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PV CASSIOPEIAE - AN ECLIPSING BINARY WITH ECCENTRIC ORBIT

As a part of the joint photoelectric program on eclipsing binaries of the Observatories Izmir and Nürnberg 4 photoelectric minima of this star were obtained with the 48 cm Cassegrain telescope at the University - Observatory of Izmir during the period 1968 September to 1969 September. They all show very big O-C's against the elements given in SAC 40 (1969) ($+0^d.061$, +0.060, +0.060, +0.062).

2 photoelectric minima, obtained by GEYER (1967 November and December), show the following O-C's against the same elements: $+0^d.027$, +0.056! The difference in epochs between the 2 minima of GEYER is uneven, while the differences in epochs between the 4 minima from Izmir and the second minima of GEYER are even!

GEYER has expressed the suspicion, that the uneven minima were not situated symmetrically between the even minima, consequently the star has an eccentric orbit and the period must be doubled.

P a r t 1. For all observed minima O-C's were calculated against elements with a mean period and the earliest observed (normal-) minimum (T_0). For the time interval JD 2415 600 to JD 2436 900 I found, with friendly help of Mr.HUTH, Sonneberg - Observatory, 130 photographic minima. In the last years 8 photoelectric minima (by GEYER and the Izmir Observatory) were obtained.

From 3 photographic minima I derived
T_0 = JD 2415 764.553

The latest observed photoelectric minima is
T_n = JD 2440 479.474

The number of epochs between T_n and T_0 is
ΔE = 28 238

The mean period: $\bar{P}=(T_n-T_0)$: ΔE = $0^d.8752362$

The O-C's were calculated with the elements:

Min JD 2415 764.553 + $0^d.8752362$. E

In Table 1 the mean values for $O-C_I$ (even E) and $O-C_{II}$ (uneven E) are given, each for a period of 2000 or 3000 epochs. n is the number of minima, from which $\overline{O-C}$ was calculated.

Table 1

E	n_I	n_{II}	$(\overline{O-C})_I$	$(\overline{O-C})_{II}$	$\Delta(\overline{O-C})_{II-I}$	
0 - 3000	8	8	$-0^d.025 \pm 13$	$-0^d.001 \pm 8$	$+0^d.024$	pg
3000 - 6000	4	7	-0.008 ± 5	$+0.027 \pm 14$	+0.035	"
9000 - 12000	10	5	-0.002 ± 13	$+0.014 \pm 10$	+0.016	"
12000 - 14000	11	8	-0.011 ± 15	$+0.028 \pm 15$	+0.039	"
14000 - 16000	17	9	-0.006 ± 7	$+0.001 \pm 6$	+0.007	"
16000 - 18000	8	6	-0.005 ± 9	$+0.019 \pm 7$	+0.024	"
18000 - 20000	6	9	-0.005 ± 10	-0.004 ± 10	+0.001	"
20000 - 22500	8	6	$+0.003 \pm 7$	-0.007 ± 10	-0.010	"
24000 - 28500	5	3	$+0.0005 \pm 4$	-0.0280 ± 5	-0.0285	ps

The $O-C_{II}$'s (uneven E) are systematically greater than those with even E ($O-C_I$) for the period E=0 to E=17000. At E = 19000 the O-C's are equal, thereafter the $O-C_{II}$'s are smaller than $O-C_I$. The mean errors of the O-C's are large, but there are some real effects:

1.) PV Cas has an eccentric orbit, and
2.) perhaps an apsidal motion with a period longer than about 120 years.
3.) The period must be doubled.
4.) At present time we have Min I - Min II = 0.5 . P $+0^d.029$

P a r t 2. For minima I new light-elements were calculated by the method of least squares. From photographic estimates 4 normal - minima were derived (each from 5 to 8 minimas, published by BUSCH, FILIN, GEYER, PEROVA and STROHMEIER). 1 photoelectric minimum of GEYER was used, and 4 photoelectric minima from Izmir (observed by GÜLMEN, GÜDÜR, IBANOĞLU and KURUTAC) were combined to 2 normal-

minima. Table 2 gives the observed Minima, O-C_1 (elements of SAC 40, 1969), O-C_2 (new elements)

Table 2

Min. (JD)		O-C_1	O-C_2
24 28 796.814	pg	-0^d.015	0^d.000
31 018.164	"	-0.001	-0.001
32 439.548	"	+0.008	-0.001
34 608.391	"	+0.028	+0.005
39 835.2976	pe	+0.055	-0.0022
40 129.3805	"	+0.061	+0.0011
40 479.4735	"	+0.061	-0.0006

C_1: (SAC 40) Min JD 2428 126.402 + 0^d.875231 . E
2P = 1.750462

C_2: (POHL) Min JD 2428 796.8142+ 1^d.75047346 . E
$\pm$17 $\pm$38

Min I - Min II = 0.5 . P + 0^d.029 = 0.516 . P

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