

Accepted Manuscript

Lie symmetries and equivalence transformations for the
Barenblatt-Gilman model

T.M. Garrido, A.A. Kasatkin, M.S. Bruzón, R.K. Gazizov

PII: S0377-0427(16)30443-5

DOI: <http://dx.doi.org/10.1016/j.cam.2016.09.023>

Reference: CAM 10811

To appear in: *Journal of Computational and Applied
Mathematics*

Received date: 20 June 2016



Please cite this article as: T.M. Garrido, A.A. Kasatkin, M.S. Bruzón, R.K. Gazizov, Lie symmetries and equivalence transformations for the Barenblatt-Gilman model, *Journal of Computational and Applied Mathematics* (2016), <http://dx.doi.org/10.1016/j.cam.2016.09.023>

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.

Lie symmetries and equivalence transformations for the Barenblatt-Gilman model

T. M. Garrido^{a,*}, A. A. Kasatkin^{b,*}, M. S. Bruzón^{a,*}, R. K. Gazizov^{b,*}

^a*Department of Mathematics, University of Cádiz*

^b*Laboratory of Group Analysis of Mathematical Models in Natural and Engineering Sciences (GAMMETT), Ufa State Aviation Technical University*

Abstract

In this paper we have considered the Barenblatt-Gilman equation which models the nonequilibrium countercurrent capillary impregnation. The equation of this model is a third-order equation and the unknown function concerns to the effective water saturation.

We have applied the classical method to get the Lie group classification with respect to unknown function and we have constructed the equivalence transformations. We have also obtained the invariant solutions for some forms of the equation, including travelling wave solutions based on the Jacobi elliptic sine function.

Keywords: Barenblatt-Gilman equation, Lie group analysis, equivalence transformations, travelling wave solutions

1. Introduction

Naturally, the study of partial differential equations plays a vital role in the physical sciences. These equations are often non-linear and solving them requires unique and creative methods. Most well-known techniques have a common feature: they exploit symmetries.

*Corresponding author.

Email addresses: tamara.garrido@uca.es (T. M. Garrido), alexei.kasatkin@mail.ru (A. A. Kasatkin), m.bruzon@uca.es (M. S. Bruzón), gazizov@mail.rb.ru (R. K. Gazizov)

Download English Version:

<https://daneshyari.com/en/article/5776427>

Download Persian Version:

<https://daneshyari.com/article/5776427>

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