James P. Kelliher

900 University Ave Riverside, CA 92521
www.math.ucr.edu/~kelliher
kelliher@math.ucr.edu

June 2025

Research Interests

Mathematical problems of fluid motion, especially singular limits involving the Navier-Stokes equations, Euler equations, and other equations of fluid mechanics.

Academic Positions

2024- **Chair Mathematics**, *University of California Riverside*
2024- **Professor**, *University of California Riverside*
2012-2024 **Associate Professor**, *University of California Riverside*
2018-2020 **Vice Chair Mathematics**, *University of California Riverside*
2014-2019 **Undergraduate Advisor Mathematics**, *University of California Riverside*
2008-2012 **Assistant Professor**, *University of California Riverside*
2005-2008 **Tamarkin Assistant Professor**, *Brown University*
2002-2005 **Assistant Instructor**, *University of Texas at Austin*
2000-2002 **Teaching Assistant**, *University of Texas at Austin*
1998-1999 **Teaching Assistant**, *George Mason University*

Degrees

May 2005 **Ph.D.** Mathematics, *University of Texas at Austin; advisor, Misha Vishik*
May 2000 **M.S.** Mathematics, *George Mason University; advisor, Flavia Colonna*
May 1980 **B.S.** Mathematics & Physics, *University of Maryland, College Park*

Grants and Awards

2012-2016 **NSF Standard Grant**
Fluid flow in the presence of boundaries and singularities, co-PI Gung-Min Gie

2010-2014 **NSF Collaborative Research Grant**
Analysis of Incompressible High Reynolds Number Flows (one of 4 PIs)

2007-2011 **NSF Standard Grant**
Vanishing viscosity in the presence of a boundary

May 2005 **Frank Gerth III Dissertation Award**
2004-2005 **VIGRE fellowship**, *UT Austin*
Spring 2004 **Hubert S. Wall Fellowship**, *UT Austin*

PhD Students

Aug 2020 **Taylor Baldwin**
Solutions to the 2D Euler Equations Satisfying the Serfati Condition With Relaxed Constraints on the Initial Vorticity
Defended 27 August 2020

Feb 2024 **Thomas Schellhous**
Striated Regularity of Vorticity in a Bounded Domain
Defended 2 February 2024

Visiting Positions

Spring 2021 **Member MSRI**
Program on *Mathematical problems in fluid dynamics*

Winter 2017 **Member ICERM**
Program on *Singularities and Waves In Incompressible Fluids*

Spring 2014 **Member IMPA**
Thematic program in *Incompressible Fluid Dynamics*

Refereed Papers

34 **With David M. Ambrose and Fazel Hadadifard**, *Horizontally periodic generalized Surface Quasigeostrophic patches and layers*, Submitted, **2025**

---

33 **With Christophe Lacave, Milton C. Lopes Filho, and Helena J. Nussenzveig Lopes**, *Large time behavior for the 3D Navier-Stokes with Navier boundary conditions*, To appear, Journal of Mathematical Fluid Mechanics, **2025**

32 **With Michael A. Gulas**, *On vanishing viscosity with inflow, outflow*, To appear, Pure and Applied Functional Analysis, **2025**

31 **With Gung-Min Gie and Anna Mazzucato**, *The 3D Euler equations with inflow, outflow and vorticity boundary*, to appear, Journal de Mathématiques Pures et Appliquées, **2024**

30 **With David M. Ambrose and Fazel Hadadifard**, *Contour dynamics and global regularity for periodic vortex patches and layers*, To appear, SIAM Journal on Mathematical Analysis, Volume 56, Number 2, 2286-2311, **2024**

29 **Kelliher**, *The strong vanishing viscosity limit with Dirichlet boundary conditions*, Nonlinearity, Volume 36, Number 5, 1-33, **2023**

28 **With David Ambrose, Elaine Cozzi, and Daniel Erickson**, *Existence of Solutions to fluid equations in Hölder and Uniformly Local Sobolev Spaces*, Journal of Differential Equations, Volume 364, 15 August 2023, pages 107-151, **2023**

27 **With Gung-Min Gie and Anna Mazzucato**, *The linearized 3D Euler equations with inflow, outflow*, Advances in Differential Equations, Volume 28, Numbers 5-6, May/June, 373-412, **2023**

26 **With Hantaek Bae**, *Propagation of regularity of level sets for a class of active transport equations*, Journal of Mathematical Analysis and Applications, Volume 497, Issue 1, 1 May **2021**

25 **Kelliher**, *Stream functions for divergence-free vector fields*, Quarterly of Applied Mathematics, 79 (2021) 163-174
Published electronically: 18 June **2020**.

24 **With Gung-Min Gie, Milton C. Lopes Filho, Anna Mazzucato, and Helena J. Nussenzveig Lopes**, *The Vanishing viscosity limit for some symmetric flows*, Annales de l'Institut Henri Poincare (C) Non Linear Analysis, 36(5), 1237-1280, **2019**

23 **With Elaine Cozzi**, *Well-posedness of the 2D Euler equations when velocity grows at infinity*, Discrete & Continuous Dynamical Systems, 39(5), 2361-2392, **2018**

22 **With Gung-Min Gie and Anna Mazzucato**, *Boundary layers for the Navier-Stokes equations linearized around a stationary Euler flow*, Journal of Mathematical Fluid Mechanics, 20 (4), 1405-1426, **2018**

21 **With Elaine Cozzi and Gung-Min Gie**, *The aggregation equation with Newtonian potential: The vanishing viscosity limit*, Journal of Mathematical Analysis and Applications, 453(2), 841-893, 15 September **2017**

20 **Kelliher**, *Observations on the vanishing viscosity limit*, Transactions of the American Mathematical Society, 369, 2003-2027, **2017**
Published electronically: 2 June 2016.

19 **With Elaine Cozzi**, *Incompressible Euler Equations and the Effect of Changes at a Distance*, Journal of Mathematical Fluid Mechanics, 18(4), 765-781, **2016**

18 **Kelliher**, *A characterization at infinity of bounded vorticity, bounded velocity solutions to the 2D Euler equations*, Indiana University Mathematics Journal, 64(6), 1643-1666, **2015**

17 **With David M. Ambrose, Milton C. Lopes Filho, and Helena J. Nussenzveig Lopes**, *Serfati solutions to the 2D Euler equations on exterior domains*, Journal of Differential Equations, 259(9), 4509-4560, **2015**

16 **With Mihaela Ignatova, Gautam Iyer, Robert L. Pego, Arghir D. Zarnescu**, *Global existence for two extended Navier-Stokes systems*, Communications in Mathematical Sciences, 13(1), 249-267, **2015**

15 **With Gung-Min Gie**, *Boundary layer analysis of the Navier-Stokes equations with generalized Navier boundary conditions*, Journal of Differential Equations, 253, pp. 1862-1892, **2012**

14 **Kelliher**, *On the flow map for 2D Euler equations with unbounded vorticity*, Nonlinearity, 24(9), 2599-2637, **2011**

13 **With Roger Temam and Xiaoming Wang**, *Boundary layer associated with the Darcy-Brinkman-Boussinesq model for convection in porous media*, Physica D: Nonlinear Phenomena, 240(7), 619-628, **2011**

12 **Kelliher**, *Eigenvalues of the Stokes operator versus the Dirichlet Laplacian for a bounded domain in the plane*, Pacific Journal of Mathematics, 244(1): 99-132, **2010**

11 **Kelliher**, *Infinite-energy 2D statistical solutions to the equations of incompressible fluids*, Journal of Dynamics and Differential Equations, 21(4): 631-661, **2009**

10 **With Milton C. Lopes Filho and Helena J. Nussenzveig Lopes**, *Vanishing viscosity limit for an expanding domain in space*, Annales de l'Institut Henri Poincaré (C) Analyse Non Linéaire, 26(6): 2521-2537, **2009**

9 **Kelliher**, *On the vanishing viscosity limit in a disk*, Mathematische Annalen, 343:701-726, **2009**

8 **With Dragoş Iftimie**, *Remarks on the vanishing obstacle limit for a 3D viscous incompressible fluid*, Proceedings of the AMS, 137(2):685-694, **2009**

7 **Kelliher**, *Vanishing viscosity and the accumulation of vorticity on the boundary*, Communications in Mathematical Sciences, 6(4):869-880, **2008**

6 **With Riad Masri**, *Analytic continuation of multiple Hurwitz zeta functions*, Mathematical Proceedings of the Cambridge Philosophical Society, 145(3):605-617, **2008**

5 ***Expanding domain limit for incompressible fluids in the plane***, *Communications in Mathematical Physics*, 278(3):753-773, **2008**

4 **With Elaine Cozzi**, *Vanishing Viscosity in the plane for vorticity in borderline spaces of Besov type*, Journal of Differential Equations, 235(2):647-657, **2007**

3 **Kelliher**, *On Kato's conditions for vanishing viscosity*, Indiana University Mathematics Journal, 56(4):1711-1721, **2007**

2 **Kelliher**, *Navier-Stokes equations with Navier boundary conditions for a bounded domain in the plane*, SIAM Journal on Mathematical Analysis, 38(1):210-232, **2006**

1 **Kelliher**, *The inviscid limit for two-dimensional incompressible fluids with unbounded vorticity*, Mathematical Research Letters, 11(4):519-528, **2004**

Invited Talks

48 ***Large time behavior for 2D and 3D Navier-Stokes with Navier boundary conditions***, *Analysis and PDE Seminar, joint with The Chinese University of Hong Kong, The University of Hong Kong, and Ulsan National Institute of Science and Technology (delivered online), 7 April 2023*

47 ***3D Euler equations with inflow, outflow***, *University of California San Diego, Analysis Seminar (delivered online), 3 May 2022*

46 ***Well-posedness and regularity of solutions to the 3D Euler equations with inflow, outflow***, *AMS Spring Western Sectional Meeting 2021 (delivered online), 1 May 2021*

45 ***The 3D Euler equations with inflow, outflow***, *MSRI Euler/Navier-Stokes Seminar (delivered online), 1 April 2021*

44 ***Vanishing Viscosity***, *MSRI introductory 5 minute talk (delivered online), 9 February 2021*

43 ***Well-posedness and regularity of solutions to the 3D Euler equations with inflow, outflow***, *Indiana University PDE/Applied Math Seminar, Indiana University (delivered online), Bloomington, Indiana, 12 October 2020*

42 ***The 3D Euler equations with inflow, outflow***, *AMS Fall Western Sectional Meeting 2020 (delivered online), 24 October 2020*

41 ***2D Euler equations with non-decaying vorticity and velocity***, *Mathematics of Fluid Motion III: Theory and Computation, Korea Institute for Advanced Study (KIAS), Seoul, South Korea, 19 December 2019*

40 ***Boundary Layers for Incompressible Fluids: The Annoyance of Characteristic Points***, *SIAM Conference on Analysis of Partial Differential Equations (PD19), La Quinta, CA, 14 December 2019*

39 ***Striated Regularity in Fluid Equations and Related PDEs***, *SIAM Conference on Analysis of Partial Differential Equations (PD19), La Quinta, CA, 12 December 2019*

38 ***The strong vanishing viscosity limit with Dirichlet boundary conditions: facts, speculations, and conjectures***, *CAMS colloquium at USC, 1 April 2019*

37 ***Non-Decaying Solutions to the 2D Euler Equations***, *Spring 2019 AMS Western Sectional Meeting, University of Hawaii, 23 March 2019*

36 ***Striated regularity for a class of active transport equations***, *Geometry & Analysis Day University of Colorado Boulder, Boulder, CO October 2018*

35 ***Bounded vorticity, unbounded velocity solutions to the 2D Euler equations***, *PDE and Analysis Seminar University of Pittsburgh, Pittsburgh, PA April 2018*

34 ***Techniques of 2D fluids applied to the aggregation equation***, *2018 Joint Math Meeting, San Diego, CA January 2018*

33 ***Mathematical Analysis in Incompressible Fluid Dynamics - Part I of II***, *2017 SIAM Conference on Analysis of Partial Differential Equations, Baltimore, MD, December 2017*

32 ***Bounded Vorticity, unbounded velocity solutions to the 2D Euler equations***, *Nonlinear Partial Differential Equations Seminar, Texas A&M University, College Station, Texas, Sept 2017*

32 ***Non-decaying solutions to the 2D Euler equations***, *DyCoV: Local and global dynamics of concentrated vortices, University of Rennes, Rennes (France), May 2017*

31 ***Vanishing viscosity***, *Dynamics of Small Scales in Fluids, ICERM, Providence, RI, February 2017*

30 ***Of Kato and Prandtl***, *Dynamics of Small Scales in Fluids, ICERM, Providence, RI, February 2017*

29 ***Does the vanishing viscosity limit hold? (Parts I and II)***, *Madison Workshop in Analysis and PDE, University of Wisconsin, Madison, WI, 30 September, 1 October 2016*

28 ***Recent progress on the vanishing viscosity limit in the presence of a boundary***, *The 7th Pacific RIM Conference on Mathematics, Seoul, South Korea, July 2016*

27 ***Aggregation equations and 2D incompressible fluids***, *2016 Joint Math Meeting, Seattle, WA January 2016*

26 ***Striated Regularity of Velocity for the Euler Equation***, *SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ December 2015*

25 ***Observations on the Vanishing Viscosity Limit***, *SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ December 2015*

24 ***Conservation of striated regularity for Eulerian velocities***, *AMS Western Sectional Meeting, Las Vegas, NV, April 2015*

23 ***Serfati's approach to vortex patches***, *Autumn School and Workshop on Mathematical Fluid Dynamics, Bad Boll Germany, 28 October 2014*

22 ***Vortex patches, a short history***, *Claremont Center for the Mathematical Sciences (CCMS) Colloquium, Claremont, CA, 24 September 2014*

21 ***Vortex patches redux***, *Fourth Workshop on Fluids and PDE, IMPA, Rio de Janeiro, 26 May 2014*

20 ***On the behavior of bounded vorticity, bounded velocity solutions to the 2D Euler equations***, *Mathematical Congress of the Americas, Guanajuato, Mexico, August 2013; SIAM Conference on Analysis of Partial Differential Equations, Orlando, FL December 2013*

19 ***Bounded solutions to the 2D Euler equations***, *Applied math seminar, Claremont Graduate University, March 2013*

18 ***A characterization of 2D bounded solutions to the Euler equations***, *PDE and Analysis Seminar, University of Pittsburgh, March 2013*

17 ***Fluids and boundaries***, *Mathematics Colloquium, California State University, Long Beach, October 2012*

16 ***Some recent results on an extended Navier-Stokes system***, *9th AIMS Conference on Dynamical Systems, Differential Equations, and Applications, Orlando, Florida, July 2012; AMS Western Sectional Meeting, University of Arizona, Tucson, 27 October 2012*

15 ***Bounded vorticity, bounded velocity (Serfati) solutions to 2D Euler equations***, *Oregon State University Analysis Seminar, 20 February 2012; Spring 2012 AMS Western Sectional Meeting, University of Hawaii, 3 March 2012; Carnegie Mellon Center for Nonlinear Analysis Seminar, 27 March 2012; 9th AIMS Conference on Dynamical Systems, Differential Equations, and Applications, Orlando, Florida, July 2012*

14 ***Boundary Layer Analysis of the Navier-Stokes Equations with Generalized Navier Boundary Conditions***, *SIAM Conference on Analysis of Partial Differential Equations (PD11), San Diego, CA, November 2011*

13 ***Boundary Layer Correctors for Curved Boundaries***, *SIAM Conference on Analysis of Partial Differential Equations (PD11), San Diego, CA, November 2011*

12 ***On uniqueness and properties of the flow map for weak solutions to the 2D Euler equations***, *3rd Workshop on Fluids and PDE, UNICAMP, Brazil, 27 June to 1 July 2011*

11 ***Boundary layers in fluid mechanics***, *CAMS colloquium at USC, 15 October 2010*

10 ***Boundary layer associated with the Darcy-Brinkman-Boussinesq model for convection in porous media***, *Fall AMS Western Section Meeting, UCLA, October 9-10 2010*

9 ***An inverse problem associated with flow maps***, *Fall AMS Western Section Meeting, UCLA, October 9-10 2010*

8 ***On the Uniqueness of Weak Solutions to the 2D Euler Equations (properties of the flow)***, *SIAM Conference on Analysis of Partial Differential Equations (PD09), Miami, FL, December 2009*

7 ***Infinite-energy statistical solutions to the equations of incompressible fluids in the plane***, *Carnegie Mellon and Penn State, December 2009; University of California Irvine, November 2009; 2009 SIAM annual meeting, Denver, Colorado, July 2009*

6 ***Vanishing viscosity and the accumulation of vorticity on the boundary***, *April 2009 Spring AMS Western Section Meeting; March 2009 Spring AMS Central Sectional Meeting; Brown University, December 2008; University of Texas at Austin, September 2008*

5 ***Vanishing viscosity in the presence of a boundary***, *Carnegie Mellon University, March 2008*

4 ***Eigenvalues of the Stokes operator versus the Dirichlet Laplacian***, *University of Texas at Austin, September 2007*

3 ***A connection between the Pompeiu problem and incompressible fluid mechanics***, *Rio de Janeiro, Brazil, Workshop on Partial Differential Equations, August 2007*

2 ***Vanishing viscosity in the presence of a boundary***, *UNICAMP, Campinas, Brazil, First annual workshop in PDE and Fluids, August 2007*

1 ***Unbounded [Expanding] domain limit for Navier-Stokes and Euler equations***, *Analytical and Stochastic Fluid Dynamics Seminar, MSRI and George Mason University, October 2005*

Professional Service

December 2019 **Co-organizer of the minisymposium, *Incompressible Fluid Mechanics***, *SIAM Conference on Analysis of Partial Differential Equations, La Quinta, CA*

Oct 2019 **Co-organizer of Special Session, *Fluid Dynamics: from theory to numerics*, at the American Mathematical Society Fall 2017 Western Sectional Meeting**, *11 November 2017, Riverside, CA*

Oct 2017 **Co-organizer of Special Session on Mathematical Fluid Mechanics at the American Mathematical Society Fall 2017 Western Sectional Meeting**, *11 November 2017, Riverside, CA*

June 2016 **Co-organizer of the workshop, Recent Advances in Hydrodynamics**, *6-10 June 2016, Banff International Research Station for Mathematical Innovation and Discovery (BIRS), Banff, Alberta, Canada*

January 2016 **Co-organizer of the special session on Equations of Fluid Motion**, *2016 Joint (AMS/MAA) Mathematics Meeting, Seattle, WA*

December 2015 **Co-organizer of the minisymposium, Analytical Methods in Fluid Mechanics**, *SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ*

May 2014 **Member of Scientific Committee**, *26-30 May 2014, Fourth Workshop on Fluids and PDE, held at IMPA, Rio de Janeiro, Brazil*

Dec 2013 **Co-organizer of the *minisymposium, Recent Progress on the Incompressible Euler Equations***, *8-9 December 2013, SIAM Conference on Analysis of Partial Differential Equations, Orlando, FL*

March 2012 **Co-organizer of the AMS special session on Fluids and Boundaries**, *Fall 2013 AMS Western Sectional Meeting*, 2-3 November 2013, held at the University of California Riverside

May 2012 **Co-organizer of the *Analysis and applications of evolutionary PDEs workshop***, *5-6 May 2012, held at the University of California Riverside*

March 2012 **Co-organizer of the AMS special session on Nonlinear Partial Differential Equations of Fluid and Gas Dynamics**, *Spring 2012 AMS Western Sectional Meeting*, 3-4 March 2012, held at the University of Hawaii at Manoa, Honolulu

Oct 2011 **Co-organizer of the *Fourth Southern California Symposium on the Mathematics of Fluids***, *October 2011, held at the University of California Riverside*

Nov 2009 **Co-organizer of the AMS special session on Fluid Mechanics**, *Fall 2009 AMS Western Sectional Meeting*, 7-8 Nov 2009, held at the University of California Riverside

Teaching

University of California Riverside

Spring 2025 **Ordinary Differential Equations (Math 46)**

Spring 2024 **Topics in Nonlinear Analysis (Math 259)**

Winter 2024 **Grad Real Analysis (Math 209b)**

Fall 2023 **Grad Complex Analysis (Math 210a)**

Spring 2023 **Calculus (Sequences and Series) (Math 9c)**

Winter 2023	**Calculus (Sequences and Series) (Math 9c)**
	Grad Complex Analysis (Math 210b)
Fall 2022	**ODE (Math 146a)**
Spring 2022	**Calculus (Sequences and Series) (Math 9c) two sections**
Winter 2022	**Grad Complex Analysis (Math 210b)**
Fall 2021	**ODE (Math 146a)**
Winter 2021	**Integral Calculus (Math 9b) two sections**
Fall 2020	**Grad Real Analysis (Math 209a)**
Winter 2020	**Multivariable Calculus (Math 10a)**
	Undergrad Complex Analysis (Math 165a)
Fall 2019	**Grad Complex Analysis (Math 210a)**
Winter 2019	**Multivariable Calculus (Math 10a)**
Fall 2018	**Grad ODE (Math 207A)**
Winter 2018	**Grad PDE (Math 207B)**
Fall 2017	**ODE (Math 46) two sections**
Spring 2017	**Grad PDE (Math 207c)**
Fall 2016	**Grad ODE (Math 207a)**
Winter 2016	**Integral Calculus (Math 9b)**
	Grad PDE (Math 207b)
Fall 2015	**Integral Calculus (Math 9b)**
Winter 2015	**Grad PDE (Math 207b)**
Fall 2014	**ODE (Math 46), Grad ODE (Math 207a)**
Winter 2014	**ODE (Math 146b), Grad ODE (Math 207a)**
Fall 2013	**Grad ODE (Math 207a)**
Spring 2013	**Multivariable Calculus (Math 10a)**
Winter 2013	**ODE (Math 146b)**
Fall 2012	**Applied Linear Algebra (Math 113), Grad ODE (Math 207a)**
Spring 2012	**ODE (Math 46), Graduate Real Analysis (Math 209c)**
Winter 2012	**Integral Calculus (Math 9b), Multi-variable Calculus (Math 10b)**
Spring 2011	**Calculus (Sequences and Series) (Math 9c)**
Winter 2011	**Grad ODE (Math 211a), Integral Calculus (Math 9b)**
Fall 2010	**Ordinary Differential Equations (Math 146a)**
Spring 2010	**Graduate Real Analysis (Math 209c)**
Winter 2010	**Numerical Analysis (Math 135b), Differential Calculus (Math 9a)**
Fall 2009	**Real Analysis (Math 151a)**
Spring 2009	**Graduate PDE (Math 212)**
Winter 2009	**Ordinary Differential Equations (Math 146b)**
Fall 2008	**Ordinary Differential Equations (Math 146a)**
	Brown University
Spring 2008	**Multivariable calculus (MA0180)**
Fall 2007	**Graduate Real Analysis (MA2210, APMA2110)**

Spring 2007 **Partial Differential Equations (MA112)**

Fall 2006 **Honors Multivariable Calculus (MA35), Analysis: Functions of Several Variables (MA113)**

Spring 2006 **Multivariable Calculus (MA18), Analysis: Functions of One Variable (MA101)**

Fall 2005 **Multivariable Calculus (MA20)**

University of Texas at Austin

Summer 2004 **Instructor for Math 305G (precalculus)**

Fall 2002 **Instructor for Emerging Scholars Program workshop**