Justin Finkel

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EDUCATION

University of Chicago, *PhD Computational and Applied Mathematics* Expected June 2022

- Advisor: Jonathan Weare (now at Courant Institute, New York University)
- Secondary advisors: Mary Silber (U. Chicago), Dorian Abbot (U. Chicago), Edwin Gerber (NYU)
- Thesis project: Analysis of rare weather events with short computer simulations

Washington University in St. Louis, *Bachelors in Physics and Mathematics* May 2017

- Graduated *Magna Cum Laude*; Dean's List seven semesters; Sigma Pi Sigma physics honor society
- Thesis project: "Changing world extreme temperature statistics". Advisor: Jonathan I. Katz

RESEARCH

- Extreme weather event predictability May 2018-present
  - Learning physical dynamics from black-box simulation data
  - Computing optimal predictors and development pathways of sudden stratospheric warming
  - Solving high-dimensional partial differential equations with stochastic representation
  - Translating mathematical results into physically interpretable insights using high-dimensional visualization and sparse statistical analysis
- Tipping points and stability in stochastic dynamical systems January 2019-present
  - Comparing low-noise to intermediate-noise characterization of tipping events in a low-order oscillating ice sheet model
  - Large deviation theory and numerical PDE solution
- Turbulence closure June-September 2019
  - practicum at Los Alamos National Laboratory in optimization and uncertainty quantification of a turbulence closure scheme in the MPAS-Ocean model. Used Gaussian process regression and Bayesian optimization to investigate structural uncertainty in physical models and its effect on large-scale quantities of interest such as vertical heat flux.
- Temperature statistics 2013-2017
  - Statistical analysis of CO_2 trends, aridity, and temperature extremes over a century. Emphasis on trend detection with regression in amplitude of annual CO_2 oscillations, aridity index, and extreme value statistics at weather monitoring stations

TEACHING AND MENTORSHIP

- Supervised a master's thesis by Matthew Shin January 2019-May 2020
  - "Towards time-dependent transition path theory: numerical study of periodically-forced dynamics"
  - Directed numerical experiments in a study of noise-induced tipping in a time-dependent dynamical system. Currently building on this for more thorough comparison to large deviation theory
- Taught a short virtual linear algebra course to 10 incoming chemistry PhD students September 2020
- Online tutoring in mathematics, physics, and computer science with Varsity Tutors June 2017-present

PUBLICATIONS

- In preparation: Finkel, J., R. J. Webber, D. S. Abbot, E. P. Gerber, and J. Weare, 2021. "Data-driven analysis of stratospheric transitions in a complex model."
- Finkel, J., R. J. Webber, D. S. Abbot, E. P. Gerber, and J. Weare, 2021. "Learning forecasts of rare stratospheric transitions from short simulations." Submitted to *Monthly Weather Review*. Available on the ArXiv at https://arxiv.org/abs/2102.07760
- Finkel, J., D. S. Abbot, and J. Weare, 2020: "Path Properties of Atmospheric Transitions: Illustration with a Low-Order Sudden Stratospheric Warming Model." *Journal of the Atmospheric Sciences*, 77 (7), 2327–2347. https://doi.org/10.1175/JAS-D-19-0278.1
- Popović, P., Finkel, J., Silber, M. C., & Abbot, D. S. (2020). Snow topography on undeformed Arctic sea ice captured by an idealized "snow dune" model. *Journal of Geophysical Research: Oceans*, 125, e2019JC016034. https://doi.org/10.1029/2019JC016034

- Finkel, J. M. and Katz, J. I. (2017), Changing U.S. Extreme Temperature Statistics. International Journal of Climatology, 37: 4749-4755. https://doi.org/10.1002/joc.5115
- Finkel, J. M. and Katz, J. I. (2017), Changing World Extreme Temperature Statistics. International Journal of Climatology. https://doi.org/10.1002/joc.5342
- C. D. Kreisch, J.A. O'Sullivan, R.E. Arvidson, D.V. Poltte, L. He, N.T. Stein, J. Finkel, E.A. Guinness, M.J. Wolff, M.G.A. Lapotre. "Regularization of Mars Reconnaissance Orbiter CRISM along-track oversampled hyperspectral imaging observations of Mars." *Icarus* 2017; 282, 136-151. https://doi.org/10.1016/j.icarus.2016.09.033
- J.M. Finkel, L.M. Canel-Katz, J.I. Katz. "Decreasing US aridity in a warming climate." *International Journal of Climatology* 2016; 36(3), 1560-1564. https://doi.org/10.1002/joc.4421

PRESENTATIONS

- University of Bristol Climate Dynamics seminar. Joint with Dorian Abbot. May 26, 2021
- European Geophysical Union General Assembly, 2021. Contributed talk. April 28, 2021
- SIAM conference on dynamical systems, 2021. Contributed talk. May 23, 2021
- American Physical Society March Meeting, 2021. Contributed talk. March 18, 2021
- Courant Institute of Mathematical Sciences student seminar, 2021. March 12, 2021
- SIAM conference on dynamical systems, 2019. P oster. May 22, 2019
- American Geophysical Union Fall Meeting, 2018. Contributed talk. December 10, 2018
- Midstates Consortium for Math and Science, Nov. 5, 2016. Poster. November 5, 2016
- Washington University Undergraduate Research Symposium. October 11, 2014