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THE KINEMATICS AND VELOCITY ELLIPSOID OF THE G III STARS

Richard L. Branham, Jr.

Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales, Argentina

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RESUMEN

Para estudiar la cinemática de las estrellas G gigante (clase de luminosidad III) se usan movimientos propios y paralajes de 3,075 estrellas, de las cuales 658 tienen velocidades radiales. Estas estrellas provienen de la reducción nueva hecha por van Leeuwen del catálogo Hipparcos. La solución da para la velocidad solar 16.72 ± 0.41 km s^{-1}; para las constantes de Oort, en unidades de km s^{-1} kpc^{-1}, $A = 14.05 \pm 3.28$ y $B = -9.30 \pm 2.87$, valores que representan una velocidad local de rotación de 198.48 ± 26.95 km s^{-1} si suponemos una distancia al centro Galáctico de 8.2 ± 1.1 kpc. Para las dispersiones de velocidades obtenemos, en unidades de km s^{-1}: $\sigma_x = 51.78 \pm 0.55$, $\sigma_y = 42.81 \pm 0.32$, $\sigma_z = 28.45 \pm 0.22$ con una desviación del vértice de $3.^\circ88 \pm 6.^\circ62$. Una comparasión de esta dispersión con las obtenidas de otras clases espectrales indica que la discontinuidad de Parengo existe también para las estrellas gigantes.

ABSTRACT

To study the kinematics of the G giant stars (luminosity class III) use is made of proper motions and parallaxes taken from van Leeuwen's new reduction of the Hipparcos catalog. 3,075 stars, of which 658 have radial velocities, were used in the final study. The solution gives: solar velocity of 16.72 ± 0.41 km s^{-1}; Oort's constant's, in units of km s^{-1} kpc^{-1}, $A = 14.05 \pm 3.28$ and $B = -9.30 \pm 2.87$, implying a rotational velocity of 198.48 ± 26.95 km s^{-1} if we take the distance to the Galactic center as 8.2 ± 1.1 kpc; velocity dispersions, in units of km s^{-1}, of: $\sigma_x = 51.78 \pm 0.55$, $\sigma_y = 42.81 \pm 0.32$, $\sigma_z = 28.45 \pm 0.22$ with a vertex deviation of $3.^\circ88 \pm 6.^\circ62$. A comparison of the velocity dispersions with those given by other spectral types shows that Parenago's discontinuity also exists for the giant stars.

Key Words: Galaxy: kinematics and dynamics — methods: numerical

1. INTRODUCTION

This paper continues a series on the kinematics and velocity ellipsoids of the giant stars (luminosity class III). Previously studied were the O-B5 giants (Branham 2006), the M giants (Branham 2008), the B6-9 and A giants (Branham 2009a), the K giants (Branham 2009b), and the F giants (Branham 2010). The G giants fill the remaining lacuna and complete the investigation of all of the giant stars. A search of the ADS data base[1] shows that the G giants as a group have not been studied since the research of Parenago in 1951 (Delhaye 1965), which adds impetus to this current study.

The methodology remains similar to that for the previous studies, so similar that I will eschew presentation of the mathematical development and refer the reader to the relevant previous publications where the necessary equations can be found. As in my investigation of the F giants the velocity ellipsoid calculation uses the singular value decomposition (SVD) to include stars for which only tangential velocities, but no radial velocities, are available. The section on the equations of condition briefly discusses this matter.

[1] `http://adswww.harvard.edu/`.