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Properties of a Proper-Motion Selected Sample of Giants in the Small Magellanic Cloud Near NGC 121

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We observed a sample of zero proper-motion stars ($\mu < 0''.50$ cent^{-1}) from a field previously studied by Suntzeff et al. (1986). This field is 2°.5 NW (2.6 kpc) of the center of the SMC. We obtained spectra for $\sim$ 40 stars in the region of the Ca II infrared triplet using the CTIO Argus fiber-fed spectrograph. We also obtained Argus echelle spectra of a single order at 6300Å with $R = 18000$ in one run. The low-dispersion spectra were reduced to metallicities based on the Ca II equivalent widths using the Da Costa & Armandroff (1995) technique and the metallicity scale from Zinn & West (1984). The typical abundance error is 0.12 dex. For half the sample, we have echelle velocities which are accurate to 1.5 km s^{-1}. For the rest of the sample, the low-dispersion data yield single-observation velocities accurate to about 5 km s^{-1} based on repeat observations.

The average properties of the sample are:

$$\overline{[\mathrm{Fe/H}]} = -1.33,\ \sigma = 0.42,\ \mathrm{N} = 35$$
$$\overline{\mathrm{v}} = 135.4 \text{ km s}^{-1},\ \sigma = 25.7 \text{ km s}^{-1},\ \mathrm{N} = 36$$

We compare these results to the data of Da Costa & Hatzidimitriou (1998).

In Fig. 1 we plot a VI cmd from CTIO 4m data. The $(V - I)$ zero point is provisional. We also plot the M5 ridge line from Sandquist et al. (1996) and Johnson & Bolte (1998). The M5 ridge line has been moved to the distance of the SMC using the relative V magnitudes of the RR Lyraes in M5 and the field of the SMC adjusted for reddening differences. No metallicity correction is needed. The M5 ridge line forms the lower envelope of the subgiant branch (SGB). The width of the SGB in V seems to indicate that star formation proceeded for about $\sim$ 6 Gyrs after the corresponding age of M5, and then essentially stopped. If the most metal-rich stars are the youngest (which we have not shown), then the field metallicity stopped at about [Fe/H]=–0.5. From the lack of a well defined HB and given the low mean metallicity, there is no evidence for a populous old component.

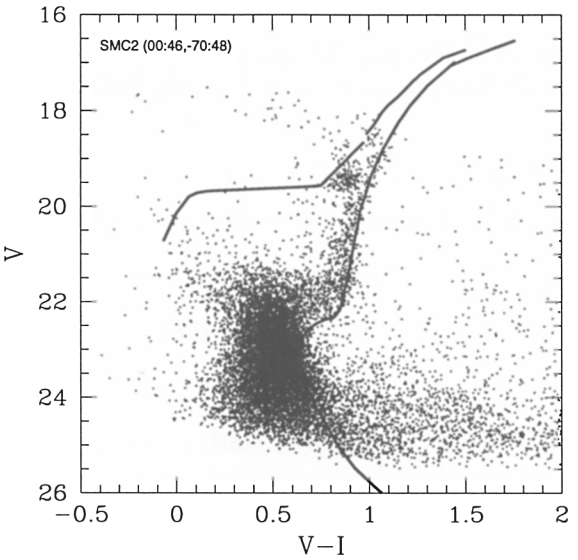

Figure 1. Color magnitude diagram of the SMC field and the ridge line for M5 moved to the distance and reddening of the SMC.

The summary of our results:

- The mean metallicity of the SMC field near NGC 121 is [Fe/H] = −1.3 with a real dispersion of 0.4 dex. The most metal rich stars are at −0.5 dex and the most metal-poor stars at −2.1 dex in a sample of 35 stars.
- The velocity dispersion of the sample is 25 km s^{-1}. The dispersion of various kinematic samples in the SMC is independent of age.
- The RGB colors are consistent with Galactic globular clusters of similar metallicity. The field population, however, does not have an extended horizontal branch, and the main sequence turnoff extends 1 magnitude brighter than the turnoff in M5. Evidently *active* star formation in this region started roughly at the age of M5 and extended for about 6 Gyrs, and then stopped.

References

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