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OPTICAL VARIABILITY ANALYSIS OF UU AQR – AN ECLIPSING NOVA-LIKE SYSTEM

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Abstract. By using our photometric observations of nova-like system UU Aqr with unstable light curve during a few nights, we plotted phase-folded light curves and calculated a model of the system. We show that the complicated character of light curves can be explained by the spiral arms in the disk. We decomposed the syntesis photometric curve into separated components as accretion disk, white and red dwarf, hot line.

Historical review. UU Aqr is known as a variable star during 100 yrs, and only in 1986 Volkov et al. discovered deep eclipses ($B \sim 1.5 - 2.0^{m}$), detected an orbital period as $\sim 3^{h}.92$ and classified it as a dwarf nova. The most complete study of UU Aqr was done by Baptista *et al.* (1994). They refined a new ephemeris T_{min} = HJD 2446347.26657(4)+0.163580429(5)·E and showed that this system was nova-like CV with high mass transfer and bright and optically thick accretion disk. They also calculated the main physical and geometric parameters, estimated the mass ratio and the inclination angle of the system as $q = M_1/M_2 = 2.70 - 4.35$, $i = 78 \pm 2°$. But the system remains poorly studied for the present time.

Observations and light curve analysis. For the analysis we have chosen our CCD-observations of UU Aqr of JD 2456941 in "the integral light". The light curve exhibits two eclipses and two wide dips. The wide dips can be interpreted by the model with spiral arms on the disk surface, see Khruzina (2005). Due to the strong variability of the LC and the different depth of eclipses we divided the original LC into two parts and studied the two consistent eclipses separately (the left plot of the Fig. 1). On the right the contribution of the accretion disk, white and red dwarfs and "hot line" are presented. We can see that the disk has changed for one period. The LC form became other at the transition from the first to the second eclipse. It can be connected with the increasing of temperature of the spot (hot line) on the disk and the increasing of density of this place.

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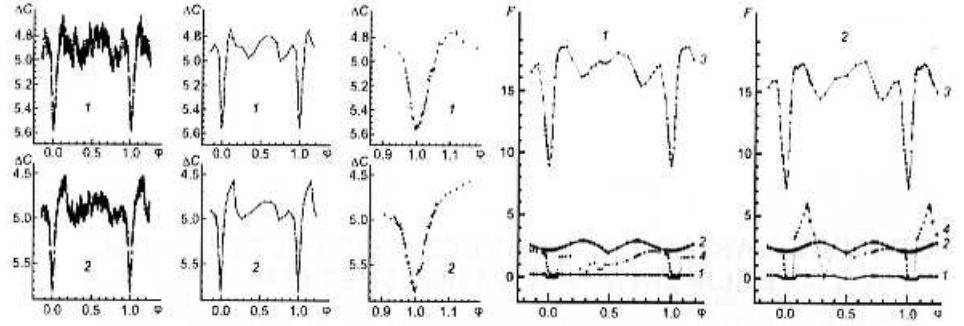

Fig. 1. *Left*: left to right – real eclipse LCs of JD 2456941 (1 and 2 eclipses), the average LCs taken for analysis and the eclipses (magnitudes in relative units). *Right*: contributions of the components of UU Aqr into total luminosity: white dwarf (1), red dwarf (2), accretion disk (3) and hot line (4)

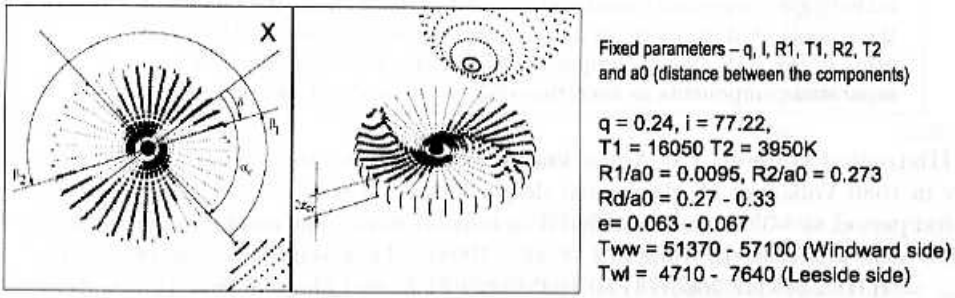

Fig. 2. A view of inner part of accretion disk, spiral arms and some disk parameters.

Changing of the spiral arms parameters shows retrograde motion of the orbital phase of 8–10° orbital cycle, Figure 2. The study of the other light curves of UU Aqr will test the validity of our conclusions.

Main results. By using method of Nelder-Mead (Press 1986) with the fixed (see Fig. 2, right) parameters we solved the inverse problem of determining the parameters of the disk, the main parameters are shown in the Figure 2, right. More detailed result will be publications in future.

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