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Chromospherically active stars in the ROTSE-1 database: Paper 4. Another 25 new variables

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Abstract: Another 25 new chromospherically active stars are presented, which were found in the ROTSE-1 database:
GSC 00140-01925, GSC 00563-00384, GSC 05165-00365, GSC 01956-00231, GSC 00723-00863, GSC 00324-00779, GSC 04688-02015, GSC 01683-00144, GSC 02424-00544, GSC 02741-01676, GSC 05003-00138, GSC 00990-02029, GSC 00024-00224, GSC 02236-00568, GSC 02460-00622, GSC 03125-01976, GSC 00583-00566, GSC 05183-00044, GSC 02933-02042, GSC 01572-00794, GSC 01571-01349, GSC 00110-01049, GSC 02221-00759, GSC 04767-00071, GSC 04734-00020

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. For further details of the programme see Bernhard & Lloyd (2008).

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) appropriate B-V (Høg et al. 2000) and 2MASS J-K (Skrutskie et al. 2006, Table 8 in Gonzalez-Solares et al. 2008) colour indexes 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 high proper motions (Ivanov 2008, Zacharias et al. 2005) supports 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.

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

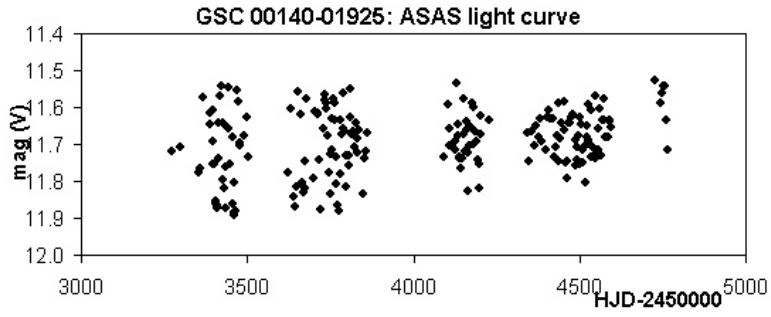
No.	GSC	RA (2000)	Dec	1RXS	Range(NSVS)	Epoch(Min)	Per.(d)	NSVS ID
76	00140-01925	06 15 18.66	+03 47 00.7	J061519.3+034717	11.1-11.3	3433.6(2)	26.2(2)	1247029
77	00563-00384	22 28 36.25	+03 05 25.5	J222836.9+030510	11.3-11.5	4268.8(3)	30.7(1)	14532601
78	05165-00365	20 11 39.60	-02 35 25.8	J201138.7-023537	10.6-10.8	4617.8(3)	35.00(2)	14193223
79	01956-00231	09 00 42.41	+28 17 30.9	J090043.6+281719	11.4-11.5	1598.62(6)	6.264(4)	7416903
80	00723-00863	05 48 22.56	+12 18 26.0	J054823.8+121833	09.7-10.0	3271.8(4)	44.85(2)	9657321
81	00324-00779	14 22 49.82	+06 41 11.5	J142250.2+064131	11.3-11.5	3571.6(6)	70.8(1)	13340477
82	04688-02015	01 46 51.71	-05 47 15.3	J014651.2-054734	11.3-11.5	3718.6(2)	17.085(5)	12030009
83	01683-00144	21 59 44.59	+16 57 38.6	J215945.4+165739	11.1-11.3	2816.8(5)	44.22(5)	11680710
84	02424-00544	06 11 32.64	+32 09 21.2	J061134.0+320933	11.1-11.3	1286.69(4)	4.291(1)	7040192
85	02741-01676	22 16 50.81	+34 11 06.9	J221650.5+341047	11.8-11.9	1352.76(7)	7.086(5)	8868030
86	05003-00138	15 26 52.83	-00 53 11.1	J152653.8-005300	11.0-11.2	3168.7(1)	11.855(2)	13406051
87	00990-02029	17 16 29.61	+13 23 16.3	J171628.7+132330	11.0-11.2	4656.6(1)	12.675(2)	10779673
88	00024-00224	01 25 26.90	+02 56 21.4	J012526.0+025637	12.3-12.5	1456.84(2)	2.490(1)	12002265
89	02236-00568	23 09 46.42	+22 33 34.2	J230945.8+223354	12.8-13.0	1448.9(1)	10.10(4)	8978707
90	02460-00622	07 24 23.96	+33 57 04.1	J072425.0+335720	12.3-12.7	1515.67(5)	5.583(1)	7234869
91	03125-01976	19 13 14.60	+39 56 08.2	J191315.1+395547	10.3-10.5	1449.7(5)	52.5(3)	5530631
92	00583-00566	23 16 44.98	+06 18 57.7	J231646.2+061912	10.5-10.7	1483.66(4)	4.190(3)	14602985
93	05183-00044	20 54 09.23	-02 45 33.9	J205409.8-024555	10.6-10.7	3170.80(1)	1.57993(2)	14354118
94	02933-02042	06 00 23.49	+42 16 53.9	J060022.5+421701	11.4-11.6	1461.79(4)	2.692(1)	4537126
95	01572-00794	18 16 52.77	+17 57 03.6	J181654.3+175713	10.8-11.1	3097.88(2)	1.8978(1)	11003608
96	01571-01349	18 13 52.40	+17 14 45.8	J181350.8+171446	12.8-13.1	1338.77(2)	2.762(1)	10999212
97	00110-01049	05 05 08.10	+06 29 51.7	J050509.2+062935	12.4-12.8	3824.51(7)	7.4910(5)	12306198
98	02221-00759	22 47 22.74	+23 13 17.1	J224721.8+231256	11.2-11.5	4741.61(5)	5.559(1)	8957500
99	04767-00071	05 39 45.55	-00 55 51.6	J053944.7-005612	10.6-10.8	3131.4(6)	64.43(5)	12387457
100	04734-00020	04 36 12.52	-01 50 25.0	J043612.7-015050	09.9-10.1	2206.7(5)	49.35(4)	12250630

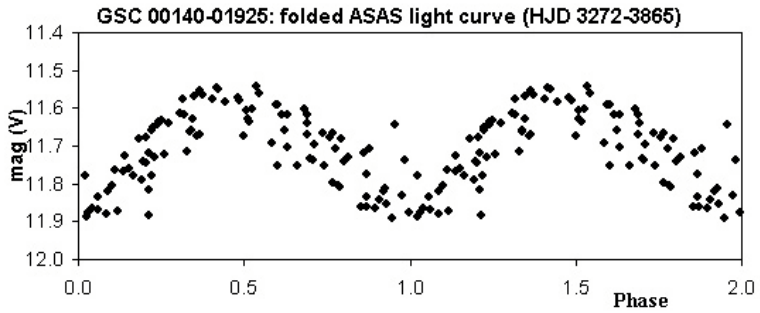
The ROTSE-I telescope was operated without any filters so the quantum efficiency of the used CCD camera AP-10 camera makes the effective band most comparable to the Johnson R band (Range in Table 1). The epochs are given for the minima as HJD-2450000, ASAS-3 data (http://www.astrouw.edu.pl/asas/?page=main) are used for the period analysis and the following figures when available (Pojmanski, 2002). Figures in brackets denote errors (sigma) in units of the last decimal.

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

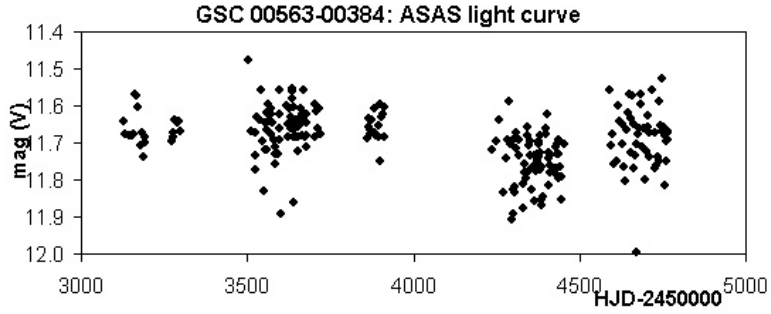
Some of the following stars showed a clear variation of the shape of the light curves.
Therefore in some cases the folded light curves are given for a distinct time period of time (described in figure as HJD 245....).

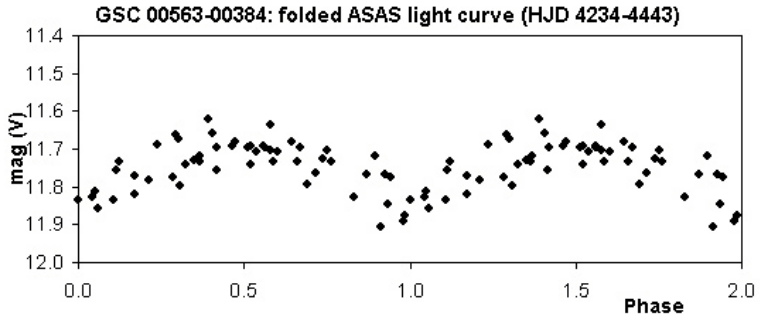
No.76: GSC 00140-01925
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=12470291&mask=32004
2MASS J-K: 0.896
Star with high proper motion 41 mas/yr (Ivanov 2008), 20 mas/yr (Zacharias et al. 2005)
Probably a BY Dra variable



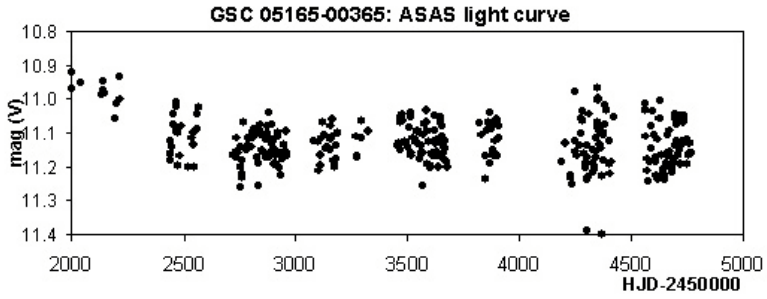


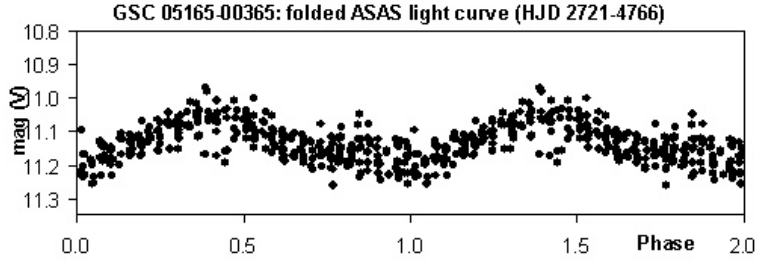
No.77: GSC 00563-00384
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=14532601&mask=32004
2MASS J-K: 0.789
Spectral type: K1 IV (Zickgraf et al., 2005)
Proper motion 9 mas/yr (Zacharias et al. 2005).
Likely RS CVn variable



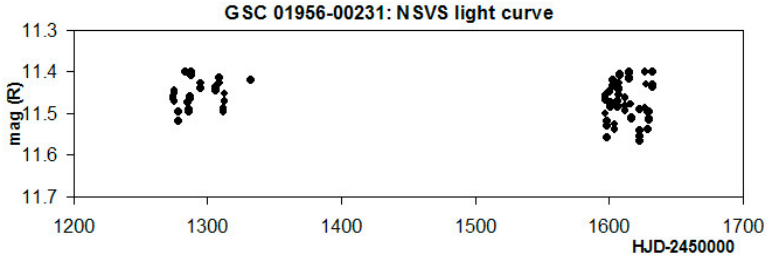


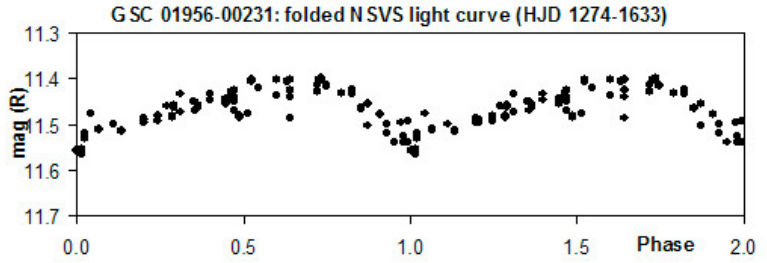
No.78: GSC 05165-00365
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=14193223&mask=32004
2MASS J-K: 0.929
Tycho-2: 05165-00365-1: Johnson B-V= 0.975 (derived from Tycho-2)
ASAS variable (type MISC)
Spectral type: K5 (Riaz et al., 2006)
Proper motion 8 mas/yr (Zacharias et al. 2005)
Probably a BY Dra variable



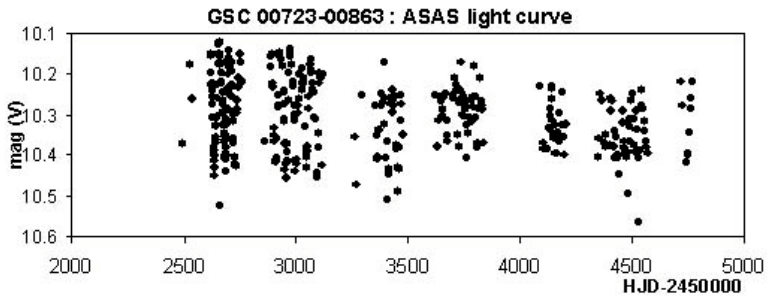


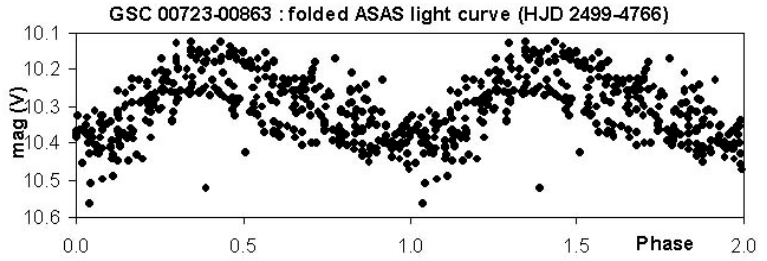
No. 79: GSC 01956-00231
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=7416903&mask=32004
2MASS J-K: 0.67
Tycho-2: 01956-00231-1: Johnson B-V= 1.051 (derived from Tycho-2)
Proper motion 8 mas/yr (Zacharias et al. 2005).
Likely RS CVn variable



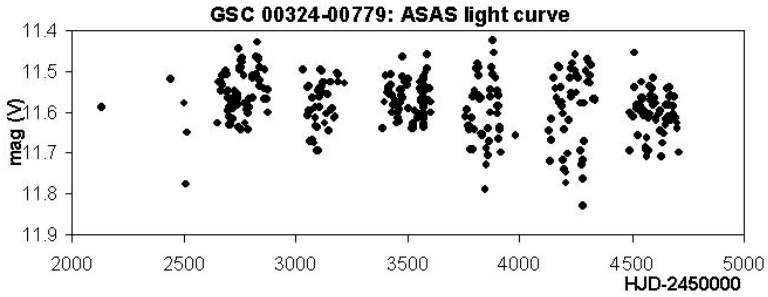


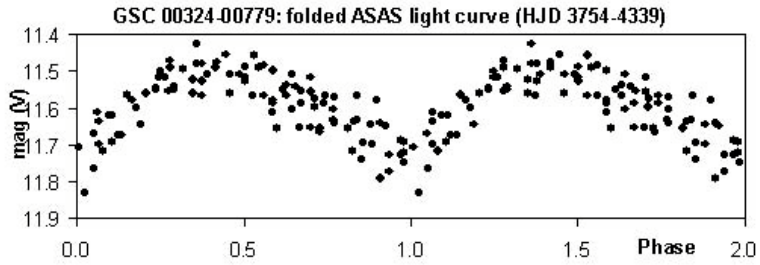
No. 80: GSC 00723-00863
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=9657321&mask=32004
2MASS J-K: 0.911
Tycho-2: 00723-00863-1: Johnson B-V= 1.123 (derived from Tycho-2)
ASAS variable (type DCEP-FU/EC):
Proper motion 6 mas/yr (Zacharias et al. 2005).
Likely RS CVn variable



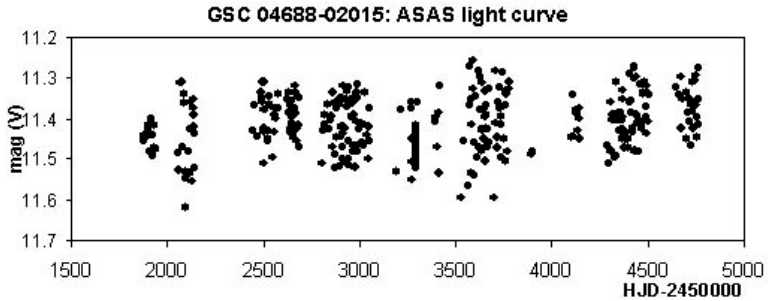


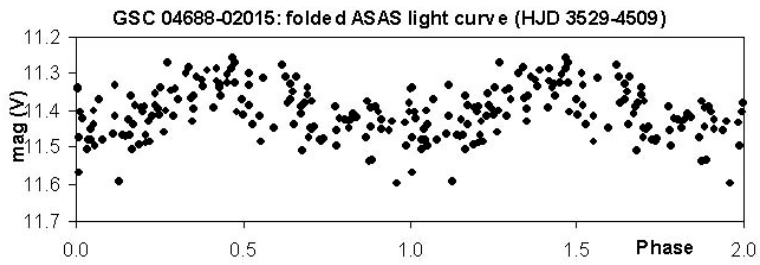
No. 81: GSC 00324-00779
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=13340477&mask=32004
2MASS J-K: 0.729
ASAS variable (type MISC):
Proper motion 19 mas/yr (Zacharias et al. 2005).
Likely RS CVn variable



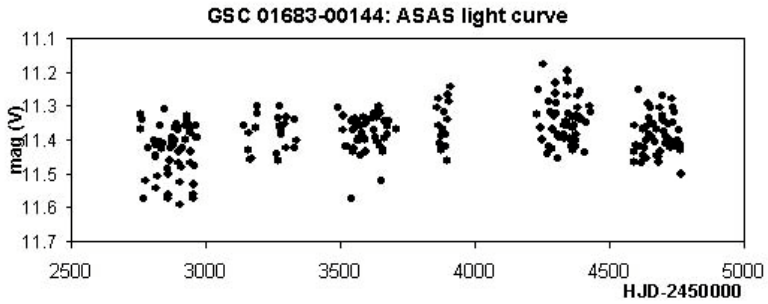


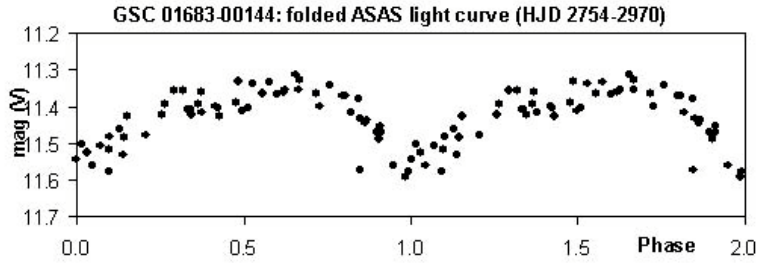
No. 82: GSC 04688-02015
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=12030009&mask=32004
2MASS J-K: 0.712
Tycho-2: 04688-02015-1: Johnson B-V= 1.370 (derived from Tycho-2)
Proper motion 44 mas/yr (Zacharias et al. 2005).
Likely RS CVn variable



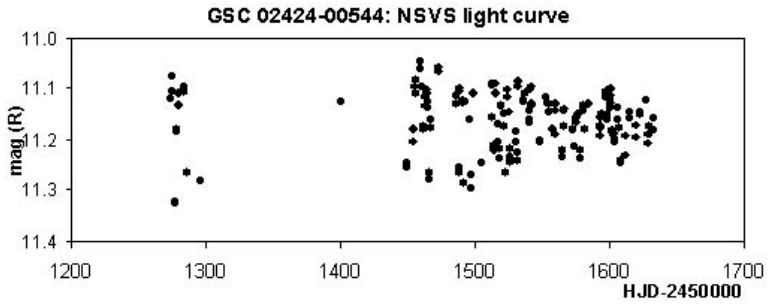


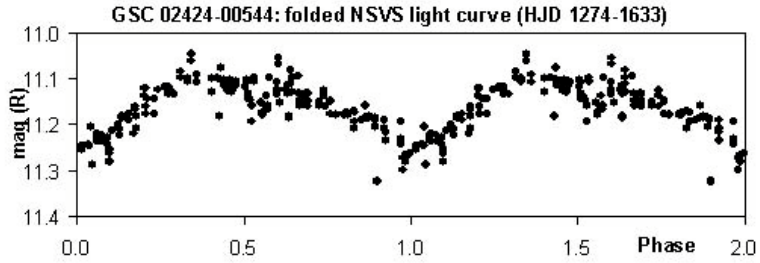
No. 83: GSC 01683-00144
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=11680710&mask=32004
2MASS J-K: 0.768
Tycho-2: 01683-00144-1: Johnson B-V= 1.028 (derived from Tycho-2)
ASAS variable (type MISC):
Proper motion 7 mas/yr (Zacharias et al. 2005).
Likely RS CVn variable



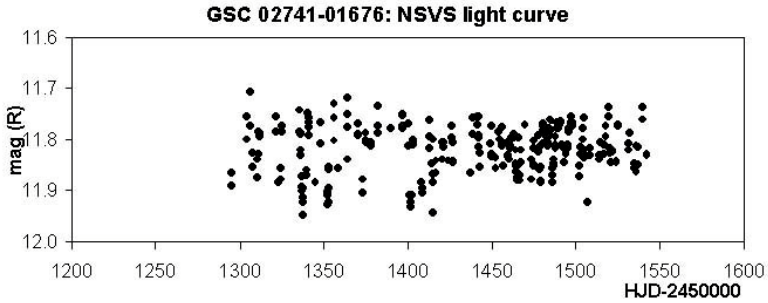


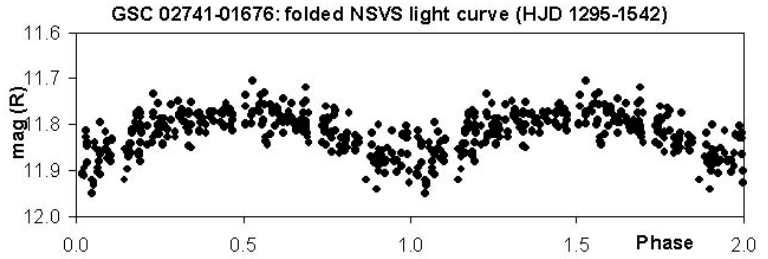
No. 84: GSC 02424-00544
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=7040192&mask=32004
2MASS J-K: 0.711
Tycho-2: 02424-00544-1: Johnson B-V= 0.860 (derived from Tycho-2)
Proper motion 23 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



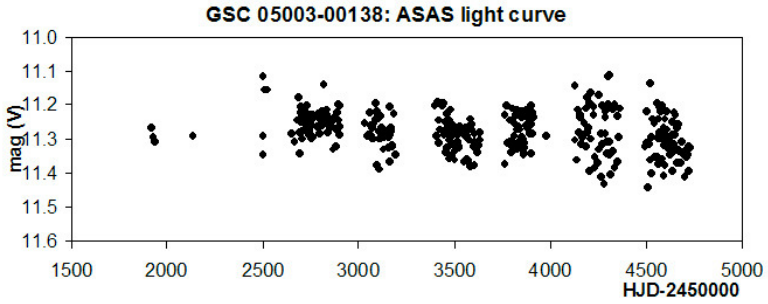


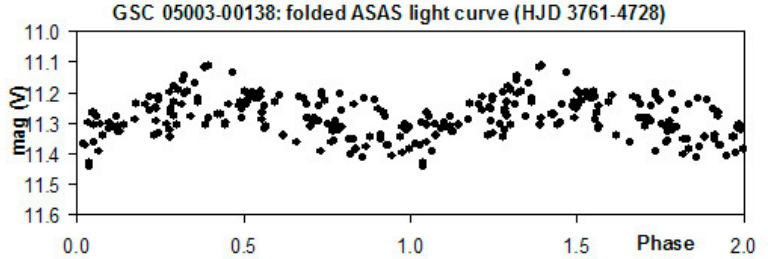
No. 85: GSC 02741-01676
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=8868030&mask=32004
2MASS J-K: 0.583
Marginal proper motion (Zacharias et al. 2005)
Likely RS CVn variable



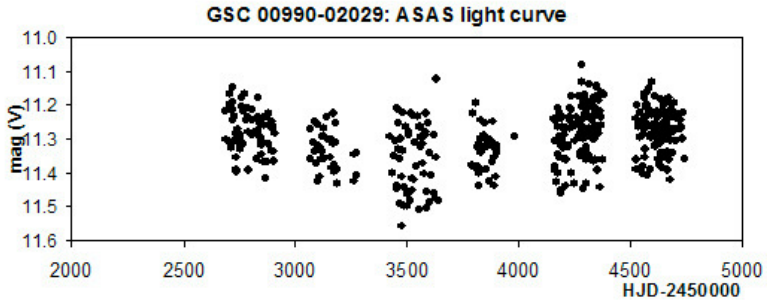


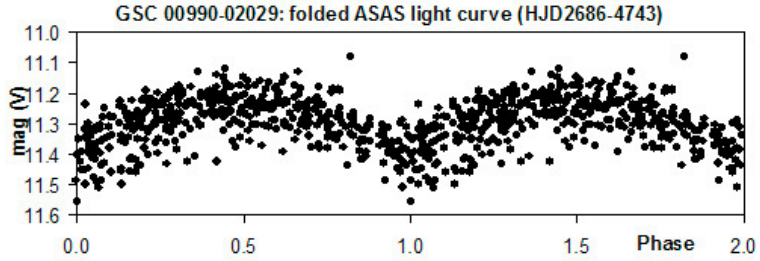
No. 86: GSC 05003-00138
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=13406051&mask=32004
2MASS J-K: 0.767
Tycho-2: 05003-00138-1: Johnson B-V= 1.201 (derived from Tycho-2)
Proper motion 32 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



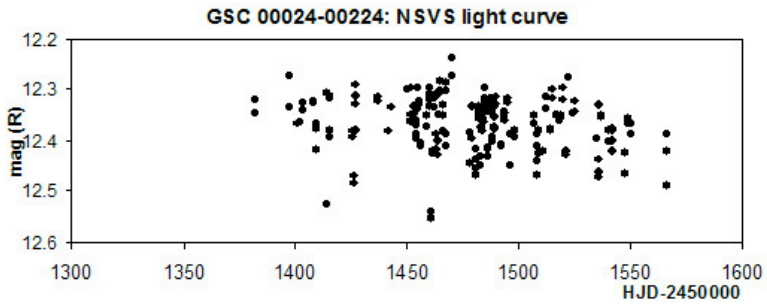


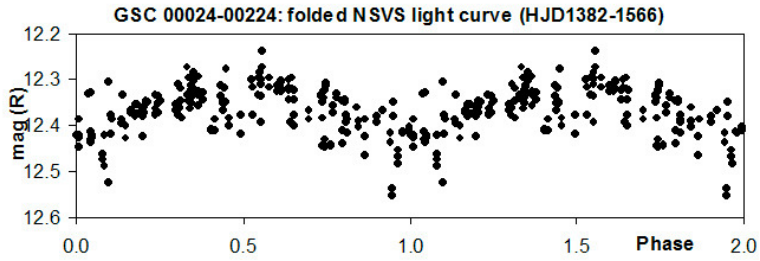
No. 87: GSC 00990-02029
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=10779673&mask=32004
2MASS J-K: 0.72
Tycho-2: 00990-02029-1: Johnson B-V= 0.758 (derived from Tycho-2)
ASAS variable (type MISC)
Proper motion 27 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



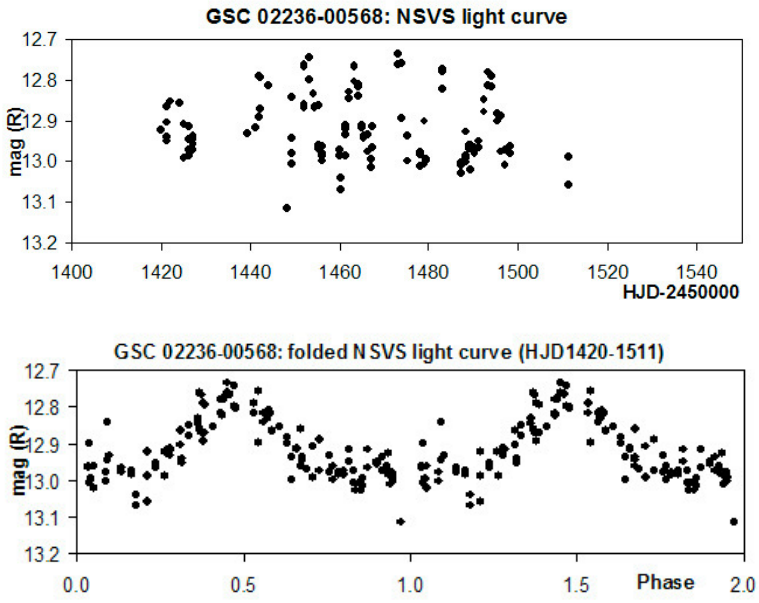


No. 88: GSC 00024-00224
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=12002265&mask=32004
2MASS J-K: 0.786
Marginal proper motion (Zacharias et al. 2005)
Likely RS CVn variable

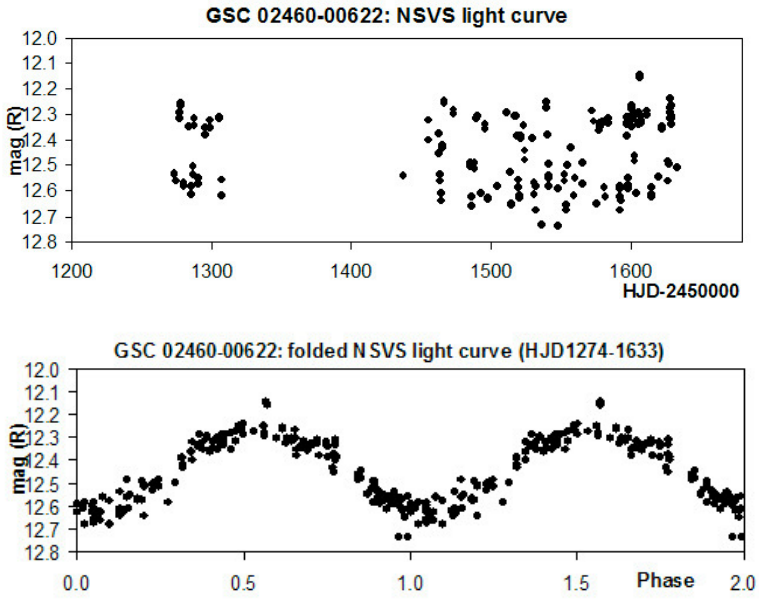




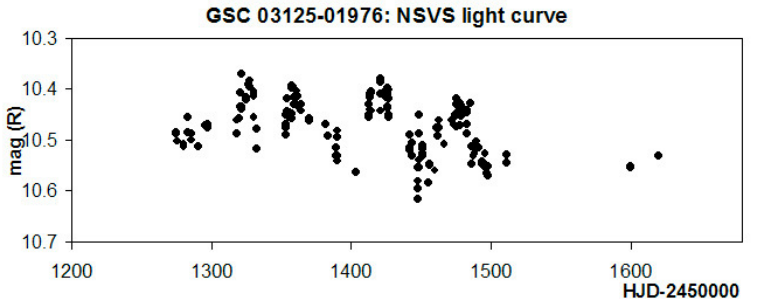
No. 89: GSC 02236-00568
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=8978707&mask=32004
2MASS J-K: 0.812
ASAS variable (type MISC)
Proper motion 12 mas/yr (Zacharias et al. 2005)
Probably a BY Dra variable

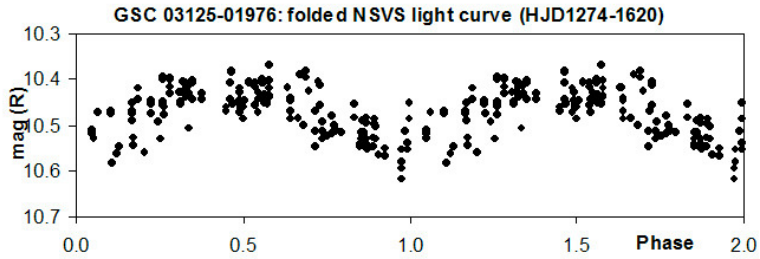


No. 90: GSC 02460-00622
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=7234869&mask=32004
2MASS J-K: 0.783
No significant proper motion (Zacharias et al. 2005)
Likely RS CVn variable

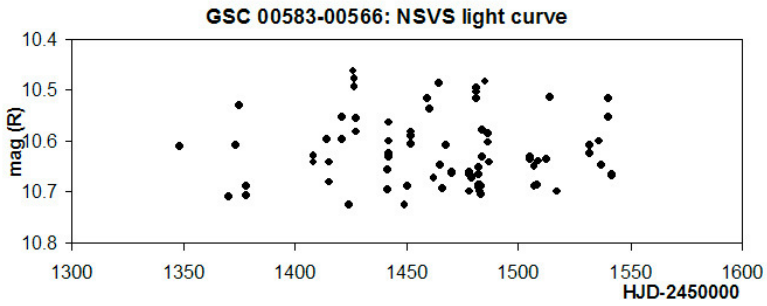


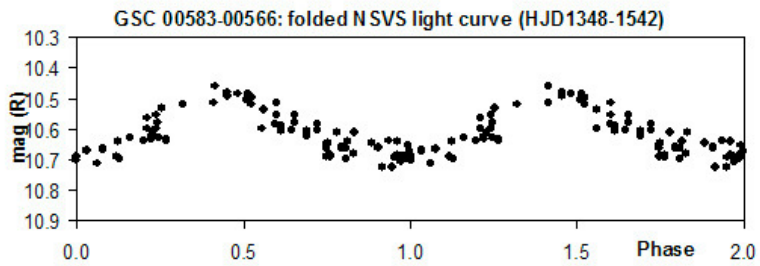
No. 91: GSC 03125-01976
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=5530631&mask=32004
2MASS J-K: 0.733
Tycho-2: 03125-01976-1: Johnson B-V=1.044 (derived from Tycho-2)
Proper motion 27 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



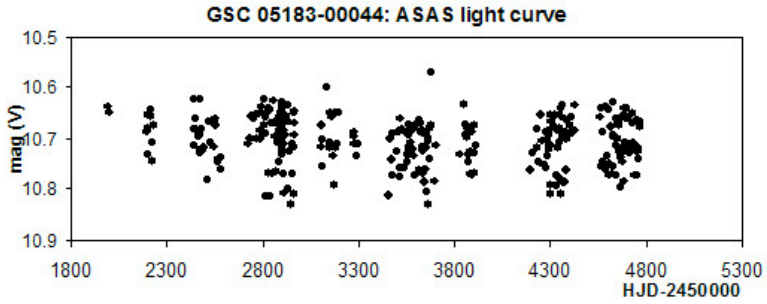


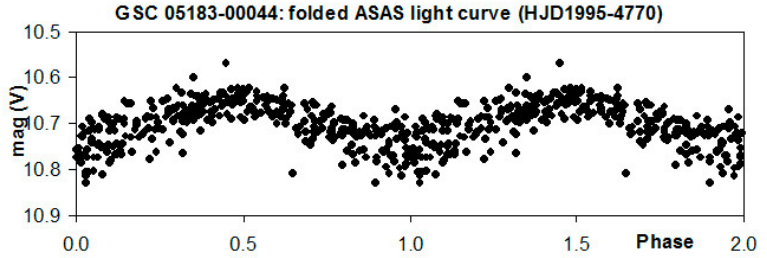
No. 92: GSC 00583-00566
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=14602985&mask=32004
2MASS J-K: 0.731
Tycho-2: 00583-00566-1: Johnson B-V=1.027 (derived from Tycho-2)
Proper motion 25 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



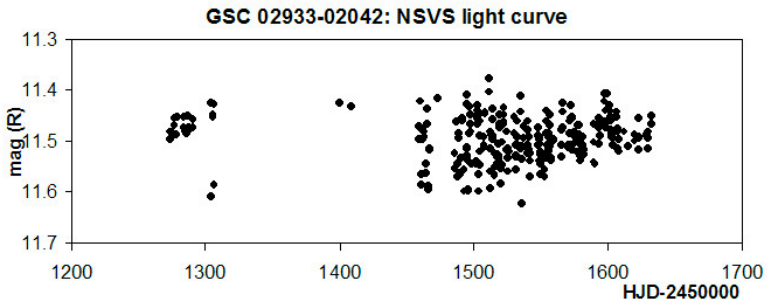


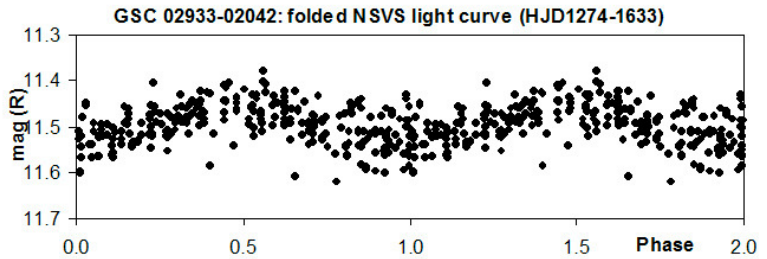
No. 93: GSC 05183-00044
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=14354118&mask=32004
2MASS J-K: 0.646
Tycho-2: 05183-00044-1: Johnson B-V=0.964 (derived from Tycho-2)
ASAS variable (type ESD/EC):
Proper motion 14 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



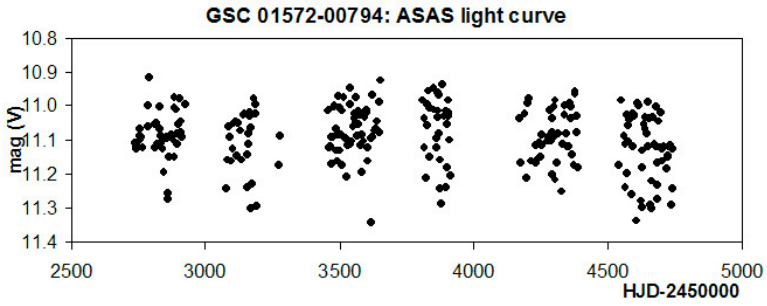


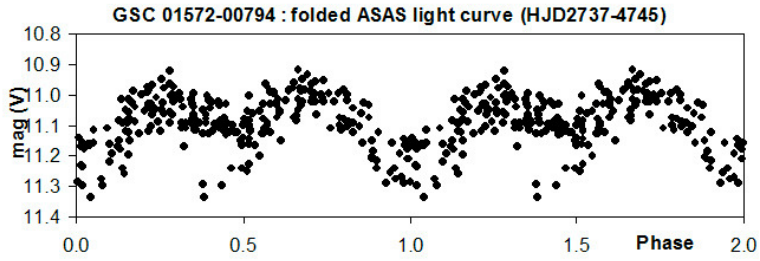
No. 94: GSC 02933-02042
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=4537126&mask=32004
2MASS J-K: 0.518
Tycho 2: 02933-02042-1: Johnson B-V=0.666 (derived from Tycho-2)
Proper motion 3 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



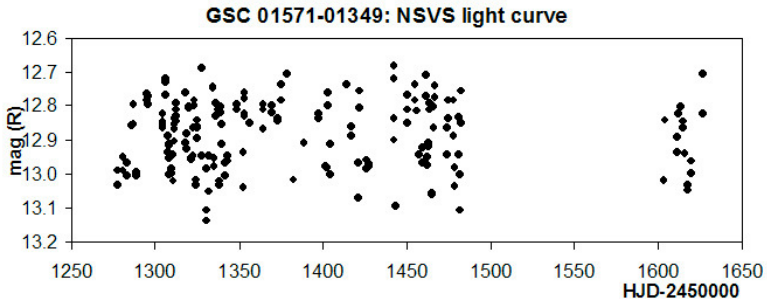


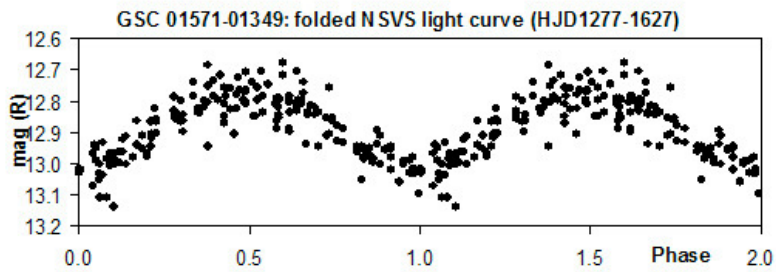
No. 95: GSC 01572-00794
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=11003608&mask=32004
2MASS J-K: 0.668
Tycho-2: 01572-00794-1: Johnson B-V=0.726 (derived from Tycho-2)
Proper motion 20 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



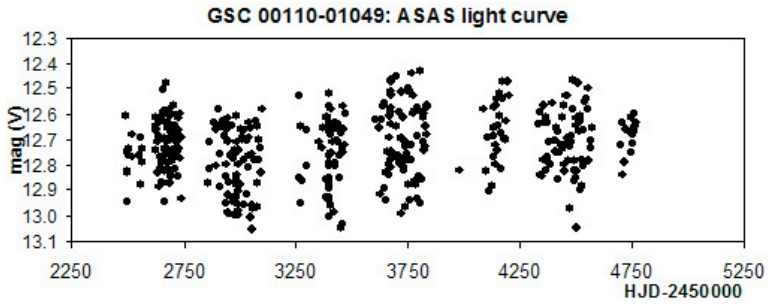


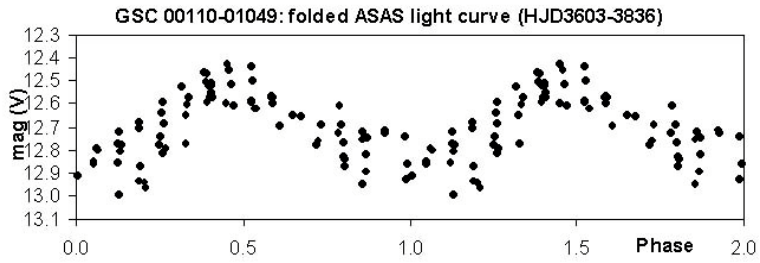
No. 96: GSC 01571-01349
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=10999212&mask=32004
2MASS J-K: 0.905
Proper motion 13 mas/yr (Zacharias et al. 2005)
Probably a BY Dra variable



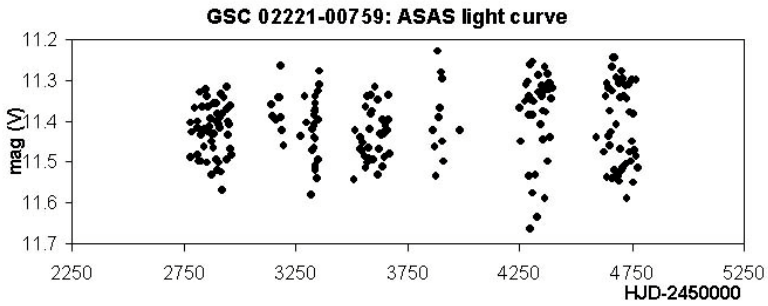


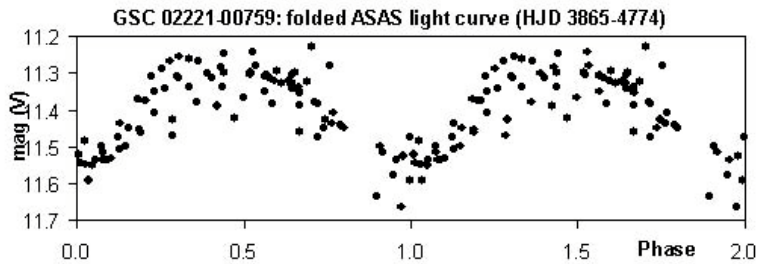
No. 97: GSC 00110-01049
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=12306198&mask=32004
2MASS J-K: 0.709
ASAS variable (type MISC)
Proper motion 12 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



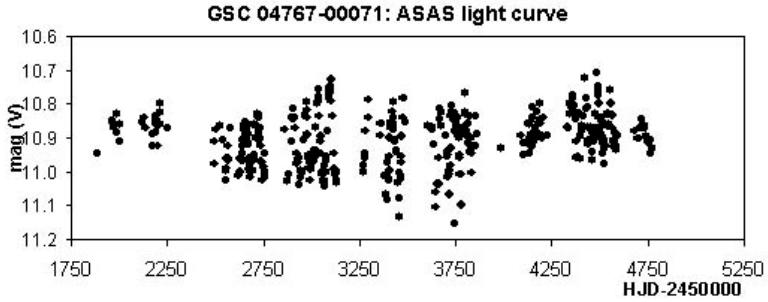


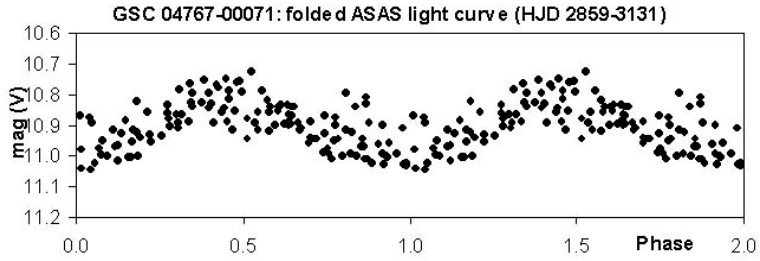
No. 98: GSC 02221-00759
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=8957500&mask=32004
2MASS J-K: 0.775
Tycho-2: 02221-00759-1: Johnson B-V=1.197 (derived from Tycho-2)
ASAS variable (type CW-FU/CW-FO)
Proper motion 4 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable



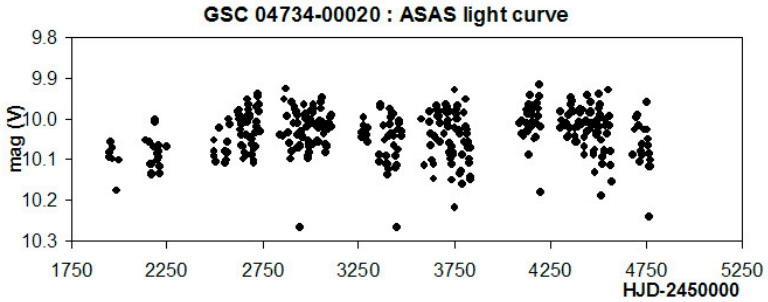


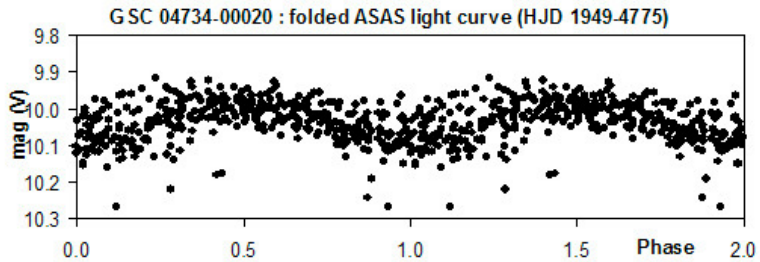
No. 99: GSC 04767-00071
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=12387457&mask=32004
2MASS J-K: 0.792
Tycho-2: 04767-00071-1: Johnson B-V=1.212 (derived from Tycho-2)
ASAS variable (type MISC)
Proper motion 11 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable





No. 100: GSC 04734-00020
NSVS data: http://skydot.lanl.gov/nsvs/star.php?num=12250630&mask=32004
2MASS J-K: 0.676
Tycho-2: 04734-00020-1: Johnson B-V=0.961 (derived from Tycho-2)
ASAS variable (type MISC)
Proper motion 11 mas/yr (Zacharias et al. 2005)
Likely RS CVn variable





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References:

Bernhard K., Lloyd C., 2008, OEJV, 92
http://var.astro.cz/oejv/issues/oejv0092.pdf

González-Solares, E. A.; Walton, N. A.; Greimel, R.; Drew, J. E.; Irwin, M. J.; Sale, S. E.; Andrews, K.; Aungwerojwit, A.; Barlow, M. J.; van den Besselaar, E.; Corradi, R. L. M.; Gänsicke, B. T.; Groot, P. J.; Hales, A. S.; Hopewell, E. C.; Hu, Haili; Irwin, J.; Knigge, C.; Lagadec, E.; Leisy, P.; Lewis, J. R.; Mampaso, A.; Matsuura, M.; Moont, B.; Morales-Rueda, L.; Morris, R. A. H.; Naylor, T.; Parker, Q. A.; Prema, P.; Pyrzas, S.; Rixon, G. T.; Rodríguez-Gil, P.; Roelofs, G.; Sabin, L.; Skillen, I.; Suso, J.; Tata, R.; Viironen, K.; Vink, J. S.; Witham, A.; Wright, N. J.; Zijlstra, A. A.; Zurita, A.; Drake, J.; Fabregat, J.; Lennon, D. J.; Lucas, P. W.; Martín, E. L.; Phillipps, S.; Steeghs, D.; Unruh, Y. C., 2008, MNRAS, 388, 89
http://arxiv.org/abs/0712.0384

Høg E., Fabricius C., Makarov V.V., Urban S., Corbin T., Wycoff G., Bastian U., Schwekendiek P., Wicenec A., 2000, Astron. Astrophys., 355, L27 (2000A&A...355L..27H)
http://adsabs.harvard.edu/abs/2000A&A...355L..27H

Ivanov G.A. , 2008, Kinematika Fiz. Nebesn. Tel., 24, 480
http://webviz.u-strasbg.fr/viz-bin/VizieR?-source=I/306A

Lenz P., Breger M., 2005, Comm. in Asteroseismology, 146, 53 (2005CoAst.146...53L)
http://adsabs.harvard.edu/abs/2005CoAst.146...53L

Pojmanski, G., 2002, Acta Astronomica, 52, 397
http://arxiv.org/abs/astro-ph/0210283

Riaz B., Gizis J.E., Harvin J., 2006, Astron. J., 132, 866-872
http://adsabs.harvard.edu/abs?bibcode=2006AJ....132..866R&

Skrutskie, R.M. Cutri, R. Stiening, M.D. Weinberg, S. Schneider, J.M. Carpenter, C. Beichman, R. Capps, T. Chester, J. Elias, J. Huchra, J. Liebert, C. Lonsdale, D.G. Monet, S. Price, P. Seitzer, T. Jarrett, J.D. Kirkpatrick, J. Gizis, E. Howard, T. Evans, J. Fowler, L. Fullmer, R. Hurt, R. Light, E.L. Kopan, K.A. Marsh, H.L. McCallon, R. Tam, S. Van Dyk, and S. Wheelock, 2006, AJ, 131, 1163
http://adsabs.harvard.edu/abs/2006AJ....131.1163S

Voges W., Aschenbach B., Boller Th., Brauninger 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

Zacharias N., Monet D.G., Levine S.E., Urban S.E., Gaume R., Wycoff G.L., 2005,
Naval Observatory Merged Astrometric Dataset (NOMAD)
San Diego AAS Meeting, January (2005) (2004AAS...205.4815Z)
http://adsabs.harvard.edu/abs/2004AAS...205.4815Z
http://cdsarc.u-strasbg.fr/viz-bin/Cat?I/297

Zickgraf F.-J., Krautter J., Reffert S., Alcala J.M., Mujica R., Covino E., Sterzik M.F., 2005, Astron. Astrophys., 433, 151-171
http://adsabs.harvard.edu/abs/2005A%26A...433..151Z