

**Proceedings of
ASME 2022 Fluids Engineering
Division Summer Meeting
(FEDSM2022)**

Volume 2

**August 3-5, 2022
Toronto, Ontario, Canada**

**Conference Sponsor
Fluids Engineering Division**

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Two Park Avenue * New York, N.Y. 10016

© 2022, The American Society of Mechanical Engineers, 2 Park Avenue, New York, NY 10016, USA
(www.asme.org)

All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

ASME shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B7.1.3). Statement from the Bylaws.

For authorization to photocopy material for internal or personal use under those circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, tel: 978-750-8400, www.copyright.com.

Requests for special permission or bulk reproduction should be addressed to the ASME Publishing Department, or submitted online at: <https://www.asme.org/publications-submissions/journals/information-for-authors/journalguidelines/rights-and-permissions>

ISBN: 978-0-7918-8584-0

CONTENTS

Proceedings of ASME 2022 Fluids Engineering Division Summer Meeting

Multiphase Flow (MFTC)

FEDSM2022-79746	V002T04A001
Uncertainty Quantification and Sensitivity Analysis of Semi-Mechanistic Models for Sand Erosion in Elbows for Single and Multiphase Flows <i>Ronald E. Vieira and Siamack A. Shirazi</i>	
FEDSM2022-85863	V002T04A002
Investigation of Volume-of-Fluid Method to Simulate Melting-Solidification of CMAS Particles <i>Brendon Cavainolo and Michael Kinzel</i>	
FEDSM2022-85965	V002T04A003
Jet Erosion of Particle Beds: Projecting Critical Suspension Velocities From Effective Clearing / Cleaning Radii <i>Leonard F. Pease, Judith Ann Bamberger, and Michael J. Minette</i>	
FEDSM2022-86006	V002T04A004
Study on the Entrainment Behaviors of the Droplet Jet Between Plates Considering the Hydrophobicity of the Plate <i>Guanghang Wang, Jian Huang, Jingzhu Wang, and Yiwei Wang</i>	
FEDSM2022-86786	V002T04A005
Experimental and Modeling Study of Sand Transport in Slightly Upward Inclined Solid-Liquid Flow <i>Ronald E. Vieira and Siamack A. Shirazi</i>	
FEDSM2022-86873	V002T04A006
Design Optimization of Laser-Induced Bubble for Highly Efficient Generation of Microjets <i>Tatsumasa Ishikawa, Hiroyuki Nishida, and Yoshiyuki Tagawa</i>	
FEDSM2022-86897	V002T04A007
Cleaning Effect of Bubbles Impacting Tilted Walls Under Acoustic Waves <i>Alireza Hooshanginejad, Timothy J. Sheppard, Janeth Manyalla, John Jaicks, and Sunghwan Jung</i>	
FEDSM2022-86962	V002T04A008
A CFD Study on the Effects of Sand Particle Size on Erosion of an Elbow <i>Ghulam Haider, Thiana Sedrez, and Siamack A. Shirazi</i>	
FEDSM2022-86965	V002T04A009
Experimental and Numerical Study on Solid Particle Erosion of Standard Elbows in Dispersed-Bubble Flow <i>F. S. Bilal, M. M. Othayq, T. A. Sedrez, and S. A. Shirazi</i>	
FEDSM2022-87029	V002T04A010
Experimental Investigation in Turbulent Shear Mixing Layer at Supercritical Condition <i>Chang Hyeon Lim, Stephen R. Johnston, and Devesh Ranjan</i>	

FEDSM2022-87037	V002T04A011
Effect of Microfiber Length on Microfiber Motion in Human Nasal Airways <i>J. Li, J. Ma, J. Y. Tu, L. Tian, and G. Ahmadi</i>	
FEDSM2022-87150	V002T04A012
Study of Thixotropic Behavior of Non-Newtonian Fluids in Tool-Joints of Oil Wells <i>Ardeshir Gholami, Zohreh Mansoori, Majid Saffar Avval, and Goodarz Ahmadi</i>	
FEDSM2022-87470	V002T04A013
A Study of Microfluidic Device Geometries on Fluid Instabilities <i>Sylvain Le Henaff, Taylor Peterson, Candice Hovell, Jeremy Mares, Melanie Coathup, Veerle Reumers, and Michael Kinzel</i>	
FEDSM2022-87588	V002T04A014
On the Transition Between Re-Entrant Jet and Condensation Shock Mechanism in Sheet to Cloud Cavitation <i>Diego Vaca-Revelo and Aswin Gnanaskandan</i>	
FEDSM2022-87651	V002T04A015
A Numerical Study on the Effect of Carrier Fluid Subgrid Scales Fluctuations on Deposition and Dispersion of Lagrangian Particles <i>Farid Roust, Bamdad Lessani, and Goodarz Ahmadi</i>	
FEDSM2022-87688	V002T04A016
Four-Way Coupled Simulation of Proppants Flowing in Rock Fracture With Realistic Geometry- Hydraulic Fracturing Application <i>Farid Roust, Goodarz Ahmadi, and Dustin Crandall</i>	
FEDSM2022-87708	V002T04A017
Concentrating Slurries Mesofluidically for Nuclear Waste Processing <i>Leonard F. Pease, Judith Ann Bamberger, Carolyn A. Burns, and Michael J. Minette</i>	
FEDSM2022-87714	V002T04A018
Sand Erosion Measurements and Simulations Under Churn Flow Conditions in Elbows in Series <i>Yeshwanth Raj Rajkumar, Soroor Karimi, and Siamack A. Shirazi</i>	
FEDSM2022-87732	V002T04A019
Ventilation System Performance on the Removal of Respiratory Droplets Emitted During Speaking <i>Morteza Ali Masoomi, Mazyar Salmanzadeh, and Goodarz Ahmadi</i>	
FEDSM2022-87895	V002T04A020
A Numerical Method and Study of Viscoelastic Droplet Breakup <i>Caroline Anderson and Michael Kinzel</i>	
FEDSM2022-88033	V002T04A021
Electrostatic Painting Process: Impact of Using Connected High-Voltage Embodiments With Rotary Bell Atomizers on Droplets Transport and Deposition <i>Mohammad-Reza Pendar and José Carlos Páscoa</i>	

Computational Fluid Dynamics (CFDTC)

FEDSM2022-79617	V002T05A001
Growth Mechanism of a Vortex Structure Formed by a Sweeping Jet and a Main Flow <i>Eisei Kobayashi, Masaki Fuchiwaki, and Surya Raghu</i>	
FEDSM2022-85407	V002T05A002
A Balance Between Odor Intensity and Odor Perception Range in Odor-Guided Flapping Flight <i>Menglong Lei and Chengyu Li</i>	

FEDSM2022-86684	V002T05A003
Modeling and Computation of Batoid Swimming Inspired Pitching Impact on Wake Structure and Hydrodynamic Performance	
<i>Alec Menzer, Chengyu Li, Frank Fish, Yuchen Gong, and Haibo Dong</i>	
FEDSM2022-86712	V002T05A004
Development of Additional Material Transport to Augmented Reality Sandbox Algorithm to Model Pollution and Contaminant Runoff	
<i>Tyler Ainsworth and Elizabeth Smith</i>	
FEDSM2022-86729	V002T05A005
Numerical and Experimental Investigations of the Effect of Distance Between Two Elbows in Series in Gas-Solid Flows on Solid Particle Erosion	
<i>Mazen M. Othayq, Faris S. Bilal, Thiana A. Sedrez, and Siamack A. Shirazi</i>	
FEDSM2022-86742	V002T05A006
A Method for Numerical Evaluation of Singular Integrals in Curved Hexahedra and With High-Order Source Functions	
<i>Adrin Gharakhani and Mark J. Stock</i>	
FEDSM2022-86755	V002T05A007
The Effect of Phase Interaction Forces and Particle Rotation on Solid Particle Erosion in Liquid-Solid and Liquid-Gas-Solid Flows	
<i>Thiana A. Sedrez and Siamack A. Shirazi</i>	
FEDSM2022-86863	V002T05A008
Validation of Low and High-Fidelity Turbulence Models for Prediction of Turbulent Heat Transfer in Low Prandtl Number Flows Under Buoyant and Separated Flow Conditions	
<i>Mohammed El Mellouki, Shanti Bhushan, Chris Pilmaier, D. K. Walters, Michael Gorman, Brent Hollrah, Y. A. Hassan, Elia Merzari, Aleksandr Obabko, and M. B. Dzodzo</i>	
FEDSM2022-86877	V002T05A009
Effects of Throttling Orifice Plate on Flow and Aerodynamic Noise Characteristics Inside Valve Downstream	
<i>Long-jie Yu, Fang-na Xiang, Jiao-shan Hao, Yong-bing Jiang, Zhi-jiang Jin, and Jin-yuan Qian</i>	
FEDSM2022-86878	V002T05A010
Research on Fluid Dynamics and Thermal Characteristics in Hydraulic Valves by Thermal-Fluid-Solid Coupling Method	
<i>Jia-xi Nie, Zhen-hao Lin, Jiao-shan Hao, Yong-bing Jiang, Zhi-jiang Jin, and Jin-yuan Qian</i>	
FEDSM2022-86921	V002T05A011
Flow Simulation and Investigation Around a Estate Vehicle Using Hybrid Methods	
<i>Francois Delassaux, Iraj Mortazavi, Vincent Herbert, and Charles Ribes</i>	
FEDSM2022-86938	V002T05A012
Evaluation of Flow and Heat Transfer During Compression Stroke in a Porous Material Using MVCEF Solving Method	
<i>Inès Marzougui, Ramla Gheith, Houda Hachem, and Fethi Aloui</i>	
FEDSM2022-86945	V002T05A013
Inferring Unsteady Wake Flow Fields From Partial Data by Physics-Informed Neural Networks	
<i>Chang Yan, Shengjun Ju, Dilong Guo, Guowei Yang, and Shuanbao Yao</i>	

FEDSM2022-86953.....**V002T05A014**
Physics-Informed Long-Short Term Memory Neural Network Performance on
Holloman High-Speed Test Track Sled Study
*José Pérez, Rafael Baez, Jose Terrazas, Arturo Rodríguez, Daniel Villanueva,
Olac Fuentes, Vinod Kumar, Brandon Paez, and Abdiel Cruz*

FEDSM2022-86957.....**V002T05A015**
Field Predictions of Hypersonic Cones Using Physics-Informed Neural Networks
*Daniel Villanueva, Brandon Paez, Arturo Rodriguez, Ashesh Chattopadhyay,
V. M. Krushnarao Kotteda, Rafael Baez, Jose Perez, Jose Terrazas,
and Vinod Kumar*

FEDSM2022-86967.....**V002T05A016**
Hydrodynamics of Metachronal Motion: Effects of Spatial Asymmetry on the
Flow Interaction Between Adjacent Appendages
Zhipeng Lou, Adrian Herrera-Amaya, Margaret L. Byron, and Chengyu Li

FEDSM2022-87027.....**V002T05A017**
CFD Simulation of Hurricane Force Wind and Its Impacts on Residential Buildings
Ghalib Siaka and Ning Zhang

FEDSM2022-87040.....**V002T05A018**
Slurry Pumps Instability Investigation Using High Fidelity CFD Simulation
Mohamed Garman and Robert Visintainer

FEDSM2022-87279.....**V002T05A019**
Numerical Investigation of Flow and Thermal Behavior in Channels With
PCM-Filled Thermal Energy Storage Columns for Potential Application in Photobioreactors
Sameed Akber, Kamran Siddiqui, and Christopher DeGroot

FEDSM2022-87412.....**V002T05A020**
Is it Turbulent or Laminar? Convolutional Neural Network Predictions
*Nicholas Dudu, Arturo Rodriguez, V. M. Krushnarao Kotteda, Jose Terrazas,
Daniel Villanueva, Clinton Chijioke, Rafael Baez, Brandon Paez,
and Vinod Kumar*

FEDSM2022-87413.....**V002T05A021**
Mesh Adaptability Technique for Canonical Turbulent Jet Flows via
Reinforcement Learning
*Brandon Paez, Arturo Rodriguez, V. M. Krushnarao Kotteda,
Ashesh Chattopadhyay, Jose Terrazas, Rafael Baez, and Vinod Kumar*

FEDSM2022-87596.....**V002T05A022**
Combining 4D MRI With CFD for Investigating Patient-Specific Cardiovascular
Flows: A Comprehensive Comparison of ANSYS, COMSOL, and
SimVascular Illustrated With the Prediction of Thoracic Aortic Hemodynamics
*Farshad Tajeddini, David A. Romero Torres, Davis McClarty, Jennifer Chung,
and Cristina H. Amon*

FEDSM2022-87630.....**V002T05A023**
Data-Driven Dynamical System Models of Roughness-Induced Secondary
Flows in Thermally Stratified Boundary Layers
Christoffer Hansen, Xiang I. A. Yang, and Mahdi Abkar

FEDSM2022-87690	V002T05A024
Computational Modeling and Hydrodynamic Analysis of Fish Schools in Three-Dimensional Arrangements <i>Yu Pan, Wei Zhang, and Haibo Dong</i>	
FEDSM2022-87718	V002T05A025
On to Quantifying the Effect of Droplet Size Distribution on the Airborne Transmission of the Virus <i>Rajendra Shrestha, Juanpablo Delgado, Douglas Fontes, Bernhard Stiehl, Jonathan Reyes, Steven Schroeder, Kareem Ahmed, and Michael Kinzel</i>	
FEDSM2022-87742	V002T05A026
A Wall-Modeled Large Eddy Simulation Method for High-Order Spectral Element Solvers <i>D. Keith Walters, Shanti Bhushan, and Wayne Strasser</i>	
FEDSM2022-87877	V002T05A027
Development of a Finite Element Solver Including a Level-Set Method for Modeling Hydrokinetic Turbines <i>Ahmed A. Hamada and Mirjam Fürth</i>	
FEDSM2022-87885	V002T05A028
Numerical Analysis to Study the Effect of Control Temperature Location Inside a Datacenter <i>Atta Ul Mannan Hashmi, Arshan Ahmed Tipu, Fahad Rafi Butt, Imran Akhtar, and Muhammad Saif Ullah Khalid</i>	
FEDSM2022-87897	V002T05A029
Nusselt Number Dependence on Aspect Ratio and Rayleigh Number: A Numerical Study of Rayleigh-Benard Instability <i>Wajeeha Siddiqui, Zafar Abbas, Imran Akhtar, and Muhammad Saif Ullah Khalid</i>	
FEDSM2022-87937	V002T05A030
Optimization of an Elliptical Fairing in the Wake of a D-Shaped Bluff Body <i>Luis Amaya, George Loubimov, and Michael Kinzel</i>	
FEDSM2022-87980	V002T05A031
Effect of Phase Difference on Wake Characteristics and Propulsive Performance of Pitching Foils in Side-by-Side Configurations <i>Ahmet Gungor, Muhammad Saif Ullah Khalid, and Arman Hemmati</i>	
FEDSM2022-88044	V002T05A032
Numerical Investigation of Automotive Paint Oven for Improving the Thermal Efficiency <i>Mohammad-Reza Pendar, José Carlos Páscoa, and Rui Lima</i>	
FEDSM2022-88368	V002T05A033
Aerodynamic Analysis of the Utility Truck With the Morphing Boom Equipment <i>Parth Y. Patel, Thannathorn Jannoi, Wenhui Zou, Vladimir Vantsevich, and Roy Koomullil</i>	
FEDSM2022-88624	V002T05A034
Immersed Boundary Method Implemented in LES for Flow Past a Sphere at Subcritical Reynolds Numbers <i>H. Ali Marefat, Jahrul Alam, and Kevin Pope</i>	

Micro and Nano Fluid Dynamics (MNFDTC)

- FEDSM2022-86966**..... **V002T06A001**
Effect of Single Nanoparticle Diameter on a Nanochannel Fluid Flow and
Heat Transfer
Isaias Gonzalez and Deify Law
- FEDSM2022-87031**..... **V002T06A002**
Geometric Analysis of Insect Wing Vein Network
Jacob White, Ying Hu, Sangjin Ryu, Seunghee Kim, and Haipeng Zhang
- FEDSM2022-87076**..... **V002T06A003**
Numerical Analysis of Dielectrophoretic-Based DNA Separation and Trapping
Jeff Darabi
- FEDSM2022-87601**..... **V002T06A004**
Internal Flow of Sessile Droplets Evaporating on Heated Hydrophobic and
Superhydrophobic Substrates
Jingbo Chen, Zhenhai Pan, Zhiguo Wang, Jun Cao, Wen Du, and Jialing Yu
- FEDSM2022-87613**..... **V002T06A005**
Fabrication of a Microfluidic Cell Compressor Using a 3D-Printed Mold
Carson Emeigh, Haipeng Zhang, and Sangjin Ryu
- FEDSM2022-87758**..... **V002T06A006**
Development of Nano- and Micro-Fluids Using Magnetic
Poly(Ionic Liquid)-Surfactant Complexes for Stimuli Response
Kayla Foley and Keisha B. Walters
- FEDSM2022-87923**..... **V002T06A007**
Fabrication of a Multi-Well Plate Channel Device With Reversible Seals
*Haipeng Zhang, Carson Emeigh, Stephen Brooks, Timothy Wei, Sangjin Ryu,
Yiannis S. Chatzizisis, and Xiang-der Liu*