

# SHANICE BAILEY

Climate Scientist

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## EDUCATION

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Columbia University Graduate School of Arts & Science	
<b>PhD</b> , Earth and Environmental Sciences	<b>2024</b>
Dissertation: <i>Water mass transformation through the lens of numerical models and observations</i>	
Advisor: Dr. Ryan P. Abernathey	
<b>MPhil</b> , Earth and Environmental Sciences	<b>2021</b>
<b>MA</b> , Earth and Environmental Sciences	<b>2020</b>
Columbia University School of Professional Studies	
<b>Postbaccalaureate Student</b>	<b>2017 – 2018</b>
Boston University	
<b>B.A., Environmental Sciences &amp; Wildlife- Ecology/Management</b>	<b>2012 – 2016</b>
Thesis: “Feeding Behavior of African Elephants ( <i>Loxodonta africana</i> ) in Tarangire-Manyara ecosystem”	

## PROFESSIONAL EXPERIENCE

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### **Postdoctoral Research Associate, Atmospheric and Oceanic Sciences**

*Princeton University – Geophysical Fluid Dynamics Laboratory* **2024 – Present**

- Analyze large-scale ocean and longterm datasets to investigate marine heatwaves and ocean circulation variability.
- Conduct novel analysis on the spatial pattern of sea surface temperature warming in the northwest Caribbean region.
- Produce scientific insights relevant to coastal communities and marine resource management
- Collaborate across interdisciplinary research teams to communicate complex environmental data

### **Graduate Research Assistance**

*Columbia University – Lamont Doherty Earth Observatory* **2018 – 2024**

- Investigated physical drivers of ocean circulation and interannual variability using numerical models and observational datasets.
- Applied an effective mathematical framework to investigate the spatio-temporal variabilities of different water masses both in the deep and surface ocean.
- Communicated research findings through publications, presentations, and collaborative projects

- Contributed to outreach and training programs focused on climate data science and environmental education for all ages.

## PUBLICATIONS

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First Author papers:

**Bailey, S.T.**, Gruenburg, L., Harrison, H., Narinesingh, V., Rand, K.: Marine Heat Extremes in the Gulf of Mexico in current and future climates: Frequency, Intensity, Duration, and Physical Drivers, *in preparation for Journal of Geophysical Research*.

**Bailey, S. T.**, Jones, C. S., Abernathey, R. P.: North Atlantic Subtropical Mode Water transformation by near surface eddy mixing in high resolution climate models, *In preparation for the Journal of Geophysical Research*.

**Bailey, S. T.** , Drake, H. F., Gruenburg, L. K., Abernathey, R. P., & Torres, M. I. (2025). The thermodynamics of the 2023 Gulf of Mexico Marine heatwave. *Geophysical Research Letters*, 52, e2024GL111768, <https://doi.org/10.1029/2024GL111768>, 2025 .

**Bailey, S. T.**, Jones, C. S., Abernathey, R. P., Gordon, A. L., and Yuan, X.: Water mass transformation variability in the Weddell Sea in ocean reanalyses, *Ocean Sci.*, 19, 381–402, <https://doi.org/10.5194/os-19-381-2023>, 2023.

*Professional Feature* – ArcGIS [StoryMap](#) featured on *Estimating the Circulation and Climate of the Ocean* group’s [Featured Publications](#) page. Highlights work from **Bailey, S.T., et al., 2023**.

Collaborations:

Narinesingh, V., Muse, N., Ortiz, L., Dixon, K., Jia L., and **Bailey, S.**: Projections of Miami Heat Index in High-Resolution Large Ensemble Climate Simulations, *Submitted to Geophysical Research Letters*, 2026.

Torres, M., Forget, G., **Bailey, S.**, Li, X., Turner, K., Drake, H.: A water mass transformation approach for understanding the physics of marine heatwaves, *In preparation for the Journal of Geophysical Research*.

Drake, H. F., **Bailey, S.**, Dussin, R., Griffies, S. M., Krasting, J., MacGilchrist, G., Stanley, G., Tesdal, J. E., & Zika, J. D. (2025). Water Mass Transformation Budgets in Finite-Volume Generalized Vertical Coordinate Ocean Models. *Journal of Advances in Modeling Earth Systems*, 17(3), Article e2024MS004383. <https://doi.org/10.1029/2024MS004383>.

## PRESENTATIONS & INVITED SEMINARS

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**NYC OceanTech Summit**

**June 2025**

The thermodynamics of the 2023 Gulf of Mexico Marine heatwave.

<https://doi.org/10.1029/2024GL111768>, 2025 .

**NSBP-NSHP Joint Conference****November 2024**

Career panel presentation: From the Surface of the Sun to the Bottom of the Sea, NOAA and the Need for more Physicists in Climate/Environmental Science and Service.

**Princeton University | Geophysical Fluid Dynamics Lab****November 2023**

Lunchtime Seminar

**Bailey, S. T.** , Jones, C. S., Abernathy, R. P., Gordon, A. L., and Yuan, X. (2020), Water-Mass Transformation in the Weddell Gyre, Abstract [HE44C-2128](#) presented at *Ocean Sciences Meeting 2020*, San Diego, CA, 16-21 Feb.

## TEACHING/OUTREACH EXPERIENCE

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**GFDL Onboarding Committee****May 2025**

Co-facilitated a Graduate School Application Workshop for summer interns at GFDL. Developed a presentation of relevant documents to prepare, and general timeline of the necessary steps in the application process. Also reviewed each intern's application documents and coordinated networking connections between interns and faculty members of interest.

**Caribbeans for Climate Panel Discussion****March 2025**

Panelist for public discussions around minority experience in the academic pipeline.

**Monmouth Junction Elementary School Science Fair****December 2024**

Served as a panelist for careers after undergraduate studies, as well as assisted with science experiments to teach students about fluid mechanics and thermodynamics.

**NSBP-HGS Mentoring program****2020-2023**

Mentor for a middle school and high school students through the National Society of Black Physicist and Harlem Gallery of Science Mentoring program. The program is directed at increasing educational resources in physics and mathematics available to students in low-income communities of color in Upper Manhattan and South Bronx. Currently serving as a mentor and role model for my students since they come from similar communities and family situations I grew up in.

**Co-Instructor for Coastal Ocean Environment Summer School****Summer 2023**

COESSING is an international collaboration aimed at advancing ocean science in West Africa and furthering ties between scientists in West Africa and elsewhere around the globe. One-week summer schools have been held every year since 2015. Contributed by helping plan the schedule for the

virtual component of the program and lectured on topics such as using JupyterLab and advanced use of Xarray package for research computing.

**Technical Support for Train-the-Trainer Bootcamp****Jan 5-6 2023**

The Center for Learning the Earth with Artificial Intelligence and Physics (LEAP) at Columbia University hosted Train-the-Trainer Bootcamp on Climate Data Science. Provided support for this two-day immersive, hands-on workshop. The bootcamp aims to teach Climate Data Science in the cloud using python tools with an emphasis on reproducibility and collaboration; and as part of LEAP's education programming to vertically integrate research and education, and forge a LEAP research and learning community.

**Software Carpentry Instructor****Summer 2021**

Co-developed and co-instructed a summer course tailored to teach doctoral students Python programming in the Biological Sciences department. Successfully implemented the course remotely via Zoom for lectures, Zulip for online discussions, and Google Colab for live-coding instructions.

**Teaching Assistant for Research Computing in Earth Science****Fall 2021**

TA for graduate-level course that teaches the basic foundations of Earth and Environmental Data Science which are often overlooked. Introduces modern computing software, programming tools, Python language and best practices that are broadly applicable to the analysis and visualization of Earth and Environmental data. The bulk of the content is devoted to in-depth exploration of the numerical analysis and visualization packages which comprise the modern Scientific Python ecosystem, including Scipy, Matplotlib, Pandas, Xarray, using real Earth and Environmental datasets.

**PyClub Outreach program****2020-2021**

Collaborated with colleagues in the Ocean & Climate Physics division to develop a high school level afterschool program teaching NYC students Python programming through the scope of oceanography. The curriculum was piloted as a virtual program in Spring 2021.

**Teaching Assistant for Science for Sustainable Development****Fall 2020**

Teaching Assistant for an undergraduate course that provided fundamental knowledge on some topics within the natural sciences that are critical to addressing sustainable development. After completing the course, students should be able to incorporate scientific approaches into their research or policy decisions and be able to interpret scientific

methods of data analysis.

**Curriculum Innovation Grant Fellow**

**2020**

Developed a technical training curriculum that promotes expanding skills in research computing. Software Carpentry certified, and trained in teaching technical topics, working closely with Columbia University's Foundation for Research Computing Program to facilitate a workshop that executes the developed curriculum.

**Girls Who Code Teacher**

**2019**

Developed syllabus and overall course structure, lectured for the class and designed practice problems.

**Tutor for Boston University Initiative for Literacy & Development**

**2012 – 2016**

Tutored K-12 grades with homework and test prep, and created activities that promoted math and literacy development in an afterschool program run by the local YMCA.

**SELECTED RELATED EXPERIENCE**

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Project Pythia Cook-off Hackathon

**Co-Author**

**June 11– 14 2024**

Cowrote a Project Pythia Cookbook called, "*Understanding extreme weather variability in the Caribbean region*". The "cookbook" is a tutorial for analyzing extreme weather events, both oceanic and atmospheric, in the Caribbean region. Students using the tutorial learn analytic tools using Python and common Python packages used in the Geosciences.

LDEO Ocean Transport Group

**Graduate Research Assistant**

**2018 – 2024**

As a PhD candidate, I investigated the physical drivers of water mass variability using ocean and climate models. More specifically, I have applied the water mass transformation framework to study: 1) the interannual variability of Weddell-Sea-derived Antarctic Bottom Water; 2) the transformation of North Atlantic Subtropical Mode Water due to eddy-induced lateral mixing in the near surface; and 3) the physical drivers behind the marine heatwave that occurred in the Gulf of Mexico in Summer 2023.

Environmental Systems Research Institute (Esri)

**Product Engineer Intern**

**Summer 2020**

Product Engineer intern within Esri's Spatial Analysis team. Completed goal for the summer to develop a prototype solution to calculate the optimal route for maritime transit and transport while

considering three major cost factors: time, energy and safety. The tool will ultimately provide users to customize their optimal route solution based on their unique, weighted set of priorities.

University of Washington

**Ocean Hack Week Participant**

**2019**

Participated in a week-long hackathon where I co-developed a Python package, Isopy, that allows users to calculate isosurfaces and tracer variables along isopycnals from 3D datasets. Key functions include computing the depths of isopycnals and isotherms, and vertical averaging above a selected isosurface.

School for Field Studies

**Student/Researcher**

**2015**

Created original elephant feeding behavior research project in the Tarangire-Manyara ecosystem, northern Tanzania – while under the advisement of Dr. Kioko, Wildlife Ecology professor. Devised the methods, wrote the proposal, conducted field data collection and analysis, composed final research paper and presented results to local community.

## PROFESSIONAL SERVICE

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Reviewer for Open-Source Tools, Frameworks, and Libraries

Reviewer for *EGUsphere*

## MEMBERSHIPS

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Girls Who Code - Teacher

American Geophysical Union – Member

Software Carpentry – Instructor

Caribbeans for Climates – Member

## RELEVANT SKILLS

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Python (Xarray, Matplotlib, Numpy, Dask, Cartopy); Geospatial analyst; data science/engineering; working with climate model data; teaching/outreach; curriculum development.