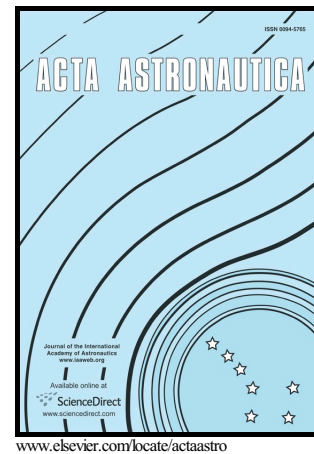


# Author's Accepted Manuscript

Propagation of a strong spherical shock wave in a gravitating or non-gravitating dusty gas with exponentially varying density

G. Nath, J.P. Vishwakarma



PII: S0094-5765(16)30246-6  
DOI: <http://dx.doi.org/10.1016/j.actaastro.2016.03.009>  
Reference: AA5740

To appear in: *Acta Astronautica*

Received date: 6 June 2015  
Revised date: 8 March 2016  
Accepted date: 11 March 2016

Cite this article as: G. Nath and J.P. Vishwakarma, Propagation of a strong spherical shock wave in a gravitating or non-gravitating dusty gas with exponentially varying density, *Acta Astronautica* <http://dx.doi.org/10.1016/j.actaastro.2016.03.009>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

# Propagation of a strong spherical shock wave in a gravitating or non-gravitating dusty gas with exponentially varying density

G. Nath<sup>a1</sup>, J. P. Vishwakarma<sup>b1</sup>

<sup>a</sup>Department of Mathematics, Motilal Nehru National Institute of Technology  
Allahabad-211004, India

<sup>b</sup>Department of Mathematics and Statistics, D. D. U. Gorakhpur University, Gorakhpur-  
273009 India

gn\_chaurasia\_univgkp@yahoo.in  
gnath@mnnit.ac.in  
jpv\_univgkp@yahoo.com

## Abstract

The propagation of a strong spherical shock wave in a dusty gas with or without self-gravitational effects is investigated in the case of isothermal and adiabatic flows. The dusty gas is assumed to be a mixture of small solid particles and perfect gas. The equilibrium flow conditions are assumed to be maintained, and the density of the mixture is assumed to be varying and obeying an exponential law. Non-similarity solutions are obtained and the effects of variations of the mass concentration of solid particles in the mixture and the ratio of the density of solid particles to the initial density of the gas, and the presence of self-gravitational field on the flow variables are investigated at given times. Our analysis reveals that after inclusion of gravitational field effects surprisingly the shock strength increases and remarkable differences are found in the distribution of flow variables. An increase in time also, increases the shock strength. Further, it is investigated that the consideration of isothermal flow increases the shock strength, and removes the singularity in the density distribution. Also, the presence of gravitational field increases the compressibility of the medium, due to which it is compressed and therefore the distance between the inner contact surface and the shock surface is reduced. The shock waves in self-gravitating dusty gas can be important for description of shocks in supernova explosions, in the study of central part of star burst galaxies, star formation and shocks in stellar explosion, nuclear explosion,

Download English Version:

<https://daneshyari.com/en/article/1714095>

Download Persian Version:

<https://daneshyari.com/article/1714095>

[Daneshyari.com](https://daneshyari.com)