

## Chromospherically active stars in the ASAS-3 database: Paper 2. 25 new variables

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**Abstract:** Another 25 new chromospherically active stars are presented, which were found in the ASAS-3 database:

GSC 08507-01025, GSC 08869-00453, GSC 08911-02430, GSC 08578-01465, GSC 08580-00916,  
GSC 08930-00601, GSC 08927-03620, GSC 08595-01161, GSC 08946-00872, GSC 08947-00153,  
GSC 08629-00597, GSC 08976-05241, GSC 08973-01607, GSC 08978-04572, GSC 08975-00871,  
GSC 08658-00162, GSC 08989-00583, GSC 08706-00357, GSC 08709-01243, GSC 08722-03145,  
GSC 09037-01041, GSC 08724-00206, GSC 09072-00688, GSC 09089-01462, GSC 09120-00185

During a programme of optical identification of X-ray sources from the ROSAT All-Sky Bright Source Catalogue (1RXS) (Voges et al. 1999) in the ASAS-3 database (Pojmanski, 2002) (<http://www.astrouw.edu.pl/asas/?page=main>) another 25 new chromospherically active stars have been found. This research continues the search for new chromospherically active stars in the ASAS-3 database (Bernhard et al., 2009).

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

i) the X-ray identification: Only those variable ASAS-3 objects were chosen, which were within the error ellipse of the ROSAT All-Sky Bright Source Catalogue. Therefore it is very likely that the X-ray identifications of the variable stars given in this paper are correct and types of variables like Cepheids or semiregular variables can be ruled out because of their low X-ray emission (see the more detailed discussion in Bernhard and Lloyd, 2008).

ii) period, amplitude and shape of the light curve are consistent with the definition of RS CVn, BY Dra and young stellar objects (IN) 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. Due to the shapes of the light curves other types of chromospherically active and X-ray emitting objects like W UMa variables and Algol stars can be ruled out.

iii) appropriate 2MASS J-K (Skrutskie et al. 2006, Table 8 in Gonzalez-Solares et al. 2008) and B-V (Høg et al. 2000) colour indices if available.

iiii) Further information like

- spectral types including the lithium content as indicator of young stellar objects,
- the ratios of X-ray to optical flux  $f_X / f_{opt}$  (Voges et al., 1999),
- proper motions,
- the relation of the maximum amplitude vs. periods of main sequence stars given in Messina et al., 2003 and
- an investigation of the respectively star fields using ALADIN (<http://aladin.u-strasbg.fr/aladin.gml>) to check, if there are nearby open star clusters or known young stellar objects

was also used for the classification of the objects.

The resulting list of variables (Table 1) contains with a very high likelihood chromospherically active stars of the types RS CVn (spectral types F-K), BY Dra (spectral types F-K) or young stellar objects (spectral types F-M).

The light variability of these objects is caused by axial rotation of a star with a variable degree of nonuniformity of the surface brightness (spots). Some of these variables are also eclipsing systems. Secular variations of the light curves, which are typical for many RS CVn, BY Dra variables and young stellar objects (see the detailed light curves below) can be explained by the existence of a long-period stellar activity cycle similar to the 11-year solar activity cycle, during which the number and total area of spots on the star's surface vary.

The ASAS-3 telescopes are situated at Las Campanas Observatory in Chile, V and I filters are used in combination with 200/2.8 lenses and AP-10 CCD cameras. The aperture suggested by the ASAS-3 system (first row of the ASAS-3 V data) was taken for the calculations of the ephemeris and the figures. The ranges given in Table 1 are derived from the time span of the ASAS-3 V observations, due to secular variations (activity cycles) the full ranges could be somewhat larger. The epochs are given for the minima as HJD-2450000, figures in brackets denote errors ( $\sigma$ ) in units of the last decimal.

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

No.	GSC	RA (2000)	Dec	IRXS	Range (ASAS3-V) Epoch (Min)	Per. (d)
26	08507-01025	03 59 40.64	-58 40 29.7	J035941.3-584028	9.35-9.70 2526.8 (2)	22.87 (1)
27	08869-00453	04 33 56.50	-61 29 16.6	J043356.7-612909	10.35-10.50 1906.59 (3)	3.652 (5)
28	08911-02430	07 43 42.88	-61 07 17.4	J074344.4-610721	10.65-10.95 3808.67 (2)	2.306 (2)
29	08578-01465	08 02 48.94	-59 13 28.0	J080248.6-591325	11.75-12.00 3893.529 (5)	0.54924 (1)
30	08580-00916	08 39 11.55	-58 34 28.1	J083912.3-583433	10.10-10.20 3509.500 (5)	0.55257 (5)
31	08930-00601	08 42 00.50	-62 18 26.4	J084200.0-621813	10.85-11.15 3064.77 (1)	1.22508 (6)
32	08927-03620	08 58 48.60	-61 15 15.1	J085848.4-611516	9.55-9.65 1915.729 (8)	0.87056 (3)
33	08595-01161	09 12 47.29	-58 39 17.4	J091248.1-583919	8.85-9.05 3069.6 (1)	15.05 (1)
34	08946-00872	09 55 15.08	-62 03 32.4	J095514.8-620316	11.10-11.40 3522.478 (5)	0.53265 (1)
35	08947-00153	10 02 31.23	-62 03 29.3	J100232.7-620336	10.45-10.60 1958.65 (6)	6.217 (1)
36	08629-00597	11 20 26.47	-58 34 02.3	J112026.0-583355	10.30-10.45 3756.76 (1)	1.0801 (1)
37	08976-05241	11 40 28.00	-62 01 33.3	J114028.6-620142	11.80-12.05 2797.526 (6)	0.67691 (1)
38	08973-01607	11 59 50.03	-61 36 24.5	J115948.2-613618	11.90-12.15 2784.61 (3)	3.0247 (5)
39	08978-04572	12 07 42.38	-62 27 28.2	J120741.4-622720	10.75-11.00 2674.81 (1)	1.3404 (1)
40	08975-00871	12 24 09.81	-60 03 41.8	J122410.4-600337	12.00-12.25 4590.73 (1)	1.4921 (1)
41	08658-00162	12 27 19.94	-58 18 34.0	J122719.8-581831	9.30-9.60 3588.61 (2)	2.591 (1)
42	08989-00583	12 56 09.40	-61 27 25.5	J125609.4-612724	9.40-9.60 2705.735 (5)	0.55613 (4)
43	08706-00357	15 16 32.27	-58 55 23.3	J151633.2-585529	11.60-11.80 4561.73 (5)	5.403 (2)
44	08709-01243	15 54 13.61	-58 55 24.3	J155413.0-585532	8.45-8.65 4632.6 (5)	48.8 (1)
45	08722-03145	16 02 17.02	-59 44 31.6	J160216.7-594438	10.20-10.30 4503.854 (5)	0.54319 (2)
46	09037-01041	16 25 38.61	-61 48 35.9	J162539.3-614843	13.00-13.55 3772.8 (1)	9.426 (1)
47	08724-00206	16 39 07.84	-58 21 24.9	J163908.0-582121	10.15-10.50 3542.8 (4)	41.9 (1)
48	09072-00688	18 27 20.41	-62 24 14.6	J182720.9-622415	12.25-12.65 1994.77 (2)	2.7867 (1)
49	09089-01462	19 48 53.41	-62 07 52.7	J194851.0-620744	9.30-9.60 4587.8 (4)	42.5 (1)
50	09120-00185	22 23 11.33	-62 35 52.5	J222312.0-623555	11.35-11.75 2141.65 (6)	6.591 (2)

**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, which is somewhat typical of chromospherically active stars.  
Therefore the folded light curves are given for a distinct time period of time (described in figure as HJD 245 ....-.....).

**No. 26: GSC 08507-01025**

Period: 22.87(1) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/035941-5840.5.asas3.0.0.500.0.0](http://www.astrow.edu.pl/cgi-asas/asas_variable/035941-5840.5.asas3.0.0.500.0.0)

2MASS J-K: 0.727

Tycho-2: 8507-1025-1: Johnson B-V= 1.136 (derived from Tycho-2)

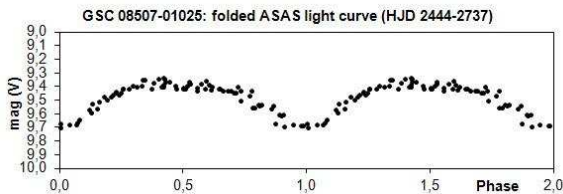
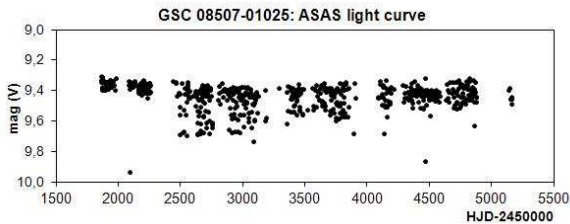
ROSAT: HR1= 0.44, HR2= 0.03, fxfopt= -2.69

Proper motion: pmRA: -12.62 mas/yr, pmDE: -28.41 mas/yr (Roeser et al., 2008)

Spectral type: K0III (Houk et al., 1975)

Known variable (UY Ret, type LB)

Likely an RS CVn variable

**No. 27: GSC 08869-00453**

Period: 3.652(5) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/043356-6129.3.asas3.0.0.500.0.0](http://www.astrow.edu.pl/cgi-asas/asas_variable/043356-6129.3.asas3.0.0.500.0.0)

2MASS J-K: 0.496

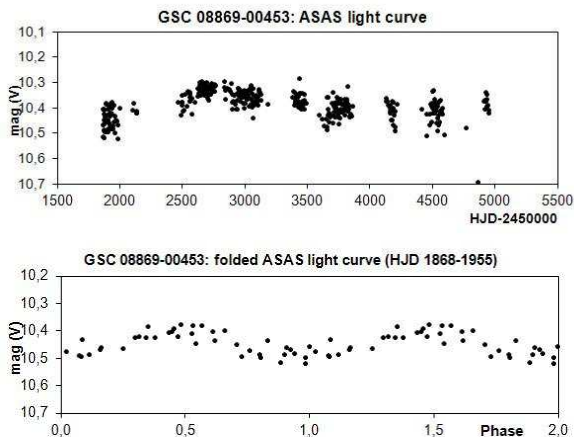
Tycho-2: 8869-453-1: Johnson B-V=0.576 (derived from Tycho-2)

ROSAT: HR1=0.04, HR2= 0.37, fxfopt= -2.32

Proper motion: pmRA: 32.73 mas/yr, pmDE: 18.92 mas/yr (Roeser et al., 2008)

Spectral type: G5 (Wright et al., 2003)

Likely an RS CVn variable

**No. 28: GSC 08911-02430**

Period: 2.306(2) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/074343-6107.3.asas3\\_0\\_0.500\\_0\\_0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/074343-6107.3.asas3_0_0.500_0_0)

2MASS J-K: 0.701

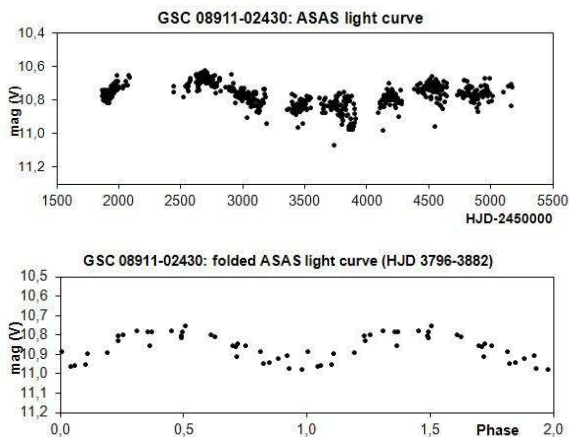
ROSAT: HR1=-0.18, HR2=0.27, fxfopt= -1.97

Tycho-2: 8911- 2430-1: Johnson B-V=0.929 (derived from Tycho-2)

Proper motion: pmRA: 2.71 mas/yr, pmDE: 26.92 mas/yr (Roesser et al., 2008)

Spectral type: KOV(e) (Torres et al., 2006)

Not to distinguish between RS CVn and BY Dra



**No. 29: GSC 08578-01465**

Period: 0.54924(1) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/080249-5913.5.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/080249-5913.5.asas3.0.0.500.0.0)

2MASS J-K: 0.615

Tycho-2: 8578-1465-1: Johnson B-V= 0.794 (derived from Tycho-2)

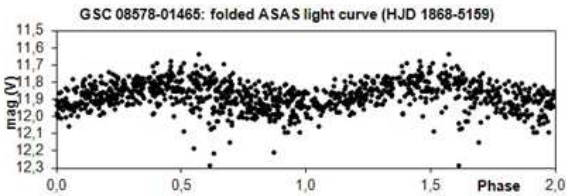
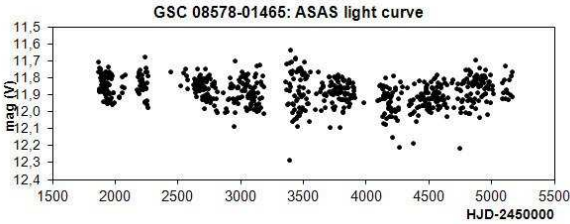
ROSAT: HR1= 0.17, HR2=-0.11, fxfopt= -1.66

Proper motion: pmRA: -35.55 mas/yr, pmDE: 30.92 mas/yr (Roeser et al., 2008)

ASAS variable (type RRC/EC/ESD)

Spectral type: K1IV(e); Li strong (Torres et. al, 2006)

Likely a young stellar object

**No. 30: GSC 08580-00916**

Period: 0.55257(5) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/083912-5834.5.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/083912-5834.5.asas3.0.0.500.0.0)

2MASS J-K: 0.525

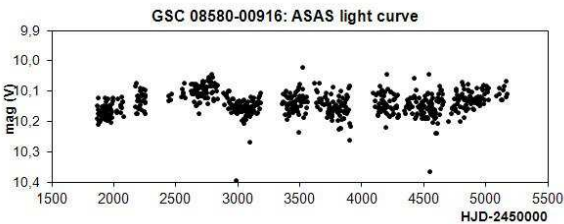
Tycho-2: 8580-916-1: Johnson B-V=0.653 (derived from Tycho-2)

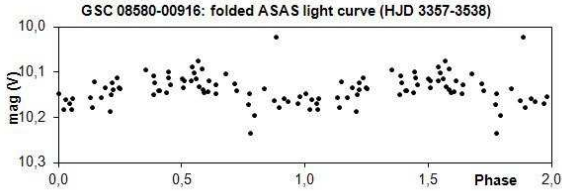
ROSAT: HR1=0.37, HR2=0.30, fxfopt= -2.09

Proper motion: pmRA: -27.58 mas/yr, pmDE: 37.16 mas/yr (Roeser et al., 2008)

Spectral type: G5V (Torres et al., 2006)

Likely an RS CVn variable



**No. 31: GSC 08930-601**

Period: 1.22508(6) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/084200-6218.4.asas3,0,0,500,0,0](http://www.astrow.edu.pl/cgi-asas/asas_variable/084200-6218.4.asas3,0,0,500,0,0)

2MASS J-K: 0.571

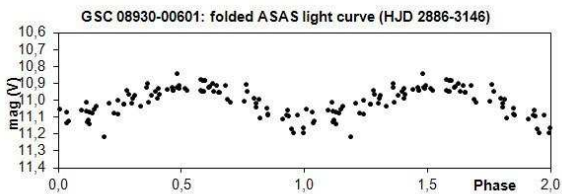
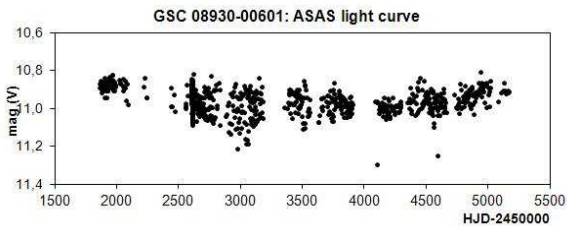
Tycho-2: 08930-00601-1: Johnson B-V= 1.024 (derived from Tycho-2)

ROSAT: HR1= 0.08, HR2= 0.25, fxfopt= -1.96

Proper motion: pmRA: -11.11 mas/yr, pmDE: 16.53 mas/yr (Roeser et al., 2008)

Spectral type: K0V (Torres et al., 2006)

Likely an RS CVn variable



**No. 32: GSC 08927-03620**

Period: 0.87056(3) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/085849-6115.3.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/085849-6115.3.asas3.0.0.500.0.0)

2MASS J-K: 0.548

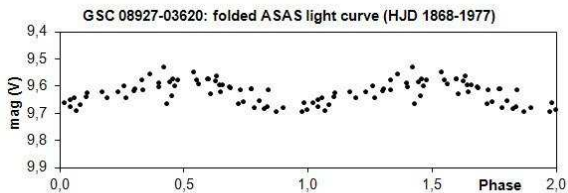
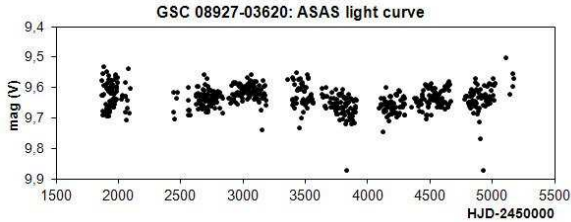
Tycho-2: 8927-3620-1: Johnson B-V= 0.685 (derived from Tycho-2)

ROSAT: HR1= 0.16, HR2= 0.04, fxfopt= -1.92

Proper motion: pmRA: -8.05 mas/yr, pmDE: 11.49 mas/yr (Roeser et al., 2008)

Spectral type: G8IV; Li strong (Torres et al., 2006)

Likely a young stellar object

**No. 33: GSC 08595-01161**

Period: 15.05(1) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/091247-5839.3.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/091247-5839.3.asas3.0.0.500.0.0)

2MASS J-K: 0.622

Tycho-2: 8595-1161-1: Johnson B-V= 0.944 (derived from Tycho-2)

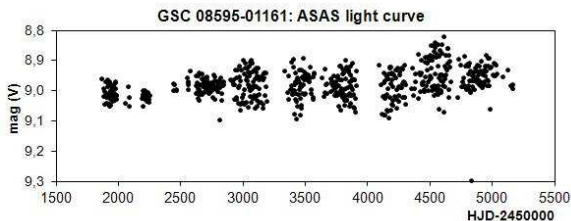
ROSAT: HR1= 0.05, HR2= 0.06, fxfopt= -2.06

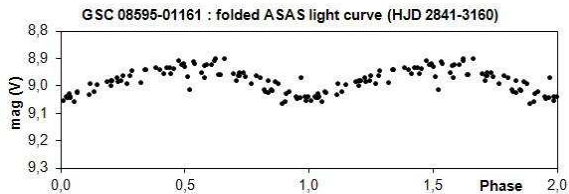
Proper motion: pmRA: -97.18 mas/yr, pmDE: 15.89 mas/yr (Roeser et al., 2008)

Spectral type: K0III SB2 (Torres et al., 2006)

ASAS variable (type RRC/EC/ESD)

Likely an RS CVn variable



**No. 34: GSC 08946-00872**

Period: 0.53265(1) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/095515-6203.5.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/095515-6203.5.asas3.0.0.500.0.0)

2MASS J-K: 0.572

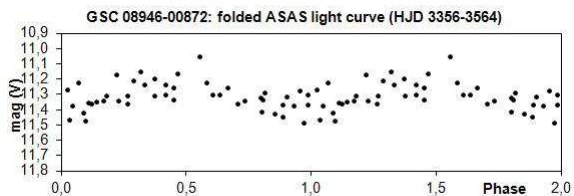
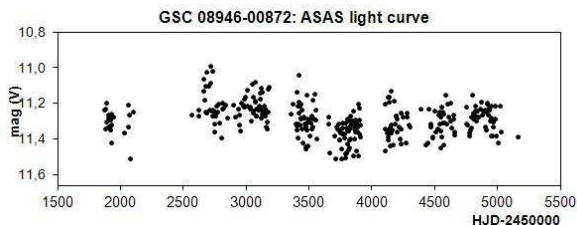
Tycho-2: 8946-872-1: Johnson B-V= 1.077 (derived from Tycho-2)

ROSAT: HR1=0.19, HR2= 0.46,  $f_{\text{fopt}} = -1.85$ 

Proper motion: pmRA: -16.05 mas/yr, pmDE: 3.55 mas/yr (Roeser et al., 2008)

Spectral type: K2V; Li strong (Torres et al., 2006)

Likely a young stellar object





**No. 35: GSC 08947-00153**

Period: 6.217(1) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/100231-6203.5.asas3.0.0.500.0.0](http://www.astrow.edu.pl/cgi-asas/asas_variable/100231-6203.5.asas3.0.0.500.0.0)

2MASS J-K: 0.731

Tycho-2: 8947-153-1: Johnson B-V= 0.791 (derived from Tycho-2)

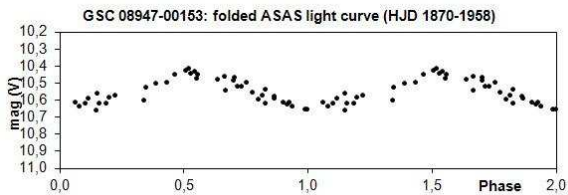
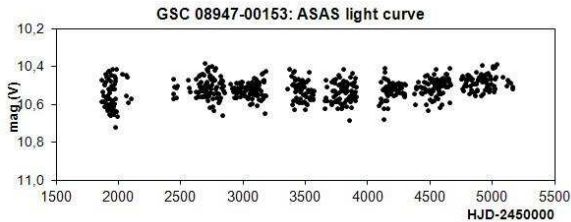
ROSAT: HR1= 0.33, HR2=0.52, fxfopt= -2.23

Proper motion: pmRA: -66.81 mas/yr, pmDE: 31.20 mas/yr (Roeser et al., 2008)

Spectral type: K0IIIe (Torres et al., 2006)

ASAS variable (type Misc)

Likely an RS CVn variable

**No. 36: GSC 08629-00597**

Period: 1.0801(1) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/112026-5834.0.asas3.0.0.500.0.0](http://www.astrow.edu.pl/cgi-asas/asas_variable/112026-5834.0.asas3.0.0.500.0.0)

2MASS J-K: 0.535

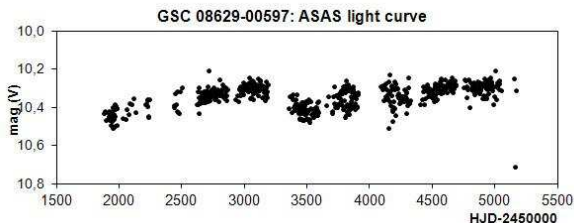
Tycho-2: 8629-597-1: Johnson B-V= 0.558 (derived from Tycho-2)

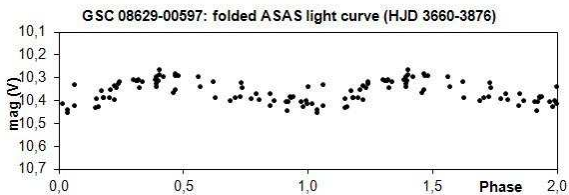
ROSAT: HR1=0.04, HR2=-0.01, fxfopt= -2.27

Proper motion: pmRA: 1.82 mas/yr, pmDE: -22.58 mas/yr (Roeser et al., 2008)

Spectral type: K0 (Fabricius et al., 2002)

Likely an RS CVn variable



**No. 37: GSC 08976-05241**

Period: 0.67691(1) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/114028-6201.6.asas3\\_0\\_0.500\\_0\\_0](http://www.astrow.edu.pl/cgi-asas/asas_variable/114028-6201.6.asas3_0_0.500_0_0)

2MASS J-K: 0.897

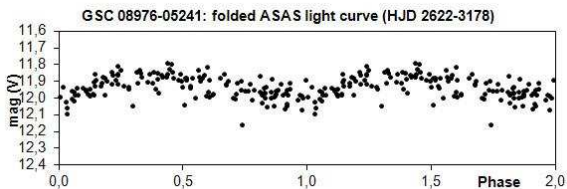
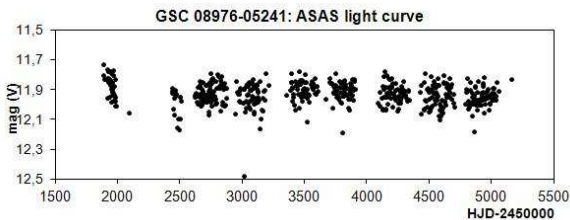
ROSAT: HR1= -0.06 , HR2= -0.05, fxfopt= -2.06

Proper motion: pmRA: -29.96 mas/yr, pmDE: -11.07 mas/yr (Roesser et al., 2008)

ASAS variable (I band variable, no type given)

Spectral type: K7 (Riaz et al., 2006)

Probable BY Dra variable



**No. 38: GSC 08973-01607**

Period: 3.0247(5) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/115950-6136.4,asas3.0.0.500.0.0](http://www.astrow.edu.pl/cgi-asas/asas_variable/115950-6136.4,asas3.0.0.500.0.0)

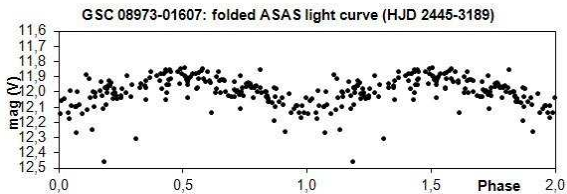
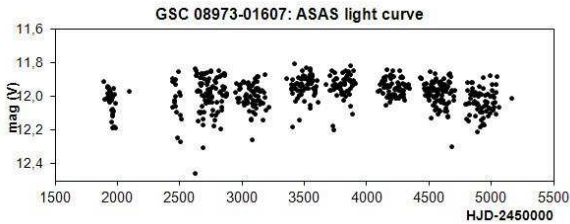
2MASS J-K: 0.857

ROSAT: HR1=0.02, HR2=0.03, fxfopt=-1.68

Proper motion: pmRA: -31.99 mas/yr, pmDE: -6.66 mas/yr (Roeser et al., 2008)

Spectral type: K7 (Riaz et al., 2006)

Probable BY Dra variable

**No. 39: GSC 08978-04572**

Period: 1.3404(1) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/120742-6227.5,asas3.0.0.500.0.0](http://www.astrow.edu.pl/cgi-asas/asas_variable/120742-6227.5,asas3.0.0.500.0.0)

2MASS J-K: 0.707

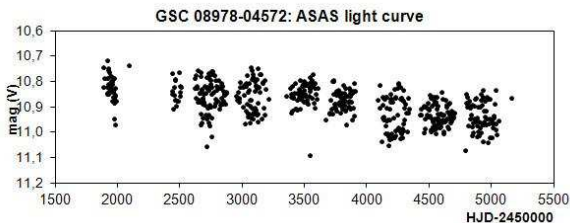
Tycho-2: 8978-4572-1 : Johnson B-V= 0.732 (derived from Tycho-2)

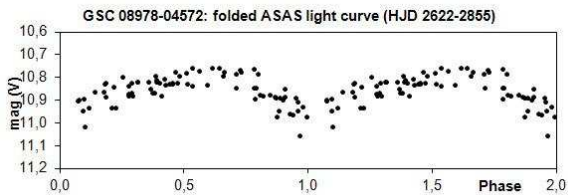
ROSAT: HR1= 0.13, HR2=-0.04, fxfopt= -2.36

Proper motion: pmRA: -34.18 mas/yr, pmDE: -10.02 mas/yr (Roeser et al., 2008)

Spectral type: K3Ve; Li strong (Torres et al., 2006)

Likely a young stellar object



**No. 40: GSC 08975-00871**

Period: 1.4921(1) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/122409-6003.7.asas3\\_0\\_0.500\\_0\\_0](http://www.astrow.edu.pl/cgi-asas/asas_variable/122409-6003.7.asas3_0_0.500_0_0)

2MASS J-K: 0.831

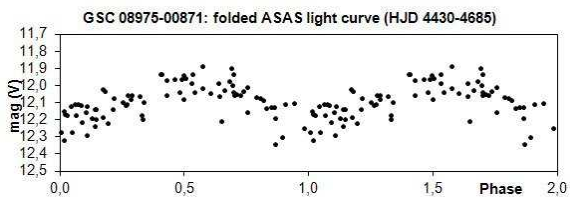
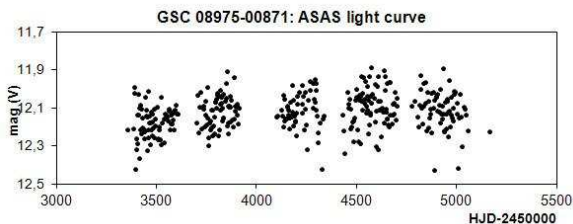
Tycho-2: 8975-871-1: Johnson B-V= 1.057 (derived from Tycho-2)

ROSAT: HR1= -0.20, HR2= 0.45, fxfopt=-1.92

Proper motion: pmRA: -39.48 mas/yr, pmDE: -9.47 mas/yr (Roesser et al., 2008)

Spectral type: K7 (Riaz et al., 2006)

Probable BY Dra variable



**No. 41: GSC 08658-00162**

Period: 2.591(1) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/122719-5818.6.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/122719-5818.6.asas3.0.0.500.0.0)

2MASS J-K: 0.567

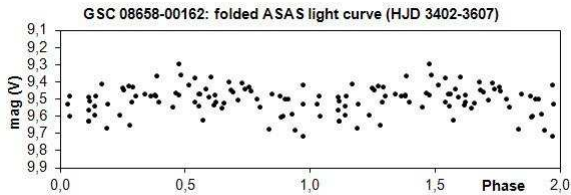
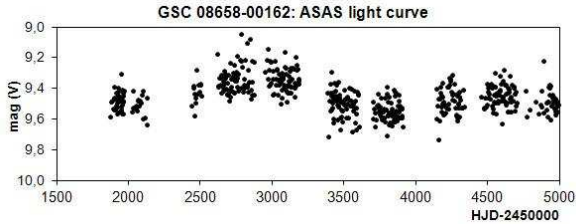
Tycho-2: 8658-162-1: Johnson B-V= 0.781 (derived from Tycho-2)

ROSAT: HR1=0.29, HR2=0.10, fxfopt= -2.43

Proper motion: pmRA: 53.78 mas/yr, pmDE: -97.71 mas/yr (Roeser et al., 2008)

Member of Sco OB2\_4 association (Hoogerwerf, 2000)

Likely a young stellar object

**No. 42: GSC 08989-00583**

Period: 0.55613(4) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/125609-6127.4.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/125609-6127.4.asas3.0.0.500.0.0)

2MASS J-K: 0.556

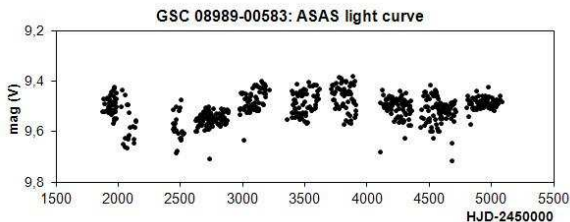
Tycho-2: 8989-583-1: Johnson B-V= 0.787 (derived from Tycho-2)

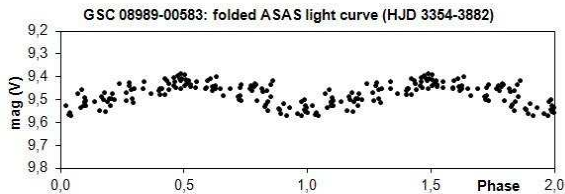
ROSAT: HR1= 0.13, HR2=0.35, fxfopt= -1.95

Proper motion: pmRA: -49.46 mas/yr, pmDE: -16.04 mas/yr (Roeser et al., 2008)

Spectral type: K0Ve Li strong (Torres et al., 2006)

Likely a young stellar object



**No. 43: GSC 08706-00357**

Period: 5.403(2) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/151632-5855.4.asas3,0,0.500,0,0](http://www.astrow.edu.pl/cgi-asas/asas_variable/151632-5855.4.asas3,0,0.500,0,0)

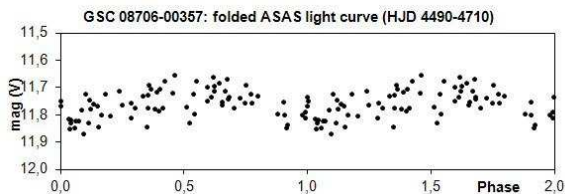
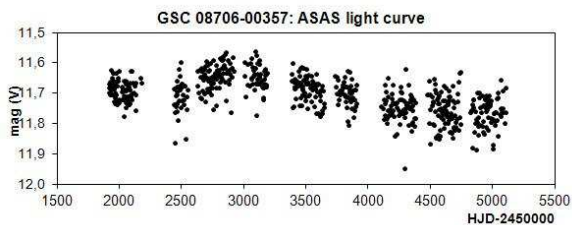
2MASS J-K: 0.806

ROSAT: HR1= -0.18, HR2= 0.35, fxfopt= -1.93

Proper motion: pmRA: -44.96 mas/yr, pmDE: -46.98 mas/yr (Roesser et al., 2008)

Spectral type: K7 (Riaz et al., 2006)

Probable BY Dra variable



**No. 44: GSC 08709-01243**

Period: 48.8(1) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/155414-5855.4.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/155414-5855.4.asas3.0.0.500.0.0)

2MASS J-K: 0.791

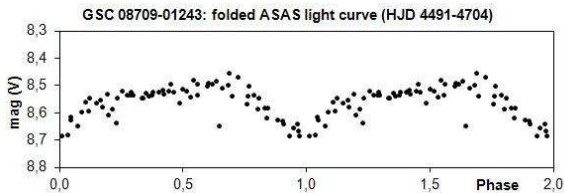
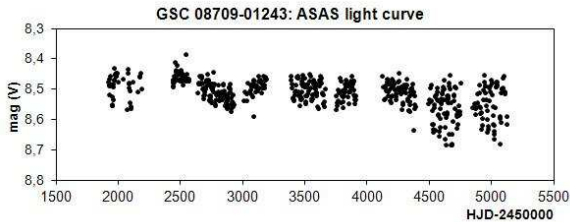
Tycho-2: 8709-1243-1: Johnson B-V= 1.266 (derived from Tycho-2)

ROSAT: HR1=0.87, HR2= 0.18, fxfopt= -3.48

Proper motion: pmRA: 24.11 mas/yr, pmDE: 6.17 mas/yr (Roeser et al., 2008)

Spectral type: K3III (Torres et al., 2006)

Likely an RS CVn variable

**No. 45: GSC 08722-03145**

Period: 0.54319(2) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/160217-5944.5.asas3.0.0.500.0.0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/160217-5944.5.asas3.0.0.500.0.0)

2MASS J-K: 0.565

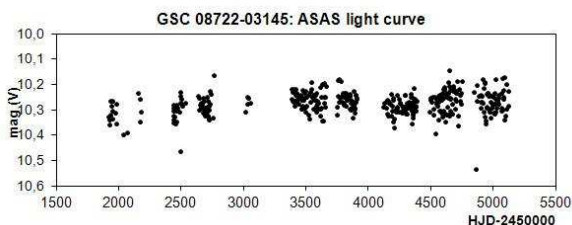
Tycho-2: 8722-3145-1: Johnson B-V= 0.705 (derived from Tycho-2)

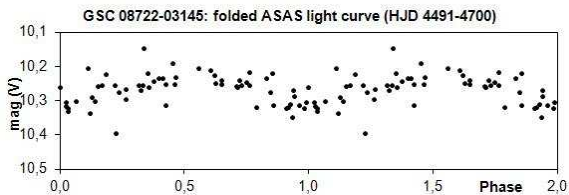
ROSAT: HR1=-0.16, HR2=-0.17, fxfopt= -2.12

Proper motion: pmRA: -16.21 mas/yr, pmDE: -61.90 mas/yr (Roeser et al., 2008)

Spectral type: G8V(e) SB2 (Torres et al., 2006)

Likely an RS CVn variable



**No. 46: GSC 09037-01041**

Period: 9.426(1) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/162538-6148.6.asas3\\_0\\_0.500\\_0\\_0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/162538-6148.6.asas3_0_0.500_0_0)

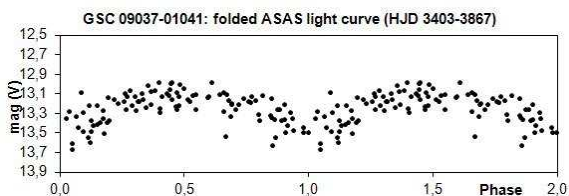
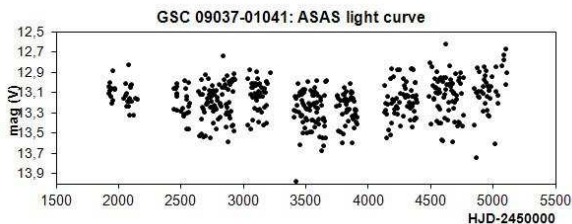
2MASS J-K: 0.806

ROSAT: HR1=0.77, HR2= 0.77, fxfopt= -1.62

Proper motion: pmRA: -5.78 mas/yr, pmDE: -7.45 mas/yr (Roeser et al., 2008)

Spectral type: K5 (Riaz et al., 2006)

Probable BY Dra variable





**No. 47: GSC 08724-00206**

Period: 41.9(1) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/163908-5821.4,asas3.0.0.500.0.0](http://www.astrow.edu.pl/cgi-asas/asas_variable/163908-5821.4,asas3.0.0.500.0.0)

2MASS J-K: 0.727

Tycho-2: 8724-206-1: Johnson B-V= 1.115 (derived from Tycho-2)

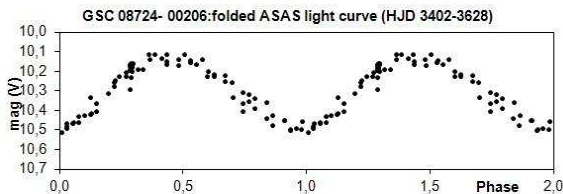
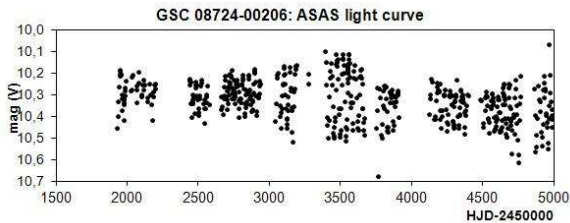
ROSAT: HR1= 0.81, HR2= 0.30, fxfopt= -2.50

Proper motion: pmRA: -29.81 mas/yr, pmDE: -11.21 mas/yr (Roeser et al., 2008)

ASAS variable (type MISC/SR)

Spectral type: K0III SB2 (Torres et al., 2006)

Likely an RS CVn variable

**No. 48: GSC 09072-00688**

Period: 2.7867(1) d

ASAS data:

[http://www.astrow.edu.pl/cgi-asas/asas\\_variable/182720-6224.3,asas3.0.0.500.0.0](http://www.astrow.edu.pl/cgi-asas/asas_variable/182720-6224.3,asas3.0.0.500.0.0)

2MASS J-K: 0.802

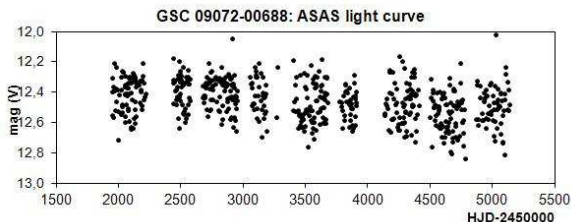
ROSAT: HR1= 1.00, HR2= 0.28, fxfopt= -1.17

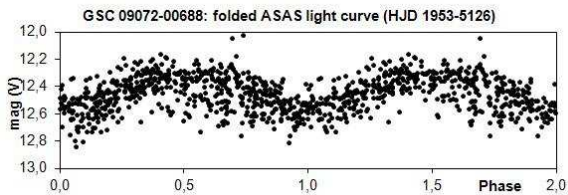
Proper motion: pmRA: -1.83 mas/yr, pmDE: 0.94 mas/yr (Roeser et al., 2008)

ASAS variable (type ESD)

Spectral type: K5 (Riaz et al., 2006)

Probable BY Dra variable



**No. 49: GSC 09089-01462**

Period: 42.5(1) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/194853-6207.9.asas3,0,0,500,0,0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/194853-6207.9.asas3,0,0,500,0,0)

2MASS J-K: 0.691

Tycho-2: 9089-1462-1: Johnson B-V= 1.169 (derived from Tycho-2)

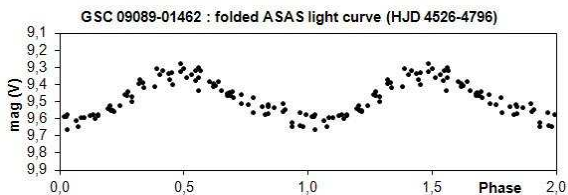
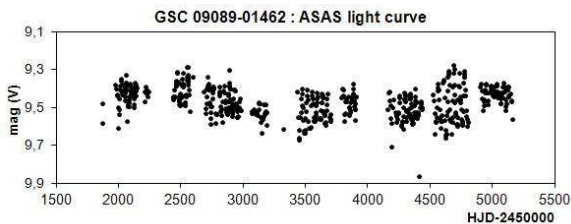
ROSAT: HR1= 0.38, HR2=-0.05, fxfopt= -2.26

Proper motion: pmRA: -20.85 mas/yr, pmDE: -1.49 mas/yr (Roeser et al., 2008)

ASAS variable (type MISC)

Spectral type: K2III (Torres et al., 2006)

Likely an RS CVn variable



**No. 50: GSC 09120-00185**

Period: 6.591(2) d

ASAS data:

[http://www.astrouw.edu.pl/cgi-asas/asas\\_variable/222311-6235.9,asas3,0,0,500,0,0](http://www.astrouw.edu.pl/cgi-asas/asas_variable/222311-6235.9,asas3,0,0,500,0,0)

2MASS J-K: 0.802

Tycho-2: 9120-185-1: Johnson B-V=1.358 (derived from Tycho-2)

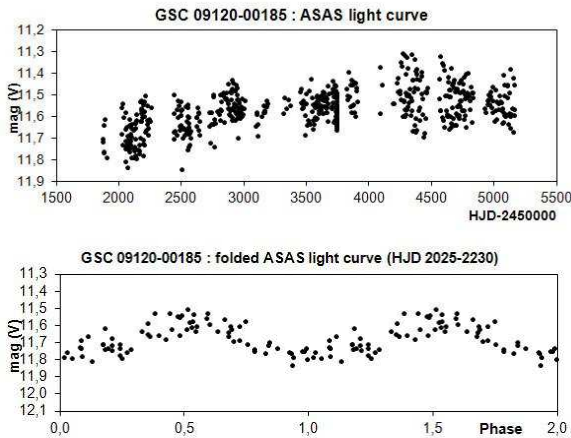
ROSAT: HR1= 0.26, HR2= 0.06, fxfopt= -1.03

Proper motion: pmRA: 4.62 mas/yr, pmDE: -2.80 mas/yr (Roeser et al., 2008)

ASAS variable (type CW-FU)

Spectral type: K4IVe SB2 (Torres et al., 2006)

Likely an RS CVn variable



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