

COMMISSION 27 OF THE I. A. U.  
 INFORMATION BULLETIN ON VARIABLE STARS

Number 2636

Konkoly Observatory  
 Budapest  
 4 December 1984  
 HU ISSN 0374 - 0676

NEW FLARE STARS IN TAURUS

After our previously published observations (Hojaev, 1983,1984) we continued the systematic search for flare stars in the Taurus dark clouds (TDC) region. The photographic multi-exposed observations were made with the 40" and 21" Schmidt telescopes of the Byurakan Astrophysical Observatory in pg-band (without filter) and with the 40" telescope in U-band (through a 2mm thick Schott UG1 filter) using ORWO ZU-21 plates. The patrol covered the period from January 1983 to April 1984 in the main. Several pg-plates obtained with the 21" telescope in 1980 ( $t_{\text{eff}}=01^{\text{h}}30^{\text{m}}$ ) and U-plates obtained with the 40" telescope in 1981-82 ( $t_{\text{eff}}=06^{\text{h}}45^{\text{m}}$ ) not used in our previous papers (Hojaev 1983,1984) were also included. Total patrol time is equal to 304.02 hours.

The data on the above-mentioned observational material (telescope, spectral band, the number of plates and exposures, effective patrol time and limiting magnitude on plates) are presented in Table I.

Table I  
 Observational Material

Teles-cope	Band	Number of Plates	Number of Exposures	$T_{\text{eff}}$	$m_{\text{lim}}$
21"	Pg	219	1322 ( $1302 \times 10^{\text{m}} + 6 \times 7^{\text{m}} + 14 \times 5^{\text{m}}$ )	$218^{\text{h}}52^{\text{m}}$	17.0
40"	Pg	85	480 ( $3 \times 10^{\text{m}} + 20 \times 7^{\text{m}} + 450 \times 5^{\text{m}} + 7 \times 3^{\text{m}}$ )	$40^{\text{h}}41^{\text{m}}$	17.5
40"	U	46	257 ( $5 \times 15^{\text{m}} + 228 \times 10^{\text{m}} + 24 \times 5^{\text{m}}$ )	$41^{\text{h}}15^{\text{m}}$	17.0 - 17.5
Total		350	2059	$300^{\text{h}}48^{\text{m}}$	

In addition to the multi-exposed material, eight direct plates of the observed field with various exposure time ( $t_{\text{eff}}=03^{\text{h}}13^{\text{m}}$ ) were also utilized.

33 new flare stars and 39 suspected flare stars were found. Data on these results are presented in Table II and Table III, respectively.

Table II

## New Flare Stars in Taurus

No.	R.A.	Decl.	m	$\Delta m$	Date	UT <sub>max</sub>	Telesc.
44	04 <sup>h</sup> 40 <sup>m</sup> .0	+23° 35'	15.7 <sup>m</sup> pg	1.5 <sup>m</sup> pg	3. I.83	17 <sup>h</sup> 49 <sup>m</sup>	21"
45	04 31.5	+23 53	17.2pg	2.2pg	3. I.83	18 39	21"
46	04 21.7	+23 41	20.0pg	5.6pg	9. I.83	19 57	21"
47	04 35.3	+22 58	15.3pg	1.2pg	10. I.83	17 23	21"
48	04 22.6	+22 42	16.5pg	1.5pg	10. I.83	17 33	21"
49	04 21.4	+26 08	16.8pg	1.6pg	10. I.83	18 54	21"
50	04 22.3	+24 10	20.0pg	5.7pg	12. I.83	22 38	21"
51	04 35.6	+23 37	18.0pg	2.0pg	13. I.83	16 12	21"
52	04 33.3	+23 23	16.0pg	1.9pg	2. II.83	18 36	21"
53	04 23.7	+22 24	16.9pg	2.2pg	7. III.83	15 53	21"
54	04 29.8	+22 13	16.7pg	2.0pg	11. III.83	18 17	21"
55	04 23.5	+22 26	16.9pg	1.7pg	6. IX.83	23 20	21"
56	04 24.2	+25 14	17.1pg	1.5pg	7. X.83	00 31	21"
57	04 41.2	+25 37	20.0pg	4.2pg	7. X.83	01 42	21"
58	04 33.4	+24 29	19.5pg	2.4pg	12. X.83	23 08	40"
59	04 30.0	+26 07	21.0pg	5.5pg	13. X.83	19 50	40"
60	04 31.9	+22 14	16.7pg	2.2pg	14. X.83	22 54	40"
61	04 30.4	+25 28	19.6pg	5.3pg	16. X.83	22 15	40"
62	04 24.7	+23 52	15.7 U	1.1 U	2. XI.83	21 57	40"
63	04 27.8	+22 48	15.6 U	2.5 U	3. XI.83	01 01	40"
64	04 38.4	+22 59	15.9 U	2.9 U	3. XI.83	02 15	40"
65	04 23.1	+23 58	16.3 U	1.4 U	10. XI.83	19 15	40"
66	04 36.7	+22 57	16.2 U	1.5 U	10. XI.83	19 25	40"
67	04 22.3	+23 27	17.2 U	1.7 U	10. XI.83	21 24	40"
68	04 23.7	+25 26	16.1 U	1.1 U	4. XII.83	21 19	40"
69	04 24.9	+23 55	17.0pg	1.3pg	5. XII.83	21 04	21"
70	04 38.4	+22 29	17.1 U	1.9 U	9. XII.83	20 40	40"
71	04 31.7	+24 40	18.8pg	3.8pg	11. XII.83	22 53	40"
72	04 31.8	+22 16	17.5pg	1.9pg	11. XII.83	23 43	40"
73 *	04 28.3	+24 05	16.1pg	2.1pg	14. XII.83	23 44	40"
74	04 34.3	+22 55	19.5pg	3.4pg	26. XII.83	15 31	40"
75	04 28.0	+24 44	18.0pg	4.3pg	26. XII.83	16 54	40"
76	04 30.9	+25 02	17.0pg	1.7pg	5. I.84	15 45	21"

\* Lk Ha 331 (Herbig and Rao, 1972)

Table III

## Suspected Flare Stars in Taurus

No.	R.A.	Decl.	m	$\Delta m$	Date	UT <sub>max</sub>	Telesc.
49	04 <sup>h</sup> 30 <sup>m</sup> .8	+24° 47'	15.2 <sup>m</sup> pg	0.5 <sup>m</sup> pg	10. I.83	22 <sup>h</sup> 58 <sup>m</sup> .5	21"
50	04 26.1	+22 11	16.4pg	1.2pg	2. II.83	16 43	21"
51	04 32.9	+23 34	16.1pg	1.1pg	3. II.83	16 33	21"
52	04 33.8	+26 17	15.1pg	0.9pg	4. II.83	15 30	21"
53	04 30.3	+25 32	15.4pg	0.7pg	31. III.83	16 44	21"
54	04 32.1	+24 42	15.9pg	0.5pg	5. IV.83	16 59	21"
55	04 28.1	+23 56	16.1pg	0.7pg	5. IX.83	22 44	21"
56	04 26.6	+25 25	16.7pg	1.9pg	10. IX.83	23 02	40"
57	04 22.2	+23 51	16.9pg	1.0pg	10. IX.83	23 32	40"

No.	R.A.	Decl.	m	$\Delta m$	Date	UT <sub>max</sub>	Telesc.
58	04 <sup>h</sup> 28 <sup>m</sup> .4	+22° 58'	16 <sup>m</sup> .9pg	1 <sup>m</sup> .3pg	10. IX.83	23 <sup>h</sup> 37 <sup>m</sup>	40"
59	04 24.3	+25 01	16.6pg	0.9pg	6. X.83	21 08	21"
60	04 33.7	+26 12	15.9pg	0.8pg	7. X.83	20 30	21"
61	04 27.7	+24 14	17.3pg	1.8pg	7. X.83	22 51	21"
62	04 39.4	+22 40	20.5pg	3.7pg	10. X.83	01 20	21"
63	04 33.6	+26 08	16.9pg	0.6pg	11. X.83	22 30	21"
64	04 22.2	+24 22	18.3pg	1.7pg	12. X.83	22 08	40"
65	04 35.8	+22 52	16.9pg	0.8pg	13. X.83	19 55	40"
66	04 26.0	+23 29	16.9pg	0.5pg	13. X.83	20 56	40"
67	04 22.4	+24 03	17.0pg	0.8pg	14. X.83	00 35	40"
68	04 22.3	+24 02	17.0pg	0.8pg	14. X.83	00 50	40"
69	04 32.8	+23 15	16.9pg	0.7pg	14. X.83	22 20	40"
70	04 31.4	+23 54	16.6pg	0.6pg	16. X.83	22 10	40"
71	04 26.0	+25 14	16.1U	0.9 U	2. XI.83	22 07	40"
72	04 28.8	+22 43	16.2U	0.9 U	5. XI.83	21 57	40"
73	04 29.1	+25 17	15.9U	1.0 U	13. XI.83	22 32	40"
74	04 29.2	+22 29	17.7pg	1.0pg	12.XII.83	22 59	40"
75	04 25.5	+23 56	17.2pg	1.8pg	13.XII.83	00 37	40"
76	04 22.3	+25 13	16.1pg	1.3pg	13.XII.83	00 47	40"
77	04 25.7	+22 28	15.8pg	0.6pg	15.XII.83	00 44	40"
78	04 37.5	+23 23	15.8pg	0.9pg	22.XII.83	15 08	40"
79	04 36.0	+24 22	16.7pg	0.8pg	23.XII.83	17 30	40"
80	04 26.6	+22 56	16.9pg	0.9pg	24.XII.83	17 05	21"
81	04 29.9	+24 03	16.9pg	0.7pg	25.XII.83	18 30	21"
82	04 30.1	+23 37	17.0pg	1.1pg	26.XII.83	20 39	40"
83	04 25.2	+24 08	17.1pg	1.5pg	4. I.84	18 12	21"
84	04 25.8	+24 06	16.8pg	1.0pg	6. I.84	17 42	21"
85	04 32.2	+22 33	16.9pg	1.3pg	23. I.84	20 03	21"
86	04 27.9	+24 17	16.7pg	0.8pg	24. I.84	17 18	21"
87	04 31.7	+23 45	17.0pg	0.8pg	24. I.84	18 20	21"

Successive columns of these tables give the following data:

1. Byurakan designation,
- 2-3. coordinates (1950.0),
- 4-5. magnitude at minimum and observed flare amplitude,
- 6-7. date of flare and moment of maximum brightness (UT),
8. telescope.

Seven repeated flares were detected on six known, newly discovered flare stars and suspected flare stars. Data on these events are summarized in Table IV.

Table IV

Star	Repeated Flares in Taurus					Reference
	m	$\Delta m$	Date	UT <sub>max</sub>	Tel.	
B 4	20 <sup>m</sup> Pg	4 <sup>m</sup> 1Pg	9. I.83.	19 <sup>h</sup> 17 <sup>m</sup>	21"	Hojaev (1983,1984)
SB42	16.3Pg	1.0Pg	7. X.83	23 33	21"	Hojaev 1984
B 27	17.2Pg	1.0Pg	11. X.83	23 30.5	21"	Hojaev 1984
SB65	16.9Pg	0.9Pg	13. X.83	21 11	40"	present paper
B 4	21.0U	5.8U	5. XI.83	20 42	40"	Hojaev(1983,1984) and present paper
SB38	16.7Pg	1.1Pg	25.XII.83	19 02	21"	Hojaev (1984)
EY	16.5Pg	0.7Pg	26.XII.83	15 36	40"	Haro and Chavira (1955)

Table IV contains data similar to those in Tables II and III omitting the coordinates. The references to the designation are presented in the last column.

Because the star B4 was fainter than the limit of our photometric U-plates its  $m_u$  was evaluated assuming  $U-B=+1$ .

At present the number of the known flare stars in the investigated region in TDS, is equal to 89. Seven flare stars showed 2 flares, two stars 3 and one star (B4) 4 flares. The lower limit of total number of the flare stars in this region estimated by Ambartsumian's (1969) formula is equal to 535.

The discussion on flare stars in Taurus will be published elsewhere.

The author is indebted to Dr.H.S.Chavushian for checking and confirming the above results.

A.S. HOJAEV

Byurakan Astrophysical Observatory  
USSR, Armenia, 378433

References:

- Ambartsumian V.A., 1969, Stars Nebulae and Galaxies, Byurakan Symposium, Academy of Sciences of Armenian SSR, Yerevan, p.283.  
Haro G., Chavira E., 1955, Bol.Obs.Tonantzintla, 12, 3.  
Herbig G.H., Rao K.N., 1972, Ap.J., 174, 401.  
Hojaev H.S., 1983, I.B.V.S., No.2412.  
Hojaev H.S., 1984, I.B.V.S., No.2635.