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COMMUNICATION FROM THE OBSERVATORY AT LEIDEN.

Provisional ephemerides of 25 new faint variable stars within 6° of τ Sagittarii,

by *J. G. Ferwerda.*

The 25 variables forming the subject of this paper have been found and estimated on a series of about 300 plates taken by Dr. H. VAN GENT with the Franklin-Adams instrument at Johannesburg. The centre of the plates is 18^h58^m – 27°·5 (1875). The time of exposure of each plate is 30^m. The extreme dates of the plates are J. D 2425442·3847 and J. D. 2426573·5093. The size of the plates is 20 × 20 cm, each plate covering a field of 10° × 10°.

The variables have been discovered with the blink microscope. One pair of plates was compared by Dr. H. VAN GENT in the blink microscope at Johannesburg. The J. D. of these plates are 2425792·4344 and 2425826·4790. This comparison produced 30 variables of which as yet 6 have turned out to be short period variables, viz: *f*, *n*, *r*, *t*, *u*, *x* of this paper. The other variables have been discovered by myself on a second plate pair (J. D. 2425862·2866 and 2425863·3492) with the blink microscope at Leiden. The only rediscovery was the variable *x*.

Of the 25 variables 21 are of the cluster type and 4 are eclipsing variables. The southern part of the plates joins with a field of 10° × 10° in which also a great number of cluster variables have been found, as published in *B. A. N.* No. 227.

The estimates were made on an arbitrary scale of steps, the variable being ordinarily inclosed between two comparison stars. Thus each plate yielded a value for the difference in steps between those two comparison stars, for which difference finally the mean of all plates was adopted. This proceeding generally in use at Leiden is to be preferred to adopting a priori certain brightnesses of the comparison stars. Table 1 shows in column 2 the brightness of the comparison stars in the scale of steps with arbitrary zeropoint (care has been taken that all values of brightness of the variable become positive). Column 3 gives the brightness of the comparison stars in magnitudes found by direct comparison with some stars of the selected area No. 159 which is in the field of the plates. The situations of the variables and the comparison stars are shown on the accompanying diagrams. The variable is indicated by an open circle. The size of these diagrams is 10′ × 10′.

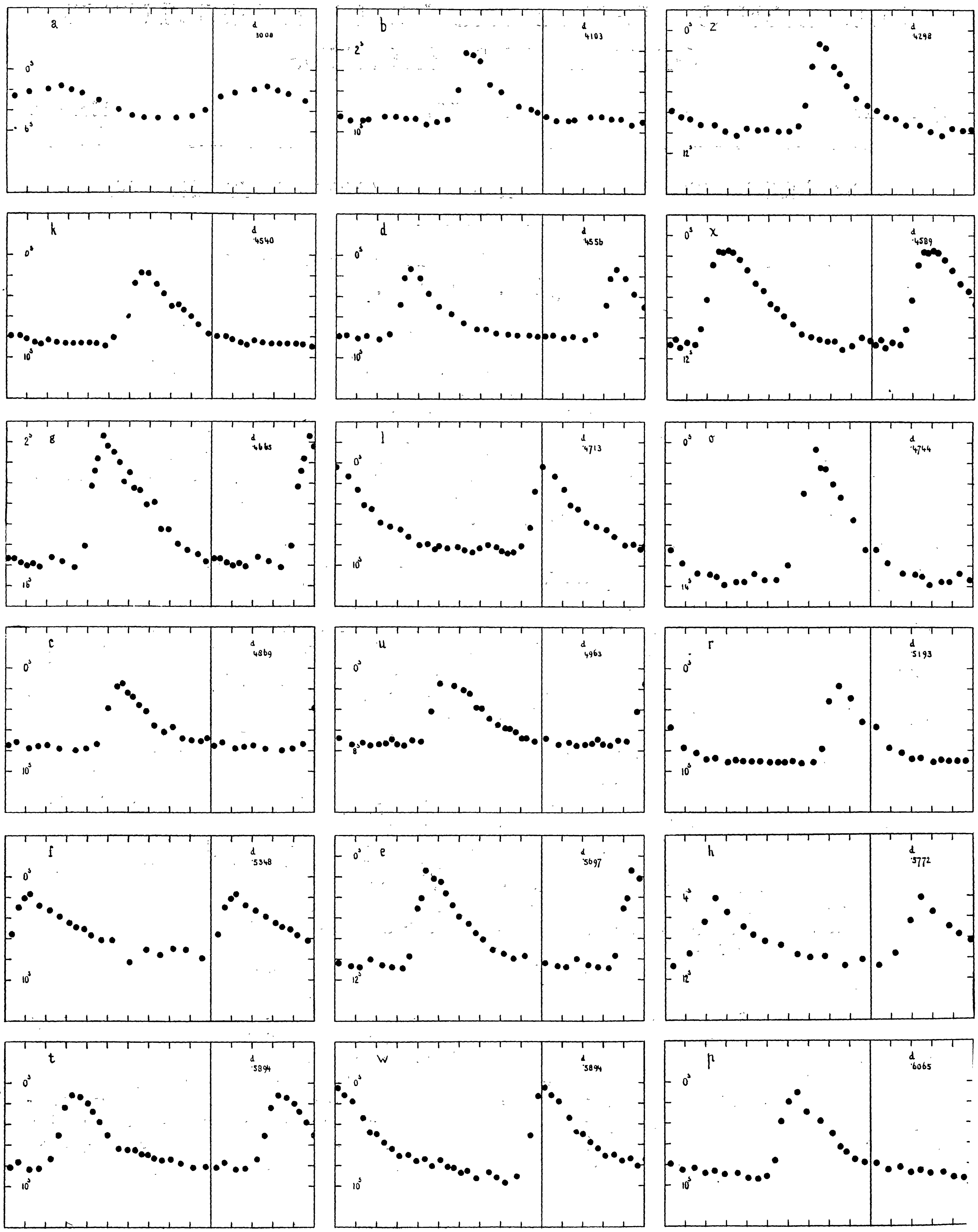
The determination of the period did in no case raise any serious difficulty owing to the circumstance that among the plates there are three sets of 15 or 16 plates taken on one night. The epochs used for the computation of the provisional period are the maxima of the cluster variables and the minima of the eclipsing variables. For variable *a* both maxima and minima have been used. For several variables this period has been corrected graphically as explained below. For those stars of which the period has been derived by least squares Table 2 contains in column 1 the J. D. Hel. Grw. astr. mean times of the epochs used, in column 2 the number of periods elapsed after the earliest epoch and in column 3 the residuals *O—C*.

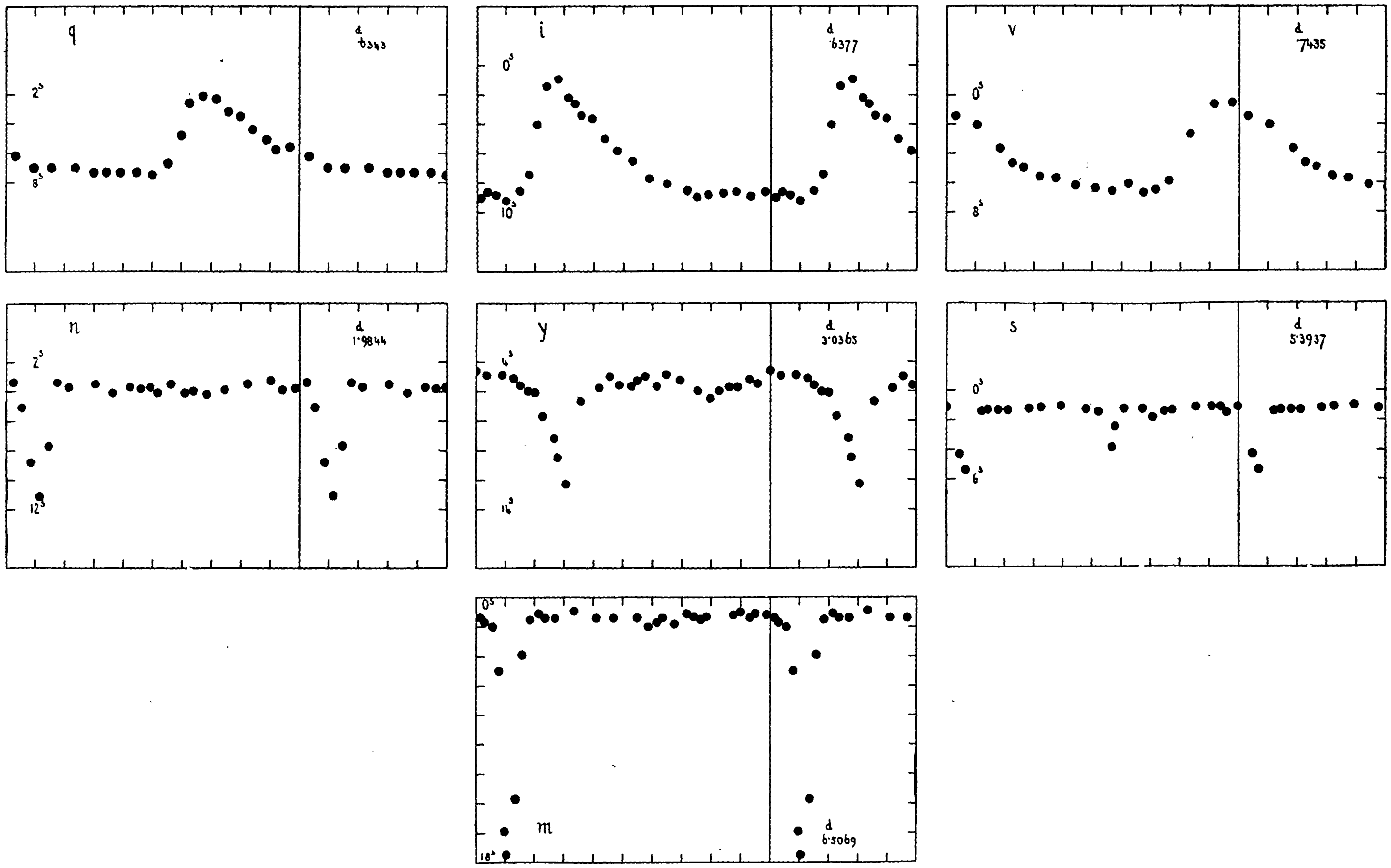
The phases have been computed by the formula

phase = reciprocal period × (J. D. H. Gr. A. M. T. — 2420000)

In some cases the period finally adopted was derived with the aid of the observations made on the steepest part of the lightcurve. The slope of this part of the lightcurve determined for each observation the reduction of its epoch to that of a point on that steep part of the light curve where the variable has a fixed brightness. The normal epochs (often few in number but relatively accurate) thus obtained were used for a graphical determination of the period.

All estimates have been classed according to phase and divided into groups. Table 3 shows in column 1 the numbers of estimates used in each group, in column 2 the mean value of phase, in column 3 the mean value of brightness. The accompanying diagrams give the corresponding light curves. For several variables the uncertainty of the estimates has been taken into account in computing the mean value of brightness. These uncertainties have been specially marked in the


a
d ·3008
b
d ·4103
z
d ·4298
k
d ·4540
d
d ·4556
x
d ·4589
g
d ·4665
l
d ·4713
d ·4744
c
d ·4869
u
d ·4963
r
d ·5193
f
d ·5348
e
d ·5697
h
d ·5772
t
d ·5894
w
d ·5894
p
d ·6065



registrations of the estimates. For some stars all uncertain estimates have been omitted, for others half weight has been assigned to uncertain estimates.

The total number of estimates used in the present paper is 6426.

For the computation of the co-ordinates of the variable three C. P. D. stars have been chosen defining a triangle within which the variable is situated. On an enlargement of the neighbourhood of the variable two straight lines have been drawn joining the four stars two by two. The position of the variable has been computed by assuming a lineair connection between line segments and co-ordinate differences.

Finally, Table 4 gives a summary of the various results. Column 4 gives the total number of estimates used for computing the points of the mean lightcurve.

Column 5 gives the period of variation together with the mean error of this period computed by means of least squares.

Column 7 gives the phase of a point on the rising branch of the mean light curve defined by the condition that the difference in phase with the point of equal brightness on the descending branch becomes a fixed value ΔP (to be found in column 8).

Column 8 gives the fraction ΔP as explained in the remarks to Column 7

Column 10 gives the epoch nearest to the mean date of the plates which is J. D. 2426119. The epoch of the variable f only is an exception, as at the time when the variable was estimated the set of plates was not yet complete. The mean date in this case is J. D. 2425991.

Colume 12 gives the mean error of a single estimate, computed by means of the formula

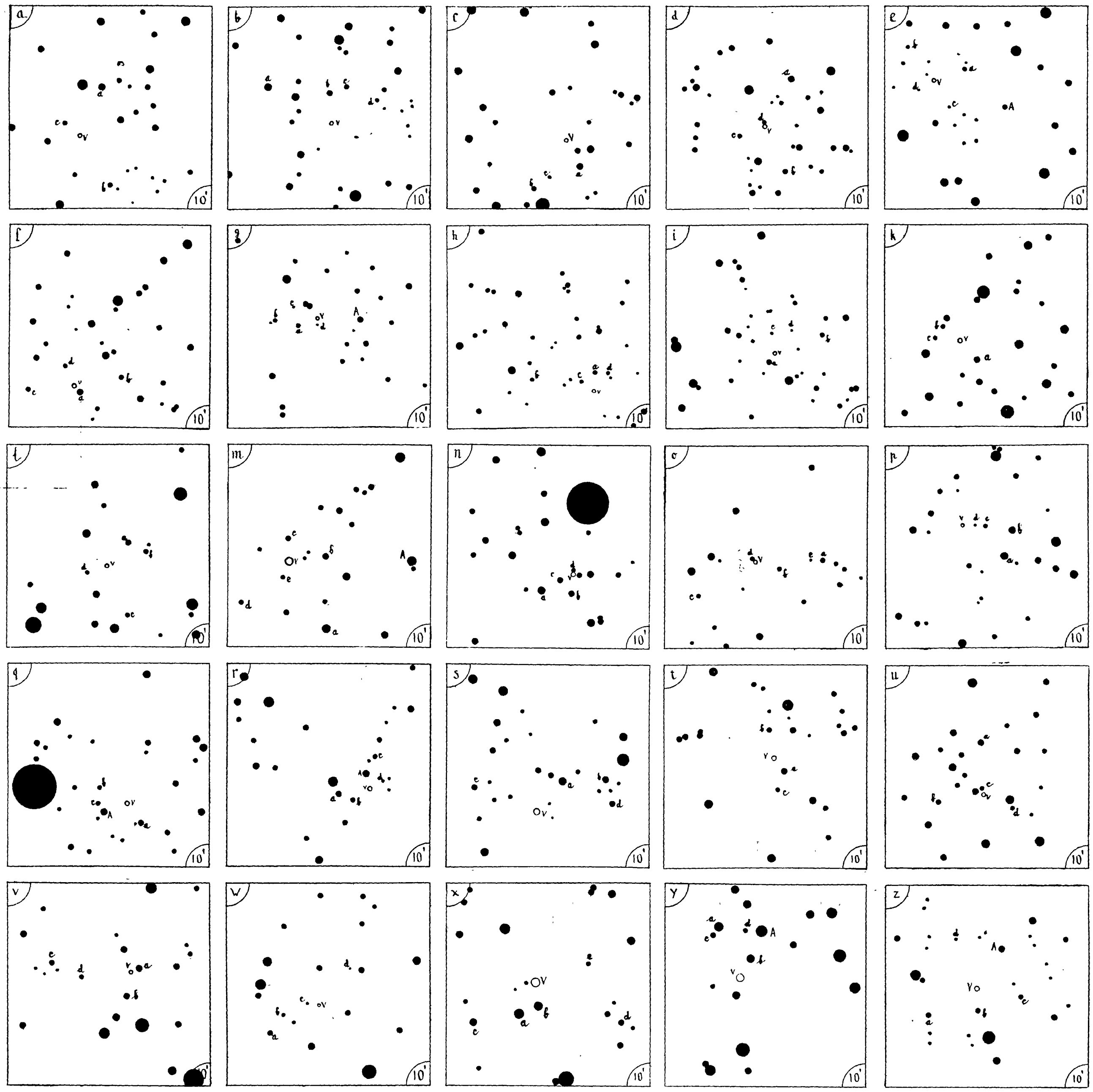
$$\text{m. e.} = \pm \sqrt{\frac{\Sigma (\Delta s)^2}{2n}}$$

in which Δs means the difference in brightness between two estimates following each other in phase and n the number of estimates used.

Column 13 shows the value of one step in magnitudes which gives together with the dates of column 12 some idea of the accuracy of a single estimate.

Remarks on a few individual variables.

Variable *a*. A period has been derived from maxima as well as from minima.



period computed from maxima: $^{d}\cdot3007609 \pm {}^{d}\cdot0000058$
period computed from minima : $\cdot3007738 \pm \cdot0000044$

Or taking the mean value: period $= {}^{d}\cdot3007673 \pm {}^{d}\cdot0000051$.

The lightcurve is approximately a sine curve, the dots of the lightcurve being represented with a mean error of $\pm {}^{s}\cdot18$ by the formula

$$s = \underset{\pm \cdot05}{3^{s}\cdot36} \; \underset{\pm \cdot07}{- 1^{s}\cdot59} \sin 2\pi P \; \underset{\pm \cdot07}{- {}^{s}\cdot09} \cos 2\pi P\,,$$

in which s is the brightness in steps and P the phase (J. D. — 2420000) $\times$ $3^{d^{-1}}\cdot32483$.

From this formula the phase of maximum is $\cdot250 \pm \cdot018$, which is given in Table 4.

Variable *s*. The depth of the secondary minimum is about half of that of the primary.

Variable *y*. The lightcurve of this eclipsing variable shows an indication of a secondary minimum.

I wish to thank Prof. E. HERTZSPRUNG for his help and advice during the preparation of this paper.

TABLE 1.

		s	m
a			
a	—	2·0	13·0
b		1·7	13·5
c		5·0	13·8
b			
a	—	1·0	12·9
b		2·9	13·4
c		5·5	13·8
d		8·8	14·8
c			
a		1·0	13·7
b		4·5	14·2
c		7·6	14·7
d			
a	—	1·0	13·0
b		2·4	13·4
c		5·0	13·8
d		8·2	14·5
e			
A		1·0	13·1
a		3·6	13·5
b		6·5	13·8
c		9·1	14·4
d		11·0	14·6
f			
a		0·0	13·2
b		3·5	13·6
c		6·6	13·8
d		9·2	14·4
g			
A		0·0	13·0
a		4·3	13·6
b		8·8	13·9
c		12·2	14·3
d		15·5	14·8
h			
a		1·0	13·2
b		4·6	14·0
c		9·0	14·5
d		11·3	14·7
i			
a		1·0	13·8
b		5 1	14·3
c		7·1	14·8
d		9·6	15·6
k			
a	—	1·0	12·9
b		4·8	13·5
c		9·2	14·3
l			
a		2·0	13·4
b		4·3	13·7
c		7·5	14·2
d		9·6	14·6
m			
A		1·0	11·9
a		4·5	12·4
b		8·1	12·9
c		11·1	13·1
d		14·6	14·0
e		17·6	14·6
n			
a		1·0	13·1
b		5·4	13·6
c		9·8	14·0
d		12·5	14·5
o			
a		1·0	13·4
b		7·0	13·8
c		11·7	14·0
d		13·6	14·2
e		15·1	14·5
p			
a		0·0	12·7
b		4·2	13·7
c		7·0	14·0
d		9·6	14·7
q			
A		0·0	12·9
a		2·1	13·1
b		6·4	13·3
c		9·1	13·8
r			
A	—	2·0	13·1
a		1·3	13·3
b		4·2	13·5
c		6·2	13·9
d		10·1	14·5
s			
a	—	2·2	12·4
b		2·0	12·8
c		3·2	13·0
d		4·2	13·1
t			
a		0·0	13·4
b		3·2	13·8
c		8·0	14·2
u			
a		2·0	13·2
b		4·0	13·8
c		6·0	14·5
d		7·8	15·1
v			
a		1·0	13·7
b		2·4	14·0
c		5·0	14·3
d		7·6	15·1
w			
a		1·0	13·2
b		5·4	13·7
c		8·1	14·2
d		9·9	14·5
x			
a		0·0	12·0
b		4·2	12·4
c		7·1	12·7
d		9·5	13·0
e		13·2	13·8
y			
A		0.0	11·5
a		3·5	12·4
b		6·4	12·7
c		10·0	13·4
d		13·1	13·9
z			
A	—	1·0	13·1
a		3·0	13·6
b		6·5	14·0
c		9·0	14·4
d		11·4	14·8

TABLE 2.

d	t		d
a			
Max.			
2425478·263	0	+	·003
5792·230	1044	—	24
5799·497	1068	+	25
5823·230	1147	—	2
.488	1148	—	45
5849·402	1234	+	3
5852·429	1244	+	23
5860·225	1270	—	1
6094·531	2049	+	12
6103·579	2079	+	38
6118·578	2129	—	2
6212·353	2441	—	64
6213·331	2444	+	12
6214·237	2447	+	16
6241·302	2537	+	12
6565·483	3615	—	27
6569·407	3628	—	13
6570·339	3631	+	17
6573·348	3641	+	18
Min.			
2425525·283	0	—	·009
5707·561	606		0
5791·474	885	—	3
5793·262	891	—	19
5435·381	1031	—	9
5861·240	1117	—	16
5864·290	1127	+	26
5486·230	1200	+	10
6160·535	2112	+	9
6212·254	2284	—	5
6240·235	2377	+	4
6265·247	2460	+	52
6569·280	3471	+	2
·550	3472	—	29
6570·479	3475	—	2
6573·209	3484	+	21
·456	3485	—	33
b			
2425707·572	0	—	·008
5716·615	22	+	7
5765·430	141	—	7
5825·362	287	+	16
5860·214	372	—	10
5862·287	377	+	11
6094·520	943	—	4
6210·226	1225	—	12
6212·287	1230	—	2
6476·554	1874	+	10
6569·277	2100	—	2
6570·511	2103	+	1
6573·381	2110	—	1
c			
2425706·566	0	—	·002
5764·494	119	—	13
5821·456	236	—	16
5825·362	244	—	6
5463·349	322	+	4
5886·242	369	+	14
6076·600	760		0
6153·542	918	+	14
6212·442	1039	+	1
6213·409	1041	—	6
6236·312	1088	+	14
6237·272	1090		0
·294	1090	+	22
6561·526	1756	—	11
6569·321	1772	—	7
6570·296	1774	—	5
6571·259	1776	—	16
6572·255	1778	+	6
6573·230	1780	+	7
d			
2425524·263	0	—	·002
5792·587	589	—	2
5836·317	685	—	5
2425862·287	742	—	·002
5888·277	799	+	21
6120·589	1309	—	2
6236·290	1563	—	13
6241·313	1574	—	1
6242·221	1576	—	4
6303·271	1710	+	1
6480·493	2099	+	11
6569·310	2294	—	6
6570·232	2296	+	5
6573·413	2303	—	3
e 1)			
f			
2425740·552	0	—	·006
5792·434	97	—	4
5798·328	108	+	7
5808·472	127	—	11
5836·317	179	+	22
6093·538	660	—	18
6153·474	772	+	15
6155·594	776	—	4
6176·455	815	—	2
6212·287	882	—	5
6213·375	884	+	14
6242·221	938	—	22
6243·311	940	—	2
6266·327	983	+	16
g			
2425706·588	0	—	·005
5720·584	30	—	3
5791·485	182	—	6
5792·434	184	+	10
5794·286	188	—	4
5797·557	195	+	2
5826·479	257	+	3
6103·579	851	+	18
6123·615	894	—	5
6153·474	958		0
6212·244	1084	—	5
2426218·323	1097	+	·009
6240·224	1144	—	14
6480·493	1659	+	22
6486·520	1672	—	15
6570·500	1852	—	1
6573·295	1858	—	4
h			
2425792·456	0	—	·013
5795·351	5	—	4
5825·362	57	—	5
6088·562	513	+	13
6213·216	729	+	2
6266·327	821	+	14
6303·271	885	+	21
6540·452	1296	—	9
6569·299	1346	—	19
i			
2425795·351	0	—	·004
5857·217	97	+	8
5885·274	141	+	7
6090·571	463	—	27
6120·567	510	—	1
6155·616	565	—	24
6212·397	654	+	4
6237·272	693	+	9
6246·235	707	+	45
6267·225	740	—	8
6569·482	1214	—	8
6573·316	1220		0
k			
2425706·566	0	+	·010
5775·566	152	—	3
5791·462	187	+	2
5821·435	253	+	9
5825·509	262	—	3
5862·275	343	—	13
6076·600	815	+	9
6176·466	1035	—	11

TABLE 2 (*continued*).

d	t	d
2426212·353	1114	+ ·008
6213·237	1116	— 17
6561·504	1883	+ 9
6568·292	1898	— 14
6569·212	1900	— 2
6573·316	1909	+ 16
l, m, n, o 1)		
p		
2425792·587	0	+ ·020
5823·499	51	0
5862·287	115	— 29
6088·541	488	— 3
6125·555	549	+ 14
6212·265	692	— 7
6218·345	702	+ 7
6568·292	1279	— 3
q		
2425527·295	0	— ·028
5719·518	303	— 5
5834·355	484	+ 18
6123·593	940	+ 3
6214·331	1083	+ 33
6240·313	1124	+ 7
6242·221	1127	+ 12
6568·271	1641	+ 19
6569·493	1643	— 28
6573·295	1649	— 32
r		
2425442·385	0	— ·018
5478·239	69	+ 3
5716·615	528	+ 11
5792·434	674	+ 9
6118·578	1302	+ 20
6129·444	1323	— 19

d	t	d
2426273·313	1600	— ·002
6480·515	1999	— 9
6561·526	2155	— 12
6567·267	2166	+ 17
6568·292	2168	+ 3
6569·343	2170	+ 16
6570·361	2172	— 5
6573·466	2178	— 16
s, t 1)		
u		
2425478·239	0	— ·004
5706·566	460	+ 12
5707·550	462	+ 3
5775·566	599	+ 22
5790·412	629	— 22
5791·462	631	+ 36
5792·434	633	+ 15
5803·351	655	+ 13
5823·208	695	+ 17
5863·371	776	— 23
5886·220	822	— 5
6103·590	1260	— 26
6129·444	1312	+ 18
6210·293	1475	— 34
6211·285	1477	— 35
6212·287	1479	— 25
6219·260	1493	— 1
6273·313	1602	— 48
6569·212	2198	+ 40
6570·210	2200	+ 45
v		
2425525·272	0	+ ·017
5791·485	358	+ 42
5799·508	369	— ·114
5803·351	374	+ 11

d	t	d
2425826·454	405	+ ·064
5830·272	410	+ ·164
5832·258	413	— 80
5849·413	436	— 27
5852·418	440	+ 4
5858·350	448	— 12
5861·286	452	— 50
5864·302	456	— 9
6153·542	845	— 7
6212·244	924	— 45
6238·299	959	— 14
6241·291	963	+ 4
6273·291	1006	+ 31
6569·212	1404	+ 22
w		
2425764·494	0	+ ·016
5790·412	44	0
5794·542	51	+ 4
5803·351	66	— 28
5822·257	98	+ 16
5832·258	115	— 3
5849·391	144	+ 37
5885·298	205	— 10
6094·542	560	— 8
6123·413	609	— 18
6153·474	660	— 17
6160·546	672	— 18
6176·466	699	— 12
6212·442	760	+ 9
6214·215	763	+ 14
6218·323	770	— 4
6241·313	809	— 1
6486·520	1225	+ 10
6565·494	1359	+ 3
6567·267	1362	+ 7
6570·210	1367	+ 3

d	t	d
x		
2425764·494	0	— ·005
5765·430	2	+ 13
5797·546	72	+ 6
5826·454	135	+ 2
6093·528	717	— 9
6160·546	863	+ 8
6212·375	976	— 20
6213·320	978	+ 7
6214·215	980	— 15
6241·302	1039	— 4
6242·221	1041	— 3
6559·324	1732	— 7
6569·439	1754	+ 12
6570·361	1756	+ 16
6571·259	1758	— 3
y 1)		
z		
2425478·239	0	+ ·003
5745·570	622	— 7
5764·494	666	+ 5
5794·564	736	— 12
5825·509	808	— 13
5851·311	868	+ 1
5885·274	947	+ 9
6088·562	1420	— 3
6123·391	1501	+ 12
6153·474	1571	+ 8
6155·616	1576	+ 1
6212·353	1708	+ 3
6213·216	1710	+ 7
6569·514	2539	— 7
6570·382	2541	+ 2
6573·381	2548	— 8

1) Period obtained grafically.

TABLE 3.

n	phase	brightness
	a	
20	·037	2·6
20	·106	2·2
20	·200	1·9
20	·262	1·6
20	·311	2·0
20	·365	2·3
20	·446	3·0
20	·542	3·9
20	·609	4·5
20	·664	4·7
20	·732	4·7
20	·821	4·7
20	·900	4·5
21	·962	3·9
	b 3)	
12	·019	8·5
12	·067	8·9
12	·128	8·9
12	·154	8·8
12	·232	8·5
13	·289	8·5

n	phase	brightness
13	·336	8·7
13	·382	8·7
12	·434	9·3
12	·488	9·0
15	·538	8·8
11	·590	4·9
12	·628	2·3
12	·662	2·5
12	·696	3·1
15	·742	5·4
16	·799	6·1
14	·883	7·5
12	·944	7·8
12	·975	8·1
	c 3)	
10	·017	7·5
10	·057	7·2
10	·119	7·8
10	·161	7·6
10	·207	7·5
11	·265	7·8
12	·345	8·0

n	phase	brightness
12	·397	7·8
11	·448	7·4
7	·501	3·9
11	·546	1·8
12	·572	1·5
10	·598	2·4
10	·622	2·8
10	·652	3·6
11	·688	4·2
9	·726	5·6
5	·773	6·2
10	·816	5·7
11	·862	6·8
11	·908	7·0
10	·951	7·1
11	·982	6·8
	d 2)	
10	·012	7·9
10	·050	7·8
10	·101	8·1
10	·147	7·9
10	·209	8·2

n	phase	brightness
11	·259	7·7
5	·310	4·8
5	·330	2·2
8	·360	1·3
10	·405	2·2
10	·446	3·7
10	·497	5·0
10	·556	5·7
10	·616	6·6
10	·680	7·2
10	·724	7·2
10	·771	7·6
9	·830	7·7
9	·877	7·8
9	·934	7·8
9	·975	7·9
	e	
9	·017	10·4
10	·078	10·7
10	·119	10·8
10	·170	10·0
10	·226	10·6

n	phase	brightness
10	·273	10·8
8	·325	10·9
8	·357	9·7
8	·398	5·1
8	·415	4·1
7	·437	1·4
8	·476	2·2
8	·510	2·5
8	·533	3·6
10	·566	4·8
10	·598	5·9
10	·644	6·6
10	·680	7·5
10	·713	8·1
10	·761	9·1
10	·815	9·5
10	·861	10·0
10	·917	9·7
	f	
6	·031	5·6
5	·065	3·0
7	·093	2·1

n	phase	brightness
10	·120	1·7
10	·166	2·8
10	·216	3·3
10	·265	3·9
10	·311	4·5
10	·343	4·9
10	·383	5·1
10	·416	5·7
10	·468	6·2
10	·520	6·2
10	·604	8·3
10	.687	7·1
10	·752	7·6
10	·816	6·9
10	·878	7·1
10	·958	7·9
	g	
10	·012	13·3
10	·041	13·3
10	·075	13·7
10	·104	14·0
10	·134	13·8

n	phase	brightness
10	·167	14·1
10	·224	13·2
14	·279	13·6
9	·338	14·2
9	·387	12·1
6	·419	6·3
7	·432	4·8
7	·446	3·6
7	·472	1·4
10	·494	2·4
10	·525	3·0
10	·553	4·0
10	·574	5·9
10	·602	5·0
10	·624	6·5
10	·653	6·7
10	·686	8·1
10	·724	7·9
10	·757	10·5
10	·793	10·5
10	·839	11·9
10	·883	12·5
10	·936	12·9

n	phase	brightness
10	·973	13·6
	h	
20	·040	10·7
18	·120	9·5
17	·193	6·4
20	·246	4·1
20	·302	5·5
20	·382	6·9
20	·430	7·7
20	·488	8·3
20	·564	8·7
20	·644	9·6
20	·705	9·
20	·779	9·
20	·874	10·
20	·960	10·
	i	
10	·015	9
10	·039	8
10	·065	8
10	·100	9

TABLE 3 (*continued*).

n	phase	brightness
10	·147	8·5
10	·179	7·4
10	·205	4·0
9	·238	1·4
9	·279	0·9
10	·311	2·2
10	·333	2·6
10	·356	3·4
10	·393	3·6
10	·434	5·0
10	·479	5·8
8	·530	6·5
10	·587	7·7
10	·646	8·1
10	·716	8·5
10	·748	9·0
10	·789	8·8
10	·838	8·7
10	·882	8·6
10	·930	8·9
9	·980	8·6
	k	
10	·021	7·9
10	·066	7·9
10	·098	8·2
10	·137	8·5
10	·167	8·7
10	·201	8·3
10	·242	8·5
10	·285	8·6
10	·324	8·6
10	·362	8·6
10	·404	8·6
10	·439	8·7
10	·481	8·9
10	·521	8·1
8	·591	6·0
8	·626	2·8
8	·658	1·8
10	·690	1·8
10	·731	2·9
10	·767	3·8
10	·805	5·0
10	·838	4·9
10	·862	5·4
10	·899	6·0
10	·932	6·8
10	·981	7·7
	l	
9	·003	0·4
10	·061	1·3

n	phase	brightness
10	·108	2·6
10	·138	4·1
10	·174	4·5
10	·217	5·8
10	·264	6·2
10	·313	6·5
10	·351	7·2
10	·404	8·0
10	·446	7·9
10	·480	8·4
10	·500	8·1
10	·541	8·3
10	·591	8·2
10	·625	8·5
10	·662	8·7
10	·699	8·3
10	·739	8·0
10	·780	8·2
10	·804	8·6
10	·832	8·8
10	·861	8·7
10	·900	8·1
9	·941	6·3
9	·966	2·8
	m	
11	·012	1·4
11	·026	1·7
11	·054	2·0
4	·078	5·0
5	·095	15·9
4	·101	17·5
4	·132	13·7
8	·155	3·9
12	·181	1·5
12	·211	1·1
12	·232	1·4
13	·269	1·4
17	·331	0·9
14	·409	1·4
14	·468	1·4
10	·549	1·4
10	·584	2·0
10	·613	1·7
10	·633	1·4
10	·673	1·8
10	·714	1·1
10	·739	1·3
10	·761	1·5
11	·782	1·3
11	·871	1·2
10	·897	1·0
10	·929	1·4
10	·947	1·1
12	·987	1·2

n	phase	brightness
	n	
11	·025	3·4
8	·053	5·1
7	·086	8·8
9	·116	11·1
10	·147	7·7
10	·177	3·4
15	·214	3·7
15	·305	3·5
15	·363	4·1
15	·422	3·7
15	·460	3·8
15	·492	3·7
15	·519	4·1
15	·562	3·5
15	·610	4·1
15	·638	4·0
15	·684	4·2
15	·744	3·9
15	·822	3·5
15	·901	3·3
11	·942	3·9
11	·987	3·8
	o [2]	
10	·028	10·5
10	·083	11·8
10	·158	12·8
10	·219	12·9
10	·251	13·1
10	·289	13·9
10	·345	13·6
10	·385	13·6
10	·433	12·8
10	·484	13·4
9	·541	13·4
6	·598	12·0
10	·675	5·0
8	·733	0·7
8	·758	2·5
8	·781	2·6
10	·817	4·1
10	·854	5·4
10	·913	7·6
10	·973	10·5
	p [3]	
13	·030	7·9
15	·088	8·5
15	·146	8·3
15	·198	8·8
15	·243	8·6
15	·291	8·9

n	phase	brightness
14	·355	8·8
14	·407	9·3
14	·455	9·4
14	·499	9·1
10	·538	7·6
6	·568	3·8
10	·604	1·9
10	·646	1·0
11	·690	2·9
14	·758	3·8
13	·816	5·0
14	·853	6·3
14	·884	6·8
15	·926	7·5
15	·972	7·8
	q [3]	
15	·030	6·2
15	·094	7·0
15	·152	7·0
15	·234	7·0
17	·298	7·3
17	·340	7·3
15	·388	7·3
15	·444	7·3
15	·497	7·5
14	·550	6·7
9	·596	4·8
9	·622	2·6
14	·669	2·1
15	·713	2·3
16	·754	3·2
15	·797	3·5
15	·839	4·4
14	·885	5·1
15	·918	4·8
15	·965	5·6
	r [3]	
14	·029	5·7
12	·092	7·7
14	·153	8·2
14	·202	8·8
13	·246	8·7
14	·308	9·1
14	·345	8·9
14	·381	9·0
14	·422	9·0
15	·464	9·0
15	·511	9·1
14	·552	9·1
14	·585	9·1
14	·622	9·0
14	·667	9·2

n	phase	brightness
14	·722	9·1
8	·764	7·8
8	·799	3·2
15	·848	1·7
15	·904	2·9
15	·960	5·2
	s	
7	·044	4·3
9	·065	5·4
15	·119	1·4
15	140	1·3
15	·176	1·3
15	·209	1·3
15	·280	1·2
15	·321	1·1
14	·390	1·0
11	·475	1·2
6	·518	1·4
4	·563	3·8
6	·574	2·4
15	·605	1·2
15	·670	1·2
15	·703	1·8
15	·743	1·4
14	·770	1·3
15	·852	1·1
15	·907	1·1
15	·938	1·1
15	·959	1·5
15	·997	1·1
	t [2]	
10	·025	8·2
10	·065	7·7
10	·120	8·4
10	·166	8·3
8	·222	7·4
8	·260	5·1
8	·290	2·4
8	·326	1·2
10	·366	1·4
10	·402	2·0
10	·427	2·8
10	·460	3·8
10	·499	5·1
10	·552	6·4
10	·596	6·5
10	·632	6·5
10	·664	6·9
10	·694	7·0
10	·725	7·3
10	·761	7·5
10	·805	7·4

n	phase	brightness
10	·854	7·8
10	·913	8·2
10	·973	8·1
	u	
10	·021	6·8
10	·083	7·4
10	·135	7·2
10	·171	7·5
10	·212	7·4
10	·247	7·3
10	·275	6·9
10	·300	7·4
10	·335	7·5
10	·374	7·0
10	·416	7·1
10	·467	4·2
7	·509	1·5
8	·578	1·7
10	·621	2·1
10	·651	2·5
10	·684	3·8
10	·710	3·9
10	·748	4·9
10	·788	5·5
10	·823	5·8
10	·848	5·9
10	·875	6·2
10	·904	6·8
10	·928	6·8
10	·968	7·1
	v	
15	·031	1·5
15	·105	2·1
15	·184	3·7
15	·226	4·7
15	·265	5·0
15	·320	5·6
15	·374	5·7
15	·442	6·2
15	·510	6·4
15	·568	6·6
15	·622	6·1
15	·675	6·7
15	·714	6·5
15	·762	5·9
15	·832	2·7
15	·916	0·7
15	·978	0·6
	w	
10	·012	0·5

n	phase	brightness
10	·045	1·2
10	·082	1·8
10	·133	3·4
10	·168	4·8
10	·200	5·0
10	·235	5·8
10	·272	6·4
10	·309	7·1
10	·351	7·0
10	·390	7·6
10	·431	7·4
10	·467	8·1
10	·507	7·5
10	·541	8·2
10	·571	8·3
10	·606	8·8
10	·638	8·6
10	·681	9·3
10	·742	8·7
10	·780	9·2
9	·820	9·7
6	·878	9·1
9	·942	5·1
10	·980	1·3
	x	
10	·019	10·7
10	·045	10·2
10	·066	11·0
10	·100	10·5
10	·140	10·7
9	·168	9·2
9	·197	6·3
9	·229	2·9
9	·256	1·6
9	·276	1·7
10	·302	1·5
10	·324	1·7
10	·358	2·4
10	·393	3·4
10	·433	4·7
10	·473	5·4
10	·507	6·7
10	·538	7·2
10	·571	7·9
10	·616	8·7
10	·659	9·7
10	·703	10·0
10	·744	10·2
10	·783	10·4
10	·818	10·4
10	·854	11·2
10	·903	10·8
10	·951	10·0
10	·992	10·3

n	phase	brightness
	y	
11	·033	4·9
9	·086	4·9
12	·125	5·1
13	·148	5·6
13	·173	6·0
13	·199	6·1
13	·223	7·7
8	·264	9·2
8	·274	10·5
9	·303	12·3
7	·353	6·7
10	·417	5·8
10	·452	5·0
11	·485	5·6
11	·525	5·7
11	·548	5·3
11	·572	5·0
12	·611	5·7
12	·645	4·9
11	·690	5·3
8	·751	6·0
10	·795	6·5
10	·823	6·0
10	·859	5·7
10	·887	5·7
11	·927	5·2
11	·955	5·5
11	·999	4·
	z [3]	
13	·026	7·9
12	·071	8·5
12	·117	8·7
12	·168	9·3
14	·235	9·3
14	·288	9·9
12	·342	10·3
13	·391	9·6
14	·445	9·8
12	·487	9·7
12	·546	9·9
10	·599	9·9
10	·643	9·4
10	·676	7·4
10	·710	3·6
12	·747	1·4
12	·777	1·8
13	·815	3·6
12	·844	4·3
13	·878	5·5
13	·923	6·7
13	·980	7·4

[2] Uncertain estimates omitted.

[3] Uncertain estimates half weight.

TABLE 4.

1	2		3	4	5		6	7	8	9	10	11			12	13	14	
var.	α(1875)	δ(1875)	type	number of estimates	period	m. e.	reciprocal period	phase of rising branch	ΔP	phase of epoch	epoch J. D. 2420000	max.	min.	range	m. e. of single estimate	value of step	max.	min.
	h m s	° ′			d	d	d⁻¹				d	s	s	s	s	m	m	m
a	18 40 22	— 30 45·2	Cl.	281	·3007673	± ·0000051	3·32483			·250 4)	6118·884	1·6	4·7	3·1	·88	·10	13·5	13·8
b	18 41 18	— 26 25·4	Cl.	254	·4103325	± ·0000032	2·437048	·57	·25	·64	6119·14	2·3	9·3	7·0		·23	13·3	14·9
c	18 44 21	— 23 27·9	Cl.	234	·4868848	± ·0000041	2·053874	·49	·20	·56	6118·95	1·5	8·0	6·5		·15	13·8	14·8
d	18 45 31	— 30 40·4	Cl.	195 2)	·4555582	± ·0000032	2·195109	·32	·20	·37	6119·23	1·3	8·2	6·9	·69	·19	13·2	14·5
e	18 48 59	— 30 31·0	Cl.	212	·5697395	1)	1·755188	·38	·25	·44	6119·25	1·4	10·9	9·5	·90	·15	13·2	14·6
f	18 51 57	— 30 29·0	Cl.	178 5)	·5348452	± ·0000099	1·869700	·05	·25	·12	5990·86	1·7	8·3	6·6		·12	13·4	14·2
g	18 52 12	— 27 52·1	Cl.	279	·4664729	± ·0000038	2·143747	·41	·30	·47	6118·95	1·4	14·2	12·8	1·2	·11	13·2	14·6
h	18 53 18	— 29 57·5	Cl.	275	·5771542	± ·0000098	1·732639	·18	·20	·25	6119·13	4·1	10·7	6·6	1·3	·12	13·8	14·6
i	18 56 15	— 31 22·1	Cl.	245	·637673	± ·000015	1·56820	·20	·25	·26	6119·28	0·9	9·2	8·3	1·0	·21	13·8	15·5
k	18 57 33	— 31 47·0	Cl.	264	·4540303	± ·0000042	2·202496	·59	·30	·67	6118·82	1·8	8·9	7·1	·83	·14	13·2	14·2
l	18 59 22	— 32 20 0	Cl.	257	·471289	1)	2·12184	·94	·30	·00	6119·22	0·4	8·8	8·4	·78	·14	13·2	14·4
m	19 00 02	— 23 48·7	Ecl.	296	6·50692	1)	·153683			·110	6117·20	0·9	17·5	16·6		·16	11·9	14·6
n	19 00 39	— 24 54·2	Ecl.	287	1·984422	1)	·503925			·110	6118·19	3·3	11·1	7·8		·12	13·3	14·2
o	19 05 05	— 30 22·1	Cl.	189 2)	·4743880	1)	2·107979	·66	·25	·73	6119·00	0·7	13·9	13·2	1.2	·08	13·3	14·3
p	19 05 19	— 24 52·6	Cl.	276	·6065108	± ·000014	1·648775	·55	·30	·64	6118·87	1·0	9·4	8·4		·20	12·9	14·6
q	19 05 51	— 27 06·0	Cl.	289	·6343265	± ·000014	1·576475	·61	·20	·67	6119·14	2·1	7·5	5·4		·07	13·1	13·5
r	19 06 27	— 26 27·1	Cl.	284	·5193201	± ·0000047	1·925594	·77	·30	·84	6119·07	1·7	9·2	7·5		·13	13·3	14·3
s	19 07 49	— 27 50·4	Ecl.	296	5·3937	1)	·18540			·062	6116·84	1·0	5·4	4·4		·11	12·7	13·2
t	19 09 51	— 29 06·6	Cl.	232 2)	·5893533	1)	1·696775	·27	·20	·34	6118·87	1·2	8·4	7·2	·71	·10	13·5	14·2
u	19 11 33	— 30 33·0	Cl.	255	·4963279	± ·0000106	2·01480	·47	·25	·52	6118·98	1·5	7·5	6·0	·71	·32	13·1	15·0
v	19 12 31	— 31 52·1	Cl.	255	·743543	± ·000043	1·34491	·83	·30	·95	6119·33	0·6	6·7	6·1	1·0	·16	13·7	14·7
w	19 12 33	— 31 00·7	Cl.	244	·5894137	± ·0000071	1·69660	·94	·30	·01	6119·30	0·5	9·7	9·2	·97	·14	13·1	14·4
x	19 15 08	— 32 12·7	Cl.	285	·4589099	± ·0000045	2·179077	·19	·30	·29	6119·24	1·5	11·2	9·7	·91	·12	12·1	13·3
y	19 15 16	— 23 39·1	Ecl.	296	3·03653	1)	·329385			·310	6118·40	4 6	12·3	7·7		·16	12·5	13·7
z	19 17 29	— 27 08·3	Cl.	268	·4298087	± ·0000027	2·326616	·69	·20	·75	6119·08	1·4	10·3	8·9		·15	13·3	14·6

1) Period obtained graphically.
2) Uncertain estimates omitted.
4) Phase of maximum of the sine curve.
5) Estimates until J. D. 2426273.