

# Emmanuel Frénod

Professeur des Universités - Mathématiques Appliquées  
Full Professor - Applied Mathematics

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Français, marié, 2 enfants (22 et 25)  
Né le : 27 oct. 1968 à Lagny sur Marne (77)

**Spécialités :** Analyse asymptotique des edp, équations cinétiques, homogénéisation, méthodes mathématiques de modélisation, analyse numérique, calcul scientifique, statistique, méthodes numériques basées sur l'homogénéisation, Machine Learning basé sur des modèles mathématiques avancées, intelligence artificielle, modélisation des environnements littoraux, biologie, physique des plasmas, tokamaks, mathématiques pour les entreprises et le business.

**HDR** (Université Bretagne Sud) 9 déc. 1999  
*Homogénéisation et simulation d'équations cinétiques*  
Rapporteurs : G. Allaire, J. L. Joly et M. Pierre  
Jury : G. Allaire, J. M. Ghidaglia, E. Le Page, M. Pierre, J. J. Quemener et D. Robert

**Doctorat** (Université Paris-Nord et ENS de Cachan)  
16 déc. 1994, mention très honorable avec félicitations du jury  
*Homogénéisation d'équations cinétiques avec potentiels oscillants*  
Directeurs : C. Basdevant et K. Hamdache  
Rapporteurs : C. Bardos et G. Métivier  
Jury : C. Bardos, P. Gérard, C. Basdevant, J. C. Guillot, K. Hamdache, F. Helein et B. Perthame

Titulaire de la **Prime d'Encadrement Doctoral et de Recherche** de 1998 à 2018

**Poste actuel, depuis sept. 2006 :** Professeur des Universités à l'Université Bretagne Sud  
**Poste actuel, depuis jan. 2015 :** Fondateur & Directeur Scientifique chez See-d  
**Sept. 2012 - août 2012 :** Délégation Inria - Projet Calvi<sup>3</sup>, Université de Strasbourg  
**Sept. 1996 - août 2006 :** Maître de conférences à l'Université de Bretagne-Sud  
**Nov. 1995 - août 1996 :** ATER au département de mathématiques de l'ENS de Cachan, Chercheur au CMLA/ENS de Cachan  
**Nov. 1993 - oct. 1994 :** Service militaire au CEA/CEL-V

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French, married, 2 children (22 and 25)  
Born on Oct. 27, 1968, in Lagny (France)

**Fields of interest:** Pde, Asymptotic Analysis, Kinetic Equations, Homogenization, Mathematical Modelling, Numerical Analysis, Computational Sciences, Statistics, Homogenization Based Numerical Methods, Advanced Mathematical Models Based Machine Learning, Artificial Intelligence, Modelling Coastal Zone Phenomena, Biology, Plasma Physics, Tokamaks, Business & Enterprises Mathematics.

**HDR** (Université Bretagne Sud) Dec., 9, 1999  
*Homogenisation and simulation of kinetic equations*  
Referees G. Allaire, J. L. Joly and M. Pierre  
Examiners G. Allaire, J. M. Ghidaglia, E. Le Page, M. Pierre, J. J. Quemener and D. Robert

**Ph.D** (Université Paris-Nord and ENS de Cachan)  
Dec. 16, 1994  
*Homogenization of kinetic equations with oscillating potentials*  
Advisors: C. Basdevant and K. Hamdache  
Referees: C. Bardos and G. Métivier  
Examiners: C. Bardos, P. Gérard, C. Basdevant, J. C. Guillot, K. Hamdache, F. Helein and B. Perthame

Awarded of **PEDR** by "Ministère de la Recherche" from 1998 to 2018

**Current position, since Sept. 2006:** Professor at "Université Bretagne Sud"  
**Current position, since Jan. 2015:** Founder & Chief Science Officer at See-d  
**Sept. 2010 - Aug. 2012:** Invited researcher on an Inria position in Calvi<sup>2</sup> at Strasbourg  
**Sept. 1996 - Aug. 2006:** Assistant Professor at "Université de Bretagne-Sud"  
**Nov. 1995 - Aug. 1996:** Lecturer and researcher at "CMLA/ENS de Cachan"  
**Nov. 1993 - Oct. 1994:** Military service at "CEA"

<sup>1</sup>Laboratoire de Mathématiques de Bretagne Atlantique

<sup>2</sup>Inria Team developing numerical methods and software for Tokamak plasma and beam simulations

<sup>3</sup>EP Inria développant des méthodes numériques et des codes de calculs pour la simulation des Tokamaks et des faisceaux.

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# Part I

## Research

### 1 Publications and scientific production

#### 1.1 Publications

- 1.1.1. **É. Gay & E. Frénod** (In Progress) Homogenization based Data Assimilation Methods in Systems with Strong Oscillations.
- 1.1.2. **H. Florent & E. Frénod** (Submitted) Existence, Uniqueness and Qualitative Properties of a PDE involved in an Artificial Intelligence for the Breeding.
- 1.1.3. **V. Lefranc, É. Gay, R. Fouchereau, E. Frénod & M. Hemous** (Submitted) Multiscale models for data assimilation and forecast : GE Echeladata challenge. Work led within a DataPoc Challenge with General Electric.
- 1.1.4. **H. Florent, E. Frénod & V. Sincholle** (Submitted) An Innovating Statistical Learning Tool Based on Partial Differential Equations, Intending Livestock Data Assimilation.
- 1.1.5. **N. Bloyet, H. Florent, E. Frénod, M. Handa, H. Moundoyi & T.V.T. Phuong** (2020) Construction of a Statistical Learning tool based on Ordinary Differential Equations to model the digestive behavior of Ross chickens. *ESAIM: Proceedings and Survey, vol.67 (CEMRACS 2018: Numerical and mathematical modeling for biological and medical applications: deterministic, probabilistic and statistical descriptions)*, pp 61–71.
- 1.1.6. **T. Nguyen, R. Fouchereau, E. Frénod, C. Gérard & V. Sincholle** (2020) Comparison of forecast models of production of dairy cows combining animal and diet parameters. *Computers and Electronics in Agriculture, vol. 170*.
- 1.1.7. **N. Bloyet, P.-F. Marteau & E. Frénod** (2020) Scott : A method for representing graphs as rooted trees for graph canonization. *In: Cherifi H., Gaito S., Mendes J., Moro E., Rocha L. (eds) Complex Networks and Their Applications VIII. COMPLEX NETWORKS (Oct 2019, Lisbon, Portugal). Studies in Computational Intelligence, vol 881. Springer, Cham*.
- 1.1.8. **N. Bloyet, P.-F. Marteau & E. Frénod** (2019) Étude lexicographique de sous-graphes pour l'élaboration de modèles structures à activité – cas de la chimie organique. *Revue des Nouvelles Technologies de l'Information, vol. 35 : Proceedings of Extraction et Gestion des Connaissances (EGC), Jan 2019, Metz, France, pp 303–308*.
- 1.1.9. **E. Frénod & S. Ludkovsky** (2018) Integral Operator Approach over Octonions to Solution of Nonlinear PDE. *Far East Journal of Mathematical Sciences vol. 103, No 5, pp 831–876*.
- 1.1.10. **E. Frénod, P. Ménard & M. Safa** (2018) Two optimization problems of a continuous-in-time financial model. *Journal of Mathematical Finance, vol 8, No 1, pp. 27-42*
- 1.1.11. **E. Frénod** (2017 Book) Two-Scale Approach to Oscillatory Singularly Perturbed Transport Equations. *Lecture Notes in Mathematics 2190, 124 p., Springer*.
- 1.1.12. **H. Canot & E. Frénod** (2017) Method of Homogenization for the Study of the Propagation of Electromagnetic Waves in a Composite Part 1: Modeling, Scaling, Existence and Uniqueness Results. *Lecture Notes in Engineering and Computer Science: Proceedings of The World Congress on Engineering 2017, 5-7 July, 2017, London, U.K., pp 5–10*.

- 1.1.13. **H. Canot & E. Frénod** (2017) Method of Homogenization for the Study of the Propagation of Electromagnetic Waves in a Composite Part 2: Homogenization. *Lecture Notes in Engineering and Computer Science: Proceedings of The World Congress on Engineering 2017, 5-7 July, 2017, London, U.K.*, pp 11–15.
- 1.1.14. **G. Durrieu, E. Frenod, T. Morineau & T. Nguyen** (2017) Modeling abstraction hierarchy levels of the cyber attacks using random process. *Open Journal of Statistics*, vol. 7, pp 500-520.
- 1.1.15. **E. Frénod** (2017) A PDE-like Toy-Model of Territory Working. In Book "Understanding Interactions in Complex Systems - Toward a Science of Interaction", Cambridge Scholar Publishing, pp 37–47.
- 1.1.16. **H. Canot & E. Frénod** (2017) Modeling electromagnetism in and near composite material using two-scale behavior of the time-harmonic Maxwell equations. *AIMS Mathematics Vol. 2 No 2*, pp 269–304.
- 1.1.17. **I. Faye, E. Frénod & D. Seck** (2016) Long term behaviour of singularly perturbed parabolic degenerated equation. *Journal of Nonlinear Analysis and Application*, Vol. 2016, No. 2, pp 82–105.
- 1.1.18. **E. Frénod & T. Chakkour** (2016) Inverse problem and concentration method of a continuous-in-time financial model. *International Journal of Financial Engineering*, Vol. 3, No 2.
- 1.1.19. **N. Assiouene, T. Amtout, M. Brachet, E. Frénod, R. Hild, C. Prud'Homme, A. Rousseau & S. Salmon** (2016) Hydromorpho: a coupled model for unsteady Stokes-Exner equations and numerical results with Feel++ library. *ESAIM: Proceedings and Surveys, CEMRACS 2015: Coupling multi-physics models involving fluids*, 55, pp.23–40.
- 1.1.20. **G. Dollé, O. Duran, N. Feyeux, E. Frénod, M. Giacomini & C. Prud'Homme** (2016) Mathematical modeling and numerical simulation of a bioreactor landfill using Feel++. *ESAIM: Proceedings and Surveys, CEMRACS 2015: Coupling multi-physics models involving fluids*, 55, pp 83–110.
- 1.1.21. **E. Frénod, P. Ménard & M. Safa** (2016) Optimal control of a continuous-in-time financial model. *American Journal of Modeling and Optimization*, Vol. 4, No. 3.
- 1.1.22. **E. Frénod & T. Chakkour** (2016) A continuous-in-time financial model. *Mathematical Finance Letters*, Vol. 2016, pp 1–37.
- 1.1.23. **E. Frénod, S. Hirstoaga, M. Lutz & E. Sonnendrücker** (2015) Long time behaviour of an exponential integrator for a Vlasov-Poisson system with strong magnetic field. *Communication in Computational Physics*, Vol. 18, No. 2, pp 263–296.
- 1.1.24. **A. Back & E. Frénod** (2015) Two-scale convergence on manifold and applications to the Vlasov equation. *DCDS-S*, Vol. 8, No. 1 (Special Issue on "Numerical Methods Based on Homogenization and Two-Scale Convergence") pp 223–241.
- 1.1.25. **E. Frénod, S. Hirstoaga & E. Sonnendrücker** (2015) ETD Scheme applied to the computation of the Vlasov-Poisson System with a strong magnetic field. *DCDS-S*, Vol. 8, No. 1 (Special Issue on "Numerical Methods Based on Homogenization and Two-Scale Convergence") pp 169–183.
- 1.1.26. **I. Faye, E. Frénod & D. Seck** (2015) Two-scale numerical simulation of sand transport. *DCDS-S*, Vol. 8, No. 1 (Special Issue on "Numerical Methods Based on Homogenization and Two-Scale Convergence") pp 151–168.
- 1.1.27. **J.-P. Bernard, E. Frénod & A. Rousseau** (2015) Absorbing boundary conditions for paralic confinement computation in coastal environment with interlocked areas. *DCDS-S*, Vol. 8, No. 1 (Special Issue on "Numerical Methods Based on Homogenization and Two-Scale Convergence") pp 45–54.
- 1.1.28. **E. Frénod** (2015) An Attempt at Classifying Homogenization-Based Numerical Methods. *DCDS-S*, Vol. 8, No. 1 (Special Issue on "Numerical Methods Based on Homogenization and Two-Scale Convergence"-Introductory paper) pp i–vi.

- 1.1.29. **E. Frénod, J.-P. Gouigoux & L. Touré** (2015) Alternative Financial Solutions seeking via a Genetic Like Algorithm. *Journal of Industrial and Management Optimization*, Vol. 11, No. 1, pp 145–170.
- 1.1.30. **E. Frénod & M. Safa** (2014) Continuous-in-time financial model for public communities. *Esaim: Proceedings (SMAI 2013 Congress)*, Vol. 45, pp 158–167.
- 1.1.31. **E. Frénod & M. Lutz** (2014) On the Geometrical Gyro-kinetic Theory. *Kinetic and Related Models*, Vol. 7, No. 4, pp 621–659.
- 1.1.32. **E. Frénod, S. Hirstoaga & M. Lutz** (2014) Long time simulation of a highly oscillatory Vlasov equation with an exponential integrator. *Special issue of Comptes Rendus de Mécanique de l'Académie des Sc. de Paris : "Theoretical and Numerical Approaches for Vlasov-Maxwell Equations*, Vol. 342, pp. 595-609.
- 1.1.33. **J.-P. Bernard, E. Frénod & A. Rousseau** (2013) Modeling confinement in Étang de Thau: numerical simulations and multi-scale aspects. *AIMS Proceedings*, Vol. 2013, Issue Special, pp 69–76.
- 1.1.34. **H. Berninger, E. Frénod, M. Gander, M. Liebendörfer, J. Michaud & N. Vasset** (2013) Derivation of the isotropic diffusion source approximation (IDSA) for supernova neutrino transport by asymptotic expansions. *Siam Journal on Mathematical Analysis*, Vol. 45, No. 6, pp 3229–3265.
- 1.1.35. **N. Crouseilles, E. Frénod, S. Hirstoaga & A. Mouton** (2013) Two-Scale Macro-Micro decomposition of the Vlasov equation with a strong magnetic field. *Mathematical Models and Methods in Applied Sciences*, Vol. 23, No. 8, pp 1527–1559.
- 1.1.36. **E. Frénod & A. Rousseau** (2013) Confinement - Models and Simulations. *Acta Applicanda Mathematicae*, Vol. 123, No. 1, pp 1–19.
- 1.1.37. **E. Frénod** (2012) Two-Scale Convergence. *Esaim: Proceedings*, Vol. 38, pp 1–35 (*Proceeding of the lectures at Cemracs 2011*).
- 1.1.38. **E. Frénod, M. Gutnic & S. Hirstoaga** (2012) First order Two-Scale Particle-In-Cell Method for Vlasov Equation. *Esaim: Proceedings*, Vol. 38, pp 348–360 (*Cemracs 2011 Project*).
- 1.1.39. **H. Berninger, E. Frénod, M. Gander, M. Liebendörfer & J. Michaud** (2012) A Mathematical description of the IDSA for Supernova neutrino transport, its discretization and a comparison with a Finite Volume scheme for Boltzmann's Equation. *Esaim: Proceedings*, Vol. 38 (*Cemracs 2011 Project*) pp 163–182.
- 1.1.40. **E. Frénod & M. Lutz** (2011) The Gyro-Kinetic Approximation - An attempt at explaining the method based on Darboux Algorithm and Lie Transform. *Proceeding of the lecture at Summer School Fusion - September 11 - JLL Laboratory - UPMC - Paris*
- 1.1.41. **I. Faye, E. Frénod & D. Seck** (2011) Singularly perturbed degenerated parabolic equations and application to seabed morphodynamics in tided environment. *Discrete and Continuous Dynamical Systems - Series A (DCDS-A)*, Vol. 29, No 3, pp 135–166.
- 1.1.42. **E. Frénod & A. Mouton** (2010) Two-dimensional Finite Larmor Radius approximation in canonical gyrokinetic coordinates. *Journal of Pure and Applied Mathematics: Advances and Applications*, Vol. 4, No. 2, pp 135-166.
- 1.1.43. **P. Ailliot, E. Frénod & V. Monbet** (2010) Modeling the coastal ocean over a time period of several weeks. *Journal of differential equations*, Vol. 246, No. 4, pp 639–659.
- 1.1.44. **J. Utzmann, C.-D. Munz, M. Dumbser, E. Sonnendrücker, S. Salmon, S. Jund & E. Frénod** (2009) Fluid-Acoustic Coupling and Wave Propagation. *In : Numerical Simulation of Turbulent Flows and Noise Generation*. Notes on Numerical Fluid Mechanics and Multidisciplinary Design, Vol. 104, Springer Berlin / Heidelberg, pp 47–74.

- 1.1.45. **T. Morineau & E. Frénod** (2009) A method to bridge the gap between affordance formalisation and visual simulation in virtual environment. *European Journal of Scientific Research*, Vol. 33, No. 1, pp 130–143.
- 1.1.46. **E. Frénod & O. Sire** (2009) An explanatory model to validate the way water activity rules periodic terrace generation in *Proteus mirabilis* swarm. *Journal of Mathematical Biology*, Vol. 59, No. 4, pp 439–467.
- 1.1.47. **E. Frénod, F. Salvarani & E. Sonnendrücker** (2009) Long time simulation of a beam in a periodic focusing channel via two-scale PIC-method. *Mathematical Models and Methods in Applied Sciences*, Vol. 19, No. 2, pp 175–197.
- 1.1.48. **T. Morineau, E. Frénod, L. Tobin & C. Blanche** (2009) Turing Machine as an ecological model for Task Analysis. *Theoretical Issues in Ergonomics Science*, Vol. 10, No. 6, pp 511–529.
- 1.1.49. **E. Frénod, A. Mouton & E. Sonnendrücker** (2007) Two scale numerical simulation of the weakly compressible 1D isentropic Euler equations. *Numerische Mathematik*, Vol. 108, No. 2, pp 263–293.
- 1.1.50. **E. Frénod & E. Goubert** (2007) A first step towards modelling confinement of paralic ecosystems. *Ecological Modelling*, Vol. 200, No. 1 - 2, pp 139–148.
- 1.1.51. **P. Ailliot, E. Frénod & V. Monbet** (2006) Long term drift forecast in the ocean with tide and wind *SIAM Multiscale Modeling and Simulation*, Vol. 5, No. 2, pp 514–531.
- 1.1.52. **E. Frénod** (2006) Existence result for a model of *Proteus mirabilis* swarm. *Differential and Integral Equations*, Vol. 19, No. 6, pp 697–720.
- 1.1.53. **E. Frénod** (2006) Application of the averaging method to the gyrokinetic plasma. *Asymptotic Analysis*, Vol. 46, No. 6, pp 1–28.
- 1.1.54. **E. Frénod & F. Watbled** (2002) The Vlasov equation with strong magnetic field and oscillating electric field as a model for isotope resonant separation. *Electronic Journal of Differential Equation*, Vol. 2002, No. 6, pp 1–20 .
- 1.1.55. **R. Forttenbach, E. Frénod, R. Klein, C.-D. Munz & E. Sonnendrücker** (2001) Multiple Scale Consideration for sound Generation in Low Mach Number Flow. *In : Numerical Flow Simulation III. Notes on Numerical Fluid Mechanics and Multidisciplinary Design*, Vol. 82, Springer Berlin / Heidelberg, pp 129–138
- 1.1.56. **E. Frénod, P. A. Raviart & E. Sonnendrücker** (2001) Two scale expansion of a singularly perturbed convection equation. *Journal de Mathématiques Pures et Appliquées*, Vol. 80, No. 8, pp 815–843.
- 1.1.57. **E. Frénod & E. Sonnendrücker** (2001) The Finite Larmor Radius Approximation. *SIAM Journal on Mathematical Analysis*, Vol. 32, No. 6, pp 1227–1247.
- 1.1.58. **E. Frénod & E. Sonnendrücker** (2001) Approximation “Rayon de Larmor Fini” pour l’équation de Vlasov. *C. R. Académie des Sciences de Paris, t. 330, série I, 2000*, pp 421–426.
- 1.1.59. **E. Frénod & E. Sonnendrücker** (2000) Long Time Behavior of the Vlasov Equation with Strong External Magnetic Field. *Mathematical Model and Methods for Applied Sciences*, Vol. 10, No. 4, pp 539–553.
- 1.1.60. **E. Frénod & E. Sonnendrücker** (1998) Homogenization of the Vlasov Equation and of the Vlasov-Poisson System with a Strong External Magnetic Field. *Asymptotic Analysis*, Vol. 18, No. 3-4, pp 193-214.
- 1.1.61. **E. Frénod & E. Sonnendrücker** (1998) Asymptotic study of the Vlasov-Poisson equations with a large external magnetic field. *Proceedings des journées Elie Cartan, Nancy, juin 1997*.
- 1.1.62. **E. Frénod & B. Lucquin-Desreux** (1998) On conservative and entropic discrete axisymmetric Fokker-Planck operators. *Mathematical Modelling and Numerical Analysis*, Vol. 32, No. 3, pp 307-339.

- 1.1.63. E. Frénod & K. Hamdache** (1996) Homogenisation of transport kinetic equations with oscillating potentials. *Proceedings of the Royal Society Edinburgh, Vol. 126 A, pp 1247-1275.*

## 1.2 Working Papers

- 1.2.1. W. Despaigne & E. Frénod** (2014) Transport hub flow modelling. <https://hal.archives-ouvertes.fr/hal-00522938>
- 1.2.2. E. Frénod** (2010) Hamiltonian Formalism for the Vlasov-Maxwell System. <http://web.univ-ubs.fr/lmba/frenod/IMG/DocRech/FreHamV1Maxw.pdf>
- 1.2.3. E. Frénod** (2009) Models for cohesive sediments describing the evolution of the characteristics of particles. <https://hal.archives-ouvertes.fr/hal-00365357>

## 1.3 Computation codes

- 1.3.1.** Management of the development and participating in the development of Lemf: Low Level Library Embedding High Level Tools for Manipulating Measures (made for MGDIS' needs). (Currently).
- 1.3.2.** Participating in the development of Selalib (Computation code developed by Inria for Tokamak plasma simulation). (Currently).
- 1.3.3.** Development of a Matlab code for financial simulation based on continuous-in-time modeling. (From 2010 to 2013)
- 1.3.4.** Development of a Matlab code for the simulation of the swarming of *Proteus mirabilis* bacteria colonies using the method described in **1.1.46**. (2005-2006).
- 1.3.5.** Participating in the development of a Two-Scale PIC code, based on the method described in **1.1.47**, for the simulation of particle beams in a focusing channel. (Cemracs, summer 2007).
- 1.3.6.** Development of a code in FORTRAN 90 for CRAY YMP solving the multi-species homogeneous Fokker-Planck equation by a generalization of the method described in **1.1.62**. (October 1995 - September 1996).
- 1.3.7.** Development of a code in FORTRAN 90 for CRAY YMP solving the homogeneous Fokker-Planck equation by the method described in **1.1.62**. (November 1993 - October 1995).

## 1.4 Communications

- 1.4.1.** Agriculture intelligente ("Smart Farming"), apprentissage automatique ("Machine Learning") et équations aux dérivées partielles. *Séminaire du Laboratoire Jacques-Louis Lions, Sorbonne Université, Paris, 14 décembre 2018.*
- 1.4.2.** Smart Farming, Learning and PDE *Séminaire Analyse Numérique & Equations aux Dérivées Partielles, Laboratoire Paul Painlevé, Université de Lille, 25 octobre 2018*
- 1.4.3.** Machine Learning: Introduction and Perspectives on an example coming from agri-business. *University of Science and Technology of Hanoi, Vietnam, 15 mars 2017.*
- 1.4.4.** Towards new Machine Learning tools based on Ode and Pde models. *Journée Maths-Industrie, Institut Henri Poincaré, Paris, 23 novembre 2016.*
- 1.4.5.** An Idea for boundary condition homogenization associated to the lagoon confinement model. *Aims Conference 2016 - Special Session 92 - Orlando - Florida, 4 juillet 2016.*
- 1.4.6.** A Continuous-in-Time financial model. *Aims Conference 2016 - Special Session 97 - Orlando - Florida, 2 juillet 2016.*

- 1.4.7. Multi-Scale Numerical Methods for the Vlasov-Poisson System with Strong Magnetic Field. *LMBA, Assemblée Générale 2015, Quimper, 11 decembre 2015.*
- 1.4.8. Multi-Scale Numerical Methods for the Vlasov-Poisson System with Strong Magnetic Field. *Conference NumKin, Max Planck Institute for Plasma Physics, Garching (Munich), 26 octobre 2015.*
- 1.4.9. The Geometrical Gyro-Kinetic Approximation. *Cemracs'15, Daily morning seminar, CIRM, Luminy, 11 août 2015.*
- 1.4.10. An exponential integrator for the 2d+2v Vlasov Poisson system with strong magnetic field. *Department of Pure Mathematics and Mathematical Statistics Seminar, Cambridge, 2 mars 2015.*
- 1.4.11. An exponential integrator for the 2d+2v Vlasov Poisson system with strong magnetic field. *CNAM - Séminaire M2N, Paris, le 26 février 2015.*
- 1.4.12. An exponential integrator for the 2d+2v Vlasov Poisson system with strong magnetic field. *Conference "Kinetic equations", CIRM, Marseille-Luminy, 10 - 14 novembre 2014.*
- 1.4.13. Two-Scale Numerical Methods for Kinetic Equations. *AIMS Conference - Special session "Kinetic equations: Theory and applications" - Madrid - Spain - 7 - 11 juillet, 2014*
- 1.4.14. Two-Scale Numerical Methods illustrated by examples. *Hunan First Normal University - Changsha - China - 25 mai 2014*
- 1.4.15. Two-Scale Numerical Methods illustrated by examples. *Hengyang Normal University - Hengyang - China - 25 mai 2014*
- 1.4.16. The Geometrical Gyro-Kinetic Approximation, *School of Mathematics & Computing Science, University of Science and Technology - Changsha - China - 23 mai 2014.*
- 1.4.17. The Geometrical Gyro-Kinetic Approximation, *Department of Mathematics, Beijing Technology and Business University - Beijing - China - 21 mai 2014.*
- 1.4.18. The gyro-kinetic model. *International Conference on Geometric Algorithms and Methods for Plasma Physics, Hefei, China, 13 - 15 mai 2014.*
- 1.4.19. Two-Scale Numerical Methods illustrated by examples. *Séminaire CEA-GAMNI de Mécanique des Fluides Numériques, Institut Henri Poincaré - Paris - 4 février 2014.*
- 1.4.20. Numerical Methods based on Two-Scale Convergence. *Séminaire du LRC Manon - Laboratoire Jacques-Louis Lions - Paris, 8 Juillet 2013.*
- 1.4.21. The Geometrical Gyro-Kinetic Approximation. *Séminaire du LMBA, Vannes, 3 juillet 2013.*
- 1.4.22. Sand transport in coastal ocean waters submitted to tide. *Workshop Asymptotic and Multiscale methods, Île de Porquerolles, 10 juin 2013*
- 1.4.23. The Geometrical Gyro-Kinetic Approximation. *Seminar of the Institute for Natural Sciences, Shanghai Jiao Tong University, Shanghai, Chine, 21 mai 2013*
- 1.4.24. Numerical Methods based on Two-Scale Convergence. *Journées Modélisation et Calcul, Reims, 21-22 mars 2013.*
- 1.4.25. Les méthodes numériques basées sur la convergence à deux échelles. *École thématique du GdR Chant, Les 7 Laux, 7-11 janvier 2013.*
- 1.4.26. Two-Scale Numerical Methods and TSAPS for Tokamak Plasma Physics. *Workshop: Asymptotic-Preserving Schemes, Île de Porquerolles, 20-26 Mai 2012*
- 1.4.27. Décomposition Macro-Micro à deux échelles pour un problème de physique des plasmas. *Séminaire d'Analyse Appliquée, LATP, Marseille, le 18 septembre 2012.*



- 1.4.28. Synthetic introduction to homogenization based numerical methods. *conférence AIMS, Orlando, Florida, US, du 1er au 7 juillet 2012.*
- 1.4.29. Two-Scale Macro-Micro Decomposition of a Tokamak Plasma Physics related Kinetic Equation *conférence DD21, Rennes, 25-29 juin 2012.*
- 1.4.30. Two-Scale Numerical Methods. *Séminaire d'analyse numérique, Section de Mathématiques, Université de Genève, le 6 décembre 2011.*
- 1.4.31. Méthodes Numérique à Deux Echelles. *Séminaire d'Analyse Numérique de l'IRMAR, Rennes le 17 novembre 2011.*
- 1.4.32. Décomposition Micro-Macro 2 échelles et TSAPS pour un problème de physique des plasmas. *Séminaire du Laboratoire de Mathématique de Brest, le 15 mars 2011.*
- 1.4.33. Sur l'utilité de la modélisation et de l'analyse asymptotique. *Doctoriales de l'École Doctorale de Mathématiques et d'Informatique de Dakar, le 9 février 2010.*
- 1.4.34. Modélisation long terme de l'océan en zone côtière. *Groupe de travail océano, Bordeaux, le 15 avril 2008.*
- 1.4.35. Modélisation long terme de l'océan en zone côtière. *Séminaire du LAMA, Chambéry, le 25 mai 2007.*
- 1.4.36. Modélisation long terme de l'océan en zone côtière. *Séminaire du projet INRIA Moise, Grenoble, le 8 mars 2007.*
- 1.4.37. Modélisation long terme de l'océan en zone côtière. *Séminaire d'analyse numérique d'Orsay, le 14 décembre 2006.*
- 1.4.38. Quelques calculs concernant Vlasov en Variables Canoniques Gyrocinétiques. *Séminaire d'analyse numérique de l'IRMA, Strasbourg le 12 décembre 2006.*
- 1.4.39. Modélisation du confinement d'une lagune. *Congrès sur les Environnements Côtiers, Vannes, Golfe du Morbihan, le 6 septembre 2006.*
- 1.4.40. Lagunes et Confinement. *Séminaire d'analyse numérique de l'IRMAR, Rennes, le 22 juin 2006.*
- 1.4.41. Confinement computation for a lagoon with tide. *Séminaire du Cemracs, Cirm, Marseille, le 11 août 2005.*
- 1.4.42. Calcul du confinement pour une lagune avec marée. *Séminaire de l'Institut de Recherche en Mathématiques Avancées de Strasbourg, le 15 février 2005.*
- 1.4.43. Développement asymptotique d'un système dynamique singulièrement perturbé. *Séminaire d'analyse numérique de l'IRMAR, Rennes, le 13 juin 2003.*
- 1.4.44. Développement asymptotique d'un système dynamique singulièrement perturbé. *Séminaire de l'INSTN, CEA Saclay, le 12 septembre 2002.*
- 1.4.45. Homogénéisation d'un model de séparation isotopique. *Séminaire du LMMAS, Université de Metz, le 14 février 2002.*
- 1.4.46. Homogenization of the weakly compressible 1D Navier-Stokes equation. *9<sup>ième</sup> Workshop du programme fédéré franco-allemand (DFG - CNRS) "simulation numérique d'écoulements", les 26 et 27 octobre 2001.*
- 1.4.47. L'asymptotique Rayon de Larmor Fini. *Workshop du GdR SPARCH, Nancy, les 26 et 27 septembre 2000.*
- 1.4.48. Le Rayon de Larmor Fini. *Séminaire du Centre de Mathématiques Appliquées de l'École Polytechnique, le 9 mai 2000.*
- 1.4.49. Équation de Vlasov et Champ Magnétique Fort. *Séminaire de l'institut de Mathématiques de Rennes, le 27 mai 1999.*

- 1.4.50. Équation de Vlasov et Champ Magnétique Fort. *Séminaire de l'institut Elie Cartan, université de Nancy 1, le 22 avril 1998.*
- 1.4.51. Équation de Vlasov et Champ Magnétique Fort. *Séminaire du MAB, université de Bordeaux, le 02 avril 1998.*
- 1.4.52. Homogénéisation de l'équation de Vlasov avec champ magnétique fort. *Groupe de travail du GdR SPARCH, école polytechnique, le 17 juin 1997.*
- 1.4.53. A multi-species Fokker-Planck code. *Analytische und numerische Approximationsmethoden für Probleme der Plasmaphysik, der Physik verünnter Gase und von Halbleitern, Mathematische Forschungsinstitut Oberwolfach, du 12 au 18 mai 1996.*
- 1.4.54. Discrétisation entropique et conservative de l'opérateur de Fokker-Planck axisymétrique et simulation de plasmas. *Groupe de travail "analyse et simulation de phénomènes complexes", MAB, université de Bordeaux, le 8 février 1996 .*
- 1.4.55. Discrétisation entropique et conservative de l'opérateur de Fokker-Planck axisymétrique. *Groupe de travail "méthodes numériques", laboratoire d'analyse numérique, université Pierre et Marie Curie, le 5 février 1996.*
- 1.4.56. Discrétisation entropique et conservative de l'opérateur de Fokker-Planck axisymétrique. *27<sup>ième</sup> congrès d'analyse numérique, du 29 mai au 2 juin 1995.*
- 1.4.57. Homogénéisation d'équations cinétiques avec potentiels oscillants. *Séminaire de l'IRMAR, université de Rennes 1, le 26 janvier 1995.*
- 1.4.58. Schémas conservatifs et entropiques pour l'équation de Fokker-Planck en géométrie axisymétrique. *Groupe de travail en analyse appliquée, institut Galilée, université Paris Nord, le 21 décembre 1994.*
- 1.4.59. Schémas conservatifs et entropiques pour l'équation de Fokker-Planck en géométrie axisymétrique. *Deuxième école d'été du GdR SPARCH, du 19 au 23 septembre 1994.*
- 1.4.60. Homogénéisation d'une équation cinétique à potentiel périodique. *Séminaire EDP et applications du CMLA, le 26 novembre 1992.*
- 1.4.61. Comportement asymptotique d'une équation de transport cinétique avec champ fortement oscillant. *Journées de Metz, du 15 au 16 juin 1992.*
- 1.4.62. Comportement asymptotique d'une équation de transport cinétique avec champ fortement oscillant. *24<sup>ième</sup> congrès d'analyse numérique, du 25 au 28 mai 1992.*

## 2 Ph.D and Post-Doc Supervision

### 2.1 Defended Ph.D

**Hélène Florent** - Construction et analyse d'outils d'apprentissage statistique biomimétiques basés sur des systèmes d'Equations aux Dérivées Partielles pour l'Assimilation de Données d'élevage. (*Construction and analysis of Statistical Learning tools based on a system of Partial Differential Equations for livestock data assimilation*) - Co-direction with Gilles Durrieu - Ph.D made within NeoVia (ADM Group) - Ecole Doctorale SICMA (Defended: March 20th, 2020 [Beginning: February 2017]).

**Related publications:**

- 1.1.5
- 1.1.2
- 1.1.4

**Currently** : Researcher-Consultant at See-d

**Nicolas Bloyet** - Apprentissage statistique appliqué à l'automatisation de l'extraction de Qsar interprétables (*Statistical Learning applied to interpretable Qsar extraction automation*) - Co-direction with Pierre-François Marteau - Ph.D made within See-d - Ecole Doctorale SICMA (Bretagne) (Defended: 17th December 2019 [Beginning: November 2016]).

**Related publications:**

- 1.1.5
- 1.1.7
- 1.1.8

**Currently :** Researcher-Consultant at See-d

**Hélène Canot** - Méthodes d'homogénéisation et simulations numériques appliquées à la réponse électromagnétique des matériaux multi-échelles complexes (*Homogenization methods and numerical simulation applied to electromagnetic response of complex multi-scale materials*). - Ecole Doctorale Sicma(Bretagne) (Defended: December 7th, 2018 [Beginning : February 2014]).

**Related publication:**

- 1.1.16
- 1.1.13
- 1.1.12

**Tarik Chakkour** - Construction, implémentation et déploiement d'un modèle financier continu en temps (*Building, implementation and deployment of a continuous-in-time financial model*). Grant financed by a Research contrat with MGDIS - École Doctorale Sicma (Bretagne) (Defended November 16th, 2017 [Beginning: December 2012]).

**Related publication:**

- 1.1.22
- 1.1.18

**Mathieu Lutz** - Etude mathématique et numérique d'un modèle gyrocinétique incluant des effets électromagnétiques pour la simulation d'un plasma de Tokamak (*Mathematical and numerical study of a gyrokinetic model, including electromagnetic effects, for the simulation of Tokamak plasmas*) - Co-direction with Eric Sonnendrücker - Grant from French Ministry of Research - École Doctorale of Strasbourg (Defended: October 24th, 2013 [Beginning: September 2010]).

**Related publications:**

- 1.1.31
- 1.1.23
- **M. Lutz** (2015) Application of Lie Transform Techniques for simulation of a charged particle beam. *DCDS-S Vol. 8, No. 1 (Special Issue on "Numerical Methods Based on Two-Scale Convergence and Homogenization") pp 185–221.*

**Currently :** Lecturer at Insa of Strasbourg.

**Ibrahima Faye** Etude mathématique de problèmes de thermo-élasticité et de transport de sable en milieu sous marins (*Mathematical study of thermo-elasticity and submarine sand transport problems*) - Co-direction with Diaraf Seck - École Doctorale of Dakar (Defended: December 28th, 2011 [Beginning: September 2008]).

**Related publications:**

- 1.1.26
- 1.1.17
- **C. Diallo, I. Faye and D. Seck**(2012) Geometrical behavior in elasticity problems by topological optimization. *Applied Mathematical Sciences, Vol. 6, No. 12, pp 553–573.*

- **1.1.41**
- **M. Ngom, A. Sy, I. Faye and D. Seck** (2011) Study on photonic and phononic crystal problems by topological optimization method. *Int. Journal of Math. Analysis, Vol. 5 No. 15, pp 723–745.*
- **A. Diop, I. Faye, I. Ly and D. Seck** (2010) Shape and topological optimization for electromagnetism problems. *Comptemporary Engineering Sciences, Vol. 3, pp 373–394.*
- **I. Faye, A. Sy and D. Seck** (2008) On topological optimization and pollution in porous medium in *Mathematical Modeling, Simulation, Visualization and e-Learning, Springer-Verlag pp 209–237.*

**Currently :** Professor at Bambey University - Senegal.

**Aurore Back** - Etude théorique et numérique des équations de Vlasov-Maxwell dans le formalisme covariant (*Mathematical and numerical study of the Vlasov-Maxwell equations in the covariant formalism*) - Codirection with Eric Sonnendrücker - Grant from French Ministry of Research - École Doctorale of Strasbourg (Defended: November 7th, 2011 [Beginning: septembre 2008]).

**Related publications:**

- **1.1.24**
- **A. Back & E. Sonnendrücker** Finite Element Hodge for Spline Discrete Differential Forms. Application to Vlasov-Poisson system. *Applied Numerical Mathematics, Vol. 79, pp. 124–136.*

**Wilfried Despagne** - Construction, analyse et implémentation d'un modèle de prévision. Déploiement sous forme d'un système de prévision chez un opérateur européen du transport et de la logistique (*Bulding, analysis and implementation of a forecast model. Deployment as a forecast system in a transportation and logistics company*) - Codirection with Valérie Monbet - Ph.D made within STEF (Defended: April 1st, 2010 [Beginning: February 2007]).

**Related publications:**

- **1.2.1**
- **W. Despagne** (2011). A Forecasting Support System for Temperature-Controlled Transport. *Foresight: The International Journal of Applied Forecasting, Vol. 22, pp 41–46.*
- **W. Despagne** (2008) Etude préliminaire à un modèle de prévision à court terme de l'activité d'un transporteur sous température dirigée. *Modulad, Vol. 39, pp 95–106.*

**Currently :** Assistant Professor at Icam de Bretagne (Engineer School).

**Alexandre Mouton** - Approximation multi-échelles de l'équation de Vlasov (*Multi-scale approximation of the Vlasov equation*) - Codirection with Eric Sonnendrücker - Grant from French Ministry of Research - École Doctorale of Strasbourg (Defended: September 16th, 2009 [Beginning: September 2005]).

**Related publications:**

- **A. Mouton** (2009) Two-scale semi-Lagrangian simulation of a charged particle beam in a periodic focusing channel. *Kinet. Relat. Models, Vol. 2, No 2, pp 251–274.*
- **1.1.49**

**Currently :** Research Engineer at Université de Lille I.

## 2.2 Ph.D Thesis in progress

**Arthur Fétiveau** - Modélisation statistique des reportings d'analyse de la performance utilisés par les entreprises (*Mathematical and Statistical Modeling of reportings used for enteerprises performance*) - Codirection with Gilles Durrieu - Ph.D made within Aldecis - Ecole Doctorale MathStic (Defense planned: 2024 [Beginning: January 2021]).

**Jules Guillot** - Analyse mathématique et statistique du couplage modèle-données pour l'IA (*Mathematical and Statistical Analysis of Data-Model Coupling*) - Academic Ph.D founded by Université Bretagne Sud. Ecole Doctorale MathStic (Defense planned: 2022 [Beginning: September 2019]).

**Tristan Grespinet** - Modélisation mathématique d'un système de production industriel (*Mathematical Model of an Industrial Production System*) - Ph.D made within Cocotine (Eureden Group) - Ecole Doctorale MathStic (Defense planned: 2021 [Beginning: April 2018]).

## 2.3 Ph.D works led but not defended

**Ismaël Landry Touré** - Construction et optimisation de stratégies financières par algorithmes génétiques (*building an optimization of financial strategies using Genetic Algorithms*) - Codirection with Thierry Dhorne - Ph.D works led within MGDIS

**Related publication:**

- 1.1.29

## 2.4 Postdocs

**Thong Nguyen** - Model-data coupling for smart farming (January 2017 - December 2018).

**Thong Nguyen** - Hidden Markov chain modeling of an agent defending a system (October 2015 - October 2016).

**Related publication:**

- 1.1.14

## 2.5 Researchers recruited on Research contrats

**Mohamad Safa** - Optimal and adaptative control of a continuous-in-time financial model - Paid on a Research contrat with MGDIS (December 2012 - March 2014).

**Related publications:**

- 1.1.21
- 1.1.30

**Jean-Paul Lucas** - Economical valuation of data - Paid on a Research contrat with STEF (September 2014 - August 2016).

**Rachid Hannaoui** - Mesh cell uncrossing in 3D - Paid on a Research contrat with CEA (November 2014 - March 2015).

# 3 Standing

## 3.1 Invitations

- 3.1.1.** Invited to give a talk at the International Conference on Geometric Algorithms and Methods for Plasma Physics : "The gyro-kinetic model", Hefei - China, May 13th - 15th, 2014.
- 3.1.2.** Invited to give a short lecture at École de Mécanique des Fluides Numérique [Site web]: "Two-Scale Convergence and Two-Scale Numerical Methods", Île de Porquerolles, June 3rd - 8th, 2013. [Slides of the lecture].
- 3.1.3.** Invited Professeur at Institute of Natural Sciences [Siteweb], Shanghai Jiao Tong University, May 8th - 27th, 2013
  - Research collaboration.
  - 6 hours lecture: "Two-Scale Convergence and Two-Scale Numerical Methods". [Slides of the lecture]
  - Seminar talk: "The Geometrical Gyro-Kinetic Approximation". [Slides of the talk].

- 3.1.4. Invited to give a talk at the thematic school of GdR Chant : "Numerical Methods based on Two-Scale Convergence", Les Sept Laux, January 7th - 11th, 2013.
- 3.1.5. Invited to give a short lecture at École d'Été Fusion: "The Gyro-Kinetic Approximation - An attempt at explaining the method based on Darboux Algorithm and Lie Transform", Laboratoire Jacques Louis Lions, UPMC, Paris, September 2011.
- 3.1.6. Invited to give a lecture at the Summer School of **Cemracs 2011**, at **CIRM**: "Two-Scale Convergence", July 18th au 23rd, 2011.
- 3.1.7. Invited by **Département de Mathématiques et Informatique** and **Laboratoire de Mathématiques de la Décision et d'Analyse Numérique** of **Université Cheikh Anta Diop de Dakar**, January 30th - February 10th, 2010.
  - 8 hours lecture: "La convergence à 2 échelles et application à la morpho-dynamique des dunes dans l'océan côtier soumis à la marée".
  - Research collaboration.

## 3.2 Technological research and contracts

- 3.2.1. **PEPS with Amies** (A 10 000 €-subvention over 2014-2015, in association with l'IRMA, Université de Strasbourg.) (*Amies is the CNRS structure in charge of helping relationships between laboratories of mathematics and enterprises.*) The goal was to finance a project at Cemracs 2015 to set out a numerical model of a Bioreactor Landfill.
- 3.2.2. **PEPS with Amies** (A 10 000 €-subvention over 2014-2015, in association with l'IRMA, Université de Strasbourg.) The goal is to build a long term relation between LMBA and IRMA, on the one hand; and, the Laboratoire National des Champs Magnétiques Intenses (LNCMI, Grenoble - Toulouse) and Sigmaphi (SME located in Vannes), who produces electromagnets, on the other hand. this relation will help LNCMI and Sigmaphi to use the open source library Feel++ [Site web].
- 3.2.3. **Research contrat with the CEA-DAM (the French organization for military nuclear applications)** (18 500 € from September to December 2014). The goal was to develop a method to disentangle cells of a 3D mesh used for Lagrangian simulations.
- 3.2.4. **Research contrat with STEF group** (115 000 € from April 2014 to September 2016). The goal is to implement high level statistical methods to bring STEF to analyse its market and customers.
- 3.2.5. **PEPS with Amies** (A 10 000 €-subvention over 2012-2013 and PEPS a 40 000 €-subvention over 2013-2014.) The goal of the first subvention is to assist the development of the relation between LMBA and MGDIS. The goal of the second one is to help the setting up of a *Department of Research for Entreprises* within LMBA.
- 3.2.6. **Research contrats with MGDIS** (20 000 to 30 000 €/year since 2009). The goal is to establish a scientific activity on problems related to management of organisations and elaboration of strategies.
- 3.2.7. **Contrat with Charier** (3 500 € in May-June 2013) for modeling the deformation of roads.
- 3.2.8. **Contrat with "Institution d'Aménagement de la Vilaine"** (20 000 €/year from 2007 to 2011) to study sediments and model the hydro-sedimentary behavior of the Vilaine estuary.
- 3.2.9. **Contrat with MGDIS** (10 000 €/year) to supervise an industrial Ph.D thesis from February 2007 to January 2010. The goal was to study the capability of Genetic Algorithm to be used to optimize financial solutions.
- 3.2.10. **Contrat with Agrostar (group Stef-TFE)** (14 000 €/year) to supervise an industrial Ph.D thesis from February 2007 to January 2010. The Goal was to model et and foresee the enterprise activity.
- 3.2.11. Contrats with CEA/CEL-V for developing codes for the simulation of thermonuclear plasmas while being confined in 1995 and 1996.

### 3.3 Diffusion and spreading of Research towards enterprises and institutions

- 3.3.1. "Concours Scientifique" (2015) Authorized to work directly for See-d to contribute to the valuation of Know-how 3.3.4.
- 3.3.2. **Know-how licensing** (2015) Contrat for licensing Know-how 3.3.4 between UBS, Bretagne Valorisation and See-d.
- 3.3.3. **Enterprise foundation** (2015) Creation of enterprise See-d.
- 3.3.4. **E. Frénod** (2014) Know-how: : Méthodologie pour la valorisation économique des données (Methodology for economical valuation of data). "Enveloppe Soleau" filed by Bretagne Valorisation at INPI, October 2015.
- 3.3.5. "Concours Scientifique" (2012) Authorized to work directly for MGDIS to contribute to the valuation of Know-how 3.3.7 and 3.3.8.
- 3.3.6. **Know-how licensing** (2012) Contrat for licensing Know-how 3.3.7 and 3.3.8 between UBS, Bretagne Valorisation and MGDIS.
- 3.3.7. **E. Frénod** (2011) Know-how: Modélisation financière continue (*Continuous financial modeling*). "Enveloppe Soleau" filed by Bretagne Valorisation at INPI, May 11th, 2011.
- 3.3.8. **E. Frénod** (2011) Know-how: Algorithmes génétiques pour les stratégies financières (*Genetic Algorithms for financial strategy*). "Enveloppe Soleau" filed by Bretagne Valorisation at INPI, May 11th, 2011.
- 3.3.9. **E. Frénod** (2010) Pourquoi passer au continu. *Talk given at MGDIS, October 28th, 2010.*
- 3.3.10. **E. Frénod & E. Goubert** (2008) Synthèse et analyse critique des modèles de comportement des sédiments en domaine estuarien et de leur adéquation aux caractéristiques sédimentologiques de l'estuaire de la Vilaine. *Report to Institution d'Aménagement de la Vilaine (IAV), November 2008.*
- 3.3.11. **E. Goubert, E. Frénod, P. Peeters, P. Thuillier, H.J. Vested, N. Bernard & V. Véron** (2008) Caractérisation du fonctionnement hydrosédimentaire de l'estuaire de la Vilaine à partir d'études bathymétriques et altimétriques (Altus). *Proceedings des Dixièmes Journées Nationales - Génie Côtier - Génie Civil, Sophia Antipolis. 14-16 octobre 2008.*
- 3.3.12. **E. Frénod** (1997) Schémas d'advection conservatifs en variables  $r, v_{\parallel}, v_{\perp}$ . *Given to CEA - Centre de Limeil-Valenton in April 1997.*
- 3.3.13. **E. Frénod** (1996) Notice et recette du code "fpmultesp". *Given to CEA - Centre de Limeil-Valenton in September 1996.*

### 3.4 Editor activity

- 3.4.1. Member of the editorial board of Journal of Computer Science and Artificial Intelligence [Website].
- 3.4.2. Member of the editorial board of Journal of Mathematics, Statistics and Computing [Website].
- 3.4.3. Member of the editorial board of AIMS-Mathematics [Website].
- 3.4.4. Member of the editorial board of DCDS-S [Website].
- 3.4.5. Guest editor of DCDS-S special issue: Vol. 8, No.1 (2015) [Website] "*Numerical Methods Based on Homogenization and Two-Scale Convergence*".

### 3.5 Popularization

- 3.5.1. Participation to a podcast of the Guss : Rise of Analytics. [Podcast] - [Announcement]
- 3.5.2. **E. Frénod** (2013) Mon littoral, c'est de la dynamique. *Short paper in: 2013 - Mathématiques pour la planète Terre.*
- 3.5.3. **E. Frénod** (2013) Aquaculture en milieux confinés : le cas de l'étang de Thau. *Short paper in: 2013 - Mathématiques pour la planète Terre.*
- 3.5.4. **E. Frénod** (2013) Un exemple d'application des mathématiques à l'environnement littoral : La dynamique à long terme des dunes marines dans les zones soumises à la marée. Modélisation, Analyse, Homogénéisation et Simulation. *Matapli (Smai), No. 100, pp 129-140.*

### 3.6 European and ANR Projets

- Involved in ANRprojet "VR-Mars" since Septembre 2018 (<https://www.enib.fr/vrmars/>).
- Involved in European Projet "Verification of global gyrokinetic codes and development of new algorithms for gyrokinetic and kinetic codes - CFP-WP15-ER/IPP-01" since January 2015.
- Involved in European Projet " Verification of global gyrokinetic codes and development of new algorithms for gyrokinetic and kinetic codes - CFP-WP14-ER-01/IPP-03" from January 2014 to December 2014.
- Involved in European Projet "Synergetic numerical-experimental approach to fundamental aspects of turbulent transport in the tokamak edge - CFP-WP14-ER-01/Swiss Confederation-01" from January 2014 to December 2014.

### 3.7 Relation with Inria and CNRS

- Member of "Labex" "Centre Henri Lebesgue"
- Member of INRIA projet "Tonus" from 2013 to 2016.
- Member of AEN INRIA "Fusion" from 2009 to 2014.
- Member of the working groupe preparing AEN INRIA "C2S@Exa" from 2010 to 2012.
- Member of INRIA projet "Calvi" from 2005 to 2012.
- Member of European Research Groupe "Numerical Fluid Dynamics" from 2005 to 2011.
- Member of ARC INRIA "Modélisation des plasmas magnétisés" from 2005 to 2008.
- Member of ACI "Méthodes haute-fréquences pour les EDO et les EDP. Applications" from 2002 to 2006.
- Member of GdR CNRS SPARCH from 1991 to 2001.
- Member of ACI "Analyse mathématique et simulation numérique de particules chargées" from 2000 to 2004.

### 3.8 Evaluation activity

- Rapporteur and member of the evaluation board of the Ph.D Thesis of Éloïse Comte.
- Rapporteur and member of the evaluation board of the Ph.D Thesis of Aurélie Finot.
- Rapporteur and member of the evaluation board of the Ph.D Thesis of Céline Caldini-Queiros. defended November 15th, 2013 at Besançon.
- Rapporteur of the Ph.D Thesis of Alassane Sy defended February 9th, 2008 at Dakar.



- Rapporteur and member of the evaluation board of the Ph.D Thesis of Carine Lucas, defended Novembre 30th, 2007 at Grenoble.
- Referee for Communication in Computational Physics
- Referee for Scientific Reports (Nature)
- Referee for Nonlinearity (IOP Publishing)
- Referee for Multiscale Modeling and Simulation
- Referee for Kinetic and Related Models
- Referee for SIAM Journal on Applied Mathematics
- Referee for Communications in Mathematical Physics
- Referee for Discrete and Continuous Dynamical Systems Series-B
- Referee for Journal of Computational and Applied Mathematics
- Referee for Journal of Statistical Physics
- Referee for M2AN
- Referee for International Journal of Computer Mathematics.
- Referee for Discrete and Continuous Dynamical Systems - Series S.
- Referee for International Conference of Numerical Analysis and Applied Mathematics (ICNAAM) 2009.
- Referee for Journal of Inequalities and Applications.
- Referee for Communications in Mathematical Sciences.
- Referee for Marine and Freshwater Research
- Rapporteur of an ANR Projet in 2012.
- Rapporteur of a Research projet for the French Region Aquitaine in 2012.
- Member of the evaluation bord of competition "Prix Bretagne Jeunes Chercheurs" 2007.

## 4 Scientific responsibilities

### 4.1 Deputy head of LMBA between August 2013 and August 2015

Between August 2013 and August 2015, I have been the Deputy Head of "Laboratoire de Mathématiques de Bretagne-Atlantique" (LMBA UMR6205) [Website], bi-located in Brest (UBO) and Vannes (UBS). I was particularly in charge of the group of Vannes.

### 4.2 Other responsibilities related to LMBA

- In charge of the communication of LMBA since 2012.
- Corresponding person for education of LMBA since 2012.

### 4.3 Head of Lemel from 2006 to 2007

Lemel is a group of researchers from several fields and several laboratories who led a research activity from 2004 to 2007. The goal of this group was to bring out a research activity inventorying, modeling and understanding processes within coastal environments.

### 4.4 Congresses and seminars organizations

- Organizer of **Mini Symposium Startups & Applied Math** at congress SMAI 2017, La Tremblade - France, June 5th - 9th, 2017.
- Co-organizer of Cemracs 2015, CIRM, Marseille-Luminy, France, July and August 2015. [Site web]
- Organizer of **Special session 94 (Homogenization Based Numerical Methods) of AIMS conference**, Madrid - Espagne July 7th - 11th, 2014. [Website]
- Organizer (with François-Xavier Le Dimet and Thomas Corpetti) of a **workshop on Complex and Heterogeneous Data Assimilation** during EGC Congress at Rennes, January 28th, 2014. [Website].
- Organizer of a **Systemic and multi-field Seminary** at UBS from 2010 to 2013. [Website]. Among the invited speakers: François-Xavier Le Dimet, Jean-Pierre Nadal, Robert Bellé, Dominique Bériot, Magali Roux.
- Organizer of **Special session 79 (Numerical Methods based on Homogenization and on Two-Scale Convergence) of AIMS conference**, Orlando - Florida - USA. July 1, 2012 - July 5, 2012.
- Organizer of **Days on complex sediments' modeling** in September 2008 at Vannes. [Website]
- Organizer of a **congress on Coastal Zones** in September 2006 in Vannes. [Website]
- Organizer of **working group** "Mathematics for Plasma Physics" at IRMAR, Rennes, France, in 2000 - 2001.

### 4.5 University - Entreprises Relationship

- Member of the Management Board of **Oggam** (An association whose goal was to help relations between University and entreprises) from 2003 to 2008.
- In charge of **industrial relations** of the LMAM from 1997 to 2000.
- Representative of UBS at Vannes Technopole from 1997 to 2000.

### 4.6 Concils, commissions

- Member of the **Management Board of the Department of Mathematics, Computation Science and Statistics** of UBS from 2000 to 2004 and from November 2012 to October 2016.
- Member of the **Management Board of the Faculty of Sciences and Engineering Sciences** from December 2012 to November 2016.
- Member of the commission managing Foreign Relations of UBS in 2013.
- Member of the **Management Board of UBS** from November 2003 to September 2006 and from May 2008 to August 2010.
- Member of the commission managing Computation Ressources of UBS from January to September 2000 and from June 2008 to August 2010.
- Member of the **Recruitment Commission for Mathematics and Statistics** of UBS from 1997 to 2006 and in 2008.

- Member of the **Disciplinary Commission** of UBS from November 2003 to September 2006.
- Member of the **Academic Senat** of UBS from November 2003 to September 2006.

## Part II

# Teaching

## 5 Full Professor at UBS since September 2013

### 5.1 Teaching for 2020 - 2021

- Lectures and Tutorial Classes of "Data-Model Coupling". Second year of Master of Data Science and Statistical Modeling (15 Hours).
- Lectures in the Second semester of License of Mathematics (30 Hours).
- Lectures of "Mathematics". First year of License of Biology (70 Hours).
- Lectures and Tutorial Classes of "Differential Calculus and Series". Third year of License of Mathematics (50 Hours)
- Lectures of "Mathematics". First year of License of Mathematics - Computer Science - Statistics (30 Hours).
- "ODE and their programing in R for enzymology". Third year of License of Biology (10 Hours).

### 5.2 Teaching for 2019 - 2020

- Lectures and Tutorial Classes of "Data-Model Coupling". Second year of Master of Data Science and Statistical Modeling (15 Hours).
- Lectures and Tutorial Classes. Second semester of License of Mathematics (50 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (70 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Mathematics - Computer Science - Statistics (70 Hours).
- "ODE and their programing in R for enzymology". Third year of License of Biology (10 Hours).

### 5.3 Teaching for 2018 - 2019

- Lectures and Tutorial Classes of ""Data-Model Coupling"". Second year of Master of Mathematics (20 Hours).
- Lectures and Tutorial Classes. Second semester of License of Mathematics (50 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (90 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Mathematics - Computer Science - Statistics (50 Hours).
- "ODE and their programing in R for enzymology". Third year of License of Biology (10 Hours).

### 5.4 Teaching for 2017 - 2018

- Lectures and Tutorial Classes of "PDE - Numerical Analysis". Second year of Master of Mathematics (40 Hours).
- Lectures and Tutorial Classes. Second semester of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (44 Hours).

- Lectures and Tutorial Classes of "Mathematics". First year of License of Mathematics - Computer Science - Statistics (44 Hours).
- Lectures and Tutorial Classes "Matrix Numerical Analysis". Third year of License of Mathematics (55 Hours).
- "ODE and their programing in R for enzymology". Third year of License of Biology (10 Hours).

### 5.5 Teaching for 2016 - 2017

- "ODE - Numerical Methods" Virtual Lectures, Tutorial Classes and Virtual Tutorial Classes. Second semester of the first year of Master of Mathematical Engineering, in distance education (40 Hours).
- "PDE - Numerical Methods" Virtual Lectures, Tutorial Classes and Virtual Tutorial Classes. First semester of the second year of Master of Mathematical Engineering, in distance education (32 Hours).
- Lectures and Tutorial Classes. Second semester of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (44 Hours).
- Lectures and Tutorial Classes "Matrix Numerical Analysis". Third year of License of Mathematics (55 Hours).
- "ODE and their programing in R for enzymology". Third year of License of Biology (10 Hours).
- Supervision of the second year of Master of Mathematical Engineering in distance education.

### 5.6 Teaching for 2015 - 2016

- "ODE - Numerical Methods" Virtual Lectures, Tutorial Classes and Virtual Tutorial Classes. Second semester of the first year of Master of Mathematical Engineering, in distance education (40 Hours).
- Lectures and Tutorial Classes. Second semester of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (44 Hours).
- Lectures and Tutorial Classes "Matrix Numerical Analysis". Third year of License of Mathematics (55 Hours).
- "ODE and their programing in R for enzymology". Third year of License of Biology (10 Hours).
- Supervision of the first year of Master of Mathematical Engineering in distance education.

### 5.7 Teaching for 2014 - 2015

- Lectures and Tutorial Classes. Second semester of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (90 Hours).
- Lectures and Tutorial Classes "Matrix Numerical Analysis". Third year of License of Mathematics (55 Hours).
- "ODE and their programing in R for enzymology". Third year of License of Biology (10 Hours).
- Supervision of DU Degree in "Statistics and Computation Science fo Decision Support" - levels 1 and 2.

## 5.8 Teaching for 2013 - 2014

- Lectures and Tutorial Classes. Second semester of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "PDE - Numerical Analysis". First year of Master of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (70 Hours).
- Lectures and Tutorial Classes "Matrix Numerical Analysis". Third year of License of Mathematics (55 Hours).
- "ODE and their programmation in R for enzymology". Third year of License of Biology (10 Hours).
- Supervision of DU Degree in "Statistics and Computation Science for Decision Support" - level 1.

## 6 Associated Professor at UBS from September 2006 to August 2013

### 6.1 Teaching for 2012 - 2013

- Lectures and Tutorial Classes. Second semester of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "PDE - Numerical Analysis". First year of Master of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (55 Hours).
- Lectures and Tutorial Classes "Matrix Numerical Analysis". Third year of License of Mathematics (55 Hours).

### 6.2 Teaching for the second semester of 2011 - 2012

- Lectures and Tutorial Classes. Second semester of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "PDE - Numerical Analysis". First year of Master of Mathematics (55 Hours).

### 6.3 Fall 2011 and 2010 - 2011

Invited on an Inria position in Team Calvi, hosted by IRMA, Université de Strasbourg.

### 6.4 Teaching for 2009 - 2010

- Tutorial Classes of "Optimization". Master of Mathematics and Statistics (22 Hours).
- Lectures and Tutorial Classes of "Mathematics", including a pedagogic innovation (c.f. section 8). First year of License of Biology (70 Hours).
- Lectures of "Mathematics". First year of License of Economics and Management (30 Hours).
- Lectures of "Banach spaces, Hilbert spaces and Fourier decomposition". Third year of License of Mathematics (33 Hours).
- Lectures and Tutorial Classes of "PDE - Numerical Analysis". First year of Master of Mathematics (55 Hours).
- Part "Modeling with ODE" of "Biological Data Processing". Third year of License of Biology (15 Hours).

## 6.5 Teaching for 2008 - 2009

- Tutorial Classes of "Optimization". Master of Mathematics and Statistics (22 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (55 Hours).
- Lectures of "Banach spaces, Hilbert spaces and Fourier decomposition". Third year of License of Mathematics (33 Hours).
- Lectures and Tutorial Classes of "PDE - Numerical Analysis". First year of Master of Mathematics (55 Hours).
- Part "Modeling with ODE" of "Biological Data Processing". Third year of License of Biology (15 Hours).

## 6.6 Teaching for 2007 - 2008

- Tutorial Classes of "Optimization". Master of Mathematics and Statistics (22 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (55 Hours).
- Lectures and Tutorial Classes of "Differential Calculus" at Engineer School "Ensibs" (10 HETD).
- Lectures of "Banach spaces, Hilbert spaces and Fourier decomposition". Third year of License of Mathematics (33 Hours).
- Lectures and Tutorial Classes of "PDE - Numerical Analysis". First year of Master of Mathematics (55 Hours).
- Part "Modeling with ODE" of "Biological Data Processing". Third year of License of Biology (15 Hours).

## 6.7 Teaching for 2006 - 2007

- Tutorial Classes of "Optimization". Master of Mathematics and Statistics (22 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (55 Hours).
- Lectures of "Banach spaces, Hilbert spaces and Fourier decomposition". Third year of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "PDE - Numerical Analysis". First year of Master of Mathematics (28 Hours).
- Part "Modeling with ODE" of "Biological Data Processing". Third year of License of Biology (15 Hours).

# 7 Assistant Professor at UBS from September 1996 to August 2006

## 7.1 Teaching for 2005 - 2006

- Tutorial Classes of "Optimization". Master of Mathematics and Statistics (22 Hours).
- Lectures and Tutorial Classes. First year of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "Mathematics". First year of License of Biology (55 Hours).
- Lectures of "Banach spaces, Hilbert spaces and Fourier decomposition". Third year of License of Mathematics (55 Hours).
- Lectures and Tutorial Classes of "PDE - Numerical Analysis". First year of Master of Mathematics (28 Hours).
- Part "Modeling with ODE" of "Biological Data Processing". Third year of License of Biology (15 Hours).

## 7.2 In 2004 - 2005

- On Sabbatical

## 7.3 Teaching for previous years

- Creating, and teaching of several lectures (including analysis, numerical analysis, modeling and CAD in mathematics degrees; mathematics in biology and environmental sciences degree; mathematics for engineer; and basic statistics for an e-commerce degree)
- Building teaching programs of Mathematics degrees in 1997.

## 8 Pedagogic innovation

During 2009-2010, I experienced in first year of License of Biology a teaching method in which learning and evaluation are concomitant. The results of this experiment are presented in the following report:

- 8.0.1. **E. Frénod, T. Morineau & E.Sirot** (2010) Sur une expérimentation d'enseignement où apprentissages et évaluations sont concomitants. *Report given to Sciences Faculty of UBS in September 2010*

## 9 Other Teachings

- 1996-97 : Supervision of projets of students of ENS de Cachan.
- 1995-96 : Teacher at Departement of Mathematics at ENS de Cachan: supervision of projets, supervision of a working group, tutorial classes, mock orals

## 10 Competitive exams

- Author of the **subject** and marking of the Numerical Analysis test of the competitive exam for **ENS de Cachan** in 2001.
- Marking of Competitive exam E3A in 1999 et 2000.