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Professional Preparation

Ph.D. in Mathematics, University of Pittsburgh, 2000

M.S. in Mathematics, University of Pittsburgh, 1997

B.S. in Mathematics, University of Bucharest, Romania, 1995

Appointments

Professor, 2013–present, Department of Mathematics, Virginia Tech

Associate Professor, 2007–2013, Department of Mathematics, Virginia Tech

Assistant Professor, 2002–2007, Department of Mathematics, Virginia Tech

Wilkinson Fellow, 2000–2002, Mathematics and Computer Science Division, Argonne National Laboratory

Honors and Awards

1. Wilkinson Fellow (Argonne National Laboratory, 2000-2002)
2. Winner of SIAM Student Paper Prize (1999)
3. Andrew Mellon Fellowship (University of Pittsburgh, 1999)
4. Culver-Teplitz Award (University of Pittsburgh, 1997)

Sponsored Research

1. Collaborative Research: Three-Dimensional Numerical Investigation of Density Currents, PI: Jinqiao Duan, CO-PI: Paul Fischer, Traian Iliescu, National Science Foundation Grant DMS-0209309, 09/01/02 - 08/31/06, Iliescu's portion: 100% of $94,829.
2. Scientific Computing Research Environment for the Mathematical Sciences (SCREMS), PI: Traian Iliescu, CO-PI: Jeff Borggaard, National Science Foundation Grant DMS-0322852, 09/01/03 - 08/31/05, Iliescu's portion: 50% of $155,858.
3. Computational Methods for Design, Control and Optimization of Micro Air Vehicles, PI: John Burns, CO-PI: Jeff Borggaard, Eugene Cliff, and Traian Iliescu, Air Force Office of Scientific Research Grant F49620-02-C-0048, 10/01/03 - 09/30/06, Iliescu's portion: 25% of $600,000.
4. Computation and Analysis of Reduced-Order Models for Distributed Parameter Systems, PI: Jeff Borggaard, CO-PI: Chris Beattie, Serkan Gugercin, Traian Iliescu, National Science Foundation Grant DMS-0513542, 06/15/05 - 06/14/08, Iliescu's portion: 25% of $431,342.

5. High Performance Parallel Algorithms for Improved Reduced-Order Modeling, PI: Jeff Borggaard, CO-PI: Chris Beattie, Serkan Gugercin, Traian Iliescu, Air Force Office of Scientific Research Grant FA9550-05-1-0449, 08/15/05 - 08/14/08, Iliescu's portion: 25% of $542,822.

6. CMG Collaborative Research: A New Modeling Framework for Nonhydrostatic Simulations of Small-Scale Oceanic Processes, PI: T. Iliescu, Co-PIs: J. Duan, P. Fischer, and T. Ozgokmen, National Science Foundation Grant OCE-0620464, 09/15/06 - 09/14/09, Iliescu's portion: 100% of $147,861.

7. Reduced Order Modeling for Optimization and Control of Complex Flows, PI: J. Borggaard, Co-PI: T. Iliescu, Air Force Office of Scientific Research Grant FA9550-08-1-0136, 03/15/08 - 03/14/11, Iliescu's portion: 50% of $391,021.

8. Transcending POD: Model Reduction for Complex Fluid Flows, PI: J. Borggaard, Co-PI: T. Iliescu and J. P. Roop, National Science Foundation Grant DMS-1016450, 09/15/10 - 09/14/13, Iliescu's portion: 100% of $110,000.

9. CMG Collaborative Research: Ocean Modeling by Bridging Primitive and Boussinesq Equations, PI: J. Duan, Co-PI: P. Fischer, T. Iliescu and T. Ozgokmen, National Science Foundation Grant OCE-0620464, 09/15/10 - 09/14/13, Iliescu's portion: 100% of $208,348.

10. Advanced Computer Design Tools for Modeling, Design, Control, Optimization and Sensitivity Analysis of Integrated Whole Building Systems, Department of Energy HUB, VT ICAM Component of the Greater Philadelphia Innovation Cluster, PI: J. Burns, Co-PI: J. Borggaard, E. Cliff, S. Gugercin, T. Herdman, T. Iliescu, M. Marathe, L. Zietsman 03/15/10 - 03/14/15, Iliescu's portion: $\sim$ 1% of $5,000,000 (one month of summer support).

11. Multiscale Modeling and Simulation of Geophysical Flows: A Numerical Laboratory, PI: A. E. Staples, Co-PI: T. Iliescu, Institute for Critical Technology and Applied Science at Virginia Tech Grant 118709, 09/15/11 - 09/14/13, Iliescu's portion: 100% of $30,000.

12. Collaborative Research: Reduced Order Modeling of Realistic Noisy Flows, PI: T. Iliescu, Co-PI: Z. Wang, National Science Foundation Grant DMS-1522656, 08/01/15 - 07/31/18, Iliescu's portion: 100% of $143,196.

13. Stochastic Nonlinear Reduced Order Modeling of the El Nino Southern Oscillation (ENSO), PI: H. Liu, Co-PI: T. Iliescu, Dean Discovery Fund, College of Science, Virginia Tech, 05/01/17-12/31/17, Iliescu's portion: 50% of $22,266.

14. Lagrangian Data-Driven Computation of Transport Structure in Realistic Flows, PI: T. Iliescu, Co-PI: S. Ross, National Science Foundation Grant, 06/15/18–06/14/21, Iliescu's portion: 100% of $121,480.

15. Mechanics-based Metrics for Vaginal Tear Evaluation, PI: R. De Vita, Co-PI: T. Iliescu, D. Dillard, National Science Foundation, 08/15/19–08/14/22, Iliescu's portion: 33% of $441,433.

Publications

Books and Monographs

1. "Mathematics of Large Eddy Simulation of Turbulent Flows," (with L.C. Berselli and W. J. Layton), *Springer Verlag*, 2005.

Book Chapters

1. "Enstrophy and ergodicity of gravity currents", (with V.P. Bongolan-Walsh, J. Duan, H. Go, T. Ozgokmen, and P.F. Fischer), *Volumes in Mathematics and its Applications on SPDEs*, vol. 140 - Probability and Partial Differential Equations in Modern Applied Mathematics, eds: J. Duan and E. C. Waymire, Springer-Verlag, New York, pp. 61-74, 2005.

2. "Horizontal Approximate Deconvolution for Stratified Flows: Analysis and Computations," (with L. C. Berselli and T. Ozgokmen), *Quality and Reliability in Large-Eddy Simulations II*, ERCOFTAC Series, vol. 16, eds: M. V. Salvetti, B. Geurts, J. Meyers, and P. Sagaut, Springer-Verlag, Berlin, pp. 399-410, 2011.

Refereed Journal Articles

1. "Approximating the Larger Eddies in Fluid Motion III: the Boussinesq Model for Turbulent Fluctuations", (with W. J. Layton), *An. St. Univ. "Al. I. Cuza"*, vol. 44, 1998, pp. 245-261.

2. "A Flow-Aligning Algorithm for Convection-Dominated Problems", *Int. J. Num. Meth. Eng.*, vol. 46, No. 7, 1999, pp. 993-1000.

3. "A 3D Flow-Aligning Algorithm for Convection-Diffusion Problems", *Appl. Math. Letters*, vol. 4, No. 12, 1999, pp. 67-70.

4. "Mathematical Analysis for the Rational Large Eddy Simulation Model", (with L. C. Berselli, G. P. Galdi, and W. J. Layton), *Math. Models Meth. Appl. Sc.*, vol. 12 (8), 2002, pp. 1131–1152.

5. "Convergence of Finite Element Approximations of Large Eddy Motion", (with V. John and W. J. Layton), *Num. Meth. P.D.E.s*, vol. 18(6), 2002, pp. 689-710.

6. "A numerical study of a class of LES models", (with V. John, W. J. Layton, G. Matthies and L. Tobiska), *Int. J. Comput. Fluid Dyn.*, vol. 17 (1), 2003, pp. 75-85.

7. "A Higher Order Subfilter-Scale Model for Large Eddy Simulation", (with L. C. Berselli), *J. Comp. Appl. Math.*, vol. 159, 2003, pp. 411-430.

8. "Large Eddy Simulation of Turbulent Channel Flows by the Rational LES Model", (with P. Fischer), *Physics of Fluids*, vol. 15(10), 2003, pp. 3036–3047.

9. "Backscatter in the Rational LES Model", (with P. Fischer), *Computers and Fluids*, vol. 33(5-6), 2004, pp. 783-790.

10. "Three-dimensional turbulent bottom density currents from a high-order nonhydrostatic spectral element model", (with T. Ozgokmen, P. Fischer, and J. Duan), *J. Phys. Oceanogr.*, vol. 34(9), 2004, pp. 2006-2026.

11. "Entrainment in bottom gravity currents over complex topography from three-dimensional nonhydrostatic simulations", (with T. Ozgokmen, P. Fischer, and J. Duan), *Geophys. Res. Letters* vol. 31(13), L13212, 2004.

12. "Genuinely Nonlinear Models for Convection-Dominated Problems", *Comput. Math. Appl.* vol. 48, 2004, pp. 1677-1692.

13. "Approximate Deconvolution Boundary Conditions for Large Eddy Simulation", (with J. Borggaard), *Appl. Math. Letters*, vol. 19(8), 2006, pp. 735-740.

14. "Impact of Boundary Conditions on Entrainment and Transport in Gravity Currents," (with V. P. Bongolan-Walsh, J. Duan, P. Fischer, and T. Ozgokmen), *Appl. Math. Modelling*, vol. 31(7), 2007, pp. 1338-1350.

15. "Large Eddy Simulation of Stratified Mixing in Two-Dimensional Dam-Break Problem in a Rectangular Enclosed Domain," (with T. Ozgokmen, P. Fischer, A. Srinivasan, and J. Duan), *Ocean Modelling*, vol. 16, 2007, pp. 106-140.

16. "An Improved Penalty Method for Power-Law Stokes Problems," (with J. Borggaard and J. P. Roop), *J. Comput. Appl. Math.*, vol. 223, 2008, pp. 646-658.

17. "A Two-Level Numerical Discretization of the Smagorinsky Model," (with J. Borggaard, H. Lee, J. P. Roop, and H. Son), *SIAM J. Multiscale Modeling and Simulation*, vol. 7(2), 2008, pp. 599-621.

18. "A Bounded Artificial Viscosity Large Eddy Simulation Model", (with J. Borggaard and J. P. Roop), *SIAM J. Num. Anal.*, vol. 47, 2009, pp. 622-645.

19. "Large Eddy Simulation of Stratified Mixing in a Three-Dimensional Lock-Exchange System," (with T. Ozgokmen and P. Fischer), *Ocean Modelling*, vol. 26, 2009, pp. 134-155.

20. "Reynolds Number Dependence of Mixing in a Lock-Exchange System from Direct Numerical and Large Eddy Simulation," (with T. Ozgokmen and P. Fischer), *Ocean Modelling*, vol. 30, 2009, pp. 190-206.

21. "Bridging the Boussinesq and Primitive Equations through Spatio-Temporal Filtering," (with J. Duan, P. Fischer and T. Ozgokmen), *Appl. Math. Letters*, vol. 23, 2010, pp. 453-456.

22. "Artificial Viscosity Proper Orthogonal Decomposition," (with J. Borggaard and Z. Wang), *Math. Comput. Model.*, vol. 53 (1-2), 2011, pp. 269-279.

23. "Two-Level Discretizations of Nonlinear Closure Models for Proper Orthogonal Decomposition," (with J. Borggaard, I. Akhtar and Z. Wang), *J. Comput. Phys.*, vol. 230 (1), 2011, pp. 126-146.

24. "Horizontal Large Eddy Simulation of Stratified Mixing in a Lock-Exchange System," (with L. C. Berselli, P. Fischer, and T. Ozgokmen), *J. Sci. Comput.*, vol. 49, 2011, pp. 3-17.

25. "Approximate Deconvolution Large Eddy Simulation of a Barotropic Model," (with O. San, A. E. Staples, and Z. Wang), *Ocean Modelling*, vol. 40, 2011, pp. 120-132.

26. "Two-level Discretization of the Navier-Stokes Equations with r-Laplacian Subgridscale Viscosity," (with J. Borggaard and J. P. Roop), *Num. Meth. P.D.E.s*, vol. 28 (3), 2012, pp. 1056-1078.

27. "A new closure strategy for proper orthogonal decomposition reduced-order models," (with I. Akhtar, Z. Wang and J. Borggaard), *J. Comp. Nonlinear Dynamics*, vol. 7(3), 034503, 2012.

28. "Proper Orthogonal Decomposition Closure Models for Turbulent Flows: A Numerical Comparison," (with Z. Wang, I. Akhtar, and J. Borggaard), *Comput. Meth. Appl. Mech. Eng.*, vol. 237-240, 2012, pp. 10-26.

29. "Variational Multiscale Proper Orthogonal Decomposition: Convection-Dominated Convection-Diffusion Equations," (with Z. Wang), *Math. Comput.*, vol. 82(283), 2013, pp. 1357-1378.

30. "Approximate Deconvolution Large Eddy Simulation of a Stratified Two-Layer Quasigeostrophic Ocean Model," (with O. San and A. E. Staples), *Ocean Modelling*, vol. 63, 2013, pp. 1-20.

31. "A Finite Element Discretization of the Streamfunction Formulation of the Stationary Quasi-Geostrophic Equations of the Ocean," (with E. Foster and Z. Wang), *Comput. Meth. Appl. Mech. Eng.*, vol. 261-262, 2013, pp. 105-117.

32. "A Two-Level Finite Element Discretization of the Streamfunction Formulation of the Stationary Quasi-Geostrophic Equations of the Ocean," (with E. Foster and D. Wells), *Comput. Math. Appl.*, vol. 66, 2013, pp. 1261–1271.

33. "Variational Multiscale Proper Orthogonal Decomposition: Navier-Stokes Equations," (with Z. Wang), *Num. Meth. P.D.E.s*, vol. 30(2), 2014, pp. 641–663.

34. "A Numerical Investigation of Velocity-Pressure Reduced Order Models for Incompressible Flows," (with A. Caiazzo, V. John and S. Schyschlowa), *J. Comput. Phys.*, vol. 259, 2014, pp. 598–616.

35. "Are the Snapshot Difference Quotients Needed in the Proper Orthogonal Decomposition?" (with Z. Wang), *SIAM J. Sci. Comput.*, vol. 36(3), 2014, pp. A1221–A1250.

36. "Proper Orthogonal Decomposition Closure Models for Fluid Flows: Burgers Equation," (with O. San), *Int. J. Numer. Anal. Model. Ser. B*, vol. 5(3), 2014, pp 217–237.

37. "Disperse Two-Phase Flows, with Applications to Geophysical Problems," (with L. Berselli and M. Cerminara), *Pure Appl. Geophys.*, vol. 172(1), 2015.

38. "SUPG Reduced Order Models for Convection-Dominated Convection-Diffusion-Reaction Equations," (with S. Giere, V. John and D. Wells), *Comput. Meth. Appl. Mech. Eng.*, vol. 289, 2015, pp. 454-474.

39. "B-spline Based Finite-Element Method for the Stationary Quasi-Geostrophic Equations of the Ocean," (with T. Y. Kim and E. Fried), *Comput. Meth. Appl. Mech. Eng.*, vol. 286, 2015, pp. 168-191.

40. "A Posteriori Analysis of Spatial Filters for Approximate Deconvolution Large Eddy Simulations of Homogeneous Incompressible Flows," (with O. San and A. E. Staples), *Int. J. Comput. Fluid Dyn.*, vol. 29(1), 2015, pp. 40–66.

41. "A Stabilized Proper Orthogonal Decomposition Reduced-Order Model for Large Scale Quasigeostrophic Ocean Circulation," (with O. San), *Adv. Comput. Math.*, vol. 41(5), 2015, pp. 1289–1319.

42. "A Conforming Finite Element Discretization of the Streamfunction Form of the Unsteady Quasi-Geostrophic Equations," (with E. Foster and D. Wells), *Int. J. Numer. Model. Anal. Ser. B*, vol. 13(6), 2016, pp. 951–968.

43. "Approximate Partitioned Method of Snapshots for POD," (with Z. Wang. and B. McBee), *J. Comput. Appl. Math.*, vol. 307, 2016, pp. 374–384.

44. "Approximate Deconvolution Reduced Order Modeling," with (X. Xie, D. Wells, Z. Wang, T. Iliescu), *Comput. Methods Appl. Mech. Engrg.*, vol. 313, 2017, pp. 512–534.

45. "An Evolve-Then-Filter Regularized Reduced Order Model For Convection-Dominated Flows," (with D. Wells, Z. Wang and X. Xie) *Int. J. Num. Meth. Fluids*, vol. 84, 2017, pp. 598–615.

46. "Energy Balance and Mass Conservation in Reduced Order Models of Fluid Flows," (with M. Mohebujjaman, L. G. Rebholz, and Xie, X), *J. Comput. Phys.*, vol 346, 2017, pp. 262–277.

47. "Numerical Analysis of the Leray Reduced Order Model," (with X. Xie, D. Wells, and Z. Wang), *J. Comput. Appl. Math.*, vol. 328, 2018, pp. 12–29.

48. "Regularized Reduced Order Models for a Stochastic Burgers Equation," (with H. Liu and X. Xie), *Int. J. Numer. Anal. Mod.*, vol 15(4–5), 2018, pp. 594–607.

49. "Data-Driven Filtered Reduced Order Modeling of Fluid Flows," (with X. Xie, M. Mohebujjaman, and L. G. Rebholz), *SIAM J. Sci. Comput.*, vol 40 (3), 2018, pp. B834–B857.

50. "A Leray Regularized Ensemble-Proper Orthogonal Decomposition Method for Parameterized Convection-Dominated Flows," (with M. Gunzburger and M. Schneier), *IMA J. Numer. Anal.*, in press.

51. "Physically-Constrained Data-Driven Correction for Reduced Order Modeling of Fluid Flows," (with M. Mohebujjaman and L. G. Rebholz), *Int. J. Num. Meth. Fluids*, vol 89 (3), 2019, pp. 103–122.

52. "Lagrangian Data-Driven Reduced Order Modeling of Finite Time Lyapunov Exponents," (with X. Xie, P. J. Nolan, and S. D. Ross), submitted.

53. "Commutation Error in Reduced Order Modeling of Fluid Flows," (with B. Koc, M. Mohebujjaman, and C. Mou), *Adv. Comput. Math.*, accepted.

54. "An Evolve–Filter–Relax Stabilized Reduced Order Stochastic Collocation Method for the Time-Dependent Navier–Stokes Equations," (with M. Gunzburger, M. Mohebujjaman, and M. Schneier), *SIAM-ASA J. Uncertain.*, vol 7 (4), 2019, pp. 1162–1184.

55. "Long-Time Reynolds Averaging of Reduced Order Models for Fluid Flows: Preliminary Results," (with L. Berselli, B. Koc, and R. Lewandowski), *Math. Engrg.*, in press.

56. "A Non-Intrusive Reduced Order Modeling Framework for Quasi-Geostrophic Turbulence," (with S. Rahman, S. Pawar, O. San, and A. Rasheed), *Phys. Rev. E*, vol 100, 2019, 053306.

57. "An Artificial Compression Reduced Order Model," (with V. DeCaria, W. Layton, M. McLaughlin, and M Schneier), *SIAM J. Num. Anal.*, accepted.

58. "Continuous Data Assimilation Reduced Order Models of Fluid Flow," (with C. Zerfas, L. G. Rebholz, and M Schneier), *Comput. Methods Appl. Mech. Engrg.*, in press.

59. "A long short-term memory embedding for hybrid uplifted reduced order models," (with S. E. Ahmed, O. San, and A. Rasheed), submitted.

Refereed Proceedings and Book Chapters

1. "Distribucion de Temperatura en las Esquinas de una Celda de Reduccion de Aluminio Tipo Hall-Heroult", (with E. Gutierrez, N. Troyani and W. J. Layton), IV Congreso Iberoamericano de Ingenieria Mecanica, Santiago de Chile, Chile, 1999.

2. "Corner Distribution of Voltage in Hall-Heroult Aluminum Reduction Cells", (with E. Gutierrez, N. Troyani and W. J. Layton), IV International Congress: Energy, Environment and Technological Innovation, Rome, 1999, pp. 1445-1451.

3. "The Center Section Temperature Distribution in Hall-Heroult Aluminum Reduction Cells from a Three-Dimensional Finite Element Simulation", (with E. Gutierrez, N. Troyani and W. J. Layton), International Thermal Energy Congress, Cesme, Izmir, Turkey, July 2001.

4. "A 3D Channel Flow Simulation at $Re_\tau = 180$ Using a Rational LES Model", (with P. Fischer), Proceedings of Third AFOSR International Conference on DNS/LES, eds. C. Liu, L. Sakell, and T. Beutner, Greyden Press, 2001, pp. 283–290.

5. "Comparison of Numerical Noise in Design Objectives using LES and Turbulence Models", (with J.Borggaard, D. Pelletier and K. Vugrin), in Proceedings of the 10th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, 2004.
6. "A Domain Decomposition Approach to POD", (with C. Beattie, J. Borggaard, and S. Gugercin), 45th IEEE Conference on Decision and Control, 2006.
7. "A numerical investigation of the boundary commutation error in large eddy simulation" (with J. Borggaard), Proceedings of ECCOMAS CFD, 2006.
8. "Reduced-Order Modeling of Turbulent Flows," (with J. Borggaard, A. Duggleby, A. Hay, and Z. Wang), Proceedings of MTNS 2008.
9. "Numerical Approximation of the Smagorinsky Model by a Two-Level Method," (with J. Borggaard, H. Lee, J. P. Roop, and H. Son), Proceedings of ICIAM07, 2007.
10. "Sensitivity Analysis-Based Reduced-Order Models for Flow Past an Elliptic Cylinder," (with I. Akhtar, J. Borggaard, and A. Hay), Proceedings of the 47th AIAA Aerospace Sciences Meeting and Exhibit, AIAA Paper Number 2009-0583, 2009.
11. "Modeling High Frequency Modes for Accurate Low-Dimensional Galerkin Models," (with I. Akhtar, J. Borggaard, and C. J. Ribbens), Proceedings of the AIAA 39th Computational Fluid Dynamics Conference, AIAA Paper Number 2009-4202, 2009.
12. "A Novel Strategy for Nonlinear Closure in Proper Orthogonal Decomposition Reduced-Order Models," (with I. Akhtar, J. Borggaard and Z. Wang), ASME ECTC, 2010.
13. "Large Eddy Simulation Ideas for Nonlinear Closure in Model Reduction of Fluid Flows," (with I. Akhtar, J. Borggaard and Z. Wang), 5th Flow Control Conference, AIAA Paper Number 2010-5089, 2010.
14. "Residual-Based Closure for the Stability of Reduced-Order Models," (with I. Akhtar, J. Borggaard and Z. Wang), 48th AIAA Aerospace Sciences Meeting, AIAA Paper Number 2010-1276, 2010.
15. "Spatial Filtering for Reduced Order Modeling," (with L. C. Berselli, X. Xie, and D. Wells), DLES11 ERCOFTAC Workshop Direct and Large-Eddy Simulation 11, 2017.
16. "Closure Learning for Nonlinear Model Reduction Using Deep Residual Neural Network," (with X. Xie and C. G. Webster), submitted.

Other Publications

1. "Algoritmos Computacionales para Resolver el Problema Termoelectrico en Tres Dimensiones en Celdas de Reduccion de Aluminio del Tipo Hall-Heroult," (with E. Gutierrez, N. Troyani and W. J. Layton), Universidad Ciencia y Tecnologia, Vol. 3, No.12, pp. 17-24, 1999.
2. "Formulacion Variacional del Problema Termoelectrico de una Celda de Reduccion Hall-Heroult en Tres Dimensiones," (with E. Gutierrez, N. Troyani and W. J. Layton), Universidad Ciencia y Tecnologia, Vol. 3, No. 9, pp. 25-29, 1999.

Presentations

Invited Conference Presentations

1. SIAM Annual Meeting, Toronto, Canada, July 1998.
2. SIAM Annual Meeting, Atlanta, Georgia, May, 1999.
3. SIAM Annual Meeting, Atlanta, Georgia, May, 1999.
4. ICIAM99, Edinburgh, Scotland, July, 1999.
5. Computational Fluid Dynamics and Related Topics summer school, Coimbra, Portugal, July, 1999.
6. Workshop in Experimental, Computational and Mathematical Fluid Dynamics, Pittsburgh, November, 1999.
7. Advanced Multiscale and Multiresolution Methods, Yosemite National Park, October 29 - November 1, 2000.
8. Third AFOSR International Conference on DNS and LES TAICDL, Arlington, Texas, August 5-9, 2001.
9. 54th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, San Diego, California, November 18-20, 2001.
10. AMIF 2002, Third International Conference on Applied Mathematics for Industrial Flow Problems, Lisbon, Portugal, April 17-20, 2002.
11. SIAM Annual Meeting, Philadelphia, July 12, 2002.
12. SIAM Annual Meeting, Montreal, June 16, 2003.
13. AMS Southeast Regional Meeting, Chapel Hill, October 24, 2003.
14. European Geosciences Union, 1st General Assembly, Nice, France, 25-30 April, 2004.
15. SIAM Annual Meeting, Portland, July 12-16, 2004.
16. AMS Fall Eastern Section Meeting, Pittsburgh, November 6-7, 2004.
17. The 57th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Seattle, November 21-23, 2004.
18. SIAM Conference on Computational Science & Engineering, Orlando, February 12-15, 2005.
19. The 58th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Chicago, November 20-22, 2005.
20. Southeastern Section MAA and SIAM Southeast Atlantic Section Joint Meeting, Auburn, Alabama, March 31-April 1, 2006.
21. ECCOMAS CFD 2006, European Conference on Computational Fluid Dynamics, Egmond aan Zee, The Netherlands, September 5-8, 2006.
22. SIAM Conference on Mathematical and Computational Issues in the Geosciences, Santa Fe, New Mexico, March 19-22, 2007.
23. SIAM Conference on Computational Science & Engineering, Costa Mesa, California, February 19-23, 2007.

24. 6th International Congress on Industrial and Applied Mathematics, Zurich, Switzerland, July 16-20, 2007.
25. **Plenary Talk**, Sandia CSRI Workshop on Mathematical Methods for Verification and Validation, Hyatt Regency Tamaya Resort, August 14-16, 2007.
26. AMS Spring Central Meeting, Bloomington, IN, April 5-6, 2008.
27. Mathematical Theory of Networks and Systems, Blacksburg, VA, July 28 - August 1, 2008.
28. Navier-Stokes Equations: Classical and Generalized Models, Centro di Ricerca Matematica Ennio De Giorgi, Pisa, Italy, September 21-28, 2008.
29. SIAM Conference on Computational Science & Engineering, Miami, Florida, March 2-6, 2009.
30. AMS Spring Southeastern Section Meeting, Raleigh, NC, April 4-5, 2009.
31. SIAM Conference on Mathematical and Computational Issues in the Geosciences, Leipzig, Germany, June 15-18, 2009.
32. The Joint ASCE-ASME-SES Conference on Mechanics and Materials, Blacksburg, VA, June 24-27, 2009.
33. SIAM Annual Meeting, Pittsburgh, PA, July 12-16, 2010.
34. AFOSR Computational Mathematics meeting, Arlington, VA, July 27-30, 2010.
35. SIAM Conference on Mathematical and Computational Issues in the Geosciences, Long Beach, CA, March 21-24, 2011.
36. SIAM Conference on Analysis of Partial Differential Equations, San Diego, CA, November 14-17, 2011.
37. **Invited Speaker**, The Eighth International Conference on Scientific Computing and Applications, University of Nevada, Las Vegas, NV, April 1 - 4, 2012.
38. **Plenary Talk**, Connections Between Regularized and Large-Eddy Simulation Methods for Turbulence Workshop, Banff International Research Station, Banff, AB, Canada, May 13-18, 2012.
39. SIAM Annual Meeting, Minneapolis, Minnesota, July 9-13, 2012.
40. Second International Workshop on Model Reduction for Parameterized Systems (MoRePaS II), (contributed talk), Schloss Reisenburg, Gunzburg, Germany, October 2-5, 2012.
41. SIAM Conference on Computational Science and Engineering, Boston, Massachusetts, February 25 - March 1, 2013.
42. SIAM Conference on Mathematical and Computational Issues in the Geosciences, Padova, Italy, June 17-20, 2013.
43. 11th World Congress on Computational Mechanics (WCCM XI), Barcelona, Spain, July 20-25, 2014.
44. SIAM Conference on Computational Science and Engineering, Salt Lake City, Utah, USA, March 14-18, 2015.
45. MoRePaS 2015 - Model Reduction of Parametrized Systems, Trieste, Italy, October 13-16, 2015.
46. Numerical Analysis and Predictability of Fluid Motion, University of Pittsburgh, May 3-4, 2016.
47. ECCOMAS Congress 2016, Crete Island, Greece, June 6-10, 2016.

48. **Plenary Talk**, Recent Developments in Numerical Methods for Model Reduction, Institut Henri Poincare, Paris, France, November 7-10, 2016.
49. SIAM Conference on Computational Science and Engineering, Atlanta, Georgia, USA, February 27 - March 3, 2017.
50. Conference on Classical and Geophysical Fluid Dynamics: Modeling, Reduction and Simulation, Virginia Tech, June 26-28, 2017.
51. SIAM Annual Meeting, Pittsburgh, Pennsylvania, July 14, 2017.
52. MoRePaS 2018 - Model Reduction of Parametrized Systems, Nantes, France, April 11, 2018.
53. SIAM Southeastern Atlantic Sectional Conference, Chapel Hill, North Carolina, March 9-11, 2018.
54. SIAM Conference on Computational Science and Engineering, Spokane, Washington, USA, February 25 - March 1, 2019.
55. SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, USA, May 19-23, 2019.
56. **Plenary Talk**, Time Filters and Predictive Accuracy, Pittsburgh, Pennsylvania, USA, May 29-30, 2019.
57. 15th US National Congress on Computational Mechanics, Austin, Texas, USA, July 28 - August 1, 2019.
58. AMS Fall Central Sectional Meeting, Madison, WI, September 14-15, 2019.
59. **Plenary Talk**, Advanced Simulation Workshop, Argonne, Illinois, USA, February 28, 2020.
60. **Plenary Talk**, Workshop on Reduced-Order Models at Work: Industry and Medicine, Bordeaux, France, March 18-20, 2020.
61. **Plenary Talk**, Algorithms for Dimension and Complexity Reduction, ICERM, Providence, Rhode Island, USA, March 23-27, 2020.
62. International Conference on Spectral and High Order Methods (ICOSAHOM), Vienna, Austria, July 6-10, 2020.
63. Joint 14th World Congress in Computational Mechanics and ECCOMAS Congress (WCCM ECCOMAS 2020), Paris, July 19-24, 2020.

Invited Colloquia and Seminars

1. Seminars on Applied Mathematics and Numerical Analysis , IST, Lisbon, Portugal, May 28, 1999.
2. Worcester Polytechnic Institute, Mathematics Department Seminar, February 2000.
3. Iowa State University, Mathematics Department Seminar, February 2000.
4. University of Nevada at Reno, Mathematics Department Seminar, February 2000.
5. Old Dominion University, Mathematics Department Seminar, February 18, 2000.
6. Argonne National Laboratory, Mathematics and Computer Science Division, March 2000.
7. University of Hawaii, Mathematics Department Seminar, March 2000.
8. University of Texas at Arlington, Mathematics Department Seminar, March 2000.

9. Texas Tech, Mathematics Department Seminar, March 2000.
10. Virginia Tech, Mathematics Department Seminar, April 2000.
11. Clemson University, Mathematics Department Seminar, November, 2000.
12. Illinois Institute of Technology, Mathematics Department Seminar, December, 2000.
13. MCS Division Seminar, Argonne National Laboratory, May 2, 2002.
14. Virginia Tech, Mathematics Colloquium, May 2, 2003.
15. Seconda Università degli Studi di Napoli, Department of Mathematics, May 23, 2005.
16. Università di Pisa, May 30, Department of Aerospace Engineering, May 30, 2005.
17. University of Ottawa, Department of Mathematics and Statistics, Ottawa, Canada, May 4, 2006.
18. Università di Pisa, Department of Applied Mathematics, Pisa, Italy, May 22, 2006.
19. Laboratory for Modeling and Scientific Computing MOX, Department of Mathematics "F. Brioschi", Politecnico di Milano, Milano, Italy, May 24, 2006.
20. University of Pittsburgh, Department on Mathematics Colloquium, October 27, 2006.
21. Florida State University, Department of Scientific Computing, Seminar, Tallahassee, FL, November 19, 2008.
22. Institute for Scientific Computing and Applied Mathematics, Indiana University, January 21, 2009.
23. Instituto Superior Tecnico, Department of Mathematics, Lisbon, Portugal, May 14, 2009.
24. Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Berlin, Germany, May 24, 2012.
25. University of Pittsburgh, Department of Mathematics, April 2, 2013.
26. University of Washington, Department of Applied Mathematics, May 1, 2014.
27. Virginia Tech, Department of Mathematics, September 24, 2014.
28. University of North Carolina at Chapel Hill, Department of Mathematics, September 26, 2014.
29. University of Rome, La Sapienza, PhD Program in Theoretical and Applied Mechanics, December 4, 2015.
30. University Roma Tre, Rome, Italy, June 21, 2016.
31. Virginia Tech, Department of Mathematics, September 22, 2017.
32. Florida State University, Department of Scientific Computing, November 2, 2017.
33. University of Pittsburgh, Department of Mathematics, March 1, 2018.
34. Università di Pisa, Department of Applied Mathematics, Pisa, Italy, June 19, 2018.
35. Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Berlin, Germany, June 26, 2018.
36. International School for Advanced Studies (SISSA), Trieste, Italy, July 3, 2018.
37. Montclair State University, Department of Mathematical Sciences, September 17, 2018.
38. University of Michigan, Department of Aerospace Engineering, November 2, 2018.
39. Sandia National Laboratories, November 26, 2018.

40. Emory University, Department of Mathematics, December 7, 2018.
41. George Mason, Department of Mathematics, February 7, 2020.

Other Presentations

1. KESPWORK99, Kent Singular Perturbations Workshop, Kent State University, December 7, 1999.
2. Finite Element Circus, Rutgers University, October 20-21, 2000.
3. Virginia Tech, NA/PDE seminar, November 8, 2001.
4. Finite Element Circus, University of Pittsburgh, April 16-17, 2004.
5. European Geosciences Union, poster presentation, 1st General Assembly, Nice, France, 25-30 April, 2004.
6. Workshop on Collaborations in the Mathematical Geosciences, poster presentation, Research Triangle Park, NC, October 6-7, 2005.
7. Fall Fluids Mechanics Minisymposium at Virginia Tech, November 13, 2008.
8. Fall Fluids Mechanics Minisymposium at Virginia Tech, November 10, 2009.
9. Virginia Tech, Department of Mathematics, Visitor's Day, March 20, 2009.
10. Workshop on Model and Data Hierarchies for Simulating and Understanding Climate, IPAM, Los Angeles, CA, March 22 - 26, 2010.
11. Workshop on Transport and Mixing in Complex and Turbulent Flows, IMA, Minneapolis, MN, April 12-16, 2010.
12. Virginia Tech Faculty Research Seminar, September 28, 2010.
13. Virginia Tech Faculty Research Seminar, October 15, 2011.
14. Virginia Tech, Department of Mathematics, Numerical Analysis Seminar, February 27, 2018.
15. Virginia Tech, Department of Mathematics, Numerical Analysis Seminar, September 26, 2018.
16. Virginia Tech, Department of Mathematics, Fluids Seminar, October 25, 2018.
17. Virginia Tech, Department of Mathematics, Fluids Seminar, January 30, 2019.
18. Virginia Tech, Department of Biomedical Engineering, March 20, 2019.
19. Finite Element Circus, Virginia Tech, November 1-2, 2019.

Professional Societies

1. Society for Industrial and Applied Mathematics (SIAM)

Professional Service

University Service

1. Graduate Curriculum Committee (2005-2006)
2. Commission on Outreach and International Affairs (2007-2008)

College Service

1. International Faculty Development Program (2006)

Department Service

1. Executive Committee (2018-2020)
2. Graduate Program Committee (2006-present)
3. Admissions to Graduate Program Committee (2006-2008, 2012-2019)
4. Preliminary Examination Restructuring Committee, chair (2018–2019)
5. Department Head Election Committee, chair (2006)
6. Layman Prize Committee, chair (2010-2011)
7. Mathematics Department Planning Committee (2005-2006)
8. Caldwell Postdoctoral Committee (2011)
9. Numerical Analysis Preliminary Exam Committee (2006-2008, 2009, 2010-2014)
10. Applied and Computational Mathematics Undergraduate Committee (2005-2008, 2009-2011)
11. Computational Resources Committee (2004-2006, 2007-2008)
12. Colloquium Committee (2003-2004)
13. Travel Committee (2005-2006)
14. Undergraduate Commencement Ceremony (2012-2017)
15. Graduate Commencement Ceremony (2012-2017)
16. Teaching Evaluation Committee (2007-present)

Professional Service

1. Guest Editor, "International Journal of Numerical Analysis and Modeling," 2017.
2. Conference Organizer:
   (a) "Conference on Classical and Geophysical Fluid Dynamics: Modeling, Reduction and Simulation," Virginia Tech, Blacksburg, VA, June 26-28, 2017
   (b) "Finite Element Circus," Virginia Tech, 2019
   (c) "Reduced Order Models for Fluids," Virginia Tech, May 18-19, 2020.
   (d) "SIAM Southeastern Atlantic Sectional Conference," Virginia Tech, 2021.
   (e) "International Conference on Computational Methods for Coupled Problems in Science and Engineering," Scientific Committee, Chia Laguna, Sardinia, Italy, 2021.

3. Minisymposium Organizer and Session Chair:

   (a) "Multi-scale Fluid Flow: Theory and Computation" at the AMS Southeast Regional Meeting, Chapel Hill, October, 2003

   (b) "Computational Issues in Control of Complex Flows" at the SIAM Annual Meeting, Portland, July, 2004

   (c) "Emerging Finite Element Methods for Complex Flow" at the SIAM Conference on Computational Science and Engineering, Costa Mesa, California, February 19-23, 2007

   (d) "Mathematics and Computations of Complex Flows" at ICIAM07, the 6th International Congress on Industrial and Applied Mathematics, Zurich, Switzerland, July 16-20, 2007

   (e) "Advancements in Turbulent Flow Modeling and Computation" at the Spring Southeastern Section Meeting, Raleigh, NC, April 4-5, 2009

   (f) "Modeling and Simulation of Oceanic Flows" at the SIAM Conference on Mathematical and Computational Issues in the Geosciences, Leipzig, Germany, June 15-18, 2009

   (g) "Modeling, Analysis and Simulation of Oceanic Flows" at the SIAM Conference on Mathematical and Computational Issues in the Geosciences, Hilton Long Beach & Executive Meeting Center, Long Beach, California, March 21-24, 2011

   (h) "Nonlinear Model Reduction of Complex Flows: Modeling, Analysis, and Computations" at the SIAM Conference on Computational Science and Engineering, Boston, Massachusetts, February 25 - March 1, 2013

   (i) "Modeling and Simulation of Oceanic Flows" at the SIAM Conference on Mathematical and Computational Issues in the Geosciences, University of Padova, Italy, June 17-20, 2013

   (j) "Special Session on Above and Beyond Fluid Flow Studies: In celebration of the 60th birthday of Prof. William Layton" at the Fall Western Sectional Meeting, University of Denver, Denver, CO, October 8-9, 2016

   (k) "Reduced Order Models for Fluids: Achievements and Open Problems" at the SIAM Conference on Computational Science and Engineering, Atlanta, Georgia, February 27 – March 3, 2017

   (l) "Reduced Order Model for Fluids," at the 19th International Conference on Finite Elements in Flow Problems (FEF 2017), Rome, Italy, April 5–7, 2017

   (m) "Progress in Model Reduction for Complex Systems" at the SIAM Southeastern Atlantic Sectional Conference, Chapel Hill, North Carolina, March 9–11, 2018

   (n) "Reduced Order Modeling for Fluids: Achievements and Open Problems" at the SIAM Conference on Computational Science and Engineering, Spokane, Washington, February 25 – March 1, 2019

   (o) "Reduced Order Modeling for Fluids" at the SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 19 – 23, 2019

   (p) "Numerical Methods and Reduced-Order Modeling in Fluid Dynamics and Control" at the SIAM Southeastern Atlantic Sectional Conference, Knoxville, Tennessee, September 20–22, 2019

   (q) "Reduced Order Models for Fluid Flows" at the SIAM Southeastern Atlantic Sectional Conference, Auburn, Auburn University, March 14-15, 2020

4. External Reviewer for Promotion to Full Professor for: University of Houston, University of Nevada at Las Vegas

5. External Reviewer for Promotion to Associate Professor for: University of Notre Dame, Clemson University, Michigan Technological University

6. Reviewed research monograph "Mathematical and Numerical Foundations of Turbulence Models and Applications," Roger Lewandowski, Tomas Chacon Rebollo, *Springer Verlag*, 2014.

7. Refereed Proposals

   - National Science Foundation (9 panels)
   - Oak Ridge Associated Universities Ralph E. Powe Junior Faculty Enhancement Awards Program (2 panels)
   - U.S. Department of Energy, Office of Advances Scientific Computing Research (1 panel)
   - Swiss National Supercomputing Centre (1 panel).
   - University of Missouri Research Board (2 proposals).

8. Refereed Papers for: Acta Mathematica Scientia, Advances and Applications in Fluid Mechanics, Advances in Mathematical Fluid Mechanics., Advances in Difference Equations, Applied Mathematics and Computation, Applied Numerical Mathematics, Communications in Pure and Applied Analysis, Computer Methods in Applied Mechanics and Engineering, Computers and Fluids, Computers and Mathematics with Applications, Discrete and Continuous Dynamical Systems series B, Finite Elements in Analysis and Design, International Journal of Computer Mathematics, International Journal for Numerical Methods in Fluids, International Journal for Uncertainty Quantification, Journal of Computational Physics, Journal of Fluid Mechanics, Journal of Mathematical Analysis and Applications, Journal of Scientific Computing, Journal of Wind Engineering & Industrial Aerodynamics, Mathematical and Computer Modelling, Mathematical Methods in the Applied Sciences, Mathematical Modelling and Numerical Analysis, Nonlinear Dynamics, Nonlinear Processes in Geophysics, Numerical Algorithms, Numerical Methods for PDEs, Physics of Fluids, Proceedings of the International Conference on Computational Science, SIAM Journal on Applied Mathematics, SIAM Journal on Numerical Analysis, SIAM Journal on Scientific Computing, Theoretical and Computational Fluid Dynamics, Zeitschrift fur Naturforschung A.

Outreach and Diversity

1. Speaker at the Virginia Tech Association for Women in Mathematics (AWM) meeting, 2015.

2. Supervised problem solving sessions at the Math Circle for 4th graders, Blacksburg, Virginia (2015-2016).

3. Supervised problem solving sessions at the Math Club of Harding Avenue Elementary, Blacksburg, Virginia (2017).

4. Gave lecture on my research to elementary school students at Rainbow Riders Daycare, Blacksburg, Virginia (2017).

5. Guest lecture on basic concepts in ocean modeling, STEMABILITY, Virginia Tech, Blacksburg, Virginia (2019). STEMABILITY is a summer camp that aims to serve, train, empower, and mentor high school students with disabilities while exposing them to science, technology, engineering, and mathematics.

6. International Collaborations: Luigi Berselli (University of Pisa, Italy), Volker John (Weierstrass Institute for Applied Analysis and Stochastics, Germany), Simona Perotto (Politecnico di Milano, Italy), Gianluigi Rozza (International School for Advanced Studies, Italy), Roger Lewandowski (University of Rennes, France), Samuele Rubino (University of Seville, Spain).

7. Interdisciplinary Collaborations: Tamay Ozgokmen, oceanographer (University of Miami), Paul Fischer, engineer (Argonne National Laboratory and University of Illinois at Urbana Champaign), Shane Ross, engineer (Virginia Tech).

8. Authored Research Monograph "Mathematics of Large Eddy Simulation of Turbulent Flows," *Springer Verlag*, 2005, laid mathematical foundations of engineering field (LES).

Undergraduate Student Advising

1. Brian Baitis, Virginia Tech, 2004-2005.
2. Grant Boquet, Virginia Tech, 2004 (co-advised with J. Borggaard).
3. Jeremy Henry, Virginia Tech, 2007.
4. Joshua Shelor, Virginia Tech, 2007.
5. Seth Hutcherson, Virginia Tech, 2011.
6. Patrick Graybeal, Virginia Tech, 2020.

Graduate Student Advising

1. Louis Ntasin, Argonne National Laboratory, 2001 (co-advised with P. Fischer).
2. Adrian Dunca, Argonne National Laboratory, 2002 (co-advised with M. Anitescu).
3. Alexey Miroshnikov, Virginia Tech, 2003-2004 (co-advised with J. Borggaard).
4. Ke Le, Virginia Tech, 2006-2008 (MS 2008).
5. Cristina Letona, Virginia Tech, 2009-2010.
6. Haofeng Yu, Virginia Tech (PhD 2011).
7. Zhu Wang, Virginia Tech (PhD 2012).
8. Erich Foster, Virginia Tech (PhD 2013).
9. David Wells, Virginia Tech (PhD 2015).
10. Xuping Xie, Virginia Tech (PhD 2017).
11. Birgul Koc, Virginia Tech (MS 2018), 2016-present.
12. Changhong Mou, Virginia Tech (MS 2018), 2017-present.
13. Ludovica Saccaro, Politecnico di Milano, 2019-present (co-advised with S. Perotto).

Graduate Student Accomplishments

1. Zhu Wang
   (a) **Associate Professor** with tenure, University of South Carolina.
   (b) *Wilkinson* Fellowship Finalist, Argonne National Lab, 2012.
   (c) *Louis Alvarez* Fellowship Finalist, Lawrence Berkeley National Lab, 2012.
   (d) *BGCE Student Paper Prize* Competition Finalist, SIAM CSE, 2012.
2. Omer San
   (a) **Assistant Professor**, tenure-track, Oklahoma State University.
   (b) *DOE Early Career Award*, 2018.
3. Xuping Xie, postdoctoral researcher, Courant Institute of Mathematical Sciences - New York University.
4. David Wells, postdoctoral researcher, University of North Carolina and Chapel Hill.
5. Erich Foster
   (a) scientist, Bettis Atomic Power Laboratory.
   (b) *BGCE Student Paper Prize* Competition Finalist, SIAM CSE, 2013.
6. Haofeng Yu, Actuary Director at AIG, Houston.
7. Adrian Dunca, *Full Professor*, University Politehnica of Bucharest.

Postdoctoral Fellow Advising

1. Andrew Duggleby, Virginia Tech, 2007.
2. Omer San, Virginia Tech, 2012-2014.
3. Muhammad Mohebujjaman, Virginia Tech, 2017-2018.

Teaching

1. Math 1114 - Elementary Linear Algebra - Honors Section
2. Math 2214H - Introduction to Differential Equations - Honors Section
3. Math 2214 - Introduction to Differential Equations
4. Math 2224 - Multivariable Calculus
5. Math 2224H - Multivariable Calculus - Honors Section
6. Math 3034 - Introduction to Proofs
7. Math 3214 - Calculus of Several Variables
8. Math 4445, Math 4446 - Introduction to Numerical Analysis (two semester sequence)
9. Math 4254 - Chaos and Dynamical Systems

10. Math 5524 - Matrix Theory
11. Math 5484 - Finite Element Methods for PDEs
12. Math 5474 - Finite Difference Methods for PDEs
13. Math 5465, Math 5466 - Numerical Analysis (two semester sequence)

Course Development

1. Math 5415 - Finite Element Methods for Viscous Incompressible Flows (two semester sequence)
2. Math 6425 - Mathematical Modeling of Atmospheric and Oceanic Flows
3. Math 5415 - Reduced Order Modeling of Fluid Flows