

MARA FREILICH

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EDUCATION

- MIT-WHOI Joint Program**, Doctor of Philosophy in Physical Oceanography *expected May 2021*
Thesis: “Vertical Fluxes in the Upper Ocean” advised by Dr Amala Mahadevan
- Brown University**, Bachelor of Science in Applied Math with honors, *magna cum laude* *May 2015*
Thesis: “Numerical modeling of the effect of transport processes on ocean biogeochemistry” with Professor Baylor Fox-Kemper and Professor Bjorn Sandstede

PEER REVIEWED PUBLICATIONS

9. **Freilich, M.**, Rebolledo, R., Corcoran, D., and Marquet, P. (2020). *Reconstructing ecological networks with noisy data*. Proceedings of the Royal Society A. 476 (2237), 20190739.
8. Dever, M., **Freilich, M.**, Farrar, J.T., Hodges, B., Lanagan, T., Baron, A., Mahadevan, A., (2020). *EcoCTD for profiling oceanic physical-biological properties from an underway ship*. Journal of Atmospheric and Oceanic Technology. 37 (5), 825-840.
7. Shroyer, E., Gordon, A., Spiro Jaeger, G., **Freilich, M.** Waterhouse, A., Farrar, J.T., Sarma, VVSS., Venkatesan, R., Weller, R., Moum, J., and Mahadevan, A. (2019) *Upper Layer Thermohaline Structure of the Bay of Bengal during the 2013 Northeast Monsoon*. Deep Sea Research II, 104630.
6. **Freilich, M.** and Mahadevan, A. (2019). *Decomposition of vertical velocity for nutrient transport in the upper ocean*. Journal of Physical Oceanography, 49 (6), 1561-1575.
5. **Freilich, M.**, Weiters, E., Broitman, B., Navarrete, S. (2018) *Species co-occurrence networks: can they reveal trophic and non-trophic interactions in ecological communities?*. Ecology, 99 (3), 690-699.
4. Mahadevan, A., Spiro-Jaeger, G., **Freilich, M.** Omand, M., Shroyer, E., Sengupta, D., Sharma, R. (2016) *Freshwater in the Bay of Bengal: Its fate and role in air-sea heat exchange*. Oceanography, 29 (2), 72-81.
3. Lucas, A.J., Nash, J.D., Pinkel, R., MacKinnon, J.A., Tandon, A., Mahadevan, A., Omand, M., **Freilich, M.**, Sengupta, D., Ravichandran, M., Le Boyer, A., and Moum, J. (2016) *Adrift upon a salinity-stratified sea: a view of upper ocean processes in the Bay of Bengal during the southwest monsoon*. Oceanography, 29 (2), 134-145.
2. Gordon, A., Shroyer, E., Mahadevan, A., Sengupta, D., and **Freilich, M.** (2016) *Bay of Bengal: Upper Ocean Circulation from the 2013 Northeast Monsoon*. Oceanography, 29 (2), 82-91
1. **Freilich, M.** and Connolly, S. (2015). *Phylogenetic Community Structure When Similarity-Based Competition and Environmental Filtering Determine Abundances*. Global Ecology and Biogeography, 24: 1390-1400.

Pre-prints

2. **Freilich, M.**, Mignot, A., Flierl, G., and Ferrari, R. (in prep). *Grazing dynamics reconcile critical depth and dilution-recoupling hypotheses for North Atlantic bloom*. Biogeosciences.
1. **Freilich, M.** and Mahadevan, A. (in prep). *Coherent pathways for vertical transport from the surface mixed layer to ocean interior*. JGR: Oceans.

HONORS, AWARDS, AND GRANTS

Awards

Fye Award for Excellence in Oceanographic Research Graduate Student Best Paper Award	2020
School of Science SPOT award	2019
Jerome L Stein Memorial Award , Division of Applied Math, Brown University	2015
Phi Beta Kappa	2014
American Meteorological Society Scholarship	2011

Fellowships

Martin Fellowship for Sustainability	2018-2020
Fulbright Fellowship	2016
National Defense Science and Engineering Graduate Fellowship	2015-2018
Royce Fellowship , Brown University research fellowship	2013

Grants

Access to the Sea , 1 day of ship time on R/V Neil Armstrong	2019
School of Science Quality of Life grant	2019
Grassle Fellowship Fund , \$7,500	2018
Montrym Fund , \$4,800	2018
MISTI-Chile – UC Graduate Student Seed Fund , \$20,000	2017-2018

FIELDWORK AND OTHER RESEARCH EXPERIENCE

Research cruises

- Physical Oceanography Ship Time Cruise (Northeast US Shelfbreak), Co-PI November 15-22, 2019
- Joint Program Cruise (Northeast US Shelfbreak), Co-Chief Scientist September 20-22, 2019
- Calypso (Western Mediterranean Sea), Biogeochemical sampling lead March 21 - April 12, 2019
- Calypso (Western Mediterranean Sea), Biogeochemical sampling lead June, 2018
- Investigating Vertical Exchanges (Mediterranean Sea), Biogeochemical sampling lead July 17-24, 2017

Climate Changed Research Group

September 2018-present

Co-PI

- Co-organized [conference and design competition](#) to facilitate interdisciplinary discussions and action about the uses of climate model projects in future architecture and planning.
- Editing a book with contributions from interdisciplinary scholars and policy-makers to facilitate knowledge exchange and utilization of climate science in architecture and planning.

Pontificia Universidad Católica de Chile

2016

Fulbright Scholar at Pontificia Universidad Católica de Chile and Universidad de Concepcion

- Investigated the use of network models to infer species interactions in microbial and intertidal communities.
- Developed stochastic models for food webs

Woods Hole Oceanographic Institution

Summer 2014

Summer Student Fellow

PI: Amala Mahadevan

- Investigated freshwater transport processes in the Bay of Bengal using satellite data in order to better understand and predict the South Asian monsoon.

Center for Environmental Studies, Brown University

2014

Research Assistant

PI: J. Timmons Roberts

- Researched strategies for adaptation to climate change and mitigation of carbon emissions.
- Wrote the *Resilient Rhode Island Act*, legislation addressing both mitigation of and adaptation to climate change.

- Lead a coalition of organizations to successfully pass the *Resilient Rhode Island Act* in the Rhode Island legislature.

ARC Centre for Excellence in Coral Reef Studies

Royce Fellow

Summer 2013

PI: Sean Connolly

- Studied the effectiveness of current methods of incorporating phylogenetic information into ecological diversity metrics to infer ecological community assembly processes.

Marine Biological Laboratory

Intern funded by Brown-MBL LINK Award

2012

PI: Linda Amaral-Zettler

- Investigated the haptophyte algae bloom ecology, alkenone production, and dependence on temperature and water chemistry.

PRESENTATIONS

Invited presentations

3. *Vertical transport of biogeochemical tracers in the upper ocean.*
 - Woods Hole Oceanographic Institution Department of Physical Oceanography (July 2019)
 - Brown University Department of Earth, Environmental, and Planetary Sciences (October 2018)
2. **Freilich, M.**, Mahadevan, A. (2015 January). *Lagrangian modeling of Aquarius surface salinity in the Bay of Bengal*. Talk at Princeton University Department of Atmospheric and Oceanic Sciences.
1. **Freilich, M.**. (2014 Fall). *A Vision for a More Resilient Rhode Island*. Intensive Workshop on Greenhouse Gas Emissions Reductions in RI: From Goals to Implementation, Providence, RI.

Other presentations and meeting participation

14. **Freilich, M.**, Pacini, A., Suca, J., Lobert, L., (22 co-authors) Gawarkiewicz, G. (2020). *Hurricane Dorian Impacts on Northeast US Shelf Marine Hydrography and Ecosystem*. Poster session at Ocean Sciences Meeting.
13. **Freilich, M.** and Mahadevan, A. (2020). *The Vertical Structure of Vertical Velocity*. Talk presented at Ocean Sciences Meeting. San Diego, CA.
12. **Freilich, M.** and Mahadevan, A., (2020). *Is vertical nutrient supply influenced by phytoplankton physiology?*. Talk presented at Ocean Sciences Meeting. San Diego, CA.
11. **Freilich, M.**, Mignot, A., Flierl, G., and Ferrari, R. (2018 June). *Rethinking the critical depth: Non-linear mortality required to model wintertime phytoplankton growth*. Poster session presented at Ocean Carbon and Biogeochemistry meeting. Woods Hole, MA.
10. **Freilich, M.** and Mahadevan, A. *Deciphering Pathways for Vertical Nutrient Supply*. Poster presented at Gordon Research Conference.
9. Mahadevan, A., **Freilich, M.**, Ruiz, S., Farrar, J.T., Pascual, A., Poirier C., Worden, A. *Effects of vertical motion on phytoplankton at a front*. Poster session presented at Ocean Sciences Meeting. Portland, OR.
8. **Freilich, M.**, Curry, R., Flierl, G., Mahadevan, A. (2018 February) *Deciphering Pathways for Vertical Nutrient Supply*. Talk presented at Ocean Sciences Meeting. Portland, OR.
7. **Freilich, M.**, Rebolledo, R., Marquet, P. (2018 January) *Reconstructing species interaction networks from time series data: The effect of stochastic noise*. Talk presented at MIT Ecology Meeting. Cambridge, MA.
6. Session chair, Graduate Climate Conference [Sessions: Numerical Modeling of the Climate System and Outreach].

5. Session organizer, Ocean Carbon and Biogeochemistry meeting. [Session: Student lightning talks].
4. **Freilich, M.** and Mahadevan, A. (2016 May). *Lagrangian exploration of submesoscale vertical transport*. Poster session presented at Liege Colloquium on Submesoscale Dynamics. Liege, Belgium.
3. **Freilich, M.**, Fox-Kemper, B., Sandstede, B. (2015 May). *Mathematical Modeling of Oceanic Phytoplankton Blooms in Chaotic Flows*. Poster session presented at The Tony and Pat Houghton Conference on Non-Equilibrium Statistical Mechanics, Providence, RI.
2. **Freilich, M.**, Mahadevan, A. (2014 December). *Lagrangian modeling of Aquarius surface salinity in the Bay of Bengal*. Poster session presented at American Geophysical Union, San Francisco, CA.
1. **Freilich, M.**, Aluthge, D., Bryant, R., Knox, B., McAdams, J., Plummer, A., Schlottman, N., Stanley, Z., Suglia, E., and Watson-Daniels, J. (2014 December). *Undergraduate-driven interventions to increase representation in science classrooms*. Poster session presented at American Geophysical Union, San Francisco, CA.

Other publications

4. Paul Lerner, Hilary I. Palevsky, Julius Busecke, **Mara Freilich**, Emma Cavan, Yassir Eddebbar, Andrea Fassbender, Jonathan Lauderdale, Jessica Luo, Precious Mongwe, Britt Stephens, Shawnee Traylor. *CMIP6 Biogeochemistry* doi: <https://doi.org/10.5281/zenodo.3559209> [Project coordinator]
3. Dever, Mathieu, **Freilich, Mara**, Hodges, Benjamin A., Farrar, J. Thomas, Lanagan, Thomas, Mahadevan, Amala, "UCTD and EcoCTD Observations from the CALYPSO Pilot Experiment (2018): Cruise and Data Report", 2019-01, DOI:10.1575/1912/23637, <https://hdl.handle.net/1912/23637>
2. **Freilich, M.** (2018 September). *Forecasting Where Ocean Life Thrives*. Oceanus.
1. Haitians and Guantanamo: Who is a refugee? What is a refuge? Guantanamo Public Memory Project. National Traveling Exhibit. 2012.

TEACHING EXPERIENCE

Teaching Assistant

- Geophysical Fluid Dynamics (Dr Amala Mahadevan, MIT/WHOI), overall rating 6.7/7 Fall 2018
- Land Use and Capitalism (Professor Jo Guldi, Brown University) Fall 2014
- Principles of Ecology (Professor Jon Witman, Brown University) Spring 2013, 2014
- Intermediate Calculus (Professor Bianca Viray, Brown University) Fall 2013

Curriculum Assistant

Write climate science-related problem sets for first year math courses

Fall 2019

MIT

Coordinator and lecturer

Coordinate a 5 week course for incoming graduate students

Summer 2016-2019

WHOI Summer Math Review

Kaufman Teaching Certificate Program

Completed semester-long teaching course

Fall 2017

MIT

University Course Guest Lectures

- Ethics Seminar, MIT 2020
- Social Movements in Boston, Northeastern University 2019
- Biophysical Interactions, MIT/WHOI 2019

English for Action

ESOL and math volunteer coordinator and facilitator

2012-2015

Providence, RI

- Curriculum design for participatory math and English classes for adult immigrants

LEADERSHIP EXPERIENCE AND OTHER PROFESSIONAL ACTIVITIES

Academic and University Service

Reviewer for AGU books, FEMS Microbiology Reviews, The ISME Journal, Science Advances, Biogeosciences

Abstract reviewer for SACNAS

Society for Women in Marine Science, treasurer 2019 - present

Graduate Climate Conference, executive committee 2017, 2019

Joint Program Applicant Support, coordinator 2019

EAPS Graduate Student Advisory Council, peer mentorship coordinator 2017-2019

recognized with MIT School of Science award for mentorship program

Program in Atmosphere, Ocean, and Climate Colloquium Committee, chair 2017-2018

Women in Course XII, core board member 2017

Public presentations and outreach

Invited panelist, Oceans and Climate, MIT Science Policy Initiative November 2019

Outreach in schools, 12 presentations in English and Spanish to over 300 students 2015 - present

Public Lecture Series on Climate Science and Policy January 2016