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DETECTION OF THE 224-MIN ORBITAL PERIOD

OF THE CATACLYSMIC VARIABLE PG 0818+513

PG 0818+513 was detected as an UV - excess object ($V=15^m.58$, $B-V=0^m.15$, $U-B=-0^m.77$) by Green et al. (1982, 1986), who classified it as a cataclysmic variable (CV). Andronov (1986) discovered its photometric variability and suspected that it is an eclipsing CV. However, neither he, nor Richter (1989) were able to determine the period and attribute the object to some sub - class of CV's.

Here we report the results based on the photographic observations on Sky Patrol plates of Moscow (n=53) and Sonneberg (n=691) collections and on that specially made in Abastumani (n=115) and Kishinev (n=70). The latter series of observations show clear Algol-type eclipses up to $1^m.2$ (a lower value, because the exposure time was 8 and 12 min for Abastumani and Kishinev, respectively), which last $0.14(\pm 0.01)P \approx 31$ min and occur every 0.156 d. For the more precise determination of the value of the period, we used the moments of minima and 'faint' observations, which are listed in the Table 1. The moments of minima were determined from "seasonal" phase curves by using the parabolic fits to the shape of the eclipse. For the periodogram analysis, we used the test function $\sigma_\varphi(f)$, where f is the trial frequency (in d^{-1}), σ_φ - is the corresponding mean-squared deviation of the phases of minima from the 'zero' ones corresponding to the trial period's value (cf. Andronov, 1988). For uniform distribution of phases, one may achieve that $\sigma_\varphi \approx 12^{-1/2}$; the significantly lower values may indicate the periods in the signal and/or in 'observational windows'.

The 'best fit' linear ephemeris is the following :

$$\text{Min HJD} = 2447180.3364 + 0.15587490 * E \qquad (1)$$
$$\pm \quad 3 \qquad\qquad 2$$

The relatively good accuracy estimate of the period's determination is due to the use of the first 'season' moment derived from Sonneberg patrol plates. The accuracy of minima timings varied typically from 0.0003 to 0.0015 days, but we did not use the weights while obtaining the Eq. (1).

The total range of brightness variations is 13.7-$16\overset{m}{.}3$ (comparison stars published by Andronov (1986)),but the mean brightness out of eclipse varied in the range 14.5 -$15\overset{m}{.}1$, the brightness in mid-eclipse was $15\overset{m}{.}5$ (Moscow plates with 30-min exposure time), $15\overset{m}{.}9$ (Abastumani, 8 min), $16\overset{m}{.}4$ (Kishinev, 12 min). This discrepancy may partly occur due to the difference in the photometric systems used; however, the variations in brightness level up to $0\overset{m}{.}5$ seem to be real. No outbursts similar to those observed in dwarf novae were found on the used plates irregularly covering the time interval 1928-1988 yrs. However, many times the brightness was found to be 13.7 -$13\overset{m}{.}8$ on Sonneberg plates, including the prominent 'flare' (or 'hump') observed at HJD 2436613.500-.542 (phases 0.50-0.78, according to Eq. (1)).

Because of slow brightness variations, the phase curves derived from the patrol plates, show larger scatter (up to $0\overset{m}{.}3$); the longer exposure times make the observed eclipse shapes shallower and thus less prominent. The full duration of eclipse was found to be 0.146 P and 0.134 P for Abastumani and Kishinev,respectively; the eclipse depth was $1\overset{m}{.}17$ and $1\overset{m}{.}24$.

No secondary eclipse was found on phase curves, pointing out that the eclipsed region is much more bright as compared with the eclipsing one suggested to be a non-degenerate secondary star in a close binary. There is no evidence for strongly X-ray heated secondary, such as in PG 1550 + 131 (Haefner, 1989) ; or extreme 'hot spot' between the stars, as in V 361 Lyr (Andronov and Richter, 1987). The object photometrically resembles DW UMa (=PG 0830 + 591) (Kopylov and Somov, 1987; Shafter et al., 1988) and UU Aqr (Volkov et al., 1986). The spectral properties, as Green et al. (1986) pointed out, are similar to the eclipsing CV PG 1012 - 029 (=SW Sex) (Penning et al., 1984).

Thus the obtained results may allow us to allocate the system PG 0818+513 into the sub-group of eclipsing nova-like variables, possibly with relatively high accretion rate.

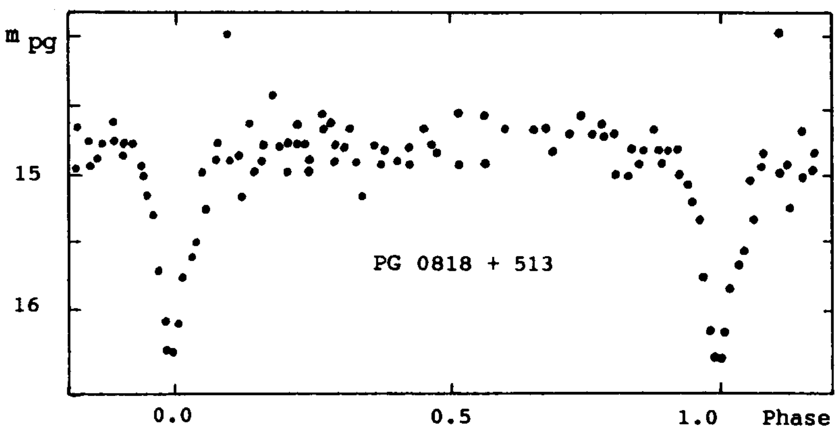

Fig. 1. Phase light curve for 75 observations obtained in Abastumani during JD 2447180 - 2447203.

Table 1

The moments of minima of PG 0818 + 513

HJD 2400000+	σ	n	E	O-C	Rem
38893.4036	0.0047	8	-53164	-0.0004	S
45376.388:	-	1	-11573	+0.0004:	M
45464.310:	-	1	-11009	-0.0082:	M
45758.2873	0.0015	18	- 9123	-0.0024	M
46764.460:	-	1	- 2668	-0.0022	S
47180.3363	0.0007	7	0	-0.0001	A
47180.4922	0.0007	7	1	-0.0001	A
47203.2505	0.0003	6	147	+0.0005	A
47203.4064	0.0003	6	148	+0.0005	A
47532.452:	-	1	2259	-0.0058	K
47592.3150	0.0006	7	2643	+0.0012	A
47592.4709	0.0006	7	2644	+0.0013	A
47643.2843	0.0008	6	2970	-0.0006	K
47643.4402	0.0008	6	2971	-0.0005	K
47664.3275	0.0014	6	3105	-0.0005	K

Remarks : the corresponding observations were obtained in Sonneberg (S), Moscow (M), Abastumani (A) and Kishinev (K); σ is the accuracy estimate, n is the number of the observations used (the 'lonesome' faint observations with n=1 were not used while obtaining the Eq. (1)), E - is the cycle number.

Co-ordinated multiwavelength photometric, polarimetric and spectral observations are needed to constrain the model of this interesting object, and they are planned to be done during February, 1990.

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