

BULGE AND BAR: A POSSIBLE WAY OF THEIR FORMATION

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Some observational data indicate that galaxy subsystems, including their central areas, first of all are the result of their global nonstationary evolution. That is why we earlier built (Nuritdinov 1992) the exact nonlinearly pulsing rotating models of disklike and spherical self-gravitating systems. Unlike other authors we want to research the stability problem of nonlinear nonstationary models. In the present report we want to give only those results of the instability studied, which have a direct attitude to the subject under discussion. We put a certain question: what initial conditions have to exist, for instance, for the value of the virial parameter $(2T/|U|)_0$ and the parameter of anisotropy $\langle T_r \rangle / \langle T_\perp \rangle$, that the collapse of a disk should result in a bar, and the spherical collapse will result in a thick ellipsoidal bulge. To answer the question it is very important to study stability of the solvable nonlinear unequilibrium models. All models discussed below pulsate under the law $R = \Pi(\psi)R_0$, where (Nuritdinov 1985)

$$\Pi(\psi) = l^{-1}(1 + \lambda \cos \psi), \quad t = l^{-3/2}(t + \lambda \sin \psi), \quad l = 1 - \lambda^2, \quad \lambda = 1 - \left(\frac{2T}{|U}\right)_0$$

In particular, we studied the bar-like instability of constructed by us a pulsating and rotating isotropic disc model. We found a critical dependence of $(2T/|U|)_0$ on the rotation degree. At $(2T/|U|)_0 < 1 - \sqrt{5/8}$ there is the radial orbits instability. We can formulate, for example, a formation criterion of a bar-like galaxy SB: the initial full kinetic energy at moment of the collapse beginning should be less than 10,4% from the potential energy. If this percent is in the interval $(21,5 \div 28,8)$, the bar-like structure is also forming. But the mechanism of this structure is connected with oscillatory and resonance instability.

The formation mechanism of the galactic bulges seems not an only one. But it is undoubtedly that a bulge is thought to result from a nonstationary evolution at a period of the galactic collapse. With the standpoint of

the theory it is also possible to apply here the formation criterion of the ellipticals, but it is necessary to take a complex multiparametric nonlinear model. We studied instabilities in a composite nonstationary model, which depends of three parameters.

References

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