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DEPENDENCES BETWEEN SOME PARAMETERS OF ACTIVE GALAXIES

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The relative internal rotational moment of galaxies is an important dynamic characteristic. It is associated with the mass, and, respectively, with the linear diameter and the maximum rotational velocity of the galaxy which enables us to study the dependences between the parameters and to compare them with those of galaxies of different morphological type, degree of multiplicity and activity.

This paper presents the results of a statistical study of 165 galaxies with different degrees of activity, including 47 Seyfert galaxies (13 of them being X-ray sources), 84 Markarian, 21 Arakelian and 13 normal galaxies. The galactic masses are determined under the assumption of spherical distribution of matter by using the scheme proposed by Karachentsev [1] and data for the neutral hydrogen line width λ 21 cm, published in the catalogue of Huchtmeier et al. [2]. The relative moment of the galaxy is determined by the relation [3] $Ri = 2/5\ \varepsilon_\tau(\gamma m_{25}\ (A_{25}/2))$ where the coefficient ε_τ changes from 0.1 to 1.0, depending on the morphological type, m_{25} is the galactic mass into the isophote 25 mag/sq. s, A_{25} is the linear diameter up to the indicated isophote and γ is the gravity constant. The linear diameters and luminosities of the galaxies are reduced to Holmberg's system, using the reduction scheme of Karachentsev et al. [4] and the value of the Hubble constant is assumed to be H=75 km/s Mpc.

The dependence between the maximum rotational velocity and the absolute magnitude (V_{niax}/M) for normal galaxies shows a tendency of V_{max} to decrease from early to late morphological types of galaxies. This has been mentioned by Zasov and Kyazou-

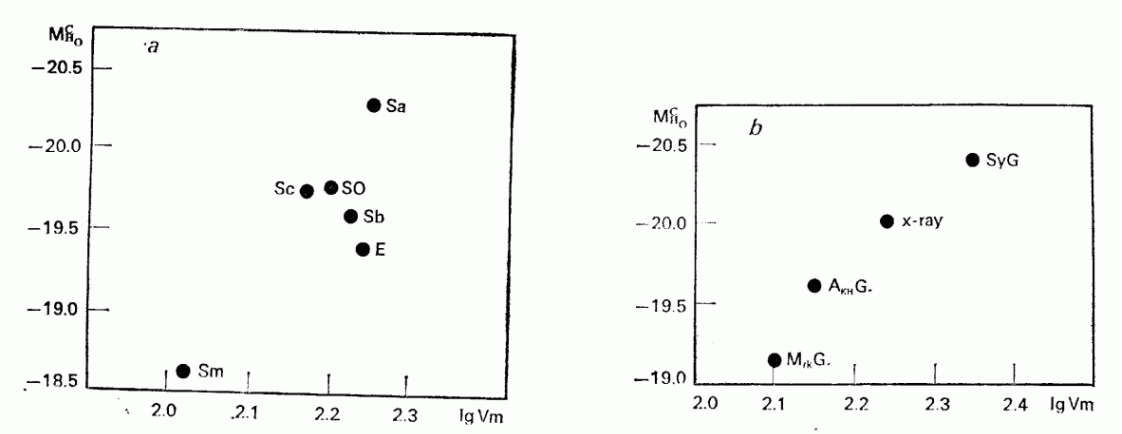

Fig. 1*a*, *b*

Table 1

Mean values and standard deviation of the absolute magnitudes and maximum rotational velocities for galaxies of different morphological type

Type	Sa	Sb	Sc	Sm	SO	E
n	33(1)	44(2)	32	29	17(1)	6
<X>	—20.33	—19.61	—19.75	—18.60	—19.77	-19.41
ΔX	±0.24	±0.26	±0.23	±0-37	±0.47	±0.45
σ	1.40	1.76	1.31	1.97	1.88	1.23
η	32(2)	45(1)	31(1)	29	18	5
X	177.0 ±13.4	168.0 ±12.8	148.8 ±11.8	109.2 ±7.6	158.3 ±23.3	174.0 ±34.5
σ	75.8	86.2	65.6	41.0	98.7	77.1

Table 2

Mean values and their dispersions for the linear diameters, masses and relative momenta for galaxies with different degree of activity

Type		lg A_{25}	lg m	lg R_i
X-ray (13)	X ± σ	1.51 ±0.05 0.18	11.02±0.12 0.43	·006 ±0.06 0.23
SyGl (14)	x± σ	1.45 ±0.07 0.28	11.24±0.12 0.45	·0.04 ±0.09 0.34
SyG2 (17)	χ±	2.11 ±0.71 2.92	11.0 ±0.12 0,51	-0.15 ±0.09 0.38
AknG (21)	x± σ	0.99 ±0.09 0.40	10.29 ±0.14 0.64	·0.74 ±0.12 0.55
MrkG (84)	x± σ	1.06 ±0.05 0.45	10,24 ±0 08 0.72	·0.71 ±0.06 0.60
Norm. (98)	x± σ	1.25 ±0.03 0.28	10.70 ±0.06 0.59	·0.36 ±0.10 0.43

mov [5] and by other authors, as well. Fig. *1a* shows the generalized dependence M_H/V_{max} for 165 active galaxies of different morphological types where is the absolute magnitude in the Holmberg system. The mean values and errors are listed in Table **1** where some extreme values are excluded from the general considerations (shown by brackets after the number of the objects) according to universal statistical criteria [6]; the critical values for n>30 are determined by extrapolation. The results obtained differ from those, obtained for normal galaxies and the above-mentioned tendency has not been observed in active galaxies [5]. It follows from Fig. 1*a* that the spiral galaxies of subtype Sm are, on the average, with lower luminosities and slower rotation. If, however, the same dependence is analyzed for galaxies with different degrees of activity, the picture changes completely (Fig. *1b)*. A fluent increase of the maximum velocity and absolute magnitude is observed with an increase in the degree of activity of the objects. It is interesting to note that the X-ray sources among the Seyfert galaxies are not identified as more active. Probably, the violent processes occurring in the nuclei of the X-ray sources distort the purely rotational motions and lead to lower mean values and the optical magnitude does not reflect visually the integral luminosity of the object.

The mean values and errors of the linear diameters, masses and relative momenta for the studied sample of active galaxies are shown in Table 2. They have been used for comparative study of the dynamic parameters of active and normal galaxies.

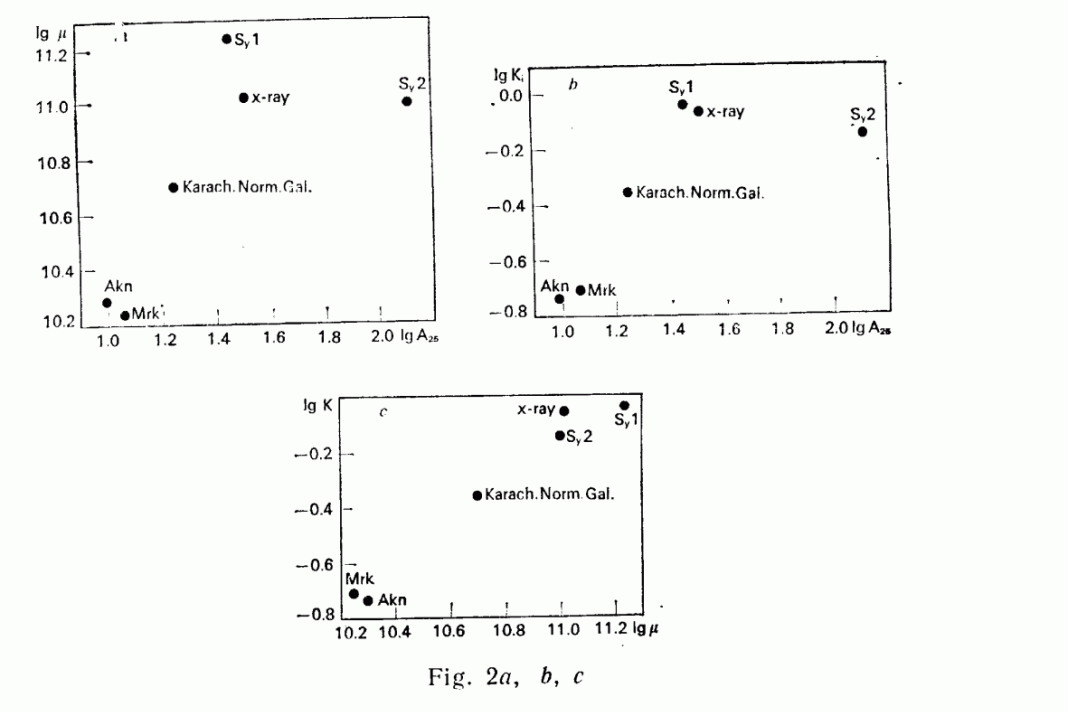

Fig. 2*a*, *b*, *c*

The latter are presented by a sample of 98 Karachentsev's galaxies [1] whose masses was determined by the neutral hydrogen linewidth λ 21 cm. Fig. *2a, b* and *c* shows the dependences Lg m/lgA_{25}, lgk/lgA_{25} and lgk/lgm for galaxies with different degrees of activity. A sharp division between the normal and active galaxies is observed. Fig. *2a* is a clear illustration of a tendency for the Markarian and Arakelian galaxies to be more compact, while the objects with a strong degree of activity —to be among the most massive and largest ones. The latter applies to the almost of Seyfert galaxies of type 2.

A close grouping of Arakelian and Markarian galaxies is also shown. Till now it has been known that about 3% of the Markarian galaxies are high-surface brightness galaxies. The respective mean values of the luminosities of 21 Arakelian and 84 Markarian galaxies are <lgL> = 10.00±0.16, σ=0.72 and <lgL>=9.60±0.15, σ = 1.33. For comparison, the analogous values for the rest galaxies are used: for 13 X-ray sources <lgL> = 10.16±0.14, σ=0.5; for 16 SyG of type 1 <lgL>=10.32±0.14, σ=0.56; for 15 SyG of type 2 <lgL>=10.28±0.14, σ=0.56, and for 98 normal galaxies <lgL>=9.98±0.06."

The obtained active-type dependences show an apparent tendency toward classifying the objects in view of types of activity but, on the other hand, the relatively small sample of galaxies does not make it possible to determine simultaneously the influence of the morphological type, as well.

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