

# Jesse Capecelatro

Assistant Professor @ University of Michigan

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## Education

- 2012–2014 **Ph.D.**, *Mechanical & Aerospace Engineering*, Cornell University.  
Thesis: *A mesoscopic formalism for simulating particle-laden flows with applications in energy conversion processes*
- 2011–2012 **M.S.**, *Mechanical & Aerospace Engineering*, Cornell University.
- 2009–2011 **M.S.**, *Mechanical Engineering*, University of Colorado Boulder.
- 2005–2009 **B.S.**, *Mechanical Engineering*, Binghamton University – The State University of New York, *Cum Laude*.

## Professional Experience

- 2020–present **Assistant Professor**, *Department of Aerospace Engineering (0%)*, University of Michigan.
- 2016–present **Assistant Professor**, *Department of Mechanical Engineering*, University of Michigan.
- May–Aug 2018 **Visiting Professor**, *Research and Innovation Center*, Ford Motor Company.
- Mar–Aug 2016 **Research Scientist**, *Center for Exascale Simulation of Plasma-Coupled Combustion (XPACC)*, University of Illinois Urbana-Champaign.
- 2014–2016 **Postdoctoral Researcher**, *XPACC*, University of Illinois Urbana-Champaign.
- May–July 2014 **Postdoctoral Researcher**, *Computational Thermo-Fluids Laboratory led by Prof. O. Desjardins*, Cornell University.
- 2011–2014 **Graduate Research Assistant**, *Computational Thermo-Fluids Laboratory led by Prof. O. Desjardins*, Cornell University.
- 2010–2011 **Graduate Research Assistant**, *Computational Modeling of Energy Systems led by Prof. O. Desjardins*, University of Colorado Boulder.

## Awards & Honors

### National

- 2020 NASA Early Stage Investigation Award
- 2019 ASME Pi Tau Sigma Gold Medal “*for outstanding achievements in mechanical engineering within ten years of graduation*”
- 2019 National Science Foundation CAREER Award
- 2019 Office of Naval Research Young Investigator Award
- 2010 Honorable Mention, NSF: Graduate Student Research Fellowship Program
- 2008 Tau Beta Pi, The Engineering Honor Society
- 2008 Pi Tau Sigma, The Mechanical Engineering Honor Society

## Institutional

- 2021 Mechanical Engineering Department Achievement Award, University of Michigan
- 2020 Pi Tau Sigma Professor of the Term, University of Michigan
- 2019 Nominated for the university-wide Golden Apple Award, a student nominated award that recognizes outstanding university teaching, University of Michigan
- 2015 Video of the Month award: *Jet in Crossflow of a Spatially Evolving Turbulent Boundary Layer*, Coordinated Science Laboratory, University of Illinois at Urbana-Champaign
- 2014 The Jayesh Prize in recognition of outstanding presentation in the Cornell Fluid Dynamics Seminar
- 2011 Outstanding Teacher Assistant Award, Department of Mechanical Engineering, University of Colorado

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## Refereed Journal Articles<sup>1</sup>

- 2021
  1. Morris, S., McAtee, W., **Capecelatro, J.**, Raghav, V. (2021) Characterization and measurement of leakage flows around surgical masks. *Journal of Exposure Science and Environmental Epidemiology*. Submitted.
  2. Zhu, M., Medina, M., Yao, Y., Nalliah, R. P., Kadhium, V., Bell, E., Han, T., Boehman, A., **Capecelatro, J.**, Wooldridge, M. S. (2021) Characterization of aerosols created during high-speed dental drilling. *Journal of Aerosol Science*. Submitted.
  3. Zhu, M., Medina, M., Nalliah, R. P., Kadhium, V., Bell, E., Han, T., Boehman, A., **Capecelatro, J.**, Wooldridge, M. S. (2021) Experimental evaluation of aerosol mitigation strategies in large, open-plan, dental clinics. *Journal of the American Dental Association*. Submitted.
  4. Lattanzi, A., Tavanashad, V., Subramaniam, S., **Capecelatro, J.** (2021) Fluid-mediated sources of granular temperature at finite Reynolds numbers. *Physical Review Letters*. Submitted.
  5. Beetham, S., Lattanzi, S., **Capecelatro, J.** (2021) On the thermal entrance length of moderately dense gas-particle flows. *International Journal of Heat and Mass Transfer*. Submitted.
  6. Lattanzi, A., Tavanashad, V., Subramaniam, S., **Capecelatro, J.** (2021) A stochastic model for the hydrodynamic force in Euler-Lagrange simulations of particle-laden flows. *Physical Review Fluids*. Submitted.
  7. Shallcross, G. S., **Capecelatro, J.** (2021) An explicit characteristic-based immersed boundary method for compressible flows, *Journal of Computational Physics*. Submitted.
  8. Zhang, J., **Capecelatro, J.**, Maki, K. (2021) On the utility of a well-mixed model for predicting disease transmission on an urban bus. *AIP Advances*. 11, 085229.
  9. Yao, Y., **Capecelatro, J.** (2021) An accurate particle-mesh method for simulating charged particles in wall-bounded flows, *Powder Technology*. 387, 239–250.
  10. Monroe, K., Yao, Y., Lattanzi, A., Raghav, V., **Capecelatro, J.** (2021) Role of pulsatility on particle dispersion in expiratory flows, *Physics of Fluids*. 33, 4.
  11. Beetham, S., Fox, R. O., **Capecelatro, J.** (2021) Sparse identification of multiphase turbulence closures for coupled fluid-particle flows. *Journal of Fluid Mechanics*. 914, A11.
  12. Yao, Y., **Capecelatro, J.** (2021) Deagglomeration of cohesive particles by turbulence, *Journal of Fluid Mechanics*. 911, A10.
  13. Zhang, J., Han, T., Hee Yoo, K., **Capecelatro, J.**, Boehman, A., Maki, K. (2021) Disease transmission through expiratory aerosols on an urban bus. *Physics of Fluids*. 30, 1.

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<sup>1</sup>Underlined names indicate students advised at UM

2020

14. Iwashyna, T. J., Boehman, A., **Capecelatro, J.**, Cohn, A. M., Cooke, J. M., Costa, D. K., Eakin, R. M., Prescott, H. C., Wooldridge, M. S. (2020) Variation in aerosol production across oxygen delivery devices in spontaneously breathing human subjects, *medRxiv*.
15. Lattanzi, A., Tavanashad, V., Subramaniam, S., **Capecelatro, J.** (2020) Stochastic models for capturing dispersion in particle-laden flows. *Journal of Fluid Mechanics*. 903, A7.
16. Beetham, S., **Capecelatro, J.** (2020) Formulating turbulence closures using sparse regression with embedded form invariance, *Physical Review Fluids*. 5, 08461.
17. Baker, M. C., Fox, R. O., Kong, B., **Capecelatro, J.**, Desjardins, O. (2020) Reynolds-stress modeling of cluster-induced turbulence in particle-laden vertical channel flow, *Physical Review Fluids*. 5, 074304.
18. Baker, M. C., Kong, B., **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2020) Direct comparison of Eulerian–Eulerian and Eulerian–Lagrangian simulations for particle-laden vertical channel flow, *AIChE Journal*. 67, 1–13.
19. Shallcross, G. S., Fox, R. O., **Capecelatro, J.** (2020) A volume-filtered description of compressible particle-laden flows. *International Journal of Multiphase Flows*. 122, 1–19.

2019

20. Yao, Y., **Capecelatro, J.** (2019) Electrohydrodynamic generation of atmospheric turbulence. *Physical Review Fluids*. 4, 1–19.
21. Wang, G., Fong, K. O., Coletti, F., **Capecelatro, J.**, Richter, D. (2019) Inertial particles distribution and modification of vertical turbulent channel flow: a numerical and experimental comparison. *International Journal of Multiphase Flows*. 120, 1–16.
22. Kord, A., **Capecelatro, J.** (2019) Optimal perturbations for controlling the growth of a Rayleigh–Taylor instability. *Journal of Fluid Mechanics*. 876, 150–185.
23. Buchta, D. A., Shallcross, G., **Capecelatro, J.** (2019) Sound and turbulence modulation by particles in high-speed shear flows. *Journal of Fluid Mechanics*. 875, 254–285.
24. Popov, P. P., Buchta, D. A., Anderson, M. J., Massa, L., **Capecelatro, J.**, Bodony, D. J., Freund, J. B. (2019) Learning-Assisted Early Ignition Prediction in a Complex Flow. *Combustion and Flame*. 206, 451–466.
25. Beetham, S., **Capecelatro, J.** (2019) Biomass pyrolysis in fully-developed turbulent riser flow. *Renewable Energy*. 140, 751–760.
26. Rao, A. A., **Capecelatro, J.** (2019) Coarse-grained modeling of sheared granular beds. *International Journal of Multiphase Flows*. 114, 258–267.
27. Guo, L., **Capecelatro, J.** (2019) The role of clusters on heat transfer in sedimenting gas-solid flows. *International Journal of Heat and Mass Transfer*. 132, 1217–1230.

2018

28. **Capecelatro, J.**, Bodony, D. J., Freund, J. B. (2018) Adjoint-based sensitivity and ignition threshold mapping in a turbulent mixing layer. *Combustion Theory and Modeling*. 23, 1–35.
29. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2018) On the transition between turbulence regimes in particle-laden channel flows, *Journal of Fluid Mechanics*. 845, 499–519.
30. Goyal, H., Desjardins, O., Pepiot, P., **Capecelatro, J.** (2018) A computational study of the effects of multiphase dynamics in catalytic upgrading of biomass pyrolysis vapor. *AIChE Journal*. 64, 3341–3353.
31. Yao, Y., **Capecelatro, J.** (2018) Competition between drag and Coulomb interactions in turbulent particle-laden flows using a coupled-fluid–Ewald-summation based approach. *Physical Review Fluids*. 3, 1–20.
32. **Capecelatro, J.** (2018) A purely Lagrangian method for simulating the shallow water equations on a sphere using smooth particle hydrodynamics, *Journal of Computational Physics*. 356, 174–191.

2017

33. Patel, R., Kong, B., **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2017) Verification of Eulerian–Eulerian and Eulerian–Lagrangian simulations for turbulent fluid–particle flows, *AIChE Journal*. 63, 5396–5412.
34. Kong, B., Feng, H., **Capecelatro, J.**, Patel, R., Desjardins, O., Fox, R. O. (2017) Euler–Euler anisotropic Gaussian mesoscale simulation of homogeneous cluster-induced gas–particle turbulence, *AIChE Journal*. 63, 2630–2643.

2016

35. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2016) Strongly-coupled gas-particle flows in vertical channels. Part I: Reynolds-averaged two-phase statistics, *Physics of Fluids*. 28, 1–22.
36. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2016) Strongly-coupled gas-particle flows in vertical channels. Part II: Turbulence modeling, *Physics of Fluids*. 28, 1–22.
37. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2016) Effect of domain size on fluid-particle statistics in homogeneous gravity-driven cluster-induced turbulence, *Journal of Fluids Engineering*. 138, 1–8.

2015

38. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2015) On fluid-particle dynamics in fully-developed cluster-induced turbulence, *Journal of Fluid Mechanics*. 780, 578–635.
39. **Capecelatro, J.**, Desjardins, O. (2015) Mass loading effects on turbulence modulation by particle clustering in dilute and moderately dilute channel flows, *Journal of Fluids Engineering*. 137, 1–8.
40. **Capecelatro, J.**, Pepiot, P., Desjardins, O. (2015) Numerical investigation and modeling of reacting gas-solid flows in the presence of clusters, *Chemical Engineering Science*. 122, 403–415.

2014

41. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2014) Numerical study of collisional particle dynamics in cluster-induced turbulence, *Journal of Fluid Mechanics*. 747, R2 1–13.
42. **Capecelatro, J.**, Pepiot, P., Desjardins, O. (2014) Numerical characterization and modeling of particle clustering in wall-bounded vertical risers, *Chemical Engineering Journal*. 245, 295–310.

2013

43. **Capecelatro, J.**, Desjardins, O. (2013) Eulerian-Lagrangian modeling of turbulent liquid-solid slurries in horizontal pipes, *International Journal of Multiphase Flow*. 55, 64–79.
44. **Capecelatro, J.**, Desjardins, O. (2013) An Euler-Lagrange strategy for simulating particle-laden flows, *Journal of Computational Physics*. 238, 1–31.

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## Refereed Conference Papers

2019

1. Agudelo, C., Vendula, R. T., **Capecelatro, J.**, Wang, Q. (2019) Design of Experiments for Effects and Interactions during Brake Emissions Testing Using High-Fidelity Computational Fluid Dynamics. *SAE Technical Paper*. 37th Annual Brake Colloquium & Exhibition. No. 2019-01-2139.

2014

2. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2014) Investigating multiphase turbulence statistics of large-scale two-way coupled gravity-driven flows, *Proceedings of the ASME 2014 4th Joint US-European Fluids Engineering Division Summer Meeting*. August 3–7, 2014, Chicago, Illinois, USA.
3. **Capecelatro, J.**, Desjardins, O. (2014) Turbulence modulation by particle clustering in dilute and moderately dilute channel flows, *Proceedings of the ASME 2014 4th Joint US-European Fluids Engineering Division Summer Meeting*. August 3–7, 2014, Chicago, Illinois, USA.

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## Publications in Popular Press

2020

1. **Capecelatro, J.** School bus safety during the COVID-19 pandemic: 8 recommendations, *The Conversation* URL: <https://theconversation.com/school-bus-safety-during-the-covid-19-pandemic-8-recommendations-145226>.

## Proceedings and Presentations

2021

1. **Capecelatro, J., Beetham, S.** (2021) Sparse identification of multiphase turbulence closures for strongly-coupled gas-particle flows, IACM Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology, San Diego, CA. Invited.
2. **Lattanzi, A., Tavanashad, V., Subramaniam, S., Capecelatro, J.** (2021) Stochastic modeling of drag forces in Euler–Lagrange simulations of particle-laden flows, NETL 2021 Workshop on Multiphase Flow Science, Virtual.
3. **Wakefield, J., Lattanzi, A., Capecelatro, J.** (2021) An open-source library for multi-step reactions in spherical and cylindrical particles, NETL 2021 Workshop on Multiphase Flow Science, Virtual.
4. **Yao, Y., Huan, X., Capecelatro, J.** (2021) Multi-fidelity uncertainty quantification for gas-solid flows, NETL 2021 Workshop on Multiphase Flow Science, Virtual.
5. **Beetham, S., Lattanzi, A., Capecelatro, J.** (2021) Simulation and modeling of thermally evolving, moderately dense gas-particle flows, NETL 2021 Workshop on Multiphase Flow Science, Virtual.
6. **Beetham, S., Lattanzi, A., Capecelatro, J.** (2021) Simulation and modeling of thermally evolving, moderately dense gas-particle flows, 2021 EUROMECH Colloquia (virtual).
7. **Lattanzi, A., Tavanashad, V., Subramaniam, S., Capecelatro, J.** (2021) Stochastic modeling of drag forces in strongly-coupled particle-laden flows, 2021 EUROMECH Colloquia (virtual).
8. **Capecelatro, J.** (2021) Understanding the fluid dynamics of airborne disease transmission from the microscale to the macroscale, 7th Micro and Nano Flows Conference 2021 (virtual). Invited.
9. **Lattanzi, A., Tavanashad, V., Subramaniam, S., Capecelatro, J.** (2021) A stochastic Euler-Lagrange (EL) framework for inertial particle suspensions, 2021 SIAM Conference on Computational Science and Engineering (virtual). Invited.
10. **Khalloufi, M., Shallcross, G., Lattanzi, A., Capecelatro, J.** (2021) Quantification of drag statistics for compressible flows past particles at finite Mach number and volume fraction, 2021 AIAA SciTech Forum (virtual).
11. **Patel, M., Shallcross, G., Fox, R. O., Capecelatro, J.** (2021) A Two Equation Eulerian-Lagrangian Model for Simulation of Shock Induced Flow Through Particle Suspensions, 2021 AIAA SciTech Forum (virtual).
12. **Yao, Y., Capecelatro, J.** (2020) Accurate Particle-Mesh Method for Simulating Charged Particles in Wall-bounded Flows, 2021 AIAA SciTech Forum (virtual).

2020

13. **Capecelatro, J.**, (2020) Modeling thermal transport in gas-particle flows using machine learning, NSF Workshop: New Frontiers of Thermal Transport (virtual)
14. Khalloofi, M., Shallcross, G., **Capecelatro, J.**, (2020) Particle-resolved direct numerical simulations of compressible flows past particles at finite Mach number and volume fraction, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
15. Patel, M., Rubio, J., Ni, R., Rabinovitch, J., **Capecelatro, J.**, (2020) Numerical Simulation of Particle-Laden Underexpanded Jets, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
16. Rubio, J., Patel, M., **Capecelatro, J.**, Rabinovitch, J., Ni, R. (2020) Experimental Investigation of Two-Way Coupling in Particle-Laden Compressible Flows, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
17. Ni, M., Mehrabadi, M., **Capecelatro, J.**, Subramaniam, S. (2020) Residual Terms in the Spatially Filtered Fluid Momentum Equation for a Particle-laden Suspension, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
18. Monroe, K., Lattanzi, A., Yao, Y., Raghav, V., **Capecelatro, J.** (2020) Role of Pulsatility on Aerosol Dispersion in Expiratory Flows, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
19. Lattanzi, A., Tavanashad, V., Subramaniam, S., **Capecelatro, J.** (2020) Stochastic methods for capturing dispersion in particle-laden flows, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
20. Beetham, S., Lattanzi, A., **Capecelatro, J.** (2020) Toward improved heat transfer models for strongly-coupled particle-laden flows, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
21. Kord, A., **Capecelatro, J.** (2020) A Discrete Adjoint-Based Method for High-Fidelity Simulations of Turbulent Reacting Flows, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
22. Yao, Y., **Capecelatro, J.** (2020) Numerical modeling of the breakup of cohesive particles by turbulence, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
23. Shallcross, G., **Capecelatro, J.** (2020) An explicit characteristic based immersed boundary method for compressible flows, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL (virtual).
24. Lattanzi, A., Tavanashad, V., Subramaniam, S., **Capecelatro, J.** (2020) Stochastic Drag Formulations for Particle-Laden Flows, 2020 AIChE Annual Meeting, Virtual.
25. Beetham, S., Hacker, K., Lattanzi, A., **Capecelatro, J.** (2020) Heat Transfer in Clustered Gas-Solids Flows, 2020 AIChE Annual Meeting, Virtual.
26. Yao, Y., **Capecelatro, J.** (2020) Numerical Modeling of Deagglomeration of Cohesive Particles By Turbulence, 2020 AIChE Annual Meeting, Virtual.
27. Kord, A., Huang, C., Duraisamy, K., J., **Capecelatro, J.** (2020) Sensitivity of flame characteristics in a coaxial jet using an adjoint-based flamelet-progress variable approach, AIAA Aviation Forum, Virtual (due to COVID-19).
28. Yao, Y., Shallcross, G., Ni, R., Kim, T., Mehta, M., Rabinovitch, J., **Capecelatro, J.** (2020) The dynamics of inertial particles in under-expanded jets: A numerical study, 58th AIAA Aerospace Sciences Meeting, Orlando, FL.
29. Kim, T., Ni, R., **Capecelatro, J.**, Yao, Y., Shallcross, G., Mehta, M., Rabinovitch, J. (2020) The dynamics of inertial particles in underexpanded jets: An experimental study, 58th AIAA Aerospace Sciences Meeting, Orlando, FL.

2019

30. Yao, Y., Rabinovitch, J., **Capecelatro, J.** (2019) Numerical modeling of inertial particles in under-expanded jets, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA.
31. Lattanzi, A. M., Beetham, S., Fong, K. O., Coletti, F., **Capecelatro, J.** (2019) Clustering of gas-solids flows in a vertical duct, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA.
32. Shallcross, G., Fox, R. O., **Capecelatro, J.** (2019) Modeling pseudo-turbulence in compressible particle-laden flows, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA.
33. Beetham, S., **Capecelatro, J.** (2019) Modeling particle-induced turbulence using sparse regression with embedded invariance, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA.
34. **Capecelatro, J.** (2019) Conveying principles of fluid mechanics... through dance, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA.
35. Kim, T., Ni, R., **Capecelatro, J.**, Yao, Y., Shallcross, G., Mehta, M., Rabinovitch, J. (2019) Experimental investigation of particle-laden under-expanded jets, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA.
36. Richter, D., Wang, G., Fong, K. O., Coletti, F., **Capecelatro, J.** (2019) Inertial particle velocity and distribution in vertical turbulent channel flow: a numerical and experimental comparison, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA.
37. Beetham, S., **Capecelatro, J.** (2019) Modeling Particle-Induced Turbulence Using Sparse Regression with Embedded Invariance, 2019 AIChE Annual Meeting, Orlando, FL.
38. **Capecelatro, J.**, Shallcross, G. (2019) Volume-filtered framework for compressible particle-laden flows, AIAA Aviation Forum, Dallas, TX.
39. Shallcross, G., **Capecelatro, J.** (2019) A volume-filtered description of shock-particle interactions, 21st Biennial Conference of the APS Topical Group on Shock Compression of Condensed Matter, Portland, OR.
40. **Capecelatro, J.**, Shallcross, G., Buchta, D. (2019) The sound of two-phase flows: Particle-turbulence effects on the pressure field in high-speed mixing layers, 10th International Conference on Multiphase Flow, Rio de Janeiro, Brazil.
41. Beetham, S., **Capecelatro, J.** (2019) Modeling turbulent flows using sparse regression with embedded invariance, 16th Pan-American Congress of Applied Mechanics, Ann Arbor, MI.
42. Agudelo, C., **Capecelatro, J.**, Wang, Q., Bautell, J. (2019) High-Fidelity Modelling and Characterization of Dynamometer Enclosure Interactions Using a DOE Approach for Brake Emissions Measurements, EuroBrake, Dresden, Germany.



2018

43. Beetham, S., **Capecelatro, J.** (2018) Sparse identification of particle-laden turbulence closures, 71st Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, GA.
44. Kord, A., **Capecelatro, J.** (2018) Controlling multi-component flow instabilities using adjoints, 71st Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, GA.
45. Yao, Y., **Capecelatro, J.** (2018) Theoretical and Numerical Study of Electrohydrodynamic Generation of Atmospheric Turbulence, 71st Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, GA.
46. Shallcross, G., Buchta, D., **Capecelatro, J.** (2018) Sound and turbulence modulation by particles in high-speed shear flows, 71st Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, GA.
47. **Capecelatro, J.** (2018) The role of particle-turbulence interactions on fluid and thermal transport, 71st Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, GA.
48. **Capecelatro, J.** (2018) Data-driven methods for multiphase turbulence modeling, Banff International Research Station, Oaxaca, Mexico.
49. Beetham, S., **Capecelatro, J.** (2018) Data-driven closure framework for multiphase turbulence modeling, NETL 2018 Workshop on Multiphase Flow Science, Houston, TX.
50. **Capecelatro, J.** (2018) Understanding and modeling the effect of clusters on heat transfer in gas-solid suspensions, NETL 2018 Workshop on Multiphase Flow Science, Houston, TX.
51. Shallcross, G., **Capecelatro, J.** (2018) A parametric study of particle-laden shock tubes using an Eulerian-Lagrangian framework, 56th AIAA Aerospace Sciences Meeting, Kissimmee, FL.

2017

52. **Capecelatro, J.**, Shallcross, G., Buchta, D. (2017) The role of particle-turbulence interactions on the pressure field near high-speed shear flows, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, CO.
53. Shallcross, G., **Capecelatro, J.** (2017) A volume-filtered formulation to capture particle-shock interactions in multiphase compressible flows, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, CO.
54. Yao, Y., **Capecelatro, J.** (2017) Numerical study of charged inertial particles in turbulence using a coupled fluid-P<sup>3</sup>M approach, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, CO.
55. Kord, A., **Capecelatro, J.** (2017) Manipulating Rayleigh–Taylor growth using adjoints, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, CO.
56. Baker, M., **Capecelatro, J.**, Kong, B., Fox, R. O., Desjardins, O. (2017) Modeling of cluster-induced turbulence in particle-laden channel flow, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, CO.
57. Kong, B., Patel, R., **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2017) Verification of Eulerian–Eulerian and Eulerian–Lagrangian simulations for fluid–particle flows, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, CO.
58. Patel, R., Kong, B., **Capecelatro, J.**, Fox, R. O., Desjardins, O. (2017) 3-D conditional hyperbolic method of moments for high-fidelity Euler–Euler simulations of particle-laden flows, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, CO.
59. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2017) Transition between turbulence regimes in particle-laden channel flows, 2017 AIChE Annual Meeting, Minneapolis, MN.
60. Baker, M., Fox, R. O., Kong, B., Desjardins, O., **Capecelatro, J.** (2017) RANS modeling of cluster-induced turbulence in particle-laden channel flow, 2017 AIChE Annual Meeting, Minneapolis, MN.
61. Patel, R., Kong, B., **Capecelatro, J.**, Fox, R. O., Desjardins, O. (2017) Verification of Euler-Lagrange and Euler-Euler simulations of meso-scale gas-solid flows, 2017 AIChE Annual Meeting, Minneapolis, MN.
62. Shallcross, G., Buchta, D., **Capecelatro, J.** (2017) An Euler-Lagrange method for compressible multiphase flow with application to water sound suppression, 20th Biennial Conference of the APS Topical Group on Shock Compression of Condensed Matter, St. Louis, Missouri.
63. Buchta, D., **Capecelatro, J.**, Freund, J. B. (2017) Adjoint-based ignition sensitivity in turbulent combustion, 20th Biennial Conference of the APS Topical Group on Shock Compression of Condensed Matter, St. Louis, Missouri.
64. Patel, R., Kong, B., **Capecelatro, J.**, Fox, R. O., Desjardins, O. (2017) A comparison of quadrature-based moment methods to Eulerian-Lagrangian methods for particle-laden flows, 3rd International Conference on Numerical Methods in Multiphase Flows, Tokyo, Japan.
65. **Capecelatro, J.**, Yao, Y. (2017) Accurate particle-mesh methods for simulating electrically charged particle-laden flows, 3rd International Conference on Numerical Methods in Multiphase Flows, Tokyo, Japan.
66. **Capecelatro, J.**, Bodony, D. J., Freund, J. B. (2017) Adjoint-based sensitivity of ignition in high-speed turbulent flows, 23rd AIAA Computational Fluid Dynamics Conference, Denver, CO.
67. **Capecelatro, J.**, Freund, J. B. (2017) Adjoint-based sensitivity of ignition in non-premixed turbulent flows, 2017 SIAM International Conference on Numerical Combustion, Orlando, FL.
68. **Capecelatro, J.**, Buchta, D. (2017) Direct numerical simulation of noise suppression by water injection in high-speed flows, 55th AIAA Aerospace Sciences Meeting, Grapevine, TX.
69. **Capecelatro, J.**, Bodony, D. J., Freund, J. B. (2017) Adjoint-based sensitivity analysis of ignition in a turbulent reactive shear layer, 55th AIAA Aerospace Sciences Meeting, Grapevine, TX.
70. Goyal, H., **Capecelatro, J.**, Desjardins, O., Pepiot, P. (2017) Impact of clustering on heterogeneous reactions in a riser, 10th U.S. National Combustion Meeting, College Park, MD.

2016

71. **Capecelatro, J.**, Bodony, D. J., Freund, J. B. (2016) Adjoint-based sensitivity of flames to ignition parameters in non-premixed shear-flow turbulence, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR.
72. Kord, A., **Capecelatro, J.** (2016) Adjoint-based approach to Enhancing Mixing in Rayleigh-Taylor Turbulence, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR.
73. Shallcross, G., Buchta, D., **Capecelatro, J.** (2016) Particle-turbulence-acoustic interactions in high-speed free-shear flows, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR.
74. Kong, B., Patel, R., **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2016) A Comparative Study of Euler-Euler and Euler-Lagrange Mesoscale Simulations of Moderately Dense Cluster-induced Gas-Particle Turbulence, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR.
75. Patel, R., Kong, B., **Capecelatro, J.**, Fox, R. O., Desjardins, O. (2016) A numerical study of bidisperse particles in cluster-induced turbulence, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR.
76. Fox, R. O., Ireland, P. J., Patel R., **Capecelatro, J.**, Desjardins, O. (2016) Clustering in gas-solid flows: How are clusters modified by shear?, 2016 AIChE Annual Meeting, San Francisco, CA.
77. Kong, B., Patel R., **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2016) A comparative study of Euler-Euler and Euler-Lagrange mesoscale simulations of moderately dense gas-solid flows, 2016 AIChE Annual Meeting, San Francisco, CA.
78. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2016) Recent insights on disperse multiphase turbulence modeling, NETL 2016 Workshop on Multiphase Flow Science, Morgantown, WV.
79. **Capecelatro, J.**, Bodony, D. J., Freund, J. B. (2016) Adjoint-informed ignition characterization, 24th International Conference on Theoretical and Applied Mechanics, Montreal, Canada.
80. **Capecelatro, J.**, Bodony, D. J., Freund, J. B. (2016) An adjoint-based search method for an ignition threshold, 12th World Congress on Computational Mechanics, Seoul, South Korea.
81. **Capecelatro, J.**, Vishnampet, R., Bodony, D. J., Freund, J. B. (2016) Adjoint-based sensitivity analysis of localized ignition in a non-premixed hydrogen-air mixing layer, 54th AIAA Aerospace Sciences Meeting, San Diego, CA.
82. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2016) Strongly coupled particle-laden flows in vertical channels, 9th International Conference on Multiphase Flow, Florence, Italy.

2015

83. **Capecelatro, J.**, Zhang, W., Fontaine, R., Elliot, G. S., Bodony, D. J., Freund, J. B. (2015) Bypass transition of low-speed boundary layers using realistic sandpaper roughness, 68th Annual Meeting of the APS Division of Fluid Dynamics, Boston, MA.
84. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2015) Strongly coupled turbulent gas-particle flows in vertical channels, 68th Annual Meeting of the APS Division of Fluid Dynamics, Boston, MA.
85. Ireland, P. J., **Capecelatro, J.**, Fox, R. O., Desjardins, O. (2015) Correcting velocity and volume-fraction calculations in two-way-coupled, particle-laden-flow simulations, 68th Annual Meeting of the APS Division of Fluid Dynamics, Boston, MA.
86. Kong, B., Feng, H., **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2015) Euler-Euler anisotropic Gaussian mesoscale direct numerical simulation of homogeneous and wall-bounded cluster-induced gas-particle turbulence, 68th Annual Meeting of the APS Division of Fluid Dynamics, Boston, MA.
87. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2015) Turbulent Gas-Particle Flow in Wall-Bounded Vertical Risers, 2015 AIChE Annual Meeting, Salt Lake City, UT.
88. Ireland, P. J., **Capecelatro, J.**, Fox, R. O., Kasbaoui, M. H., Desjardins, O. (2015) Numerical Simulation of Sheared, Gas-Particle, Cluster-Induced Turbulence, 2015 AIChE Annual Meeting, Salt Lake City, UT.
89. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2015) Turbulent Gas-Particle Flow in Wall-Bounded Vertical Risers, 2015 AIChE Annual Meeting, Salt Lake City, UT.
90. Kong, B., Feng, H., **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2015) Euler-Euler Anisotropic Gaussian Mesoscale Direct Numerical Simulation of Homogeneous and Wall-Bounded Cluster-Induce Gas-Particle Turbulence, 2015 AIChE Annual Meeting, Salt Lake City, UT.
91. Arolla, S., **Capecelatro, J.**, Fox, R. O., Desjardins, O. (2015) Sand Transport Modeling in Multiphase Pipelines Based on Euler-Lagrange Large Eddy Simulation Data, 2015 AIChE Annual Meeting, Salt Lake City, UT.
92. Kong, B., Feng, H., **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2015) Euler-Euler anisotropic Gaussian mesoscale direct numerical simulation of homogeneous cluster-induced gas-particle turbulence, NETL 2015 Workshop on Multiphase Flow Science, Morgantown, WV.

2014

93. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2014) Fluid-particle characteristics in fully-developed cluster-induced turbulence, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA.
94. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2014) Multiphase turbulence in vertical wall-bounded collisional gas-particle flows, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA.
95. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2014) Turbulence modeling of collisional gas-particle flows in wall-bounded risers, 2014 AIChE Annual Meeting, Atlanta, GA.
96. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2014) The role of granular temperature in turbulent gas-particle flows, 2014 AIChE Annual Meeting, Atlanta, GA.
97. Arolla, S., **Capecelatro, J.**, Desjardins, O. (2014) Numerical prediction of critical deposition velocity for turbulent liquid-solid slurry flow through a horizontal pipe, 2014 AIChE Annual Meeting, Atlanta, GA.
98. **Capecelatro, J.**, Desjardins, O. (2014) Turbulence modulation by particle clustering in dilute and moderately dilute channel flows, Proceedings of the ASME 2014 4th Joint US-European Fluids Engineering Division Summer Meeting, Chicago, IL.
99. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2014) Investigating multiphase turbulence statistics of large-scale two-way coupled gravity-driven flows, Proceedings of the ASME 2014 4th Joint US-European Fluids Engineering Division Summer Meeting, Chicago, IL.
100. Desjardins, O., **Capecelatro, J.**, Fox, R. O. (2014) An adaptive filter strategy for extracting multiphase flow statistics from Euler-Lagrange simulations, NETL 2014 Workshop on Multiphase Flow Science, Morgantown, WV.
101. Desjardins, O., **Capecelatro, J.**, Pepiot, P. (2014) Numerical investigation and modeling of reacting gas-solid flows in the presence of clusters, NETL 2014 Workshop on Multiphase Flow Science, Morgantown, WV.
102. **Capecelatro, J.**, Arolla, O., Desjardins, O. (2014) Eulerian-Lagrangian large eddy simulations of liquid-solid slurries, 17th U.S. National Congress on Theoretical & Applied Mechanics, Michigan State University, East Lansing, MI.
103. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2014) Numerical investigation of particle dynamics in cluster-induced turbulent flows, 17th U.S. National Congress on Theoretical & Applied Mechanics, Michigan State University, East Lansing, MI.

2013

104. **Capecelatro, J.**, Desjardins, O. (2013) A study of turbulence modulation by particle clusters in dilute and moderately-dilute channel flows using mesoscale DNS, 66th Annual Meeting of the APS Division of Fluid Dynamics, Pittsburgh, PA.
105. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2013) Evaluating multiphase turbulence statistics using mesoscale DNS of gravity-driven particle-laden flows, 66th Annual Meeting of the APS Division of Fluid Dynamics, Pittsburgh, PA.
106. Arolla, S., **Capecelatro, J.**, Desjardins, O. (2013) Eulerian-Lagrangian large eddy simulations of dense liquid-solid slurry flow through a horizontal pipe, 66th Annual Meeting of the APS Division of Fluid Dynamics, Pittsburgh, PA.
107. **Capecelatro, J.**, Desjardins, O., Fox, R. O. (2013) Turbulence Modeling of Collisional Gas-Particle Flows, 2013 AIChE Annual Meeting, San Francisco, CA.
108. **Capecelatro, J.**, Desjardins, O., Pepiot, P., Jarvis, M., Foust T. (2013) Numerical Investigation of Multiphase Dynamic Effects in Catalytic Upgrading of Biomass Pyrolysis Vapor, 2013 AIChE Annual Meeting, San Francisco, CA.
109. **Capecelatro, J.**, Desjardins, O. (2013) A fully coupled multiscale approach for simulating fluid-particle flows, NETL 2013 Workshop on Multiphase Flow Science, Morgantown, WV.
110. Fox, R. O., **Capecelatro, J.**, Desjardins, O. (2013) Validation of a multiphase turbulence model using mesoscale DNS of gravity-driven gas-particle flow, NETL 2013 Workshop on Multiphase Flow Science, Morgantown, WV.
111. **Capecelatro, J.**, Jarvis, M., Desjardins, O. (2013) A numerical investigation of turbulent particle-laden flows in vertical risers, 8th International Conference on Multiphase Flow, Jeju, Korea.

2012

112. **Capecelatro, J.**, Desjardins, O. (2012) A numerical investigation of cluster fall velocity in vertical particle-laden turbulent pipe flow, 65th Annual Meeting of the APS Division of Fluid Dynamics, San Diego, CA.
113. **Capecelatro, J.**, Desjardins, O. (2012) Detailed investigation of clustering in riser flows using an Euler-Lagrange approach, 244th ACS National Meeting & Exposition, Philadelphia, PA.
114. Malhotra, K., Pepiot, P., **Capecelatro, J.**, Desjardins, O. (2012) Impact of feed injection strategies on fluidization dynamics for biomass thermochemical conversion, 244th ACS National Meeting & Exposition, Philadelphia, PA.
115. **Capecelatro, J.**, Desjardins, O. (2012) A massively parallel Euler-Lagrange strategy for simulating fluidized bed reactors, NETL 2012 Workshop on Multiphase Flow Science, Morgantown, WV.

2011

116. **Capecelatro, J.**, Desjardins, O., Pepiot, P. (2011) Large-scale simulations of realistic fluidized bed reactors using novel numerical methods, 64th Annual Meeting of the APS Division of Fluid Dynamics, Baltimore, MD.
117. Desjardins, O., **Capecelatro, J.** (2011) Large-scale Eulerian-Lagrangian simulations of turbulent particle-laden riser flows, 64th Annual Meeting of the APS Division of Fluid Dynamics, Baltimore, MD.
118. Pepiot, P., **Capecelatro, J.**, Desjardins, O. (2011) Effect of particle devolatilization on bed dynamics during biomass thermochemical conversion, 64th Annual Meeting of the APS Division of Fluid Dynamics, Baltimore, MD.

2010

119. **Capecelatro, J.**, Pepiot, P., Desjardins, O. (2010) Eulerian-Lagrangian simulation of three-dimensional turbulent riser flows, 63rd Annual Meeting of the APS Division of Fluid Dynamics, Long Beach, CA.

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## Invited Talks<sup>2</sup>

- 08/2021 "Turbulent disperse two-phase flows: simulations and data-driven modeling," Data-driven physical simulation seminar, Lawrence Livermore National Laboratory
- 05/2021 "Turbulence modeling of strongly-coupled gas-particle flows," Mechanical and Aerospace Engineering Fluid Mechanics, Combustion, & Engineering Physics Webinar Series, University of California San Diego
- 05/2021 "Addressing challenges of COVID-19 through the lens of fluid dynamics," COVID-19 Modeling Symposium organized by the Michigan Institute for Computational Discovery & Engineering (MICDE) and the School of Public Health at the University of Michigan
- 04/2021 "Turbulence modeling of strongly-coupled gas-particle flows," Fluid Mechanics in the Spirit of G.K. Batchelor Webinar Series, Cambridge, United Kingdom
- 02/2021 "Stochastic Modeling of Dense Particle Suspensions," Applied Interdisciplinary Mathematics (AIM) Seminar, University of Michigan
- 10/2020 "Simulation and modeling of high-speed disperse two-phase flows," Mechanical and Civil Engineering Seminar Series, Caltech
- 10/2020 "Simulation and modeling of high-speed disperse two-phase flows," Jack and Ann Waddey Seminar, Auburn University
- 09/2020 "Simulation and modeling of high-speed disperse two-phase flows," Chair's Distinguished Lecture Series, Aerospace Engineering, University of Michigan
- 09/2020 "Simulation and modeling of turbulent particle-laden flows: COVID19 and Mars2020," Frontiers in Mechanical Engineering and Sciences, A Multi-University Webinar Series
- 06/2020<sup>†</sup> "Towards robust turbulence models for strongly-coupled gas-particle flows," IUTAM Symposium on turbulent structure and particles-turbulence interaction, Lanzhou, China
- 05/2020<sup>†</sup> "Physics-informed machine learning for developing multiphase turbulence closure," Institut Jean Le Rond d'Alembert, Sorbonne Université, Paris, France
- 12/2019 "Simulation and modeling of strongly-coupled gas-particle flows," ME 100/200 Fall seminar, University of California Santa Barbara, Santa Barbara, CA
- 08/2019 "Using supercomputers to understand and predict emergent structures in particle-laden flows," Division 35 Technical Seminar Series, Jet Propulsion Laboratory, Pasadena, CA
- 02/2019 "Towards understanding and modeling disperse multiphase flows in engineering-relevant regimes," Center for Environmental & Applied Fluid Mechanics Seminar, Johns Hopkins University, Baltimore, MD
- 11/2018 "Towards understanding and modeling turbulent reacting particle-laden flows," Chemical and Biomolecular Engineering Seminar, Ohio State University, Columbus, OH
- 10/2018 "Big data challenges in understanding and modeling multiphase flows," 2018 Symposium of the Center for Network and Storage Enabled Collaborative Computational Science, University of Michigan, MI
- 08/2018 "The peculiar behavior of particle-laden flows and their role in heat and momentum transfer," Mechanical engineering seminar series, Iowa State, Ames, IA

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<sup>2</sup>† indicates date postponed due to COVID-19

- 01/2018 “Towards Accurate and Tractable Methods of Disperse Multiphase Flows in Extreme Environments,” Michigan Institute for Computational Discovery & Engineering Seminar, University of Michigan, MI
- 08/2016 “Adjoint-based methods for optimization and UQ of multiphase flows,” National Energy Technology Laboratory Technical Seminar
- 02/2016 “Particles, turbulence, and adjoint-based sensitivity: targeting energy and environmental challenges with high-performance computing,” Mechanical engineering seminar series, University of New Hampshire, NH
- 01/2016 “Particles, turbulence, combustion, and adjoint-based sensitivity: targeting energy challenges with high-performance computation,” Mechanical engineering seminar series, University of Michigan, MI
- 07/2015 “Towards predictive simulations of plasma-assisted ignition of a fuel jet in a turbulent crossflow,” Turbulence seminar, Los Alamos National Lab, New Mexico
- 09/2014 “Recent progress in understanding disperse multiphase flows: a theoretical formalism and numerical study of cluster-induced turbulence,” Fluid mechanics seminar, University of Illinois, Urbana-Champaign, Illinois
- 05/2014 “Methods for simulating large-scale particle-laden flows with applications in energy conversion processes,” University of Illinois, Urbana-Champaign, Illinois
- 03/2014 “Using supercomputers to study biofuel production and injection,” US Military Academy, West Point, New York
- 02/2014 “Exploring multiphase dynamics in energy conversion systems using super computers,” Mechanical Engineering seminar series, Binghamton University, Binghamton, New York
- 06/2013 “Exploring turbulent particle-laden flows using large-scale numerical simulations,” École Centrale Paris, EM2C Laboratory, Paris, France

## Teaching Experience

### University of Michigan

- 2016–2018, 2020, 2021 **Instructor**, *Computational Fluid Dynamics*, ME 523 (graduate).
- 2021 **Instructor**, *Laboratory II*, ME 495 (undergraduate).
- 2019–2020 **Co-instructor**, *Professional Skills for Graduate Student Success*, ME 599 (graduate).
- Fall 2019 **Instructor**, *Multiphase Flow*, ME 527 (graduate).
- 2017–2020 **Instructor**, *Introduction to Fluid Mechanics*, ME 320 (undergraduate).

### University of Colorado

- 2010–2011 **Teaching Assistant**, *Flow Visualization*, MCEN 4151/5151 (undergraduate/graduate).
- 2010 **Teaching Assistant**, *Wind Energy*, MCEN 5228 (undergraduate/graduate).
- 2009 **Teaching Assistant**, *Fluid Mechanics*, MCEN 3021 (undergraduate).

## Research Funding

- 2021–2024 **Predictive hydrodynamics model & experimental database for circulating fluidized bed of Geldart group A particles.**
  - Role: PI
  - Sponsor: The Dow Chemical Company
  - Amount: \$1,231,671



- 2021–2022 **Next generation computational tools for particle-laden biological flows in subject-specific geometries.**
- Role: PI
  - Sponsor: Michigan Institute for Computational Discovery and Engineering (MICDE)
  - Program: MICDE Catalyst Grant
  - Amount: \$42,000
- 2021–2024 **Collaborative Research: Effect of Pulsatility on Expiratory Droplet-Laden Flows.**
- Role: Co-PI
  - Sponsor: National Science Foundation
  - Program: CBET – Fluid Dynamics
  - Amount: \$222,228
- 2021–2022 **Quantifying Risk and Uncertainty of Indoor Airborne Transmission of COVID-19.**
- Role: PI
  - Sponsor: College of Engineering, University of Michigan
  - Program: CoE COVID-19 Skunkworks Initiative
  - Amount: \$150,000
- 2020–2022 **Measurement and Modeling of High Speed Polydisperse Granular Flow Under Plume/Surface Interaction Conditions.**
- Role: Co-PI
  - Sponsor: CFD Research Corporation
  - Program: NASA SBIR Phase II
  - Amount: \$109,105
- 2020–2021 **Mathematical Model for Cascading Reactions in Cylindrical Pellets.**
- Role: PI
  - Sponsor: National Renewable Energy Laboratory (NREL)
  - Amount: \$50,000
- 2020–2021 **Modeling gas-particle flows for lunar and planetary landing: A review and future perspectives.**
- Role: PI
  - Sponsor: National Aeronautics and Space Administration (NASA)
  - Amount: \$65,000
- 2020–2023 **Collaborative Research: CDS&E: Advances in closure modeling for turbulent flows with finite-sized particles informed by massive simulations on heterogeneous architectures.**
- Role: Co-PI
  - Sponsor: National Science Foundation
  - Program: Computational and Data-Enabled Science and Engineering (CDS&E)
  - Amount: \$205,365
- 2019–2024 **CAREER: Towards Understanding and Modeling Turbulent Reacting Particle-Laden Flows.**
- Role: PI
  - Sponsor: National Science Foundation
  - Program: CBET – Particulate & Multiphase Processes
  - Amount: \$505,489
- 2020–2022 **Multiscale Modeling to Enable Physics-Based Simulations of Plume-Surface Interactions with Quantified Uncertainty.**
- Role: PI
  - Sponsor: National Aeronautics and Space Administration (NASA)
  - Program: Early Stage Innovations
  - Amount: \$523,449

- 2019–2022 **High-Fidelity Modeling of Particulate Transport and Deposition in Extreme Environments.**
- Role: PI
  - Sponsor: Office of Naval Research (ONR)
  - Program: Young Investigator Program
  - Amount: \$513,081
- 2019–2022 **Collaborative Research: Bridging the Gap Between Particle-Scale Thermal Transport and Device-scale Predictions.**
- Role: PI
  - Sponsor: National Science Foundation
  - Program: CBET – Thermal Transport Processes
  - Amount: \$239,350
- 2019–2020 **Dynamic data-driven model development (DDMD) of acoustically forced shear coaxial jets.**
- Role: PI
  - Sponsor: Engineering Research and Consulting
  - Program: Air Force Research Laboratory subcontract
  - Amount: \$29,879
- 2019–2020 **Measurement and Modeling of High Speed Polydisperse Granular Flow Under Plume/Surface Interaction Conditions.**
- Role: Co-PI
  - Sponsor: CFD Research Corporation
  - Program: NASA SBIR Phase I
  - Amount: \$12,968
- 2019–2020 **Towards Validated, Accurate, & Predictive Simulations of High-Speed Particle-Laden Flows.**
- Role: Co-PI
  - Sponsor: National Aeronautics and Space Administration (NASA)
  - Program: Jet Propulsion Lab Center Innovation Fund (CIF)
  - Amount: \$136,000
- 2018–2019 **Computational Characterization of Link Engineering Brake System Particulate Emissions Test Facility.**
- Role: PI
  - Sponsor: Link Engineering
  - Amount: \$18,584
- 2017–2021 **High Fidelity Modeling of Plume-Induced Soil Erosion During Lunar and Planetary Landing.**
- Role: PI
  - Sponsor: National Aeronautics and Space Administration (NASA)
  - Program: NASA Space Technology Research Fellowship (student: Gregory Shallcross)
  - Amount: \$298,889
- 2016–2019 **Center for Exascale Simulation of Plasma-Coupled Combustion.**
- Role: PI
  - Sponsor: University of Illinois-Urbana-Champaign (subcontract)
  - Prime Sponsor: Department of Energy – National Nuclear Security Administration
  - Amount: \$207,693
- 2017 **Advanced Multiphase Combustion Library for Modeling Liquid Fuel Sprays.**
- Role: PI
  - Sponsor: Metacomp Technologies, Inc.
  - Program: Naval Air Warfare Center Aircraft Division SBIR
  - Amount: \$54,000

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## Computational Grants

- 2020–2022 **XSEDE – CTS200008**, *Simulation and Modeling of Strongly-Coupled Particle-Laden Flows*, TACC Stampede 2, Awarded 41.480M CPU-hours (estimated value \$316,596.88).
- 2020–2021 **NASA Advanced Supercomputing**, *Multiscale Modeling to Enable Physics-Based Simulations of Plume-Surface Interactions with Quantified Uncertainty*, Pleiades, Awarded 2.6M CPU-hours.
- 2019–2020 **NASA Advanced Supercomputing**, *Towards Validated, Accurate, & Predictive Simulations of High-Speed Particle-Laden Flows*, Pleiades, Awarded 6.1M CPU-hours.
- 2017–2018 **INCITE (DOE)**, *Demonstration of Noise Suppression by Water Injection in High-Speed Flows with Direct Numerical Simulations*, OLCF Titan, Rhea, and EOS, Awarded 0.73M CPU-hours.

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## Reviewer Service

### Proposal Reviewer Service.

- o NSF (CBET – Fluid Dynamics, Particulate and Multiphase Processes, Thermal Transport Processes)
- o NASA (NASA Space Technology Research Fellowships)
- o DOE (DOE Office of Fossil Energy)
- o ACS (Petroleum Research Fund)

### Journal Reviewer Service.

Nature Communications, Journal of Fluid Mechanics, Physical Review Fluids, Physics of Fluids, International Journal of Multiphase Flow, International Journal of Heat and Mass Transfer, Journal of Computational Physics, Computers and Fluids, Journal of Fluids Engineering, American Institute of Chemical Engineers, Chemical Engineering Science, Canadian Journal of Chemical Engineering, Powder Technology, Combustion & Flame, Energy & Fuels, PLOS One

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## Committee Service

### Departmental

- 2019–2021 **Member**, *Department of Mechanical Engineering*, Undergraduate Program Committee.
- 2018–2019 **Chair**, *Department of Mechanical Engineering*, Seminar Committee.
- 2017–2018 **Coordinator**, *Department of Mechanical Engineering*, Junior Faculty Mentoring Luncheon.
- 2016–2021 **Member**, *Department of Mechanical Engineering*, Seminar Committee.

### University

- 2020 **Member**, *University of Michigan*, Online Academic Integrity Committee.
- 2020 **Member**, *University of Michigan*, COVID19 Rapid Response Steering Committee.
- 2017–2018 **Member**, *University of Michigan*, Advanced Research Computing Advisory Team (ARCAT).

### National

- 2018–2020 **Chair**, *American Physical Society*, Division of Fluid Dynamics Educational & Career Outreach Committee.
- 2018–2019 **Member**, *American Physical Society*, International Research Travel Award Program (IRTAP) Proposal Review Committee.

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## Professional Affiliations

American Institute of Aeronautics and Astronautics (AIAA)  
American Institute of Chemical Engineers (AIChE)  
American Physical Society (APS)  
American Society of Mechanical Engineering (ASME)

US Association for Computational Mechanics (USACM)