THE STRUCTURE OF GALAXIES AND THEIR NUCLEAR ACTIVITY

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The structure of active galaxies is related to the activity of their nuclei. The activity of galaxies is known to be caused by the processes occurring in their central regions with sizes of less than 10 pc, luminosities of 10^{44} erg/s (exceeding by 3-4 orders of magnitude the typical values for normal galaxies), and masses not exceeding 1% of the total galactic mass.

Nowadays there are two approaches to the problem of active galactic nuclei:

1) all the galaxies suffer rather short-lived nuclear activity on time scales of 10^8 yr;

2) active galaxies represent a special not numerous class of objects and the duration of the active phase is of the order of the galaxy age - 10^{10} yrs.

A sample of Seyfert and normal galaxies of similar morphological types is studied (Afanas'ev, 1983). The main aspects of this study are:

- the construction of a homogeneous sample of objects;
- the use of identical methods on the 6-m telescope
- problems of selection effects.

The parameters of normal and Seyfert galaxies are compared on the basis of the brightness distribution and rotation characteristics in the framework of the Fridman-Morosov model (1973). The galaxy is described by two components: a spherical one with a small rotation moment, a volume density R(r) and a rotating thin disk with a given surface density.

A correlation between volume luminosity of the spherical component and nuclear activity is found. The mass-to-luminosity ratio for the central regions of Seyfert galaxies is comparable with the M/L ratio for normal galaxies of the same morphological types. These objects present a correlation between the volume density of the spherical component and their nuclear activity. In Seyfert galaxies at a distance of 1 kpc from the centre the stellar density reaches 10-60 $M_\odot/pc^3$ and increases with the brightness of the nucleus.

The difference found earlier between the surface brightness

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gradient value for normal and active galaxies (Zasov and Lyuty, 1973) is not confirmed. Normal galaxies are clearly distinguished from the Seyfert ones comparing the volume luminosity I and the angular rotation velocity ω_1 at a distance of 1 kpc from the centre. An asymptotic solution in the galaxy centre of the equilibrium equation for the Fridman-Morosov model gives the following relation between these values:

$$I(s) = \frac{w_1^2(s)}{\pi G f_d} + R(0)\left[\frac{\pi}{f_s} - \frac{4}{3 f_d}\right], \quad s \to 0$$

where f_s and f_d are the mass-to-luminosity ratios for spherical and disk components.

Fig. 1 presents the diagrams $[I(s), \omega_1^2(s)]$ for our sample of Seyfert and normal galaxies ($f_d = 4 f_s$).

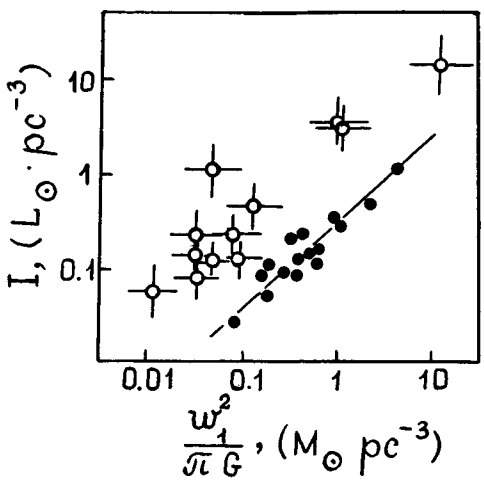

Figure 1. Plot of the volume luminosity I versus the angular rotation velocity ω_1 for galaxies: o - Seyfert; • - normal, s = 1 kpc.

The phenomenon of the nuclear activity is realized in a galaxy through a definite relation between the density of the spherical component and the angular moment of the disk.

Activity is caused by the definite dynamic structure of the galaxy existing for about 10^{10} yrs.

REFERENCES

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