Magnetic chemically peculiar stars

II. Spatial distribution

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Abstract. The paper describes the ongoing study of magnetic chemically peculiar (MCP) stars. We present general information about these stars divided into reversive (changing the sign of the longitudinal component of the magnetic field) and non-reversive (with mainly the same sign, i. e. seen predominantly from one pole). Differences in spatial distribution of reversive and non-reversive stars and their fraction in open clusters have been found.
The fraction of stars with measured surface field B^S among slowly rotating SrCrEu stars is 2 times larger for non-reversive stars. This indicates that narrow-line stars are observed both from rotational and magnetic poles, supporting conclusion of J. Landstreet and G. Mathys (1999) that the angle between the rotational and magnetic axes for slow rotators is small.

1. Introduction

In the first paper of this series (Romanyuk, 2000, this issue, hereinafter Paper 1) we presented a sample of magnetic chemically peculiar (MCP) stars. The sample includes 211 CP stars with reliably measured magnetic fields. The study of magnetic CP stars is being continued and in this paper we analyze their spatial distribution in our Galaxy and discuss some general properties.

It should be noted that the largest sample of CP stars containing about 6700 stars mainly brighter than 11 magnitude has been collected by Renson et al. (1991). About 2000 different type CP stars brighter than 9.5 mag are contained in the Hipparcos catalogue (Gomes et al., 1998). About half of them are probably magnetic: He-rich (or He-strong), He-weak, Hg-Mn, Si, Si+ (i.e. Si + other peculiarities) and the coolest CP stars with Sr, Cr and Eu peculiarities. Non-magnetic CP stars are: Am (with enhanced metal lines) and λ Boo stars (with weak metal lines).

Some data of a magnetic field of Am stars have been already reported (for example, Kuvshinov, 1972) but they are not generally accepted yet. Magnetic measurements of λ Boo stars show "zero" results (Iliev et al., 1988, Bohlender and Landstreet, 1990).

As we mentioned in Paper 1, the fraction of CP stars is about 15 % of the upper main-sequence stars in the spectral range B5-F5. It is very likely that all He-r, He-wk, Hg-Mn, Si, Si+ and SrCrEu stars are magnetic, but actually we have found only 211 MCP stars, the presence of a magnetic field for the rest of them (about 80 %) needs to be confirmed.

2. General parameters of magnetic CP stars

We present some general parameters of 211 MCP stars from our sample in Table 1 which shows in succession: HD/BD number, another name of the star (if available), HIP number in the Hipparcos catalogue, Sp and pec — spectral class and peculiarity type (taken mainly from the paper by Glagolevskij and Chunakova (1986)), magnitude V and colour B - V taken from the Hipparcos catalogue, P — period in days (from the catalogue of Catalano and Renson (1998) or from original papers for each star of our sample — references see in Paper 1).

We can conclude, that the ratio of the number of CP stars with measured magnetic field and the number of all CP stars from the Hipparcos catalogue varies strongly from type to type: magnetic fields were found in 64% of He-r and 57% of He-wk in comparison with 8 % of Si-stars. We suppose that these differences are mainly due to observational selection, because Si peculiarities can easily be found on low dispersion spectra which are usually used for spectral classification of faint stars.

This is why, faint CP stars are mainly classified as Si stars. Peculiarities of Sr, Cr or Eu can only be seen on the spectra with higher resolution, because of this they were found in a smaller fraction of cool stars. Our next step is a comparison of the number of MCP stars from our sample with that for CP stars from the Hipparcos catalogue (Gomes et al., 1998). The number of different type peculiar stars in both catalogues and their ratios (HIP/MCP) are given in Table 2.

Table 1: *General parameters of magnetic chemically peculiar stars*

HD/BD	Name	HIP	Sp	Pec	V	B–V	P (days)
HD 965		1127	A5p	Sr	8.624	+0.260	
HD 2453	GR And	2243	A2p	SrCrEu	6.900	+0.071	547
HD 3980	χ Phe	3277	A7p	SrCrEu	5.708	+0.131	3.952
HD 4778	GO And	3919	AOp	SrCrEu	6.138	+0.008	2.562
HD 5737	α Scl	4577	B6p	He–wk	4.311	−0.154	21.65
BD +40.175A	ADS 693 A		Ap	SrCrEu	9.4		
BD +40.175B	ADS 693 B		Ap		9.9		
HD 6532		5150	F2p	SrCr	8.437	+0.161	1.9450
HD 8441	HN And	6560	A2p	SrCrEu	6.704	+0.012	69
HD 8855		6848	A1p	Si	8.241	−0.085	
HD 9996	GY And	7651	B9p	CrEu	6.337	−0.021	8000
HD 10783	UZ Psc	8210	A2p	SrCr	6.542	+0.052	4.133
HD 11187	NSV632	8643	A0p	SiCr	7.932	+0.260	
HD 11503	γ Ari (S)	8832 A	A0p	SiCr	4.65	−0.047	1.6092
HD 12288	V 540 Cas	9604	A2p	CrSi	7.751	+0.081	35
HD 12447	α Psc	9487 AB	B9p	Cr	3.818	−0.024	1.49
HD 12767	ν For	9677	A0p	Si	4.692	−0.156	1.9
HD 14437		10951	Ap	SrCrEu	7.271	−0.029	26
HD 15089	ι Cas	11569	B9p	SrCr	4.510	+0.128	1.74
HD 15144	AB Cet	11348A	Ap	SrCr	5.877	+0.116	16
HD 18078		13712	A0p	SrCr	8.265	+0.227	
HD 18296	21 Per	13775	B9p	SiSrCrEu	5.110	−0.018	2.884
HD 19832	56 Ari	14893	B7p	Si	5.765	−0.106	0.72790
HD 19918		14026	A5	SrCrEu	9.355	+0.269	
HD 21590		16268	A0p	Si	7.062	−0.052	
HD 21699	V396 Per	16470	B8p	He–wk	5.453	−0.101	2.49
HD 22316	HR 1094	16974	B9p	CrHgSi	6.299	−0.112	2.98
HD 22470	20 Eri	16803	B9p	Si	5.222	−0.117	1.929
HD 22920	22 Eri	17167	B9p	He–wk	5.528	−0.145	3.95
HD 24155	V766 Tau	18033	B9p	Si	6.310	−0.058	2.53
HD 24712	DO Eri	18339	Ap	SrCrEu	5.991	+0.323	12.46
HD 25267	τ 09 Eri	18673	Ap	Si	4.645	−0.121	1.21
HD 25354	V380 Per	18912	AOp	SrCrEu	8.360	+0.120	3.901
HD 25823	41 Tau	19171	B9p	Si	5.197	−0.136	7.2274
HD 27309	56 Tau	20186	A0p	Si	5.322	−0.165	1.569
HD 28843	DZ Eri	21192 A	B9p	He–wk	5.799	−0.144	1.3738
HD 29578		21460	A5p	SrCrEu	8.553	+0.279	
HD 30466	V473 Tau	22402	AOp	SiCr	7.281	+0.065	1.39
HD 32633	HZ Aur	23733	B9p	SiCr	7.072	−0.052	6.43
HD 33904	μ Lep	24305	B9p	Hg–Mn	3.269	−0.110	
HD 34452	1Q Aur	24799	A0p	Si	5.377	−0.198	2.466
HD 35298	V1156 Ori	25236	B6p	He–wk	7.917	−0.121	1.85
HD 35456	GC 6661	25293	B7p	He–wk	6.932	−0.048	1.7?
HD 35502		25327A	B5p	He–wk	7.350	−0.040	1.7?
HD 36313	V1093 Ori		B8p	He–wk	8.200		0.589
HD 36429		25897	B4p	He–wk	7.560	−0.122	
HD 36485	δ Ori C		B2p	He–r	6.809	−0.20	1.708
HD 36526	V1099 Ori		B8p	He–wk	8.286	−0.11	1.54
HD 36540	V1101 Ori	25954	B7p	He–wk	8.163	+0.047	2.17

Table 1: *General parameters of magnetic chemically peculiar stars (continued)*

HD/BD	Name	HIP	Sp	Pec	V	B–V	P (days)
HD 36629		26000	B2p	He–wk	7.650	+0.040	
HD 36668	V1107 Ori	26048	B7p	He–wk	8.070	−0.109	2.12
HD 36916	V1045 Ori	26182	B8p	He–wk	6.738	−0.139	1.565
HD 37017	V1046 Ori	26233	B2p	He–r	6.550	−0.140	0.9012
HD 37058	V 359 Ori		B3p	He–wk	7.330		14.6
HD 37140	V1130 Ori		B8p	He–wk	8.542		2.71
HD 37210	V1133 Ori		B8p	He–wk	8.109	−0.07	11.05
HD 37479	σ Ori E		B3p	He–r	6.669	−0.24	1.191
HD 37642	V1148 Ori	26656	B9p	He–wk	8.051	−0.122	1.08
HD 37776	V 901 Ori	26742	B2p	He–r	6.992	−0.139	1.539
HD 40312	θ Aur A	28380	B9p	Si	2.649	−0.063	3.619
HD 42616	QR Aur	29565	A2p	SrCrEu	7.164	+0.083	17
HD 47103			Ap	SrCrEu	9.14		
HD 49333	12 CMa	32504	B7p	He–wk	6.061	−0.164	2.1792
HD 49606	33 Gem	32753	B8p	Hg–Mn	5.870	−0.136	3.35
HD 49976	V592 Mon	32838	A2p	SrCr	6.312	+0.011	2.9767
HD 50169	MWC 823	32965	A4p	SrCr	9.022	−0.010	
HD 51418	NY Aur	33643	A0p	SrCrEu	6.624	+0.121	5.438
HD 54118	V386 Car	34105	Ap	Si	5.167	−0.065	3.275
HD 55719	70 G Pup	34802	A3p	SrEu	5.311	+0.053	2.3
HD 58260		35830	B2p	He–r	6.739	−0.124	1.49
HD 59435		36419	A5p	SrCrEu	7.978	+0.439	long
HD 61468		37181	A3p	SrCrEu	9.810	+0.020	
HD 62140	49 Cam	37934	F0p	SrEu	6.471	+0.262	4.287
HD 63843		38291	Ap	SrCrEu	10.252	+0.200	
HD 64486	HR 3082	39538 AB	A0p	Si	5.398	−0.048	
HD 64740	HR 3089	38500	B2p	He–r	4.611	−0.251	1.33
HD 65339	53 Cam	39261	A2p	SrCrEu	6.041	+0.158	8.027
HD 66522		39246	B2p	He–r	7.199	+0.069	
HD 68351	15 Cnc	40240	B9p	SiSr	5.269	−0.073	3.2
HD 70331			B8p	Si	8.898		
HD 71866	TZ Lyn	41782	A0p	SiSrEu	6.728	+0.090	6.80
HD 72968	3 Hya	42616	A1p	SrCr	5.732	−0.030	11.3
HD 73340	HV Vel	42177	B8p	Si	5.798	−0.132	2.6676
HD 74521	49 Cnc	42917	A1p	SiCr	5.653	−0.100	7.77
HD 75445		43257	A3p	SrEu	7.148	+0.275	
HD 78316	κ Cnc	44798	B8p	Hg	5.237	−0.103	
HD 79158	36 Lyn	45290	B8p	He–wk	5.276	−0.130	3.835
HD 81009	KU Hya	45999	A5p	SrCrEu	6.520	+0.216	34.0
HD 83368	HR 3831	47145	A8p	SrCrEu	6.167	+0.277	2.852
HD 86592		48958	Ap	SrCrEu	7.880	+0.224	
HD 89822	30 UMa	50933	A0p	Hg	4.942	−0.052	no var
HD 90044	25 Sex	50885	Ap	SiCrSr	5.920	−0.048	4.3790
HD 90569	45 Leo	51213	AOp	SiCrEu	6.025	−0.043	7.9
HD 92664	V364 Cas	52221	B9p	Si	5.512	−0.158	1.673
HD 93507		52637	Ap	Si	8.448	+0.028	550
HD 94660	235 G.Vel	53379	AOp	Si	6.109	−0.103	long
HD 96446		54266	B2p	He–r	6.701	−0.137	0.851
HD 96707	HR 4330	54540	F0p	Sr	6.078	+0.219	0.928

Table 1: *General parameters of magnetic chemically peculiar stars (continued)*

HD/BD	Name	HIP	Sp	Pec	V	B–V	P (days)
HD 98088	SV Crt	55106	A2p	SrCr	6.115	+0.211	5.90513
HD 101065	V816 Cen	56709	B5p	pec	8.019	+0.757	
HD 103192	β Hya	57936	B9p	Si	4.275		2.3567
HD 103498	HR 4561	58117	A1p	SrCrEu	7.030	+0.015	
HD 108651	17 Com B	60891	Am		6.614	+0.212	
HD 108662	17 Com A	60904A	A0p	SrCr	5.292	−0.056	5.07
HD 108945	21 Com	61071	A2p	SrCr	5.459	+0.056	2.004
HD 109026	γ Mus	61199	B5p	He–wk	3.858	−0.157	
HD 110066	AX CVn	61748	A0p	CrEu	6.410	+0.061	long
HD 111133	EP Vir	62376	A0p	SrCrEu	6.331	−0.051	16.307
HD 112185	ϵ UMa	62956	A0p	Cr	1.763	−0.022	5.089
HD 112381	V823 Cen	63204	Ap	Si	6.506	−0.095	2.8
HD 112413	α^2 CVn	63125A	A0p	SiHgCrEu	2.890	−0.115	5.46939
HD 115708	HH Com	64937	A2p	SrCrEu	7.803	+0.266	5.076
HD 116114		65203	Ap	SrCrEu	7.035	+0.302	
HD 116458	HR 5049	65522	Ap	SrEu	5.666	−0.035	1.48
HD 118022	78 Vir	66200	A1p	SrCr	4.930	+0.029	3.722
HD 119027			A3p	SrEu	10.02		
HD 119213	CQ UMa	66700	A4p	CrEu	6.275	+0.111	2.45
HD 119419	V827 Cen	67036	A0p	Si+	6.461	−0.151	2.60
HD 120198	84 UMa	67231	B8p	Cr	5.666	−0.072	1.3807
HD 122532	V828 Cen	68673	Ap	Si	6.100	−0.112	3.681
HD 124224	CU Vir	69389	B8p	Si	4.972	−0.118	0.52068
HD 125248	CS Vir	69929	Ap	CrEu	5.873	−0.007	9.295
HD 125823	α Cen	70300	B3	He–wk	4.383	−0.185	8.8177
HD 126515	FF Vir	70553	A2p	CrSr	7.104	+0.000	130
HD 128898	α Cir	71908 A	F1p	Eu	3.194	+0.620	4.479
HD 130559	μ Lib A	72489	Ap	SrCrEu	5.316	+0.066	
HD 133029	BX Boo	73543	B9p	SiSr	6.372	−0.108	2.89
HD 133652	HR 5619	73937	B7p	SiCr	5.975	−0.076	2.304
HD 133880	HR 5624	74066	B9p	Si	5.791	−0.150	0.877
HD 134214		74145	F2	SrCrEu	7.475	+0.353	248
HD 134793	LV Ser	74334	A3p	SrCrEu	7.563	+0.135	2.78
HD 135297	FI Ser	74584	A0p	SrCrEu	7.986	−0.002	2.8
HD 137193		75558	B8p	Si	7.386	−0.007	4.9
HD 137389	HR 5731	75256	A0p	Si	5.974	−0.033	
HD 137509	NN Aps	76011	Ap	Si+	6.875	−0.125	4.49
HD 137909	β CrB	75695 AB	F0p	SrCrEu	3.678	+0.280	18.487
HD 137949	33 Lib	75848	Ap	SrCrEu	6.678	+0.365	7.2
HD 140160	χ Ser	76886	A0p	SrCr	5.326	+0.033	1.596
HD 140728	BP Boo	76957	B8p	Cr	5.507	−0.086	1.296
HD 142070		77752	A0p	SrCrEu	7.976	+0.165	3.37
HD 142301	3 Sco	77909	B4p	He–wk	5.874	−0.069	1.459
HD 142884	V928 Sco	78183	B9p	Si	6.776	−0.008	0.803
HD 142990	V913 Sco	78246	B5p	He–wk	5.434	−0.121	0.979
HD 143473		78533	Ap	Si	7.421	+0.089	
HD 143699	HR 5967	78655	B6p	He–wk	4.888	−0.146	
HD 143807	i CrB	78493	A0p	Hg	4.984	−0.058	
HD 144334	HR 5988	78877	B8p	He–wk	5.912	−0.078	1.495

Table 1: *General parameters of magnetic chemically peculiar stars (continued)*

HD/BD	Name	HIP	Sp	Pec	V	B–V	P (days)
HD 144661	HR 5998	79031	B8p	He–wk	6.328	−0.055	
HD 144897		79197	AOp	EuCr	8.611	+0.216	48
HD 145501	ν Sco CD	79374 AB	B9p	He–wk	4.002	+0.076	1.42
HD 146001	HR 6054	79622	B8p	He–wk	6.059	+0.050	
HD 147010	V933 Sco	80024A	B9p	SiSr	7.395	+0.156	3.9207
HD 148112	ω Her	80463	B9p	SrCrEu	4.575	+0.002	3.043
HD 148199		80607	AOp	SiSrCr	7.019	+0.083	7.8
HD 148330	HR 6127	80375	A2p	pec	5.741	+0.001	4.288
HD 148898	ω Oph	80975	Ap	SrCr	4.449	+0.130	1.8
HD 149911	HR 6179	81440	A0p	CrEu	6.079	+0.164	6
HD 150562			A5p	EuSi?	9.848		
HD 151525	45 Her	82216A	Ap	Cr	5.242	−0.010	4.12
HD 151965	V911 Sco	82554	B9p	Si	6.344	−0.141	1.6084
HD 152107	52 Her	82321	A2p	SrCr	4.820	+0.087	3.857
HD 153882	V451 Her	83308A	B9p	Cr	6.289	+0.031	6.0089
HD 318107			B8p		9.35		52
HD 164258	HR 6709	88148	A3p	SrCrEu	6.363	+0.160	0.83
HD 164429	V771 Her	88030	B9sp	SrCrEu	6.501	−0.091	0.517
HD 165474	HR 6754 B	88267	A7p	SrCrEu	6.510	+0.276	23.4
HD 166473			A5p	SrCrEu	7.937		
HD 168733	HR6870	90074	B7p	He–wk	5.339	−0.125	6.354
HD 170000	φ Dra	89908	Ap	Si	4.215	−0.093	1.7165
HD 170397	V432 Sct	90651	A0p	Cr	6.043	−0.037	2.191
HD 170973	MV Ser	90858	A0p	SrSiCr	6.426	−0.044	18.2
HD 171586	FR Ser	91142A	A2p	SrCrEu	6.468	+0.075	2.1
HD 173650	V535 Her	92036	B9p	SiCrSr	6.508	+0.028	9.975
HD 174933	HR 7113	92614	B9p	Hg	5.404	−0.068	
HD 175362	HR 7129	92989	B3p	He–wk	5.354	−0.147	3.674
HD 176232	10 Aql	93179	F0p	SrCr	5.900	+0.251	6.5
HD 177517	HR 7230	93736	B9p	HgSi	5.980	−0.015	0.4
HD 177765			A5p	SrCrEu	9.155		
HD 179761	21 Aql	94477 A	B8p	Si	5.138	−0.069	1.7
HD 183339	HR 7401	95520	B8p	He–wk	6.597	−0.141	
HD 184905	V1264 Cyg	96292	A0p	SiSrCr	6.626	−0.034	1.845
HD 184927	V1671 Cyg	96362	B2p	He–r	7.448	−0.160	9.53
HD 187474	HR 7552	97749	A0p	CrEu	5.318	−0.065	2345
HD 188041	V1291 Aql	97871	A5p	SrCrEu	5.642	+0.181	224
HD 190073	V1295 Aql	98719	A0pe		7.859	+0.100	
HD 191742		99340	A7p	SrCrEu	8.138	+0.224	
HD 192678	V1372 Cyg	99672	A4p	Cr	7.366	−0.030	6.42
HD 192913	MW Vul	99927	A0p	Si	6.650	−0.066	16.8
HD 196178	HR 7870	101475	B9p	Si	5.770	−0.162	1.01
HD 196502	73 Dra	101260	A0p	SrCrEu	5.198	+0.066	20.275
HD 335238		102896	A0p	SrCrEu	9.255	+0.069	11.2
HD 200177		103658	B9p	Cr	7.342	−0.003	
HD 200311		103736	B9p	SiCrHg	7.708	−0.102	52.0
HD 201601	γ Equ	104521 AB	F0p	CrEu	4.696	+0.262	long
HD 203006	θ Mic	105382	A2p	SrCrEuMg	4.818	+0.029	2.122
HD 205087	HR 8240	106355	B9p	SiSrCrEu	6.705	−0.092	

Table 1: *General parameters of magnetic chemically peculiar stars (continued)*

HD/BD	Name	HIP	Sp	Pec	V	B–V	*P* (days)
HD 208095	HR 8357 B	107930	B6p	SiSr	5.705	−0.081	
HD 208217		108340	A0p	SrCrEu	7.206	+0.189	8.445
HD 209515	HR 8407	108845	AOp	SiMn	5.600	−0.030	1
HD 213918	V362 Lac	111400	B7p	SiSr	8.710	−0.046	1.431
HD 215038	GQ Cep	111849	A0p	Si	8.178	−0.036	2.0398
HD 215441	GL Lac	112247	A0p	Si	8.839	+0.031	9.4876
HD 216018		112705	A5p	SrCrEu	7.623	+0.294	
HD 216533	MX Cep	112969	A2p	SrCr	7.908	+0.082	17.2
HD 217833	V638 Cas	113797	Ap	He–wk	6.500	−0.130	5.4
HD 220825	k Psc	115738A	A0p	CrSr	4.936	+0.036	1.41
HD 221006	CG Tuc	115908	Ap	Si	5.672	−0.175	2.315
HD 221394		116119	A1p	SrCr	6.412	+0.022	2.86
HD 221568	V436 Cas	116210	A0p	SrCrEu	7.568	+0.183	159
HD 223640	108 Aqr	117629	Ap	Si	5.182	−0.138	3.7352
HD 224801	CG And	63	B9p	SiSrEu	6.365	−0.052	3.7398

Table 2: *The number of different type peculiar stars*

Pec	HIP	MCP	%
He–r	14	9	64
He–wk	58	33	57
HgMn+	44	6	14
Si	415	36	9
Si+	66	29	44
SrCrEu	353	86	24
total	950	199	

The large fraction of magnetic stars among helium CP stars is probably connected with the small number of these stars and the more detail investigation of each of them. On the other hand, the possibility that the increased fraction of magnetic stars among helium stars reflects the real situation may not be excluded.

The distribution of the number of MCP stars in brightness V and colour B-V is demonstrated in Fig. 1.

It is seen from Fig. 1 that the number of magnetic CP stars strongly decreases for objects fainter than 8 magnitudes. Magnetic field observations need a high spectral resolution and therefore they have been made only for bright stars, even using modern technique.

Colours B-V of practically all MCP stars are in the range from -0.2 to +0.3 magnitude.

3. Reversive and non-reversive magnetic CP stars

Magnetic field data for most of CP stars of our sample have been obtained from the longitudinal component (B^e) measurements. We noted earlier (in Paper 1), that a sufficiently large number (over 10 for each star) of measurements of B^e had been made for 79 magnetic CP stars. We know now only 3 of them with an essential non-dipolar component: HD 32633 (Renson, 1984), HD 37776 (Thompson and Landstreet, 1985) and HD 133880 (Landstreet, 1990), detailed references can be found in Paper 1.

The rest 76 of these stars show sinusoidal variations of B^e *om* constant B^e, suggesting a dipolar magnetic field of the well-known MCP stars. All variations are the result of rotation of a "chemically spotted" star when the magnetic and rotation axes are not co-axial (well-known oblique rotator model). A study of the well-known MCP stars shows that the physical conditions in an essential part of them are different at the magnetic pole and magnetic equator.

The dependence of peculiarity distribution on magnetic latitude has been studied by Floquet (1979) for 18 stars, but we are ignorant of systematic studies in this area made over the passed 20 years. We will now attempt to do this using modern observational data.

All 211 stars from our sample may be divided into 3 groups: reversive, non-reversive and poorly studied magnetic stars.

1. **Reversive magnetic stars.** These stars have reliably measured longitudinal fields B^e, the number of measurements *[n]* > 5, the B^e curve changes the sign.

2. **Non-reversive stars.** These stars have reliably measured longitudinal fields, the number of measurements [n] > 5, but the B^e curve has mainly the same sign. The criterion for distinguishing between reversive and non-reversive magnetic CP stars is the following: the star is non-reversive if the B^e curve has the same sign for at least 2/3 of the period or more. In the simplest case of a sine curve of B^e and random

spatial distribution of rotational and magnetic axes, the fraction N of such selected non-reversive stars can be calculated using the expression

$$N = \frac{1}{2} + \frac{4}{\pi^2}\int_0^{\frac{\pi}{2}} \mathrm{arctg}\,\frac{\mathrm{tg}\,i}{2+\mathrm{tg}^2\,i}\,di = 0.637,$$

and the ratio of non-reversive and reversive stars is 1.75.

If the period is unknown, both B^e extrema must be of the same sign or one of the extrema must at least be more than twice as large as the second.

3. **Poorly studied stars.** These are really magnetic CP stars but with a small number of B^e measurements, therefore it is impossible to decide whether these stars are reversive or non-reversive. This group contains also MCP stars with measured surface fields B^s but with lacking B^e measurements, and the stars with very small magnetic fields when measurements are highly uncertain.

It can be inferred that reversive stars are seen from both the magnetic equators and the magnetic poles, while non-reversive stars are predominantly seen from the magnetic poles.

We may expect some regularities in distribution of chemical anomalies with magnetic latitude (Floquet, 1979) and reversive and non-reversive stars may therefore show different types of peculiarities.

In the case of very long-period stars (period $P > 5$ years), the sign of B^e usually does not change during the period of observation and we can study practically the same part of the star's surface. For this reason we will consider very long-period MCP stars, such as HD 201601 *(P* is about 75 years), as non-reversive.

The distribution of MCP stars for reversive, non-reversive and poorly studied stars according to the types of peculiarities and the ratio non-reversive/reversive *(N/R)* is presented in Table 3.

Note that we present in the table the data on 193 MCP stars of 5 peculiarity types. The rest 18 of the total of 211 are: a few Hg-Mn, Am and stars with rarely seen peculiarities, and some non-classified poorly known faint Ap stars.

A superficial analysis of the data from Table 3 shows interesting features in different type stars. For example, the fraction of non-reversive He-r stars *(N/R* = 2.50) is essentially larger than that of He-wk stars *(N/R* = 1.55).

This may suggest that He in hot MCP stars concentrates mainly around the magnetic poles. Of course, a detail investigation is still to be made but we want to note that among 9 He-r stars 5 are non-reversive, while 2 reversive He-r stars (HD 37776 and HD 64740) with available magnetic field modeling show enhanced helium around the magnetic poles (Khokhlova et al., 2000; Bohlender et al., 1987). This is an additional support of our point of view: helium concentrates around the magnetic poles, where the magnetic lines of force are perpendicular to the surface of the star.

The same is possibly true for the distribution of silicon. If the star is viewed from the magnetic pole, only silicon anomalies are mostly observable; if silicon and other anomalies are observed, the star rotates so that both the pole and equator are visible.

About half of the coolest MCP stars with peculiarities of Cr, Eu and Sr have insufficient number of B^e measurements. Very often different peculiarities (for example, Cr and Eu) vary in antiphase with the period of rotation. Therefore they are concentrated in different parts of the star and our shallow analysis cannot provide adequate results; the study needs to be continued and a detail analysis to be made.

As was demonstrated in Paper 1, we had collected 49 MCP stars with surface magnetic field measurements. Since direct measurements of B^S are possible only for stars with very narrow lines ($v \sin i < 10$ km/s), the sample of stars with measured B^s values includes either slowly rotating stars (small *v)* or stars visible from the pole of rotation (small sin *i*) or both values are small.

Let us consider the fraction of stars with measured B^s among reversive and non-reversive CP stars. We exclude hot He stars from our consideration because they are fast rotators and only for the star HD 37776 with an enormous field direct observation of splitted Zeeman components is possible.

Taking into account the above said, we have 7 reversive stars with B^s measurements among 39 (fraction is 7/39 = 17.9%) and 18 non-reversive stars with B^S measurements among 61 (fraction is 18/61 = 29.5%).

If the coolest stars with anomalous Sr, Cr and Eu abundances were considered, the differences would be still larger: 5 stars (25 %) with measured B^s out of 20 for reversive, and 14 (50 %) out of 28 for non-reversive stars.The larger fraction of non-reversive stars among slow rotators indicates that they are seen mostly from one pole.

The presented data support the result of Landstreet and Mathys (1999), that the angle β (between the magnetic and rotational axes) in slow rotating stars is small (non-oblique rotator).

4. Spatial distribution

The solar system is located at the periphery of our Galaxy, at a distance of about 8 pc from the centre in the Orion spiral arm. In the nearest neighbourhood the spiral arm is directed along a line with galactic longitudes from Z = 60° to l = 240°. The Gould Belt is a region with higher concentration of A and B stars in the direction with galactic longitudes from l = 230° to l = 260° to a distance as great as 300-400 pc.

Table 3: *Distribution of magnetic CP stars into 3 groups*

Pec	Total	Reversive	Non-reversive	Poorly studied	N/R
He-r	9	2	5	2	2.50
He-wk	33	11	17	5	1.55
Si	36	8	16	12	2.00
Si+	29	10	12	7	1.20
SrCrEu	86	17	25	44	1.47
total	193	48	75	70	1.56

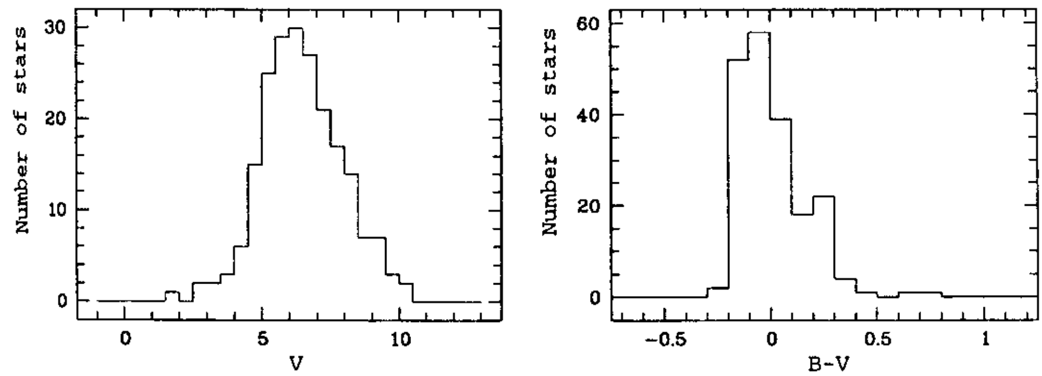

Figure 1: *The distribution of the number of MCP stars in V and B-V.*

Let us examine the spatial distribution of MCP stars of our sample. The Hipparcos results are being extensively discussed in literature. The parallaxes available in the Catalogue (ESA, 1992; 1997) cannot be applied to all cases to determine distances, mainly because of the influence of duplicity. Therefore the Hipparcos team continues to print reduced data, main data on CP stars were published by Gomes et al. (1998), North et al. (1998) and others. We will make use of the data from these papers.

The data on the spatial distribution: equatorial coordinates α and δ for the epoch 2000.0, galactic coordinates l and b, membership in clusters and parallaxes (in milliarcseconds) for stars of our sample are presented in the next 3 tables. Membership in clusters was taken from Kopylov (1987) and references therein and from Renson catalogue (1988). Reversive stars are presented in Table 4.

Thus, we have found 51 reversive MCP stars, 11 of them (22 %) are members of different open clusters.

Longitudinal magnetic field component changes the sing, these stars have large spectral variations and are best suited for mapping of chemical anomalies on the surface of the star.

Non-reversive magnetic stars are listed in Table 5.

Thus, we selected 83 stars, the longitudinal component B_l of magnetic field of which has mainly the same sign. The selection criteria in this group were given above. Among these 83 non-reversive stars we have found 36 with (+), (i.e. seen mainly from the positive pole of the dipolar magnetic field) and 47 with (-). We disregard this peculiarity for the time being but will keep it in mind.

Of 83 stars 35 non-reversive stars (42 %) are members of different open clusters. This implies that the fraction of non-reversive stars in clusters is 2 times higher that of reversive stars.

Two explanations of this effect can be suggested. First, this is the result of observational selection. Since peculiarities concentrate mostly at the magnetic poles, peculiar stars are then easier to find among non-reversive stars. Second, this effect reflects real spatial orientation of magnetic stars, connected with generation and evolution of magnetic fields in our Galaxy.

If we restrict ourselves to inspection of only the youngest open clusters in Orion and Scorpio which consist mainly of hot He-stars, we will get a more impressive picture.

We have found 5 reversive and 10 non-reversive MCP stars in Orion (4(+) and 6 (-)) and 3 reversive and 13 non-reversive MCP stars in Scorpio (3(+) and 10 (-)), a total of 8 reversive and 23 non-reversive.

It should not be left out of account that among 23 non-reversive stars 7 are (+) and 16 are (-).

We checked many times the "zero-point" of the

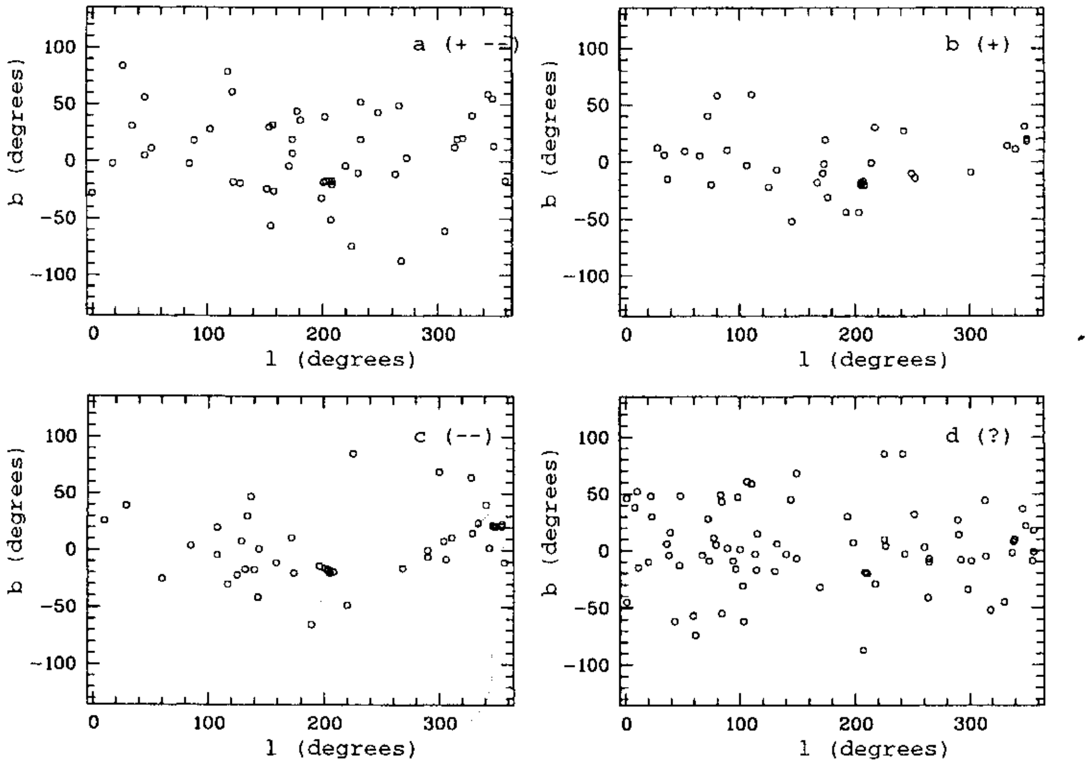

Figure 2: *The distribution of MCP stars in galactic coordinates: a) – reversive stars, b) – non-reversive stars (+), c) — non-reversive stars (–), d) – poorly studied stars.*

scale of magnetic observation and have not found any "zero-point" instrumental shifts in measurements of Babcock, Landstreet and his co-authors, and our own measurements. Therefore we cannot see any obvious instrumental effects which should possibly lead to such results. This may result from poor statistics.

On the other hand, this might suggest that magnetic fields of young MCP stars in clusters could equally form at a time from a relic field in the Galaxy.

General data for poorly studied MCP stars are present in Table 6.

This group contains a total of 77 stars, 16 of them (21 %) are members of clusters. The fraction is the same as that of reversive stars. Note that more than half (40 of 77) stars of this group are cool SrCrEu stars, basically with measured B_s but with a small number of B_e measurements.

195 stars of our sample (92%) have measured Hipparcos parallaxes. This permits us to construct a very reliable spatial distribution of MCP stars in our Galaxy up to a distance of 200-300 pc from the Sun. The distribution of MCP stars of our 3 groups in galactic coordinates l and b is demonstrated in Fig. 2.

The Hipparcos parallaxes often need to be reduced, because close binary systems are not spatially resolved and the parallax determination is strongly affected by orbital motions. Hipparcos team (Gomes et al., 1998, North, 1998) has considered and reduced the data on CP stars and published corrected distances d from the Sun and z distance from the plane of the Galaxy. We will construct such a distribution for MCP stars from our sample using the data from the papers indicated above.

The results are presented in Fig. 3.

The spatial distribution of MCP stars is the same as for all CP stars; all MCP are upper main-sequence stars.

We present the data on distances, proper motions and velocities in the next 3 tables. We consider only the stars with known parallaxes. Information on d and z was taken from Gomes et al. (1998), μ_α, μ_δ and v_r — from HIP, v_{calc} are our calculations. In case when the data on reduced d and z were not available, we calculated distance d using direct parallax measurement from Hipparcos catalogue (ESA, 1997), indicating it as d.

Table 7 contains the data for reversive stars.

The data for non-reversive stars are presented in

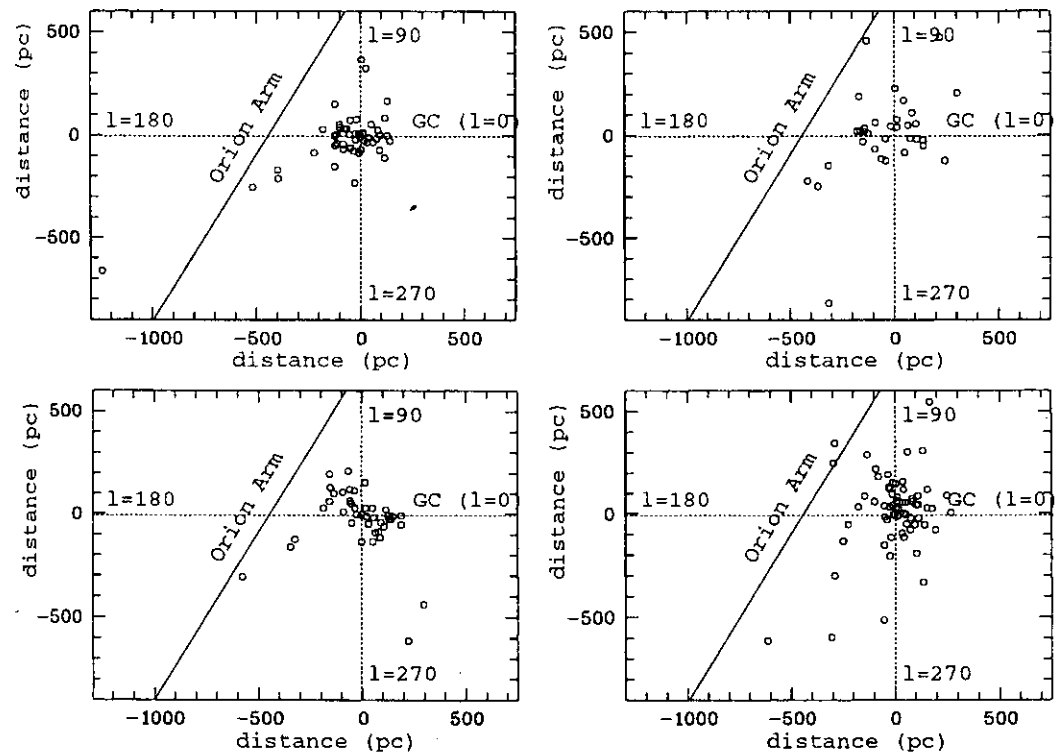

Figure 3: *The distribution of MCP stars in solar neighbourhood. The designations are the same as in Fig. 2.*

Table 8.

The data for poorly studied MCP stars are listed in Table 9.

Recently Romanyuk (1994) has found that there exist essential differences in the spatial distribution of non-reversive stars (+) and (-) in different directions in the Galaxy.

We will now consider this problem using a new sample of stars. We select two perpendicular directions in the plane of our Galaxy: 1 along and 2 across the Orion local spiral arm. Calculate the number of MCP stars along these directions inside the angles of 60°. Explanation see in Fig. 4.

For economy of space consider now only reversive and non-reversive CP stars in Tables 10 and 11, respectively. Note that the Scorpio cluster (l = 310 - 355°, b = 10 - 40°) is included in our discussion, but Orion (l = 201 - 208°, b = -17-:--20°) is not.

Calculations show that 15 reversive magnetic stars are distributed along the Orion spiral arm and approximately the same number, 21, along the perpendicular direction. Ratio 21/15 = 1.40.

The data for non-reversive stars are given in Table 11.

Non-reversive stars behave in a quite different way: 18 stars are distributed along the spiral arm and 39 in a perpendicular direction. Ratio 39/18 = 2.17 is essentially larger than ratio 21/15 = 1.40 for reversive stars.

For 18 non-reversive stars distributed along the Orion arm 13 are (+) and 5 are (-), for 39 observed in a direction perpendicular to the spiral arm 13 are (+) and 26 are (-).

This indicates, that there exist great differences in spatial distribution of (+) and (-) non-reversive stars. While the number of stars (+) is equal: 13 along and 13 across the local spiral arm, for stars (—) we observe great differences: 5 along the arm and 26 across it.

Probability of random appearance of such spatial distribution of stars is less than 0.02%, therefore the above mentioned effect may not be a result of random coincidence in the case of small number of measurements. This problem needs a more detail study.

Since most of stars (—) are members of Sco-Cen association, we planned to make a more detail study of MCP stars, members of clusters and associations.

A very rough estimate of velocities shows that they are equal in all directions and do not differ from these of all CP stars.

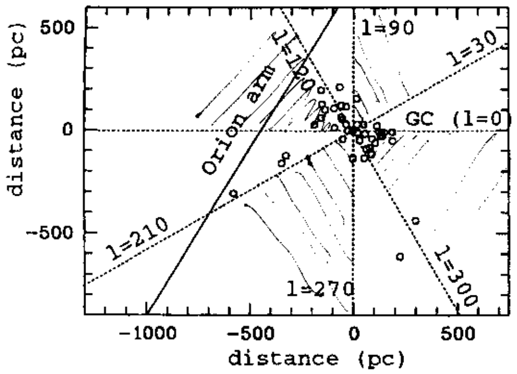

Figure 4: *Number of non-reversive stars (–) along and across the Orion arm. Direction 1 — along the Orion spiral arm in 60-degree interval of galactic longitudes (from $l = 30°$ to $l = 90°$ and from $l = 210°$ to $l = 270°$). Direction 2 — perpendicular to the Orion spiral arm (from $l = 120°$ to $l = 180°$ and from $l = 300°$ to $l = 360°$).*

5. Conclusions

In this part of our study of magnetic chemically peculiar stars we present the data on their parameters: magnitude, colour, coordinates, period, parallax, velocities.

Our division of stars into reversive and non-reversive permits new features, for instance, in the spatial distribution of stars and membership in clusters, to be found.

It is demonstrated that among cool SrCrEu stars the fraction of stars with measured surface field B_s for non-reversive stars is two times that of reversive. This indicates that among slowly rotating stars the angle β (between the rotational and magnetic axes) can be small, supporting the work of Landstreet and Mathys (1999).

We have found that fraction of non-reversive He-stars in the open clusters Ori and Sco is 2 times higher than that of reversive stars. This fact is possibly caused by both observational selection and relic origin of magnetic field; in this case MCP stars in clusters form simultaneously and orientation of their rotational and magnetic axes can be more or less colinear.

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Table 4: *Equatorial and galactic coordinates of reversive magnetic CP stars*

HD	Membership	α_{2000}	δ_{2000}	l	b	π (mas)
HD 3980		$00^h41^m46^s.3$	$-56^\circ30'06''$	306	−61	15.29
HD 4778		$00^h50^m18^s.2$	$+45^\circ00'08''$	123	−18	11.01
HD 5737		$00^h58^m36^s.4$	$-29^\circ21'27''$	268	−87	4.85
HD 8441		$01^h24^m18^s.7$	$+43^\circ08'31''$	129	−19	4.91
HD 12447		$02^h02^m02^s.8$	$+02^\circ45'49''$	155	−56	23.45
HD 12767		$02^h04^m29^s.4$	$-29^\circ17'49''$	225	−74	9.03
HD 18296		$02^h57^m17^s.2$	$+31^\circ56'03''$	152	−24	8.43
HD 19832		$03^h12^m14^s.2$	$+27^\circ15'25''$	158	−26	8.78
HD 22470		$03^h36^m17^s.4$	$-17^\circ28'01''$	207	−51	6.89
HD 28843		$04^h32^m37^s.4$	$-03^\circ12'33''$	199	−32	7.61
HD 32633		$05^h06^m08^s.4$	$+33^\circ55'07''$	171	−4	6.38
HD 35298	Ori OB1	$05^h23^m50^s.4$	$+02^\circ04'56''$	201	−18	4.02
HD 36629	Ori OB1	$05^h32^m57^s.0$	$-04^\circ33'59''$	208	−20	0.67
HD 36668	Ori OB1	$05^h33^m26^s.1$	$+00^\circ37'17''$	203	−17	2.72
HD 37642	Ori OB1	$05^h39^m55^s.4$	$-03^\circ19'60''$	208	−17	1.67
HD 37776	Ori OB1	$05^h40^m56^s.3$	$-01^\circ30'26''$	206	−17	1.96
HD 40312		$05^h59^m43^s.2$	$+37^\circ12'45''$	174	7	18.83
HD 49333	NGC 2287 ?	$06^h47^m01^s.5$	$-21^\circ00'56''$	231	−10	4.88
HD 49976		$06^h50^m42^s.3$	$-08^\circ02'28''$	220	−4	9.89
HD 54118		$06^h59^m20^s.1$	$+42^\circ18'52''$	174	19	5.31
HD 62140		$07^h46^m27^s.3$	$+62^\circ49'49''$	154	30	12.32
HD 64740		$07^h53^m03^s.7$	$-49^\circ36'47''$	263	−11	4.53
HD 65339		$08^h01^m42^s.4$	$+60^\circ19'27''$	157	32	10.16
HD 71866		$08^h31^m10^s.8$	$+40^\circ13'29''$	181	36	6.81
HD 72968		$08^h35^m28^s.2$	$-07^\circ58'56''$	233	19	12.15
HD 78316		$09^h07^m44^s.8$	$+10^\circ40'05''$	202	39	7.14
HD 79158		$09^h13^m48^s.2$	$+43^\circ13'04''$	178	44	5.69
HD 83368		$09^h36^m25^s.4$	$-48^\circ45'05''$	273	3	13.80
HD 90044		$10^h23^m26^s.5$	$-04^\circ04'27''$	248	43	9.28
HD 90569		$10^h27^m39^s.0$	$+09^\circ45'44''$	233	52	8.47
HD 98088		$11^h16^m58^s.1$	$-07^\circ08'05''$	266	49	7.75
HD 112185	UMa stream	$12^h54^m01^s.7$	$+55^\circ57'35''$	122	61	40.30
HD 112413		$12^h56^m01^s.6$	$+38^\circ19'06''$	118	79	29.60
HD 115708		$13^h18^m37^s.2$	$+26^\circ21'57''$	27	84	7.53
HD 122532	Sco-Cen	$14^h03^m27^s.4$	$-41^\circ25'54''$	317	19	5.91
HD 124224		$14^h12^m15^s.8$	$+02^\circ24'34''$	344	59	12.45
HD 125248		$14^h18^m38^s.2$	$-18^\circ42'57''$	330	40	11.08
HD 125823	Sco-Cen	$14^h23^m02^s.3$	$-39^\circ30'43''$	322	20	7.79
HD 126515		$14^h25^m55^s.9$	$+00^\circ59'34''$	348	55	7.07
HD 137509		$15^h31^m27^s.0$	$-71^\circ03'43''$	315	12	4.01
HD 137909		$15^h27^m49^s.7$	$+29^\circ06'21''$	46	56	28.60
HD 148199	Sco-Cen	$16^h27^m29^s.6$	$-29^\circ17'17''$	349	13	6.64
HD 153882		$17^h01^m33^s.0$	$+14^\circ56'59''$	35	31	5.92
HD 170000		$18^h20^m46^s.3$	$+71^\circ20'16''$	103	28	11.28
HD 170397		$18^h29^m46^s.8$	$-14^\circ34'55''$	18	−2	11.46
HD 173650		$18^h45^m35^s.6$	$+21^\circ59'05''$	52	11	4.66
HD 175362		$18^h56^m40^s.5$	$-37^\circ20'35''$	359	−17	7.67
HD 176232		$18^h58^m46^s.9$	$+13^\circ54'24''$	46	5	13.45
HD 183339	Pleiades group	$19^h25^m46^s.7$	$+58^\circ01'38''$	89	18	2.60
HD 187474		$19^h51^m51^s.0$	$-39^\circ52'27''$	0	−28	9.62
HD 200311		$21^h01^m14^s.3$	$+43^\circ43'19''$	85	−2	3.37

Table 5: *Equatorial and galactic coordinates of non-reversive magnetic CP stars*

HD/BD	Membership	α_{2000}	δ_{2000}	l	b	π (mas)
HD 2453		$00^h28^m28^s.6$	$+32°26'16''$	117	−30	6.59
BD +40.175 A		$00^h51^m10^s.2$	$+41°11'51''$	125	−22	
BD +40.175 B		$00^h51^m10^s.2$	$+41°11'51''$	125	−22	
HD 9996		$01^h38^m31^s.5$	$+45°23'59''$	132	−17	7.17
HD 10783		$01^h45^m42^s.5$	$+08°33'33''$	145	−52	5.37
HD 11187		$01^h51^m26^s.6$	$+54°55'28''$	132	−7	4.26
HD 11503	Pleiades group	$01^h53^m31^s.8$	$+19°17'33''$	143	−41	15.96
HD 12288		$02^h03^m30^s.4$	$+69°34'56''$	129	8	4.33
HD 14437		$02^h21^m02^s.6$	$+42°56'38''$	140	−17	6.06
HD 15144	UMa stream	$02^h26^m00^s.2$	$-15°20'27''$	189	−65	15.24
HD 22316		$03^h38^m19^s.7$	$+56°55'57''$	144	1	5.85
HD 22920		$03^h40^m38^s.3$	$-05°12'38''$	192	−44	4.41
HD 24155		$03^h51^m15^s.8$	$+13°02'45''$	176	−31	7.36
HD 24712		$03^h55^m16^s.1$	$-12°05'57''$	203	−44	20.41
HD 25267		$03^h59^m55^s.4$	$-24°00'58''$	220	−48	9.85
HD 25354		$04^h03^m10^s.8$	$+38°03'17''$	159	−11	6.90
HD 25823	Pleiades group	$04^h06^s36^s.4$	$+27°36'00''$	167	−18	6.60
HD 27309	Pleiades group	$04^h19^m36^s.7$	$+21°46'24''$	174	−20	10.32
HD 30466		$04^h49^m16^s.0$	$+29°34'16''$	172	−10	6.12
HD 34452		$05^h19^m00^s.1$	$+33°44'55''$	173	−2	7.28
HD 35456	Ori OB1	$05^h24^m40^s.4$	$-02°29'52''$	205	−20	2.13
HD 35502	Ori OB1	$05^h25^m01^s.1$	$-02°48'56''$	205	−20	2.45
HD 36313	Ori OB1	$05^h30^m45^s.2$	$-00°22'24''$	204	−18	
HD 36429	Ori OB1	$05^h31^m41^s.1$	$+02°49'58''$	201	−16	3.58
HD 36485	Ori OB1	$05^h32^m00^s.5$	$-00°17'04''$	203	−17	
HD 36526	Ori OB1	$05^h32^m13^s.0$	$-01°36'01''$	205	−18	
HD 36540	Ori OB1	$05^h32^m14^s.9$	$-04°31'06''$	208	−20	1.79
HD 37017	Ori OB1	$05^h35^m21^s.8$	$-04°29'39''$	208	−19	2.68
HD 37140	Ori OB1	$05^h36^m18^s.8$	$-00°13'18''$	204	−17	
HD 37479	Ori OB1	$05^h38^m47^s.2$	$-02°35'40''$	207	−17	
HD 42616		$06^h13^m43^s.0$	$+41°41'50''$	172	11	5.75
HD 47103		$06^h37^m34^s.0$	$+19°56'52''$	196	−14	
HD 50169		$06^h51^m59^s.2$	$-01°38'40''$	214	−1	3.47
HD 51418		$06^h59^m20^s.1$	$+42°18'52''$	174	19	5.31
HD 55719		$07^h12^m15^s.8$	$-40°29'56''$	252	−14	7.51
HD 58260		$07^h23^m19^s.6$	$-36°20'54''$	249	−10	1.21
HD 64486		$08^h04^m47^s.2$	$+79°28'46''$	134	30	9.88
HD 73340	IC 2391	$08^h35^m52^s.0$	$-50°58'10''$	268	−16	6.99
HD 74521	Pleiades group	$08^h44^m45^s.0$	$+10°04'53''$	217	30	8.00
HD 81009		$09^h22^m50^s.8$	$-09°50'19''$	242	27	7.20
HD 92664	IC 2602	$10^h40^m11^s.4$	$-65°06'01''$	290	−6	7.00
HD 94660		$10^h55^m01^s.0$	$-42°15'04''$	304	8	1.87
HD 96446		$11^h06^m05^s.8$	$-59°56'59''$	290	0	1.87
HD 96707		$11^h09^m39^s.8$	$+67°12'36''$	137	47	9.18
HD 108662	Coma	$12^h28^m54^s.7$	$+25°54'46''$	225	85	12.06
HD 109026		$12^h32^m27^s.9$	$-72°07'58''$	301	−9	10.07
HD 111133		$12^h47^m02^s.2$	$+05°57'10''$	300	69	6.23
HD 112381	Sco–Cen	$12^h56^m58^s.3$	$-54°35'13''$	304	8	9.91
HD 116458		$13^h25^m50^s.2$	$-70°37'38''$	306	−8	7.03

Table 5: *Equatorial and galactic coordinates of non-reversive magnetic CP stars (continued)*

HD/BD	Membership	α_{2000}	δ_{2000}	l	b	π (mas)
HD 118022	UMa stream	$13^h34^m07^s.9$	$+03°39'32''$	328	64	17.79
HD 119213		$13^h40^m21^s.3$	$+57°12'27''$	110	59	11.32
HD 119419	Sco–Cen	$13^h44^m16^s.0$	$-51°00'44''$	311	11	8.88
HD 130559	Sco–Cen	$14^h49^m19^s.0$	$-14°08'56''$	341	40	13.86
HD 133029		$15^h00^m38^s.6$	$+47°16'38''$	80	58	6.84
HD 133652	Sco–Cen	$15^h06^m33^s.2$	$-30°55'06''$	334	24	10.44
HD 133880	Sco–Cen	$15^h08^m12^s.1$	$-40°35'02''$	329	15	7.90
HD 137193	Sco–Cen	$15^h26^m06^s.9$	$-39°53'21''$	333	14	3.83
HD 137949		$15^h29^m34^s.7$	$-17°26'27''$	348	31	11.21
HD 142301	Sco–Cen	$15^h54^m39^s.5$	$-25°14'37''$	347	22	7.16
HD 142990	Sco–Cen	$15^h58^m34^s.8$	$-24°49'53''$	348	21	6.68
HD 143473		$16^h01^m58^s.8$	$-37°32'04''$	340	11	8.07
HD 144334	Sco–Cen	$16^h06^m06^s.3$	$-23°36'23''$	350	21	6.70
HD 144661	Sco–Cen	$16^h07^m51^s.9$	$-24°27'44''$	350	20	8.50
HD 145501	Sco–Cen	$16^h11^m59^s.7$	$-19°27'38''$	355	23	7.47
HD 146001	Sco–Cen	$16^h14^m53^s.5$	$-25°28'37''$	350	18	7.06
HD 147010	Sco–Cen	$16^h20^m05^s.5$	$-20°03'22''$	355	21	6.98
HD 148112	UMa stream	$16^h25^m25^s.0$	$+14°02'00''$	29	39	13.87
HD 149911		$16^h38^m01^s.5$	$-06°32'16''$	10	26	7.92
HD 151965		$16^h52^m27^s.4$	$-40°43'23''$	344	2	5.54
HD 152107	UMa stream	$16^h49^m14^s.2$	$+45°59'00''$	72	40	18.62
HD 164258		$18^h00^m15^s.7$	$+00°37'46''$	28	12	8.26
HD 168733		$18^h22^m53^s.1$	$-36°40'10''$	357	−11	5.27
HD 170973		$18^h32^m06^s.9$	$+03°39'35''$	34	6	2.73
HD 174933	Pleiades group	$18^h52^m16^s.4$	$+21°25'30''$	52	9	7.10
HD 184927		$19^h35^m32^s.0$	$+31°16'36''$	65	5	1.79
HD 188041		$19^h53^m18^s.7$	$-03°06'52''$	37	−15	11.79
HD 192678		$20^h13^m36^s.2$	$+53°39'23''$	89	10	4.34
HD 196178		$20^h33^m54^s.7$	$+46°41'39''$	85	4	6.78
HD 196502		$20^h31^m30^s.4$	$+74°57'16''$	108	20	7.82
HD 201601		$21^h10^m20^s.5$	$+10°07'53''$	60	−25	28.38
HD 205087		$21^h32^m26^s.9$	$+23°23'39''$	75	−20	5.39
HD 215441		$22^h44^m07^s.5$	$+55°35'21''$	106	−3	1.40
HD 217833		$23^h02^m43^s.8$	$+55°14'12''$	108	−4	4.51

Table 6: *Equatorial and galactic coordinates of poorly studied magnetic CP stars*

HD	Membership	α_{2000}	δ_{2000}	l	b	π (mas)
HD 965		$00^h14^m04^s.0$	$-00^\circ01'59''$	103	-62	3.20
HD 6532		$01^h05^m55^s.7$	$-26^\circ43'45''$	207	-87	4.45
HD 8855		$01^h28^m05^s.7$	$+43^\circ52'39''$	130	-18	2.67
HD 15089		$02^h29^m04^s.0$	$+67^\circ24'09''$	132	6	23.04
HD 18078		$02^h56^m32^s.0$	$+56^\circ10'41''$	140	-3	0.51
HD 19918		$03^h00^m36^s.9$	$-81^\circ54'08''$	298	-34	3.82
HD 21590		$03^h29^m42^s.5$	$+16^\circ45'44''$	169	-32	4.81
HD 21699	α Per	$03^h32^m08^s.6$	$+48^\circ01'24''$	149	-7	5.57
HD 29578		$04^h36^m30^s.8$	$-54^\circ37'15''$	263	-41	3.37
HD 33904	Pleiades group	$05^h12^m55^s.8$	$-16^\circ12'19''$	217	-29	17.69
HD 36916	Ori OB1	$05^h34^m54^s.0$	$-04^\circ06'38''$	208	-19	2.88
HD 37058	Ori OB1	$05^h35^m33^s.7$	$-04^\circ50'15''$	209	-19	
HD 37210	Ori OB1	$05^h36^m31^s.0$	$-06^\circ27'14''$	210	-20	
HD 49606		$06^h49^m49^s.8$	$+16^\circ12'10''$	198	7	3.52
HD 59435		$07^h29^m35^m.5$	$-09^\circ15'34''$	226	4	0.69
HD 61468		$07^h38^m22^s.6$	$-27^\circ52'08''$	243	-3	2.71
HD 63843		$07^h50^m41^s.8$	$-06^\circ03'38''$	225	10	-0.33
HD 66522		$08^h01^m35^s.1$	$-50^\circ36'20''$	264	-10	1.91
HD 68351		$08^h13^m08^s.8$	$29^\circ39'24''$	193	30	3.74
HD 70331		$08^h19^m17^s.3$	$-48^\circ04'09''$	264	-7	
HD 75445		$08^h48^m42^s.9$	$-39^\circ14'02''$	260	3	8.80
HD 86592		$09^h59^m14^s.3$	$-12^\circ45'14''$	251	32	5.96
HD 89822		$10^h24^m08^s.0$	$+65^\circ33'59''$	144	45	10.84
HD 93507		$10^h45^m50^s.7$	$-68^\circ07'50''$	292	-8	2.93
HD 101065		$11^h37^m37^s.0$	$-46^\circ42'35''$	290	14	7.95
HD 103192	Sco–Cen	$11^h52^m54^s.5$	$-33^\circ54'29''$	289	27	8.93
HD 103498		$11^h55^m11^s.4$	$+46^\circ28'12''$	149	68	3.18
HD 108651	Coma	$12^h28^m44^s.6$	$+25^\circ53'56''$	225	85	12.66
HD 108945	Coma	$12^h31^m00^s.6$	$+24^\circ34'01''$	241	85	10.49
HD 110066		$12^h39^m16^s.8$	$+35^\circ57'06''$	110	59	11.32
HD 116114		$13^h21^m46^s.3$	$-18^\circ44'30''$	313	44	7.12
HD 119026	Sco	$12^h32^m27^s.9$	$-72^\circ07'58''$	301	-9	10.07
HD 120198		$13^h46^m35^s.6$	$+54^\circ25'57''$	106	61	11.58
HD 128898		$14^h42^m30^s.4$	$-64^\circ58'30''$	314	-5	60.97
HD 134214		$15^h09^m02^s.4$	$-13^\circ59'59''$	346	37	10.92
HD 134793		$15^h11^m34^s.2$	$+08^\circ31'01''$	10	52	2.99
HD 135297		$15^h14^m21^s.0$	$+00^\circ22'10''$	1	46	1.78
HD 137389		$15^h22^m37^s.3$	$+62^\circ02'49''$	98	47	7.07
HD 140160		$15^h41^m47^s.4$	$+12^\circ50'51''$	22	48	5.62
HD 140728		$15^h42^m50^s.7$	$+52^\circ21'39''$	83	49	10.30
HD 142070		$15^h52^m35^s.0$	$-01^\circ01'51''$	8	38	3.07
HD 142884		$15^h57^m48^s.8$	$-23^\circ31'38''$	349	22	
HD 143699	Sco-Cen	$16^h03^m24^s.2$	$-38^\circ36'09''$	339	10	6.19
HD 143807	Pleiades group	$16^h01^m26^s.5$	$+29^\circ51'03''$	48	48	9.29
HD 144897		$16^h09^m51^s.2$	$-41^\circ09'28''$	338	8	4.77
HD 148330		$16^h24^m25^s.3$	$+55^\circ12'18''$	84	43	8.90
HD 148898		$16^h32^m08^s.2$	$-21^\circ27'58''$	356	18	18.66
HD 150562		$16^h44^m11^s.4$	$-48^\circ39'18''$	337	-2	
HD 151525	Sco–Cen	$16^h47^m46^s.4$	$+05^\circ14'48''$	23	30	7.09

Table 6: *Equatorial and galactic coordinates of poorly studied magnetic CP stars (continued)*

HD	Membership	α_{2000}	δ_{2000}	l	b	π (mas)
HD 318107	NGC 6405	$17^h39^m41^s.2$	$-32°17'57''$	356	-1	
HD 164429		$17^h58^m52^s.3$	$+45°28'35''$	72	28	6.99
HD 165474		$18^h05^m43^s.7$	$+12°00'13''$	39	16	7.63
HD 166473		$18^h12^m25^s.8$	$-37°45'09''$	355	-9	
HD 171586	IC 4756	$18^h35^m36^s.4$	$+04°56'09''$	36	6	9.74
HD 177517		$19^h05^m41^s.2$	$-15°39'37''$	20	-10	3.75
HD 177765		$19^h07^m09^s.8$	$-26°19'55''$	11	-15	
HD 179761		$19^h13^m42^s.7$	$+02°17'37''$	38	-4	5.09
HD 184905		$19^h34^m43^s.9$	$+43°56'45''$	77	11	6.06
HD 190073		$20^h03^m02^s.5$	$+05°44'17''$	47	-13	0.20
HD 191742		$20^h09^m46^s.9$	$+42°32'29''$	79	5	2.81
HD 192913		$20^h16^m27^s.1$	$+27°46'33''$	67	-4	2.31
HD 335238		$20^h50^m43^s.6$	$+29°48'12''$	73	-9	1.42
HD 200177		$21^h00^m06^s.6$	$+48°40'46''$	89	2	7.18
HD 203006		$21^h20^m45^s.6$	$-40°48'34''$	1	-45	17.49
HD 208095		$21^h52^m01^s.6$	$+55°47'48''$	100	1	5.07
HD 208217		$21^h56^m56^s.6$	$-61°50'46''$	330	-45	6.83
HD 209515	UMa stream	$22^h02^m56^s.6$	$+44°38'59''$	94	-9	6.16
HD 213918		$22^h34^m07^s.3$	$+39°20'08''$	96	-16	
HD 215038		$22^h39^m22^s.8$	$+75°39'27''$	115	15	3.77
HD 216018		$22^h49^m26^s.5$	$-11°20'56''$	59	-57	9.13
HD 216533		$22^h52^m41^s.9$	$+58°48'22''$	43	-62	4.14
HD 220825	Pleiades group	$23^h26^m55^s.9$	$+01°15'20''$	84	-55	20.12
HD 221006		$23^h29^m01^s.0$	$-63°06'39''$	318	-52	!
HD 221394		$23^h31^m43^s.0$	$+28°24'11''$	102	-31	6.78
HD 221568		$23^h32^m47^s.5$	$+57°54'20''$	113	-3	4.10
HD 223640		$23^h51^m21^s.9$	$-18°54'32''$	61	-74	10.16
HD 224801		$00^h00^m43^s.7$	$+45°15'12''$	114	-17	4.81

Table 7: *Distances and proper motions of reversive magnetic CP stars*

HD	d (pc)	z	μ_α	μ_δ	v_r	v_{calc}
HD 3980	66	3	+90.16	+57.28	+9.8	34.8
HD 4778	93	4	+60.72	+6.93	+1.6	
HD 5737	171	19	+22.44	+6.30	+10.3	21.5
HD 8441	205	30	−1.53	−9.17	+8.9	12.7
HD 12447	43 ?		+33.29	−0.42	+7.5	10.1
HD 12767	114	10	+12.56	+8.54	+18.5	
HD 18296	125		+3.02	−31.13	+7.7	20.1
HD 19832	119		+11.77	−18.34		
HD 22470	146	15	+33.35	−9.65		
HD 28843	140	15	+17.97	−16.69	+18.4	24.5
HD 32633	183	28	−10.23	−17.20	−19.8	26.3
HD 35298	249 ?		+6.22	−2.17		
HD 36629	1500 ?		+3.01	−1.69	+21.2	
HD 36668	452	98	−1.65	−1.80		
HD 37642	469	96	+2.42	−1.43		
HD 37776	603	173	+3.11	+2.09	+27.0	29.0
HD 40312	53	2	+42.09	−73.61		
HD 49333	198	22	−15.17	+6.24	+19.0	24.4
HD 49976	106	9	−8.95	+2.98	+22.4	22.9
HD 54118	88	4	−10.66	−4.71	+29.5	29.9
HD 62140	84	5	−36.98	−61.01	+1.9	28.5
HD 64740	238	30	−8.44	+14.65		
HD 65339	99 ?		−33.56	−22.24	−2.2	19.0
HD 71866	155	19	−24.44	−24.82		
HD 72968	84		−21.98	+16.14	+24.0	26.3
HD 78316	167	21	−20.36	−9.96	+24.2	30.1
HD 79158	162	15	−28.41	−36.23		
HD 83368	72 ?		−8.02	−7.70		
HD 90044	112	9	−50.51	+4.24		
HD 90569	122	12	+7.85	−6.27	−8.0	9.9
HD 98088	132	13	−7.15	+7.68	−8.1	10.4
HD 112185	25 ?		+111.74	−8.99	−9.3	16.2
HD 112413	34	1	−233.43	+54.98	−3.3	38.8
HD 115708	151	22	+4.19	+14.02	+5.3	11.7
HD 122532	170 ?		−33.79	−16.51	+4.0	30.5
HD 124224	83	6	−44.67	−26.10		
HD 125248	93		−65.60	−35.37	−9.3	34.1
HD 125823	127	11	−24.32	−21.81		
HD 126515	142	18	−32.80	−29.20	−3.0	29.7
HD 137509	51	33	−16.39	−16.09		
HD 137909	35	1	−181.39	+86.84	−18.7	38.2
HD 148199	151 ?		−15.48	−13.27	−22.0	26.4
HD 153882	170	20	+5.82	−1.13	−32.4	32.7
HD 170000	89	4	−5.91	+35.79	−16.0	22.1
HD 170397	89		+21.87	+15.08	−15.8	19.3
HD 173650	215 ?		+5.87	+1.70	−16.9	18.0
HD 175362	135	14	+8.79	−23.68	+1.3	
HD 176232	76	4	+0.94	−51.42	+14.5	23.5
HD 183339	385 ?		−2.00	+5.01		
HD 187474	108		+19.12	−12.05	−1.9	11.7
HD 200311	325	57	+6.91	+2.40		

Table 8: *Distances and proper motions of non-reversive magnetic CP stars*

HD	d (pc)	z	μ_α	μ_δ	v_r	v_{calc}
HD 2453	156	18	−26.66	−19.52	−18.0	30.3
HD 9996	149		−16.21	+0.59	−0.6	11.4
HD 10783	179	20	+5.22	−2.43	+19.0	19.6
HD 11187	253	40	+7.59	−10.00	+5.0	15.8
HD 11503	62	3	+79.43	−99.10	−0.6	37.3
HD 12288	253	40	+8.24	−1.70		
HD 14437	210	34	+6.27	−13.07		
HD 15144	67	4	−44.31	−54.13	−8.0	23.6
HD 22316	171 ?		+26.90	−34.89	−0.6	35.7
HD 22920	212	28	+0.14	−3.64	+15.7	16.1
HD 24155	147	18	+20.62	+22.18	+16.3	26.7
HD 24712	62	49	−76.94	−22.14	+22.4	32.4
HD 25267	102		+11.41	+17.08	+24.0	26.0
HD 25354	174	28	−9.47	+0.34	−10.2	12.9
HD 25823	152 ?		+22.13	−50.18	−2.0	39.5
HD 27309	98	7	+29.77	−41.39	+12.4	26.7
HD 30466	167	20	+8.53	−33.05	+67.3	72.5
HD 34452	144		+13.62	+29.63	+28.6	36.2
HD 35456	370	67	−4.98	−1.29		
HD 35502	408 ?		+4.73	−0.13		
HD 36429	363	79	+2.33	−0.34		
HD 36540	503	112	+2.66	−0.15		
HD 37017	692	231	+2.12	+0.94	+29.0	30.0
HD 42616	194	32	−4.79	−7.56	+0.8	8.3
HD 50169	443	118	−4.81	−0.15		
HD 51418	188 ?		−2.93	−10.61	−22.5	24.5
HD 55719	134	8	−18.35	−12.36	−7.0	15.7
HD 58260	891	214	−3.35	+8.12	+36.0	51.7
HD 64486	102	5	−2.79	−3.26	+2.7	3.4
HD 73340	143 ?		−13.69	+10.46	+23.1	25.9
HD 74521	131		−13.55	−17.39	+24.4	28.0
HD 81009	146	16	−28.31	−14.74		
HD 92664	146	11	−17.45	+12.86	+29.7	33.3
HD 94660	535 ?		−10.99	+4.71		
HD 96446	653	153	−10.99	+4.71	+6.5	37.6
HD 96707	109 ?		−87.45	−27.39	+4.7	47.6
HD 108662	85	6	−20.21	−15.00	−2.4	10.4
HD 109026	99	5	−50.59	−5.16	+2.5	24.0
HD 111133	160 ?		+29.95	−55.54	+16.2	50.5
HD 112381	112	11	−33.73	−15.29		
HD 116458	146		−55.50	+1.05		
HD 118022	56 ?		+43.89	−24.03	−11.9	17.8
HD 119213	90	5	−50.00	+26.54	−0.2	24.1
HD 119419	119	10	−29.15	−19.87	+9.4	22.0
HD 130559	75	7	−65.89	−14.79	−4.1	24.3
HD 133029	146 ?		−8.22	+15.49	−11.2	16.5
HD 133652	107	11	−23.00	−28.66		
HD 133880	126 ?		−28.59	−30.38	+2.8	25.1
HD 137193	282	49	−15.39	−11.21		

Table 8: *Distances and proper motions of non-reversive magnetic CP stars (continued)*

HD	d (pc)	z	μ_α	μ_δ	v_r	v_{calc}
HD 137949	92	7	−67.68	+6.75	−31.1	43.0
HD 142301	143	18	−12.29	−25.45	−8.7	21.0
HD 142990	150 ?		−11.41	−24.06	−11.1	21.9
HD 143473	152	21	−11.50	−23.93		
HD 144334	146	15	−10.98	−29.18	−6.6	22.5
HD 144661	118 ?		−9.52	−23.92	−4.6	15.1
HD 145501	134 ?		−9.70	−25.50	+2.4	17.5
HD 146001	148	15	−9.79	−22.09	−8.0	18.7
HD 147010	157	20	−13.07	−25.51	−9.0	23.1
HD 148112	71	5	+39.39	−59.89		
HD 149911	127	16	−7.45	−9.23		
HD 151965	195	28	−9.27	−19.90		
HD 152107	54	2	+22.78	−51.37	−1.0	14.4
HD 164258	121		−20.25	−2.08	−34.3	36.2
HD 168733	190 ?		−1.69	−25.97	−11.8	26.6
HD 170973	366 ?		+9.22	+3.24	−8.3	18.8
HD 174933	140 ?		−7.25	−10.12	−19.8	21.5
HD 184927	523	96	+4.81	+2.42	−16.0	20.8
HD 188041	85 ?		+21.64	+13.62	−18.8	21.4
HD 192678	230 ?		−29.54	−23.52		
HD 196178	155	16	+9.66	+1.82	−21.7	22.9
HD 196502	128 ?		+6.36	−16.47	+9.2	14.1
HD 201601	35	1	+49.07	−151.85	−17.0	31.4
HD 205087	185 ?		+28.41	+3.66	−10.8	27.3
HD 215441	475	82	+4.96	−0.98		
HD 217833	222 ?		+17.29	+3.45	−12.6	22.4

Table 9: *Distances and proper motions of poorly studied magnetic CP stars*

HD	d (pc)	z	μ_α	μ_δ	v_r	v_{calc}
HD 965	286	53	+25.02	−11.05		
HD 6532	225 ?		−33.37	−17.39	−0.3	
HD 8855	475	107	+3.01	−5.68		
HD 15089	44	1	−27.92	+37.04	+1.2	9.7
HD 18078	387	70	−1.08	+3.34		
HD 19918	262 ?		−26.24	−17.14		
HD 21590	213	31	+23.87	−16.28	+2.4	29.3
HD 21699	172	17	+22.84	−23.78	+0.5	26.9
HD 29578	274	39	+22.61	+32.30		
HD 33904	57 ?				+27.0	
HD 36916	298	49	−5.56	−0.32		
HD 49606	53	2	+42.09	−73.61		
HD 59435	419	77	−10.72	+2.23		
HD 61468	670	192	−5.21	+5.91		
HD 63843	880	251	−2.14	+2.60		
HD 66522	524 ?		−6.51	+5.39		
HD 68351	267 ?		−10.39	−20.48	+19.7	35.1
HD 75445	117	9	−33.43	+48.95		
HD 86592	189	29	−46.96	+12.61		
HD 89822	92 ?		−8.93	−20.83	−0.1	
HD 93507	362	60	−10.42	−2.82		
HD 101065	125 ?		−47.30	+33.93	+10.2	

Table 9: *Distances and proper motions of poorly studied magnetic CP stars (continued)*

HD	d (pc)	z	μ_α	μ_δ	v_r	v_{calc}
HD 103192	111	10	−58.02	+2.40		
HD 103498	310 ?		+11.21	+0.27	−7.0	17.9
HD 108651	79 ?		−18.5	−15.76	+1.7	
HD 108945	95 ?		−12.02	−8.94	+1.0	6.8
HD 110066	85 ?		−19.31	−2.63	−14.8	
HD 116114	147	18	−46.29	−13.63		
HD 120198	86 ?		−19.19	−4.51	−1.8	8.2
HD 128898	16	0	−192.64	−234.07	+7.2	24.1
HD 134214	96	8	−46.15	+13.25		
HD 134793	250	44	+18.14	−5.69	+0.5	22.5
HD 135297	383	48	−14.15	−1.06	−31.5	40.7
HD 137389	141 ?		−9.30	−38.47	−23.5	35.4
HD 140160	178 ?		−10.15	−20.60	+1.9	19.4
HD 140728	97 ?		−66.30	+29.68	−16.1	37.1
HD 142070	227	32 ?	−16.02	−26.03		
HD 142884	122 ?		−8.32	−16.23	−12.0	
HD 143699	152	14	−17.68	−28.54	−1.6	24.2
HD 143807	108		−38.20	−6.90	−20.3	28.4
HD 144897	210		−3.37	−11.92		
HD 148330	112 ?		+11.87	+20.67		
HD 148898	54	2	+20.21	+36.23	+2.5	10.9
HD 151525	127	12	−21.75	−38.74		
HD 164429	142 ?		+0.40	+26.98	−19.0	26.3
HD 165474	146	24	−2.48	−2.83	+13.0	13.2
HD 171586	103	9	+30.70	−29.84	−10.9	23.6
HD 177517	267 ?		+0.74	−10.36		
HD 179761	196 ?		+5.78	−2.58	−5.4	8.0
HD 184905	165 ?		+19.62	−0.89	−9.6	
HD 191742	310	46	+8.84	−1.47	−3.2	13.5
HD 192913	338	54	+9.05	+2.27	−6.0	
HD 335238	576	155	+0.68	−3.06		
HD 200177	148	13	+11.38	−5.66	−40.2	41.1
HD 203006	58	3	+76.18	+17.66	+2.3	21.6
HD 208095	196 ?		+18.90	−0.53	−6.5	18.7
HD 208217	151	18	+23.46	−39.24	+10.3	34.3
HD 209515	155	15	−21.46	−32.32	−1.2	28.5
HD 213918	?					
HD 215038	330	57	+7.97	+0.67		
HD 216018	121	14	+39.12	+8.65		
HD 216533	233	33	+26.47	+4.68	−1.7	29.7
HD 220825	50	2	+85.60	−94.43		
HD 221006	119	7	!	!		
HD 221394	147 ?		−29.93	−13.78	−6.2	
HD 221568	239	31	+23.27	−0.05		
HD 223640	98 ?		+26.60	−3.56	+12.7	17.8
HD 224801	208		+17.38	+0.22	−0.7	17.1

Table 10: *Spatial distribution of reversive magnetic CP stars*

HD	l	b	d (pc)	z	pec	T_e	M_v
direction 1 (along Orion spiral arm: l = 30–90° and l = 210–270°)							
HD 5737	268	−87	171	19	He–wk	13700	−2.0
HD 12767	225	−74	113	10	Si	9200	−0.6
HD 49333	231	−10	198	22	He–wk	17000	−0.5
HD 49976	220	−4	106	9	SrCr	9700	+1.1
HD 64740	263	−11	238	30	He–r	24000	−2.5
HD 72968	233	19	84		SrCr	9700	+1.1
HD 90044	248	43	112	9	SiCrSr	10400	+0.6
HD 90569	233	52	122	12	SiCrEu	9500	
HD 98088	266	49	132	13	SrCr	8700	
HD 137909	46	56	35	1	SrCrEu	7900	+1.1
HD 153882	35	31	170	20	Cr	8800	+0.1
HD 173650	359	−17	215 ?		SiCrSr	9350	
HD 176232	46	5	76	4	SrCr	7750	
HD 183339	89	18	389 ?		He–wk	14500	
HD 200311	85	−2	325	57	SiCrHg		
direction 2 (perpendicular to Orion arm: l = 120–180° and l = 300–360°)							
HD 4778	123	−18	93	4	SrCrEu	9600	+1.2
HD 8441	129	−19	205	30	SrCrEu	9000	−0.1
HD 12447	155	−56	43		Cr	9200	
HD 18296	152	−24	125		SiSrCrEu	10600	−0.5
HD 19832	158	−26	119		Si	12600	+0.3
HD 32633	171	−4	183	28	SiCr	12600	+0.4
HD 40312	174	7	53	2	Si	10000	−1.0
HD 54118	174	19	88	4	Si	9800	+0.3
HD 62140	154	30	84	5	SrCr	8150	
HD 65339	157	32	99 ?		SrCrEu	8500	+1.1
HD 79158	178	44	162	15	He–wk	13000	
HD 112185	122	61	25 ?		Cr	8900	
HD 122532	317	19	170 ?		Si	10000	
HD 124224	344	59	83	6	Si	11800	+0.3
HD 125248	330	40	93		CrEu	9300	
HD 125823	322	20	127	11	He–wk	20000	−1.4
HD 126515	348	55	142	18	CrSr	9300	+1.1
HD 137509	315	12	51	33	Si+	14000	−0.5
HD 148199	349	13	151 ?		SiSrCr		
HD 175362	359	−17	135	14	He–wk	18000	−0.5
HD 187474	0	−28	108		CrEu	10300	

Table 11: *Spatial distribution of non-reversive magnetic CP stars*

HD	l	b	d (pc)	z	pec	T_e	M_v
direction 1 (along Orion spiral arm: l = 30–90° and l = 210–270°)							
HD 25267	220	−48	102		Si	11800	−0.3
HD 50169	214	−1	443	118	SrCr	9200	+0.5
HD 55719	252	−14	134	8	SrEu	9200	+0.3
HD 58260	249	−10	891	214	He–r		−3.3
HD 73340	268	−16	143 ?		Si		
HD 74521	217	30	131		SiCr	10600	
HD 81009	242	27	146	16	CrEuSr	8000	+1.2
HD 108662	225	85	85	6	SrCr	10000	+0.9
HD 133029	80	58	146 ?		SiCr	11000	
HD 152107	72	40	54	2	SrCr	8800	+1.1
HD 170973	34	6	366 ?		SrSiCr	9500	
HD 174933	52	9	140 ?		Hg	12500	
HD 184927	65	5	523	96	He–r	22500	−1.4
HD 188041	37	−15	85 ?		SrCrEu	8700	
HD 192678	89	10	230 ?		Cr	9000	
HD 196178	85	4	155	16	Si	13400	
HD 201601	60	−25	35	1	SrCrEu	7600	+2.3
HD 205087	75	−20	185 ?		SiSrCrEu	10800	
direction 2 (perpendicular to Orion arm: l = 120–180° and l = 300–360°)							
HD 9996	132	−17	149		CrEu	9700	+0.7
HD 10783	145	−52	179	20	SrCr	10000	+0.2
HD 11187	132	−7	253	40	SiCr	9900	−0.3
HD 11503	143	−41	62	3	SiCr	9900	−0.1
HD 12288	129	8	253	40	CrSi	8300	+0.5
HD 14437	140	−17	210	34	SrCrEu	10700	+0.4
HD 22316	144	1	171 ?		CrHgSi		
HD 24155	176	−31	147	18	Si	13800	+0.4
HD 25354	159	−11	174	28	SrCrEu	8900	+1.4
HD 25823	167	−18	151 ?		Si	12900	−0.7
HD 27309	174	−20	98	7	Si	12300	+0.2
HD 30466	172	−10	167	20	SiCr	10800	+0.1
HD 34452	173	−2	144		Si	15700	−0.4
HD 42616	172	11	194	32	SrCrEu	9000	+0.6
HD 51418	174	19	188 ?		SrCrEu	9500	
HD 64486	134	30	102	5	Si		+0.3
HD 94660	304	8	535 ?		Si	10800	
HD 96707	137	47	109 ?		Sr	8000	
HD 109026	301	−9	99	5	He–wk	16000	−1.4
HD 111133	300	69	160 ?		SrCrEu	9500	
HD 112381	304	8	112	11	Si		+1.8
HD 116458	306	−8	146		SrEu	10000	
HD 118022	328	64	56 ?		SrCr	9500	
HD 119419	311	11	119	10	Si+		+0.9
HD 130559	341	40	75	7	SrCrEu	10000	+1.2
HD 133652	334	24	107	11	SiCr	12700	+1.4
HD 133880	329	15	329	15	Si		

Table 11: *Spatial distribution of non-reversive magnetic CP stars (continued)*

HD	l	b	d (pc)	z	pec	T_e	M_v
direction 1 (along Orion spiral arm: l = 30–90° and l = 210–270°)							
HD 137193	333	14	282	49	Si		−0.4
HD 137949	348	31	92	7	SrCrEu	7500	+1.7
HD 142301	347	22	143	18	He–wk	17000	−0.5
HD 142990	348	21	150 ?		He–wk	18500	
HD 143473	340	11	152	21	Si		+1.2
HD 144334	350	21	146	15	He–wk	16000	−0.5
HD 144661	350	20	118 ?		He–wk	15700	
HD 145501	355	23	134 ?		He–wk	15000	
HD 146001	350	18	148	15	He–wk	13700	−0.4
HD 147010	355	21	157	20	He–wk	13000	+0.7
HD 151965	344	2	195	28	Si		−0.5
HD 168733	357	−11	190 ?		He–wk	14300	