

25 new chromospherically active stars in the ROTSE-1 data base

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Abstract: 25 new chromospherically active stars are presented, which were found in the ROTSE-1 data base: GSC 4721-00552, GSC 2518-00781, GSC 2628-01345, GSC 164-01162, GSC 3345-01977, GSC 3525-01869, GSC 2912-01219, GSC 115-00801, GSC 3333-00117, GSC 1979-00569, GSC 1291-00887, GSC 2229-00611, GSC 105-00869, GSC 63-00006, GSC 5253-00472, GSC 2339-01230, GSC 4920-01189, GSC 1164-00392, GSC 1756-00430, GSC 2276-00205, GSC 2280-00897, GSC 234-00306, GSC 4912-01357, GSC 612-00169, GSC 1935-01066

One of these variables (No.4: GSC 164-01162) is a new long-period eclipsing RS CVn variable.

During a programme of optical identification of X-ray sources from the ROSAT All-Sky Faint Source Catalogue (1RXS) (Voges et al. 2000) in the ROTSE1 database (<http://skydot.lanl.gov/>, Wozniak et al., 2004) 25 new chromospherically active stars have been found.

The criteria for including a star in this list of chromospherically active stars were, i) the X-ray identification, ii) a suitable period after an analysis of the NSVS data with Period 04 (Lenz and Breger 2005) and iii) an appropriate B-V colour index (Høgg et al. 2000) if available. 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). Partial information about spectral classifications (Wright et al., 2003) and high proper motions (Ivanov 2007) support the classification as chromospherically active stars. Because of the high absolute magnitudes of pulsating variables with similar light curves (especially Cepheids) their large distances should result in small proper motions.

Cepheids are not expected to show X-ray emission any greater than non-variable supergiants of similar temperatures (Böhm-Vitense and Parsons 1983, Schmidt and Parsons 1984) so if the X-ray identifications are correct then these stars are most likely chromospherically active. An estimate by Norton et al. (2007) showed that there is a chance of less than 0.001% that one of 13 active stars found in the SuperWASP survey area would coincide with one of the ROSAT sources falling within their survey area. Therefore, it is also very likely that the X-ray identifications of the variables given in this paper are correct.

Table 1: Positions, identifications and photometric data for the new chromospherically active stars

No.	GSC	RA (2000)	Dec	1RXS	Range (NSVS)	Per. (d)	NSVS ID
01	4721-00552	03 50 39.55	-03 53 53.4	J035039.4-035356	12.2-12.3	1.37330	12167174
02	2518-00781	10 46 46.89	+37 17 29.4	J104646.9+371730	11.6-11.8	14.902	4956842
03	2628-01345	18 35 42.42	+32 58 46.0	J183542.4+325846	12.7-13.1	3.6265	8225014
04	164-01162	07 18 14.83	+01 41 26.0	J071814.7+014128	10.7-11.0	14.820	12674712
05	3345-01977	05 10 43.94	+46 14 39.5	J051044.3+461435	11.5-11.7	24.920	4420571
06	3525-01869	18 14 14.25	+46 14 10.2	J181414.0+461408	12.0-12.2	1.59309	5414983
07	2912-01219	05 53 13.44	+38 24 07.0	J055313.4+382412	11.5-11.7	14.003	4527442
08	115-00801	05 39 14.88	+00 31 12.9	J053914.8+003110	13.1-13.4	4.05459	12353370
09	3333-00117	04 19 11.53	+47 16 40.7	J041911.9+471637	11.6-11.7	4.7334	4257087
10	1979-00569	10 45 56.75	+26 29 57.9	J104556.8+262959	12.0-12.1	2.51292	7549220
11	1291-00887	05 12 39.34	+19 28 35.5	J051239.3+192831	12.9-13.2	1.93115	9552176
12	2229-00611	22 47 05.52	+26 52 54.3	J224705.3+265257	11.2-11.3	2.22033	8957530
13	105-00869	05 26 15.92	+03 05 01.7	J052615.6+030502	11.9-12.0	3.6492	12331039
14	63-00006	03 24 05.62	+07 29 27.5	J032405.3+072926	10.2-10.4	20.504	9318075
15	5253-00472	23 57 57.33	-01 09 47.4	J235757.1-010952	10.3-10.4	6.17421	11912481
16	2339-01230	03 02 39.90	+30 32 18.1	J030239.7+303213	12.4-12.6	3.20744	6596978

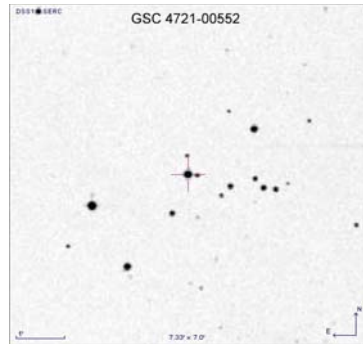
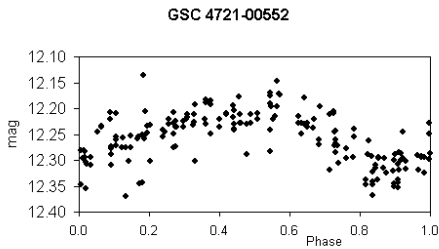
17	4920-01189	10	56	09.64	-05	40	20.8	J105609.5-054016	12.4-12.6	1.483315	13100346
18	1164-00392	23	17	08.18	+11	37	00.9	J231707.7+113657	12.1-12.3	0.942903	11844458
19	1756-00430	01	47	10.24	+23	45	31.9	J014709.9+234529	9.8-9.9	21.203	6500037
20	2276-00205	00	47	05.49	+30	18	23.8	J004705.9+301823	11.1-11.2	12.464	6363421
21	2280-00897	00	49	57.84	+32	56	07.3	J004958.0+325613	12.2-12.5	6.8388	6366189
22	234-00306	09	22	05.06	+07	00	01.7	J092204.7+070003	11.9-12.0	1.72442	12976829
23	4912-01357	10	30	02.66	-00	47	32.6	J103002.8-004726	11.7-11.9	16.1239	13085670
24	612-00169	01	05	06.41	+09	35	08.3	J010506.8+093505	12.2-12.5	10.0108	9158567
25	1935-01066	08	10	35.27	+27	49	27.9	J081035.5+274934	11.6-11.9	17.737	7383299

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

No.1: GSC 4721-00552

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=12167174&mask=32004>



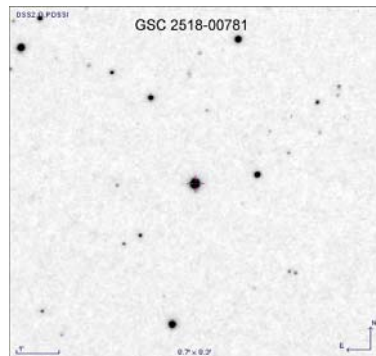
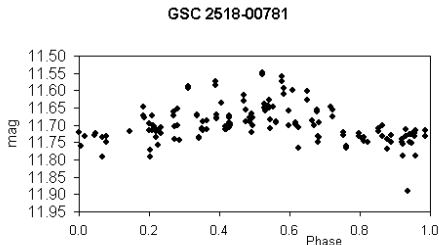
No.2: GSC 2518-00781

Tycho-2: 2518-781-1: Johnson B-V=1.345 (derived from Tycho-2)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=4956842&mask=32004>

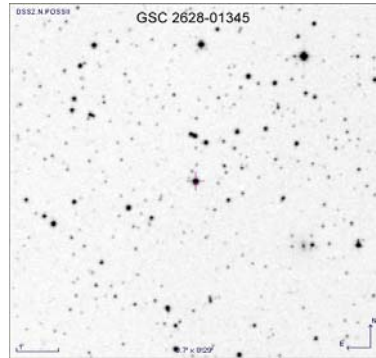
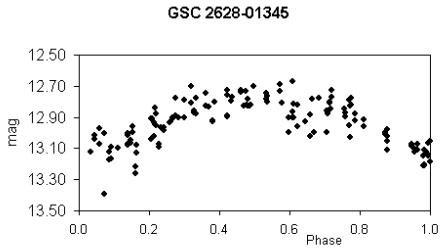
Possible BY Dra star



No.3: GSC 2628-01345

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=8225014&mask=32004>



No.4: GSC 164-01162

Tycho-2: 164-1162-1; Johnson B-V=0.595 (derived from Tycho-2)

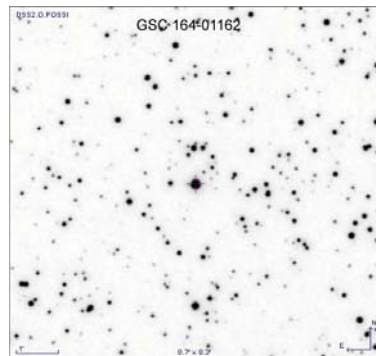
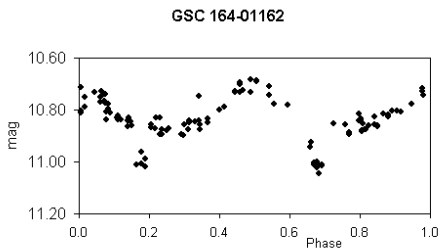
ASAS variable:

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NSVS data:

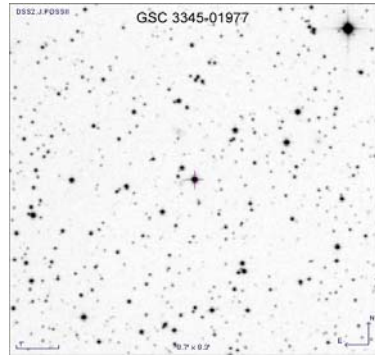
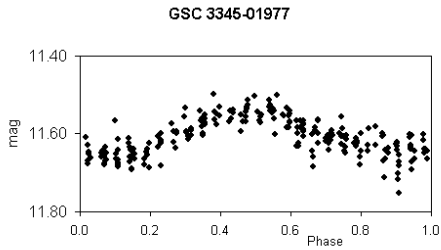
<http://skydot.lanl.gov/nsvs/star.php?num=12674712&mask=32004>

Eclipsing RS CVn variable



No.5: GSC 3345-01977

<http://skydot.lanl.gov/nsvs/star.php?num=4420571&mask=32004>



No.6: GSC 3525-01869

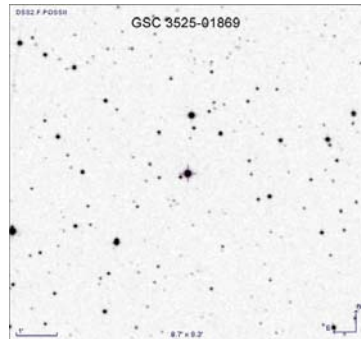
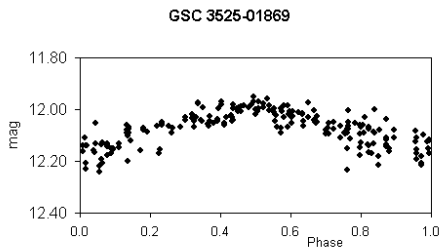
Tycho-2: 3525-1869-1 Johnson B-V=1.096 (derived from Tycho-2)

Star with high proper motion (Ivanov 2007)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=5414983&mask=32004>

Likely a RS CVn variable



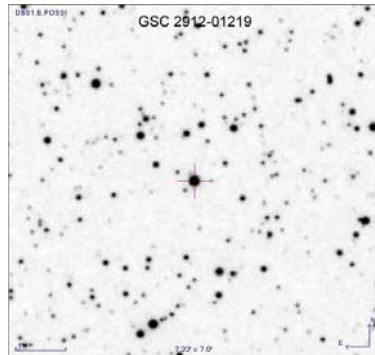
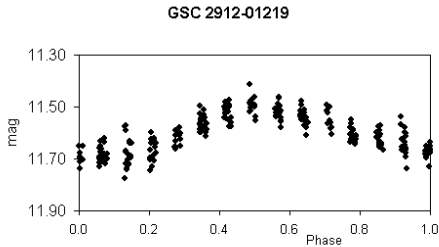
No.7: GSC 2912-01219

Tycho-2: 2912-1219-1: Johnson B-V=0.879 (derived from Tycho-2)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=4527442&mask=32004>

Likely a RS CVn variable



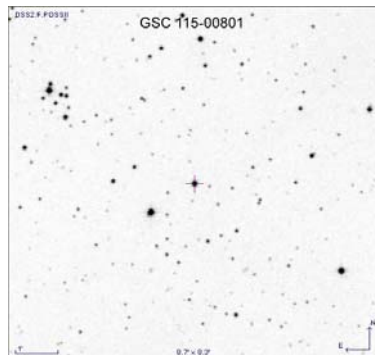
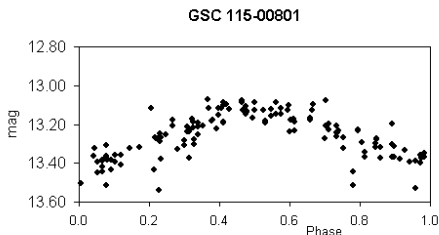
No.8: GSC 115-00801

ASAS variable:

<http://vizier.u-strasbg.fr/viz-bin/vizExec/Vgraph?II/264/vareq/053915%2b0031.2.lc=7872557&>

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=12353370&mask=32004>



No.9: GSC 3333-00117

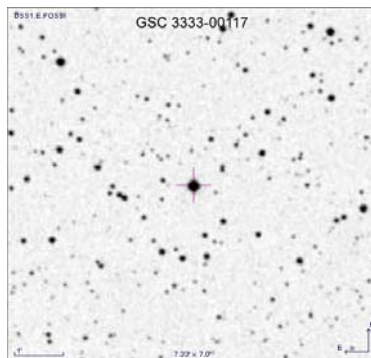
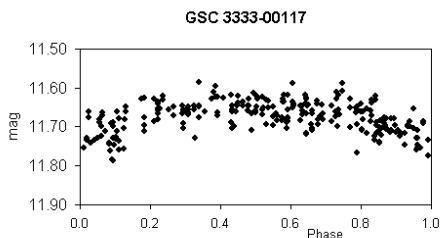
Tycho-2: 3333-117- 1: Johnson B-V=0.997 (derived from Tycho-2)

Star with high proper motion (Ivanov 2007)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=4257087&mask=32004>

Likely a RS CVn variable

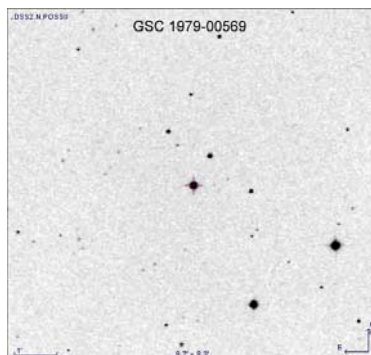
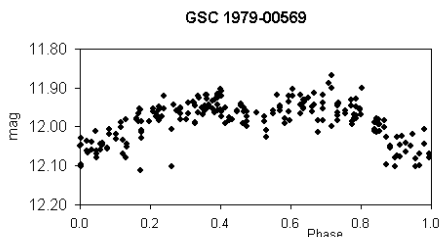
**No.10: GSC 1979-00569**

Tycho-2: 1979-569-1: Johnson B-V=0.609 (derived from Tycho-2)

NSVS data:

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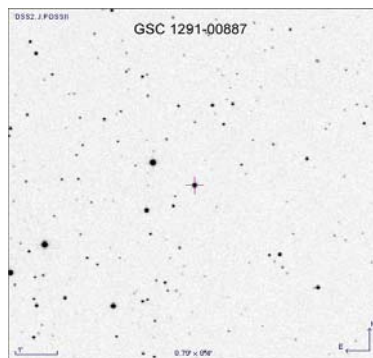
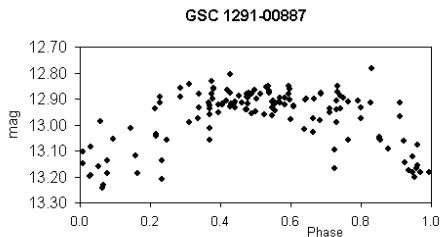
Likely a RS CVn variable



No.11: GSC 1291-00887

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=9552176&mask=32004>



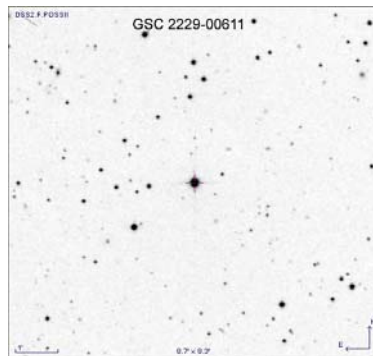
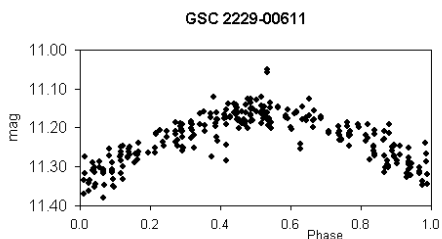
No.12: GSC 2229-00611

Tycho-2: 2229-611-1: Johnson B-V=0.918 (derived from Tycho-2)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=8957530&mask=32004>

Likely a RS CVn variable



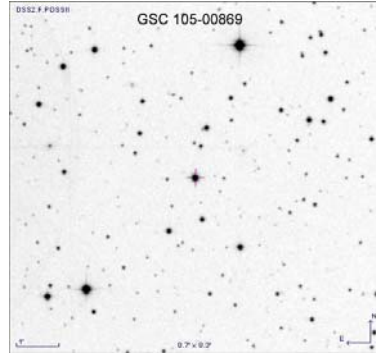
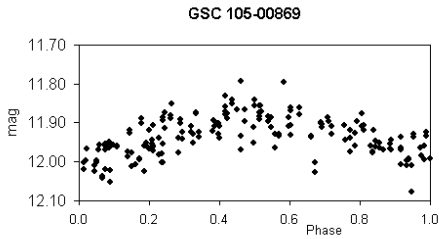
No.13: GSC 105-00869

Tycho-2: 105-869-1: Johnson B-V=0.466 (derived from Tycho-2)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=12331039&mask=32004>

Likely a RS CVn variable



No.14: GSC 63-00006

Tycho-2: 63-6-1: Johnson B-V=1.482 (derived from Tycho-2)

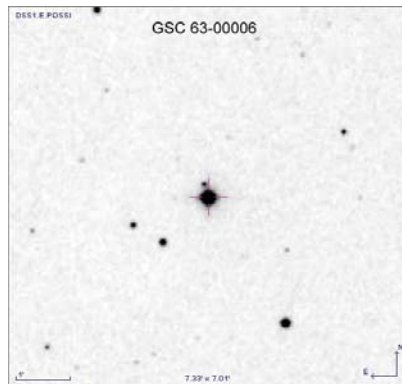
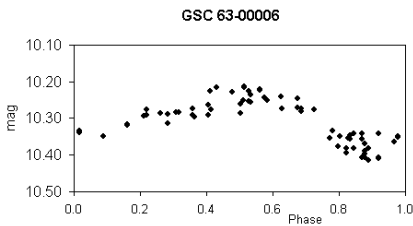
ASAS variable:

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NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=9318075&mask=32004>

Possible BY Dra star



No.15: GSC 5253-00472

HD 224440

Tycho-2: 5253-472-1: Johnson B-V=1.027 (derived from Tycho-2)

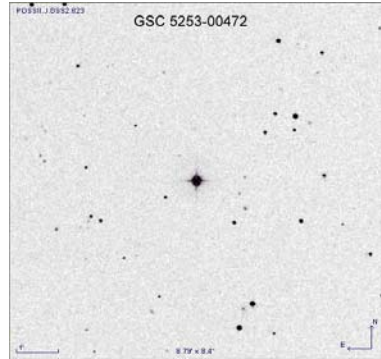
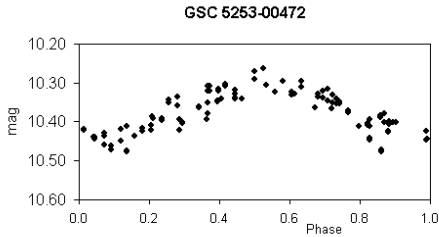
ASAS variable:

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NSVS data:

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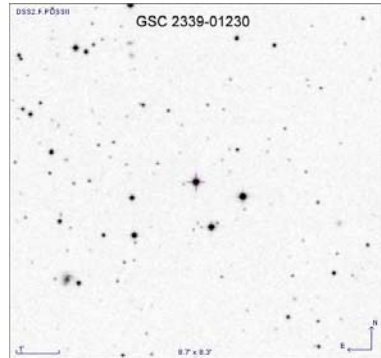
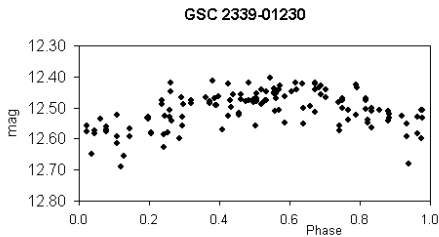
Likely a RS CVn variable



No.16: GSC 2339-01230

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=6596978&mask=32004>



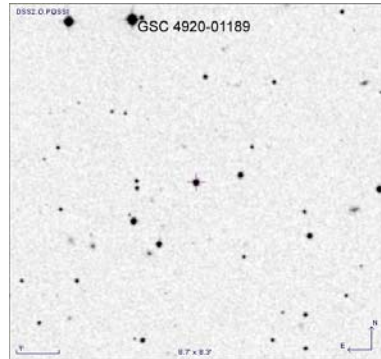
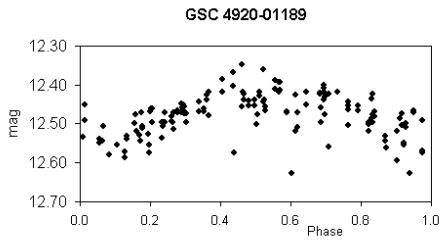
No.17: GSC 4920-01189

spectral type: K7 (V) E (Buscombe 1999)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=13100346&mask=32004>

Possible BY Dra star

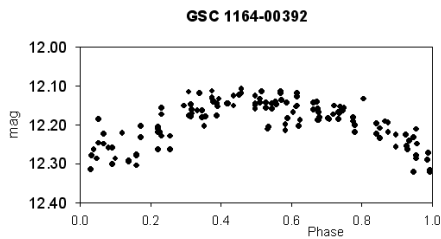


No. 18: GSC 1164-00392

Star with high proper motion (Ivanov 2007)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=11844458&mask=32004>



No.19: GSC 1756-00430

BD+23 235, Tycho-2: 1756-430-1: Johnson B-V=1.122 (derived from Tycho-2)

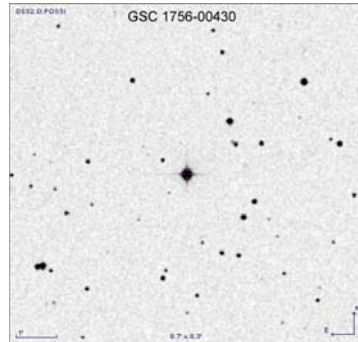
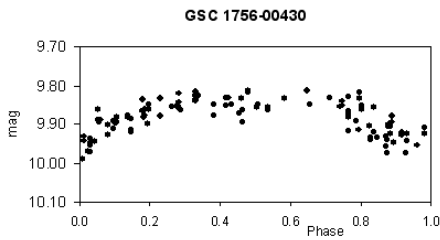
Star with high proper motion (Ivanov 2007)

Spectral type: K0 (Wright et al., 2003)

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=6500037&mask=32004>

Likely a RS CVn variable



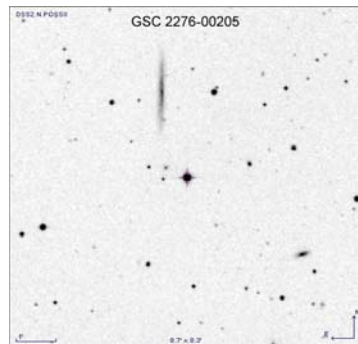
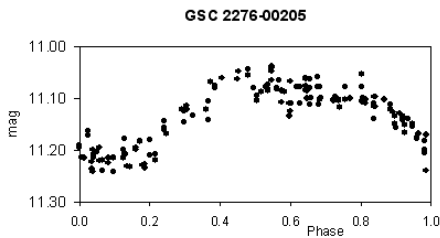
No.20: GSC 2276-00205

BD+29 135, Tycho-2: 2276-205-1: Johnson B-V=0.730 (derived from Tycho-2)

NSVS data:

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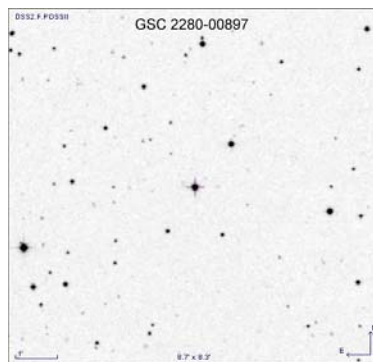
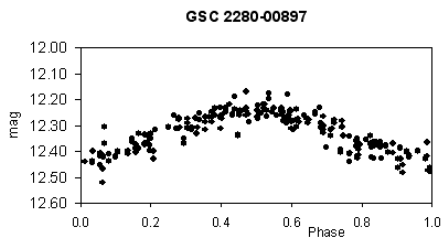
Spectral type: G0 (Simbad), Likely a RS CVn variable



No.21: GSC 2280-00897

NSVS data:

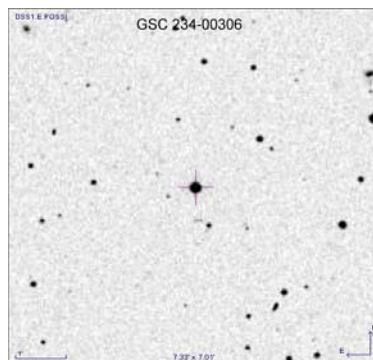
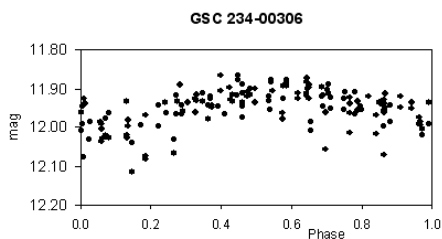
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No.22: GSC 234-00306

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=12976829&mask=32004>



No.23: GSC 4912-01357

Tycho-2: 4912-1357-1: Johnson B-V=0.406 (derived from Tycho-2)

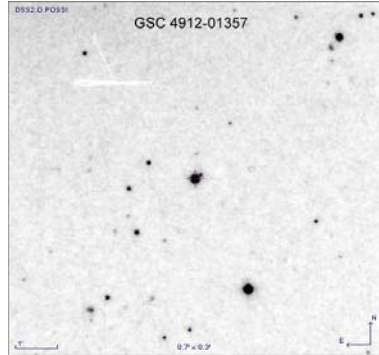
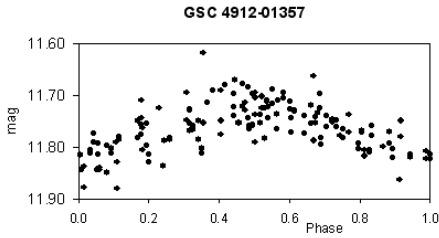
ASAS variable:

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NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=13085670&mask=32004>

Likely a RS CVn variable



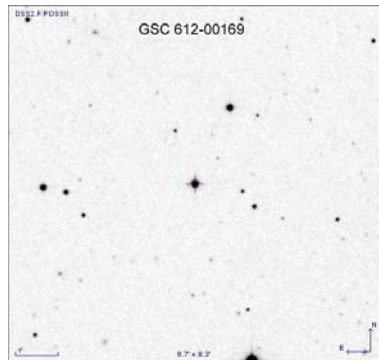
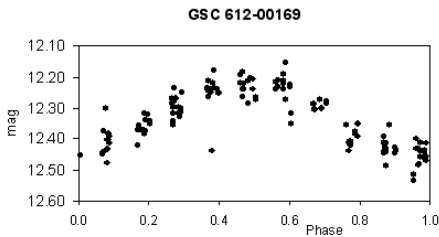
No.24: GSC 612-00169

ASAS variable:

<http://vizier.u-strasbg.fr/viz-bin/vizExec/Vgraph?II/264/vareq/010507%2b0935.1.lc=674560&>

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=9158567&mask=32004>



No.25: GSC 1935-01066

Tycho-2: 1935-1066-1: Johnson B-V=0.881 (derived from Tycho-2)

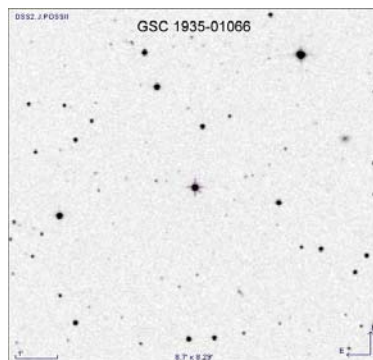
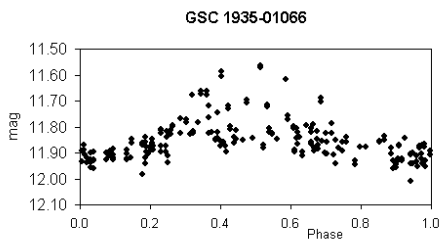
ASAS variable:

<http://vizier.u-strasbg.fr/viz-bin/vizExec/Vgraph?II/264/081035%2b2749.4&P=0.253052>

NSVS data:

<http://skydot.lanl.gov/nsvs/star.php?num=7383299&mask=32004>

Likely a RS CVn variable



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References:Böhm-Vitense E., Parsons S.B., 1983, *Astrophys. J.* 266, 171 (1983ApJ...266..171B)<http://adsabs.harvard.edu/abs/1983ApJ...266..171B>

Buscombe, W., 1999, MK spectral classifications, 14th General Catalogue, Northwestern Univ., Evanston, Illinois

<http://cdsarc.u-strasbg.fr/viz-bin/Cat?III/222>Høg, E., Fabricius, C., Makarov, V.V., Urban, S., Corbin, T., Wycoff, G., Bastian, U., Schwekendiek, P., Wicenc, A., 2000, *Astron. Astrophys.*, 355, L27 (2000A&A...355L..27H)<http://adsabs.harvard.edu/abs/2000A&A...355L..27H>

Ivanov, G.A., 2007, Catalogue of stars with high-proper motions - version 1., Ivanov G.A., Main Astronomical Observatory (MAO), Kiev, Ukraine

<http://cdsarc.u-strasbg.fr/viz-bin/Cat?I/306>Lenz, P., Breger, M., 2005, *Comm. in Asteroseismology*, 146, 53 (2005CoAst.146...53L)<http://adsabs.harvard.edu/abs/2005CoAst.146...53L>

Norton, A.J., Wheatley, P.J., West, R.G., Haswell, C.A., Street, R.A., Collier Cameron, A., Christian, D.J., Clarkson, W.I., Enoch, B., Gallaway, M., Hellier, C., Horne, K., Irwin, J., Kane, S.R., Lister, T.A., Nicholas, J.P., Parley, N., Pollacco, D., Ryans, R., Skillen, I., Wilson, D.M., 2007, A&A 467, 785-905 (2007A&A...467..785N)

<http://adsabs.harvard.edu/abs/2007A%26A...467..785N>

Schmidt E.G., Parsons S.B., 1984, Astrophys. J. 279, 215 (1984ApJ...279..215S)

<http://adsabs.harvard.edu/abs/1984ApJ...279..215S>

Voges W., Aschenbach B., Boller Th., Brauning H., Briel U., Burkert W., Dennerl K., Englhauser J., Gruber R., Haberl F., Hartner G., Hasinger G., Pfeffermann E., Pietsch W., Predehl P., Schmitt J., Trumper J., Zimmermann U. 2000, IAU Circ. 7432, ROSAT all-sky survey faint source catalogue. (2000IAUC.7432R...1V)

<http://adsabs.harvard.edu/abs/2000IAUC.7432R...1V>

Wozniak P. R., Vestrand W. T., Akerlof C. W., Balsano R., Bloch J., Casperson D., Fletcher S., Gisler G., Kehoe R., Kinemuchi K., Lee B. C., Marshall S., McGowan K. E., McKay T. A., Rykoff E. S., Smith D. A., Szymanski J., Wren J., 2004, Astron. J., 127, 2436, Northern Sky Variability Survey: Public Data Release (2004AJ....127.2436W)

<http://adsabs.harvard.edu/abs/2004AJ....127.2436W>

Wright C.O., Egan M.P., Kraemer K.E., Price S.D., 2003, The Tycho-2 Spectral Type Catalog, Astron. J., 125, 359 (2003)

<http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=III/231>