GEOS GEOS CIRCULAR ON ECLIPSING BINARIES GEOS

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NSV 5339 : A VERY SHORT PERIOD EB VARIABLE

ABSTRACT

NSV 5339 is a short eclipsing variable star of the EB type. Its V magnitude is going from 10.72 to 11.31 ; min II = 10.87. Its B-V colour index is going from 0.80 to 0.93 (sp. G5 – K3). Its period elements is following the formula : HDJ 2449465.055 + 0.3518608 d x E (2).

RESUME

NSV 5339 est une étoile variable à éclipses du type EB et de courte période. Sa magnitude V va de 10.72 à 11.31 ; min II = 10.87. Son indice de couleur B-V va de 0.80 à 0.93 (sp. G5 – K3). Les éléments de sa période suivent la formule : JJH 2449465.055 + 0.3518608 j x E (2).

RIASSUNTO

NSV 5339 è una stella variabile rapida del tipo EB. La sua magnitudine varia da 10.72 a 11.3 ; min II = 10.87. Il suo indice de colore B-V varia da 0.80 a 0.93 (sp. G5 – K3). I suos elementi corrispondona alla seguente formula : JJH 2449465.055 + 0.3518608 d x E (2).

RESUMEN

NSV 5339 està una estrella variabile ràpida de tipo EB. Su magnitud vaia de 10.72 a 11.31 ; min II = 10.87. Su indice de color B-V varia de 0.80 a 0.93 (sp. G5 – K3). Los elementos de su período corresponde a la fórmula siguiente : DJH 2449465.055 + 0.3518608 d x E (2).

1. INTRODUCTION

The variability of NSV 5339 = GSC 2526.1034 in UMa (11h 47min 49s ; + 35° 13.7' ; 2000) was suspected by R. Weber (1955) through the examination, by stereoscopic comparison, of photographic plates. It is listed in the NSV (Kholopow et al., 1982) as a probable EA going from magnitude 11.0 to 11.6 (p) and a spectrum G5.

The star was visually monitored by two GEOS observers since 1994 and the period searches on their estimates showed off an apparent period of 0.351862 day or twice (J.P. Verrot and J. Vandenbroere, 1998).

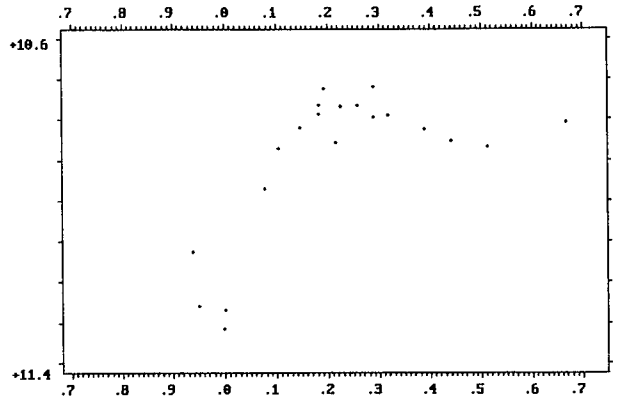
Before they could obtain measurements along the whole light curve of NSV 5339, E. Escola Sirisi and E. Garcia-Melendo (1999) published a short paper with a V CCD light curve of the star which appear to be an EB type eclipsing variable with a maximum V amplitude of 0.56 between minimum I and phase 0.25, with min II fading 0.15 magnitude and with an O'Connell effect of 0.06 magnitude. Their computed ephemeris is :

Min I = HJD 2451220.4869 + 0.351862 d x E (1)
± 0.0002 ± 0.000003

2.. NEW MEASUREMENTS

During two GEOS missions at the Jungfraujoch's observatory in January 1997 and December 1998, we could obtain 20 measurements of NSV 5339 in the B and V filters of the Geneva system (see fig. 1 and 2). Unfortunately, the photometer of the observatory was removed before we could complete the observation of the whole light curve.

Nevertheless, the all-sky photometry allowed us to see that NSV 5339 is at 10.72 V magnitude at maximum light after min I which goes to 11.31 V. The amplitude of variation in V is thus 0.59 since the B-V colour indices show a little reddening during primary minimum. The $(B-V)_G$ are going from 0.03 to 0.20 what corresponds to $(B-V)_J$ of 0.80 to 0.93 and spectra of G5 to K3 assuming that the interstellar reddening is negligible at that galactic latitude. At min II, the magnitude of NSV 5339 is 10.87.



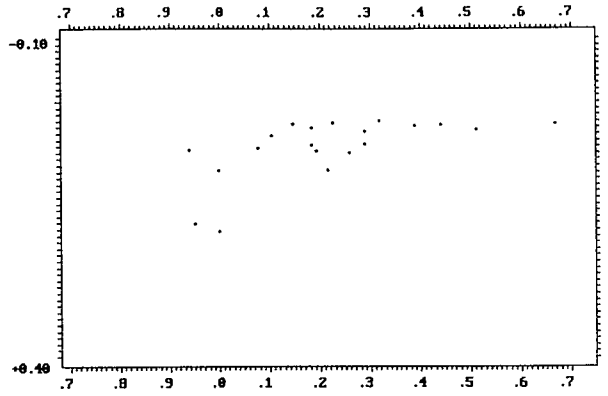


fig 1 and 2 : photoelectric V and B-V measurements with ephemeris 2

Another star of the field was measured in 1997, January 11. GSC 2526.2379 is of magnitude 11.20 V with a $(B-V)_G$ of 0.16 (spectrum G5-K2).

167 CCD measurements of NSV 5339 were also obtain at the Château-Renard observatory, with the CCD HISIS-22 16 bits camera of the Astroqueyras association attached to the 62-cm Cassegrain telescope. The images were taken in total light the night of April 10-11, 1999. The project to obtain a complete light curve was forsaken after the results obtained by Escola Sirisi and Garcia-Melendo (1999).

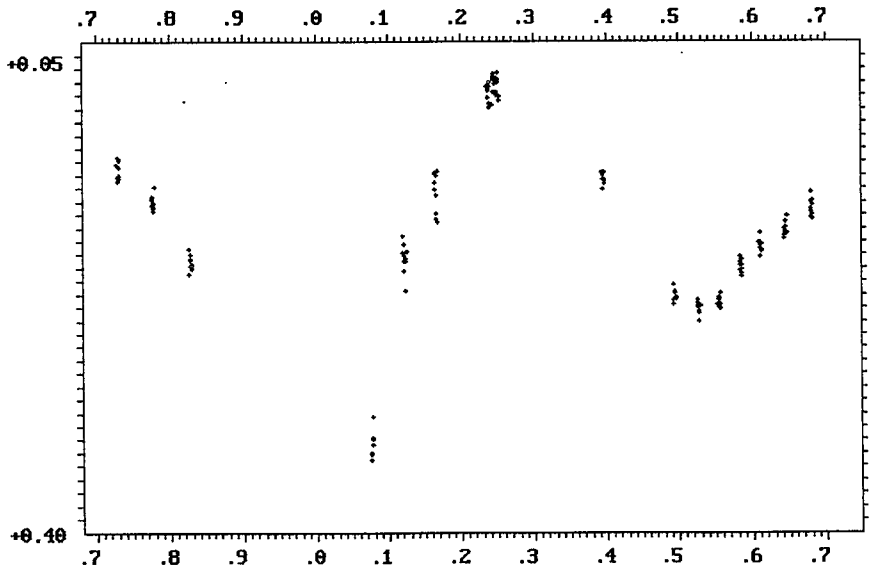


fig. 3 : CCD measurements in total light with ephemeris 2

Contrary to Escola Sirisi and Garcia-Melendo (1999), we did not measure NSV 5339 together with the faint star (GSC 2506.775) about 20 min to the east. The background level was also calculated excluding this star.

All the measurements, even if it is not so obviously appearing with partial light curves, confirm the asymmetry of the light curve of NSV 5339. The maximum after the deeper eclipse is higher than the other one.

3. PERIOD ELEMENTS

The period calculated by Verrot and Vandenbroere (1998) and the one of Escola Sirisi and Garcia-Melendo (1999) are identical with the same significant digits : 0.351862 day (± 0.000003). We can hope that the minima instants determined out of all the data with the new instants observed more recently can give still more accurate period elements. This was performed by a linear regression collecting 1 photoelectric minimum in V (JUV), 8 CCD V minima from Escola Sirisi and Garcia-Melendo data private communication (CCD) and 31 visual minima (VBR = J. Vandenbroere and VRR = J.P. Verrot) (see table 1). A triple weight was given to the JUV and CCD instants. The period elements of NSV 5339 UMa corresponds to the new following ephemeris :

HDJ 2449465.055 + 0.3518608 d x E (2)
± 0.001 ± 0.0000008

Table 1 : the 40 instants of minima used to obtain ephemeris (2)

OBS.	HDJ	E (2)	O-C (2)	OBS.	HDJ	E (2)	O-C (2)
VBR	49465.4038	1	- 0.0030	VRR	50984.3831	4318	- 0.0068
VBR	49787.3653	916	+0.0059	JUV	51172.6358	4853	+0.0004
VBR	49828.5376	1033	+0.0105	CCD	51220.4872	4989	- 0.0013
VBR	49877.4300	1172	- 0.0058	CCD	51222.5973	4995	- 0.0023
VBR	50170.5274	2005	- 0.0084	CCD	51224.7100	5001	- 0.0008
VBR	50225.4322	2161	+0.0061	CCD	51226.4680	5006	- 0.0021
VBR	50250.4086	2232	+0.0004	CCD	51228.5802	5012	- 0.0011
VRR	50553.3552	3093	-0.0052	VBR	51249.3479	5071	+0.0069
VBR	50556.5243	3102	-0.0028	VRR	51255.3252	5088	+0.0025
VRR	50572.3507	3147	-0.0102	VRR	51261.3116	5105	+0.0073
VBR	50594.5249	3210	-0.0032	CCD	51261.6556	5106	- 0.0006
VBR	50599.4551	3224	+0.0010	VBR	51262.3664	5108	+0.0065
VRR	50599.4642	3224	+0.0101	CCD	51177.4876	5151	- 0.0023
VRR	50623.3857	3292	+0.0050	CCD	51282.4155	5165	- 0.0005
VBR	50823.5829	3861	- 0.0066	VBR	51327.4601	5293	+0.0060
VRR	50863.3550	3974	+0.0053	VRR	51332.3771	5307	- 0.0031
VRR	50875.3151	4008	+0.0021	VBR	51555.4559	5941	- 0.0040
VRR	50894.3113	4062	- 0.0022	VRR	51598.3896	6063	+0.0026
VRR	50959.4163	4247	+0.0086	VBR	51609.6440	6095	+0.0029
VBR	50972.4290	4284	- 0.0007	VBR	51694.4489	6336	+0.0039

4. DISCUSSION AND CONCLUSION

All the CCD instants have little but negative O-C's. It is perhaps the result of a systematic shift of the visual timings. The new period is a little shorter than the two first periods previously published but the difference does not exceed the precision of the first results. Nevertheless, with so short a period and probable mass exchange between components, it would be surprising that the orbital period of the system remains constant during a long time.

As its unusual light curve, NSV 5339 is a very interesting object for more sophisticated future studies.

5. BIBLIOGRAPHY

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