

HENRI F. DRAKE

305 Massachusetts Ave, Room 4081, Cambridge, MA 02139

(+1) 415 244 8829 ♦ henrifdrake@gmail.com

EDUCATION

MIT/WHOI Joint Program in Oceanography

2016 - Present

PhD Candidate in Physical Oceanography

Haverford College

2011 - 2015

B.S. in Mathematics, Magna Cum Laude

RESEARCH EXPERIENCE

Graduate Research Assistant, MIT/WHOI Joint Program in Oceanography

2016 - Present

- Developed a quasi-realistic high-resolution simulation of the Brazil Basin Tracer Release Experiment, to help interpret enigmatic results from the twenty-year old observational campaign, and to inform the practical planning of an upcoming follow-up campaign.
- Developed novel theoretical and numerical ocean circulation models to unite several independent decades-long research tracks into a unified conceptual model of abyssal ocean circulation and stratification.
- Developed a simple and user-friendly climate-economic model for use in climate education, outreach, and answering research questions that conventional Integrated Assessment Models are not well suited for.
- Decoded data from forgotten decades-old climate simulations and compared them against both historical observation data and modern generations of climate models (CMIP3, 5, 6).

Research Specialist in Physical Oceanography, Princeton University

2015 - 2016

- Simulated millions of Lagrangian particle trajectories in a high-resolution model of the Southern Ocean and analyzed the spatial and temporal pathways of deep ocean upwelling.

TEACHING EXPERIENCE

Organizer and Instructor (2020) for a student-led January-term workshop, *Practical Computing Tutorials for Earth Scientists (PraCTES)* [[course website](#)] at MIT. Responsibilities included curriculum design, development of code tutorials, assisting other instructors during live hands-one exercises, and presenting two 2 hour lectures.

Teaching Assistant (2019) for *Climate Change* [[MIT 6.S898 course website](#)], a project-based climate change seminar course cross-listed in the Computer Science and Earth, Atmospheric, and Planetary Sciences departments. Responsibilities included curriculum design, helping students with final projects, leading discussions of assigned readings, and presenting 3 hours of lectures on climate models and data analysis.

Guest Lecturer (2020) (1 hour session) Interactive Julia demo exploring climate feedbacks, instability, and multiple equilibria via a simple zero-dimensional energy balance model with the ice-albedo effect.

Guest Lecturer (2020) (1 hour session). Interactive [ClimateMARGO.jl](#) demo exploring trade-offs between emissions mitigation, carbon dioxide removal, solar geoengineering, and adaptation, for MIT course 12.884[J] *Dimensions of Geoengineering*.

Guest lecturer (2019) (1.5 hour session). Mixed blackboard-powerpoint lecture on abyssal ocean circulation for graduate-level physical oceanography course at University of Rhode Island Graduate School of Oceanography.

Lecturer (2017-2019) (four 1.5 hour sessions). Summer Math Review of Linear Algebra, ODEs, and PDEs for incoming graduate students in the Massachusetts Institute of Technology / Woods Hole Oceanographic Institution Joint Program in Oceanography.

Staff tutor (2014-2015) at Haverford College Math Question Center.

AWARDS

Goodwin Medal (Nominated), for a “graduate TA [...] who has performed above and beyond the norm, and whose teaching efforts can truly be characterized as ‘conspicuously effective’” [\[Description\]](#). 2019

National Science Foundation Graduate Research Fellowship [Awarded] 2017 - 2020

MIT Rosenblith Presidential Fellowship [Awarded] 2016 - 2017

RESEARCH PUBLICATIONS

In preparation

[Drake, H. F.](#), Ogden, K., Ledwell, J., Thurnherr, A., Ferrari, R. **Simulated Brazil Basin Tracer Release Experiments**. (in preparation).

[Drake, H. F.](#), Callies, J., Ogden, K., Ledwell, J., Thurnherr, A., Ferrari, R. **Dynamics of mixing-driven flow up and down Mid-Ocean Ridge fracture zone valleys** (in preparation).

[Drake, H. F.](#), Rivest, R. L., Deutch, J., Edelman, A. **A multi-control climate policy process for a trusted decision maker** (in preparation). [\[Preprint\]](#)

[Drake, H. F.](#), Lickley, M., Abbott, T., Brady, R. X. **Assessing climate model projections of anthropogenic warming patterns** (in preparation). [\[Preprint\]](#)

2020

5. [Drake, H. F.](#), Ferrari, R., Callies, J. **Abyssal circulation driven by near-boundary mixing: water mass transformations and interior stratification**. *Journal of Physical Oceanography*. [\[doi\]](#).
4. Hausfather, Z., [Drake, H. F.](#), Abbott, T., Schmidt, G. A. **Evaluating the performance of past climate model projections**. *Geophysical Research Letters*, **46**. [\[doi\]](#)

2018

3. [Drake, H. F.](#), Morrison, A. K., Griffies, S. M., Sarmiento, J. L., Weijer, W., Gray, A. R. (2018). **Lagrangian timescales of Southern Ocean upwelling in a hierarchy of model resolutions**. *Geophysical Research Letters*, **45**. [\[doi\]](#) [\[Read online\]](#)
2. van Sebille, E., Griffies, S. M., Abernathey, R., Adams, T. P., Berloff, P., Biastoch, A., Blanke, B., Chassignet, E. P., Yu Cheng, Y., Cotter, C. J., Deleersnijder, E., Döös, K., [Drake, H. F.](#), Drijfhout, S., Gary, S. F., Heemink, A. W., Kjellsson, J., Koszalka, I. M., Lange, M., Lique, C., MacGilchrist, G. A., Marsh, R., Adame, C. G. M., McAdam, R., Nencioli, F., Paris, C. B., Piggott, M. D., Polton, J. A., Rühls, S., Shah, S. H. A. M., Thomas, M. D., Wang, J., Wolfram, P. J., Zanna, L., Zika, J. D. (2018).

Lagrangian ocean analysis: fundamentals and practices. *Ocean Modelling*, **121**, 49-75. [\[doi\]](#)
[\[Download PDF\]](#)

2017

1. Tamsitt, V., [Drake, H. F.](#), Morrison, A. K., Talley, L. D., Dufour, C. A., Gray, A. R., Griffies, S. M., Mazloff, M. R., Sarmiento, J. L., Wang, J., Weijer, W. (2017). **Spiraling up: pathways of global deep water to the surface of the Southern Ocean.** *Nature Communications*, **8**, 172. [\[doi\]](#)
[\[Download PDF\]](#)

OTHER PUBLICATIONS

Freilich, M., Wilka, C., Shivamoggi, R., Freese, L., Heiderich, J., [Drake, H. F.](#), Cantine, M. (2019). **Young Climate Scientists Speak Out.** *Special Climate Crisis Issue of DigBoston* [\[url\]](#)

[Drake, H. F.](#) (2019). **Eight ways to support women in science.** *EOS* [\[doi\]](#) [\[Download PDF\]](#)

SERVICE

Seminar series, conferences, and workshops

Co-Organizer (2020-2021), **MIT EAPS Student Seminar.**

Co-Organizer (2020-2021), **MIT PAOC Sack Lunch Seminar (SLS).**

Executive Committee Co-Chair (2019), **Graduate Climate Conference.**

Executive Committee Member (2018), **Society for Women in Marine Sciences Annual Symposium.**

Executive Committee Member (2017, 2020), **Graduate Climate Conference** [\[url\]](#).

Department Retreat Committee Chair (2017), **MIT Program for Atmospheres, Oceans, and Climate.**

Departmental Leadership and Administrative roles

Student Representative for Physical Oceanography (2019-present), **MIT/WHOI Joint Program.**

Web developer [\[url\]](#) (2020-present), **Towards Inclusion and Diversity in EAPS (TIDE)**

DEI Scorecard maintainer [\[url\]](#), **Towards Inclusion and Diversity in EAPS (TIDE)**

Mentoring and Advising

Graduate Residential Advisor for **26 MIT undergraduates in Maseeh Hall** (2020-present)

“Near-peer” mentor for **1 WHOI Summer Student Fellow** (2020)

Peer mentor for **3 MIT/WHOI Joint Program PhD students** (2018-present)

Peer review

Reviewer for: *Nature* (1), *Ocean Sciences* (1), *Journal of Geophysical Research: Oceans* (1), *Journal of Physical Oceanography* (1).

OUTREACH

K-12 Outreach

- Active participant of [Skype-a-Scientist](#) program with over 15 virtual classroom visits (2016–present).
- *Ocean Currents* virtual lecture and discussion with several classrooms of 5th–8th grade students via [Exploring By The Seat Of Your Pants](#) [\[Youtube Recording\]](#) (2018)
- Rotating-tank fluid demonstrations at MIT Museum Girls Day event (2017, 2018, 2019).

- Rotating tank “Nor’Easter” demonstration for Science Club at Boston International School (2017).

General audience lectures

- *Climate Modelling: Whence, What, and Why* lecture for MIT EAPS administrative staff (2019)
- *Warming Oceans and Sea Level Rise* lecture at Science in the News DayCon symposium, open to local residents of Cambridge Sommerville, MA (2017, twice).

Online Science Communication

- Active climate science communicator on Twitter.com (@henrifdrake), 2500+ followers.
- Active on [reddit.com/r/science/](https://www.reddit.com/r/science/), an online science forum with 20+ million members, where I am an accredited panelist on the topics of Ocean Circulation and Climate Modelling (/u/aClimateScientist) have had over 26,000 users engage with my educational comments.
- Founder of **Climate Gamers**, a program that used computer games to communicate climate science.

FIELD WORK

Upcoming (2021)	Bottom Layer Turbulence (30-40 day cruise). Will investigate the turbulent bottom boundary layer along the continental slope of the Rockall Trough (off the west coast of Ireland), using a combination of ship-based casts, anchored mooring arrays, free-falling profilers, and inert tracer injections to measure turbulence statistics.
2018	MIT-WHOI Joint Program Orientation (10 days on <i>R/V Corwith Cramer</i>). Conducted hydrographic and biological surveys of the shelf break jet south of Cape Cod and a warm core eddy on the northern flank of the Gulf Stream.

SELECTED PRESENTATIONS

- Drake, H. F., Hausfather, Z., Abbott, T., Schmidt, G. (2019). **How accurate have climate models been so far?** *Graduate Climate Conference*, Woods Hole, MA. [POSTER]
- Drake, H. F., Callies, J., Ferrari, R. (2019). **Circulation and stratification of an abyssal ocean controlled by bottom boundary mixing.** *Atmospheric and Oceanic Fluid Dynamics (AOFD) Conference*, Portland, ME. [POSTER]
- Drake, H. F., Callies, J., Ferrari, R. (2018). **Impact of Mixing Layer Flows on the Abyssal Circulation and Stratification.** *Workshop on Bottom Boundary Layer Turbulence and the Ocean Overturning Circulation*, Massachusetts Institute of Technology, MA. [TALK]
- Drake, H. F., Callies, J., Ferrari, R. (2018). **Boundary Mixing Forcing Abyssal Overturning.** *Gordon Research Conference on Ocean Mixing*, Hannover, NH. [POSTER]
- Drake, H. F., Callies, J., Ferrari, R. (2018). **Testing a New Paradigm for the Abyssal Ocean Circulation.** *Ocean Sciences Meeting*, Portland, OR. [TALK]
- Drake, H. F., Tamsitt, V., Morrison, A. K., Sarmiento, J. L., Griffies, S. M., Weijer, W., Gray, A. R., Talley, L., Wang, J., Mazzlof, M., Dufour, C. (2017). **Spatial and Temporal Structure of Southern Ocean Upwelling.** *Graduate Climate Conference*, Woods Hole, MA. [POSTER]
- Drake, H. F., Tamsitt, V., Morrison, A. K., Sarmiento, J. L., Griffies, S. M., Weijer, W., Gray, A. R., Talley, L., Wang, J., Mazzlof, M., Dufour, C. (2016). **Three-Dimensional Pathways of Deep Water Upwelling in the Southern Ocean.** *Southern Ocean Carbon and Climate Observations and Modelling (SOCCOM) Annual Meeting*, Scripps Institution of Oceanography, CA. [TALK]

[Drake, H. F.](#), Morrison, A. K., Sarmiento, J. L., Griffies, S. M., Weijer, W., Gray, A. R., Dufour, C. (2016). **Lagrangian Upwelling Pathways of Deep Waters in the Southern Ocean.** *Ocean Sciences Meeting*, New Orleans, LA. [POSTER]