

# Gustavo M. Marques

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## CONTACT

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## EDUCATION

**\* PhD in Meteorology & Physical Oceanography** **Sep 2010 - May 2015**

Rosenstiel School of Marine & Atmospheric Science, University of Miami

Dissertation title: *On the processes controlling Antarctic dense shelf water outflows*

**Advisor:** Dr. Tamay M. Özgökmen

**\* M.Sc. in Physical Oceanography** **Sep 2007 - May 2010**

School for Marine Science and Technology, University of Massachusetts Dartmouth

Thesis title: *Secondary Flow Associated with Transient Tidal Eddy Motion in the Western Gulf of Maine*

**Advisor:** Dr. Wendell S. Brown

**\* B.Sc., Oceanography** **Jan 2002- Dec 2006**

Oceanographic Institute of the University of Sao Paulo (IOUSP), Sao Paulo, SP, Brazil

Thesis title: *Assessment of the Toxicity Field of Santos/Sao Vicente Sewage Outfall between Hydrodynamic Dispersion Models Coupled with an Empirical Ecotoxicological Model*

**Advisor:** Dr. Joseph Harari

## WORK HISTORY

**\* Project Scientist II** **April, 2022 - present**

Oceanography Section of the Climate & Global Dynamics division, National Center for Atmospheric Research

**\* Project Scientist I** **June, 2017 - April, 2022**

Oceanography Section of the Climate & Global Dynamics division, National Center for Atmospheric Research

**\* Postdoctoral Research Associate** **Jul 2015 - Jun 2017**

Program in Atmospheric and Oceanic Sciences, Princeton University / Geophysical Fluid Dynamics Laboratory

## COMMUNITY SERVICE

- Member, CESM Tutorial Committee, 2019 - present.
- Chair, CESM Tutorial Committee, 2021.
- Member, CGD/NCAR - CESM Dycore Evaluation Panel, 2021 - present.
- Science liaison for the Ocean Model Working Group of CESM, 2017 - present.

PEER-REVIEWED  
PUBLICATIONS

- Member, Task Team for Ice Sheet Model Intercomparison Project for CMIP6 Ocean Forcing, Jan to Dec 2018.
- Reviewer, NCAR Advanced Study Program Postdoctoral Applications, 2017 - present.
- Chair, Workshop on "Introduction to the Regional Ocean Modeling System (ROMS)". University of Miami, Fall 2013.
- Loose, N., **Marques, G.**, Adcroft, A., Bachman, S.D., Griffies, S.M., Grooms, I., Hallberg, R.W. and Jansen, M.F., (**in review**). Parameterizing eddy form stress in a thickness-weighted average isopycnal ocean model. Submitted to *J. Adv. Model. Earth Sys.*, preprint available at: doi.org/10.1002/essoar.10512867.1
- **Marques, G.**, Shao, A. E., Bachman, S., Danabasoglu, G., and Bryan, F., (2023). Representing eddy diffusion in the surface boundary layer of ocean models with general vertical coordinates. *J. Adv. Model. Earth Sys.*, doi.org/10.1029/2023MS003751.
- **Marques, G.**, Loose, N., Yankovsky, E., Steinberg, J.M., Chang, C.Y., Bhamidipati, N., Adcroft, A., Fox-Kemper, B., Griffies, S.M., Hallberg, R.W. and Jansen, M.F., (2022). Never-World2: An idealized model hierarchy to investigate ocean mesoscale eddies across resolutions. *Geoscientific Model Development*, doi.org/10.5194/gmd-15-6567-2022.
- Partee, S., Ellis, M., Rigazzi, A., Shao, A., Bachman, S., **Marques, G.**, and Robbins, B., (2022). Using Machine Learning at scale in numerical simulations with SmartSim: An application to ocean climate modeling. *Journal of Computational Science*, doi.org/10.1016/j.jocs.2022.101707.
- Loose, N., Abernathey, R., Busecke, J., Steinberg, J. M. , Grooms, I., Yankovsky, E., **Marques, G.**, Khatri, H., Bachman, S. D., (2021): GCM-Filters: A Python package for Diffusion-based Spatial Filtering of Gridded Data from General Circulation Models. *The Journal of Open Source Software*. doi.org/10.21105/joss.03947.
- Grooms, I., Loose, N., Abernathey, R., Steinberg, J., Bachman, S., **Marques, G.**, Guillaumin, A., Yankovsky, E., (2021). Diffusion-based smoothers for spatial filtering of gridded geophysical data. *J. Adv. Model. Earth Sys.*, doi.org/10.1029/2021MS002552.
- Wu, X., Reed, K., Wolfe, C., **Marques, G.**, Bachman, S. and Bryan, F., (2021). The Dependence of Tropical Modes of Variability on Zonal Asymmetry. *Geophysical Research Letters*. doi.org/10.1029/2021GL093966.
- Wu, X., Reed, K., Wolfe, C., **Marques, G.**, Bachman, S., and Bryan, F., (2021). Coupled Aqua and Ridge Planets in the Community Earth System Model. *J. Adv. Model. Earth Sys.*, doi.org/10.1029/2020MS002418.
- Stern, A., Adcroft, A., Sergienko, O., and **Marques, G.**, (2017). Modeling tabular icebergs submerged in the ocean. *J. Adv. Model. Earth Sys.*, doi.org/10.1002/2017MS001002.
- **Marques, G.**, Wells, M.G., Padman, L., and Özgökmen, T.M., (2017). Flow splitting in numerical simulations of oceanic dense-water outflows. *Ocean Modelling*, 113, 66-84, doi:10.1016/j.ocemod.2017.03.011.
- **Marques, G.** and Özgökmen, T.M. , (2014). On Modeling Turbulent Exchange in Buoyancy-Driven Fronts. *Ocean Modelling*, 83, pp. 43-62, doi:10.1016/j.ocemod.2014.08.006.
- **Marques, G. M.**, Padman, L., Springer, S. R., Howard, S. L. , and Özgökmen, T. M., (2014). Topographic vorticity waves forced by Antarctic dense shelf water outflows, *Geophys. Res. Lett.*, 41, doi:10.1002/2013GL059153.
- Brown, W.S. and **Marques, G.**, (2012). Tidal eddy motions in the western Gulf of Maine, Part 1: Primary Structure. *Continental Shelf Research*, doi:10.1016/j.csr.2012.08.018.
- **Marques, G.** and Brown, W.S., (2012). Tidal eddy motions in the western Gulf of Maine, Part 2: Secondary Flow. *Continental Shelf Research*, doi:10.1016/j.csr.2012.02.008.

## TEACHING AND MENTORING EXPERIENCE

Graduate students: Xiaoning Wu (Stony Brook), Mauricio Reboucas Rocha (University of Sao Paulo), Giovanni Seijo-Ellis (University of Colorado Boulder).

Undergraduate interns: Kenzie Klisz (Embry Riddle Aeronautical University).

Teaching Assistant:

- Survey of Oceanography, MSC-101. University of Miami, Fall 2012.
- Numerical Methods in Fluid Dynamics, RSMAS/MPO-662. University of Miami, Fall 2011.

Lectures:

- Ocean Modeling I at the 2022 CESM Tutorial, National Center for Atmospheric Research, Summer 2022.
- Ocean Modeling I at the 2019 CESM Tutorial, National Center for Atmospheric Research, Summer 2019.
- Ocean Physics for Climate, GEO-425, Princeton University, Fall 2015.
- Atmospheric and Oceanic Turbulence, RSMAS/MPO-664. University of Miami, Fall 2013.
- Geophysical Fluid Dynamics I, RSMAS/MPO-511. University of Miami, Fall 2011, 2012, and 2013.

## ORAL PRESENTATIONS

- Progress towards CESM3 ocean model and workflows. 28th Annual CESM Workshop, Boulder - CO, USA, June 2023.
- The state of CESM with a focus on the ocean component and a touch of machine learning. Multiscale Machine Learning In Coupled Earth System Modeling Spring Meeting, NY, USA, June 2023 (**invited**).
- Exploring the effects of energy backscatter parameterizations in forced ocean/sea-ice eddy-permitting global simulations with CESM. Ocean Transport and Eddy Energy Annual Meeting, May 2023.
- Progress and Plans - CESM/MOM6. CESM Ocean Model Working Group meeting, Feb 2023.
- Assessing the performance of a machine-learning-based parameterization of eddy kinetic energy in global ocean/sea-ice simulations. DRAKKAR Ocean Modelling Workshop, Jan 2023 (**invited**).
- An overview of the CESM/MOM6 development. Model Diagnostics Task Force monthly telecon, Oct 2022 (**invited**).
- Status of fully-coupled simulations with MOM6. 27th Annual CESM Workshop, Boulder - CO, USA, June 2022.
- Groundwork for incorporating enthalpy fluxes in CESM-MOM6. CESM Ocean Model Working Group meeting, Jan 2022.
- Assessing the performance of a machine-learning-based parameterization of eddy kinetic energy in global ocean/sea-ice simulations. Climate Process Team: Ocean Transport and Eddy Energy Annual Meeting, April 2022.
- A method for applying horizontal surface eddy diffusion in ocean models with a general vertical coordinate. Climate Process Team: Ocean Transport and Eddy Energy Annual Meeting, April 2022.
- Improving the representation of oceanic processes in NCAR's next-generation climate model. ATOC Colloquium, University of Colorado Boulder, Oct 2021 (**invited**).
- Conceitos basicos de modelagem oceanica com foco nos modelos do CESM. IV Semana Meteorologica da Universidade de Santa Maria, Brazil, June 2021 (**invited**).
- Enabling Intelligent parameterizations through distributed, online inference with SmartSim: A case study simulating ocean eddy kinetic energy in MOM6. CGD Seminar Series, Feb 2021.
- Towards CESM3 with MOM6. Earth System Model working group from the Institute for Marine and Atmospheric Research, Utrecht University, Feb 2021 (**invited**).

- Representing the mesoscale horizontal diffusion of tracers within the boundary layers of general vertical coordinate ocean models. MOM6 Webinar Series, June 2020 (**invited**).
- Current simulations with MOM6 in CESM. MOM6 Webinar Series, April 2020 (**invited**).
- Representing the horizontal diffusion of tracers within the boundary layers of general vertical coordinate ocean models. Hamburg COMMODORE Conference, Hamburg, Germany, Jan 2020.
- Developing MOM6 towards CESM3. 24rd Annual CESM Workshop, Boulder - CO, USA, June 2019.
- Standalone and coupled MISOMIP experiments using CISM and MOM6. CESM Land Ice Working Group Meeting, Boulder - CO, USA, Feb 2019.
- An idealized framework to study interactions between ocean, sea ice and ice shelves. COMMODORE Workshop, Paris, France, Sep 2018.
- New developments in ocean models since CMIP5. ISMIP6 Workshop, Sassenheim, Netherlands. (**invited**).
- Improving vertical mixing parameterizations in MOM6. 23rd Annual CESM Workshop, Boulder - CO, USA, June 2018.
- The impact of wind forcing on sub-ice-shelf melting and circulation. Rising Coastal Seas on a Warming Earth III, Abu Dhabi, United Arab Emirates, May 2018 (**invited**).
- The impact of sub-ice-shelf melting on sea-ice formation under different atmospheric forcing. Ocean Science Meeting, Portland - OR, USA, Feb 2018.
- Sensitivity of sub-ice-shelf melting to changes atmospheric forcing. Regional Sea Level Changes and Coastal Impacts, New York, USA, July 2017.
- The effects of sub-ice-shelf melting on dense shelf water formation and export in idealized simulations of Antarctic margins. European Geosciences Union General Assembly, Vienna, Austria, April 2017.
- Processes controlling bottom water formation and sub-ice-shelf melting in idealized simulations of Antarctic margins. Center for Coastal Physical Oceanography, Old Dominion University, Norfolk - VA, USA, March 2017(**invited**).
- Changes in bottom water formation in the western Ross Sea due to the melting of ice shelves in West Antarctica. Rising Coastal Seas on a Warming Earth II, Abu Dhabi, United Arab Emirates, May 2016(**invited**).
- Flow Splitting in Numerical Simulations of Oceanic Dense-Water Outflows. Ocean Science Meeting, New Orleans - LA, USA, Feb 2016.
- Topographic vorticity waves forced by Antarctic dense shelf water outflows. Ocean Science Meeting, Honolulu - HI, USA, Feb 2014.
- On modeling the turbulent exchange in buoyancy-driven fronts. ROMS/TOMS User Workshop, Rio de Janeiro, Brazil, Oct 2012.
- Lagrangian Coherent Structures Introduced by Overflows. LAPCOD V, Miami Beach - FL, USA, June 2012.
- Transient Tidal Eddy Motion and Associated Secondary Flow in the Western Gulf of Maine. Graduate School of Oceanography, University of Rhode Island, USA, June 2010 (**invited**).

#### HONORS AND AWARDS

- Earned a scientific initiation scholarship from the Foundation for Research Support of the State of São Paulo (FAPESP), 2006.

#### COURSES AND WORKSHOPS

- *Tackling Climate-Induced Challenges with AI*, Convergence Research (CORE) Institute, from March 6th to April 15th, 2023 (virtual).
- *Google Earth Engine Workshop*, Google Campus, Boulder, CO, October 28th, 2022.

- *Workshop on ice-ocean interactions*, Joint IAPSO/IACS Commission on Ice-Ocean Interactions (JCIOI), October 17-19, 2022 (virtual.)
- *Artificial Intelligence for Earth System Science Summer School*, National Center for Atmospheric Research, Boulder - CO, June 22-26, 2020.
- *Using Satellite Observations to Advance Climate Models*, Keck Institute for Space Studies, California Institute of Technology, Pasadena - CA, Aug 31-Sep 4, 2015.
- *Summer School in Fluid Dynamics of Sustainability and the Environment*, Department of Applied Mathematics and Theoretical Physics at the University of Cambridge, UK, Sep 1-12, 2014.
- *All Hands Meeting/Tutorials*, Consortium for Advanced Research on Transport of Hydrocarbon in the Environment, Miami - FL, May 29-31, 2013
- *ROMS/TOMS User Workshop*, Rio de Janeiro, Brazil, Oct 22-25, 2012.
- *Coastal Modeling Summer School* organized by the CNRS and University of Toulon in La Londe des Maures, France, Sep 18-23, 2011.
- *Glider training*, Coastal Ocean Observation Laboratory, Rutgers University - NJ, January 9-11, 2008.
- *Course on physical and biological ocean modeling: Biogeochemical (ROMS-NPZ-PISES) and individual based (IBM) modeling*, Universidad de Concepcion, Dichato, Chile, Jul 03-14, 2007, (SACC - CRN Scholarship).
- *Modeling the ocean in the climate system*, Dr. William George Large. III Brazilian Symposium of Oceanography, Brazil. Dec 04-08, 2006.

#### FIELDWORK

- Cruises around São Paulo and Rio de Janeiro, Brazil. Observation of physical, biological, geological and chemical properties.
- Coastal cruises around Massachusetts, USA. Observation of physical properties.
- Cruise around Florida, USA. Observation of physical properties.
- Instruments deployed: glider, CTD, ADCP, rosette, Niskin and Nansen bottles, fluorometer, plankton net, Van Veen grab, box-corer, fish net, moorings and side-scan sonar. Total of approximately 21 days at sea.

#### PROFESSIONAL SOCIETIES

- American Geophysical Union, 2009-present.

*Last update: July 3, 2023*