

NEW FLARE STARS AND REPETITIONS IN THE ORION ASSOCIATION REGION¹

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RESUMEN

El presente trabajo contiene los resultados de la re-examinación del material fotográfico obtenido con la cámara Schmidt en Tonantzintla, en la región de Orión, centrado en el trapecio durante los años 1955-1981. El trabajo contiene los resultados de 116 ráfagas: 38 corresponden a nuevas ráfagas, 78 son repeticiones de las ráfagas conocidas, descubiertas principalmente en Tonantzintla. Cuatro de ellas fueron observadas en los observatorios de Abastumani y Rogen.

ABSTRACT

This paper contains the results of a re-examination of all the photographic material obtained with the Schmidt telescope in Tonantzintla on the Orion association between the years 1955 and 1981. During this re-examination 116 flare-ups were detected, of these, 38 correspond to new flare stars and 78 are flare-up repetitions of known flare stars, mainly discovered at Tonantzintla. Four of these were recently observed at Abastumani and Rogen observatories.

Key words: STARS-FLARE

I. INTRODUCTION

The re-examination of the photographic material on the Pleiades at Tonantzintla Observatory by Haro and González (1970), yielded a good number of new flare stars and repetitions of flare-ups of known flare stars. In order to estimate the physical parameters and in particular the evolution of stellar aggregates, it is necessary to have more complete information on flare stars at definite intervals of time.

Photographic material of the Orion association from Tonantzintla Schmidt plates, covering essentially the interval from 1959 to 1978, allowed us to find 38 flare stars and 78 flare-ups of known flare stars. The total observational time is about 930 hours.

1. The authors dedicate with admiration their paper to Guillermo Haro, as a tribute to his pioneering and continued work on flare stars.

II. NEW FLARE STARS AND REPEATED FLARES

The results obtained from the present re-examination are summarized in Tables 1 and 2. In Table 1 the new flare stars are presented. In column 1 we continue the Tonantzintla numbering of the Orion association flare stars, designated 261 to 298; the second column gives the number from the catalog of Parenago; the third and fourth columns give the approximate equatorial coordinates (error in R.A. ± 0.6 s, in Dec. $\pm 0.30''$) (1900); column five, the apparent ultraviolet magnitude at minimum; column six the ΔU (the amplitude of the flare event in the U magnitude); column seven the spectral type; column eight the date of the flare-up; column nine indicates the chart where the stars are marked; column ten lists the references.

Figure 1 (Plate 1) gives the approximate location of the new flare stars. Identification of each of these 38 flare stars is given in Figures 2 and 3 (Plates 2 and 3).

TABLE 1
NEW FLARE STARS IN THE ORION ASSOCIATION
REGION 1959 - 1978

No. Ton	Star	R. A. (1900)	Dec.	U mag	ΔU mag	Spec. Type	Date of flare	Fig. Ref. ^a
261	P786	5 21.6	-4 40	16.9pg	0.7pg		1959 12/28	1
262		26.0	4 17	16.1	1.0		1965 1/27	1
263		26.2	7 36	>18.9	>4.7		1967 1/15	1
264		26.9	6 05	15.4	1.2		1989 2/8	
265		26.9	4 30	16.9pg	1.3pg		1960 1/2	1
266	P999	27.2	7 16	17.7	3.6		1967 2/14	1
267		27.8	4 34	17.0	2.2		1970 1/31	
268		27.9	3 42	16.2	0.7		1967 12/27	1
269	P1057	28.0	5 45	18.1	2.5		1965 2/5	
270		28.1	4 14	17.4	1.0		1966 1/18	1
271	P1084	28.1	5 24	16.8	1.1		1973 1/3	
272	P1340	28.8	6 47	17.2	1.0		1965 1/3	1
273		29.2	5 07	17.6	0.6		1966 2/16	
274		29.5	3 38	>18.5	>3.7		1976 2/29	1
275		29.4	4 26	>18.5	>3		1972 12/6	1
276	P1452, IPORI	29.5	5 01	17.7	2.5	K5eV	1966 2/16	
277	P1487	29.6	6 15	15.1	0.9		1966 1/15	1
278		29.6	6 26	18.3	2.5		1964 12/28	1
279	P1531	29.7	4 26	17.4	2.0		1965 1/8	
280	P1566	29.8	4 09	17.5	3.2		1972 12/6	
281	P2369, BBORI	30.1	6 52	>18.8	>1.8		1967 1/6	1
282		30.2	4 29	17.4pg	1.6pg		1959 12/23	1
283		30.7	6 19	>18.8	>2.3		1969 2/20	2
284		31.1	6 20	16.5	0.6		1967 1/15	2
285		31.4	6 21	17.0	1.0	e	1967 12/29	2
286	P2372	31.4	5 09	15.5	0.7		1963 12/21	
287	P2390	31.5	3 54	18.5	2.5	e	1967 2/2	2
288		31.5	5 50	17.6	2.5		1969 2/9	2
289		31.6	6 30	17.4	1.7		1978 2/11	2
290		31.7	3 50	17.1	2.0		1972 12/13	2
291	P2440, PVORI	31.7	5 16	17.5	2.0		1970 2/9	2
292		31.9	5 34	18.4	2.0		1965 12/28	
293		32.1	4 04	>18	>2		1965 1/2	2
294		33.7	6 40	18.5	3.2		1969 1/22	2
295		33.9	4 06	18.3pg	1.6pg		1960 1/22	2
296 ^b	P2797	34.5	4 02	17.3	0.9		1967 2/9	2
297		34.5	6 58	14.7	2.1		1964 12/29	
298		36.9 -	6 27	16.0	0.8		1968 2/1	2

a. References: 1. Walker 1983, 2. Parsamian and Chavira 1982.
b. Star flare on weak star.

Table 2 lists the flare stars that have been detected and published previously at Tonantzintla, Abastumani and Rogen observatories or found during the present study.
Data on 16 flare-ups of star T176, which is not a member of the Orion association, are given

elsewhere (Parsamian and Chavira 1990).
This work was carried out in collaboration with Graciela González and Guillermo Haro.
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TABLE 2

REPEATED FLARES IN ORION 1955-1978

Number	Star	U. mag	ΔU mag	Spec. Type	Date of flare up	Ref. ^a
T16	V394	18.1	0.5	e	11/3 1956	3
T17	V716	18.0	2.5		2/11 1978	
"	"	"	1.0		1/14 1967	
T18	V721	18.1	0.6		12/10 1955	
T23	V545	18.1	0.6	e	1/6 1965	2
T24	V734	17.9	1.2		12/11 1963	
"	"	"	1.5		12/19 1963	
"	"	"	0.5		1/2 1965	
T37	V761	18.5	1.0	e	2/17 1966	2
T52	V779	15.7pg	0.8pg		23/11 1962	
T57		>18.5	>1.2	e	2/1 1960	2
T60	V800	18.6	0.8	e	2/16 1969	1
T66	V329	17.0	1.0	K7e	2/28 1965	4
"	"	"	0.8		2/8 1973	
T73	V813	18.5	1.0		12/19 1955	
T75	V816	18.5	0.5		12/5 1959	
T77	V578, P2305	15.8	1.5		1/14 1966	
T78	V654	18.6	0.5	e	2/2 1965	3
"	"	18.0pg	0.5pg		11/22 1962	
"	"	18.6	0.5		1/8 1965	
T82	V580, P2337	18.6	0.8	e	1/26 1965	3
T83	V822	17.4	0.6		1/16 1966	
T85	V656, P2348	17.3	2.5		1/8 1965	
T86	V502	17.2	2.5	e	12/31 1964	3
T88	V391	18.4	1.5	e	12/19 1965	2
"	"	18.4	2.0	e	12/30 1967	
T91	V831	19.0	1.5		2/7 1965	
T93	V839	18.7	0.6	e	12/27 1964	3
T97	V657	18.5	0.5	e	1/26 1965	3
T99	V658	17.5	1.0		1/8 1965	
T100	V850	18.1	1.5		2/3 1960	
"	"	"	1.5		1/7 1960	
T102	V854, P2455	17.3	1.0	M2	2/2 1960	5
"	"	"	0.5		12/31 1964	
T104	PW, P2470	16.5	3.5	e	1/31 1968	3
T110	V867	16.pg	2.5pg		12/22 1959	
T113	V590	17.8	2.0		2/2 1965	
T122	V676	17.1pg	2.5pg		11/20 1962	
"	"	18.9	4.0		2/7 1965	
"	"	"	3.4		2/2 1967	
T123	V682	17.8	1.0		12/29 1964	
T125	V687	18.0	2.5		1/18 1966	
T127	V691	18.0	0.5		2/9 1967	
T143	V755, P1502	18.1	0.5	e	12/13 1972	2
"	"	"	1.5		2/2 1978	
T146	V398, P1553	14.7	1.1	K0e	1/15 1966	3
T149	V763	18.1	0.5	e	1/26 1965	3
T153	V788, P1741	18.1	1.2		1/26 1965	
"	"	"	0.7		1/26 1965	
T154	V789	18.2	0.5		12/19 1963	
T171	V889	18.5	0.5		2/15 1966	
T181	V678	18.0	0.8		2/12 1978	
T182	V680	18.2	1.0		2/17 1966	
T184	V683	17.0pg	1.6pg		12/24 1959	
T191	UZ, P1009	17.8	0.5	e	2/2 1965	6
T193	V712	16.2	1.3		2/30 1968	
T194	V715	17.5	0.5		2/28 1968	

TABLE 2

(CONTINUED)

Number	Star	U mag	ΔU mag	Spec. Type	Date of flare up	Ref. ^a
T205	V733	18.4	1.0		12/9 1972	
T206	WW, P1341	16.9	1.2		3/1 1976	
T217	V373, P1613	17.0	0.5		12/11 1972	
T219	V771	16.8	2.0		12/27 1965	
"	"	"	0.8		2/1 1978	
T223	V355, P1764	17.6	1.3		1/19 1966	
T234	V835, P2394	17.6	1.8		12/29 1965	
T238	V856	18.2pg	0.5pg		12/24 1959	
T250	V897	21.0	1.0	e	1/29 1968	
T254		16.0	1.0		1/30 1965	
"	"	"	0.5		2/27 1968	
"	"	"	0.5		12/8 1972	
T269		18.1	1.4		1/18 1966	
T278		18.3	3.7		12/28 1981	
T284		16.5	0.8		3/1 1976	
T288		17.6	0.9	e	1/3 1973	2
T297		17.3	1.8		2/9 1967	
AB36	V698	18.5	1.5		2/29 1968	7
AB65		18.0	0.9		1/31 1968	8
AB122	P2538	17.3pg	1.8pg		1/23 1960	9
R6		17.6	2.1		1/21 1963	10

a. References: 1. Walker 1983; 2. Parsamian and Chavira 1982; 3. Haro 1968; 4. Herbig 1962; 5. Blanco 1963; 6. Haro and Chavira 1969; 7. Kiladze and Natsvlishvili 1980; 8. Natsvlishvili 1981; 9. Natsvlishvili 1982; 10. Tsvetkov *et al.* 1980.

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NEW FLARE STARS IN ORION

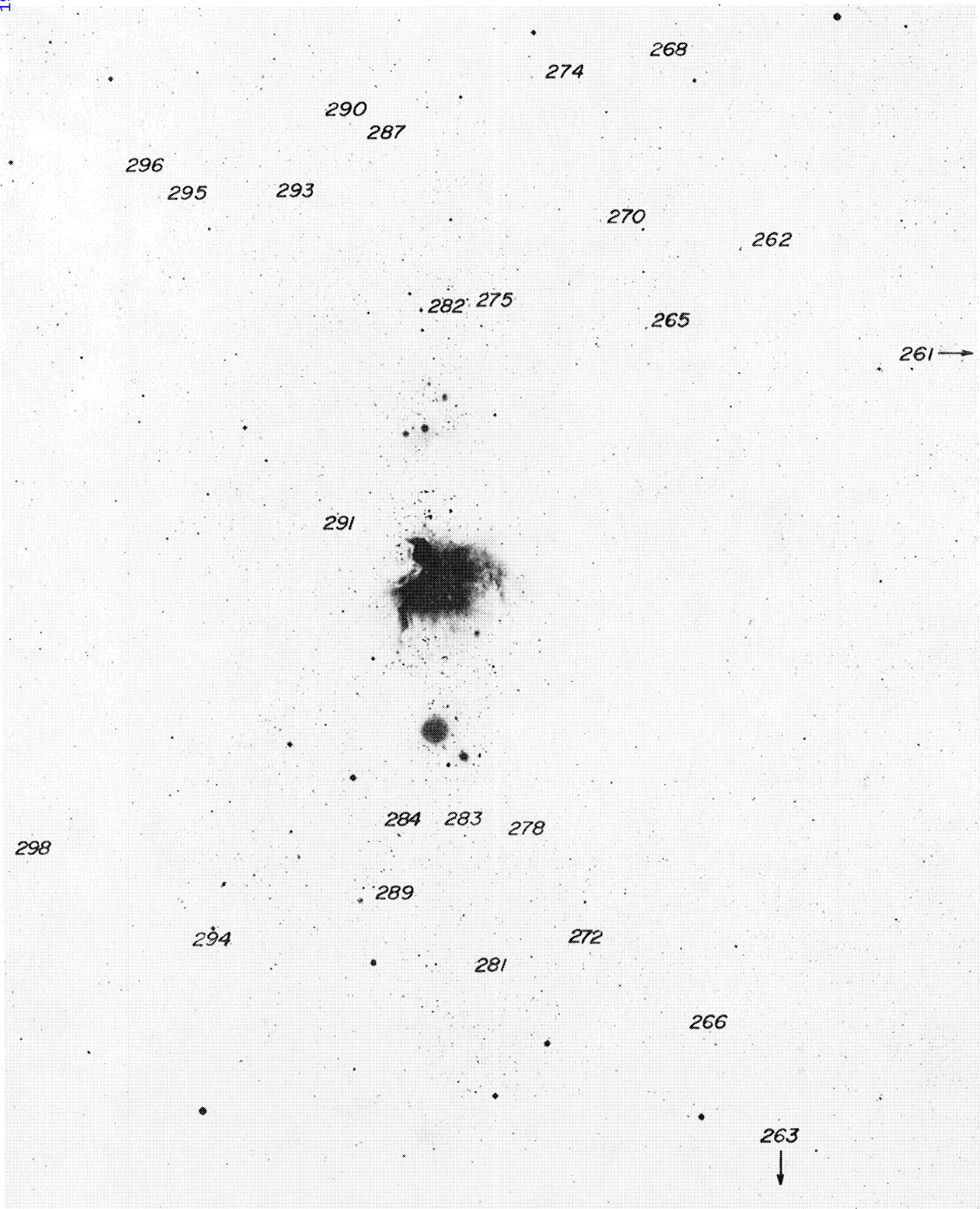


Fig. 1. Approximate location of the new flares.

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NEW FLARE STARS IN ORION

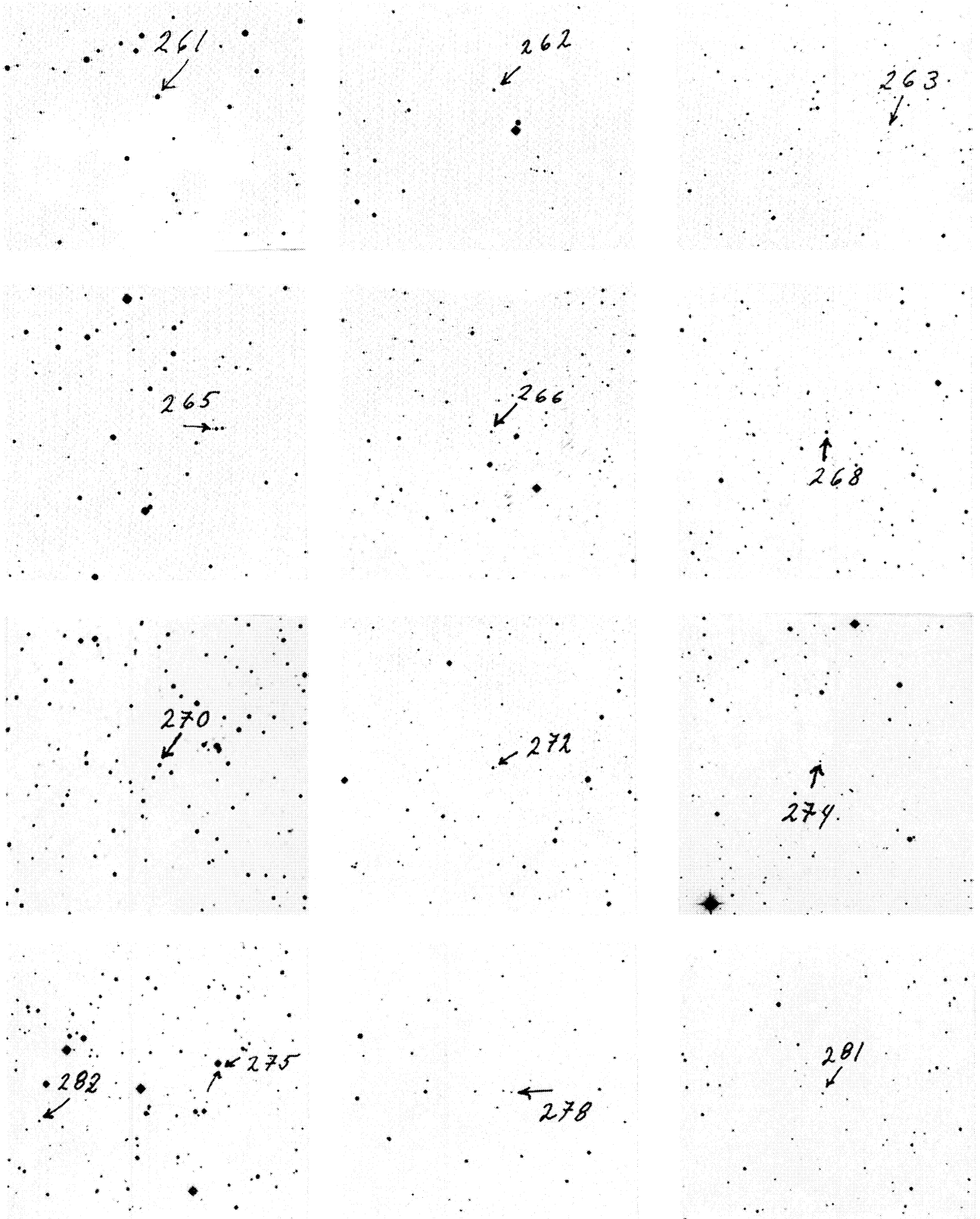


Fig. 2. Identification charts for the flare stars.

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NEW FLARE STARS IN ORION

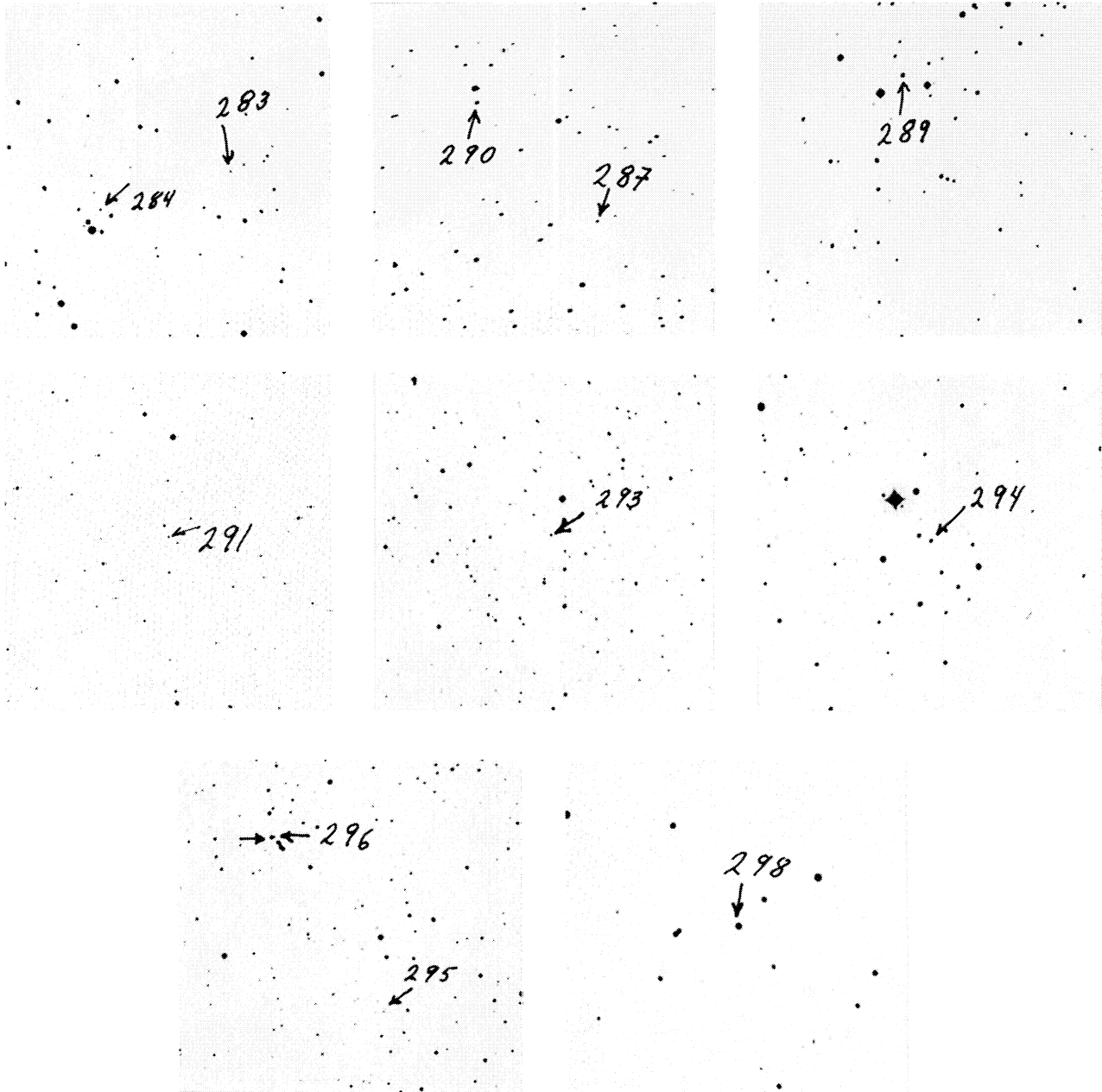


Fig. 3. Identification charts for the flare stars.