

Publications and related work

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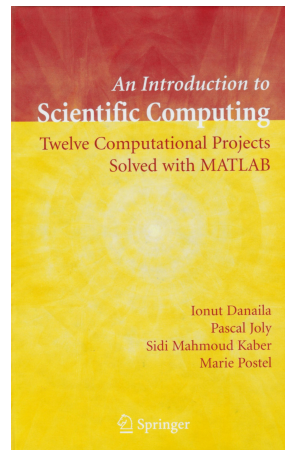
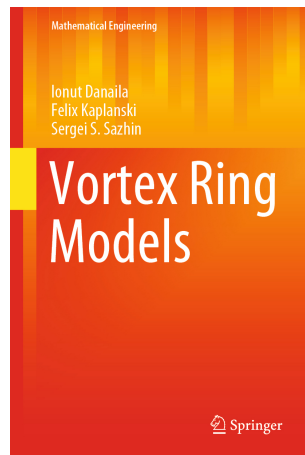
- ➡ Books
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- ➡ Scientific illustrations
- ➡ Research visits abroad

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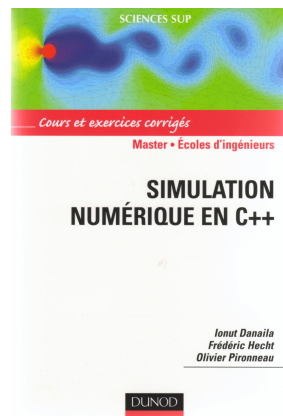
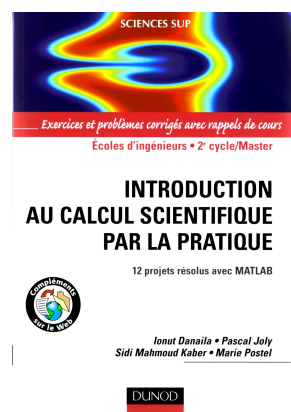
May, 2023

Books

- [B1] (to appear) I. Danaila, P. Joly, S. M. Kaber, M. Postel
An Introduction to Scientific Computing. Fifteen Computational Projects Solved with MATLAB., **Springer**, 2023.
- [B2] ➡ I. Danaila, F. Kaplanski, S. S. Sazhin
Vortex Ring Models., **Springer**, 2021.
- [B3] ➡ I. Danaila, P. Joly, S. M. Kaber, M. Postel
An Introduction to Scientific Computing. Twelve Computational Projects Solved with MATLAB., **Springer**, 2007.



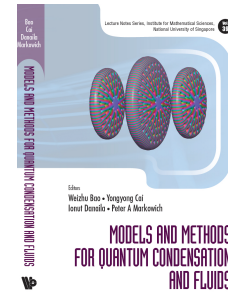
- [B4] ➡ I. Danaila, P. Joly, S. M. Kaber, M. Postel
Introduction au calcul scientifique par la pratique. 12 projets résolus avec Matlab., **Dunod**, Collection Science Sup: Masters et Ecoles d'Ingénieurs, Paris, 2005.
- [B5] ➡ I. Danaila, F. Hecht, O. Pironneau
Simulation numérique en C++, **Dunod**, Collection Science Sup: Masters et Ecoles d'Ingénieurs, Paris, 2003.



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Books (editor)

- [Be1] ➡ Editors W. Bao, Y. Cai, I. Danaila, P. Markowich
Models and Methods for Quantum Condensation and Fluids,
World Scientific, January 2023.



Book Chapters

- [Bc1] ➡ I. Danaila and L. Danaila, *From Classical to Quantum Turbulence: Basic Concepts and Models*, p. 203-270, in Editors W. Bao, Y. Cai, I. Danaila, P. Markowich, *Models and Methods for Quantum Condensation and Fluids*, **World Scientific**, January 2023.

Articles

- [A1] ➡ G. Sadaka, V. Kalt, I. Danaila and F. Hecht, *A finite element toolbox for the Bogoliubov-de Gennes stability analysis of Bose-Einstein condensates*, submitted, [hal-04021868](#), [arXiv:2303.05350](#), 2023.
- [A2] ➡ I. Danaila, C. Legrand and F. Luddens, *On the convergence of a low order Lagrange finite element approach for natural convection problems*, submitted, in revision, [hal-03737519v1](#), [arXiv:2207.127320](#), 2022.
- [A3] ➡ M. E. Brachet, G. Sadaka, Z. Zhang, V. Kalt and I. Danaila, *Coupling Navier-Stokes and Gross-Pitaevskii equations for the numerical simulation of two-fluid quantum flows*, **Journal of Computational Physics**, **488**, p. 112193(1-17), [hal-03852256](#), [arXiv:2211.07361](#), 2023.
- [A4] ➡ Z. Zhang, I. Danaila, E. L  v  que and L. Danaila, *Higher-order statistics and intermittency of a two-fluid HVBK quantum turbulent flow*, **Journal of Fluid Mechanics**, **962**, p. A22(1-28), 2023.
- [A5] ➡ V. Kalt, G. Sadaka, I. Danaila and F. Hecht, *Identification of vortices in quantum fluids: Finite element algorithms and programs*, **Computer Physics Communications**, **284**, p. 108606(1-15), 2023.
- [A6] ➡ A. Papoutsakis, I. Danaila, F. Luddens and M. Gavaises, *Droplet nuclei caustic formations in exhaled vortex rings*, **Scientific Reports**, **12**, Article number: 3892, <https://www.nature.com/> (Open access), 2022.

- [A7] ➡ J. G. Caputo, I. Danaila and C. Tain, *An Abelian Higgs model of pulsed field magnetization in superconductors*, **Journal of Physics: Conference Series**, **2043**, p. 012006(1-10), 2021.
- [A8] ➡ V. Barbu, I. Ciotir and I. Danaila, *Existence and uniqueness of solution to the two-phase Stefan problem with convection*, **Applied Mathematics & Optimization**, <https://doi.org/10.1007/s00245-021-09764-w>, p. 1-26, April 2021.
- [A9] ➡ M. Kobayashi, Ph. Parnaudeau, F. Luddens, C. Lothodé, L. Danaila, M. Brachet and I. Danaila, *Quantum turbulence simulations using the Gross-Pitaevskii equation: high-performance computing and new numerical benchmarks*, **Computer Physics Communications**, **258**, p. 107579(1-26), 2021.
- [A10] ➡ G. Sadaka, A. Rakotondrandisa, P.-H. Tournier, F. Luddens, C. Lothodé, I. Danaila, *Parallel finite-element codes for the simulation of solid-liquid phase-change systems with natural convection*, **Computer Physics Communications**, **257**, p. 107492(1-26), 2020.
- [A11] ➡ A. Rakotondrandisa, G. Sadaka, I. Danaila, *A finite-element toolbox for the simulation of solid-liquid phase-change systems with natural convection*, **Computer Physics Communications**, **253**, p. 107188(1-20), 2020.
- [A12] ➡ A. Rakotondrandisa, I. Danaila, L. Danaila, *Numerical modelling of a melting-solidification cycle of a phase-change material with complete or partial melting*, **International Journal of Heat and Fluid Flow**, **76**, p. 57-71, 2019.
- [A13] ➡ P. G. Kevrekidis, I. Danaila, J.-G. Caputo, R. Carretero-González, *Planar and radial kinks in nonlinear Klein-Gordon models: Existence, stability, and dynamics*, **Physical Review E**, **98**, p. 052217-(1-13), 2018.
- [A14] ➡ I. Danaila, F. Luddens, F. Kaplanski, *Formation number of confined vortex rings*, **Physical Review Fluids**, **3**, p. 094701-(1-22), 2018.
- [A15] ➡ A. Papoutsakis, S. S. Sazhin, S. Begg, I. Danaila, F. Luddens, *An efficient Adaptive Mesh Refinement (AMR) algorithm for the Discontinuous Galerkin method: applications for the computation of compressible two-phase flows*, **Journal of Computational Physics**, **363**, p. 399-427, 2018.
- [A16] ➡ I. Danaila, B. Protas, *Computation of Ground States of the Gross-Pitaevskii Functional via Riemannian Optimization*, **SIAM Journal on Scientific Computing**, **39**, p. B1102-B1129, 2017.
- [A17] ➡ I. Danaila, F. Kaplanski and S. Sazhin, *A model for confined vortex rings with elliptical core vorticity distribution*, **Journal of Fluid Mechanics**, **811**, p. 67-94, 2017.
- [A18] ➡ G. Vergez, I. Danaila, S. Auliac and F. Hecht, *A finite-element toolbox for the stationary Gross-Pitaevskii equation with rotation*, **Computer Physics Communications**, **209**, p. 144–162, 2016.

- [A19] ➡ I. Danaila, M. A. Khomehchi, V. Gokhroo, P. Engels and P. G. Kevrekidis, *Vector dark-antidark solitary waves in multicomponent Bose-Einstein condensates*, **Physical Review A**, **94**, p. 053617 (1-8), 2016.
- [A20] ➡ I. Danaila and B. Protas, *Optimal reconstruction of inviscid vortices*, **Proceedings of the Royal Society A: Mathematical, Physical & Engineering Sciences**, **471**, p. 20150323, 2015.
- [A21] ➡ I. Danaila, F. Kaplanski and S. Sazhin, *Modelling of confined vortex rings*, **Journal of Fluid Mechanics**, **774**, p. 267-297, 2015.
- [A22] ➡ I. Danaila, R. Moglan, F. Hecht, S. Le Masson, *A Newton method with adaptive finite elements for solving phase-change problems with natural convection*, **Journal of Computational Physics**, **274**, p. 826–840, 2014.
- [A23] ➡ Y. Zhang, I. Danaila, *Existence and numerical modelling of vortex rings with elliptic boundaries*, **Applied Mathematical Modelling**, **37**, p. 4809–4824, 2013.
- [A24] ➡ P. Kazemi, I. Danaila, *Sobolev gradients and image interpolation*, **SIAM Journal on Imaging Sciences**, **5**(2), p. 601–624, 2012.
- [A25] ➡ Y. Zhang, I. Danaila, *A finite element BFGS algorithm for the reconstruction of the flow field generated by vortex rings*, **Journal of Numerical Mathematics**, **3–4**, p. 325–340, 2012.
- [A26] ➡ R. Moglan, I. Danaila, S. Le Masson, *Méthodes d'ordre élevé pour la simulation numérique des phénomènes thermo-aéraulique dans les armoires de télécommunications*, dans **Thermique en conditions extrêmes**, Editeurs JC. Batsale, M. Azaiez, Editions Société Française de Thermique, p. 237–245, 2012.
- [A27] ➡ I. Danaila, *Modeling and simulating the flow generated by new automotive injectors*, dans *European Success Stories in Industrial Mathematics*, édité par European Mathematical Society et European Science Foundation, Springer, 2011.
- [A28] ➡ I. Danaila, P. Kazemi, *A new Sobolev gradient method for direct minimization of the Gross–Pitaevskii energy with rotation*, **SIAM Journal on Scientific Computing**, **32**, p. 2447–2467, 2010.
- [A29] ➡ I. Danaila, F. Hecht, *Finite element methods with mesh adaptivity for computing vortex states in fast-rotating Bose-Einstein condensates*, **Journal of Computational Physics**, **229**, p. 6946–6960, 2010.
- [A30] ➡ I. Danaila, C. Vadean, S. Danaila, *Specified discharge velocity model for numerical simulations of vortex rings*, **Theoretical and Computational Fluid Dynamics**, **23**, p. 317-332, 2009.
- [A31] ➡ I. Danaila, J. Hélie, *Numerical simulation of the postformation evolution of a laminar vortex ring*, **Physics of Fluids**, **20**, p. 073602(1–14), 2008.
- [A32] ➡ S. Benteboula, I. Danaila, *Variable density vortex rings*, in **Advances in Turbulence XI**, Ed. J. M. Palma and A. Silva Lopes, Springer, p. 771, 2007.

- [A33] ➡ I. Danaila, *Three-dimensional simulations of quantized vortices in rotating Bose-Einstein condensates*, **Bulletin of the "Politehnica" University of Timisoara, Transactions on Mechanics**, **51**, p. 155-162, 2006.
- [A34] ➡ S. Benteboula, I. Danaila, *Simulation numérique de l'injection gaz-gaz à masse volumique variable*, in **Défis thermiques dans l'industrie nucléaire**, Editions Société Française de Thermique, p. 521-525, 2006.
- [A35] ➡ O. El Ganaoui, C. Habchi, G. Bruneaux and I. Danaila, *Numerical simulation of an experimental gas-gas jet generated by single-hole diesel-like injection*, **Int. Journal of Numerical Methods in Fluids**, **47**, p. 1011-1018, 2005.
- [A36] ➡ I. Danaila, *Three-dimensional vortex structure of a fast rotating Bose-Einstein condensate with harmonic-plus-quartic confinement*, **Physical Review A**, **72**, p. 013605(1-6), 2005.
- [A37] ➡ I. Danaila, *Vortex dipoles impinging on finite aspect ratio rectangular obstacles*, **Flow, Turbulence and Combustion**, **72**, p. 391-406, 2004.
- [A38] ➡ A. Aftalion, I. Danaila, *Giant vortices in combined harmonic and quartic traps*, **Physical Review A**, **69**, p. 033608(1-6), 2004.
- [A39] ➡ L.-C. Crasovan, V. M. Pérez-García, I. Danaila, D. Mihalache, L. Torner *Three-dimensional parallel vortex rings in Bose-Einstein condensates*, **Physical Review A**, **70**, p. 033605(1-5), 2004.
- [A40] ➡ I. Danaila, *Numerical simulation of a rotating Bose Einstein condensate*, in **Actes du CANUM**, 2003.
- [A41] ➡ A. Aftalion, I. Danaila, *Three-dimensional vortex configurations in a rotating Bose Einstein condensate*, **Physical Review A** **68**, p. 023603(1-6), 2003.
- [A42] ➡ I. Danaila, B. J. Boersma, *Direct numerical simulation of bifurcating jets*, **Physics of Fluids**, **12** (5), p. 1255–1258, 2000.
- [A43] I. Danaila, T. Baritaud, *Direct numerical simulation of IC engine flows using a boundary body-force method*, in **Actes du CANUM**, 2000.
- [A44] ➡ I. Danaila, J. Dusek, F. Anselmet, *Nonlinear dynamics at a Hopf bifurcation with axisymmetry breaking in a jet*, **Physical Review E**, **57** (4), p. 3695–3698, 1998.
- [A45] ➡ I. Danaila, B. J. Boersma, *Mode interaction in a forced homogeneous jet at low Reynolds numbers*, in *Proceedings of the Summer Program 1998*, Center for Turbulence Research, Stanford University and NASA Ames, p. 141–158, 1998.
- [A46] I. Danaila, J. Dusek, F. Anselmet, *Nonlinear dynamics of Low Reynolds Number Round Jets: Periodic Attractors and Transition to Chaos*, in **Advances in Turbulence VII**, Editor U. Frisch, Kluwer Academic Publishers, p. 105–108, 1998.
- [A47] ➡ I. Danaila, J. Dusek, F. Anselmet, *Coherent structures in a round, spatially evolving, unforced, homogeneous jet at low Reynolds numbers*, **Physics of Fluids**, **9** (11), p. 3323–3342, 1997.

- [A48] I. Danaila, J. Dusek, F. Anselmet, *Direct numerical simulations of the free, unsteady, round, unforced jet at low Reynolds numbers*, in **Direct and Large-Eddy Simulation II**, Editors J.-P. Chollet, P. R. Voke and L. Kleiser, Kluwer Academic Publishers, p. 1–10, 1997.
- [A49] I. Danaila, J. Dusek, F. Anselmet, *Space Structure of the Free, Unsteady, Round, Homogeneous Jet at Low Reynolds Numbers*, in **Advances in Turbulence VI**, Editors S. Gavrilakis, L. Machiels and P. A. Monkewitz, Kluwer Academic Publishers, p. 11–14, 1996.
- [A50] J. Dusek, Ph. Fraunié, C. Dauchy, I. Danaila, *Secondary instabilities and transition to turbulence in wakes and jets*, in **Computation of Three-Dimensional Complex Flows**, Editors M. Deville, S. Gavrilakis and I. L. Ryhming, Vieweg, Braunschweig/Wiesbaden, p. 78–87, 1996.

Numerical codes

- [Cde1] Toolbox in **FreeFem++** for solving the Bogoliubov-de Gennes (BdG) equations (linearized Gross-Pitaevskii) (2022).
Equations: BdG for single- or two-component Bose-Einstein condensates.
Newton method to compute stationary solutions to the Gross-Pitaevskii equation. Eigenvalues and eigenvectors computed with ARPACK or SLEPC. Adaptive finite-element mesh.
2D and 3D Toolboxes published in the submitted CPC [Article A1] and developed during the PhD of Victor Kalt. Free distribution of codes under Apache 2.0 license.
- [Cde2] Toolbox in **FreeFem++** for the identification of quantized vortices in superfluids and superconductors (2022).
Post-processing programs for a (numerical or experimental) complex wave function field. Identification of vortices using a fast method (in 2D or 3D). Visualisation and computation of vortex characteristics.
2D and 3D Toolboxes published in CPC [Article A5] and developed during the PhD of Victor Kalt. Free distribution of codes under Apache 2.0 license.
- [Cde3] Toolbox in **FreeFem++** for Liquid-solid phase-change systems (> 2014).
Equations: Navier-Stokes-Boussinesq + enthalpy models (2D/3D).
Single-domain method with an enthalpy-porosity approach; Newton solver, second order in time and space.
2D Toolbox published in CPC [Article A11] and developed during the PhD of Aina Rakotonrandisa.
3D version developed during the postdoc of Georges Sadaka [Article A10] .
Free distribution of codes under Apache 2.0 license (see [A10, A11, A13, A23]).

- [Cde4] Module for **FreeFem++** for Bose-Einstein simulations (> 2009).
 Equations: stationary Gross-Pitaevskii,
 Methods: direct minimization of the Gross-Pitaevskii energy using different methods: Newton, Sobolev gradients, imaginary time propagation.
 Applications: 2D simulations of Bose-Einstein condensates (high rotations and strong interactions) (see article [A19]).
- [Cde5] Code **NSB-XYZ**: 3D code written from scratch with my PhD student R. Moglan.
 Equations: Navier-Stokes-Boussinesq 3D in Cartesian coordinates.
 Method: sixth order compact finite-difference schemes; immersed boundary method for complex geometries.
 Applications: simulation of 2D/3D flows in cavities with obstacles and thermal effects; optimisation of the configuration of outdoor telecommunications cabinets.
- [Cde6] Code **BETI** Origin: 3D code written from scratch.
 Equations: non-linear Schrödinger (Gross-Pitaevskii) equations,
 Method: finite-difference method, compact schemes,
 Scheme: Runge-Kutta + Crank-Nicolson ,
 Applications: 3D simulation of rotating Bose-Einstein condensates, 3D structure of quantized vortices.
- [Cde7] Code **JETLES** Origin: 3D code written from scratch.
 Equations: incompressible Navier-Stokes, cylindrical coordinates,
 Method: second order finite difference schemes, staggered grids,
 Scheme: Runge-Kutta + Crank-Nicolson,
 Turbulence model: direct (DNS) and large numerical simulations (SGS=dynamic model). Applications: axisymmetric and 3D round jets, vortex rings.

Invited conference talks

- [C1] ➡ (February 2023) *Workshop on Multiscale analysis and methods for PDEs: fluids and active matter dynamics*, organized by W. Bao, P. A. Markowich, B. Perthame, E. Tadmor, February 6-12, Singapore. Talk: *Numerical methods for coupling Navier-Stokes and Gross-Pitaevskii solvers for two-fluid quantum flows*.
- [C2] ➡ (January 2023) *Workshop on Mathematical Structures in Quantum Fluids*, organized by R. Fukuizumi, M. Kobayashi, T. Sakajo, M. Tsubota, , January 23-25, Osaka City University, Japan (virtual). Talk: *Numerical methods for the Bogoliubov-de Gennes stability analysis of Bose-Einstein condensates*.

- [C3] ➡ (August 2022) *XVème Colloque Franco-Roumain de Mathématiques Appliquées*, Special session *Mathematics for Industry*, organized by V. Ehrlacher, L. Dumas, August 29 - September 2, University of Toulouse, France. Talk: *Modelling and simulation of phase-change materials*.
- [C4] ➡ (March 2022) *IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena*, Special session *Nonlinear waves in Bose-Einstein Condensates: recent developments*, organized by R. Carretero, P. Kevrekidis, S. Charalampidis, March 30- April 1, University of Georgia, Athens, USA. Talk: *Numerical studies of quantum turbulence*.
- [C5] ➡ (February 2021) *Workshop on Quantized Vortices and Nonlinear Waves*, organized by M. Kobayashi, February 18-19, Kochi University of Technolog, Japan (virtual). Talk: *Simulations of Quantized Vortices and Quantum Turbulence using the Gross-Pitaevskii equation*.
- [C6] ➡ (November 2019) *Workshop on Modeling and Simulation for Quantum Condensation, Fluids and Information*, organized by W. Bao, P. A. Markowich, B. Perthame, E. Tadmor, November 18-22, Singapore. Talk: *Finite-element tools for the 2D/3D simulation of fluids and phase-change materials*.
- [C7] ➡ (July 2019) *International Colloquium on Fluid Turbulence Applications in Both Industrial and Environmental topics (in honor of Prof. F. Anselmet)*, organised by M. Amielh, July 9-11, Marseille, France. Talk: *Vortices in classical fluids and superfluid Bose-Einstein condensates*.
- [C8] ➡ (July 2019) *International Colloquium on Bluff bodies flows (in honor of Prof. J. Dusek)*, organised by D. Funfschilling, Y. Hoarau, M. Essa, July 4-5, Strasbourg, France. Talk: *Vortices in classical fluids and superfluid Bose-Einstein condensates: a numerical investigation*.
- [C9] ➡ (January 2018) *Conference on Mathematical Models and Computation of Nonlinear Problems*, organised by W. Bao, S. Jin, Y. Cai, Z. Huang, H. Wu, Tsinghua Sanya International Mathematics Forum, China. Talk: *Newton and Sobolev gradient methods for nonlinear fluid and superfluid flow problems*.
- [C10] ➡ (June 2017) *Conference and school Focus Activity on Mathematical and Computational methods for Quantum and Kinetic Problems*, Beijing Computational Science Research Center, organised by W. Bao, Y. Cai, Q. Du. Talk: *Computation of stationary states of Bose-Einstein condensates via Riemannian Optimization*.
- [C11] ➡ (June 2017) *27th Biennial Conference on Numerical Analysis, Symposium Numerical Modelling with Freefem++*, organised by V. Dolean, P.-H. Tournier, University of Strathclyde, Glasgow, UK. Talk: *Finite-element tools for the simulation of Bose-Einstein condensates*.
- [C12] ➡ (octobre 2016) *Conference on Novel Developments in Evolutionary Partial Differential Equations*, King Abdullah University of Science and Technology, organised by D. Gomes, R. Tempone, T. Tzavaras. Talk: *Sobolev gradient methods for solving minimisation problems in fluid or superfluid systems*.

- [C13] ➡ (juillet 2016) International Workshop on *Nonlinear Partial Differential Equations and Scientific Computing*, Beijing Computational Science Research Center, organised by W. Bao, H. Li, S. Wang. Talk: *Finite-element tools for the simulation of Bose-Einstein condensates*.
- [C14] ➡ (avril 2015) Workshop on *Numerical Approximation of PDEs. Honoring the 60th birthday of Frédéric Hecht*, Malaga, organised by M. J. Castro Díaz, T. Chacón Rebollo, C. Parés Madroñal, O. Pironneau. Talk: *Newton and Sobolev gradient methods for Navier-Stokes-Boussinesq and Gross-Pitaevskii equations*.
- [C15] ➡ (février 2015) Workshop on *High Performance and Parallel Computing Methods and Algorithms for Materials Defects*, National University of Singapore, organised by W. Bao, W. Ren, U. Rüde. Talk: *Towards high resolution 3D computations of quantum turbulence in Bose-Einstein condensates*.
- [C16] ➡ (septembre 2014) Symposium on *Vortices and Wall Turbulence: Paolo Orlandi, a vortical and turbulent life*, Rome, organised by R. Verzicco, S. Leonardi and S. Pirozzoli. Talk: *Direct numerical simulations of injection flows using cylindrical and spherical coordinates*.
- [C17] ➡ (juillet 2014) 10th AIMS (American Institute of Mathematical Sciences) Conference, Madrid, Spain. Session: *Advances in the numerical solution of nonlinear evolution equations*, organised by M. Thalhammer. Talk: *Combined Newton and Sobolev gradient methods for Navier-Stokes-Boussinesq and Gross-Pitaevskii equations*.
- [C18] ➡ (novembre 2013) Symposium on Frontiers of Fluid Dynamics-A Legacy: 70th Birthday of Professor Fazle Hussain, Puerto-Rico, organised by R. Adrian, W.K. George, J. Kim, C. Meneveau et al. Talk: *Vortex configurations in rotating Bose-Einstein condensates*.
- [C19] ➡ (juillet 2013) Workshop on *Quantized vortices in superfluidity and superconductivity and related problems*, Wolfgang Pauli Institute (WPI), Vienna, organised by C. Bardos, W. Bao, Q. Du, N. J. Mauser. Talk: *Minimization methods for computing stationary vortex states of fast rotating Bose-Einstein condensates*.
- [C20] ➡ (février 2013) SIAM Conference on Computational Science and Engineering, Boston, USA. Session: *Numerical Methods and Analysis for Nonlinear Dispersive Equations and Applications*, organised by X. Antoine, C. Besse, W. Bao. Talk: *Improved Sobolev gradient methods for solving the stationary Gross-Pitaevskii equation with rotation*.
- [C21] ➡ (janvier 2013) Conférence *Non-linear optical and atomic systems: deterministic and stochastic aspects*, Centre Européen pour les Mathématiques, la Physique et leurs Interactions (CEMPI), Lille, organised by C. Besse. Talk: *Numerical methods for computing vortex states in rotating Bose-Einstein condensates*.
- [C22] ➡ (novembre 2012) European Workshop *Superfluid turbulence from the perspective of numerics: modeling, methods and challenges*, ENS Lyon, organised by E. Lévêque, P.E. Roche, L. Chevillard, B. Castaing. Talk: *Advanced numerical methods for computing vortex states in Bose-Einstein condensates*.

- [C23] ➡ (juillet 2012) 9th AIMS (American Institute of Mathematical Sciences) Conference, Orlando, Florida, USA. Session: *Advances in the numerical solution of nonlinear evolution equations*, organised by M. Thalhammer. Talk: *High-order numerical methods for the stationary Gross-Pitaevskii equation*.
- [C24] ➡ (juin 2012) *Conference on Variational and Topological Methods: Theory, Applications, Numerical Simulations, Open Problems*, Northern Arizona University, organised by J. M. Neuberger. Talk: *Effective Gradient Methods for the Computation of Vortex States in Bose-Einstein Condensates*.
- [C25] ➡ (mars 2012) Spring school of physics *New challenges in turbulence research*, Les Houches, organised by A. Naso, M. Bourgoin, A. Pumir, B. Rousset. Talk: *High-order numerical methods for the simulation of Bose-Einstein condensate*.
- [C26] ➡ (juillet 2011) Symposium *Theory, Numerical Analysis, and Applications of Sobolev Gradients*, organised by J. W. Neuberger, ICIAM (International Conference for Industrial Applied Mathematics), Vancouver. Talk: *Sobolev Gradient Methods for the Computation of Vortex States in Fast Rotating Bose-Einstein Condensates*.
- [C27] ➡ (juillet 2011) Symposium *Modeling, analysis and simulation for degenerate quantum gases*, organised by W. Bao, ICIAM (International Conference for Industrial Applied Mathematics), Vancouver. Talk: *Three-dimensional numerical simulations of vortex structures in Bose-Einstein condensates*.
- [C28] ➡ (juillet 2011) Summer school of CNRS *Morphology and dynamics of anisotropic flows*, Cargèse, organised by L. Danaila, J. B. Flor, F. Godeferd. Session: *Superfluid turbulence*. Talk: *Vortex structures in Bose-Einstein condensates*.
- [C29] ➡ (décembre 2010) JSPS-EDIGE Conference on Dynamics of model equations in Bose-Einstein Condensation, Kyoto, organised by: Y. Tsutsumi, A. de Bouard, R. Fukuizumi. Talk: *Vortex configurations in rotating Bose-Einstein condensates*.
- [C30] ➡ (mars 2010) **Séminaire de Mathématiques Appliquées au Collège de France, Chaire de P.-L. Lions: Méthodes de gradients de Sobolev pour la simulation numérique de condensats de Bose-Einstein en rotation.**
- [C31] (mai 2009) First International Symposium on Green Energies, Cluj, Roumanie. Talk: *Towards a better physical understanding of the gasoline fuel injection*.
- [C32] ➡ (septembre 2008) Conference on Gross-Pitaevskii equation and related topics, Porquerolles, organised by E. Sandier et R. Danchin. Talk: *Numerical simulation of the imaginary-time evolution of the 3D Gross-Pitaevski equation*.
- [C33] (mai 2003) Turbulence conference in honor of Prof. R. A. Antonia, Newcastle, Australia. Talk: *Vortex dipoles*

Other conferences (peer-reviewed proceedings)

- [C34] I. Danaila, C. Lothodé, F. Luddens, A. Rakotondrandisa, G. Sadaka, P.-H. Tournier, *Parallel 2D and 3D numerical simulations of melting with convection*, **Congrès d'Analyse Numérique (CANUM)**, Evian-les-Bains, 13-17 juin 2022.
- [C35] I. Danaila, L. Danaila, Z. Zhang, *Numerical simulations and statistical description of the quantum turbulence modelled by HVBK equations*, **Congrès d'Analyse Numérique (CANUM)**, Evian-les-Bains, 13-17 juin 2022.
- [C36] J.-G. Caputo, I. Danaila, C. Tain, *An Abelian Higgs model of pulsed field magnetisation in superconductors*, **7th International Workshop on Numerical Modelling of High Temperature Superconductors**, June 22-23, Nancy (virtual), 2021.
- [C37] I. Danaila, G. Sadaka, A. Rakotondrandisa, C. Lothode, F. Luddens, P.-H. Tournier, *Parallel 2D and 3D numerical simulations of melting with convection*, **European Turbulence Conference ETC-17**, September 3-6, Torino, Italy, 2019.
- [C38] I. Danaila, L. Danaila, M. Kobayashi, C. Lothode, F. Luddens, Ph. Parnaudeau, *Spectral Simulations of Quantum Turbulence using the Gross-Pitaevskii Equation*, **European Turbulence Conference ETC-17**, September 3-6, Torino, Italy, 2019.
- [C39] I. Danaila, L. Danaila, M. Kobayashi, C. Lothode, F. Luddens, Ph. Parnaudeau, *Simulations of dense vortex lattices and Quantum Turbulence using the Gross-Pitaevskii equation*, **Workshop on Quantum Systems in Cold-matter Physics and Chemistry**, April 22-26, Fields Institute, Toronto, Canada, 2019.
- [C40] I. Danaila, F. Hecht, B. Protas, G. Vergez, *Finite-element tools for the simulation of Bose-Einstein condensates*, **The 12th American Institute of Mathematical Sciences Conference**, July 5-9, Taipei, Taiwan, 2018.
- [C41] A. Rakotondrandisa, I. Danaila, S. Le Masson, L. Danaila, *Numerical simulations of melting-solidification problems with natural convection. Application to phase-change materials.*, **12th European Fluid Mechanics Conference**, September 9-13, Vienna, Austria, 2018.
- [C42] I. Danaila, *Energies renouvelables et gestion énergétique durable: problèmes mathématiques et numériques*, **44ème Congrès d'Analyse Numérique CANUM-2018**, 28 mai - 1 juin, Cap d'Agde, 2018.
- [C43] A. Rakotondrandisa, I. Danaila, *Modélisation et simulation de matériaux à changement de phase*, **44ème Congrès d'Analyse Numérique CANUM-2018**, 28 mai - 1 juin, Cap d'Agde, 2018.
- [C44] A. Rakotondrandisa, I. Danaila, L. Danaila, *Etude numérique d'un cycle complet fusion-solidification pour un matériau à changement de phase*, **25ème Congrès Français de Thermique**, 29 mai - 3 juin, Pau, 2018.

- [C45] A. Rakotondrandisa, I. Danaila *Simulation de matériaux à changement de phase par une méthode d'éléments finis adaptatifs*, **25ème Congrès Français de Thermique**, 30 mai- 2 juin, Marseille, 2017.
- [C46] A. Papoutsakis, I. Danaila, F. Kaplanski, F. Luddens, S. S Sazhin *Numerical modelling of confined swirling vortex rings*, **28th International Symposium on Transport Phenomena**, 22-24 September, Peradeniya, Sri Lanka, 2017.
- [C47] A. Papoutsakis, S. S Sazhin, S. Begg, I. Danaila, F. Luddens *A new approach to modelling the two way coupling for momentum transfer in a hollow-cone spray*, **ILASS Europe 2017**, 28th Annual Conference on Liquid Atomization and Spray Systems, 6-8 September, València, Spain, 2017.
- [C48] B. Protas, I. Danaila *Reconstruction of Inviscid Vortices as an Inverse Problem*, **XXIV ICTAM**, 21-26 August, Montreal, Canada, 2016.
- [C49] F. Kaplanski, I. Danaila, S. Begg, O. Rybdylova, S. S Sazhin, M. Heikal *Confined Vortex Rings in Gasoline Fuel Sprays: Modelling and Observations*, **ILASS Europe 2016**, 27th Annual Conference on Liquid Atomization and Spray Systems, 4-7 September, Brighton, UK, 2016.
- [C50] O. Rybdylova, I. Danaila, A. Osipov, S. Begg, S. S Sazhin, *Modelling of a two-phase vortex ring flow based on the fully Lagrangian Approach*, **ILASS Europe 2016**, 27th Annual Conference on Liquid Atomization and Spray Systems, 4-7 September, Brighton, UK, 2016.
- [C51] I. Danaila, P. Parnaudeau, *High performance computing of the 3D structure of Bose Einstein condensates*, **Workshop on Computation Of Quantum Systems In Cold-matter Physics And Chemistry**, February 22–26, The Fields Institute, Toronto, 2016.
- [C52] G. Vergez, I. Danaila, S. Auliac, F. Hecht, *A finite-element toolbox for the stationary Gross-Pitaevskii equation with rotation*, **Workshop on Computation Of Quantum Systems In Cold-matter Physics And Chemistry**, February 22–26, The Fields Institute, Toronto, 2016.
- [C53] I. Danaila, B. Protas *On the optimal vorticity function of vortex rings*, **European Turbulence Conference (ETC 15)**, Delft, The Netherlands, 2015.
- [C54] I. Danaila, P. Parnaudeau, A. Suzuki *Three-dimensional structure of quantized vortices in rotating Bose-Einstein condensates*, **European Turbulence Conference (ETC 15)**, Delft, The Netherlands, 2015.
- [C55] F. Kaplanski, I. Danaila, O. Rybdylova, A. Osipov, S. Begg, S. Sazhin, Y. Rudi, M. Heikal *New approaches to modelling vortex rings and vortex ring-like structures*, **7th Baltic Heat Transfer Conference**, Tallinn, Estonia, August 24-26, 2015.
- [C56] I. Danaila, R. Moglan, F. Hecht, *Newton and Sobolev gradient methods for Navier-Stokes-Boussinesq and Gross-Pitaevskii equations*, **12ème Colloque franco-roumain de mathématiques appliquées**, Lyon, August 28, 2014.

- [C57] I. Danaila, R. Moglan, F. Hecht, S. Le Masson *Accurate interface tracking for phase-change problems with natural convection*, **European Fluid Mechanics Conference (EFMC10)**, Copenhagen, 2014.
- [C58] B. Protas, I. Danaila *Inverse problem of vortex ring reconstruction*, **67th Annual Meeting of the APS Division of Fluid Dynamics**, in **Bulletin of the American Physical Society**, Vol **59**, Nb 20, 2014.
- [C59] I. Danaila, *Condensation de Bose-Einstein: problèmes mathématiques et numériques*, **Congrès national d'analyse numérique**, Carry-le-Rouet, 2014.
- [C60] R. Moglan, I. Danaila, S. Le Masson *Méthodes d'ordre élevé pour la simulation numérique des phénomènes thermo-aérauliques dans les armoires de télécommunications*, **Rencontres Mathématiques de Rouen**, 2013.
- [C61] R. Moglan, I. Danaila, S. Le Masson *High order numerical simulations of convection in domains with heated obstacles: application to heat management in telecom outdoor cabinets*, **European Fluid Mechanics Conference (EFMC9)**, Rome, 2012.
- [C62] Y. Zhang, I. Danaila and F. Kaplanski *Modelling and reconstruction of impulsively started flows using vortex ring models*, **European Fluid Mechanics Conference (EFMC9)**, Rome, 2012.
- [C63] R. Moglan, I. Danaila, S. Le Masson *Simulation numérique des phénomènes thermo-aérauliques dans les armoires de télécommunications*, **Journées AUM/AFM**, Rouen, 2012.
- [C64] Y. Zhang, I. Danaila, *Vortex models for modeling the fuel injection in automotive engines*, **3rd Workshop on Freefem++**, LJLL, Paris, 2011.
- [C65] I. Danaila, *FreeFem++ and quantized vortices in fast-rotating Bose-Einstein condensates*, **2nd Workshop on Freefem++**, LJLL, Paris, 2010.
- [C66] I. Danaila, G.-M. Cojocaru, S. Danaila, *Direct numerical simulations of impulsively started jets from conical nozzles*, **Fifth European Conference on Computational Fluid Dynamics**, Lisbonne, 2010.
- [C67] I. Danaila, *Tourbillons en fluides et superfluides*, **Conference La Diaspora Scientifique Roumaine dans la Recherche**, Bucharest, 2008.
- [C68] S. Benteboula, I. Danaila, *Variable density vortex rings*, **European Turbulence Conference (ETC 11)**, Porto, 2007.
- [C69] I. Danaila, *Vortices in fluids and superfluids*, **Second Workshop on Vortex Dominated Flows**, Bucharest, 2006.
- [C70] S. Benteboula, I. Danaila, *Simulation numérique de l'injection gaz-gaz à masse volumique variable*, **Congrès Français de Thermique**, Ile de Ré, 2006.
- [C71] I. Danaila, *Vortex configurations in rotating Bose-Einstein condensates*, **Euro-mech Colloquium on Vortices and field interactions**, Paris, 2004.

- [C72] O. El Ganaoui, C. Habchi, G. Bruneaux, I. Danaila, *Numerical model for the single-hole Diesel-like injection*, **ICFD Conference on Numerical Methods for Fluid Dynamics**, Oxford, 2004.
- [C73] I. Danaila, *Numerical simulation of a rotating Bose Einstein condensate*, **Congrès national d'analyse numérique**, Montpellier, 2003.
- [C74] I. Danaila, T. Baritaud, *Direct numerical simulation of compressed tumbling vortices*, **Second International Symposium on Turbulence and Shear Flow Phenomena (TSFP-2)**, Stockholm, 2001.
- [C75] I. Danaila, C. Angelberger, *Direct numerical simulation of compressed tumbling vortices*, **13ème Séminaire de Mécanique des Fluides Numérique**, CEA, 2001.
- [C76] I. Danaila, *Vortex dynamics investigation by direct numerical simulations: bifurcating jets and tumbling flows*, **5th French-Russian-Finnish Workshop on Mathematical Modeling and Experimental/Computational Fluid Dynamics**, Jyväskylä, Finland, 2000.
- [C77] I. Danaila, T. Baritaud, *Direct numerical simulation of IC engine flows using a boundary body-force method*, **32e Congrès national d'analyse numérique**, Port d'Albret, 2000.

Invited seminars (> 2000)

- [S1] **University of Singapore, Applied and Computational Mathematics (ACM) seminar series:** *Numerical methods and finite-element toolboxes for the simulation of Bose-Einstein condensates*, 6/11/2019.
- [S2] **University of Brighton, Centre for Automotive Engineering, UK:** *Optimization problems for vortex rings*, 24/08/2018.
- [S3] **IRMAR, Université de Rennes, Séminaire d'Analyse Numérique:** *Sobolev gradient and conjugate-gradient methods for solving optimization problems for fluid or superfluid systems*, 17/05/2018.
- [S4] **Peking University, Beijing, Department of mathematics:** *Sobolev gradient and conjugate-gradient methods for solving optimization problems for fluid or superfluid systems*, 09/06/2017.
- [S5] **University of Kyoto, Department of mathematics:** *Finite-element methods and tools for the simulation of fluid or superfluid flows*, 11/04/2017.
- [S6] **University of Kyoto, Department of physics:** *Computation of stationary states of rotating Bose-Einstein condensates via Riemannian Optimization*, 11/04/2017.
- [S7] **University of Osaka, Department of physics:** *Finite-element tools for the simulation of Bose-Einstein condensates*, 19/04/2017.
- [S8] **University of Brighton, Centre for Automotive Engineering, UK:** *On the formation number of confined vortex rings*, 21/08/2017.

- [S9] **McMaster University, Department of Mathematics and Statistics, Hamilton, Canada:** *Vortices in classical fluids and superfluid Bose-Einstein condensates: a numerical investigation*, 2/03/2016.
- [S10] **The Fields Institute, Seminar series, Toronto, Canada:** *Vortices in superfluid Bose-Einstein condensates: numerical and mathematical contributions*, 10/02/2016.
- [S11] **Sir Ricardo Laboratories, University of Brighton, UK:** *On the optimal vorticity function of vortex rings*, 23/08/2016.
- [S12] **Université de Rouen Normandie, LMRS: Rencontres mathématiques de Rouen.** *La simulation numérique comme outil d'exploration scientifique: quelques applications en mécanique des fluides et physique quantique*, 17/06/2016.
- [S13] **INSA de Rouen: Rencontres SMAI Mathématiques-Industrie:** *Modèles mathématiques et numériques pour les matériaux à changement de phase*, 10/06/2016.
- [S14] **Sir Ricardo Laboratories, University of Brighton, UK:** *Direct Numerical Simulation of axisymmetric flows*, 14/07/2015.
- [S15] **Université Pierre et Marie Curie:** *Bose-Einstein condensation and cold matter: the new technological revolution*, FreeFem++ Days, 10/12/2014.
- [S16] **University of Newcastle, Department of Mechanical Engineering, Australia:** *Vortices in superfluid Bose-Einstein condensates: numerical and mathematical contributions*, Seminar on Turbulence Research, 23/01/2014.
- [S17] **University of Brighton, Centre for Automotive Engineering, UK:** *Reconstruction of the flow field generated by vortex rings*, Workshop on Vortex rings: theory and applications, 20/11/2013.
- [S18] **Laboratoire de Mathématiques Nicolas Oresme, Caen:** *Méthodes de gradient de Sobolev pour la simulation numérique de condensats de Bose-Einstein*, Séminaire de Modélisation Mathématique, Mécanique et Numérique, 28/01/2013.
- [S19] **Laboratoire de Mathématiques de Reims, :** *Méthodes numériques pour le calcul de solutions stationnaires de l'équation de Gross-Pitaevskii avec rotation*, Journées ANR ArDyPiTeQ, 14/12/2012.
- [S20] **CANUM 2012:** *Méthodes d'ordre élevé pour la simulation d'écoulements fluides et super-fluides*, Minisymposium "Méthodes d'ordre élevé pour Navier-Stokes", 24/05/2012.
- [S21] **Fédération Normandie Mathématiques, :** *Simulation numérique de condensats de Bose-Einstein*, Colloquium, 02/02/2012.
- [S22] **Institut Élie Cartan de Nancy:** *Méthodes numériques pour la simulation de condensats de Bose-Einstein*, Séminaire EDP et Applications, 18/10/2011.
- [S23] **Université Joseph Fourier, Laboratoire Jean Kuntzmann, Grenoble:** *Tourbillons quantiques dans les condensats de Bose-Einstein en rotation*, Séminaire MODANT (MODélisation, Analyse Numérique et Théorique), 13/04/2011.
- [S24] **Université Aix-Marseille III, LATP:** *Simulation numérique de condensats de Bose-Einstein*, Séminaire d'Analyse Appliquée, 12/01/2010.

- [S25] **Université de Rouen, CORIA:** *Modélisation et simulation numérique de l'injection fluide monophasique: analyse des structures tourbillonnaires*, Séminaire du CORIA, 19/06/2009.
- [S26] **Université Blaise Pascal, Clermont-Ferrand:** *Tourbillons en fluides et superfluides: qu'apporte la simulation numérique ?*, Séminaire de Mathématiques Appliquées, 15/05/2008.
- [S27] **Laboratoire Jacques-Louis Lions, Paris:** *Vortices in Bose-Einstein condensates*, Présentation pour l'évaluation AERES du LJLL, 7/01/2008.
- [S28] **Siemens VDO Automotive, Rouen:** *Variable density vortex ring simulations*, IDE2 Project Meeting, 30/08/2007.
- [S29] **Laboratoire Jacques-Louis Lions, Paris:** *Tourbillons en fluides et superfluides: qu'apporte la simulation numérique ?*, Journées du laboratoire, 11/10/2007.
- [S30] **University of Castilla-La Mancha:** *Vortices in Bose Einstein condensates*, Applied Mathematics Seminar, 20/12/2006.
- [S31] **The Institute of Photonic Sciences, Barcelone:** *Numerical simulation of Bose Einstein condensates*, Nonlinear Optics Seminar, 16/12/2006.
- [S32] **McGill University, Montreal, Canada:** *Variable density vortex rings*, Dep. of Mechanical Engineering, 30/06/2006.
- [S33] **Université de Picardie-Jules Verne, Amiens:** *Tourbillons en fluides et superfluides - simulations numériques*, Séminaire d'analyse appliquée A3, 6/03/2005.
- [S34] **Penn State University, USA:** *3D vortex configurations in Bose Einstein condensates*, Computational and Applied Mathematics Colloquium Series, 16/01/2004.
- [S35] **Institut Henri Poincaré:** *3D structure of vortices in a Bose-Einstein condensate trapped in harmonic and quartic potentials*, Journée entre mathématiciens et physiciens autour des Condensats de Bose-Einstein, 14/10/2003.
- [S36] **Université Paris-Sud:** *Condensats de Bose-Einstein et tourbillons quantiques*, Séminaire d'Equations aux Dérivées Partielles, 6/11/2003 .
- [S37] **Laboratoire Jacques-Louis Lions:** *Structure 3D des tourbillons quantiques présents dans un condensat de Bose-Einstein*, Séminaire du laboratoire, 28/03/2003.
- [S38] **University of Newcastle, Australia:** *Jets and vortices*, Department of Mechanical Engineering, 26/07/2001.
- [S39] **Delft University of Technology, Pays Bas:** *Direct numerical simulation of compressed tumbling vortices*, Department of Fluid Mechanics, 28/09/2000.
- [S40] **Université Paris 6:** *Approche numérique des écoulements industriels*, Journées "Science en Fête", 28/03/2000.

Scientific illustrations

- [V1] I provided the cover image of the edited volume: Editors W. Bao, Y. Cai, I. Danaila, P. Markowich *Models and Methods for Quantum Condensation and Fluids*, **World Scientific**, January 2023.
- [V2] One of my films on the vortex pairing in a round jet was selected for the last edition of the CDrom *Multimedia Fluid Mechanics*, Cambridge University Press, 2008.
- [V3] Some of my images of quantized vortices in Bose-Einstein condensates are used as illustrations in the book by A. Aftalion, *Vortices in Bose-Einstein Condensates*, Birkhäuser, 2006.
- [V4] One of my images of a giant vortex in rotating Bose-Einstein condensates is on the cover of the special issue *Bose Einstein condensates: recent advances in collective effects*, CRAS de Physique, 2004.
- [V5] One of my images on bifurcating jets is used as illustration in the book by P. Durbin and B. Pettersson Reif, *Statistical Theory and Modeling of Turbulent Flows*, John Wiley & Sons, 2000.

Research visits abroad (> 2000)

- 2023 (2 weeks) – Institute for Mathematical Sciences, Singapore. Invited by W. Bao.
- 2022 (2 weeks) – Kyoto University, Japan. Invited by T. Sakajo.
- 2019 (4 weeks) – Institute for Mathematical Sciences, Singapore. Invited by W. Bao.
- 2019 (3 weeks) – Fields Institute, Toronto, Canada. Organizer of workshop.
- 2018 (2 weeks) – University of Brighton, Sir Ricardo Laboratories, UK. Invited by S. Sazhin, F. Kaplanski.
- 2017 (4 weeks) – University of Kyoto. Invited by R. Fukuizumi, M. Kobayashi.
- 2017 (1 week) – Beijing Computational Science Research Center, Beijing, China. Invited by W. Bao, Y. Cai.
- 2017 (2 weeks) – University of Brighton, Sir Ricardo Laboratories, UK. Invited by S. Sazhin, F. Kaplanski.
- 2016 (4 months) – The Fields Institute for Research in Mathematical Sciences, Toronto, Canada. **Lead organizer** of the thematic program on *Multiscale Scientific Computing: From Quantum Physics and Chemistry to Material Science and Fluid Mechanics*, January 1 to April 30, 2016.
- 2016 (2 weeks) – Beijing Computational Science Research Center, Beijing, China. Invited by W. Bao, Y. Cai.
- 2016 (1 week) – University of Brighton, Sir Ricardo Laboratories, UK. Invited by S. Sazhin, F. Kaplanski.

- 2015 (1 week) – University of Brighton, Sir Ricardo Laboratories, UK. Invited by S. Sazhin, F. Kaplanski.
- 2015 (1 week) – National University of Singapore. Invited by W. Bao.
- 2014 (4 weeks) – University of Newcastle, Australia. Invited by L. Djenidi.
- 2013 (1 week) – University of Brighton, Sir Ricardo Laboratories, UK. Invited by S. Sazhin.
- 2010 (1 week) – Kyoto University, Japan. Invited by R. Fuikuzimi.
- 2006 (1 week) – University of Castilla–La Mancha, Departement of Mathematics, Spain. Invited by Víctor M. Pérez-García.
- 2006 (1 week) – Institute of Photonic Sciences, Barcelona. Invited by L. C. Crasovan.
- 2006 (1 week) – Delft University of Technology, Dept. of Mechanics, The Netherlands. Invited by B. J. Boersma.
- 2004 (1 week) – Penn State University, Dept. of Mathematics. Invited by Q. Du.
- 2003 (3 weeks) – University of Newcastle, Australia. Invited by L. Djenidi.
- 2001 (4 weeks) – University of Newcastle, Australia. Invited by R. A. Antonia.
- 2000 (3 weeks) – Delft University of Technology. Invited by B. J. Boersma.