HALO AND HIGH–VELOCITY DISK STARS

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ABSTRACT. Using the $uvby - \beta$ data of Schuster and Nissen (1988) to calculate photometric distances and using the galactic potentials of Allen and Martos (1986) and Allen and Santillán (1991), galactic orbits have been integrated for 615 halo and high-velocity disk stars. Correlations between orbital characteristics, metallicities, and ages are being studied. For the 206 halo stars of this sample, a particularly high percentage of the orbits (35-50%) show some chaotic behavior, due mainly to their low angular momenta which lead to small (< 1 Kpc) perigalactic distances. The newer potential of Allen and Santillán, which includes a spherical central bulge rather than a central mass point, gives the higher percentage of chaotic orbits. The effects of this chaos upon chemical gradients and upon the dynamical structure of the halo are being investigated.

CONCLUSIONS

a) Stars which pass near ($\leq$ 1 Kpc) the galactic center are likely to have chaotic orbits. The percentage of chaotic orbits in the halo may be as high as 50%. This chaos is a product of the central spherical mass distribution in the Galaxy, b) Chemical gradients are not found in the galactic halo, neither as a function of R_{Max} nor Z_{Max}. This holds even after those stars whose orbits show some evidence of chaotic behavior are removed from the sample, c) The chaotic "scattering" process near the galactic center produces vertical segregation of chaotic and non-chaotic orbits in the galactic halo; certain Z_{Max} 's are preferred by the chaotic orbits over others due to the conservation of the total orbital energy and due to the focusing of the "scattered" stars around families of tube orbits, and d) This vertical segregation may explain certain discrepant observations of the halo, such as, conflicting c/a values for the shape of the halo and unusual velocity dispersions or distributions near the galactic poles. Our results are in excellent agreement with Hartwick's two–component model for the halo.

References

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