ESTIMATING SPATIAL DENSITY OF CLOSE BINARY SYSTEMS WITH SUBGIANT SECONDARIES IN SOLAR NEIGHBORHOOD

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ABSTRACT. The spatial density of close binary systems with subgiant secondaries in solar neighborhood are evaluated taking into account the effects of observational selection. It was found to be about 0.00018 pc^{-3} or about 0.00035 $M_\odot$ pc^{-3}.

Key words: Close binary systems, Effects of observational selection, Spatial density.

In close binary systems (CBS) with subgiant secondaries the more massive components are the stars of Main Sequence (MS) and the less massive components are the subgiants with considerable excesses of luminosity and radius. Among the known eclipsing variable stars 50 per cent are the systems with subgiant secondaries. However observational data are too distorted by observational selection effects and do not show the real number of these systems in space.

In this paper the effects of observational selection connected with both discovery probability of CBS as eclipsing variable stars (Eretnova & Svechnikov 1991) and incomplete investigation samples (Eretnova & Svechnikov 1993) were taken into account to estimate the spatial density of these systems. The information about 2240 systems with subgiant secondaries from the "Catalogue of approximate photometric and absolute elements of eclipsing variable stars" by Svechnikov & Kuznetsova (1990) was used as observational data.

The evaluated spatial density of research systems approximately was found to be 0.00018 pc^{-3} or about 0.00035 $M_\odot$ pc^{-3}. It is about 1% from the total density of star mass in 1 cubic parsec which approximately is 0.0044 $M_\odot$ pc^{-3}

according to Allen (1977). However the systems of K- and M- spectral classes were not encountered among the CBS with subgiant secondaries. The spatial density of these systems in other spectral classes is about 4% from the total star mass density in 1 cubic parsec which equals to about 0.0089 $M_\odot$ pc^{-3} in the same spectral classes.

The comparison of estimated space density with corresponding data to CBS where both components belong to MS is of certain interest. Among the eclipsing variable stars the CBS with subgiant secondaries are about 6 times as numerous as the main – sequence binaries. According to Svechnikov & Kuznetsova (1992), the real number of CBS with both components belonging to MS in 1 cubic parsec is about 0.00066 pc^{-3}. Thus the spatial density of main – sequence binaries on the early evolutionary stages exceeds the one for CBS with subgiant secondaries approximately by 3.5 times. It agrees with computational data.

References

Allen K.U.: 1977, *Astrophysical magnitudes.*, (Russian Transl.), Moscow, Mir, 446pp.

Eretnova O.V., Svechnikov M.A.: 1991, *Astronomo–geodez. issled.*, Sverdlovsk, 87.

Eretnova O.V., Svechnikov M.A.: 1993, *Astronomo–geodez. issled.*, Sverdlovsk, (in press).

Svechnikov M.A., Kuznetsova E.F.: 1990, *A catalogue of approximate photometric and absolute elements of eclipsing variable stars.* Sverdlovsk. Ural State University, V.1., 224pp.; v.2, 232pp.

Svechnikov M.A., Kuznetsova E.F.: 1992, *Astronomo–geodez. issled.*, Sverdlovsk, 81.