DETERMINATION OF THE AGE OF LOW-MASS CLOSE BINARY STARS OF EARLY SPECTRAL CLASSES

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ABSTRACT. The results of the determination of age of less-massive close binary stars of the early spectral classes are presented.

Key words: Stars: close binary: less-massive of the early spectral classes;

1. Introduction

The determination of age of close binary stars of the early spectral classes (CE) was made for the systems by Bondarenko and Perevozkina (1997). CE-stars with mass of a secondary component less than 3 solar masses belong to the group of less-massive CE. Secondaries of CE have F-K spectral classes. The determination of age was made by three methods: 1) of isochrones by Claret and Gimenez (1992) (isochrones on the diagram L–T_{eff} with the treks of Claret which were made by G. Dremova); 2) using the relation age-mass of Barrando et al. (1994)

$$\begin{aligned} \lg T &= 9.883 - 2.965 \lg M, \\ &\pm 22 \pm 122 \end{aligned}$$

where T - age of star in years, M - mass in solar masses. This relation is recommended to use for obtaining of age of chromosphere active binary stars (less-massive CE, KW and ~KW-systems). 3) according to the law of braking of Scumanich (1972)

$$v_e = \lambda \cdot 10^{14} \cdot T^{-0.5}, \qquad (1)$$

where T - age of star in seconds, $\lambda = 1.7$. The majority of the secondaries of less-massive CE has spectral class F5 and later, i.e. these components have well-developed convective envelope. It is able to use the empirical law of Scumanich to calculate age of CE. Adopted, that the orbits are round ($e = 0$), an orbital period P is equal to the period of rotational motion. The equatorial speed v_e is calculated using means of radii of secondaries and means of orbital periods and adopted 4.5 times larger than the mean of speed in Scumanich law, $\lambda = 1.7$. Accounting adopted means Scumanich law is

$$T = 2.86 \cdot 10^{10} \cdot P^2 / R^2, \qquad (2)$$

where T - age of star in years, P - orbital period in days, R - radius of star in solar radii. The calculated means of age of primaries by the methods of Barrando et al (1994) and Claret and Gimenez (1992) are accord in limit of 25%. The accordiance of means of age of secondaries with use of the methods of Barrando, Claret and Scumanich is in limit of 22%. The calculations, which were made, confirm possibility to use an empirical law of Scumanich for obtaining of age of less-massive binary stars. Less-massive CE-systems have age from million years to ten milliard. Such interval of means of age points to an evolutionary ungomogeneous of CE-stars.

References

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