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New Light Elements for 100 Variable Stars

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Classifications and light elements, based on data mining in the ASAS-3 and ROTSE-I/NSVS data, are presented for 100 variable stars, 78 of them from the NSV catalog. Availability of online observations makes it possible to suggest all these stars for GCVS Name-Lists.

Introduction

In our work on improved coordinates for all stars in the database of the GCVS and the NSV catalog (Samus et al., 2002, 2003, 2006), it was very important to be able to "recover" many variables (especially those from the NSV catalog), which had no finding charts and only very rough coordinates published. Successful search became possible with publicly available electronic archives of CCD observations from large-scale automatic sky surveys, like ASAS-3 (Pojmanski, 2002) and ROTSE1/NSVS (Woźniak et al., 2004). Recovered variables can be effectively studied using these data. In some cases, additional insight into the lower brightness limit of red variable stars can be gained using the US Naval Observatory Image and Catalog Archive (http://www.nofs.navy.mil/data/fchpix/).

Usually we proceeded in the following way. We selected candidate stars by brightness, within a radius about $5'$ around the position published by the discoverer. Then the candidates were tested for brightness variations using the CCD archives mentioned above. Alternatively, for fainter variability limits, we sometimes looked for variable stars comparing several images of the USNO Archive. For stars with CCD observations available, we searched for periodicity using the WINEFK code developed by Dr. V.P. Goranskii; usually the well-known Lafler–Kinman algorithm was applied.

In this way, we have already recovered several hundred "lost" variables. A part of them were earlier found by the author of the ASAS-3 survey in the cause of automatic reductions of the original observations and included into the catalog of ASAS-3 variable stars, which contains approximate coordinates, variability types, and parameters of the mean light curves. Note that, in most cases, the ASAS-3 cataloged light elements for stars with uncertain classification (the ASAS type MISC) are, in fact, fictitious.

Results

For this paper, we have selected 100 variable stars, mainly from the NSV catalog but also a number of recently discovered but insufficiently studied variables, for which we were able to derive significant information sufficient for the stars to be named in the GCVS system. The stars will be included in one of the Name-Lists of Variable Stars soon.

Table 1. Coordinates of the studied NSV-catalog stars

NSV	$\alpha_{2000.0}$	$\delta_{2000.0}$	NSV	$\alpha_{2000.0}$	$\delta_{2000.0}$
NSV 0917	$02^h46^m21^s.1$	$-36°13'36''$	NSV 4944	$10^h41^m13^s.2$	$-71°33'15''$
NSV 1773	04 55 30.3	+03 04 28	NSV 4974	10 47 46.5	–46 10 00
NSV 3245	06 50 54.9	–37 29 23	NSV 4984	10 48 46.4	–69 17 50
NSV 3552	07 21 14.8	–29 18 00	NSV 4989	10 50 36.3	–52 30 40
NSV 3967	08 19 47.2	+77 44 32	NSV 4993	10 51 05.6	–55 47 35
NSV 3981	08 17 01.9	–15 00 43	NSV 5010	10 53 23.8	–59 35 12
NSV 4081	08 26 04.2	–30 06 41	NSV 5026	10 57 00.1	–53 45 58
NSV 4114	08 31 02.3	–10 58 04	NSV 5029	10 57 19.2	–55 35 25
NSV 4229	08 43 45.4	–55 01 52	NSV 5046	10 59 25.4	–58 12 18
NSV 4342	08 59 25.8	–55 58 50	NSV 5065	11 00 54.5	–84 05 27
NSV 4378	08 56 35.7	–83 05 11	NSV 5052	11 00 55.4	–48 00 56
NSV 4353	09 01 00.9	–54 57 00	NSV 5061	11 01 48.0	–56 10 31
NSV 4358	09 02 42.4	–30 32 43	NSV 5095	11 07 25.4	–52 48 00
NSV 4381	09 05 18.0	–67 08 24	NSV 5130	11 11 39.7	–54 11 25
NSV 4388	09 07 15.3	–53 25 19	NSV 5135	11 12 32.6	–47 33 41
NSV 4403	09 10 14.7	–37 55 23	NSV 5142	11 13 28.9	–67 35 29
NSV 4424	09 12 57.9	–57 48 28	NSV 5145	11 14 22.4	–42 40 20
NSV 4467	09 21 08.9	–61 56 22	NSV 5148	11 14 59.9	–42 28 27
NSV 4468	09 22 04.5	–36 42 09	NSV 5162	11 17 35.4	–51 37 40
NSV 4487	09 23 08.1	–78 36 41	NSV 5168	11 18 42.7	+27 31 50
NSV 4483	09 23 32.2	–72 22 49	NSV 5176	11 21 58.3	–49 28 55
NSV 4481	09 24 07.0	–36 05 50	NSV 5186	11 23 32.0	–71 36 12
NSV 4535	09 33 14.2	–64 21 07	NSV 5187	11 23 58.3	–33 08 23
NSV 4639	09 49 11.2	–40 41 36	NSV 5191	11 24 05.9	–75 54 49
NSV 4655	09 51 08.6	–57 08 45	NSV 5207	11 26 46.2	–50 47 14
NSV 4708	10 00 19.4	–69 13 40	NSV 5215	11 28 18.5	–49 15 00
NSV 4719	10 03 09.5	–47 24 03	NSV 5216	11 28 21.4	–70 24 06
NSV 4728	10 04 57.7	–60 04 56	NSV 5236	11 30 57.0	–69 34 44
NSV 4735	10 05 27.8	–67 36 59	NSV 5275	11 37 38.9	–72 11 10
NSV 4754	10 07 34.1	–63 09 49	NSV 5292	11 39 25.2	–87 09 26
NSV 4760	10 09 14.3	–62 42 23	NSV 5288	11 40 14.8	–30 15 49
NSV 4780	10 11 50.9	–48 51 19	NSV 5295	11 41 19.5	–72 30 39
NSV 4783	10 12 46.3	–57 49 51	NSV 5301	11 42 33.4	–67 52 09
NSV 4795	10 14 12.1	–66 08 19	NSV 5340	11 47 53.8	–63 44 59
NSV 4805	10 16 16.1	–51 29 25	NSV 5342	11 48 24.1	–67 53 47
NSV 4830	10 21 23.9	–68 50 23	NSV 5406	11 59 19.1	–27 09 03
NSV 4853	10 24 54.1	–63 52 14	NSV 5480	12 10 06.8	–53 25 40
NSV 4900	10 35 03.9	–44 25 32	NSV 5541	12 18 37.0	–53 08 12
NSV 4932	10 40 13.8	–44 19 45	NSV 8470	17 18 10.9	–24 30 05

Remark to Table 1. NSV 5162 has the alternative name NSV 5164; the two entries of the NSV catalog turned out to be the same star.

Table 2. Coordinates of the new variables

Name	$\alpha_{2000.0}$	$\delta_{2000.0}$	Ref.
Mis V1246	02 03 21.1	+46 23 48	1
Mis V1190	02 09 46.9	+46 43 17	1
Mis V1250	04 00 39.7	+51 21 02	1
Toa V20	08 25 40.3	–22 10 34	2
GSC 8586–00290	09 00 58.1	–54 55 55	3
GSC 3010–01290	11 13 06.0	+40 21 38	4
GSC 3015–00374	11 21 41.1	+43 36 53	4
GSC 3453–01714	11 32 20.9	+49 44 10	4
GSC 3015–01522	11 33 34.7	+42 58 29	4
GSC 3013–01988	11 35 36.7	+38 45 58	4
Mis V0038	16 51 24.6	–28 21 54	1
GSC 7872–02362	16 56 43.3	–40 36 25	5
Mis V0005	16 59 28.1	–13 23 14	1
Mis V0483	17 59 09.3	–26 38 00	1
Mis V0111	18 57 29.9	+20 05 28	1
Mis V0213	18 57 40.7	–13 13 35	1
Mis V0033	18 57 42.3	–10 49 04	1
Mis V0110	18 59 38.6	+19 59 00	1
Mis V0168	19 02 53.7	–10 26 43	1
Had V107	19 43 21.5	+00 30 35	6
IRAS 19582–0613	20 00 56.8	–06 05 13	7
Brh V124	21 25 44.1	+16 02 11	8

References. 1. http://www.aerith.net/misao/data/misv.cgi?en 2. Takao (2003) 3. ASAS-3 (Pojmanski, 2002) 4. Kehoe et al. (2002) 5. Fu et al., 2003 6. Haseda (2002) 7. Wils (2003a) 8. http://mitglied.lycos.de/KlausBernhard/index.html

Tables 1 presents coordinates for the NSV stars studied by us, Table 2 contains coordinates for newly-discovered variables and references to their discovery announcements.

The variability data for the program stars are collected in Table 3. Its contents is typical of the GCVS. Epochs of maxima for pulsating stars and of minima for eclipsing variables are given. An asterisk in the "Remarks" column means that the star appears in the ASAS-3 variable-star online catalog (Pojmanski, 2002), but our solution differs considerably from that in the cited catalog. Asterisks instead of the photometric system mean CCD unfiltered observations (usually related to R-band magnitudes of comparison stars). Remarks concerning several stars follow the table.

Table 3. Variability data

Name	Rem.	Max	Min		Type	Epoch, 24...	Period, d
NSV 0917		10.2	<11.2	*V*	M	52886.764	304
NSV 1773		12.0	<14.6	*V*	M	51565	396
NSV 3245	1	12.4	<15.5	*V*	M	53466	299
NSV 3552	2,*	11.3	13.0	*V*	SR		290
NSV 3967		9.1	9.6	*	SR	51630	56
NSV 3981		12.6	<15	*V*	M	53054	254
NSV 4081	*	11.0	13.4	*V*	RVA	53077.7	58.1
NSV 4114		10.5	<15.0	*V*	M	53364	315
NSV 4229		11.2	<14.0	*V*	M	53455	180
NSV 4342		12.4	14.5	*V*	SR	53421	460
NSV 4378		12.0	<14.8	*V*	M	53119	266
NSV 4353		11.7	<14.0	*V*	M	52903	370
NSV 4358		11.3	<15.0	*V*	M	53356	326
NSV 4381	*	11.0	12.6	*V*	SRA:	52624	252
NSV 4388		11.9	<13.8	*V*	M	53117	489
NSV 4403	*	12.0	14.4	*V*	SRA	53644	261
NSV 4424	*	10.9	<15.0	*V*	M	53463	301
NSV 4467		11.0	<14.2	*V*	M	52971	406
NSV 4468	*	10.6	<14.3	*V*	M	52945	333
NSV 4487		12.4	<15.2	*V*	M	53133	228
NSV 4483		12.6	<15.0	*V*	M	53500	245
NSV 4481	*	12.5	14.3	*V*	SRA	53070	287
NSV 4535	*	10.8	14.3	*V*	M	52174	386
NSV 4639		12.3	16.2	*R*	M	52468	236
NSV 4655	*	11.6	<12.8	*V*	SRA:	52950	346
NSV 4708		13.2	<15.0	*V*	SR:	53472	344:
NSV 4719		13.7	16.7	*B*	EA	52949.8504	4.414288
NSV 4728		12.0	<14.2	*V*	M	53159	203
NSV 4735		12.6	<13.8	*V*	SRA:	51939	275:
NSV 4754	*	11.	16.5	*V*	M	53455	350
NSV 4760		12.7	16.2:	*V*	M	52984	304:
NSV 4780	*	11.4	<14.0	*V*	M	53391	215
NSV 4783		11.8	<14.6	*V*	M	53443	288
NSV 4795		12.6	<15.8	*V*	M	52999	328
NSV 4805	*	11.	14.5	*R*	M	51941	345
NSV 4830		12.7	<15.0	*V*	M	52999	290
NSV 4853		12.0	13.8	*V*	SRA	52105	376
NSV 4900		10.5	14.0	*V*	M	53504	165
NSV 4932	*	12.0	<14.5	*V*	M	53385	365
NSV 4944		13.0	<16.2	*V*	M	52566	336
NSV 4974	*	11.1	12.7	*V*	SRA	53407	265
NSV 4984	*	10.5	15.8	*R*	M	51940	269
NSV 4989		10.8	<13.9	*V*	M	52952	380
NSV 4993		12.6	<14.4	*V*	M	53159	270
NSV 5010		12.0	13.1	*V*	SRA:	52969	290
NSV 5026		12.2	14.2:	*V*	SRA:	53512	256

Table 3 (continued)

Name	Rem.	Max	Min		Type	Epoch, 24...	Period, d
NSV 5029		12.4	<16.8	*V*	M	53383	379
NSV 5046		12.3	<14.7	*V*	SRA:	53561	355
NSV 5065		11.6	<14.5	*V*	M	53562	305
NSV 5052	*	11.2	<14.8	*V*	M	53480	240
NSV 5061		10.7	<13.0	*V*	M	52039	312
NSV 5095		12.6	<15.2	*V*	M	52830	261
NSV 5130		12.9	<14.8	*V*	SRA:	51927	281
NSV 5135		11.4	<15.3	*V*	M	52056	340
NSV 5142		12.0	<15.2	*V*	M	53541	131
NSV 5145	*	11.9	<14.9	*V*	M	53539	318
NSV 5148		11.9	<14.6	*V*	M	53391	273
NSV 5162		10.2	<14.6	*V*	M	53423	278
NSV 5168		13.8	14.4	*	EW	51286.7082	0.33770
NSV 5176		11.6	<15.0	*V*	M	53466	276
NSV 5186	*	11.2:	<13.9	*V*	M	52976	323
NSV 5187		13.1	14.3	*V*	EA	53499.6027	1.50944
NSV 5191	*	11.3	12.6:	*V*	SRA	53541	234
NSV 5207		12.3	17.1:	*V*	M	52963	360:
NSV 5215	3	11.2	<13.2	*V*	SRA:	52835	145
NSV 5216	*	11.7	<14.7	*V*	M	53564	268
NSV 5236	*	11.8	13.3	*V*	SRA	53476	196
NSV 5275		11.2	<14.0	*V*	M	53075	334
NSV 5292		11.3	<14.9	*V*	M	53597	193.4
NSV 5288	*	12.0	12.7	*V*	SRA:	52701	148
NSV 5295	4,*	11.0	<14.4	*V*	M	52650	399
NSV 5301		12.0	<14.2	*V*	M	53115	290
NSV 5340		11.7	<14.6	*V*	M	53516	345
NSV 5342		11.0	<14.2	*V*	M	53541	367
NSV 5406	*	11.7	<15.4	*V*	M	53457	301
NSV 5480		12.8	<15.0	*V*	M	53393	325
NSV 5541		13.2	<15.0	*V*	M:	53141	241
NSV 8470		13.4	<15.0	*V*	M	52157	261
Mis V1246		10.5	13.6	*	M	51410	285:
Mis V1190		12.2	12.9	*	EW	51370.877	0.33853
Mis V1250		11.7	13.9	*	SRA:	51418	350
Toa V20		12.0	<14.6	*V*	M	51418	350
GSC 8586–00290		10.6	11.2	*V*	SRB		93.3
GSC 3010–01290		11.66	12.04	*	RRC	51306.702	0.31802
GSC 3015–00374		11.57	11.83	*	EW	51312.8513	0.476058
GSC 3453–01714		11.97	12.60	*	EW	51563.9502	0.410384
GSC 3015–01522		11.75	12.16	*	EW	51330.7415	0.800632
GSC 3013–01988		11.8	12.3	*	RRC	51305.7228	0.267946
Mis V0038		12.4	<16.0	*V*	M	52483	555:
GSC 7872–02362	5	11.0	(0.22)	*B*	EA	52468.5701	1.9083
Mis V0005		13.1	<14.9	*V*	M	52821	210
Mis V0483		12.9	<18.0	*V*	M	52465	585

Table 3 (continued)

Name	Rem.	Max	Min		Type	Epoch, 24...	Period, d
Mis V0111		11.8	<15.2	*V*	M	53574	364:
Mis V0213		12.4	<14.1	*V*	M	53469	288
Mis V0033		13.0	<15.8	*V*	M	53240	291:
Mis V0110		11.0	<13.3	*	M	51375	365:
Mis V0168		10.5	<13.2	*	M	53275	370
Had V107		12.2	<13.4	*	SRA	51335	192
IRAS 19582–0613		12.1	<14.6	*V*	M	53166	321
Brh V124		11.2	<13.0	*V*	M	52952	223

Remarks to Table 3

1. $P = 148^{\rm d}$: in Wils (2003b) is wrong. 2. $P = 260^{\rm d}$ (P. Wils, vsnet-id No. 791, 2003) is worse. 3. This is a wide double star, with a separation about $0\farcs5$. The ASAS-3 catalog contains the northern component as a variable. The infrared colors clearly indicate that the southern star must be the variable. Though it is formally possible to retrieve ASAS-3 observations separately for the northern and the southern component, the times of brightenings actually coincide. The ASAS-3 period ($850^{\rm d}$) seems wrong. 4. $P = 199^{\rm d}$ in Wils (2003b) is wrong. 5. The star's period was first determined by Fu et al. (2005) as $P = 1\fd92$.

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