

Thibault MAUREL OUIJA

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ThibaultMaurelOujia



FORMATION

Doctorat en mathématiques appliquées

Aix-Marseille Université, France

Jan 2021—Juin 2024

Thèse : Sur la dynamique des particules dans la turbulence pleinement développée : Méthodes de tessellation, de multirésolution et d'apprentissage automatique

Encadrants : Prof. Kai Schneider et Dr. Keigo Matsuda

Master en mathématiques appliquées

Aix-Marseille Université, France

Sept 2018—Juin 2020

Licence en mathématiques

Aix-Marseille Université, France

Sept 2015—Juin 2018

EMPLOI

Chercheur Postdoctoral — Bourse Apollo 11

School of Aeronautics and Astronautics, Université de Purdue, IN, USA

Juillet 2024—Décembre 2025

West Lafayette, IN, USA

- Superviseur scientifique :** Prof. Kazuki Maeda
- Description :** Modélisation, simulation et analyse d'écoulements réactifs supersoniques, avec un accent sur les interactions complexes entre ondes de choc et chimie hors équilibre, dans le cadre d'applications en propulsion spatiale et systèmes énergétiques avancés.

Attaché temporaire d'enseignement et de recherche (ATER)

Aix-Marseille Université, France

Sept 2023—Juin 2024

Marseille, France

EXPÉRIENCE DE RECHERCHE

JSPS Short-term Fellowship 2023

JAMSTEC et Université de Nagoya, Japan

Mai 2023—Août 2023

Yokohama et Nagoya, Japan

- Hôtes :** Dr. Keigo Matsuda et Prof. Katsunori Yoshimatsu
- Projet :** Simulations numériques massivement parallèles (HPC) pour étudier la dynamique des particules en turbulence. Développement de codes distribués (MPI), extraction d'informations multiéchelles et intégration de modèles de prédiction par réseaux profonds. Collaboration avec des instituts de recherche internationaux dans un environnement de haute performance.

CTR Summer Program 2022

Université de Stanford, CA, USA

Juillet 2022—Août 2022

Palo Alto, CA, USA

- Collaborateur :** Kai Schneider, Keigo Matsuda, Thibault Oujia, Jacob West, Suhas S. Jain et Kazuki Maeda
- Projet :** Participation sélective à l'un des programmes internationaux les plus prestigieux en turbulence numérique. Développement d'outils d'analyse innovants pour l'étude du regroupement de particules dans la turbulence, mêlant transformées multiéchelles, et modèles d'IA. Trois rapports publiés dans les *Proceedings CTR* en collaboration avec Stanford et partenaires internationaux.

DISTINCTIONS ET RÉCOMPENSES

- Apollo 11 Postdoctoral Fellowship, Purdue University, 2024
- JSPS Short-Term Fellowship, Japan Society for the Promotion of Science, 2023
- CTR Summer Program, Center for Turbulence Research (CTR), Stanford University, 2022

INTÉRÊT DE RECHERCHE

- **Dynamique des fluides** : Écoulements chargés en particules ; turbulence ; écoulements diphasiques.
- **Analyse numérique** : Techniques de tessellation ; analyse multirésolution.
- **Combustion** : Dynamique moléculaire réactive ; combustion supersonique ; applications hypersoniques ; interactions onde de choc-réactivité.
- **Apprentissage automatique** : Statistiques prédictives ; accélération de simulations.

PUBLICATIONS

Articles de revue

- T. Maurel-Oujia and K. Maeda, "Subcontinuum structures of reactive shock waves in gaseous H_2/O_2 mixtures," *Physical Review Fluids*, vol. 10, no. 10, p. 103 201, 2025.
- Z. Lin, T. Maurel-Oujia, S. Benkadda, and K. Schneider, "Tessellation-based analysis of impurity clustering in the edge plasma of tokamaks," *Journal of Plasma Physics*, vol. 91, no. 1, E30, 2025.
- J. Bergmann, T. Maurel-Oujia, X.-Y. Yin, J.-C. Nave, and K. Schneider, "Singularity formation of vortex sheets in 2D Euler equations using the characteristic mapping method," *Physics of Fluids*, vol. 36, no. 12, 2024.
- T. Maurel-Oujia, S. S. Jain, K. Matsuda, K. Schneider, J. R. West, and K. Maeda, "Neural network models for preferential concentration of particles in two-dimensional turbulence," *Theoretical and Computational Fluid Dynamics*, vol. 38, 2024.
- J. R. West*, T. Maurel-Oujia*, K. Matsuda, K. Schneider, S. S. Jain, and K. Maeda, "Clustering, rotation, and swirl of inertial particles in turbulent channel flow," *International Journal of Multiphase Flow*, p. 104 764, 2024, (*Co-corresponding authors).
- Z. Lin, T. Maurel-Oujia, B. Kadoch, *et al.*, "Synthesizing impurity clustering in the edge plasma of tokamaks using neural networks," *Physics of Plasmas*, vol. 31, no. 3, 2024.
- T. Maurel-Oujia, K. Matsuda, and K. Schneider, "Computing differential operators of the particle velocity in moving particle clouds using tessellations," *Journal of Computational Physics*, vol. 498, p. 112 658, 2024.
- S. V. Apte, T. Oujia, K. Matsuda, B. Kadoch, X. He, and K. Schneider, "Clustering of inertial particles in turbulent flow through a porous unit cell," *Journal of Fluid Mechanics*, vol. 937, 2022.
- T. Oujia, K. Matsuda, and K. Schneider, "Divergence and convergence of inertial particles in high-reynolds-number turbulence," *Journal of Fluid Mechanics*, vol. 905, 2020.

Actes de conférence à comité de lecture

- T. Maurel-Oujia and K. Maeda, "Microscopic simulation and analysis of reactive shock wave in a H_2/O_2 fuel mixture," **12th International Conference on Multiphase Flow (ICMF)**.
- K. Matsuda, T. Maurel-Oujia, and K. Schneider, "Relationship between inertial particle divergence and local flow structure in homogeneous isotropic turbulence," **12th International Conference on Multiphase Flow (ICMF)**.
- T. Maurel-Oujia, K. Matsuda, and K. Schneider, "Multiresolution analysis of convergence and divergence of inertial particle velocity in turbulence," **13th Turbulence and Shear Flow Phenomena (TSFP13)**.
- T. Maurel-Oujia, S. S. Jain, K. Matsuda, K. Schneider, J. West, and K. Maeda, "Synthesis of preferential concentration of particles in isotropic turbulence using neural networks," **18th European Turbulence Conference (ETC18)**.
- K. Matsuda, T. Maurel-Oujia, and K. Schneider, "Clustering formation of inertial particles in high reynolds number isotropic turbulence," **18th European Turbulence Conference (ETC18)**.
- J. Bergmann, T. Maurel-Oujia, X. Y. Yin, J.-C. Nave, and K. Schneider, "On singularities in vortex sheets in 2D Euler flows using a high resolution characteristic mapping method," **18th European Turbulence Conference (ETC18)**.
- T. Oujia, J. West, K. Matsuda, K. Schneider, S. S. Jain, and K. Maeda, "Divergence and rotation of inertial particles in a four-way coupled channel flow," **11th International Conference on Multiphase Flow (ICMF)**.
- T. Oujia, K. Matsuda, and K. Schneider, "Extreme divergence and rotation values of the inertial particle velocity in high reynolds number turbulence using delaunay tessellation," **12th Turbulence and Shear Flow Phenomena (TSFP12)**.

Rapports techniques

- T. Oujia, S. S. Jain, K. Matsuda, K. Schneider, J. West, and K. Maeda, "Neural networks for synthesizing preferential concentration of particles," in *Center for Turbulence Research (CTR), Proceedings of the Summer Program 2022*. 2022, Stanford University.
- J. West, T. Oujia, K. Matsuda, K. Schneider, S. S. Jain, and K. Maeda, "Divergence and curl of the inertial particle velocity in a four way coupled turbulent channel flow," in *Center for Turbulence Research (CTR), Proceedings of the Summer Program 2022*. 2022, Stanford University.
- K. Matsuda, K. Schneider, T. Oujia, J. West, S. S. Jain, and K. Maeda, "Multiresolution analysis of inertial particle tessellations for clustering dynamics," in *Center for Turbulence Research (CTR), Proceedings of the Summer Program 2022*. 2022, Stanford University.

Résumés de conférences

- T. Maurel-Oujia and K. Maeda, “Combined molecular dynamics simulations and regression analysis for high-speed reacting flows,” in Salt Lake City, USA, **Bull. Amer. Phys. Soc.**, 2024.
- T. Maurel-Oujia, K. Matsuda, and K. Schneider, “Multiscale analysis of inertial particle dynamics in turbulent flows using a tessellation-based method,” in Washington, USA, **Bull. Amer. Phys. Soc.**, 2023.
- T. Maurel-Oujia, S. Jain, K. Matsuda, K. Schneider, J. West, and K. Maeda, “Synthesizing inertial particle distribution in isotropic turbulence using neural networks,” in Washington, USA, **Bull. Amer. Phys. Soc.**, 2023.
- L. Zetao, T. Maurel-Oujia, B. Kadoch, *et al.*, “Analysis of inertial impurity clustering in the edge plasma of tokamaks,” in **EFTC 2023, 20th European Fusion Theory Conference**, 2023.
- L. Zetao, T. Maurel-Oujia, B. Kadoch, *et al.*, “Data-driven modeling of impurity transport in the edge plasma of tokamaks,” in **12th ITER International School**, 2023.
- T. Maurel-Oujia, K. Matsuda, and K. Schneider, “A tessellation-based approach to analyze elementary processes of inertial particles in turbulence,” in Kyoto, Japan, **RIMS workshop**, 2023.
- J. Bergmann, T. Oujia, X.-Y. B. Yin, J.-C. Nave, and K. Schneider, “High resolution vortex layer computations in 2D Euler flows using a characteristic mapping method,” in 67(19), Indianapolis, USA, **Bull. Amer. Phys. Soc.**, 2022.
- T. Oujia, S. Jain, K. Matsuda, K. Schneider, J. West, and K. Maeda, “Physics-informed neural networks for synthesizing preferential concentration of particles in turbulent flows,” in 67(19), Indianapolis, USA, **Bull. Amer. Phys. Soc.**, 2022.
- K. Schneider, T. Oujia, J. West, K. Matsuda, S. Jain, and K. Maeda, “On divergence, curl, and helicity of the inertial particle velocity in a 4-way coupled channel flow,” in Indianapolis, USA, **Bull. Amer. Phys. Soc.**, 2022.
- T. Oujia, K. Matsuda, and K. Schneider, “Quantifying divergence and rotation of the inertial particle velocity in high reynolds number turbulence using voronoi and delaunay tessellation,” in 66(17), Phoenix, USA, **Bull. Amer. Phys. Soc.**, 2021.
- T. Oujia, K. Matsuda, and K. Schneider, “Analysis of divergence and rotation of the inertial particle velocity in high reynolds number turbulence,” in 65(13), Chicago, USA, **Bull. Amer. Phys. Soc.**, 2020.
- X. He, T. Oujia, B. Kadoch, K. Matsuda, K. Schneider, and S. Apte, “Clustering of inertial particles in turbulent flow through a face-centered cubic cell,” in 65(13), Chicago, USA, **Bull. Amer. Phys. Soc.**, 2020.
- T. Oujia, K. Matsuda, and K. Schneider, “On the divergence of the inertial particle velocity in high reynolds number turbulence,” in 23-28 August 2020, Milano, Italy, **XXV ICTAM**, 2020.
- T. Oujia, K. Matsuda, and K. Schneider, “Divergence and convergence of inertial particles in high reynolds number turbulence,” in 64(13), 639, Seattle, USA, **Bull. Amer. Phys. Soc.**, 2019.
- S. Apte, T. Oujia, X. He, B. Kadoch, K. Matsuda, and K. Schneider, “Pore-scale investigation of clustering of inertial particles in turbulent flow through a porous medium,” in 64(13), 638, Seattle, USA, **Bull. Amer. Phys. Soc.**, 2019.

PRÉSENTATIONS INVITÉES


- “Multiscale Analysis of Particle Dynamics in Turbulent Flows Using Tessellation-Based Techniques”, 2025, *CIGP Seminar*, **Purdue University**, West Lafayette, IN, USA.
- “Multiscale Dynamics of Inertial Particles in Turbulence: A Tessellation Technique Analysis”, 2023, *AAE Special Seminar*, **Purdue University**, West Lafayette, IN, USA.
- “A Tessellation-based Approach for Multiscale Dynamics in Particle-Laden Turbulence”, 2023, *CEIST Guest Seminar*, **JAMSTEC**, Yokohama, Japan.
- “A Tessellation-based Approach for Multiscale Dynamics in Particle-Laden Turbulence”, 2023, *Fluid Mechanics Special Seminar*, **Nagoya Institute of Technology**, Nagoya, Japan.
- “A tessellation-based approach to study the dynamics of inertial particles in turbulence”, 2023, *Onishi Lab. Seminar Series*, **Tokyo Institute of Technology**, Tokyo, Japan.
- “Physics-informed neural networks for synthesizing preferential concentration of particles in isotropic turbulence”, 2022, *PIAI Seminar Series*, **Aix-Marseille University**, **Osaka University**, **Web Seminar**, Osaka, Japan.

EXPÉRIENCE D'ENSEIGNEMENT

Encadrement de recherche

Université de Purdue, USA

- **Co-encadrant** : Prof. Kazuki Maeda (Université de Purdue-USA)
- **Sujet** : Visualisation scientifique de données de champ discret

 Sept 2024—Present

Étudiante : Eylül Ustaoglu (Université de Purdue-USA)

Aix-Marseille Université, France

- **Co-encadrant** : Prof. Kai Schneider (I2M–France)
- **Sujet** : Méthode CMM (Characteristic Mapping Method) pour un solveur d'Euler 2D, implémentée en CUDA

📅 Sept 2021–Mars 2022 **Étudiant** : Julius Bergmann (TU Berlin–Germany)

📅 Avril 2021–Sept 2021 **Étudiant** : Nicolas Saber (I2M–France)

Attaché temporaire d'enseignement et de recherche (ATER)

Aix-Marseille Université, France

Code	Intitulé	Campus	CM	TD	TP
SPO1U20C	Outils mathématiques (4c, S1)	St-Charles	–	24 h	–
SPO1U88C	Aide à la réussite (0c, S1)	St-Charles	–	10 h	–
SPO1U04C	Outils mathématiques (6c, S1)	St-Charles	–	18 h	–
SPO1U71C	Réussite (oui-si consolidé, Maths) (3c, S1)	St-Charles	–	8 h	24 h
JPE11A	Introduction à l'analyse (0c, S1)	St-Jérôme	15 h	15 h	–
JPE21A	Analyse (0c, S2)	St-Jérôme	30 h	30 h	–