

Accepted Manuscript

Time fractional Cattaneo-Christov anomalous diffusion in comb frame with finite length of fingers

Lin Liu, Liancun Zheng, Fawang Liu

PII: S0167-7322(16)33762-X
DOI: doi: [10.1016/j.molliq.2017.03.034](https://doi.org/10.1016/j.molliq.2017.03.034)
Reference: MOLLIQ 7069
To appear in: *Journal of Molecular Liquids*
Received date: 24 November 2016
Revised date: 3 March 2017
Accepted date: 8 March 2017



Please cite this article as: Lin Liu, Liancun Zheng, Fawang Liu , Time fractional Cattaneo-Christov anomalous diffusion in comb frame with finite length of fingers. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), doi: [10.1016/j.molliq.2017.03.034](https://doi.org/10.1016/j.molliq.2017.03.034)

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.

Time fractional Cattaneo-Christov anomalous diffusion in comb frame with finite length of fingers

Lin Liu ^{a, b}, Liancun Zheng ^{b*}, Fawang Liu ^c

^a School of Mechanical Engineering, University of Science and Technology Beijing,
Beijing 100083, China

^b School of Mathematics and Physics, University of Science and Technology Beijing,
Beijing 100083, China

^c School of Mathematical Sciences, Queensland University of Technology, GPO Box 2434,
Brisbane, Qld. 4001, Australia

Abstract: Fractional Cattaneo-Christov flux model is used in analyzing the anomalous diffusion in comb frame subject to finite length of fingers. Formulated governing equation contains Dirac delta function and mixed partial derivatives. Solutions are obtained by numerical discretization method where the time fractional derivative of order α in $(0, 1]$ is approximated by L1-scheme. The correctness of numerical method is verified by introducing a source item to construct an exact solution. Results show that, when there exists relaxation, the particles distribution displays a parabolic feature with the spatial evolution at small times while a hyperbolic feature appears with a larger relaxation parameter at large times, the particles distribution and the total number of particles on x axis are oscillating with the temporal evolution. Moreover, the effects of involved parameters on dynamic characteristics are graphically analyzed and discussed in detail.

Keywords: Anomalous diffusion, Cattaneo-Christov flux, Comb frame, Fractional derivative.

1. Introduction

Diffusion is one of the most fascinating and important nature phenomena. The study on diffusion [1-3] has attracted a number of scholars' attention and the comb frame [4-5] is one of the classical and useful models to simulate anomalous diffusion, which was originally proposed to mimic percolation clusters [6], consisted of the quasilinear structure and dangling ends. Recently,

*Corresponding author. Tel. (8610)62332891
Email addresses: liancunzheng@ustb.edu.cn

Download English Version:

<https://daneshyari.com/en/article/5408649>

Download Persian Version:

<https://daneshyari.com/article/5408649>

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