

MAGELLANIC CLOUD HALO RR LYRAE STARS:
THE NGC 2257 FIELD IN THE OUTSKIRTS OF THE LMC

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The discovery of three RR Lyrae stars beyond the limiting radius of NGC 1841, a globular star cluster in the extreme halo of the Magellanic Cloud system, led Kinman, Stryker and Hesser (1976) to suggest that they might represent a stellar component of a tenuous halo that could have resulted from tidal interactions with the Galaxy. The field of NGC 2257, a "red" globular about 7° east of the LMC, is ideal for evaluation of the gradient in RR Lyrae surface density at intermediate distance in the Magellanic Cloud halo system. Sixty plates taken by Graham, Hesser and Kinman are available (6 from the 1.5-m telescope taken in 1971, and 54 from the 4-m telescope taken in 1974-1977); the 4-m plates are usually IIa0+GG385 exposed for 5 to 10 minutes with a 7 to 21 day Moon (avoiding full Moon by ± 3 days). Extreme hour-angle coverage during two 4-m telescope runs consisting of three consecutive nights each and separated by one month aided in detection and period determination for the short-period variables. Walker's (1972) electronographically measured stars were used as standards, after being made brighter by $B=0.10$ mag to bring them nearer to Gascoigne's (1978) photoelectric scale. Care was taken to account for increasing background near the cluster center in the iris-to-magnitude conversion. Twenty-eight variables were known in the cluster from the early work of Alexander (1960) who was able to determine periods of six of them. He has kindly made his original step estimates available to us, and they have yielded corresponding increases in the precision of our period estimates. Among our results are: (1) We have found 16 new RR Lyrae variables in the cluster and ~ 12 in the surrounding field; 3 of Alexander's variables appear constant on the CTIO plates. (2) The period-frequency diagram for stars

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within 8 arcmin of the cluster shows a high ratio, $N(c)/N(ab)$, in contradistinction to the variables in the surrounding field.

(3) If the effects of the variable background have been properly removed, then the mean B magnitudes of the cluster variables implies that they, like the cluster, lie about 9 kpc closer to the Galaxy than do the field variables. (4) Walker star 95 is a c -type variable with $P=0.360^d$, $\langle B \rangle = 19.44$ mag, and $A_B \approx 0.60$ mag, and should not be used as a local standard star.

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