

SIMILARITY SOLUTIONS FOR CYLINDRICAL SHOCK WAVE IN SELF-GRAVITATING NON-IDEAL GAS WITH AXIAL MAGNETIC FIELD: ISOTHERMAL FLOW

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Abstract

The purpose of this study is to obtain the solution using the Lie group of symmetry method for the problem of propagating magnetogasdynamic strong cylindrical shock wave in a self-gravitating non-ideal gas with the magnetic field which is taken to be axial. Here, isothermal flow is considered. In the undisturbed medium, varying magnetic field and density are taken. Out of four different cases, only three cases yield the similarity solutions. Numerical computations have been performed for the cases of power-law and exponential law shock paths, to find out the behavior of flow variables in the flow-field immediately behind the shock. Similarity solutions are carried out by taking arbitrary constants in the expressions of infinitesimals of the Lie group of transformations. Also, the study of the present work provides a clear picture of whether and how the variations in the non-ideal parameter of the gas, Alfven-Mach number, adiabatic exponent, ambient magnetic field variation index and gravitational parameter affect the propagation of shock and the flow behind it. Software package “MATLAB” is used for all the computations.

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