

Curriculum Vitae

Adrien TENDANI-SOLER

Personal informations

Nationality : French

Birth : April 8, 1995 in Bordeaux, France

Mail : adrien.tendani-soler@math.u-bordeaux.fr

Website : <https://atendanisolier.perso.math.cnrs.fr>

Academic informations

Current Position

I am a 3rd year PhD student at Institut de Mathématiques de Bordeaux under the supervision of Sylvain Ervedoza and Marius Paicu

Research interests

Control theory of PDE

- ★ Controllability of quasilinear system with parabolic behavior (parabolic/dispersive)
- ★ Reachable space for linear and nonlinear parabolic systems and the Stokes system

Cauchy theory and smoothing effects

- ★ Existence of weak solutions for equations from fluid mechanics
- ★ Well-posedness for quasilinear parabolic/dispersive system and nonlinear hypoelliptic system
- ★ Smoothing effects and estimates of the radius of analyticity for nonlinear PDE with parabolic behavior (parabolic/dispersive) or with degenerate hypoelliptic diffusion

Geometric analysis

- ★ PDE in the context of sub-Riemannian geometry (the sub-Riemannian Navier-Stokes system)
- ★ Harmonic analysis, Fourier analysis and microlocal analysis on nilpotent Lie groups

Keywords

Equations

- *The compressible Navier-Stokes-Korteweg models* (Local controllability, well-posedness and analytic smoothing effects)
- *The sub-Riemannian Navier-Stokes system* (Global existence of weak solutions, anisotropic weak-strong uniqueness criterion, well-posedness and anisotropic smoothing effects)
- *The Stokes system with non-homogeneous boundary conditions* (Estimate of the reachable space)
- *Heat equation with various perturbations* (Controllability in functional spaces of holomorphic functions and reachable spaces)

Tools

- **For nonlinear PDE** : Paradifferential calculus, Besov spaces and multilinear Calderón-Zygmund theory
- **For control theory of PDE** : Carleman estimates, semi-groups theory and complex analysis
- **For geometric analysis** : Harmonic analysis and microlocal analysis on nilpotent Lie groups, spectral analysis of the sub-Laplacians and subelliptic Sobolev spaces

Education

2021-October 2024. Doctoral degree (University of Bordeaux)

«Smoothing effect, controllability and anisotropy in fluid mechanics» under the supervision of *Sylvain Ervedoza* and *Marius Paicu*

2018-2021. Master degree (University of Bordeaux)

2020-2021. M2 on Analysis, Probability and PDE *with honors*

- (01/02/2021-11/04/2021) Master's thesis «On the radius of analyticity of solutions to semi-linear parabolic systems» under the supervision of *Marius Paicu* (University of Bordeaux)
- (12/04/2021-15/07/2021) Master's thesis «Optimal control of the heat equation» under the supervision of *Jérôme Lohéac* and *Takéo Takahashi* (INRIA Nancy-Grand Est)

2019-2020. M2 «Agrégation de mathématiques» obtained this year

- Master's thesis «Finite group representations, Burnside and Frobenius theorem» under the supervision of *Oliver Brinon* (University of Bordeaux)

2018-2019. M1 on fundamental mathematics

- Internship «Introduction to microlocal analysis» under the supervision of *Laurent Michel*

2015-2018. Licence degree (University of Bordeaux)

2017-2018. L3 on fundamental mathematics

- Internship «Square on finite and p-adic fields» under the supervision of *Arnaud Jehanne* (University of Bordeaux)

2016-2017. L2 on fundamental and applied mathematics

- Internship «Hyperbolic system, Schauder theory and De Giorgi theorem and Strichartz estimates» under the supervision of *David Lannes* (University of Bordeaux)

2015-2016. L1 on Mathematics and informatics

Articles

Published

1. **Analytic regularity for the Navier-Stokes-Korteweg model on pseudo-measure spaces** Dynamics of Partial Differential Equations, Volume 20 number 1, pages 1–21, 2023 (arXiv).

Submitted

2. **Local exact controllability to constant trajectories for the Navier-Stokes-Korteweg model** Submitted in 2023, 36 pages (arXiv).

Work in finalization phase (A preliminary version can be provided upon request)

3. **Sub-Riemannian Navier-Stokes system : Existence, well-posedness and smoothing effects** ~ 59 Pages.
4. **Weak-strong uniqueness and anisotropic framework for the sub-Riemannian Navier-Stokes system on the Heisenberg group** ~ 28 Pages.
5. **On the reachable space for parabolic equations** (with *Sylvain Ervedoza*) ~ 26 Pages.

Teaching

- 2021-2022. «Outils mathématiques» (32h) (mathematical tools) to first year bachelor's degree students (L1).
- 2022-2023. «Outils mathématiques» (32h) and «Mathématiques générales» (32h) (general mathematics) to first year bachelor's degree students (L1)
- 2023-2024. «Outils mathématiques» (32h) to first year bachelor's degree students (L1)

Organization of scientific events

Co-organizer of a reading seminar for PhD students and Postdocs in Analysis and PDE

- 2021-2022 Semester 2. (with *Florent Noisette*) **Riemannian geometry** based on the book «Riemannian Geometry and Geometric Analysis» (Jost)
- 2022-2023 Semester 1. **Microlocal analysis** based on the book «The Analysis of Linear Partial Differential Operators I» (Hörmander)
- 2022-2023 Semester 2. **Dynamic systems** based on the book «Introduction to Dynamical Systems» (Brin and Stuck)

Co-organizer of PDE working group

- 2023-2024 Semester 1. (with *Lois Delande*) Talks given by PhD students and Postdoc from the IMB «PDE and Mathematical Physics» team

Communications

Talks

1. «*Résultats d'existence et de régularité pour le système de Navier-Stokes sous-Riemannien*» **Analysis and PDE Seminar** at CY Cergy Paris University, Cergy-Pontoise, France, 06/05/2024
2. «*On the reachable spaces for some parabolic systems*» **Meeting of the ANR TRECOS**, Nancy, France, 02/04/2024
3. «*Sub-Riemannian fluids*» **Workshop for young researchers in analysis and mathematical physics**, Munich, Germany, 09/10/2023
4. «*Sub-Riemannian Navier-Stokes equation : Well-posedness, smoothing effects and anisotropy*» (Short talks) **MathFlows** at CIRM, Marseille, France, 05/12/2022
5. «*Anisotropic phenomenon dans the sub-Riemannian Navier-Stokes equation*» **Working group Scattering and Stability**, Bordeaux, France, 07/10/2022

6. «*Analytic smoothing effect on Navier-Stokes-Korteweg system and radius of analyticity*» (Short talks) **Mathematical Advances in Geophysical Flows** at CIRM, Marseille, France, 05/04/2022
7. «*Schrödinger's equation : infinite propagation speed and observability on the torus*» **the lambda Seminar** at IMB, Bordeaux, France, 02/03/2022

Poster sessions

1. «*Controllability of Navier-Stokes-Korteweg models*» **Spectral Theory, Control and Inverse problems winter school** at CIRM, Marseille, France, 22/11/2022
2. «*Hidden parabolic properties for the Navier-Stokes-Korteweg system*» **the 11th edition of the MMKT Summer School**, Pesaro, Italy, 15/06/2022

Reviews for Mathematical journals

I was reviewer for the following mathematical journals

Acta Applicandae Mathematicae

Monatshefte für Mathematik

Conferences attended (without talk)

2021

- «Conférence à la mémoire de Geneviève Raugel» in 8-10 Novembre 2021 at Laboratoire mathématique d'Orsay, Orsay, France
- «Analysis and Control of PDE Systems : In honor of Marius TUCSNAK for his 60th birthday» from November 29 -December 1 2021 at IMB, Bordeaux, France

2022

- «Conférence itinérante du GDR» 2-4 February 2022, Vannes, France
- «Journées Jeunes EDPistes 2022» 23-25 March 2022 at Université Claude Bernard Lyon 1, Lyon, France
- «CY Days in Nonlinear Analysis» 28-31 March 2022 at CY Cergy Paris University, Cergy-Pontoise, France
- «ANR Singflows (Mathematical and Numerical Methods for Fluids with Singularities)» 12-14 April 2022 at IMB, Bordeaux, France
- «Nonlinear PDEs in Fluid Dynamics» 9-13 May 2022 at CIRM, Marseille, France
- «Journées EDP 2022» 30 May- 3 June 2022, Obernai, France
- «Summer School on Fluids and Turbulence» 27 June-1 July 2022 at Institut Camille Jordan, Lyon, France
- «The Dirac equation» 6-8 July 2022 at IMB, Bordeaux, France
- «Shocking Developments : New Directions in Compressible and Incompressible Flows : A Conference in Honor of Alexis Vasseur's 50th Birthday» 26-30 June 2022, Leipzig, Germany
- «The 11th edition of the Methods and models of kinetic theory Summer school» 12-18 June 2022, Pesaro, Italy
- «Spectral Theory, Control and Inverse problem» 21–25 November 2022 at CIRM, Marseille, France

2023

- «Conférence itinérante du GDR Analyse des équations aux dérivées partielles» 18-20 January 2023 at University of Nantes, Nantes, France

- «Advances in Nonlinear Analysis and Nonlinear Waves, a conference in honor of Frank Merle» 22-26 May 2023 at IHES, Paris France
- «New Trends in Mathematical Fluid Dynamic» 5-16 June 2023, Grenoble, France
- «Journées EDP 2023» 19-23 June, 2023 at Centre Paul Langevin, Aussois France
- «Summer school on unique continuation and applications» 3-7 July 2023 at Castro Urdiales, Spain
- «Workshop for young researchers in analysis and mathematical physics» 6-12 October 2023, Munich, Germany
- «Analysis, modeling and numerical method for kinetic and related models» 14-15 November 2023 at IMB, Bordeaux, France

2024

- «Journées Jeunes EDPistes 2024» 20-22 Mars 2024 at IMT, Toulouse, France
- «Contrôle et stabilisation d'équations aux dérivées partielles» 2-4 April 2024 at Institut Elie Cartan de Lorraine, Nancy, France
- «Bilbao-Bordeaux workshop on PDE's» 8-9 April 2024 at BCAM, Bilbao, Spain
- «Les Journées EDP 2024» 7-3 June 2024 at Centre Paul Langevin, Aussois, France