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VARIABLES IN MESSIER 5: A STUDY OF MOUNT WILSON 1917 OBSERVATIONS

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VARIABLES IN MESSIER 5: A STUDY OF MOUNT WILSON 1917 OBSERVATIONS

By Christine M. Coutts

Abstract

This paper portrays the light curves and gives the epochs of maximum light for 62 variables from Shapley's 1917 collection of photographs of M5. This completes the publication of their magnitudes.

Messier 5 is the fifth globular cluster in richness of variable stars, being surpassed only by Messier 3, Omega Centauri, IC 4499 and Messier 15. Of its 97 variables, 93 are of the RR Lyrae type. The other types represented are W Virginis (nos. 42 and 84), irregular (no. 50) and SS Cygni (no. 101). Periods have been determined for 91 of the RR Lyrae stars (Bailey 1917, Shapley 1927 and Oosterhoff 1941). Period changes have been investigated by Coutts and Sawyer Hogg (1969), and independently by Kukarkin and Kukarkina (1969).

This paper presents the results from the measurement of Shapley's collection of photographs taken with the Mount Wilson 60-inch telescope on eight different nights in 1917. When the periods were published by Shapley in 1927, the individual magnitudes from the plates were not given. For the above-mentioned study of the period changes, Dr. H. W. Babcock, Director of the Hale Observatories, kindly lent us the plates for measurement. The 1917 series on Seed 27 blue-sensitive emulsion consists of 115 exposures on 59 plates. Most of the plates have double exposures with the two images separated by approximately half a millimetre. Previously (Coutts and Sawyer Hogg 1969), measures from 62 exposures on 32 of the plates were published. The present paper, with results from 51 exposures on 26 plates, completes the study. One plate, no. 3753, was not measureable.

Only sixty-two of the 97 variables were measured. The double exposures made measuring difficult in crowded areas and where the resolution was insufficient. Of the 62, 61 are of the RR Lyrae type. The other is the W Virginis star no. 42, with a period of 25.738 days. (The W Virginis, no. 84, was too crowded for measurement.) The stars were measured with a Cuffey iris astrophotometer. The photographic sequence was derived by converting Arp's (1962) B, V sequence to the photographic system. The photographic magnitudes of the 62 variables are listed in Table I with the heliocentric Julian days of the observations. Attempts were made to determine which of the two exposures

TABLE I: PHOTOGRAPHIC MAGNITUDES

Plate	Julian Day	No. 1	No. 2	No. 3	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
3802	2421424.678	15.26	15.42	15.38			14.71	15.09	15.65	
	.680	15.36	15.42	15.36			14.76	15.07	15.70	15.24
3804	.697	15.69	15.69	15.72	14.84		15.20	15.09	15.76	15.20
	.699	15.69	15.91	15.81			15.26	15.00	15.65	15.72
3805	.716	15.85	15.50	15.85	14.72	15.77	14.97	14.82	15.69	
	.717	15.81	15.85	15.65			15.30	14.78	15.80	
3807	.733	15.50	15.57	15.50	14.96	15.57	15.14	14.67	15.77	15.72
	.735	15.57	15.65	15.45		15.65	15.20	14.59	15.65	15.48
3808	.749	15.42	15.95	15.62	14.76	15.20	15.33	14.57	15.91	15.24
	.750	15.54	15.66	15.50		15.05	15.40	14.62	15.69	15.48
3810	.769	15.54	15.91	15.57		14.45	15.38	14.59	15.70	15.50
	.771		15.91	15.69		14.50	15.42	14.65	15.68	15.72
3811	.785	15.76	15.69	15.69		14.38	15.45	14.74	15.80	15.50
	.787	15.85	15.76	15.69		14.38	15.45	14.76	15.99	15.42
3813	.803	15.81	15.60	15.65		14.55	15.54	14.73	15.80	15.54
	.805	15.65	15.57	15.45		14.53	15.38	14.84	15.72	15.38
3814	.820					14.73	15.48	14.91		
	.821					14.78	15.60	14.91	15.6	15.54
3816	.842									
3817	25.679	15.38	15.72	15.36	14.90	15.85	14.78	15.33	15.73	15.00
	.681	15.33	15.57	15.33		15.77	14.62	15.28	15.75	15.05
3819	.697	15.50	15.50	15.42	15.15	15.79	14.77	15.40		14.95
	.699	15.47	15.45	15.38		15.85	14.71	15.28		15.02
3820	.713	15.60	15.72	15.30	15.07		14.82	15.33	15.73	14.95
	.715	15.54	15.69	15.38		15.89	14.87	15.33	15.85	15.14
3822	.735	15.57	15.65	15.40	15.15	15.38	14.87	15.40	15.88	15.20
	.737	15.85	15.62	15.40		15.33	14.89	15.33	15.85	15.11
3823	.751	15.57	15.65	15.57	15.12	14.73	15.26	15.38	15.85	15.20
	.753	15.57	15.60	15.40	14.98	14.65	14.98	15.33	15.77	15.17
3825	.772	15.76	15.57	15.42	15.09	14.30	15.07	15.36	15.62	15.24
	.774	15.60	15.72	15.40		14.30	15.02	15.42	15.70	15.33
3826	.794	15.69	15.85	15.57	15.05	14.59	15.24	15.42	15.65	15.22
	.796	15.60	15.76	15.45		14.59	15.36	15.45	15.65	15.30
3828	.815	15.60	15.62	15.60	15.09	14.84	15.42	15.62	15.75	
	.818	15.72	15.57	15.50		14.78	15.48	15.57	15.77	15.40
3830	26.705	15.33	15.60	15.12	15.15	15.85	15.65	15.76	15.57	
	.707	15.30	15.45	15.02		15.70	15.57	15.62	15.57	14.73
3832	.721	15.38	15.40	15.02	15.09	15.42	15.42	15.54	15.80	14.24
	.723	15.26	15.45	14.84		15.45	15.22	15.62	15.70	14.26
3833	.758	15.57	15.72	14.82	15.00	14.36	14.67	15.42	15.61	14.34
	.762	15.60	15.62	14.82		14.40	14.73	15.36	15.70	14.51
3835	.777			15.22		14.67	14.67	15.60	15.90	14.65
	.778			15.24			14.86	15.20	15.64	14.80
3836	.793	16.00		15.30		14.88	15.05	15.48		14.67
	.794	15.81		15.14		14.80	15.05	15.17	15.77	14.57
3837	.801	16.00		15.20		14.65	14.95	15.22	15.85	14.80
	.803	16.00		15.22		14.74	14.95	15.11	15.90	14.69
3838	.810	15.76	15.30	15.12	15.28	14.88	14.95	14.82	16.00	14.71
	.812	15.81	15.72	15.05		15.00	14.97	14.84	15.66	14.71
3866	54.721									
	.723									

No. 12	No. 14	No. 15	No. 16	No. 18	No. 19	No. 20	No. 21	No. 25	No. 28	No. 29
14.84	15.20	14.86		14.22	14.62	14.74		14.40		14.95
14.82	15.28	14.84		14.40	14.65	14.82		14.36		15.07
15.12	14.76	15.17	15.30	14.50	14.97	14.69	15.57	14.27		15.09
15.24	14.89	15.05	15.14	14.84	14.97	14.69	15.65	14.35		15.26
	14.38	14.99	15.32	14.78	15.00	14.48	15.65			15.26
	14.40	15.05	15.23	14.73	15.17	14.55	15.54			15.40
15.22	14.57	14.99	15.16	14.67	15.02	14.71	15.57	14.35	15.65	15.50
15.20	14.48	14.91	14.97	14.71	15.00	14.74	15.28	14.27	15.62	15.42
15.40	14.53	15.09	15.18	14.93	15.30	14.76	15.77	14.32		15.26
15.42	14.65	15.09	15.04	14.86	15.30	14.76	15.66	14.25	15.48	15.69
15.36	14.71	15.17	15.30	15.00	15.30	14.95	15.70	14.50	15.07	15.66
15.54	14.80	15.26	15.30	15.09	15.54	15.02	15.80	14.52	15.17	15.69
15.42	14.84	15.42	15.28	15.22	15.44	14.97	15.85	14.44	14.82	15.50
15.38	14.86	15.48	15.32	15.30	15.72	14.89	15.85	14.54	14.82	15.57
15.54	15.02	15.42	15.32		15.54	14.93	15.77	14.44	14.57	15.65
15.44	15.02	15.42	15.28		15.50	14.95	15.69	14.43		15.60
15.47	15.11	15.62	15.44	15.48		15.07	15.57	14.59	14.71	
15.50	15.05	15.65	15.26	15.40		15.05	15.54	14.52	14.69	
15.30	14.67	15.07	14.59	15.07	15.36	15.60	15.42	14.32	15.80	15.57
15.22	14.57	15.02	14.35	14.98	15.30	15.54	15.40	14.27	15.69	15.65
15.28	14.36	14.97	14.14	15.12	15.48	15.38	15.60	14.41	15.70	15.50
15.24	14.32	15.02	14.02	15.02	15.50	15.40	15.50	14.32	15.66	15.50
15.44	14.50	15.05	14.16	15.12	15.62	15.42	15.50	14.39	15.80	15.88
15.38	14.45	15.05	14.04	15.20	15.60	15.54	15.42	14.41	15.69	15.70
15.48	14.65	15.02	14.18	15.33	15.54	15.50	15.48	14.37	15.69	15.72
15.45	14.69	15.14	14.18	15.33	15.69	15.57	15.44	14.41	15.65	15.65
15.54	14.78	15.20	14.20	15.50	15.85	15.57	15.69	14.44	15.75	15.77
15.50	14.71	15.14	14.18	15.44	15.76	15.45	15.57	14.35	15.63	15.73
15.64	14.86	15.24	14.38	15.57	15.76	15.72	15.81	14.41	15.75	15.77
15.70	15.00	15.20	14.30	15.57	15.85	15.76	15.57	14.43	15.70	15.80
15.80	14.91	15.38		15.65	15.72	15.69	15.69	14.46	15.75	15.95
15.67	15.00	15.40	14.36	15.57	15.85	15.88	15.69	14.50	15.64	15.77
15.80	15.20	15.65	14.49	16.00	15.88	15.62	15.66	14.52		15.71
15.70	15.17	15.54	14.52	16.00	15.85	15.69	15.70	14.48		15.69
15.62	14.67	15.05	15.26	15.65	15.62	15.20	14.55	14.35	15.69	15.73
15.60	14.73	15.00	15.26	15.40	15.57	15.17	14.53	14.32	15.54	15.71
15.57	14.67	15.07	15.38	15.88	15.88	15.26	14.59	14.39	15.80	15.69
15.66	14.57	15.05	15.2	15.62	15.72	15.17	14.57	14.37	15.66	15.71
15.73	14.89	15.14	15.35	15.91	15.72	15.38	14.84	14.41	15.72	15.72
15.85	15.00	15.14	15.28	15.95	15.65	15.24	14.84	14.39	15.57	15.60
16.00	14.91	15.44		16.00		15.26	15.14	14.67		
15.68	15.02	15.62		16.00	15.81	15.14	15.07	14.61		
15.69	15.14			16.00			15.57	14.65		
15.40	14.91	15.33		16.00	16.0		15.20	14.50		
	15.36	15.65		16.00	15.95		15.40	14.44		
	15.14	15.45		16.00	16.04		15.28	14.32		
16.00	15.17	15.54		16.00	15.91	15.42	15.12	14.56		15.3
16.00	15.24	15.50		16.00	16.08	15.48	15.12	14.54		15.17

Julian Day	No. 30	No. 31	No. 32	No. 33	No. 35	No. 38	No. 39	No. 40	No. 41	No. 42
2421424.678			14.84	14.82		15.22		15.12	15.36	12.10
.680			14.86	14.84		15.36		15.00	15.36	
.697	15.48	15.62	14.65	14.91	15.20		15.36	15.09	15.26	
.699	15.50	15.57	14.59	14.89	15.40		15.57	15.11	15.26	
.716	15.44	15.48	14.05	15.00	15.28		15.60	14.95	15.30	
.717	15.57	15.42	14.26	15.20	15.40		15.48	15.02	15.40	
.733	15.42	15.40	14.28	15.26	15.13		15.44	14.89	15.48	12.20
.735	15.24	15.26	14.30	15.07	15.08		15.40	14.73	15.48	
.749	15.50	15.40	14.53	15.22	15.06		15.57	14.78	15.48	12.10
.750	15.42	15.42	14.53	15.20	15.00	15.65	15.54	14.82	15.38	
.769	15.54	15.42	14.69	15.36		15.62	15.81	14.95	15.72	11.95
.771	15.62	15.48	14.80	15.33	15.13		15.81	14.91	15.65	
.785	15.57	15.30	14.86	15.40		15.45	15.75	14.93	15.70	11.75
.787	15.57	15.40	14.95	15.36	15.18	15.65	15.80	14.97	15.70	
.803	15.50	15.02	15.07	15.44	14.82		15.72	14.97	15.81	11.85
.805	15.47	15.02	14.97	15.42	14.82	15.54	15.65	14.93	15.62	
.820	15.72	15.07	15.22					15.18		11.75
.821	15.60	14.91	15.38		14.71			15.12		
.842										12.15
25.679	15.14	15.48	14.67	14.88			15.36	14.91	15.30	
.681	14.95	15.42	14.78	14.91	15.19	15.70	15.28	14.97	15.42	
.697	14.91	15.22	14.89	14.93	15.06		15.40	14.84	15.57	12.15
.699	14.74	15.12	14.78	15.00	15.10		15.30	14.95	15.57	
.713	14.82	14.97	15.00	14.95	15.00	15.60	15.42	14.84	15.42	12.05
.715	14.76	14.89	14.97	15.02	15.02	15.67	15.44	14.93	15.40	
.735	14.86	14.93	15.09	15.17	14.87	15.54	15.44	14.82	15.62	12.15
.737	14.84	14.95	15.20	15.12	14.71		15.54	14.89	15.69	
.751	15.00	14.91	15.38	15.26	14.64	15.62	15.62	14.86	15.72	12.05
.753	14.95	14.95	15.26	15.07	14.56	15.62	15.50	14.95	15.60	
.772	15.02	14.88	15.42	15.33		15.60	15.54	14.95	15.72	12.20
.774	15.00	14.88	15.42	15.17	14.68	15.62	15.54	14.93	15.72	
.794	15.17	15.00	15.57	15.12	14.58	15.48	15.62	15.09	15.60	12.00
.796	15.12	14.97	15.48	15.24	14.58	15.48	15.62	15.07	15.69	
.815	15.26	15.12	15.72	15.40	14.60	15.60	15.76	15.24	15.75	11.85
.818	15.26	15.14	15.69	15.44	14.64	15.70	15.62	15.26	15.66	
26.705	15.72	14.95	15.44	15.00	14.75	15.65	14.57	14.89	15.50	12.00
.707	15.57	15.00	15.44	14.91	14.56	15.60	14.53	14.93	15.50	
.721	15.75	15.17	15.69	15.17	14.68	15.60	14.67	15.02	15.65	12.25
.723	15.63	15.14	15.48	14.91	14.57	15.30	14.55	15.00	15.62	
.758	15.65	15.30	15.69	15.24	14.73	15.62	14.89	15.14	15.81	12.05
.762	15.65	15.26	15.81	15.22	14.68		14.89	15.24	15.50	
.777	15.65		15.85				14.80			12.15
.778	15.75	15.57	16.00		14.94		14.86			
.793	15.75					14.73	14.82		16.00	12.35
.794	15.57	15.65	15.85		15.00	14.59	14.69	15.42	15.69	
.801	15.73	15.65	16.00		14.97	14.76		15.50	15.68	12.20
.803	15.63		15.96		14.91	14.67		15.52	15.75	
.810		15.85				14.26	15.09	15.62	15.78	12.00
.812		15.69		15.48	15.08	14.20	15.26	15.50	15.66	
54.721										12.20
.723										

No. 43	No. 44	No. 45	No. 47	No. 52	No. 55	No. 58	No. 59	No. 61	No. 62	No. 63
15.22	14.65		15.00	14.55		14.86	15.05	15.38		15.17
15.12	14.76		15.07	14.80		14.84	15.07	15.36		15.20
14.76	14.89	15.72		15.09			14.93	15.70	15.62	15.62
14.95	14.89	15.60		15.40	14.97	14.59	15.07	15.77	15.70	15.54
14.84	15.02	15.70		15.14	15.00	14.55	14.53	15.73	15.26	15.57
14.97	15.05	15.95		15.30	15.02	14.89	14.50	15.85	15.38	15.65
15.05	15.22	15.70		15.24	15.12	15.24	14.59	15.65	15.14	15.40
15.07	15.20	15.73	15.38	15.30	14.91	15.22	14.56	15.65	15.00	15.36
15.05	15.17	15.65	15.50	15.38	14.86	15.28	14.50	15.75	15.02	15.68
14.93	15.12	15.57	15.57	15.28	14.95	15.57	14.84	15.67	14.91	15.75
15.09	15.22	15.60	15.54	15.42		15.72	14.80	15.80	14.91	15.65
15.17	15.14	15.65	15.48	15.44	15.05	15.69	14.91	15.75	15.05	15.70
15.17	15.20	15.36		15.44		15.62	14.74	15.69	14.91	15.75
15.12	15.17	15.33	15.57	15.37	15.24	15.65	14.84	15.72	14.88	15.85
15.26	15.50	14.76	15.42	15.40			14.89	15.65	14.88	15.70
15.22	15.17	14.93	15.42	15.50	15.22	15.69	14.95	15.57	14.86	15.68
15.26	15.22	14.78					15.02	15.72	15.05	15.73
15.26	15.22	14.78			15.38		15.00	15.50	15.00	15.66
15.60	14.82	15.22	15.28	15.14		15.02	15.48	15.05	15.07	15.50
15.60	14.80	15.24	15.14	15.16	15.02	15.00	15.54	15.09	15.14	15.62
15.57	14.80	15.22	15.30	15.22		14.86	15.57	14.93	15.20	15.75
15.50	14.78	15.30	15.17	15.38	14.89	14.93	15.50	14.97	15.17	15.65
15.54	14.91	15.17	15.26	15.24	14.93	15.28	15.72	15.14	15.26	15.68
15.57	14.82	15.24	15.22	15.33	15.02	15.22	15.76	15.17	15.30	15.73
15.69	14.95	15.33	15.33	15.30		15.28	15.65	15.20	15.33	15.62
15.57	14.89	15.24	15.28	15.50	14.95	15.28	15.60	15.14	15.44	15.77
15.54	14.95	15.22	15.40	15.38	15.17	15.42	15.48	15.30	15.60	15.68
15.36	14.97	15.24	15.36	15.42	15.09	15.42	15.42	15.22	15.57	15.66
15.54	15.30	15.40	15.48	15.44		15.54	14.84	15.28	15.67	15.65
15.62	15.12	15.33	15.48	15.50	15.05	15.62	14.88	15.36	15.69	15.70
15.44	15.14	15.20	15.40	15.44	15.20	15.76	14.53	15.48	15.70	15.65
15.42	15.12	15.24	15.36	15.62	15.14	15.85	14.42	15.42	15.70	15.75
15.72	15.22	15.30	15.54	15.55		15.69	14.42	15.54	15.60	15.77
15.60	15.22	15.28	15.38	15.55	15.46	15.69	14.48	15.42	15.54	15.80
15.02	14.80	14.38	14.93	15.20	15.12	15.38	15.57	15.20	15.20	15.57
15.00	14.80	14.53	14.89	15.26	14.95	15.24	15.50	15.14	15.12	15.57
15.00	14.89	14.50	15.02	15.36	15.02	15.42	15.57	14.65	15.00	15.66
15.00	14.91	14.42	15.00	15.34	15.00	15.33	15.57	14.62	15.00	15.68
15.14	15.17	14.65		15.38		15.50	15.50	14.73	14.86	15.73
15.17	15.12	14.71	15.22	15.60	15.14	15.42	15.48	14.78	14.86	15.70
15.07							15.65	15.00		16.00
15.14					15.42		15.48	14.71	14.97	15.85
15.17							15.50	14.65	15.26	16.00
15.00	15.42		15.40		15.36		15.40	14.57	15.09	15.90
15.20	15.57						15.22	14.53	15.22	15.90
15.20	15.57				15.42		15.22	14.57	15.24	15.85
15.09	15.65	15.09				15.69	15.90	14.91	15.26	15.90
15.12	15.50	14.95			15.65	15.88	15.77	15.02	15.22	15.90

Julian Day	No. 64	No. 65	No. 66	No. 67	No. 68	No. 69	No. 70	No. 71	No. 72	No. 73
2421424.678				14.40		16.00	15.30		14.24	15.23
.680				14.40			15.36		14.36	15.23
.697	15.72	15.67		14.38			14.71	15.66	14.30	
.699	15.72	15.70		14.35			14.86	15.90	14.30	
.716	15.72	15.85	15.26	14.30	14.59		15.17	15.70	14.30	14.80
.717	15.60	15.88	15.50	14.38	14.93		15.36	15.90	14.30	14.97
.733	15.57	15.75	15.48	14.86	15.17		15.36	15.75	14.32	15.22
.735	15.50	15.48	15.33	15.02	15.17		15.60	15.60	14.57	15.14
.749	15.76	15.95	15.69	15.07	15.85		15.76	15.95	14.59	15.30
.750	15.48	15.60	15.50	15.00	15.48		15.54	15.77	14.67	15.28
.769	15.67	15.86	15.42	15.17			15.48		14.91	15.33
.771	15.73	15.80	15.65	15.30			15.69		15.07	15.45
.785	15.75	15.65	15.70	15.38			15.87	16.00	15.36	15.72
.787	15.73	15.62	15.70	15.40			15.73		15.36	15.60
.803	15.67	15.60	15.54	15.38			15.87		15.54	15.72
.805	15.48	15.57	15.65	15.28			15.65		15.38	15.60
.820										
.821										
.842										
25.679	15.50		15.22		15.17	15.90			16.00	14.59
.681	15.38	15.65	15.20		15.24	15.90	15.28	15.85	15.95	14.84
.697	15.50	15.69	15.30	14.73	15.42		15.36			14.95
.699	15.40	15.57	15.30	14.78	15.48		15.30			14.97
.713	15.68	15.69	15.22	14.84	15.50		14.73	16.00		15.02
.715	15.65	15.78	15.20	14.80	15.42		14.78	16.00		15.02
.735	15.76	15.73	15.33	14.53	15.48		14.74			14.93
.737	15.62	15.36	15.36	14.65	15.42		14.74			15.07
.751	15.73	15.88	15.50	14.73	15.80		15.00			15.20
.753	15.65	15.69	15.48	14.67	15.75		14.78			14.88
.772	15.75	15.70	15.48	14.84	15.73		15.12			15.24
.774	15.75	15.62	15.44	14.82	15.67		15.05			15.36
.794	15.70	15.89	15.44	15.07	15.85		15.26		15.20	15.42
.796	15.64	15.65	15.54	15.14	15.80		15.24		15.07	15.42
.815	15.77	15.75	15.63	15.12			15.42		14.36	15.60
.818	15.77	15.60	15.70	15.00			15.36		14.38	15.48
26.705	15.28	15.77	14.91	15.54			16.00	15.95	16.00	14.84
.707	15.20	15.50	14.89	15.44			15.90	15.77	15.95	14.84
.721	15.26	15.75	15.14	15.38			15.90			15.00
.723	15.17	15.65	15.12	15.28			15.98			15.05
.758	15.42	15.73	15.12	14.69	15.50		15.95	16.00	15.92	14.97
.762	15.28	15.48	15.17	14.59	15.48		15.95	16.00	16.00	15.02
.777	15.22	15.85	14.91	14.30						14.86
.778	15.38	15.57	15.30	14.30						14.82
.793	15.44	15.20		14.36						15.48
.794	15.24	14.84	15.50	14.32			15.57			15.30
.801		14.76	15.60	14.30			15.48			15.36
.803		14.76	15.64	14.30			15.64			15.30
.810	15.68	14.89	15.57	14.48			15.33			15.24
.812	15.50	14.74	15.62	14.65			15.20			15.30

No.74	No.75	No.76	No.77	No.78	No.79	No.80	No.81	No.83	No.87	No.92
			14.73	15.20	14.89	14.78	14.57			
			14.74	15.38	14.89	15.20	14.46			
13.90	14.71	14.50	14.89	15.24		14.91	15.12		15.02	
13.90	14.89	14.67	15.07	15.36		15.33	14.76	15.85	15.26	14.54
13.90	14.69	14.67	14.93	15.09	15.38	14.88	14.93	15.77	14.91	14.70
13.90	14.89	14.57	14.93	15.24	15.38	15.50	14.78	15.75	15.17	14.77
13.90	15.00	14.71	14.91	15.00	15.07	15.00	15.02	15.77	14.93	14.42
13.90	14.89	14.78	14.91	15.05		15.20	14.73	15.77	14.95	14.44
13.90	15.24	14.76	15.07	14.84	15.22	14.71	15.00	15.72	14.89	14.09
13.92	15.17	14.74	15.00	14.97	15.09	15.07	14.80	15.36	14.93	14.57
13.91	15.26	14.82	14.97	14.82	15.14	14.74	15.17	15.64	14.91	14.72
13.98	15.30	14.95	15.09	15.05	15.22	15.02	15.09	15.62	15.05	14.72
14.18	15.36	14.93	15.09	14.97	15.00	14.84	15.17	15.60	15.02	14.40
14.24	15.28	15.05	15.09	14.95		15.05	15.17	15.60	15.07	14.38
14.10	15.30	15.05	15.02	15.12	14.95	14.76	15.24	15.64	14.91	14.38
14.30	15.28	14.95	15.07	15.00	14.84	14.91	15.09	15.46	15.02	14.07
14.36	15.38	15.09	15.17	15.12	15.00		15.26		15.02	14.22
14.32		15.20	15.09	15.14	14.93		15.30	15.50	15.09	14.57
14.02	15.57	15.09	15.09	15.30	15.24	15.07	15.75	15.40	15.17	14.48
13.96	15.65	15.02	15.24	15.33	15.12	15.36	15.55	15.36	15.26	14.30
14.16	15.69	14.89	15.14	15.44	15.36	15.02	15.85	15.48	15.17	14.26
14.18	15.57	15.02	15.17	15.48	15.22	15.36	15.60	15.50	15.28	14.07
13.98	15.81	15.22	15.20	15.38	15.36	14.82	15.73	15.57	15.17	14.65
14.14	15.76	15.30	15.22	15.38	15.40	15.26	15.54	15.60	15.22	14.42
14.04	15.60	15.26	15.12	15.36	15.33	14.91	15.07	15.50	15.14	14.76
14.00	15.62	15.24	15.24	15.42	15.17	15.20	14.95	15.57	15.26	14.40
14.16	15.76	15.30	15.20	15.33	15.24	14.78	14.95	15.50	15.22	14.22
14.08	15.81	15.24	15.22	15.26	15.26	14.97	14.74	15.57	15.20	14.12
14.12	15.73	15.30	15.17	15.17	14.97	14.67	14.48	15.60	15.24	14.40
14.18	15.80	15.36	15.12	15.07	14.97	14.97	14.38	15.48	15.24	14.38
14.20	15.77	15.40	15.28	14.89	14.89	14.65	14.57	15.50	15.30	14.00
14.24	15.73	15.38	15.30	14.95	15.00	14.88	14.65	15.57	15.36	14.02
14.30	15.73	15.57	15.40	14.93	14.93	14.74	14.78	15.54	15.38	13.50
14.28	15.77	15.48	15.33	14.97	14.91	14.84	14.74	15.44	15.60	13.34
14.28	15.02	15.24	15.28	15.20	15.28		15.72	15.02	15.38	14.07
14.12	14.95	15.20	15.36	15.22	15.20	15.28	15.42	15.14	15.40	14.17
14.16	15.12	15.36	15.26	15.26	15.30	14.97	15.70	15.20	15.36	14.00
14.26	15.07	15.24	15.26	15.44	15.17	15.38	15.48	15.24	15.38	13.97
14.24	15.07	15.00	15.38	15.40	15.07	14.89	15.60	15.36	15.24	13.18
14.18	15.02	14.91	15.36	15.40	15.17	15.14	15.65	15.28	15.12	13.34
14.26	15.26		15.44	15.80	15.44			15.77		13.62
14.26	15.14		15.26	15.65	15.20		15.72	15.73		13.26
	15.20	15.09		15.68	15.07	15.00		15.69		13.73
	15.07	14.95		15.68	14.74	15.14		15.60		13.60
	15.20	14.95		15.67	14.76			15.60		13.91
	15.14	15.05		15.80	14.80					13.70
14.18	15.40	14.97	15.48	15.50	15.02	14.82		15.92		14.02
14.22	15.44	14.97	15.50	15.48	15.02	14.97		15.76		13.93

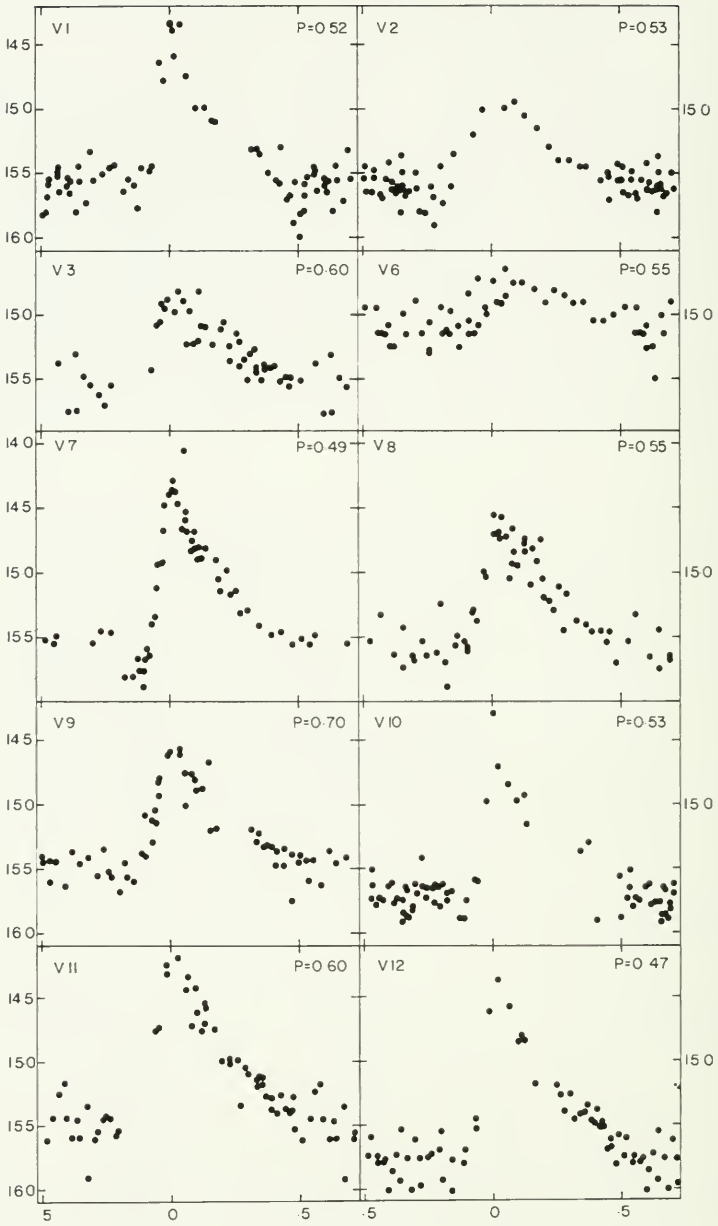

FIG. 1—Light Curves of the 62 Variables.

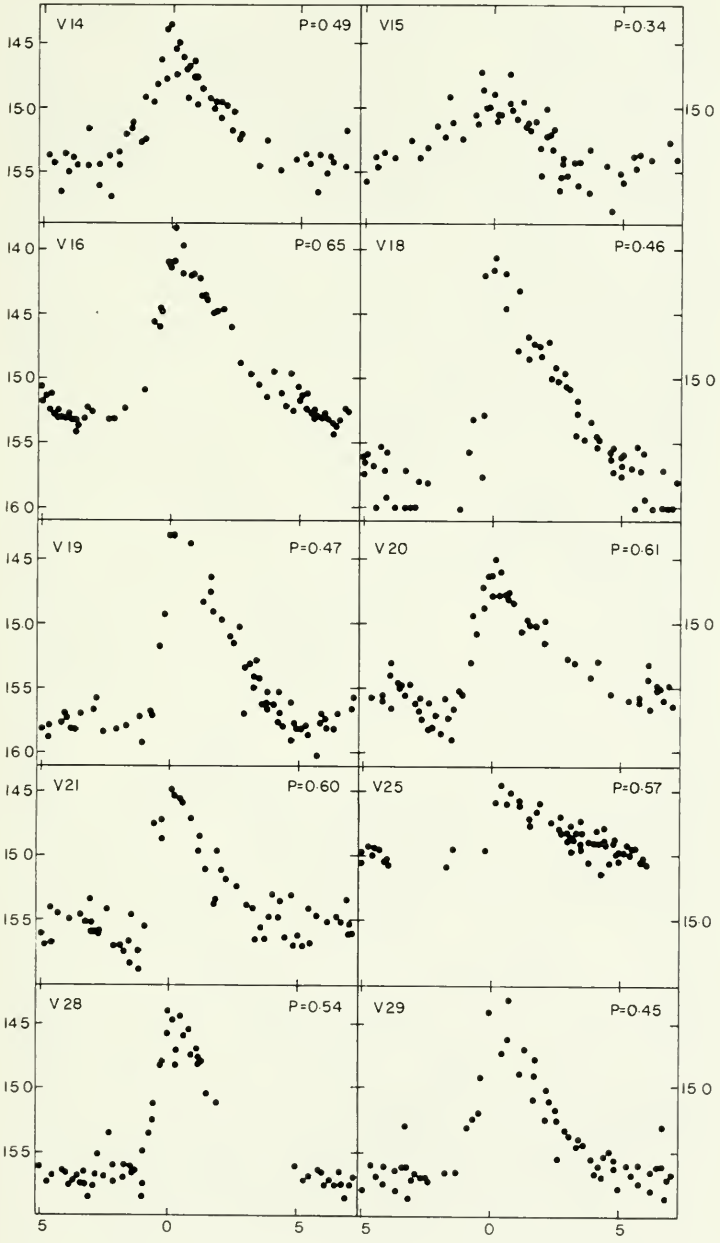

FIG. 1, cont'd—Light Curves of the 62 Variables.

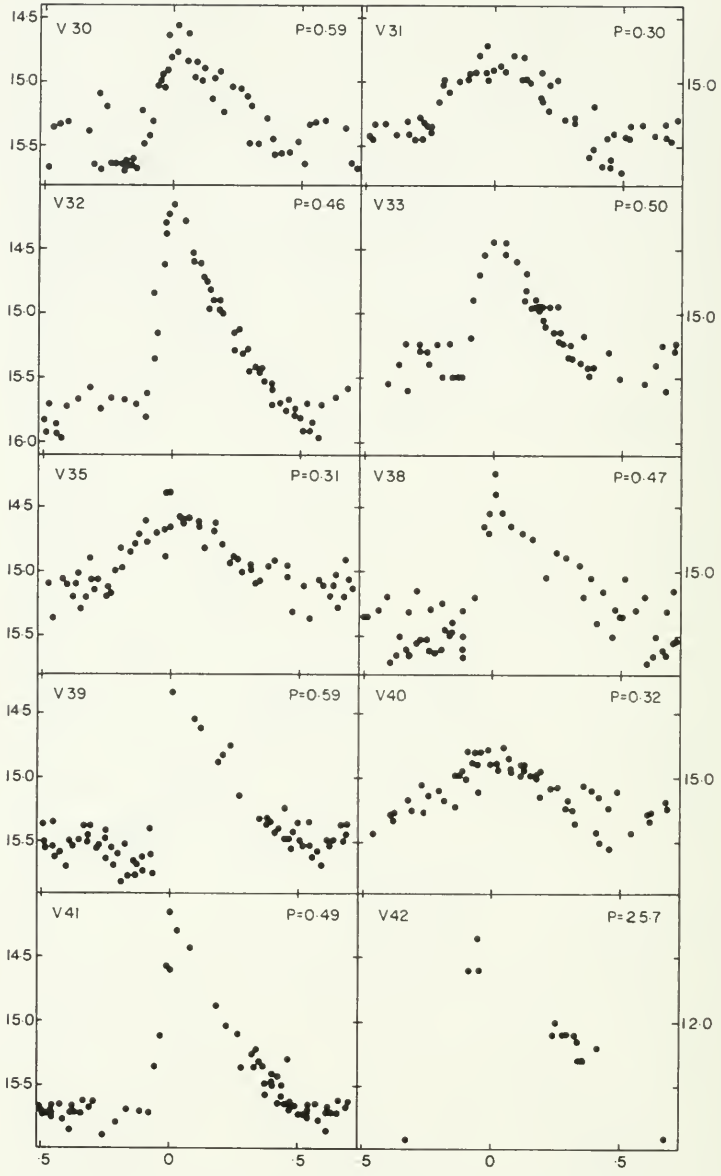

FIG. 1, cont'd—Light Curves of the 62 Variables.

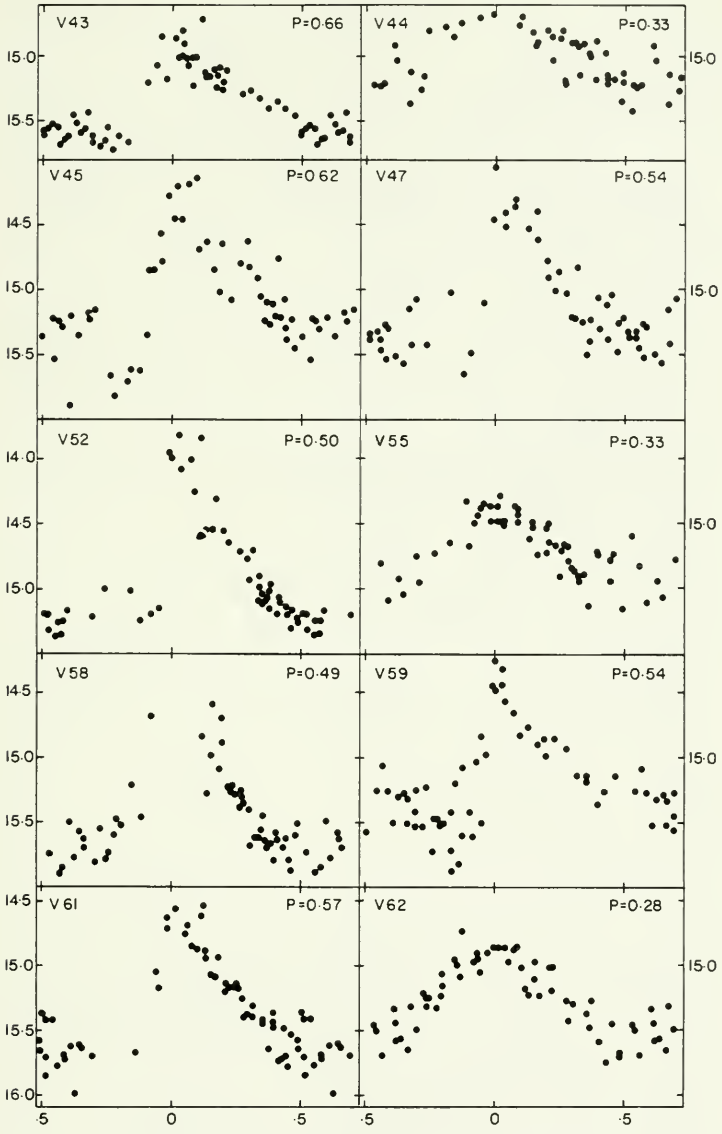

FIG. 1, cont'd—Light Curves of the 62 Variables.

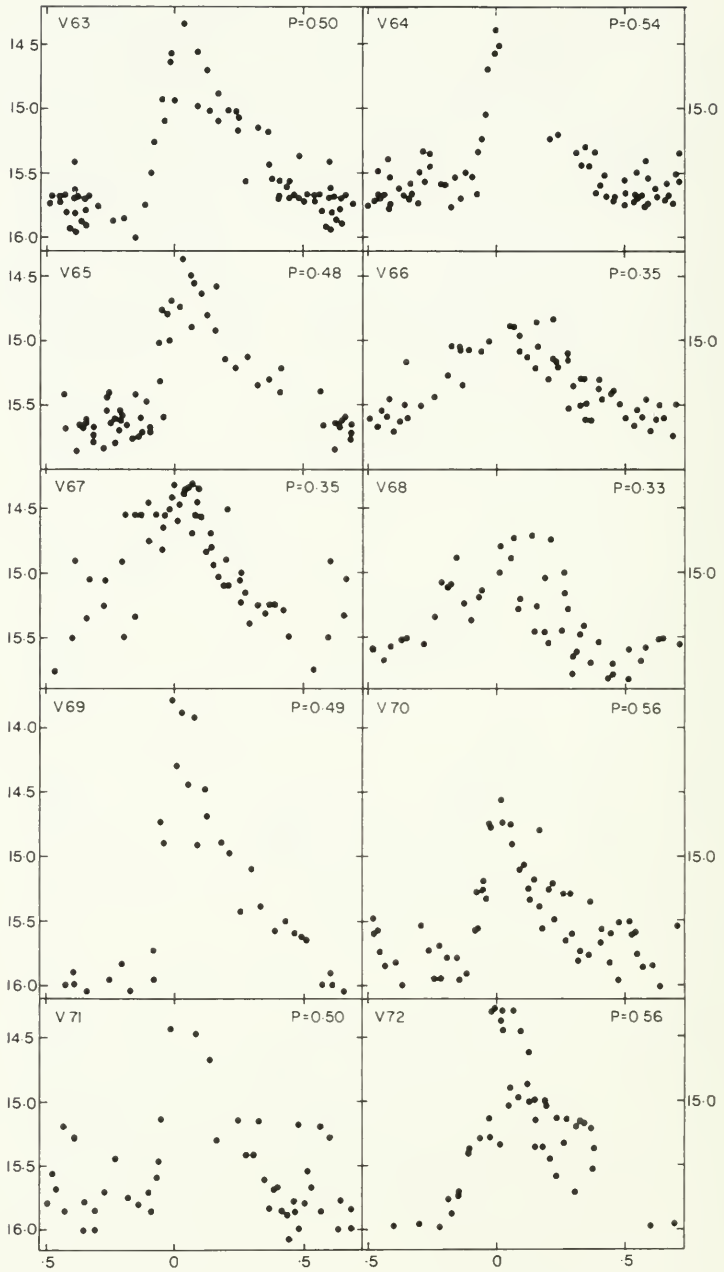

FIG. 1, cont'd—Light Curves of the 62 Variables.

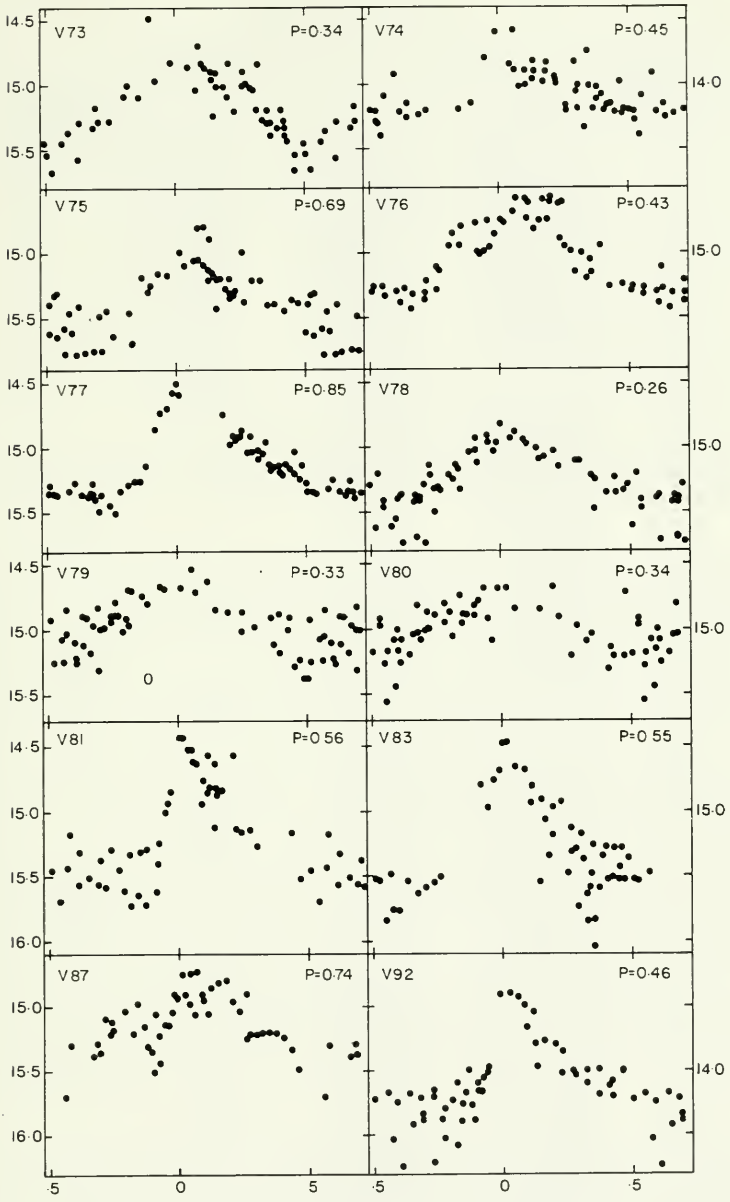

FIG. 1, cont'd—Light Curves of the 62 Variables.

TABLE II

ELEMENTS OF THE VARIABLES

Var.	Epoch of Max.	Period	β	Comments on Period
1	21424.976	0.5217856		const
2	21424.886	0.526		
3	21424.937	0.6001832	0.04	
6	21424.744	0.5488311	−0.05	
7	21424.779	0.4943896	0.07	
8	21424.575	0.546224	0.09	
9	21424.739	0.698895		const
10	21424.852	0.5306628	−0.02	
11	21424.943	0.5958914		const
12	21424.621	0.4677144	−0.06	
13		0.5131223	0.04	
14	21424.726	0.4872423		
15	21424.693	0.3367607	0.03	
16	21424.406	0.6476223	0.12	
18	21424.631	0.46388		
19	21424.603	0.4699535	0.16	
20	21424.699	0.6094759		const
21	21424.876	0.6048941		const
25	21424.525	0.508		
27		0.4703		
28	21424.805	0.5439474	−0.13	
29	21424.584	0.4514334	−0.12	
30	21424.518	0.5921755		const
31	21424.560	0.3005826		const
32	21424.710	0.4577863		const
33	21424.616	0.5014722	0.04	
34		0.5681431		const
35	21424.548	0.3081197		
36		0.6277229		const
38	21424.927	0.4704441		
39	21424.881	0.5890346	0.05	
40	21424.762	0.3173286	0.03	
41	21424.538	0.4885749	−0.04	
42	21418.129	25.738		W Virginis
43	21424.689	0.6602264		const
44	21424.643	0.329		
45	21424.847	0.6166364		const
47	21424.978	0.5397295	−0.09	
52	21424.522	0.5017848		
55	21424.719	0.3288968	0.03	
58	21424.620	0.491265		
59	21424.712	0.5420259		const
61	21424.456	0.5686157	0.10	
62	21424.789	0.2814092		
63	21424.500	0.4976763	0.04	
64	21424.954	0.5445075	−0.13	
65	21424.902	0.480691		
66	21424.574	0.350682		
67	21424.681	0.3490462		
68	21424.647	0.3342797		
69	21424.881	0.4948743		const
70	21424.603	0.5585255	0.18	
71	21424.968	0.5024676	0.07	

TABLE II—*continued*

Var.	Epoch of Max.	Period	β	Comments on Period
72	21424.682	0.562		
73	21424.626	0.3401118	0.05	
74	21424.667	0.4539961	−0.06	
75	21424.639	0.6854136	0.07	
76	21424.663	0.432421	0.03	
77	21424.521	0.8451121	0.11	
78	21424.760	0.2648174		const
79	21424.548	0.3331387		const
80	21424.836	0.3365424	−0.02	
81	21424.647	0.5573235	−0.18	
83	21424.955	0.5533073		const
87	21424.736	0.7383888		const
92	21424.893	0.4635789		

Remarks to Table II

Vars. 13, 27, 34 and 36 were all studied on the David Dunlap plates by Coutts and Sawyer Hogg (1969), but were too crowded for measurement on the Mount Wilson 1917 plates.

was taken first. Both Dr. Shapley and Miss Henrietta Swope were consulted. The latter perused the Mt. Wilson records, but no definite decision was made. In constructing the Table it was assumed that the later exposure is the one to the west. This point is not of great importance because an average of the two was used in forming the light curves of the 62 variables which are shown in Figure I.

The curves, based on observations from eight different nights, are well defined and are therefore very useful for any studies of period changes of the variables. The periods adopted are the same as those used in Coutts and Sawyer Hogg (1969) and are listed in Table II, along with the epoch of maximum light for 1917. Also listed is β, the rate of period change, adopted from Coutts and Sawyer Hogg (1969) or Coutts (1969). Of the 61 RR Lyrae type stars, 46 are of type *a* and have periods ranging from 0.45 to 0.85 days and median 0.54 days. The other 15 are of type *c* with periods between 0.26 and 0.43 days and median 0.33 days. This is the period distribution for a cluster of the Oosterhoff type I.

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