IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Gravity and Fundamental Physics (1)

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MATHEMATICAL MODELING OF TWO GRAVITATING CLOUDS COLLISION

Abstract

Flows of high energy and cold plasma, as well as gas / dust flows in the interstellar medium, form the space-time structure of the Universe. Collisions between molecular clouds and the interaction of the latter with a strong shock wave, which is, for example, the result of a Supernova explosion, are proposed as key mechanisms for launching protostars that appear in areas of strong compression. The paper presents the results of mathematical modeling of the processes of formation of super-dense clots (proto nuclear), as well as the formation of thin film structures - filaments. Numerical simulations of collisions of two dissimilar (in size, displacement, and internal distribution of matter) spherical clouds were performed under different scenarios on high-resolution grids containing several billion nodes. The author's program based on a high-resolution difference scheme in a three-dimensional setting was created to simulate the fine structure that occurs during a shock interaction with molecular clouds. The shape of the structure and vibrations in the impact core depend on the initial conditions of the collision. The paper presents a morphological analysis of the redistribution of dense inclusions in a layer of shock-compressed gas and generated filaments. The mechanism of perturbations and turbulence of the substance, fragmentation and destruction of molecular clouds is revealed. As a result of the calculations, coherent radiation was detected, which occurs during the penetration of one molecular cloud into another. These numerical results are confirmed by the experimental detection of the source of coherent radiation that occurs during the interaction of molecular clouds. This radiation was detected as a result of observations of the interaction of molecular clouds in the constellation Orion and published in the journal Nature.

Russian basic research foundation (project code 19-29-09070) is acknowledged for financial support.