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NEW VARIABLE STARS IN THE NORTHERN MILKY WAY

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This report summarizes the results of a variable-star search in the $20^\circ \times 15^\circ$ area centered at 20^h18^m, $+60^\circ$ (1950). Five similar fields have been previously described (Dahlmark 1982, 1986, 1993, 1996, 1997). The two earliest reports describe the camera systems used for the survey.

Sixteen yellow/blue plate pairs (Kodak 103a-D + GG11 filter and 103-O unfiltered) were exposed between 1967 and 1981, and forty-seven films (Kodak TechPan 4415 + GG495 filter) taken in the years 1987 to 1998. Four exposures with a 200/210/300mm Schmidt camera taken 1995–97 on TechPan without a filter were also examined and used to prepare finding charts. Ten plate or film pairs were scanned for variables with a blink comparator and with four stereo comparators used in tandem. Magnitudes were determined in a stereomicroscope using comparison stars taken from the Guide Star Catalogue (GSC, Lasker *et al.* 1990). The yellow-light magnitudes 'm_v' shown in Table 2 are thus tied to the GSC (northern) magnitude scale and will be systematically somewhat brighter than standard Johnson V.

In this field 35 variables were found, two of which were later identified with known variables after correcting for position errors in the GCVS4. In addition, data for six designated but poorly-studied variables were analyzed. Improved coordinates and elements are provided for these. Table 1 shows positions and identifications. The coordinates were drawn from the GSC (source code G) or from the more comprehensive USNO–A1.0 catalogue (code A, Monet *et al.* 1996); for a few stars not appearing in either of these, positions were estimated ($\pm 2''$) using the Digitized Sky Survey via the Goddard SkyView facility (code S, McGlynn *et al.* 1996). An asterisk by the star name indicates a note at the bottom of the table. For the reddest stars, b–r colors from USNO–A1.0 are shown; these are not calibrated to any standard system, but serve to indicate in a qualitative way those stars of extreme color.

The lightcurves are based on 65 magnitude estimates for each star. From these the range, approximate color-index, provisional variability type, epoch of maximum, and period have been determined. These elements are collected in Table 2.

The finder charts show a field of $15' \times 15'$ centered on the variables; north is up and east to the left.

I would like to thank Brian Skiff (Lowell Observatory) for his assistance in obtaining identifications and precise positions for the stars.

Table 1: Positions and identifications

Name	RA (2000)	Dec	s	GSC	IRAS	Remarks
LD 281	18 49 51.0	+62 17 25	G	4219-2324	18493+6213	
LD 282	19 07 56.6	+59 23 52	G	3932-0152		
LD 283	19 26 36.5	+58 52 41	G	3933-0532		
LD 284	19 30 51.5	+59 20 03	G	3933-0464	19300+5913	
LD 285	19 35 03.1	+62 19 46	A			
LD 286*	19 35 18.9	+54 39 53	A			FBS 1934+545
LD 287	19 47 53.2	+51 45 15	G	3569-1495		
LD 288	20 04 29.3	+53 21 50	G	3936-1293		
LD 289	20 05 23.6	+63 24 57	G	4236-1227		
LD 290	20 13 42.7	+65 56 28	A		20132+6547	
LD 291	20 14 32.1	+52 59 36	A			
LD 292	20 15 59.0	+63 46 32	G	4240-1183		
LD 293	20 18 45.0	+62 32 45	G	4237-1933		
LD 294*	20 20 16.9	+55 08 57	G	3941-1952	20190+5459	V770 Cyg; b–r = 4.8
LD 295*	20 21 49.5	+53 01 25	S		20204+5251	
LD 296	20 23 19.6	+65 28 18	G	4241-1345	20227+6518	
LD 297	20 29 05.8	+64 17 43	G	4241-1140		
LD 298*	20 29 11.7	+64 16 23	A		20284+6406	
LD 299	20 33 23.5	+61 52 30	A			faint companion on E
LD 300	20 35 15.0	+61 05 48	A		20342+6055	
LD 301*	20 35 13.8	+55 58 51	A			V566 Cyg
LD 302	20 36 31.9	+53 26 17	A		20351+5315	
LD 303	20 44 05.7	+54 33 52	A		20427+5422	b–r = 7.4
LD 304	20 47 16.7	+60 35 27	A		20461+6024	
LD 305	20 47 30.6	+61 38 12	A		20464+6127	
LD 306	20 48 55.9	+63 26 26	S		20480+6315	
LD 307	20 55 47.4	+58 15 18	A			b–r = 5.0
LD 308*	20 56 24.5	+52 56 58	S		20549+5245	M8
LD 309	21 00 41.7	+58 05 09	S		20593+5753	southeastern of two
LD 310	21 03 26.9	+59 58 30	A		21021+5946	b–r = 5.3
LD 311	21 06 52.0	+58 04 45	A			
LD 312	21 10 58.0	+58 01 03	G	3961-0044		b–r = 5.2
LD 313	21 17 07.5	+55 30 22	A		21156+5517	
LD 314	21 17 14.5	+54 24 42	G	3957-0169	21156+5412	
LD 315	21 31 11.1	+64 27 36	G	4257-0783	21300+6414	
HH Cep	20 18 43.6	+60 36 14	A		20177+6026	
V1198 Cyg	20 32 22.3	+52 19 42	A			b–r = 6.1
UW Cep	20 59 23.0	+58 53 33	A	3964-0838	20581+5841	b–r = 5.5
UX Cep	21 03 54.7	+55 27 51	A		21024+5515	
V339 Cep	21 11 45.4	+57 42 49	A		21103+5730	
V341 Cep	21 13 23.7	+58 02 48	A	3961-0207	21120+5750	

Notes:

LD 286 b–r = 7.0; carbon Mira according to Abrahamian & Gigoian (1993).

LD 294 GCVS4 position in error; identification verified on MVS 290.

LD 295 faint companion 5″ south.

LD 298 southwestern of two; the variable is itself a close double.

LD 301 GCVS4 position in error; identification verified on MVS 290.

LD 308 spectral type from Kwok *et al.* (1997).

Table 2: Elements of variation

Name	max min (m_v)	m_b–m_v	type	epoch JD 2400000+	period (days)
LD 281	11.1 – 14.9	2.4	M	50746	312
LD 282*	11.8 – 14.8	0	EA	49681	short
LD 283	12.8 – >16.0	1.2	M	50746	244
LD 284	10.4 – 14.5	1.0	M	50806	298
LD 285	13.5 – 14.7	0	Ia	50189	269:
LD 286	12.9 – 15.0	0.7	SRa	50715	300
LD 287	12.3 – 14.9	>0.7	SRa	50715	312
LD 288	12.3 – 14.3	1.4	Lb		
LD 289*	12.0 – 14.4	0	E		27?
LD 290	11.5 – >15.5	1.5	M	50388	269
LD 291	13.4 – 15.5	0.9	SRa	50835	318
LD 292*	13.0 – 15.8	0.6	SRb	49843	272
LD 293	11.8 – >16.2	1.7	M	50776	300
LD 294*	11.9 – 15.6	2.1	M	50835	314
LD 295	12.7 – >15.2	>0.9	M	50572	345
LD 296	11.8 – 15.8	2	M	50546	352
LD 297	13.1 – 14.4	1.0	Lb		
LD 298	11.9 – 15.4	1.2	M	50636	260
LD 299*	13.1 – 14.7	>1	SRb		
LD 300	13.4 – >16.2	>0.9	Lb		
LD 301*	12.3 – >16.2	1.0	M	50636	224
LD 302	12.1 – 14.4	1.9	SRa	50776	457
LD 303	12.8 – 14.0	>0.7	SRa	50690	375
LD 304	13.2 – >16.2	0.7	SRd	50599	297
LD 305	12.3 – >16.2	>2	M	50746	362
LD 306	12.3 – >16.0	>1.2	Lb		
LD 307	13.0 – >16.0		M?	49569	272
LD 308	13.7 – >16.0		L		
LD 309	14.2 – >16.0		SRa?	50596	351
LD 310	12.4 – 15.3	1.4	M	50018	363
LD 311	13.6 – 14.6		L		
LD 312	13.7 – 16.0	>0.7	SRa	50690	350
LD 313	12.1 – 14.6	>1.6	M	50388	491
LD 314	12.0 – 15.5	1.7	M	50249	337
LD 315	12.6 – >16.0	>1.1	M	50820	333
HH Cep	12.1 – 14.2	>1.2	SRa	50746	278
V1198 Cyg	11.7 – 15.5	1.5	M	50599	400
UW Cep	10.5 – 15.9	2.3	M	50806	472
UX Cep	12.2 – >16.0	>1	M	50746	191
V339 Cep	14.2 – 16.0		SRb	50690	340:
V341 Cep	13.7 – 16.0		SRa	50835	332

Notes:

LD 282 four dimmings observed, of which two were within one hour of normal brightness.

LD 289 period is possibly a shorter fraction of 27^d.

LD 292 period fluctuates by $\pm 20^d$.

LD 294 V770 Cyg; GCVS period (156^d) is closely one-half the present determination.

LD 299 cyclic variations in the range 400^d– 450^d.

LD 301 V566 Cyg; GCVS period ($226\overset{d}{.}3$) confirmed.

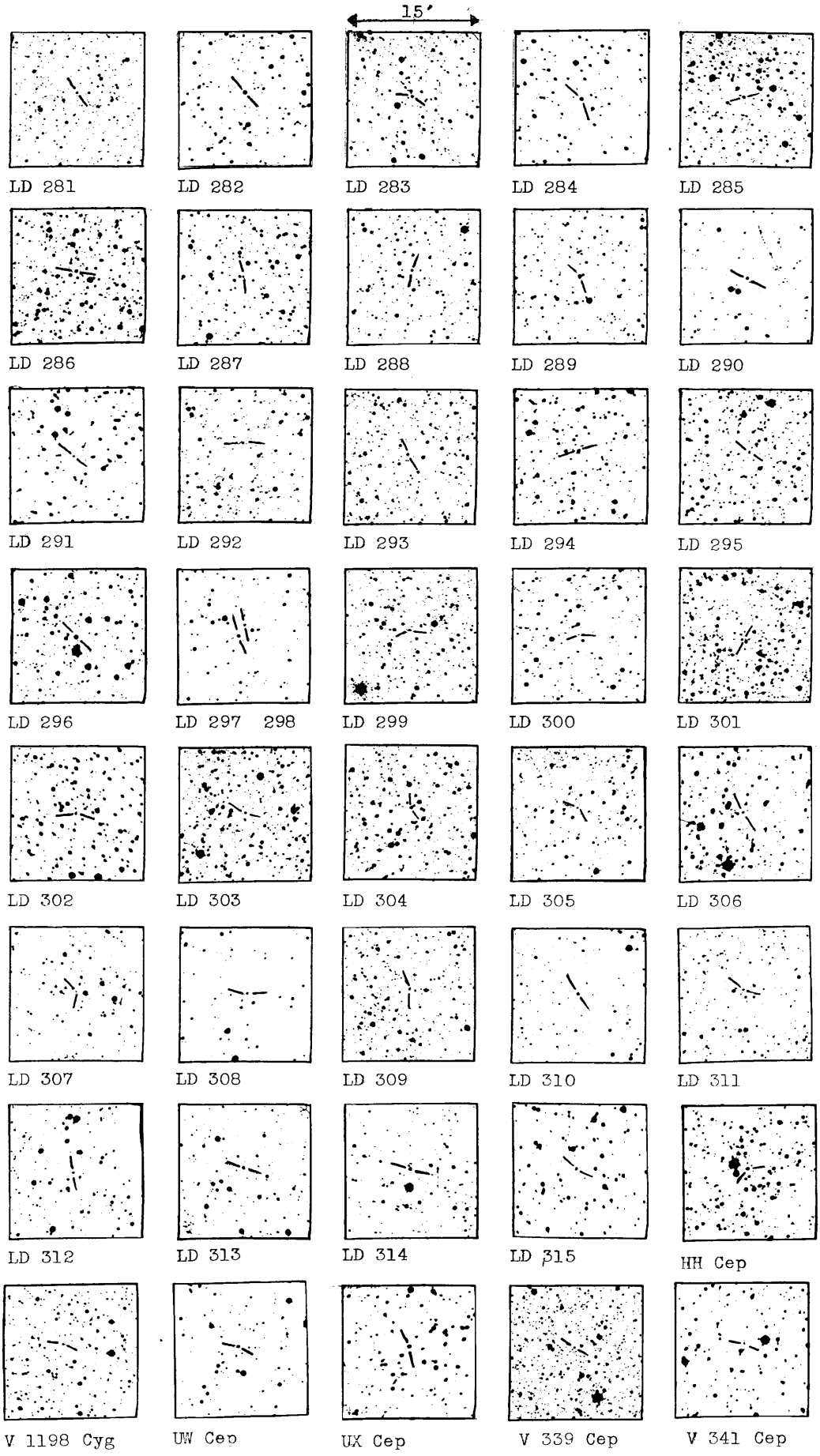
15′
LD 281
LD 282
LD 283
LD 284
LD 285
LD 286
LD 287
LD 288
LD 289
LD 290
LD 291
LD 292
LD 293
LD 294
LD 295
LD 296
LD 297 298
LD 299
LD 300
LD 301
LD 302
LD 303
LD 304
LD 305
LD 306
LD 307
LD 308
LD 309
LD 310
LD 311
LD 312
LD 313
LD 314
LD 315
HH Cep
V 1198 Cyg
UW Cep
UX Cep
V 339 Cep
V 341 Cep

Figure 1.

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