European Journal of Research volume 8 issue 6 2023 pages 73-77

STUDY OF THE PULSATION STATE OF THE KAMM MODEL AND SMALL DISTURBANCE IN ITS BACKGROUND

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Abstract: A number of authors have previously fully studied the gravitational instability of the equilibrium Camm model, but a pulsating case has so far been sudied partially. In this thesis sn analysis of a small – scale model in a pulsating model is performed. In order to find the critical diagram between two parametrs of the model, a nonstationary pulsating system is considered. The instability increments for the pulsating system are calculated

Keywords: galaxies, Kamm’s model.

INTRODUCTION

In the modern era of astronomy and astrophysics, first of all, outer astronomy from our galaxy is studied, where extremely great discoveries lie, the evolution of the galaxy and the emergence of its large-scale structure, the evolution of the universe takes an important place. Also, studying the initial stage of the formation of galaxies, i.e. when they become unstable, under what initial conditions do galaxies appear.

In the study of the formation of galaxies and their large-scale structure, first of all, the early evolution of the galaxy is considered. The early evolution of a galaxy includes a collapsing or pulsating system. In order to study such systems, it is first necessary to create their models, and then with the help of numerical experiments on the computer, its instability or stability is calculated. We are required to construct a pulsating model of the non-equilibrium model.

Model selection

One of the main problems of modern cosmogony is the problem of the origin and evolution of the main compounds of the Universe - galaxies. We know from observations that there are many types of galaxies morphologically, that is, from their

ISSN 2521-3261 (Online)/ ISSN 2521-3253 (Print)
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external appearance. A natural question arises from this - what could have caused their origin and formation? In this, physical models of the studied objects are created and their changes under the influence of various physical conditions are analyzed and a conclusion is drawn by comparison with the observational data. In this regard, the world's leading scientific research institutions mainly create numerical models and study them through computer experiments. Such experiments are distinguished by their demonstration. That is, the results are visible directly on the computer screen. However, in such a direction of assumptions, important events and effects that may occur during the evolution of galaxies may be overlooked.

In this work, we consider a non-stationary version of the steady-state Kamm model. We are talking about the nonlinear pulsation of the Kamm model in the equilibrium state. If we conduct research on the stationary version of the Kamm model, we have to take into account that it is difficult by its nature compared to other non-stationary models. Therefore, before analyzing this pulsating Kamm model, we should take into account its following properties.

The general feature of the turbulence potential: in the non-stationary model we built, like the stationary model, in order to find the non-stationary dispersion equation, we need to take into account whether the initial form of the potential turbulence is sectoral or zonal harmonics.

From here we know that the model under study is spherically symmetric. But if we take into account the rotation property of the model, the main function requires finding the non-stationary dispersion equation.

We can easily find the spatial density of a pulsating system..

$$\Psi(r, v_r, v_\perp, t) = \rho\Pi^4/(\pi^2 R^2 \Omega_0^2) \cdot f^{-1/2} \cdot \chi(f), \qquad (1)$$

Here

$$f = (1 - r^2/R^2) \cdot (\Omega_0^2 R^2/\Pi^4 - v_\perp^2) - \{v_r + \Omega_0 \lambda \cdot \sin\varphi \cdot r/[(1-\lambda^2)^{1/2} \cdot \Pi^2]\}^2. \qquad (2)$$

(1) function $\rho = \int \Psi d\vec{v}$ satisfies the condition

ISSN 2521-3261 (Online)/ ISSN 2521-3253 (Print)
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The rotational property: exactly in the nonlinear pulsating model we are looking at, corresponds to a specific perturbation potential at each azimuthal wavenumber and has the following form for volume and surface oscillations

$$r^{n} \cdot e^{im\varphi} \cdot P_n^m(\cos\theta), \qquad r^{N} \cdot e^{im\varphi} \cdot P_n^m(\cos\theta) \quad (3)$$

When analyzing a non-rotating model, the azimuthal indicator m in the function $P_n^m(\cos\theta)$ does not affect the increment, and it can also be written in a different form of the function $P_n^m(\cos\theta)$. If we were to determine individual harmonics, we would have to calculate the sum of m for all the models we saw above.

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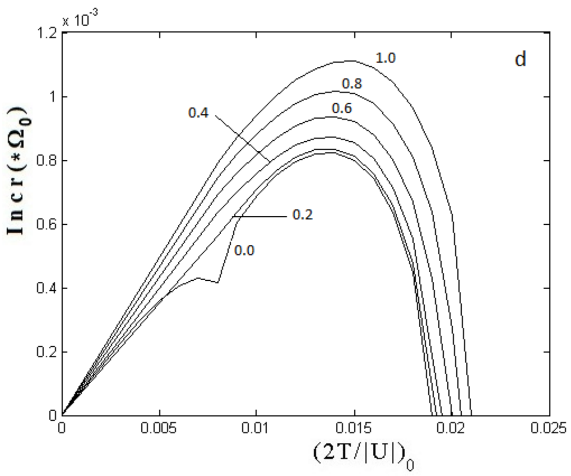
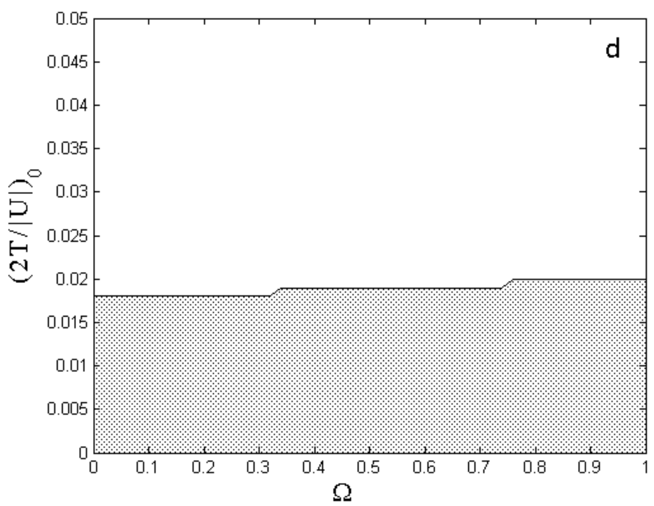
We calculated 16 equations using Legendre's formula to construct the dispersion equation, and this gives the results obtained for the real part of the dispersion equation. In addition, we found 16 equations for the abstract part. Putting these equations into a Fortran program, we got the results and plotted the relationship between the increment and the virial parameter.





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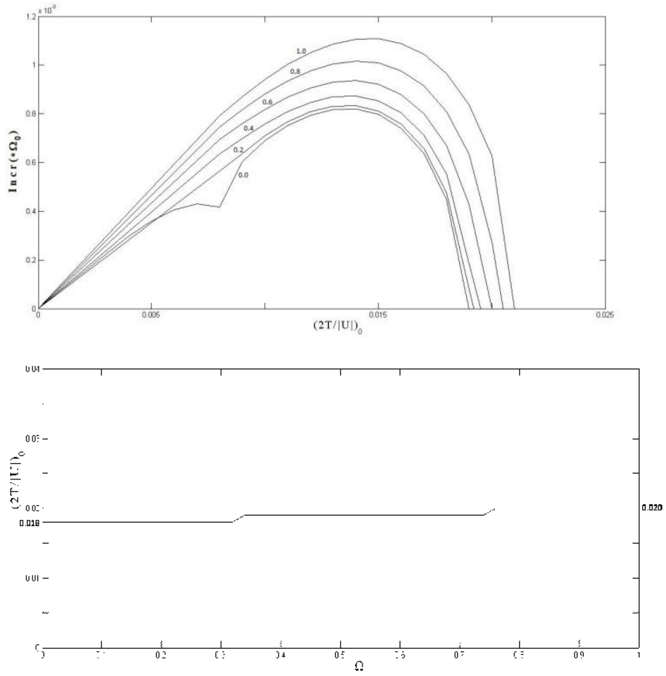

Figure.1. Critical diagramm

From the obtained results, a critical diagram was made: the area painted in black is the unstable area, the unpainted area is the stable area.

Conclusions

To calculate the vibration modes, a nonlinear unbalance structured model was studied. The nonlinear pulsating Einstein sphere was compared to the pulsating state of the Kamm model. Spatial and surface perturbations from the nonlinear pulsation background were considered and compared. Mode (3;1) was considered using the dispersion equation for the pulsating non-stationary state of the Kamm model. Using the dispersion equation (16;10) for the pulsating non-stationary state of the Kamm model, the mode theoretical calculation results were obtained and compared with other modes.

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