COMPARING M AND K GIANTS IN THE BULGE

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Abstract. Kinematics and abundances of samples of K and M giants in a field at the edge of the bulge are compared. Despite a higher mean abundance, the M giants have the same kinematics as the metal-richer K giants.

Key words: Kinematics - M giants - K giants

While studies of M giants in the galactic bulge (see Frogel *et al* 1990 and references therein) have contributed a great deal to our understanding of the bulge, there still remain some puzzling discrepancies. For example, Frogel *et al* find evidence for an abundance gradient along the minor axis, but find a very narrow metallicity dispersion within a given field, in contrast with results for K giants in the same fields. This may be due to the use of M giants as tracers: it is difficult to measure [Fe/H] for late M giants, both because of the lack of good model atmospheres for these very cool stars and because we lack empirical calibrators (most globular clusters have [Fe/H] well below solar).

Harding and Morrison (this volume) describe a survey of a field at the edge of the bulge ($l = 350, b = -10$) where the mean abundance has dropped to [Fe/H] $\simeq$ −0.8. A comparison of the K and M giants in this field with those in fields closer to the galactic center is useful because we do not need to extrapolate to measure abundances in our field. Different methods of selection have been used for M giants in the Blanco surveys used by Frogel *et al* and our survey. Both have abundance selection effects: Blanco identified M giants by the presence of strong TiO bands on grism spectra, while we used T1–T2 color (very close to Cousins R–I) of stars from our CCD scans, which is less sensitive to abundance but still not a pure estimate of temperature for M giants.

Abundance has a strong effect on magnitude of M giants in an optical color-magnitude diagram. Thus comparison of the positions of stars in the T1 vs. T1–T2 diagram with the loci of globular cluster giant branches (placed at the distance of the bulge) gives a rough estimate of our M giant abundances. In our field almost all the M giants are fainter than the 47 Tuc locus, and thus have [Fe/H] significantly higher than −0.75. JHK photometry, obtained at Siding Spring Observatory for 75 of the M giants, confirms that their mean abundance lies between −0.75 and solar. Since the K giants in our field have a mean [Fe/H] of ~ -0.8, this means that the M giants have a higher mean abundance than the K giants, as we would expect from stellar evolution. Interestingly, the evidence for this effect is much less strong in Baade's window (Frogel *et al* 1990).

If the K and M giants have different mean abundances, are their kinematics

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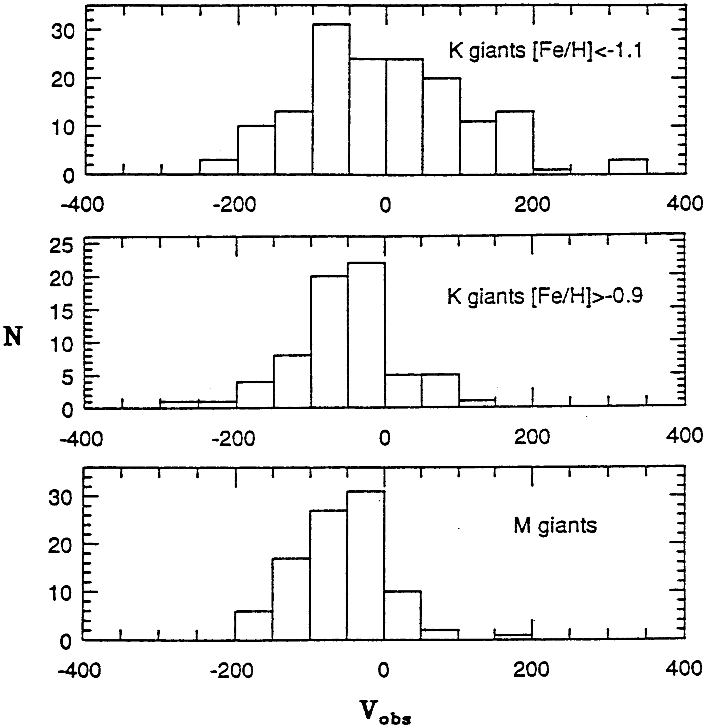

Fig. 1. V_{obs} (velocity corrected to LSR only) histograms for both K and M giants. It can be seen that the M giant velocities are very similar to those of the metal-rich K stars, suggesting that their rotational kinematics are also similar.

different too? The rotational kinematics of the M giants are harder to measure, because we need an accurate distance in order to calculate V_ϕ, and this requires more accurate abundance estimates than we presently have. However, it is possible to simply compare the line-of-sight radial velocities of the K and M giants in the field. Figure 1 shows that the kinematics of the M giants are unlike that of the metal-poor K giants but very similar to the metal-rich K giants. Thus, at this distance from the galactic center, both M giants and metal-rich K giants seem to be drawn from the same population.

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References

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