Kelsey Murphy

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PhD candidate at Rice University with expertise in climate science, hydroclimate change, and science communication. integrating data-driven analysis with systems-level thinking to investigate impacts on the Mississippi River Basin. Passionate about advancing innovative, impactful approaches to climate resilience through research, public engagement, and mentorships.

EDUCATION

Rice University, Department of Earth, Environmental, and Planetary Sciences, Houston, TX, USA
PhD, Earth Science *anticipated defense date*: May, 2026
Advisor: Dr. Sylvia Dee, PhD
Dissertation Title: Last Millennium Changes in Mississippi River Basin Hydroclimate as a Framework for Understanding Future Anthropogenic Impacts

University of Massachusetts, Amherst, Massachusetts, USA
BSc, Geology - 2019

Massasoit Community College, Brockton, Massachusetts, USA
AA, Liberal Arts - Media Communications - 2016

RESEARCH AND SCHOLARSHIP

Murphy, K., Dee, S., Doss‐Gollin, J., Dunne, K. B., O'Donnell, M., & Muñoz, S. (2024). Competing influences of land use and greenhouse gas emissions on Mississippi River Basin hydroclimate simulated over the Last Millennium. *Paleoceanography and Paleoclimatology*, 39(7), e2024PA004902.

Murphy, K., Dee S. G., Hancock, C. L., Pitchon, E., Doss-Gollin, J., Wallace, E. J., Muñoz, S. E. (In press). Bermuda High and Great Plains Low-Level Jet Drive Changes in Mississippi River Basin Hydroclimate from Last Millennium to 2100. *Journal of Geophysical Research: Atmospheres*.

Hancock, C. L., Dee S. G., Haider, M. R., Doss-Gollin, J., Lehner, F., **Murphy, K.**, Muñoz, S. E. (In press). Robust 21st century hydrological trends in the Mississippi River basin from CMIP6: west-gets-drier, east-gets-wetter. *Journal of Climate*.

O'Donnell, M., **Murphy, K.**, Doss-Gollin, J., Dee, S., & Munoz, S. (2025). Evaluation of hydroclimatic biases in the Community Earth System Model (CESM1) within the Mississippi River basin. *Hydrology and Earth System Sciences*, 29(18), 4637-4660.

RESEARCH AND PROFESSIONAL TRAINING

Graduate Research Assistant - Rice University - 2021-present
- Conduct research on the evolution of the Mississippi River basin's large-scale hydrology over the Last Millennium and into the 21st century.
- Manage large datasets and employ statistical and machine learning models to analyze climate and hydrological data.
- Direct contributions from high school and undergraduate students to enhance data collection, analysis, and visualization in hydroclimate research.

Field Assistant - El Yunque National Forest, Puerto Rico - 2022
- Collected and prepared water samples during high-discharge events to support water isotope analysis aimed at understanding shallow flowpath activation across different watershed lithologies under varying hydrologic conditions.

Office Assistant - University of Massachusetts - 2018-2019
- Renovated the primary storage space for research samples collected by the Geosciences Department over the last 60+ years, ensuring the organization and accessibility of critical data for ongoing research.
- Assisted faculty and staff with exam preparation and various research-related tasks.

AWARDS, HONORS, AND FUNDING

Graduate Fellowship, Rice University Center for Teaching Excellence – 2024/25
- Awarded $1,000 fellowship to create and lead teaching workshops and mentor graduate students in effective teaching strategies.

Mills-Bennett Fellowship, Rice University Earth, Environmental and Planetary Sciences - 2024
- Awarded 12-month stipend (approx. $36,000) for exceptional academic performance and research on past and future hydroclimate variability over the Mississippi River Basin, with emphasis on the occurrence, movement, and distribution of water.

OSPA, American Geophysical Union Fall Meeting - 2022
- Awarded $200 for outstanding student research presentation and effective science communication

Ken Kennedy Institute Computational Science and Engineering Fellowship – 2021
- Selected as one of the top 10-20% of incoming EEPS graduate students, recognized for academic excellence and awarded a bonus stipend of $15,000 in recognition of outstanding potential and achievements during the admission cycle.

SCIENTIFIC PRESENTATIONS AND CONFERENCE ABSTRACTS

Murphy, K., Dee, S., Gebhart, E., Hancock, C., O'Donnell, M., Vergopolan, N., Doss-Gollin, J., & Muñoz, S. (2025). Investigating the Relationship between Hydroclimate Whiplash and Anomalous Atmospheric Moisture Pathways in the Mississippi River Basin. American Geophysical Union, Fall Meeting. (Oral presentation)

Gebhart, E., Hancock, C., **Murphy, K**., Dee, S., Doss-Gollin, J., & Muñoz, S. (2025). Analysis of the Effects of Spatial Resolution in Climate Models on Precipitation Values in the Mississippi River Basin. American Geophysical Union, Fall Meeting.

Hancock, C. L., Dee S. G., Haider, M. R., **Murphy, K**., Doss-Gollin, J., Lehner, F., & Muñoz, S. E. (2025). Robust 21st century hydrological trends in the Mississippi River basin from CMIP6: west-gets-drier, east-gets-wetter. American Geophysical Union, Fall Meeting.

Hartigan, N., Dee, S., **Murphy, K**., Hancock, C., & Steiger, N. (2025). Contemporary Wet Extremes in the Middle East in the Context of the Last Millennium. American Geophysical Union, Fall Meeting.

Murphy, K., Dee, S., Wallace, E.J., Pitchon, E., Doss-Gollin, J., & Muñoz, S. (2025). Last Millennium Changes in Mississippi River Basin Hydroclimate as a Framework for Understanding Future Anthropogenic Impacts. AI for Climate Risk & Resilience Summer Seminar Series. (Oral presentation)

Murphy, K., Dee, S., Wallace, E.J., Pitchon, E., Doss-Gollin, J., & Muñoz, S. (2025). Last Millennium Changes in Mississippi River Basin Hydroclimate as a Framework for Understanding Future Anthropogenic Impacts. PAGES (Past Global Changes), 7th Open Science Meeting. (Oral presentation)

Murphy, K., Dee, S., Wallace, E.J., Pitchon, E., Doss-Gollin, J., & Muñoz, S. (2025). Dynamical Drivers of Changing Rainfall and Flood Risk in the Mississippi River Basin from the Last Millennium to the 21st Century. American Meteorological Society, 105th Annual Meeting. (Poster presentation)

Murphy, K., Dee, S., Wallace, E.J., Pitchon, E., Doss-Gollin, J., & Muñoz, S. (2024). Last Millennium Changes in Mississippi River Basin Hydroclimate Driven by Anthropogenic Forcing and Atmospheric Dynamics. American Geophysical Union, Fall Meeting. (Oral presentation)

Hartigan, N., Dee, S., **Murphy, K.**, Steiger, N.J. (2024). Recent Flooding in the Middle East in the Context of the Last Millennium. American Geophysical Union, Fall Meeting.

Wiman, C., **Murphy, K.**, Dee, S., Muñoz, S.E. (2024). Enhanced discharge of the lower Mississippi River due to historic land use and land cover change. American Geophysical Union, Fall Meeting.

Murphy, K., Dee, S., Doss-Gollin, J., Dunne, K., O'Donnell, M., & Muñoz, S. (2024). Attributing the Impacts of Last Millennium Land Use and Greenhouse Gas Emissions on Mississippi River Basin Hydroclimate. 18th Annual Graduate Climate Conference. (Poster presentation)

Murphy, K., Dee, S., Muñoz, S., Pitchon, E., Wallace, E.J., O'Donnell, M., & Doss-Gollin, J. (2023). Last Millennium Changes in Mississippi River Basin Hydrology driven by the Bermuda High and Great Plains Low Level Jet. American Geophysical Union, Fall Meeting. (Poster presentation)

Murphy, K., Dee, S., Muñoz, S., Dunne, K., O'Donnell, M., & Doss-Gollin, J. (2023). Competing Influences of Anthropogenic and Natural Climate Change on Mississippi River Basin Hydroclimate. 21st International Swiss Summer Climate School: Climate-Water-Energy-Food-Nexus Poster Session.

Murphy, K., Dee, S., Muñoz, S., Dunne, K., O'Donnell, M., & Doss-Gollin, J. (2022). The Mississippi River's Hydrologic Response to Natural vs. Anthropogenic Forcing from the Last Millennium through the 21st Century. American Geophysical Union, Fall Meeting. (Poster presentation) -*Recipient of Outstanding Student Presentation Award*

Murphy, K., Dee, S. & Luo, X. (2022). The Mississippi River's Hydrologic Response to Natural and Anthropogenic External Climate Forcing over the Last Millennium. Energy HPC Conference. (Poster presentation)

Murphy, K. (2022). Insights from the Last Millennium: Past and Future Hydroclimate Extremes on the Mississippi River Basin. Annual Department Seminar Presentation, GIESS. (Oral presentation)

TEACHING AND MENTORING

EXPLORE Program Graduate Mentor – Rice University - Summer 2025

- Supervised a rising senior in developing an original research project, performing analyses, and producing publication quality figures, which led to an AGU conference presentation and preparation of a peer reviewed article.

Gulf Scholars Program Graduate Student Team Adviser – Rice University - Summer 2024

- Mentored 4 undergraduate students on a research project focused on climate change impacts and solutions in Gulf Coast communities.
- Facilitated group discussions and provided individual coaching on research design, presentation skills, and project development.
- Guided students in developing a Houston Climate Justice Museum exhibit on hydroclimatic trends and their impact on the Gulf Coast.

Graduate Teaching Assistant – Rice University - Summer 2024

- TA for Climate Justice Storytelling Workshop: Helped develop and facilitate a 4-week workshop focused on communicating climate justice narratives.
- Worked with 20 students from diverse backgrounds to create compelling narratives that combine science and social justice.

Invited Speaker – Gulf Scholars Conference - Summer 2024

- Led a discussion table for undergraduate students in the Gulf Scholar program during a 2-hour conference session, facilitating conversations on mentorship, networking, and role modeling in higher education.

Graduate Teaching Assistant – Rice University - Spring 2024

- TA for EEPS 107: Climate Change and Extreme Weather.
- Lead discussion sections and assist students with course materials on climate science and extreme weather events.
- Provide feedback on assignments and mentor students through course-related projects.

Guest Lecturer – Rice University - Summer 2023

- Prepared 8 REU students for field work at St. Mary's Glacier by delivering presentations on paleoclimate records, focusing on ice cores and glaciers, and facilitated related hands-on activities.

Guest Lecturer – Rice University - Spring 2023

- Delivered lecture on Discoveries in Earth, Environmental, and Planetary Sciences (ESCI 114) to 15 undergraduate students.

- Designed and presented materials on paleoclimatology and its relevance to modern climate change.

PROFESSIONAL DEVELOPMENT ACTIVITIES

Teaching and Learning Certificate – Fall 2023-24
- Completed a 4-course graduate certificate program offered by the Center for Teaching Excellence at Rice University, focused on evidence-based pedagogical practices.
- Developed future course material, crafted teaching philosophy, and delivered mock lectures. Workshop materials are publicly available via DOI: https://doi.org/10.25611/JM00-DW66.

Climate Change AI Summer School – Summer 2024
- Participated in a virtual summer school focused on the intersection of artificial intelligence and climate action, gaining knowledge from experts through lectures and hands-on tutorials to enhance skills in applying AI to climate-related challenges.

Nvidia Machine Learning Workshop – Spring 2024
- Attended an intensive workshop focused on machine learning methods with the goal of integrating AI tools into hydroclimate research and data analysis.

PaleoCAMP – Summer 2023
- Participated in a paleoclimate workshop focused on applying climate models to paleoclimatic data.
- Learned new methodologies for analyzing past climate data using paleoclimatological proxies.

Machine Learning Bootcamp – Spring 2022
- Completed a bootcamp focused on applying machine learning to individual research.

SERVICE AND OUTREACH

Guest Speaker for Young Women's College Prep Academy – Summer 2025
- Invited to speak with high school students interested in coding and data science.
- Shared experiences as a graduate researcher and introduced applications of data in climate and environmental science.

Guest Speaker for Science National Honor Society Seminar Night – Spring 2024
- Delivered lecture to James E. Taylor High School students, providing an overview of climate science, insights from graduate research, and guidance on preparing for college pathways in STEM.

Volunteer for Academic Fair – Fall 2023/24
- Participated in the Rice University Academic Fair, representing the Environmental Sciences department and engaging prospective students.

Member of URGE Action Group – Spring 2024
- Joined the URGE (Unlearning Racism in Geoscience) action group to promote diversity and inclusivity within the department.

Volunteer and Workshop Developer for the Girl Scout Climate Challenge – Fall 2023
- Mentored 50+ K-12 girls on climate science concepts, guiding them through interactive climate projects.

GeoUnion President – Fall 2022-Spring 2023
- Led the GeoUnion student organization, organizing events to promote inclusivity and support for graduate students in the geosciences.

SKILLS AND PROFICIENCIES

Programming Languages: Python, R, Julia, Matlab
Software: LaTeX, Microsoft Office Suite, ArcGIS, MATLAB
Data Science & Analysis: Machine Learning, Statistical Modeling, Data Visualization