Tyler Waterman

PhD Candidate ▪ Duke University ▪ Civil and Environmental Engineering
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Education

Duke University

PhD Candidate in Civil and Environmental Engineering, Hydrology and Fluid Dynamics Track 05/2024

- 2024 Dissertation: *Representing the Heterogeneity of Land-Atmosphere Interactions in Earth System Models*
- Certificate in College Teaching

University of California Berkeley

B.S in Civil and Environmental Engineering 05/2019

- 2018 Honors Research Thesis: *Developing a Framework for Modern Modeling of Interception Loss in Forest Canopies* advised by Dr. Sally Thompson
- 2017 Honors Research Thesis: *Development of Efficient CRISPR-Cas9 Genome Editing in Desulfovibrio vulgaris Hildenborough (DvH) for Studying Anaerobic Microbial Functions and Interactions* advised by Dr. Lisa Alvarez Cohen

Academic Interests

Earth systems science, land-atmosphere interactions, big environmental data, hydrology, boundary layer meteorology, atmospheric modeling, ecohydrology, numerical modeling, large eddy simulation, machine learning, remote sensing, pedagogy in environmental data analysis, pedagogy in earth systems science

Research Experience

Duke University: Dr. Nathaniel Chaney Hydrology Lab

Research Assistant (August 2019 – Present)

- Created a publicly accessible codebase to complete preprocessing workflow for the Weather Research and Forecasting Hydrologic Model Hydrologic Model (WRF-Hydro)
- Analyzed a large database of eddy flux measurements across the United States to improve the surface boundary conditions of turbulent temperature variance in atmospheric models
- Developed a two column implementation of Cloud Layers Unified by Binormals (CLUBB) to parameterize the effect of heterogeneity induced secondary circulations in Earth System Models
- Examining the effect of the homogenization of surface fluxes on convection, precipitation and cloud development in WRF over the Continental United States

University of California Berkeley: Dr. Sally Thompson Ecohydrology Lab

Undergraduate Researcher (May 2018 – January 2019)

- Developed an independent honors research project to create an improved model framework for interception of precipitation by tree canopies
- Collected environmental samples for a fire ecology project, including basic meteorological data, soil moisture and fuel moisture, in field sites in Yosemite National Park

Teaching Experience

Duke Civil and Environmental Engineering

Environmental Spatial Data Analysis – Teaching Assistant (Fall 2021)

- Taught and helped develop materials for a series of course lectures
- Codeveloped course assignments with instructor, graded them, and answered student questions
- Anonymous Feedback: "*Tyler was an Integral part of my learning*" (download full evaluations here)

Fluid Mechanics – Teaching Assistant (Fall 2022)

- Ld undergraduate lab sessions and experiments on fluids topics
- Held office hours and graded student coursework
- Anonymous Feedback: *"Tyler teaches for learning and understanding rather than assignment completion. In office hours he would challenge me to fully understanding the background knowledge, concepts and applications of the questions"* (download full evaluations here)

Berkeley Civil and Environmental Engineering

International Water Development – Student Instructor (Spring 2018)

- Established and created the curriculum for a lower division Berkeley undergraduate course on water systems in developing countries
- Taught basic computer aided design and principles of water development, water systems, social implications of water, and the design process to Berkeley undergraduate students

Honors and Awards

2022 Preparing Future Faculty Fellow ($500)
2022 Duke Professional Development Fund ($250)
2020 NSF Graduate Research Fellowship Program – Honorable Mention
2019 Pratt Gardner Fellowship ($10,000)
2018 Slotman Award for Excellence in New Student Services
2015 Croul Family Scholarship ($4,000)

Publications

Waterman, T., Bragg, A., Katul, G., Chaney, N. (2022) "Examining Parameterizations of Potential Temperature Variance Across Varied Landscapes for use in Earth System Models" *Journal of Geophysical Research: Atmospheres*, 127, https://doi.org/10.1029/2021JD036236

Waterman, T., Bragg, A., Hay-Chapman, F. et. al. (2023) A Two-Column Model Parameterization for Subgrid Surface Heterogeneity Driven Circulations. Preprint. ESS Open Archive. In Revision. *Journal of Advances in Modelling Earth Systems*. https://doi.org/10.22541/essoar.169111704.41223034/v1

Fowler, M., Neale, R., **Waterman, T.**, et. al (2024) Assessing the Atmospheric Response to Subgrid Surface Heterogeneity in the Single-column Community Earth System Model, version 2 (CESM2). *Journal of Advances in Modelling Earth Systems, 16(3). https://doi.org/10.1029/2022MS003517*

Torres Rojas, L., **Waterman, T.**, Cai, J., Zorzetto, E. Wainwright, H., Chaney, N. (2024) The observed spatio-temporal patterns of Land surface temperature over the Contiguous United States. Submitted to *Journal of Geophysical Research: Atmospheres.*

Bacelar, L., Torres Rojas, L., Vergopolan, N., **Waterman, T.,** Chaney, N. Leveraging clustering to enable locally relevant and computationally efficient runoff predictions. Submitted to *Journal of Hydrology*. Preprint: http://dx.doi.org/10.2139/ssrn.4737923

Lau, R., Seguí, C. **Waterman, T.,** Chaney, N., Veveakis, M. (2024) InSAR-Informed In-Situ Monitoring for Deep-Seated Landslides: Insights from El Forn (Andorra). Submitted to *Journal for Remote Sensing and the Environment.* Preprint: https://doi.org/10.48550/arXiv.2311.01564

Talks, Posters and Presentations

Waterman, T. , Bragg, A., Hay-Chapman, F., Dirmeyer, P., Fowler, M., Chaney, N. "Parameterizing the Large Scale Impact of Land Surface Heterogeneity Induced Circulations on Convective Cloud Development" European Geophysical Union General Assembly, Talk, Vienna, Austria, 2023

Waterman, T., Bragg, A., Hay-Chapman, F., Dirmeyer, P., Fowler, M., Chaney, N. "Parameterizing the Large Scale Impact of Land Surface Heterogeneity Induced Circulations on Convective Cloud Development" National Center for Atmospheric Research Climate and Global Dynamics, Invited Talk, Boulder, CO, 2023

Waterman, T. Bragg, A., Hay-Chapman, F., Dirmeyer, P., Fowler, M., Chaney, N. "A Two Column Model for Parameterizing Heterogeneity-Driven Sub-Grid Circulations" Coupling of Land and Atmospheric Sub-grid Parameterizations (CLASP) Project Meeting Princeton GFDL. Invited Talk* (assisted with organization after invitation) Princeton, NJ, 2023

Waterman, T. Bragg, A., Chaney, N. "Modeling the Impact of Sub-Grid Land Surface Heterogeneity on Convective Cloud Development in Earth System Models" American Meteorological Society 103rd Annual Meeting, Poster, Denver, 2023

Waterman, T. Bragg, A., Chaney, N. "Modeling the Impact of Sub-Grid Land Surface Heterogeneity on Convective Cloud Development in Earth System Models" American Geophysical Union Fall Meeting, Poster, Chicago, 2022

Waterman, T., Chaney, N. "A Multi-Column Approach to Resolving Heterogeneity Induced Secondary Circulations" European Geophysical Union General Assembly, Talk, Remote, 2022

Waterman, T., Laura, T., Chaney, N. "Exploring How Heterogeneities in Land Surface Temperature Drive the 'Missing Flux'" Frontiers in Hydrology Meeting, Poster, 2022

Waterman, T., Chaney, N. "Capturing the Effects of Surface Flux Heterogeneity on the Lower Sub-grid Atmosphere in Earth System Models with a Multi-Column Approach" American Geophysical Union Fall Meeting, Poster, 2021

Waterman, T., Chaney, N. "A Multi-Column Approach to Resolving Heterogeneity Induced Secondary Circulations" Coupling of Land and Atmospheric Sub-grid Parameterizations (CLASP) Fall Project Meeting, Talk, Remote, 2021

Waterman, T., Chaney, N. "Evaluating and Improving Parameterizations of the Variance of Temperature Fluctuations Over Heterogeneous Landscapes for Surface Boundary Conditions in Atmospheric Models", European Geophysical Union General Assembly, Talk, Remote, 2021

Waterman, T., Chaney, N. "Parameterizing the Variance of Temperature Fluctuations Over Heterogeneous Landscapes for Surface Boundary Conditions in Atmospheric Models", American Geophysical Union Fall Meeting, Talk, Remote, 2020

Waterman, T., Chaney, N. "Improving Higher Order Surface Turbulence Statistics for CLUBB", Coupling of Land and Atmospheric Sub-grid Parameterizations (CLASP) Fall Project Meeting, Invited Talk, Remote, 2020

Leadership, Outreach and Service

Duke Hydrology and Fluid Dynamics (HFD) Seminar

Founder and Organizer (January 2022 –December 2023)

- Facilitating a biweekly space for students and postdocs in the HFD program to practice talks

Peer Reviewer

Earth and Space Science, Quarterly Journal of the Royal Meteorological Society

Engineers Without Borders (EWB) UC Berkeley Chapter

Chapter Education Director (November 2017 – November 2018)

- Established an educational curriculum for new members of the chapter, teaching technical and soft skills necessary to promote EWB's mission of international development

Chapter Vice President (May 2017 – January 2018)

- Organized and coordinated chapter meetings and project managers,

Project Manager (May 2016 – May 2017)

- Managed a 1500-person water project for a developing community including basic research, finances, design, planning, construction scheduling, and coordination between 30+ project members and professional contacts

UC Berkeley New Student Orientation

Orientation Mentor (December 2016 – May 2019)

- Organized events and trained orientation leaders to welcome new students
- Facilitated and helped train orientation leaders to facilitate diversity equity and inclusion (DEI) training for students covering implicit bias and awareness of socio-economic barriers in academia among other topics

Memberships

American Geophysical Union (2019 – present)
Member Society of Duke Fellows (2019 – present)
American Meteorological Society (2022 – present)
Member UC Berkeley Chi Epsilon Civil Engineering Honors Society (2016 – 2019)