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RED FLARES AT THE PRIMARY MINIMA OF THE ECLIPSING BINARY FF ORIONIS

The eclipsing variable FF Ori (=HD 288053=49.1929, m=10.2-11 pg, Sp=A1) was discovered by Hoffmeister (1929). After that, the star was observed only visually and photographically. The binary is situated in the region of the OB association Ori I.

Our UBVR photoelectric observations were made with 60cm telescope on Mt. Maidanak (Uzbekistan) in 1990/92. The star BD+2°1008 (V=$10^{m}.44$, U−B=$0^{m}.14$, B−V=$0^{m}.67$, V−R=$0^{m}.38$) was used as a comparison one. 106 in U, 176 in B, 179 in V and 174 in R measurements for the binary were made. The principal photometric characteristics of the light curves are presented in Table 1.

Table 1

	V	U−B	B−V	V−R
Max	11.23	−0.11	+0.15	+0.18
MinI	12.13	−0.05	+0.23	+0.25
MinII	11.32	−0.14	+0.13	+0.14

The amplitude of the primary minimum shows the most depth in U ($1^{m}.02$) and the least one in R ($0^{m}.82$). Both minima have the equal durations of $0^{p}.145$. They do not show flat bottoms. According to Kordylewski's (1948) ephemeris the phase of the primary minimum is moved by $0^{p}.0103 \pm 0^{p}.0002$. On the base of the known times of minima listed in Table 2 we calculated the improved light elements of FF Ori using the method of least squares:

$$\text{Min I} = \text{JDH}\,2448916.658 + 1^{d}.8105251 \times E \pm 0.003 \pm 0.0000004$$

This ephemeris was used to calculate the O−C values in Table 2.

The UBVR-curves are shown in Figure 1. The first three curves are typical for Algols, but the R-curve has a distortion after the primary minimum. We have reinspected carefully all our measurements of both the variable and the comparison star but not any mistake has been found. The phases of the curve were obtained on JD 2448556 (one point) and on JD 2448918 (8 points). 52 measurements of the binary were made on the second night and 44 of them did not show any anomalies. The bottom of the R-curve is plotted in detail in Figure 2 where the normal curve is drawn by the solid line. The distortion was $0^{p}.014$ or 36 minutes long and it got the peak of approximately $0^{m}.10$R. This peak brightness is considered to be due to the contribution of some third light equivalent to a star of $14^{m}.6$R. We have calculated $\Delta R = R_{nor} - R_{obs}$ where R_{nor} is the brightness of the binary on its normal curve and R_{obs} is that observed. Plotted in Figure 3 are ΔR values as a function of phase. It is seen from the Figure that the graph of the distortion resembles

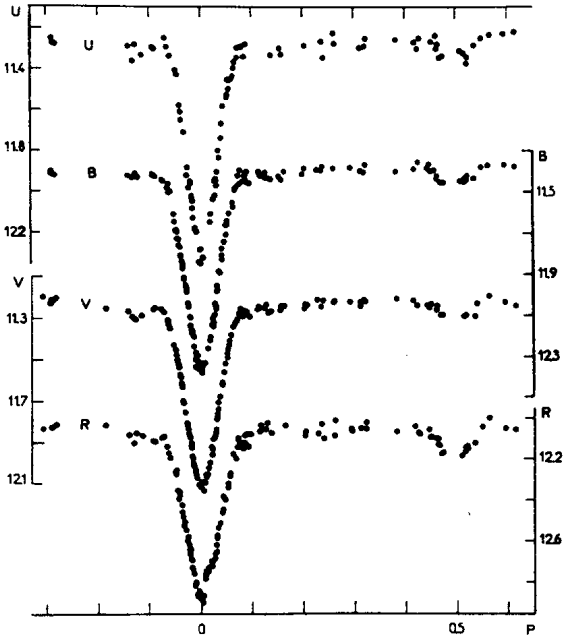

Figure 1. The light curves of FF Ori.

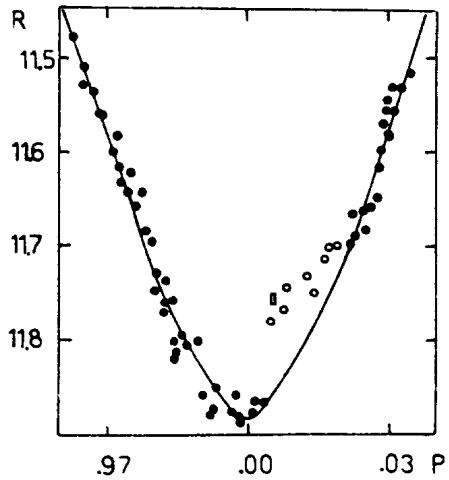

Figure 2. The R-curve bottom. (The distortion's points are denoted by empty symbols.)

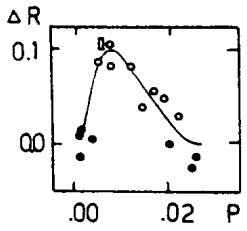

Figure 3. The light curve of the distortion.

Table 2.

J.D. 2400000+	E	O−C	Reference
25890.40	−12717	$+0^d.0011$	Schneller, 1938
30693.727	−10064	+0.0049	Whitney, 1948
31497.600	−9621	+0.0048	"
31772.793	−9469	−0.0020	"
32216.367	−9224	−0.0067	Kordylewski, 1948
42833.289	−3360	−0.0041	Kreiner, Mistecka, 1980
47553.335	−753	+0.0028	Danielkiewicz-Krosniak, 1990
48916.6576	0	−0.0008	Present paper

that of flares on the UV Cet type stars. We suppose these flares to occur on a cool secondary the spectrum of which we estimated to be K0. It is well known, however, that the flares of UV Cet stars reach the peak amplitude at short wavelengths. The flares observed do not show this important feature of these stars. The fact that only red flares (perhaps, regular) occur on FF Ori is difficult to understand.

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