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LIGHTCURVE AND PERIOD OF THE SYSTEM V450 HERCULIS

Discovered in 1955 by Geyer (1955, 1963) on Bamberg plates, the star BD+34°2831 has been given the provisional designation BV 104. The system was classified as EA type star with a period of $0^d.912718$ and light variations ranging from $10^m.1$ to $10^m.65$ (pg.). No secondary minimum could be detected and the eclipse duration was given $2^h.6$. In 1968 the list of pg. minima was extended by H. Bauernfeind (Geyer, 1968). A period lengthening of $0^s.15$ after JD 2425000 was assumed. This leads to the elements

$$\text{Min.=JD } 2425687.585 + 0^d.912729 \times E \qquad \text{(I)}$$

In the years 1984-85 and 1988-90 the star was observed photoelectrically with a DC photometer attached to the 34cm Cassegrain at the Nürnberg Observatory. The measurements were made through the V filter and are given in the instrumental system. BD +34°2829 was taken as the comparison star. This choice could not be recommended because of the large B−V index as compared with the variable, whose spectral type was determined as A0 by Götz and Wenzel (1962). BD +34°2832 was chosen as the check star. Throughout the observation period, the magnitude difference check – comparison remained constant. Each point in the lightcurve (Figure 1) is the mean of five consecutive measurements. The standard deviation of 91% from a total of 132 points fell down to a limit of $\pm 0^m.020$ with a neat maximum of the error distribution in the $0^m.010$ to $0^m.015$ range.

The 1984-85 observations confirmed roughly the Bamberg period, but the long eclipse duration ($D=0^P.38$) led us to the conclusion that the period must be doubled. The lightcurve (Figure 1) shows two nearly equal partial eclipses with an amplitude of $0^m.31$, so that the minima attribution in Table 1 is arbitrary. The EA-type classification could be confirmed. The system shows a marked reflection effect with an additional brightening amounting up to $0^m.050$ at maximum phases. Both short and long time-scale variations in the reflection phase may be present if the 1985 and 1988-90 lightcurves are compared (Gröbel and Lichtschlag, 1991). The V magnitude of the nearby star BD +34°2830 is $5^m.99$ (Papousek, 1988). The magnitude of the comparison could be determined as $9^m.73 \pm 0^m.007$. Therefore V450 Her varies within the limits $10^m.26$ to $10^m.64$ (V).

In the O−C diagram (Figure 2) three observation periods could be discerned:

1. From JD 15000 to 34000: A total of 11 normal minima, each consisting of 9 to 10 observations, could be calculated. The period lengthening around JD 25000 could not be confirmed. The period of $0^d.9127221$ derived from that data failed to reproduce later observations.

2. From JD 38000 to 44000: These minima were found by Berthold (1982) on Hartha survey plates. Two normal minima from 6, resp. 5 observations could be calculated. The period of the elements

$$\text{Min.=} 2444635.591 + 0^d.9127152 \times E \qquad \text{(II)}$$

is a little bit too short to represent all available minima.

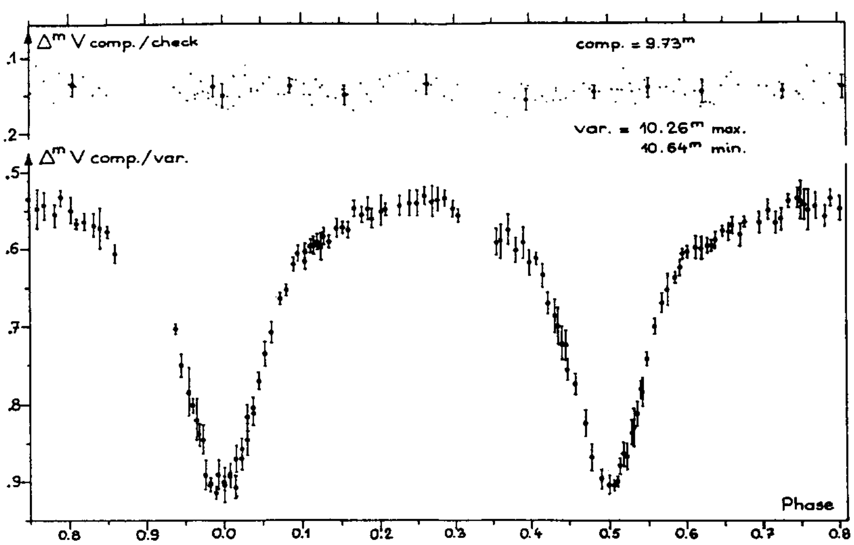

Figure 1. The differential V lightcurve of V450 Her.

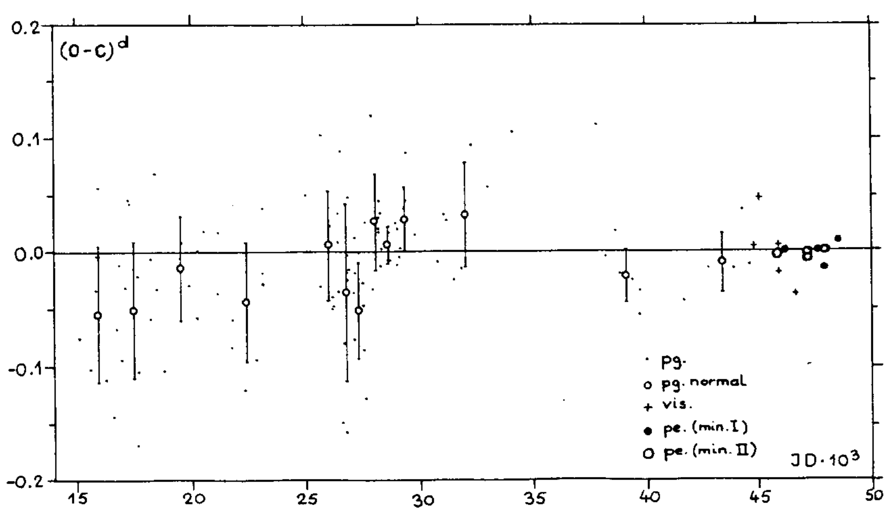

Figure 2. The O−C diagram from the year 1902 to 1992.

Table 1

The residuals of the pg. normal minima and pe. minima in the column $O-C_{III}$ were calculated with half the period given in elements (III).

	Minimum	(O-C) I	(O-C) II	Ep. III	(O-C) III	Min.	Reference
1	15959.791	0.092	-0.114	-33150	-0.055		(5,6,7)
2	17497.727	0.079	-0.103	-31465	-0.049		" "
3	19518.518	0.088	-0.063	-29251	-0.015		" "
4	22419.105	0.023	-0.085	-26073	-0.044		" "
5	26033.518	0.029	-0.025	-22113	0.007		" "
6	26780.079	-0.023	-0.065	-21295	-0.036		" "
7	27361.464	-0.046	-0.079	-20658	-0.052		" "
8	28112.708	0.022	0.000	-19835	0.026		" "
9	28657.581	-0.004	-0.018	-19238	0.006		" "
10	29388.690	0.009	0.006	-18437	0.028		" "
11	32040.139	-0.020	0.018	-15532	-0.032		" "
12	39083.527	-0.162	-0.017	-7815	-0.022		(3)
13	43486.488	-0.205	0.005	-2991	-0.011		" "
14	45903.3733	-0.226	0.021	-343	-0.0025	Min.II	pres. paper
15	46216.4380	-0.228	0.024	0	0.0000	Min.I	pres.paper
16	47239.5904	-0.244	0.023	1121	-0.0041	Min.II	" "
17	47239.5904	-0.243	0.024	1121	-0.0031	Min.II	(1)
18	47616.5465	-0.245	0.028	1534	-0.0004	Min.I	(10)
19	47669.467:	-0.263	0.011	1592	-0.017:	Min.I	pres. paper
20	47670.3977	-0.245	0.029	1593	0.0004	Min.II	pres. paper
21	48496.414:	-0.269	0.038	2498	0.0072	Min.I	(2)

3. After JD 45000: In addition to the pe. observations, some visual minima are plotted in the O−C diagram (Brelstaff, 1985, Kucera, 1986).

The two last observation periods are shifted against the first one, but it is rather improbable that a period change occurred in the remaining observational gap. A search for additional pg. minima will be useful to verify this assumption. For the present, it could be assumed that no significant period change has occurred since the beginning of the observations, contradicting the conclusions of Srivastava (1991).

A mean period derived from Table 1 and the proposed doubling of the period leads to the elements

$$\text{Min. I. (hel.)} = \text{JD } 2446216.4380 + 1^{d}.8254354 \times E \qquad \text{(III)}$$

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