People's Democratic Republic of Algeria
Ministry of higher education and scientific research
Mohamed Khider University, Biskra, Algeria
Faculty of Exact Sciences, Natural Sciences and life Sciences
Department of Mathematics

LMA

LMAPO
UNIVERSITY OF BISKRA

CERTIFICATE OF PARTICIPATION

This is to certify that

Bilal BASTI

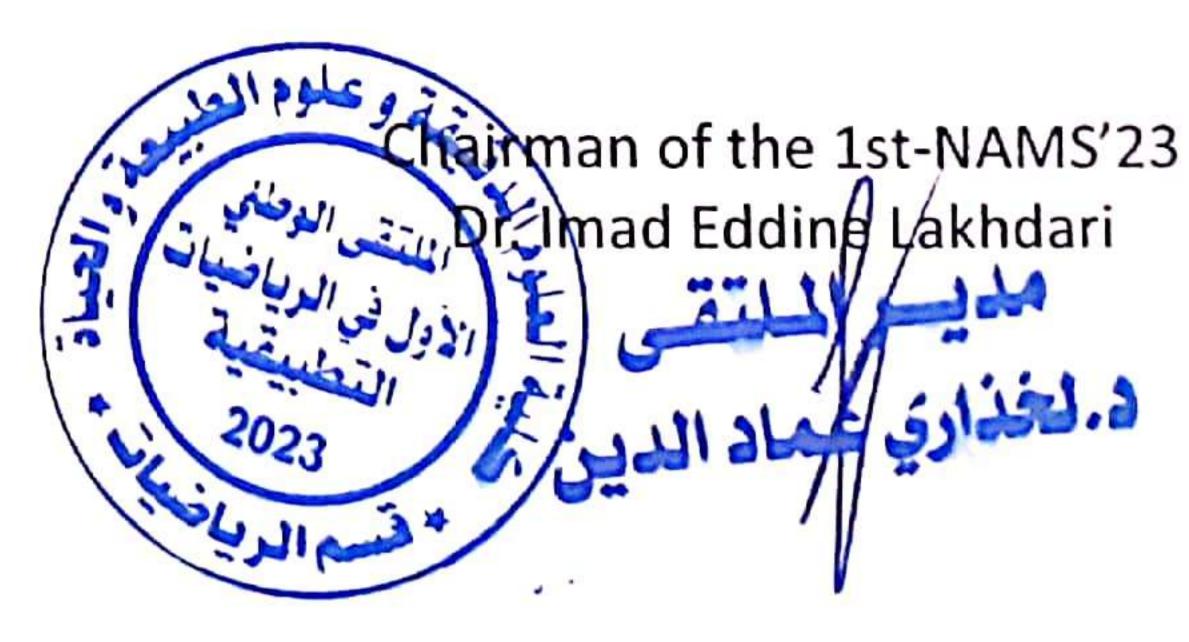Has actively participated in 1-st NAMS'23

Type of Presentation: **Poster**
Paper Authors Names: **Rabah Djemiat**
This certificate is proudly presented to **Bilal BASTI** who has successfully participated in the first National Applied Mathematics Seminar 1st-NAMS'23, 14-15 May, 2023 Biskra, Algeria.
Title: "**Effective results concerning new functional solutions of fractional hyperbolic problems with an inverse source term**"

Biskra, May 14-15, 2023

Chairman of the 1st-NAMS'23
Dr. Imad Eddine Lakhdari

Effective results concerning new functional solutions of fractional hyperbolic problems with an inverse source term

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Abstract

This paper investigates the problem of the existence and uniqueness of one solution under the traveling wave form for a free boundary problem of a space-fractional wave equation with an inverse source term. It does so by applying Banach's fixed point theorem.

Keywords: hyperbolic problem, traveling wave, inverse source term, existence and uniqueness.

1 Introduction

In this work, we shall give an example of a class of well-known fractional-order's PDEs; such the equation which is the space-fractional wave equation and is written as follows:

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^\alpha u}{\partial x^\alpha} + v(x,t), \ c \in \mathbb{R}^*, \ 2 \le \alpha < 3, \tag{1}$$

where $u = u(x,t)$ and $v(x,t)$ are scalar functions of space variables $x \in [ct, X]$ and time $t \in [0, T]$, for $T > 0$ and $X > |c| T$. With

$$\frac{\partial^\alpha u}{\partial x^\alpha} = \begin{cases} \frac{\partial^m u}{\partial x^m}, & \alpha = m \in \mathbb{N}, \\ \frac{\partial^\alpha u}{\partial x^\alpha} = \int_{ct}^x \frac{(x-\tau)^{m-\alpha-1}}{\Gamma(m-\alpha)} \frac{\partial^m}{\partial \tau^m} u(\tau, t) \, d\tau, & m-1 < \alpha < m \in \mathbb{N}^*. \end{cases}$$

The symbol $\mathcal{I}_*^\alpha$ presents the Riemann-Liouville's fractional integral of order α.

Our main goal in this work is to determine the existence, uniqueness and main properties of solutions of the space-fractional PDE (1), under the traveling wave form:

$$u(x,t) = \exp\left(-c^2 t\right) f(x - ct), \ \text{with } c \in \mathbb{R}^*, \tag{2}$$

the basic profile f is not known in advance and is to be identified.

2 Main results

Throughout the rest of this paper, we have:

$$2 \leq \alpha < 3, \ T > 0 \text{ and } X > |c| \, T \text{ for some } c \in \mathbb{R}^*. \tag{3}$$

We discuss the existence and uniqueness of solutions to the following free boundary problem of the space-fractional wave equation:

$$\begin{cases} \frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^\alpha u}{\partial x^\alpha} + v\left(x,t\right), \ \left(x,t\right) \in [ct, X] \times [0,T], \ \ 2 \leq \alpha < 3, \ c \in \mathbb{R}^*, \\ \frac{\partial u}{\partial x}\left(ct,t\right) = \frac{\partial^2 u}{\partial x^2}\left(ct,t\right) = 0, \text{ and } u\left(x,0\right) = f\left(x\right), \ \ f \in C\left([0,\lambda], \mathbb{R}\right), \end{cases} \tag{4}$$

under the traveling wave form (2).

Theorem 1 *Let $\alpha, c, T, X \in \mathbb{R}$, be the real constants given by (3) which satisfy the following inequality:*

$$0 < X + |c| \, T < \left(c^{-2} \Gamma\left(\alpha + 1\right)\right)^{\frac{1}{\alpha}}.$$

If

$$\frac{\alpha\left(X + |c|\,T\right)^\alpha \left[2\left(X + |c|\,T\right)|c| + \alpha - 1\right]}{\Gamma\left(\alpha + 1\right) - c^2\left(X + |c|\,T\right)^\alpha} < \left(X + |c|\,T\right)^2, \tag{5}$$

then the problem (4) admits a unique solution in the traveling wave form (2).

References

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AMS'23

The first National
Applied **M**athematics **S**eminar
2023

May 14 - 15, 2023 Biskra - Algeria

The first National Applied Mathematics Seminar

May 14 -15, 2023

SCIENTIFIC PROGRAM

Sunday, May 14, 2023

- **08h30-09h30 : Welcome Session and Opening Ceremony**
(in Assassi Great Conferences Hall of the University).

Opening Speech
- **Dr. Imad Eddine LAKHDARI, General Conference Chair**
- **Pr. Boubakeur LABED, Director of the LMA Laboratory**
- **Pr. Mokhtar Hafayed, Director of the LMAPO Laboratory**
- **Pr. Abdellah ATTAF, Dean of Faculty**
- **Pr. Mahmoud DEBABECHE, Rector of Biskra University**

Plenary lectures

	Chairman: Prof. Madani MOUSSAI
09h30 – 10h15 : Keynote 1	**Statistique des valeurs extrêmes incomplètes** **Prof. Abdelhakim NECIR, Biskra University**
10h15 - 10h45 :	**Coffee break + Poster Session 1**
	Chairman: Prof. Khaled MELKEMI
10h45 – 11h30 : Keynote 2	**Equation différentielles à coefficients opérateurs et applications concrètes** **Prof. Ahmed MEDEGHRI, National Higher School of Mathematics (NHSM)**
	Chairman: Prof. Zouhir MOKHTARI
11h30 – 12h15 : Keynote 3	**Study of Fractional Evolution Boundary Value Problem with Nonlocal Conditions** **Prof. Ahcene MERAD , Oum El Bouaghi University**

Session I: Statistics of Extremes (Sunday, May 14, 2023) In Conferences Hall, Bahlali Laboratory Center		Session II: Stochastic Analysis (Sunday, May 14, 2023) In Mehda-Conferences Hall, Sciences Faculty	
Chairman: Prof. BRAHIMI Brahim		**Chairman: Prof. GHERBEL Boulakhras**	
14h00 – 14h20	Kernel estimator for the tail index of a right-censored Pareto-type distribution. **SOLTANE L.**, Biskra University	14h00 – 14h20	Weighted exact weak laws. **BERNOU I.**, Tlemcen University
14h20 – 14h40	Bayesian estimation of extropy based on record statistics for Weibull distribution. **ZOUAOUI N-H.**, Biskra University	14h20 – 14h40	The Best and The Worst Equilibrium and The Price of Anarchy. **Khanchouche F.**, Setif University
14h40 – 15h00	Empirical Copula for Twice Censored Data. **TOUMI S.**, Biskra University	14h40 – 15h00	Stochastic optimal control problem of McKean-Vlasov equations with Teugels martingales. **KAOUACHE R.**, Biskra University
Chairman: Prof. YAHIA Djabrane		**Chairman: Prof. KHELFALLAH Nabil**	
15h00 – 15h20	Gaussian approximation to the heavy tail index t-Hill estimator for right-censored Pareto-type distribution. **Brahimi B.**, Biskra University	15h00 – 15h20	Bounds on the stability radius of a class of stochastic systems. **MAISSA K.**, Batna 2 University
15h20 – 15h40	A novel bias reduction method for kernel quantile function estimation at the boundary. **Sayah A.**, Biskra University	15h20 – 15h40	Infinite horizon optimal control of forward-backward stochastic Volterra equations. **YAKHLEF S.**, Biskra University
15h40 – 16h00	Sciences des Données et Intelligence Artificielle. **TERRISSA L-S.**, Biskra University	15h40 – 16h00	Stability result of Lord Shulman thermoelastic system with memory. **BOUDELIOU M.**, Annaba University
Chairman: Prof. CHERFAOUI Mouloud		**Chairman: Pr. CHALA Adel**	
16h00 – 16h20	Probabilistic properties of periodic generalized poisson integer-valued AR process. **SOUAKRI R.**, USTHB Alger	16h00 – 16h20	Improved stochastic fractal search algorithm. **CHAREF KHODJA D.**, Biskra University
16h20 – 16h40	Study of an unreliable M/M/1/N Queue with Various Effects. **AFROUN F.**, Tizi-Ouzou University	16h20 – 16h40	Stochastic optimization estimation and experimental verification for parameter identification applied to induction motor drives. **Houili R.**, Biskra University
16h40 – 17h00	Analysis of an M/M/1 queue with working vacation and interruption vacation and application in NOC network. **AHMEDI EZZOURGUI Z.**, USTHB Alger	16h40 – 17h00	Results on fractional stochastic differential equation. **HAMED I.**, Biskra University
Chairman: Prof. BENATIA Fatah		**Chairman: CHIGHOUB Farid**	
17h00 – 17h20	A method for detecting pollution in dissipative systems with incomplete data. **ELHAMZA B.**, Tebessa University	17h00 – 17h20	Optimal control with regime switching. **TAMER L.**, Biskra University
17h20 – 17h40	Comparison between ARIMA, fractional ARIMA and neural network model. Forecasting Ethereum Capital Market. **SEBA D.**, Bejaia University	17h20 – 17h40	Extended HJB Equations for Solving Time-Inconsistent Problems in SDDEs. **BAHLALI D.**, Biskra University
17h40 – 18h00	Energy decay in a nonlinear wave equation with finite memory. **YOUKANA A.**, Bejaia University	17h40 – 18h00	Risk-sensitive necessary optimality condition for a BSDE driven by fractional Brownian motion. **BOUAZIZ T.**, Biskra University

Session III: Numerical analysis and Operator theory
In ASSASSI Great Conferences Hall
(Sunday, May 14, 2023)

Chairman: Dr. HOUAS Amrane

Time	Title
14h00 – 14h20	Further results on positive strongly p-summing multilinear operators. DJERIBIA O., Laghouat University
14h20 – 14h40	Differential equations of elliptic type with variable operators and homogeneous Robin boundary condition in Lp spaces. HAOUA R., Mostaganem University
14h40 – 15h00	New results on operational second-order differential equations of elliptic type with the integral boundary conditions in Hölder Spaces. CHEGGAG M., Polytechnic School of Oran

Chairman: Prof. KHELIL Naceur

Time	Title
15h00 – 15h20	Numerical study for an integro-differential nonlinear volterra equation. ROUIBAH K., Mila University
15h20 – 15h40	On some properties of Cohen weakly p-nuclear multilinear operators. BELAADA A., M'sila University
15h40 – 16h00	On strictly Lipschitz p-nuclear operators BELAALA M., M'sila Univesrsity

Chairman: Dr. BRAHIMI Mahmoud

Time	Title
16h00 – 16h20	New scheme for image compression. HOUAS A., Biskra University
16h20 – 16h40	Numerical solution of linear Volterra integro-differential equations. REMILI W., Bordj Bou Arreridj University
16h40 – 17h00	Extended spectrum-preserving maps. ZAIZ K., Eloued University

Chairman: Dr. REZKI Brahim

Time	Title
17h00 – 17h20	Numerical simulations for the fractional order generalized Van Der Pol systems. LEJDEL ALI T., Eloued University
17h20 – 17h40	Numerical solution of fractional boundary value problem with Caputo-Fabrizio and its fractional integral. MANSOURI S., Eloued University
17h40 – 18h00	Gradient Neural Network for Solving Linear Equations. KHELIL H., M'sila Univesrsity

Session IV: PDE and Fractional calculus
In Audio-visual Conferences Hall - Computer Department
(Sunday, May 14, 2023)

Chairman: Dr. KACI Fatma

Time	Title
14h00 – 14h20	A stability results by Krasnoselskii's fixed point theorem for FDE with initial conditions on unbounded interval. NAIMI A., Ouargla University
14h20 – 14h40	Existence and uniqueness of solutions for p-Laplacian boundary value problems of weighted impulsive FDE CHABANE F., Ghardaia University
14h40 – 15h00	Blow-up of solutions to a coupled quasilinear viscoelastic wave system with nonlinear damping and source terms. YAZID F., Laghouat University

Chairman: Prof. MENACEUR Tidjani

Time	Title
15h00 – 15h20	Existence results of weak solutions to a nonlinear fractional partial differential system. Abada E. Skikda University
15h20 – 15h40	General decay estimates for a type III thermo-viscoelastic coupled system with infinite memory and boundary interaction feedback. LIMAM A., Tamanghasset University
15h40 – 16h00	Monotone Iterative Method for psi-Caputo FDE with Nonlinear Boundary Conditions. BAITICHE Z., Constantine University

Chairman: Dr. BELAGOUNE Abdelghani

Time	Title
16h00 – 16h20	General decay rate estimate for the energy of a viscoelastic wave equation with fractional delay. AOUNALLAH R., Sidi Belabbes University
16h20 – 16h40	Caputo-Hadamard FDE with four-point boundary conditions. GORINE H., Saida University
16h40 – 17h00	Stability and recovery rate of a modified human immunodeficiency virus dynamic model with recovery rate. ABDESSELAM N., Laghouat University

Chairman: Prof. BERBICHE Mohamed

Time	Title
17h00 – 17h20	A new two dimensional piecewise smooth maps and its applications. MENASRI A., HNSF Khenchela
17h20 – 17h40	Uses of Lyapunov polynomial functional to prove the global existence of reaction diffusion systems. HAOUAM F., Tebessa University
17h40 – 18h00	Abstract FDE with Caputo-Fabrizio Derivative. OULD MELHA K., University of Chlef

Session I: Statistics of Extremes
In Conferences Hall, Bahlali Laboratory Center
(Chairman: Prof. MERAGHNI Djamel)

08h30 – 08h50 : Bias reduction in kernel tail index estimation for randomly truncated Pareto-type data.
MANCER S., Biskra University

08h50 – 09h10 : Panel Data Models and Their Applications
KOUADRIA M., Annaba University

09h10 – 09h30 : A new convex under estimator for univariate functions.
ZERROUKI D., Tizi-Ouzou University

Session II: Stochastic Analysis
In Mehda-Conferences Hall, Sciences Faculty
(Chairman: Dr. TAMER Lazhar)

08h30 – 08h50 : Stochastic control systems driven by G-Brownian motion for the multi-dimensional situation.
DASSA M., Biskra University

08h50 – 09h10 : Contrôle optimal G-stochastique.
GUESRAYA S., Biskra University

09h10 – 09h30 : L^q (q≥2) Solutions of Quadratic Backward Stochastic Differential Equations. **DOUBBAKH S., Biskra University**

Session III: Numerical analysis and Operator theory
In ASSASSI Great Conferences Hall
(Chairman: Prof. SAADI Khelil)

08h30 – 08h50 : Solution bounds of the discrete Lyapunov equation in Hilbert space.
ZAOUIA S., Batna 2 University

08h50 – 09h10 : Global property of the weak solution for a nonlinear wave equation with boundary damping and internal source terms. **BOULMERKA I., Batna 2 University**

09h10 – 09h30 : A new method projective for solution of a semidefinite primal-dual problem. **LAOUAR M., Batna 2 University**

Session IV: PDE and Fractional calculus
In Audio-visual Conferences Hall - Computer Department
(Chairman: Prof. BERBICHE Mohamed)

08h30 – 08h50 : Designing Non-Stationary Biorthogonal Wavelets.
FOURAR Y., Batna University

08h50 – 09h10 : Some results on the boundary stabilization of strings traveling at a constant speed.
SENGOUGA A., M'sila University

09h10 – 09h30 : Some Nonlinear Anisotropic Parabolic Problems with Integrable Data. **HELLAL A., M'sila University**

Plenary lectures

Chairman: Prof. Abdelhakim NECIR

09h30 – 10h15 : Keynote 4
Méthode du noyau pour l'estimation d'une densité : théorie et applications
Prof. Mouloud CHERFAOUI, Biskra University

10h15 - 10h45 :
Coffee break + Poster Session 2

Chairman: Prof. Ahcene MERAD

10h45 – 11h30 : Keynote 5
Aperçu sur la géométrie des espaces de Banach
Prof. Lahcène MEZRAG, M'sila University

Chairman: Prof. Ahmed MEDEGHRI

11h30 – 12h15 : Keynote 6
Composition operators on Sobolev spaces, boundedness and continuity
Prof. Madani MOUSSAI, M'sila University

12h15 – 13h00 :
Seminar Concluding Ceremony

Poster Session 1
Sunday, May 14, 2023

Stochastic Analysis:

1. KORICHI Fatiha, **Biskra University.**
2. BOUKAF Samira, **Mila University.**
3. BEN BRAHIM Hafida, **Biskra University.**
4. LABED Saloua, **Biskra University.**
5. DEROUICHE Farida. **Oum El-Bououaghi University.**
6. MAKHLOUF Khouloud, **Biskra University.**
7. RAHMANI Naceur, **Biskra University.**

Statistics of Extremes:

8. ELBAY Roumaissa, **Biskra University.**
9. KHEMISSI Zahia, **Biskra University.**
10. BOUREDJI Hind, **Biskra University.**
11. KOUIDER Mohamed Ridha, **Biskra University.**

Numerical Analysis, Operator Theory, PDE and Fractional Calculus:

12. MEHAMDIA AbdElhamid, **Souk Ahras University.**
13. DAIRA Ibtissem, **Souk Ahras University.**
14. MALEK Abdelali, **Setif 1 University.**
15. FERRADI Athmane, **M'sila University.**
16. KENOUCHE Samir, **Biskra University.**
17. CHETTOUH Besma, **Biskra University.**
18. KHEZZANI Rimi, **Eloued University.**
19. DJEMAI Samiha, **Setif 1 University**
20. BOUGHAMSA Wissem, **Skikda University.**
21. KHERCHOUCHE Nacereddine, **Biskra University.**
22. MEBARKI Khadidja, **Adrar University.**
23. ZAAMOUNE Faiza, **Biskra University.**
24. LEGOUIRAH Maria, **Biskra University.**
25. HAMDI Soumia, **Biskra University.**
26. MESSAOUDI Hassan, **Souk Ahras University.**

Poster Session 2
Monday, May 15, 2023

Numerical analysis, Operator theory, PDE and Fractional calculus:

1. OUAAR Fatima, **Biskra University.**
2. BENDAHMANE Raouia, **Biskra University.**
3. MAKHELOUFI Hocine, **Mascara University.**
4. SMAIL Sara, **Laghouat University.**
5. ABDENNEBI Issam, **Bordj Bou Arreridj University.**
6. AL-NADHARI Abdulrahman, **Biskra University.**
7. RABIA AFEF AMINA, **Annaba University.**
8. LAADJAL Baya, **Biskra University.**
9. DEROUICHE Djamila, **Khenchela University.**
10. DJEMIAT Rabah, **M'sila University.**
11. BENGUESMIA Amal, **Oum El Bouaghi University.**
12. TEBBA Zakia, **Tebessa University.**
13. CHITA Fouzia, **Khemis Miliana University.**
14. AMMAR Malik, **Biskra University.**
15. BENMESSAOUD Hibaterrahmane, **Laghouat University.**
16. ZEKRI Abdelkrim, **Constantine University.**
17. GARTI Ines, **Biskra University.**
18. ADOUANE Saida, **Biskra University.**
19. BASTI Bilal, **Djelfa University.**
20. ACHOUR Imane, **Biskra University.**
21. NEMER Ahlem, **Biskra University.**
22. DRAIFIA Ala Eddine, **Tebessa University.**
23. SAKER Meriem, **Tebessa University.**
24. LOUCIF Sami, **Tebessa University.**
25. ZIDI Salim, **Tebessa University.**
26. MERAH Yasmine, **Biskra University.**

All posters are displayed in the space allocated in ASSASSI Great Conferences Hall of the University, between: 10h15 - 10h45.