The All Sky Automated Survey. The Catalog of the Short Period Variable Stars in the Selected Fields *

by

G. Pojmański

Warsaw University Observatory Al Ujazdowskie 4, 00-478 Warsaw, Poland
e-mail: gp@sirius.astrouw.edu.pl

ABSTRACT

Results of the first two month of observations using the All Sky Automated Survey prototype camera are presented. More than 45 000 stars in 24 Selected Fields covering 140 sq. degrees were monitored a few times a night resulting in the I-band catalog containing 10^7 individual measurements. Period search revealed 126 periodic variables brighter than 13 mag. Only 30 of them are known variables included in GCVS. The other 90 objects are newly detected variables - mainly eclipsing binaries (75%) and pulsating stars (17%). We estimate that completeness of the current catalogs of variable stars is smaller than 50 % already for the stars brighter than 9 mag. The Catalog is accessible over the WWW: *http://www.astrouw.edu.pl/∼gp/asas/asas.html*

Key words: *Catalogs – Stars:variables – Surveys*

1 Introduction

The All Sky Automated Survey (Pojmański 1997, hereafter Paper I) is a new observing project which ultimate goal is detection and investigation of any kind of the photometric variability present all over the sky (Paczyński 1997). We want to achieve this aim at relatively low cost, using simple automatic modules. In 1997 we have started monitoring over 20 Selected Fields to the limiting magnitude 13 (in I-band) using prototype automated mount equipped with 768 $\times$ 512 MEADE Pictor 416 CCD camera, 135 mm f/1.8 telephoto lens and I-band (Schott RG-9, 3mm) filter. The instrument was placed at the Las Campanas Observatory which is operated by the Carnegie Institution of Washington, in the vicinity of the new OGLE-2 telescope (Udalski, Kubiak and Szymański 1997), where room for the control computer was kindly allocated.

During the routine observations control program loops over the list of selected fields pointing camera and taking 3 minute exposures. Dark and flat-field images are exposed at the beginning of the night and appropriate data reduction process is applied after data acquisition in the fully automated way. Results of the aperture photometry are put into the ASAS Catalog, from which they may be retrieved e.g.

*Based on observations obtained at the Las Campanas Observatory of the Carnegie Institution of Washington.

using the World Wide Web. Detailed description of the prototype instrument, data acquisition and reduction process and ASAS Catalog can be found in Paper I.

This paper presents results of the search for periodic variables in the ASAS Catalog using data obtained during the first two month of the prototype instrument operation.

2 Observations, Data Reduction and Period Search

Twenty four 2×3 deg fields were selected for the test run at the Las Campanas Observatory and for the follow-up observations. To obtain the largest possible diversity of images required for tests we have selected some standard calibration fields (e.g. PG1323-086, S-107 from Landolt (1992)), crowded fields (e.g. Milky Way in Centaurus, LMC), star-poor regions (e.g. Octans), ecliptic fields (e.g. Aquarius) and galaxy rich area (in Virgo). Coordinates of the Selected Field centers as well as number of exposures N_{exp}, number of measured stars N_{star}, number of detected variables N_{var} and detection rate $f_{det} = N_{var}/N_{star}$ are given in Table 1.

Table 1

Selected Fields observed during the first two month of ASAS operation

Field ID	α_{2000} hh:mm	δ_{2000} dd:mm	N_{exp}	N_{star}	N_{var}	f_{det}
LMC 1	05:10	-68:10	85	949	3	0.0032
LMC 2	05:10	-70:00	86	1037	2	0.0019
LMC 3	05:40	-68:10	92	1109	3	0.0027
LMC 4	05:40	-70:00	94	1159	1	0.0008
Centaurus 1	11:35	-60:00	279	6497	19	0.0029
Centaurus 2	11:35	-61:50	268	5676	33	0.0058
Centaurus 3	11:35	-63:40	262	5358	25	0.0045
Octans 1	12:00	-85:00	328	2035	5	0.0025
Virgo	12:30	03:00	156	505	1	0.0019
Coal Sack	12:50	-63:00	294	5147	16	0.0031
PG1323-086	13:25	-08:50	192	641	0	
Centaurus 4	13:50	-30:00	211	1255	4	0.0032
Centaurus 5	13:50	-31:50	206	1511	0	
Libra	15:05	-15:00	178	1074	2	0.0018
S-107	15:40	-00:20	83	682	0	
Sagittarius 1	17:00	-22:30	74	2524	1	0.0003
Sagittarius 2	18:00	-23:30	68	3262	4	0.0010
Sagittarius 3	19:00	-22:30	71	2987	0	
Corona Australis	19:00	-40:00	79	2185	3	0.0014
Sagittarius 4	20:00	-20:30	71	1246	2	0.0016
Capricornus 1	21:00	-17:00	66	715	1	0.0013
S-113	21:40	-00:20	59	563	1	0.0018
Capricornus 2	22:00	-12:00	58	448	0	
Aquarius	23:00	-06:30	44	265	0	
Totals			3404	46244	126	0.0027

Even though Selected Fields were observed only if the air-mass of the frame center was smaller than 2 and the angular distance from the Moon was larger than 45 deg, we have encountered some problems with flat correcting the frames (cf. aper I). This resulted in some offset (up to $0.^{m}1$) between magnitudes of the same stars measured in the overlapping areas of the Centaurus and LMC fields. The data from the overlapping fields were processed and stored separately.

Photometric calibration was performed using Landolt (1992) standard fields: PG131323-086, S-107 and S-113. Since our project is monochromatic at present we were not able to use color terms in the magnitude calibration - we have determined only the zero point i_0 of the transformation between instrumental i and standard $I_{\rm cat}$ magnitudes:

$$I_{cat} = i_0 + i + k_{\rm I}X. \tag{1}$$

where $k_{\rm I}$ and X denote extinction coefficient in the I-band and air mass, respectively.

For the photometric nights of April 28 and 29 with average $k_{\rm I}$ extinction of 0.058 and 0.047 respectively we have found that for 20 stars in the magnitude range $8 < I_{cat} < 12$ zero point of the transformation amounts to: $i_0 = 0.34 \pm 0.035$. One must be aware that lacking color terms and having problems with flat correction our I_{cat} values might be in some cases erroneous even by a tenth of a magnitude.

Transformation given by Eq. 1 was used only once for each Selected Field - at the time it was added to the catalog for the first time. For the remaining images median difference between catalog and instrumental magnitudes was calculated and used for transformation. This was possible, since differential extinction over our field of view does not exceed $0.^{m}01$. When adding a new frame to the catalog the rms difference q between the catalog magnitudes and transformed magnitudes for all stars on the frame was calculated and stored, since it is a good indicator of the individual frame quality.

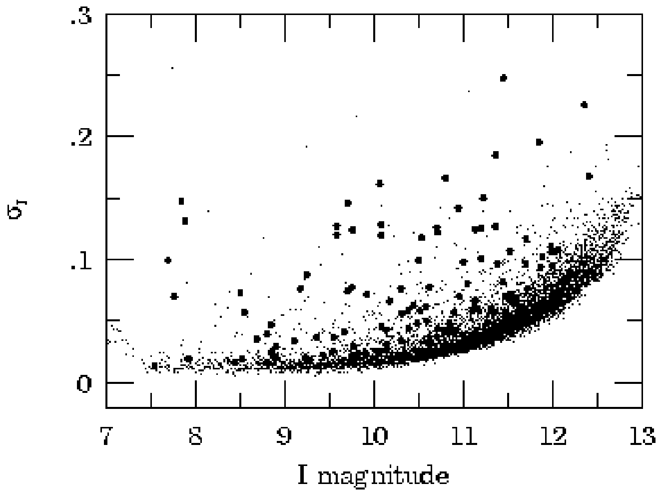


Fig. 1. Standard deviation σ_I of the stellar magnitudes *vs.* I-band magnitudes in the ASAS Catalog. Black dots denote detected variables. Most of the remaining points with large σ_I values are due to the long term variables.

The following algorithm was applied to find periodic variable stars in the ASAS catalog: First, the standard deviations σ_I of stellar magnitudes were plotted against the I-band magnitudes (Fig. fig1), and the lower envelope of the plotted points was determined. Next, the stars with at least 40 measurements were selected and their light curves extracted from the Catalog - rejecting data coming from the frames of bad quality ($q > 0.04$). Stellar magnitude dispersion was then calculated and if it was large (2 times the envelope value) the star was tested using the analysis of variance (AoV) method (Schwarzenberg-Czerny 1989) which proved efficient in the OGLE variable star search (Udalski *et al.* 1994).

Light curves of the stars showing large AoV statistics (detection thresold was set to 10 - more than required for 99.5% confidence) were then plotted against the phase and inspected visually.

Slowly or irregulary varying stars, which tend to produce spurious AoV statistics enhancements at $(k \times 0.5)^{-1}\mathrm{d}^{-1}$ frequencies, as well as stars with large σ_I deviations were stored separately for future analysis. In few cases of low amplitude variables (e.g. ASAS 112552-6232.9, ASAS 113858-6328.7) we may not exclude spurious period asignment due to the problems with photometry quality.

3 The Catalog of the Short Period Variable Stars

Stars, that passed visual inspection are presented in Table 2 containing ASAS designation, equatorial coordinates α, δ (equinox 2000), $I_{\max}$ magnitude at maximum brightness, light curve amplitude ΔI, epoch T_0 of minimum brightness (maximum for pulsating stars), period P and variability classification. Their corresponding light curves are collected in the Appendix.

ASAS designation consists of the letters ASAS followed by the object equatorial coordinates in the format hhmmss-ddmm.m. Accuracy of such designation is consistent with the Catalog resolution of 15 arcsec, resulting from the 14.2 arcsec pixels of the prototype instrument. Actual coordinates of the stars were calculated for individual frames, using astrometric solution based on star positions from the HST Guide Star Catalog (Lasker 1988). An rms error of astrometric transformation was usually smaller than 3 arcsec. For about 70 variables observed in the overlapping areas of Centaurus and LMC fields it was possible to determine independent coordinates, based on different GSC star sets. An average rms difference between them was found to be $\Delta\alpha = 0\overset{s}{.}2 \pm 0\overset{s}{.}13$ and $\Delta\delta = 0\overset{''}{.}17 \pm 1\overset{''}{.}55$, so the α and δ values given in the Table 2 are presented with 1 arcsec accuracy.

Period accuracy depends on the stellar brightness, light curve shape, nuber of the available data points and observation time-base. Because of the data reduction automation we decided to present periods in homogeneous format - with the last digit usually not being very significant.

Epoch of the minimum/maximum light was determined from the phased light curves, and its accuracy is between 0.005 and 0.05 of the period, depending on the light curve shape.

Light curves were classified according to the Kholopov *et al.* (1985) criteria used in the GCVS catalog. Most of the variables are EB, EW, EA, DCEP and RR stars. Objects showing low amplitude, sinus-like variation were were designated MISC. A few of them (marked with ?) migth be spurious detections due to the bad photometry. We did not attempt to recognize RS CVn stars yet, although in some cases (e.g. ASAS 112706-6037.3) such classification might be relevant.

Table 2

Short Period Variable Stars in the Selected Fields.

ID	α_{2000}	δ_{2000}	$I_{\max}$	ΔI	T_0 -2450000	P [days]	Type
045913-6935.7	04:59:13.3	-69:35:44	10.87	0.27	558.6047	0.3291	RRc
050048-7029.8	05:00:48.0	-70:29:52	10.57	0.37	558.5631	0.3873	EW
050526-6743.2	05:05:27.0	-67:43:13	9.78	0.44	559.563	4.064	EB
050554-6810.8	05:05:54.9	-68:10:49	11.22	0.29	559.114	1.757	EB
051833-6813.5	05:18:32.4	-68:13:33	9.94	0.58	558.5128	0.2854	EW
052558-7011.1	05:25:58.1	-70:11:08	10.45	0.17	557.017	3.168	EB
052927-6852.0	05:29:27.4	-68:52:02	8.87	0.06	558.294	5.216	EB
054000-6828.6	05:39:59.7	-68:28:41	10.61	0.52	558.5662	0.3622	EW
055122-6812.7	05:51:21.7	-68:12:45	11.53	0.41	558.9188	0.6434	EW
110234-8530.2	11:02:33.2	-85:30:13	11.26	0.17	553.267	8.381	MISC
112229-6313.7	11:22:29.5	-63:13:44	11.84	0.42	559.387	3.910	EA
112238-6332.9	11:22:37.8	-63:32:53	8.64	0.10	559.277	2.093	ACV
112301-6146.8	11:23:01.6	-61:46:53	10.14	0.09	546.331	2.677	EA
112325-6238.7	11:23:25.8	-62:38:40	10.13	0.20	556.767	4.667	EA
112331-6423.2	11:23:30.6	-64:23:15	10.88	0.39	558.2904	0.9056	EA
112405-6403.1	11:24:04.8	-64:03:05	11.08	0.52	558.863	1.703	EB
112419-6344.0	11:24:19.0	-63:44:00	11.83	0.33	559.79	16.15	DCEPS
112502-6251.4	11:25:01.8	-62:51:26	11.35	0.18	558.707	1.373	DCEPS
112506-6044.1	11:25:05.7	-60:44:03	7.53	0.37	559.817	5.311	DCEP
112513-6122.2	11:25:12.9	-61:22:08	7.66	0.20	548.489	3.216	DCEPS
112552-6232.9	11:25:52.3	-62:32:52	11.05	0.20	558.1833	0.7206	EW
112612-6210.2	11:26:12.4	-62:10:12	10.45	0.45	545.815	1.316	EA
112629-6148.9	11:26:28.4	-61:48:54	10.68	0.09	546.8368	0.9282	?MISC
112644-6251.8	11:26:44.5	-62:51:45	11.12	0.46	554.908	1.595	EA
112653-6211.9	11:26:53.5	-62:11:52	11.70	0.62	546.6698	0.5877	EW
112706-6037.3	11:27:05.9	-60:37:19	8.84	0.22	559.21	10.57	EA
112742-6127.8	11:27:42.7	-61:27:53	11.29	0.22	546.7606	0.8978	EW
112746-6110.5	11:27:46.7	-61:10:26	11.48	0.23	557.357	1.608	EB
112803-6124.7	11:28:03.1	-61:24:42	8.47	0.52	546.239	3.488	EB
112810-6010.5	11:28:10.4	-60:10:27	9.50	0.27	566.41	19.14	EB
112843-5925.7	11:28:42.8	-59:25:42	9.58	0.22	558.1728	0.9220	RRab
112852-6255.8	11:28:51.9	-62:55:51	8.81	0.16	558.559	2.513	EA
112901-6052.8	11:29:00.5	-60:52:50	9.52	0.41	558.017	1.626	EA
112923-6154.5	11:29:23.7	-61:54:31	11.15	0.31	546.380	1.608	EA
112926-6201.9	11:29:26.5	-62:01:56	10.56	0.47	546.474	3.223	EA
112939-5953.7	11:29:39.2	-59:53:41	11.47	0.46	559.447	1.915	EA
112943-6323.2	11:29:42.9	-63:23:13	9.66	0.23	559.1225	0.9451	EW
113019-6316.6	11:30:19.1	-63:16:34	10.39	0.24	559.384	1.201	EB
113023-6226.2	11:30:22.9	-62:26:14	11.35	0.20	550.060	6.330	EB
113043-6305.0	11:30:43.7	-63:05:00	10.76	0.13	558.982	1.830	EB
113131-6233.2	11:31:30.6	-62:33:12	9.06	0.15	557.51	10.36	EB
113149-5918.0	11:31:49.1	-59:18:03	10.81	0.17	558.933	3.109	EB
113210-5948.9	11:32:10.3	-59:48:51	10.23	0.23	558.7552	0.4534	EW
113318-6306.2	11:33:17.9	-63:06:15	9.21	0.06	558.7505	0.1684	DSCT

Table 2

Continued

ID	α_{2000}	δ_{2000}	$I_{\max}$	ΔI	T_0 -2450000	P [days]	Type
113321-5949.6	11:33:21.4	-59:49:32	11.97	0.42	558.897	1.134	EB
113333-6353.7	11:33:33.4	-63:53:41	9.15	0.28	558.684	1.982	EA
113426-6320.0	11:34:26.2	-63:20:02	10.84	0.12	558.224	1.718	EA
113451-6128.0	11:34:50.9	-61:27:57	10.02	0.14	547.784	3.422	EB
113547-6104.8	11:35:47.7	-61:04:45	10.90	0.14	557.005	1.122	MISC
113617-6128.0	11:36:16.8	-61:28:02	8.48	1.14	547.704	3.697	EB
113648-6029.6	11:36:47.6	-60:29:35	9.50	0.11	562.040	5.346	EB
113648-6425.6	11:36:47.6	-64:25:38	9.91	0.17	558.817	2.116	EA
113708-6148.1	11:37:07.5	-61:48:04	9.96	0.38	547.140	1.227	EB
113713-5952.6	11:37:13.7	-59:52:35	10.76	0.14	558.840	1.365	EB
113745-6014.5	11:37:45.1	-60:14:37	11.63	0.40	559.327	2.940	EA
113840-6117.8	11:38:40.0	-61:17:53	11.24	0.19	589.626	2.388	EB
113858-6328.7	11:38:58.0	-63:28:41	10.05	0.04	558.0529	0.8709	?MISC
113915-6026.1	11:39:15.4	-60:26:10	10.32	0.18	558.4585	1.7472	EB
113958-6449.0	11:39:58.1	-64:48:59	9.64	0.37	556.9345	0.4457	EW
114035-6306.2	11:40:35.8	-63:06:14	11.78	0.27	558.9338	0.2859	EW
114059-6241.5	11:40:58.6	-62:41:33	7.63	0.47	558.929	3.347	CEP(B)
114101-6036.8	11:41:01.4	-60:36:48	8.51	0.04	554.010	4.411	MISC
114119-6215.9	11:41:19.3	-62:15:54	10.38	0.34	547.870	5.846	DCEP
114141-6236.5	11:41:41.4	-62:36:26	10.59	0.07	558.1389	0.6582	MISC
114155-6347.7	11:41:54.8	-63:47:44	7.91	0.04	557.806	1.413	MISC
114201-6140.3	11:42:01.0	-61:40:24	9.42	0.28	552.579	9.571	EB
114248-5859.6	11:42:48.0	-58:59:36	9.49	0.51	555.36	12.11	DCEP
114250-6226.0	11:42:49.8	-62:26:05	8.44	0.26	554.442	6.295	EA
114257-6248.4	11:42:56.5	-62:48:24	9.83	0.07	558.8346	0.8924	EA
114308-6029.1	11:43:07.9	-60:29:05	11.07	0.20	558.992	1.549	EA
114345-6144.6	11:43:45.7	-61:44:35	9.64	0.76	546.601	2.992	EB
114353-6024.8	11:43:52.9	-60:24:50	10.10	0.43	559.020	3.240	EB
114357-6322.8	11:43:57.2	-63:22:49	8.87	0.07	558.3115	1.715	MISC
114416-6143.0	11:44:15.7	-61:43:00	9.75	0.31	545.736	3.689	EB
114417-6233.8	11:44:16.6	-62:33:47	8.77	0.08	554.09	11.22	DCEP
114510-6058.1	11:45:09.7	-60:58:11	10.11	0.55	558.066	3.914	EB
114555-5922.7	11:45:54.6	-59:22:42	10.86	0.86	558.9086	0.4529	RRab
114557-6352.9	11:45:57.0	-63:52:53	11.69	0.32	559.0727	0.9538	EA
114617-6100.0	11:46:16.6	-61:00:06	10.34	0.15	558.475	1.227	EB
114659-6228.4	11:46:59.1	-62:28:25	11.26	0.64	558.8235	0.9110	EW
114720-6155.1	11:47:19.7	-61:55:02	10.57	0.40	559.054	1.250	EB
114736-6310.4	11:47:36.2	-63:10:26	9.85	0.22	558.8002	0.3393	EW
114736-6322.7	11:47:35.9	-63:22:39	10.26	0.25	558.188	2.314	EB
114757-6225.3	11:47:57.7	-62:25:15	8.62	1.23	559.459	1.657	EB
114758-6034.0	11:47:57.3	-60:33:58	12.17	0.50	560.4544	0.3952	EW
114806-6221.3	11:48:05.7	-62:21:17	11.50	0.54	560.154	4.131	EA
115935-8545.9	11:59:36.0	-85:45:54	11.08	0.31	558.6769	0.6111	EW
122418+0351.6	12:24:18.5	+03:51:34	12.21	0.63	555.7581	0.3545	EW

Table 2

Concluded

ID	α_{2000}	δ_{2000}	$I_{\max}$	ΔI	T_0 -2450000	P [days]	Type
123748-6219.4	12:37:47.6	-62:19:22	9.33	0.11	558.8874	0.4349	EW
123808-6353.8	12:38:07.6	-63:53:48	11.49	1.00	558.144	1.126	EA
123824-6404.8	12:38:24.0	-64:04:49	10.27	0.10	555.849	7.782	EB
123826-6303.9	12:38:26.5	-63:03:51	11.94	0.34	559.373	1.867	EB
124203-6226.2	12:42:02.7	-62:26:12	10.87	0.64	559.013	1.909	EB
124220-6259.6	12:42:20.4	-62:59:38	9.11	0.23	559.649	1.885	EB
124421-6300.8	12:44:21.7	-63:00:44	11.09	0.60	555.05	12.70	DCEP
124435-6331.8	12:44:35.2	-63:31:46	9.51	0.08	559.471	2.570	EB
125210-6312.7	12:52:10.0	-63:12:40	10.23	0.22	555.660	7.937	EA
125319-6401.4	12:53:19.0	-64:01:23	10.37	0.20	558.8440	0.4262	EW
125427-6356.1	12:54:27.2	-63:56:06	9.61	0.72	567.06	23.56	DCEP
125815-6258.1	12:58:15.1	-62:58:08	11.07	0.52	557.625	2.526	EA
125933-6210.5	12:59:32.8	-62:10:36	11.20	0.21	559.366	1.544	EB
125953-6159.5	12:59:53.4	-61:59:33	10.61	0.37	558.056	1.482	EB
130221-6328.4	13:02:20.5	-63:28:23	10.40	0.09	558.9958	0.3785	EW
130308-6349.4	13:03:07.7	-63:49:22	10.10	0.06	559.836	5.362	DCEPS
130807-8503.5	13:08:04.2	-85:03:30	11.06	0.14	558.6656	0.5138	RRc
131312-8528.6	13:13:10.5	-85:28:34	10.93	0.29	558.9488	0.5528	EW
134460-3019.2	13:44:59.5	-30:19:17	9.00	0.02	558.2425	0.8734	MISC
135335-2934.8	13:53:35.5	-29:34:49	11.62	0.60	558.2297	0.6366	RRab
135340-3036.0	13:53:40.1	-30:35:59	8.89	0.16	558.4830	0.4760	EW
135546-2911.5	13:55:46.5	-29:11:25	10.61	0.08	558.5863	0.1476	DSCT
145960-1417.0	15:00:00.0	-14:17:03	12.14	0.41	558.8451	0.1675	RRab
150414-1517.9	15:04:14.4	-15:17:56	9.28	0.09	558.279	1.470	EB
170511-2133.4	17:05:10.7	-21:33:23	10.08	0.61	558.575	2.217	EA
180059-2301.9	18:00:58.6	-23:01:54	9.18	0.34	560.802	4.668	EB
180254-2409.8	18:02:53.8	-24:09:46	9.82	0.44	559.597	2.113	EB
180305-2251.9	18:03:04.7	-22:51:52	9.38	0.86	557.476	3.911	EB
180325-2237.1	18:03:24.9	-22:37:02	8.10	0.56	558.746	1.393	EB
185622-4040.6	18:56:22.1	-40:40:39	10.58	0.15	558.324	1.492	EA
185627-4044.0	18:56:27.1	-40:43:58	11.76	0.38	558.7765	0.3602	EW
190537-3904.6	19:05:37.0	-39:04:32	11.99	0.88	558.7585	0.3383	EW
195723-2105.2	19:57:22.5	-21:05:14	11.12	0.31	559.0770	0.4586	EW
200338-1956.0	20:03:38.3	-19:55:59	10.98	0.30	558.9758	0.9134	EW
210553-1647.8	21:05:53.4	-16:47:46	11.65	0.32	558.8694	0.3034	EW
214610-0106.8	21:46:10.1	-01:06:47	11.71	0.68	558.7722	0.2850	EW

All variable stars in our survey were searched for in the GCVS catalog and, if missing, in the SIMBAD database. Table 3 lists 37 matches with objects classified as variable. 30 of them are GCVS variables, 7 other are SIMBAD objects marked as VAR. One match (V 440 Cen) is doubtful, since the GCVS object is fainter, slightly offseted and has different period ($3\overset{d}{.}13$ *vs.* $2\overset{d}{.}67$). A few other stars show large coordinate offsets (≥ 15 arcsec) but are easily identified by their properties (IV Cen, LV Cen, TV Mus, IZ Cen, BI Cen, VZ Cru, RY Cru, and FY Hya).

The opposite test, search in the GCVS for variables located in the Selected

Table 3

Known variable stars detected by ASAS.

ASAS ID	Other ID	Type	Offset ["]	ASAS ID	Other ID	Type	Offset ["]
045913-6935.7	XX Dor	VAR	31.7	114248-5859.6	KK Cen	DCEP	6.0
051833-6813.5	RW Dor	EW	12.6	114250-6226.0	V346 Cen	EA	2.9
052558-7011.1	SHV 0526293-701248			114345-6144.6	MP Cen	EB	3.6
		VAR	45.6	114416-6143.0	MQ Cen	EA	7.1
112301-6146.8	? V440 Cen	EA	50.0	114510-6058.1	MR Cen	EB	6.0
112506-6044.1	AY Cen	DCEP	0.0	114555-5922.7	BI Cen	RRAB	25.8
112513-6122.2	AZ Cen	DCEP	7.1	114659-6228.4	CKS91 11445-6211		
112653-6211.9	V343 Cen	EB	6.9			VAR	4.7
112803-6124.7	MN Cen	EA	2.1	114720-6155.1	HD 309079	EA	8.3
112810-6010.5	IV Cen	EA	30.9	114736-6310.4	HD 309036	VAR	2.7
112901-6052.8	LT Cen	EA	0.0	114736-6322.7	CKS91 11451-6253		
113318-6314.5	LV Cen	DCEP	14.7			VAR	4.1
113321-5949.6	IW Cen	EB	9.6	114757-6225.3	SV Cen	EB	10.0
113333-6353.7	HD 100530	DBLE	6.6	114806-6221.3	KT Cen	EA	9.1
113617-6128.0	BF Cen	EA	5.6	123808-6353.8	VZ Cru	EA	24.8
113958-6449.0	TV Mus	EW	51.6	125427-6356.1	RY Cru	VAR	20.6
114059-6241.5	UZ Cen	CEP	4.7	135335-2934.8	FY Hya	RRAB	27.3
114119-6215.9	IZ Cen	DCEP	13.8	180059-2301.9	WY Sgr	EA	6.2
114155-6347.7	V915 Cen	ACV	2.3	180305-2251.9	V792 Sgr	EB	0.0
114201-6140.3	MO Cen	EA	6.3	180325-2237.1	V4202 Sgr	E	6.4

Table 4

GCVS variables that were not detected during ASAS variability search.

GCVS ID	Type	α_{2000}	δ_{2000}	m	$\Delta\ m$	P
S Dor	SDOR	05:18:14.0	-69:14:59	8.60	2.90	0.3638
AA Dor	EA	05:31:40.5	-69:53:10	11.13	0.47	0.2615
V384 Cen	EA	11:39:19.7	-62:10:20	11.80	0.60	12.6352
BG Cen	E	11:37:20.5	-64:02:19	11.80	0.80	0.7431
BH Cen	EB	11:39:10.0	-63:25:13	10.03	1.13	0.7916
LW Cen	EB	11:37:32.1	-63:20:49	8.90	0.75	1.0026
BX Cru	DCEP	12:50:36.5	-63:04:19	12.20	0.46	19.537

Fields and fulfilling selection criteria ($P < 20^{\rm d}$, $7^{\rm m} < m < 13^{\rm m}$ and $N_{obs} > 40$), revealed 7 objects that were missed by ASAS variability search. They are listed in Table 4; each such case was individualy inspected.

S Dor is eruptive variable and was constant during observations.

LW Cen was rejected because its period ($1.^{\rm d}002$) was too close to one day.

BG Cen ($\alpha_{GCVS} = 11^{\rm h}37^{\rm m}20.5^{\rm s}$, $\delta_{GCVS} = -64°02'19''$) coordinates point close to the blended Catalog pair (2 pixel separation) ($\alpha = 11^{\rm h}37^{\rm m}19^{\rm s}$, $\delta = -64°03'36''$

and $\alpha = 11^{\rm h}37^{\rm m}22^{\rm s}$, $\delta = -64°02'32''$). Its period ($0\overset{d}{.}7431$) can be recognized only in the second component of the the blend, but at very low AoV statistics level.
BH Cen is located 57 arcsec (4 pixels) from the bright (I=$7\overset{m}{.}9$) companion and its photometry is inaccurate.
V384 Cen is a $12^{\rm d}$ Algol system. Only 10 observations (out of 260) were obtained during eclipse, so the star was not tested for periodicity.
AA Dor was missed because of its low magnitude dispersion ($\sigma_I = 0.05$).
BX Cru true period ($\sim 39^{\rm d}$) appeared to be twice the GCVS value - too long for the present study.

Having only a small sample of missed stars we are not able to make definite statements about completeness of the Catalog - most omitted stars are probably blended objects and long period Algols, as well as stars with small number of observations. We estimate that over 200 data points are necessary to guarantee period detection for pulsating, EW and EB stars, and much more for Algol variables. We will address the question of completeness in future - comparing current results and data obtained during the next months of ASAS operation.

4 Summary

Table 5

Number of ASAS variable stars *vs.* previously known variables in 1 mag bins
and completeness of the former and current data.

Mag	N_{ASAS}	N_{known}	$\frac{N_{known}}{N_{ASAS}}$	N_{obs}	$\frac{N_{ASAS}}{N_{obs}}$
7-8	4	4	1.00	438	0.009
8-9	13	5	0.38	1106	0.012
9-10	28	12	0.43	3254	0.009
10-11	42	9	0.20	8582	0.006
11-12	36	6	0.17	17516	0.002
12-13	3	0	0.00	6678	0.0004

The Catalog of the Short Period Variable Stars in the Selected Fields contains 126 objects found among 45000 stars. About 90 of them where not previously known to be variable. Results presented in Table 5 suggest that completeness of the existing catalogs is smaller than 50% already for stars brighter than 9 mag and drops significantly for fainter objects. This drop is even more pronounced if one takes into account, that current ASAS survey starts to be incomplete at about 11 mag.

There are many more other variable stars in the Selected Fields. Many of them are long period variables, which were already discovered, but their period has not been determined yet. We will perform detailed analysis of such objects using the data collected during almost one year of the ASAS prototype instrument operation.

Our preliminary results show, that the small-scale instruments are ideal tools for reducing incompleteness of our knowledge about bright objects on the sky. We are going to extend our survey for much larger area of the sky, trying to increase the ASAS Catalog completeness to 13 mag using longer focal length.

The Catlog of the Short Period Variable Stars, as well as the ASAS Catalog are accessible over the World Wide Web:

http://www.astrouw.edu.pl/$\sim$gp/asas/variables.html

or

http://www.astrouw.edu.pl/$\sim$gp/asas/asas.html .

Acknowledgements. It is a great pleasure to thank Prof. Bohdan Paczyński for initiative in this project, valuable discussions and providing necessary funds.

We are indebted to the OGLE collaboration for letting us use facilities of the Warsaw telescope and for the permanent support of our instrumentation (opening and closing enclosure, tape exchanging and many more).

Special thanks are due to Andrzej Udalski for his invaluable technical help and reanimating our equipment after serious break-down, to Michał Szymański for lots of computing hints and to Marcin Kubiak and Przemek Woźniak for instrument re-adjustment after the earthquake.

I am very indebted to Carnegie Institution of Washington for providing the excellent site for my instrument.

This work was partly supported by the KBN BST grant.

REFERENCES

Landolt, A.U. 1992, *Astron. J.*, **104**, 340.

Lasker *et al.* 1988, *Astrophys. J. Suppl. Ser.*, **68**, 1.

Kholopov, P.N., *et al.* 1985, General Catalog of Variable Stars, The Fourth Edition, Nauka, Moscow.

Paczyński, B. 1997, ”The Future of Massive Variability Searches”, in *Proceedings of 12th IAP Colloquium*: ”Variable Stars and the Astrophysical Returns of Microlensing Searches”, Paris (Ed. R. Ferlet), p. 357.

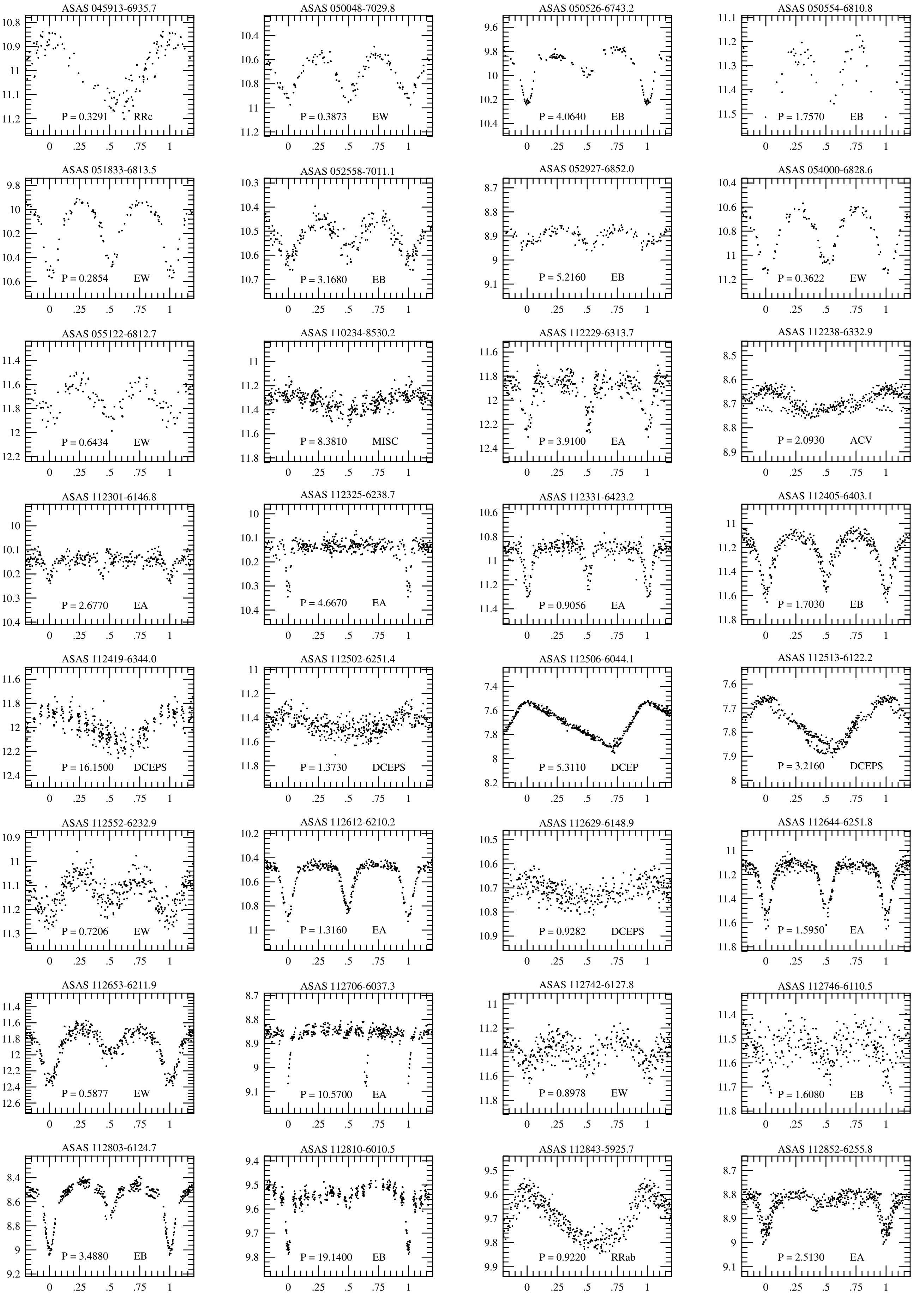
Pojmański, G. 1997, *Acta Astron.*, **47**, 467.

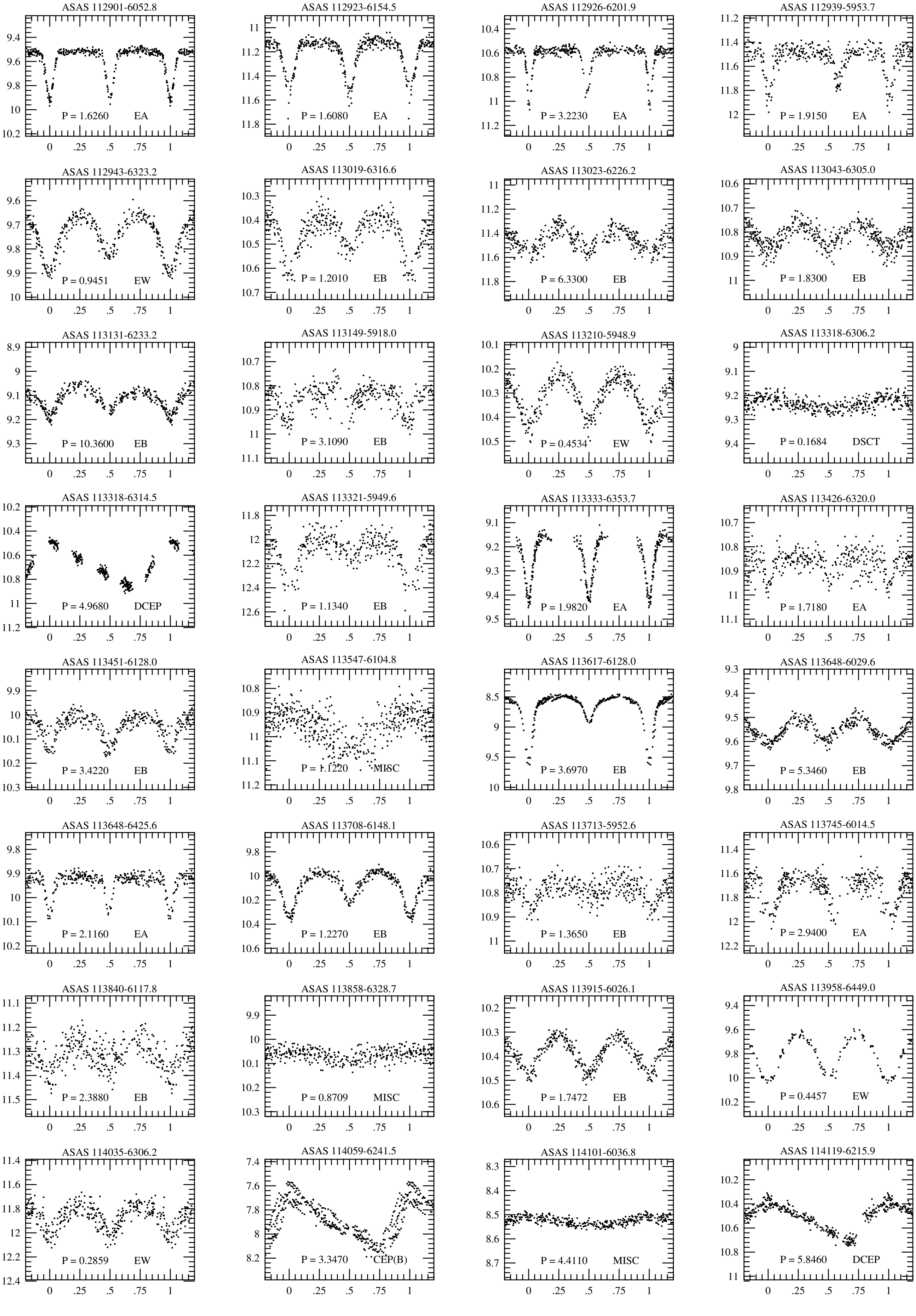
Schwarzenberg-Czerny, A. 1989, *MNRAS*, **241**, 153.

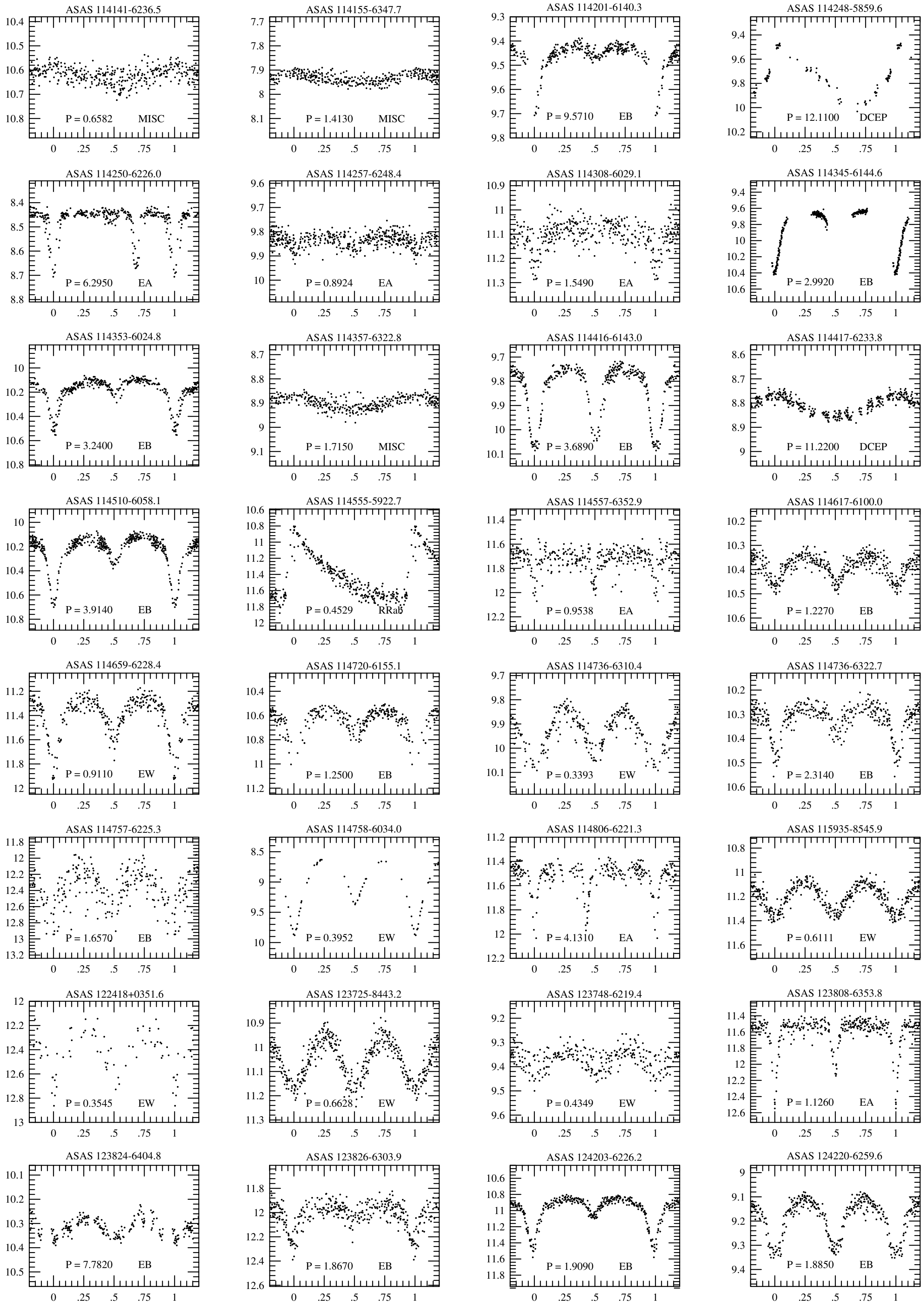
Udalski, A. Kubiak, M., and Szymański, M. 1997, *Acta Astron.*, **47**, 319.

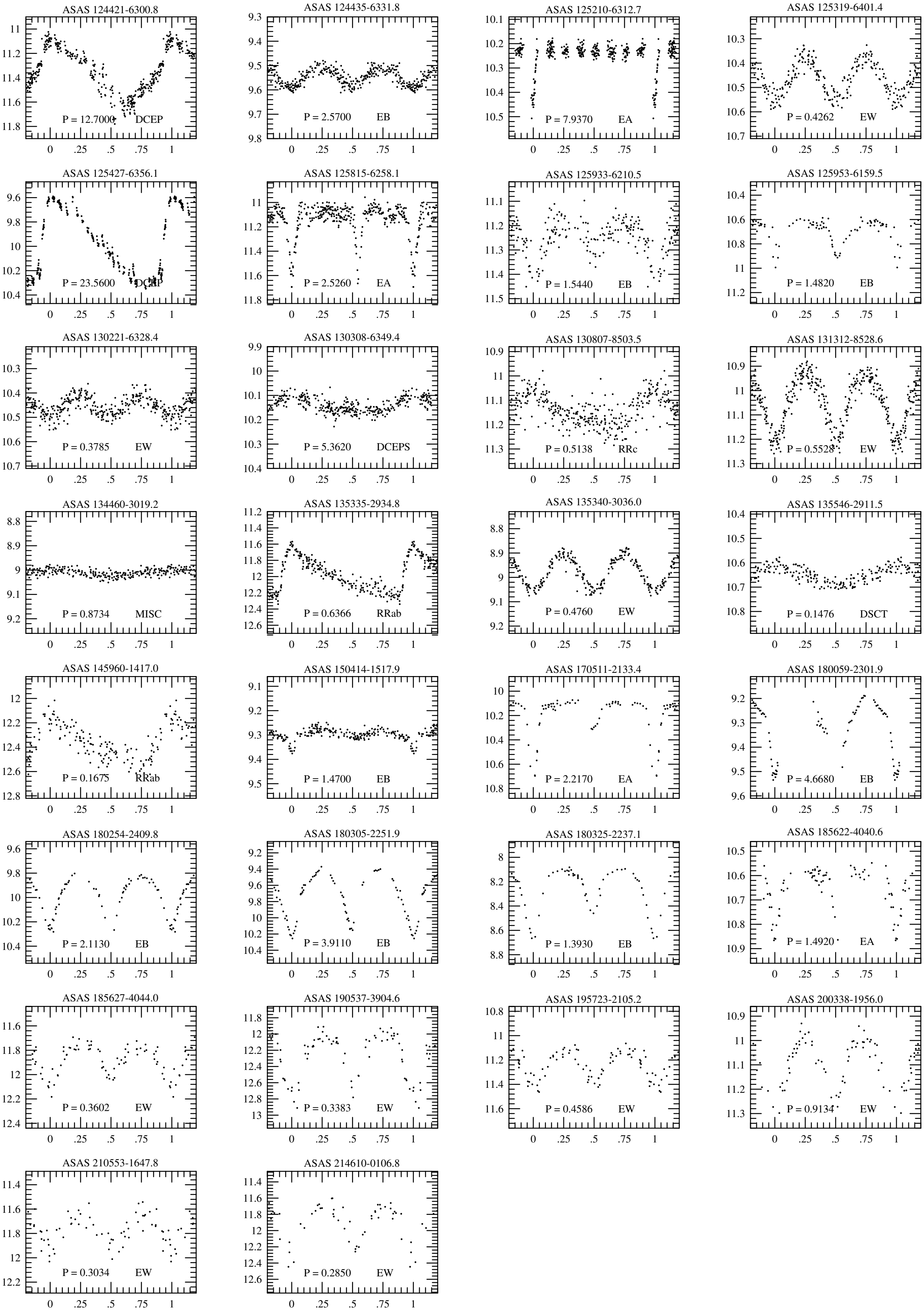
Udalski, A. Kubiak, M., Szymański, M., Kałużny, J., Mateo, M., Krzemiński, W. 1994, *Acta Astron.*, **44**, 317.

Appendix
Light Curves of the Short Period Variable Stars in the Selected Fields of the ASAS Catalog
(on the next pages)


ASAS 045913-6935.7
P = 0.3291 RRc
ASAS 050048-7029.8
P = 0.3873 EW
ASAS 050526-6743.2
P = 4.0640 EB
ASAS 050554-6810.8
P = 1.7570 EB
ASAS 051833-6813.5
P = 0.2854 EW
ASAS 052558-7011.1
P = 3.1680 EB
ASAS 052927-6852.0
P = 5.2160 EB
ASAS 054000-6828.6
P = 0.3622 EW
ASAS 055122-6812.7
P = 0.6434 EW
ASAS 110234-8530.2
P = 8.3810 MISC
ASAS 112229-6313.7
P = 3.9100 EA
ASAS 112238-6332.9
P = 2.0930 ACV
ASAS 112301-6146.8
P = 2.6770 EA
ASAS 112325-6238.7
P = 4.6670 EA
ASAS 112331-6423.2
P = 0.9056 EA
ASAS 112405-6403.1
P = 1.7030 EB
ASAS 112419-6344.0
P = 16.1500 DCEPS
ASAS 112502-6251.4
P = 1.3730 DCEPS
ASAS 112506-6044.1
P = 5.3110 DCEP
ASAS 112513-6122.2
P = 3.2160 DCEPS
ASAS 112552-6232.9
P = 0.7206 EW
ASAS 112612-6210.2
P = 1.3160 EA
ASAS 112629-6148.9
P = 0.9282 DCEPS
ASAS 112644-6251.8
P = 1.5950 EA
ASAS 112653-6211.9
P = 0.5877 EW
ASAS 112706-6037.3
P = 10.5700 EA
ASAS 112742-6127.8
P = 0.8978 EW
ASAS 112746-6110.5
P = 1.6080 EB
ASAS 112803-6124.7
P = 3.4880 EB
ASAS 112810-6010.5
P = 19.1400 EB
ASAS 112843-5925.7
P = 0.9220 RRab
ASAS 112852-6255.8
P = 2.5130 EA


ASAS 112901-6052.8
P = 1.6260 EA
ASAS 112923-6154.5
P = 1.6080 EA
ASAS 112926-6201.9
P = 3.2230 EA
ASAS 112939-5953.7
P = 1.9150 EA
ASAS 112943-6323.2
P = 0.9451 EW
ASAS 113019-6316.6
P = 1.2010 EB
ASAS 113023-6226.2
P = 6.3300 EB
ASAS 113043-6305.0
P = 1.8300 EB
ASAS 113131-6233.2
P = 10.3600 EB
ASAS 113149-5918.0
P = 3.1090 EB
ASAS 113210-5948.9
P = 0.4534 EW
ASAS 113318-6306.2
P = 0.1684 DSCT
ASAS 113318-6314.5
P = 4.9680 DCEP
ASAS 113321-5949.6
P = 1.1340 EB
ASAS 113333-6353.7
P = 1.9820 EA
ASAS 113426-6320.0
P = 1.7180 EA
ASAS 113451-6128.0
P = 3.4220 EB
ASAS 113547-6104.8
P = 1.1220 MISC
ASAS 113617-6128.0
P = 3.6970 EB
ASAS 113648-6029.6
P = 5.3460 EB
ASAS 113648-6425.6
P = 2.1160 EA
ASAS 113708-6148.1
P = 1.2270 EB
ASAS 113713-5952.6
P = 1.3650 EB
ASAS 113745-6014.5
P = 2.9400 EA
ASAS 113840-6117.8
P = 2.3880 EB
ASAS 113858-6328.7
P = 0.8709 MISC
ASAS 113915-6026.1
P = 1.7472 EB
ASAS 113958-6449.0
P = 0.4457 EW
ASAS 114035-6306.2
P = 0.2859 EW
ASAS 114059-6241.5
P = 3.3470 CEP(B)
ASAS 114101-6036.8
P = 4.4110 MISC
ASAS 114119-6215.9
P = 5.8460 DCEP


ASAS 114141-6236.5
P = 0.6582 MISC
ASAS 114155-6347.7
P = 1.4130 MISC
ASAS 114201-6140.3
P = 9.5710 EB
ASAS 114248-5859.6
P = 12.1100 DCEP
ASAS 114250-6226.0
P = 6.2950 EA
ASAS 114257-6248.4
P = 0.8924 EA
ASAS 114308-6029.1
P = 1.5490 EA
ASAS 114345-6144.6
P = 2.9920 EB
ASAS 114353-6024.8
P = 3.2400 EB
ASAS 114357-6322.8
P = 1.7150 MISC
ASAS 114416-6143.0
P = 3.6890 EB
ASAS 114417-6233.8
P = 11.2200 DCEP
ASAS 114510-6058.1
P = 3.9140 EB
ASAS 114555-5922.7
P = 0.4529 RRab
ASAS 114557-6352.9
P = 0.9538 EA
ASAS 114617-6100.0
P = 1.2270 EB
ASAS 114659-6228.4
P = 0.9110 EW
ASAS 114720-6155.1
P = 1.2500 EB
ASAS 114736-6310.4
P = 0.3393 EW
ASAS 114736-6322.7
P = 2.3140 EB
ASAS 114757-6225.3
P = 1.6570 EB
ASAS 114758-6034.0
P = 0.3952 EW
ASAS 114806-6221.3
P = 4.1310 EA
ASAS 115935-8545.9
P = 0.6111 EW
ASAS 122418+0351.6
P = 0.3545 EW
ASAS 123725-8443.2
P = 0.6628 EW
ASAS 123748-6219.4
P = 0.4349 EW
ASAS 123808-6353.8
P = 1.1260 EA
ASAS 123824-6404.8
P = 7.7820 EB
ASAS 123826-6303.9
P = 1.8670 EB
ASAS 124203-6226.2
P = 1.9090 EB
ASAS 124220-6259.6
P = 1.8850 EB


ASAS 124421-6300.8
P = 12.7000 DCEP
ASAS 124435-6331.8
P = 2.5700 EB
ASAS 125210-6312.7
P = 7.9370 EA
ASAS 125319-6401.4
P = 0.4262 EW
ASAS 125427-6356.1
P = 23.5600 DCEP
ASAS 125815-6258.1
P = 2.5260 EA
ASAS 125933-6210.5
P = 1.5440 EB
ASAS 125953-6159.5
P = 1.4820 EB
ASAS 130221-6328.4
P = 0.3785 EW
ASAS 130308-6349.4
P = 5.3620 DCEPS
ASAS 130807-8503.5
P = 0.5138 RRc
ASAS 131312-8528.6
P = 0.5528 EW
ASAS 134460-3019.2
P = 0.8734 MISC
ASAS 135335-2934.8
P = 0.6366 RRab
ASAS 135340-3036.0
P = 0.4760 EW
ASAS 135546-2911.5
P = 0.1476 DSCT
ASAS 145960-1417.0
P = 0.1675 RRab
ASAS 150414-1517.9
P = 1.4700 EB
ASAS 170511-2133.4
P = 2.2170 EA
ASAS 180059-2301.9
P = 4.6680 EB
ASAS 180254-2409.8
P = 2.1130 EB
ASAS 180305-2251.9
P = 3.9110 EB
ASAS 180325-2237.1
P = 1.3930 EB
ASAS 185622-4040.6
P = 1.4920 EA
ASAS 185627-4044.0
P = 0.3602 EW
ASAS 190537-3904.6
P = 0.3383 EW
ASAS 195723-2105.2
P = 0.4586 EW
ASAS 200338-1956.0
P = 0.9134 EW
ASAS 210553-1647.8
P = 0.3034 EW
ASAS 214610-0106.8
P = 0.2850 EW