

ROYAL ASTRONOMICAL SOCIETY OF NEW ZEALAND.

VARIABLE STAR SECTION.

CIRCULAR No. 141.

U CRUCIS.

Frank M. Bateson, A.F. Jones and B. Menzies.

SUMMARY:

Photoelectric magnitudes of comparison stars included in the photographic sequence in H.A. 47, 1 are given.

Observations of the Mira Ceti type variable, U Crucis, from 1961 July 24 (J.D. 2,437,506) to 1968 July 26 (J.D. 2,440,064) are now published. From eight maxima a period of 342.6 days is determined with Epoch 2,440,020. Range 9.6-10.7 max; <13.0 min. Mean max. magnitude is 10.21.

.....

INTRODUCTION:

U Crucis is listed in the Second Edition (1958) of the G.C.V.S. as of Mira Ceti type with a photographic range of 10.3 to 14. The period given is 351.4 days with epoch of maximum as 2,412,954. The spectrum is M4e-M6e.

The position of U Crucis is:

(1900):- 12h 26m 50s S. 57° 01.7
(1950):- 12 29 40 S. 57 18.3

SEQUENCES & CHART.

A photographic sequence is listed in H.A. 47, 1. The stars of this sequence are shown on Chart No. 96 (1) with the SPv magnitudes given for comparison stars 1, 2, 3 and "a" to "f" inclusive. These numbers and letters were omitted from the chart but comparison stars "g" to "p" for which no SPv magnitudes are available were shown by these letters on Chart 96.

Under the direction of B. Menzies, assisted by G. Christie, photoelectric V magnitudes have been determined for comparison stars "g" to "o" using the Zeiss 50cm Cassegrain reflector at the Auckland Observatory.

Star "f" (CPD -56° 5261) was adopted as the zero point for determining this sequence for stars "g" to "o". The SPv magnitude of 9.7 for "f" was adopted. The Spg magnitude of this star is 9.72 and its spectrum is A0.

The resultant V magnitudes are:-

"g"	10.06	Adopted	10.1
"h"	10.23		10.2
"k"	10.55		10.6
"l"	11.28		11.3
"m"	11.94		11.9
"n"	12.24		12.2
"o"	12.37		12.4

The adopted values should be used by observers in future. The magnitude of "p" has not been determined.

OBSERVATIONS:

A.F. Jones commenced observations on 1961 July 24. From April 1966 observations were also made by Bateson, whilst from 1967 observations were also made by several other members. Those who have contributed observations are listed in Table 1.

The observations are presented as ten day means in Table 2. The mean J.D. is given in the first column and the mean visual magnitude in the second column. Because of the uneven nature of the material no weights have been assigned to these means. Observations before 1966 April (J.D. 2,439,218) are dependent entirely on A.F. Jones' records and generally have one observation in each ten day period. From 1966 April the number of observations increased and from 1967 June the star has been fairly well observed.

The period covered by the observations now published is 1961 July 24 (J.D. 2,437,506) to 1968 July 26 (J.D. 2,440,064). Observations after that date will be published in the usual observational circulars.

DISCUSSION:

U Crucis at minima was well below the limit of the instruments used. For this reason it is not possible to publish a table of phases or a mean light curve.

The observed dates of maxima are listed in Table 3, in which the first column gives the observed J.D. of maxima; the second the visual magnitude at maxima and the third column the interval, in days, between successive maxima. The next two columns give respectively the Epoch number and O-C residuals, in days, calculated by taking Epoch 0 as J.D. 2,412,954 and the period of 351.4 days as listed in the GCVS.

The final two columns of Table 3 list respectively the Epoch and O-C residuals, in days, calculated for a period of 342.6 days and an epoch (0) of J.D. 2,412,954.

The period determined from the observations now published is 342.6 days. The best determined maxima are at J.D. 2,439,684 and 2,440,020 when observations were most numerous.

The elements found from the observations published in this Circular are:-

EPOCH (Max)	2,440,020
PERIOD	342.6 days
RANGE	MAX. 9.6 to 10.7 visual; Min <13.0
MEAN MAX.	10.21 visual.

In Table 3 the first set of O-C residuals would appear to indicate a changing period. This is misleading and is not borne out by a plot of the intervals between successive maxima. It seems possible that the original period is incorrect. By accepting the Epoch listed in the GCVS of J.D. 2,412,954 and using the period of 342.6 days now found, the O-C residuals listed in the final column of Table 3 are derived. These residuals are well within the normal O-C residuals for stars of this type.

1970 January 27

18 POOLES ROAD,
GREERTON,
TAIRANGA NEW ZEALAND.

CIRCULAR No. 141 (cont).

ACKNOWLEDGEMENTS:

The authors wish to record their appreciation to the Auckland Observatory Trust Board for use of their 50cm Zeiss Cassegrain reflector and auxiliary equipment for determination of a photoelectric sequence. Thanks are also due to G. Christie, of Auckland, for assistance in these observations. We also wish to thank all observers for their records.

REFERENCE:

- (1). 1966. CHARTS FOR SOUTHERN VARIABLES, SERIES 3. Bateson, Jones & Stranson. Published by F.M. Bateson, N.Z.

.....

TABLE 1.

LIST OF OBSERVERS.

BATESON,	F.M.	MARINO,	B.F.
CHRISTIE,	G.W.	MATCHETT, (Dr)	V.L.
FISHER,	D.C.	MCMILLAN,	S.C.
HÓVELL,	S.R.	MENZIES,	B.F.
HUNTER,	K.R.	STRANSON,	I.
JONES,	A.F.	WALKER,	W.S.G.
JONES,	M.V.		

TABLE 2.

U CRUCIS---TEN DAY MEANS.

MEAN J.D.	MEAN MAG.	MEAN J.D.	MEAN MAG.	MEAN J.D.	MEAN MAG.
	v	2,437,000+	v	2,438,000+	v
2,437,000+		943	11.0		
506	<11.9	963	10.5	417	<12.4
528	<12.4	973	10.5	467	<12.4
549	<12.4	2,438,000+		492	<12.4
562	<11.9	000	11.35	520	<11.9
575	<12.4	022	11.8	533	<11.9
587	12.0	074	12.0?	550	<12.4
621	10.5	105	<12.4	563	<11.9
642	11.3	116	<12.4	575	<11.9
662	11.4	142	13.2	588	<12.4
674	12.4	150	13.0	605	<12.4
689	<11.9	168	12.4	623	10.6
697	12.1	177	12.3	637	10.3
726	<12.4	194	12.3	648	10.3
755	<12.4	207	13.1	665	10.2
766	<11.9	223	<12.4	679	11.1
779	<12.4	233	<12.9	698	11.5
793	<12.4	255	<12.9	709	11.6
821	<12.4	264	<12.9	729	12.3
840	<12.4	283	10.1	739	12.6
850	<12.4	300	9.6	757	12.8
865	12.7	315	10.1	773	12.9
879	12.30	330	10.5	786	12.4
898	12.3	356	<11.9	797	<12.9
908	12.4	382	<12.4	813	<12.4
917	<11.9	404	<12.4	826	<12.4
				844	<12.4

V.S.S. CIRCULAR No: 141 (cont).

TABLE 2 (cont).

MEAN J.D.	MEAN MAG. v	MEAN J.D.	MEAN MAG. v	MEAN J.D.	MEAN MAG. v	MEAN J.D.	MEAN MAG. v
2,438,000+		2,439,000+		2,439,000+		2,440,000+	
854	<12.4	302	12.3	741	11.43	010	9.37
862	<12.4	316	10.5	761	12.2	021	9.70
873	<12.4	329	10.46	777	12.7	028	9.47
884	<12.4	345	10.6	791	12.75	038	9.92
890	<12.4	351	10.50	805	13.0	050	9.93
908	<12.4	358	10.8	820	<12.4	061	10.10
918	<12.4	394	11.7	834	<12.4		
932	13.5	413	12.6	850	13.4		
940	13.1	449	<12.4	861	<12.4		
960	11.0	467	<12.4	875	<12.4		
969	10.4	485	<12.4	881	<11.9		
990	10.1	502	<12.4	887	<12.9		
2,439,000+		514	<12.4	902	<12.4		
001	10.0	533	<12.4	913	<12.4		
008	10.1	554	<12.4	918	13.40		
023	10.3	564	<12.4	931	<12.4		
030	10.7	583	<12.4	941	<13.8		
065	11.8	593	<12.4	946	<12.4		
094	12.7	610	<12.4	963	<12.4		
112	12.2	623	12.15	971	12.32		
143	13.4	628	<12.4	983	11.70		
159	<12.4	641	<12.4	992	11.0		
171	<12.4	652	12.15	999	9.86		
188	<12.4	657	11.7				
218	<12.4	670	10.83				
231	<12.4	680	10.50				
245	<12.4	688	10.7				
257	12.0	696	10.7				
267	12.4	711	11.05				
283	<12.4	734	11.2				
291	12.9?						

TABLE 3.

U CRUCIS--OBSERVED DATES OF MAXIMA.

J.D.	MAG. v.	INT. d	EPOCH (1)	O-C (1) d	EPOCH (2)	O-C (2) d
2,437,622	10.2	...	70	+70	72	- 1
966	10.5	344	71	+63	73	- 2
2,438,295	9.8	329	72	+40	74	-11
646	10.3	351	73	+40	75	- 3
2,439,003	10.1	357	74	+45	76	+11
327	10.5	324	75	+18	77	- 7
684	10.7	357	76	+24	78	+ 7
2,440,020	9.6	336	77	+ 8	79	+ 1

.....