COMPLEX APPROACH TO THE PROBLEM OF NUMERICAL INVESTIGATION OF THE SHOCK WAVE – DENSE PARTICLES CLOUD INTERACTION

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Abstract: The problem of interaction between a planar shock wave and a cloud of particles is solved using two approaches. In the first, two-dimensional (2D) gasdynamic modeling of the interaction of a planar shock wave with Mach number 1.67 with a set of cylinders is carried out. The authors' original numerical algorithm, a Cartesian grid method, is used. The set of cylinders models a dense cloud of particles with the volume fraction of 0.15. As a result of interaction, the collective reflected and transmitted waves are formed. In the second approach, the one-dimensional (1D) system of equations governing dense two-phase flows is solved. The results of 1D modeling are compared with the cross-section averaged pressure distribution obtained in the 2D calculation. The quantitative agreement is achieved. The specific features of the process are discussed. The idea of a combined approach to the investigation of shock–cloud interaction has been formulated based on getting the particles' drag coefficient from the results of multidimensional calculations and using it in the two-phase model.

Keywords: shock wave; particles cloud; mathematical modeling; Cartesian grid method; two-fluid model

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