PERIOD CHANGES IN THE GROUP OF ALGOL-TYPE BINARY SYSTEMS WITH ASYNCHRONOUS ROTATION OF THE MAIN COMPONENT

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ABSTRACT. The period change for the group Algol-type binaries with an asynchronous rotation of a main component is studied. Under the observational data, available in the literature, a general tendency in change of periods of these systems was obtained. As against to the majority of Algols, for 6 of 8 systems of this group the period decrease is observed for last decades.

Key words: binary systems, period changes; individual: U Cep, S Cnc, SW Cyg, RX Gem, RY Gem, RW Per, U Sge, RW Tau

Variations of the period P appear to be connected with the configuration of the binary; they occur predominantly in systems containing at least one the Roche limit. Algols are product of the mass transfer process and they display various kinds of activity including the period changes. Some of these period variations are implied by the evolutionary processes during the mass exchange, but the observatios suggest that additional mechanisms are needed in most cases. Evolution period changes caused by mass transfer from one star onto its companion often determinent for the case conservative mass transfer. Matter just flows from the loser to the gainer - both total mass ratio and angular momentum of the binary are constant. In this case for Algols, matter is flowing from the less massive loser onto the more massive gainer, dominant increase of the length of P should be therefore observed. Such a monotonous period change would be most easily distiguishable. However, large mass transfer rate ($\dot{m} = 10^{-6} M_{\odot} yr^{-1}$) is needed for producing an O-C change detectable on the time scale of decades. This value of $\dot{m}$ would have to be even larger for the non-conservative transfer which could, in principle, lead to more complicated course of O-C. Large $\dot{m}$ occurs only in the initial phase of the mass transfer before the mass ratio reversal. It means that the number of Algols with $\dot{m}$ still high enough for producihg observable period changes is expected to be small. Several kinds of period changer for binary systems described in the article by Šimon (Šimon, 1998).

The group of Algols with asynchronous rotation main star's (19 systems, Glazunova 1999) differ from other Algols bigest mass transfer rate and them what main star systems rotatio rapidest, them necessary at synchronous rotation stars in system. The understanding nature this asinchonous can help investigation of the period changes this systems and his distinction from them Algols. In detail study the period changes for four system this group: RW Tau (Šimon, 1998), SW Cyg and U Sge (Šimon, 1997a, b), U Cep (Olson et al. , 1981). The O-C diagrams of these Algols have diferend kinds, but general tendencies on a background of monotone change of period short-term jumps, identical. The possible reasons of such behaviour of the diagram O-C (the third body, the Applegate theory, modification of an internal structure of the cool loser) do not allow to explain to its feature.

The study of period changes at other systems of this group with large meaning of the factor asynchronous F would continue: RX Gem, S Cnc, RW Per.

In Fig. 1–3 the O-C variability for these systems is presented. In Table 1 is given the parameters of this group of systems with previously investigated period changes. The O-C calculations are carried out using all published during 100 years data (Hall 1973, Schaefer 1991, Crawford 1980) data using different methods. We can not investigate in detail the short-period variability for systems having periods several times longer than in RW Tau and U Cep (for which there are obtained good quality observations). We can study only the general tendency of period variability on that timescales. As we see, in RW Per the period was increased and later on decreased. The accuracy of moments of minima determination of this system is low, due to variability of the amplitude of the primary minima and presence of total eclipse. In RX Gem, during the ob-

served time interval, period was increased. The shortest time interval of observations we have for S Cnc, but due to high accuracy of minima determination , we can mark decreasing of periods during the last decades. We can conclude, that six from eight systems show the period decrease for the last decades.

In the Table 1 there are given the period variability estimations. for the last decades $\Delta P/P$.

Star	P d	F	Sp	$\Delta P/P$
RW Tau	2.76	4.5	B9 V+K3 IV	$-2{\cdot}10^{-5}$
SW Cyg	4.57	6.1	A2 V+K0	$-6{\cdot}10^{-5}$
U Sge	3.38	1.7	B8 IV +G2	$-1{\cdot}10^{-5}$
U Cep	2.49	4.0	B7 V+G8 III	$+1{\cdot}10^{-5}$
RY Gem	6.86	7.4	A2 V+K2 IV	$-4{\cdot}10^{-5}$
RW Per	13.2	10	B9 III+K2 III	$-2{\cdot}10^{-7}$
RX Gem	12.21	8.7	A2 III+K2	$+3{\cdot}10^{-5}$
S Cnc	9.48	9.6	B9 V+K0	-410^{-7}

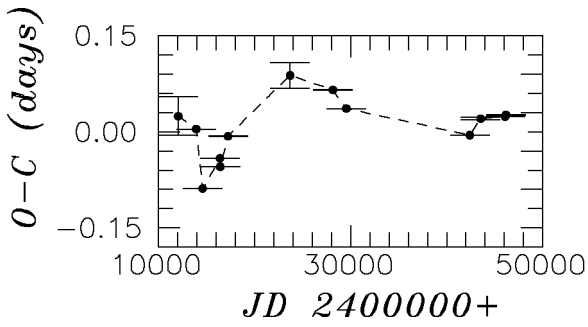

Figure 1: RW Per

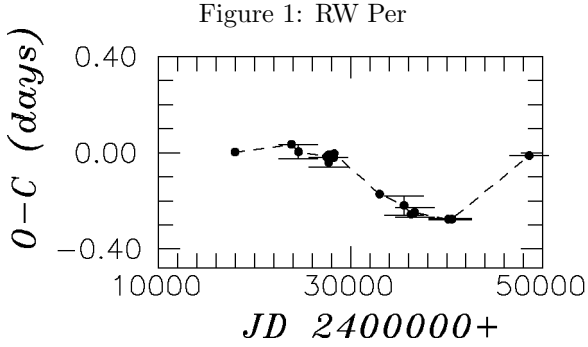

Figure 2: RX Gem

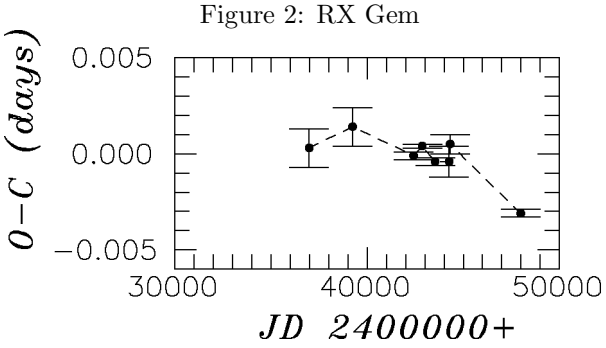

Figure 3: S Cnc

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