

Reclassification of ROTSE-1 Cepheids: 18 new chromospherically active stars

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Abstract: 18 new chromospherically active stars are presented, which were previously identified as Cepheids: GSC 978-01306, GSC 966-00193, GSC 1541-00191, GSC 2058-00642, GSC 2.2 N022132016439, GSC 2598-01430, GSC 2557-01181, GSC 2560-00711, GSC 2541-00338, GSC 2636-00533, GSC 2617-01977, GSC 2579-00167, GSC 3021-00206, GSC 3062-01317, GSC 3130-01158, GSC 3527-00201, GSC 3106-00264, GSC 3115-01770

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) 18 new chromospherically active stars have been found, which were previously identified as Cepheids (Akerlof et al. 2000). 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 the “ROTSE Cepheids” in the SuperWASP survey area would coincide with one of the ROSAT sources falling within their survey area, but 13 ROTSE Cepheids coincident with ROSAT sources were found. Therefore, it is also very likely that the X-ray identifications of the “ROTSE Cepheids” given in this paper are correct.

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 (Høg 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 (Skiff 2007) and high proper motions (Zacharias et al. 2005, Ivanov 2007) support the classification as chromospherically active stars. Because of the high absolute magnitudes of Cepheids their large distances should result in small proper motions. The periods found here are all consistent with those reported for these stars by Akerlof et al. (2000).

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

No.	GSC	RA (2000)	Dec	Range (NSVS)	Per.(d)	Epoch (max., HJD)	NSVS
1	GSC 978-01306	17 17 11.52	+08 15 24.5	11.8-11.9	3.098	2451306.92	13680204
2	GSC 966-0193	16 47 03.47	+09 45 58.2	11.3-11.5	4.586	2451310.76	10749766
3	GSC 1541-00191	17 24 04.97	+18 29 37.3	11.0-11.2	11.563	2451426.71	10826221
4	GSC 2058-00642	16 51 23.14	+23 55 41.1	12.0-12.2	3.026	2451359.75	7903069
5		18 23 19.13	+24 16 16.3	12.6-12.9	33.861	2451304.73	8153684
6	GSC 2598-01430	17 05 38.09	+33 51 00.4	11.5-11.7	5.778	2451606.85	7948049
7	GSC 2557-01181	14 45 41.04	+34 07 20.2	11.2-11.4	11.131	2451312.73	7760395
8	GSC 2560-00711	14 38 06.93	+35 49 41.0	12.2-12.4	1.384	2451310.73	7756919
9	GSC 2541-00338	13 19 25.98	+36 04 06.7	11.1-11.3	16.599	2451607.69	7688162
10	GSC 2636-00533	18 33 40.24	+36 13 19.4	11.6-11.8	11.733	2451465.65	8222790

11	GSC 2617-01977	17 31 48.46 +36 32 14.2	13.3-13.6	13.378	2451287.87	8041586
12	GSC 2579-00167	16 05 18.16 +37 26 24.5	12.2-12.4	5.915	2451332.69	7850758
13	GSC 3021-00206	12 43 28.13 +37 57 35.4	10.7-11.0	11.034	2451312.87	7645885
14	GSC 3062-01317	16 21 57.24 +38 17 33.2	10.2-10.4	31.977	2451460.63	5238499
15	GSC 3130-01158	18 47 06.26 +43 40 34.5	10.8-11.0	39.637	2451312.71	5502141
16	GSC 3527-00201	18 37 07.27 +45 07 41.4	10.6-10.7	55.121	2451437.73	5450255
17	GSC 3106-00264	18 07 32.56 +40 15 27.2	12.4-12.6	4.574	2451287.69	5373030
18	GSC 3115-01770	18 17 05.25 +43 49 59.8	11.6-11.7	13.018	2451481.58	5473919

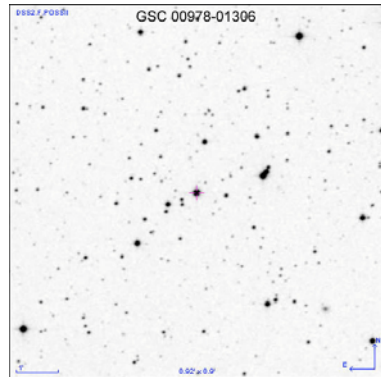
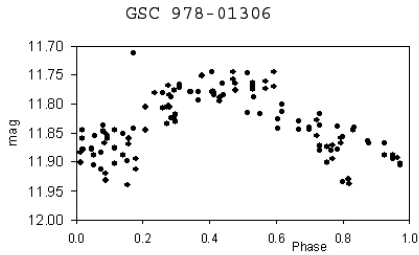
Folded light curves (with the period given above), finding charts and comments:

No. 1: GSC 978-01306

ROTSE1 J171711.85+081521.4

1RXS J171710.2+081535

Proper motion 30 mas/yr (Zacharias et al. 2005)



No. 2: GSC 966-0193

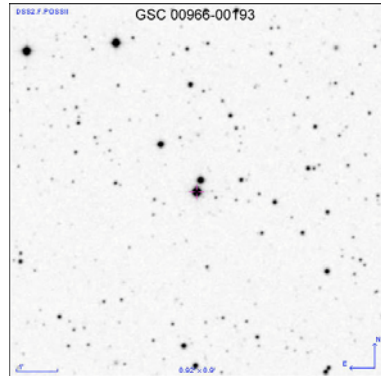
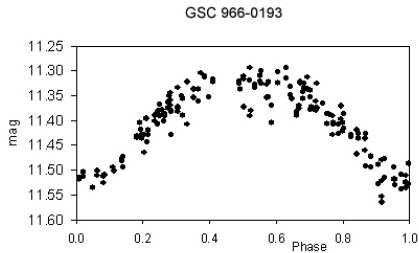
ROTSE1 J164703.37+094601.4

IRXS J164702.9+094608

TYC 966-193-1 Johnson B-V=0.987 (derived from Tycho-2)

Proper motion 25 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable



No. 3: GSC 1541-00191

ROTSE1 J172404.95+182937.3

IRXS J172405.5+182933

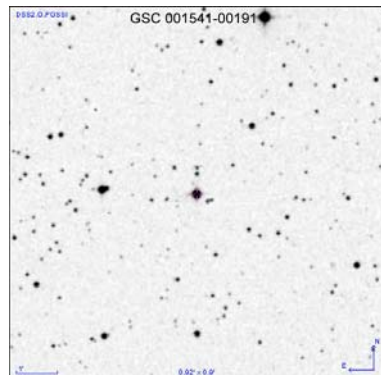
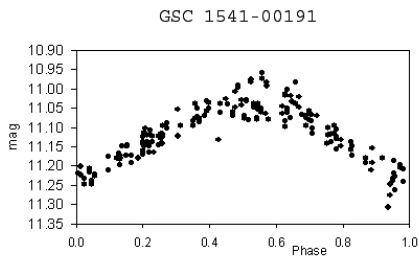
TYC 1541-191-1 Johnson B-V=0.751 (derived from Tycho-2)

Variability was detected by ASAS (type: Misc):

<http://www.astrouw.edu.pl/cgi-asas/asas_variable/172405+1829.6,asas3,11.487749,2732.000000,0,0>

Proper motion 16 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable



No. 4: GSC 2058-00642

ROTSE1 J165123.13+235539.7

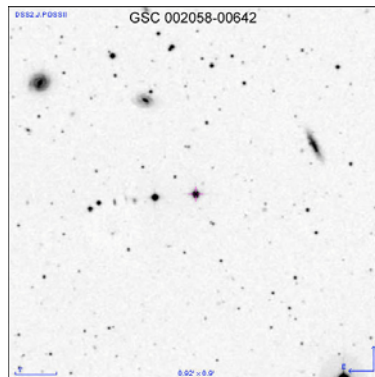
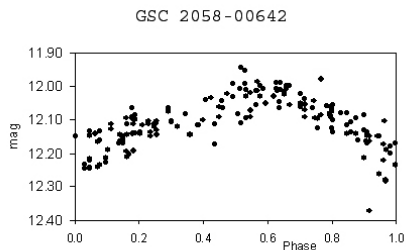
1RXS J165121.8+235547

TYC 2058-642-1 Johnson B-V=0.827 (derived from Tycho-2)

Star with high proper motion (Ivanov 2007)

Proper motion 13 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable

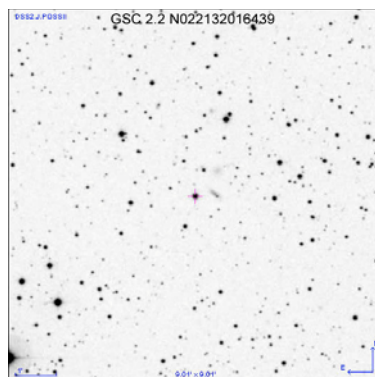
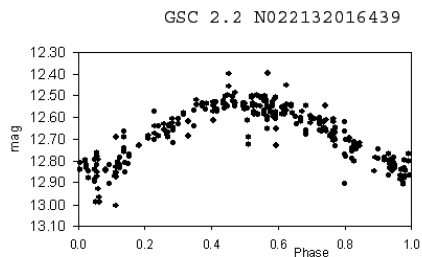


No. 5: GSC 2.2 N022132016439

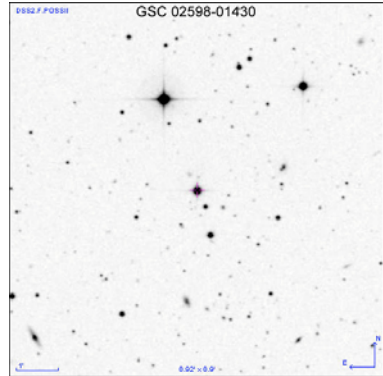
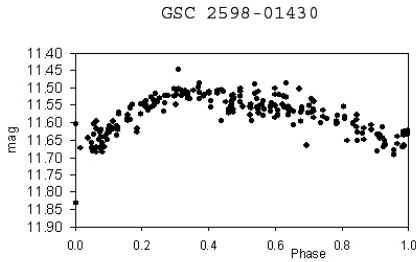
ROTSE1 J182319.18+241614.2

1RXS J182318.4+241617

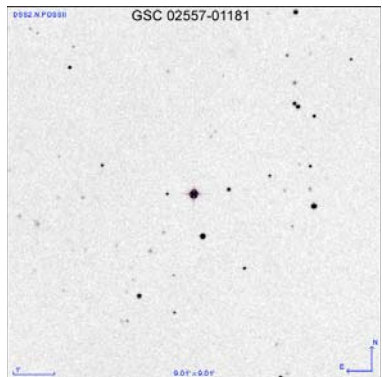
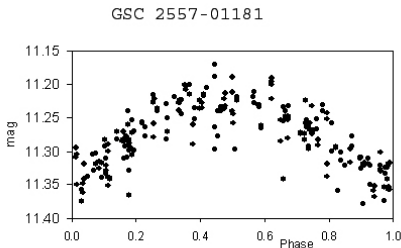
Proper motion 12 mas/yr (Zacharias et al. 2005)



- No. 6: GSC 2598-01430
 ROTSE1 J170537.88+335052.5
 IRXS J170538.2+335103
 TYC 2598-1430-1 Johnson B-V=0.881 (derived from Tycho-2)
 Proper motion 25 mas/yr (Zacharias et al. 2005)
 Likely a RS CVn variable



- No. 7: GSC 2557-01181
 ROTSE1 J144540.93+340714.0
 IRXS J144541.8+340718
 TYC 2557-1181-1 Johnson B-V=0.795 (derived from Tycho-2)
 Star with high proper motion (Ivanov 2007)
 Proper motion 63 mas/yr (Zacharias et al. 2005)
 Likely a RS CVn variable



No. 8: GSC 2560-00711

ROTSE1 J143806.75+354941.3

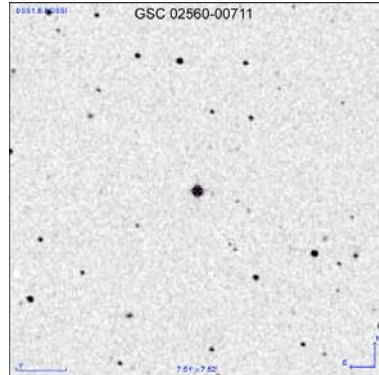
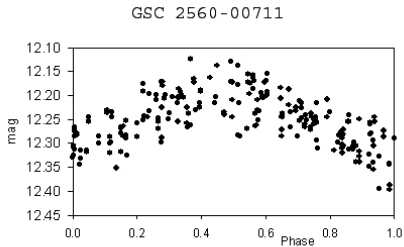
IRXS J143806.5+354948

TYC 2560-711-1 Johnson B-V=0.478 (derived from Tycho-2)

Star with high proper motion (Ivanov 2007)

Proper motion 112 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable

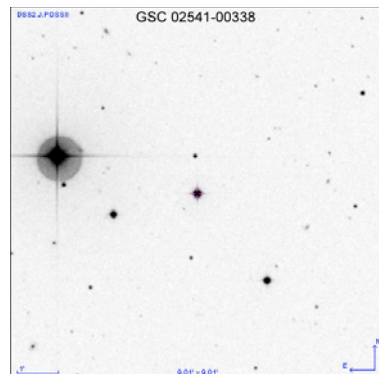
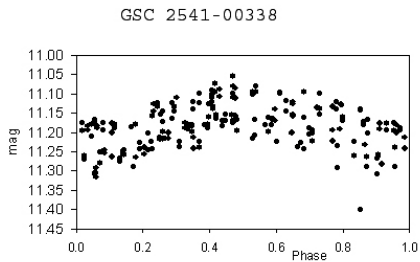


No. 9: GSC 2541-00338

ROTSE1 J131925.99+360407.5

IRXS J131926.2+360357

Proper motion 13 mas/yr (Zacharias et al. 2005)



No. 10: GSC 2636-00533

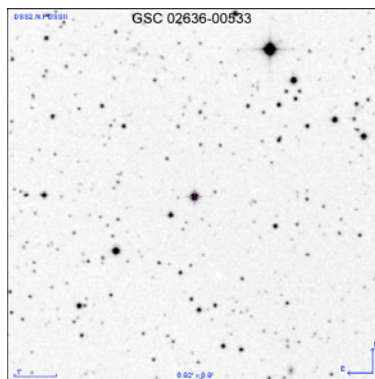
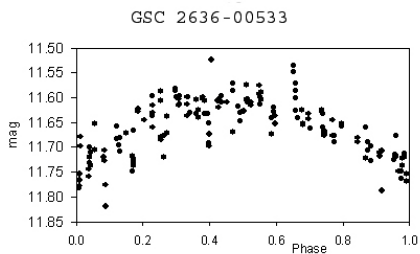
ROTSE1 J183340.49+361316.3

IRXS J183340.3+361311

TYC 2636-533-1 Johnson B-V=0.803 (derived from Tycho-2)

Proper motion 23 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable

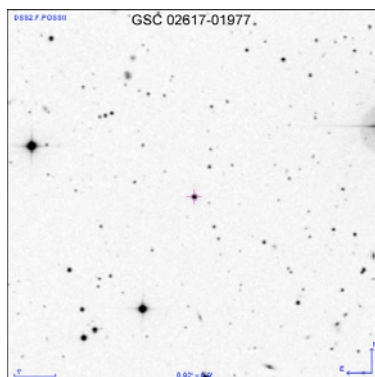
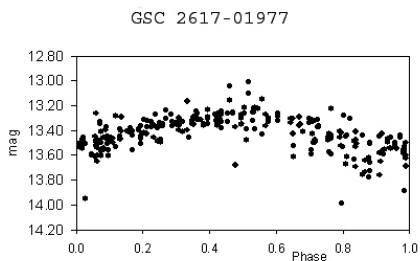


No. 11: GSC 2617-01977

ROTSE1 J173148.31+363215.8

IRXS J173147.8+363201

Proper motion 17 mas/yr (Zacharias et al. 2005)



No. 12: GSC 2579-00167

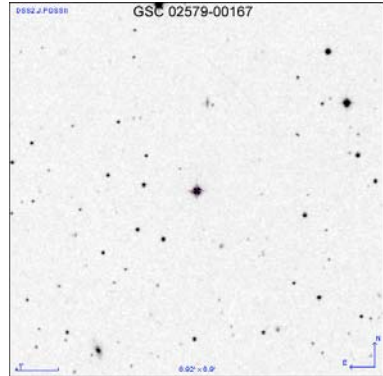
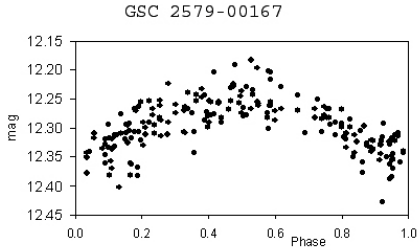
ROTSE1 J160518.19+372623.5

IRXS J160520.3+372627

TYC 2579-167-1 Johnson B-V=0.397 (derived from Tycho-2)

Proper motion 41 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable



No. 13: GSC 3021-00206

ROTSE1 J124327.98+375736.0 TYC 3021-206-1

IRXS J124328.0+375731

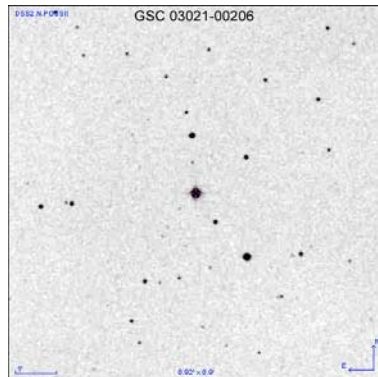
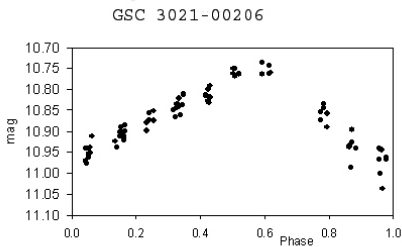
TYC 3021-206-1 Johnson B-V=0.814 (derived from Tycho-2)

Spectral type: K2V (Skiff 2007)

Star with high proper motion (Ivanov 2007)

Proper motion 58 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable



No. 14: GSC 3062-01317

ROTSE1 J162157.22+381733.6 TYC 3062-1317-1

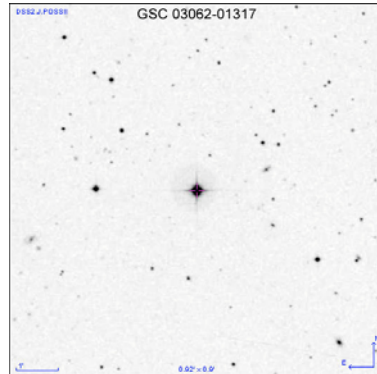
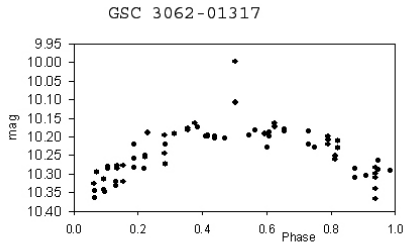
1RXS J162157.6+381727

TYC 3062-1317-1 Johnson B-V=1.288 (derived from Tycho-2)

Star with high proper motion (Ivanov 2007)

Proper motion 49 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable



No. 15: GSC 3130-01158

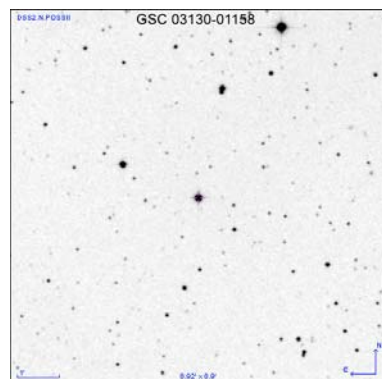
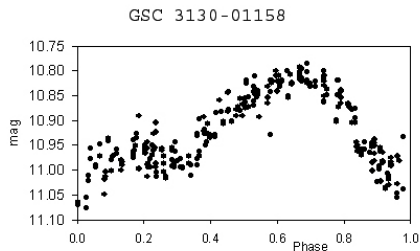
ROTSE1 J184706.07+434032.7

1RXS J184707.8+434038

TYC 3130-1158-1 Johnson B-V=1.060 (derived from Tycho-2)

Negligible proper motion (Zacharias et al. 2005)

Likely a RS CVn variable



No. 16: GSC 3527-00201

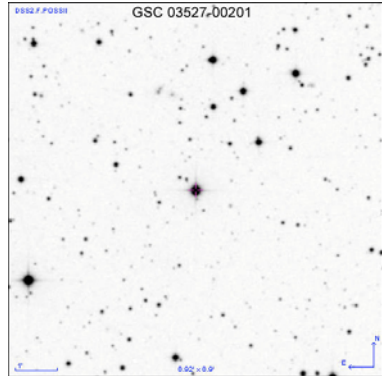
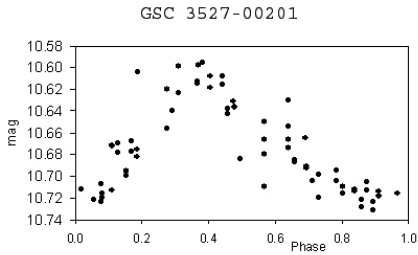
ROTSE1 J183707.28+450740.9 TYC 3527-201-1

IRXS J183707.4+450730

TYC 3527-201-1 Johnson B-V=1.112 (derived from Tycho-2)

Negligible proper motion (Zacharias et al. 2005)

Likely a RS CVn variable



No. 17: GSC 3106-00264

ROTSE1 J180733.25+401530.1

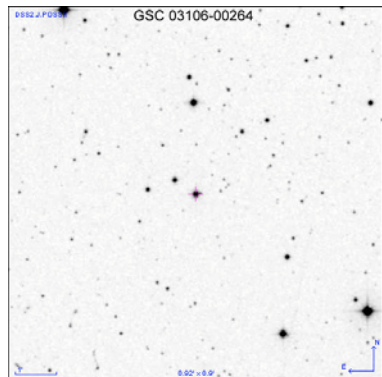
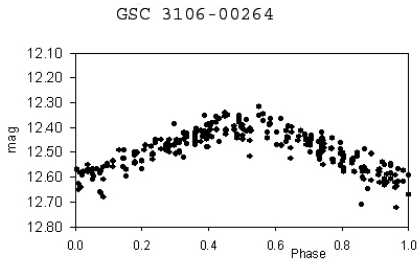
IRXS J180732.1+401531

PQ Her

Spectral type: G8 (Skiff 2007)

Proper motion 15 mas/yr (Zacharias et al. 2005)

Likely a RS CVn variable



No. 18: GSC 3115-01770

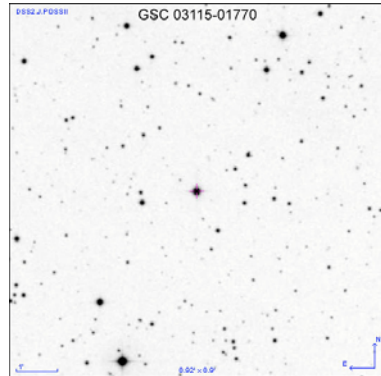
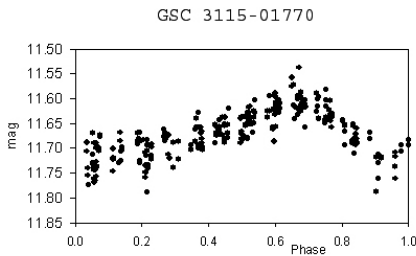
ROTSE1 J181705.18+434959.1

1RXS J181705.0+435006

TYC 3115-1770-1 Johnson B-V=1.61 (derived from Tycho-2)

Proper motion 10 mas/yr (Zacharias et al. 2005)

Possibly a BY Dra star



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