Justin Cooke | Postdoctoral Fellow

University of Rhode Island Graduate School of Oceanography
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Education

Ph.D. in Mechanical Engineering, University of Pennsylvania **May 2024**
Department of Mechanical Engineering and Applied Mechanics. Philadelphia, PA
Dissertation: "Computational Study on Rough Wall-Bounded Flows and their Effects at Low and Very-High Reynolds Numbers"
Advisor: George Ilhwan Park

M.S. in Mechanical Engineering, University of Pennsylvania **Dec. 2022**
Department of Mechanical Engineering and Applied Mechanics. Philadelphia, PA

B.S. in Mechanical Engineering, University of Pittsburgh **Dec. 2018**
Department of Mechanical Engineering and Materials Science. Pittsburgh, PA
Magna Cum Laude

Research Experience

Postdoctoral Fellow **Sept. 2024 - Present**
Graduate School of Oceanography, University of Rhode Island, Narragansett, RI
Advisors: D. Randolph Watts and Kathleen Donohue. Project: Understanding Gulf Ocean Systems (UGOS). Identifying role of deep ($>$ 2000m) cyclones in the Loop Current system using a publicly available HYCOM 54-year nature run. Assessing ensemble transform forecast performance of NCOM, with a focus on deep current variability.

Research Assistant **May - Aug. 2024**
PennSED Lab, University of Pennsylvania, Philadelphia, PA
Advisors: Douglas Jerolmack and Paulo Arratia. Project: Exploring universal scaling of internal boundary layers that formed due to changes in surface roughness.

Graduate Researcher **Aug. 2019 - May 2024**
Park Lab at Penn, University of Pennsylvania, Philadelphia, PA
Advisor: George Ilhwan Park. Projects: Understanding turbulence characteristics in atmospheric flows encountering roughness step-changes. Leveraging surface roughness to enhance micro-unmanned-aerial-vehicle propeller performance.

GEM Full Fellow **June - Aug. 2019**
Air and Missile Defense Sector, Johns Hopkins Applied Physics Lab, Laurel, MD
Advisors: James Reuster and Ira Sorenson. Project: Numerical modeling of thermal environment to understand discrepancies between observations and simulations.

Undergraduate Researcher **May 2017 - Aug. 2018**

Babaee Lab, University of Pittsburgh, Pittsburgh, PA

Advisor: Hessam Babaee. Projects: Identifying correlations between Rayleigh Number and Reynolds Number for ellipsoids.

Journal Publications

4. **J. P. Cooke***, Park, G. I., Jerolmack, D. J., and Arratia, P. E. Internal boundary layer scaling for roughness transitions in turbulent flows. *ArXiv* DOI:10.48550/arXiv.2411.08705 (*Under Review*).
3. **J. P. Cooke**, Jerolmack, D. J., and Park, G. I. (2025) The evolution of turbulence producing motions in the neutral ABL across a natural roughness transition. *Journal of Geophysical Research: Atmospheres*, 130(5).
2. **J. P. Cooke**, Jerolmack, D. J., and Park, G. I. (2024) Mesoscale structure of the atmospheric boundary layer across a natural roughness transition. *PNAS*, 121(13).
1. **J. P. Cooke**, Campbell, M. F., Steager, E. B., Bargatin, I., Yim, M. H., & Park, G. I. (2023). Numerical and experimental study on the addition of surface roughness to micro-propellers. *Physics of Fluids*, 35(11).

   * Denotes Corresponding Author.

Presentations & Seminars

6. "Scaling for Turbulent Flows Encountering Roughness Transitions" 77^{th} *Annual Meeting of the APS Division of Fluid Dynamics*. Salt Lake City, UT, November, 2024.
5. "Evolution of the Flow within the Atmospheric Boundary Layer Encountering a Dune Field" *University of Pennsylvania Environmental and Biological Fluid Dynamics Group Seminar*. Philadelphia, PA, February 2024.
4. "Mesoscale Dynamics of the Atmospheric Boundary Layer Across a Natural Roughness Transition" *AGU Annual Meeting 2023*. San Francisco, CA, December, 2023.
3. "Mesoscale Structure of the Atmospheric Boundary Layer Across a Natural Roughness Transition at White Sands National Park" 76^{th} *Annual Meeting of the APS Division of Fluid Dynamics*. Washington, D.C., November, 2023.
2. "Computational Study on the Influence of Roughness at Low and Very-High Reynolds Numbers" *University of Pennsylvania MEAM Seminar*. Philadelphia, PA, June, 2023.
1. "Numerical and Experimental Investigation of the Addition of Surface Roughness on Micro-Scale Propeller Performance" 74^{th} *Annual Meeting of the APS Division of Fluid Dynamics*. Phoenix, AZ, November, 2021.

Grants and Honors

PI on NSF ACCESS Explore Resource Allocation October 2024 - October 2025

PI on NSF ACCESS Explore Resource Allocation June 2023 - June 2024

Outstanding Teaching Assistant in MEAM Award Runner-up Spring 2021

National GEM Consortium: GEM Full Fellow 2019

Teaching Experience

Teaching Assistant: Heat and Mass Transfer (MEAM 333) **Jan. - May 2022**
University of Pennsylvania, Philadelphia, PA
Taught by Jennifer Lukes

- Held weekly in-person recitation and office hours.
- Deployed an active teaching style to great success, and saw participation from a large majority of students.
- **Received positive feedback from students in anonymous peer evaluations (shown below).**
  - "Having had Justin as a TA for (thermodynamics) and now heat transfer, he is definitely one of the best TAs I have had in MEAM core. He always is really prepared for recitation and can even teach us concepts that we had not covered in lecture yet. His explanations are clear and concise and his board work/PDF uploads are super clear and easy to read."
  - "Helpful with examples, and did [his] best to communicate and answer questions always."

Teaching Assistant: Thermodynamics (MEAM 203) **Jan. - May 2021**
University of Pennsylvania, Philadelphia, PA
Taught by Igor Bargatin

- Remotely led twice weekly recitations and office hours.
- Deployed an active learning style where students were encouraged to provide assistance in solving problems.
- **Nominated by students for the Department's Outstanding Teaching Assistant (Runner-up).**

Teaching Assistant: Fluid Dynamics (MEAM 302) **Aug. - Dec. 2020**
University of Pennsylvania, Philadelphia, PA
Taught by George I. Park

- Remotely led weekly recitation, and held office hours twice per week.
- Utilized a passive learning style during recitations where example problems were completed step-by-step, and students would ask questions as the problem was solved.

Leadership and Mentorship

Society of Hispanic Professional Engineers **Aug. 2014 - Aug. 2024**
Various Positions, Pittsburgh and Philadelphia, PA

- Graduate student liaison for Penn's chapter, connected graduate and undergraduate student members through organizing workshops and social events, and advised undergraduate board members.
- Held the role of president at the University of Pittsburgh's chapter, guided the organization with great success, and received the Small Chapter of the Year Award in 2017 from the national organization.

B.R.O.T.H.E.R.H.O.O.D. **May 2016 - Dec. 2018**
Various Positions, Pittsburgh, PA

- Co-president of Brothers Respecting Open Thought Helping Every-man Realize His Own Original Dream. Our Mission is to develop academically, professionally, and emotionally,

historically underrepresented minority men in STEM.

Professional Service

Reviewer for the Following Journals:
- *Physics of Fluids* (Since 2023)

URI GSO Physical Oceanography Seminar Coordinator (Spring 2025 - Fall 2025)

Skills

- **Language:** *Spanish*: Reading and Writing (Intermediate), Speaking (Intermediate)
- **Flow Solvers:** *CharLES* from Cascade Technologies (Cadence Design Systems) (Advanced)
- **Programming Languages:** C++ (Intermediate), Fortran (Basic), Python (Intermediate), Julia (Basic)
- **Software:** Microsoft Office (Advanced), Paraview (Basic), Pointwise (Basic), Tecplot (Basic)
- **Data Analysis:** Matlab (Advanced)