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PROPER MOTIONS IN THE SOUTHERN ESO AREAS 207, 439, AND 440[1]

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ABSTRACT

Proper motion stars have been identified from red IIIaF ESO Schmidt plates. This catalogue includes stars found in ESO Areas 207, 439, and 440 having $\mu \geqslant 0.1''$/yr. Finding charts for stars with $\mu \geqslant 0.25''$/yr are provided.

1. INTRODUCTION

In recent years, the interest in studying intrinsically faint stars like cool white dwarfs, subdwarfs, late red dwarfs, and brown dwarfs has grown considerably. This has been motivated by the many important astrophysical problems that can be addressed studying these objects, like the local dark matter, the age of the Galactic Disk, later stages of stellar evolution, cooling theories, and the Initial Mass Function just to mention a few. The operation of large telescopes equipped with modern detectors which allow, for the first time, the acquisition of good S/N data of these extremely faint objects, is also a factor that motivates research in this field.

The technique of obtaining stellar distances from astrometric parallaxes is still restricted in its use to objects previously selected as interesting, therefore it is not an efficient tool to identify nearby faint stars. Most of the known low luminosity stars have been found by proper motion surveys, which have proven to be the source of many interesting discoveries. The extensive works by Giclas *et al.* (1971), Gliese (1969), and Luyten (1976) have produced most of the known low luminosity stars.

In an attempt to identify low luminosity stars in the, relatively less explored, southern hemisphere, we conducted a search for proper motion stars in three ESO areas: Area 207, Area 439, and Area 440. Several publications have resulted from the statistical analysis of proper motions in these areas (Mendez & Ruiz 1992; Mendez *et al.* 1992) and from the study of individual objects (Ruiz *et al.* 1989; Ruiz & Maza 1988a,b, 1990; Ruiz *et al.* 1991). In this work we present the proper motion catalogue for the three ESO areas including objects with proper motions down to 0.10 ″/yr. Finding charts are provided for objects with $\mu \geqslant 0.25''$/yr.

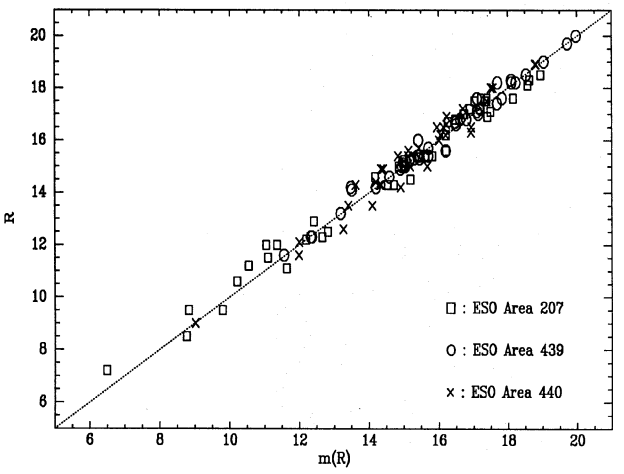

FIG. 1. Relation between magnitudes estimated by eye from *R* ESO plates and those obtained with a CCD and an *R* (Cousins) filter for the same stars.

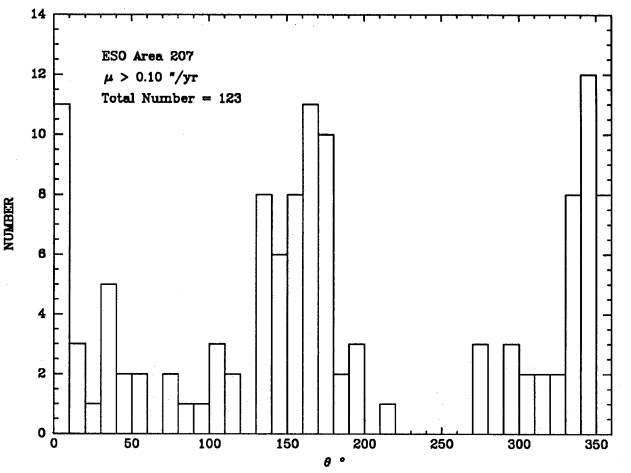

FIG. 2. Distribution of position angles of proper motions in ESO Area 207.

[1]This work was based on data obtained at La Silla (ESO).
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TABLE 1. Plate material.

ESO Area	Epoch yr	Exp. Time hr	Emulsion & Filters	Seeing "	Comments
207	1981.1	2	IIIaF + RG630	~2	glass copy
207	1989.0	"	"	"	original plate
439	1979.3	"	"	"	glass copy
439	1986.1	"	"	"	glass copy
440	1979.2	"	"	"	glass copy
440	1988.4	"	"	"	original plate

2. PLATE MATERIAL

Positions and proper motions were measured from red (IIaF) plates taken with the ESO Schmidt Camera at La Silla. Some of the plates are original and some are glass copies made for this project by the ESO photographic laboratory in Garching. The plate scale is 67.5"/mm and their magnitude limit is $m_R \sim 20.5$. Table 1 gives a summary of the plate material used in this work.

TABLE 2. ESO area 207.[a]

N	Star Number in Area	Other names	RA (1950) h	m	s	Dec (1950) °	′	″	m_R	μ ″ yr^{-1}	θ °
1	160	LTT2768	7	11	42.66	-52	15	3.3	11.1	0.93	349
2	78	LTT2762	7	10	12.21	-49	20	31.5	7.5	0.78	358
3	98		6	53	1.99	-49	52	55.2	14.3	0.67	170
4	124		7	4	40.07	-50	48	21.8	17.0	0.58	18
5	32		7	1	23.72	-48	14	1.0	14.1	0.49	339
6	120		6	56	54.15	-50	44	36.0	16.7	0.42	41
7	61		7	6	33.18	-48	56	4.0	18.3	0.41	358
8	8		6	57	47.76	-47	42	45.0	17.6	0.37	346
9	70		6	53	44.72	-49	12	55.6	14.5	0.36	133
10	21		6	51	48.39	-47	58	11.1	18.5	0.35	328
11	139	LTT2775	7	12	46.94	-51	22	56.6	9.5	0.34	356
12	125		7	12	14.42	-50	52	18.7	15.0	0.34	153
13	171	LTT2702	6	56	36.48	-52	34	43.1	7.2	0.33	169
14	87	LTT2759	7	9	46.40	-49	33	59.8	11.5	0.31	159
15	170		6	52	42.45	-52	29	46.6	14.1	0.30	32
16	97		6	46	53.88	-49	51	57.2	17.5	0.30	342
17	58		6	49	31.55	-48	52	20.9	17.6	0.27	144
18	149		7	4	59.74	-51	55	28.8	18.1	0.27	166
19	43		6	51	9.08	-48	39	36.4	17.0	0.24	154
20	57		7	3	4.05	-48	55	36.7	17.2	0.24	148
21	138		6	55	0.97	-51	25	28.8	12.9	0.24	11
22	126		7	8	12.63	-50	52	33.1	17.5	0.23	345
23	134		7	14	34.35	-51	3	19.5	16.5	0.23	4
24	132		7	5	35.43	-51	4	2.8	14.1	0.22	334
25	107		6	45	38.60	-50	9	34.5	14.3	0.21	161
26	148		7	1	48.80	-51	58	23.8	16.8	0.21	174
27	52		6	50	5.79	-48	44	45.1	17.6	0.21	359
28	108		6	50	6.67	-50	13	4.6	16.9	0.21	337
29	4	LTT2738	7	4	50.40	-47	30	30.4	9.5	0.21	157
30	166		7	7	27.13	-52	29	26.1	14.5	0.20	345
31	23a		6	53	6.21	-47	58	11.6	15.0	0.20	299
32	76		6	54	31.44	-49	15	7.5	14.4	0.20	336
33	128		6	48	29.21	-50	59	41.4	12.6	0.20	273
34	29		6	51	18.71	-48	13	18.9	14.5	0.19	341
35	6		6	56	33.16	-47	27	24.8	17.3	0.19	75
36	33		7	3	32.13	-48	16	29.0	14.5	0.19	13
37	156		7	0	37.03	-52	5	15.7	14.2	0.19	358
38	80		6	50	48.97	-49	20	32.3	17.0	0.19	347
39	167		7	6	24.69	-52	27	33.5	16.3	0.19	88
40	116		6	49	27.12	-50	29	51.1	13.9	0.18	137

[a]Table 2 is presented in its complete form in the ApJ/AJ CD-ROM Series, volume 1, 1993. The first page of this table is presented here for guidance regarding its form and content.

TABLE 3. ESO area 439.[a]

N	Star Number in Area	Other names	RA (1950) h	m	s	Dec (1950) °	′	″	m_R	μ ″ yr^{-1}	θ °
1	246	LTT4280	11	32	1.45	-32	33	26.6	6.5	1.09	324
2	237	LHS2429	11	32	58.04	-32	15	35.5	8.5	0.78	186
3	202		11	20	15.84	-31	49	2.5	15.2	0.64	169
4	131		11	36	6.07	-30	24	50.3	19.7	0.45	117
5	3		11	21	6.06	-27	55	26.5	13.2	0.44	202
6	162		11	27	24.07	-31	6	18.7	18.2	0.38	306
7	163		11	27	25.79	-31	6	14.6	19.0	0.38	306
8	224		11	29	30.19	-32	11	38.0	18.5	0.38	260
9	119	LTT4244	11	27	38.88	-30	26	10.8	12.3	0.36	259
10	26		11	36	33.40	-28	35	39.8	20.0	0.34	267
11	52	LTT4332	11	38	38.28	-28	55	11.4	7.3	0.34	321
12	54		11	42	14.51	-29	1	26.2	9.8	0.34	274
13	80		11	24	40.79	-29	23	35.3	15.0	0.34	148
14	178	LTT4242	11	27	6.80	-31	16	55.1	9.5	0.32	254
15	128		11	39	55.63	-30	27	43.0	15.4	0.32	246
16	129		11	38	34.32	-30	30	6.3	17.1	0.32	216
17	134	LTT4250	11	28	34.64	-30	33	44.2	11.4	0.31	271
18	248		11	23	36.93	-32	36	56.1	11.6	0.29	138
19	24	LTT4304	11	35	10.83	-28	34	26.5	8.5	0.28	260
20	35		11	42	4.50	-28	48	39.1	17.2	0.27	236
21	20		11	36	20.76	-28	25	55.2	16.9	0.26	305
22	171		11	21	55.02	-31	9	11.8	16.8	0.25	259
23	148		11	35	30.16	-30	53	10.2	14.3	0.25	182
24	96b		11	32	52.96	-29	52	42.6	14.6	0.24	213
25	205		11	24	29.66	-31	58	35.4	15.4	0.23	139
26	11		11	33	1.28	-28	9	34.6	15.5	0.23	253
27	106		11	42	2.99	-30	14	15.7	16.8	0.23	141
28	71		11	19	19.51	-29	19	8.8	15.7	0.21	253
29	70		11	19	17.86	-29	19	3.0	14.2	0.21	253
30	25		11	40	20.19	-28	35	38.2	14.2	0.22	291
31	222		11	40	53.87	-32	7	54.5	13.5	0.21	272
32	28b		11	21	28.02	-28	34	33.4	15.0	0.20	158
33	185		11	20	22.97	-31	24	7.9	14.9	0.20	198
34	8		11	37	34.28	-28	15	2.1	16.0	0.20	296
35	73		11	38	25.59	-29	18	12.4	16.0	0.20	150
36	111		11	29	57.09	-30	17	35.2	12.3	0.20	151
37	64	LTT4321	11	37	42.21	-29	12	0.6	11.3	0.20	207
38	22		11	27	38.52	-28	26	35.1	18.2	0.20	138
39	42		11	26	14.74	-28	52	32.1	15.2	0.19	213
40	84		11	35	35.94	-29	30	22.1	17.1	0.19	195

[a]Table 3 is presented in its complete form in the ApJ/AJ CD-ROM Series, volume 1, 1993. The first page of this table is presented here for guidance regarding its form and content.

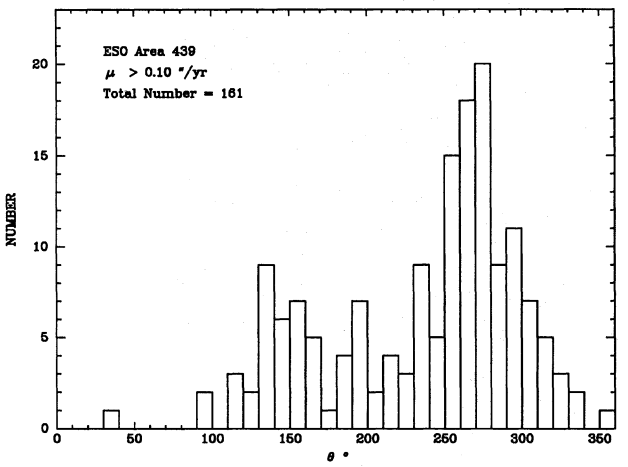

FIG. 3. Same as Fig. 1 but for ESO Area 439.

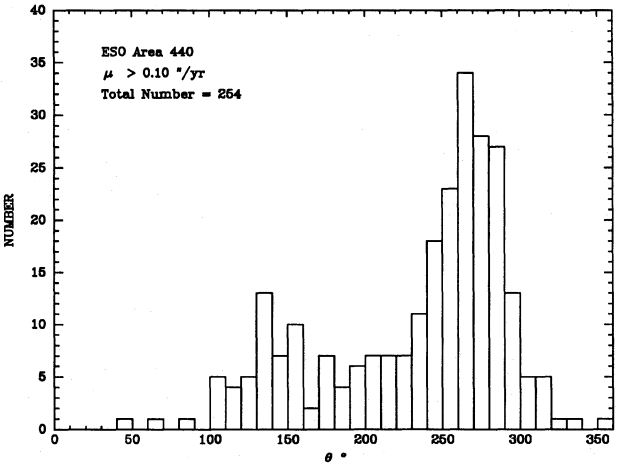

FIG. 4. Same as Fig. 1 but for ESO Area 440.

TABLE 4. ESO area 440.[a]

N	Star Number in Area	Other names	RA (1950) h	m	s	Dec (1950) °	′	″	m_R	μ ″ yr^{-1}	θ °
1	375	LHS317	11	50	41.10	-31	7	13.9	12.4	1.11	264
2	64		11	46	19.39	-28	16	39.6	15.0	0.71	260
3	419	LHS2489	11	57	7.10	-31	30	36.8	16.0	0.59	257
4	78	LTT4511	12	2	38.76	-28	26	14.9	7.4	0.47	151
5	87		11	45	19.36	-28	33	0.7	14.1	0.43	239
6	152	LTT4452	11	55	34.68	-29	14	28.1	13.5	0.42	107
7	153	LTT4451	11	55	34.84	-29	14	37.5	12.4	0.42	108
8	380		11	57	55.20	-31	14	11.9	15.0	0.41	174
9	256	LTT4379	11	44	44.71	-30	0	28.3	6.9	0.35	230
10	155		11	57	18.88	-29	14	26.2	14.2	0.33	150
11	220		11	59	55.77	-29	52	1.8	13.5	0.33	267
12	431	LTT4492	12	0	4.48	-31	42	22.9	12.3	0.32	261
13	139		12	0	54.21	-29	6	17.6	13.5	0.31	316
14	186		11	46	49.13	-29	31	25.8	18.0	0.31	159
15	305	LTT4402	11	49	9.45	-30	33	19.6	6.0	0.30	177
16	101		11	56	45.34	-28	42	3.6	14.9	0.29	280
17	416		11	53	56.88	-31	28	45.7	16.5	0.28	269
18	146		11	46	32.50	-29	5	11.6	17.5	0.28	47
19	185	LTT4351	11	41	26.12	-29	28	13.3	7.5	0.27	259
20	273		11	46	56.28	-30	8	41.1	14.1	0.27	288
21	229		11	44	11.38	-29	48	57.6	15.0	0.26	133
22	302		11	51	50.45	-30	33	14.3	13.5	0.26	248
23	123	LTT4359	11	42	14.68	-29	1	26.0	11.5	0.26	278
24	97		11	59	55.29	-28	40	40.7	18.1	0.25	209
25	435		11	43	26.45	-31	45	35.7	16.2	0.25	263
26	491		11	59	36.62	-32	28	33.7	18.9	0.25	281
27	25	LTT4462	11	56	29.79	-28	1	44.4	11.3	0.25	248
28	433		11	54	8.26	-31	41	6.8	18.0	0.25	276
29	121		11	42	4.82	-28	48	38.5	17.2	0.24	228
30	485		11	59	47.54	-32	20	17.0	15.7	0.24	253
31	150		11	48	49.72	-29	8	50.0	17.2	0.24	285
32	135		11	56	26.86	-28	58	13.3	17.5	0.23	260
33	378		12	2	42.48	-31	10	1.7	16.9	0.23	298
34	327		11	46	20.38	-30	46	40.1	11.0	0.23	278
35	288		11	43	31.26	-30	17	17.3	17.2	0.23	252
36	37		11	49	21.76	-28	7	49.4	18.3	0.23	208
37	493	440-55A	12	4	2.93	-31	20	28.1	18.9	0.22	280
38	492	440-55B	12	4	2.99	-31	20	22.2	18.9	0.22	280
39	171		11	41	59.49	-29	23	55.7	18.1	0.22	218
40	344		11	49	23.99	-30	52	57.5	15.8	0.22	255

[a]Table 4 is presented in its complete form in the ApJ/AJ CD-ROM Series, volume 1, 1993. The first page of this table is presented here for guidance regarding its form and content.

A detailed description of the method used in obtaining proper motions can be found in Mendez *et al.* 1992. In the present catalogue we have included stars with $\mu \geqslant 0.1''$/yr. The estimated errors in proper motions and position angles (θ) are about 0.04″/yr and 10°, respectively.

3. PROPER MOTIONS AND MAGNITUDES

Magnitudes have been visually estimated from plates, using for this purpose a magnitude scale constructed with stars in the ESO areas, for which we have CCD *R* magnitudes. In Fig. 1 we present the correlation between the estimated magnitudes m_R and the corresponding CCD *R* (Kron–Cousins) measured magnitudes for a group of stars (in the three areas) for which we have CCD photometry. Estimated magnitudes given in Tables 2, 3, and 4 should be better than ±0.5 mag.

Figures 2, 3, and 4, show the distribution of position angles of the proper motions in each ESO area. The estimated error in PA is about 10°.

Méndez *et al.* (1992), found that the present catalogue is statistically complete (in ESO Areas 439 and 440), down to $\mu \geqslant 0.1''$/yr. Comparing our catalogue with Luyten's *LHS Catalogue* (stars with $\mu \geqslant 0.5''$/yr) in the same areas, we recovered all of the stars in LHS catalogue (five stars), and discovered five new ones with $\mu \geqslant 0.5''$/yr. If we extend this comparison to $\mu \geqslant 0.2''$/yr using Luytens

LTT Catalogue (1957), we have that for stars with $6 < m_R < 21$, we recovered 100% of the LTT stars in ESO Area 440 and 60% of the LTT stars in Areas 207 and 439. This difference in the percentage of recovery reflects the longer time base used for the proper motions in Area 440. Some stars were not recovered due to their position in the plate (near an edge), and some were too bright (the image was severely saturated), but a few were unexplainably missed. However, the total number of stars in this catalogue, with $\mu \geqslant 0.2''$/yr, is 3 times larger than the number in the corresponding areas of the LTT catalogue.

Finding charts for stars with proper motions exceeding 0.25″/yr are given in Fig. 5 (Plates 111–114), they have been made from the ESO *R* plates. Each chart covers an area of $6' \times 6'$. North is up and East to the left.

We would like to thank Dr. R. West for providing us with glass copies of some ESO *R* plates, Dr. H. Schuster for taking new epoch plates with the Schmidt Camera at La Silla, and J. Garcia for help with the tables. This research received partial support from Grant No. 880-92 from FONDECYT.

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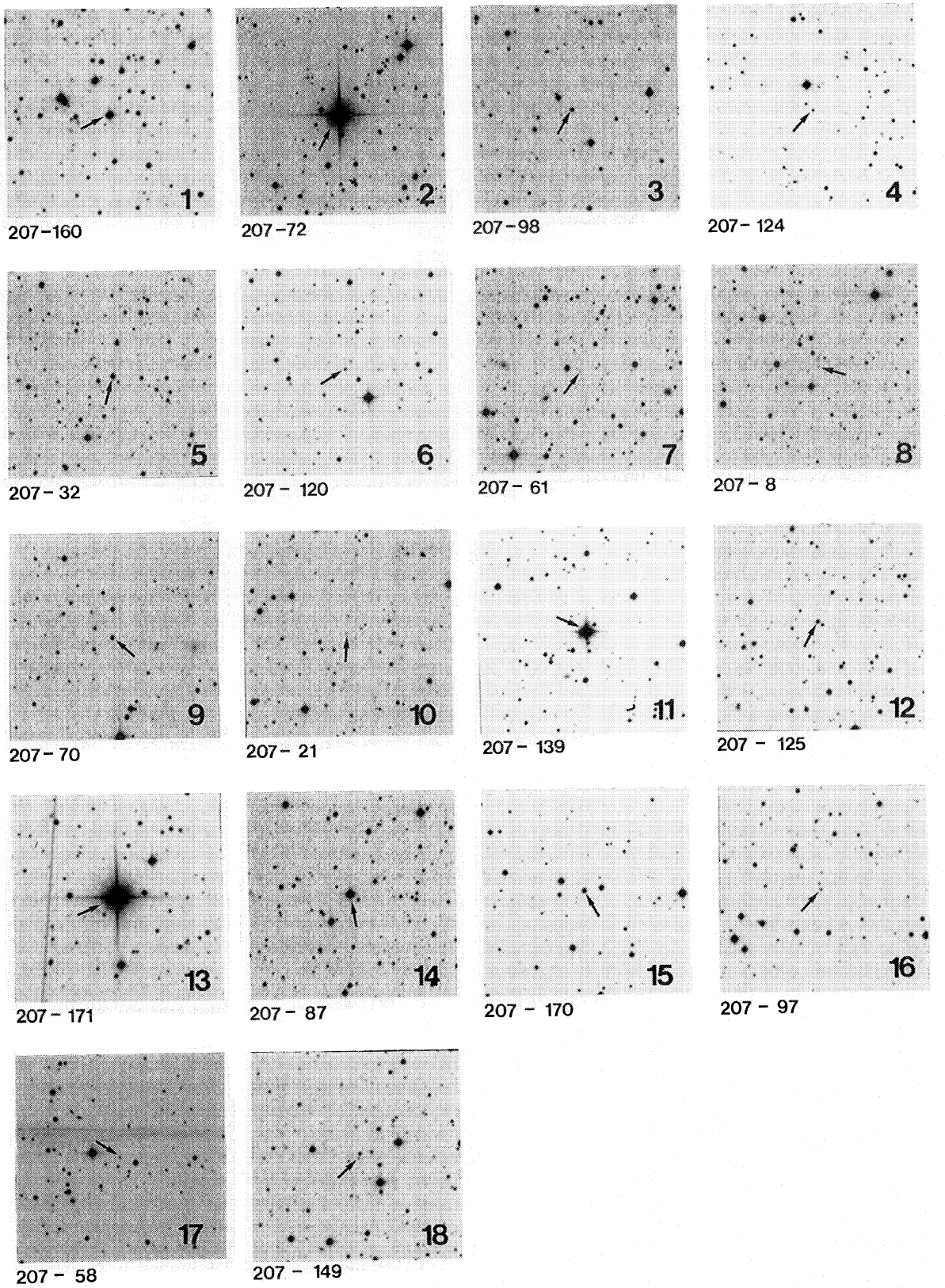

FIG. 5. Finding charts for stars with proper motions exceeding 0.25″/yr in ESO Areas 207, 439, and 440. The field is 6′×6′ in size, North is up and East to the left.

Ruiz *et al.* (see page 2579)

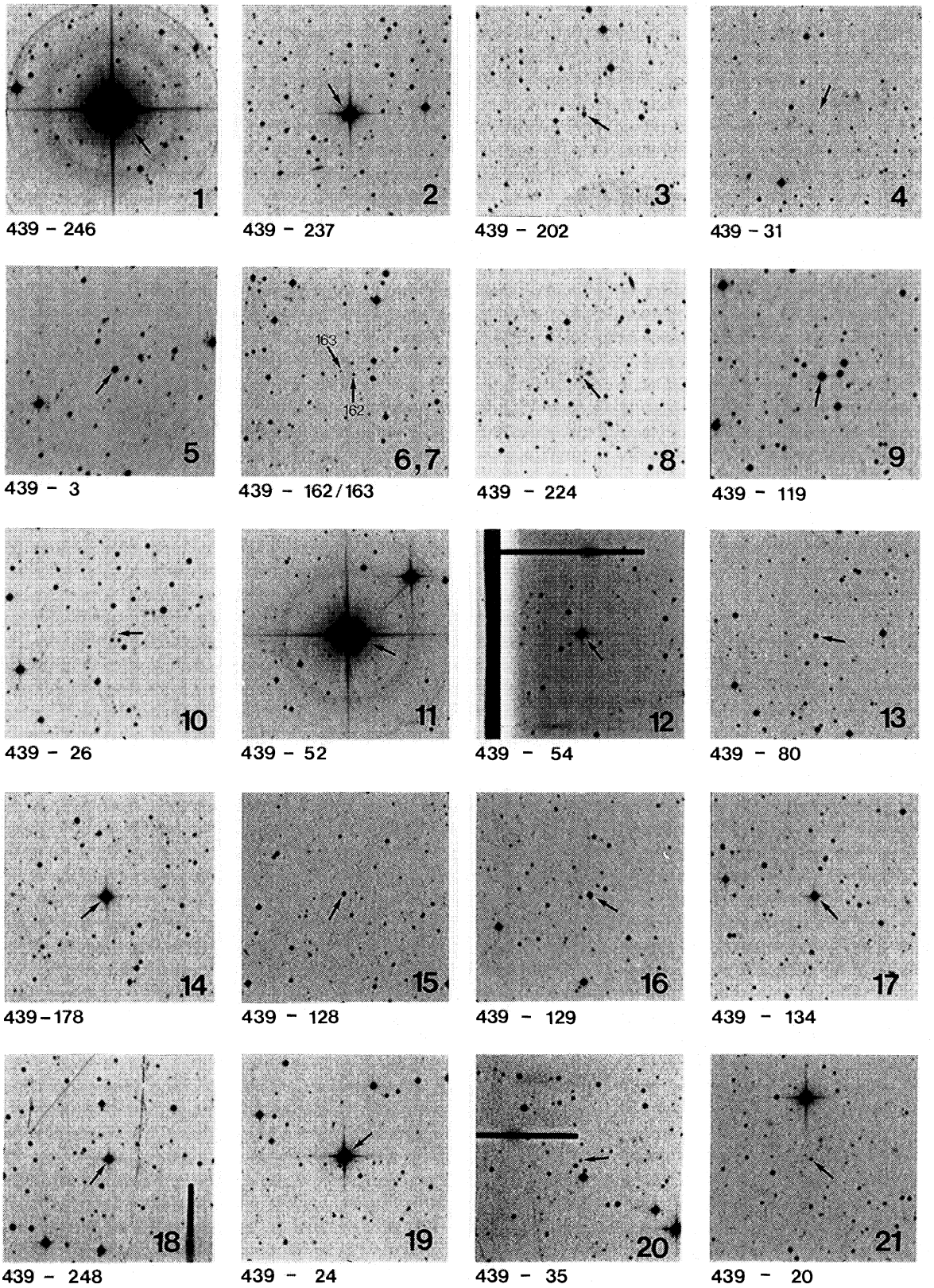

FIG. 5. (continued)

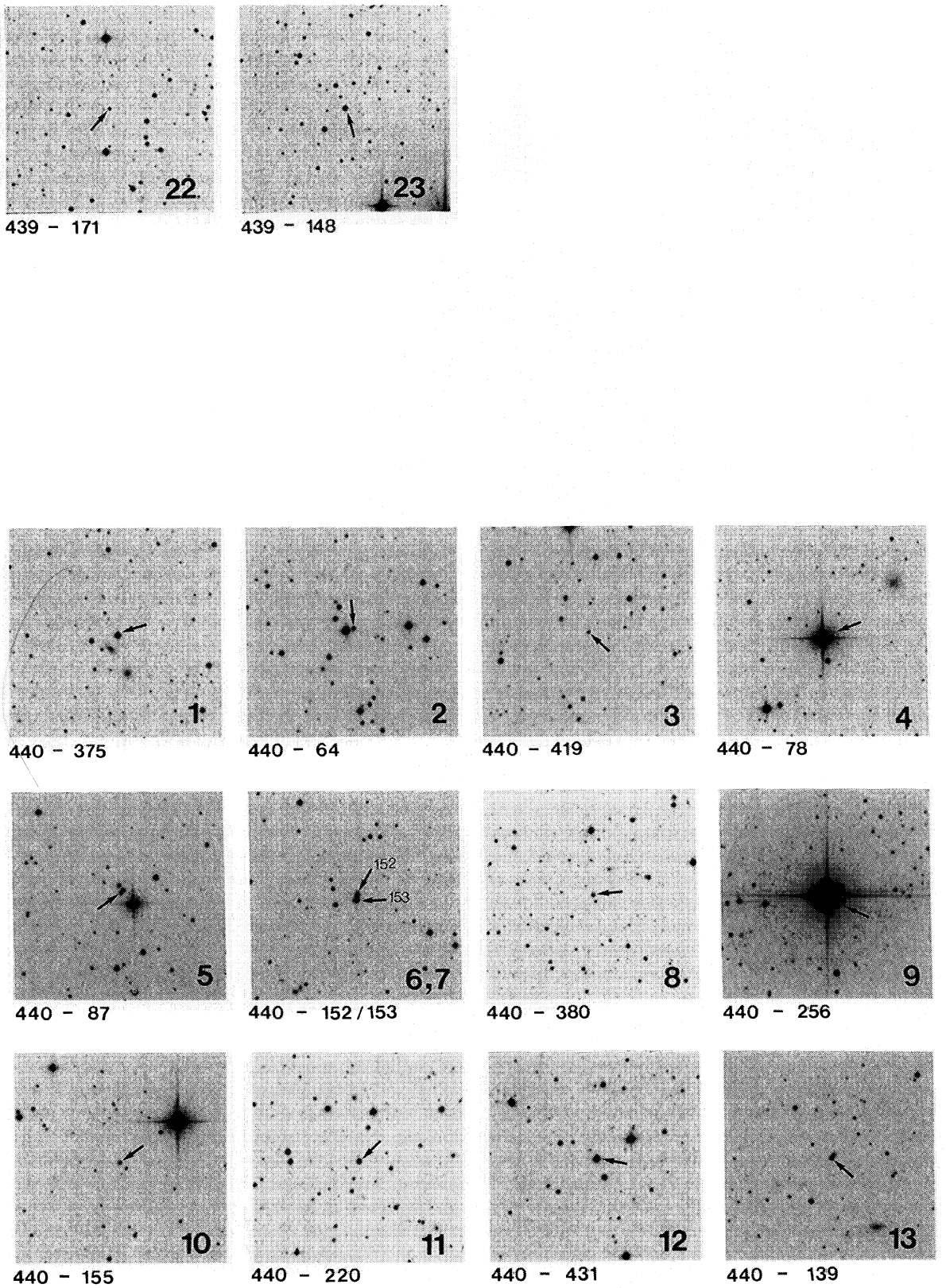

FIG. 5. (continued)

Ruiz *et al.* (see page 2579)

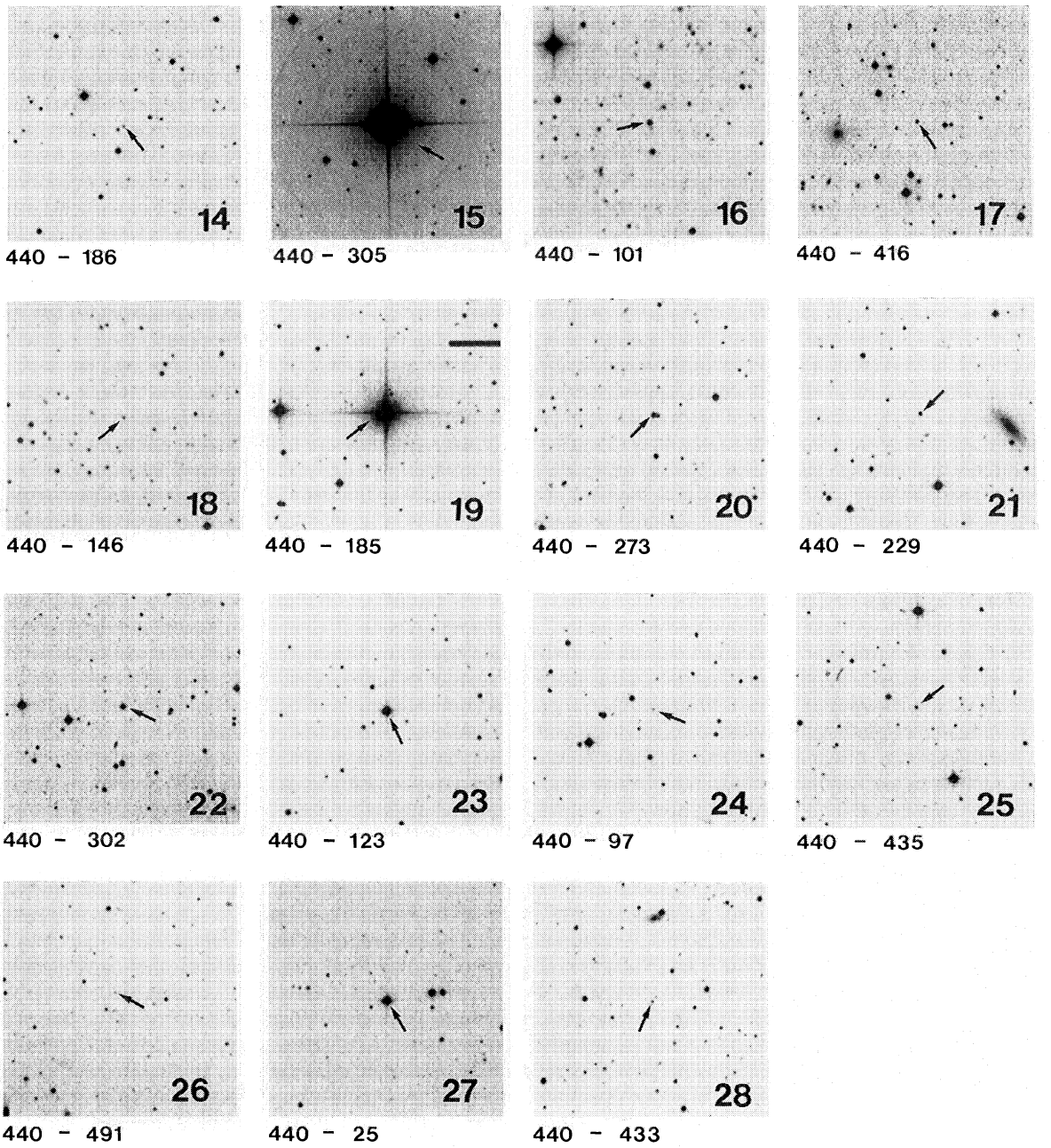

FIG. 5. (continued)

Ruiz (see page 2579)