

AN AUTOMATED HR DIAGRAM FOR NGC 6809 (M 55)

Michael J. Irwin

Institute of Astronomy, Cambridge

Virginia Trimble

University of Maryland and University of California

ABSTRACT: For decades, star counts and HR diagrams extending below the main sequence turnoff in globular clusters meant the work of Sandage (1957). The advent of large CCD's at the foci of large telescopes has changed this (McClure et al. 1985, Harris & Hesser 1985, Christian & Heasley 1986, Heasley et al. 1986, Penny & Dickens 1986, Richer & Fahlman 1986, Smith et al. 1986) and made clear that clusters differ in the shapes of their luminosity functions and in the morphology of their HR diagrams. We return here to photographic methods, which can capture an order of magnitude more images and so possibly reveal new details.

J and R Anglo-Australian Observatory plates of the rich, open southern globular cluster M55 have been scanned and analyzed with the Automated Plate Measurement facility of the Inst. of Astronomy and a new crowded-field algorithm (Irwin 1985). Almost 30,000 images were identifiable in both colors, of which slightly less than half represent cluster stars, extending nearly 3^m below the main sequence turnoff. Comparison of images in the two colors confirms earlier conclusions (Irwin & Trimble 1984) that (a) the luminosity function begins to flatten below $M_V = +5.5$ and (b) the radial profile, while generally well fit by a King model (with core and tidal radii of 2.2 and 26.6 pc at $d = 4.8$ kpc), shows several bumps and wiggles, of marginal statistical significance, that repeat from plate to plate.

The HR diagram (Fig. 1 is the raw data for the inner $16'$ or 22 pc radius) shows the usual features. The distribution of cluster stars around the ridge line of the main sequence is, at least, consistent with a sufficient population of close binaries to agree with a W UMa identification for the main sequence variables found in the earlier work. We have not yet attempted to fit evolutionary tracks or isochrones to the data, but the exceedingly sharp turnoff and a possible ridge-line job may prove interesting.

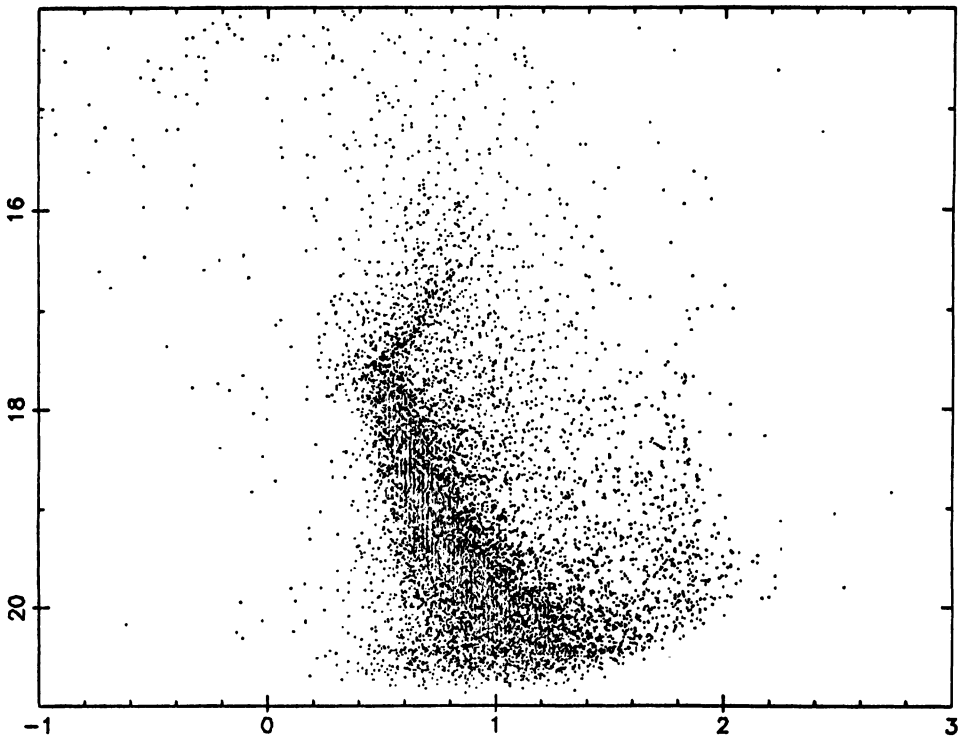


Fig.1. Automated HR diagram showing about 10,000 stars out to $r=16'$ in the southern half of the cluster field. Axes are apparent magnitude R and color $J-R$. Diagonal bottom cutoff is the plate limit $J=22$ or M_J about 8.3 at the apparent distance modulus, 13.7, of $M 55$.

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