

VARIABLE STAR SECTION.

CIRCULAR No. 190.

SU DORADUS.

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SUMMARY: Improved elements for the Mira type variable, SU Dor, are presented together with a list of observed maxima derived from visual observations during the interval J.D. 2,435,463 to 2,441,094.

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INTRODUCTION: SU Dor was assigned a range of 10 - (13 p (Hoffmeister 1949). Charts, with a Cape sequence for the brighter comparison stars, were published (Bateson 1957). Charts 42 and 43 were subsequently published (Bateson et al 1966) on which the fainter comparison stars were identified by letters. A photoelectric sequence for these stars has since appeared (Bateson et al 1971).

OBSERVATIONS. Visual observations for the interval J.D. 2,435,463 (1955 December 20) to 2,441,093 (1971 May 21) are listed in Table 1 as Ten Day Means. The first column of the table gives the mean J.D. for each ten day interval ( 5 through 4). The second column gives the mean of the observed magnitudes for each ten day interval. The third column lists the weight given to each mean on the scale 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 observations. Weight 5 implies that there were adequate observations, in good agreement, throughout the ten day interval. A few photoelectric observations are included and these are shown separately in Table 1 followed by "v".

SU Dor has been generally well observed by almost every member of the section, largely because its rapid variations make it an interesting star to follow.

DISCUSSION. During the interval covered by the observations no maxima have been missed. The observed maxima are listed in Table 2, where the first column gives the number of the respective maxima, based on the Epoch given below. The second column gives the date of each observed maximum and is followed, in the next column, by the maximum magnitude. The weight shown in the fourth column is on the scale 1 (poorly determined) to 5 (well determined, with the rising and falling branches of the curve adequately observed). This is followed by the interval, in days, between successive maxima. The final column gives the O-C residuals, in days, derived from the following elements.

The elements which best fit the observations are:-

EPOCH maximum J.D. 2,440,741 + 235<sup>d</sup>.36

Mean maximum magnitude:- 9.34<sup>v</sup>

Range of max. magnitudes:- 8.53<sup>v</sup> to 10.27<sup>v</sup>.

Minimum Magnitude:- Fainter than 14.0<sup>v</sup> (Probably average 14.5<sup>v</sup>)

The period has been derived in the usual manner. As a check periods were also found from the intervals between the times at which the variable reached intermediate magnitudes on both the rise and fall. These gave periods of:-

235<sup>d</sup>.3 (at 12.0 on rise); 235<sup>d</sup>.9 (12.0 fall); 235<sup>d</sup>.2 (11.0 rise); 235<sup>d</sup>.5 (11.0 fall). The mean of the individual intervals between successive maxima is 235<sup>d</sup>.13. The simple mean for the five preceding periods is 235<sup>d</sup>.41, in excellent agreement with the derived period of 235<sup>d</sup>.36.

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The mean of the O-C residuals in Table 2 is  $\pm 6.46$ , which is satisfactory for a star of this type.

The curve is asymmetrical with the average time to rise from magnitude 13.0 to maximum being 58<sup>d</sup>.6. To fade from maximum to 13.0 averages 87<sup>d</sup>.6. Maxima have been arbitrarily assigned to three types, viz., bright (9.20 or brighter); medium (9.21 to 9.69) and faint (fainter than 9.7). Bright maxima tend to occur earlier than predicted and are often followed by a faint maximum. If the interval between successive maxima is greater than 240 days the maxima tend to be faint.

Minima have not been observed because they are below the limits of the instruments used. However, the shape of the light curve suggests that minima fall between 14.0 and 15.0 and average 14.5. Dates of minima are not listed since they were not observed although the general shape of the curve indicates the dates on which minima took place. The light curve and phases appear in Memoir No. 2, now in course of preparation.

ACKNOWLEDGEMENTS. Appreciation is expressed to all observers for their most careful records. I acknowledge receipt of a grant from the Trustees of the Low Estate under which this investigation has been made.

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REFERENCES:

- BATESON, F.M. 1957. Circ. 80, VSS; RASNZ.  
BATESON, F.M., JONES, A. & STRANSON, I. 1966. "Charts for Southern Variables" Series 3. Published by F.M. Bateson.  
BATESON, F.M., GORDON, P.J. & MENZIES, B. 1971. Circ. 177, VSS, RASNZ.  
HOFFMEISTER, C. 1949. Erg. A.N., 12, 1, 23.

TABLE 1.

SU DORADUS---TEN DAY MEANS.

<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>Mag.<sub>v</sub></u>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>Mag.<sub>v</sub></u>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>Mag.<sub>v</sub></u>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>Mag.<sub>v</sub></u>	<u>Wt.</u>
2,435,000 +											
463	(12.2	-	753	11.2	1	983	11.2	1	238	10.00	3
481	(11.2	-	762	11.2	1	987	10.9	1	261	9.8	1
506	12.7	1	771	9.7	1	997	9.6	1	266	9.6	1
531	10.40	3	789	9.40	3	2,436,000+			277	10.00	3
542	9.45	3	801	9.5	1	009	8.60	3	289	10.17	3
549	9.30	4	810	9.5	1	018	9.10	3	305	10.6	1
564	9.3	1	822	9.8	1	029	9.3	1	313	10.7	1
582	9.1	1	831	10.2	1	039	9.4	1	334	12.3	1
591	9.7	1	840	11.45	3	051	10.05	3	340	12.6	1
598	9.8	1	860	12.2	1	071	11.2	1	349	13.1	1
609	10.8	1	875	(13.0	-	090	11.6	1	361	(13.2	-
631	12.7	1	880	(12.2	-	102	(11.6	-	370	14.0	1
640	(12.7	-	901	(13.0	-	127	13.7	1	377	(12.2	-
672	(12.2	-	906	(13.0	-	160	(13.2	-	399	(13.6	-
682	(12.2	-	925	(12.5	-	174	(14.0	-	429	11.2	1
694	(12.7	-	935	12.7	1	188	(14.0	-	458	11.5	1
703	(12.2	-	955	(12.2	-	215	13.6	1	470	10.3	1
727	(12.2	-	966	(11.7	-	224	12.05	3	491	8.7	1

V.S.S. CIRCULAR No. 190 (cont). TABLE 1 (cont).

<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u> <sub>v</sub>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u> <sub>v</sub>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u> <sub>v</sub>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u> <sub>v</sub>	<u>Wt.</u>
2,436,000+						2,438,000+					
499	8.4	1	292	12.20	3	012	13.3	1	725	13.25	2
509	9.3	1	296	12.3	1	023	(13.2)	-	739	(14.0)	-
516	9.2	1	310	13.20	3	028	13.8	1	752	(13.6)	-
526	9.4	1	325	13.9	1	043	(13.6)	-	757	(13.6)	-
543	9.8	1	338	(13.2)	-	052	(14.0)	-	765	(13.6)	-
556	10.5	1	347	(13.6)	-	084	13.7	1	779	(13.2)	-
570	11.6	1	364	(12.4)	-	090	13.7	1	792	(13.6)	-
578	12.1	1	368	(13.6)	-	101	(13.2)	-	799	13.5	1
586	12.7	1	379	13.00	4	109	13.3	1	811	12.65	4
601	13.6	1	394	12.6	1	120	11.65	3	821	11.48	5
608	(13.6)	-	401	12.17	4	132	10.33	4	828	11.07	5
638	(13.6)	-	411	10.80	5	141	9.66	4	841	10.43	5
661	(13.2)	-	424	9.80	5	149	9.5	1	851	10.01	5
673	(13.6)	-	429	8.51	5	161	9.35	4	858	9.92	5
684	(12.7)	-	439	8.63	5	168	9.4	1	871	9.84	5
686	(12.7)	-	451	8.80	4	179	9.85	4	880	10.07	5
704	11.9	1	462	9.80?	1	200	10.50	3	888	10.17	4
718	10.4?	1	469	9.3	1	212	11.7	1	901	10.94	5
726	11.1?	1	479	9.60	3	231	13.0	1	912	11.80	5
735	10.4	1	492	10.2	1	241	13.4	1	941	13.45	5
750	10.05	3	506	11.2	1	245	13.5	1	969	(13.6)	-
761	10.1	1	524	12.3	1	258	(13.2)	-	977	(13.6)	-
768	10.65	3	549	13.6	1	273	(12.7)	-	2,439,000+		
781	10.5	1	562	14.05	3	290	(13.6)	-	000	(13.6)	-
791	11.4	1	574	(11.6)	-	313	(13.6)	-	008	(13.6)	-
809	11.9	1	578	14.0	1	340	12.3	1	022	(13.6)	-
821	12.55	3	589	(14.0)	-	350	10.92	3	025	13.6	4
843	13.5	1	601	(12.2)	-	361	10.00	4	036	13.3	1
868	(13.6)	-	606	(13.2)	-	368	9.55	4	050	11.05	4
882	(14.0)	-	620	(13.6)	-	381	9.52	4	061	9.16	4
898	14.3	1	634	(12.2)	-	390	9.5	1	068	8.4	1
939	11.10	3	640	12.80	3	401	9.65	4	079	8.68	4
958	9.6	1	651	11.8	1	411	9.67	4	091	9.28	4
969	9.00	3	660	10.56	4	417	9.9	1	112	9.66	5
989	9.3	1	672	9.77	5	428	9.87	3	121	10.02	5
997	9.7	1	676	9.66	5	439	10.37	4	132	10.05	2
2,437,000+			691	9.40	5	454	11.6	1	140	10.55	5
014	10.0	1	699	9.47	5	462	12.00	4	151	11.82	5
024	10.6	1	707	9.70	5	470	12.30	4	161	12.37	3
029	10.9	1	721	9.82	5	487	13.4	1	166	12.6	1
040	11.8	1	730	10.35	5	501	14.0	1	182	(13.6)	-
058	12.3	1	739	10.70	5	520	(14.0)	-	194	(13.2)	-
070	13.3	1	751	11.17	5	524	13.5?	1	202	(14.0)	-
082	(13.6)	-	762	12.70	5	554	(12.2)	-	209	(13.6)	-
099	(12.7)	-	779	(13.2)	-	568	11.1	1	224	(13.2)	-
110	(13.6)	-	786	(13.6)	-	588	9.80	3	231	(13.6)	-
117	(13.6)	-	796	(13.2)	-	598	9.40	4	241	12.85?	1
132	(13.6)	-	807	(13.2)	-	611	8.95	5	250	(13.2)	-
143	14.0	1	838	(12.7)	-	621	9.05	4	264	(14.0)	-
166	11.6	1	847	13.5	1	627	8.7?	1	267	(13.2)	-
188	9.5	1	870	11.7	1	644	9.3	1	283	(12.7)	-
202	9.3	1	882	11.1	1	649	9.35	2	293	12.53	4
219	9.3	1	901	10.05	3	657	9.90	3	299	11.60	4
232	9.75	3	917	9.10	3	672	10.33	5	320	10.30	4
246	9.8	1	933	9.25	3	680	11.17	5	329	10.20	4
263	10.17	3	943	9.6	1	695	12.20	3	336	10.5	1
267	10.6	1	959	9.9	1	698	12.3	1	349	10.40	3
285	12.00	3	970	10.35	2	708	12.2	1	355	10.5	1
			993	12.15	3						

V.S.S. CIRCULAR No. 190 (cont).

TABLE 1 (cont).

<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u> <sub>v</sub>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u> <sub>v</sub>	<u>Wt.</u>	<u>MEAN</u> <u>J.D.</u>	<u>MEAN</u> <u>MAG.</u> <sub>v</sub>	<u>Wt.</u>
2,439,000+			2,440,000+			2,440,000+		
388	(12.4	-	154	(12.7	-	930	11.87	5
418	(13.6	-	159	(12.2	-	940	10.52	5
442	(14.0	-	174	13.4	1	951	9.56	5
466	(14.0	-	181	13.6	1	956	9.60	2
490	(13.2	-	186	(12.7	-	972	9.27	5
504	13.8	1	200	12.35	2	980	9.21	4
521	11.17	4	210	12.41	3	995	8.9	1
530	10.06	5	216	12.1	1	999	9.55	4
539	9.74	5	232	10.55	4	2,441,000+		
549	9.55	5	240	9.72	5	010	9.79	5
560	9.33	5	251	8.80	5	023	10.50	4
567	9.40	5	260	8.97	5	031	11.04	5
583	9.67	5	271	8.72	3	042	11.77	5
592	9.90	5	279	9.02	5	046	11.97	3
598	9.83	3	291	9.18	5	058	12.73	4
612	10.77	5	301	9.36	5	069	13.33	4
621	11.16	5	309	9.44	5	094	13.5	1
639	12.4	1	320	9.94	5			
648	13.4	1	328	10.17	5			
656	13.7	1	338	11.42	5			
685	(13.2	-	349	11.70	5			
700	(13.6	-	367	(11.7	-			
716	(13.6	-	380	13.5	1			
733	(13.2	-	429	(10.7	-			
741	(13.2	-	456	11.8	1			
763	11.4	1	501	9.67	3			
768	10.57	3	508	9.2	1			
790	9.78	4	531	9.70	4			
800	9.62	5	541	9.82	3			
810	9.55	5	551	10.30	4			
820	9.57	5	562	10.72	4			
829	9.90	5	572	10.9	1			
840	10.12	5	583	11.33	v			
852	10.65	5	584	11.6	1			
859	11.30	4	591	11.77	3			
881	12.70	4	601	(12.4	-			
891	(13.2	-	622	13.2	±			
897	(14.0	-	628	(13.2	-			
909	14.0	1	651	(13.2	-			
920	13.83	3	674	13.2	1			
931	(14.0	-	680	12.70	4			
944	(14.0	-	688	12.10	5			
971	12.64	4	703	10.37	5			
979	12.03	4	711	9.80	4			
992	10.40	4	732	9.23	4			
2,440,000+			742	9.10	4			
000	9.82	4	751	9.3	1			
008	9.35	3	769	9.15	3			
026	9.2	1	800	10.8	1			
037	9.3	1	836	(12.2	-			
061	9.45	3	861	(12.2	-			
072	10.1	1	878	(12.7	-			
084	10.35	3	891	(13.2	-			
090	10.80	3	902	(12.2	-			
114	(11.7	-	914	12.43	4			
118	(11.7	-	921	12.27	4			

V.S.S. CIRCULAR. No. 190 (cont).

TABLE 2.

SU DORADUS---OBSERVED MAXIMA.

<u>MAX No.</u>	<u>J.D.</u>	<u>MAG.</u> <sub>v</sub>	<u>Wt.</u>	<u>Int.</u> <sub>d</sub>	<u>O-C</u> <sub>d</sub>
-22	2,435,568	9.40	2	...	+ 5
-21	793	9.45	3	225	- 5
-20	2,436,009	8.60	3	216	-25
-19	261	9.80	4	252	- 8
-18	500	8.60	2	239	- 5
-17	749	10.05	3	249	+ 9
-16	976	9.05	3	227	+ 1
-15	2,437,206	9.35	3	230	- 5
-14	433	8.53	5	227	-13
-13	686	9.50	4	253	+ 5
-12	925	9.17	4	239	+ 8
-11	2,438,154	9.40	5	229	+ 2
-10	391	9.53	5	237	+ 4
- 9	620	9.05	5	229	- 3
- 8	863	9.95	5	243	+ 5
- 7	2,439,072	8.93	5	209	-21
- 6	340	10.27	5	268	+11
- 5	561	9.33	5	221	- 3
- 4	805	9.55	5	244	+ 5
- 3	2,440,030	9.35	5	225	- 5
- 2	263	8.78	5	233	- 7
- 1	506	9.70	5	243	+ 0
+ 0	741	9.17	4	235	+ 0
+ 1	976	9.21	5	235	+ 0

CORRECTIONS TO TABLE 1.

PAGE 2. For 2,436,429 11.2 1 read 2,436,429 14.2 1  
 4. 2,440,940 11.52 5 read 2,440,940 10.52 5