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DETERMINATIONS OF MAXIMA FOR V 526 AQL, BD CAS AND V 514 CYG; IMPORTANT O-C VALUES OBSERVED FOR V 526 AQL AND BD CAS

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ABSTRACT. DETERMINATIONS OF MAXIMA FOR V 526 AQL, BD CAS AND V 514 CYG; IMPORTANT O-C VALUES OBSERVED FOR V 526 AQL AND BD CAS.

The present paper gives the results of the visual observations made by GEOS on V 526 Aql, BD Cas and V 514 Cyg. The following maxima were determined :

V 526 Aql : Max = 2,445,178.43 ± 0.45
BD Cas : Max = 2,445,089.52 ± 0.19
V 514 Cyg : Max = 2,444,532.36 ± 0.09

These determinations establish important O-C values for V 526 Aql and BD Cas. As for V 526 Aql, the O-C is so important that the number E of elapsed cycles cannot be known with certainty.

On the contrary, the O-C found for V 514 Cyg is quite small and might not be significant at all.

RESUME. DETERMINATION D'UN MAXIMUM MOYEN POUR V 526 AQL, BD CAS ET V 514 CYG; IMPORTANTS O-C POUR V 526 AQL ET BD CAS.

La présente étude donne les résultats des observations visuelles réalisées par le GEOS sur V 526 Aql, BD Cas et V 514 Cyg. Le calcul des maximums moyens a conduit aux valeurs suivantes :

V 526 Aql : Max = 2 445 178,43 ± 0,45
BD Cas : Max = 2 445 089,52 ± 0,19
V 514 Cyg : Max = 2 444 532,36 ± 0,09

Ces determinations correspondent à d'importants O-C pour V 526 Aql et BD Cas. Dans le cas de V 526 Aql, l' O-C est si élevé que le nombre E de cycles écoulés depuis l'époque de l'éphéméride utilisée ne peut être connu avec certitude.

En revanche, l' O-C trouvé pour V 514 Cyg est très faible et pourrait ne pas être significatif.

RIASSUNTO. DETERMINAZIONI DEL MASSIMO DI V 526 AQL, BD CAS E V 514 CYG; IMPORTANTI O-C OSSERVATI SU V 526 AQL E BD CAS.

In questo studio sono presentati i risultati delle osservazioni visuali realizzate dal GEOS su V 526 Aql, BD Cas e V 514 Cyg. Calcolando i massimi medi per ciascuna stella si ottiene :

V 526 Aql : Max = 2 445 178,43 ± 0,45
BD Cas : Max = 2 445 089,52 ± 0,19
V 514 Cyg : Max = 2 444 532,36 ± 0,09

Queste determinazioni comportano notevoli O-C per V 526 Aql e BD Cas. Nel caso di V 526 Aql, l' O-C è tanto grande che non si può stabilire il numero esatto di cicli trascorsi.

Al contrario per V 514 Cyg l'O-C è tanto piccolo da non poterlo considerare significativo.

RESUMEN. DETERMINACIONES DEL MAXIMO DE V 526 AQL, BD CAS Y V 514 CYG; IMPORTANTES O-C OBSERVADOS EN V 526 AQL Y BD CAS.

El presente articulo presenta los resultados de las observaciones visuales realizadas por el GEOS sobre V 526 Aql, BD Cas y V 514 Cyg, y se calculan los máximos medios, que resultan :

V 526 Aql : Máx = 2 445 178,43 ± 0,45
BD Cas : Máx = 2 445 089,52 ± 0,19
V 514 Cyg : Máx = 2 444 532,36 ± 0,09

Estas determinaciones significan importantes O-C para V 526 Aql y BD Cas. En el caso de V 526 Aql, el O-C es tan grande, que incluso el número E de ciclos transcurridos no puede conocerse con certeza.

Por el contrario, el O-C para V 514 Cyg es muy débil y puede no ser significativo.

1. INTRODUCTION

V 526 Aql, BD Cas and V 514 Cyg are three underobserved faint Cepheids whose elements, as given in the GCVS(69), are listed in Table 1.

Star	Type	Range of variation	Maximum	Period	M-m	Spectral type
V 526 Aql	Cep	13.4 - 15.1 p	2425535.3	4.2112	0.25	
BD Cas	CW	12.2 - 12.9 p	2429124.88	3.65087	0.47	
V 514 Cyg	C	12.4 - 13.2 p	2427976.4	5.0988	0.24	K3

Table 1. Elements given by the GCVS(69).

As regards BD Cas, the star was observed later by SZABADOS (1977). Rediscussing the O-C diagram, he found a change in the period at J.D. 2429000 and, by using observations made after this date, he could calculate an ephemeris:

$$\text{Max} = \text{J.D.}\ 2441932.032 + 3.650900 \cdot E$$

2. OBSERVATIONS

The present paper is based on the observations made in the course of the Faint Cepheid Patrol undertaken at the GEOS observing camps held at Casinos (Valencia, Spain) from July 24 to August 8, 1981 and at Bédarieux (Hérault, France) from August 16 to 29, 1982. Some complementary observations made by A. FIGER in Paris have also been used.

The total amounts to 722 brightness estimates, all made visually using the Argelander method.

The observers who took part are listed in Table 2, together with the individual number of measures. The identification charts and the comparison stars are shown in fig. 1.

Observer	Initials	Site	Number of measures		
			V526 Aql	BD Cas	V514 Cyg
R. Boninsegna	BNN	B - Dourbes	3	17	-
J. Busquets	BSQ	E - Valencia	12	37	35
J. Fabregat	FBG	E - Valencia	2	22	34
S. Ferrand	FND	F - Bougival	-	16	-
A. Figer	FGR	F - Paris	35	64	292
P. Guiraudou	GUI	F - Montpellier	22	34	32
E. Nezry	NZY	F - Toulouse	-	11	2
P. Ralincourt	RAL	F - Nantes	6	26	20

Table 2. List of observers.

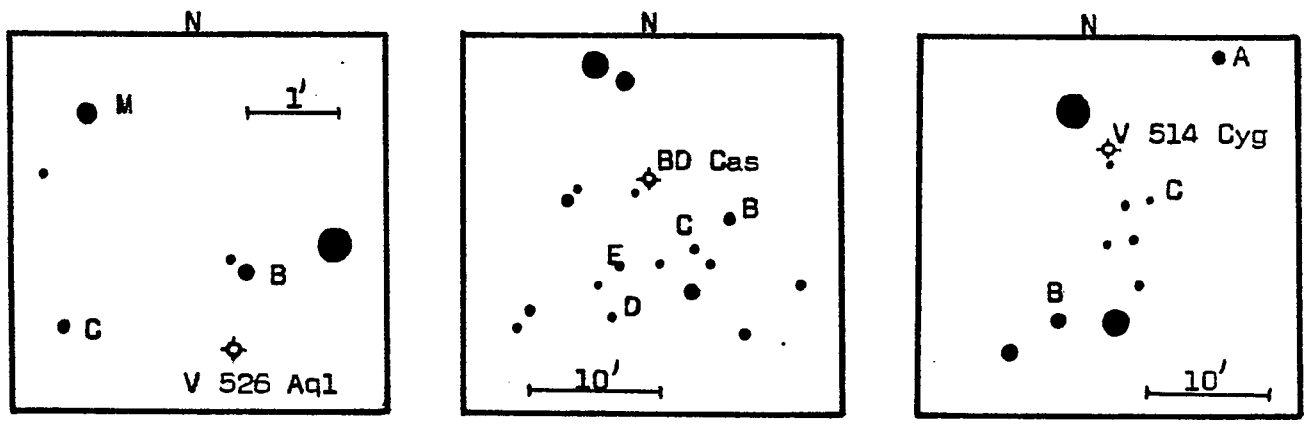

Fig. 1. Identification charts.

3. RESULTS

For all the stars, the estimates made by an observer have been grouped into yearly series. However, in the case of V 526 Aql, it was possible to consider a single series for each observer. Even then, the number of observations is still rather small and some series cannot be used for that reason.

3.1 V 526 Aql

After plotting combined light curves for each observer, it appeared that only those of FGR and GUI had a number of measures sufficient to determine a maximum.

The curves are given in Fig. 2, while the determinations of the respective maxima are given in Table 3. As the magnitudes of the comparison stars were not known, the curves were directly graduated in Argelander steps, assuming a value of 5 for the relative brightness of comparison star B.

Observer	φ max	E	J.D.	O-C (days)
FGR	0.47	4664	45178.32	+ 1.98
GUI	0.52	4664	45178.53	+ 2.19

Table 3. Maxima determined for V 526 Aql.

3.2 BD Cas

The comparison stars are those given by ZONN and SEMENIUK (1959). The magnitudes were first derived from the visual estimates of various observers, which led to the values listed in Table 4. A personal sequence was then calculated for each observer by means of a least-squares fit.

Star	m_v
B	11.1
C	11.9
D	12.2
E	12.4

Table 4. Comparison stars for BD Cas.

After plotting combined light curves for each observer, four of them only could be used to determine a maximum with sufficient accuracy. These determinations are given in Table 5, while the respective light curves appear in Fig. 3.

Observer	year	φ max	E	J.D.	O-C (days)
FGR	1981	0.78	4299	44819.17	- 0.80
FGR	1982	0.83	4397	45177.13	- 0.62
BSQ	1982	0.86	4397	45177.24	- 0.51
FND	1982	0.86	4397	45177.24	- 0.51

Table 5. Maxima determined for BD Cas.

3.3 V 514 Cyg

Only the comparison stars labelled B and C on the chart were used. The difference in brightness between the two stars was estimated at 0.8 mag. The light curves were therefore directly graduated in brightness differences, assuming a value of 0 for the brightness of B.

After plotting the combined light curves corresponding to each series, only the curves of FGR offered a sufficient number of measures to allow an accurate determination to be made. (See Table 6).

Observer	year	φ max	E	J.D.	O-C (days)
FGR	1977	0.01	3025	43400.32	+ 0.05
FGR	1978	0.02	3102	43792.98	+ 0.10
FGR	1980	0.03	3247	44532.36	+ 0.15
FGR	1981	0.04	3303	44817.94	+ 0.20
FGR	1982	0.05	3382	45220.80	+ 0.25

Table 6. Maxima determined for V 514 Cyg.

The corresponding light curves are shown in Figure 4. As regards the curve for 1982 (Fig.4e), the observations made at Bédarieux are considered as an independant series and are not included.

3.4 Mean maxima

It is possible to calculate a mean O-C as there is more than one maximum determined for each star. The confidence interval can then be estimated by means of the formula

$$\pm t \frac{\sigma}{\sqrt{n}}$$

were n is the number of determinations,
σ is the standard deviation of the mean,
t is Student's t for the 95% level and for n-1 degrees of freedom.

The results thus obtained are given in Table 7. On examining them, the following conclusions can be made:

V 526 Aql: the O-C value lacks accuracy. Moreover, the great difference between the two values shows that E cannot be determined accurately. The period must be verified.

BD Cas: none of the ephemerides used is verified.

V 514 Cyg: a slight lag on the ephemeris is possible, though not established with certainty as the confidence interval may have been underestimated (only five determinations, all by the same observer).

Star	n	t	Mean max. J.D.	$O-C_{GCVS}$(d.)	$O-C_{SZAB}$(d.)
V 526 Aql	2	4.30	2445178.43 ± 0.45	+ 2.09 ± 0.45	
BD Cas	4	2.78	2445089.52 ± 0.19	- 0.61 ± 0.19	+ 0.46 ± 0.19
V 514 Cyg	5	2.57	2444532.36 ± 0.09	+ 0.16 ± 0.09	

Table 7. Mean maxima and mean O-C's.

4. CONCLUSIONS

At any rate, it is possible to conclude that the ephemerides available are not confirmed for BD Cas and V 526 Aql. It might also be the case for V 514 Cyg.

The difference is particularly important in the case of V 526 Aql, so that the ephemeris is sufficiently inaccurate to prevent concluding with certainty on the value of E.

These three stars will be observed further by GEOS.

J. BUSQUETS

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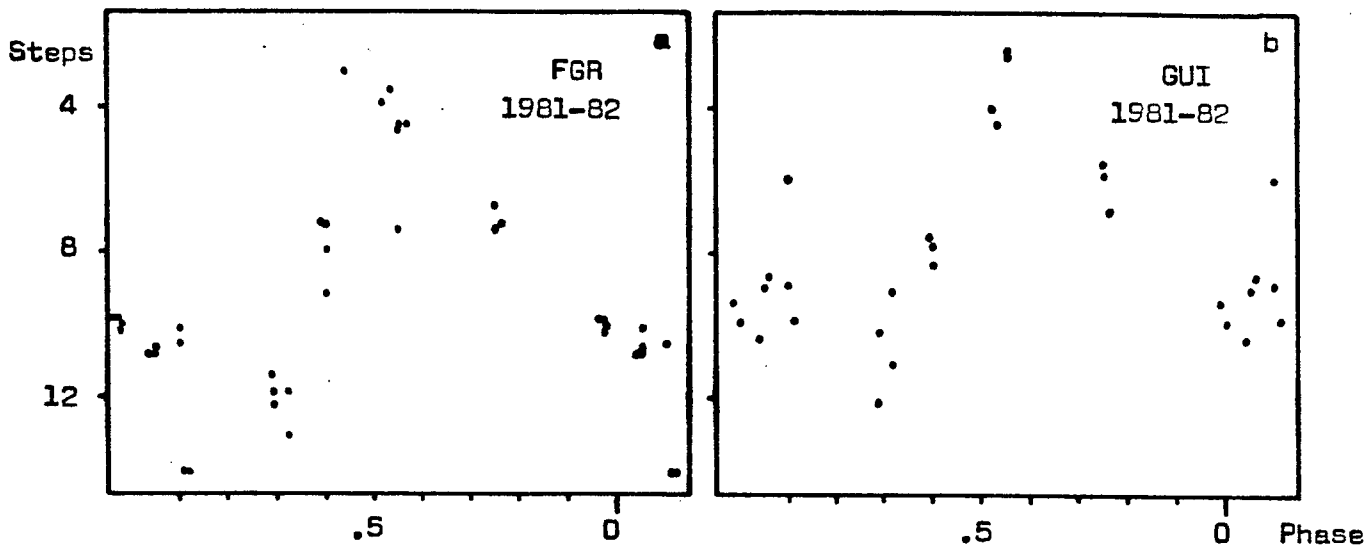

Fig. 2. Light curves of V 526 Aql.

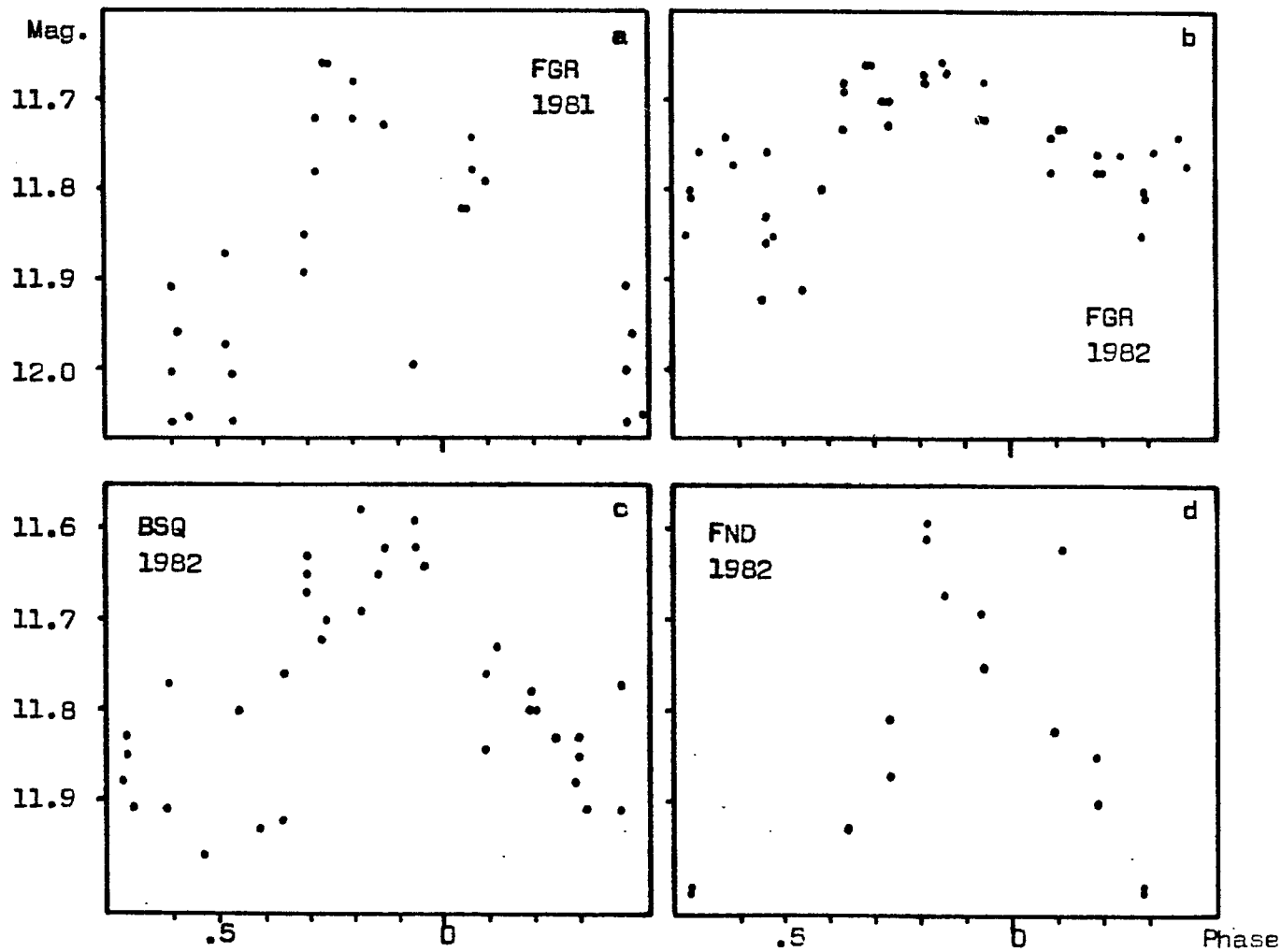

Fig. 3. Combined light curves of BD Cas.

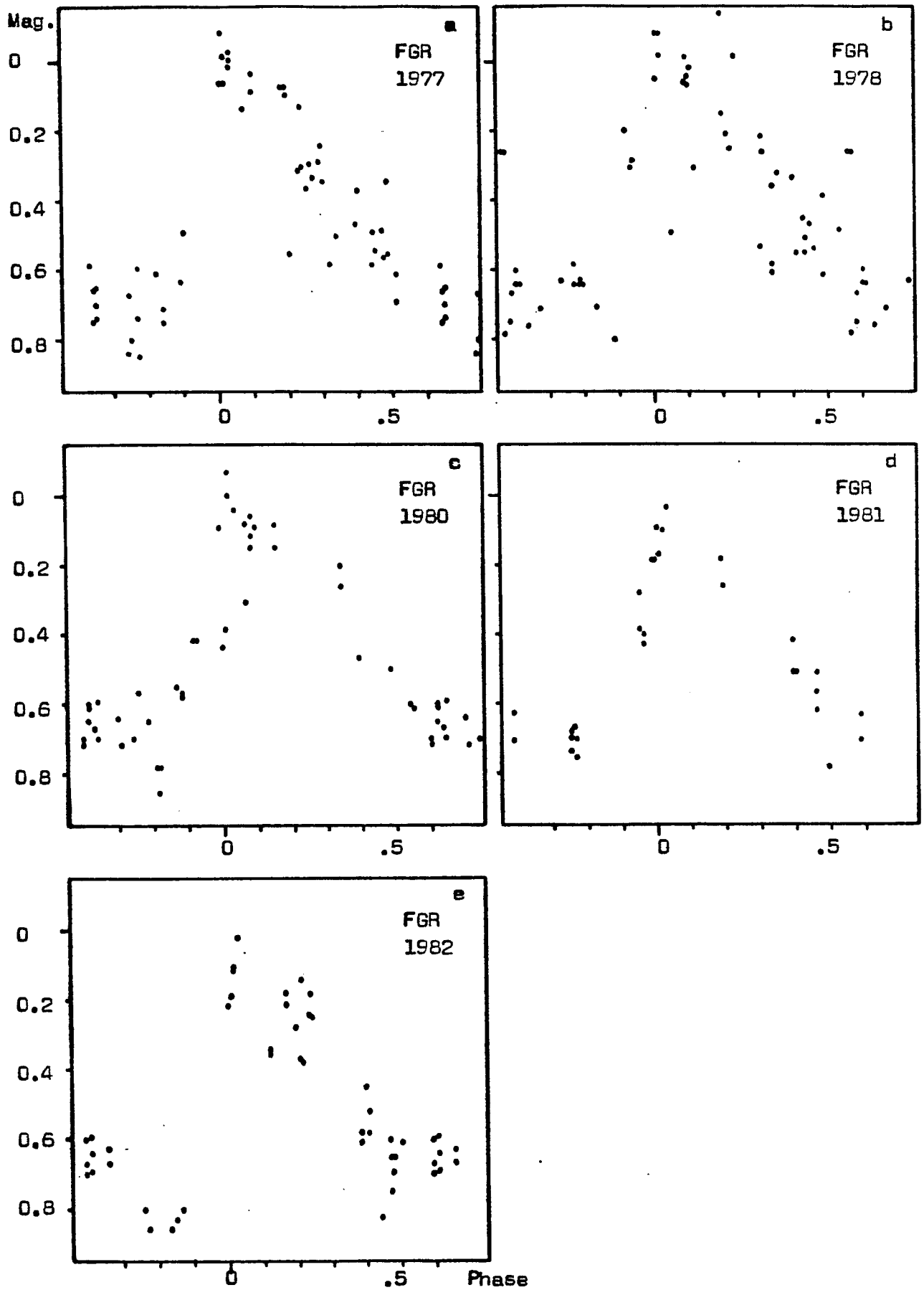

Fig. 4. Combined light curves of V 514 Cyg.