Matthieu Ménard — Curriculum vitae

https://webusers.imj-prg.fr/~matthieu.menard/
menard@imj-prg.fr

Positions

IMJ-PRG, Université Paris-Cité, France *2025-Now*
Postdoctoral position, supervised by David Gérard-Varet, Amina Mecherbet, and Franck Sueur.

Université Libre de Bruxelles, Belgique *2023-2025*
Postdoctoral position, supervised by Mitia Duerinckx.

Institut Fourier, Université Grenoble Alpes, France *2020-2023*
PhD student, supervised by Christophe Lacave and Evelyne Miot. My thesis "Mean-field limits in kinetic theory and fluid mechanics" was defended on December 13th, 2023.

Studies

Institut Fourier, Université Grenoble Alpes, Grenoble, France *2020-2023*
PhD in mathematics
Supervised by Christophe Lacave and Evelyne Miot, entitled "Mean-field limits in kinetic theory and fluid mechanics". Defended on December 13th, 2023.

École Normale Superieure, Lyon, France *2016 - 2020*
Master's degree in mathematics 2019-2020
Analysis of partial differential equations.
Master Feadep (Mathematical education) 2018-2019
Agrégation de mathématiques (french national teaching diploma) ranked 28/303.
Bachelor's degree in mathematics - 2017.

Lycee Chateaubriand, Rennes, France *2014-2016*
CPGE MPSI-MP

Research internships

Institut Fourier, Grenoble, France *2020*
Euler equation with point vortices, supervised by Christophe Lacave.

Université Libre de Bruxelles, Bruxelles, Belgium *2018*
Gromov's non-squeezing theorem, supervised by Mélanie Bertelson.

Institut Fourier, Grenoble, France *2017*
Bessel functions, supervised by Catriona McLean.

Articles

Publications

Creation of chaos for interacting Brownian particles - with A. Bernou and M. Duerinckx *Published in 2026*
We study the *creation of chaos* phenomenon for N interacting Brownian particles. For large times, and as N tends to ∞, the particles become independent even if they were correlated at time zero. More precisely, we establish some relaxation estimates for higher-order correlations between the particles. Published in Stochastic Processes and their Applications. Link `https://www.sciencedirect.com/science/article/pii/S0304414925002935` or Arxiv : `https://arxiv.org/abs/2504.09917`.

Bloch-Floquet band gaps for water waves over a periodic bottom - with C. Lacave and C. Sulem *Published in 2025*
We study the spectrum of the Dirichlet-Neumann operator which characterizes the water wave system linearized near equilibrium. We find that in a domain with a small variable periodic bottom, and under some conditions on the bottom variations, the spectrum is composed of bands separated by gaps, with explicit formulas for their sizes and locations. Published in EMS Surveys in mathematical sciences. Link `https://ems.press/journals/emss/articles/14298538` or arxiv : `https://arxiv.org/abs/2403.00114`.

Mean-Field Limit of Point Vortices for the Lake Equations *Published in 2024*
We study the mean-field limit of a system of point vortices for the lake equations using a modulated energy method. Published in Communications in Mathematical Sciences. Link: `https://link.intlpress.com/JDetail/1836149168623136769`

or preprint https://arxiv.org/abs/2309.10453.

Mean-Field Limit Derivation of a Monokinetic Spray Model with Gyroscopic Effects *Published in 2024*

We show the local strong well-posedness and the mean-field limit derivation of a two dimensional spray model with gyroscopic effects (coupled system between the Euler equation and a monokinetic Vlasov-like equation). Published in SIAM Journal on Mathematical Analysis - SIMA. Link: https://epubs.siam.org/doi/full/10.1137/22M1495937 or preprint https://arxiv.org/abs/2204.02145.

Teaching

- Matrices and functions of several variables (second year physics bachelor's) *2022*
- Introduction to numerical analysis (second year mathematics bachelor's) *2022*
- Applied linear algebra (first year physics bachelor's) *2021*
- Introduction to mathematical modeling and to population dynamics (first year biology bachelor's) *2021*
- Mathematical methods for physicists (first year physics bachelor's) *2020*
- Colles in CPGE-MPSI (oral tests for first year students) *2018-2019*

Talks

Partial Differential Equations in Interaction Workshop - Spa, Belgium *December 2025*
Spectral gaps for linearized water waves above a small periodic bottom.

Séminaire Analyse - Université de Nantes *November 2025*
Creation of chaos for interacting Brownian particles.

Séminaire PM-EDP - Université Sorbonne Paris Nord *N - October 2025*
Creation of chaos for interacting Brownian particles.

MathFlows'25 conference - Porquerolles *September 2025*
Spectral gaps for linearized water waves above a small periodic bottom.

Séminaire EDP - Physique Mathématique - Bordeaux *September 2025*
Creation of chaos for interacting Brownian particles.

Séminaire EDPs2 - Chambéry *April 2025*
Creation of chaos for interacting Brownian particles.

Journées Jeunes Edpistes en France - Nice *January 2025*
Creation of chaos for interacting Brownian particles.

Recent Progress in Mean-Field Dynamics - Lyon *December 2024*
The Dean-Kawasaki equation and long-time fluctuations of interacting Brownian particles.

Young Researcher Symposium - Strasbourg *June 2024*
Spectral gaps for linearized water waves above a small periodic bottom (short talk).

Students meet PhDs and Postdocs Seminar - Bruxelles *May 2024*
An introduction to periodic Schrödinger operators.

ANEDP Seminar - Lille *February 2024*
Spectral gaps for linearized water waves above a small periodic bottom.

Order and Randomness in PDEs program - Mittag-Leffler Institute, Djursholm *November 2023*
Spectral gaps for linearized water waves above a small periodic bottom.

Mathematical physics seminar - Grenoble - Institut Fourier *December 2022*
Mean-field limit of point vortices for the lake equations.

Horizons in non-linear PDEs summer school - Ulm, Germany *September 2022*
Mean-field limit derivation of a gyrokinetic spray model (short talk).

"Singflows" conference - Bordeaux *April 2022*
Mean-field limit derivation of a gyrokinetic spray model.

PHD days - Institut Fourier - Grenoble *October 2021*
Interactions of vortex and particles in a two-dimensional fluid.

Conferences attended

Journée EDP du LAMA *2026*
Partial differential equations, Créteil.

Journées "Jeunes Edpistes" *2026*
Partial differential equations, Paris.

Particles in flow *2025*
Summer school, Bonn.

Journées EDP *2025*
Partial differential equations, Aussois.
Fluid solid interactions and related problems *2025*
Cirm, Marseille.
Kinetic theory and fluid mechanics: couplings, scalings and asymptotics *2025*
Cirm, Marseille.
ICMP *2024*
International Congress on Mathematical Physics, Strasbourg.
Journées EDP *2024*
Partial differential equations, Aussois.
Turbulent·e·s *2024*
Wave turbulence, Paris.
Journées "Jeunes Edpistes" *2024*
Partial differential equations, Toulouse.
Advanced Summer School on Mathematical Fluids Dynamics *2023*
Water waves, IESC, Cargèse.
New trends in mathematical fluid dynamics *2023*
Fluid mechanics, Institut Fourier, Grenoble.
Mathflows conference *2022*
Fluid mechanics, Cirm, Marseille.
When kinetic theory meets fluid mechanics *2022*
Summer school in ETH Zurich.
Journées EDP *2022*
Partial differential equations, Obernai.
Journées "Jeunes Edpistes" *2022*
Partial differential equations, Lyon.
Journées EDP Auvergne Rhône-Alpes *2021*
Partial differential equations, Saint-Etienne.
Advanced Summer School On Mathematical Fluids Dynamics *2021*
Geophysical Fluid Dynamics and Wave turbulence, IESC, Cargèse.
Journées EDP *2021*
Partial differential equations, Obernai.
MathsInFluid *2020-2023*
Workshop-Seminar in fluid mechanics, Lyon.
Journées Louis Antoine *2019*
Numerical Analysis, Rennes.
Introductory workshop : Microlocal analysis *2019*
Summer school in MSRI, Berkeley.

Invitations

Université Claude Bernard Lyon 1 *2024*
Invited by Armand Bernou for a week.
Mittag-Leffler Institute, Djursholm *2023*
Invited by Catherine Sulem for a week for the "Order and Randomness in PDEs" program.
University of Toronto *2023*
Invited by Catherine Sulem for two months.

Responsibilities

ULB, Bruxelles *2024-2025*
Co-organizer of the analysis and partial differential equations seminar.
Institut Fourier, Grenoble *2022-2023*
Representative of the PhD students in the administrative council of the research institute.

Languages

French (Native)
English (Professionnal, C1 certification from the *Cambridge English Advanced*)

Popularisation

MathaLyon exhibition *2018*
Mathematical exhibition for middle school students, Lyon.

Jury for TFJM² *2018*
Member of jury for the french tournament for young mathematicians, Lyon.