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THE RADIAL VELOCITIES AND SPECTRAL CLASSES OF 55 KAPTEYN AREA FUNDAMENTAL STARS IN HIGH GALACTIC LATITUDES

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THE RADIAL VELOCITIES AND SPECTRAL CLASSES OF 55 KAPTEYN AREA FUNDAMENTAL STARS IN HIGH GALACTIC LATITUDES

By John F. Heard

Abstract

In 1954 a programme was set up for the determination of the radial velocities of 55 fundamental stars in Kapteyn's Selected Areas 13-15, 29-35, 53-60, that is, in the selected areas near the north galactic pole. The stars selected were those brighter than photographic magnitude 10.01 (on the *Bergedorfer Spectral-Durchmusterung* scale) which are listed in Hins' (1934) Catalogue in the stated areas and for which no radial velocities were known in 1954. Observations were obtained over a period of ten years and the results both of radial velocity and of MK spectral classification are presented here.

Observations and Results

Spectrograms. The instrument used to obtain the spectrograms was the one-prism Hilger spectrograph with a camera lens of 12.5 inches focal length giving a dispersion of 66 A./mm. at Hγ. With a slit which gave a projected width of 20μ the spectra of these 9th to 10th magnitude stars required exposures of two hours or more. The rule was to observe the stars at least four times in different seasons. Actually most of the stars were observed more than four times.

Radial Velocities. The spectrograms were measured for radial velocity by the standard technique used at this Observatory. In addition to the writer the following persons did appreciable shares of the measuring: Miss Küli Milles, Messrs. W. Russell, S. C. Morris, D. Crampton, M. P. FitzGerald, H. Mairo. As a general rule between 10 and 20 star lines were measured except for the B- and A-type stars, and the probable errors of the means mostly ranged between 1 and 4 km./sec. as computed from the inter-agreement of the lines. Decisions as to constancy or variability of the velocities were made not by any fixed rule but by judgement based on experience in measuring similar spectrograms on other programmes.

Spectral Classification. All spectra were classified by the writer on the MK system with the aid of an almost complete set of spectrograms of the MK standards taken with the same dispersion.

The Tabulations. Table I lists the stars. Column 1 gives the Kapteyn Selected Area number and the star number in Hins' (1934) catalogue.

TABLE I

S.A. and Hins No.	H.D. or B.D.	R.A. (1950)	Dec. (1950)	Ptg. Mag.	Class	Velocity (km./sec.)	P.E.	Pl.	Ref.
		h m	° ′						
53/567	82011	9 27.1	+30 16	10.09	B9 III	+31.1 v?	2.7	5	II
53/568	82069	9 27.5	29 48	9.45	F8 V	Var.		6	II
53/569	29°1907	9 27.6	29 20	9.89	F5 V	Var		8	II
53/570	29°1908	9 28.2	29 31	9.93	K0 III	− 1.2	0.8	4	
53/571	30°1875	9 29.6	29 48	9.73	F3 V	Var.		6	II
53/573	82570	9 30.6	+29 06	10.02	G8 III:	+11.0 v?	2.8	4	II
29/301	83697	9 38.4	44 26	9.72	G8 III	+29.0 v?	2.1	7	II
29/302	44°1898	9 39.8	44 04	9.85	G0 V	−10.0	2.6	5	
29/303	45°1753	9 39.9	45 16	9.87	A2 V	Var.		6	II
29/304	84059	9 40.6	44 56	7.50	F0 III	Var.		5	II
29/306	84219	9 41.7	+44 39	8.52	G0V	−28.5	2.0	5	
29/307	45°1758	9 41.9	45 10	9.99	F8 V	Var.		6	II
29/308	45°1761	9 43.4	44 36	9.88	F8 V	+ 4.5	2.9	5	
29/310	45°1763	9 43.6	45 18	9.95	F8 V	−26.0	0.9	4	
29/311	44°1904	9 44.2	44 28	9.39	A9 III	+ 0.4 v?	3.2	5	II
54/579	30°2024	10 26.9	+29 46	9.66	F8 V	− 9.0	3.0	4	
30/312	92124	10 36.0	45 06	9.76	K5 III	+58.9	2.9	8	N
30/317	45°1859	10 41.3	44 56	9.59	F3 V	Var.		21	N
13/117	95866	11 01.6	59 10	9.86	G0 IV	+87.4	1.0	5	
13/118	95975	11 02.2	59 50	9.85	F7 IV	−31.1	2.1	4	
13/119	96093	11 02.9	+60 06	9.56	F5 III	− 1.6	1.8	4	
13/122	96950	11 07.7	59 10	10.08	G8 IV	−52.6	2.0	5	
13/124	97420	11 10.6	59 25	9.32	F6 V	+ 6.0	3.3	4	
13/125	97438	11 10.7	60 01	9.81	F0 III	−29.6	1.3	4	
55/587	30°2175	11 32.4	29 42	9.78	G0 V	Var.		8	II
31/322	44°2112	11 35.9	+44 22	9.65	F6 V	−32.2 v?	2.4	7	II
31/327	101674	11 39.6	44 25	9.12	F6 III	−29.5	1.4	6	
56/596	105020	12 03.0	28 47	8.91	K3 III	−38.7 v?	1.7	9	II
32/333	111851	12 49.4	44 18	9.27	F6 IV	− 6.6	2.1	5	
32/335	112297	12 52.9	44 34	9.48	F8 V	− 5.6	3.1	5	
57/600	113995	13 04.8	+28.59	9.76	K3 III	−23.9	1.7	4	
57/601	114059	13 05.3	29 43	10.06	G8 V:	−21.8	1.1	3	
57/602	114071	13 05.3	29 44	10.08	F7 V	Var.		7	II
14/133	117845	13 29.7	59 13	8.36	G2 V	+ 3.4	2.8	6	
33/341	45°2134	13 48.8	44 37	9.90	F8 IV	−23.7	1.9	6	
33/344	45°2137	13 52.1	+44 58	9.57	F5 V	+ 2.2	2.2	5	
33/347	121933	13 55.6	45 24	9.28	F3 V	− 4.0	2.9	6	
58/617	29°2495	14 04.8	29 30	10.00	F7 IV	Var.		6	II
34/349	130988	14 47.8	45 05	9.17	G8 V	+19.8	1.3	6	
34/352	131381	14 50.0	45 23	9.68	F6 IV	−33.4	1.6	6	
34/353	131447	14 50.4	+44 26	9.88	K0 IV	−46.6	2.2	5	
34/355	131861	14 52.6	45 30	7.64	F5 V	Var.		20	N
34/356	132046	14 53.8	45 06	9.13	F0 III	− 7.8	0.3	4	
59/625	133965	15 04.3	29 23	9.42	F6 V	−19.8	1.6	8	
15/134	135721	15 12.6	60 08	9.60	F2 II	Var.		6	II

TABLE I—*Continued*

S.A. and Hins No.	H.D. or B.D.	R.A. (1950)	Dec. (1950)	Ptg. Mag.	Class	Velocity (km./sec.)	P.E.	Pl.	Ref.
		h m	° ′						
15/135	135741	15 12.8	+59 43	9.45	F5 V	Var.		7	II
15/136	135962	15 14.1	59 37	9.69	G8 II	−13.1 v?	2.7	5	II
15/137	60°1598	15 15.4	59 57	9.84	F5 II	−31.1	0.9	4	
15/138	136244	15 15.6	60 17	9.08	K3 III	Var.		8	II
15/140	136617	15 17.7	59 42	9.75	K5 V	−64.3	1.4	4	N
15/144	60°1611	15 22.9	+60 05	9.98	F8 V	−20.5 v?	3.1	5	II
35/360	45°2344	15 50.2	44 51	9.67	F3 V	−38.0 v?	3.3	6	II
35/364	142592	15 51.9	45 06	9.25	A4 V	Var.		10	II
60/634	143585	15 58.2	30 15	10.08	K0 III	− 1.9	2.3	4	
60/635	29°2751	15 58.7	29 42	9.99	A9 III:	−20.4	2.0	6	

NOTES TO TABLE I

H.D.92124 Exclusion of one discordant measure (of 76.4 km./sec.) would change the mean velocity to +55.8 km./sec. and would reduce the P.E. to 0.7 km./sec.

B.D.45°1859 Twenty-one observations show the velocity to be variable; the period seems to be about 22.7 days, the half-range 26 km./sec., and the velocity of the system—81 km./sec. This would make this star a rare combination of high-velocity and binary.

H.D.131861 Twenty observations show the velocity to be variable; preliminary elements are: period 3.55 days, half-range 72 km./sec., velocity of the system—20 km./sec.

H.D.136617 The G-band is weak.

Columns 2 to 4 are self-explanatory. Column 5 gives the photographic magnitudes as listed in the *Bergedorfer Spectral-Durchmusterung*. Column 6 is our MK classification. Column 7 lists the mean radial velocities for those stars which are believed to have constant velocities and for stars whose velocities *may* be variable (*v*?), but no mean velocities are listed for those stars which are more certainly variable. (The individual velocity measures are tabulated in Table II both for stars which are of doubtful and of certain velocity variability.) Column 7 lists the probable errors of the means computed from the inter-agreement of plate measures, and column 8 gives the number of plates measured. Column 9 refers to the notes (*N*) and to inclusion of the star in Table II.

TABLE II

STARS WITH DEFINITELY (DEF.) OR POSSIBLY (POSS.) VARIABLE VELOCITY

Star H.D. or B.D.	Julian Day (243...)	Velocity km./sec.
S2011	5559.639	+ 17.1
(poss.)	5783.892	+ 28.7
	6222.819	+ 44.7
	7747.662	+ 43.0
	8061.806	+ 22.1
S2069	5146.788	+ 9.0
(def.)	5514.867	+ 26.6
	6255.708	+ 6.9
	6323.583	+ 9.6
	7734.726	− 3.6
	8045.791	+ 14.0
29°1907	5527.731	− 19.2
(def.)	5874.805	− 31.0
double lines	6271.772	− 28.5
	6650.749	− 47.7
	7771.622	− 97.7
		+ 95.8
	7997.850	−106.2
		+ 68.7
	8046.891	− 21.4
30°1875	5573.631	− 8.0
(def.)	5587.605	− 12.0
	6644.696	+ 3.4
	6672.658	− 27.8
	7750.631	− 5.2
	8046.762	− 20.0
S2570	5551.659	+ 10.2
(poss.)	5881.768	+ 11.2
	6655.633	+ 20.8
	6673.576	+ 1.9
S3697	5533.713	+ 33.5
(poss.)	5564.660	+ 32.8
	6302.610	+ 33.7
	6635.635	+ 12.3
	7410.603	+ 32.5
	8453.732	+ 24.5
	8478.695	+ 33.9
45°1753	5553.651	− 67.7
(def.)	5583.623	− 63.7
	6309.594	− 29.1
	6646.702	+ 75.5
	7335.778	+117.4
	7742.684	+ 38.8
S4059	5215.540	− 20.0
(def.)	5538.631	− 38.0
	7044.578	− 42.0
	8085.753	− 18.8
	8473.680	− 35.5
45°1758	5215.555	− 10.8
(def.)	5557.704	− 16.6
	6656.647	− 39.2
	7746.668	− 51.6
	7779.600	− 22.2
	7780.644	− 17.4
44°1904	5141.786	− 2.7
(poss.)	5601.604	+ 13.2
	6638.688	− 15.0
	7341.814	+ 5.6
	7726.699	+ 0.8
30°2175	5527.829	+ 13.0
(def.)	5551.755	+ 53.0
	6222.897	+ 1.6
	6624.823	+ 46.2
	7410.731	+ 40.1
	7412.717	+ 52.7
	8058.894	+ 30.6
	8461.786	+ 7.6
44°2112	4883.626	− 21.8
(poss.)	5533.858	− 27.5
	5602.626	− 21.0
	6309.708	− 41.9
	7427.642	− 35.4
	7751.831	− 34.3
	8500.725	− 43.2

TABLE II—*Continued*

Star H.D. or B.D.	Julian Day (243...)	Velocity km./sec.
105020	2989.760	− 31.9
(poss.)	3015.697	− 37.0
	3031.646	− 28.9
	4089.776	− 44.4
	4558.635	− 33.8
	4562.624	− 40.4
	5142.934	− 53.5
	5559.757	− 35.7
	5587.708	− 43.1
114071	5251.663	− 6.9
(def.)	5552.865	− 24.4
	5890.923	− 27.1
	6308.866	− 12.5
	6635.865	− 34.2
	7378.842	− 22.3
	7749.839	− 22.9
29°2495	4908.625	− 37.5
(def.)	5226.790	− 58.4
	5559.868	− 39.9
	6271.876	− 43.6
	7057.631	− 74.8
	7398.836	− 67.7
135721	4880.747	− 13.3
(def.)	5261.625	− 7.5
	6309.884	− 36.6
	6673.780	− 4.9
	7057.807	− 28.6
	7389.832	− 5.0
135741	4881.728	− 10.8
(def.)	5295.630	− 28.5
	6637.936	− 33.0
	6673.853	− 17.1
	7416.786	− 9.2
	7747.784	− 12.5
	8486.885	− 0.6
135962	4881.793	− 20.5
(poss.)	5261.722	− 5.7
	6308.892	− 7.2
	6637.891	− 25.0
	7416.864	− 7.0
136244	4880.677	− 51.5
(def.)	5283.649	− 48.3
	6672.848	− 29.2
	7087.738	− 60.7
	7761.842	− 51.4
	7765.781	− 49.9
	8134.726	− 56.9
	8486.802	− 35.6
60°1611	4922.685	− 24.8
(poss.)	5285.685	− 4.8
	6644.846	− 16.4
	6680.848	− 32.2
	7791.778	− 24.2
45°2344	4886.796	− 27.3
(poss.)	5260.708	− 39.5
	5601.797	− 41.0
	5608.802	− 25.4
	8467.857	− 48.6
	8489.880	− 46.0
142592	4881.856	− 16.1
(def.)	5215.887	− 10.4
	5283.689	− 79.3
	5602.819	− 46.9
	7056.839	− 46.3
	7057.685	− 19.2
	8125.832	+ 0.7
	8477.881	+ 1.3
	8502.811	+ 36.3
	8512.776	− 23.4

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Reference

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