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SPACE DISTRIBUTION OF STARS AND DIFFUSE MATTER IN THE REGION OF IC 1396

ABSTRACT

Space distribution of stars and the interstellar absorbing medium have been investigated in a field of 19.5 square degrees containing the galactic cluster IC 1396 by means of objective prism spectral classification and photographic UBV photometry. This open cluster is a central region of the large OB association Cep OB2 and the field itself is the densest part of the association. Distribution of the absorbing material is very irregular in the region. The average absorption at the distance of the association is $1\overset{m}{.}5$. In addition to the earliest type stars, late B and early A stars also show some concentration at the distance of the association.

INTRODUCTION

OB associations are known to be groups of the earliest type stars associated with a large amount of interstellar gas and dust. They are considered to be places of star formation. OB stars within an association probably do not form a gravitationally bound group; they seem to expand (*Ambartsumian* 1949). It is natural to suppose that OB associations contain stars of lower mass too, for they may arise during the same processes as OB stars. However, large volumes and low spatial densities of the associations make it difficult to find the possible fainter association members. It would be interesting to investigate what kinds of stars other than OB stars originate from OB associations and what sort of relationship exists between space densities and kinematics of different type of stars within an association. The answers to these questions might well help us to understand the processes by which associations come into being. This is of special interest in the case of the local spiral arm which is probably not a density-wave arm (*Lin* et al. 1969) so there must be a triggering mechanism of star formation different from the galactic shock accompanying the density wave.

The present work is based on the observational material gathered from the field around IC 1396 in the period 1969-1972 at Konkoly Observatory. The aim of this study is to search for stars having lower absolute magnitude than OB stars in the association Cep OB2 by investigating the stellar space density along the line of sight in the direction of the association.

Association Cep OB2 lies near the outer edge of the local spiral arm. Its galactic coordinates are: $l=97^{o}-107^{o}$; $b=+2^{o}-+8^{o}$. It contains two galactic clusters: IC 1396 and NGC 7160. IC 1396 is an O-type cluster (*Markarian*, 1951) embedded in a large HII region (*Markarian*,1957); NGC 7160 is a very small B1 type cluster (*Markarian*, 1953). These clusters seem to be the centres of the expansion (*Ambartsumian*,1959). The average distance of the association from the Sun is 830 pc (*Simonson* , 1968). Because of the large dimensions and low spatial density of the stars its structural investigations in the optical wavelenghts were restricted to the most luminous stars. I have tried to extend the study to the fainter stars in the densest part of the association. The dark material is concentrated in the same volume as the association stars so it reduces the limiting distance of the study. The observational material available here allows a rough mapping of the space distribution of the absorbing clouds as well as the plotting of the distribution of different type stars in the direction of this part of the association.

OBSERVATIONAL DATA

a) Spectral classification

Spectral classes of stars up to 13^{m} in B colour have been derived from objective prism spectra obtained from four objective prism plates. These plates were taken with aid of the 60/90/180cm Schmidt telescope at Konkoly Observatory using an objective prism giving a dispersion of 580 A/mm at Hγ. One exposure was taken on Kodak OaO plate with an exposure time of 24^{m}, and three were taken on Kodak IIIa-J plates with the exposure times 120^{m}, 96^{m} and 60^{m}. The widening was 18" on each plate (i. e. 0.16mm). Classification criteria are virtually the same as those described by *Nassau* and *Seyfert* (1946). The number of classified stars is 843.

Sharpness of the classification criteria necessitates a dividing of classified stars into the following groups: earlier than B3; B3-B7; B8-A1; A2-A6; A7-F1; F2-F8; G0-G8; K-M. The numbers of stars in each of the different spectral groups are given below:

earlier than B3	38
B3-B7	63
B8-A1	203
A2-A6	112
A7-F1	75
F2-F8	151
GO-G8	81
KO-MO	120

In principle, it is possible to distinguish the different luminosity classes of G-K stars at such a dispersion (*Seitter*, 1975) but as most K stars are between $7-9^m$ they are somewhat overexposed on our plates. Because of this, their two-colour diagrams and distance modulus - colour excess diagrams were used estimating their luminosity classes (see below).

b) Photographic photometry

UBV photographic magnitudes of stars having objective prism spectra have been determined. Five plates were taken in each colour. The plate - filter combinations and exposure times were the following:

	plate	filter	exposure time
U	Kodak 103a-O	Schott UG1 2mm	10^m
B	Kodak 103a-O	Schott GG13 "	4^m
V	Kodak 103a-D	Schott GG14 "	4^m

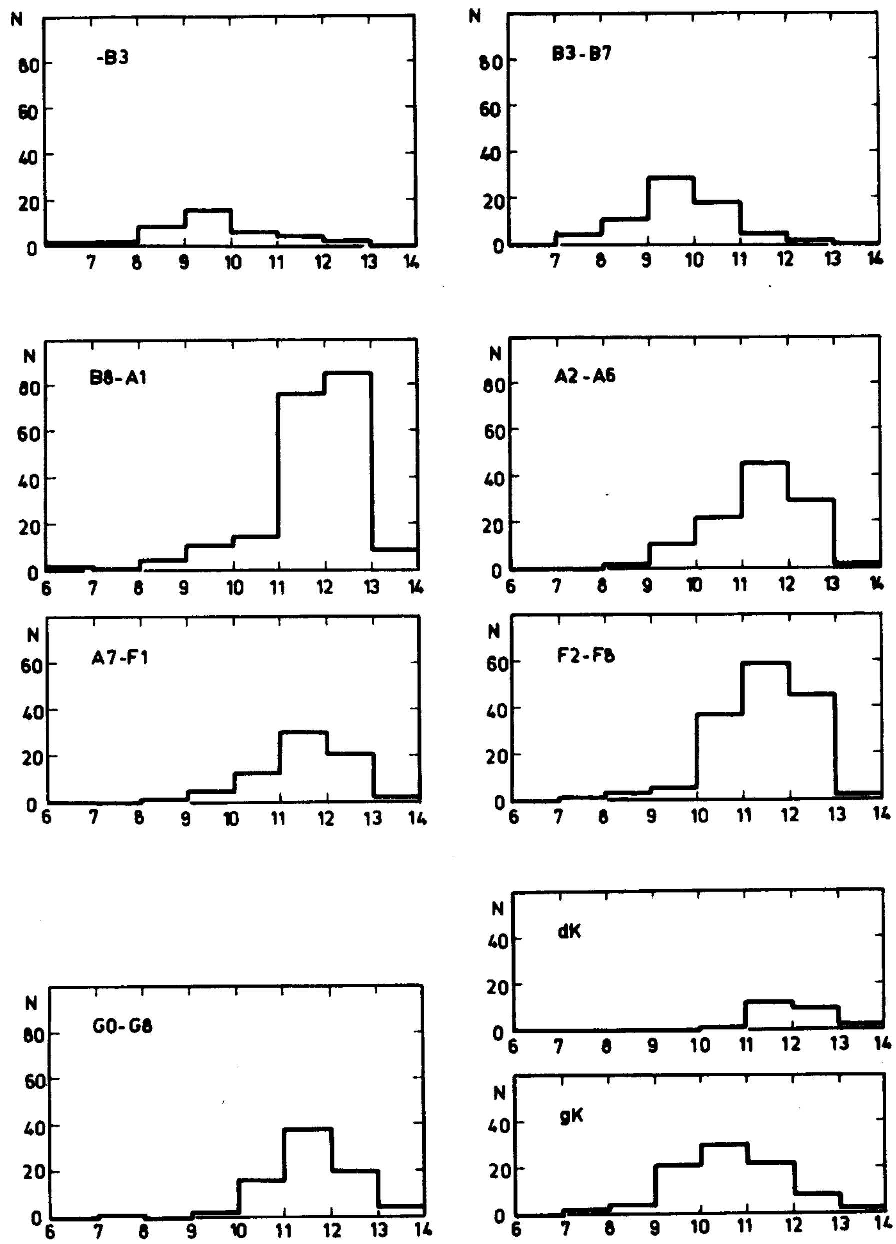
The photometric scale based on photoelectric magnitudes of 14 stars of the cluster IC 1396, was determined by B. A. Balázs at Kitt Peak National Observatory in 1967-68 using 36 and 16 inch telescopes. The transformation equations between the instrumental and international colour systems are the following:

$$V_{instr} = V + 0.07(B-V) - 0.07$$

$$B-V_{instr} = 1.04(B-V) - 0.03$$

$$U-B_{instr} = 0.91(U-B) - 0.11(B-V) + 0.01$$

The plates were measured using the Becker type iris photometer of the Konkoly Observatory. Mean errors of the photometry: $\pm 0\overset{m}{.}06$ for both V and B; $\pm 0\overset{m}{.}08$ for U. These errors are independent of the magnitude. In addition to these random errors the ultraviolet filter had a field error in a restricted area. Figure 1



N
-B3
B3-B7
B8-A1
A2-A6
A7-F1
F2-F8
G0-G8
dK
gK
0
20
40
60
80
6
7
8
9
10
11
12
13
14

Figure 1.

shows the distribution of the stars of different spectral groups as a function of the apparent B magnitude. A comparison of the present spectral classification with the HD spectral types can be seen in Fig. 2.

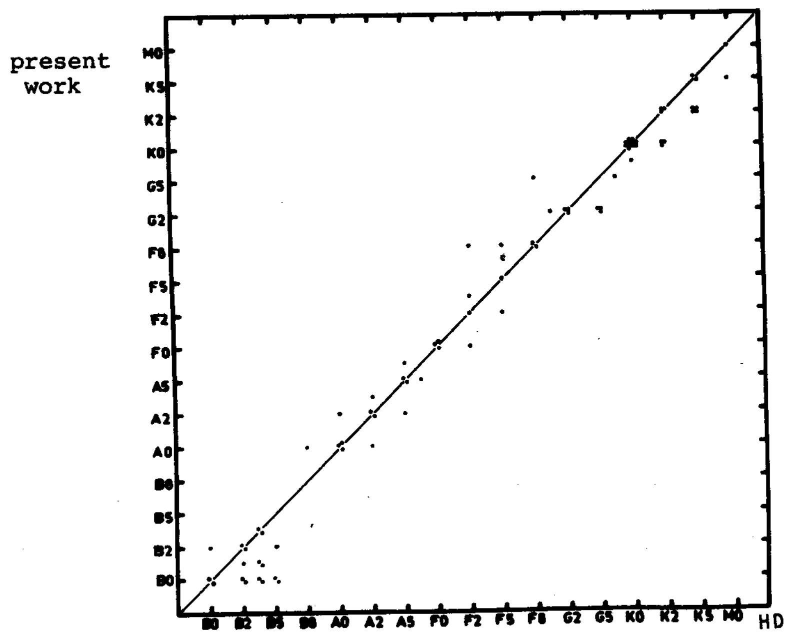


Figure 2.

INTERSTELLAR REDDENING AND ABSORPTION

Apparent stellar density strongly changes within the field presumably due to dark foreground clouds. According to the surface stellar density the field can be divided into six parts (Fig. 3). The surfaces of these parts (A), the number of stars (N) and the surface stellar densities (σ) are given in the following table:

Part	A($\square^o$)	N	σ (star/square degree)
1	2.3	94	40.84
2	5.3	148	27.92
3	1.6	85	53.12
4	2.0	62	31.09
5	5.8	359	61.81
6	2.6	90	34.61

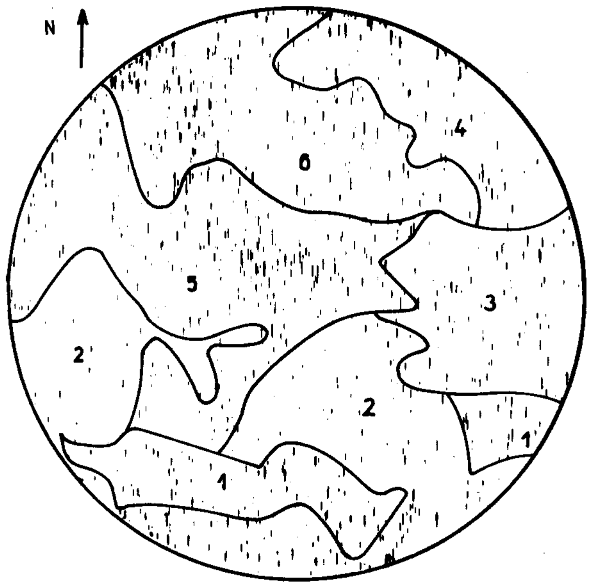


Figure 3.

Distance modulus - E_{B-V} colour excess diagrams have been drawn for each part separately. This has been done using the B0-F8 stars and assuming that all of these belong to the main sequence (Fig. 4). Absolute magnitudes and intrinsic colours of the spectral types were taken from *Allen* (1973). There is a strong reddening everywhere except in region 5 which contains the cluster IC 1396. In the region of the cluster the dispersions of the colour excesses are large; these dispersions are caused by a large number of small dark clouds having different absorptions (*Shajn* and *Gaze*, 1951).

An interesting part of the field is region 3, situated east of the cluster. In this region the reddening is about $0\overset{m}{.}8$, as in the almost starless region 2, but the surface stellar density is nearly as high as in the region of the cluster.

In the literature there are different values of the total to selective absorption for this region. *Johnson* (1965) found R=5.4 by infrared photometry of the μ Cephei; in addition, he obtained R=4.8 by applying the variable extinction method for the neigh-

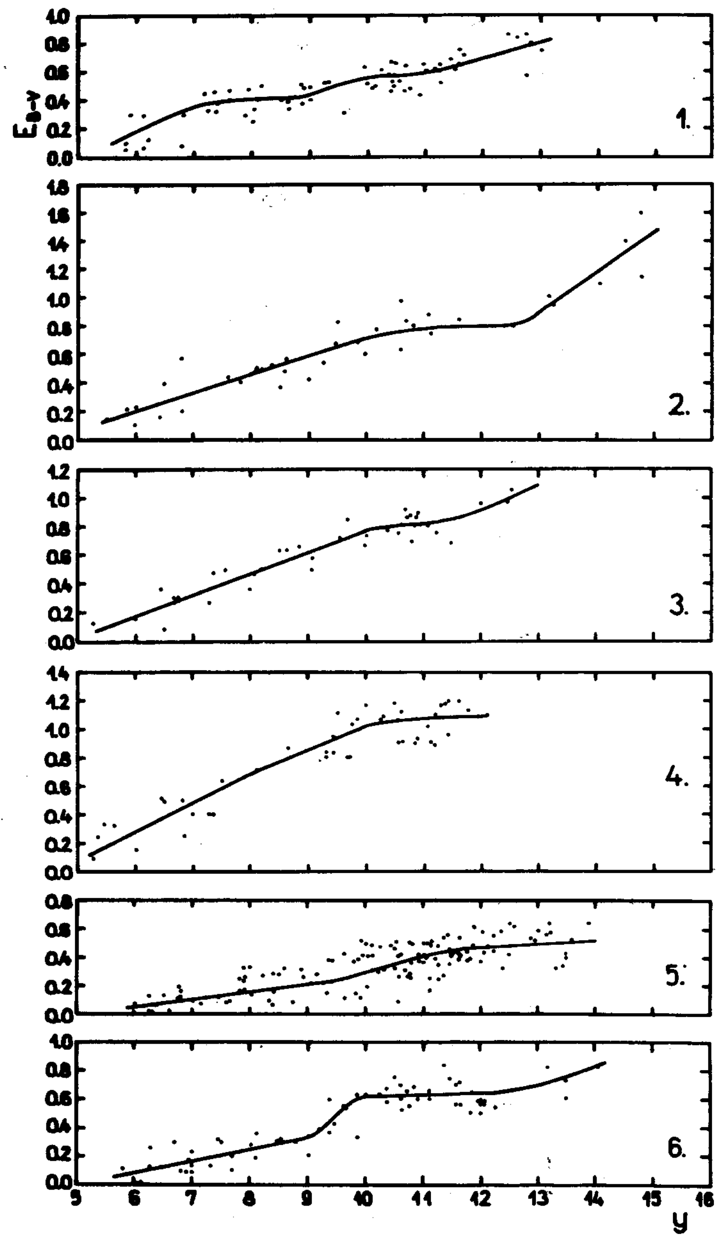
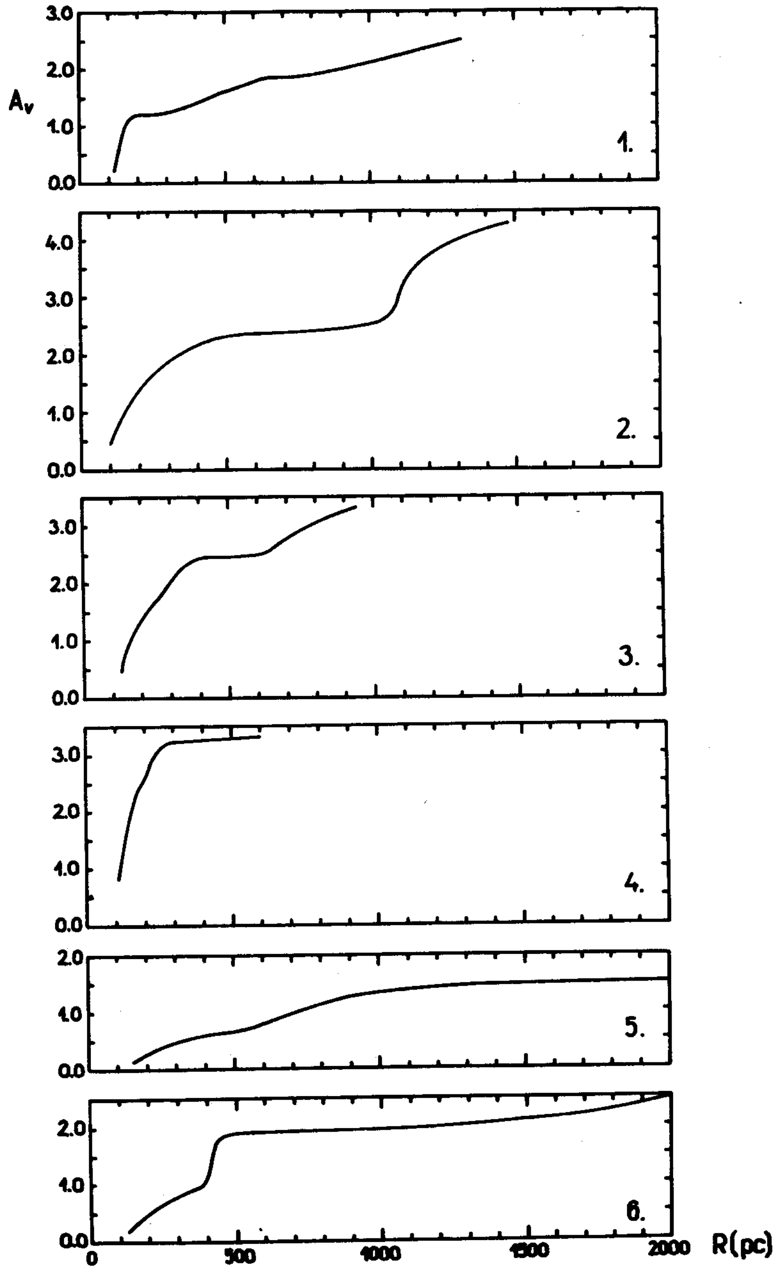


Figure 4.



3.0
2.0
1.0
0.0
A_v
1.
4.0
3.0
2.0
1.0
0.0
2.
3.0
2.0
1.0
0.0
3.
3.0
2.0
1.0
0.0
4.
2.0
1.0
0.0
5.
2.0
1.0
0.0
6.
0
500
1000
1500
2000
R(pc)

Figure 5.

bouring association Cep OB3. *Simonson* (1968) showed that neither of these methods is suitable for determining R in this region; he also suggested that there is no reason to assume an abnormally high value of R. The value R=3.0 has been adopted in this work.

Figure 5 shows the total absorption, a_V as a function of the distance assuming R=3.0 for each region separately. Except for region 5, there is a strong foreground absorption everywhere, caused by clouds situated 200-400 pc from the Sun. In the region of the cluster this method gives only a very smoothed picture of the dark material. The dust clouds seem to be concentrated between 600-1100 pc and the reddening changes almost from star to star.

The strong absorption makes possible a rough division of the late type stars into different luminosity classes (*Trumpler* and *Weaver*, 1953), if they are put onto the $y-E_{B-V}$ diagrams obtained from the main sequence stars. According to this estimation 64 G type stars are dwarfs, 14 are giants; in addition, 27 K type stars are dwarfs and 93 are giants. It is not possible to give a more accurate estimation of the absolute magnitudes of these giants as the absorption does not increase beyond 1200 pc; thus, this method gives only a lower limit of their luminosities and distances.

SPACE DISTRIBUTION OF STARS

Having evaluated the interstellar absorption it becomes possible for one to solve the convolution equation

$$A(m) = \int_{-\infty}^{+\infty} D(y)\Phi(m-y)dy,$$

separately for each spectral class. Here A(m) is the number of stars in the apparent magnitude interval $(m-\delta m, m+\delta m)$; D(y) is the number of stars between distance moduli $y-\delta y$ and $y+\delta y$; and $\Phi(M=m-y)$ is the luminosity function of a given spectral and luminosity class. The apparent magnitudes m and the distance moduli y are corrected for the absorption. To solve the equation the matrix method described by *Dolan* (1974) was used. At the absolute magnitudes of B8-A1 stars the absorption difference between the different parts of the field may cause noticeable differences between the distance limits in them. So it is not possible to deal with them together. Since it is only in region 5 that there are sufficient stars for the reliable evaluation of the equation, the densities of stars later than B7 have been calculated only for this part of the field. In the case of stars later than A1 the plate limit is within 500 pc even at the smallest absorption.

The space distribution of the three spectral groups earlier than A2 are shown in Fig. 6, 7 , 8. Straight lines show the field star densities assuming that these are functions solely of the

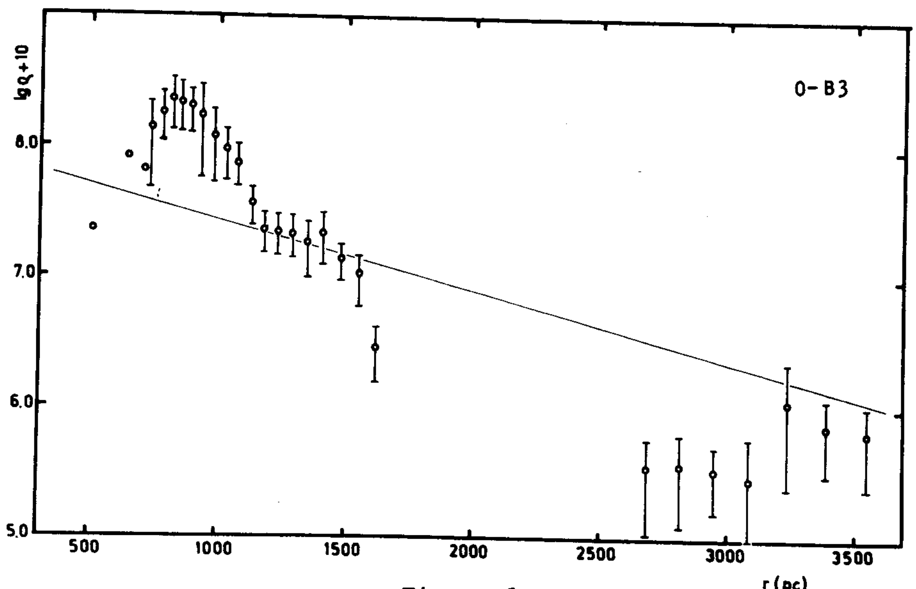


Figure 6.

distance from the galactic plane (*Allen*,1973) . Absolute values of the field star densities have been estimated in the case of stars earlier than B3 and B3-B7 from the shape of the density curve, and from *van Rhijn*'s (1955)data in the case of B8- A1 stars. Density of stars earlier than B3 shows a maximum between 2500 and 3500 pc; it may well be that these stars form the upper edge of the Perseus spiral arm. The line of sight goes 300 pc above the galactic plane at this distance. Stars of the association are concentrated between 600 and 1100 pc. B3-B7 stars also show a concentration between the same distance limits. It is more difficult to decide whether or not there is a concentration of B8-A1 stars because the plate limit is about 1150 pc. With the assumption that the space density of the field A0 stars is nearly constant at a given galactic longitude and distance from the galactic equator an extrapolation has been made for its value from *van Rhijn*'s (1955) data obtained at $l=100^{\circ}$, $b=+7^{\circ}$. The gradient of the curve indicates that there is a concentration within 1100 pc.

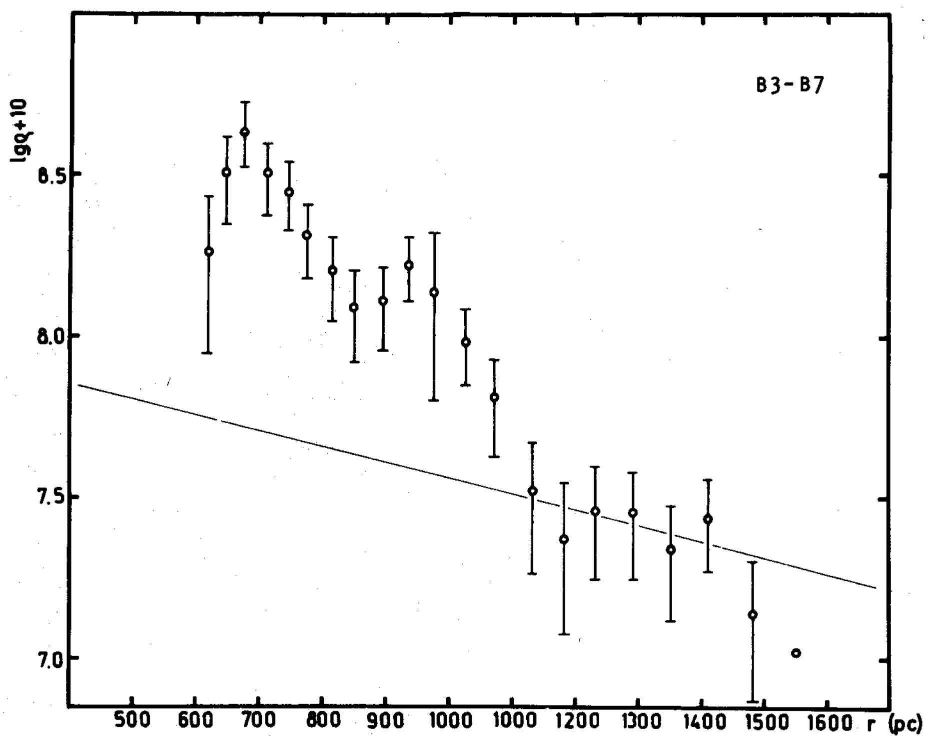


Figure 7. Space distribution of B3-B7 stars

Space density units are given as stars/10^3 pc^3. Error bars have been calculated on the assumption that the star number in every field segment has the statistical error $N^{1/2}$ (*Dolan*,1974)

Figures 9a, b, and c show respectively the densities of A2-A6, A7-F1 as well as F2-F8 stars. The density of A2-A6 stars is nearly constant within the plate limit in this direction, whereas the densities of the A7-F1 as well as the F2-F8 stars decrease in accordance with other observations (*McCuskey*, 1956).

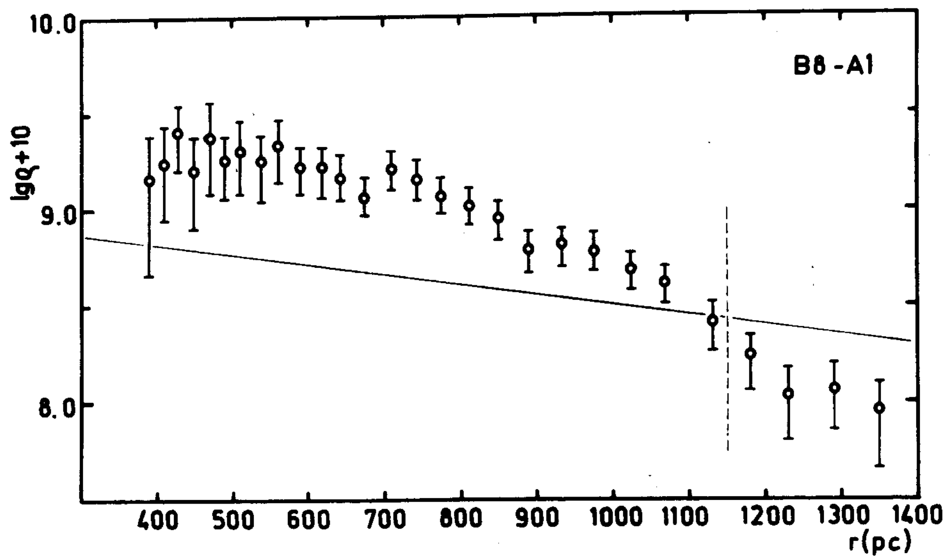
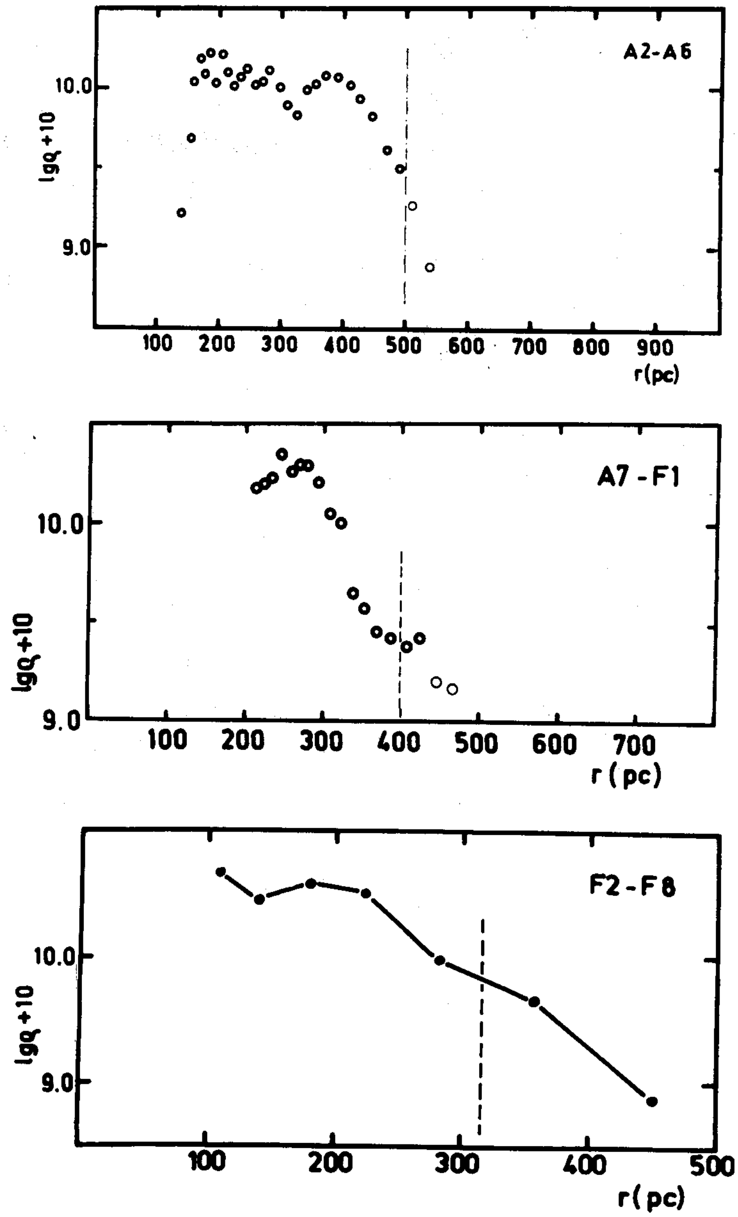


Figure 8. Space distribution of B8-A1 stars. The dashed line indicates the plate limit.

There are two possibilities for estimating the distance of K giants assuming that all they belong to the same luminosity class. On the basis of the available data, including the literature, it is not possible to decide whether this assumption is true or not.

The first possibility is a statistical parallax calculation utilizing the available proper motion data. The results obtained in this way are independent of the photometry. The SAO Catalogue contains the proper motions of 36 K type giants of our field. Their apparent magnitudes are between $8^m\!.0$ and $9^m\!.5$. From these data r=724 pc has been found to be the average distance. It implies an absolute magnitude $M_V=-2^m\!.3$, so these stars are bright giants and they lie almost at the distance of the association.

The other method of distance estimation is based on the assumption that these stars are of the third luminosity class, like the largest percentage of the late type giants of the galactic field. Then their absolute magnitudes are about $+1^m\!.0$. In this



Figures 9a, b, c. Space distribution of A2-A6, A7-F1 and F2-F8 stars. Dashed lines indicate the plate limit.

case all these stars are nearer than 500 pc. Their two-colour diagram (Fig. 10) confirms this assumption as being the average colour excess in B-V about $0^m.2$, whereas at a distance 724 pc it ought to be at least $0^m.5$.

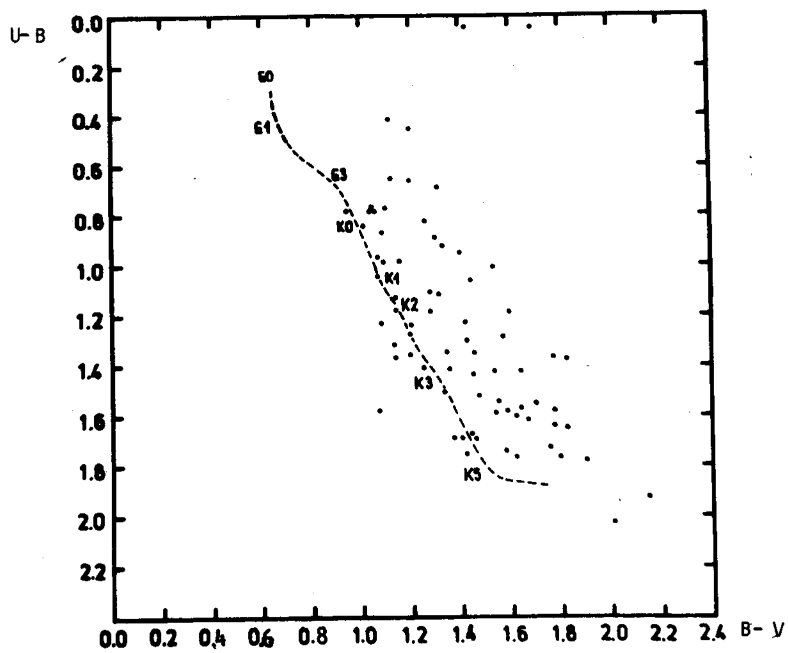


Figure 10. Two-colour diagram of K giants. The dashed line indicates the unreddened diagram of the third luminosity class taken from *Golay* (1974).

These two contradictory results indicate that either the kinematic or photometric data contain some systematic error, or one of our preliminary assumptions is not true (in particular, that they do not belong to the same luminosity class). So neither of the above estimations can be accepted without exact spectroscopic determination of the luminosity classes.

CONCLUSIONS

The distribution of stars in space shows that not only are OB stars concentrated at the distance of the association, but later B stars as well. There are, however, some signs of concentration of B8-A1 stars too, even though this is not really significant. In particular, the slope of the density curve shows that concentration does exist within 1100 pc. In the distribution of stars later than A1 the association cannot be traced because of the high foreground absorption and the limiting magnitude of the spectral classification. Due to the high interstellar absorption the study of B8-A1 stars has been restricted to an area of 5.8 square degrees including the cluster whose angular diameter is about one degree (*Trumpler*, 1930; *Collinder*, 1931; *Markarian*, 1951). Investigations of space distribution of stars in galactic clusters indicate the existence of extended coronae, whose diameters are 2.5-10 times larger than those of the clusters (*Kholopov*,1968). The central part of a cluster contains the brightest cluster members, whereas the corona mainly consists of fainter stars. So it is possible that A0 or the later association members - if they exist - form a gravitationally bound system as the corona of the IC 1396. *Reddish* (1967) has found this feature to be true for the association Cyg OB2; *Kholopov* (1974) also claims that the expansion is the property of only the earliest type stars. The surface density of B8-A1 stars in region 5 is nearly constant; their distribution makes it difficult to recognize the core of the cluster (Fig.11). This figure shows as well that the

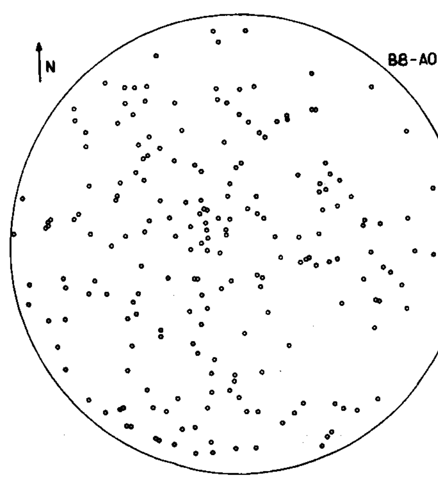


Figure 11.

surface density of B8-A1 stars in region 3 is nearly the same as in the region of the cluster. A0 stars in part 3 have a reddening of about $0\overset{m}{.}9$, they all are behind a dust cloud. The constant surface density indicates that the high concentration of the stars continues in this direction with a dark foreground cloud in front of it. Nearly in the direction of the axis of this elongated concentration are the NGC 7160, μ Cephei and numerous bright stars. The whole association seems to have an elongated shape whose axis inclines to the galactic plane at 20^{o}.

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TABLE

Spectra and UBV data of the survey stars

No.	Sp.	V	B-V	U-B	remarks
1	A7	10.49	1.05	0.13	
2	B8	9.96	0.62	0.12	BD +54°2560
3	FO	10.33	0.73	0.02	
4	BO	8.89	0.52	-0.68	BD +54°2575
5	GO	11.50	0.71	-0.03	
6	K2	9.14	1.28	1.19	BD +54°2579
7	A5	8.12	0.55	-0.33	BD +54°2581
8	K2	8.37	1.62	1.60	BD +54°2585
9	B5	9.27	0.42	-0.22	BD +54°2587
10	AO	10.14	0.67	0.27	BD +54°2589
11	AO	9.60	0.08	0.26	BD +54°2598
12	B2	9.04	0.52	-0.44	BD +54°2611
13	AO	11.51	0.80	0.63	
14	AO	11.29	0.63	0.54	
15	BO	8.27	0.74	-0.44	BD +54°2607
16	A7	11.42	0.60	0.07	blend
17	AO	11.82	0.74	0.53	
18	F6	9.87	0.66	-0.10	BD +54°2601
19	A5	8.93	0.57	-0.26	BD +54°2593
20	B8	11.08	0.66	0.28	
21	AO	11.28	0.99	0.22	blend
22	AO	10.22	1.93	1.66	
23	FO	10.04	1.39	0.58	
24	A3	8.95	0.43	-0.05	BD +54°2573
25	FO	10.73	0.63	0.12	BD +54°2569
26	F8	9.62	1.55	0.97	
27	B3	11.93	0.65	-0.12:	
28	B8	10.96	0.61	0.20	
29	AO	10.56	0.69	-0.05	BD +54°2556
30	F2	9.48	1.80	1.40	BD +54°2554
31	F5	10.30	0.95	-0.02:	BD +54°2564
32	K5	9.05	2.16	2.28	BD +54°2557
33	G8	10.11	0.93	0.16	
34	A2	8.93	0.45	-0.25:	BD +54°2567
35	F8	10.70	0.72	0.03	
36	B8	10.46	0.58	-0.17	BD +54°2573
37	A4	10.78	0.46	0.25:	
38	B8	10.86	0.78	0.12	
39	A2	10.53	0.68	0.18	
40	A7	10.67	0.72	0.38	
41	KO	7.54	1.16	0.43	BD +54°2590
42	KO	7.85	1.20	0.45:	BD +54°2597
43	AO	10.69	0.60	0.18	BD +54°2600
44	A5	10.38	0.62	0.46	
45	F2	10.64	0.31	0.16	BD +54°2605
46	AO	11.04	0.31	-0.07	
47	AO	11.81	0.18	0.15	
48	AO	10.68	0.44	0.16	
49	AO	10.50	0.47	0.18	
50	AO	11.54	0.57	0.16	

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
51	B5	9.33	0.49	-0.52	BD +54°2610
52	A0	10.89	0.58	0.43	
53	A2	10.15	0.70	-0.01	BD +54°2608
54	B9	8.14	0.44	0.12	BD +54°2606
55	G6	10.64	0.65	0.02	
56	G4	9.73	0.75	0.02	BD +54°2594
57	B0	10.74	0.64	-0.46	BD +54°2592
58	A0	11.24	0.53	0.09	
59	F0	11.36	0.66	0.16	
60	B2	10.26	0.62	-0.30	BD +54°2588
61	B8	11.72	0.88	-0.25	
62	B8	11.70	0.60	-0.43	
63	B7	10.21	0.49	-0.04	BD +54°2578
64	A2	10.73	0.52	0.12	
65	B5	10.44	0.37	-0.21	
66	F0	11.05	0.91	0.42	
67	A0	11.62	0.86	0.24	
68	A0	11.38	0.98	-0.11	
69	F0	10.60	0.65	0.11	
70	K0	7.58	1.21	0.66	BD +54°2555
71	A0	11.41	0.83	0.30	
72	A7	11.16	0.73	0.23	
73	A2	10.54	0.46	0.27	BD +54°2552
74	A7	10.68	0.74	-0.06	BD +54°2548
75	A0	10.30	0.82	-0.02	BD +54°2546
76	F8	10.57	0.88	-0.07	BD +54°2549
77	F2	10.55	0.70	-0.01	BD +54°2550
78	B9	6.31	0.14	--	BD +54°2544
79	A0	10.42	0.80	-0.13	BD +54°2539
80	F4	10.86	0.84	-0.20	
81	K5	8.88	1.70	0.04	BD +55°2585
82	K0	7.99	1.53	1.05	BD +54°2538
83	F4	10.46	0.89	-0.06	BD +55°2590
84	K2	10.03	1.47	0.31	BD +54°2571
85	F0	12.11	0.55	0.05	blend
86	B5	11.36	0.45	-0.23	
87	K	8.84	1.36	1.41	BD +54°2582
88	F0	10.39	0.54	0.03	BD +54°2584
89	K	10.03	1.48	1.51	
90	A0	11.12	0.44	0.40	
91	F7	11.14	0.90	-0.20	
92	G0	9.53	0.76	0.16	BD +54°2609
93	A0	11.36	0.22	0.31	blend
94	A0	9.81	0.47	0.35	BD +55°2622
95	A2	11.00	0.50	0.33	
96	F0	9.47	0.36	-0.08	
97	G	10.86	0.79	0.32	
98	G8	10.74	0.79	0.14	blend
99	G2	9.80	0.66	0.05	BD +54°2612
100	A0	11.90	0.38	0.01	
101	B5	7.89	0.38	-0.52	BD +54°2589

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
102	F2	10.70	0.52	0.22	blend
103	A0	9.25	0.27	-0.01	BD +55°2610
104	A5	8.95	0.57	-0.09	blend
105	A4	9.90	0.26	0.02	BD +55°2602
106	F0	11.02	0.84	-0.18	
107	F2	11.20	0.87	-0.30	
108	K	9.74	2.07	2.09	
109	K5	9.08	2.17	1.92:	BD +55°2581
110	K0	9.43	1.31	0.69	BD +55°2589
111	G8	10.74	0.83	0.54	
112	K0	7.72	1.42	1.22	BD +55°2597
113	K2	8.86	1.57	1.54	BD +55°2598
114	A2	10.71	0.90	0.43	
115	K2	9.28	1.64	1.62	BD +55°2601
116	B8	11.13	0.60	-0.44	
117	B5	10.24	0.35	-0.11	blend
118	B7	10.76	0.48	-0.19	BD +55°2606, blend
119	G2	9.47	0.70	-0.03	BD +55°2608
120	A0	11.75	0.62	0.53	
121	F2	10.80	0.79	0.13	
122	G2	10.89	0.63	0.15	
123	F0	9.92	0.54	0.15	BD +55°2621
124	K0	8.45	1.20	0.74	BD +55°2624
125	B6	10.20	0.36	-0.02	BD +55°2625
126	A0	11.18	0.48	0.40	
127	A2	9.54	0.41	0.33	BD +55°2628
128	F5	9.70	0.64	0.00	BD +55°2632
129	A0	11.00	0.91	0.42	
130	K7	9.25	1.70	1.55	BD +55°2635
131	F0	11.35	0.61	0.45	
132	A5	10.81	0.47	0.34	BD +55°2618
133	F0	10.37	0.66	0.12	
134	A0	11.84	0.90	0.50	
135	A0	10.27	1.60	1.31	blend
136	F8	10.74	0.68	0.11	
137	F5	11.36	0.73	0.12	
138	K0	10.43	0.91	--	blend
139	B8	11.41	0.72	0.25	blend
140	G0	11.35	0.91	--	blend
141	G	11.46	2.19	--	
142	F8	9.31	0.63	-0.13	BD +55°2596
143	F0	11.31	0.74	0.39	
144	F0	10.75	0.79	-0.09	
145	K2	9.27	1.43	0.04	BD +55°2583
146	F0	10.03	0.72	0.08	BD +55°2579
147	F0	10.06	0.60	-0.08	BD +55°2578
148	A0	7.86	0.59	--	BD +55°2576
149	G	11.66	1.01	0.03	
150	G	10.46	1.04	0.08	
151	F8	9.97	0.62	-0.27	BD +55°2574
152	G0	9.01	0.85	0.20	BD +55°2577

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
153	F8	10.10	0.75	-0.06	BD +55°2582
154	A3	9.52	0.42	0.15	BD +55°2586
155	B8	9.50	0.39	0.14	BD +55°2591
156	AO	10.57	0.68	0.08	
157	B2	8.97	0.71	-0.38	BD +55°2592
158	KO	10.78	1.08	0.36	
159	GO	11.35	0.98	-0.12	
160	GO	10.56	0.72	0.14	
161	KO	9.82	1.04	0.79	BD +55°2605
162	F8	10.85	0.98	0.16	
163	AO	10.74	0.73	0.54	BD +55°2607
164	AO	12.36	0.49	-0.03	
165	F2	10.45	0.53	0.15	BD +55°2616
166	F8	10.43	0.57	-0.01	
167	A2	10.34	0.44	0.50	
168	F2	10.70	0.58	0.19	BD +55°2619, blend
169	AO	11.02	0.43	0.44	
170	F8	11.56	0.76	0.30	
171	B8	11.31	0.87	0.20	
172	FO	10.28	0.69	0.54	
173	F5	10.19	0.65	-0.20	
174	F8	10.33	0.95	0.25	blend
175	KO	9.12	1.60	1.19	BD +55°2634
176	F2	11.26	0.82	0.41	
177	B5	10.31	0.36	0.32	BD +55°2559, edge
178	B5	10.92	0.78	0.06	edge
179	AO	11.67	0.86	0.18	
180	G	11.92	0.83	--	
181	F2	12.60	0.87	0.43	blend
182	K	10.57	1.57	1.28	
183	B3	9.23	0.59	--	BD +55°2637
184	F2	9.74	0.35	0.19	BD +55°2629
185	F5	10.70	0.58	0.25	
186	A2	11.15	0.49	0.38	blend
187	A2	11.33	0.54	0.42	
188	F8	11.51	1.30	0.29	
189	K7	8.39	1.82	1.65	BD +55°2620
190	AO	11.80	0.55	0.45	
191	F8	11.20	0.74	0.05	
192	F2	10.92	0.59	0.05	
193	AO	12.63	0.90	0.11	
194	F2	10.84	0.60	0.05	
195	F8	11.56	0.77	0.00	
196	A2	11.03	0.59	0.16	
197	F5	10.74	1.60	1.34	
198	B2	10.46	0.53	-0.30	
199	F8	11.16	0.90	0.30	
200	KO	7.62	1.44	1.06	BD +55°2595
201	F6	10.27	0.67	-0.07	BD +55°2580
202	B8	11.46	0.92	0.17	
203	B3	8.62	0.78	-0.48	BD +55°2575, blend

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
204	B3	9.12	0.69	-0.31	BD +55°2569
205	FO	9.42	0.49	-0.04	BD +55°2568
206	A2	9.07	0.42	0.07	BD +55°2560
207	AO	11.16	0.97	0.27	
208	F2	10.01	0.56	-0.01	BD +55°2584
209	KO	7.77	1.42	1.76	BD +55°2587
210	AO	11.36	0.90	0.43	
211	AO	9.82	0.94	0.85	BD +55°2588
212	FO	11.63	0.86	0.22	
213	F5	10.04	0.48	0.03	
214	AO	11.79	0.70	0.22	
215	FO	11.52	0.63	0.29	
216	F2	11.43	0.71	-0.01	
217	A5	11.55	0.95	0.35	
218	K5	8.94	2.13	2.64	BD +55°2600
219	G5	9.47	1.12	0.42	BD +55°2604
220	AO	11.47	0.21	--	blend
221	A2	10.46	0.59	0.20	BD +55°2609
222	A7	11.63	0.57	0.56	
223	AO	8.93	0.35	-0.04	BD +55°2613
224	F2	10.16	0.52	0.09	BD +55°2615
225	B8	11.04	0.59	0.03	BD +55°2626
226	FO	10.67	0.48	0.31	
227	A2	11.37	0.57	0.49	
228	F2	11.06	0.60	0.14	
229	G2	10.48	0.64	0.21	
230	AO	11.96	0.34	0.19	
231	A2	11.72	0.37	0.04	blend
232	K5	10.71	1.80	1.77	blend
233	AO	12.42	0.11	--	blend
234	A7	10.66	0.40	0.17	
235	G2	11.00	0.69	-0.04	
236	G5	10.97	0.63	0.16	
237	K5	9.22	1.33	0.92	BD +55°2633
238	AO	11.53	0.79	0.18	
239	AO	11.51	0.57	0.78	
240	AO	10.87	1.17	0.84	
241	AO	11.04	0.74	0.41	
242	AO	11.22	0.65	0.37	
243	A7	11.06	0.59	0.40	
244	K	10.87	1.30	1.11	
245	A2	10.95	0.58	0.48	
246	AO	11.08	0.34	0.15	
247	AO	11.21	0.26	0.01	
248	B2	10.40	0.72	-0.31	
249	AO	11.01	0.44	0.35	
250	G5	10.70	0.82	0.39	
251	F6	10.73	0.78	0.30	
252	K2	9.87	1.47	--	BD + 56°2603
253	F4	10.94	1.04	0.13	
254	AO	11.51	0.61	-0.22	

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
255	A2	10.45	0.68	0.44	BD +56°2587
256	F8	11.43	0.73	-0.12	
257	A2	10.20	0.71	0.25	BD +56°2583
258	KO	8.19	1.30	0.89	BD +56°2580
259	AO	11.67	0.87	0.58	blend
260	G2	10.95	0.93	0.37	
261	F5	10.25	0.67	0.10	
262	KO	8.05	1.26	--	BD +56°2565
263	A7	10.63	0.81	0.36	
264	AO	11.49	0.88	0.55	
265	AO	11.34	0.91	-0.05	
266	A2	10.67	0.74	0.43	
267	A4	11.52	0.82	0.35	
268	F6	11.48	0.78	-0.09	
269	F2	10.43	0.57	0.00	
270	AO	11.81	0.72	0.04	
271	AO	11.15	0.66	-0.01	
272	AO	9.42	0.09	-0.02	BD +56°2608
273	F5	10.08	0.41	-0.15	BD +56°2611
274	AO	10.86	0.31	-0.11	
275	KO	11.06	0.85	0.62	
276	B2	11.48	0.56	-0.27	
277	B6	10.11	0.34	-0.05	
278	AO	11.23	0.53	0.38	
279	G	11.48	0.92	0.44	
280	FO	9.72	0.29	0.08	BD +56°2633
281	B2	9.25	0.70	-0.35	BD +56°2640
282	AO	11.53	0.96	0.29	
283	A2	11.35	0.96	0.52	
284	F8	11.35	0.80	0.45:	
285	AO	11.58	0.85	0.49	
286	F2	11.64	0.96	0.68:	
287	AO	12.25	0.57	0.38	
288	B5	10.73	0.44	-0.26	
289	K2	10.15	1.54	1.42	
290	F8	10.40	0.85	0.74	BD +56°2639
291	K5	9.50	1.68	2.27	BD +56°2637
292	AO	11.15	0.48	0.27	
293	B3	8.92	0.29	-0.62	BD +56°2632
294	B3	9.49	0.21	-0.70	BD +56°2631
295	F8	11.27	0.43	0.25	
296	AO	11.79	0.40	0.17	
297	B7	11.05	0.25	-0.26	
298	GO	11.29	0.65	0.29	
299	B7	11.69	0.50	-0.07	
300	K	11.08	1.05	0.00	
301	K	8.61	0.94	0.79	BD +56°2624
302	AO	12.25	0.80	0.44	
303	AO	11.10	1.23	0.84	blend
304	A7	12.10	0.50	0.56	
305	F2	10.11	2.05	0.29	

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
306	B2	9.21	0.23	-0.64	BD +56°2618
307	B0	7.40	0.14	-0.79	BD +56°2614
308	G0	9.80	0.51	--	BD +56°2609
309	G8	10.00	0.82	0.52	BD +56°2597
310	A4	10.98	0.73	0.43	
311	A0	11.27	0.84	0.25	
312	A2	9.51	0.59	0.11	BD +56°2591
313	B8	11.00	0.65	0.24	
314	A0	11.35	0.81	0.65	blend
315	A0	9.22	0.30	-0.02	BD +56°2585
316	A0	11.27	0.76	0.29	
317	A0	11.81	0.80	0.12:	
318	A7	10.98	0.79	0.50	
319	K	10.46	1.76	1.73	
320	A4	10.07	0.74	0.80	
321	G2	10.69	0.83	0.04	
322	B8	10.68	0.67	0.00	
323	K	9.62	1.77	1.37	BD +56°2572
324	A5	11.30	0.91	0.55	
325	A7	11.46	0.88	0.29	
326	G5	9.79	0.82	0.19	BD +56°2568
327	A7	11.37	1.71	1.27	
328	A0	11.08	0.78	0.23	
329	A5	10.22	0.60	0.09	BD +56°2566
330	B5	10.27	0.89	-0.06	
331	B8	10.89	0.94	0.03	
332	A6	10.77	1.06	0.62	blend
333	B0	11.54	0.98	0.15	edge
334	A2	11.68	0.95	0.14	blend
335	F0	11.56	0.77	0.46	
336	A2	10.83	0.67	0.40:	
337	F0	10.62	0.64	0.18	
338	F0	10.39	0.78	-0.05	
339	G0	10.02	0.56	0.18	BD +56°2579
340	F4	8.27	0.35	-0.23	BD +56°2581
341	B1	8.68	0.33	-0.83	BD +56°2584
342	F4	11.22	0.69	-0.08	
343	F2	11.15	0.47	0.10	
344	G2	10.37	0.68	0.05	
345	K	10.12	1.20	1.22	
346	F2	10.31	0.47	0.02	
347	B8	10.63	0.12	-0.09	BD +56°2612
348	G2	10.82	0.48	0.38	
349	K2	9.28	1.69	2.29	BD +56°2624
350	B8	9.98	1.07	0.97	
351	K	11.06	1.31	1.12	
352	F0	10.51	0.64	0.53	BD +56°2635
353	F0	10.58	0.57	0.51	BD +56°2638
354	F8	9.97	0.47	0.08	BD +56°2646
355	A5	10.59	0.64	0.03	BD +56°2647
356	F8	10.78	0.52	0.23	BD +56°2650

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
357	B5	10.60	0.57	-0.06	
358	F8	11.50	0.62	0.05	
359	K	10.34	1.77	1.58	
360	G8	10.05	0.64	0.53	
361	K5	9.42	1.44	2.36	BD +56°2666
362	KO	10.79	1.79	1.18	
363	F2	11.30	0.47	0.35	
364	B7	10.43	0.35	0.09	edge
365	F2	11.97	0.53	0.46	
366	G8	11.59	0.47	0.44	
367	F5	10;31	0.68	0.07	BD +56°2648
368	KO	9.85	1.14	1.13	BD +56°2644
369	AO	9.84	0.26	0.10:	BD +56°2642
370	F5	12.03	0.63	0.22	
371	A5	11.19	0.63	0.58	
372	A2	11.36	0.45	0.16	
373	B8	11.06	0.21	-0.31	
374	FO	11.65	0.55	--	
375	AO	11.48	0.36	0.43	
376·	B5	9.24	0.87	0.35	BD +56°2621
377·	A7	9.42	0.35	0.14	BD +56°2606
378·	KO	9.09	1.07	0.97	BD +56°2619
379·	B8	10.57	0.34	-0.04	
380·	A2	10.71	0.58	0.37	
381·	FO	10.57	0.40	0.06	
382·	K	10.89	1.54	1.59	
383·	FO	11.70	0.69	0.41	
384·	BO	6.90	0.19	-0.72	BD +57°2374
385·	F2	9.20	0.43	0.03	BD +56°2600
386·	F2	9.65	0.41	-0.02	BD +56°2600
387·	A2	10.10	0.45	2.04	
388·	O6	5.86	0.19	-0.60	BD +56°2717
389·	BO	8.04	0.27	-0.77	BD +56°2717
390·	BO	8.03	0.14	-0.68	BD +56°2717
391·	F4	7.44	0.46	0.04	BD +56°2623
392·	F4	8.76	0.62	0.08	BD +56°2623
393·	BO.5	10.47	0.65	-0.35	
394·	B2	8.65	0.25	-0.57	BD +56°2610
395	AO	11.80	0.16	0.03	
396	AO	11.42	0.26	0.38	
397	F6	10.25	0.46	0.04	
398	MO	9.15	1.76	2.45	BD +56°2616
399	K5	9.10	1.02	0.19	BD +56°2613
400	B1	9.16	0.36	-0.50	BD +56°2615
401	AO	11.45	0.28	0.08	
402	B5	12.10	0.56	-0.18	
403	KO	10.18	1.35	1.17	
404	B3	10.32	0.37	-0.33	BD +56°2602
405	F6	10.15	0.57	-0.01	BD +56°2599
406	B5	10.81	0.52	-0.18	
407	KO	10.30	1.29	0.25	

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
408	A2	11.53	0.58	-0.29	
409	B9	9.45	0.24	-0.19	BD +56°2594
410	B5	12.51	0.70	0.19	
411	AO	12.57	1.06	0.17	
412	FO	10.35	0.37	-0.04	BD +56°2568, blend
413	AO	11.04	0.36	0.15	
414	K2	10.33	1.10	0.78	
415	M	9.91	1.90	1.78	
416	G8	8.13	0.87	-0.01	BD +56°2578
417	G8	10.69	0.95	0.22	
418	B5	9.94	0.82	0.00	BD +56°2577
419	M	10.94	2.24	1.21	
420	K5	10.18	1.44	1.43	BD +56°2576
421	AO	11.81	0.81	0.64	
422	KO	8.08	1.26	0.83	BD +56°2574
423	AO	11.86	0.88	0.16	
424	F8	10.29	0.88	0.05	
425	GO	10.22	1.00	0.28	
426	AO	11.96	1.07	0.45	
427	F8	10.49	0.97	0.15	BD +56°2563
428	KO	7.68	1.77	1.67	BD +56°2561
429	B8	10.74	1.01	0.05	
430	F8	10.81	0.96	0.14	edge
431	KO	9.48	1.35	-0.01:	
432	A2	11.56	1.27	0.68	
433	A5	11.43	0.83	0.57	
434	KO	8.00	1.64	1.54	BD +56°2569
435	G8	11.72	0.96	0.12	
436	K2	9.45	1.42	1.30	BD +56°2575
437	AO	11.73	0.92	0.39	
438	K	8.70	1.59	1.59	BD +56°2582
439	F8	11.65	0.71	0.21	
440	F5	10.59	0.51	0.13	
441	G2	11.29	0.73	0.10	
442	A3	10.01	0.24	0.06	BD +56°2593
443	A2	10.38	0.16	0.48	
444	B5	11.30	0.45	-0.12	
445	AO	9.39	0.05	-0.05	BD +56°2595
446	B3	10.11	0.25	-0.42	
447	B3	8.38	0.41	-0.72	BD +56°2598
448	B3	9.46	0.14	-0.39	BD +56°2604
449	AO	12.14	0.46	0.16	
450	BO	8.39	0.39	-0.79	BD +56°2620
451	B5	10.20	0.23	-0.52	BD +56°2622, blend
452	G2	11.14	0.40	0.53	blend
453	F8	12.62	0.92	0.36	
454	K	11.96	1.41	0.08	
455	F2	10.72	0.42	0.38	
456	B8	10.74	0.48	0.22	
457	K5	8.46	1.08	1.23	BD +56°2634
458	A5	11.68	0.70	0.72	

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
459	KO	11.59	0.85	0.53	blend
460	AO	12.37	0.38	0.66	
461	F5	11.71	0.65	0.54	
462	FO	10.39	0.59	0.46	BD +56°2645
463	B8	11.54	0.53	0.22	
464	AO	11.96	0.31	0.15	edge
465	KO	10.90	0.69	0.66	
466	AO	12.01	0.63	0.64	
467	AO	11.21	0.32	0.42	
468	AO	11.18	0.32	0.35	
469	AO	8.72	0.04	-0.06	BD +56°2652
470	AO	12.39	0.71	0.23	
471	A2	11.64	0.37	0.52	
472	F8	10.49	0.45	0.10	
473	A2	11.21	0.44	0.69	
474	FO	10.93	0.68	0.42	
475	G5	9.70	0.53	0.29	
476	F2	10.71	0.79	0.29	
477	K2	8.52	1.48	1.75	BD +56°2636
478	F6	11.79	0.81	0.43	
479	AO	12.36	0.45	0.48	
480	K4	10.67	1.17	0.90	
481	B8	11.25	0.12	-0.11	
482	GO	10.67	0.67	0.50	
483	A7	11.93	0.48	0.49	
484	F2	11.50	0.71	0.46	
485	B2	9.81	0.04	-0.65	
486	A2	9.48	0.22	-0.12	
487	B8	11.04	0.02	-0.16	
488	AO	11.94	0.35	0.61	
489	B8	10.70	0.25	-0.10	
490	AO	11.94	0.49	0.10	
491	BO	8.63	0.33	-0.79	BD +56°2605
492	B3	11.02	0.54	-0.20	edge
493	B5	10.86	0.82	0.11	blend
494	AO	11.19	0.85	0.38	
495	KO	10.69	0.71	0.40	
496	AO	11.96	0.90	-0.26	blend
497	F8	11.05	0.75	0.13	
498	G8	10.02	0.74	0.17	BD +57°2347
499	B5	10.95	0.71	-0.13	
500	KO	8.08	1.09	0.87	BD +56°2590
501	G8	11.72	0.72	0.35	
502·	BO	7.45	0.57	-0.45	BD +56°2589
503	AO	11.39	1.02	0.70	
504	AO	11.31	0.90	1.01:	blend
505	A2	11.28	0.85	0.56	
506	A5	9.34	0.49	0.31	BD +56°2571
507	F8	9.44	0.86	0.41	BD +56°2570
508	F5	9.63	0.70	0.13	BD +56°2564
509	F8	7.82	0.82	-0.05	BD +56°2562

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
510	F8	10.44	0.75	0.03	edge
511	AO	11.25	1.19	0.24	blend
512	F6	9.41	0.75	0.22	BD +57°2316
513	F2	8.44	0.77	-0.22	BD +57°2317
514	AO	11.69	1.06	0.79	
515	F8	11.73	1.02	0.70	
516	F8	11.18	0.76	0.20	
517	F6	11.57	0.99	0.40	
518	AO	12.27	1.07	0.70	
519	B8	10.72	0.50	0.14	BD +57°2336
520	A7	11.29	0.67	0.76:	
521	F8	10.42	0.50	0.05	BD +57°2345
522	B3	9.92	0.29	-0.44	BD +57°2350
523	A2	10.71	0.71	0.45	
524	K2	9.81	1.06	1.05	BD +57°2353
525	B8	10.34	0.58	0.10	
526	M	10.65	1.83	1.37	
527	F8	11.39	0.70	-0.13	
528	K2	10.52	1.40	0.95	
529	G5	11.04	0.82	0.16	
530	AO	12.00	0.53	0.09	
531	FO	11.04	0.79	-0.05	
532	A5	11.58	0.65	0.46	
533	A2	9.48	0.56	0.36	BD +57°2356
534	AO	11.31	0.42	0.03	
535	A7	11.67	0.53	0.33	
536	A4	10.84	0.47	0.41	
537	AO	11.43	0.35	0.10	
538	AO	12.45	0.38	0.20	
539	A4	11.63	0.59	0.43	blend
540	B6	11.24	0.27	-0.25	
541	A7	12.05	0.62	0.50	
542	A5	11.26	0.32	0.41	
543	AO	12.19	0.41	0.42	
544	B2	9.95	0.06	-0.55	BD +57°2369
545	B7	10.58	0.13	-0.23	
546	F	10.36	1.32	1.47	
547	A2	12.01	0.29	0.35	
548	K4	9.83	1.33	1.51	BD +56°2630
549	K	9.98	1.91	2.35	BD +56°2627
550	B8	9.04	0.37	0.09	BD +57°2386
551	FO	11.59	0.75	0.56	
552	F	11.51	0.73	0.44	
553	F	11.51	0.75	0.30	
554	B8	11.39	0.43	0.11	
555	F8	10.87	0.59	0.38	
556	G5	11.01	0.58	0.43	
557	KO	8.95	1.05	0.79	edge
558	A2	8.35	0.14	-0.07	BD +57°2402
559	FO	12.15	0.73	0.67	
560	M	9.35	1.94	1.69	BD +57°2398

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
561	AO	9.95	0.12	0.38	BD +57°2395, blend
562	B3	9.48	0.49	-0.23	BD +57°2395, blend
563	AO	11.61	0.71	0.73	
564	FO	11.58	0.72	0.59	
565	B5	9.73	0.41	--	BD +57°2383
566	FO	12.02	0.43	0.37	
567	AO	11.59	0.92	0.93	
568	B5	10.01	0.12	-0.12	BD +57°2375
569	A6	10.68	0.46	-0.27	
570	KO	8.38	1.20	1.28	BD +57°2371
571	A7	12.49	0.63	0.30	blend
572	G8	11.40	0.76	0.27	
573	KO	7.90	1.05	0.79	BD +57°2359
574	F8	10.46	0.60	0.19	
575	AO	11.77	0.42	0.17	
576	KO	11.25	0.84	0.48	
577	G8	10.79	0.80	0.31	
578	F4	10.77	0.76	0.35	
579	F6	12.69	0.76	0.51	
580	B8	11.95	0.91	0.57	
581	B2	9.53	0.23	-0.51	BD +57°2343
582	B7	10.15	0.32	-0.16	BD +57°2335
583	AO	11.18	0.42	-0.03	
584	B3	9.39	0.29	-0.44	BD +57°2334
585	AO	11.57	0.90	0.82	blend
586	AO	11.37	0.91	0.36	
587	B3	10.45	0.58	-0.21	BD +57°2327
588	K2	9.08	1.34	1.35	BD +57°2319
589	GO	11.47	0.84	0.13	
590	A2	11.46	1.21	0.54	edge
591	KO	7.49	1.31	1.09	BD +57°2318
592	G2	10.39	0.79	0.05	
593	G5	7.09	0.77	-0.23:	BD +57°2322
594	F8	10.37	0.69	--	BD +57°2324
595	A7	9.61	0.34	0.15	BD +57°2332
596	B8	10.12	0.55	0.35	BD +57°2333
597	G	11.84	1.00	0.21	
598	B5	9.92	0.38	-0.08	BD +57°2339
599	G2	11.67	0.85	0.51	
600	K2	9.21	1.20	1.36	BD +57°2351
601	A2	11.77	0.74	0.85	
602	B8	12.82	0.86	0.48	
603	B8	10.39	0.34	0.10	
604	G8	10.86	0.86	0.37	
605	A2	11.33	0.65	0.78	
606	A5	11.18	0.77	0.68	
607	A5	10.89	0.81	0.70	
608	B7	9.67	0.35	-0.31	BD +57°2363
609	F2	11.15	0.57	0.13	blend
610	F8	10.24	0.61	0.11	BD +57°2373
611	K4	9.36	1.60	2.24	BD +57°2381

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
612	B8	10.60	0.30	0.12	BD +57°2382
613	F2	11.79	0.71	0.24	
614	AO	12.21	0.57	0.61	
615	GO	10.80	0.91	0.51	
616	A7	10.94	0.78	0.64	BD +57°2397
617	KO	10.33	1.45	1.25	BD +57°2400
618	A5	10.39	0.47	0.55	
619	AO	10.42	0.46	0.43	
620	A2	8.28	0.20	-0.05	BD +57°2403
621	A7	10.39	0.51	0.46	BD +57°2400
622	A4	11.35	0.48	0.52	
623	G4	12.38	0.53	0.69	
624	KO	11.75	0.71	0.15:	edge
625	AO	12.05	0.26	0.21:	edge
626	BO	11.17	0.34	-0.67	
627	G5	10.71	0.72	0.48	
628	G8	11.27	0.77	0.64	
629	G5	8.40	0.73	0.08	BD +57°2399
630	K	11.98	1.31	1.14	
631	A2	12.57	0.48	0.51	
632	A2	11.46	0.44	0.49	
633	M	7.23	2.03	2.36	BD +57°2396
634	A2	11.74	0.40	0.42	
635	AO	9.30	0.40	0.29	BD +57°2391
636	KO	6.79	1.12	0.66	BD +57°2392
637	F8	11.71	0.71	0.22	
638	KO	9.11	1.12	0.35	BD +57°2388
639	A4	11.35	0.49	0.49	
640	GO	10.73	0.73	0.47	
641	AO	10.74	0.49	0.52	
642·	B2	8.92	0.29	-0.62	BD +57°2380
643	AO	10.77	0.41	0.42	
644	F8	11.36	0.59	0.15	
645	B2	9.72	0.37	0.47	BD +57°2376
646	A2	10.15	0.36	0.56	
647	AO	11.68	0.70	0.26	
648	K2	9.32	1.25	1.41	BD +57°2367
649	A6	11.75	0.68	0.62	
650	B6	9.97	0.42	-0.09	BD +57 2366
651	AO	11.63	0.60	0.55	
652	B2	8.83	0.35	-0.29:	BD +57°2360
653	AO	12.08	0.50	0.54	
654	B2	8.51	0.58	0.60	BD +57°2354
655	B7	10.66	0.65	0.13	BD +57°2352
656	A2	7.97	0.30	-0.10	BD +57°2349
657	F2	8.80	0.49	0.06	BD +57°2342
658	A2	8.88	0.31	0.11	BD +57°2338
659	A2	9.05	0.37	0.19	BD +57°2337
660	G	11.68	0.84	0.41	
661	F8	11.45	0.69	0.22	
662	A4	10.10	0.82	0.48:	

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
663	K5	7.98	1.45	1.44:	BD +57°2323
664	A2	9.10	0.36	0.18	BD +57°2320
665	B8	10.78	1.04	0.46	edge
666	G8	11.69	1.61	1.30	blend
667	GO	9.29	0.73	0.15	BD +57°2321, edge
668	F8	11.86	1.00	0.48	
669	K2	8.76	1.14	1.32	BD +57°2330
670	A3	10.12	0.46	0.37	BD +57°2330
671	A7	12.15	0.41	-0.03	blend
672	K4	10.08	1.62	1.77	
673	G8	10.84	0.70	0.41	
674	B8	11.10	0.65	0.27	
675	AO	12.07	0.67	0.43	
676	AO	12.32	0.54	0.46	
677	KO	10.15	1.01	0.85	BD +57°2365
678	K4	9.29	2.03	2.92:	BD +57°2368
679	K2	11.40	0.94	0.57	
680	B8	11.69	0.44	-0.01	
681	B5	11.41	0.32	-0.18	
682	AO	11.62	0.52	-0.07	
683	FO	11.65	0.73	0.15	
684	F8	11.41	0.65	0.11	
685	K4	10.46	1.40	1.69	
686	F2	11.93	0.52	0.46	
687	B7	9.97	0.15	-0.15	BD +57°2366
688	AO	11.45	0.44	-0.07	
689	B2	10.56	0.37	-0.53:	
690	FO	11.60	0.60	0.59	
691	F8	10.22	0.67	0.44	
692	F5	10.65	0.51	0.26	
693	F5	9.81	0.50	0.21	
694	F2	11.33	0.54	0.30	
695	KO	11.82	0.62	0.95:	edge
696	F2	11.67	0.52	0.50	
697	AO	11.41	0.31	0.29	
698	A2	10.47	1.14	1.37	
699	K2	10.47	1.23	0.47	
700	F8	11.52	0.58	0.19	
701	FO	10.47	0.36	0.17	BD +57°2394
702	AO	11.30	0.34	0.22	
703	F6	9.66	0.72	0.20	BD +57°2398
704	B7	9.62	0.53	0.18	BD +57°2387
705	FO	11.21	0.72	0.36	blend
706	G2	10.81	0.55	0.64	BD +57°2387
707	F8	11.07	0.75	0.30	
708	AO	11.61	0.84	0.23	
709	M	9.77	1.86	2.32	BD +57°2379
710	G5	10.74	0.63	0.32	
711	A4	11.71	0.61	0.16	
712	B3	8.49	0.41	-0.56	BD +57°2372
713	G8	11.19	0.65	0.26	

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
714	AO	11.73	0.62	0.52	
715	A4	11.20	0.49	0.71	
716	A2	11.07	0.48	0.52	
717	B8	11.26	0.51	-0.08	
718	AO	11.51	0.68	-0.01	
719	K2	10.64	1.64	1.62	
720	AO	11.37	0.52	0.35	
721	A4	11.37	0.70	0.61	
722	B1	9.28	0.42	-0.35	BD +57°2343
723	AO	12.04	0.84	0.77	
724	AO	12.20	0.74	0.38	
725	FO	8.13	0.45	0.02	BD +57°2344
726	F4	10.92	0.68	0.19	
727	B8	10.89	0.53	0.24	
728	AO	11.84	0.60	1.02	
729	A2	10.56	0.39	0.19	BD +57°2329
730	G5	9.94	0.97	0.15	BD +57°2328
731	K2	8.01	1.28	1.11:	BD +58°2263
732	AO	10.54	1.07	0.19	
733	F8	10.31	0.71	0.01	BD +58°2269
734	BO	7.90	0.92	-0.26	BD +58°2272
735	G2	11.04	0.76	0.05:	
736	A4	10.48	0.40	0.36:	BD +58°2278
737	F8	10.26	0.58	0.11	BD +58°2286
738	K2	10.48	1.47	1.69	BD +58°2280
739	B1	8.61	0.20	-0.58	BD +58°2283
740	F8	10.98	0.73	0.14	
741	A2	10.37	0.27	0.34	BD +57°2348
742	A2	11.23	0.61	0.52	
743	B3	9.88	0.48	-0.26	BD +58°2292
744	B3	10.01	0.16	-0.31:	
745	KO	7.93	1.16	0.99:	BD +58°2295
746	B8	11.14	0.55	-0.05	
747	B2	10.67	0.70	0.24	BD +58°2297
748	G2	11.54	0.74	0.31	
749	B8	7.76	0.27	-0.17	BD +58°2300
750	G8	11.01	0.75	0.55	
751	AO	11.21	0.65	0.18	
752	G2	11.42	0.67	0.41	
753	B5	11.32	0.43	-0.03	
754	B5	11.98	0.53	-0.03	blend
755	F5	10.86	0.56	0.24	
756	A7	10.04	0.44	0.40	BD +57°2377
757	F6	10.23	0.38	--	BD +57°2389
758	B8	10.28	0.28	0.23	BD +57°2389
759	A4	11.37	0.49	0.76	blend
760	A4	11.17	0.44	0.60	
761	AO	11.70	0.37	0.20	
762	K5	8.57	1.17	2.87:	edge
763	AO	12.01	0.33	0.35:	
764	F8	11.17	0.55	0.34:	

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
765	AO	12.76	0.59	0.23	blend
766	G8	11.66	0.43	0.49	
767	AO	9.77	0.46	-0.29	BD +58°2315
768	FO	9.04	0.46	0.03	BD +58°2313
769	GO	9.90	0.53	0.00	BD +58°2312
770	F8	10.75	0.56	0.30	
771	FO	11.67	0.67	0.49	
772	G	12.04	0.85	0.29	
773	AO	11.79	0.81	0.10	
774	AO	11.06	0.68	0.33	
775	A2	11.85	0.68	0.13	
776	A2	11.42	0.68	0.01	
777	F8	11.35	0.68	0.16:	
778	AO	11.64	0.72	0.64:	
779	A2	11.20	0.91	0.53:	
780	A4	10.02	0.37	0.55	BD +58°2287, blend
781	F5	10.20	0.68	0.45	BD +58°2286
782	F6	10.21	0.50	0.15:	BD +58°2284
783	F2	9.79	0.99	0.34	BD +58°2288
784	B5	9.87	0.90	0.10	
785	FO	10.80	0.48	0.16:	
786	KO	10.23	1.14	1.18:	blend
787	A2	10.20	0.35	0.42:	BD +58°2271
788	F2	11.56	0.84	0.42:	
789	A4	11.77	1.13	0.70	
790	FO	11.03	0.51	0.18	
791	A2	10.68	0.97	0.73:	
792	F3	10.98	0.62	0.30	
793	A2	11.24	0.59	0.41:	
794	F2	10.11	0.41	0.20:	BD +58°2291
795	B5	8.38	0.15	-0.23	BD +58°2290
796	FO	10.43	0.39	0.29	blend
797	B5	10.40	0.68	0.11	
798	F8	10.62	0.60	0.22	BD +58°2298
799	F8	9.73	0.43	0.50	BD +58°2285, blend
800	A7	10.76	0.48	0.50	
801	GO	10.89	0.58	0.30	
802	A7	10.39	0.42	0.25	
803	F8	11.15	1.21	0.54	blend
804	F6	11.22	0.79	0.52	
805	AO	11.37	0.57	0.21	
806	F8	10.76	0.66	0.03	
807	A2	9.21	0.40	0.03	BD +58°2318
808	B5	10.14	0.46	0.32	
809	B2	9.21	0.30	-0.54	BD +58°2320
810	AO	10.72	0.42	0.25:	
811	F2	9.50	0.45	0.28	BD +58°2322
812	A2	11.40	0.39	0.55	
813	AO	11.78	0.69	0.19	
814	A2	11.04	0.32	0.45	
815	A2	11.89	0.25	0.60:	edge

TABLE

(Continued)

No.	Sp.	V	B-V	U-B	remarks
816	A7	11.19	0.41	0.37	
817	F2	11.57	0.51	0.24	
818	K	6.21	1.07	1.58	BD +58^{o}2314
819	F2	10.56	0.52	0.29:	BD +58^{o}2310
820	G5	10.40	0.72	0.35	BD +58^{o}2308
821	F8	10.81	0.92	0.62	
822	B3	9.46	0.74	0.13	BD +58^{o}2303
823	F8	11.19	0.73	0.41	blend
824	A4	11.73	0.90	0.18	
825	F2	10.63	1.22	0.64:	
826	KO	8.33	1.45	1.78:	BD +58^{o}2277
827	A2	11.30	0.90	0.73:	
828	B8	10.64	0.66	0.07:	BD +58^{o}2293
829	B8	10.33	0.69	0.44:	
830	AO	9.09	0.28	0.28:	BD +58^{o}2301
831	GO	9.59	0.58	0.25:	BD +58^{o}2304
832	F4	10.34	0.51	0.39	
833	F6	12.32	0.54	0.48	
834	AO	11.45	0.51	0.35	
835	G2	11.51	0.41	0.41	
836	A2	10.76	0.39	0.60	
837	AO	12.45	0.44	0.32	
838	A2	11.65	0.21	0.34	
839	AO	7.73	0.25	-0.22	BD +57^{o}2326
840	F5	12.14	0.81	0.84	
841	FO	8.08	0.77	-0.01	blend
842	FO	8.81	0.57	0.25	blend

NOTES TO THE TABLE

A point at the right upper side of the running number denotes photoelectrically measured magnitudes.

Blend is remarked if the photographic image of the measured star is distorted by a neighbouring star.

A colon beside the U-B colour denotes that the ultraviolet magnitude of the star is uncertain because of the field error of the ultraviolet filter.

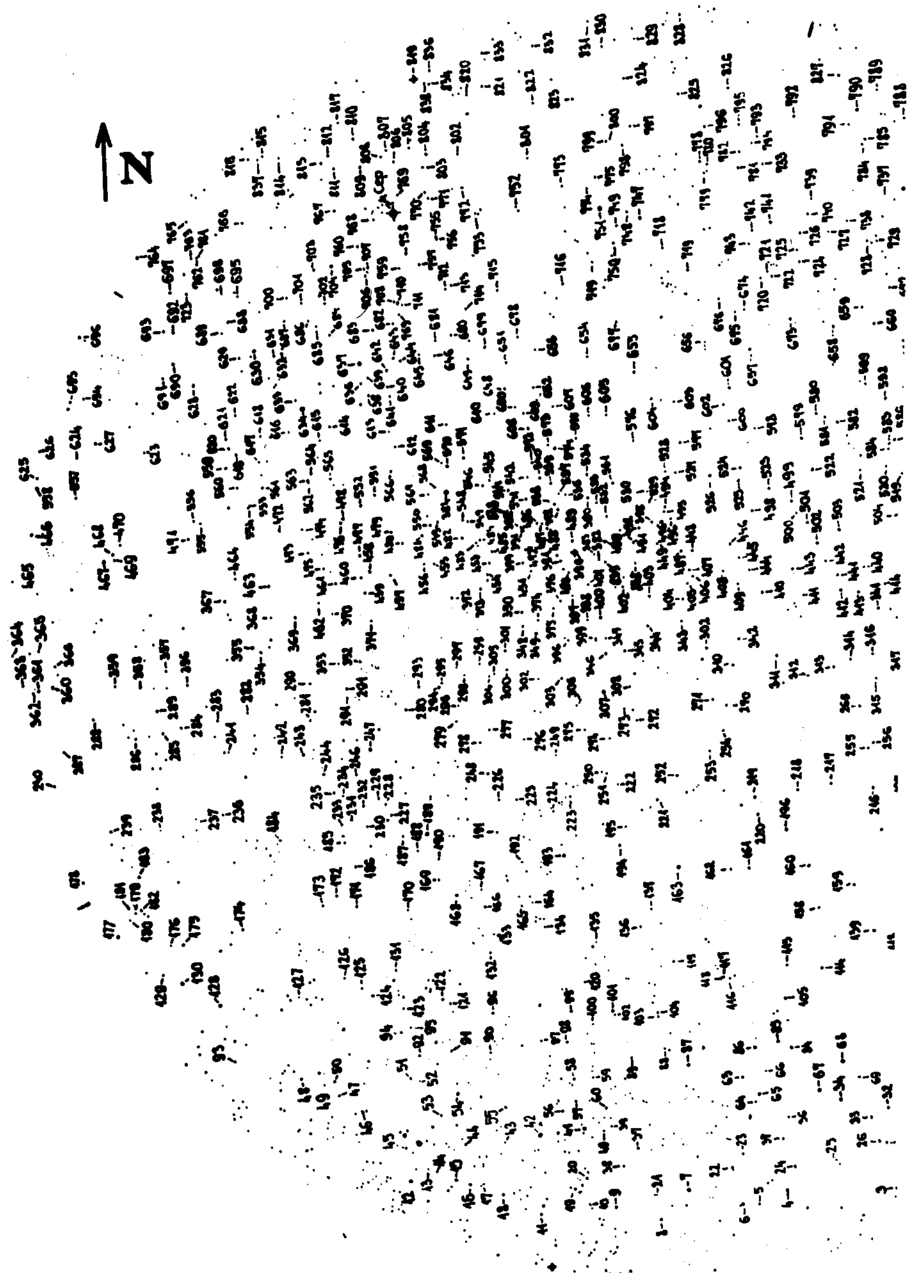
Edge is remarked if the star is near the edge of the plate.

Photoelectric magnitudes and colours of stars were taken from the following sources:

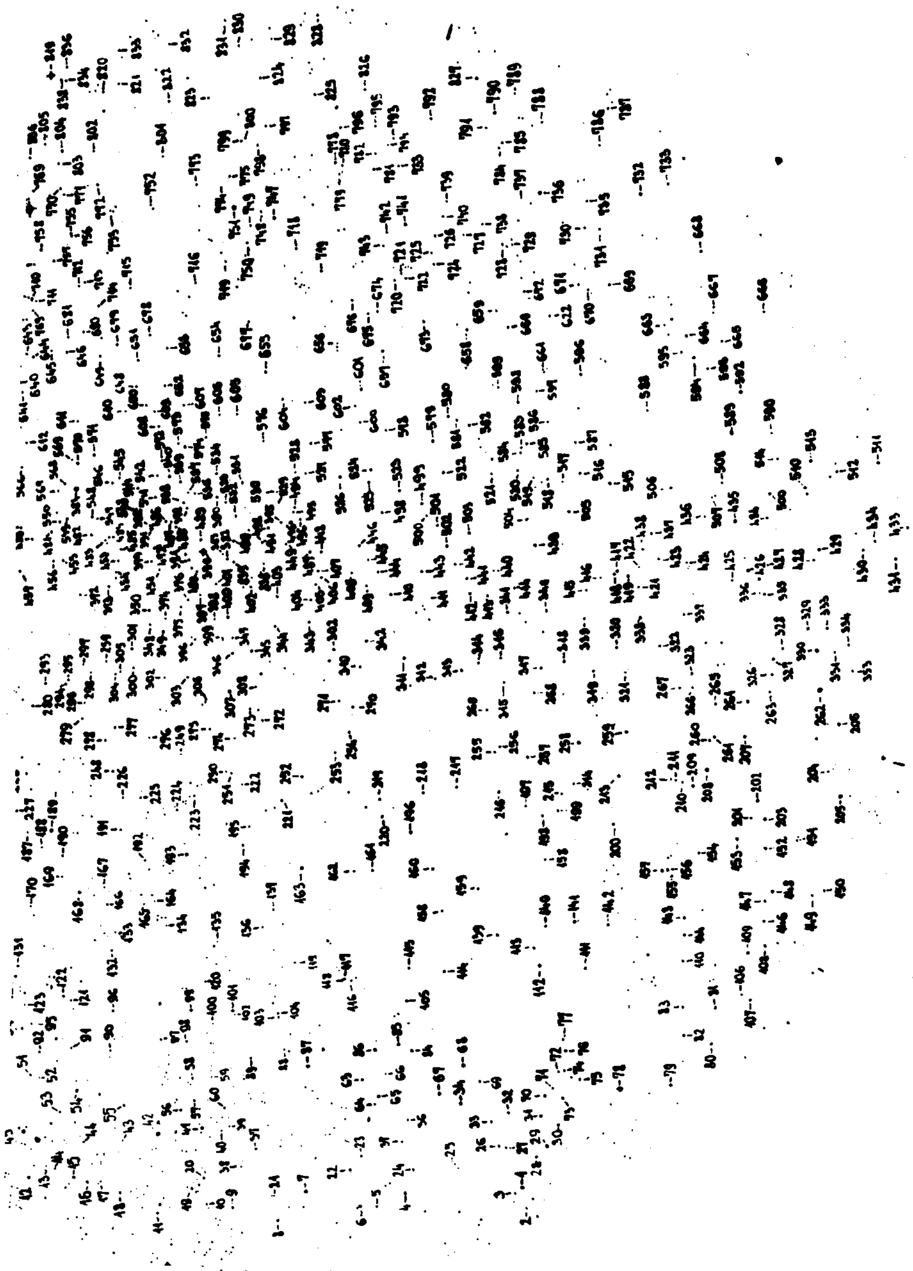
Balázs, B. A.,private communication (376, 377, 378, 379, 380, 381, 382, 383, 387).

Eggen, O. J. 1966. Roy. Obs. Bull. No. 120.(385, 386, 391, 392).

Deutschman, W. A., Davis, R. J., Schild, R. E. 1976. ApJ. Suppl. 30. 97. (293, 642).
Hiltner, W. A. 1956. ApJ. Suppl. 2. 389. (281, 307, 384, 502).
Simonson, S. C. 1968. ApJ. 154. 923. (388, 389, 390, 394).



Finding chart of the survey stars I..



Finding chart of the survey stars II.