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THE PERIOD ELEMENTS OF V 501 HER

ABSTRAC

The period elements of the eclipsing variable V 501 Her correspond to the formula HDJ 2429743.766 + 8.597646 d x E. It is an EA of magnitude 11.13 V and of $(B-V)_J$ index of 0.75 out of eclipses.

RESUME

Les éléments de la période de la variable à éclipses V 501 Her correspondent à la formule JJH 2429743.766 + 8.597646 j x E. Il s'agit d'une EA de magnitude 11.13 V et d'indice $(B-V)_J$ de 0.75 hors éclipses.

RIASSUNTO

Gli elementi del periodo della binaria ad eclisse V 501 Her correspondono alla formula GGH 2429743.766 + 8.597646 g x E. E un' EA di magnitudine 11.13 V e d'indice $(B-V)_J$ di 0.75 fuori eclisse.

RESUMEN

Los elementos del período de la variable eclipsante V 501 Her corresponden a la fórmula DJH 2429743.766 + 8.597646 d x E. Està una EA de magnitud 11.13 V y de indice $(B-V)_J$ de 0.75 fuera eclipses.

1. INTRODUCTION

V 501 Her = GSC 2606.1905 (17h 35min 43s ; 30° 36.9' ; 2000) was first mentioned as a suspected variable in 1957 (MVS n° 299) and an identification chart was given. Afterwards, H. Gessner (1966) published four instants, placed between 1940 and 1945, during which the star was faint. He could not find the period. With these references, the GCVS 85 listed V 501 Her as an eclipsing star varying between magnitudes 10.5 and 11.0 (p).

2. VISUAL OBSERVATIONS

The author has been observing V 501 Her visually since May 1991. Five years of estimates were necessary to get a first approximation of the period of the star because the eclipses are rare, do not last long and are not very deep.

In 1995, three GEOS members, Mario Checcucci (CHC), Andrea Manna (MAA) and Jean-Paul Verrot (VRR) helped me (VBR) to observe V 501 Her and within the end of the year we had gathered 705 estimates (VBR 621, CHC 50, MAA 26 and VRR 8). All the period searches showed the possibility of a period a little over 8 days, but the instants of minima were poorly determined and obviously some estimates were wrong.

Nevertheless, doing a step-by-step analysis of a linear ephemeris fitting the observed times of minima, I could find one satisfying all of them but one. By adding the four instants of the discovery paper, the following ephemeris was established and presented at the 1996 GEOS meeting in San Pellegrino (3-5 May) :

$$\text{HDJ } 29743.766 + 8.597651 \text{ d x E} \quad (1)$$
$$\pm 0.086 \pm 0.000086$$

12 instants of minima were used, 2 of them occurring at phase 0.5.

Since this meeting, we have gathered new estimates of V 501 Her. A sumtotal of 1030 estimates were acquired by Jean-Paul Verrot (VRR) 536, Bernard Paris (PAR) 208, Jacqueline Vandenbroere (VBR) 171, Mario Checcucci (CHC) 55, Roland Boninsegna (BNN) 37, Andrea Manna (MAA) 14, Davide Dalmazio (DDL) 6 and Michel Dumont (DMT) 3. From these, 13 new instants of minima could be determined.

All these instants confirm the first results. The new, more numerous sets of times of minima allowed me to discard the ones determined with a poor accuracy (few estimates, both branches not well covered,...). Based on 22 reliable minima timings (see table 1), the linear regression gives the following formula :

HJD 2429743.766 + 8.597646 d x E (2)

$\pm$ 0.028 $\pm$ 0.000032

Table 1 : minima instants of V 501 Her

OBSERVERS	HJD (2400000 +)	E (2)	O-C (2)
GES	29752.393	1	+0.0292
GES	30431.540	80	- 0.0378
GES	30990.419	145	- 0.0058
GES	31652.464	222	+0.0204
VBR	48400.553	2170	- 0.1052
VBR	48512.372	2183	- 0.0556
VBR	48538.322	2186	+0.1015
VBR	48757.443	2211.5	- 0.0175
VBR	49922.508	2347	+0.0665
VBR	50283.545	2389	+0.0023
VRR	50309.439	2392	+0.1034
VBR	50571.483	2422.5	- 0.0808
VBR	50657.471	2432.5	- 0.0693
MAA	50670.450	2434	+0.0133
VBR	50713.424	2439	- 0.0010
VRR	50726.292	2440.5	- 0.0294
BNN	50945.591	2466	+0.0296
VBR	51014.419	2474	+0.0764
VRR	51044.366	2477.5	- 0.0683
VRR	51315.361	2509	+0.1008
VBR	51362.487	2514.5	- 0.0602
VRR	51431.316	2522.5	- 0.0124

3. PHOTOELECTRIC MEASUREMENTS

Although we intended to obtain the whole photoelectric light curve of V 501 Her, we could perform only 10 measurements in each of the B and V filters of the Geneva system during two missions at Jungfraujoch observatory in January 1997 and September 1998 (see table 2).

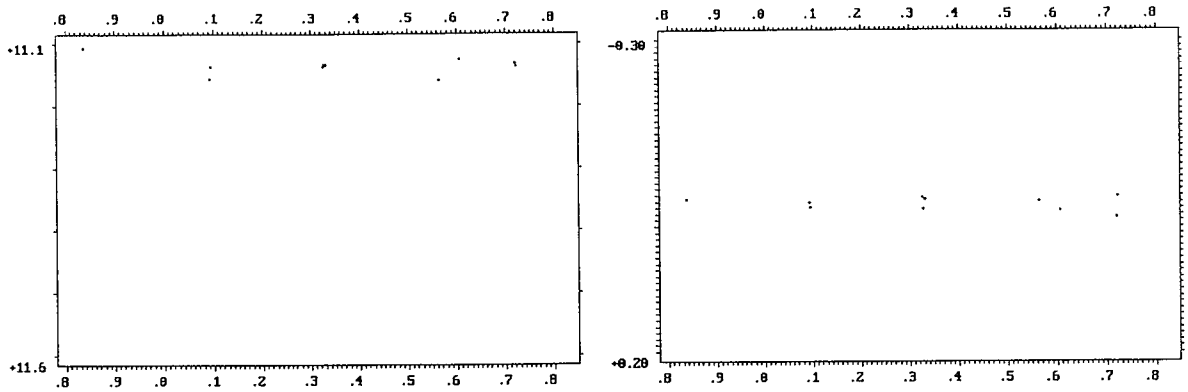
Table 2 : photoelectric measurements of V 501 Her phased with ephemeris (2)

HJD	MAG V	$(B-V)_G$	PHASES (2)
50460.7124	11.125	- 0.026	0.607
50461.6944	11.131	- 0.016	0.721
50461.7159	11.136	- 0.049	0.724
50462.6958	11.106	- 0.044	0.838
51075.3351	11.156	- 0.040	0.094
51075.3588	11.136	- 0.032	0.097
51077.3364	11.135	- 0.047	0.327
51077.3600	11.132	- 0.030	0.330
51077.3843	11.132	- 0.044	0.332
51079.3773	11.159	- 0.041	0.564

Those measurements show that out of eclipses (see fig. 1 and 2) V 501 Her is constant at magnitude 11.13 V ($\pm$ 0.02 mag.) with a colour index $(B-V)_G$ of – 0.03 ($\pm$ 0.02) what corresponds to a $(B-V)_J$ of 0.75

using the transformation formulae described by Meylan and Hauck (1981) for a luminosity class V. It is thus an EA type binary with a spectrum likely to be G5.

Fig. 1 and 2 : V and B-V photoelectric measurements of V 501 Her folded with ephemeris (2)



From the visual estimates, we can also assert that the duration of the eclipses is not much longer than 0.02 period or 4h 07min. At minimum light, the visual brightness of V 501 Her is between GSC 2606 2109 and GSC 2606 739 which corresponds well to an eclipse depth of 0.5 magnitude.

4. DISCUSSION AND FUTURE STUDIES

We have no measurement during eclipses and the visual estimates are not accurate enough to discriminate between the primary and the secondary minima. With the epoch chosen, the four instants published by H. Gessner (1966) and the most numerous visual minima are primary ones. But it is also possible that the minima should be inverted or that the orbital period is twice shorter.

Further work has thus to be done with measurements in two colours, covering the two possibly different minima. It would be easy to plan this acquisition using ephemeris (2).

5. CONCLUSION

V 501 Her is an eclipsing binary of the EA type. The elements of its period agree with the formula : HJD 29743.766 + 8.597646 d x E (2) without any certain distinction between primary and secondary minima. The orbital period may be twice shorter. Its magnitude at maximum light is 11.13 V with a $(B-V)_J$ of 0.75 ($\cong$ spectrum G5).

6. THANKS

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7. BIBLIOGRAPHY

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