

# BRANDON MONTEMURO

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## SUMMARY OF DOCTORAL RESEARCH

I used asymptotic theory to explain the origin and self-sustenance of quasi-coherent flow structures in the inertial region of the turbulent boundary. The theory involves a mixture of matched-asymptotic and WKBJ analysis to systematically simplify the Navier-Stokes equations. I then wrote pseudo-spectral numerical codes to simulate these reduced equations. Additionally, I have collaborated on work using the generalized quasilinear approximation to simulate plane Poiseuille flow utilizing the *Dedalus* computational framework.

## EDUCATION

**FALL 2013- MAY 2020**

**PH.D. IN INTEGRATED APPLIED MATHEMATICS, UNIVERSITY OF NEW HAMPSHIRE**

**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 2019 - PRESENT**

**POSTDOCTORAL SCHOLAR, UNIVERSITY OF WASHINGTON**

- BIS/BIO 285 – Our Changing Oceans

**FALL 2018**

**LECTURER, 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 EXPERIENCE**

**SUMMER 2010 – SUMMER 2013**

**SYSTEMS ENGINEER, LOCKHEED MARTIN**

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

## **PUBLICATIONS**

### **PUBLISHED:**

- 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 REVIEW:**

- 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*
- Montemuro B, Manucharyan G, SubZero: Sea Ice Discrete Element Model with Bonded Polygon Implementation

### **IN PREPARATION:**

- Montemuro B, Manucharyan G. SubZero: A discrete element sea ice model that simulates floes as evolving concave polygons. *Journal of Open Source Software*
- Montemuro B, Manucharyan G, Viviani C, Liu Y, Sea ice break up and ice flux through Nares Strait with SubZero

## **DISSERTATION**

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

## **INVITED TALKS**

- 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

## **CONFERENCE PRESENTATIONS**

- AGU Fall Meeting 2022 (Upcoming)
  - 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

## **HONORS**

At University of Washington

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

At University of New Hampshire

- CEPS Fellowship Recipient 2013
- Honorable Mention for NSF GRFP 2014
- Summer TA Fellowship 2015
- NSF and USNC/TAM 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**

- Co-organizer for Granular Nature of Sea Ice Workshop 2021
- Review Duties: Journal of Fluid Mechanics, Acta Oceanologica Sinica

## **SOFTWARE**

- Montemuro, B., & Manucharyan, G. (2022, October). Subzero v1.0.1. Zenodo. Retrieved from <https://doi.org/10.5281/zenodo.7222680> doi: 10.5281/zenodo.7222680

## **ADVISING**

- Summer 2022 - Present
  - Currently advising Camille Viviani and Yuna Liu on undergraduate research at the University of Washington

## **DIVERSITY, EQUITY, AND INCLUSION ACTIVITIES**

- 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.

## **SKILLS**

### Programming Languages

- Matlab
- Julia
- Python
- Dedalus computational framework

## **PROFESSIONAL MEMBERSHIPS**

- 2013-Present *American Mathematical Society*
- 2013-Present *Society of Industrial and Applied Mathematics*
- 2016-Present *American Physical Society*
- 2022-Present *American Geophysical Union*