Scott Hottovy

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RESEARCH INTERESTS

- Stochastic differential equations and applications in the atmosphere, biology, and physics.
- Limit theorems of stochastic processes.
- Interacting particle systems, phase transitions, critical phenomena.

EMPLOYMENT

2016-Present **United States Naval Academy**, Department of Mathematics

- **Position 2022-Present:** Associate Professor
- **2016-2022:** Assistant Professor

Fall 2022 **Basque Center of Applied Mathematics**,

- **Position:** Visiting Fellow

2013-2016 **University of Wisconsin-Madison**, Department of Mathematics

- **Position:** Postdoctoral Researcher
- **PI:** Professor Sam Stechmann

EDUCATION

May 2013 **PhD in Applied Mathematics** from the University of Arizona

- **Dissertation:** *The Smoluchowski-Kramers Approximation with State Dependent Friction: a framework for the small mass limit.*
- **Advisor:** Professor Jan Wehr

2010 **MS in Applied Mathematics** from the University of Arizona

2008 **BS in Mathematics** from the University of Nebraska at Lincoln

HONORS AND AWARDS

2023 Visiting Professor at Climate Change Research Centre, Sydney, Australia.

2023 Research in Pairs Fellow at Centre de Recerca Matemàtica, Barcelona, Spain.

2022-2023 Visiting Fellow at Basque Center of Applied Mathematics, Bilbao, Spain.

2012-2013 University of Arizona G-TEAMS Fellowship (NSF GK-12).

2012 University of Arizona College of Science Galileo Scholar.

2010-2011 University of Arizona NSF VIGRE Fellowship.

2008-2009 University of Arizona Fellowship.

2008 University of Nebraska Chair's Prize in Mathematics.

2006-2008 University of Nebraska MCTP Undergraduate Scholar.

GRANTS

ONR (PI) N0001423WX00746: Improving Prediction of Tropical Weather with Reduced Order Models, $300,000 (2023-2026).

NSF (PI) DMS-1815061: Simple Stochastic Models of Tropical Atmospheric Waves, $100,000 (2018-2022).

PREPRINTS

1. Kozak, E. & Hottovy, S. (2023). Monte Carlo Tree Search for a single target search game on a 2-D lattice. **arXiv preprint** arXiv:2011.14246.

PEER REVIEWED PUBLICATIONS

1. Hottovy, S. & Stechmann S.N. (2023). *Rain process models and convergence to point processes*. **Nonlinear Processes in Geophysics**, 30(1), 85–100.
2. Stechmann S. N., & Hottovy, S. (2020). *Asymptotic Models for the Madden-Julian Oscillation and Tropical Geostrophic Balance*. **Journal of Climate** 33(11), 4715–4737.
3. Ogrosky, H. R., Stechmann S. N., & Hottovy, S. (2019). *Instability and nonlinear evolution of the MJO in a model with vertically-varying convective adjustment*. **Theoretical and Computational Fluid Dynamics**. 1–17.
4. Hottovy, S., McDaniel, A., & Wehr, J. (2019). *A small delay and correlation time limit of stochastic differential delay equations with state-dependent colored noise*. **Journal of Statistical Physics**. 1–28.
5. Stechmann S N, Hottovy S, (2017): Unified spectrum of tropical rainfall and waves in a simple stochastic model. **Geophys. Res. Lett.** 44(20).
6. Stechmann S N, Hottovy S, (2016): Cloud regimes as phase transitions. **Geophys. Res. Lett.** 43, pp. 6579-6587.
7. Birrell, J., Hottovy, S., Giovanni Volpe, Wehr, J. (2016). *Small Mass Limit of Langevin Equation on a Manifold*. **Annales Henri Poincare**, 18(2) pp. 707-755.
8. Herzog, D. P., Hottovy, S., & Volpe, G. (2016). *The Small-Mass Limit for Langevin Dynamics with Unbounded Coefficients and positive friction*. **Journal of Statistical Physics**. 163(3), pp. 659-673.
9. Hottovy, S. & Stechmann, S.N. (2015). *A spatiotemporal stochastic model for tropical precipitation and water vapor dynamics,* **Journal of the Atmospheric Sciences**, 72(12), pp.4721-4738.
10. Hottovy, S., & Stechmann, S.N. (2015). *Threshold models for rainfall and convection: deterministic versus stochastic triggers*. **SIAM Journal on Applied Mathathematics**, 75(2), pp. 861-884.

11. Hottovy, S., McDaniel, A., Volpe, G., & Wehr, J. (2014). *The Smoluchowski-Kramers limit of stochastic differential equations with arbitrary state-dependent friction*. **Communications in Mathematical Physics**, 336(3), pp. 1259-1283.
12. Pesce, G., McDaniel, A., Hottovy, S., Wehr, J., & Volpe, G. (2013). *Stratonovich-to-Itô transition in noisy systems with multiplicative feedback*. **Nature communications** 4, pp. 2733.
13. Hottovy, S. (2013). *The Smoluchowski-Kramers approximation for stochastic differential equations with arbitrary state dependent friction* (Doctoral dissertation, The University of Arizona).
14. Hottovy, S., Volpe, G., & Wehr, J. (2012). *Thermophoresis of Brownian Particles Driven by Coloured Noise*. **EPL (European Physics Letters)**, 99(6), pp. 60002.
15. Hottovy, S., Volpe, G., & Wehr, J. (2012). *Noise-Induced Drift in Stochastic Differential Equations with Arbitrary Friction and Diffusion in the Smoluchowski-Kramers Limit*. **Journal of Statistical Physics**, 146(4), pp. 762-773.
16. Avalos, G., Gunderson, M., & Hottovy, S. (2009). *Computation of Minimal Norm Control Asymptotics Relative to the Null Controllability of Non-Standard Parabolic-Like Dynamics*. **Nonlinear Analysis: Theory, Methods & Applications**, 71(12), pp. e2674-e2689.

REPORTS

1. Cui, Y., Gao, M., Hottovy, S., Rajapakshe, C., & Zhang, Z. (2018). *The impacts of 3D radiative transfer effects on cloud radiative property simulations and retrievals*. **Technical Report**.
   `https://userpages.umbc.edu/~gobbert/papers/CT2018Team5.pdf`

PRESENTATIONS

- **Courses**
  - 10-hour course on "Convergence of stochastic integrals and their application," short course Basque Center of Applied Mathematics (BCAM), (Bilbao, Spain, 03–07 OCT 2022).
- **Invited Speaker**
  - Centre de Recerca Matemàtica (CRM) Seminar (Barcelona, Spain, February 2023)
  - Navy Research Labs, Seminar (Monterey, CA, USA April 2022)
  - University of Nebraska-Lincoln, Mathematics Colloquium (Lincoln, NE, October 2021)
  - University of Colorado, Colorado Spring, Mathematics Colloquium (Online, January 2021)
  - Clarkson University, Mathematics Colloquium (Online, January 2021)
  - SIAM-Mathematics of Planet Earth (Online, August 2020)
  - Marquette University, Mathematics and Statistics Colloquium (Milwaukee, WI, USA January 2020)

- University of Wisconsin-Madison, Probability Seminar (Madison, WI, USA August 2019)
- Navy Research Labs, Seminar (Monterey, CA, USA August 2019)
- Oberwolfach Mathematical Institute, "Moist processes in the atmosphere," (Oberwolfach, Germany February 2019)
- University of Victoria, Math Colloquium (Victoria, BC, Canada February 2019)
- Wake Forrest University, Math Colloquium (Winston-Salem, NC, USA March 2018)
- SIAM-SEAS Sectional Meeting, (Chapel Hill, NC, USA March 2018)
- Metro State University of Denver, Math Colloquium (Denver, CO, USA October 2017)
- Navy Research Labs, Seminar (Monterey, CA, USA May 2017)
- Virginia Commonwealth University (VCU), Mathematical Biology Seminar (Richmond, VA, USA February 2017)
- University of Maryland (College Park), Probability Seminar (College Park, MD, USA November 2016)
- SIAM conference on Mathematics of Planet Earth (Philadelphia, PA, USA October 2016)
- University of Central Florida, Math Colloquium (Orlando, FL, USA February 2016)
- United States Naval Academy, Math Colloquium (Annapolis, MD, USA February 2016)
- Montana State University, Math Colloquium (Bozeman, MT, USA January 2016)

- Iowa State University, Probability Seminar (Ames, IA, USA September 2015)
- *Turbulent and Coherent Convection* (Madision, WI, USA May 2015)
- Université de Genéve, Theoretical Physics seminar (Geneva, Switzerland, September 2012)
- *Frontiers in Nonlinear Waves* (Tucson, AZ, USA October 2011)

- **Presentations at Conferences and Meetings**
  - *14th Conference on Dynamical Systems Applied to Biology and Natural Sciences*, (Bilbao, Spain, February 2023)
  - *Weather and Climate Extremes and their Predictability CAFE Final Conference*, (Barcelona, Spain, September 2022)
  - *Symposium on Big Data + High-Performance Computing + Atmospheric Sciences*, (Baltimore, MD May 2018)
  - *American Meteorological Society Conference on Hurricanes and Tropical Meteorology*, (Ponte Vedre, FL May 2018)
  - *SIAM Geosciences (GS)*, (Erlangen, Germany, September 2017)
  - *Joint Mathematics Meetings*, (Atlanta, GA, USA, January 2017)

- *American Meteorological Society Conference on Hurricanes and Tropical Meteorology* (San Juan, PR, April 2016)
- *Joint Mathematics Meetings* (Seattle, WA, January 2016)
- *Young Research Symposium at ICMP* (Santiago, Chile, July 2015)
- *Probability Theory and Combinatorial Optimization* (Durham, NC, USA, March 2015)
- *AGU Fall Meeting* (San Francisco, CA, USA, December 2014)
- *Frontier Probability Days* (Tucson, AZ, USA, May 2014)
- *AMS 31st Conference on Hurricanes and Tropical Meteorology [poster]* (San Diego, CA, USA, April 2014)
- *Conference of Stochastic Processes and Applications* (Boulder, CO, USA, July 2013)
- *Joint Mathematics Meetings* (San Diego, CA, USA, January 2013)
- *International Congress on Mathematical Physics* (Aalborg, Denmark, August 2012)
- *Young Research Symposium at ICMP* (Aalborg, Denmark, August 2012)
- *Statistical Mechanics* (Rutgers, NJ, USA, May 2012)
- *APS sectional meeting [poster]* (Tucson, AZ, USA, October 2011)
- *National Alliance Field of Dreams [poster]* (Phoenix, AZ, USA, October 2011)
- *Arizona Days* (Tucson, AZ, USA, April 2011)
- *Regional Workshop in Mathematics* (Lincoln, NE, USA, October 2006)

- **Seminar Talks**
  - UNSW Statistics Seminar, Sydney, Australia (June 2023)
  - Climate Change Research Centre (CCRC) Seminar, Sydney, Australia, (April 2023)
  - UPV, Leioa, Spain, Bilbao Analysis and PDE Seminar (January 2023)
  - United States Naval Academy, USA, Applied Mathematics seminar (October 2018)
  - United States Naval Academy, USA, Teaching seminar (August 2018)
  - United States Naval Academy, USA, Basic Notions seminar (October 2017)
  - United States Naval Academy, USA, Teaching seminar (February 2017)
  - University of Wisconsin, USA, Probability seminar (April 2015)
  - University of Wisconsin, USA, Applied and Computation Mathematics seminar (February 2014)
  - University of Wisconsin, USA, Probability Reading seminar (February 2014)
  - University of Wisconsin, USA, Probability seminar (December 2013)
  - University of Arizona, USA, Mathematical Physics seminar (November 2012)
  - University of Arizona, USA, Analysis seminar (October 2012)
  - University of Arizona, USA, Mathematical Physics seminar (April 2012)
  - University of Arizona, USA, Analysis seminar (March 2012)
  - University of Arizona, USA, Mathematical Physics seminar (April 2011)

- **Workshop participation**
  - *Moist Processes in the Atmosphere* (Oberwolfach, Germany, February 2019)
  - *MAA Mathfest, Project Next* (Denver, CO, August 2018)
  - *JMM, Project Next* (Atlanta, GA, January 2017)
  - *MAA Mathfest, Project Next* (Columbus, OH, August 2016)
  - *Disordered Models in Mathematical Physics* (Valparaiso, Chile, July 2015)
  - *Midwest Probability Colloquium* (Evanston, IL, USA, October 2014)
  - *Frontier in Probability Days* (Tucson, AZ, USA, October 2013)
  - *Midwest Probability Colloquium* (Evanston, IL, USA, October 2013)
  - *Random Dynamical Systems* (Institute of Mathematics and its Applications, MN, USA, October 2012)
  - *Arizona School of Analysis and Mathematical Physics* (Tucson, AZ, USA, March 2012)
  - *Institute of Mathematical Education* (Tucson, AZ, USA, March 2012)

MENTORING GRADUATE RESEARCH

- 2023: Andrea Fiorese — Master Degree in Mathematical Engineering at the Politecnico di Torino "Stochastic processes for collective dynamics of self-propelled particles" (co-Advised with Gianni Pagnini (BCAM) and Luigi Preziosi (PdT)).

MENTORING UNDERGRADUATE RESEARCH

- Honors Students
  - 2023: MIDN Sean Lee "Data Assimilation and Atmospheric Waves"
  - 2022: MIDN Moira Camacho "Describing the Effects of Diurnal Forcing on the Kelvin Wave"
  - 2021: MIDN Lillian Baker "Exploring Links between Climate Shocks and Migration"
  - 2019-2021: MIDN Elana Kozak: "Monte Carlo Search Methods"
  - 2020: MIDN Shaun Rodock: "Classification of linear models of the MJO"
  - 2019: MIDN Jacob Santer: "Probabilistic models of lightning leaders"
- Mentored three separate groups of undergraduate research through MATH 485-Mathematical Modeling (University of Arizona, Spring 2010, 2011, 2012).
- **Papers**
  - Chernobelskiy A., Dixit, V., Cala, A., Pandya, S. & Rosas, H.J. , Sponsor: Hottovy, S. (2013). *Modeling Learning and Cooperation in Iterative Games.* **SIAM Undergraduate Research Online (SIURO)**, 6, 42-53.

TEACHING EXPERIENCE

- **Courses as a Primary Instructor**

* SM474: Modeling with Differential Equations with Noise (Capstone), Spring 2022, USNA.
* SM222: Differential equations with matrices (course coordinator), Spring 2022, USNA.
* SM212: Differential equations, Fall 2021, USNA.
* SM222: Differential equations with matrices (course coordinator), Fall 2021, USNA.
* SM212P: Differential equations, Spring 2021, USNA.
* SM426: Numerical Method of ODEs, Spring 2021, USNA.
* SM222: Differential equations with matrices (course coordinator), Fall 2020, USNA.
* SM121: Calculus I, Fall 2020, USNA.
* SM222: Differential equations with matrices (course coordinator), Fall 2019, USNA.
* SM121: Calculus I, Fall 2019, USNA.
* SM316: Engineering math with probability and statistics (course coordinator), Spring 2019, USNA.
* SM221P: Calculus III with vector fields (for Freshmen), Fall 2018, USNA.
* SM473: Randomness in the Real World (Capstone), Spring 2018, USNA.
* SM212: Differential Equations, Spring 2018, USNA.
* SM212: Differential Equations, Fall 2017, USNA.
* SM221: Calculus III with vector fields, Spring 2017, USNA.
* SM261: Matrix Theory, Fall 2016, USNA.
* SM221P: Calculus III with vector fields (for Freshmen), Fall 2016 USNA.
* Math 276: Topics in Calculus II (Honors), Spring 2015, University of Wisconsin.
* Math 431: Introduction to Probability, Spring 2014, University of Wisconsin.
* Math 124: Calculus I, Fall 2011, University of Arizona.
* Math 109C: College Algebra with Data Analysis, Spring 2010, University of Arizona.
* Math 112: College Algebra, Fall 2010, University of Arizona.

– **Other Teaching Experiences**

* GTEAMS Fellow University of Arizona (Fall 2012-Spring 2013)
  - Led discussions and projects at St. Micheal's Parish Day School (Grades 6-8) in Tucson, AZ.
  - At least 10 hours per week of classroom experience.
  - Use of technology including Smart Board and integration of IPADs in the school at 1:1 ratio.
  - Served as a resource for the science and mathematics students and the Instructor: Jennifer Gould.

* **Graduate Teaching Assistant University of Arizona**, Applied Methods Course (Fall 2010-Spring 2011)
  - Led review sessions for Applied Mathematics graduate student first year core course.
  - Lectured two classes.
* **Teaching Assistant University of Nebraska** (Spring 2007, Fall 2007, Spring 2008).
  - Calculus I, II (discussion leader).
  - Participated in the Mathematics Resource Center

SERVICE

– Departmental Service

AY 2022 Applied Math Seminar Organizer.
AY 2017-2022 Midshipmen Research Liaison
AY 2018-2022 Majors advisor.
AY 2017-2022 Founder and coach for the Differential Equations Modeling Competition Team.
AY 2016-2022 Midshipmen Group Study Program mentor
AY 2019-2021 Performance Evaluation Committee.
AY 2019-2021 Faculty Senate Member.

– University Service

AY 2019-2020 Faculty Senate Member.
AY 2017-2019 Capstone Day Organizer
2015 Teaching Circle Speaker
2014 Math Circle Speaker
2012 Volunteer for Arizona Math Counts Competitions.
2010-2011 University of Arizona Applied Mathematics Graduate Representative.
2009-2011 University of Arizona SIAM Student Chapter Vice President.
2005-2007 University of Nebraska Math Day Volunteer.

– Field Service

* **Conference Organizer:**
  - Co-organized, with H. Reed Ogrosky, sessions on "Modeling developments in atmospheric and oceanic science," SIAM-SEAS (Chapel Hill, NC, USA, March 2018).
  - Co-organized session on "How to structure a semester long course around active classroom ideas," JMM (Atlanta, GA, USA, January 2017)
* **Reviewer for Journals:**
  - Journal of Mathematical Physics, Journal of Statistical Physics, Acta Physica Polonica B, Euro Physics Letters, Physica A, Statistics and Probability Letters, Mathematics of Climate and Weather Forecasting, Nonlinearity, Journal of the Atmospheric Sciences, CHAOS, Journal of Stochastic Processes and their Applications, AMS Notices.