

PHOTOELECTRIC UBV OBSERVATIONS OF RR LYRAE
VARIABLE STARS, SECOND LIST

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RESUMEN

Se da la fotometría de setenta estrellas RR Lyrae seleccionadas de la lista de van Herk. Se obtuvieron magnitudes y colores durante máximo y mínimo de sesenta y cuatro estrellas. Para una estrella se dan los valores sólo durante el mínimo. Para las cinco faltantes, las observaciones fueron insuficientes para determinar máximos y mínimos. En la Tabla 4 se listan magnitudes y colores promedio de ciento setenta y cuatro estrellas bien observadas. Estos promedios corresponden a máximo y mínimo.

ABSTRACT

Photoelectric UBV observations are given for 70 RR Lyrae stars selected from van Herk's list of field variables with known proper motion or radial velocity. Magnitudes and colors at maximum and minimum light were obtained for 64 stars, while only minimum light values were observed for one star. For the remaining five stars the observations were insufficient to determine either light extreme. In Table 4 are listed the mean colors and magnitudes at light extreme for all the 174 stars adequately observed during the course of this program.

Key words: PHOTOMETRY — VARIABLE STARS.

I. INTRODUCTION

At the suggestion of Professor J. Oort of Leiden Observatory, we undertook, starting in the fall of 1963, to obtain photoelectric UBV magnitudes and colors at minimum and maximum light of all the brighter RR Lyrae stars selected, from a list provided by Dr. van Herk, as being accessible to us in Tucson. The measures obtained in the first portion of the program have already been published (Fitch, Wiśniewski and Johnson 1966; hereinafter referred to as Paper I). Observations on the concluding portion of the program were obtained up to the spring of 1970 and are reported here.

II. THE OBSERVATIONS

The equipment and observing procedures were essentially the same as described in Paper I. The

observations listed in Table 1 were obtained with the 28-inch and 61-inch telescopes at the Catalina observing stations of LPL by Bookmeyer Lee and Wiśniewski; and the data reductions were carried out in the LPL data-processing center by Messrs. J. Kij and R. I. Mitchell. The measures listed in Table 2 were obtained with the 36-inch telescope at the Kitt Peak observing station of Steward Observatory by Fitch, and processed on the CDC 6400 computer at the University of Arizona Computing Center with programs written by Fitch.

As in Paper I, U, B, and V magnitudes at light extrema were read from smoothed curves through the phase plots of the measures. The resulting colors and magnitudes at individually observed light extremes are given in Table 3, where minima and maxima observed on the same night are listed on

the same line. Finally, Table 4 gives our best estimates, for each of the 174 stars observed during the full course of this program, of V, B-V, and U-B at minimum and maximum light, together with the period P (taken from the GCVS or the Cracow ephemeris), the *observed* rise time $(M-m)/P$, and the *observed* V amplitude ΔV . When two or more observed extrema for one star agreed well, their average value was used in Table 4; but when the amplitude was highly variable, the larger amplitude values were used. As indicated in the last column of Table 4, the RRc-type variable RW Ari was found by Wiśniewski (1972) to also be a member of an eclipsing system.

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TABLE 1 (CONTINUED)

Table with columns: HELIO. JD 2400000 +, V, HELIO. JD 2400000 +, B, HELIO. JD 2400000 +, U, HELIO. JD 2400000 +, V, HELIO. JD 2400000 +, B, HELIO. JD 2400000 +, U. Sub-sections include RM ARI and UU 800. Data rows list numerical values for various parameters.

UBV OBSERVATIONS OF RR LYRAE STARS

TABLE 1 (CONTINUED)

Table with columns for Heliocentric Julian Day (HELIO. JD), magnitude (V, B, U), and star ID. The table is divided into sections: ST LEO, UX LYR, SZ LEO, FN LYR, AA LEO, and UX LYR. Each section lists multiple stars with their respective magnitudes and IDs.

UBV OBSERVATIONS OF RR LYRAE STARS

TABLE 1 (CONTINUED)

HELIO. JD 2400000 +	V	HELIO. JD 2400000 +	B	HELIO. JD 2400000 +	U	HELIO. JD 2400000 +	V	HELIO. JD 2400000 +	B	HELIO. JD 2400000 +	U
BP PEG						BF SER					
39416.7568 .7645	11.847 11.932	39416.7548 .7624	12.114 12.226	39416.7589 .7666	12.380 12.462	4033A.8865 .8899	12.465 12.465	4033B.8818 .8856	12.988 12.979	4033B.8838 .8874	12.908 12.971
RY PSC						CH SER					
39422.7561 .7623	11.921 11.858	39422.7547 .7602	12.139 12.062	39422.7582 .7644	12.235 12.165	39625.8251 .8986	12.048 11.617	39625.8244 .8978	12.426 11.877	39625.8257 .8996	12.547 12.053
39479.8338 .8068	11.879 11.876	39479.8324 .8047	12.080 12.108	39479.8358 .8082	12.273 12.317	39970.8950 .9057	11.606 11.621	39970.8942 .8978	11.872 11.878	39970.8960 .9006	12.031 12.051
39789.8338 .8068	11.978 11.978	39789.8324 .8047	12.154 12.183	39789.8358 .8082	12.273 12.317	39973.9186 .9258	11.585 11.621	39973.9140 .9249	11.816 11.835	39973.9195 .9267	11.961 12.032
39795.6105 .6175	12.476 12.706	39795.6077 .6154	13.022 13.139	39795.6126 .6188	12.703 13.223	39974.8982 .9018	11.829 11.760	39974.8973 .9009	11.993 12.057	39974.8991 .9029	12.133 12.171
39800.8449 .8449	11.961 11.961	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39975.8126 .8126	11.793 11.793	39975.8118 .8118	11.993 11.993	39975.8140 .8140	12.291 12.291
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39976.8126 .8126	11.793 11.793	39976.8118 .8118	11.993 11.993	39976.8140 .8140	12.291 12.291
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39977.9186 .9186	11.585 11.585	39977.9140 .9140	11.816 11.816	39977.9195 .9195	11.961 11.961
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39978.9186 .9186	11.585 11.585	39978.9140 .9140	11.816 11.816	39978.9195 .9195	11.961 11.961
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39979.9186 .9186	11.585 11.585	39979.9140 .9140	11.816 11.816	39979.9195 .9195	11.961 11.961
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39980.8847 .8847	11.951 11.951	39980.8832 .8832	12.274 12.274	39980.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39981.8847 .8847	11.951 11.951	39981.8832 .8832	12.274 12.274	39981.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39982.8847 .8847	11.951 11.951	39982.8832 .8832	12.274 12.274	39982.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39983.8847 .8847	11.951 11.951	39983.8832 .8832	12.274 12.274	39983.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39984.8847 .8847	11.951 11.951	39984.8832 .8832	12.274 12.274	39984.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39985.8847 .8847	11.951 11.951	39985.8832 .8832	12.274 12.274	39985.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39986.8847 .8847	11.951 11.951	39986.8832 .8832	12.274 12.274	39986.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39987.8847 .8847	11.951 11.951	39987.8832 .8832	12.274 12.274	39987.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39988.8847 .8847	11.951 11.951	39988.8832 .8832	12.274 12.274	39988.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39989.8847 .8847	11.951 11.951	39989.8832 .8832	12.274 12.274	39989.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39990.8847 .8847	11.951 11.951	39990.8832 .8832	12.274 12.274	39990.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39991.8847 .8847	11.951 11.951	39991.8832 .8832	12.274 12.274	39991.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39992.8847 .8847	11.951 11.951	39992.8832 .8832	12.274 12.274	39992.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39993.8847 .8847	11.951 11.951	39993.8832 .8832	12.274 12.274	39993.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39994.8847 .8847	11.951 11.951	39994.8832 .8832	12.274 12.274	39994.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39995.8847 .8847	11.951 11.951	39995.8832 .8832	12.274 12.274	39995.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39996.8847 .8847	11.951 11.951	39996.8832 .8832	12.274 12.274	39996.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39997.8847 .8847	11.951 11.951	39997.8832 .8832	12.274 12.274	39997.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39998.8847 .8847	11.951 11.951	39998.8832 .8832	12.274 12.274	39998.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	39999.8847 .8847	11.951 11.951	39999.8832 .8832	12.274 12.274	39999.8856 .8856	12.321 12.321
39800.8449 .8449	11.978 11.978	39800.8435 .8435	12.292 12.292	39800.8463 .8463	12.189 12.189	40000.8847 .8847	11.951 11.951	40000.8832 .8832	12.274 12.274	40000.8856 .8856	12.321 12.321

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TABLE 1 (CONTINUED)

Table with columns for HELIO. JD, V, B, U and sub-sections like CH SER, AD VIR, AF VIR, and UV VIR. Contains numerous numerical entries.

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TABLE 2

STANDARD OBSERVATORY UBV MAGNITUDES OF RR LYRAE STARS

Table with columns for HELIO. JD 2400000 +, V, B, U magnitudes, and star names/IDs. Includes sections for CC AND, 14 AUR, SS CVN, RX CVN, DO CEP, RO AQR, BT AQR, SV CVN, and RX GET.

UBV OBSERVATIONS OF RR LYRAE STARS

TABLE 2 (CONTINUED)

Table with columns for HELIO JD (2400000 +), V, B, U, Z COM, DELTA DEL, and RX CET. It lists various RR Lyrae stars and their photometric observations in multiple bands.

UBV OBSERVATIONS OF RR LYRAE STARS

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TABLE 2 (CONTINUED)

HELIO. JD 2400000 +	V	B	U	HELIO. JD 2400000 +	V	B	U	HELIO. JD 2400000 +	V	B	U
RHO PUP				AM VIR				AM VIR			
39887.8186	2.818	3.225	3.406	39600.7476	11.575	11.963	11.997	39951.8703	11.745	12.224	12.282
.8215	2.814	3.215	3.395	.7525	11.528	11.915	11.895	.8739	11.756	12.224	12.311
.8241	2.812	3.208	3.383	.7610	11.427	11.785	11.831	.8774	11.760	12.244	12.309
.8401	2.787	3.184	3.358	.7659	11.400	11.749	11.786	.8979	11.788	12.278	12.318
.8427	2.784	3.188	3.352	.7820	11.321	11.627	11.773	.9020	11.798	12.260	12.340
.8459	2.784	3.181	3.351	.7907	11.333	11.616	11.736	.9052	11.792	12.287	12.333
.8483	2.785	3.186	3.359	.7955	11.318	11.611	11.722	.9141	11.793	12.274	12.323
.8527	2.781	3.179	3.354	.8033	11.349	11.584	11.767	.9176	11.801	12.270	12.337
.8551	2.787	3.193	3.368	39613.6714	11.472	11.917	11.974	.9227	11.798	12.275	12.309
.8577	2.789	3.198	3.374	.6783	11.418	11.786	11.851	.9336	11.792	12.268	12.281
XX VIR				.6922	11.334	11.681	11.792	.9373	11.775	12.292	12.277
39997.6651	12.777	13.249	13.263	39656.6730	11.820	12.302	12.397	.9411	11.765	12.299	12.268
.6714	12.762	13.231	13.259	.6798	11.821	12.311	12.371	.9453	11.746	12.211	12.204
.6771	12.780	13.236	13.293	.6853	11.819	12.310	12.360	.9491	11.721	12.189	12.169
.6843	12.786	13.225	13.274	.6907	11.821	12.293	12.366	.9525	11.702	12.149	12.112
.6894	12.794	13.238	13.286	.6968	11.785	12.268	12.346	BB VIR			
.7199	12.744	13.178	13.205	.7023	11.780	12.242	12.294	39599.6628	10.807	10.908	10.987
.7255	12.736	13.179	13.249	.7073	11.749	12.197	12.238	.6688	10.839	10.914	11.031
.7310	12.729	13.150	13.200	.7124	11.711	12.154	12.188	.6735	10.868	10.946	11.076
.7442	12.665	13.083	13.108	.7180	11.672	12.106	12.106	.6794	10.890	11.000	11.105
.7593	12.554	12.957	12.886	.7231	11.602	12.026	12.013	.6909	10.948	11.068	11.209
.7812	12.275	12.610	12.572	.7299	11.509	11.913	11.924	.6977	10.983	11.110	11.266
.7869	12.231	12.555	12.532	.7459	11.412	11.776	11.836	39613.7309	11.360	11.603	11.679
.7984	12.153	12.437	12.456	.7510	11.414	11.776	11.821	.7358	11.340	11.564	11.669
.8024	12.111	12.393	12.433	.7560	11.416	11.786	11.841	.7489	11.272	11.491	11.591
.8069	12.063	12.334	12.391	39950.7562	11.416	11.775	11.852	.7458	11.165	11.365	11.469
.8262	11.798	11.983	12.091	.7607	11.398	11.762	11.826	.7500	11.061	11.243	11.318
.8304	11.750	11.928	12.003	.7654	11.394	11.751	11.840	.7590	10.835	10.973	11.064
.8442	11.641	11.768	11.884	.7733	11.370	11.708	11.786	.7625	10.788	10.877	10.982
.8482	11.626	11.757	11.884	.7772	11.351	11.681	11.776	.7683	10.725	10.796	10.885
.8535	11.600	11.736	11.846	.7836	11.311	11.641	11.722	.7764	10.708	10.789	10.878
.8576	11.591	11.723	11.849	.7874	11.299	11.612	11.716	.7812	10.725	10.805	10.893
.8644	11.587	11.713	11.797	.7922	11.277	11.577	11.675	.7889	10.752	10.841	10.948
.8682	11.590	11.707	11.818	.8058	11.220	11.531	11.645	39614.6437	11.403	11.615	11.706
.8718	11.589	11.707	11.811	.8095	11.212	11.511	11.623	.6472	11.414	11.636	11.773
.8755	11.592	11.710	11.824	.8132	11.211	11.516	11.635	.6514	11.420	11.637	11.749
AM VIR				.8174	11.209	11.493	11.617	.6548	11.416	11.648	11.752
39600.7425	11.643	12.073	12.078	.8219	11.207	11.493	11.616	.6583	11.418	11.647	11.765
				.8281	11.201	11.496	11.633	.6618	11.412	11.639	11.768
				.8324	11.210	11.503	11.640	.6652	11.412	11.637	11.782
				.8361	11.219	11.513	11.637				
				39951.8668	11.742	12.218	12.302				

TABLE 3

INDIVIDUAL MINIMA AND MAXIMA OF RR LYRAE STARS

NAME	MINIMUM LIGHT		MAXIMUM LIGHT		HELJD MAX 2400000 +	NAME	MINIMUM LIGHT		MAXIMUM LIGHT		HELJD MAX 2400000 +			
	V	B-V	U-B	U-B			V	B-V	U-B	U-B				
CC AND	9.47	+0.35	+0.12	9.31	+0.31	+0.11	B9 ERI	11.91	+0.46	+0.05	10.96	+0.22	+0.13	40151.993
CC AND	12.43	+0.46	+0.12	11.57	+0.23	+0.11	B9 ERI	11.90	+0.44	+0.04	11.12	+0.10	+0.06	40125.865
TZ AQR	12.61	+0.45	+0.05	11.56	+0.17	+0.06	RX FOR	12.46	+0.40	+0.03	12.23	+0.13	+0.08	38527.952
B0 AOR	11.92	+0.49	+0.07	11.56	+0.17	+0.06	RX FOR	13.35	+0.44	+0.02	11.53	+0.11	+0.15	40387.815
B3 AOR	12.84	+0.52	+0.21	10.77	+0.11	+0.15	AF HER	12.79	+0.49	+0.08	11.79	+0.16	+0.12	39478.934
BR AOR	12.58	+0.43	+0.18	11.78	+0.14	+0.15	CE HER	12.73	+0.42	+0.06	11.26	+0.13	+0.15	39832.011
RW ARI	5.03	+0.22	+0.10	12.13	+0.30	+0.16	UU HYA	12.43	+0.46	+0.08	11.61	+0.15	+0.16	39951.713
14 AUR	12.81	+0.44	+0.06	4.95	+0.20	+0.10	XX HYA	12.62	+0.45	+0.07	11.99	+0.15	+0.06	40364.812
UU B00	11.51	+0.04	+0.07	11.51	+0.04	+0.07	D6 HYA	13.03	+0.41	+0.02	10.77	+0.46	+0.27	39394.765
UU B00	11.50	+0.02	+0.02	14.50	+0.02	+0.02	FY HYA	11.26	+0.84	+0.37	10.76	+0.06	+0.09	39509.945
UU B00	11.54	+0.22	+0.09	10.54	+0.22	+0.09	CZ LAC	11.26	+0.84	+0.37	10.76	+0.06	+0.09	39509.945
UY B00	11.23	+0.39	+0.02	10.25	+0.10	+0.11	ST LEO	12.02	+0.44	+0.05	11.91	+0.20	+0.12	39556.742
UY B00	11.27	+0.37	+0.02	12.09	+0.12	+0.12	SZ LEO	12.79	+0.46	+0.06	12.08	+0.25	+0.12	39832.950
UY B00	13.30	+0.48	+0.07	12.09	+0.12	+0.12	SZ LEO	12.87	+0.49	+0.04	11.61	+0.09	+0.11	39596.655
RZ CAM	13.29	+0.47	+0.11	11.41	+0.21	+0.02	WM LEO	12.83	+0.41	+0.06	11.24	+0.07	+0.08	39565.854
RZ CAM	13.29	+0.47	+0.11	11.51	+0.18	+0.12	AA LEO	12.51	+0.46	+0.13	12.53	+0.05	+0.11	39055.539
Z CVN	12.36	+0.33	+0.04	12.19	+0.17	+0.10	TV L19	13.90	+0.47	+0.15	14.47	+0.11	+0.17	40381.88
Z CVN	12.97	+0.41	+0.06	10.88	+0.12	+0.21	Y LVR	15.39	+0.47	+0.22	11.91	+0.15	+0.12	39416.643
RX CVN	11.92	+0.43	+0.01	11.52	+0.11	+0.16	UX LVR	13.23	+0.48	+0.05	11.69	+0.32	+0.25	39622.892
RZ CVN	11.86	+0.43	-0.01	11.52	+0.11	+0.16	UX LVR	12.63	+0.58	+0.22	11.28	+0.39	+0.31	39967.925
SS CVN	12.27	+0.38	+0.02	11.15	+0.17	+0.10	FN LVR	13.23	+0.48	+0.05	11.69	+0.32	+0.25	39622.892
ST CVN	11.44	+0.39	+0.10	11.15	+0.17	+0.10	FN LVR	12.63	+0.58	+0.22	11.28	+0.39	+0.31	39967.925
ST CVN	11.57	+0.38	+0.09	11.04	+0.26	+0.17	V452 OPH	12.60	+0.74	+0.25	11.85	+0.26	+0.23	40358.954
ST CVN	13.00	+0.24	+0.01	11.15	+0.16	+0.07	V716 OPH	12.60	+0.74	+0.25	11.71	+0.25	+0.18	39655.880
SV CVN	13.34	+0.38	+0.01	12.20	+0.16	+0.10	V716 OPH	12.95	+0.57	+0.14	11.69	+0.23	+0.20	39416.739
SK CVN	7.32	+0.35	+0.03	12.03	+0.03	+0.03	V784 OPH	12.95	+0.57	+0.14	11.82	+0.20	+0.13	39422.772
DQ CEP	7.32	+0.35	+0.03	7.22	+0.33	+0.14	V784 OPH	13.04	+0.63	+0.26	10.78	+0.25	+0.21	39391.795
RV CET	11.22	+0.47	+0.07	7.22	+0.33	+0.14	V816 OPH	12.72	+0.42	+0.08	2.78	+0.40	+0.17	39887.843
RV CET	11.15	+0.47	+0.09	10.67	+0.29	+0.07	BP PEC	12.17	+0.40	+0.18	11.05	+0.06	-0.02	39998.746
RV CET	11.80	+0.44	+0.02	10.94	+0.17	+0.10	RY PSC	12.06	+0.38	+0.16	11.61	+0.27	+0.16	39970.894
RV CET	12.36	+0.43	+0.08	11.25	+0.15	+0.10	RY PSC	12.06	+0.38	+0.16	11.59	+0.23	+0.18	39973.914
RZ CET	12.36	+0.46	-0.01	11.22	+0.16	+0.13	SS PSC	12.02	+0.40	+0.13	11.62	+0.24	+0.12	39980.313
UU CET	13.80	+0.41	+0.05	12.48	0.00	+0.05	SS PSC	12.02	+0.40	+0.13	11.36	+0.08	+0.18	39992.720
V COM	13.76	+0.39	+0.03	13.14	+0.09	+0.14	SS PSC	2.87	+0.43	+0.19	11.59	+0.12	+0.10	39997.868
Z COM	14.29	+0.41	+0.06	11.54	+0.12	0.00	RHO PUP	12.78	+0.46	+0.04	10.94	+0.14	+0.06	40333.771
Z COM	14.49	+0.39	+0.07	13.73	+0.18	+0.13	BF SER	12.01	+0.21	+0.14	11.21	+0.29	+0.12	39950.820
RT COM	14.32	+0.27	+0.02	13.62	+0.20	+0.10	CH SER	11.80	+0.47	+0.06	11.42	+0.23	+0.12	39517.947
RT COM	13.40	+0.11	+0.01	13.40	+0.11	+0.01	CH SER	11.80	+0.47	+0.06	10.71	+0.08	+0.09	39613.776
RV COM	13.87	+0.16		13.87	+0.16		CH SER	12.16	+0.46	+0.10				
RV COM	13.92	+0.20		13.92	+0.20		CH SER	12.14	+0.46	+0.10				
RY COM	11.68	+0.06	+0.05	11.68	+0.06	+0.05	CM SER	12.16	+0.46	+0.10				
RY COM	10.91	+0.18	+0.20	10.91	+0.18	+0.20	CM SER	12.14	+0.46	+0.10				
RY COM	12.83	+0.44	+0.04	39983.708			CM SER	12.16	+0.46	+0.10				
ST COM	11.80	+0.47	+0.07	39910.867			CM SER	12.14	+0.46	+0.10				
ST COM	12.08	+0.48	+0.14	11.87	+0.34	+0.32	CM SER	11.42	+0.23	+0.12				
H CRT	12.56	+0.65	+0.54	4.38	+0.28	+0.07	BB VIR	12.56	+0.36	+0.06				
BX DEL	4.46	+0.30	+0.09	4.38	+0.28	+0.07	BC VIR	12.66	+0.29	+0.05				
DELTA DEL							BC VIR							

UBV OBSERVATIONS OF RR LYRAE STARS

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TABLE 4

OBSERVATIONAL DATA ON RR LYRAE STARS

NAME	PERIOD	M-m/P	ΔV	MINIMUM LIGHT			MAXIMUM LIGHT			REMARKS
				V	B-V	U-B	V	B-V	U-B	
SW AND	0.442	0.18	0.95	10.09	+0.52	+0.21	9.14	+0.21	+0.18	
XX AND	0.722	0.17	0.96	11.13	+0.43	+0.06	10.17	+0.17	+0.15	
AT AND	0.617	0.21	0.50	10.92	+0.56	+0.09	10.42	+0.42	+0.17	
CC AND	0.125	0.40	0.16	9.47	+0.35	+0.12	9.31	+0.31	+0.11	A,P
WY ANT	0.574	0.15	0.89	11.23	+0.43	+0.02	10.34	+0.17	+0.12	
SW AQR	0.459	0.13	1.29	11.68	+0.43	+0.09	10.39	+0.10	+0.10	
SX AQR	0.536	0.13	1.14	12.19	+0.34	+0.05	11.05	+0.09	+0.08	
TZ AQR	0.571	0.20	0.86	12.43	+0.46	+0.12	11.57	+0.23	+0.11	
BO AQR	0.694	0.17	1.05	12.61	+0.45	+0.05	11.56	+0.17	+0.06	
BR AQR	0.482	0.13	1.15	11.92	+0.49	+0.07	10.77	+0.11	+0.15	
BS AQR	0.198	0.30	0.45	9.61	+0.39	+0.10	9.16	+0.22	+0.09	
BT AQR	0.407	0.15	1.06	12.84	+0.52	+0.21	11.78	+0.14	+0.15	P
CY AQR	0.061	0.37	0.71	11.14	+0.35	+0.00	10.43	+0.16	+0.14	
AA AQL	0.362	0.17	1.34	12.34	+0.55	+0.20	11.00	+0.05	+0.14	
V341 AQL	0.578	0.14	1.22	11.35	+0.47	+0.09	10.13	+0.10	+0.14	
X ART	0.651	0.15	0.94	9.91	+0.56	+0.12	8.97	+0.28	+0.20	
RV ART	0.093	0.50	0.41	12.26	+0.44	+0.10	11.85	+0.29	+0.16	A,P
RH ART	0.261	0.50	0.45	12.58	+0.43	+0.18	12.13	+0.30	+0.16	E,P
TZ AUR	0.392	0.14	1.31	12.45	+0.48	+0.14	11.14	+0.08	+0.08	
14 AUR	0.122	0.50	0.08	5.03	+0.22	+0.10	4.95	+0.20	+0.10	A,P
RS BOO	0.377	0.19	1.12	10.85	+0.46	+0.17	9.73	+0.09	+0.12	
RU BOO	0.493	0.13	1.21	14.18	+0.44	+0.09	12.97	+0.09	+0.13	
ST BOO	0.622	0.21	0.92	11.41	+0.41	+0.03	10.49	+0.12	+0.11	
SV BOO	0.581	0.17	0.74	13.52	+0.44	+0.11	12.78	+0.17	+0.16	
SW BOO	0.514	0.13	1.12	12.88	+0.39	+0.06	11.76	+0.09	+0.12	
SZ BOO	0.523	0.12	1.13	13.05	+0.35	+0.08	11.92	+0.11	+0.10	
TV BOO	0.313	0.36	0.59	11.30	+0.22	+0.04	10.71	+0.10	+0.13	
TW BOO	0.532	0.13	1.05	11.68	+0.40	+0.05	10.63	+0.12	+0.12	
UU BOO	0.457	0.10	1.31	12.81	+0.44	+0.06	11.50	+0.03	+0.04	P
UY BOO	0.651	0.18	1.00	11.25	+0.38	+0.02	10.25	+0.10	+0.11	A,P
YZ BOO	0.104	0.32	0.39	10.75	+0.31	+0.04	10.36	+0.18	+0.08	
RZ CAM	0.480	0.05	1.21	13.30	+0.48	+0.09	12.09	+0.12	+0.12	P
RM CNC	0.547						11.60	+0.24	+0.08	
SS CNC	0.367	0.13	1.23	12.72	+0.52	+0.24	11.49	+0.09	+0.13	
TT CNC	0.563	0.16	1.05	11.78	+0.48	+0.10	10.73	+0.24	+0.19	
VZ CNC	0.178	0.27	0.67	7.91	+0.37	+0.10	7.24	+0.17	+0.14	A,P
W CVN	0.552	0.17	0.84	10.90	+0.42	+0.10	10.06	+0.15	+0.17	
Z CVN	0.653		0.90	12.36	+0.33	+0.04	11.46	+0.20	+0.07	A,P
RR CVN	0.559	0.15	1.21	13.10	+0.45	+0.08	11.89	+0.09	+0.10	
RU CVN	0.573	0.13	1.12	12.48	+0.39	+0.02	11.36	+0.10	+0.11	
RX CVN	0.540	0.17	0.78	12.97	+0.41	+0.06	12.19	+0.17	+0.10	
RZ CVN	0.567	0.17	1.01	11.89	+0.43	+0.00	10.88	+0.12	+0.21	P
SS CVN	0.479	0.15	0.75	12.27	+0.38	+0.02	11.52	+0.11	+0.16	
ST CVN	0.329	0.45	0.39	11.50	+0.31	+0.09	11.11	+0.20	+0.11	A
SV CVN	0.668	0.16	0.80	13.00	+0.38	+0.01	12.20	+0.16	+0.10	P
SW CVN	0.442	0.12	1.31	13.34	+0.35	+0.03	12.03	+0.03	+0.03	
RV CAP	0.448	0.15	1.35	11.57	+0.42	+0.10	10.22	+0.06	+0.12	A
YZ CAP	0.273	0.40	0.46	11.52	+0.33	+0.08	11.06	+0.20	+0.19	
RZ CEP	0.309	0.32	0.49	9.68	+0.56	+0.24	9.19	+0.40	+0.30	
DQ CEP	0.079	0.50	0.10	7.32	+0.35	+0.15	7.22	+0.33	+0.14	A,P
RR CET	0.553						9.15	+0.18	+0.14	
RV CET	0.623	0.19	0.52	11.19	+0.47	+0.08	10.67	+0.29	+0.07	P
RX CET	0.574	0.14	0.86	11.80	+0.44	+0.02	10.94	+0.17	+0.10	
RZ CET	0.511	0.25	1.12	12.36	+0.43	+0.08	11.24	+0.16	+0.12	
UU CET	0.606	0.20	0.82	12.36	+0.46	-0.01	11.54	+0.12	+0.00	P
S COM	0.587	0.14	1.24	12.13	+0.40	+0.04	10.89	+0.08	+0.10	
U COM	0.293	0.35	0.47	11.97	+0.26	+0.08	11.50	+0.14	+0.11	
V COM	0.469	0.08	1.28	13.76	+0.39	+0.03	12.48	+0.00	+0.05	P
Z COM	0.547	0.13	1.15	14.29	+0.41	+0.06	13.14	+0.09	+0.14	P
RT COM	0.565	0.19	0.87	14.49	+0.39	+0.07	13.62	+0.20	+0.10	A,P
RV COM	0.350	0.40	0.42	14.32	+0.27	+0.02	13.90	+0.18	+0.09	
RY COM	0.469	0.20	1.16	12.84	+0.42	+0.07	11.68	+0.06	+0.05	
ST COM	0.599		0.89	11.80	+0.47	+0.07	10.91	+0.18	+0.20	P
RV CRB	0.332	0.36	0.56	11.70	+0.30	+0.04	11.14	+0.17	+0.16	
W CRT	0.412	0.14	1.28	12.08	+0.48	+0.14	10.80	+0.07	+0.09	
X CRT	0.733	0.18	0.64	11.76	+0.43	+0.02	11.12	+0.23	+0.08	
UY CYG	0.561	0.16	0.87	11.46	+0.55	+0.12	10.59	+0.26	+0.18	
XX CYG	0.135	0.20	0.85	12.13	+0.40	+0.08	11.28	+0.12	+0.12	
XZ CYG	0.467	0.19	0.92	10.04	+0.35	+0.05	9.12	+0.11	+0.13	
OH CYG	0.420	0.13	1.04	11.97	+0.56	+0.23	10.93	+0.17	+0.26	
BX DEL	1.092	0.20	0.69	12.56	+0.65	+0.54	11.87	+0.34	+0.32	P
DX DEL	0.473	0.19	0.74	10.26	+0.53	+0.20	9.52	+0.27	+0.18	
DELTA DEL	0.157	0.50	0.08	4.46	+0.30	+0.09	4.38	+0.28	+0.07	A,P
RH DRA	0.443	0.21	0.98	12.03	+0.38	+0.06	11.05	+0.02	+0.14	
SU DRA	0.660	0.16	1.00	10.27	+0.41	+0.04	9.27	+0.11	+0.14	
SW DRA	0.570	0.18	1.00	10.94	+0.43	+0.09	9.94	+0.16	+0.16	
XZ DRA	0.476	0.20	1.05	10.64	+0.45	+0.13	9.59	+0.12	+0.13	
RX ERI	0.587	0.16	0.88	10.10	+0.53	+0.09	9.22	+0.21	+0.21	
SV ERI	0.714	0.30	0.59	10.22	+0.45	+0.11	9.63	+0.33	+0.15	
BB ERI	0.570	0.12	0.95	11.91	+0.46	+0.05	10.96	+0.22	+0.13	P
RX FOR	0.597	0.14	1.34	12.46	+0.40	+0.03	11.12	+0.10	+0.06	P
SS FOR	0.495	0.14	1.08	10.57	+0.35	+0.04	9.49	+0.07	+0.02	
RR GEM	0.397	0.12	1.22	11.88	+0.50	+0.22	10.66	+0.12	+0.11	
SZ GEM	0.501	0.12	1.24	12.22	+0.41	+0.05	10.98	+0.09	+0.16	
SW HER	0.493	0.10	1.21	14.73	+0.40	+0.05	13.52	+0.12	+0.09	
TW HER	0.400	0.14	1.28	11.80	+0.49	+0.15	10.52	+0.08	+0.10	

REMARKS: A=VARIABLE AMPLITUDE, P=VARIABLE PERIOD, E=ECLIPSING SYSTEM.

TABLE 4 (CONTINUED)

NAME	PERIOD	M-m/P	ΔV	MINIMUM LIGHT			MAXIMUM LIGHT			REMARKS
				V	B-V	U-B	V	B-V	U-B	
VX HER	0.455	0.20	1.31	11.20	+0.42	+0.07	9.89	+0.09	+0.08	
VZ HER	0.440	0.13	1.29	12.01	+0.39	+0.06	10.72	+0.05	+0.08	
AF HER	0.630	0.10	1.12	13.35	+0.44	+0.02	12.23	+0.13	+0.08	
AG HER	0.649	0.14	1.25	13.24	+0.39	+0.03	11.99	+0.07	+0.12	
AR HER	0.470	0.20	0.92	11.63	+0.33	+0.03	10.71	+0.08	+0.12	
CE HER	1.209	0.11	1.26	12.79	+0.49	+0.08	11.53	+0.11	+0.15	
DY HER	0.149	0.28	0.48	10.63	+0.42	+0.16	10.15	+0.26	+0.15	
SV HYA	0.479	0.17	1.03	10.94	+0.44	+0.06	9.91	+0.13	+0.11	P
SZ HYA	0.537	0.16	1.40	11.84	+0.47	+0.13	10.44	+0.07	+0.04	A,P
UU HYA	0.524	0.14	0.94	12.73	+0.42	+0.06	11.79	+0.16	+0.12	
VX HYA	0.223	0.25	0.51	10.88	+0.40	+0.09	10.37	+0.24	+0.12	A,P
WZ HYA	0.538	0.16	1.01	11.28	+0.45	+0.09	10.27	+0.18	+0.17	
XX HYA	0.508	0.12	1.17	12.43	+0.46	+0.08	11.26	+0.13	+0.15	P
DG HYA	0.430	0.15	1.01	12.62	+0.45	+0.07	11.61	+0.15	+0.16	P
DH HYA	0.488	0.13	1.24	12.60	+0.42	+0.07	11.36	+0.14	+0.11	
FY HYA	0.637	0.15	1.13	13.03	+0.41	+0.02	11.90	+0.15	+0.06	P
CZ LAC	0.432		0.49	11.26	+0.84	+0.37	10.77	+0.46	+0.27	A
DE LAC	0.254	0.33	0.32	10.41	+0.54	+0.22	10.09	+0.42	+0.21	
RR LEO	0.452	0.13	1.30	11.24	+0.41	+0.08	9.94	+0.07	+0.12	
RV LEO	0.515	0.14	1.15	14.41	+0.37	+0.05	13.26	+0.14	+0.10	
RX LEO	0.653	0.23	0.71	12.27	+0.44	+0.04	11.56	+0.20	+0.13	
SS LEO	0.626	0.12	1.14	11.56	+0.42	+0.04	10.42	+0.12	+0.11	
ST LEO	0.478	0.21	1.26	12.02	+0.44	+0.05	10.76	+0.06	+0.09	P
SZ LEO	0.534	0.33	0.88	12.79	+0.46	+0.06	11.91	+0.20	+0.12	
TV LEO	0.402	0.12	1.10	12.56	+0.44	+0.05	11.46	+0.12	+0.16	
HW LEO	0.603	0.17	0.79	12.87	+0.49	+0.04	12.08	+0.25	+0.12	P
AA LEO	0.599	0.14	1.22	12.83	+0.41	+0.06	11.61	+0.09	+0.11	
V LMI	0.544	0.15	1.13	12.23	+0.44	+0.07	11.10	+0.11	+0.07	
X LMI	0.684	0.17	1.05	12.81	+0.44	+0.04	11.76	+0.14	+0.11	
U LEP	0.581	0.13	1.21	11.11	+0.38	+0.02	9.90	+0.08	+0.06	
TV LIB	0.270	0.12	1.27	12.51	+0.46	+0.13	11.24	+0.07	+0.08	
EH LIR	0.088	0.29	0.53	10.01	+0.34	+0.07	9.48	+0.18	+0.11	
Y LIR	0.503	0.15	1.32	13.90	+0.47	+0.15	12.58	+0.05	+0.11	
RR LYR	0.567	0.19	0.95	8.08	+0.44	+0.04	7.13	+0.16	+0.13	A,P
RZ LYR	0.511	0.14	1.10	12.02	+0.42	+0.06	10.92	+0.17	+0.10	A,P
UX LYR	0.543	0.10	0.92	15.39	+0.47	+0.22	14.47	+0.11	+0.17	
FN LYR	0.527	0.13	1.32	13.23	+0.48	+0.05	11.91	+0.15	+0.12	
KX LYR	0.441	0.19	1.05	11.43	+0.48	+0.16	10.38	+0.10	+0.17	
ST OPH	0.450	0.16	1.35	12.74	+0.67	+0.18	11.39	+0.28	+0.23	
V445 OPH	0.397	0.18	0.86	11.39	+0.74	+0.37	10.53	+0.41	+0.31	
V452 OPH	0.597	0.13	0.94	12.63	+0.58	+0.22	11.69	+0.32	+0.25	
V567 OPH	0.130	0.40	0.33	11.41	+0.66	+0.35	11.08	+0.52	+0.35	
V716 OPH	1.116	0.13	1.32	12.60	+0.74	+0.15	11.28	+0.39	+0.31	
V784 OPH	0.500	0.15	1.10	12.95	+0.56	+0.15	11.85	+0.26	+0.23	
V816 OPH	0.381	0.16	1.33	13.04	+0.63	+0.26	11.71	+0.25	+0.18	
VV PEG	0.488	0.12	1.18	12.31	+0.40	+0.02	11.13	+0.13	+0.10	
AV PEG	0.390	0.17	0.99	10.88	+0.54	+0.21	9.89	+0.18	+0.19	
BH PEG	0.641	0.20	0.75	10.74	+0.51	+0.10	9.99	+0.27	+0.10	
BP PEG	0.219	0.15	0.48	12.17	+0.40	+0.18	11.69	+0.23	+0.20	
CG PEG	0.467	0.17	0.89	11.53	+0.54	+0.18	10.64	+0.22	+0.20	
DH PEG	0.256	0.26	0.54	9.79	+0.34	+0.17	9.25	+0.26	+0.21	A
DY PEG	0.073	0.29	0.55	10.58	+0.35	+0.10	10.03	+0.21	+0.14	
TU PER	0.607	0.16	1.11	13.05	+1.02	+0.60	11.94	+0.68	+0.46	A
AR PER	0.426	0.18	0.90	10.84	+0.78	+0.41	9.94	+0.43	+0.35	
RU PSC	0.390	0.48	0.42	10.40	+0.35	+0.07	9.98	+0.22	+0.14	
RY PSC	0.530	0.15	0.90	12.72	+0.42	+0.08	11.82	+0.20	+0.13	
SS PSC	0.288	0.50	0.38	11.16	+0.38	+0.20	10.78	+0.25	+0.21	
XX PUP	0.517	0.13	1.28	11.77	+0.41	+0.07	10.49	+0.07	+0.15	
BB PUP	0.480	0.14	0.96	12.55	+0.56	+0.13	11.59	+0.30	+0.18	
RHO PUP	0.141	0.50	0.09	2.87	+0.43	+0.19	2.78	+0.40	+0.17	
V440 SGR	0.477	0.15	1.13	10.73	+0.50	+0.12	9.60	+0.16	+0.10	
RU SCL	0.493	0.12	1.29	10.75	+0.41	+0.07	9.46	+0.07	+0.08	
VY SER	0.714	0.20	0.69	10.46	+0.44	+0.04	9.77	+0.22	+0.09	
AN SER	0.522	0.20	1.01	11.43	+0.53	+0.22	10.42	+0.17	+0.20	
AP SER	0.254	0.45	0.42	11.30	+0.34	+0.07	10.88	+0.19	+0.13	
AR SER	0.330						11.69	+0.22	+0.09	
AT SER	0.747	0.20	0.92	11.92	+0.42	+0.06	11.00	+0.18	+0.10	
AV SER	0.488	0.14	1.16	12.00	+0.51	+0.22	10.84	+0.23	+0.21	
RF SER	1.165	0.11	1.51	12.56	+0.43	+0.06	11.05	+0.06	+0.02	
CW SER	0.189	0.40	0.43	12.04	+0.39	+0.15	11.61	+0.24	+0.15	P
T SEX	0.325	0.42	0.47	10.29	+0.31	+0.10	9.82	+0.22	+0.18	
SS TAU	0.370	0.15	1.10	13.02	+0.66	+0.32	11.92	+0.33	+0.24	
U TRI	0.447	0.16	1.32	13.20	+0.50	+0.16	11.88	+0.15	+0.08	A
RV UMA	0.468	0.20	1.12	11.23	+0.41	+0.07	10.11	+0.06	+0.11	
SX UMA	0.307	0.38	0.56	11.14	+0.24	+0.04	10.58	+0.12	+0.14	A
TU UMA	0.558	0.16	0.98	10.24	+0.41	+0.07	9.26	+0.15	+0.15	
ST VIR	0.411	0.12	1.24	12.08	+0.42	+0.08	10.84	+0.07	+0.08	
UU VIR	0.476	0.16	1.16	11.07	+0.45	+0.06	9.91	+0.10	+0.10	
UV VIR	0.587	0.21	0.91	12.27	+0.44	+0.03	11.36	+0.08	+0.18	P
XX VIR	1.348	0.14	1.19	12.78	+0.46	+0.04	11.59	+0.12	+0.10	
AF VIP	0.484	0.30	1.07	12.01	+0.21	+0.14	10.94	+0.14	+0.06	A,P
AM VIP	0.615	0.21	0.59	11.80	+0.47	+0.06	11.21	+0.29	+0.12	P
AS VIR	0.553	0.13	0.92	12.34	+0.42	+0.09	11.42	+0.16	+0.15	P
AT VIR	0.526	0.11	1.16	11.79	+0.39	+0.04	10.63	+0.10	+0.11	
AU VIR	0.343	0.34	0.45	11.86	+0.27	+0.04	11.41	+0.14	+0.11	
AV VIR	0.657	0.18	0.73	12.15	+0.46	+0.10	11.42	+0.23	+0.12	P
BB VIR	0.471	0.13	0.71	11.42	+0.23	+0.12	10.71	+0.08	+0.09	
RC VIR	0.565			12.61	+0.32	+0.06				P

REMARKS: A=VARIABLE AMPLITUDE, P=VARIABLE PERIOD, E=ECLIPSING SYSTEM.