

Marcus J. Grote

Professor of Numerical Analysis and
Computational Mathematics

Mathematisches Institut, Universität Basel
Rheinsprung 21, CH-4051 Basel

EDUCATION

- 1990–1995 **Stanford University**, USA
Ph.D. in Scientific Computing and Computational Mathematics,
graduated Spring 95. Advisor: Professor Joseph B. Keller.
Dissertation: "Nonreflecting Boundary Conditions"
Ph.D. minor in Mathematics,
Ph.D. minor in Mechanical Engineering.
- 1985–1990 **Université de Genève**, Geneva, Switzerland
Diplôme de mathématicien, equivalent to an M.S. in Mathematics.
Advisor: Professor Gerhard Wanner.
- 1985–1990 **Université de Genève**, Geneva, Switzerland
Diplôme d'informaticien, equivalent to an M.S. in Computer Science.

HONORS AND AWARDS

- Spring 2001 Offered the Chair of Numerical Analysis (C-4 Professur) at the L.-M.-Universität München, Munich, Germany. Declined May 2001.
- 1993–1995 *IBM graduate fellowship*, nationwide(USA) competition
- August 1992 **IMA**, University of Minnesota
Competitive admission to a four week workshop on mathematical modeling in engineering science and industry
- 1990–1991 *Graduate fellowship*, School of Engineering, Stanford University

PROFESSIONAL APPOINTMENTS

- 2001–present **Department of Mathematics, Universität Basel**, Basel, Switzerland
Professor of Numerical analysis and computational mathematics.
- 2008–2009 **Courant Institute, NYU**, New York, USA
Visiting professor, on sabbatical leave.
- 2004–2005 **Courant Institute, NYU**, New York, USA
Visiting professor, on sabbatical leave.
- 1997–2001 **Department of Mathematics, ETH**, Zürich, Switzerland
Assistant professor.
- 1995–1997 **Courant Institute of Mathematical Sciences**, New York
Associate research scientist. Post-doctoral position under Prof. Andrew Majda.
- Summer 1993 **U.C. San Francisco**, San Francisco, California
Research assistant. Collaborated with Prof. David A. Agard, Department of Biochemistry. Implemented a complete volume rendering algorithm for the display and analysis of three-dimensional biological images coming from confocal microscopy.

Summer 1992 **NASA Ames**, Moffett Field, California
Research assistant. Continued the work started in summer 1991 with Dr. Horst Simon on the Connection Machine CM-2. Combined the preconditioner with an iterative solver, and applied the method to an extensive set of test problems coming from scientific and industrial applications.

Summer 1991 **NASA Ames**, Moffett Field, California
Research assistant. Collaborated with Dr. Horst Simon. Implemented a parallel preconditioner for the iterative solution of large linear systems on the Connection Machine CM-2.

INVITED TALKS

- Jan. 2013 *Oberwolfach*, Germany, meeting on Computational Electromagnetics and Acoustics
- Oct. 2012 *Prague*, Czech Republic, EUROMECH Colloq. Adv. Model. of Wave Propagation
- May 2012 *Heraklion*, Crete, ACMAC workshop on Wave Propagation in Complex Media
- Mar 2012 *University of Metz*, France, “Journées de Metz” on Wave Propagation, on local-time stepping.
- Feb. 2012 *Oberwolfach*, Germany, meeting on Discontinuous Galerkin Methods
- Nov. 2011 *Linz*, Austria, RICAM Workshop on Wave Propagation and Scattering
- Oct. 2011 *Freudenstadt*, Germany, KIT workshop on Wave Phenomena
- Sept. 2011 *Würzburg*, Germany, ESF-OPTPDE meeting on Fast Solvers for Wave Propagation
- Apr. 2011 *Uppsala University*, Sweden, on FE-HMM for wave propagation.
- Sept. 2010 *Cambridge*, UK, on Next generation numerical methods for computational wave propagation.
- Aug. 2010 *Oberwolfach*, Germany, meeting on Math. Th. and Model. in Atm.-Ocean Science
- Jun. 2010 *Stanford University*, USA, on FE-HMM for wave propagation.
- Feb. 2010 *Oberwolfach*, Germany, meeting on Computational Electromagnetics and Acoustics
- Oct. 2009 *EPFL*, Lausanne, on DG-FEM and local time-stepping
- Jan. 2009 *ICCAM conference*, Shanghai, on ABC and multiple scattering
- Dec. 2008 *Courant Institute*, USA, winter school “Real Time Filtering”
- Nov. 2008 *University of Delaware*, USA, on DG-FEM and local time-stepping
- Jun. 2008 *FoCM 2008 conference*, Hong-Kong, on DG-FEM and local time-stepping
- Jun. 2008 *Chinese Acad. of Sciences*, Peking, on Multiple scattering
- Nov. 2007 *BIRS*, Banff, Canada, meeting on DG-FEM
- Nov. 2007 *Université Louis Pasteur*, Strasbourg, on DG-FEM and local time-stepping
- Apr. 2007 *Lawrence Livermore Nat. Lab.*, USA, on DG-FEM and local time-stepping
- Mar. 2007 *Stanford 50 conference*, USA, on Multiple scattering and DG-FEM
- Mar. 2007 *Universität Innsbruck*, Austria, on DG-FEM and local time stepping
- Feb. 2007 *Oberwolfach*, Germany, meeting on Computational Electromagnetics and Acoustics
- Nov. 2006 *INRIA, Rocquencourt*, France, winter school “Ecole des Ondes” on DG-FEM
- Aug. 2006 *Oberwolfach*, Germany, meeting on Math. Th. and Model. in Atm.-Ocean Science
- May 2006 *Universität Zürich*, Switzerland, on Multiple scattering and DG-FEM
- Mar. 2006 *Université de Genève*, Switzerland, on Multiple scattering and DG-FEM

Jan. 2006 *Université de Fribourg*, Switzerland, on Multiple scattering and DG-FEM
 Nov. 2005 *Universität Karlsruhe*, Germany, on Multiple scattering and DG-FEM
 Nov. 2005 *Techn. Universität München*, Germany, on Multiple scattering and DG-FEM
 Mar. 2005 *University of Delaware*, USA, on Multiple scattering
 Mar. 2005 *NJIT*, USA, on Multiple scattering
 Mar. 2005 *Stanford University*, USA, on Multiple scattering
 Feb. 2005 *Courant Institute*, USA, on Multiple scattering
 Feb. 2005 *Columbia University*, USA, on Multiple scattering
 Jul. 2004 *WIAS Berlin*, Germany, Nonreflecting boundary conditions
 Feb. 2004 *Oberwolfach*, Germany, meeting on Computational Electromagnetics
 May 2003 *Universität Münster*, Germany, on Wave propagation in unbounded media
 Dec. 2002 *Université de Haute-Alsace, Mulhouse*, France, on Wave prop. in unbound. med.
 Aug. 2002 *Oberwolfach*, Germany, meeting on Math. Th. and Model. in Atm.-Ocean Science
 Mar. 2002 *HYP 2002 conference*, Caltech, CA, on Nonreflecting boundary conditions
 July 2001 *Universität Freiburg i. Br.*, Germany, on Nonreflecting boundary conditions
 Jan. 2001 *RWTH Aachen*, Germany, on Parallel preconditioning with approximate inverses
 Aug. 2000 *PMAA 2000 meeting*, Switzerland, tutorial on the SPAI Algorithm
 June 2000 *Universität Heidelberg*, Germany, on Nonreflecting boundary conditions
 Mar. 2000 *Université de Rennes*, France, on Modeling geophysical flows via statistical theory
 Feb. 2000 *EPFL*, Switzerland, on Nonreflecting boundary conditions
 Dec. 1999 *L.-M.-Universität München*, Germany, on Nonreflecting boundary conditions
 Dec. 1999 *Universität Zürich*, Switzerland, on Nonreflecting boundary conditions
 Dec. 1999 *Universität Basel*, Switzerland, on Nonreflecting boundary conditions
 June 1999 *Oberwolfach*, Germany, meeting on Fast Solvers for PDE's
 Feb. 1999 *Techn. Universität München*, Germany, on Nonreflecting boundary conditions
 Jan. 1999 *Université de Fribourg*, Switzerland, on Nonreflecting boundary conditions
 June 1998 *ETH Zürich*, Switzerland, on Modeling large scale geophysical flows
 June 1998 *Oxford University*, UK, on Nonreflecting boundary conditions
 June 1998 *Oxford University*, UK, on Parallel preconditioning
 May 1998 *Universität Tübingen*, Germany, on Nonreflecting boundary conditions
 Dec. 1997 *Courant Institute, NY*, on Large and small scale interaction via topographic stress
 Nov. 1997 *Universität Göttingen*, Germany, on Nonreflecting boundary conditions
 March 1997 *ETH, Zürich*, Switzerland, on Nonreflecting boundary conditions
 April 1996 *University of Maryland, MD*, on Nonreflecting boundary conditions
 Feb. 1996 *NJIT, Institute of Technology, NJ*, on Nonreflecting boundary conditions
 Nov. 1995 *AT&T, Bell Labs, NJ*, on Nonreflecting boundary conditions
 Nov. 1995 *Courant Institute, NY*, on Nonreflecting boundary conditions
 Aug. 1995 *Swiss Center for Supercomputing (CSCS)*, on Parallel preconditioning

TEACHING EXPERIENCE

Fall 2001– **Universität Basel**

Since Fall 2001, teaching undergraduate and graduate level courses in Linear Algebra, Numerical Analysis, Applied Analysis, etc.

Responsible for a “Mathematics laboratory” course at the computer on the use of Maple, Matlab, LaTeX, C.

PH.D. THESES DIRECTED

Feb. 2011– M. Mehlin, *Discontinuous Galerkin and Local Time-Stepping Methods for Maxwell's Equations*, (Dept. of Mathematics, Uni Basel), ongoing work.

Spring 2008– J. Huber, *Time-harmonic inverse scattering problems in heterogenous media*, (Dept. of Mathematics, Uni Basel), ongoing work (joint work with O. Schenk, Dept. of Computer Science).

Spring 2008– Ch. Stohrer, *Heterogeneous multiscale methods for the wave equation*, (Dept. of Mathematics, Uni Basel), ongoing work.

June 2009 I. Sim, *Local nonreflecting boundary conditions for multiple scattering*, (Dept. of Mathematics, Uni Basel).

March 2009 V. Palumberi, *Mathematical modeling and simulation of cell populations*, (Dept. of Mathematics, Uni Basel).

July 2006 A. Schneebeli, *Interior Penalty Discontinuous Galerkin Methods for Electromagnetic and Acoustic Wave Equations*, (Dept. of Mathematics, Uni Basel).

April 2005 C. Kirsch, *Nonreflecting boundary conditions for the numerical solution of wave propagation problems in unbounded domains*, (Dept. of Mathematics, Uni Basel).

May 2003 O. Bröker, *Parallel Multigrid Methods using Sparse Approximate Inverses*, (Dept. of Computer Science, ETH Zürich).

NUMERICAL SOFTWARE

June 1994 *SPAI*, SParse Approximate Inverse preconditioner, FORTRAN 77 version, joint work with Prof. T. Huckle, TU-München,
see <ftp://simplicity.Stanford.EDU/pub/grote/spai/>

May 1999 *SPAI Version 3.0*, C/MPI parallel version, PETSc interface, Matlab interface, joint work with S. Barnard, NASA Ames Research Center,
see <http://www.sam.math.ethz.ch/~grote/spai/>

Mar. 2006 *SPAI Version 3.2*, auto configure installation and fixed sparsity added, new Matlab functions `spaidiags`, `spaitau` added, joint work with O. Bröker and M. Hagemann,
see <http://www.computational.unibas.ch/software/spai/>

SPECIAL SKILLS

Bilingual in French and German, fluent in English.

Experienced in FORTRAN, C, Unix, L^AT_EX, Matlab, and Mathematica.

Parallel programming experience on the Connection Machine CM-2, on the SGI/Cray SV-1, and on the NEC SX-4.

PROFESSIONAL ACTIVITIES

May 2011 **ProDoc Mini-course**, On PDE-Constrained Optimization (by Prof. E. Haber, UBC, Canada), member of the organizing committee.

April 2009 **Schweizer Numerik Kolloquium**, Swiss NA-day 2009 in Basel, member of the organizing committee.

- July 2007 **ICIAM07**, Internat. Congress on Industrial and Applied Mathematics, Zurich, Switzerland, member of the scientific committee.
- June 2004 **CANUM04**, Congrès National d'Analyse Numérique, Obernai, France, member of the scientific committee.
- June 2003 **BASNUM03**, Spring Meeting of the Swiss Mathematical Society, organisor (with D. Schötzau).
- Nov. 2002 **PMAA 2002**, Neuchâtel, Switzerland
Member of the organizing committee.
Minisymposium on Parallel Algebraic Multigrid Methods (with O. Schenk)
- July 2001 **AMCW01**, Berlin, Germany
Organized two minisymposia:
Statistical mechanics models for the atmosphere and ocean (with. A. Majda);
Numerical methods for wave propagation in unbounded media (with F. Schmidt)
- Feb. 2001 **GAMM 2001**, ETH Zürich, member of the organizing committee
- Aug. 2000 **PMAA 2000**, Neuchâtel, Switzerland
Organized a minisymposium on Sparse approximate inverses at the International workshop on parallel matrix algorithms and applications (with P. Arbenz, ETHZ)
- July 1999 **ENUMATH 99**, Jyväskylä, Finland
Organized a minisymposium on Mathematical and numerical modeling in atmosphere-ocean science (with A. Majda)
- 1997–2001 Member of the committee responsible for inviting guests for post-graduate lectures at the ETH Zürich
- 1997–present Acting referee for *SIAM Journal on Scientific Computing*, *SIAM Journal on Applied Mathematics*, *SIAM Journal on Numerical Analysis*, *SIAM Journal on Matrix Analysis*, *Journal of Computational Physics*, *Numerische Mathematik*, *Journal of the Acoustical Society of America*, *Computer Methods in Applied Mechanics and Engineering*, *European Journal of Applied Mathematics*, *Mathematics and Computers in Simulation*, *High Performance Computing Applications*, *ZAMP*

REFERENCES

Available upon request from:

Prof. Joseph B. Keller, Depts. of Mathematics and Mechanical Engineering, Stanford University, Stanford, CA 94305, (415) 723–0851.

Prof. Andrew J. Majda, Courant Institute of Mathematical Sciences, 251 Mercer St., New York, NY 10012, (212) 998–3323.

Prof. Gerhard Wanner, Dépt. de Mathématiques, Université de Genève, 2–4 rue du Lièvre, CH–1211 Genève 4, Switzerland, (+41) 22 702–6952.

JOURNAL PUBLICATIONS

- (with A. Abdulle) *Finite Element Heterogeneous Multiscale Method for the Wave Equation*, SIAM J. Multiscale Modeling and Simulation 9, pp. 766–792 (2011).
- (with I. Sim) *Local Nonreflecting Boundary Condition for Time Dependent Multiple Scattering*, J. Comp. Phys. 230, pp. 3135–3154 (2011).
- (with V. Palumberi, B. Wagner, A. Barbero and I. Martin) *Dynamic Formation of Oriented Patches in Chondrocyte Cell Cultures*, J. Math. Biol. 63, pp. 757–777 (2011).
- (with T. Mitkova) *Explicit Local Time Stepping For Maxwell's Equations*, J. Comp. Appl. Math. 234, pp. 3283–3302 (2010).
- (with L. Beilina) *Adaptive Hybrid Finite Element/Difference Method for Maxwell's Equations*, TWMS J. Pure Appl. Math 1, pp. 176–198 (2010).
- (with M. Bollhöfer and O. Schenk) *Algebraic Multilevel Preconditioner for the Helmholtz Equation in Heterogeneous Media*, SIAM J. Sc. Computing 31, pp. 3781–3805 (2009).
- (with I. Sim) *On Local Nonreflecting Boundary Conditions for Time Dependent Wave Propagation*, Chinese Ann. Math. Ser. B, vol. 30, pp. 589–606 (2009).
- (with A.J. Majda) *Mathematical test models for superparametrization in anisotropic turbulence*, Proc. Natl. Acad. Sci. USA, 106, pp. 5470–5474 (2009).
- (with J. Diaz) *Energy conserving explicit local time-stepping for second-order wave equations*, SIAM J. Sc. Computing, vol. 31, pp. 1985–2014 (2009).
- (with D. Schötzau) *Optimal Error Estimates for the Fully Discrete Interior Penalty DG Method for the Wave Equation*, J. Sc. Computing, vol. 40, pp. 257–272 (2009).
- (with A. Schneebeli and D. Schötzau) *Interior Penalty Discontinuous Galerkin Method for Maxwell's Equations: Optimal L^2 -Norm Error Estimates*, IMA J. Numer. Analysis 28, pp. 440–468 (2008).
- (with A.J. Majda) *Explicit Off-line Test Criteria for Stable Accurate Time Filtering of Strongly Unstable Spatially Extended Systems*, Proc. Natl. Acad. Sciences 104, pp. 1124–1129 (2007).
- (with C. Kirsch) *Nonreflecting Boundary Conditions for Time Dependent Multiple Scattering*, J. Comp. Physics 221, pp. 41–62 (2007).
- (with A. Schneebeli and D. Schötzau) *Interior Penalty Discontinuous Galerkin Method for Maxwell's Equations: Energy Norm Error Estimates*, J. Comput. Appl. Math. 204, pp. 375–386 (2007).
- (with A. Schneebeli and D. Schötzau) *Discontinuous Galerkin Finite Element Method For The Wave Equation*, SIAM J. Num. Analysis, 44, pp. 2408–2431 (2006).
- (with A.J. Majda) *Stable Time Filtering of Strongly Unstable Spatially Extended Systems*, Proc. Natl. Acad. Sciences, 103, pp. 7548–7553 (2006).
- *Local Nonreflecting Boundary Conditions for Maxwell's Equations*, Comput. Methods Appl. Mech. Engrg. 195, pp. 3691–3708 (2006).
- (with A. Barbero, V. Palumberi, B. Wagner, et al.) *Experimental and Mathematical Study of the Influence of Growth Factors on the Growth Kinetics of Adult Human Articular Chondrocytes*, J. Cell. Physiology 204, pp. 830–838 (2005).
- (with C. Kirsch) *Dirichlet-to-Neumann Boundary Conditions for Multiple Scattering Problems*, J. Comp. Phys. 201, pp. 630–650 (2004).

- (with W. Bangerth and C. Hohenegger) *Finite Element Method for Time Dependent Scattering: Nonreflecting Boundary Conditions, Adaptivity, and Energy Decay*, Comp. Meth. Appl. Mech. Engrg. 193, pp. 2453–2482 (2004).
- (with G. Gächter) *Dirichlet-to-Neumann Map for Three-Dimensional Elastic Waves*, Wave Motion, vol. 37/3, pp. 293–311 (2003).
- (with O. Bröker) *Sparse Approximate Inverse Smoothers For Geometric and Algebraic Multigrid*, Appl. Num. Math. 41, pp. 61–80 (2002).
- (with O. Bröker, C. Mayer, and A. Reusken) *Robust Parallel Smoothing for Multigrid via Sparse Approximate Inverses*, SIAM J. Sc. Comput. 23, pp. 1396–1417 (2001).
- (with M.T. DiBattista and A.J. Majda) *Meta-stability of Equilibrium Statistical Structures for Prototype Geophysical Flows with Damping and Driving*, Physica D: 151, 271–304 (2001).
- *Nonreflecting Boundary Condition for Elastodynamic Scattering*, J. Comput. Phys. 161, 331–353 (2000).
- (with A.J. Majda) *Crude Closure for Flow with Topography Through Large Scale Statistical Theory*, Nonlinearity 13, 569–600 (2000).
- *Am Rande des Unendlichen – Numerische Verfahren für unbegrenzte Gebiete*, (Numerical methods for unbounded domains, in German), Elem. Math. 55, 67–83 (2000).
- (with J.B. Keller) *Exact Nonreflecting Boundary Condition for Elastic Waves*, SIAM J. Appl. Math. 60, 803–819 (2000).
- *Nonreflecting Boundary Conditions for Electromagnetic Scattering*, Int. J. Numer. Model. 13, 397–416 (2000). (Special issue on absorbing boundary conditions for computational electromagnetics).
- (with A.J. Majda, and C. Ragazzo) *Dynamic Mean Flow and Small-Scale Interaction Through Topographic Stress*, J. Nonlin. Science 9, 89–130 (1999).
- (with J.B. Keller) *Nonreflecting Boundary Conditions for Maxwell’s Equations*, J. of Comput. Phys. 139, 327–342 (1998).
- (with A.J. Majda) *Model Dynamics and Vertical Collapse in Decaying Strongly Stratified Flows*, Phys. of Fluids 9, 2932–2940 (1997).
- (with A.J. Majda) *Crude Closure Dynamics Through Large Scale Statistical Theories*, Phys. of Fluids 9, 3431–3442 (1997).
- (with T. Huckle) *Parallel Preconditioning with Sparse Approximate Inverses*, SIAM J. of Scient. Comput. 18, 838–853 (1997).
- (with J.B. Keller) *Nonreflecting Boundary Conditions for Time Dependent Scattering*, J. of Comput. Phys. 127, 52–65 (1996).
- (with J.B. Keller) *On Nonreflecting Boundary Conditions*, J. of Comput. Phys. 122, 231–243 (1995).
- (with J.B. Keller) *Exact Nonreflecting Boundary Conditions for the Time-dependent Wave Equation*, SIAM J. of Appl. Math. 55, 280–297 (1995).

REFEREED CONFERENCE PROCEEDINGS

- (with J. Huber and O. Schenk) *Interior Point Methods for the Inverse Medium Problem on Massively Parallel Architectures*, in Proc. of Internat. Conf. on Computational Science (ICCS 2011), held in Singapore, June 1–3, 2011, Procedia Comp. Sc. vol. 4, Elsevier, pp. 1466–1474, 2011.

- (with J. Huber, O. Schenk and A. Waechter) *Solving time-harmonic inverse medium optimization problems with inexact interior-point step computation*, in Proc. of SIAM Conference on Optimization (OPT 11), held in Darmstadt, May 16–19, 2011.
- (with T. Mitkova) *High-order explicit local time-stepping methods for transient wave motion*, in Proc. of 10th Internat. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2011), held at SFU, Vancouver, July 25–29, 2011.
- (with A. Abdulle and C. Stohrer) *Finite element heterogeneous multiscale method for transient wave propagation*, in Proc. of 10th Internat. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2011), held at SFU, Vancouver, July 25–29, 2011.
- (with J. Huber and O. Schenk) *Inexact interior-point methods for time-harmonic inverse medium problems*, in Proc. of 10th Internat. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2011), held at SFU, Vancouver, July 25–29, 2011.
- (with T. Mitkova) *Discontinuous Galerkin Methods and Local Time Stepping for Wave Propagation*, in Proc. of Internat. Conf. on Numer. Analysis and Appl. Math. (ICNAAM 2010), held in Rhodos, Sept. 19–25, 2010, AIP vol. 1281, pp. 320–324, 2010.
- (with I. Sim) *On local nonreflecting boundary conditions for time-dependent multiple scattering*, in Proc. of 9th Internat. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2009), pp. 62–63, held at INRIA, Pau, France, June 15–19, 2009.
- (with T. Mitkova) *Explicit local time-stepping for transient electromagnetic waves*, in Proc. of 9th Internat. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2009), pp. 70–71, held at INRIA, Pau, France, June 15–19, 2009.
- (with I. Sim) *Perfectly matched layer for the second-order wave equation*, in Proc. of 9th Internat. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2009), pp. 370–371, held at INRIA, Pau, France, June 15–19, 2009.
- (with T. Mitkova) *Discontinuous Galerkin methods and local time-stepping for transient electromagnetic waves*, in Proc. of Internat. Conf. on the Math. of Finite Elements and Applic. (MAFELAP 2009), p. 119, held at Brunel University, London, UK, June 9–12, 2009.
- (with J. Diaz and T. Mitkova) *Discontinuous Galerkin methods and local time-stepping for transient wave motion*, in Proc. of WCCM8 and ECCOMAS 2008, held in Venice, Italy, June 30–July 5, 2008.
- (with I. Sim) *Exact local nonreflecting boundary conditions for time-dependent multiple scattering*, in Proc. of 6th Intern. Congress on Indust. and Appl. Math. (ICIAM 2007), held in Zurich, July 16–20, 2007.
- (with Ch. Kirsch) *Nonreflecting boundary condition for time-dependent multiple scattering*, in Etude de la propagation ultrasonore en milieux non-homogènes en vue du contrôle non destructif (Proc. Journées du GDR US, France, 2006); Eds. M. Deschamps, B. Desoudin, A. Léger, INRIA, pp. 210–218, 2007.
- (with J. Diaz) *Explicit energy conserving local time stepping for second order wave equations*, in Proc. of 8th Intern. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2007), pp. 263–265, held at Univ. of Reading, UK, July 23–27, 2007.
- (with I. Sim) *Local nonreflecting boundary conditions for time-dependent multiple scattering*, in Proc. of 8th Intern. Conf. on Math. and Numerical Aspects of

Wave Propagation (WAVES 2007), pp. 283–285, held at Univ. of Reading, UK, July 23–27, 2007.

- (with O. Schenk, M. Bollhöfer) *Algebraic multilevel preconditioning for Helmholtz equation*, in Proc. of Europ. Conf. on Comput. Fluid Dynamics (ECCOMAS CFD 2006), held in Egmond aan Zee, The Netherlands, Sept. 5–8, 2006.
- (with A. Schneebeli, D. Schötzau) *Interior penalty DG-FEM for second order wave equations*, in Proc. of 7th Intern. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2005), pp. 408–410, held at Brown Univ., June 20–24, 2005.
- (with C. Kirsch, P. Meury) *Nonreflecting boundary conditions for multiple domain wave scattering in unbounded media*, In Numerical Mathematics and Advanced Applications (Proc. ENUMATH 2003), M. Feistauer, V. Dolejší, P. Knobloch, K. Najzar, eds., Springer, 2004, pp. 391–399
- (with C. Kirsch) *Dirichlet-to-Neumann boundary condition for multiple scattering problems*, in Proc. of Sixth Intern. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2003), Eds. G. Cohen et al., Springer-Vg, 2003, pp. 263–267.
- (with C. Kirsch) *Far-field evaluation via nonreflecting boundary conditions*, in Proc. of Ninth Intern. Conf. on Hyperbolic Problems: Theory, Numerics, Applications (HYP 2002), Eds. T. Hou and E. Tadmor, Springer-Vg, 2003, pp. 195–201.
- (with O. Bröker) *Parallel smoothing for multigrid with sparse approximate inverses*, in Proc. of Third Intern. Conf. on High-Performance Scient. Engin. Computing: Meth., Developments, and Applic. (FORTWIHR 2001), held in Erlangen, Germany, March 2001.
- (with O. Bröker) *Parallel Algebraic Multigrid via Sparse Approximate Inverses*, in Proc. of 16th IMACS World Congress 2000, held in Lausanne, Switzerland, August 2000.
- (with A.J. Majda, and M.G. Shefter) *Analytical Models for Vertical Collapse and Instability in Strongly Stratified Flows*, in Proceedings of IUTAM Conference on Rotating Stratified Turbulence, (held in Boulder, Colorado, 1998), edited by Kerr, Herring and Kimura, 2000.
- *Nonreflecting Boundary Conditions for the Simulation of Elastic Waves in Unbounded Media*, in Proc. Fifth Internat. Conf. on Math. and Numerical Aspects of Wave Propagation (WAVES 2000), held in Santiago de Compostela, Spain, July 2000.
- (with A.J. Majda) *Crude Closure Dynamics for Geophysical Flows via Large Scale Statistical Theory*, in Proc. of the 12th Conf. on Atmospheric and Oceanic Fluid Dynamics, held in New York, NY, June 1999.
- (with S. Barnard) *A Block Version of the SPAI Preconditioner*, Proceedings of the 9th SIAM conference on Parallel Processing for Scientific Computing, San Antonio, TX, March 1999.
- (with V. Deshpande, P. Messmer, and W. Sawyer) *Parallel Implementation of a Sparse Approximate Inverse Preconditioner*, in Proceedings of Irregular '96, held in Santa Barbara, CA, August 1996.
- (with T. Huckle) *Effective Parallel Preconditioning with Sparse Approximate Inverses*, Proceedings of the 7th SIAM conference on Parallel Processing for Scientific Computing, San Francisco, CA, February 1995.
- (with J.B. Keller) *Nonreflecting Boundary Conditions*, Anniversary volume, Danish Center for Applied Mathematics and Mechanics, Lyngby, Denmark, 1994.

- (with H.D. Simon) *Parallel Preconditioning and Approximate Inverses on the Connection Machine*, Proceedings of the 6th SIAM conference on Parallel Processing for Scientific Computing, Norfolk, VA, March 1993.
- (with H.D. Simon) *Parallel Preconditioning and Approximate Inverses on the Connection Machine*, Proceedings of the Scalable High Performance Computing Conference (SHPCC) 1992, Williamsburg, VA, April 1992, IEEE Comp. Sc. Press.

BOOKS AND MONOGRAPHS

- *Local and Nonlocal Nonreflecting Boundary Conditions for Electromagnetic Scattering*, in Modeling and Computations in Electromagnetics (Ed. H. Ammari), Lect. Notes in Comput. Sciences and Engin., vol. 59, pp. 105–127, Springer, 2007.
- *Information Theory and Stochastics for Multiscale Nonlinear Systems*, A.J. Majda, R.V. Abramov, and M.J. Grote, Amer. Math. Soc., Providence, USA, 2005
- *Nonreflecting Boundary Conditions for Time Dependent Waves*, in A Celebration of Mathematical Modeling, The Joseph B. Keller Anniversary Volume (Eds. D. Givoli, M. J. Grote, G. Papanicolaou), Kluwer Acad. Publ., 2004.
- *Nonreflecting Boundary Conditions*, in Absorbing Boundaries and Layers, Domain Decomposition Methods (Eds. L. Halpern, L. Tourrette), Nova Science Publishers, Inc., New York, 2001.
- (with H. Chen, J. Swedlow, et al.) *The Collection, Processing and Display of Digital Three-Dimensional Images in Biological Specimens*, in Handbook of Biological Confocal Microscopy, 2nd ed., ed. J. Pawley, Plenum, NY, 1995.
- (et al.) *A model for venous blood flow in the legs, Model of radionuclide contaminants in an aquifer, Flame propagation through combustible gases in a cylinder, Flow improvement in hydrofractured reservoirs*, in Mathematical Modeling, IMA Preprint Series #1021, University of Minnesota, 1992.

UNPUBLISHED ADDRESSES, ABSTRACTS, POSTERS, ETC.

- (with I. Sim) *Accurate Simulation of Transient Multiple Scattering*, Proc. of 6th Intern. Conf. Sc. Comput. and Applic. SCA 2008, held in Busan, Korea, June 2–5, 2008.
- (with Ch. Kirsch) *Non-reflecting boundary conditions for time-harmonic multiple scattering*, Fifth International Conference of Applied Mathematics and Computing, held in Plovdiv, Bulgaria, Aug. 12–18, 2008.
- (with I. Sim) *Local Nonreflecting Boundary Condition for Time-dependent Multiple Scattering*, Swiss NA-Day, held at the University of Fribourg, Fribourg, April 25, 2008
- (with A. Barbero, I. Martin, V. Palumberi, and B. Wagner) *Spatio-angular modeling for the formation of oriented patches in chondrocyte cultures*, Biovalley Life Sciences Week 2007, held in Basel, Switzerland, Oct. 19–23, 2007.
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