

Kinematic Properties of Chromospheric Active Binary Stars

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Abstract. The kinematic behaviour of 362 chromospherically active binary stars (CABs) in the solar neighbourhood were investigated. The Third CABs Catalog by Eker *et al.* (2008) was used as the main source. The spatial distribution and the components of the Galactic space velocities of the programme stars were determined. The effects of differential rotation and Local Standard of Rest (LSR) were corrected for all systems.

Forty probable moving group (MG) members were determined by Eggen's criteria. The kinematic age of the young systems, which are probable members of MGs, was calculated as 0.79 (0.21) Gyr and the rest of 322 field stars were found to have a kinematic age of 4.38 (1.1) Gyr. Field CABs were separated into two sub-groups: dwarf systems, which were formed by main sequence (dwarf) stars, and evolved systems included at least one evolved (giant or sub-giant) component. The kinematic age of 134 dwarf systems was calculated as 4.69 (0.75) Gyr and 4.15 (1.29) Gyr for 188 evolved CABs.

Keywords. active stars, kinematic, kinematic age

1. Introduction

Chromospheric Active Binary Stars (CABs), whose one or two components with late spectral types (F-G-K-M) are giant, sub-giant or Main Sequence stars, are detached binary systems. Emission in the centre of the Ca II H and K, and sometimes, H lines is the most basic indicator of chromospheric activity. Another evidence for magnetic activity is photometric variations, which are caused by large stellar spots. The activity is usually explained by the “dynamo model” (Hall 1989)

2. Kinematic Properties

Galactic space velocity components (U, V, W) of CABs and their errors are calculated using the algorithm given by Johnson and Soderblom (1987). In order to determine the space velocities, the equatorial coordinates, proper motion components, parallaxes of the stars, radial velocities of the mass centre of binary systems, and also the errors of all these, the data must be available. Taking into account the Third CAB Catalogue and the literature, radial velocity data of 362 CABs stars have been collected. Astrometric data of these systems (components of proper motion and trigonometric parallax) were obtained from the new Hipparcos satellite data. Correction for galactic differential rotation was made on the space velocities. Besides this, for kinematic age determination, the solar velocity correction was also made. Space velocity values given for effects of differential rotation and Local Standard of Rest (LSR) were used. The galactic velocity components of CABs were calculated and velocity diagrams of U-V and W-V were formed (Fig. 1). Applying Eggen's criteria to the targets, moving group (MG) members were identified (N=40 CABs) and population analysis was performed.

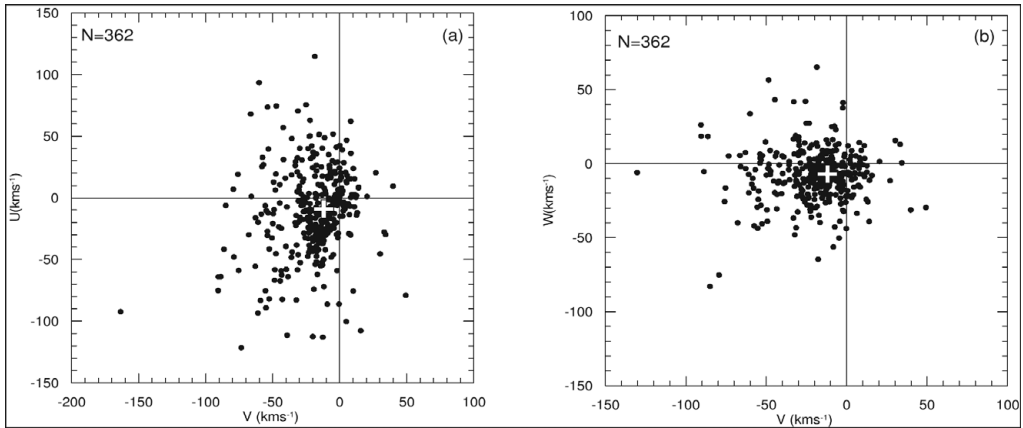


Figure 1. Velocity dispersions of the sample of the CABs (a) on the U, V plane and (b) on the W, V plane. The velocities are heliocentric. The position of the LSR is marked by $+$.

3. Kinematic Ages

All CAB's were divided into three sub-groups: (i) MG members, (ii) dwarf systems, (iii) evolved systems. For each sub-group, kinematic age determination was made by using Wielen's (1977) tables of age-space velocity dispersion formula. Ages of 4.69, 4.15 and 0.79 Gyr were calculated for 134 dwarf systems, 188 evolved systems, and the MG members, respectively.

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