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12 NEW VARIABLE STARS DISCOVERD FROM PATROL FILMS (NEW VARIABLE STARS SERIES II)

Kesao Takamizawa
(65-1 Oohinata, Saku-machi, Nagano, 384-0502 Japan)
E-mail: GHA07243@niftyserve.or.jp
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1. Introduction

The author reported on nine new variable stars in the last bulletin (Takamizawa,1997a). In this bulltein, I report on 12 new variable stars. Seven of them are Mira-type, four of them are SR. The last one is L. The summary of the 12 newvariable stars is given in Table 1.

Table 1. New variable stars

Desig.	R.A. (J2000.0)	Decl.	max	min	type	period	epoch JD 2400000+
TmzV12	06 43 04:28	+15°03'44".0	10.6	14.2p	M	200:	50373
TmzV14	17 19 21:57	-05°49'13".2	12.3	(15.6p	M	330:	50110:
TmzV15	16 44 49:95	-20°12'16".7	11.7	(15.5p	M:	330:	50133:
TmzV16	18 01 44:44	-10°40'25".2	12.7	15.3p	M	257	50650
TmzV18	17 27 52:89	-13°41'02".4	13.8	(14.7p	M	200:	50330:
TmzV19	17 54 33:88	-10°14'33".4	13.1	14.4p	L	-	-
TmzV20	19 05 21:30	-03°18'33".7	12.8	(14.6p	M	98	50710
TmzV21	07 14 33:77	-32°59'47".6	11.5	(15.0p	M	570	50835
TmzV22	05 27 36:32	+48°42'23".0	10.5	11.3p	SR	-	-
TmzV25	15 03 31:98	-09°44'31".5	12.8	14.6p	SR	-	-
TmzV26	16 05 12:16	+10°40'33".2	11.8	14.5p	SR:	-	-
TmzV28	15 01 31:56	+02°26'19".9	12.3	14.1p	SR	-	-

¤ JD-2400000.

The observations were done at Saku Observatory (Saku-machi,Nagano,Japan),using the twin 10cm patrol cameras (PENTAX 100SDUF °=400mm) and T-Max400 ¯lms. The magnitude was determined against neighboring GSC stars.

2. TmzV12

The star is identicial with USNO 1050.04220117 = IRAS 06402+1506.The star is a Mira-type variable with a range of 10.6-14.2,and period of about 200d.The staris visible at mag.12.7 on Real-Sky CD. The C-type spectrum is expected from the identity with the carbonstar CS 1362.(Takamizawa 1997b)

Table 2. Observations of TmzV12

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49417.937	13.4	50071.140	14.0	50693.292	(13.5
49444.968	14.1	50094.992	13.8	50721.260	13.1
49472.025	(12.5	50150.938	11.6	50748.248	12.6
49690.237	14.2	50373.269	10.6	50786.186	11.3
49767.997	11.6	50424.132	11.7	50807.103	11.4
50016.231	12.1	50691.300	(13.5	50861.968	12.4

3. TmzV14

TmzV14 is identicial with USNO 0825.10361606 = IRAS 17166-0546. This star is a Mira-type variable star with a range of 12.3-(15.6p,and period of about 330d. The star is visible at mag. 14 on Real-Sky CD(Takamizawa 1997c).

Table 3. Observations of TmzV14

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49454.299	13.5	49759.298	14.4	50254.067	(15.6
49479.185	14.3	49775.267	14.2	50492.311	14.7
49507.144	14.7	49834.169	15.0	50606.151	(15.6
49518.003	14.8	50003.908	(15.2	50631.031	(15.6
49620.962	15.3	50109.329	12.3	50746.897	13.2
49647.887	(15.2	50135.296	13.1	50839.340	(14.0
49745.330	(15.0	50213.092	15.4		

4. TmzV15

The star is identical with USNO 0675.11165528 = IRAS 16418-2006. This star is Mira-type variable star with a range 11.7-(15.6,and a period of about 330d.The star is visible at mag 19 on Real-Sky CD, and at mag (15 on Atlas Stellarum (Takamizawa 1997c).

Table 4. Observations of TmzV15

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49401.307	13.1	49756.284	13.3	50254.049	15.3
49454.276	14.1	49775.258	13.9	50489.331	13.8
49479.173	15.3	49831.151	14.1	50515.257	13.7
49507.115	(15.5	50110.308	11.7	50578.115	15.2
49728.359	14.6	50133.283	11.5	50839.321	14.4
49745.322	13.6	50187.257	13.1		

5. TmzV16

TmzV16 is identcial with GSC 5679.529 = USNO 0750.12581825 = IRAS 17589-1040 = GCSS 1016. The observed range of variability was 12.7-15.3.This star is Mira-type variable star with a period of 257d. From the identity with GCSS 1016, the spectrum of TmzV16 is expected to be S. (Takamizawa 1997c).

Table 5. Observations of TmzV16

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49401.342	14.1	50003.937	(14.2	50570.163	14.9
49457.168	(15.1	50109.347	12.8	50578.167	13.9
49503.046	(15.1	50135.305	12.7	50606.176	12.9
49537.094	14.2	50254.112	15.3	50644.169	12.8
49620.969	12.7	50328.954	12.9	50653.999	12.7
49647.911	13.0	50372.911	12.9	50682.962	13.7
49749.322	(14.2	50494.322	(15.1	50710.933	14.5
49756.309	(15.1	50515.287	(15.1	50719.940	(14.2
49775.281	(15.1	50549.262	(15.1	50746.915	(14.5
49860.152	12.7				

6. TmzV18

TmzV18 is identical with USNO 0750.11179153. No IRAS identi¯cation.This star is a Mira-type variable with a range of 13.8-(14.7p, and period of about 200d. The star is visible at mag 15 on Real-Sky CD. A star of 18 mag lies 2" east of the variable (Takamizawa 1997d).

Table 6. Observations of TmzV18

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49401.342	14.0	50003.937	(14.5	50570.163	(14.5
49457.168	(14.7	50109.347	(14.5	50578.167	(14.5
49507.152	(14.7	50135.305	14.1	50606.176	(14.5
49537.094	(14.7	50254.112	(14.7	50644.169	(14.5
49647.911	(14.5	50328.954	13.8	50653.999	(14.5
49749.322	14.6	50372.911	(14.2	50682.962	(14.5
49756.309	14.7	50494.322	(14.2	50710.933	14.2
49775.281	(14.7	50515.287	14.5	50746.915	(14.0
49860.152	(14.7	50549.262	14.4		

7. TmzV19

TmzV19 is identical with GSC 5678.416 = USNO 0750.12313457 = IRAS 17518-1014 = LMS 409 = TMSS -10384.The star has spctrum of M7III(Buscombe 1995). The range of variability was 13.1-14.4p, without detectable regularity.I have judged the type of variability as L (Takamizawa 1997d).

8. TmzV20

TmzV20 is identical with GSC 5132.1651 = USNO 0825.14414731 = IRAS 19027-0323. The star is Mira-type variable with a range of 12.8-(14.6p, and period of 98d (Takamizawa 1997e).

9. TmzV21

TmzV21 is identical with GSC 7107.835 = USNO 0525.03643930 = IRAS 07126-3254. This star is Mira-type variable star with range of 11.5-(15.0p, and period of 570d or its half (Takamizawa 1998a).

Table 7. Observations of TmzV19

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49401.342	13.8	49860.152	14.4	50549.262	13.7
49457.168	13.1	50003.937	13.5	50570.163	14.3
49507.152	13.5	50109.347	13.7	50578.167	13.7
49537.094	13.6	50135.305	13.4	50606.176	13.7
49620.969	13.7	50254.112	13.3	50644.169	13.7
49647.911	14.0	50328.954	13.3	50653.999	13.4
49749.322	14.2	50372.911	13.5	50682.962	13.4
49756.309	14.1	50494.322	13.4	50710.933	13.7
49775.281	14.0	50515.287	13.6	50746.915	13.5

Table 8. Observations of TmzV20

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49485.217	13.0	49972.980	(14.5	50513.319	12.9
49518.171	12.9	49981.989	(14.5	50549.242	14.0
49537.062	13.6	50002.919	(14.5	50570.197	(14.5
49575.055	(14.0	50015.918	(14.5	50578.208	14.0
49621.010	(14.0	50133.322	13.3	50586.193	(14.5
49648.928	14.0	50161.252	14.1	50597.080	(14.5
49680.892	14.0	50169.267	14.6	50613.164	(14.5
49756.339	(14.0	50186.191	(14.0	50629.136	14.6
49775.314	(14.0	50197.255	(14.5	50634.099	14.6
49783.286	(14.0	50229.209	13.8	50636.136	(14.5
49788.276	(14.0	50254.166	(14.5	50644.187	(14.5
49809.237	(14.0	50277.117	13.9	50654.027	(14.5
49815.231	(14.0	50286.137	13.8	50683.001	14.4
49831.192	(14.5	50300.017	13.5	50693.102	13.9
49834.219	(14.5	50311.008	13.2	50696.998	13.3
49860.119	14.54	50328.958	13.8	50710.912	12.8
49870.183	14.0	50361.658	(13.8	50719.971	13.1
49922.103	13.9	50372.928	(14.0	50740.923	13.6
49934.113	13.9	50386.897	(14.0	50746.949	13.8
49944.988	14.0	50415.887	(13.8	50771.902	(14.0
49957.069	14.5				

Table 9. Observations of TmzV21

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49668.231	12.3	50452.131	(15.0	50787.196	13.2
49690.205	11.8	50735.298	14.6	50807.133	12.3
49752.036	12.4	50756.310	14.3	50814.106	11.9
50074.194	14.2	50758.286	14.3	50835.049	11.5
50378.260	14.4	50786.197	12.8	50861.997	11.7

10. TmzV22

TmzV22 is identical with GSC 3363.399 = IRAS 05237+4839 = RAFGL 746 = TMSS+50145 = DO29288. The observed range of variability was 10.5-11.3p. The type of variability is SR (Takamizawa 1998a).

Table 10. Observations of TmzV22

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49665.087	11.3	50069.037	11.2	50672.228	10.5
49710.970	10.8	50091.915	11.1	50776.106	11.2
49745.030	10.6	50349.237	11.1	50777.050	11.2
49797.022	10.9	50372.240	11.2	50804.008	11.1
50050.100	11.1	50663.240	10.5	50814.080	10.5

11. TmzV25

This star is identical with GSC 5583.456. No IRAS identi¯cation. The rang of variability 12.8-14.6p. I have judged the type of variability as E (Takamizawa 1998b).

Table 11. Observations of TmzV25

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49422.231	13.9	49809.205	14.4	50329.944	14.0
49454.194	13.4	49869.999	14.1	50606.087	14.3
49507.065	14.5	50082.328	14.3	50684.946	14.2
49539.064	14.4	50186.174	14.1	50816.337	12.8
49719.328	14.6				

12. TmzV26

The star is identical with GSC GSC 949.94. No IRAS identi¯cation. The observed range of variability was 11.8-14.5p. It is seem Mira-type,s range. But i have judged the type of variability as SR (Takamizawa 1998c).

Table 12. Observations of TmzV26

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49485.161	13.6	49831.124	11.8	50634.035	13.5
49531.001	14.5	50069.333	13.9	50684.994	13.7
49539.095	14.0	50079.334	13.6	50741.914	13.8
49620.939	13.5	50489.290	14.3	50819.342	13.2
49728.283	13.6	50578.105	13.8		

13. TmzV28

TmzV28 is identical with GSC 338.597 = IRAS FSC14590+0238. The observed range of variability was 12.3-14.1p. The type of variability is SR (Takamizawa 1998d).

Table 13. Observations of TmzV28

JD-2400000	mag	JD-2400000	mag	JD-2400000	mag
49422.222	12.4	49719.321	13.1	50329.952	12.5
49454.185	12.9	49809.212	14.1	50438.349	12.6
49478.103	13.9	49870.006	12.6	50683.022	13.6
49539.051	12.6	50053.346	14.1	50684.953	13.5
49693.323	13.3	50186.163	12.6	50842.291	12.3

Figure 1. Finding chart of 12 new variable stars

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| | | | 1997e. ditto, No.132 | | | | 1998a. ditto, No.162

| | | | 1998b. ditto, No.170 | | | | 1998c. ditto, No.175

| | | | 1998e. ditto, No.231

Visual and CCD minima of eclipsing binaries during 1997

Kazuo Nagai and Seiichiro Kiyota
E-mail:PXS10547@nifty.ne.jp, skiyota@abr.a®rc.go.jp
Received 1998 Apr. 8

Following table is summary of minima of eclipsing binary reported from VSOLJ members.

Minimum was observed on V; Johnson V, v; visual. pv; photo-visual
O-C: elements from GCVS IV (Kholopov et al, Moscow 1986) .
n: number of estimates
Obs: abbreviation for observers

Ioh: Hiroshi Ito	(Tokyo)	Kyh: Hiroshi Koyama	(Tokyo)
Mhh: Hiroyuki Maehara	(Saitama)	Mkn: Nobuhiro Makiguchi	(Kanagawa)
Nga: Kazuo Nagai	(Kanagawa)	Sny: Yuji Sekino	(Kanagawa)
Som: Hiroyuki Someya	(Saitama)	Stm: Minoru Sato	(Akita)
Wnt: Tsutomu Watanabe	(Shizuoka)		

Inst: instrument(s) used for observation: number indicates diameter of mirror or lens.
SCT; schmidt cassegrain telescope, L; re°ector, R; refractor, B; binocular, N: naked eye.
*1; 2nd minimum

References

Kholopov et al, 1986 General Catalog of Variable Stars 4th ed.

star	min. JDhel 2400000+	O-C		n	obs.	inst.
V805 Aql	50663.9757	-0.0057	V	25	Nga	10L+ST-5
ST Aqr	50719.9349	-0.0084	V	113	Nga	10L+ST-5
ZZ Aur	50459.153	0.014	v	18	Mhh	20L
RZ Cas	50631.186	0.029	v	16	Mhh	6R
RZ Cas	50637.161	0.028	v	18	Mhh	6R
R CMa	50503.0084	0.0529	V	88	Nga	6R+ST-5
XZ CMi	50501.9987	-0.0100	V	99	Nga	6R+ST-5
XZ CMi	50513.0044	-0.0017	V	73	Nga	6R+ST-5
YY Eri	50452.0221	0.0569	v	32	Mkn	13L
YY Eri	50459.095	0.053	v	22	Mhh	8R
GW Gem	50502.024	0.021	v	22	Mhh	20L
UX Leo	50519.030	0.013	V	25	Nga	6R+ST-5
XY Leo	50516.2127	-0.012	V	93	Nga	6R+ST-5
VZ Lib	50635.960 *1	0.122	V	20	Nga	10L+ST-6
V566 Oph	50624.036	0.045	V	11	Nga	6R+ST-6
V566 Oph	50635.097	0.046	V	62	Nga	10L+ST-5
ER Ori	50473.9838 *1	0.0325	V	82	Nga	6R+ST-5
ER Ori	50483.9353	0.0341	V	75	Nga	6R+ST-5
beta Per	50685.12	0.02	v	43	Stm	N
beta Per	50728.13	0.02	v	10	Stm	N
V432 Per	50458.126	0.06	v	42	Mhh	20L
V432 Per	50459.088	0.058	v	33	Mhh	20L
RS Sct	50671.0438	0.0006	V	39	Nga	10L+ST-5
RS Sct	50672.047 *1	0.007	V	50	Nga	10L+ST-5
Y Sex	50552.966 *1	-0.003	V	44	Nga	6R+ST-5
AM Tau	50451.094	-0.027	v	37	Mhh	20L
AM Tau	50494.018	-0.025	v	32	Mhh	20L
X Tri	50744.2232	-0.034	v	21	Stm	40L
X Tri	50747.1393	-0.029	v	25	Wnt	32L
X Tri	50748.1085	-0.032	pv	30	Kyh	20L+PO-0+T-max400
X Tri	50748.1104	-0.030	v	28	Mhh	20L
X Tri	50748.111	-0.029	v	20	Som	13L
X Tri	50748.1137	-0.027	v	33	Mkn	13L
X Tri	50749.081	-0.031	v	23	Sny	28SC
X Tri	50753.9351	-0.034	v	18	Som	13L
X Tri	50753.9362	-0.0333	V	126	Nga	10L+ST-5
X Tri	50753.9378	-0.032	v	29	Ioh	30SC
X Tri	50753.9381	-0.031	v	34	Mkn	13L
VV UMa	50501.168	-0.038	v	15	Mhh	20L
VV UMa	50532.096	-0.042	v	24	Mhh	20L
W UMa	50532.060	-0.023	v	18	Mhh	6R
W UMa	50538.069	-0.020	v	13	Mhh	6R
XZ UMa	50532.079	-0.029	v	22	Mhh	20L
AE UMa	50467.278	-0.033	v	43	Mhh	20L
AE UMa	50532.061	-0.021	v	13	Mhh	20L
BH Vir	50566.1116	-0.0045	V	43	Nga	6R+ST-5
GR Vir	50594.0015 *1	0.0015	V	34	Nga	6R+ST-5
DL Vir	50599.0496	0.038	V	23	Nga	6R+ST-5

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