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Chromospherically active stars in the OGLE-II database: Paper 1. 25 new variables

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Abstract: 25 new chromospherically active stars are presented, which were found in the OGLE-II database:
OGLE-II NOR_SC1_127324, OGLE-II BUL_SC1_268450, OGLE-II BUL_SC4_648283,
OGLE-II BUL_SC4_268274, OGLE-II BUL_SC4_293840, OGLE-II BUL_SC4_475761,
OGLE-II BUL_SC33_691176, OGLE-II BUL_SC35_347003, OGLE-II BUL_SC35_369625,
OGLE-II BUL_SC35_521447, OGLE-II BUL_SC35_544397, OGLE-II BUL_SC35_555023,
OGLE-II BUL_SC35_576350, OGLE-II BUL_SC36_204166, OGLE-II BUL_SC36_636869,
OGLE-II BUL_SC45_125532, OGLE-II BUL_SC45_126250, OGLE-II CAR_SC1_35056,
OGLE-II CAR_SC1_38287, OGLE-II CAR_SC1_85427, OGLE-II BUL_SC4_280309,
OGLE-II BUL_SC5_194541, OGLE-II BUL_SC4_14642, OGLE-II BUL_SC4_280505,
OGLE-II BUL_SC4_281800

The new chromospherically active stars presented in this paper have been mainly found during a programme of optical identification of X-ray sources from the 2XMMi Catalogue (Watson et al., 2009) and from the Chandra X-ray observatory (http://cxc.harvard.edu/) in the DIA OGLE-II candidate variable stars catalog (Wozniak et al., 2002). One further new chromospherically active star included in Table 1 (No. 1, without X-ray identification) has been found using the OGLE Photometry Database Query Page (Bernhard&Wils, 2009).
The OGLE-II 1.3 m Warsaw University Telescope is situated at Las Campanas Observatory in Chile, an I filter is used in combination with a SITe 2048×2049 thin chip (Szymański, 2005, Udalski et. al, 1997) . The OGLE-II data are available at http://ogledb.astrouw.edu.pl/~ogle/photdb/ .

Table 1: Positions, identifications and photometric data for the new chromospherically active stars, Figures in brackets denote errors (sigma) in units of the last decimal, the epochs are given as HJD-2450000.

No.	OGLE II	RA (2000)	Dec	X-Ray id	Range(OGLE)	Epoch(Min)	Per.(d)
1	NOR_SC1_127324	16 12 52.42	-54 28 41.5		16.6-17.1	1689.5(1)	16.997(3)
2	BUL_SC1_268450	18 02 22.32	-29 57 59.4	2XMMi J180222.3-295759	12.3-12.4	0627.7(1)	10.582(4)
3	BUL_SC4_648283	17 54 52.26	-29 53 09.5	2XMMi J175452.2-295310	14.4-14.9	0624.75(2)	2.52044(3)
4	BUL_SC4_268274	17 54 28.63	-29 51 04.5	CXO J175428.6-295104	15.4-15.7	1623.8(2)	20.49(1)
5	BUL_SC4_293840	17 54 30.22	-29 47 12.1	CXO J175430.2-294712	15.8-16.1	0561.6(2)	23.06(2)
6	BUL_SC4_475761	17 54 49.57	-29 49 34.2	CXO J175449.5-294934	15.6-15.8	1313.8(3)	36.61(1)
7	BUL_SC33_691176	18 05 48.18	-28 36 29.9	2XMMi J180548.2-283630	12.8-13.1	1949.6(7)	72.16(5)
8	BUL_SC35_347003	18 04 26.47	-27 44 41.9	2XMMi J180426.4-274442	16.7-16.9	1297.87(7)	7.0227(3)
9	BUL_SC35_369625	18 04 19.21	-27 38 19.4	2XMMi J180419.2-273819	14.3-14.4	1750.5(2)	22.57(1)
10	BUL_SC35_521447	18 04 35.58	-27 49 26.1	2XMMi J180435.5-274925	16.0-16.1	1400.705(6)	0.66143(7)
11	BUL_SC35_544397	18 04 37.01	-27 42 07.0	2XMMi J180436.9-274206	16.0-16.3	0569.88(9)	9.4992(3)
12	BUL_SC35_555023	18 04 31.66	-27 36 18.8	2XMMi J180431.6-273618	15.6-15.7	0614.85(2)	2.4042(2)
13	BUL_SC35_576350	18 04 43.36	-27 29 36.4	2XMMi J180443.3-272935	15.7-16.3	0568.885(5)	0.593191(4)
14	BUL_SC36_204166	18 05 06.42	-27 32 42.3	2XMMi J180506.3-273241	13.2-13.5	0643.6(7)	73.2(1)
15	BUL_SC36_636869	18 05 40.47	-27 34 27.5	2XMMi J180540.4-273427	16.9-17.1	0671.55(2)	1.98321(5)
16	BUL_SC45_125532	18 03 09.34	-29 49 30.2	2XMMi J180309.2-294929	13.6-13.7	1239.8(3)	28.86(7)
17	BUL_SC45_126250	18 03 08.46	-29 48 28.4	2XMMi J180308.4-294829	15.8-15.9	1280.8(4)	38.95(6)
18	CAR_SC1_35056	11 05 23.81	-61 08 22.2	CXO J110523.6-610822	13.5-13.8	1321.5(1)	15.625(4)
19	CAR_SC1_38287	11 05 24.46	-61 06 02.8	CXO J110524.3-610602	14.9-15.0	0933.595(8)	0.79082(2)
20	CAR_SC1_85427	11 05 53.74	-61 06 05.9	CXO J110553.5-610605	17.1-17.3	0934.58(1)	1.62173(2)
21	BUL_SC4_280309	17 54 29.53	-29 49 43.4	2XMMi J175429.4-294943	14.1-14.3	0667.5(1)	16.569(5)
22	BUL_SC5_194541	17 50 19.78	-29 30 01.4	CXO J175019.8-293001	15.3-15.4	0569.69(6)	6.866(1)
23	BUL_SC4_14642	17 54 10.35	-30 05 35.1	CXO J175410.3-300535	16.6-16.9	0900.82(9)	9.2355(8)
24	BUL_SC4_280505	17 54 23.12	-29 49 44.0	2XMMi J175423.1-294944	15.1-15.2	0588.7(5)	55.0(2)
25	BUL_SC4_281800	17 54 23.55	-29 49 42.9	CXO J175423.5-294943	16.2-16.4	1609.8(2)	22.387(3)

The criteria for including a star in this list of chromospherically active stars after an analysis of the OGLE-II data with Period 04 (Lenz and Breger 2005) were:

i) Period, amplitude and shape of the light curve are consistent with the definition of RS CVn and BY Dra stars in the GCVS (http://www.sai.msu.su/groups/cluster/gcvs/gcvs/iii/vartype.txt , for a detailed description and sample light curves of the various types of chromospherically active stars see Berdyugina, 2005),

ii) the X-ray identification, and

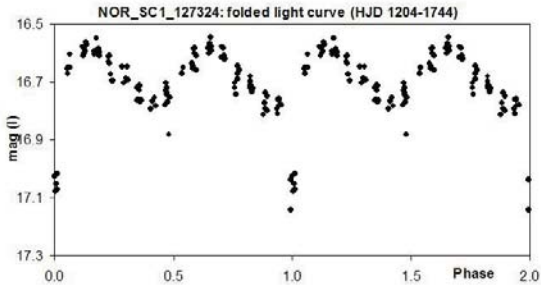
iii) appropriate 2MASS J-K (Skrutskie et al. 2006, Table 8 in Gonzalez-Solares et al. 2008) colour index if available. A possible interstellar reddening of the 2MASS J-K values has to be considered near the Galactic plane (Sumi, 2004).

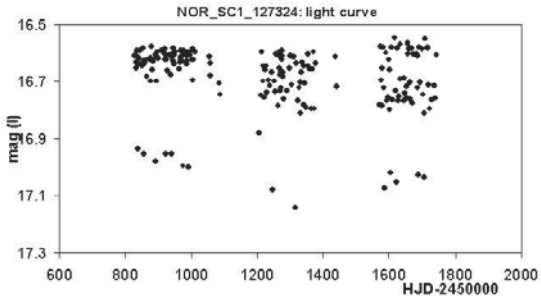
Further information like proper motions (Sumi et al., 2003) and the relation of the maximum amplitude vs. periods of main sequence stars given in Messina et al., 2003 were also used for the classification of the objects. Chromospherically active stars exhibit spectral types of F-K (these are mostly RS CVn systems, and a smaller number of FK Comae stars) and K-M (BY Dra variables).

Folded light curves (with the period given above), light curves and comments:

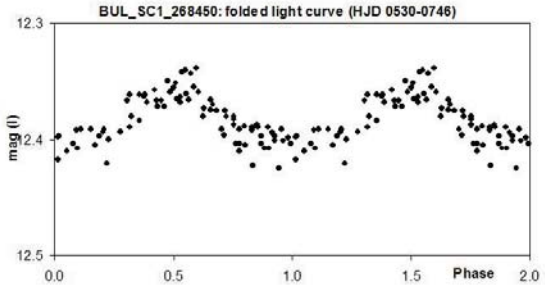
Some of the following stars showed a clear variation of the shape of the light curves.
Therefore the folded light curves are given for a distinct time period of time (described in figure as HJD 245 ....-....). This is somewhat typical of chromospherically active stars which can show secular variation in mean magnitude and/or amplitude as a result of starspot cycles similar in nature to the Suns`s sunspot cycle.

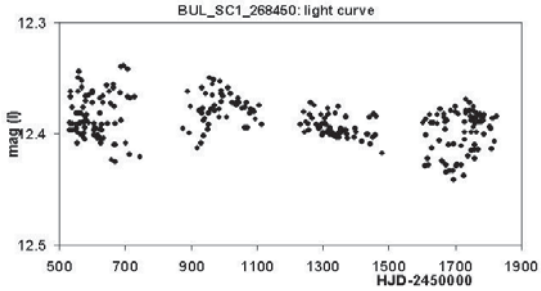
No. 1: OGLE-II NOR_SC1_127324
period: 16.997(3) d
2MASS J-K: 0.783
likely an eclipsing RS CVn variable





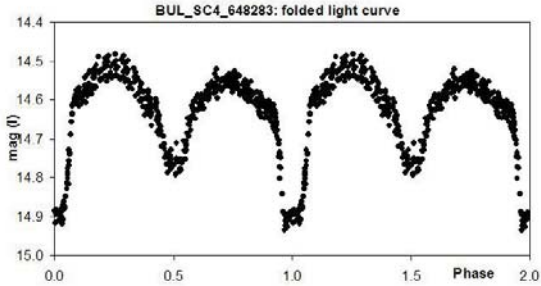
No.2: OGLE-II BUL_SC1_268450
period: 10.582(4) d
2MASS J-K: 0.665
pmRA 4.90 mas/yr pmDEC 3.64 mas/yr (Sumi et al., 2003)
likely a RS CVn variable

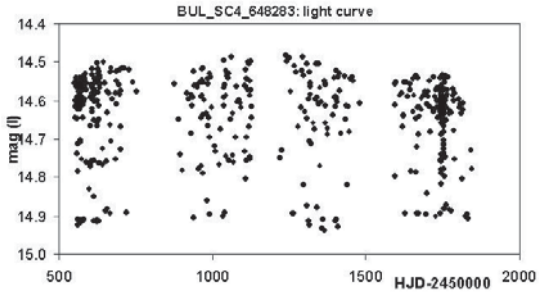




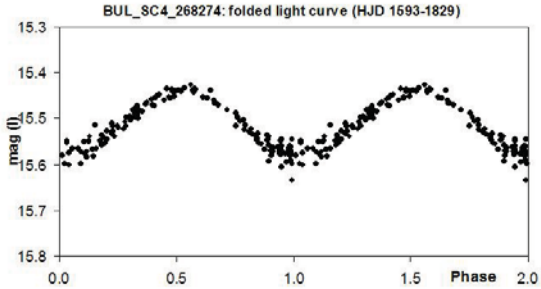
No.3: OGLE-II BUL_SC4_648283
period: 2.52044(3) d
2MASS J-K: 0.872
pmRA 5.98 mas/yr pmDEC 3.64 mas/yr (Sumi et al., 2004)

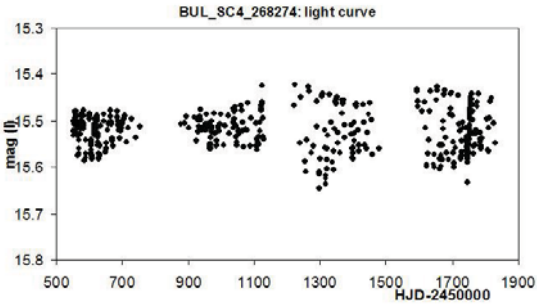
Eclipsing binary (Groenewagen, 2005)
likely an eclipsing RS CVn variable



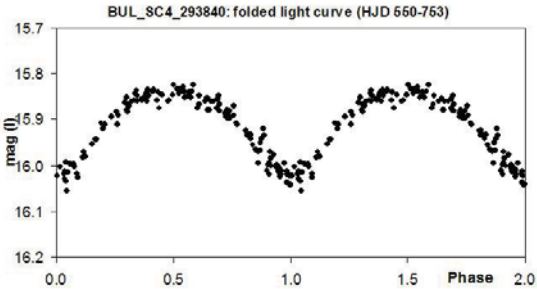


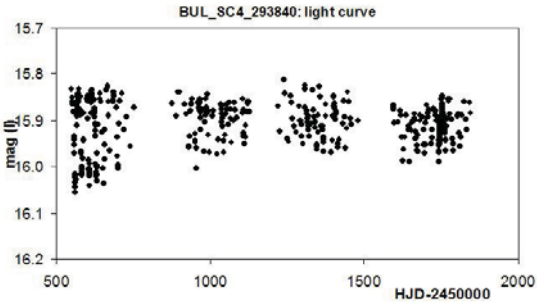
No. 4: OGLE-II BUL_SC4_268274
period: 20.49(1) d
pmRA 0.20 mas/yr pmDEC -1.89 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



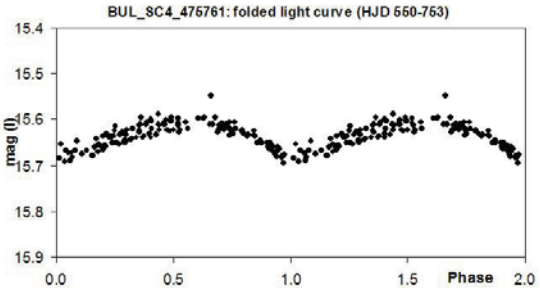


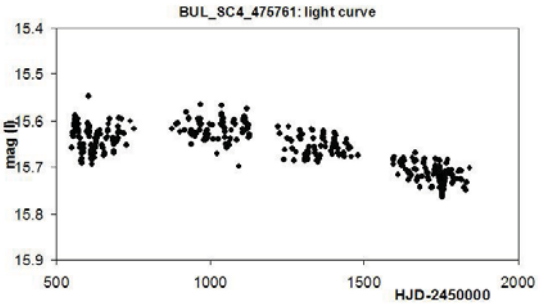
No. 5: OGLE-II BUL_SC4_293840
period: 23.06(2) d
pmRA -4.96 mas/yr pmDEC -4.40 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



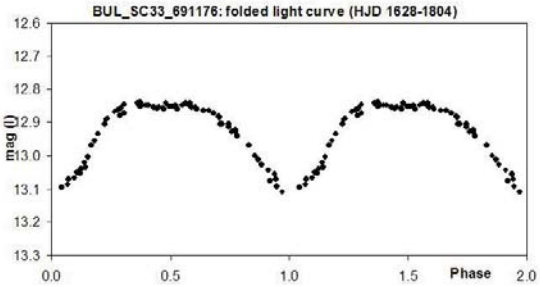


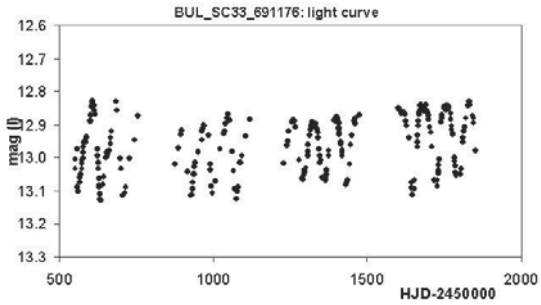
No. 6: OGLE-II BUL_SC4_475761
period: 36.61(1) d
pmRA -8.49 mas/yr pmDEC 4.32 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



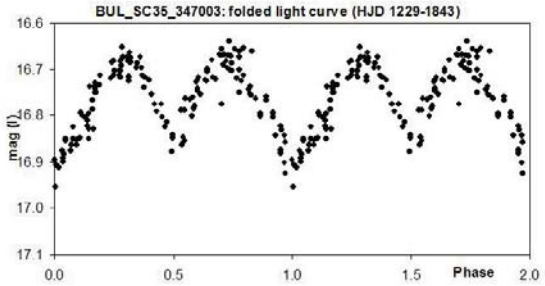


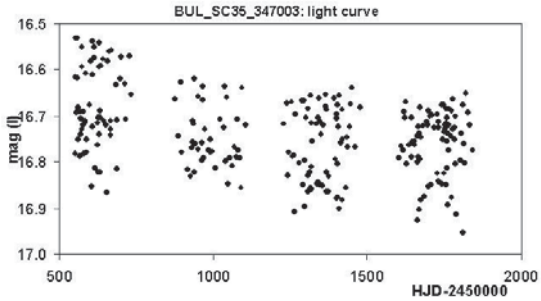
No. 7: OGLE-II BUL_SC33_691176
period: 72.16(5) d
2MASS J-K: 0.915
pmRA 0.17 mas/yr pmDEC -0.25 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



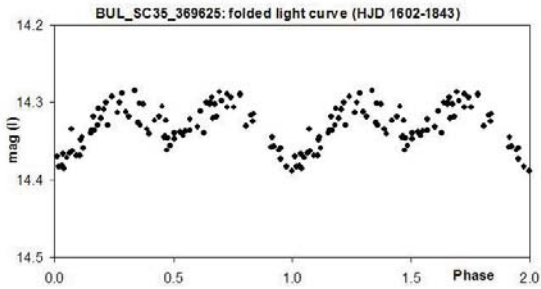


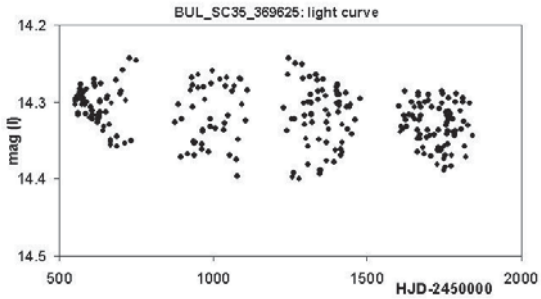
No. 8: OGLE-II BUL_SC35_347003
period: 7.0227(3) d
2MASS J-K: 0.932
pmRA -1.79 mas/yr pmDEC -6.37 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



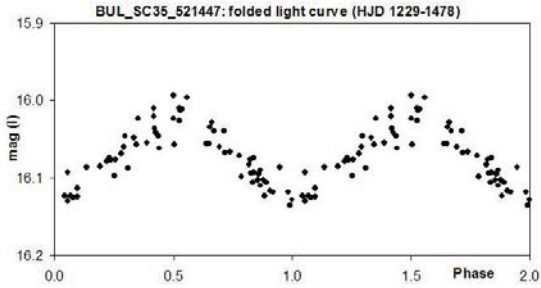


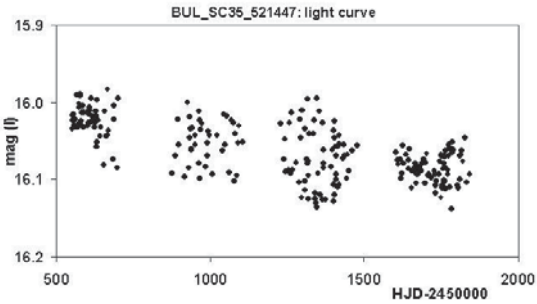
No. 9: OGLE-II BUL_SC35_369625
period: 22.57(1) d
2MASS J-K: 1.17
pmRA -2.59 mas/yr pmDEC -0.52 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



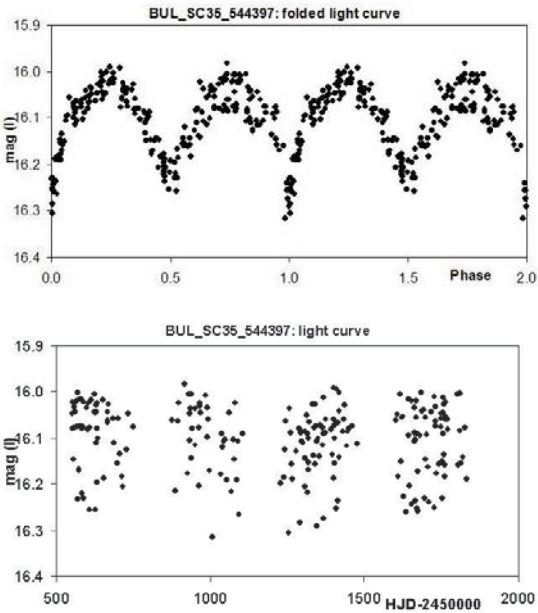


No. 10: OGLE-II BUL_SC35_521447
period: 0.66143(7) d
pmRA 1.67 mas/yr pmDEC 5.96 mas/yr (Sumi et al., 2004)
it is not possible to decide whether the star is BY Dra or RS CVn

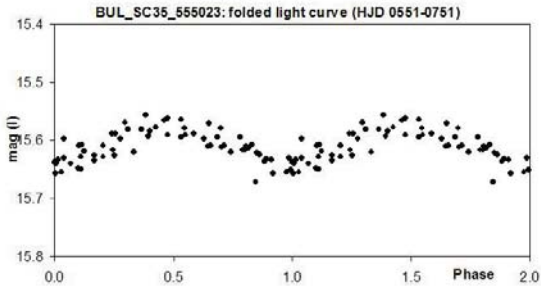


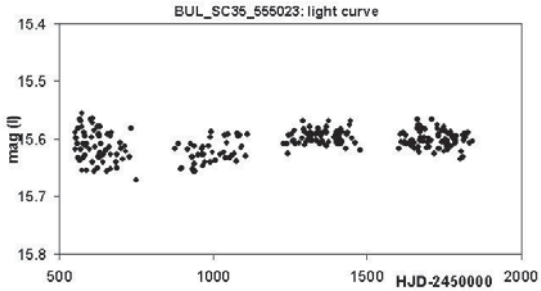


No. 11: OGLE-II BUL_SC35_544397
period: 9.4992(3) d
2MASS J-K: 1.14
pmRA -13.37 mas/yr pmDEC -7.58 mas/yr (Sumi et al., 2004)
Eclipsing binary (Groenewagen, 2005)
likely an eclipsing RS CVn variable



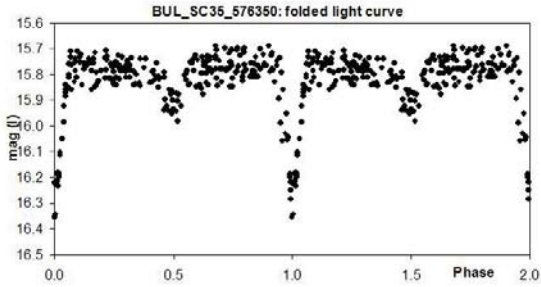
No. 12: OGLE-II BUL_SC35_555023
period: 2.4042(2) d
2MASS J-K: 0.912
pmRA 1.32 mas/yr pmDEC 6.50 mas/yr (Sumi et al., 2004)
it is not possible to decide whether the star is BY Dra or RS CVn

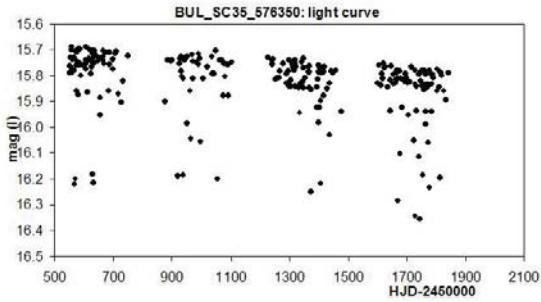




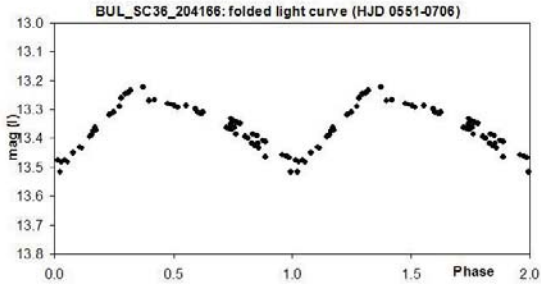
No. 13: OGLE-II BUL_SC35_576350
period: 0.593191(4) d

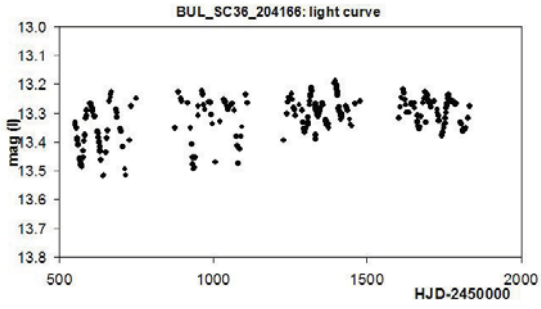
pmRA 4.48 mas/yr pmDEC 4.73 mas/yr (Sumi et al., 2004)
probably an asynchronous RS CVn eclipser with RS CVn period close to the eclipsing period but difficult to determine as the RS CVn variation amplitude is of similar scale as the secular declining trend



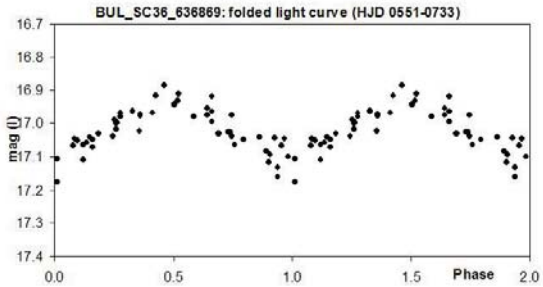


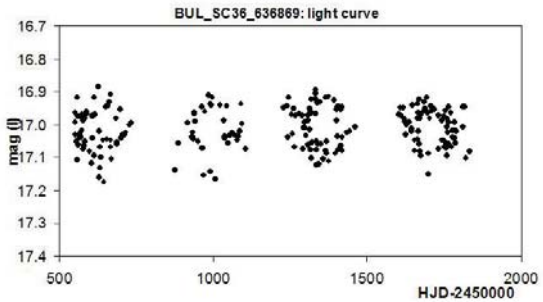
No. 14: OGLE-II BUL_SC36_204166
period: 73.2(1) d
2MASS J-K: 0.878
pmRA -8.78 mas/yr pmDEC 17.38 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



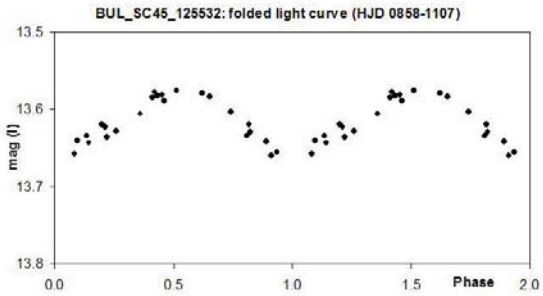


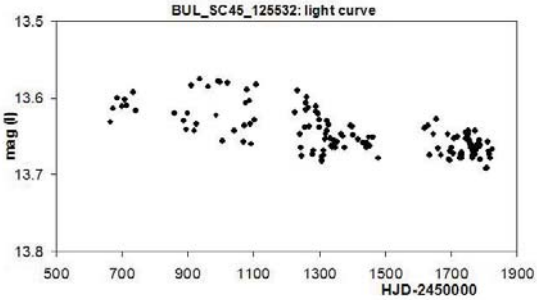
No. 15: OGLE-II BUL_SC36_636869
period: 1.98321(5) d
2MASS J-K: 0.813
pmRA 1.99 mas/yr pmDEC 1.19 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



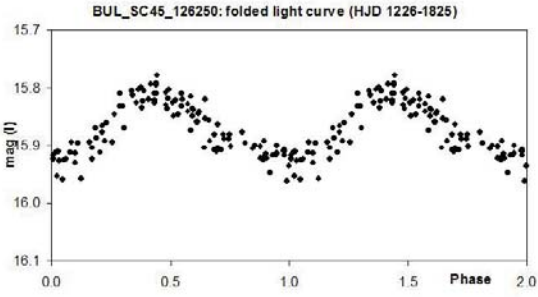


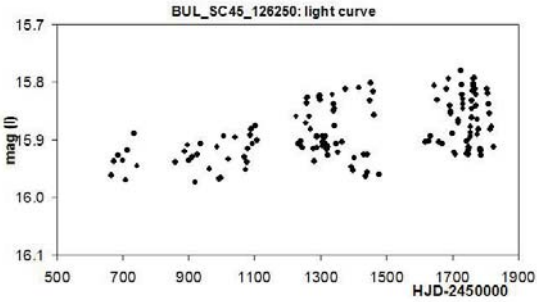
No. 16: OGLE-II BUL_SC45_125532
period: 28.86(7) d
2MASS J-K: 0.876
pmRA -1.59 mas/yr pmDEC -8.85 mas/yr (Sumi et al., 2004)
likely a RS CVn variable



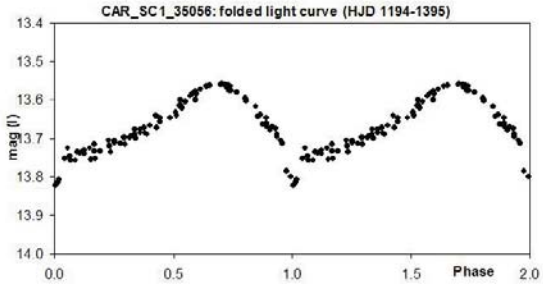


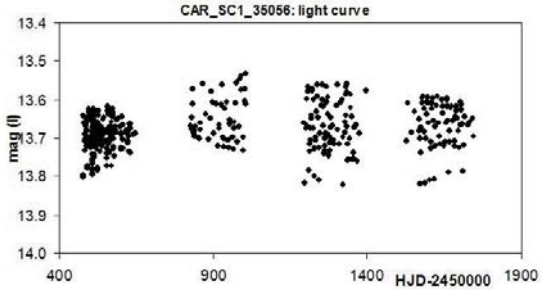
No. 17: OGLE-II BUL_SC45_126250
period: 38.95(6) d
2MASS J-K: 0.960
pmRA -15.89 mas/yr pmDEC 2.52 mas/yr (Sumi et al., 2004)
OGLE Galactic Bulge periodic variable, type S (Udalski et al. 1995)
likely a RS CVn variable



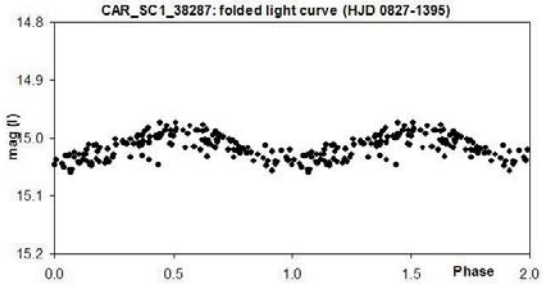


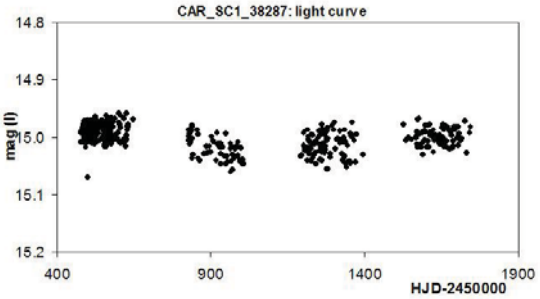
No. 18: OGLE-II CAR_SC1 35056
period: 15.625(4) d
2MASS J-K:0.819
likely an eclipsing RS CVn variable



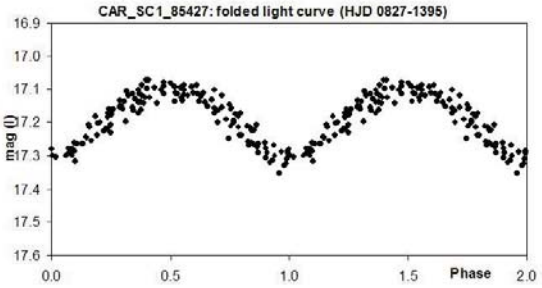


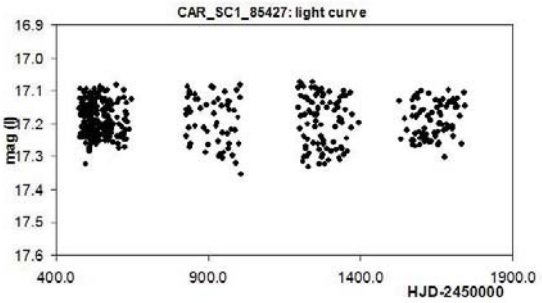
No. 19: OGLE-II CAR_SC1 38287
period: 0.79082(2) d
2MASS J-K: 0.415
likely a RS CVn variable



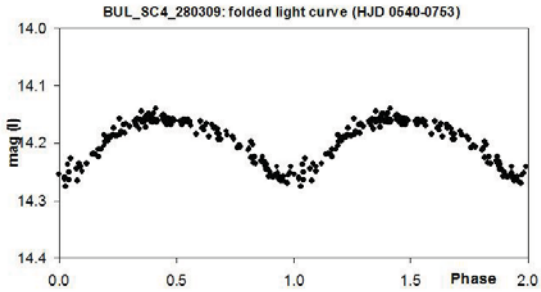


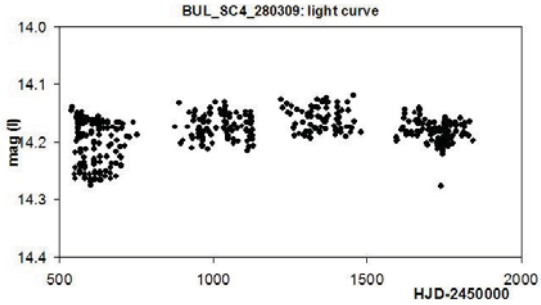
No. 20: OGLE-II CAR_SC1 85427
period: 1.62173(2) d
2MASS J-K: 0.663
likely a RS CVn variable



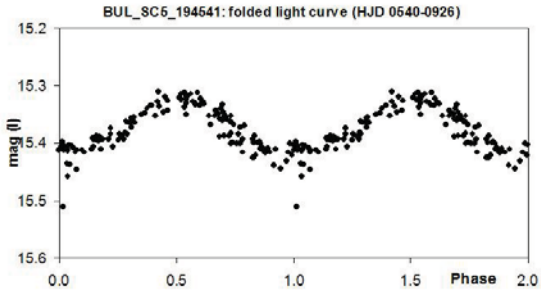


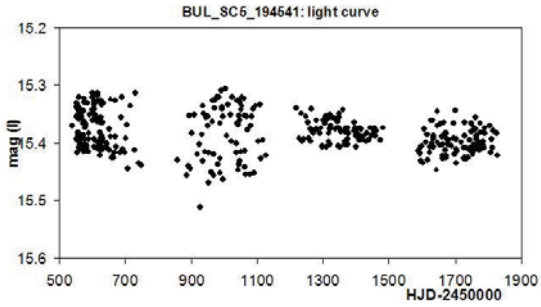
No. 21: OGLE-II BUL_SC4 280309
period: 16.569(5) d
2MASS J-K 1.025
pmRA 2.42 mas/yr pmDEC -0.99 mas/yr (Sumi et al., 2004)
it is not possible to decide whether the star is BY Dra or RS CVn



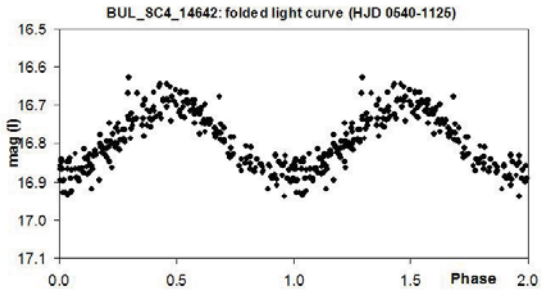


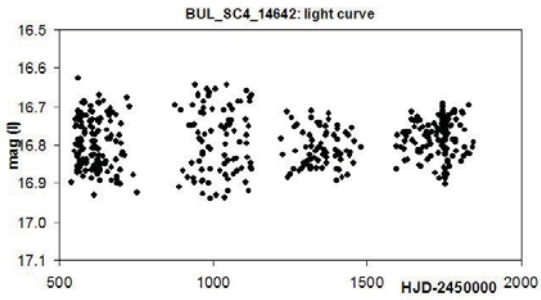
No. 22: OGLE-II BUL_SC5 194541
period: 6.866(1) d
pmRA 1.67 mas/yr pmDEC 4.26 mas/yr (Sumi et al., 2004)
it is not possible to decide whether the star is BY Dra or RS CVn



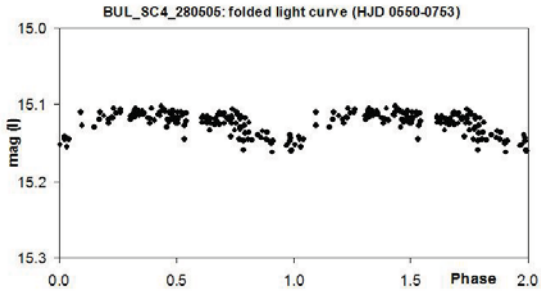


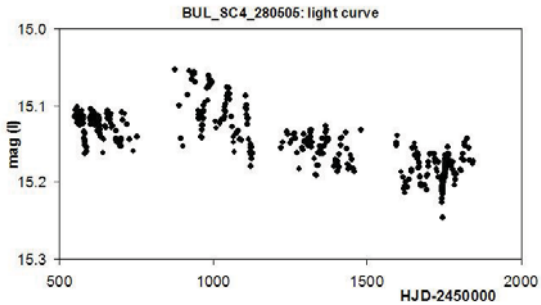
No. 23: OGLE-II BUL_SC4 14642
period: 9.2355(8) d
pmRA 10.22 mas/yr pmDEC 3.03 mas/yr (Sumi et al., 2004)
it is not possible to decide whether the star is BY Dra or RS CVn



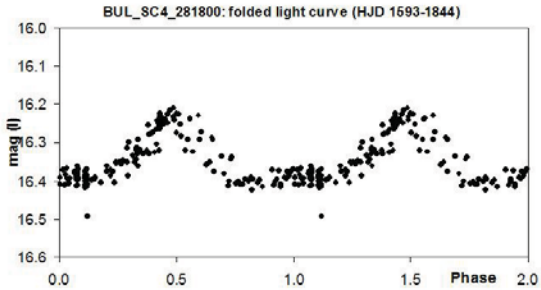


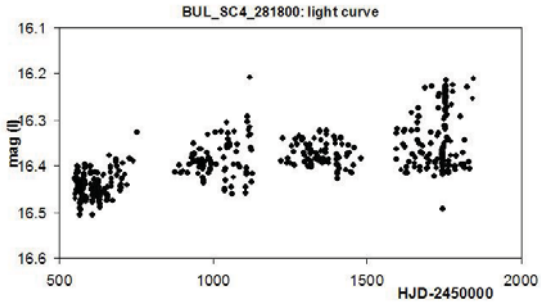
No. 24: OGLE-II BUL_SC4 280505
period: 55.0(2) d
2MASS J-K: 1.123
pmRA 4.82 mas/yr pmDEC 5.40 mas/yr (Sumi et al., 2004)
likely a RS CVn variable





No. 25 OGLE-II BUL_SC4_281800
period: 22.387(3) d
2MASS J-K: 1.038
pmRA 2.74 mas/yr pmDEC -4.80 mas/yr (Sumi et al., 2004)
likely a RS CVn variable





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