Matthew Emmett
Center for Computational Science and Engineering
Lawrence Berkeley National Laboratory, Berkeley CA
mwemmett@lbl.gov

Academics

Postdoc 2012–present
Center for Computational Science and Engineering, Lawrence Berkeley National Laboratory, Berkeley CA.
Simulation and analysis of reacting flow. Supervisor: **Dr. J. Bell**.

Postdoc 2010–2012
University of North Carolina, Chapel Hill NC.
Parallel in time methods for PDEs, low-mach number projection methods. Supervisor: **Dr. M. L. Minion**.

PhD 2005–2010
University of Alberta, Edmonton AB.
Applied Mathematics. Fluid mechanics (shallow-water sediment transport) and numerical analysis (WENO methods). Supervisor: **Dr. T. B. Moodie**.

MSc 2003–2005
University of Calgary, Calgary AB.
Applied Mathematics. Differentiable manifolds and Hamiltonian mechanics (non-holonomic reduction). Supervisor: **Dr. Jędrzej Śniatycki**; co-supervisor: **Dr. Marcelo Epstein**.

BSc 1996–2001
Simon Fraser University, Burnaby BC.
Mathematical Physics with First Class Honours.

Publications

2013 R. Speck, D. Ruprecht, M. Emmett, M. Minion, M. Bolten, R. Krause; *A multi-level spectral deferred correction method*; Submitted to the SIAM Journal on Scientific Computing.

2012 M. Emmett, M. Minion; *Efficient implementation of a multi-level parallel in time algorithm.*; To appear in the Proceedings of the 21^{st} International Conference on Domain Decomposition Methods; DD21 no. 40.

2012 R. Speck, D. Ruprecht, R. Krause, M. Emmett, M. Minion, M. Winkel, P. Gibbon; *Integrating an N-body problem with SDC and PFASST*; To appear in the Proceedings of the 21^{st} International Conference on Domain Decomposition Methods; DD21 no. 5.

2012 R. Speck, D. Ruprecht, R. Krause, M. Emmett, M. Minion, M. Winkel, P. Gibbon; *A massively space-time parallel N-body solver*; Proceedings of the International Conference on High Performance Computing, Networking, Storage and Analysis; SC' 12 no. 92.

2012 D. I. Ketcheson, K. T. Mandli, A. Ahmadia, A. Alghamdi, M. Quezada, M. Parsani, M. Knepley, M. Emmett; *An Accessible Extensible Parallel Wave Propagation Solver for General Hyperbolic PDEs*; SIAM Journal on Scientific Computing vol. 34 no. 4 pp. 210–231.

2012 M. Emmett and M.L. Minion; *Toward an efficient parallel in time method for partial differential equations*; Communications in Applied Mathematics and Computational Science vol. 7 no. 1 pp. 105–132.

2010 M. Emmett; *Dam-break flows as agents of sediment transport*; PhD thesis.

2009 M. Emmett and T.B. Moodie; *Sediment transport via dam-break flows over sloping erodible beds*; Studies in Applied Mathematics vol. 123 no. 3 pp. 257-290.

2009 M. Emmett and T.B. Moodie; *Sediment transport via dam-break flows over sloping erodible beds*; Presented at, and published in the proceedings of, the Multiphase Fluid Flow 2009 conference, hosted by the Wessex Institute of Technology, New Forest, UK.

2008 M. Emmett and T.B. Moodie; *Dam-break flows with resistance as agents of sediment transport*; Physics of Fluids vol. 20 no. 8 pp. 086603; http://link.aip.org/link/?PHF/20/086603/1.

2006 O. Artoun, D. David-Rus, M. Emmett, L. Fishman, S. Fital, C. Hogan, J. Lim, E. Lushi, and V. Marinov; *Seismic Imaging, One-Way Wave Equations, Pseudodifferential Operators, Path Integrals, and all that Jazz*; Mathematical Modeling of Wave Phenomena: 2nd Conference on Mathematical Modeling of Wave Phenomena; AIP vol. 834 no. 1 pp. 286-295; http://link.aip.org/link/?APC/834/286/1.

2005 M. Emmett; *Mechanics of a pseudo-rigid disc rolling in a plane on a line*; MSc thesis.

Research interests

Numerical Analysis	Parallel in time methods for PDEs. Spectral Deferred Correction integration schemes. High-order finite volume and projection methods. Weighted Essentially Non-Oscillatory schemes for hyperbolic systems.
Fluid Mechanics	Fluid dynamics, reacting flows, geophysical and environmental flows, gravity currents and sediment transport, free boundary flows and surface tension, turbulence, and applications in biology.
Partial Differential Equations	Systems of hyperbolic conservation and balance laws, perturbation theory, Sobolev spaces, and weak solutions.
Non-linear Dynamics and Chaos	Fixed point stability, bifurcations, and simple examples of the onset of chaos.
Differentiable Manifolds	Hamiltonian mechanics, Lie groups, holonomic and non-holonomic reduction of constraints.

Grants, scholarships and awards

2012	M. Minion and M. Emmett.; *Space-time Parallelization of Numerical Methods for Partial Differential Equations*; US National Science Founation (NSF) Division of Mathematical Sciences base research grant no. 1217080.
2012	D. Ruprecht and M. Emmett; *Towards a space-time parallel Navier-Stokes solver*; Swiss National Science Foundation (SNF) International Co-operation grant no. 147597.
2009	Queen Elizabeth II Scholarship, *U. of Alberta.*
2008	Graduate Student Teaching Award, *U. of Alberta.*
2008	Teaching Excellence Award, *Delta Chi student group, U. of Alberta.*
2006	Josephine Mitchell Graduate Scholarship, *U. of Alberta.*
2005	Provost Doctoral Entrance Scholarship, *U. of Alberta.*

Teaching experience

Fall 2011	**Instructor**, *Dept. of Mathematics, U. of North Carolina, Chapel Hill NC.* Differential equations and linear algebra (M383). Upper level undergraduate class; class size of 35 students.
Winter 2008	**Instructor**, *Dept. of Math and Stats, U. of Alberta, Edmonton AB.* Calculus II (M101). Class size roughly 80 students.
Fall 2007	**Instructor**, *Dept. of Math and Stats, U. of Alberta, Edmonton AB.* Calculus I (M100). Class size roughly 90 students.
Fall 2006	**Instructor**, *Dept. of Math and Stats, U. of Alberta, Edmonton AB.* Calculus II (M101). Class size roughly 90 students.
2005–2010	**Teaching Assistant**, *Dept. of Math and Stats, U. of Alberta, Edmonton AB.* Calculus I, II, and III (M113, M100, M101, M209). Differential Equations I (M201). Help sessions. Class sizes roughly 30 students.
2003–2005	**Teaching Assistant**, *Dept. of Math and Stats, U. of Calgary, Calgary AB.* Calculus I, II, and III (M249, M251, M253, M349); Linear Algebra I (M211, M221); Introduction to Fourier Analysis (M415); Continuous tutorials. Class sizes ranging from 10 to 100 students.

Seminars and presentations (selected)

2013 PFASST efficiency and Multi-grid SDC schemes for Adaptive Mesh Refinement methods. *SIAM Conference on Computational Science & Engineering (CSE13), Boston MA.*

2012 Toward efficient parallel in time methods for PDEs.. *Applied Math seminar Lawrence Berkeley National Laboratory, Berkeley CA.*

2012 The Parallel Full Approximation Scheme in Space and Time (PFASST) algorithm (invited). *Workshop on High Performance Computing and Hybrid Programming Concepts for Hyperbolic PDE Codes, King Abdullah University of Science and Technology, Saudi Arabia.*

2012 Toward efficient parallel in time methods for PDEs.. *SIAM Conference on Parallel Processing for Scientific Computing, Savannah GA.*

2011 Parallelizing higher-order projection methods in space and time. *International Congress of Applied and Industrial Mathematics, Vancouver BC.*

2010 WENO methods for sediment transport via dam-break flows. *Applied Math seminar, University of North Carolina, Chapel Hill NC.*

2010 Shallow-water waves and bed ripples due to erosion (poster). *Fluid dynamics, Analysis, and Numerics 2010, Duke University, Durham NC.*

2010 WENO methods for sediment transport via dam-break flows. *Wave Phenomena IV, U. of Alberta.*

2010 Dam-break flows, sediment transport and WENO methods. *Physical Mathematics Seminar, Massachusetts Institute of Technology, Boston MA.*

2009 Sediment transport via dam-break flows over sloping erodible beds. *Multiphase Fluid Flow 2009, Wessex Institute of Technology, New Forest, UK.*

2008 Sediment transport via dam-break flows over sloping erodible beds. *Graduate Research Symposium of the Institute of Geophysical Research, U. of Alberta.*

2008 Dam-break flows with resistance as agents of sediment transport. *Graduate Colloquium, U. of Alberta.*

2007 Hyperbolic conservation laws and finite volume methods. *Canadian Young Researchers Conference, U. of Calgary.*

2006 The logistic map as a simple example of chaos. *GAME Seminar, U. of Alberta.*

2005 The strange attractor of the Hénon map. *Young Researchers Conference, U. of Calgary.*

2005 Hamiltonian mechanics and the Hopf fibration. *Applied Math Seminar, U. of Calgary.*

Conferences and workshops attended (selected)

2013	SIAM Conference on Computational Science & Engineering (CSE13). *Boston MA.*
2012	High Performance Computing and Hybrid Programming Concepts for Hyperbolic PDE Codes. *King Abdullah University of Science and Technology, SA.*
2012	SIAM Conference on Parallel Processing for Scientific Computing. *Savannah GA.*
2011	International Congress of Applied and Industrial Mathematics. *Vancouver BC.*
2011	High Performance Computing and Hybrid Programming Concepts for Hyperbolic PDE Codes. *King Abdullah University of Science and Technology, SA.*
2010	Fluid dynamics, Analysis, and Numerics 2010. *Duke University, Durham NC.*
2010	Waves Phenomena IV. *University of Alberta, Edmonton AB.*
2009	Multiphase Fluid Flow 2009. *Wessex Institute of Technology, New Forest UK.*
2008	Second Canada-France Congress. *U. du Québec à Montréal, Montréal QC.*
2007	Graduate Industrial Mathematical Modelling Camp, and Industrial Problem Solving Workshop. *U. of Alberta, Edmonton AB.*
2007	Complex Geophysical Gravity Currents Workshop. *U. of British Columbia, Vancouver BC.*
2006	Applied Mathematics Graduate Student Conference. *Simon Fraser University, Burnaby BC.*
2006	Graduate Industrial Mathematical Modelling Camp, and Industrial Problem Solving Workshop. *U. of Calgary, Calgary AB.*
2004	MRI Spring School: Lie groups in Analysis, Geometry and Mechanics. *U. of Utretch, Utretch North-Holland, Netherlands.*
2004-2008	Annual Canadian Young Researchers Conferences. *U. of Alberta and U. of Calgary, Edmonton AB and Calgary AB.*

Professional work experience (selected)

2002–present	**System Administrator**, *The Communitas Group, Edmonton AB.* File, mail, web and firewall server installation and maintenance.
2001–2003	**Programmer**, *Matrix Geoservices, Calgary AB.* Developed an anisotropic velocity analysis tool – a graphical data analysis tool to assist geophysicists in building anisotropic velocity models of the earth's surface.
2001–2006	**Programmer and System Administrator**, *Cooperative Auto Network (CAN), Vancouver BC.* Co-developed an on-line booking system for CANs network of shared cars. Ongoing maintenance of computing infrastructure.

Organising experience (selected)

2012	**Co-organiser**: *Time-parallel integration minisymposia, SIAM Parallel Processing conference.*
2006–2010	**Organiser**: *Canadian Young Researchers Conference, Edmonton AB.*
2006–2009	**Secretary**: *Allendale Community League, Edmonton AB.*
2005–2009	**Secretary**: *Graduates at Alberta Mathematics Etc, Edmonton AB.*
2002–2006	**Various Committees, Committee Chair**: *Prairie Sky Cohousing Cooperative, Calgary AB.*
2003–2005	**Board of Directors**: *Calgary Community Network Association, Calgary AB.*
2002–2005	**President**: *Fair Vote Canada - Calgary Chapter, Calgary AB.*
2001–2004	**Board of Directors**: *Boiled Frog Trading Cooperative, Calgary AB.*