KINEMATICS OF HALO AND HIGH-VELOCITY DISK STARS

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ABSTRACT. $uvby-\beta$ photometry for 1149 high-velocity and metal-poor stars has been obtained and is being used to derive metallicities, distances, and ages for these stars. The distances have been combined with proper motions and radial velocities from the literature to calculate the stars' galactic space velocities. Our ultimate aim is to reach a better understanding of the early dynamical and chemical evolution of our Galaxy by studying the possible existence of correlations between metallicity, age, and kinematics for these stars. In particular, the $V(rot)$, [Fe/H], Toomre energy, and W',[Fe/H] diagrams are being used to analyze the kinematic characteristics of this sample. Two distinct, separate populations are very clearly seen, and there is also some evidence for additional stellar components. Our kinematic and metallicity data argue quite strongly for mostly uncoupled evolutions for the disk and halo populations of the Galaxy.

CONCLUSIONS

a) Disk and Halo populations are very obvious in our sample. Even with the high-velocity, high-proper-motion, and low-metallicity selection criteria, the sample is still significantly contaminated by old thin disk stars, together with the thick disk and halo stars. Very low metallicity tails and very retrograde motions may indicate other components, or at least distinct physical processes during the Galactic evolution. b) The separation criterion of Paper V, a diagonal cut in the V(rot),[Fe/H] diagram, is a good one, but it is not perfect. The "halo" sample is nearly pure due to the small dispersions of the disk stars. The "high velocity disk" stars are more contaminated by the halo stars. c) The mean curve in the V(rot),[Fe/H] diagram for our total sample clearly shows a decoupling between the disk and halo evolutions. However, the mean curve for the $|W'| \geq 60$ km/s sample is different. The final interpretation of this diagram may not be so straightforward. d) $\sigma_{W'}$ for the thick disk is $\sim$ 46 km/s corresponding to a scale height $\geq$ 1.4 kpc. This velocity dispersion has been obtained from a nearly pure sample of thick disk stars, and e) The W$'$,[Fe/H] diagram for halo stars, selected according to the diagonal cut in the V(rot),[Fe/H] diagram, indicates no metallicity gradient in the halo.

Reference

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