

**Dr. Kay McMonigal (he/him or they/them)**

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**EDUCATION**

- 2020      **Ph.D.**, University of Miami (UM) Rosenstiel School of Marine and Atmospheric Sciences (RSMAS)  
 Meteorology and Physical Oceanography  
 Dissertation: *Estimating a time-series of South Indian Ocean heat transport*  
 Advisor: Lisa Beal
- 2015      B.A., Northwestern University  
 Earth and Planetary Sciences, Math, Integrated Sciences, minor: Gender Studies

**EMPLOYMENT**

- 2023 -      Assistant Professor of Oceanography  
 University of Alaska Fairbanks, College of Fisheries and Ocean Sciences
- 2020 - 2023    Postdoctoral Scholar  
 MEAS, North Carolina State University. Advisor: Sarah Larson
- 2022      Visiting Instructor  
 Duke University, course: *The Climate System*
- 2015 - 2020    Graduate Research Assistant  
 University of Miami RSMAS
- 2014 - 2015    Undergraduate Research Assistant  
 Northwestern University Earth and Planetary Sciences (EPS)

**PUBLICATIONS - PEER REVIEWED**

\*NCSU student first author

[8] **McMonigal, K.**, Larson, S., Hu, S., & Kramer, R. (2023). Historical changes in wind-driven ocean circulation can accelerate global warming. *Geophysical Research Letters*, 50, e2023GL102846. <https://doi.org/10.1029/2023GL102846>  
*Highlighted as AAAS Editors' Choice In Other Journals: <https://www.science.org/doi/10.1126/science.adh4769>*

- [7] Hasan, M.\*, S. Larson, **K. McMonigal** (2022), Hadley cell edge modulates the role of Ekman heat flux in a future climate, *Geophysical Research Letters*. <http://doi.org/10.1029/2022GL100401>
- [6] Gunn, K.L., **K. McMonigal**, L.M. Beal, S. Elipot (2022), Decadal and Intra-annual Variability of the Indian Ocean Freshwater Budget, *Journal of Physical Oceanography*. <https://doi.org/10.1175/JPO-D-22-0057.1>
- [5] **McMonigal, K.**, K.L. Gunn, L.M. Beal, S. Elipot, & J.K. Willis (2022). Reduction in Meridional Heat Export Contributes to Recent Indian Ocean Warming, *Journal of Physical Oceanography*, 52(3), 329-345. <https://journals.ametsoc.org/view/journals/phoc/52/3/JPO-D-21-0085.1.xml>
- [4] **McMonigal, K.**, S. Larson (2022), ENSO explains the link between Indian Ocean Dipole and ocean meridional heat transport, *Geophysical Research Letters*, 49. DOI: [10.1029/2021GL095796](https://doi.org/10.1029/2021GL095796).
- [3] **McMonigal, K.**, L.M. Beal, S. Elipot, K. Gunn, T. Morris, J. Hermes, A. Houk (2020): The impact of meanders, deepening and broadening, and seasonality on Agulhas Current temperature variability, *Journal of Physical Oceanography*, **50** (12). DOI: [10.1175/JPO-D-20-0018.1](https://doi.org/10.1175/JPO-D-20-0018.1)
- [2] Gunn, K.L., L.M. Beal, S. Elipot, **K. McMonigal**, A. Houk (2020): Mixing of subtropical, central and intermediate waters driven by shifting and pulsing of the Agulhas Current, *Journal of Physical Oceanography*, **50** (12). DOI: [10.1175/JPO-D-20-0093.1](https://doi.org/10.1175/JPO-D-20-0093.1)
- [1] **McMonigal, K.**, L.M. Beal, and J.K. Willis (2018): The seasonal cycle of the south Indian Ocean subtropical gyre circulation as revealed by Argo and satellite data, *Geophysical Research Letters*, **45** (17). DOI: [10.1029/2018GL078420](https://doi.org/10.1029/2018GL078420)

## PUBLICATIONS - IN REVIEW

- [1] McMonigal, K., Talia Evans, et al (12 authors). Navigating gender at sea, in review with *AGU Advances*.

## PUBLICATIONS - IN PREPARATION

- [3] Fu, S., S. Hu, X.-T. Zheng, S. Larson, **K. McMonigal**, Wind driven ocean circulation changes induce historical eastern equatorial Pacific Warming.
- [2] Larson, S., **K. McMonigal**, Y. Okumura, D. Amaya, A. Capotondi, K. Bellomo, I. Simpson, A. Clement, Ocean realism shapes sea surface temperature variability in a CESM2 coupled model hierarchy.

[1] Gunn, K.L., **K. McMonigal**, L.M. Beal, S. Elipot, Eddy heat fluxes within the Agulhas Current.

## INVITED TALKS

- 2023      *The role of wind driven ocean circulation changes in climate*  
UW Applied Physics Lab, Seattle, WA
- 2022      *The role of the wind driven ocean circulation in climate*  
Lamont-Doherty Earth Observatory Ocean and Climate Physics Seminar series  
(virtual)
- 2022      *Combining observations and models to understand the role of the ocean in climate*  
University of Maine School of Marine Sciences, Orono, ME
- 2022      *Combining observations and models to understand the role of the ocean in climate*  
URI Graduate School of Oceanography, Narragansett, RI
- 2022      *Why is the Indian Ocean warming so rapidly?*  
NOAA AOML, Miami, FL (virtual)
- 2021      *Estimating a time series of South Indian Ocean heat transport*  
Physical Oceanography Dissertation Symposium, HI
- 2021      *Why is the Indian Ocean warming so rapidly?*  
George Mason University, Fairfax, VA (virtual)
- 2021      *Convergence Indian Ocean heat transport drives recent warming*  
CASPO seminar, Scripps Institute of Oceanography, San Diego, CA (virtual)

## SELECTED SCIENTIFIC PRESENTATIONS

- 2023      *Effect of Indian Ocean Dipole on meridional ocean heat transport depends on ENSO*  
European Geophysical Union, Vienna, Austria
- 2023      *The role of wind driven ocean circulation changes in climate change in CESM2*  
Climate and Global Dynamics Seminar, NCAR (virtual)
- 2022      *Wind driven ocean redistribution of heat leads to increased anthropogenic surface warming over 1979-2014 in CESM2*  
American Geophysical Union (Chicago, IL)

- 2022 *Drivers of Atlantic SST variability in a coupled model hierarchy (poster)*  
Atmospheric and Oceanic Fluid Dynamics conference (Breckenridge, CO)
- 2022 *Anthropogenically forced wind driven ocean redistribution of heat leads to increased warming over the historical period (poster)*  
CLIVAR pattern effect workshop (Boulder, CO)
- 2022 *What role do wind driven ocean circulation trends play in the rate of global warming?*  
NCSU MEAS department symposium (Raleigh, NC)
- 2022 *ENSO explains the link between Indian Ocean Dipole and meridional heat transport*  
Ocean Sciences Meeting (virtual): [YouTube](#)
- 2022 *ENSO explains the link between Indian Ocean Dipole and meridional heat transport*  
Climate Variability and Change Working Group (virtual)
- 2022 *Why is the Indian Ocean warming so rapidly?*  
South African Network for Coastal and Oceanic Research seminar (virtual)
- 2022 *Why is the Indian Ocean warming so rapidly?*  
Woods Hole Oceanographic Institute seminar series (virtual)
- 2022 *Why is the Indian Ocean warming so rapidly?*  
Northwestern University Earth and Planetary Sciences seminar (virtual)
- 2021 *Drivers of Indian and Pacific Ocean heat transport*  
International Workshop for Air-sea Interactions (virtual poster)
- 2020 *Estimating a time series of meridional heat transport of the Indian Ocean at 34°S*  
Ocean Sciences Meeting, San Diego, CA
- 2020 *Variability in Agulhas Current temperature and freshwater transports, with implications for Agulhas Leakage fluxes*  
Gateways to the Ocean Symposium, San Diego, CA
- 2019 *The time varying temperature transport of the Agulhas Current*  
IUGG Assembly, Montreal, Canada

- 2018 *The seasonal cycle of the South Indian Ocean subtropical gyre as revealed by Argo and satellite data*  
National Oceanography Centre, Southampton, UK
- 2018 *The seasonal cycle of the South Indian Ocean subtropical gyre as revealed by Argo and satellite data*  
University of Cape Town, South Africa
- 2018 *The seasonal cycle of the South Indian Ocean subtropical gyre (poster)*  
Statewide Graduate Research Symposium, Florida State University
- 2018 *The seasonal cycle of the South Indian Ocean subtropical gyre*  
University of Miami, Graduate Research Symposium
- 2017 *Meridional heat transport of the Indian Ocean across 34°S based on high resolution Agulhas Current hydrography, satellite, and Argo data*  
IAPSO-IAMAS-IAGA Joint Assembly, Cape Town, South Africa
- 2014 *Calcite rafts-rapid deposition of transgressive infill cave sequences as a new paleo sea level proxy (poster)*  
Geological Society of America, Vancouver, CA

## FUNDED GRANTS

- 2022 NSF, *Determining the role of ocean dynamics in Atlantic sea surface temperature variations using a hierarchy of coupled models*  
PI: Martha Buckley. I am named postdoc and contributed to proposal writing.
- 2019 **K. McMonigal:** Mary Roche Scholarship. University of Miami. \$10,000
- 2018 **K. McMonigal:** *Elevating diversity and inclusion at RSMAS*. University of Miami Career Development Fund. \$2,500.

## SUBMITTED GRANTS

- 2022 NASA, *Quantifying the effect of trends in wind stress driven ocean dynamics on the pattern of ocean heat content warming*  
PI: Sarah Larson. I am science PI and named postdoc. I led scientific content and proposal writing. Not funded.

## AWARDS & SCHOLARSHIPS

- 2019 Mary Roche Scholarship, University of Miami

2018	Best physical sciences presentation, Graduate Student Research Symposium, UM
2017	RSMAS Career Development Award, University of Miami
2015 - 2020	University of Miami Graduate School Fellowship
2015	Scymour Schlanger Undergraduate Earth Science Award, EPS
2012	Academic All-Big Ten Student Athlete

### **SEAGOING EXPERIENCE**

2020	FLOTSAM undergraduate cruises, RV Walton Smith, Florida Straits, Chief Scientist: Jim Happell. Two one day cruises. CTD operations and plankton tows.
2019	GO-SHIP I06S, RV Thomas G Thompson, Indian/Southern Ocean, Chief Scientist: Alex Orsi. 42 days. CTD operations, drifter and float deployment.
2018	Agulhas System Climate Array (ASCA), SA Agulhas, Indian Ocean, Chief Scientist: Lisa Beal. 14 days. Mooring recovery, CTD operations.
2016	ASCA, RV Algoa, Indian Ocean, Chief Scientist: Lisa Beal. 14 days. Mooring deployment, CTD operations.

### **TEACHING EXPERIENCE**

#### **Instructor of Record**

2022	<i>The Climate System</i> , Duke University Graduate level for a professional Masters of Environmental Management
2019	<i>Basic Dynamical Oceanography</i> , University of Cape Town Two week intensive course at Honours level (1 year degree post BS)

#### **Guest Lecturer**

2022	<i>Climate Predictability</i> , NCSU. Instructor: Sarah Larson
2022	<i>Introduction to Coastal Environments</i> , NCSU. Instructor: Christopher Osborne
2021	<i>Introduction to Coastal Environments</i> , NCSU. Instructor: Christopher Osborne
2019	<i>Climate Change</i> , UM. Instructor: Amy Clement

#### **Teaching Assistant**

2020	<i>Introduction to Physical Oceanography</i> , UM In person instructor for hybrid course. Lead instructor: Lisa Beal
2018	<i>Environmental Oceanography</i> , UM. Instructor: Pamela Reid
2016	<i>Climate and Global Change</i> , UM. Instructor: Igor Kamenkovich

## Other Teaching Experience

2019 University of Miami Teaching Academy  
 2016 - 2019 Tutor, Tutorial Resources. Math, sciences, English for grades 6-12

## Mentoring

Madhi Hasan, PhD student, NCSU  
 I meet with Mahdi weekly to discuss science results, monitor his progress, and mentor him.

Sam Michlowitz, MS student, NCSU  
 I meet with Sam weekly. I taught her to use NCSU's HPC system.

Hawke Woznick, MS student, Utah State University  
 I mentored Hawke as they applied to graduate programs and through their MS

Lauren Pressley, undergraduate student, NCSU  
 Lauren worked for 1 semester on understanding the drivers of wintertime tropical instability waves.

Jenna Wilkie & Michael Fredericks, MS students, NCSU statistics department  
 Jenna and Michael did a statistical consulting project with our group. I was involved in scientific question generation for the project.

## PUBLISHED DATASETS

CESM2 Mechanically Decoupled Model, publicly available on Earth System Grid. DOI: <https://doi.org/10.26024/ffeq-wr08>

Agulhas System Climate Array in situ volume, temperature, and salt transport twenty six month time series. <https://beal-agulhas.earth.miami.edu/data-and-products/index.html>

Agulhas System Climate Array cross sectional velocity, temperature, and salinity twenty six month time series. <https://beal-agulhas.earth.miami.edu/data-and-products/index.html>

## SERVICE & OUTREACH

Reviewer for *Geophysical Research Letters*, *Scientific Reports*, *Journal of Geophysical Research: Oceans*, *Journal of Climate*, *Atmosphere*, *Ocean Sciences*, *Nature Climate Change*, *Nature*, *Communications Earth & Environment*, *Geoscientific Model Development*, IPCC AR6 report.

Maintaining an Environment of Respect Aboard Ships (MERAS) committee member (UNOLS), 2021 - present

International Association for the Physical Sciences of the Ocean, Early Career Scientist working group, committee member, 2019 - present  
 Geosciences Education & Mentorship Support mentor  
 Unlearning Racism in Geosciences (URGE) Pod member, 2021  
 University of Miami RSMAS Student-Led Evaluations and Development, committee member  
 Ocean Sciences Bowl 2020 volunteer  
 Ocean Kids program 2019 volunteer

## **RESEARCH EXPERIENCE**

CTD operations and sampling  
 Mooring deployment and recovery  
 Set up, calibration, quality control, and analysis of hydrographic data from CTDs, microCATs, CPIES, ADCPs, Nortek current meters  
 Interpolation of disparate data sources including mooring, Argo, and satellite  
 HPC usage  
 Programing with Matlab, python, cdo, NCL, shell, C++  
 Code modifications and running of climate models (CESM)  
 Processing of CCSM and CESM ocean, atmosphere, and sea ice output  
 Running CESM including coupler modifications and large ensembles  
 Writing workshop with Dallas Murphy, 2018  
 Mentoring workshop with Merlin Wahlberg, 2018

## **PROFESSIONAL MEMBERSHIPS**

European Geophysical Union, member  
 American Meteorological Society, member  
 The Oceanography Society, member  
 American Geophysical Union, member

## **REFERENCES**

Lisa Beal, Professor  
[lbeal@rsmas.miami.edu](mailto:lbeal@rsmas.miami.edu)

Sarah Larson, Assistant Professor  
[slarson@ncsu.edu](mailto:slarson@ncsu.edu)

Rana Fine, Professor Emeritus  
[rfine@rsmas.miami.edu](mailto:rfine@rsmas.miami.edu)