2014: The Journal of Astronomical Data 20, 4.

APASS discovery and characterization of 180 variable stars in Aquarius*

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Received July 6, 2013, accepted December 1, 2014

Abstract

During a search for RR Lyr variable stars candidate members of the Aquarius stream, which led to the discovery of 71 such objects, we also discovered an additional 180 variables which are presented in this paper. Of them, 141 were previously reported as variables and 39 are brand new. For all 180 objects, we provide: our epoch photometry, accurate positions, mean magnitude and amplitude of variation in Landolt B,V and Sloan g, r, i bands, cross-identification with WISE, 2MASS and GALEX surveys, accurate BVR_CI_Cgri photometric sequences and finding charts identifying the variable and the stars of the photometric sequence provided to support follow-up observations. We carried out a Fourier search on all 39 new variables and found periods for 10 of them.

Keywords: technique: APASS photometry – stars: variable

1 Introduction

A large number of variable stars have been discovered during the search for RR Lyr variables candidate members of the Aquarius stream (Munari et al. 2014a, hereafter M14), that we carried out from CTIO (Chile) with telescopes primarily used for the AAVSO Photometric All-Sky Survey (APASS). The Aquarius stream was discovered by Williams et al. (2011) in the RAVE data (RAdial Velocity Experiment; Steinmetz et al. 2006, Zwitter et

*Tables 2 and 5 provided in ASCII format only al. 2008, Siebert et al. 2011, Kordopatis et al. 2013). Wylie-De Boer et al. (2012) presented an abundance analysis of six of the Aquarius stars from high resolution spectra. They turned out to be highly coherent from the chemical point of view, with a mean metallicity of [Fe/H]=-1.0 and a dispersion of just 0.1 dex, with the abundance ratios of Ni, Na, O, Mg and Al typical of globular clusters. The Aquarius stream therefore appears to be the product of the tidal disruption of a 12 Gyr old, [Fe/H]=-1.0, [Fe/α]-enhanced globular cluster.

As the members of the stream fall toward the disk of the Galaxy from their highly inclined Galactic orbit, their velocity increases from -160 km s^{-1} for the most distant known members, located at about 3 kpc, to -210 km s^{-1} for those at 1 kpc. A well-constrained orbit would place stringent constraints on the Galactic gravitational potential in the solar suburb. Towards this aim, we have carried out an extensive search for RR Lyr variables over the Aquarius stream area of the sky, providing an input catalog for spectroscopic observations to segregate the members of the stream via accurate barycentric velocities and chemical abundances. This search identified the 71 RR Lyr variables already discussed by M14, and additional 180 variables, which are the subject of this paper.

2 Observations

The large area on the sky covered by the Aquarius stream requires instruments with a very large field of view. We obtained multi-band photometry from CTIO (Chile) with the same equipment used for the APASS all sky photometric survey, separately from the main Survey program (Henden et al. 2012, Henden & Munari 2014). A pair of twin remotely controlled, small telescopes obtain simultaneous CCD observations over five optical bands: B, V (tied to the equatorial standards of Landolt 2009) and g,r,i bands (tied to the 158 primary standards given by Smith et al. 2002, that define the Sloan photometric system). The telescopes are 20-cm $f/3.6$ astrographs feeding Apogee U16m cameras (4096$\times$4096 array, 9 μm pixels), that cover a field 2.9 deg wide with a 2.6 arcsec/pix plate factor. One telescope exposes the B and g bands, while the other in parallel exposes the V, r and i bands. The photometric filters are of the dielectric multi-layer type and are produced by Astrodon. Transmission curves and photometric performances of Astrodon filters are discussed and compared to more conventional types of photometric filters in Munari et al. (2012) and Munari & Moretti (2012). The Sloan measurements are on the "prime" system as defined by Smith et al. (2002); we leave off the primes on the bandpasses in this paper.

The observations for this paper were obtained with fixed exposure times (different and optimized for each photometric band), set to detect V=17 stars at S/N=5 on a single exposure. The sparsely populated stellar fields in Aquarius mean that aperture photometry is fully adequate to measure stellar magnitudes, without the need to pursue PSF fitting. Stars brighter than V=10 may saturate under optimal seeing conditions. Differential photometry within a given field is accurate to better than 0.010 mag. Absolute photometric calibration is obtained against the APASS main survey data. The area to be surveyed was divided into 38 pointings, highlighted in Figure 1, with different degrees of overlap between adjacent pointings. During September and October 2012, the 38 pointings were visited on 15 different epochs, separated by at least a couple of hours and grouped up to four visits per night

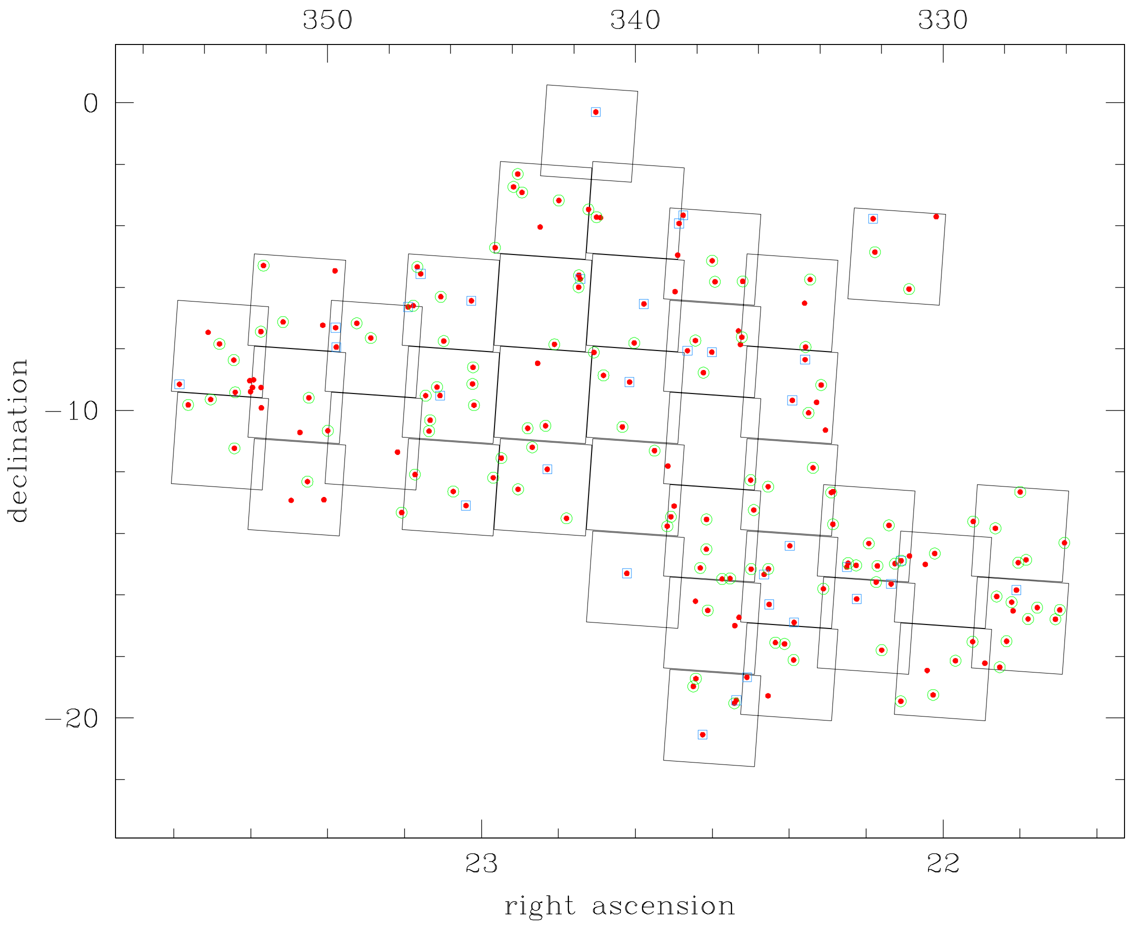

Figure 1: The area of the sky surveyed for variables. The squares outline the 38 monitored fields. The red dots mark the 180 variables stars discussed in this paper. The green circles and blue squares mark those already known and listed in SIMBAD and AAVSO-VSX, respectively.

and characterized by largely variable atmospheric conditions. A total of 246 968 stars were detected in at least one band on one epoch, and 92 876 stars were those detected simultaneously in all five bands on at least 8 different epochs (named the "8-epoch sample" in the following). On average, $V \leq 14.0$ mag stars were detected and measured on all 15 observing epochs, while $V \sim 15.4$ mag stars were on average detected and measured on 8 observing epochs.

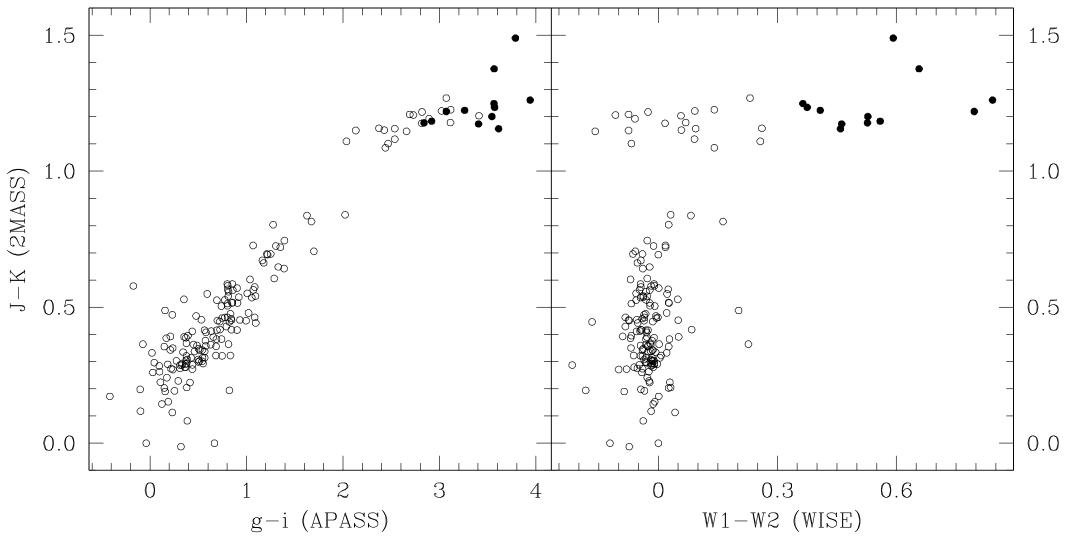

Figure 2: Comparison of the APASS $g-i$, 2MASS $J-K$, and WISE $W1-W2$ colors for the program 180 variable stars. Those with $W1-W2>0.3$ are plotted as solid circles in both panels.

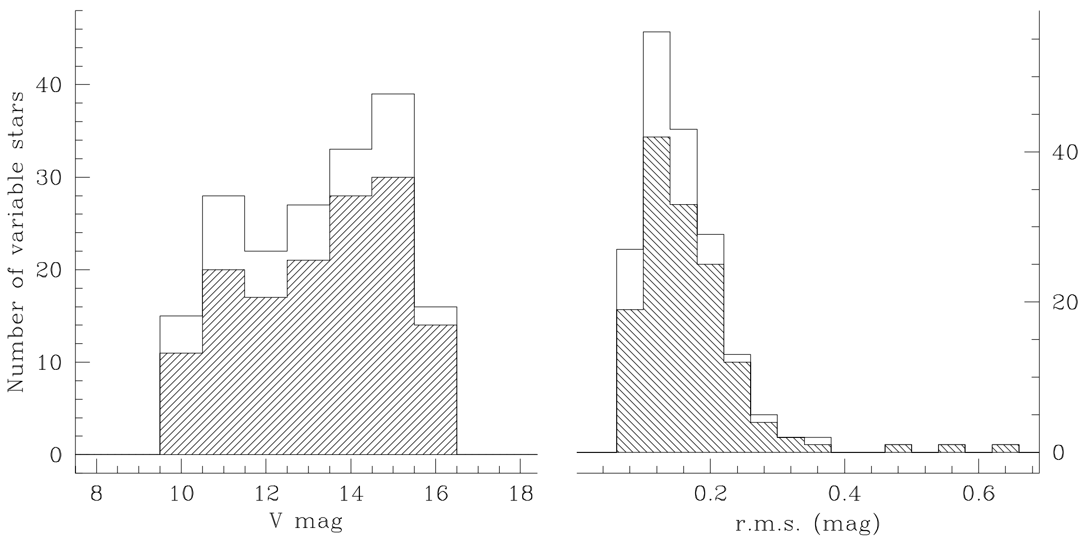

Figure 3: Distribution in V magnitude and in r.m.s. of the 180 program stars. The distribution of the 141 stars already reported as variables is marked in grey. The r.m.s. is the average value over the V, g and r bands.

3 Searching for the variable stars

To discover the variable stars among the surveyed sample, we computed the r.m.s. of recorded data and plotted it versus the mean brightness, separately for all bands. The photometric bands providing the sharpest and cleanest distributions were V, g and r. With a high degree of confidence, we considered as variable stars all those showing an r.m.s. in excess of 4 times that of non-variable stars of the same magnitude, and this *simultaneously* and independently in all three V, g and r bands.

The selection based on the r.m.s. presents some advantages compared to that based on the recorded amplitude, especially when a limited number of observations are at disposal and the type of variability is continuous, like in pulsating stars or over-contact binaries. For them, the r.m.s. does not in principle depend on the number of observations, while the total amplitude increases asymptotically with the number of observations. On the other hand, the selection based on r.m.s. is disadvantageous for systems like detached eclipsing binaries, flare stars and cataclysmic variables that spend most of their time at nearly constant magnitude in between eclipses or outbursts.

Of the 92 876 stars of the 8-epoch sample, 251 satisfy the above variability criterion based on the r.m.s. of the data in the V, g and r bands. The 71 of them that turned out to be RR Lyr variables have been already presented and studied by M14. In this paper we focus on the remaining 180. Their coordinates on the sky, mean magnitude and r.m.s. in each photometric band are given in Table 1. Their distribution on the sky is presented in Figure 1. The epoch photometry we collected for them is provided in Table 2 (available electronic only as ASCII file *Table_2.txt*). Below, as a guideline, a section of Table 2 regarding the data of a single star is reproduced. The first line provides the mean magnitude in the five photometric bands (B, V, g, r and i, respectively) and the value of the r.m.s. for the same bands. Following lines give the measurements, one individual epoch per row. The first two columns list the coordinates (RA and DEC) as derived from that individual observation, followed by the magnitudes in the five photometric bands (B, V, g, r and i, respectively), and finally the respective associated errors. A missing measurement is indicated by "99.999" and the corresponding error reads "0.000".

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#  13.772 13.403 13.544 13.352 13.523  0.345  0.355  0.352  0.321  0.331
 333.88890600 -15.80054400  56168.83594 13.948 13.420 99.999 99.999 99.999  0.065  0.060  0.000  0.000  0.000
 333.88895780 -15.80050880  56176.52734 13.627 13.256 13.420 13.193 13.344  0.009  0.010  0.005  0.011  0.024
 333.88900580 -15.80048800  56195.67969 13.686 13.421 13.432 13.318 13.858  0.015  0.020  0.009  0.018  0.056
 333.88889620 -15.80048720  56182.68750 13.679 13.372 13.494 13.415 13.752  0.010  0.013  0.006  0.014  0.036
 333.88888280 -15.80047920  56202.51953 13.638 13.261 13.414 13.229 13.432  0.009  0.011  0.006  0.011  0.025
 333.88929490 -15.80047780  56202.65625 13.626 13.209 13.429 13.248 13.632  0.016  0.018  0.009  0.017  0.038
 333.88900080 -15.80046160  56180.69922 13.697 13.252 13.468 13.196 13.157  0.009  0.008  0.005  0.008  0.018
 333.88897800 -15.80045700  56195.68750 13.714 13.336 13.480 13.248 13.197  0.014  0.011  0.008  0.011  0.024
 333.88870590 -15.80045380  56195.51953 13.704 13.418 13.487 13.346 13.528  0.013  0.016  0.008  0.014  0.035
 333.88897320 -15.80043380  56182.69922 13.728 13.366 13.531 13.353 13.316  0.009  0.009  0.006  0.009  0.020
 333.88896800 -15.80043050  56182.51563 13.681 13.321 13.424 13.288 13.493  0.009  0.011  0.005  0.012  0.026
 333.88929830 -15.80042980  56179.69531 13.615 13.222 13.401 13.227 13.782  0.010  0.012  0.006  0.012  0.034
 333.88899600 -15.80042780  56179.70313 13.662 13.280 13.479 13.205 13.208  0.009  0.009  0.005  0.008  0.018
 333.88886130 -15.80042180  56175.52344 13.661 13.340 13.433 13.270 13.406  0.009  0.011  0.006  0.011  0.025
 333.88950775 -15.80041525  56180.69141 13.652 13.334 99.999 99.999 99.999  0.010  0.013  0.000  0.000  0.000
 333.88903640 -15.80041100  56202.66406 13.682 13.252 13.433 13.176 13.215  0.015  0.012  0.009  0.011  0.025
 333.88921080 -15.80040680  56179.51172 15.164 14.840 14.856 14.524 14.452  0.027  0.039  0.014  0.032  0.067
 333.88872730 -15.80038680  56180.53125 13.744 13.425 13.520 13.395 13.599  0.010  0.012  0.006  0.013  0.031
 333.88856775 -15.80022900  56174.54297 13.753 13.338 99.999 99.999 99.999  0.069  0.062  0.000  0.000  0.000
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4 Multi-wavelength cross-identification

We have searched the infrared 2MASS and WISE as well as the ultraviolet GALEX all-sky survey databases for counterparts of the 180 program variable stars. The results are summarized in Table 3.

All but two of the program stars have a WISE and 2MASS counterpart within 6 arcsec and with matching magnitudes, the median distance being 0.685 arcsec, which is consistent with the typical astrometric accuracy of WISE. APASS DR7 astrometry is calibrated on UCAC4, and the median difference between APASS positions and those of the Carlsberg Meridian Circle (CMC-15) is just 0.098 arcsec (cf. Munari et al. 2014b). In Table 3 we list only WISE $W1$ (3.35 μm) and $W2$ (4.6 μm) magnitudes; the corresponding $W3$ (11.6 μm) and $W4$ (22.1 μm) bands are mostly upper limits.

Half (92) of the program stars have a GALEX counterpart within 6 arcsec (median separation 1.21 arcsec). The GALEX satellite observed over two ultraviolet bands, FUV and NUV, with effective wavelengths 1540 and 2315 Å, respectively, and in two modes: the All-sky Imaging Survey (AIS), and the much deeper and more sensitive Medium-depth Imaging Survey (MIS). When data from both AIS and MIS are available, Table 3 lists the MIS data because they have associated errors which are an order of magnitude lower than the corresponding AIS data.

The relationships between APASS $g-i$, 2MASS $J-K$ and WISE $W1-W2$ colors for the program stars are shown in Figure 2. There is a good correspondence between APASS $g-i$ and 2MASS $J-K$ for all but the reddest objects, where small temperature changes do not impact significantly the $J-K$ color and instead have large repercussions on $g-i$, which is dominated by molecular opacity at such red colors. WISE $W1-W2$ color is sufficiently far into the infrared to be on the insensitive Rayleigh-Jeans part of the energy distribution for all program stars but the coolest, as illustrated in Figure 2. The objects with a GALEX counterpart are generally those that are the bluest and/or the brightest at optical wavelengths.

5 Photometric sequences for follow-up observations

To facilitate the work of follow-up observers, we have derived accurate photometric comparison sequences around all the 180 program variable stars. They are tabulated in Table 5 and plotted in Figure 5. A short section of Table 5 is reproduced below, for guidance regarding its form and content. The table is accessible in its entirety as the associated electronic ASCII file *Table_5.txt*. The letters in the first column of Table 5 are the same used to identify the stars in Figure 5. Comparing the mean color of the variable (listed next to its name and coordinates) with the colors listed in the column labelled $B-V$ helps to quickly check how well the sequence can transform the observations from the local to the standard system.

APASS J335.67764-15.15421 : 22 22 42.6 -15 09 15.2 B-V=0.696

																number of epochs				
	RA	DEC	B (± err)		V (± err)		g' (± err)		r' (± err)		i' (± err)		R_C	I_C	$B-V$	B	V	g'	r'	i'
A	335.546515	–15.085360	14.163	0.007	13.468	0.006	13.807	0.004	13.283	0.007	13.126	0.022	13.080	12.713	0.695	13	13	13	13	13
B	335.580917	–14.990845	14.247	0.018	13.308	0.009	13.762	0.004	13.037	0.010	12.758	0.021	12.812	12.323	0.939	14	14	13	13	13
C	335.584384	–15.295086	13.690	0.006	13.054	0.007	13.369	0.003	12.900	0.004	12.753	0.019	12.701	12.344	0.636	13	13	13	13	13
D	335.592573	–15.155546	14.451	0.005	13.998	0.006	14.196	0.004	13.913	0.010	13.860	0.023	13.730	13.471	0.453	13	13	13	13	13
E	335.704815	–15.050597	10.965	0.005	10.484	0.008	10.715	0.005	10.387	0.008	10.322	0.023	10.201	9.929	0.481	15	15	14	14	14
F	335.761967	–15.278650	13.577	0.007	12.701	0.005	13.143	0.002	12.450	0.007	12.231	0.025	12.231	11.802	0.876	14	14	13	13	13
G	335.776436	–15.008589	14.782	0.006	14.141	0.011	14.445	0.005	13.970	0.011	13.906	0.026	13.776	13.502	0.641	13	13	13	13	13
H	335.804450	–15.234465	14.523	0.007	13.841	0.007	14.177	0.004	13.667	0.008	13.534	0.031	13.466	13.123	0.682	13	13	13	13	13
I	335.805926	–15.123024	14.633	0.018	13.948	0.006	14.293	0.005	13.787	0.008	13.661	0.027	13.587	13.251	0.685	14	14	13	13	13
J	335.822909	–15.186121	14.458	0.006	13.784	0.005	14.125	0.003	13.616	0.009	13.506	0.030	13.417	13.097	0.674	13	13	13	13	13
K	335.830367	–15.001800	13.250	0.012	12.689	0.007	12.952	0.003	12.554	0.009	12.475	0.031	12.363	12.076	0.561	15	15	13	13	12

The median number of independent epochs of measurements for the photometric sequences is 14, and the median errors of the magnitudes is 0.010 mag for B, 0.008 mag for V, 0.007 mag for g, 0.009 mag for r, and 0.026 mag for i. Magnitudes for the stars in the photometric comparison sequences are tabulated also for the Landolt R_C and I_C bands, derived from APASS Landolt V and Sloan g,r,i following the transformations:

$$I_C = i - 0.3645 - 0.0743 \times (g-i) + 0.0037 \times (g-i)^2 \quad (1)$$

$$R_C = r - 0.1712 - 0.0775 \times (V-i) - 0.0290 \times (V-i)^2 \quad (2)$$

The sequences are contained within a square area of 20×20 arcmin centered on the variable, and are composed of at least 8 unsaturated stars. Within the sparsely populated field, we have selected the (obviously non variable) comparison stars that best satisfy the following criteria: (i) typically 1 mag brighter than the variable, and (ii) a color range that extends for $\Delta(B-V) \geq 0.5$ mag and covers (or is the closest possible choice to) the range of colors displayed by the variable.

6 Cross-identification with literature

We cross-identified with the General Catalog of Variable Stars (GCVS), and we found 14 matches among the 180 program stars. A search with the variable stars listed in SIMBAD expanded the number of stars in common to 34, primarily objects with a tentative classification as eclipsing binaries. Most of them have just one bibliographic reference cited in SIMBAD (the discovery paper usually based on unfiltered, or white light, observations).

We also searched the AAVSO Variable Star Index (VSX) via the CDS Vizier service. In addition to all but one of the 34 stars already cited in SIMBAD, VSX lists additional 107 stars already noted as variable stars, mostly in the course of unfiltered (white light) surveys or that have been observed in just one band without information about the photometric colors. The result of cross-matching with GCVS, SIMBAD and VSX is summarized in Table 4.

Therefore, of the 180 program stars, a total of 141 have already been reported as variable while 39 are brand new and are presented for the first time in this paper. Many of the objects already known do not have however color information in literature of measurements in a properly defined photometric band, which are instead provided with this paper.

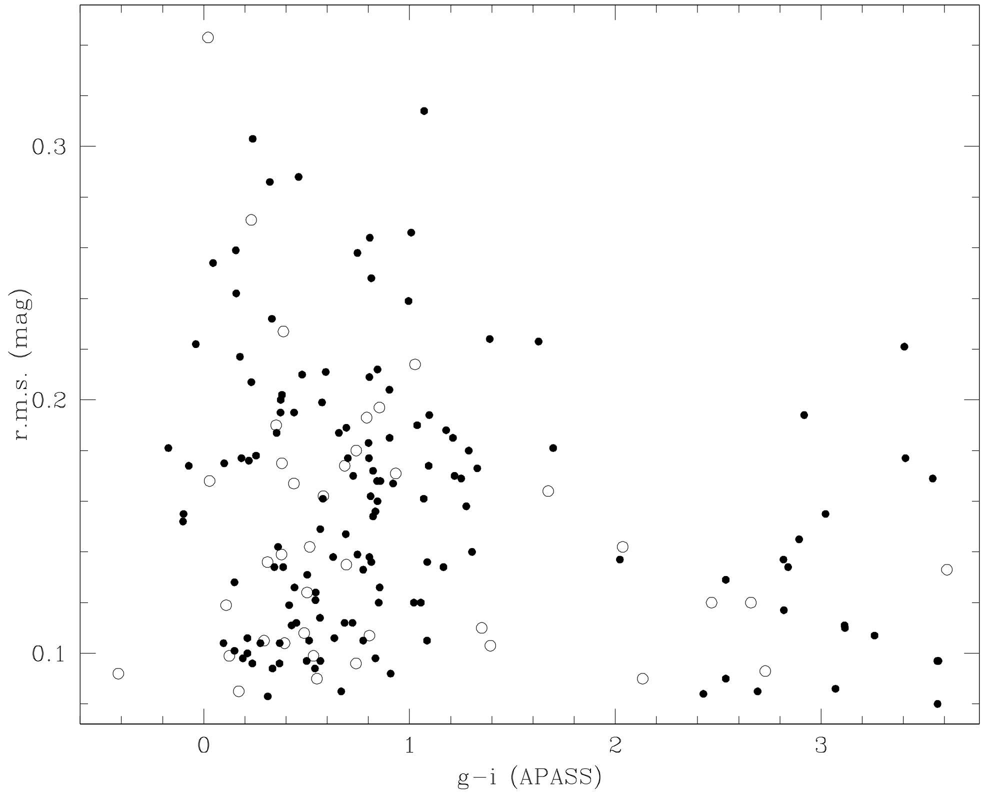

Figure 4: Relation between amplitude of variability (r.m.s.) and $g-i$ color for the 180 program stars. The 141 stars already reported as variables are marked with solid circles.

The distribution of the 141 previously known and 39 new variable stars in terms of magnitude and amplitude of variation is presented in Figure 3. The distributions are quite similar, suggesting that our observations – on average – did not probe stars fainter or with smaller amplitude than those already known in literature.

7 Search for periodicities and classification of new variables

We have carried out a Fourier search (implementing in C++ the code for unequally spaced data formulated by Deeming 1975) of the APASS data for the 39 brand new variables, augmented by data found in various public archives (like ASAS, Catalina SS, Tycho-2, etc.) and arbitrary scaled to a common zero point. We have been able to find periodicities for eleven stars, which are listed in Table 6 together with a classification of the type of variability based on period, amplitude and shape of the resulting phased lightcurves.

Table 6: List of the periods we found to modulate the lightcurve of some of the 39 brand new variables reported in this paper.

	ΔV	type	P (days)
APASS J327.7257-16.5170	0.40	EW	0.32707
APASS J330.5148-18.4544	0.46	RRab	0.33078
APASS J331.0878-14.7348	0.43	RRab	0.82887
APASS J333.5743-12.6415	1.0	SRB	153.850
APASS J338.0436-16.2047	0.48	RRAb	0.59455
APASS J338.0477-07.7294	0.13	EW	0.66602
APASS J339.3754-11.3095	0.25	EW	0.70524, 5.8999
APASS J345.2428-09.8319	1.78	EA	1.46096
APASS J351.1834-12.9252	0.22	EW	0.39008
APASS J353.8013-09.6452	0.40	RRab	0.61892

Table 7: Summary of the 19 RR Lyr variables found in addition to the 71 already listed in Munari et al. (2014a).

APASS	RA	DEC		$\langle V \rangle$	ΔV	P (days)
J329.5952-18.1396	21 58 22.85	–18 08 22.4	Blaz	15.515	0.81	0.36240
J330.5148-18.4544	22 02 03.56	–18 27 15.9	RRab	14.491	0.46	0.33078
J331.0878-14.7348	22 04 21.08	–14 44 05.2	RRab	15.715	0.43	0.82887
J331.3737-19.4555	22 05 29.69	–19 27 19.9	RRab	15.257	0.45	0.44485
J331.5647-14.9832	22 06 15.53	–14 58 59.5	RRc	15.341	0.46	0.28766
J331.9945-17.7950	22 07 58.67	–17 47 42.1	RRd	15.906	0.47	0.28610
J333.9605-09.1767	22 15 50.52	–09 10 36.1	RRc	14.416	0.39	0.30963
J336.5840-07.8615	22 26 20.17	–07 51 41.4	RRc	15.240	0.20	0.28970
J338.0436-16.2047	22 32 10.46	–16 12 16.9	RRab	14.932	0.48	0.59455
J338.8432-13.4586	22 35 22.37	–13 27 31.1	RRc	15.992	0.46	0.34473
J339.7217-06.5402	22 38 53.20	–06 32 24.9	RRab	15.691	0.42	0.73196
J340.0356-07.8081	22 40 08.55	–07 48 29.0	RRc	15.060	0.39	0.38511
J341.8430-05.9970	22 47 22.32	–05 59 49.3	RRab	15.584	0.72	0.53856
J343.4995-10.5819	22 53 59.87	–10 34 54.6	RRab	15.171	0.27	0.68056
J345.2744-08.6017	23 01 05.84	–08 36 06.0	RRab	15.275	0.60	0.57945
J351.4501-07.1260	23 25 48.04	–07 07 33.7	RRab	14.915	0.36	0.65766
J353.0493-08.3654	23 32 11.83	–08 21 55.6	RRab	14.691	0.96	0.57675
J353.5154-07.8401	23 34 03.70	–07 50 24.5	RRab	15.049	0.58	0.57156
J353.8013-09.6452	23 35 12.31	–09 38 42.8	RRab	14.750	0.40	0.61892

8 Additional RR Lyr variables

In addition to the 71 RR Lyr variables found by M14, we have identified a 19 more in this paper that are summarized in Table 7, bringing to 90 the total of RR Lyr variables known over the surveyed area. The reasons why these 19 additional RR Lyr were not recorgnized as such by M14, who worked on APASS observations alone, are various but basically they are the combination of three factors: (1) less than the 8 observations simultaneously valid in

V, g and r bands which was the minimum for further consideration by M14, (2) a brightness fainter than that of other the variables discovered and discussed by M14, and (3) the APASS observations being not well distributed along the phased lightcurve.

Acknowledgements. We would like to thank the referee, N. Samus, for a careful reading of and useful suggestions on the original version of this paper.

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Table 1: List of the 180 discovered variable stars. The coordinates are for the equinox of 2000 and epoch 2012.9. *N* is the number of independent epochs of observations. The last five columns give, for each photometric band, the r.m.s. of the recorded magnitudes.

APASS	R.A.	DEC.	*N*	mean mag					r.m.s.				
				B	*V*	*g*	*r*	*i*	*B*	*V*	*g*	*r*	*i*
J326.0544-14.3050	21 44 13.06	–14 18 18.0	5	15.954	15.097	15.467	14.745	14.874	0.345	0.258	0.219	0.156	0.194
J326.2057-16.4888	21 44 49.37	–16 29 19.7	16	13.299	12.824	13.015	12.708	12.740	0.103	0.110	0.104	0.098	0.142
J326.3477-16.7895	21 45 23.45	–16 47 22.0	16	13.577	13.052	13.274	12.909	12.906	0.098	0.097	0.091	0.100	0.154
J326.9397-16.4112	21 47 45.54	–16 24 40.2	16	10.417	10.115	10.262	10.067	10.026	0.093	0.096	0.099	0.094	0.125
J327.2368-16.7817	21 48 56.82	–16 46 54.0	16	11.989	10.392	11.150	9.656	7.584	0.077	0.081	0.086	0.074	0.161
J327.3012-14.8578	21 49 12.28	–14 51 28.0	16	12.644	11.122	11.819	10.496	8.703	0.102	0.101	0.116	0.114	0.110
J327.4915-12.6530	21 49 57.97	–12 39 10.8	8	16.165	15.241	15.700	14.968	14.607	0.212	0.165	0.190	0.168	0.117
J327.5562-14.9503	21 50 13.47	–14 57 01.2	17	12.779	11.225	11.950	10.480	8.385	0.088	0.105	0.093	0.094	0.159
J327.6162-15.8413	21 50 27.88	–15 50 28.5	16	12.357	10.814	11.554	10.001	7.767	0.161	0.199	0.181	0.175	0.267
J327.7257-16.5170	21 50 54.18	–16 31 01.3	10	15.744	14.995	15.328	14.821	14.536	0.231	0.201	0.174	0.205	0.225
J327.7704-16.2364	21 51 04.90	–16 14 10.9	16	14.097	12.502	13.251	11.897	10.358	0.142	0.149	0.133	0.153	0.176
J327.9367-17.5034	21 51 44.81	–17 30 12.4	16	14.758	13.863	14.290	13.554	13.235	0.146	0.114	0.131	0.114	0.130
J328.1577-18.3457	21 52 37.84	–18 20 44.5	13	14.434	13.757	14.044	13.541	13.318	0.196	0.182	0.164	0.163	0.228
J328.2582-16.0519	21 53 01.97	–16 03 06.9	6	16.936	16.106	16.559	15.731	14.861	0.126	0.212	0.171	0.160	0.000
J328.2979-13.8341	21 53 11.50	–13 50 02.6	7	16.227	15.647	15.908	15.502	15.074	0.065	0.151	0.161	0.155	0.000
J328.6438-18.2195	21 54 34.52	–18 13 10.2	16	16.380	15.685	16.071	15.481	15.217	0.129	0.158	0.233	0.199	0.096
J329.0197-13.6124	21 56 04.72	–13 36 44.5	6	15.529	14.566	15.054	14.218	14.249	0.151	0.170	0.124	0.121	0.128
J329.0394-17.5205	21 56 09.46	–17 31 13.9	24	12.075	11.325	11.654	11.061	10.879	0.145	0.133	0.139	0.127	0.208
J329.5952-18.1396	21 58 22.85	–18 08 22.4	6	15.898	15.515	15.659	15.426	15.220	0.239	0.162	0.218	0.205	0.015
J330.2192-03.7034	22 00 52.61	–03 42 12.4	10	12.641	11.982	12.280	11.803	11.699	0.155	0.158	0.157	0.172	0.147
J330.2678-14.6520	22 01 04.27	–14 39 07.2	15	11.837	11.119	11.458	10.899	10.614	0.134	0.160	0.139	0.181	0.105
J330.3205-19.2497	22 01 16.93	–19 14 58.9	15	12.937	12.322	12.596	12.148	11.906	0.150	0.149	0.147	0.146	0.149
J330.5148-18.4544	22 02 03.56	–18 27 15.9	14	14.734	14.491	14.548	14.505	14.439	0.174	0.119	0.126	0.111	0.109
J330.5758-15.0042	22 02 18.20	–15 00 15.0	15	12.106	10.657	11.386	9.898	7.774	0.121	0.139	0.139	0.120	0.159
J331.0878-14.7348	22 04 21.08	–14 44 05.2	15	16.219	15.715	15.868	15.621	15.481	0.320	0.205	0.257	0.219	0.319
J331.1018-06.0573	22 04 24.43	–06 03 26.4	14	10.589	10.242	10.349	10.175	10.130	0.166	0.191	0.168	0.169	0.200
J331.3628-14.8872	22 05 27.07	–14 53 14.0	16	13.379	12.834	13.078	12.701	12.692	0.128	0.134	0.137	0.131	0.201
J331.3737-19.4555	22 05 29.69	–19 27 19.9	10	15.552	15.257	15.451	15.293	15.268	0.242	0.140	0.272	0.118	0.161
J331.5647-14.9832	22 06 15.53	–14 58 59.5	12	15.562	15.341	15.347	15.336	15.189	0.259	0.226	0.268	0.231	0.201
J331.6877-15.6446	22 06 45.04	–15 38 40.7	9	11.418	9.866	10.605	9.304	7.765	0.102	0.113	0.139	0.149	0.090
J331.7599-13.7366	22 07 02.39	–13 44 11.9	16	13.826	13.117	13.430	12.885	12.690	0.108	0.093	0.108	0.088	0.100
J331.9945-17.7950	22 07 58.67	–17 47 42.1	7	16.279	15.906	16.079	15.833	15.748	0.280	0.191	0.326	0.179	0.067
J332.1334-15.0579	22 08 32.00	–15 03 28.4	5	16.639	15.791	16.167	15.571	15.325	0.104	0.144	0.197	0.164	0.228
J332.1739-15.5807	22 08 41.73	–15 34 50.5	13	13.456	11.690	12.513	11.049	9.976	0.109	0.131	0.111	0.146	0.078
J332.2123-04.8570	22 08 50.95	–04 51 25.4	15	13.192	11.503	12.311	10.891	9.619	0.085	0.084	0.083	0.087	0.101
J332.2741-03.7718	22 09 05.79	–03 46 18.4	15	13.874	13.675	13.703	13.576	13.547	0.307	0.315	0.206	0.257	0.226
J332.4133-14.3247	22 09 39.19	–14 19 28.8	15	14.655	13.640	14.125	13.262	12.874	0.187	0.171	0.177	0.158	0.149
J332.8057-16.1299	22 11 13.37	–16 07 47.5	16	13.370	11.672	12.522	10.790	8.582	0.239	0.266	0.284	0.220	0.221
J332.8219-15.0382	22 11 17.26	–15 02 17.7	16	15.040	13.667	14.395	13.071	12.373	0.159	0.140	0.138	0.132	0.135
J333.0837-14.9675	22 12 20.08	–14 58 03.0	16	10.946	10.664	10.731	10.638	10.607	0.138	0.098	0.123	0.076	0.078
J333.1283-15.0920	22 12 30.79	–15 05 31.2	16	13.034	12.356	12.647	12.138	11.924	0.118	0.113	0.117	0.105	0.146
J333.5743-12.6415	22 14 17.84	–12 38 29.3	18	16.327	14.516	15.381	13.837	13.345	0.210	0.135	0.144	0.148	0.177
J333.5779-13.7020	22 14 18.68	–13 42 07.1	16	14.559	13.018	13.718	12.447	10.989	0.104	0.097	0.083	0.100	0.186
J333.6328-12.6708	22 14 31.87	–12 40 14.8	8	16.465	15.793	16.248	15.640	15.152	0.146	0.246	0.144	0.192	0.000
J333.8215-10.6413	22 15 17.16	–10 38 28.8	11	15.779	14.779	15.241	14.418	14.172	0.157	0.171	0.160	0.151	0.212
J333.8888-15.8005	22 15 33.32	–15 48 02.0	19	13.772	13.403	13.544	13.352	13.523	0.345	0.355	0.352	0.321	0.331
J333.9605-09.1767	22 15 50.52	–09 10 36.1	13	14.665	14.416	14.456	14.443	14.557	0.179	0.152	0.162	0.143	0.149
J334.1082-09.7374	22 16 25.96	–09 44 14.8	12	15.649	15.212	15.292	14.997	14.914	0.448	0.465	0.329	0.282	0.159
J334.2270-11.8679	22 16 54.47	–11 52 04.4	14	15.799	14.408	15.047	13.937	13.373	0.225	0.155	0.170	0.167	0.158
J334.3194-05.7454	22 17 16.66	–05 44 43.4	7	16.459	15.697	16.044	15.437	15.141	0.212	0.168	0.215	0.173	0.250
J334.3709-10.0809	22 17 29.02	–10 04 51.4	15	12.755	11.233	11.912	10.631	8.890	0.115	0.146	0.125	0.195	0.206
J334.4688-07.9399	22 17 52.53	–07 56 23.7	10	11.378	11.112	11.172	11.149	11.127	0.270	0.235	0.277	0.250	0.289
J334.4808-08.3511	22 17 55.40	–08 21 04.0	15	13.669	13.578	13.518	13.545	13.591	0.201	0.169	0.191	0.162	0.158
J334.5008-06.5163	22 18 00.18	–06 30 58.7	14	14.014	13.403	13.669	13.252	13.102	0.102	0.093	0.100	0.097	0.096
J334.8429-16.8926	22 19 22.28	–16 53 33.4	13	11.029	10.728	10.815	10.692	10.603	0.083	0.093	0.081	0.125	0.086
J334.8573-18.1132	22 19 25.75	–18 06 47.4	12	14.880	13.907	14.356	13.572	13.285	0.345	0.316	0.328	0.298	0.266
J334.8969-09.6758	22 19 35.26	–09 40 32.8	15	12.735	11.233	11.917	10.619	8.999	0.226	0.192	0.218	0.172	0.158
J334.9768-14.4020	22 19 54.43	–14 24 07.1	15	11.528	9.870	10.737	9.223	7.666	0.555	0.576	0.581	0.519	0.194
J335.1491-17.5929	22 20 35.79	–17 35 34.4	13	12.694	12.041	12.336	11.864	11.668	0.080	0.090	0.084	0.082	0.068
J335.4491-17.5492	22 21 47.78	–17 32 56.9	8	15.687	15.002	15.319	14.850	14.662	0.184	0.181	0.204	0.176	0.211

Table 1: List of the 180 discovered variable stars (*continued*).

APASS	R.A.	DEC.	*N*	mean mag					r.m.s.				
				B	*V*	*g*	*r*	*i*	*B*	*V*	*g*	*r*	*i*
J335.6481-16.3077	22 22 35.54	–16 18 27.6	15	12.850	12.399	12.601	12.311	12.232	0.100	0.104	0.104	0.104	0.142
J335.6776-15.1542	22 22 42.63	–15 09 15.2	14	13.845	13.149	13.525	12.981	12.832	0.225	0.187	0.196	0.185	0.184
J335.6843-12.4799	22 22 44.22	–12 28 47.6	11	15.924	15.037	15.421	14.754	14.400	0.137	0.125	0.109	0.125	0.159
J335.6871-19.2769	22 22 44.92	–19 16 36.8	13	14.166	13.332	13.715	13.071	12.807	0.096	0.087	0.096	0.094	0.110
J335.8164-15.3323	22 23 15.92	–15 19 56.4	15	10.884	10.340	10.604	10.224	10.163	0.124	0.122	0.129	0.127	0.150
J336.1498-13.2377	22 24 35.94	–13 14 15.7	24	13.191	11.698	12.368	11.048	9.254	0.108	0.114	0.111	0.108	0.213
J336.2375-15.1604	22 24 56.99	–15 09 37.5	24	12.898	12.526	12.668	12.470	12.569	0.180	0.170	0.178	0.176	0.219
J336.2523-12.2688	22 25 00.54	–12 16 07.7	23	15.202	13.651	14.369	12.909	10.959	0.135	0.182	0.193	0.156	0.199
J336.3728-18.6762	22 25 29.48	–18 40 34.3	22	10.831	10.408	10.591	10.350	10.379	0.113	0.100	0.108	0.111	0.152
J336.5104-05.8077	22 26 02.49	–05 48 27.8	10	15.766	14.746	15.268	14.446	14.182	0.127	0.160	0.119	0.130	0.193
J336.5374-07.6222	22 26 08.96	–07 37 19.8	24	12.482	10.894	11.626	10.306	9.089	0.082	0.087	0.091	0.092	0.127
J336.5840-07.8615	22 26 20.17	–07 51 41.4	9	15.599	15.240	15.306	15.239	15.157	0.210	0.120	0.138	0.126	0.243
J336.6308-16.7299	22 26 31.40	–16 43 47.8	17	13.760	12.924	13.268	12.635	12.463	0.104	0.110	0.100	0.110	0.207
J336.6476-07.4183	22 26 35.43	–07 25 05.7	6	15.186	14.565	14.863	14.411	14.178	0.246	0.100	0.121	0.302	0.345
J336.7174-19.4197	22 26 52.17	–19 25 10.9	19	14.487	13.781	14.125	13.573	13.378	0.277	0.255	0.271	0.248	0.238
J336.7689-16.9969	22 27 04.54	–16 59 48.7	9	15.656	14.566	15.110	14.321	14.083	0.371	0.194	0.286	0.163	0.194
J336.7821-19.5216	22 27 07.71	–19 31 17.8	16	13.241	11.650	12.404	11.081	9.745	0.121	0.120	0.113	0.128	0.097
J336.9218-15.4628	22 27 41.22	–15 27 46.2	7	13.857	13.120	13.414	12.858	12.639	0.117	0.097	0.118	0.101	0.094
J337.1780-15.4789	22 28 42.73	–15 28 44.0	9	14.784	13.981	14.285	13.685	13.383	0.189	0.229	0.190	0.192	0.191
J337.4128-05.8205	22 29 39.06	–05 49 13.7	13	15.102	14.145	14.719	13.927	13.634	0.090	0.106	0.096	0.112	0.121
J337.5017-05.1377	22 30 00.40	–05 08 15.6	7	16.539	15.411	16.031	15.115	14.743	0.178	0.207	0.153	0.181	0.188
J337.5122-08.1076	22 30 02.93	–08 06 27.3	14	13.811	13.148	13.452	12.965	12.638	0.152	0.131	0.141	0.136	0.142
J337.6458-16.5037	22 30 35.00	–16 30 13.1	14	13.692	13.200	13.362	13.048	12.901	0.317	0.314	0.275	0.275	0.241
J337.6873-13.5435	22 30 44.95	–13 32 36.8	14	10.605	10.061	10.324	9.905	9.784	0.099	0.096	0.090	0.097	0.096
J337.6917-14.5134	22 30 46.01	–14 30 48.3	7	15.937	15.347	15.590	15.172	14.843	0.204	0.144	0.150	0.123	0.136
J337.7851-08.7742	22 31 08.43	–08 46 27.0	7	16.472	15.529	15.996	15.163	14.667	0.249	0.185	0.158	0.177	0.242
J337.8143-20.5425	22 31 15.43	–20 32 32.9	16	12.602	12.134	12.336	12.053	11.921	0.117	0.114	0.123	0.121	0.136
J337.8896-15.1224	22 31 33.51	–15 07 20.6	15	12.617	11.100	11.763	10.434	8.503	0.103	0.104	0.124	0.093	0.105
J338.0323-18.7206	22 32 07.74	–18 43 14.2	15	15.060	13.941	14.528	13.507	12.901	0.282	0.231	0.269	0.168	0.184
J338.0436-16.2047	22 32 10.46	–16 12 16.9	8	15.304	14.932	15.052	14.859	14.821	0.370	0.253	0.332	0.229	0.202
J338.0477-07.7294	22 32 11.44	–07 43 45.8	11	15.877	14.072	14.993	13.447	12.525	0.092	0.124	0.112	0.123	0.130
J338.1183-18.9711	22 32 28.40	–18 58 16.1	15	10.996	10.653	10.792	10.671	10.602	0.073	0.091	0.069	0.135	0.113
J338.3077-08.0616	22 33 13.86	–08 03 41.6	13	14.058	13.210	13.615	12.959	12.620	0.260	0.230	0.257	0.231	0.193
J338.4430-03.6577	22 33 46.33	–03 39 27.6	14	14.409	13.575	14.078	13.347	13.273	0.221	0.255	0.182	0.189	0.205
J338.5772-03.9252	22 34 18.54	–03 55 30.6	7	15.818	15.622	15.620	15.561	15.659	0.241	0.324	0.185	0.158	0.000
J338.6224-04.9544	22 34 29.38	–04 57 15.9	8	16.237	14.929	15.680	14.543	14.290	0.262	0.224	0.232	0.216	0.193
J338.7109-06.1389	22 34 50.61	–06 08 20.2	24	10.861	10.443	10.644	10.376	10.474	0.063	0.092	0.072	0.092	0.174
J338.7382-13.1109	22 34 57.16	–13 06 39.2	24	15.291	14.092	14.687	13.625	13.294	0.090	0.104	0.095	0.110	0.185
J338.8432-13.4586	22 35 22.37	–13 27 31.1	6	16.235	15.992	16.033	16.043	16.205	0.228	0.174	0.174	0.194	0.093
J338.9401-11.8129	22 35 45.62	–11 48 46.4	15	16.373	15.227	15.757	14.807	14.481	0.218	0.167	0.162	0.145	0.197
J338.9627-13.7657	22 35 51.04	–13 45 56.4	23	13.867	13.289	13.554	13.180	13.181	0.213	0.193	0.211	0.181	0.279
J339.3754-11.3095	22 37 30.09	–11 18 34.1	14	15.112	14.035	14.546	13.659	13.195	0.145	0.108	0.122	0.101	0.113
J339.7217-06.5402	22 38 53.20	–06 32 24.9	8	16.160	15.691	15.986	15.634	15.163	0.207	0.173	0.149	0.195	0.056
J340.0356-07.8081	22 40 08.55	–07 48 29.0	9	15.303	15.060	15.071	14.930	14.817	0.215	0.234	0.193	0.108	0.088
J340.1883-09.0801	22 40 45.19	–09 04 48.3	15	13.029	12.494	12.733	12.356	12.189	0.142	0.120	0.140	0.111	0.108
J340.2755-15.2981	22 41 06.10	–15 17 53.2	14	14.450	13.484	13.950	13.133	12.772	0.202	0.191	0.201	0.172	0.157
J340.4210-10.5369	22 41 41.04	–10 32 12.8	12	15.800	14.749	15.249	14.364	13.945	0.198	0.143	0.137	0.140	0.148
J341.0344-08.8628	22 44 08.25	–08 51 46.1	14	12.166	10.444	11.270	9.840	8.842	0.072	0.078	0.087	0.087	0.139
J341.1326-03.7367	22 44 31.81	–03 44 12.1	15	14.801	14.126	14.447	13.951	13.882	0.125	0.106	0.126	0.109	0.171
J341.2591-03.7204	22 45 02.19	–03 43 13.5	16	14.555	13.668	14.105	13.384	13.247	0.199	0.164	0.188	0.151	0.137
J341.2844-00.3033	22 45 08.26	00 18 11.9	16	14.016	13.326	13.687	13.179	13.003	0.109	0.118	0.112	0.105	0.121
J341.3465-08.1170	22 45 23.16	–08 07 01.1	6	12.450	10.820	11.591	10.328	9.458	0.063	0.080	0.086	0.105	0.178
J341.5219-03.4697	22 46 05.26	–03 28 10.9	6	15.281	14.503	14.848	14.341	14.617	0.244	0.214	0.212	0.196	0.279
J341.7897-05.7298	22 47 09.54	–05 43 47.3	16	12.831	12.313	12.516	12.141	12.089	0.117	0.106	0.113	0.113	0.107
J341.8339-05.6078	22 47 20.14	–05 36 28.2	11	15.558	14.779	15.123	14.535	14.312	0.182	0.155	0.190	0.141	0.136
J341.8430-05.9970	22 47 22.32	–05 59 49.3	7	15.991	15.584	15.785	15.530	15.464	0.494	0.340	0.355	0.163	0.306
J342.2361-13.5090	22 48 56.66	–13 30 32.2	12	14.246	13.515	13.794	13.268	13.094	0.202	0.231	0.154	0.147	0.142
J342.4869-03.1759	22 49 56.86	–03 10 33.3	13	15.575	14.687	15.086	14.361	14.078	0.281	0.245	0.288	0.265	0.301
J342.6312-07.8546	22 50 31.49	–07 51 16.7	14	12.531	11.105	11.720	10.486	8.650	0.056	0.076	0.088	0.095	0.210
J342.8611-11.9155	22 51 26.67	–11 54 55.8	15	12.000	11.440	11.680	11.313	11.168	0.111	0.112	0.101	0.102	0.102

Table 1: List of the 180 discovered variable stars (*continued*).

APASS	R.A.	DEC.	*N*	mean mag					r.m.s.				
				B	*V*	*g*	*r*	*i*	*B*	*V*	*g*	*r*	*i*
J342.9200-10.5019	22 51 40.79	–10 30 07.0	13	14.894	14.058	14.429	13.796	13.509	0.171	0.159	0.151	0.191	0.171
J343.0947-04.0402	22 52 22.72	–04 02 24.5	7	16.365	15.683	15.985	15.514	15.141	0.238	0.177	0.250	0.209	0.132
J343.1770-08.4702	22 52 42.48	–08 28 12.7	15	14.007	13.121	13.542	12.862	12.609	0.188	0.172	0.171	0.170	0.167
J343.3508-11.1980	22 53 24.19	–11 11 52.9	14	12.864	12.293	12.533	12.157	12.018	0.127	0.143	0.125	0.159	0.168
J343.4995-10.5819	22 53 59.87	–10 34 54.6	8	15.626	15.171	15.298	14.978	14.955	0.171	0.159	0.119	0.125	0.144
J343.6829-02.9159	22 54 43.90	–02 54 57.2	16	13.925	13.469	13.620	13.364	13.286	0.098	0.090	0.101	0.091	0.083
J343.8109-12.5649	22 55 14.62	–12 33 53.7	14	13.253	11.610	12.371	11.015	9.552	0.114	0.126	0.111	0.115	0.179
J343.8210-02.3172	22 55 17.05	–02 19 01.8	15	13.052	11.527	12.244	10.770	8.701	0.160	0.170	0.188	0.150	0.139
J343.9588-02.7359	22 55 50.11	–02 44 09.3	7	16.494	15.714	15.975	15.437	15.152	0.198	0.171	0.147	0.144	0.051
J344.3547-11.5496	22 57 25.14	–11 32 58.4	13	14.664	13.787	14.220	13.492	13.419	0.176	0.192	0.177	0.180	0.279
J344.5578-04.7132	22 58 13.87	–04 42 47.6	9	14.178	13.609	13.793	13.424	13.343	0.151	0.109	0.120	0.107	0.148
J344.6198-12.1897	22 58 28.73	–12 11 23.1	12	14.339	13.627	13.930	13.442	13.452	0.249	0.190	0.219	0.221	0.255
J345.2428-09.8319	23 00 58.26	–09 49 54.9	10	15.302	14.840	14.998	14.773	14.646	0.192	0.170	0.167	0.234	0.219
J345.2744-08.6017	23 01 05.84	–08 36 06.0	12	15.677	15.275	15.424	15.152	15.070	0.249	0.156	0.227	0.177	0.211
J345.2923-09.1398	23 01 10.13	–09 08 23.4	13	15.462	14.663	15.042	14.388	14.187	0.112	0.125	0.149	0.104	0.138
J345.3293-06.4377	23 01 19.04	–06 26 15.7	14	10.575	9.928	10.278	9.775	9.712	0.167	0.160	0.132	0.155	0.204
J345.5041-13.0960	23 02 00.97	–13 05 45.4	14	13.137	12.491	12.766	12.321	12.187	0.158	0.143	0.164	0.175	0.179
J345.9174-12.6381	23 03 40.19	–12 38 17.1	15	14.250	13.686	13.917	13.519	13.374	0.144	0.124	0.129	0.109	0.136
J346.2291-07.7461	23 04 54.98	–07 44 46.0	14	13.794	12.997	13.371	12.754	12.537	0.105	0.099	0.098	0.097	0.094
J346.3227-06.3064	23 05 17.46	–06 18 23.1	15	12.562	10.864	11.694	10.105	8.123	0.100	0.094	0.114	0.083	0.125
J346.3474-09.5183	23 05 23.36	–09 31 05.7	16	11.728	11.096	11.378	10.929	10.803	0.205	0.198	0.204	0.195	0.182
J346.4456-09.2446	23 05 46.93	–09 14 40.4	16	11.670	11.203	11.382	11.126	11.071	0.087	0.089	0.081	0.080	0.100
J346.6685-10.3198	23 06 40.44	–10 19 11.3	16	12.213	10.773	11.449	10.082	8.044	0.205	0.231	0.221	0.211	0.255
J346.7040-10.6752	23 06 48.97	–10 40 30.8	15	13.656	13.333	13.436	13.318	13.287	0.103	0.091	0.098	0.115	0.144
J346.8143-09.5226	23 07 15.42	–09 31 21.5	9	15.665	15.026	15.304	14.883	14.611	0.125	0.151	0.126	0.127	0.124
J346.9740-05.5631	23 07 53.76	–05 33 47.3	13	13.983	13.100	13.540	12.864	12.737	0.191	0.182	0.176	0.173	0.171
J347.0864-05.3369	23 08 20.74	–05 20 12.7	6	15.924	15.225	15.605	15.090	14.864	0.192	0.192	0.180	0.167	0.102
J347.1612-12.0866	23 08 38.69	–12 05 11.8	23	13.919	12.326	13.044	11.731	10.227	0.130	0.149	0.113	0.149	0.236
J347.2153-06.5958	23 08 51.67	–06 35 44.7	14	10.594	10.161	10.366	10.113	10.270	0.107	0.094	0.107	0.110	0.107
J347.3839-06.6390	23 09 32.14	–06 38 20.4	24	14.561	13.525	14.055	13.183	13.018	0.216	0.198	0.186	0.185	0.193
J347.5942-13.3241	23 10 22.62	–13 19 26.7	10	15.075	14.135	14.549	13.856	13.742	0.273	0.246	0.298	0.248	0.319
J347.7281-11.3581	23 10 54.74	–11 21 29.2	6	15.840	14.773	15.279	14.403	14.114	0.190	0.116	0.123	0.164	0.190
J348.5959-07.6467	23 14 23.00	–07 38 48.2	17	12.029	11.571	11.756	11.481	11.382	0.213	0.199	0.209	0.193	0.194
J349.0535-07.1681	23 16 12.84	–07 10 05.3	15	14.400	13.704	14.009	13.544	13.380	0.112	0.157	0.110	0.146	0.172
J349.7183-07.9429	23 18 52.38	–07 56 34.6	23	12.791	12.330	12.552	12.279	12.376	0.228	0.223	0.213	0.216	0.279
J349.7419-07.3143	23 18 58.06	–07 18 51.5	24	14.063	12.510	13.309	12.027	10.870	0.744	0.661	0.697	0.596	0.471
J349.7622-05.4633	23 19 02.91	–05 27 47.8	9	15.886	14.874	15.453	14.571	14.234	0.174	0.160	0.175	0.175	0.158
J349.9955-10.6615	23 19 58.91	–10 39 41.3	20	12.122	11.351	11.710	11.139	11.177	0.039	0.073	0.130	0.093	0.209
J350.1190-12.9063	23 20 28.57	–12 54 22.8	13	15.356	14.604	14.991	14.455	14.177	0.229	0.254	0.246	0.243	0.237
J350.1574-07.2315	23 20 37.79	–07 13 53.2	15	11.842	11.295	11.514	11.158	11.026	0.035	0.132	0.072	0.119	0.154
J350.6109-09.5909	23 22 26.61	–09 35 27.1	16	11.301	10.879	11.060	10.804	10.680	0.226	0.200	0.224	0.182	0.179
J350.6556-12.3168	23 22 37.35	–12 19 00.6	14	14.480	13.706	14.101	13.475	13.251	0.138	0.132	0.119	0.110	0.164
J350.9015-10.7202	23 23 36.35	–10 43 12.9	15	12.076	11.600	11.805	11.467	11.303	0.043	0.089	0.178	0.104	0.100
J351.1834-12.9252	23 24 44.02	–12 55 30.7	14	13.475	12.896	13.185	12.789	12.635	0.101	0.085	0.093	0.093	0.082
J351.4501-07.1260	23 25 48.04	–07 07 33.7	9	15.424	14.915	15.129	14.824	14.626	0.196	0.143	0.138	0.112	0.109
J352.0836-05.2932	23 28 20.07	–05 17 35.5	14	11.579	11.128	11.287	11.022	10.994	0.025	0.083	0.121	0.110	0.140
J352.1568-09.9197	23 28 37.62	–09 55 11.0	24	14.873	14.181	14.510	14.000	13.875	0.116	0.096	0.125	0.098	0.160
J352.1631-09.2570	23 28 39.14	–09 15 25.1	20	11.710	11.222	11.390	11.133	11.080	0.047	0.142	0.119	0.146	0.203
J352.1714-07.4398	23 28 41.13	–07 26 23.4	24	14.468	13.428	13.937	13.030	12.726	0.207	0.175	0.205	0.175	0.224
J352.4076-09.0084	23 29 37.83	–09 00 30.1	24	10.450	10.345	10.285	10.450	10.700	0.050	0.110	0.084	0.083	0.219
J352.4459-09.2575	23 29 47.02	–09 15 27.0	19	10.428	9.760	10.044	9.508	9.606	0.053	0.135	0.235	0.131	0.235
J352.5093-09.3917	23 30 02.23	–09 23 30.3	17	10.724	10.352	10.450	10.181	10.422	0.058	0.166	0.208	0.131	0.171
J352.5277-09.0349	23 30 06.67	–09 02 05.7	16	11.785	11.149	11.366	10.947	10.973	0.046	0.158	0.083	0.072	0.150
J353.0043-09.4124	23 32 01.03	–09 24 44.6	11	12.327	11.838	11.958	11.735	11.580	0.057	0.157	0.113	0.148	0.034
J353.0286-11.2332	23 32 06.86	–11 13 59.7	12	14.191	13.676	13.900	13.564	13.400	0.068	0.094	0.096	0.102	0.167
J353.0493-08.3654	23 32 11.83	–08 21 55.6	9	15.010	14.691	14.772	14.678	14.534	0.370	0.289	0.344	0.276	0.200
J353.5154-07.8401	23 34 03.70	–07 50 24.5	9	15.466	15.049	15.215	15.012	14.854	0.177	0.122	0.174	0.131	0.119
J353.8013-09.6452	23 35 12.31	–09 38 42.8	10	15.201	14.750	14.887	14.632	14.507	0.204	0.165	0.197	0.164	0.136
J354.5303-09.8228	23 38 07.28	–09 49 22.2	6	16.547	15.410	15.939	14.942	13.566	0.717	0.497	0.586	0.396	0.359
J354.8174-09.1516	23 39 16.19	–09 09 05.7	16	11.294	11.128	11.127	11.142	11.225	0.146	0.171	0.144	0.150	0.153

Table 3: WISE *W1* and *W2*, 2MASS *J*, *H* and K_s, and GALEX FUV and NUV magnitudes. The separation of APASS sources with WISE/2MASS and GALEX counterparts are given in arcsec.

APASS	WISE			2MASS			GALEX		
	dist	$W1$	$W2$	J	H	K_s	dist	FUV	NUV
J326.0544-14.3050	0.353	12.653	12.631	13.020	12.585	12.471	1.358		21.2
J326.2057-16.4888	0.233	11.402	11.416	11.729	11.511	11.426			
J326.3477-16.7895	0.273	11.630	11.633	11.948	11.682	11.657			
J326.9397-16.4112	0.201	8.949	9.018	9.323	9.054	8.973			
J327.2368-16.7817	0.151	3.708	3.051	5.078	3.880	3.701			
J327.3012-14.8578	0.695	5.184	5.043	6.482	5.594	5.256			
J327.4915-12.6530	1.731	13.070	13.108	13.566	13.163	13.025	1.963		20.9
J327.5562-14.9503	0.264	4.446	4.082	5.812	4.965	4.563	1.522		22.2
J327.6162-15.8413	0.618	3.719	3.127	5.186	3.946	3.696			
J327.7257-16.5170	1.261	13.246	13.329	13.692	13.388	13.263			
J327.7704-16.2364	0.288	7.012	7.071	8.243	7.351	7.050			
J327.9367-17.5034	0.409	11.682	11.727	12.396	11.952	11.861	1.008		20.5
J328.1577-18.3457	2.546	11.942	11.858	12.654	12.291	12.236			
J328.2582-16.0519	0.925	13.589	13.647	14.428	13.849	13.722			
J328.2979-13.8341	0.705	14.183	14.245	14.500	14.234	14.178			
J328.6438-18.2195	0.774	13.733	13.744	14.212	13.768	13.627	1.206		20.21
J329.0197-13.6124	0.489	12.321	12.296	13.505	13.016	12.939	1.400		20.8
J329.0394-17.5205	0.225	9.046	9.077	9.688	9.200	9.161	0.426	20.4	
J329.5952-18.1396	1.165	14.239	14.319	14.604	14.284	14.332	0.791		19.03
J330.2192-03.7034	0.610	10.170	10.200	10.616	10.267	10.208	1.608	22.9	
J330.2678-14.6520	0.088	9.244	9.288	9.680	9.372	9.263			
J330.3205-19.2497	0.291	10.672	10.703	11.278	10.901	10.895			
J330.5148-18.4544	0.757	13.643	13.614	13.887	13.668	13.663	0.687	20.6	
J330.5758-15.0042	0.288	3.689	3.230	5.098	4.234	3.942			
J331.0878-14.7348	0.636	14.382	14.420	14.860	14.476	14.778			
J331.1018-06.0573	1.759	9.122	9.162	9.360	9.133	9.086	1.139	18.62	
J331.3628-14.8872	0.909	11.467	11.503	12.030	11.776	11.722			
J331.3737-19.4555	1.902	14.160	14.170	14.423	14.206	14.133	2.053	20.5	
J331.5647-14.9832	0.864	14.405	14.491	14.630	14.549	14.440			
J331.6877-15.6446	0.925	4.372	3.845	5.624	4.768	4.446			
J331.7599-13.7366	0.364	10.948	10.957	11.480	11.070	10.976			
J331.9945-17.7950	2.233	15.040	15.257	15.252	15.011	14.965			
J332.1334-15.0579	1.467	13.713	13.754	14.065	13.671	13.607	1.776		21.2
J332.1739-15.5807	0.450	6.864	6.773	8.117	7.218	6.999			
J332.2123-04.8570	0.223	6.333	6.408	7.557	6.679	6.348			
J332.2741-03.7718	0.607	11.842	11.640	12.971	12.629	12.483			
J332.4133-14.3247	0.385	10.825	10.889	11.506	10.967	10.810			
J332.8057-16.1299	0.363	3.859	3.017	5.496	4.716	4.234			
J332.8219-15.0382	0.550	9.908	9.877	10.757	10.106	9.917			
J333.0837-14.9675	0.236	9.817	9.830	9.970	9.845	9.826			
J333.1283-15.0920	0.275	10.544	10.558	11.105	10.738	10.658			
J333.5743-12.6415	0.844	10.351	10.094	11.816	10.983	10.706			
J333.5779-13.7020	0.271	7.399	7.507	8.701	7.809	7.494			
J333.6328-12.6708	2.278	14.053	14.105	14.476	14.076	14.034	2.917		20.5 8
J333.8215-10.6413	1.470	11.729	11.711	12.475	11.882	11.748	1.372		21.2
J333.8888-15.8005	0.571	12.002	11.981	12.449	12.156	12.117	1.389		16.8
J333.9605-09.1767	0.437	13.513	13.557	13.867	13.714	13.669			
J334.1082-09.7374	0.649	13.708	13.729	14.783	14.446	14.416			
J334.2270-11.8679	1.146	10.819	10.656	11.911	11.295	11.096			
J334.3194-05.7454	1.694	13.850	13.892	14.504	14.129	14.088			
J334.3709-10.0809	0.886	5.121	5.029	6.408	5.520	5.186	1.269		21.5
J334.4688-07.9399	0.229	9.924	9.954	10.226	9.981	9.930			
J334.4808-08.3511	0.511	12.408	12.181	12.872	12.745	12.508			
J334.5008-06.5163	0.196	11.901	11.932	12.200	11.931	11.886	0.568		18.08
J334.8429-16.8926	0.212	9.569	9.659	10.199	9.937	9.806	1.168	17.49	13.854
J334.8573-18.1132	0.411	11.354	11.401	12.051	11.604	11.487			
J334.8969-09.6758	0.310	5.247	4.688	6.924	6.178	5.740	0.852		22.1
J334.9768-14.4020	0.225	4.316	3.520	6.233	5.428	5.013	1.221		19.4
J335.1491-17.5929	0.363	10.448	10.570				4.011	21.5	
J335.4491-17.5492	0.876	13.328	13.357	13.840	13.489	13.450	1.179		19.27

Table 3: WISE, 2MASS and GALEX data (*continued*).

APASS	WISE			2MASS			GALEX		
	dist	$W1$	$W2$	J	H	K_s	dist	FUV	NUV
J335.6481-16.3077	0.416	11.262	11.275	11.514	11.297	11.235	0.984	20.8	16.24
J335.6776-15.1542	0.933	11.427	11.453	12.168	11.870	11.753	1.171		18.16
J335.6843-12.4799	0.613	12.812	12.791	13.457	13.020	12.978			
J335.6871-19.2769	0.277	11.241	11.214	11.810	11.385	11.295	0.080		19.60
J335.8164-15.3323	0.259	9.020	9.068	9.933	9.680	9.645	0.626	20.9	14.656
J336.1498-13.2377	0.304	5.231	5.162	6.590	5.696	5.411			
J336.2375-15.1604	1.408	11.284	11.308	11.550	11.349	11.287			
J336.2523-12.2688	0.778	6.748	6.691	8.002	7.128	6.798			
J336.3728-18.6762	0.680	9.301	9.316	9.777	9.562	9.434			
J336.5104-05.8077	0.796	12.481	12.525	12.978	12.541	12.404			
J336.5374-07.6222	1.139	5.845	5.751	7.033	6.207	5.876			
J336.5840-07.8615	1.828	14.439	14.413	14.638	14.425	14.283			
J336.6308-16.7299	4.118	11.129	11.212	11.785	11.403	11.322			
J336.6476-07.4183	6.136	12.826	12.853	13.245	12.949	12.889			
J336.7174-19.4197	0.518	11.812	11.817	12.301	11.893	11.841	0.526		18.41
J336.7689-16.9969	0.347	9.513	8.828	12.530	11.639	10.850	0.942		21.8
J336.7821-19.5216	0.173	6.422	6.581	7.707	6.818	6.560			
J336.9218-15.4628	0.270	11.061	11.096	11.530	11.105	11.068	0.510		19.10
J337.1780-15.4789	0.924	11.529	11.528	12.105	11.654	11.535			
J337.4128-05.8205	1.446	12.365	12.366	12.958	12.581	12.495	1.580		19.8
J337.5017-05.1377	1.056	13.162	13.190	13.929	13.450	13.323			
J337.5122-08.1076	0.304	11.492	11.490	12.067	11.740	11.703			
J337.6458-16.5037	0.414	11.757	11.776	12.726	12.438	12.389			
J337.6873-13.5435	0.137	8.693	8.708	8.992	8.807	8.691			
J337.6917-14.5134	0.749	13.727	13.767	14.065	13.759	13.744			
J337.7851-08.7742	0.552	12.813	12.835	13.521	13.011	12.873	1.095		21.99
J337.8143-20.5425	0.438	11.040	11.062	11.241	10.983	11.018			
J337.8896-15.1224	0.337	4.809	4.401	6.097	5.253	4.873			
J338.0323-18.7206	1.116	10.387	10.305	11.311	10.676	10.474	1.598		20.09
J338.0436-16.2047	0.425	13.772	13.730	14.053	13.868	13.940			
J338.0477-07.7294	0.351	9.678	9.746	10.915	10.029	9.813			
J338.1183-18.9711	0.261	9.791	9.800	9.966	9.822	9.814	0.766	17.10	
J338.3077-08.0616	0.296	11.032	11.068	11.475	11.120	11.025	0.944	23.7	18.91
J338.4430-03.6577	1.132	11.772	11.793	12.306	11.933	11.801	1.292		18.57
J338.5772-03.9252							0.533	15.30	15.431
J338.6224-04.9544	0.411	12.300	12.339	12.938	12.417	12.296			
J338.7109-06.1389	0.371	9.155	9.225	9.614	9.301	9.228			
J338.7382-13.1109	1.679	10.758	10.786	11.633	11.016	10.888			
J338.8432-13.4586	1.709	15.078	15.096	15.316	15.040	14.738	2.429		19.52
J338.9401-11.8129	0.703	12.092	12.066	12.974	12.320	12.171			
J338.9627-13.7657	0.638	11.681	11.692	12.306	12.004	11.918	1.638		17.75
J339.3754-11.3095	0.422	10.902	10.884	11.766	11.126	11.045			
J339.7217-06.5402	1.495	14.268	14.451	14.514	14.328	14.320			
J340.0356-07.8081	1.508	14.009	14.044	14.326	14.141	14.134	1.838	20.5	
J340.1883-09.0801	0.186	11.023	11.019	11.289	11.019	10.975			
J340.2755-15.2981	0.356	10.818	10.871	11.828	11.303	11.165	1.385		20.2
J340.4210-10.5369	0.450	11.973	11.985	12.902	12.366	12.177			
J341.0344-08.8628	0.204	5.542	5.484	6.819	5.898	5.668	0.823		21.3
J341.1326-03.7367	0.703	12.463	12.494	12.757	12.444	12.342	1.483		18.72
J341.2591-03.7204	0.445	11.423	11.445	12.233	11.748	11.670	1.602		20.0
J341.2844-00.3033	0.292	11.953	11.946	12.362	12.060	12.040	1.060		18.23
J341.3465-08.1170	1.072	5.904	5.979	7.109	6.230	5.959			
J341.5219-03.4697	0.776	12.655	12.691	13.043	12.672	12.571			
J341.7897-05.7298	0.228	10.885	10.901	11.182	10.972	10.868	0.822		17.05
J341.8339-05.6078	1.526	12.801	12.829	13.267	12.776	12.727			
J341.8430-05.9970	0.971	14.374	14.447	14.495	14.443	14.508	2.399		19.8
J342.2361-13.5090	0.685	11.410	11.483	12.115	11.708	11.664			
J342.4869-03.1759	0.756	12.062	12.118	12.550	12.111	11.999	0.908		20.7
J342.6312-07.8546	0.546	4.949	4.718	6.254	5.321	4.985	0.641	24.0	21.42
J342.8611-11.9155	0.345	10.067	10.078	10.328	10.087	10.026			

Table 3: WISE, 2MASS and GALEX data (*continued*).

APASS	WISE			2MASS			GALEX		
	dist	$W1$	$W2$	J	H	K_s	dist	FUV	NUV
J342.9200-10.5019	1.425	11.889	11.927	12.325	11.887	11.788	1.298		19.86
J343.0947-04.0402	0.771	13.769	13.719	14.116	13.778	13.664	1.482		20.6
J343.1770-08.4702	0.324	11.092	11.167	11.641	11.242	11.188	0.610		19.69
J343.3508-11.1980	0.186	10.776	10.790	11.146	10.879	10.804			
J343.4995-10.5819	2.621	13.733	13.740	14.134	13.932	13.799	2.798		18.978
J343.6829-02.9159	0.340	12.150	12.166	12.492	12.235	12.199	0.813	21.3	16.96
J343.8109-12.5649	0.192	6.190	6.216	7.491	6.576	6.273			
J343.8210-02.3172	1.562	4.611	4.083	5.605	4.812	4.404			
J343.9588-02.7359	1.305	14.022	14.189	14.980	14.680	14.534	1.262		20.7
J344.3547-11.5496	0.684	11.437	11.482	12.250	11.792	11.665	0.752		19.4
J344.5578-04.7132	3.424	11.851	11.870	12.432	12.141	12.069	3.388		18.36
J344.6198-12.1897	1.136	11.658	11.664	12.331	11.927	11.863	1.426		18.38
J345.2428-09.8319	0.852	13.155	13.106	13.560	13.185	13.031			
J345.2744-08.6017	0.746	13.922	13.871	14.375	14.057	13.984			
J345.2923-09.1398	0.498	12.439	12.413	13.004	12.590	12.487	0.759		15.871
J345.3293-06.4377	0.894	8.400	8.426	8.818	8.523	8.481	0.454	20.3	
J345.5041-13.0960	0.438	10.759	10.785	11.313	11.012	10.955	1.474		17.50
J345.9174-12.6381	0.587	12.085	12.125	12.649	12.376	12.307	1.101		19.37
J346.2291-07.7461	1.086	10.983	11.015	11.579	11.206	11.103			
J346.3227-06.3064	0.201	4.148	3.773	5.549	4.660	4.314			
J346.3474-09.5183	0.435	9.595	9.611	9.921	9.617	9.544	0.538	20.75	16.06
J346.4456-09.2446	0.301	10.024	10.077	10.376	10.182	10.101	0.885	19.48	21.34
J346.6685-10.3198	0.350	4.168	3.706	5.392	4.538	4.218			
J346.7040-10.6752	0.320	12.397	12.371	12.606	12.481	12.403	1.128		16.44
J346.8143-09.5226	3.057	13.230	13.286	13.760	13.315	13.234	3.123		17.83
J346.9740-05.5631	0.285	11.084	11.152	12.056	11.674	11.543			
J347.0864-05.3369	1.000	13.453	13.425	13.860	13.519	13.477			
J347.1612-12.0866	0.583	6.401	6.384	7.717	6.843	6.541			
J347.2153-06.5958	0.182	9.154	9.172	9.512	9.297	9.228			
J347.3839-06.6390	0.897	11.010	11.080	11.595	11.104	10.993			
J347.5942-13.3241	0.102	11.665	11.675	12.410	11.971	11.831			
J347.7281-11.3581	0.687	12.008	12.052	12.945	12.367	12.273			
J348.5959-07.6467	0.310	10.398	10.416	10.796	10.561	10.491	0.633		19.97
J349.0535-07.1681	0.494	12.047	12.078	12.476	12.145	12.114	1.564		18.56
J349.7183-07.9429	0.637	11.177	11.205	11.432	11.237	11.191			
J349.7419-07.3143	1.734	6.736	6.595	8.578	7.822	7.492	2.522		18.90
J349.7622-05.4633	0.651	12.011	12.011	12.723	12.145	12.030	1.104		21.4
J349.9955-10.6615	0.507	9.453	9.507	9.955	9.578	9.501			
J350.1190-12.9063	0.717	12.721	12.752	13.612	13.195	13.055	1.136		18.78
J350.1574-07.2315	0.512	9.629	9.674	10.061	9.772	9.702	1.009		15.161
J350.6109-09.5909	0.210	9.670	9.689	9.924	9.699	9.631			
J350.6556-12.3168	0.470	11.762	11.784	12.267	11.843	11.751	0.699		19.28
J350.9015-10.7202	0.605	10.281	10.313	10.638	10.420	10.339	1.160	17.91	15.44
J351.1834-12.9252	0.204	11.571	11.581	11.966	11.722	11.673	0.594	22.1	20.26
J351.4501-07.1260	2.601	13.495	13.533	13.848	13.543	13.501	2.614		14.126
J352.0836-05.2932	1.424	9.863	9.886	10.170	9.984	9.941	1.593	20.33	17.092
J352.1568-09.9197	0.561	12.415	12.461	12.853	12.457	12.441	1.291	23.0	
J352.1631-09.2570	0.635	9.957	9.972	10.278	10.071	9.991	1.120	21.30	
J352.1714-07.4398	0.950	10.458	10.498	11.261	10.662	10.565	2.594	22.6	20.37
J352.4076-09.0084	0.671	9.891	9.890	10.080	9.989	9.908			
J352.4459-09.2575	1.258	8.103	8.158	8.533	8.228	8.122			
J352.5093-09.3917	1.091	9.108	9.150	9.465	9.215	9.205	0.972	19.73	14.146
J352.5277-09.0349	0.370	9.476	9.544	9.917	9.643	9.522	0.295		
J353.0043-09.4124	0.925	10.311	10.356	10.726	10.478	10.405	1.332	23.5	
J353.0286-11.2332	0.562	12.405	12.424	12.620	12.348	12.312	0.863	23.8	
J353.0493-08.3654	2.205	13.440	13.540	13.980	13.747	13.709	3.365	22.3	
J353.5154-07.8401	0.682	13.751	13.812	14.028	13.776	13.749	1.032	23.7	18.46
J353.8013-09.6452	0.189	13.343	13.312	13.770	13.573	13.565			
J354.5303-09.8228	1.749	9.451	9.190	10.987	10.195	9.829			
J354.8174-09.1516	0.643	10.359	10.377	10.695	10.632	10.578	0.800	16.793	13.955

Table 4: List of the 141 stars among the discovered variables which have a cross-identification in either SIMBAD or the AAVSO Variable Star Index (VSX) with already known variables. The columns labelled SIMBAD and VSX list the respective classifications. The last two columns give the amplitude of variability and period as listed by VSX.

APASS	name	SIMBAD	VSX	Δmag	P (days)
J326.0544-14.3050	CSS J214413.1-141818		EW	0.53	0.2793860
J326.2057-16.4888	ASAS J214450-1629.3		ESD,ED	0.30	0.787467
J326.3477-16.7895	ASAS J214524-1647.4		EC	0.29	1.22119
J326.9397-16.4112	HD 207225		ED	0.51	2.695697
J327.2368-16.7817	BD-17.6380		MISC	0.33	67.449806
J327.3012-14.8578	TYC 5800-842-1		MISC	0.19	79.312622
J327.4915-12.6530	CSS J214958.0-123908		EW	0.45	0.2934320
J327.5562-14.9503	2MASS J21501347-1457009		MISC	0.48	53.028294
J327.6162-15.8413	AA Cap	sr*	SR	1.00	72.9
J327.7704-16.2364	ASAS J215105-1614.2		MISC	0.51	381.944458
J327.9367-17.5034	CSS J215144.8-173012		EW	0.34	0.3013706
J328.1577-18.3457	ASAS J215238-1820.7		ESD,EC	0.51	0.34732
J328.2582-16.0519	CSS J215301.9-160306		EW	0.51	0.2471760
J328.2979-13.8341	SEKBO 99755.404		EB	0.40	0.424148
J329.0197-13.6124	CSS J215604.7-133644		EW	0.68	0.2844140
J329.0394-17.5205	TYC 6379-161-1		EA	0.25	0.496921
J329.5952-18.1396	CSS J215822.9-180822		Blaz	0.81	0.3623990
J330.2678-14.6520	TYC 5808-1009-1		EC,ESD	0.62	1.00746
J330.3205-19.2497	ASAS J220117-1914.9		EC	0.40	0.295249
J331.1018-06.0573	HD 209559		EC	0.59	0.72728
J331.3628-14.8872	NSVS 17304268	EB?	EW	0.37	0.43244
J331.3737-19.4555	CSS J220529.5-192719		RRAB	0.45	0.4448498
J331.5647-14.9832	CSS J220615.5-145859		RRC	0.46	0.2876556
J331.6877-15.6446	BM Aqr	sr*	SRB	0.80	55.6
J331.9945-17.7950	CSS J220758.8-174740		RRD	0.47	0.2861008
J332.1334-15.0579	CSS J220832.0-150327		EW	0.44	0.2763940
J332.1739-15.5807	ASAS J220842-1534.9		MISC	0.34	132.120346
J332.2123-04.8570	TYC 5227-1235-1		MISC	0.21	42.547501
J332.2741-03.7718	UU Aqr	NL*	EA+NL:	2.65	0.16358045
J332.4133-14.3247	ASAS J220939-1419.4		EC,DSCT,ESD	0.30	0.37326
J332.8057-16.1299	YY Aqr	sr*	SRB	2.30	197.0
J332.8219-15.0382	1SWASP J221117.26-1502		EW	0.19	0.2152487
J333.1283-15.0920	2MASS J22123078-1505309	EB?	EC,DSCT	0.37	0.321818
J333.6328-12.6708	CSS J221431.8-124012		EW	0.27	0.2936280
J333.8215-10.6413	CSS J221517.2-103827		RS	0.30	2.7663555
J333.9605-09.1767	CSS J221550.5-091035		RRC	0.39	0.3096310
J334.1082-09.7374	CSS J221625.9-094413		EA	0.86	0.7188740
J334.3194-05.7454	CSS J221716.6-054443		EW	0.40	0.3363600
J334.3709-10.0809	IRAS 22148-1019		MISC	0.15	38.997673
J334.4688-07.9399	BD-08.5848		ED	0.64	2.55422
J334.4808-08.3511	FO Aqr	DQ*	DQ+E	1.50	0.2020593
J334.5008-06.5163	CSS J221800.2-063059		EW	0.25	0.3713020
J334.8429-16.8926	CW Aqr	bL*	EB	0.47	0.5429077
J334.8573-18.1132	CSS J221925.7-180646		EW	0.79	0.3405360
J334.8969-09.6758	ZZ Aqr	sr*	SRA	2.30	173.5

Table 4: Cross-identification in either SIMBAD or VSX (*continued*).

APASS	name	SIMBAD	VSX	Δmag	P (days)
J334.9768-14.4020	SS Aqr	Mi*	M	4.40	202.2
J335.1491-17.5929	ASAS J222036-1735.6		ESD,EC	0.19	0.373816
J335.4491-17.5492	CSS J222147.8-173256		EW	0.43	0.3109320
J335.6481-16.3077	2MASS J22223555-1618272	EB?	EC,ESD	0.32	0.69505
J335.6776-15.1542	ASAS J222243-1509.3		EC	0.58	0.43834
J335.6843-12.4799	CSS J222244.2-122846		EW	0.29	0.2821700
J335.6871-19.2769	CSS J222244.9-191636		EW	0.21	0.2994140
J335.8164-15.3323	BW Aqr	Al*	EA	0.61	6.719708
J336.1498-13.2377	TYC 5810-728-1		MISC	0.77	122.209549
J336.2375-15.1604	2MASS J22245705-1509375		ESD	0.59	0.548297
J336.2523-12.2688	NSVS J2225004-121607		L:	0.69	98.0
J336.3728-18.6762	HD 212561	EB?	EC	0.31	0.73566
J336.5104-05.8077	CSS J222602.4-054827		EW	0.26	0.3025680
J336.5374-07.6222	BD-08.5871		MISC	0.26	50.171417
J336.5840-07.8615	CSS J222620.1-075139		RRC	0.20	0.2897040
J336.7174-19.4197	AY Aqr	WU*	EW	1.00	0.281996
J336.9218-15.4628	ASAS J222741-1527.8		DSCT	0.50	0.157326
J337.1780-15.4789	CSS J222842.7-152843		EA	0.56	0.9486650
J337.4128-05.8205	CSS J222939.1-054914		EW	0.21	0.3467120
J337.5017-05.1377	CSS J223000.4-050815		EW	0.28	0.2908320
J337.5122-08.1076	GV Aqr	dS*	EW	0.50	0.33677
J337.6458-16.5037	ASAS J223035-1630.2		EA	0.90	0.942444
J337.6873-13.5435	HD 213321		EB,EW	0.40	0.407646
J337.6917-14.5134	SEKBO 125867.131		EW	0.50	0.357072
J337.7851-08.7742	CSS J223108.4-084627		EA	0.37	0.4374000
J337.8143-20.5425	2MASS J22311541-2032326	EB?	EB,EW	0.34	0.383328
J337.8896-15.1224	IRAS 22288-1522		MISC	0.72	220.588242
J338.0323-18.7206	VSX J223207.6-184313		BY	0.50	1.567469
J338.1183-18.9711	HD 213537		EW	0.20	0.6389
J338.3077-08.0616	2MASS J22331386-0803414	EB?	EC	0.62	0.297387
J338.4430-03.6577	GSC 05236-00391	WU*	EW	0.42	0.34155
J338.5772-03.9252	CSS 090910:223418-0355	CV*	UGSU	4.75	
J338.6224-04.9544	CSS J223429.3-045715		EW	0.44	0.2699840
J338.8432-13.4586	CSS J223522.3-132729		RRC	0.46	0.3447270
J338.9401-11.8129	CSS J223545.5-114846		EW	0.31	0.6073680
J338.9627-13.7657	ASAS J223551-1346.0		EC	0.69	0.369648
J339.7217-06.5402	Loneos-RR 183	RR*	RRAB	0.42	0.7319567
J340.0356-07.8081	CSS J224008.4-074827		RRC	0.39	0.3851069
J340.1883-09.0801	2MASS J22404518-0904481	EB?	EC,DSCT	0.34	0.392039
J340.2755-15.2981	ASAS J224106-1517.9	EB?	EC	0.61	0.256902
J340.4210-10.5369	CSS J224141.0-103212		EW	0.34	0.2515460
J341.0344-08.8628	BD-09.6042		MISC	0.82	413.156372
J341.1326-03.7367	CSS J224431.8-034411		EW	0.41	0.2696940
J341.2591-03.7204	NSVS 14566845		EW	1.12	0.29133146
J341.2844-00.3033	FASTT 1576	V*	EW	0.30	0.364895
J341.5219-03.4697	VSX J224605.2-032810		EW	0.59	0.3233
J341.7897-05.7298	TYC 5240-1352-1	EB?	EC,ESD	0.31	1.12674
J341.8339-05.6078	CSS J224720.2-053627		EW	0.56	0.2544400

Table 4: Cross-identification in either SIMBAD or VSX (*continued*).

APASS	name	SIMBAD	VSX	Δmag	P (days)
J341.8430-05.9970	CSS J224722.3-055948		RRAB	0.72	0.5385575
J342.2361-13.5090	NSVS 17355749		EW	0.49	0.39126
J342.4869-03.1759	CSS J224956.8-031032		EW	0.67	0.2824020
J342.6312-07.8546	TYC 5813-199-1		MISC	0.28	56.217224
J342.8611-11.9155	TYC 5816-987-1	EB?	EB,EW	0.34	0.394227
J342.9200-10.5019	CSS J225140.8-103006		EW	0.46	0.2846700
J343.0947-04.0402	CSS J225222.6-040223		EW	0.46	0.3266420
J343.4995-10.5819	CSS J225359.6-103453		RRAB	0.27	0.6805582
J343.6829-02.9159	VSX J225443.8-025456		EB	0.29	0.401
J343.8109-12.5649	ASAS J225515-1233.9		MISC	0.55	131.110123
J343.8210-02.3172	TYC 5235-876-1		MISC	0.49	205.882355
J343.9588-02.7359	SEKBO 127225.240		EB	0.90	0.408219
J344.3547-11.5496	NSVS 17360222		EW	0.55	0.257555
J344.5578-04.7132	CSS J225813.7-044247		EW	0.28	0.3922500
J344.6198-12.1897	ASAS J225829-1211.3		DSCT,EC	0.52	0.12604
J345.2744-08.6017	SEKBO 113489.341		RRAB	0.60	0.579453
J345.2923-09.1398	CSS J230110.1-090822		EW	0.29	0.2699140
J345.3293-06.4377	EF Aqr	Al*	EA	0.62	2.85357206
J345.5041-13.0960	TYC 5826-1082-1	EB?	EC	0.46	0.374121
J345.9174-12.6381	NSVS 17396804		EW	0.42	0.3880164
J346.2291-07.7461	ASAS J230455-0744.8		DSCT,EC	0.31	0.169086
J346.3227-06.3064	IRAS 23026-0634		MISC	0.84	365.484497
J346.3474-09.5183	BD-10.6054	EB?	EC	0.64	0.394845
J346.4456-09.2446	TYC 5820-811-1		EC	0.23	0.42696
J346.6685-10.3198	BD-11.6000		MISC	0.41	51.764809
J346.7040-10.6752	NSVS 17398458		EA	0.35	2.15872
J346.9740-05.5631	2MASS J23075377-0533470	EB?	EB,EW	0.86	0.323088
J347.1612-12.0866	ASAS J230839-1205.2		MISC	0.42	79.527763
J347.2153-06.5958	BD-07.5940		EC	0.47	0.789609
J347.3839-06.6390	2MASS J23093218-0638200	EB?	ESD,EC	0.52	0.26664
J347.5942-13.3241	ASAS J231423-0738.8		EB	0.90	0.628635
J347.7281-11.3581	CSS J231054.7-112129		EW	0.52	0.2437500
J348.5959-07.6467	TYC 5821-87-1	EB?			
J349.0535-07.1681	CSS J231612.8-071005		VAR	0.08	
J349.7183-07.9429	2MASS J23185237-0756340	EB?	EC	0.64	0.536243
J349.7419-07.3143	DM Aqr	Mi*	M	3.50	149.7
J349.7622-05.4633	CSS J231902.8-052747		EW	0.40	0.3158420
J350.1190-12.9063	CSS J232028.5-125421		EW	0.56	0.3857960
J350.6109-09.5909	BD-10.6100		EA,EB		0.88958392
J350.6556-12.3168	NSVS 17407025		EW	1.24	0.3104539
J351.4501-07.1260	CSS J232547.8-070732		RRAB	0.36	0.6576585
J352.1568-09.9197	CSS J232837.6-095510		EW	0.24	0.3838720
J352.1714-07.4398	NSVS 11898775		EA	1.13	1.06893948
J353.0286-11.2332	NSVS 14614655		EW	0.60	0.403391
J353.0493-08.3654	CSS J233211.8-082152		RRAB	0.96	0.5767478
J353.5154-07.8401	GD 1187		RRAB	0.58	0.5715618
J354.5303-09.8228	NSVS J2338074-094922		M	2.18	163.0
J354.8174-09.1516	EK Aqr	WU*	EW	0.53	0.61279

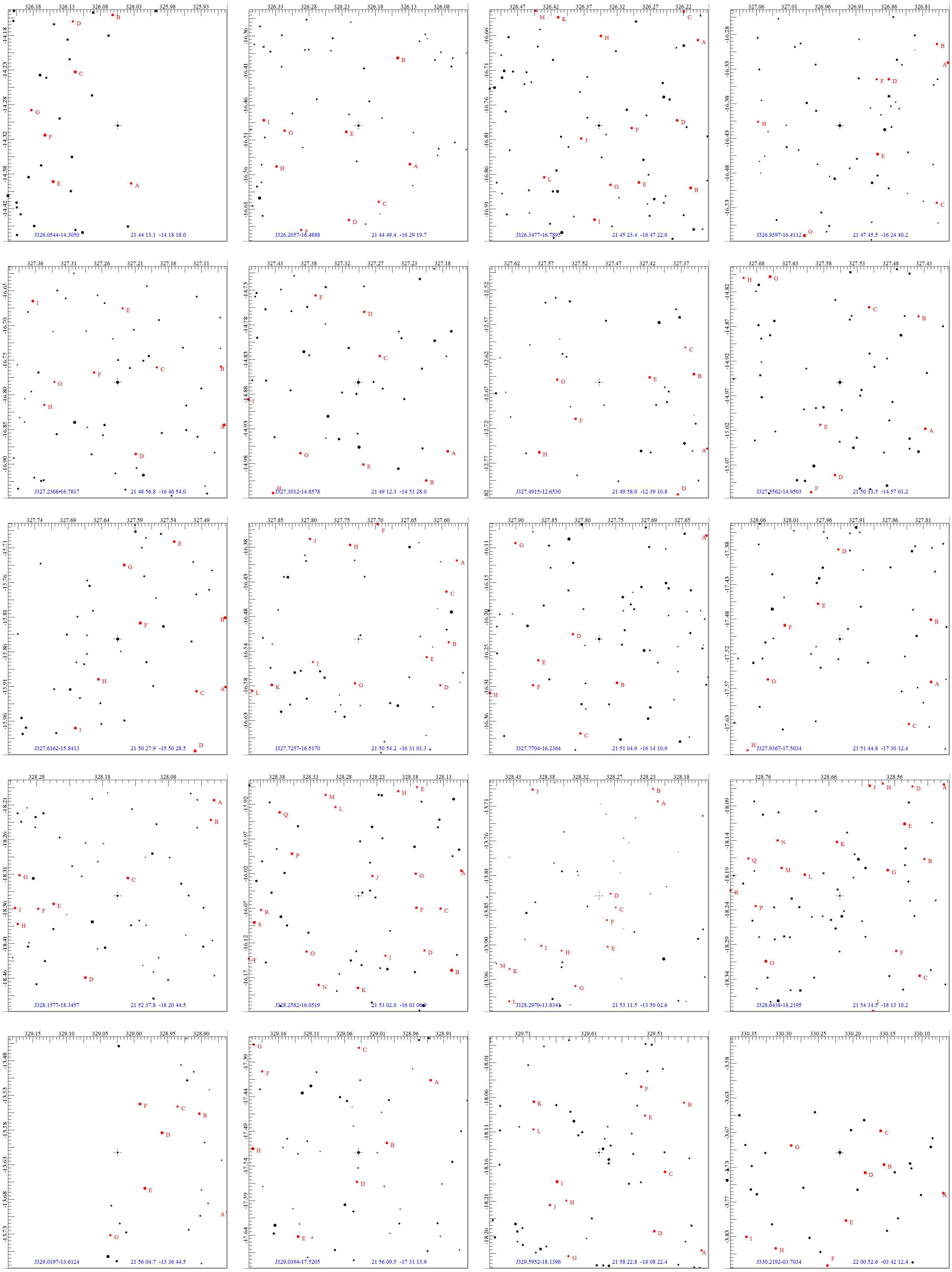

Figure 5: Finding charts for the variables and their comparison photometric sequences, listed in the same order as in Table 1. The stars forming the photometric comparison sequence (cf. Table 5) are highlighted in red and labelled with a letter. The variable is at the center of each panel, marked by the cross, the field is 20×20 arcmin and the orientation is North at the top, East to the left.

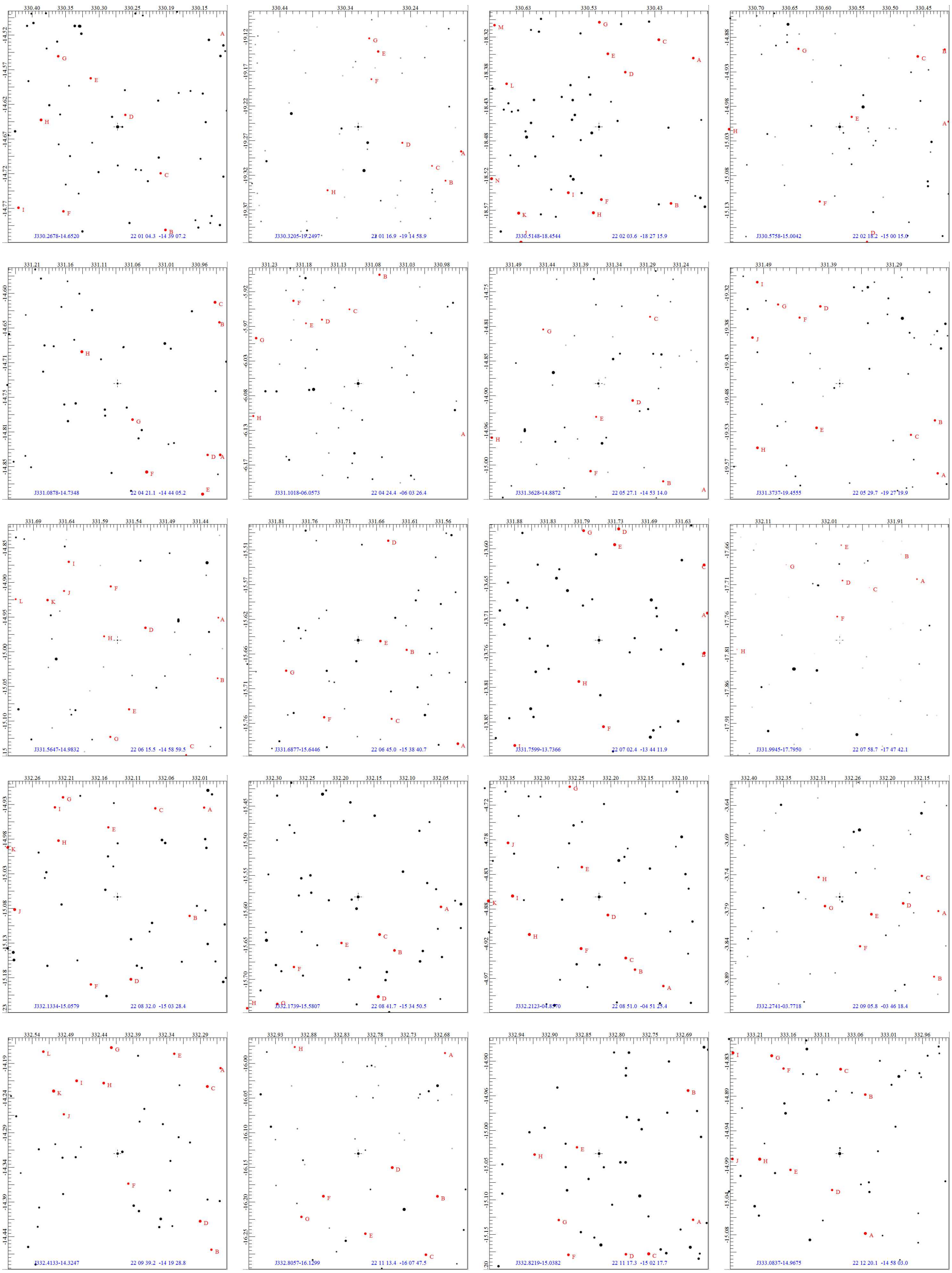

Figure 2: Finding charts for the variables and their comparison photometric sequences (*continued*).

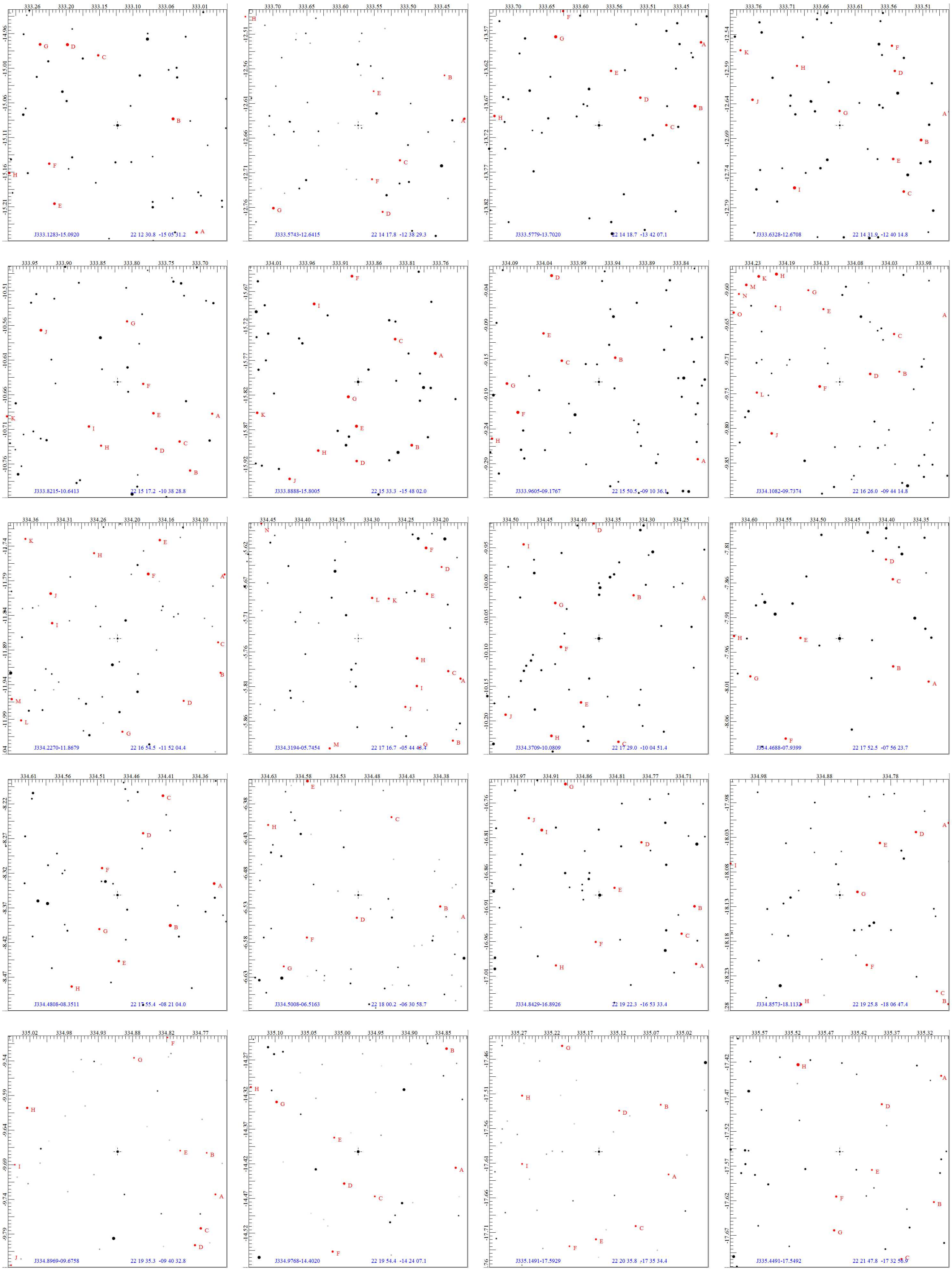

Figure 2: Finding charts for the variables and their comparison photometric sequences (*continued*).

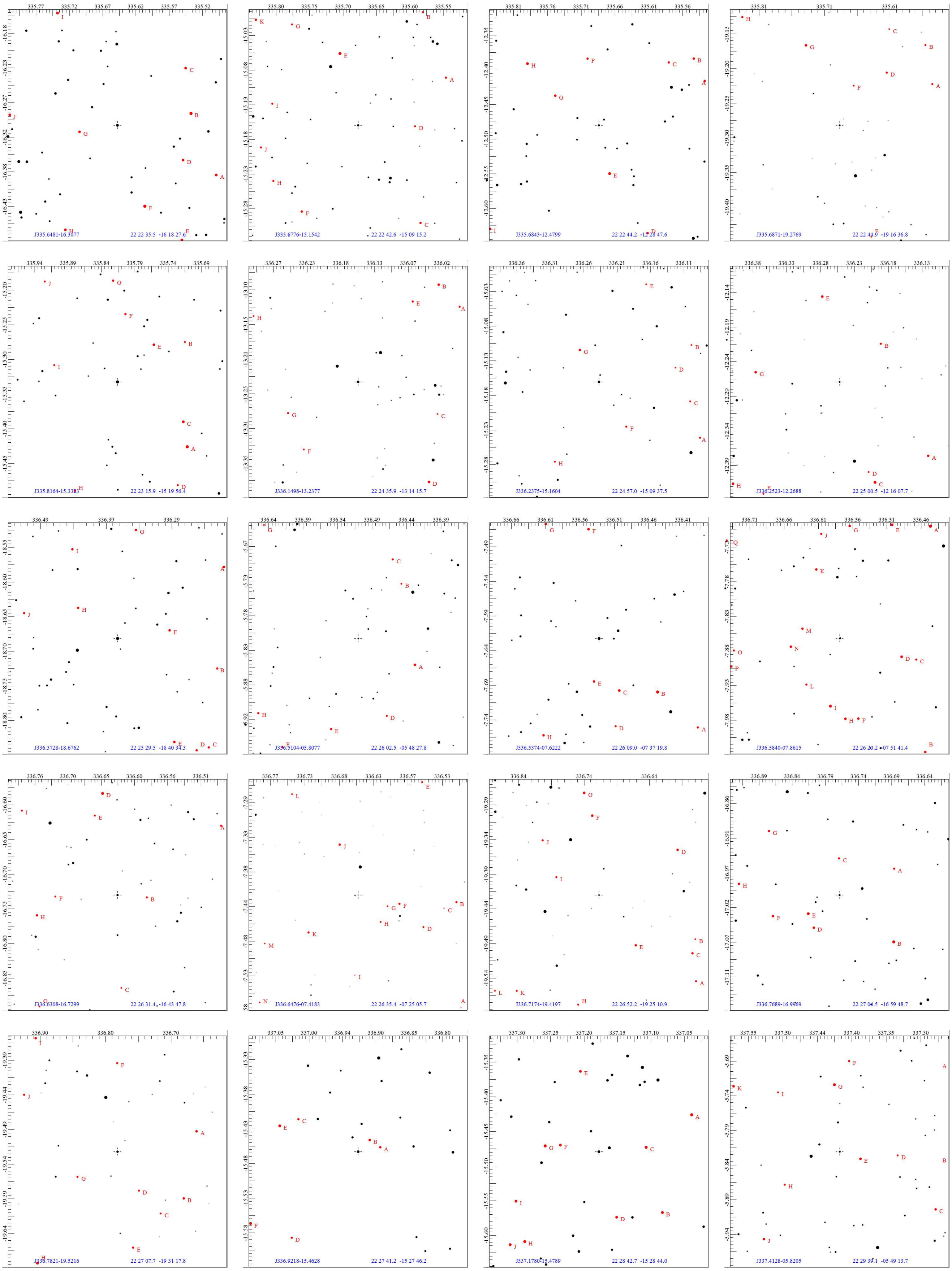

Figure 2: Finding charts for the variables and their comparison photometric sequences (*continued*).

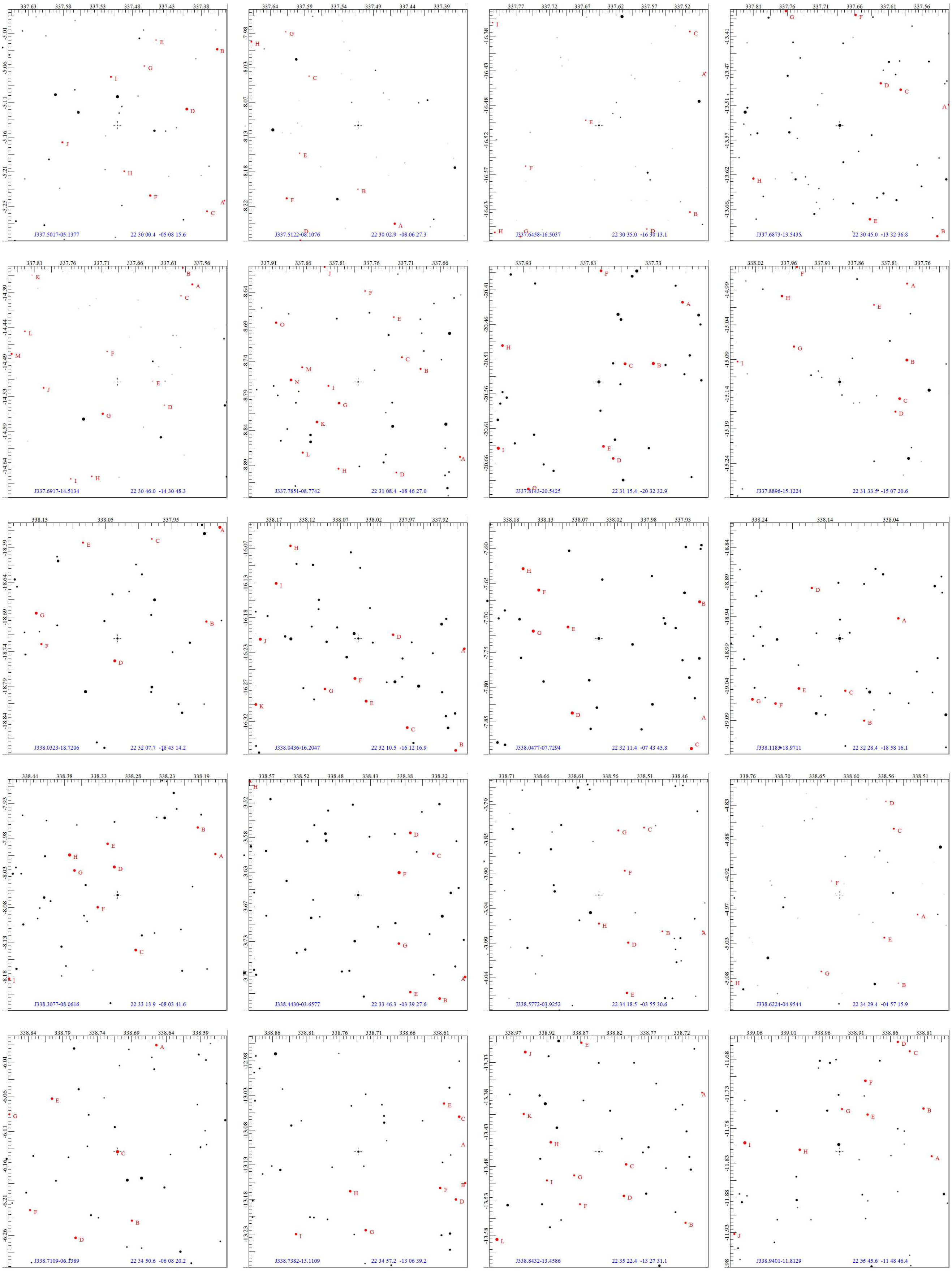

Figure 2: Finding charts for the variables and their comparison photometric sequences (*continued*).

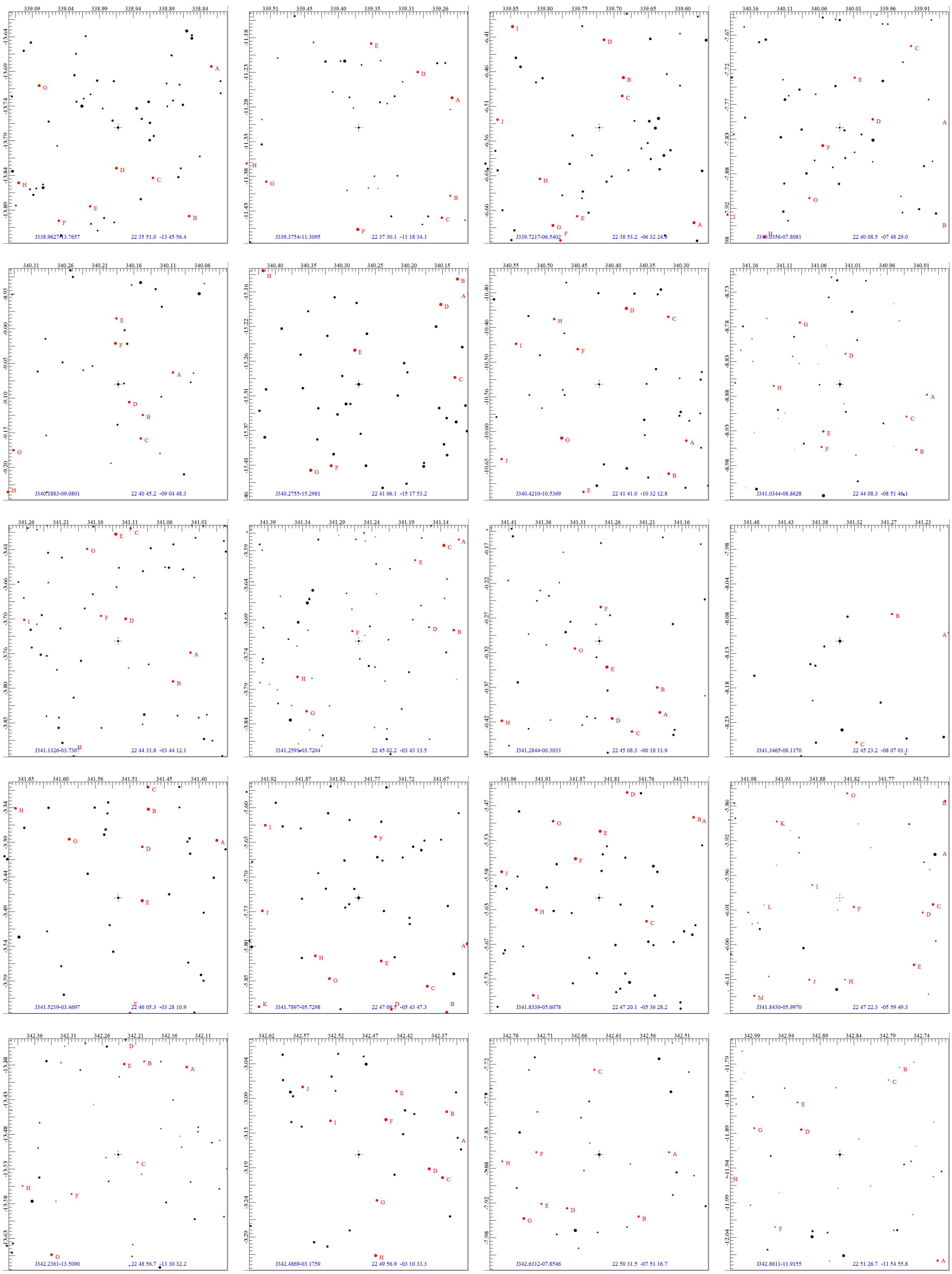

Figure 2: Finding charts for the variables and their comparison photometric sequences (*continued*).

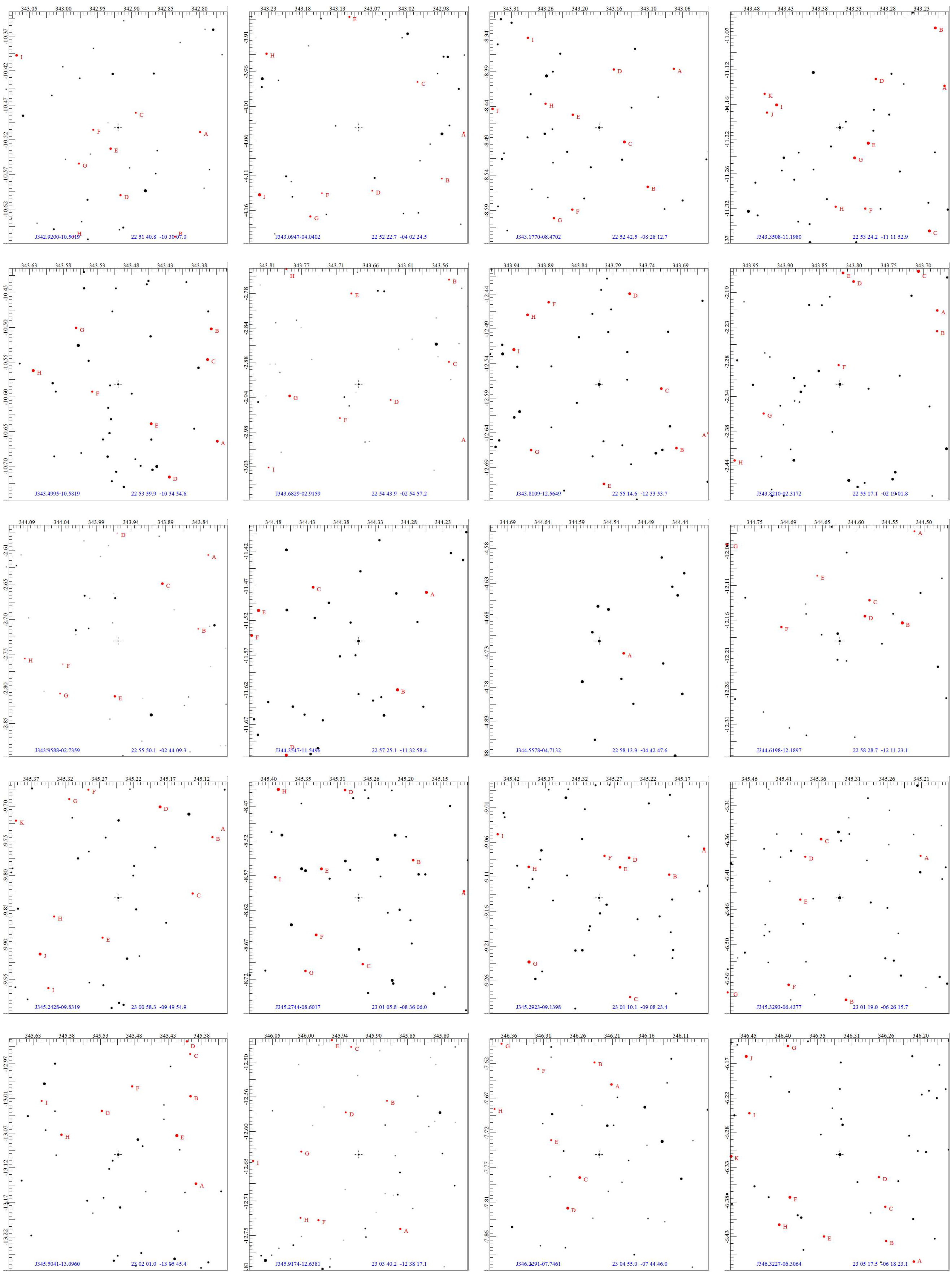

Figure 2: Finding charts for the variables and their comparison photometric sequences (*continued*).

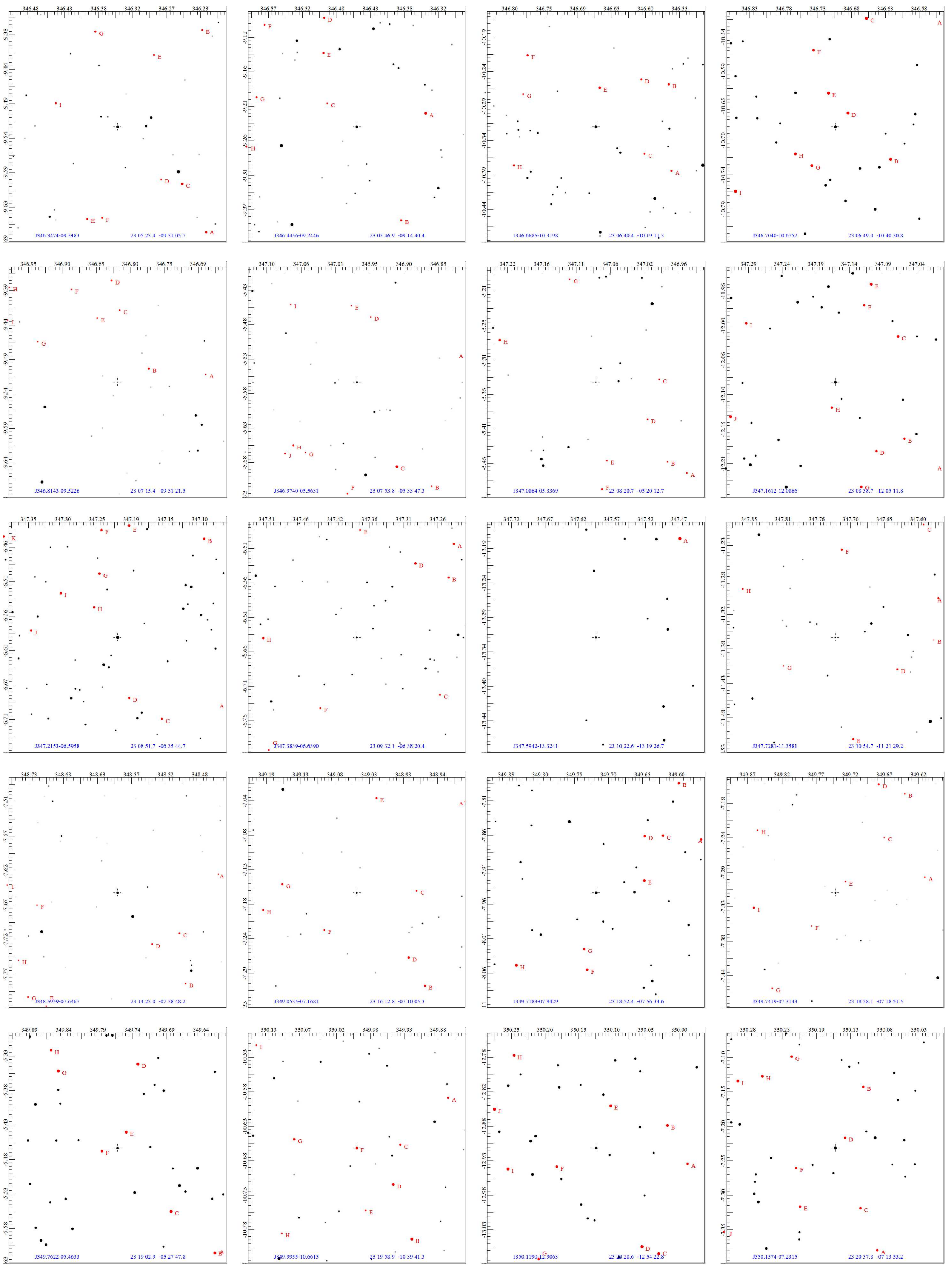

Figure 2: Finding charts for the variables and their comparison photometric sequences (*continued*).

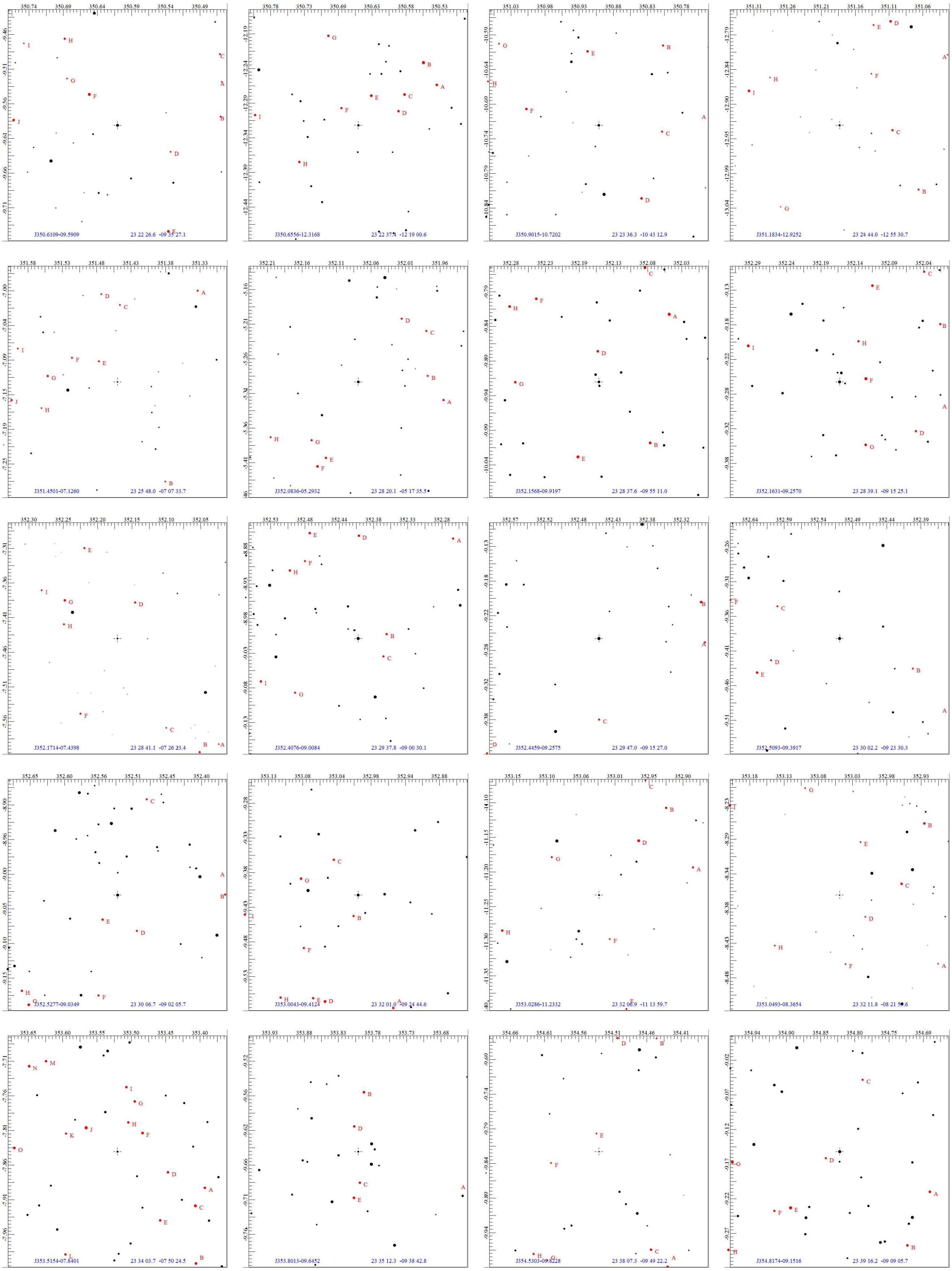

Figure 2: Finding charts for the variables and their comparison photometric sequences (*continued*).