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14 New Eclipsing Variables

A. V. Khruslov[#1,2]

#1. Sternberg Astronomical Institute, Lomonosov Moscow State University, Moscow, Russia;
#2. Institute of Astronomy, Russian Academy of Sciences, Moscow, Russia.

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(E-mail for contact: khruslov@bk.ru)

#	Name	Other	Coord (J2000)	Type	Max	Min	System	Period	Epoch (JD)	type	Sp	Comment	L.Curve	Find.Chart	Data
1		GSC 03695-01701	02 27 49.01 +56 39 43.4	EA	10.79	11.00	V	4.21857	2454000.650	min		Comm. 1	lc_01.PNG	ch_10.PNG	dt_a_01.txt dt_n_01.txt dt_w_01.txt
2		GSC 03699-01986	02 37 11.20 +58 22 02.3	EA	13.30	13.69	V	2.544617	2457777.594	min		Comm. 2	lc_02.PNG	ch_02.PNG	dt_a_02.txt dt_n_02.txt dt_w_02.txt
3		GSC 03713-00648	02 54 16.39 +58 30 25.1	EA	11.01	11.14	V	2.394144	2457778.69	min		Comm. 3	lc_03.PNG	ch_03.PNG	dt_a_03.txt dt_n_03.txt dt_w_03.txt
4		GSC 03709-00539	02 54 24.96 +58 01 59.7	EB	11.47	11.56	V	1.85959	2457777.74	min		Comm. 4	lc_04.PNG	ch_04.PNG	dt_a_04.txt dt_n_04.txt dt_w_04.txt
5		GSC 03331-00963	04 05 17.67 +48 29 47.9	ELL	11.79	11.86	V	5.16915	2457779.29	min		Comm. 5	lc_05.PNG	ch_05.PNG	dt_a_05.txt dt_n_05.txt dt_w_05.txt
6		USNO-B1.0 1371-0127827	04 28 22.67 +47 11 47.9	EA	14.80	15.15	V	1.193945	2457778.188	min		Comm. 6	lc_06.PNG	ch_06.PNG	dt_a_06.txt dt_w_06.txt
7		GSC 02897-00549	04 47 34.83 +41 03 52.0	ELL	12.06	12.11	V	0.519415	2457777.357	min		Comm. 7	lc_07.PNG	ch_07.PNG	dt_a_07.txt dt_w_07.txt
8		GSC 02897-00982	04 48 21.23 +39 39 21.2	ELL	11.71	11.74	V	0.456521	2457777.021	min		Comm. 8	lc_08.PNG	ch_08.PNG	dt_a_08.txt dt_w_08.txt
9		GSC 02898-00479	04 53 43.01 +41 01 54.3	EA	10.36	10.59	V	2.187770	2457778.897	min		Comm. 9	lc_09.PNG	ch_09.PNG	dt_a_09.txt dt_n_09.txt dt_w_09.txt
10		GSC 02898-01983	04 54 53.60 +39 52 11.7	EA	9.59	9.80	V	2.592917	2457779.180	min		Comm. 10	lc_10.PNG	ch_10.PNG	dt_a_10.txt dt_n_10.txt dt_w_10.txt
11		GSC 02902-03186	04 57 36.94 +42 23 15.8	EA	13.63	14.24	g	185.19	2458465.9	min		Comm. 11	lc_11.PNG	ch_11.PNG	dt_a_11.txt dt_n_11.txt dt_w_11.txt
12		GSC 02397-00879	05 06 35.04 +35 17 45.7	EB	10.11	10.21	V	2.31662	2457778.36	min		Comm. 12	lc_12.PNG	ch_12.PNG	dt_a_12.txt dt_n_12.txt dt_w_12.txt
13		GSC 03345-02514	05 11 49.75 +45 24 57.1	EB	11.56	11.70	V	0.838287	2457777.012	min		Comm. 13	lc_13.PNG	ch_13.PNG	dt_a_13.txt dt_n_13.txt dt_w_13.txt
14		GSC 00733-01267	06 37 30.10 +08 15 16.5	ELL	11.97	12.07	V	0.329092	2457777.300	min		Comm. 14	lc_14.PNG	ch_14.PNG	dt_a_14.txt dt_n_14.txt dt_a3_14.txt

Comments:

1. D = 0.07 P. MinII = 10^{m}.89 (V). From the 1SWASP data, 11^{m}.08 – 11^{m}.30, MinII = 11^{m}.16; from the ROTSE-I/NSVS data, 11^{m}.21 – 11^{m}.43 (R), MinII = 11^{m}.31 in the R band. J–K = 0.08 (2MASS).

2. D = 0.10 P. Total eclipse with duratioh d = 0.02 P is possible. MinII = 13^{m}.35 (V). From the 1SWASP data, 13^{m}.52 – 13^{m}.93, MinII = 13^{m}.57; from the ROTSE-I/NSVS data, 13^{m}.25 – 13^{m}.60 (R), MinII = 13^{m}.31: in the R band. J–K = 0.43 (2MASS).

3. D = 0.09 P. MinII = 11^{m}.135 (V). From the 1SWASP data, 11^{m}.16 – 11^{m}.30, MinII = 11^{m}.28; from the ROTSE-I/NSVS data, 11^{m}.16 – 11^{m}.27, MinII = 11^{m}.27 in the R band. J–K = 0.22 (2MASS).

4. Asymmetrical phases of maxima: 0.28 P for MaxI, 0.72 P for MaxII. MinII = $11^{m}.52$ (V). From the 1SWASP data, $11^{m}.47$ – $11^{m}.55$, MinII = $11^{m}.52$; from the ROTSE-I/NSVS data, $11^{m}.31$ – $11^{m}.40$, MinII = $11^{m}.35$ in the R band. J–K = 0.26 (2MASS).

5. MinII = $11^{m}.855$ (V). From the 1SWASP data, $12^{m}.04$ – $12^{m}.11$; from the ROTSE-I/NSVS data, $12^{m}.05$ – $12^{m}.13$ in the R band. J–K = 0.15 (2MASS).

6. D = 0.07 P. From the 1SWASP data, $15^{m}.1$ – $15^{m}.5$; J–K = 0.56 (2MASS).

7. MinII = 12.105 (V). From the 1SWASP data, $12^{m}.26$ – $12^{m}.31$, MinII = $12^{m}.305$; J–K = 0.33 (2MASS).

8. Period varies. Two systems of the light elements for two series of data. Elements for the ASAS-SN are given in table; from the 1SWASP the light elements are HJD(min) = 2454111.320 + 0.45648×E ; MinII = $11^{m}.73$ (V). From the 1SWASP data, $11^{m}.91$ – $11^{m}.94$, MinII = $11^{m}.94$. J–K = 0.24 (2MASS).

9. D = 0.10 P. MinII = $10^{m}.38$ (V). From the 1SWASP data, $10^{m}.57$ – $10^{m}.80$, MinII = $10^{m}.60$; from the ROTSE-I/NSVS data, $10^{m}.80$ – $11^{m}.06$, MinII = $10^{m}.84$ in the R band. J–K = 0.31 (2MASS). The reflection effect with amplitude $0^{m}.04$ is well visible in all series of observations.

10. D = 0.08 P. MinII = $9^{m}.71$ (V). From the 1SWASP data, $9^{m}.76$ – $9^{m}.95$, MinII = $9^{m}.88$; from the ROTSE-I/NSVS data, $9^{m}.93$ – $10^{m}.12$, MinII = $10^{m}.07$ in the R band. J–K = 0.23 (2MASS).

11. D = 0.06 P. MinII = $14^{m}.12$ (g). From the ASAS-SN data, V-band range $12^{m}.85$ – $>13^{m}.29$ (V), phase 0.00 was not observed, MinII = $13^{m}.35$ (V). Blend of two stars in the NSVS and the 1SWASP data (distance 25"), amplitude is underestimated. From the 1SWASP data, $12^{m}.65$ – $13^{m}.05$, MinII = $12^{m}.99$; from the ROTSE-I/NSVS data, $12^{m}.20$ – $12^{m}.68$, MinII = $12^{m}.60$ in the R band. J–K = 0.93 (2MASS). Included in the ASAS-SN Catalog of Variable Stars I with type L.

12. Mean magnitudes of the ASAS-SN data for two cameras are shifted by $0^{m}.1$ to each other. The V-band range of the ba camera is given in the table, MinII = $10^{m}.18$ (V). Range of the bb camera $10^{m}.21$ – $10^{m}.31$, MinII = $10^{m}.27$ (V) in the ASAS-SN data. From the 1SWASP data, $10^{m}.44$ – $10^{m}.54$, MinII = $10^{m}.50$; from the ROTSE-I/NSVS data, $10^{m}.50$ – $10^{m}.61$, MinII = $10^{m}.57$ in the R band. The apsidal motion is possible. In the 1SWASP and the NSVS data phase of MinII is 0.545 (1SWASP) and 0.535 (NSVS), in the ASAS-SN data phase of MinII is 0.505 (cam bb) and 0.510 (cam ba). J–K = 0.09 (2MASS).

13. MinII = $11^{m}.67$ (V). From the 1SWASP data, $11^{m}.60$ – $11^{m}.73$, MinII = $11^{m}.70$; from the ROTSE-I/NSVS data, $11^{m}.86$ – $12^{m}.00$ in the R band. O'Connell effect: from the ASAS-SN data, MaxII = $11^{m}.59$ (V); from the 1SWASP, MaxII = $11^{m}.64$; J–K = 0.27 (2MASS).

14. MinII = $12^{m}.07$ (V). From the ROTSE-I/NSVS data, $12^{m}.05$ – $12^{m}.15$, MinII = $12^{m}.14$ in the R band. from the ASAS-3 data, $11^{m}.92$ – $12^{m}.02$ (V). J–K = 0.37 (2MASS).

Remarks:

I present a study of 14 new eclipsing variable stars. I analyzed all observations of these stars available in the Northern Sky Variability Survey (NSVS, Woźniak et al. 2004), Wide Angle Search for Planets (SuperWASP, Butters et al. 2010), All-Sky Automated Survey for Supernovae (ASAS-SN, Shappee et al. 2014 and Kochanek et al. 2017). For one of the cases I used data of the All Sky Automated Survey (ASAS-3, Pojmanski 2002).

The variability of most stars (No. 1-5 and 9-14) was suspected by J.S. Shaw and his colleagues in 2008. They described the project at a website. The authors searched for variability of the objects automatically in the NSVS data. I looked through the data available in untyped.cat. Shaw and coauthors list two possible periods for each star in this catolog. Detected periods for some stars are often incorrect. There are many cases of false variability (these stars were not confirmed with other available photometric data archives). Therefore, the suspected variables of the untyped.cat are not included in the ASAS and the VSX databases. The appendix for this paper provides the periods 1 and 2 of suspected variables according to the list from untyped.cat.

One star (No. 11) is included in the ASAS-SN Catalog of Variable Stars I (Jayasinghe et al. 2018) as an irregular variable (L-type).

These observations were analyzed using the period-search software developed by Dr. V.P. Goranskij. The coordinates were drawn from the Gaia DR2 catalog (Gaia Collaboration et al. 2018). All studied stars were not detected as a variables in Gaia DR2 project. The variables were classified according to the GCVS classification (Samus et al. 2017).

The SuperWASP observations are available as FITS tables, which were converted into ASCII tables using theOMC2ASCII program as described by Sokolovsky (2007).

The table photometric magnitudes are given according to ASAS-SN data (also, magnitude of MinII in Comments).

Appendix. Possible periods of the suspected variables according to J.S. Shaw and colaborators (see above).

No.	**P_1, days**	**P_2, days**

1	4.21649697	2.10776135
2	5.0930874	2.54292742
3	2.39467158	1.1973764
4	3.71987474	0.92951574
5	12.92821174	2.58447116
9	2.18699034	2.18736215
10	1.29633705	1.2966482
11	93.3874471	96.34513098
12	2.31682144	1.15893086
13	0.83800075	0.41898316
14	1.18178128	0.16451686

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