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Light variations of α Cygni variables in the Magellanic Clouds

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Abstract

We present time-series monitoring of 19 Magellanic Cloud super- and hypergiants, among which 13 α Cygni variables, viz.: the SMC stars S 18 = AzV 154, HDE 268835 = R 66, HD 37974 = R 126, HDE 268757 = R 59, HDE 268822 = GV 505, HDE 269355 = GV 258, HDE 269612 = GV 322, HDE 270025 = GV 439, AzV 121, HD 5277 = AzV 136 = R 10, AzV 197, AzV 310 = R 26, and AzV 369; the LMC stars HD 32034 = GV 80 = R 62, HDE 268819 = GV 91, HDE 269661 = GV 346 = R 111, HDE 269697 = GV 352, HDE 269953 = GV 423 = R 150 and HDE 270111 = GV 460.

1 Introduction

This paper presents photometric time-series monitoring of 19 Magellanic Cloud super- and hypergiants, of which 6 turned out to be constant, and 13 are α Cyg variables. The complete analysis and interpretation of the data were published by van Genderen & Sterken (2002), van Genderen, Sterken & Jones (2004), and van Genderen & Sterken (2005). The presented data include all observations used in the references mentioned previously, as well as new data obtained since these papers appeared.

The Walraven and Strömgren photometric data are reproduced in print and are included as ASCII files, but no figures are given, as most of the graphs are included in the above-mentioned papers. The visual estimates, on the other hand, are not printed *in extenso*, but are shown as light curves, and the visual magnitudes are also included as ASCII files. Hipparcos photometry of HDE 268835 (used by van Genderen & Sterken 2002) is not included in our

Tables. Table 1 gives the identification numbers, locations of the stars, and whether they are variable or constant.

Table 1: Identifications.

HD/HDE	R/S	Other	Spectral Type	Location	Character
		AzV 121	F9Ia	SMC	constant
HD 5277		AzV 136	A2 Ia	SMC	constant
	R 26	AzV 310	F1 Ia	SMC	constant
		AzV 369	G0 Ia	SMC	variable
	S 18	AzV 154	B[e]sg	SMC	variable
		AzV 197	F3Ia	SMC	constant
HD 32034	R 62	GV 80	B9 Ia^+	LMC	variable
HD 37974	R 126		B0.5 Ia^+	LMC	variable
HDE 268757	R 59		G7 Ia^+	LMC	variable
HDE 268819		GV 91	F6 Ia	LMC	variable
HDE 268822		GV 505	F6 Ia	LMC	variable
HDE 268835	R 66		B8p	LMC	variable
HDE 269355		GV 258	F6 Ia	LMC	constant
HDE 269612		GV 322	F0 Ia	LMC	variable
HDE 269661	R 111	GV 346	A0 Ia^+	LMC	variable
HDE 269697		GV 352	F5 Ia	LMC	variable
HDE 269953	R 150	GV 423	G0 Ia	LMC	variable
HDE 270025		GV 439	F6 Ia	LMC	constant
HDE 270111		GV 460	F8 Ia	LMC	variable

2 Observations

2.1 Walraven $VBLUW$ photometry

All objects were observed from 1987 through 1991 with the 90-cm Dutch telescope equipped with the simultaneous $VBLUW$ photometer of Walraven at ESO, Chile.

The precise effective wavelengths and the band widths of the five channels are given by de Ruyter & Lub (1986). The L band (3840 Å) contains the Balmer limit and the U band (3620 Å) contains the Balmer jump and partly the Balmer continuum, while the W band (3230 Å) lies completely in the Balmer continuum. The photometric data in the $VBLUW$ system are given in log intensity (I) scale, as usual. For a general description of the Walraven photometric system, we refer to Lub & Pel (1977) and Pel & Lub (2007).

Table 2 lists the photometric data for the comparison stars. Table 3 lists the average photometric parameters of the 19 programme stars (13 variables and 6 constant stars, see Table 1), and the average standard deviations (σ) per data point (nightly averages) relative to the comparison star, all in log intensity scale. For 5 variables we do not give time-series colour indices, as no significant variations in colour were found. All time-series $VBLUW$ differential data are listed in Tables 5–14, and the corresponding ASCII files are `S18`,

Table 2: The average magnitudes V and colour indices $V-B, B-U, U-W$ and $B-L$ of the comparison stars (in log intensity scale).

Star	Sp.	V	$V-B$	$B-U$	$U-W$	$B-L$	Comparison star for
HD 3719	A1m	0.004	0.052	0.452	0.136	0.203	S 18
HD 33486	B9V	−0.390	−0.010	0.330	0.078	0.112	HDE 268835, HD 37974, HDE 268757 HDE 268822, HDE 269355, HDE 269612, HDE 270025 HD 32034, HDE 268 819, HDE 269 661, HDE 269 697, HDE 269 953, HDE 270 111
HD 10747	B3 V	−0.510	−0.044	0.079	−0.001	0.026	AzV 121, HD 5277, AzV 197, R 26, AzV 369

Table 3: The average magnitudes V and colour indices $V-B, B-U, U-W$ and $B-L$ of the programme stars (in log intensity scale). σ is the average standard deviation per differential data point (in units of 0.001 log intensity scale). N is the number of data points; the aperture used is $16.''5$.

Star	V	σ	$V-B$	σ	$B-U$	σ	$U-W$	σ	$B-L$	σ	N
S 18	−2.660	7	0.180	7	−0.100	10	0.090	21	0.010	8	142
HDE 268835	−1.508	3	0.069	2	0.062	4	0.108	7	0.024	3	40
HD 37974	−1.632	3	0.088	3	−0.087	4	0.040	8	0.009	4	84
HDE 268757	−1.320	2	0.745	3	0.680	9	0.430	46	0.580	7	79
HDE 268822	−1.540	3	0.245	3	0.530	6	0.439	26	0.253	4	88
HDE 269355	−1.717	5	0.200	3	0.542	10	0.371	38	0.229	5	44
HDE 269612	−1.820	5	0.120	3	0.375	10	0.230	23	0.120	5	44
HDE 270025	−2.003	5	0.242	4	0.547	13	0.352	44	0.264	7	40
AzV 121	−1.778	5	0.333	5	0.530	12	0.378	43	0.292	7	54
HD 5277	−1.642	4	0.066	3	0.309	6	0.224	19	0.061	4	61
AzV 197	−1.995	5	0.195	5	0.518	14	0.350	42	0.199	7	56
R 26	−1.893	4	0.140	5	0.540	12	0.365	45	0.156	2	60
AzV 369	−1.65	5	0.28	5	0.54	11	0.40	40	0.24	6	66
HD 32034	−1.13	4	0.050	3	0.061	4	0.110	7	0.017	3	25
HDE 268 819	−1.277	3	0.218	3	0.532	5	0.413	17	0.223	3	45
HDE 269 661	−1.40	3	0.065	2	0.106	5	0.116	9	0.032	4	23
HDE 269 697	−1.385	3	0.179	3	0.537	5	0.397	18	0.197	3	45
HDE 269 953	−1.229	3	0.367	3	0.546	5	0.468	25	0.312	4	44
HDE 270 111	−1.351	3	0.313	3	0.539	5	0.413	25	0.308	4	43

`HD37974`, `HD268835`, `HD268757`, `HD269612`, `HD268822`, `AZV369`, `G91`, `G352`, `G423`, `HD270111`, `G80` and `G346`.

2.2 Strömgren *uvby* photometry

HDE 268835 = R 66 was also observed in the *ubvy* system by the LTPV (Long-Term Photometry of Variables) group organized by Sterken (1983) in 1982 and 1983 during 19 nights (Manfroid et al. 1991). Table table:uvby-means gives the average *uvby* magnitudes (and the associated mean errors) in filtersets 1 and 4. As described in Chapter 11 of Sterken & Manfroid (1993), these filtersets yield magnitudes and colour indices in different versions of the

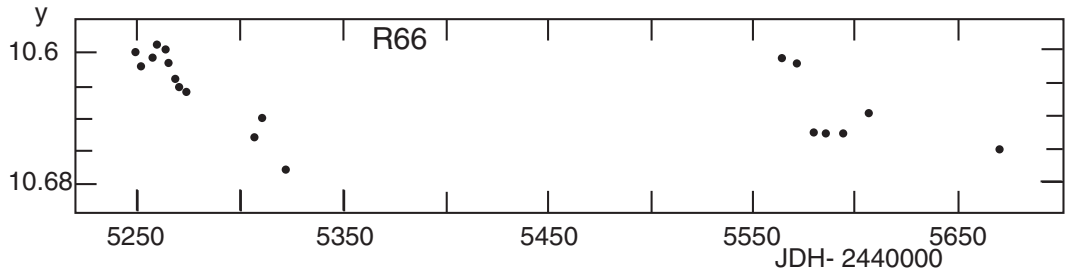

Figure 1: The light curve of HDE 268835 = R 66 in Strömgren y, 1982–1983.

uvby system, which are not strictly transformable. Fig. 1 shows the y light curve (magnitude scale) indicating two descending branches ~ 300 d apart. The average magnitude, the amplitude and the time scale are of the same order as those in the years 1989–1993. The colour variations are small, but significant. The *uvby* data are given in file `R66UVBY` and list star identification (P5001, A5001 or B5001), HJD-2400000, air mass X, and magnitudes and standard deviations $u, \sigma_u, v, \sigma_v, b, \sigma_b, y, \sigma_y$. S is the photometric "system" number (1 or 4).

Table 4: Average *uvby* magnitudes according to "system" S, and mean errors. A5001 (HD 32762) and B5001 (HD 31722) are comparison stars, P5001 is R 66. N is the number of measurements.

Star	u	v	b	y	$b-y$	m_1	c_1	S	N
A5001	9.7795	8.5297	8.1960	8.0583	0.1377	0.1961	0.9160	1	21
m.e.	95	86	78	79	19	30	21		
B5001	10.1749	8.8730	8.5722	8.4466	0.1255	0.1753	1.0011	1	11
m.e.	87	83	65	86	37	56	53		
P5001	11.2515	10.9967	10.8221	10.6366	0.1855	-0.0109	801	1	15
m.e.	84	133	131	126	30	40	69		
A5001	9.7754	8.5090	8.1567	8.0293	0.1274	0.2249	0.9141	4	7
m.e.	61	42	47	64	23	22	31		
B5001	10.2071	8.8833	8.5579	8.4500	0.1079	0.2176	0.9984	4	7
m.e.	60	48	39	53	22	28	54		
P5001	11.2233	10.9744	10.8070	10.6343	0.1727	-0.0053	0.0814	4	7
m.e.	78	77	79	107	53	73	69		

2.3 Visual estimates

The visual estimates of HDE 268835 = R 66, HDE 268757 = R 59, and HD 37974 = R 126 were obtained by one of us (AFJ) using a 317-mm $f/5$ Newtonian reflector. We refer to Jones & Sterken (1997) for full details on the observing practice. Figure 2 shows the visual light curve represented by a moving average of 7 visual estimates. As is evident, neither of

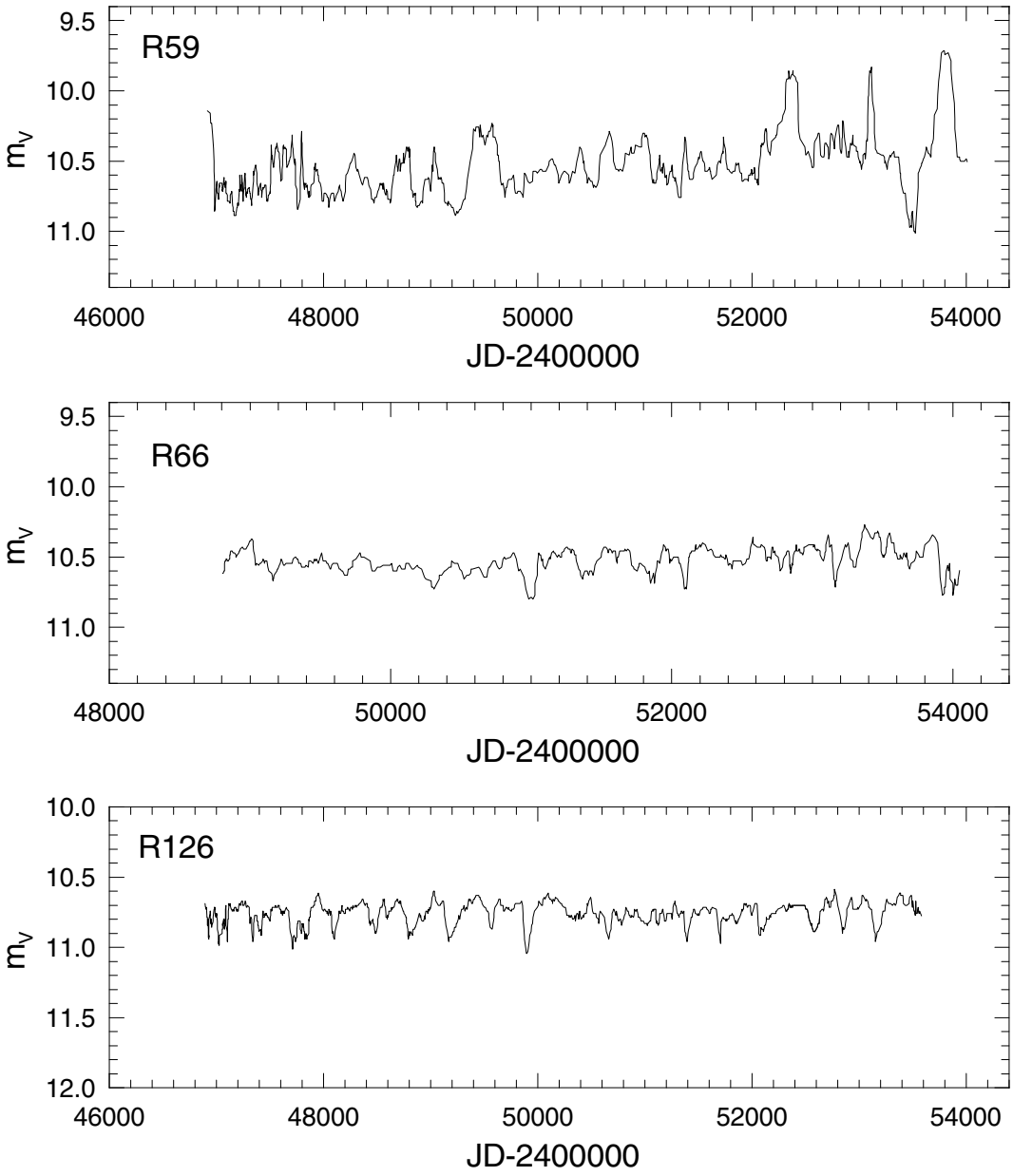

Figure 2: Visual magnitudes of R 59, R 66 and R 126 represented by a moving average of 7 estimates.

the three stars shows conspicuous variability, though R 59 displays a higher degree of long-term variability. All individual m_v estimates are included in electronic Tables `R59AFJ`, `R66AFJ` and `R129AFJ`.

2.4 A note on standardisation

In our analysis papers we presented V_J and $(V-B)_J$ – the so-called Johnson equivalents of Walraven $V, B-V$) – but we also stressed that these transformed magnitudes and colours for red stars (such as HD 268757 = R 59) may be systematically in error by a few $0\overset{m}{.}01$. As magnitudes and indices V_J and $(B-V)_J$ have led to widespread confusion among those users who are not familiar with the concept of "Johnson-like" observables, we refrain giving those transformed quantities in the present paper. The transformation equations are given by Pel (1987, see van Genderen et al. 1992).

For the *uvby* system, a similar warning is in place: some batches of the *Long-Term Photometry of Variables* data are not supported by an adequate set of sufficiently red standards to warrant a highly accurate transformation to the standard system. We, therefore, also give our data in the untransformed instrumental system. These data can be readily transformed to the standard system using the transformation matrices given by Manfroid et al. (1991, 1994) and Sterken et al. (1993, 1995).

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Sterken, C., Manfroid, J., Beele, D., et al. 1995, A&AS 113, 31

Table 5: Differential Walraven photometry of S 18.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
6968.85	−2.568				
6979.90	−2.691				
7006.78	−2.730	0.155	−0.604	−0.007	−0.199
7025.23	−2.803	0.163	−0.571	−0.030	−0.181
7028.32	−2.786	0.157	−0.567	−0.022	−0.191
7032.78	−2.809	0.164	−0.565	−0.037	−0.180
7035.80	−2.810	0.159	−0.582	−0.012	−0.195
7037.73	−2.806	0.171	−0.568	−0.029	−0.187
7040.76	−2.810	0.172	−0.566	−0.011	−0.190
7041.72	−2.807	0.143	−0.554	−0.051	−0.178
7043.82	−2.846	0.149	−0.591	−0.034	−0.206
7044.79	−2.816	0.163	−0.583	−0.026	−0.217
7047.78	−2.820	0.148	−0.508		−0.198
7096.58	−2.573	0.073	−0.491	−0.097	−0.186
7097.59	−2.598	0.072	−0.514	−0.043	−0.196
7101.58	−2.567	0.065	−0.526	−0.058	−0.190
7103.54	−2.615	0.106	−0.538	−0.060	
7104.57	−2.561	0.054	−0.523	−0.154	−0.198
7375.78	−2.553	0.067	−0.523	−0.064	−0.188
7378.88	−2.598	0.077	−0.498	−0.052	−0.190
7382.62	−2.550	0.074	−0.458	−0.037	−0.160
7388.86	−2.606	0.087	−0.472	0.019	−0.172
7393.61	−2.597	0.079	−0.467	−0.028	−0.172
7397.89	−2.607	0.074	−0.464	−0.007	−0.191
7437.62	−2.583	0.047	−0.513	−0.072	−0.192
7441.70	−2.548	0.049	−0.513	−0.064	−0.197
7445.59	−2.561	0.061	−0.512	−0.051	−0.208
7449.61	−2.434	0.110	−0.506	−0.098	−0.186
7453.62	−2.548	0.056	−0.504	−0.080	−0.184
7459.60	−2.537	0.084	−0.529		−0.200
7462.60	−2.507	0.091	−0.529	−0.059	−0.195
7465.61	−2.566	0.061	−0.519	−0.038	−0.209
7468.57	−2.597	0.060	−0.519	−0.007	−0.198
7489.54	−2.625	0.089	−0.543	0.002	−0.196
7493.54	−2.615				
7499.55	−2.653	0.086	−0.525	−0.015	−0.199
7511.56	−2.638	0.102	−0.526	−0.063	−0.185
7723.89	−2.677	0.112	−0.379	−0.060	−0.163
7739.78	−2.673	0.146	−0.397	−0.076	−0.194
7749.72	−2.692	0.085	−0.360	−0.017	−0.146
7766.86	−2.672	0.078	−0.359	−0.022	−0.163
7787.59	−2.616				
7798.64	−2.616	0.067	−0.393	−0.014	−0.147
7808.62	−2.647	0.085	−0.427	−0.006	−0.170
7845.79	−2.537	0.133	−0.419		−0.180
7846.56	−2.491	0.087	−0.434	0.034	−0.168
7848.64	−2.484	0.073	−0.446	0.002	−0.169

Table 5: Differential Walraven photometry of S 18 – continued.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7849.74	−2.509	0.085	−0.434	−0.010	−0.170
7873.72	−2.483	0.144	−0.447		−0.208
7875.60	−2.471	0.098	−0.473		−0.189
7876.59	−2.468	0.097	−0.490	−0.010	−0.192
7877.69	−2.483	0.088	−0.503	−0.032	−0.215
7878.57	−2.457	0.095	−0.489	−0.015	−0.187
7880.68	−2.492	0.087	−0.516	−0.002	−0.195
7881.57	−2.475	0.091	−0.504	0.021	−0.191
7897.61	−2.558	0.096	−0.503	0.038	−0.200
7898.57	−2.577	0.102	−0.477	−0.035	−0.198
7899.57	−2.588	0.126	−0.508	0.011	−0.226
7901.65	−2.639				
7906.58	−2.555	0.080			
7909.59	−2.567	0.082	−0.394	0.099	−0.174
7910.58	−2.548	0.087	−0.398	0.091	−0.156
7911.64	−2.576	0.065	−0.383	0.034	−0.156
7924.58	−2.542	0.107	−0.360	0.026	−0.136
7925.57	−2.549	0.108	−0.383	−0.042	−0.140
7926.57	−2.540	0.119	−0.376	−0.025	−0.155
7928.56	−2.562	0.144	−0.242	−0.038	−0.152
8028.88	−2.726	0.132	−0.654		−0.190
8030.88	−2.714	0.091	−0.636	−0.286	−0.152
8031.90	−2.707	0.136	−0.664		−0.208
8050.91	−2.791	0.059	−0.640	−0.138	−0.201
8061.90	−2.769	0.094	−0.627		−0.171
8062.90	−2.796	0.110	−0.621	−0.119	−0.182
8063.83	−2.797	0.108	−0.619		−0.176
8066.86	−2.818	0.097	−0.616	−0.143	−0.176
8067.86	−2.798	0.138	−0.638		−0.196
8068.86	−2.811	0.173	−0.670		−0.206
8075.86	−2.806	0.107	−0.621		−0.176
8076.85	−2.798	0.138	−0.609		−0.162
8077.83	−2.807	0.131	−0.611		−0.189
8078.82	−2.829	0.118	−0.651		−0.210
8082.78	−2.782	0.080	−0.596		−0.157
8083.78	−2.792	0.118	−0.634		−0.182
8084.77	−2.800	0.075	−0.585		−0.182
8088.84	−2.838	0.099	−0.611		−0.178
8093.82	−2.786	0.061	−0.540		−0.140
8097.85	−2.847	0.110	−0.593	−0.127	−0.164
8099.82	−2.843	0.100	−0.574	−0.196	−0.169
8100.72	−2.840	0.122	−0.592		−0.178
8101.75	−2.821	0.124	−0.567	−0.166	−0.154
8102.72	−2.829	0.090	−0.543		−0.143
8104.82	−2.886	0.123	−0.609		−0.187
8105.72	−2.833	0.125	−0.589		−0.169
8112.81	−2.877	0.169	−0.609		−0.168
8115.80	−2.824	0.171	−0.639		−0.210

Table 5: Differential Walraven photometry of S 18 – continued.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
8116.75	−2.834	0.162	−0.612		−0.196
8119.72	−2.846	0.228	−0.644		−0.267
8121.73	−2.850	0.160	−0.588		−0.184
8123.70	−2.860	0.191	−0.625		−0.203
8125.80	−2.863	0.145	−0.578	−0.152	−0.167
8148.58	−2.807	0.145	−0.581	−0.037	−0.185
8155.67	−2.752	0.150	−0.587	−0.059	−0.204
8156.60	−2.756	0.158	−0.646	−0.002	−0.210
8157.69	−2.743	0.140	−0.623	−0.045	−0.218
8158.69	−2.752	0.138	−0.611	−0.042	−0.191
8159.65	−2.748	0.122	−0.598		−0.178
8161.63	−2.759	0.144	−0.639	−0.082	−0.191
8162.65	−2.750	0.127	−0.630	−0.104	−0.189
8163.61	−2.771	0.121	−0.650	0.037	−0.213
8165.61	−2.765	0.127	−0.628		−0.244
8168.64	−2.768	0.144	−0.615		−0.228
8174.65	−2.715	0.128	−0.633	−0.118	−0.220
8176.59	−2.769	0.134	−0.656	−0.038	−0.228
8177.60	−2.781	0.144	−0.673		−0.250
8180.59	−2.722	0.105	−0.632	−0.071	−0.209
8181.61	−2.738	0.123	−0.646	0.032	−0.213
8182.61	−2.725	0.116	−0.646	−0.033	−0.216
8183.62	−2.715	0.124	−0.641	−0.049	−0.212
8184.58	−2.721	0.118	−0.638	−0.054	−0.215
8185.60	−2.731	0.123	−0.657	−0.038	−0.207
8187.59	−2.731	0.130	−0.658	−0.022	−0.224
8188.58	−2.726	0.119	−0.653	−0.080	−0.220
8192.61	−2.772	0.115	−0.659		
8193.58	−2.746	0.118	−0.639	−0.072	−0.206
8196.58	−2.712	0.118	−0.615	−0.024	
8197.56	−2.764	0.146	−0.682		−0.259
8198.59	−2.812	0.205	−0.719		−0.348
8200.55	−2.783	0.108	−0.665	−0.108	−0.217
8201.55	−2.769	0.111	−0.658	−0.065	−0.217
8202.56	−2.764	0.104	−0.636	−0.104	−0.194
8203.59	−2.790	0.114	−0.656	−0.069	−0.200
8204.56	−2.774	0.133	−0.668	−0.083	−0.223
8207.60	−2.774	0.135	−0.671	−0.041	−0.217
8208.53	−2.790	0.112	−0.658	−0.096	−0.203
8209.56	−2.778	0.143	−0.665	−0.099	−0.215
8210.61	−2.782	0.128	−0.661	−0.104	−0.225
8279.61	−2.702	0.112	−0.540	−0.061	−0.180
8281.60	−2.803	0.118	−0.591	−0.170	−0.213
8284.60	−2.758	0.097	−0.519	−0.036	−0.220
8287.57	−2.692	0.085	−0.514	−0.062	−0.208
8290.58	−2.659	0.175	−0.544	−0.020	−0.247
8302.57	−2.536	0.181	−0.541	−0.077	−0.192

Table 6: Differential Walraven photometry of HD 37974 = R 126.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7772.882	−1.256	0.104	−0.425	−0.020	−0.109
7776.889	−1.250	0.092	−0.417		−0.098
7778.892	−1.257	0.084	−0.414		−0.095
7783.868	−1.243	0.093	−0.417	−0.037	−0.099
7784.774	−1.235	0.086	−0.413	−0.059	−0.095
7786.767	−1.238	0.094	−0.417	−0.031	−0.098
7788.740	−1.240	0.098	−0.417	−0.040	−0.102
7789.875	−1.249	0.099	−0.418	−0.035	−0.104
7792.882	−1.254	0.098	−0.420	−0.044	−0.105
7794.806	−1.248	0.102	−0.423	−0.023	−0.106
7797.875	−1.249	0.100	−0.422	−0.027	−0.107
7798.701	−1.247	0.100	−0.420	−0.034	−0.106
7799.684	−1.248	0.099	−0.418	−0.021	−0.104
7849.660	−1.234	0.099	−0.417	−0.023	−0.110
7865.753	−1.232	0.097	−0.412	−0.027	−0.103
7874.646	−1.230	0.091	−0.406	−0.035	−0.101
7875.774	−1.235	0.094	−0.410	−0.032	−0.105
7878.681	−1.226	0.094	−0.410	−0.029	−0.104
7898.660	−1.225	0.096	−0.412	−0.026	−0.106
7899.684	−1.230	0.095	−0.408	−0.034	−0.105
7901.784	−1.238	0.100			
7909.816	−1.235	0.098	−0.410	−0.028	−0.098
7910.694	−1.227	0.101	−0.412	−0.027	−0.101
7926.653	−1.238	0.100	−0.414	−0.023	−0.100
7929.719	−1.246	0.103	−0.418	−0.029	−0.104
7931.587	−1.240	0.104	−0.420	−0.024	−0.106
7944.715	−1.248	0.095	−0.416	−0.031	−0.101
7945.684	−1.244	0.096	−0.414	−0.022	−0.099
7946.708	−1.243	0.098	−0.414	−0.027	−0.100
7947.646	−1.238	0.096	−0.414	−0.025	−0.100
7948.674	−1.243	0.095	−0.414	−0.027	−0.101
7949.625	−1.239	0.096	−0.415	−0.029	−0.102
7950.632	−1.240	0.096	−0.416	−0.032	−0.103
7956.604	−1.239	0.099	−0.415	−0.029	−0.105
7963.594	−1.245	0.102	−0.421	−0.027	−0.109
7965.622	−1.245	0.103	−0.412	−0.026	−0.102
7966.663	−1.245	0.101	−0.414	−0.025	−0.103
7967.601	−1.246	0.099	−0.418	−0.027	−0.105
7968.639	−1.244	0.099	−0.416	−0.032	−0.099
7970.524	−1.242	0.100	−0.419	−0.026	−0.104
7971.618	−1.240	0.099	−0.415	−0.032	−0.102
7972.597	−1.245	0.098	−0.417	−0.028	−0.102
7982.521	−1.239	0.098	−0.418	−0.027	−0.104
7991.513	−1.248	0.101	−0.416	−0.030	−0.107

Table 6: Differential Walraven photometry of HD 37974 = R 126 – continued.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
8144.806	−1.244	0.095	−0.412	−0.039	−0.101
8145.757	−1.244	0.093	−0.410		−0.097
8146.826	−1.244	0.099	−0.419	−0.019	−0.102
8147.778	−1.243	0.099	−0.420	−0.029	−0.102
8162.760	−1.244	0.096	−0.417		−0.100
8163.812	−1.247	0.096	−0.417	−0.028	−0.101
8164.802	−1.246	0.098	−0.415	−0.030	−0.100
8168.781	−1.235	0.090	−0.414	−0.021	−0.102
8176.653	−1.249	0.101	−0.423		−0.102
8179.826	−1.249	0.098	−0.42	−0.032	−0.105
8181.674	−1.253	0.098	−0.418		−0.106
8183.823	−1.248	0.098	−0.421	−0.027	−0.107
8185.802	−1.248	0.099	−0.421	−0.028	−0.104
8187.656	−1.250	0.098	−0.420	−0.027	−0.106
8191.597	−1.243	0.098	−0.416		−0.105
8193.757	−1.243	0.095	−0.411	−0.031	−0.098
8195.583	−1.230	0.091	−0.414	−0.021	−0.097
8197.688	−1.236	0.088	−0.414	−0.032	−0.102
8200.691	−1.241	0.092	−0.416	−0.029	−0.103
8202.628	−1.243	0.096	−0.417	−0.034	−0.102
8204.660	−1.243	0.099	−0.420	−0.028	−0.106
8208.660	−1.254	0.097	−0.420	−0.023	−0.105
8210.632	−1.244	0.096	−0.416	−0.033	−0.102
8270.691	−1.244	0.101	−0.420	−0.024	−0.106
8272.663	−1.238	0.100	−0.418	−0.023	−0.105
8274.646	−1.242	0.100	−0.418	−0.026	−0.107
8276.656	−1.244	0.100	−0.420	−0.023	−0.107
8278.649	−1.245	0.099	−0.419	−0.024	−0.106
8280.642	−1.245	0.100	−0.419	−0.024	
8281.750	−1.246	0.099	−0.419	−0.026	−0.104
8283.663	−1.244	0.100	−0.417	−0.027	−0.105
8285.607	−1.245	0.102	−0.421	−0.023	−0.107
8287.632	−1.250	0.099	−0.418	−0.026	−0.106
8289.646	−1.248	0.097	−0.416	−0.028	−0.106
8291.639	−1.245	0.100	−0.418	−0.026	−0.106
8293.701	−1.242	0.101	−0.420	−0.023	−0.104
8295.698	−1.242	0.102	−0.419	−0.021	−0.105
8297.635	−1.244	0.100	−0.419	−0.025	−0.105
8299.639	−1.247	0.097	−0.417	−0.024	−0.103
8301.632	−1.246	0.097	−0.418	−0.024	−0.106

Table 7: Differential Walraven photometry of HD 268835 = R 66.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7772.882	−1.111	0.078	−0.271	0.028	−0.090
7776.889	−1.113	0.082	−0.276	0.044	−0.094
7783.864	−1.108	0.079	−0.259		−0.082
7785.757	−1.109	0.082	−0.269	0.033	−0.088
7788.736	−1.112	0.081	−0.268	0.040	−0.090
7789.875	−1.110	0.080	−0.270	0.035	−0.091
7792.882	−1.113	0.080	−0.268	0.031	−0.090
7794.806	−1.108	0.080	−0.268	0.027	−0.090
7797.872	−1.114	0.081	−0.270	0.035	−0.089
7799.681	−1.117	0.084	−0.273	0.028	−0.091
7844.642	−1.103	0.079	−0.270	0.020	−0.088
7846.674	−1.107	0.080	−0.270	0.027	−0.088
7848.660	−1.104	0.082	−0.270	0.032	−0.089
7849.660	−1.103	0.083	−0.270	0.032	−0.089
7850.684	−1.103	0.084	−0.268	0.028	−0.089
7865.753	−1.110	0.082	−0.268	0.025	−0.089
7866.611	−1.110	0.081	−0.269	0.026	−0.090
7867.618	−1.111	0.080	−0.265		−0.084
7874.646	−1.110	0.079	−0.268	0.035	−0.089
7898.656	−1.108	0.080	−0.272	0.031	−0.088
7925.663	−1.121	0.079	−0.268	0.027	−0.088
7944.712	−1.114	0.076	−0.271	0.015	−0.090
7949.622	−1.114	0.079	−0.268	0.025	−0.091
7956.601	−1.112	0.079	−0.272	0.026	−0.089
7965.618	−1.116	0.076	−0.267	0.032	−0.084
7970.521	−1.119	0.079	−0.270	0.020	−0.090
7982.521	−1.128	0.077	−0.261	0.027	−0.087
7991.513	−1.123	0.076	−0.268	0.030	−0.086
8144.806	−1.127	0.078	−0.260	0.026	−0.087
8162.760	−1.123				
8170.653	−1.119	0.078	−0.264	0.046	−0.085
8183.819	−1.113	0.077	−0.261	0.025	−0.089
8191.594	−1.120	0.080	−0.264		
8200.684	−1.125	0.079	−0.265	0.024	−0.086
8208.656	−1.127	0.076	−0.266	0.032	−0.089
8272.660	−1.119	0.078	−0.265	0.026	−0.090
8278.645	−1.119	0.078	−0.265	0.028	−0.089
8285.604	−1.116	0.077	−0.264	0.031	−0.088
8291.632	−1.120	0.878	−0.269	0.029	−0.089
8297.632	−1.125	0.081	−0.268	0.031	−0.088

Table 8: Differential Walraven photometry of HDE 268757 = R 59.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
4165.600	−0.934	0.769	0.383	0.242	0.510
4199.600	−0.944	0.776	0.391	0.320	0.521
4922.763	−0.907	0.711	0.360	0.394	0.474
4923.762	−0.904	0.706	0.350	0.371	0.465
4924.760	−0.902	0.706	0.350	0.394	0.455
4948.554	−0.901	0.703	0.326	0.404	0.440
4951.548	−0.903	0.705	0.337	0.350	0.454
4973.594	−0.903	0.703	0.332	0.354	0.444
5266.803	−0.978	0.728	0.314	0.357	0.424
5275.801	−0.979	0.721	0.285	0.343	0.440
5308.774	−0.976	0.746	0.384	0.379	0.477
5330.719	−0.949	0.735	0.340	0.343	0.464
5422.854	−0.928	0.730			
5450.538	−0.948	0.784			
5659.688	−1.023	0.769	0.354	0.256	0.472
5660.618	−1.021	0.762	0.346	0.272	0.448
5661.649	−1.022	0.768	0.351	0.356	0.470
5662.587	−1.026	0.780			
5783.542	−1.017	0.772	0.369	0.289	0.479
5792.587	−1.011	0.768	0.341	0.258	0.475
6014.583	−0.894	0.715	0.324	0.320	0.455
6153.559	−0.934	0.772	0.361	0.290	0.488
6158.510	−0.933	0.768	0.332	0.362	0.480
6311.823	−0.938	0.765	0.346	0.381	0.470
6322.885	−0.938	0.773	0.355	0.308	0.483
6330.826	−0.938	0.769	0.351	0.353	0.491
6421.607	−0.899	0.747	0.332	0.331	0.454
6435.736	−0.892	0.738	0.324	0.314	0.453
6451.590	−0.886	0.740	0.330	0.342	0.449
6493.611	−0.877	0.745	0.338	0.322	0.466
6506.597	−0.872	0.748	0.330	0.349	0.457
6518.524	−0.871	0.756	0.362	0.350	0.482
6526.535	−0.871	0.746	0.328	0.326	0.458
6685.875	−0.902	0.753	0.337	0.340	0.454
6686.844	−0.904	0.751	0.328	0.303	0.466
6688.892	−0.905	0.758	0.341	0.360	0.463
6748.607	−0.888	0.765	0.365		0.457
6798.740	−0.869	0.768	0.376	0.356	0.487
6809.750	−0.866	0.762	0.338	0.353	0.474
6848.611	−0.853	0.760	0.370	0.301	0.490
6860.573	−0.853	0.761	0.396	0.283	0.512
6865.576	−0.848	0.759	0.400	0.289	0.507
6870.601	−0.850	0.745			
6892.521	−0.859	0.759	0.379	0.383	0.506
6904.549	−0.862	0.748	0.391	0.276	0.500

Table 8: Differential Walraven photometry of HDE 268757 = R 59 – continued.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7198.750	−0.978	0.752	0.337	0.306	0.453
7207.660	−0.979	0.761	0.358	0.296	0.489
7216.569	−0.978	0.764	0.362	0.434	0.485
7243.569	−0.965	0.757	0.350	0.335	0.483
7433.833	−0.910	0.746	0.358	0.288	0.479
7444.722	−0.905	0.753	0.366	0.286	0.509
7455.708	−0.902	0.744	0.341	0.219	0.494
7461.844	−0.897	0.742	0.372	0.269	0.507
7464.844	−0.902	0.750	0.369	0.394	0.502
7467.840	−0.900	0.750	0.396	0.291	0.506
7490.535	−0.896	0.770			
7510.639	−0.885	0.728	0.358	0.396	0.529
7518.649	−0.882	0.717	0.361	0.454	0.495
7616.549	−0.901	0.748	0.348	0.370	0.468
7636.559	−0.900	0.740			
7784.807	−0.932	0.765	0.352	0.382	0.483
7797.705	−0.935	0.770	0.365	0.395	0.486
7811.688	−0.936	0.764	0.373	0.460	0.500
7848.802	−0.941	0.771			
7866.677	−0.938	0.759	0.337	0.461	0.469
7874.757	−0.938	0.747			0.465
7900.764	−0.946	0.745			0.457
7925.677	−0.960	0.764	0.354	0.295	0.487
7947.600	−0.974	0.772	0.348	0.351	0.481
7967.646	−0.985	0.769	0.324	0.297	0.470
8148.722	−0.918	0.733	0.355	0.200	0.481
8163.830	−0.914	0.732	0.368	0.391	0.486
8180.785	−0.907	0.724	0.350	0.419	0.478
8191.809	−0.904	0.723	0.364	0.359	0.489
8197.788	−0.902	0.714			0.470
8203.792	−0.900	0.716	0.326	0.305	0.470
8298.635	−0.942	0.743	0.366	0.311	0.472
8315.628	−0.949	0.737	0.313	0.296	0.452

Table 9: Differential Walraven photometry of HDE 269612 = GV 322.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7139.740	−1.426	0.129	0.058	0.178	0.008
7141.736	−1.439	0.135	0.106	0.257	0.027
7145.597	−1.428	0.124	0.037		0.008
7154.826	−1.448	0.150	0.138	0.307	0.035
7196.660	−1.454	0.144			0.017
7200.635	−1.440	0.139			0.024
7207.604	−1.442	0.134	0.079	0.222	0.020
7214.587	−1.434	0.131	0.065	0.184	0.012
7217.594	−1.443	0.142	0.120	0.270	0.029
7221.569	−1.437	0.139	0.096	0.248	0.017
7238.549	−1.430	0.138	0.107	0.256	0.023
7462.743	−1.435	0.118	0.042	0.117	−0.004
7467.684	−1.418	0.124	0.042	0.130	0.005
7470.864	−1.416	0.126	0.038	0.119	0.004
7489.708	−1.405	0.117	0.032	0.124	−0.002
7495.548	−1.414	0.124	0.034	0.129	−0.001
7499.583	−1.415	0.125	0.035	0.132	0.003
7502.569	−1.418	0.125	0.026	0.113	0.001
7508.562	−1.426	0.126	0.031	0.091	0.004
7513.805	−1.432	0.129	0.050	0.156	0.008
7518.719	−1.436	0.134	0.063	0.200	0.006
7575.583	−1.448	0.136	0.062	0.210	0.009
7628.559	−1.428	0.128	0.044	0.163	0.007
7638.549	−1.437	0.141	0.042	0.235	0.005
7644.510	−1.432	0.139			
7788.851	−1.416	0.122	0.025	0.077	0.005
7795.694	−1.415	0.123	0.021		0.002
7806.785	−1.412	0.123	0.026	0.127	0.002
7813.688	−1.399	0.113	−0.005	0.060	0.006
7851.795	−1.411	0.123	0.042	0.158	−0.002
7866.705	−1.418	0.122	0.037	0.120	0.003
7876.681	−1.426	0.125	0.032		0.002
7899.719	−1.426	0.126	0.027	0.134	0.004
7930.663	−1.426	0.128			0.013
7943.660	−1.410	0.120	0.038	0.174	0.001
7949.611	−1.405	0.116	0.027	0.148	−0.005
7956.607	−1.407	0.122	0.027	0.152	−0.012
7965.615	−1.428	0.125	0.046	0.168	0.000
7970.528	−1.434	0.124	0.030	0.150	0.000
8150.847	−1.435	0.126	0.031	0.141	−0.002
8162.868	−1.457	0.131	0.048	0.132	0.012
8164.844	−1.450	0.133	0.032	0.104	0.010
8189.715	−1.424	0.136	0.037	0.112	0.014
8203.757	−1.410	0.130	0.029	0.103	0.005

Table 10: Differential Walraven photometry of HDE 268822 = GV 505.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
3450.500	−1.132	0.239	0.172	0.380	0.118
3539.500	−1.218	0.287	0.148		0.154
4383.500	−1.159	0.253	0.182	0.358	0.139
4572.771	−1.161	0.257	0.198	0.355	0.141
4573.535	−1.157	0.255	0.190	0.363	0.139
4650.618	−1.135	0.251	0.195	0.348	0.137
4667.590	−1.135	0.253	0.189	0.347	0.138
5267.767	−1.133	0.240	0.203	0.352	0.128
5270.632	−1.132	0.236	0.201	0.354	0.133
5308.750	−1.141	0.241	0.192	0.358	0.129
5313.736	−1.146	0.243	0.196	0.337	0.134
6322.868	−1.173	0.273	0.201	0.360	0.162
6335.847	−1.157	0.261	0.197	0.308	0.148
6421.587	−1.170	0.282	0.207	0.350	0.162
6435.750	−1.166	0.283	0.214	0.345	0.170
6451.576	−1.164	0.283	0.215	0.359	0.167
6497.597	−1.175	0.275	0.208	0.346	0.158
6512.635	−1.171	0.272	0.204	0.403	0.162
6678.895	−1.192	0.294	0.214	0.339	0.171
6748.625	−1.138	0.254	0.203	0.400	0.135
6790.604	−1.172	0.271	0.202	0.349	0.156
6850.587	−1.161	0.266	0.196	0.347	0.147
6860.583	−1.156	0.260	0.203	0.348	0.152
6865.607	−1.152	0.258	0.207	0.336	0.148
7089.698	−1.108	0.237	0.205		0.111
7091.677	−1.111	0.233	0.200		0.116
7092.760	−1.114	0.231	0.198	0.381	0.118
7095.729	−1.118	0.232	0.198	0.372	0.118
7104.757	−1.132	0.242	0.209	0.388	0.126
7137.736	−1.172	0.269	0.205	0.354	0.152
7140.719	−1.175	0.269	0.206	0.332	0.158
7142.667	−1.177	0.271	0.200	0.351	0.156
7147.583	−1.179	0.274	0.203	0.355	0.157
7156.697	−1.181	0.276	0.202	0.351	0.161
7160.587	−1.181	0.277	0.205	0.366	0.159
7162.763	−1.180	0.273	0.202	0.354	0.161
7163.677	−1.181	0.274	0.212	0.366	0.161
7195.590	−1.183	0.264	0.198	0.382	0.152
7197.646	−1.184	0.263	0.188	0.335	0.150
7202.681	−1.186	0.263	0.189	0.361	0.147
7205.653	−1.184	0.262	0.190	0.375	0.149
7212.597	−1.186	0.264	0.189	0.340	0.144
7216.635	−1.186	0.262	0.186	0.337	0.147
7218.569	−1.186	0.265	0.194	0.331	0.147

Table 10: Differential Walraven photometry of HDE 268822 = GV 505, continued.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7220.576	−1.187	0.265	0.191	0.362	0.149
7222.562	−1.184	0.268	0.192	0.345	0.147
7241.531	−1.177	0.267	0.197	0.373	0.154
7431.806	−1.126	0.230	0.185	0.327	0.118
7433.694	−1.122	0.232	0.205	0.356	0.116
7437.677	−1.120	0.227	0.197	0.339	0.118
7439.722	−1.116	0.228	0.199	0.378	0.118
7443.688	−1.119	0.227	0.202	0.342	0.120
7445.764	−1.121	0.230	0.203	0.330	0.119
7448.698	−1.121	0.231	0.199	0.369	0.122
7450.708	−1.125	0.230	0.199	0.326	0.125
7452.698	−1.126	0.232	0.193	0.339	0.121
7454.694	−1.130	0.232	0.183	0.316	0.122
7456.698	−1.132	0.236	0.193	0.299	0.124
7459.812	−1.140	0.238	0.175	0.245	0.118
7463.784	−1.143	0.241	0.205	0.354	0.131
7467.767	−1.147	0.243	0.198	0.369	0.132
7468.833	−1.155	0.245	0.206	0.373	0.133
7470.840	−1.151	0.247	0.192	0.351	0.131
7628.524	−1.161	0.267	0.205	0.363	0.157
7638.517	−1.148	0.259	0.188	0.376	0.145
7786.812	−1.130	0.245	0.205	0.373	0.132
7793.837	−1.131	0.244	0.189	0.406	0.130
7802.861	−1.130	0.245	0.204	0.353	0.135
7809.833	−1.131	0.249	0.200	0.378	0.137
7851.891	−1.154	0.256	0.200		0.148
7867.785	−1.167	0.268	0.202	0.389	0.157
7878.819	−1.175	0.273	0.204	0.357	0.162
7899.753	−1.178	0.278	0.215	0.368	0.176
7928.753	−1.186	0.277	0.211	0.353	0.171
7931.670	−1.186	0.283	0.210		0.161
7947.552	−1.179	0.268	0.211	0.377	0.168
7952.549	−1.179	0.268	0.208	0.411	0.160
7963.635	−1.160	0.256	0.193	0.328	0.150
7967.653	−1.153	0.248	0.200	0.371	0.140
7974.562	−1.139	0.238	0.197	0.376	0.133
8150.812	−1.186	0.261	0.194	0.337	0.152
8160.861	−1.177	0.255	0.181	0.347	0.142
8169.688	−1.199	0.282			0.147
8180.809	−1.143	0.243	0.190	0.370	0.132
8186.847	−1.131	0.238	0.196	0.347	0.128
8194.708	−1.123	0.233	0.196	0.370	0.119
8197.844	−1.119	0.231	0.198	0.338	0.117
8204.625	−1.117	0.228	0.192	0.386	0.116

Table 11: Differential Walraven photometry of AzV 369.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7024.761	−1.133	0.318	0.457		0.216
7028.757	−1.128	0.317	0.436	0.393	0.207
7032.812	−1.130	0.317	0.426	0.332	0.206
7035.833	−1.131	0.318	0.429	0.309	0.207
7037.833	−1.136	0.318	0.421	0.310	0.208
7041.757	−1.158	0.302	0.417	0.341	0.197
7042.760	−1.165	0.303	0.429	0.336	0.208
7044.750	−1.164	0.301	0.427	0.350	0.200
7049.722	−1.163	0.308	0.443	0.378	0.209
7081.645	−1.143	0.330	0.474		0.230
7085.635	−1.134	0.327	0.461		0.225
7087.635	−1.137	0.328	0.461		0.225
7089.625	−1.142	0.329	0.474		0.229
7091.583	−1.136	0.331	0.464		0.227
7092.698	−1.139	0.328	0.454	0.386	0.227
7094.639	−1.140	0.326	0.462	0.425	0.227
7095.594	−1.138	0.325	0.457		0.226
7096.708	−1.139	0.327	0.452	0.385	0.220
7103.625	−1.153	0.317	0.446	0.342	0.214
7104.611	−1.148	0.334			0.229
7137.625	−1.127	0.322	0.434	0.324	0.224
7139.597	−1.128	0.326	0.450	0.357	0.229
7141.573	−1.129	0.327	0.445	0.332	0.223
7143.604	−1.126	0.326	0.432	0.327	0.219
7158.656	−1.134	0.318	0.453	0.406	0.223
7162.594	−1.138	0.313	0.455	0.397	0.226
7164.604	−1.134	0.306	0.430	0.324	0.215
7207.562	−1.126	0.321	0.449		0.219
7214.552	−1.124	0.321	0.444	0.394	0.219
7375.823	−1.122	0.310	0.471	0.463	0.215
7377.799	−1.116	0.311	0.468	0.426	0.216
7379.865	−1.121	0.310	0.458	0.442	0.215
7382.653	−1.124	0.302	0.464	0.436	0.215
7385.778	−1.119	0.310	0.459	0.433	0.214
7389.722	−1.120	0.309	0.457	0.439	0.214
7397.774	−1.124	0.318	0.474	0.462	0.219

Table 11: Differential Walraven photometry of AzV 369, continued.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7431.646	−1.154	0.317	0.486		0.230
7436.764	−1.160	0.308	0.467	0.445	0.225
7439.639	−1.150	0.310	0.454	0.423	0.224
7442.715	−1.131	0.325	0.463	0.439	0.227
7445.632	−1.132	0.325	0.460	0.414	0.230
7447.607	−1.125	0.326	0.451	0.380	0.221
7449.656	−1.130	0.324	0.459	0.427	0.227
7451.594	−1.129	0.322	0.460	0.420	0.224
7455.625	−1.126	0.324	0.470	0.434	0.225
7460.635	−1.132	0.335			0.223
7463.625	−1.129	0.319			0.220
7466.569	−1.123	0.311	0.457	0.420	0.219
7489.632	−1.120	0.317			0.213
7491.562	−1.116	0.310	0.471	0.436	0.211
7497.559	−1.117	0.303	0.455	0.450	0.209
7500.562	−1.114	0.301	0.460	0.430	0.206
7507.580	−1.116	0.300	0.457	0.379	0.203
7514.569	−1.124	0.305	0.458	0.430	0.204
7517.576	−1.121	0.306	0.461	0.417	0.205
7688.889	−1.124	0.312	0.443	0.399	0.215
7753.729	−1.142	0.328		0.362	0.220
7766.753	−1.138	0.318	0.436	0.404	0.213
7771.812	−1.131	0.317	0.439	0.439	0.218
7788.688	−1.122	0.323	0.456		0.210
7793.642	−1.116	0.312	0.445		0.211
7797.597	−1.125	0.309	0.447		0.213
7802.642	−1.123	0.310	0.442	0.436	0.213
7807.597	−1.120	0.312	0.452	0.409	0.214
7812.569	−1.122	0.318	0.477		0.215
7851.601	−1.130	0.316	0.430		0.208

Table 12: Differential Walraven photometry of GV 91, GV 352, and GV 423.

HJD−2440000	G91 ΔV	G352 ΔV	G423 ΔV
7139.667	−0.878	−1.007	−0.830
7143.667	−0.876	−1.006	−0.832
7152.583	−0.876	−1.005	−0.832
7159.615	−0.875	−1.007	−0.834
7163.583	−0.873	−1.007	−0.833
7164.781	−0.872	−1.012	−0.836
7198.667	−0.885	−1.001	−0.838
7205.604	−0.886	−0.998	−0.842
7210.615	−0.887	−0.997	−0.844
7215.604	−0.888	−0.994	−0.843
7219.576	−0.887	−0.994	−0.844
7240.535	−0.891	−0.994	−0.844
7437.764	−0.893	−0.995	−0.840
7441.750	−0.890	−0.995	−0.841
7445.701	−0.889	−0.996	−0.840
7449.740	−0.889	−0.996	−0.840
7453.701	−0.885	−0.993	−0.836
7459.655	−0.884		
7463.698	−0.890	−0.992	−0.836
7466.656	−0.892	−0.995	−0.840
7469.667	−0.889	−0.990	−0.839
7491.667	−0.897	−0.988	−0.834
7493.583	−0.900	−0.987	−0.836
7497.729	−0.900	−0.988	−0.837
7501.635	−0.898	−0.988	−0.835
7510.597	−0.903	−0.992	−0.836
7514.674	−0.904	−0.996	−0.836
7573.556	−0.891	−0.996	−0.834
7612.549	−0.894	−0.992	−0.837
7627.531	−0.884	−0.993	−0.843
7639.540	−0.884	−0.996	−0.847
7851.736	−0.888	−0.994	−0.846
7867.694	−0.888	−0.995	−0.844
7880.819	−0.890	−0.991	−0.840
7900.694	−0.888	−0.987	−0.845
7920.774	−0.881	−0.987	−0.848
7929.611	−0.875	−0.989	−0.846
7944.562	-	−0.991	
7950.587	−0.872	−0.992	−0.838
7956.559	−0.872	−0.990	−0.836
7965.559	−0.875	−0.993	−0.839
8156.770	−0.887	−0.988	−0.844
8165.865	−0.887	−0.985	−0.850
8181.646	−0.892	−0.993	−0.844
8188.778	−0.893	−0.994	−0.842
8195.779	−0.890	−0.987	−0.838

Table 13: Differential Walraven photometry of HDE 270111 = G 460.

HJD−2440000	ΔV	$\Delta(V-B)$	$\Delta(B-U)$	$\Delta(U-W)$	$\Delta(B-L)$
7139.667	−0.978	0.330	0.215	0.355	0.210
7143.688	−0.978	0.328	0.215	0.342	0.200
7152.583	−0.973	0.326	0.205	0.270	0.196
7159.615	−0.974	0.323	0.213	0.313	0.197
7163.583	−0.974	0.324	0.206	0.280	0.196
7164.781	−0.980	0.336			
7198.667	−0.976	0.333	0.226	0.363	0.206
7205.604	−0.978	0.330	0.212	0.340	0.204
7210.615	−0.982	0.329	0.211	0.340	0.204
7215.604	−0.982	0.332	0.213	0.338	0.203
7219.576	−0.982	0.335	0.220	0.361	0.206
7240.535	−0.974	0.330	0.206	0.363	0.202
7437.764	−0.960	0.320	0.206	0.341	0.198
7441.750	−0.958	0.320	0.204	0.321	0.193
7445.701	−0.956	0.320	0.205	0.342	0.190
7449.740	−0.956	0.320	0.206	0.316	0.193
7453.701	−0.956	0.317	0.197	0.318	0.191
7463.698	−0.946	0.317	0.206	0.336	0.196
7466.656	−0.950	0.316	0.204	0.368	0.188
7469.667	−0.953	0.314	0.209	0.345	0.191
7491.667	−0.947	0.314	0.196	0.319	0.190
7493.583	−0.949	0.316	0.206	0.321	0.193
7497.729	−0.950	0.317	0.209	0.328	0.190
7501.635	−0.948	0.318	0.208	0.322	0.191
7510.597	−0.950	0.316	0.206	0.334	0.195
7514.674	−0.951	0.318	0.211	0.329	0.193
7573.556	−0.951	0.325	0.228	0.369	0.198
7627.531	−0.948	0.322	0.221	0.347	0.199
7851.736	−0.968	0.330	0.216	0.311	0.207
7867.694	−0.963	0.327	0.212		0.207
7880.819	−0.962	0.327	0.217	0.360	0.203
7900.694	−0.959	0.324			0.196
7920.774	−0.953				
7929.611	−0.956	0.322			0.195
7944.562	−0.954	0.316	0.205	0.351	0.191
7950.587	−0.958	0.318	0.205	0.334	0.192
7956.559	−0.960	0.320	0.210	0.382	0.190
7965.559	−0.964	0.324	0.209	0.360	0.197
8156.770	−0.962	0.321	0.196	0.320	0.193
8165.865	−0.963	0.322	0.205	0.298	0.198
8181.646	−0.960	0.317	0.199		0.193
8188.778	−0.958	0.314	0.202		0.192

Table 14: Differential Walraven V photometry of G 80 and G 346.

HJD−2440000	G80 ΔV	G346 ΔV
7845.676	−0.717	−1.024
7850.767	−0.722	−1.017
7866.781	−0.731	−1.001
7876.714	−0.747	−1.010
7898.724	−0.740	−1.011
7921.755	−0.718	−1.002
7929.654	−0.725	−1.001
7946.552	−0.769	−1.029
7949.550	−0.770	−1.024
7955.524	−0.760	−1.013
7963.632	−0.730	−1.004
7967.602	−0.727	−1.002
7970.640	−0.723	−0.997
8141.865	−0.744	
8148.748	−0.747	−1.010
8157.764	−0.747	−1.015
8162.799	−0.746	−1.011
8166.700	−0.742	−1.004
8169.795	−0.742	
8177.835	−0.727	−1.018
8182.758	−0.723	−1.006
8186.765	−0.727	−1.000
8190.724	−0.732	−0.995
8194.662	−0.739	−0.994
8197.750	−0.739	−0.997