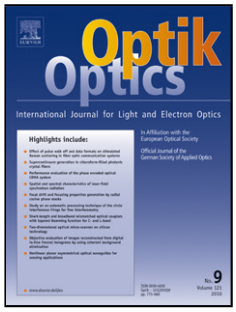

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PII: S0030-4026(16)31256-6
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2016.10.106
Reference: IJLEO 58378

To appear in:

Received date: 21-8-2016
Accepted date: 24-10-2016

Please cite this article as: Qinghua Feng, A new analytical method for seeking traveling wave solutions of space-time fractional partial differential equations arising in mathematical physics, <*![CDATA[Optik - International Journal for Light and Electron Optics]]*> (2016), http://dx.doi.org/10.1016/j.ijleo.2016.10.106

A new analytical method for seeking traveling wave solutions of space-time fractional partial differential equations arising in mathematical physics

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Abstract

In this paper, based a new fractional sub-equation and the properties of the modified Riemann-Liouville fractional derivative, we propose a new analytical method named improved fractional $(\frac{D^{\alpha}G}{G})$ method for seeking traveling wave solutions of space-time fractional partial differential equations, which can be seen as the fractional version of the improved (G'/G) method, and is the improvement of the common fractional $(\frac{D^{\alpha}G}{G})$ method. Due to given traveling wave transformation, one certain space-time fractional fractional partial differential differential equation can be converted into another fractional ordinary differential equation with respect to one new variable. For demonstrating the validity of this method, we apply it to seek exact traveling wave solutions for the (2+1)-dimensional space-time fractional Nizhnik-Novikov-Veselov System and the space-time fractional KP-BBM equation. With the aid of the mathematical software, some new exact traveling wave solutions including solitary wave solutions, periodic wave solutions and solutions with other forms for them are successfully found.

Key words: modified Riemann-Liouville fractional derivative; improved fractional $(\frac{D^{\alpha}G}{G})$ method; space-time fractional partial differential equation; traveling wave solution; space-time fractional KP-BBM equation; space-time fractional Nizhnik-Novikov-Veselov System

1. Introduction

Fractional differential equations have recently proved to be valuable tools to the modeling of many physical phenomena. Recently, Many experts have investigated various aspects of fractional differential