Orbits of HIPPARCOS metal-poor stars with well-defined spectroscopic abundances

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1 Introduction

Orbital characteristics of 80 HIPPARCOS midly metal-poor stars are derived assuming a Galactic model slightly modified from that of Ostriker and Caldwell (1979). A comparison with other works is performed and a relationship between the dynamical properties of the stars and their well-determined spectroscopic abundances is investigated.

2 Stars sample

The sample was built from 3 different sources and has a mean star metallicity of [Fe/H] ~ -1, which corresponds more or less to the transition between the halo and the disk.

- Jehin *et al.* (1998) have determined high precision abundance ratios of 21 nearby unevolved metal-poor stars.
- Edvardsson *et al.* (1993) derived accurate abundances of a dozen elements for 189 F and G disk stars among which we selected the 40 most metal-poor. The authors originally computed the orbital parameters with a three-component Myamoto potential.
- 25 disk and halo metal-poor stars were also taken from Nissen and Schuster (1997) who originally computed orbits with the model of Allen and Santillàn (1991).

We derived orbital parameters for the stars of Jehin *et al.* (1998) and reanalysed the two last samples with our Galactic model using new parallaxes and proper motions from HIPPARCOS (ESA, 1997).

3 Mass model

We adopted a Galactic model made up of a central mass, a flattened disk, a spherical bulge-halo and a spherical dark corona. The density laws were taken from Ostriker and Caldwell's Galaxy mass model (1979) except for the disk whose isodensity surfaces are oblate similar concentric spheroids. It was preferred to Ostriker and Caldwell's surface disk because it makes orbit integration possible.

Following a classical scheme we adjusted the contribution of each component of the model in order to reproduce the observed Galactic rotation curve.

For each star our calculations were carried on during 1000 crossings of the Galactic plane. We used time steps of 10^4 years and at the end of most orbital computations the total energy was conserved to $|\Delta E/E| < 10^{-4}$. The z-component of the angular momentum was kept to its initial value.

Our star sample gave rise to both regular (box, tube, ...) and chaotic orbits. Orbital characteristics such as R_{min}, R_{max} , eccentricity and z_{max} (the maximum height reached by the star) were computed along with their mean errors.

4 Results

With these new orbital parameters we confirm the correlation found by Nissen and Schuster (1997) between [Ni/Fe] abundance ratio and z_{max}. Other possible relationships are currently under investigation and may help to better understand the transition between disk and halo stars.

References

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