AGES AND METAL ABUNDANCES OF STAR CLUSTERS IN THE MAGELLANIC CLOUDS

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It has long been apparent that the rich star clusters in the Magellanic Clouds differ widely in age, a circumstance which renders these clusters particularly useful in tracing the age-metallicity relations of their parent systems. We have attempted to exploit this potential by studying the integrated light of red globular clusters in the Large and Small Clouds.

We used the photon-counting spectrograph on the 2.5 m du Pont telescope to sample the integrated blue spectra of populous clusters. Two indices, h, an indicator of the strength of the Balmer lines, and m, a measure of the strength of the CaII H and K lines and the G-band, were determined for each cluster.

To calibrate h and m in terms of age and [Fe/H] we modeled h and m indices for clusters of given ages and metallicities. These models have been calculated with Bell's synthetic spectrum program and modified versions of the Yale isochrones. Similarly, synthetic Q(ugr) and Q(vgr) indices were calculated for comparison with the cluster photometry of Searle, Wilkinson, and Bagnuolo (1980). We do not propose that these calculations give definitive results, but they are useful in exploring the utility of the approach. Ages determined from the models are in good agreement with results from color-magnitude diagrams for older clusters, but may be slightly too old for clusters aged 1-2 Gyr. A semi-empirical correction has been applied to remedy this.

The age-metallicity relations we obtain are shown in figure 1. In interpreting this figure, it should be realized that for clusters aged 9-16 Gyr, the ages given by our approach could easily be in error by 2-4 Gyr. Averaged over the past 6-8 Gyr, the rate of chemical enrichment in the LMC appears greater than in the SMC or the solar neighborhood.

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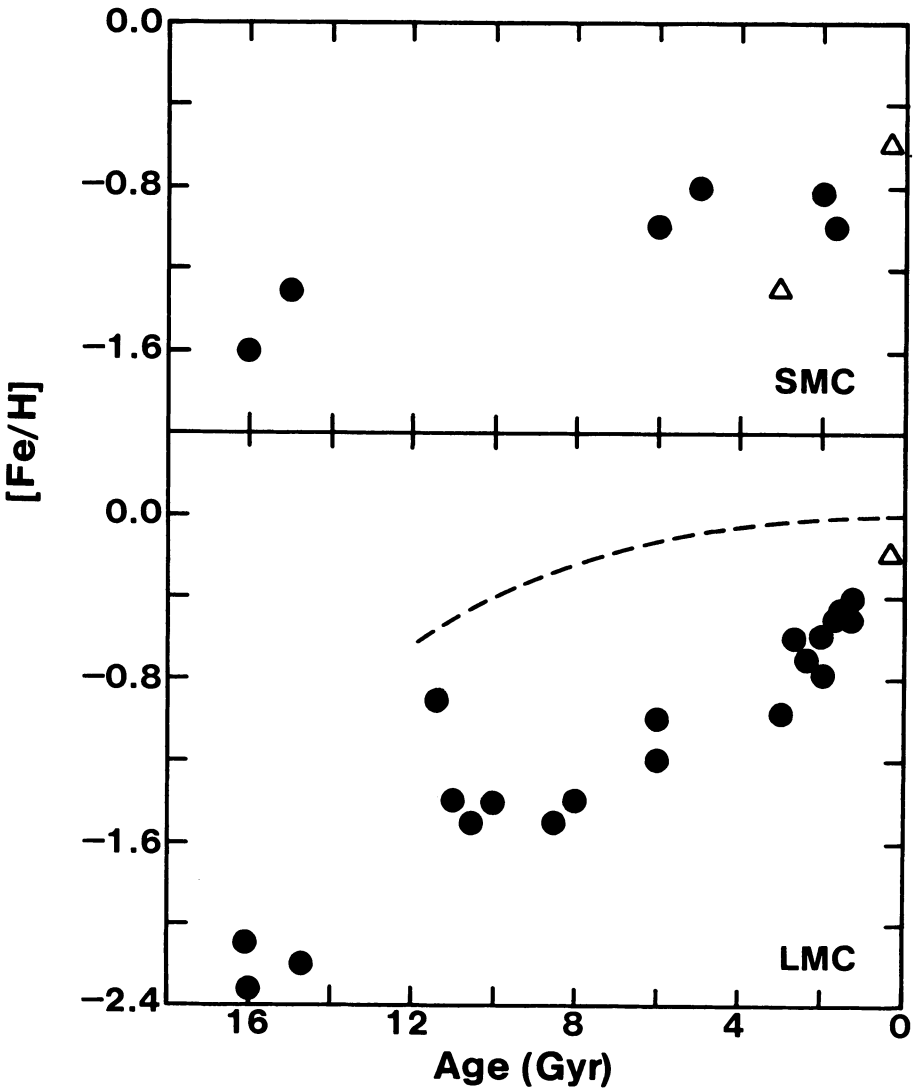

Fig. 1. Age-metallicity relations for the SMC and LMC. Closed circles represent star clusters. Triangles are recent results for variable stars in the field. The dashed line is the solar neighborhood relation according to Twarog (1980).

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