

# THE PERIOD CHANGES AND EVOLUTION OF CONTACT BINARY STARS OF THE EARLY SPECTRAL TYPE

I.I. Bondarenko, E.L. Perevozkina  
Ural State Pedagogical University

**ABSTRACT.** The analysis of the Catalogue of the early type contact systems with period changes is presented.

**Key words:** Contact early binaries (CE-stars), low-massive detached systems (DS), semidetached systems (SDS), KW-type systems (KW), period change.

The important results about evolution of close binaries may be received from the study of change of orbital periods. Stellar wind, magnetic stellar wind (MSW), conservative transfer of matter, the loss of matter in surrounding area are the main reasons of period change.

In (Svechnikov, 1990) was made research of comparing of periods of DS and SDS (after role exchange). The majority of SDS have periods  $P = 1-3$  days. The increasing of orbital period of SDS with decreasing of mass ratio take place. Many SDS, which evolves in "case A" transform to the contact configures, for example to CE-systems. By opinion of (Giuricin et al., 1984) the majority of observed CE-stars of the late spectral B- subclasses and A are formed from the more wide DS at first in process of the role exchange.

In (Kricheva et al., 1986) was shown that systems with mass fewer than 5 solar masses, whose secondaries have convective outer envelopes, loss the angular momentum due to MSW (SDS, CE, KW). In (Svechnikov, 1990; Fedorova and Tutukov, 1994) was noted that primaries of low-mass CE-stars ( $M_1 1.5M_{\odot}$ ) have radiative envelopes and their secondaries have convective envelopes. It helps to decreasing of distance between the components due to MSW. For example, SDS-systems of R CMa-type are the previous stage of low-massive CE-

stars. They have the "century" decreasing of orbital period.

The class of CE-stars presents a great interest regarding evolution of close binaries. CE-stars from Catalogue (Bondarenko and Perevozkina, 1997) have as decreasing as increasing orbital periods. According period change and a degree of filling of Roche-lobe of the components it is may to define what take place in system: is there a matter transfer from one component to other or mass loss with system?

MSW is a significant factor of decreasing of orbital period. The change of large semiaxis due to MSW according the law from (Scumanich, 1972) is presented in (Fedorova and Tutukov, 1994). The study of CE-stars with changing periods confirms that mass transfer in system and mass transfer to the second Roche-lobe with formation of the nearsystem gas structures are the main factors of the CE-stars evolution. Uncorresponding of observed and theoretical light curves demonstrates a presence of the gas streams in system. For low-massive CE-stars with increasing period due to mass loss of secondary MSW prevents from increasing of large semiaxis and orbital period.

As a result of abovementioned CE-stars are evolutionary unhomogeneous systems. Also great interest presents the class of KW-type. They may be formed from low-mass DS due MSW and following decreasing of orbital period. However, the union of KW components in one star is not observed. Is it possible that KW are evolutionary unhomogeneous class too? Are KW-stars future evolutionary stage of CE-systems?

## References

Bondarenko I.I., Perevozkina E.L.: 1997, *The*

- Contact Binary Stars of the Early Spectral Classes.*, Ekaterinburg, 54.
- Fedorova A.V., Tutukov A.V.: 1994, *Astron. Zh.*, **71**, 431.
- Giuricin G., Mardirossian F., Mezzetti M.: 1984, *Ap. J. Suppl.*, **54**, 421.
- Kricheva Z.T., Tutukov A.V., Yungelson L.R.: 1986, *Astrofizika*, **24**, 287.
- Scumanich A.: 1972, *As. J.*, **171**, 565.
- Svechnikov M.A.: 1990, in: *The Statistical Researchs of Close Binaries The Researchs of Effects of Mutualaction in Close Binaries*, Tallin, 26-89.