Temistocle Grenga

CONTACT INFORMATION

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RESEARCH INTERESTS

Computational Fluid Dynamics: turbulent compressible reacting flows, multiphase flows, direct numerical simulations, large eddy simulations, adaptive mesh refinement methods, wavelet methods, numerical methods, parallel programming, high performance computing
Combustion: model reduction, analysis and solution of large chemical kinetic mechanisms in view of CFD applications, development of stiff solvers for dissipative systems
Machine Learning: turbulence and combustion closure modeling through Generative Adversarial Network, Convolutional Neural Network, and Gene Expression Programming
Data Driven Modeling: Dynamic Mode Decomposition, Principal Component Analysis

ACADEMIC APPOINTMENTS

University of Southampton, Southampton, UK
Lecturer (Assistant Professor) **February 2023 - present**
Computational Fluid Dynamics for Aerospace
Conducting research on turbulent reacting flows, data-driven modeling of subgrid scales, high-performance computing, and numerical methods.
Lecturing courses in the Aeronautics and Astronautics program.

Rheinisch-Westfälische Technische Hochschule Aachen, Aachen, Germany
Postdoctoral Research Associate (Senior level: TV-L14) **September 2018 - January 2023**
Leader of the ITV Multiphase group and the HPC group.
Conducting research in the Institute of Combustion Technology (ITV) directed by Prof. H. Pitsch.
Lecturing the Multiphase course.

Princeton University, Princeton, New Jersey USA
Postdoctoral Research Associate **October 2015 - August 2018**
Conducting research in the Computational Turbulent Reacting Flow Laboratory directed by Prof. M. E. Mueller.

NON-ACADEMIC APPOINTMENTS

Ecotech GmbH
Consultant **November 2019 - December 2020**
Conducting numerical simulations for optimization of burners for domestic application.

EDUCATION

University of Notre Dame, Notre Dame, Indiana USA

Ph.D., Aerospace and Mechanical Engineering, September 2015

- Dissertation Topic: "Numerical simulation of multi-dimensional compressible reactive flow using a parallel wavelet adaptive multi-resolution method"
- Advisor: Prof. S. Paolucci

University of Notre Dame, Notre Dame, Indiana USA

M.S., Mechanical Engineering, August 2013

- Dissertation Topic: "Numerical simulation of multi-dimensional compressible reactive flow using a parallel wavelet adaptive multi-resolution method"
- Advisor: Prof. S. Paolucci

Sapienza University of Rome, Rome, Italy

M.S., Aeronautical Engineering, July 2009

- Dissertation Topic: "Model reduction and analysis for the combustion of hydrocarbon fuels"
- Advisor: Prof. M. Valorani

Sapienza University of Rome, Rome, Italy

B.S., Aerospace Engineering, July 2005

- Dissertation Topic: "Modeling and analysis of turbojet engine performances"
- Advisor: Prof. F. Nasuti

Visiting periods

Barcelona Supercomputing Center, Barcelona, Spain
Visiting researcher **September 2023**
Development of GPU libraries for multi-physics CFD solver with dynamically adaptive mesh refinement based on wavelet.

University of Notre Dame, Notre Dame, Indiana USA
Visiting researcher **September 2022**
Development of physics-informed machine learning models for turbulence closure in large eddy simulations

Los Alamos National Laboratory, Los Alamos, New Mexico USA
Visiting researcher **October - December 2014**
Investigation of the Richtmyer-Meshkov instability (RMI) using Wavelet Adaptive Multi-resolution Representation (WAMR) method.

Center for Research in Extreme Scale Technologies (CREST), Indiana University, Bloomington, Indiana USA
Visiting researcher **June 2014**
Implementation of the parallel solver for partial differential equations, Wavelet Adaptive Multi-resolution Representation (WAMR), in HPX-5

Teaching Experience

University of Southampton, Southampton, UK
Lecturer **February, 2023 - Present**
Thermofluids course (1-st year), Propulsion (2-nd year) and Aircraft Propulsion courses (4-th year) for the Bachelor and Master degrees in Aeronautical Engineering.
Supervisor for Individual Projects (3-rd year) for the Bachelor degree in Aeronautical Engineering and Astronautical Engineering, and Group Design Projects (4-th year) for the Master degree in Aeronautical and Astronautical Engineering.
Internal examiner for the doctoral program.
External examiner for the doctoral program at Universitat Politècnica de Catalunya - Barcelona Tech (Spain).

University of Southampton, Southampton, UK
Advisor **September, 2024 - Present**
Ph.D. students supervision:

- Y. Lu (Department of Psychology), Project: *The origin of crossmodal correspondence in learning and experience*

Master thesis students supervision:

- N. R. Hulikattimath, Project: *Stable combustion regime for hydrogen diffusive flames*
- A. Zampella (University of Bologna), Project: *Regimes and interactions of thermally-driven flows during Materhorn field experiment*
- L. Brunaccioni (Polytechnic University of Milan), Project: *Generalization of generative adversarial network models for turbulent reacting flows*

National High-Performance Computing for Computational Engineering Science, Aachen,

Germany
Lecturer at NHR Training: Machine learning in combustion **November, 2023**
Course on Machine learning for combustion modeling: Generative adversarial network for combustion closure modeling
(https://www.nhr4ces.de/machine-learning-in-combustion/)

Rheinisch-Westfälische Technische Hochschule Aachen, Aachen, Germany
Lecturer **October, 2019 - January 2023**
Multiphase Flows course for the Master degrees in Mechanical Engineering, Computational Engineering Science, Energy Engineering and Simulation Science.

Rheinisch-Westfälische Technische Hochschule Aachen, Aachen, Germany
Advisor **June, 2019 - January 2023**
Ph.D. students supervision (as Leader of Multiphase Flows Group at ITV):

- A. Y. Deshmukh, November 2021, Project: *Physics-based reduced-order modeling of fuel injection and combustion processes in internal combustion engines*
- H. Chu, July 2023, Project: *Investigation and modeling of the early flame spread in gasoline engine*. This project is part of the graduate program *Integrated Energy Supply Modules for Roadbound E-Mobility" (mobilEM)* at RWTH Aachen University funded by DFG.
- A. Saha, September 2024, Project: *Modeling of flash-boiling effect of spray in gasoline engine*
- F. Fröede, expected 2024, Project: *Influence of atomization on particle synthesis in spray flames*
- L. Nista, expected 2025, Project: *Turbulent reacting flow modeling through generative adversarial network*
- M. Vivenzo, expected 2026, Project: *Hybrid implicit/explicit approach for massively parallelizes ODE integration*

Master thesis students supervision:

- P. Hermsmeyer, November 2022, *Laminar flame speed models for premixed flames using Gene-Expression Programming*
- B. Cocco, expected March 2022, Project: *Reduced order model for soot through Principal Component Analysis*
- C. D. K. Schumann, June 2021, Project: *Development of a super-resolution generative adversarial network with physics-based loss function in the context of turbulent reacting flows*
- A. N. Karimi, March 2021, Project: *Data-driven model for turbulent flows using machine learning*
- S. Böhmer, April 2020, Project: *Deep learning driven computing in computational mechanics*
- M. Possega (University of Bologna), September 2019, Project: *Wavelet analysis of downslope flows in Materhorn 2012 experiment*

National High-Performance Computing for Computational Engineering Science, Darmstadt, Germany
Lecturer at NHR Training: Machine learning in combustion **December, 2022**
Course on Machine learning for combustion modeling: Generative adversarial network for combustion closure modeling
(https://www.nhr4ces.de/appploads/2022/11/Agenda_Training_MachineLearning.pdf)

PRACE Advanced Training Centers, Barcelona, Spain
Lecturer at Introduction to machine learning in the application area of fluid mechanics and combustion using HPC **December, 2022**
Course on Machine learning for combustion modeling: GAN modeling of sub-filter turbulence

(https://coec-project.eu/training/patc-introduction-to-machine-learning-in-the-application-area-of-fluid-mechanics-and-combustion-using-hpc/)

Barcelona Supercomputing Center, Barcelona, Spain
Lecturer at ERCOFTAC course: Understanding and predicting hydrogen combustion **November, 2022**
Course on Data-driven analysis of turbulent reactive flows
(https://coec-project.eu/training/ercoftac-course-understanding-and-predicting-hydrogen-combustion/)

PRACE Advanced Training Centers, Barcelona, Spain
Lecturer at Introduction to high-fidelity combustion simulations using HPC **November, 2022**
Course on Machine Learning based methodologies for combustion
(https://events.prace-ri.eu/event/1409/)

National center for Supercomputing Application, Sofia, Bulgaria
Lecturer at Combustion Autumn School 2022 **October, 2022**
Course on Machine Learning and data-driven modeling for turbulent reacting flows
(https://www.ncsa.bg/ncsa-training)

National center for Supercomputing Application, Sofia, Bulgaria
Lecturer at South-East Europe Combustion Spring School 2022 **March, 2022**
Course on Machine Learning based methodologies for combustion
(https://www.ncsa.bg/ncsa-training)

University of Notre Dame, Notre Dame, Indiana USA
Lecturer at Notre Dame Summer Scholars program **August, 2015**
Research Computing: Computers Accelerating Discovery
(http://precollege.nd.edu/summer-scholars/research-computing/)

University of Notre Dame, Notre Dame, Indiana USA
Teacher Assistant **August, 2009 - May 2015**
Duties at various times have included office hours, teaching computational exercises, leading weekly practice exercises, leading weekly experimental lab, homework assignments, and grading for the graduate courses in Continuum Mechanics, Numerical Methods, and Mathematical Methods as well as undergraduate courses in Heat Transfer, Molecular Thermodynamics, and Introduction to Mechanical Engineering.

University of Notre Dame, Notre Dame, Indiana USA
Lecturer at Notre Dame Summer Scholars program **August, 2014**
Research Computing: Computers Accelerating Discovery
(http://precollege.nd.edu/summer-scholars/research-computing/)

University of Notre Dame, Notre Dame, Indiana USA
Advisor for Undergraduate Research **Spring semester, 2014**
Verification of the Wavelet Adaptive Multi-resolution Representation method to a prescribed error threshold

Research and Professional Experience

Coordinating the research activities for the NERC project 'Contrail Assessment of Future Aircraft and Propulsion Architectures' (May 2024 - ongoing) in the Work Package 2 Contrail formation and transport.

Collaboration with Prof. A. Cuoci of Polytechnic University of Milan (March 2021 - ongoing) on the use of Principal Component Analysis-based Cell Agglomeration for CFD simulations with detailed kinetic mechanisms.

Collaboration with Prof. A. Attili of University of Edinburgh (April 2020 - ongoing) on the realization of turbulence and combustion closure models through the use of Convolutional Neural

Network.

Leading and coordinating the research activities involved in Work Package 4 (development of numerical methodologies for discretization, grid management, reduced thermo-physical-chemical models) and Tasks 7.1 (DNS of complex multi-physics processes) and 7.4 (machine learning techniques for turbulence-chemistry interaction) on behalf of the WP/task leader (Prof. Pitsch, ITV) in the *Center of Excellence of Combustion (CoEC)* (https://coec-project.eu/). This is a European Horizon2020 project (October 2020 - September 2023) for the collective development of in-house codes for turbulent reacting flows ready for coming exascale computing systems.

Leading the activities of HPC group at ITV (May 2019 - ongoing) : supervision and coordination of applications for computing time and data storage at European and national facilities; coordinating the development of in-house codes; research data managing organization; realization and managing of regression tests platform for in-house codes, maintenance of ITV cluster.

Supervision of the ITV research activities (in the role of Group Leader at ITV) for the following projects:

- Development of in-house libraries for combustion models and particle transport for the German national project *National High-Performance Computing for Computational Engineering Science (NHR4CES)* (https://www.nhr4ces.de/) for the efficient use of Tier-2 HPC systems (January 2021 - ongoing).
- Simulation and characterization of the physical phenomena, such as break-up, atomization, combustion, particle nucleation and growth, occurring during the flame synthesis of nanoparticles for the project*Influence of atomization on particle synthesis in spray flames* (DFG Priority Program SPP1980 Nanoparticle Synthesis in Spray Flames SpraySyn: Measurement, Simulation, Processes) (https://www.uni-due.de/spp1980/) (February 2019 - ongoing).
- Numerical modeling, simulation and characterization of flash boiling and cavitation phenomena and their effects on spray features in gasoline engines, and realization and development of a reduced-order model (cross-sectionally averaged) for transient turbulent reactive sprays in compression ignition engines for the project *High-fidelity numerical simulations and model development for fuel injection in advanced combustion systems* in the Fuel Science Center (Cluster of Excellence) (https://www.fuelcenter.rwth-aachen.de/cms/ siul/Fuelcenter/?lidx=1) (January 2019 - ongoing).
- Realization of an ANN-based predictive combustion model for direct-injected CNG engines to assess NO_x and UHC emissions for the project *Combustion simulation modeling of CNG engines* (Ford - RWTH Alliance) (April 2019 - March 2021).

Collaboration with Prof. R. Sandberg of University of Melbourne (April 2020 - ongoing) on the realization of turbulence and combustion closure models through the use of Gene Expression Programming. This activity is integrated in the framework of the joint PhD program between RWTH Aachen University and the University of Melbourne.

Realization of parallel in-house code for Dynamic Mode Decomposition and application to massive DNS databases of turbulent reacting flows (October 2015 - August 2018)

Collaboration with the *Center for Shock Wave-processing of Advanced Reactive Material (C-SWARM)*, University of Notre Dame, for the development of the Wavelet Adaptive Multiresolution Representation method in both MPI and HPX versions (October 2015 to May 2017).

Realization of in-house time-adaptive solver for stiff ODE systems, and creation of a chemical reduction tool (G-Scheme) (September 2009 - September 2015).

Research Grants

Natural Environment Research Council (NERC), **CoI for the project**: "Contrail assessment of future aircraft and propulsion architectures", £ 1,000,000, May 2024-April 2026

Defence Science and Technology Laboratory (DSTL), **PI for the project**: "Immersed Large Eddy Simulations for Accurate Force and Acoustic Predictions", £ 130,000, October 2024-March 2028

Jülich Supercomputing Centre (JSC) Computing Project, **PI for the project**: "Influence of physically-inspired losses on Super-Resolution Generative Adversarial Network for turbulent flows" ,March-September 2021

Jülich Supercomputing Centre (JSC) Data Storage Projects, **PI for the projects**: "CoEC Database of Turbulent Reacting flow", April 2021 - April 2023, "DNS Database of Turbulent Combustion", April 2021 - Apri 2023, "DNS database for Multiphysics Modeling of Combustion", May 2021 - April 2023

RWTH Computing Project (CLAIX18), **PI for the projects**: "Investigation of the generalization capability of a data-driven subgrid-scale model for turbulent premixed combustion", September 2022 - August 2023; "Detailed simulations of the nozzle-dependent primary atomization of the SpraySyn burner", December 2021 - November 2022; "Direct Numerical Simulation setup for a turbulent solid pulverized fuel flame", June 2021 - May 2022; "Understanding the effects of the strong scaling approach on 3D super-resolution Generative Adversarial Networks with turbulent flows", March 2021 - February 2022; "Setup of Sooting Flame Direct Numerical Simulation", December 2020 - November 2021; "Investigation of Irregular Combustion Phenomena in SI Engines using Large-Eddy Simulations", December 2020 - November 2022; "Flame kernel development in hydrogen/air mixture", December 2020 - November 2021

XSEDE Production Allocation, **Co-PI for the project** "Direct Numerical Simulation investigation of Heat Release Effects on Turbulence Dynamics and Energy Transfer", April 2017 - March 2018

NERSC Production Allocation Award, **Co-PI for the project** "Direct Numerical Simulations of Turbulent Combustion: Heat Release Effects on Turbulence Dynamics and Energy Transfer", 2016, 2017 and 2018

NERSC Production Allocation Awards, **Co-PI for the project** "Parallel Adaptive Wavelet Method for the Simulation of Compressible Reactive Flow", 2012, 2013, 2014, 2015, and 2016

XSEDE Startup Allocation, **Co-PI for the project** "Direct Numerical Simulation investigation of Heat Release Effects on Turbulence Dynamics and Energy Transfer", 2016

ISCRA Class B Project for HPC, **Co-PI for the project** "Simulation of a turbulent reacting mixing layer using a Wavelet Adaptive Multi-Resolution Method", 2013

Awards

Fellow of **Higher Education Academy** (HEA), 2024
Habilitation as Associate Professor in Aerospace Engineering by the Italian Ministry of Universities and Research, 2023
Distinguished paper award 39th International Symposium on Combustion, 2022
Kaneb Center Outstanding Graduate Student **Teacher Award**, 2012

Professional Service

Member of the British Section of the Combustion Institute Committee. December 2024 - Ongoing

Organizer of the *Machine Learning for Combustion Meeting* for the British Section of the Combustion Institute, London, December 5th, 2024

Member of the Scientific Advisory Board of the European Horizon2020 project *Center of Excellence of Combustion (CoEC)*. February 2023 - December 2023

Reviewer for *Combustion and Flame*, *Combustion Theory and Modelling*, *Journal of Compu-*

tational Physics, *Journal of Propulsion and Power*, *Proceedings of the Combustion Institute*, *Journal of Energy Engineering*, *Fuel*, *Journal of Heat and Mass Transfer*, *Atmosphere*, *Fluids*, *American Society of Mechanical Engineers Turbo Expo*, and *27th International Colloquium on the Dynamics of Explosions and Reactive Systems (ICDERS)*.

Reviewer for computing time proposal for *High Performance Computing Center Stuttgart (HLRS)*, *Jülich Aachen Research Alliance (JARA)*, National High Performance Computing Alliance (NHR), and RWTH Computing Project.

Session Chair

- *Advances in dimensionality reduction and manifold learning for the parametrization and modeling of large combustion systems, 19th International Conference on Numerical Combustion*, Kyoto, Japan, May 7–10, 2024
- *Numerical Combustion Session, 39th International Symposium on Combustion*, Vancouver, Canada, July 24th - 29th, 2022
- *Premixed DNS II, 18th International Conference on Numerical Combustion*, San Diego, USA, May 8th - 11th, 2022
- *Numerical Methods, 17th International Conference on Numerical Combustion*, Aachen, Germany, May 6th - 8th, 2019
- *Turbulent Combustion Session, 37th International Symposium on Combustion*, Dublin, Ireland, July 29th - August 3rd, 2018
- *Sooting Flame Simulations Session, 2018 Eastern States Section of Combustion Institute Technical Meeting*, Penn State University, USA, March 4th - 7th, 2018

Program Committee Member of the *17th International Conference on Numerical Combustion*, Aachen, May 6th - 8th, 2019

Organizer of the *6th International Workshop on Model Reduction in Reactive Flow*, Princeton University, July 11th - 14th, 2017

Member of *Graduate Student Senate*, University of Notre Dame, August 2012 - May 2013

Professional Memberships

- Combustion Institute (2010–present)
- American Physics Society (2011–present)
- Institute of Physics (2023-present)
- American Society of Mechanical Engineers (2014–2018)
- Society for Industrial and Applied Mathematics (2017–2019)

Invited Talks

T. Grenga, Challenges in hydrogen combustion subgrid modeling. *Department of chemistry, materials and chemical engineering, Polytechnic University of Milan*, March 25, 2025

T. Grenga, Efficient use of computational resources: The Wavelet Adaptive Multi-resolution Method. *NHR4CES Community Workshop: Performance Engineering for Numerical Methods in Computational Fluid Dynamics*, June 14th, 2024

T. Grenga, Data-driven turbulence modeling: the potential of generative adversarial network. *CISAS, University of Padua*, April 18, 2024

T. Grenga, Modeling of turbulent combustion through generative adversarial networks. *Department of chemistry, materials and chemical engineering, Polytechnic University of Milan*, April 16, 2024

T. Grenga, Data-Driven Modeling in turbulent combustion: progress in generative artificial intelligence. *University of Pisa*, April 12, 2024

T. Grenga, Deep learning modeling for high-fidelity combustion. *Rolls Royce AI-SMT*, Southampton (UK), September 28th, 2023

T. Grenga, Wavelet adaptive Multi-resolution representation for compressible reacting flows. *Barcelona Supercomputing Center*, Barcelona (Spain), September 19th, 2023

T. Grenga, Numerical methods for exa-scale simulations of turbulent reacting flows. *Department of Energy*, CORIA- INSA Rouen (France), October 11th, 2022.

T. Grenga, Numerical methods for exa-scale simulations of turbulent reacting flows. *Department of Aeronautical and Astronautical Engineering*, University of Southampton (UK), September 22nd, 2022.

T. Grenga, Numerical methods meet HPC. *6th Icelandic HPC Community Workshop*, University of Iceland (Iceland), August 31st, 2022.

T. Grenga, A super-resolution data-driven model for large eddy simulation. *Department of Industrial Engineering*, University of Bologna (Italy), May 16th, 2022.

T. Grenga, Advanced tools for a new combustion age. *Department of Engineering Science*, University of Oxford (UK), April 8th, 2022.

T. Grenga, Artificial Intelligence for future energy system. *AI4Media*, Online event, March 17th, 2022.

T. Grenga, Wavelet adaptive multi-resolution representation for compressible flow. *Department of physics and astronomy*, University of Bologna (Italy), April 4th, 2019.

T. Grenga, Compressible reacting flow: advanced methods for simulation. *Institute of Fluid Dynamics and Acoustics Technology*, Technical University Berlin (Germany), January 23rd, 2019.

T. Grenga, Compressible reacting flow: advanced methods for simulation and analysis. *Reacting Flow Center*, Sandia National Laboratory - Livermore (USA), May 7th, 2018.

T. Grenga, Compressible reacting flow: advanced methods for simulation and analysis. *Department of Mechanical Engineering*, University of Birmingham (UK), April 23rd, 2018.

T. Grenga, Compressible reacting flow: advanced methods for simulation and analysis. *Department of Mechanical Engineering*, University of Wisconsin Madison (USA), February 12th, 2018.

T. Grenga, Multi-dimensional compressible reactive flow: direct numerical simulation and analysis. *Department of Mechanical Engineering*, KAUST (Saudi Arabia), February 8th, 2017.

T. Grenga, Numerical solution of multi-dimensional compressible reactive flow using a parallel Wavelet Adaptive Muti-Resolution method. *Department of Mechanical Engineering*, KAUST (Saudi Arabia), November 3rd, 2016.

T. Grenga, Advanced Mathematical Tools for the Analysis of Chemical Kinetics and Reactive Flows. *Clean Combustion Research Center*, KAUST (Saudi Arabia), November 2nd, 2016.

T. Grenga, Numerical solution of multi-dimensional compressible reactive flow using a parallel Wavelet Adaptive Muti-Resolution method. *Center of Mixing Under Extreme Conditions (CoMuEx)*, Los Alamos National Laboratory (USA), October 16th, 2014.

T. Grenga, Numerical Solution of compressible reactive flow using a parallel Wavelet Adaptive Muti-Resolution method. *Environmental Fluid Dynamics Laboratories*, University of Notre Dame

(USA), April 25th, 2014.

T. Grenga, G-Scheme-based mechanism simplification and analysis for hydrogen and hydrocarbon ignition. *Environmental Fluid Dynamics Laboratories*, University of Notre Dame (USA), April 29th, 2011.

Database Publications

Nista, L., Schumann, C. D. K., Vivenzo, M., Fröde, F., Grenga, T., MacArt, J. F., Attili, A., Pitsch, H., Homogeneous isotropic turbulence database for training super-resolution data-driven turbulence closure models. No. RWTH-2024-03259. Lehrstuhl und Institut für Technische Verbrennung, 2024. (https://publications.rwth-aachen.de/record/981830)

Peer Reviewed Publications

Fruzza, F., H. Chu, R. Lamioni, T. Grenga, C. Galletti, H. Pitsch, Three-dimensional numerical investigation of flashback in premixed hydrogen flames within perforated burners. *Combustion and Flame*, **274**, 2025.

Nista, L., C. D. K. Schumann, P. Petkov, V. Pavlov, T. Grenga, J. F. MacArt, A. Attili, S. Markov, H. Pitsch, Parallel implementation and performance of super-resolution generative adversarial network turbulence models for large-eddy simulation. *Computers and Fluids*, **288**, 2025.

Waschkowski, F., H. Li, A. Deshmukh, T. Grenga, Y. Zhao, H. Pitsch, J. Klewicki, R. D. Sandberg, Gradient Information and Regularization for Gene Expression Programming to Develop Data-Driven Physics Closure Models. *Flow, Turbulence and Combustion*, **114**, 1, 145 – 175, 2025.

Fruzza, F., H. Chu, R. Lamioni, T. Grenga, C. Galletti, H. Pitsch, The importance of Soret effect, preferential diffusion, and conjugate heat transfer for flashback limits of hydrogen-fueled perforated burners. *Proceedings of the Combustion Institute*, **40**, (1-4), 105581, 2024.

Cuoci, A., A. Nobili, A. Parente, T. Grenga, H. Pitsch, Tabulation-based sample-partitioning adaptive reduced chemistry and cell agglomeration. *Proceedings of the Combustion Institute*, **40**, (1-4), 105386, 2024.

Nista, L., H. Pitsch, C. D. K. Schumann, M. Bode, T. Grenga, J. F. M. McArt, A. Attili, Influence of adversarial training on super-resolution turbulence reconstruction. *Physical Review Fluids*, **9**, 064601, 2024.

Saha, A., A. Y. Deshmukh, T. Grenga, H. Pitsch, Physics-based reduced-order modeling of flash-boiling sprays in the context of internal combustion engines. *International Journal of Multiphase Flow*, **171**, 104673, 2024

Fröde, F., T. Grenga, S. Dupont, R. Kneer, R. Tischendorf, O. Massopo, H.-J. Schmid, H. Pitsch, Large eddy simulation of iron oxide formation in a laboratory spray flame. *Applications in Energy and Combustion Science*, **16**, 100191, 2023.

Saha, A., A. Y. Deshmukh, T. Grenga, H. Pitsch, Dimensional analysis of vapor bubble growth considering bubble–bubble interactions in flash boiling microdroplets of highly volatile liquid electrofuels. *International Journal of Multiphase Flow*, **165**, 104479, 2023

Chu, H., L. Berger, T. Grenga, Z. Wu, H. Pitsch, Effects of differential diffusion on hydrogen flame kernel development under engine conditions. *Proceedings of the Combustion Institute*, **39**, (2), 2129-2138, 2023.

Nista, L., C. D. K. Schumann, T. Grenga, A. Attili, H. Pitsch, Investigation of the generalization capability of a Generative Adversarial Network for Large Eddy Simulation of turbulent premixed reacting flows. *Proceedings of the Combustion Institute*, **39**, (4), 5279-5288, 2023.

Grenga, T., L. Nista, C. D. K. Schumann, A. N. Karimi, G. Scialabba, A. Attili, H. Pitsch, Predictive data-driven model based on generative adversarial network for premixed turbulence-combustion regimes. *Combustion Science and Technology*, **195**, (15), 3923-3946, 2023.

Fröde, F., T. Grenga, V. Le Chedanec, M. Bode, H. Pitsch, A three-dimensional cell-based Volume-of-Fluid method for conservative simulations of primary atomization. *Journal of Computational Physics*, **465**, 111374, 2022.

Nista, L., C. D. K. Schumann, G. Scialabba, T. Grenga, M. Bode, A. Attili, H. Pitsch, Influence of adversarial training on turbulence closure modeling with deep convolutional neural networks. *American Institute of Aeronautics and Astronautics (AIAA) SciTech 2022*, 185, 2022.

Deshmukh, A. Y., T. Grenga, M. Davidovic, L. Schumacher, J. Palmer, M. A. Reddemann, R. Kneer, H. Pitsch, A Reduced-order Model for Multiphase Simulation of Transient Inert Sprays in the Context of Compression Ignition Engines. *International Journal of Multiphase Flow*, **147**, 103872, 2022

Deshmukh, A. Y., M. Davidovic, T. Grenga, R. Lakshmanan, L. Cai, H. Pitsch, A Reduced-order model for turbulent reactive sprays in compression ignition engines. *Combustion and Flame*, **236**, 111751, 2022

Saha, A., T. Grenga, A. Y. Deshmukh, M. Davidovic, J. Hinrichs, M. Bode, H. Pitsch, Numerical modeling of single droplet flash boiling behavior of E-fuels considering internal and external vaporization. *Fuel*, **308**, 121934, 2022

Grenga, T., and M. E. Mueller, Dynamic mode decomposition: a tool to extract structures hidden in massive datasets. *Data Analysis in Direct Numerical Simulation of Turbulent Combustion*, Springer, 2020.

Valorani, M., F. Creta, P. P. Ciottoli, R. Malpica Galassi, D. A. Goussis, H. N. Najm, S. Paolucci, H. G. Im, E.-Al. Tingas, D. M. Manias, A. Parente, Z. Li, T. Grenga. Computational singular perturbation method and tangential stretching rate analysis of large scale simulations of reactive flows: Feature tracking, time scale characterization, and cause/effect identification. Part 1, basic concepts *Data Analysis in Direct Numerical Simulation of Turbulent Combustion* Springer, 2020.

Valorani, M., F. Creta, P. P. Ciottoli, R. Malpica Galassi, D. A. Goussis, H. N. Najm, S. Paolucci, H. G. Im, E.-Al. Tingas, D. M. Manias, A. Parente, Z. Li, T. Grenga. Computational singular perturbation method and tangential stretching rate analysis of large scale simulations of reactive flows: Feature tracking, time scale characterization, and cause/effect identification. Part 2, analyses of ignition systems, laminar and turbulent flames. *Data Analysis in Direct Numerical Simulation of Turbulent Combustion* Springer, 2020.

Nunno, A. C., T. Grenga, and M. E. Mueller, Comparative analysis of methods for heat losses in turbulent premixed flames using physically-derived reduced-order manifolds. *Combustion Theory and Modelling*, **23**, 42-66, 2019.

MacArt, J. F., T. Grenga, and M. E. Mueller, Evolution of flame-conditioned velocity statistics in turbulent premixed jet flames at low and high Karlovitz numbers. *Proceedings of the Combustion Institute*, **37**, 2503-2510, 2019.

Valorani, M., P. P. Ciottoli, R. Malpica Galassi, S. Paolucci, T. Grenga, E. Martelli, Enhancements of the G-Scheme Framework. *Flow, Turbulence and Combustion*, **101**, 1023-1033, 2018.

DeBuhr, J., B. Zhang, M. Anderson, D. Neilsen, E. W. Hirschmann, T. Grenga, and S. Paolucci, Relativistic Hydrodynamics with Wavelets. *Astrophysical Journal*, **867**, 112, 2018.

Grenga, T., J. F. MacArt, and M. E. Mueller, Dynamic mode decomposition of a direct numerical

simulation of a turbulent premixed planar jet flame: convergence of the modes. *Combustion Theory and Modelling*, **22**, 795-811, 2018.

Grenga, T., S. Paolucci, and M. Valorani, Sensitivity analysis and mechanism simplification using the G-Scheme framework. *Combustion and Flame*, **189**, 275-287, 2018.

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