



# Comparison of New Iterative Method and Natural Homotopy Perturbation Method for Solving Nonlinear Time-Fractional Wave-Like Equations with Variable Coefficients

A. Khalouta\* and A. Kadem

*Laboratory of Fundamental and Numerical Mathematics,  
Department of Mathematics, Faculty of Sciences,  
Ferhat Abbas Sétif University 1, 19000 Sétif, Algeria.*

Received: June 18, 2018    Revised: January 31, 2019

**Abstract:** In this paper, we present a comparison between the new iterative method (NIM) and the natural homotopy perturbation method (NHPM) for solving nonlinear time-fractional wave-like equations with variable coefficients. The two methods introduced an efficient tool for solving this type of equations. The results show that the NIM has an advantage over the NHPM because it takes less time and uses only the inverse operator to solve the nonlinear problems and there is no need to use any other inverse transform as in the case of NHPM. Numerical examples are presented to illustrate the efficiency and accuracy of the proposed methods.

**Keywords:** *nonlinear time-fractional wave-like equations, Caputo fractional derivative, new iterative method, natural homotopy perturbation method.*

**Mathematics Subject Classification (2010):** Primary 35L05, 35R11; Secondary 35A35, 26A33.

---

\* Corresponding author: <mailto:nadjibkh@yahoo.fr>