ASTRONOMY & ASTROPHYSICS
SUPPLEMENT SERIES

Astron. Astrophys. Suppl. Ser. **126,** 15-19 (1997)

Kinematical data on early-type galaxies. II.*,**

F. Simien and Ph. Prugniel

CRAL-Observatoire de Lyon (CNRS: UMR 142), F-69561 St-Genis-Laval Cedex, France

Received November 6, 1996; accepted February 14, 1997

Abstract. We present new kinematical data for a sample of 38 early-type galaxies. Rotation curves and velocity-dispersion profiles are determined for 32 objects, while the central velocity dispersions are given for the whole sample. This is our second paper in a series devoted to the presentation of kinematical data on elliptical and S0 galaxies, derived from long-slit absorption spectroscopy.

Key words: galaxies: elliptical & lenticular, cD — galaxies: kinematics and dynamics — galaxies: fundamental parameters

1. Introduction

We have recently begun to present kinematical measurements from absorption spectroscopy on early-type galaxies (Simien & Prugniel 1997, hereafter Paper I); these data are intended to contribute to the study of several structural and evolutionary issues. As part of our continued effort to get reliable velocity dispersions and rotation curves on a statistically significant sample of objects, we presently report on new observations on a second, and longer, list of targets.

This work follows closely the technique already described in full detail in Paper I, for both observation and reduction, and only a minimum of explanations will be given here.

2. Sample and observations

Our present sample consists of 38 early-type galaxies, with ellipticals and lenticulars in roughly equal proportions. This set adds up to the 21-object sample of Paper I; there are four objects in common (NGC 2329, NGC 2332, NGC 4434 and UGC 3696), whose new measurements have been included in the present work for comparison purposes. Relevant catalog elements are presented in Table 1. The Es have ellipticities corresponding to classes between $\simeq$ E0 and $\simeq$ E4, and the S0s are moderately to highly flattened. The distances are in the range of $\simeq 15$ to $\simeq 100$ Mpc (for $H_0 = 75\,\mathrm{km\,s^{-1}\,Mpc^{-1}}$). The absolute magnitudes are intermediate ($-21.8 < M_B < -17.3$).

The observations have been secured at the 1.93-m telescope of the Observatoire de Haute-Provence, equipped with the *CARELEC* long-slit spectrograph. In March and June 1995, two observing runs totalling 12 nights collected spectra on the major axis of the galaxies.

The atmospheric conditions were variable, with a seeing disk between $2''$ and $3.5''$ (FWHM) for most objects, but up to $\simeq 5''$ for three of them. The log of the observations is given in Table 2, which is proposed in electronic form only.

3. Data reduction

As in Paper I, standard pre-processing was applied to the raw data, up to the rebinning in wavelength. The galaxy centers ($r = 0$) were determined by a gaussian fitting to a limited range ($\simeq 12''$) around the brightest line. In the outer regions, cosmic-ray hits were removed with a median filter, and adjacent lines were combined with a variable weighting function (a gaussian continuously wider faintward). A Fourier-Fitting technique determined the central velocity dispersion σ_0 and, when possible, the radial profile $\sigma(r)$ of the dispersion, together with the projected rotation curve $V(r)$ along the major axis. A two-pass mode (described in Paper I) allowed to remove cosmics on the inner lines, where the spatial resolution must be preserved. We adopted as the systemic velocity the value measured at $r = 0$. Whenever possible, we have measured the maximum rotation velocity $V_{\max}$, as the mean of representative values on the opposite semi-axes.

Send offprint requests to: F. Simien (simien@obs.univ-lyon1.fr)

* Based on observations collected at the Observatoire de Haute-Provence.

** Tables 2 and 4 are presented in electronic form only; Tables 1 through 4 are available at the CDS via anonymous ftp to cdsarc.u-strasbg.fr (130.79.128.5) or via http://cdsweb.u-strasbg.fr/Abstract.html

Table 1. Catalog elements

Object	Type	α_{1950}	δ_{1950}	$v_{\rm hel}$	$B_{\rm T}$	$-M_B$	$r_{\rm e}$	ϵ	PA	ref.	σ_0	$V_{\max}$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
NGC 1521	−5	04 06 08.0	−21 11 00	4183	12.32	21.22	34.7	0.22	19	1	236 ± 36	... ± ...
NGC 1653	−4	04 43 16.5	−02 28 53	4345	12.60	20.92	25.4	0.08	118	1	253 ± 55	... ± ...
NGC 2329	−3	07 05 21.7	48 41 48	5726	12.97	21.29	21.5	0.14	175	3	244 ± 19	99 ± 05
NGC 2332	−2	07 05 43.3	50 15 48	5809	13.52	20.74	...	0.32	60	3	... ± ...	... ± ...
NGC 2563	−2	08 17 40.7	21 13 40	4583	12.94	20.93	21.1	0.15	80	3	260 ± 26	... ± ...
NGC 2695	−2	08 51 55.8	−02 52 36	1825	12.81	19.38	14.9	0.28	175	3	192 ± 19	... ± ...
NGC 2986	−5	09 41 57.0	−21 02 54	2313	11.65	20.76	34.5	0.12	43	1	253 ± 21	... ± ...
NGC 3853	−5	11 41 53.3	16 50 10	3349	13.31	20.03	14.1	0.33	140	1	170 ± 19	... ± ...
NGC 3862	−5	11 42 29.1	19 53 05	6474	13.23	21.34	31.2	0.03	84	1	259 ± 18	... ± ...
NGC 3921	0	11 48 28.0	55 21 20	5839	13.05	21.26	18.1	0.38	20	3	200 ± 53	... ± ...
NGC 4270	−2	12 17 15.4	05 44 31	2484	13.05	19.44	13.4	0.53	110	3	196 ± 22	... ± ...
NGC 4283	−5	12 17 50.3	29 35 18	727	12.88	18.17	13.1	0.10	56	1	103 ± 10	... ± ...
NGC 4318	−5	12 20 10.6	08 28 33	1383	14.11	16.90	7.2	0.33	67	1	101 ± 11	... ± ...
NGC 4339	−5	12 21 01.3	06 21 32	1282	12.26	18.75	32.4	0.16	134	1	119 ± 18	... ± ...
NGC 4340	−1	12 21 03.7	17 00 06	911	11.80	19.21	50.4	0.29	85	2	115 ± 11	... ± ...
NGC 4429	−1	12 24 54.1	11 23 05	1130	10.63	20.38	68.6	0.54	93	2	181 ± 29	... ± ...
NGC 4434	−5	12 25 04.2	08 25 53	1064	13.03	17.98	12.9	0.09	33	1	118 ± 15	... ± ...
NGC 4435	−2	12 25 08.6	13 21 23	786	11.56	19.45	23.9	0.38	13	2	165 ± 16	... ± ...
NGC 4442	−2	12 25 31.3	10 04 53	535	11.30	19.71	22.5	0.60	87	3	216 ± 35	... ± ...
NGC 4461	−1	12 26 31.1	13 27 43	1924	11.95	19.06	22.4	0.36	10	1	161 ± 15	... ± ...
NGC 4464	−1	12 26 48.1	08 26 05	1236	13.52	17.49	6.6	0.19	1	1	120 ± 09	... ± ...
NGC 4468	−3	12 26 59.6	14 19 33	895	13.70	17.31	15.9	0.28	72	2	75 ± 91	... ± ...
NGC 4479	−2	12 27 46.8	13 51 15	822	13.29	17.72	26.7	0.14	14	2	... ± ...	... ± ...
NGC 4489	−5	12 28 21.1	17 02 05	934	12.68	18.33	33.0	0.11	160	1	63 ± 15	... ± ...
NGC 4552	−5	12 33 08.4	12 49 56	263	10.43	20.58	56.0	0.08	115	1	263 ± 15	1 ± 05
NGC 4638	−3	12 40 16.4	11 43 00	1114	12.16	18.85	11.9	0.50	125	2	129 ± 09	150 ± 10
NGC 4874	−4	12 57 11.1	28 13 53	7127	12.25	22.48	63.4	0.15	37	1	275 ± 25	7 ± 10
NGC 4886	−5	12 57 40.0	28 15 32	6319	15.00	19.73	6.5	0.10	89	1	154 ± 11	... ± ...
NGC 5353	−2	13 51 19.8	40 31 47	2306	11.84	20.86	21.9	0.29	145	3	294 ± 15	... ± ...
NGC 5424	−2	14 00 28.2	09 39 38	5940	13.78	20.66	15.9	0.24	111	1	189 ± 42	... ± ...
NGC 5490	−5	14 07 34.9	17 46 53	5008	12.88	21.29	21.8	0.19	94	1	272 ± 35	... ± ...
NGC 5557	−5	14 16 20.4	36 43 25	3227	11.85	21.33	30.1	0.20	99	1	259 ± 26	... ± ...
NGC 5854	−1	15 05 16.7	02 45 37	1675	12.60	19.20	12.9	0.46	63	1	145 ± 16	... ± ...
NGC 5864	−2	15 07 02.7	03 14 33	1838	12.50	19.30	21.4	0.58	55	1	166 ± 23	... ± ...
NGC 5966	−5	15 34 04.4	39 56 03	4525	12.93	20.88	28.5	0.38	84	1	172 ± 24	... ± ...
NGC 6146	−5	16 23 29.5	41 00 24	8860	13.38	21.78	13.7	0.23	75	1	251 ± 32	... ± ...
UGC 3696	−5	07 05 36.9	48 42 58	5892	13.60	20.66	11.2	0.28	77	3	260 ± 26	... ± ...
UGC 3792	0	07 15 25.7	51 23 04	5973	13.43	20.83	...	0.28	65	3	... ± ...	... ± ...

Notes:
Col. (2): morphological type (from the *LEDA* database);
Cols. (3), (4): coordinates;
Col. (5): $v_{\rm hel}$, heliocentric radial velocity, in $\rm km\,s^{-1}$ (from *LEDA*);
Col. (6): $B_{\rm T}$, integrated blue magnitude, corrected for Galactic extinction and k term (as calculated by Prugniel & Simien 1997, hereafter PS97; except for NGC 2332 and UGC 3792, for which $B_{\rm T}$ is from *LEDA*);
Col. (7): $-M_B$, absolute B magnitude (for a distance modulus from PS97, corresponding to $H_0 = 75\,\rm km\,s^{-1}\,Mpc^{-1}$);
Col. (8): $r_{\rm e}$, effective radius (from PS97), in arcsec;
Col. (9): ϵ, ellipticity;
Col. (10): PA, position angle of major axis, in degrees (North through East);
Col. (11): reference for ϵ and PA, 1= Djorgovski (1985), 2= Michard (1985), 3= *LEDA*;
Col. (12): σ_0, central velocity dispersion available in the literature, from an updated version of the compilation in PS96 (excluding all previous measurements by ourselves), in $\rm km\,s^{-1}$;
Col. (13): $V_{\max}$, maximum rotation velocity available in the literature, from PS96 (same remarks as for σ_0), in $\rm km\,s^{-1}$.

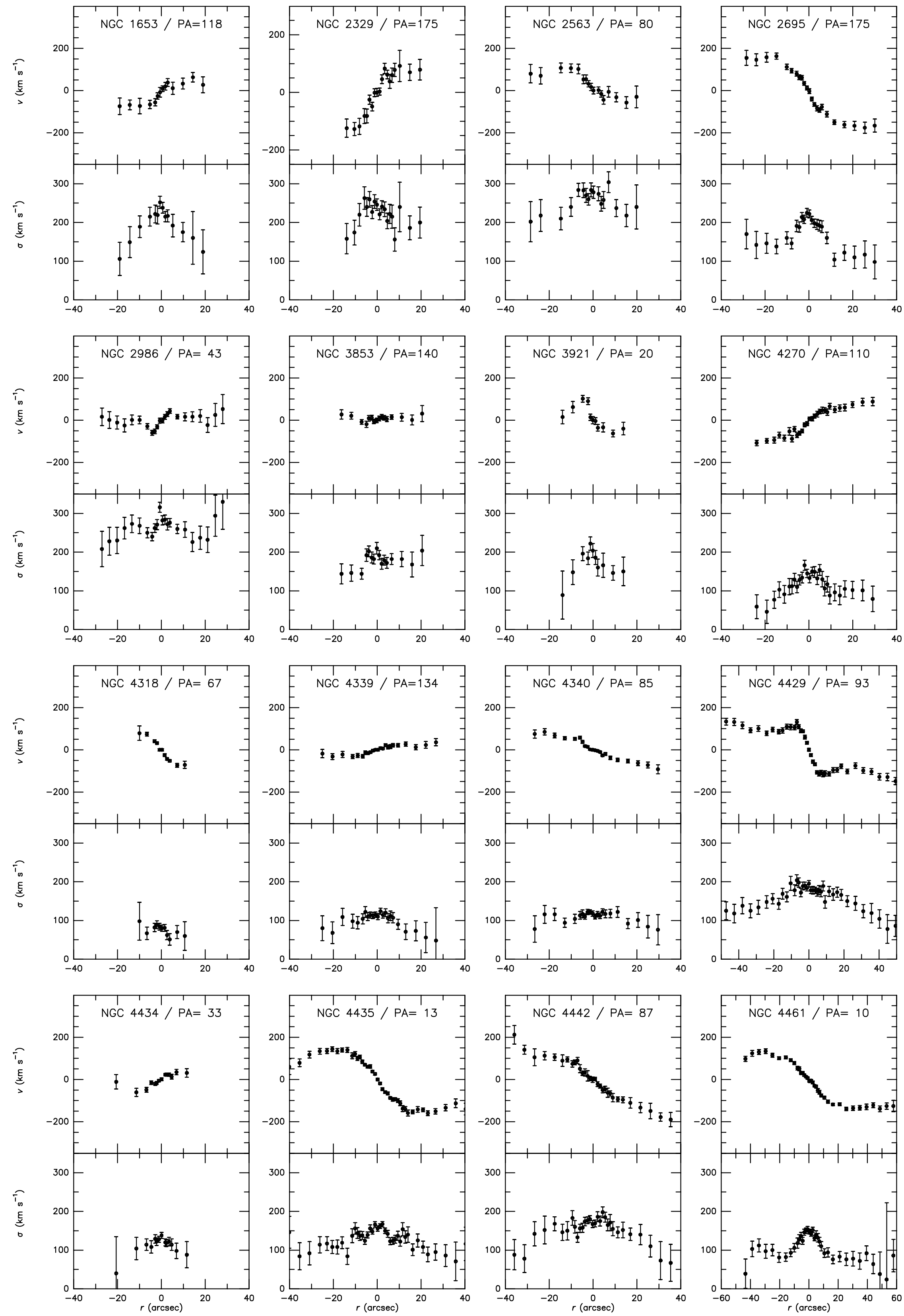

Fig. 1. Profiles of rotation velocities and velocity dispersions

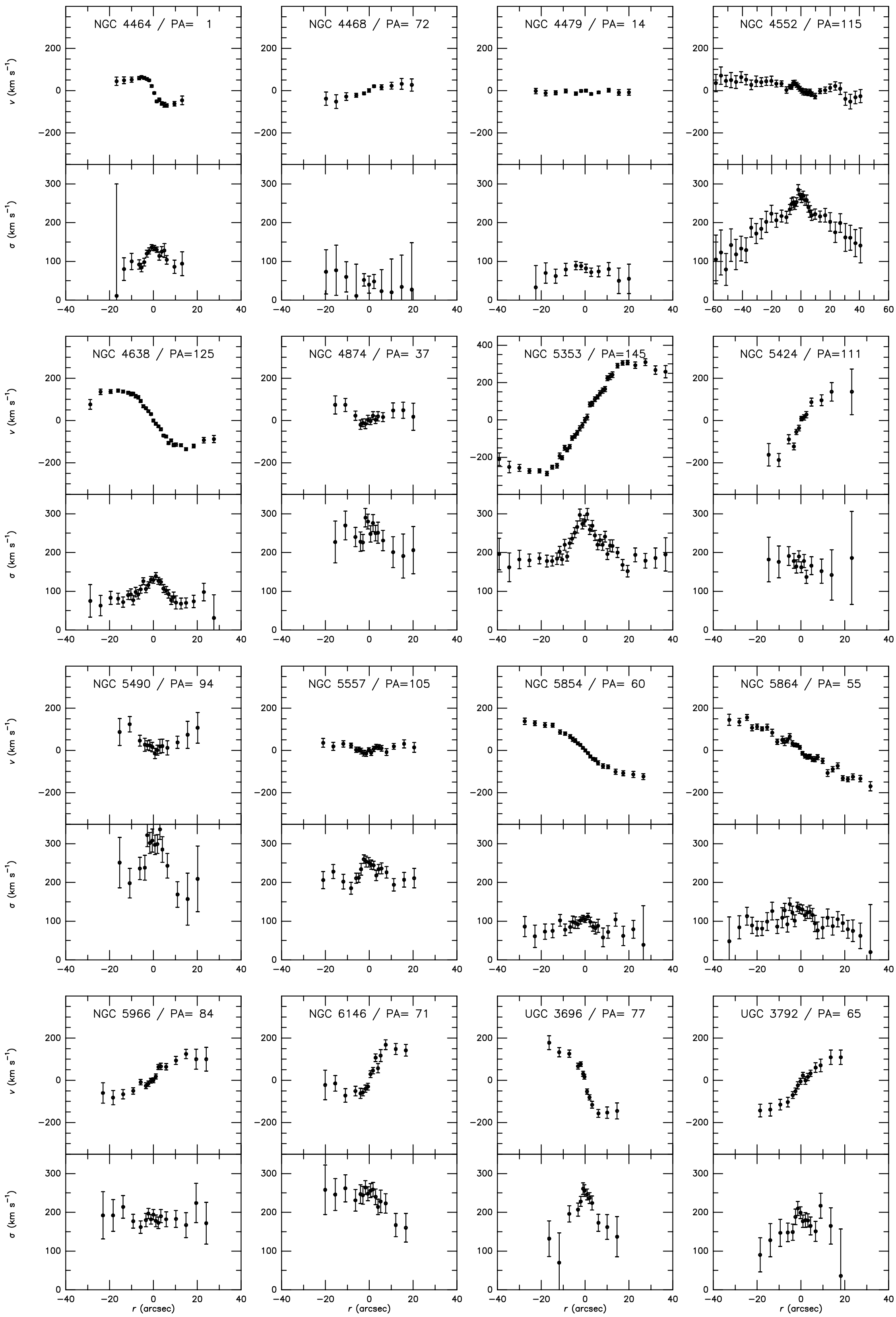

Fig. 1. continued

4. Presentation of the results

Determinations of the heliocentric radial velocity $v_{\rm hel}$, of σ_0, and of $V_{\rm max}$ (together with the corresponding radius $r_{\rm max}$) are listed in Table 3. The $V(r)$ and $\sigma(r)$ profiles are presented in Fig. 1, and also in Table 4, which is proposed in electronic form only. Tables 1 through 4 are available from the CDS.

Our results are summarized as follows:

- We have determined the central velocity dispersion σ_0 for 38 E and S0 galaxies; in the literature (excluding Paper I and all previous measurements by ourselves), σ_0 was still unavailable for three of these objects (NGC 2332, NGC 4479 and UGC 3792).
- For 32 galaxies in our sample, we have been able to measure the $\sigma(r)$ and $V(r)$ profiles along the major axis. For 22 of these, the profiles extend beyond the effective radius. Whenever possible (for 30 galaxies), we have determined the maximum rotation velocity $V_{\rm max}$: this parameter was still unavailable for 27 of these objects.
- In about half a dozen galaxies, there is an apparent asymmetry in the rotation curve; in the particular case of NGC 3921, there is also a clear asymmetry of the photometric profile outside $r \gtrsim 5''$. For three other galaxies (NGC 5490, and, marginally, NGC 4874 and NGC 5557), the rotation looks aberrant in the outer regions, being apparently in opposite sense for $r < 0$ and $r > 0$; deeper spectra would be valuable to settle the question. We note cases of asymmetry in the inner dispersion profiles, and also secondary peaks of $\sigma(r)$ (e.g., NGC 4270, NGC 4435, and NGC 5353), which could be artefacts caused by a strongly non-gaussian LOSVD (line-of-sight velocity distribution).

Acknowledgements. We are endebted to the telescope operators at the Observatoire de Haute-Provence for their continuous support. We are pleased to thank A. Pharasyn for his help during one of the observing runs, and the referee, G. Busarello, for his valuable comments. We have made use of the Lyon-Meudon Extragalactic Database supplied by the *LEDA* team.

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Table 3. Kinematical results

Object	$v_{\rm hel}$	σ_0	$V_{\rm max}$	$r_{\rm max}$
(1)	(2)	(3)	(4)	(5)
NGC 1521	4216 ± 26	233 ± 24	... ± ...	...
NGC 1653	4331 ± 14	245 ± 14	66 ± 23	15
NGC 2329	5794 ± 16	246 ± 15	99 ± 15	20
NGC 2332	5770 ± 23	237 ± 20	... ± ...	...
NGC 2563	4480 ± 18	278 ± 16	109 ± 18	15
NGC 2695	1836 ± 13	222 ± 10	169 ± 16	20
NGC 2986	2329 ± 18	282 ± 12	52 ± 08	08
NGC 3853	3316 ± 13	207 ± 15	$< 25 \pm$ ...	10
NGC 3862	6429 ± 19	254 ± 20	... ± ...	...
NGC 3921	5839 ± 19	186 ± 18	$80? \pm 30$	08
NGC 4270	2357 ± 11	139 ± 12	97 ± 11	24
NGC 4283	1045 ± 14	140 ± 15	... ± ...	...
NGC 4318	1231 ± 09	81 ± 09	75 ± 20	10
NGC 4339	1289 ± 09	111 ± 08	28 ± 11	21
NGC 4340	950 ± 09	118 ± 07	80 ± 11	22
NGC 4429	1106 ± 10	195 ± 08	130 ± 12	43
NGC 4434	1071 ± 10	137 ± 08	43 ± 20	20
NGC 4435	801 ± 10	156 ± 07	152 ± 08	21
NGC 4442	547 ± 11	170 ± 09	113 ± 16	20
NGC 4461	1931 ± 09	150 ± 06	137 ± 08	30
NGC 4464	1287 ± 00	135 ± 07	66 ± 05	05
NGC 4468	909 ± 11	40 ± 22	32 ± 22	20
NGC 4479	876 ± 10	82 ± 11	$< 10 \pm$ ...	...
NGC 4489	971 ± 10	63 ± 13	... ± ...	...
NGC 4552	364 ± 14	268 ± 12	17 ± 10	08
NGC 4638	1164 ± 10	129 ± 08	139 ± 07	17
NGC 4874	7129 ± 24	267 ± 20	... ± ...	...
NGC 4886	6317 ± 14	158 ± 14	... ± ...	...
NGC 5353	2186 ± 16	284 ± 14	298 ± 09	18
NGC 5424	5951 ± 15	168 ± 14	150 ± 34	15
NGC 5490	4855 ± 24	303 ± 29	... ± ...	...
NGC 5557	3213 ± 13	251 ± 11	$< 16 \pm$ ...	...
NGC 5854	1663 ± 10	104 ± 08	128 ± 09	25
NGC 5864	1885 ± 12	131 ± 12	135 ± 15	28
NGC 5966	4474 ± 14	194 ± 13	93 ± 30	18
NGC 6146	8689 ± 18	252 ± 18	110 ± 21	12
UGC 3696	6231 ± 14	253 ± 15	145 ± 19	11
UGC 3792	6178 ± 16	195 ± 15	126 ± 23	18

Notes:
Col. (2): $v_{\rm hel}$, heliocentric radial velocity, in km s^{-1};
Col. (3): σ_0, central velocity dispersion, in km s^{-1};
Col. (4): $V_{\rm max}$, maximum rotation velocity, in km s^{-1};
Col. (5): $r_{\rm max}$, the radius at which $V_{\rm max}$ has been measured, in arcsec.