Geophysical Research Abstracts, Vol. 8, 00216, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00216

The statistical approach to exploring formation of Solar system

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Kant (1755) and Laplace (1796) built own hypothesis on the idea of Sun and planets forming from a scattered substance in space. It is well known the main difficulty of the Kant-Laplace hypothesis consists in exploring appearance of angular momentum. The next step in cosmogony was a Jeans hypothesis. Beginning with 40-years of XX the great works have been carried out in cosmogony (e.g., Veizsacker (1943), Schmidt (1944)). In particular, academician O. Schmidt (1944) proposed a model [1] to origin of planets and their satellites based on statistical low of distribution of specific angular momentum. However, Schmidt's model was not able to explore the origin of gas-dust cloud around Sun. In the past years modified models for planets forming have been proposed. In this connection the aim of this report is to develop a more realistic model for origin of planetary system (in particular, Solar system).

A new statistical model of the gravitational interaction of particles has been proposed in [2], [3]. Within the framework of this model, bodies have fuzzy outlines and are represented by means of spheroidal forms, i.e. as *spheroidal bodies* [2]-[5]. This work considers a representation for planetary systems forming based on statistical model of gravitating and rotating spheroidal body. Since a formation of planetary systems is determined by the distribution of densities and velocity of matter, the main result of this paper is to reveal the function of particle distribution in space as well as the function of distribution of specific angular momentum for gravitating and rotating spheroidal body.

The principal conclusion resulting from the statistical model considered is that gravitating bodies have indistinct contours. It is necessary to note that some arguments in favor of the existence of fuzzy borders were partly expressed in a number of works.

Thus, A.S.Eddington [6], considering Schwarzschild's solution of Einstein equations for a homogeneous liquid sphere, pointed out that "… It is most regretful that it is for large spheres that the solution stops being real, for *the existence of the upper border* for spheres is one of the most interesting points of the whole problem",…then Ya.B.Zeldovich and I.D.Novikov, investigating in [7] the statistical characteristics of star substance distribution, noted that "the definition being unsatisfactory is the fact that a sphere *with a distinct border* is taken. …It is necessary to introduce a weight function equal to 1 inside the sphere and decreasing smoothly to the edges, "blurring" thereby the distinctness of the border".

It should be noted that according to the statistical model of a slow gravitational interaction of a dust-like body particles, the notion of "distinctness" or "blurring" of borders of gravitating bodies is highly relative. Thus, a gravitating body has a distinctly outlined shape, if the potential energy of the gravitational interaction of its particles is sufficiently great, the body mass itself and the masses of particles forming it being relatively small. In connection with this, ordinary macroscopic bodies have distinct contours due to their relatively small masses, whereas giant cosmic objects have fuzzy ones because of their huge masses and a vast number of particles forming them. Thus, the principal provisions of the statistical model of particle gravitational interaction can be used as a basis of investigating the structure and evolution of large cosmic objects (stars and planetary systems).

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