MULTI-FACTOR ANALYSIS OF ASTROPHYSICAL PARAMETERS FOR CIRCUMLUNAR AND CIRCUMSOLAR METEOROIDS AND STUDY OF THEIR GENETIC CONNECTIONS

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Introduction: The analysis of meteoroid dynamics is an important direction in the study of evolutionary processes in the Solar System. The majority of NEOs reach the orbits with small perihelion distance, and this also applies to the near-Moon objects (NMO). The evolution of asteroids in the solar neighborhood is supposed to play a significant role in the formation of physical properties, distribution for size, and dynamic features of NEOs [1]. Near-Sun objects (NSO) may achieve equilibrium temperatures high enough to change surface as a result of thermal breaks, drying, and decomposition of hydrated silicates. When an NSO moves near the Sun, it is exposed to significant tidal and thermal influences and also interacts with the solar atmosphere at rather small heliocentric distances [2]. These physical phenomena must change the surface of the NSO substantially and probably lead to its disintegration or full collapse. The study of these processes is considered in the paper.

Methods: The study of activity of NMO allows investigating the subtle structure of meteor showers. Currently, various aspects of meteoroids' collisions with the Moon are being intensively analyzed. Falls of meteorites lead to the increase in alkaline metals (Na and K) content in the lunar exosphere [3]. When the main meteor showers are at the stage of activity, the dust particle content in the lunar atmosphere increases [4]. It means at least a part of the dust particles are brought to the lunar atmosphere when meteoroids fall. The processing of the observations of dust clouds generated at meteoroid falls on the Moon is going to be carried out with standard methods used for plotting light curves of optical flashes on the Moon. When constructing a model of equilibrium composition of impact steam formed after large meteoroids collide with the Moon, the method based on using the maximum entropy principle is planned to be applied [5]. The study of MHD-formations was conducted using flicker-noise spectroscopy and the new method of multi-parametric analysis [6].

Results: To analyze and simulate the dynamic processes related to NMO, the interrelated tasks on the study of meteoroid environment, its influence on physical and chemical properties of the Moon using the seismic data, determination of lunar meteorite bombardment intensity, and investigation of subtle effect of the lunar spin-orbital dynamics were solved. NSO include objects that are located or have been moving on orbits with perihelion distances $q < 0.1$ AU. To study NSO, MHD-formations were analyzed and a method of constructing a simulation model of NSO accounting astrophysical parameters of these objects, their distribution for size, and dynamic behavior in space was developed [7].

Discussion: It should be noted that the Moon acts as a huge meteoroid detector [8]. This allows studying the distribution of large impactors for size and collisions with the Moon rate. Besides, the study of NMO activity also allows investigating the subtle structure of meteor showers. On the other hand, properties of NSO are related to solar wind influence, and its parameters at distances greater than 0.3 AU would significantly further understanding of the influence of the varying solar magnetic field on the structure and dynamics of corona and solar wind. However, the corona's heating and acceleration resulting in the generation of solar wind are still unexplained.

Conclusions: The results obtained in the paper will allow creating and analyzing physical models and long-term processes caused by tidal evolution and meteoroids' interaction with planets and other small bodies using the new parameters [9]. The produced methods and software are going to be in demand for the reduction of both existing and new data obtained in space missions [10].

Acknowledgements: The work is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University, was supported by scholarship of the President of the RF CP-3225.2018.3; by the RFBR grant nos. 18-32-00895 mol_a, and by the Foundation for the Advancement of Theoretical Physics and Mathematics "BASIS".

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