

# ADAM LARIOS

## Curriculum Vitae

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## EDUCATION

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<b>University of California Irvine</b> Ph.D. in Mathematics Advisor: Dr. Edriss S. Titi Thesis Title: The Inviscid Voigt-Regularization for Hydrodynamic Models: Global Regularity, Boundary Conditions, and Blow-Up Phenomena	Irvine, CA <i>June 2011</i>
<b>Western Washington University</b> M.S. in Mathematics Advisor: Dr. David Hartenstine	Bellingham, WA <i>June 2006</i>
<b>Western Washington University</b> B.S. in Mathematics ( <i>Cum Laude</i> ) Advisor: Dr. Robert Jewett	Bellingham, WA <i>June 2004</i>
<b>Edmonds Community College</b> A.A.	Lynnwood, WA <i>2001</i>

## RESEARCH INTERESTS

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My research is primarily in the fields of partial differential equations, fluid dynamics, numerical analysis, and scientific computation. I am especially interested in problems related to turbulence modeling, geophysics (ocean/atmospheric dynamics), and magnetohydrodynamics (MHD). In particular, my work is focused on studying the mathematical well-posedness and large-time asymptotic behavior of models based on the Navier-Stokes equations, on developing new turbulence models, on performing large-scale massively-parallel numerical simulations on supercomputers to validate these models, and on testing mathematical and scientific hypotheses computationally. Related to this research, I work on generalized notions of attractors for semi-dissipative systems. I am also interested in phase-field models, such as the Allen-Cahn and Cahn-Hilliard equations. In recent years, I have turned my attention to data assimilation in turbulent fluids, problems in relativistic fluid dynamics, and the Kuramoto-Sivashinky equation. I also work on nonlocal problems in peridynamics.

## AWARDS

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- (Awarded grants are listed in “Successful and Pending Proposals” below.)
- **Simons Foundation Fellowship** for workshop “Mathematical aspects of turbulence: where do we stand?” Isaac Newton Institute, Cambridge, UK, 2022.
- **School of Physical Sciences Faculty Endowed Fellowship**, UC Irvine, 2011

- **Von Neumann Award for Outstanding Performance as a Graduate Student**, UC Irvine, 2010
- **Award for Outstanding Contributions to the Department**, UC Irvine, Spring 2009
- **GAANN [Graduate Assistance in Areas of National Need] Fellowship**, UC Irvine, Spring 2009
- **GAANN Fellowship**, UC Irvine, Winter 2009
- **Pre-Dissertation Fellowship**, UC Irvine, Fall 2008
- **Pre-Dissertation Fellowship**, UC Irvine, Summer 2007
- **Euler Award for Outstanding Promise as a Graduate Student**, UC Irvine, 2007
- **Pre-Dissertation Fellowship**, UC Irvine, Spring 2007
- **Richard Greene Teaching Award**, Western Washington University, 2006
- **Elias Bond Graduate Fellowship**, Western Washington University, 2005
- **Elias Bond Graduate Fellowship**, Western Washington University, 2004
- **SAIC [Science Applications International Corporation] Award for Academic Achievement and Creative Problem Solving**, Western Washington University, 2004
- **Honorable Mention, COMAP MCM [Consortium for Mathematics and its Applications - Mathematical Contest in Modeling]**, 2003

## APPOINTMENTS

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- **Associate Professor, University of Nebraska–Lincoln**  
Lincoln, Nebraska, USA  
Department of Mathematics, Aug 2020 - Present.
- **Assistant Professor, University of Nebraska–Lincoln**  
Lincoln, Nebraska, USA  
Department of Mathematics, Sept 2014 - Aug 2020.
- **Visiting Assistant Professor, Texas A&M University**  
College Station, Texas, USA  
Department of Mathematics, Sept 2011 - July 2014.  
Postdoc advisors: Professors Ciprian Foias and Jean-Luc Guermond
- **Graduate Research Assistant, Los Alamos National Laboratory**,  
Los Alamos, New Mexico, USA  
November 1, 2010 - December 2010; June 16 2010 - August 20, 2010; and June 12 2009 - September 24, 2009.  
Computational study of a turbulence model known as the Navier-Stokes Voigt model using direct numerical simulation (DNS). Code written in Fortran 90 and run using MPI on the Coyote super computer. Data processed with Matlab, Paraview, and NCL (NCAR Command Language).

## PUBLICATIONS AND PREPRINTS

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### ACCEPTED AND SUBMITTED PUBLICATIONS

31. M. Enlow, A. Larios, J. Wu, *Algebraic calming for the 2D Kuramoto-Sivashinsky equations*. arXiv:2304.10493 (submitted)
30. E. Carlson, A. Larios, E. S. Titi, *Super-exponential convergence rate of a nonlinear continuous data assimilation algorithm: The 2D Navier-Stokes equations paradigm*. arXiv:2304.01128 (submitted)
29. A. Larios, Y. Pei, C. Victor, *The second-best way to do sparse-in-time continuous data assimilation: Improving convergence rates for the 2D and 3D Navier-Stokes equations*. arXiv:2303.03495 (submitted)
28. A. Farhat, A. Larios, V. R. Martinez, J. P. Whitehead *Identifying the body force from partial observations of a 2D incompressible velocity field*. arXiv:2302.04701 (submitted)
27. J. Zhao, A. Larios, F. Bobaru, *Construction of a peridynamic model for viscous flow*. J. Comp. Physics **468** (2022) Paper No. 111509, 16 pp.
26. T. Franz, A. Larios, C. Victor, *The Bleeps, the Sweeps, and the Creeps: Convergence Rates for Dynamic Observer Patterns via Data Assimilation for the 2D Navier-Stokes Equations*. Comput. Methods Appl. Mech. Engrg., **392** (2022) Paper No. 114673, 19 pp.
25. E. Carlson, J. Hudson, A. Larios, V. R. Martinez, E. Ng, J. P. Whitehead, *Dynamically learning the parameters of a chaotic system using partial observations*. Discrete Contin. Dyn. Syst. **42** (2022), no. 8, 3809–3839.
24. S. Jafarzadeh, F. Mousavi. A. Larios, F. Bobaru, *A general and fast convolution-based method for peridynamics: applications to elasticity and brittle fracture*. Comput. Methods Appl. Mech. Engrg., **392** (2022) Paper No. 114666, 36 pp.
23. E. Carlson, L. Van Roekel, H. Godinez, M. Petersen, A. Larios, *Exploring a New Computationally Efficient Data Assimilation Algorithm For Ocean Models*. (submitted)
22. A. Larios, M. M. Rahman, K. Yamazaki, *Regularity criteria for the Kuramoto-Sivashinsky equation in dimensions two and three*. J. Nonlinear Sci. **32**(6) (2022), 1–33.
21. E. Carlson, A. Larios, *Sensitivity analysis for the 2D Navier-Stokes equations with applications to continuous data assimilation*. J. Nonlinear Sci. **31** (2021), no. 5, 1–30.
20. S. Jafarzadeh, L. Wang. A. Larios, F. Bobaru, *A fast convolution-based method for peridynamic transient diffusion in arbitrary domains*. Comput. Methods Appl. Mech. Engrg., **375**, 113633, (2021).
19. M. Gardner, A. Larios, L. G. Rebholz, D. Vargun, C. Zervas, *Continuous data assimilation applied to a velocity-vorticity formulation of the 2D Navier-Stokes equations*. AIMS Electronic Research Archive. **29** (2021), no. 3, 2223–2247.
18. A. Larios, C. Victor, *Continuous Data Assimilation with a Moving Cluster of Data Points for a Reaction Diffusion Equation: A Computational Study*. Commun. Comput. Phys., **29** (2021), no. 4, 1273–1298.
17. A. Larios, K. Yamazaki, *On the well-posedness of an anisotropically-reduced two-dimensional Kuramoto-Sivashinsky equation*. Physica D. **14** (2020), 1–14.
16. S. Jafarzadeh, A. Larios, F. Bobaru, *Efficient solutions for nonlocal diffusion problems via boundary-adapted spectral methods*. J. Peridynam. Nonlocal Modeling. **2** (2020), no. 1, 85–110.
15. E. Carlson, J. Hudson, A. Larios, *Parameter Recovery and Sensitivity Analysis for the 2D Navier-Stokes Equations Via Continuous Data Assimilation*. SIAM J. Sci. Computing. **42**, no. 1 (2020), 250–270.

14. A. Larios, Y. Pei Nonlinear Continuous Data Assimilation. (submitted) arXiv:1703.03546
13. A. Larios, Y. Pei, *Approximate continuous data assimilation of the 2D Navier-Stokes equations via the Voigt-regularization with observable data*. *Evol. Eq. Control Th.* **9** (2020), no. 3, 733–751.
12. A. Larios, L. G. Rebholz, C. Zervas, *Global in time stability and accuracy of IMEX-FEM data assimilation schemes for the Navier-Stokes equations*. *Comput. Methods Appl. Mech. Engrg.* **345** (2019), 1077–1093.
11. A. Larios, Y. Pei, L. Rebholz, *Global well-posedness of the velocity-vorticity-Voigt formulation of the 3D Navier-Stokes equations*. *J. Differential Equations.* **266**, no. 5 (2019), 2435–2465.
10. A. Biswas, J. Hudson, A. Larios, and Y. Pei, *Continuous data assimilation for the magneto-hydrodynamic equations in 2D using one component of the velocity and magnetic fields*. *Asymptotic Anal.* **108** (2018), no. 1–2, 1–43.
9. A. Larios, M. Petersen, E. S. Titi, B. Wingate, *The Euler-Voigt equations and a computational investigation of the finite-time blow-up of solutions to the 3D Euler Equations*. *Theor. Comp. Fluid Dyn.* **3**, no. 1 (2018), 23–34.
8. A. Larios, Y. Pei, *On the local well-posedness and a Prodi-Serrin-type regularity criterion of the three-dimensional MHD-Boussinesq system without thermal diffusion*. *J. Differential Equations.* **263** (2017), no. 2, 1419–1450.
7. A. Biswas, C. Foias, and A. Larios, *On the Attractor for the Semi-Dissipative Boussinesq Equations*. *Ann. Inst. H. Poincaré Anal. Non Linéaire.* **34** (2017), no. 2, 381–405.
6. A. Larios and E.S. Titi, *Global regularity vs. finite-time singularities: some paradigms on the effect of boundary conditions and certain perturbations*, “Topics in the Theory of the Navier-Stokes Equations”, J.C. Robinson, J.L. Rodigo, W. Sadowski, & A. Vidal- López, editors. London Mathematical Society, Cambridge University Press. (2016), 96–125.
5. J.-L. Guermond, A. Larios, T. Thompson, *Validation of an entropy-viscosity model for large eddy simulation*. *Direct and Large-Eddy Simulation IX, ERCOFTAC Series*, **20** (2015), 43–48.
4. A. Larios, E.S. Titi, *Higher-order global regularity of an inviscid Voigt-regularization of the three-dimensional inviscid resistive magnetohydrodynamic equations*, *J. Math. Fluid Mech.*, **16** (2014), 59–76.
3. A. Larios, E. Lunasin, and E.S. Titi, *Global well-posedness for the 2D Boussinesq system without heat diffusion and with either anisotropic viscosity or inviscid Voigt- $\alpha$  regularization*. *J. Differential Equations.* **255** (2013) 2636–2654.
2. P. Kuberry, A. Larios, L.G. Rebholz, and N.E. Wilson, *Numerical approximation of the Voigt regularization of incompressible NSE and MHD flows*. *Comput. Math. Appl.* **64**(8) (2012), 2647–2662.
1. A. Larios and E.S. Titi, *On the higher-order global regularity of the inviscid Voigt-regularization of three-dimensional hydrodynamic models*, *Discrete Contin. Dyn. Syst. Ser. B* **14** (2010), no. 2/3 #15, 603–627.

## MEDIA PUBLICATIONS

1. L. Augustyn, M. Homp, A. Larios, J. Lewis, K. Pfabe, A. Zupan. *Learning in Place: Nebraska transitions summer graduate program for teachers online*. *MAA FOCUS*. April/May (2021), 26–28.

## AWARDED PROPOSALS

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- U.S. Department of Interior–Geological Survey proposal (Awarded) *Improved processing and delivery of stationary and mobile cosmic-ray neutron sensor data*. Cosmic-Ray Neutron Sensor (CNRS) Data Processing. PI: T. Franz, Co-PIs: Justin Bradley, Adam Larios. \$349,822.
- NSF Applied Math proposal. (Awarded) *Collaborative Research: Data Assimilation for Turbulent Flows: Dynamic Model Learning and Solution Capturing*. PI: A. Larios, Co-PI: Jared Whitehead. \$167,505.
- NSF CDS&E proposal. (Awarded) *Corrosion-induced Damage and Fracture: Pushing Micro-Scale Simulations to the Macro-Scale, in Both Space and Time*. (Awarded) CMMI-1953346. PI: Florin Bobaru, Co-PI: A. Larios. \$748,375.
- NSF Applied Math proposal. (Awarded) *Linear and Nonlinear Data Assimilation in Turbulent Systems*. (Awarded) DMS-1716801. Sole PI: A. Larios. \$140,067.
- Industry collaborative grant from Industrial Dynamic Systems  
Amount: \$4,956.  
PI: Daniel Toundykov  
Co-PIs: George Avalos, Steve Cohn, Adam Larios, Yuan Pei, Petronela Radu.  
Title: *Controlled Positioning of a Moving Grinding Wheel in a Camshaft Manufacture Process*. 2016–2017.
- Collaborate@ICERM. (Awarded)  
This proposal awards a dedicated group of 5 mathematicians, including myself, a week at the Institute for Computational and Experimental Research in Mathematics (ICERM) at Brown University working on a project called, “*A Numerical and Analytical Study of Invariant Measures for Turbulent Flows*.” Proposal was joint with Profs. John Bowman (U Alberta), Michael Jolly (Indiana U), Jared Whitehead (BYU), Djoko Wirosoetisno (Durham U), and myself. Proposed: Fall 2015.
- Supercomputer Resource Proposal. (Awarded)  
Project on *Leveraging the large-scale high performance computing facilities at N.I.C.S. to explore the efficacy of a novel entropy-viscosity based large eddy simulation model*, Oak Ridge National Laboratory. Awarded 300,000 hours ( $\approx 34.2$  years) of processing time on the Kraken supercomputer. PIs: J.-L. Guermond, A. Larios. 21 August 2013.

## PRESENTATIONS

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### CONFERENCE AND/OR INVITED TALKS

100. (*Invited*) “Singularity detection via regularization: Blow-up criteria for 3D Euler and related equations.” International Congress on Industrial and Applied Mathematics (ICIAM 2023), Special session on “Problems in incompressible fluid flows: Stability, Singularity, and Extreme Behavior.” Waseda University, Tokyo, Japan. 20–25 August 2023.
99. (*Invited*) “Toward more realistic data assimilation: New results and analysis.” SIAM Conference on Applications of Dynamical Systems – Minisymposium on “Rigorous and Computational Studies of Data Assimilation and Parameter Estimation”, Portland, Oregon, USA. 16–17 May 2023.
98. (*Invited*) “Catching fire: New techniques for calming the flame equation.” Seventh KUMUNU-ISU Conference in PDE, Dynamical Systems and Applications. Iowa State University (ISU), Ames, IA, USA. 22–23 April 2023.
97. (*Invited*) “A Song of Water and Fire: The Navier-Stokes and Kuramoto-Sivashinsky Equations.” CAMS Seminar, University of Southern California, Center for Applied Mathematical Sciences, Los Angeles, CA, USA. 14 November 2022.

96. *(Invited)* “Nonlinear calming of the 2D Kuramoto-Sivashinsky Equations”, Fall Western Sectional AMS Meeting – Special Session on “Recent advances in the theory of fluid dynamics”, University of Utah, Salt Lake City, UT, USA. 22–23 October 2022.
95. *(Invited)* “Nonlocal equations: Analysis and fast solvers” Society of Engineering Science (SES) Meeting, symposium titled “A Celebration of Peridynamics: Honoring the contributions of Dr. Stewart Silling”, Texas A&M University, College Station, TX, USA. 16–19 October 2022.
94. *(Invited)* “Reductions of the 2D Kuramoto-Sivashinsky Equations”, Seventh Annual Meeting of SIAM Central States Section, Oklahoma State University, Stillwater, OK, USA. 1 October 2022.
93. *(Invited)* “Twixt firelight and water: The flame equation with relations to Navier-Stokes”, University College Dublin, Dublin, Ireland. 25 May 2022.
92. *(Invited)* “An equation that should be easy: Partial results for the flame equation in 2D”, Twelfth IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory – Special Session on “Nonlinear Waves in Parabolic Evolution Problems”, University of Georgia, Athens, GA, USA. (Delivered via Zoom due to COVID-19.) 30 March – 1 April, 2022.
91. *(Invited)* “Accelerating convergence rates for data assimilation in turbulent flows using Lagrangian and non-Lagrangian observers”, AMS Spring Central Sectional Meeting – Special Session on “Analytical, Computational, and Data-Driven Approaches in Fluid Dynamics”, Spring Central and Western Joint Sectional Meeting, Purdue University, West Lafayette, IN, USA. (Delivered via Zoom due to COVID-19.) 26–27 March 2022.
90. *(Invited)* “The Bleeps, the Sweeps, and the Creeps: Paradigms for dynamic observers in data assimilation in turbulent flows”, SIAM Conference on Analysis of Partial Differential Equations – Minisymposium on “Recent Developments in Fluid Dynamics - Theory and Numerical Approximation”, Berlin, Germany. (Delivered via Zoom due to COVID-19.) 14–18 March 2022.
89. *(Invited)* “A back door to blow-up: Inviscid regularization for the 3D Euler and Navier-Stokes equations”, Isaac Newton Institute Seminar Series, part of “Mathematical aspects of turbulence: where do we stand?” Isaac Newton Institute, Cambridge, UK. 22 February 2022.
88. *(Invited)* “Fourier methods for nonlocal equations with physical boundary conditions”, AMS Fall Central Sectional Meeting, special session on “Theoretical and Applied Aspects of Nonlocal Equations”, Creighton University, Omaha, NE, USA. 10 October 2021. (Delivered via Zoom due to COVID-19.)
87. *(Invited)* “Fanning the flames: Unreasonable modifications to the flame equations”, AMS Fall Central Sectional Meeting, special session on “Progress on Nonlinear Waves”, Creighton University, Omaha, NE, USA. 10 October 2021. (Delivered via Zoom due to COVID-19.)
86. *(Invited)* “Inviscid Regularization: Good or bad for turbulence modeling?”, AMS Fall Central Sectional Meeting, special session on “Recent Advances in Numerical Methods for Partial Differential Equations”, Creighton University, Omaha, NE, USA. 9 October 2021. (Delivered via Zoom due to COVID-19.)
85. *(Invited)* “Recent Progress on the 2D Kuramoto-Sivashinsky Equations”, 29th IFIP TC7 Conference on System Modelling and Optimization – Minisymposium on “Qualitative and Quantitative Analysis of Nonlinear Evolutionary Partial Differential Equations”, La Escuela Politécnica Nacional, Quito, Ecuador. (Moved to Zoom due to COVID-19.) 30 August 30 – 3 September, 2021.
84. *(Invited)* “Beauty and the Beast: The Flame Equation in 1D and 2D”, University of Maryland-Baltimore County, Baltimore, MD, USA. 7 May 2021. (Delivered via Zoom due to COVID-19.)
83. *(Invited)* “On the 2D Kuramoto-Sivashinsky Equations, or How I Learned to Stop Worrying and Love the Nonlinearity”, Kansas State University, Manhattan, KS, USA. 29 April 2021. (Delivered via Zoom due to COVID-19.)

82. *(Invited)* “Eternal Sunshine of the Spotless Data”, Texas Tech University, Lubbock, TX, USA. 3 February 2021. (Delivered via Zoom due to COVID-19.)
81. *(Invited)* “2D Kuramoto-Sivashinsky: A reduced model with comparisons to Navier-Stokes”, AIMS Conference on Dynamical Systems, Differential Equations and Applications – Minisymposium on “Recent advances in the theory of fluid dynamics” at the Fall Western Sectional AMS Meeting, University of Utah, Salt Lake City, UT, USA (Moved to Zoom due to COVID-19.). 24–25 October 2020.
80. *(Invited)* “Continuous Data Assimilation via Dynamic Sampling”, AIMS Conference on Dynamical Systems, Differential Equations and Applications – Minisymposium on “Interactive PDE Systems: Qualitative analysis, numerical analysis and control theory”, Zoom. 29 June 2020.
79. *(Invited)* “Continuous Data Assimilation via Dynamic Sampling”, SIAM Conference on Mathematics of Data Science – Minisymposium on “Bridging Data Assimilation with Data-driven analysis”, Cincinnati, OH, USA. 5–7 May 2020. (Conference canceled due to COVID-19.)
78. *(Invited)* “On a partially reduced 2D Kuramoto-Sivashinsky system”, 35<sup>th</sup> Shanks Lecture, Vanderbilt University, Nashville, TN, USA. 14 March 2020. (Conference canceled due to COVID-19.)
77. *(Invited)* “Continuous Data Assimilation with Moving Observers”, SIAM Conference on Analysis of Partial Differential Equations – Minisymposium on “Applicable and numerical analysis and control theory for fluid and fluid-structure PDE models”, La Quinta, California, USA. 11–14 December 2019.
76. *(Invited)* “Global well-posedness of an anisotropically reduced version of the 2D Kuramoto-Sivashinsky system” AMS Fall Southeastern Sectional Meeting, special session on “Nonlinear PDEs in Fluid Dynamics”, University of Florida, Gainesville, FL, USA. 2 November 2019.
75. *(Invited)* “How PDEs Work: Fourier series as a candle in the dark”, Brigham Young University, Provo, UT, USA. 24 October 2019.
74. *(Invited)* “Approximate Models for the 2D Kuramoto-Sivashinsky System”, Fifth Annual Meeting of SIAM Central States Section, Iowa State University, Ames, IA, USA. 19 October 2019.
73. *(Invited)* “Adventures in Scientific Computing: A Safari for Pure Mathematicians”, Western Washington University, Bellingham, WA, USA. 6 June 2019.
72. *(Invited)* “Improving efficiency and quantifying uncertainty in data assimilation for the Navier-Stokes equations”, Pennsylvania State University, State College, PA, USA. 7 April 2019.
71. *(Invited)* “Inviscid Regularization and Blow-Up Criteria for the 3D Euler and Navier-Stokes equations”, Workshop on “Scientific Computing Across Scales: Extreme Events and Criticality in Fluid Mechanics”, Fields Institute, Toronto, Ontario, Canada. 17 April 2019.
70. *(Invited)* “Parameter Recovery in the Navier-Stokes Equations via Continuous Data Assimilation.”, Special Session on “Mathematical Analysis of Nonlinear Phenomena”, Spring Central and Western Joint Sectional Meeting, University of Hawaii at Manoa, Honolulu, HI, USA. 24 March 2019.
69. *(Invited)* “Data meets PDEs: New approaches to parameter recovery and data assimilation in the Navier-Stokes equations”, Oklahoma State University, Stillwater, OK, USA. 1 March 2019.
68. *(Invited)* “An Inviscid Regularization of the Velocity-Vorticity formulation of the 3D Navier-Stokes Equations.” AMS Fall Western Sectional Meeting, special session on “Recent Advances in Mathematical Fluid Mechanics”, University of Arkansas, Fayetteville, AR, USA. 4 November 2018.
67. *(Invited)* “Variations on the Azouani-Olson-Titi Algorithm for Data Assimilation in PDEs.”, AMS Fall Western Sectional Meeting, special session on “Recent Developments on Fluid Turbulence”, University of Arkansas, Fayetteville, AR, USA. 3 November 2018.
66. *(Invited)* “Silly Ideas In Data Assimilation That Still Work”, University of Michigan, Ann Arbor, MI, USA. 21 September 2018.

65. (*Gave brief presentation in discussion session*), Workshop on *Regularity and Blow-up of Navier-Stokes Type PDEs using Harmonic and Stochastic Analysis*, Banff, Alberta, CA. 20 August 2018.
64. (*Invited*) “Continuous Data Assimilation for Turbulent Flows via Feedback Penalization”, Los Alamos National Lab, Applied Mathematics and Plasma Physics Group (T5), Los Alamos National Lab, Los Alamos, NM, USA. 2 August 2018.
63. (*Invited*) “Linear and Nonlinear Continuous Data Assimilation”, 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications – special session on “Nonlinear PDEs Modeling Fluid Dynamics”, National Taiwan University, Taipei, Taiwan. 6 July 2018.
62. (*Invited*) “A Key to the Secret Garden of Partial Differential Equations”, Oregon State University, Corvallis, OR, USA. 4 June 2018.
61. (*Invited*) “PDEs Meet Data Assimilation: New Approaches to Capturing Fluid Motion”, Tulane University, New Orleans, LA, USA. 20 April 2018.
60. (*Invited*) “The Solution’s Shadow: Unlocking the Hidden Realm of Partial Differential Equations”, University of South Dakota, Vermillion, SD, USA. 29 March 2018.
59. (*Invited*) “On the local well-posedness and a Prodi-Serrin type regularity criterion of the three-dimensional MHD-Boussinesq system without thermal diffusion”, SIAM Conference on Analysis of Partial Differential Equations – Minisymposium on “Recent Developments in Fluid Dynamics - Theory and Numerical Approximation”, Baltimore, MD, USA. 10 December 2017.
58. (*Invited*) “Data Assimilation for nonlinear dissipative PDEs”, University of California, Irvine, Irvine, CA, USA. 6 November 2017.
57. (*Invited*) “A new approach to the computational study of the blow-up of the 3D Euler equations”, AMS Fall Western Sectional Meeting, special session on “Mathematical Fluid Mechanics”, University of California, Riverside, Riverside, CA, USA. 4 November 2017.
56. (*Invited*) “Turbulence Modeling and Blow-Up”, University of Kansas, Lawrence, KS, USA. 11 October 2017.
55. (*Invited*) “The Voigt model as a tool for computationally analyzing the blow-up of the 3D Euler equations.”, 3rd Annual Meeting of SIAM Central States Section, Colorado State University, Fort Collins, CO, USA. 30 September 2017.
54. (*Invited*) “Continuous Data Assimilation: Multiphysics and Nonlinear Feedback”, Mathematical Congress of the Americas (MCA 2017) Conference minisymposium on “Equations of Fluid Mechanics: Analysis”. Montreal, Canada, 27 July 24-28, 2017.
53. (*Invited*) “Computational study of the blow-up of the 3D Euler equations of fluids via the 3D Euler-Voigt equations.”, AMS Spring Eastern Sectional Meeting, special session on “Euler and Related PDEs: Geometric and Harmonic Methods”, Hunter College, CUNY, New York, NY, USA. 7 May 2017.
52. (*Invited*) “Data Assimilation in Turbulent Fluids”, NeDA 2017 - Second Nebraska Data Analytics Workshop. University of Nebraska-Lincoln, Lincoln, NE, USA. 10 April 2017.
51. (*Invited*) “The Singularity’s Tale” *CAMS Seminar*, University of Southern California, Center for Applied Mathematical Sciences, Los Angeles, CA, USA. 27 February 2017.
50. (*Invited*) “Ideas in Partial Differential Equations” *Talk to Mechanical Engineering class*, University of Nebraska-Lincoln, Lincoln, NE, USA. 1 December 2016.
49. (*Invited*) “Examining Blow-up of the 3D Euler Equations via Inviscid Regularization: A New Computational Approach”, Workshop on *Recent Advances in Hydrodynamics*, BIRS (Banff International Research Station), Banff, Alberta, CA. 7 June 2016.

48. “The Orchestra of Partial Differential Equations”, Western Washington University, Bellingham, WA, USA. 2 June 2016.
47. *(Invited)* “The Weak Sigma-Attractor For the Semi-Diffusive 2D Boussinesq Equations”, 31<sup>st</sup> Shanks Lecture, Vanderbilt University, Nashville, TN, USA. 19 May 2016.
46. *(Invited)* “Attractor for a Coupled Parabolic-Hyperbolic System from Ocean Dynamics”, AMS Spring Eastern Sectional Meeting, special session on Evolution of Partial Differential Equations and their Control, Stony Brook, NY, USA. 19 March 2016.
45. *(Invited)* “Analytical and Computational Results for Blow-Up Criteria for the 3D Incompressible Euler Equations Based on the Voigt Regularization”, 2016 Joint Mathematics Meeting – AMS Special Session on “Equations of Fluid Motion”, Seattle, WA, USA. 8 January 2016.
44. *(Invited)* “Blow-Up Criteria for the 3D Incompressible Euler Equations Based on the Voigt Regularization”, SIAM Conference on Analysis of Partial Differential Equations – Minisymposium on “Vortices: Analysis and Simulation”, Scottsdale, AZ, USA. 9 December 2015.
43. *(Invited)* “The Weak Sigma-Attractor: Physical and Topological Properties”, SIAM Conference on Analysis of Partial Differential Equations – Minisymposium on “Deterministic and Stochastic Aspects of Fluid Dynamics”, Scottsdale, AZ, USA. 7 December 2015.
42. *(Invited)* “Computers: Friends or foes of the modern mathematician?”, *Canada/USA Math Camp*, University of Puget Sound, Tacoma, WA, USA. 28 July 2015.
41. *(Invited)* “Modern Approaches to Partial Differential Equations and Fluid Dynamics”, *A lecture series given at Xi’an Jiaotong University (XJTU)*, Xi’an, China. 5–18 July 2015.
40. *(Invited)* “Large-Time Dynamics of a Semi-Dissipative Equation”, *KUMU PDE, Dynamical Systems and Applications*, University of Kansas, Lawrence, KS, USA. 18 April 2015.
39. *(Invited Keynote Speaker)* “Mathematics and computers: A happy marriage?”, *MAA Regional Undergraduate Mathematics Conference*, Dordt College, Sioux Center, IA, USA. 11 April 2015.
38. *(Invited)* “Recent computational results on the Voigt model and related models”, *Third Workshop on Turbulence in Physical Systems Through Complex Singularities and Determining Modes*, Texas A&M University, College Station, TX, USA. 9 January 2015.
37. *(Invited)* “The Semi-Dissipative Boussinesq Equations: Global Well-Posedness and a Generalized Attractor”, AMS Spring Central Sectional Meeting, special session on “Navier-Stokes Equations and Fluid Dynamics”, Texas Tech University, Lubbock, TX, USA. 8 April 2014.
36. *(Invited)* “The Semi-Dissipative Boussinesq Equations: Well-Posedness and A Generalized Attractor”, University of Houston, Houston, TX, USA. 7 March 2014.
35. *(Invited)* “Singularity Formation, Fluid Flows, and New Approaches to Turbulence Modeling”, State University of New York - New Paltz, New Paltz, NY, USA. 7 February 2014.
34. *(Invited)* “Recent Numerical and Computational Approaches”, University of Nebraska-Lincoln, Lincoln, NE, USA. 5 February 2014.
33. *(Invited)* “Fluids, Turbulence, and Differential Equations”, Cal. State Long Beach, Long Beach, CA, USA. 23 January 2014.
32. *(Invited)* “Global Attractors for Dissipative and Semi-Dissipative Equations”, Analysis of Nonlinear PDEs and Fluid Flows, University of Maryland, Baltimore Campus, Baltimore, MD, USA. 19-20 January 2014.
31. *(Invited)* “Turbulence Modeling via Entropy Functionals”, 2014 Joint Mathematics Meeting, SIAM Minisymposium on Turbulence and Mixing in Fluids: Analysis and Applications, Baltimore, MD, USA. 15-18 January 2014.

30. *(Invited)* “The Entropy-Viscosity Technique and Splitting Methods for Turbulent Flows”, Pennsylvania State University, PA, USA. 13 January 2014.
29. *(Invited)* “New Techniques for Large-Scale Parallel Turbulence Simulations at High Reynolds Numbers”, Oak Ridge National Laboratory, Oak Ridge, TN, USA. 19 December 2013.
28. *(Co-organizer)* “An Appropriate Notion of Attractor for Semi-Dissipative Equations”, SIAM Conference on Analysis of Partial Differential Equations – Minisymposium on “Global Attractors, Dissipative Dynamical Systems, and Turbulence”, Orlando, FL, USA. 9 December 2013.
27. *(Invited)* “The Asymptotic Behavior of a Semi-Dissipative System”, 2013-2014 AMS Western Fall Sectional Meeting – special session on “Fluids and Boundaries”, University of California, Riverside, Riverside, CA, USA. 2 November 2013.
26. *(Invited)* “Regularization via Entropy-Viscosity for Hydrodynamic Models”, SIAM Conference on Applications of Dynamical Systems, Snowbird Ski and Summer Resort, Snowbird, UT, USA. 19-23 May 2013.
25. “Validation of an Entropy-Viscosity Model for LES”, ERCOFTAC Workshop: Direct and Large-Eddy Simulation 9, Institute of Fluid Mechanics, Dresden, Germany. 3 April 2013.
24. *(Invited)* “Entropy-Viscosity for the Navier-Stokes Equations”, Workshop on Turbulence in Physical Systems Through Complex Singularities and Determining Modes 2, Indiana University, Bloomington, IN, USA. 8 February 2013.
23. *(Invited)* “Regularizations for Fluid Models with Applications to Geophysical Flows”, Special Session on Mathematical Fluid Dynamics and its Application in Geosciences, AMS Fall Western Sectional Meeting, Tucson, AZ, USA. 27 October 2012.
22. *(Invited)* “A Turbulence Model for Ideal Fluids: Analytical and Numerical Results With Applications to Ocean Dynamics”, Los Alamos National Lab, Center for Non-Linear Studies, Los Alamos National Lab, Los Alamos, NM, USA. 2 August 2012.
21. *(Invited)* “Recent Numerical Results for the 3D MHD-Voigt Model and Related Models”, *Special Session on Recent Developments on Turbulence for the 9th AIMS International Conference on Dynamical Systems, Differential Equations and Applications*, Orlando, FL, USA. 2 July 2012.
20. *(Invited)* “Progress on the Voigt Regularization for Hydrodynamic Models”, *Workshop on Turbulence in Physical Systems Through Complex Singularities and Determining Modes*, Texas A&M University, College Station, TX, USA. 18 February 2012.
19. *(Invited)* “The Voigt Regularization for Inviscid Hydrodynamic Models”, *Conference on Incompressible Fluids, Turbulence and Mixing: In honor of Peter Constantin’s 60th birthday*, Carnegie Mellon University, Pittsburgh, PA, USA. 9 November 2011.
18. *(Invited)* “A New Blow-up Criterion for the 2D Boussinesq and 3D Euler Equations: Analytical and Numerical Results”, *SIAM Conference on Analysis of Partial Differential Equations*, San Diego, CA, USA. 14 October 2011.
17. *(Invited)* “A stream-function approach to the 2D Boussinesq equations for Ocean Dynamics”, University of Campinas, Brazil. 29 June 2011.
16. *(Invited)* “Analytical Results for Inviscid Voigt-Regularizations of the 2D Boussinesq and 3D MHD Equations”, Northwest University, Xi’an, China. 16 June 2011.
15. “The Inviscid Voigt-Regularization for Hydrodynamic Models: Thesis Defense”, University of California, Irvine, Irvine, CA, USA. 31 May 2011.
14. *(Invited)* “The Two-dimensional Boussinesq System: Analytical Results”, *SIAM Conference on Mathematics and Computational Issues in the Geosciences*, Long Beach, CA, USA. 21 March 2011.

13. *(Invited)* “The Voigt Regularization: Analytical and Numerical Results for Inviscid Fluid Models”, *AMS/MAA 2011 Joint Mathematics Meeting*, New Orleans, LA, USA. 8 January 2011.
12. “The Voigt Regularization and Its Potential for Ocean Models”, Los Alamos National Lab, Center for Non-Linear Studies, Los Alamos National Lab, Los Alamos, NM, USA. 15 December 2010.
11. “Recent Analytical and Numerical Results for The Navier-Stokes-Voigt Model and Related Models”, *American Physical Society - Division of Fluid Dynamics Meeting*, Long Beach, CA, USA. 22 November 2010.
10. “Direct Numerical Simulations for the Navier-Stokes-Voigt Turbulence Model”, *Student Symposium 2010*, Los Alamos National Lab, Los Alamos, NM, USA. 12 October 2010.
9. “Applications of the Navier-Stokes-Voigt Model to Turbulence Modeling”, Los Alamos National Lab, Center for Non-Linear Studies, Los Alamos National Lab, Los Alamos, NM, USA. 4 October 2010.
8. “An Inviscid Regularization of Various Hydrodynamic Models: Numerical and Analytical Results”, Pan American Studies Institute, Choroní, Venezuela. 6 June 2010.
7. “On the Voigt Regularization of Various Hydrodynamic Models”, *Fourth Southern California Symposium on Flow Physics*, University of California Irvine, Irvine, CA, USA. 17 April 2010.
6. “Inviscid Regularization for Equations of Hydrodynamic Models: An Analytical and Computational Study”, *Advancement Talk*, University of California Irvine, Irvine, CA, USA. 12 Nov 2009.
5. *(Invited)* “A New Hydrodynamic Alpha-Model With Applications To Ocean Modeling”, *AMS South-eastern Section Meeting: Special Session on Partial Differential Equations from Fluid Mechanics*, Florida Atlantic University, Boca Raton, FL, USA. 1 November 2009.
4. “A New Hydrodynamic  $\alpha$ -Model with Applications to Ocean Modeling”, *COSIM (Climate, Ocean, Sea-Ice Modeling) Group Meeting*, Los Alamos National Lab, Los Alamos, NM, USA. 2 Sept 2009.
3. “A New Hydrodynamic  $\alpha$ -Model”, Los Alamos National Lab, Center for Non-Linear Studies, Los Alamos National Lab, Los Alamos, NM, USA. 19 Aug 2009.
2. “Variational Approaches to Solving Certain Boundary Value Problems”, Western Washington University, Bellingham, WA, USA. 11 May 2006.
1. “p-Adic Numbers”, *Pacific Northwest MAA Conference*, Anchorage, AK, USA. June 2004.

## POSTER PRESENTATIONS

3. “Nonlinear Continuous Data Assimilation”, *KUMUNU Conference on PDE, Dynamical Systems and Applications*. University of Nebraska-Lincoln, Lincoln, NE, USA. 22 April 2017.
2. “Entropy-Viscosity for Navier-Stokes: An Entropy-Based LES Model”, *Workshop I: Mathematical Analysis of Turbulence*, Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, CA, USA. Sept 29 - Oct. 3, 2014.
1. “Entropy-Viscosity for Navier-Stokes: An Entropy-Based LES Model”, LANL, CNLS conference on Ocean Turbulence. La Fonda Hotel, Santa Fe, NM, USA. 3 June 2013.

## SEMINAR AND COLLOQUIUM TALKS

45. “The Black Hole Solution: Schwarzschild’s metric for the Einstein field equations (part 2)”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 29 March 2023.
44. “The Black Hole Solution: Schwarzschild’s metric for the Einstein field equations”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 22 March 2023.

43. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 9 February 2023.
42. “Some Recent Numerical Techniques for Large-Scale Simulations of Incompressible Turbulent Fluids”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 12 October 2022.
41. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 10 February 2022.
40. “Prodi-Serrin integrability criteria for the 3D Navier-Stokes equations and related equations”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 26 October 2021.
39. “The Boussinesq equations with anisotropic diffusion”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 23 February 2021.
38. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 15 February 2021.
37. “2D Kuramoto-Sivashinsky equations and a modification”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 25 August 2020.
36. “Blow-Up and Regularization for the 3D Euler and Navier-Stokes Equations of Fluid Dynamics”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 6 February 2020.
35. “A brief introduction to the Navier-Stokes equations of fluid dynamics”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 21 January 2020.
34. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 11 February 2020.
33. “The Courant–Friedrichs–Lewy (CFL) condition”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 29 Oct 2019.
32. “Numerical methods in PDEs”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 3 Sept 2019.
31. “Uniform norms in active scalar equations, with applications to the 2D incompressible Euler equations, part II”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 2 April 2019.
30. “Uniform norms in active scalar equations, with applications to the 2D incompressible Euler equations, part I”, *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 26 March 2019.
29. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 7 March 2019.
28. “Attractors for the Dissipative Differential Equations”. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. Fall 2018.
27. “Stochastic Differential Equations” Part II. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. Fall 2018.
26. “Stochastic Differential Equations” Part I. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. Fall 2018.
25. “Littlewood-Paley Decomposition and Besov spaces” Part III. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. Spring 2018.
24. “Littlewood-Paley Decomposition and Besov spaces” Part II. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. Spring 2018.

23. “Littlewood-Paley Decomposition and Besov spaces” Part I. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. Spring 2018.
22. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 15 February 2018.
21. “Turbulence Models and Blow-Up” *Nebraska Fluid Dynamics Research Initiative (NFDRI) Seminar*. 19 April 2017.
20. “Galerkin Methods for Fluid Equations” Part III. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. March 2017.
19. “Galerkin Methods for Fluid Equations” Part II. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. March 2017.
18. “Galerkin Methods for Fluid Equations” Part I. *PDE and Applied Analysis Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. March 2017.
17. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 19 January 2017.
16. “Tips on Finding a Non-Academic Job”, Western Washington University, Bellingham, WA, USA. 2 June 2016.
15. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 11 February 2016.
14. “Introduction to mathematical analysis of the Navier-Stokes equations”, *Continuum Mechanics Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 22 Sept 2015 - 6 Oct 2015.
13. “Can mathematicians compute our way out of doing mathematics?”, *Math Club*, University of Nebraska-Lincoln, Lincoln, NE, USA. 3 Sept 2015.
12. “The Orchestra of Partial Differential Equations”. *UNL Landscape Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 30 April 2015.
11. “Parallel Programming Basics I & II”, *Numerical & Computational Seminar*, University of Nebraska-Lincoln, Lincoln, NE, USA. 5 & 12 March 2015.
10. “Turbulence Models Inspired by Analysis”, University of Nebraska-Lincoln, Lincoln, NE, USA. 12 April 2014.
9. “The Mathematics of Fluid Motion”, *GSO (Graduate Student Organization)*, Texas A&M University, College Station, TX, USA. 21 November 2013.
8. “Structures in Mathematical Fluid Dynamics”, Postdoc Colloquium Series, Texas A&M University, College Station, TX, USA. 10 October 2013.
7. **(Invited)** “Making Differential Equations Get Along With Nature”, AMUSE (Applied Mathematics Undergraduate Seminar), Texas A&M University, College Station, TX, USA. 13 November 2012.
6. “The Mathematics of Fluids With Minimal Assumptions On Viscosity”, Postdoc Colloquium Series, Texas A&M University, College Station, TX, USA. 23 October 2012.
5. “The Navier-Stokes Equations and the Mathematics of Fluids: A Brief Introduction”, Postdoc Colloquium Series, Texas A&M University, College Station, TX, USA. 20 October 2011.
4. “The Voigt Regularization for Inviscid Hydrodynamic Models: Analytical and Numerical Results”, Numerical Analysis Seminar, Texas A&M University, College Station, TX, USA. 20 September 2011.
3. “Fluid Modeling with FEniCS”, University of California, Irvine, Irvine, CA, USA. 10 March 2011.

2. “Can mathematics help us understand the motion of fluids?”, *MGSC (Mathematics Graduate Student Colloquium)*, University of California, Irvine, Irvine, CA, USA. 6 January 2011.
1. “The Spooky World of  $p$ -Adic Numbers: A Math Talk Appropriate for Halloween”, *Anteaters Mathematics Club (talk for undergraduates)*, University of California Irvine, Irvine, CA, USA. 31 Oct 2007.

## TEACHING EXPERIENCE

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### UNDERGRADUATE RESEARCH INSTRUCTION

- **Mentoring through Critical Transition Points (MCTP) program: Pre-REU on Imaging, Fourier Analysis, and Wavelets** Summer 2013
- **MCTP program: Pre-REU on Imaging, Fourier Analysis, and Wavelets** Summer 2012

The pre-REU was a five week NSF program taught by myself and another faculty member. Twenty students were selected nation-wide applicant pool of freshmen and sophomores without a background in higher mathematics. We mentored the students on projects which involved teaching them about Fourier transforms, Haar wavelets, Matlab, and L<sup>A</sup>T<sub>E</sub>X. The students wrote papers on a wide variety of topics, including image and speech recognition, and gave presentations on their work.

### EXTRA-DEPARTMENTAL MENTORING

- Served as a research mentor for undergraduate student Michael Piper, lead student on **UNL’s High-Powered Rocketry Team**, on a rocket modeling competition. I advised on fluid dynamical aspects of the project and also on software implementation (using the OpenRocket software program). The students designed and built a rocket, and entered it into a competition, completing four launches, with an average maximum altitude of 4827 ft, and receiving an honorable mention. Spring 2016.
- Served as a research mentor for graduate student Kimberly Stanke from the **Complex Biosystems Department**. This was part of her lab rotations required by her department. It involved her registering for 2 credits in independent research with me. We worked on computer modeling of fluid in the inner ear. Spring 2016.

### ACHIEVEMENTS AND AWARDS OF STUDENTS

- Luke Diego Galvan: Awarded an **NSF Graduate Research Fellowship**. (\$138,000) (2021). Accepted to the Undergraduate Creative Activities and Research Experience (UCARE) program at UNL (2020).
- Collin Victor: Awarded an **NSF Graduate Research Fellowship**. (\$138,000) (2020). Accepted to the Undergraduate Creative Activities and Research Experience (UCARE) program at UNL (2017). Research internship Los Alamos National Lab (2021-2022).
- Elizabeth Carlson: Awarded an **NSF Graduate Research Fellowship**. (\$138,000) (2018). Accepted to CoDesign workshop on supernovae at Los Alamos National Lab (2019). Research internship Los Alamos National Lab (2019-2021). Accepted to MSRI workshop (2019).
- William Jamieson: Awarded an **NSF Graduate Research Fellowship**. (\$138,000) (2015). Accepted to MSRI workshop (2015). Summer internship at NASA (2016).
- Ashley Orr: Won a \$150 prize and a book from **Pi Mu Epsilon** for her talk, “Fourier and Wavelet Analysis: Extracting the Business Cycle” based on her project from the MCTP/pre-REU program, mentored by myself and Dr. Gregory Berkolaiko (2013).

## INSTRUCTOR OF RECORD

University of Nebraska-Lincoln

Short combined list (course number (count)): **106** (1), **107/H** (2), **208** (1), **221/821** (4), **221H** (3), **314** (1), **325** (2), **424/824** (1), **430** (1), **433/833** (1), **447/847** (1), **489/889** (1), **806T** (1), **812T** (4), **830** (1), **831** (2), **896** (1), **921** (1), **928** (1), **929** (1), **934** (2). *Total for UNL: 31 courses, 21 unique.*

Chronological list

33. **Differential Equations II.** Math 831. Spring 2022.
32. **Real Analysis.** Math 921. Fall 2022.
31. **Ordinary Differential Equations.** Math 221. Fall 2022.
30. **Geometry for Geometry Teachers.** Math 812T. Summer 2022.
29. **Topics in Differential Equations.** Math 934. Fall 2021.
28. **Ordinary Differential Equations.** Math 430. Fall 2021.
27. **Elementary Analysis.** Math 325. Spring 2021.
26. **Differential Equations.** Math 221. Spring 2021.
25. **Introduction to Partial Differential Equations.** Math 424/824. Fall 2020.
24. **Differential Equations (Honors).** Math 221H. Fall 2020.
23. **Geometry for Geometry Teachers.** Math 812T. Summer 2020.
22. **Elementary Analysis.** Math 325. Spring 2020.
21. **Differential Equations II.** Math 831. Spring 2020.
20. **Differential Equations I.** Math 830. Fall 2019.
19. **Calculus II.** Math 107. Spring 2019.
18. **Stochastic Processes.** Math 489/889. Fall 2018.
17. **Differential Equations (Honors).** Math 221H. Fall 2018.
16. **Functional Analysis II.** Math 929. Spring 2018.
15. **Calculus I.** Math 106. Fall 2017.
14. **Functional Analysis I.** Math 928. Fall 2017.
13. **Mathematical Literature.** Math 896. Summer 2017.
12. **Geometry for Geometry Teachers.** Math 812T. Summer 2017.
11. **Topics in Differential Equations.** Math 934. Spring 2017.
10. **Calculus II (Honors).** Math 107H. Fall 2016.
9. **Calculus III.** Math 208. Fall 2016.
8. **Geometry for Geometry Teachers.** Math 812T. Summer 2016.
7. **Nonlinear Optimization.** Math 433/833. Spring 2016.
6. **Linear Algebra.** Math 314. Fall 2015.
5. **Differential Equations (Honors).** Math 221H. Fall 2015.
4. **Number Theory and Cryptology.** Math 806T. Summer 2015.

3. **Numerical Analysis.** Math 447/847. Spring 2015.
2. **Differential Equations.** Math 221/821. Fall 2014.
1. **Differential Equations.** Math 221/821. Fall 2014. (two sections).

Texas A&M University

7. **Differential Equations.** Math 308. Summer 2014.
6. **Partial Differential Equations.** Math 602. Spring 2014.
5. **Numerical Analysis.** Math 609. Fall 2013.
4. **Engineering Mathematics I (Calculus I).** Math 151. Fall 2013.
3. **Differential Equations.** Math 308. Fall 2012.
2. **Differential Equations.** Math 308. Spring 2012.
1. **Engineering Mathematics I (Calculus I).** Math 151. Fall 2011.

University of California, Irvine

1. **Statistics.** Math 7. Summer 2007.

Western Washington University

7. **Trigonometry.** Math 115. Spring 2006.
6. **Trigonometry.** Math 115. Winter 2006.
5. **Pre-Calculus.** Math 114. Fall 2005.
4. **Business Pre-Calculus.** Math 156. Summer 2005.
3. **Business Pre-Calculus.** Math 156. Spring 2005.
2. **Trigonometry.** Math 115. Winter 2005.
1. **Functions and Algebraic Methods.** Math 102. Fall 2004.

## TEACHING ASSISTANT

University of California, Irvine

9. **Introduction to Graduate Analysis II.** Math 205B. Winter 2011.
8. **Introduction to Partial Differential Equations.** Math 112A. Winter 2010.
7. **Elementary Analysis II.** Math 140B. Winter 2010.
6. **Multi-variable Calculus II.** Math 2E. Summer 2008
5. **Introduction to Cryptology.** Math 173A. Summer 2007.
4. **Differential Calculus.** Math 2A. Spring 2007. (*two sections*)
3. **Abstract Algebra.** Math 120A. Winter 2007.
2. **Integral Calculus.** Math 2B. Winter 2007.
1. **Integral Calculus.** Math 2B. Fall 2006.

## PROFESSIONAL ACTIVITIES

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### COMMUNITY OUTREACH

- Gave a one-week course on computational mathematics to high school age students at the **2015 Canada/USA Math Camp** in the University of Puget Sound, Tacoma, WA, USA. The course was titled “The Hidden Dance of Partial Differential Equations.” This was part of the “Research in Pairs” program, and was joint with Prof. Jared Whitehead. Our research project was titled “Universal Bounds on the Attractor of the Boussinesq Equations of Ocean Flows.” 28 July – 3 August 2015.
- Ran an activity titled “Euler Plays Connect-The-Dots: Characteristics and Topology”, **Math Circle** activity for elementary and middle school students, Texas A&M University, College Station, TX, USA. 26 April 2014, and 10 May 2014.

### ORGANIZATIONAL ACTIVITIES

10. **Co-Organizer.** The 8th Annual Meeting of SIAM Central States Section. University of Nebraska–Lincoln, Lincoln, NE, USA. 7–8 October 2023.
9. **Co-Organizer.** Minisymposium on “Data, Parameters, and Inverse Problems for Dissipative Systems” at the upcoming AMS Western Sectional Meeting to be held at the University of Utah, 22–23 October 2022.
8. **Co-Organizer.** AIM Conference/Workshop on “Criticality and stochasticity in quasilinear fluid systems (part 2)”. San Jose, CA, USA. 2–6 May 2022.
7. **Co-Organizer.** AIM Conference/Workshop on “Criticality and stochasticity in quasilinear fluid systems.” San Jose, CA, USA. 5–9 April 2021. (Moved online due to COVID-19.)
6. **Co-organizer.** Minisymposium on “Advances in Mathematical Fluid Mechanics”, Spring Central and Western Joint Sectional Meeting, University of Hawaii at Manoa, Honolulu, HI, USA; 22–24 March 2019.
5. **Co-organizer.** Minisymposium on “Multiphysics and Turbulence: Analysis and Simulation”, SIAM Conference on Analysis of Partial Differential Equations, Baltimore, MD, USA. 12 December 2017.
4. **Organizer.** Minisymposium on “Large-Time Dynamics of the Navier-Stokes Equations and Related Models”, SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ, USA. 7 December 2015.
3. **Co-organizer.** Minisymposium on “Global Attractors, Dissipative Dynamical Systems, and Turbulence”, SIAM Conference on Analysis of Partial Differential Equations, Orlando, FL, USA. 9 December 2013.
2. **Local organizer.** Workshop on “Turbulence in Physical Systems Through Complex Singularities and Determining Modes”, College Station, TX. 17–20 February 2012.
1. **Co-organizer.** Minisymposium on “Mathematical Foundations of Turbulent Flows and Its Application to Geophysics”, SIAM Conference on Analysis of Partial Differential Equations, San Diego, CA, USA. 14–17 November 2011.

### SYNERGISTIC ACTIVITIES

(For conference organization, see “Organizational Activities” section above.)

14. **Co-Founder of “Applied Data Assimilation and Parameter Tracking” (ADAPT) research group.** A group which meets weekly to discuss and advance research on data assimilation and related topics. This group of 12 (4 faculty, 3 postdocs, and 5 grad students) includes 4 women and 5 underrepresented minorities, from 7 universities and 1 national lab. 2020–Present.

13. **Mentoring an engineering grad student.** (Siavash Jafarzadeh), a PhD student of Florin Bobaru in Mechanical Engineering. The three of us are working on novel numerical methods for handling non-local PDEs that arise in modeling corrosion phenomena. Our work was awarded an NSF grant, and we are collaborating on several papers. 2020–2021.
12. **Advising an undergrad.** (Diego Galvan) as part of the UCARE program at UNL. 2020–2021.
11. **Co-advising an undergrad.** (Elizabeth Spaulding) with Prof. Jae Sung Park in Mechanical Engineering. Project on simulating the Navier-Stokes equations of fluids, and measuring new statistical laws near the boundary in turbulent flows. Fall 2018–Spring 2019.
10. **Co-Founder of the Nebraska Fluid Dynamics Research Initiative.** An interdisciplinary group of mathematicians, engineers, experimentalists, and computational researchers at UNL aimed at advancing fluid dynamics research and education in Nebraska through collaborative efforts. We hold monthly interdisciplinary seminar talks, and in spring 2018, we will hold our first series of educational workshops. University of Nebraska-Lincoln; Fall 2016–present.
9. **Co-Founder of Peer Proposal Preparation program** (with Rebecca Roston, Asst. Prof. in Biochemistry). This was a group for young faculty from across UNL to interact, giving and receiving feedback on grant proposals. 2015–2016.
8. **Founder of Writing Group *Agraphia*.** A group for early career faculty to discuss and motivate academic writing. University of Nebraska-Lincoln; 2014–2017.
7. **Mentor for Undergraduates.** Pre-REU on Imaging, Fourier Analysis, and Wavelets. Texas A&M University; Summer 2012, and Summer 2013.
6. **Research interaction team leader.** Special study on Besov spaces, Littlewood-Paley theory, and paradifferential calculus. Texas A&M University; 2012–2013.
5. **Local organizer.** Workshop on “Turbulence in Physical Systems Through Complex Singularities and Determining Modes”. Texas A&M University; 17-20 February 2012.
4. **Co-Founder, Co-Organizer.** “Graduate Student Mentoring Program;” (A program for senior graduate students to mentor incoming graduate students.) University of California, Irvine; 2009–2011.
3. **Co-Organizer.** “Math Graduate Student Colloquium;” (A monthly colloquium by graduate students, for graduate students.) University of California, Irvine; 2007–2009.
2. **Co-Founder.** “Gravity and Chaos Club;” (A math and physics club for graduate students.) Western Washington University; 2004.
1. **President, Founder.** “Abstract Reasoning Club;” (A math club for undergraduates.) Western Washington University; 2003.

## DEPARTMENTAL SERVICE

- Co-chair of the Tenure-Track Search Committee for the academic year 2022–2023.
- Math Day Planning Committee. Fall 2022.
- Served in the Math Job Search Workshop. Fall 2021.
- Member of Computer Systems Advisory Committee, Fall 2021–present.
- Member of Graduate Advisory Committee (GAC). Spring 2021.
- Member of Diversity Committee. Spring 2021.
- Math Department Tea co-organizer. 2020–2021.
- GSS panelist for panel on getting fellowships. 7 Sept 2020.

- Member of the Postdoctoral Search Committee for the academic year 2019–2020.
- GSS panelist for panel on job searches. 7 Oct 2019.
- GSS panelist for panel on getting fellowships. 16 Sept 2019.
- Committee Chair: Course Reorganization Committee. Spring 2019
- Department Executive Committee. Fall 2016–Spring 2018.
- Member of the Postdoctoral Search Committee for the academic year 2016–2017.
- Organized Pick up/Dinner for 2016 Howard Rowlee Lecturer Jordan Ellenberg. 16 March 2016.
- Volunteered as a moderator for the NCUWM panel. February 2016.
- Volunteered at UNL’s booth at JMM (the Joint Mathematics Meetings in Seattle): January 2016.
- Organizer of UNL’s Partial Differential Equations Seminar. 2017–present.
- Committee member: Ad Hoc Computer Support Transition committee Spring 2017.
- Serving on MAT committee: Fall 2015–present. Administer the MAT portion of the graduate program, providing advice to the GAC about this program as appropriate.
- Served in the Math Job Search Workshop. Met weekly with UNL math grad students and Dr. Judy Walker to discuss career strategies. Proofread CVs, research statements, teaching statements, cover letters, etc. for students on the job market. Fall 2014, Fall 2015.
- Member of panel on non-academic job searches, Fall 2014 and Fall 2015.
- Served on Tenure-Track hiring committee: Fall 2015–Spring 2016.
- Served on Textbook Committee for Math 221/821: Spring 2015 and 2017. (Served as committee chair in 2017.)
- Founded “Agraphia” writing group: Spring 2015–Spring 2017.
- Regular volunteer for Math Day at UNL, 2014–present.
- Member of the Tenure-Track Search Committee for the academic year 2015–2016.
- Founded and ran the Numerical and Computational Seminar, 2014–2015.
- Member of the Postdoctoral Search Committee for the academic year 2014–2015.

#### **Wider College/Campus/University**

- Volunteer for Complex Biosystems PhD Program recruitment in February 2015. Met with prospective grad students.

#### **EDITORIAL DUTIES**

*Associate Editor.* Rocky Mountain Journal. November 2021–present.

#### **REFEREE FOR JOURNALS**

- *Acta Applicandae Mathematicae, Annals Appl. Anal., Arab J Math Sci, Appl. Math Lett., Asymptotic Anal, Commun Nonlinear Sci Numer Simul, Electronic Research Archive, Evol. Equ. Control Theory, J Comp Appl Math, J Funct Anal, J Math Anal Appl, J Math Phys, J Nonlinear Sci, Math Methods Appl Sci, Nonlinear Anal. Real World Appl., Numer Math, Phys D, Rocky Mountain J. Math., SIAM-SIADS, Theor Comp Fluid Dyn, ZAMM Z. Angew. Math. Mech.*

## COLLABORATORS, CO-AUTHORS & OTHER AFFILIATIONS

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### Co-Authors (*Current total: 32*)

- Animikh Biswas (U. Maryland, Baltimore County); Florin Bobaru (U. Nebraska-Lincoln); Elizabeth Carlson (U. Victoria); Aseel Farhat (Florida State University); Ciprian Foias (Texas A&M U.); Trenton Franz (U. Nebraska-Lincoln); Matthew Gardner (Clemson U.); Humberto Godinez (Los Alamos National Lab); Jean-Luc Guermond (Texas A&M U.); Joshua Hudson (Sandia National Laboratories); Siavash Jafarzadeh (U. Nebraska-Lincoln); Paul Kuberry (Sandia National Lab); Evelyn Lunasin (U.S. Naval Academy); Vincent Martinez (Hunter College); Farzaneh Mousavi (U. Nebraska-Lincoln); Eunice Ng (Stony Brook U.); Yuan Pei (Western Washington U.); Mark Petersen (Los Alamos National Lab); Mohammad Mahabubur Rahman (Texas Tech); Leo G. Rebholz (Clemson U.); Luke Van Roekel (Los Alamos National Lab); Travis Thompson (Texas Tech); Edriss Titi (Texas A&M U.); Duygu Vargun (Clemson U.); Collin Victor (U. Nebraska-Lincoln, LANL); Longzhen Wang (U. Nebraska-Lincoln); Jared Whitehead (Brigham Young U.); Nick Wilson; Beth Wingate (U. Exeter); Kazuo Yamazaki (Texas Tech); Jiangming Zhao (U. Nebraska-Lincoln); Camille Zervas (NextEra Energy, Inc.)

### Advisors

- Dr. Ciprian Foias (Postdoctoral adviser). Texas A&M University.
- Dr. Jean-Luc Guermond (Postdoctoral adviser). Texas A&M University.
- Dr. Edriss S. Titi (Ph.D. adviser). University of California, Irvine.
- Dr. David Hartenstine (M.S. thesis adviser). Western Washington University.
- Dr. Robert Jewett (B.S. thesis adviser). Western Washington University.

### Undergraduate Student Mentoring/Advising

- Diego Galvan. University of Nebraska-Lincoln. UCARE Advisor, Spring 2019–Summer 2021.
- Elizabeth Spaulding. University of Nebraska-Lincoln. Mentor, Fall 2017–Spring 2019.
- Collin Victor. University of Nebraska-Lincoln. Mentor, Fall 2016–Summer 2017. UCARE Advisor, Fall 2017–Summer 2018.
- Kimberly Stanke. Complex Biosystems Rotation. University of Nebraska-Lincoln. Mentor, Spring 2016.
- Jack Rodenburg. University of Nebraska-Lincoln. Mentor, Fall 2015.

### Graduate Student Advising

- Amanda Rowley. University of Nebraska-Lincoln (2022–present)
- Matthew Enlow. University of Nebraska-Lincoln (2021–present)
- Isabel Safarik. University of Nebraska-Lincoln (2021–present)
- Collin Victor. University of Nebraska-Lincoln (2018–present)
- Elizabeth Carlson. University of Nebraska-Lincoln (2017–2021) PhD: Spring 2021
- William Jamieson. University of Nebraska-Lincoln (2014–2016)

### Postdoctoral Students

- Yuan Pei. Co-mentor (with Dr. George Avalos). University of Nebraska-Lincoln (2015–2018)

## FACULTY DEVELOPMENT LEAVE

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- Sabbatical. Isaac Newton Institute, Cambridge, UK, January 29–June 15, 2022.

## COMPUTATIONAL SKILLS

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### Programming Languages:

- **Highly Proficient:** Fortran 90/95, MATLAB, Unix/Linux shell scripting (bash, sed, awk, etc.).
- **Some Proficiency:** C/C++, Fortran 77, Perl, Python.

**Algorithms and Methods:** Parallel computing with MPI, CFD (Computational Fluid Dynamics), DNS (direct numerical simulation) for nonlinear PDEs, finite element methods, finite difference and MAC schemes, pseudo-spectral methods, IMEX/IF/ETD time-stepping methods, nonlinear optimization, many others.

**Libraries:** FEniCS, deal.II, Dedalus.

**Markup Languages:** LaTeX, Beamer, tikZ, HTML/CSS, XML.

**Data and Visualization:** Paraview, VisIt, VTK.

**Operating Systems:** Linux/Unix based systems.

**Applications:** Spreadsheets (LibreOffice/Excel), Emacs, Vim, Eclipse, GIMP/Photoshop.

**Video Editing:** Kdenlive.