Giovanni Di Cristina Torres

Mechanical Engineer · Fire Scientist

Google Scholar

Education

University of Notre Dame — *Notre Dame, IN*

Ph.D. in Mechanical Engineering — *May 2021*

Dissertation: *Forced Convective Flame-Flow Interactions in Discrete Fuel Arrays*

University of Notre Dame — *Notre Dame, IN*

M.S. in Mechanical Engineering — *Jan. 2019*

Worcester Polytechnic Institute — *Worcester, MA*

B.S. in Aerospace Engineering — *May 2015*

Experience

National Institute of Standards and Technology — *Gaithersburg, MD*

Mechanical Engineer (ZP 3), National Fire Research Lab — *Aug. 2023 - Present*

- Assisted in the planning of fire experiments on furnishings, Douglas-fir trees, and vehicles to expand the NIST Fire Calorimetry Database (FCD). Engaged with management, safety personnel, and other stakeholders to ensure successful execution of the large fire tests.
- Spearheaded data acquisition and analysis of FCD expansion fire experiments. Multiple reports and peer-reviewed journal articles are in preparation.
- Collaborated with project team, devised instrumentation plan, and assisted in flow measurements of Wildland-Urban Interface fire experiments examining eave vent performance on a mock home exterior wall.
- Liaised and interfaced between outside PIs and lab staff to implement instrumentation and experimental designs of projects conducted in the NFRL.
- Commissioning of large scale wind tunnel, including writing safety documentation and flow characterization plan.
- Deployed smoke extinction laser instrument in the 20 MW hood duct system, allowing for soot yield measurements in any experiments conducted under the hood.

National Institute of Standards and Technology — *Gaithersburg, MD*

NRC Postdoctoral Research Associate (ZP 3), National Fire Research Lab — *Aug. 2021 - Aug. 2023*

- Proposed and carried out research examining the formation of buoyancy-induced columnar vortices above fuel beds. CFD simulations using Fire dynamics simulator (FDS) informed the experimental design, comparisons between simulations and experiments were published in a peer-reviewed journal. Optical measurements including PIV, schlieren, and direct video capture were utilized.
- Conducted wind tunnel and open-jet studies to characterize s-type pitot probes as an alternative for bi-directional probes utilized in fire experiments. The results were presented at an international symposium and generated a peer-reviewed journal article and report.
- Assisted in the implementation of a Fourier Transform Infrared spectrometer in the calorimetry system of the National Fire Research Lab, allowing for the measurement of over 15 species in combustion experiments in real time. Findings from the FTIR have been presented in multiple peer-reviewed journals and reports.

Worcester Polytechnic Institute — *Worcester, MA*

Visiting Researcher, Combustion Lab — *May 2018 - May 2021*

- Led the design, manufacturing, and initial operation of a large, portable, wind tunnel for wildland fire research as part of a collaborative multi-institutional effort to study wind-driven fire spread. Commissioning work included assembly, flow characterization and conditioning, and a study on wind driven fire spread along pine needle beds. The design and implementation of the wind tunnel was published in a peer-reviewed journal article.
- Conducted research in large-scale and separate bench-top wind tunnels studying the flow-flame interactions of flame spread along solid fuel arrays subject to a range of flow speeds from 1 to 4 m/s. Findings from this study resulted in three peer-reviewed publications.

University of Notre Dame — *Notre Dame, IN*

Graduate Research Assistant, Institute for Flow Physics and Control — *Aug. 2016 - May 2021*

- Performed hypersonic wind tunnel research including optical diagnostics (Schlieren, Rayleigh scattering) and designing data acquisition systems.
- Investigated shock-boundary layer interactions of inlet flows and inlet-isolator shockwave train experiments of streamline traced scramjet inlets.
- As part of a multi-institutional grant (SERDP) to study wind driven fire spread, was stationed at WPI conducting multi-scale fire spread studies along wooden dowel arrays. This included the design and commissioning of a wildland fire research wind tunnel.

Publications

[1] **G. Di Cristina** and R. A. Bryant. Comparison of two flow measurement devices for use in fire experiments. *Proceedings of the Combustion Institute*, 40(1-4):105557, 2024a. doi: 10.1016/j.proci.2024.105557

[2] **G. Di Cristina**, R. Falkenstein-Smith, I. Kim, S. Wessies, M. Bundy, and M. Zammarano. Towards fire safe and flame-retardant-free upholstered furniture. *Proceedings of the Combustion Institute*, 40(1-4):105399, 2024. ISSN 15407489. doi: 10.1016/j.proci.2024.105399

[3] **G. Di Cristina** and R. A. Bryant. Comparison of flow measurement devices for large fire experiments. Technical Report NIST TN 2285, National Institute of Standards and Technology (U.S.), Gaithersburg, MD, Apr. 2024b. URL `https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.2285.pdf`

[4] **G. Di Cristina** and R. A. Bryant. CFD informed design of bench-scale experiments to characterize air entrainment into fuel beds induced by columnar vortices. *Fire Safety Journal*, 141:103907, 2023. doi: https://doi.org/10.1016/j.firesaf.2023.103907

[5] S. Ramesh, L. Choe, M. Hoehler, M. Bundy, R. Bryant, and **G. Di Cristina**. Fire resilience of a steel-concrete composite floor system : full scale experimental evaluation for influence of slab reinforcement and unprotected secondary beam (test #3). Technical Report NIST TN 2267, National Institute of Standards and Technology (U.S.), Gaithersburg, MD, Oct. 2023. URL `https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.2267.pdf`

[6] **G. Di Cristina**, M. R. Gallagher, N. S. Skowronski, A. Simeoni, A. Rangwala, and S. kyun Im. Design and implementation of a portable, large-scale wind tunnel for wildfire research. *Fire Safety Journal*, 131:103607, 2022. ISSN 0379-7112. doi: https://doi.org/10.1016/j.firesaf.2022.103607

[7] **G. Di Cristina**, N. S. Skowronski, A. Simeoni, A. S. Rangwala, and S. Im. Flame spread predictions over linear discrete fuel arrays using an empirical B-number model and stagnation point flow. *Combustion and Flame*, 234:111644, 2021c. ISSN 0010-2180. doi: https://doi.org/10.1016/j.combustflame.2021.111644

[8] **G. Di Cristina**, N. S. Skowronski, A. Simeoni, A. S. Rangwala, and S. Im. Flame spread behavior characterization of discrete fuel array under a forced flow. *Proceedings of the Combustion Institute*, 38(3):5109--5117, 2021b. ISSN 1540-7489. doi: https://doi.org/10.1016/j.proci.2020.05.035

[9] **G. Di Cristina**, S. Kozhumal, A. Simeoni, N. Skowronski, A. Rangwala, and S. Im. Forced convection fire spread along wooden dowel array. *Fire Safety Journal*, 120:103090, 2021a. ISSN 0379-7112. doi: https://doi.org/10.1016/j.firesaf.2020.103090. Fire Safety Science: Proceedings of the 13th International Symposium

[10] **G. Di Cristina**, K. Kang, S. J. Song, J. H. Choi, H. Do, and S. Im. Visualization of streamline tracing inlet-isolator flows using a planar laser rayleigh scattering imaging technique. *Journal of Visualization*, 22(2):359–369, Apr 2019a. doi: https://doi.org/10.1007/s12650-018-00541-6

Conference Proceedings & Presentations

[11] **G. Di Cristina**, N. S. Skowronski, A. Simeoni, A. S. Rangwala, and S. Im. Flame spread behavior characterization of discrete fuel array under a forced flow. In *38th International Symposium on Combustion*, Adelaide, Australia, 2021

[12] **G. Di Cristina**, N. S. Skowronski, A. Simeoni, A. S. Rangwala, and S. Im. Fire spread along dowel array. In *11th U.S Combustion Institute meeting*, Pasadena, CA USA, 2019b

[13] **G. Di Cristina**, S. Im, J. H. Choi, K. Kang, and H. Do. Visualization of scoop inlet-induced circular isolator flows using planar laser rayleigh scattering imaging. In *2018 AIAA Aerospace Sciences Meeting*, page 1620, Kissimmee, FL USA, 2018

[14] **G. Di Cristina**, N. S. Skowronski, A. Simeoni, A. S. Rangwala, and S. Im. Wind tunnel for wildland fire research. In *North Atlantic Fire Science Exchange*, Portland, ME USA, 2018

[15] **G. Di Cristina**, S. P. Kozhumal, A. Rangwala, and S. Im. Manipulating turbulent mixing behavior through particle injection. In *10th US National Combustion Meeting*, College Park, MD USA, 2017

[16] S. P. Kozhumal, **G. Di Cristina**, N. S. Skowronski, A. Simeoni, S. Im, and A. S. Rangwala. Numerical investigation of fire dynamics in the presence of burning obstacles under a unidirectional wind. In *10th US National Combustion Meeting*, College Park, MD USA, 2017

[17] **G. Di Cristina**, S. Im, A. Rangwala, and V. Raghavan. Mixing in turbulent flows: Influence of particle injection. In *2016 Spring Technical Meeting of the Eastern States Section of the Combustion Institute*, Princeton, NJ USA, 2016

[18] S. Im, **G. Di Cristina**, and H. Do. Contraction ratio effect on boundary layer separation induced by shockwave boundary layer interactions. In *APS Division of Fluid Dynamics Meeting Abstracts*, pages D5--009, 2016