

SEARCH FOR LONG-TERM PERIODICITY IN THE PLEIADES ACTIVE DWARF STARS FROM PHOTOGRAPHIC SKY SURVEYS

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Abstract. A program for searching for long-term periodicity of the Pleiades active dwarf stars is presented. As a basis the Pleiades flare stars (or UV Cet type stars) from the Flare Stars Database, which are identified in the USNO A2.0 catalogue are used. The investigation for long-term variability will be made by the usage of European astronomical plate archives, included in the Wide-Field Plate Database (<http://www.skyarchive.org>), whose time distribution covers more than 100 years. Among these plate archives are those of Rozhen Observatory (Bulgaria), Konkoly Observatory (Hungary), Byurakan (Armenia), Potsdam (Germany), Royal Observatory of Edinburgh (UK), Bamberg (Germany), etc. Limited number of the existing plates in the Pleiades region are already digitized with different scanning machines as PDS 1010 (Sofia), PDS 2020 (Muenster), SUPER COSMOS (Edinburgh) and some flatbed scanners.

1. INTRODUCTION

The long-term brightness variations in the active dwarf stars are subject of special interest in the contemporary stellar astrophysics because of the detection of the long-term solar like activity cycles in these stars. Because there is no theoretical understanding of the solar activity cycle, it is very important to detect such cycles in other dwarf stars in order to constrain the theoretical models. Mirzoyan (1977) first indicated to a cyclic recurrence of the flare activity from two groups of the Pleiades flare stars with duration about two decades. The analysis of the behaviour of several red dwarfs in the solar vicinity shows that their changes in photographic magnitudes range

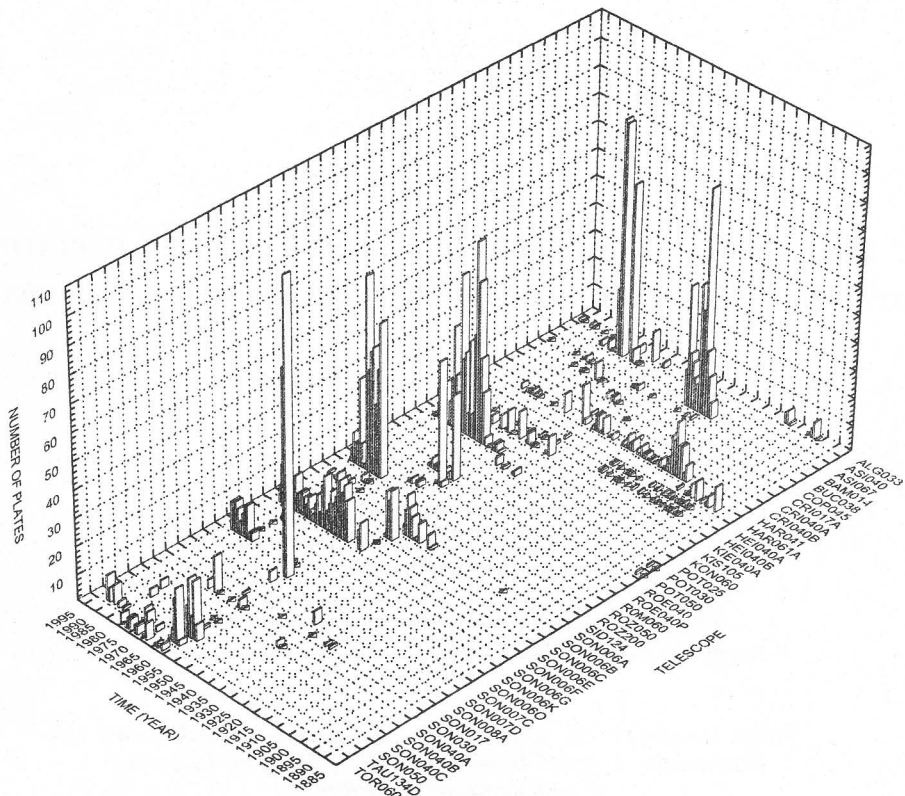


Fig. 1: Distribution of the Pleiades plates for the archives included into the Wide-Field Plate Database (<http://www.skyarchive.org>)

from 0.2 to 1.0 with typical time scale of variability from 10-60 years (see Pettersen et al. 1992, Mavridis and Avgolupis 1993, Bondar 1995). Cutispoto (1990) executed another dedicated program for long-term photoelectric monitoring of selected southern active dwarf stars in the European Southern Observatory. Recently Gershberg (1998) also appealed to the owners of the plate archives to study the flare stars long term behaviour on the basis of photographic monitoring since the 60's of the last century. There is no systematic monitoring before 1963. Therefore the plate archives are very important.

2. RESEARCH PROGRAMME

The Pleiades open cluster (M45) in Taurus is one of the most studied stellar clusters in the Galaxy according to the existing data in CDS (<http://simbad.u-strasbg.fr/Simbad>) and WEBDA (<http://obswww.unige.ch/webda/>). This young open cluster (7×10^7 years) is a constant target for study of the stellar evolution stages in comparison with the comparatively old stellar cluster Praesepe (M44) and very young aggregate in

Table 1: List of known astronomical archives containing the Pleiades plates.

WFPDB Telescope Identifier	Location of the Archive	Telescope Type	Years of Operation
ALG033	Floirac, France	Ast	1891-1975
ASI040	Asiago, Italy	Sch	1958-1992
ASI067	Asiago, Italy	Sch	1965-1992
BAM014A	Bamberg, Germany	Cam	1928-1938
BUC038	Bucharest, Romania	Rfr	1930-
COP045	Brorfelde, Denmark	Sch	1966-
CRI017A	Crimea, Ukraine	Cam	1948-1965
CRI040A	Crimea, Ukraine	Ast	1947-1950
CRI040B	Crimea, Ukraine	Ast	1951-1984
HAR041	Cambridge, USA MA	Rfr	1909-1932
HAR061A	Cambridge, USA MA	Rfr	1893-1895
HEI040A	Heidelberg, Germany	Ast	1900-1981
HEI040B	Heidelberg, Germany	Ast	1900-1981
KIE040A	Kiev, Ukraine	Ast	1950-1996
KIS105	Kiso, Japan	Sch	1977-
KON060	Budapest, Hungary	Sch	1962-
POT025	Potsdam, Germany	Sch	1948-1956
POT030	Potsdam, Germany	Rfr	1879-1930
POT050	Potsdam, Germany	Sch	1952-1970
ROE040	Edinburgh, UK	Sch	1962-1974
ROE040P	Edinburgh, UK	Sch	1962-1974
ROM060	Edinburgh, UK	Sch	1967-
ROZ050	Sofia, Bulgaria	Sch	1979-
ROZ200	Rozhen, Bulgaria	RCr	1979-
SID124	Edinburgh, UK	Sch	1973-
SON006A	Sonneberg, Germany	Cam	1941-1953
SON006B	Sonneberg, Germany	Cam	1953-1962
SON006C	Sonneberg, Germany	Cam	1956-1962
SON006E	Sonneberg, Germany	Cam	1956-
SON006F	Sonneberg, Germany	Cam	1956-
SON006G	Sonneberg, Germany	Cam	1957-
SON006K	Sonneberg, Germany	Cam	1958-
SON006O	Sonneberg, Germany	Cam	1958-
SON007C	Sonneberg, Germany	Cam	1963-1965
SON007D	Sonneberg, Germany	Cam	1963-1965
SON008A	Sonneberg, Germany	Cam	1925-1939
SON017	Sonneberg, Germany	Cam	1923-1971
SON030	Sonneberg, Germany	Sch	1960-1976
SON040A	Sonneberg, Germany	Ast	1938-1945
SON040B	Sonneberg, Germany	Ast	1960-
SON040C	Sonneberg, Germany	Ast	1961-
SON050	Sonneberg, Germany	Sch	1952-
TAU134	Tautenburg, Germany	Sch	1960-
TOR060	Torun, Poland	Sch	1962-

Table 2: List of already scanned plates.

WFPDB Plate Identifier	Date of Observation	Scanning Machine
CLU020 000003	19 02 1952	UMAX 3000
CLU020 000007	26 10 1953	UMAX 3000
CLU020 000008	27 10 1953	UMAX 3000
CLU020 000078	25 09 1955	UMAX 3000
CLU020 000448	missing date	UMAX 3000
CLU020 000473	27 07 1956	UMAX 3000
CLU020 000474	18 07 1956	UMAX 3000
CLU020 000475	27 07 1956	UMAX 3000
CLU020 000476	28 07 1956	UMAX 3000
KON060 000833	25 11 1965	UMAX 3000
KON060 002767	29 10 1968	UMAX 3000
KON060 002878	12 01 1969	UMAX 3000
KON060 002877	11 01 1969	UMAX 3000
KON060 003868	26 12 1970	UMAX 3000
KON060 003898	01 02 1971	UMAX 3000
KON060 003928	27 02 1971	UMAX 3000
KON060 003929	24 05 1971	UMAX 3000
KON060 004180	22 09 1971	UMAX 3000
POT030 000153	04 12 1885	PDS 2020, EPSON
POT030 000154	18 03 1886	PDS 2020, EPSON
POT030 000155	23 03 1886	PDS 2020, EPSON
POT030 000206	04 12 1888	PDS 2020, EPSON
POT030 000209	05 12 1888	PDS 2020, EPSON
POT050 000041	05 09 1953	PDS 2020, UMAX 3000
POT050 000039	05 09 1953	PDS 2020, UMAX 3000
POT050 000040	05 09 1953	PDS 2020, UMAX 3000
POT050 000045	05 09 1953	PDS 2020, UMAX 3000
POT050 000048	22 02 1954	PDS 2020, UMAX 3000
POT050 000077	04 02 1954	PDS 2020, UMAX 3000
POT050 000121	15 11 1955	PDS 2020, UMAX 3000
POT050 000447	07 11 1964	PDS 2020, UMAX 3000
POT050 000465	18 02 1966	PDS 2020, UMAX 3000
ROE040 000134	26 11 1962	UMAX 3000
ROE040 000537	28 12 1965	UMAX 3000
ROE040 000538	28 12 1965	UMAX 3000
ROE040 000540	17 01 1966	UMAX 3000
ROE040 000541	17 01 1966	UMAX 3000
ROE040 000547	14 02 1966	UMAX 3000
ROE040 001012	17 10 1969	UMAX 3000
ROE040 001013	17 10 1969	UMAX 3000
ROE040 001026	04 11 1969	UMAX 3000
ROE040 001182	19 01 1969	UMAX 3000
ROE040 001262	26 10 1971	UMAX 3000
ROE040 001279	16 11 1971	UMAX 3000
ROE040 001363	07 12 1972	UMAX 3000
ROE040 001587	14 12 1973	UMAX 3000
ROE040 001588	14 12 1973	UMAX 3000
ROE040 001869	29 03 1972	UMAX 3000
SID124 008935	08 12 1983	SUPER COSMOS
SID124 008960	23 12 1983	SUPER COSMOS

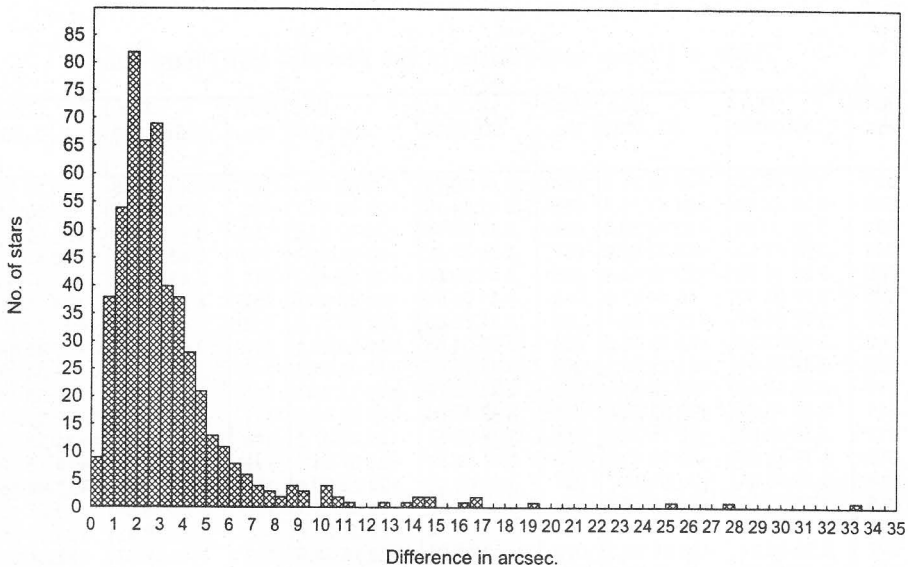


Fig. 2: Differences in the star location between Kazarovets (1993) and our estimations.

Orion (M42/43). The major population of the Pleiades consists of red dwarfs, which have important role in the identification of faint cluster members for deriving of the complete luminosity function. The total number of the known Pleiades flare stars according to the Flare Stars Database (Tsvetkova et al. 1995) is 547, having in view that for some stars published as flare stars better observations are needed to confirm their membership to the flare star class of variables according to Tsvetkova and Tsvetkov (1989). The statistical evaluation of the total number of all flare stars in the Pleiades (registered and not registered up to now) is about 1000 (Hambaryan et al. 1990). Taking this in consideration we think that the Pleiades is a good and accessible sample for studying of long-term brightness variations in the red dwarf stars.

Having access to different Pleiades wide-field photographic plates (from the archives in Bamberg, Sonneberg, Potsdam, Rozhen, Edinburgh, Byurakan, Konkoly) we are going to investigate G-K-M dwarf type stars for long term variability over unprecedently large time-scale since 1885. A detailed information on the Pleiades plate selection can be provided by the Wide-Field Plate Database (WFPDB), created in Bulgaria (<http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=VI/90>) or (<http://www.skyarchive.org>) which compiles the information for more than 2 000 000 astronomical plates, stored in 337 archives. Using the search resources (<http://www.skyarchive.org/>) (Table 1) we found 3 890 Pleiades plates, made in the period 1885–1998 (their distribution is presented in Fig. 1) and it gives the opportunity to obtain almost continuous photometric data set for the red dwarf stars in the cluster.

In the frames of our cooperation with Konkoly and Potsdam observatories we scanned 49 plates, given in Table 2 with PDS 2020 (Muenster), SUPER COSMOS (Edinburgh), PDS 1010 (Sofia), UMAX 3000 (Konkoly) and Epson scanners. We

Table 3: Precise coordinates of the Pleiades HCG flare stars

HCG No.	R.A. JD. 2000	Dec. JD. 2000	HCG No.	R.A. JD. 2000	Dec. JD. 2000	HCG No.	R.A. JD. 2000	Dec. JD. 2000
001	3 36 25.30	+24 53 39.8	054	3 41 50.75	+25 05 19.4	107	3 43 18.48	+23 34 10.0
002	3 36 27.30	+24 41 19.8	055	3 41 54.13	+25 43 49.7	108	3 43 26.55	+24 59 41.8
003	3 36 30.99	+22 46 59.4	056	3 41 58.78	+26 12 23.8	109	3 43 28.13	+24 53 33.2
004	3 36 37.60	+23 27 55.5	057	3 41 47.00	+22 51 27.4	110	3 43 18.93	+22 47 12.9
005	3 36 38.50	+23 08 44.5	058	3 41 58.86	+25 19 46.7	111	3 43 22.50	+23 07 48.8
006	3 37 03.42	+24 44 37.9	059	3 41 53.94	+23 32 41.1	112	3 43 34.07	+25 35 28.5
007	3 37 45.57	+22 00 30.7	060	3 41 50.66	+22 55 17.2	113	3 43 36.35	+25 21 37.7
008	3 37 52.26	+22 42 26.2	061	3 42 04.63	+25 53 11.5	114	3 43 26.39	+22 42 44.7
009	3 38 23.93	+23 11 55.1	062	3 42 08.77	+25 45 25.4	115	3 43 37.23	+25 24 34.8
010	3 38 33.45	+23 23 43.8	063	3 42 02.79	+24 12 38.6	116	3 43 27.37	+22 37 44.0
011	3 38 43.24	+25 22 29.8	064	3 42 02.84	+23 55 56.2	117	3 43 32.11	+22 52 49.3
012	3 38 48.62	+25 11 21.9	065	3 42 03.77	+24 42 47.3	118	3 43 36.85	+24 23 40.5
013	3 38 52.83	+25 14 13.6	066	3 41 58.59	+22 57 04.2	119	3 43 36.58	+24 13 58.6
014	3 38 49.51	+23 51 51.7	067	3 42 01.60	+22 23 29.0	120	3 43 44.73	+25 59 43.3
015	3 38 53.84	+24 25 09.5	068	3 42 10.85	+24 05 11.1	121	3 43 36.53	+23 27 16.3
016	3 39 08.06	+24 46 17.1	069	3 42 09.73	+22 31 38.8	122	3 43 36.48	+23 12 36.7
017	3 39 06.74	+23 59 58.3	070	3 42 10.63	+22 15 38.5	123	3 43 42.07	+24 34 25.7
018	3 39 12.12	+25 14 50.9	071	3 42 21.46	+24 39 54.9	124	3 43 38.99	+23 44 08.0
019	3 39 29.60	+24 58 00.3	072	3 42 28.00	+25 11 33.0	125	3 43 48.37	+25 02 39.3
020	3 39 29.14	+23 30 00.0	073	3 42 26.22	+24 14 10.1	126	3 43 53.80	+25 28 32.6
021	3 39 32.25	+24 16 04.0	074	3 42 31.17	+24 49 23.9	127	3 43 52.08	+24 50 32.0
022	3 39 42.66	+23 54 30.2	075	3 42 26.22	+22 53 43.0	128	3 43 51.69	+24 14 18.3
023	3 39 46.95	+25 25 43.7	076	3 42 27.25	+22 34 27.0	129	3 43 56.63	+24 59 39.0
024	3 40 01.81	+24 46 28.5	077	3 42 29.36	+22 47 28.3	130	3 43 55.62	+24 25 37.3
025	3 39 56.68	+22 28 24.9	078	3 42 38.03	+24 41 20.7	131	3 44 02.76	+25 39 25.1
026	3 40 00.13	+23 26 08.4	079	3 42 36.20	+23 22 07.1	132	3 44 04.42	+25 51 25.1
027	3 40 03.62	+24 30 04.2	080	3 42 40.16	+23 59 24.0	133	3 44 57.20	+24 13 22.9
028	3 40 10.85	+26 06 43.3	081	3 42 48.08	+25 54 59.5	134	3 44 02.21	+25 03 56.0
029	3 40 06.71	+24 25 08.6	082	3 42 41.11	+24 01 45.0	135	3 43 56.93	+23 57 08.4
030	3 40 06.74	+23 21 57.5	083	3 42 47.56	+25 17 51.9	136	3 43 54.43	+23 21 16.5
031	3 40 09.61	+23 10 35.0	084	3 42 35.56	+21 50 32.4	137	3 43 57.39	+23 34 42.8
032	3 40 12.68	+23 09 37.9	085	3 42 42.32	+23 30 12.8	138	3 44 13.89	+25 32 17.7
033	3 40 22.98	+25 29 50.2	086	3 42 42.33	+23 20 24.2	139	3 43 59.22	+22 34 21.6
034	3 40 24.12	+24 35 06.4	087	3 42 46.20	+23 27 12.0	140	3 44 09.85	+24 16 06.2
035	3 40 26.80	+23 50 17.7	088	3 42 56.60	+25 58 52.8	141	3 44 08.74	+23 04 49.9
036	3 40 31.10	+25 08 55.5	089	3 43 00.28	+25 50 26.6	142	3 44 26.31	+26 02 33.2
037	3 40 31.06	+24 21 43.2	090	3 42 53.24	+23 31 09.4	143	3 44 23.32	+25 21 32.5
038	3 40 31.63	+24 32 36.3	091	3 42 53.10	+23 26 52.2	144	3 44 16.38	+23 37 06.4
039	3 40 42.50	+25 42 22.0	092	3 42 56.67	+24 13 45.9	145	3 44 17.69	+24 26 49.0
040	3 40 39.91	+24 44 11.6	093	3 42 56.49	+24 05 00.5	146	3 44 19.01	+24 35 20.8
041	3 40 43.57	+22 15 07.2	094	3 43 05.05	+25 44 38.5	147	3 44 21.83	+24 46 08.7
042	3 40 57.36	+25 50 58.6	095	3 43 03.92	+25 20 18.9	148	3 44 24.62	+24 51 55.9
043	3 40 51.75	+23 13 52.8	096	3 43 07.50	+25 34 31.5	149	3 44 24.76	+24 46 08.5
044	3 40 54.97	+22 21 01.1	097	3 43 05.46	+24 49 30.9	150	3 44 25.52	+24 40 55.3
045	3 41 02.93	+23 43 23.9	098	3 43 10.99	+25 25 03.5	151	3 44 28.22	+25 15 38.9
046	3 41 06.05	+22 53 21.0	099	3 43 05.84	+23 52 51.7	152	3 44 30.07	+25 35 48.1
047	3 41 08.05	+23 12 56.7	100	3 43 09.67	+24 41 35.3	153	3 44 22.99	+24 04 08.3
048	3 41 19.28	+23 51 44.1	101	3 43 04.12	+22 48 05.7	154	3 44 27.24	+24 50 40.6
049	3 41 22.82	+23 55 50.6	102	3 43 12.06	+24 44 47.5	155	3 44 20.81	+23 33 42.4
050	3 41 33.65	+25 06 51.0	103	3 43 13.00	+24 39 21.7	156	3 44 26.81	+24 24 34.0
051	3 41 25.25	+22 32 58.4	104	3 43 13.49	+24 23 11.0	157	3 44 33.01	+25 45 12.1
052	3 41 37.49	+22 16 41.4	105	3 43 26.13	+26 02 33.3	158	3 44 27.95	+24 10 19.8
053	3 41 39.37	+22 20 57.3	106	3 43 20.64	+24 26 34.6	159	3 44 36.71	+24 36 03.5

Table 3: continued

HCG No.	R.A. JD. 2000	Dec. JD. 2000	HCG No.	R.A. JD. 2000	Dec. JD. 2000	HCG No.	R.A. JD. 2000	Dec. JD. 2000
160	3 44 39.54	+24 31 46.8	213	3 45 59.39	+22 26 15.4	266	3 47 22.63	+23 44 09.0
161	3 44 36.21	+23 30 13.2	214	3 46 05.17	+22 58 56.3	267	3 47 15.64	+22 21 19.8
162	3 44 47.49	+25 54 58.1	215	3 46 08.33	+23 20 53.1	268	3 47 37.29	+25 20 04.8
163	3 44 48.28	+25 47 37.1	216	3 46 10.84	+23 37 18.5	269	3 47 26.68	+23 38 04.8
164	3 44 37.84	+22 55 19.1	217	3 46 09.51	+22 42 39.8	270	3 47 23.77	+23 08 59.4
165	3 44 44.44	+24 10 30.5	218	3 46 23.56	+24 01 49.5	271	3 47 17.33	+22 12 58.4
166	3 44 47.69	+24 12 54.5	219	3 46 25.32	+24 09 39.3	272	3 47 21.58	+22 22 12.3
167	3 44 47.26	+24 00 40.5	220	3 46 18.03	+22 42 36.2	273	3 47 30.55	+24 22 16.4
168	3 44 50.11	+24 54 42.3	221	3 46 24.09	+23 02 19.2	274	3 47 23.15	+22 14 42.6
169	3 44 55.08	+25 21 41.8	222	3 46 28.56	+24 45 34.8	275	3 47 25.61	+22 21 02.2
170	3 44 58.55	+24 23 28.2	223	3 46 27.72	+23 35 36.0	276	3 47 28.72	+22 22 38.2
171	3 44 55.93	+23 55 55.7	224	3 46 31.13	+24 07 04.8	277	3 47 33.40	+23 41 35.2
172	3 45 01.05	+24 46 43.7	225	3 46 32.24	+23 58 58.3	278	3 47 33.60	+24 41 05.3
173	3 44 57.22	+23 59 31.5	226	3 46 49.39	+26 18 47.7	279	3 47 35.80	+24 52 28.9
174	3 45 14.48	+25 05 19.6	227	3 46 36.02	+23 58 02.4	280	3 47 38.01	+24 53 32.7
175	3 45 19.97	+26 03 31.3	228	3 46 37.22	+24 20 38.8	281	3 47 38.36	+24 44 04.3
176	3 45 06.73	+23 36 53.4	229	3 46 35.27	+23 24 44.3	282	3 47 39.28	+24 27 34.1
177	3 45 12.23	+24 30 19.7	230	3 46 53.00	+26 21 36.6	283	3 47 40.30	+24 18 09.3
178	3 45 16.92	+25 15 50.1	231	3 46 40.18	+24 55 54.0	284	3 47 34.69	+22 48 07.0
179	3 45 18.07	+25 06 00.6	232	3 46 39.96	+23 59 17.5	285	3 47 41.37	+23 58 21.2
180	3 45 12.21	+24 15 24.5	233	3 46 45.71	+25 27 32.7	286	3 47 41.11	+23 44 27.2
181	3 45 16.59	+24 34 34.7	234	3 46 39.95	+23 47 00.2	287	3 47 45.83	+24 38 03.9
182	3 45 06.18	+22 38 35.4	235	3 46 34.77	+22 56 10.4	288	3 47 44.99	+24 48 10.2
183	3 45 16.11	+24 07 17.3	236	3 46 48.36	+24 18 06.6	289	3 47 50.06	+24 47 09.3
184	3 45 13.35	+23 31 03.3	237	3 46 49.15	+24 36 02.3	290	3 47 40.91	+22 55 50.5
185	3 45 12.07	+23 21 55.5	238	3 46 54.59	+24 59 10.6	291	3 47 45.02	+23 52 20.0
186	3 45 10.76	+23 03 00.6	239	3 46 47.16	+23 17 35.6	292	3 47 49.71	+24 25 45.2
187	3 45 11.89	+23 06 55.3	240	3 46 50.02	+23 31 58.5	293	3 47 51.18	+25 59 58.9
188	3 45 23.42	+24 51 05.0	241	3 46 53.96	+25 14 47.1	294	3 47 49.71	+24 28 16.0
189	3 45 24.50	+25 02 42.1	242	3 46 55.66	+25 12 37.0	295	3 47 50.90	+24 30 21.0
190	3 45 29.52	+23 45 40.0	243	3 46 57.07	+25 04 15.5	296	3 47 51.86	+24 05 47.7
191	3 45 28.46	+22 59 06.5	244	3 46 53.55	+24 17 17.4	297	3 47 59.21	+24 30 24.2
192	3 45 32.88	+24 18 14.2	245	3 46 48.70	+23 04 09.8	298	3 47 47.84	+22 33 22.6
193	3 45 33.34	+23 35 34.6	246	3 46 58.47	+24 27 42.5	299	3 47 44.60	+22 23 55.8
194	3 45 36.64	+24 39 09.0	247	3 46 57.02	+23 15 04.6	300	3 47 59.67	+24 43 55.0
195	3 45 41.61	+25 41 14.7	248	3 47 04.66	+25 22 52.7	301	3 47 52.06	+22 52 48.8
196	3 45 38.96	+25 13 30.4	249	3 47 03.52	+24 09 37.0	302	3 47 55.20	+23 19 08.1
197	3 45 40.28	+24 50 39.2	250	3 47 10.37	+24 57 19.0	303	3 47 58.92	+23 29 05.9
198	3 45 41.59	+24 04 32.5	251	3 47 03.71	+23 37 01.1	304	3 48 12.37	+26 35 04.0
199	3 45 52.58	+25 51 44.5	252	3 47 06.22	+24 18 13.2	305	3 48 16.29	+26 20 07.5
200	3 45 44.01	+24 04 29.0	253	3 47 08.09	+24 18 27.0	306	3 48 08.89	+24 29 39.6
201	3 45 48.87	+23 51 12.7	254	3 47 10.98	+24 13 51.6	307	3 48 07.90	+23 44 26.0
202	3 45 52.67	+23 27 56.4	255	3 47 07.27	+23 13 37.2	308	3 48 21.60	+25 43 43.4
203	3 45 46.40	+22 06 47.7	256	3 47 08.48	+23 42 41.1	309	3 48 05.76	+23 02 05.4
204	3 46 06.62	+25 14 46.9	257	3 47 09.38	+23 44 33.9	310	3 48 11.17	+23 39 45.3
205	3 45 56.89	+23 01 31.5	258	3 47 13.60	+23 49 55.5	311	3 48 13.27	+23 58 49.3
206	3 46 03.48	+24 20 58.3	259	3 47 17.07	+25 56 39.4	312	3 48 17.23	+24 30 18.3
207	3 46 01.59	+23 43 17.6	260	3 47 30.51	+26 16 47.3	313	3 48 20.24	+24 54 57.2
208	3 46 06.83	+24 33 48.4	261	3 47 22.90	+24 50 58.6	314	3 48 05.63	+22 38 11.9
209	3 46 08.65	+24 40 35.7	262	3 47 18.28	+24 02 11.7	315	3 48 13.70	+23 38 01.8
210	3 46 07.45	+24 22 30.0	263	3 47 25.71	+25 08 35.8	316	3 48 26.04	+25 13 07.9
211	3 46 09.83	+24 40 27.5	264	3 47 09.00	+22 17 32.8	317	3 48 25.97	+25 14 43.3
212	3 45 58.56	+22 19 56.5	265	3 47 32.96	+25 38 20.2	318	3 48 16.35	+22 32 42.6

Table 3: continued

HCG No.	R.A. JD. 2000	Dec. JD. 2000	HCG No.	R.A. JD. 2000	Dec. JD. 2000	HCG No.	R.A. JD. 2000	Dec. JD. 2000
319	3 48 22.71	+23 58 23.3	372	3 49 32.95	+24 32 05.2	425	3 51 14.00	+25 23 11.5
320	3 48 26.70	+25 03 30.7	373	3 49 36.04	+23 56 25.7	426	3 51 17.76	+25 02 28.5
321	3 48 20.48	+23 31 00.9	374	3 49 34.85	+23 27 19.3	427	3 51 24.09	+26 03 14.0
322	3 48 25.20	+24 14 28.3	375	3 49 36.44	+24 18 16.7	428	3 51 25.80	+24 47 41.4
323	3 48 22.56	+22 52 24.1	376	3 49 35.84	+22 09 07.6	429	3 51 24.36	+24 05 16.9
324	3 48 30.99	+24 16 55.6	377	3 49 42.58	+24 19 07.3	430	3 51 25.30	+23 53 24.2
325	3 48 24.73	+22 24 28.5	378	3 49 51.72	+21 18 28.4	431	3 51 29.89	+23 53 59.7
326	3 48 31.82	+24 04 46.6	379	3 49 49.40	+25 06 42.4	432	3 51 39.07	+24 35 31.3
327	3 48 31.80	+24 02 01.3	380	3 49 55.72	+24 44 33.9	433	3 51 35.51	+25 29 59.2
328	3 48 29.68	+23 58 08.3	381	3 49 57.03	+25 05 14.8	434	3 51 36.52	+26 26 02.3
329	3 48 25.42	+22 12 43.9	382	3 50 02.09	+23 51 47.0	435	3 51 37.98	+23 11 02.2
330	3 48 29.64	+23 00 03.3	383	3 50 01.55	+24 36 49.1	436	3 51 47.18	+24 13 20.8
331	3 48 27.96	+23 18 05.1	384	3 50 00.58	+25 23 57.8	437	3 51 50.54	+22 53 46.7
332	3 48 26.48	+23 11 32.1	385	3 50 01.77	+25 12 43.6	438	3 51 50.88	+23 17 41.1
333	3 48 40.37	+24 36 36.4	386	3 50 08.32	+25 32 58.2	439	3 51 54.45	+23 33 34.0
334	3 48 32.17	+23 26 43.1	387	3 50 12.36	+24 32 01.1	440	3 51 54.99	+23 57 44.8
335	3 48 35.57	+24 12 02.2	388	3 50 11.89	+24 17 46.9	441	3 51 53.87	+24 02 54.0
336	3 48 35.48	+23 46 05.9	389	3 50 11.10	+23 55 42.6	442	3 51 57.15	+23 59 48.7
337	3 48 39.88	+24 12 45.3	390	3 50 12.84	+24 21 09.2	443	3 51 56.71	+24 14 41.6
338	3 48 41.85	+25 01 21.5	391	3 50 12.20	+23 59 47.6	444	3 51 53.34	+24 23 15.3
339	3 48 42.08	+25 00 30.7	392	3 50 13.38	+23 25 39.4	445	3 51 59.25	+24 40 01.4
340	3 48 35.22	+22 53 43.2	393	3 50 15.03	+22 40 24.8	446	3 51 57.44	+25 48 33.9
341	3 48 37.57	+22 46 11.8	394	3 50 15.18	+24 13 38.6	447	3 52 01.57	+25 01 31.6
342	3 48 45.77	+25 56 50.1	395	3 50 20.92	+23 19 25.8	448	3 52 02.19	+24 39 49.7
343	3 48 40.90	+23 14 20.2	396	3 50 25.08	+23 55 44.0	449	3 52 07.91	+25 27 57.3
344	3 48 45.35	+23 20 22.5	397	3 50 23.89	+24 28 43.4	450	3 52 07.29	+25 39 01.1
345	3 48 37.57	+22 15 24.8	398	3 50 22.86	+22 11 20.6	451	3 52 13.27	+26 08 39.4
346	3 48 45.32	+24 37 27.8	399	3 50 21.97	+22 37 34.9	452	3 52 12.14	+26 22 11.6
347	3 48 46.10	+25 07 44.6	400	3 50 24.32	+22 27 10.9	453	3 52 18.98	+25 35 28.0
348	3 48 49.26	+23 58 40.0	401	3 50 31.90	+22 08 49.7	454	3 52 20.62	+24 33 58.1
349	3 48 57.30	+24 19 46.0	402	3 50 28.11	+24 23 00.6	455	3 52 21.85	+24 39 51.0
350	3 48 51.83	+22 53 39.2	403	3 50 29.89	+25 03 09.2	456	3 52 30.86	+24 32 42.1
351	3 49 00.91	+24 54 12.4	404	3 50 37.34	+22 28 10.6	457	3 52 37.47	+24 44 57.3
352	3 49 00.60	+23 57 30.3	405	3 50 39.77	+23 01 04.6	458	3 52 34.42	+22 30 09.9
353	3 49 00.94	+22 58 52.2	406	3 50 43.58	+22 17 38.7	459	3 52 31.13	+25 29 40.2
354	3 49 05.81	+23 44 25.3	407	3 50 34.01	+24 52 31.6	460	3 52 48.64	+21 42 30.7
355	3 49 10.94	+24 20 54.1	408	3 50 46.04	+21 52 38.3	461	3 52 38.83	+25 50 27.7
356	3 49 03.54	+22 51 12.2	409	3 50 48.91	+22 40 14.5	462	3 52 51.67	+22 31 35.3
357	3 49 05.89	+23 06 24.7	410	3 50 43.11	+25 19 41.8	463	3 52 56.91	+22 26 03.7
358	3 49 11.23	+23 33 21.2	411	3 50 53.97	+24 45 55.1	464	3 52 54.21	+25 17 45.5
359	3 49 15.32	+24 34 05.0	412	3 50 56.55	+25 35 08.8	465	3 53 05.35	+24 46 04.3
360	3 49 11.15	+22 10 38.7	413	3 50 53.74	+23 43 01.3	466	3 53 09.55	+26 00 06.8
361	3 49 11.41	+22 16 23.2	414	3 50 58.09	+23 55 45.1	467	3 53 15.64	+22 52 16.8
362	3 49 16.29	+24 03 48.3	415	3 50 57.35	+24 06 33.3	468	3 53 18.34	+25 55 17.7
363	3 49 21.46	+23 39 08.5	416	3 50 57.02	+24 24 49.8	469	3 53 25.50	+23 37 59.7
364	3 49 17.17	+24 20 50.2	417	3 51 02.26	+25 03 21.5	470	3 53 21.82	+25 38 35.1
365	3 49 12.55	+25 42 09.8	418	3 51 05.52	+24 44 14.7	471	3 53 24.43	+25 02 09.4
366	3 49 20.19	+25 25 44.9	419	3 51 07.24	+24 28 53.9	472	3 53 26.57	+25 31 22.0
367	3 49 20.48	+25 49 07.2	420	3 51 23.83	+22 06 50.8	473	3 53 40.91	+24 25 11.9
368	3 49 19.50	+24 48 28.1	421	3 51 10.28	+24 24 08.4	474	3 53 47.52	+23 44 33.5
369	3 49 20.54	+24 46 38.6	422	3 51 11.47	+24 23 15.8	475	3 53 45.28	+25 55 34.0
370	3 49 27.56	+24 31 56.7	423	3 51 15.76	+23 16 58.5	476	3 53 48.93	+25 21 14.4
371	3 49 32.45	+23 55 44.9	424	3 51 18.99	+24 10 15.8	477	3 53 57.22	+23 20 45.5

Table 3: continued

HCG No.	R.A. JD. 2000	Dec. JD. 2000	HCG No.	R.A. JD. 2000	Dec. JD. 2000	HCG No.	R.A. JD. 2000	Dec. JD. 2000
478	3 54 00.59	+22 46 11.5	492	3 54 39.56	+22 36 36.5	506	3 56 15.57	+25 29 23.7
479	3 54 02.15	+24 19 10.7	493	3 54 50.02	+24 45 35.9	507	3 56 19.05	+23 55 52.5
480	3 54 07.06	+22 53 49.1	494	3 54 54.53	+23 02 49.4	508	3 56 23.44	+24 49 58.7
481	3 54 10.35	+23 05 36.5	495	3 54 52.52	+24 34 36.6	509	3 56 30.32	+24 17 20.9
482	3 54 12.95	+23 20 53.1	496	3 55 00.99	+24 27 30.3	510	3 56 25.07	+26 08 11.2
483	3 54 20.70	+22 06 44.6	497	3 55 02.46	+25 19 32.5	511	3 56 57.02	+24 48 36.6
484	3 54 11.42	+25 18 45.2	498	3 55 28.90	+23 46 24.4	512	3 57 09.10	+22 01 54.0
485	3 54 13.30	+25 28 28.9	499	3 55 33.80	+22 48 34.3	513	3 57 18.95	+22 05 24.3
486	3 54 23.17	+25 59 34.8	500	3 55 45.26	+26 15 56.9	514	3 57 37.00	+25 24 20.3
487	3 54 25.22	+24 42 43.5	501	3 55 50.92	+24 12 03.2	515	3 57 40.62	+25 16 06.4
488	3 54 34.74	+21 53 04.3	502	3 55 48.68	+23 55 38.2	516	3 57 42.90	+25 23 09.4
489	3 54 27.91	+23 50 09.9	503	3 55 51.74	+23 04 30.3	517	3 57 50.80	+24 52 05.3
490	3 54 30.48	+24 29 05.0	504	3 55 56.37	+25 18 01.9	518	3 57 59.56	+24 29 16.0
491	3 54 33.56	+25 40 46.0	505	3 56 08.55	+21 45 49.6	519	3 58 56.98	+23 42 33.6

intend to collect as much as possible plates in the Pleiades obtained in different observatories in order to cover the period of more than 100 years on the way of long term brightness variations investigation of selected UV Cet type stars.

3. COORDINATES OF THE PLEIADES FLARE STARS

The results of the joint flare stars optical monitoring programme since 1963 in which 8 observatories (Tonantzintla, Asiago, Byurakan, Konkoly, Sonneberg, Abastumani, Rozhen, Palomar) took part up to 1981 have been presented in the Catalog and Identification Charts of the Pleiades Flare Stars of Haro et al. (1982, HCG stars) for 519 flare stars with very rough coordinates and magnitudes. More precise coordinates of the Pleiades flare stars have been provided in the Catalogue of Kazarovets (1993), available via VizieR (<http://vizier.u-strasbg.fr/cgi-bin/VizieR?-source=J/other/PZ/23.141>), but because of the problems in the star identification in such crowded field as the Pleiades the coordinates are not enough correct for automated photometric measurements. This is one of the reasons for recalculating the coordinates for all UV Cet type stars found in the Pleiades for which the finding charts have been published.

As a result of cooperation with the Royal Observatory of Edinburgh we obtained a Super COSMOS scan of the UKST plate No. R 8935. We estimated the exact coordinates of the UV Cet stars from the Catalog of Haro et al. (1982) and of 13 stars included in the Flare Stars Database (Tsvetkova et al. 1995), using the USNO A2.0 Catalogue of Astrometric Standards (Monet et al. 1998, <http://www.nofs.navy.mil>). The results are presented in Tables 3 and 4. The differences between the estimated coordinates and those from the Catalogue of Kazarovetz (<http://vizier.u-strasbg.fr/cgi-bin/VizieR?-source=J/other/PZ/23.141>) are presented in Fig.2.

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Table 4: Coordinates of the additional Pleiades flare stars with published finding charts from the Flare Stars Database, not included in the Catalog of Haro et al. (1982). The Hertzprung (1947) HII numbers are given.

GCVS No.	HII No.	R.A. JD 2000	DEC JD 2000
V1041TAU	738	03 45 39.33	+23 45 17.5
	1332	03 47 13.47	+23 42 53.7
V1048TAU	2381	03 49 36.64	+23 29 08.4
	2870	03 50 51.40	+23 19 47.0
V1051TAU	2984	03 51 16.81	+23 49 38.1
V1054TAU	3096	03 51 39.24	+24 32 58.6
V0877TAU		03 49 48.38	+22 10 50.9
V0851TAU		03 45 10.25	+24 23 31.0
V0854TAU		03 45 27.45	+23 37 59.5
V0859TAU		03 45 12.36	+22 41 53.5
V0853TAU		03 46 31.25	+22 18 22.4
	378	03 44 33.65	+23 41 24.4
	1451	03 47 32.55	+24 36 17.4

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