

# Emmanuel Audusse

*Maître de Conférences en  
Mathématiques*

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## Position

- 2005 - Present **Associate Professor in Applied Mathematics.**  
Laboratoire Analyse Géométrie Applications  
Institut Galilée - Université Paris 13
- 2004 – 2005 **Post Doctoral Position.**  
Freie Universität Berlin  
Group of Prof. R. Klein
- 2001 – 2004 **PhD Student.**  
UPMC & INRIA Paris - Project Team BANG - Advisor : Prof. B. Perthame  
Modélisation hyperbolique et analyse numérique pour les écoulements en eaux peu profondes

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## Education

- 1998 – 1999 **Master in Applied Maths UPMC.**  
Master Thesis : Schéma équilibre pour le système de Saint-Venant
- 1995 – 1999 **ENPC Engineering School.**  
Spécialité Mathématique et Informatique pour l'Ingénierie

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## Research

- Numerics **Finite Volume Methods.**  
Well-balanced Schemes for Hyperbolic Balance Laws  
Non-linear Stability Properties (Positivity, Entropy)  
Domain Decomposition Algorithms
- Modeling **Free Surface Flows.**  
Shallow Water System and Sediment Transport  
Three-dimensional Flows and Layerwise Models  
Incompressible Navier-Stokes equations
- Softwares **TELEMAC-MASCARET.**  
Development <http://opentelemac.org>
- FreshKiss3D.**  
<https://team.inria.fr/ange/research/software/>

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## Teaching

- MACS - **Numerical Analysis.**  
Sup'Galilée Optimization, Partial and Ordinary Differential equations, Linear Algebra, Interpolation...
- Hyperbolic systems and Finite Volume Method.**
- Scientific Computing with MATLAB.**

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## Popularization

- Softwares **TsunaMaths.**  
<http://tsunamath.paris.inria.fr>
- Conferences **Mathematic Park & Maths en Mouvement.**  
Numerical Simulations and Geophysical Flows
- Others **Maths en Jean - Savantes Banlieues - Fete de la Science.**

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## PhD Supervisor

- 2016 - Present **P. Quemar**, with *O. Lafitte (Advisor) & A. Decoene*.  
Improvements in TELEMAC software for free surface incompressible Navier-Stokes equations
- 2016 - Present **L. Boittin**, with *J. Sainte-Marie (Advisor) & M. Parisot*.  
Modelling and Simulation for Sediment Transport
- 2014 - Present **E. Nayir**, with *J. Sainte-Marie (Advisor) & Y. Penel*.  
Theoretical and Numerical Study of Layerwise Models for Hydrostatic Flows
- 2014 - 2017 **M.H. Do**, with *P. Omnes (Advisor) & Y. Penel*.  
Well balanced Finite Volume Schemes for Shallow Water System with Coriolis Forces
- 2012 - 2015 **P. Ung**, with *S. Cordier (Advisor) & M. Jodeau*.  
Numerics for Sediment Transport Processes : Deterministic and Stochastic Aspects
- 2010 - 2013 **S. Sari**, with *F. Benkhaldoun (Advisor) & M. Seaid*.  
Finite Volume Schemes for Free Surface Flows

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## Participation to PhD Comitees

- 2017 - PhD **H. Zakerzadeh**, *Univ. Aachen (Germany) - Advisor : S. Noelle*.  
Reviewer Asymptotic Preserving Finite Volume Schemes for the Singularly-perturbed Shallow Water Equations with Source Terms
- 2014 - Comitee **J. Demange**, *Univ. Grenoble - Advisors : E. Blayo, L. Debreu & P. Marchesiello*.  
Member Schémas numériques d'advection et de propagation d'ondes de gravité dans les modèles de circulation océanique
- 2013 - Comitee **M. Tayachi**, *Univ. Grenoble - Advisors : E. Blayo & A. Rousseau*.  
Member Couplage de modèles de dimensions hétérogènes et application en hydrodynamique

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## Conferences Organization

- 2017 **Finite Volume for Complex Applications**.  
Eighth edition - Lille (France)
- 2013 **Num. Approx. of Hyperbolic Syst. with Source Terms and Applications**.  
Third edition - Aachen (Germany)
- 2011 **Num. Approx. of Hyperbolic Syst. with Source Terms and Applications**.  
Second edition - Roscoff (France)

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## Events Organization

- 2016 **Forum Emploi Maths**, *Cellule Entreprise*.  
Fifth edition - Cité des Sciences (Paris)
- 2013 ; 2015 **Journée Accueil en Mathématiques**.  
Fifth and Sixth editions - IHP - En partenariat avec la SMF, la SMAI et la SFdS

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## Administrative Responsibilities

- 2014 - Present **Deputy director - SupGalilee MACS engineering school**.  
Institut Galilée - Université Paris 13
- 2010 - 2014 **Deputy Director for Internships - SupGalilee MACS engineering school**.  
Institut Galilée - Université Paris 13

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## International Conferences (since 2012)

- 2017 **SIAM Geosciences**, *Erlangen (Germany)*.  
Invited Talk in a Minisymposium
- 2016 **Int. Conference on Hyperbolic Problems**, *Aachen (Germany)*.
- 2015 **Int. Conference on Low Mach Number Flows**, *Paris (France)*.  
Invited Speaker
- 2014 **Colloque Franco-Roumain de Math. Appliquées**, *Lyon (France)*.  
Invited Talk in a Minisymposium
- 2013 **MAMERN**, *Granada (Spain)*.  
Invited Talk in a Minisymposium
- 2012 **Int. Conference on Hyperbolic Problems**, *Padova (Italy)*.
- 2012 **Int. Workshop on Fluid and Population Dynamics**, *Beyrouth (Lebanon)*.  
Invited Speaker

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## Invited Speaker in Workshops and Seminars (since 2012)

- 2017 **Workshop NumWave**, *Montpellier*.
- 2017 **EGRIN GdR Annual Meeting**, *Cargese*.
- 2017 **Groupe de Travail MathOcean**, *Bordeaux*.
- 2016 **TranSNat GdR Annual Meeting**, *Roscoff*.
- 2016 **Workshop Modélisation de l'Hydrodynamique Littorale**, *Vannes*.
- 2015 **Séminaire LMNO Mathématiques Appliquées**, *Caen*.
- 2015 **Séminaire LAMFA Analyse Appliquée**, *Amiens*.
- 2015 **Séminaire IJRA Mécanique des Fluides**, *Paris*.
- 2014 **COMODO ANR Annual Meeting**, *Montpellier*.
- 2013 **Séminaire LJK Modèles et Algorithmes Déterministes**, *Grenoble*.
- 2012 **Séminaire LMO Analyse Numérique et EDP**, *Orsay*.
- 2012 **EGRIN GdR Annual Meeting**, *Orléans*.

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## Preprints (Submitted)

- 2018 **E. Audusse, M.O. Bristeau, J. Sainte-Marie.**  
Kinetic entropy for layer-averaged hydrostatic Navier-Stokes equations.  
HAL Id : hal-01583511
- 2018 **N. Aguilon, E. Audusse, E. Godlewski, M. Parisot.**  
Analysis of the Riemann Problem for a shallow water model with two velocities.  
HAL Id : hal-01618722v2

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## Articles (not related to the PhD manuscript)

- 2018 **E. Audusse, M.H. Do, P. Omnes, Y. Penel.**  
Analysis of the modified Godunov type scheme for the linear wave equation with Coriolis source term on cartesian mesh.  
Accepted in Journal of Computational Physics. HAL Id : hal-01618753
- 2018 **E. Audusse, C. Chalons, P. Ung.**  
Three-wave Approximate Riemann Solver to the Saint-Venant Exner equations.  
Accepted in International Journal for Numerical Methods in Fluids. HAL Id : hal-01204754v2
- 2016 **E. Audusse, F. Bouchut, M.O. Bristeau, J. Sainte-Marie.**  
Kinetic entropy inequality and hydrostatic reconstruction scheme for the Saint-Venant system, Mathematics of Computation, American Mathematical Society, 2016, Vol. 85, pp. 2815-2837.
- 2015 **E. Audusse, C. Chalons, P. Ung.**  
A simple well-balanced and positive numerical scheme for the shallow-water system, Communications in Mathematical Sciences, International Press, 2015, Vol. 13, pp. 1317-1332.
- 2014 **E. Audusse, F. Benkhaldoun, S. Sari, M. Seaid, P. Tassi.**  
A fast finite volume solver for multi-layered shallow water flows with mass exchange, Journal of Computational Physics, 2014, Vol. 272, pp. 23-45.
- 2011 **E. Audusse, F. Benkhaldoun, J. Sainte-Marie, M. Seaid.**  
Multilayer Saint-Venant equations over movable beds, Discrete and Continuous Dynamical Systems - Series B, 2011, Vol. 15, pp. 917-934.
- 2011 **E. Audusse, M.O. Bristeau, M. Pelanti, J. Sainte-Marie.**  
Approximation of the hydrostatic Navier-Stokes system for density stratified flows by a multilayer model. Kinetic interpretation and numerical solution, Journal of Computational Physics, Elsevier, 2011, Vol. 230, pp. 3453-3478.
- 2011 **E. Audusse, M.O. Bristeau, B. Perthame, J. Sainte-Marie.**  
A multilayer Saint-Venant system with mass exchanges for shallow water flows. Derivation and numerical validation, M2AN Mathematical Modeling and Numerical Analysis, 2011, Vol. 45, pp. 169-200.
- 2010 **E. Audusse, P. Dreyfuss, B. Merlet.**  
Schwartz wave form relaxation for primitive equations of the ocean, SIAM Journal for Scientific Computing, 2010, Vol. 32, pp. 2908-2936.
- 2009 **E. Audusse, R. Klein, A.Z. Owinoh.**  
Conservative Discretization of Coriolis Force, Journal of Computational Physics, 2009, Vol. 228, pp. 2934-2950.
- 2008 **E. Audusse, M.O. Bristeau, A. Decoene.**  
Numerical simulations of 3D free surface flows by a multilayer Saint-Venant model, International Journal for Numerical Methods Fluids, 2008, Vol. 56, pp. 331-350.
- 2007 **E. Audusse, M.O. Bristeau.**  
Finite volume solvers for a multilayer Saint-Venant system, International Journal of Applied Mathematics and Computer Science, 2007, Vol. 17, pp. 311-320.

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## Proceedings (not related to the PhD manuscript)

- 2017 **E. Audusse, O. Lafitte, B. Mélinand, P. Quemar.**  
Parametric study of the accuracy of an approximate solution for the mild-slope equation. To appear in Proceedings of SYSNASC 2017.
- 2017 **E. Audusse, S. Dellacherie, M.H. Do, P. Omnes, Y. Penel.**  
Godunov type scheme for the linear wave equation with Coriolis source term.  
To appear in ESAIM Proceedings and Surveys.
- 2017 **E. Audusse, M.H. Do, P. Omnes, Y. Penel.**  
Analysis of Apparent Topography Scheme for the Linear Wave Equation with Coriolis Force.  
Finite Volumes for Complex Applications VIII - Hyperbolic, Elliptic and Parabolic Problems.  
Springer Proceedings in Mathematics & Statistics, Vol. 200.
- 2015 **E. Audusse, S. Boyaval, Y. Gao, D. Hilhorst.**  
Numerical Simulations of the Periodic Inviscid Burgers Equation with Stochastic Forcing,  
ESAIM: Proceedings and Surveys. 2015, Vol. 48, pp. 308-320.
- 2015 **E. Audusse, S. Boyaval, N. Goutal, M. Jodeau, P. Ung.**  
Numerical simulation of the dynamics of sedimentary river beds with a stochastic Exner equation,  
ESAIM: Proceedings and Surveys. 2015, Vol. 48, pp. 321-340.
- 2013 **E. Audusse, O. Delestre, L. Minh-Hoang, M. Masson-Fauchier, P. Navaro, R. Serra.**  
Parallelization of a relaxation scheme modelling the bedload transport of sediments in shallow water flow,  
ESAIM: Proceedings and Surveys, 2013, Vol. 43, pp. 80-94.
- 2012 **E. Audusse, C. Berthon, C. Chalons, O. Delestre, J. Giesselman, N. Goutal, M. Jodeau, G. Sadaka, J. Sainte-Marie.**  
Sediment transport modelling : relaxation schemes for Saint-Venant - Exner and three layer models,  
ESAIM: Proceedings and Surveys, 2012, Vol. 38, pp. 78-98.
- 2011 **E. Audusse, R. Klein, D.D. Nguyen, S.Vater.**  
Preservation of the discrete geostrophic equilibrium in shallow-water flows,  
Finite Volumes for Complex Applications VI - Hyperbolic, Elliptic and Parabolic Problems.  
Springer Proceedings in Mathematics & Statistics.

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## Articles (related to the PhD manuscript)

- 2005 **E. Audusse, M.O. Bristeau.**  
A Well-balanced Positivity Preserving "Second-order" Scheme for Shallow Water Flows on Unstructured Grids,  
Journal of Computational Physics, 2005, Vol. 206, pp. 311-333.
- 2005 **E. Audusse.**  
A multilayer Saint-Venant System : Derivation and Numerical Validation,  
Discrete and Continuous Dynamical System - Series B, 2005, Vol. 5, pp. 189-214.
- 2005 **E. Audusse, B. Perthame.**  
Uniqueness for discontinuous flux via adapted entropies,  
Proceedings of the Royal Society of Edinburgh - Section A : Mathematics, 2005, Vol. 135, pp. 253-265.
- 2004 **E. Audusse, F. Bouchut, M.O. Bristeau, R. Klein, B. Perthame.**  
A Fast and Stable Well-balanced Scheme with Hydrostatic Reconstruction for Shallow Water Flows,  
SIAM J. Sci. Comput., 2004, Vol. 25, pp. 2050-2065.
- 2003 **E. Audusse, M.O. Bristeau.**  
Transport of Pollutant in Shallow Water Flows : A Two Time Steps Kinetic Method,  
M2AN Mathematical Modeling and Numerical Analysis, 2003, Vol. 37, pp. 389-416.