a tight locus around [Ca/H] = -1.5±0.1, in contrast with the well-known star-to-star spread in calcium abundance for ω Cen; (b) the value of calcium abundance is very similar for both clusters.

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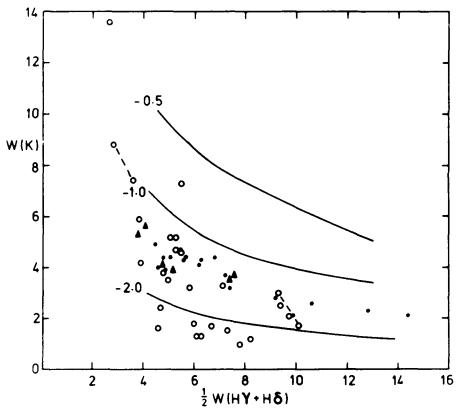

Figure 1. The equivalent width of the CaII K line versus the mean equivalent width of the Hγ and Hδ lines. The solid lines represent results from Manduca and Bell's (1978) calculations of model atmospheres with log g = 3, [A/H] = -0.5, -1.0 and -2.0 and T_{eff} ranging from 6000 to 7500 K. The dots and the triangles represent our data for the RR Lyraes in NGC 3201 and M 5 respectively, and the open circles represent Freeman and Rodgers' (1975) data for ω Cen.

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