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Southern triplets of galaxies

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Abstract. Using the ESO/SERC and POSS-I sky surveys we selected 76 isolated triple systems of galaxies with Dec. $< -3°$. For each triplet the equatorial coordinates, type of configuration, angular diameters, apparent angular separation of the components, morphological types, total magnitudes and some other characteristics are presented. 33 of 76 triplets have the measured radial velocities for all the components. The median values of basic dynamic parameters: a radial velocity dispersion, mean harmonic separation, an absolute magnitude of galaxies, mass-to-luminosity ratio are very close to those obtained earlier for 83 northern isolated triple systems from the list of Karachentseva et al. (1979).

1. Introduction

The first published list of isolated galaxy triplets (Karachentseva et al., 1979) contains 83 triple systems of galaxies with apparent magnitudes $m_p \leq 15.7$ and declinations $\delta > -3°$. The members of triple systems were selected on the basis of the Palomar Sky Atlas and Zwicky et al. (1968) Catalogue. Three galaxies were considered to form an isolated triplet if their "significant" neighbors were at least three times as far away from them as the components of the triplet were from one another. The significant neighbors were neighboring galaxies whose angular diameters differed by a factor (1/2–2) of the diameter of a triplet member.

Triple system membership of galaxies was determined disregarding to their radial velocities. Therefore a system may be isolated only in projection on the sky but, generally, not in three-dimensional space. The radial velocities of all members of triplets have been measured mainly with the 6-m telescope of SAO. That allowed to compile the catalogue of northern triple systems (Karachentseva et al., 1988) and determine their dynamical parameters (Karachentsev et al., 1989).

Over the last years this complete and homogeneous sample has been used as the observational basis to study the formation and evolution of triple galaxy systems by computer simulation methods. The results obtained by teams from Finland, Russia, and USA have been reviewed in Karachentsev et al. (2000). Due to the obvious importance of the specific kinds of small galaxy groups for the study of the dynamical evolution of groups of galaxies, we have performed a search for isolated triple systems in the southern hemisphere with almost the same selection criterion which have been used for the northern triplets (hereafter NTs).

2. Description of the sample of southern isolated triplets

For selection of isolated southern triplets in the declination range $\{-20, -90\}^\circ$ we used the ESO/SERC Sky Survey as well as the "ESO/Uppsala Survey of the ESO(B) Atlas" by Lauberts (1982) with a limiting angular diameter of galaxies $\simeq 1'$. In the declination range $\{-3, -20\}^\circ$ we used the POSS-I Sky Survey, and the Morphological Catalogue of Galaxies (hereafter MCG) by Vorontsov-Velyamonov and Arkhipova (1963, 1968) having an apparent magnitude limit $\simeq$15 mag. The fields with Galactic latitude $b < 20^\circ$ were not considered.

The above described criteria of local isolation have been applied to all galaxies from Lauberts' Catalogue as well to those galaxies from MCG whose angular diameters exceed $0.85'$. The difference in the limiting galaxy diameters is caused by the deeper photometric limit of the ESO/SERC survey with respect to POSS-I. In total we found 76 isolated triple systems containing about 1 percent of the number of galaxies, i.e. almost the same percentge as for the northern sky. The resulting list of southern triplets (Karachentseva & Karachentsev, 1999) is organized in columns as follows (see Table 2):

1 The triplet number (TS) and letter designation of its components A, B, C arranged by increasing right ascension.

2 Satisfaction of the isolation criterion (Is) for each component with + as yes and − as no. About 2/3 of the triple systems are fully isolated (+ + +). For NTs this share is 64%.

3 Right ascension and declination at epoch 1950.0. For the MCG galaxies and for galaxies absent in the ESO/Uppsala Catalogue, coordinates were measured on the DigSS.

4, 5 "Blue" angular diameter a (major axis) and b (minor axis) in arcmin referring to the maximum extent of features which we described as belonging to the object. The diameters measured on the ESO/SERC films have been translated into the POSS-I system according to the relations from Kudrya et al. (1997): $a_O = 0.8078 \cdot a_J$ and $b_O = 0.7827 \cdot b_J$.

6 Apparent angular separations $x_{i,k}$ of the components in arcmin;

7 Configuration (C) of the triplet: D — double or hierarchical (one of the sides of the apparent triangle is 1/3 or less than each of the two other sides); L — linear (one of the angles of the apparent triangle is more than 150°); T — triangle (all the three sides and angles are comparable). The distribution of triplets according to their configuration is the following: 34%(D), 42%(T), and 24%(L). (For NTs these ratios are: 38%(D), 49%(T),and 13%(L)). Figs 1(a) and (b) show the different types of triple galaxy configurations.

8 Morphological type (Ty) of the galaxies, one of 6 classes: E, S0, Sa, Sb, Sc, Sm+Pec distributed (in percent) as 9:13:17:31:19:11. (For NTs they are 16:12:21:28:18:5).

9 The galaxy number in other catalogues. Note that 12% of galaxies entering in our list were uncatalogued before.

10 Total apparent magnitude of the galaxy taken from the LEDA database.

11 Radial velocity (v) in $\mathrm{km\,s^{-1}}$, together with internal error, σ_v, of the radial velocity measurements also taken from the LEDA. About 60% of galaxies entering in the southern triplets have the measured radial velocities.

The whole sky distribution of the centres of 159 northern and southern triplets in equatorial coordinates is presented in Fig. 2. The distibution seems to be rather homogeneous with about the same surface number density for both hemispheres.

3. Dynamical parameters of the triplets

Among 76 southern triplets 33 have radial velocity measurements for all three components. For them we calculated the main dynamical characteristics using the same scheme as for northern triplets (Karachentsev et al., 1989, Karachentsev et al., 1999). Each triplet as a dynamical system is characterized by the following parameters:

- the average centroid radial velocity, $< v >$, corrected for the Solar motion;
- the rms velocity of triple galaxies relative to their center, s_v^2;
- the mean harmonic separation in projection, r_H in kpc with the Hubble constant $H = 75\ \mathrm{km\,s^{-1}\,Mpc^{-1}}$;
- the luminosity of galaxy in solar units, where the absolute magnitude of the galaxy is determined from the mean velocity and the apparent magnitude corrected for the galactic extinction (Schlegel et al., 1998) and internal absorption in the galaxy;
- the dimensionless crossing time of the triplets expressed in terms of the Hubble time (H^{-1});
- the virial mass-to-luminosity ratio for the triple system, f;
- the statistically unbiased estimate of the same ratio, f^c.

In Table 1 we present the median values of the main dynamical parameters for the southern triplets in comparison with the northern ones. We compare the data for the entire samples (for STs it is only 42% of the sample with known radial velocities) as well as for "physical" triplets with $s_v < 300\ \mathrm{km\,s^{-1}}$. Both subsamples have nearly the same global parameters. However, detailed analysis of the data is only reasonable when radial velocities are determined for all components of the southern triple systems.

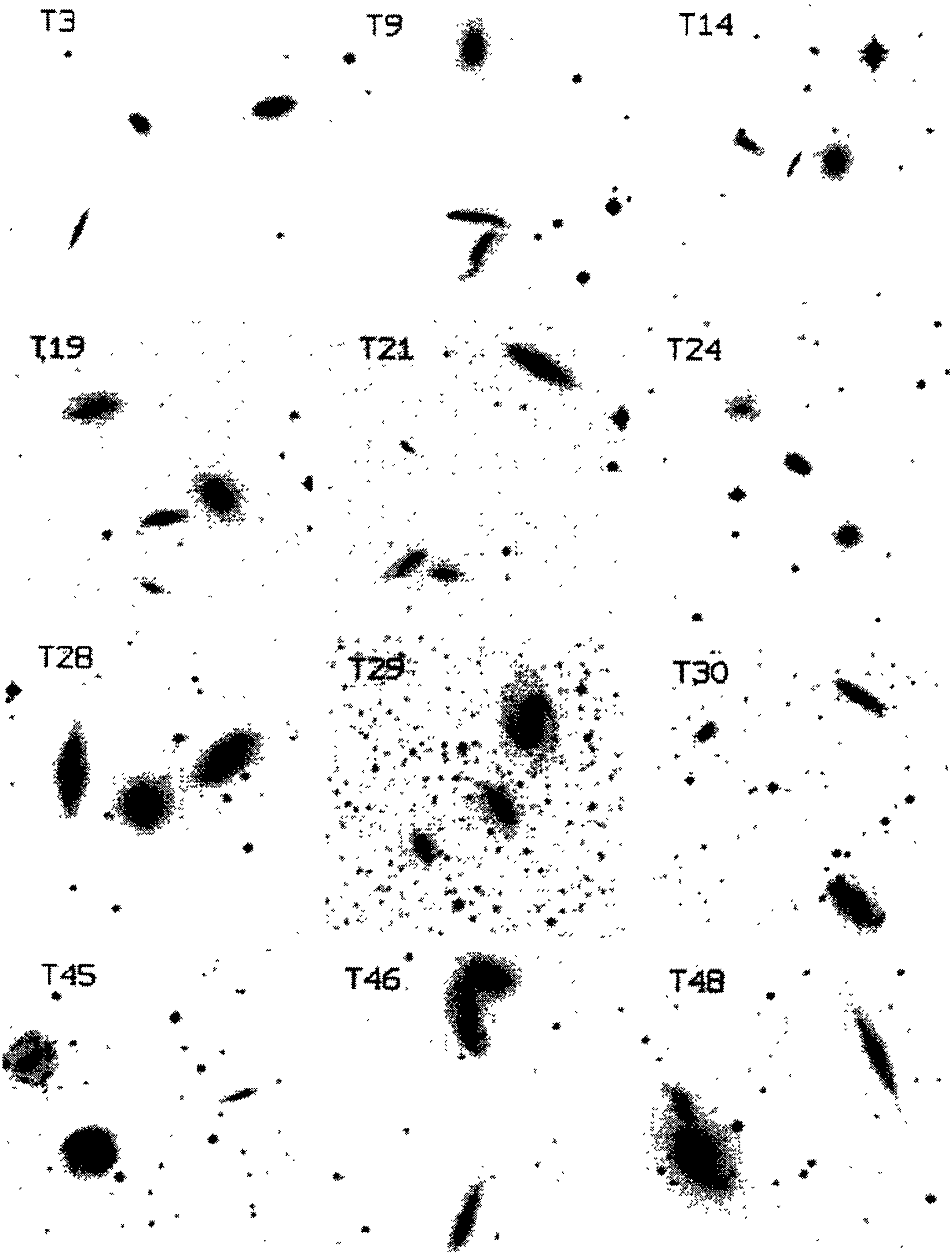

Figure 1(a). The images of the southern triplets from the digitized POSS-I. Each panel is 5 arcmin on a side. North is at the top, and east is to the left.

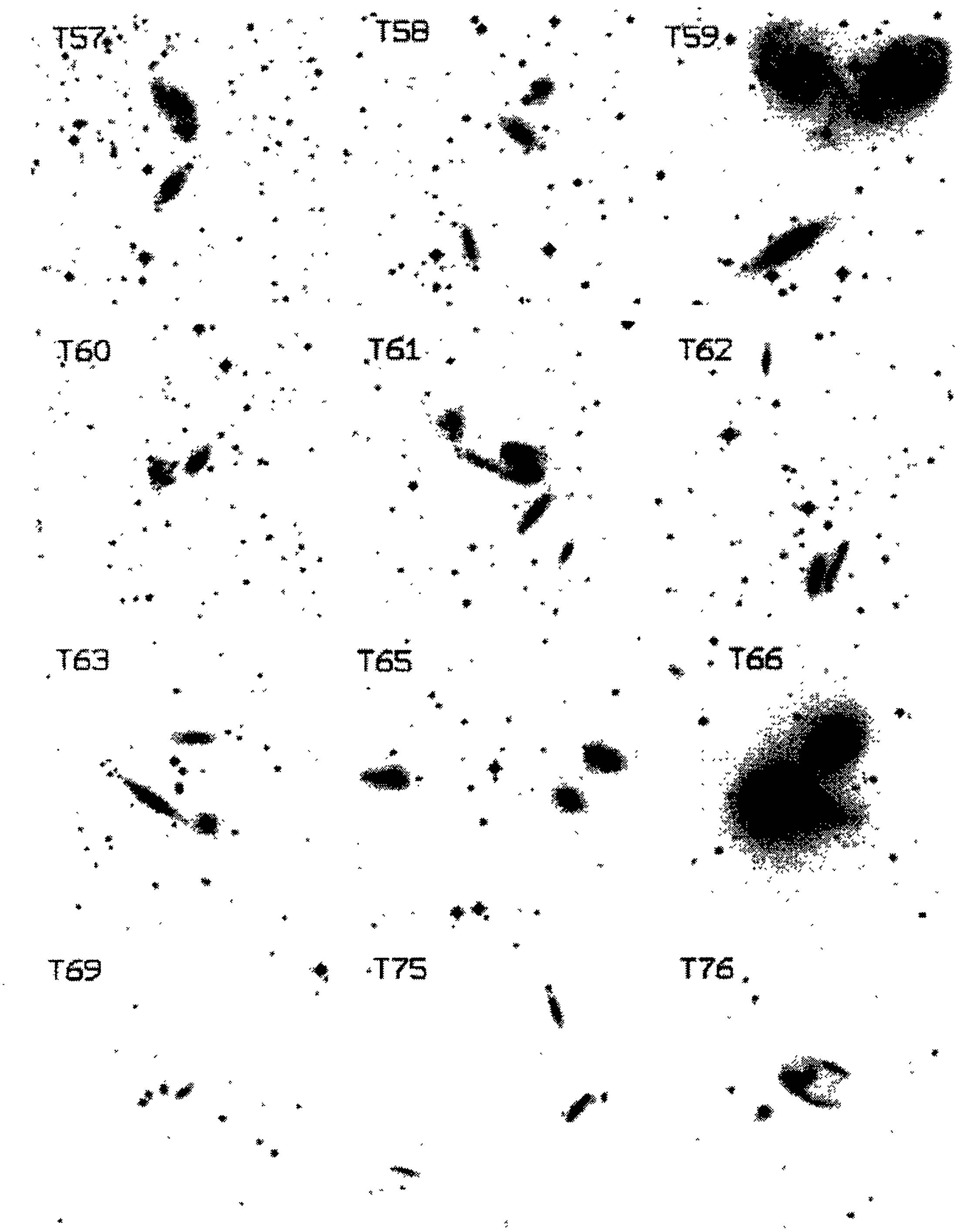

Figure 1(b). Further images of southern triplets from the digitized POSS-I. Image size and orientation as for Fig 1(a)

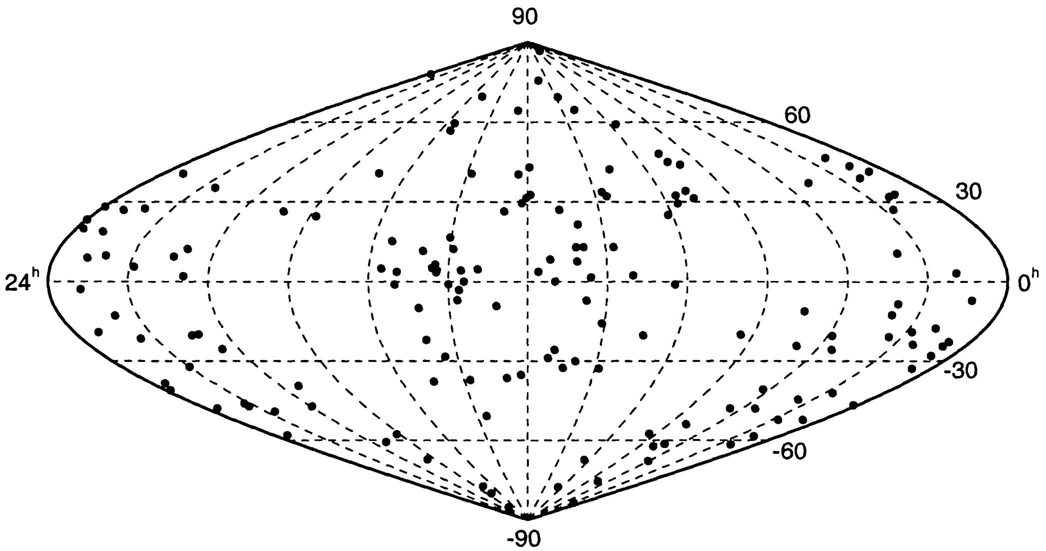

Figure 2. The all-sky distribution of the centres of the northern and southern triplets in equatorial coordinates.

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Table 1. Medians of some parameters of triplets

Parameter	Present paper Southern N=33	All Northern N=83	$s_v < 300$ km s^{-1} Southern N=24	Northern N=53
s_v (km s^{-1})	166	133	119	100
r_H (kpc)	72	63	60	55
L ($L_\odot$)	7.1×10^{10}	7.4×10^{10}	6.3×10^{10}	7.6×10^{10}
τ (H^{-1})	0.08	0.04	0.08	0.07
f ($f_\odot$)	102	67	64	31
f^c ($f_\odot$)	99	58	44	27

Notes to Table 2: *Southern Isolated Triplets of Galaxies*

1 The triplet number (TS) and letter designation of its components A, B, C arranged by increasing right ascension.

2 Satisfaction of the isolation criterion (Is) for each component with + as yes and − as no. About 2/3 of the triple systems are fully isolated (+ + +). For NTs this share is 64%.

3 Right ascension and declination at epoch 1950.0. For the MCG galaxies and for galaxies absent in the ESO/Uppsala Catalogue, coordinates were measured on the DigSS.

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9 The galaxy number in other catalogues. Note that 12% of galaxies entering in our list were uncatalogued before.

10 Total apparent magnitude of the galaxy taken from the LEDA database.

11 Radial velocity (v) in km s^{-1}, together with internal error, σ_v, of the radial velocity measurements also taken from the LEDA. About 60% of galaxies entering in the southern triplets have the measured radial velocities.

Table 2. List of southern isolated triplets of galaxies

TS	Is.	R.A.(1950) Dec.	a	b	X_{ij}	C.	Type	Alias.	B_t	$v \pm \sigma$
1	2	3	4	5	6	7	8	9	10	11
1A	+	00 07 49 −46 41 50	2.17	0.54	4.47	D	SBb	241-21	14.26	6071 ± 61
1B	−	00 07 54 −46 46 14	1.08	0.45	4.71		SBbc	241-22	14.17	
1C	+	00 07 56 −46 41 29	0.59	0.59	1.34		Sc			
2A	+	00 33 40 −32 52 48	0.90	0.45	1.94	D	Sa	350-37	14.49	
2B	−	00 33 44 −32 51 03	0.68	0.39	11.27		Sa			
2C	+	00 34 36 −32 48 17	1.18	0.45	12.58		S0-a	350-39	15.83	14803 ± 60
3A	+	00 33 59 −28 03 37	0.99	0.44	2.20	T	S0-a	410-24	14.57	10431 ± 52
3B	+	00 34 09 −28 03 49	0.99	0.57	2.01		E-S0	410-25	15.09	6910 ± 52
3C	+	00 34 14 −28 05 32	0.86	0.09	3.81		Sc	410-26	16.29	
4A	+	00 34 10 −22 52 06	1.08	0.22	8.07	L	S0-a	474- 4	14.92	3890 ± 60
4B	+	00 34 45 −22 51 36	2.26	0.27	5.31		SBbc	474- 5	14.08	2965 ± 62
4C	+	00 35 06 −22 49 24	2.26	0.53	13.17		Sab	474- 6	14.16	3858 ± 54
5A	+	00 36 04 −24 36 54	1.18	0.44	3.93	T	SBb	474- 8	14.98	3764 ± 9
5B	+	00 36 06 −24 33 00	1.72	1.67	4.44		SBc	474- 9	13.62	3681 ± 39
5C	−	00 36 20 −24 29 52	0.54	0.44	7.89		Sdm			
6A	+	00 44 23 −52 23 02	0.82	0.17	4.74	D	Sb			
6B	+	00 44 44 −52 19 28	0.82	0.48	0.75		Sa}	194-39}	14.99}	8185 ± 118
6C	+	00 44 49 −52 19 24	0.90	0.10	5.35		Scd			
7A	+	00 48 16 −07 09 26	2.35	0.56	10.90	D	S0	-1-3-19	13.87	4753 ± 60
7B	+	00 48 30 −07 19 42	0.95	0.67	0.70		E	-1-3-21	12.71	1750 ± 11
7C	+	00 48 32 −07 20 14	1.23	1.01	11.50		SBc	-1-3-22	12.63	1744 ± 8
8A	+	01 10 13 −58 30 42	1.81	0.96	3.11	T	SBab	113-23	12.77	4849 ± 103
8B	+	01 10 29 −58 28 24	1.36	0.52	5.05		SO-a	113-24	15.66	4828 ± 8
8C	+	01 10 48 −58 32 48	0.82	0.52	5.03		Sbc	113-25	13.67	5015 ± 93
9A	+	01 18 09 −17 39 30	1.68	0.67	0.60	D	Sb	-3-4-53	14.51	5961 ± 48
9B	+	01 18 09 −17 38 55	1.12	0.22	2.75		SBb	-3-4-52	14.67	5927 ± 60
9C	+	01 18 09 −17 36 10	1.23	0.67	3.35		E	-3-4-51	14.45	9296 ± 68
10A	+	01 18 45 −61 35 36	1.08	0.79	6.71	D	SBab	113-40	15.11	
10B	+	01 19 37 −61 38 12	1.36	0.79	1.32		SBb	113-41	15.04	8622 ± 42
10C	+	01 19 39 −61 36 54	0.82	0.61	6.55		E-S0	113-42	14.72	
11A	+	01 28 24 −23 50 42	0.99	0.57	6.80	L	SBc	476-17	14.91	
11B	+	01 28 53 −23 52 12	0.68	0.52	5.99		Sa			
11C	−	01 29 19 −23 51 23	0.76	0.16	12.60		Sbc			
12A	+	01 40 21 −83 37 00	2.08	0.70	10.38	T	SBc	3- 3	14.56	4934 ± 40
12B	+	01 43 06 −83 27 48	1.81	0.35	14.10		Sbc	3- 4	14.85	4595 ± 41
12C	+	01 48 13 −83 38 55	1.63	0.96	13.29		E-S0			

TS	Is.	R.A.(1950) Dec.	a	b	X_{ij}	C.	Type	Alias.	B_t	$v \pm \sigma$
1	2	3	4	5	6	7	8	9	10	11
13A	+	01 42 52 −42 14 41	0.90	0.12	7.19	T	Sbc	297-26	16.08	
13B	+	01 43 03 −42 07 48	1.45	0.88	7.90		Sb	297-27	14.89	6317 ± 48
13C	+	01 43 37 −42 12 24	0.90	0.22	8.64		Sbc	297-28	16.51	
14A	+	01 46 05 −52 17 55	0.72	0.52	0.67	L	SO-E			
14B	+	01 46 10 −52 17 57	0.80	0.07	0.84		Sc}	197- 1	15.32	14708 ± 60
14C	+	01 46 14 −52 17 37	0.99	0.28	1.46		Sa			
15A	+	01 50 06 −19 01 09	1.12	1.01	2.63	D	Sc	-3-5-26	14.35	
15B	+	01 50 17 −19 01 39	1.01	0.67	12.48		Sc	-3-5-27	14.47	14580 ± 60
15C	+	01 50 52 −19 11 00	1.34	0.25	14.67		Sa	-3-5-28	15.22	
16A	+	02 19 34 −21 03 07	1.90	1.58	5.15	D	Irr	545- 7	13.14	1563 ± 11
16B	+	02 19 42 −20 58 20	1.13	0.61	14.37		Irr	545- 8	14.15	1580 ± 6
16C	+	02 20 43 −20 56 24	2.99	0.61	17.45		SBd	545-10	13.19	1726 ± 11
17A	+	02 29 07 −44 38 48	1.08	0.48	2.20	D	SBc	246-22	14.83	5127 ± 60
17B	−	02 29 07 −44 36 36	0.54	0.48	10.55		Sc			
17C	+	02 29 45 −44 44 42	1.63	1.14	8.98		S0	246-23	13.70	4775 ± 9
18A	+	02 37 02 −08 20 54	2.69	0 90	22.56	T	Sc	-1-7-27	12.88	1241 ± 7
18B	+	02 37 57 −08 38 52	5.60	4.14	14.57		SBc	-2-7-54	11.46	1373 ± 8
18C	−	02 38 37 −08 28 10	2.58	2.02	24.60		E	-1-7-34	11.36	1507 ± 40
19A	+	02 40 14 −12 38 01	1.12	0.67	1.04	D	E	-2-7-73	14.21	4285 ± 34
19B	+	02 40 18 −12 38 22	1.12	0.25	2.09		Sa	-2-7-74	15.68	4246 ± 39
19C	+	02 40 22 −12 36 31	1.34	0.56	2.46		Sm	-2-7-75	15.39	4160 ± 41
20A	−	03 28 29 −48 01 54	0.63	0.44	9.88	D	S0-a	200-29	14.16	6635 ± 62
20B	+	03 29 15 −48 08 07	0.77	0.66	0.94		Sbc	200-32	15.54	13800 ± 190
20C	+	03 29 18 −48 08 54	0.95	0.66	10.79		Sbc	200-33	13.70	6964 ± 213
21A	+	03 34 09 −25 46 12	1.36	0.35	3.84	D	Sbc	482-11	15.21	
21B	−	03 34 17 −25 49 36	0.63	0.17	0.46		S0			
21C	+	03 34 19 −25 49 30	0.90	0.35	4.00		Sb	482-12	16.01	
22A	+	03 52 17 −20 34 24	0.84	0.45	5.06	T	E	-3-10-53	14.52	
22B	+	03 52 27 −20 38 54	1.57	1.01	9.27		Sa	-3-10-54	13.14	1859 ± 8
22C	+	03 52 52 −20 31 42	1.12	1.01	8.62		Sc	-3-10-55	15.51	
23A	+	03 59 23 −67 46 30	4.34	1.58	11.14	T	Sa	55- 4	11.85	1341 ± 14
23B	+	04 00 08 −67 56 48	1.99	0.35	12.22		SBa	55- 5	14.16	1323 ± 8
23C	+	04 00 42 −67 45 00	2.17	0.27	7.61		SBcd	55- 6	15.06	
24A	+	04 13 47 −40 48 19	0.54	0.44	1.48	L	E			
24B	+	04 13 52 −40 47 08	0.45	0.27	1.28		S(r)			
24C	+	04 13 57 −40 46 15	1.18	0.53	2.78		Sc	303- 6	15.86	

TS	Is.	R.A.(1950) Dec.	a	b	X_{ij}	C.	Type	Alias.	B_t	$v \pm \sigma$
1	2	3	4	5	6	7	8	9	10	11
25A	+	04 26 34 −48 01 12	1.63	1.40	6.78	D	Spec	202-23	13.47	4913 ± 61
25B	+	04 26 56 −47 55 30	1.45	1.05	2.91		E	202-25	13.68	4696 ± 53
25C	+	04 27 08 −47 53 24	1.27	0.74	9.66		SBc	202-26	13.81	5105 ± 29
26A	+	04 37 01 −24 16 54	1.08	0.44	1.13	D	Sc	485- 3	14.53	4486 ± 77
26B	+	04 37 06 −24 16 42	1.54	0.13	16.53		Sc	485- 4	15.99	4409 ± 47
26C	+	04 38 09 −24 24 54	1.08	0.96	17.44		SBc	485- 6	14.58	4422 ± 42
27A	−	04 49 41 −61 19 54	0.98	0.74	5.90	D	Sc	119-12	14.56	5941 ± 60
27B	+	04 49 50 −61 25 42	1.27	1.09	1.66		SBc	119-13	13.67	5903 ± 40
27C	+	04 50 03 −61 26 18	1.18	0.61	6.92		Scd	119-14	15.06	
28A	+	04 56 56 −11 11 35	3.25	1.68	1.67	L	SBb	-2-13-27	13.15	4607 ± 134
28B	+	04 57 02 −11 12 24	1.23	1.01	1.34		S0	-2-13-28	13.70	3998 ± 122
28C	+	04 57 07 −11 11 49	1.79	0.67	2.69		Sa	-2-13-30	14.76	4301 ± 291
29A	+	04 58 52 −75 29 48	1.99	0.96	1.45	L	SBbc	33 -4	14.04	5192 ± 60
29B	+	04 58 58 −75 31 12	0.95	0.52	1.35		Sab	33- 5	14.21	
29C	−	04 59 16 −75 31 58	0.45	0.27	2.62		Pec			
30A	+	05 14 00 −62 13 34	1.04	0.27	3.44	T	Sb	119-46	14.95	4966 ± 60
30B	+	05 14 02 −62 17 00	1.08	0.66	3.76		SBb	119-47	13.98	5100 ± 63
30C	−	05 14 22 −62 14 03	0.82	0.35	2.60		S0-a			
31A	+	05 14 03 −53 47 36	2.54	2.02	23.79	D	SBbc	159- 2	13.71	4290 ± 8
31B	+	05 15 06 −54 09 30	2.17	1.31	8.94		S0	159- 3	13.97	3902 ± 60
31C	−	05 16 05 −54 07 12	1.27	0.61	26.59		S0-a	159- 4	14.45	10300 ± 190
32A	+	06 18 56 −20 01 24	3.71	1.31	10.50	T	SBa	556-15	12.71	1981 ± 11
32B	+	06 19 36 −20 06 06	1.18	0.52	6.01		Sbc	556-18	15.80	
32C	+	06 19 41 −20 12 00	1.53	1.49	14.96		SBm	556-19	14.96	1868 ± 8
33A	+	06 19 26 −57 33 12	1.90	0.52	2.80	L	Sa	121-24	13.79	2442 ± 96
33B	+	06 19 27 −57 30 24	1.08	0.35	2.93		SBa	121-25	14.14	2601 ± 47
33C	+	06 19 40 −57 28 18	1.27	0.52	5.25		SBd	161- 1	14.74	
34A	+	08 17 48 −67 25 12	1.27	0.74	2.46	T	SBc	89-15	14.31	
34B	+	08 18 03 −67 27 12	1.08	0.61	7.35		E	89-16	14.39	
34C	+	08 18 37 −67 20 36	1.36	0.70	6.58		E	89-17	13.67	
35A	+	08 24 44 −77 41 18	1.36	0.61	2.04	L	SBbc	18- 7	13.52	5291 ± 87
35B	+	08 24 52 −77 39 18	0.99	0.44	3.48		Sc	18- 8	14.40	5432 ± 87
35C	+	08 25 41 −77 37 00	0.82	0.79	5.26		Sb	18- 9	13.80	5313 ± 27
36A	+	08 54 27 −20 21 54	1.36	0.52	3.53	T	Sm	563-33	14.40	
36B	+	08 54 40 −20 20 06	1.18	0.79	4.55		Sab	563-34	13.86	
36C	+	08 54 55 −20 23 00	1.36	0.79	6.64		Sa	563-36	13.61	2630 ± 60

TS	Is.	R.A.(1950) Dec.	a	b	X_{ij}	C.	Type	Alias.	B_t	$v \pm \sigma$
1	2	3	4	5	6	7	8	9	10	11
37A	−	09 52 12 −32 52 48	1.45	0.27	9.74	D	Sb	374- 8	15.62	1510 ± 60
37B	+	09 52 58 −32 54 00	3.34	1.84	4.40		Sb	374-10	12.6	3012
37C	+	09 52 59 −32 58 24	1.53	0.78	11.34		SBbc	374-11	13.65	2601 ± 44
38A	+	10 03 36 −15 52 46	2.35	1.01	6.75	T	Sb	-3-26-20	14.31	4635 ± 10
38B	+	10 03 50 −15 46 54	2.35	0.34	6.49		Sc	-3-26-21	14.89	5009 ± 7
38C	+	10 04 01 −15 52 55	1.57	0.31	5.77		Sb	-3-26-22	14.62	4536 ± 43
39A	+	10 30 37 −07 05 55	0.95	0.50	0.58	D	Sc	-1-27-16	15.11	
39B	+	10 30 39 −07 05 37	0.90	0.67	6.87		Sa	-1-27-17	15.57	
39C	+	10 30 43 −07 12 25	1.01	1.01	6.67		S0	-1-27-18	14.02	4942 ± 44
40A	−	10 36 55 −30 02 18	3.34	1.05	11.24	T	SBbc	437-30	13.73	3773 ± 15
40B	+	10 37 38 −29 56 00	1.63	1.05	4.59		SBa	437-33	13.72	3338 ± 148
40C	+	10 37 44 −30 00 24	1.81	0.79	10.78		SBbc	437-35	14.26	3445 ± 65
41A	−	10 49 55 −32 24 18	2.35	2.20	17.18	L	SBab	437-67	13.60	3162 ± 25
41B	+	10 50 32 −32 39 36	3.53	1.05	19.42		SBab	376-25	12.83	3290 ± 15
41C	+	10 51 46 −32 51 11	1.81	1.05	35.67		S0-a	376-26	13.52	3478 ± 149
42A	+	11 14 25 −25 51 36	1.27	0.17	12.97	T	Sbc	503- 8	15.81	
42B	+	11 15 17 −25 46 00	1.72	0.96	5.86		SBc	503-11	15.55	2047 ± 9
42C	+	11 15 23 −25 51 42	1.63	1.14	13.05		E	503-12	13.60	2205 ± 42
43A	+	11 24 37 −28 42 12	2.08	1.75	17.25	D	S0-a	439- 8	13.21	1636 ± 30
43B	+	11 24 55 −28 59 00	1.53	0.44	5.28		Sa	439- 9	14.79	7137 ± 102
43C	+	11 25 04 −28 54 06	1.72	0.66	13.28		Sb	439-10	15.77	7164 ± 34
44A	+	12 12 08 −35 13 54	2.99	1.40	5.77	T	SBb	380- 1	12.90	2689 ± 6
44B	+	12 12 18 −35 19 18	1.18	0.44	8.14		Sbc	380- 2	15.30	2626 ± 44
44C	+	12 12 57 −35 21 06	3.53	1.40	12.31		Sb	380- 6	12.63	2943 ± 8
45A	+	12 37 59 −36 27 55	1.36	0.13	2.65	T	Sc	381- 6	15.93	3180 ± 60
45B	+	12 38 11 −36 29 00	1.08	0.96	1.79		SBbc	381- 8	13.19	3396 ± 160
45C	+	12 38 16 −36 27 30	1.45	1.14	3.44		SBbc	381- 9	13.93	3302 ± 71
46A	+	12 47 57 −09 10 46	1.01	0.56	4.16	D	S0	-1-33-21	13.74	4645 ± 109
46B	+	12 47 58 −09 14 53	1.40	0.67	3.43		Scd	-1-33-22	14.62	
46C	+	12 47 58 −09 11 28	1.57	0.34	0.76		SBa	-1-33-23	15	4515 ± 96
47A	+	13 37 00 −50 47 00	0.99	0.83	6.45	T	Sbc	220-27	14.02	4045 ± 49
47B	+	13 37 05 −50 53 24	1.90	0.24	5.15		Sbc	220-28	14.73	3639 ± 10
47C	+	13 37 23 −50 49 06	0.82	0.70	4.19		S0	220-29	13.37	4031 ± 106
48A	+	13 46 22 −06 56 54	2.58	0.45	3.43	D	Sb	-1-35-13	15.07	7644 ± 41
48B	+	13 46 34 −06 58 35	1.34	0.78	0.93		S0	-1-35-14	13.10	7246 ± 36
48C	−	13 46 35 −06 57 41	0 78	0.34	3.31		Sb	-1-35-15	15.66	7368 ± 104

TS	Is.	R.A.(1950) Dec.	a	b	X_{ij}	C.	Type	Alias.	B_t	$v \pm \sigma$
1	2	3	4	5	6	7	8	9	10	11
49A	+	13 47 35 −37 02 30	2.44	0.27	22.71	T	SBcd	383-91	14.35	1079 ± 8
49B	−	13 48 25 −37 22 54	1.72	0.27	14.87		Sb	384- 3	14.37	3849 ± 129
49C	+	13 49 19 −37 12 36	2.26	0.22	23.04		SBd	384- 5	15.41	1640 ± 8
50A	+	14 21 00 −28 27 42	1.36	0.70	7.32	T	SBbc	446-58	13.50	4347 ± 10
50B	+	14 21 30 −28 24 30	1.27	0.30	5.61		Sbc	446-59	15.28	
50C	+	14 21 37 −28 29 54	1.04	0.16	8.42		Sbc	446-60	16.21	
51A	+	14 44 33 −22 11 54	1.08	0.70	14.98	L	Scd	580-25	14.34	
51B	+	14 44 36 −21 56 56	1.36	0.79	7.26		S0	580-26	14.92	3194 ± 133
51C	+	14 44 37 −22 04 12	1.90	1.49	7.55		SBa	580-27	13.66	3286 ± 9
52A	+	14 46 48 −09 57 58	2.80	1.12	0.80	D	Scd	-2-38-16	13.38	1859 ± 20
52B	+	14 46 50 −09 57 19	1.90	0.56	5.45		Sdm	-2-38-17	14.28	1856 ± 10
53C	+	14 46 53 −09 51 55	0.90	0.34	6.15		Irr			
53A	+	14 58 20 −37 47 48	2.26	0.44	3.87	T	Sa	328- 5	15.0	
53B	+	14 58 33 −37 44 54	0.90	0.79	3.87		SBc	328- 6	14.58	4434 ± 60
53C	+	14 58 51 −37 46 24	1.36	0.22	6.28		Sbc	328- 7	14.76	
54A	+	17 06 19 −77 28 30	3.71	2.20	6.69	L	Sc	44- 3	12.40	2941 ± 7
54B	+	17 08 12 −77 25 54	3.26	0.61	17.15		SBb	44- 5	13.94	2948 ± 8
54C	+	17 12 28 −77 18 42	1.72	0.30	22.52		SBcd	44-10	14.61	
55A	+	17 15 10 −80 00 54	1.18	1.05	5.01	T	SBcd	24- 1		4845 ± 60
55B	+	17 15 18 −80 05 54	1.27	1.23	5.56		Sc	24- 2	13.80	5330 ± 60
55C	+	17 17 08 −80 08 54	1.36	0.52	9.47		S0	24- 5		4872 ± 60
56A	−	17 23 33 −85 16 30	2.26	1.49	51.61	D	Sbc	9-10		2422 ± 8
56B	+	18 05 51 −85 25 06	1.18	0.88	0.58		S0	10- 1	12.13	2437 ± 21
56C	+	18 06 18 −85 25 18	2.08	0.79	53.18		Irr	10- 2	12.39	2515 ± 9
57A	+	18 09 19 −57 44 48	0.32	0.30	0.42	L	Pec	140- 9	14.77	4960 ± 62
57B	+	18 09 20 −57 44 24	1.63	1.05	1.41		Sb	140-10	14.28	5189 ± 35
57C	+	18 09 21 −57 45 48	0.82	0.30	1.04		Sa	140-11	15.00	5140 ± 156
58A	+	18 31 32 −67 16 23	0.54	0.48	0.87	L	SBa			
58B	+	18 31 37 −67 17 06	1.08	0.44	2.13		Sb	103-29	15.34	
58C	+	18 31 47 −67 19 00	1.08	0.27	3.00		Sbc	103-30	15.65	
59A	+	19 13 57 −60 35 30	1.90	1.14	1.85	T	SBb	141-48	12.57	3810 ± 119
59B	+	19 14 12 −60 35 18	2.44	2.19	2.91		SBb	141-49	12.76	3834 ± 96
59C	−	19 14 14 −60 38 12	2.35	0.44	3.41		S0-a	141-50	13.57	4221 ± 76
60A	+	19 26 46 −39 30 49	0.73	0.39	0.68	T	Sab}	338- 8}	16.73	} 2835 ± 67
60B	+	19 26 49 −39 31 09	0.45	0.24	0.24		Pec			
60C	+	19 26 50 −39 31 01	0.73	0.27	0.80		Pec			

TS	Is.	R.A.(1950) Dec.	a	b	X_{ij}	C.	Type	Alias.	B_t	$v \pm \sigma$
1	2	3	4	5	6	7	8	9	10	11
61A	−	19 57 21 −47 13 22	0.99	0.27	0.85	L	Sa			
61B	+	19 57 21 −47 12 30	1.90	0.61	1.50		Sb}	284- 8}	13.83	} 6348 ± 75
61C	+	19 57 29 −47 11 51	1.08	0.57	2.02		Sbc			
62A	+	20 27 52 −25 31 54	0.77	0.13	0.49	D	Sb	528-13	15.57	
62B	+	20 27 54 −25 32 06	0.82	0.27	3.76		Sa	528-14	15.24	
62C	+	20 27 58 −25 28 27	0.68	0.10	3.71		Sb			
63A	+	20 45 19 −20 02 27	0.63	0.44	1.45	T	E-S0			
63B	+	20 45 19 −20 01 00	0.86	0.27	1.37		Sa			
63C	+	20 45 23 −20 02 00	1.36	0.24	1.04		Sb	597-36	15.22	8694 ± 41
64A	+	20 55 37 −20 10 30	1.27	0.44	9.87	L	Sb	598- 9	14.38	
64B	+	20 56 15 −20 14 12	1.36	0.96	15.07		Sc	598-11	15.74	
64C	−	20 57 07 −20 19 22	0.90	0.52	22.89		S0			
65A	+	21 41 35 −49 14 10	0.82	0.48	0.95	D	Sm			
65B	+	21 41 39 −49 14 51	0.63	0.35	3.15		E-S0			
65C	+	21 41 58 −49 14 18	0.82	0.35	3.76		Irr	236-39	15.08	
66A	+	21 59 09 −32 12 54	1.18	0.79	1.27	T	E	466-39	12.86	2548 ± 75
66B	+	21 59 12 −32 14 00	1.36	0.61	0.43		Sab	466-40	13.85	2754 ± 88
66C	+	21 59 14 −32 13 54	1.08	0.70	1.44		E	466-41	12.39	2528 ± 28
67A	+	22 12 33 −46 06 00	2.54	0.79	1.91	T	S0-a	289- 7	12.87	2152 ± 8
67B	+	22 12 44 −46 05 48	1.53	1.05	4.26		SBa	289- 8	13.10	1915 ± 8
67C	+	22 12 48 −46 01 48	1.72	1.40	4.94		SBm	289- 9	13.87	2042 ± 42
68A	+	22 13 44 −21 40 54	2.26	1.84	4.17	D	SBa	602- 1	12.70	2616 ± 11
68B	−	22 13 55 −21 44 12	1.08	0.70	13.72		SBa	602- 2	14.75	9634 ± 22
68C	+	22 14 06 −21 30 00	2.08	0.70	12.04		Irr	602- 3	14.70	2571 ± 11
69A	+	22 14 47 −47 09 28	0.73	0.16	0.34	L	Sa			
69B	+	22 14 48 −47 09 25	0.63	0.13	0.27		Pec}	289-14}	16.28	
69C	+	22 14 48 −47 09 30	0.30	0.10	0.57		S0-E			
70A	+	22 33 50 −12 49 36	1.57	0.67	4.33	T	Sa	-2-57-22	14.38	7504 ± 73
70B	+	22 34 07 −12 48 20	1.12	0.39	2.18		S0a	-2-57-23	14.35	7248 ± 11
70C	−	22 34 15 −12 49 18	1.01	0.56	6.09		Sc	-2-57-24		7159 ± 60
71A	+	23 11 37 −03 03 08	0.90	0.56	4.16	L	S0a	-1-59-4	15	3475 ± 60
71B	+	23 11 48 −03 00 00	1.23	0.56	1.99		S0a	-1-59-5	13.85	3555 ± 17
71C	+	23 11 52 −02 58 17	0.78	0.50	6.12		Ir	-1-59-6	14.54	3521 ± 47
72A	+	23 21 01 −19 17 06	1.63	1.40	12.86	T	Sc	605- 4	14.71	7677 ± 60
72B	+	23 21 54 −19 20 06	1.36	1.31	14.02		S0p	605- 5	14.41	7632 ± 71
72C	−	23 22 24 −19 08 00	0.82	0.35	21.60		Sc	605- 6	15.94	

TS	Is.	R.A.(1950) Dec.	*a*	*b*	X_{ij}	C.	Type	Alias.	B_t	$v \pm \sigma$
1	2	3	4	5	6	7	8	9	10	11
73A	+	23 22 31 −58 03 54	1.07	0.96	6.17	T	Sb	148-10	13.44	3380
73B	+	23 22 47 −58 09 42	1.36	0.61	10.46		Sa	148-11	14.45	
73C	+	23 23 57 −58 04 48	1.40	0.27	11.40		SBd	148-12	14.67	3138 ± 43
74A	+	23 35 03 −47 46 54	2.44	1.23	13.32	T	S0	240-10	12.59	3189 ± 31
74B	+	23 35 08 −48 00 12	5.34	0.52	16.66		Sc	240-11	13.19	2843 ± 6
74C	−	23 36 46 −48 03 00	1.40	0.96	23.58		SBb	240-13	14.00	3246 ± 31
75A	+	23 35 11 −38 32 58	0.90	0.27	1.59	T	Sbc	347-32	15.88	
75B	+	23 35 12 −38 31 23	0.82	0.17	3.62		Sbc			
75C	+	23 35 25 −38 33 59	0.73	0.10	2.92		Sc			
76A	+	23 50 43 −41 04 57	1.08	0.10	0.77	L	Scd			
76B	+	23 50 47 −41 05 07	1.08	0.44	0.74		Sp}	293- 8}	15.09}	9057 ± 86
76C	+	23 50 50 −41 05 40	0.54	0.17	1.49		S0			