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The equation for evolution of distribution function of a gas-dust proto-planetary cloud and its application for Solar system formation modeling

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According to the Titius-Bode's low there are theories for exploring Solar system formation: electromagnetic, gravitational and hydrodynamic (nebular) theories [1]-[4].

In spite of great number of work aimed to exploring formation of the Solar system, however, the mentioned theories were not able to explain all phenomena completely. In this connection *the statistical theory* for a cosmological body forming (so-called the spheroidal body model) has been proposed in [5]-[13]. Within the framework of this theory, bodies have fuzzy outlines and are represented by means of spheroidal forms. In the work [7], which is a continuation of the papers [5], [6], it has been investigated a slowly evolving in time process of a gravitational compression of a spheroidal body close to an unstable mechanic equilibrium state.

The proposed theory follows from the conception for forming a spheroidal body as a protoplanet from planetary nebula; it permits to derive the form of distribution functions for an immovable spheroidal body [5]-[7] and rotating one [11]-[14] as well as their density masses (gravitational potentials and strengths) and also to find the distribution function of specific angular momentum for the rotating spheroidal body [14], [15].

It has been shown by Jeans [2], the important low of statistical mechanics can be obtained from equation for evolution of distribution function of a dust-like substance. However, it has not been solved the main problem of self-tightening an infinitely distributed substance within the framework of Jeans theory [4]. In this connection this work explains a slowly evolving process of gravitational formation of a spheroidal body from an infinitely distributed substance. The equation for initial evolution of distribution function of a gas-dust protoplanetary cloud is derived for the Jeans distribution function [2]. This equation coincides completely with the analogous equation for a slowly compressed spheroidal body [7], [8]. The proposed theory is applied to exploring formation of planets of Solar system.

As a result, the obtained low for Solar system planetary distances generalizes the well-known Schmidt low [3]. The new low gives a very good estimation of real planetary distances in Solar system (the relative error of estimation is 0%; absolute error of estimation is 0.5% besides its maximal value is equal to 5% for Earth) [14]. Moreover, the proposed low shows that Pluto is not a result of Solar system forming.

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