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K. OLÁH and B. SZEIDL

PERIOD CHANGES OF RR LYRAE STARS I. AT AND, SU DRA, RR LEO, TT LYN AND AR PER

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789838 MTA KESZ Sokszorosító F.v.: dr.Héczely Lászlóné

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ABSTRACT

Photographic and photoelectric observations obtained at Konkoly Observatory during the past 45 years are presented.Using all available observations the O-C diagrams of AT And, SU Dra, RR Leo, TT Lyn and AR Per are constructed. Period jumps are characteristic of AT And and TT Lyn. In the period of AT And two jumps occurred: $+710 \times 10^{-8}$ days in 1956 and -545×10^{-5} days in 1962 (Figure 2). The period of TT Lyn is constant, but a jump of 8×10^{-5} days might have taken place in 1958 (Figure 10). The O-C diagram of SU Dra consists of waves of small amplitude, the photoelectric maxima from 1955 were able to be fitted by a straight line (Figure 5). The period of AR Per shows a constant increase with time at a rate of 1.01×10^{-8} days/year (Figure 13). The period of RR Leo also shows an increase at a rate of 15.849×10^{-8} days/year during the past 70 years. A more rigorous period analysis showed that cyclic variations with an amplitude of 0.006-0.007 days and with cycle length of 25000 epoch numbers were superimposed on the positive parabolic O-C diagram (Figures 7 and 8).

INTRODUCTION

Forty-five years ago *L. Detre* commenced to observe RR Lyrae stars at the Konkoly Observatory with the aim of investigating their possible multiple periodicity and secular period changes. In the thirties it was firmly believed that the evolutionary changes in the stars' constitution were reflected in the period changes. We now know that the question of period changes is more complex. The well-observed field RR Lyrae stars provide a good opportunity for us to investigate not only the rough structure but also the delicate features of their O-C diagrams as well as the minute changes in their periods. In this way it is hoped, that we will be able to elucidate the confused problem of period changes of RR Lyrae stars. Under the stimulation and inspiration of the late director of the Konkoly Observatory, *L. Detre*, we have buckled down to the task of processing the photographic and photoelectric data obtained at our observatory during the past 45 years and to collecting all the available moments of maximum of the RR Lyrae stars in order to construct precise and detailed O-C diagrams. In this paper we present the results on the RR Lyr type stars AT And, SU Dra, RR Leo, TT Lyn and AR Per. In subsequent papers we plan to publish our results on further RR Lyrae variables.

OBSERVATIONS

Since 1933 through the years some thousands of photographic and about 150000 photoelectric observations have been collected for field RR Lyrae variables at the Konkoly Observatory. The photographic observations were made with a 16 cm astrograph mostly using Kodak Eastman 40 and Guilleminot Superfulgur plates. The typical exposure times were 2-5 minutes. Photographic observations ceased in 1957.

The photoelectric observations were first carried out using the 60 cm Newton telescope at Budapest in 1952. Initially the observations were made without filters but since 1954, conventional filters of the UBV system have been used. The mirror of the telescope was first aluminized in 1963. The following multipliers were used: an RCA 931 A with Schott filters BG 12 in B and GG 11 in V; from 1954 an RCA 1P21 with Schott filters UG 1 in U, BG 12+ GG 13 in B and GG 11 in V; and after the aluminization of the mirror in 1963 an EMI 9052 B with the same filters as in the previous years. Since 1972 photoelectric observations were also made close to the international UBV system with the new 50 cm telescope at Konkoly Observatory's mountain station. At this location we used an integrating photometer equipped with an unrefrigerated EMI 9058 QB photomultiplier and the following Schott filters: UG 2 in U, BG 12 + GG 13 in B and GG 11 in V.

The photoelectric observations have been transformed into the UBV system in the traditional way (see e.g. *Hardie*, 1962).

The journal of the observations of AT And, SU Dra, RR Leo, TT Lyn and AR Per is given below.

Table 1

star	year	kind of obs.	number of obs.	star	year	kind of obs.	number of obs.
AT And	1974	pe ΔV	385	RR Leo	1965	pe ΔV	25
		pe ΔB	385			pe ΔB	28
	1975	pe ΔV	281		1966	pe ΔV	25
		pe ΔB	288			pe ΔB	86
	1977	pe ΔV	44			pe ΔU	59
		pe ΔB	46		1967	pe ΔV	76
						pe ΔB	81
SU Dra	1937	pg	19		1968	pe ΔV	28
	1939	pg	190			pe ΔB	28
	1946	pg	100		1969	pe ΔV	28
	1952	pg	149			pe ΔB	27

Table 1 (cont.)

star	year	kind of obs.		number of obs.	star	year	kind of obs.		number of obs.
SU Dra	1954	pg		94	RR Leo	1970	pe	ΔV	23
	1955	pe	Δm	26			pe	ΔB	28
	1957	pe	ΔV	120		1971	pe	ΔV	95
		pe	ΔB	107			pe	ΔB	98
	1959	pe	ΔV	230		1972	pe	ΔV	39
		pe	ΔB	232			pe	ΔB	34
	1974	pe	ΔV	43			pe	ΔU	27
		pe	ΔB	42		1973	pe	ΔV	33
	1975	pe	ΔV	234			pe	ΔB	34
		pe	ΔB	234		1975	pe	ΔV	53
		pe	ΔU	174			pe	ΔB	56
	1976	pe	ΔV	18		1976	pe	ΔV	55
		pe	ΔB	19			pe	ΔB	57
	1977	pe	ΔV	23		1977	pe	ΔV	14
		pe	ΔB	22			pe	ΔB	16
RR Leo	1952	pg		16	TT Lyn	1959	pe	ΔV	233
	1953	pg		34			pe	ΔB	228
	1954	pg		63		1978	pe	ΔV	78
		pe	Δm	117			pe	ΔB	88
	1955	pe	Δm	57					
	1956	pg		25	AR Per	1937	pg		82
		pe	Δm	144		1954	pe	Δm	28
	1957	pg		98			pe	ΔV	12
	1958	pe	ΔV	113			pe	ΔB	15
		pe	ΔB	110		1958	pe	ΔV	181
	1959	pe	ΔV	131			pe	ΔB	183
		pe	ΔB	131		1969	pe	ΔV	26
	1961	pe	ΔV	56			pe	ΔB	25
		pe	ΔB	56			pe	ΔU	24
	1963	pe	ΔV	47		1976	pe	ΔV	31
		pe	ΔB	60			pe	ΔB	31
	1964	pe	ΔV	37					
		pe	ΔB	36					
		pe	ΔU	19					

In Tables 8-15 the photographic and photoelectric observations of the stars mentioned are given. Asterisks indicate that the observations were carried out without filters and are not, of course, converted into the UBV system.

AT ANDROMEDAE

AT And = 178.1935 And was discovered by *Morgenroth* (1935). *Lange* (1935) classified the star as an RR Lyrae variable and gave the preliminary ephemeris:

$$\text{J.D. max. hel.} = 2428022.37 + 0^{d}.628 \times E$$

During the past 40 years a number of visual and photographic observations were carried out on this star. *Parenago* (1940) in-

Table 2

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\overline{E}$	Reference
1906	2417469.447	pg n	+0.029	-40320	+0.029	-40320	Tsessevich,(1966)
1935	27999.542	vis n	-0.006	-23251	+0.001	-23233	Kanishcheva, Lange,(1971)
	28022.37:	vis n	+0.009:	-23214			Lange,(1935)
1937	28745.378	pg n	-0.008	-22042	-0.008	-22042	Tsessevich,(1966)
1938	29162.423	pg n	+0.003	-21366	+0.003	-21366	-"-
1945	31700.402	vis n	-0.005	-17252	-0.005	-17252	-"-
1954	34961.450	pg n	+0.031	-11966	+0.031	-11966	Alania,(1956)
1956	35755.378	pg	-0.010	-10679	-0.022	-10597	Romano, Perissinotto (1969)
	35802.250	pg	-0.023	-10603			-"-
1957	35860.229	pg	-0.034	-10509			-"-
	36135.375	pg	-0.032	-10063	-0.016	-10062	-"-
	36137.257	pg	-0.001	-10060			-"-
1958	36378.470	pg	-0.002	- 9669	-0.011	- 9515	-"-
	36427.179	vis n	-0.029	- 9590			Lange,(1959)
	36491.354	pg	-0.013	- 9486			Romano, Perissinotto (1969)
1959	36596.244	pg	+0.001	- 9316			-"-
	36805.357	pg	-0.020	- 8977	-0.016	- 8894	-"-
	36821.386	pg	-0.031	- 8951			-"-
	36900.380	pg	-0.002	- 8823			-"-
	36908.392	pg	-0.010	- 8810			-"-

Table 2 (cont.)

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\overline{E}$	Reference
1963	2438298.313:	pg n	+0.003:	- 6557	+0.002:	- 6530	Daube,(1969)
	38334.709	pe	+0.001	- 6498			Sturch,(1966)
1965	39026.887	pe	0.000	- 5376	0.000	- 5376	Fitch et al.,(1966)
1968	40220.617:	pe	0.000:	- 3441	0.000:	- 3441	Epstein,(1969)
1974	42277.4110	pe	+0.0004	- 107	-0.0002	+ 22	present paper
	42304.5565	pe	+0.0016	- 63			-"-
	42307.6405	pe	+0.0011	- 58			-"-
	42309.4887	pe	-0.0015	- 55			-"-
	42319.3592	pe	-0.0016	- 39			-"-
	42343.4205	pe	0.0000	0			-"-
	42361.3110	pe	0.0000	+ 29			-"-
	42367.4810	pe	+0.0008	+ 39			-"-
	42369.3290	pe	-0.0019	+ 42			-"-
	42403.2644	pe	+0.0032	+ 97			-"-
1975	42422.3849	pe	-0.0007	+ 128			-"-
	42424.2338	pe	-0.0025	+ 131			-"-
	42432.2550	pe	-0.0012	+ 144			-"-
	42712.3350	pe	-0.0005	+ 598	-0.0005	+ 598	-"-
1977	43422.4067	pe	+0.0023	+ 1749	+0.0023	+ 1749	-"-

vestigated AT And on 431 photographic plates of the Moscow Sternberg Institute and determined the following new elements:

$$\text{J.D. max. hel.} = 2429146.347 + 0^{d}.6169129xE$$

The amplitude of the light variation turned out to be fairly small, only $0^{m}.53$ pg.

Other visual and photographic maxima were derived from the observations of *Kippenhahn* (1953), *Alania* (1956), *Lange* (1959, 1968), *Tchumak* (1965), *Daube* (1969), *Romano* and *Perissinotto* (1969) and *Kanishcheva* and *Lange* (1971). *Tsessevich* (1966) examined the old Harvard plates and gave a very important time of maximum for the year 1906.

Tchumak (1965), using both *Parenago*'s and *Tsessevich*'s observations, stated that this star had a strong Blazhko effect. According to him the period of the secondary variation of the light curve was $P_B = 82^{d}.75$ and during this cycle the O-C oscillation of the maxima was 1.5 hours = $0^{d}.06 = 0^{p}.10$.

Lange (1968) and *Olah* (1975) questioned *Tchumak*'s results. Here we publish all the photoelectric observations obtained at the Konkoly Observatory in 1974, 1975 and 1977 (Table 8). These observations (see Figure 1) clearly and unambiguously show that AT And has a stable light curve and does not possess Blazhko effect. Other photoelectric observations (*Fitch* et al. 1966, *Sturch* 1966, *Epstein* 1969) also confirm the stable character of its light curve.

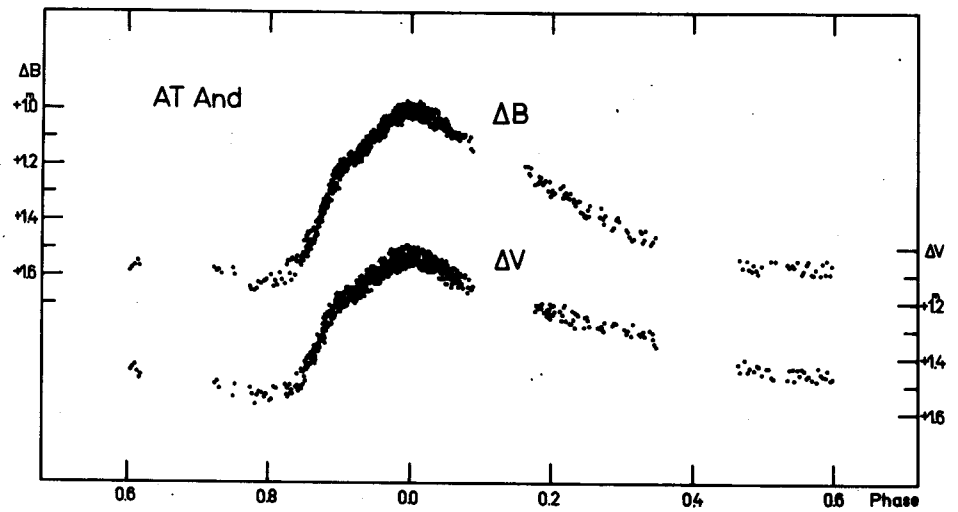

Figure 1: B and V light curves of AT And

The comparison star used for the photoelectric observations at Konkoly Observatory was BD +42°4739. Its magnitude and colour were adopted from *Sturch* (1966): V = 9.465 and B-V = 0.372.

All the published maxima are given in Table 2. For each year we determined a mean value of O-C's. The O-C diagram (Figure 2) was constructed by using these mean values with the elements:

J.D. max. hel. = 2442343.4205 + 0^d.61691475xE

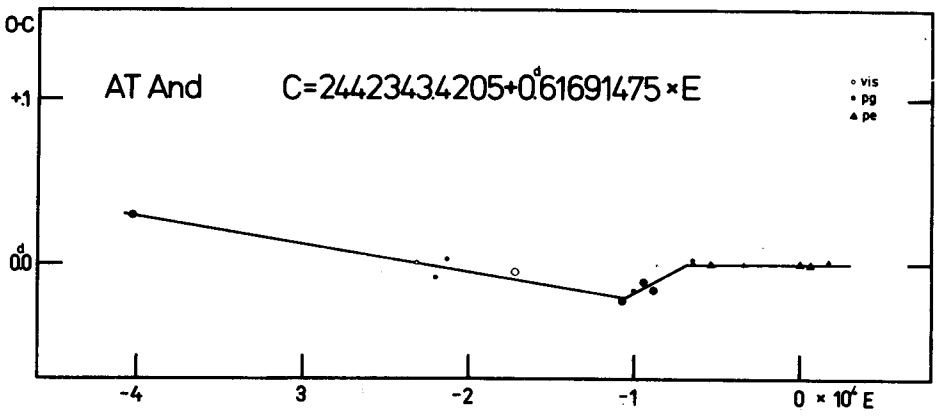

Figure 2: O-C diagram of AT And

Because of the abnormally wide scatter of *Tchumak*'s observations, they were omitted. We also did not take into account *Alania*'s maximum in constructing the O-C diagram.

The O-C diagram can be approximated by broken lines. The periods are:

interval	period
- 2436000	0.61691310
2436000 - 2438000	0.61692020
2438000 -	0.61691475

The period jumps were $+710 \times 10^{-8}$ days and -545×10^{-8} days.

SU DRACONIS

This bright RR Lyrae type variable was discovered by Miss *Leavitt* from plates of the Harvard Map of the Sky; its variability was announced by *Pickering* (1907a). The first investigators of SU Dra = BD +68°652 (9.5) = HD 100971 (A2) = 43.1907 = HV 2900 = AG Chri 1788 (9.4) were *Enebo* (1907, 1911), *Seares* (1908), *Sperra*

(1909) and *Ginori* (1912). Their visual observations yielded a fairly good period of the star. *Martin* and *Plummer* (1913) found strange fluctuations superimposed on the light curve.Since *Martin* and *Plummer*'s observations a great number of accurate photographic and photoelectric observations have been collected but this unusual phenomenon has never again been seen. Certainly these fluctuations resulted from the fairly large observational errors of *Martin* and *Plummer*.

The period change of SU Dra can easily be followed. The star has been observed almost continuously over the years. *Floria* (1931, 1933), *Lange* (1938, 1960), *Soloviev* (1934a,b, 1936a,b), *Ahnert* (1960b), *Sacharov* (1964) and *Braune* et al.(1970,1972,1973) carried out visual observations, *Robinson* (1933), *Jordan* (1929), *Kepinski* and *Kowalczewski* (1934), *Dziewulski* (1938,1951), *Opalski* (1938), *Alania* (1956), *Koshuba* (1961) and *Harding* and *Penston* (1966) photographic observations. *Payne-Gaposchkin* (1954), using the old Harvard plates, gave the first known time of maximum.

Tsessevich (1966) rediscussed a few observations and gave new maxima. We have not included *Jost*'s data (*Jost*, 1933) in our discussion because of the large observational errors. The most accurate moments of maximum were obviously obtained from photoelectric measurements (see *Geyer* (1961), *Spinrad* (1961) and *Fitch* et al. (1966)).

In the years 1939, 1946, 1952 and 1954 the star was photographically observed at Konkoly Observatory. The measurements are given in Table 10. We used the following comparison stars (see Figure 3):

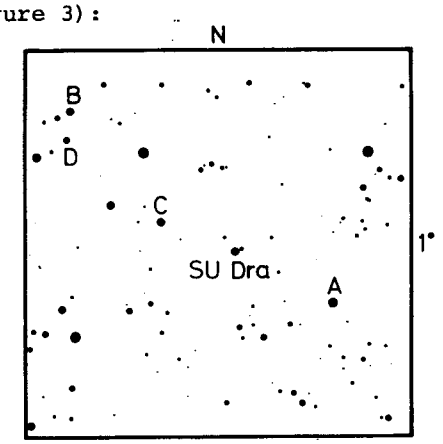

Figure 3

star	m_{pg}
A	9.11
B	9.96
C	10.24
D	11.10

The first photoelectric observations were made at our observatory without filter in 1955. These observations of course cannot be transformed into the international UBV system. Later on, our photoelectric observations were obtained in a system close to the international one. Our data are given in Table 9 and in Figure 4. As a comparison star we used BD $+68^{\circ}655$. A tie-in observation yielded for this star: V = 9.26, B-V = 1.05, U-B = 0.98. The photoelectric observations clearly show that SU Dra has a stable, repetitive light curve.

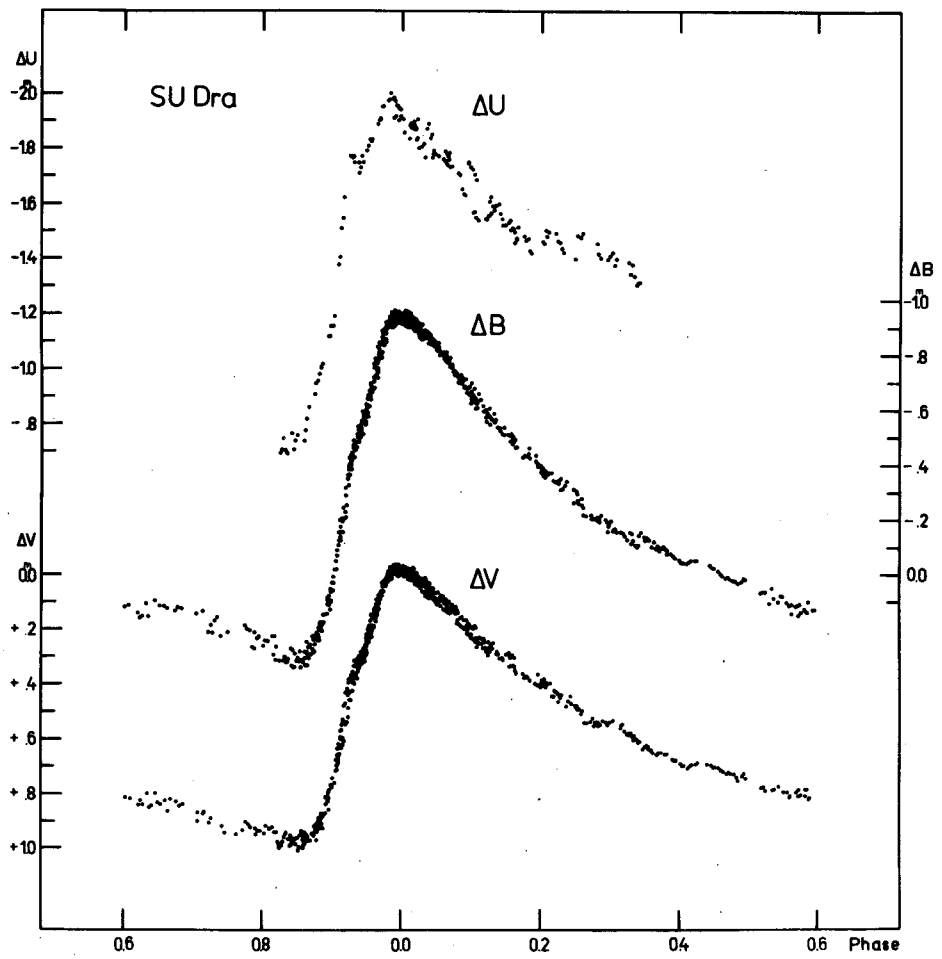

Figure 4: U, B and V light curves of SU Dra

Table 3

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\overline{E}$	Reference
1904	2416556.38	pg n	+0.004	- 6131	+0.004	- 6131	Payne-Gaposchkin,(1954)
1907	17845.27	vis n	+0.099	- 4180			[1]Enebo,(1907)
	17981.25	vis n	-0.007	- 3974	-0.0075	- 3776	Enebo,(1911)
1908	18073.70	vis	-0.016	- 3834			Seares,(1908)
	18104.76	vis	+0.004	- 3787			-"-
	18118.63	vis	+0.006	- 3766			-"-
	18122.57	vis	-0.017	- 3760			-"-
	18131.82	vis	-0.013	- 3746			-"-
	18138.80	vis	-0.297	- 3735			[1] -"-
	18251.3591	vis n	-0.0095	- 3565			Enebo,(1911)
1909	18394.6736	vis n	-0.0059	- 3348	-0.0059	- 3348	[2]Sperra,(1909)
1912	19451.3499	vis n	+0.0001	- 1748	-0.0021	- 1541	[3]Ginori,(1912)
	19724.7589	pg n	-0.0043	- 1334			[2]Martin, Plummer,(1913)
1915	20568.1440	pg n	+0.0259	- 57	+0.0101	+ 34	Robinson,(1933)
	20688.3088	pg n	-0.0056	+ 125			Jordan,(1929)
1930	26258.9548	pg n	+0.0070	+ 8560	+0.0063	+ 8608	Floria,(1933)
	26322.3536	vis n	+0.0056	+ 8656			[2]Floria,(1931)
1931	26540.2710	vis n	-0.0152	+ 8986	-0.0054	+ 9012	Floria,(1933)
	26583.8783	vis n	+0.0044	+ 9052			-"-
1932	26929.9310	vis n	-0.0024	+ 9576	-0.0024	+ 9576	-"-
1933	27151.1668	pg n	-0.0070	+ 9911	-0.0050	+10033	Kepinski, Kowalczewski,(1934)
	27312.313	vis n	-0.003	+10155			Lange,(1938)
1934	27486.664	vis n	-0.003	+10419	+0.0020	+10484	Soloviev,(1934a, b)
	27572.528	vis n	+0.007	+10549			Tsessevich,(1966)
1935	27882.2645	vis n	+0.0071	+11018	-0.0008	+11142	Dziewulski,(1938)
	27974.703	vis n	-0.013	+11158			Soloviev,(1936a, b)
	28036.1386	pg n	+0.0036	+11251			Dziewulski,(1938)
1939	29372.6803	vis n	-0.1426	+13275			[1] -"-
	29375.466	pg	+0.001	+13279	+0.001	+13279	present paper
1946	32061.392	pg	+0.004	+17346	+0.004	+17346	-"-
1952	34099.434	pg	-0.008	+20432	-0.0002	+20491	-"-
	34126.526	pg	+0.008	+20473			-"-
	34130.485	pg	+0.004	+20479			-"-

Table 3 (cont.)

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\overline{E}$	Reference
1952	2434196.518	pg	-0.005	+20579			present paper
1954	34807.415	pg	+0.005	+21504	-0.0020	+21521	Alania,(1956)
	34830.516	pg	-0.009	+21539			present paper
1955	35186.484	pe	-0.006	+22078	-0.006	+22078	-"-
1957	35892.4618	pe	-0.0165	+23147	-0.0075	+23465	Geyer,(1961)
	36152.6811	pe	-0.0022	+23541			present paper
	36164.5657	pe	-0.0052	+23559			-"-
	36199.5671	pe	-0.0060	+23612			-"-
1959	36610.357	vis n	+0.003	+24234	+0.003	+24234	Ahnert,(1960b)
	36619.5941	pe	-0.0054	+24248	-0.0060	+24267	present paper
	36645.3492	pe	-0.0066	+24287			-"-
	36902.263	pg n	+0.004	+24676	+0.004	+24676	[3]Koshuba,(1961)
1960	37044.9066	pe	-0.0027	+24892	-0.0027	+24892	Spinrad,(1961)
	37137.360	vis n	-0.008	+25032	-0.008	+25032	Lange,(1960)
1962	37881.6643	vis n	+0.0043	+26159	+0.0043	+26159	Sacharov,(1964)
1963	38150.447	pg n	-0.003	+26566	-0.003	+26566	Harding, Penston(1966)
1964	38464.810	pe	0.000	+27042	0.000	+27067	Fitch et al.,(1966)
	38497.831	pe	0.000	+27092			-"-
1966	39245.419	vis n	-0.006	+28224	-0.0147	+28290	Braune et al.,(1970)
	39255.306	vis n	-0.025	+28239			Batyrev,(1973)
	39261.252	vis n	-0.023	+28248			-"-
	39389.391	vis n	-0.005	+28442			Braune et al.,(1970)
	39710.341	vis n	-0.019	+28928	-0.0155	+28978	Batyrev,(1973)
1967	39776.390	vis n	-0.012	+29028			-"-
1971	41075.436	vis n	-0.010	+30995	-0.010	+30995	Braune et al.,(1972)
1972	41394.431	vis n	+0.003	+31478	+0.003	+31478	Braune et al.,(1973)
1975	42403.5545	pe	+0.0063	+33006	+0.0074	+33038	present paper
	42415.4444	pe	+0.0087	+33024			-"-
	42454.4077	pe	+0.0072	+33083			-"-
1976	42948.3975	pe	+0.0037	+33831	+0.0037	+33831	-"-
1977	43204.6427	pe	+0.0064	+34219	+0.0064	+34219	-"-

Remarks: [1] omitted, [2] rediscussed by Floria (1933), [3] rediscussed by Tsessevich (1966)

The times of maximum are collected in Table 3. The residuals were calculated by the elements:

J.D. max. hel. = 2420605.7620 + $0^d.66041890 \times E$

From the O-C values yearly means were formed. These are plotted against epoch numbers in Figure 5. The waves in the O-C diagram seem to be real. Since 1955 the O-C values using only the photoelectric observations can be approximated by a straight line, i.e. with the period $0^d.66042001$.

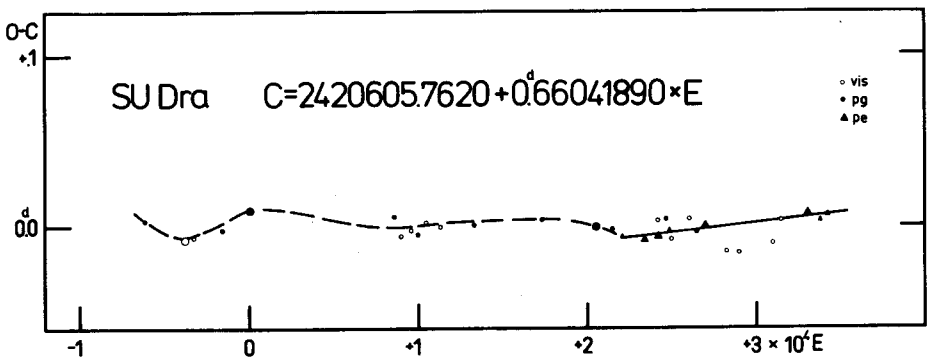

Figure 5: O-C diagram of SU Dra

RR LEONIS

The variability of this star RR Leo = BD $+24^\circ 2183$ (9.4) = 170.1907 = HV 3015 was discovered by *Leavitt* (*Pickering*, 1907) on Harvard photographs. *Luizet* later determined the period. At first he found it to be 4.74867 days (*Luizet*, 1909) but later determined it as only 0.452368 days (*Luizet*, 1911a). *Luizet* (1911b) gave a long list of maxima from his visual observations. We were of the view that *Luizet*'s observations should be rediscussed and that normal maxima be determined using his data.

Martin and *Plummer* (1921) derived the light curve of this star and found secondary oscillations which have never been present in any of the light curves ever observed. The time of maximum was redetermined using *Martin* and *Plummer*'s data but it still remained very uncertain because they used exposition times of 34-60 minutes.

Jordan (1922) was the first to question the existence of these curious secondary oscillations on the descending branch of the variable. From his excellent photographic observations

(*Jordan*, 1929), we were able to derive three different moments of maximum and the moments are given in Table 4.

As RR Leo is relatively bright and the rising branch is very steep the star is easy to observe and has naturally attracted many observers. As early as 1929, *Nielsen* (1929) drew attention to the slow increase in the period of this star. He gave the elements:

J.D. max. hel. = $2418120.3412 + 0^d.4523702xE + 0^d.275x10^{-9}xE^2$

Oosterhoff (1930) obtained new sets of very accurate photographic observations. Having analysed the available data he arrived at the quadratic term $+0^d.183x10^{-9}xE^2$. Since *Oosterhoff*'s investigation several attempts were made to give a more accurate value for the quadratic term (*Tsessevich*, 1934, *Kooreman*, 1935, *Gaposchkin*, 1934, *Balazs*, 1936). Following *Oosterhoff*'s procedure *Balazs* and *Detre* (1949) performed very detailed and precise period analysis. They gave the formula for the period as follows:

$P = 0^d.45238142 + 0^d.360x10^{-9}xE - 0^d.7x10^{-6}x \cos 0^o.0134x(E+6500)$

This period satisfied all the observations obtained up to 1949.

A long term periodic change in the period of an RR Lyrae type star is very interesting because it probably reflects the binary nature of the variable. The light-time effect can easily be made responsible for this kind of cyclic variation in the period.

This question seemed very interesting and a great number of photographic and photoelectric observations have been collected at Konkoly Observatory during the past 30 years. Since 1952 the star has been observed photoelectrically almost every year. The photographic plates were measured by a Cuffey microphotometer and the same comparison stars were used as by *Balazs* (1936). Their magnitudes were also adopted from her measurements. As comparison star we used BD $+24^o2181$ (V = 10.400, B-V = 0.090 and U-B = 0.105 adopted from *Kim* and *Sturch*, 1967, and *Sturch*, 1966) to our photoelectric observations (Table 11, 12, Figure 6).

The number of maxima and the time interval now seem to be sufficiently large for us to make a reasonable period analysis in order to answer the challenging question raised by the periodic term in the elements. In the course of the more rigorous period analysis some maxima observed by *Gaposchkin* (1934), *Sacharov* (1953), *Soloviev* and *Shakhovskoj* (1958), *Guriev* (1937), *Ashbrook* (1949), *Alania* (1954), *Huth* (1964), *Ahnert* (1959b, c, 1961),

Karetnikov (1961, 1962) and *Demjanovskij* (1975) should have been ignored. All of these apart from *Gaposchkin's*, *Alania's*, *Huth's* and *Demjanovskij's* observations were made visually. *Gaposchkin* elaborated the old Harvard plates which had been obtained with very long exposure times and sparsely distributed in time. There-

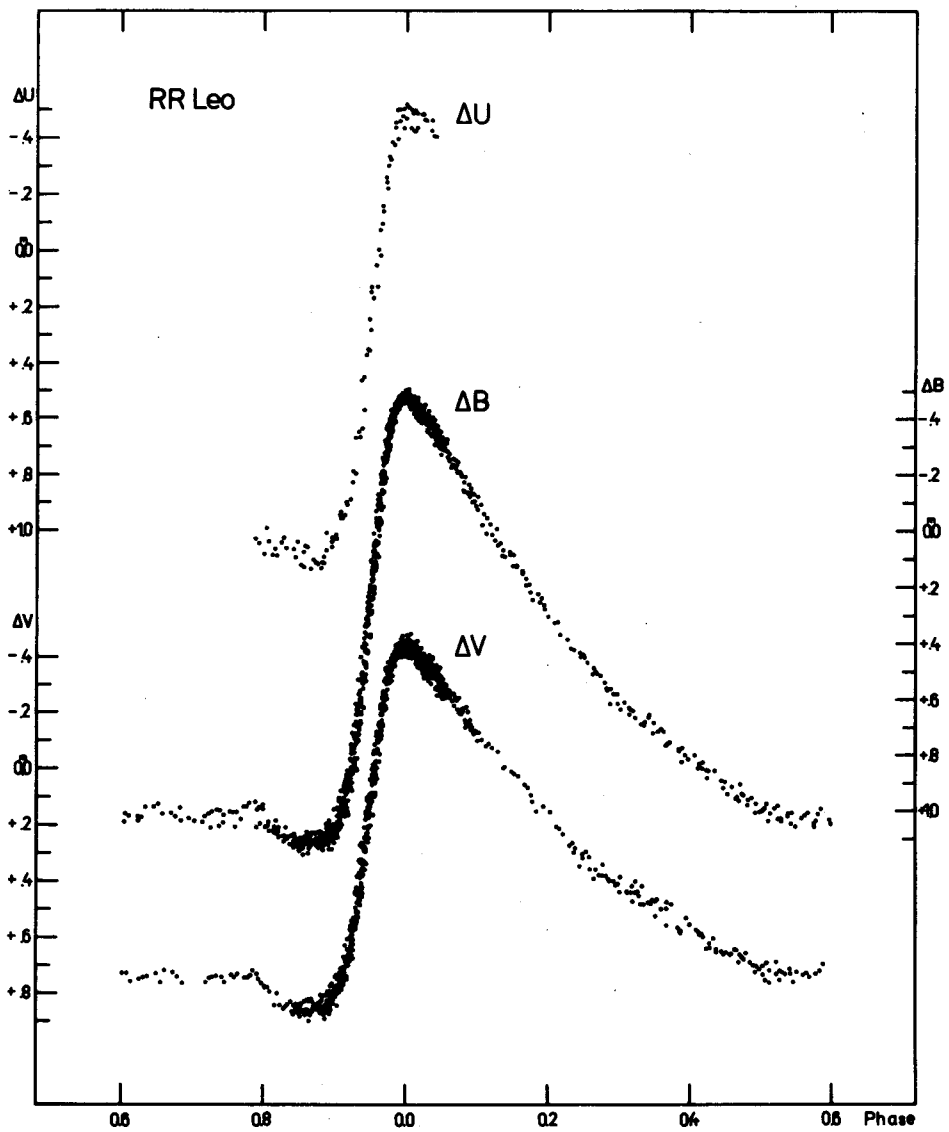

Figure 6: U,B and V light curves of RR Leo

fore the maxima given by him have very low accuracy. *Huth* worked on the Sonneberg sky patrol plates which had also been made with fairly long exposure times. *Alania's* and *Demjanovskij's* photographic observations also have very low weight in comparison with the photoelectric observations obtained at our observatory at about the same time.

The moments of maxima are collected in Table 4. The O-C residuals are calculated by the linear elements:

$$\text{J.D. max. hel.} = 2430440.3625 + 0^d.45238172 \times E$$

and plotted against epoch numbers (Figure 7).

A parabolic curve fit yielded the quadratic term:

$$+1^d.963 \times 10^{-10} \times E^2$$

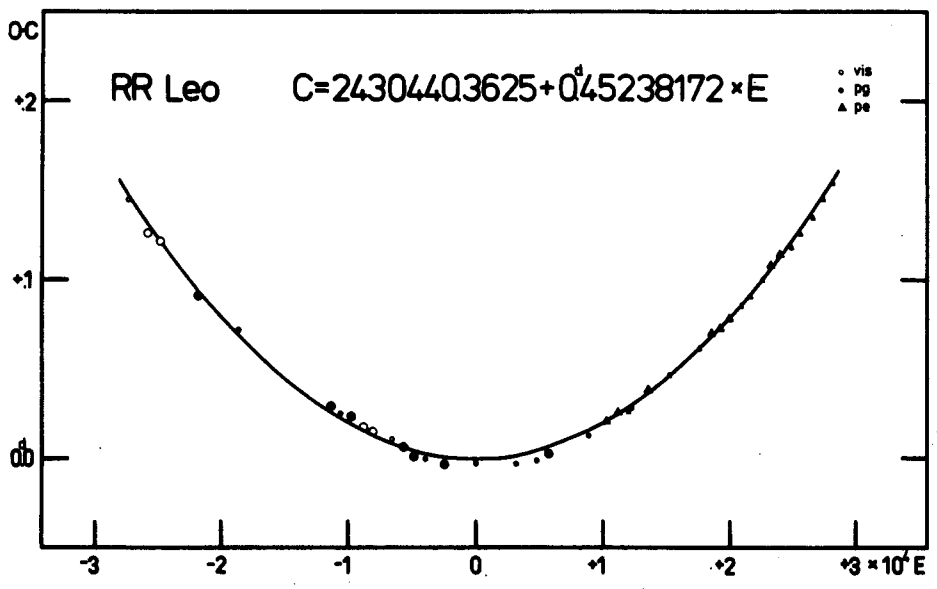

Figure 7: O-C diagram of RR Leo

The O-C residuals calculated by the quadratic formula clearly show a cyclic variation which is superimposed on the parabola. Since the time of maximum can be determined with lower accuracy than that of a well-defined point of the ascending branch of the light curve we decided to follow *Oosterhoff's* and *Balazs* and *Detre's* procedure (*Oosterhoff*, 1930; *Balazs* and *Detre*, 1949). After careful consideration we chose the points on the ascending branch at the following magnitudes:

Table 4

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\bar{E}$	Reference
1898	2414639.81	pg n	+0.24	-34927			[1]Gaposchkin,(1934)
1906	17257.68	pg n	+0.17	-29141			[1] -"-
1908	18062.439	vis n	+0.145	-27362	+0.145	-27362	[2]Luizet,(1911b)
1910	18756.373	vis n	+0.126	-25828	+0.126	-25828	[2] -"-
1911	19202.417	vis n	+0.121	-24842	+0.121	-24842	[2] -"-
1915	20547.774	pg	+0.090	-21868	+0.091	-21831	[2]Jordan,(1929)
	20567.676	pg	+0.092	-21824			[2] -"-
	20577.626	pg	+0.090	-21802			[2] -"-
1919	22023.420	pg n	+0.072	-18606	+0.072	-18606	[2]Martin, Plummer,(1921)
	22313.86	pg n	+0.083	-17964			[1]Gaposchkin,(1934)
1927	24922.90	pg n	+0.24	-12196			[1] -"-
1928	25299.527	pg	+0.030	-11364	+0.029	-11338	[3]Oosterhoff,(1930)
	25304.502	pg	+0.029	-11353			[3] -"-
	25318.525	pg	+0.028	-11322			[3] -"-
	25323.502	pg	+0.029	-11311			[3] -"-
	25335.716	vis	+0.029	-11284	+0.029	-11284	Nielsen,(1928)
1929	25645.594	pg	+0.025	-10599	+0.025	-10599	[3]Oosterhoff,(1930)
	25920.188	pg	+0.024	- 9992	+0.023	- 9789	[2]Allen, Marsh,(1932)
1930	26016.544	pg	+0.022	- 9779			[3]Oosterhoff,(1930)
	26030.570	pg	+0.025	- 9748			[3] -"-
	26031.473	pg	+0.023	- 9746			[3] -"-
	26060.424	pg	+0.021	- 9682			[3] -"-
	26143.200	vis	+0.012	- 9499			[1]Sacharov,(1953)
	26146.280	vis	-0.075	- 9492			[1] -"-
	26148.227	vis	+0.062	- 9488			[1] -"-
1931	26382.5197	vis	+0.0212	- 8970	+0.0167	- 8869	Lause,(1931)
	26387.4973	vis	+0.0226	- 8959			-"-
	26397.4484	vis	+0.0213	- 8937			-"-
	26406.4862	vis	+0.0115	- 8917			-"-

Table 4 (cont.)

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\overline{E}$	Reference
1931	2426415.5357	vis	+0.0134	- 8897			Lause,(1931)
	26416.4417	vis	+0.0146	- 8895			-"-
	26417.3513	vis	+0.0194	- 8893			-"-
	26420.5077	vis	+0.0092	- 8886			-"-
	26421.4239	vis	+0.0206	- 8884			-"-
	26430.4662	vis	+0.0153	- 8864			-"-
	26440.4186	vis	+0.0153	- 8842			-"-
	26474.3538	vis	+0.0218	- 8767			-"-
	26487.4637	vis	+0.0127	- 8738			-"-
	26497.4180	vis	+0.0146	- 8715			-"-
1932	26764.320	vis n	+0.014	- 8126	+0.014	- 8126	Detre,(1936)
1934	27458.271	vis	+0.009	- 6592	+0.011	- 6548	Tsessevich,(1934)
	27472.75	pg n	+0.02	- 6560			[1]Gaposchkin,(1934)
	27498.536	vis n	+0.012	- 6503			Kanishcheva, Lange,(1971)
1935	27834.651	vis n	+0.007	- 5760	+0.007	- 5760	Soloviev,(1935b, c, 1936b)
	27840.531	pg	+0.006	- 5747	+0.006	- 5673	Kooreman,(1935)
	27864.507	pg	+0.006	- 5694			-"-
	27869.483	pg	+0.006	- 5683			-"-
	27874.459	pg	+0.006	- 5672			-"-
	27875.364	pg	+0.006	- 5670			-"-
	27889.388	pg	+0.006	- 5639			-"-
	27903.412	pg	+0.006	- 5608			-"-
1936	28178.460	vis n	+0.006	- 5000			[1]Soloviev, Shakhovskoj,(1958)
	28190.208	vis n	-0.008	- 4974			[1]Guriev,(1937)
	28245.4067	pg	+0.0003	- 4852	+0.0007	- 4845	Balázs, Detre,(1949)
	28249.4800	pg	+0.0022	- 4843			-"-
	28250.3822	pg	-0.0004	- 4841			-"-
1937	28668.3830	pg	-0.0003	- 3917	-0.0003	- 3917	-"-
1938	29136.605	vis n	+0.007	- 2882			[1] Soloviev, Shakhovskoj,(1958)

Table 4 (cont.)

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\bar{E}$	Reference
1939	2429312.5725	pg	-0.0024	- 2493	-0.0032	- 2428	Balázs, Detre,(1949)
	29371.3806	pg	-0.0039	- 2363			-"-
1942	30440.3598	pg	-0.0027	0	-0.0027	0	-"-
1946	31888.4332	pg	-0.0032	+ 3201	-0.0032	+ 3201	-"-
1948	32615.4126	pg	-0.0012	+ 4808	-0.0012	+ 4808	-"-
1949	33010.3456	pg	+0.0025	+ 5681	+0.0028	+ 5697	-"-
	33011.7061	vis n	+0.0059	+ 5684			[1]Ashbrook,(1949)
	33024.3700	pg	+0.0031	+ 5712			Balázs, Detre,(1949)
1952	34097.371	pg	-0.045	+ 8084			[1]Alania,(1954)
1953	34443.501	pg	+0.013	+ 8849	+0.013	+ 8849	present paper
1954	35069.6055	pe	+0.0209	+10233	+0.0212	+10276	-"-
	35069.606	pg	+0.021	+10233			-"-
1955	35127.5109	pe	+0.0214	+10361			-"-
1956	35479.4664	pe	+0.0239	+11139	+0.0256	+11225	-"-
	35489.4204	pe	+0.0255	+11161			-"-
	35542.3512	pe	+0.0277	+11278			-"-
	35561.3490	pe	+0.0254	+11320			-"-
1957	35874.3982	pe	+0.0265	+12012	+0.0265	+12012	Geyer,(1961)
	35925.519	pg	+0.028	+12125	+0.028	+12125	present paper
1958	36229.549	pg	+0.058	+12797			[1]Huth,(1964)
	36287.433	pg	+0.037	+12925			[1] -"-
	36513.6249	pe	+0.0378	+13425	+0.0385	+13612	present paper
1959	36586.4585	pe	+0.0380	+13586			-"-
	36599.587	pg	+0.047	+13615			[1]Huth,(1964)
	36604.5533	pe	+0.0375	+13626			present paper
	36610.441	vis n	+0.044	+13639			[1]Ahnert,(1959b, c)
	36614.5064	pe	+0.0382	+13648			present paper
	36667.464	pg	+0.067	+13765			[1]Huth,(1964)
	36672.4142	pe	+0.0411	+13776			Geyer,(1961)

Table 4 (cont.)

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\overline{E}$	References
1961	2437316.6118	pe	+0.0472	+15200	+0.0472	+15200	present paper
	37375.427	pg	+0.053	+15330			[1]Ahnert,(1961)
	37375.438	pg	+0.064	+15330			[1]Huth,(1964)
	37376.329	vis n	+0.050	+15332			[1]Ahnert,(1961)
	37399.401	pg	+0.051	+15383			[1]Huth,(1964)
	37454.5845	vis n	+0.0434	+15505			[1]Karetnikov,(1961, 1962)
1962	37768.102	pg n	+0.060	+16198			[1]Demjanovskij,(1975)
1964	38414.5572	pe	+0.0621	+17627	+0.0621	+17627	present paper
1965	38824.876	pe	+0.071	+18534	+0.0698	+18576	Fitch et al.,(1966)
	38825.778	pe	+0.068	+18536			-"-
	38881.4237	pe	+0.0707	+18659			present paper
1966	39146.5225	pe	+0.0738	+19245	+0.0730	+19250	-"-
	39150.5922	pe	+0.0721	+19254			-"-
1967	39503.4564	pe	+0.0785	+20034	+0.0786	+20039	-"-
	39507.5280	pe	+0.0787	+20043			-"-
1968	39906.5364	pe	+0.0864	+20925	+0.0864	+20925	-"-
1969	40232.7079	pe	+0.0907	+21646	+0.0907	+21646	-"-
1970	40654.3372	pe	+0.1002	+22578	+0.1002	+22578	-"-
1971	40980.5097	pe	+0.1055	+23299	+0.1077	+23325	-"-
	41003.5855	pe	+0.1098	+23350			-"-
	41311.6607	pe	+0.1131	+24031	+0.1142	+24032	-"-
	41312.5677	pe	+0.1153	+24033			-"-
1972	41682.6190	pe	+0.1184	+24851	+0.1184	+24851	-"-
1973	42019.6515	pe	+0.1265	+25596	+0.1265	+25596	-"-
1975	42443.5415	pe	+0.1348	+26533	+0.1348	+26533	-"-
1976	42829.4335	pe	+0.1452	+27386	+0.1452	+27386	-"-
1977	43213.5140	pe	+0.1536	+28235	+0.1536	+28235	-"-

Remarks: [1] omitted, [2] redetermined by us, [3] determined by us

m_{pg} = 10.63 in the case of photographic observations

Δm = +0.33 in the case of photoelectric observations without filters

ΔV = +0.194 and ΔB = +0.326 in the case of photoelectric observations made in the UBV system

These points correspond to the point defined by *Oosterhoff* (1930) and used by *Balazs* and *Detre* (1949). The epochs of these points are designated by "t". In Table 5 the epochs determined by *Balazs* and *Detre* (1949, Table 4) are supplemented with the epochs based on our observations. The error of these epochs certainly does not exceed $0^d.0010$. The t-C′ residuals in Table 5 have been calculated by the formula taking into account the quadratic term as well:

$$C' = 2430440.3385 + 0^d.45238172 \times E + 1^d.963 \times 10^{-10} \times E^2$$

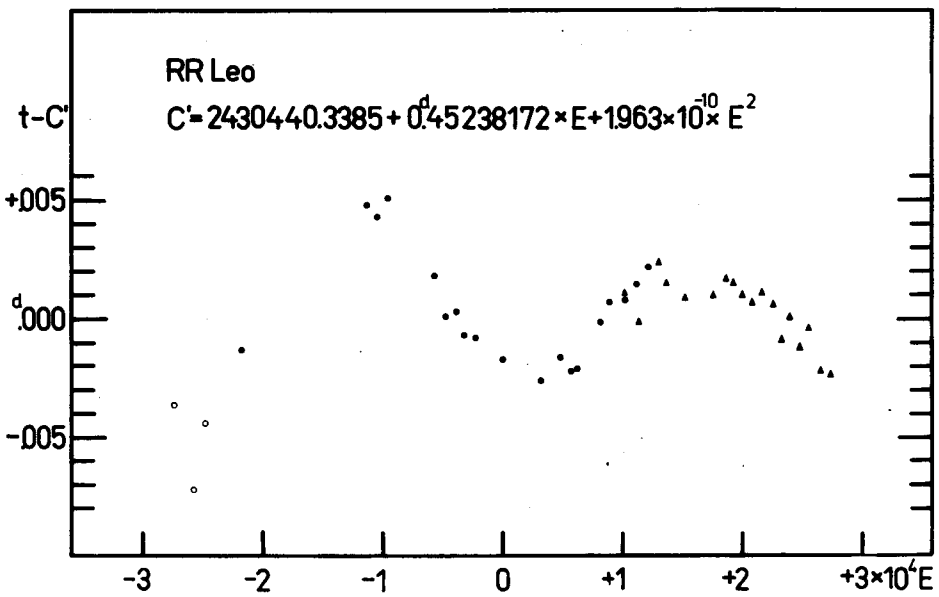

Figure 8: t-C′ diagram of RR Leo

The t-C′ values plotted against epoch numbers are presented in Figure 8. Although the cyclic variation is evident we do not have the courage to fit in a sine curve. The question of the existence of the sine term in the elements is open to further discussion and only by new observations which span at least the next two decades can the final answer be given.

Table 5

J.D.t.hel.	Type	t-C′	E	Reference
2400000+				
18062.4133	vis	-0.0036	-27362	Luizet
18756.3471	vis	-0.0072	-25828	-"-
19202.3885	vis	-0.0044	-24842	-"-
20547.7476	pg	-0.0013	-21868	Jordan
25318.5027	pg	+0.0048	-11322	Oosterhoff
25675.4279	pg	+0.0043	-10533	-"-
26060.4022	pg	+0.0051	- 9682	-"-
27874.4375	pg	+0.0018	- 5672	Kooreman
28249.4585	pg	+0.0001	- 4843	Balázs
28668.3626	pg	+0.0003	- 3917	-"-
28963.3136	pg	-0.0007	- 3265	Detre
29371.3608	pg	-0.0008	- 2363	-"-
30440.3368	pg	-0.0017	0	-"-
31903.3405	pg	-0.0026	+ 3234	Balázs
32615.3927	pg	-0.0016	+ 4808	-"-
33024.3471	pg	-0.0022	+ 5712	-"-
33264.5632	pg	-0.0021	+ 6243	Detre
34126.3577	pg	-0.0001	+ 8148	present paper
34443.4804	pg	+0.0007	+ 8849	-"-
35069.5820	pg	+0.0008	+10233	-"-
35069.5823	pe	+0.0011	+10233	-"-
35507.4922	pg	+0.0015	+11201	-"-
35542.3244	pe	-0.0001	+11278	-"-
35896.5452	pg	+0.0022	+12061	-"-
36288.3122	pe	+0.0024	+12927	-"-
36604.5297	pe	+0.0015	+13626	-"-
37316.5869	pe	+0.0009	+15200	-"-
38414.5331	pe	+0.0010	+17627	-"-
38881.3990	pe	+0.0017	+18659	-"-
39146.4989	pe	+0.0015	+19245	-"-
39503.4337	pe	+0.0010	+20034	-"-
39906.5127	pe	+0.0007	+20925	-"-
40232.6863	pe	+0.0011	+21646	-"-
40654.3137	pe	+0.0006	+22578	-"-
40980.4859	pe	-0.0009	+23299	-"-
41311.6371	pe	+0.0001	+24031	-"-
41682.5966	pe	-0.0012	+24851	-"-
42019.6292	pe	-0.0004	+25596	-"-
42433.5661	pe	-0.0022	+26511	-"-
42829.4092	pe	-0.0023	+27386	-"-

TT LYNCIS

This relatively bright RR Lyrae type variable (TT Lyn = BD +45°1669 (9.3) = S 4752 = CSV 1938) was discovered by *Hoffmeister* (1949) on Sonneberg plates. Subsequently it was studied visually by *Tsessevich* (1956) and both visually and photographically by *Ahnert* (1959d, 1960a). *Tremko* (1974) thoroughly investigated TT Lyn and constructed its light curves in U,B,V and colour-colour diagram. He made use of nearly 400 photographic and about 4600 photoelectric observations obtained at Skalnate Pleso Observatory (*Tremko*, 1976). In his discussion he also used the photoelectric observations obtained at Konkoly Observatory in 1959. The observations were tested for Blazhko-effect and it was unambiguously shown that TT Lyn has a stable, strictly repetitive light curve.

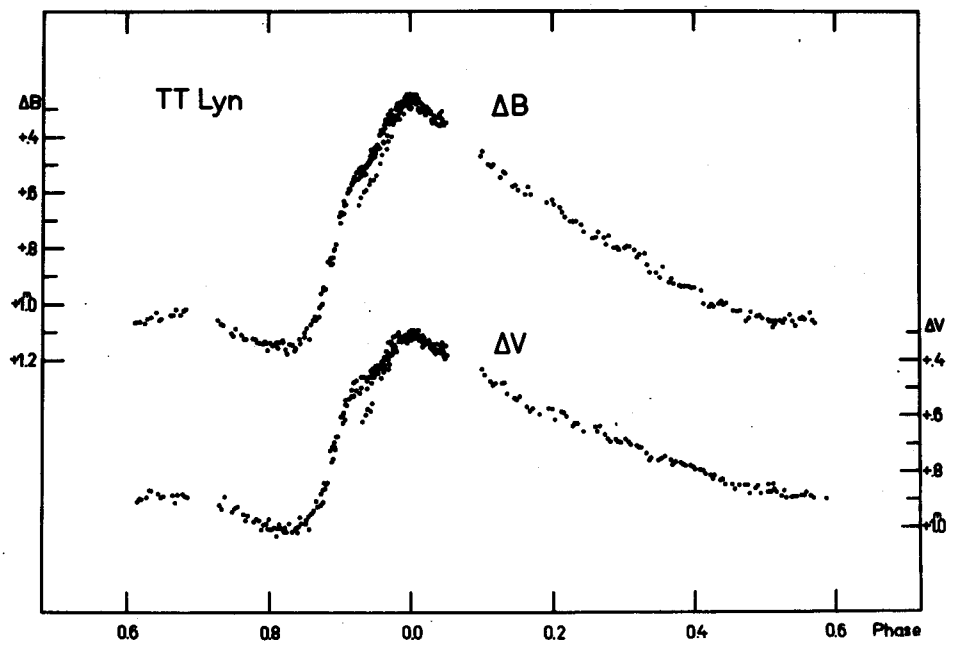

Figure 9: B and V light curves of TT Lyn

The star was reobserved at our observatory in 1978. As a comparison star BD +45°1666 was used. Its magnitude and colours V = 9.16, B-V = 0.28 were adopted from a tie-in observation. The observations made at Konkoly Observatory are given in Table 13.

On J.D. 2443583 the ascending branch was, oddly enough, much

steeper than it used to be (see Figure 9). We have found no explanation for this strange, unexpected phenomenon. The maximum in phase and height is not shifted, therefore any Blazhko-effect is out of the question.

Tremko, in his paper mentioned above (1974), gave the list of maxima of various observers. In the following table we supplement this list with the maxima obtained from *Jones'* (1966) and our observations. *Sturch*'s (1966) observations were insufficient for deriving the time of maximum (Table 6).

Table 6

J.D.max.hel.	O-C	E	Reference
2438463.3775	+0.0034	+ 3033	Jones (1966)
43580.3935	-0.0033	+11598	present paper
43583.3855	+0.0015	+11603	-"-
43595.3350	+0.0023	+11623	-"-

The O-C diagram has been constructed using the new elements:

$$J.D.max.\ hel. = 2436651.3566 + 0^d.59743406xE$$

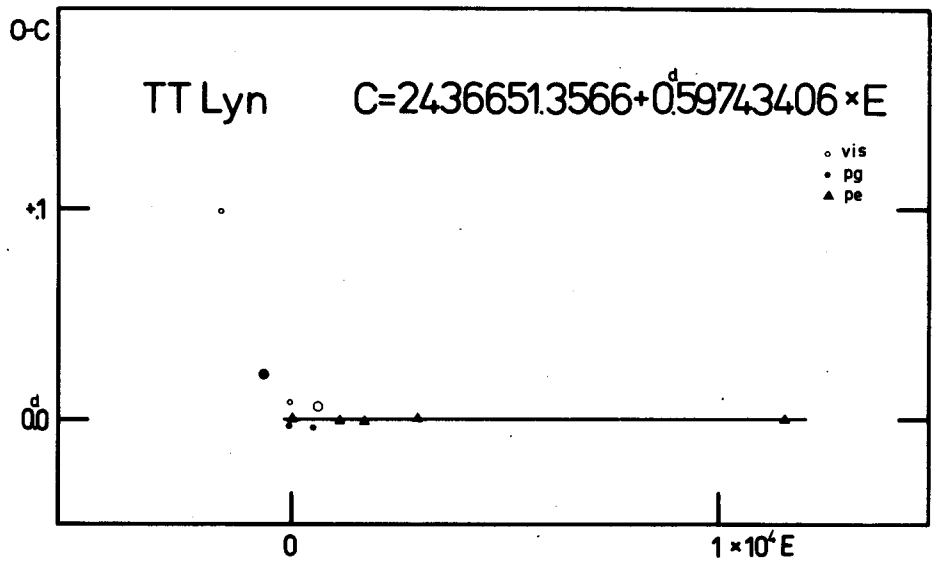

Figure 10: O-C diagram of TT Lyn

Yearly means were formed separately from the visual, photographic and photoelectric observations and plotted against epoch numbers (Figure 10). The photoelectric maxima can easily be approximated by a straight line and the new elements were obtained in this way.

AR PERSEI

The discovery of the variability of BD $+47^{\circ}965$ (9.5)=421.1928 was announced by *Guthnick* (1928) and named AR Per by *Guthnick* and *Prager* (1930). Immediately after the discovery *Kukarkin* (1930) and *Lange* (1931) investigated this variable, but *Floria* (1932a,b) and *Beyer* (1932,1943) were the first to determine its correct period using their own visual observations: $0^{d}.4255463$ and $0^{d}.425551$, respectively.

Long series of visual observations were obtained by *Soloviev* (1934a, 1935a, 1937, 1939), *Kukarkin* (1937, 1941, 1949), *Lange* (1938), *Guriev* (1938), *Miczaika* (1946), *Batyrev* (1957), *Soloviev* and *Shakhovskoj* (1958), *Steinman* (1958), *Ahnert* (1959a, c) and *Tsessevich* (1966). *Alania* (1954) and *Payne-Gaposchkin* (1954) gave photographic maxima. *Tsessevich* (1966) examined the Harvard plate collection and succeeded in determining a great number of maxima between 1900-1950. His observations are unique and make it possible to construct the O-C diagram of AR Per from the very beginning of this century.

Krygier (1965) also investigated the star photographically but since the light curve around the maximum was not sufficiently covered by observations we were not able to determine a time of maximum from his observations.

Since 1954 accurate photoelectric observations are available. Although *Paczynski* (1965), *Sturch* (1966) and *Epstein* (1969) did not give any moments of maximum we were able to deduce reliable

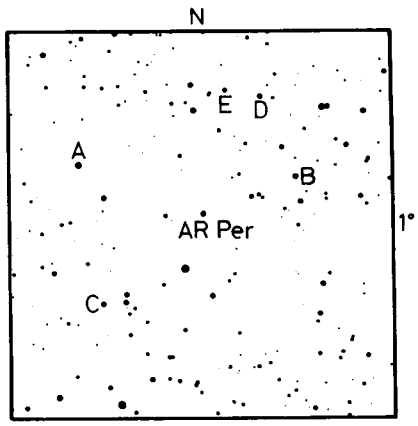

Figure 11

star	m_{pg}
A	9.37
B	10.37
C	10.67
D	10.94
E	11.55

maxima from their observations. *Geyer* (1961) and *Fitch* et al. (1966) published exact times of maximum for the years 1958, 1959 and 1964.

At Konkoly Observatory the star was photographically observed in 1937 (Table 15). The comparison stars used are given in Figure 11. From these observations a maximum could be derived.

The star was first observed photoelectrically in 1954, on J.D. 2435093. For these observations BD $+46^{\circ}860$ was used as a comparison star (m_V = 8.75, B-V = 0.47, U-B = 0.10 adopted from *Geyer*, 1961). Later on we used BD $+46^{\circ}858$ for comparison purposes (V = 9.73, B-V = 0.89, U-B = 0.35 given by *Paczynski*, 1965). Our photoelectric observations are given in Table 14 and presented in

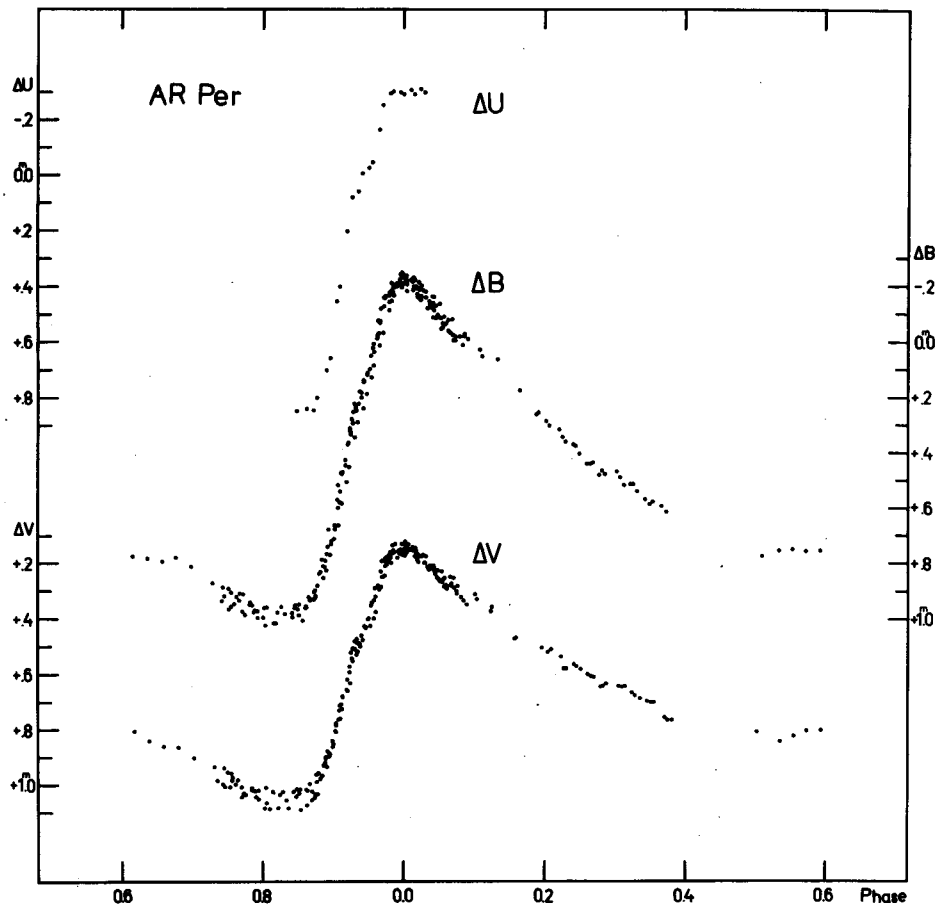

Figure 12: U, B and V light curves of AR Per

Table 7

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\bar{E}$	Reference
1900	2415049.27	pg n	+0.07	-28640			[1]Floria,(1932a, b)
	15236.878	pg n	+0.007	-28200	+0.007	-28200	Tsessevich,(1966)
	15312.24	pg n	+0.05	-28022			[1]Floria,(1932a, b)
1903	16303.726	pg n	+0.004	-25692	+0.004	-25692	Tsessevich,(1966)
1905	17006.729	pg n	0.000	-24040	0.000	-24040	-"-
1907	17850.589	pg n	-0.003	-22057	-0.003	-22057	-"-
1910	18778.706	pg n	-0.008	-19876	-0.008	-19876	-"-
1915	20511.541	pg n	-0.008	-15804	-0.008	-15804	-"-
1918	21670.737	pg n	-0.007	-13080	-0.007	-13080	-"-
1920	22500.986	pg n	-0.003	-11129	-0.003	-11129	-"-
1921	23014.626	pg n	-0.001	- 9922	-0.001	- 9922	-"-
1923	23562.730	pg n	-0.004	- 8634	-0.004	- 8634	-"-
1924	24124.873	pg n	-0.011	- 7313	-0.011	- 7313	-"-
1925	24462.762	pg n	-0.007	- 6519	-0.007	- 6519	-"-
1927	25036.835	pg n	0.000	- 5170	0.000	- 5170	-"-
1928	25556.00	pg n	0.00	- 3950	0.00	- 3950	[2]Floria,(1932a, b)
1929	25939.426	vis n	+0.002	- 3049	+0.002	- 3049	[3]Beyer,(1932)
1930	26156.866	pg n	-0.013	- 2538	-0.010	- 2427	[3] -"-
	26251.344	vis n	-0.007	- 2316			[3] -"-
1931	26576.460	vis	-0.010	- 1552	-0.010	- 1470	Lange,(1931)
	26576.461	vis	-0.009	- 1552			Floria,(1932a, b)
	26576.464	vis	-0.007	- 1552			Soloviev,(1939)
	26585.400	vis	-0.007	- 1531			Floria,(1932a, b)
	26597.322	vis	0.000	- 1503			-"-
	26600.295	vis	-0.006	- 1496			Tsessevich,(1966)
	26603.268	vis	-0.012	- 1489			Floria,(1932a, b)
	26605.404	vis	-0.004	- 1484			-"-
	26628.371	vis	-0.016	- 1430			-"-

Table 7 (cont.)

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\overline{E}$	Reference
1931	2426649.220	vis	-0.019	- 1381			Floria,(1932a, b)
1932	26761.144	vis	-0.014	- 1118			-"-
	26979.464	vis	-0.001	- 605	+0.001	- 598	[3]Beyer,(1932)
	26985.425	vis	+0.002	- 591			[3] -"-
1933	27236.922	pg	0.000	0	-0.002	0	[3] -"-
	27353.519	vis	-0.003	+ 274			Lange,(1938)
1934	27460.323	vis	-0.012	+ 525	-0.006	+ 868	Tsessevich,(1966)
	27576.510	vis n	0.000	+ 798			Soloviev,(1935a)
	27782.470	vis	-0.006	+ 1282			Tsessevich,(1966)
1935	27858.209	vis	-0.014	+ 1460	-0.008	+ 1790	-"-
	27954.818	pg	-0.004	+ 1687			[3]Guriev,(1938)
	28087.164	vis	-0.005	+ 1998			Tsessevich,(1966)
1936	28397.389	vis n	-0.005	+ 2727	-0.005	+ 2727	Soloviev,(1937)
1937	28545.4760	pg	-0.0086	+ 3075	-0.007	+ 3266	present paper
	28632.292	vis n	-0.005	+ 3279			Kukarkin,(1937)
	28702.932	pg n	-0.006	+ 3445			Tsessevich,(1966)
1938	29226.792	pg n	+0.004	+ 4676	+0.004	+ 4676	-"-
1939	29613.623	pg n	+0.011	+ 5585	+0.005	+ 5598	-"-
	29624.675	pg n	-0.001	+ 5611			Payne-Gaposchkin,(1954)
1940	29968.529	pg n	+0.009	+ 6419	+0.009	+ 6419	Tsessevich,(1966)
1941	30337.891	pg n	-0.005	+ 7287	-0.005	+ 7287	-"-
1942	30705.987	pg n	-0.009	+ 8152	-0.009	+ 8152	-"-
1943	31075.802	pg n	+0.004	+ 9021	+0.004	+ 9021	-"-
1944	31431.551	pg n	-0.006	+ 9857	-0.006	+ 9857	-"-
1945	31793.270	vis n	-0.003	+10707	-0.003	+10707	[3]Miczaika,(1946)
1946	31962.642	pg n	0.000	+11105	0.000	+11105	Tsessevich,(1966)
1947	32530.751	pg n	+0.002	+12440	+0.002	+12440	-"-
1949	33030.763	pg n	-0.006	+13615	-0.006	+13615	-"-

Table 7 (cont.)

Year	J.D.max.hel.	Type	O-C	E	$\overline{O-C}$	$\overline{E}$	Reference
1950	2433588.667	pg n	+0.003	+14926	+0.003	+14926	Tsessevich,(1966)
1951	33898.463	vis	0.000	+15654	+0.001	+15709	Batyrev,(1957)
	33916.338	vis	+0.002	+15696			-"-
	33951.233	vis	+0.002	+15778			-"-
1952	34339.342	vis	+0.010	+16690	+0.006	+16755	-"-
	34343.593	pg	+0.006	+16700			Alania,(1954)
1953	34385.301	vis	+0.010	+16798			Batyrev,(1957)
	34399.329	vis	-0.005	+16831			-"-
1954	35093.4080	pe	+0.0039	+18462	+0.0039	+18462	present paper
1957	36070.4666	vis n	+0.0024	+20758	+0.0024	+20758	Steinman,(1958)
1958	36231.3203	pe	-0.0013	+21136	-0.0013	+21136	Geyer,(1961)
	36485.3792	pe	+0.0050	+21733	+0.0037	+21843	present paper
	36495.5914	pe	+0.0039	+21757			-"-
	36530.4855	pe	+0.0030	+21839			-"-
	36541.5501	pe	+0.0034	+21865			-"-
1959	36605.394	vis n	+0.015	+22015			[1]Ahnert,(1959a, c)
	36607.5100	pe	+0.0032	+22020			Geyer,(1961)
1963	38293.9620	pe	+0.0053	+25983	+0.0044	+26020	Paczynski,(1965)
	38299.9195	pe	+0.0051	+25997			-"-
	38334.8123	pe n	+0.0029	+26079			Sturch,(1966)
1964	38729.726	pe	+0.0073	+27007	+0.0073	+27007	Fitch et al.,(1966)
1966	39469.7561	pe n	+0.0080	+28746	+0.0080	+28746	Epstein,(1969)
1969	40528.5256	pe	+0.0121	+31234	+0.0121	+31234	present paper
1976	43124.3793	pe	+0.0180	+37334	+0.0180	+37334	-"-

Remarks: [1] omitted [2] observed by Guthnick [3] rediscussed by Tsessevich

Figure 12. The observations made on J.D. 2435093 were shifted by 1.281 in V and by 1.653 in B in the composite light curves.

Ahnert (1959a , c) claimed that the star exhibited a Blazhko-effect. A comparison of the photoelectric light curves made by *Geyer* (1961), *Paczynski* (1965), *Fitch* et al. (1966) and ourselves (present paper) in the years 1954,1958,1959,1963,1964,1969 and 1976 is proof of the stable character of the light variation of AR Per: any kind of light curve variation i.e. Blazhko-effect is out of the question. Nevertheless the small amplitude of the light variation as compared with the short period is remarkable.

The list of maxima observed are presented in Table 7. The letter "n" indicates that the maximum is a normal one. The O-C values were calculated by the linear formula:

$$\text{J.D. max. hel.} = 2427236.9220 + 0^d.42554881 \times E$$

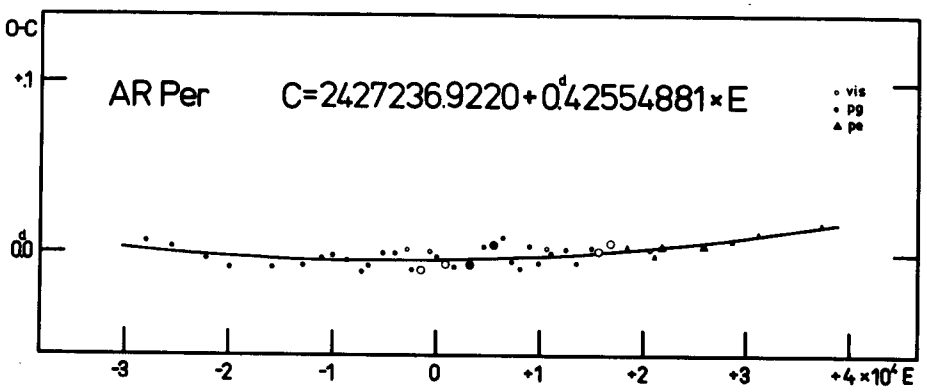

Figure 13: O-C diagram of AR Per

The seasonal means are plotted against epoch numbers in Fig. 13.

A quadratic fit of the O-C diagram gives the elements:

$$\text{J.D. max. hel.} = 2427236.9179 + 0^d.42554892 \times E + 1^d.18 \times 10^{-11} \times E^2$$

The steady increase of the period is:

$$1.18 \times 10^{-11} \text{ days/cycle} = 1.01 \times 10^{-8} \text{ days/year}$$

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Table 8

Photoelectric observations of AT And

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2442277		2442303		2442307	
.3561	+1.086	.4470	+1.177	.5423	+1.471
.3571	1.106	.4529	1.209	.5433	1.449
.3583	1.112	.4540	1.191	.5467	1.444
.3597	1.120	.4568	1.210	.5488	1.440
.3650	1.079	.4602	1.221	.5502	1.385
.3664	1.086	.4609	1.219	.5523	1.372
.3675	1.065	.4637	1.207	.5534	1.354
.3685	1.068	.4647	+1.235	.5555	1.338
.3697	1.060			.5565	1.329
.3746	1.032	2442304		.5811	1.148
.3759	1.027	.5095	+1.092	.5839	1.154
.3772	1.030	.5105	1.099	.5849	+1.102
.3784	1.028	.5130	1.099		
.3795	1.020	.5143	1.092	2442309	
.3842	0.997	.5165	1.106	.4340	+1.163
.3854	0.990	.5175	1.077	.4347	1.157
.3864	0.996	.5202	1.077	.4372	1.133
.3878	0.988	.5216	1.065	.4382	1.122
.3890	0.994	.5244	1.050	.4414	1.145
.3935	0.960	.5255	1.035	.4424	1.128
.3947	0.979	.5279	1.056	.4449	1.112
.3961	0.967	.5290	1.055	.4463	1.058
.3971	0.985	.5312	1.033	.4486	1.116
.3982	0.981	.5326	1.041	.4500	1.088
.4025	0.966	.5355	1.030	.4525	1.047
.4039	0.969	.5366	1.026	.4539	1.053
.4051	0.956	.5397	0.982	.4567	1.025
.4062	0.949	.5411	1.000	.4577	1.035
.4073	0.940	.5439	0.976	.4608	1.030
.4218	0.955	.5450	-0.971	.4622	1.058
.4239	0.966	.5480	0.945	.4650	1.003
.4286	0.986	.5494	0.975	.4664	1.010
.4299	0.996	.5519	1.012	.4688	1.019
.4312	0.985	.5533	1.018	.4699	1.015
.4324	0.980	.5554	1.000	.4719	0.967
.4382	0.992	.5568	0.988	.4733	0.995
.4395	1.004	.5591	0.997	.4761	0.959
.4406	1.003	.5605	0.993	.4768	0.961
.4417	0.997	.5630	0.997	.4803	0.955
.4429	+1.010	.5644	0.999	.4826	0.947
		.5668	1.007	.4837	0.960
2442303		.5679	1.022	.4861	0.942
.4304	+1.177	.5709	0.976	.4875	0.941
.4345	1.149	.5720	1.005	.4896	0.950
.4352	1.165	.5748	1.006	.4903	0.958
.4383	1.179	.5758	1.013	.4931	0.970
.4394	1.178	.5783	1.012	.4942	0.996
.4418	1.182	.5793	+0.995	.4976	0.970
.4432	1.202			.5000	1.019
.4459	+1.191			.5011	+1.000

Table 8 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2442309		2442319		2442319	
.5039	+1.015	.3916	+1.078	.4493	+1.028
.5046	0.995	.3930	1.079	.4507	1.033
.5070	1.013	.3964	1.093	.4535	1.060
.5081	0.971	.3978	1.065	.4549	1.058
.5108	1.016	.4013	1.074	.4569	1.078
.5122	0.986	.4027	1.090	.4578	+1.071
.5150	1.011	.4055	1.081		
.5157	0.997	.4069	1.094	2442361	
.5185	1.013	.4103	1.112	.2293	+1.321
.5192	1.033	.4117	1.091	.2307	1.266
.5208	1.029	.4145	1.101	.2342	1.268
.5219	1.035	.4159	+1.087	.2355	1.225
.5251	1.025			.2386	1.200
.5282	1.021	2442343		.2400	1.196
.5292	1.023	.3417	+1.313	.2432	1.224
.5326	+1.057	.3431	1.279	.2446	1.189
		.3465	1.212	.2474	1.166
2442319		.3479	1.194	.2487	1.181
.2791	+1.320	.3563	1.157	.2515	1.167
.2798	1.323	.3577	1.147	.2529	1.144
.2812	1.298	.3611	1.147	.2557	1.134
.2819	1.288	.3625	1.120	.2571	1.125
.2846	1.246	.3660	1.145	.2599	1.129
.2860	1.263	.3688	1.129	.2612	1.093
.2888	1.238	.3722	1.143	.2647	1.108
.2902	1.229	.3736	1.117	.2661	1.089
.2937	1.203	.3764	1.132	.2689	1.052
.2951	1.197	.3778	1.114	.2730	1.032
.3041	1.122	.3847	1.075	.2744	1.030
.3089	1.095	.3861	1.066	.2772	1.031
.3138	1.071	.3889	1.048	.2786	1.049
.3159	1.082	.3903	1.057	.2821	1.025
.3187	1.111	.3944	1.027	.2835	1.026
.3201	1.076	.3958	1.031	.2862	1.027
.3235	1.069	.4000	1.026	.2876	1.025
.3249	1.072	.4014	1.015	.2911	1.007
.3277	1.071	.4042	1.029	.2925	1.004
.3291	1.050	.4056	1.030	.2953	1.023
.3339	1.044	.4083	1.032	.2967	0.996
.3360	1.032	.4097	1.009	.3099	0.962
.3388	1.027	.4125	1.026	.3113	0.975
.3409	1.049	.4139	0.996	.3140	1.013
.3444	1.042	.4167	0.989	.3154	0.984
.3465	1.008	.4181	0.984	.3376	1.027
.3499	1.003	.4208	1.015	.3390	1.027
.3520	0.981	.4250	1.008	.3418	1.042
.3735	1.029	.4292	1.023	.3432	1.030
.3784	1.020	.4306	1.011	.3460	1.050
.3812	1.019	.4333	1.017	.3474	1.040
.3826	1.024	.4347	1.023	.3501	1.044
.3860	1.060	.4375	1.031	.3515	1.029
.3874	+1.062	.4385	+1.025	.3543	+1.043

Table 8 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2442361		2442369		2442422	
.3557	+1.050	.2869	+1.113	.2833	+1.481
.3585	1.056	.2879	1.083	.2861	1.453
.3592	1.044	.2900	1.107	.2875	1.451
.3619	1.063	.2932	1.103	.2910	1.461
.3633	+1.094	.2942	1.038	.2924	1.401
		.2945	1.049	.2958	1.390
2442367		.2969	1.031	.2972	1.376
.3885	+1.417	.2976	1.018	.3000	1.352
.3899	1.378	.3001	1.044	.3014	1.318
.3975	1.368	.3015	1.027	.3042	1.303
.4017	1.310	.3036	1.051	.3056	1.314
.4031	1.273	.3046	1.039	.3083	1.286
.4059	1.296	.3070	1.023	.3097	1.252
.4184	1.137	.3077	1.060	.3132	1.228
.4482	1.021	.3101	1.042	.3146	1.182
.4524	1.078	.3112	1.025	.3174	1.165
.4538	1.024	.3129	1.006	.3188	1.164
.4566	1.039	.3143	0.956	.3215	1.115
.4579	1.018	.3164	1.022	.3229	1.135
.4607	1.032	.3175	1.027	.3313	1.111
.4621	1.010	.3195	0.981	.3326	1.124
.4656	1.019	.3202	0.999	.3361	1.136
.4670	1.003	.3226	0.961	.3375	1.136
.4697	1.001	.3233	0.992	.3403	1.126
.4711	1.021	.3258	0.973	.3417	1.129
.4739	+1.020	.3268	0.943	.3444	1.089
		.3348	1.005	.3451	1.099
2442369		.3365	0.960	.3542	1.075
.2411	+1.349	.3376	0.972	.3556	1.079
.2418	1.343	.3400	0.967	.3583	1.081
.2445	1.329	.3411	0.972	.3597	1.074
.2452	1.337	.3435	0.962	.3625	1.051
.2476	1.305	.3445	0.983	.3639	1.024
.2487	1.354	.3469	0.975	.3667	0.995
.2515	1.325	.3480	+0.991	.3681	1.000
.2529	1.270			.3722	1.024
.2557	1.205	2442403		.3736	1.014
.2570	1.192	.2543	+1.018	.3764	1.035
.2594	1.199	.2557	1.014	.3778	1.003
.2605	1.182	.2599	0.967	.3806	1.011
.2626	1.206	.2613	0.948	.3819	1.026
.2636	1.193	.2641	0.948	.3847	0.976
.2661	1.135	.2655	0.982	.3861	0.982
.2671	1.113	.2682	0.948	.3889	0.990
.2695	1.150	.2696	0.963	.3938	1.002
.2702	1.113	.2731	0.994	.3962	1.026
.2730	1.129	.2745	+0.994	.3979	1.026
.2737	1.116			.4007	1.035
.2772	1.094	2442422		.4014	0.999
.2800	1.134	.2781	+1.482	.4049	1.031
.2830	1.095	.2792	1.492	.4063	+1.016
.2848	+1.139	.2819	+1.481		

Table 8 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2442424		2442712		2442712	
.2144	+1.031	.2441	+1.362	.3547	+0.981
.2158	1.007	.2453	1.370	.3561	0.997
.2186	1.012	.2480	1.340	.3589	1.013
.2199	1.008	.2494	1.347	.3603	1.011
.2230	1.034	.2529	1.342	.3630	1.040
.2244	1.041	.2544	1.302	.3644	1.023
.2290	1.026	.2575	1.277	.3672	1.024
.2338	1.005	.2589	1.268	.3686	+1.023
.2373	0.989	.2617	1.238		
.2387	0.990	.2631	1.238	2442713	
.2422	0.988	.2658	1.180	.2393	+1.368
.2540	1.037	.2672	1.170	.2407	1.394
.2574	1.035	.2700	1.156	.2449	1.352
.2591	1.028	.2714	1.130	.2477	1.395
.2633	1.040	.2742	1.179	.2491	1.380
.2651	1.061	.2756	1.142	.2532	1.388
.2686	1.047	.2783	1.110	.2560	1.370
.2699	1.058	.2797	1.093	.2574	1.374
.2734	1.058	.2825	1.131	.2602	1.404
.2748	1.067	.2839	1.125	.2643	1.382
.2779	1.067	.2867	1.103	.2657	1.382
.2793	+1.067	.2881	1.122	.2685	1.412
		.2908	1.114	.2699	1.417
2442432		.2922	1.072	.2831	1.422
.2163	+1.107	.2950	1.106	.2841	1.386
.2197	1.066	.2964	1.077	.2872	1.383
.2211	1.074	.2992	1.108	.2886	1.426
.2239	1.070	.3006	1.050	.2914	1.383
.2260	1.071	.3033	1.020	.2928	1.404
.2288	1.053	.3047	1.027	.2956	1.383
.2302	1.026	.3082	1.047	.2970	1.390
.2336	1.014	.3096	1.097	.2997	1.415
.2350	1.002	.3123	1.024	.3011	1.408
.2385	1.023	.3137	1.038	.3039	1.422
.2399	1.027	.3165	1.054	.3081	1.428
.2427	1.030	.3179	0.999	.3096	1.381
.2440	0.981	.3207	1.010	.3122	1.403
.2489	0.961	.3221	1.007	.3136	1.408
.2524	1.011	.3248	0.958	.3164	1.413
.2538	0.981	.3262	0.984	.3178	1.391
.2565	0.982	.3290	0.984	.3206	1.424
.2586	0.994	.3304	0.987	.3220	1.420
.2628	0.998	.3332	1.013	.3254	1.393
.2642	0.997	.3350	0.994	.3268	1.384
.2670	1.028	.3380	0.990	.3296	1.376
.2684	0.982	.3394	0.996	.3310	1.400
.2718	0.992	.3422	0.998	.3328	1.423
.2732	1.009	.3436	0.974	.3342	1.409
.2767	+0.991	.3464	0.964	.3991	1.441
		.3478	0.974	.4018	1.433
2442712		.3505	0.991	.4032	1.458
.2411	+1.401	.3519	+0.994	.4157	+1.490

Table 8 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2442713		2442725		2443422	
.4171	+1.444	.4136	+1.158	.3357	+1.209
.4303	1.457	.4150	1.156	.3387	1.139
.4317	1.480	.4212	1.174	.3401	1.155
.4345	1.517	.4247	1.159	.3432	1.118
.4359	1.485	.4261	1.152	.3447	1.168
.4386	1.472	.4326	1.175	.3520	1.129
.4400	1.474	.4347	1.180	.3535	1.142
.4428	1.490	.4361	1.185	.3561	1.148
.4442	1.481	.4375	1.189	.3575	1.133
.4470	1.503	.4420	1.234	.3602	1.112
.4484	1.499	.4430	1.198	.3647	1.124
.4511	1.454	.4444	1.197	.3701	1.106
.4525	1.458	.4455	1.210	.3737	1.075
.4609	1.444	.4469	1.231	.3751	1.067
.4623	1.458	.4548	1.235	.3828	1.033
.4650	1.446	.4565	1.236	.3845	1.052
.4664	1.467	.4579	1.231	.3878	0.997
.4713	1.407	.4587	1.242	.3893	1.009
.4747	1.390	.4600	1.249	.3922	1.012
.4792	1.385	.4663	1.215	.3936	1.008
.4806	+1.377	.4677	1.226	.3963	1.029
		.4692	1.217	.3977	1.021
2442720		.4706	1.221	.4007	1.001
.3576	+0.967	.4781	1.241	.4050	0.992
.3590	0.984	.4795	1.257	.4062	0.975
.3597	0.985	.4806	1.245	.4106	0.982
.3609	0.980	.4837	1.265	.4117	1.015
.3624	0.964	.4851	1.221	.4147	1.015
.3674	0.970	.4906	1.257	.4196	0.989
.3685	0.974	.4920	1.261	.4211	0.977
.3702	0.980	.4934	1.252	.4239	1.021
.3715	0.963	.4944	1.250	.4260	0.999
.3727	+0.966	.4955	1.267	.4288	1.003
		.5006	1.247	.4300	1.034
2442725		.5020	1.256	.4331	1.013
.4003	+1.154	.5030	1.274	.4344	1.009
.4014	1.161	.5044	1.294	.4374	1.037
.4024	1.164	.5055	+1.304	.4392	1.061
.4038	1.154			.4418	1.074
.4052	1.148	2443422		.4430	1.076
.4101	1.196	.3299	+1.277	.4455	1.048
.4115	1.169	.3311	+1.251	.4468	+1.048
.4126	+1.148				

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442277		2442277		2442277	
.3589	+1.183	.3691	+1.136	.3789	+1.112
.3603	1.180	.3703	1.137	.3801	1.085
.3657	1.149	.3752	1.083	.3848	1.070
.3670	1.183	.3765	1.082	.3859	1.051
.3680	+1.124	.3778	+1.074	.3869	+1.072

Table 8 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442277		2442304		2442309	
.3884	+1.072	.5133	+1.143	.4344	+1.202
.3895	1.081	.5158	1.159	.4368	1.194
.3941	1.033	.5168	1.140	.4379	1.156
.3955	1.032	.5199	1.117	.4407	1.179
.3967	1.011	.5209	1.113	.4421	1.169
.3977	1.022	.5237	1.102	.4442	1.146
.3988	1.037	.5248	1.087	.4456	1.131
.4030	1.001	.5272	1.103	.4483	1.148
.4045	1.023	.5283	1.069	.4493	1.118
.4056	0.986	.5305	1.081	.4518	1.104
.4067	0.977	.5319	1.066	.4532	1.105
.4079	0.983	.5359	1.042	.4560	1.101
.4206	0.992	.5394	1.027	.4570	1.078
.4225	0.992	.5404	1.007	.4601	1.100
.4245	1.022	.5432	1.006	.4615	1.109
.4295	1.028	.5446	1.002	.4643	1.048
.4305	1.020	.5473	1.012	.4657	1.081
.4317	1.007	.5487	0.997	.4681	1.030
.4330	1.006	.5526	1.030	.4695	1.045
.4341	1.003	.5551	1.016	.4715	1.038
.4388	1.052	.5561	0.987	.4726	1.054
.4401	1.076	.5584	1.008	.4754	1.020
.4412	1.054	.5598	1.004	.4764	1.013
.4423	1.064	.5627	1.022	.4789	1.002
.4434	+1.052	.5637	1.033	.4799	0.983
		.5661	1.025	.4823	0.982
2442303		.5675	1.038	.4830	0.982
.4255	+1.237	.5702	1.026	.4858	0.999
.4297	1.270	.5716	1.012	.4868	0.986
.4338	1.239	.5741	1.064	.4893	0.993
.4348	1.244	.5751	1.050	.4900	0.985
.4376	1.259	.5776	1.049	.4924	0.991
.4387	1.255	.5790	+1.068	.4935	0.980
.4415	1.293			.4958	1.003
.4425	1.257	2442307		.4972	0.993
.4452	1.289	.5419	+1.549	.4997	0.980
.4526	1.283	.5426	1.552	.5007	0.979
.4533	1.317	.5450	1.540	.5032	1.027
.4561	1.313	.5460	1.521	.5042	1.010
.4575	1.314	.5485	1.529	.5067	1.031
.4595	1.320	.5495	1.531	.5077	1.008
.4605	1.300	.5520	1.473	.5101	1.025
.4630	1.320	.5530	1.441	.5115	1.001
.4644	1.346	.5548	1.428	.5143	1.029
.4699	1.367	.5562	1.467	.5153	1.035
.4713	1.369	.5793	1.238	.5178	1.049
.4738	+1.379	.5804	1.210	.5188	1.072
		.5832	1.226	.5205	1.066
2442304		.5842	+1.217	.5212	1.057
.5092	+1.180			.5248	1.072
.5098	1.143	2442309		.5258	1.077
.5127	+1.148	.4337	+1.203	.5278	+1.094

Table 8 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442309		2442343		2442361	
.5289	+1.081	.3556	+1.280	.2480	+1.234
.5310	1.092	.3570	1.229	.2508	1.205
.5320	+1.097	.3604	1.203	.2522	1.196
		.3618	1.224	.2550	1.192
2442319		.3653	1.209	.2564	1.186
.2794	+1.456	.3667	1.200	.2592	1.185
.2808	1.426	.3715	1.204	.2605	1.194
.2815	1.395	.3719	1.192	.2640	1.158
.2839	1.349	.3757	1.186	.2654	1.136
.2853	1.327	.3771	1.176	.2682	1.149
.2881	1.310	.3840	1.141	.1696	1.117
.2895	1.296	.3854	1.135	.2724	1.099
.2930	1.238	.3882	1.117	.2737	1.098
.2944	1.222	.3938	1.103	.2765	1.093
.3034	1.190	.3951	1.092	.2779	1.083
.3082	1.183	.3993	1.056	.2814	1.081
.3096	1.179	.4007	1.042	.2828	1.077
.3131	1.162	.4035	1.050	.2855	1.072
.3145	1.160	.4049	1.038	.2869	1.072
.3180	1.152	.4076	1.031	.2904	1.058
.3194	1.151	.4090	1.034	.2918	1.049
.3221	1.154	.4118	1.026	.2946	1.035
.3242	1.106	.4132	1.037	.2960	1.007
.3270	1.096	.4160	1.024	.3092	0.993
.3332	1.062	.4174	1.015	.3106	0.989
.3353	1.037	.4201	1.014	.3133	0.989
.3381	1.041	.4215	1.034	.3147	0.984
.3395	1.024	.4243	1.020	.3411	1.036
.3430	1.029	.4257	1.033	.3425	1.049
.3451	1.039	.4285	1.039	.3453	1.071
.3492	1.005	.4299	1.036	.3467	1.084
.3506	1.034	.4326	1.044	.3494	1.082
.3763	1.012	.4340	1.030	.3508	1.082
.3805	1.031	.4368	1.052	.3536	1.090
.3819	1.005	.4382	1.019	.3550	1.097
.3853	1.044	.4486	1.039	.3578	1.097
.3902	1.044	.4500	1.047	.3588	1.091
.3923	1.043	.4528	1.075	.3612	1.112
.3957	1.102	.4542	1.074	.3626	+1.097
.3971	1.093	.4566	1.079		
.4006	1.087	.4572	+1.090	2442367	
.4020	1.108			.3878	+1.474
.4048	1.092	2442361		.3892	1.462
.4062	1.099	.2286	+1.458	.3968	1.420
.4138	1.141	.2300	1.427	.3982	1.406
.4152	+1.150	.2335	1.398	.4010	1.371
		.2349	1.360	.4024	1.354
2442343		.2379	1.345	.4052	1.367
.3410	+1.405	.2393	1.336	.4177	1.237
.3424	1.386	.2425	1.304	.4475	1.076
.3458	1.355	.2439	1.279	.4489	1.111
.3472	+1.342	.2467	+1.238	.4517	+1.100

Table 8 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442367		2442369		2442422	
.4531	+1.062	.3198	+1.025	.3354	+1.171
.4559	1.079	.3223	1.003	.3368	1.174
.4572	1.077	.3230	0.987	.3396	1.189
.4600	1.045	.3251	1.014	.3410	1.183
.4614	1.026	.3261	1.013	.3438	1.167
.4649	1.017	.3341	0.994	.3447	1.145
.4663	0.995	.3362	0.997	.3486	1.152
.4691	0.982	.3372	1.008	.3500	1.136
.4704	1.006	.3397	1.006	.3525	1.104
.4732	+1.000	.3404	0.999	.3549	1.103
		.3428	0.993	.3576	1.088
2442369		.3442	1.004	.3590	1.078
.2404	+1.469	.3466	1.001	.3618	1.056
.2414	1.446	.3473	+1.015	.3632	1.031
.2439	1.473			.3660	1.027
.2448	1.488	2442403		.3674	1.024
.2473	1.482	.2536	+1.017	.3708	1.019
.2508	1.423	.2550	1.003	.3757	1.051
.2550	1.359	.2592	0.983	.3771	1.039
.2564	1.323	.2606	0.977	.3799	1.028
.2587	1.330	.2634	0.978	.3813	1.023
.2598	1.301	.2648	0.995	.3840	1.024
.2622	1.259	.2675	0.981	.3854	1.019
.2633	1.266	.2689	0.971	.3882	1.008
.2657	1.215	.2724	0.992	.3896	0.996
.2664	1.231	.2738	+1.002	.3917	0.996
.2689	1.215			.3931	1.004
.2698	1.186	2442422		.3958	0.998
.2723	1.171	.2778	+1.562	.3972	0.998
.2768	1.162	.2785	1.548	.4000	1.005
.2793	1.175	.2813	1.547	.4010	1.023
.2814	1.191	.2826	1.541	.4042	1.025
.2841	1.185	.2854	1.543	.4056	+1.033
.2862	1.179	.2868	1.551		
.2876	1.145	.2903	1.536	2442424	
.2897	1.139	.2917	1.548	.2137	+1.094
.2911	1.128	.2951	1.503	.2151	1.060
.2935	1.125	.2965	1.488	.2179	1.026
.2962	1.112	.2993	1.480	.2192	1.035
.2973	1.107	.3007	1.475	.2223	1.049
.2994	1.111	.3035	1.447	.2237	1.036
.3008	1.083	.3049	1.401	.2269	1.053
.3032	1.113	.3076	1.403	.2283	1.034
.3043	1.053	.3090	1.343	.2331	0.970
.3067	1.077	.3125	1.333	.2366	1.001
.3073	1.067	.3139	1.274	.2380	0.993
.3108	1.071	.3167	1.278	.2408	1.003
.3126	1.051	.3181	1.242	.2429	1.005
.3136	1.035	.3208	1.218	.2463	1.033
.3157	1.029	.3222	1.204	.2480	1.023
.3168	1.033	.3306	1.182	.2512	1.016
.3192	+1.032	.3319	+1.164	.2533	+1.054

Table 8 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442424		2442712		2442713	
.2564	+1.071	.2707	+1.223	.2511	+1.580
.2581	1.068	.2735	1.255	.2525	1.557
.2623	1.064	.2749	1.206	.2553	1.575
.2644	1.072	.2776	1.204	.2567	1.589
.2679	1.093	.2790	1.218	.2595	1.562
.2692	1.087	.2818	1.190	.2678	1.537
.2727	1.087	.2832	1.190	.2720	1.544
.2741	1.098	.2860	1.162	.2824	1.557
.2772	1.105	.2874	1.172	.2834	1.564
.2786	+1.112	.2901	1.154	.2865	1.557
		.2915	1.154	.2879	1.564
2442432		.2943	1.155	.2907	1.545
.2190	+1.136	.2957	1.132	.2949	1.589
.2204	1.117	.2985	1.140	.2963	1.579
.2232	1.104	.2999	1.109	.2990	1.556
.2246	1.111	.3026	1.096	.3004	1.545
.2281	1.090	.3040	1.091	.3032	1.590
.2295	1.057	.3075	1.104	.3046	1.592
.2329	1.026	.3089	1.132	.3074	1.576
.2343	1.037	.3116	1.062	.3115	1.595
.2378	1.033	.3130	1.101	.3129	1.553
.2392	1.024	.3158	1.051	.3157	1.573
.2420	1.012	.3172	1.045	.3171	1.542
.2433	1.011	.3200	1.043	.3199	1.593
.2468	1.004	.3241	1.044	.3213	1.563
.2482	0.991	.3255	1.014	.3247	1.585
.2517	0.995	.3283	1.009	.3261	1.576
.2531	1.008	.3297	1.021	.3289	1.565
.2558	1.026	.3325	0.994	.3321	1.549
.2579	1.018	.3339	1.027	.3335	1.568
.2621	1.033	.3373	1.017	.3984	1.576
.2635	1.034	.3387	0.997	.4011	1.584
.2663	1.046	.3415	1.012	.4025	1.582
.2677	1.043	.3429	1.016	.4053	1.594
.2725	1.060	.3457	1.011	.4150	1.574
.2760	+1.060	.3471	1.015	.4164	1.597
		.3498	1.009	.4296	1.642
2442712		.3512	1.007	.4310	1.653
.2403	+1.563	.3540	1.013	.4338	1.656
.2434	1.531	.3554	1.017	.4352	1.650
.2447	1.516	.3582	1.049	.4379	1.625
.2473	1.501	.3596	1.015	.4393	1.628
.2488	1.505	.3623	1.034	.4421	1.621
.2521	1.469	.3637	1.040	.4435	1.615
.2536	1.435	.3665	1.045	.4477	1.597
.2567	1.407	.3679	+1.058	.5504	1.641
.2582	1.383			.4518	1.621
.2610	1.353	2442713		.4532	1.637
.2624	1.353	.2400	+1.539	.4556	1.593
.2651	1.273	.2428	1.571	.2474	1.615
.2665	1.274	.2470	1.538	.4602	1.629
.2693	+1.245	.2484	+1.573	.4643	+1.588

Table 8 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442713		2442725		2443422	
.4657	+1.618	.4427	+1.384	.3512	+1.193
.4688	1.600	.4437	1.385	.3528	1.165
.4706	1.530	.4449	1.360	.3568	1.183
.4740	1.549	.4462	1.381	.3595	1.176
.4754	1.526	.4476	1.342	.3609	1.188
.4785	1.498	.4558	1.385	.3652	1.162
.4799	+1.515	.4572	1.349	.3682	1.140
		.4583	1.390	.3695	1.117
2442720		.4593	1.408	.3731	1.105
.3580	+1.032	.4607	1.378	.3744	1.089
.3594	1.002	.4670	1.430	.3822	1.071
.3603	1.005	.4685	1.423	.3872	1.055
.3617	0.995	.4699	1.393	.3915	1.019
.3630	1.019	.4713	1.384	.3929	1.054
.3681	1.022	.4724	1.401	.3956	1.055
.3695	1.029	.4788	1.431	.3970	1.007
.3709	1.029	.4802	1.437	.3999	1.009
.3733	+0.996	.4810	1.454	.4014	0.998
		.4844	1.470	.4042	1.021
2442725		.4858	1.467	.4056	1.021
.3910	+1.206	.4913	1.433	.4099	0.995
.3921	1.244	.4927	1.440	.4112	0.987
.3934	1.206	.4938	1.477	.4142	1.040
.3942	1.232	.4949	1.468	.4157	1.036
.3956	1.210	.4962	1.434	.4190	0.996
.4010	1.266	.5013	1.484	.4203	1.036
.4018	1.265	.5024	1.476	.4232	1.031
.4031	1.258	.5037	1.507	.4253	1.055
.4045	1.249	.5051	+1.457	.4281	1.053
.4059	1.270			.4293	1.052
.4143	1.304	2443422		.4323	1.068
.4157	1.298	.3292	+1.374	.4337	1.043
.4216	1.282	.3304	1.336	.4369	1.065
.4240	1.273	.3336	1.324	.4385	1.072
.4253	1.305	.3351	1.330	.4411	1.084
.4319	1.302	.3380	1.294	.4424	1.089
.4333	1.332	.3394	1.270	.4450	1.093
.4368	1.329	.3424	1.202	.4461	+1.082
.4382	+1.327	.3441	+1.188		

Table 9

Photoelectric observations of SU Dra

J.D.	Δm*	J.D.	Δm*	J.D.	Δm*
2435186		2435186		2435186	
.4607	-0.264	.4777	-0.440	.4960	-0.442
.4620	0.306	.4788	0.426	.4970	0.425
.4628	0.327	.4798	0.454	.4992	0.422
.4642	0.365	.4809	0.443	.5003	0.402
.4688	0.405	.4815	0.450	.5054	0.397
.4696	0.419	.4877	0.423	.5064	0.383
.4707	0.392	.4890	0.423	.5075	0.331
.4721	0.422	.4899	0.431	.5092	-0.316
.4726	-0.426	.4910	-0.421		

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436152		2436164		2436187	
.5607	+0.978	.4952	+0.840	.4875	+0.902
.5621	0.983	.4975	0.814	.4917	0.876
.5729	0.994	.5037	0.718	.4980	0.908
.5742	0.989	.5048	0.699	.4993	0.892
.5864	0.986	.5060	0.693	.5106	0.921
.5881	0.971	.5072	0.657	.5128	0.946
.5976	0.931	.5106	0.600	.5243	0.949
.5991	0.925	.5135	0.548	.5304	0.935
.6079	0.916	.5195	0.389	.5426	0.950
.6089	0.888	.5207	0.377	.5828	1.008
.6180	0.683	.5250	0.355	.5883	0.988
.6192	0.676	.5261	0.337	.6005	0.941
.6280	0.488	.5326	0.247	.6051	0.910
.6291	0.460	.5348	0.239	.6123	0.860
.6358	0.370	.5379	0.184	.6175	0.762
.6369	0.380	.5444	0.105	.6251	0.622
.6437	0.304	.5505	+0.021	.6305	0.521
.6449	0.295	.5571	-0.001	.6402	0.343
.6519	0.191	.5618	-0.005	.6458	0.318
.6530	0.168	.5631	+0.006	.6525	0.199
.6602	0.064	.5753	-0.005	.6575	0.148
.6667	+0.009	.5801	+0.006	.6635	+0.062
.6767	-0.012	.5876	0.042		
.6826	-0.026	.5960	0.060	2436199	
.6889	+0.006	.6038	0.075	.4759	+0.945
		.6054	0.081	.4780	0.963
2436163		.6125	0.136	.5168	0.540
.6099	+0.795	.6175	0.142	.5198	0.431
.6159	0.810	.6280	0.190	.5223	0.394
.6244	0.809	.6294	0.188	.5279	0.318
.6308	0.807	.6368	0.233	.5313	0.309
.6337	+0.821	.6449	0.236	.5337	0.257
		.6525	0.271	.5390	0.202
2436164		.6576	0.282	.5421	0.133
.4799	+0.972	.6659	0.292	.5497	0.062
.4862	0.972	.6738	+0.350	.5525	0.019
.4892	+0.894			.5556	+0.012

Table 9 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436199		2436619		2436619	
.5588	-0.014	.4755	+0.943	.6473	+0.147
.5626	0.016	.4841	0.944	.6514	0.154
.5657	0.037	.4859	0.968	.6535	0.164
.5733	0.009	.4899	0.979	.6556	0.187
.5765	0.001	.4917	0.972	.6598	0.190
.5796	-0.024	.4936	0.984	.6619	0.194
.5827	+0.010	.4973	0.953	.6639	0.188
.5907	+0.080	.4991	0.937	.6681	0.231
		.5010	0.953	.6702	0.236
2436203		.5047	0.972	.6723	0.246
.4341	+0.998	.5190	0.928	.6764	+0.246
.4372	1.001	.5209	0.876		
.4515	0.927	.5246	0.822	2436624	
.4549	0.882	.5331	0.716	.4251	+0.562
.4586	0.872	.5371	0.633	.4271	0.548
.4617	0.827	.5394	0.611	.4292	0.573
.4654	0.778	.5413	0.542	.4334	0.581
.4711	+0.684	.5454	0.459	.4355	0.585
		.5473	0.425	.4376	0.604
2436617		.5491	0.400	.4417	0.610
.6155	-0.007	.5528	0.329	.4438	0.612
.6207	-0.002	.5547	0.321	.4501	0.627
.6228	+0.023	.5565	0.311	.4521	0.630
.6249	0.034	.5607	0.262	.4542	+0.648
.6270	0.021	.5625	0.248		
.6311	0.037	.5644	0.215	2436626	
.6332	0.031	.5693	0.157	.3281	+0.366
.6381	0.064	.5711	0.095	.3320	0.387
.6402	0.070	.5730	0.070	.3338	0.382
.6422	0.071	.5767	0.060	.3357	0.397
.6579	0.126	.5785	0.017	.3415	0.446
.6600	0.134	.5804	+0.024	.3433	0.447
.6641	0,117	.5852	-0.014	.3470	0.465
.6662	0.139	.5873	0.021	.3489	0.451
.6683	0.161	.5892	-0.016	.3549	0.483
.6745	0.164	.5929	+0.001	.3568	0.462
.6766	+0.179	.5947	-0.020	.3586	0.446
		.5966	0.020	.3632	0.481
2436619		.6003	0.013	.3651	0.480
.4004	+0.867	.6021	0.009	.3669	0.492
.4059	0.867	.6040	-0.016	.3706	0.553
.4466	0.906	.6181	+0.053	.3744	0.543
.4487	0.914	.6202	0.065	.3818	0.555
.4507	0.926	.6223	0.062	.3855	0.555
.4553	0.930	.6264	0.067	.3873	0.549
.4573	0.935	.6285	0.066	.3892	0.535
.4594	0.937	.6306	0.098	.4278	0.637
.4636	0.948	.6348	0.102	.4297	0.630
.4657	0.919	.6369	0.111	.4334	0.641
.4678	0.930	.6389	0.123	.4352	0.646
.4718	0.925	.6431	0.125	.4371	0.653
.4737	+0.943	.6452	+0.130	.4410	+0.660

Table 9 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436626		2436626		2442403	
.4429	+0.653	.6165	+0.800	.4981	+0.597
.4447	0.653	.6186	0.849	.4990	0.548
.4484	0.657	.6206	0.845	.5022	0.480
.4503	0.657	.6248	0.798	.5034	0.473
.4521	0.657	.6269	0.834	.5061	0.394
.4558	0.675	.6290	0.839	.5075	0.386
.4577	0.681	.6338	0.826	.5102	0.381
.4595	0.680	.6366	0.864	.5116	0.336
.4632	0.693	.6394	0.820	.5244	0.337
.4651	0.699	.6446	0.831	.5158	0.342
.4669	0.699	.6474	0.844	.5186	0.311
.4706	0.709	.6502	+0.838	.5199	0.270
.4725	0.702			.5220	0.259
.4744	0.697	2436645		.5234	0.233
.4781	0.694	.3174	+0.278	.5262	0.184
.4799	0.690	.3195	0.230	.5276	0.148
.4892	0.694	.3237	0.194	.5304	0.127
.4929	0.697	.3258	0.169	.5317	0.108
.4947	0.705	.3278	0.123	.5345	0.108
.4968	0.704	.3320	0.043	.5359	0.085
.5005	0.707	.3341	0.026	.5387	0.029
.5024	0.715	.3362	+0.032	.5401	0.024
.5042	0.719	.3403	-0.010	.5429	+0.004
.5079	0.730	.3424	0.035	.5442	-0.012
.5098	0.723	.3445	0.027	.5477	0.013
.5116	0.728	.3487	0.015	.5501	0.034
.5153	0.730	.3508	0.008	.5554	0.023
.5172	0.742	.3528	-0.014	.5623	0.011
.5190	0.756	.3570	+0.018	.5637	-0.018
.5230	0.737	.3591	0.020	.5665	+0.005
.5248	0.727	.3657	0.014	.5672	0.006
.5267	0.748	.3678	0.014	.5699	0.010
.5415	0.780	.3699	0.015	.5713	0.028
.5436	0.778	.3740	0.022	.5741	0.027
.5456	0.791	.3761	0.039	.5755	0.033
.5519	0.787	.3782	0.059	.5790	0.013
.5540	0.786	.3827	0.088	.5804	0.030
.5581	0.775	.3848	0.105	.5827	0.033
.5623	0.795	.3869	0.114	.5841	0.052
.5665	0.796	.3924	0.091	.5869	0.051
.5686	0.816	.3949	0.098	.5883	0.084
.5748	0.794	.3973	0.111	.5911	0.093
.5769	0.786	.4022	0.128	.5925	+0.085
.5790	0.806	.4088	0.196		
.5831	0.784	.4129	0.218	2442415	
.5852	0.786	.4150	0.223	.3597	+0.947
.5873	0.815	.4171	0.232	.3607	0.954
.5956	0.814	.4216	0.242	.3639	0.921
.5998	0.817	.4237	0.249	.3653	0.916
.6081	0.840	.4258	+0.252	.3681	0.924
.6102	0.824			.3694	0.886
.6123	+0.840			.3729	+0.813

Table 9 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2442415		2442452		2442452	
.3743	+0.798	.4409	-0.002	.6438	+0.584
.3819	0.678	.4500	+0.028	.6457	0.582
.3833	0.638	.4515	0.030	.6473	0.592
.3868	0.573	.4536	0.043	.6493	0.590
.3882	0.542	.4550	0.067	.6512	0.602
.3910	0.433	.4569	0.057	.6529	+0.616
.3924	0.417	.4652	0.090		
.3951	0.381	.4672	0.094	2442454	
.3965	0.360	.4689	0.100	.2926	+0.999
.3993	0.314	.4706	0.119	.2944	0.990
.4007	0.315	.4720	0.102	.2956	0.978
.4042	0.311	.4899	0.204	.2971	0.958
.4056	0.301	.4917	0.191	.2986	0.951
.4090	0.283	.4934	0.189	.3039	0.955
.4104	0.262	.4953	0.198	.3052	0.966
.4142	0.211	.4969	0.196	.3065	0.969
.4153	0.228	.5096	0.270	.3079	0.966
.4188	0.155	.5112	0.264	.3095	0.962
.4201	0.143	.5125	0.261	.3150	0.971
.4236	0.072	.5141	0.271	.3163	0.959
.4250	0.078	.5155	0.251	.3175	0.950
.4285	0.041	.5280	0.293	.3188	0.955
.4299	0.018	.5296	0.288	.3200	0.959
.4333	0.006	.5312	0.302	.3248	0.944
.4347	+0.018	.5331	0.295	.3263	0.918
.4382	-0.002	.5348	0.306	.3276	0.914
.4396	0.017	.5602	0.399	.3294	0.904
.4424	0.010	.5618	0.393	.3307	0.892
.4438	0.010	.5632	0.399	.3323	0.875
.4472	0.019	.5646	0.411	.3382	0.812
.4486	0.018	.5662	0.402	.3396	0.798
.4514	0.008	.5732	0.426	.3407	0.788
.4528	-0.003	.5748	0.428	.3421	0.768
.4563	+0.003	.5766	0.437	.3436	0.744
.4576	-0.002	.5782	0.445	.3479	0.663
.4604	+0.009	.5800	0.440	.3490	0.618
.4618	0.039	.5894	0.473	.3503	0.601
.4646	0.031	.5929	0.483	.3515	0.567
.4660	0.035	.5952	0.493	.3529	0.529
.4691	0.084	.5982	0.509	.3579	0.440
.4701	+0.074	.5997	0.498	.3595	0.388
		.6078	0.538	.3604	0.379
2442452		.6098	0.526	.3615	0.378
.4166	-0.027	.6115	0.541	.3625	0.360
.4187	0.017	.6132	0.540	.3664	0.323
.4222	0.036	.6151	0.541	.3673	0.314
.4251	-0.010	.6221	0.541	.3685	0.309
.4335	0.000	.6238	0.551	.3695	0.296
.4350	+0.001	.6258	0.539	.3707	0.286
.4365	0.003	.6289	0.535	.3746	0.243
.4381	+0.005	.6306	0.550	.3756	0.221
.4395	-0.004	.6419	+0.584	.3766	+0.199

Table 9 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2442454		2442532		2442948	
.3776	+0.190	.3836	+0.139	.3683	+0.236
.3790	0.168	.3905	0.181	.3717	0.204
.3841	0.121	.3921	0.180	.3731	0.158
.3854	0.093	.3941	0.187	.3766	0.137
.3869	0.077	.3955	0.193	.3780	0.125
.3885	0.082	.3969	0.197	.3811	0.067
.3898	0.060	.4041	0.221	.3825	0.031
.3942	0.025	.4059	0.237	.3856	0.009
.3955	0.014	.4069	0.235	.3870	0.017
.3969	+0.007	.4086	0.244	.3905	+0.014
.3981	-0.008	.4097	0.266	.3919	-0.002
.3994	0.005	.4159	0.271	.3950	-0.005
.4004	0.014	.4174	0.269	.3964	+0.004
.4024	0.025	.4188	0.283	.3998	0.001
.4037	0.015	.4204	0.297	.4015	+0.004
.4050	0.030	.4218	0.282		
.4063	0.035	.4289	0.293	2443204	
.4085	0.014	.4303	0.293	.5984	+0.336
.4098	0.019	.4321	0.307	.6001	0.318
.4154	0.009	.4337	0.307	.6041	0.282
.4167	0.012	.4353	0.313	.6055	0.300
.4181	0.012	.4412	0.338	.6096	0.242
.4192	-0.007	.4428	0.334	.6110	0.222
.4206	+0.005	.4445	0.336	.6152	0.152
.4224	-0.005	.4459	0.338	.6169	0.128
		.4471	0.362	.6210	0.097
2442532		.4535	0.363	.6225	0.091
.3509	+0.020	.4552	0.378	.6267	0.041
.3530	0.039	.4567	0.372	.6306	0.003
.3556	0.051	.4584	0.374	.6326	+0.002
.3575	0.062	.4602	0.388	.6365	-0.005
.3588	0.068	.4653	0.401	.6384	0.015
.3655	0.085	.4674	0.404	.6426	0.026
.3669	0.085	.4688	0.406	.6442	0.029
.3686	0.088	.4704	0.410	.6489	0.020
.3703	0.099	.4720	+0.406	.6504	0.018
.3718	0.109			.6545	-0.019
.3779	0.128	2442948		.6560	+0.002
.3793	0.131	.3627	+0.328	.6596	0.014
.3808	0.130	.3641	0.306	.6610	+0.029
.3822	+0.138	.3669	+0.283		

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436152		2436152		2436152	
.5571	+0.293	.6109	+0.093	.6394	-0.511
.5586	0.312	.6122	+0.063	.6465	0.612
.5693	0.320	.6213	-0.158	.6477	0.615
.5709	0.308	.6227	0.154	.6544	0.730
.5820	0.279	.6307	0.416	.6556	0.752
.5946	0.287	.6318	0.433	.6618	0.846
.5956	+0.282	.6381	-0.486	.6684	-0.927

Table 9 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436152		2436187		2436617	
.6751	-0.942	.6020	+0.241	.6363	-0.870
.6810	0.919	.6031	0.200	.6391	0.871
.6873	-0.956	.6141	0.094	.6412	-0.855
		.6158	+0.057		
2436163		.6272	-0.211	2436619	
.6174	+0.142	.6286	0.256	.3990	+0.143
.6232	0.148	.6418	0.526	.4046	0.133
.6258	0.138	.6437	0.557	.4073	0.162
.6324	+0.138	.6543	0.704	.4129	0.182
		.6560	-0.726	.4157	0.168
2436164				.4184	0.154
.4785	+0.308	2436199		.4455	0.187
.4815	0.272	.4770	+0.332	.4476	0.197
.4877	0.239	.4791	+0.332	.4497	0.203
.4964	0.111	.5153	-0.210	.4542	0.208
.5022	+0.029	.5184	0.328	.4563	0.232
.5121	-0.207	.5210	0.384	.4584	0.225
.5224	0.456	.5268	0.502	.4625	0.259
.5235	0.464	.5296	0.529	.4646	0.240
.5311	0.569	.5325	0.583	.4667	0.243
.5363	0.645	.5351	0.607	.4709	0.224
.5395	0.700	.5407	0.693	.4727	0.226
.5460	0.810	.5438	0.778	.4746	0.262
.5521	0.880	.5511	0.891	.4889	0.269
.5589	0.924	.5539	0.921	.4908	0.275
.5603	0.929	.5571	0.943	.4926	0.288
.5649	0.928	.5608	0.937	.4963	0.249
.5787	0.890	.5643	0.944	.4982	0.230
.5860	0.878	.5719	0.925	.5075	0.292
.5941	0.841	.5751	0.961	.5153	0.227
.6021	0.799	.5788	0.943	.5179	0.206
.6070	0.782	.5810	0.933	.5200	0.185
.6143	0.752	.5847	0.893	.5237	0.093
.6157	0.739	.5925	-0.873	.5271	+0.063
.6259	0.684			.5322	-0.090
.6310	0.657	2436203		.5362	0.126
.6386	0.633	.4357	+0.318	.5403	0.229
.6467	0.600	.4393	0.306	.5445	0.365
.6543	0.588	.4535	0.176	.5463	0.403
.6557	0.566	.4566	0.142	.5482	0.427
.6640	0.538	.4602	0.117	.5519	0.499
.6721	-0.505	.4635	0.073	.5538	0.508
		.4672	+0.019	.5556	0.533
2436187		.4692	-0.019	.5598	0.584
.4964	+0.209			.5616	0.617
.5013	0.212	2436617		.5635	0.651
.5090	0.225	.6166	-0.962	.5683	0.720
.5154	0.209	.6218	0.927	.5702	0.778
.5390	0.264	.6238	0.896	.5720	0.802
.5409	0.271	.6259	0.901	.5757	0.853
.5847	0.340	.6301	0.902	.5776	0.894
.5863	+0.312	.6322	-0.913	.5794	-0.902

Table 9 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436619		2436626		2436626	
.5843	-0.919	.3329	-0.361	.4938	-0.024
.5864	0.948	.3348	0.355	.4959	0.022
.5882	0.947	.3387	0.373	.4996	0.012
.5919	0.940	.3406	0.373	.5014	-0.003
.5938	0.940	.3424	0.343	.5033	+0.004
.5956	0.941	.3461	0.340	.5070	0.012
.5994	0.948	.3480	0.340	.5088	0.009
.6012	0.930	.3498	0.349	.5107	0.017
.6031	0.914	.3450	0.324	.5144	0.022
.6068	0.921	.3558	0.339	.5163	0.026
.6107	0.918	.3623	0.311	.5181	0.032
.6171	0.888	.3642	0.305	.5220	0.027
.6191	0.882	.3660	0.295	.5239	0.014
.6212	0.873	.3697	0.278	.5257	0.018
.6254	0.844	.3716	0.218	.5404	0.067
.6275	0.837	.3734	0.215	.5425	0.066
.6296	0.821	.3790	0.206	.5446	0.065
.6337	0.812	.3808	0.203	.5488	0.108
.6358	0.787	.3845	0.198	.5509	0.051
.6379	0.771	.3864	0.205	.5529	0.087
.6421	0.764	.3882	0.214	.5571	0.101
.6441	0.743	.3919	0.199	.5592	0.077
.6462	0.736	.3938	0.154	.5613	0.079
.6504	0.730	.3956	0.184	.5654	0.103
.6525	0.715	.3993	0.161	.5675	0.112
.6546	0.712	.4012	0.161	.5696	0.109
.6587	0.685	.4031	0.155	.5738	0.116
.6608	0.700	.4068	0.155	.5759	0.113
.6629	0.679	.4086	0.152	.5779	0.109
.6671	0.659	.4105	0.140	.5821	0.127
.6691	0.637	.4288	0.138	.5842	0.134
.6712	0.614	.4325	0.132	.5863	0.099
.6754	0.588	.4343	0.126	.5904	0.131
.6775	-0.608	.4362	0.100	.5925	0.131
		.4401	0.096	.5946	0.118
2436624		.4419	0.103	.5988	0.113
.4344	-0.155	.4438	0.086	.6071	0.139
.4365	0.150	.4475	0.099	.6092	0.158
.4428	0.143	.4494	0.093	.6113	0.149
.4448	0.154	.4512	0.087	.6154	0.104
.4490	0.124	.4549	0.075	.6175	0.152
.4511	0.126	.4568	0.067	.6238	0.096
.4573	0.120	.4586	0.059	.6279	0.114
.4615	0.099	.4623	0.053	.6325	0.115
.4657	0.097	.4642	0.043	.6352	0.123
.4698	-0.075	.4660	0.043	.6432	0.132
		.4697	0.040	.6460	0.120
2436626		.4716	0.044	.6488	+0.122
.3193	-0.463	.4734	0.049		
.3259	0.434	.4771	0.050	2436645	
.3271	0.407	.4790	0.050	.3164	-0.556
.3311	-0.373	.4919	-0.036	.3185	-0.574

Table 9 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436645		2442403		2442415	
.3226	-0.670	.5533	-0.956	.4431	-0.920
.3247	0.679	.5547	0.938	.4465	0.933
.3268	0.712	.5616	0.947	.4479	0.926
.3310	0.789	.5630	0.929	.4507	0.923
.3351	0.847	.5658	0.916	.4521	0.915
.3414	0.910	.5668	0.905	.4556	0.908
.3435	0.918	.5692	0.922	.4569	0.918
.3476	0.959	.5706	0.904	.4597	0.887
.3497	0.950	.5734	0.893	.4611	0.885
.3518	0.953	.5748	0.885	.4639	0.858
.3560	0.932	.5783	0.885	.4653	0.862
.3581	0.923	.5797	0.889	.4688	0.864
.3667	0.883	.5820	0.875	.4694	-0.842
.3730	0.871	.5834	0.874		
.3751	0.864	.5862	0.858	2442452	
.3772	0.857	.5876	0.832	.4173	-0.958
.3817	0.847	.5904	0.821	.4198	0.958
.3838	0.843	.5918	-0.829	.4230	0.949
.3858	0.845			.4258	0.932
.3935	0.810	2442415		.4340	0.940
.3963	0.789	.3593	+0.225	.4355	0.928
.4011	0.727	.3604	0.238	.4371	0.930
.4039	0.700	.3632	0.212	.4386	0.933
.4119	0.663	.3646	0.221	.4400	0.921
.4160	0.626	.3674	0.189	.4414	0.933
.4206	-0.605	.3688	0.176	.4505	0.900
		.3722	0.144	.4520	0.886
2442403		.3736	0.143	.4541	0.844
.4977	-0.154	.3764	+0.098	.4557	0.863
.4987	0.201	.3813	-0.051	.4574	0.847
.5015	0.259	.3826	0.071	.4657	0.806
.5029	0.291	.3861	0.138	.4678	0.799
.5054	0.364	.3875	0.194	.4694	0.800
.5068	0.398	.3903	0.317	.4711	0.788
.5095	0.445	.3917	0.350	.4725	0.785
.5109	0.489	.3944	0.427	.4903	0.679
.5151	0.541	.3958	0.434	.4924	0.654
.5179	0.565	.3986	0.472	.4943	0.668
.5192	0.597	.4000	0.483	.4958	0.655
.5227	0.603	.4035	0.525	.4974	0.645
.5258	0.654	.4049	0.517	.5100	0.581
.5269	0.696	.4083	0.571	.5116	0.574
.5297	0.767	.4097	0.592	.5130	0.567
.5311	0.776	.4181	0.754	.5146	0.562
.5338	0.830	.4194	0.738	.5160	0.558
.5352	0.824	.4229	0.844	.5286	0.510
.5380	0.867	.4278	0.881	.5302	0.504
.5394	0.881	.4292	0.889	.5317	0.512
.5422	0.891	.4340	0.924	.5336	0.495
.5436	0.900	.4375	0.966	.5355	0.493
.5470	0.922	.4389	0.934	.5607	0.382
.5484	-0.928	.4417	-0.922	.5623	-0.376

Table 9 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442452		2442454		2442532	
.5636	-0.383	.3387	+0.107	.3415	-0.910
.5650	0.378	.3400	0.078	.3433	0.916
.5667	0.370	.3410	0.053	.3447	0.910
.5737	0.337	.3426	0.030	.3512	0.926
.5754	0.336	.3440	+0.008	.3537	0.905
.5771	0.332	.3482	-0.107	.3563	0.907
.5788	0.311	.3494	0.124	.3579	0.880
.5805	0.312	.3507	0.175	.3594	0.868
.5916	0.262	.3520	0.203	.3659	0.845
.5936	0.271	.3533	0.244	.3676	0.846
.5961	0.261	.3582	0.386	.3691	0.832
.5988	0.253	.3598	0.406	.3708	0.834
.6002	0.246	.3609	0.421	.3722	0.817
.6082	0.217	.3618	0.430	.3784	0.790
.6103	0.202	.3628	0.462	.3798	0.780
.6120	0.203	.3668	0.512	.3815	0.774
.6137	0.211	.3677	0.527	.3828	0.778
.6158	0.192	.3690	0.532	.3843	0.757
.6226	0.192	.3700	0.547	.3910	0.722
.6244	0.178	.3710	0.558	.3927	0.715
.6270	0.197	.3748	0.622	.3948	0.697
.6296	0.165	.3761	0.642	.3962	0.703
.6311	0.166	.3768	0.655	.3977	0.682
.6424	0.128	.3781	0.673	.4046	0.640
.6462	0.113	.3793	0.693	.4064	0.639
.6478	0.124	.3846	0.783	.4074	0.629
.6500	0.106	.3860	0.784	.4092	0.626
.6517	0.101	.3873	0.810	.4102	0.607
.6533	-0.107	.3888	0.839	.4162	0.594
		.3902	0.850	.4177	0.576
2442454		.3947	0.907	.4190	0.553
.2932	+0.316	.3961	0.912	.4221	0.550
.2948	0.343	.3974	0.917	.4295	0.538
.2962	0.315	.3986	0.926	.4309	0.534
.2976	0.299	.3997	0.925	.4327	0.523
.2991	0.319	.4008	0.932	.4342	0.513
.3043	0.333	.4027	0.943	.4359	0.509
.3056	0.337	.4040	0.941	.4417	0.488
.3068	0.338	.4055	0.949	.4433	0.478
.3087	0.316	.4069	0.953	.4448	0.485
.3101	0.305	.4088	0.947	.4462	0.462
.3154	0.319	.4101	0.928	.4479	0.465
.3166	0.282	.4159	0.937	.4540	0.428
.3180	0.283	.4171	0.921	.4557	0.434
.3192	0.293	.4184	0.928	.4574	0.433
.3204	0.257	.4197	0.923	.4589	0.442
.3253	0.238	.4211	0.910	.4604	0.426
.3267	0.255	.4227	-0.923	.4660	0.416
.3285	0.222			.4680	0.394
.3300	0.194	2442532		.4692	0.399
.3313	0.180	.3377	-0.922	.4709	0.398
.3328	+0.185	.3395	-0.913	.4725	-0.390

Table 9 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442948		2442948		2443204	
.3620	-0.501	.3991	-0.925	.6217	-0.789
.3634	0.512	.4005	0.929	.6260	0.840
.3662	0.548	.4039	0.905	.6300	0.926
.3676	0.575	.4051	-0.903	.6316	0.909
.3710	0.639			.6358	0.904
.3724	0.668	2443204		.6374	0.926
.3759	0.724	.5977	-0.427	.6418	0.922
.3773	0.744	.6033	0.521	.6434	0.932
.3804	0.799	.6048	0.524	.6481	0.904
.3818	0.811	.6089	0.581	.6496	0.902
.3849	0.859	.6103	0.591	.6537	0.926
.3863	0.861	.6143	0.680	.6554	0.902
.3912	0.903	.6161	0.706	.6589	0.876
.3943	0.915	.6202	-0.788	.6603	-0.864
.3957	-0.924				

J.D.	ΔU	J.D.	ΔU	J.D.	ΔU
2442452		2442452		2442454	
.4180	-1.914	.5341	-1.459	.2937	-0.696
.4211	1.921	.5360	1.472	.2951	0.706
.4240	1.906	.5613	1.465	.2966	0.747
.4262	1.920	.5628	1.457	.2981	0.702
.4345	1.886	.5641	1.506	.2995	0.693
.4360	1.880	.5655	1.486	.3047	0.764
.4376	1.890	.5671	1.499	.3061	0.706
.4390	1.901	.5742	1.496	.3073	0.737
.4404	1.878	.5760	1.468	.3091	0.758
.4419	1.911	.5777	1.462	.3159	0.737
.4510	1.874	.5794	1.441	.3170	0.775
.4526	1.892	.5810	1.424	.3184	0.817
.4545	1.840	.5922	1.402	.3207	0.861
.4562	1.856	.5943	1.487	.3259	0.908
.4579	1.794	.5969	1.479	.3271	0.948
.4664	1.765	.5994	1.495	.3290	0.957
.4684	1.757	.6127	1.458	.3303	0.983
.4698	1.746	.6144	1.421	.3319	1.008
.4715	1.763	.6164	1.406	.3333	1.019
.4729	1.735	.6233	1.399	.3391	1.121
.4909	1.755	.6251	1.412	.3403	1.120
.4928	1.735	.6275	1.426	.3414	1.157
.4947	1.727	.6301	1.380	.3431	1.158
.4963	1.709	.6316	1.403	.3445	1.193
.4980	1.691	.6430	1.390	.3487	1.381
.5106	1.610	.6452	1.348	.3499	1.408
.5121	1.628	.6467	1.382	.3512	1.512
.5135	1.595	.6482	1.339	.3523	1.549
.5150	1.581	.6506	1.307	.3538	1.624
.5165	1.597	.6522	1.316	.3591	1.775
.5291	1.535	.6538	-1.318	.3612	1.770
.5307	1.543			.3621	1.773
.5323	-1.512	2442454		.3632	-1.752

Table 9 (cont.)

J.D.	ΔU	J.D.	ΔU	J.D.	ΔU
2442454		2442454		2442532	
.3670	-1.750	.4164	-1.896	.3965	-1.638
.3680	1.712	.4176	1.892	.3983	1.632
.3692	1.731	.4189	1.876	.4052	1.570
.3703	1.776	.4202	1.888	.4066	1.573
.3714	1.753	.4214	1.873	.4080	1.553
.3751	1.795	.4232	-1.841	.4107	1.543
.3764	1.813			.4169	1.550
.3773	1.835	2442532		.4183	1.548
.3784	1.831	.3454	-1.838	.4197	1.560
.3797	1.835	.3516	1.836	.4211	1.562
.3851	1.889	.3540	1.805	.4226	1.571
.3866	1.904	.3567	1.809	.4300	1.602
.3878	1.911	.3584	1.820	.4316	1.568
.3893	1.956	.3598	1.770	.4332	1.548
.3905	1.956	.3664	1.771	.4348	1.524
.3952	1.974	.3681	1.786	.4364	1.524
.3964	1.981	.3698	1.783	.4420	1.508
.3977	2.002	.3725	1.775	.4440	1.510
.3991	1.982	.3791	1.792	.4454	1.501
.4000	1.988	.3801	1.783	.4467	1.478
.4019	1.976	.3818	1.774	.4484	1.517
.4034	1.957	.3831	1.787	.4545	1.485
.4045	1.956	.3851	1.738	.4562	1.469
.4058	1.947	.3916	1.715	.4581	1.475
.4072	1.946	.3932	1.707	.4596	1.431
.4095	1.910	.3951	-1.656	.4609	-1.423
.4107	-1.860				

Table 10

Photographic observations of SU Dra

J.D.	Δm_{pg}	J.D.	Δm_{pg}	J.D.	Δm_{pg}
2428657		2428657		2429336	
.5319	10.04	.5674	9.48	.3582	10.42
.5340	10.00	.5694	9.40	.3603	10.44
.5361	9.88	.5715	9.42	.3624	10.46
.5375	9.96			.3645	10.53
.5395	9.86	2429336		.3666	10.52
.5419	9.76	.3353	10.32	.3687	10.48
.5444	9.80	.3374	10.24	.3707	10.54
.5475	9.68	.3395	10.34	.3728	10.56
.5486	9.64	.3416	10.34	.3749	10.46
.5507	9.60	.3437	10.30	.3770	10.52
.5549	9.66	.3457	10.38	.3791	10.48
.5569	9.62	.3478	10.36	.3812	10.54
.5590	9.58	.3499	10.44	.3832	10.54
.5611	9.50	.3520	10.42	.3853	10.50
.5632	9.52	.3541	10.48	.3874	10.50
.5653	9.50	.3562	10.50	.3895	10.54

Table 10 (cont.)

J.D.	Δm_{pg}	J.D.	Δm_{pg}	J.D.	Δm_{pg}
2429336		2429366		2429375	
.3916	10.52	.3959	9.88	.4663	9.21
.3937	10.54	.3980	9.87	.4746	9.24
.3957	10.48	.4001	9.91	.4767	9.22
.3978	10.52	.4022	9.86	.4809	9.26
.3999	10.54	.4043	9.90	.4829	9.20
.4020	10.52	.4070	9.92	.4850	9.20
.4041	10.56	.4091	9.92	.4871	9.28
.4062	10.54	.4112	9.92	.4892	9.24
.4082	10.56	.4133	9.94	.4913	9.28
.4103	10.56	.4189	9.92	.4934	9.22
.4124	10.50	.4209	9.99	.4954	9.24
.4145	10.50			.4975	9.30
		2429375		.4996	9.28
2429366		.3746	10.54	.5059	9.32
.3068	9.50	.3788	10.48	.5079	9.31
.3084	9.52	.3809	10.52	.5100	9.30
.3105	9.50	.3829	10.56	.5121	9.33
.3126	9.54	.3850	10.54	.5142	9.34
.3147	9.52	.3871	10.50	.5163	9.32
.3168	9.58	.3892	10.55	.5184	9.36
.3189	9.60	.3913	10.50	.5204	9.38
.3209	9.60	.3934	10.50	.5225	9.44
.3230	9.62	.3954	10.42	.5246	9.40
.3251	9.58	.3975	10.36	.5267	9.42
.3272	9.56	.3996	10.34	.5288	9.42
.3314	9.64	.4017	10.36	.5309	9.46
.3334	9.66	.4038	10.30	.5329	9.50
.3355	9.60	.4059	10.22	.5350	9.44
.3376	9.68	.4079	10.16	.5371	9.50
.3397	9.70	.4100	10.04	.5392	9.48
.3418	9.68	.4121	9.99	.5413	9.48
.3439	9.72	.4142	9.90	.5468	9.54
.3466	9.66	.4163	9.86	.5489	9.60
.3522	9.72	.4204	9.74	.5510	9.59
.3543	9.76	.4225	9.68		
.3564	9.78	.4246	9.76	2429450	
.3584	9.80	.4267	9.60	.3614	10.02
.3605	9.77	.4288	9.60	.3635	10.04
.3626	9.74	.4309	9.60	.3656	10.04
.3647	9.76	.4329	9.54	.3677	10.10
.3689	9.78	.4350	9.48	.3697	10.10
.3716	9.76	.4371	9.42	.3718	10.12
.3730	9.82	.4392	9.44	.3739	10.16
.3751	9.80	.4413	9.40	.3760	10.18
.3772	9.82	.4441	9.32	.3781	10.12
.3800	9.80	.4496	9.26	.3802	10.15
.3820	9.82	.4538	9.20	.3822	10.14
.3841	9.82	.4559	9.22	.3843	10.15
.3876	9.84	.4579	9.18	.3864	10.18
.3897	9.86	.4600	9.20	.3885	10.20
.3918	9.83	.4621	9.22	.3927	10.18
.3939	9.84	.4642	9.16	.3947	10.20

Table 10 (cont.)

J.D.	Δm_{pg}	J.D.	Δm_{pg}	J.D.	Δm_{pg}
2429450		2432061		2432061	
.3968	10.24	.3409	9.88	.4652	9.50
.4079	10.26	.3430	9.82	.4714	9.55
.4100	10.30	.3450	9.82	.4735	9.54
.4121	10.28	.3471	9.76	.4756	9.56
.4142	10.22	.3492	9.72	.4777	9.60
.4170	10.30	.3513	9.68	.4798	9.54
.4211	10.26	.3534	9.62	.4819	9.55
.4232	10.26	.3555	9.60	.4860	9.60
.4253	10.32	.3575	9.50	.4881	9.58
.4274	10.30	.3596	9.50	.4902	9.66
.4295	10.34	.3617	9.40	.4923	9.62
.4336	10.36	.3638	9.40	.4964	9.64
.4357	10.34	.3659	9.32	.4985	9.70
		.3680	9.34		
2432030		.3700	9.30	2434099	
.3457	9.30	.3721	9.24	.4132	9.42
.3478	9.24	.3742	9.24	.4153	9.38
.3499	9.28	.3763	9.26	.4174	9.36
.3520	9.32	.3784	9.22	.4194	9.30
.3541	9.34	.3825	9.18	.4236	9.18
.3562	9.34	.3867	9.08	.4257	9.12
.3603	9.36	.3888	9.10	.4278	9.12
.3624	9.34	.3909	9.14	.4299	9.18
.3645	9.32	.3930	9.12	.4319	9.16
.3666	9.34	.3950	9.12	.4382	9.10
.3707	9.36	.3971	9.10	.4403	9.16
.3728	9.44	.3992	9.16	.4424	9.20
.3749	9.40	.4013	9.12	.4444	9.18
.3770	9.46	.4034	9.12	.4486	9.22
.3791	9.44	.4055	9.18	.4528	9.20
.3812	9.40	.4075	9.16	.4570	9.24
.3839	9.42	.4096	9.20	.4590	9.30
.3860	9.42	.4117	9.22	.4611	9.30
.3881	9.46	.4138	9.22	.4632	9.24
.3902	9.46	.4159	9.24	.4674	9.30
.3923	9.46	.4180	9.28	.4694	9.34
.3964	9.52	.4200	9.34	.4715	9.32
.4006	9.58	.4242	9.32	.4736	9.38
.4027	9.54	.4263	9.30	.4757	9.37
.4048	9.60	.4284	9.28	.4778	9.44
.4069	9.56	.4325	9.34	.4819	9.42
.4110	9.58	.4367	9.36	.4840	9.50
.4131	9.60	.4444	9.38	.4861	9.42
.4152	9.58	.4464	9.42	.4882	9.48
.4173	9.66	.4492	9.40	.4903	9.52
		.4506	9.42	.4924	9.54
2432061		.4527	9.36	.4944	9.54
.3305	10.10	.4548	9.40		
.3325	10.04	.4569	9.46	2434126	
.3346	9.96	.4589	9.48	.4819	9.58
.3367	9.92	.4610	9.46	.4839	9.52
.3388	9.90	.4631	9.52	.4860	9.57

Table 10 (cont.)

J.D.	Δm_{pg}	J.D.	Δm_{pg}	J.D.	Δm_{pg}
2434126		2434130		2434196	
.4881	9.54	.4323	9.73	.5014	9.32
.4902	9.48	.4344	9.74	.5035	9.32
.4923	9.45	.4365	9.72	.5056	9.28
.4944	9.44	.4392	9.64	.5076	9.30
.4964	9.46	.4407	9.60	.5097	9.34
.4986	9.44	.4428	9.60	.5118	9.28
.5006	9.40	.4448	9.58	.5139	9.24
.5027	9.34	.4469	9.54	.5160	9.21
.5048	9.40	.4490	9.50	.5181	9.30
.5069	9.36	.4511	9.48	.5201	9.26
.5089	9.36	.4532	9.46	.5264	9.27
.5110	9.31	.4553	9.41	.5285	9.30
.5152	9.34	.4574	9.34	.5326	9.32
.5173	9.26	.4594	9.30	.5347	9.36
.5194	9.28	.4615	9.30		
.5214	9.28	.4636	9.32	2434830	
.5256	9.24	.4657	9.30	.4840	9.63
.5277	9.28	.4698	9.28	.4861	9.58
.5298	9.28	.4719	9.30	.4882	9.59
.5319	9.23	.4740	9.28	.4903	9.50
.5360	9.32	.4761	9.26	.4924	9.50
.5381	9.32	.4782	9.22	.4944	9.44
.5402	9.30	.4840	9.26	.4965	9.44
.5423	9.32	.4865	9.20	.4986	9.37
.5444	9.28	.4886	9.22	.5007	9.34
.5464	9.32	.4907	9.26	.5028	9.33
.5485	9.32	.4928	9.26	.5049	9.30
.5506	9.30	.4948	9.23	.5069	9.25
.5527	9.34	.4969	9.24	.5090	9.23
.5548	9.36	.4990	9.28	.5111	9.20
				.5132	9.14
2434130		2434196		.5153	9.16
.3844	10.48	.4514	10.10	.5174	9.17
.3865	10.42	.4557	10.01	.5194	9.19
.3886	10.42	.4577	9.98	.5215	9.18
.3907	10.40	.4597	9.90	.5236	9.20
.3948	10.43	.4618	9.92	.5257	9.25
.3969	10.36	.4639	9.88	.5278	9.25
.3990	10.33	.4660	9.80	.5299	9.24
.4032	10.34	.4681	9.82	.5319	9.27
.4054	10.24	.4701	9.78	.5340	9.29
.4073	10.30	.4722	9.72	.5361	9.31
.4115	10.22	.4743	9.68	.5383	9.30
.4136	10.23	.4785	9.68	.5403	9.28
.4157	10.22	.4802	9.66	.5424	9.31
.4178	10.17	.4826	9.60	.5444	9.32
.4198	10.12	.4847	9.54		
.4219	10.10	.4889	9.48	2434832	
.4240	10.00	.4910	9.50	.5055	9.24
.4261	9.82	.4931	9.40	.5075	9.24
.4282	9.78	.4971	9.42	.5096	9.23
.4303	9.76	.4993	9.42	.5117	9.23

Table 10 (cont.)

J.D.	Δm_{pg}	J.D.	Δm_{pg}	J.D.	Δm_{pg}
2434832		2434840		2434949	
.5138	9.24	.3571	10.23	.4623	9.49
.5159	9.25	.3594	10.24	.4644	9.53
.5180	9.27	.3613	10.26	.4665	9.54
.5200	9.30			.4686	9.56
.5221	9.32	2434949			
.5242	9.33	.4249	9.32	2434964	
.5263	9.33	.4269	9.28	.5409	9.67
.5284	9.33	.4290	9.36	.5430	9.64
.5305	9.35	.4311	9.33	.5450	9.55
.5346	9.37	.4352	9.36	.5471	9.54
.5367	9.36	.4373	9.40	.5492	9.47
.5388	9.37	.4394	9.35	.5513	9.46
		.4415	9.39	.5534	9.43
2434840		.4436	9.40	.5555	9.43
.3405	10.09	.4456	9.42	.5575	9.44
.3426	10.10	.4477	9.43	.5638	9.37
.3446	10.11	.4498	9.45	.5659	9.34
.3467	10.18	.4519	9.42	.5700	9.32
.3488	10.18	.4540	9.47	.5721	9.29
.3509	10.23	.4561	9.46	.5742	9.29
.3530	10.16	.4582	9.50	.5784	9.27
.3551	10.24	.4602	9.47	.5805	9.23

Table 11

Photoelectric observations of RR Leo

J.D.	Δm^*	J.D.	Δm^*	J.D.	Δm^*
2435068		2435068		2435068	
.6565	+0.984	.6729	+0.544	.6891	-0.275
.6570	1.012	.6736	0.538	.6897	0.318
.6578	0.956	.6743	0.498	.6904	0.326
.6582	0.956	.6750	0.476	.6925	0.375
.6588	0.955	.6757	0.433	.6930	0.404
.6595	0.980	.6764	0.385	.6941	0.389
.6601	0.951	.6770	0.341	.6949	0.406
.6608	0.925	.6776	0.331	.6957	0.415
.6633	0.859	.6783	0.280	.6964	0.422
.6638	0.823	.6789	0.257	.6973	-0.451
.6644	0.819	.6796	0.222		
.6650	0.846	.6802	0.184	2435069	
.6657	0.796	.6809	0.175	.5636	+0.956
.6662	0.785	.6815	0.143	.5642	0.972
.6669	0.811	.6822	+0.130	.5648	0.914
.6675	0.770	.6849	-0.002	.5653	0.909
.6683	0.745	.6856	0.104	.5659	0.894
.6704	0.677	.6862	0.114	.5687	0.881
.6710	0.600	.6872	0.163	.5692	0.893
.6716	0.625	.6876	0.190	.5697	0.879
.6723	+0.576	.6885	-0.248	.5703	+0.852

Table 11 (cont.)

J.D.	Δm*	J.D.	Δm*	J.D.	Δm*
2435069		2435069		2435127	
.5709	+0.816	.6180	-0.397	.5086	-0.451
.5713	0.799	.6184	0.397	.5096	0.452
.5719	0.752	.6210	0.365	.5108	0.449
.5744	0.723	.6214	-0.364	.5118	0.454
.5758	0.687			.5129	0.441
.5764	0.680	2435127		.5140	0.435
.5771	0.589	.4336	+0.976	.5167	0.444
.5779	0.572	.4351	0.988	.5177	0.448
.5785	0.531	.4362	1.004	.5187	0.445
.5793	0.477	.4372	1.016	.5199	0.438
.5816	0.368	.4407	1.003	.5206	-0.441
.5822	0.338	.4417	1.035		
.5829	0.309	.4427	1.032	2435479	
.5835	0.265	.4442	1.019	.4509	-0.003
.5839	0.236	.4451	1.027	.4520	0.049
.5845	0.194	.4478	1.061	.4532	0.148
.5852	0.182	.4488	1.046	.4543	0.191
.5872	0.077	.4499	1.041	.4552	0.222
.5878	0.041	.4510	1.023	.4586	0.328
.5884	0.037	.4560	1.037	.4638	0.404
.5889	+0.007	.4569	1.015	.4650	0.442
.5894	-0.001	.4580	0.997	.4661	0.436
.5901	0.076	.4591	0.990	.4693	0.419
.5906	0.089	.4597	0.997	.4704	0.382
.5930	0.190	.4634	0.976	.4717	0.395
.5936	0.225	.4645	0.955	.4724	-0.388
.5941	0.265	.4658	0.966		
.5948	0.294	.4675	0.936	2435489	
.5959	0.325	.4726	0.864	.3832	+0.859
.5968	0.363	.4742	0.873	.3842	0.798
.5974	0.390	.4756	0.818	.3849	0.783
.5997	0.427	.4769	0.760	.3861	0.756
.6005	0.439	.4785	0.716	.3871	0.711
.6012	0.445	.4792	0.685	.3880	0.711
.6018	0.446	.4823	0.578	.3908	0.601
.6024	0.452	.4835	0.517	.3921	0.557
.6030	0.466	.4848	0.479	.3930	0.512
.6037	0.473	.4861	0.416	.3939	0.410
.6060	0.473	.4872	0.365	.3949	0.391
.6067	0.456	.4902	0.199	.3960	0.332
.6073	0.467	.4912	0.138	.3989	0.154
.6080	0.455	.4930	0.089	.3998	0.117
.6085	0.464	.4938	0.014	.4008	0.077
.6091	0.469	.4946	+0.002	.4018	+0.013
.6099	0.458	.4951	-0.037	.4029	-0.031
.6118	0.446	.4984	0.217	.4057	0.183
.6125	0.437	.4997	0.269	.4067	0.208
.6131	0.426	.5008	0.329	.4078	0.266
.6136	0.422	.5022	0.369	.4098	0.372
.6144	0.432	.5035	0.398	.4109	0.406
.6150	0.417	.5045	0.414	.4119	0.420
.6157	-0.415	.5074	-0.433	.4145	-0.458

Table 11 (cont.)

J.D.	Δm*	J.D.	Δm*	J.D.	Δm*
2435489		2435542		2435561	
.4157	-0.481	.3231	+0.368	.3156	+0.826
.4168	0.470	.3244	0.300	.3165	0.732
.4180	0.472	.3253	0.290	.3175	0.647
.4192	0.485	.3278	0.184	.3184	0.655
.4224	0.481	.3288	0.130	.3191	0.621
.4237	0.491	.3296	0.098	.3230	0.410
.4247	0.487	.3304	0.066	.3240	0.357
.4258	0.475	.3313	0.044	.3250	0.326
.4268	0.493	.3322	+0.010	.3277	0.199
.4278	0.474	.3331	-0.029	.3286	0.158
.4306	0.455	.3357	0.156	.3294	0.077
.4317	0.454	.3367	0.168	.3302	+0.073
.4329	0.445	.3392	0.310	.3322	-0.008
.4339	0.433	.3402	0.338	.3330	0.021
.4350	0.424	.3411	0.325	.3377	0.274
.4360	0.403	.3422	0.360	.3388	0.310
.4388	0.376	.3431	0.390	.3396	0.340
.4399	0.379	.3464	0.449	.3404	0.385
.4409	0.338	.3474	0.443	.3428	0.425
.4419	0.341	.3484	0.448	.3436	0.456
.4429	0.330	.3494	0.473	.3446	0.445
.4440	0.337	.3505	0.476	.3468	0.485
.4467	0.290	.3546	0.473	.3494	0.474
.4505	0.261	.3554	0.453	.3503	0.471
.4537	0.224	.3565	0.444	.3528	0.476
.4580	-0.231	.3572	0.443	.3539	0.464
		.3582	0.437	.3547	0.457
2435542		.3611	0.435	.3557	0.426
.3111	+0.802	.3622	0.421	.3581	0.410
.3121	0.785	.3633	0.411	.3589	0.399
.3129	0.790	.3642	0.400	.3597	0.378
.3137	0.741	.3650	-0.389	.3605	0.384
.3165	0.636			.3627	0.370
.3174	0.586	2435561		.3636	0.379
.3184	0.599	.3114	+0.909	.3644	0.377
.3193	0.536	.3123	0.881	.3653	0.352
.3202	+0.519	.3149	+0.821	.3664	-0.366

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436288		2436513		2436513	
.2989	+0.663	.6051	+0.005	.6323	-0.366
.3018	0.642	.6069	-0.069	.6340	0.371
.3079	0.339	.6107	0.246	.6356	-0.342
.3112	0.260	.6123	0.321		
.3169	+0.034	.6141	0.353	2436530	
.3196	-0.107	.6176	0.417	.5376	+0.579
.3229	0.216	.6193	0.424	.5418	0.529
.3262	-0.316	.6215	0.409	.5439	0.555
		.6249	0.406	.5481	0.575
2436513		.6266	0.399	.5505	0.591
.6028	+0.101	.6283	-0.394	.5526	+0.597

Table 11 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436530		2436545		2436586	
.5567	+0.638	.6454	+0.736	.4767	-0.334
.5588	0.604	.6493	0.731	.4788	0.321
.5609	0.642	.6522	0.762	.4829	0.294
.5651	0.660	.6543	0.776	.4850	0.276
.5672	0.643	.6824	0.900	.4871	0.263
.5696	0.653	.6845	0.867	.4916	0.213
.5741	0.644	.6864	0.858	.4937	0.198
.5762	0.663	.6901	0.870	.4958	0.174
.5783	0.677	.6919	0.877	.4999	0.139
.5824	0.691	.6939	+0.858	.5020	0.124
.5845	0.701			.5041	-0.099
.5866	0.700	2436556			
.5908	0.702	.5478	+0.854	2436604	
.5929	0.690	.5519	0.845	.5070	+0.810
.5949	0.718	.5540	0.808	.5091	0.737
.5991	0.687	.5612	0.737	.5112	0.743
.6012	0.720	.5629	0.681	.5154	0.707
.6033	0.724	.5646	0.685	.5174	0.650
.6081	0.729	.5683	0.575	.5195	0.593
.6102	0.761	.5702	0.531	.5237	0.471
.6123	0.723	.5718	0.452	.5258	0.358
.6165	0.732	.5763	0.209	.5279	0.277
.6186	0.728	.5787	0.122	.5320	+0.086
.6206	0.743	.5807	+0.045	.5341	-0.026
.6248	0.729			.5362	0.094
.6269	0.719	2436560		.5404	0.265
.6290	0.694	.5754	+0.718	.5424	0.333
.6349	0.728	.5791	0.749	.5445	0.376
.6376	0.728	.5829	0.779	.5487	0.423
.6404	0.757	.5845	0.777	.5508	0.457
.6456	0.750	.5861	0.794	.5529	0.448
.6481	0.743	.5892	0.843	.5570	0.451
.6508	0.740	.5909	0.801	.5591	0.453
.6564	0.731	.5926	0.843	.5612	0.440
.6592	0.763	.5973	0.841	.5654	0.412
.6620	0.717	.5994	0.831	.5674	0.403
.6675	0.724	.6013	0.846	.5695	0.401
.6703	0.740	.6055	+0.838	.5737	0.344
.6731	+0.762			.5758	0.330
		2436586		.5779	0.297
2436545		.4437	-0.195	.5820	0.279
.6172	+0.760	.4475	0.337	.5841	0.268
.6193	0.744	.4496	0.393	.5862	0.246
.6210	0.742	.4517	0.427	.5904	0.218
.6250	0.738	.4538	0.448	.5924	0.222
.6271	0.743	.4679	0.454	.5945	-0.175
.6290	0.760	.4600	0.468		
.6334	0.736	.4621	0.455	2436614	
.6352	0.742	.4663	0.431	.4545	+0.892
.6371	0.729	.4683	0.401	.4587	0.818
.6417	0.745	.4705	0.395	.4608	0.779
.6436	+0.743	.4746	-0.342	.4649	+0.756

Table 11 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436614		2436614		2437316	
.4670	+0.723	.6184	+0.303	.6009	-0.362
.4691	0.685	.6205	0.294	.6022	0.389
.4712	0.646	.6226	0.315	.6056	0.403
.4754	0.504	.6267	0.358	.6080	0.447
.4774	0.408	.6288	0.378	.6107	0.453
.4795	0.328	.6309	0.378	.6138	0.451
.4816	0.230	.6354	0.398	.6154	0.460
.4858	+0.033	.6382	0.401	.6171	0.430
.4879	-0.063	.6410	0.409	.6210	0.395
.4899	0.143	.6465	0.434	.6224	0.393
.4920	0.230	.6493	0.440	.6238	0.369
.4962	0.340	.6521	0.439	.6262	0.360
.4983	0.377	.6535	0.437	.6279	0.327
.5004	0.399	.6590	0.453	.6292	0.328
.5045	0.416	.6618	0.480	.6331	0.305
.5066	0.405	.6646	0.471	.6346	0.280
.5087	0.415	.6701	0.522	.6365	0.269
.5129	0.407	.6722	0.498	.6407	0.264
.5149	0.418	.6750	+0.482	.6432	0.227
.5170	0.398			.6462	0.201
.5212	0.382	2437316		.6500	0.148
.5233	0.332	.5416	+0.867	.6517	0.155
.5254	0.330	.5426	0.857	.6533	0.160
.5295	0.299	.5435	0.843	.6571	0.133
.5316	0.278	.5458	0.842	.6607	-0.104
.5337	0.261	.5469	0.865		
.5399	0.210	.5481	0.827	2438114	
.5420	0.204	.5509	0.828	.3012	+0.340
.5441	0.164	.5523	0.818	.3096	0.413
.5483	0.151	.5540	0.855	.3124	0.385
.5504	0.135	.5579	0.804	.3200	0.417
.5524	0.129	.5590	0.808	.3220	0.399
.5566	0.079	.5601	0.808	.3262	0.418
.5587	0.090	.5625	0.827	.3304	0.477
.5608	0.074	.5635	0.806	.3332	0.467
.5649	0.063	.5653	0.765	.3360	0.465
.5670	0.005	.5683	0.739	.3386	0.501
.5691	-0.008	.5693	0.751	.3422	0.476
.5733	+0.008	.5706	0.724	.3491	0.564
.5754	0.016	.5730	0.670	.3512	0.573
.5774	0.026	.5741	0.627	.3623	0.579
.5816	0.056	.5752	0.605	.3644	0.588
.5837	0.064	.5780	0.541	.3672	0.640
.5858	0.093	.5790	0.529	.3693	0.620
.5868	0.115	.5801	0.494	.3735	0.652
.5976	0.153	.5833	0.332	.3770	0.649
.6017	0.208	.5850	0.278	.3832	0.659
.6038	0.213	.5870	+0.173	.3860	0.642
.6059	0.232	.5913	-0.056	.3881	0.689
.6101	0.273	.5939	0.137	.3901	0.671
.6122	0.262	.5961	0.222	.3929	0.654
.6142	+0.282	.5997	-0.353	.3985	+0.726

Table 11 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2438114		2438414		2439146	
.4013	+0.715	.5229	+0.617	.5089	-0.249
.4033	0.733	.5260	0.528	.5117	0.316
.4054	0.753	.5321	0.258	.5127	0.334
.4075	0.762	.5342	0.123	.5141	0.370
.4123	0.729	.5367	+0.020	.5169	0.427
.4144	0.752	.5416	-0.124	.5276	0.419
.4179	0.729	.5444	0.203	.5308	0.432
.4207	+0.713	.5466	0.326	.5349	0.394
		.5512	0.395	.5363	0.408
2438118		.5541	0.428	.5384	0.399
.3542	+0.297	.5625	0.419	.5419	0.356
.3577	0.348	.5711	0.354	.5433	0.363
.3598	0.317	.5765	-0.336	.5450	0.304
.3646	0.357			.5488	0.255
.3674	0.392	2438881		.5502	-0.246
.3744	0.381	.3764	+0.809		
.3765	0.395	.3778	0.805	2439503	
.3834	0.438	.3792	0.739	.4079	+0.859
.3882	0.439	.3855	0.676	.4093	0.860
.3917	0.472	.3889	0.570	.4155	0.805
.3966	0.483	.3907	0.532	.4176	0.770
.3987	0.482	.3920	0.496	.4190	0.748
.4132	0.558	.3952	0.376	.4218	0.665
.4223	+0.584	.3966	+0.272	.4232	0.676
		.4070	-0.161	.4287	0.454
2438413		.4084	0.194	.4298	0.379
.4599	+0.791	.4112	0.316	.4322	0.241
.4620	0.762	.4125	0.357	.4332	0.174
.4707	0.771	.4139	0.395	.4339	0.160
.4759	0.742	.4226	0.442	.4364	+0.025
.4807	0.786	.4240	0.457	.4374	-0.010
.4835	0.797	.4271	0.433	.4381	0.027
.4856	0.779	.4285	0.429	.4419	0.155
.5037	0.792	.4299	0.431	.4440	0.265
.5064	0.776	.4334	0.406	.4447	0.306
.5106	0.792	.4348	0.373	.4457	0.318
.5155	0.768	.4362	0.395	.4475	0.375
.5182	0.777	.4396	0.335	.4506	0.424
.5287	0.763	.4410	0.335	.4534	0.424
.5342	0.747	.4438	-0.342	.4548	0.427
.5370	0.737			.4558	0.434
.5453	0.723	2439146		.4589	0.426
.5481	0.748	.4905	+0.544	.4600	0.432
.5696	0.745	.4922	0.485	.4610	0.433
.5724	0.773	.4933	0.421	.4634	0.387
.5814	+0.799	.4960	0.334	.4645	0.375
		.4974	0.246	.4655	0.368
2438414		.4985	0.203	.4676	0.368
.5031	+0.830	.5009	0.057	.4690	0.362
.5085	0.846	.5023	+0.020	.4697	0.337
.5113	0.773	.5064	-0.156	.4721	0.332
.5173	+0.754	.5078	-0.211	.4732	-0.336

Table 11 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2439503		2439906		2440654	
.4739	-0.326	.5102	+0.293	.2898	+0.848
.4766	0.289	.5130	0.164	.2940	0.844
.4777	0.282	.5144	0.100	.2954	0.795
.4787	0.275	.5172	+0.005	.2981	0.767
.4811	0.281	.5213	-0.201	.3023	0.666
.4822	0.256	.5227	0.266	.3037	0.629
.4832	-0.257	.5255	0.360	.3065	0.477
		.5269	0.382	.3079	0.436
2439507		.5297	0.405	.3106	0.334
.4911	+0.740	.5311	0.439	.3120	0.292
.4925	0.685	.5339	0.441	.3148	0.136
.4939	0.639	.5353	0.430	.3162	+0.054
.4974	0.528	.5380	0.428	.3231	-0.239
.4988	0.464	.5394	0.441	.3273	0.338
.4998	0.444	.5422	0.427	.3287	0.377
.5022	0.358	.5436	0.407	.3315	0.407
.5029	0.285	.5478	0.384	.3329	0.422
.5043	0.208	.5505	0.379	.3356	0.458
.5071	0.116	.5519	0.354	.3398	0.428
.5085	+0.051	.5547	0.363	.3412	0.428
.5099	-0.006	.5561	-0.373	.3440	0.401
.5140	0.215			.3481	0.358
.5154	0.268	2440232		.3495	-0.326
.5189	0.356	.6584	+0.859		
.5200	0.400	.6598	0.825	2440980	
.5210	0.407	.6625	0.802	.4797	+0.441
.5238	0.431	.6639	0.776	.4806	0.430
.5248	0.426	.6667	0.760	.4827	0.323
.5259	0.441	.6681	0.736	.4838	0.266
.5283	0.452	.6709	0.693	.4861	0.181
.5297	0.433	.6750	0.604	.4871	0.110
.5307	0.440	.6764	0.554	.4893	+0.038
.5335	0.410	.6792	0.470	.4905	0.000
.5349	0.386	.6806	0.425	.4924	-0.087
.5363	0.373	.6834	0.337	.4935	0.119
.5390	0.373	.6848	0.247	.4955	0.220
.5404	0.363	.6876	0.163	.4967	0.270
.5418	0.367	.6890	+0.085	.4996	0.357
.5446	0.346	.6917	-0.052	.5007	0.383
.5460	0.338	.6931	0.121	.5029	0.398
.5474	0.335	.6959	0.224	.5063	0.438
.5502	0.332	.6973	0.284	.5074	0.451
.5516	-0.323	.7000	0.383	.5093	0.452
		.7014	0.417	.5104	0.458
2439906		.7042	0.430	.5121	0.461
.4963	+0.750	.7056	0.430	.5141	0.450
.4977	0.736	.7084	0.459	.5164	0.412
.5005	0.688	.7098	0.464	.5179	-0.408
.5019	0.637	.7126	0.455		
.5047	0.547	.7140	0.437	2441003	
.5061	0.516	.7167	-0.413	.5611	+0.098
.5088	+0.418			.5639	+0.005

Table 11 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2441003		2441311		2441682	
.5653	-0.066	.6764	-0.329	.6088	-0.325
.5681	0.165	.6778	0.325	.6106	0.375
.5695	0.231	.6792	0.328	.6125	0.367
.5722	0.339	.6820	0.320	.6145	0.445
.5736	0.378	.6834	0.309	.6169	0.452
.5764	0.396	.6848	-0.300	.6198	0.460
.5778	0.416			.6222	0.424
.5806	0.412	2441312		.6246	0.448
.5820	0.412	.5361	+0.383	.6268	0.434
.5861	0.399	.5375	0.371	.6340	0.343
.5889	0.402	.5389	0.323	.6371	0.375
.5903	0.409	.5417	0.153	.6394	0.359
.5945	0.361	.5431	+0.099	.6418	-0.334
.5972	0.351	.5486	-0.103		
.5986	0.336	.5500	0.168	2442019	
.6028	0.290	.5583	0.370	.5881	+0.825
.6056	0.282	.5611	0.438	.5895	0.822
.6070	-0.253	.5625	0.405	.5923	0.831
		.5639	0.414	.5937	0.840
2441311		.5667	0.425	.5964	0.835
.6097	+0.871	.5681	0.429	.5978	0.849
.6111	0.850	.5696	-0.423	.6006	0.841
.6139	0.793			.6089	0.795
.6153	0.800	2441679		.6103	0.774
.6167	0.793	.4736	-0.332	.6135	0.688
.6194	0.741	.4750	0.336	.6149	0.668
.6208	0.711	.4797	0.302	.6180	0.589
.6222	0.705	.4846	0.269	.6194	0.542
.6250	0.674	.4861	0.256	.6319	+0.097
.6264	0.602	.4880	0.255	.6346	-0.026
.6278	0.574	.4938	-0.204	.6360	0.137
.6305	0.509			.6395	0.249
.6319	0.450	2441682		.6409	0.307
.6333	0.388	.5519	+0.859	.6437	0.394
.6361	0.246	.5542	0.860	.6451	0.428
.6375	0.176	.5583	0.861	.6485	0.467
.6389	+0.146	.5610	0.866	.6499	0.477
.6417	-0.012	.5644	0.858	.6527	0.480
.6431	0.059	.5688	0.854	.6548	0.482
.6445	0.115	.5717	0.841	.6576	0.455
.6472	0.255	.5745	0.822	.6593	0.458
.6486	0.314	.5784	0.781	.6645	0.389
.6500	0.324	.5803	0.745	.6673	0.393
.6528	0.397	.5887	0.569	.6687	0.393
.6542	0.411	.5915	0.445	.6721	0.338
.6556	0.413	.5934	0.360	.6735	0.319
.6583	0.426	.5961	0.210	.6770	0.306
.6667	0.402	.5979	0.132	.6784	-0.286
.6681	0.419	.5997	+0.052		
.6708	0.383	.6025	-0.055	2442433	
.6722	0.375	.6046	0.158	.5204	+0.837
.6736	-0.364	.6069	-0.246	.5221	+0.869

Table 11 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2442433		2442443		2442829	
.5308	+0.877	.5411	-0.422	.4110	+0.138
.5322	0.855	.5488	0.377	.4119	+0.087
.5350	0.861	.5502	0.365	.4138	-0.001
.5364	0.867	.5529	0.352	.4148	0.065
.5395	0.866	.5543	0.336	.4167	0.122
.5409	0.869	.5571	0.316	.4175	0.158
.5440	0.835	.5581	0.305	.4199	0.257
.5454	0.812	.5613	0.285	.4208	0.278
.5481	0.771	.5627	0.261	.4230	0.314
.5495	0.735	.5654	0.261	.4238	0.332
.5523	0.742	.5668	-0.262	.4260	0.390
.5537	0.701			.4269	0.400
.5565	0.622	2442829		.4291	0.409
.5579	0.573	.3576	+0.856	.4301	0.412
.5607	0.451	.3586	0.847	.4322	0.415
.5621	0.440	.3627	0.865	.4333	0.427
.5649	0.231	.3635	0.874	.4356	0.439
.5663	0.205	.3666	0.867	.4364	0.414
.5690	+0.045	.3677	0.883	.4384	0.420
.5704	-0.017	.3698	0.863	.4393	0.420
.5739	0.106	.3709	0.860	.4413	0.402
.5753	0.175	.3733	0.871	.4420	0.409
.5795	0.335	.3744	0.878	.4444	0.397
.5809	0.366	.3766	0.846	.4455	0.389
.5837	-0.390	.3776	0.842	.4475	0.386
		.3799	0.843	.4485	-0.377
2442443		.3809	0.826		
.4918	+0.807	.3833	0.849	2443213	
.4932	0.793	.3842	0.847	.4945	+0.021
.4974	0.797	.3862	0.873	.4961	-0.020
.4995	0.799	.3940	0.784	.4991	0.153
.5029	0.751	.3949	0.737	.5005	0.200
.5043	0.744	.3971	0.673	.5033	0.361
.5092	0.610	.3978	0.642	.5047	0.355
.5106	0.554	.3999	0.557	.5078	0.376
.5147	0.374	.4007	0.573	.5091	0.397
.5161	+0.291	.4026	0.433	.5128	0.402
.5314	-0.353	.4035	0.422	.5144	0.416
.5328	0.376	.4055	0.325	.5227	0.395
.5356	0.388	.4065	0.273	.5246	0.374
.5370	0.397	.4084	0.211	.5283	0.359
.5397	-0.406	.4092	+0.157	.5297	-0.359

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436288		2436288		2436513	
.2979	+0.918	.3210	-0.169	.6040	+0.124
.3004	0.821	.3246	0.340	.6061	+0.037
.3064	0.605	.3282	-0.391	.6099	-0.191
.3096	0.478			.6116	0.277
.3156	0.110	2436513		.6131	0.318
.3184	+0.018	.6019	+0.195	.6167	-0.398

Table 11 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436513		2436530		2436586	
.6185	-0.425	.6689	+1.019	.4256	+0.852
.6201	0.439	.6717	+0.988	.4447	-0.211
.6240	0.455			.4485	0.363
.6257	0.464	2436545		.4506	0.417
.6275	0.464	.6161	+1.019	.4527	0.442
.6313	0.452	.6182	1.010	.4569	0.472
.6331	0.411	.6202	1.005	.4590	0.491
.6349	-0.417	.6241	0.994	.4610	0.485
		.6260	1.001	.4652	0.471
2436530		.6281	1.016	.4673	0.431
.5366	+0.780	.6324	1.003	.4694	0.410
.5408	0.801	.6341	1.006	.4735	0.376
.5429	0.815	.6361	1.006	.4756	0.372
.5470	0.800	.6408	0.986	.4777	0.339
.5491	0.848	.6426	0.984	.4819	0.322
.5515	0.847	.6445	0.973	.4840	0.312
.5557	0.854	.6484	0.967	.4860	0.276
.5599	0.854	.6508	0.988	.4906	0.232
.5640	0.890	.6533	0.993	.4926	0.210
.5661	0.895	.6814	1.104	.4947	0.144
.5682	0.941	.6835	1.124	.4989	0.122
.5731	0.956	.6855	1.114	.5010	0.103
.5751	0.962	.6892	1.116	.5031	-0.087
.5772	0.937	.6910	1.112		
.5814	0.960	.6929	+1.117	2436604	
.5835	0.953			.5060	+1.069
.5856	1.006	2436556		.5081	1.049
.5897	1.000	.5467	+1.108	.5102	1.041
.5918	0.989	.5509	1.059	.5143	0.989
.5939	1.035	.5530	1.058	.5164	1.002
.5981	0.989	.5604	0.996	.5185	0.885
.6001	0.973	.5620	0.931	.5227	0.725
.6022	1.024	.5638	0.880	.5247	0.597
.6071	1.008	.5674	0.791	.5268	0.468
.6092	1.004	.5693	0.724	.5310	0.268
.6113	1.054	.5711	0.629	.5331	0.143
.6154	1.024	.5748	0.420	.5352	+0.038
.6175	1.016	.5776	0.271	.5393	-0.172
.6196	1.005	.5796	+0.153	.5414	0.308
.6238	1.042			.5435	0.386
.6258	1.010	2436560		.5477	0.462
.6279	0.991	.5781	+0.997	.5497	0.463
.6335	1.032	.5819	0.977	.5518	0.479
.6363	1.008	.5853	1.040	.5560	0.469
.6390	1.017	.5885	1.069	.5581	0.456
.6446	1.019	.5899	1.036	.5602	0.444
.6467	1.023	.5917	1.059	.5643	0.423
.6494	0.987	.5965	1.059	.5664	0.390
.6550	0.984	.5982	1.093	.5685	0.405
.6578	0.976	.6046	+1.106	.5727	0.327
.6606	1.011			.5747	0.309
.6661	+1.008			.5768	-0.304

Table 11 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436604		2436614		2437316	
.5810	-0.251	.5764	+0.128	.5735	+0.901
.5831	0.230	.5806	0.143	.5746	0.885
.5852	0.225	.5826	0.194	.5774	0.769
.5893	0.199	.5847	0.189	.5785	0.722
.5914	0.192	.5924	0.241	.5795	0.696
.5935	-0.165	.5945	0.279	.5822	0.531
		.5965	0.306	.5841	0.451
2436614		.6007	0.327	.5860	0.383
.4535	+1.140	.6028	0.326	.5903	+0.106
.4576	1.099	.6049	0.369	.5926	-0.038
.4597	1.067	.6090	0.388	.5948	0.119
.4639	1.000	.6111	0.420	.5992	0.323
.4660	0.971	.6132	0.426	.6002	0.364
.4681	0.940	.6174	0.448	.6015	0.382
.4701	0.859	.6195	0.451	.6048	0.426
.4743	0.745	.6215	0.467	.6070	0.439
.4764	0.624	.6257	0.487	.6132	0.459
.4785	0.518	.6278	0.508	.6146	0.483
.4806	0.405	.6299	0.515	.6162	0.476
.4847	0.181	.6340	0.567	.6202	0.442
.4868	+0.091	.6368	0.562	.6217	0.451
.4889	-0.022	.6396	0.580	.6231	0.431
.4910	0.136	.6451	0.611	.6256	0.381
.4951	0.347	.6479	0.638	.6268	0.399
.4972	0.394	.6507	0.640	.6286	0.375
.4993	0.428	.6576	0.694	.6312	0.321
.5035	0.472	.6604	0.664	.6337	0.316
.5056	0.473	.6632	0.720	.6354	0.289
.5076	0.474	.6688	0.708	.6395	0.249
.5118	0.462	.6712	0.767	.6416	0.232
.5139	0.443	.6736	+0.756	.6450	0.210
.5160	0.423			.6491	0.143
.5201	0.390	2437316		.6509	0.137
.5222	0.346	.5411	1.082	.6526	0.129
.5243	0.334	.5422	1.109	.6559	0.106
.5285	0.297	.5431	1.115	.6579	0.076
.5306	0.296	.5453	1.097	.6599	-0.092
.5326	0.284	.5464	1.134		
.5389	0.205	.5475	1.107	2438114	
.5410	0.195	.5502	1.153	.3026	+0.540
.5431	0.172	.5516	1.083	.3082	0.583
.5472	0.135	.5531	1.104	.3103	0.583
.5493	0.129	.5573	1.123	.3186	0.635
.5514	0.122	.5584	1.094	.3311	0.656
.5556	0.060	.5596	1.089	.3339	0.686
.5576	0.045	.5619	1.048	.3367	0.716
.5597	0.023	.5630	1.048	.3402	0.716
.5639	-0.007	.5648	1.081	.3498	0.784
.5660	+0.044	.5678	1.035	.3519	0.776
.5681	0.070	.5688	0.989	.3630	0.829
.5722	0.074	.5700	0.966	.3651	0.826
.5743	+0.084	.5725	+0.926	.3679	+0.855

Table 11 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2438114		2438413		2438881	
.3700	+0.880	.4613	+1.036	.4077	-0.169
.3783	0.918	.4710	1.045	.4091	0.212
.3839	0.913	.4731	1.039	.4118	0.301
.3867	0.951	.4821	1.035	.4132	0.370
.3889	0.903	.5092	1.034	.4146	0.389
.3908	0.942	.5148	1.027	.4233	0.498
.3936	0.978	.5176	1.038	.4247	0.496
.3992	0.973	.5231	1.039	.4278	0.466
.4020	1.007	.5280	1.061	.4292	0.482
.4040	0.994	.5335	1.054	.4306	0.458
.4061	0.972	.5363	1.042	.4341	0.438
.4082	1.008	.5439	1.057	.4355	0.444
.4130	1.027	.5474	1.030	.4403	0.338
.4151	1.037	.5682	1.078	.4431	0.305
.4193	1.018	.5710	1.074	.4445	-0.326
.4214	+1.046	.5787	1.119		
		.5808	+1.120	2439146	
2438118				.4898	+0.854
.2961	-0.021	2438414		.4915	0.709
.2987	+0.011	.5040	+1.105	.4926	0.681
.3019	0.015	.5095	1.069	.4953	0.525
.3039	0.035	.5122	1.056	.4967	0.437
.3056	0.052	.5166	0.975	.4981	0.380
.3084	0.088	.5210	0.880	.5002	0.240
.3105	0.093	.5244	0.731	.5016	+0.142
.3139	0.086	.5269	0.654	.5058	-0.084
.3155	0.124	.5313	0.431	.5071	0.141
.3180	0.126	.5335	0.318	.5082	0.187
.3214	0.153	.5359	+0.145	.5110	0.308
.3239	0.169	.5408	-0.046	.5124	0.358
.3263	0.219	.5436	0.187	.5134	0.386
.3278	0.247	.5460	0.288	.5162	0.442
.3312	0.226	.5504	0.393	.5183	0.460
.3327	0.254	.5530	0.432	.5203	0.466
.3352	0.265	.5558	0.468	.5262	0.462
.3584	0.435	.5702	0.387	.5287	0.476
.3605	0.440	.5755	-0.305	5335	0.452
.3660	0.511			.5356	0.430
.3681	0.501	2438881		.5377	0.405
.3751	0.560	.3771	+1.137	.5412	0.375
.3772	0.618	.3785	1.114	.5426	0.356
.3821	0.616	.3799	1.080	.5440	0.334
.3841	0.634	.3834	0.972	.5474	0.262
.3896	0.655	.3848	0.909	.5495	-0.224
.3931	0.667	.3862	0.856		
.3973	0.689	.3896	0.795	2439150	
.3994	0.682	.3914	0.773	.4975	+1.059
.4139	0.759	.3931	0.698	.4996	1.044
.4230	+0.825	.3959	0.505	.5031	1.057
		.3973	0.403	.5044	1.052
2438413		.3987	0.331	.5058	1.072
.4592	+1.054	.4042	+0.042	.5086	+1.057

Table 11 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2439150		2439150		2439507	
.5100	+1.082	.6121	-0.377	.4932	+0.914
.5114	1.095			.4967	0.849
.5142	1.089	2439503		.4981	0.749
.5156	1.089	.4072	+1.084	.4995	0.655
.5170	1.101	.4086	1.091	.5015	0.530
.5218	1.095	.4114	1.079	.5026	0.469
.5232	1.115	.4127	1.092	.5036	0.433
.5246	1.132	.4173	1.008	.5064	0.296
.5281	1.114	.4193	0.934	.5078	0.200
.5294	1.117	.4211	0.903	.5092	+0.132
.5308	1.134	.4225	0.867	.5120	-0.033
.5343	1.109	.4266	0.700	.5134	0.133
.5357	1.125	.4280	0.679	.5147	0.203
.5371	1.133	.4294	0.544	.5182	0.335
.5399	1.125	.4315	0.487	.5196	0.373
.5413	1.089	.4329	0.372	.5203	0.408
.5426	1.111	.4336	0.350	.5231	0.440
.5461	1.100	.4357	0.174	.5245	0.467
.5475	1.094	.4370	0.139	.5252	0.485
.5489	1.095	.4377	+0.087	.5279	0.503
.5517	1.049	.4395	-0.007	.5290	0.499
.5531	1.014	.4402	0.022	.5300	0.507
.5551	0.991	.4412	0.075	.5328	0.481
.5579	0.927	.4436	0.176	.5342	0.476
.5600	0.841	.4443	0.246	.5356	0.468
.5614	0.812	.4454	0.327	.5384	0.425
.5642	0.687	.4471	0.369	.5394	0.426
.5656	0.630	.4482	0.361	.5411	0.408
.5670	0.534	.4541	0.493	.5439	0.369
.5697	0.371	.4554	0.479	.5453	0.361
.5711	0.285	.4582	0.478	.5467	0.356
.5725	0.222	.4593	0.468	.5495	0.333
.5753	+0.093	.4603	0.474	.5509	0.321
.5767	-0.024	.4627	0.446	.5522	-0.306
.5781	0.085	.4641	0.437		
.5808	0.272	.4652	0.437	2439906	
.5822	0.300	.4673	0.435	.4956	+1.047
.5836	0.354	.4683	0.411	.4970	0.097
.5864	0.457	.4693	0.404	.4998	0.912
.5878	0.479	.4714	0.383	.5012	0.860
.5892	0.480	.4725	0.403	.5040	0.816
.5919	0.478	.4735	0.373	.5054	0.746
.5933	0.480	.4759	0.360	.5081	0.617
.5947	0.473	.4770	0.357	.5095	0.563
.5975	0.467	.4780	0.347	.5123	0.336
.5989	0.464	.4804	0.327	.5137	0.267
.6003	0.454	.4815	0.327	.5165	0.139
.6031	0.421	.4829	-0.327	.5179	+0.083
.6044	0.414			.5206	-0.117
.6065	0.416	2439507		.5220	0.216
.6093	0.403	.4897	+1.021	.5248	0.290
.6107	-0.395	.4918	+1.015	.5262	-0.352

Table 11 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2439906		2440654		2441003	
.5290	-0.408	.3072	+0.694	.5715	-0.333
.5332	0.467	.3099	0.537	.5729	0.351
.5346	0.478	.3113	0.472	.5757	0.410
.5373	0.479	.3141	0.297	.5799	0.469
.5387	0.482	.3155	0.241	.5813	0.480
.4515	0.447	.3183	0.085	.5840	0.460
.5429	0.465	.3224	-0.183	.5854	0.443
.5471	0.412	.3238	0.252	.5882	0.451
.5498	0.401	.3266	0.361	.5896	0.445
.5512	0.390	.3280	0.391	.5924	0.439
.5540	0.390	.3308	0.434	.5938	0.437
.5554	-0.373	.3322	0.446	.5965	0.407
		.3349	0.467	.5979	0.406
2440232		.3363	0.460	.6007	0.366
.6591	+1.120	.3391	0.456	.6021	0.354
.6618	1.085	.3405	0.460	.6049	0.306
.6632	1.071	.3433	0.434	.6063	-0.307
.6660	1.067	.3447	0.401		
.6674	1.054	.3474	-0.386	2441311	
.6702	0.976			.6132	+1.138
.6716	0.962	2440980		.6146	1.095
.6743	0.865	.4800	+0.683	.6160	1.088
.6757	0.824	.4808	0.637	.6187	1.058
.6785	0.728	.4833	0.509	.6201	1.043
.6799	0.647	.4840	0.416	.6215	1.017
.6827	0.513	.4867	0.312	.6243	0.965
.6841	0.428	.4878	0.234	.6257	0.906
.6869	0.268	.4898	0.111	.6271	0.862
.6883	0.202	.4909	+0.072	.6298	0.740
.6910	+0.043	.4931	-0.030	.6312	0.655
.6924	-0.031	.4938	0.090	.6326	0.579
.6952	0.184	.4961	0.202	.6354	0.407
.6966	0.254	.4972	0.249	.6368	0.339
.6993	0.358	.5003	0.375	.6382	0.256
.7007	0.398	.5014	0.400	.6410	0.130
.7035	0.443	.5035	0.433	.6424	+0.075
.7049	0.448	.5045	0.453	.6438	-0.017
.7077	0.469	.5068	0.474	.6465	0.133
.7091	0.459	.5078	0.476	.6493	0.310
.7119	0.455	.5098	0.478	.6521	0.392
.7133	-0.459	.5109	0.473	.6535	0.405
		.5136	0.473	.6549	0.424
2440654		.5146	0.465	.6576	0.454
.2891	+1.090	.5171	0.420	.6590	0.459
.2905	1.089	.5182	-0.422	.6604	0.459
.2933	1.061			.6660	0.445
.2947	1.037	2441003		.6674	0.466
.2974	0.995	.5590	+0.304	.6701	0.429
.2988	0.954	.5632	0.090	.6715	0.414
.3016	0.922	.5646	+0.050	.6757	0.355
.3030	0.900	.5674	-0.099	.6771	0.348
.3058	+0.761	.5688	-0.174	.6813	-0.322

Table 11 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2441311		2441682		2442433	
.6827	-0.298	.6230	-0.484	.5388	+1.092
.6841	-0.271	.6251	0.476	.5402	1.084
		.6274	0.468	.5433	1.049
2441312		.6349	0.392	.5447	0.994
.5354	+0.617	.6380	0.383	.5474	0.954
.5368	0.583	.6403	0.371	.5488	0.927
.5382	0.531	.6429	-0.353	.5516	0.925
.5410	0.340			.5530	0.918
.5424	0.276	2442019		.5558	0.845
.5438	0.205	.5888	+1.075	.5572	0.780
.5465	+0.011	.5902	1.086	.5600	0.655
.5479	-0.070	.5930	1.104	.5614	0.598
.5493	0.129	.5944	1.101	.5642	0.427
.5521	0.260	.5971	1.113	.5656	0.372
.5576	0.429	.5985	1.110	.5683	0.173
.5604	0.439	.6013	1.100	.5697	+0.126
.5618	0.451	.6055	1.113	.5732	-0.002
.5632	0.479	.6069	1.099	.5746	0.082
.5660	0.475	.6096	1.035	.5787	0.286
.5674	0.487	.6110	0.988	.5802	0.366
.5689	-0.477	.6142	0.924	.5830	0.409
		.6156	0.914	.5843	-0.441
2441679		.6187	0.792		
.4729	-0.316	.6201	0.743	2442443	
.4743	0.324	.6312	0.210	.4911	+1.120
.4786	0.288	.6326	+0.122	.4967	1.088
.4840	0.258	.6353	-0.031	.4988	1.064
.4852	0.252	.6367	0.140	.5022	1.001
.4871	0.244	.6402	0.285	.5036	0.969
.4955	-0.153	.6416	0.348	.5078	0.897
		.6444	0.428	.5099	0.829
2441682		.6465	0.446	.5133	0.621
.5527	+1.144	.6492	0.483	.5154	0.545
.5550	1.159	.6506	0.472	.5203	0.238
.5756	1.117	.6534	0.468	.5217	+0.172
.5790	1.057	.6555	0.466	.5307	-0.268
.5821	0.989	.6583	0.463	.5321	0.333
.5896	0.746	.6600	0.449	.5349	0.406
.5921	0.625	.6635	0.408	.5363	0.443
.5943	0.515	.6652	0.392	.5404	0.492
.5967	0.330	.6680	0.393	.5432	0.481
.5985	0.248	.6694	0.381	.5446	0.494
.6004	+0.127	.6728	-0.352	.5481	0.476
.6033	-0.022			.5522	0.431
.6053	0.146	2442433		.5536	0.437
.6075	0.256	.5197	+1.131	.5564	0.404
.6094	0.337	.5214	1.126	.5578	0.381
.6112	0.395	.5245	1.122	.5606	0.344
.6130	0.427	.5266	1.117	.5620	0.331
.6153	0.467	.5315	1.107	.5647	0.296
.6183	0.474	.5343	1.076	.5661	-0.291
.6207	-0.495	.5357	+1.076		

Table 11 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2442829		2442829		2442829	
.3571	+1.110	.4021	+0.725	.4388	-0.460
.3581	1.090	.4031	0.695	.4408	0.453
.3622	1.088	.4050	0.615	.4417	0.451
.3632	1.108	.4059	0.569	.4439	0.421
.3660	1.113	.4080	0.405	.4450	0.403
.3671	1.123	.4089	0.362	.4470	0.394
.3693	1.116	.4106	0.285	.4480	-0.388
.3704	1.092	.4114	0.220		
.3728	1.088	.4133	0.143	2443213	
.3739	1.091	.4144	+0.070	.4937	+0.152
.3762	1.077	.4163	-0.044	.4953	+0.053
.3771	1.080	.4170	0.096	.4984	-0.083
.3794	1.099	.4194	0.181	.4998	0.176
.3804	1.092	.4204	0.234	.5026	0.318
.3827	1.083	.4225	0.311	.5040	0.367
.3837	1.080	.4235	0.363	.5072	0.401
.3858	1.093	.4254	0.412	.5084	0.439
.3867	1.077	.4265	0.415	.5121	0.453
.3913	1.021	.4286	0.422	.5136	0.470
.3935	0.964	.4296	0.455	.5172	0.481
.3945	0.926	.4317	0.477	.5189	0.435
.3966	0.896	.4328	0.456	.5220	0.406
.3975	0.871	.4351	0.463	.5236	0.394
.3994	0.815	.4360	0.472	.5274	0.392
.4003	+0.778	.4379	-0.469	.5290	-0.363

J.D.	ΔU	J.D.	ΔU	J.D.	ΔU
2438414		2439150		2439150	
.5046	+1.117	.5024	+1.084	.5482	+1.017
.5106	1.025	.5038	0.992	.5510	0.944
.5158	0.932	.5051	1.038	.5524	0.956
.5202	0.911	.5079	1.088	.5538	0.945
.5237	0.787	.5093	1.066	.5572	0.890
.5251	0.668	.5107	1.091	.5586	0.828
.5305	0.449	.5135	1.043	.5607	0.797
.5328	0.352	.5149	1.026	.5635	0.665
.5350	+0.148	.5163	1.062	.5649	0.635
.5398	-0.002	.5211	1.068	.5663	0.567
.5427	0.141	.5225	1.097	.5690	0.356
.5453	0.221	.5239	1.040	.5704	0.282
.5494	0.374	.5274	1.077	.5718	0.171
.5520	0.397	.5288	1.056	.5746	0.127
.5550	0.478	.5301	1.057	.5760	+0.017
.5609	0.499	.5336	1.106	.5774	-0.094
.5632	0.422	.5350	1.114	.5801	0.243
.5695	0.468	.5364	1.121	.5815	0.303
.5745	-0.362	.5392	1.116	.5829	0.323
		.5406	1.096	.5857	0.455
2439150		.5420	1.008	.5871	0.501
.4968	+1.029	.5454	1.039	.5885	0.499
.4989	+1.044	.5468	+1.031	.5912	-0.502

Table 11 (cont.)

J.D.	ΔU	J.D.	ΔU	J.D.	ΔU
2439150		2441682		2441682	
.5926	-0.519	.5560	+1.133	.6017	+0.052
.5940	0.509	.5601	1.141	.6039	-0.072
.5968	0.487	.5668	1.137	.6060	0.158
.5982	0.498	.5701	1.072	.6081	0.260
.5996	0.487	.5737	1.061	.6100	0.332
.6024	0.485	.5765	1.030	.6118	0.385
.6038	0.486	.5796	0.955	.6137	0.437
.6058	0.463	.5828	0.899	.6163	0.459
.6086	0.428	.5907	0.648	.6191	0.434
.6100	0.407	.5927	0.463	.6213	0.470
.6114	-0.405	.5954	0.371	.6238	0.434
		.5973	0.246	.6260	0.423
2441682		.5991	+0.130	.6279	-0.434
.5535	+1.126				

Table 12

Photographic observations of RR Leo

J.D.	m_{pg}	J.D.	m_{pg}	J.D.	m_{pg}
2434126		2434443		2435068	
.3374	11.37	.4729	10.87	.6577	11.17
.3395	11.25	.4750	10.82	.6591	11.14
.3416	11.20	.4771	10.80	.6619	11.07
.3437	11.08	.4792	10.73	.6633	11.07
.3457	11.16	.4813	10.55	.6647	10.97
.3499	10.96	.4833	10.44	.6661	10.93
.3520	10.97	.4854	10.25	.6675	10.81
.3541	10.75	.4875	10.13	.6688	10.75
.3582	10.60	.4896	10.00	.6702	10.69
.3603	10.55	.4917	9.92	.6716	10.60
.3624	10.40	.4938	9.78	.6730	10.50
.3714	9.90	.4958	9.72	.6744	10.45
.3735	9.95	.5000	9.60	.6758	10.41
.3756	9.60	.5021	9.70	.6772	10.33
.3777	9.60	.5042	9.65	.6786	10.25
.3798	9.52	.5063	9.70	.6821	10.05
		.5083	9.64	.6835	9.94
2434443		.5104	9.80	.6849	9.90
.4479	11.30	.5125	9.69	.6863	9.82
.4500	11.31	.5146	9.83	.6877	9.73
.4521	11.39	.5167	9.79	.6891	9.73
.4542	11.40	.5188	9.83	.6905	9.74
.4583	11.18	.5208	9.82	.6919	9.71
.4604	11.23				
.4625	11.30	2435068		2435069	
.4646	11.12	.6508	11.34	.5540	11.38
.4667	11.00	.6522	11.35	.5554	11.36
.4688	11.09	.6536	11.35	.5581	11.32
.4708	10.89	.6550	11.26	.5595	11.29

Table 12 (cont.)

J.D.	m_{pg}	J.D.	m_{pg}	J.D.	m_{pg}
2435069		2435507		2435896	
.5609	11.28	.5069	9.77	.5437	10.73
.5693	11.08	.5083	9.73	.5457	10.55
.5706	11.07	.5097	9.65	.5478	10.39
.5734	10.93	.5111	9.59	.5499	10.30
.5762	10.89	.5125	9.65	.5520	9.93
.5776	10.90	.5139	9.59	.5541	9.82
.5790	10.85	.5153	9.60		
.5804	10.68			2435925	
.5817	10.60	2435869		.4422	11.26
.5831	10.61	.3605	11.33	.4436	11.26
.5845	10.52	.3626	11.39	.4449	11.41
.5859	10.43	.3647	11.41	.4477	11.40
.5873	10.30	.3668	11.35	.4505	11.46
.5887	10.32	.3689	11.30	.4519	11.37
.5901	10.22	.3709	11.38	.4533	11.38
.5915	10.10	.3730	11.30	.4547	11.38
.5929	10.01	.3751	11.32	.4561	11.39
.5956	9.90	.3772	11.36	.4574	11.32
.5970	9.84	.3793	11.30	.4588	11.45
.5984	9.85	.3820	11.38	.4602	11.48
.6005	9.73	.3841	11.24	.4630	11.36
.6033	9.69	.3862	11.18	.4658	11.42
.6060	9.66	.3890	11.18	.4672	11.42
.6081	9.67	.3911	11.10	.4686	11.42
.6095	9.65	.3932	11.01	.4699	11.37
.6109	9.72	.3952	10.95	.4713	11.31
.6123	9.66	.3973	10.81	.4727	11.35
.6137	9.73	.3994	10.76	.4741	11.35
.6151	9.73	.4015	10.66	.4755	11.30
.6165	9.78	.4057	10.51	.4769	11.22
.6179	9.80	.4077	10.30	.4783	11.28
.6193	9.79			.4797	11.24
		2435896		.4811	11.26
2435507		.5020	11.27	.4824	11.15
.4792	11.26	.5041	11.30	.4838	11.17
.4806	11.26	.5062	11.39	.4852	11.16
.4819	11.15	.5082	11.33	.4887	10.99
.4833	11.14	.5103	11.25	.4901	11.07
.4847	11.08	.5124	11.35	.4915	10.95
.4875	10.84	.5145	11.35	.4943	10.76
.4889	10.80	.5166	11.24	.4956	10.70
.4903	10.80	.5187	11.18	.4970	10.60
.4917	10.65	.5107	11.19	.4984	10.57
.4931	10.63	.5228	11.26	.4998	10.49
.4944	10.45	.5249	11.25	.5012	10.43
.4958	10.41	.5270	11.25	.5026	10.32
.4972	10.37	.5291	11.15	.5040	10.20
.4986	10.25	.5312	11.05	.5054	10.14
.5000	10.13	.5353	11.00	.5074	9.88
.5014	10.03	.5374	10.99	.5109	9.72
.5042	9.88	.5395	10.90	.5123	9.72
.5056	9.82	.5416	10.81	.5137	9.67

Table 12 (cont.)

J.D.	m_{pg}	J.D.	m_{pg}	J.D.	m_{pg}
2435925		2435925		2435925	
.5151	9.67	.5193	9.70	.5234	9.66
.5165	9.64	.5206	9.60	.5248	9.71
.5179	9.63				

Table 13

Photoelectric observations of TT Lyn

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436648		2436649		2436649	
.4294	+0.428	.3555	+0.886	.5070	+0.595
.4315	0.450	.3631	0.879	.5092	0.541
.4364	0.472	.3652	0.907	.5121	0.536
.4384	0.487	.3673	0.877	.5213	0.516
.4405	0.481	.3718	0.874	.5293	0.461
.4463	0.481	.3739	0.884	.5315	0.457
.4484	0.478	.3760	0.887	.5344	0.432
.4505	0.518	.4027	0.916	.5431	+0.364
.4566	0.539	.4048	0.928		
.4589	0.539	.4069	0.884	2436650	
.4616	0.528	.4138	0.937	.2779	+0.571
.4668	0.564	.4159	0.924	.2812	0.573
.4694	0.579	.4180	0.921	.2837	0.613
.4717	0.569	.4225	0.948	.2887	0.582
.4778	+0.592	.4246	0.969	.2908	0.584
		.4267	0.952	.2929	0.600
2436649		.4319	0.973	.2975	0.636
.2694	+0.842	.4340	0.963	.2998	0.626
.2735	0.860	.4360	0.970	.3022	0.624
.2756	0.869	.4402	0.982	.3066	0.652
.2798	0.885	.4423	0.981	.3167	0.636
.2819	0.864	.4444	0.966	.3191	0.653
.2840	0.891	.4489	0.994	.3211	0.636
.2881	0.888	.4510	1.026	.3255	0.666
.2906	0.887	.4531	0.983	.3276	0.681
.2926	0.887	.4572	1.009	.3297	0.689
.2968	0.883	.4593	1.009	.3342	0.681
.2989	0.883	.4614	0.981	.3363	0.690
.3010	0.870	.4673	0.996	.3384	0.692
.3051	0.886	.4694	0.993	.3429	0.681
.3072	0.892	.4715	0.979	.3450	0.691
.3183	0.895	.4760	0.967	.3471	0.699
.3329	0.906	.4781	1.000	.3516	0.703
.3350	0.893	.4801	0.944	.3537	0.710
.3371	0.895	.4881	0.914	.3557	0.709
.3416	0.888	.4901	0.905	.3603	0.730
.3437	0.863	.4922	0.837	.3623	0.757
.3458	0.866	.4975	0.759	.3644	0.748
.3513	0.876	.4996	0.691	.3703	0.757
.3534	+0.891	.5014	+0.669	.3731	+0.751

Table 13 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436650		2436651		2436679	
.3759	+0.741	.3194	+0.500	.3985	+0.455
.3807	0.754	.3237	0.481	.4041	0.428
.3828	0.772	.3257	0.443	.4061	0.418
.3849	0.759	.3278	0.429	.4082	0.417
.3894	0.763	.3320	0.402	.4169	0.332
.3915	0.770	.3339	0.412	.4190	0.332
.3936	0.775	.3360	0.398	.4211	0.315
.3978	0.775	.3403	0.339	.4256	0.307
.3998	0.779	.3421	0.356	.4277	0.326
.4019	0.791	.3443	0.344	.4297	0.308
.4061	0.789	.3495	0.321	.4343	0.296
.4082	0.792	.3513	0.325	.4363	0.290
.4103	0.805	.3529	0.307	.4388	0.295
.4144	0.811	.3565	0.293	.4433	0.324
.4165	0.823	.3580	0.290	.4454	0.330
.4186	0.810	.3593	0.298	.4475	0.340
.4228	0.828	.3622	0.289	.4520	+0.352
.4247	0.824	.3636	0.289		
.4268	0.843	.3649	0.317	2443580	
.4326	0.842	.3677	0.334	.3490	+0.617
.4351	0.861	.3691	0.339	.3522	0.592
.4386	0.846	.3705	0.331	.3537	0.572
.4437	0.846	.3749	0.361	.3566	0.580
.4459	0.846	.3766	0.363	.3578	0.552
.4479	0.874	.3785	0.359	.3659	0.459
.4525	0.855	.3826	0.365	.3672	0.440
.4549	0.847	.3840	+0.371	.3712	0.430
.4570	0.874			.3724	0.409
.4633	0.870	2436679		.3756	0.365
.4657	0.870	.3096	+1.002	.3770	0.345
.4678	+0.859	.3155	0.999	.3810	0.327
		.3183	0.999	.3824	0.314
2436651		.3238	0.997	.3858	0.307
.2640	+0.958	.3266	0.997	.3875	0.325
.2675	0.983	.3294	0.996	.3909	0.311
.2697	0.954	.3350	1.009	.3922	0.302
.2732	0.942	.3377	1.003	.3959	0.314
.2747	0.935	.3405	1.013	.3975	0.319
.2766	0.900	.3572	0.919	.4007	0.307
.2818	0.859	.3600	0.876	.4021	0.315
.2840	0.854	.3627	0.836	.4058	0.326
.2860	0.836	.3676	0.721	.4077	0.357
.2907	0.750	.3697	0.704	.4125	0.338
.2928	0.716	.3718	0.707	.4172	0.333
.2947	0.671	.3770	0.599	.4204	0.344
.2992	0.623	.3791	0.585	.4218	+0.379
.3011	0.611	.3811	0.556		
.3030	0.558	.3856	0.502	2443583	
.3066	0.525	.3877	0.477	.3478	+0.468
.3086	0.525	.3898	0.471	.3489	0.461
.3104	0.505	.3943	0.457	.3529	0.444
.3147	+0.494	.3964	+0.458	.3565	+0.431

Table 13 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2443583		2443583		2443595	
.3579	+0.424	.4079	+0.368	.3227	+0.368
.3614	0.392	.4091	0.371	.3240	0.301
.3625	0.389	.4125	0.383	.3270	0.326
.3665	0.375	.4137	+0.393	.3285	0.321
.3680	0.377			.3316	0.323
.3717	0.349	2443595		.3378	0.295
.3730	0.311	.3009	+0.434	.3412	0.311
.3759	0.326	.3024	0.458	.3426	0.323
.3772	0.329	.3057	0.433	.3460	0.337
.3820	0.337	.3068	0.444	.3472	0.333
.3851	0.323	.3098	0.425	.3509	0.342
.3863	0.322	.3109	0.424	.3521	0.356
.3898	0.312	.3137	0.387	.3553	0.373
.3908	0.313	.3150	0.395	.3567	0.362
.3954	0.349	.3183	0.374	.3596	0.345
.4035	0.357	.3197	+0.349	.3610	+0.358
.4047	+0.339				

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436648		2436649		2436649	
.4283	+0.470	.3319	+1.062	.4499	+1.137
.4305	0.452	.3340	1.061	.4520	1.152
.4353	0.499	.3360	1.060	.4562	1.124
.4375	0.512	.3406	1.064	.4583	1.157
.4394	0.499	.3426	1.048	.4603	1.174
.4453	0.542	.3447	1.043	.4663	1.166
.4475	0.524	.3503	1.026	.4683	1.162
.4492	0.532	.3524	1.052	.4704	1.119
.4555	0.577	.3544	1.048	.4749	1.098
.4578	0.572	.3621	1.035	.4791	1.122
.4601	0.592	.3642	1.036	.4870	1.007
.4660	0.608	.3663	1.015	.4890	0.999
.4682	0.580	.3708	1.034	.4910	0.945
.4706	+0.607	.3728	1.020	.4963	0.847
		.3749	1.014	.4984	0.850
2436649		.4017	1.052	.5005	0.799
.2683	+1.052	.4038	1.068	.5058	0.670
.2725	1.081	.4058	1.070	.5081	0.629
.2746	1.067	.4128	1.099	.5129	0.600
.2788	1.054	.4149	1.111	.5167	0.560
.2808	1.062	.4169	1.082	.5227	0.539
.2829	1.049	.4215	1.104	.5283	0.498
.2871	1.034	.4235	1.119	.5304	0.494
.2892	1.058	.4256	1.119	.5327	0.459
.2916	1.074	.4308	1.120	.5422	0.386
.2958	1.048	.4329	1.121	.5443	+0.394
.2978	1.044	.4350	1.132		
.2999	1.050	.4392	1.137	2436650	
.3041	1.027	.4413	1.131	.2760	+0.636
.3062	1.056	.4433	1.161	.2805	0.626
.3083	+1.066	.4478	+1.142	.2822	+0.643

Table 13 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436650		2436650		2436651	
.2876	+0.652	.4490	+1.026	.3833	+0.357
.2897	0.670	.4540	1.041		
.2917	0.688	.4561	1.037	2436679	
.2964	0.702	.4584	1.048	.3087	+1.136
.2987	0.702	.4644	1.060	.3141	1.136
.3010	0.702	.4667	1.058	.3169	1.135
.3056	0.716	.4691	+1.055	.3225	1.133
.3077	0.741			.3252	1.133
.3153	0.763	2436651		.3280	1.133
.3181	0.761	.2630	+1.137	.3336	1.138
.3202	0.740	.2666	1.115	.3363	1.139
.3245	0.760	.2685	1.082	.3391	1.156
.3266	0.785	.2725	1.070	.3558	1.052
.3287	0.753	.2739	1.055	.3586	1.042
.3328	0.797	.2755	1.041	.3613	0.994
.3353	0.794	.2808	0.957	.3662	0.845
.3373	0.805	.2830	0.937	.3686	0.829
.3419	0.797	.2851	0.943	.3707	0.829
.3439	0.791	.2897	0.855	.3759	0.685
.3460	0.792	.2918	0.803	.3780	0.677
.3505	0.804	.2938	0.783	.3801	0.646
.3526	0.830	.2983	0.707	.3846	0.587
.3547	0.820	.3001	0.674	.3867	0.569
.3592	0.817	.3020	0.643	.3888	0.556
.3613	0.857	.3058	0.591	.3933	0.516
.3634	0.884	.3075	0.566	.3954	0.511
.3689	0.884	.3095	0.545	.3975	0.507
.3717	0.903	.3136	0.551	.4030	0.447
.3745	0.866	.3159	0.512	.4051	0.448
.3797	0.919	.3182	0.535	.4072	0.444
.3818	0.906	.3247	0.469	.4159	0.339
.3839	0.925	.3268	0.461	.4179	0.320
.3884	0.932	.3311	0.441	.4200	0.305
.3905	0.936	.3329	0.381	.4245	0.293
.3926	0.936	.3350	0.357	.4266	0.303
.3967	0.934	.3393	0.340	.4287	0.297
.3988	0.939	.3412	0.343	.4332	0.271
.4009	0.938	.3486	0.296	.4353	0.267
.4071	0.949	.3505	0.288	.4374	+0.272
.4092	0.997	.3521	0.285		
.4134	1.008	.3557	0.255	2443580	
.4155	1.001	.3572	0.279	.3470	+0.642
.4176	1.005	.3586	0.255	.3483	0.617
.4217	0.994	.3615	0.256	.3516	0.595
.4238	0.985	.3629	0.267	.3529	0.591
.4256	0.999	.3642	0.275	.3560	0.571
.4280	0.992	.3670	0.301	.3573	0.554
.4339	1.020	.3684	0.300	.3593	0.553
.4373	1.022	.3737	0.318	.3620	0.537
.4398	1.020	.3758	0.349	.3654	0.496
.4448	1.057	.3776	0.336	.3666	0.464
.4469	+1.048	.3821	+0.359	.3706	+0.446

Table 13 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2443580		2443583		2443595	
.3718	+0.417	.3557	+0.446	.3002	+0.488
.3750	0.400	.3572	0.433	.3016	0.469
.3763	0.355	.3620	0.419	.3050	0.473
.3802	0.323	.3673	0.330	.3063	0.437
.3815	0.341	.3707	0.329	.3093	0.394
.3851	0.280	.3724	0.326	.3104	0.380
.3866	0.265	.3753	0.293	.3132	0.370
.3902	0.261	.3765	0.310	.3143	0.356
.3915	0.263	.3802	0.321	.3176	0.355
.3952	0.276	.3844	0.297	.3189	0.321
.3968	0.278	.3856	0.298	.3222	0.340
.4001	0.280	.3891	0.279	.3233	0.299
.4014	0.286	.3905	0.283	.3264	0.281
.4053	0.315	.3934	0.314	.3279	0.277
.4066	0.323	.3948	0.309	.3310	0.260
.4118	0.312	.3981	0.322	.3323	0.286
.4149	0.317	.3995	0.315	.3371	0.273
.4165	0.308	.4027	0.340	.3406	0.280
.4196	0.360	.4042	0.339	.3418	0.304
.4211	+0.354	.4072	0.352	.3454	0.298
		.4086	0.361	.3466	0.305
2443583		.4120	0.334	.3501	0.303
.3399	+0.528	.4131	+0.347	.3514	0.310
.3441	0.518			.3546	0.324
.3482	0.508	2443595		.3560	0.331
.3511	0.484	.2954	+0.527	.3589	0.326
.3523	+0.483	.2966	+0.534	.3604	+0.350

Table 14

Photoelectric observations of AR Per

J.D.	Δm*	J.D.	Δm*	J.D.	Δm*
2435095		2435095		2435095	
.4738	+1.157	.4874	+0.895	.5094	+0.377
.4747	1.150	.4886	0.844	.5104	0.363
.4754	1.175	.4908	0.773	.5114	0.348
.4762	1.146	.5011	0.561	.5125	0.318
.4790	1.079	.5023	0.561	.5173	0.177
.4798	1.034	.5034	0.528	.5183	0.163
.4806	1.000	.5044	0.502	.5193	0.136
.4815	0.996	.5050	0.494	.5203	0.143
.4827	0.965	.5084	+0.373	.5216	+0.097
.4865	+0.897				

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2435093		2435093		2435093	
.3853	+1.707	.4032	+1.447	.4114	+1.429
.3954	+1.474	.4041	+1.450	.4123	+1.441

Table 14 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2335093		2436485		2336495	
.4477	+1.594	.5120	+0.643	.6215	+0.253
.4487	1.611	.5159	0.666	.6240	0.282
.4568	1.656	.5179	0.678	.6292	+0.349
.4577	1.639	.5212	0.687		
.4714	1.754	.5254	0.698	2436530	
.4722	+1.751	.5277	0.700	.4393	+0.903
		.5294	0.699	.4436	0.863
2436477		.5354	0.755	.4453	0.806
.5105	+0.809	.5375	0.765	.4487	0.708
.5205	0.842	.5403	+0.764	.4517	0.655
.5288	0.822			.4550	0.543
.5366	0.805	2436495		.4566	0.510
.5455	0.802	.4830	+0.937	.4583	0.487
.5557	0.805	.4851	0.954	.4618	0.477
.5646	0.839	.4872	0.957	.4634	0.436
.5734	0.859	.4913	0.982	.4654	0.398
.5821	0.862	.4934	1.007	.4693	0.319
.5915	0.902	.4997	1.017	.4711	0.281
.6040	0.936	.5018	1.023	.4728	0.229
.6152	0.972	.5038	1.020	.4763	0.204
.6263	+1.010	.5080	1.010	.4782	0.165
		.5122	1.025	.4801	0.163
2436485		.5163	1.034	.4842	0.150
.3666	+0.192	.5184	1.026	.4865	0.159
.3704	0.162	.5205	1.054	.4883	0.162
.3719	0.154	.5247	1.025	.4925	0.155
.3770	0.155	.5268	1.014	.4944	0.187
.3791	0.123	.5288	1.015	.4962	0.175
.3811	0.132	.5330	1.020	.5006	0.215
.3853	0.144	.5358	1.022	.5026	0.211
.3874	0.175	.5379	1.033	.5041	0.218
.3936	0.225	.5420	0.967	.5077	0.259
.3968	0.219	.5441	0.904	.5097	0.263
.4030	0.255	.5462	0.886	.5115	0.279
.4072	0.274	.5504	0.777	.5149	0.277
.4615	0.506	.5524	0.729	.5167	0.289
.4650	0.519	.5545	0.682	.5183	+0.303
.4671	0.510	.5587	0.572		
.4732	0.537	.5608	0.507	2436541	
.4750	0.580	.5629	0.472	.4381	+0.985
.4767	0.579	.5837	0.201	.4413	0.998
.4813	0.566	.5858	0.180	.4427	1.007
.4831	0.579	.5903	0.131	.4455	1.007
.4851	0.583	.5924	0.127	.4470	0.986
.4895	0.601	.5955	0.152	.4490	0.998
.4917	0.608	.5997	0.167	.4525	1.044
.4932	0.611	.6021	0.172	.4541	1.031
.4970	0.646	.6045	0.199	.4556	1.034
.4988	0.642	.6097	0.211	.4598	1.020
.5006	0.635	.6122	0.228	.4614	1.045
.5079	0.643	.6146	0.229	.4632	1.053
.5101	+0.645	.6195	+0.249	.4664	+1.085

Table 14 (cont.)

J.D.	ΔV	J.D.	ΔV	J.D.	ΔV
2436541		2436541		2440528	
.4679	+1.064	.5689	+0.230	.5402	+0.175
.4695	1.087	.5707	0.252		
.4745	1.083	.5751	0.286	2443124	
.4811	1.085	.5767	0.292	.3258	+0.963
.4882	1.091	.5826	0.309	.3272	0.957
.4920	1.072	.5852	0.323	.3313	0.920
.4950	1.056	.5869	+0.334	.3327	0.936
.4968	1.047			.3365	0.853
.4986	1.032	2440528		.3375	0.811
.5022	0.930	.4610	+1.042	.3407	0.759
.5042	0.877	.4631	1.030	.3421	0.724
.5060	0.889	.4673	1.017	.3453	0.661
.5099	0.786	.4694	0.996	.3467	0.632
.5117	0.762	.4735	0.990	.3505	0.529
.5132	0.724	.4756	0.977	.3522	0.489
.5163	0.619	.4812	0.898	.3559	0.432
.5180	0.593	.4832	0.840	.3577	0.399
.5195	0.553	.4874	0.712	.3605	0.397
.5229	0.519	.4895	0.680	.3621	0.375
.5242	0.499	.4944	0.523	.3654	0.286
.5294	0.401	.4964	0.481	.3675	0.245
.5313	0.353	.5006	0.459	.3709	0.172
.5329	0.332	.5027	0.427	.3729	0.162
.5360	0.294	.5069	0.343	.3755	0.158
.5378	0.251	.5089	0.291	.3769	0.165
.5397	0.210	.5131	0.193	.3798	0.173
.5455	0.176	.5152	0.180	.3852	0.156
.5471	0.180	.5194	0.136	.3869	0.171
.5503	0.171	.5214	0.131	.3900	0.176
.5520	0.166	.5256	0.157	.3916	0.199
.5536	0.150	.5277	0.141	.3963	0.213
.5575	0.174	.5319	0.142	.3979	0.241
.5598	0.197	.5339	0.156	.4008	0.268
.5672	+0.216	.5381	+0.171	.4022	+0.270

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2435093		2435093		2436477	
.3804	+1.796	.4856	+1.907	.6138	+0.905
.3886	1.643			.6249	0.948
.3895	1.626	2436477		.6346	+1.022
.3977	1.476	.5096	+0.773		
.3985	1.457	.5195	0.752	2436485	
.4060	1.433	.5279	0.748	.3658	-0.156
.4139	1.441	.5357	0.755	.3695	0.175
.4231	1.495	.5445	0.752	.3712	0.175
.4414	1.588	.5545	0.776	.3759	0.222
.4505	1.684	.5637	0.781	.3780	0.231
.4520	1.709	.5724	0.792	.3801	0.217
.4612	1.718	.5810	0.777	.3843	0.231
.4742	1.831	.5900	0.811	.3863	0.170
.4848	+1.915	.6027	+0.869	.3884	-1.162

Table 14 (cont.)

J.D	ΔB	J.D	ΔB	J.D.	ΔB
2436485		2436495		2436530	
.3926	-0.118	.5431	+0.810	.5087	-0.082
.3957	0.138	.5451	0.765	.5106	0.088
.4016	0.063	.5514	0.570	.5157	0.022
.4061	0.031	.5535	0.472	.5176	-0.001
.4082	-0.001	.5576	0.371		
.4642	+0.288	.5597	0.281	2436541	
.4660	0.302	.5618	+0.225	.4407	+0.936
.4719	0.314	.5826	-0.110	.4420	0.918
.4740	0.342	.5847	0.195	.4449	0.964
.4759	0.361	.5892	0.240	.4463	0.956
.4803	0.370	.5913	0.237	.4482	0.945
.4822	0.376	.5934	0.236	.4517	0.932
.4840	0.406	.5986	0.198	.4532	0.973
.4887	0.440	.6007	0.184	.4548	0.985
.4907	0.441	.6035	0.182	.4590	0.950
.4924	0.434	.6087	0.159	.4605	0.967
.4961	0.479	.6111	0.127	.4623	0.995
.4978	0.465	.6132	0.135	.4657	0.993
.4997	0.478	.6181	0.075	.4720	1.016
.5069	0.467	.6205	0.078	.4734	1.016
.5090	0.491	.6281	0.018	.4835	0.993
.5110	0.518	.6302	-0.008	.4875	0.985
.5150	0.514			.4897	1.004
.5169	0.516	2436530		.4913	0.957
.5191	0.540	.4386	+0.812	.4943	0.932
.5244	0.570	.4427	0.729	.4961	0.929
.5266	0.588	.4446	0.677	.4975	0.918
.5285	0.577	.4479	0.581	.5014	0.786
.5337	0.592	.4495	0.470	.5034	0.789
.5366	+0.615	.4510	0.446	.5050	0.677
		.4541	0.323	.5090	0.662
2436495		.4557	0.294	.5110	0.599
.4820	+0.884	.4574	0.238	.5125	0.541
.4861	0.890	.4610	0.186	.5156	0.427
.4903	0.919	.4625	0.144	.5172	0.366
.4924	0.908	.4645	0.114	.5187	0.336
.4945	0.911	.4684	+0.037	.5221	0.249
.4986	0.941	.4702	-0.020	.5236	0.224
.5007	0.974	.4719	0.068	.5251	0.202
.5028	0.971	.4755	0.163	.5285	0.119
.5070	0.959	.4773	0.164	.5304	0.099
.5090	0.957	.4791	0.182	.5321	+0.022
.5153	0.975	.4833	0.209	.5352	-0.075
.5174	0.954	.4852	0.195	.5368	0.072
.5195	0.981	.4873	0.207	.5388	0.124
.5236	0.978	.4915	0.216	.5446	0.165
.5257	0.950	.4933	0.193	.5464	0.197
.5278	0.948	.4954	0.191	.5496	0.237
.5320	0.954	.4996	0.157	.5512	0.210
.5347	0.931	.5016	0.142	.5528	0.204
.5368	0.903	.5034	0.119	.5565	0.194
.5410	+0.831	.5068	-0.092	.5589	-0.158

Table 14 (cont.)

J.D.	ΔB	J.D.	ΔB	J.D.	ΔB
2436541		2440528		2443124	
.5607	-0.148	.4999	+0.179	.3446	+0.507
.5663	0.128	.5020	0.148	.3460	0.452
.5680	0.086	.5062	0.052	.3498	0.344
.5699	0.082	.5082	+0.010	.3515	0.289
.5742	0.048	.5124	-0.117	.3549	0.241
.5759	0.063	.5145	0.155	.3569	0.191
.5774	0.038	.5187	0.209	.3598	0.129
.5817	0.018	.5249	0.245	.3612	0.087
.5844	-0.018	.5270	0.227	.3647	+0.014
.5861	+0.015	.5312	0.219	.3667	-0.031
		.5332	0.219	.3700	0.139
2440528		.5374	0.199	.3716	0.146
.4603	+0.960	.5395	-0.177	.3748	0.207
.4624	0.965			.3762	0.209
.4666	0.961	2443124		.3790	0.206
.4687	0.920	.3251	+0.924	.3804	0.179
.4728	0.897	.3265	0.881	.3845	0.183
.4749	0.837	.3303	0.852	.3862	0.189
.4805	0.741	.3320	0.825	.3893	0.151
.4826	0.720	.3348	0.768	.3950	0.134
.4867	0.518	.3368	0.712	.3973	0.110
.4888	0.478	.3399	0.663	.4001	0.085
.4937	0.313	.3416	+0.583	.4015	-0.044
.4958	+0.253				

J.D.	ΔU	J.D.	ΔU	J.D.	ΔU
2440528		2440528		2440528	
.4617	+0.849	.4923	+0.205	.5180	-0.292
.4680	0.843	.4951	0.080	.5201	0.301
.4721	0.848	.4992	+0.061	.5242	0.298
.4742	0.803	.5013	-0.005	.5263	0.291
.4798	0.703	.5055	0.025	.5305	0.306
.4819	0.661	.5076	0.045	.5326	0.290
.4860	0.456	.5117	0.163	.5367	0.309
.4881	+0.402	.5138	-0.250	.5388	-0.297

Table

Photographic observations of AR Per

J.D.	m_{pg}	J.D.	m_{pg}	J.D.	m_{pg}
2428459		2428459		2428459	
.5879	10.76	.6025	10.82	.6171	10.84
.5900	10.74	.6046	10.83	.6192	10.87
.5921	10.77	.6067	10.82	.6212	10.89
.5942	10.78	.6087	10.83	.6233	10.92
.5962	10.80	.6108	10.86	.6254	10.90
.5983	10.81	.6129	10.87	.6275	10.91
.6004	10.82	.6150	10.93	.6296	10.87

Table 15 (cont.)

J.D.	m_{pg}	J.D.	m_{pg}	J.D.	m_{pg}
2428459		2428545		2428545	
.6317	10.94	.4651	10.35	.5213	10.58
.6337	10.89	.4672	10.31	.5234	10.60
.6358	10.92	.4693	10.31		
.6379	10.91	.4720	10.29	2428547	
.6400	10.94	.4776	10.26	.4628	11.35
.6421	10.92	.4797	10.31	.4649	11.30
.6476	11.08	.4818	10.30	.4670	11.33
.6497	11.03	.4838	10.30	.4691	11.34
.6518	11.07	.4859	10.32	.4711	11.37
.6539	11.09	.4880	10.34	.4732	11.38
		.4901	10.30	.4753	11.35
2428545		.4922	10.30	.4795	11.36
.4443	11.00	.4943	10.39	.4816	11.37
.4463	11.02	.4984	10.38	.4836	11.36
.4484	10.82	.5005	10.48	.4857	11.38
.4505	10.78	.5026	10.50	.4878	11.35
.4526	10.78	.5047	10.50	.4899	11.33
.4547	10.66	.5088	10.49	.4961	11.36
.4568	10.64	.5109	10.53	.4982	11.40
.4588	10.50	.5130	10.50	.5003	11.41
.4609	10.44	.5151	10.49	.5024	11.40
.4630	10.40	.5175	10.59		