

Timothy M. Wildey

CONTACT INFORMATION	Sandia National Laboratories Optimization and Uncertainty Quantification Department P.O. Box 5800, Mail Stop 1318 Albuquerque, NM 87185-1318	<i>Phone:</i> (505) 844-0760 <i>E-mail:</i> tmwilde@sandia.gov
CURRENT POSITION	Research and Development Staff	
RESEARCH INTERESTS	Finite element and finite volume methods, <i>a posteriori</i> error analysis and estimation, uncertainty quantification, adjoint methods, multiphysics and multiscale problems, operator splitting and decomposition, computational fluid dynamics, geomechanics, flow and transport in porous media, numerical linear algebra, domain decomposition, multilevel and multiscale preconditioners, parallel computing.	
EDUCATION	PhD., Mathematics <i>Colorado State University, Department of Mathematics</i> • Dissertation: “ <i>A posteriori</i> Analysis of Operator Decomposition in Interface Problems” • Advisors: Don Estep and Simon Tavener	August 2007
	M.S., Mathematics <i>Colorado State University, Department of Mathematics</i> • Dissertation: “A Pseudospectral Method for the Globally Coupled Ginzburg-Landau Equations in 2D” • Advisors: Iuliana Oprea and Gerhard Danglemayr	August 2004
	B.S., Mathematics <i>Michigan State University, Department of Mathematics</i>	May 2001
EXPERIENCE	Senior Member of Technical Staff <i>Sandia National Laboratories</i>	January 2011 - present
	ICES Postdoctoral Fellow <i>The University of Texas at Austin</i>	August 2007 - December 2010
	Graduate Research Assistant <i>Colorado State University</i>	January 2004 - August 2007
	Summer Internship <i>Sandia National Laboratory</i>	May - August, 2005
	Graduate Teaching Assistant <i>Colorado State University</i>	August 2001 - December 2004
	Teaching Assistant <i>Michigan State University</i>	August, 2000 - May, 2001

PUBLICATIONS

1. *Introducing FACETS, the Framework Application for Core-Edge Transport Simulations*, J.R. Cary, J. Candy, R.H. Cohen, S. Krashennnikov, D.C. McCune, D.J. Estep, J. Larson, A.D. Malony, P.H. Worley, J.A. Carlsson, A.H. Hakim, P. Hamill, S. Kruger, S. Muzsala, A. Pletzer, S. Shasharina, D. Wade-Stein, N. Wang, L. McInnes, T. Wildey, T. Casper, L. Diachin, T. Epperly, T.D. Rognlien, M.R. Fahey, J.A. Kuehn, A. Morris, S. Shende, E. Feibush, G.W. Hammett, K. Indireskumar, C. Ludescher, L. Randerson, D. Stotler, A. Yu Pigarov, P. Bonoli, C.S. Chang, D.A. D'Ippolito, P. Colella, D.E. Keyes, R. Bramley and J.R. Myra, *Journal of Physics: Conference Series* 78(1), (2007).
2. *A posteriori error estimation of approximate boundary fluxes*, T. Wildey, S. Tavener, and D. Estep, *Communications in Numerical Methods in Engineering*, 24 (2008), pp. 421-434
3. *A posteriori analysis and improved accuracy for an operator decomposition solution of a conjugate heat transfer problem*, D. Estep, S. Tavener, T. Wildey, *SIAM J. Numer. Anal.*, 46 (2008), pp. 2068-2089
4. *A posteriori error analysis of multiscale operator decomposition methods for multiphysics models*, D. Estep, V. Carey, V. Ginting, S. Tavener, T. Wildey, *Journal of Physics: Conference Series* 125 (2008), pp. 1-16
5. *Stochastic collocation and mixed finite elements for flow in porous media*, B. Ganis, H. Klie, M. F. Wheeler, T. Wildey, I. Yotov, and D. Zhang, *Comp. Meth. in Appl. Mech. and Engng.*, 197 (2008) pp. 3547-3559.
6. *A posteriori error analysis for a transient conjugate heat transfer problem*, D. Estep, S. Tavener, T. Wildey, *Finite Elements in Analysis and Design*, 45 (2009) pp. 263-271
7. *Domain decomposition for linear elasticity with DG jumps and mortars*, V. Girault, G. Pencheva, M. F. Wheeler, T. Wildey, *Comp. Meth. in Appl. Mech. and Engng.*, 198 (2009) pp. 1751-1765
8. *A posteriori error estimation and adaptive mesh refinement for a multi-discretization operator decomposition approach to fluid-solid heat transfer*, D. Estep, S. Tavener, T. Wildey, *Journal of Computational Physics*, 229 (2010), pp. 4143-4158
9. *A multiscale preconditioner for stochastic mortar mixed finite elements*, M. F. Wheeler, T. Wildey, I. Yotov, *Comp. Meth. in Appl. Mech. and Engng.*, 200 (2011) pp. 1251-1262.
10. *Domain decomposition for poroelasticity and elasticity with DG jumps and mortars*, V. Girault, G. Pencheva, M.F. Wheeler, T. Wildey. *M3AS.*, 21 (2011) pp. 169-213.
11. *Role of Computational Science in Protecting the Environment: Geological Storage of CO₂*, M. F. Wheeler, M. Delshad, X. Kong, S. Thomas, T. Wildey, G. Xue. *Proceedings of the International Congress of Mathematicians (Hyderabad, India, August 2010)*, Vol. IV, Hindustan Book Agency, 2010, pp. 2864-2885.
12. *Recent Advances in Multiscale Mortar Methods*, M. F. Wheeler, T. Wildey, and G. Xue. *Numerical Linear Algebra with Applications*, Vol. 17, 2010, pp. 771-785.
13. *A posteriori analysis of stochastic differential equation utilizing polynomial chaos expansions*, T. Butler, C. Dawson, T. Wildey. *SIAM J. Sci. Comput.* 33, (2011) pp. 1267-1291
14. *A frozen Jacobian multiscale preconditioner for nonlinear interface operators*, B. Ganis, G. Pencheva, M. F. Wheeler, T. Wildey, I. Yotov. *Multiscale Model. Simul.*, 10(3), 853873.
15. *A Posteriori Error Analysis of Parameterized Linear Systems Using Spectral Methods* T. Butler, P. Constantine, T. Wildey. *SIAM. J. Matrix Anal. Appl.* 33, (2012) pp. 195-209

16. *Preconditioning for Mixed Finite Element Formulations of Elliptic Problems* T. Wildey, G. Xue. Proceeding of Domain Decomposition Methods in Science and Engineering XX, Vol. 91, Springer Berlin Heidelberg, 2013, pp. 175-182.
17. *Certified a posteriori error estimates for multiscale, multinumercs, and mortar coupling.* G. Pencheva, M. Vohralik, M. F. Wheeler, T. Wildey. SIAM J. Numer. Anal., 51 (2013), pp. 526-554.
18. *Propagation of Uncertainties Using Improved Surrogate Model*, T. Butler, C. Dawson, T. Wildey. SIAM/ASA Journal on Uncertainty Quantification, 1 (2013), pp. 164-191.
19. *A Posteriori Error Estimates for Multiscale Mortar Discretizations.* S. Tavener and T. Wildey, Accepted for publication in SIAM. J. Sci. Comput. 2012.
20. *A posteriori Analysis of Stabilized Finite Element Methods.* E. Cyr, J. Shadid, and T. Wildey. Submitted to SIAM. J. Sci. Comput. 2012.
21. *A Posteriori Error Analysis of Interior Penalty Discontinuous Galerkin Methods.* T. Wildey. Submitted to Int. J. Numer. Model. Engrg. 2012.
22. *Efficient uncertainty propagation for network multiphysics systems.* P. Constantine, E. Phipps, and T. Wildey. Submitted to Int. J. Numer. Model. Engrg. 2013.
23. *A posteriori Error Control for Partial Differential Equations with Random Data.* C. Bryant, S. Prudhomme, and T. Wildey. Submitted to SIAM J. Uncert. Quant. 2013.

PAPERS IN
PREPARATION

1. *A Geometric Multigrid Algorithm Based on Dirichlet-to-Neumann Maps*, T. Wildey, M. F. Wheeler.
2. *Utilizing Error Estimates and Adaptive Surrogate Models to Accurately Predict the Probabilities of Events.* T. Butler, T. Wildey.
3. *Efficient Adjoint Based a posteriori Error Estimation using Data Compression .* E. Cyr, J. Shadid, and T. Wildey.
4. *Enhancing adaptive sparse grid approximations and refinement using a-posteriori error estimation.* J. Jakeman and T. Wildey.

UNPUBLISHED /
TECHNICAL
REPORTS

1. *A pseudospectral method for the globally coupled Ginzburg-Landau equations in 2D*, T. Wildey, M.S. Thesis, 2004
2. *Connecting finite volume element methods with Galerkin methods*, T. Wildey, 2006.
3. *A posteriori analysis of operator decomposition in interface problems*, T. Wildey, PhD. Thesis, 2007.
4. *Software documentation for ACES*, T. Wildey, 2008.
5. *The preconditioned Newton-Krylov iteration for coupled multiphysics problems*, D. Estep, S. Tavener, T. Wildey, 2008.
6. *Uncertainty Assessment in Atmospheric Component of Climate Models*, L. P. Swiler, T. M. Wildey, and K. Dalbey, October 2011, SAND2011-8310.
7. *Propagation of Model Form Uncertainty for Thermal Hydraulics using RANS Turbulence Models in Drekar*, M. S. Eldred and T. M. Wildey. July 2012, SAND2012-5845.
8. *Adjoint Based a posteriori Error Estimation in Drekar::CFD*, T. M. Wildey, E. C. Cyr, R. Pawlowski, J. Shadid, T. Smith. October 2012, SAND2012-8910.
9. *A Comparison of Adjoint and Data-Centric Verification Techniques*, T. Wildey, E.C. Cyr, R. Pawlowski, J. Shadid, T. Smith., April 2013, SAND2013-2879.
10. *Does Solution Adaptivity Help or Hinder Solution Verification?* , W. J. Rider, G. Weirs, and T. Wildey, September 2013, SAND2013-7920.

PRESENTATIONS

ASCR Applied Mathematics Meeting, Albuquerque, NM August 2013
Adjoint-Based Error Analysis for Stabilized Formulations and IMEX Schemes

ADMOS 2013: International Conference on Adaptive Modeling and Simulation, June 2013
Adjoint Based a posteriori Error Estimates Using Data Compression

4th International Congress on Computational Engineering and Sciences, May 2013
A Posteriori Error Analysis and Adaptive Construction of Surrogate Models

SIAM Conference on Computational Science and Engineering, February 2013
Adjoint Techniques for Adjoint Inconsistent Methods

SIAM Conference on Uncertainty Quantification, April 2012
A Posteriori Error Analysis and Adaptive Construction of Surrogate Models for Probabilities

Uncertainty Quantification and Multiscale Materials Modeling Workshop, June 2011
A Posteriori Error Analysis of Stochastic Differential Equations Using Polynomial Chaos Expansions

Colorado State University, May 2011
Multiscale Mortar Methods for Flow and Mechanics in Porous Media

SIAM Conference on Computational Issues in Geoscience, March 2011
A Dirichlet-to-Neumann Multigrid Algorithm for Locally Conservative Methods

CSM Industrial Affiliates Meeting, October 2010
A Novel Geometric Multigrid Algorithm for Multinumerics on Unstructured Meshes

Sandia National Labs, September 2010
Efficient Uncertainty Quantification and a posteriori Error Estimation for Multiscale Mortar Methods

SIAM Annual Meeting, July 2010
Domain Decomposition for Poroelasticity and Elasticity

CSM Workshop on CO₂ Sequestration, June 2010
Introduction to Parallel Computing

InterPore Annual Meeting, March 2010
Multiscale Mortar Preconditioners for Flow in Porous Media

National Renewable Energy Laboratory, February 2010
Utilizing Multiscale Information in the Design Efficient Solvers for Stochastic and Nonlinear Interface Operators

CSM Industrial Affiliates Meeting, October 2009
A Multiscale Mortar Preconditioner with Applications to Nonlinear Interface Operators

SIAM Annual Meeting, July 2009
A Multiscale Preconditioner for Nonlinear Multiphysics Problems in Porous Media

SIAM Conference on Computational Issues in Geosciences, June 2009
Multiscale Mortar Mixed Finite Element Preconditioners for Stochastic Flow in Porous Media

SIAM Conference on Computational Issues in Geosciences, June 2009
A Multiscale Preconditioner with Application to Solute Transport in Porous Media

SIAM Conference on Computational Issues in Geosciences, June 2009
MPFA Mortar Multiscale Method for Multiphase Flow in Porous Media

CSM Industrial Affiliates Meeting, October 2008
A Multiscale Preconditioner with Application to Flow in Porous Media

SIAM Annual Meeting, July 2008
Iterative Techniques for the Solution of Coupled Multiphysics Problems

Finals of the Melosh Medal Competition, April 2007
A posteriori Error Estimation and Adaptive Mesh Refinement for a Multi-discretization Operator Decomposition Approach to Fluid-Solid Heat Transfer

Copper Mountain Conference on Iterative Methods, April 2007
A Low Fidelity Approach for Efficient Uncertainty Quantification of High Fidelity Models

CSM Industrial Affiliates Meeting, October 2007
Uncertainty Quantification and Error Estimation

Tech-X Corporation April 2007
Adjoint Methods for a posteriori Error Estimation

SIAM Conference on Computational Science and Engineering, February 2007
A posteriori Analysis of An Operator Decomposition Method for Time-Dependent Transfer of Information Through an Interface

Lawrence Livermore National Laboratory, February 2007
A posteriori Analysis of Operator Decomposition on Interface Problems

SIAM Annual Meeting, July 2005
A posteriori Analysis of a Finite Element Solution of Heat Conduction in an Coupled System of Two Objects

Sandia National Laboratory, December 2005
A posteriori Error Estimation of Approximate Boundary Fluxes

Colorado State University, September 2005
Introduction to a posteriori Error Estimation

Colorado State University, September 2004
A Pseudospectral Method for the Globally Coupled Ginzburg-Landau Equations in 2D

- HONORS / AWARDS
- Finalist for Melosh Medal
 - ICES Postdoctoral Fellowship
 - Graduate Research Fellowship
 - National Science Foundation Fast Track to Work Scholarship
 - Grand Haven Community Foundation Scholarship

PROFESSIONAL
SERVICE

- Reviewer for SIAM Journal on Numerical Analysis, Finite Elements in Analysis and Design, SIAM Journal on Multiscale Modeling and Simulation, Computational Geosciences
- Minisymposium organizer for SIAM Annual Meeting 2010, SIAM Conference on Uncertainty Quantification 2012.

MEMBERSHIPS

- Society for Industrial and Applied Mathematics (SIAM)
- U.S. Association for Computational Mechanics (USACM)
- American Mathematical Society (AMS)
- Eagle Scout, Boy Scouts of America

COMPUTER SKILLS

- Languages: Fortran, C, C++, MPI, HTML, MATLAB, \LaTeX .
- Software Packages: ACES (Adaptive Coupled Equation Solver) and PACES (Parallel Adaptive Coupled Equation Solver)