

Amina MECHERBET

born on 02/23/1993, Tlemcen, Algeria

Professional career

- 09/2020 - **Maître de conférences**, *Equipe analyse fonctionnelle*, IMJ-PRG, Université de Paris.
pres
- 10/2019 - **PostDoc Position**, *Laboratoire Jacques-Louis Lions*, Sorbonne university.
08/2020 In collaboration with Anne-Laure DALIBARD and David GÉRARD-VARET.
Funding:
- European Research Council program Grant agreement No 637653, project BLOC “Mathematical Study of Boundary Layers in Oceanic Motion”.
 - SingFlows project, grant ANR-18- CE40-0027 of the French National Research Agency (ANR).
- 10/2016 - **Ph.D. in Applied Mathematics**, *IMAG, Montpellier university* .
09/2019
- **Ph.D. Thesis:** Modeling of multiphase flows.
 - **Advisor:** Matthieu HILLAIRET.
 - **Referees:** Laurent DESVILLETES, Pierre-Emmanuel JABIN.
 - **Thesis committee:**
 - Kleber CARRAPATOSO
 - Anne-Laure DALIBARD (president of the committee)
 - Laurent DESVILLETES
 - Pierre-Emmanuel JABIN
 - Aline LEFEBVRE-LEPOT
 - Charlotte PERRIN
- July 2016 **Master Degree of Applied Mathematics**, *IMAG, Montpellier university*, Major of the promotion.
○ **Master thesis:** Homogénéisation du problème de Stokes et estimations L^p
○ **Advisor:** Matthieu HILLAIRET
- Feb 2015 **Master 1 internship**, *IMAG, Montpellier university*, Initiation à la méthode des éléments
June 2015 finis .
○ **Advisor :** Fabien MARCHE
○ Pair work with Bastien HAMLAT
- 2014 **Batchelor degree in mathematics**, *University of Tlemcen, Algeria*, Major of the promotion.

Research topics

I am interested in the mathematical analysis and modelling of suspension of particles in a viscous fluid. Precisely, it consists in the rigorous derivation of mesoscopic models (kinetic description) by performing a mean-field analysis of the microscopic model (ODEs system for a large number of particles). This

asymptotic analysis is related to the homogenization of Stokes equation in a perforated domain. The main mathematical concepts involved are the method of reflections, mean-field limit using the Wasserstein distance, existence and uniqueness analysis for Stokes and fluid-kinetic equations.

I am also interested in the analysis of the limit model which is a Stokes-transport coupled system. The main interesting aims are existence and uniqueness results for irregular data, modeling and analysis of the surface of a falling drop in a viscous flow.

The modelling of sedimentation of particles in a Stokes flow involves also the rigorous justification of some effective phenomena such as the effective viscosity. A challenging issue is to extend the well-known Einstein's effective viscosity formula for high order terms of the suspension volume fraction.

I also collaborated on a work regarding fluid-kinetic modelling for respiratory aerosols that takes into account the radius growth of aerosol particles due to humidity in the respiratory system. This work includes 2D numerical simulations of aerosol deposit in the trachea in order to investigate the hygroscopic effects on the aerosol.

Scientific Contribution

- A. Mecherbet. On the sedimentation of a droplet in Stokes flow. 2020. To appear in Comm Math Sci.
- D. Gérard-Varet and A. Mecherbet. On the correction to Einstein's formula for the effective viscosity. 2020. To appear in Annales de l'IHP (C)-ANL.
- A. Mecherbet. A model for suspension of clusters of particle pairs. 2019. ESAIM: Mathematical Modelling and Numerical Analysis. <https://doi.org/10.1051/proc/202067007>
- L. Boudin, C. Grandmont, B. Grec, S. Martin, A. Mecherbet and F. Noël. Fluid-kinetic modelling for respiratory aerosols with variable size and temperature. 2019. ESAIM: Proceedings and Surveys.
- A. Mecherbet. Sedimentation of particles in Stokes flow. Kinetic & Related Models, 2019, 12 (5) : 995-1044.
- A. Mecherbet and M. Hillairet. L^p estimates for the homogenization of Stokes problem in a perforated domain. Journal of the Institute of Mathematics of Jussieu, 1-28. 2018.

Communications

- Vorticity, Rotation and Symmetry (V) - Global Results and Nonlocal Phenomena, 26-30 october 2020, CIRM Marseille.sessions parallèles. **Speaker**.
- Workshop The mathematical theory of particle suspensions, Bonn university, 20-22 January 2020. **Invited speaker**.
- Modélisation, analyse et simulation - Le Laboratoire Jacques-Louis Lions fête ses 50 ans. 27-29 november 2019. **Poster session**
- Séminaire d'équipe analyse appliquée, I2M Aix-Marseille Université, 02 July 2019. **Invited speaker**.
- SMAI 9ème biennale, may 2019, Guidel. sessions parallèles. Analyse de EDP. **Speaker**.
- Workshop RheoSUNN, 27-28 Mars 2019, École Polytechnique, Palaiseau, **Poster session**.
- Séminaire d'équipe EDP, 15 January 2019, IECL Nancy. **Invited speaker**.
- ABPDE III, 28-31 August 2018, Lille, **Poster session**.
- CEMRACS 2018, August 2018, CIRM Marseille. Size-varying respiratory aerosols modeling. **Speaker** with Frédérique Noël.
- Séminaire ACIOM 2016, Montpellier university, IMAG. L^p estimates for the homogenization of Stokes problem in a perforated domain. **Speaker**

Collaborative research

- July 2018 **CEMRACS 2018**, CIRM, Luminy, Marseille.
- August 2018 Participation to the research project: Size-varying respiratory aerosols modeling

- o In collaboration with Laurent Boudin, Céline Grandmont, Bérénice Grec, Sébastien Martin and Frédérique Noël.

Training

- July 2018 **CIRM, Marseille**, *CEMRACS Summer school*, Numerical and mathematical modeling for biological and medical applications: deterministic, probabilistic and statistical descriptions, 27h.
- Feb 2018 **IMAG, Montpellier**, *Initiation à l'enseignement des mathématiques en début d'université*, 20h.
- January 2018 **IRMA, Strasbourg**, *Master Class autour de l'Analyse*, 24h.
- Feb 2017 **IMAG, Montpellier**, *Outils de commande, d'observation et optimisation des systèmes pour la modélisation*, 24h.

Teaching

- o PEIP Polytech Montpellier. Student supervision. XLDE101, 2018, (6h).
 - Covered concepts: linear algebra, analysis (limit, continuity and differentiability of a function)
- o Université de Montpellier. TD L1 mention Chimie. Mathématiques pour la chimie. HLMA102, 2016/2017/2018. (36h).
 - Covered concepts: complex numbers, limit, continuity and differentiability of a function, integration calculations, derivation of ODE for chemical reactions, solving ODEs.
- o Université de Montpellier. TD L1 Biomaths. HLMA103, 2018.(24h)
 - Covered concepts: limit, continuity and differentiability of a function, integration calculations, derivation of ODE for population dynamics, solving ODEs, study of functions of two variables.
- o Université de Montpellier. TD L2 mention Sciences de la Vie. Statistiques. HLMA315, 2016/2017. (24h).
 - Covered concepts: Descriptive statistics, sample of one and two variables (mean, variance, covariance, Median, Mode, dispersion Variance, coefficient of variation, interquartile range). Statistical hypothesis testing.

Languages

French	Native speaker
Algerian (arabic dialect)	Native speaker
Arabic	Fluent
English	Scientific

Computer skills

Matlab, C++, GNUplot, FreeFem++, GMSH, Paraview, Latex.