
Michael A. Meehan

PhD Candidate
Department of Mechanical Engineering
University of Colorado, Boulder

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Education

- May 2022 **Ph.D. in Mechanical Engineering**, *University of Colorado Boulder*, Boulder, CO, GPA: 3.91/4.0.
Dissertation: The near-field dynamics of buoyant helium plumes.
Advisor: Dr. Peter E. Hamlington.
- May 2020 **M.S. in Mechanical Engineering**, *University of Colorado Boulder*, Boulder, CO, GPA: 3.91/4.0.
Research: Computational fluid dynamics and turbulent combustion.
Advisor: Dr. Peter E. Hamlington.
- May 2017 **B.S. in Mechanical Engineering**, *Pennsylvania State University*, State College, PA, GPA: 3.89/4.0.
Minor in Mathematics
Research: Experimental investigation of bluff-body stabilized flames and flow.
Advisor: Dr. Jaqueline O'Connor

Honors and Awards

- 2019 **Vogel Family Fellowship.**
Department of Mechanical Engineering, University of Colorado Boulder
- 2018 **Outstanding Teaching Assistant.**
Department of Mechanical Engineering, University of Colorado Boulder
- 2017 **Outstanding Mechanical Engineering Research Potential Fellowship.**
Department of Mechanical Engineering, University of Colorado Boulder
- 2017 **Dr. John P. Kardis Department Head's Award for Research and Achievement in Mechanical Engineering.**
Department of Mechanical Engineering, Pennsylvania State University
- 2016 **First Place Award for Best Project at the Senior Design Showcase.**
Department of Mechanical Engineering, Pennsylvania State University
- 2016 **Louis A Harding Memorial Scholarship.**
Department of Mechanical Engineering, Pennsylvania State University

Experience

- 2017 - Present **Research Assistant**, *Turbulence and Energy Systems Laboratory*, University of Colorado Boulder.
Advisor: Dr. Peter Hamlington
- 2017 - 2018 **Teaching Assistant**, *Department of Mechanical Engineering*, University of Colorado Boulder.
- 2016 - 2017 **Research Assistant**, *Reacting Flow Dynamics Laboratory*, Pennsylvania State University.
Advisor: Dr. Jacqueline O'Connor

Research Interests

Computational fluid dynamics, turbulent combustion, buoyancy-driven flows, adaptive mesh refinement, propulsion generation, reduced-order modeling, algorithm development, Bayesian methods, fluid mechanics, high performance computing, software development.

Publications

Refereed Journal Publications - Published

- [1] Ryan Darragh, C A Z Towery, **M A Meehan**, and P E Hamlington. Lagrangian analysis of enstrophy dynamics in a highly turbulent premixed flame. *Physics of Fluids*, 33(5):055120, 2021.
- [2] N T Wimer, M S Day, C Lapointe, **M A Meehan**, A S Makowiecki, J F Glusman, J W Daily, G B Rieker, and P E Hamlington. Numerical simulations of buoyancy-driven flows using adaptive mesh refinement: Structure and dynamics of a large-scale helium plume. *Theoretical and Computational Fluid Dynamics*, 35(1):61–91, 2021.
- [3] T P Dare, Z P Berger, **M A Meehan**, and J O'Connor. Cluster-based reduced-order modeling to capture intermittent dynamics of interacting wakes. *AIAA Journal*, pages 1–9, 2019.
- [4] **M A Meehan**, A Tyagi, and J A O'Connor. Flow dynamics in a variable-spacing, three bluff-body flowfield. *Physics of Fluids*, 30(2):025105, 2018.

Refereed Journal Publications - Submitted

- [5] O Patil, **M A Meehan**, and P E Hamlington. The puffing frequency for interacting, two-dimensional, helium plumes. Drafted, 2022.
- [6] **M A Meehan**, S Simons-Wellin, and P E Hamlington. Efficient algorithm to perform proper orthogonal decomposition on block-structured adaptively refined grids. Submitted, 2022.
- [7] **M A Meehan**, N Wimer, and P E Hamlington. Richardson and Reynolds number effects on the near-field of buoyant plumes: Temporal variability and puffing. Submitted, 2022.
- [8] S H R Whitman, T J Souders, **M A Meehan**, J G Bresseur, and P E Hamlington. Pressure gradient tailoring effects on vorticity dynamics in the near-wake of bluff-body premixed flames. Submitted, 2022.

Refereed Journal Publications - In Preparation

- [9] **M A Meehan** and P E Hamlington. A Galerkin model of the laminar puffing instability. In preparation, 2022.
- [10] **M A Meehan** and P E Hamlington. Richardson and Reynolds number effects on the near-field of buoyant plumes: Enstrophy and kinetic energy dynamics. In preparation, 2022.
- [11] **M A Meehan** and P E Hamlington. The role of entrainment on the buoyant plume puffing frequency. In preparation, 2022.
- [12] **M A Meehan**, N Wimer, and P E Hamlington. Richardson and Reynolds number effects on the near-field of buoyant plumes: Flow statistics and fluxes. Drafted, 2022.

Conference Proceedings - Published

- [13] **M A Meehan**, N T Wimer, A Tyagi, J A O'Connor, and P Hamlington. Identifying complex dynamics of interacting turbulent jets through modal decompositions. In *AIAA Scitech 2019 Forum*, page 0323, 2019.
- [14] W Culler, J Crane, J Samarasinghe, **M A Meehan**, and J O'Connor. Effect of flame spacing and flow velocity on the dynamics of three interacting V-flames. In *9th U.S. National Combustion Meeting*, May 2015.

Fellowships

- 2018 – Present **Fellow of National Science Foundation Graduate Research Fellowship Program (NSF GRFP)**, *Reactant Pocket Dynamics in Interacting Turbulent Flames*.
Funding: \$138,000 for three years (\$34,000/yr stipend, \$12,000/yr towards cost-of-education)
- 2018 **Finalist of National Defense Science and Engineering Graduate Fellowship Program (NDSEG)**, *Reduced-Order Modeling of Turbulent Bluff-Body Stabilized Flames*.

2017 – 2018 **Dean’s Graduate Assistantship**, Department of Mechanical Engineering, University of Colorado Boulder.
Funding: \$21,800 for one year

Leadership Roles

- 2020 – Present **Student Organizer of the Rocky Mountain Fluid Mechanics Conference**.
Department of Mechanical Engineering, University of Colorado Boulder
- 2018 – 2021 **Co-President of the Graduate Engineering Annual Research & Recruitment Symposium**.
Department of Mechanical Engineering, University of Colorado Boulder
- 2015 – 2016 **President of the Penn State Triathlon Club**.
Pennsylvania State University

Mentorship Roles

- 2021 – Present **Undergraduate Research**, *Characterizing the dynamics of two-dimensional interacting buoyant plumes*, Student: Omkar Patil.
Department of Mechanical Engineering, University of Colorado Boulder
- 2020 – 2021 **Discovery Learning Apprenticeship**, *Development of GPU-based tools for simulations of fluid flows*, Student: Derrick Choi.
Department of Mechanical Engineering, University of Colorado Boulder
- Summer 2019 **Undergraduate Research Opportunities Program**, *Efficient algorithm to perform proper orthogonal decomposition on block-structured adaptively refined grids*, Student: Sam Simons-Wellin.
Department of Mechanical Engineering, University of Colorado Boulder

Conference Presentations

- [P.1] The puffing instability in buoyant plumes. 19th Annual Graduate Engineering Annual Research & Recruitment Symposium. Boulder, CO, February 24, 2022.
- [P.2] Reynolds and Richardson number dependence of near-field flow behavior for axisymmetric plumes. American Physical Society, Division of Fluid Dynamics. Phoenix, AZ, November 23, 2021
- [P.3] Vorticity dynamics in buoyant helium plumes. 6th Annual Rocky Mountain Fluid Mechanics Symposium. Boulder, CO, August 10, 2021
- [P.4] Analyzing buoyant plume simulations using yt. RHyTHM: Research using yt Highlights Meeting. December 9, 2020
- [P.5] Effect of Reynolds number on the buoyant jet puffing instability. American Physical Society, Division of Fluid Dynamics. November 24, 2020
- [P.6] The Reynolds number dependence of the buoyant jet puffing frequency. 6th Annual Rocky Mountain Fluid Mechanics Symposium. Boulder, CO, August 4, 2020.
- [P.7] Synthetic turbulence generation method to simulate turbulence generating plates. 5th Annual Rocky Mountain Fluid Mechanics Symposium. Boulder, CO, July 29, 2019.
- [P.8] Identifying and controlling complex dynamics in turbulent buoyant jets. 16th Annual Graduate Engineering Annual Research & Recruitment Symposium. Boulder, CO, February 21, 2019.
- [P.9] Identifying complex dynamics of interacting turbulent jets with modal decompositions. American Institute of Aeronautics and Astronautics. San Diego, CA, January 7, 2019
- [P.10] Characterization of flapping in a plane turbulent buoyant jet using proper orthogonal decomposition. 4th Rocky Mountain Fluid Mechanics Symposium. Boulder, CO, August 15, 2018.

Computer Time Grants

- 2020 – Present **Texas Advanced Computing Center**, *Quantifying small-scale dynamics in buoyant plumes using vorticity transport*, Award: 5000 node hours.
- 2019 – 2020 **Texas Advanced Computing Center**, *Direct numerical simulations of practical turbulent combustion configurations*, Award: 1600 node hours.

Professional Service

- 2022 **Grader**, MCEN 6001, Reacting Flows.
- 2021 **Contributor**, yt Project: an open source, community-developed analysis and visualization code..
- 2021 **Subject Lead & Mentor**, Fluid Dynamics Oral Preliminary Exam Preparation.
- 2021 **Co-chair**, Reacting Flows: Turbulent Combustion Session for , November 22, 2021.
- 2021 **Panelist**, Graduate Engineering Annual Research & Recruitment Symposium, November 3, 2021.
- 2020 **Subject Lead & Mentor**, Fluid Dynamics Oral Preliminary Exam Preparation.
- 2020 – 2021 **Developer**, Research team website: <https://teslacu.org/>.
- 2019 **Subject Lead & Mentor**, Fluid Dynamics Oral Preliminary Exam Preparation.
- 2019 **Volunteer**, 5th Rocky Mountain Fluid Mechanics Symposium. Boulder, CO, July 29, 2019.
- 2018 – Present **Reviewer**, Physics of Fluids.
- 2018 **Volunteer**, 4th Rocky Mountain Fluid Mechanics Symposium. Boulder, CO, August 14–15, 2018.
- 2017 **Volunteer**, 70th Meeting of the Division of Fluid Dynamics, American Physical Society. Denver, CO, November 19–21, 2017..
- 2017–2018 **Transportation Committee Member**, Mechanical Engineering Graduate Student Research & Recruitment Committee, Department of Mechanical Engineering, University of Colorado Boulder.
- 2016–2017 **Student Representative**, Interviewing Prospective Mechanical Engineering Faculty, Department of Mechanical Engineering, Pennsylvania State University.