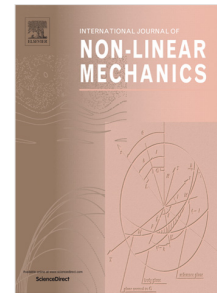


## Accepted Manuscript

Delta shock wave to the compressible fluid flow with the generalized Chaplygin gas

Yicheng Pang, Yu Zhang, Yongsong Wen



PII: S0020-7462(17)30765-5

DOI: <https://doi.org/10.1016/j.ijnonlinmec.2017.12.014>

Reference: NLM 2957

To appear in: *International Journal of Non-Linear Mechanics*

Received date: 8 November 2017

Revised date: 29 December 2017

Accepted date: 29 December 2017

Please cite this article as: Y. Pang, Y. Zhang, Y. Wen, Delta shock wave to the compressible fluid flow with the generalized Chaplygin gas, *International Journal of Non-Linear Mechanics* (2018), <https://doi.org/10.1016/j.ijnonlinmec.2017.12.014>

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 proof before it is published in its final 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.

# Delta shock wave to the compressible fluid flow with the generalized Chaplygin gas\*

Yicheng Pang<sup>a</sup>, Yu Zhang<sup>b</sup>, Yongsong Wen<sup>a</sup>

*a. School of Mathematics and Statistics, Guizhou University of Finance and Economics, Guiyang 550025, China*

*b. Department of Mathematics, Yunnan Normal University, Kunming 650500, China*

**Abstract:** We concern with the Riemann problem the compressible fluid flow with the generalized Chaplygin gas. With the analysis on the phase plane, we rigorously confirm the occurrence of delta shock wave with Dirac delta function in density. Then the formation mechanism, generalized Rankine-Hugoniot relation and entropy condition for the delta shock wave are clarified. Based on these preparations, five kinds of exact solutions are obtained. Finally, the corresponding numerical results are also presented to illustrate our analysis.

*Keywords:* Delta shock wave; Generalized Chaplygin gas; Compressible fluid flow; Riemann problem.

## 1 Introduction

We consider the one-dimensional compressible fluid flow of the form

$$\begin{cases} \rho_t + (\rho u)_x = 0, \\ u_t + \left( \frac{u^2}{2} + \int^{\rho} \frac{p'(s)}{s} ds \right)_x = 0, \end{cases} \quad (1.1)$$

where the variables  $\rho, u, p$  denote density, velocity and pressure. System (1.1) was first given by Earnshaw [1], and is called as the one-dimensional compressible fluid flow [2]. Besides, this system is also a hydrodynamic limit for the Vlasov equation [3],

---

\* This work is partially supported by the National Natural Science Foundation of China (11661015), the Science and Technology Foundation of Guizhou Province (J[2015]2026), the PhD Research Startup Foundation of Yunnan Normal University (2016zb012) and the Project of High Level Creative Talents in Guizhou Province.

Download English Version:

<https://daneshyari.com/en/article/7174506>

Download Persian Version:

<https://daneshyari.com/article/7174506>

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