GEOS
RR 5

GEOS CIRCULAR ON RR LYR TYPE VARIABLES

1984 May 13

GEOS
12 rue Bezout
F-75014 PARIS

IMPROVED ELEMENTS FOR THE DWARF CEPHEID V 567 OPH

(Received 1983 May 23; accepted 1983 September 06)

ABSTRACT. IMPROVED ELEMENTS FOR THE DWARF CEPHEID V567 OPH. V567 Oph is a dwarf cepheid variable star, the period of which, given in the GCVS (1976), is 0.149521 day. The visual estimates made by GEOS observers from 1977 to 1982 enable the period to be improved. The new elements for maximum are the following:

max. = hel. J.D. 2443525.0444 + 0.14952377 E
± 25 ± 13

The mean V light curve obtained from published photoelectric measures gives a rising branch equal to 0.31 time the period.

RESUME. NOUVEAUX ELEMENTS DE LA CEPHEIDE NAINE V567 OPH. V567 Oph est une étoile variable de type céphéide naine. Sa période donnée dans le GCVS (1976) est de 0.149521 jour. Les estimations visuelles effectuées par les observateurs du GEOS entre 1977 et 1982 permettent d'améliorer la période. Ceci donne l'éphéméride suivante pour le maximum:

max. = J.J. hel. 2443525.0444 + 0.14952377 E
± 25 ± 13

La courbe moyenne des mesures photoélectriques V publiées dans la littérature permet d'établir le temps de montée d'éclat à 0.31 fois la période.

RIASSUNTO. NUOVI ELEMENTI PER LA CEFEIDE NANA V567 OPH. V567 Oph è una variabile cefeide nana con un periodo, secondo il GCVS (1976), di 0.149521 giorni. Le stime visuali effettuate dal 1977 al 1982 dai osservatori del GEOS permettono un miglioramento nel valore del periodo. Da esse si ricava infatti la seguente effemeride per i max.:

max. = G.G. hel. 2443525.0444 + 0.14952377 E
± 25 ± 13

La curva media delle misure fotoelettriche V pubblicate in letteratura permette di stabilire anche il valore di M-m (durata della fase di salita in luminosità) di 0.31 volte il periodo.

RESUMEN. NUEVOS ELEMENTOS DE LA CEFEIDA ENANA V567 OPH. V567 Oph es una estrella variable de tipo cefeida enana. Su periodo, dado en el GCVS (1976), es de 0.149521 días. Las estimaciones visuales efectuadas por los observadores del GEOS entre 1977 y 1982 permiten mejorar el periodo. Este da la efeméride siguiente para el máximo:

máx. = D.J. hel. 2443525.0444 + 0.14952377 E
± 25 ± 13

La curva media de las medidas fotoeléctricas V publicadas en la literatura permite establecer el tiempo de ascenso de brillo en 0.31 veces el periodo.

1. INTRODUCTION

V567 Oph is a dwarf cepheid discovered by C. HOFFMEISTER (1943) who found a period of 0.1300729 day. HOFFMEISTER thought it was a Bailey c-type RR Lyrae star. In the Third Supplement of the General Catalogue of Variable Stars (B.V. KURKAKIN et al., 1976) (hereafter GCVS) V567 Oph is classified as a dwarf cepheid varying from 11.43 to 11.07 V with the elements:

max. = hel. J.D. 2438592.4048 + .149521 E (1)

The ascending branch of the light curve is given as 0.42 time the period, and the spectral class ranges from A5 to F3. The elements refer to a private communication from A.G. de BRUYN (april 1972). In a contemporary paper (1972), de BRUYN gives the period with less precision: 0.14952 ± 0.00003 day. This latter period was found according to de BRUYN's photoelectric observations and reexamination of HOFFMEISTER's observations. V.P. TSESEVICH (1969), refering to HOFFMEISTER's elements, notes that "the light of this star undergoes rapid irregular fluctuations, although on the average the period is close to 0.130 day."

Four times of maximum are avaliable in the literature (table 1)

MAXIMUM (HJD)	REFERENCE	NOTES
2429785.455	HOFFMEISTER (1943)	mean maximum
38592.4048	de BRUYN (1972)	photoelectric
38641.315	CLUBE et al. (1969)	"
38825.960	FITCH et al. (1966)	"

table 1. Times of maximum found in the literature

In the present paper, new visual times of maximum enables the period given by de BRUYN (1972) to be improved.

2. THE PERIOD

From 1977 to 1982, GEOS observers whose names are in table 2 made 793 visual estimates of V567 Oph using ARGELANDER's method. The observations were made using a 25 cm newtonian telescope at annual GEOS summer camp and in Paris. 32 times of maximum have been obtained.

Table 3 gives the list of all known times of maximum. φ_0 is the phase of maximum calculated with elements (1) of the GCVS third supplement.

OBSERVERS		NUMBER OF MAXIMA
R. BONINSEGNA (Dourbes, Belgium)	BNN	1
J. BUSQUETS (Valencia, Spain)	BSQ	4
A. FIGER (Paris, France)	FGR	21
P. GUIRAUDOU (Montpellier, France)	GUI	3
J.F. LE BORGNE (Toulouse, France)	FLB	1
E. NEZRY (Toulouse, France)	NZY	1
P. RALINCOURT (Nantes,France)	RAL	1

table 2. List of observers

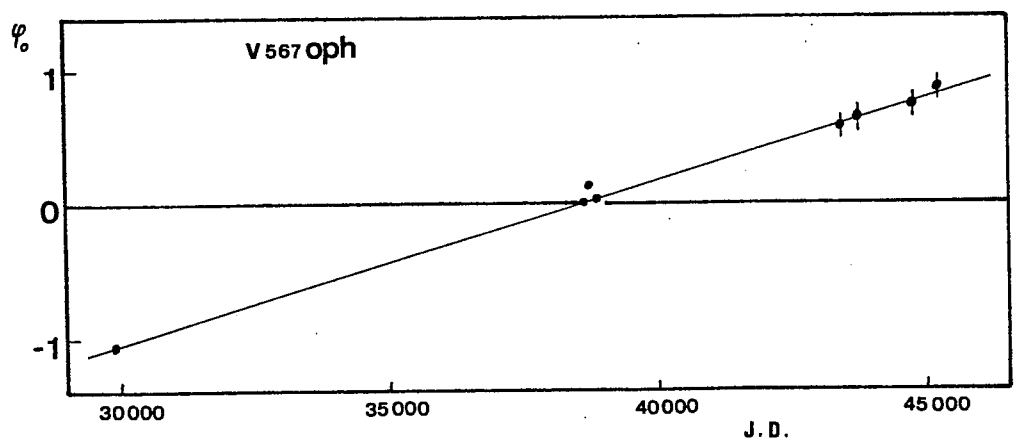
As shown in figure 1, where φ_0 is plotted as a function of julian day, these times of maximum can be fitted unambiguously with a period close to de BRUYN's period. In figure 1, visual maxima are averaged over one year (table 4). We must consider that HOFFMEISTER's mean time of maximum is at phase -1.089. Note that time of maximum given by CLUBE et al. (1969) is quite far from the other photoelectric observations made at the same time. The new elements are computed without taking the maximum of CLUBE et al. into account (this is justified in § 3). A linear regression of the 35 known maxima (time of maximum versus number E) gives the new elements:

$$\text{max.} = \text{hel. J.D. } 2443525.0444 + 0.14952377\ E \qquad (2)$$

$$\pm 25 \qquad \pm 13$$

Errors are classical ones on origin and slope of a regression, with a confidence level of 95%. Origin of elements (2) is the mean maximum of those tabulated in table 3. O-C (in day) according to elements (2) are given in table 3.

Figure 1.



OBSERVER	MAXIMUM (HJD)	φ_0	E	O-C(day)
HOFFMEISTER	2429785.455	-0.089	0	0.0003
de BRUYN	38592.4048	0.000	58900	.0000
CLUBE et al.	641.315	0.113	59227	.0160
FITCH et al.	825.960	0.023	60462	-.0009
GUI	43306.438	0.565	90427	-.0026
FGR	306.439	0.570	90427	-.0016
FGR	391.373	0.613	90995	.0029
FGR	392.420	0.617	91002	.0032
FGR	397.359	0.650	91035	.0079
FGR	398.400	0.611	91042	.0022
FGR	400.335	0.550	91055	-.0066
FGR	401.388	0.595	91062	-.0002
FGR	404.373	0.555	91082	-.0057
FGR	670.529	0.615	92862	-.0020
FGR	712.413	0.736	93142	.0153
FGR	712.553	0.670	93143	.0058
FGR	741.390	0.533	93336	-.0153
FGR	768.329	0.704	93516	.0094
FGR	775.342	0.609	93563	-.0052
FGR	776.387	0.593	93570	-.0069
FGR	784.319	0.647	93623	.0004
FGR	44819.466	0.732	100546	-.0057
FLB	819.471	0.769	100546	-.0007
NZY	822.445	0.656	100566	-.0172
FGR	822.457	0.734	100566	-.0052
BSQ	822.461	0.767	100566	-.0012
FGR	45169.510	0.833	102887	.0032
GUI	169.511	0.842	102887	.0042
BNN	169.512	0.846	102887	.0052
BSQ	169.515	0.870	102887	.0082
FGR	172.496	0.808	102907	-.0013
BSQ	172.505	0.864	102907	.0077
RAL	176.525	0.754	102934	-.0094
BSQ	176.532	0.796	102934	-.0024
FGR	176.542	0.866	102934	.0076
GUI	176.549	0.912	102934	.0146

table 3. List of known maxima of V567 Oph

YEAR	MEAN JD	MEAN PHASE	STANDARD DEVIATION
1977	2443380	0.592	0.034
1978	43740	0.638	0.065
1981	44820	0.732	0.046
1982	45170	0.839	0.044

table 4. Phase of visual maxima averaged over one year

3. MEAN LIGHT CURVE

The mean V light curve is given in figure 2. The data are the photoelectric measurements published by de BRUYN (1972), CLUBE et al. (1969) and FITCH et al. (1966). We can see on figure 2 that CLUBE et al's maximum has been wrongly determined because of the erroneous measures at phase 0.2. De BRUYN's measures, made in the Walraven system, have been converted into standard UBV system. We must note that the rising branch of the V light curve is 0.31 time the period rather than 0.42 as given in the GCVS. 0.42 is the value given by HOFFMEISTER (1943) who concluded the star was an RRc variable. This value has not been changed since its publication in the GCVS. 0.31 is indeed better value for a dwarf cepheid.

J.F. LE BORGNE

REFERENCES

BRUYN A.G. de, A.& A., 16, 478 (1972)

CLUBE S.V.M., EVANS D.S., JONES D.H.P., Mem. RAS 72,101 (1969)

FITCH W.S.,WISNIEWSKI W.Z.,JOHNSON H.L.,Comm.L.A.P.L.,5,n°71 (1966)

HOFFMEISTER C., K.V.B.B., 28, 88 (1943)

KUKARKIN et al., General Catalogue of Variable Stars, Moscow 1976, third edition, third supplement

TSESEVICH V.P., RR Lyrae, Israel Program for Scientific Translations Ltd., Jerusalem (1969)

Figure 2. Mean V light curve of V567 Oph (+ de Bruyn,1972; • Fitch et al.,1966; ∘ Clube et al.,1969)