

# BRANDON MONTEMURO

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## **EDUCATION**

### **FALL 2013- MAY 2020**

PH.D. IN INTEGRATED APPLIED MATHEMATICS

UNIVERSITY OF NEW HAMPSHIRE

ADVISOR: Greg Chini

DISSERTATION: An Asymptotic Self-Sustaining Process Theory for Uniform Momentum Zones and Internal Interfaces in Unbounded Couette Flow

GPA 3.87/4.00

### **FALL 2006-SPRING 2010**

B.S. IN AEROSPACE ENGINEERING

PENNSYLVANIA STATE UNIVERSITY

Minors in Mathematics and Engineering Leadership Development

GPA 3.78/4.00

## **ACADEMIC POSITIONS**

### **FALL 2024- PRESENT**

INSTRUCTOR/LEAHY TEACHING FELLOW IN PHYSICS, SAINT MICHAEL'S COLLEGE

PHYS 107 – Meteorology

PHYS 220 – General Physics I

PHYS 221 – General Physics II

ES 312 – Energy and Climate Change

PY 410 – Senior Seminar

PY 420/ES 301 – Introduction to Climate Change Modeling

### **SPRING 2024**

INSTRUCTOR, FREEDOM EDUCATION PROJECT PUGET SOUND

PHYS 114 – General Physics I

### **FALL 2019 - SPRING 2024**

POSTDOCTORAL SCHOLAR, UNIVERSITY OF WASHINGTON

ADVISOR: Georgy Manucharyan

## **WINTER 2023**

INSTRUCTOR, UNIVERSITY OF WASHINGTON BOTHELL

- BIS/BIO 285 – Our Changing Oceans

## **FALL 2018**

INSTRUCTOR, UNIVERSITY OF NEW HAMPSHIRE

- ME 503 – Thermodynamics

## **FALL 2015 – SPRING 2019**

RESEARCH ASSISTANT, UNIVERSITY OF NEW HAMPSHIRE

## **FALL 2014 – SPRING 2015**

TEACHING ASSISTANT, UNIVERSITY OF NEW HAMPSHIRE

- ME 696 – Introduction to Engineering Computing
- ME 503 – Thermodynamics

## **PROFESSIONAL DEVELOPMENT**

- Summer 2023, UW Mentoring Enrichment and Leadership Development Institute
  - Mentoring and Advising learning track designed for graduate students, postdoctoral scholars, research scientists and staff, interested in building an intentional mentoring and advising culture of care, engagement and accountability.
- Summer 2023, MAA Team-Based Inquiry Learning workshop attendee
  - Team-Based Inquiry Learning (TBIL) is a structured form of active learning that uses the structure of Team-Based Learning as a means of bringing inquiry into lower-division courses. This workshop provides instructors with an overview of how to use TBIL in their courses, such as Calculus I, Calculus II, and Linear Algebra.
- Fall 2022, The Inclusive STEM Teaching Project attendee
  - The Inclusive STEM Teaching project is a 6-week course designed to advance the awareness, self-efficacy, and ability of faculty, postdocs, and doctoral students to cultivate inclusive STEM learning environments for all their students and to develop themselves as reflective, inclusive practitioners.

## **PROFESSIONAL EXPERIENCE**

### **SUMMER 2010 – SUMMER 2013**

SYSTEMS ENGINEER, LOCKHEED MARTIN

- Created new and modify existing requirements
- Wrote Request for Changes (RFCs), System Problem Reports, and Engineering Directives
- Interface Control Document Point of Contact
- Reviewed incoming Customer RFCs

## **HONORS**

At University of Washington

- Science Teaching Experience Program-Working in Science Education Scholar 2022-2023

#### At University of New Hampshire

- College of Engineering and Physical Sciences Fellowship Recipient 2013
- Honorable Mention for NSF Graduate Research Fellowship Program 2014
- Summer TA Fellowship 2015
- NSF and US National Committee on Theoretical and Applied Mechanics Early Career Presenter Fellowships 2021

#### At Penn State

- Graduated with Distinction from the Pennsylvania State University
- Diefenderfer Scholarship Recipient

#### At Lockheed Martin

- Team Special Recognition Award

### **SERVICE**

- Organizer for Climate Change Seminar series at Saint Michael's College Spring 2026
- Co-organizer for Earth Month Activities at Saint Michael's College 2025
- Saint Michael's College Institute for the Environment leadership committee Fall 2024 - Present
- Co-organizer for Granular Nature of Sea Ice Workshop 2021
- Review Duties: Journal of Fluid Mechanics, Cryosphere, Acta Oceanologica Sinica

### **ADVISING**

- Fall 2025 - Present
  - AJ Coronato: Senior seminar physics research at Saint Michael's College studying river morphology. Analyzing a theoretical model for the processes involved in the formation of valleys by rivers. The model treats valley growth as the advance of a moving boundary travelling via linearly diffusive erosion.
- Summer 2025
  - Eliana Gonzalez: Cooperative Institute for Climate, Ocean, and Ecosystem Studies undergraduate intern. Synthesized observational data from ice breakup at Kotzebue to compare lake ice and sea ice. Additionally performed parameter explorations with the SubZero sea ice model.
- Fall 2024 - Fall 2025
  - AJ Coronato: Junior seminar physics research at Saint Michael's College. Approximation algorithms were used to simplify common physical scenarios in fluid mechanics. These were implemented to solve the governing equations that describe these situations using numerical methods.
- Summer 2023 - Summer 2024
  - Krista Matuska: Cooperative Institute for Climate, Ocean, and Ecosystem Studies undergraduate intern. Synthesized observational data from arctic sea ice floes and performed parameter explorations on a simplified sea ice model.

- Summer 2023
  - Hugh Shields: Princeton High Meadow Environmental Institute undergraduate intern. Ran the SubZero sea ice model to explore the physical processes that govern the creation of pancake ice in the Arctic.
- Summer 2022 - Spring 2023
  - Camille Viviani: Undergraduate research at the University of Washington; used image segmentation software on optical satellite imagery to validate model outputs.
  - Yuna Liu: Undergraduate research at the University of Washington; ran SubZero simulations of the Nares Strait for parameter explorations.

## **PUBLISHED SOFTWARE**

- Brandon P. Montemuro, & Georgy E. Manucharyan. (2023). SubZero: a discrete element sea ice model that simulates floes as evolving concave polygons (v1.0.4). Zenodo.  
<https://doi.org/10.5281/zenodo.8205778>

## **SKILLS**

### Programming Languages

- Matlab
- Julia
- Python
- Dedalus computational framework

## **PROFESSIONAL MEMBERSHIPS**

- 2013-Present *American Mathematical Society*
- 2013-Present *Society for Industrial and Applied Mathematics*
- 2016-Present *American Physical Society*
- 2022-Present *American Geophysical Union*
- 2022-Present *Association of Polar Early Career Scientists*

## **CONFERENCE PRESENTATIONS**

- Ocean Sciences Meeting 2026
  - The Impact of Small Islands on the Dynamics of Sea Ice Arch Breakup in Nares Strait
- AGU Annual Meeting 2024
  - Role of Small Islands in Sea Ice Dynamics and Transport Through Nares Strait
- Ocean Sciences Meeting 2024
  - The role of islands in the summer breakup of sea ice arches in Nares Strait
- AGU Fall Meeting 2022
  - Lifecycle of sea ice floes reproduced using a new discrete element sea ice model
- Ocean Sciences Meeting 2022

- Subzero: A new Discrete Element Sea Ice Model with an Explicit Representation of Floe Life Cycle
- International Congress of Theoretical and Applied Mechanics 2020+1
  - A Self-Sustaining Process Theory for Uniform Momentum Zones and Internal Interfaces in Turbulent Shear Flows
- Modeling the Granular Nature of Sea Ice Workshop 2021
  - SubZero: Floe-Resolving Sea Ice Model Validation and Test Cases
- American Physical Society Division of Fluid Dynamics 2018
  - A Self-Sustaining Process Theory for Uniform Momentum Zones and Internal Layers in Wall Turbulence
- UNH Graduate Research Conference 2018
  - Viscous Versus Inviscid Exact Coherent States in High Reynolds Number Wall Flows
- American Physical Society Division of Fluid Dynamics 2017
  - Viscous Versus Inviscid Exact Coherent States in High Reynolds Number Wall Flows
- American Physical Society Division of Fluid Dynamics 2016
  - A Theory for Coupled Uniform Momentum Zones and Vortical Fissures in Turbulent Wall Flows
- UNH Graduate Research Conference 2016
  - Asymptotically-Reduced Modeling of Coexisting Uniform Momentum Zones and Internal Shear Layers in Turbulent Wall Flows

## **INVITED TALKS**

- University of Puget Sound Seminar Series 2023
  - Modeling the Intermittent Jamming of Sea Ice Floes in Nares Strait
- CICOES Intern Seminar Series 2023
  - SubZero: Explicit Representation of the Floe Life Cycle with a new Discrete Element Sea Ice Model
- UW Physical Oceanography Seminar 2023
  - Modeling the dynamics of sea ice floes passing through Nares Strait
- UNH IAM Seminar 2022
  - SubZero: Explicit Representation of the Floe Life Cycle with a new Discrete Element Sea Ice Model
- 9th Annual ArcTrain Meeting 2022
  - SubZero: A new Floe-Resolving Sea Ice Model with an explicit representation of Floe Life Cycle
- UW Physical Oceanography Seminar 2022
  - SubZero: Sea Ice Model with an Explicit Representation of a Floe Life Cycle

## **PUBLICATIONS**

### **PUBLISHED:**

- **Montemuro B,** Manucharyan G. SubZero: A discrete element sea ice model that simulates floes as evolving concave polygons. *Journal of Open Source Software*, **8(88)**, 5039, 2023

- Manucharyan G, **Montemuro B**. SubZero: A Sea Ice Model with an Explicit Representation of the Floe Life Cycle. *Journal of Advances in Modeling Earth Systems*, **14**, e2022MS003247, 2022
- **Montemuro B**, White C, Klewicki J, & Chini, G. A self-sustaining process theory for uniform momentum zones and internal shear layers in high Reynolds number shear flows. *Journal of Fluid Mechanics*, **901**, A28, 2020
- Chini G, **Montemuro B**, White C, Klewicki J. A self-sustaining process model of inertial layer dynamics in high Reynolds number turbulent wall flows, *Philosophical Transactions of the Royal Society A* ., **375**, 20160090, 2017

#### **IN REVISIONS:**

- **Montemuro B**, Manucharyan G. The Role of Islands in the Sea Ice Transport Through Nares Strait. *JGR Oceans*

#### **IN PREPARATION:**

- Stechmann S, Hu J, **Montemuro B**, Chen N, Manucharyan G, Tollar E, and Zhang M. Power laws in the sea ice floe size distribution: a stochastic theory
- **Montemuro B**, Manucharyan G, Gonzalez E, Kovaleski M. The Role of Small Islands on the Dynamics of Sea Ice Arch Breakup in Nares Strait
- Gonzalez E, **Montemuro B**, Manucharyan G, Kovaleski M. Contrasting Floe Size Distributions in Lake Ice and Sea Ice from Satellite Observations
- Kovaleski M, Manucharyan G, **Montemuro B**, Gonzalez E. The Timing of Seasonal Ice Breakup Events in Kobuk Lake

### **REFERENCES**

- Available upon request