

ROYAL ASTRONOMICAL SOCIETY OF NEW ZEALAND

VARIABLE STAR SECTION

CIRCULAR No. 170.

WW CENTAURI.

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SUMMARY:

V magnitudes are given for four comparison stars to complete the sequence at its fainter limits. Visual observations from 2,437,090 to 2,440,848 are given as ten day means. It is concluded that two periods operate for WW Cen--a primary period of 299 days \pm 24d and a secondary period of 150 days \pm 19d. Visual mean magnitudes are: Primary Max. 9.12; Primary Min. 11.32; Secondary Max. 9.87, Secondary Min. 10.70. The secondary period disappears entirely when the two cycles are in step.

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INTRODUCTION:

WW Cen is a semi-regular variable with a range of 10.5 to 11.7 ptg and a period of 304 days according to Gaposchkin (1). He pointed out that at times it was possible to detect two groups of maxima with periods of about 285 and 325 days.

CHARTS & SEQUENCE.

WW Cen appears on Brun & Petit's chart for NN Cen (2). Bateson, Jones & Stranson (3) published charts 127 and 128 on which SPv magnitudes for all comparison stars were shown with the exception of four lettered stars. V magnitudes have now been determined for these four stars by Menzies in accordance with the procedures already outlined (4). The standard used for his determinations was HD 114024, which was taken as V= 9.78; B-V +0.27, Spectrum BO (5). Menzies' values are:-

<u>CHART LETTER.</u>	<u>C.P.D.</u>	<u>V.</u>	<u>ADOPTED.</u>
k	-59° 4789	10.55	10.5
l	-59 4791	11.29	11.3
p	-59 4779	11.49	11.5
q	-59 4777	11.65	11.7

The final column gives the magnitude, to tenths, to be used by visual observers in future.

OBSERVATIONS:

Visual observations, in ten day means, for the interval 2,437,090 (1960 June 4) to 2,440,848 (1970 Sept. 18) are given in Table 1. The first column gives the mean J.D. for each ten day interval (5 through 4). The second column gives the mean of the observed magnitudes, whilst the third column lists the weight on a scale of 1 to 5. Weight 1 refers to either a single observation, when the magnitude is given to tenths, or to a mean for which the individual observations have a large scatter. The means of the latter are given to hundredths to separate them clearly from the single estimates. Weight 5 implies that there were adequate observations, in good agreement, throughout the ten day period.

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DISCUSSION:

Table 2 lists the observed maxima and minima in the usual form. The nature of the variations reveal marked differences in the light curve for different intervals. Between 2,437,340 and 2,438,040 the curve is regular with the rise slightly steeper than the decline. The period is about 300 days. Two thousand days later these regular variations repeat themselves in the interval 2,439,340 to 2,440,040. Outside of these two intervals a secondary period appears to operate, usually in such a manner that the magnitude of WW Cen declined or increased in a series of waves, the amplitudes of which decreased as the star approached a primary maximum.

What appears to be the primary maxima and minima have been denoted by "P" in the final columns of Table 2. For these a period of 299 days with Epoch (Maximum) 2,437,504 give O-C residuals of ± 24 days for both maxima and minima. The interval minimum to maximum is 181 days. Primary maxima have a mean magnitude of 9.12 (8.8 to 9.4); primary minima average 11.32 (10.3 to 11.6).

The secondary period appears to be about 150 days ± 19 days but becomes completely merged with the primary period at times when no secondary variations are apparent. Secondary maxima average 9.87 (9.3 to 10.7); secondary minima 10.70 (9.9 to 11.3).

ACKNOWLEDGEMENTS:

We wish to express our appreciation to the observers for their records. We also wish to thank the Board of Trustees of the Auckland Observatory for the use of their 50cm Zeiss reflector and attached equipment which permitted the determination of V magnitudes of comparison stars.

1971 January 12

18 POOLES ROAD,
GREERTON.
TAURANGA.
NEW ZEALAND.

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TABLE 1.

WW CENTAURI-----TEN DAY MEANS.

<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u>	<u>Wt.</u>
	v			v			v			v	
2,437,000		+	2,437,000		+	2,438,000		+	2,439,000		+
090	10.2	1	821	9.6	1	574	9.9	1	258	9.40	5
100	10.0	1	827	9.45	3	576	9.6	1	268	9.40	5
113	10.35	3	840	9.3	1	590	10.00	3	291	9.42	5
117	9.8	1	850	9.8	1	603	10.1	1	299	9.40	3
130	8.80	3	865	9.7	1	609	10.7	1	319	8.88	4
141	9.45	3	879	9.90	3	623	10.9	1	329	8.72	5
146	9.5	1	898	9.9	1	637	11.3	1	344	8.85	3
159	9.9	1	907	10.8	1	648	10.3	1	349	8.74	5
170	9.70	4	917	10.0	1	665	10.80	4	357	8.85	3
188	9.7	1	946	10.9	1	678	10.4	1	394	9.9	1
199	9.60	4	963	11.4	1	698	10.2	1	401	9.9	1
219	10.0	1	973	11.4	1	708	10.10	4	416	10.6	1
231	9.4	1				733	11.4	1	442	11.4	1
250	9.3	1	2,438,000		+	738	9.20	5	449	11.4	1
262	10.0	1	001	11.4	1	757	9.30	5	467	11.55	3
279	10.0	1	017	10.9	1	767	9.3	1	485	11.4	1
289	10.3	1	027	10.1	1	789	9.73	5	500	11.0	1
295	10.7	1	051	9.0	1	797	10.0	1	508	11.25	4
313	10.5	1	079	9.5	1	818	9.90	5	522	11.10	3
325	9.6	1	094	9.2	1	829	9.70	5	533	10.9	1
339	11.1	1	102	9.4	1	842	9.65	5	542	10.20	4
356	10.9	1	111	9.4	1	852	9.37	5	552	9.70	4
368	11.4	1	124	9.6	1	862	9.5	1	562	10.30	1
381	11.15	3	131	9.4	1	869	10.0	1	568	10.3	1
401	11.45	4	142	9.4	1	879	9.75	4	584	9.60	3
411	11.15	3	150	9.9	1	889	9.9	1	594	9.40	3
429	10.9	1	165	9.3	1	915	10.2	1	599	9.50	4
439	9.9	1	178	9.80	3	929	10.3	1	612	9.20	3
451	9.60	5	194	10.7	1	941	10.15	4	621	9.22	3
460	9.4	1	207	10.7	1	961	9.90	5	627	9.40	3
471	9.20	5	223	10.7	1	970	9.73	3	639	9.3	1
483	9.3	1	233	10.2	1	976	9.67	4	648	9.40	3
492	9.2	1	238	9.9	1	990	9.85	5	656	9.3	1
509	9.20	4	253	10.0	1				671	9.60	3
527	9.60	4	260	9.8	1	2,439,000		+	682	9.70	4
541	9.40	4	267	10.0	1	000	9.80	5	701	9.9	1
555	9.50	3	283	10.1	1	008	9.8	1	711	10.20	3
571	9.7	1	290	10.2	1	023	9.13	4	738	11.07	4
578	10.10	1	299	10.95	3	030	9.05	5	762	11.57	5
587	10.0	1	311	11.00	1	051	9.00	5	794	11.6	1
607	10.9	1	353	9.3	1	067	8.9	1	802	11.4	1
620	10.4	1	363	9.6	1	095	9.3	1	807	11.4	1
642	11.4	1	380	9.9	1	120	11.3	1	820	10.3	1
650	11.4	1	404	9.4	1	144	10.45	1	830	10.10	3
674	11.5	1	408	9.1	1	152	9.88	5	852	9.30	2
681	11.50	3	417	9.5	1	158	9.80	4	858	9.65	4
691	11.4	1	433	9.7	1	174	9.8	1	868	9.4	1
699	11.6	1	456	9.9	1	183	9.90	4	883	9.3	1
722	10.1	1	470	10.9	1	187	10.60	1	897	9.2	1
734	9.6	1	491	11.3	1	200	10.26	2	911	9.4	1
753	9.5	1	510	10.9	1	208	11.1	1	925	9.2	1
763	9.4	1	523	10.60	3	218	11.3	1	940	9.37	4
772	9.4	1	533	10.2	1	232	10.30	2	946	9.8	1
779	9.4	1	548	9.9	1	240	9.80	5	970	9.85	4
793	9.6	1	560	9.55	3	246	9.7	1	981	10.20	3
									989	10.42	1

V.S.S. CIRCULAR No. 170 (cont).

TABLE 1 (cont).

<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u>	<u>Wt.</u>
	<u>v</u>			<u>v</u>			<u>v</u>	
2,440,000+			2,440,000+			2,440,000+		
000	10.97	4	279	11.20	2	621	11.6	1
009	10.65	1	292	11.30	4	637	11.3	1
018	10.6	1	303	11.0	1	648	10.67	1
037	11.15	3	310	11.55	3	677	10.70	2
052	11.10	3	323	10.8	1	692	11.25	3
062	11.23	3	332	10.8	1	708	10.80	1
069	11.4	1	338	10.7	1	716	10.00	1
081	11.42	5	353	10.7	1	734	9.9	1
089	11.40	5	380	10.90	2	740	9.94	4
097	11.07	3	392	10.35	1	751	10.17	1
124	9.8	1	412	9.43	4	764	10.25	2
131	10.8	1	439	9.08	5	770	10.03	2
210	9.0	1	449	8.90	5	791	9.32	3
216	9.1	1	460	8.85	5	799	9.10	4
245	9.9	1	469	9.15	4	821	9.04	4
272	10.8	1	596	11.5	1	833	9.37	5
						848	9.8	1

TABLE 2.

WW CENTAURI----- OBSERVED MAXIMA & MINIMA.

<u>MAXIMA.</u>					<u>MINIMA.</u>				
<u>J.D.</u>	<u>MAG</u> <u>v</u>	<u>INT</u> <u>d</u>	<u>Wt.</u>	<u>P or</u> <u>S.</u>	<u>J.D.</u>	<u>MAG</u> <u>v</u>	<u>INT</u> <u>d</u>	<u>Wt.</u>	<u>P or</u> <u>S.</u>
2,437,132	8.8	...	2	?	2,437,160	9.9	...	2	S
248?	9.3	116	1	S	295	10.7	135	2	S
325	9.6	77	1	S	395	11.4	100	4	P
504	9.2	179	5	P	672	11.5	277	4	P
801	9.4	297	4	P	984	11.4	312	4	P
2,438,075	9.2	274	3	P	2,438,205	10.7	221	4	S
259	9.8	184	3	S	305	11.0	100	2	P
395	9.3	136	3	P	492	11.3	187	3	S
560	9.6	165	5	S	637	11.3	145	3	P
740	9.2	180	2	P	805	10.0	168	4	S
853	9.4	113	4	S	926	10.3	121	5	P
2,439,050	9.0	197	3	P	2,439,120	11.3	194	1	S
170	9.8	120	4	S	217	11.3	97	3	P
333	8.8	163	5	P	474	11.5	257	5	P
641	9.3	308	5	P	783	11.6	309	5	P
904	9.2	263	5	P	2,440,087	11.4	304	4	P
2,440,180?	8.9?	276	1	P	312	11.6	225	2	P
345	10.7	165	2	S	375	10.9	63	2	S
448	8.9	103	3	P	620	11.6	245	2	P
665	10.7	217	3	S	693	11.2	73	3	S
731	9.9	66	3	S	761	10.2	68	3	S
810	9.0	79	3	P					