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Investigation of spherical waves propagation in a slow-flowing gravitational compressed spheroidal body

A.M.Krot

United Institute of Informatics Problems of National Academy of Sciences of Belarus
(alxkrot@newman.bas-net.by / Fax: (375 17) 331 84 03)

The statistical theory for a cosmological body forming (so-called the spheroidal body model) has been proposed in the works [1]-[4]. Within the framework of this theory, gravitating bodies have fuzzy outlines, and they are represented by means of spheroidal forms. A slowly evolving in time process of a gravitational compression of a spheroidal body (close to an unstable mechanical equilibrium state) has been investigated in [2]. The proposed theory follows from the conception for forming a spheroidal body as a cosmological body (in particular, proto-Sun) inside a gas-dust nebula (protoplanetary cloud); it permits to derive the form of distribution functions for an immovable spheroidal body and rotating one (as well as their mass density, potential and strength of gravitational field) [1], [2] and also to find the distribution function of specific angular momentum for a rotating spheroidal body [3], [4].

This work considers a slowly evolving process of gravitational condensation of a spheroidal body from an infinitely distributed gas-dust substance in space. The equation for an initial evolution of distribution function of a gas-dust cloud is derived here. It is found this equation coincides completely with the analogous equation for a slowly gravitational compressed spheroidal body [2].

The first equation for spherical waves in a spheroidal body is obtained relatively a strength vector of gravitational field. We suppose that a spheroidal body as a system in homogeneous limit case ($\frac{\partial \vec{a}}{\partial r} = 0; r = r_*$) has two stable solutions $\vec{a}^{(1)}(r,t)$, $\vec{a}^{(2)}(r,t)$ and one instable solution $\vec{a}^{(3)}(r,t)$. Analogously to [5] we seek solutions corresponding the bigger magnitude $\vec{a}^{(2)}$ in the left part $(r_2 = 0)$and the smaller one

$\vec{a}^{(1)}$in the right part$(r_1 = \infty)$. There becomes a long transient domain (a wave front) between the states $\vec{a}^{(1)}$ and $\vec{a}^{(2)}$. A location $R$of wave front can be determined (by analogy with [5]) as a value r when the strength magnitude corresponds a mean (instable) stationary magnitude $\vec{a}^{(3)}$, i.e. $\vec{a}(R,t) = \vec{a}^{(3)}$. Then the velocity of wave front propagation is to be found by differentiation of this obtained equation. Taking into account the first equation for spherical waves together with the definition of velocity of wave front propagation we obtain the equation of wave front motion in a slowly gravitational compressed spheroidal body under consideration.

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