RESUME - Leo G Rebholz

PERSONAL DATA

Professor
Department of Mathematical Sciences
Clemson University
Clemson, SC 29634
864-656-1840

EDUCATION

Ph.D., University of Pittsburgh, 2006, Mathematics
  Thesis: *Helicity and physical fidelity in models and algorithms*
  Advisor: Prof. W. Layton
M.A., University of Pittsburgh, 2003, Mathematics
M.S., Duquesne University, 2002, Computational Mathematics
  Thesis: *Bankruptcy as a cusp catastrophe*
  Advisor: Prof. A. Gaur
B.S., Duquesne University, 2000, Mathematics

PROFESSIONAL EXPERIENCE

Clemson University
  2016- , Coordinator of Undergraduate Studies for Mathematical Sciences
  2015- , Professor of Mathematical Sciences
  2012-2015, Associate Professor of Mathematical Sciences
  2008-2012, Assistant Professor of Mathematical Sciences
Emory University
  2014-2015, Adjunct Associate Professor of Mathematics
Bechtel Bettis Atomic Power Laboratory
  2007-2008, Senior Mathematician
  2004-2007, Mathematician
University of Pittsburgh
  2002-2006, Teaching Fellow and Research Assistant
Community College of Allegheny County
  2002-2003, Mathematics Instructor
Management Science Associates Inc.
  2001-2002, Market Research Analyst (Statistician)
Duquesne University
  2000-2002 Teaching Assistant
The Home Depot
  1996-2001 Plumbing sales and service

MEMBERSHIPS

Member, American Mathematical Society, AMS, (2000-)
Member, Society for Industrial and Applied Mathematics, SIAM, (2007-)

PUBLICATIONS
Books

1. T. Heister, L. Rebholz and F. Xue, *Numerical Analysis*, DeGruyter (Berlin), in final editing stage and under contract to deliver by August 2018. [this is a textbook for MATH 4600]

2. T. Heister and L. Rebholz, *Introduction to Scientific Computing for Scientists and Engineers*, DeGruyter (Berlin), 2015. [this is a textbook for MATH 3650]

3. W. Layton and L. Rebholz, *Approximate Deconvolution Models of Turbulence: Analysis, Phenomenology and Numerical Analysis*, Springer (Heidelberg), 2012. [this is a research monograph]

Refereed Journal Publications (* denotes student)

91. A. Larios, Y. Pei, and L. Rebholz, Global well-posedness of the velocity-vorticity-Voigt formulation of the 3D Navier-Stokes equations, submitted to *Journal of Differential Equations.*

90. L. Rebholz, D. Wang, Z. Wang, K. Zhao, and C. Zerfas, Initial Boundary Value Problems for a System of Parabolic Conservation Laws Arising From a Keller-Segel Type Chemotaxis Model in Multiple Space Dimensions, submitted to *DCDS-A.*

89. S. Charnyi*, T. Heister, M. Olshanskii and L. Rebholz, Efficient discretizations for the EMAC formulation of the incompressible Navier-Stokes equations, submitted to *Applied Numerical Mathematics.*

88. M. Akbas, A. Linke, L. Rebholz and P. Schroeder*, The analogue of grad-div stabilization in DG methods for incompressible flows: limiting behavior and extension to tensor-product meshes, submitted to *Computer Methods in Applied Mechanics and Engineering.*

87. L. Rebholz, A. Viguerie* and M. Xiao*, Efficient nonlinear iteration schemes based on algebraic splitting for the incompressible Navier-Stokes equations, *Mathematics of Computation*, in revision.

86. X. Xie, M. Mohebujjaman, L. Rebholz and T. Iliescu, Data-driven filtered reduced order modeling of fluid flows, *SIAM Journal on Scientific Computing*, to appear.

85. F. Eroglu*, S. Kaya, and L. Rebholz, POD-ROM for the Darcy-Brinkman equations with double-diffusive convection, *Journal of Numerical Mathematics*, to appear.

84. L. Rebholz, S.M. Wise, and M. Xiao*, Penalty-Projection Schemes for the Cahn-Hilliard Navier-Stokes Diffuse Interface Model of Two Phase Flow, and their Connection to Divergence-Free Coupled Schemes, *International Journal on Numerical Analysis and Modeling*, 4, 649-676, (2018).

83. M. Olshanskii, L. Rebholz, and A. Salgado, On well-posedness of a velocity-vorticity formulation of the Navier-Stokes equations with no-slip boundary conditions, *DCDS-A*, 38(7), 3459-3477, (2018).

82. M. Akbas, L. Rebholz and C. Zerfas*, Optimal vorticity accuracy in an efficient velocity-vorticity method for the 2D Navier-Stokes equations, *Calcolo*, 55(1):3, 1-29, (2018).

81. M. Mohebujjaman*, L. Rebholz, X. Xie*, and T. Iliescu, Energy balance and mass conservation in reduced order models of fluid flows, *Journal of Computational Physics*, 346, 262-277, (2017).

80. F. Eroglu*, S. Kaya, and L. Rebholz, A modular regularized variational multiscale proper orthogonal decomposition for incompressible flows, *Computer Methods in Applied Mechanics and Engineering*, 325, 350-368, (2017).

79. M. Akbas, M. Mohebujjaman*, L. Rebholz, and M. Xiao*, High order algebraic splitting for magnetohydrodynamics simulation, *Journal of Computational and Applied Mathematics*, 321, 128-142, (2017).

78. S. Charnyi*, T. Heister, M. Olshanskii, and L. Rebholz, On conservation laws of Navier-Stokes Galerkin discretizations, *Journal of Computational Physics*, 337, 289-308, (2017).

77. L. Rebholz, C. Zerfas* and K. Zhao, Global in time analysis and sensitivity analysis for the reduced NS-α model of incompressible flow, *Journal of Mathematical Fluid Mechanics*, 19(3), 445-467, (2017).

76. L. Rebholz and M. Xiao*, Improved accuracy in algebraic splitting methods for Navier-Stokes equations, *SIAM Journal on Scientific Computing*, 39(4), A1489-A1513, (2017).

75. A. Linke, M. Neilan, L. Rebholz, and N. Wilson*, Improving efficiency of coupled schemes for Navier-Stokes equations by a connection to grad-div stabilized projection methods, *Journal of Numerical Mathematics*, 25(4), 229-248, (2017).

74. T. Heister, M. Mohebujjaman* and L. Rebholz, Decoupled, unconditionally stable, higher order discretizations for MHD flow simulation, *Journal of Scientific Computing*, 71(1), 21-43, (2017).

73. V. John, A. Linke, C. Merdon, M. Neilan and L. Rebholz, On the divergence constraint in mixed finite element methods for incompressible flows, *SIAM Review*, 59(3), 492544, (2017).

72. T. Heister, M.A. Olshanskii and L. Rebholz, Unconditional long-time stability of a velocity-vorticity method for the 2D Navier-Stokes equations, *Numerische Mathematik*, 135, 143-167, (2017).

71. M. Mohebujjaman* and L. Rebholz, An efficient algorithm for computation of MHD flow ensembles, *Computational Methods in Applied Mathematics*, 17(1), 121-137, (2017).

70. L. Rebholz, T.-Y. Kim and Young-Li Byon, On an accurate α model for coarse mesh turbulent channel flow simulation, *Applied Mathematical Modelling*, 43, 139-154, (2017).

69. M. Akbas*, S. Kaya, and L. Rebholz, On the stability at all times of linearly extrapolated BDF2 timestepping for multiphysics incompressible flow problems, *Numerical Methods for Partial Differential Equations*, 33(4), 995-1017, (2017).

68. A. Bowers and L. Rebholz, The reduced NS-α model for incompressible flow: a review of recent progress, *Fluids*, 2 (38), 1-20, (2017).

67. T. Heister, L. Rebholz and M. Xiao*, Flux-preserving enforcement of inhomogeneous Dirichlet boundary conditions for strongly divergence-free mixed finite element methods for flow problems, *Journal of Mathematical Analysis and Applications*, 438(1), 507-513, (2016).

66. Y. Cao, S. Chen, and L. Rebholz, Well-posedness and a numerical study of a regularization model with adaptive nonlinear filtering for incompressible fluid flow, *Computers and Mathematics with Applications*, 71(11), 2192-2205, (2016).

65. M. Morales Hernandez*, L. Rebholz, C. Tone and F. Tone, On the stability of the Crank–Nicolson–Adams–Bashforth Scheme for the 2d Leray-alpha model, *Numerical Methods for Partial Differential Equations*, 32(4), 1155-1183, (2016).

64. L. Berselli, T.-Y. Kim, and L. Rebholz, Analysis of a reduced-order approximate deconvolution model and its interpretation as a Navier-Stokes-Voigt regularization, *Discrete and Continuous Dynamical Systems, Series B*, 21(4), 1027-1050, (2016).

63. M. Akbas*, S. Kaya, M. Mohebujjaman* and L. Rebholz, Numerical analysis and testing of a fully discrete, decoupled penalty-projection algorithm for MHD in Elsasser variable, *International Journal of Numerical Analysis and Modeling*, 13(1), 90-113, (2016).

62. N. Jiang*, M. Mohebujjaman*, L. Rebholz and C. Trenchea, Analysis of a family of optimally accurate regularization methods for Navier-Stokes equations, *Computer Methods in Applied Mechanics and Engineering*, 310, 388-405, (2016).

61. M. Neda, F. Pahlevani, L. Rebholz and J. Waters, Sensitivity analysis of the grad- div stabilization parameter in finite element simulations of incompressible flow, *Journal of Numerical Mathematics*, 24(3), 189-206 (2016).

60. M. Olshanskii, T. Heister, L. Rebholz and K. Galvin*, Natural vorticity boundary conditions on solid walls, *Computer Methods in Applied Mechanics and Engineering*, 297, 18-37, (2015).

59. L. Rebholz and M. Xiao*, On reducing the splitting error in Yosida methods for the Navier-Stokes equations with grad-div stabilization, *Computer Methods in Applied Mechanics and Engineering*, 294, 259-277, (2015).

58. M. Akbas*, L. Rebholz, and F. Tone, A note on the importance of mass conservation in long-time stability of Navier-Stokes simulations using finite elements, *Applied Mathematics Letters*, 45, 98-102, (2015).

57. M. Morales Hernandez* and L. Rebholz, A note on helicity conservation in Leray models of incompressible flow, *Journal of Mathematical Analysis and Applications*, 422(1), 776-781, (2015).

56. M. Akbas*, S. Kaya, and L. Rebholz, An explicitly decoupled variational multiscale method for incompressible, non-isothermal flows, submitted, *Computational Methods in Applied Mathematics*, 15(1), 1-20, (2015).

55. I. Monteiro*, C. Manica, and L. Rebholz, Numerical study of a regularized barotropic vorticity model of geophysical flow, *Numerical Methods for Partial Differential Equations*, 31(5), 1492-1514, (2015).

54. S. Le Borne and L. Rebholz, Preconditioning sparse grad-div/augmented Lagrangian stabilized saddle point systems, *Computing and Visualization in Science*, 16(6), 259-269, (2015).

53. A. Dunca, T.-Y. Kim, L. Rebholz and E. Fried, Energy analysis and improved regularity estimates for multiscale deconvolution models of incompressible flow, *Mathematical Methods in the Applied Sciences*, 38(17), 4199-4209, (2015).

52. V. Cuff*, A. Dunca, C. Manica and L. Rebholz, The reduced order NS-α model for incompressible flow: theory, numerical analysis and benchmark testing, *ESAIM: Mathematical Modelling and Numerical Analysis (M2AN)*, 49(3), 641-662, (2015).

51. S. Kaya, C. Manica and L. Rebholz, On Crank-Nicolson Adams-Bashforth timestepping for approximate deconvolution models in two dimensions, *Applied Mathematics and Computation*, 246, 23-38, (2014).

50. A. Bowers*, S. Le Borne, and L. Rebholz, Error analysis and iterative solvers for Navier-Stokes projection methods with standard and sparse grad-div stabilization, *Computer Methods in Applied Mechanics and Engineering*, 275, 1-19, (2014).

49. L. Rebholz and S. Watro*, A note on Taylor-eddy and Kavosnay solutions of NS-α-deconvolution and Leray-α-deconvolution models, *Journal of Nonlinear Dynamics*, Volume 2014, ID 959038, 1-5, (2014).

48. K. Galvin*, L. Rebholz, and C. Trenchea, Efficient, unconditionally stable, and optimally accurate FE algorithms for approximate deconvolution models, *SIAM Journal on Numerical Analysis*, 52(2), 678-707, (2014).

47. E. Jenkins, V. John, A. Linke and L. Rebholz, On the parameter choice in grad-div stabilization for incompressible flow problems, *Advances in Computational Mathematics*, 40(2), 491-516, (2014).

46. A. Dunca, M. Neda, and L. Rebholz, A mathematical and numerical study of a filtering-based multiscale fluid model with nonlinear eddy viscosity, *Computers and Mathematics with Applications*, 66(6), 917-933, (2013).

45. L. Rebholz, Well-posedness of a reduced order approximate deconvolution turbulence model, *Journal of Mathematical Analysis and Applications*, 405(2), 738-741, (2013).

44. A. Linke and L. Rebholz, On a reduced sparsity stabilization of grad-div type for incompressible flow problems, *Computer Methods in Applied Mechanics and Engineering*, 261, 142-153, (2013).

43. W. Layton and L. Rebholz, On relaxation times in the Navier-Stokes-Voigt model, *International Journal of Computational Fluid Dynamics*, 27(3), 184-187, (2013).

42. A. Bowers* and L. Rebholz, Numerical study of a regularization model for incompressible flow with deconvolution-based adaptive nonlinear filtering, *Computer Methods in Applied Mechanics and Engineering*, 258, 1-12, (2013).

41. B. Cousins*, S. Le Borne, A. Linke, L. Rebholz, and Z. Wang*, Efficient linear solvers for incompressible flow simulations using Scott-Vogelius finite elements, *Numerical Methods for Partial Differential Equations*, 29(4), 1217-1237, (2013).

40. M. Akbas*, S. Kaya, L. Rebholz, and N. Wilson*, A subgrid stabilization finite element method for incompressible magnetohydrodynamics, *International Journal of Computer Mathematics*, 90(7), 1506-1523, (2013).

39. A. Bowers*, T.-Y. Kim, M. Neda, L. Rebholz, and E. Fried, The Leray-$\alpha\beta$-deconvolution model: energy analysis and numerical algorithms, *Applied Mathematical Modelling*, 37(3), 1225-1241, (2013).

38. M. Benzi, M. Olshanskii, L. Rebholz, and Z. Wang*, An iterative solver for the Navier-Stokes equations in Velocity-Vorticity-Helicity form, *Computer Methods in Applied Mechanics and Engineering*, 247, 216-225, (2012).

37. A. Bowers*, L. Rebholz, A. Takhirov, and C. Trenchea, Improved accuracy in regularization models of incompressible flow via adaptive nonlinear filtering, *International Journal for Numerical Methods in Fluids*, 70(7), 805-828, (2012).

36. P. Kuberry*, A. Larios, L. Rebholz, and N. Wilson*, Numerical approximation of the Voigt regularization of incompressible NSE and MHD flows, *Computers and Mathematics with Applications*, 64(8), 2647-2662, (2012).

35. A. Bowers* and L. Rebholz, Increasing accuracy and efficiency of FE computations of the Leray-deconvolution model, *Numerical Methods for Partial Differential Equations*, 28(2), 720-736, (2012).

34. W. Layton, L. Rebholz, and C. Trenchea, Modular nonlinear filter stabilization of methods for higher Reynolds numbers flow, *Journal of Mathematical Fluid Mechanics*, 14(2), 325-354 (2012).

33. K. Galvin*, H.K. Lee, and L. Rebholz, Approximation of viscoelastic flows with defective boundary conditions, *Journal of Non-Newtonian Fluid Mechanics*, 169-170, 104-113, (2012).

32. T.-Y. Kim, L. Rebholz, and E. Fried, A deconvolution enhancement of the Navier–Stokes-$\alpha\beta$ model, *Journal of Computational Physics*, 231(11), 4015-4027, (2012).

31. K. Galvin*, A. Linke, L. Rebholz, and N. Wilson*, Stabilizing poor mass conservation in incompressible flow problems with large irrotational forcing and application to thermal convection, *Computer Methods in Applied Mechanics and Engineering*, 237, 166-176, (2012).

30. A. Dunca, K. Kohler*, M. Neda and L. Rebholz, A mathematical and physical study of multiscale deconvolution models of turbulence, *Mathematical Methods in the Applied Sciences*, 35, 1205-1219, (2012).

29. C. Manica, M. Neda, M. Olshanskii and L. Rebholz, Enabling accuracy of Navier-Stokes-alpha through deconvolution and enhanced stability, M^2AN: *Mathematical Modelling and Numerical Analysis*, 45(2), 277-307, (2011).

28. M. Case*, V. Ervin, A. Linke, L. Rebholz, and N. Wilson, Stable computing with an enhanced physics based scheme for the 3D Navier-Stokes equations, *International Journal of Numerical Analysis and Modeling*, 8(1), 118-136, (2011).

27. C. Manica, M. Neda, M. Olshanskii, L. Rebholz and N. Wilson*, On an efficient finite element method for NS-$\overline{\omega}$ with strong mass conservation, *Computational Methods in Applied Mathematics*, 11(1), 3-22, (2011).

26. H.K. Lee, M. Olshanskii and L. Rebholz, On error analysis for the 3D Navier-Stokes equations in Velocity-Vorticity-Helicity form, *SIAM Journal on Numerical Analysis*, 49(2), 711-732, (2011).

25. A. Linke, L. Rebholz, and N. Wilson*, On the convergence rate of grad-div stabilized Taylor-Hood to Scott-Vogelius solutions for incompressible flow problems, *Journal of Mathematical Analysis and Applications*, 381, 612-626, (2011).

24. T.-Y. Kim, M. Neda, L. Rebholz, and E. Fried, A numerical study of the Navier–Stokes-$\alpha\beta$ model, *Computer Methods in Applied Mechanics and Engineering*, 200, 2891-2902, (2011).

23. M. Case*, V. Ervin, A. Linke and L. Rebholz, A connection between Scott-Vogelius elements and grad-div stabilization, *SIAM Journal on Numerical Analysis*, 49(4), 1461-1481, (2011).

22. B. Cousins*, L. Rebholz and N. Wilson*, Enforcing energy, helicity and strong mass conservation in FE computations for incompressible Navier-Stokes simulations, *Applied Mathematics and Computation*, 218, 1208-1221, (2011).

21. J. Connors, E. Jenkins, and L. Rebholz, On small-scale divergence penalization for incompressible flow problems via time relaxation, *International Journal of Computer Mathematics*, 88(15), 3202-3216, (2011).

20. M.A. Olshanskii and L. Rebholz, Application of barycenter refined meshes in linear elasticity and incompressible fluid dynamics, *ETNA: Electronic Transactions in Numerical Analysis*, 38, 258-274, (2011).

19. K. Galvin*, H.K. Lee and L. Rebholz, A Numerical Study for a Velocity-Vorticity-Helicity formulation of the 3D Time-Dependent NSE, *International Journal of Numerical Analysis and Modeling, Series B*, 2(4), 355-368, (2011).

18. M. Case*, A. Labovsky, L. Rebholz, and N. Wilson*, A high physical accuracy method for incompressible magnetohydrodynamics, *International Journal on Numerical Analysis and Modeling, Series B*, 1(2), 219-238, (2010).

17. W. Miles and L. Rebholz, An enhanced physics based scheme for the NS-alpha turbulence model, *Numerical Methods for Partial Differential Equations*, 26, 1530-1555, (2010).

16. A. Bowers*, B. Cousins*, A. Linke and L. Rebholz, New connections between finite element formulations of the Navier-Stokes equations, *Journal of Computational Physics*, 229(24), 2090-2095, (2010).

15. M. Olshanskii and L. Rebholz, A note on helicity balance of the Galerkin method for the 3D Navier-Stokes equations, *Computer Methods in Applied Mechanics and Engineering*, 199, 1032-1035, (2010).

14. M. Olshanskii and L. Rebholz, Velocity-Vorticity-Helicity formulation and a solver for the Navier-Stokes equations, *Journal of Computational Physics*, 229, 4291-4303, (2010).

13. W. Layton, C.D. Pruett, and L. Rebholz, Temporally regularized direct numerical simulation, *Applied Mathematics and Computation*, 216, 3728-3738, (2010).

12. L. Rebholz and M. Sussman, On the high accuracy NS-alpha-deconvolution model of turbulent fluid flow, M^3AS: *Mathematical Models and Methods in Applied Sciences*, 20 (4), 611-633, (2010).

11. W. Layton, C. Manica, M. Neda and L. Rebholz, Numerical analysis and computational comparisons of the NS-alpha and NS-omega regularizations, *Computer Methods in Applied Mechanics and Engineering*, 199, 916-931, (2010).

10. W. Layton, L. Rebholz, and M. Sussman, Energy and helicity dissipation rates of the NS-alpha and NS-alpha-deconvolution models, *IMA Journal of Applied Mathematics*, 75 (1), 56-74, (2010).

9. L. Rebholz, Enhanced physics-based numerical schemes for two classes of turbulence models, *Advances in Numerical Analysis*, 2009 (ID:370289), 1-13, (2009).

8. A. Labovsky, W. Layton, C. Manica, M. Neda and L. Rebholz, The stabilized, extrapolated trapezoidal finite element method for the Navier-Stokes equations, *Computer Methods in Applied Mechanics and Engineering*, 198 (9-12), 958-974, (2009).

7. W. Layton, C. Manica, M. Neda, M. Olshanskii and L. Rebholz, On the accuracy of the rotation form in simulations of the Navier-Stokes equations, *Journal of Computational Physics*, 228 (9), 3433-3447, (2009).

Refereed Journal Publications before Clemson employment

6. W. Layton, C. Manica, M. Neda and L. Rebholz, Numerical Analysis and Computational Testing of a high-order Leray-deconvolution turbulence model, *Numerical Methods for Partial Differential Equations*, 24 (2), 555-582, (2008).

5. L. Rebholz, A family of new high order NS-alpha models arising from helicity correction in Leray turbulence models, *Journal of Mathematical Analysis and Applications*, 342 (1), 246-254, (2008).

4. W. Layton, C. Manica, M. Neda and L. Rebholz, The joint helicity-energy cascade for homogeneous, isotropic turbulence generated by approximate deconvolution models, *Advances and Applications in Fluid Mechanics*, 4 (1), 1-46, (2008).

3. L. Rebholz, An Energy and Helicity conserving finite element scheme for the Navier-Stokes Equations, *SIAM Journal on Numerical Analysis*, 45 (4), 1622-1638, (2007).

2. L. Rebholz, Conservation laws of turbulence models, *Journal of Mathematical Analysis and Applications*, 326 (1), 33-44, (2007).

1. L. Rebholz, A multiscale V-P discretization for flow problems, *Applied Mathematics and Computation*, 177 (1), 24-35, (2006).

Refereed Conference Proceedings

1. L. Bertagna, A. Quaini, L.G. Rebholz, A. Veneziani, On the sensitivity to the filtering radius in Leray models of incompressible flow, to appear in Springer-ECCOMAS series 'Computational Methods in Applied Sciences'.

2. M. Akbas*, S. Kaya and L. Rebholz, Numerical Studies on a Second Order Explicitly Decoupled Variational Multiscale Method, Numerical Mathematics and Advanced Concepts - ENUMATH 2015, edited by: B. Karasozen, M. Manguoglu, M. Tezer-Sezgin, S. Goktepe and U. Omur, Springer Lecture Notes in Computational Science and Engineering, volume 112, (2016).

3. E. D'Agnillo* and L. Rebholz, On the enforcement of discrete mass conservation in incompressible flow simulations with continuous velocity approximation, In: Recent Advances in Scientific Computing and Applications: Proceedings of the 8th International Conference on Scientific Computing and Applications, edited by: Jichun Li, Eric Macharro, and Hongtao Yang, AMS Contemporary Mathematics, volume 586, (2013).

Refereed Conference Proceedings before Clemson employment

4. A. Labovschii, W. Layton, C. Manica, M. Neda, L. Rebholz, I. Stanculescu, C. Trenchea, Architecture of approximate deconvolution models of turbulence, *Quality and Reliability of Large-Eddy Simulations*, Part I, ERCOFTAC Series, Volume 12, editors J. Meyers, B. Guerts, P. Sagaut, (2008).

Publications by my advisees while they were Clemson students without me as coauthor

- J. Honeycutt, H. Johnson and S. Kelly, Using Data Assimilation to Better Predict Contaminant Transport in Fluids, to be submitted in May 2018 to *SIAM Undergraduate Research Online*.

- A. Viguerie and M. Xiao, Effective Chorin-Temam Algebraic Splitting Schemes for the Steady Navier-Stokes Equations, to be submitted in April 2018.

- M. Xiao, An efficient algebraic splitting methods for steady magnetohydrodynamics simulation, submitted.

- S. Malick, A connection between grad-div stabilized FE solutions and pointwise divergence-free FE solutions on general meshes, *SIAM Undergraduate Research Online*, 9, 1-17, (2016).

- N. Heavner, Locally chosen grad-div stabilization parameters for finite element discretizations of incompressible flow problems, *SIAM Undergraduate Research Online*, 7, 1-32, (2014).

- A. Bowers, Numerical approximation of a multiscale Leray model for incompressible, viscous flow, *AMS Contemporary Mathematics*, volume 586, (2013).

- N. Wilson, On the Leray-deconvolution model for the incompressible Magnetohydrodynamics equations, *Applied Mathematics and Computation*, 218(21), 10557-10571, (2012).

- K. Galvin, New subgrid artificial viscosity methods for the Navier-Stokes equations, *Computer Methods in Applied Mechanics and Engineering*, 200(1-4), 242-250, (2011).

PRESENTATIONS
Conference Talks

2004 AMS Eastern Fall 2004, S.S. on Multiscale Algorithms in CFD, Pittsburgh PA

2005 Mathematics as an Enabling Science Conference, Virginia Tech

2006 Finite Element Circus, March 2006, University of Maryland Baltimore County

2007 AMS Midwestern Fall 2007, S.S. on Math. Mod. and Num. Meth., DePaul, Chicago, IL

2009 Joint VT/UTK/Pitt/Clemson Applied Math Conference, Virginia Tech

2009 AMS Southeast Spring 2009, S.S. on Adv. in Turbulent Flow Mod. and Comp., N.C. State

2009 Finite Element Circus, University of Tennessee at Knoxville

2010 SIAM Annual Meeting 2010, S.S. on Alg. Anal., Design and Comp. for Turbulent Flows

2010 SIAM Annual Meeting 2010, S.S. on Nonconforming Finite Element Methods

2011 AMS Western Spring 2011, S.S. on Advances in Modeling, Numerical Analysis and Computations of Fluid Flow Problems, UNLV

2011 Workshop/conference on Approximation Theory and Harmonic Analysis, Kennesaw State

2012 8th International Conference on Scientific Computing and Applications, UNLV

2012 Workshop on 'Connections Between Regularized and Large-Eddy Simulation Methods for Turbulence', Banff International Research Station, Alberta CA

2012 SIAM Annual 2012, SS on Rec.adv. in mod and num meth fluid flow probs, Minneapolis MN

2013 SIAM Conference on Applications of Dynamical Systems 2013, S.S. on Recent Advancements in Large Eddy Simulations of Turbulent Flows, Snowbird UT

2013 SIAM Annual 2013, SS on Numerical methods for incompressible flows, San Diego CA

2013 Finite Element Circus, October 2013, University of Delaware

2014 JMM 2014, SIAM MS on Turbulence and Mixing in Fluids: Anal. Appl., Baltimore MD

2014 SIAM Southeast 2014, SS on Rec.adv. in mod of complex systems: anal. and comp., Fl. Tech

2014 AMS Southeast Fall 2014, SS on Rec.adv. in num.meth. for fluid flow prob., UNC Greensboro

2015 AMS Midwest Spr 2015, SS on Rec.adv. in FE and DG Methods for PDEs, Michigan State

2015 AMS Southeast Spr 2015, SS on Rec.adv in num.meth for nonlinear PDEs, Alabama Huntsville

2015 AMS West Spr 2015, SS on Dev. of Num.Meth. and Comp. for Fluid Flow Prob., UNLV

2015 13th US National Congress on Computational Mechanics, SS on Old and New Challenges for Navier-Stokes Equations, San Diego CA

2015 Finite Element Circus (Fall 2015), UMass Dartmouth

2016 SIAM Southeast 2016, SS on Rec.adv. in fluid flow and applications, U. Georgia

2016 Conference on 'Numerical Analysis and Predictability of Fluid Motion', Pitt

2017 JMM 2017, SS on Recent advances in numerical analysis of PDEs, Atlanta GA

2017 SIAM Computational Science and Engineering 2017, SS on Reduced order models for fluids, Atlanta GA

2017 Tenth IMACS Int. Conf. on Nonlinear Evolution Equations and Wave Phenomena, S.S. on Analysis of numerical methods for dispersive and fluid equations, Athens GA

2017 Workshop on Applied Analysis, Kennesaw State

2017 SIAM Annual 2017, SS on Synergy of Design, Analysis, and Computations in Fluid Flow Dynamics, Pittsburgh PA

2017 Mathematical Congress of the Americas 2017, SS on Equations of Fluid Mechanics: Numerics, Montreal CA

2017 SIAM PDE 2017, Multiphysics and Turbulence: Analysis and Simulation, Baltimore MD

2018 SIAM Southeast 2018, SS on ROM, multiscale and conservative numerical methods for fluids, Chapel Hill NC

2018 Finite Element Circus (Spring 2018), Tennessee Knoxville

2018 MAA Southeast Spring 2018, Special Session on Mathematical Experiences and Projects in Business, Industry and Government, Clemson SC

Seminar/Colloquium Talks

2004 University of Pittsburgh, Computational Math Seminar

2005 University of Pittsburgh, Computational Math Seminar

2006 University of Pittsburgh, Computational Math Seminar

2007 University of Pittsburgh, Computational Math Seminar

2008 Clemson University, Fluid Mechanics Seminar Series

2009 Clemson University, Fluid Mechanics Seminar Series

2009 Emory University, Scientific Computing Seminar

2009 UNLV, Dept of Mathematical Sciences Colloquium

2010 Clemson University, Computational Math Seminar, (Spring)

2010 University of Pittsburgh, Computational Math Seminar, (Spring)

2010 Clemson University, Computational Math Seminar, (Fall)

2010 University of Pittsburgh, Computational Math Seminar, (Fall)

2010 Florida State University, Department of Scientific Computing Colloquium

2010 Virginia Tech, ICAM Seminar

2010 Tennessee Tech, Department of Mathematics Colloquium

2011 Clemson University, Computational Math Seminar, (Spring)

2011 Kennesaw State University, Analysis and Applied Mathematics Seminar

2011 Clemson University, Computational Math Seminar, (Fall)

2011 University of Alberta, Applied Mathematics Institute Seminar

2011 University of Houston, Department of Mathematics Colloquium

2012 University of Pittsburgh, Computational Math Seminar

2012 Clemson University, Computational Math Seminar (Fall)

2012 Michigan Tech University, Department of Mathematics Colloquium

2012 Weierstrass Institute (Berlin, Germany), Seminar Numerische Mathematik

2012 University of Houston, Scientific Computing Seminar

2013 University of Pittsburgh, Computational Math Seminar

2013 Clemson University, Computational Math Seminar (Fall)

2013 UNLV, Computational and Applied Math Seminar

2013 Universidade Federal do Rio Grande do Sul (Porto Alegre, Brazil), Institute of Mathematics Colloqium (2 talks)

2014 Clemson University, Computational Math Seminar (Spring)

2014 College of Charleston, Department of Mathematics Colloquium

2014 University of South Carolina, Applied and Computational Mathematics Seminar

2014 University of Texas at Dallas, Department of Mathematical Sciences Colloquium

2014 Temple University, Department of Mathematics Colloquium

2014 Auburn University, Applied Mathematics Seminar

2014 Technische Universitt Hamburg-Harburg (Hamburg, Germany), Kolloquium fur Angewandte Mathematik

2014 Weierstrass Institute (Berlin, Germany), Seminar Numerische Mathematik

2014 UNLV, Computational and Applied Math Seminar

2014 Emory, Scientific Computing Seminar

2014 Tulane, Department of Mathematics Colloquium

2014 Tulane, Applied and Computational Math Seminar

2014 Virginia Tech, Department of Mathematics Colloquium

2015 Clemson University, Computational Math Seminar (Spring)

2015 University of Pittsburgh, Computational Math Seminar

2015 University of Pittsburgh, Talk for SIAM Student Chapter

2015 Michigan Tech, Department of Mathematics Colloquium

2015 University of Alberta, Applied Mathematics Institute Seminar

2016 Florida State University, Department of Scientific Computing Colloquium

2016 Florida State University, Talk for Scientific Computing graduate students

2016 University of Tennessee, Department of Mathematics Colloquium

2016 Tulane, Department of Mathematics Colloquium

2017 Indiana University, Institute for Scientific Computing Seminar

2017 University of Nebraska, PDE seminar

2017 Goettingen University (Germany), Seminar Numerishce Mathematik

2017 Weierstrass Institute (Berlin, Germany), Seminar Numerische Mathematik

2017 University of Pittsburgh, Department of Mathematics Colloquium

AWARDS and HONORS

Mathematical Sciences Faculty Teaching Award, 2012

Clemson Board of Trustees Recognition for Excellence in Research, 2014

Stories in the media about my work:

Clemson University Featured Story, June 22, 2015: 'Clemson University professor works to cut costs for companies and students', written by Paul Alongi

Greenville News (front page!) July 1, 2015: 'Clemson, Furman professors done with pricey textbooks', written by Nathaniel Cary

Channel 4 news, 6:00pm, July 1, 2015: Story about the book Timo Heister and I wrote for numerical methods course

SPONSORED RESEARCH

"Collaborative Research: Variational Structure Preserving Methods for Incompressible Flows: Discretization, Analysis, and Parallel Solvers", National Science Foundation, DMS-1522191/1522192, Principal Investigator, $324,780 ($117,390), (2015-2018). [co-PI Timo Heister, PI at UofH is Maxim Olshanskii]

"Eighth Annual Graduate Student Mini-conference in Computational Mathematics", National Science Foundation, DMS-1547107, Principal Investigator, $9,808 ($3,269), (2016). [co-PIs are Qingshan Chen and Hyesuk Lee]

"Long-term stable conservative multiscale methods for vortex flows", US Army Research Office, 65294-MA, Principal Investigator, $160,809 ($160,809), (2014-2017). [Collaborative research; co-PI is Maxim Olshanskii]

"Fifth Annual Graduate Student Mini-conference in Computational Mathematics," National Science Foundation, DMS-1245607, Principal Investigator, $8,000 ($4,000), (2013). [co-PI is Hyesuk Lee]

"Improving numerical methods for incompressible, viscous flow simulation," National Science Foundation, DMS-1112593, Principal Investigator, $150,000 ($150,000), (2011-2015).

"Parallel fluid dynamics algorithms development," National Computational Science Institute and Shodor, Principal Investigator, $8,000 ($8,000), (2010-2011).

"Enabling long time accuracy in turbulent flow simulations," National Science Foundation, DMS-0914478, Principal Investigator, $256,583 ($256,583), (2009-2012).

GRADUATE STUDENT ADVISING
Ph.D. Graduates

1. Michael A. Case (Ph.D.) (co-advisor: E. Jenkins), *Improved accuracy for fluid flow problems via enhanced physics*, (2010, posthumous)

2. Nicholas E. Wilson (Ph.D.), *Physics-based algorithms and divergence free finite elements for coupled flow problems*, (2012) [Postdoc Michigan Tech 2012-2013, Risk Analyst at Disney 2013-present]

3. Keith J. Galvin (Ph.D.) (co-advisor: Hyesuk Lee), *Improved numerical methods for Newtonian and non-Newtonian fluids*, (2013) [Postdoc University of Michigan 2013-2014, Mathematician in Marine Hydrodynamics group at Applied Physical Systems 2014-present]

4. Abigail L. Bowers (Ph.D.), *On numerical algorithms for fluid flow regularization models*, (2014) [Visiting Assistant Professor Clemson 2014-2016, Assistant Professor Florida Polytechnic 2016-present]

5. Mine Akbas (Ph.D.), (co-advisor: S. Kaya Merdan), *Numerical methods for multiphysics flow problems*, (2016) [Postdoc Duzce University 2016-2018, Assistant Professor Duzce University 2018-present]

6. Muhammad Mohebujjaman (Ph.D.), (co-advisor: Timo Heister) *Efficient numerical methods for magnetohydrodynamic flow*, (2017) [Postdoc Virginia Tech 2017-present]

Research awards won by my students

- Mengying Xiao, Outstanding Graduate in Discovery, College of Science, Clemson University, 2018

- Mengying Xiao, Outstanding Graduate Researcher Award, Department of Mathematical Sciences, Clemson University, 2018 (runner up in 2017)

- Keith Galvin, Outstanding Graduate Researcher Award, Department of Mathematical Sciences, Clemson University, 2013

- Nicholas Wilson, Outstanding Graduate Researcher Award, Department of Mathematical Sciences, Clemson University, 2012

- Michael Case, SIAM Southeast Student Paper Prize, 2010

Masters Graduates

1. Keith J. Galvin (M.S.), *Subgrid scale viscosity methods for the Navier-Stokes equations* (2010) [continued into Phd program]

2. Ryan G. Hill, (M.S.), *Benchmark testing of the α models of turbulence* (2010) [Applied Mathematician at Naval Surface Warfare Center, 2010-present]

3. Abigail L. Bowers (M.S.), *Increased accuracy and efficiency in finite element computations of the Leray-deconvolution model of turbulence* (2010) [continued into Phd program]

4. Michael C. Dowling (M.S.) *Enhanced physics schemes for the 2D NS-α model of incompressible flow* (2012) [continued into Phd program]

5. Erica D'Agnillo (M.S.), *The importance of discrete mass conservation in incompressible flow simulations* (2012) [Analyst Epic Systems 2012-present]

6. Kara E. Kohler (M.S.), *A mathematical and physical study of multiscale deconvolution models of turbulence* (2012) [Mathematics Instructor, Salem Academy]

7. Stacey A. Watro (M.S.), *Analytical solutions to turbulent flow models* (2013) [Analyst Thoughtworks, 2013-]

8. Victoria M. Cuff (M.S.), *Unconditionally stable and efficient algorithms for NS-α models* (2013) [Analyst Hanscom Airforce Base 2013-present]

9. Muhammad Mohebujjaman (M.S.), *Linear solvers for saddle points systems arising from Navier-Stokes simulations* (2014) [continued into Phd program]

10. Monica Morales Hernandez (M.S.), *Some new results for Leray models and their discretizations* (2015) [Lecturer Emmanuel College 2017-2018, Lecturer Adelphi University 2018-present]

11. Becca Knoll (M.S.), *On the choice of grad-div parameter in finite element discretizations of the steady Navier-Stokes equations* (2016) [Mathematics Instructor Rockbridge Academy 2016-present]

12. Camille Zerfas (M.S.), *Sensitivity study for the rNS-α model of turbulence* (2016) [continued into Phd program]

Current Graduate Advising

Mengying Xiao (Ph.D.) (co-advisor: Timo Heister),*Splitting methods and divergence-free finite elements for fluid flow problems*, expected 2018.

Sergey Charnyi (Ph.D.) (co-advisor: Timo Heister), *Large scale vorticity-based numerical methods for Navier-Stokes equations*, expected 2018.

Camille Zerfas (Ph.D.), *Long time behavior and data assimilation in nonlinear PDE models for fluids*, expected 2019.

UNDERGRADUATE STUDENT ADVISING
Past Undergraduate Honors/Research Advising

Benjamin R. Cousins (B.S.), *Scott-Vogelius elements and the p-method for fluid flow simulations*, (2012)

Victoria M. Cuff (B.S.), *Simulation of the Navier-Stokes equation with adaptive mesh refinement*, (2012)

Nathan Heavner (B.S.), *On local choice of grad-div stabilization parameters in finite element methods for incompressible flows*, (2014)

Barbara Woo (B.S.), *Numerical methods for differential equations*, (2015)

Sarah Malick (B.S.), *A connection between grad-div stabilized FE solutions and pointwise divergence-free FE solutions on general meshes*, (2016)

Current Undergraduate Honors/Research Advising

Jacob Honeycutt (B.S. 2019), Hannah Johnson (B.S. 2019), Sarah Kelly (B.S. 2018), *Using Data Assimilation to Better Predict Contaminant Transport in Fluids*

TEACHING
Courses Taught at Clemson (Beginning Fall 2008)
Math206, Multivariable Calculus, FA08,SP09,FA12
Math311, Linear Algebra, SU14
Math365, Numerical Methods for Engineering (many, many times)
Math453, Advanced Calculus, SU11, SU15
Math460, Intro to Numerical Analysis, SP13, SP16, SP18

Math826, Partial Differential Equations, SP12
Math860, Scientific Computing, SP09, SP11(2), SP15
Math861, Numerical Linear Algebra, FA13
Math866, Finite Element Method, SP14
Math983, Computational Fluid Mechanics, FA09, FA11
Math983, Splitting methods for Navier-Stokes equations, FA15
Math983, Turbulence Modeling, FA12

Courses Taught pre-Clemson (2001-2008)
Math101 (Duquesne Univ.) College Algebra, FA01
Math125 (Duquesne Univ.) Fundamentals of Statistics, SP02
Math110 (Comm. College Allegheny County) Business Calculus SU02
Math225 (Comm. College Allegheny County) Calculus 3 SU03
Math116 (Univ. of Pittsburgh) Business Calculus SU03

SERVICE

National Science Foundation
Panelist: Numerical Methods Panel, March 2013
Panelist: Numerical Methods Panel, March 2012
Panelist: Math/Fluids Panel, March 2010
Ad hoc reviewer: December 2010, August 2016

Natural Sciences and Engineering Research Council of Canada
Ad hoc reviewer, January 2014
Ad hoc reviewer, June 2014
Ad hoc reviewer (Mitacs), November 2015, April 2016, February 2018

Czech Science Foundation
Ad hoc reviewer, July 2013

Associate Editor
Advances in Applied Mathematics and Mechanics, 2018-
Int. J. of Numerical Analysis and Modeling, 2015-
Int. J. of Numerical Analysis and Modeling, Ser. B, 2010-2015
Int. J. of Analysis, 2012-2014

Departmental
Clemson Calculus Challenge 2009 exam writing and grading committees
Clemson Calculus Challenge 2010 exam writing and grading committees
Clemson Calculus Challenge 2011 exam writing and grading committees
Clemson Calculus Challenge 2012 exam writing and grading committees
Clemson Calculus Challenge 2013 exam writing and grading committees
Research Committee (2009-2011, 2013)
Graduate Committee (2011-2012, 2015)
Math Science Council (2012-2013, 2015-)
Teaching Award Committee (2012-2015)
Clemson Computational Math Research Seminar organizer, SP10-FA12
Faculty advisor to Clemson SIAM Student Chapter, 2012-2016
Chair evaluation committee, 2015
Chair search committee (chair), 2016
Chair search committee (chair), 2017

College

Associate Dean for Research Search Committee, 2013

Awards Committee, 2016-2017

Curriculum Committee, 2017-

Conferences organized

2016 Graduate student mini-conference on computational mathematics
Clemson, SC, February 2016 (funded by NSF, PIs: Rebholz, Q. Chen and H.K. Lee)

2013 Graduate student mini-conference on applied and computational mathematics
Clemson, SC, February 2013 (funded by NSF, PIs: Rebholz and H.K. Lee)

2011 Graduate student mini-conference on applied and computational mathematics
Clemson, SC, February 2011

Special sessions organized/organizing

SIAM Southeast 2018 special session organizer:
Special Session on ROM, multiscale and conservative numerical methods for fluids
UNC-Chapel Hill, NC, March 2018

JMM 2018 special session organizer:
Recent Trends in Analysis of Numerical Methods for Partial Differential Equations
San Diego, CA, January 2018

AMS Southeast Spring 2017 special session organizer:
Special Session on Recent Trends in Finite Element Methods
Charleston, SC, March 2017

AMS Western Fall 2016 special session organizer:
Above and beyond fluid flow studies and a celebration of Bill Layton's 60th
Denver, CO, October 2016

SIAM Southeast 2016 special session organizer:
Recent advances in numerical methods for fluid flow with applications
Athens, GA, March 2016

ICIAM 2015 special session organizer:
Divergence-free elements, grad-div, and related for incompressible flow problems
Beijing China, August 2015

AMS Southeast Sectional Meeting Fall 2014 special session organizer:
Recent Advances in Numerical Methods for Fluid Flow Problems
Greensboro, NC, November 2014

SIAM Annual Meeting 2013 special session organizer:
Numerical methods for incompressible fluid flows
San Diego, CA, July 2013

SIAM Annual Meeting 2012 special session organizer:
Recent advances in analysis and numerical methods for fluid flow simulation
Minneapolis, MN, July 2012

SIAM Southeast Meeting 2012 special session organizer:
Numerical methods for incompressible flow problems

Huntsville, AL, March 2012

SIAM Southeast Meeting 2011 special session organizer:
Recent advances in numerical methods for PDE
Charlotte, NC, March 2011

SIAM Annual Meeting 2010 special session organizer:
Algorithm analysis, design and computation for turbulent flows
Pittsburgh, PA, July 2010

AMS Southeast Spring 2009 special session organizer:
Advancements in Turbulent Flow Modeling and Computation
North Carolina State University, April 2009

External Evaluation of Tenure and Promotion Cases
One in 2009, 2014, 2015, 2016, 2017

Journal Refereeing
Advances in Mathematical Physics
Advances in Numerical Analysis
Analysis and Applications
Applied Mathematical Modelling
Applied Mathematics and Computation
Applied Mathematics Letters
Applied Numerical Mathematics
Calcolo
Communications in Computational Physics
Communications in Mathematical Sciences
Computer Methods in Applied Mechanics and Engineering
Computer Physics Communications
Computers and Fluids
Computers and Mathematics with Applications
IMA Journal of Numerical Analysis
Int. J. of Analysis
Int. J. Computational Fluid Dynamics
Int. J. Computer Mathematics
Int. J. Numerical Analysis and Modeling, Series B
Int. J. Numerical Analysis and Modeling
Int. J. Numerical Methods in Engineering
Journal of Applied Mathematics
Journal of Computational and Applied Mathematics
Journal of Computational Physics
Journal of Mathematical Analysis and Applications
Journal of Mathematical Physics
Journal of Nonlinear Science
Journal of the Korean Mathematical Society
Journal of Scientific Computing
Mathematical Methods in Applied Sciences
Numerische Mathematik
Numerical Methods for Partial Differential Equations

Physica D
SIAM Journal on Numerical Analysis

Other

Graduate student thesis committees

    Current:

        Liang Zhao, PhD Mathematical Sciences, Clemson

        Alistair Bentley, PhD Mathematical Sciences, Clemson

        Jianwei Liu, PhD Computer Science, Clemson

    Completed:

        Alex Viguerie, PhD Mathematics, Emory University, 2018

        Ryan Grove, PhD Mathematical Sciences, Clemson, 2017

        Conrad Clevenger, MS Mathematical Sciences, Clemson, 2016

        Shuhan Xu, PhD Mathematical Sciences, Clemson, 2016

        Paul Kuberry, PhD Mathematical Sciences, Clemson, 2015

        Igor Monteiro, PhD Mathematics, Univ. Rio Grande do Sul (Brazil), 2015

        Luca Bertagna, PhD Mathematics, Emory University, 2014

        Alistair Bentley, MS Mathematical Sciences, Clemson, 2014

        Shuhan Xu, MS Mathematical Sciences, Clemson, 2012

        Andrew Fuchs, MS Mathematical Sciences, Clemson, 2012

        Chelsea Law, MS Mathematical Sciences, Clemson, 2012

        Jeremy White, MS Mathematical Sciences, Clemson, 2012

        Travis Flemming, MS Mathematical Sciences, Clemson, 2011

        Patrick Buckingham, MS Mathematical Sciences, Clemson, 2010

        Pu Song, MS Mathematical Sciences, Clemson, 2010

        Kristen Harnett, MS Mathematics , Pitt, 2008

        Sara Marashinia, MS Mathematics, Pitt, 2007

Updated April, 2018