## Iury T. Simoes-Sousa, Ph.D.

## Curriculum Vitae

Postdoctoral Fellow – Woods Hole Oceanographic Institution Physical Oceanography Department

## **Education**

2019 – 2023 Ph.D., Computational Sciences, **University of Massachusetts Dartmouth** 

2015 – 2017 M.Sc., Physical Oceanography, **University of São Paulo**, Brazil

2011 – 2014 B.Sc., Interdisciplinary Oceanography, Federal University of Ceará, Brazil

## **Professional Experience**

2023 - · · · Postdoctoral Investigator, Department of Physical Oceanography,

Woods Hole Oceanographic Institution (WHOI).

Funding: Institutional (Fellowship by Vision Funds)

2020 – 2023 **Graduate Research Assistant,** College of Engineering,

University of Massachusetts Dartmouth (UMassD).

Funding: ONR and NSF

2019 (Jan - Jul) | Physical Oceanographer, Oceanographic Institute,

University of São Paulo (USP).

Responsibilities: Scientific and technical support in physical oceanography data analysis, mentorship leading to publication of scientific articles.

**■** Data Scientist in Artificial Intelligence,

InsilicAll.

Responsibilities: Data processing for neural networks, interactive visualization of machine learning model results.

2017 – 2019 Data Scientist in Artificial Intelligence and Backend Developer,

Altox - Alternative Toxicology.

Responsibilities: Developed first Brazilian online platform for *in-silico* toxicological tests, machine learning model development, co-authorship in cancer research paper.

## **Selected Academic Honors**

**Postdoctoral Fellowship,** *Vision Funds,* Woods Hole Oceanographic Institution.

Geophysical Fluid Dynamics Fellowship, Woods Hole Oceanographic Institution.

2019 First-Year Doctoral Fellowship, University of Massachusetts.

2015 **Master's Research Fellowship,** São Paulo Research Foundation (FAPESP).

## **Additional Training**

**Certified Programming Instructor,** The Carpentries.

Mode: Virtual (20 hours).

Skills: Teaching in programming and data science, engagement in active pedagogical practices.

# **Additional Training (continued)**

Life Skills for Young Scientists, Planetary Science Institute.

Instructor: Dr. Jonathan Lilly, Mode: Virtual (12 months).

Skills: Communication, conflict management, teamwork, resilience, and well-being in academia.

Data-driven GFD, Geophysical Fluid Dynamics Fellowship, WHOI.

Instructors: Profs. Laure Zanna and Peter Schmid

Mode: In-person (400 hours).

Skills: Advanced methods in spatio-temporal analysis and decomposition, AI in fluid dynamics and development of a scientific project.

**Openscapes Champions Cohort,** NASA.

Mode: Virtual (2 months).

Skills: Cloud computing in Earth science research, open science principles.

OceanHackWeek, Data Science + Oceanography, Bigelow Laboratory for Ocean Sciences and University of Washington.

Mode: In-person - Boothbay, ME, USA (40 hours).

Skills: Multidimensional data analysis, version control, AI in oceanography.

2018 Nanodegree in Machine Learning Engineering, Udacity.

Mode: Virtual (6 months).

Focus: Linear regression, decision trees, SVM, neural networks, reinforcement learning.

2016 **Lagrangian Perspective of Ocean Circulation**, Federal University of Santa Catarina.

Instructor: Prof. Albert Kirwan

Mode: In-person - Florianópolis, Brazil (20 hours).

Integrated Teaching with Digital Technologies, UFC Virtual - Federal University of Ceará. Mode: In-person - Fortaleza, CE (64 hours).

## **Educational Activities**

### **Given Short Courses and Tutorials**

2024 (40h) **Geophysical Flows Workshop,** IIT Madras.

Theory and simulation of Ocean Gravity Currents and the effect of Earth's rotation.

2023 (1h) S-MODE Meeting, NASA Ames Center.

Multidimensional PO.DAAC data access, processing and visualization

2023 (2h) Summer School on Marine Heatwave, ICTP / CLIVAR.

Version control and cloud computing in Physical Oceanography

2021 (10h) Unravelling Oceanography with Python, Federal University of Ceará.

2016 (8h) **Python for Physical Oceanography**, University of São Paulo.

## **Teaching Assistant**

### Advising

**Rebeca Crisóstomo Melo,** Undergraduate in Oceanography, Federal University of Ceará. Project: Parnaíba River plume variability from satellite data (*Main advisor*).

**Caio Erick Braga Costa,** Masters in Tropical Marine Sciences, Federal University of Ceará. Project: Surface gravity waves and numerical reanalyses validation (*Co-advisor*).

## **Educational Activities (continued)**

## Mentoring

Rafael Couto Martins, Undergraduate in Physical Oceanography, University of São Paulo (USP). Project: Modeling the Brazil Current recirculation.

Main advisor: Amit Tandon.

2020 – 2023 Alan Andonian, Undergraduate/Masters, University of Massachusetts Dartmouth (UMassD). Projects: Taylor columns and vortex shedding simulations.

Main advisor: Amit Tandon.

2019 – 2022 **Igor Uchôa Farias,** Masters in Physical Oceanography, University of São Paulo. Project:

Altimetry-based characterization of Brazil Current mesoscale eddies.

Main advisor: Ilson Silveira.

2019 – 2021 **Caique Dias Luko,** Undergraduate in Oceanography, University of São Paulo (USP).

Project: Revisiting the Atlantic South Equatorial Current.

Main advisor: Ilson Silveira.

#### **Academic Outreach**

**Tutorial Education Program (PET),** Federal University of Ceará. Institutional Scholarship. Activities: Educational projects, thematic weeks, outreach and training focused

on reducing dropout rates from vulnerable students.

2012 – 2013 **Exchange Student Support Program (PAI),** Federal University of Ceará. Volunteer.

Activities: Assisting international students, focused support for low-income students.

## Ad Hoc Reviewer for Scientific Journals

- Journal of Open Source Software
- Journal of Physical Oceanography
- Frontiers in Marine Science
- Ocean and Coastal Research
- Geophysical Research Letters
- Remote Sensing
- Journal of Atmospheric and Oceanic Technology
- Journal of Geophysical Research: Oceans

### Research

2015-2017

## **Grants as Single Beneficiary**

Vision Funds Postdoctoral Fellowship, Woods Hole Oceanographic Institution (WHOI).

Funds: US\$ 202 thousand.

2019-2020 First-year Doctoral Fellowship, University of Massachusetts Dartmouth (UMassD).

Master's Research Fellowship, University of São Paulo (USP).

Title: Dynamics of the multiple retroflections and recirculations of the North Brazil Undercurrent.

Funding Agency: São Paulo Research Foundation (FAPESP)

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## Research (continued)

## Participation in Research Projects

- Sub-Mesoscale Ocean Dynamics Experiment (S-MODE).

  Role: Collaborator, Funding Agency: NASA, PI: Tom Farrar (WHOI).
  - Surface Water Ocean Topography (SWOT) Science Team.
    Role: Collaborator, Funding Agency: NASA, PI: Tom Farrar (WHOI).
  - Ecological Connectivity and Material Dispersion on the Continental Shelf of Ceará.

Role: Collaborator, Funding Agency: FUNCAP (Brazil), PI: Carlos Eduardo Peres Teixeira (UFC).

- 2020 2023 Understanding the Ocean-Atmosphere Coupling in the Northern Indian Ocean.
  Role: Research Assistant, Funding Agency: ONR, PI: Amit Tandon.
  - The Role of Sub-mesoscale Eddies and Fronts in Near-inertial Waves Generation.
    Role: Research Assistant, Funding Agency: ONR, PI: Prof. Amit Tandon.
  - Sub-mesoscale and Mesoscale Interactions STudy (SubMIST).
    Role: Research Assistant, Funding Agency: ONR, Program: Marine Underwater Science and Technology (MUST), PI: Amit Tandon.
  - Network for Studies of the Brazil Current on the Southeast-South Continental Margin (REMARSUL).

Role: Physical Oceanographer, Funding Agency: CAPES (Brazil), PI: Ilson Silveira.

- 2017 2019 Virtual InSilicoTox: Real-time in silico toxicological screening platform. Funding Agency: São Paulo Research Foundation (FAPESP).
- 2015 2017 Hydrodynamic Characterization of the Sergipe and Alagoas Basin (MARSEAL).
  Role: Physical Oceanographer, Funding Agency: Partnership between USP and Petrobras, PI: Ilson Silveira.

## **Publications**

### **Journal Articles**

- C. Carvalho, I. T. **Simoes-Sousa**, L. P. Santos, *et al.*, "Surfing the currents: The longest distance traveled by a released West Indian manatee (*Trichechus manatus*) and the implications for conservation," *Journal of the Marine Biological Association of the United Kingdom*, 2023, Under review., ISSN: 1469-7769.
- C. B. Rocha and I. T. **Simoes-Sousa**, "Compact mesoscale eddies in the South Brazil Bight," *Remote Sensing*, vol. 14, no. 22, p. 5781, 2022. ODI: 10.3390/rs14225781.
- I. C. Silveira, F. Pereira, G. R. Flierl, et al., "The Brazil Current quasi-stationary unstable meanders at 22°S–23°S," Progress in Oceanography, p. 102 925, 2022, ISSN: 0079-6611. ODI: https://doi.org/10.1016/j.pocean.2022.102925.
- I. T. **Simoes-Sousa**, A. Tandon, J. Buckley, D. Sengupta, E. Shroyer, and S. P. de Szoeke, "Atmospheric cold pools in the Bay of Bengal," *Journal of the Atmospheric Sciences*, 2022. ODI: 10.1175/JAS-D-22-0041.1.
- I. T. **Simoes-Sousa**, A. Tandon, F. Pereira, C. Z. Lazaneo, and A. Mahadevan, "Mixed layer eddies supply nutrients to enhance the spring phytoplankton bloom," *Frontiers in Marine Science*, vol. 9, 2022, ISSN: 2296-7745. ODI: 10.3389/fmars.2022.825027.
- I. Uchoa, I. T. **Simoes-Sousa**, and I. C. Silveira, "The Brazil Current mesoscale eddies: Altimetry-based characterization and tracking," *Deep Sea Research Part I: Oceanographic Research Papers*, p. 103 947, 2022, ISSN: 0967-0637. ODI: 10.1016/j.dsr.2022.103947.

- C. Luko, I. Silveira, I. T. **Simoes-Sousa**, J. Araujo, and A. Tandon, "Revisiting the Atlantic South Equatorial Current," *Journal of Geophysical Research: Oceans*, e2021JC017387, 2021. ODOI: 10.1029/2021JC017387.
- D. C. Napolitano, C. B. Rocha, I. C. da Silveira, I. T. **Simoes-Sousa**, and G. R. Flierl, "Can the Intermediate Western Boundary Current recirculation trigger the Vitória Eddy formation?" *Ocean Dynamics*, vol. 71, no. 3, pp. 281–292, 2021. DOI: 10.1007/s10236-020-01437-6.
- P. S. Polito, O. T. Sato, D. C. Napolitano, I. T. **Simoes-Sousa**, H. Almeida, and F. R. Lapolli, "Insights on the non-linear solution of Munk's ocean circulation theory from a rotating tank experiment," *Ocean and Coastal Research*, vol. 69, 2021. ODI: 10.1590/2675-2824069.20-011psp.
- E. Shroyer, A. Tandon, D. Sengupta, et al., "Bay of Bengal intraseasonal oscillations and the 2018 monsoon onset," Bulletin of the American Meteorological Society, pp. 1–44, 2021. ODOI: 10.1175/BAMS-D-20-0113.1.
- I. T. **Simoes-Sousa**, I. C. A. Silveira, A. Tandon, G. R. Flierl, C. H. Ribeiro, and R. P. Martins, "The Barreirinhas Eddies: Stable energetic anticyclones in the near-equatorial South Atlantic," *Frontiers in Marine Science*, vol. 8, p. 28, 2021. *Opic* DOI: 10.3389/fmars.2021.617011.
- J. R. Santin, G. F. da Silva, M. V. Pastor, et al., "Biological and toxicological evaluation of n-(4methyl-phenyl)-4-methylphthalimide on bone cancer in mice," Anti-Cancer Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry-Anti-Cancer Agents), vol. 19, no. 5, pp. 667–676, 2019.

  DOI: 10.2174/1871520619666190207130732.
- I. Silveira, I. T. **Simoes-Sousa**, D. Napolitano, H. M. R. Almeida, P. Baldasso, and W. Watanabe, "As correntes oceânicas na Bacia Sergipe-Alagoas," *Revista Marseal: Edição Águas Profundas SE/AL*, vol. 2, pp. 36–39, 2018, Ciências da Terra e Meio Ambiente, Geologia e Geomorfologia., ISSN: 2596-0547. URL: https://www.livraria.ufs.br/produto/revista-marseal-edicao-aguas-profundas-seal-volume-2/.

### **Proceedings**

- J. T. Farrar, E. D'Asaro, E. Rodriguez, et al., "Ocean surface current measurements in the sub-mesoscale ocean dynamics experiment," in *Proceedings of the 2024 IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Under review, 2024.
- I. T. **Simoes-Sousa**, "Stochasticity of turbulence closures," in *Proceedings Volumes of the GFD WHOI*, In press., Woods Hole, MA: Woods Hole Oceanographic Institution, 2022. URL: https://gfd.whoi.edu/gfd-publications/gfd-proceedings-volumes/.

### **Contributions to Open-Source Software**

- T. Biló and I. T. **Simoes-Sousa**, *vector\_fields*, Python functions developed for handling vector fields. 
  •• URL: https://github.com/iuryt/vector\_fields.
- K. Drushka, D. Balwada, D. LaScala-Gruenewald, I. T. Simoes-Sousa, and C. Cai, ohw21-proj-model-subsampling, OceanHackWeek21 project to subsample high-resolution model outputs for seagliders, ships, or other in situ platforms. URL: <a href="https://github.com/oceanhackweek/ohw21-proj-model-subsampling">https://github.com/oceanhackweek/ohw21-proj-model-subsampling</a>.
- A. Ramadhan, G. L. Wagner, N. C. Constantinou, *et al.*, *CliMa/Oceananigans.jl: Vo.88.o*, version vo.88.o, Numerical model in Julia for oceanic fluid dynamics on CPUs and GPUs. Contributed to the source code on different pull requests. *P* DOI: 10.5281/zenodo.4019271.
- I. T. **Simoes-Sousa**, *Bioceananigans.jl*, Modules for estimating depth of mixing layer, phytoplankton shading, and calculating light-limited growth. **OURL:** https://github.com/iuryt/Bioceananigans.jl.
- I. T. **Simoes-Sousa**, *env\_coringa*, Specialized Python environment for Earth sciences, focusing on analysis of oceanographic data. 

  Our unit https://github.com/iuryt/env\_coringa.

- I. T. **Simoes-Sousa**, *gaussian\_bump*, MITgcm simulation of rotating flow over a Gaussian bump. **O** URL: https://github.com/iuryt/gaussian\_bump.
- I. T. **Simoes-Sousa**, *ocean\_gyre\_tank*, MITgcm simulation for General Ocean Circulation in a rotating tank, based on the paper "Insights of the non-linear solution of Munk's ocean circulation theory from a rotating tank experiment". **OURL:** https://github.com/iuryt/ocean\_gyre\_tank.
- I. T. **Simoes-Sousa**, *Panthalassan*, Template tutorials for teaching Data Science in Oceanography using Python, GitHub, and Google Colab. URL: https://github.com/iuryt/Panthalassan.
- I. T. **Simoes-Sousa**, *tico\_peixeboi*, Contains data analysis and codes related to the paper "Surfing the currents: The longest distance traveled by a released West Indian manatee (Trichechus manatus) and the implications for conservation". **Our Unit Part of the Indian Methods** (Trichechus manatus) and the implications for conservation.
- I. T. **Simoes-Sousa**, V. McDonald, and A. Wineteer, 2023-SMODE-Open-Data-Workshop, Tutorial on access, processing, and combined multi-dimensional analysis of different datasets from the S-MODE project. **Our Unit** https://github.com/podaac/2023-SMODE-Open-Data-Workshop.
- I. T. **Simoes-Sousa**, D. C. Napolitano, F. Vilela-Silva, L. Almeida, and O. Wang, *OceanLab*, Python script package for Oceanography with tools for optimal interpolation, estimation of vertical pressure modes, and empirical orthogonal functions. **OURL:** https://github.com/OceanLabPy/OceanLab.
- I. T. **Simoes-Sousa**, *github.com/iuryt/NorthAtlanticBloom*, version v1.0.0, Code for simulations and data analysis related to the paper "Mixed layer eddies supply nutrients to enhance the spring phytoplankton bloom", Apr. 2024. ODI: 10.5281/zenodo.10980522.
- I. T. **Simoes-Sousa** and K. J. Burns, *github.com/iuryt/stochastic\_closures*, version v1.0.0, WHOI GFD summer school project repository exploring the stochasticity of turbulent closures, Apr. 2024. ODOI: 10.5281/zenodo.10980584.
- Various Contributors, *matplotlib*, Comprehensive library for creating visualizations in Python. Contributed to the documentation with an example for 3D plotting. 

  URL: https://github.com/matplotlib/matplotlib.
- Various Contributors, *OceanBioME.jl*, Modeling environment for coupled interactions between ocean physics and biogeochemistry. Contributed with a pull request and overall as a reviewer. **OURL:** https://github.com/OceanBioME/OceanBioME.jl.

### **Gray Literature**

- 1. T. **Simoes-Sousa**, Swirls and gusts: Computational insights into ocean vortices and atmospheric cold pools, Ph.D. Thesis (Computational Science and Engineering), North Dartmouth, United States, 2023.
- I. T. **Simoes-Sousa**, Recurrent anticyclone formation and shedding within the barreirinhas bight (ne-brazil), Master's Dissertation in Oceanografia Física, doi:10.11606/D.21.2018.tde-27032018-151700, São Paulo, Brazil, 2017. **O** URL: https://www.teses.usp.br/teses/disponiveis/21/21135/tde-27032018-151700/ (visited on 12/29/2023).
- I. T. **Simoes-Sousa**, Sistema subcorrente norte do brasil através da aplicação do método dinâmico referenciado, Portuguese, Bachelor's Thesis (Oceanography), 48 f., Fortaleza, Brazil, 2014. **O** URL: https://repositorio.ufc.br/handle/riufc/33651 (visited on 12/29/2023).

## **Selected Presentations and Conferences**

### 2024 American Geophysical Union Annual Meeting.

Location: Washington, DC. Role: Session Convener. Status: Submitted.

Session title: "Explaining and Predicting Mid-latitude Weather, Climate and Ocean Variability and Change Through Air-Sea Interactions and Teleconnections."

#### Gordon Research Conference in Ocean Mixing.

Location: Holyoke, Massachusetts. Role: Poster presentation. Status: Submitted.

Title: "Rapid Vertical Transport of Wind-Driven Inertial Signals by Near-Buoyancy Waves."

#### ■ IIT Madras Geophysical Flows Workshop: Innovations in Oceanography.

Location: IIT Madras, Chennai, India. Role: Lecturer.

### Ocean Sciences Meeting.

Location: New Orleans - LA. Role: Oral Presentation, Title: "A Global Unified Vortex-Profile Dataset and its Implications for Internal-Wave Mixing," Status: Accepted.

### 2023 S-MODE Meeting.

Location: NASA Ames Center, Mountain View, CA. Role: Oral Presentation, Title: "S-MODE and SWOT."

#### **XV OMARSAT.**

Location: Cabo Frio - Brazil. Role: Oral Presentation, Title: "At the Forefront of Oceanic Submesoscale Observations: A comparative study of NASA's S-MODE project and SWOT."

#### ■ IEEE High Performance Extreme Computing Virtual Conference.

Location: Virtual. Role: Participant.

#### **■** ICTP/CLIVAR Summer School on Marine Heatwave.

Location: Virtual. Role: Invited Lecturer, Title: "Version Control in Data Science: GitHub and Google Colab."

### ■ Gordon Research Conference and Seminar in Coastal Ocean Dynamics.

Location: Bryant University - RI. Role: Oral Presentation and Poster, Title: "Did Tico surf or swim? A case study of a manatee released in Brazil that ended up in Venezuela."

#### NR Code 32 Graduate Student and Post-Doc Workshop.

Location: Arlington, VA. Role: Participant.

### Mesoscale and Frontal-Scale Air-Sea Interactions Workshop.

Location: CLIVAR, Boulder, CO. Role: Poster Presentation, Title: "Atmospheric cold pools in the Bay of Bengal."

## 2022 | High Performance Computing Day.

Location: University of Massachusetts Lowell. Role: Participant.

### FilaChange.

Location: Brown University, RI. Role: Oral Presentation, Title: "Mixed layer eddies supply nutrients to enhance spring phytoplankton blooms."

### ■ IEEE High Performance Extreme Computing Virtual Conference.

Location: Virtual. Role: Participant.

#### Ocean Sciences Meeting.

Location: Virtual. Role: Poster Presentation, Title: "Atmospheric cold pools in the Bay of Bengal."

## ■ Gordon Research Conference and Seminar in Ocean Mixing.

Location: Holyoke College, MA. Role: Poster Presentation, Title: "The impact of submesoscale fronts on the near-inertial wave generation."

#### ■ Intercampus Marine Science Symposium.

Location: University of Massachusetts Dartmouth. Role: Plenary Lecture, Title: "Atmospheric cold pools in the Bay of Bengal."

## **Selected Presentations and Conferences (continued)**

## 2021 Colóquio Belmiro de Castro.

Location: Virtual, University of São Paulo. Role: Invited Lecture, Title: "How does submesoscale intensify phytoplankton blooms?"

### 2020 Ocean Sciences Meeting.

Location: San Diego, CA. Role: Poster Presentation, Title: "The Barreirinhas Eddies conundrum: Why are these super anticyclones at low latitudes so long-lived?"

#### SciPy.

Location: Virtual. Role: Participant.

## 2018 **2<sup>nd</sup> Pan-American Conference for Alternative Methods.**

Location: Rio de Janeiro, Brazil. Role: Poster Presentation, Title: "Contribution Mapping: a tool for Structure–toxicity relationship (STR) interpretation of the Machine and Deep Learning methods."

## 2017 **Brazilian Symposium on Water Waves.**

Location: Rio de Janeiro, Brazil. Role: Oral Presentation, Title: "Recurrent anticyclone formation and shedding in the Barreirinhas Bight."

## 2013 Python Nordeste.

Location: Fortaleza - Brazil. Role: Participant.

## 2012 **Brazilian Symposium of Oceanography.**

Location: Rio de Janeiro - Brazil. Role: Poster Presentation, Title: "Activities developed by the PET Oceanography group since its creation."