Kara Hartig

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EDUCATION

Harvard University | Cambridge, MA
PhD Candidate, Department of Physics, 2018 – Present
Advisor: Professor Eli Tziperman (Earth & Planetary Sciences)

Brown University | Providence, RI
Sc.B (Honors) in Physics, *magna cum laude,* Phi Beta Kappa, 2014 – 2018
Thesis: "Langmuir Turbulence in the Ocean Surface Boundary Layer: Towards a Sub-grid Statistical Climate Process Model"
Advisor: Professor Brad Marston
Awards: 2018 R. Bruce Lindsay Prize for Excellence in Physics

RESEARCH EXPERIENCE

Cold Air Outbreaks in Modern & Warmer Climates **Cambridge, MA**
Harvard PhD Thesis (primary project; ongoing) 05/2019 – present

- Analyzing back trajectories for air parcels advected from the Arctic into the midlatitudes to determine the primary physical processes leading to cold air outbreaks and how those will change in a warmer climate

Connections Between Surface Weather and Stratospheric Variability **Cambridge, MA**
Harvard PhD Thesis (secondary project; ongoing) 08/2021 – present

- Exploring possible teleconnections between stratospheric variability and wintertime surface temperatures in the Northern Hemisphere in reanalysis and models

Direct Measurement of the Surface Capillary Force **Cambridge, MA**
Research Rotation at Harvard 09/2018 – 12/2018

- Imaged deflection of an optical fiber to directly measure the strength of capillary repulsion along the air-water interface between a hydrophobic floater and an elliptical boundary

Simulating Langmuir Turbulence in the Upper Ocean **Providence, RI**
Brown Senior Honors Thesis 05/2017 – 05/2018

- Simulated Langmuir turbulence in the ocean surface boundary layer to compare the quasi-linear and generalized quasi-linear approximations to direct numerical simulation, focusing on trade-offs between accuracy and computational resource use

Simulating and Interpreting RNA Nucleobase Irradiation **Nashville, TN**
Vanderbilt University Physics REU 06/2016 – 08/2016

- Designed an ensemble of time-dependent density functional theory simulations of irradiation of uracil and adenine by protons and alpha particles to investigate energy transfer through electron excitation and ionization

Pluto's Atmospheric Structure from a Stellar Occultation **Boulder, CO**
Southwest Research Institute Internship 05/2015 – 08/2015

- Traveled to New Zealand to capture CCD images of the June 29, 2015 Pluto occultation, then extracted light curves and consolidated across observation sites to determine the temperature profile and haze properties of Pluto's atmosphere

PUBLICATIONS

K. Hartig, C. P. Loughner, and E. Tziperman (2023). Processes Contributing to North American Cold Air Outbreaks Based on Air Parcel Trajectory Analysis. *Journal of Climate*, 36(3).

Zeng, C., Faaborg, M.W., Sherif, A. ***et al.*** (2022). 3D-printed machines that manipulate microscopic objects using capillary forces. *Nature* **611**.

Covington, C., **K. Hartig**, A. Russakoff, R. Kulpins and K. Varga (2017). Time-dependent density-functional-theory investigation of the collisions of protons and α particles with uracil and adenine. *Physical Review A*, 95(5).

PRESENTATIONS

Air Parcel Trajectory Analysis to Identify Processes Contributing to High-latitude Cold Air Outbreaks (talk), *AGU* (Dec 2021)

The Known Unknowns of Climate Change in the Arctic (talk), Harvard University Kavli Seminar (Apr 2021)

Air Parcel Trajectory Analysis to Identify the Effects of Low Clouds on High-latitude Cold Air Formation in Warm Climates (poster), AGU (Dec 2020)

Air Parcel Trajectory Analysis to Determine whether Nature or Nurture Dominate in Cold Air Outbreaks (poster), GCC (Nov 2020)

The Unique Signature of Climate Change in the Arctic (talk), Harvard University Kavli Seminar (Oct 2020)

Air Parcel Trajectory Analysis to Identify the Effects of Low Cloud Formation on High-Latitude Cold Air Outbreaks in Warm Climates (poster), *AGU* (Dec 2019)

Improving Climate Models: Langmuir Turbulence in the Ocean Surface Boundary Layer (talk), *Brown Physics Senior Thesis Presentations* (May 2018)

Simulated Irradiation of DNA and RNA Nucleobases (poster), *Conference for Undergraduate Women in Physics*: *Boulder, CO* (Jan 2017)

Irradiation of DNA and RNA Nucleobases (poster), *Vanderbilt Physics & Astronomy REU* (Aug 2016)

Irradiation of DNA/RNA Bases (talk), *Vanderbilt Physics & Astronomy REU* (Aug 2016)

Constraints on Pluto's Hazes from 2-color Occultation Light Curves (poster), *American Astronomical Society Division of Planetary Science* (Nov 2015)

PROFESSIONAL SERVICE & OUTREACH

Member: Diversity, Inclusion, & Belonging Sub-group on Workshops, Resources, & Colloquia, Harvard University, 2020-present

Steward for Cambridge Sciences and Department Representative for Earth & Planetary Sciences: Harvard Graduate Student Union (HGSU-UAW), 2020-present

Co-chair: Women in Physics, Brown University, 2016/2017 and 2017/2018

TEACHING EXPERIENCE

Teaching Fellow, Spring 2021, EPS 101: Global Warming Science
- Certificate of Distinction in Teaching

Teaching Fellow, Spring 2020, EPS 101: Global Warming Science

FELLOWSHIPS & AWARDS

National Defense Science & Engineering Graduate (NDSEG) Fellowship, 2020-2023

R. Bruce Lindsay Prize for Excellence in Physics, Brown University, 2018