

Dr. Elia Merzari
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Educational Background:

Doctoral Degree, 2008-2005, Nuclear Engineering, Tokyo Institute of Technology (Tokyo, Japan)

Master Degree, 2005-2003, Nuclear Engineering, Politecnico di Milano (Milan, Italy) -110/110 cum laude

International Program, 2005-2004, Ecole Polytechnique (Paris, France)

Bachelor Degree, 2003-2000, Engineering of Energy Systems, Politecnico di Milano (Milan, Italy) - 110/110 cum laude

Appointments:

2019-present Associate Professor, Nuclear Engineering, Pennsylvania State University

2019 -present Joint Appointment, Argonne National Laboratory

2013-2019 Joint Appointment with Argonne's Mathematics and Computer Science Division

2010-2019 Principal Nuclear Engineer/Nuclear Engineer at Argonne National Laboratory

2010-2009 Post-Doctoral Researcher at Argonne National Laboratory

2009-2008 Post-Doctoral Researcher at Tokyo Institute of Technology.

Research and Programs:

Current projects and programs.

- PI, NEUP IRP on "Center for thermal-fluids application in nuclear energy: Establishing the knowledgebase for thermal-hydraulic multiscale simulation to accelerate the deployment of advanced reactors" 2021-2023
- Co-PI on NEUP project "Development of innovative overlapping-domain coupling between SAM and NEK5000", led by Annalisa Manera, 2020-2022
- Co-PI on NEUP project "Experimental Investigations and Numerical Modeling of Near-wall and Core Bypass Flows in Pebble Bed Reactors", led by T. Nguyen 2020-2023
- Co-PI on NEUP project "High-Resolution Measurements and Advanced Modeling for Design Optimization of Advanced Small Modular Reactor Steam Generators ", led by Yassin Hassan 2021-2024
- Co-PI on NEUP project "Estimation of low temperature cladding failures during an RIA transient ", led by Arthur Motta 2021-2024
- Co-PI on NRC project "Heat Transfer Experimental and Computational Data for Molten Salt Reactors Applications", led by Yassin Hassan 2020-2023
- Co-Pi on NRC project "High Fidelity Modeling and Experiments to inform Safety Codes for Heat Pipe Microreactors", led by Annalisa Manera 2020-2013
- Thermal-Hydraulics Area lead, Nuclear Energy Advanced Modeling and Simulation (NEAMS), 2019-present.
- Co-PI on ExaSMR project (part of Exascale Computing Project) on exascale simulation of Small Modular Reactors.

- Received several computing time allocations on DOE supercomputers as principal investigator under the DOE-ASCR Leadership Computing Challenge program (2012-present)

Past programs

- Director, DOE-NE Center of Excellence for Thermal-Fluids Applications in Nuclear Energy
- 2015-2019 Member, Nuclear Energy Advanced Modeling and Simulation (NEAMS) Leadership Council
- Led High Impact Problem (HIP) project in the NEAMS (DOE-NE) program focused on the numerical simulation of flow induced vibrations in advanced steam generators.
- Contributed as one of the PIs to the CESAR initiative (DOE-ASCR) and SHARP (DOE-NE) initiative, via the development of new numerical methods for Petascale and Exascale-level multi-physics simulations in nuclear reactors.

Research interests

- Published on Rod bundle flows, Pebble beds, SMRs, CFD, Large Eddy Simulation, Linear Stability Analysis, POD, Reduced Order Methods, Multi-physics, Design of Accelerator Driven Systems, FIV.
- Contributed to several software projects at ANL, including Nek5000, NekRS, SHARP, WireHexMesher and Cardinal.

Publications:

Over 200 publications.

Over 180 peer-reviewed publications (more than 55 in international journals)

Full list of publications on Google Scholar profile (h-index:21, over 1800 citations)

Selected publications

1. Hufnagel L., Canton J., Orlu R., Marin O., Merzari E., Schlatter P., "The three-dimensional structure of swirl-switching in bent pipe flow", *Journal of Fluid Mechanics*, 835, pp. 86-101 (2018)
2. Makarashvili V., Merzari E., Obabko A., Siegel A., Fischer P., "A performance analysis of ensemble averaging for high fidelity turbulence simulations at the strong scaling limit", *Computer Physics Communications*, 219, pp. 236-245 (2018)
3. Yuan, Haomin, Jerome Solberg, Elia Merzari, Adam Kraus, and Iulian Grindeanu. "Flow-induced vibration analysis of a helical coil steam generator experiment using large eddy simulation." *Nuclear Engineering and Design*, 322, 547-562 (2017)
4. Merzari E., Obabko A., Fischer P., Halford N., Walker J., Siegel A., Yu Y., "Large-scale large eddy simulation of nuclear reactor flows: Issues and perspectives", *Nuclear Engineering and Design*, 312, pp. 86-98 (2017)
5. Lomperski S., Obabko A., Merzari E., Fischer P., Pointer W.D., "Jet stability and wall impingement flow field in a thermal striping experiment", *International Journal of Heat and Mass Transfer*, 115, pp. 1125-1136 (2017)
6. Sprague M., Boldyrev S., Chang C.S., Fischer P., Grout R., Gustafson W. I., Hittinger J. A., Merzari E., Moser R., "Outcomes from the DOE Workshop on Turbulent Flow Simulation at the Exascale", in 46th AIAA Fluid Dynamics Conference, p. 3321 (2016)
7. Walker J., Merzari E, Obabko A., Fischer P., Siegel A., "Accurate Prediction of the Wall Shear Stress in Rod Bundles with the Spectral Element Method at High Reynolds Numbers", *International Journal of Heat and Fluid Flow*, 50, pp. 287-299 (2014)

8. Merzari E., Fischer P., Pointer W.D., "Numerical simulation and proper orthogonal decomposition of the flow in a Counter-flow T-junction", *Journal Fluids Engineering*, 135, 091304 (2013)
9. E. Merzari and H. Ninokata, "Proper orthogonal decomposition of the flow in Tight- lattice Rod Bundle," *Nuclear Engineering and Design*, Vol. 241, pp. 4621-4632 (2011)
10. Merzari E., Ninokata H., Mahmood A., Rohde M., "Proper orthogonal decomposition of the flow in geometries containing a narrow gap", *Theoretical and Computational Fluid Dynamics*, 23, pp. 333-351 (2009)
11. Merzari E., Ninokata H. "Anisotropic turbulence and coherent structures in eccentric annular channels", *Flow, Turbulence and Combustion*, 82, no. 1, pp. 93-120 (2009)
12. Merzari E., Wang S., Ninokata H., Theofilis V. 2008, "Biglobal linear stability analysis for the flow in eccentric annular channels and a related geometry", *Physics of Fluids*, 20, no. 11. (2008)

Professional Activities:

- Selected to participate in 2015 Frontiers' of engineering National Academy of Engineering symposium.
- IAHR, SIAM, ASME, ANS member.
- Associate editor of *Nuclear Engineering and Design*.
- Chair of the CFD Technical Committee of the Fluids Engineering division of ASME 2016-2018, Vice-chair of the same committee for the term 2014-2016.
- Member of K-20 committee (Heat transfer division) 2019- present
- Member of V&V30 committee 2021-present
- Officer of the Young Member Group of American Nuclear Society 2011-2014.
- Chair of the Young Member Group of American Nuclear Society, 2014-2015.
- Program Chair of the Thermal Hydraulic Division of ANS, 2016-2019. Assistant Program Chair of the same committee, 2013-2016.
- Chair of the Thermal-hydraulic division of ANS, 2021-2022
- Officer of the Thermal-hydraulic division of ANS, 2018-2021
- Executive Committee Member of the Thermal Hydraulic Division of ANS, 2013-2019.
- ANS Technical Journal Committee Member 2012-present.
- ANS National Program Committee Member, 2016-present.
- Conference Track Chair for ICONE20, ICONE22, ICONE23, ICONE24, FEDSM 2017, FEDSM2018, ICONE 26, ICONE 27 and ICONE 28.
- Assistant Technical Program Chair for ATH'14, NURETH-16, ATH'16, NURETH-17, ANS Winter Meeting 2016, ANS Winter Meeting 2017.
- Technical Program Chair for ATH'18, NURETH-19 and ANS Winter Meeting 2020.
- Session Organizer/Chairman for Several ANS conferences (ANS Meetings - Winter 2013, Winter 2012, Winter 2011, Winter 2010, Spring 2013, Spring 2012, NURETH13, NURETH14, NURETH15, etc.) and several ASME conferences.
- Program Committee member for several conferences including M&C 2013, NURETH-14
- Reviewer for *Nuclear Engineering and Design* (69 reviews performed), *Experimental Thermal and Fluid Science*, *International Journal of Thermal Sciences*, *Nuclear Technology*, *Annals of Nuclear Energy*, *International Journal of Heat and Fluid Flow*, *Journal of Turbulence*, *Journal of Fluids Engineering (ASME)*, *Journal of Turbulence*, *Journal of Verification, Validation and Uncertainty Quantification (ASME)*, *Journal of Nuclear Engineering and Radiation Science*

(ASME), Journal of Fluid Mechanics, International Journal of Heat and Mass Transfer, Journal of Computational Physics.

- Member of editorial advisory board for Nuclear Engineering and Technology.

Scholarships and Fellowships:

- Mombukagakusho scholarship for doctoral students (2005-2008).
- JSPS Postdoctoral Fellowship (2008-2009).

Honors and Awards:

- ANS Thermal Hydraulic Division Best Paper Award (2010, 2017).
- ANS Young Member Excellence Award (2012).
- Argonne Pacesetter Award (2013, 2018).
- ANS Landis Young Member Engineering Achievement Award (2014).
- Department of Energy's NEAMS Program Innovation Award (2014).
- HPC Innovation Excellence Award (2014).
- NURETH-16 Best Paper Award (2015).
- ASME George Westinghouse Silver medal (2016).
- Argonne Inaugural Energy and Global Security Directorate Project Award (2016).
- R&D100 Award (2016).
- 2nd Placement in Visualization Competition at ASME Fluids Engineering Summer Meeting (2017)
- NURETH-17 Best paper award (2017)
- NURETH-17 Reviewer award (2017)
- 1st Placement in Visualization Competition at ASME Fluids Engineering Summer Meeting (2018)
- Outstanding Track Organizer at ASME Fluids Engineering Summer Meeting (2018)
- ASME Fluids Engineering Division CFDTC Best paper Award (2018)
- NURETH-18 Reviewer Award (2019)
- ASME Lewis F. Moody Award (2020)
- ANS Sehgal Memorial Award (2021)
- ASME fellow (2021)

Other Recognition:

- Co-author of paper selected for best paper award at ICONE 28 (David Reger)
- Co-author of paper selected for best presentation award at ICONE 28 (Carolina Duarte)
- Co-author of paper selected for best paper award at NUCLEAR 2020 (Tri Nguyen)
- Co-author of paper selected for best paper award at NUCLEAR 2020 (Adam Kraus)
- Co-author of paper selected for Graduate Student Scholar (GSS) competition (V. Coppo Leite)
- Co-author of best student poster award at ICONE 26 (First author: Gerrit Botha).
- Co-author of student paper winner of the Akiyama medal at ICONE 24 (First author: Lambert Fick).
- Co-author of Best student paper at ICONE 24 (First author: Landon Brockmeyer).
- Co-author of Best student paper in thermal-hydraulics at ANS student conference 2017 (First author: Lane Carasik).

- Co-author of paper winner of the Young Professional Thermal-hydraulic Research Competition 2014 (First author: Y. Yu).
- Co-author of paper winner of the Young Professional Thermal-hydraulic Research Competition 2012 (First author: A. Dave).

Students advised (Penn State):

- Adam Kraus
- Victor Coppo Leite
- Tri Nguyen
- David Reger
- Carolina Duarte
- John Acierno
- Luiz Almeida

Students advised (Texas A&M):

- Lambert Fick (Graduated)
- Jonathan Lai (Graduated)
- Landon Brockmeyer (Graduated)
- Alper Yildiz (Graduated)

Postdoctoral fellows advised (ANL):

- Yiqi Yu
- Haomin Yuan
- Javier Martinez Rubio
- Landon Brockmeyer

Invited Talks:

- McMaster University, Hamilton (ON), Canada November 2008
- Politecnico di Milano, Milan, Italy, March 2009
- Tokyo Institute of Technology, Tokyo, Japan, September 2009
- Ohio State University. Columbus (OH), USA, November 2011
- University of Ottawa. Ottawa (ON), Canada, January 2012
- University of Wisconsin, Madison (WI), USA, March 2012
- MIT, Cambridge (MA), USA, September 2013
- Texas A&M University, College Station (TX), USA, October 2013
- North Carolina State University, Raleigh (NC), USA, April 2014
- HPCSET Symposium, Frankfurt, Germany, July 2015
- University of California – Berkeley, August 2017
- George Washington University, October 2017
- **Lecture**, IS-ReCTHA conference, August 2018
- **Keynote lecture**, International SESAME workshop, Petten, Netherlands, March 2018
- **Keynote**, 18th International Topical Meeting on Nuclear Reactor Thermal-hydraulics, Portland, Oregon, August 2018
- **Keynote**, “Toward full core CFD: An update from the ExaSMR and NEAMS programs”, Combined First Annual Technical Meeting of CCP for Nuclear Thermal Hydraulics

(CCP NTH) and Sixth Meeting of the UKFN SIG in Nuclear Thermal Hydraulics (SIG NTH), September 2020.

- **Keynote**, NENE'21, September 2021.